RadiMation® EMC software
------- User manual -------

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The information contained in this document describes how RadiMation® can be configured and used to perform EMC measurements. Read the standard(s) that apply to the device under test for information on the implementation of EMC measurements.
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RadiMation® EMC software

RadiMation® EMC software
------- Preface -------

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Preface

Thank you for purchasing RadiMation® Version 2022.3 EMC test software from Raditeq. RadiMation® is a professional EMC test software package, used for full compliant EMC testing as well as pre-compliance testing and engineering purposes. RadiMation® is developed and written in close co-operation with EMC test engineers of Raditeq and EMC experts of other test houses. Due to the direct feedback between test engineers and software developers, the RadiMation® software is ideally matched to the needs of EMC test engineers. Our software engineers told me "they had forgotten to implement the software bugs". However, I am afraid this is wishful thinking.

Version 2022.3 contains many improvements that you will find useful.

Of course, as with any software package, the improvement of functionality and addition of new features will always be needed. Your suggestions for any changes are welcome and will be studied for implementation in new updates of the software.

We hope that you will find the RadiMation® EMC test software as useful, configurable and powerful as we do.

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May 2020

RadiMation® EMC software
------- Getting started -------

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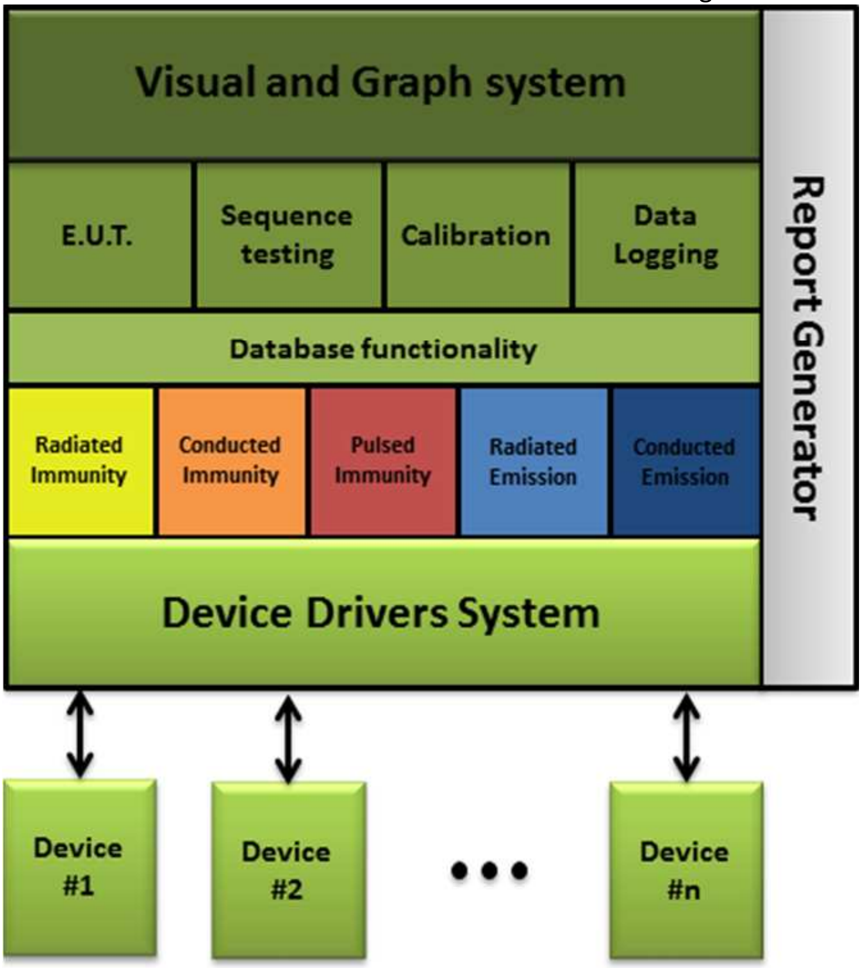
Getting started
Chapter 2 "Getting Started" provides information relevant to first time use of RadiMation®. This includes (but is not limited to) a product overview and installation guide, as well as the configuration of some basic settings (such as passwords, users, languages and test parameters).
For more (detailed) information, follow the links and references in the text, or go straight to the chapter related to your topic of interest.

2.1 Software overview

RadiMation® consists of a software core and 7 complementing software modules. It can be used to perform 5 different types of EMC tests, calibrations, sequence testing and has an automatic report generation function.
An overview of the RadiMation® software is visible in the figure below:



The RadiMation® Core consists of the following components:

- The Visual and Graph System
- The EUT data management System
- Sequence Testing
- Calibration
- Data Logging
- Database Functionality
- The Device Driver System

Depending on the requirement, one ore more modules can be added to the RadiMation® Core. The different modules are integrated in one single software package. The separate modules are:

- Radiated immunity testing (RI)
- Conducted immunity testing (CI)
- Pulsed immunity (ESD, EFT, Surge)
- Radiated emission testing (RE)
- Conducted emission testing (CE)
- Report generator
- Excel Exporter

The implementation of different modules in one software package has a number of advantages compared to other software:

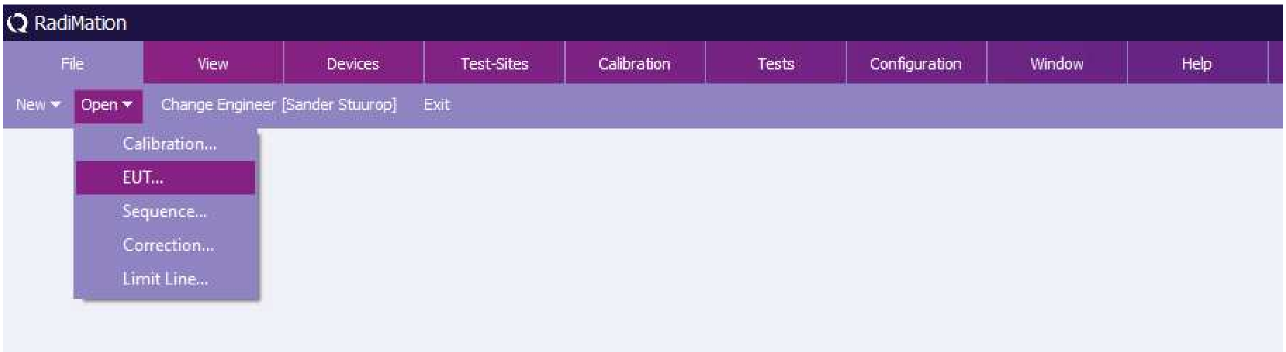
- Easy to use because all the modules have the same "look & feel".
- Seamless data exchange between the different modules.
- Calibration functionality enables an easy exchange of the calibration files.
- Different types of tests can be performed, fully automatic, after each other (Sequence testing).
- Fast automatic report generation, made possible by one data repository for all test data.

2.2 Conventions

RadiMation® uses the Windows structure of pull down menu's. In this manual the pull down menu's are visualized as followed:

- **File**
  - **Open**
    - **EUT**

The example above shows that, to show the file open selection window, the **'File'** item from the menu bar should be selected first, followed by the **'Open'** item and then the **'EUT'** item.
A screenshot of these menu items is visible below:



2.3 Hardware and software requirements

There are certain requirements that the PC(-environment, used to perform the EMC tests) needs to comply with to run RadiMation®.

2.3.1 Hardware requirements

The RadiMation® software makes extensive use of data calculations, bus interactions (to control the test equipment) and screen interactions (for the use of graphs). Because of this the processor

performance is very important and a dedicated PC for RadiMation® is required. Running other programs on the same computer can cause compatibility problems and is not supported. Programs which are supported are the programs used by RadiMation®, such as Word, Excel and MySQL.
To use the software to its full extent the following hardware configuration is required:

- Processor type: 2 GHz minimum, > 3 GHz recommended
- Free RAM memory: 1 GB minimal, > 2 GB recommended
- Free hard disk space: 1 GB minimal
- Monitor resolution: Full HD (1920 x 1080) or larger
- IEEE card: Any GPIB Card that is supported by the National Instruments NI-488.2 Software Library

2.3.1.1 Memory

RadiMation® needs a considerable amount of memory to perform at its best. We recommend that you have at least 512 MB (Mega Bytes) of free memory available, but more if possible. Free memory is defined as the amount of free RAM *without* having to use the swap file. Thus, not the specification of the total amount of memory that the machine has. The following steps are to help you determine the amount of free memory in your PC:

1. Cold boot your machine from power off, not from hibernate or restart.
2. Determine the total amount of memory put into the computer.
3. Start the windows task manager and determine the commit charge.
4. Calculate the amount of free memory by subtracting the amount of memory of the commit charge from the amount of memory put in the computer.

If the amount of free memory is less then 512 MB, there are several options to obtain more free memory. Depending on the configuration and situation, the following options are available:

- Insert additional memory modules into the machine.
- Remove/uninstall programs with large memory usage that do not involve measuring, for example VNC viewers.
- Prevent programs from starting automatically during the booting of the computer.

2.3.1.2 GPIB card

If a GPIB connection to one of the measurement equipments is used, the GPIB hardware and software needs to be installed correctly before RadiMation® is installed. Raditeq is not responsible for any additional costs or delays that may occur if this card is not installed prior to the installation of RadiMation®. The used GPIB card has to be supported by the National Instruments NI-488.2 software library. At least version 15.0 or higher of the NI-488.2 software should be used. RadiMation® is able to use any version of National Instruments NI-488.2 which is 15.0 or higher, so it is not needed to update the NI-488.2 library as long as the installed version is supported by National Instruments and RadiMation®.

2.3.2 Software requirements

The RadiMation® software is supported on all the Microsoft Windows operating systems that are still supported by Microsoft. If a specific version of Microsoft Windows is still supported, can be checked on Microsoft Lifecycle Policy pages. Both the 32-bit and 64-bit versions of these operating systems are supported. In order to run RadiMation it is required that the used operating system is up to date. It can result in severe delays during an installation in the case that Windows Updates are not completely updated and installed.

2.3.2.1 Microsoft .NET framework

The Microsoft .NET Framework 4.6.1 is also required, but this will be automatically downloaded and installed by the RadiMation setup program, if it is not yet installed. A working internet connection is required in that case.

2.3.2.2 Microsoft office

It is required to have a supported, licensed and working version of Microsoft Office Word installed on the PC. This should be at least Microsoft Word 2016 or higher, as Microsoft Word 2013 and lower has no mainstream support anymore from Microsoft. RadiMation® uses Microsoft Office Word to generate and print the printouts, besides creating the reports. The RadiMation® report generater can create reports in the following formats:

- Microsoft Word
- Microsoft Excel

2.3.2.3 Installation

During the installation of RadiMation® a network/PC administrator from the IT department must be available. This person must be able to grant rights (for one day or more) and have sufficient knowledge of the (local) network. Raditeq is not responsible for any additional costs or delays that may occurs if this support is not provided.
When RadiMation® is installed for the first time, it needs to be installed with administrator rights. Upgrades have no need for full rights (although rights to perform installations are required). To update RadiMation® the following rights needs to be set:

- Read rights to the 'C:\' drive
- Full rights to the installation directory (e.g. 'C:\Program Files\Raditeq', please note that the path may be different depending on the used OS and language)

2.4 Software installation

2.4.1 First time software installation

To install the RadiMation® software, please download the RadiMation® setup program from our download website at: https://www.raditeq.com/radimation-download/ . Once the download has been finished, the setup program can be started. The Installation Wizard will guide you through the installation process. After installation the computer must be restarted before running RadiMation®. Please read User rights and installation about the user rights and information that is required for first time installation.

2.4.2 Software installation on a network

In a network environment multiple computers are connected with each other though a shared communication medium. This provides several advantages compared to a local installation. One of these benefits is that data can be shared between the connected computers. The RadiMation® software is designed to optimally use this advantage. All the data that is used or generated by RadiMation® can also be shared on the network. In most cases we recommend the use a of network configuration over a local configuration.

Note: When RadiMation® is using a network configuration the program itself will still be executed from the local computer. It is therefore neither cached nor running directly from the network.

To fully use the functionality of data sharing, the configuration of RadiMation® should be changed slightly. Make the necessary alterations by following the steps below:

1. Create a shared network directory (with the appropriate rights) on one of the Network Servers. Your Network Administrator can help you with this. This directory will be called <NetworkDir> from now on.
2. Create a drive assignment for this specific <NetworkDir>. This will avoid the use of excessive path depths. Your Network Administrator can also help you with this step.
3. Create a sub-directory with the name <Setup> in the <NetworkDir>.
4. Copy the RadiMation® setup.exe file from the CD-ROM (or, if you downloaded RadiMation®, directly from local disk) to the <Setup> directory in the <NetworkDir>.
5. Install RadiMation® on one of the network computers. This can be done by launching the setup.exe program. Use the installation procedure as described in the previous section.
6. In the <NetworkDir>, create the following sub-directories:

- CAL_File
- CONFDVDR
- COR_File
- EUT_File
- LLF_File
- Printout
- RGO_File
- RGT_File
- SEQ_File
- TSF_File

7. Start the installed RadiMation® program and open the Configuration window. On the **Directories** tab, change the location of the **Device Driver Configuration** directory to the CONFDVDR directory in the <NetworkDir>. (Note: do not change the other directories yet.)
8. Restart the RadiMation® program.
9. Open the Configuration window again and on the **Directories** tab, change the location of all the other directories to the corresponding directories in the <NetworkDir>.
10. Restart the RadiMation® program again.
11. The RadiMation® program will use the <NetworkDir> as its main data directory from now on.
12. Start the Configuration of the RadiMation® software as described in the remaining part of this chapter. The complete configuration will be written to the <NetworkDir>.

When the RadiMation® software is installed on another computer in the network, the following steps can be used:

1. Install the RadiMation® software from the <Setup> sub-directory in the <NetworkDir>. Use the installation procedure as described in the previous section.
2. Start the installed RadiMation® program and open the Configuration window. On the **Directories** tab, change the location of the **Device Driver Configuration** directory to the CONFDVDR directory in the <NetworkDir>.
3. Restart the RadiMation® program.

The newly installed RadiMation® will now use the already configured <NetworkDir>.

2.4.3 Automated / Silent installation

RadiMation® is not provided as a .MSI file that can be used by network administrators to perform an automated installation on a lot of PC's. However RadiMation® is provided as an .EXE file that does accept additional command line arguments that can be used to perform an automated silent installation. The following arguments can be specified to the RadiMation® setup .EXE program:

Argument	Purpose and explanation
/SP-	Disables the 'This will install ... Do you wish to continue?' prompt at the beginning of the setup
/SILENT	Instructs the setup program to be silent
/VERYSILENT	Instructs the setup program to be very silent
/SUPPRESSMSGBOXES	Instructs the setup to suppress message boxes
/LOG	Causes setup to create a log file in the user's TEMP directory
/LOG="filename"	Same as /LOG, except it allows to specify a fixed path/filename to use for the log file.
/NOCANCEL	Prevents the user from cancelling during the installation process.
/NORESTART	Prevents Setup from restarting the system following a successful installation, or after a Preparing to Install failure that requests a restart.
/DIR="x:\dirname"	Overrides the default directory name
/HELP	Shows a detailed explanation of all the command line parameters

The RadiMation® SETUP.EXE also contains the DRIVERS.EXE that was actual at the moment that the SETUP.EXE was build. That embedded DRIVERS.EXE will automatically be installed during the installation of the RadiMation® version. If in the same directory in which the SETUP.EXE is located, also an 'AUTOINSTALLDRIVERS.EXE' is present, then that 'AUTOINSTALLDRIVERS.EXE' will be installed instead of the embedded DRIVERS.EXE. The 'AUTOINSTALLDRIVERS.EXE' can be created by just renaming the desired DRIVERS.EXE to 'AUTOINSTALLDRIVERS.EXE'.

2.4.4 Installing software updates

Software updates can be downloaded from the RadiMation® Download page. These updates are supplied as RadiMation® versions with a higher version number.
Once the download of the new version has been finished, the setup program can be started. The setup program will install the new RadiMation® version at the same location as the previous older, but in a separate installation folder. This will allow you to use the previously installed RadiMation® version, as well as the new one.

2.4.4.1 Installing from a network directory

If the already installed RadiMation® version was installed from a network directory, the new setup file can be copied to the <Setup> sub-directory of the <NetworkDir>.
The new RadiMation® version can then be installed on each computer from that <Setup> sub-directory. This installation still has to be started manually, RadiMation® will not automatically detect that a newer version is available on the network directory, and it will not automatically start the installation of the newer version.

2.4.4.2 Updating device drivers

After the new RadiMation® version is installed, we strongly recommend that you install the latest device drivers as well. These device drivers can be installed by starting the 'DRIVERS.EXE' program that can be downloaded from our RadiWiki website.
The DRIVERS.EXE program will detect the different RadiMation® versions installed on your PC. A dialog will start, asking you to select the RadiMation® version that needs updated device drivers. Select the latest version of RadiMation® that was just installed.

You have successfully obtained the latest released version of RadiMation® when both the software and device drivers have been updated.

Note: We strongly advice that a you make a complete backup of all your files and directories (e.g. TSF/Sequence/Correction/Calibration and EUT) before installing a RadiMation® update.

Warning: Do *NOT* uninstall RadiMation®!! This will cause removal of all user settings, TSF, sequence, calibration and correction files. This is unrecoverable.

2.5 User rights and installation

For a new installation or an update, different user rights are required.

2.5.1 New installation

A new installation can only be performed with administrator rights. When installed without administrator rights a successful installation is not guaranteed.

2.5.2 Update

To update the RadiMation® software, the user must have the rights to read and write in the RadiMation® folder, which is normally located in the C:\Program Files (x86)\Raditeq\ directory.

2.5.3 Daily usage

For daily usage of the RadiMation® software, no specific rights are needed. Every standard end-user should be able to start and use the already installed RadiMation® software.

2.6 Software protection key

Software protection key

The RadiMation® software is copy protected with an USB Software protection key. The USB Software protection key should be connected to the PC while a RadiMation® test is running, or when the report generator or Excel Exporter is used. The USB Software protection key is not needed to open and review the test results.

A network license or a floating license of the USB Software protection key is not available, and each RadiMation® test PC should thus have it's own USB Software protection key physically connected to the PC.

2.7 Software configuration

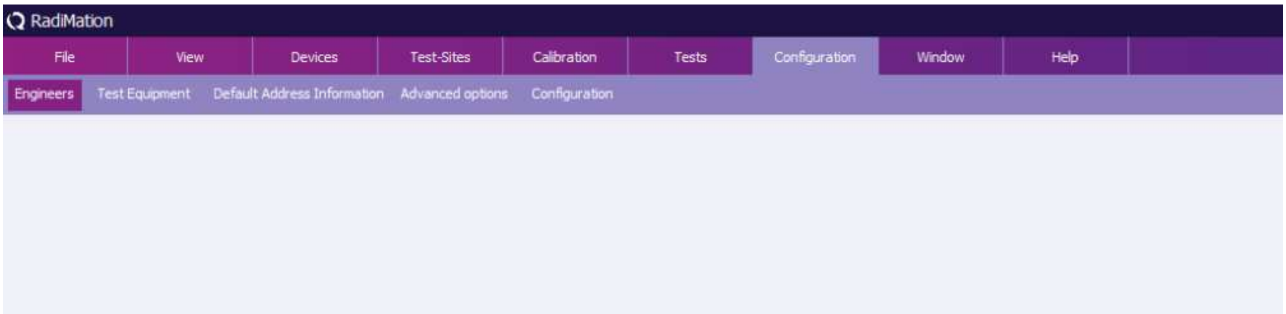
In the main menu, under the configuration pull down menu, a number of standard configurations can be made. The selected and/or entered configurations will be used as the default settings for future use.
The next paragraphs will explain the required configurations.

2.7.1 Password protection

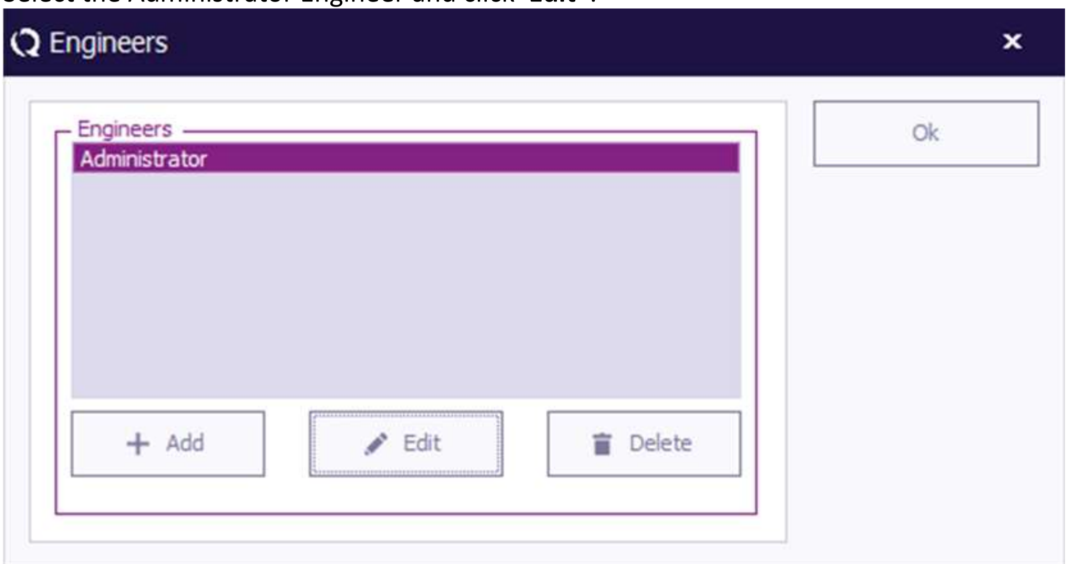
RadiMation® allows you to protect a number of configurations with a password.

- The password is standard turned on for the default used test engineer 'Administrator'.
- The default password is **Radimation**.

To change the password protection settings, go to the **'Engineers' window** in the **'Configuration' tab**.



Select the Administrator Engineer and click **'Edit'** .

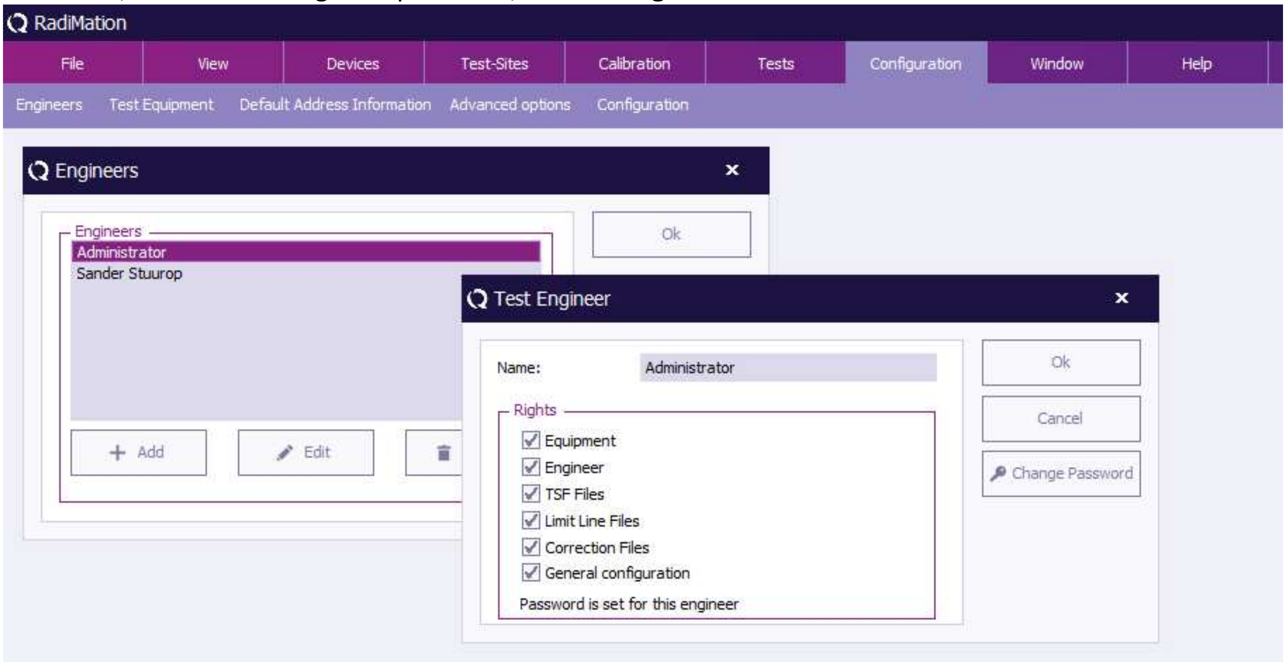


In the (Administrator) **'Test Engineer' window** the password can be enabled, disabled or changed. The current password setting for the selected engineer is displayed at the bottom of the window. This will indicate whether a password has been 'set' or 'not set'.
In addition, the protection can be enabled or disabled for the following items.

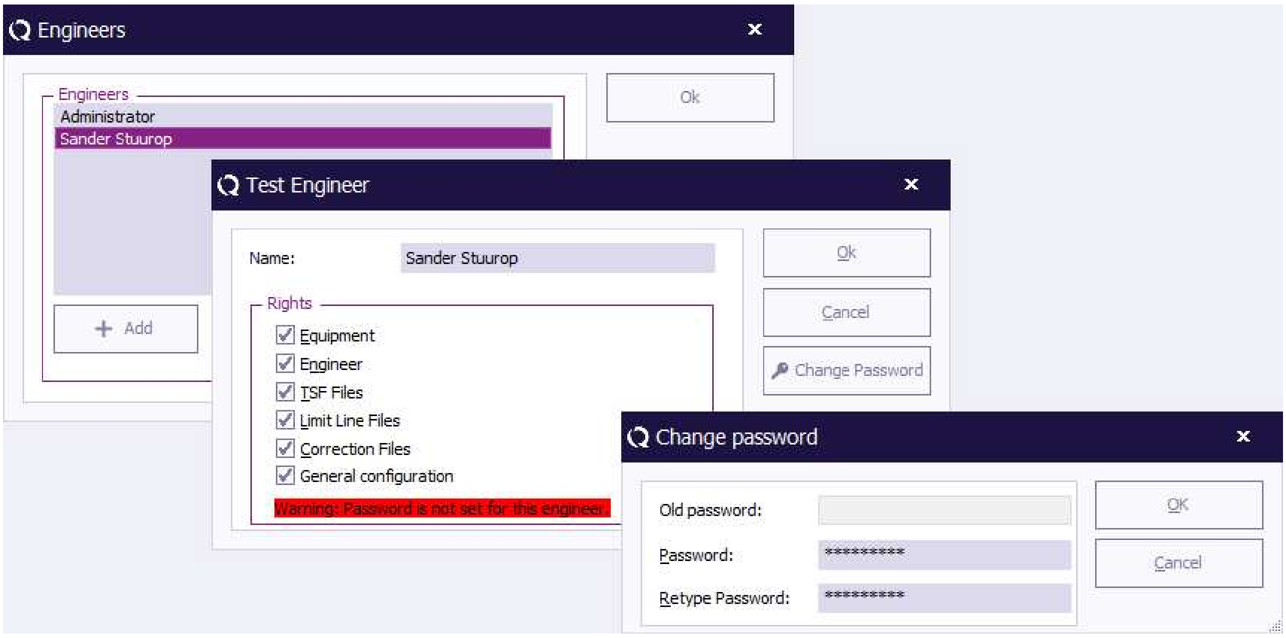
- **Equipment** Prevents unauthorized changes to test equipment configuration.
- **Engineer** Prevents unauthorized changes to test engineers configuration.

- **TSF Files** Prevents unauthorized changes to Test Setup Files (TSF) files.
- **Limit Line** Prevents unauthorized changes to Limit Line Files (LLF) files.
- **Correction File** Prevents unauthorized changes to correction files.
- **General Configuration** Prevents unauthorized changes to the general configuration.

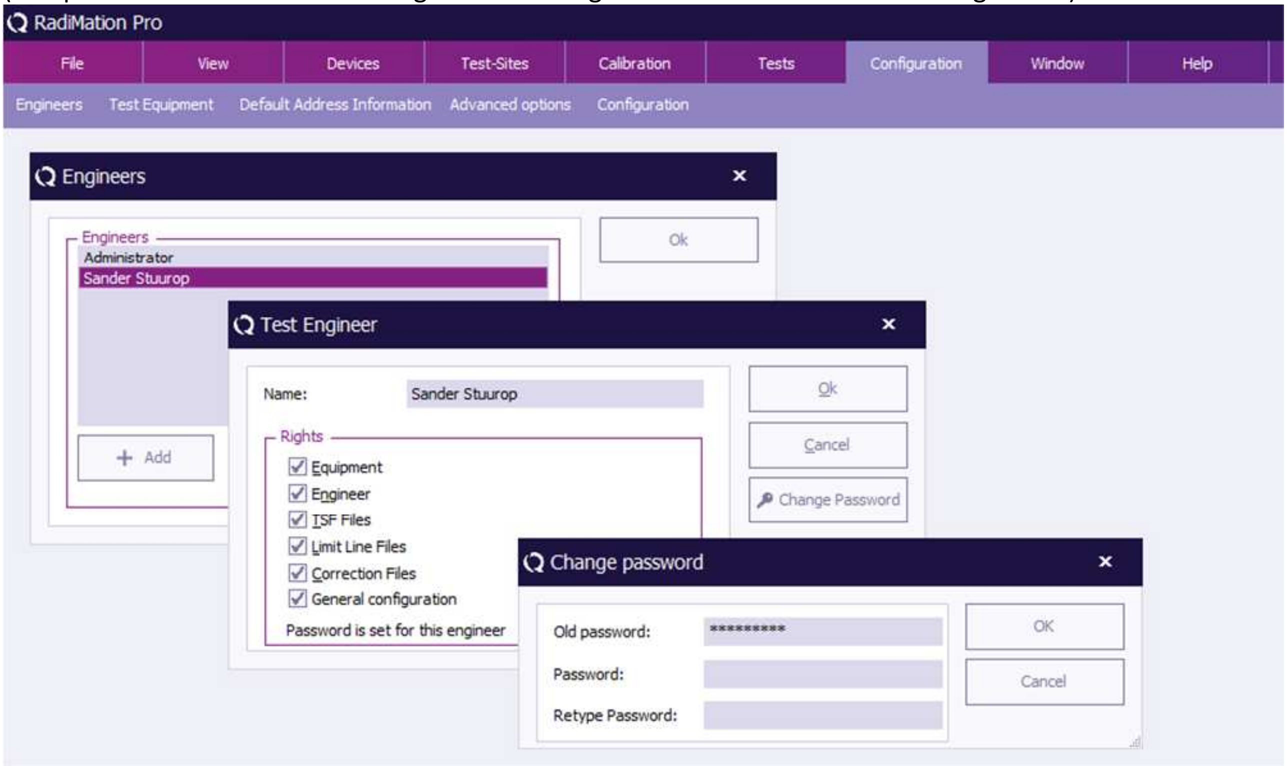
To enable, disable or change the password, click **'Change Password'** .



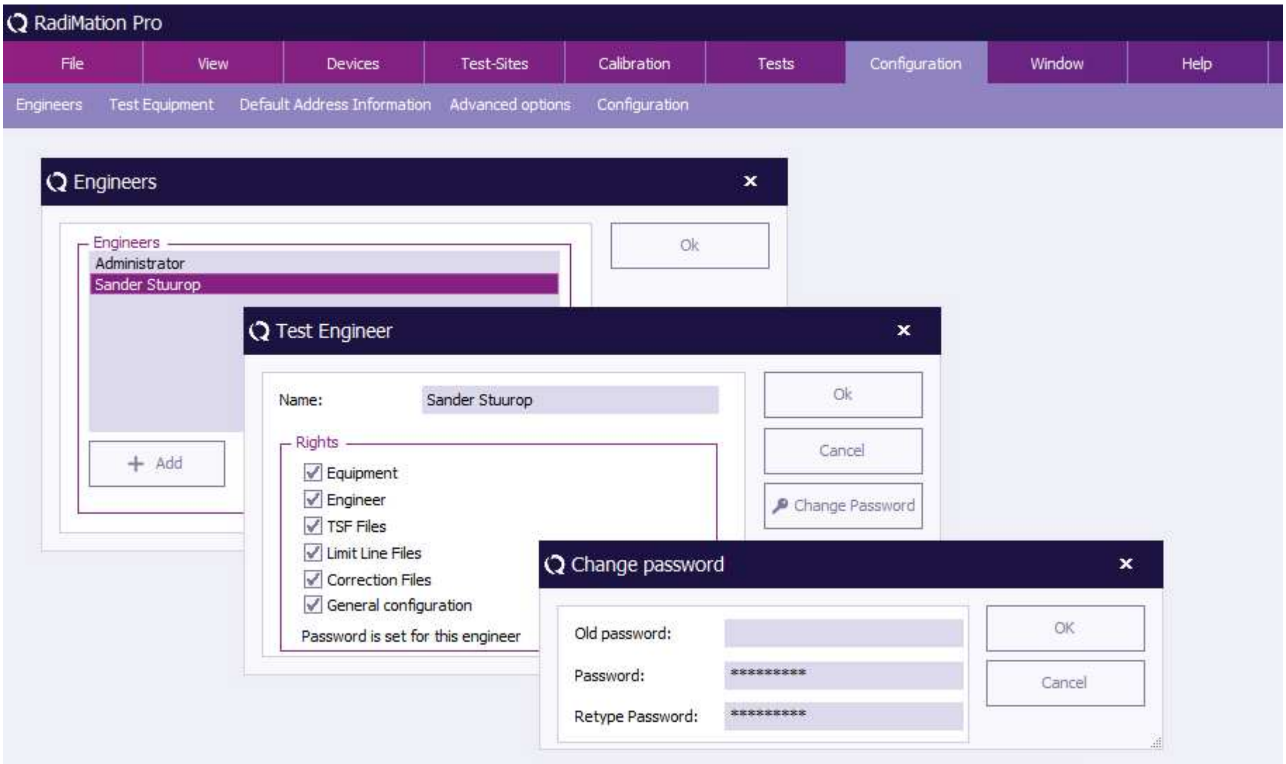
To change the password, enter the old password and the new password (twice), then click **'OK'** . You will be returned to the **'Test Engineer' window**.



To disable the password, enter the old password and leave the other two fields empty, then click **'OK'** . You will be returned to the **'Test Engineer' window**.
(The password indication will change to: "Warning: Password is not set for this engineer.")



To enable the password, enter the new password (twice), then click **'OK'** . You will be returned to the **'Test Engineer' window**.
(The password indication will change to: "Password is set for this engineer.")

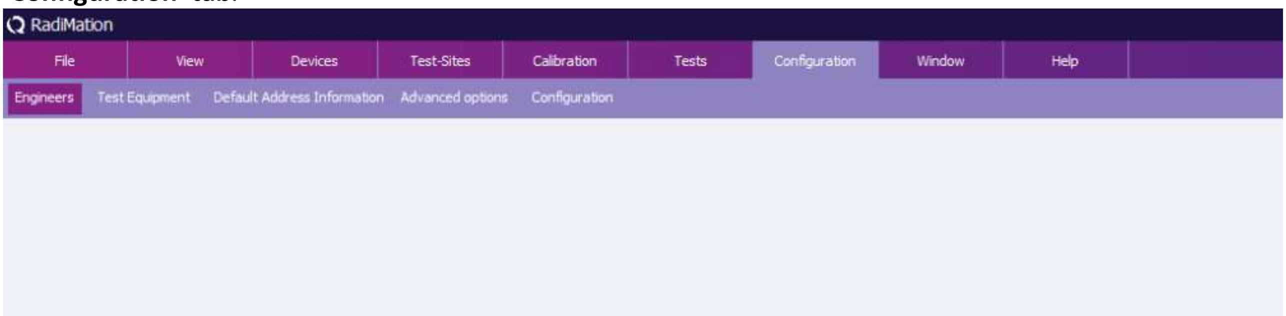


To leave the **'Engineers' window**, click **'OK'** .

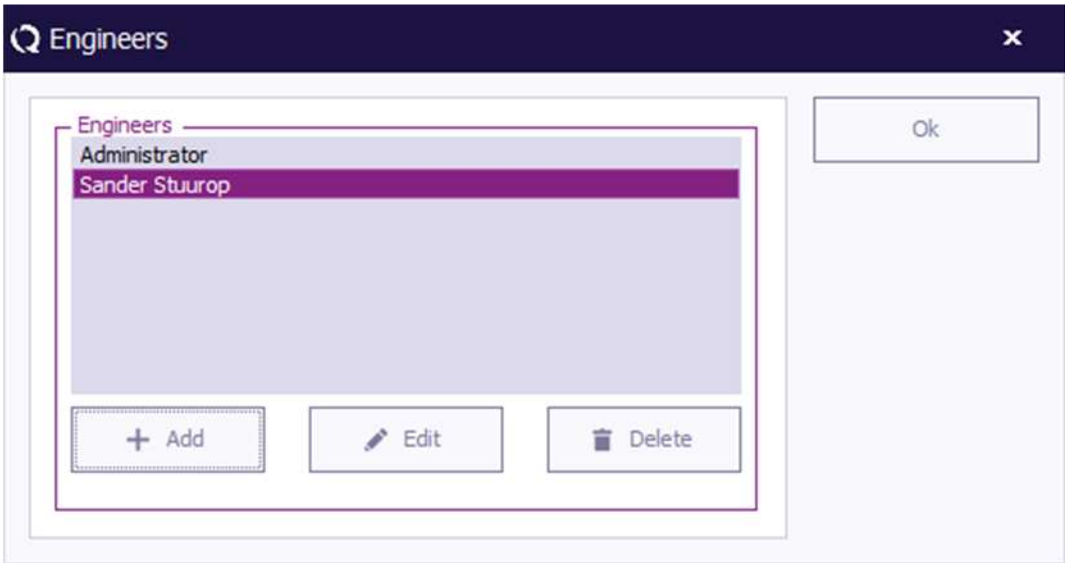
2.7.2 Test engineers

For each test, the name of the test engineer performing the current test can be entered.

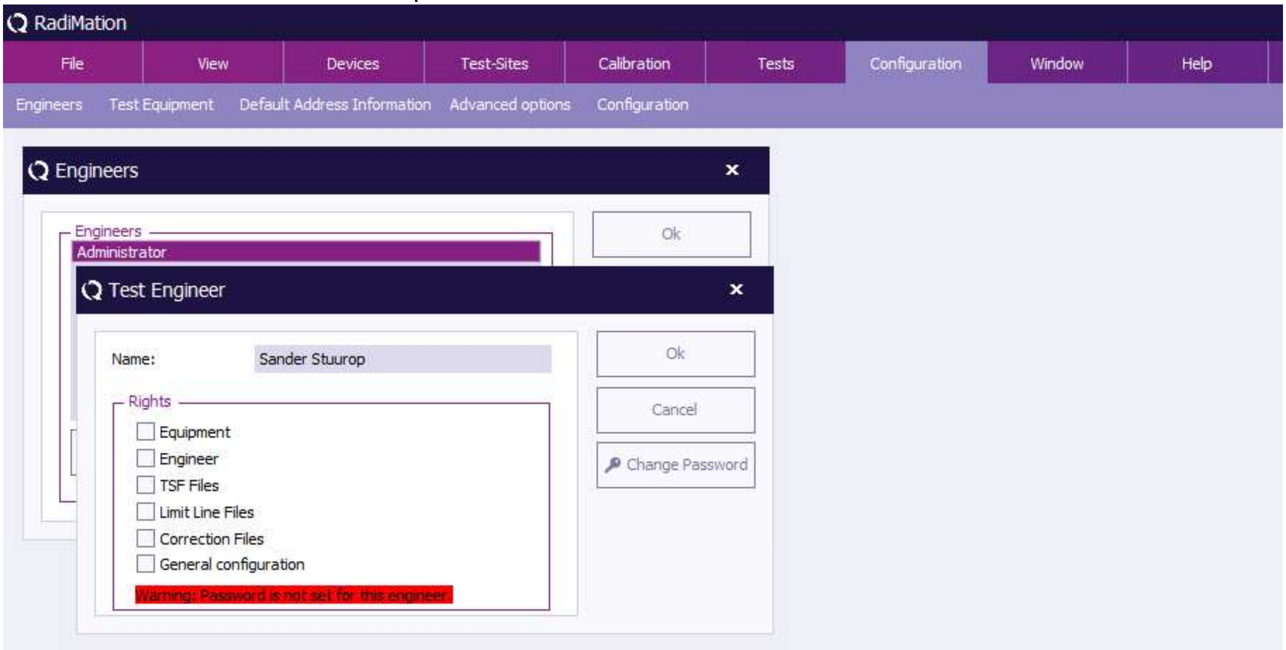
To add, delete or edit (the names of) test engineers, go to the **'Engineers' window** in the **'Configuration' tab**.



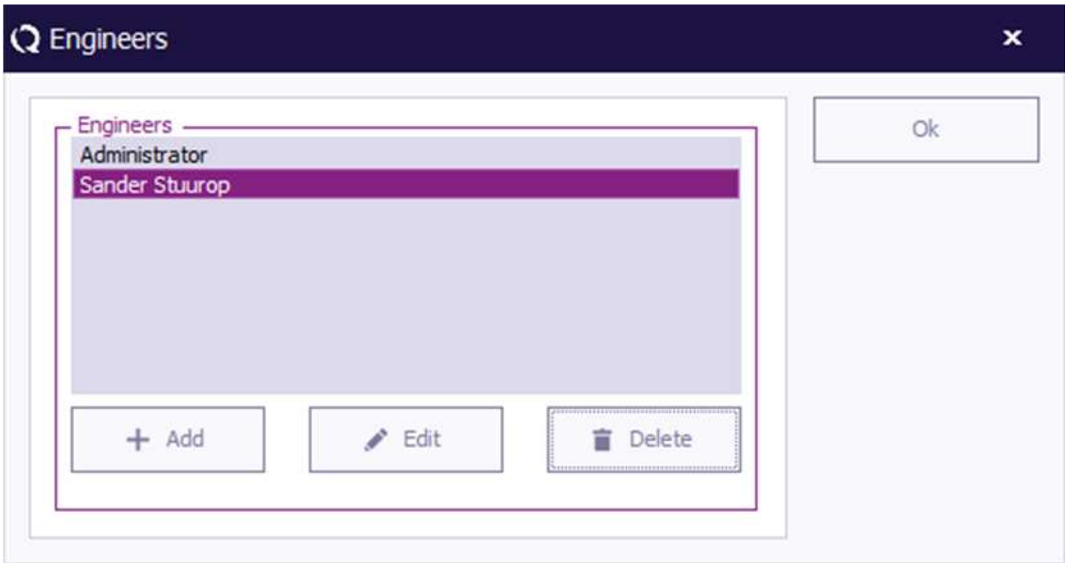
The Engineers window will show the current configured list of engineers. To leave the **'Engineers' window**, click **'OK'** .
To add a new test engineer, click **'Add'** .



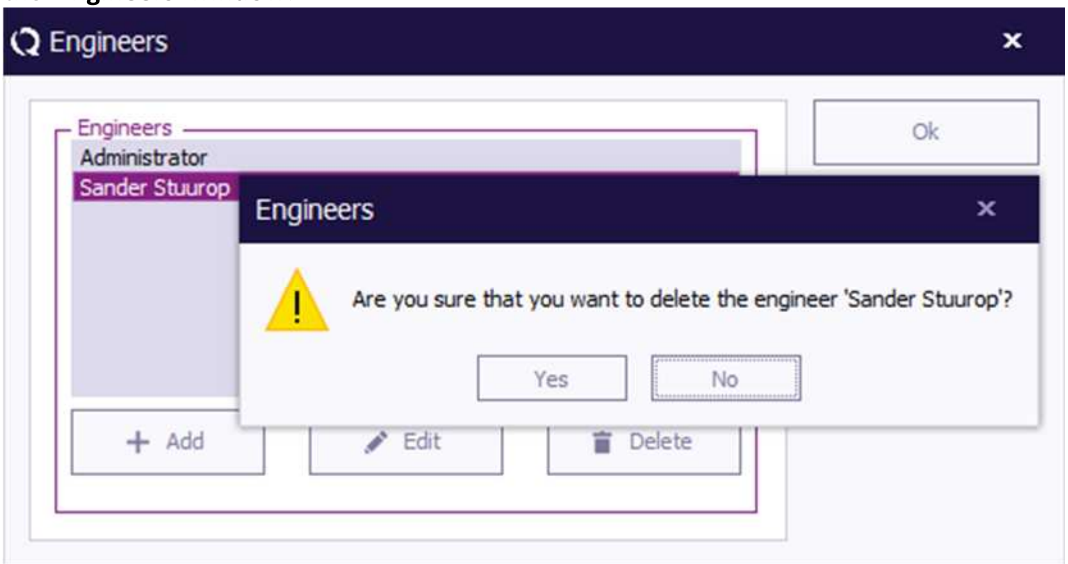
Enter the name and set the rights of the new engineer, then click **'OK'** . You will be returned to the **'Engineers' window**.
The new engineer will not have a protection password (yet), this can be enabled by clicking **'Change Password'** . Please read Password protection for more information.



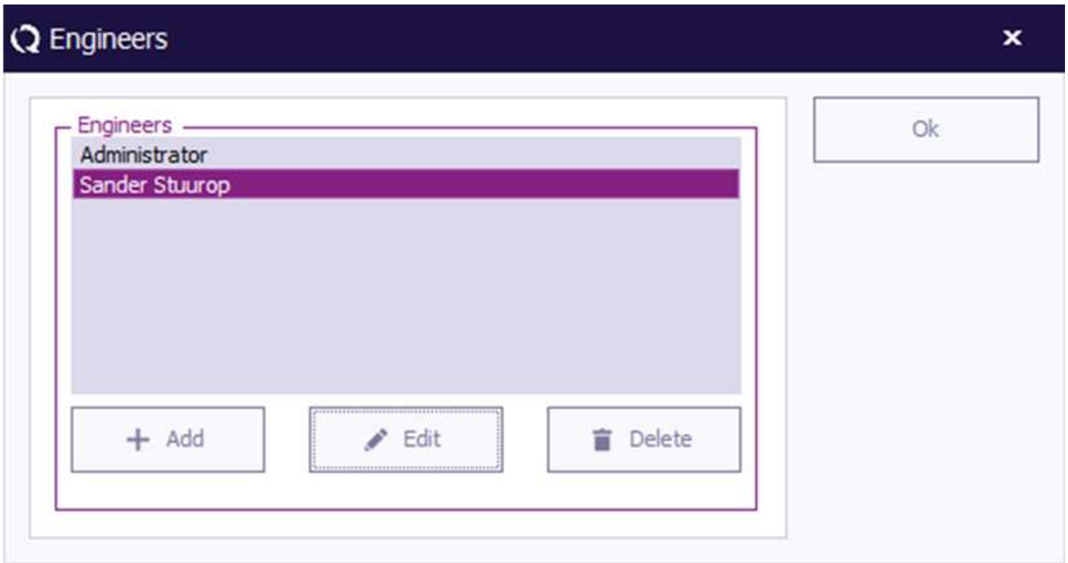
To delete a test engineer, select the engineer and click **'Delete'** .



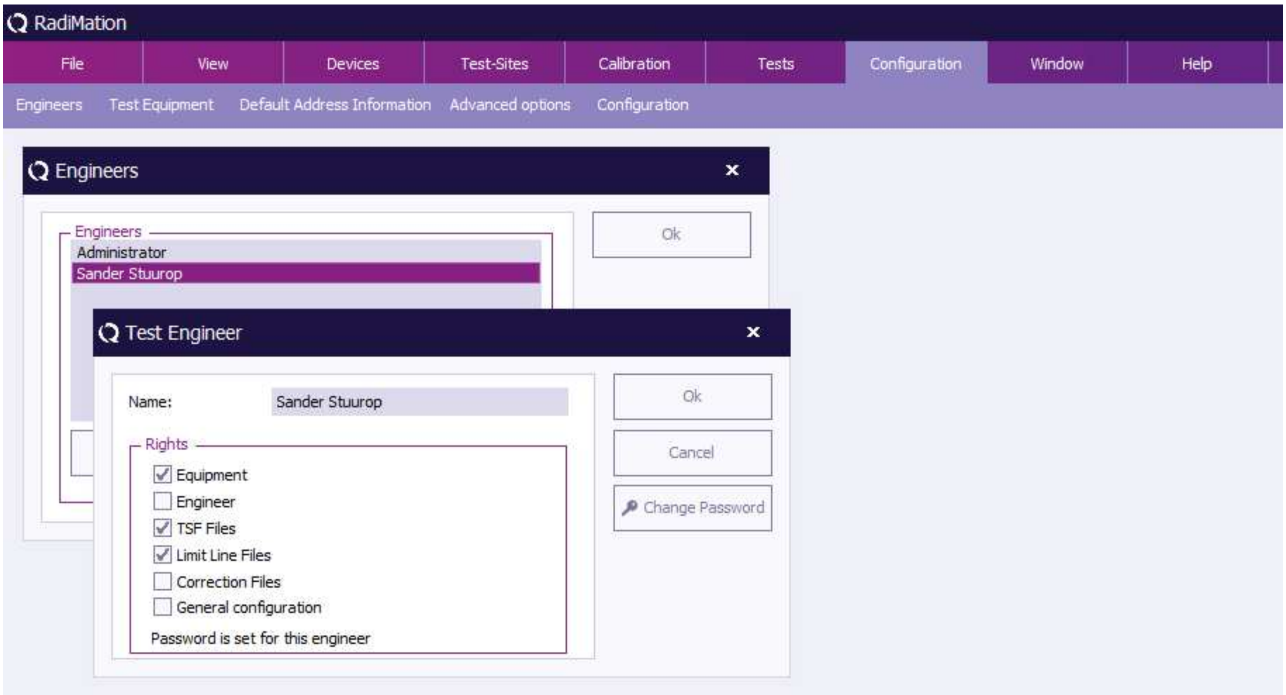
To confirm that you want to delete the engineer from the configuration list, click **'Yes'** .
If you do not want to delete this engineer from the list, click **'No'** or **'Cancel'** . You will be returned to the **'Engineers' window**.



To edit the name, rights and/or password of an engineer, select the engineer and click **'Edit'** .



Make the desired changes in the **'Test Engineer' window** and click **'OK'** .
If you want to undo or cancel your changes, click **'Cancel'** . You will be returned to the **'Engineers' window**.



2.7.3 Default address information configuration

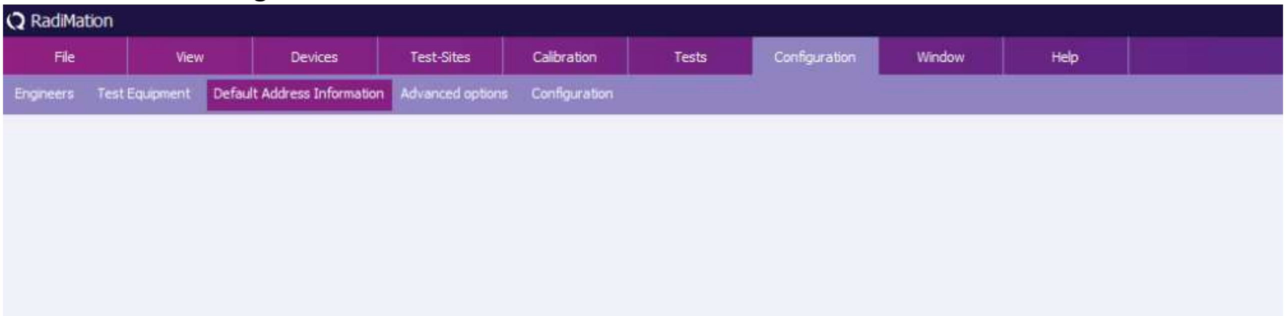
When you make a new EUT file the name and address information of the producer, test house and client can be entered separately.
In many situations one or more of this information will be the same for different EUT files (i.e.: when a test house owns the software, the test house data will always be the same).
To prevent users from having to enter repetitive data input, RadiMation® provides the option to set default address information for:

- The default client

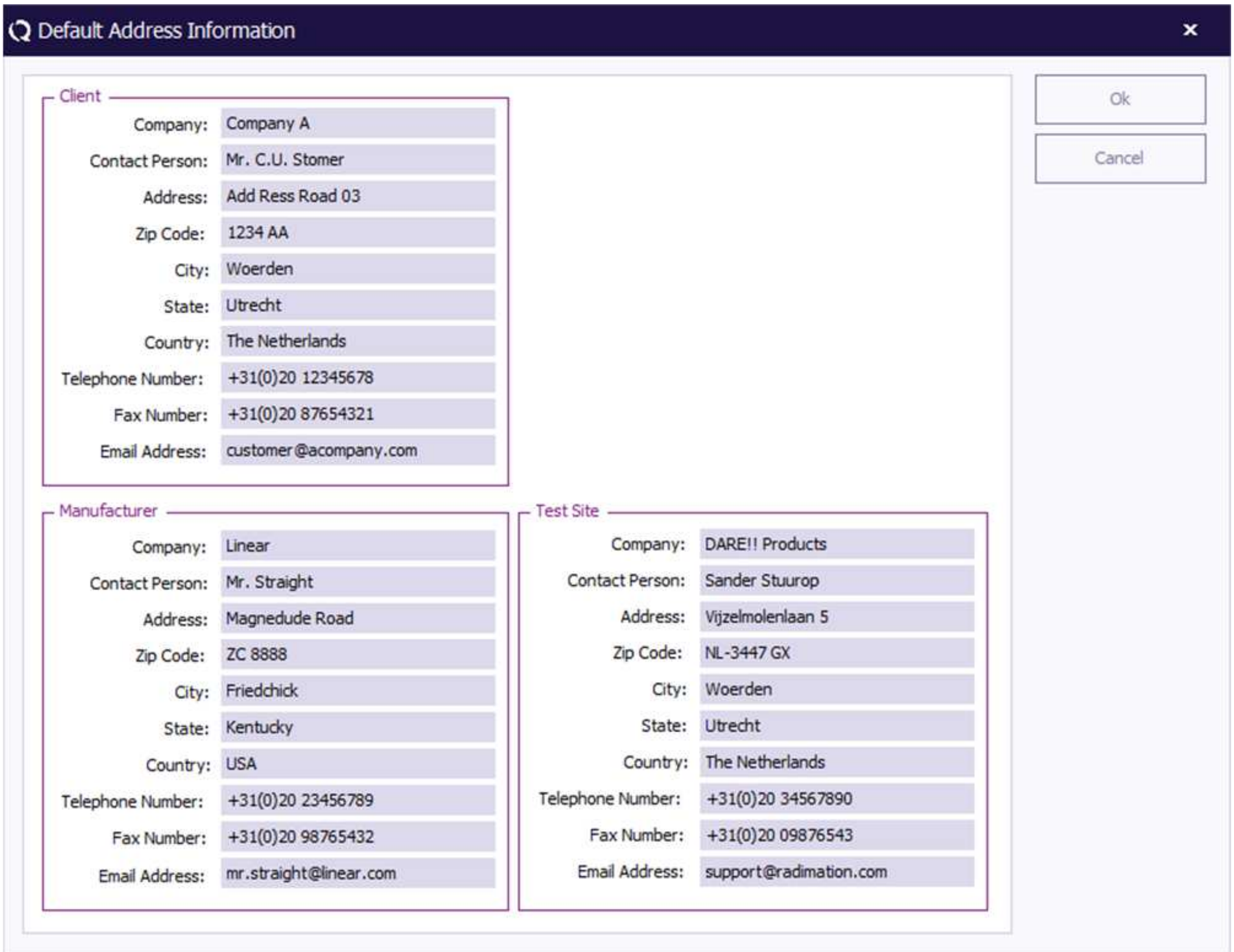
- The default manufacturer
- The default test site

Data entered under **'Default Address Information'** , will automatically be entered in the EUT window and therefore only needs to be entered once.

To add, modify or delete the default address information, go to the **'Default Address Information' window** in the **'Configuration' tab**.



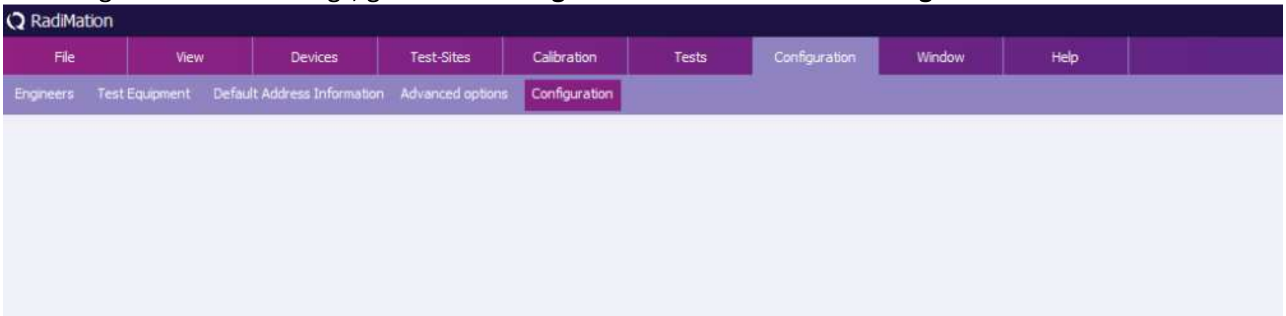
Enter the desired information as shown in the example below.
To confirm the data input, click **'OK'** , to cancel the data input, click **'Cancel'** . The **'Default Address Information' window** will close.



2.7.4 Default Units

RadiMation® allows the user to define the default units. These units are used throughout the software package and can be changed at any time during measurements and viewing.

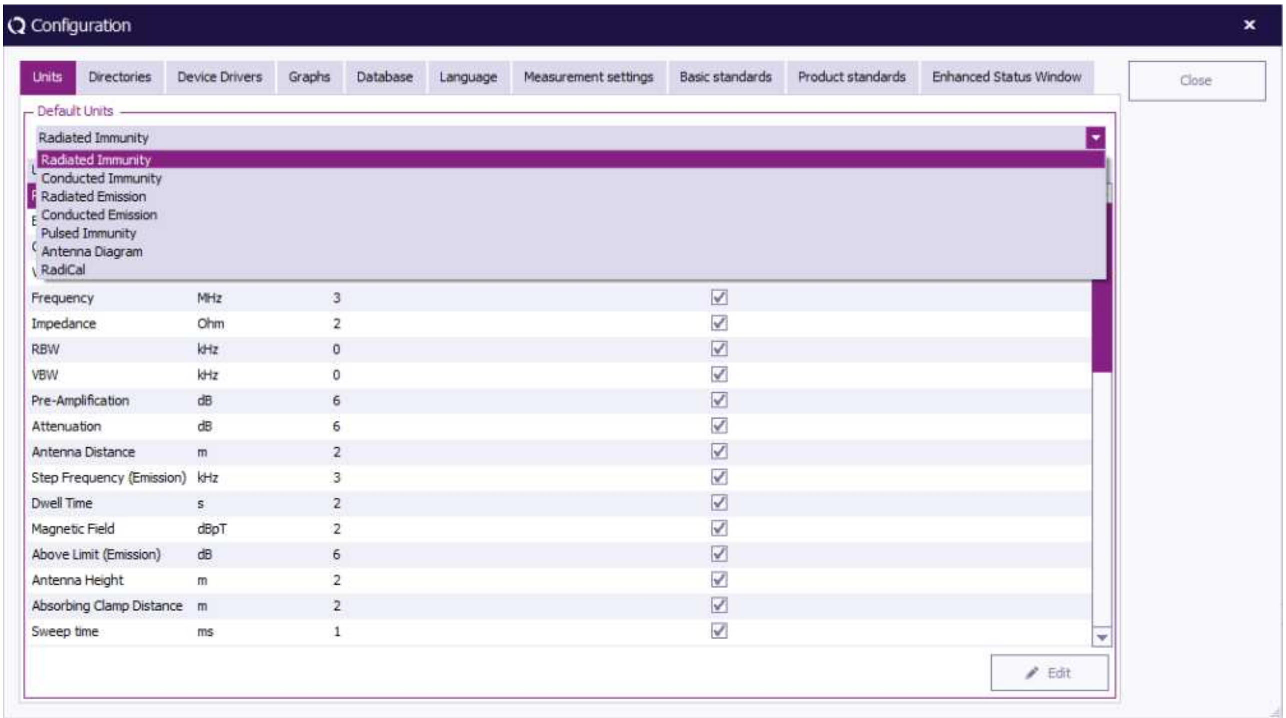
To configure the unit settings, go to the **'Configuration' window** in the **'Configuration' tab**.



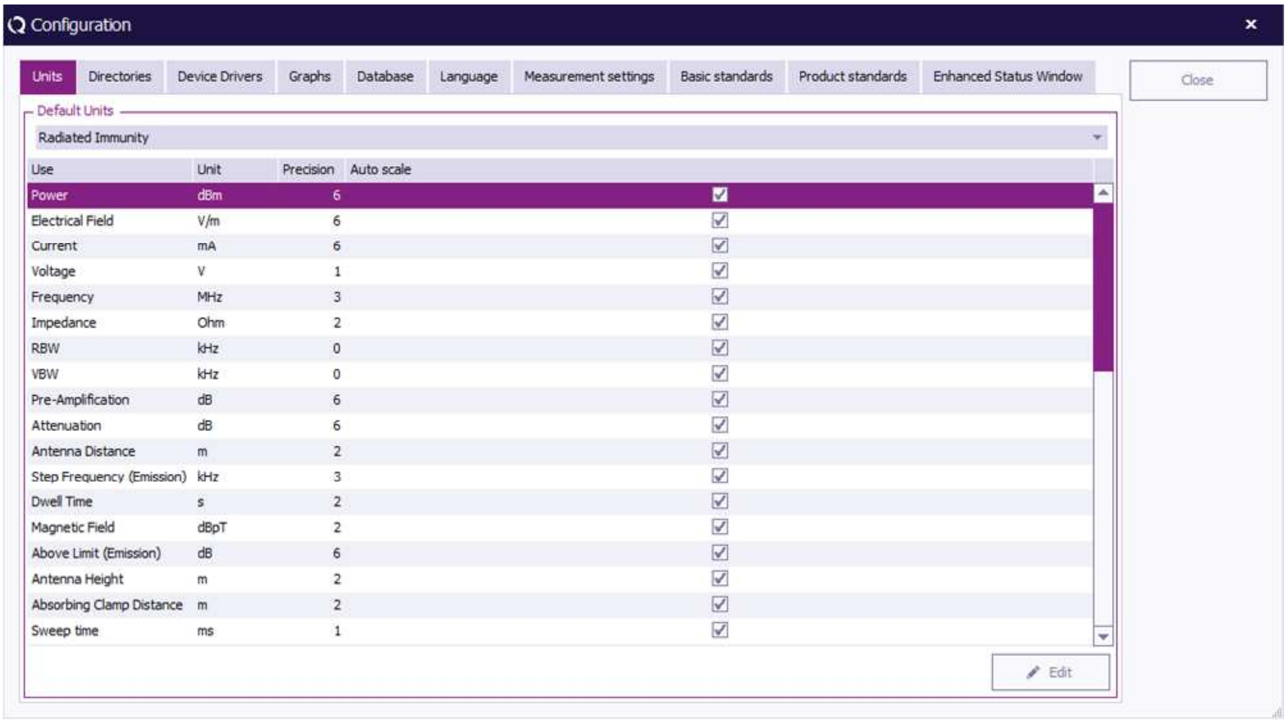
The default settings for the different units can be set in the **'Units' tab**.
It is possible to define different units for different tests. The following can be selected:

- Radiated Immunity
- Conducted Immunity
- Radiated Emission
- Conducted Emission
- Pulsed Immunity
- Antenna Diagram
- RadiCal

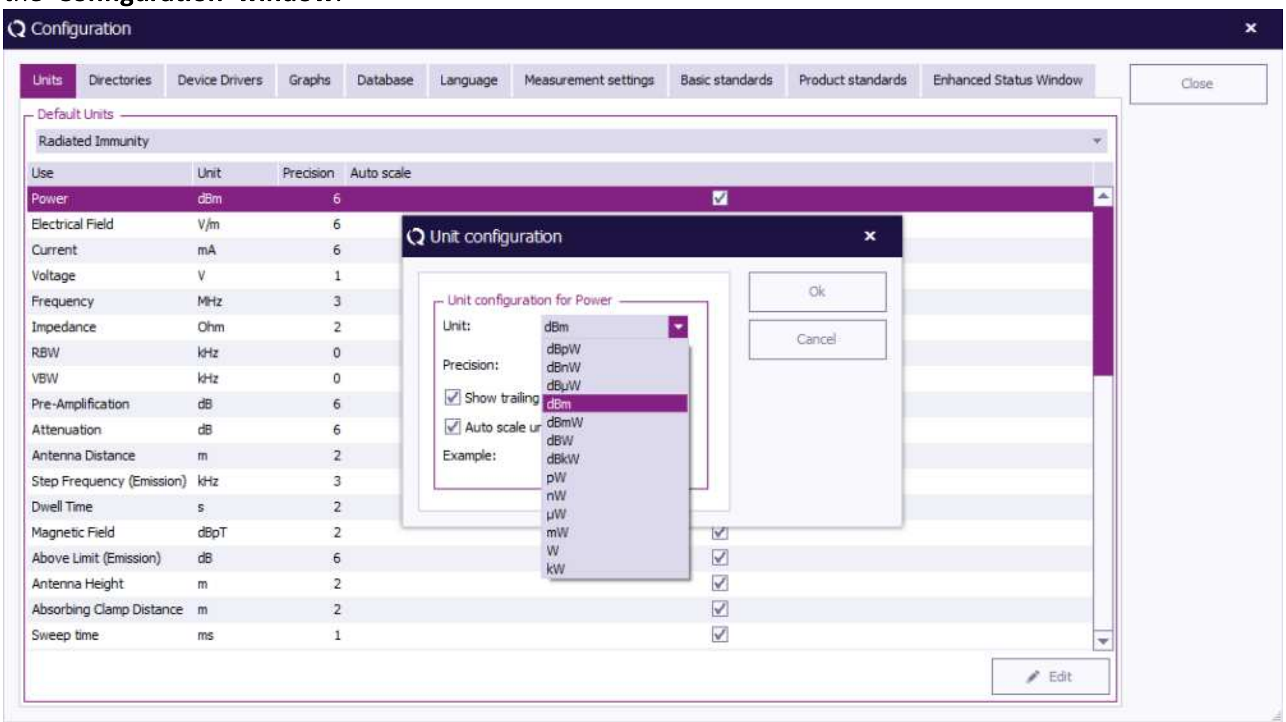
To change the settings of a unit, choose the desired test (e.g. Radiated Immunity) from the drop down menu in the **'Units' tab**.



Select the measurement (e.g. Power) and click **'Change'.**



The 'Unit configuration' **window** will appear, allowing you to change the parameters of the unit. To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.



Click **'Close'** to leave the **'Configuration' window**.

2.7.5 Default directories configuration

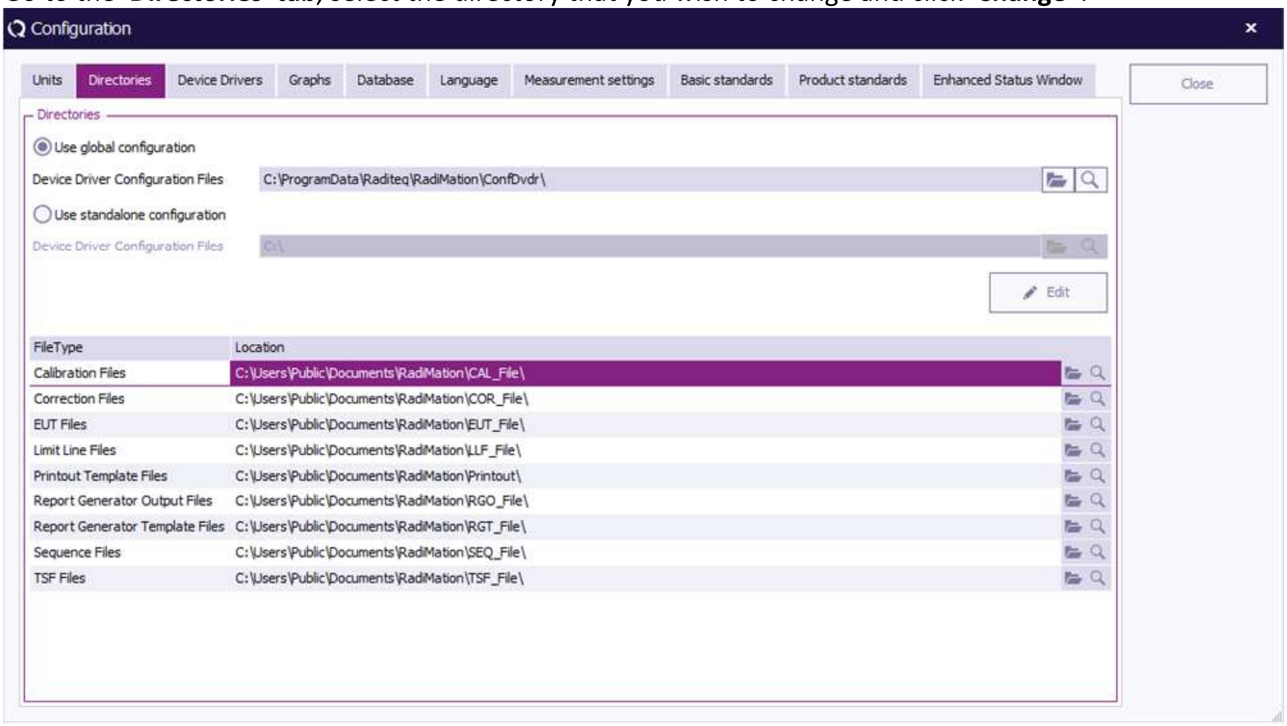
The RadiMation® software can use different directories to store different data file types.
The location of the following file types can be specified:

- Equipment Under Test Data files (*.EUT files),
- Correction files (*.COR files)
- Calibration files (*.CAL files),
- Configuration files (*.TSF files),
- Sequence files (*.SEQ files),
- Limit line files (*.LLF files).
- Printout files (*.DOC files).

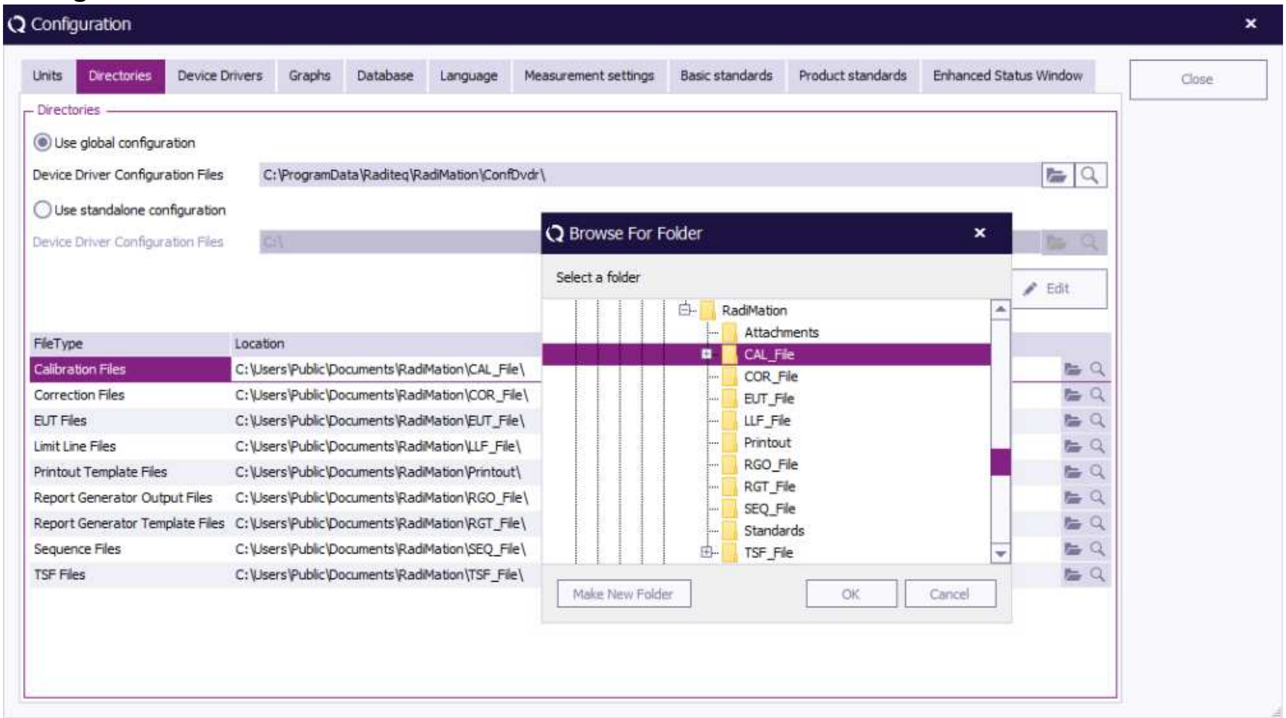
The different file types are described in Chapter 18 “RadiMation® file types and locations”.
For each data type the default location can be entered through the configuration. The path name can link to a directory on a local or network drive.
Selecting a network drive will allow you to store data (e.g. EUT data) on a computer network, making it more accessible.

To modify a path name, go to the **'Configuration' window** in the **'Configuration' tab**.

Go to the **'Directories' tab**, select the directory that you wish to change and click **'Change'** .



The **'Browse For Folder' window** will appear, allowing you to select (or make) a new folder in your directory.
To confirm your change, click **'OK'** , to cancel your change, click **'Cancel'** . You will be returned to the **'Configuration' window**.

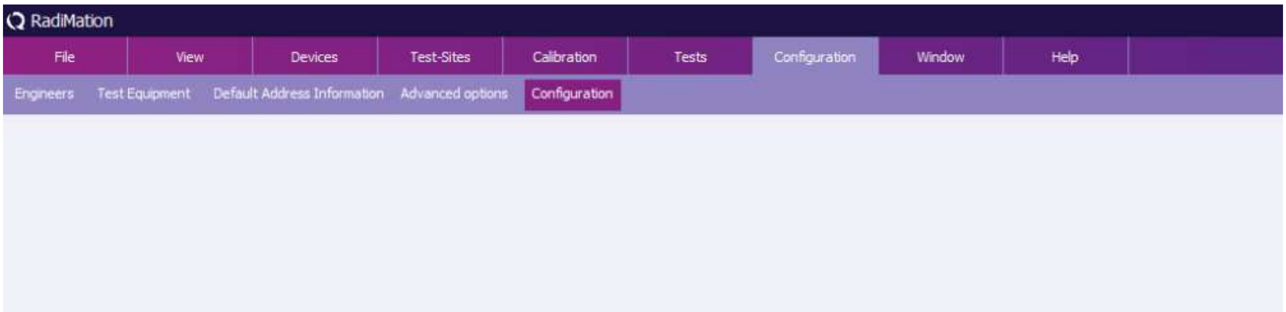


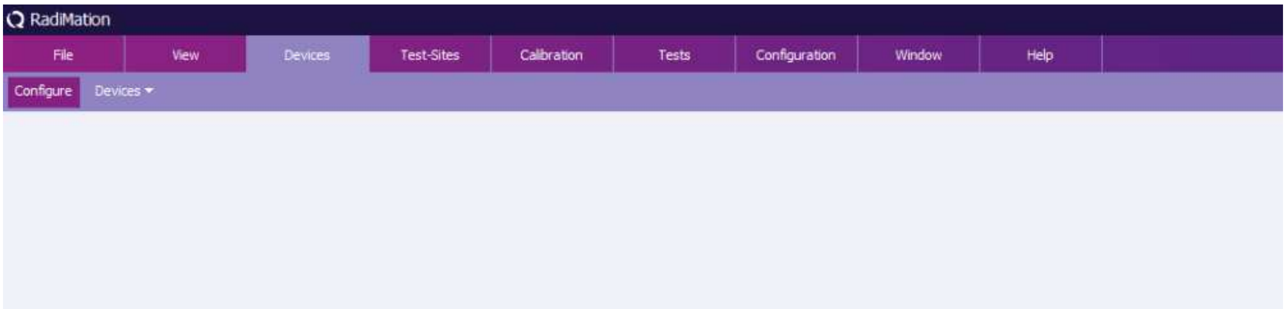
Click **'Close'** to leave the **'Configuration' window**.

2.7.6 Device driver configuration

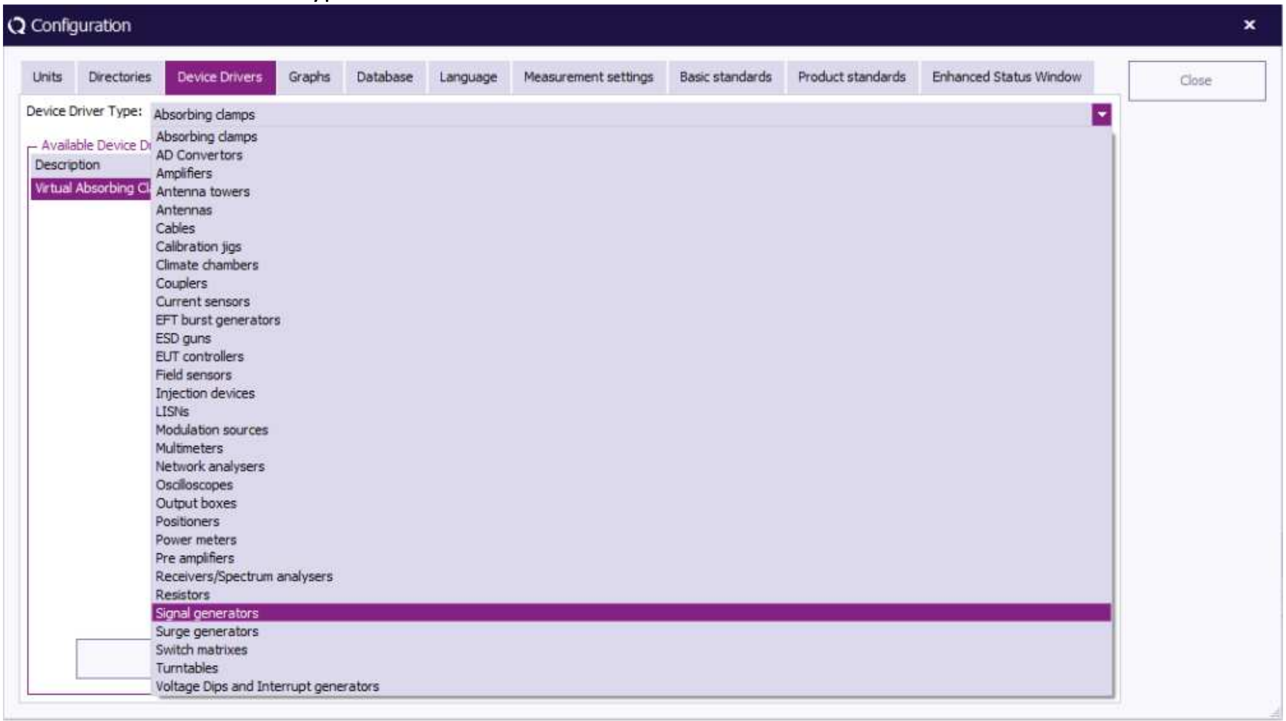
Device drivers let your software know which equipment has to be used and controlled during EMC tests.
In RadiMation®, the device drivers only need to be configured to the customer requirements once.
During the configuration of the device driver, information such as the IEEE address or RS232 COM-port has to be entered.

You can configure the device drivers in the **'Configuration' window**.
This window can be accessed in one of two ways, either through the **'Configuration' tab** or through the **'Devices' tab**.

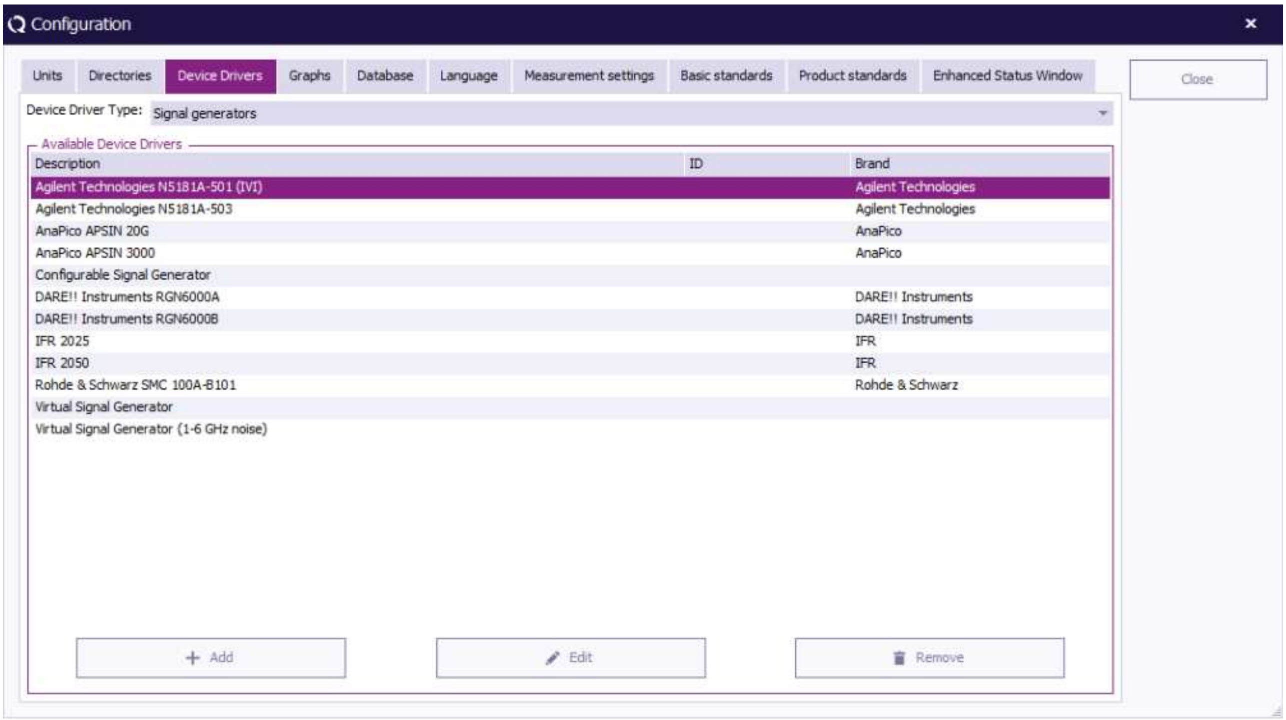




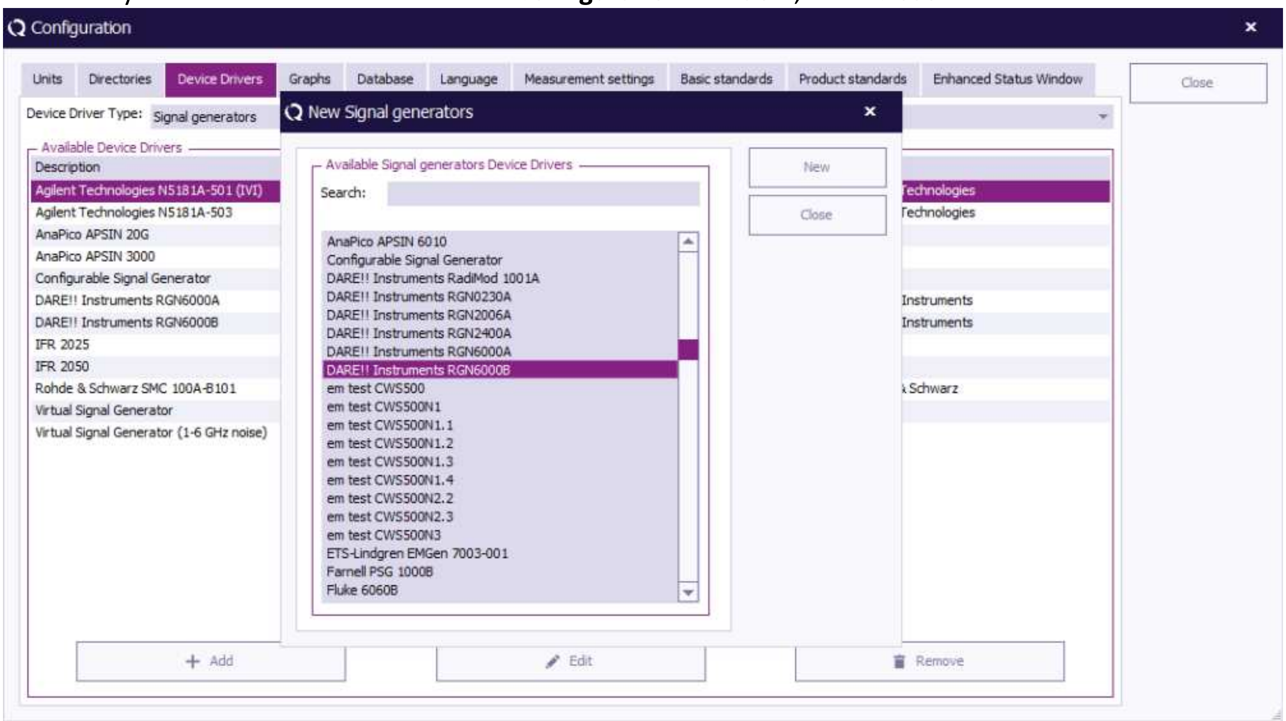
To configure a device driver, go to the **'Device Drivers' tab** in the **'Configuration' window**.
Select the desired **'Device Driver Type'** from the drop-down menu (e.g. Signal Generator). The available drivers for that type will be shown.



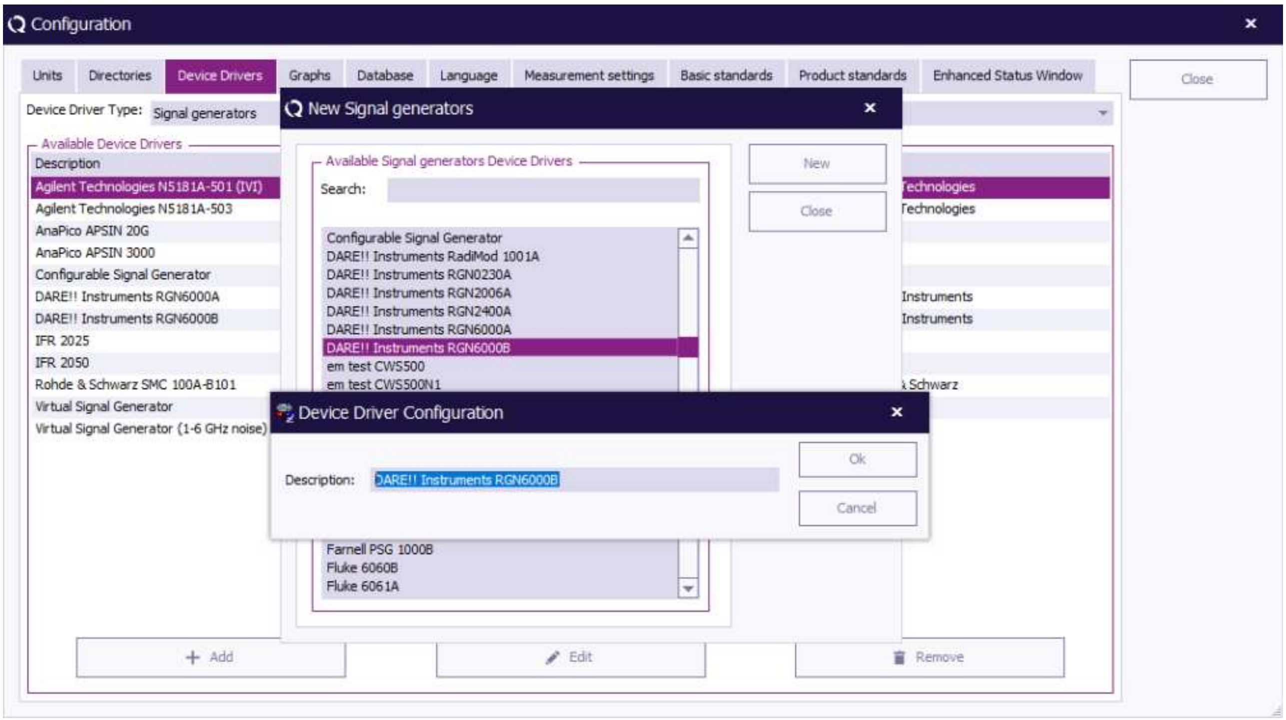
To create a new RadiMation® device driver, select the desired **'Device Driver Type'** (e.g. Signal Generator) and click **'Add'** .



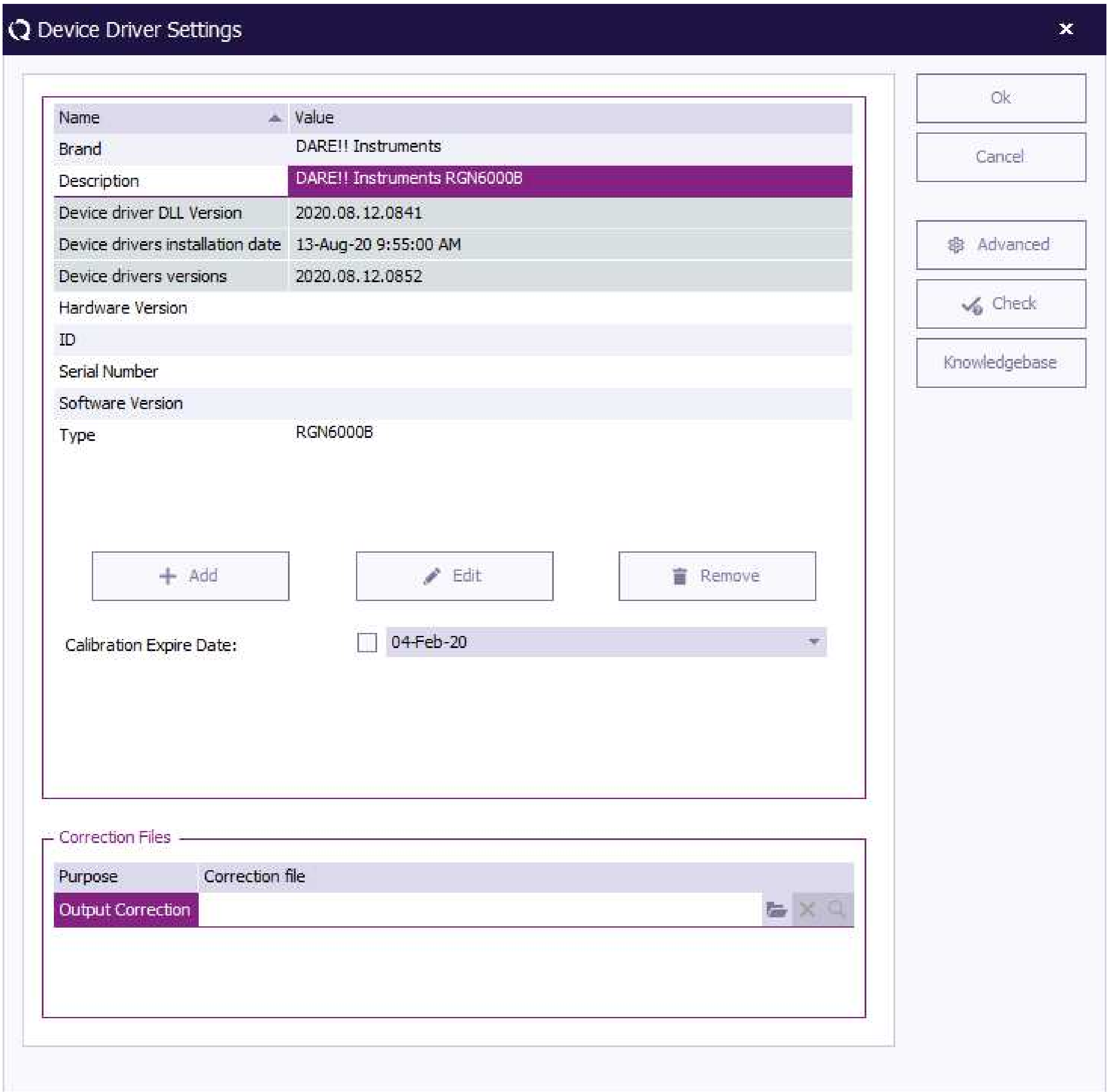
Select a new device driver (in the scroll menu or through the search function) and click **'New'** .
To cancel your selection and return to the **'Configuration' window**, click **'Close'** .



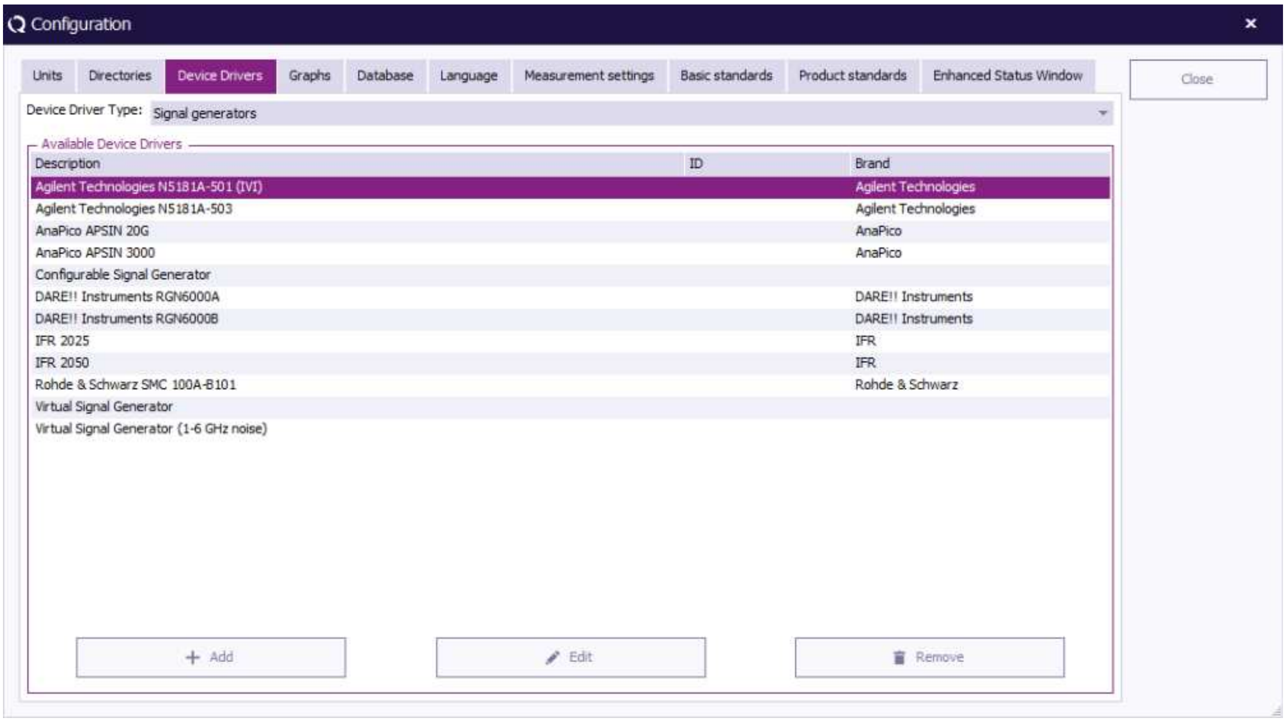
The name/description of the chosen device driver can be changed in the **'Device Driver Configuration' window**.
To confirm your changes (or the provided description), click **'OK'** , the **'Device Driver Settings' window** will appear.
To cancel your changes, click **'Cancel'** . You will be returned to the previous window (e.g. New Signal generators).



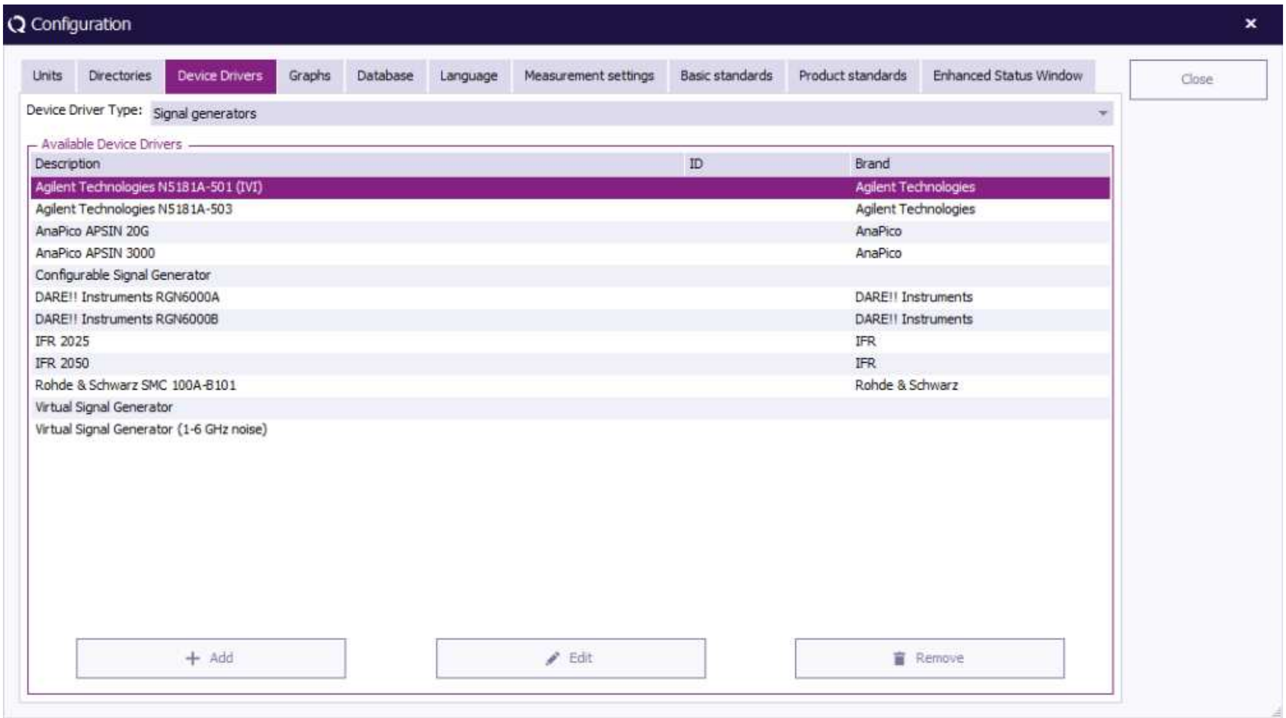
The **'Device Driver Settings' window** will appear with information on the selected device driver. In this window information can be added, edited and removed.
To confirm the settings, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.
More detailed device driver settings are described in the paragraph "Device Driver settings" in Chapter 14.



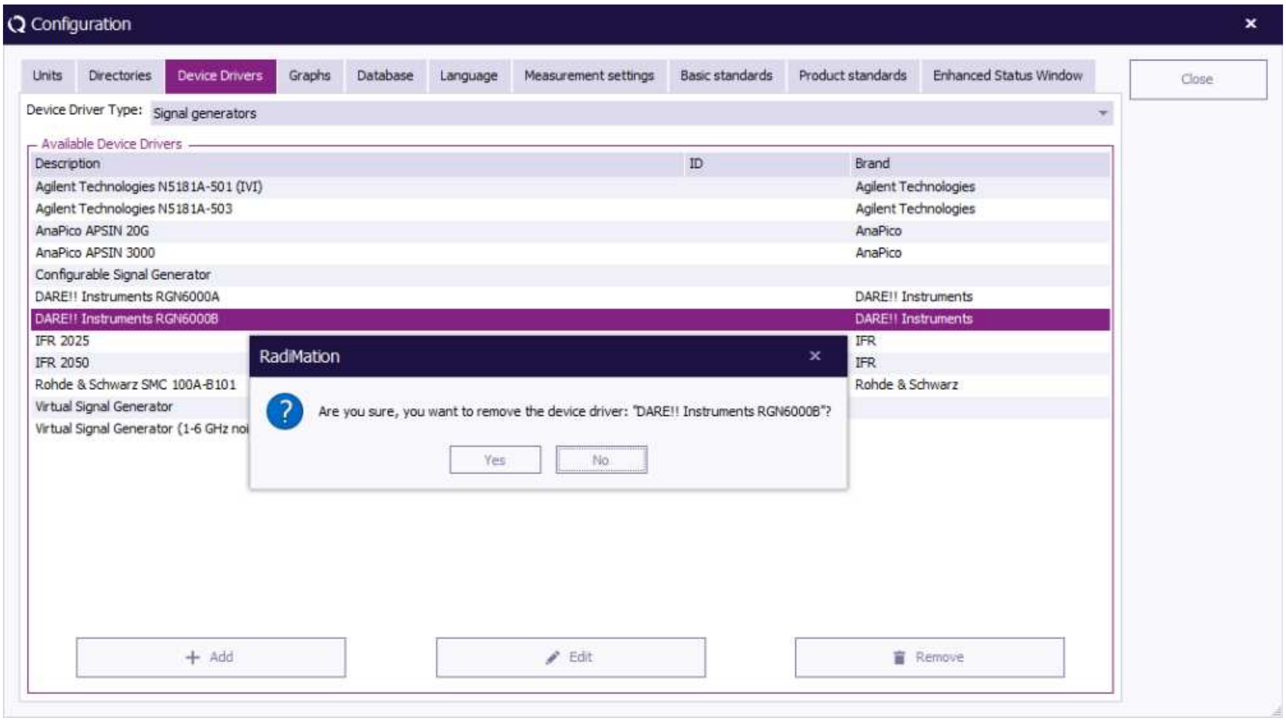
To edit an existing device driver, select the desired (device driver) type and device driver, then click **'Edit'** . (The **'Device Driver Settings' window** will appear.)



To remove an existing device driver, select the desired (device driver) type and device driver, then click **'Remove'** .



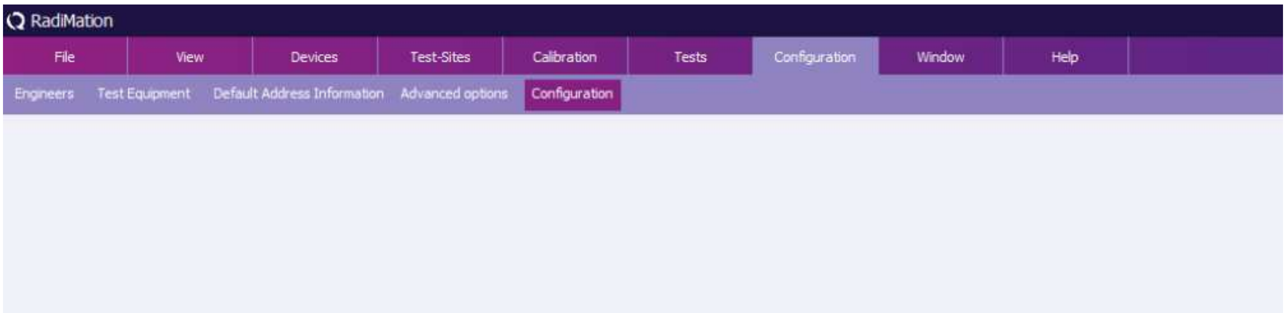
A confirmation window will appear. To remove the selected device driver, click **'Yes'** , to cancel, click **'No'** . You will be returned to the **'Configuration' window**.



Click **'Close'** to leave the **'Configuration' window**.

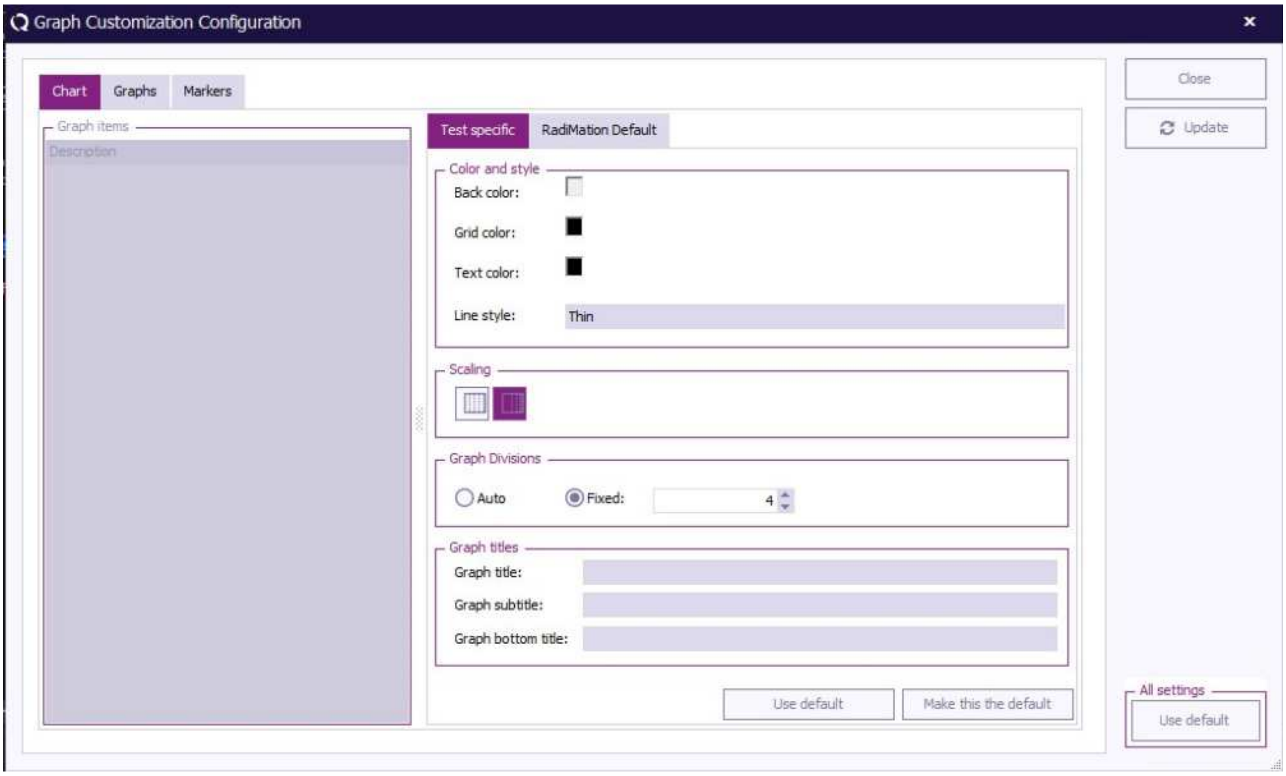
2.7.7 Graphics configuration

RadiMation® allows you to customize the way graphics are displayed on your screen.
To configure the style of the shown graphs, go to the **'Configuration' window** in the **'Configuration' tab**.



An example graph is shown in the **'Graphs' tab** that is created with the current settings. To change these graph settings, click **'Customize'** .

The '**Graph Customization Configuration' window** contains three tabs; **'Chart'** , **'Graph'** and **'Markings'** .
The **'Chart' tab** contains the settings related to the overall graph and can be used to determine the colours, layout and titles.
The **'Graph' tab** contains the settings related to the graph lines shown in the graph and can be used to determine the colours, scaling and layout of each and every shown graph line.
The **'Markers' tab** contains the settings related to the markers on the graph and can be used to determine the colours, style and scaling of each and every shown marker.



To change the graph settings, select a graph (component) in the left section of the window, then make the desired changes in the right section of the window.
Click **'Update'** to update the graph settings without closing the '**Graph Customization Configuration' window**. This will allow you to see the effect of the new settings and make additional changes.
Click **'Close'** to update (and save) the graph settings and close the '**Graph Customization Configuration' window**. You will be returned to the **'Configuration' window**.
The selected settings in the '**Graph Customization Configuration' window** are used as the RadiMation® default settings. It is still possible to overrule these settings for individual tests to more specific settings.
Click **'Restore factory default'** to return to the factory settings.

2.7.8 Database Configuration

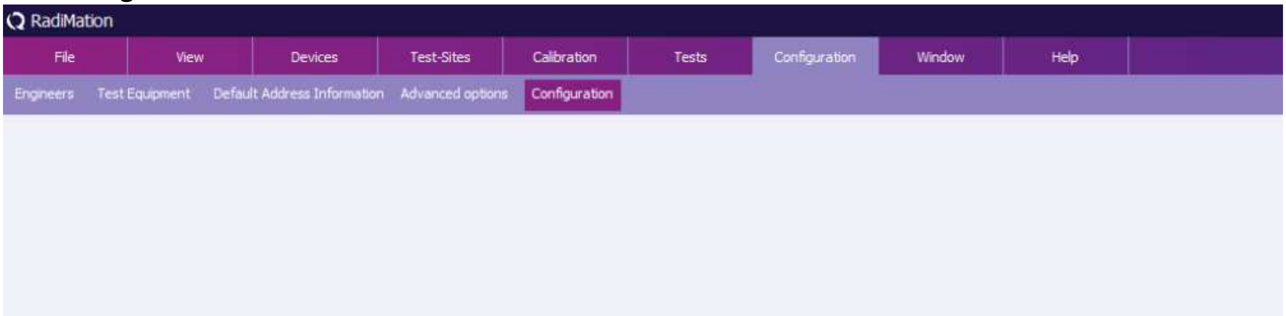
2.7.8.1 Introduction

RadiMation® can retrieve customer information (such as name and address) from external databases, for example from your company's customer relationship management (CRM) database. This option is called **Customer database** and will reduce the need to manually enter large amounts of customer information in RadiMation®.
Customer database can interface with several external databases, such as:

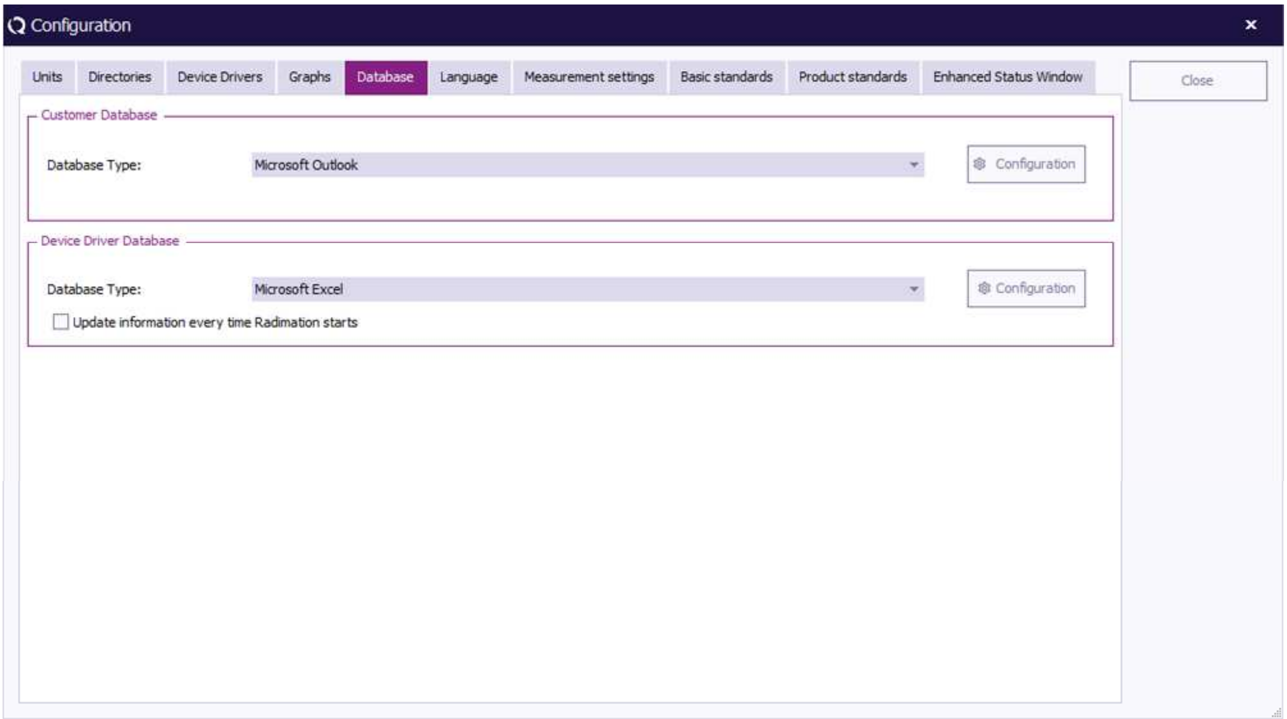
- text based files (through ODBC)
- MySQL
- MSSQL
- Microsoft Access database
- ODBC
- Act! 6

2.7.8.2 Changing the customer database driver

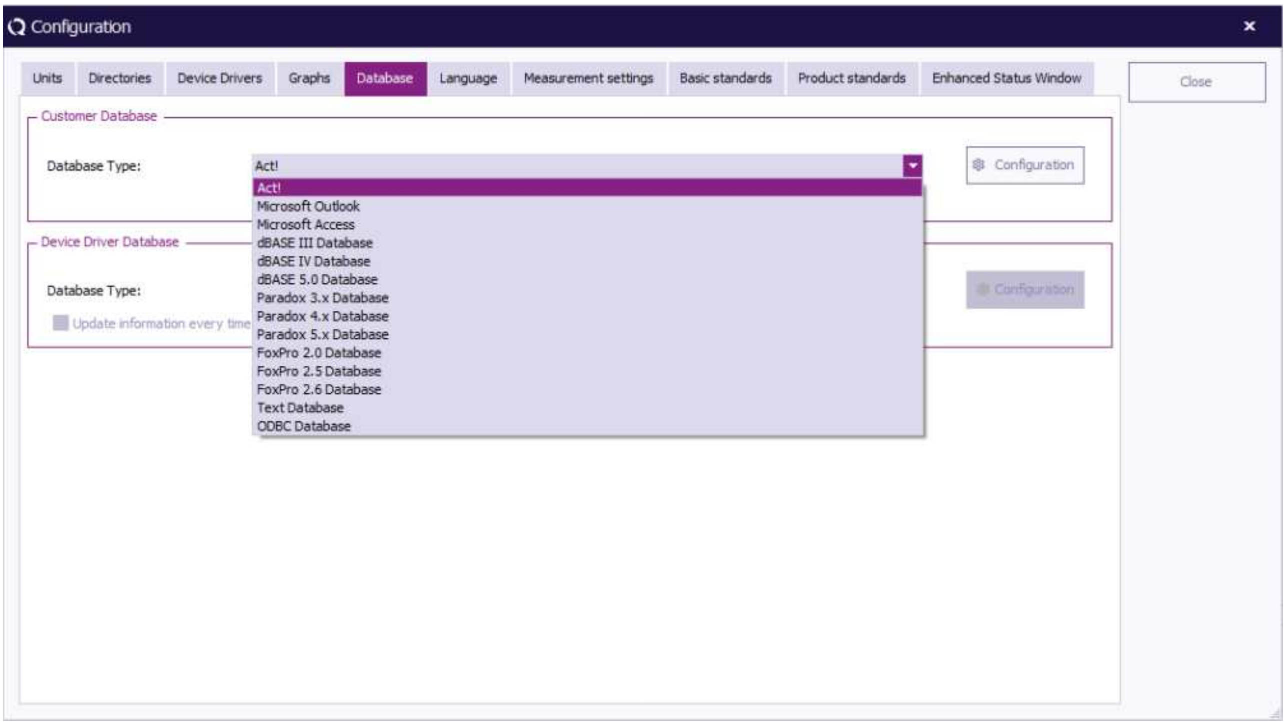
To configure RadiMation® to support your customer database, go to the **'Configuration' window** in the **'Configuration' tab**.



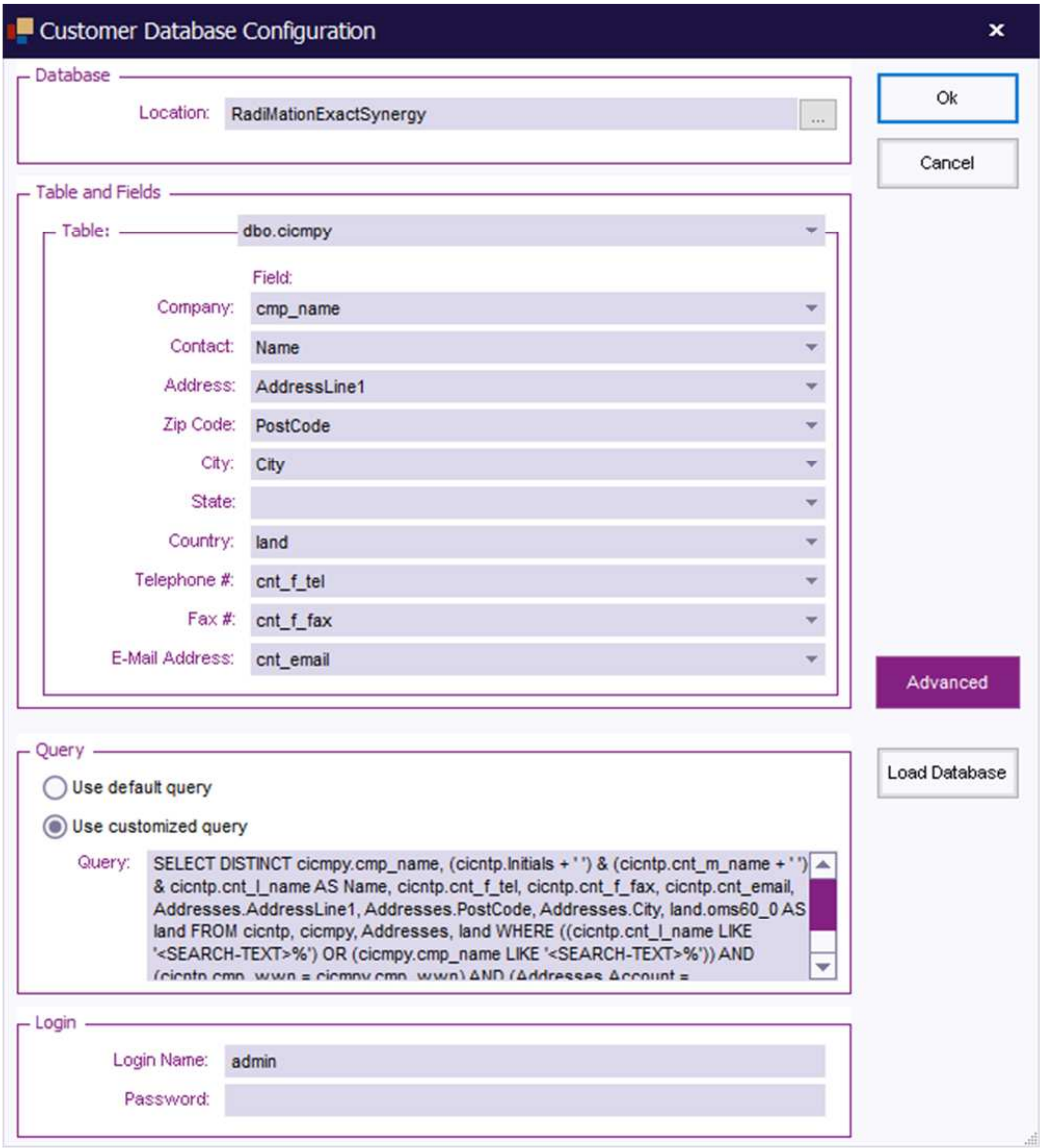
Go to the **'Database' tab** to select and/or change the **Customer Database** and **Device Driver Databases**.



To select a **Customer Database**, select a database type from the pull-down menu.

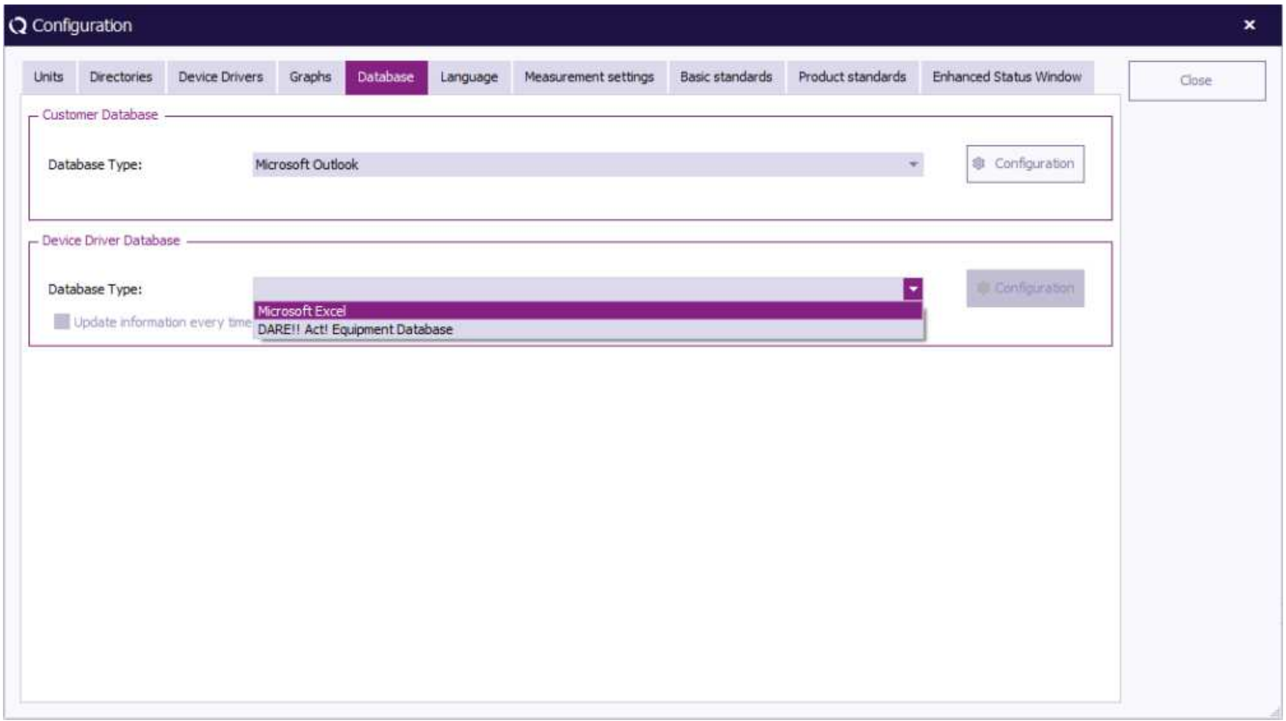


To see and/or change more detailed settings (of the selected database type), click **'Configuration'** . The '**Customer database configuration' window** will appear. (This window can differ depending on the selected database type).

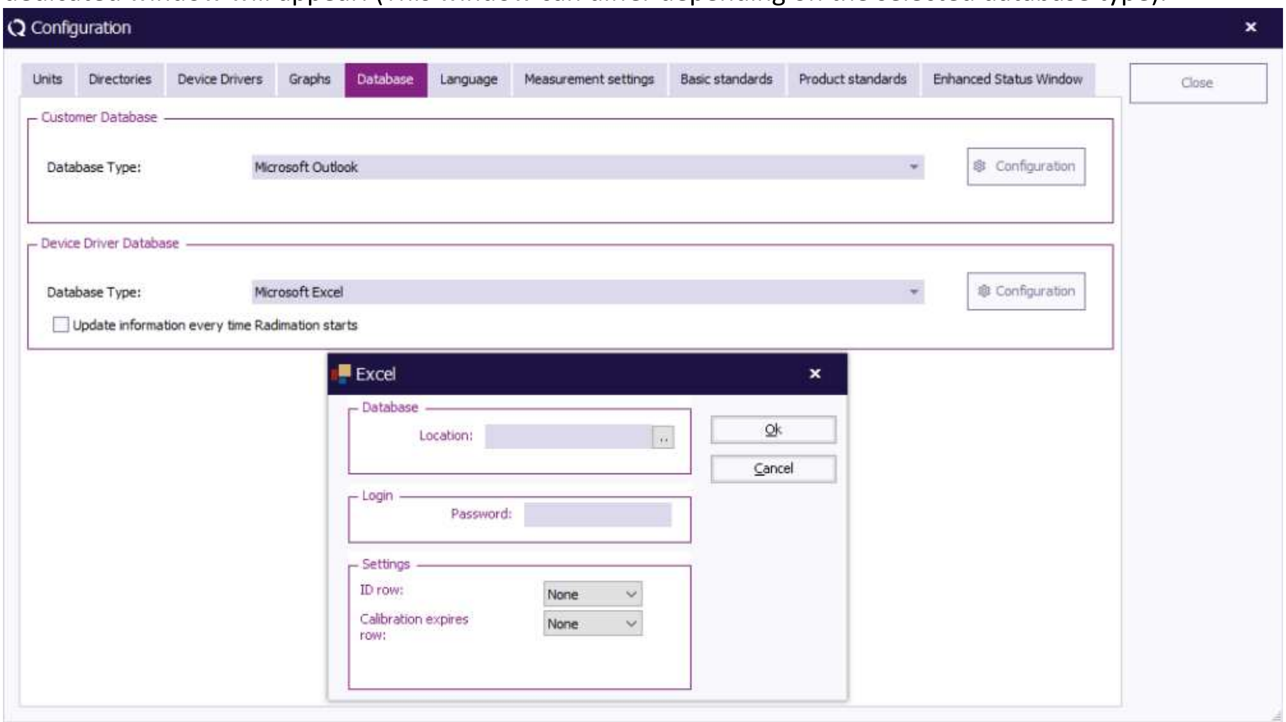


To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.
For more detailed information on the Database Configuration settings, go to Chapter 14 “Database Configuration”. Information on the settings of the different database types can be found in the paragraphs that follow “Database Configuration”.

To select a **Device Driver Database**, select a database type from the pull-down menu.



To see and/or change more detailed settings (of the selected database type), click **'Configuration'** . A dedicated window will appear. (This window can differ depending on the selected database type).

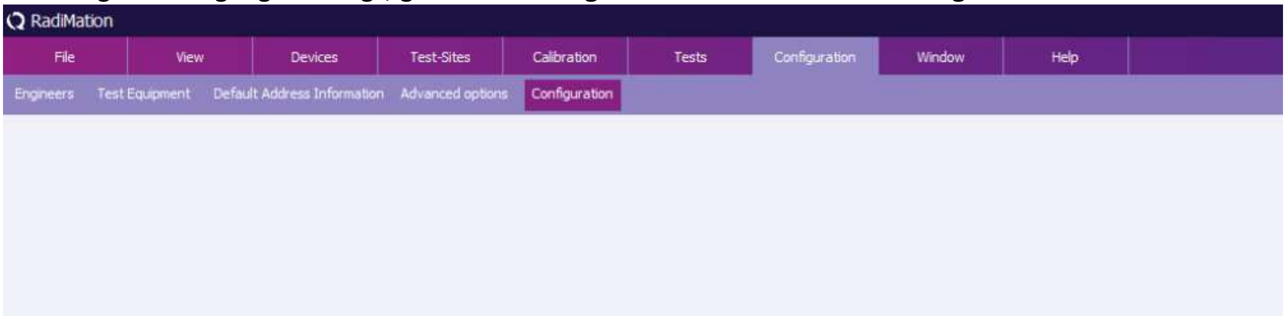


To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.
Click **'Close'** to leave the **'Configuration' window**.

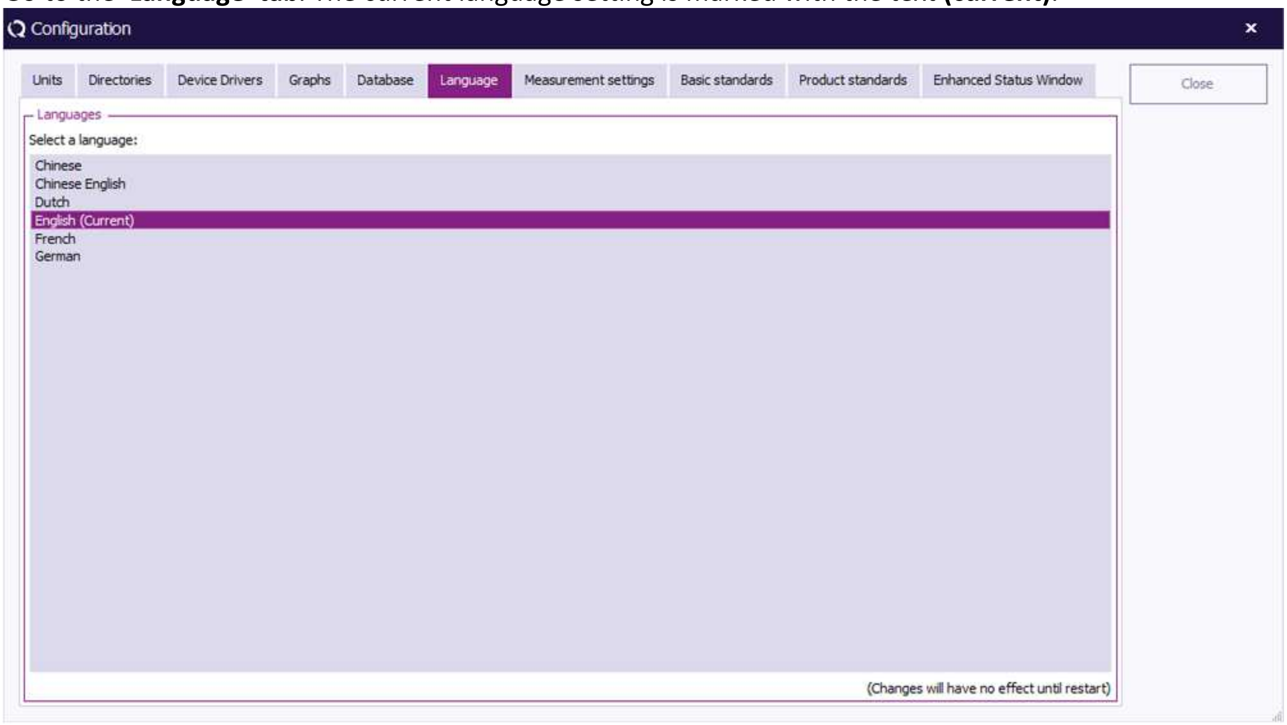
2.7.9 Language Selection

RadiMation® supports multi-language use. This means that the software package can be operated in several language.
In addition, the multi- language support allows for easy translation from English to most other languages.
Please contact your local reseller for the availability of your required language driver.

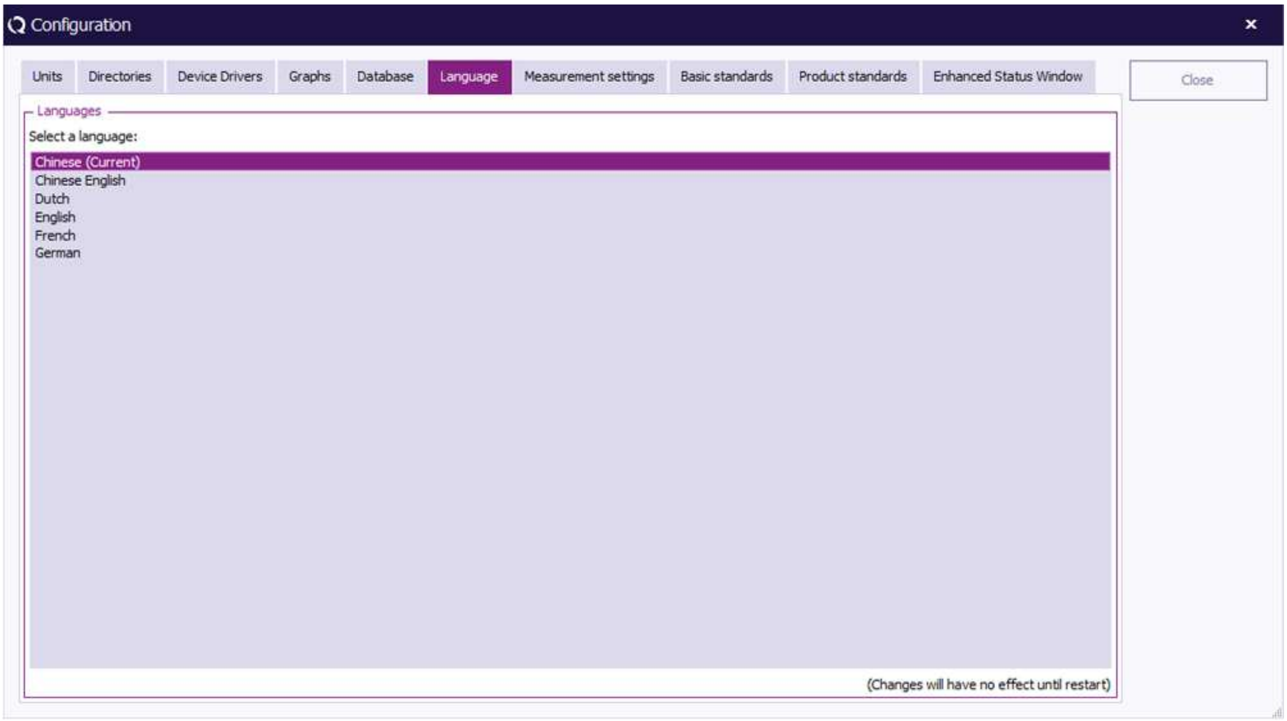
The default language of RadiMation® is English.
To change the language settings, go to the **'Configuration' window** in the **'Configuration' tab**.



Go to the **'Language' tab**. The current language setting is marked with the text **(current)**.



To change the language setting, select one of the other languages, click **'Close'** (to leave the **'Configuration' window**) and restart RadiMation®.
The selected language will only be active after RadiMation® is restarted.



Note: Not all languages are currently available. Please contact your local reseller for language availability.

2.7.10 Product Standard

2.7.10.1 Introduction

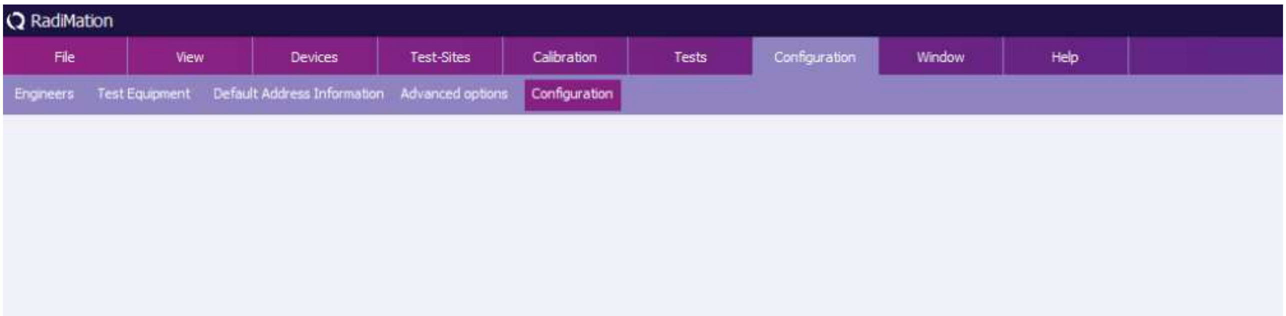
Product Standards describe the requirements (e.g. dimensional, technical, etc.) and the methods of testing (as well as grading, marking, etc.) of a product.
The objective of these standards is to define and impose 'standards' that will ensure that the product in question will not represent harm or hazard to consumers.
Because the standards with regards to product testing can be relevant to RadiMation® users, RadiMation® offers the possibility to add this documentation to your configuration.

There are many Product Standards for individual products and product types. These, in turn, often refer to multiple Basic Standards.
Where a Product Standard describes all the tests that should be performed on a EUT, a Basic Standard only describes one single test.
For example:
The Product Standard for product X describes four different requirements/tests that the product needs to comply with.
These four tests are described in four Basic Standards, where each basic standard describes the requirements for one test.

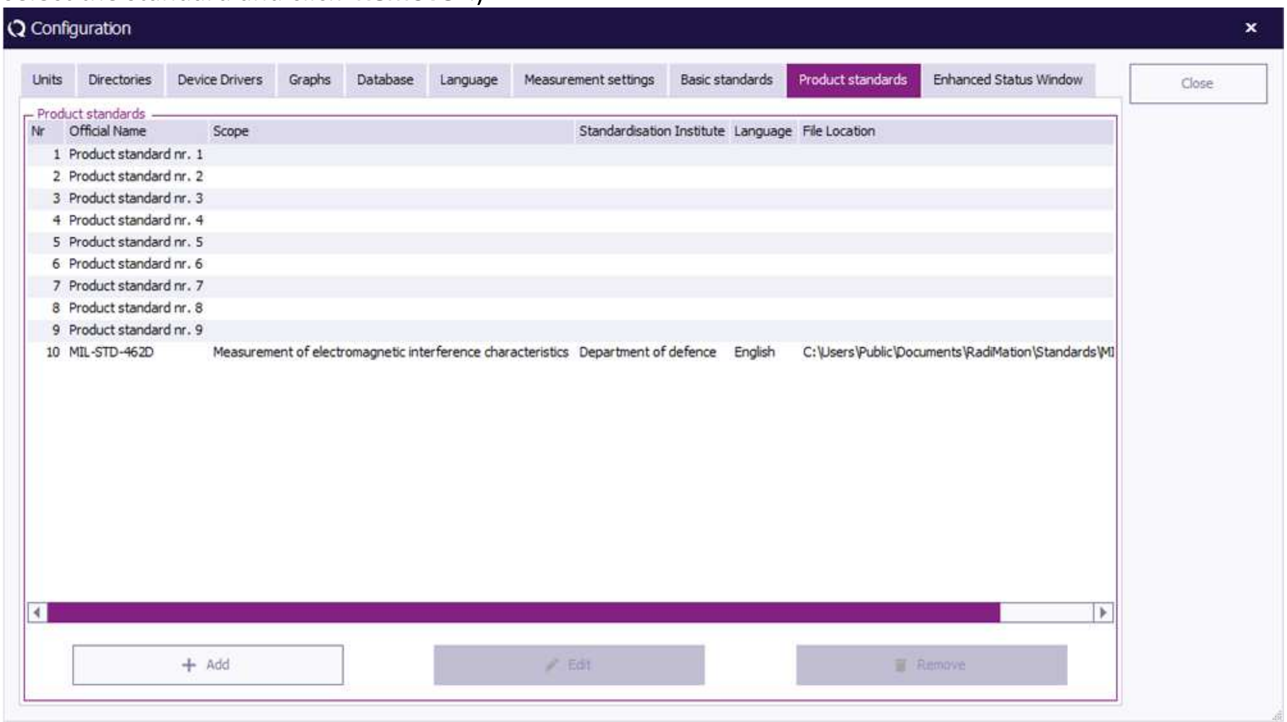
Basic Standards can also be added to RadiMation®.
In addition, one single Technical Setup File (TSF) can be generated for each Basic Standard, configured to perform the test as described in the standard.

2.7.10.2 Adding a Product Standard

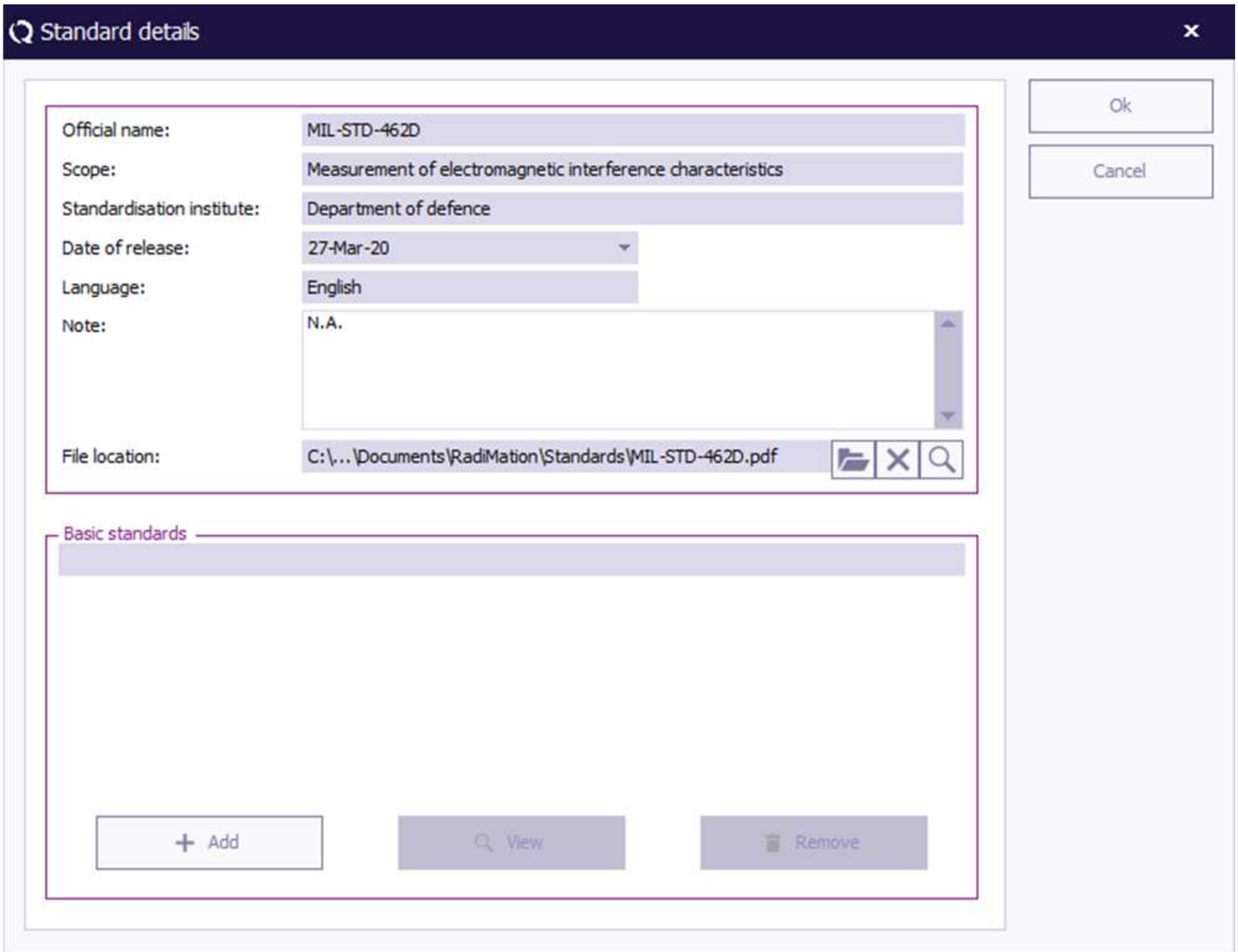
To add a Product Standard to RadiMation®, go to the **'Configuration' window** in the **'Configuration' tab**.



Select the **'Product standards' tab** and click **'Add'** .
(To edit a Product Standard, select the standard and click **'Edit'** . To remove a Product Standard, select the standard and click **'Remove'** .)

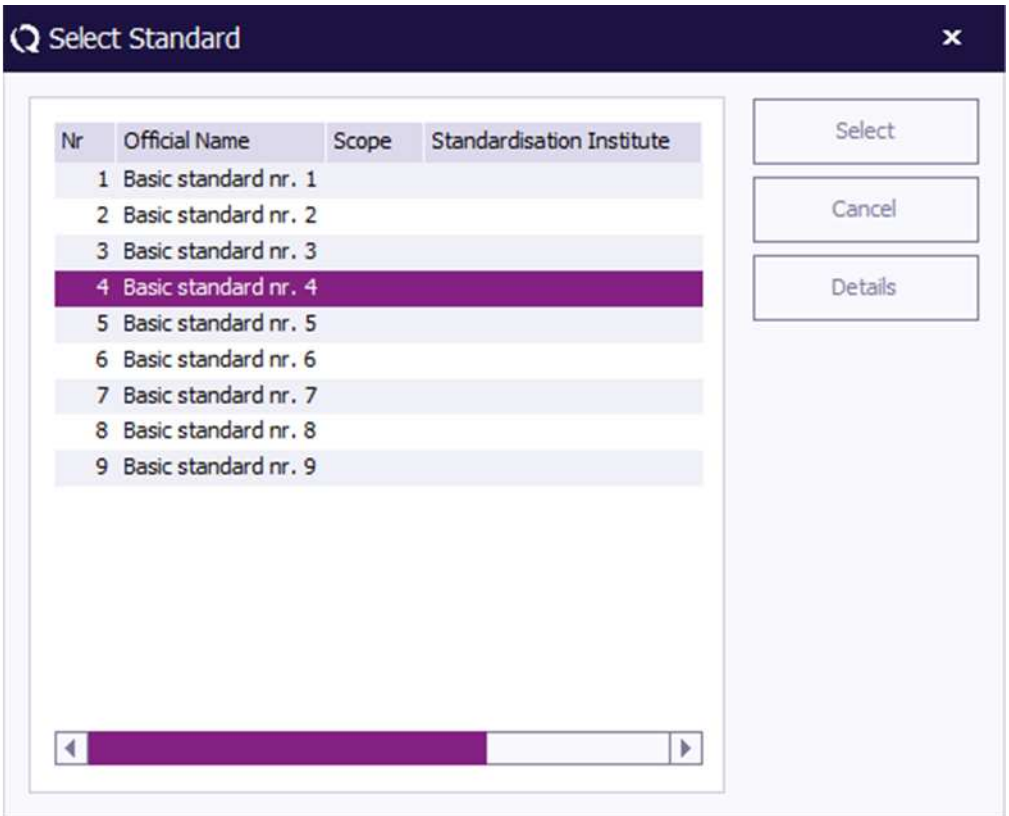


Insert the required information in the **'Standard details' window** (as visible in the example below).
Please note that the **Official name** can only be inserted the first time and has to be unique.
In addition, it is possible to link a file to the standard in the **File location** field. For example a PDF, DOC or HTML file that describes the standard.
RadiMation® will open the file (with the default reader for this file type) when the engineer selects the magnifying glass button next to that field.
To confirm your data input, click **'OK'** , to cancel your input, click **'Cancel'** . You will be returned to the **'Configuration' window**.



2.7.10.3 Add(ing) Basic Standard(s)

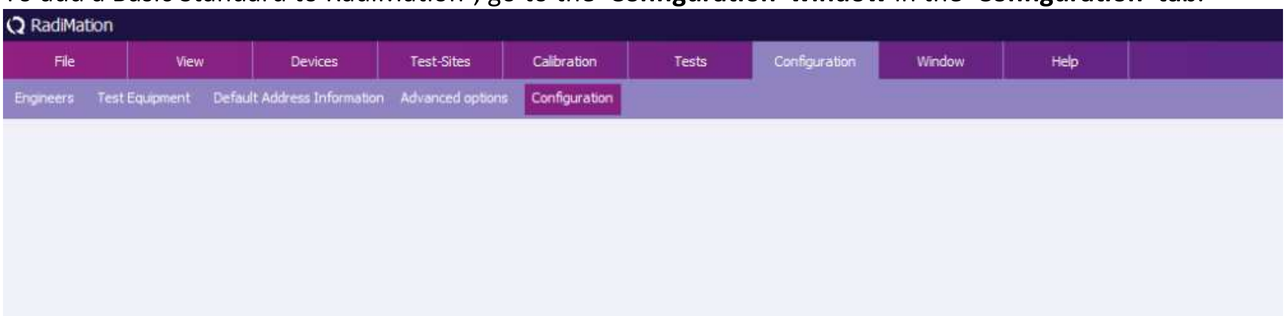
To add a Basic Standard to the product standard, click **'Add'** . The **'Select Standard' window** will appear.
Select one or more Basic Standards (hold the ‘Ctrl’ key to select multiple standards) and click **'Select'** .
To cancel your selection, click **'Cancel'** . You will be returned to the **'Standard details' window**.
To see the details of a Basic Standard, double click the standard or click ‘Details’.



Note: When a product standard is selected or added in the **'EUT' window**, the data of that standard is copied into the EUT Document. At that moment a copy of the data of the standard from the configuration is made. This means that, if the configuration of a standard in the **'Configuration' window** of RadiMation® is changed, the data in the EUT file will still have the old data of the standard!!! This is as it should be, because this is the information of the standard that is used at the time that the EUT was tested.

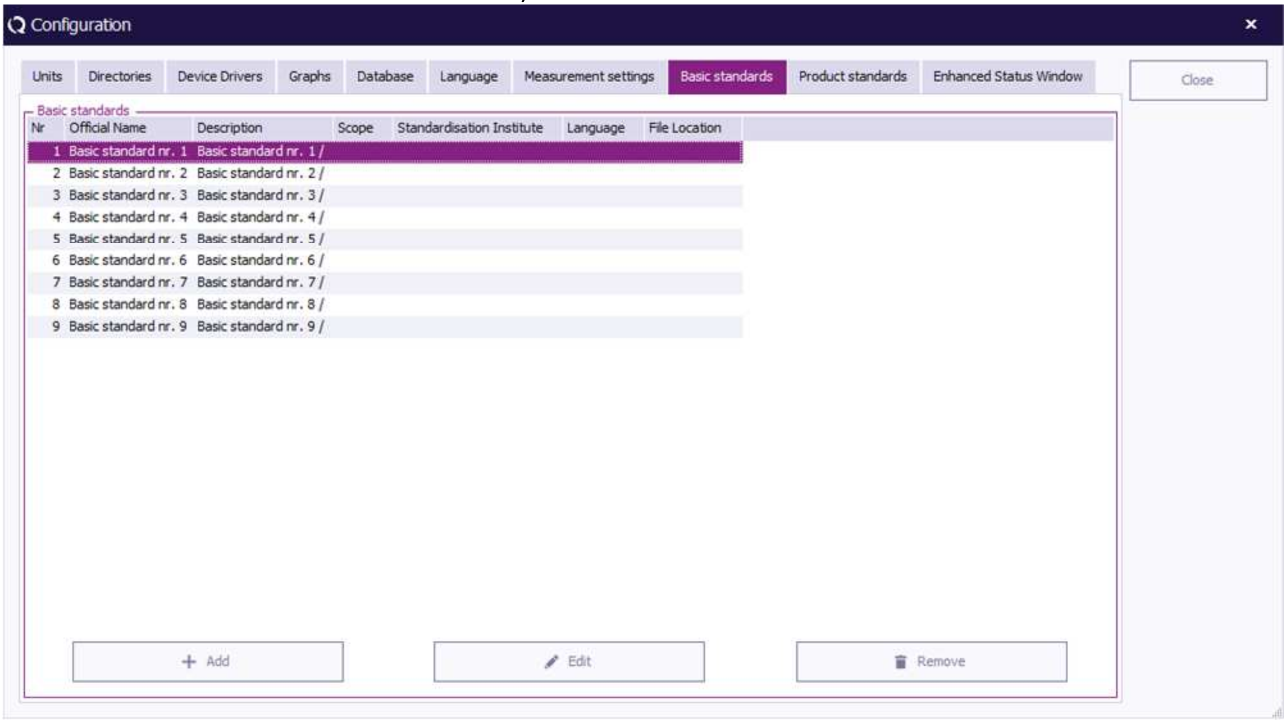
2.7.11 Basic Standard

To add a Basic Standard to RadiMation®, go to the **'Configuration' window** in the **'Configuration' tab**.

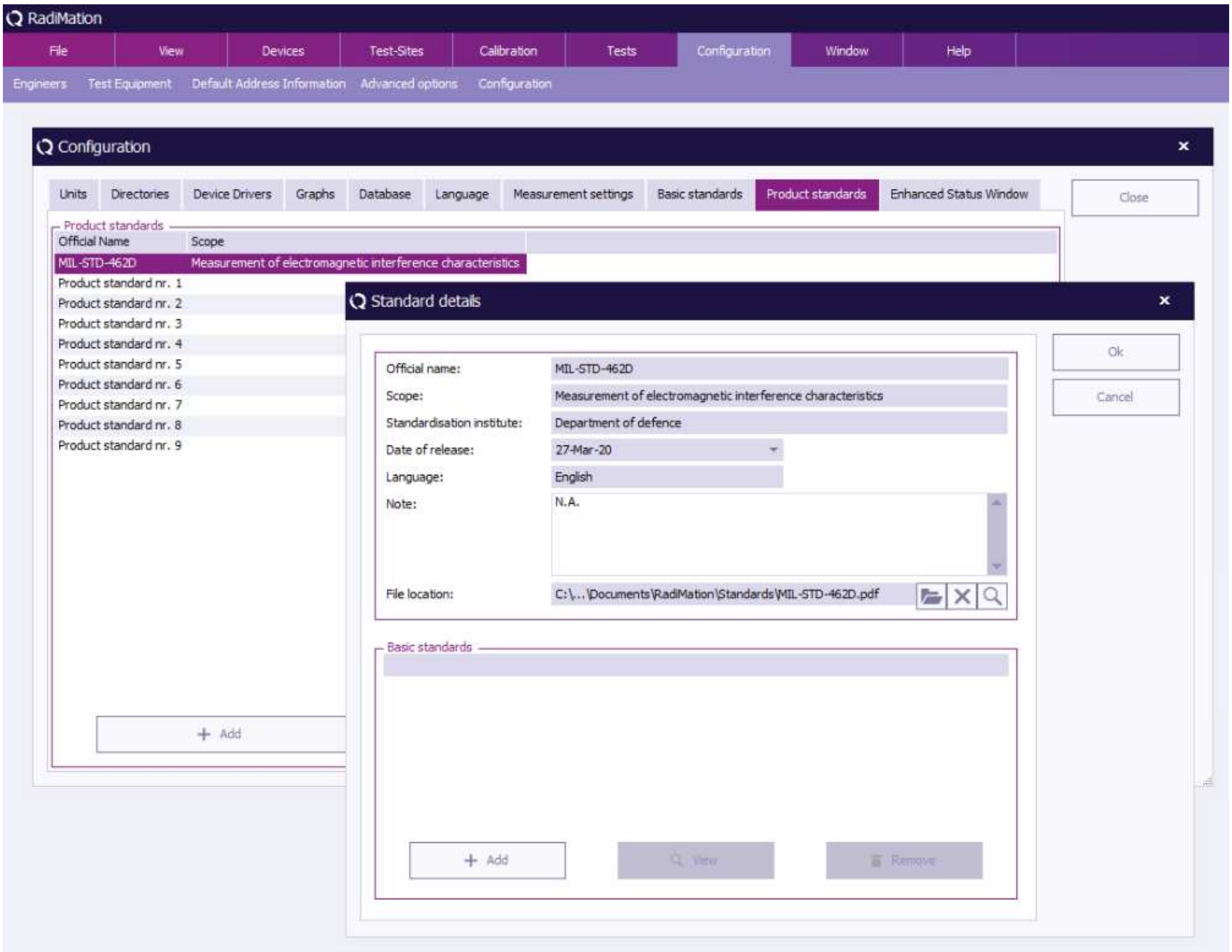


Select the **'Basic standards' tab** and click **'Add'** .
(To edit a Basic Standard, select the standard and click **'Edit'** . To remove a Basic Standard, select the standard and click **'Remove'** .

Please note that removing a Basic Standard from the list will also remove any references of this standard entered in the Product Standards.)



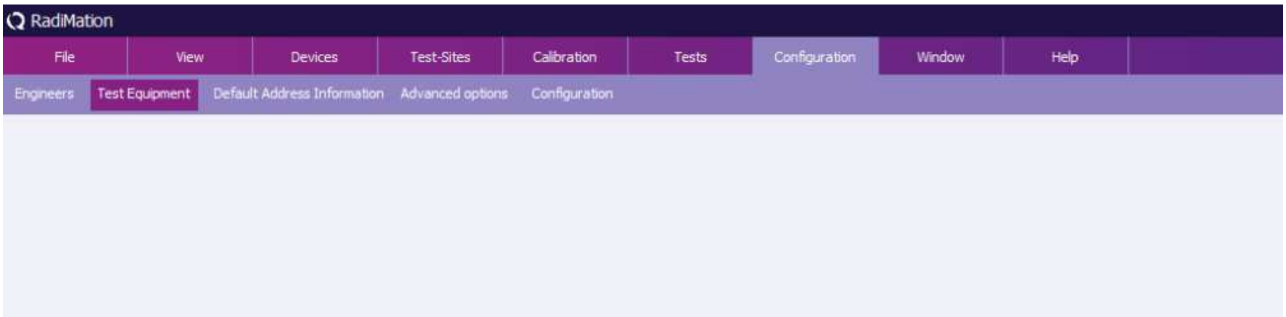
Insert the required information in the **'Standard details' window** (as visible in the example below).
Please note that the **Official name** can only be inserted the first time and has to be unique.
In addition, it is possible to link a file to the standard in the **File location** field. For example a PDF, DOC or HTML file that describes the standard.
RadiMation® will open the file (with the default reader for this file type) when the engineer selects the magnifying glass button next to that field.
To confirm your data input, click **'OK'** , to cancel your input, click **'Cancel'** . You will be returned to the **'Configuration' window**.



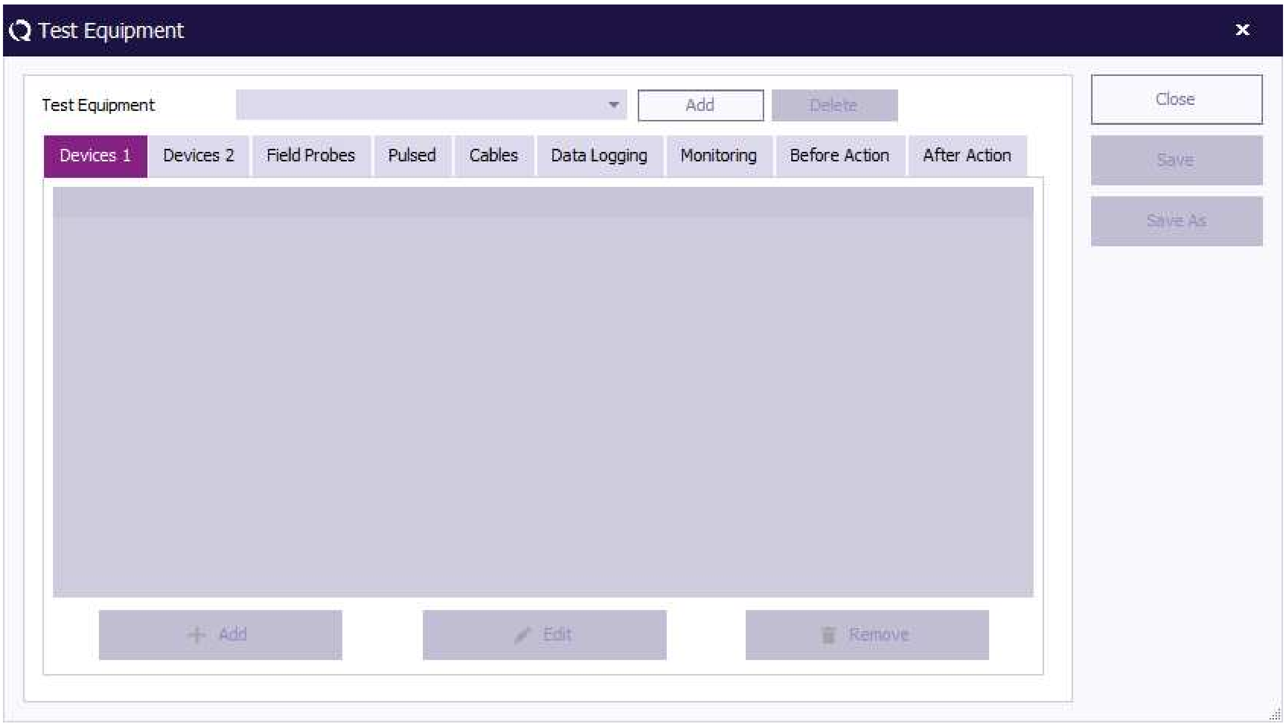
2.7.12 Test equipment list configuration

The test equipment configuration contains a list of all the test equipment used during a test. The software uses this list to determine which device drivers should be used to control the test equipment. RadiMation® allows you to configure specific test equipment lists for each type of test as well as different test equipment lists for the same type of tests. (This can be useful if you have, for example, more than one signal generator to perform conducted immunity tests with).
In the **'Test Equipment' window** a set of test equipment will be selected. When a calibration file is generated, RadiMation® will record this test equipment configuration together with the calibration data. When a substitution test is started, the test equipment selected for the substitution test will be compared with the test equipment used (as recorded) during the calibration test. If the equipment does not match, an error message will be displayed.
The error message window will ask you to abort the test or to ignore the error message and continue the test with different test equipment. To achieve maximum accuracy, the same test equipment should be used (whenever possible) during both the calibration and the substitution tests.

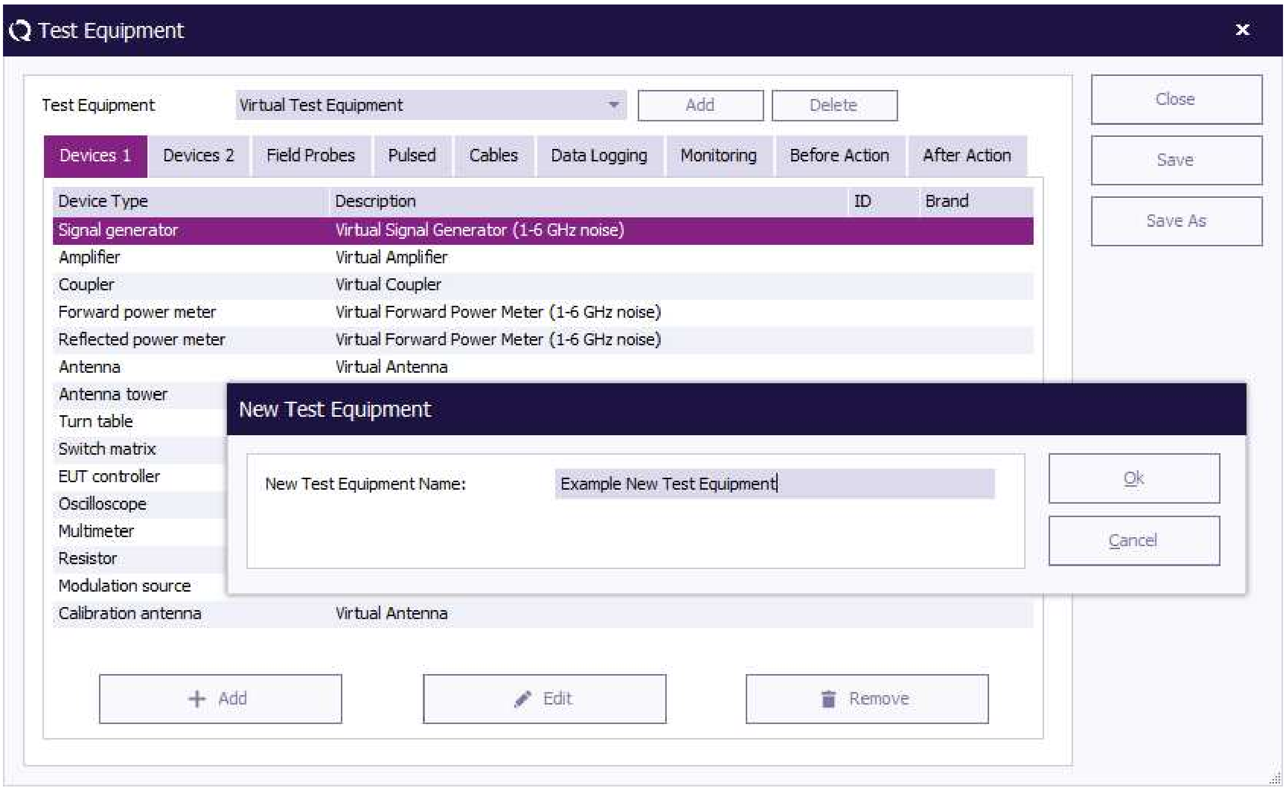
To add, modify or delete test equipment lists, go to the **'Test Equipment' window** in the **'Configuration' tab**.



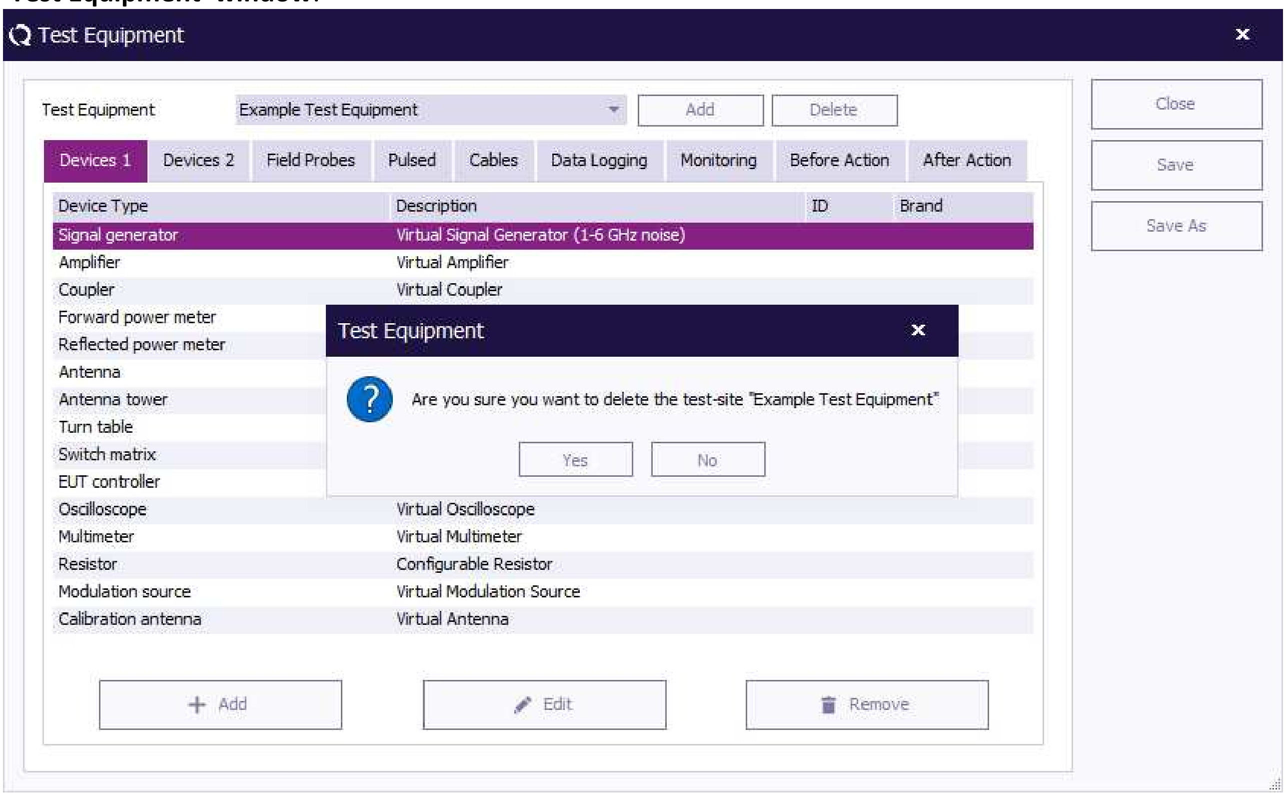
If no test equipment has been added to RadiMation®, click the **'Add'** button in the top of the window.



Enter a name for the new test equipment in the **'New Test Equipment' window** (e.g. Example Test Equipment).
Click **'OK'** to confirm the name of the new test equipment, or click **'Cancel'** to cancel the new name.
You will be returned to the **'Test Equipment' window**.

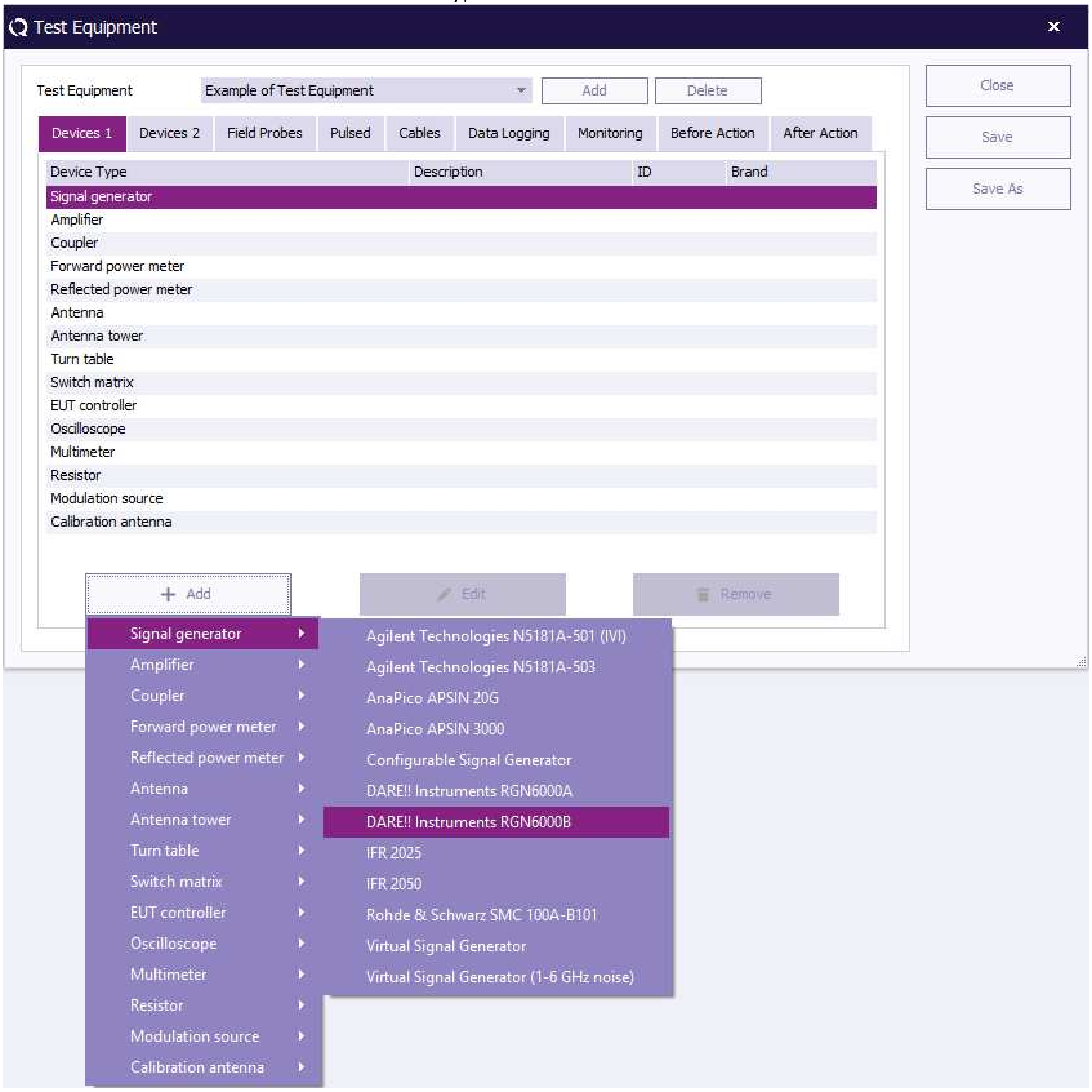


To delete a test equipment from RadiMation®, select the **Test Equipment** from the pull down menu and click the **'Delete' button** in the top of the window. A confirmation window will appear.
Click **'Yes'** to remove the device from the list, click **'Cancel'** to cancel. You will be returned to the **'Test Equipment' window**.

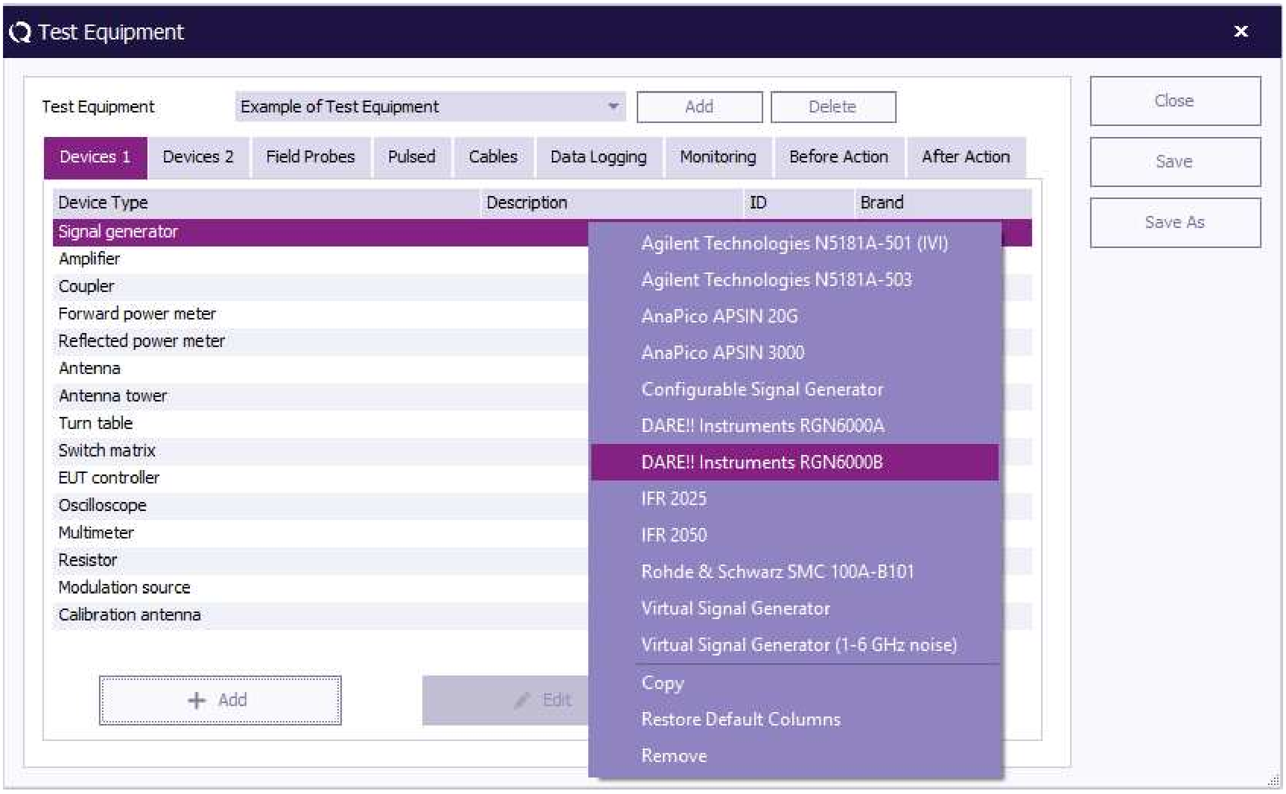


To configure the equipment of a test, select the desired **Test Equipment** from the pull down menu (e.g. Example Test Equipment).
Specify the equipment for the test by adding, editing and/or removing devices.

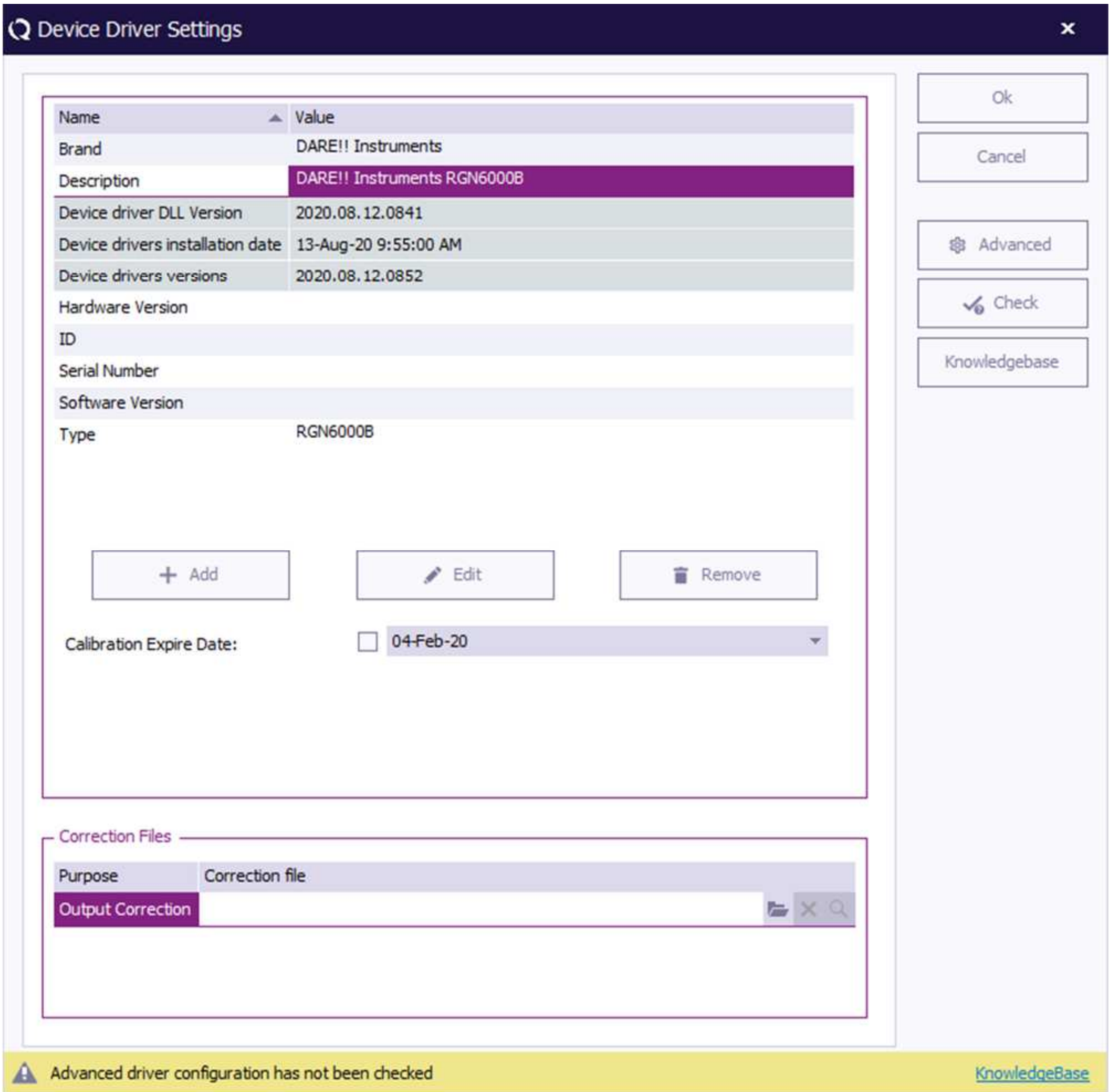
To add a device, click **'Add'** (at the bottom left of the window), a menu will open below the button to show the available devices for each Device Type.



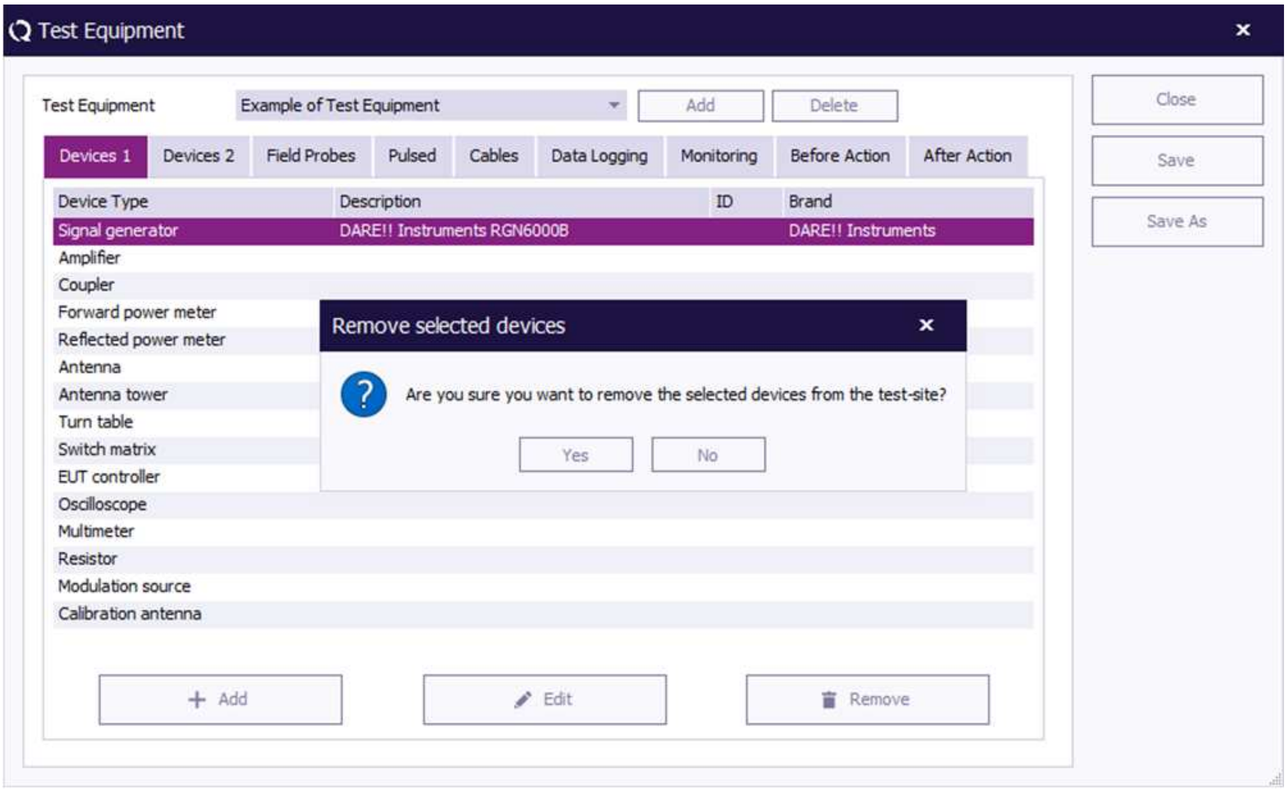
Another way to add a device is to click the desired **Device Type** in the **'Test Equipment' overview**.
A menu will open (at your mouse point) with the available devices for that Device Type.
Select and click on the desired device. The device will then appear in the equipment overview.



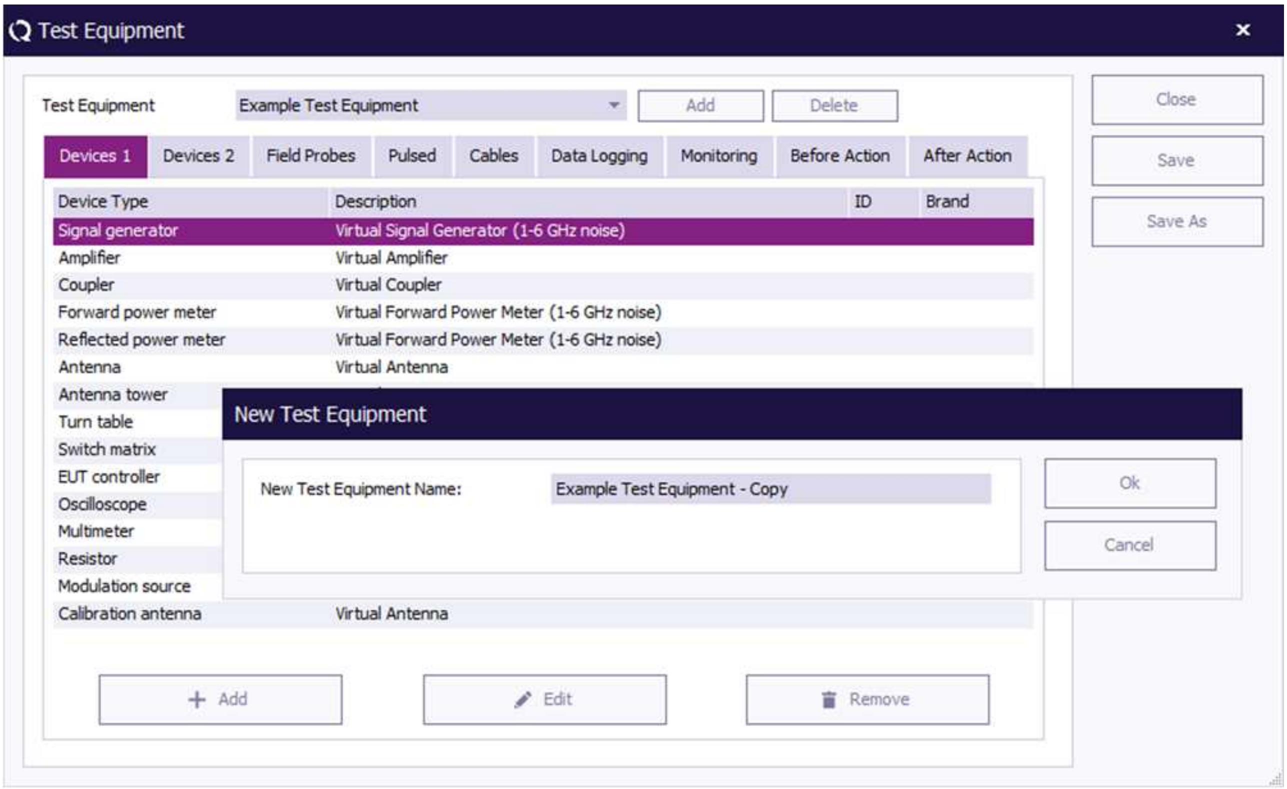
To edit a device, select the device and click **'Edit'** . The **Device Driver Settings** window will appear. Edit the settings as desired. To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Test Equipment' window**.



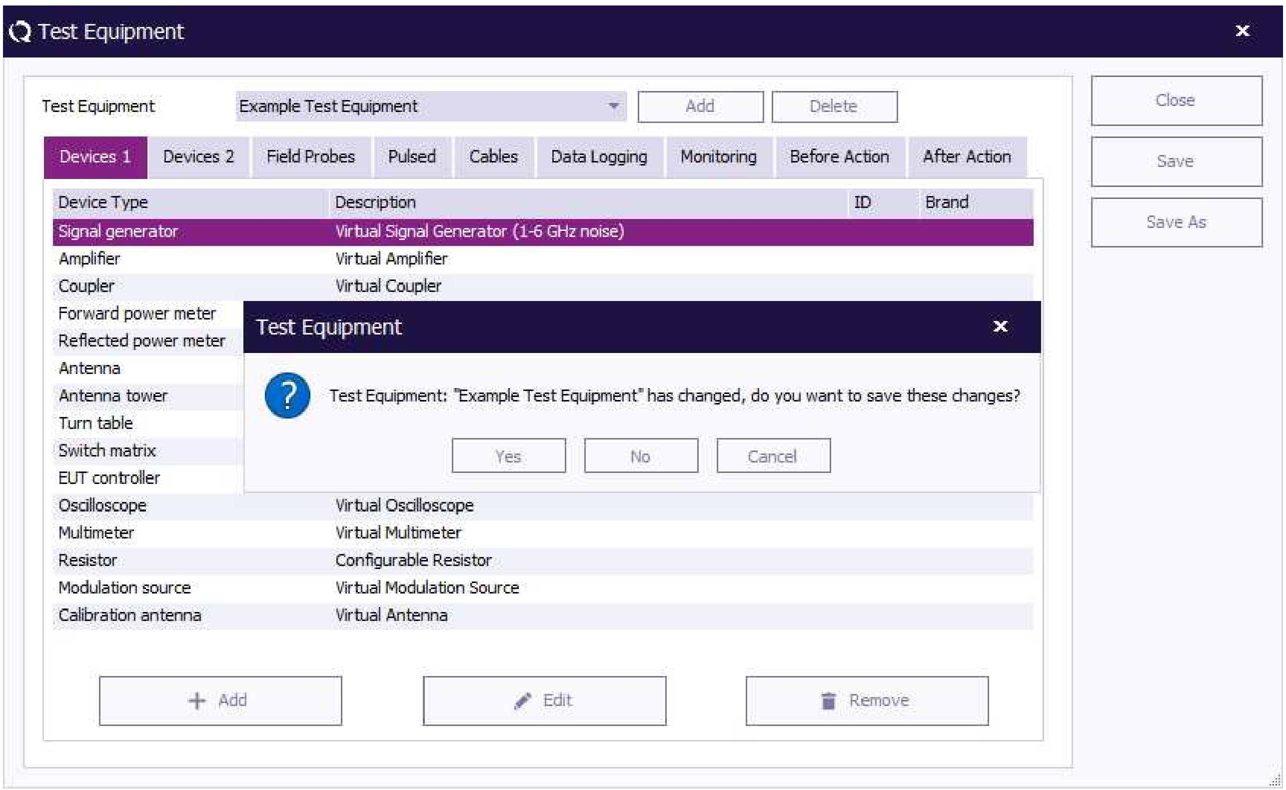
To remove a device, select the device and click **'Remove'** . A confirmation window will appear. Click **'Yes'** to remove the device from the list, click **'Cancel'** to cancel. You will be returned to the **'Test Equipment' window**.



To save the changes made in the test equipment list, click **'Save'** (you will remain in the **'Test Equipment' window**).
To save the test equipment list under a new name, click **'Save As'** .
Enter a new name for the test equipment in the **'New Test Equipment' window** (e.g. Example Test Equipment 2).
Click **'OK'** to confirm the name of the new test equipment, or click **'Cancel'** to cancel the new name.
You will be returned to the **'Test Equipment' window**.



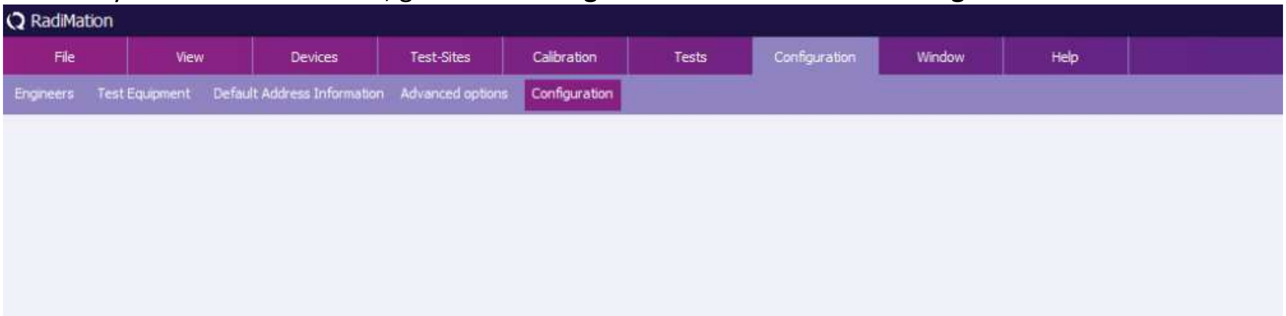
To close the **'Test Equipment' window**, click **'Close'** .
If you have not saved the changes to the test equipment list, a dedicated window will appear asking you to save these changes.
To save the changes, click **'Yes'** , to not save the changes, click **'No'** . The **'Test Equipment' window** will close.



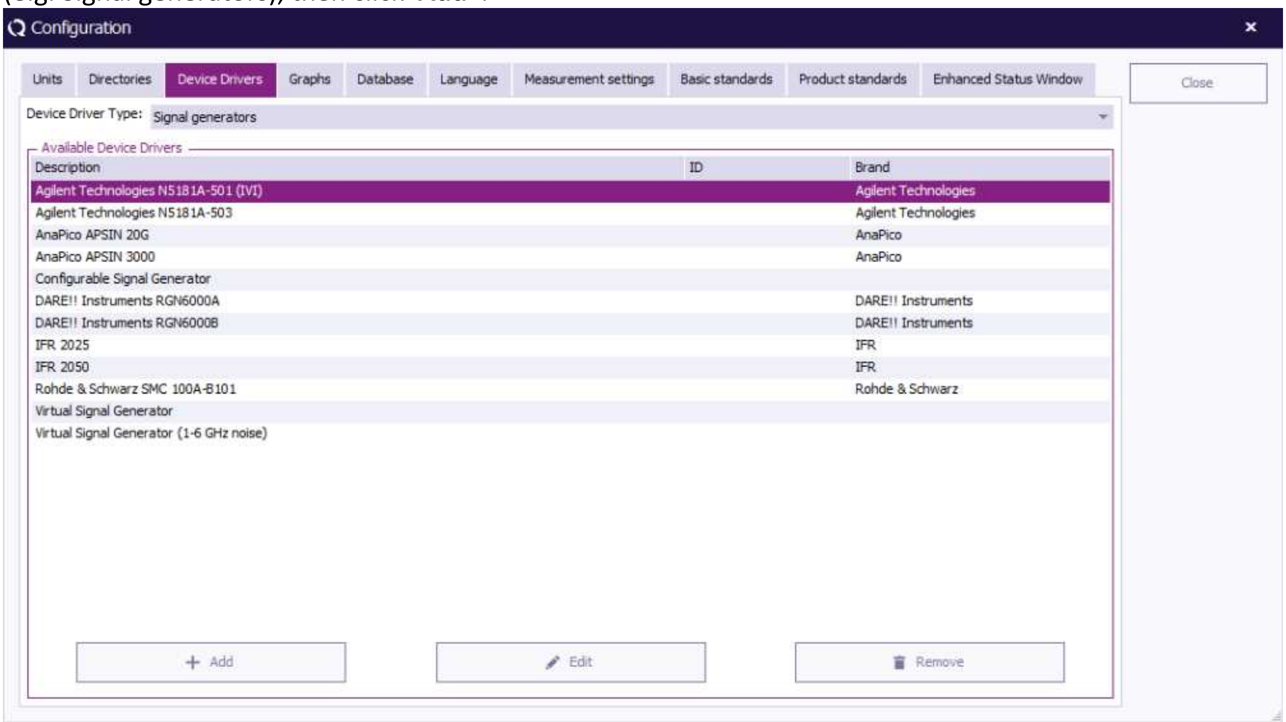
2.8 User configurable device drivers

RadiMation® allows users to create their own device drivers for test equipment (in addition to the standard device drivers). The so called ‘user configurable device drivers’.
The option to set up a user configurable device driver is available for nearly all types of test equipment. Please note that this option is not available for spectrum analyzers and measurement receivers. The complexity (and differences between suppliers) of these devices is too high.

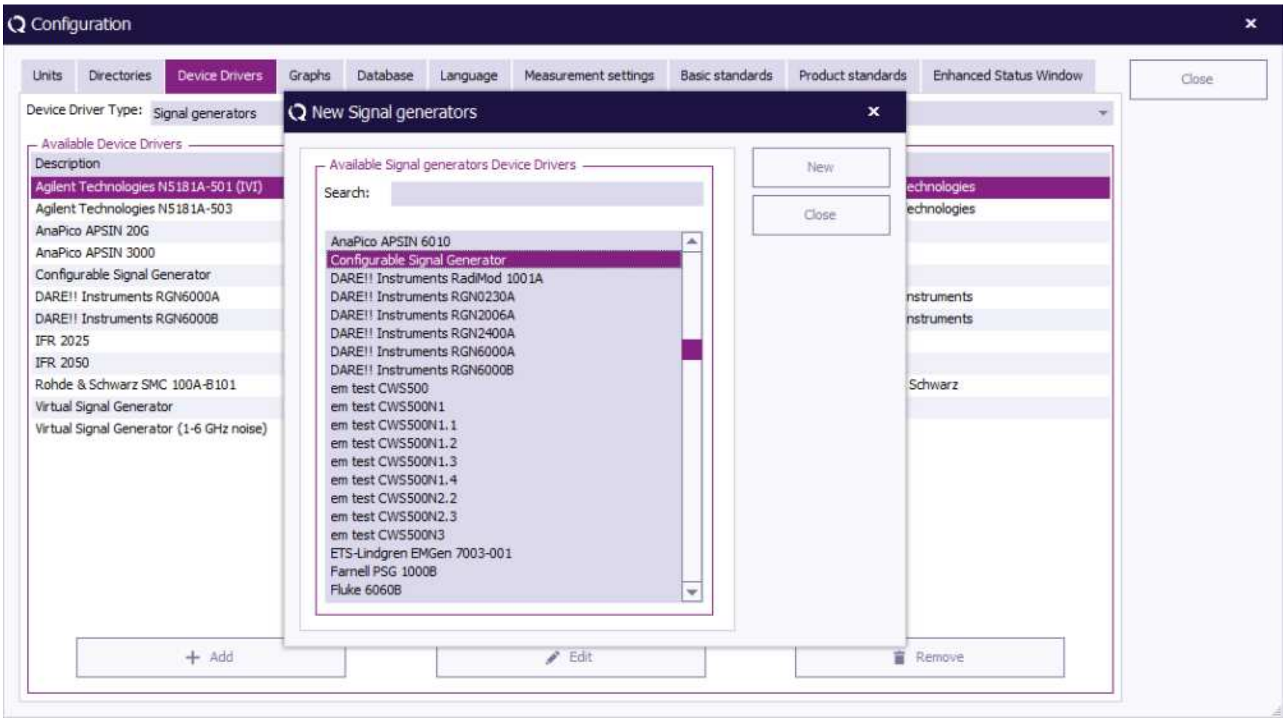
To make your own device driver, go to the **'Configuration' window** in the **'Configuration' tab**.



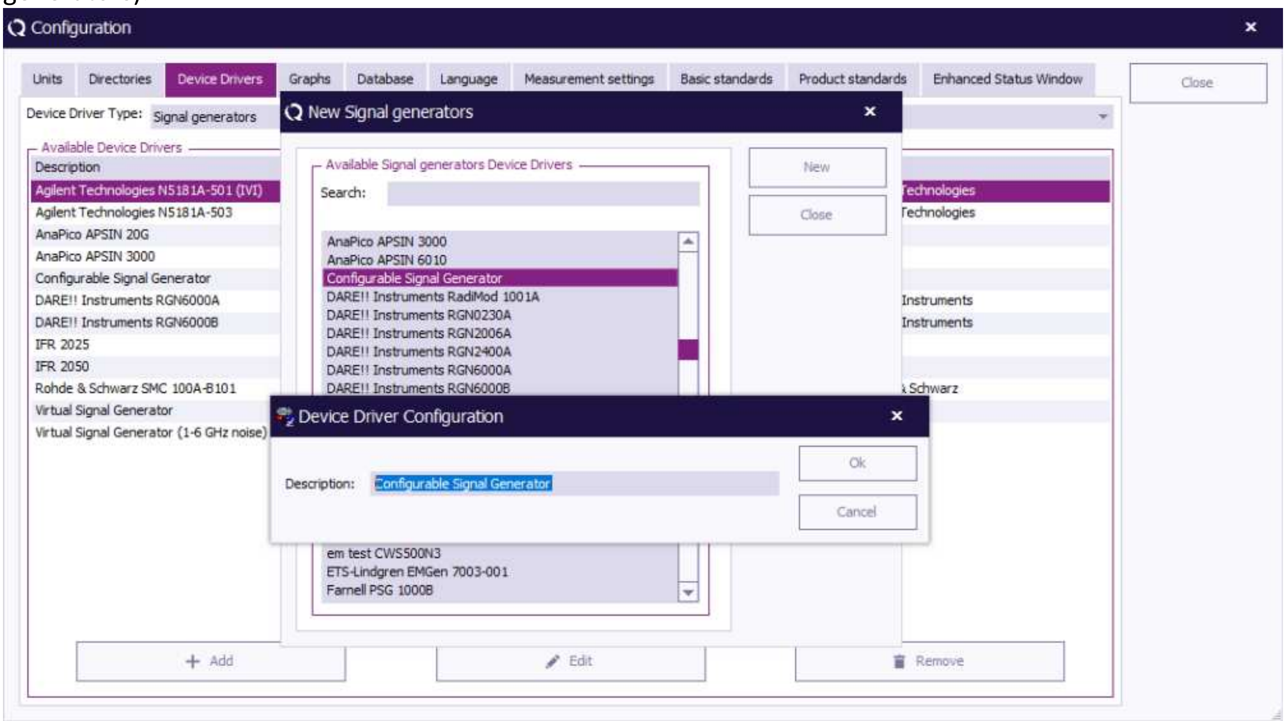
Go to the **'Device Drivers' tab** and select the required **Device Driver Type** from the pull down menu (e.g. Signal generators), then click **'Add'** .



Select the **Configurable driver** (e.g. the Configurable Signal Generator) and click **'New'** .

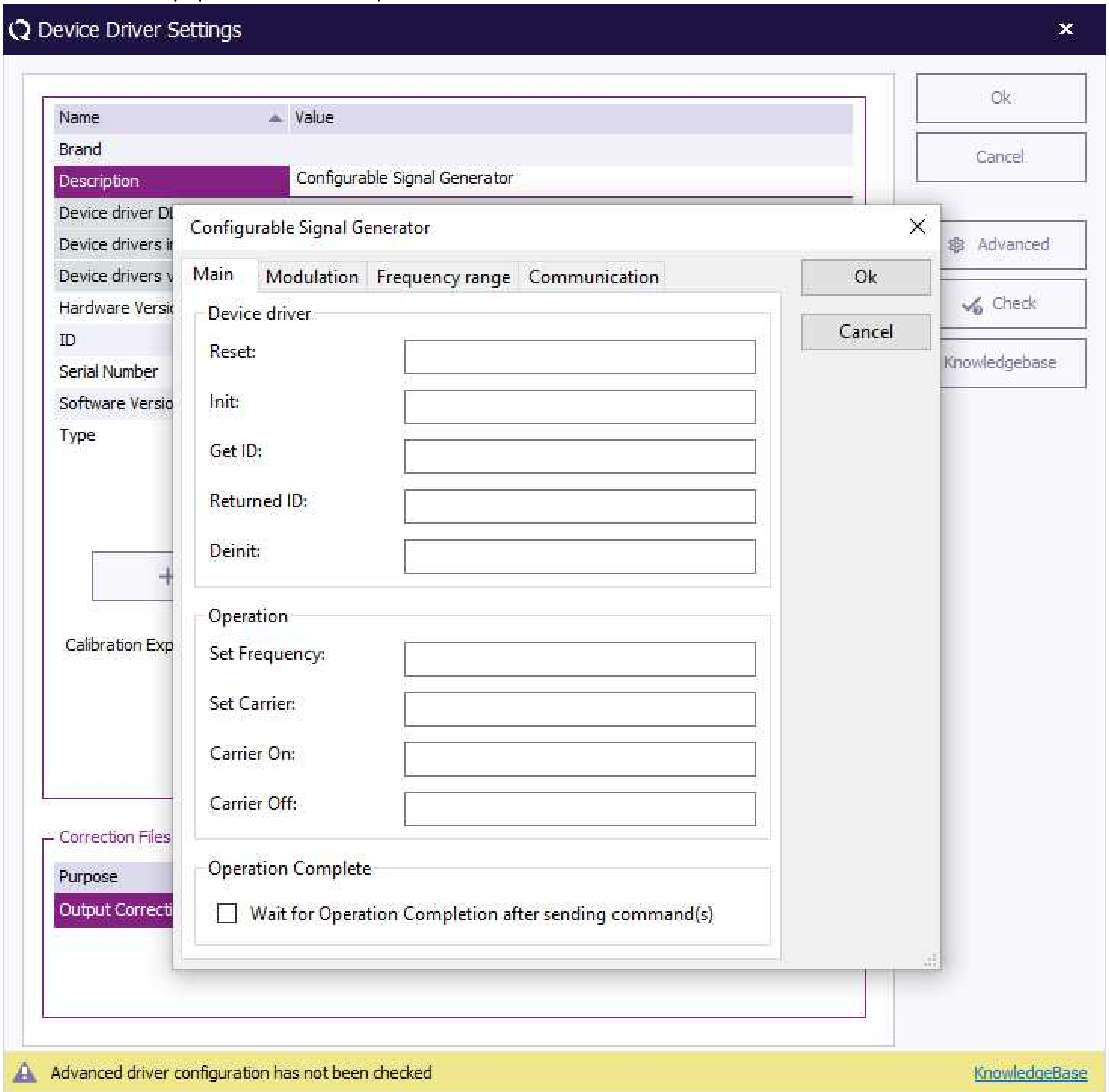


Enter a description for the device driver (e.g. the type number of the generator) and click **'OK'** , the **'Device Driver Settings' window** will appear.
To cancel your changes, click **'Cancel'** . You will be returned to the previous window (e.g. New Signal generators).



Edit he information about your ‘user configurable device driver’ in the **'Device Driver Settings' window**.
Click **'Advanced'** and enter the required control commands for the device in the tabs of the dedicated window.

After the commands are entered the device driver is ready for use. Please refer to the operating manual of the equipment for the required commands.



To confirm the advanced settings, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Device Driver Settings' window**.
To confirm your (final) settings, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.
Your new ‘user configurable device driver’ is now visible on the **Available Device Drivers** list in the **'Configuration' window** and can be used as any other device driver (by selecting it in the Equipment list).

Note: Passive equipment, such as antennas, current probes, cables etc., also need a device driver. This is required because RadiMation® has to know a number of

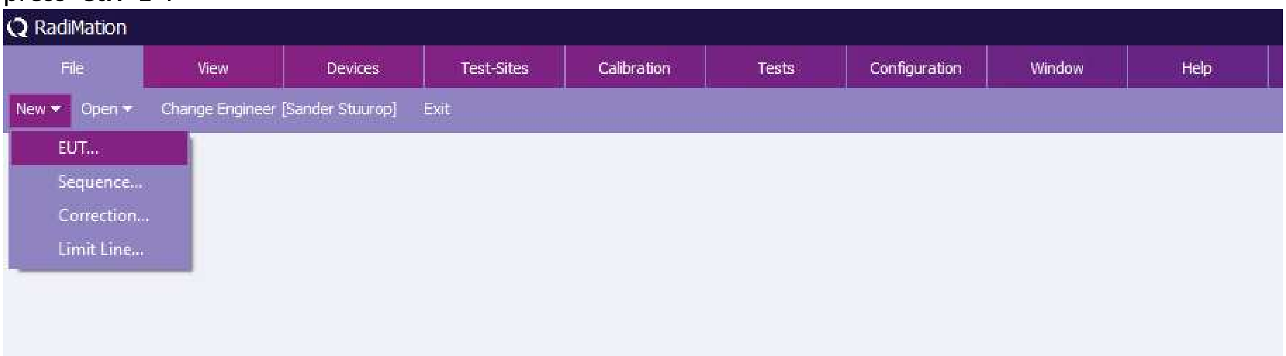
	parameters for these devices. Among others the following information is relevant: • Frequency range • Maximum input power • The report generator needs to know which equipment is used during a test • Correction files for these devices

2.9 EUT files

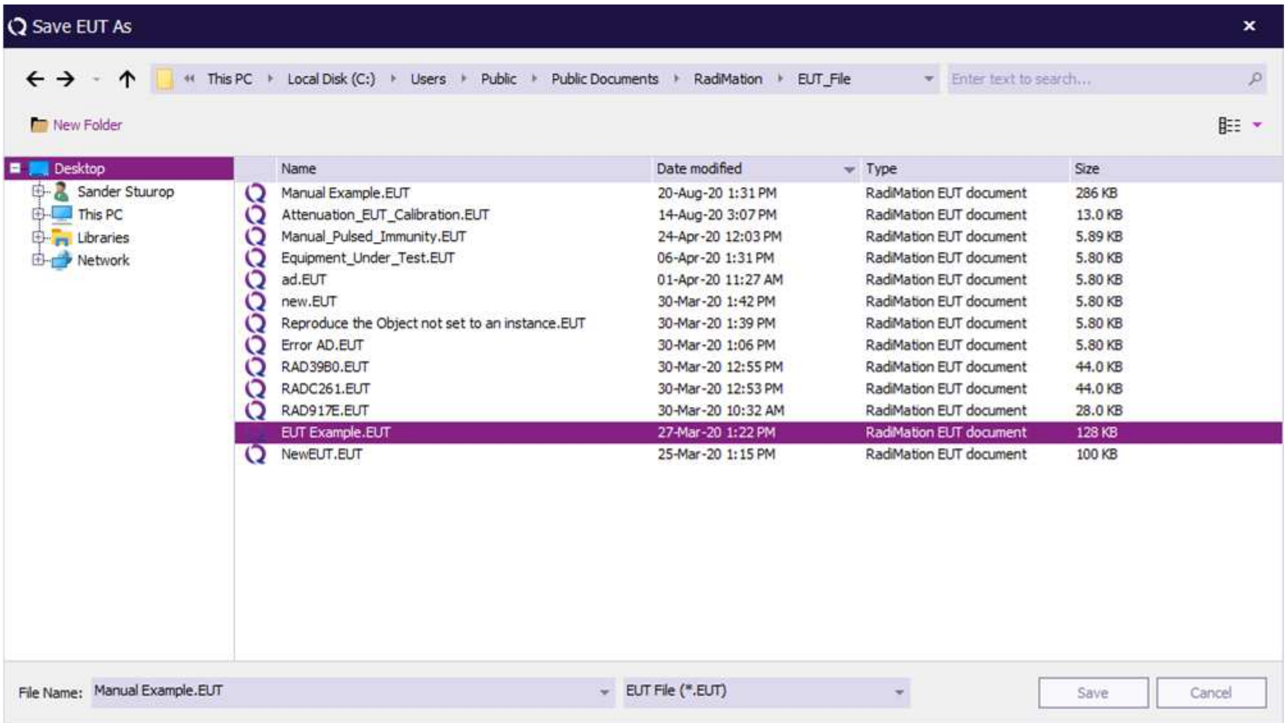
During the development of RadiMation® it became clear to us that, not the EMC tests, but the Equipment Under Test (EUT) played the central role in EMC automation software.
Because of this RadiMation® requires that the EUT must be defined prior to any test. Defining a EUT consists of; creating a new EUT file and specifying the EUT, client and producer information.
After a EUT has been defined, a test window can be opened (from the 'Test' menu) and a test can be started. Different types of tests can be performed from the same EUT window. All the test data for the EUT will be stored in the same EUT file.
When, at a later time, tests are to be performed on the same EUT, the old EUT file can be opened and the new test results can be stored under this (old) EUT window.
This allows test data from different tests, using different sets of test equipment, performed at different times and even at different locations, (regarding one EUT), to be stored in one clear EUT file.
Make sure that a network is used to store all the test data when performing tests at different locations.

2.9.1 Creating a new EUT file

To perform test(s) on a new device, start by creating a new EUT file. Select **'File' , 'New' , 'EUT'** or press **'Ctrl+E'** .

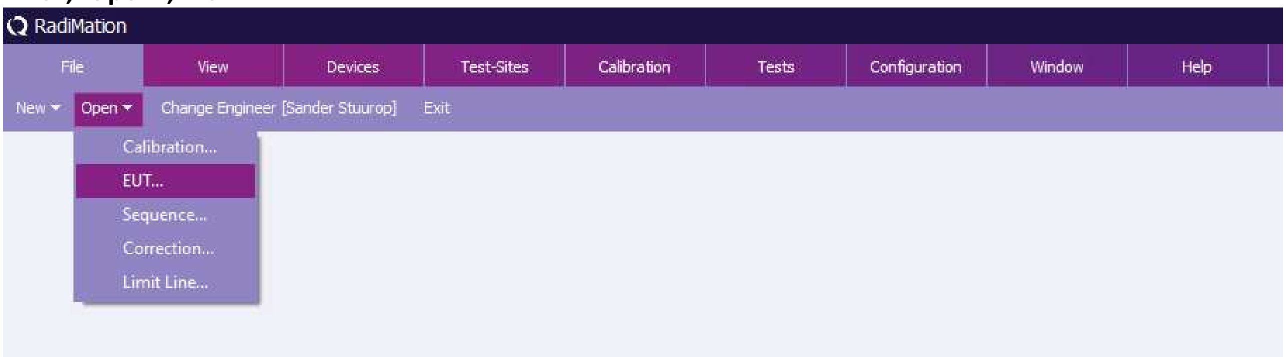


RadiMation® will ask you to specify and save a file name for this new EUT file. Name the EUT file and click **'Save'** .
(All the test data for this EUT will be stored under this EUT file name.) The **'EUT' window** will open.

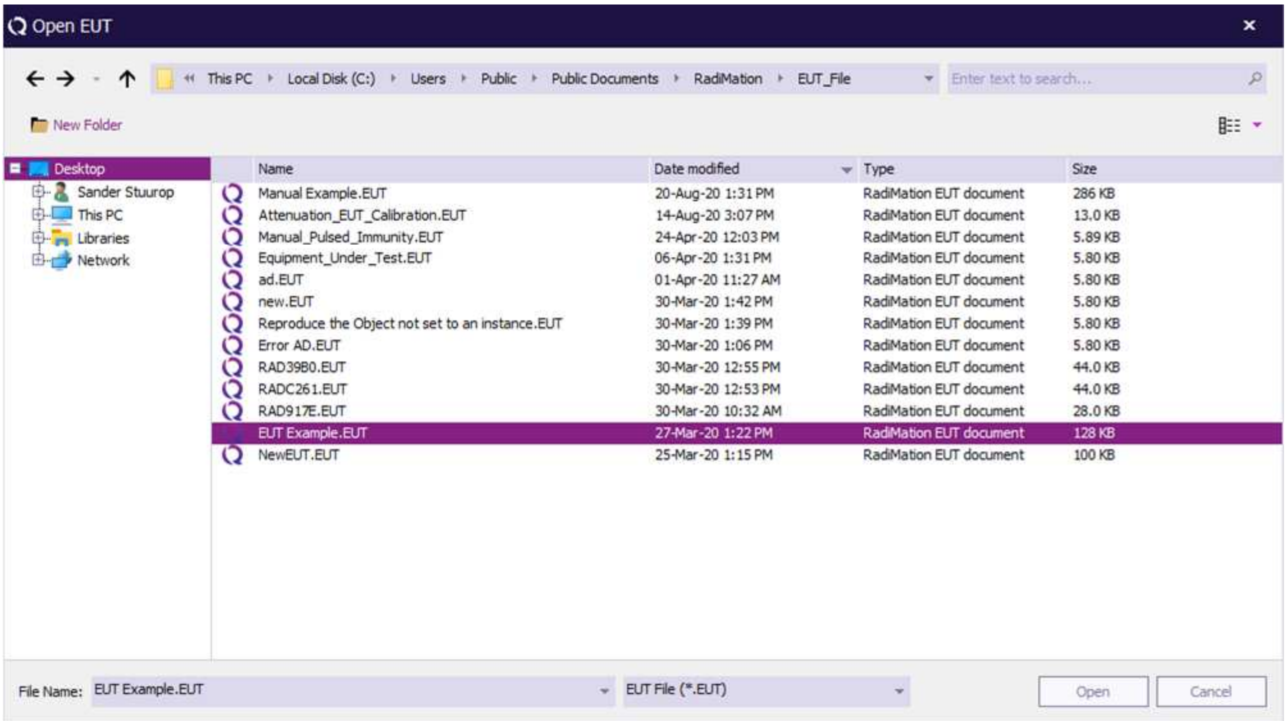


2.9.2 Opening an existing EUT file

To perform test(s) on a previously tested device, open the existing EUT file for that device. Select **'File' , 'Open' , 'EUT'** .

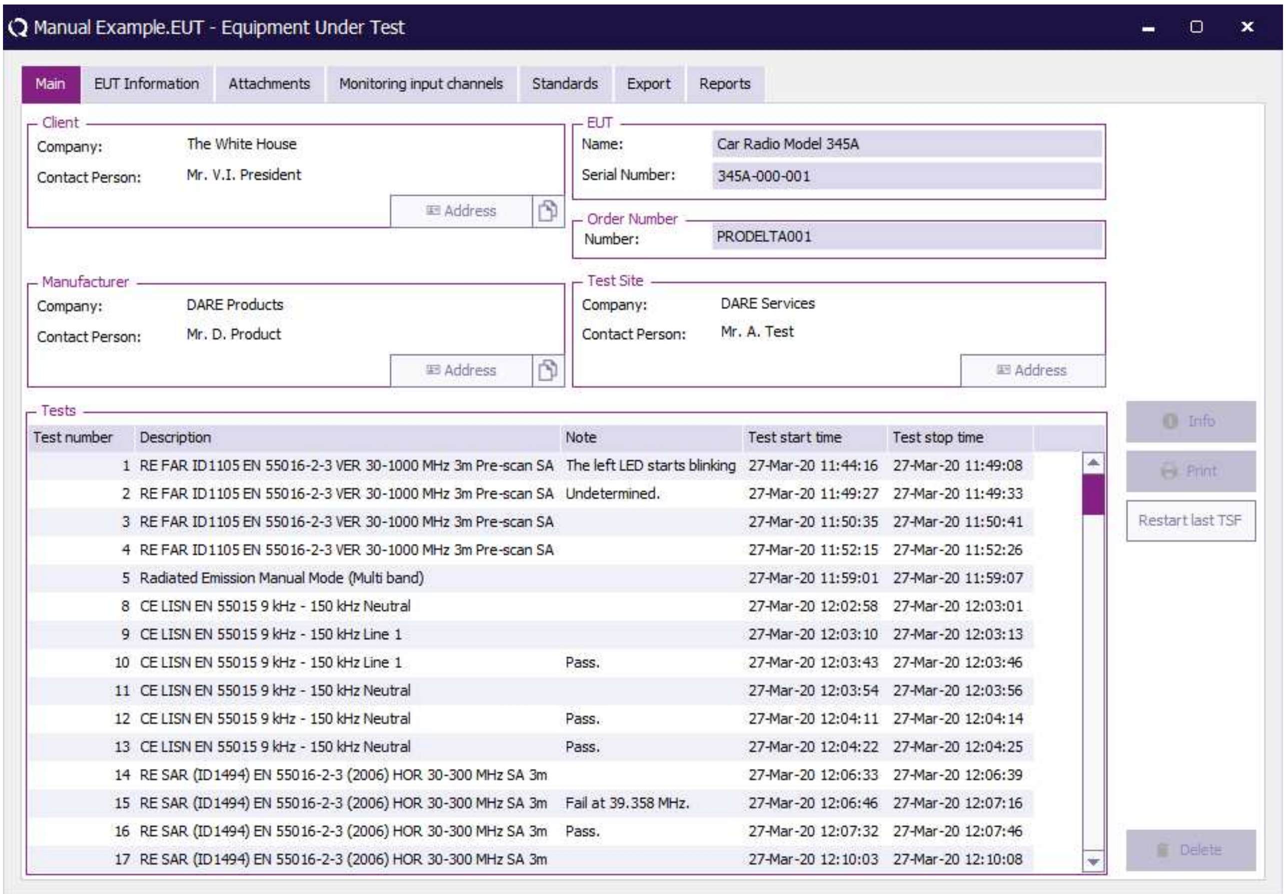


RadiMation® will ask you to specify and open an existing EUT file. Select the desired EUT file and click **'Open'** .
(The new test data will be added to the already existing EUT file.)



2.9.3 EUT window overview

After performing a number of test the **'EUT' window** will look something like the example shown below.



The **'EUT' window** contains five tabs; 'Main', 'EUT Information', 'Monitoring input channels', 'Standards' and 'Reports'.

- The **'Main' tab** consists of six areas where Client, Manufacturer, EUT, Order Number, Test Site and Test information can be found and specified.
- The **'EUT information' tab** consists of two areas; EUT and Cables. Here (more detailed) EUT information can be specified. This includes the cables that are connected to the EUT.
- The **'Monitoring input channels' tab** consists of two areas that can be used to monitor the input channels and setup short cut keys (that can be used during measurements).
- The **'Standards' tab** consists of two areas; Product Standards and Basic Standards. Standards related to the EUT can be added in these fields. (Documentation for standards can be added to RadiMation® in the 'Product standards' and 'Basic standards' tabs of the 'Configuration' window.)
- The **'Reports' tab** can be used to generate reports with the configured report generator, export reports to a spread sheet program and print detailed EUT information.

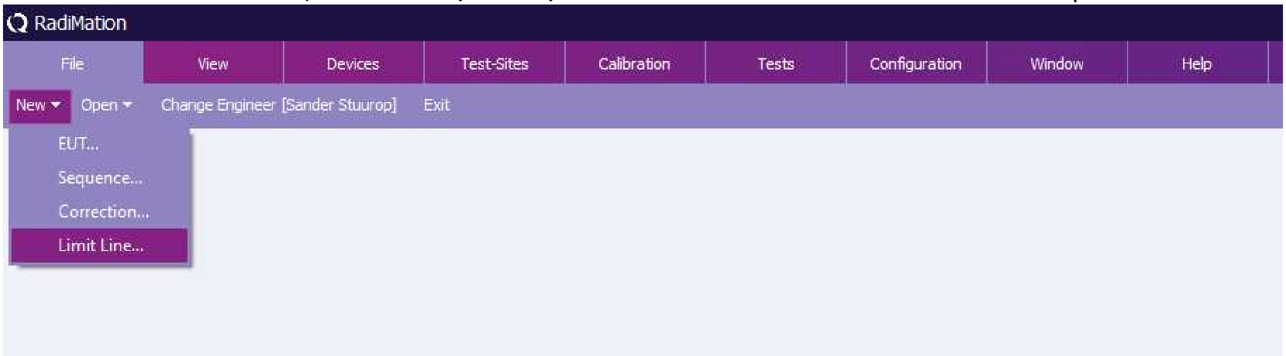
More information about the content of these tabs can be found in Chapter 3 "EUT Information".

2.10 Limit line files

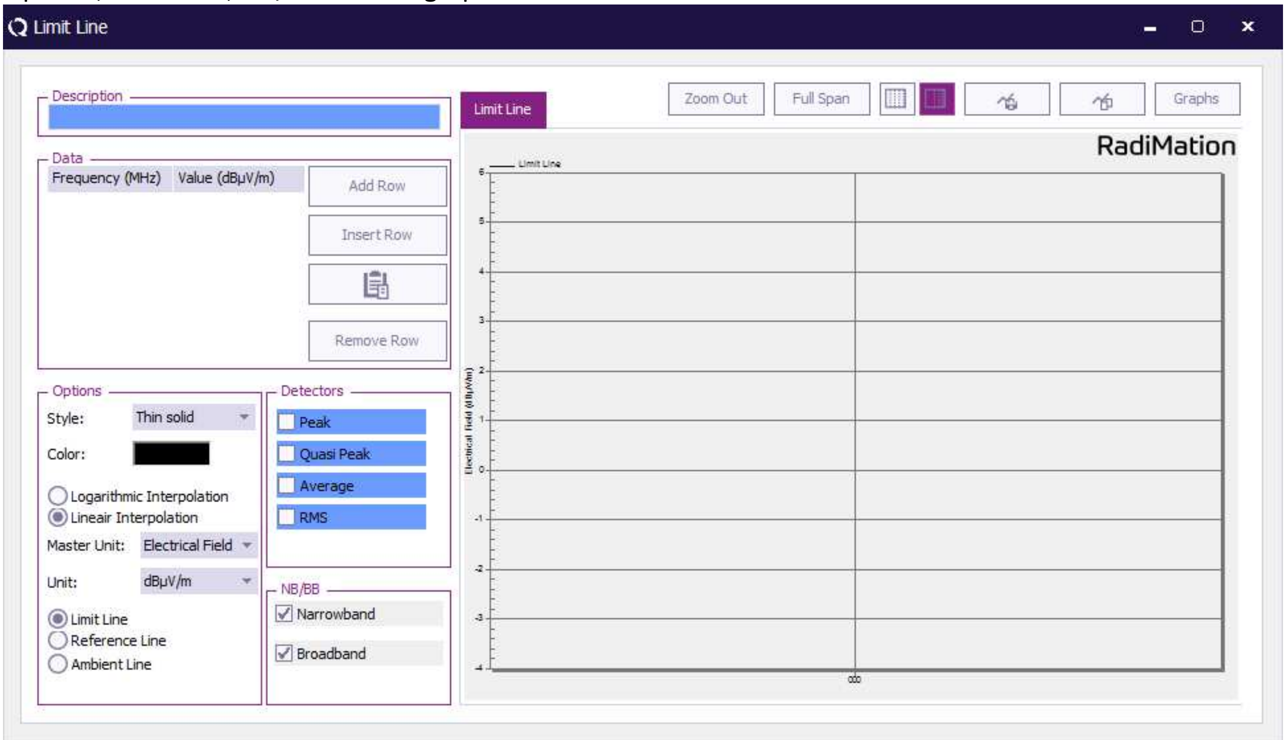
Limit line files are used during Radiated and Conducted emission tests. The operator can define limit line files in accordance to the applicable standard and select them when starting an emission test.

2.10.1 Creating limit lines

To create a Limit Line File, select **'File' , 'New' , 'Limit Line'** . The **'Limit Line' window** will open.



The default **'Limit Line' window** will appear. This window contains six fields; Description, Data, Options, Detectors, NB/BB and the graph area.



2.10.1.1 Enter limit line information

To set up a limit line, enter the following information:

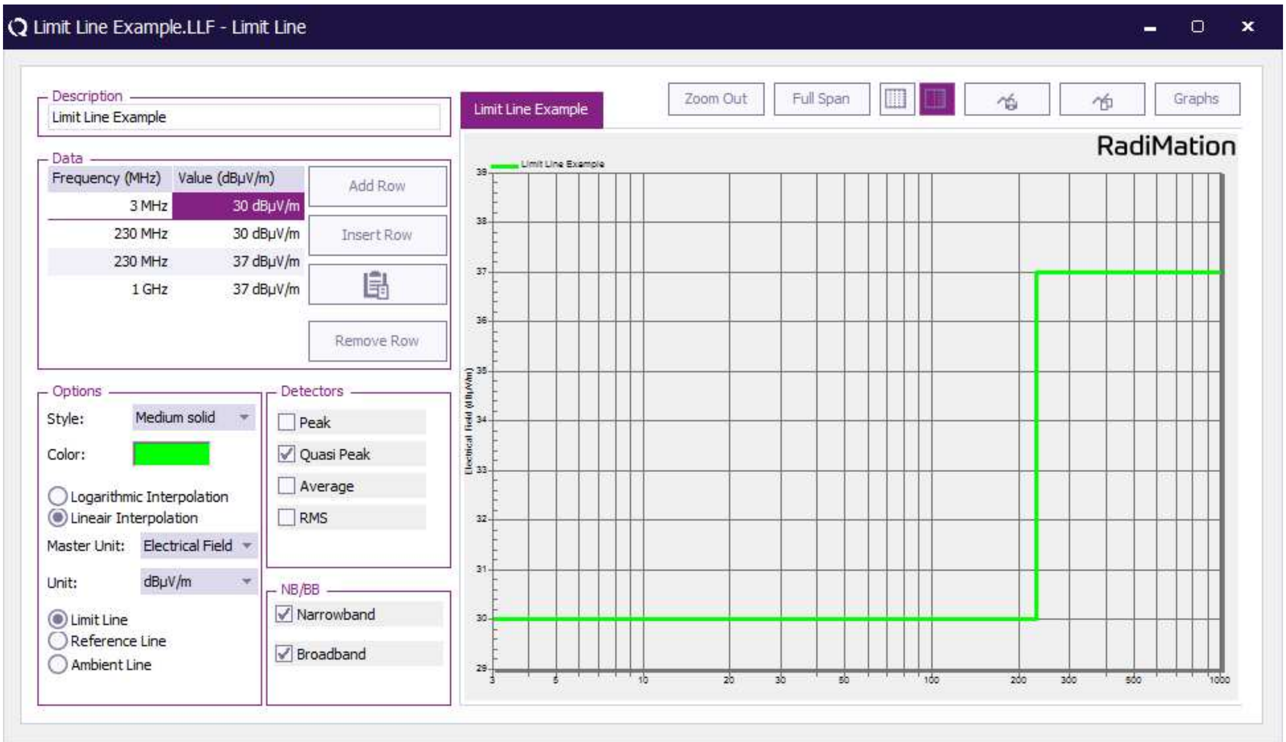
- **Description** Enter a file description for the limit line in the Description field (e.g. Limit Line Example).
- **Data** Enter frequency-value pairs for the limit line in the Data field (see ‘Enter, edit & remove data pairs’ below).
- **Options** Setup the Options field:
  - Select a line style and colour for the graph line.
  - Select either logarithmic or linear interpolation. In between the specified frequency points, the correct value of the limit line will be calculated by using

either a logarithmic or linear interpolation over the frequency axis. This choice is depending on the requirements of the applicable standard.

- Select the Master Unit (or Dimension) for the y-axis, (e.g. Electrical Field).
- Select the Unit for the y-axis, (e.g. dBµV/m).
- Mark the line as a Limit Line or Reference Line. The value of a limit line is compared to detected peaks. The value of a reference line is only usable as a graphical comparison with graphs.

➢ **Detectors** Setup the Detectors field by selecting one or more detectors. During emission tests, RadiMation® will check if the measured emissions are below the limit line(s). To perform this check in the correct way, the software must know for which detector(s) the limit line is valid.

➢ **NB/BB** Setup the NB/BB field by selecting the option(s) Narrowband and/or Broadband.



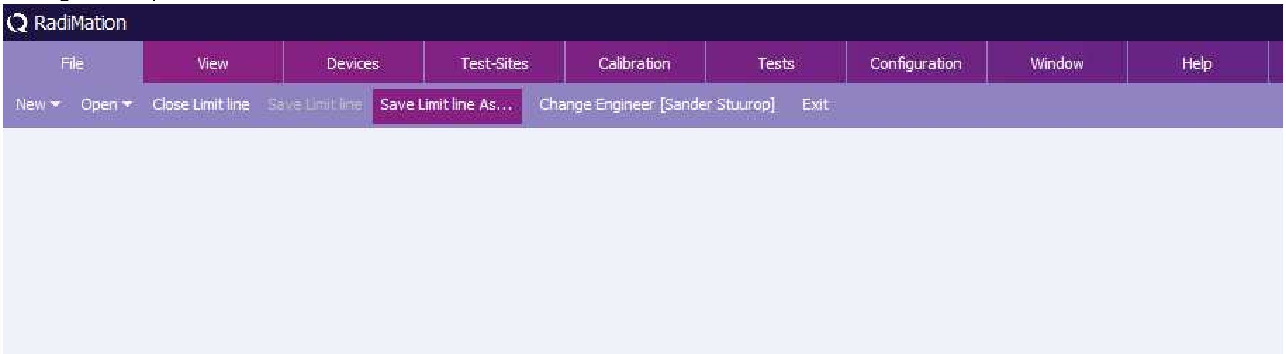
2.10.1.2 Enter, edit & remove data pairs

- To enter a frequency-value pair, click the **'Add Row'** or **'Insert Row'** button, a new row will appear in the data field. Select the desired row and enter the frequency and value data, the limit line will be drawn directly in the graph.
- To edit a data pair, select the desired value and/or unit of the data that you wish to edit and insert the new value and/or unit.
- To remove a frequency-value pair, select the desired data pair and click **'Remove Row'** .

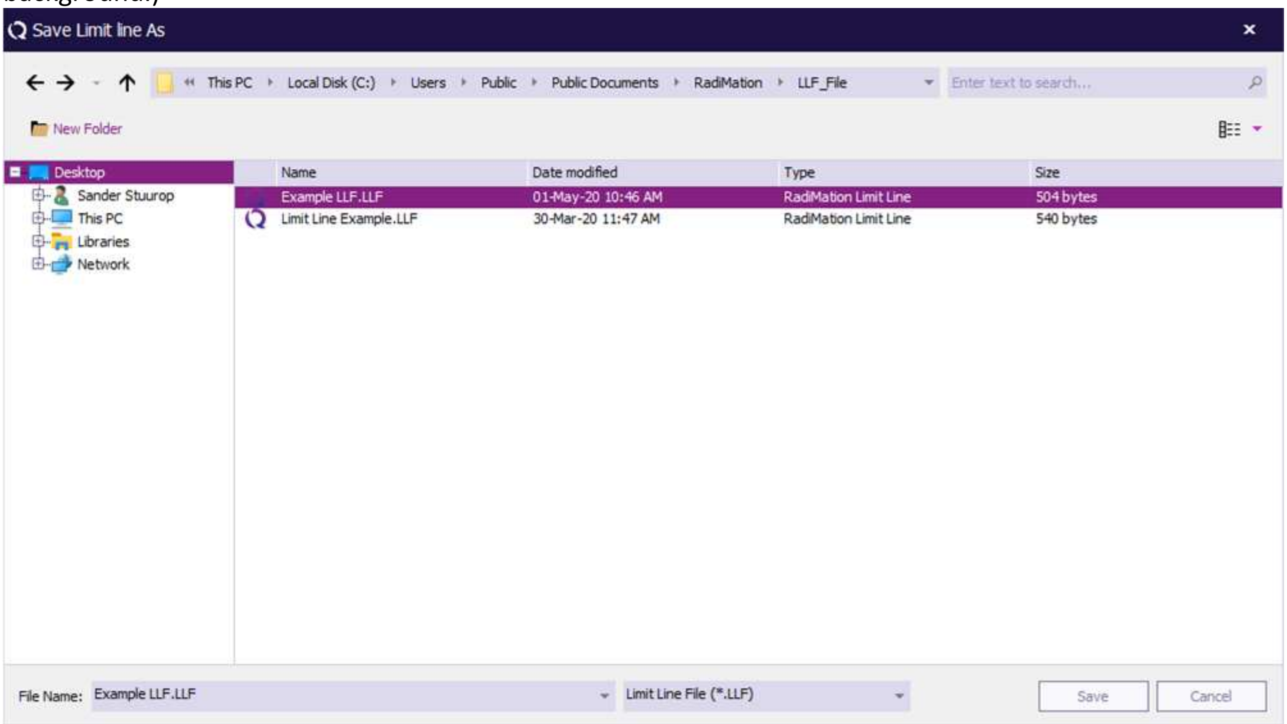
2.10.2 Saving limit line files

Before a limit line can be saved, make sure the required information has been entered into the **Description**, **Data** and **Detectors** fields. Otherwise a **'RadiMation Warning' window** will appear when you try to save the limit line.

To save a Limit Line File, select **'File' , 'Save Limit line'** (or **'Save Limit line As...'**).
The **'Save Limit line As' window** will open. (The 'Limit Line' window will remain open in the background.)

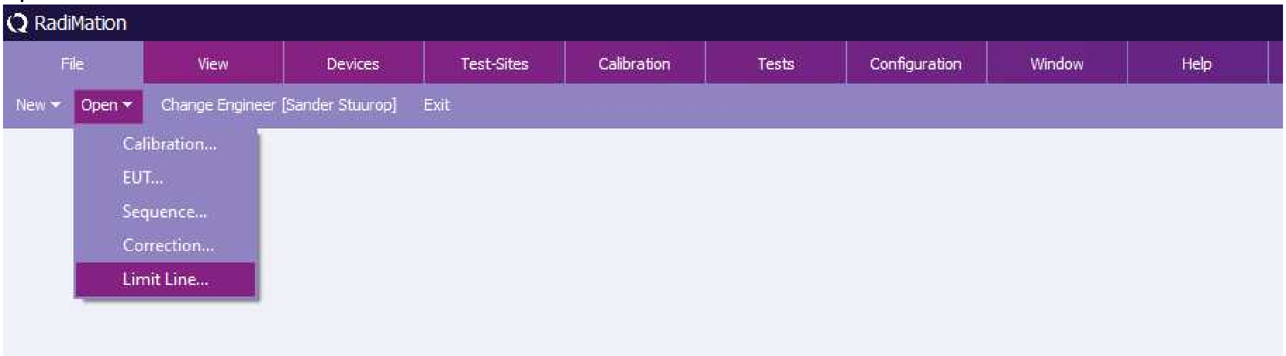


RadiMation® will ask you to specify and save a file name for the (new) Limit Line File.
This can be the same or a different filename as used in the limit line **Description** field of the **'Limit Line' window**.
Name the Limit Line File and click **'Save'** . (The 'Limit Line' window will remain open in the background.)

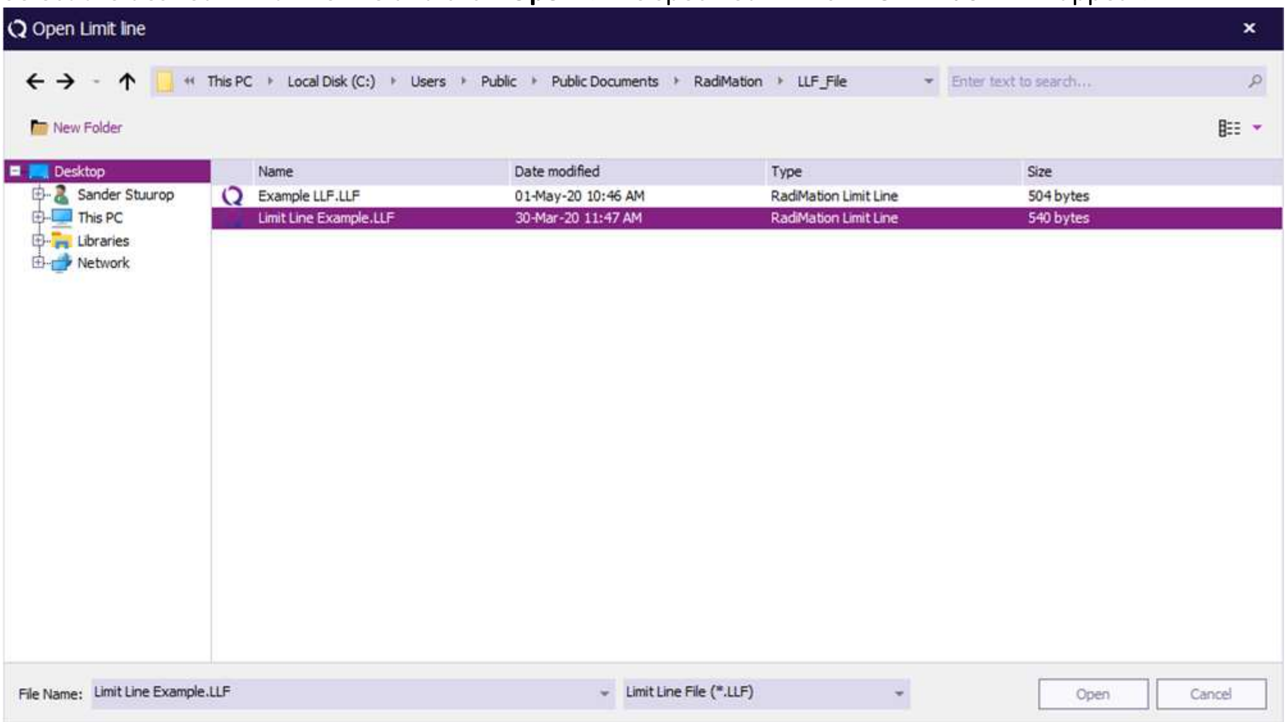


2.10.3 Opening limit line files

To open an existing limit line file, select **'File' , 'Open' , 'Limit Line'** . The **'Limit Line' window** will open.



RadiMation® will ask you to specify and open an existing Limit Line File.
Select the desired Limit Line File and click **'Open'** . The specified **'Limit Line' window** will appear.

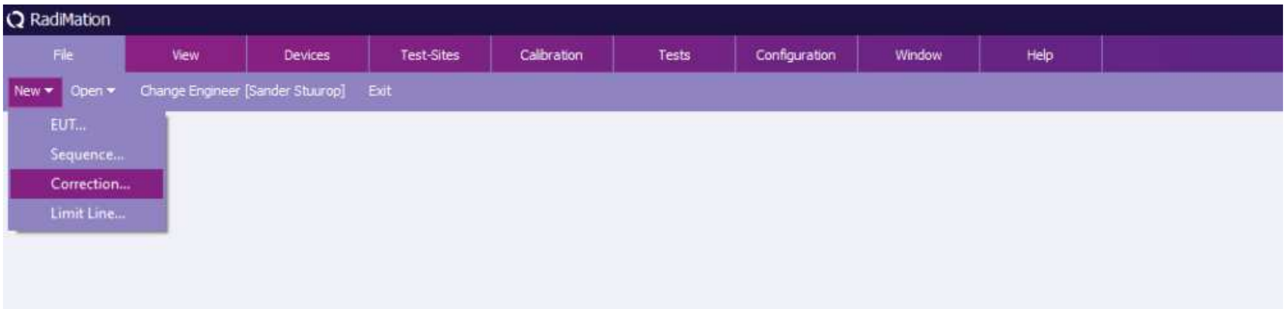


2.11 Correction files

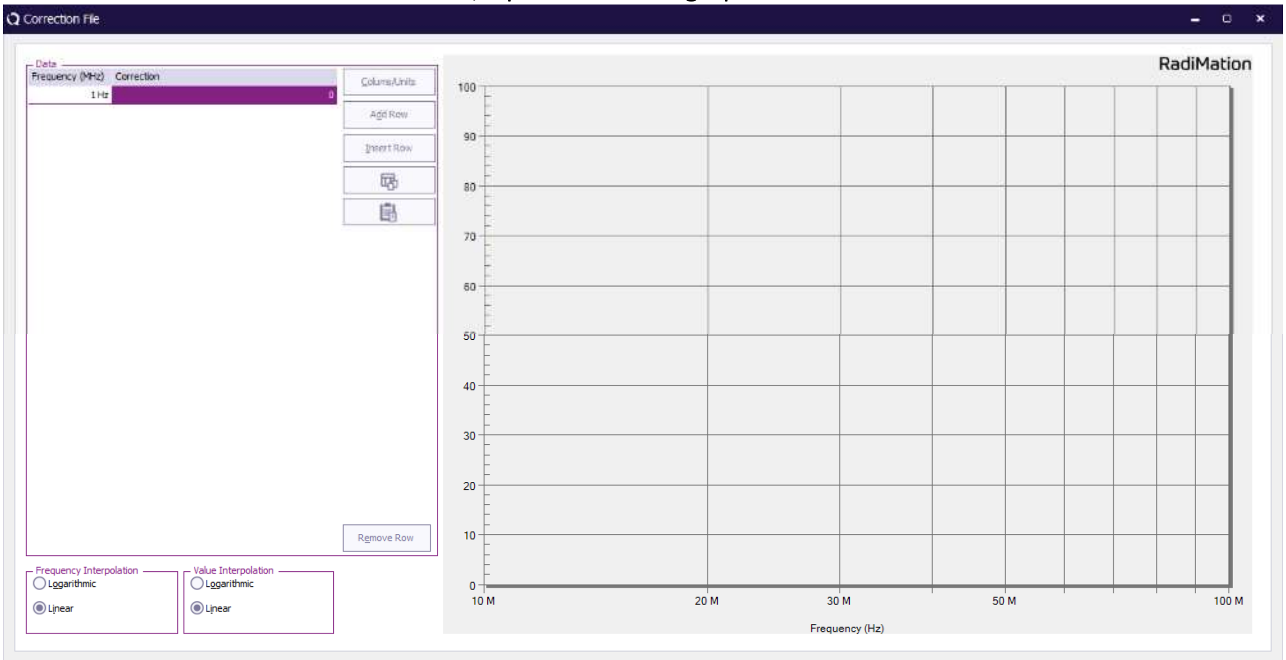
Correction files can be used to for a lot of different purposes, for example to correct the frequency response of cables, generators, clamps, antenna's, couplers, etc. When the frequency response of a device is known, the operator can create a new correction file and assign it to the device. From then on, every time that the device is used during a test, the values in selected correction are used to correct the measurement results.

2.11.1 Creating correction files

To create a Correction File, select **'File' , 'New' , 'Correction'** or press **'Ctrl+O'** .



The default **'Correction File' window** will appear.
This window contains three areas: Data, Options and the graph area.



2.11.1.1 Enter correction file information

To set up a correction file, enter the following information:

- **Data** Enter data pairs for the correction value in the Data field (see ‘Enter, edit & remove data pairs’ below).

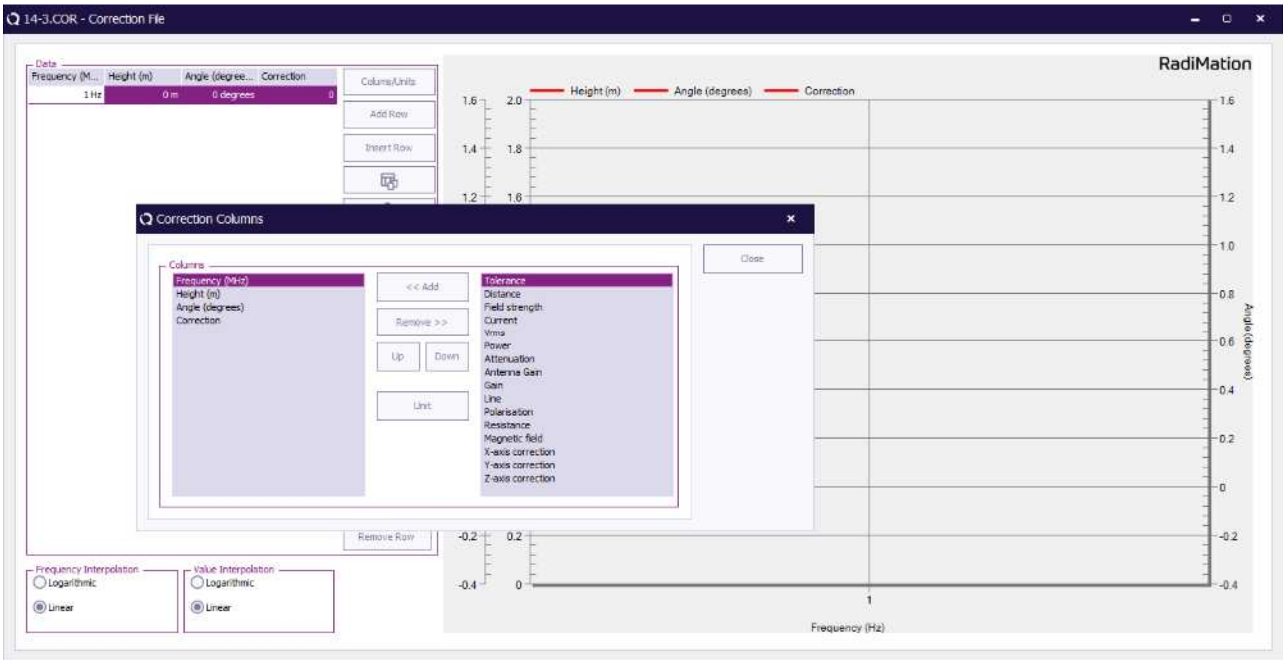
- **Options** Select either logarithmic or linear interpolation.
In between the specified frequency points, the correct value of the correction value will be calculated by using either a logarithmic or linear interpolation over the frequency axis. This depends on the requirements of the applicable standard.

2.11.1.2 Enter, edit & remove data pairs

The **Data columns** need to be defined before data pairs can be added.

To select the desired columns (based on the use of the correction file), click **'Columns/Units'** . The **'Correction Columns' selection window** will appear where columns can be added and/or removed. Depending on the usage of the correction file, one or more columns can be selected. E.g. an amplifier limitation correction file will need two columns: frequency and power. A radiated emission

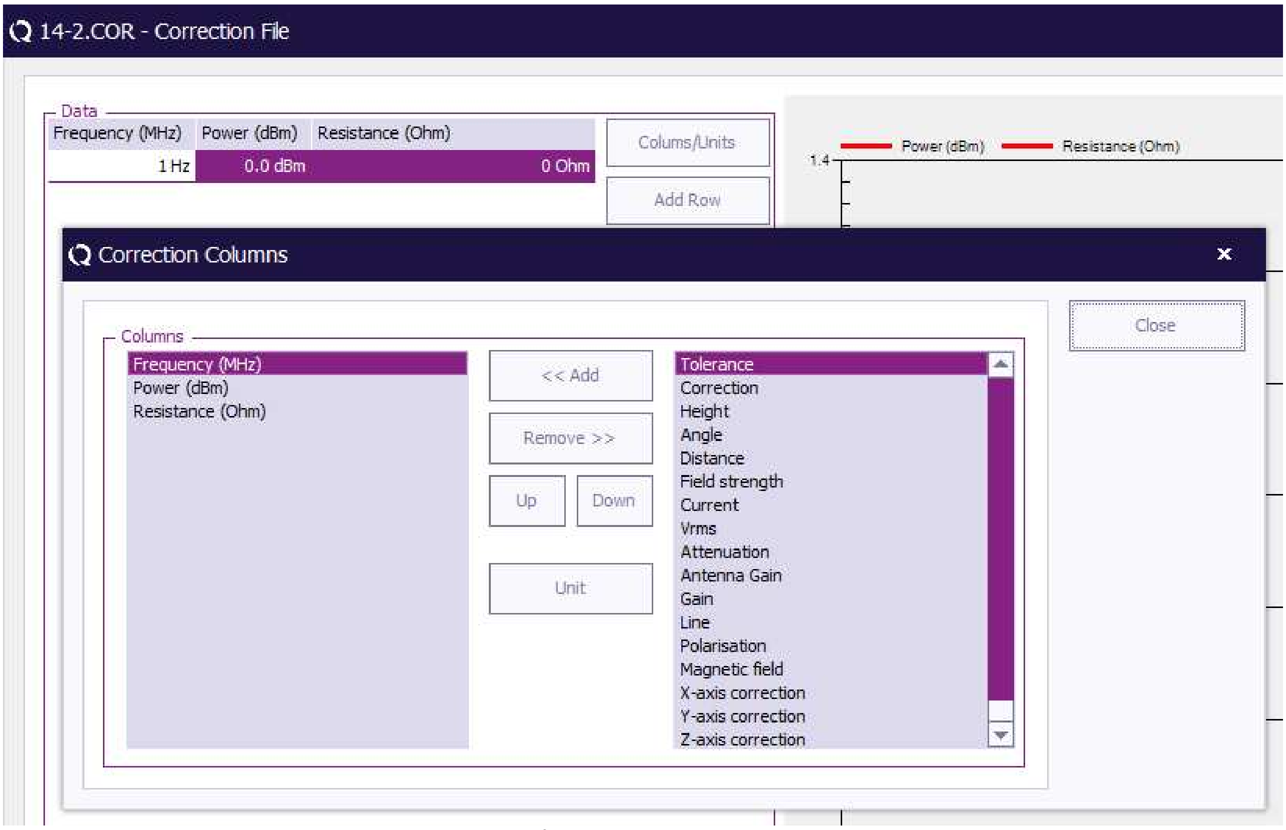
test frequency list requires three columns: frequency, angle and height. A simple frequency list for an immunity test only contains a single column: frequency. Also the unit of each of the columns can be modified to represent the desired unit.
Click **'Close'** to return to the **'Correction File' window**.



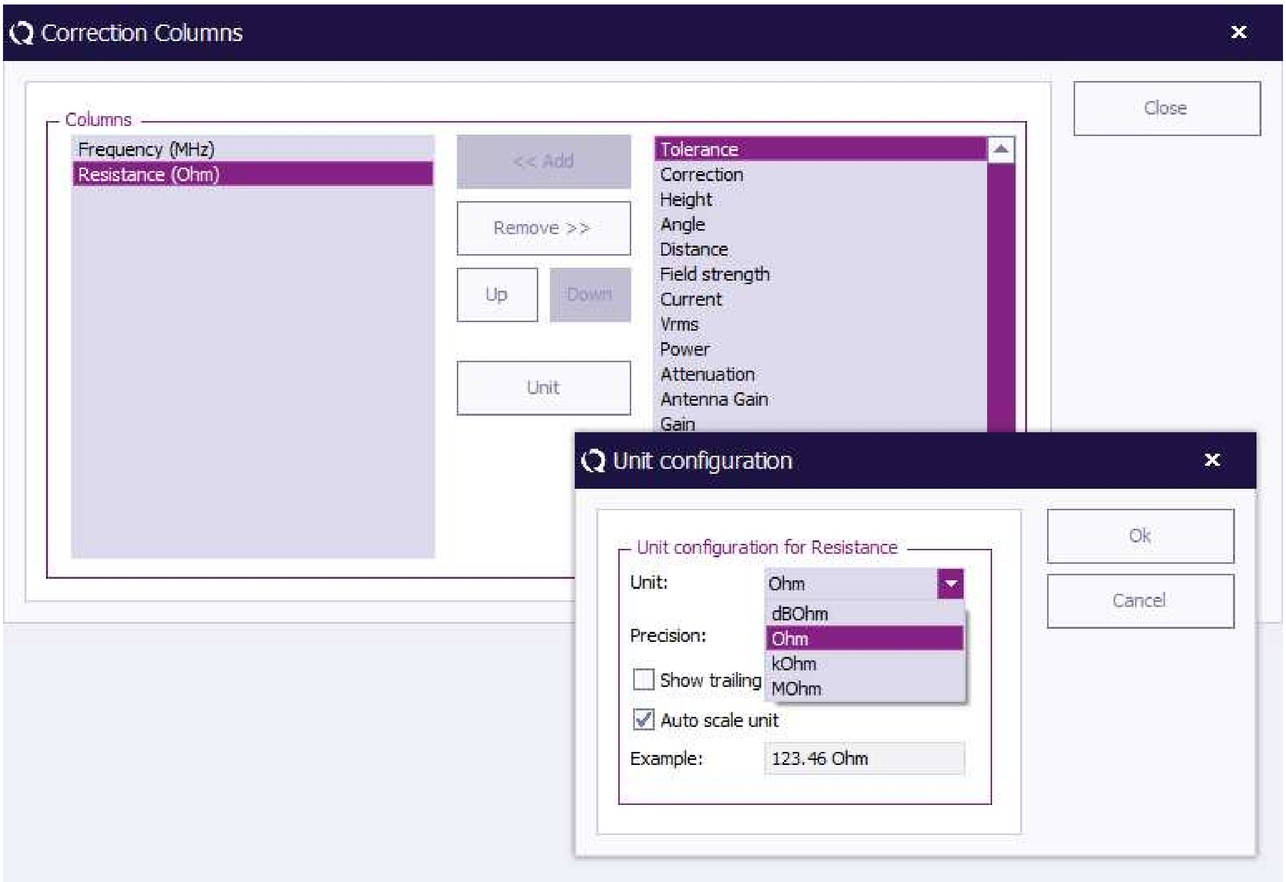
- To enter a data pair, click the **'Add Row'** or **'Insert Row'** button, a new row will appear in the data field. Select the desired row and enter the information for the data pair, the correction value will be drawn directly in the graph.
- To edit a data pair, select the desired value and/or unit of the data that you wish to edit and insert the new value and/or unit.
- To remove a data pair, select the desired data point row and click **'Remove Row'** .

2.11.1.3 Defining the units for the column

As shown in the paragraph above you can use the button **'Columns/Units'** to add columns for specific types of information.



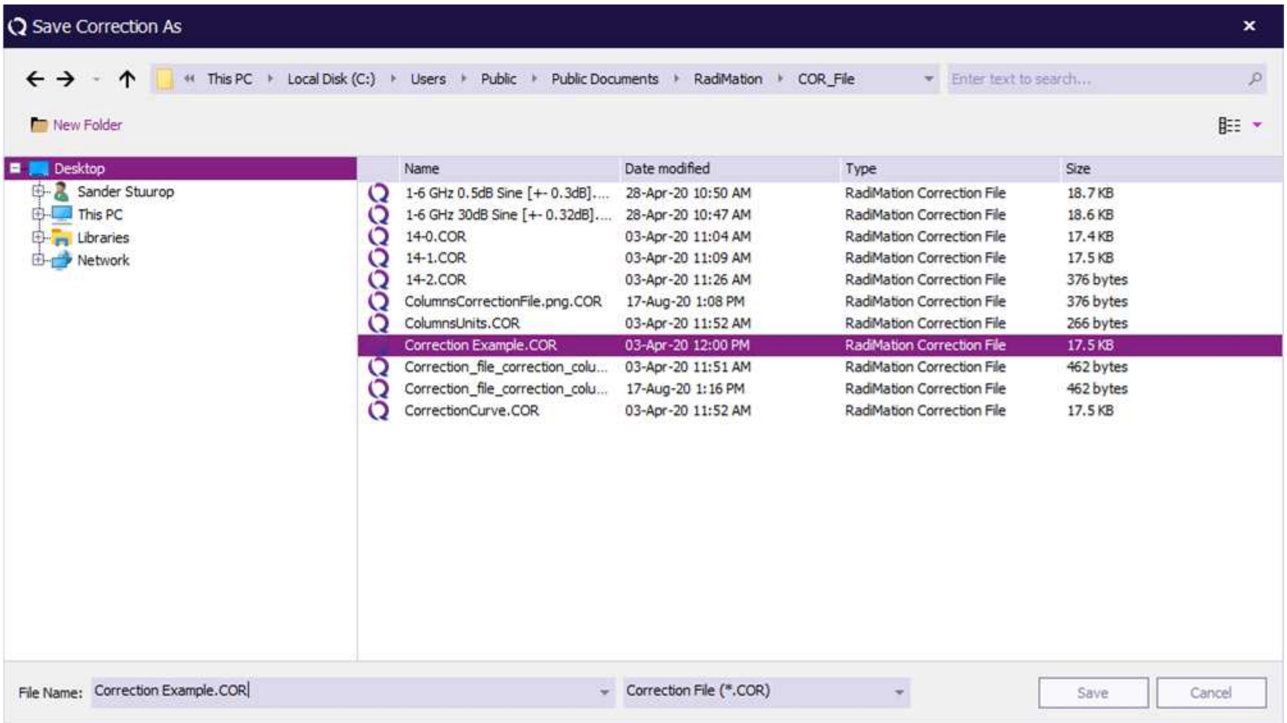
Correction files are being used in RadiMation® to correct the data in a lot of different situations. An example of this would be when you add a new current sensor device to your setup, which should be corrected with the correct resistance. The correction factor you need to use is usually supplied by the manufacturer, but different manufacturers use different units to express the correction factor. To accommodate for this you can select a specific unit (like Ohm or dBOhm) for the resistance column.
See the picture below on how to change the unit.



2.11.2 Saving correction files

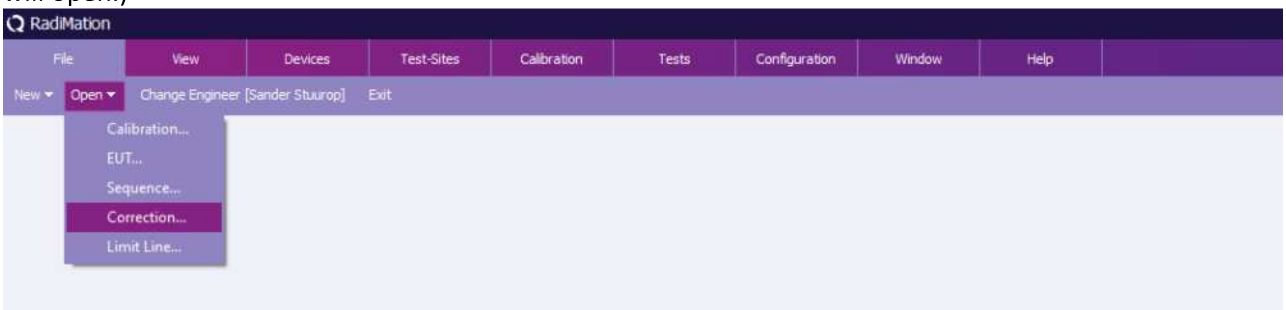
To save a Correction File, select **'File' , 'Save Correction' (or 'Save Correction As...').**
(The 'Save Correction As' window will open. The 'Correction File' window will remain open in the background.)

RadiMation® will ask you to specify and save a file name for the (new) Correction File.
Name the Correction File and click **'Save'** . (The 'Correction File' window will remain open in the background.)

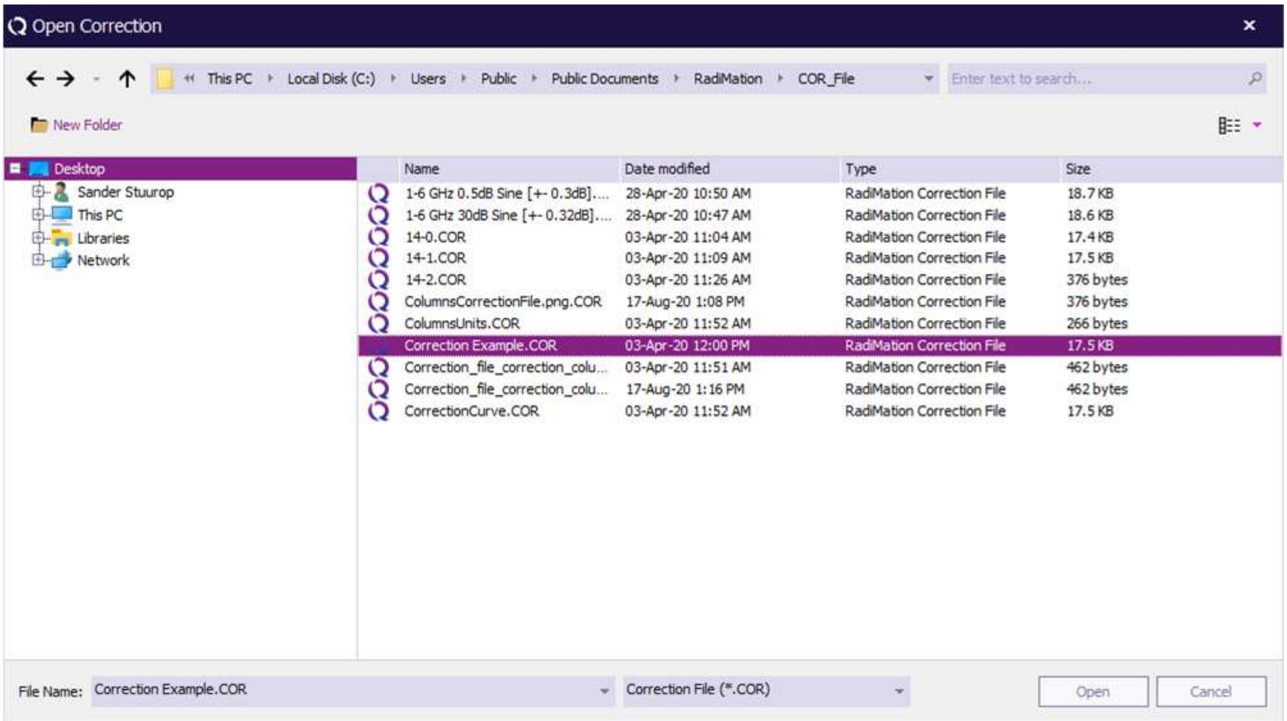


2.11.3 Opening correction files

To open an existing limit line file, select **'File' , 'Open', 'Correction'** . (The 'Open Correction' window will open.)

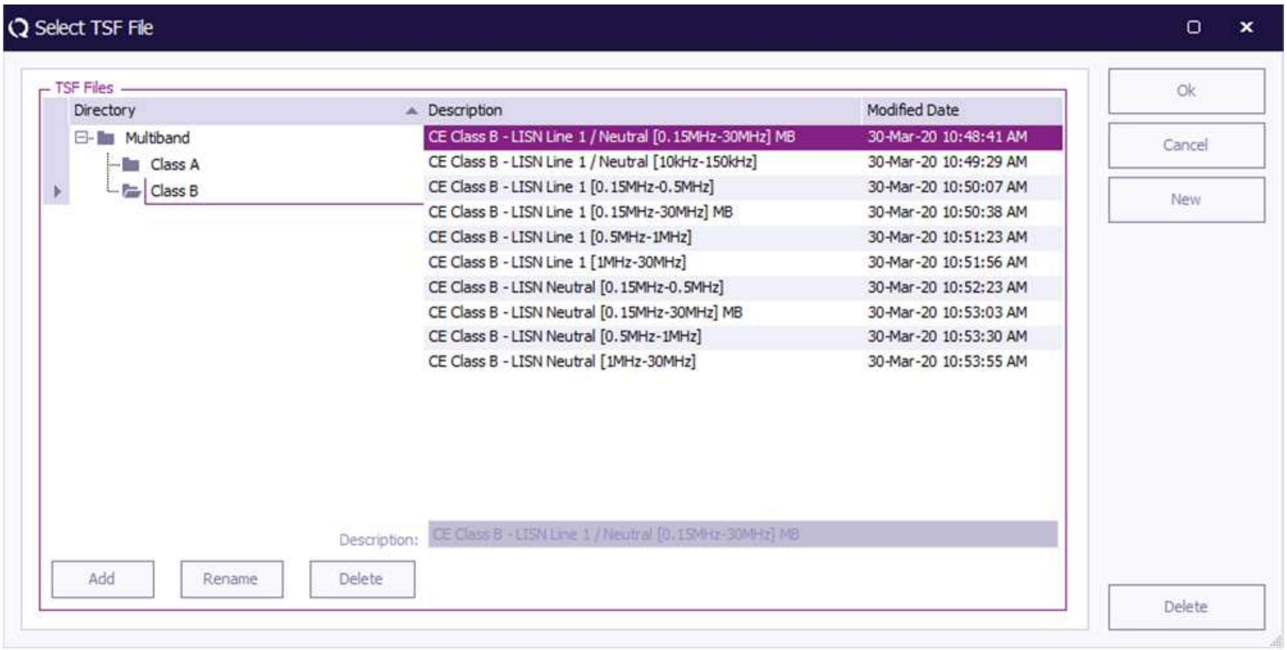


RadiMation® will ask you to specify and open an existing Correction File.
Select the desired Correction File and click **'Open'** . (The specified 'Correction File' window will appear.)



2.12 Using Test Setup Files (TSF)

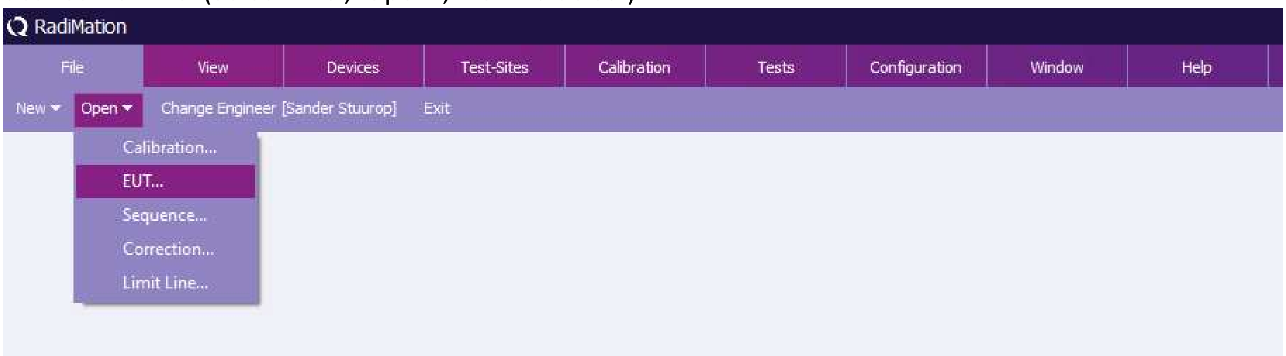
RadiMation® is a modular integrated test software package, which, in its full configuration, can perform full automatic EMC tests. The software package includes Radiated immunity tests [R.I.], Conducted immunity tests [C.I.], Radiated emission tests [R.E.] and Conducted emission tests [C.E.]. (For more information about the modular test package, consult the software overview.)
The test configuration data for each type of test (such as start/stop frequency, test level, dwell time, etc.) can be saved in a Test Setup File (*.TSF). This file also stores the calibration file and test site information. Save the TSF file with a clear name/description for future reference. A maximum of 40 characters can be used for the description of the TSF file. When the same type of test must be performed, one can simply load the matching TSF file and start the test.
RadiMation® enables the user to create a directory tree to organize and store the different TSF files in a structured way.



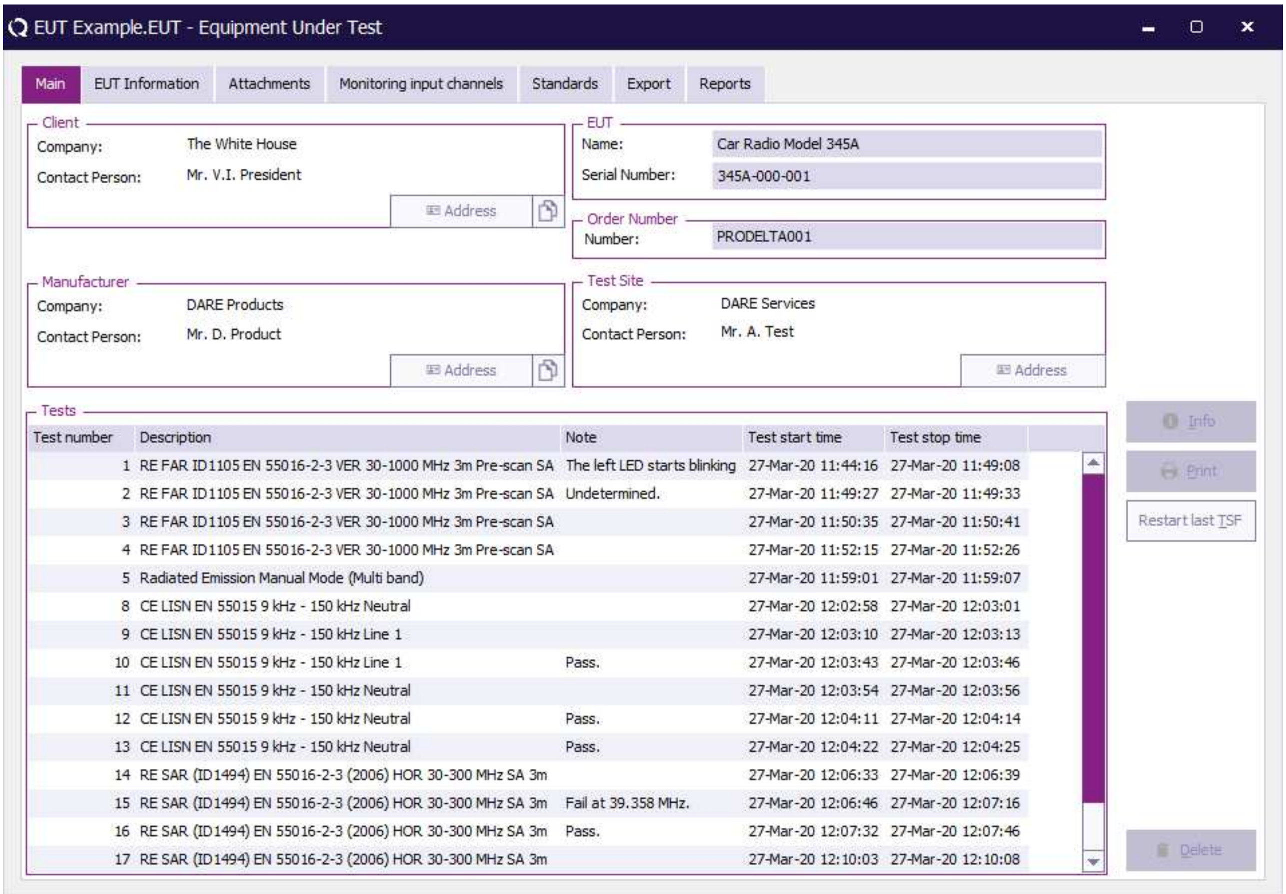
A more advanced use of the TSF files takes place during sequence testing. In a sequence, different TSF files (even from different types of tests) can be lined up and started without the intervention of a test engineer.
(See Chapter 11 "Sequence Testing" for more information.)

2.13 Viewing test data

RadiMation® stores all the test data in the corresponding EUT files. To view the test data, open the desired EUT file. (Select 'File , 'Open' , 'EUT' to do so.)



The **'EUT' window** will show a list of all the performed tests for the selected EUT (in the 'Main' tab). To view the extended data from a single test, select the desired test from the list and click the **'Info' button** on the right side of the window.

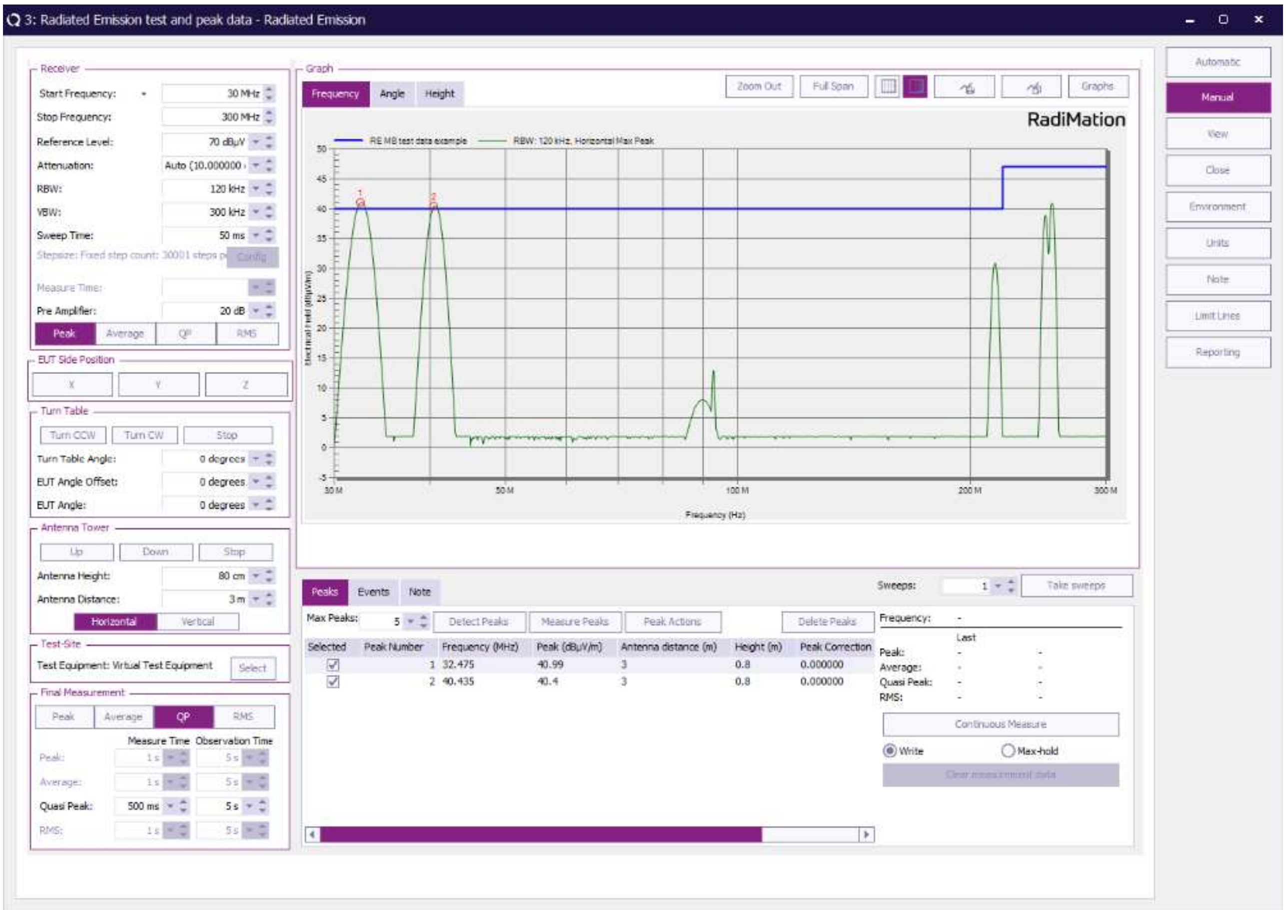


A **'test data window'** will open, displaying all the data for that test. This includes general information, such as:

- Time and date of the test
- Equipment used during the test (including serial numbers)
- Test engineer
- Notes
- Ambient information

And test specific information, such as:

- Test graphs
- Test configuration data
- Calibration file used during the test (if applicable)



2.14 Printing test data

Test data can be printed in a few different ways.
Open the **'EUT' window** ('File' , 'Open' , 'EUT') that contains the desired test data and select the most appropriate print option for your situation:

1. To print part of the data from one test;

- Select the desired test (in the 'EUT' window) and click **'Info'** at the right side of the list.
- Select the graph that you want to print (in the 'test data window'). The graph will be displayed on the screen.
- Click the **'print graph' button** above the graph (containing a graph and printer icon). The selected graph will be printed.

2. To print all the data from one test;

- Select the desired test (in the 'EUT' window) and click **'Print'** at the right side of the list. The data from the selected test will be printed.

3. To print the data of more than one test;

- Select the desired tests (in the 'EUT' window) while holding the **'Shift'** button.
- Click **'Print'** at the right side of the list, the selected tests will be printed.

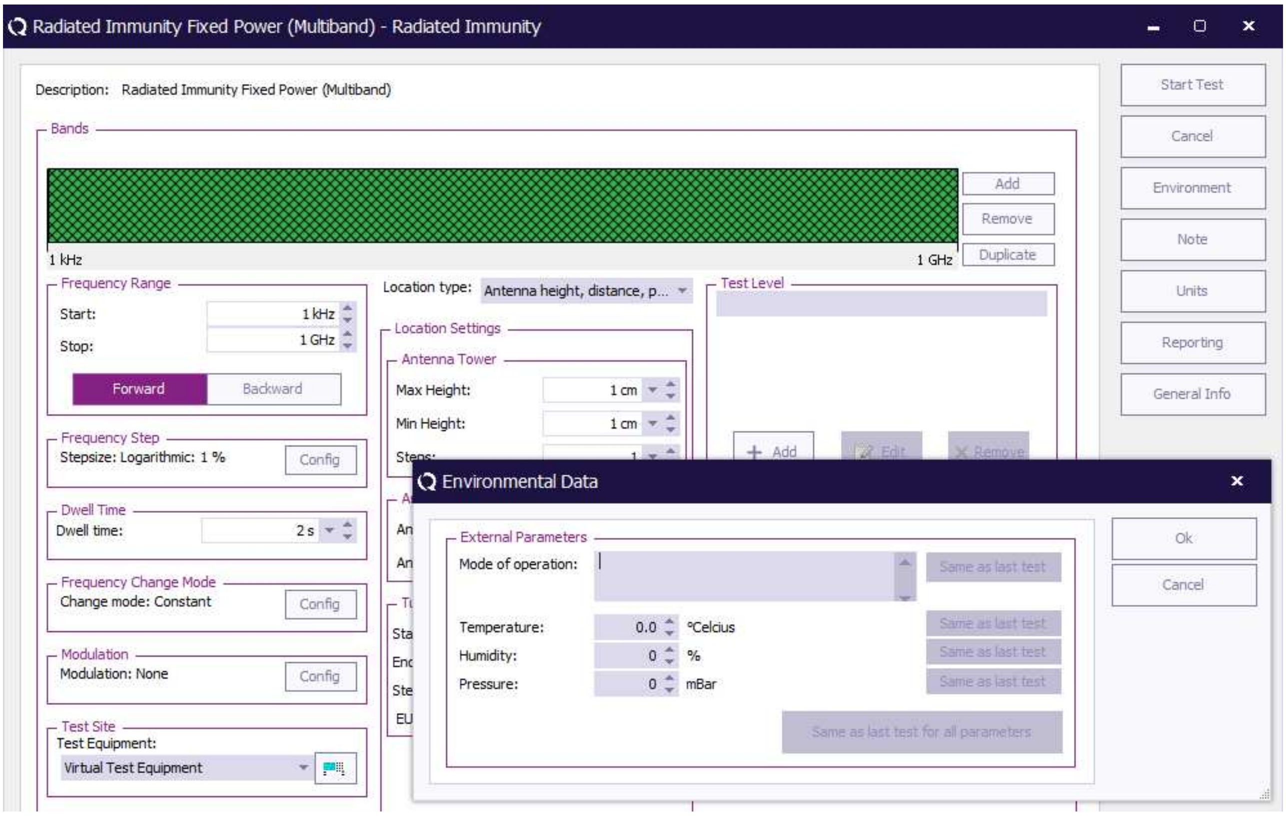
> **Warning:** Printing from RadiMation® will be done by your default Windows printer (with its default settings). To change the printer/settings used by RadiMation®, please change the default printer settings in your Windows environment.

2.15 Report generation

RadiMation® can use the information of the performed tests to automatically generate a report as well as export all the data to Microsoft Excel.
This can be done with the Report Generator and Excel Exporter. Please read Chapter 13 for detailed descriptions of these functions.

2.16 Ambient information

During EMC tests, ambient temperature, air pressure and relative humidity can influence test accuracy. Because of this most EMC standards define (at the very least) the temperature range in which EMC tests must be performed.
Each test configuration menu allows you to enter a value for the temperature, pressure and relative humidity at the start of the test. This data can be entered, and viewed, in the **'Environmental Data' window**, which can be opened from any **'test data window'** .
To open the **'Environmental Data' window**, click the **'Environment' button** in the **'test data window'** .



2.17 The first test

Now that we successfully have installed RadiMation and know how to configure the general settings we can launch RadiMation with a (default or created) test engineer account. Most importantly, we are able to create and configure the device drivers needed for our test setup and add them to our created test equipment.
Also, when we need Correction files and/or Limit Line Files we know how to handle them. Creating or opening an EUT file and the general EUT overview has been explained.
To start performing tests it is necessary to have an EUT opened and to create your first TSF (Test Setup File). Proceed to the next Chapters of the manual to read on how a test is configured. For some tests it is required to run a calibration first in order to run.

RadiMation® EMC software
------- EUT information -------

Table of contents:

EUT Information

EUT information is defined as all the information related to the EUT with the exception of real test specific information and test results. EUT Information can for example be address information, needed cables, attachments, dimensions and other information. The EUT file can be used to maintain all this information for the EUT that is being tested. The EUT information can be exported using the Report generator and the Exporter. Some information is also used in the print outs, depending on the print out.

A new EUT file can be created by selecting from the menu:

- **File**
  - **New**
    - **EUT**

The new EUT should be directly saved, thus the 'Save As...' dialog is automatically shown.

To view the contents of an existing EUT file, the EUT file can be opened from the menu:

- **File**
  - **Open**
    - **EUT**

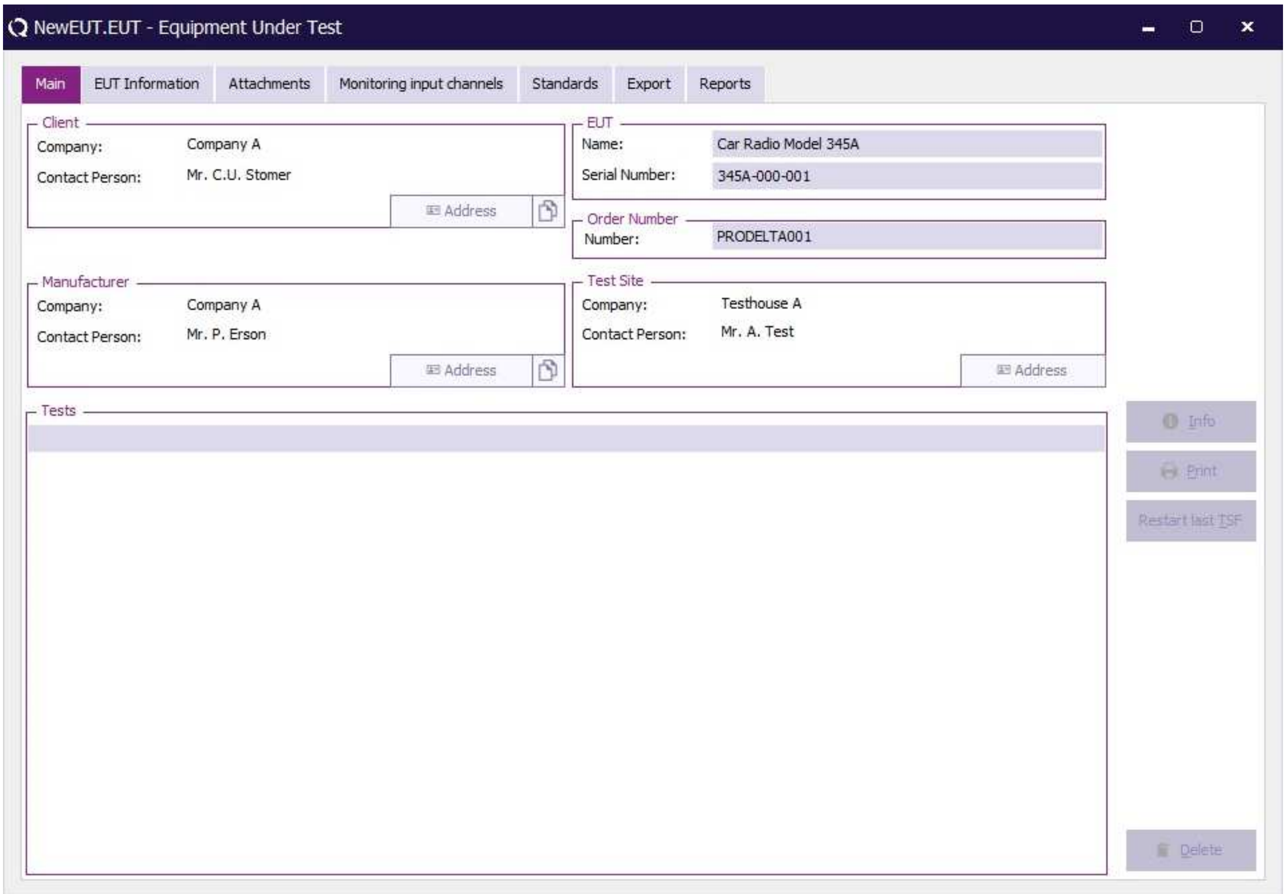
Then the EUT window is shown, and the information can be reviewed, modified and saved again.

If a test should be performed, first an EUT file should be opened, before the test can be started. RadiMation® requires that an EUT file is opened, because RadiMation® then is able to link the test results to the correct EUT on which the test is being performed.

An EUT file that is stored on a networked can be opened by multiple PC's simultaneously. The information and content of the EUT file can be reviewed by all the PC's. However if modifications are made in an EUT file, the PC that saves the EUT file at the latest moment, will determine the new content of the saved EUT file. Any changes to the contents of the EUT file that are modified by the other PC's will be lost. It is possible to open the same EUT file on multiple PC's, and perform tests on that same EUT file on multiple PC's. The test results of those simultaneously running tests will all be stored and linked to the same EUT file correctly. The test results of tests performed on the same EUT file from different PC's will thus be maintained.

3.1 Main tab

On the main tab, it is possible to specify the name, serial number and order number of the EUT. On the same tab it is also possible to specify the client, manufacturer and test site address information.



All address fields work identical. We will take the client address for the example. Pressing the **Address** button will open the **Address Information for Client** window:

3.2 EUT Information tab

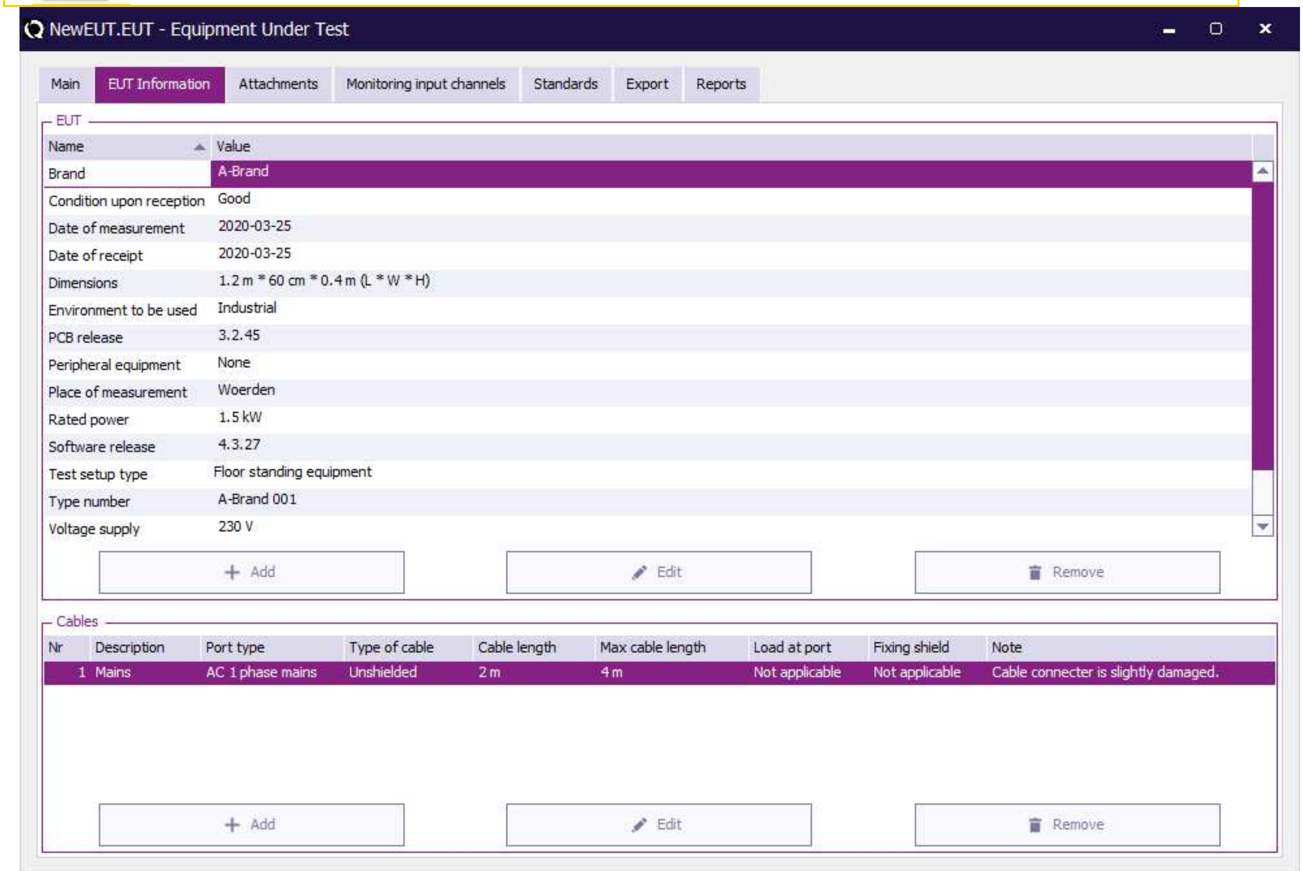
The **EUT Information** tab, can be used to specify EUT specific information. This tab contains a list of information items which is a general list of items that affect almost all EUT's. However some end-users do not need certain fields, and other end-users always need some additional fields. It is possible for end-users to specify 'Customizable EUT Information items'. The end-user can add an unlimited number of information items, and for each Information item a 'string' value can be specified. Each name of an information item should be unique compared to all other names in the information items list.

Some examples of additional information fields that can be needed are:

- Motor capacity
- Microcontroller board Firmware
- Website name of product
- Responsible engineer
- Name of account manager
- Market on which the product will be solved
- etc..

The list of information items will be represented as a 'list control' with two columns: 'Name' and 'Value'. If a value needs to be changed, the value can be edited in-line. Multi-line values are not allowed. If a name needs to be changed, the name can also be edited in-line. It is not possible to specify a name that is already available.

For more information on how to change the default EUT Information items, see https://wiki.radimation.com/wiki/index.php/Radimation_Application_Note_132



Three buttons are be available below the list. **Add**, **Edit** and **Remove**:

- **Add** Will create a new row, and will insert the edit point in the name of the information item

- **Edit** Will set the edit-point in the value of the information item. This button is only enabled if an information item is selected.
- **Remove** Will remove the selected information items without a confirmation. This button is only enabled if one or more information items are selected.

Double clicking in the information item name will activate the edit-point in the name field, then the name of the information item can be changed. Single clicking on the information item value will activate the edit-point in the value field, the value of the information item can then be changed.
Clicking on a column header will sort the contents of the list in alphabetic order. If the same column header is clicked again, the sorting will be reversed. The information item list will be alphabeticly sorted on the information item name, when it is first shown.

> The contents of each field can be retrieved in the report generator with the code: **||EUT|<INFORMATION ITEM NAME>||**, where the <INFORMATION ITEM NAME>, is the name of the information item. For example: **||EUT|Condition uport receipt||** will be replaced with the corresponding value (which is 'Good' in the above example).
> The report generator will check the list of information items as last. This means that other Report generator codes of the EUT file will have a higher priority to be included in the report.

A '|' is not allowed in the information item name to prevent confusion of the report templates. Valid characters in the information item name are: 'a-zA-Z0-9' and the dot '.', dash '-', underscore '_', hash '#' and plus '+'. Spaces are allowed, but not at the begin or the end. Other characters are not allowed in the information item name. All characters are allowed in the value of a information item.
By default, RadiMation® will always include the following information items in a new EUT:

- **Brand** The **brand** of the EUT
- **Type Number** The **type number** of the EUT
- **Voltage supply** The **voltage supply** of the EUT.
- **Rated Power** The **rated power** of the EUT.
- **Peripheral Equipment** The **peripheral equipment** of the EUT.
- **Dimensions** The **dimensions** of the EUT.
- **Condition upon receipt** The **condition** of the EUT upon receipt.
- **Environment to be used** The **environment** the EUT is to be used.

➢ **Date of Receipt**	The **date** the EUT was received.
➢ **Date of Measurement**	The **date** of the EUT measurement.
➢ **Place of Measurement**	The **place**of the EUT measurement
➢ **Software release**	The **software release** of the EUT.
➢ **PCB Release**	The **PCB release** of the EUT.
➢ **Test setup type**	The **test setup type** of the EUT. This item can be edited by hand, but also holds some predefined items. These items can be selected from the drop down list.

3.2.1.1 Copy and Paste EUT information

Since RadiMation 2021.1 it is possible to copy and paste eut information from other applications like Word, Excel or text format.

3.2.1.1.1Paste plain data

The copied data can be a plain list or in tabular format, it will be pasted in the cells (Name or Value) and the cells below it, it will replace the existing values.
Copied tables from Word and Excel will automatically be detected, however in text files (for example data copied from notepad) columns must be separated with a '\t' (tab), '=', ':', or ';' character.

3.2.1.1.2Paste data with headers, merging data

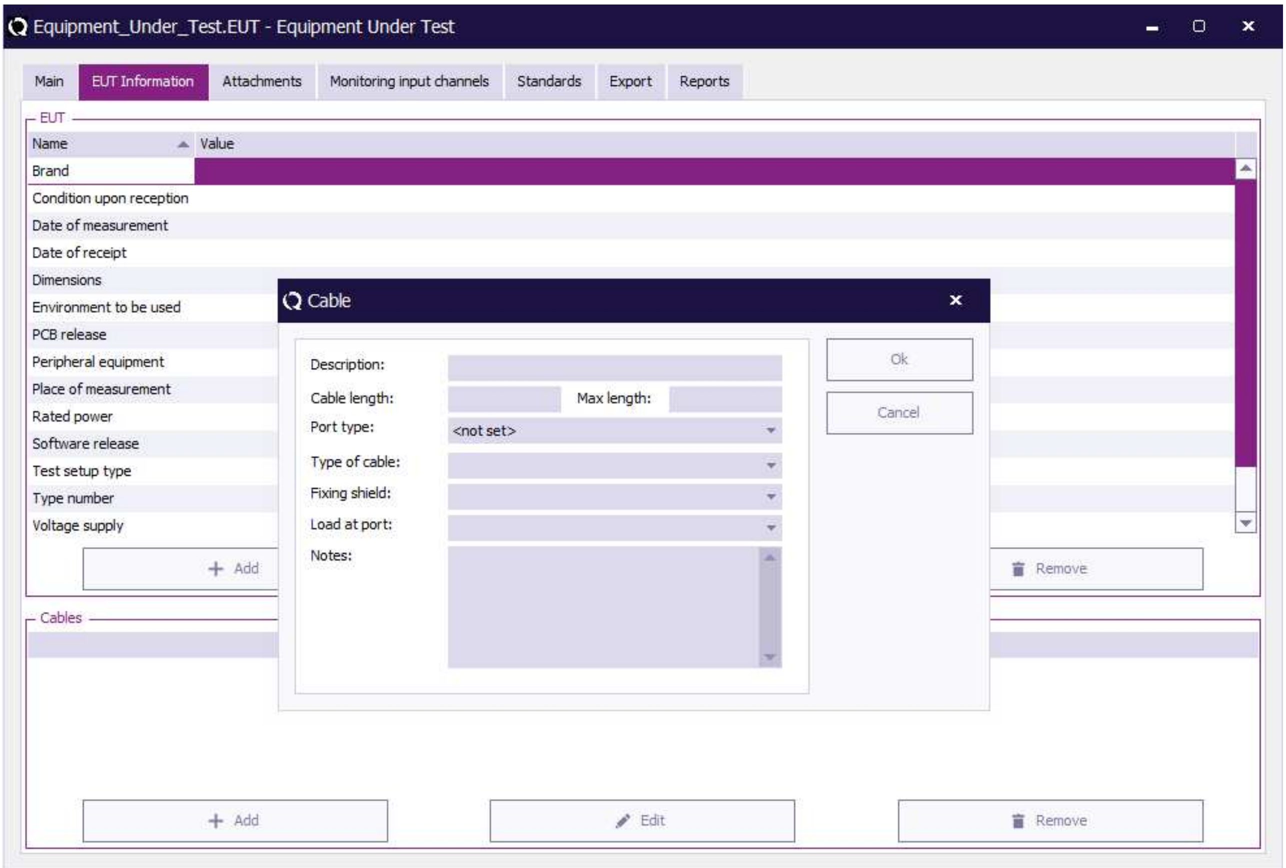
When tabular data is pasted with a header (Name and Value) on the first line, the data will be merged into the current eut information table from the point where data is pasted. If the data contains a row for Name that doesn't exist, it will be added to the list.

3.2.2 Cables

RadiMation® is capable of storing a lot of EUT related information, this includes information on the cables connected to the EUT.
Every cable of the EUT can be specified by adding, editing and removing items in the cable information. Go to the **EUT Information** tab in the **EUT** window. The lower section of this tab is dedicated to information on the cables connected to the EUT.

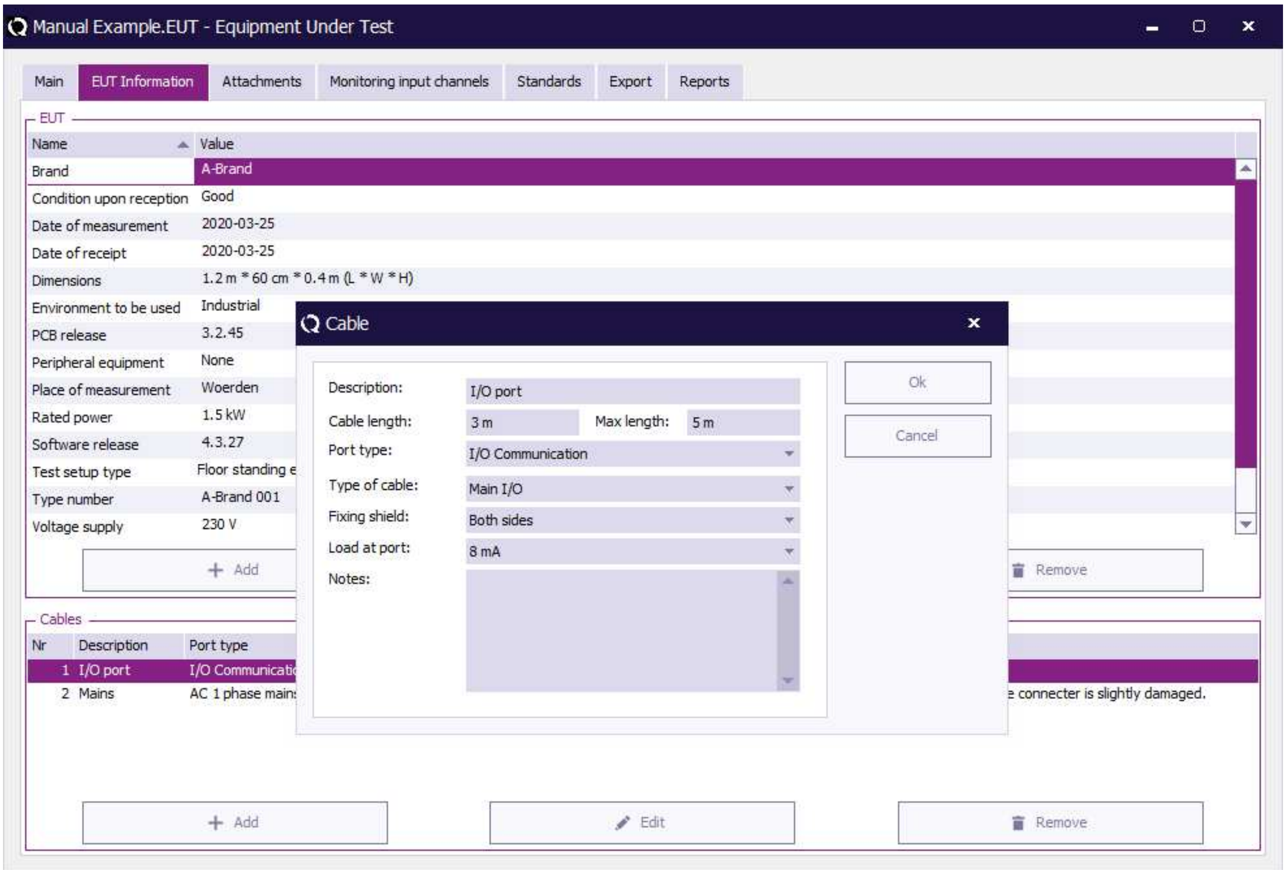
3.2.2.1 Adding cable information

To add information about a cable, click ‘Add’. A dedicated **Cable** window will appear.

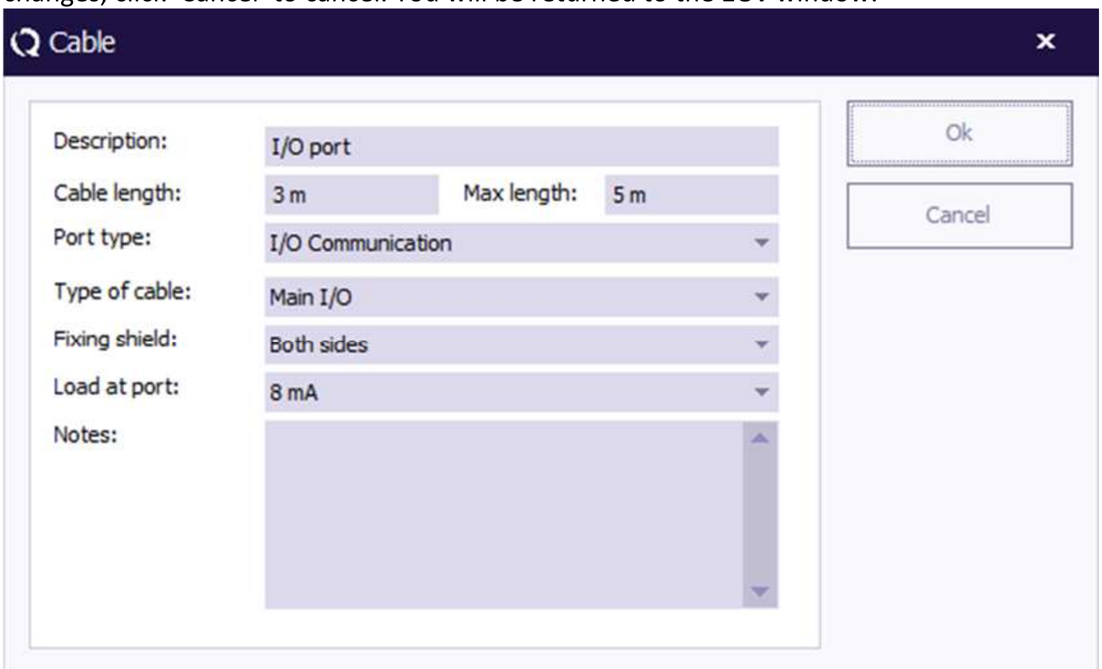


3.2.2.2 Editing cable information

To edit information on a cable, select the desired cable and click ‘Edit’. The dedicated **Cable** window will appear.

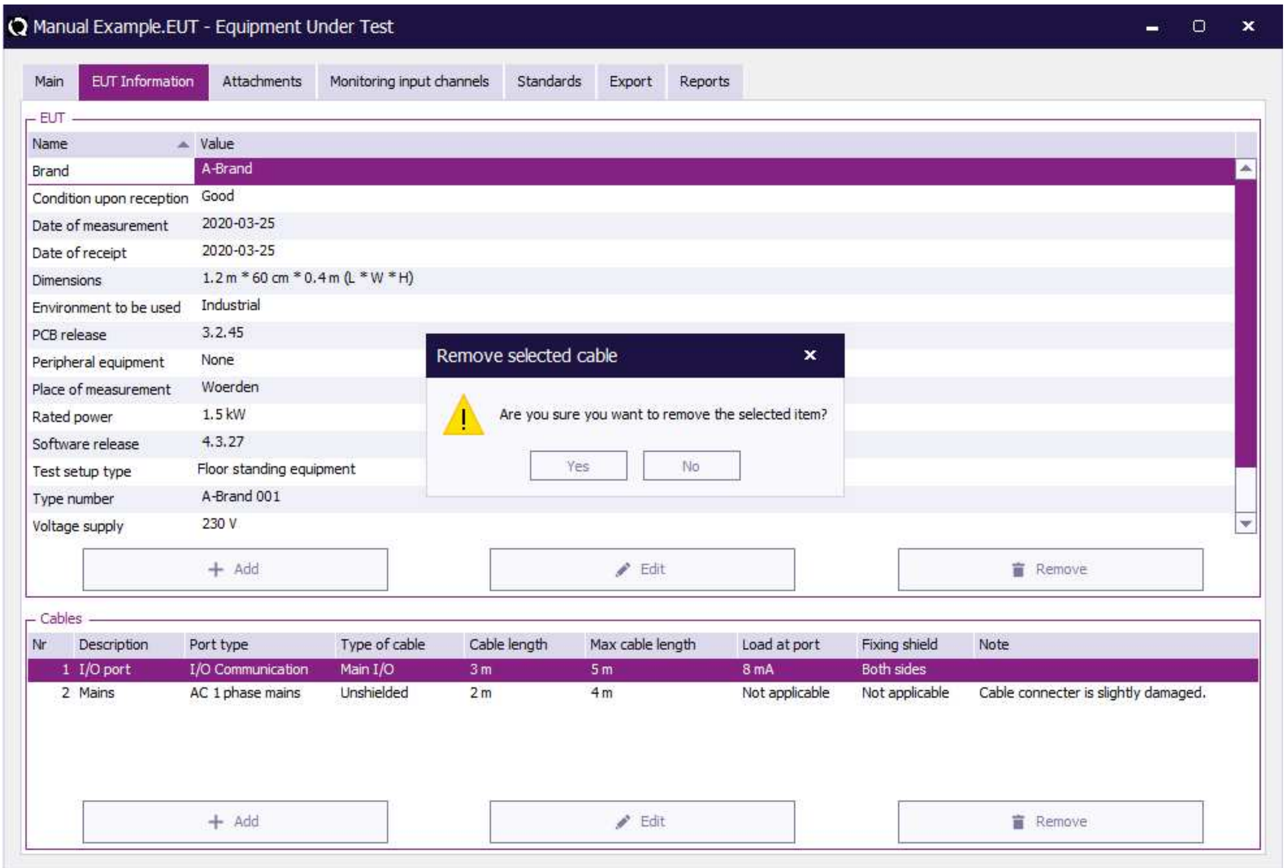


Fill in and/or alter the cable information as desired in the **Cable** window. Click ‘Ok’ to confirm your changes, click ‘Cancel’ to cancel. You will be returned to the **EUT** window.



3.2.2.3 Removing cable information

To remove information on a cable, select the desired cable and click ‘Remove’. A dedicated window will appear to remove the selected cable from the Cables list. Click ‘Ok’ to confirm your changes, click ‘Cancel’ to cancel. You will be returned to the **EUT** window.



3.2.2.4 Copy and Paste Cable information

Since RadiMation 2021.1 it is possible to copy and paste cable information from other applications like Word, Excel or text editors.

3.2.2.4.1 Paste plain data

The copied data can be a plain list or in tabular format, it will be pasted in the visible cells and the cells below it, it will overwrite the existing values.
Copied tables from Word and Excel will automatically be detected, however in text files (for example data copied from notepad) columns must be separated with a '\t' (tab) or ';' character.

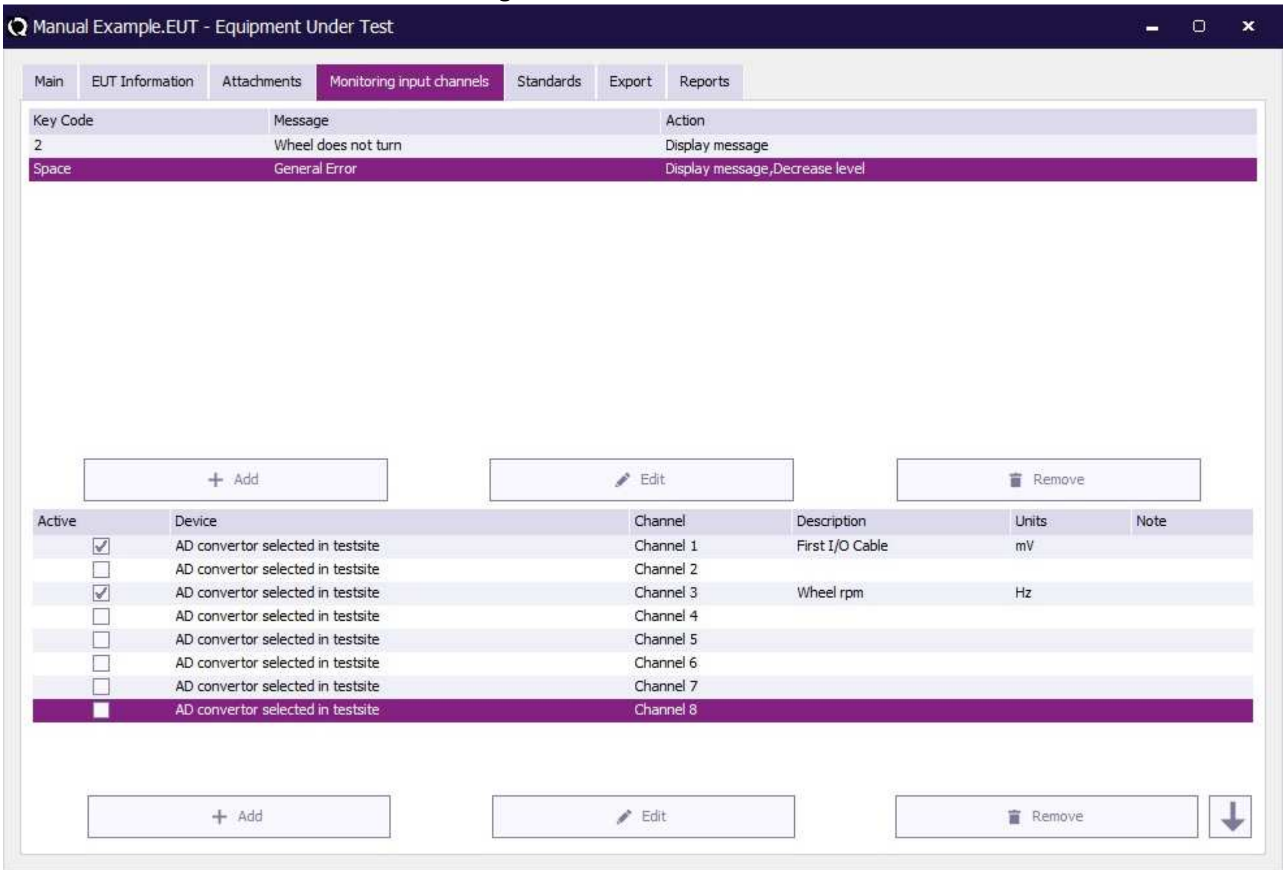
3.2.2.4.2 Paste data with headers, merging data

When tabular data is pasted with a header on the first line, the data will be merged (based on matching description) into the current cable information table from the point where data is pasted. If the data contains a row for a cable description that doesn't exist, it will be added to the list.
Allmost all cable fields are free text, however, except the "Port type", this field can only contain a value exactly as shown in the drop down menu for a cable.

A table with all the details of all the cables can be included in the report generator with the **||EUT|CABLE TABLE||** code.

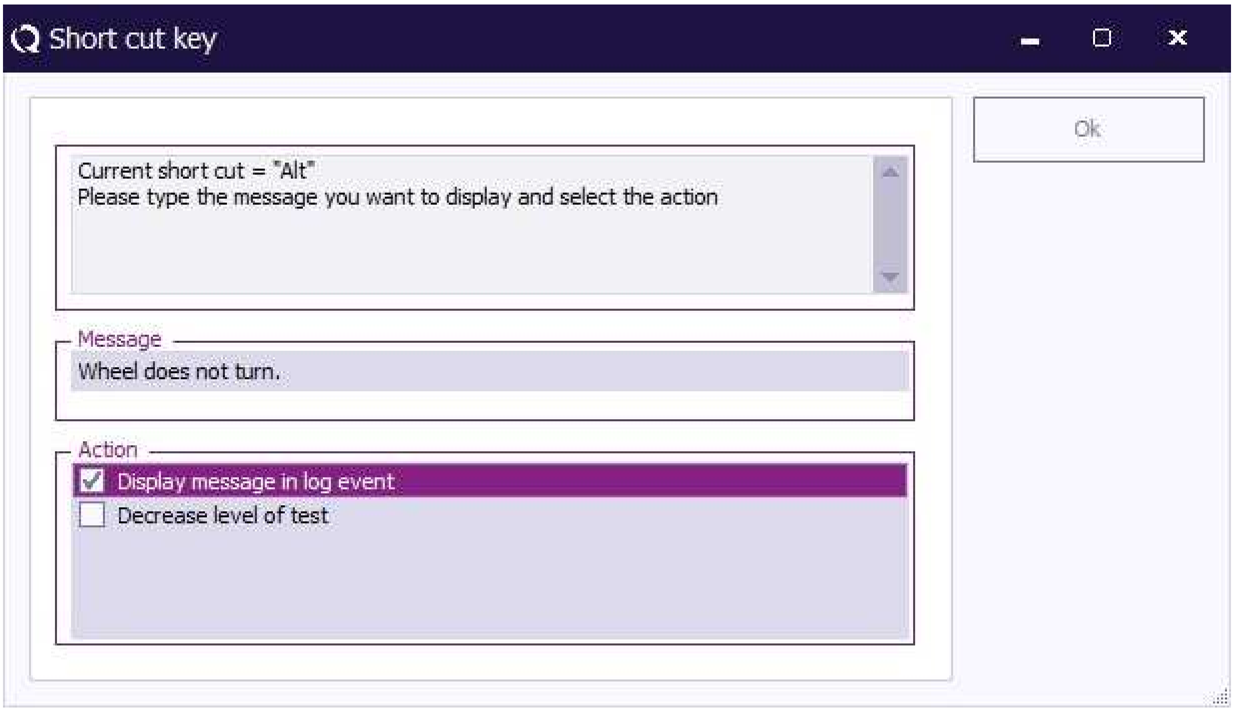
3.3 AD-channel tab

The AD-channel tab shows information about short cut keys that can be used during measurement, as well as the AD – channels that are being used.



3.3.1 Short cut key

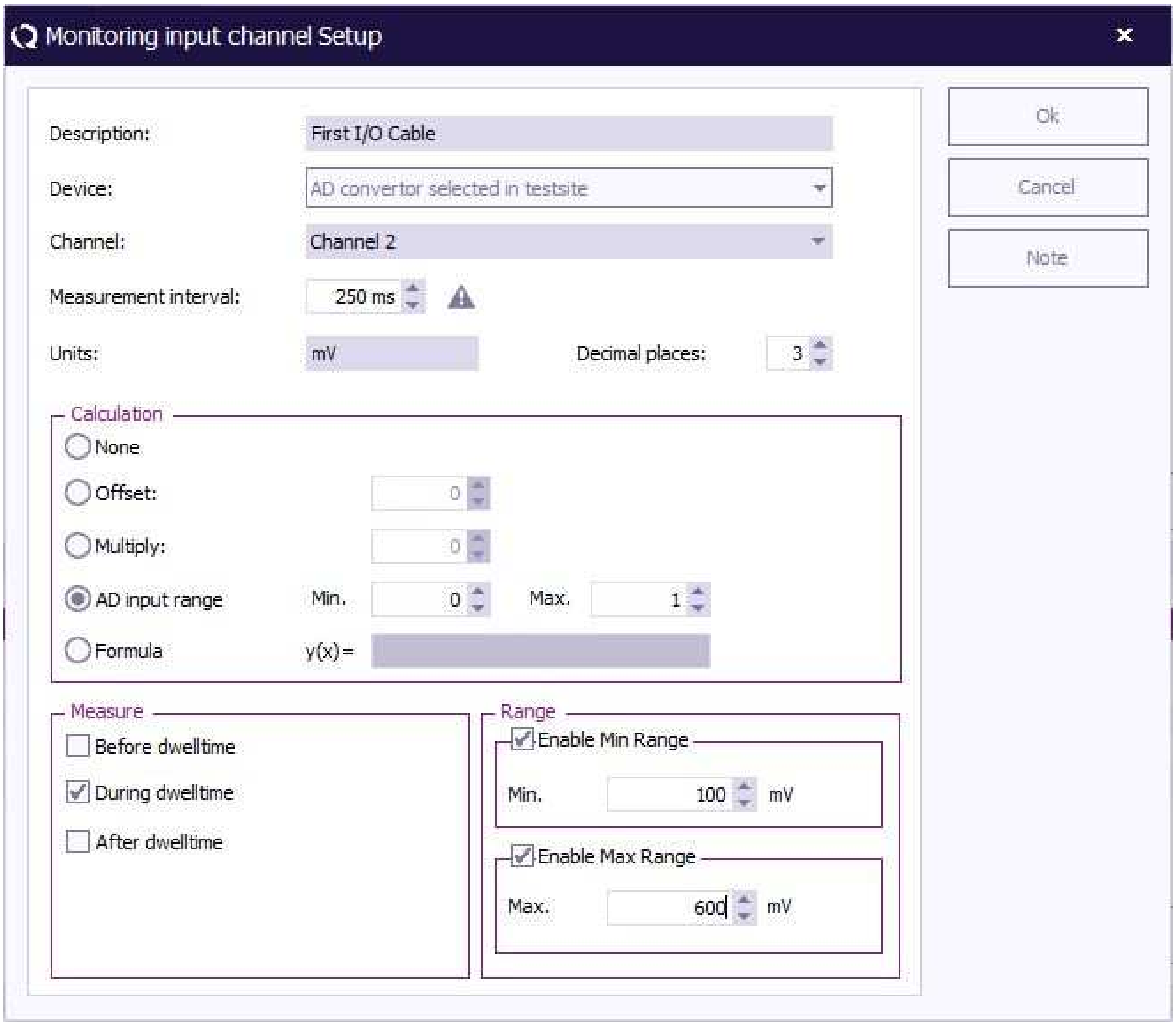
A short cut key is useful when a user wants to record information that can not be recorded when using AD-channels. For example a wheel that is slowing down or increasing speed. With short cut keys the engineer can press a key and RadiMation will insert some predefined text in the test log or/and decrees the level of the measurement. This depends on the settings for the specific key or key combination. Adding or creating a short cut key can be done by selecting the button for the desired action. Of course when editing an item, you must select the item before pressing the button. The window displayed below will appear.



Select the top window and press the key or key combination you wish to use. The window will display the currently used short cut key. In the window showed above it's the "Alt" button. Select the second window and type the message you want to display in the log file. Then select the actions you want to have when pressing the short cut key. Press Ok to confirm.

3.3.2 AD input

AD-input is used to monitor the EUT during testing. It is an easy way of checking if the EUT is affected by external sources. You simply attach the AD input to the EUT, and tell RadiMation that you want to measure this device for every frequency. The chapter "EUT monitoring and control" will discuss this topic in detail.
You can select an AD-channel to be used during the measurement by using the check box in front of the channel. Then press the setup button for that AD-channel, this will open a new window.

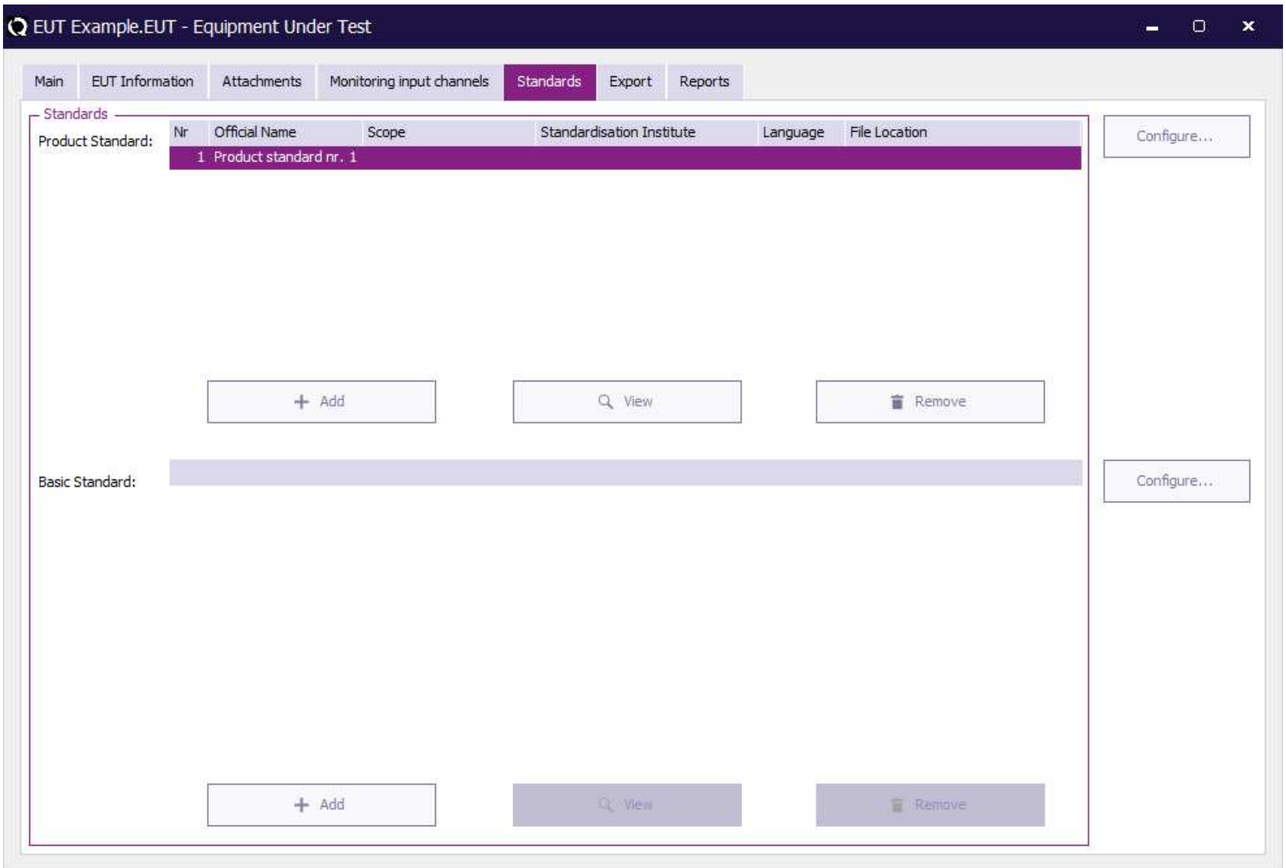


Every item in the “AD Input” frame needs to be set correctly in order to get the correct information. In the “Measure” frame one can specify if one wants to measure before/during or after the dwell time. Default “During” should be selected. “Range” is used for minimum performance testing. One can specify the minimum and maximum value by selecting the check box and setting the corresponding values. When neither of these two boxes are selected RadiMation® will not take them into account during testing.

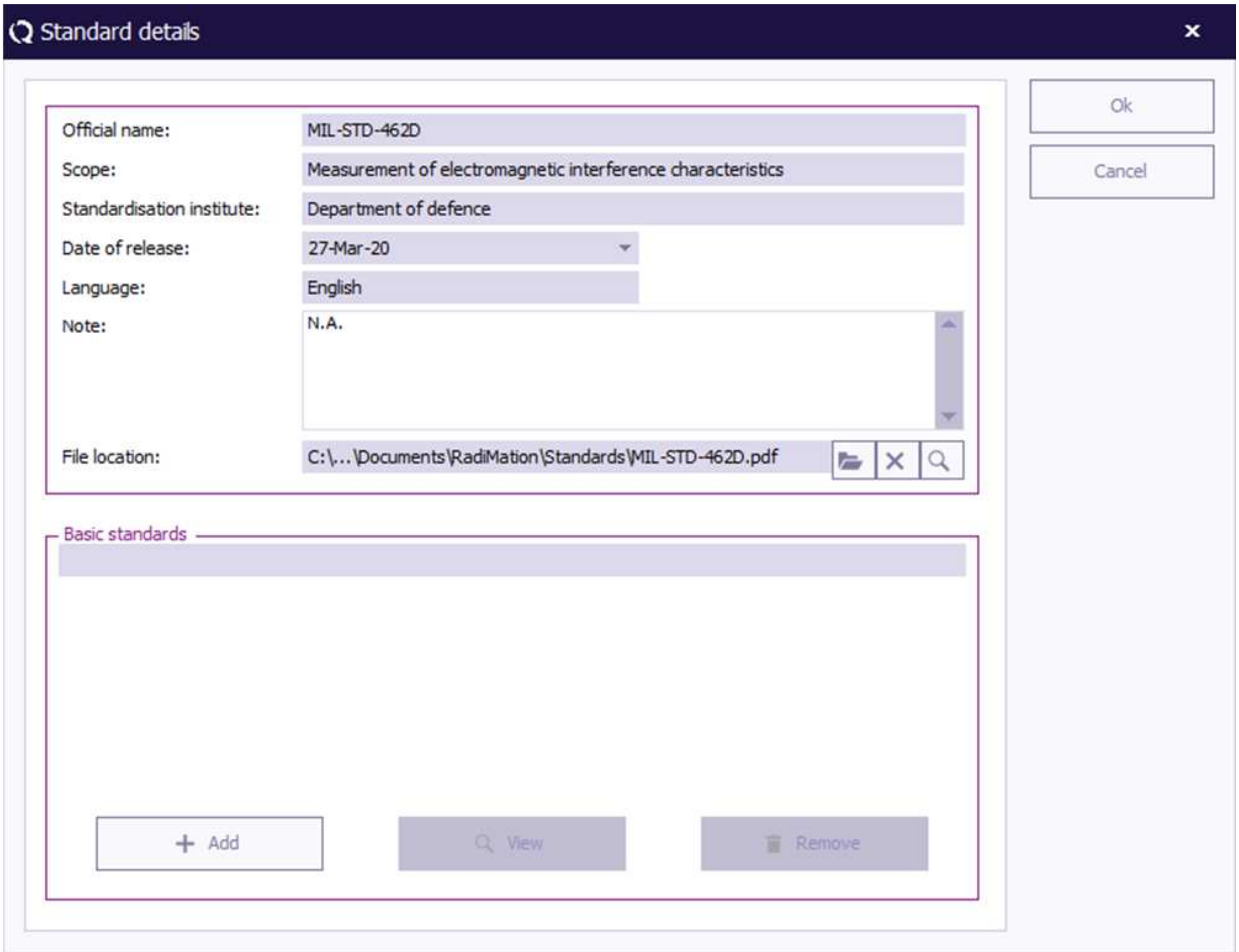
3.4 Standards

Product Standards describe which tests have to be performed on a specific type of product. There are many product standards, roughly one for each type of product. There (probably) is a product standard for: - Washing machine - Hair dryer - Car radio - Television Very often the product standards refer to multiple basic standards.
A basic standard describes a type of test that should be performed. For each test there is a basic standard. Also for each basic standard, one single TSF could be generated which is configured to perform the test described in the basic standard.
A Product standard describes all the tests that should be performed on an EUT, a basic standard only describes one single test.

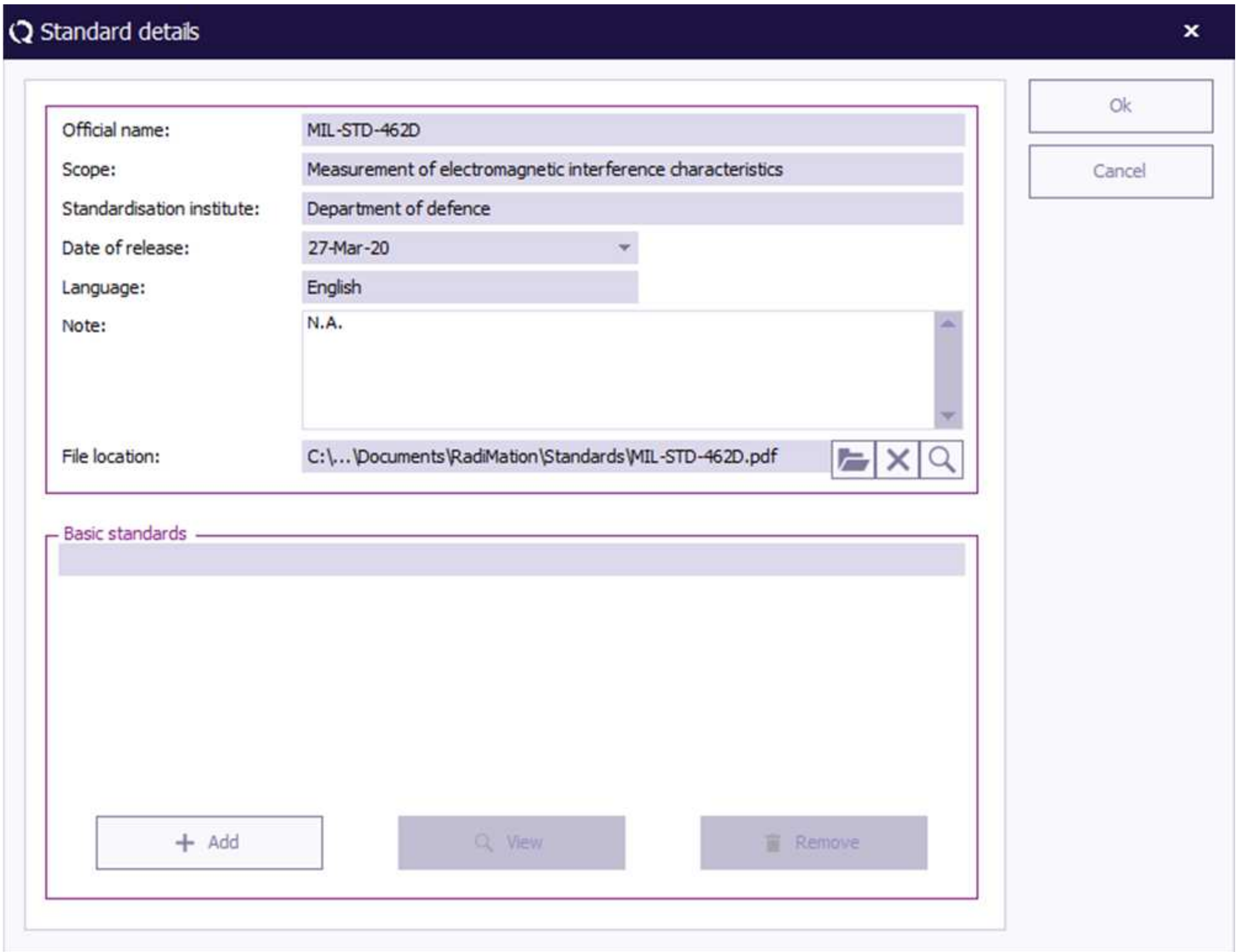
RadiMation should be changed in such a way that the software knows the names of the standard that are used to perform the tests. There are two known types of standards in RadiMation: - Basic Standard - Product Standard.



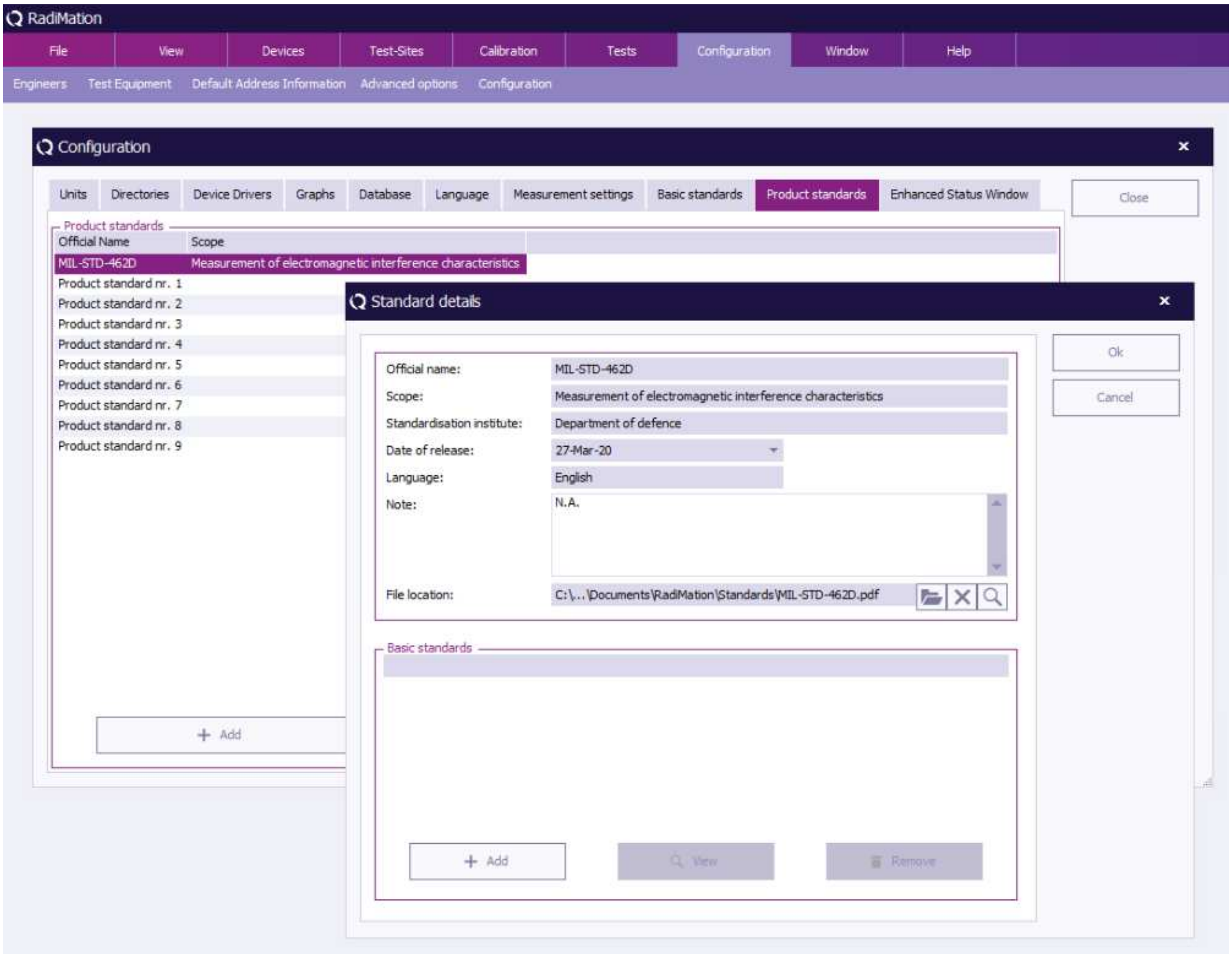
Press select to select a product standard. Selecting a product standard will overwrite all basic standards displayed in the lower window. When basic standards are selected, Radimation® will ask if you want to overwrite the information.



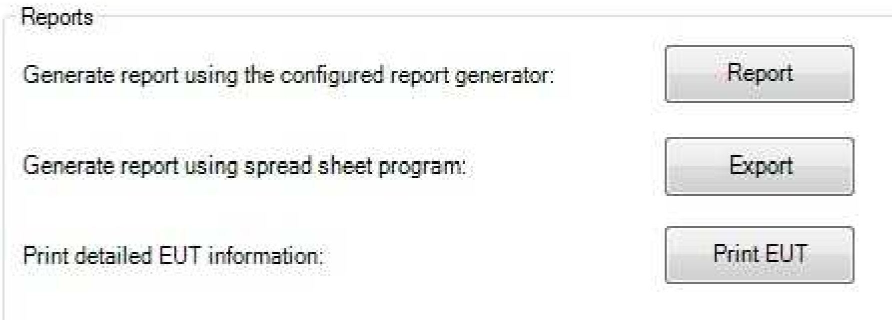
In the select standard window you can select or view the details of a standard. Select the standard you whish to view or select and press the button that applies to your desire.
Pressing the detail button will show the window below.



Once a file has been inserted in the file selection the test engineer can open this file, with default viewer when installed, by pressing the magnifying glass. Selecting a basic standard and pressing the detailed button will display a window, showed below, with the information of the basic standard.



3.5 Reports tab



- **Report** Pressing **Report** will start the report generator. Please read the chapter Report generator for further information.
- **Export** Pressing **Export** will start the Excel Exporter. Please read the chapter Report generator for further information.
- **Print EUT** Pressing **Print EUT** starts the print out of the EUT information. This printout holds all the information about the EUT.

RadiMation® EMC software
------- Radiated Immunity -------

Table of contents:

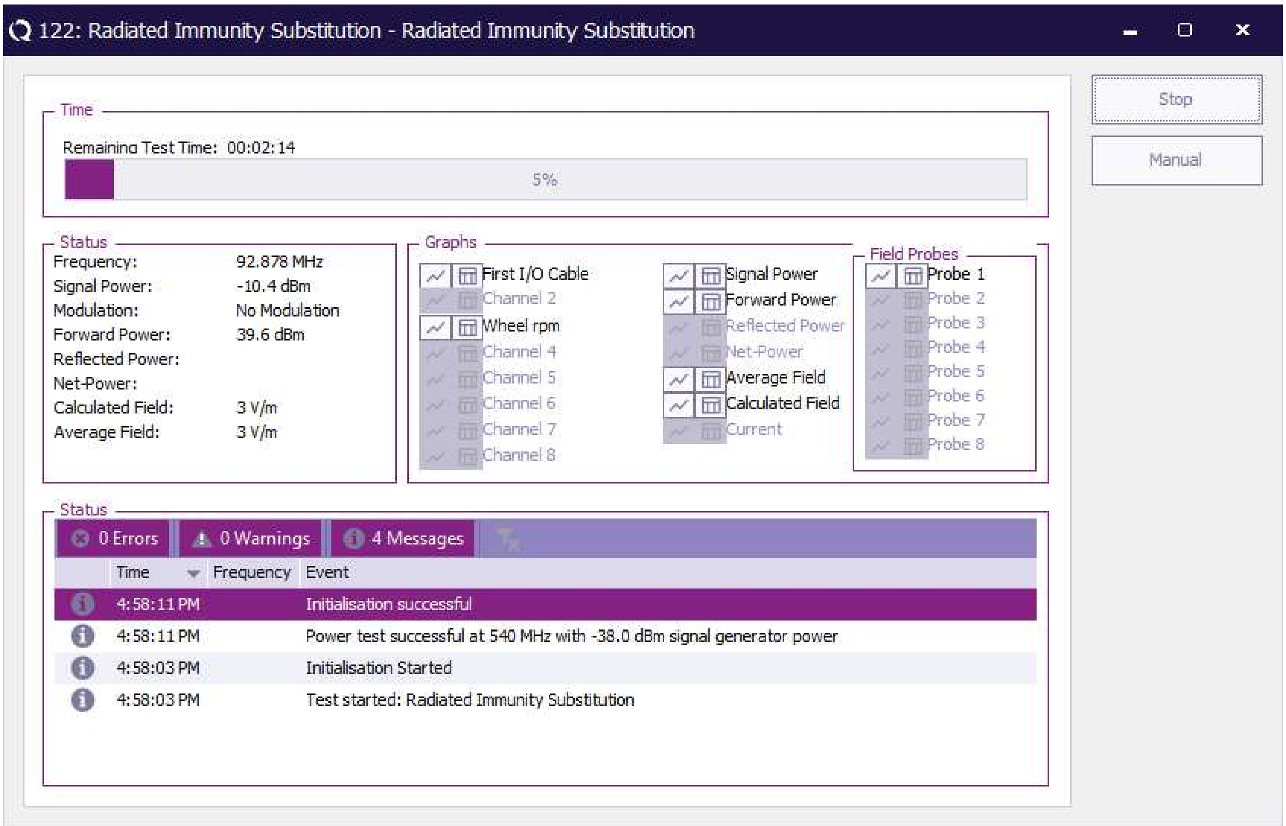
Radiated immunity

Radiated immunity test are a simulation of R.F. fields generated by strong transmitters as walky-talkies, mobile phones, porto-phones and broadcast transmitters.

During radiated immunity tests, a RF field is generated in the test anechoic chamber. Different EMC standards use different methods to generate this field. The RadiMation® test software supports the following four different methods for radiated immunity tests:

- Substitution method
- Field leveling method
- Fixed generator method
- Performance level method

For more information, please read the chapters 'Substitution test method', 'Fixed Field test method', 'Fixed Power test method' and 'Minimum performance test method', Each test method has it's own benefits and draw backs.



4.1 Substitution test method

To perform radiated immunity tests according to the substitution' method, the empty anechoic chamber is first calibrated. The calibration file is then used generate the same power into the transmitting antenna as was needed during the calibration, to achieve the desired field strength (with the EUT in the anechoic chamber).

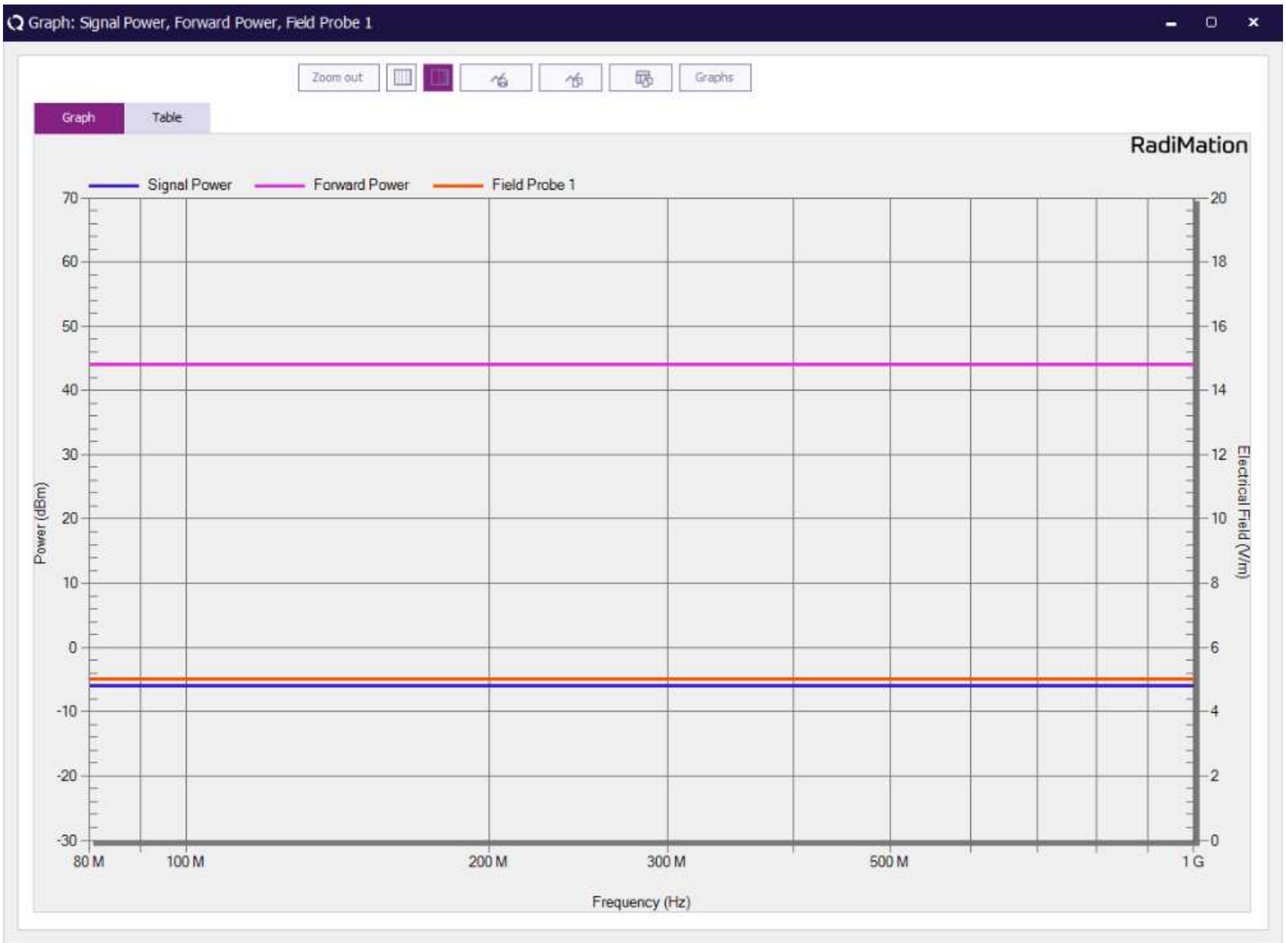
For immunity tests according to IEC 1000-4-3, normally a shielded, full anechoic chamber is used. The chamber must have a minimum of 1.5 m * 1.5 m square homogeneous field area in front of the transmitting antenna.
The transmitting antenna should be preferable at a distance of 3 meters from the Equipment Under Test. Before actual tests can take place, calibration of the test set-up is required. See the chapter on Calibration for more information about the method for a 1-point calibration, and the method used for a 16-point field homogeneity check as required by IEC 1000-4-3.
During the calibration, a calibration file is made, which contains the drive power levels for each test frequency. The values recorded in the calibration file are depended on the type of calibration. Three different types can be used:

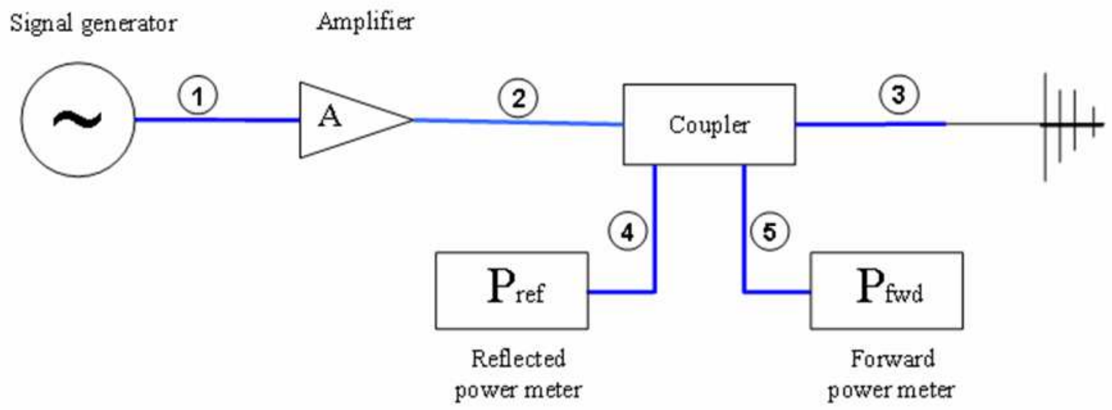
1. Signal generator level
2. Forward power
3. Net power (Forward-Reflected)

The calibration files are downwards compatible. This means that a Net power calibration file can be used to perform a Forward power or signal generator level test and a Forward power calibration file can be used to perform a signal generator level test.
The recorded value is the value necessary to generate a constant field in the anechoic chamber. For example, if a test level of 10 V/m has to be generated, the generated field in the anechoic chamber must be 10 V/m (- 0 dB + 6 dB) on 75% of the 16 test points in the 1.5 m * 1.5 m area (See Calibration).
After the test set-up has been calibrated, tests can be performed using the calibration file. Care should be taken for selecting the correct calibration file. The calibration file(s) for horizontal and vertical antenna polarization are quite often different. Chamber characteristics and dimensions cause these differences.

4.1.1 Benefits

Substitution method tests have a high level of reproducibility. In contradiction to the field leveling method no correction is made for the influence on the field strength caused by the EUT.





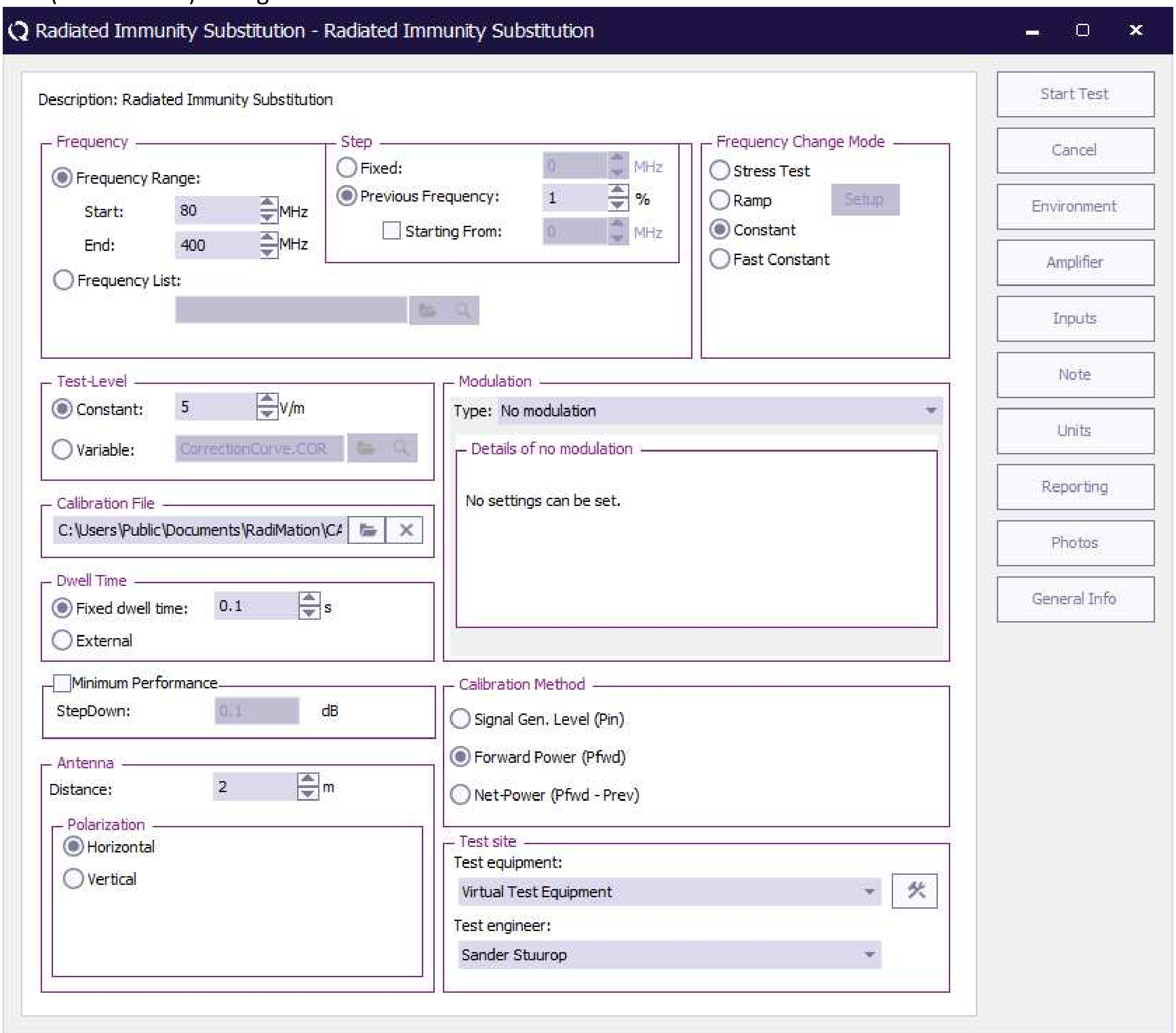
#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward Power meter	Devices 1
	Reflected Power meter Pref	Devices 1
	Antenna	Devices 1
Cables		

1	Cable SG -> amplifier	Cables
2	Cable amplifier -> coupler	Cables
3	Cable coupler -> antenna	Cables
4	Cable coupler -> refl power meter	Cables
5	Cable couper -> fwd power meter	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. Although, during immunity measurements according to the substitution method, cable correction factors will increase the accuracy of measured/displayed power values. The generated field accuracy will however be the same when using correction factors or not.
When in doubt contact your reseller.

4.1.2 Configuration window

The (substitution) configuration window looks as followed:

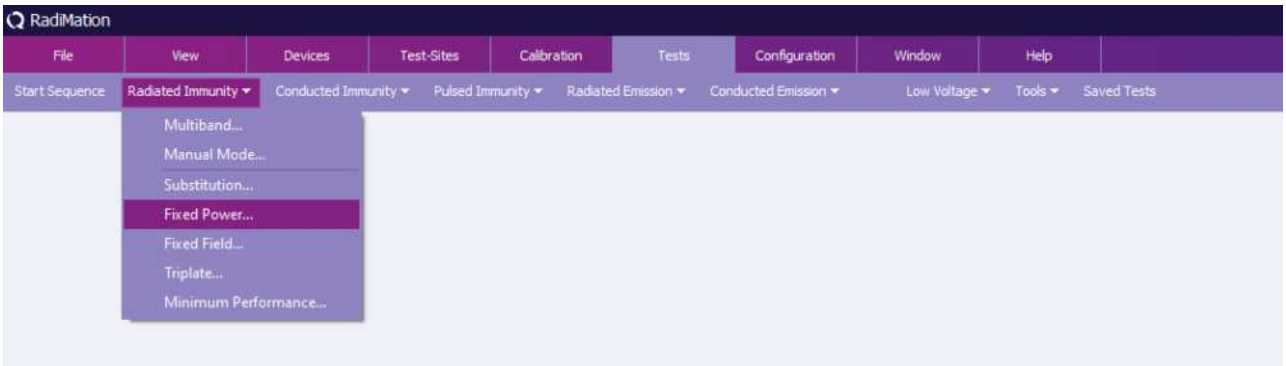


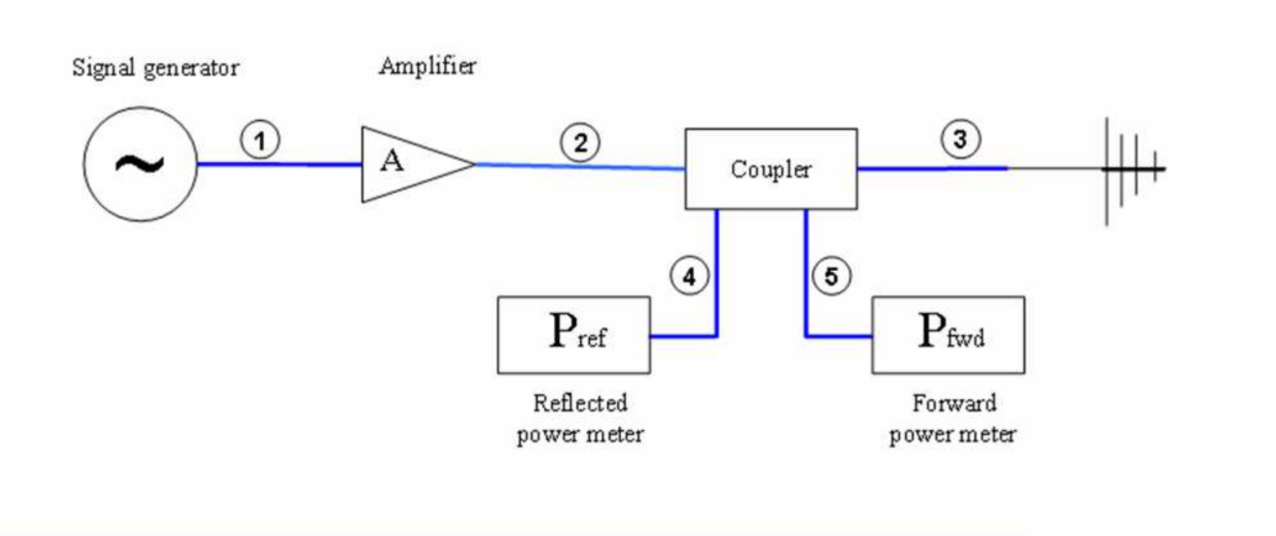
- **Dwell Time:** The dwell time is applied after the levelling routine has finished.
- **Fixed dwell time:** The fixed dwell time is a fixed time period.
- **External:** The external dwell time can be used with an external EUT controller. RadiMation® asks the EUT controller is the dwell time is finished. The EUT controller is determining if the dwell time has finished.

4.2 Fixed Power test method

Fixed generator tests can be useful during various kinds of EMC tests. During current injection tests, this method can be used to achieve the maximum injected current the amplifier is able to generate. Although this will not be a constant current over the frequency range, it can be useful during engineering work.
Fixed generator tests can be performed in three different ways:

1. Fixed signal generator output level. Tests with a fixed generator output level do not take cable losses and amplifier frequency response into account. No power meters are needed during these tests and therefore, the test speed is higher than the fixed forward and fixed transmitted power tests.
2. Fixed Forward power level Tests with a fixed forward power level do take cable losses and amplifier frequency response into account. One power meter is required during these tests. This test method does not take VSWR mismatch between the amplifier and current probe into account (i.e.: the forward power and transfer impedance of the current probe alone are not enough to calculate the actually injected current).
3. Tests with a fixed transmitted power level take cable losses, amplifier frequency response and VSWR mismatch into account. Two power meters are required during these tests, one to measure the forward power, and one to measure the reflected power. The difference between forward power and reflected power is the transmitted power.



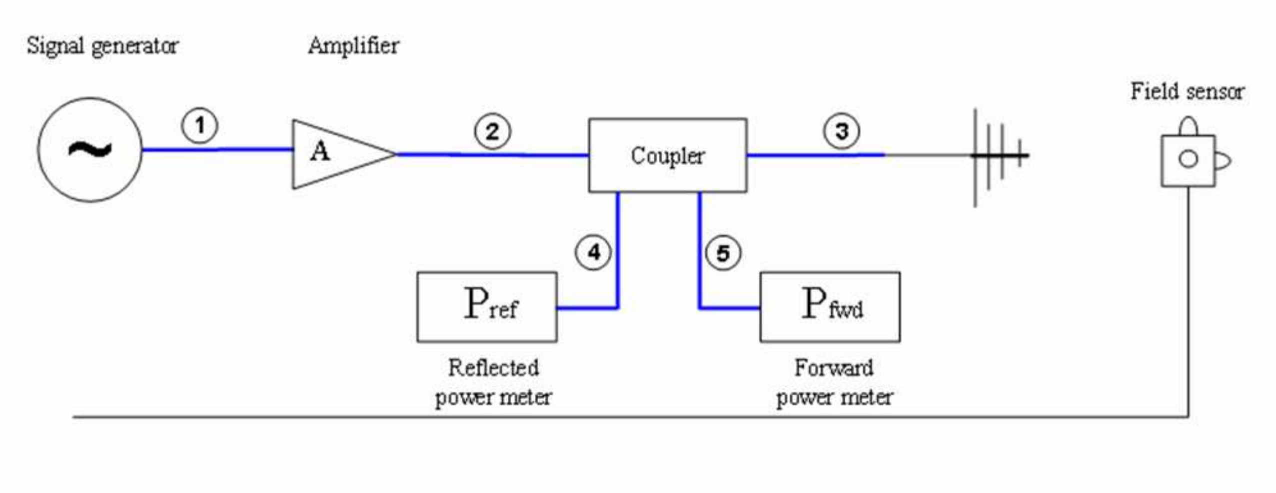


#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward Power meter	Devices 1
	Reflected Power meter	Devices 1
	Antenna	Devices 1
Cables		
1	cable sg -> Amplifier	Cables
2	cable amplifier -> Coupler	Cables
3	cable coupler -> Antenna	Cables
4	cable coupler -> fwd power meter	Cables
5	cable Couper -> refl	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. When in doubt contact your reseller.

4.3 Fixed Field test method

During Radiated immunity tests according to the “field leveling” method, the generated field during the test is real time leveled to the desired value. For “Field leveling” tests, no calibration files are required. Some EMC standards, like automotive standards, describe field leveling test methods.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward Power meter	Devices 1
	reflected Power meter	Devices 1
	Antenna	Devices 1
	Field sensor	Field probes
Cables		
1	cable sg -> amplifier	Cables
2	cable amplifier -> coupler	Cables
3	cable coupler -> antenna	Cables
4	cable coupler -> fwd power meter	Cables
5	cable coupler -> refl power meter	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. When in doubt contact your reseller.

4.4 Triplate test method

The triplate test is a substitution test, based on a triplate calibration. The triplate test is almost the same as the substitution test. The major difference is the amount of points and the determination of the needed power. The triplate impedance is determined during the calibration, using 5 calibrations. To calculate the required power the following formula is used:

$$P_{mid}(f)[W] = \frac{E_v(f)^2 * h^2}{Z(f)}$$

Formula 4-1

where

$$P_{mid}(f)[W] = \frac{P_{net}[W] + P_{out}[W]}{2}$$

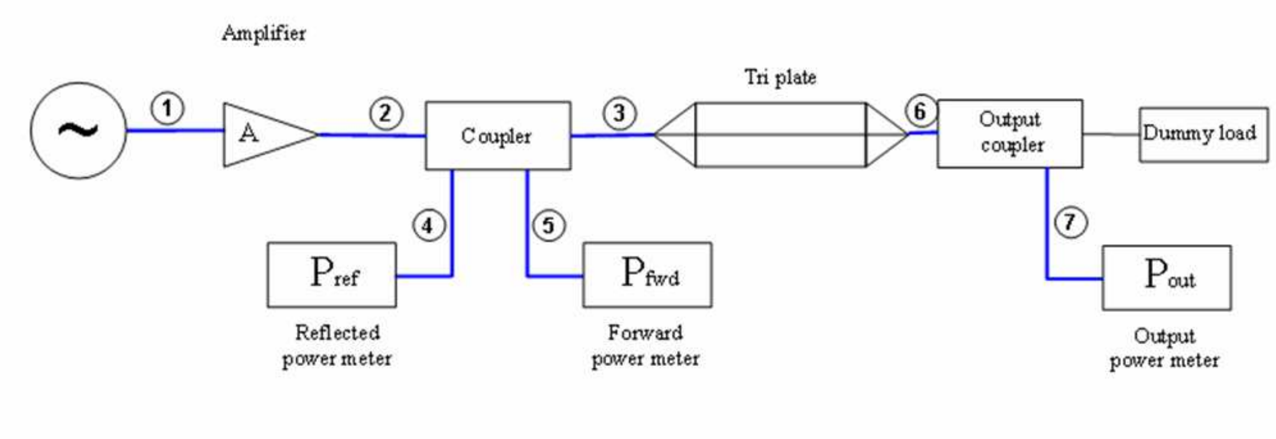
Formula 4-2: Calculation of middle power

To configure a triplate test you need to open the configuration window.

In the configuration window, you need to specify the calibration file you wish to use. Please note that it is possible to select a five-point calibration file as well as a one-point calibration. This is done so that you can verify your one point calibration. Don't forget to define the following points:

- Testlevel
- Dwelltime
- Antenna distance, in our case the triplate
- Amplifier protection

Press the Start test button to start the test.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward Power meter	Devices 1
	Reflected Power meter	Devices 1
	Antenna	Devices 1
	Output coupler	Devices 2
	Output power meter	Devices 2
Cables		
1	cable sg -> amplifier	Cables
2	cable amplifier -> coupler	Cables
3	cable coupler -> antenna	Cables
4	cable coupler -> fwd power meter	Cables
5	cable coupler -> refl power meter	Cables
6	cable triplate -> coupler	Cables
7	cable coupler -> output power meter	Cables

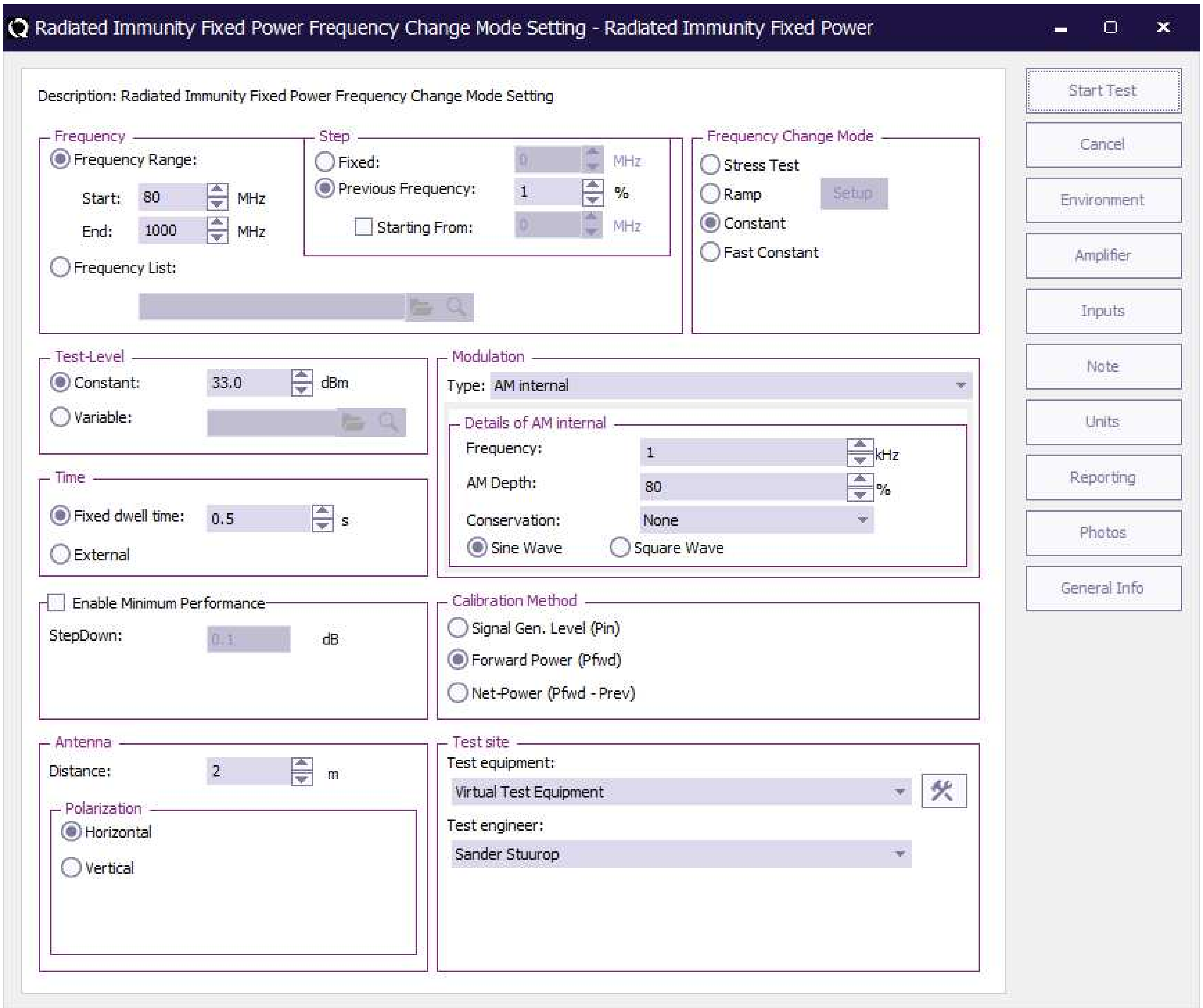
	Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. When in doubt contact your reseller.

4.5 Frequency Change Mode test methods

Most EMC standards do not describe if, or how the RF signal must be switched on and off between the test frequencies.
In real world situations, transitions in RF fields occur quite often. For example, switching on a hand held transmitter or mobile phone would give a transition in the RF field. For this reason, if the used test standard does not prescribe a defined method to handle the field between test points, we recommend to use the “stress tested” method. During this test method, the RF signal is switched on and off between each test point.
RadiMation® supports four different ways to generate the RF signal between test frequencies. These four methods can be used during substitution, current leveling, fixed generator and minimum performance level tests. For more information on these methods, see the paragraphs:

- Stress test method
- **Ramp** method
- Constant method
- Fast Constant method

Next to these 'standard' test methods RadiMation® supports the so-called minimum performance method described in paragraph 3.4.6.

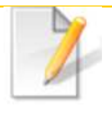


4.5.1 Stress test method

During the stress test method, The RF test signal is switched on and off between test points. Transients in the RF field can cause great influence on electronic equipment, where a constant RF field with the same amplitude, does not have any influence. The “stress tested” test method therefore is a worst case test method, which is not required for all EMC standards. However, since this test method simulates the real world situation in the best way, we recommend using this method as the standard method, unless there is a very good reason to test the EUT with another method.

4.5.2 Ramp method

During the Ramp method, for each test point, the RF signal is ramped up from a level below the required level. The ramp up and ramp down time, as well as the attenuation, is software configurable. After testing for a period of the “Dwell time”, the RF signal is ramped down to a level of below the test level.



For more information on how to use the frequency change mode: Ramp in Multi Band Tests, see https://wiki.radimation.com/wiki/index.php/Radimation_Application_Note_134

4.5.3 Constant method

During the constant method, the RF field is kept constant as good as possible (i.e. the field is not switched off between test point). Of course, any test set-up (signal generator, amplifier, anechoic cabling and injection clamp) will have a frequency response, which is not completely flat. Because of this frequency response, switching between frequency points will always give a slight change in RF level. Depending on the frequency response, the gain of the system for the next frequency point can be greater or smaller than the gain of the previous frequency point. To avoid positive RF level transitions during frequencies changes (which will have over testing as a result) the software determines if the drive level for the next frequency point is higher or lower than the drive level of the current frequency point. If the drive level for the next frequency point is lower, first the amplitude is decreased and then the frequency is incremented. However, if the drive level for the next frequency point is higher, first the frequency is increased and then the amplitude is increased. The dwell time starts after the correct power level has been reached, and modulation when configured is applied.

4.5.4 Fast constant method

As for the constant method, during the fast constant method, the RF field is kept constant as good as possible (i.e. the field is not switched off between test point). In contradiction to the constant field method, the modulation is not switched on and off during the test. This means that the software measures power and field with the modulation switched on. The software will correct for measurement errors due to the modulation. Although this will result in slightly higher test errors, no transients in the RF field will occur caused by modulation switching. This test method will be faster than constant field-testing caused by the lack of leveling time. Depending on the quality of the test equipment and the frequency step size, the amplitude of the test signal will slightly change. Using a small step size will minimize this problem. Due to the method described above, during the constant field method, over testing does not occur.

Note: Powermeter that are not using an RMS detector, should not be used in combination with Fast constant mode

4.5.5 Minimum performance Method

The RadiMation® package also supports a specific method to determine the minimum performance level of a Equipment Under Test. This method differentiates itself from the aforementioned methods that is does not generate a fixed specified field strength but a varying field strength based on the susceptibility of the Device Under Test.
The method relies heavily on EUT monitoring (see chapter 8) to determine at which level the Equipment Under Test is influenced. Before the test is started the relevant A/D-channels have to be configured. Pushing the input button on the configuration screen does this.
The test is started at a (low) field strength level after which the field strength is increased with a specified increment till either of both situations arises. The field strength is limited by amplifier protection or the Equipment Under Test will be influenced in such way that the specified limits are exceeded. The field strength is than reduced with a specified step and the software will change to the next frequency point. This test will result in a graph showing the level to which the Equipment Under Test is unaffected by a radiated field.

4.6 Calibration methods

4.6.1 Signal generator level calibration

During signal generator level calibration only the signal generator level is recorded during the calibration. During a signal generator power substitution test, the signal generator level to input of the amplifier, is kept the same as recorded during the calibration. This method does not take amplifier instability into account. During this calibration method, no power meters are required. This method is less accurate than the FWD power and transmitted power calibrations and therefore not recommended for full compliance tests. During a signal level calibration, the field strength during calibration is recorded.

4.6.2 Forward power calibration

During a Forward power calibration, the forward power to the transmitting antenna is recorded. During a forward power substitution test, the FWD power to the antenna is kept the same as during the calibration. By this method, amplifier drift will have no influence on the test. When a forward calibration is made, this calibration file can also be used to perform a signal generator substitution test. During a forward power calibration, the signal generator level and the field strength during calibration is recorded.

4.6.3 Net power calibration

During a net power calibration, the forward and reflected power to the antenna is recorded. The difference between the forward power and reflected power is the net power. During a test, the net power is kept the same as during calibration. When a large metallic, EUT is placed in front of the antenna, some R.F. energy is reflected back into the antenna, resulting in a worse V.S.W.R. When only forward power is calibrated, this effect is not compensated for. When net power is calibrated, the by the antenna transmitted power is kept the same as during calibration. When a net power calibration is made, this calibration file can also be used to perform a signal generator substitution test or a forward power substitution test. During a forward power calibration, the signal generator level, forward power level and the field strength during calibration is recorded.

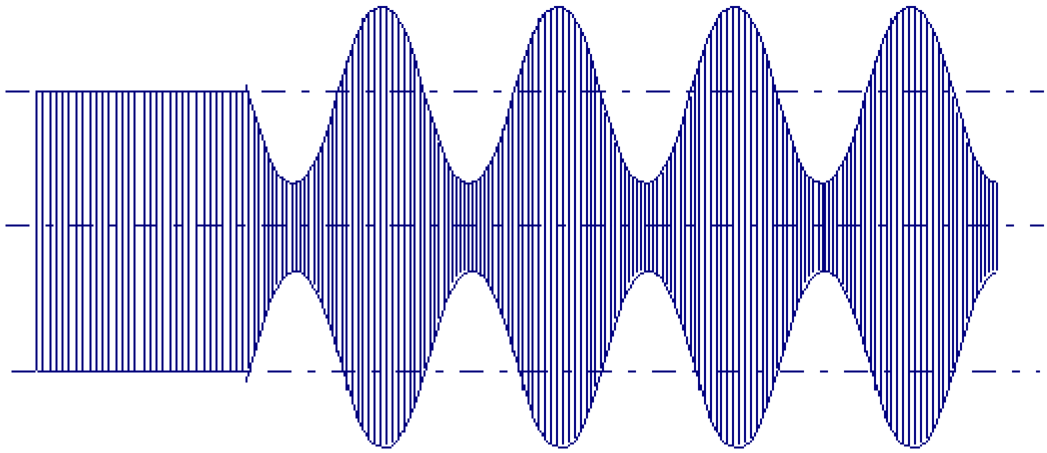
4.7 Modulation

4.7.1 Amplitude Modulation (AM)

During most radiated and conducted immunity tests, the test signal must be Amplitude Modulated (AM). If a modulation is chosen, this modulation will only be switched on during the period of the dwell time. In between test points, when the test signal is set and adjusted to the next frequency point, the modulation is switched off. The reason for this is that measurements of the field or current, with the modulation switched on, are less accurate than without modulation. This is essentially important during real time leveled tests. Dependent on the capabilities of the signal generator used, internal and external modulation sources can be used.
For most EMC standards the RF signal is modulated with a 1 kHz, 80% AM modulation.

4.7.1.1 No conservation

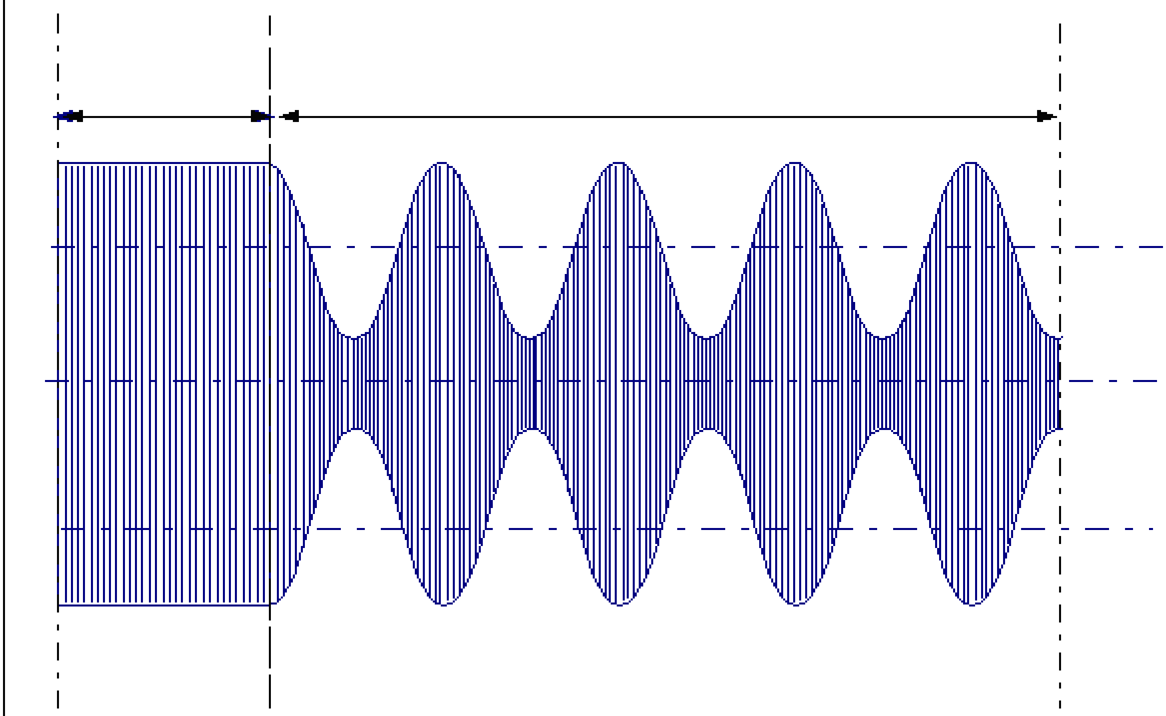
When 'None' conservation is selected, the AM will be applied on top of the CW signal, and the maximum value of the modulated signal will be higher than the not moduldated CW signal.



According to EN61000-4-3 and EN61000-4-6, the amplitude of the modulated RF signal is 1,8 times the amplitude of the not modulated CW RF signal. When 'None conservation' is selected, the peak value of the AM signal equals ((100% + Modulation depth) / 100%) times the peak value of the not modulated CW signal.

4.7.1.2 Voltage conservation

For automotive standards, as for the 95/54/EEC, the peak value of the modulated signal should be regulated in such a way that the peak voltage value of the modulated signal equals the peak voltage value of the not modulated CW signal.



RadiMation® supports this type of AM modulation with the option 'Voltage conservation' (also known as 'Amplitude conservation'). The amplitude of the AM modulated signal is adjusted in such a way that the peak voltage value of the modulated signal equals the peak voltage value of the not modulated CW signal.

4.7.1.3 Power conservation

When 'Power conservation' is selected, the amplitude of the AM modulated signal is adjusted in such a way that the RMS power contents of the modulated signal equals the RMS power contents of the not modulated CW signal.

4.7.1.4 Displaying of modulated values

In RadiMation®, the measured field, measured voltages and measured currents are always displayed as corresponding non-modulated test-levels. The measured values are corrected for the applied modulation and the possible applied modulation conservation.
The reason for the displaying of corrected measurement data is caused by the specification of test levels in the standards. Every standard is specifying the testlevel in the unmodulated CW-values. When also modulation should be applied, this is separately specified in the standard. A more specific requirement for voltage or power conservation of the modulation can also be specified. If modulation and possibly conservation is applied, this will result in a different measurement value which will be displayed in the graph. In that situation the graphs will show a higher or lower test-level compared to the test-level specification from the standard. When the measured values are corrected for the applied modulation and the possible applied conservation, the displayed values in the graphs will be corresponding CW values, which will be directly comparable to the test-level specifications from the standard. The displaying of the corrected measurement values will thus

prevent a lot of confusion between the measurement values and the test-level specification in the standards.
An example: in a radiated immunity substitution test with no modulation with a test-level of 10 V/m, the measured field strength will be 10 V/m, and this value will also be displayed. If the same test is performed with 80% AM Modulation, a field strength of 18 V/m will be measured. In this case the software will however display 10 V/m, because that is the requested test-level. The displayed values are still measured values, but the measured values are corrected for the applied modulation. The graphs are also corrected to show the relevant level if conservation of the modulation is used. So if during the above example also voltage conservation of the modulation is selected, the carrier level will be 5.1 dB lower. The measured field strength will be 10 V/m again, and the graph will also display 10 V/m. As a result of this implementation, in an optimal situation, the values of calculated field, measured field and specified test-level should be displayed at the same values in the graphs. Also the graphs for the current, voltage and power levels are corrected for the applied modulation and conservation. The corrections on the measured values are depending on the ability of the used measuring device to correctly measure a value when modulation is applied. If for example a field strength sensor makes an error during the measurement of the electrical field when modulation is also applied, the corrected and displayed value of the measured field strength will also not be accurate. This situation only applies to situations where a modulated signal is measured, and that is only possible when the 'fast constant' frequency change mode is used during a single band test or the 'Apply modulation outside dwell-time' is enabled during a multiband test.

4.7.2 Frequency modulation (FM)

Frequency modulation is a simulation of the frequency modulated signals. During frequency modulation the carrier frequency is slightly changed to another frequency to encode information in the transmitted signal. This is for example used by FM radio broadcasts, where the carrier frequency is slightly modified in the frequency according to the audio that should be transmitted. A larger variation in the carrier frequency then encodes a louder value, and the speed in which the carrier is fluctuating denotes the frequency of the generated tone. A 1 kHz tone that is transmitted by a FM radio broadcast station at 90.8 MHz thus varies the carrier frequency between 90.725 MHz and 90.875 MHz at a rate of 1 kHz.
There are 2 parameters that define how the frequency modulation should be performed:

- Frequency: The frequency that specifies the rate at which the carrier frequency should be changed.
- Frequency deviation: The maximum change in the carrier frequency that should be applied. The carrier frequency is thus variated between the (tested frequency - frequency deviation) and (tested frequency + frequency deviation).

When frequency modulation is used during EMC testing, the frequency variation of the carrier frequency is applied as a sine wave over time, where the specified deviation is the maximum frequency shift of the carrier frequency which is being applied in the top of the sine wave. The frequency in which the frequency deviation sine wave is applied, is the specified frequency modulation frequency.
In the earlier given example of the FM radio broadcast station, the settings of the FM modulation would thus be: frequency: 1 kHz, frequency deviation: 75 kHz.

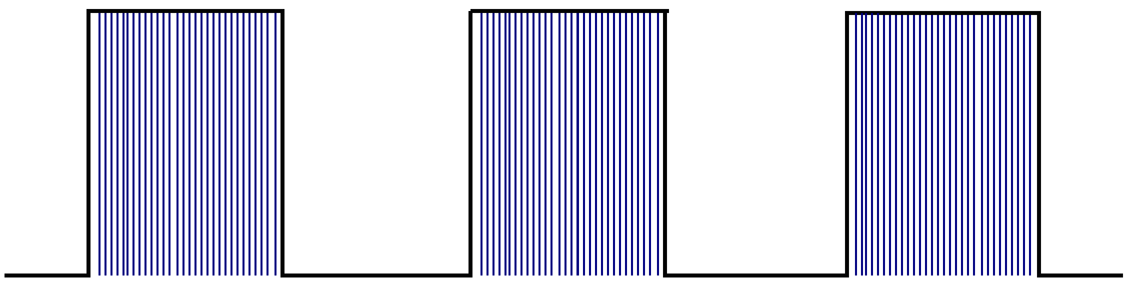
4.7.3 Pulse modulation (PM)

Pulse modulation is a simulation of the digital modulation technique which is for example used by mobile phones. With pulse modulation the CW carrier is temporarily enabled (on) and disabled (off).

While the carrier is disabled, no signal is being generated during that off-time period. There are few parameters that define how the pulse modulation should be performed:

- Frequency: The frequency that determines how often the pulses are being generated.
- Duty cycle: The relation (in percentage) between the on-time compared to the combined on and off-time. The duty cycle should always be between 0 % and 100 %
- Pulse width: The duration of the on-time of a single generated pulse. The pulse width should always be smaller than: 1 / Frequency [Hz].

Different standards describe different parameters for the pulse modulation that should be applied. The picture below shows an example pulse modulation with a 50% duty cycle.



There is a relation between the parameters of the pulse modulation, and modifying one parameter will automatically change one of the other parameters.

Failed to parse (Missing <code>texvc</code> executable. Please see math/README to configure.): pulsewidth [s] = \frac{dutycycle [%] / 100}{frequency [Hz]}

Failed to parse (Missing <code>texvc</code> executable. Please see math/README to configure.): dutycycle [%] = \frac{pulsewidth [s]}{frequency [Hz]} * 100

4.7.3.1 Gated/Burst pulse modulation (BPM)

Gated pulse modulation uses the same modulation settings as the above described pulse modulation. These settings are also applied similiar.

Gated pulse modulation is applied on top of the above described pulse modulation, by doing so it adds the following functionality:

Only a set amount of "pulses" will be generated after which the remainder of the "gating period" is waited before the next cycle is started.

To implement this gated pulse modulation uses the following additional parameters:

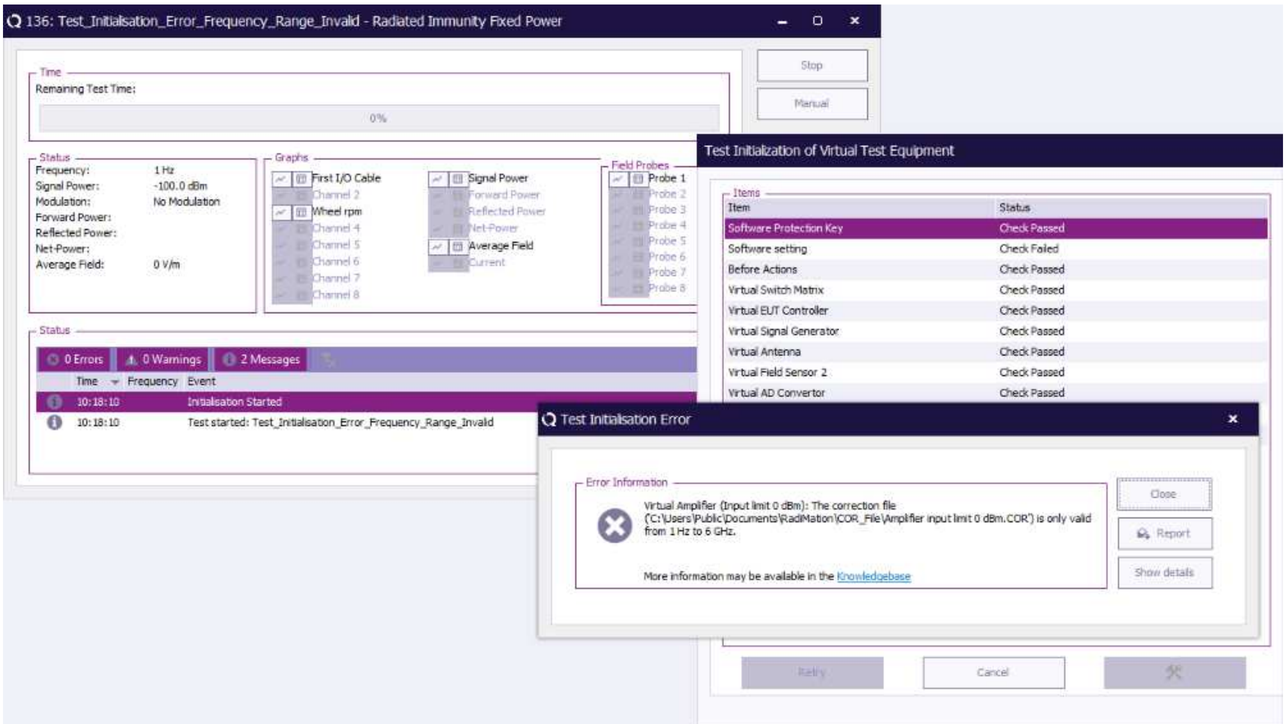
- Pulse count **[-]**: The amount of pulses that must be gated in each burst.
- Gating period **[s]**: The duration of time between the start moments of each generated burst cycle.

4.8 Software checks:

To prevent accidental use of wrong calibration files and / or equipment, RadiMation® checks if calibration file has been made with the same equipment and under the same conditions as the currently configured test. The following items are checked, each time a test is started:

1. Check for the correct antenna polarization
2. Check for the correct amplifier
3. Check for the correct signal generator
4. Check for the correct power meter
5. Check for the correct current sensor
6. Check for the correct distance between EUT and antenna
7. Check if the selected test start frequency is higher then the lowest calibration frequency
8. Check if the selected test stop frequency is lower then the highest calibration frequency
9. Power delivery test

The power delivery test is is done to ensure that the amplifier and powermeters are connected, and it can also be used to determine if the antenna is connected (based on the reflected power). The power delivery test is done in the middle of the frequency band of the current test. The signal generator is set to the 'Signal generator starting level', and then a step of +4 dB is done. If the powermeter reading also increases with +4 dB, we do a step of -3 dB. If the powermeter reading also measures a step of -3 dB, we are sure that the amplifiers and powermeters are connected, and the amplifier is in a more or less linear range. If the powermeter reading is not following with the expected step, we just do another +4 dB increment, until the powermeter reading is also increasing with +4 dB. The signal generator level on which the power delivery test is successful is also logged in the eventlog of the test.
If an error occurs during the system check the user informed about the error and given additional information so the cause of the error can be corrected.



4.9 Amplifier protection

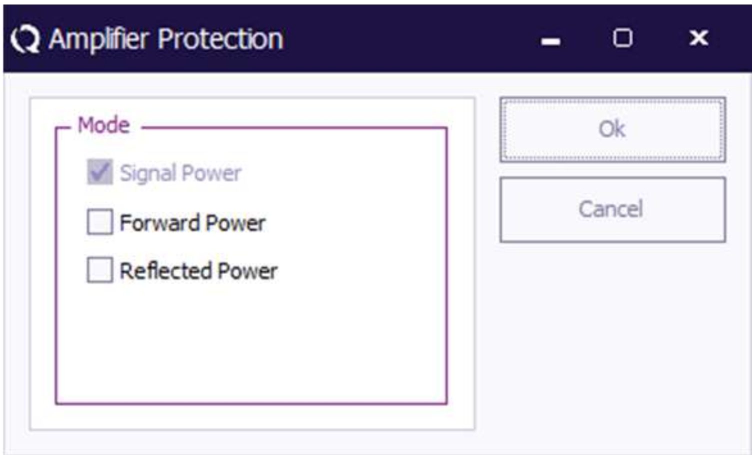
During EMC tests, there are three different situations where amplifier protection is needed:

- If an input level above the maximum allowed input level of the amplifier is supplied to the input, the input stage of the amplifier can be damaged. Limiting the output of the signal generator to protect the input of the amplifier will only be correct if the cable losses (which are frequency dependent) between the signal generator and amplifier are taken into account. Otherwise the maximum input to the amplifier will be higher at low frequencies.
- If the amplifier is used above it's maximum allowed output power for an extensive period of time the amplifier life will be reduced significantly. This is especially through for high power amplifiers with tubes in the final stages. Further more, limiting the maximum output power of the RF amplifier will keep the amplifier in it's linear region, avoiding non linear distortion and / or a distorted AM signal. Limiting the output power of the amplifier can be realized with a coupler and power meter, connected at the output of the amplifier. To measure the correct output power of the amplifier, the frequency response of cables between the coupler and power meter must be corrected for.
- When a poor antenna match is encountered most of the RF power is reflected back into the amplifier. Most amplifiers do not appreciate this while the reflected power will cause self-heating.

RadiMation® supports three levels of amplifier protection:

- The maximum input level to the amplifier can be limited. To correct for cable losses between the signal generator and the power amplifier, a correction graph can be entered.
- The maximum output power of the amplifier can be limited. To correct for cable losses between the coupler and the power sensor, a correction graph can be entered.
- The maximum reflected power to the amplifier can be limited. To correct for cable losses between the coupler and the power sensor, a correction graph can be entered.

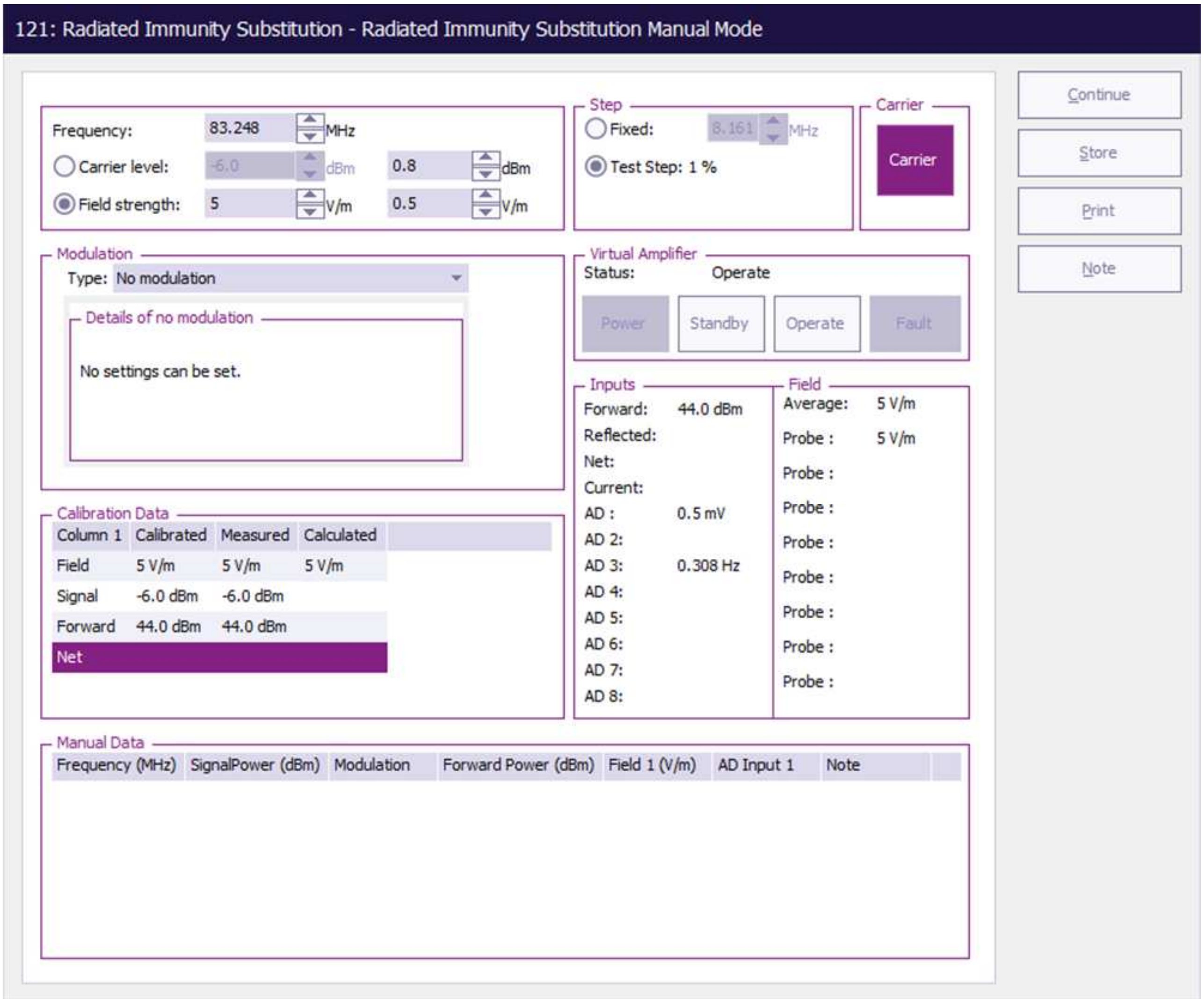
In the case the software wants to drive the amplifier outside it's predefined settings, the software will limit the generator level, output power or reflected power to the maximum allowed value.



4.10 Manual mode

4.10.1 Goal

At any moment during a test, the software can be switched to manual mode by simply pressing the "Manual" button. When the manual mode is entered, the software will automatically switch off the output power. The picture below shows the manual mode window.

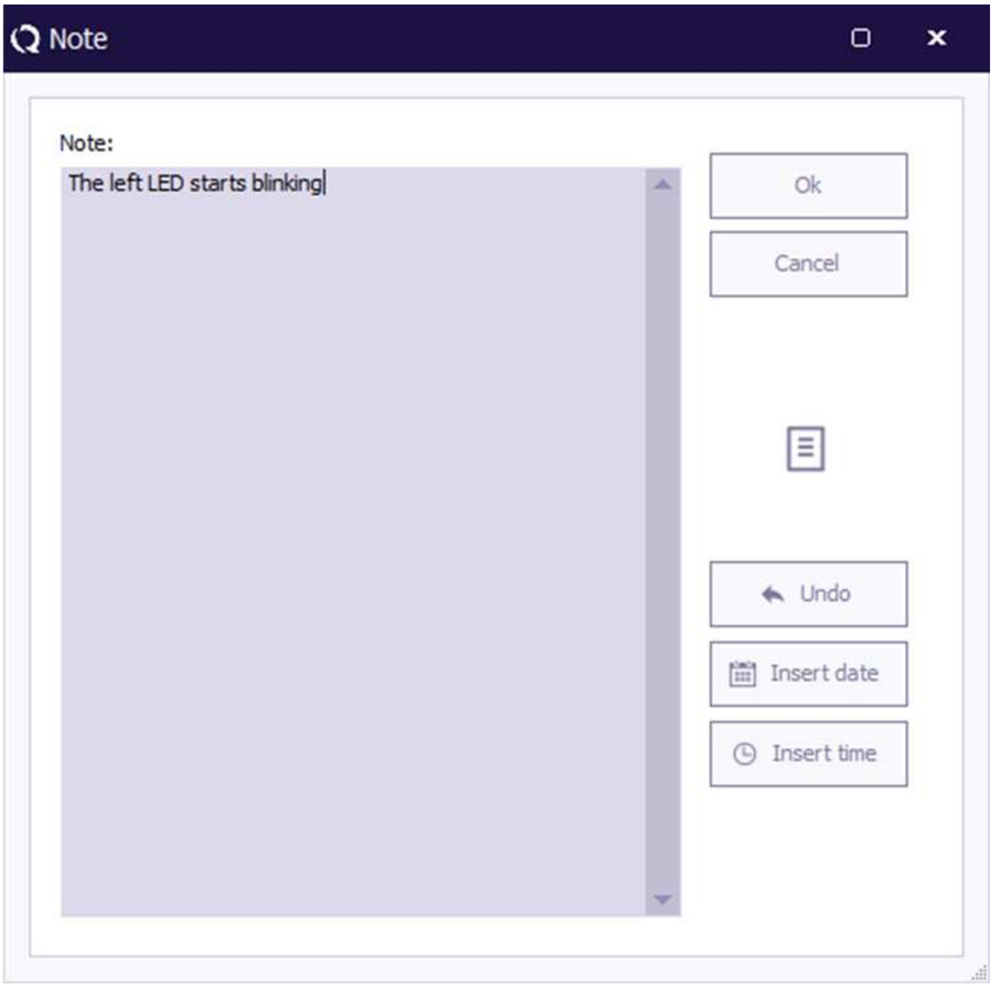


In the “manual mode” window, the immunity system can be completely manual controlled. The RF output can be switched on and off and the frequency and the amplitude can be changed.
Manual mode can be used for one of the following purposes:

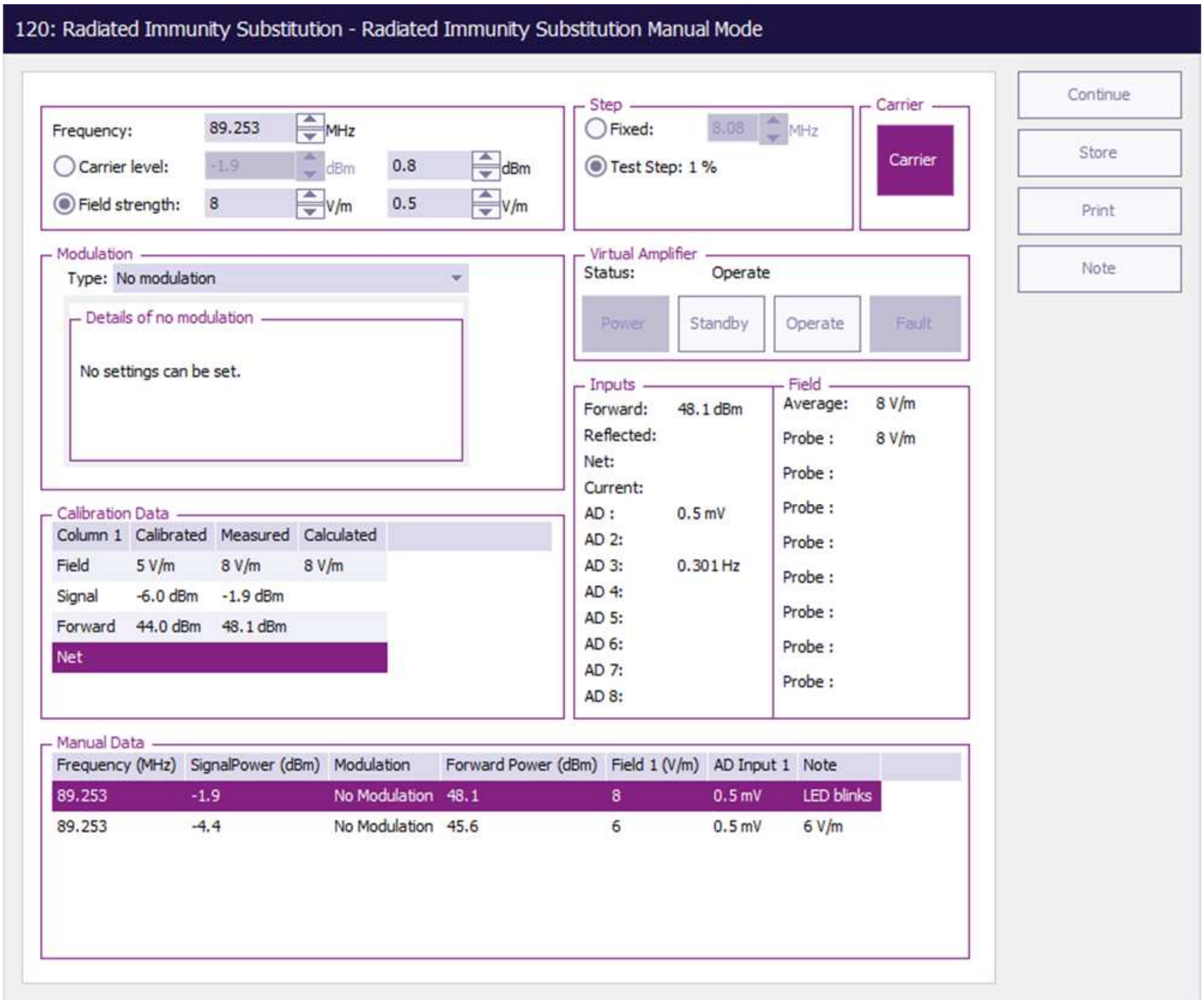
1. Examine the performance of an EUT in a small frequency band
2. Change the frequency and/or test level and continue with the automated test at this new frequency and/or test level settings.
3. Make notes during the test, to record EUT failure (see also “event lists”)
4. Verify the functionality of the software and or test system

4.10.2 Entering Manual Data

When in manual mode the user can explore the area around the desired frequency point and determine the behavior of the EUT. In case the user wants to store information during a manual mode session the store button should be pushed. A note window appears in which the user can add his observations.



This note together with all relevant data will be stored and showed in the manual data view. Manual data like all other data collected in RadiMation® is available at all times after the test.



4.10.3 Displayed values

In manual mode, the software will display:
Measured values:

1. The (maximal 8) field strength(s) [or current] sensors
2. The (maximal 8) A/D channels
3. Forward power
4. Reflected power
5. The current sensor value

Calculated value's:

1. Field strength (or current).
2. Net power
3. Average field value of the selected field sensors

Calibration file information

2. Signal generator power which was required during the generation of the calibration file (during net power, forward and signal power calibrations)
3. Forward power which was required during the generation of the calibration file (only during forward and net power calibrations)
4. Net power, which was required during the generation of the calibration file (only during net power calibrations). With this information, the functionality of the software and test set-up can be easily verified. Furthermore, this information can be very useful during investigation of the EUT.

Calculation methods
The calculated values are calculated depending on the calibration type (signal power, forward power or net power), selected in the main test window.
The software will use the following different calculation methods:

4.10.3.1 Signal power test

When a signal power substitution test is performed, the software will use the signal generator level, which is recorded during calibration, to resolve the “calculated field” value. If the gain of the amplifier changes after the calibration file is made, the software will not detect this. For this reason, this method will make an error during the calculation of the field, when the gain of the amplifier is changed.
Calculation of the field during modulation:
During a substitution test according to the signal power calibration method, the signal generator power is set to the same value as the signal generator power during calibration. This is always done without modulation. When the modulation is switched on (for example 80% AM, 1000 kHz, without peak conservation), the forward power at the output of the amplifier, will be lower (due to the modulation). The software will derive the “calculated field” from the signal generator power and therefore will not correct for this change in output power. The calculated field can not be derived from the forward power because a power meter is not required during signal generator power calibrations and tests.
Because of this, the software will display a difference between the measured field and the calculated field when the modulation is applied. The calculated field will give the same reading as the field strength indicated in the calibration file, and the measured field strength will indicate the RMS field of the RF signal with the modulation applied.

4.10.3.2 Forward power test

When a forward power substitution test is performed, the software will use the forward power level, which is recorded during calibration, to calculate the “calculated field” value. While the forward power is kept constant during this test method, even if the gain of the amplifier changes, the software will calculate the correct value for the “calculated field”
The net power value can not be calculated with a forward power calibration file, and will therefore not be displayed.
Calculation of the field during modulation:
During a substitution test according to the forward power calibration method, the forward power is set to the same value as the forward power during calibration. This is always done without modulation. When the modulation is switched on (for example 80% AM, 1000 kHz, without peak conservation), the forward power will be lower (due to the modulation). The principal of a substitution test requires no correction for this change in forward power.
During manual mode, (while performing a forward power test), changing the test level will change the forward power, generated. Because of this, the software will derive the same value for the

“calculated’ and “measured field” as for the “calibration file” field, making it more easy to check the performance of the system.
Due to a high-reflected power level, the calculated field can be inaccurate. This will be especially true if the reflected power is less than 20 dB lower than the forward power. Also, slight differences in the calculated field strength can occur due to field sensor and power meter uncertainties.

4.10.3.3 Net power test

When a net power (FWD - RFL) substitution test is performed, the software will use the net power level, which is recorded during calibration, to calculate the “calculated field” value. While the net power is kept constant during this test method, even if the gain of the amplifier changes or more energy is reflected back into the amplifier, the software will calculate the correct value for the “calculated field”

1. The calculated signal generator power is directly copied from the signal generator setting in the manual mode control window.
2. The calculated forward power in this situation will be copied from the measured forward power window.
3. The net power value will be calculated from the measured forward power and reflected power levels.

4.10.4 Calculation of the field during modulation

During a substitution test according to the net power calibration method, the net power is set to the same value as the net power during calibration. This is always done without modulation. When the modulation is switched on (for example 80% AM, 1000 kHz, without peak conservation), the net power will be lower (due to the modulation). The principal of a substitution test requires no correction for this change in net power.
However, this will result in a lower calculated field as well, because RadiMation® uses the net power to calculate the field.
During manual mode (while performing a net power test), changing the test level will change the net power, generated. Because of this, the software will derive the same value for the “calculated” and “measured field” as for the “calibration file” field, making it easier to check the performance of the system.
In this situation in contradiction to the forward power method, errors in the calculated power, due to a high-reflected power level will not occur.
Slight differences in the calculated field strength can occur due to field sensor and power meter uncertainties.

4.10.5 Changing the current test level

When the current test level is changed, the RadiMation® software automatically displays the new calculated field strength (or injected current) for this test level. Furthermore the Forward power, net power, measured Field strength and/or AD channels will be shown on the screen (only if the required field sensor(s), AD channels or power meter(s) are selected under the Configuration, test site pull down menu).
In manual mode, depending on the test method (signal generator calibration, forward power calibration or net power calibration) respectively, the signal generator level, forward power or net power will be changed.

The test level can be changed with the mouse button (using the up and down arrows), be typed in using the keyboard or be changed using the up and down arrows on the keyboard. For all methods, the step size of the increments is determined by the “step size” value behind the “test level” field.
When the shift key is pressed together with the up and down arrows, the level will change with a value of the step size divided by 10.

4.10.6 Changing the current test frequency

During manual mode the test frequency can be changed. The step size for the frequency changes can be altered with the “step size” button. When the frequency is changed, RadiMation® will display the calculated field strength for the new frequency point. Furthermore the Forward power, Reflected power, Transmitted power and measured field strength will be displayed (only if these devices are selected under the Configuration, test site pull down).
The test frequency can be changed with the mouse button (using the up and down arrows), be typed in using the keyboard or be changed using the up and down arrows on the keyboard. For all methods, the step size of the increments is determined by the “step size” value behind the “frequency” field.
When the shift key is pressed together with the up and down arrows, the frequency will change with a value of the step size divided by 10.

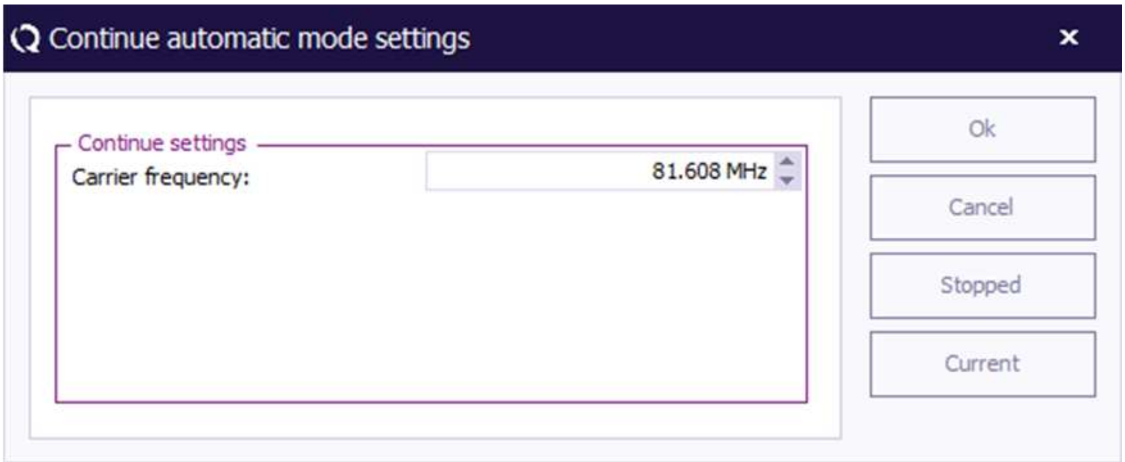
4.10.7 Short cut keys in manual mode

The following short cut keys can be used during manual mode.

Key	Function
Up	Carrier level up.
Down	Carrier level down.
Left	Carrier frequency down.
Right	Carrier frequency up.
N,n	Set carrier on.
F,f	Set carrier off.

4.10.8 Continuing a test

Continuing a test at a different test level
When, during manual mode, the test level has been changed, RadiMation® will ask you to continue with the new test level or to continue at the old test level.
Continuing a test at a different frequency.
When, during manual mode, the test frequency has been changed, RadiMation® will ask you to continue with the new start frequency or to continue at the old test frequency.



4.11 Tolerance

For every radiated immunity test you can define a tolerance. This tolerance has great effect on the measurement. If you choose the tolerance to large then the test results are not usable, if you choose the tolerance to small then it could be that RadiMation® has problems performing the test correctly. For example if you define a tolerance of 0.1 dB and your system is only capable of measuring with an uncertainty of 0.2dB than it could be you get a very large event log. So what does it really mean this tolerance? The best way is to explain by using an example. Suppose you are performing a fixed power test, leveling is set on netpower. You have told RadiMation® to generate 50 dBm with a tolerance of 0.2 dB. When RadiMation® is leveling the power it will accept any power level between 50 and 50.2 dBm as a correct leveled value, and will continue with the test.

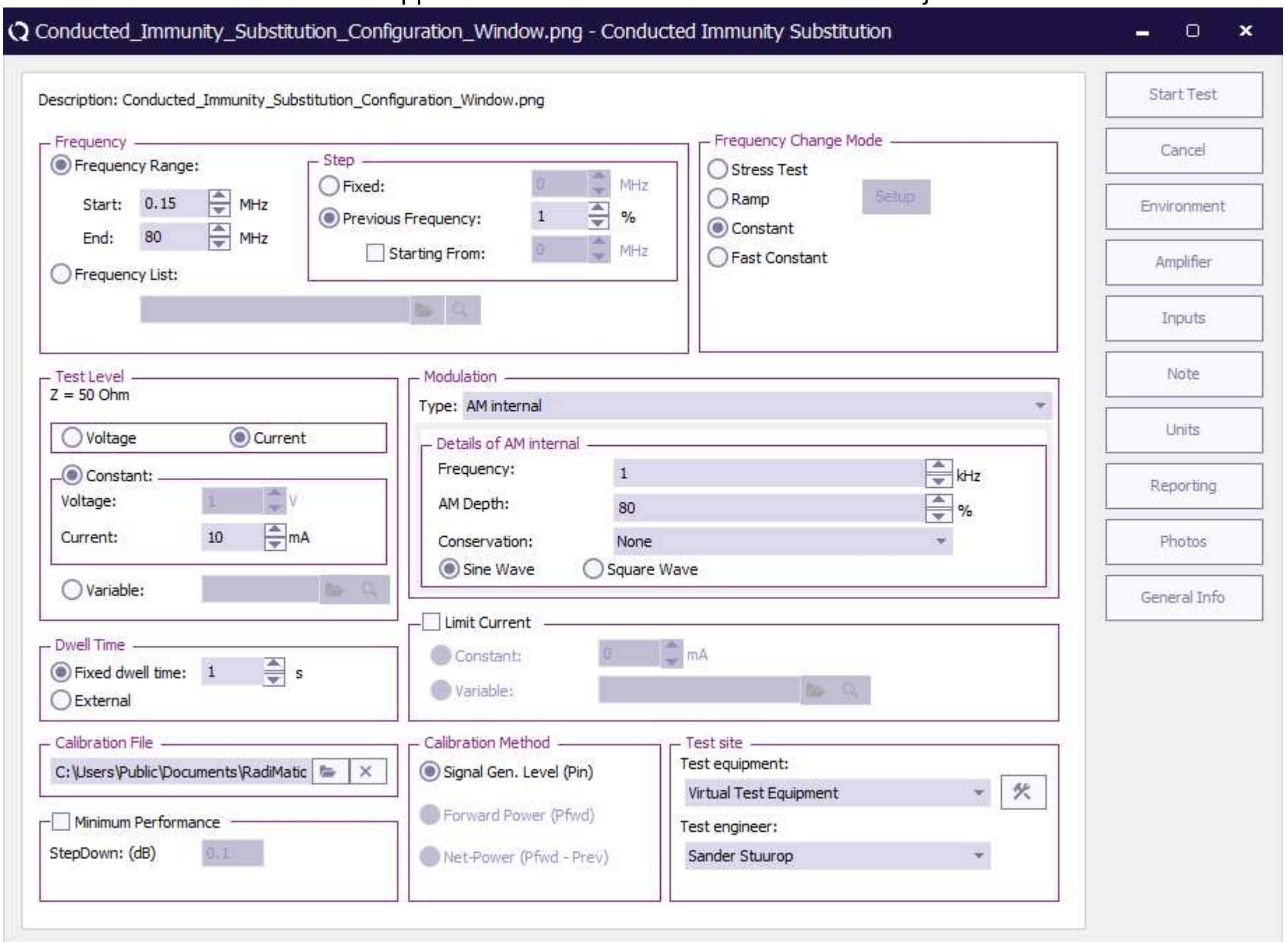
RadiMation® EMC software
------- Conducted Immunity -------

Table of contents:

Conducted immunity

5.1 Introduction

Conducted immunity tests are a simulation of R.F. currents in cables, induced by R.F. fields of transmitters working in the lower frequency bands. At frequencies below 30 MHz it is quite difficult to generate an R.F. field in an anechoic chamber. This is caused by the fact that the wavelength of the test signal becomes increasingly longer at lower frequencies (l [m]= 300 / f [MHz]) and therefore, the transmitting antenna becomes either very long (± 5 meter at 30 MHz) or very in-efficient.
The dimensions of most anechoic chambers do not allow antennas greater than 5 meter (labda / 2). On the other hand, when smaller antennas are used, the power needed to generate a field becomes very high. At 30 MHz with a 3 meter EUT, Antenna separation, a transmitted power of approximately 500 W is needed. For frequencies below 30 MHz the desired power rapidly increases to several Kilowatts. During conducted immunity tests, a RF current is injected in to the cabling of the equipment under test. Different EMC standards use different methods to control the injected current.
The RadiMation® test software supports four different methods for current injection.



5.2 Substitution method

During current injection tests according to the substitution method, a constant voltage is applied to the injection clamp.

- **Tests**
  - **Conducted Immunity**

➢ **Substitution**

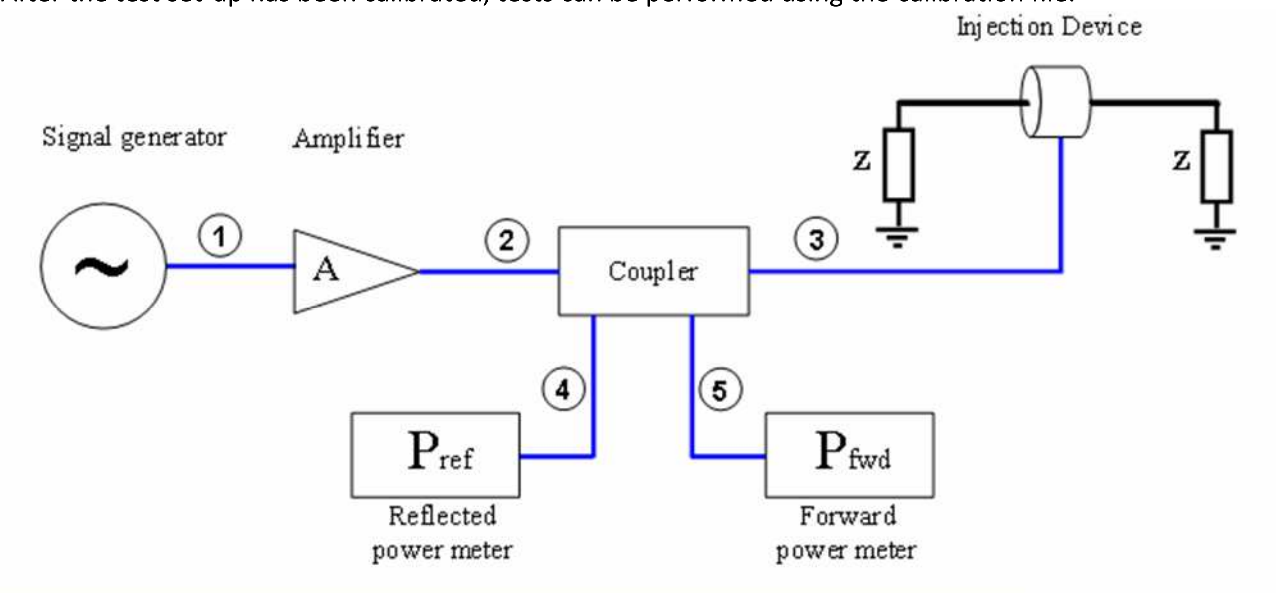
Related standards are:

5.2.1 EN 61000-4-6

For tests in accordance to EN 61000-4-6 a CDN (Coupling Device Network) or injection clamp with characteristic impedance of 150 Ω is used. Before actual tests can take place, calibration of the test set-up is required. See the “Calibration” chapter for the method to calibrate the current clamp.
During the calibration, a calibration file is made, which contains the drive levels for each test frequency. The values recorded in the calibration file are the forward power levels to the clamp, necessary to inject a constant current into a 150 Ω reference wire. For example, if a test level of 10 Vrms has to be injected, a current of 33 mA is injected in the 150 Ω reference wire (10 Vrms / (150 Ω + 150 Ω)).
After the test set-up has been calibrated, tests can be performed using the calibration file.
The current injected into the cabling of the EUT (Equipment Under Test) during a test, will be determined by the impedance of the cable and the 150 Ω of the injection clamp. Worst case, the injected current will be twice as high as the injected current during the calibration.

5.2.2 95/54/EEG

Tests for automotive and military applications often are revered to as Bulk Current Injection (B.C.I.) tests. For tests in accordance to 95/54/EEG a Bulk Current Injection clamp is used. Before actual tests can take place, calibration of the test set-up is required.
Chapter 12 describes the method for the calibration of the bulk current injection set-up. During the calibration, a calibration file is made, which contains the drive levels for each test frequency. The values recorded in the calibration file are the forward power levels to the clamp, necessary to inject a constant current into a 100 Ω calibration Jig.
After the test set-up has been calibrated, tests can be performed using the calibration file.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Forward power meter	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Reflected power meter	Devices 1

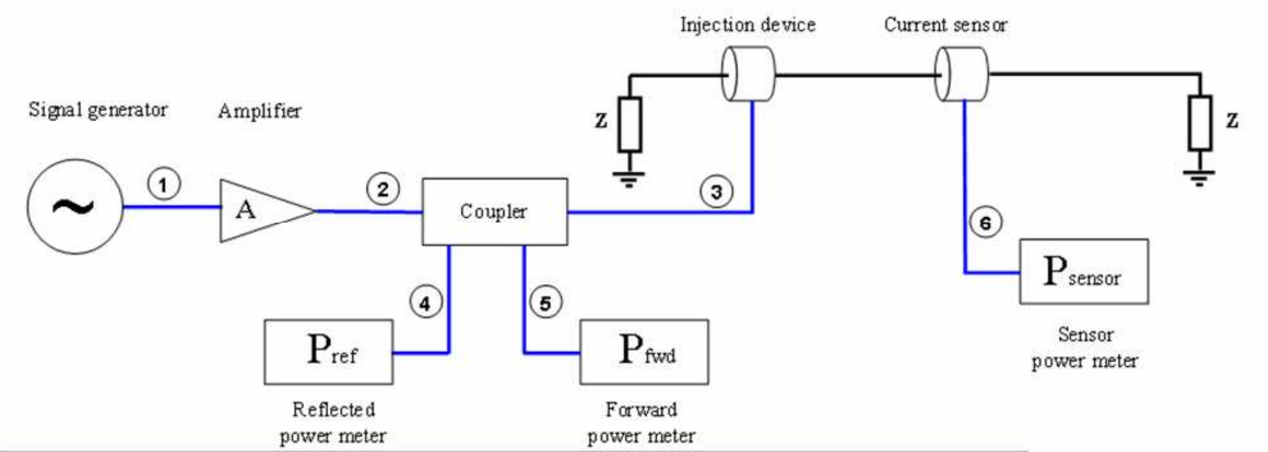
	Injection device	Devices 2
Cables		
1	Cable SG -> Amplifier	Cables
2	Cable Amplifier -> coupler	Cables
3	Cable Coupler -> Antenna	Cables
4	Cable Coupler -> fwd Power meter	Cables
5	Cable Coupler -> refl power meter	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. Although, during immunity measurements according to the substitution method, cable correction factors will increase the accuracy of measured/displayed power values. The generated field accuracy will however be the same when using correction factors or not.
When in doubt contact your reseller.

5.3 Current levelling method

- **Tests**
  - **Conducted Immunity**
    - **Fixed Current**

During conducted immunity tests according to the "current levelling" method, the injected current during the tests is real time levelled to the desired value. For "current levelling" tests, no calibration files are required. Some EMC standards, like automotive standards, describe current levelling test methods.
Some EMC standards prescribe the use of a selective power meter like a spectrum analyser. A selective power meter will only measure the fundamental frequency of the injected current, where a broad band power meter measures the fundamental frequency with all of its harmonics. On the other hand, a broadband power meter is much more accurate than the amplitude accuracy of a spectrum analyser. RadiMation® supports both the use of spectrum analysers and power meters simply by selecting the corresponding power meter device driver.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward power meter	Devices 1

	Reflected Power meter	Devices 1
	Injection device	Devices 2
	Current sensor	Devices 2
	Sensor power meter	Devices 2
Cables		
1	Cable SG -> Amplifier	Cables
2	Cable Amplifier -> Coupler	Cables
3	Cable Coupler -> Antenna	Cables
4	Cable Coupler -> Fwd Power meter	Cables
5	Cable Coupler -> Refl Power Meter	Cables
6	Cable Current -> Power Meter	Cables

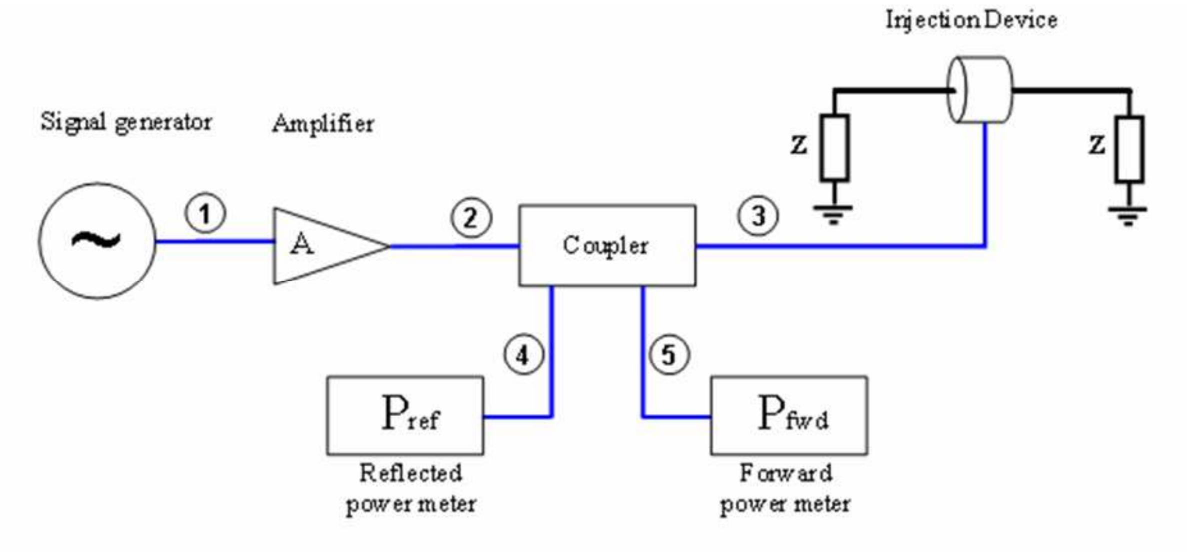
Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. When in doubt contact your reseller.

5.4 Fixed Power method

Fixed generator tests can be useful during various kinds of EMC tests. During current injection tests, this method can be used to achieve the maximum injected current the amplifier is able to generate. Although this will not be a constant current over the frequency range, it can be useful during engineering work.

- **Tests**
  - **Conducted Immunity**
    - **Fixed Power**

Fixed generator tests can be performed in three different ways:
Fixed signal generator output level. Tests with a fixed generator output level do not take cable losses and amplifier frequency response into account. No power meters are needed during these tests and therefore, the test speed is higher than the fixed forward and fixed transmitted power tests. Fixed Forward power level Tests with a fixed forward power level do take cable losses and amplifier frequency response into account. One power meter is required during these tests. This test method does not take VSWR mismatch between the amplifier and current probe into account (i.e.: the forward power and transfer impedance of the current probe alone is not enough to calculate the actually injected current). Tests with a fixed transmitted power level take cable losses, amplifier frequency response and VSWR mismatch into account. Two power meters are required during these tests, one to measure the forward power, and one to measure the reflected power. The difference between forward power and reflected power is the transmitted power.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward power meter	Devices 1
	Reflected power meter	Devices 1
	Injection device	Devices 2
Cables		
1	Cable SG -> Amplifier	Cables
2	Cable Amplifier -> Coupler	Cables
3	Cable Coupler -> Antenna	Cables
4	Cable Coupler -> Fwd Power Meter	Cables
5	Cable Coupler -> Refl Power Meter	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements.
When in doubt contact your reseller.

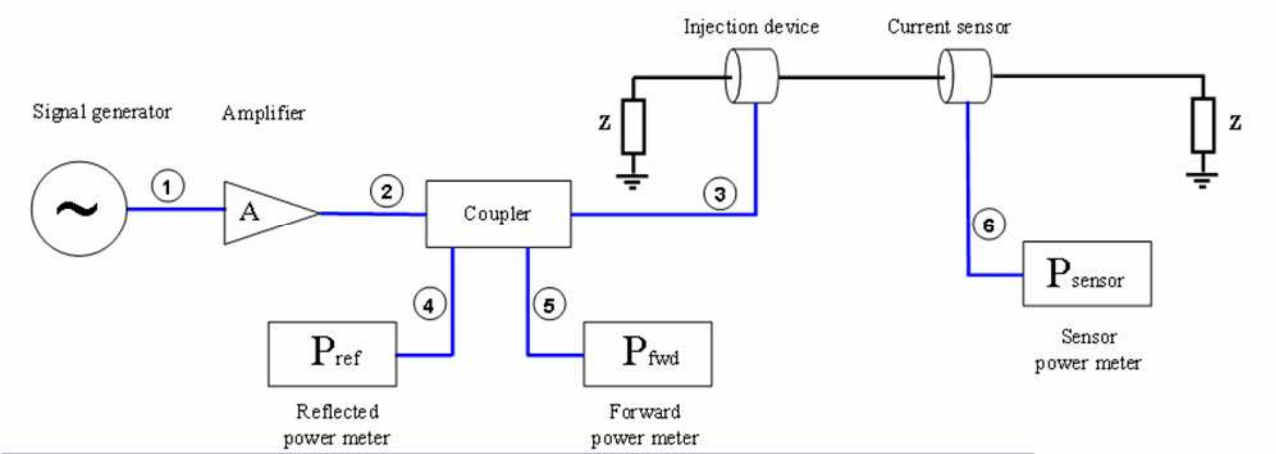
5.5 Minimum performance method

The RadiMation® package also supports a specific method to determine the minimum performance level of a Device Under Test. This method differentiates itself from the aforementioned methods that is does not generate a fixed specified injected current but a varying injected current based on the susceptibility of the Device Under Test.

- **Tests**
  - **Conducted Immunity**
    - **Minimum Performance**

The method relies heavily on EUT monitoring (see chapter 10) to determine at which level the Device Under Test is influenced. Before the test is started the relevant A/D-channels have to be configured. Pushing the input button on the configuration screen does this.

The test is started at a (low) injection level after which the current is increased with a specified increment till either of both situations arises. The current is limited by amplifier protection or the Device Under Test will be influenced in such way that the specified limits are exceeded. The field strength is than reduced with a specified step and the software will change to the next frequency point. This test will result in a graph showing the level to which the Device Under Test is unaffected by a current injection.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward Power meter	Devices 1
	reflected Power meter	Devices 1
	Injection device	Devices 2
	Current sensor	Devices 2
	Sensor power meter	Devices 2
Cables		
1	Cable SG -> Amplifier	Cables
2	Cable Amplifier -> Coupler	Cables
3	Cable Coupler -> Antenna	Cables
4	Cable Coupler -> Fwd Power Meter	Cables
5	Cable Coupler -> Refl Power Meter	Cables
6	Cable Current -> Power Meter	Cables

Note: The current sensor, the sensor power meter and cable only need to be inserted when current limiting is selected. When not selected usage of these devices will be omitted.

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. When in doubt contact your reseller.

5.6 Calibration methods

RadiMation® supports three different ways of power calibration. During the configuration of the calibration, the desired method should be selected. During a test, when a calibration file is selected, RadiMation® will automatically select the method that was used during calibration.

5.6.1 Signal generator level calibration

When a signal generator level calibration is used, only the signal generator level is recorded during the calibration. During a test, the signal power that was recorded during a calibration will be re-established. This method does not take amplifier instability or fluctuation into account. During this calibration method no forward and reflected powermeters are required. This method is less accurate than the Forward power and Net power calibrations and therefore is not recommended for full compliance tests. Because no powermeters are used, this method is the fastest method to perform a test.

5.6.2 Forward power calibration

During a Forward power calibration, the forward power to the transmitting antenna is recorded. During a test, the Forward power to the antenna is kept the same as during the calibration. When this method is used, amplifier drift will have no influence on the test, because the same output power out out of the amplifier is re-established as was present during the calibration.

5.6.3 Net power calibration

During a Net power calibration, the Forward and Reflected power to the antenna are recorded. The difference between the Forward power and Reflected power is the Transmitted power. When net power is calibrated, then during the test, the transmitted power by the antenna is kept the same as during calibration. This method has the advantage, that the transmitted power is adjusted to be the same as during the calibration, also when a large metallic, EUT is placed in front of the antenna. In that situation some RF energy can be reflected back into the antenna, resulting in a worse VSWR. If in this situation a forward power calibration or a signal generator level calibration was used, this effect is not compensated for. When net power is calibrated, the by the antenna transmitted power is kept the same as during calibration. When a net power calibration is made, this calibration file can also be used to perform a signal generator substitution test or a forward power substitution test. During a forward power calibration, the signal generator level, forward power level and the field strength during calibration is recorded.

5.7 Short cut keys in manual mode

The following short cut keys can be used during manual mode.

Key	Function
Up	Carrier level up.
Down	Carrier level down.
Left	Carrier frequency down.
Right	Carrier frequency up.
N,n	Set carrier on.
F,f	Set carrier off.

5.8 Tolerance

For every conducted immunity test you can define a tolerance. This tolerance has great effect on the measurement. If you choose the tolerance to large then the test results are not usable, if you choose the tolerance to small then it could be that RadiMation® has problems performing the test correctly. For example if you define a tolerance of 0.1 dB and your system is only capable of measuring with an uncertenty of 0.2dB than it could be you get a very large event log. So what does it really mean this tolerance? The best way is to explain by using an example. Suppose you are performing a fixed power test, leveling is set on netpower. You have told RadiMation® to generate 50 dBm with a tolerance of 0.2 dB. When RadiMation® is leveling the power it will accept any power level between 50 and 50.2 dBm as a correct leveled value, and will continue with the test.

RadiMation® EMC software
------- Pulsed Immunity -------

Table of contents:

Pulsed immunity

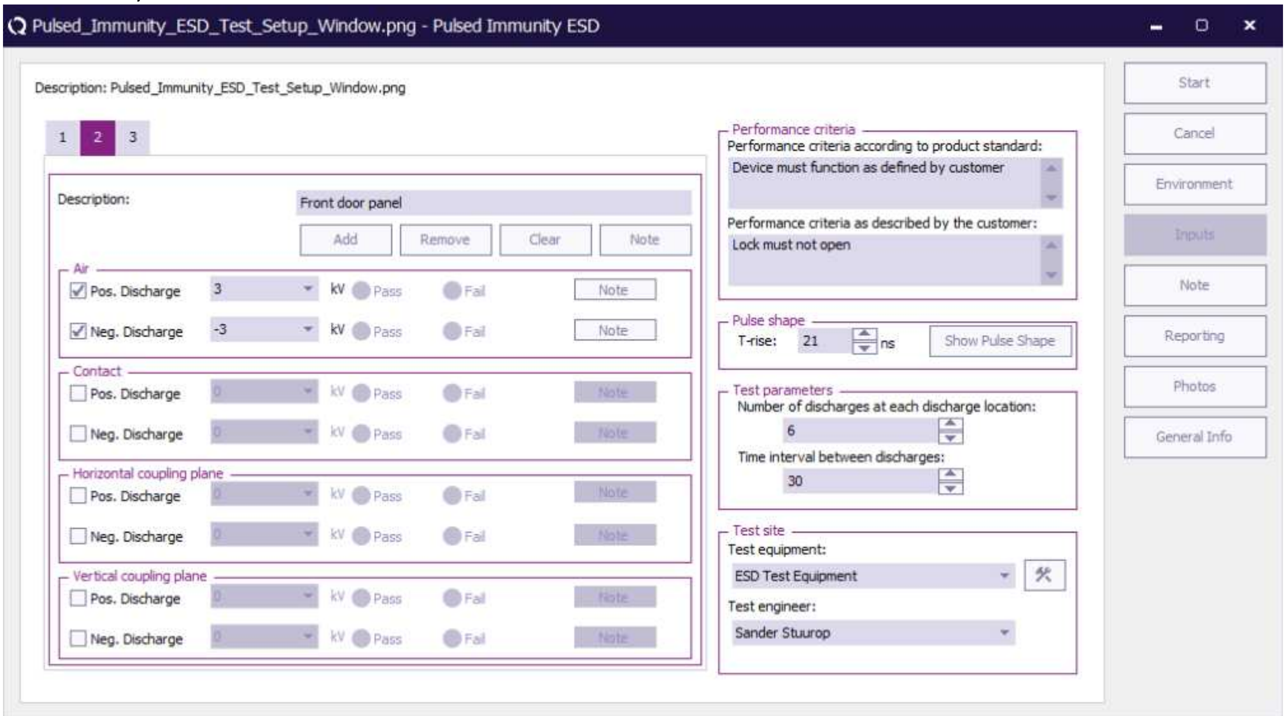
6.1 Introduction

The pulsed immunity test modules are used to record test data in the RadiMation® software. Most of the pulsed immunity tests are carried out manually while the test engineer enters the test results. The report generator can use the results of the tests.
The following pulsed immunity tests are implemented:

- Electro static discharge (ESD) testing
- Electrical Fast Transient (EFT) testing
- Surge testing

6.2 ESD testing

The picture below shows the ESD configuration screen. The operator has to select test levels and pulse polarity. Furthermore the burst waveform has to be configured by the operator. The measurement results can be recorded in the right side of the screen. For each injection mode, the operator can select pass or fail and make notes in the “notes” field. All configurations (except for the test results) can be stored in a TSF file.



6.3 Starting an ESD test

6.3.1 Loading a TSF file

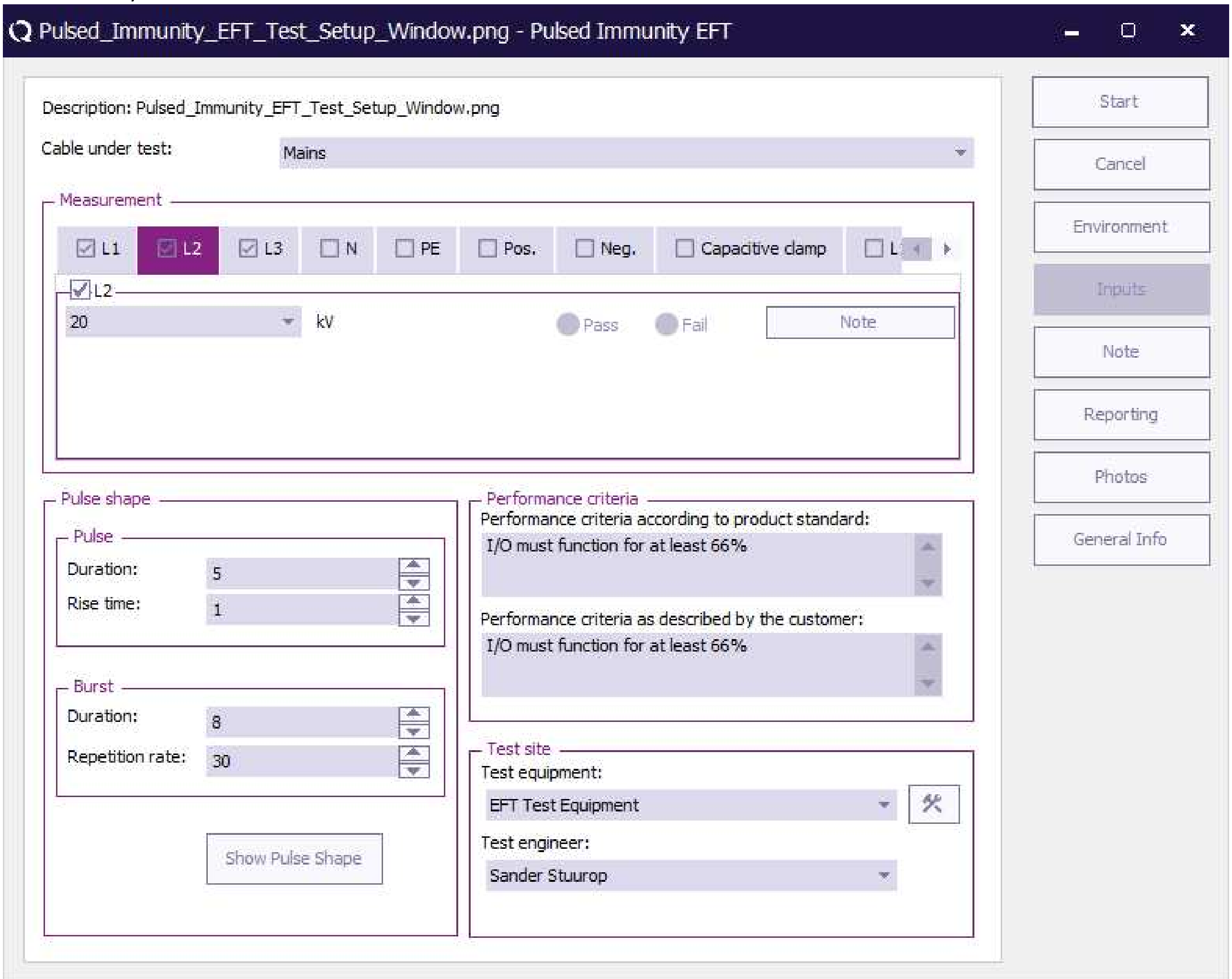
To start an ESD test, an EUT file must be defined first. From the EUT file, select

- **Tests**
  - **Pulsed immunity**
    - **ESD**

A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press cancel to define a new emission test.
After the TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen can start the test.
When a new TSF file is loaded (by pressing New in the TSF selection window) all parameters will be at zero and can be configured by the operator.

6.4 EFT testing

The picture below shows the EFT configuration screen. The operator has to select the cable to be tested (AC / DC / IO). The cable under test is part of the EUT so it needs to be configured in the EUT window under cables. Furthermore the burst waveform has to be configured by the operator. The measurement results can be recorded in the right side of the screen. For each injection mode, the operator can select pass or fail and make notes in the “notes” field. All configurations (except for the test results) can be stored in a TSF file.



➢ **Cable under test** Selection of cable on which the test is performed. The cable is created in the cable section in the EUT window.

- **Measurement** Configuration of the tests that need to be performed on the specific cable.
  - **Level** The level applied to the cable.
  - **Note** A note that can be added before performing the test relate.
- **Pulse shape** These parameters describe the characteristics of the applied pulses.
  - **Pulse Duration** The duration of the pulse applied to the cable.
  - **Pulse Rise time** The rise time of the pulse applied to the cable.
  - **Burst Duration** The duration of the burst applied to the cable.
  - **Burst Repetition rate** The repetition rate of the burst applied to the cable.
  - **Show Pulse Shape** Display a graphical view of the pulse shape.
- **Performance criteria**
  - **Performance criteria according to the product standard** In this field the performance criteria according to the standard can be written down.
  - **Performance criteria as described by the customer** In this field the performance criteria as described by the customer can be written down.
- **Test site**
  - **Test equipment** In the test site window the test engineer can select which equipment list will be used during this test.
  - **Test engineer** In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.
  - **Equipment icon** By clicking on the equipment icon, the equipment list can be viewed and edited.

6.5 Starting an EFT test

6.5.1 Loading a TSF file

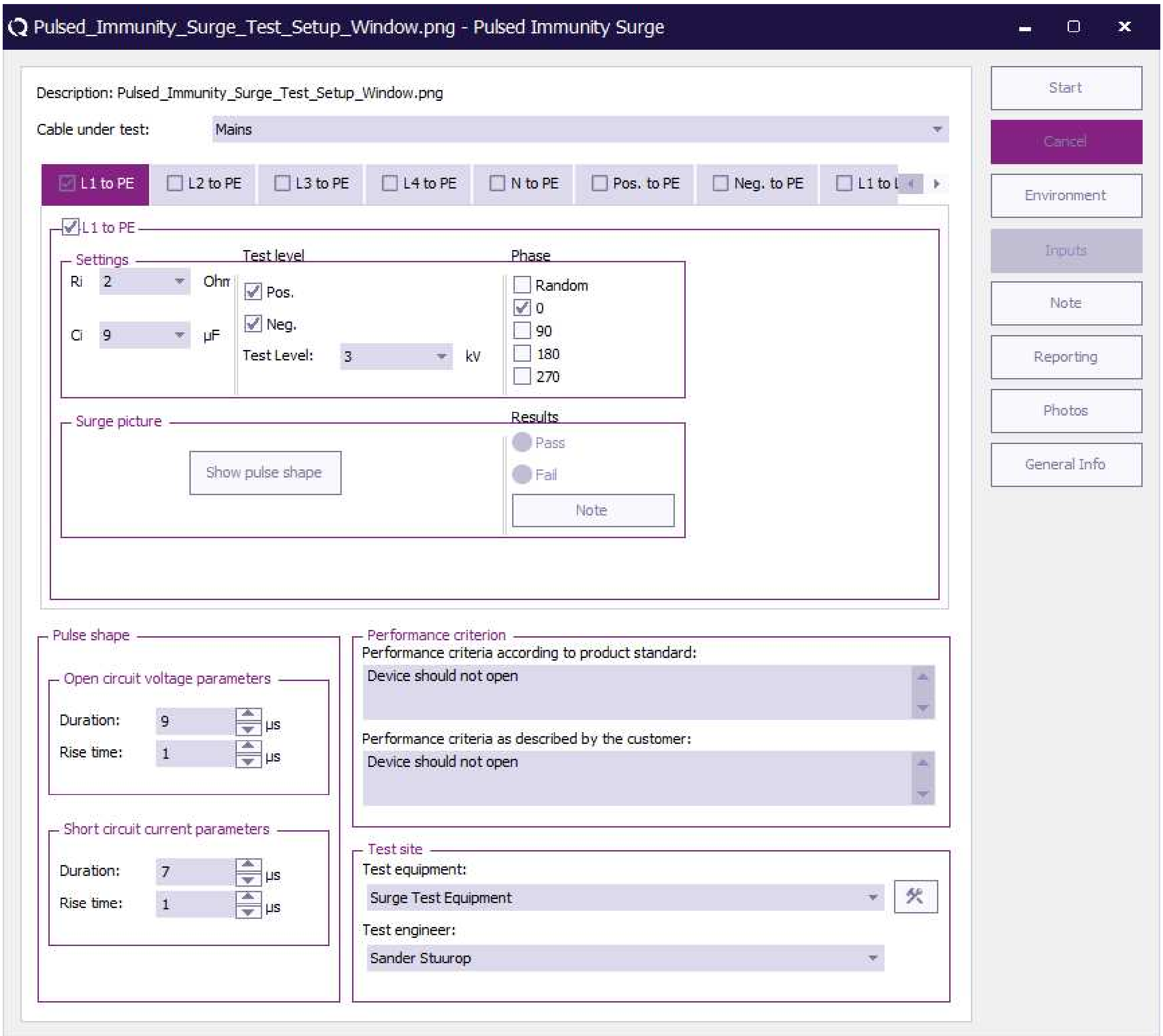
To start an EFT test, an EUT file must be defined first. From the EUT file, select

- **Tests**
  - **Pulsed immunity**
    - **EFT**

A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press cancel to define a new emission test.
After the TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen can start the test.
When a new TSF file is loaded (by pressing New in the TSF selection window) all parameters will be at zero and can be configured by the operator.

6.6 Surge testing

The picture below shows the Surge configuration screen. The operator has to select cable to be tested (1 or 3 phase / DC / IO). The cable under test is part of the EUT so it needs to be configured in the EUT window under cables. Furthermore the operator has to configure the test level, polarity, phase and the internal resistor and capacitor of the generator. The measurement results can be recorded in the right side of the screen. For each injection mode, the operator can select pass or fail and make notes in the “notes” field. All configurations (except for the test results) can be stored in a TSF file.



➢ **Cable under test**	Selection of cable on which the test is performed. The cable is created in the cable section in the EUT window.
➢ **Pulse shape**	➢ **Open circuit duration** — The duration of the open circuit applied to the cable.
	➢ **Open circuit rise time** — The rise time of the open circuit applied to the cable.
	➢ **Short circuit duration** — The duration of the short circuit applied to the cable.

	➢ **Short circuit rise time**	The rise time of the short circuit applied to the cable.
➢ **Performance criteria window**	➢ **Performance criteria according to the product standard**	In the Performance criteria according to the product standard window the performance criteria according to the standard can be written down.
	➢ **Performance criteria as described by the customer**	In the Performance criteria as described by the customer window the performance criteria as described by the customer can be written down.
➢ **Test site**	➢ **Test equipment**	In the test site window the test engineer can select which equipment list will be used during this test.
	➢ **Test engineer**	In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.
	➢ **Equipment icon**	By clicking on the equipment icon, the equipment list can be viewed and edited.

6.7 Starting an Surge test

6.7.1 Loading a TSF file

To start a Surge test, an EUT file must be defined first. From the EUT file, select

- ➢ **Tests**
  - ➢ **Pulsed immunity**
    - ➢ **Surge**

A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press cancel to define a new emission test.
After the TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen will start the test.
When a new TSF file is loaded (by pressing New in the TSF selection window) all parameters will be at zero and can be configured by the operator.

RadiMation® EMC software
------- Radiated Emission -------

Table of contents:

Radiated emission

7.1 Introduction

The RadiMation® package supports several different radiated emission methods:

- Multiband
- Manual Mode
- Burst
- Anechoic chamber
- Fixed height
- GTEM
- Mil Std Magnetic
- Manual mode (Singleband)
- Merge
- X + k * S

These methods are described in the subsequent paragraphs.

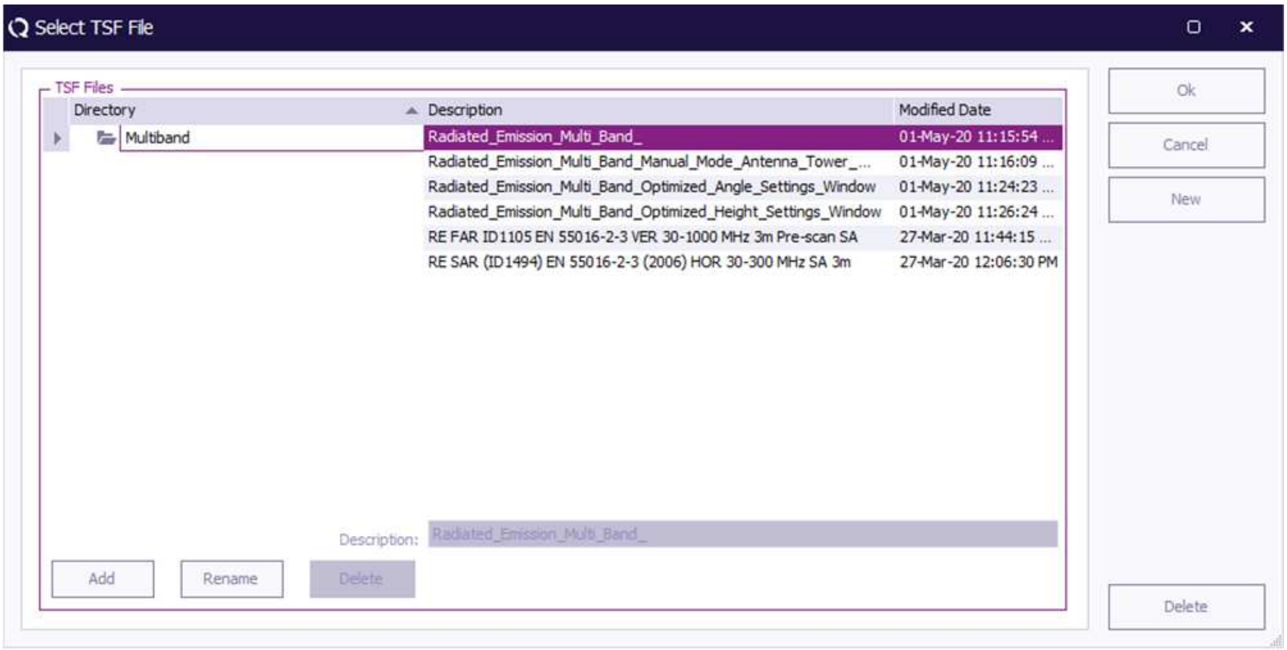
7.2 Starting a radiated emission test

7.2.1 Loading a TSF file

To start a radiated emission test, an EUT file must be defined first. From the EUT file, select:

- **Tests**
  - **Radiated Emission** and then the desired test method.

A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press **New** to define a new emission test.



After the TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the **Start Test** button on the right side of the screen will start the radiated emission test.

When no TSF file is loaded (by pressing **New** in the TSF selection window) all parameters will be at zero and can be configured by the operator.

7.2.2 Test initialisation and self test

When the **Start Test** button is pressed, the software first runs a number of checks.

1. The presence of a valid software key is checked.
2. The software settings are checked (i.e. is all test equipment used within its parameters?)
3. The presence of all test equipment is checked.
4. All relevant equipment will be initialised.

When one or more of the tests mentioned above fail, an error message is displayed.

7.2.3 Test results screen

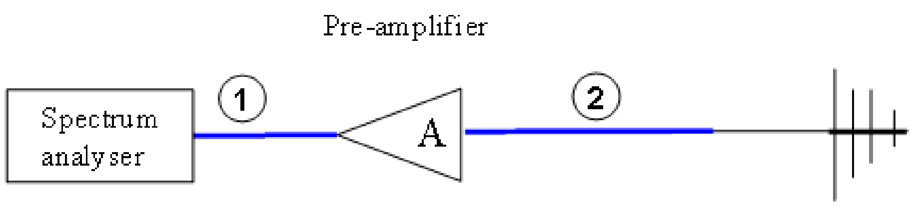
You can access the test results of the performed test by selecting the test in the EUT window and then press the **Info** button. For the Multiband test, the window that is appearing looks a lot like the manual mode screen, the reason that it looks the same is because it is. You can continue testing after you finished a test, just select the testsite you want to use and you can continue testing.

Note: The pass/fail criteria, shown in the tables do not take the measure uncertainty of the test setup into account.

Note: Continuing the test is only possible with the selected test site. RadiMation® will not select the correct test site for you. All measurements are done with the selected test site. If you want automatic changes of the test site, restart the configured TSF file.

7.2.4 Testsite information

An radiated emission test, requires that a testsite is used that can have the following components.

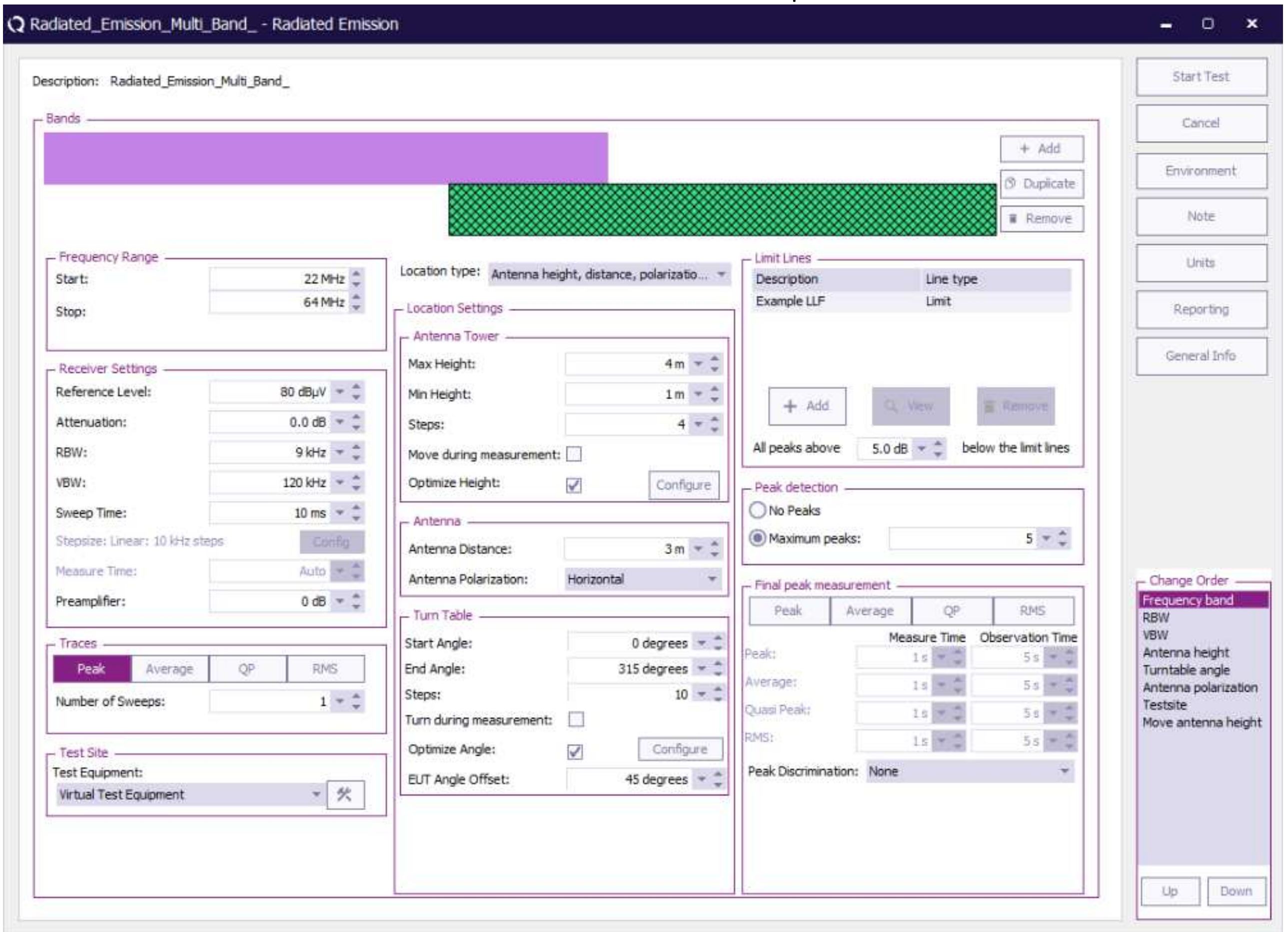


#	Device name	Tab in RadiMation® configuration window
	Spectrum analyser	Devices 2
	Pre amplifier	Devices 2
	Antenna	Devices 1
	Turn table	Devices 1
	Antennatower	Devices 1
Cables		
1	Cable preamp -> analyser	Cables
2	Cable antenna -> preamp	Cables

Note: Usage of cable correction factors is not mandatory. However, using cable correction factors will increase measurement accuracy during emission measurements. When in doubt contact your reseller.

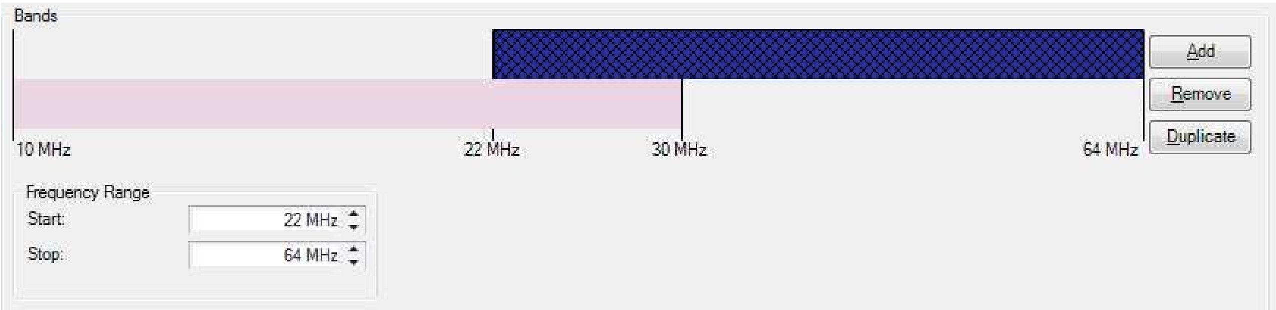
7.3 Multiband

The radiated emission Multiband test, is a very flexible and powerful test to perform radiated emission tests. When the multiband test is performed, it will first perform a prescan measurement on all the specified locations. After this prescan is finished the temporary results are shown, and some peaks are automatically detected and shown. At this moment those peaks are NOT measured yet with the final measurement detectors and are also not optimized yet. The end-user now has the possibility to add additional peaks, or do some other peak investigation/changes. When the end-user is satisfied with the list of detected peaks, he can continue with the final measurement, by pressing the **Automatic** button again. When the end-user has configured peak optimization to be active, the peak optimization will now also be performed. Now the peaks will be measured with the detector that are selected in the **Final peak measurement** box. Only after those measurements are finalized, those detector values will become available in the list of detected peaks.



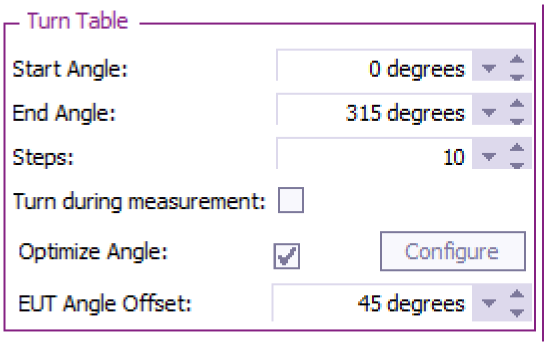
The test engineer can configure a complete radiated emission test in the Radiated Emission configuration menu. The test engineer can change the frequency range from one frequency band or the RBW of several bands. It all depends on the selection of bands. When several bands are selected and some options are blank, this means that these settings in bands are different. For example if the test engineer selects both frequency band in the window above, the frequency range will be blank. If the engineer sets the start and stop frequency, all the selected bands will have the same frequency setting. One of the advantages of this feature is the quick settings of several settings like the RBW or the peak detection.

7.3.1 Frequency window



In the frequency window, the test engineer can enter a frequency range to be measured. Pressing **Add** will add a new frequency band to the test, **Remove** will remove all the selected bands and **Duplicate** will duplicate all selected bands.

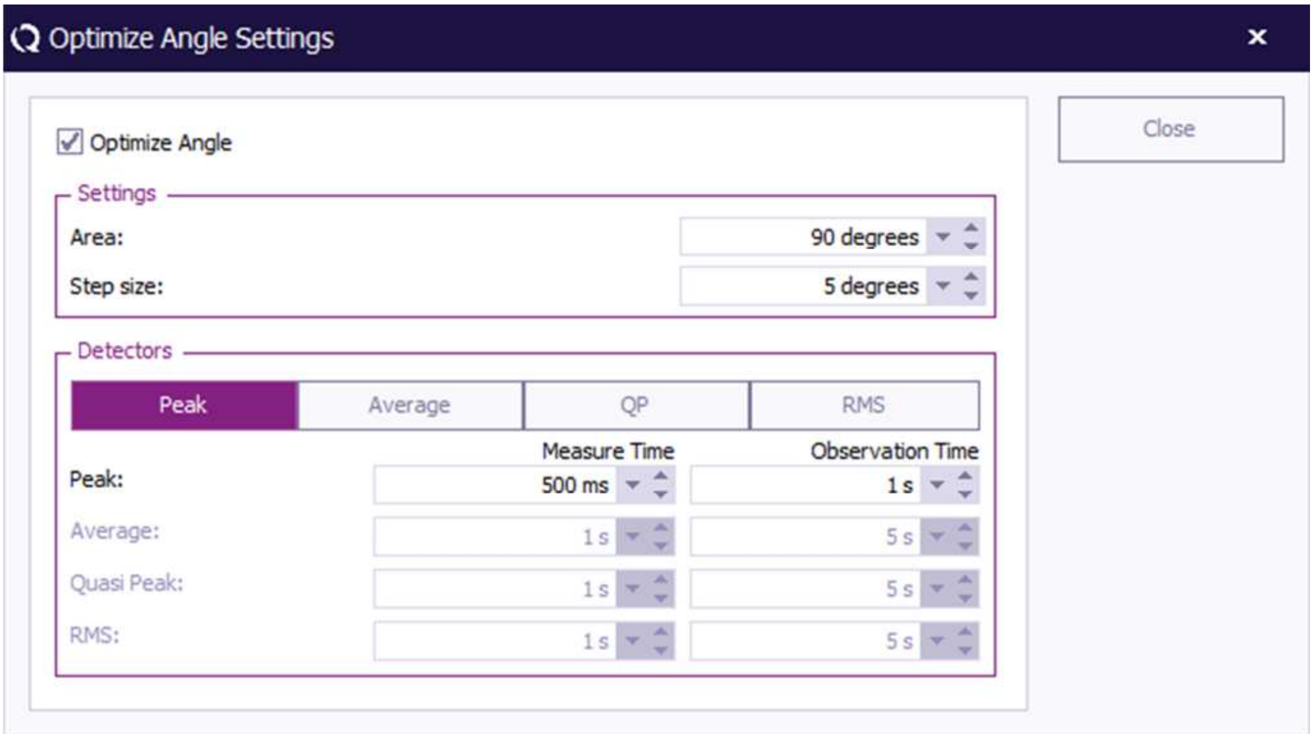
7.3.2 Turntable window



In the turntable window, the following parameters can be configured:

- **Start Angle** Sets the start position of the turntable.
- **End Angle** Sets the stop position of the turntable.
- **Steps** Sets the number of steps for one turntable rotation.
- **Turn during measurements** This will force the turntable to continuously rotate during the test and will disable steps setting.
- **EUT angle offset** The offset of the EUT compared to the zero angle of the table.
- **Optimize Angle** Optimized settings for searching the correct angle.

7.3.3 Turntable window optimize angle settings

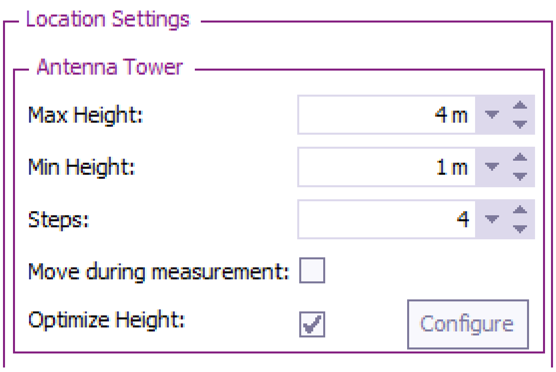


When optimize angle is selected, the user can configure the way a peak search is performed. In the optimize angle configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed (0 to 360 degrees max.).
- **Step size** The angle step size.

The area is defined 50% left of the starting position and 50% right. So if the area is 30 degrees, RadiMation® will scan between starting position plus and minus 15 degrees.
In the detector window the test engineer can select which detectors to use for measuring the optimal angle. After selecting the detectors the measure time and observation time of the selected detector are enabled. It is possible to use other settings for finding the peak then the settings on the main configuration window.

7.3.4 Antenna tower window



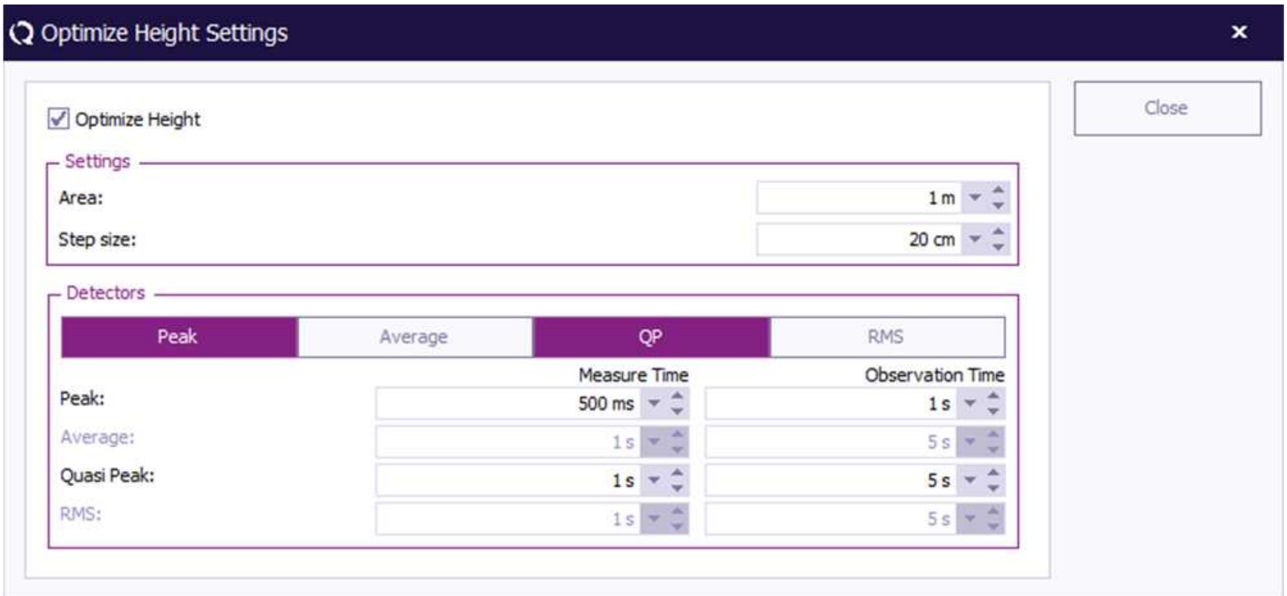
In the antenna tower window, the following parameters can be configured:

- **Max. height** Sets maximum height of the antenna tower.

- **Min. height** Sets the minimum height of the antenna tower.
- **Steps** Sets the number of steps to go from min. height to max. height.
- **Move during measurements** This will force the Antenna Tower to continuously move during the test and will disable steps setting.
- **Optimize height** The software will automatically detect on which antenna height maximum emission will occur.

When Optimize height is selected, the user can configure the way a peak search is performed.

7.3.5 Optimize height settings

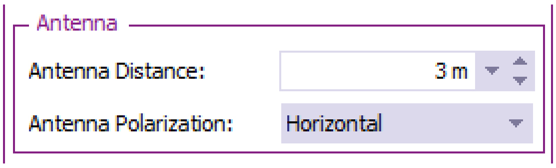


When optimize height is selected, the user can configure the way a peak search is performed. In the optimize height configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed (0 to Max height).
- **Step size** The height step size.

The area is defined 50% above of the starting position and 50% below. So if the area is 1 meter, RadiMation® will scan between starting position plus and minus 50 cm.
In the detector window the test engineer can select which detectors to use for measuring the optimal height. After selecting the detectors the measure time and observation time of the selected detector are enabled. It is possible to use other settings for finding the peak then the settings on the main configuration window.

7.3.6 Antenna window



7.3.6.1 Polarisation

In the antenna window the user can select the antenna polarisation. The test engineer can select the following three options:

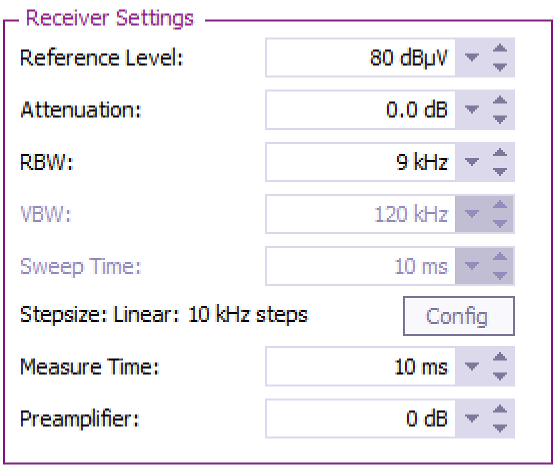
1. Horizontal
2. Vertical
3. Both

When Horizontal or Vertical is selected, the software will measure only one antenna polarisation.
When the option “Both” is selected, the software will measure both Horizontal and Vertical polarisation (an antenna positioner is required for this option).
When this option is selected, all data will be displayed in one graph thus loosing some polarisation information. However the peak list table will show if a peak was measured in horizontal or vertical polarisation.
If the both emission graphs of horizontal and vertical polarisation are required, two separate tests must be configured. These tests can be put in a sequence, eliminating the need for a user intervention.

7.3.6.2 Distance

RadiMation® uses the distance information for reference only.

7.3.7 Receiver settings

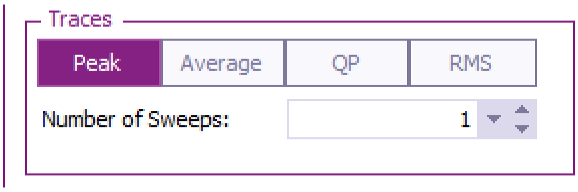


- **Reference level** Sets the reference level of the receiver.
- **Attenuator** Sets the receiver attenuator level.
- **RBW** Sets the Resolution Band Width filter.

- **VBW** Sets the Video Band Width filter.
- **Sweep** Sets the sweep time of the receiver.
- **Step frequency** Sets the frequency step size of the receiver.
- **Measure time** Sets the measure time of the receiver.
- **Pre-amp** Sets the pre-amp gain.

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.

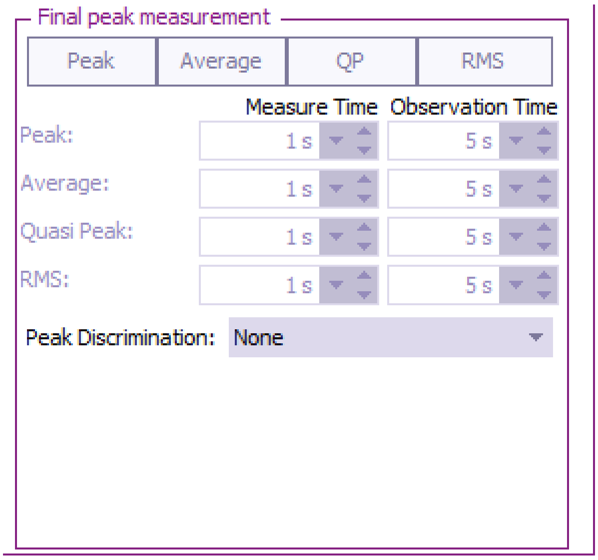
7.3.8 Traces window



In the traces window, the test engineer can select a maximum of four traces, which can be measured and displayed at the same time.

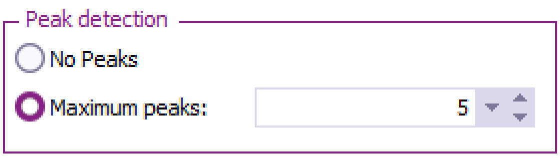
- **Detectors** The detector settings (Peak, Average, Quasi-peak, RMS) used during sweeptime. This setting is generic. So it is possible to select multiple detectors, but only one detector can be selected due to the device limitations. In that case for each enabled detector the amount of sweeps will be performed by RadiMation®.
- **Number of sweeps** The number op peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times for each turntable and antenna tower position. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweep speed. For spectrum analysers and CW signals you can use a relatively low amount of peak sweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peak sweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

7.3.9 Final peak measurement



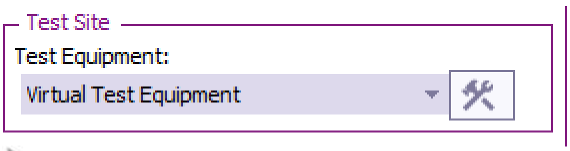
In the final peak measurement window the test engineer can configure the detectors used during the final emission measurements of the detected peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired button.

7.3.10 Peak detection window



- **No peaks** When no final peak measurements are required select the option no peaks.
- **Maximum Peaks** With the max. peaks option, the user can limit the number of peak signals the software will detect and re-measure.

7.3.11 Test site window



- **Test equipment** In the test site window the test engineer can select which equipment list will be used during this test.

It is possible to use different test equipment for every configured frequency band.

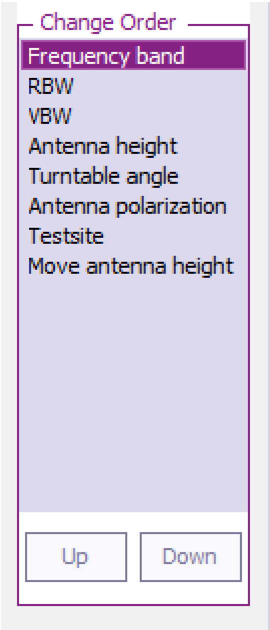
- **Equipment icon** By clicking on the equipment icon, the equipment list can be viewed and edited.

7.3.12 Limit lines window

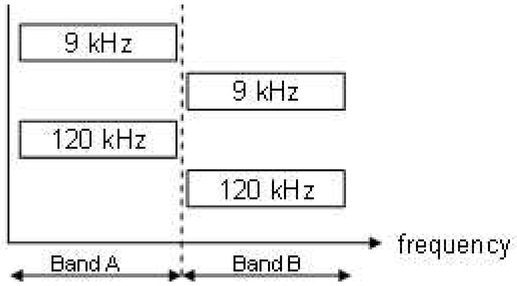
In the limit line window the operator select one or more limit lines to be used during the test.

- **All peaks above "xx" below the limit lines** In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 5 dB, the software will detect all peaks, which are higher than 5 dB below the limit line.

7.3.13 Change Order window



In some case you want to switch for example the antenna height scan before the turn table scan because this will decrease the total measuring time. With the change order the test engineer can control the way RadiMation® performs the testing sequence. Read the list from top to bottom to see what changes first. The best way explain the change order window is by example.



You need to perform a test as shown but you have 2 test sites. One with an antenna with the frequency range that is equal to the total band. The second test site you have 2 antennas, one for every frequency band. For test site one you want the RBW filter to change as little as possible to prevent the old analyser from breaking down.
So for Site 1 you want:

- Band A RBW 9 kHz
- Band B RBW 9 kHz
- Band A RBW 120 kHz
- Band B RBW 120 kHz

And for test site 2:

- Band A RBW 9 kHz
- Band A RBW 120 kHz
- Band B RBW 9 kHz
- Band B RBW 120 kHz

For test site one, we do not have to change the order. Why? you may wonder. The explanation is quite easy. Look at the frequency change list, first change frequency band then change RBW. That is exactly what you want. Let check what the software is going to do:

- Band A RBW 9 kHz
- Band B RBW 9 kHz
- Band B RBW 120 kHz
- Band A RBW 120 kHz

This is even better then we had hoped for, the amount of switching has been decrees due to the fact that RadiMation® detected that it had to measure the same frequency twice.
For test site two, it is a bit more complicated. You might wonder why? It looks easy just put the RBW in front the Frequency band and you are done. So far you are correct, but a different antenna also means a different test site. So changing the test site should also be above frequency band. When doing so, lets check it again. The top three settings:

- RBW
- Testsite
- Frequency band

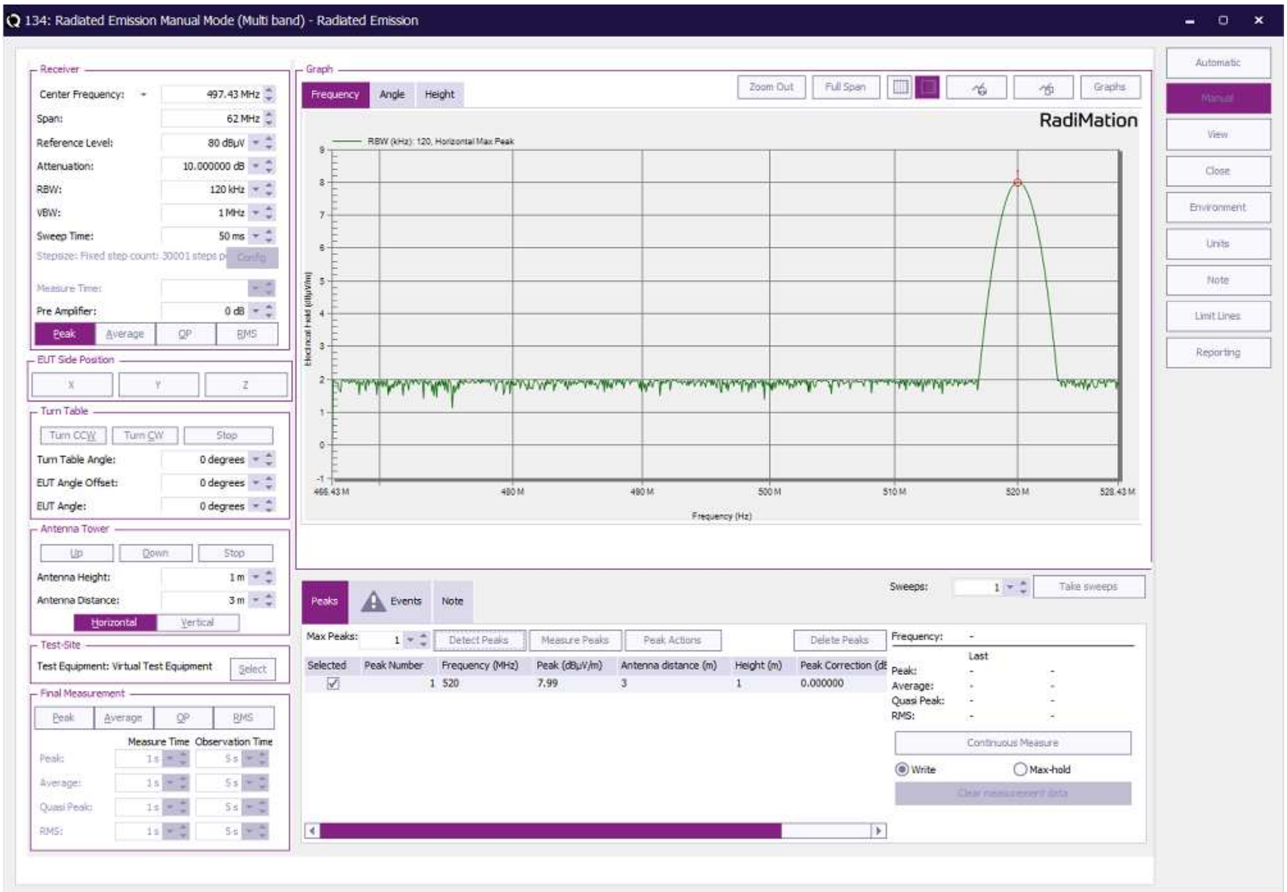
In words again, first change the RBW then the test site and then the frequency band.

- Band A RBW 9 kHz
- Band A RBW 120 kHz
- Band B RBW 120 kHz
- Band B RBW 9 kHz

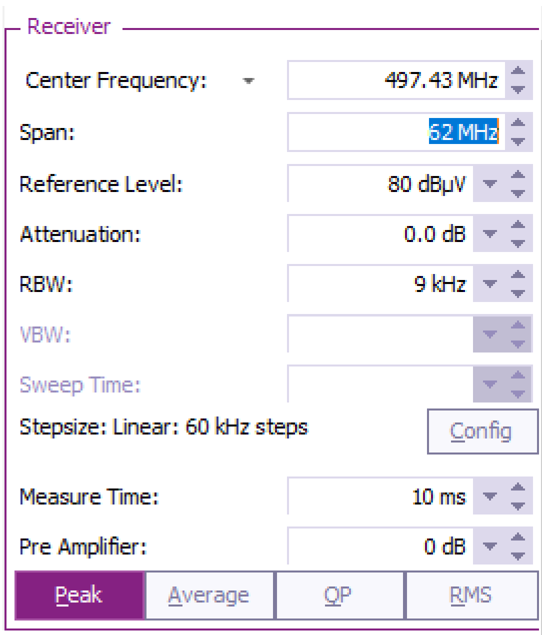
This is also better then we had hoped for, the amount of switching has been decrees due to the fact that RadiMation® detected that it had to measure the same RBW twice.

Note: If you have any questions regarding the setting of the change order please contact your reseller.

7.4 Manual Mode

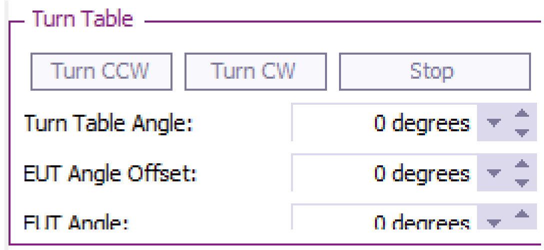


7.4.1 Receiver settings



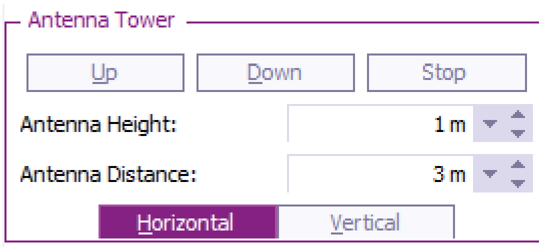
With receiver settings the test engineer has full control over the analyser/receiver. Depending on the personal taste the frequency range can be set using in Center/span or start/stop mode. The rest of the settings speak for themselves except the buttons on the bottom. The test engineer can use them to select which type traces should be used to measure the spectrum. For configuring the detectors used during final measurement see chapter “Final measurement”.

7.4.2 Turn table



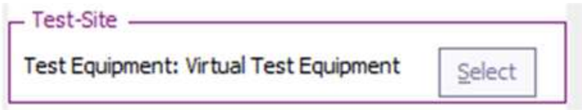
The turn table settings are directly linked to the turn table. Meaning that when a test engineer changes one of the settings then RadiMation® will apply this setting directly.

7.4.3 Antenna tower



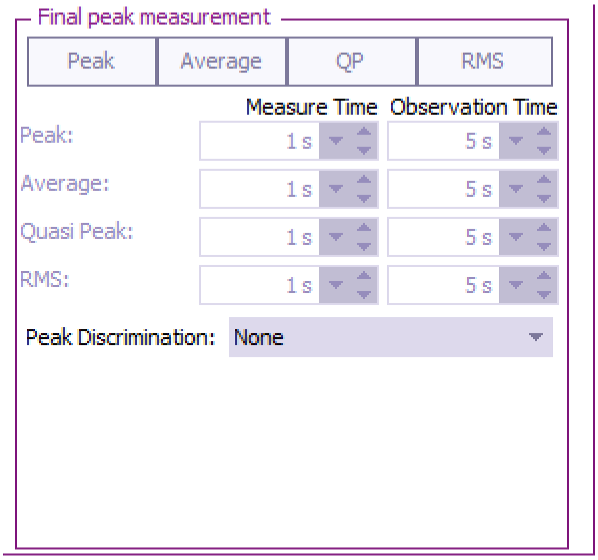
The antenna tower settings are directly linked to the antenna tower. Meaning that when a test engineer changes one of the settings then RadiMation® will apply this setting directly.

7.4.4 Test site



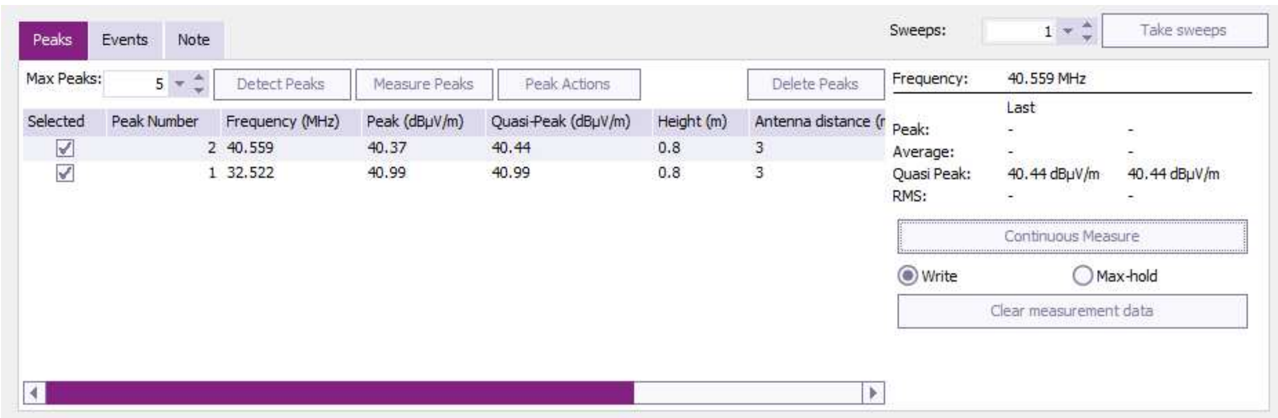
Before manual mode can be used the test site needs to be selected so that RadiMation® knows which devices to use.

7.4.5 Final measurement



In the final peak measurement window the test engineer can configure the detectors used during the final emission measurements of the peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired button.

7.4.6 Peaks window



- **Max Peaks** — Maximum allowed amount of peaks to be automatically determined.
- **Detect Peaks** — Detects the configured amount of sweeps in the measured spectrum.
- **Measure Peaks** — Measures all selected peaks with the configured settings in the final measurement window.
- **Peak Actions** — Allows several actions to be performed on the detected peaks, like select all and deselect all.

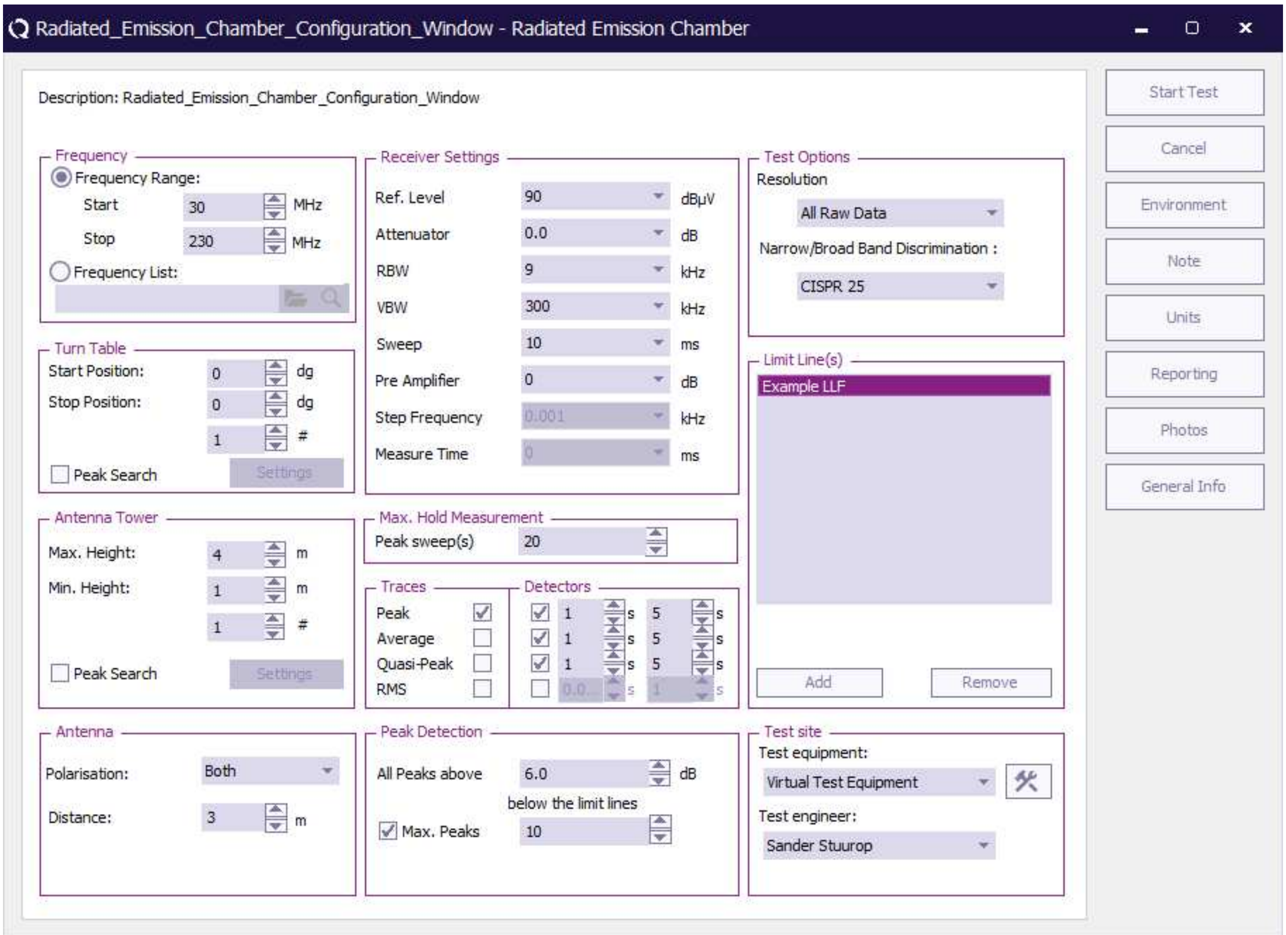
Peaks to maximum	Start performing measurement to redetermine on which turntable angle and antenna tower height the highest emission value was measured. This angle and height will be updated in the selected peak, together with the corresponding measured emission values. If multiple peaks are selected, this search for the highest emission value is done individually for every selected peak. This 'peaks to maximum' function can be very helpful during the angle or height optimization of a peak. If after manual changes of the antenna height or turntable angle, no other maximum is found, the peak can be reset to the angle and height where the maximum was determined. 'Peaks to maximum', will thus select that location on which the highest emission value was measured.
Measure Peaks	Start performing a final measurement on the selected peaks.
Optimize Angle	Start performing a measurement as configured for the Optimize Angle.
Optimize Height	Start performing a measurement as configured for the Optimize Height.
Go To Peak Location	If possible it will adjust the Antenna Tower and Turntable to the location of the selected peak.
Set receiver to Peak settings	Set the current receiver settings to the used settings of the selected peak.
Configure -> Optimize Angle	Opens a new window to configure the Optimize Angle settings. (See also Optimize Angle settings.)
Configure -> Optimize Height	Opens a new window to configure the Optimize Height settings. (See also Optimize height settings.)
Delete peaks	Delete selected peak(s).

Delete Peaks	Delete the selected peaks from the list.

➢ **Sweeps**	Amount of sweeps to be measured.
➢ **Take Sweeps**	Triggers the receiver of analyser to take the configured amount of sweeps.
➢ **Continuous Measure**	Start performing of taking measurements. This is a heavy process and it is normal when more CPU is used by the computer.
➢ **Continuous Measure Write**	Each new measurement will overwrite the previous measurement data.
➢ **Continuous Measure Max-hold**	Only higher new measurement values will overwrite the previous measurement data.
➢ **Clear measurement data**	Removes all previous measurement data.

7.5 Anechoic chamber

The test engineer can configure a complete radiated emission test in the Radiated Emission configuration menu.



7.5.1 Frequency window

In the frequency window, the operator can enter a frequency range to be measured or select a frequency list.
When the Frequency range is selected, the following items can be entered:

- **Start** Sets **start** frequency
- **Stop** Sets **stop** frequency

When the frequency list option is selected the operator can select a frequency list file by browsing to the file location. With the start-stop frequency the software searches for the peaks, while with a frequency list the frequencies on the list are measured.

7.5.2 Turntable window

In the turntable window, the end-user can select the start and stop position of the turntable and the number of steps for the turntable.

- **Start position** Sets the start angle of the turntable.
- **Stop position** Sets the stop angle of the turntable.
- **#** Number of locations from **Start postion** to **Stop position** that should be measured.

- **Peak search** The software will automatically detect on which turntable angle the maximum measurement value of each peak is present.

It is not required to have a turntable selected while performing the measurement. In this configuration there are two possibilities related to the selected turntable device in the the selected test-site.

- If a turntable device is specified in the selected test-site, RadiMation® will control the turntable to turn to the specified angle.
- If no turntable device is specified in the selected test-site, RadiMation® will assume that the EUT is already positioned on that specified angle. No actions on the turntable will be taken.

As long as a single angle is measured, and no turntable device is specified in the test-site, it is possible to use the Multiband Radiated Emission test without a turntable. So, if you specify the same **Start position** and **Stop position**, and specify '1' to the number of steps (**#**), then the test will assume that only that single specified angle should be measured.

When **Peak search** is selected, the user can configure the method that is used during the peak search. In the peak search configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed. The initially detected turntable angle of the peak will be the middle of this **Area**, and the total search area for this peak will be half of this area clockwise and half of this area counter-clockwise.

- **Step size** The step size for each turntable movement.

- **Threshold** This value is only used during the **Intelligent** mode. It influences how long the movement is continued. The movement will stop when the measurement value is lower than the specified **Threshold** below the highest known measurement value of the searched peak.

- **Mode** The mode setting determines the way a peak is detected. The following modes are available:
  - Intelligent
  - Complete area

  The Intelligent mode has the advantage that it stops with the scan as soon as a maximum measurement value has been determined. This could improve overall testtime as less movement of the turntable angle is possible. The Complete area mode has the advantage that the complete specified **Area** is measured.

7.5.2.1 Intelligent

In this mode the software increases the angle of the turntable from the initial point with a step equal to **Step size** as long as the measurement value is not more than **Threshold** below the already known maximum measurement value. As soon as measurement value is detected that is **Threshold** below the already known meaximum value, the turntable movement is reversed until the initial point and from this initial point the angle of the turntable is decreased with a step equal to **Step size** until a measurement value is measured that is **Threshold** below the already known maximum measurement value. The step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the intial number of steps (**#**) is set to a low value.

7.5.2.2 Complete area

In this mode the complete area around the initial point and defined by **Area** is scanned for a peak. The turntable angle is moved to one end of the to be measured area, and is then moved with the specified **Step size** to the other end of the to be measured area. On each step the measurement value is determined, and the step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the **Area** is set to a smaller value than the original stepsize (given by the stop position minus start position divided by the number of steps).

7.5.3 Antenna tower window

In the antenna tower window, the end-user can select the start and stop position of the antenna tower and the number of steps for the antenna tower.

- **Max. height** Sets maximum height of the antenna tower.
- **Min. height** Sets the minimum height of the antenna tower.
- **#** Number op locations from **Max. height** to **Min. height** that should be measured.
- **Peak search** The software will automatically detect on which antenna height the maximum measurement value of each peak is present.

When **Peak search** is selected, the user can configure the method that is used during the peak search. In the peak search configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed. The initially detected antenna height of the peak will be the middle of this **Area**, and the total search area for this peak will be half of this area up and half of this area down.
- **Step size** The step size for each antenna height movement.
- **Threshold** This value is only used during the **Intelligent** mode. It influences how long the movement is continued. The movement will stop when the measurement value is lower than the specified **Threshold** below the highest known measurement value of the searched peak.
- **Mode** The mode setting determines the way a peak is detected. The following modes are available:
  - Intelligent
  - Complete area

  The Intelligent mode has the advantage that it stops with the scan as soon as a maximum measurement value has been determined. This could improve overall testtime as less movement of the antenna tower is possible. The Complete area mode has the advantage that the complete specified **Area** is measured.

7.5.3.1 Intelligent

In this mode the software increases the height of the antenna from the initial point with a step equal to **Step size** as long as the measurement value is not more than **Threshold** below the already known maximum measurement value. As soon as measurement value is detected that is **Threshold** below the already known meaximum value, the antenna movement is reversed until the initial point and from this initial point the distance of the clamp is decreased with a step equal to **Step size** until a measurement value is measured that is **Threshold** below the already known maximum measurement value. The step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the intial number of steps (**#**) is set to a low value.

7.5.3.2 Complete area

In this mode the complete area around the initial point and defined by **Area** is scanned for a peak. The antenna is moved to one end of the to be measured area, and is then moved with the specified **Step size** to the other end of the to be measured area. On each step the measurement value is determined, and the step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the **Area** is set to a smaller value than the original stepsize (given by the stop position minus start position divided by the number of steps).

7.5.4 Antenna window

7.5.4.1 Polarisation

In the antenna window the user can select the antenna polarisation. The test engineer can select the following three options:

1. Horizontal
2. Vertical
3. Both

When Horizontal or Vertical is selected, the software will measure only one antenna polarisation. When the option “Both” is selected, the software will measure both Horizontal and Vertical polarisation (an antenna positioner is required for this option).
When this option is selected, all data will be displayed in one graph thus loosing some polarisation information. However the peak list table will show if a peak was measured in horizontal or vertical polarisation.
If the both emission graphs of horizontal and vertical polarisation are required, two separate tests must be configured. These tests can be put in a sequence, eliminating the need for a user intervention.

7.5.4.2 Distance

RadiMation® uses the distance information for reference only.

7.5.5 Receiver settings

➢ **Reference level**	Sets the reference level of the receiver
➢ **Attenuator**	Sets the receiver attenuator level
➢ **RBW**	Sets the Resolution BandWidth filter
➢ **VBW**	Sets the Video BandWidth filter
➢ **Sweep**	Sets the sweep time of the receiver
➢ **Pre-amp**	Sets the pre-amp gain
➢ **Step frequency**	Sets the frequency step size of the receiver
➢ **Measure time**	Sets the measure time of the receiver

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver. However, using the 'Auto' setting for the attenuator can let the analyser decides to use a different attenuator setting during (re-)measuring of a peak, which as a result can lead to measuring a higher Quasi-Peak value than the Peak value. This is related to the used analyser when auto attenuator is used. If it is not desired that the analyser can decide to switch to a different attenuator setting, then this should be disabled by the test engineer in RadiMation® by using a fixed attenuator value.

Warning: All these settings are generic. Therefore, always verify that the configured settings are also supported by the used hardware to ensure it is correctly used and no measurement faults are introduced. Use a fixed value to disabled interference of equipment intelligence.

7.5.6 Max. hold measurements

In this window the number of peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times for each turntable and antenna tower position. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweepspeed. For spectrum analysers and CW signals you can use a relatively low amount of peaksweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peaksweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

7.5.7 Traces window

In the traces window, the test engineer can select a maximum of four traces, which can be measured and displayed at the same time.

7.5.8 Detectors window

In the detectors window the test engineer can configure the detectors used during the final emission measurements of the detected peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired box.

7.5.9 Peak detection window

- **All peaks above "xx" below the limit lines** In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 6 dB, the software will detect all peaks, which are higher than 6 dB below the limit line.
- **Max. Peaks** With the max. peaks option, the user can limit the number of peak signals the software will detect and re-measure.

7.5.10 Test site window

- **Test equipment** In the test site window the test engineer can select which equipment list will be used during this test.
- **Test engineer** In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.
- **Equipment icon** By clicking on the equipment icon, the equipment list can be viewed and edited.

7.5.11 Limit lines window

In the limit line window the operator select one or more limit lines to be used during the test.

7.5.12 Test options window

- **Record data** In the test options window the operator can select whether all RAW data must be stored or only the measurement results are stored. It should be noted that for full tracebility, all test data should be stored.
- **Narrow band / broad band discrimination** RadiMation® supports two types of narrow band / broad band determination.

The first one is called 'Generic'. During the determination of the peak, the so called 'zooming'. RadiMation® verifies if the peak is bigger or equal to twice the RBW filter. If so, the peak is determined broad band. Otherwise it is called narrow band. The second method is called 'Mil Standard'. This method is also based on the RBW filter. But now the filter is changed to determine the type of peak. First the peak is measured with the current RBW, then it is made 10 times bigger. If multiplying the current RBW gives a RBW that is bigger then 1 MHz the current RBW is divided by 10. A delta RBW is calculated according to the formula below.

$$DeltaRBW = 10 * log(\frac{RBW_1}{RBW_2})$$

Formula 7-1: Difference in a peak measurement, as a result of changing the used RBW

Where RBW1 is the RBW used in the first measurement and RBW2 is used in the second measurement. Also a Delta V is calculated, V1 is the dbuV measured during the first measurement and V2 is voltage measured during the second measurement.

$$DeltaV = V_1 - V_2$$

Formula 7-2: Difference in a peak amplitude

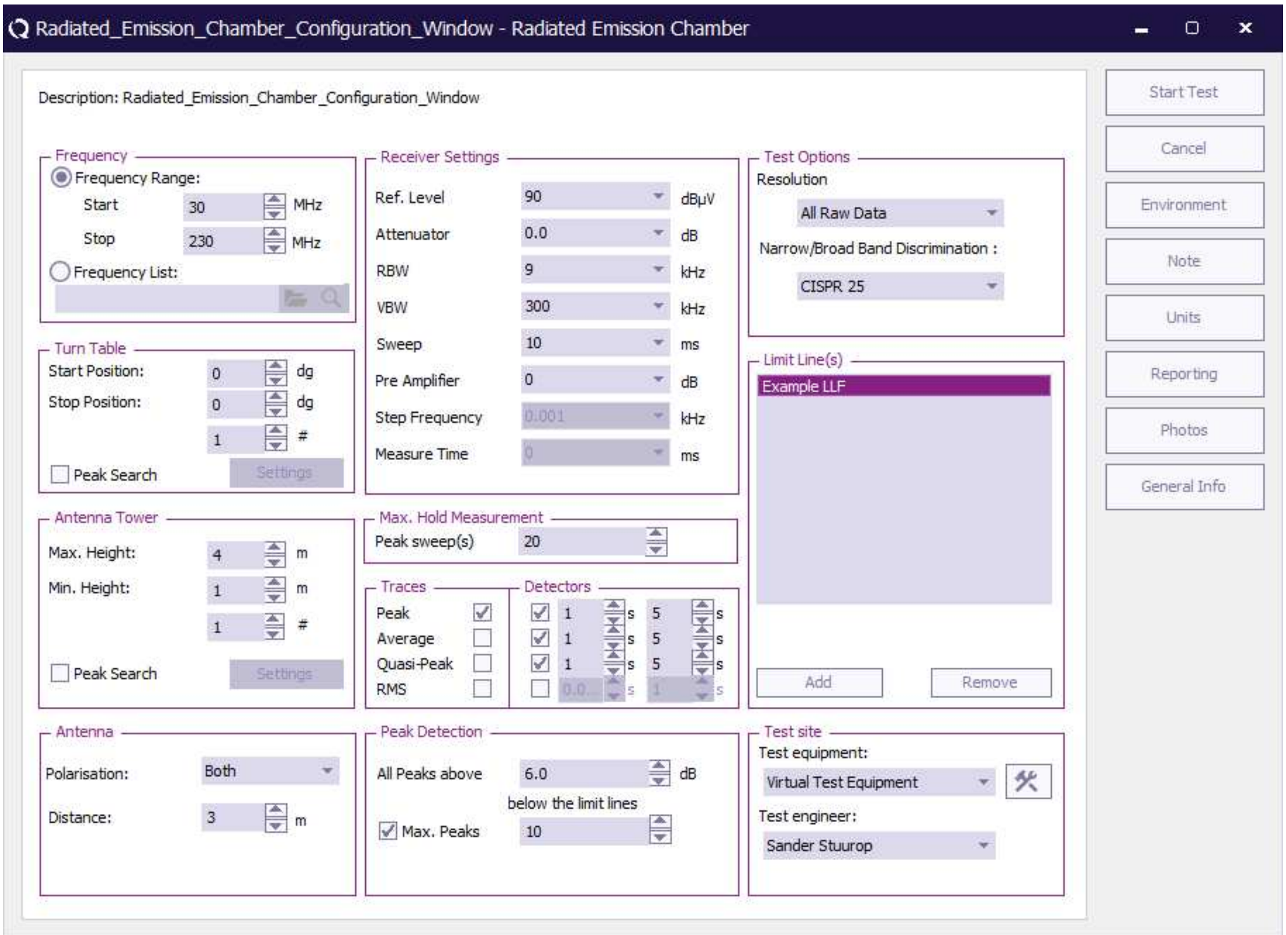
Determination the type of peak is done according to the table below.

Limits	Distortion type
Delta V <= 5 Delta RBW	Narrow band
Delta V is > than 5 Delta RBW and delta V is <= 15 delta RBW	Random noise
Delta V > 15 delta RBW	Broad band

7.5.13 Starting a Anechoic Chamber test

Loading a TSF file
To start a radiated emission test, an EUT file must be defined first. From the EUT file, select “Tests > Radiated emission > Anechoic chamber. A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press cancel to define a new emission test.
The figure below shows the TSF window.

After the TSF file has been selected, the emission configuration window will appear.



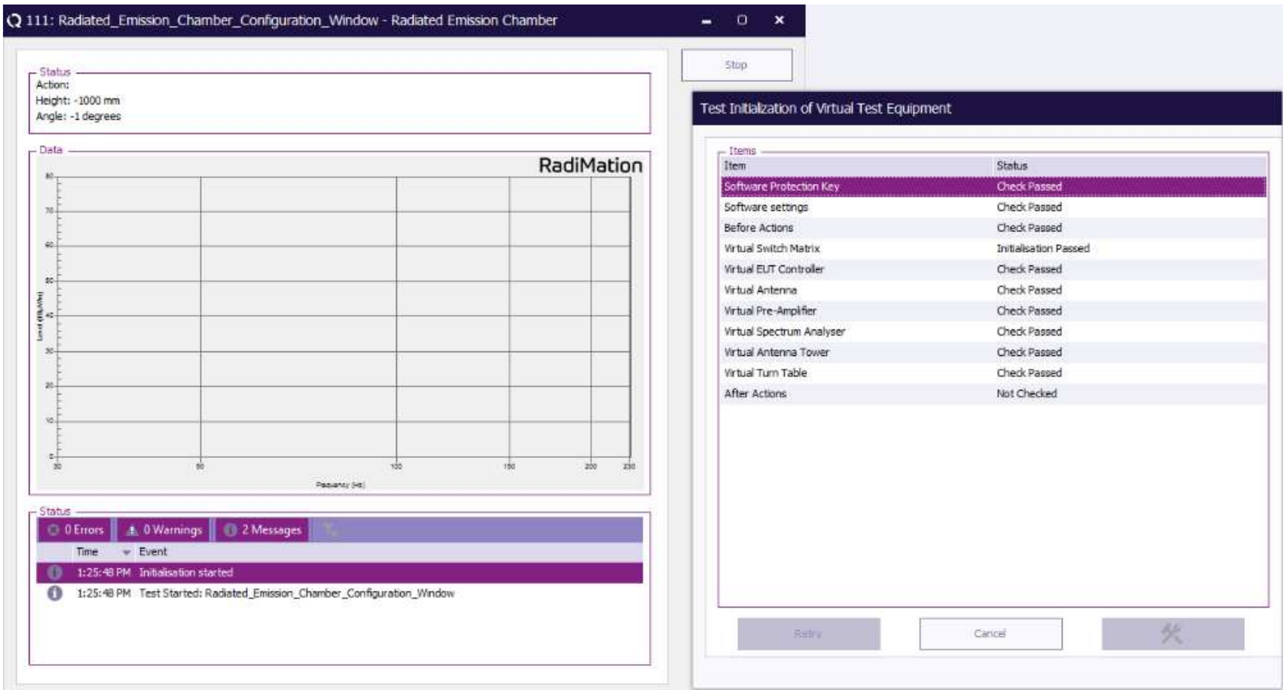
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen can start the test.
When no TSF file is loaded (by pressing Cancel in the TSF selection window) all parameters will be at zero and can be configured by the operator.

7.5.13.1 Test initialisation and self test

When the start button is pressed, the software first runs a number of checks.

1. The presence of a valid software key is checked.
2. The software settings are checked (i.e. is all test equipment used within its parameters?)
3. The presence of all test equipment is checked.
4. All relevant equipment will be initialised.

When one or more of the tests mentioned above fail, an error message is displayed.



7.5.14 Test Procedure

The test procedure is better to understand with an example with a receiver, turntable and antenna tower.
Suppose you set 3 points on the turntable and 2 on the antenna. The angles of the turntable are 0, 45 and 90 degrees and the antenna positions are 1 and 4 meters. We start at 0 degrees and 1 meter.

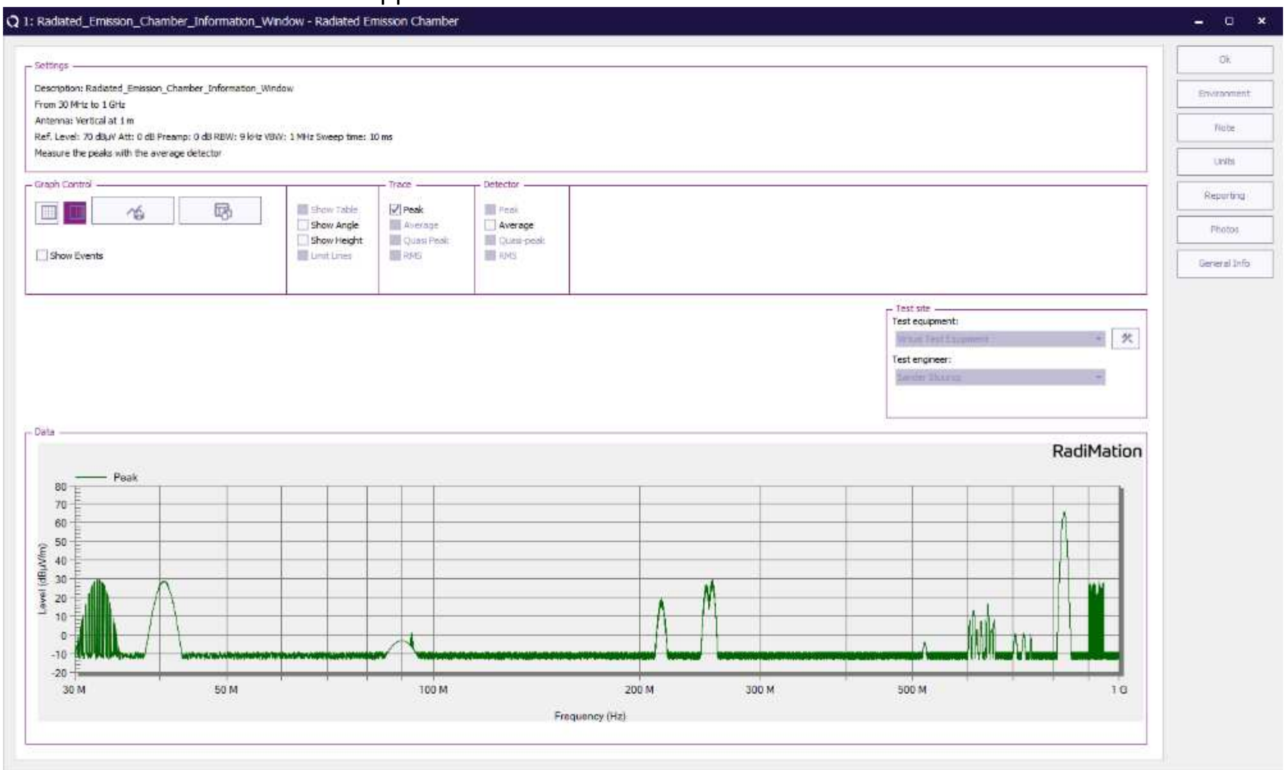
1. The receiver takes the desired sweeps of the spectrum.
2. The antenna is moved to 4 meters.
3. The receiver takes the desired sweeps of the spectrum.
4. The turntable is moved to 45 degrees.
5. The receiver takes the desired sweeps of the spectrum.
6. The antenna tower is moved to 1 meter.
7. The receiver takes the desired sweeps of the spectrum.
8. The turntable is moved to 90 degrees.
9. The receiver takes the desired sweeps of the spectrum.
10. The antenna tower is moved to 4 meters
11. The receiver takes the desired sweeps of the spectrum.

RadiMation® now performs a maxhold on all the sweeps and determines the peaks. Then it determines the position a peak was found. And changes the turntable and antenna to that current position to re-measure the peak. When multiple peaks have been detected, the most compact way is determined to measure these peaks.
Please note that the example above makes the assumption that there is an antenna tower and turntable controller. When either or neither of the controllers are available the test can still be performed except for the missing unit. When neither of the controllers are available the software performs the test on one point.

7.5.15 Info screen

Note: The pass/fail criteria, shown in the tables do not take the measure uncertainty of the test setup into account.

You can access the info screen by selecting the test you whish to see and then press the info button. A window like below here will appear.



➢**Settings** In the settings window all the used settings are displayed.

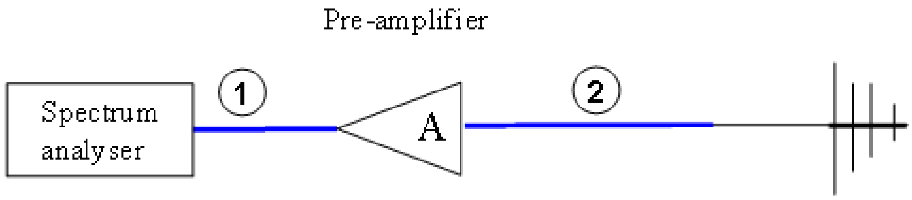
➢**Graph control** In the graph control window the scale of the graph can be changed. You can show or hide the table by selecting or deselecting the show table checkbox.

➢**Trace** In the trace window you can control the traces that are shown in the graph by selecting or deselecting the checkbox. If during a measurement a trace is not used then the check box is grayed out.

➢**Detector** The detector window gives you the possibility to show and hide the values measured on the peaks. If during a measurement a type of detector is not used for determining the value on the peak the checkbox is grayed out.

➢**Table** In the table all the measured peaks are showed. The table also shows the limit values for that frequency point when a limit was given at the beginning of the test.

7.5.16 Test site information



#	Device name	Tab in RadiMation® configuration window
	Spectrum analyser	Devices 2
	Pre amplifier	Devices 2
	Antenna	Devices 1
Cables		
1	cable Preamp -> analyser	Cables
2	cable Antenna -> Preamp	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during emission measurements. When in doubt contact your reseller.

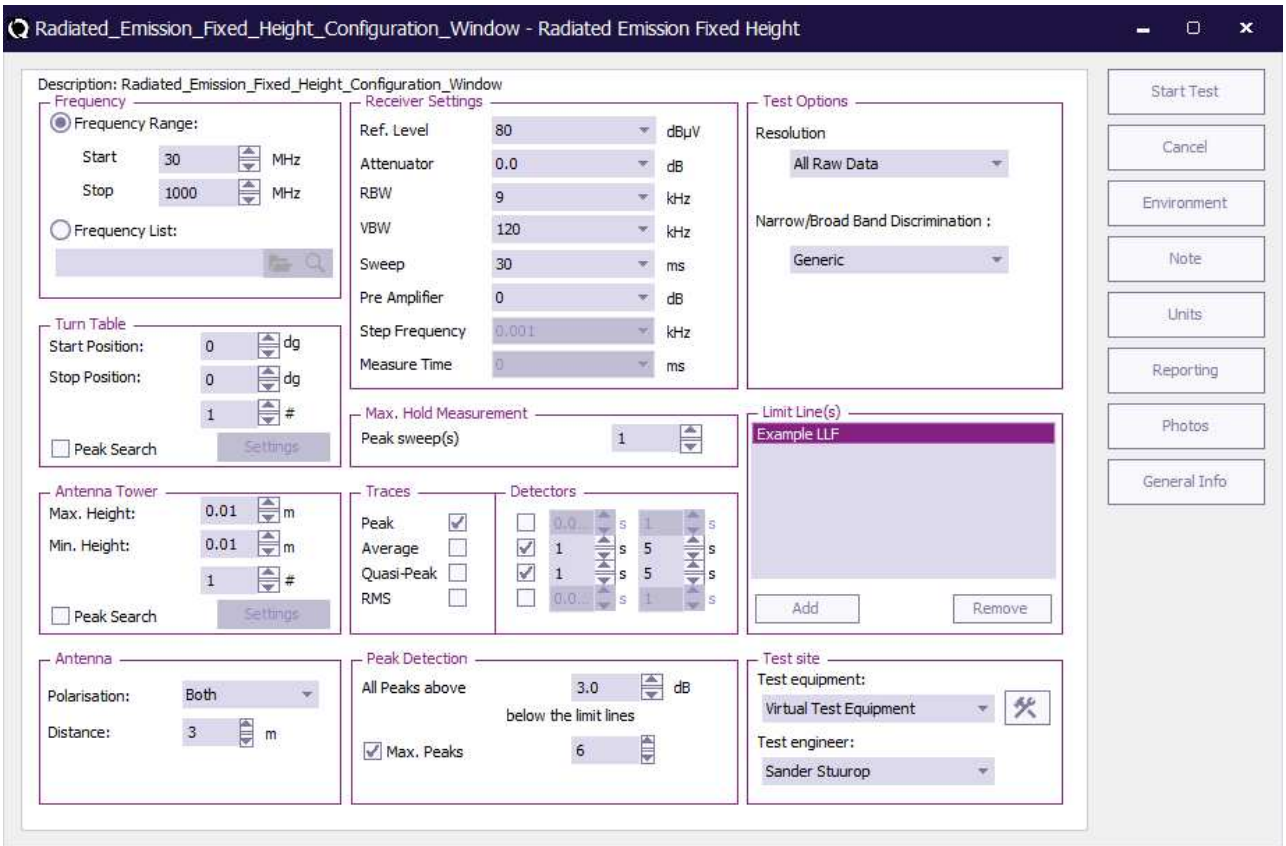
7.6 Measurement of peak amplitude and peak frequency

When using a spectrum analyser for emission measurements, RadiMation® first performs a full span max. hold measurement with the configured trace detector. The number of max. hold peak sweeps can be defined by the user. From the obtained max hold graph, RadiMation® determines a number of peaks, which will be further investigated. The number of peak signals to be measured can be defined by the user. For each peak from the graph, RadiMation® will zoom in, by reducing the span in several steps. This must be done while span inaccuracy of the analyser in large frequency spans will give slightly incorrect frequency information. After the exact peak frequency is determined, RadiMation® will perform the configured Peak,Quasi peak, Average and / or RMS measurements. Due to the above, the finally measured frequency and amplitude of a peak can slightly differ from the max hold graph. This is not an error, but merely an indication that the final measurements are more accurate. The peak table always shows the final measured values (most accurate).

7.7 Fixed height

7.7.1 Introduction

The “fixed height” test method is intended to increase measurement speed of radiated emission tests. Instead of measuring the radiated emission of an EUT under all turntable positions and for all antenna tower positions, this method uses a fixed antenna height to measure the radiated emission level for all turn table positions. The software then determines the maximum emission peaks from the measured data and re- measures the emission levels on these frequencies (and corresponding turntable positions). During these final measurements the antenna tower is scanned in height to find the maximum emission level on these frequencies. This method decreases measurement time dramatically. A trade-off for this method is a slight decrease in measurement accuracy.



7.7.2 Frequency window

In the frequency window, the operator can enter a frequency range to be measured or select a frequency list.
When the Frequency range is selected, the following items can be entered:

➢ **Start** Sets start frequency

➢ **Stop** Sets stop frequency

When the frequency list is selected the operator can select a frequency list file by browsing to the file location.

7.7.3 Turntable window

In the turntable window, the end-user can select the start and stop position of the turntable and the number of steps for the turntable.

➢ **Start position** Sets the start angle of the turntable.

➢ **Stop position** Sets the stop angle of the turntable.

➢ **#** Number of locations from **Start postion** to **Stop position** that should be measured.

➢ **Peak search** The software will automatically detect on which turntable angle the maximum measurement value of each peak is present.

It is not required to have a turntable selected while performing the measurement. In this configuration there are two possibilities related to the selected turntable device in the the selected test-site.

- If a turntable device is specified in the selected test-site, RadiMation® will control the turntable to turn to the specified angle.
- If no turntable device is specified in the selected test-site, RadiMation® will assume that the EUT is already positioned on that specified angle. No actions on the turntable will be taken.

As long as a single angle is measured, and no turntable device is specified in the test-site, it is possible to use the Multiband Radiated Emission test without a turntable. So, if you specify the same **Start position** and **Stop position**, and specify '1' to the number of steps (**#**), then the test will assume that only that single specified angle should be measured.

When **Peak search** is selected, the user can configure the method that is used during the peak search. In the peak search configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed. The initially detected turntable angle of the peak will be the middle of this **Area**, and the total search area for this peak will be half of this area clockwise and half of this area counter-clockwise.

- **Step size** The step size for each turntable movement.

- **Threshold** This value is only used during the **Intelligent** mode. It influences how long the movement is continued. The movement will stop when the measurement value is lower than the specified **Threshold** below the highest known measurement value of the searched peak.

- **Mode** The mode setting determines the way a peak is detected. The following modes are available:
  - Intelligent
  - Complete area

  The Intelligent mode has the advantage that it stops with the scan as soon as a maximum measurement value has been determined. This could improve overall testtime as less movement of the turntable angle is possible. The Complete area mode has the advantage that the complete specified **Area** is measured.

7.7.3.1 Intelligent

In this mode the software increases the angle of the turntable from the initial point with a step equal to **Step size** as long as the measurement value is not more than **Threshold** below the already known maximum measurement value. As soon as measurement value is detected that is **Threshold** below the already known meaximum value, the turntable movement is reversed until the initial point and from this initial point the angle of the turntable is decreased with a step equal to **Step size** until a measurement value is measured that is **Threshold** below the already known maximum measurement value. The step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the intial number of steps (**#**) is set to a low value.

7.7.3.2 Complete area

In this mode the complete area around the initial point and defined by **Area** is scanned for a peak. The turntable angle is moved to one end of the to be measured area, and is then moved with the specified **Step size** to the other end of the to be measured area. On each step the measurement value is determined, and the step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the **Area** is set to a smaller value than the original stepsize (given by the stop position minus start position divided by the number of steps).

7.7.4 Antenna tower window

In the antenna tower window, the end-user can select the start and stop position of the antenna tower and the number of steps for the antenna tower.

- **Max. height** Sets maximum height of the antenna tower.
- **Min. height** Sets the minimum height of the antenna tower.
- **#** Number op locations from **Max. height** to **Min. height** that should be measured.
- **Peak search** The software will automatically detect on which antenna height the maximum measurement value of each peak is present.

When **Peak search** is selected, the user can configure the method that is used during the peak search. In the peak search configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed. The initially detected antenna height of the peak will be the middle of this **Area**, and the total search area for this peak will be half of this area up and half of this area down.
- **Step size** The step size for each antenna height movement.
- **Threshold** This value is only used during the **Intelligent** mode. It influences how long the movement is continued. The movement will stop when the measurement value is lower than the specified **Threshold** below the highest known measurement value of the searched peak.
- **Mode** The mode setting determines the way a peak is detected. The following modes are available:
  - Intelligent
  - Complete area

  The Intelligent mode has the advantage that it stops with the scan as soon as a maximum measurement value has been determined. This could improve overall testtime as less movement of the antenna tower is possible. The Complete area mode has the advantage that the complete specified **Area** is measured.

7.7.4.1 Intelligent

In this mode the software increases the height of the antenna from the initial point with a step equal to **Step size** as long as the measurement value is not more than **Threshold** below the already known maximum measurement value. As soon as measurement value is detected that is **Threshold** below the already known meaximum value, the antenna movement is reversed until the initial point and from this initial point the distance of the clamp is decreased with a step equal to **Step size** until a measurement value is measured that is **Threshold** below the already known maximum measurement value. The step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the intial number of steps (**#**) is set to a low value.

7.7.4.2 Complete area

In this mode the complete area around the initial point and defined by **Area** is scanned for a peak. The antenna is moved to one end of the to be measured area, and is then moved with the specified **Step size** to the other end of the to be measured area. On each step the measurement value is determined, and the step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the **Area** is set to a smaller value than the original stepsize (given by the stop position minus start position divided by the number of steps).

7.7.5 Antenna window

7.7.5.1 Polarisation

In the antenna window the user can select the antenna polarisation. The test engineer can select the following three options:

1. Horizontal
2. Vertical
3. Both

When Horizontal or Vertical is selected, the software will measure only one antenna polarisation. When the option "Both" is selected, the software will measure both Horizontal and Vertical polarisation (an antenna positioner is required for this option).
When this option is selected, all data will be displayed in one graph thus loosing some polarisation information. However the peak list table will show if a peak was measured in horizontal or vertical polarisation.
If the both emission graphs of horizontal and vertical polarisation are required, two separate tests must be configured. These tests can be put in a sequence, eliminating the need for a user intervention.

7.7.5.2 Distance

In this box, the operator can enter the distance between antenna and EUT. RadiMation® uses the distance information for reference only.

7.7.6 Receiver settings

➢ **Reference level**	Sets the reference level of the receiver
➢ **Attenuator**	Sets the receiver attenuator level

- **RBW** Sets the Resolution BandWidth filter
- **VBW** Sets the Video BandWidth filter
- **Sweep** Sets the sweep time of the receiver
- **Pre-amp** Sets the pre-amp gain
- **Step frequency** Sets the frequency step size of the receiver
- **Measure time** Sets the measure time of the receiver

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.

7.7.7 Max. hold measurements

In this window the number op peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times for each turntable and antenna tower position. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweepspeed. For spectrum analysers and CW signals you can use a relatively low amount of peaksweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peaksweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

7.7.8 Traces window

In the traces window, the test engineer can select a maximum of four traces which can be measured and displayed at the same time.

7.7.9 Detectors window

In the detectors window the test engineer can configure the detectors used during the final emission measurements of the detected peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired box.

7.7.10 Peak detection window

- **All peaks above “xx” below the limit lines** In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 6 dB, the software will detect all peaks, which are higher than 6 dB below the limit line.

➢ **Max. Peaks**	With the ‘max. peaks” option, the user can limit the number of peak signals the software will detect and re-measure.

7.7.11 Test site window

➢ **Test equipment**	In the test site window the test engineer can select which equipment list will be used during this test.
➢ **Test engineer**	In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.
➢ **Equipment icon**	By clicking on the equipment icon, the equipment list can be viewed and edited.

7.7.12 Limit lines window

In the limit line window the operator select one or more limit lines to be used during the test.

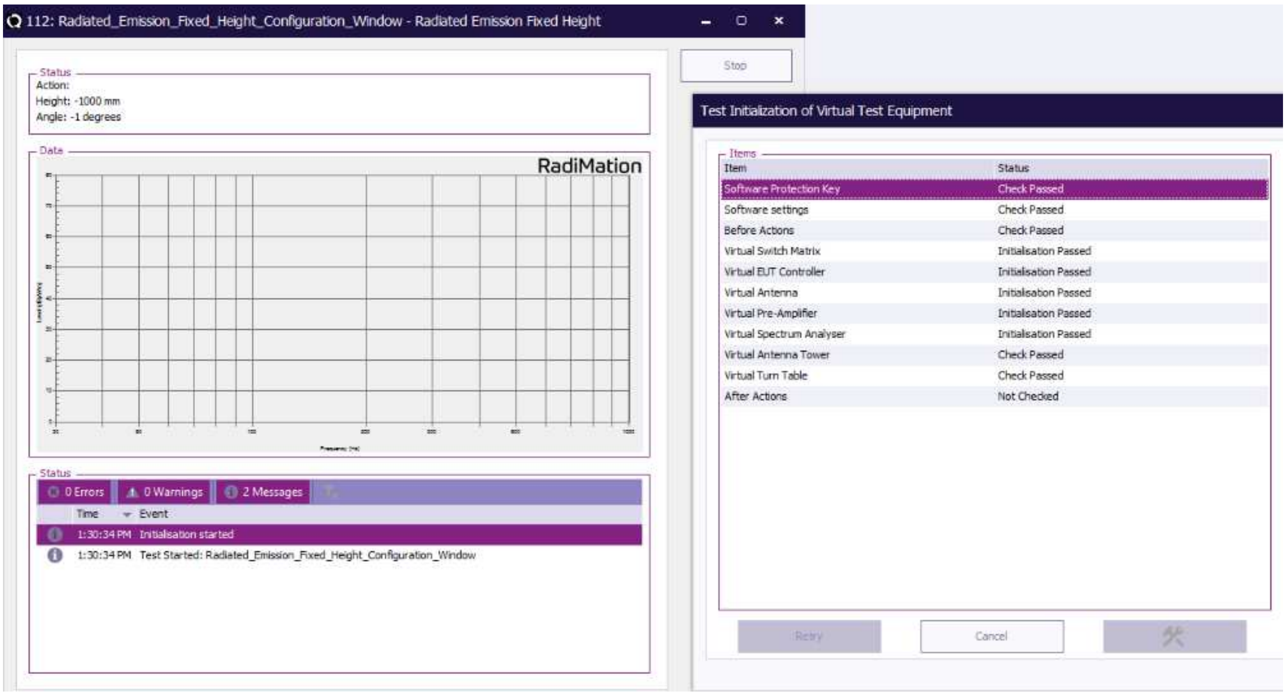
7.7.13 Test options window

In the test options window the operator can select whether all RAW data must be stored or only the measurement results are stored. It should be noted that for full tracebility, all test data should be stored.

7.7.14 Starting a fixed height test

Loading a TSF file
To start a fixed height - radiated emission test, an EUT file must be defined first. From the EUT file, select “Tests > Radiated emission > Fixed height. A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press cancel to define a new emission test.
After the TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen can start the test.

When no TSF file is loaded (by pressing Cancel in the TSF selection window) all parameters will be at zero and can be configured by the operator.
Test initialisation and self test
When the start button is pressed, the software first runs a number of checks.
5. The presence of a valid software key is checked. 6. The software settings are checked (i.e. is all test equipment used within its parameters?) 7. The presence of all test equipment is checked. 8. All relevant equipment will be initialised.
When one or more of the above tests fail, an error message is displayed as shown in de picture below.



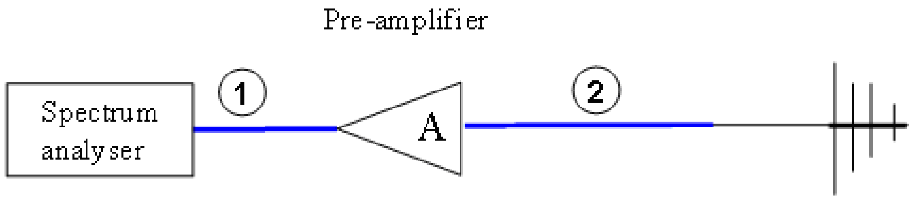
7.7.15 Test Procedure

The test procedure is better to understand with an example with a receiver, turntable and antenna tower.
Suppose you set 3 points on the turntable. The points of the turntable are 0, 45 and 90 degrees. We start at 0 degrees and 1 meter.

1. The receiver takes the desired sweeps of the Spectrum.
2. The turntable is moved to 45 degrees.
3. The receiver takes the desired sweeps of the Spectrum.
4. The turntable is moved to 90 degrees.
5. The receiver takes the desired sweeps of the Spectrum.

RadiMation® now performs a maxhold on all the sweeps and determines the peaks. Then it determines the position a peak was found. The turntable position is changes to that position to re-measure the peak. The antenna tower is changed in height according to the settings.
Please note that the example above makes the assumption that there is an antenna tower and turntable controller. When either or neither of the controllers are available the test can still be performed except for the missing unit. When neither of the controllers are available the software performs the test on one point.

7.7.16 Test site information



#	Device name	Tab in RadiMation® configuration window
	Spectrum analyser	Devices 2
	Pre amplifier	Devices2
	Antenna	Devices 1
Cables		
1	cable amplifier ->Spectrum	Cables
2	cable antenna ->Preamp	Cables

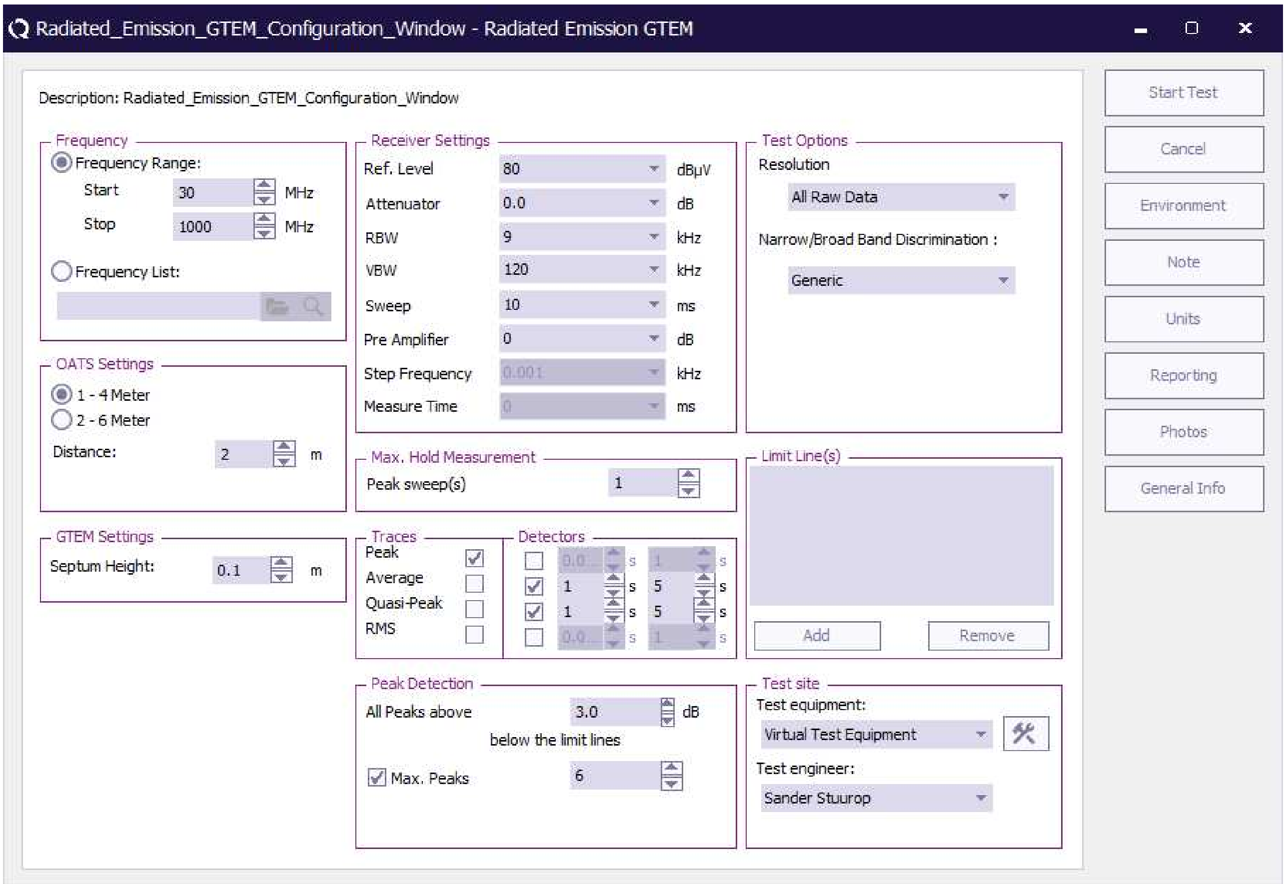
Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during emission measurements.
When in doubt contact your reseller.

7.8 GTEM

7.8.1 Correlation method

In order to use a G-TEM cell for radiated emission measurements, a good correlation has to be found between emissions measurements on an Open Area Test Site (OATS) and emission measurements in a G-TEM cell.
For this purpose the following method can be used:
When radiated emission measurements are made in the G-TEM cell in three directions (i.e. X-Y-Z axis), the total radiated power for each frequency can be calculated by:

$$P_{tr}^{\ 2} = X^2 + Y^2 + Z^2$$



When this total radiated power would be fed into an isotrope antenna on an OATS, one would measure a value equal to the radiated power, minus the site attenuation of the open area test site for this specific frequency.

RadiMation® uses the above method to correlate the radiated emission measurements performed in a G-TEM to the emission levels on an OATS.

7.8.2 Measurement procedure

To start a Radiated emission test, the operator must (as for all tests) first define a EUT window. To start a Radiated emission measurement in a G-TEM cell, please select:

- **Tests**
  - **Radiated emission**
    - **G-TEM**

The TSF window will appear. If tests are configured previously, select the required test configuration and press “START” to start the emission test.
The software will ask the operator to place the EUT in the X direction. After pressing “OK”, the software will perform all measurements on this axis. When the X-axis measurements are finished, the software will ask the operator to place the EUT in the Y- direction. After pressing “OK”, the software will perform all measurements on the Y-axis. When the Y-axis measurements are finished, the software will ask the operator to place the EUT in the Z-direction. After pressing “OK”, the software will perform all measurements on this axis. When the Z-axis measurements are finished, the software will ask the operator to place the EUT again in the (X,Y and Z) direction . This is required

to perform the automatic peak measurements on the peaks found during the first three measurements.

When a new test has to be configured please press the “Cancel” button. A blank test configuration screen will appear. The chapter below will explain all settings for this test configuration screen.

7.8.3 Test configuration

7.8.3.1 Frequency range selection

In the frequency window, the operator can enter a frequency range to be measured or select a frequency list.
When the Frequency range is selected, the following items can be entered:

- **Start** Sets start frequency
- **Stop** Sets stop frequency

When the frequency list is selected the operator can select a frequency list file by browsing to the file location.

7.8.3.2 Frequency list selection

In stead of measuring a defined frequency band, emission measurements can also be performed using a pre-defined frequency list. When the check box before “frequency list” is checked, the operator can browse to the required frequency list file.

7.8.3.3 OATS settings

In this window the operator has to define to which kind of OATS the correlation measurements will be made.
The operator can enter the antenna tower height and the measurement distance on the OATS (i.e. 3, 10 or 30 meters).

7.8.3.4 G-TEM settings

The operator has to define the Height of the septum of the G-TEM cell used for the radiated emission measurements.

7.8.3.5 Receiver settings

- **Reference level** Sets the reference level of the receiver.
- **Attenuator** Sets the receiver attenuator level.
- **RBW** Sets the Resolution BandWidth filter.
- **VBW** Sets the Video BandWidth filter.
- **Sweep** Sets the sweep time of the receiver.
- **Pre-amp** Sets the pre-amp gain.

Step frequency Sets the frequency step size of the receiver.

Measure time Sets the measure time of the receiver.

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.

7.8.3.6 Max. hold measurements

In this window the number op peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times for each turntable and antenna tower position. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweepspeed. For spectrum analysers and CW signals you can use a relatively low amount of peaksweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peaksweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

7.8.3.7 Traces window

In the traces window, the test engineer can select a maximum of four traces which can be measured and displayed at the same time.

7.8.3.8 Detectors window

In the detectors window the test engineer can configure the detectors used during the final emission measurements of the detected peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired box.

7.8.4 Peak detection window

All peaks above “xx” below the limit lines
In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 6 dB, the software will detect all peaks, which are higher than 6 dB below the limit line.
Max. Peaks
Under max. peaks, the user can limit the number of peak signals the software will detect and re-measure.

7.8.5 Test site window

Test equipment In the test site window the test engineer can select which equipment list will be used during this test.

Test engineer In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.

- **Equipment icon** By clicking on the equipment icon, the equipment list can be viewed and edited.

7.8.6 Limit lines window

In the limit line window the operator can add or remove one or more limit lines to be used during the test.

7.8.7 Test options window

In the test options window the operator can select whether all RAW data must be stored or only the measurement results are stored. It should be noted that for full tracebility, all test data should be stored.

7.8.8 Starting a G-TEM test

7.8.8.1 Loading a TSF file

To start a radiated emission test in the G-TEM cell, an EUT file must be defined first. From the EUT file, select “Tests > Radiated emission > G-TEM. A list of Technical Setup Files (TSF files) will be displayed. The test engineer can select one of these TSF files to load all parameters from a previously defined emission test or press cancel to define a new emission test.

After the TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen can start the test.
When no TSF file is loaded (by pressing Cancel in the TSF selection window) all parameters will be at zero and can be configured by the operator.

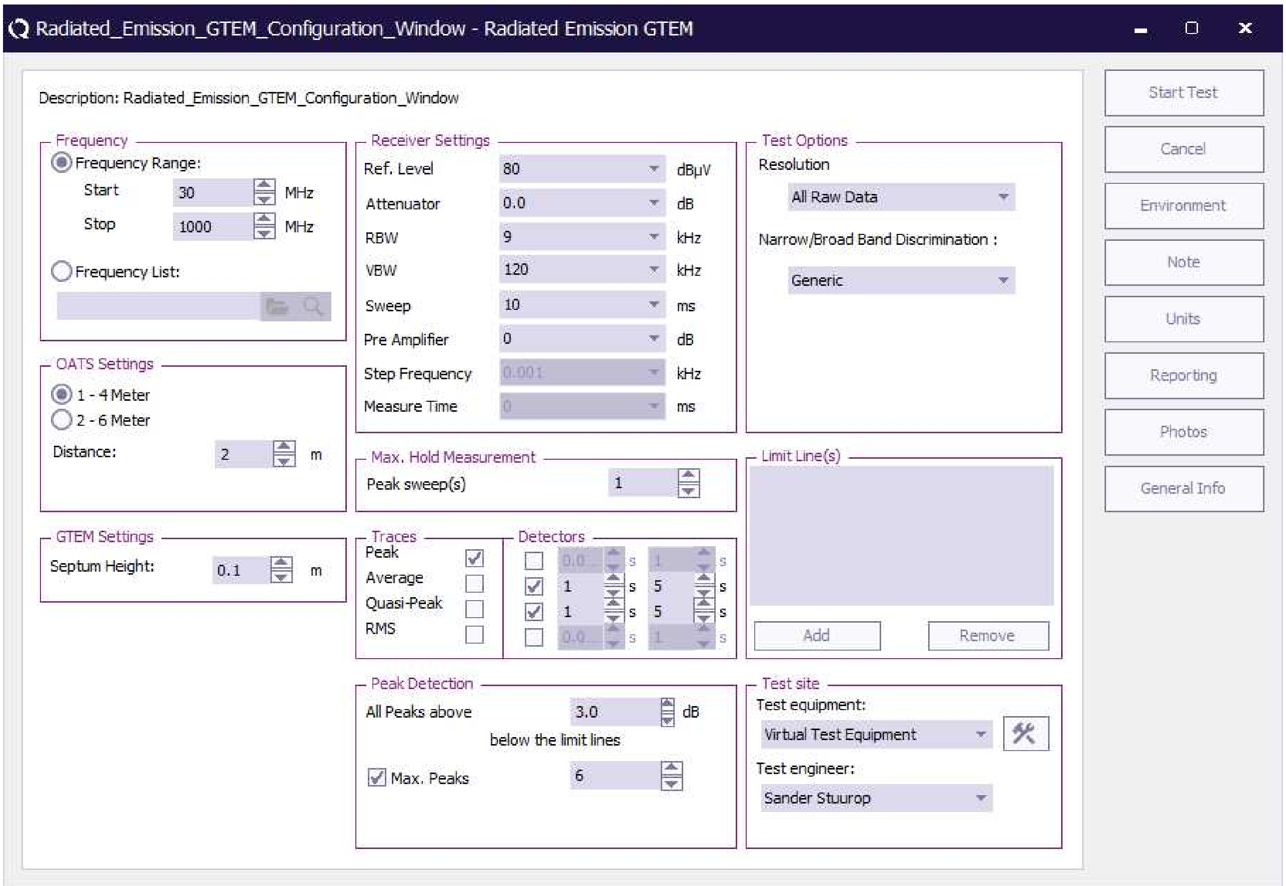
7.8.8.2 Test initialisation and self test

When the start button is pressed, the software first runs a number of checks.

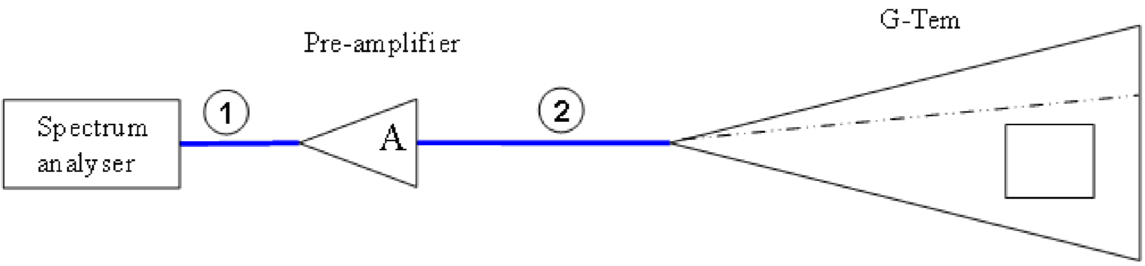
1. The presence of a valid software key is checked.
2. The software settings are checked (i.e. is all test equipment used within its parameters?)
3. The presence of all test equipment is checked.
4. All relevant equipment will be initialised.

When one or more of the above tests fail, an error message is displayed.

The figure below shows the TSF window.



7.8.9 Test site information



#	Device name	Tab in RadiMation® configuration window
	Spectrum analyser	Devices 2
	Pre amplifier	Devices 2
	Antenna	Devices 1
Cables		
1	cable Preamp->analyser	Cables
2	cable Antenna->Preamp	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during emission measurements.
When in doubt contact your reseller.

7.9 Manual mode (Singleband)

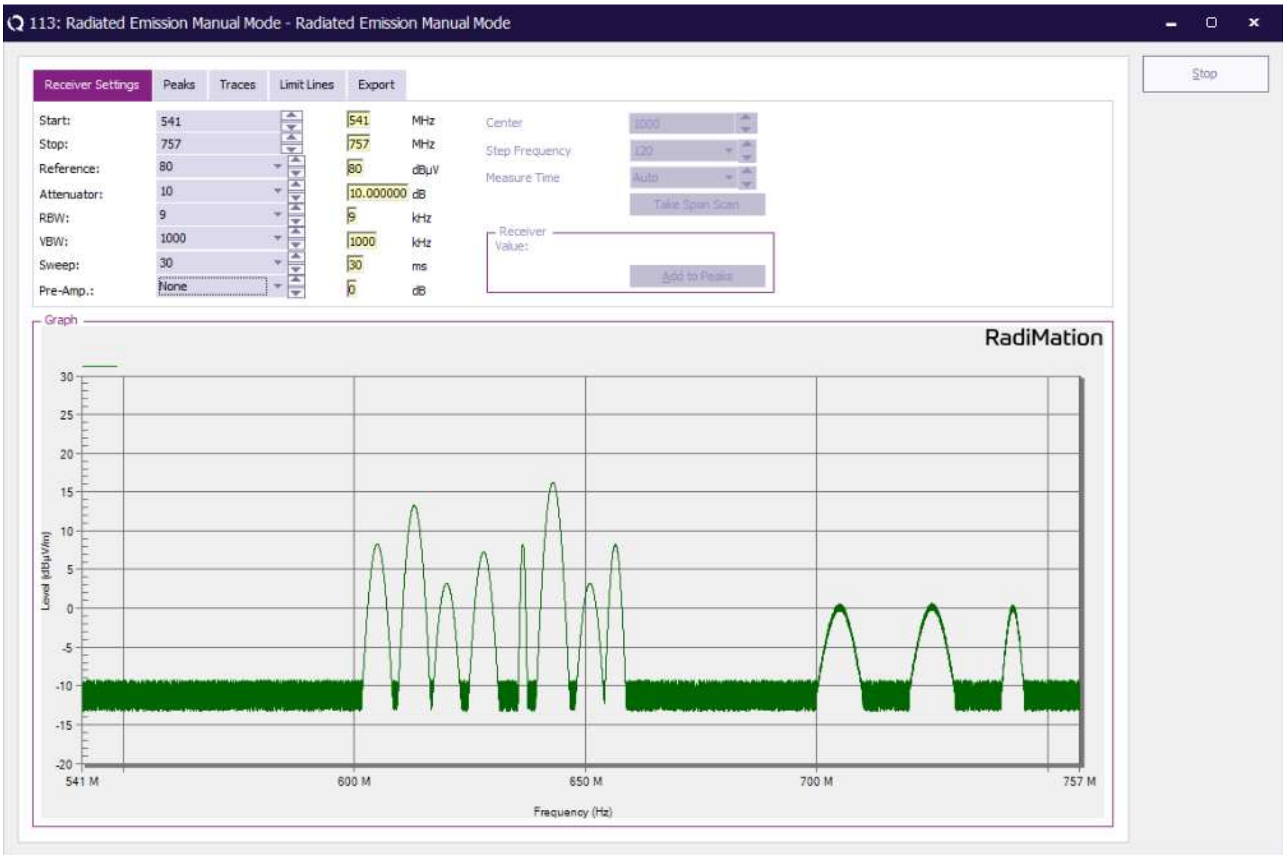
For product improvements, it quit often is required to operate the test set-up in manual mode. This can be done either by operating the measurement receiver (or spectrum analyser) manually or by the RadiMation® software. In our opinion it is no use to take over the buttons of the receiver without adding any extra functionality. For this reason a number of handsome futures are included in manual mode.

7.9.1 Receiver settings

The receiver setting menu allows the operator to configure the measurement receiver. The following parameters can be configured:

- **Start** Sets start frequency
- **Stop** Sets stop frequency
- **Reference** Sets the reference level of the receiver
- **Attenuator** Sets the receiver attenuator level
- **RBW** Sets the Resoution Band Width filter
- **VBW** Sets the Video BandWidth filter
- **Sweep** Sets the sweep time of the receiver
- **Pre-amp** Sets the pre-amp gain

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.
The left column in the receiver setting menu shows the parameters as configured by the test engineer while the right column shows the actual receiver configuration.
The figure shows the receiver settings menu.



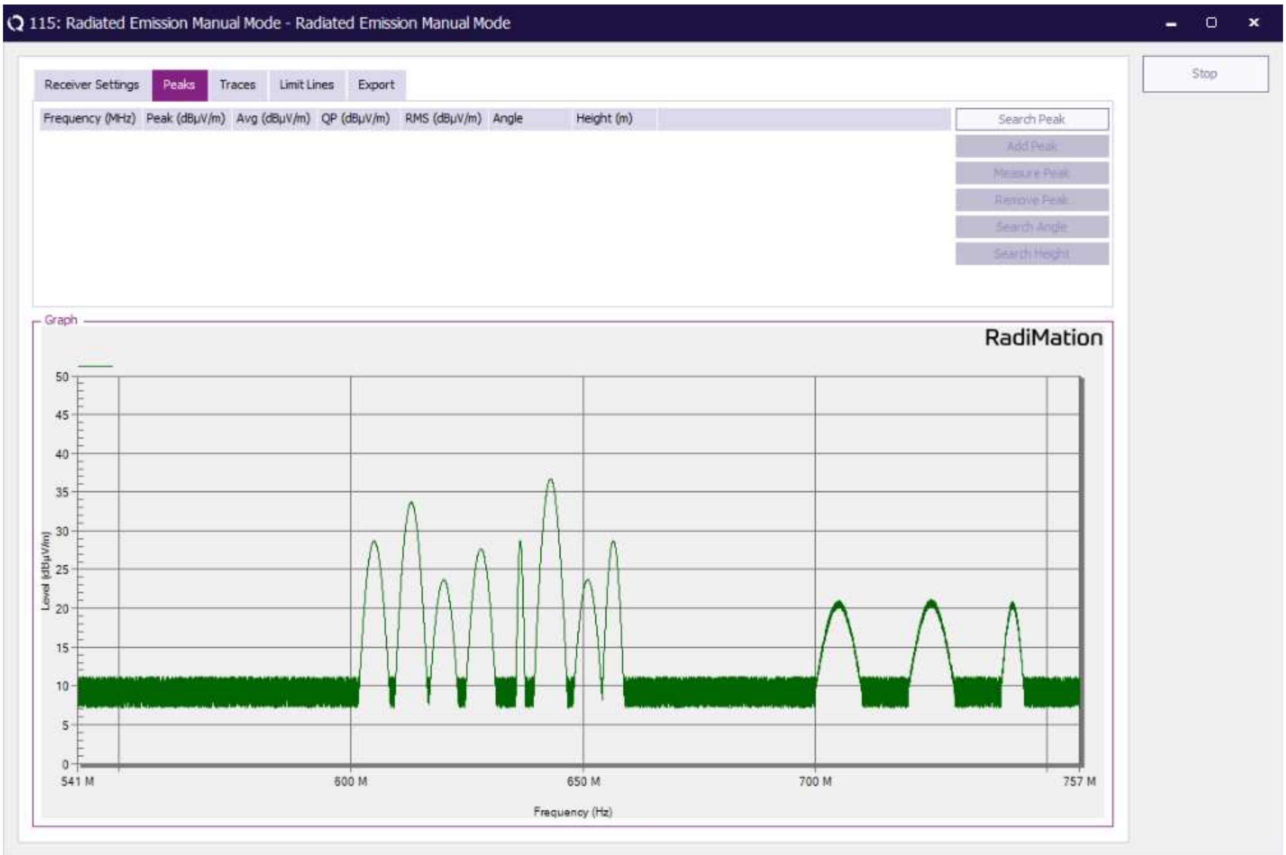
7.9.1.1 Data correction

The semi- manual mode of RadiMation® uses the PC screen to display the emission data real time on the computer screen. However the measured data is corrected for antenna factors and cable losses.

7.9.2 Peak menu

- **Search peak** RadiMation® can detect peaks automatically. From the "peaks" TAB, choose "Search peak" to detect the maximum signal. The software will measure the detected peak.
- **Add peak** The measured values can be added to the peak list by pressing the "Add Peak" button.
- **Search angle** By pressing the "Search Angle" button, the software starts a turntable scan to determine at which turn table angle maximum emission takes place.
- **Search Height** By pressing the "Search Height" button, the software starts an antenna height scan to determine at which antenna height maximum emission takes place.

The picture below shows the "manual mode" peak list option

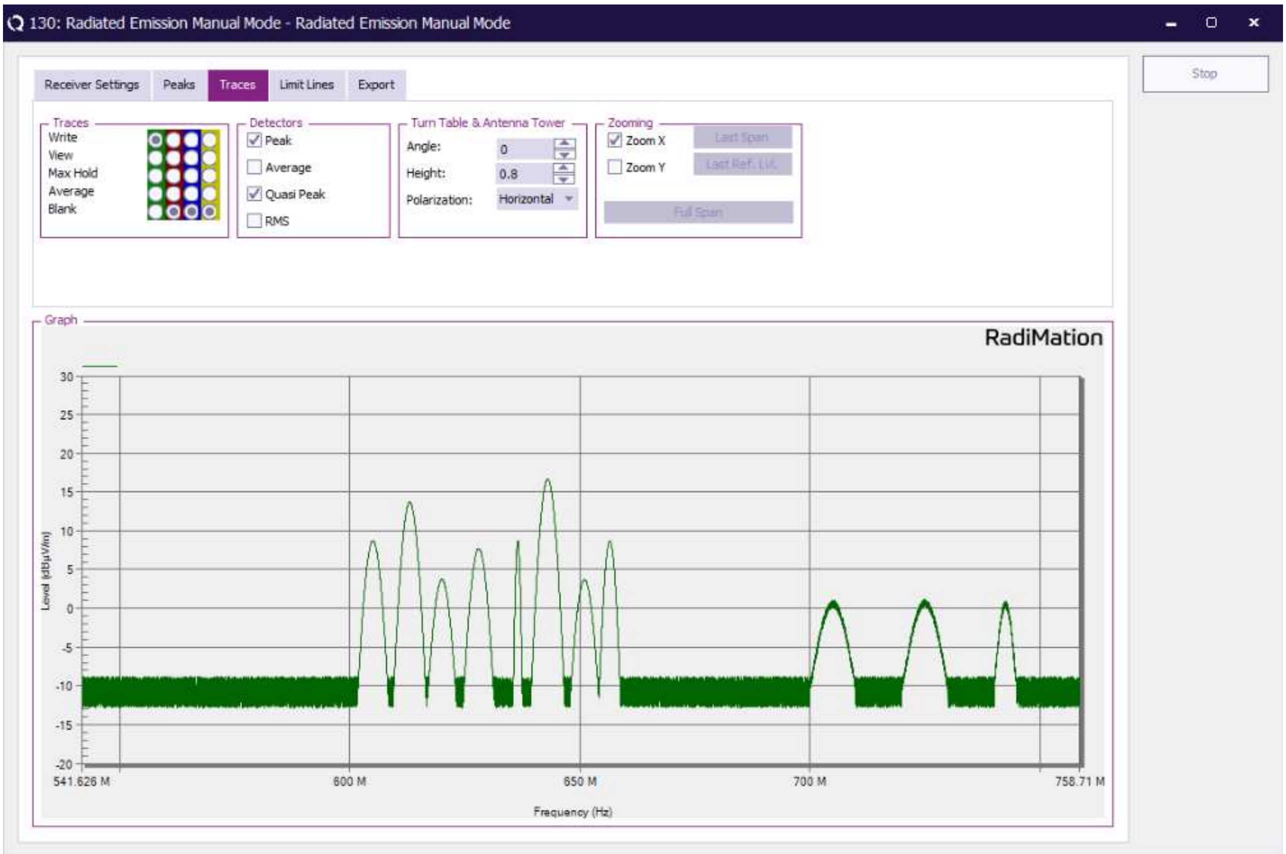


7.9.3 Traces Menu

7.9.3.1 Traces

In the "traces" menu, a maximum off four traces can be switched on. Each trace can be appointed to be a Max hold trace, Average trace, Write trace or be switched either to View mode or just left Blank.

The figure below shows the traces menu:



7.9.3.2 Detectors

In the traces menu, The following detectors can be switched on and off:

- Peak detector
- Average detector
- Quasi peak detector
- RMS detector

7.9.3.3 Turntable and antenna tower position

The turntable position and antenna height can be entered. The manual mode measurements will be carried out on the entered antenna height and turntable position.

7.9.3.4 Zoom function

RadiMation® features a live zoom function. When the operator wants to "zoom in" on a certain signal just use the mouse to drag a box around the signal of interest. The RadiMation® software will fully automatic zoom in to this signal. The screen, as well as the measurement receiver will be zoomed. This reduces the number of actions of the operator significantly.
The figures on the next page show how to drag a box to zoom into a graph, while the second graph shows the zoomed graph.
The following options are possible for the automatic zooming function:

- **X-axis** When this option is switched on, the frequency settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.

- **Y-axis** When this option is switched on, the amplitude settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.

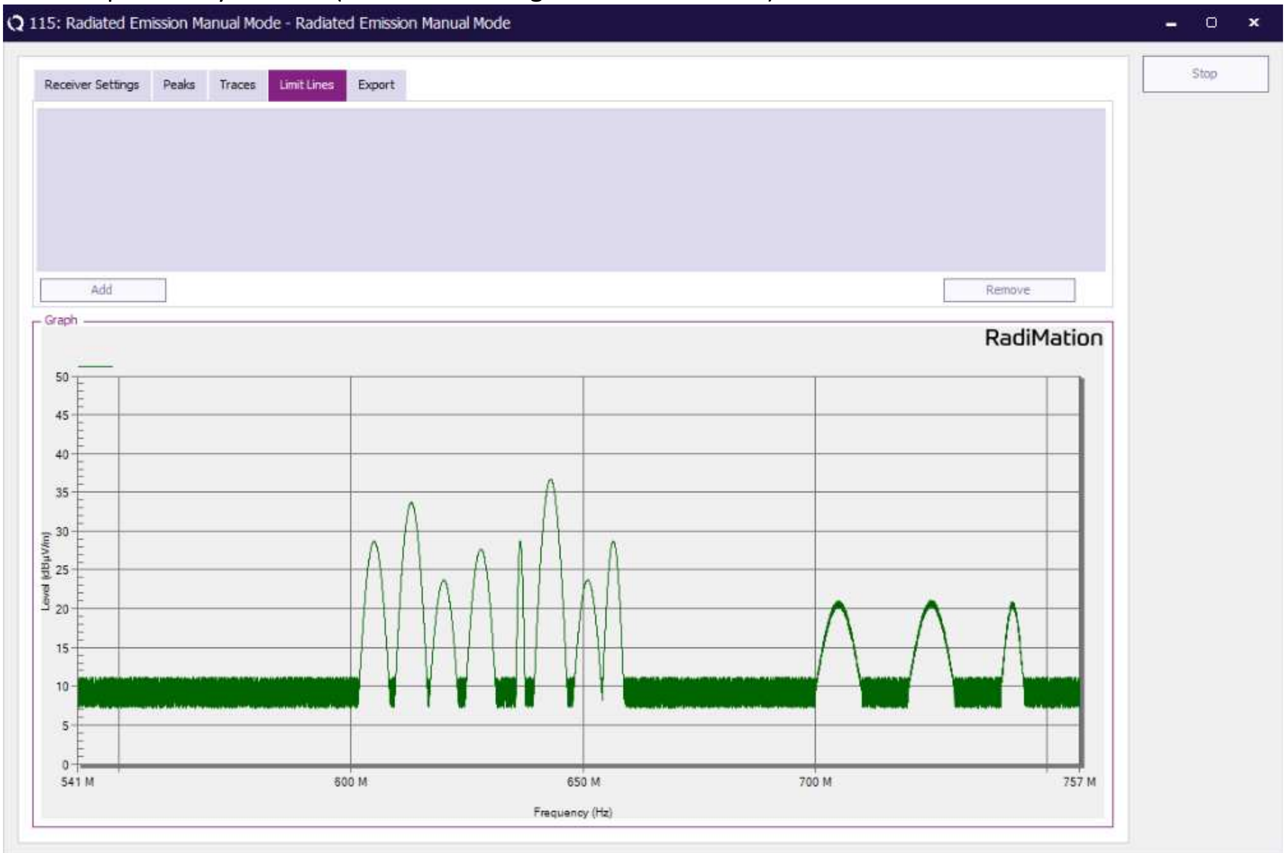
Under the “traces” TAB, the user can select two different ways of zooming:

- **X-axis** When this option is switched on, the frequency settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.

- **Y-axis** When this option is switched on, the amplitude settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.

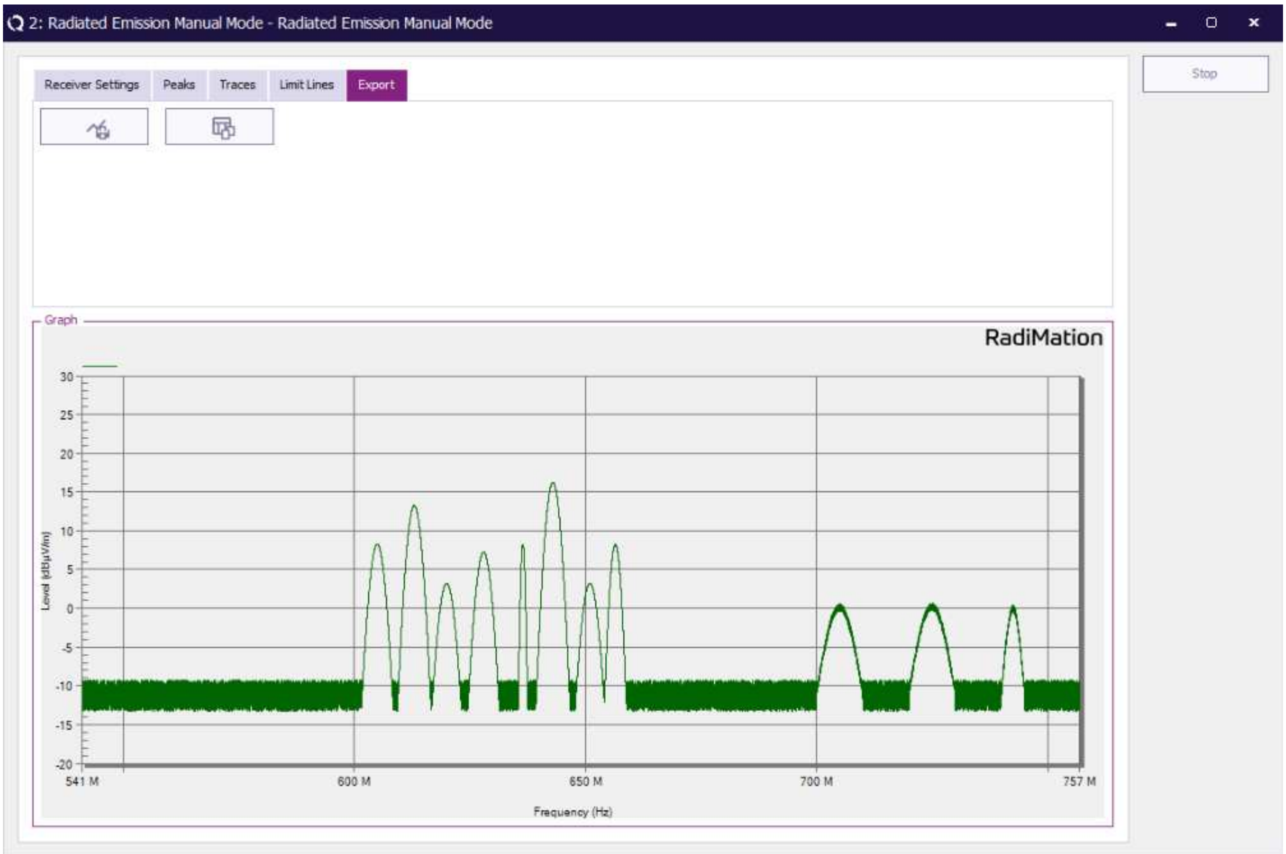
7.9.4 Limit lines

Under the TAB “limit lines”, limit lines can be added to and removed from graphs. The limit lines must be previously defined (See also creating new limit line files).



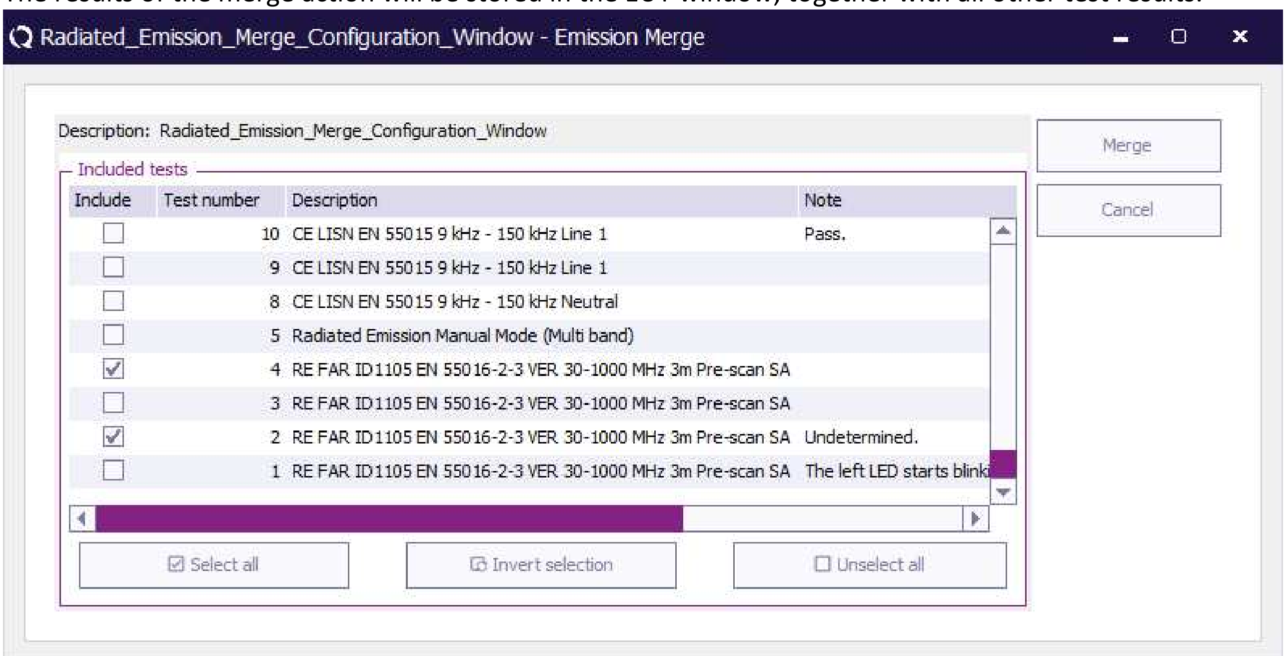
7.9.5 Export menu

Data from the graphs and peak list can be exported to the clipboard by pressing the corresponding icons in the export menu. From the clipboard, the graph (or table) can be pasted in to any Windows application.



7.10 Merge

The merge function is used to merge separate emission graphs to one graph.
The figure below shows the merge window. All emission tests, carried out on the Equipment Under Test, will be shown in this menu. The operator can select which emission measurements have to be merged together.
The results of the merge action will be stored in the EUT window, together with all other test results.



7.11 X + k * S

The X + k * S function is a statistic calculation method used when a number of the same measurements are made to the same type of EUT.
The figure below shows the X + k * S function window. All emission tests, carried out on the Equipment Under Test, will be shown in this menu. The operator can select on which emission measurements the calculations have to be performed.
The results of the X + k * S function will be stored in the EUT window, together with all other test results.

RadiMation® EMC software
------- Conducted Emission -------

Table of contents:

Conducted Emission

8.1 Introduction

The conducted emission measurements can be performed with a Line Impedance Stabilisation Network (L.I.S.N.) on power supply cables, or with an absorbing clamp, on power supply cables and/or I/O cables). Automotive standards use a Line Impedance Stabilisation Network to measure the conducted emission on 12V and 24V board voltages.
RadiMation® supports the use of 1, 2, 3 and 4 phase, Line Impedance Stabilisation networks. Generally 1 phase LISN's are used for measurements on DC lines, as is the case during automotive measurements. 2 phase LISN's are normally used to measure conducted emission on single-phase mains supplies (in this case the emission on Phase and Neutral are measured separately). 3 and 4 phase LISN's are used to measured conducted emissions on 3 phase mains supplies (in this case the emission on L1, L2, L3 and, if applicable, N are measured).
Conducted emission tests can either be performed with a measurement receiver, or a spectrum analyser. For full compliant conduced emission tests, the measurement receiver, or spectrum analyser must be CISPR 16-1 compliant. This standard describes the dynamic range, input, sensitivity, needed filters and accuracy of the measuring device.

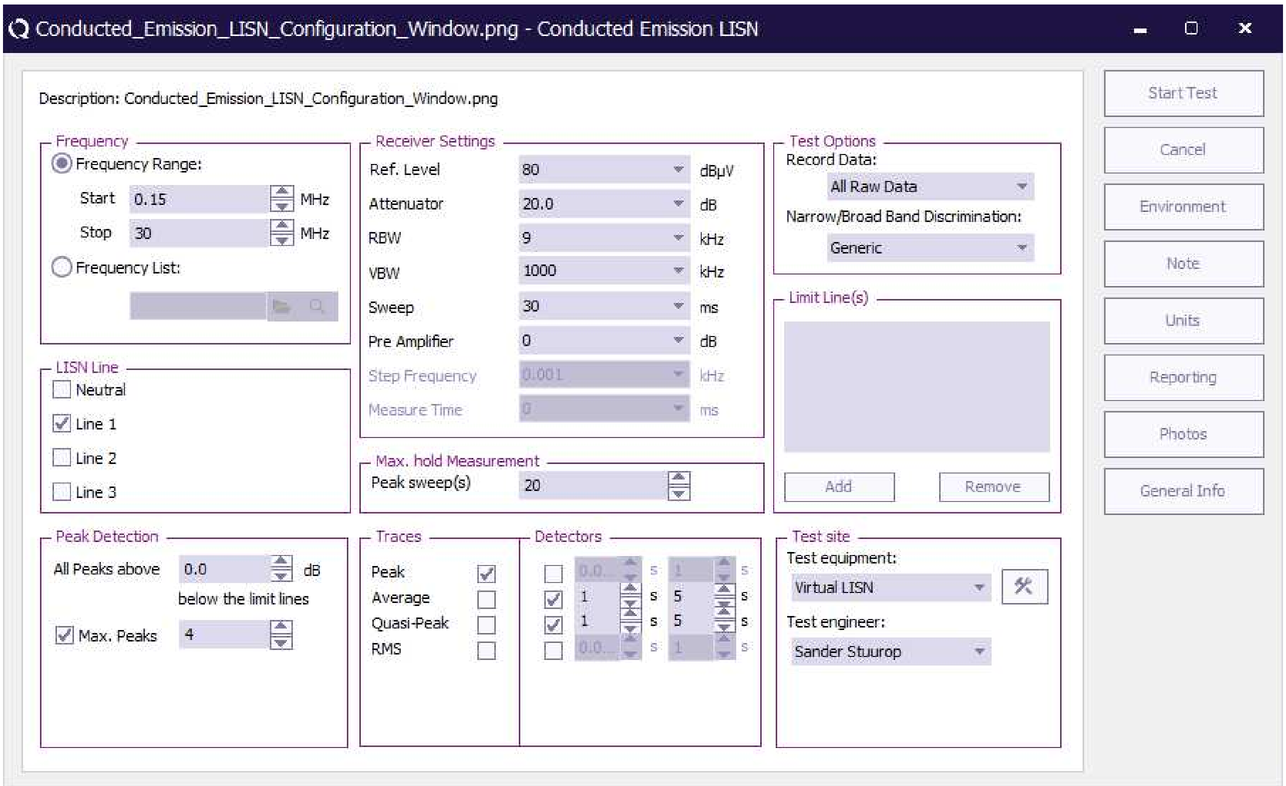
Warning: Extreme care should be taken when the LISN measuring output is switched from one phase to the other. The measurement output of the LISN is capacitive coupled to the mains line and therefore switching between Phase and Neutral will cause a voltage transient of 310 V at the input of the receiver. When no extra protection is used, this transient can easily destroy the mixer diode(s) of the measuring device.
We recommend to use a transient limiter or to disconnect the receiving device when the LISN is switched on or off. The used LISN, spectrum analyser and/or measurement receiver can be selected under the configuration, tests site pull down menu.

The measuring device can be configured for the desired test through the Attenuator, RBW, VBW and sweep time settings.
Measurements can be performed in peak, average and quasi peak mode. For Peak mode tests, the number of sweeps to be made, can be selected. For Quasi Peak and Average measurements, the number of points can be entered on which the QP and average measurements are made. The QP and average measurements are made on the highest emission points as measured during the peak sweeps. RadiMation® automatically selects the highest peaks from the peak measurement file and performs the QP measurements on these peaks.

When the measurements must be repeated on more than one phase, simply select all phases to measure. The configured test can be saved as a TSF file for use at a later time. When conducted emission tests must be performed in different frequency bands, several TSF files can be placed in a sequence file. The next chapters explain in depth how a test should be configured.

8.2 LISN measurements

The test engineer can configure a complete conducted emission test in the Conducted Emission configuration menu. To enter this menu, please select Tests > Conducted emission > LISN.



The next paragraphs describe all configuration field of this window.

8.2.1 Frequency window

In the frequency window, the operator can enter a frequency range to be measured or select a frequency list.
When the Frequency range is selected, the following items can be entered:

- **Start** Sets start frequency
- **Stop** Sets stop frequency

When the frequency list is selected the operator can select a frequency list file by browsing to the file location. With the start-stop frequency the software searches for the peaks, while with a frequency list the frequencies on the list are measured.

8.2.2 LISN line window

In this window the operator can select which lines have to be measured. The operator can either select to measure just one LINE at a time (and have the possiblity to put them in a sequence) or select two or more lines in the same test.
When two or more LINES are selected in the same test, all data will be displayed in one graph thus loosing information. However the peak list table will show on which LINE a peak was measured.
If the emission graphs of all separate LINES are required, separate tests must be configured for each LINE. These tests can be put in a sequence, eliminating the need for a user intervention.

8.2.3 Receiver settings

- **Reference level** Sets the reference level of the receiver.

➢ **Attenuator**	Sets the receiver attenuator level.
➢ **RBW**	Sets the Resolution BandWidth filter.
➢ **VBW**	Sets the Video BandWidth filter.
➢ **Sweep**	Sets the sweep time of the receiver.
➢ **Pre-amp**	Sets the pre-amp gain.
➢ **Step frequency**	Sets the frequency step size of the receiver.
➢ **Measure time**	Sets the measure time of the receiver.

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.

8.2.4 Max. hold measurements

In this window the number op peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times for each turntable and antenna tower position. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweepspeed. For spectrum analysers and CW signals you can use a relatively low amount of peaksweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peaksweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

8.2.5 Traces window

In the traces window, the test engineer can select a maximum of four traces which can be measured and displayed at the same time.

8.2.6 Detectors window

In the detectors window the test engineer can configure the detectors used during the final emission measurements of the detected peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired box.

8.2.7 Peak detection window

➢ **All peaks above “xx” below the limit lines**	In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 6 dB, the software will detect all peaks, which are higher than 6 dB below the limit line.

Max. Peaks	Under max. peaks, the user can limit the number of peak signals the software will detect and re-measure.

8.2.8 Test site window

Test equipment	In the test site window the test engineer can select which equipment list will be used during this test.
Test engineer	In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.
Equipment icon	By clicking on the equipment icon, the equipment list can be viewed and edited.

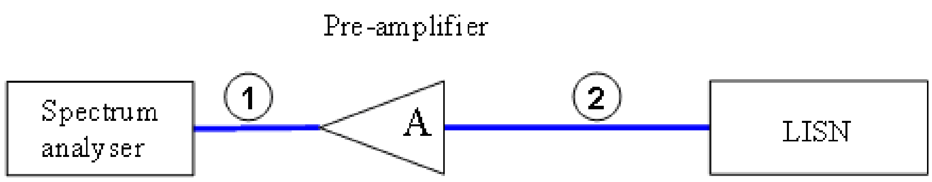
8.2.9 Limit lines window

In the limit line window the operator select one or more limit lines to be used during the test.

8.2.10 Test options window

In the test options window the operator can select whether all RAW data must be stored or only the measurement results are stored. It should be noted that for full tracebility, all test data should be stored.

8.2.11 Test site information



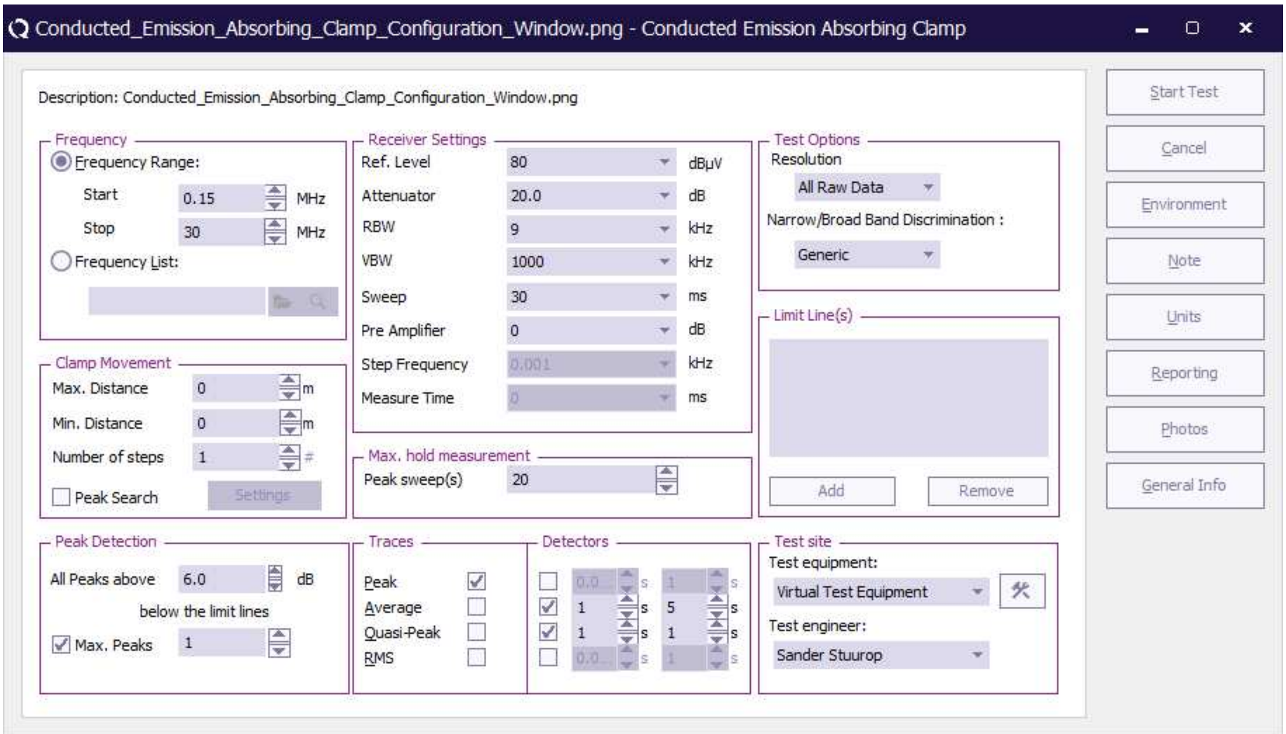
#	Device name	Tab in RadiMation® configuration window
	Spectrum analyser	devices 2
	Pre amplifier	devices 2
	LISN	devices 2
Cables		
1	cable Preamp -> analyser	Cables
2	cable antenna -> Preamp	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during emission measurements. When in doubt contact your reseller.

8.3 Absorbing clamp measurements

Absorbing clamp measurements can be performed full automatically when a clamp positioner is used. The test engineer can configure a complete absorbing clamp test in the Conducted Emission-Absorbing clamp configuration menu. To enter this menu, please select

- **Tests**
  - **Conducted emission**
    - **Absorbing clamp**



8.3.1 Frequency window

In the frequency window, the operator can enter a frequency range to be measured or select a frequency list.
When the Frequency range is selected, the following items can be entered:

- **Start** Sets start frequency.

- **Stop** Sets stop frequency.

When the frequency list is selected the operator can select a frequency list file by browsing to the file location.

8.3.2 Clamp movement window

In this window the operator can select the start and stop position of the clamp and the number of steps for the clamp.

- **Max. distance** Sets the maximum clamp position.

- **Min. distance** Sets the minimum clamp position.
- **#** Number op locations from **Max. distance** to **Min. distance** that should be measured.
- **Peak search** The software will automatically detect on which clamp distance the maximum measurement value of each peak is present.

When **Peak search** is selected, the user can configure the method that is used during the peak search. In the peak search configuration window, the following configurations can be made:

- **Area** Range over which the peak search will be performed. The initially detected clamp distance of the peak will be the middle of this **Area**, and the total search area for this peak will be half of this area up and half of this area down.
- **Step size** The step size for each clamp movement.
- **Threshold** This value is only used during the **Intelligent** mode. It influences how long the movement is continued. The movement will stop when the measurement value is lower than the specified **Threshold** below the highest known measurement value of the searched peak.
- **Mode** The mode setting determines the way a peak is detected. The following modes are available:
  - Intelligent
  - Complete area

  The Intelligent mode has the advantage that it stops with the scan as soon as a maximum measurement value has been determined. This could improve overall testtime as less movement of the clamp is possible. The Complete area mode has the advantage that the complete specified **Area** is measured.

8.3.2.1 Intelligent

In this mode the software increases the distance of the clamp from the initial point with a step equal to **Step size** as long as the measurement value is not more than **Threshold** below the already known maximum measurement value. As soon as measurement value is detected that is **Threshold** below the already known meaximum value, the clamp movement is reversed until the initial point and from this initial point the distance of the clamp is decreased with a step equal to **Step size** until a measurement value is measured that is **Threshold** below the already known maximum measurement value. The step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the intial number of steps (**#**) is set to a low value.

8.3.2.2 Complete area

In this mode the complete area around the initial point and defined by **Area** is scanned for a peak. The clamp is moved to one end of the to be measured area, and is then moved with the specified **Step size** to the other end of the to be measured area. On each step the measurement value is determined, and the step on which the highest measurement value is measured, will be the optimum peak search location that is found for that peak.

Warning: This might cause a measurement error if the **Area** is set to a smaller value than the original stepsize (given by the stop position minus start position divided by the number of steps).

8.3.3 Receiver settings

- **Reference level** Sets the reference level of the receiver.
- **Attenuator** Sets the receiver attenuator level.
- **RBW** Sets the Resolution BandWidth filter.
- **VBW** Sets the Video BandWidth filter.
- **Sweep** Sets the sweep time of the receiver.
- **Pre-amp** Sets the pre-amp gain.
- **Step frequency** Sets the frequency step size of the receiver.
- **Measure time** Sets the measure time of the receiver.

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.

8.3.4 Max. hold measurements

In this window the number op peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times for each turntable and antenna tower position. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweepspeed. For spectrum analysers and CW signals you can use a relatively low amount of peaksweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peaksweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

8.3.5 Traces window

In the traces window, the test engineer can select a maximum of four traces which can be measured and displayed at the same time.

8.3.6 Detectors window

In the detectors window the test engineer can configure the detectors used during the final emission measurements of the detected peaks. The first value is the time constant of the detector while the second value is used for the measure time at each frequency point for this detector. The time constant is send to the receiver, to set the sample time of the detector. To select a detector, check the desired box.

8.3.7 Peak detection window

➢ **All peaks above "xx" below the limit lines**	In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 6 dB, the software will detect all peaks, which are higher than 6 dB below the limit line.
➢ **Max. Peaks**	Under max. peaks, the user can limit the number of peak signals the software will detect and re-measure.

8.3.8 Test site window

➢ **Test equipment**	In the test site window the test engineer can select which equipment list will be used during this test.
➢ **Test engineer**	In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.
➢ **Equipment icon**	By clicking on the equipment icon, the equipment list can be viewed and edited.

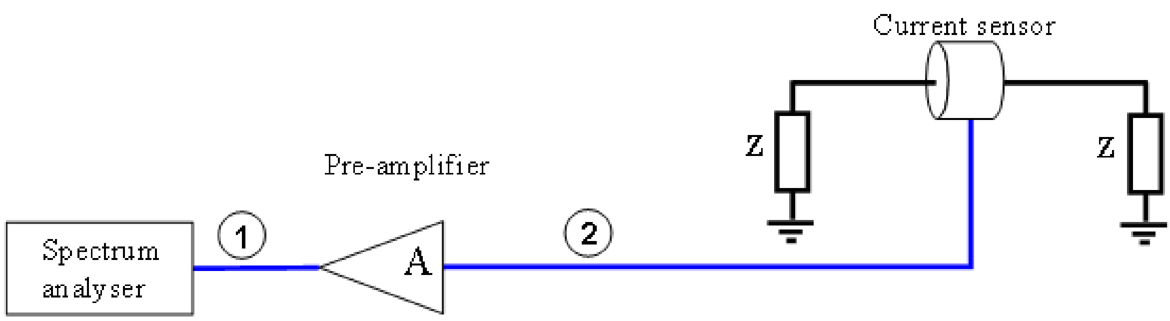
8.3.9 Limit lines window

In the limit line window the operator select one or more limit lines to be used during the test.

8.3.10 Test options window

In the test options window the operator can select whether all RAW data must be stored or only the measurement results are stored. It should be noted that for full tracebility, all test data should be stored.

8.3.11 Test site information



#	Device name	Tab in RadiMation® configuration window
	Spectrum analyser	devices 2
	Pre amplifier	devices 2

	Current sensor	devices 2
Cables		
1	cable preamp -> analyser	Cables
2	cable antenna -> Preamp	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during emission measurements. When in doubt contact your reseller.

8.4 Current Probe Measurement

The test engineer can perform a conducted emission test in the conducted emission configuration Menu. To enter this menu, please select Tests > Conducted Emission -> Current probe

8.4.1 Frequency Window

In the frequency window, the operator can enter a frequency range to be measured or select a frequency list.
When the Frequency range is selected, the following items can be entered:

- **Start** Sets start frequency
- **Stop** Sets stop frequency

When the frequency list is selected the operator can select a frequency list file by browsing to the file location. With the start-stop frequency the software searches for the peaks, while with a frequency list the frequencies on the list are measured.

8.4.2 Max. Hold Measurement/Peak Sweeps

The number op peak hold sweeps for each measurement can be selected. If this value is set to, for example 10, the software will measure the frequency band 10 times. This value will normally be set to 1 for measurement receivers while a higher value is used for spectrum analysers. The amount of required peak sweeps is depending on the type of signal and the setting of the sweep speed. For spectrum analysers and CW signals you can use a relatively low amount of peak sweeps, for example 10. But when you have discontinues signals like a spark bridge, you may need 100 peak sweeps or more. A good indication if you are using enough peak sweeps is to look at the envelope of the frequency spectrum. When it has gaps or jumps then you are not using enough sweeps to determine a correct signal envelope.

8.4.3 Peak detection window

➢ **All peaks above "xx" below the limit lines**	In the peak detection window, the test engineer can configure which signal peaks must be detected. If the operator selects a value of 6 dB, the software will detect all peaks, which are higher than 6 dB below the limit line.
➢ **Max. Peaks**	With the max. peaks option, the user can limit the number of peak signals the software will detect and re-measure.

8.4.4 Receiver Settings

➢ **Reference level**	Sets the reference level of the receiver
➢ **Attenuator**	Sets the receiver attenuator level
➢ **RBW**	Sets the Resolution BandWidth filter
➢ **VBW**	Sets the Video BandWidth filter
➢ **Sweep**	Sets the sweep time of the receiver
➢ **Pre-amp**	Sets the pre-amp gain
➢ **Step frequency**	Sets the frequency step size of the receiver
➢ **Measure time**	Sets the measure time of the receiver

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver. However, using the 'Auto' setting for the attenuator can let the analyser decides to use a different attenuator setting during (re-)measuring of a peak, which as a result can lead to measuring a higher Quasi-Peak value than the Peak value. This is related to the used analyser when auto attenuator is used. If it is not desired that the analyser can decide to switch to a different attenuator setting, then this should be disabled by the test engineer in RadiMation® by using a fixed attenuator value.

Warning: All these settings are generic. Therefore, always verify that the configured settings are also supported by the used hardware to ensure it is correctly used and no measurement faults are introduced. Use a fixed value to disabled interference of equipment intelligence.

8.4.5 Traces

In the traces window, the test engineer can select a maximum of four traces, which can be measured and displayed at the same time

8.4.6 Test Options

➢ **Record Data**	Select to record all raw data or only the results. When choosing only the results you will only have the data from the found peaks and the data of the final measurement when this is performed
➢ **Narrow/Broad Band Discrimination**	Selects the method used to determine if a signal is broad band or narrow band. There are three options: Generic (The standard of your analyser)/CISPR 25 (Broad/Narrow band discrimination according to the CISPR 25 standard)/MilStandard(Broad/Narrow band discrimination according to the MilStandard

8.4.7 Limit lines window

In the limit line window the operator select one or more limit lines to be used during the test.

8.4.8 Test site window

➢ **Test equipment**	In the test site window the test engineer can select which equipment list will be used during this test.
➢ **Test engineer**	In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results.

8.5 Starting a test

8.5.1 Loading a TSF file

To start a conducted emission test, an EUT file must be defined first. From the menu, select:

- **Tests**
  - **Conducted emission**
    - **CISPR LISN**

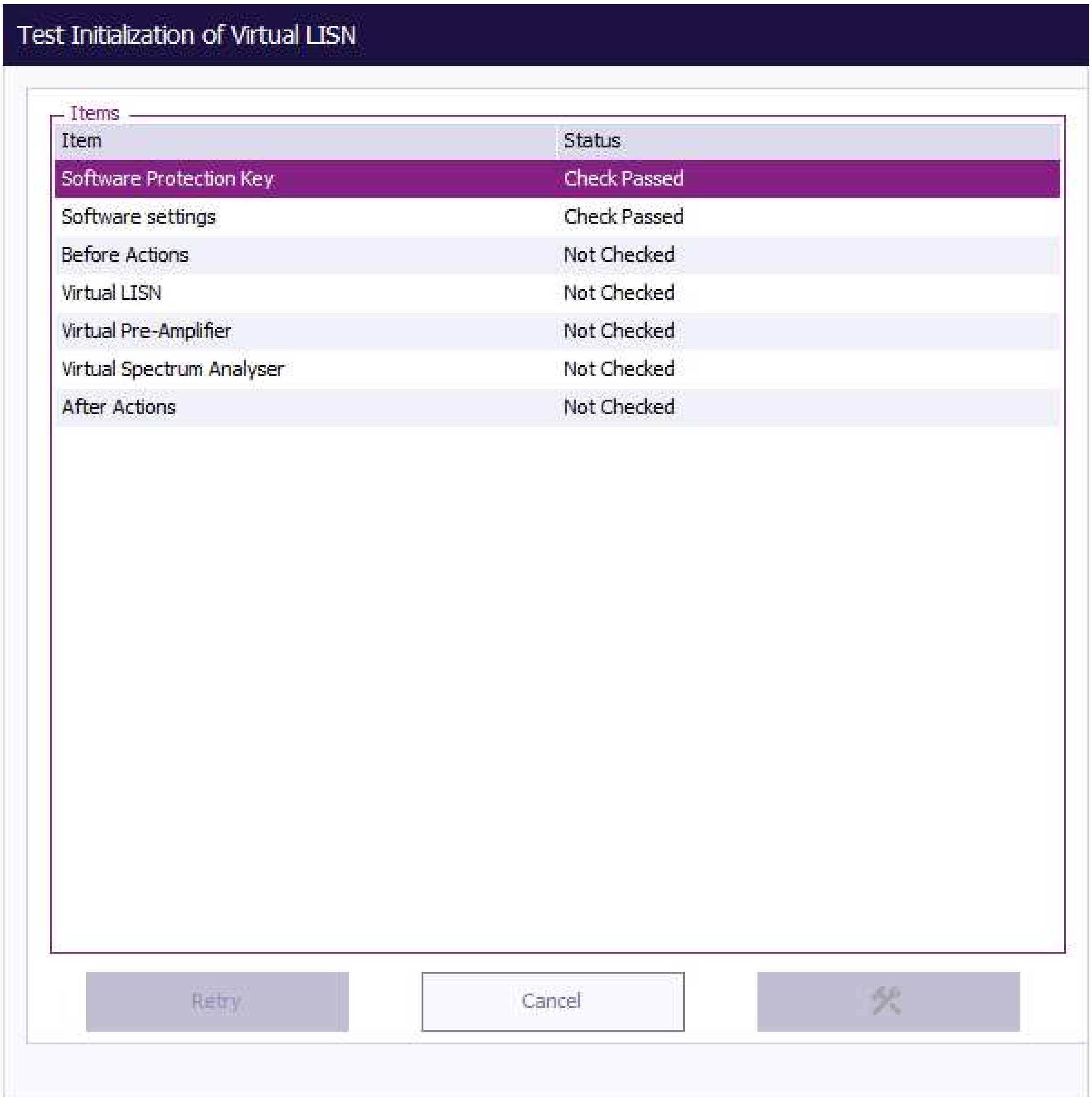
After a TSF file has been selected, the emission configuration window will appear.
When a TSF file is loaded, all test parameters will be already configured and pressing the start button on the right side of the screen can start the test.
When no TSF file is loaded (by pressing **Cancel** in the TSF selection window) all parameters will be at zero and can be configured by the operator.

8.5.2 Test initialisation and self test

When the start button is pressed, the software first runs a number of checks.

1. The presence of a valid software key is checked.
2. The software settings are checked (i.e. is all test equipment used within its parameters?)
3. The presence of all test equipment is checked.

4. All relevant equipment will be initialized.



When one or more of the above tests fail, an error message is displayed.

8.6 Manual mode

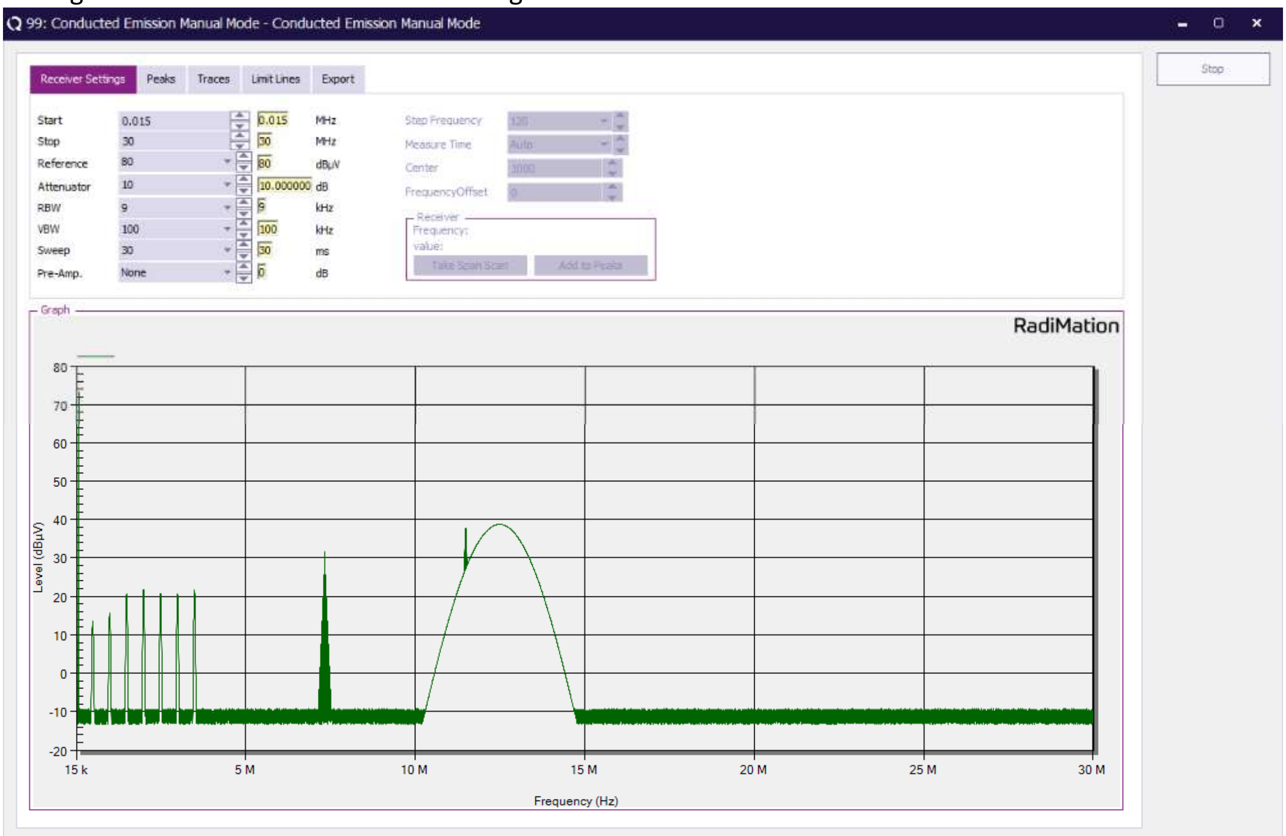
For product improvements, it quit often is required to operate the test setup in manual mode. This can be done either by operating the measurement receiver (or spectrum analyser) manually or by the RadiMation® software. In our opinion it is no use to take over the buttons of the receiver without adding any extra functionality. For this reason a number of handsome futures are included in manual mode.

8.6.1 Receiver settings

The receiver settings menu allows the operator to configure the measurement receiver. The following parameters can be configured:

- **Start** Sets start frequency.
- **Stop** Sets stop frequency.
- **Reference** Sets the reference level of the receiver.
- **Attenuator** Sets the receiver attenuator level.
- **RBW** Sets the Resolution Band Width filter.
- **VBW** Sets the Video Band Width filter.
- **Sweep** Sets the sweep time of the receiver.
- **Pre-amp** Sets the pre-amp gain.

When a parameter is set to auto, RadiMation® will determine the most optimum settings for this parameter. If the parameter is set to coupled, the parameter will be set to automatic internally in the receiver.
The left column in the receiver settings menu shows the parameters as configured by the test engineer while the right column shows the actual receiver configuration.
The figure below shows the receiver settings menu.



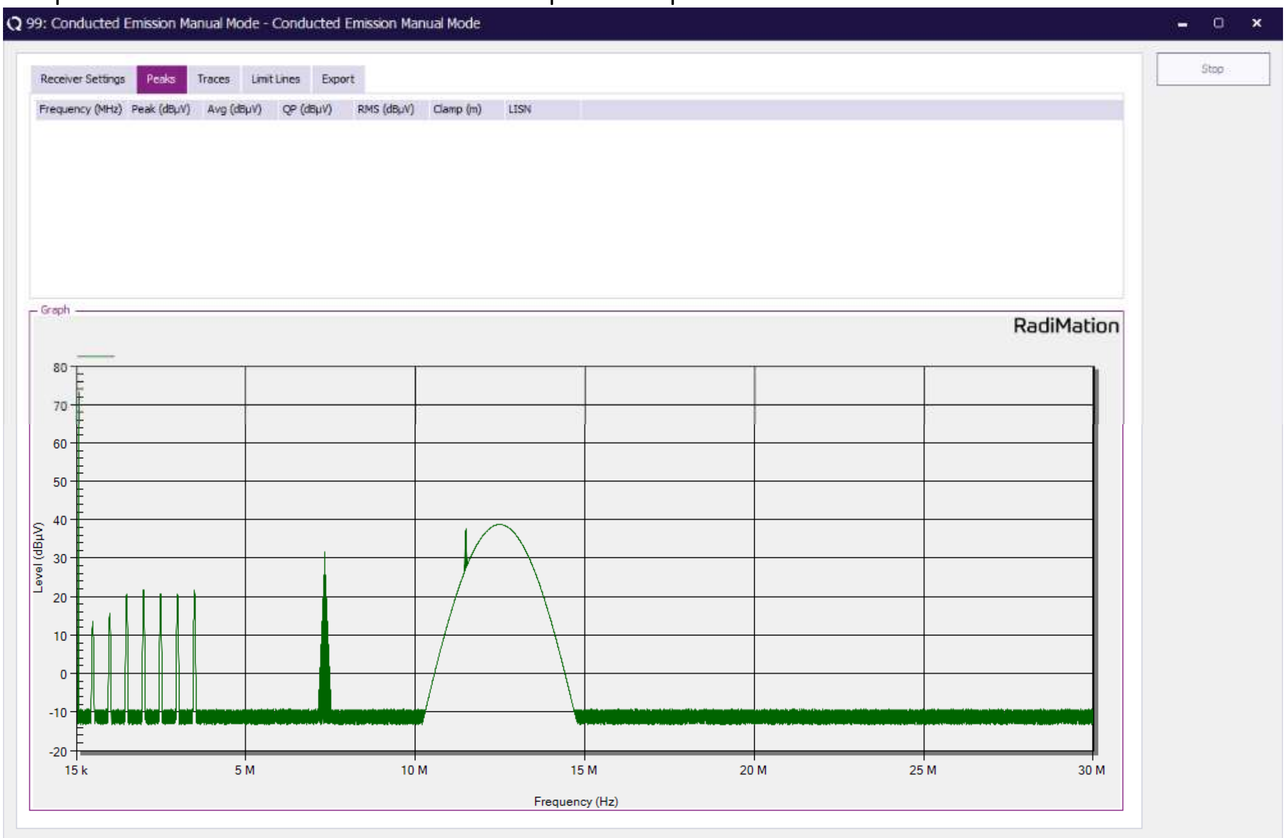
8.6.2 Data correction

The manual mode of RadiMation® uses the PC screen to display the emission data real time on the computer screen. However the measured data is corrected for antenna factors and cable losses.

8.6.3 Peak menu

- **Search peak** RadiMation® can detect peaks automatically. From the “peaks” TAB, choose “Search peak” to detect the maximum signal. The software will measure the detected peak.
- **Add peak** The measured values can be added to the peak list by pressing the “Add Peak” button.
- **Search angle** By pressing the “Search Angle” button, the software starts a turntable scan to determine at which turn table angle maximum emission takes place.
- **Search Height** By pressing the “Search Height” button, the software starts an antenna height scan to determine at which antenna height maximum emission takes place.

The picture below shows the “manual mode” peak list option.

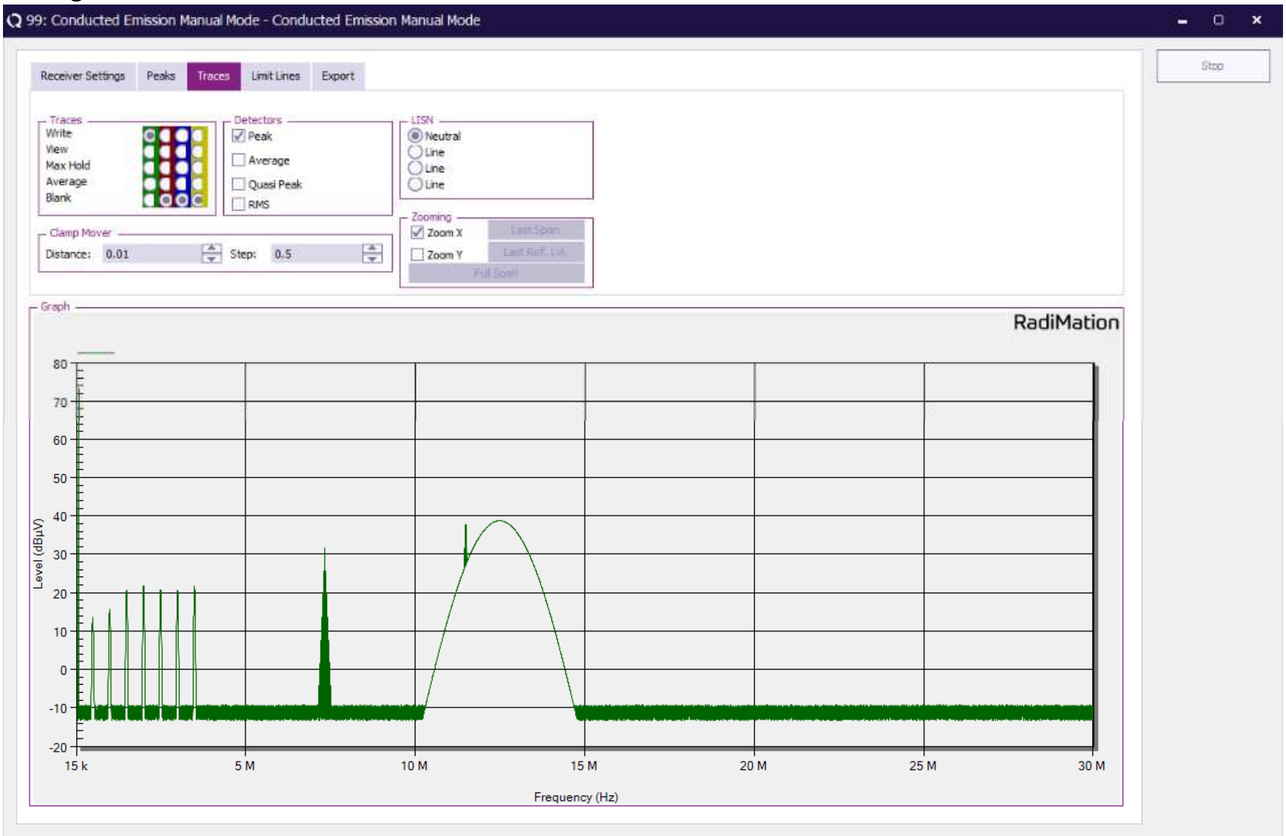


8.6.4 Traces menu

8.6.4.1 Traces

In the “traces” menu, a maximum off four traces can be switched on. Each trace can be appointed to be a Max hold trace, Average trace, Write trace or be switched either to View mode or just left Blank.

The figure below shows the traces menu:



8.6.4.2 Detectors

In the traces menu, The following detectors can be switched on and off:

- Peak detector
- Average detector
- Quasi peak detector
- RMS detector

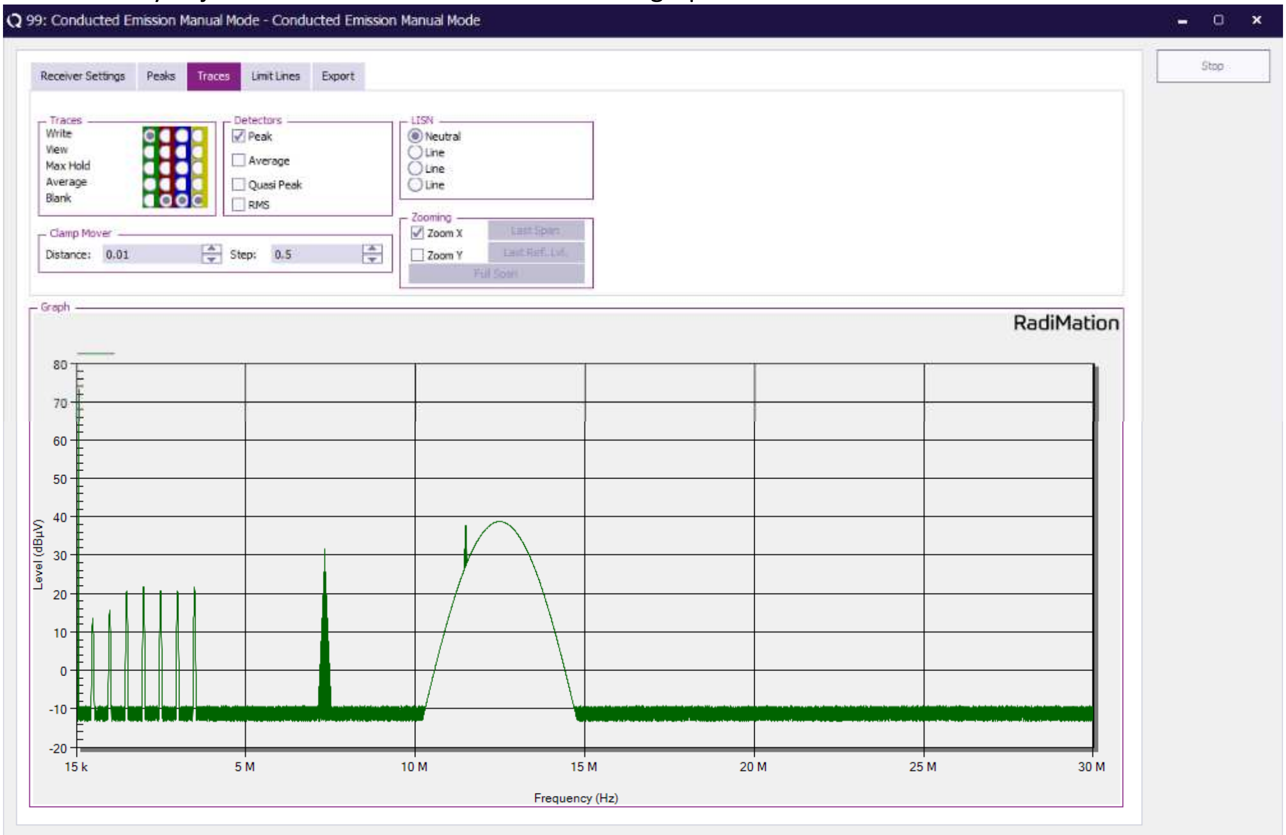
8.6.4.3 LISN line selection

In this window the operator can select which line will be monitored. In manual mode only one line at a time can be selected.

8.6.4.4 Zoom function

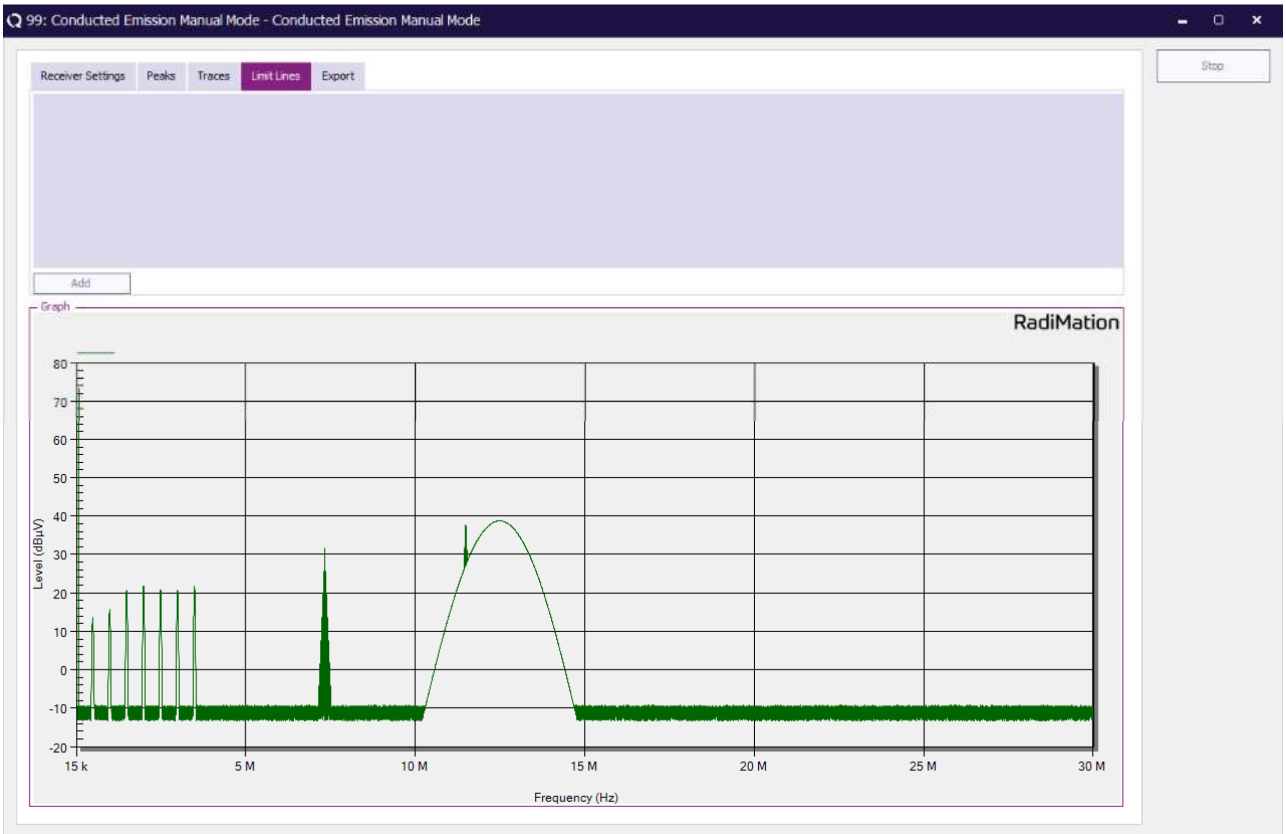
When the operator wants to “zoom in” on a certain signal just use the mouse to drag a box around the signal of interest. The RadiMation® software will fully automatic zoom in to this signal. The screen, as well as the measurement receiver will be zoomed. This reduces the number of actions for the operator significantly.
The figure below shows how to drag a box to zoom into a graph, while the second graph shows the zoomed graph.
The following options are possible for the automatic zooming function:
X-axis, When this option is switched on, the frequency settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.
Y-axis, When this option is switched on, the amplitude settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.
Under the “traces” TAB, the user can select two different ways of zooming:

X-axis, When this option is switched on, the frequency settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.
Y-axis, When this option is switched on, the amplitude settings of the receiver and the graph will be automatically adjusted when the user zooms in to the graph.



8.6.5 Limit lines

Under the TAB “limit lines”, limit lines can be added to and removed from graphs. The limit lines must be previously defined (See also creating new limit line files).



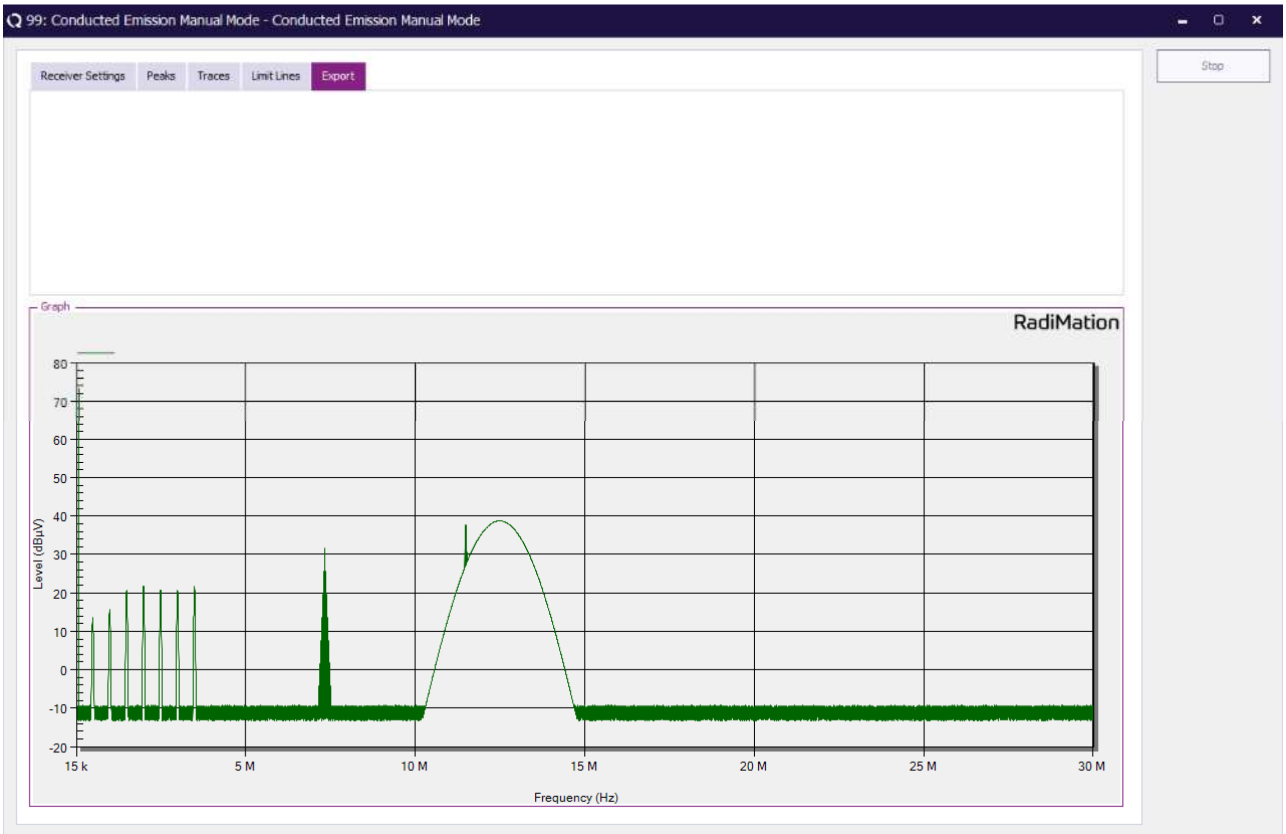
8.6.6 Short cut keys

The following short cut keys can be used during manual mode.

Key	Function
F3	Turn engine of the clampmover left, full speed.
F4	Turn engine of the clampmover left, quarter speed.
F5	Turn engine of the clampmover right, quarter speed.
F6	Turn engine of the clampmover right, full speed.
F7	Frequency offset down.
F8	Frequency offset up.
F9	Center frequency down.
F10	Center frequency up.

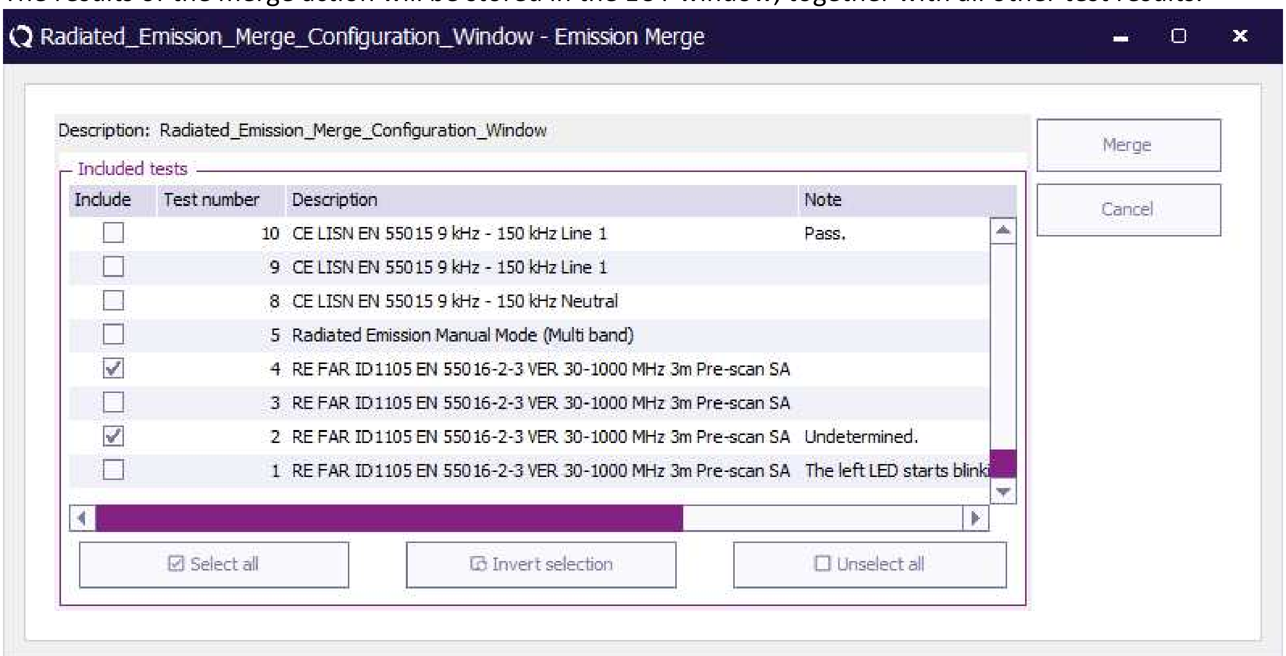
8.6.7 Export menu

Data from the graphs and peak list can be exported to the clip board by pressing the corresponding icons in the export menu. From the clip board, the graph (or table) can be pasted in to any windows application.



8.6.8 Merge function

The merge function is used to merge separate emission graphs to one graph.
The figure below shows the merge window. All emission tests, carried out on the Equipment Under Test, will be shown in this menu. The operator can select which emission measurements have to be merged together.
The results of the merge action will be stored in the EUT window, together with all other test results.



8.7 X+k*S calculation

The X+k*S function is a statistic calculation method used when a number of the same measurements are made to the same type of EUT.
The figure below shows the X+k*S function window. All emission tests, carried out on the Equipment Under Test, will be shown in this menu. The operator can select on which emission measurements the calculations have to be performed.
The results of the X+k*S function will be stored in the EUT window, together with all other test results.

8.8 Measurement of peak amplitude and peak frequency

When using a spectrum analyser for emission measurements, RadiMation® first performs a full span max. hold measurement with a peak detector. The number of max. hold peak sweeps can be defined by the user. From the obtained max hold graph, RadiMation® determines a number of peaks, which will be further investigated. The number of peak signals to be measured can be defined by the user. For each peak from the graph, RadiMation® will zoom in, by reducing the span in several steps. This must be done while span inaccuracy of the analyser in large frequency spans will give slightly incorrect frequency information. After the exact peak frequency is determined, RadiMation® will perform Peak,Quasi peak, Average and / or RMS measurements. Due to the above, the finally measured frequency and amplitude of a peak can slightly differ from the max hold graph. This is not an error, but merely an indication that the final measurements are more accurate. The peak table always shows the final measured values (most accurate).

RadiMation® EMC software
------- Antenna Diagram -------

Table of contents:

Antenna Diagram
The antenna diagram module of the RadiMation software is developed for special measurements that can be performed to characterise the antenna diagram of a broadcasting antenna by means of a helicopter. This module is only visible to specific customers who are using this module. Because of some slight differences from the general RadiMation concept, it can otherwise be confusing to normal users.

9.1 Overview

The following steps are normally performed during an antenna diagram measurement:

- Site survey by engineers on the ground
- Preparation of the test on the ground
- Input of information of the antenna tower
- Input of the frequency related information
- Integrity test of all equipment in the helicopter on the ground
- Data collection during flight
- Propagation flight(s)
- Vertical flight(s)
- Circle flight(s)

Before a measurement is started, engineers perform a site survey. The information collected during this survey should be entered in the RadiMation software. The screen where the information should be entered is named the location screen and is described in paragraph 9.2. This screen contains all information relevant and unique for the antenna tower including a section with a maximum of eight different radio stations called frequencies.
These frequencies can be generated from the file pull down menu. On the frequency window all information relevant and unique to the specific frequency and the used antenna can be entered. An unlimited number of frequency files can be generated. These frequency files are all related to the selected tower only. The files will be stored in the directory specific to the current location and the files will be automatically and uniquely named by a combination of the frequency and the program name.
As soon as all required frequency information is entered and saved, the prepared files can be selected with a maximum of eight from the location screen. Only the selected frequencies in the location window will be measured during the measurements
Now all relevant information from the site survey is entered in the RadiMation software and the specific tests can be prepared. This is done by means of so called Test Set-up Files or TSF's. In these files all information on a specific test is entered and stored for future use such that a minimum of effort is needed during the expensive helicopter flight.
Three types of tests are available in the antenna diagram module:

- Propagation flight (see paragraph 0)
- Vertical flight (see paragraph 9.6)
- Circle flight (see paragraph 0)

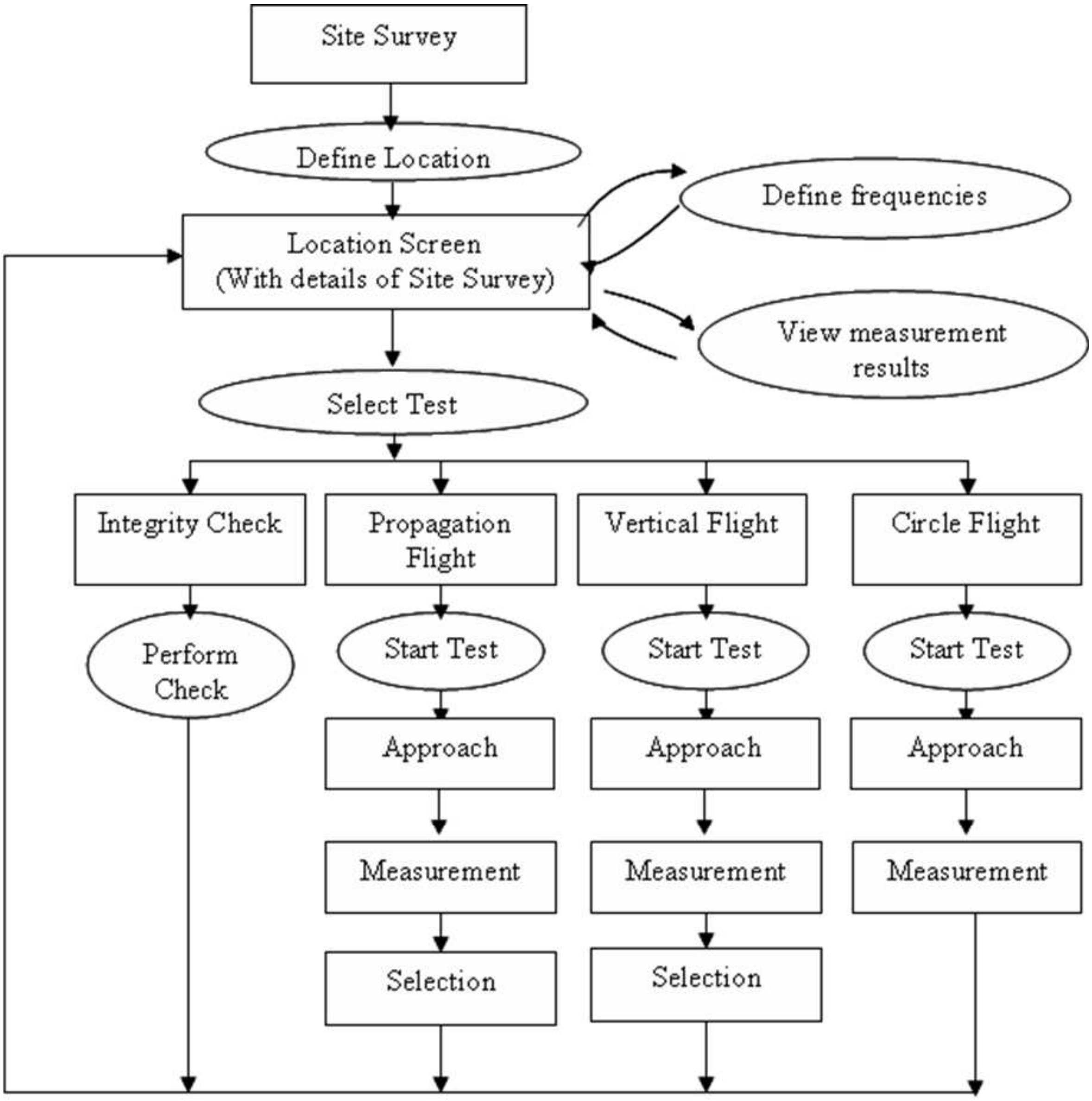
In the TSF's all information specific to a test can be entered as a preparation of the real test flights. As soon as all preparations are finished the helicopter can be arranged and prepared with all required equipment properly installed. Before actual takeoff of the helicopter a system integrity check (see paragraph 9.4)can be performed. The presence and working conditions of the necessary hardware (DGPS, receiver and pilot display) is checked in order to ensure that no expensive flight time is lost. As the integrity test is successfully completed the helicopter can takeoff and the actual testing can commence.
The tests will normally be performed in the following order:

- Propagation flight
- Vertical flight
- Circle flight

Although the first two may be omitted. The order is important, as each test will deliver information needed in the subsequent tests. So will the propagation flight deliver information on the exact distance of the vertical flight and will the vertical flight deliver the appropriate information on the height on which the circle flight would optimally be performed. Information of these two measurements will be passed to the circle flight in order to perform a circle flight at the optimum distance and height around the antenna tower.
The circle flight will always be performed in concentric circles around the defined center of the antenna tower. It is known that this center will normally not coincide with the center of the specific antenna. The software will correct the resulting error.
During the helicopter flight a test can be selected from the menu. For example: Tests > Antenna Diagram > Propagation flight will select the Propagation flight test. The user will get an overview of all available configured propagation flight TSF's and he has the possibility to select the appropriate one. If everything is right, pressing the start button will start the actual measurement. First all equipment is checked and intialised. When the initialisation was succesfull a new screen appears that will be available during the measurement. The measurement itself can be splitted into three phases:

1. Approach: The helicopter is directed to the start position of the flight
2. Measurement: The actual measurement and recording of the data.
3. Selection: Selection of the ideal point in the graph. The selected distance or height will then be used during the other tests.

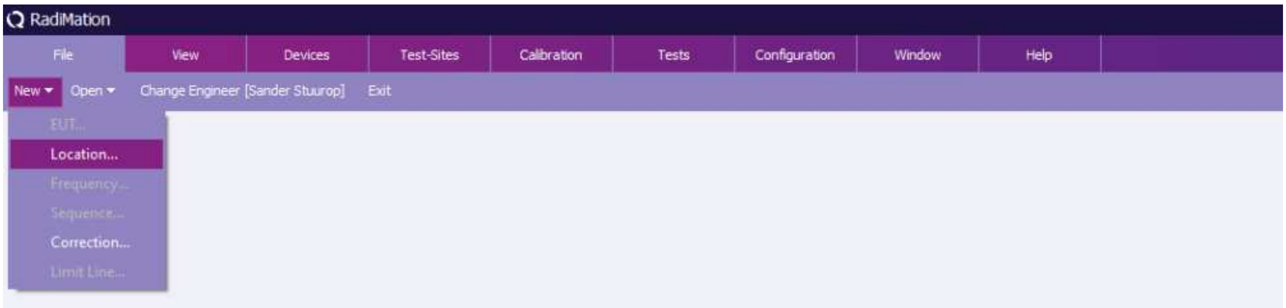
The circle flight doesn't include the third phase, because it is not necessary to pass an optimal height or distance to one of the other tests. When the measurement is performed and a selection is made, the location windows is shown again. Now another test can be started, or the measurement results of an already performed test can be viewed.



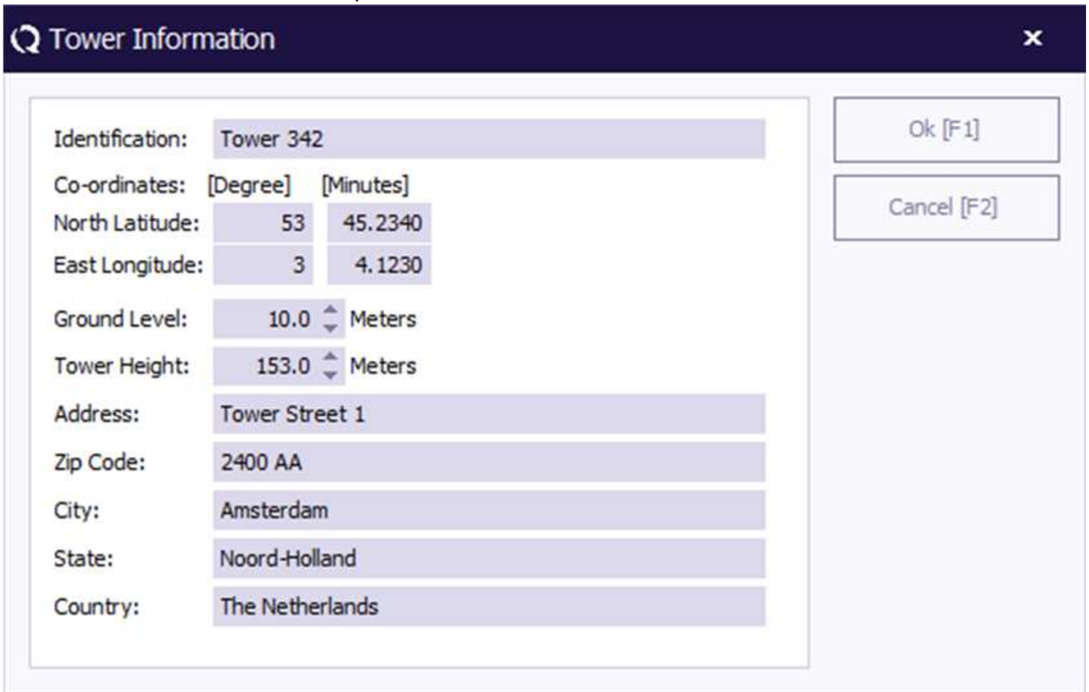
9.2 Location File

The Location screen contains all information related to the antenna tower. Most of this information is collected during the site survey or is available from other sources. A new location file can be created by selecting:

- **File**
  - **New**
    - **Location**



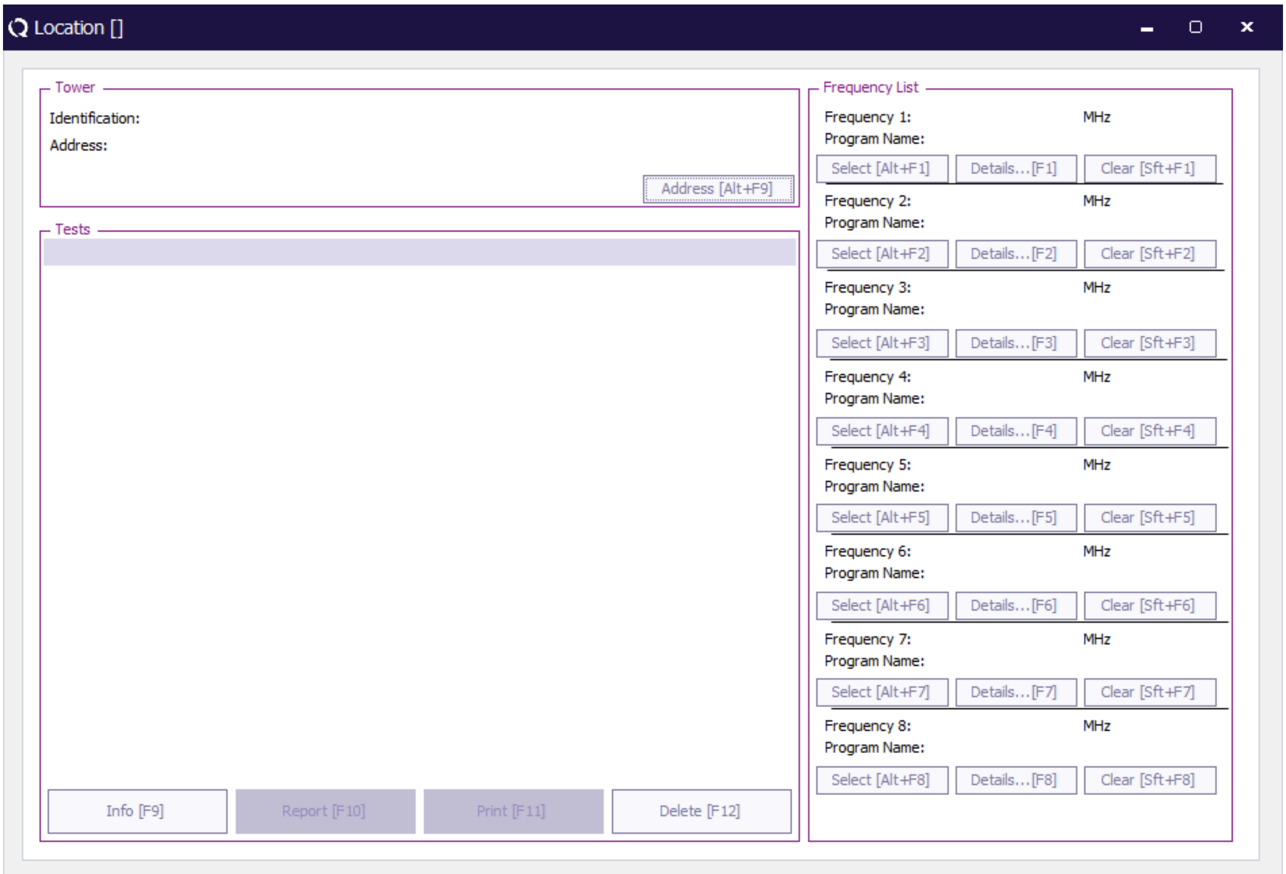
When a new location is made, the user is forced to enter the information of the antenna tower.



The tower information window gives the user the possibility to define:

- Identification: A clear (internal) identification for the antenna tower. This identification will also be used to create an unique filename for the location file
- North Latitude and East Longitude: The exact location of the center of the antenna tower
- Ground level: The ground level at the location of the antenna tower
- Tower Height: The height of the tower
- Adress
- ZIP code
- City
- State
- Country

The items "Identification", "North Latitude", "East Longitude", "Ground level", "Tower height" and "Address" have to be filled in. The items "North Latitude", "East Longitude" and "Ground level" are used during the meaurements to calculate the correct distance between the helicopter and the antenna's in the antenna tower.



The location window shows the identification and the address of the antenna tower. Pressing the Address button will show additional information of the antenna tower. The white square labeled "Tests" will show all tests performed for this specific tower. The tests are identified by the description of the TSF. So each test generates a single line in the test screen. This line represents the description given to the Test Setup File as described in the three different test. The buttons in the "Tests" area are used to perform operations on the available test-results:

- Info: show the measurements results of the selected test
- Delete: delete the selected test(s). Before the information is actually deleted the user is asked to confirm the delete operation.

On the right side of the screen an overview of a maximum of eight selected frequencies is presented. For each frequency the frequency and the program name are displayed. Buttons below each frequency enable the user to select a frequency file ("Select"), display the details of a selected frequency file ("Details") or clear the frequency from the list ("Clear"). Doing this will unselect the file and clear the related information from the screen. All frequencies below the cleared frequency will shift one position up.

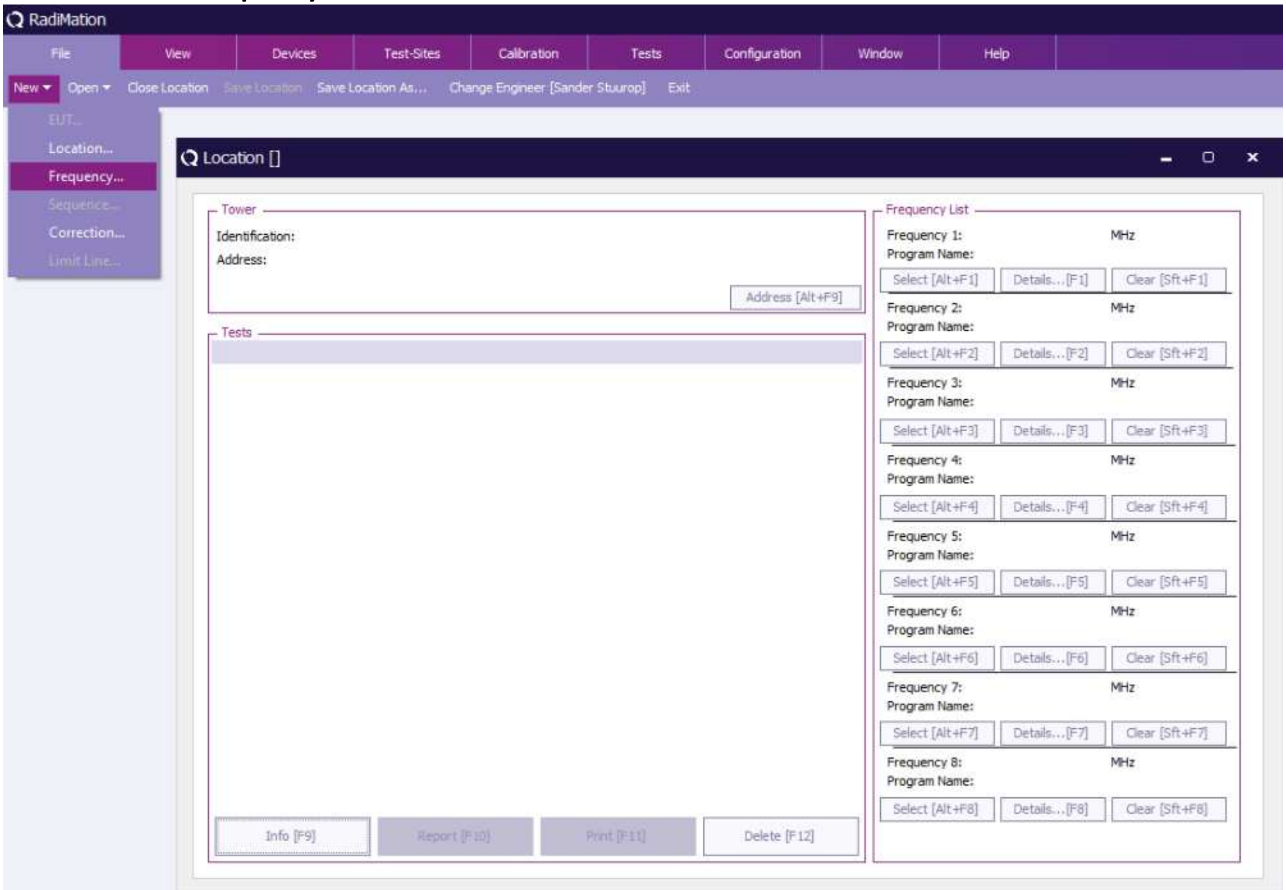
9.3 Frequency File

A frequency file describes the information of a to be measured frequency, and the antenna that is used to transmit the broadcasting signal on that frequency. Most of this information is collected during the site survey or is available from other sources. The information should be entered before the real helicopter measurements are started.

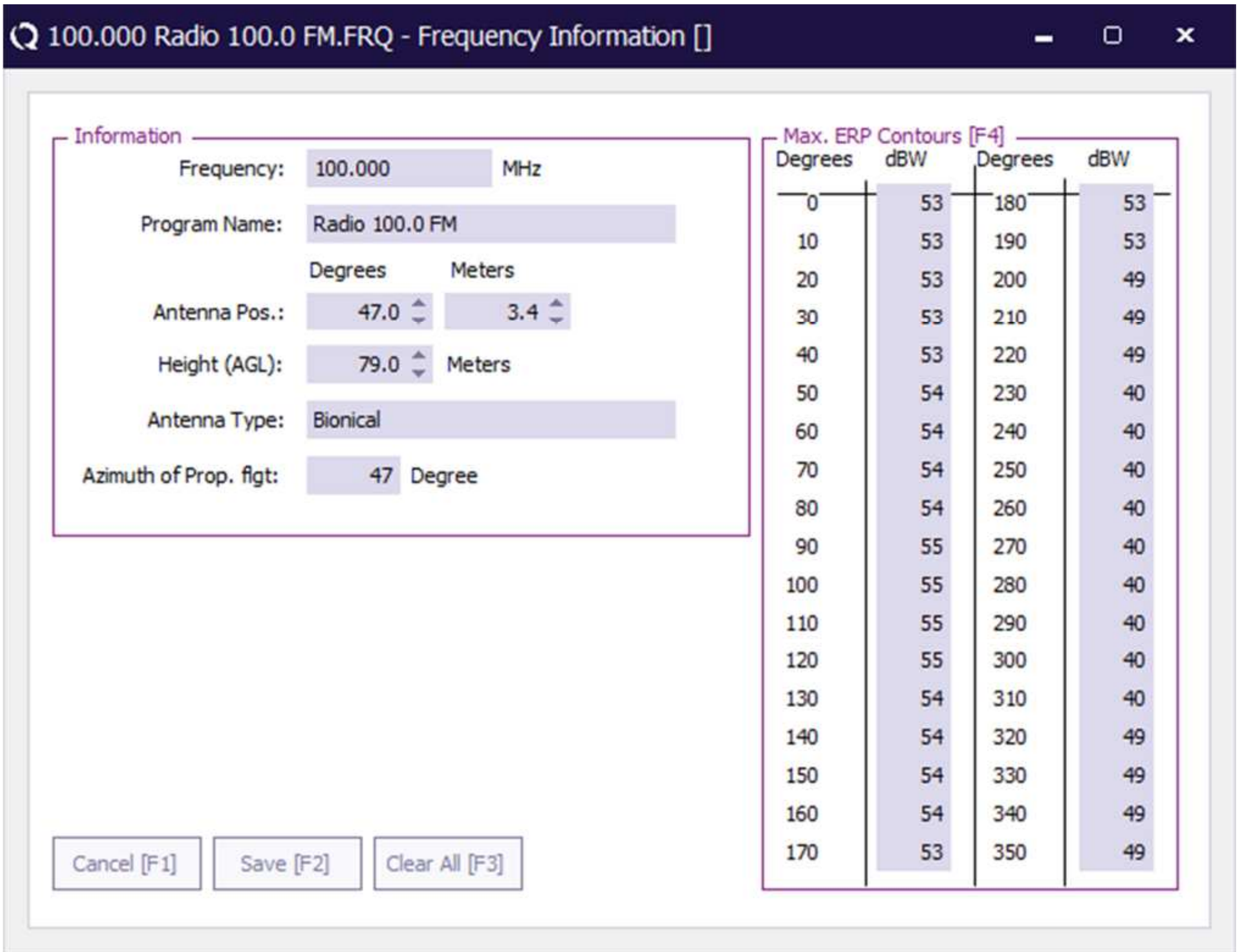
The frequency file will be saved in an unique filename, which is a combination of the frequency and the program name. The frequency file is associated with the location file. This means that a

frequency will be stored close to the location file. This results into that a frequency file will not appear in the list of saved frequency files of another location file.
Due to this reason it is necessary that first a new location file is made (see paragraph 9.2). Only when a location file is opened in RadiMation, a new frequency file can be created by selecting:

- **File**
  - **New**
    - **Frequency**



When a new frequency file is made, the frequency information window will appear automatically.



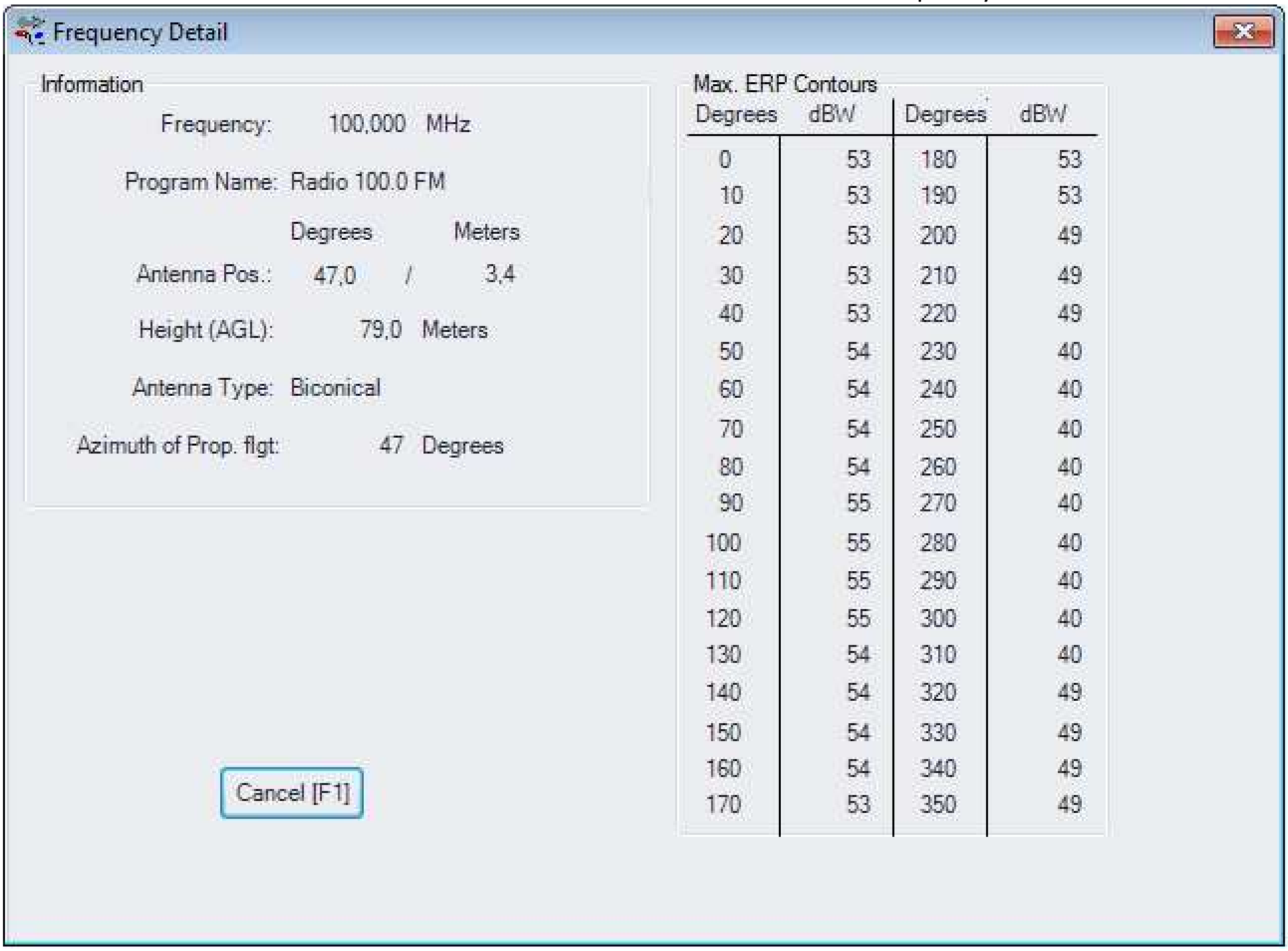
On the frequency information window the following items have to be filled in:

- Frequency: The exact frequency that should be measured during the measurements
- Program Name: A description
- Antenna degree: At which angle the antenna is positioned relative to the center of the antenna tower
- Antenna distance (meters): The distance from the center of the antenna to the center of the antenna tower.
- Height (AGL): The location of the antenna Above the Ground Level (AGL). The ground level at the location of the antenna tower is already specified in the location file.
- Antenna type: A description of the type of the antenna
- Azimuth of Prop. Flgt: The proposed azimuth for the propagation flight.

If the maximum effective radiated power (ERP) of this antenna should be limited to certain values, the user has the possibility to define the maximum ERP values in 10 degree steps. The ERP values have to specified in dBm. The maximum ERP value that can be entered is limited to 70 dBW. The minimum ERP value that can be entered is -40 dBW. It is not necessary to specify an ERP contour for an antenna. But if an ERP value is specified for a specific angle, all the ERP contour values also have to be specified. If an ERP contour is specified the ERP contour will be shown during the circle flight tests. If no contour is specified then no contour for this frequency will be shown during the circle flight test.

The button "Cancel" will close the frequency information window, without saving the changes that were made. The button "Save" will save the entered information into a frequency file. If a frequency

file with the correct name does not already exist, the frequency file will be generated. If the frequency or the program name is changed, a new frequency file will be created based on the changed parameters. The button "Clear All" can be used to clear all the ERP values from the ERP contour list.
An unlimited number of different frequency files can be created. However only a maximum of 8 different frequencies can be selected at one time in a location file. On the location window eight frequency boxes are present. After a frequency file has been created, a frequency can be selected in one of these boxes by pushing the "Select" button. Only the frequency and the program name will be displayed on the location screen. As soon as a file is selected all parameters are defined. The "Details" button can be used to show the information inside the selected frequency file.



The button "Clear" will unselect a frequency file from the location window. The related information of the frequency will also be removed from the window. All frequencies below the cleared frequency will shift one position up.

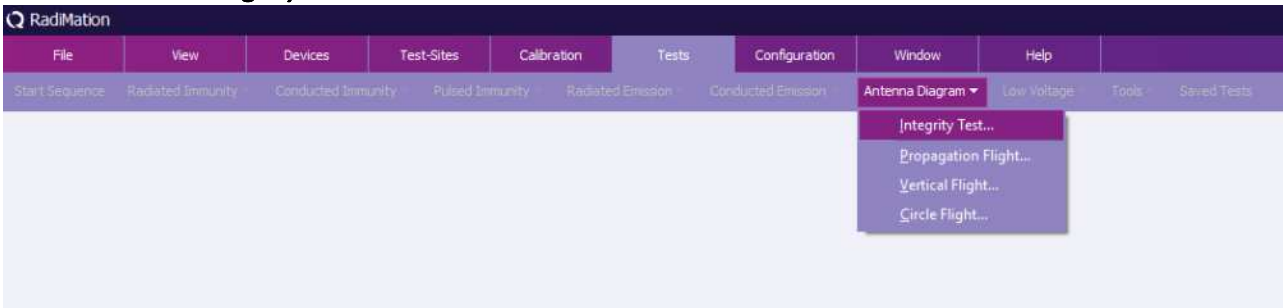
9.4 Integrity Test

The integrity Test is not a real test in the sense that it is used to collect or measure real data. The integrity Test is meant to check the if complete system is correctly setup in the helicopter, before the helicopter is actual take-ing off. With the help of the integrity test is it possible to decrease the helicopter flying time (which is extremely expensive) to a minimum by ensuring that all the equipment is correctly setup.
The integrity test can be started by selecting from the pull down menu:

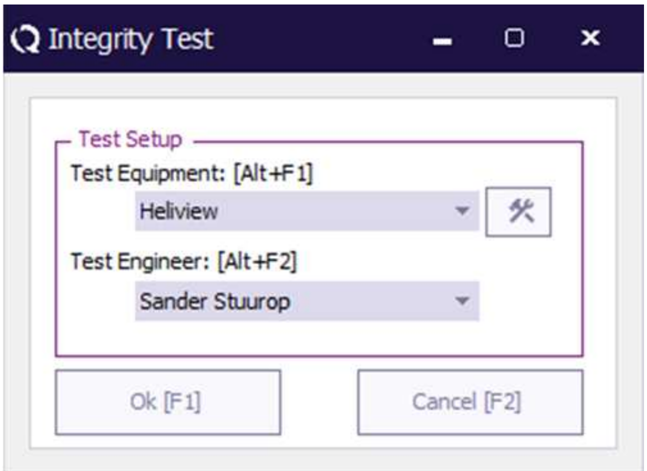
- **Tests**

➢ **Antenna Diagram**

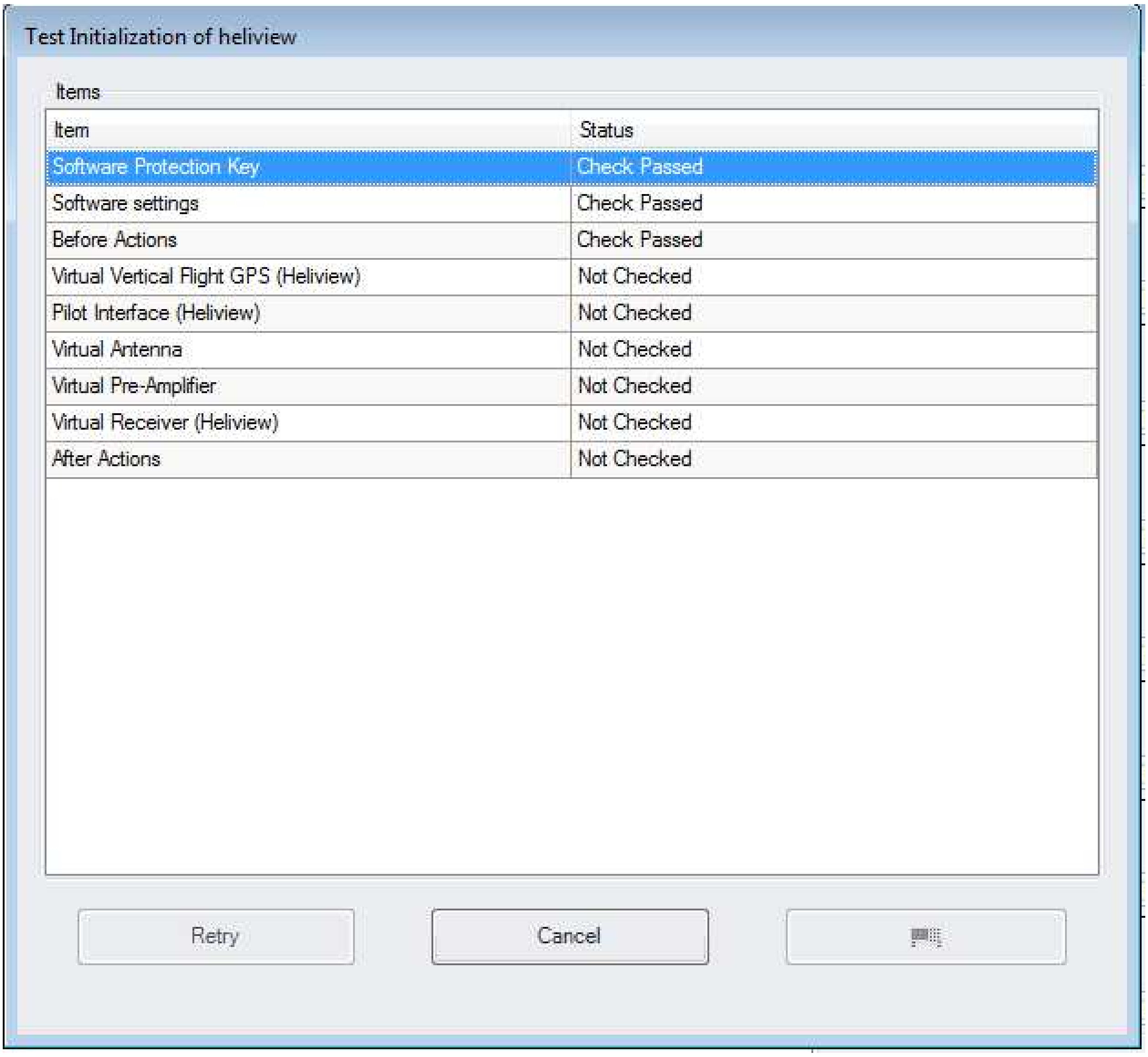
➢ **Integrity Test**



It is possible to start the integrity test with and without an open location file. To only parameters that have to be specified is, which test-site has to be used to check all the equipment.



When the "Ok" button is pressed, the integrity test will be started.



The following items are checked and initialized:

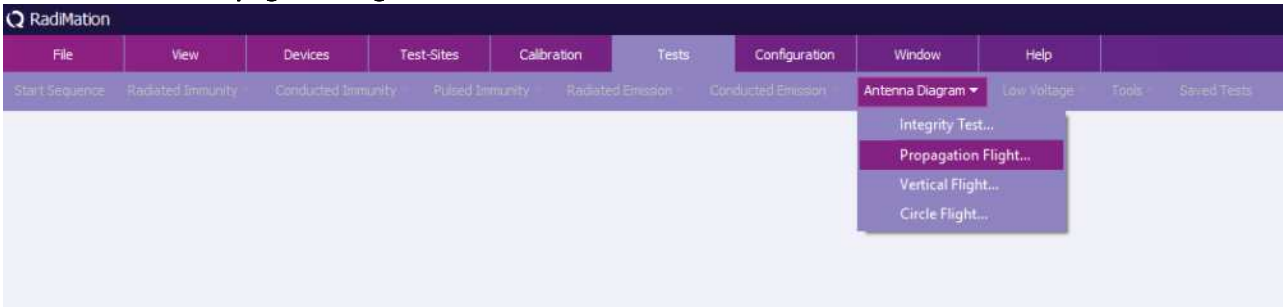
- Software protection key
- Software settings
- GPS receiver
- Antenna
- Pre-Amplifier
- Receiver
- Pilot Interface

After the integrity test is performed and all checks and intialisations are passed, the user can be sure that the other tests can be performed. The integrity test will also be automatically be performed before each test is executed as it is always possible some anomalies occur during flying in a helicopter with all sort of vibrations.

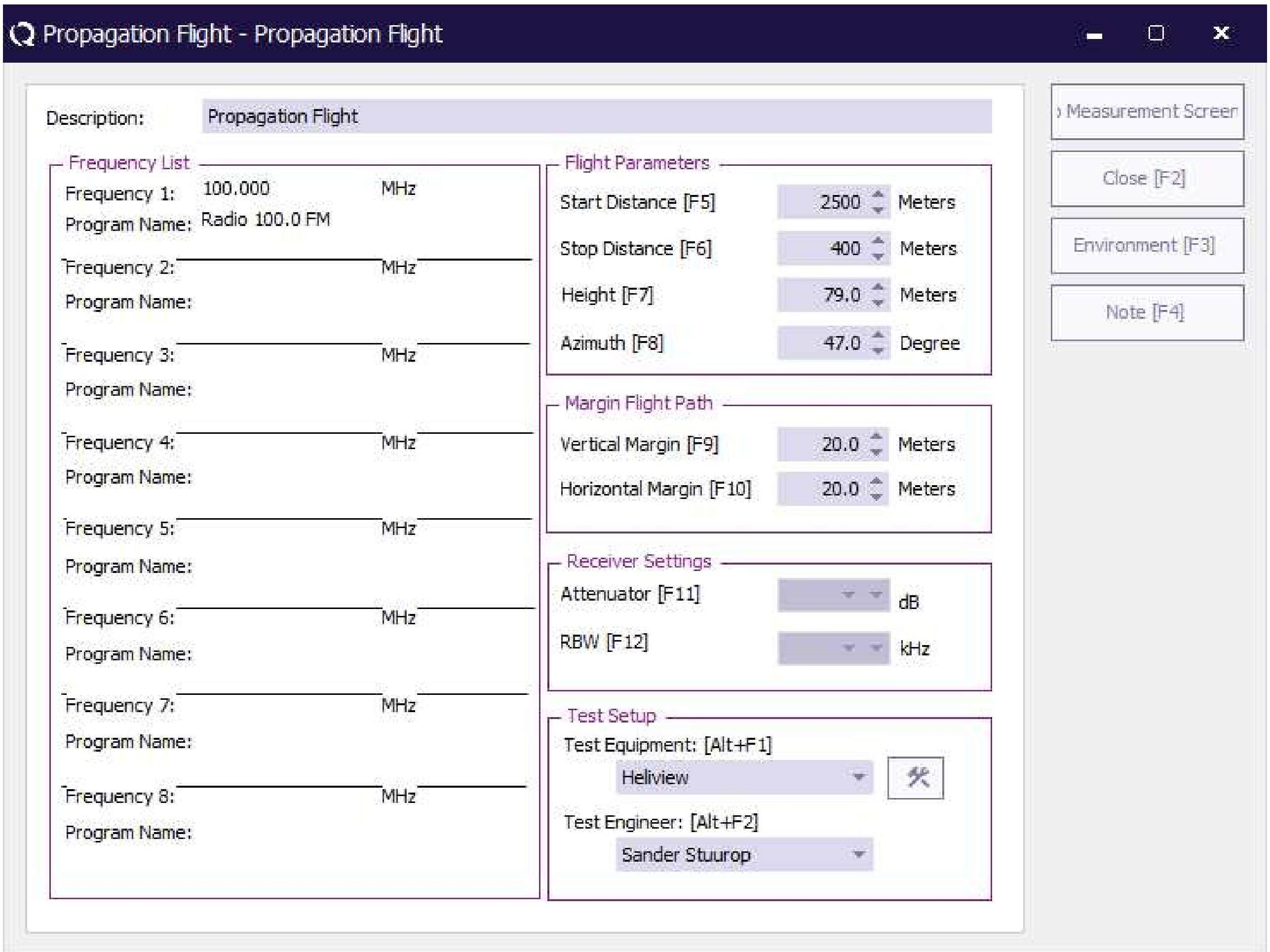
9.5 Propagation Flight

After the site survey has been performed and the location and frequency files have been created. the details of propagation flight have to be entered before the actual test is commenced. So from the Test pull down menu the user selects the appropriate test by selecting:

- **Test**
  - **Antenna Diagram**
    - **Propagation flight**



A window will be shown where the test-engineer has the possibility to select an already configured Test Setup File (TSF) for a propogation flight for this location. When a configured test is selected, the "Ok" button can be pressed, and the test configuration will be opened. If a new configuration has to be made the "New" button can be pressed, which will create a new TSF file for the propogation flight. The following screen will appear. This is the input screen for the Test Setup File (TSF) for the Propagation flight.



On the left side of the screen an overview of the selected frequencies is presented. Another four frames respectively represent the information on the flight path (approach) of the test, the margins of the flight path, the receiver settings and the test setup. The following parameters have to be configured:

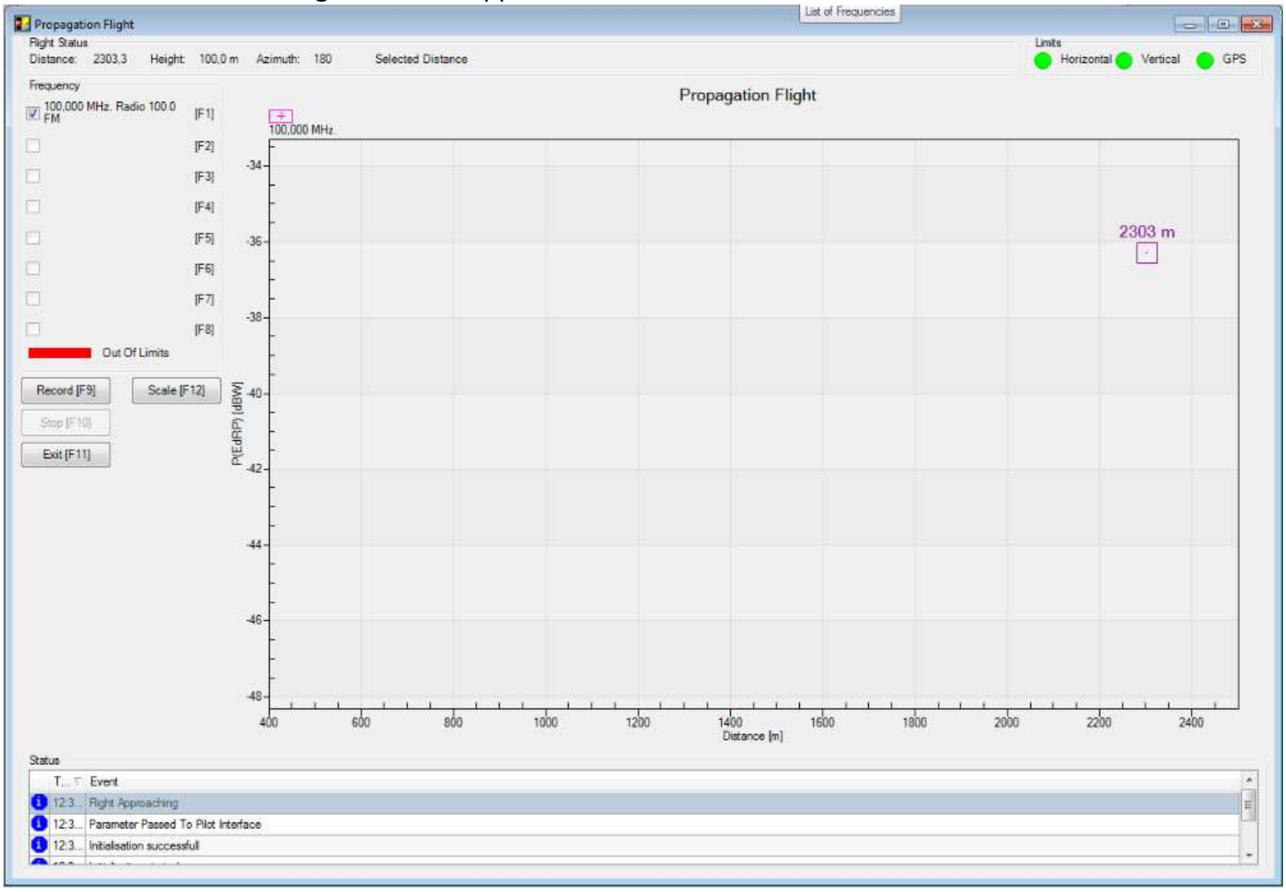
- Description: A descriptive name for the propagation flight configuration
- Start Distance: the distance from where the helicopter will fly to the antenna tower
- Stop Distance: the distance to the antenna tower, where the measurement has to stop automatically
- Height: the height (above ground level) at which the helicopter should fly
- Azimuth: The direction relative to the antenna tower at which the helicopter should fly
- Horizontal margin: the maximum accepted horizontal deviation of the helicopter apposed to the optimal flight path. This value will be used to show the margins on the pilot interface display to the helicopter pilot. Also when data is measured when the helicopter is outside the valid margins, the data will be plotted in red in the graphs.
- Vertical margin: the maximum accepted vertical deviation of the helicopter apposed to the optimal flight path. This value will be used to show the margins on the pilot interface display to the helicopter pilot. Also when data is measured when the helicopter is outside the valid margins, the data will be plotted in red in the graphs.
- Attenuator: The to be used attenuation setting on the measurement receiver
- RBW: The to be used RBW setting on the measurement receiver
- Test Equipment: The configuration of the test-site which has to be used during the measurements

- Test Engineer: The test-engineer who will perform the measurements

All parameters should be configured, before the measurement can be started.
The following buttons are available:

- Go To Measurement Screen: Start the measurement
- Close: Close this window without starting the measurement
- Environment: Some additional data can be entered like: Temperature, Humidity and Pressure.
- Note: Any kind of information can be entered that could be relevant to this measurement. This note is also available during and after the test.

When all parameters are configured correctly, the configuration of this measurement can be saved as a TSF file. This can be done by selecting from the menu: File > Save TSF. The configuration will be stored in a TSF file with a filename which is the same as the given description. When the configuration is saved to a TSF file, the same configuration can easily be selected the next time a propagation flight should be started.
When a propagation flight test is started, first an integrity test is performed. When the integrity test was succesfull the folowing screen will appear:



This window is displaying the current status of the measurement, and all important real-time information is displayed on this window during the measurement:

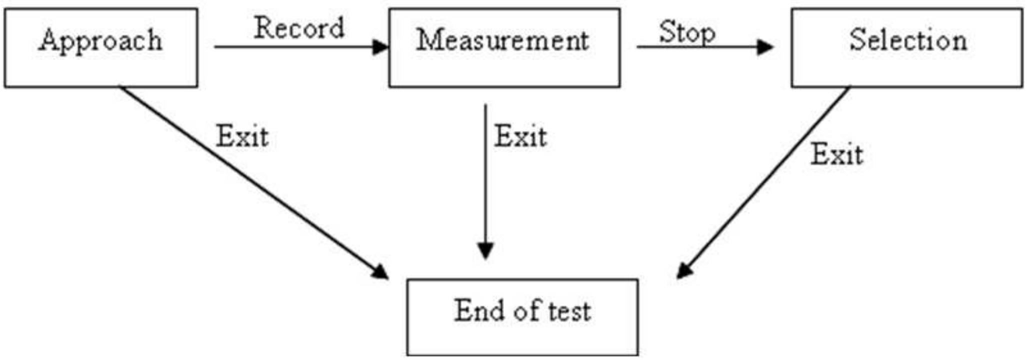
- Distance: The current distance of the helicopter to the antenna tower
- Height: The current height of the antenna below the helicopter compared to the ground level
- Azimuth: The current angle between the helicopter and the antenna tower
- Limits: The LED's are indications of a current error situation:
- Horizontal: the helicopter is within the horizontal margins
- Vertical: the helicopter is within the vertical margins
- GPS: A correct and accurate GPS signal is received

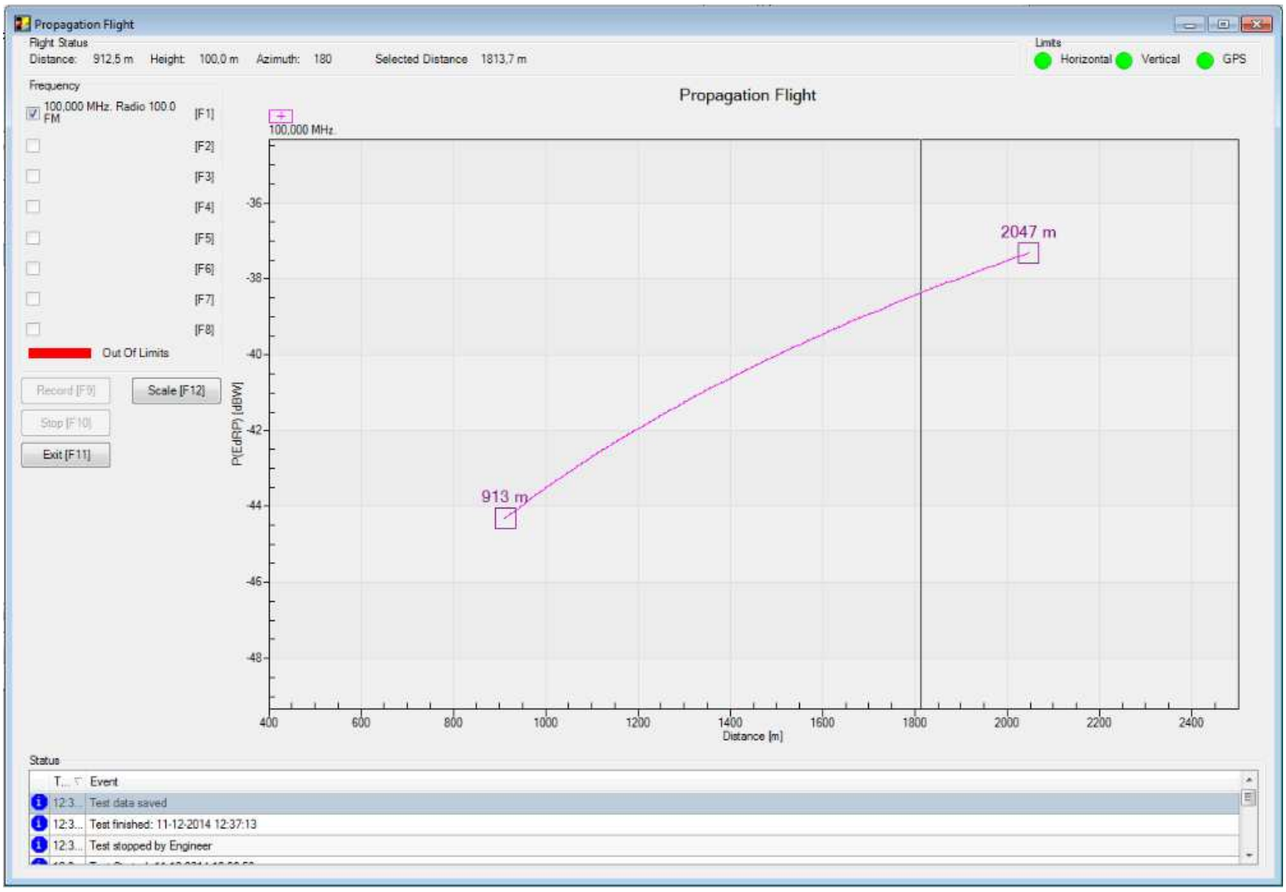
- Status: A list of all informational, warning and error messages during a test. Several warnings and errors can be displayed in this list

The biggest part of the screen is occupied by the graph which contains the measured and calculated ERP power for each measured frequency. Each line in the graph for a frequency is displayed by it's own colour. The legend above the graph is also showing all the currently plotted frequencies. Which frequencies are shown inside the graph is determined by the checkboxes on the left side of the window. By pressing the buttons F1 to F8, frequencies can be turned on or off. All the frequencies are always measured, but only the selected frequencies will be plotted inside the graph. The "Scale" button will calculate a new optimum displaying scale for the graph, and it will redraw the graph with the new scales. The upper Y-value of the graph will be calculated to be 3 dB more than the maximum measured value. The lower Y-value of the graph will be calculated to be 12 dB less than the maximum measured value.
The measurement window also has some buttons that control the measurement phase during the test. The propagation flight has three phases:

1. Approach
2. Measurement
3. Selection

The propagation flight will always start in the Approach phase, this phase should be used to position the helicopter on the correct starting position. Based on the indication of the LED's, the test-engineer can determine when the correct starting position has been reached. During the Approach phase, the graph will only show the last measured and calculated values for each frequency. When the correct starting position has been reached, the "Record" should be pushed to enter the measurement phase. In the measurement phase all the measured and calculated ERP values for each frequency will be plotted in the graph. Each the frequency will be plotted in his own colour, except when the helicopter is flying outside the specified margins, if that is the case, the frequencies will be drawn in red. The test-engineer can stop the measurement phase by pressing the "Stop" button. The measurement phase will automatically be ended when the helicopter reaches the specified stop distance.



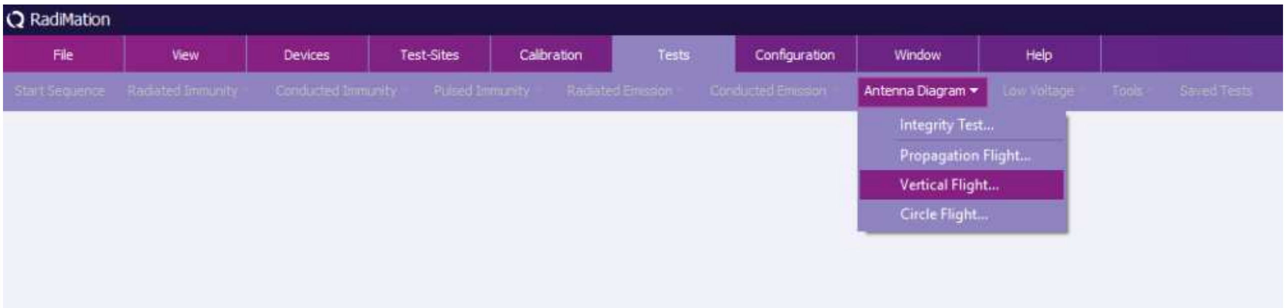


When the propagation flight is in the selection phase, the test-engineer has the possibility to select the best measurement distance for the vertical and circle flight. When the selection phase is entered, the graph will get a selection line. The selection line can be moved with the mouse (by clicking on any frequency in the graph) or with the keyboard. The PageUp key and the Left-Arrow button will move the selection line to the stop distance. The PageDown key and the Right-Arrow button will move the selection line to the start distance. When the selection line is moved, the selected distance in the top of the window will be updated to the selected distance. When the test-engineer has selected the correct distance, the "Exit" button should be pressed. This will end the test, and will deinitialise all the used equipment.
The propagation flight can be stopped from any phase by pressing the "Exit" button.
After completion of the test, the test-engineer can view the data of the measurement in the graph by selecting the test and pressing the "Info" button in the location screen. The same window will appear as during the test, but without the "Record" and "Stop" buttons. Also on this window the available frequencies can also be shown or hidden by selecting the checkboxes on the left part of the window.

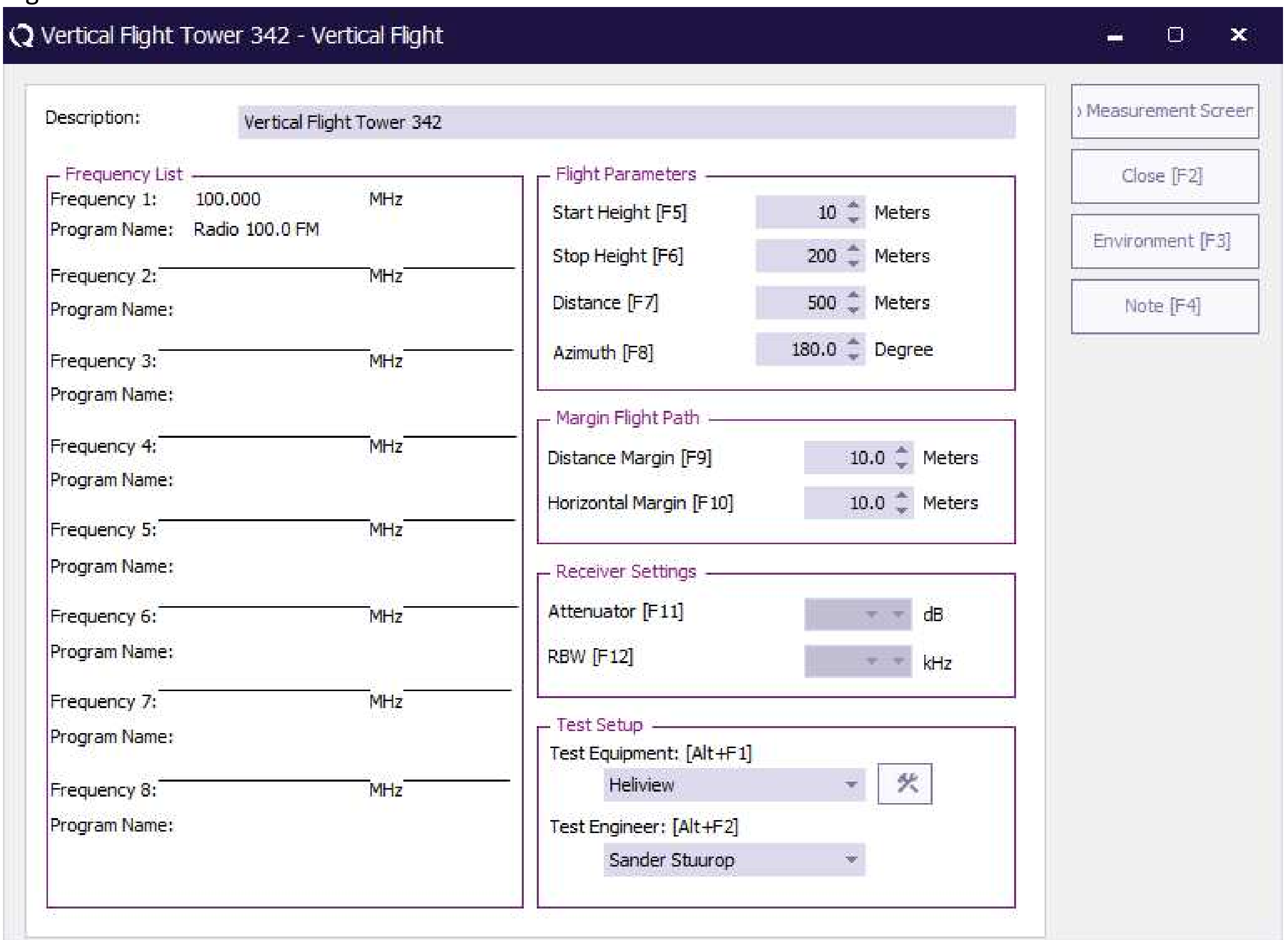
9.6 Vertical Flight

After the site survey has been performed and the location and frequency files have been created. the details of vertical flight have to be entered before the actual test is commenced. So from the Test pull down menu the user selects the appropriate test by selecting:

- **Test**
  - **Antenna Diagram**
    - **Vertical flight**



A window will be shown where the test-engineer has the possibility to select an already configured Test Setup File (TSF) for a vertical flight for this location. When a configured test is selected, the "Ok" button can be pressed, and the test configuration will be opened. If a new configuration has to be made the "New" button can be pressed, which will create a new TSF file for the vertical flight. The following screen will appear. This is the input screen for the Test Setup File (TSF) for the Vertical flight.



On the left side of the screen an overview of the selected frequencies is presented. Another four frames respectively represent the information on the flight path (approach) of the test, the margins of the flight path, the receiver settings and the test setup. The following parameters have to be configured:

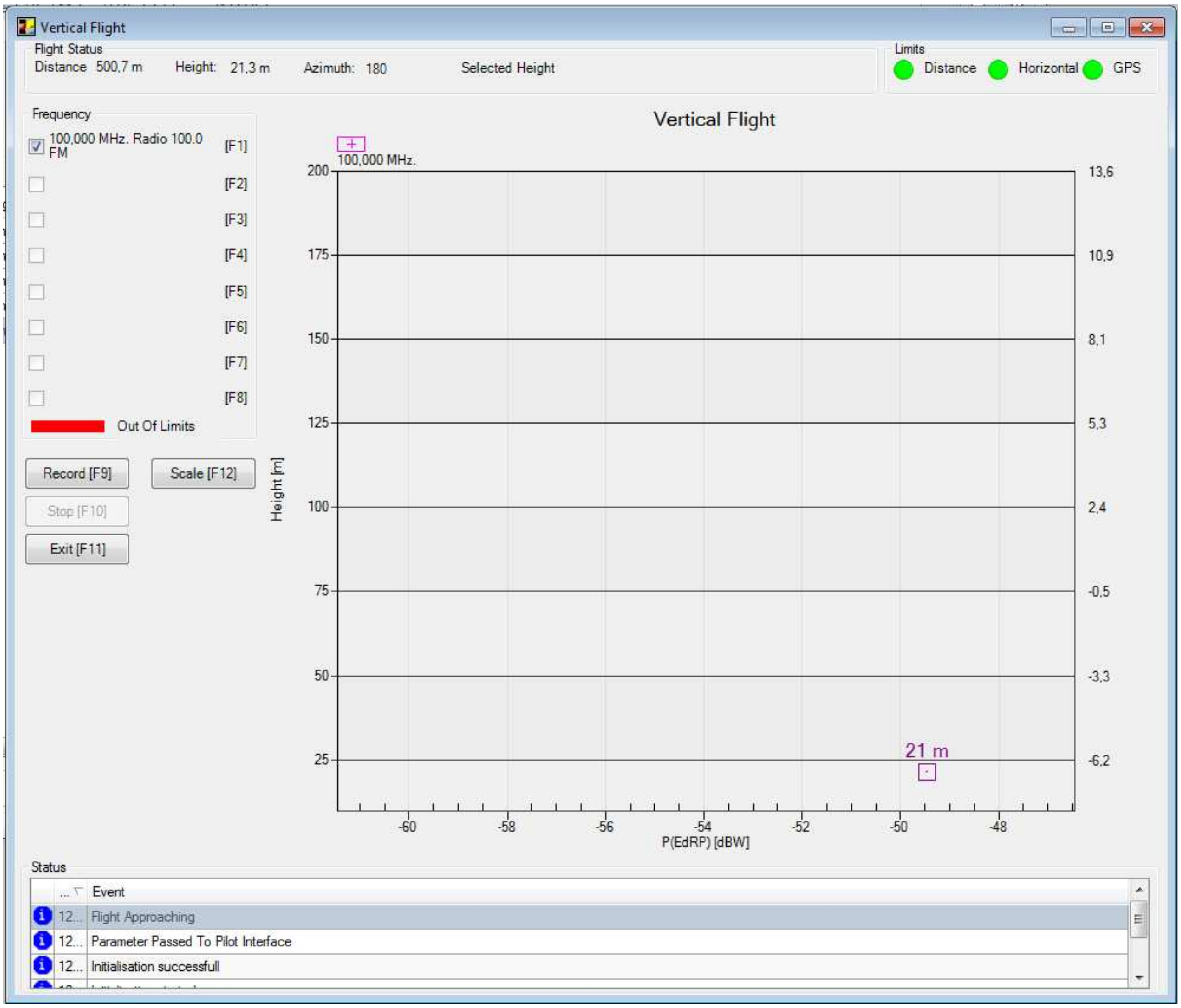
- Description: A descriptive name for the veritcal flight configuration
- Start Height: the height where the helicopter will start. The helicopter should fly up, so the start height show be lower than the stop heigth

- Stop Height: the height where the measurement has to stop automatically. The stop height should be heigher than the start height.
- Distance: the optimum distance from the antenna tower at which the helicopter should fly. This value will automatically be updated to be the last selected distance from the last propagation flight.
- Azimuth: The direction relative to the antenna tower at which the helicopter should fly
- Distance margin: the maximum accepted distance deviation of the helicopter apposed to the optimal distance. This value will be used to show the margins on the pilot interface display to the helicopter pilot. Also when data is measured when the helicopter is outside the valid margins, the data will be plotted in red in the graphs.
- Vertical margin: the maximum accepted vertical deviation of the helicopter apposed to the optimal flight path. This value will be used to show the margins on the pilot interface display to the helicopter pilot. Also when data is measured when the helicopter is outside the valid margins, the data will be plotted in red in the graphs.
- Attenuator: The to be used attenuation setting on the measurement receiver
- RBW: The to be used RBW setting on the measurement receiver
- Test Equipment: The configuration of the test-site which has to be used during the measurements
- Test Engineer: The test-engineer who will perform the measurements

All parameters should be configured, before the measurement can be started.
The following buttons are available:

- Go To Measurement Screen: Start the measurement
- Close: Close this window without starting the measurement
- Environment: Some additional data can be entered like: Temperature, Humidity and Pressure.
- Note: Any kind of information can be entered that could be relevant to this measurement. This note is also available during and after the test.

When all parameters are configured correctly, the configuration of this measurement can be saved as a TSF file. This can be done by selecting from the menu: File > Save TSF. The configuration will be stored in a TSF file with a filename which is the same as the given description. When the configuration is saved to a TSF file, the same configuration can easily be selected the next time a vertical flight should be started.
When a vertical flight test is started, first an integrity test is performed. When the integrity test was succesfull the folowing screen will appear:



This window is displaying the current status of the measurement, and all important real-time information is displayed on this window during the measurement:

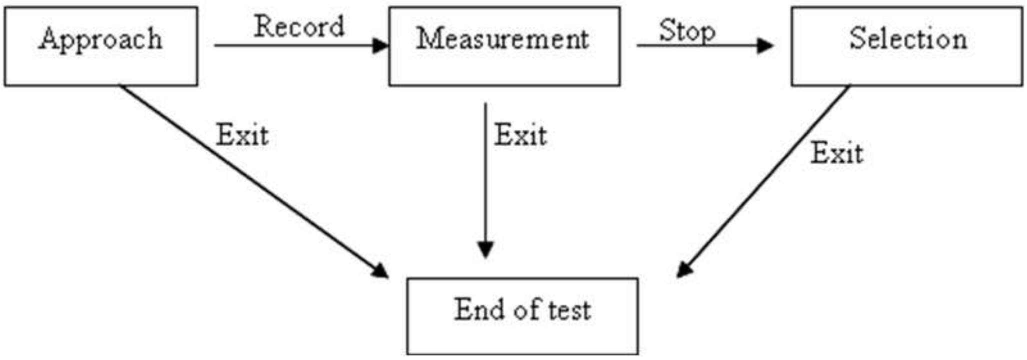
- Distance: The current distance of the helicopter to the antenna tower
- Height: The current height of the antenna below the helicopter compared to the ground level
- Azimuth: The current angle between the helicopter and the antenna tower
- Limits: The LED's are indications of a current error situation:
- Distance: the helicopter is within the distance margins
- Horizontal: the helicopter is within the horizontal margins
- GPS: A correct and accurate GPS signal is received
- Status: A list of all informational, warning and error messages during a test. Several warnings and errors can be displayed in this list

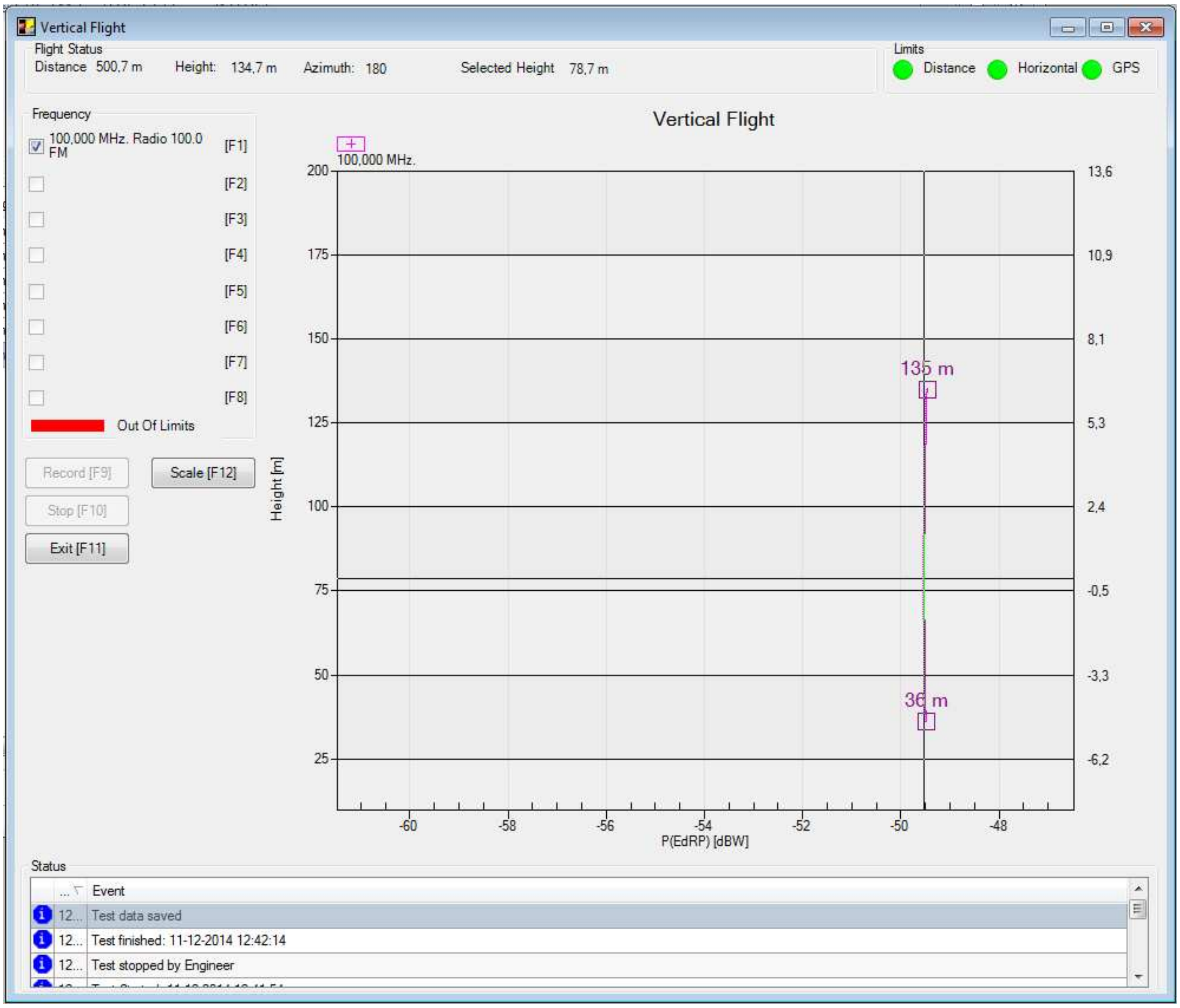
The biggest part of the screen is occupied by the graph which contains the measured and calculated ERP power for each measured frequency. Each line in the graph for a frequency is displayed by it's own colour. The legend above the graph is also showing all the currently plotted frequencies. Which frequencies are shown inside the graph is determined by the checkboxes on the left side of the window. By pressing the buttons F1 to F8, frequencies can be turned on or off. All the frequencies are always measured, but only the selected frequencies will be plotted inside the graph. The "Scale" button will calculate a new optimum displaying scale for the graph, and it will redraw the graph with the new scales. The right X-value of the graph will be calculated to be 3 dB more than the maximum

measured value. The left X-value of the graph will be calculated to be 12 dB less than the maximum measured value. The left Y-axis of the graph is showing the height in meters. The right Y-axis of the graph is showing the down-tilt from the transmitting antenna to the helicopter antenna.
The measurement window also has some buttons that control the measurement phase during the test. The vertical flight has three phases:

1. Approach
2. Measurement
3. Selection

The vertical flight will always start in the Approach phase, this phase should be used to position the helicopter on the correct starting position. Based on the indication of the LED's, the test-engineer can determine when the correct starting position has been reached. During the Approach phase, the graph will only show the last measured and calculated values for each frequency. When the correct starting position has been reached, the "Record" should be pushed to enter the measurement phase. In the measurement phase all the measured and calculated ERP values for each frequency will be plotted in the graph. Each the frequency will be plotted in his own colour, except when the helicopter is flying outside the specified margins, if that is the case, the frequencies will be drawn in red. The test-engineer can stop the measurement phase by pressing the "Stop" button. The measurement phase will automatically be ended when the helicopter reaches the specified stop distance.



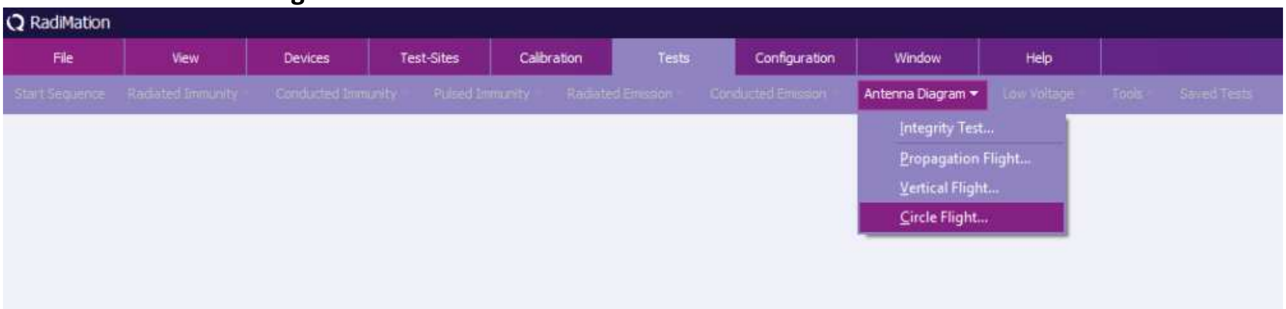


When the vertical flight is in the selection phase, the test-engineer has the possibility to select the best measurement height for the circle flight. When the selection phase is entered, the graph will get a selection line. The selection line can be moved with the mouse (by clicking on any frequency in the graph) or with the keyboard. The PageUp key and the Up-Arrow button will move the selection line to the stop height. The PageDown key and the Down-Arrow button will move the selection line to the start height. When the selection line is moved, the selected height in the top of the window will be updated to the selected height. When the test-engineer has selected the correct height, the "Exit" button should be pressed. This will end the test, and will deinitialise all the used equipment.
The vertical flight can be stopped from any phase by pressing the "Exit" button
After completion of the test, the test-engineer can view the data of the measurement in the graph by selecting the test and pressing the "Info" button in the location screen. The same window will appear as during the test, but without the "Record" and "Stop" buttons. Also on this window the available frequencies can also be shown or hidden by selecting the checkboxes on the left part of the window.

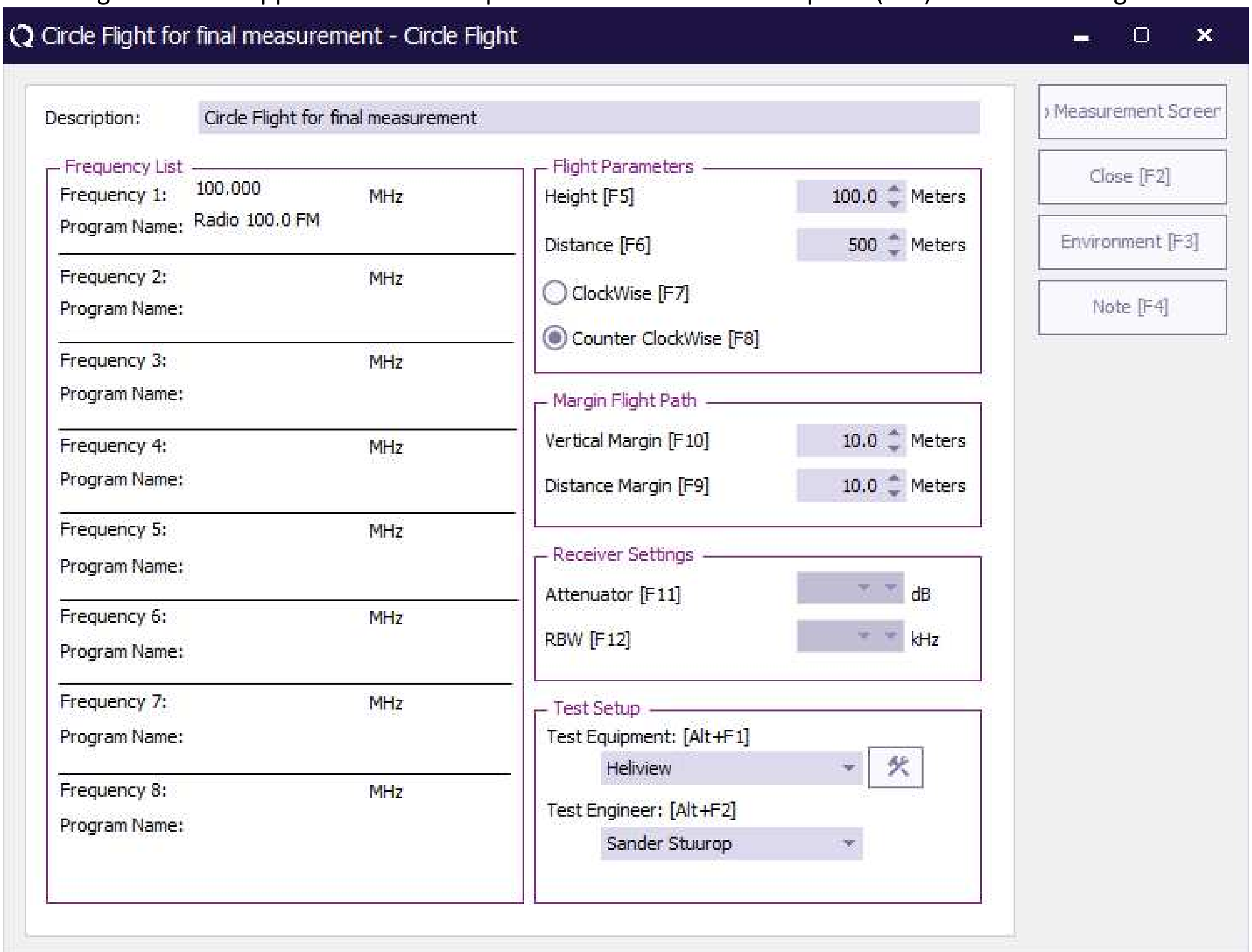
9.7 Circle Flight

After the site survey has been performed and the location and frequency files have been created. the details of circle flight have to be entered before the actual test is commenced. So from the Test pull down menu the user selects the appropriate test by selecting:

- **Test**
  - **Antenna Diagram**
    - **Circle flight**



A window will be shown where the test-engineer has the possibility to select an already configured Test Setup File (TSF) for a circle flight for this location. When a configured test is selected, the "Ok" button can be pressed, and the test configuration will be opened. If a new configuration has to be made the "New" button can be pressed, which will create a new TSF file for the circle flight. The following screen will appear. This is the input screen for the Test Setup File (TSF) for the circle flight.



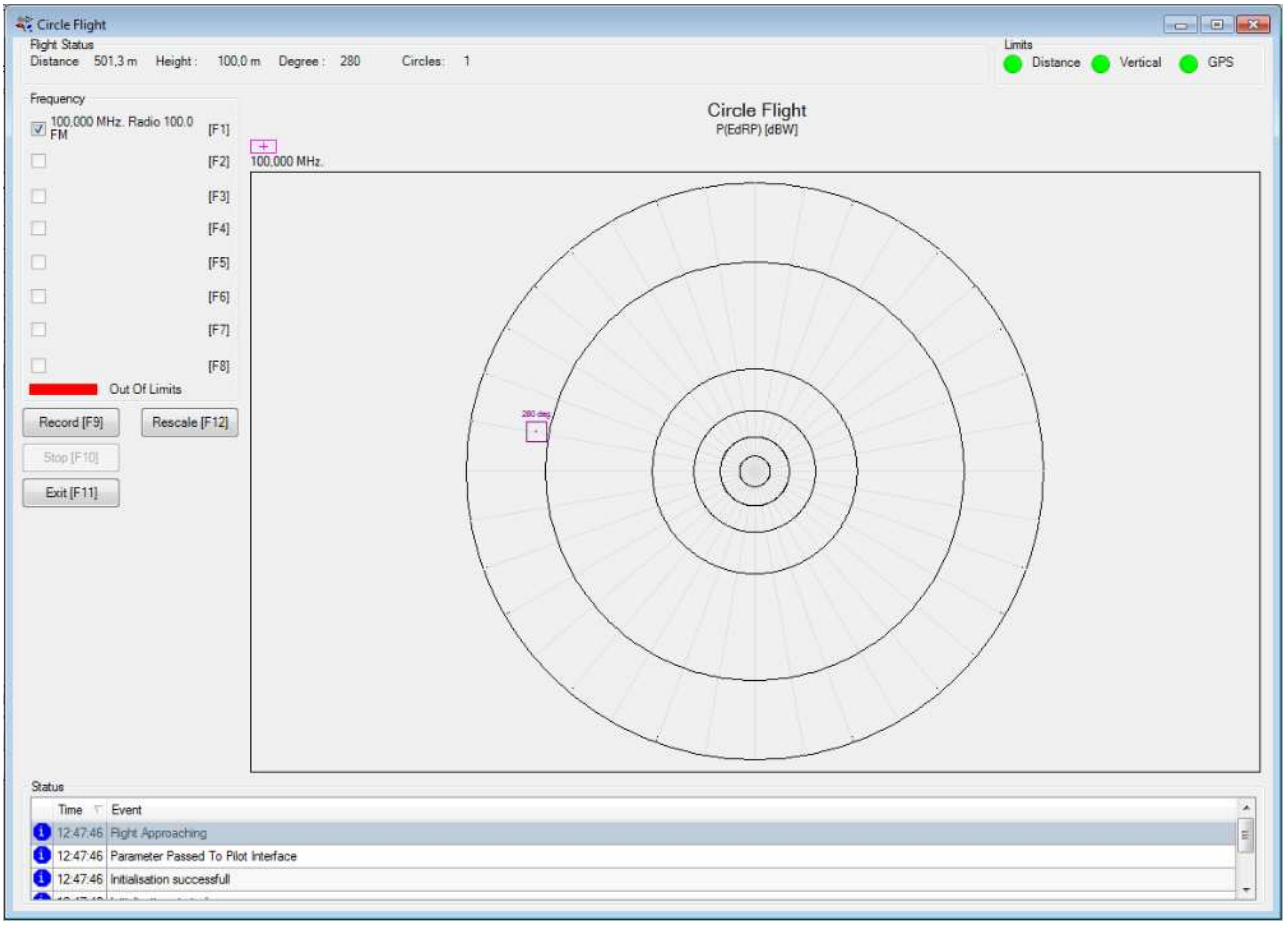
On the left side of the screen an overview of the selected frequencies is presented. Another four frames respectively represent the information on the flight path (approach) of the test, the margins of the flight path, the receiver settings and the test setup. The following parameters have to be configured:

- Description: A descriptive name for the circle flight configuration
- Height: the height (above ground level) at which the helicopter should fly. This value will automatically be updated to be the last selected height from the last vertical flight.
- Distance: the optimum distance from the antenna tower at which the helicopter should fly. This value will automatically be updated to be the last selected distance from the last propagation flight.
- Clockwise or Counter Clockwise: the selection of the suggested flying direction around the tower. This information is used to correctly display information on the pilot interface.
- Vertical margin: the maximum accepted vertical deviation of the helicopter apposed to the optimal flight path. This value will be used to show the margins on the pilot interface display to the helicopter pilot. Also when data is measured when the helicopter is outside the valid margins, the data will be plotted in red in the graphs.
- Distance margin: the maximum accepted distance deviation of the helicopter apposed to the optimal distance to the antenna tower. This value will be used to show the margins on the pilot interface display to the helicopter pilot. Also when data is measured when the helicopter is outside the valid margins, the data will be plotted in red in the graphs.
- Attenuator: The to be used attenuation setting on the measurement receiver
- RBW: The to be used RBW setting on the measurement receiver
- Test Equipment: The configuration of the test-site which has to be used during the measurements
- Test Engineer: The test-engineer who will perform the measurements

All parameters should be configured, before the measurement can be started.
The following buttons are available:

- Go To Measurement Screen: Start the measurement
- Close: Close this window without starting the measurement
- Environment: Some additional data can be entered like: Temperature, Humidity and Pressure.
- Note: Any kind of information can be entered that could be relevant to this measurement. This note is also available during and after the test.

When all parameters are configured correctly, the configuration of this measurement can be saved as a TSF file. This can be done by selecting from the menu: File > Save TSF. The configuration will be stored in a TSF file with a filename which is the same as the given description. When the configuration is saved to a TSF file, the same configuration can easily be selected the next time a circle flight should be started.
When a circle flight test is started, first an integrity test is performed. When the integrity test was succesfull the folowing screen will appear:



This window is displaying the current status of the measurement. All important real-time information is displayed on this window during the measurement:

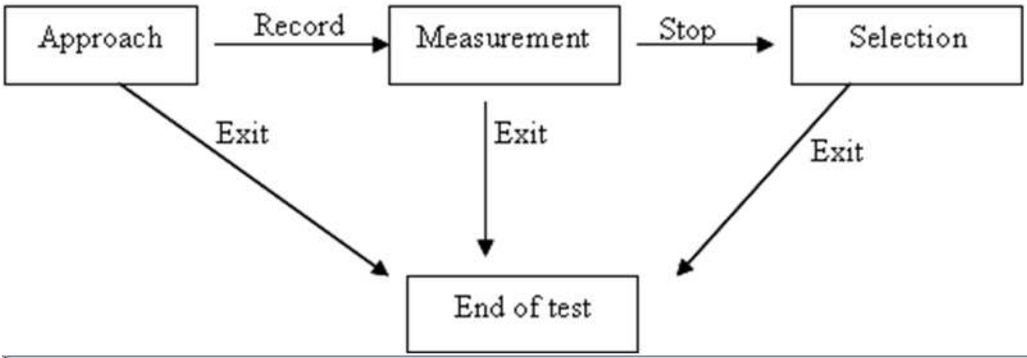
- Distance: The current distance of the helicopter to the antenna tower
- Height: The current height of the antenna below the helicopter compared to the ground level
- Degree: The current angle between the helicopter and the antenna tower
- Limits: The LED's are indications of a current error situation:
- Horizontal: the helicopter is within the horizontal margins
- Vertical: the helicopter is within the vertical margins
- GPS: A correct and accurate GPS signal is received
- Status: A list of all informational, warning and error messages during a test. Several warnings and errors can be displayed in this list

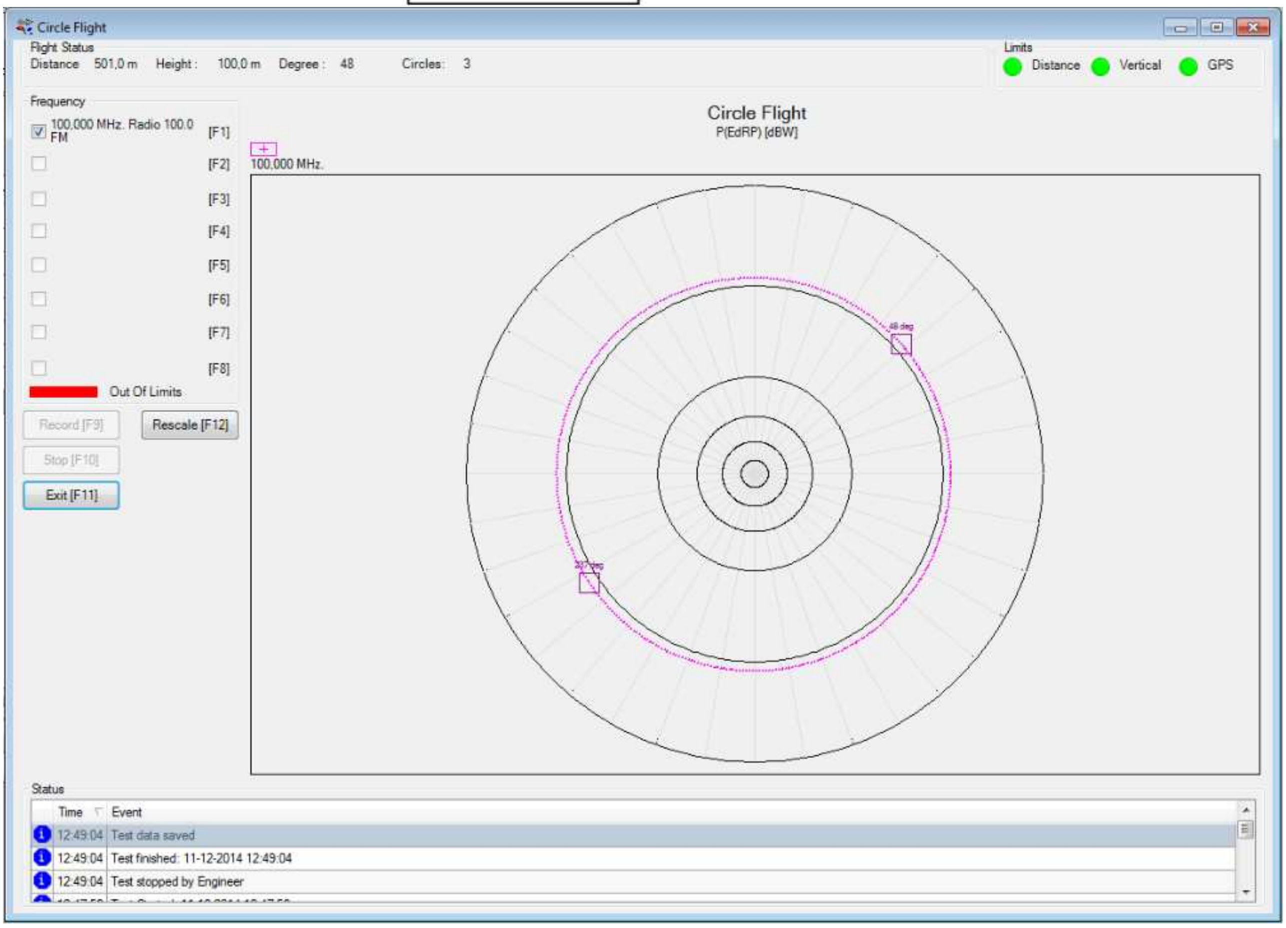
The biggest part of the screen is occupied by the graph which contains the measured and calculated ERP power for each measured frequency. Each line in the graph for a frequency is displayed by it's own colour. The legend above the graph is also showing all the currently plotted frequencies. Which frequencies are shown inside the graph is determined by the checkboxes on the left side of the window. By pressing the buttons F1 to F8, frequencies can be turned on or off. All the frequencies are always measured, but only the selected frequencies will be plotted inside the graph. The "Rescale" button will calculate a new optimum displaying scale for the graph, and it will redraw the graph with the new scales. The outer polar graph value will be calculated to be 3 dB more than the maximum measured value. The middle polar graph value will be calculated to be around 40 dB less than the maximum measured value.

The measurement window also has some buttons that control the measurement phase during the test. The circle flight has three phases:

1. Approach
2. Measurement
3. Viewing

The circle flight will always start in the Approach phase, this phase should be used to position the helicopter on the correct starting position. Based on the indication of the LED's, the test-engineer can determine when the correct starting position has been reached. During the Approach phase, the graph will only show the last measured and calculated values for each frequency. When the correct starting position has been reached, the "Record" should be pushed to enter the measurement phase. In the measurement phase all the measured and calculated ERP values for each frequency will be plotted in the graph. Each the frequency will be plotted in his own colour, except when the helicopter is flying outside the specified margins, if that is the case, the frequencies will be drawn in red. The test-engineer can stop the measurement phase by pressing the "Stop" button.





When the circle flight is in the viewing phase, the test-engineer has the possibility to interpret the data, and to still turn on or off some frequencies. When the test-engineer is ready, the "Exit" button should be pressed. This will end the test, and will deinitialise all the used equipment.
The circle flight can be stopped from any phase by pressing the "Exit" button.
After completion of the test, the test-engineer can view the data of the measurement in the graph by selecting the test and pressing the "Info" button in the location screen. The same window will appear as during the test, but without the "Record" and "Stop" buttons. Also on this window the available frequencies can also be shown or hidden by selecting the checkboxes on the left part of the window.

9.8 Pilot Interface

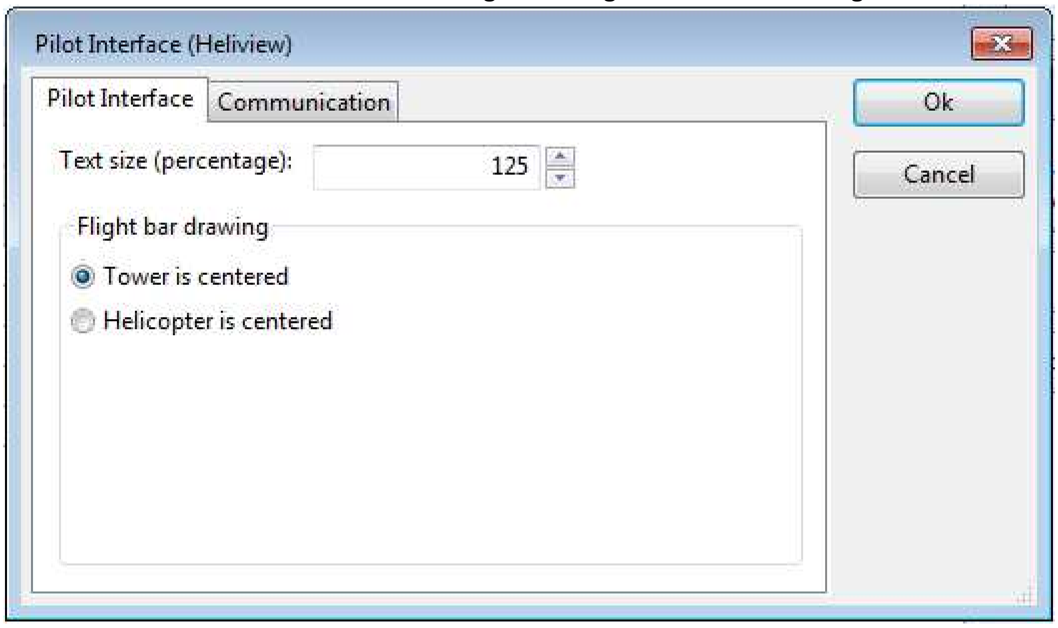
The pilot interface is a small software program that is designed to give flying directions to a helicopter pilot. The pilot interface program is communicating with the Antenna diagram module of the RadiMation software to give the helicopter pilot correct and accurate information. The pilot interface program also is connected to a (D)GPS receiver to get accurate information of the current position of the helicopter. The pilot interface program can have four different states:

1. Standby
2. Propagation Flight
3. Vertical Flight
4. Circle Flight

Depending on the actions taken by the test-engineer who is controlling the RadiMation software the correct display state is shown to the helicopter pilot. The pilot interface program has no keyboard or mouse control, it is designed to only be controlled by the RadiMation software.

9.8.1 RadiMation device driver

A device driver is available in RadiMation® that controls the Pilot Interface. And this device driver also allows that text-size and the drawing of the flight bars can be configured.



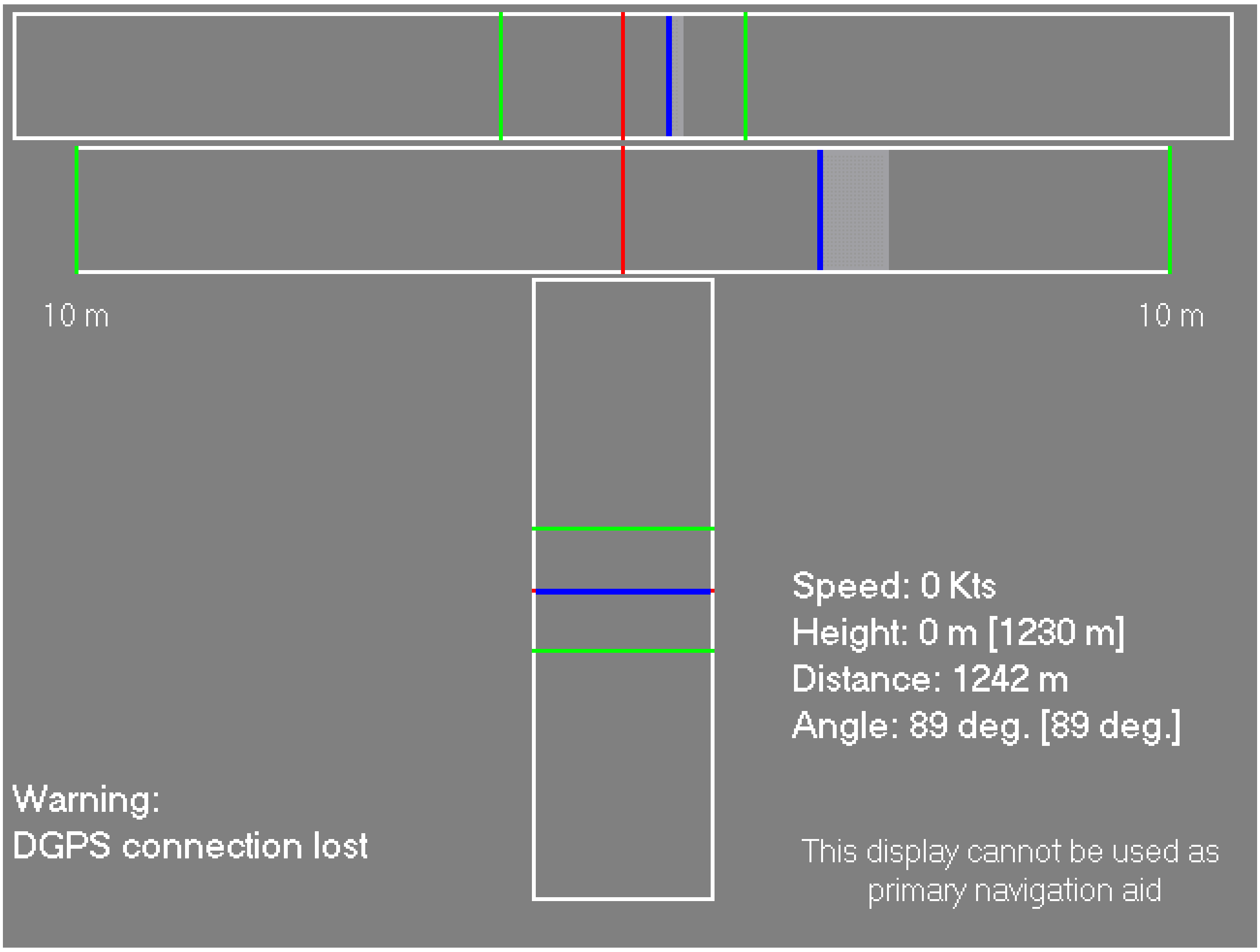
9.8.2 Standby

When no measurement is active, the following pilot interface screen is available.

No directions are given by the RadiMation or pilot interface software to the helicopter pilot. The test-engineer and the helicopter pilot have to discuss how to fly to a destination. This situation often occurs between measurements, and also during the flight from the air-port to the antenna tower, and back again.

9.8.3 Propagation Flight

During a propagation flight, the pilot interface will show a window like:



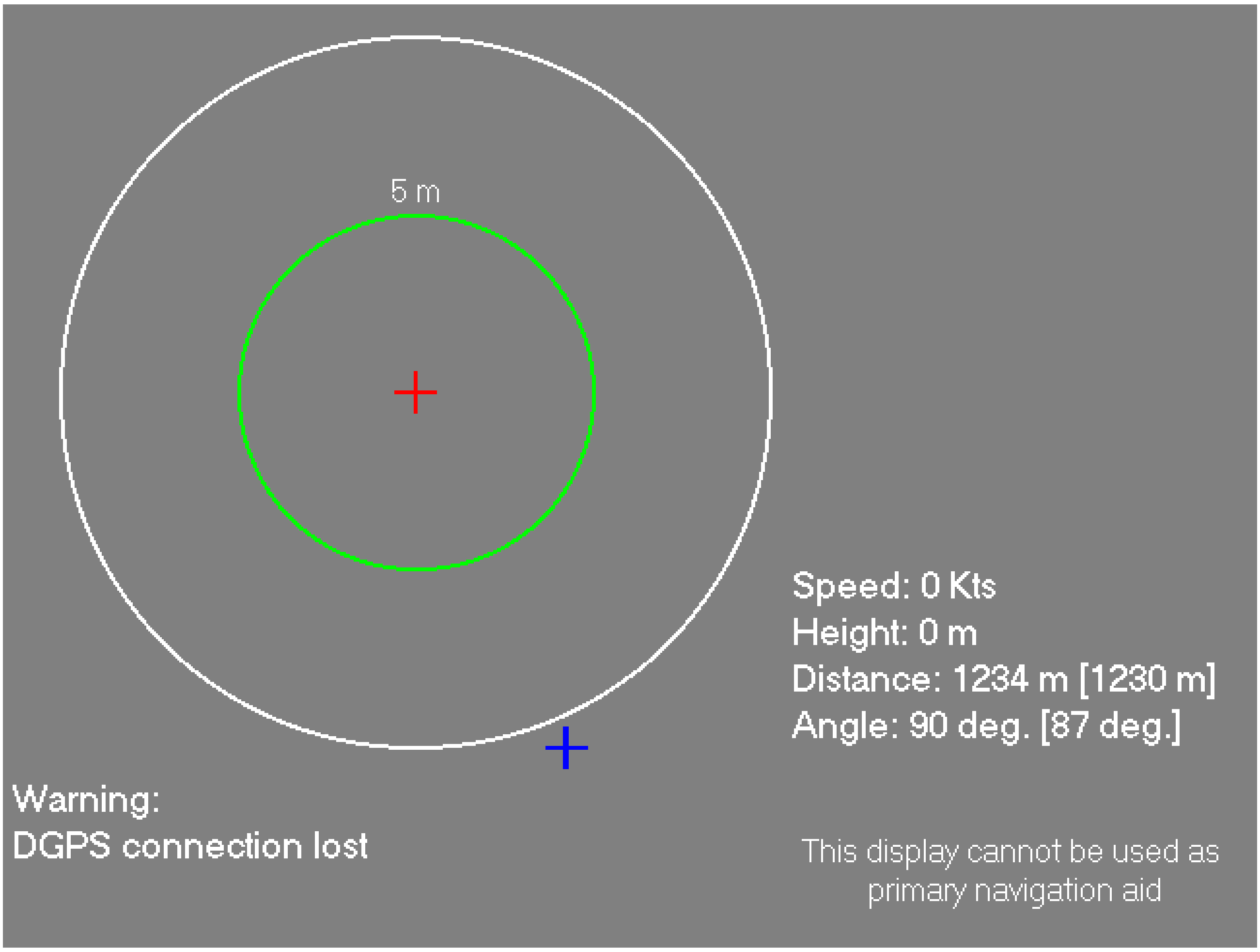
The two indication bars on top of the screen are the current indication of the horizontal deviation from the optimal flight path. The two inidication bars display the same information, but the lower bar is only displayed with a higher resolution. When in the top indication bar the blue line is outside the valid margins (the green lines), there will be no blue line indication in the higher resolution bar. The vertical indication bar in the lower half of the screen is the vertical deviation of the optimal flight path. The center of the bars (the red-lines) is the helicopter itself. The blue line is the optimal flight path. The green lines are the indications of the borders of the accepted margins of the deviation of the optimal flight path. During movement of the helicopter, the blue lines will show a movement trail, to give the helicopter pilot a good indication of the speed and direction of the movement. If some error conditions are available, a warning will be displayed in the lower left part of the screen. In the example above, a warning is given that the data from the DGPS is lost or is not accurate enough. The lower right part of the screen is used to display the current values of:

- Speed of the helicopter
- Height of the helicopter
- Distance to the antenna tower
- Angle of the helicopter compared to the antenna tower

The actual real-time values are displayed, and when optimal flight paramers are known, these values are shown within brackets behind the actual values.

9.8.4 Vertical Flight

During a vertical flight, the pilot interface will show a window like:



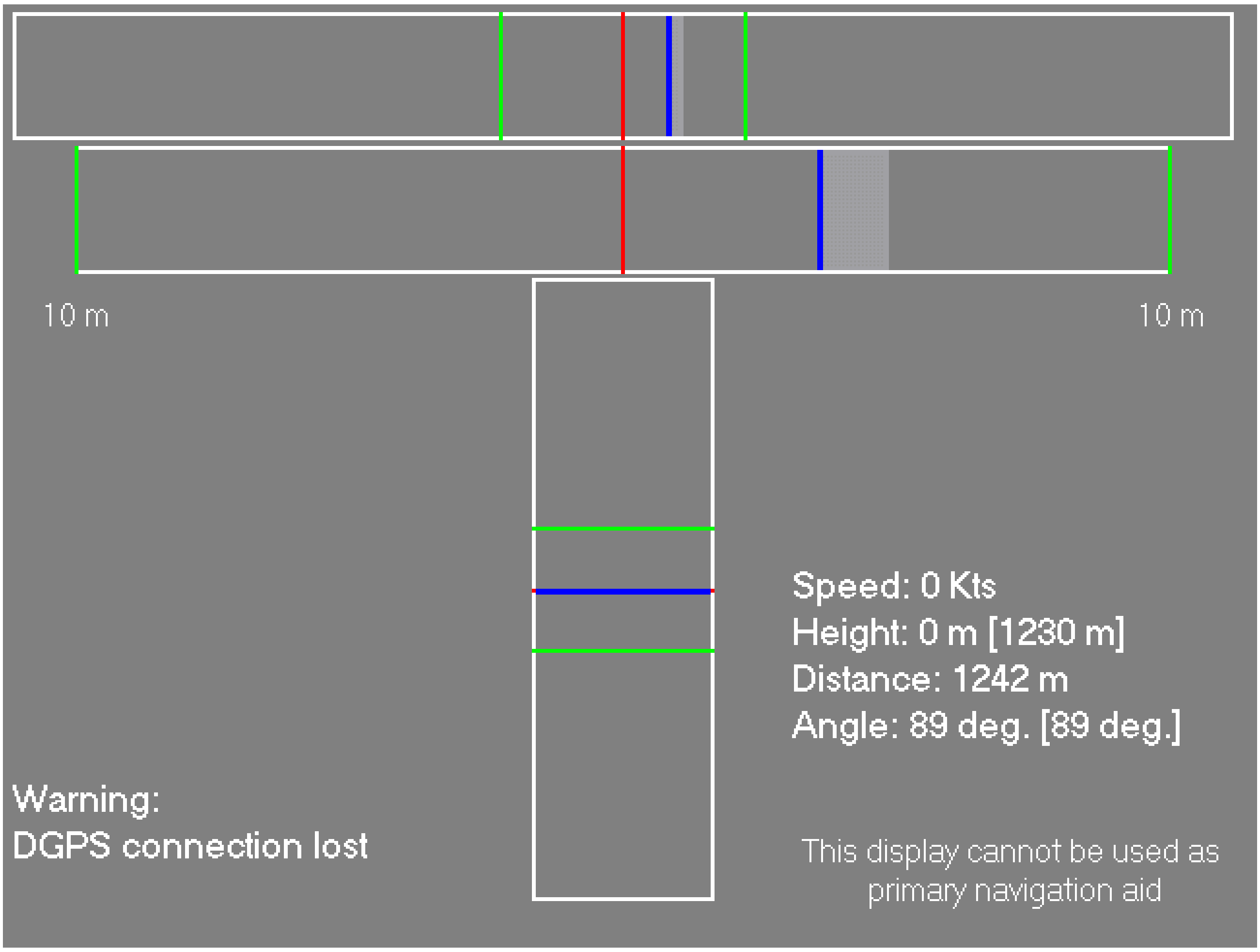
On this window, the helicopter is indicate by the red cross. The optimal location to perform the vertical flight is indicated by the blue cross. The location of the tower is not shown in this window. The green circle is the border of the accepted margins of the vertical flight. As long as the blue cross stays in the green circle, the measurement will be inside the accepted margins. During movement of the helicopter, the blue cross will show a movement trail, to give the helicopter pilot a good indication of the speed and direction of the movement. If some error conditions are available, a warning will be displayed in the lower left part of the screen. In the example above, a warning is given that the data from the DGPS is lost or is not accurate enough. The lower right part of the screen is used to display the current values of:

- Speed of the helicopter
- Height of the helicopter
- Distance to the antenna tower
- Angle of the helicopter compared to the antenna tower

The actual real-time values are displayed, and when optimal flight paramers are known, these values are shown within brackets behind the actual values.

9.8.5 Circle Flight

During a circle flight, the pilot interface will show a window like:



The two indication bars on top of the screen are the current indication of the horizontal deviation from the optimal flight path. The two inidication bars display the same information, but the lower bar is only displayed with a higher resolution. When in the top indication bar the blue line is outside the valid margins (the green lines), there will be no blue line indication in the higher resolution bar. The vertical indication bar in the lower half of the screen is the vertical deviation of the optimal flight path. The center of the bars (the red-lines) is the helicopter itself. The blue line is the optimal flight path. The green lines are the indications of the borders of the accepted margins of the deviation of the optimal flight path. During movement of the helicopter, the blue lines will show a movement trail, to give the helicopter pilot a good indication of the speed and direction of the movement. If some error conditions are available, a warning will be displayed in the lower left part of the screen. In the example above, a warning is given that the data from the DGPS is lost or is not accurate enough. The lower right part of the screen is used to display the current values of:

- Speed of the helicopter
- Height of the helicopter
- Distance to the antenna tower
- Angle of the helicopter compared to the antenna tower

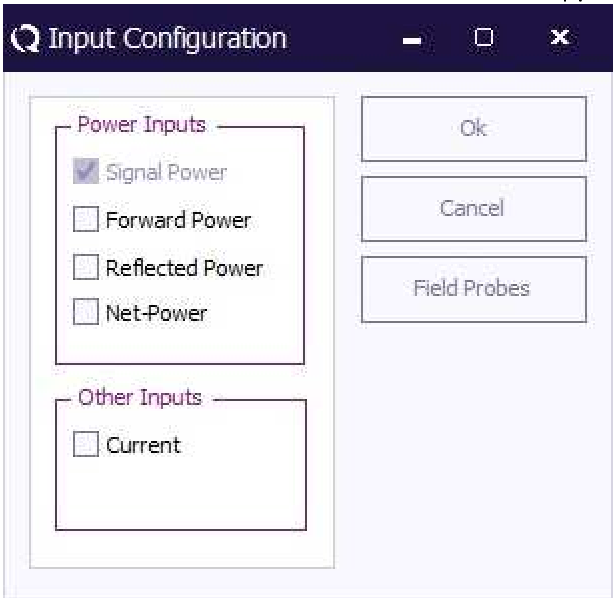
The actual real-time values are displayed, and when optimal flight paramers are known, these values are shown within brackets behind the actual values.

RadiMation® EMC software
------- EUT monitoring and control -------

Table of contents:

10.1 Input Channels

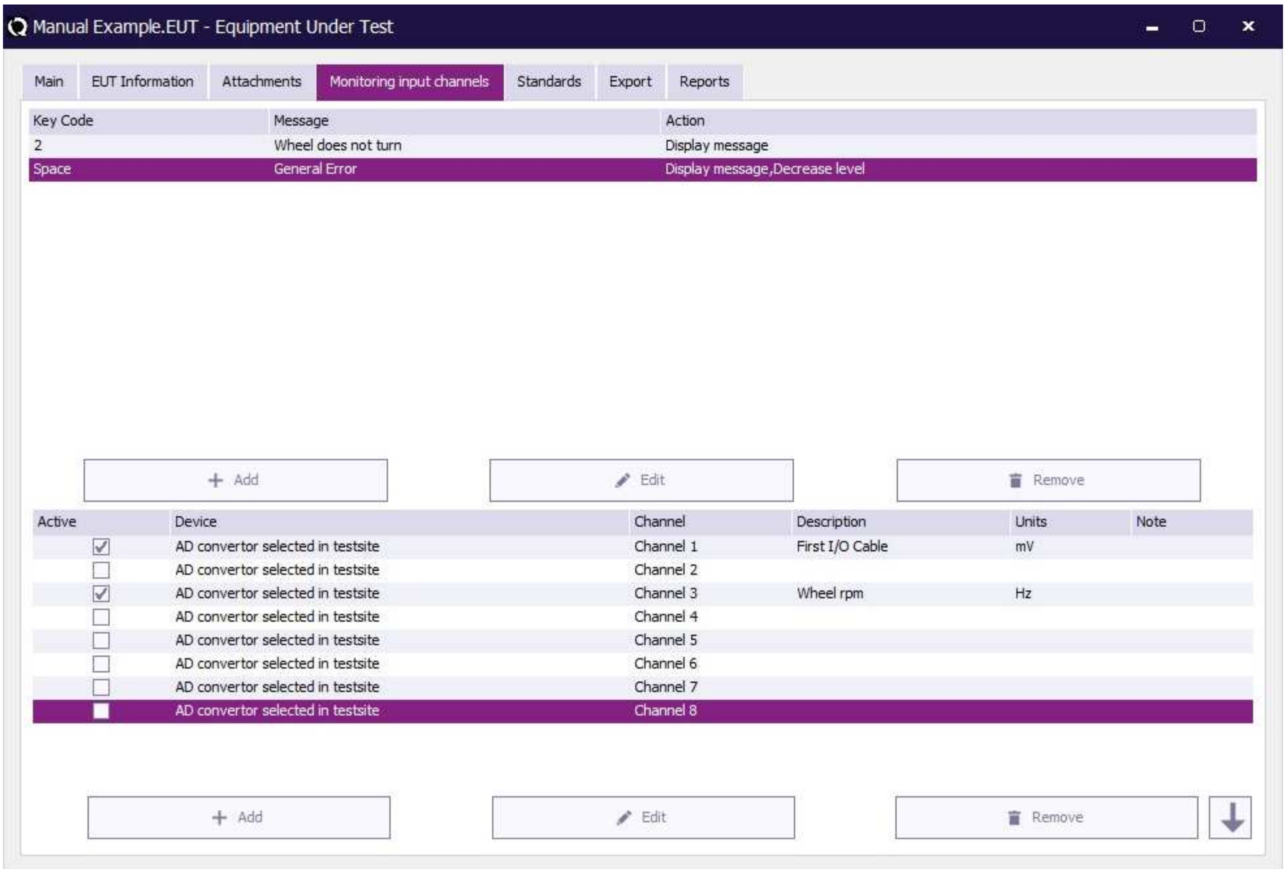
The input configuration is selected by pushing the **Input** button in the TSF window of an immunity test. A window like the one shown below will appear.



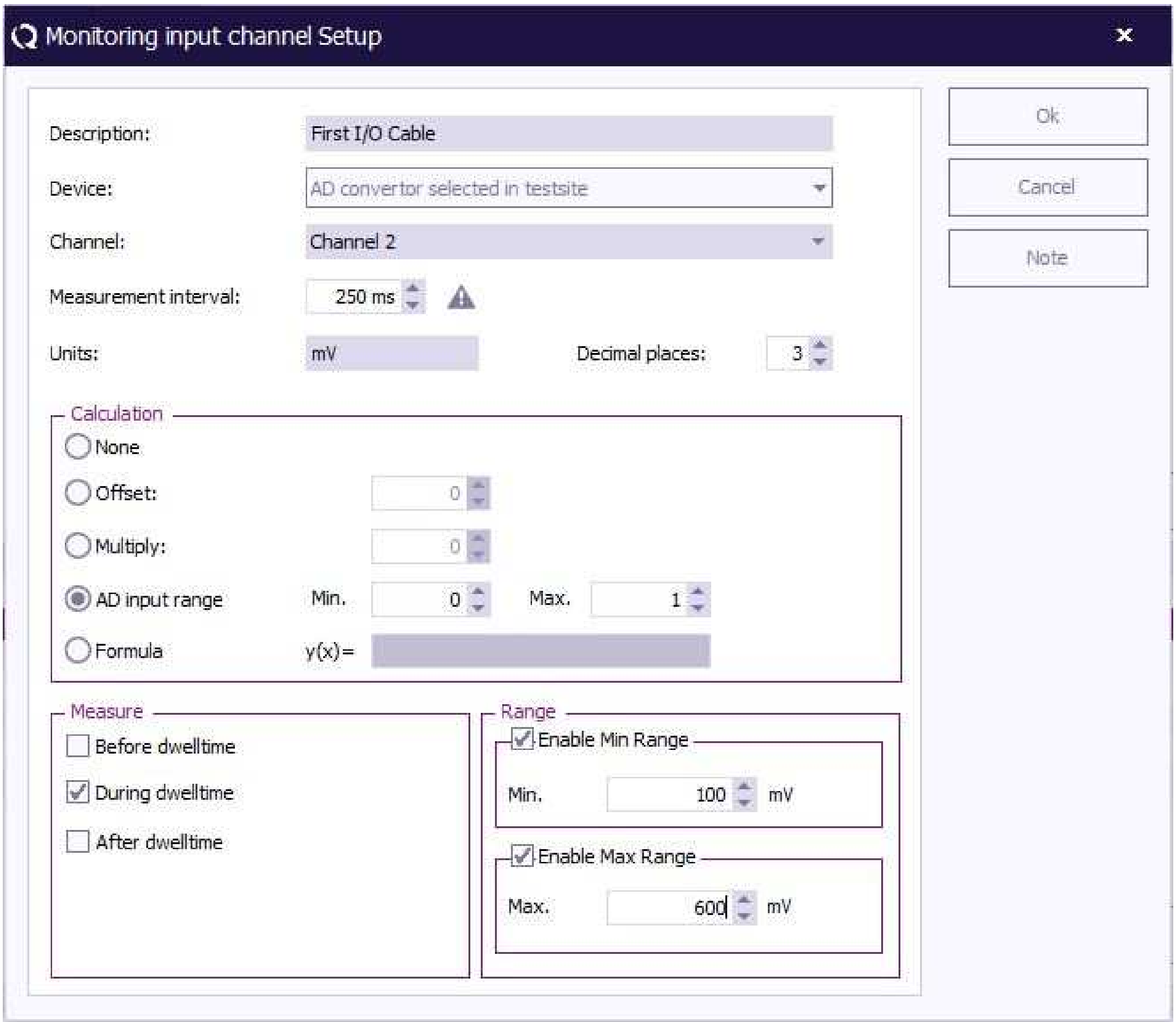
10.1.1 Goal

The input channels of the RadiMation® software are implemented to monitor output signals of the EUT as a function of the test frequency. The software is able to monitor each channel before, during and after each test frequency. This way of data storage is useful during certification tests as well as during the development process of a product.
The inputs channels allow automatic and accurate monitoring of EUT performance. Together with the output channels, full automatic tests can be performed without intervention of the test engineer.
The **before field** data of each input channel, tells you if the equipment is functioning properly before each test point. The **during field** data of each input channel records if the equipment is influenced during period the test signal is applied.
The **before field** graph will record all instability and/or drift of the EUT, where the **during field** graph will record both the instability and/or drift of the EUT and any influence of the EUT by the RF field.
The Software is able to support a maximum of 8 A/D converters. For each A/D channel, two graphs can be recorded ('before field' and 'during field' graph). As an alternative, RadiMation® can also read data from oscilloscopes, audio analysers etc and use it as an A/D input signal. In this case, the operator should select the device driver for the measurement device (for example the oscilloscope) under A/D converter device driver in the equipment list.
The analogue channels can be used to monitor analogue voltages, currents, temperature, tacho generators etc. With some extra tools like opto couplers LED’s of the EUT can be monitored. Apart from the AD converters, 'Field sensors', 'forward power', 'reflected power' and 'current probes' can be used as input.

10.1.2 AD channel Configuration



The input channels are configurated under the **AD-channel** tab in the EUT window. In the **AD Input, configuration menu** each A/D channel can be switched on and off separately. If a channel is switched on, the following items can be configurated in the set-up menu of that channel:



- **Description** — Under Description, a title can be applied to the corresponding A/D channel. The title may have a maximum length of 40 characters.
- **Units** — Under **Units** the units of the measured value can be entered. The entered units are only used as a label in the corresponding graph.
- **Min. Input / Max. Input** — Under **Min. Input** and **Max. Input** the minimum and maximum scale values of the graphic are entered.

> **Warning:** This setting does not change the input range of the A/D converter.

Example:
If an A/D converter is used with a maximum input range of 1 V and an external shunt resistor of 0.1 Ω is used, the A/D configuration menu is set-up as the following:
Units : [A]
Min. Input : 0
Max. Input : 0.1

The graph will be displayed with a scale from 0 to 0.1 A on the Y- scale, and the frequency on the X-scale (from the start frequency tot the stop frequency as entered under the test configuration menu).

- **Note** The option “Note” allows text notes to be added to each A/D channel. This text field can be used to describe test conditions or the response of the EUT during the tests. The text fields can be changed after the test is completed under the “Info” screen.

- **Measure** The selection(s) under “Measure” determine under which conditions the A/D channel is measured. The “Before Field” graphic is measured before the test signal is applied at each test frequency. The “During Field” graphic is measured at the end of the “Dwell time”, during the period the test signal is applied.

- **Range** When selecting a minimum or a maximum “Range”, RadiMation® can react if an A/D-channel is out of range. For example during a Radiated immunity test, the field generated can influence an EUT. RadiMation® can detect this and level the field back to a point that the EUT is not influenced any more. When no “Range” is selected, the A/D-channel is used for recording only.

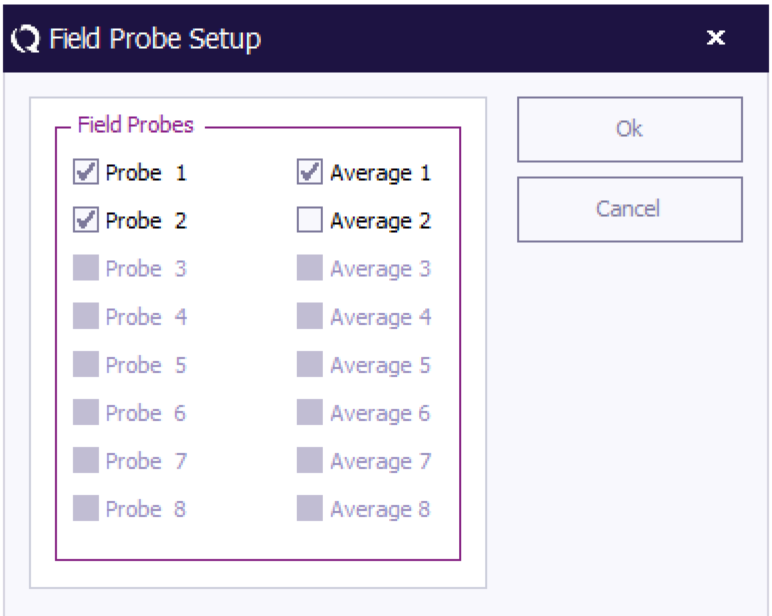
- **Measurement Interval** By configurating the measurement interval a suggestion can be given to RadiMation that the monitor input should be measured with atleast the configured time interval between two sequential measurements.
  The default value **250 ms**
  The minimal value **1 ms**
  The maximal value **60 sec**

Warning: While reading each A/D channel will take a little time, scanning 8 A/D channels in the 2 modes for each test point will increase the total test time. Therefore we recommend switching off all unused A/D channels.

Furthermore, drawing the graphs on the screen will also take some time. For maximum performance, do not leave all graphs open on the screen.

10.1.3 Field sensors

During a substitution test, a field sensor can be used to record the field strength near the EUT and record it in a graph. It should be noted that the presence of the EUT in the chamber will influence the field homogeneity in the close vicinity of the EUT. Therefore, the field sensor will probably not give the same reading as it would give in an empty chamber. The field sensor reading should therefore only be used as an indication.



10.1.4 Current probes

Current injection tests are more easily carried out and are less expensive than tests in an anechoic chamber (caused by the very expensive test equipment needed for radiated immunity tests). Product improvements on an EUT therefore are more easily performed with a current injection set-up . For this purpose, during a substitution test, a current sensor can be used to record the RF current in one of the I/O cables of the EUT. RadiMation® can record the injected current in this cable due to the applied field.

This current sensor data can be used to simulate the influence to the EUT, in a current injection test set-up.
To get accurate current values, the current probe should be connected through a fibre optic cable in stead of using a coaxial cable. A coax cable will cause common-mode currents to flow on the screen, resulting in inaccurate test results.

RadiMation® EMC software
------- Sequence Testing -------

Table of contents:

11.1 Goal

The goal of sequence testing is to run different (type of) tests after each other, without the intervention of a test engineer. These tests can be of the same type or of completely different types. The sequence testing functionality can for example be used to:

- Run a radiated emission test, a conducted emission test and a radiated immunity test (all performed in the same anechoic chamber) after each other.
- Another example is the situation where different amplifiers are used for different frequency bands. For this situation, multiple TSF files can be generated where each TSF file defines one of the frequency bands. All the created TSF files, can then be placed in a sequence so they can be run like one test. The same is true for antenna polarisation, where a horizontal and a vertical TSF file can be created and be put into a single sequence.
- three (or more) different conducted emission frequency bands can be added to a sequence file, and be tested sequentially after each other.

Warning: Sequence testing allows unattended testing. However some tests can cause dangerous situations. Please be especially aware with immunity testing!

Especially in combination with the Pause test, sequence testing can be very attractive to easily automate a fixed combination of tests.

11.2 Creating and saving a sequence

From the main menu, select:

- **File**
  - **New**
    - **Sequence**

A new sequence file will be created. To add a test to a sequence, open the test configuration menu for the desired test, and select the desired TSF file.
This sequence file can be saved through the pull down menu:

- **File**
  - **Save as**

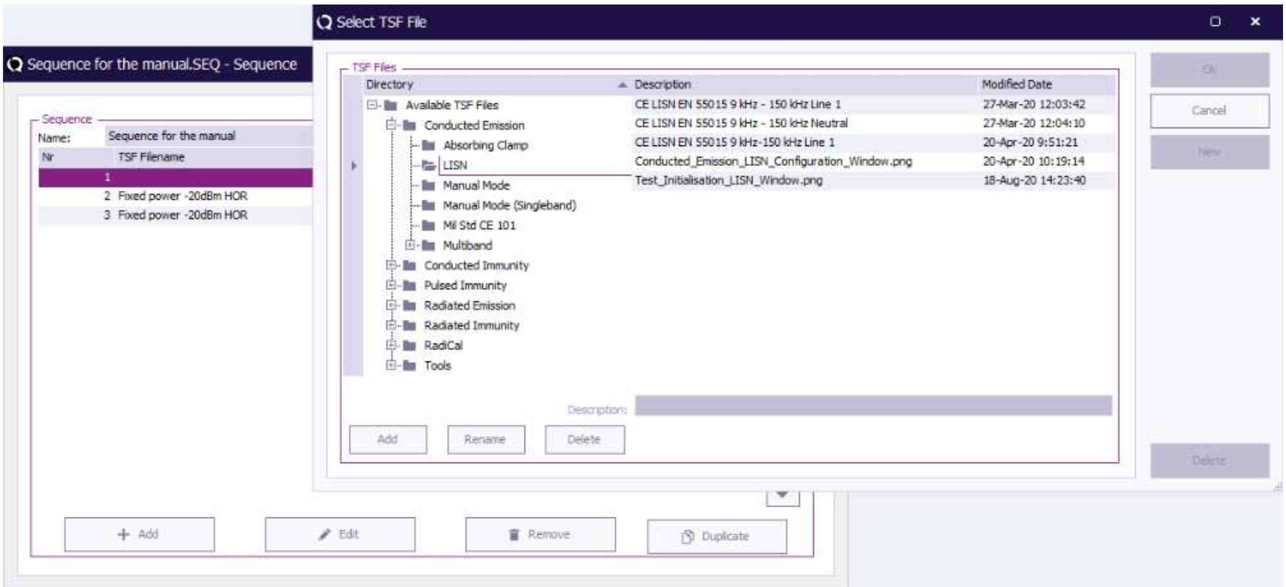
EXAMPLE 1:
Select:

- **File**
  - **New**
    - **Sequence**

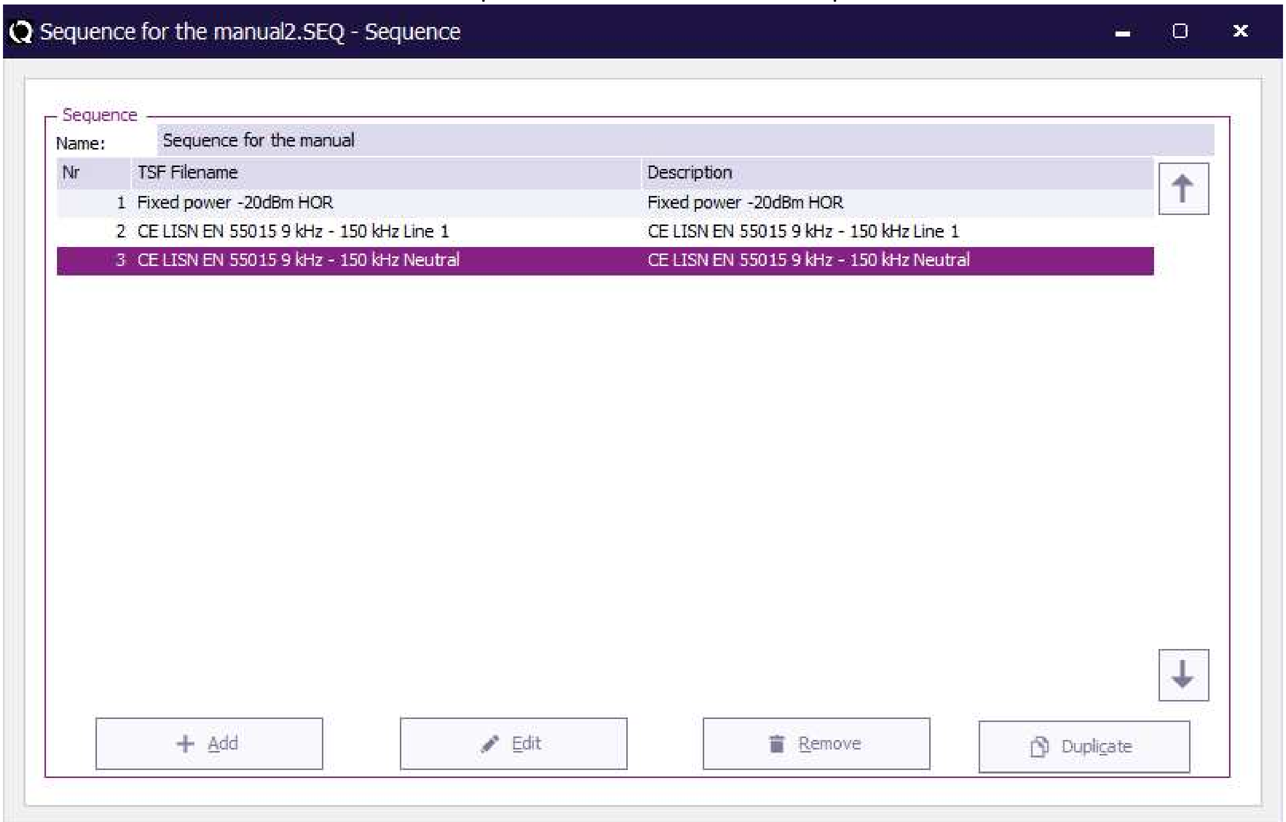
Enter a description for this sequence file

- **Tests**
  - **Radiated immunity**
    - **Substitution**

select the desired TSF file from the list.



The TSF file will now be added in the sequence window as shown the picture below.



To save the sequence file, select:

- **File**
  - **Save sequence as...**

Check if the correct sequence name is mentioned.

11.2.1 Adding a test to a sequence

When a sequence file has to be modified, the file can be opened from the menu:

- **File**
  - **Open**
    - **Sequence...**

The list of current TSF files in the sequence will be displayed.
To add a new test to a sequence, select the desired test from the Tests, pull down menu.
A list of the available TSF files for this test method will be shown. Select the desired TSF file by double clicking on it.
The TSF file will be added to the sequence file.

Note: A copy of the selected TSF file will be added to the sequence. This means that if the original TSF file is changed afterwards, the copied TSF that is present in the sequence, will still use the original test parameters.
If the changed TSF file should also be updated in the sequence, the corresponding TSF file has to be removed from the sequence, and the changed TSF file has to be added again to the sequence.

11.2.2 Changing a test in a sequence

The configuration of a TSF that is already included in a sequence, can be changed by selecting the test in the sequence and pressing the **Edit** button.
The TSF window of the selected test will be shown, and it is possible to change any parameter. When all the required parameters are changed, pressing the **Store** button will update the configuration of the TSF file in the Sequence, and the TSF window will be closed.

11.2.3 Removing a test from a sequence

On the other hand, TSF files can be deleted from the sequence list, by selecting the test in the sequence and pressing the **delete** button.

11.2.4 Changing the order of the tests

The order off the tests in the sequence can be changed by selecting the desired test and click the up or down arrow in order to promote or demote this specific test.

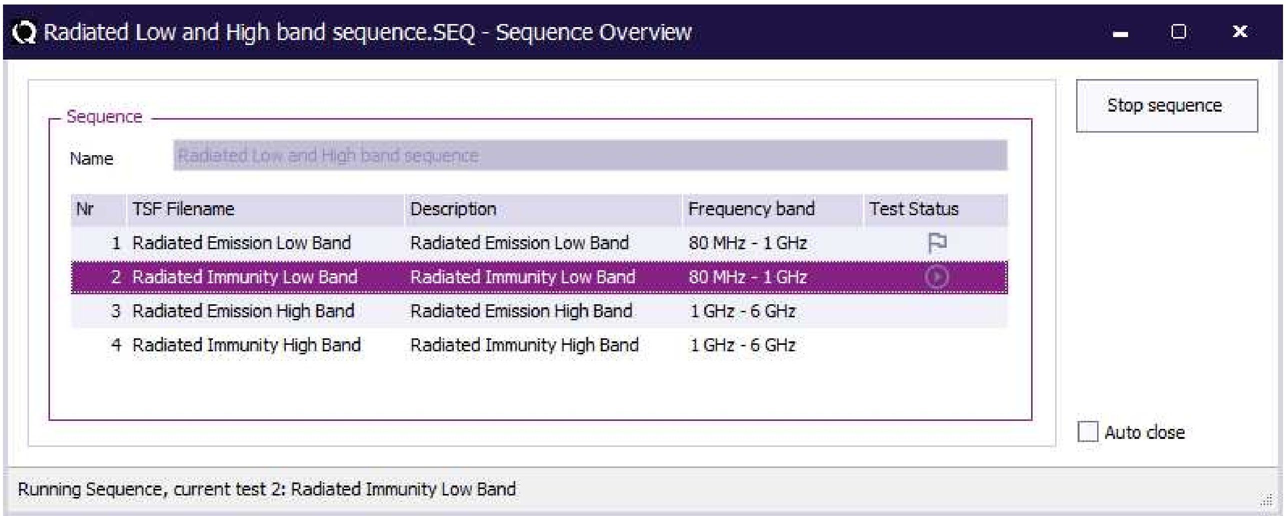
11.3 Starting a sequence

A sequence can be started by selecting from the menu:

- **Tests**
  - **Sequence**
    - **Start Sequence...**

A file selection window will be shown, in which a sequence file (*.SEQ) can be selected. As soon as the sequence file is opened, RadiMation® will start to perform all tests that are selected in the sequence, in the order in which they are specified.
While the sequence is running, the Sequence Overview window is being shown, which shows the contents of the sequence file, and indicates which test is currently running.
The sequence overview window can also be made visible by selecting from the menu:

- **Tests**
  - **Sequence**
    - **Sequence overview...** .



11.4 Stopping (a test in) a sequence

To end the currently running test in the sequence, press the **Stop** button in the test itself. RadiMation® will then interrupt the current test as soon as possible, save the already determined test data, and continue to the next test that was configured in the sequence.
There are two ways to stop the complete sequence:

1. Press the **Stop sequence** button in the Sequence overview window.
2. Select the menu entry

- **Tests**
  - **Sequence**
    - **Stop Sequence...** .

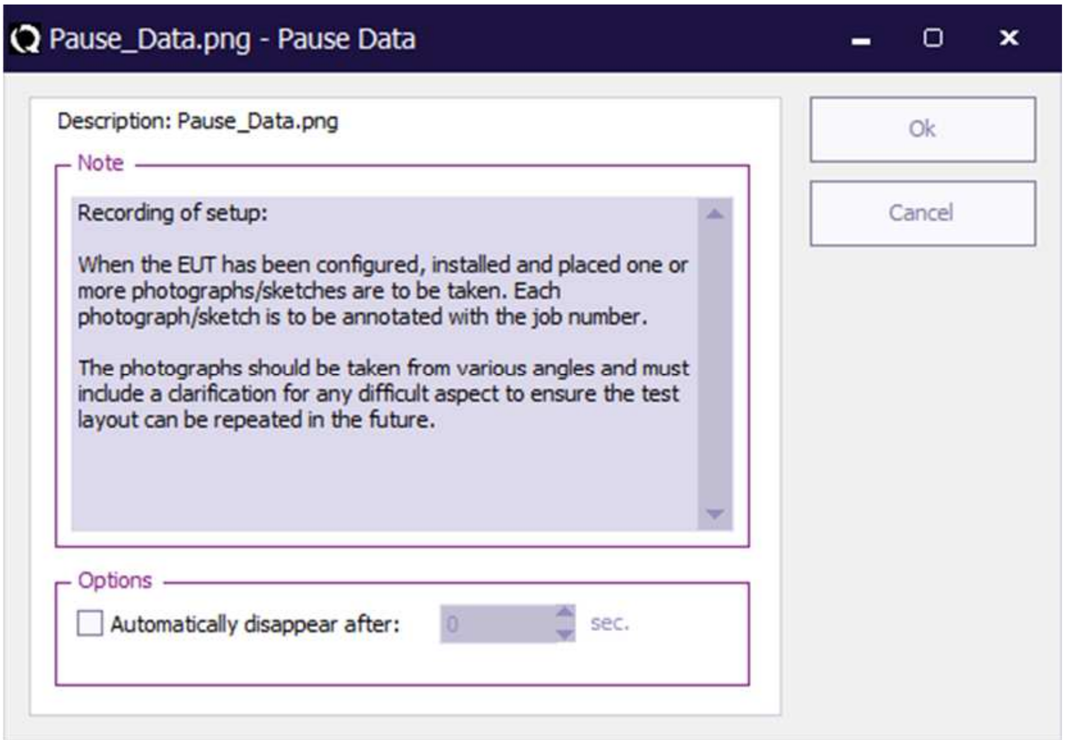
When the **Auto close** checkbox is unchecked, the sequence overview window will not automatically close at the end of the sequence. This allows to review the actual status of the sequence, and if it has actually finished running all tests. The sequence overview window has to be closed manually by the user.
When the **Auto close** checkbox is checked, the sequence overview window will be closed automatically if the sequence has finished executing all tests.

11.5 Pause test

A Pause test is available in RadiMation® to insert informational messages between two tests in a sequence. This Pause test can for example be used to direct the end-user to change the test setup, or it can be a reminder to turn off the amplifier. It is allowed to include multiple Pause tests (also after each other) in a sequence, so it can be used to easily automate a fixed sequence of steps.
The Pause test is available from the menu via:

- **Tests**
  - **Other**
    - **Pause**

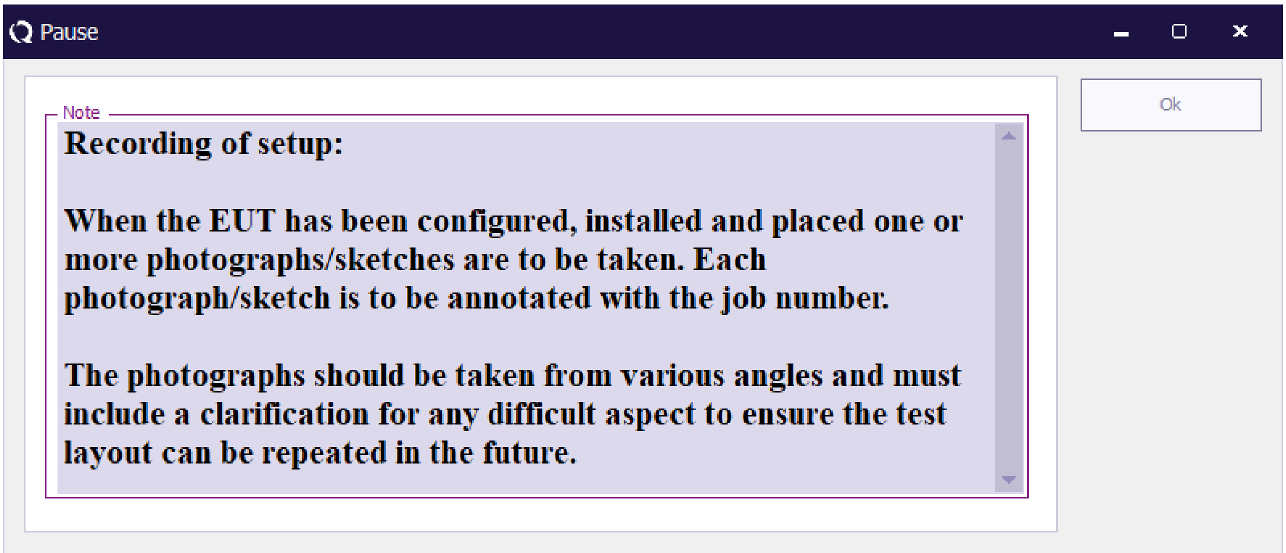
The **Pause Data** window is used to configure the Pause test.



The following elements are available on this window:

- **Note** Is the note (or informational message) that should be shown during the pause period, when the pause test is started.
- **Automatically disappear after** If the checkbox is activated, it is possible to specify a timeout (in seconds) after which the pause test should automatically close. This option allows to show a message for only a determined amount of time, between two tests. When the specified time has passed, the sequence will automatically continue with the next test in the sequence.
- **Ok** Saves the current configuration of the pause test to the TSF file and closes the window.
- **Cancel** Closes the window, without storing the modifications to the TSF file.

The **Pause** window will be shown, when the Pause test is included in the sequence.



The informational message that was specified in the **Pause Data** window is shown in a bigger font, to make it more visible. The shown message can also be selected and copied to clipboard (using Ctrl+C).
If a timeout has been specified, the window will automatically close after the specified timeout period. It is however also possible to close the window with the **Ok** button.
The **Pause** window will remember its position and size, and will be shown on the same position with the same size, the next time it shown again. This allows the end-user to place the **Pause** window on a convenient and visible location.
The pause test will not store any test results, and therefore no test results will be added to the list of performed tests in the EUT file.

RadiMation® EMC software
------- Calibration -------

Table of contents:

Calibration

During an (immunity) calibration, RadiMation® stores all settings and used equipment during the calibration in the final calibration (CAL) file. All these important settings (like start frequency, stop frequency, probe response time, frequency step size, calibration type (FWD, transmitted or signal generator level, etc.) are recorded.

Furthermore, the following graphs are stored:

- The achieved field strength (or current or voltage) during calibration.
- The signal generator level, necessary to achieve this field strength (or current or voltage level)
- The forward power, necessary to achieve this field strength (or current or voltage level)
- The transmitted power, necessary to achieve this field strength (or current or voltage level)

Note: When a signal level calibration is made, the forward and reflected power graphs are not stored.
When a forward power calibration is made, the signal and forward power graph will be stored.
When a net power calibration is made, the signal, forward and reflected power graph will be stored.

All this information can later be viewed, reported, processed and printed by the end-user.

To view the results of a calibration, the calibration data can be opened from the menu:

- **File**
  - **Open**
    - **Calibration**

Then the calibration data window is shown, and the configuration of the calibration, as well as the used equipment and the calibration data is displayed.

12.1 Frequency interpolation

RadiMation® allows you to use a frequency step size during a test, that is different than the frequency step size during the calibration. To have optimal results, RadiMation® will use a linear interpolation between the frequency point which is just below the desired test frequency (f_{test-1}) and the frequency point which is directly above the test frequency (f_{test+1}), to correctly calculate the needed power values at the desired test frequency. For the most accurate results it is however advised to perform the calibration in the same frequency range and with the same frequency steps, as will be used during the substitution test. RadiMation® will not (and cannot) allow that a test is performed on frequencies that is outside the calibrated frequency range.

$$P_{test}(f_{test})[W] = P_{calibrated}(f_{test-1})[W] + \frac{(f_{test} - f_{test-1})\ (P_{calibrated}(f_{test+1})[W] - P_{calibrated}(f_{test-1})[W])}{(f_{test+1} - f_{test-1})}$$

Formula 12-1: Frequency interpolation

Frequency interpolation can be used in combination with Amplitude extrapolation.

12.2 Amplitude extrapolation

RadiMation® allows you to run an immunity substitution test at a different test level the was used during the calibration. To facilitate this, RadiMation® will use a linear extrapolation from the calibration level to the desired level.

If, for example, at a certain frequency point 100 Watt (+50 dBm) is needed to generate an electrical field of 10 V/m (which is determined during calibration), it is possible to use this calibration file to run a substitution test at 3 V/m. RadiMation® will recalculate the needed power level to: 50 dBm - 20 log (10/3) = 40 dBm (10 Watt). Of coarse, amplitude extrapolation will reduce the accuracy of the test level and should therefore only be used during pre-compliance tests. For the most accurate results it is therefore advised to perform the calibration on the same test level, as will be used during the test.

$$P_{test}(f)[dBm] = P_{calibrated}(f)[dBm] - 20 *^{10} log(\frac{E_{calibrated}(f)[V/m]}{E_{test}(f)[V/m]})$$

Formula 12-2: Electrical field strength extrapolation

Amplitude extrapolation can be used in combination with Frequency interpolation.

Warning: The amplitude extrapolation will only be correct if the amplifier works in its linear region, and was not saturated during the calibration.

12.3 Calibration methods

RadiMation® supports three different ways of power calibration. During the configuration of the calibration, the desired method should be selected. During a test, when a calibration file is selected, RadiMation® will automatically select the method that was used during calibration.

12.3.1 Signal generator level calibration

When a signal generator level calibration is used, only the signal generator level is recorded during the calibration. During a test, the signal power that was recorded during a calibration will be re-established. This method does not take amplifier instability or fluctuation into account. During this calibration method no forward and reflected powermeters are required. This method is less accurate than the Forward power and Net power calibrations and therefore is not recommended for full compliance tests. Because no powermeters are used, this method is the fastest method to perform a test.

12.3.2 Forward power calibration

During a Forward power calibration, the forward power to the transmitting antenna is recorded. During a test, the Forward power to the antenna is kept the same as during the calibration. When this method is used, amplifier drift will have no influence on the test, because the same output power out out of the amplifier is re-established as was present during the calibration.

12.3.3 Net power calibration

During a Net power calibration, the Forward and Reflected power to the antenna are recorded. The difference between the Forward power and Reflected power is the Transmitted power. When net power is calibrated, then during the test, the transmitted power by the antenna is kept the same as during calibration. This method has the advantage, that the transmitted power is adjusted to be the same as during the calibration, also when a large metallic, EUT is placed in front of the antenna. In that situation some RF energy can be reflected back into the antenna, resulting in a worse VSWR. If in this situation a forward power calibration or a signal generator level calibration was used, this effect is not compensated for. When net power is calibrated, the by the antenna transmitted power is kept the same as during calibration. When a net power calibration is made, this calibration file can also be used to perform a signal generator substitution test or a forward power substitution test. During a forward power calibration, the signal generator level, forward power level and the field strength during calibration is recorded.

12.4 Radiated Immunity calibration

Calibration of the radiated immunity test set-up is necessary when tests in accordance to the substitution method are performed. During a calibration, the empty anechoic chamber is calibrated. During this calibration the power to the transmitting antenna is recorded, which is necessary to achieve the desired field strength in the anechoic chamber. During the substitution test, the EUT is placed inside the anechoic chamber, and the same power is applied to the transmitting antenna. With the same power applied to the transmitting antenna, it is assumed that the the EUT is located in an electrical field that is the approximately the same as during the calibration.
Some standards describe two different methods for the actual way of levelling to a required test-level. These methods are often called the: 'Constant field strength calibration method', and the 'Constant power calibration method'. During the one-point calibrations, RadiMation® will always use the 'constant field strength calibration method' that is described by the standards. This method has several advantages:

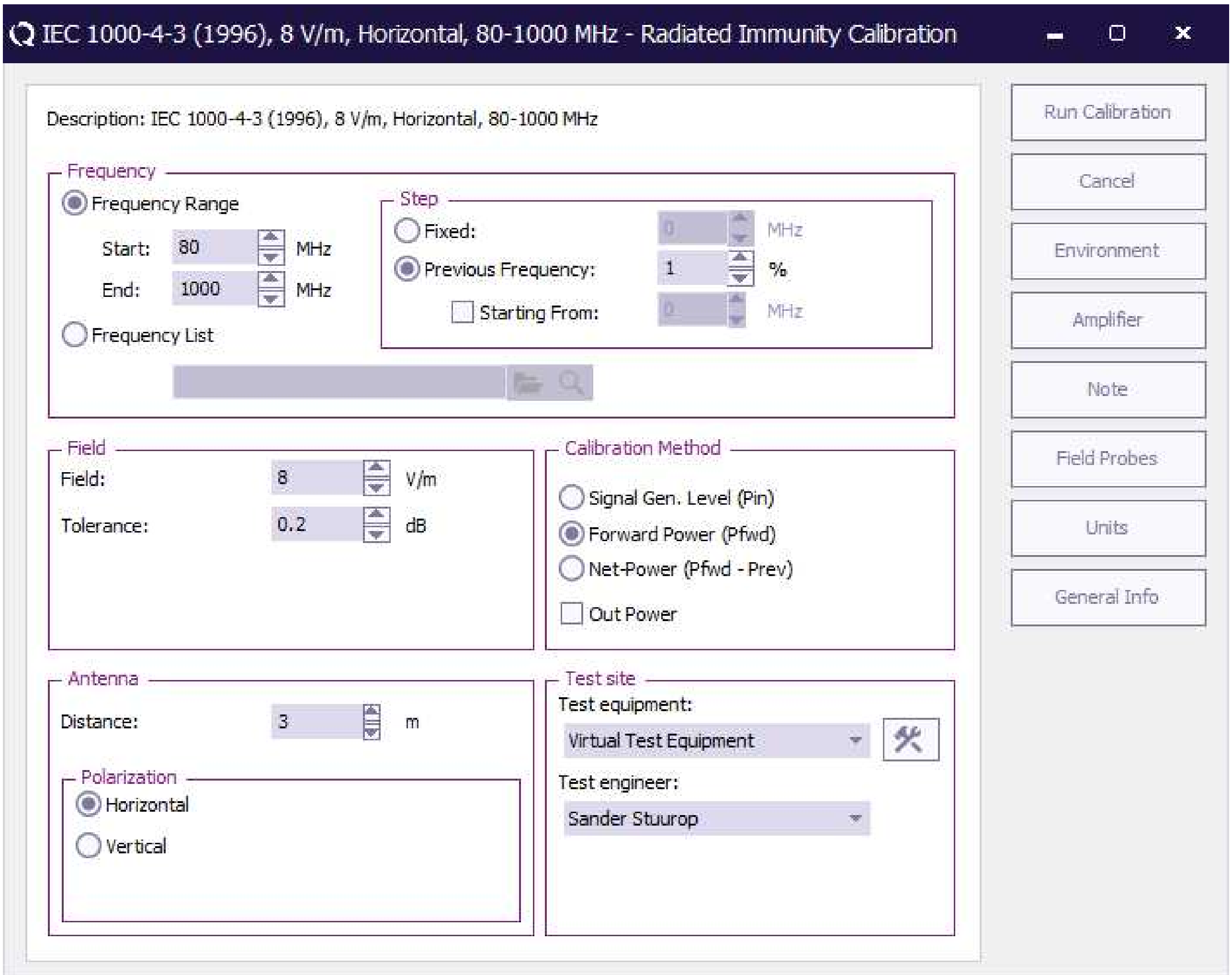
- Some fieldsensors have problems with their accuracy at the overlapping of their measurements ranges. To avoid these problems it is better to always level to the same field strength level, which will result in the usage of the same measurement range of the field sensor.
- With the constant field strength calibration method, it is more obvious if the required field strength level can be achieved. If the 'constant power calibration method' is used, there may be a big dip or peak in the calibration. This can result in interpolation errors. For example, a constant power calibration at 50 dBm can generate a field of 100 V/m at 100 MHz, and in the same calibration it is possible that a field of 80 V/m is generated at 800 MHz, due to the amplifier/powermeters/cables and couplers characteristics. If with these calibration results, a substitution is performed for a fixed field of 110 V/m, the error that is made as a result of the extrapolation from 100 V/m will be much smaller then from 80 V/m.
- The linearity error from the field sensor is much larger than the linearity error of the powermeter. When a 'constant field calibration method' is used, the error caused by the linearity of the fieldsensor is reduced to a minimum because the field sensor is always levelled to the same measurement value. The powermeter will perform measurements over a larger amplitude range, but the dynamic range of all powermeters is large enough to have a minimal linearity error. So when the calibration is levelling on the field sensor, the linearity error of the calibration is minimal.

12.4.1 One-point calibration

During a one-point calibration, RadiMation® for each frequency point increases the power to the antenna, until the desired field strength is reached. Then, depending on the type of calibration method, RadiMation® records the Signal generator level, forward power and/or the transmitted power in the calibration file.
To start a one-point calibration, close all EUT windows. And select the one-point calibration from the menu:

- **Calibration**
  - **Radiated Immunity**
    - **1 Point Calibration**

The Radiated Immunity calibration configuration window will appear, which allows modification of the settings for the calibration.



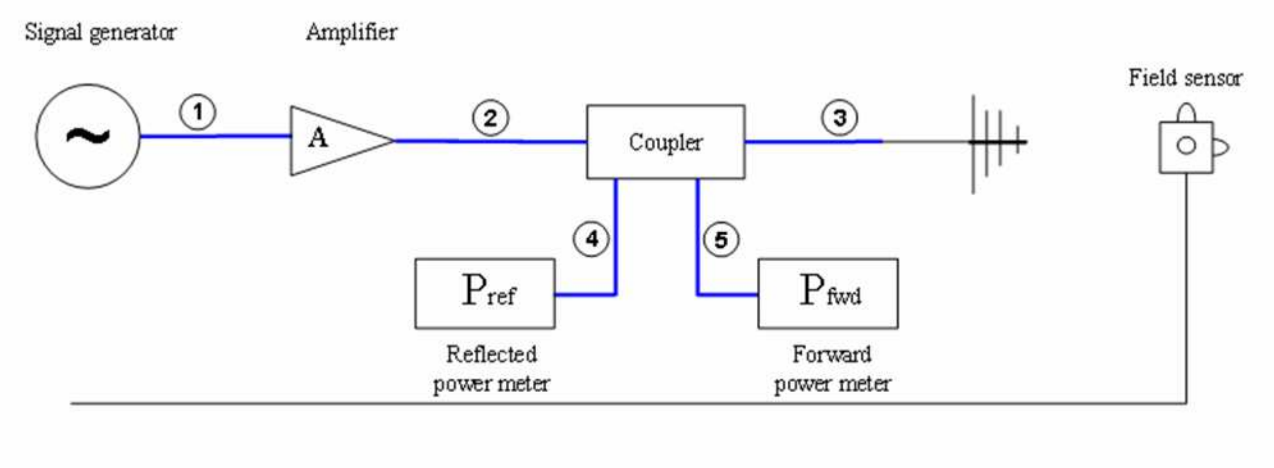
➤ **Description**	The name of the selected TSF file
➤ **Frequency Range**	Sets the frequency specification to a **frequency range**.
➤ **Start**	Sets **start** frequency.
➤ **End**	Sets **end** frequency.
➤ **Step Fixed**	Sets a fixed step size from start to end frequency.
➤ **Step Previous Frequency**	Sets a logarithmic step size from start to stop frequency
➤ **Starting From**	Sets the start frequency for a logarithmic step from which the actual measurement frequencies will be calculated. the starting from frequency should be lower then

the actual start frequency. The test will start at the first calculated frequency that is equal or higher then the specified start frequency.

- **Frequency list**: With **frequency list** the operator can select a frequency list file by browsing to the file location. The frequencies inside the frequency list file will be measured.
- **Field**: The field strength that should be calibrated
- **Tolerance**: The allowed (positive) tolerance of the calibrated field strength.
- **Calibration Mehod**: If signal power, forward power or net-power should be logged in the resulting calibration file.
- **Out power**: If the output power (from a triplate) should also be measured and stored in the calibration file.
- **Antenna Distance**: The distance between the antenna and the calibration plane.
- **Antenna Polarization**: The polarization of the transmitting antenna.
- **Test equipment**: In the test site window the test engineer can select which equipment list will be used during this test
- **Test engineer**: In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results
- **Run calibration**: Starts the calibration.
- **Cancel**: Cancel the configured calibration.
- **Environment**: Display the environment window.
- **Amplifier**: Shows the amplifier configuration dialog where limitations of the amplifiers can be selected.
- **Note**: Display the note window
- **Field Probes**: Select one or more of the field probe(s) that should be used during the calibration.
- **Units**: Display the Units configuration window.

General info

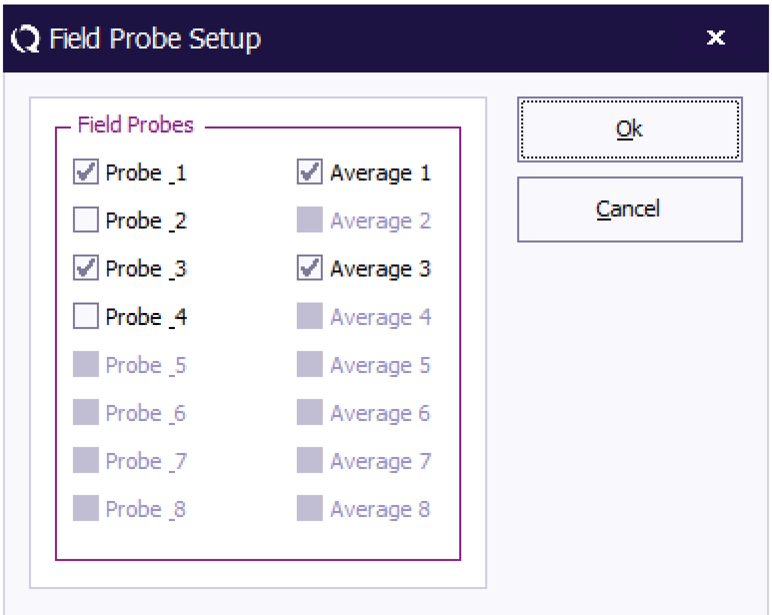
The one-point calibration is also able to perform a calibration of a triplate setup. The triplate calibration is required, to perform the triplate test. With the triplate calibration it is also possible to determine the impedance of the triplate, which is needed to calculate the field. The difference between an anechoic chamber calibration and a triplate calibration is the out power. To perform a triplate calibration the Net-power calibration method as well as the out-power method needs to be selected.
To define the fieldprobe position height during a triplate calibration, use the antenna distance. The selection of a polarization does not influence the triplate calibration, and it will thus be ignored.



#	Device name	Tab in RadiMation® configuration window
	Signal Generator	Devices 1
	Amplifier	Devices 1
	Coupler	Devices 1
	Forward Power meter	Devices 1
	Reflected Power meter	Devices 1
	Antenna	Devices 1
	Field sensor	Field probes
Cables		
1	cable SG -> coupler	Cables
2	cable amplifier -> coupler	Cables
3	cable coupler -> antenna	Cables
4	cable coupler -> fwd power meter	Cables
5	cable coupler -> refl power meter	Cables

Note: Usage of cable correction factors is not mandatory. However, using correction factors will increase measurement accuracy during immunity measurements. When in doubt contact your reseller.

In the testsite up to 8 field probes can be selected, the calibration will only use those field probes from the testsite that are actually selected in the **Field probe setup** configuration dialog.



- **Probe 1** If the probe 1 from the testsite should be measured during the calibration.
- **Probe 2** If the probe 2 from the testsite should be measured during the calibration.
- **Probe 3** If the probe 3 from the testsite should be measured during the calibration.
- **Probe 4** If the probe 4 from the testsite should be measured during the calibration.
- **Probe 5** If the probe 5 from the testsite should be measured during the calibration.
- **Probe 6** If the probe 6 from the testsite should be measured during the calibration.
- **Probe 7** If the probe 7 from the testsite should be measured during the calibration.
- **Probe 8** If the probe 8 from the testsite should be measured during the calibration.
- **Average 1** If the measured field of probe 1 should be included in the calculation of the average field.
- **Average 2** If the measured field of probe 2 should be included in the calculation of the average field.
- **Average 3** If the measured field of probe 3 should be included in the calculation of the average field.
- **Average 4** If the measured field of probe 4 should be included in the calculation of the average field.
- **Average 5** If the measured field of probe 5 should be included in the calculation of the average field.

- **Average 6** If the measured field of probe 6 should be included in the calculation of the average field.

- **Average 7** If the measured field of probe 7 should be included in the calculation of the average field.

- **Average 8** If the measured field of probe 8 should be included in the calculation of the average field.

The one-point calibration will measure all the field probes that are selected to be included in the calculation of the average field. The calibration will then modify the level power and the electrical field in such a way that the average field will be regulated to the requested calibration field. It thus is required to have at least 1 probe selected to be included in the average field.

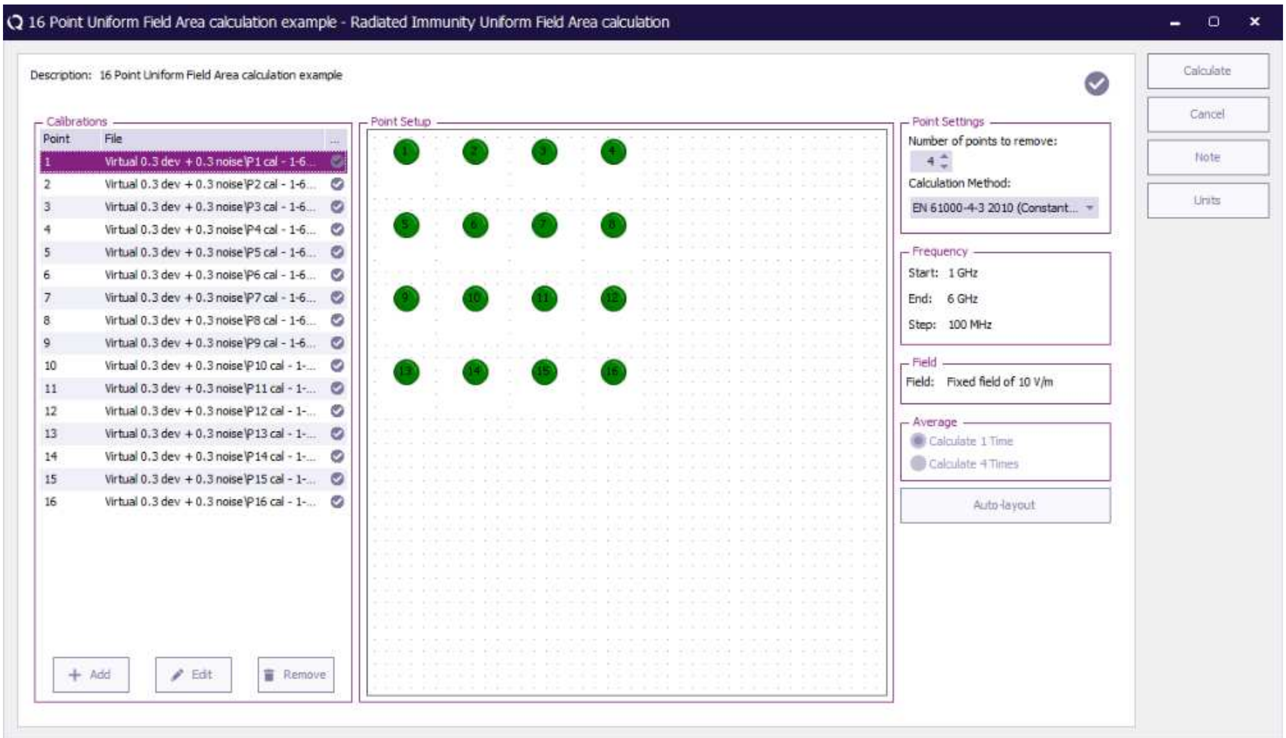
12.4.2 Uniform Field Area calculation

The EN 61000-4-3 (and other standards) state that the anechoic chamber must have a homogeneous electrical field distribution in a 1.5 m x 1.5 m square area, 80 cm. above the ground.
The electrical field is defined to be homogeneous if, at 12 of 16 points in the 1.5 m x 1.5 m square the field strength lies between the desired value and the desired value plus 6 dB.
If, for example, the field homogeneity check is made at a field strength of 10 V/m, 12 of the 16 calibration points must lie between 10 V/m and 20 V/m.
Also based on this information, a power curve can be calculated, which can best be used during a substitution test, to achieve a homogeneous electrical field.
RadiMation® is able to verify and calculate the homogeneous field distribution in the 'Uniform Field Area calculation'. The input for this calculation are sixteen '1 point calibrations'. All these 16 single point calibrations, should be performed first, after which the 16 point field homogeneity verification software can be used to verify the field homogeneity in the anechoic chamber.
The Uniform Field Area calculation not only allows the calculation of this specific configuration, but it is more flexible. It is not necessary to have exactly 16 calibration points. The calculation can also be performed with less then 16 calibration points. The calculation is also able to perform calculations on calibrations that are performed on a triplate.

The Uniform Field Area calculation is started by selecting from the menu:

- **Calibration**
  - **System Calibration**
    - **Radiated immunity**
      - **Uniform Field Area calculation**

In the Uniform Field Area calculation, after a preconfigured Uniform Field Area calculation TSF file is selected, the configuration window of the calculation is shown.



The RadiMation® package supports different ways to calculate the homogeneity of a field, and some other settings can also be configured.

- ➢ **Description** The name of the selected TSF file

- ➢ **Calibrations** The list of calibration files that should be included in the calculation. At least 2 calibration files should be selected, and more than 16 calibration files can be used. The correct calibration files can be added by pressing on the **Add** button. All the selected calibration files should have the same frequency range, frequency step, calibrated field strength level and antenna polarization. Any variation in these parameters between the selected calibration files, can result into not accurate results of the calculation. The Uniform Field Area calculation therefore requires that the same frequency range, frequency step, calibrated field strength level and antenna polarization are used in the selected calibration files. If a calibration file is selected which has different settings compared to one of the other already selected calibration files, an error will be shown.

- ➢ **Point Setup** The layout of the points can be manually modified to be corresponding with the numbering that is used during the calibration of each individual point.

- ➢ **Number of points to remove** It is not required that always 4 calibration points are discarded during the calculation. The number in the **Number of points to remove** box, determines the number of calibration points that will be discarded during the calculation. This number should be between 0 and the number of calibration files that are selected.

- ➢ **Calculation Method** The calculation method that should be used by the Uniform Field Area calculation, to calculate the homogeneity. The following methods are supported:
  - EN 61000-4-3 1995 (Average Power)
  - EN 61000-4-3 2002 (Average Field)

- EN 61000-4-3 2002 Amendment 1 (Maximum Power)
- EN 61000-4-3 2006 (Constant field method)
- EN 61000-4-3 2006 (Constant power method)
- EN 61000-4-3 2008 (Constant field method)
- EN 61000-4-3 2008 (Constant power method)
- EN 61000-4-3 2010 (Constant field method)
- EN 61000-4-3 2010 (Constant power method)
- ISO 11451-2
- SAE J1113-25

Start Frequency Shows the start frequency of the selected calibration files.

End Frequency Shows the end frequency of the selected calibration files.

Step Frequency Shows the step frequency that is used in the selected calibration files.

Field Shows the field strength level that was used in the selected calibration files.

Calculate 1 Time During some calculations, the average field of the remaining calibration points is calculated, to determine the calibration point that should be discarded. When the **Calculate 1 Time** option is selected, the average field will not be recalculated when the calibration point is discarded. With this option activated, the calculation for each frequency point, will take the average field of all the calibration points once, and will determine the four calibration points which differ the most from the calculated average field. This option can result in a different calculation, compared to the **Calculate 4 Times** option.

Calculate 4 Times During some calculations, the average field of the remaining calibration points is calculated, to determine the calibration point that should be discarded. When the **Calculate 4 Times** option is selected, the average field will be recalculated when a calibration point is discarded. A removal of a calibration point will influence the average field of the remaining points, and this can influence the calibration point that should discarded next. This option can result in a different calculation, compared to the **Calculate 1 Time** option.

Auto-Layout The auto-layout function can be used to automatically layout the points in the grid. It is possible to specify the number of rows and columns, but also where the first point (number 1) should be positioned. After an auto-layout is performed, it is still possible to modify the layout of the points.

Calculate Closes the configuration window, and starts the calculation of the homogeneity of the anechoic chamber, based on the selected calibration files and settings.

Cancel Closes the configuration window, and now calculation will be performed.

Note Shows the **Note** window, in which a Note can be specified.

➢ **Units** Shows the **Units** window, where the used units can be configured.

12.4.2.1 EN 61000-4-3 1995 calculation

The EN 61000-4-3 standard contains a description of the uniform field, which specifies that at least 12 of the 16 calibration points should be within a -0 dB to +6 dB tolerance.
The Uniform Field Area calculation, first normalizes the power levels of all the frequencies in the selected calibration point calibration files, to the electrical field strength for which the Uniform Field Area is calculated. Every calibration file, has small deviations in the measured field strength on each frequency. It is for example possible that a 10.4 V/m (with a forward power of 56.3 dBm) is measured during the calibration of a 10 V/m field strength. This small deviation is normalized to exactly 10 V/m, by adjusting the forward power level to 56.0 dBm (more exact: 55,95933321 dBm). It is necessary to normalize the forward power levels because the differences (0.35 dB in this example) can have it's influence in the reduction of the calibration points.
The 1995 version of the standard describes a method for the reduction of the calibration points, which states that a maximum of 4 points (from the total of 16 calibration points) should be removed that have the greatest deviation. The remaining points should be within +-3 dB. The final calibration file should use the calibration point that has the lowest field strength on each frequency as the reference.
This version standard doesn't describe how the greatest deviation should be calculated. The options **Calculate 1 Time** and **Calculate 4 times**, can be used in combination with this standard to achieve the best results.
RadiMation® performs this calculation method as it is described in the standard.

12.4.2.2 EN 61000-4-3 2002 calculation

The EN 61000-4-3 standard contains a description of the uniform field, which specifies that at least 12 of the 16 calibration points should be within a -0 dB to +6 dB tolerance. A bigger tolerance (from +6 dB to +10 dB) is allowed for a maximum of 3% of the calibration frequencies.
The Uniform Field Area calculation, first normalizes the power levels of all the frequencies in the selected calibration point calibration files, to the electrical field strength for which the Uniform Field Area is calculated. Every calibration file, has small deviations in the measured field strength on each frequency. It is for example possible that a 10.4 V/m (with a forward power of 56.3 dBm) is measured during the calibration of a 10 V/m field strength. This small deviation is normalized to exactly 10 V/m, by adjusting the forward power level to 56.0 dBm (more exact: 55,95933321 dBm). It is necessary to normalize the forward power levels because the differences (0.35 dB in this example) can have it's influence in the reduction of the calibration points.
The 2002 version of the standard describes a method for the reduction of the calibration points, which states that a maximum of 4 points (from the total of 16 calibration points) should be removed that have the greatest deviation. The remaining points should be within +-3 dB. The final calibration file should use the calibration point that has the lowest field strength on each frequency as the reference.
This version standard doesn't describe how the greatest deviation should be calculated. The options **Calculate 1 Time** and **Calculate 4 times**, can be used in combination with this standard to achieve the best results.
RadiMation® performs this calculation method as it is described in the standard.

12.4.2.3 EN 61000-4-3 2002 Amendment 1 calculation

The EN 61000-4-3 standard contains a description of the uniform field, which specifies that at least 12 of the 16 calibration points should be within a -0 dB to +6 dB tolerance. A bigger tolerance (from -0 dB to +10 dB) is allowed for a maximum of 3% of the calibration frequencies.

The Uniform Field Area calculation, first normalizes the power levels of all the frequencies in the selected calibration point calibration files, to the electrical field strength for which the Uniform Field Area is calculated. Every calibration file, has small deviations in the measured field strength on each frequency. It is for example possible that a 10.4 V/m (with a forward power of 56.3 dBm) is measured during the calibration of a 10 V/m field strength. This small deviation is normalized to exactly 10 V/m, by adjusting the forward power level to 56.0 dBm (more exact: 55,95933321 dBm). It is necessary to normalize the forward power levels because the differences (0.35 dB in this example) can have it's influence in the reduction of the calibration points.
The 2002 Amendment 1 version of the standard describes a method for the reduction of the calibration points, which states that the required power of all 16 calibration points should be sorted in ascending order. Then from the highest value in the sorted list, it should be checked that the 11 power values below the maximum power are within -6 dB to 0 dB of the maximum power value. If the 12 power values are not within the -6 dB to 0 dB tolerance, the next power value below the maximum should be compared with the 11 power values below it. The -6 dB to 0 dB check should be continued until at least 12 power values are found that are within 6 dB of used maximum power value. The final calibration file should use the calibration point that has the power value that was used as the maximum power value in the list of 12 power levels.
RadiMation® performs this calculation method as it is described in the standard.
The 2002 Amendment 1 version of the standard also specifies that the calibration should be performed on a field strength that is at least 1.8 times higher than the field strength that will be used during the substitution test. It is also stated that it has to be ensured that the amplifier is not used in a range in which it is saturated. The standard suggests that this can best be achieved by preventing that the amplifier is used above the 1 dB compression point of the amplifier.

12.4.2.4 EN 61000-4-3 2006 calculation

The EN 61000-4-3 standard contains a description of the uniform field, which specifies that at least 12 of the 16 calibration points should be within a -0 dB to +6 dB tolerance. A bigger tolerance (from -0 dB to +10 dB) is allowed for a maximum of 3% of the calibration frequencies.
The Uniform Field Area calculation, first normalizes the power levels of all the frequencies in the selected calibration point calibration files, to the electrical field strength for which the Uniform Field Area is calculated. Every calibration file, has small deviations in the measured field strength on each frequency. It is for example possible that a 10.4 V/m (with a forward power of 56.3 dBm) is measured during the calibration of a 10 V/m field strength. This small deviation is normalized to exactly 10 V/m, by adjusting the forward power level to 56.0 dBm (more exact: 55,95933321 dBm). It is necessary to normalize the forward power levels because the differences (0.35 dB in this example) can have it's influence in the reduction of the calibration points.
The 2006 version of the standard describes a method for the reduction of the calibration points, which is exactly the same as the method that is described in the 2002, Amendment 1 version of the standard.
RadiMation® performs this calculation method as it is described in the standard. There is no difference in the calculation of the 2002, Amendment 1 and the calculation of the 2006 version. RadiMation® will perform the Uniform Field Area calculation exactly the same for both these versions.
The 2006 version of the standard also specifies that the calibration should be performed on a field strength that is at least 1.8 times higher than the field strength that will be used during the substitution test. It is also stated that it has to be ensured that the amplifier is not used in a range in which it is saturated. The standard suggests that this can best be achieved by one of the following procedures:

- Use the final calibration result file, to perform a signal generator level substitution test on a field strength level that is 1.8 times lower than the calibrated field strength. The forward power of the calibration file, and the forward power during the substution test should then be within 3.1 dB to 5.1 dB difference.

- Determine the 1 dB compression point of the amplifier, and ensure that the amplifier is not used above the determined 1 dB compression point. However due to impedance mismatches during the compression point calibration and the field strength calibration, this 1 dB compression point calibration is still no 100% guarantee that the amplifier is not used without saturation. In this case it is accepted that the 2 dB compression point of the amplifier is used as the maximum forward power level of the amplifier during the field strength calibration.

12.4.2.5 EN 61000-4-3 2008 calculation

The 2008 version of the EN 61000-4-3 standard describes a method for the reduction of the calibration points, which is exactly the same as the method that is described in the 2006 version of the standard.

12.4.2.6 EN 61000-4-3 2010 calculation

The 2010 version of the EN 61000-4-3 standard describes a method for the reduction of the calibration points, which is exactly the same as the method that is described in the 2006 version of the standard.

12.4.2.7 ISO 11451-2 calculation

The ISO 11451-2 standard specifies that a calibration can be performed on a single location, on 2 different location or on 4 different locations.
The calculated calibration file should use the average of the calibration points.
RadiMation® performs this calculation method as it is described in the standard.

12.4.2.8 SAE J1113-25 calculation

The SAE J1113-25 standard describes how Radiated Immunity measurements can be performed by using the triplate line method.
The following formulas are used to determine the impedance of the triplate

$$Z(f)[\Omega] = h^2 * \frac{(E_{avg}(f)[V/m])^2}{P_{mid}(f)[W]}$$

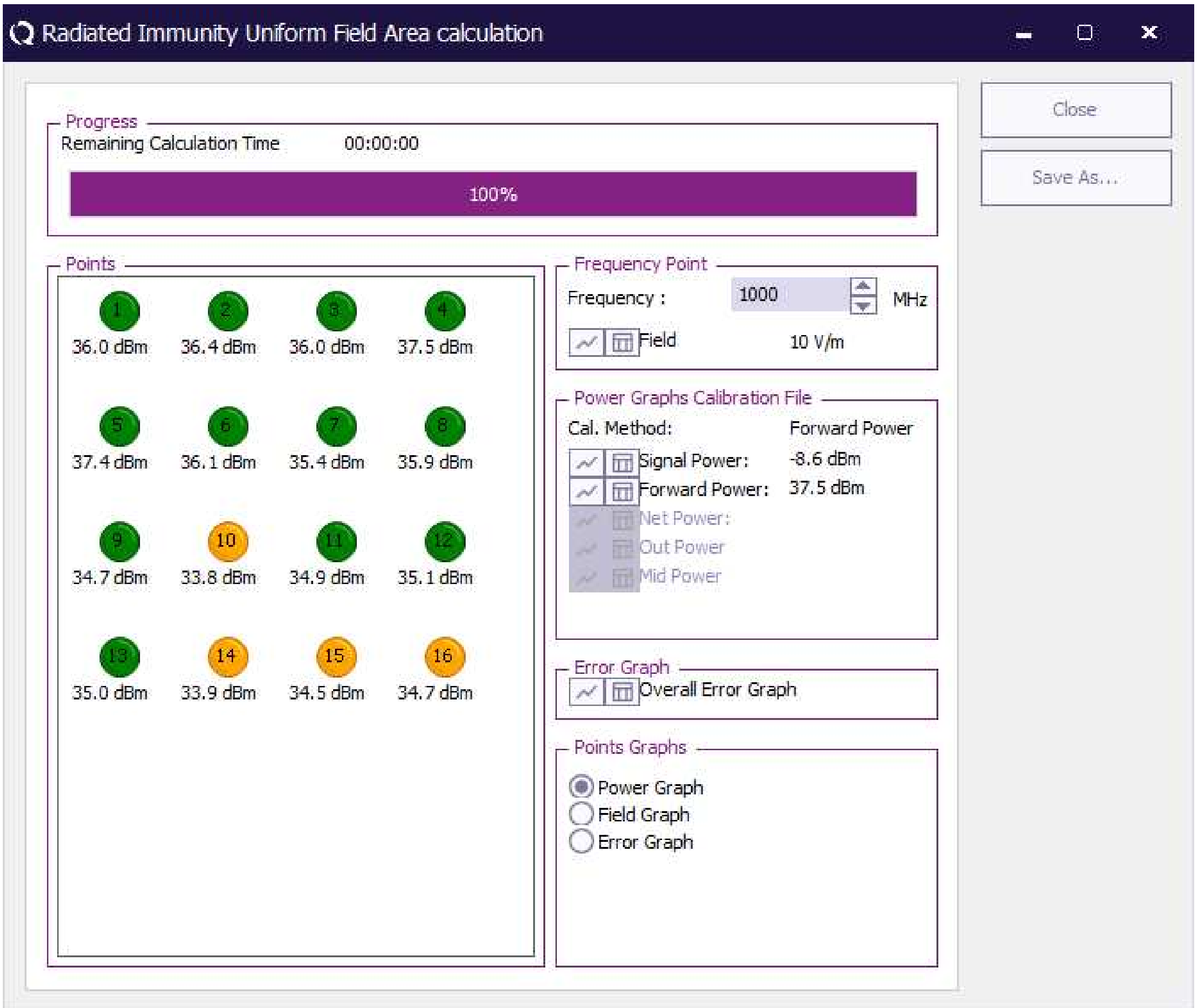
Formula 12-3: Impedance calculation of a triplate

$$P_{mid}(f)[W] = \frac{P_{net}(f)[W] + P_{out}(f)[W]}{2}$$

Formula 12-4: Middle power calculation of a triplate

12.4.2.9 Uniform Field Area calculation results

After RadiMation® has calculated the Uniform Field Area calculation, a graphical representation of the calibrations results will be displayed. The calculated information can also be saved to a calibration file, so the results of the Uniform Field Area calculation can be used during a substitution test.



The graphical representation of the calculation is shown as 16 coloured dots on the screen. Each dot represents a calibration point in the anechoic chamber. The colours of the dots have the following meaning:

- Green dot: This calibration point is one of the remaining calibration points, which are taken into account for the calibration file.
- Yellow dot: This calibration point is one of the calibration points, which are discarded by the calculation. This calibration point is one of the **Number of points to remove**.
- Red dot: This calibration point was not discarded by the calculation, and is thus used in the final calculation of the needed power. However, it has an error of more than 6 dB compared to the ideal calculated power. This means that this calibration point does not meet the requirements for the field homogeneity in the anechoic chamber.

➢ **Points**	The graphical representation of the individual points
➢ **Frequency**	Selects the frequency for which the coloured dots should be shown.
➢ **Field**	Shows the electrical field graph for the calculated calibration file. Because the Uniform Field Area calculation always normalizes the field strength from the

selected calibration files to the requested field strength, this graph will always be a straight line that is **exactly** the requested field strength on all the frequencies.

- **Signal Power** — Shows the signal power graph for the calculated calibration file.
- **Forward Power** — Shows the forward power graph for the calculated calibration file. This graph is only available if the forward or net power calibration method was selected in the original calibration files.
- **Net Power** — Shows the net power graph for the calculated calibration file. This graph is only available if the net power calibration method was selected in the original calibration files.
- **Out Power** — Shows the output power graph for the calculated calibration file. This graph is only available if the output power of a triplate was also measured in the original calibration files.
- **Mid Power** — Shows the mid power graph for the calculated calibration file. This graph is only available if the output power of a triplate was also measured in the original calibration files.
- **Overall error graph** — Shows the error graph of the calibration points that are used during the calculation of the calculated calibration file. The maximum error of the remaining calibration points is shown in this graph. All the values in this graph should be below 6 dB, otherwise the homogeneity of the anechoic chamber doesn't fullfill the electrical field strength requirements. The frequencies at which the **Overall error graph** is more than 6 dB, are the problematic frequencies for the calibrated anechoic chamber.
- **Power Graph** — When this option is selected, a mouse click on one of the coloured dots, will show the Power Graph for that calibration point.
- **Field Graph** — When this option is selected, a mouse click on one of the coloured dots, will show the Field Graph for that calibration point.
- **Error Graph** — When this option is selected, a mouse click on one of the coloured dots, will show the Error Graph for that calibration point.
- **Close** — Closes the result window, without saving the calculation results into a calibration file.
- **Save As...** — Shows a **Save Calibration As** window, where the calculation results can be saved into a calibration file. This calibration file can later be used in a substitution test, to generate an optimal uniform electrical field. The saved calibration file is another 1-point calibration file. This calibration file can be opened and reviewed again, but it will only contain the information of the calculated calibration. The saved calibration file will not contain the information of all the calibrated points, and the error graphs. The Uniform Field Area calculation does normalize the field strength

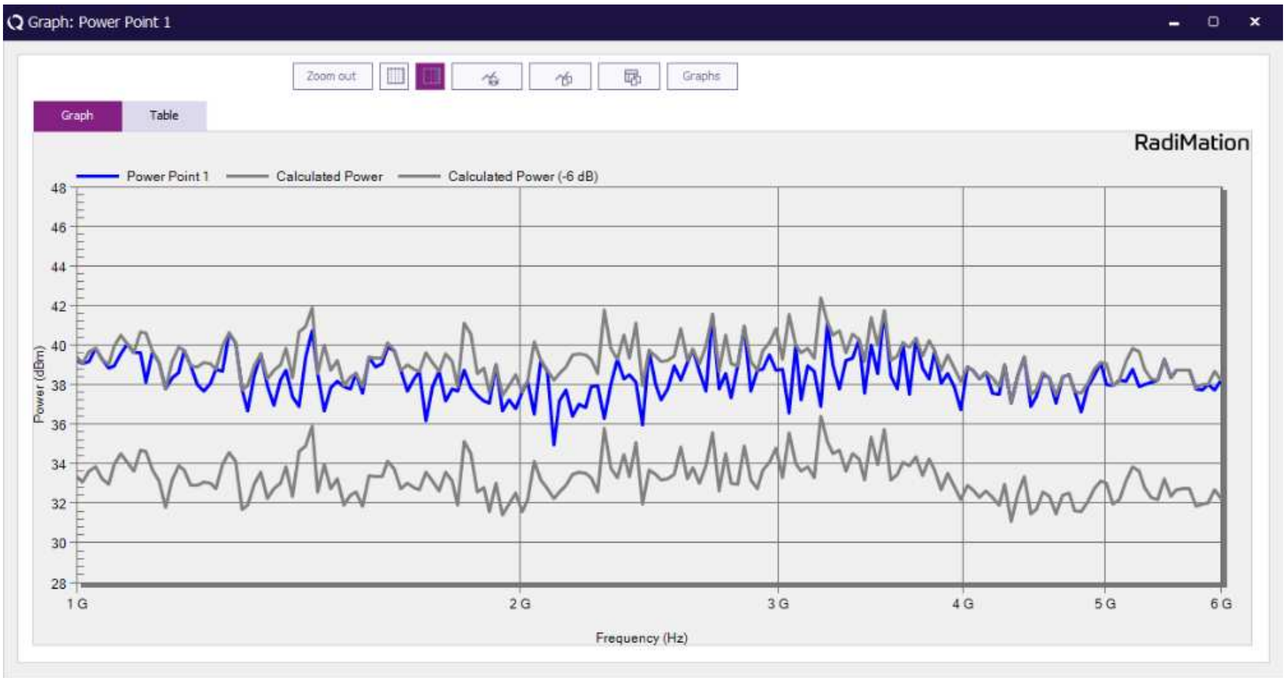
level that was measured in the individual calibration points. As a result of this, the Uniform Field Area calculation is calculating and comparing all the field strength levels and their corresponding power values to the requested field strength level. This will result into a final calibration file, which has a field strength graph that is **exactly** the requested field strength on all the frequencies.

For each coloured dot, also a graph can be shown, which shows the relevant information for that specific calibration point. These graphs can be shown by clicking on one of the dots. Depending on the selected **Power Graph**, **Field Graph** or **Error Graph** option, the corresponding graph will be shown.

- Power Graph: Shows the power that is used to achieve the desired electrical field strength level during the calibration of the calibration point. This graph is corrected for the error and tolerance that occurred during the calibration. If the calibration is made at a test level of 10 V/m with an tolerance of 1 V/m, the Uniform Field Area calculation will more accurately determine the power that is needed to exactly achieve 10 V/m (even if the calibration is made at for example 10.4 V/m).
- Field Graph: When the final calibration file is used in a substitution test, the Field graph displays the calculated field that will be generated at the selected calibration point.
- Error Graph: The Error Graph display the error for the selected calibration point, which is the difference between the power level on the selected calibration point, and the most ideal calibration point. On frequencies where the calibration point was discarded during the Uniform Field Area calculation, the graph will show a 0 dB error value.

In the power graph it is possible to show the following points:

- Power Point 1: The power used to get the required field for this point only (1-point calibration result).
- Calculated Power: This is the result of the UFA calculation, and this is the power used to get the required field and have 12 points within the 6 dB.
- Calculated Power (-6 dB): This field is to show the lower bound in the graph



12.5 Conducted immunity calibration

12.5.1 Calibration methods

Calibration of the conducted immunity test set-up is necessary when tests in accordance with the substitution method are performed. During the calibration, the current in a reference wire is determined, and the power to the injection device is recorded.
During the test, the injecting device is connected to a cable of the EUT and the same power is injected into the cable by the usage of the injection device.
The transfer correction needs to be corresponding to the setup situation in order to obtain correct measurements, referring to Calibration Jig Transfer correction

12.5.2 Voltage calibration

The EN 61000-4-6 describes testing based on an EUT cable impedance of 150 Ω. To calibrate the test system, a cable with a characteristic impedance of 150 Ω is used. This reference cable is placed in the injection clamp. The left side of this cable is terminated through a 150 Ω terminator resistor. The right side of the cable is terminated with a 100 Ω resistor in series with a 50 Ω power meter. The measured power in the 50 Ω powerhead can be used to calculate the RF current in the 150 Ω reference wire.
The test level U_{rms}, as described in the EN 61000-4-6 is the output voltage of an unterminated generator (or amplifier). The current injected in a 150 Ω wire will thus be $I_{injected} = \frac{\frac{U_{rms}}{2}}{150[\Omega]}$.
If an injection clamp with a 50 Ω input impedance is used, the voltage applied to the input of the injection clamp will be $\frac{U_{rms}}{2}$.
By measuring the voltage across the 50 Ω powerhead, the calibration software determines the signal generator level which generates the desired current in the reference cable.

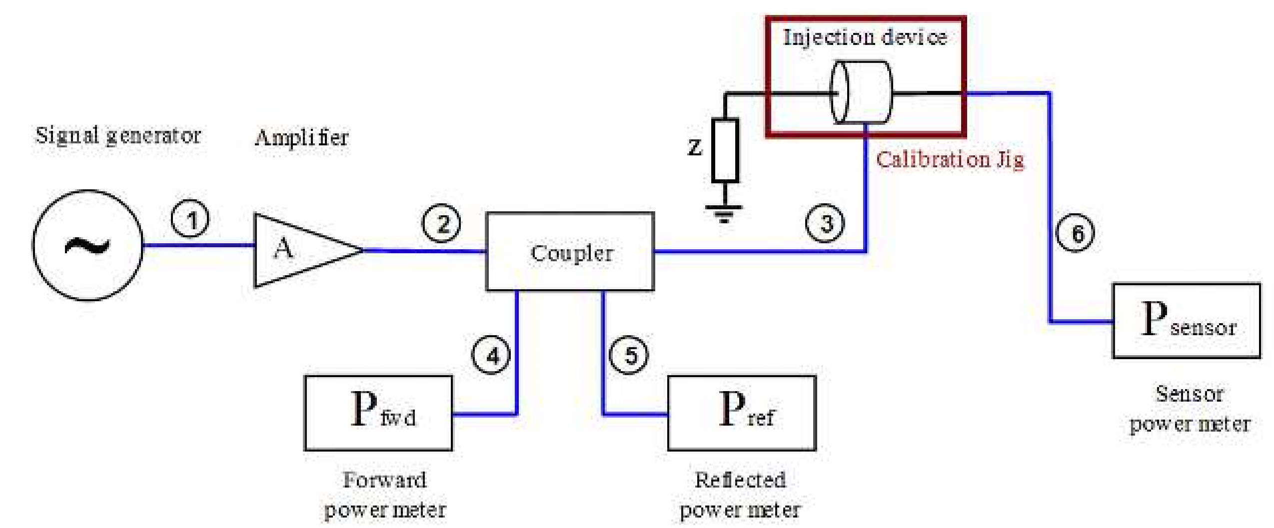
$$U_{powerhead}[V] = U_{rms}[V] - 6[dB] - 20 *^{10} log \frac{50[\Omega]}{150[\Omega]} = U_{rms}[V] - 15.6[dB]$$

Formula 12-5: Expected powermeter reading

Example:

Test level according to EN 61000-4-6: 10 Vrms (140 dBuV) testlevel. Measured value at the powerhead: $U_{powerhead}[dBuV] = 140[dBuV] - 15.6[dB] = 124.4[dBuV]$. In a powerhead with a 50 Ω impedance this will be:
$P_{powerhead} = 124.4[dBuV] - 107 = 17.4[dBm]$.

The calibration is carried out with an unmodulated test signal.



➢ **Frequency Range**	The start and stop range can be set here. Also an frequency list can be added. Correction files can be used as frequency list if the correction file contains a frequency column.
➢ **Step**	The step size can either be liniar or logarithmic.
➢ **Test-Level**	The test level can be set to a constant level. For the Variable test-level, a cor file can also be used. This can be the same file as for the Frequency List.
➢ **Harmonics**	The amount and type can be selected.
➢ **Calibration Method**	Selection of 3 different methods.
➢ **Power meter settings**	Choose the ammount of samples before continuing to the next frequency.
➢ **Test site**	For every test, a test site must be selected.

	Device name	tab in testsite configuration	Correction
	Signal generator	Devices 1	Output correction
	Amplifier	Devices 1	Maximum input / Maximum forward / Maximum reflected
	Coupler	Devices 1	Forward correction / Reflected correction
	Foward power meter	Devices 1	Power Correction
	Reflected power meter	Devices 1	Power Correction
	Injection device	Devices 2	
	Calibration jig	Devices 2	Transfer correction
	Sensor power meter	Devices 2	Power Correction
#	Cables		
1	Cable SG -> amplifier	Cables	Cable loss
2	Cable amplifier -> coupler	Cables	Cable loss
3	Cable coupler -> antenna	Cables	Cable loss
4	Cable coupler -> fwd power meter	Cables	Cable loss
5	Cable coupler -> refl power meter	Cables	Cable loss
6	Cable current -> power meter	Cables	Cable loss

Usage of correction factors is not mandatory. However, using correction factors will increase measurement accuracy during measurements. The details of the possible correction factors for each device are described in chapter 14.

12.5.3 Current calibration

Verification procedure:
After a calibration has been carried out, the calibrated test set-up can be checked by the following procedure. The same set-up is made as during calibration. As an extra check, a measuring current probe is placed around the 150 Ω reference wire. After the calibration has been completed, a radiated immune, substitution test is made with a test level of 10 Vrms.
The theoretical current with a test level of 10 Vrms will be: (Urms/2) / 150 = 33 mA
When a current probe with an transfer impedance of 1 Ω is used, a voltage of 33 mV should be measured (or approximately 90 dBuV).

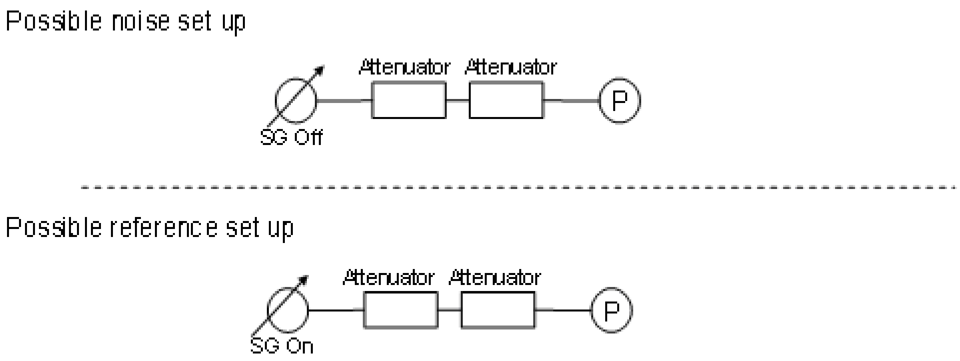
12.6 System Calibration

System calibrations are performed on a test setup, before the test setup can be used to perform the actual calibration on a device that should be calibrated. Some examples of supported (system) calibrations are:

1. Attenuation measurements of cables, couplers or other attenuators.
2. 1-16 point calibration of anechoic chamber before a radiated immunity test can be performed.
3. Calibration of conducted immunity setup before a conducted immunity test can be performed.
4. Open/Short/Through calibration of network analyser before S-parameter measurement can be performed.

12.6.1 Attenuation system calibration

During the system calibration for the attenuation the complete set up is connected but without the EUT.



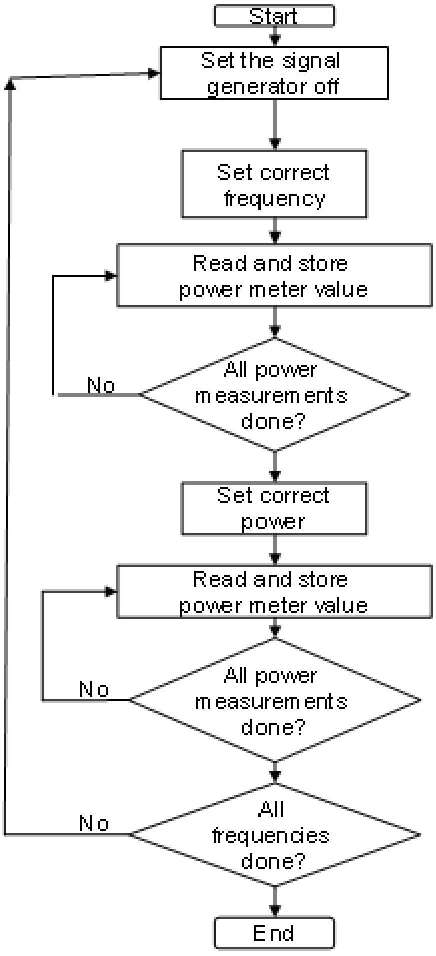
During the system calibration the signal generator is turned on and off at each frequency to determine the dynamic range at that certain frequency. The flow chart below describes the system calibration. The routine has been optimized for the least amount of power switching. The system calibration for attenuation is performed in two steps:

1. The frequency response of the signal generator and power meter is determined. The measurement response is used as a correction for the actual attenuation calibration of the d.u.t. during the attenuator calibrations.
2. The dynamic range of the test setup is determined. This is done by switching of the signal generator and measuring of the noise floor.

The dynamic range is the difference between the measured power when the signal generator is on and when the signal generator is off.

$$Dynamic\ range[dB] = P_{on}[dBm] - P_{off}[dBm]$$

Formula 12-6: Dynamic range



System calibration set up

Before starting a system calibration, make sure all the EUT windows are closed. The configuration window of a system calibration can be opened by selecting from the menu:

- **Calibration**
  - **System Calibration**
    - **Attenuation / Gain**

In the configuration window you can define the number of sample that should be taken. The fastest way is one sample but this will disable the calculation of the standard deviation.

12.6.1.1 Power meter setting

For every frequency the average of all the samples is taken using the formula below

$$P_{powermeasurement}(f)[dBm] = 10 *^{10} log(\frac{\sum_{N}^{i=1} 10^{\frac{P_{powermeter(f,i)[dBm]}}{10}}}{N})$$

Formula 12-7: Average power calculation

As can be seen the average of the power measurement is taken over the linear value.

Note: The power measurement settings done in the device driver configuration screen are the settings for one sample. This is done because each power meter has a different leveling and measuring time. For the most optimal settings look at the device driver chapter for explanation and tips.

12.6.1.2 Signal power setting

The signal generator level is set for the complete frequency range, this is desirable because it gives you full control. For example you can set the signal generator level higher when the dynamic range is insufficient, or lower when using a small amplifier.

12.6.1.3 Reviewing measurement data

During and after the test it is possible to view graphs by pressing the graph buttons.
In the graph window additional graphs for the related information can be added to the graphs. If the system calibration is configured to use multiple samples of the powermeter, the standard deviation of the following items is calculated:

- Dynamic range
- Reference attenuation
- Reference noise floor

Calculation of the standard deviation is done by using the formula:.

$$Stddev = \sqrt{\frac{\sum_{n=1}^{N} X^2(n) - N * \left(\frac{\sum_{n=1}^{N} X(n)}{N}\right)^2}{N-1}}$$

Formula 12-8: Standard deviation

The standard deviation for the dynamic range is calculated using the formula:

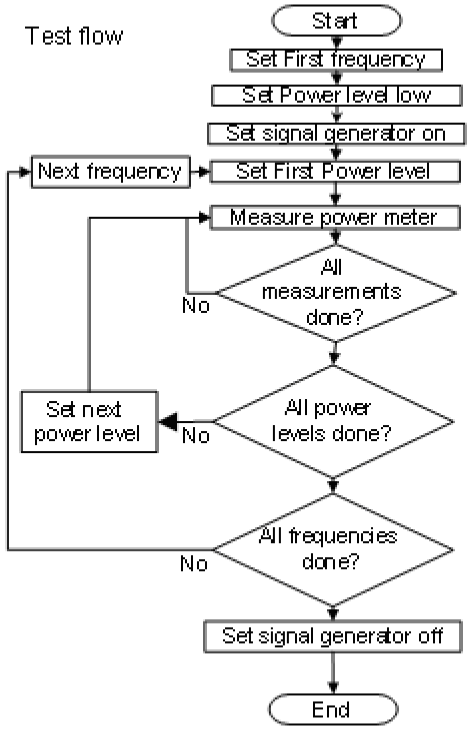
$$Stddev_{dynamic\ range} = \sqrt{(Stddev_{reference\ attenuation})^2 + (Stddev_{reference\ noise\ floor})^2}$$

Formula 12-9: Standard deviation of the dynamic range

12.6.2 System Compression Calibration

The goal of the system compression calibration is to increase the accuracy of the measurement. It is possible to perform the EUT compression calibration without a system calibration but this will may have a measurement error in the number of 0.3 or 0.4 dB. This error comes from the difference between the signal generator and the power meter. Also attenuator clicks in the signal generator are not corrected. In the ideal situation there is no need for a System calibration.
The general thought behind the calibration is, the signal generator nor the power meter are exactly correct for every frequency and every power level. The signal generator has attenuator switches that can cause an error and the power meter has power ranges that can cause an error. Because this is a relative measurement, the power meter is defined to be infinitely accurate. The software records the difference between the signal generator and the power meter, measured with the new “accurate” power meter.

Note: Setting the power meter to be infinitely accurate is only valid in a relative measurement. The error caused by the power meter and the signal generator are corrected in the signal generator.



To open the configuration window of a system calibration select. Before starting a calibration of a system make sure all the EUT windows are closed.

- **Calibration**
  - **System Calibration**
    - **Gain Compression**

In the configuration window you can define the number of sample you want to take. The fastest way is one sample but this will leave the possibility for standard deviation calculation out.

12.6.2.1 Power meter setting

For every frequency the average of all the samples is taken using the formula below

$$P_{powermeasurement}(f)[dBm] = 10 *^{10} log(\frac{\sum_{i=1}^{N} 10^{\frac{P_{powermeter}(f,i)[dBm]}{10}}}{N})$$

Formula 12-10: Average power calculation

As you can see the average is taken over the linear power value.

Note: The power measurement settings done in the device driver configuration screen are the settings for one sample. This is done because each power meter has a different leveling and measuring time. For the most optimal settings look at the device driver chapter for explanation and tips.

12.6.2.2 Signal power setting

The signal generator level is set for the complete frequency range, this is desirable because it gives you full control. For example you can set the signal generator level higher when the dynamic range is insufficient, or lower when using a small amplifier.

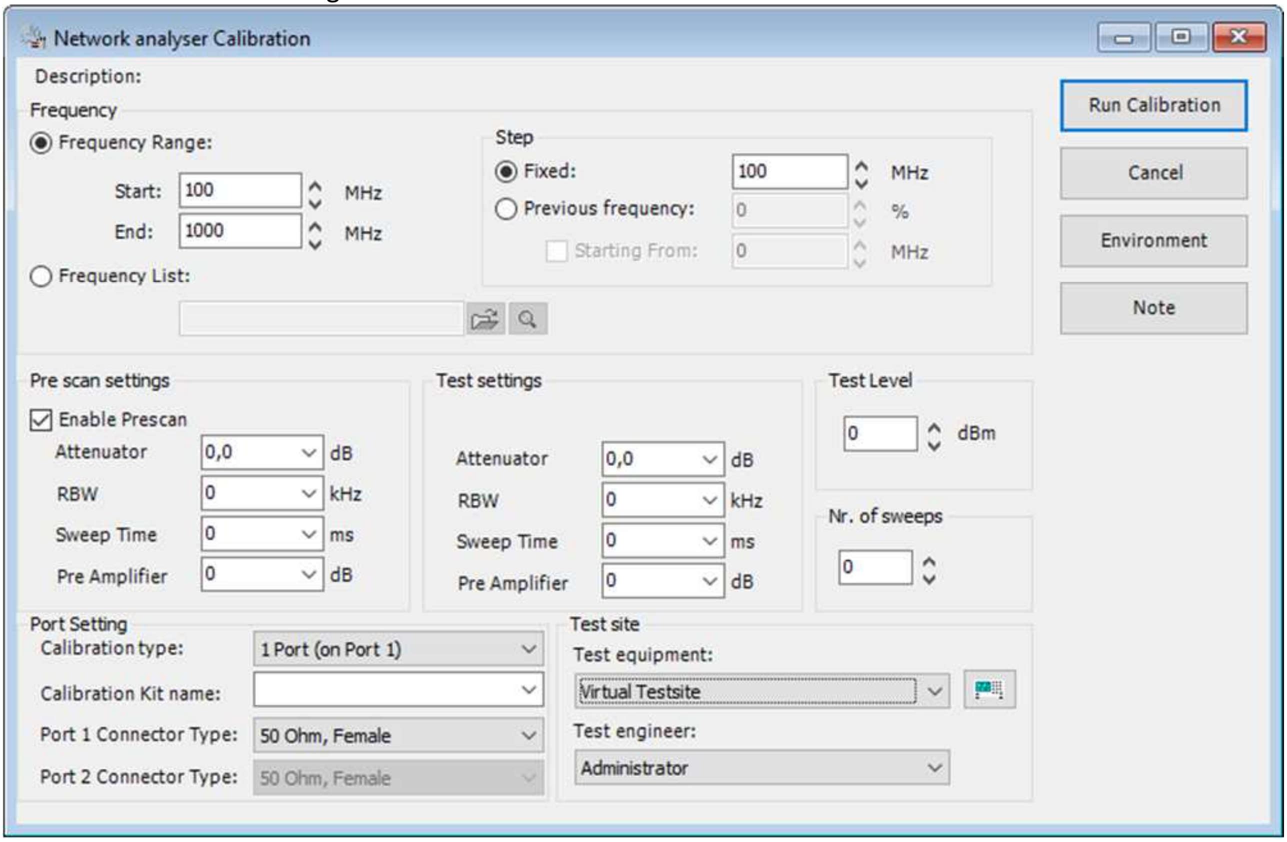
Note: When inserting the calibration in the EUT compression configuration the same test levels are used. It is not possible to change the value, so select the settings with care.

12.6.3 Network Analyser (S-Parameter)

Before RadiMation® can measure S parameters it first needs a calibration file of the network analyser. Make sure all the EUT windows are closed first. To open the configuration window of the system calibration select.

- **Calibration**
  - **System Calibration**
    - **Network Analyser (S-Parameter)**

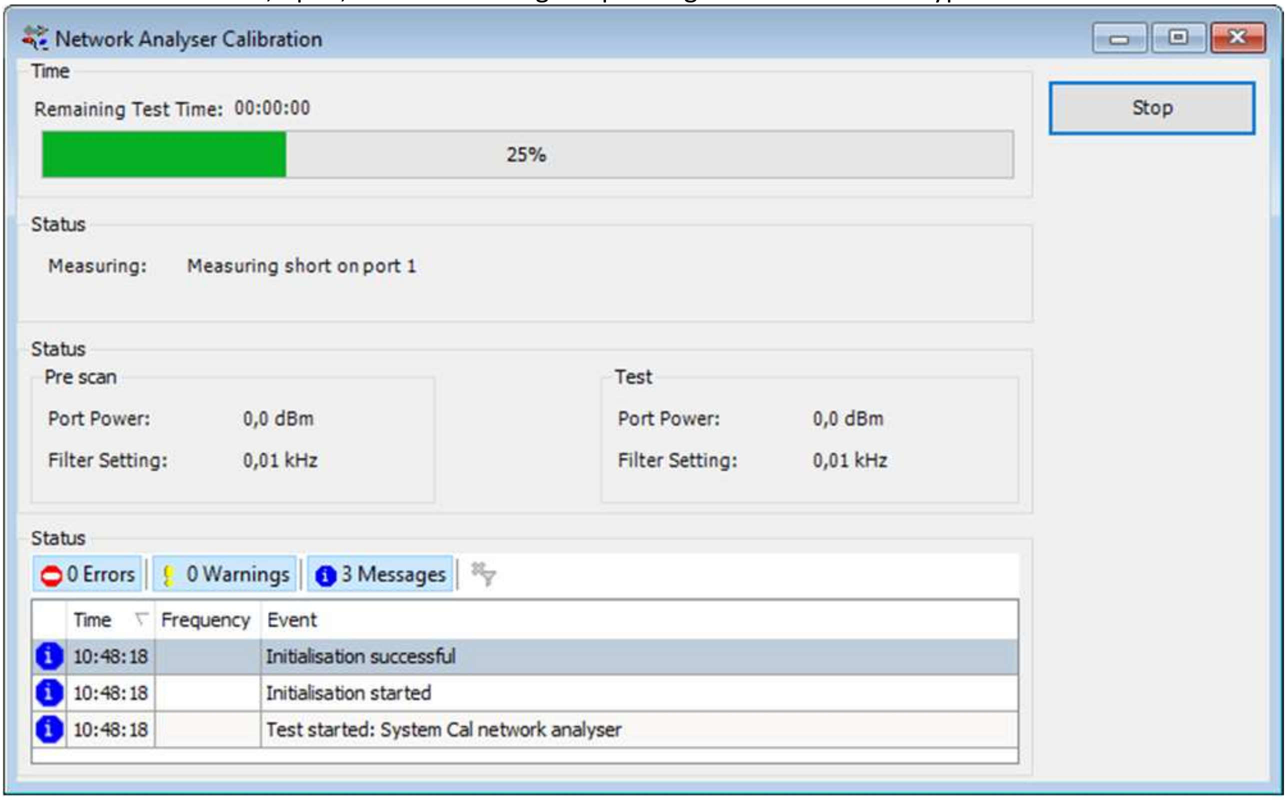
Create or choose an existing calibration.



➢ **Start**	Sets the start frequency.
➢ **Stop**	Sets the stop frequency.
➢ **Frequency List**	With a frequency list the operator can select a frequency list file by browsing to the file location. The frequencies inside the frequency list file will be measured.
➢ **Fixed**	Sets the fixed stop in MHz to use.
➢ **Previous frequency**	Sets the increment in percentage to use.
➢ **Starting from**	Sets the starting frequency.

➢ **Enable Prescan**	Sets the prescan enabled.
➢ **Attenuator**	Sets attenuator value in dB.
➢ **RBW**	Sets the RBW in kHz.
➢ **Sweep Time**	Sets the sweep time in ms.
➢ **Pre Amplifier**	Sets the pre amplifier in dB.
➢ **Test level**	Sets the test level.
➢ **Number of sweeps**	Sets the number of sweeps.
➢ **Calibration type**	Sets the type of calibration, Port 1, Port 2 or Full port.
➢ **Calibration Kit name**	Sets the name of the calibration kit used.
➢ **Port 1 Connector Type**	Sets the connector type of port 1.
➢ **Port 2 Connector Type**	Sets the connector type of port 2.
➢ **Test Equipment**	Sets the equipment to use.
➢ **Engineer**	Sets the engineer.

Press **Run Calibration** to start the process. During the calibration process RadiMation® will ask to connect either a short, open, match or through depending on the calibration type selected.



When the process is finished RadiMation® will prompt to save the Calibration file, which is needed to run the EUT S Parameter test.

12.7 EUT Calibration

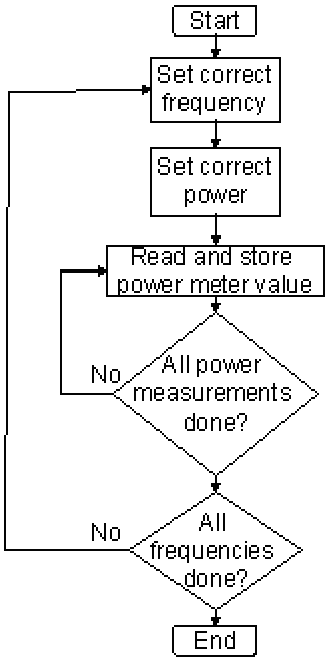
EUT calibrations are performed on devices that are considered to be an EUT. For example, during an attenuation calibration, the attenuation of an attenuator, cable or coupler can be measured.

12.7.1 EUT Attenuation Calibration

During an attenuation calibration, the attenuation of an attenuator, cable or coupler can be measured. It is also possible to use the calibration to determine the gain of an amplifier. The attenuation will in this case have a negative value.

12.7.1.1 EUT Attenuation Calibration

Before an EUT calibration can be performed, the calibration system first needs to be calibrated using a system calibration. After calibrating the EUT there is a possibility to save the measured attenuation into a correction file.
The flowchart below describes the testing procedure used for EUT calibration.



12.7.1.2 EUT calibration set up

To open the configuration of a calibration, as shown below, make sure the correct EUT window is open. Then select from the menu:

- **Calibration**
  - **E.U.T. Calibration**
    - **Attenuation / Gain**

Select the correct calibration file and all the other setting will automatically be set.
The EUT calibration is performed with the same configuration settings as the configuration of the system calibration that was selected. This will ensure the lowest error, and the highest accuracy during the calibration:

1. There is no interpolation error possible between frequency points.
2. The calibration is performed at the same signal generator level preventing extra amplitude errors.
3. Error budget calculation is possible

12.7.1.3 Reviewing measurement data

In the EUT calibration the standard deviation of the following items are calculated:

- Dynamic range
- EUT attenuation

For the dynamic range the standard deviation is calculated with the formula below

$$Stddev_{dynamicrange} = \sqrt{(Stddev_{EUT-attenuation})^2 + (Stddev_{reference\ noise\ floor})^2}$$

Formula 12-11: Standard deviation of the dynamic range

For the attenuation the standard deviation is calculated with the formula below

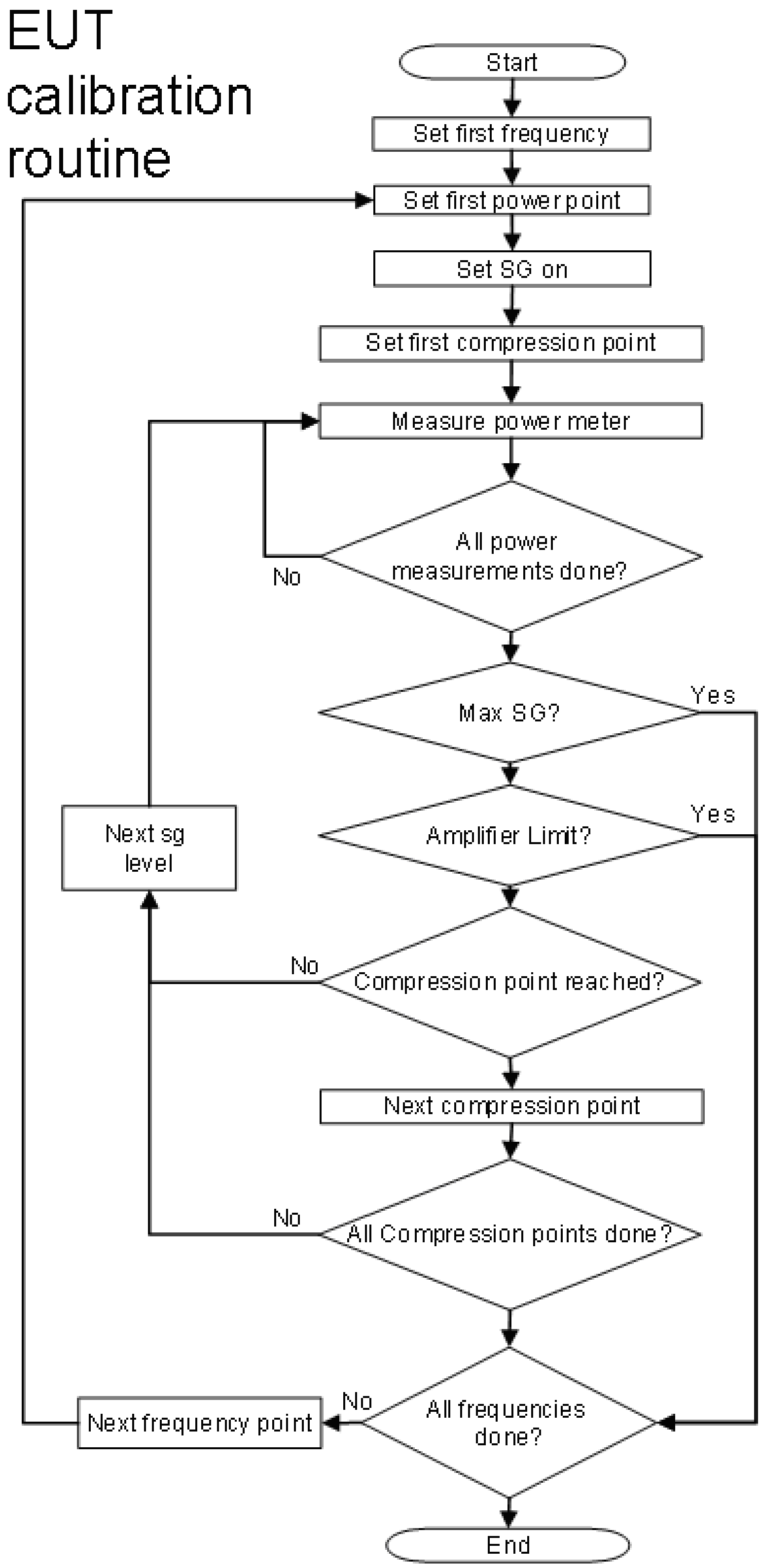
$$stddev_{attenuation} = \sqrt{(stddev_{reference})^2 + (stddev_{measurement})^2}$$

Formula 12-12: Standard deviation of the attenuation

In the information screen you can create a correction file for the attenuation measured. After pressing the “Create correction file” button a save dialog will appear, allowing you to select the desired path and filename for the correction file. This correction file can be attached to the calibrated device. For example, when the frequency response of a cable is measured, the correction file can be attached to the cable device driver, in the configuration menu of the cable.

12.7.2 EUT Compression Calibration

EUT compression calibrations are performed on amplifiers that are considered to be an EUT. The goal of this calibration is to determine the 1 dB or 2 dB compression point. The calibration also allows to calibrate any other compression point, because the required compression levels can be configured in the calibration. It is thus also possible to measure for example the 1 dB and the 3 dB compression points during a single calibration.
Before a EUT calibration can be performed, it is best to first perform the system calibration. This will decrease the overall error, which is depending on the devices you are using. The flowchart below describes the testing procedure used for EUT calibration.



12.7.2.1 EUT calibration set up

To open the configuration of the amplifier compression calibration, make sure the correct EUT window is open, and then select from the menu:

- **Calibration**
  - **E.U.T. Calibration**
    - **Gain Compression**

The configuration can be automatically set by selecting the correct amplifier compression system calibration file.
The EUT calibration is then configured to be performed with the same configuration settings as during the system calibration, to perform the calibration with the lowest possible error.

1. There is no interpolation error possible between frequency points.
2. The calibration is performed at the same signal generator level preventing extra amplitude errors.

When no amplifier compression system calibration file has been selected, the settings of the test can also be set manually.
Calibration of an amplifier can result in damaging the amplifier itself! It is therefore suggested to use the following security precautions, during these type of calibrations:

- **Signal power amplifier protection**} should be set high enough for testing. The maximum input level is default 0 dBm when no correction file is attached to the amplifier. With a correction file the maximum input can be set higher then 0 dBm.
- Forward power amplifier protection should be used when the amplifier has an output power protection. The fail safe option is setting the limitation to the maximum and decrees this with one step size of the test. For example the limitation is set on 56,5 dBm (450 Watt) and the step size is 0.3 dB, than the limitation should be set on 56,2 dBm (420 Watt). This way the changes of the amplifier turning off during testing will become significantly smaller.
- **Start level** of the signal generator should be set on 20 dB lower then the lowest point specified by the manufacturer.
- **Stop level** of the signal generator should be the maximum input of the amplifier, most of the times this level will not be reached.

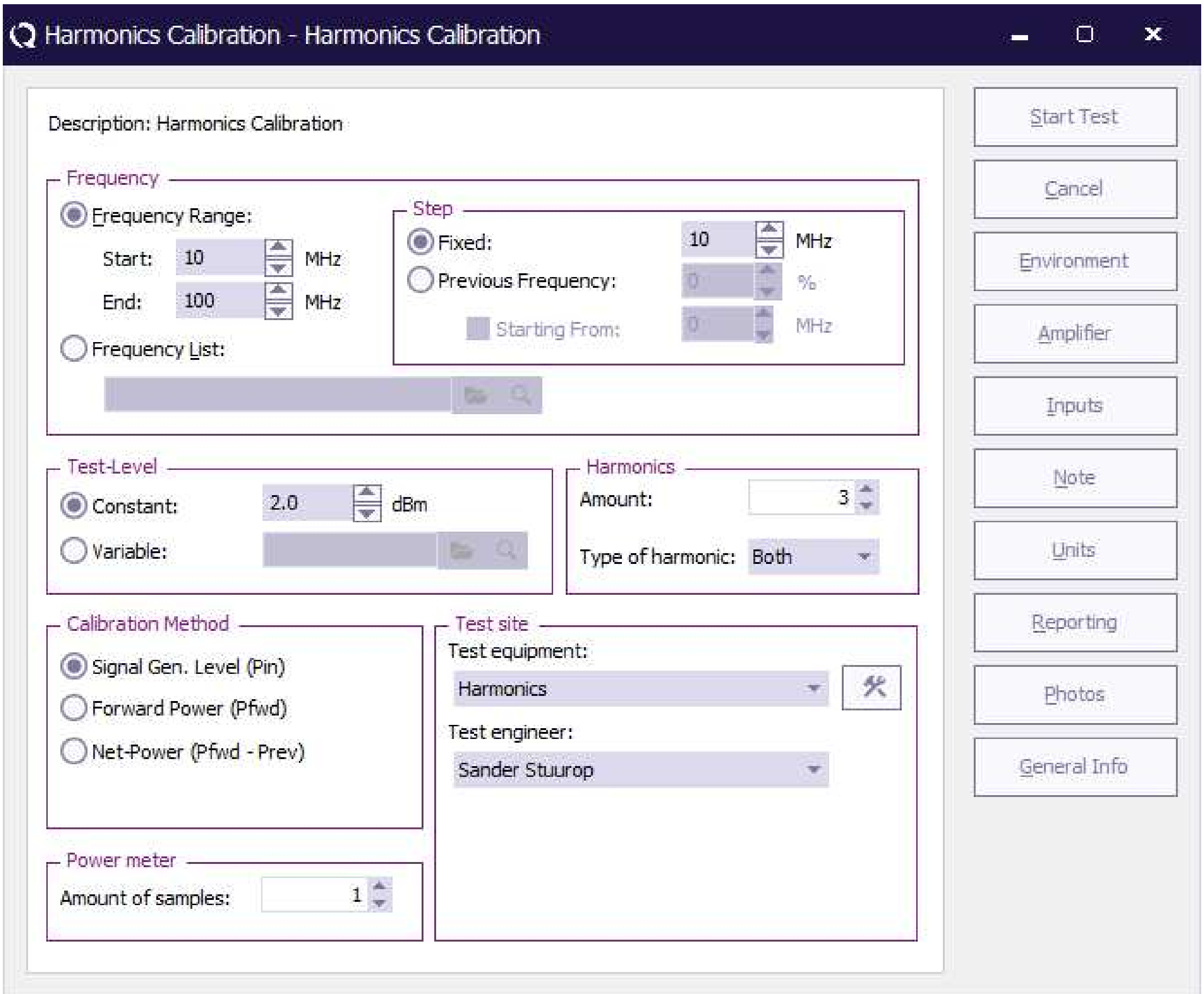
Note: Please note that these settings are guidelines and should be treated as such.

12.7.2.2 Reviewing measurement data

In the results overview of the amplifier compression EUT calibration the standard deviation of the following items are calculated:

- Small signal gain power
- Compression points power

12.7.3 EUT Harmonics



- **Description** — The name of the selected TSF file.
- **Frequency Range** — Sets the frequency specification to a **frequency range**.
- **Start** — Sets **start** frequency.
- **End** — Sets **end** frequency.
- **Step Fixed** — Sets a fixed step size from start to end frequency.
- **Step Previous Frequency** — Sets a logarithmic step size from start to stop frequency

➢ **Starting From**	Sets the start frequency for a logarithmic step from which the actual measurement frequencies will be calculated. the starting from frequency should be lower then the actual start frequency. The test will start at the first calculated frequency that is equal or higher then the specified start frequency.
➢ **Frequency list**	With **frequency list** the operator can select a frequency list file by browsing to the file location. The frequencies inside the frequency list file will be measured.
➢ **Constant**	The test level can be set to a constant level.
➢ **Variable**	A .COR file can also be used. This can be the same file as for the Frequency List.
➢ **Amount**	The number of harmonics that should be measured.
➢ **Type of harmonic**	If only the even, odd or both (even and odd) harmonics should be measured.
➢ **Calibration method**	On which power levelling point the desired testlevel should be regulated.
➢ **Test Equipment**	In the test site window the test engineer can select which equipment list will be used during this test.
➢ **Test engineer**	In the test engineer window, the test engineer can select its own name. The test engineer name will be stored by the test results
➢ **Amount of samples**	The amount of measurements that are measured on each harmonic to determine its power. The average of these measurements will be used as the power of the harmonic.
➢ **Start Test**	Starts the configured calibration.
➢ **Cancel**	Cancel the configured calibration.
➢ **Environment**	Display the environment window.
➢ **Amplifier**	
➢ **Inputs**	
➢ **Note**	Display the note window.
➢ **Units**	Display the Units configuration window
➢ **Reporting**	

➢ **Photos**

➢ **Genaral info**

The harmonics calibration will step through the configured frequency range with the specified frequency step. On each of those tested frequencies, the calibration routine will regulate the output power of the amplifier to the specified power level on the forward powermeter, and will then measure the harmonics of that frequency. Depending on the selected equipment different amplifier harmonic measurements can be performed:

- If a sensor powermeter is present in the selected testsite, the sensor powermeter will be used to measure the power of the harmonic. The sensor powermeter should in this case be connected to the coupler at the output of the amplifier. Often a frequency selective powermeter (like a spectrum analyzer) is used as the sensor powermeter. This setup allows to see the difference between the broadband output power of the amplifier compared to the actual output power of the CW frequency (the 1st harmonic) out of the amplifier.
- If no sensor powermeter is present in the selected testsite, the spectrum analyzer will be used to measure the power of the harmonic. The spectrum analyzer should in this case be connected to the calibration antenna and optionally the preamplifier. This setup allows to perform a calibration of the electrical field strength harmonics, also taking the frequency dependant antenna gain of the transmit antenna into account.
- If no sensor powermeter and no spectrum analyzer are selected, the forward powermeter will be used to measure the power of the harmonic. The forward powermeter should in this case be connected to the coupler at the ouput of the amplifier. A frequency selective powermeter (like a spectrum analyzer) should be used in this setup to correctly perform the amplifier harmonic calibration.

The measurement of the harmonic will also use the correction that is selected by the corresponding cables that are selected in the testsite.
The option that is selected at **Type of harmonic** and the number that is specified for **Amount** determine which harmonics are measured.

Type of harmonic	Amount	Measured harmonics	CW Frequency	Measured harmonic frequencies
Both	4	1, 2, 3, 4, 5	100 MHz	100, 200, 300, 400 and 500 MHz
Even	3	1, 2, 4, 6	600 MHz	600 MHz, 1.2, 2.4 and 3.6 GHz
Odd	2	1, 3, 5	1.5 GHz	1.5, 4.5 and 7.5 GHz

The 1st harmonic (which is the same as the generated CW signal) is always measured to ensure that the gain of the harmonics can be compared to the 1st harmonic.

12.7.3.1 Reviewing measurement data

In the results overview of the amplifier harmonics EUT calibration the following measurement values are available in the graph and the table:

➢ **Signal power** The power of the signal generator that is driving the amplifier.

➢ **Forward power** The (broadband) output power that is generated by the amplifier.

➢ **Power (1st harmonic)**	The power of the first harmonic (the actual CW frequency) that is generated by the amplifier.
➢ **Power (...th harmonic)**	The power of specified harmonic that is generated by the amplifier.
➢ **Gain (...th harmonic)**	The dBc difference between the specified harmonic and the first harmonic.
➢ **Std. Dev. (...th harmonic)**	The standard deviation of the measured power samples of the specified harmonic.

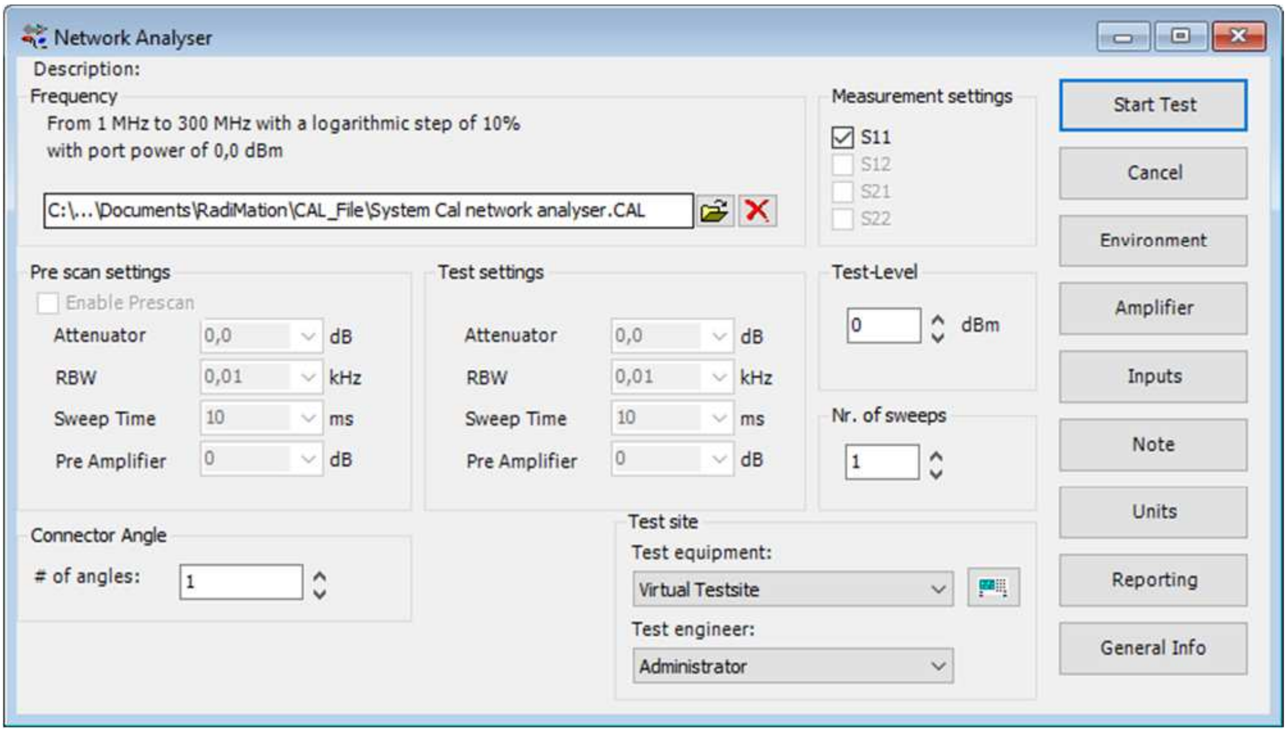
All the values of the harmonics are shown relative to the applied CW frequency that was generated by the signal generator when the harmonic was measured. If for example a CW frequency of 500 MHz is generated, the power value of the 3rd harmonic is also shown in the table at 500 MHz, even though it was actually measured on 1500 MHz. Showing the measured values of the harmonics on the same frequency as the CW frequency simplifies the comparison of the values between the harmonics and the value of the 1st harmonic itself.
It is possible that one or more of the higher harmonics have not been measured due to limitations of the allowed frequency range of the used equipment (which can be powermeter, coupler, spectrum analyzer, antenna and cables). For a CW frequency of 500 MHz, the 5th harmonic is generated at 2500 MHz. If however the used spectrum analyzer is only able to measure up to 2000 MHz, it is not possible to measure the 5th harmonic of 500 MHz, and thus the value in the table will be empty. Also the graphline of the 5th harmonic will then only be drawn up to 400 MHz, which corresponds to the 5th harmonic at 2000 MHz, which is the highest measurable frequency of that spectrum analyzer.

12.7.4 EUT S-Parameter

Before an EUT S-Parameter test can be performed, the network analyser needs to be calibrated. After calibrating the network analyser, there is a possibility to save the measured calibration into a calibration file which should be selected and used in this test.
To open the configuration of a calibration, as shown below, make sure the correct EUT window is open. Then select from the menu:

- **Calibration**
  - **E.U.T. Calibration**
    - **S Parameter**

Select the previously created calibration file and configure the settings.

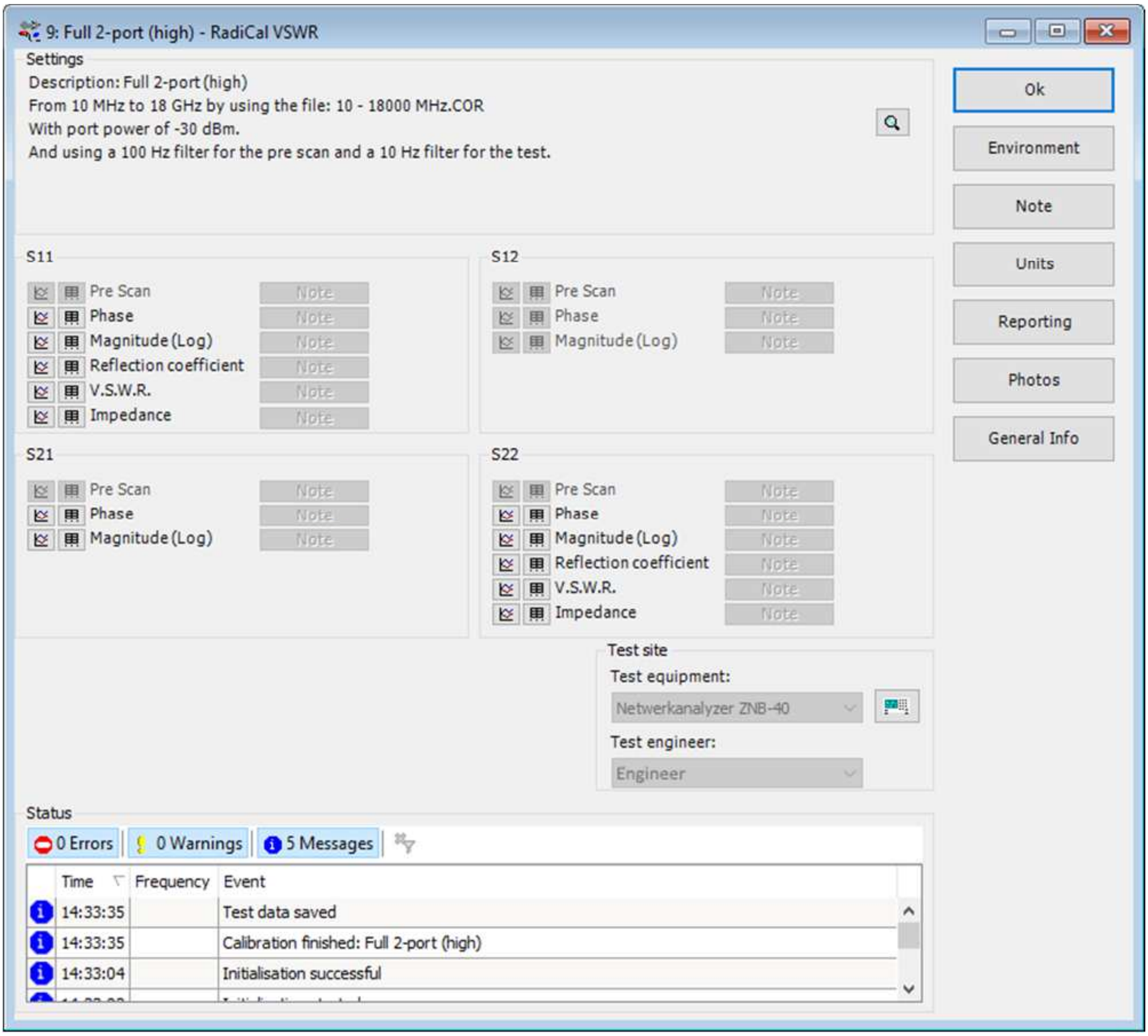


- **Measurement settings** Select the type of measurement, S11, S12, S21 and/or S22.
- **Test level** Sets the test level to use.
- **Nr. of sweeps** Sets the number of sweeps to use.
- **# of angles** Sets the number of angles to use.
- **Test equipment** Sets the test-site to use.
- **Engineer** Sets the engineer which is performing the test.

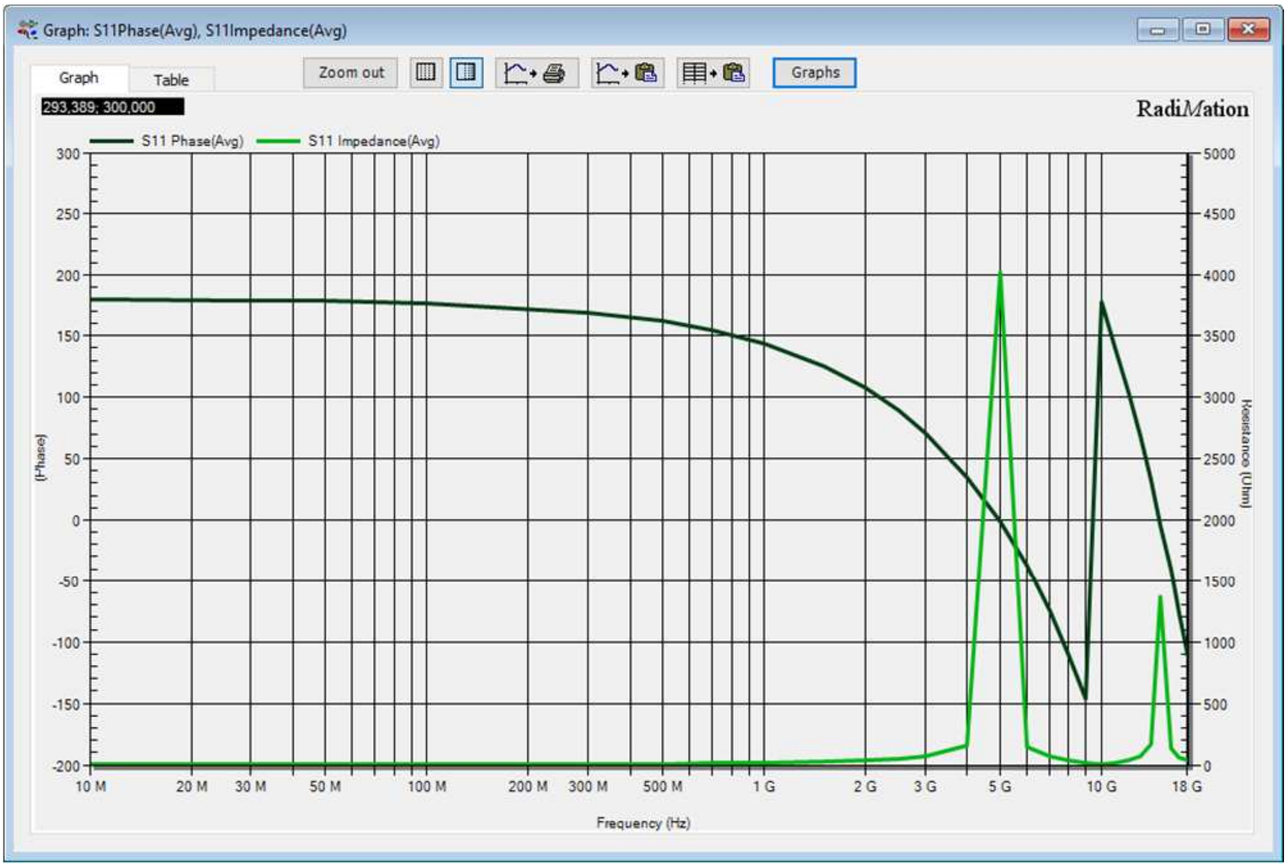
Press **Start Test** to perform the S-Parameter test.

12.7.4.1 Reviewing measurement data

The test results of the S-Parameter test can be opened from the list of performed tests from the EUT window.



The specific test result of interest, either in graph or tabular format, can be opened by clicking the corresponding button in front of the measurement name. It is possible to show more results in one graph by clicking the **Graphs** button and select the measurement data.


Graph: S11Phase(Avg), S11Impedance(Avg)
Graph
Table
Zoom out
Graphs
293,389; 300,000
RadiMation
S11 Phase(Avg)
S11 Impedance(Avg)
(Phase)
Resistance (Ohm)
Frequency (Hz)
10 M
20 M
30 M
50 M
100 M
200 M
300 M
500 M
1 G
2 G
3 G
5 G
10 G
18 G

RadiMation® EMC software
------- Report Generator -------

Table of contents:

Report Generator

13.1 Introduction

The Report Generator is a software module that can automatically generate a test report from tests carried out by RadiMation®. This function can save a test engineer a lot of time, since the Report Generator only needs a few minutes to generate a complete test report. These test reports can be written in Microsoft Word, Microsoft Excel or Text format.
The basic information needed to create to generate a test report, as well as the more specific features of the Report Generator, are explained in the following paragraphs.

13.2 About the Report Generator

13.2.1 Template files and Report files

The Report Generator uses two files to generate a report; the Template file and the Report file.
The **Report file** is the 'output' of the Report Generator and the actual test report. It is containing all the desired data from the tests performed in the form of text, graphs, tables, etc. . Depending on the Template file, this report will be written in Microsoft Word, Microsoft Excel or Text format.
The **Template file** is the 'input' of the Report Generator. It contains the data for the Report file in the form of specific keywords. The Report Generator then replaces these keywords with test data to produce the actual test report (i.e. the Report file). Depending on the wishes of the test engineer, this file can be written in Microsoft Word, Microsoft Excel or Text format.
The Template file is not altered or destroyed when a Report file is generated. As such it can be 're-used' (as an example) for other test reports if the situation allows for it. (Great care should be taken to make sure that the content of the 're-used' Template file is suitable for the desired test report.)
Since the Template file is the foundation for the test report we recommend that you safeguard its content. Make the Template file read-only so it cannot be (accidentally) deleted or modified.
The Template file and report file may not be the same file!
Multiple 'test-specific' templates can be used instead of one 'generic' template. The biggest advantage of this option is that it simplifies the process of setting up and generating very large test reports. For more information, please read the paragraph 'Test-specific templates' (under 'Special features') further down.

13.2.2 Keywords

In the Template file, the test data is represented by specific keywords that tell the Report Generator which data to insert at the position of the code. These are divided into Main Keywords and Secondary Keywords.
In the (generic) Template file these keywords are coded as followed: ||Main keyword | second keyword||
The **Main Keyword** indicates the part of RadiMation® from which the data must be retrieved, such as; EUT, Configuration, Radiated Immunity, etc. (A list of Main Keywords and their complementing Secondary Keywords is visible further in this chapter.)
The **Second Keyword** indicates the data that must be retrieved, such as; filename, test start time, frequency, etc. (A list of Main Keywords and their complementing Secondary Keywords is visible further in this chapter.)
Every Main Keyword has a set of (Secondary) Keywords that can only be used in combination with that specific Main Keyword. In many cases tests share the same Keywords even though they refer to

different data. (This is not a problem because the combination of the Main and Secondary Keywords will always result in a unique code.)
An overview of these keywords is visible further in this chapter.
Keep in mind that:

- The Keywords must be spelled correctly, including spaces and other symbols.
- To separate multiple words, only one space is used.
- Keywords are not case sensitive.
- Keywords that are not recognized cannot be replaced with data.
- Unrecognized Keywords will appear in the Report file 'unchanged' (as codes).
- In a 'test-specific' template the Main Keywords are not used, (only the second keywords).

13.2.2.1 Unrecognized Keywords

If a Keyword is not recognized the test engineer will be alerted to this error in the 'settings screen' of the Report Generator. This might occur when:

- The Keyword is spelled incorrectly.
- The data it refers to does not exist/no longer exists.
- The data it refers to does not exist/no longer exists in the specified location.
- The data it refers to does not exist/no longer exists under the specified name.

Errors are easily located by searching the test report (i.e. Report file) for the characters "||". Once found these can be deleted, or changed into a correct code. If the Report Generator is executed once again, (using the modified file as the template), the Report Generator should generate the report without errors (not replaced keywords).

13.3 Generating a report

Generating a report is a three step process. First you (make and) select a Template file to use as the foundation for your report. Then you set-up the desired Report Generator settings. Lastly you generate (and check) the test report (i.e. the Report file).
If the test report contains an error or is not to your liking for some reason, it can be altered. Please read the following paragraphs for more information about 'generating a report'.
We also recommend that you read the 'Specific features' paragraphs, because they contain further and more detailed information about specific features and uses of the Report Generator.

13.3.1 Step 1. Making and selecting a Template file

A Template file is needed to generate a report. Select/alter an existing file or create a new file if necessary.

13.3.1.1 Making a template file

Template files can be made in Microsoft Word, Microsoft Excel or Text format. As described previously, the Template file is the 'input' for the Report Generator and contains the data for the Report file in the form of specific keywords. These codes can be included in the templates in a variety of ways. Some of the possibilities are visible below:
In a template file made in **Microsoft Word**:

- Report generator codes can be included 'as is' (meaning, without context).
- Report generator codes can be included in a table.
- Report generator codes can be included in a header or footer.
- Report generator codes can be included in a heading.
- Report generator codes can be combined with other text and report generator codes in a cell of a table.

- Report generator codes that include texts into the final report are allowed.
- Report generator codes that include tables into the final report are allowed.
- Report generator codes that include pictures into the final report are allowed.

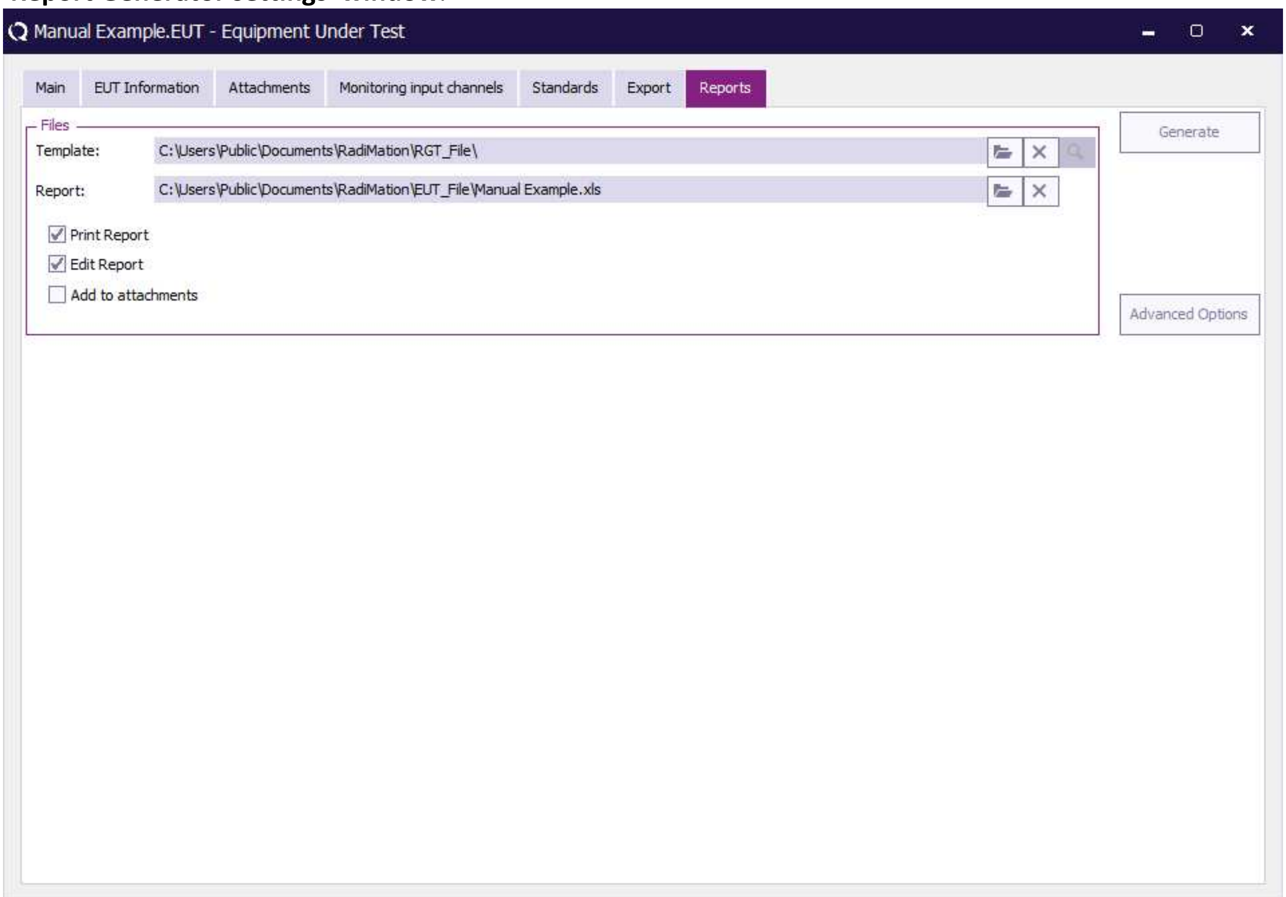
In a template file made in **Microsoft Excel**:

- Report generator codes can be included 'as is' (meaning, without context) in a single cell.
- Report generator codes can be combined with other text in a cell.
- Multiple report generator codes (and also text) can be combined in a cell.
- (Multiple) Report generator codes can be included in a note attached to a cell.
- Multiple worksheets are allowed, all worksheets will be checked for report generator codes.
- Report generator codes can be used as part of a formula of a cell. However it might be necessary to convert the contents from a text to numerical value. The simplest form of a formula is: "=VALUE("||START FREQUENCY||")".
- Report generator codes that include texts into the final report are allowed.
- Report generator codes that include tables into the final report are allowed.
- Report generator codes that include pictures into the final report are allowed.

Additional information and possibilities about the use of Microsoft Word and Excel as template files is described in the paragraph 'Microsoft Word/Excel report generator editor' (under 'Special features') further below.

13.3.1.2 Selecting a template file in RadiMation

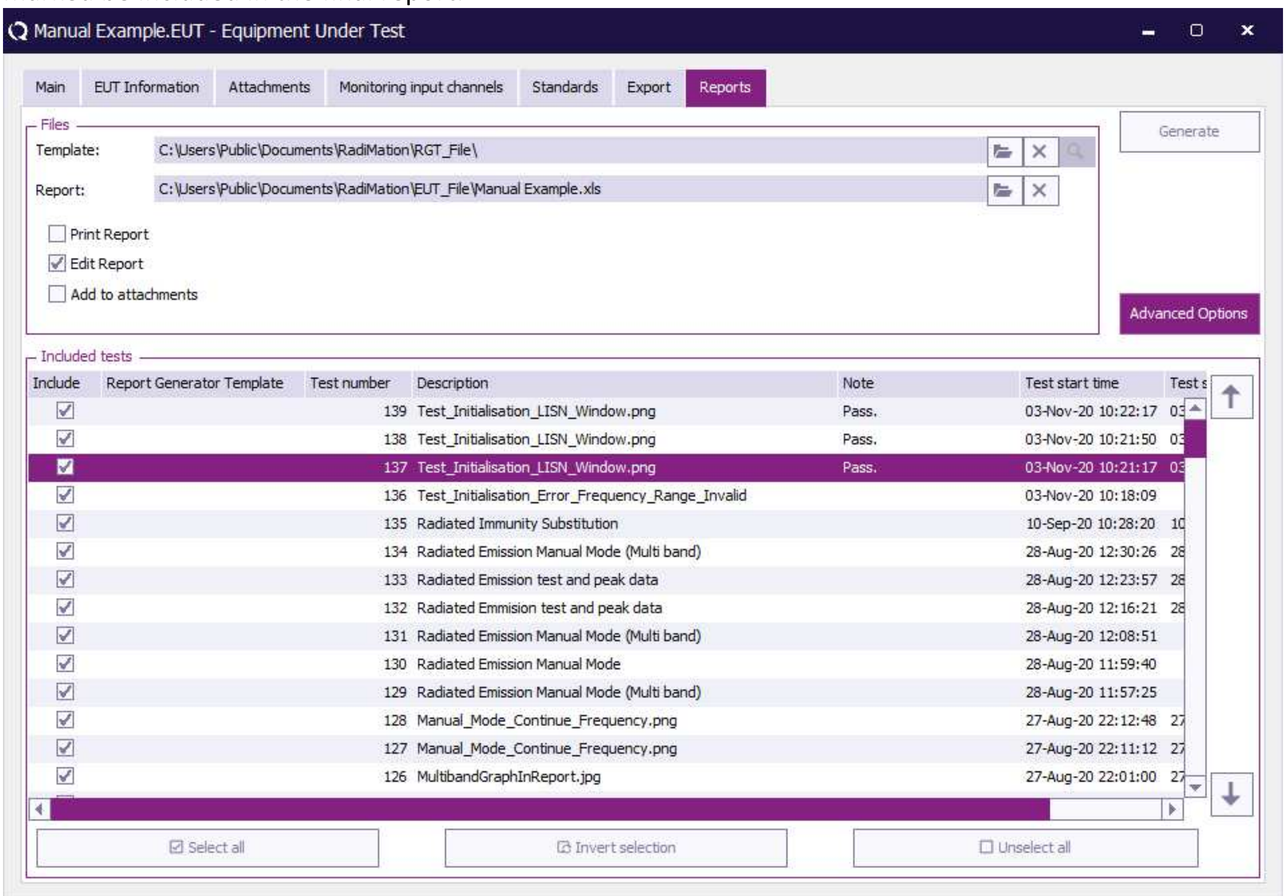
To generate a report, open the **'EUT' window** and go to the **'Reports' tab**. Click **'Report'** to open the **'Report Generator settings' window**.



To select a Template file, click on the 'Template' path or the folder button next to it and select a file from the pop-up window.
To view the selected Template file, click the magnifying glass.
To delete the file selection, click the red cross. (The red cross does not delete the file itself.)

13.3.2 Step 2. Viewing and/or altering the report content

By default all the tests performed on the EUT are included in the report. To view these tests, click the **'Advanced Options' button** in the **'Report Generator settings' window**.
The tests that are included in the report, as well as the order in which they are displayed, is visible in the **'Included Tests' section** of the **'Report Generator settings' window**. Excluding tests from the report and/or changing the order of the tests can be achieved in this section as well.
Click the **'Advanced Options' button** in the **'Report Generator settings' window** to open this field.
To **chance the order of the list**, select a test from the list and change its position by using the arrows on the right side of the field.
To **include/exclude tests from the list**, use the buttons just below the field. Only the tests that are marked be included in the final report.



13.3.3 Step 3. Generating the report

The report can be generated ones the template file has been selected and the content of the report has been determined.
The report will be generated when you click the **'Generate' button**. If you want to print the report directly after it has been generated, check the **'Print Report' checkbox** on the bottom left of the

window. If you want to open the report in your screen (and possibly edit it as well), check the **'Edit Report' checkbox**.
The report generation process cannot be paused or cancelled be the end user. Depending on the content, this process can take a few seconds (for a text file) up to several minutes (for an extensive report containing many tables and graphs in MS Word).

13.4 Specific Features

13.4.1 Available report generator codes for EUT's

The Main Keyword for EUT data is "EUT". All the data entered in the EUT Window in RadiMation® can be placed in one Report file. This data can be added as single lines of text or in tables. Tables are supported for Client data, Manufacturer data and Test site data. In addition, a table with all the information can be inserted as well.

13.4.2 Removing unrecognized codes 'automatically'

When working with a template system, it is not unusual for superfluous (or 'unrecognized') codes to appear in the resulting report. There are two 'automatic' ways to remove these codes from the report. The first method simply removes all the unrecognized codes, the second method is more selective and can be used to remove text as well. Both methods are described below.

13.4.2.1 Removing all 'unrecognized' codes

Normally when a keyword is neither correct nor recognized by the Report Generator, it will remain unchanged. The keyword ||RemoveIllegalCodes(TRUE)|| can automatically remove all these 'errors'. Keep in mind that using this keyword can be both an advantage and a disadvantage. If you are aware of the error(s), then this is a handy way to remove them from the test report. However, if you are not aware of them, this might lead you to miss errors that need to be addressed!

13.4.2.2 Removing selected text and codes

The special ||STARTDELETEBLOCK()|| and ||ENDDELETEBLOCK()|| keywords identify a block of text that will be removed from the report if none of the report generator codes between the tags are replaced.
For example: ||STARTDELETEBLOCK()|| Client: ||EUT|CLIENT CONTACT PERSON|| ||ENDDELETEBLOCK()||

- If the 'Client Contact Person' data has been entered in the EUT file, the code above will be replaced (with the corresponding data) and the text 'Client: ' and the actual data will remain visible in the report.
- If no data was entered for the 'Client Contact Person' in the EUT file, the code will **not** be replaced and the complete block including the text 'Client: ' and the not replace report generator code will be removed from the final report.
- If multiple report generator keywords are specified within the ||STARTDELETEBLOCK()|| and ||ENDDELETEBLOCK()||, the block will only be removed if all of the report generator codes are not replaced. The complete block will remain in the report if one or more of the report generator codes are replaced.
- It is allowed and possible to use a ||STARTDELETEBLOCK()|| and ||ENDDELETEBLOCK()|| combination within another ||STARTDELETEBLOCK()|| and ||ENDDELETEBLOCK()|| set.

This can help to automatically adjust what is or is not included in the report when certain data is not available.

13.4.3 Test-specific templates

The report generator has been extended in such a way, that it is no longer necessary to create one single template that includes all the codes for all the (performed) tests. Instead, it is now possible to link a 'test-specific' template to each test and then combine these into one 'main-template'. (This is an additional method to create a template file and does NOT replace the original method. Templates made with the original method will still work correctly.)
The biggest advantage of this option is that it simplifies the process of setting up and generating a test report, because:

- Test-specific template files contain simpler codes, are more compact and easier to 're-use'.
- The main-template is easier to set up and more accessible because its content is divided into more manageable chunks.

With this system, each test uses a different 'test-specific' template that contains the report generator codes for that test. It is necessary to combine these specific templates in order to generate a (complete) test report. This can be done by including the 'test-specific' templates into one 'main-template' for the report generator to process.

13.4.3.1 Example of a 'main-template'

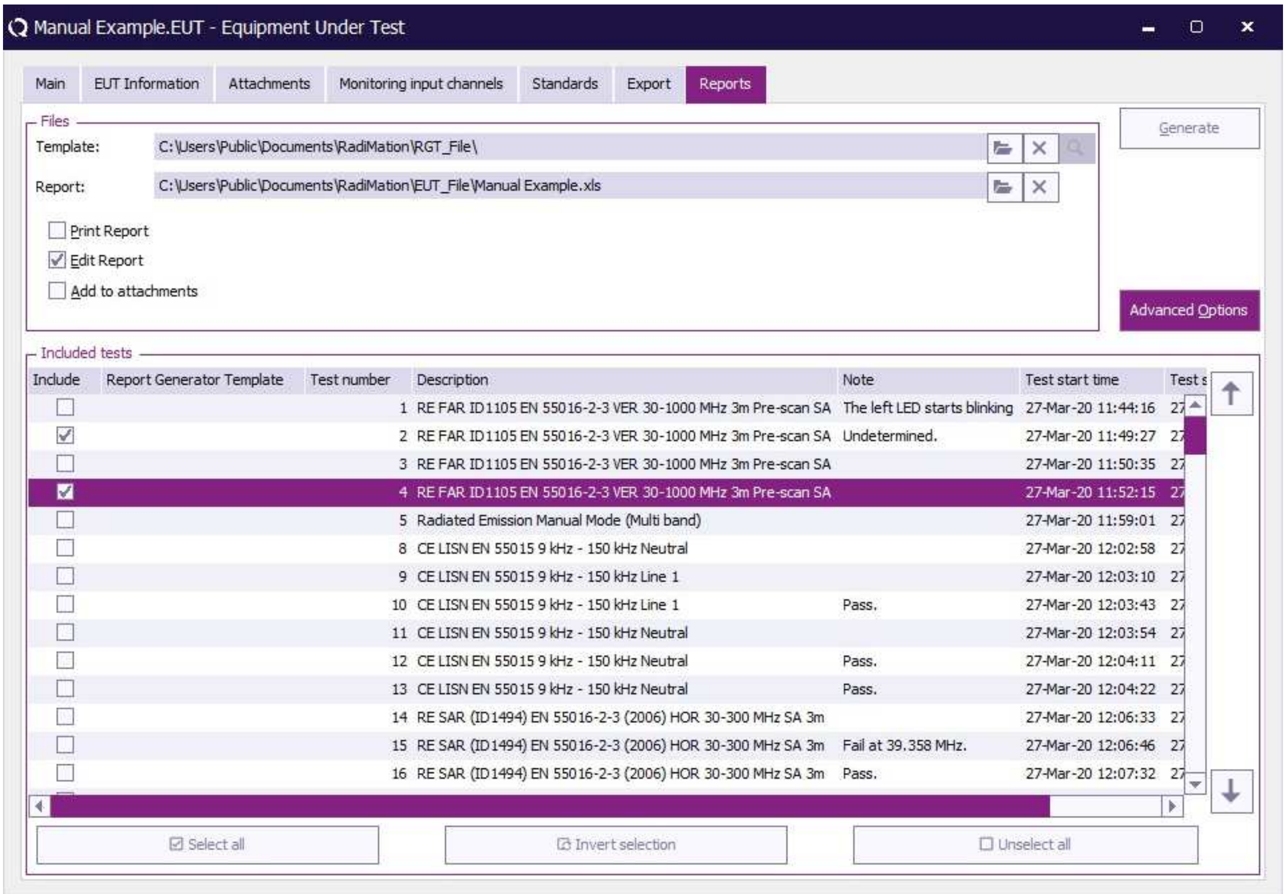
An example of a 'main-template' is visible below:

```
Introduction

||EUT|ALL TESTS||

Conclusion
```

During the report generation, the **||EUT|ALL TESTS||** code will be replaced with the codes of the 'test-specific' templates of all the (different) tests performed on a EUT. It is also possible generate a report based on a specific set of tests, for example **||EUT|ALL IMMUNITY TESTS||**. (See the Test specific report generator inclusion codes for a complete list of all the available codes.)

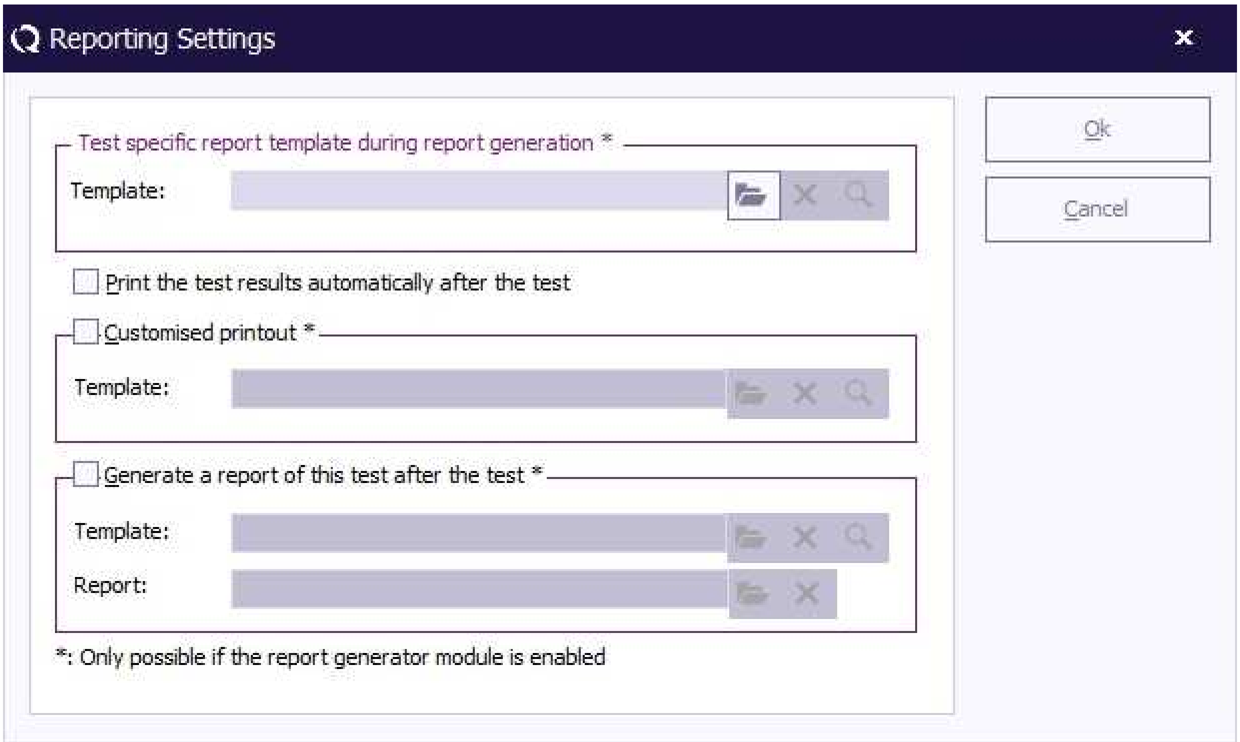


13.4.3.2 Making a 'test-specifc' template

'Test-specific' templates are created in the same way as the 'generic' report generator templates are created. All the available report generator codes (from the 'generic' templates) can also be included in the 'test-specific' templates.
However there is one big difference, and that it is no longer necessary to specify the first-part of the report generator code with a 'Main Keyword' (as described in the previous chapter 'Keywords').

- In 'generic' templates the Main Keyword is used to indicate the location of the data that needs to be retrieved. For example: **||TEST 1|MODULATION||**, where 'TEST 1' refers to the test from which the used modulation should be included.
- With 'test-specific' templates is it sufficient to specify **||MODULATION||**, because the Report Generator already knows that the template (and the codes within) are linked to that test.

A 'test-specific' template can be linked to a test by using the **'Reporting' button** of the test. Each TSF configuration window, and each test-information window have this button. By pressing the button the **'Reporting Settings' window** will open. More detailed reporting settings can be modified in this configuration window. The top entry field can be used to specify the name of the 'test-specific' template that should be linked to the test.



13.4.4 Combining graphs in a report

The report generator has been extended in such a way that it is more flexible and powerful in its ability to include graphs in a report. Not only is it easier to specify which graphs should be included, but it is even possible to include multiple 'lines' in one single graph.
With the support for this combination of report generator codes, a very powerful solution is presented to include graphs with multiple lines in a report.

13.4.4.1 Combining multiple graph lines

The code '||SIGNAL POWER GRAPH||' will include a graph with the signal power in a report. The same code can be extended with other 'graph lines' which are semi-colon separated. All the possible graph report generator codes can be combined into one single report generator code, as long as codes are ';' separated. If a specified graph line is not measured, the graph line will not be included in the final graph. It is thus acceptable to include the code '||SIGNAL POWER GRAPH; FORWARD POWER GRAPH||', even if the forward power is not measured. The graph will still be inserted but only contain the graph line for the signal power. If one or more of the graph lines are using a different unit, additional y-axes will be displayed.
For example:

- ||SIGNAL POWER GRAPH; FORWARD POWER GRAPH|| Will create a graph with the signal power and the forward power graph lines.
- ||FIELD GRAPH 1; FIELD GRAPH 2; AVERAGE FIELD GRAPH|| Will create a field strength graph with the field strength of the probes 1 and 2, and the average field graph.
- ||CURRENT GRAPH; NET POWER GRAPH|| Will create a graph with the current and the net power. This graph will have two y-axes to indicate the different units.

A special report generator code '||ALL GRAPHS||' is available, which will include a graph in the report which includes all the measured graph lines.

13.4.4.2 Single band immunity tests

The known graph report generator codes for a single band immunity test are:

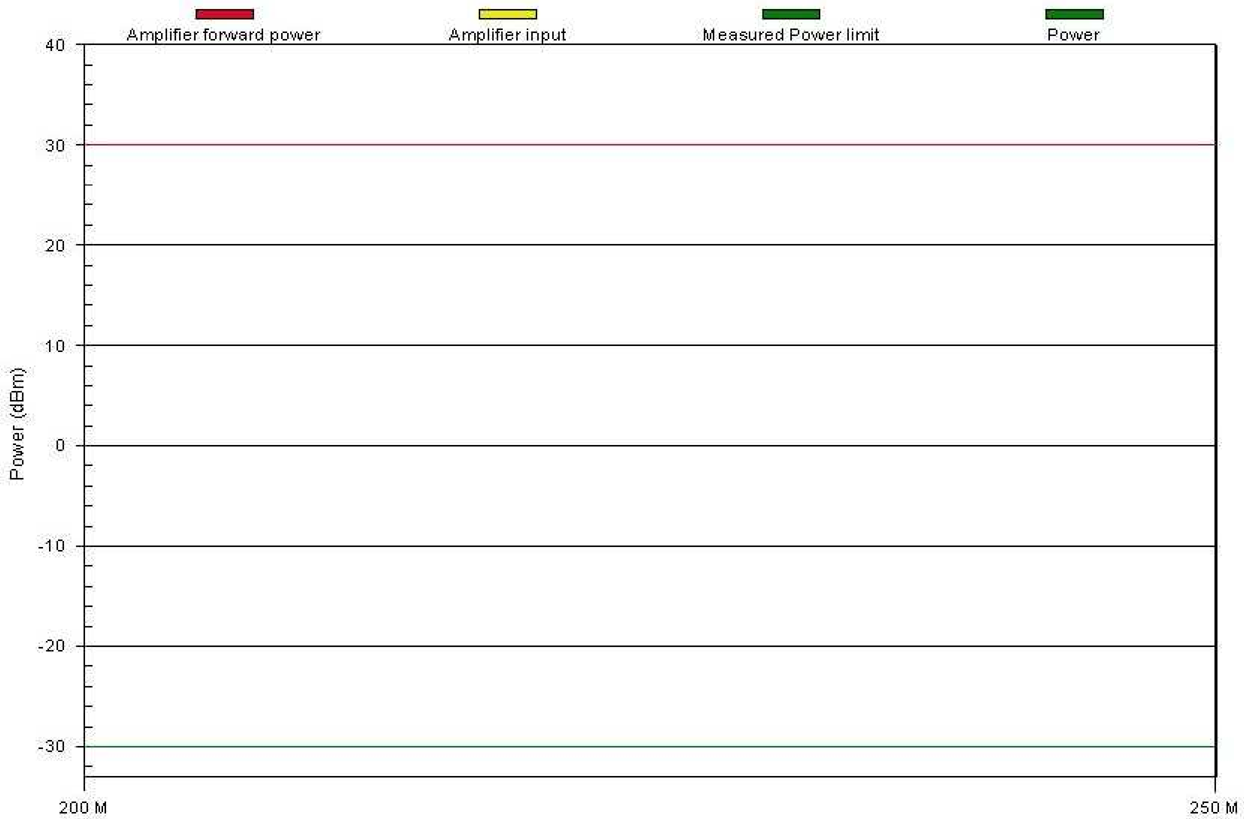
- SIGNAL POWER GRAPH
- CURRENT GRAPH
- VOLTAGE GRAPH
- FORWARD POWER GRAPH
- REFLECTED POWER GRAPH
- NET POWER GRAPH
- MID POWER GRAPH
- OUT POWER GRAPH
- IMPEDANCE GRAPH
- ERROR GRAPH
- CALCULATED FIELD GRAPH
- AVERAGE FIELD GRAPH
- CALCULATED VOLTAGE GRAPH
- CALCULATED CURRENT GRAPH
- AD GRAPH 1
- AD GRAPH 2
- AD GRAPH 3
- AD GRAPH 4
- AD GRAPH 5
- AD GRAPH 6
- AD GRAPH 7
- AD GRAPH 8
- FIELD GRAPH 1
- FIELD GRAPH 2
- FIELD GRAPH 3
- FIELD GRAPH 4
- FIELD GRAPH 5
- FIELD GRAPH 6
- FIELD GRAPH 7
- FIELD GRAPH 8
- POINT 16 POWER GRAPH <n> where <n> is a number between 1 and 16 inclusive.
- POINT 16 FIELD GRAPH <n> where <n> is a number between 1 and 16 inclusive.
- POINT 16 ERROR GRAPH <n> where <n> is a number between 1 and 16 inclusive.
- CALIBRATED POWER GRAPH
- GENERATED MAGNETIC FIELD GRAPH
- MEASURED MAGNETIC FIELD GRAPH
- EUT ATTENUATION GRAPH
- EUT ATTENUATION STD DEV GRAPH
- EUT DYNAMIC RANGE GRAPH
- EUT DYNAMIC RANGE STD DEV GRAPH
- SIGNAL POWER ATTENUATION GRAPH

These report generator codes are currently only implemented in the single band version of the immunity tests. The functionality for the multiband version is a little bit different.

13.4.4.3 Multiband immunity and Multiband emission

The list of known graph report generator codes for multiband tests is not a fixed list, because an unlimited number of graph lines can be created in a multiband test. However, the report generator can include any graph that is also available in the multibnad test. The report generator code to

include a graph in the report for a multiband test is the same as the name of the graph as it is shown in the legend above the graph in the multiband test results. A combination of the available graphs can also be included as a single graph in the report by combining the desired graph names in a single report generator code. As long as the labels of the graph are ';' separated, any number of graph lines can be included in the graph in the report.
For example the code ||POWER; MEASURED POWER LIMIT; Amplifier forward power; Amplifier input|| will result in the following graph:



By default the graphs are used from the frequency tab. It is also possible to include a time, angle or height graph. If a graph from another graph tab should be included in the report, the graph name should be prefixed with one of the following prefixes:

- time:
- frequency:
- angle:
- height:

> **Example:**
> - Export an angle graph: ||angle:RBW: 1000 kHz, Horizontal Max Peak for peak 1||
> - Export a time graph: ||time:Signal Power;Channel1;Channel2||
> - Export a height graph: ||height:RBW: 1000 kHz, Horizontal Max Peak for peak 1||

13.4.5 Customizable AD-Channel measurement table

The report generator is extended in such a way that it is more flexible and powerful in its ability to specify the columns that should be included in a 'frequency sorted table' that includes the values of one or more measured channels.

With the support for this extensive report generator code, a very powerful solution is presented to include tables in a report with a customizable number of columns.

13.4.5.1 Implementation in version 5.2

The code '||AD CHANNEL 1 LIST||' will generate a table with the columns:

- Frequency
- Measured value of AD-Channel 1

The code '||AD CHANNEL 3,2,4,1 LIST||' will generate a table with the columns:

- Frequency
- Measured value of AD-Channel 3
- Measured value of AD-Channel 2
- Measured value of AD-Channel 4
- Measured value of AD-Channel 1

If one of the specified channels is not measured, those columns will not be included in the table.

The code '||AD CHANNEL 5,8 TABLE||' will generate a table with the columns:

- Frequency
- Measured value of AD-Channel 5
- Measured value of AD-Channel 8

Please keep in mind that there is a significant difference between the '||.... LIST||' and '||.... TABLE||' codes.

- The '||.... TABLE||' code will only include the frequencies for which the values were out of the specified range for that AD-Channel.
- The '||.... LIST||' code will include all the frequencies.

These report generator codes are currently only implemented in the single band version of the immunity tests. This functionality is not yet included in the multiband version, because the support for AD-Channels is not yet for 100% supported in the multiband test modules.

13.4.5.2 Implementation in version 5.3

The 'column' report generator codes are even more powerful in RadiMation version 5.3. From version 5.3.0 (and higher) it is also possible to include other 'measurement values' in the code. For example:

- ||SIGNAL POWER, FORWARD POWER, AD CHANNEL 5 LIST||
- ||NET POWER, AD CHANNEL 2, CALCULATED FIELD TABLE||
- ||VOLTAGE, CALCULATED CURRENT, FORWARD POWER LIST||

All the above report generator codes will result in a table that is included in the final report, containing the columns that are included in the report generator code. The order of the columns in the table is the same as the order in which the 'measurement values' are included in the code. A frequency column is always included as a first column. Invalid 'measurement values' or channels that are not measured will not be included in the generated table.
The **frequency dependent** measurement values that can be used in the codes are:

- FREQUENCY
- SIGNAL POWER
- FORWARD POWER
- REFLECTED POWER
- NET POWER

- CURRENT
- VOLTAGE
- CALCULATED FIELD
- CALCULATED CURRENT
- CALCULATED VOLTAGE
- AVERAGE FIELD
- FIELD 1
- FIELD 2
- FIELD 3
- FIELD 4
- FIELD 5
- FIELD 6
- FIELD 7
- FIELD 8
- AD CHANNEL 1
- AD CHANNEL 2
- AD CHANNEL 3
- AD CHANNEL 4
- AD CHANNEL 5
- AD CHANNEL 6
- AD CHANNEL 7
- AD CHANNEL 8

All the 'measurement values' mentioned above are dependent on the frequency that is used for that row of the table. It is also possible to include **frequency independent data** as part of the table. If one or more of these frequency independent codes are included in the report generator code, an additional column will be added to the table, where the value is repeated on each row. This feature can for example be used in combination with the Microsoft Excel report generator, where each row contains all the needed information.
The **frequency independent** measurement values that can be used in the codes are:

- CALIBRATION FILE
- TEST ENGINEER
- TEST DATE
- TEST TIME
- START TIME
- STOP TIME
- TEMPERATURE
- HUMIDITY
- PRESSURE
- START FREQUENCY
- STOP FREQUENCY
- FREQUENCY STEP
- LOGARITHMIC STEP
- LOGARITHMIC STEP FROM
- POLARIZATION
- DISTANCE
- TOLERANCE
- DWELL TIME

- MODULATION
- MODULATION DEPTH
- MODULATION CONSERVATION
- MODULATION FREQUENCY
- MODULATION SIGNAL
- MODULATION DUTY CYCLE
- MAINS VOLTAGE
- FREQUENCY CHANGE MODE
- AVERAGE FIELD
- CURRENT MEASURED
- CALIBRATION METHOD
- FORWARD POWER MEASURED
- REFLECTED POWER MEASURED
- NET POWER MEASURED
- CALCULATED FIELD MEASURED
- RECALCULATE AVERAGE
- DESCRIPTION
- TSF FILENAME
- AMPLIFIER PROTECTION MODE
- AUTODISAPPEAR
- USE VOLTAGE TEST LEVEL
- VOLTAGE TEST LEVEL
- POWER TEST LEVEL
- FIELD TEST LEVEL
- USE CURRENT TEST LEVEL
- CURRENT TEST LEVEL
- STEP DOWN
- USE CURRENT LIMIT
- CURRENT LIMIT
- MODULATION TYPE
- MAGNETIC FIELD TEST LEVEL

These report generator codes are currently only implemented in the single band version of the immunity tests. This functionality has not been included in the multiband version yet, because the support for AD-Channels is not supported in the multiband test modules.

13.4.6 Microsoft Word report generator editor

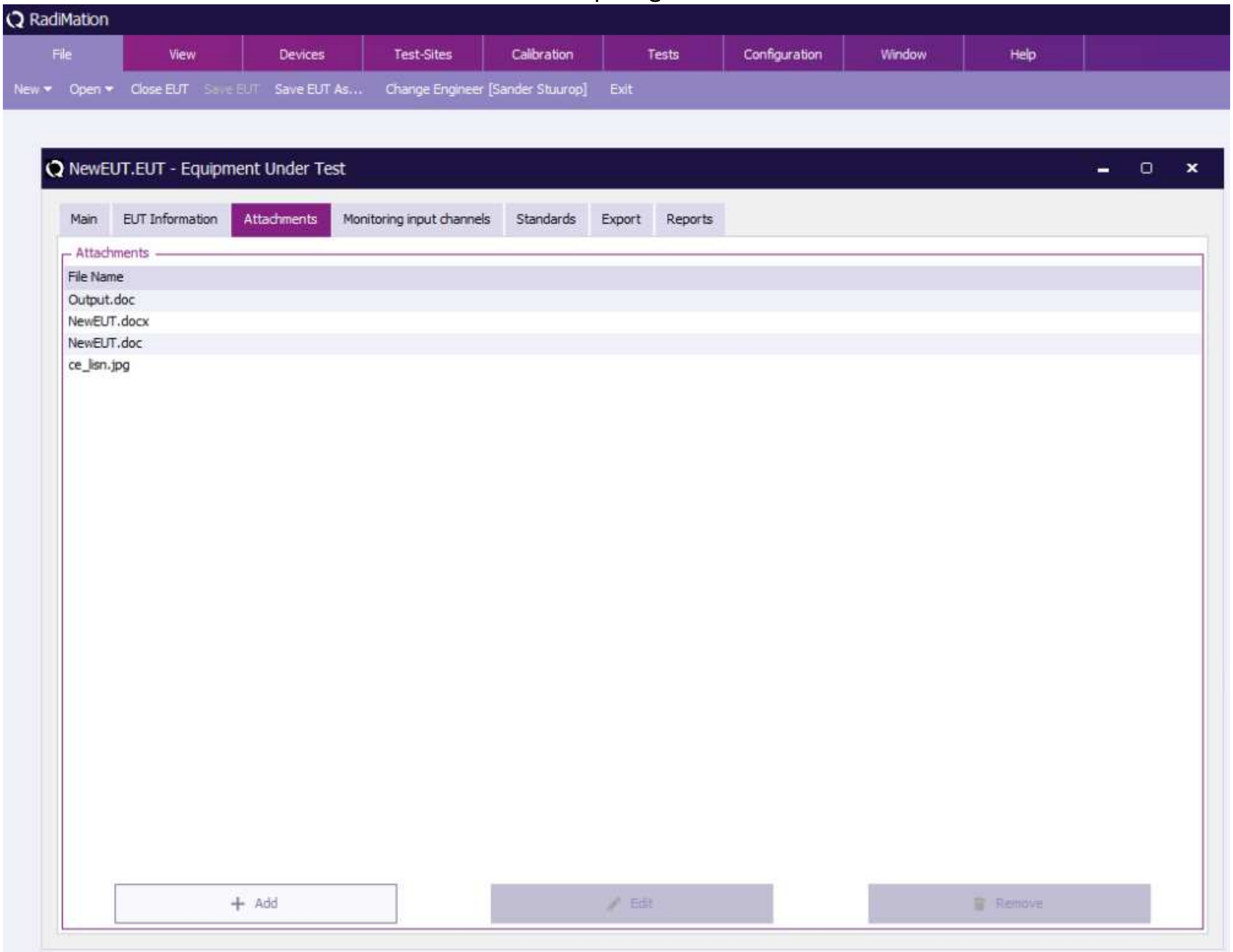
13.4.6.1 Inclusion of other files

When the "||InsertFile(<OTHER WORD DOCUMENT FILENAME>)||" code is used, the contents from the other specified Microsoft Word document will be included in the generated report. The complete contents of the other document will be inserted at the location of the report generator code.
The filename of a Bitmap, JPEG or PNG file can also be specified as part of the "||InsertFile(<PICTURE FILENAME>)||" report generator code. The corresponding picture will then be loaded from the specified disk location and will be included at the location of the report generator code. This function is similar to the 'Insert Picture, From File' action of Microsoft Word.

The filename of a text or ASCII file can also be specified as part of the "||InsertFile(<TXT FILENAME>)||" report generator code. The contents of the file be loaded from the specified disk location and will be included at the location of the report generator code.

13.4.6.2 Inclusion of EUT attachments

Pictures, Microsoft Word documents and other files can also be attached to the EUT document, on the **Attachments** tab. These attachments can also be included in the generated report using the code "||EUT|ATTACHMENT <FILENAME> CONTENTS||". The '<FILENAME>' part should be the name of the attachment. It is also possible to use the code "||EUT|ATTACHMENT 1 CONTENTS||", where the "1" is the number of the attachment, but can be any number. The complete contents of the attachment will be inserted at the location of the report generator code.



13.4.6.3 Macros

With the report generator code "||RunMacro(<MACRO NAME>)||" it is possible to start a predefined macro function. The '<MACRO NAME>' may be:

- A macro defined by Microsoft Word
- The name of a public function in a public macro module
- A macro name predefined by the Microsoft Word report generator editor. These macro's are:
- AutoFitThisTable: Will perform an 'Auto-Fit' on the table in which the "||RunMacro(AutoFitThisTable)||" is present.

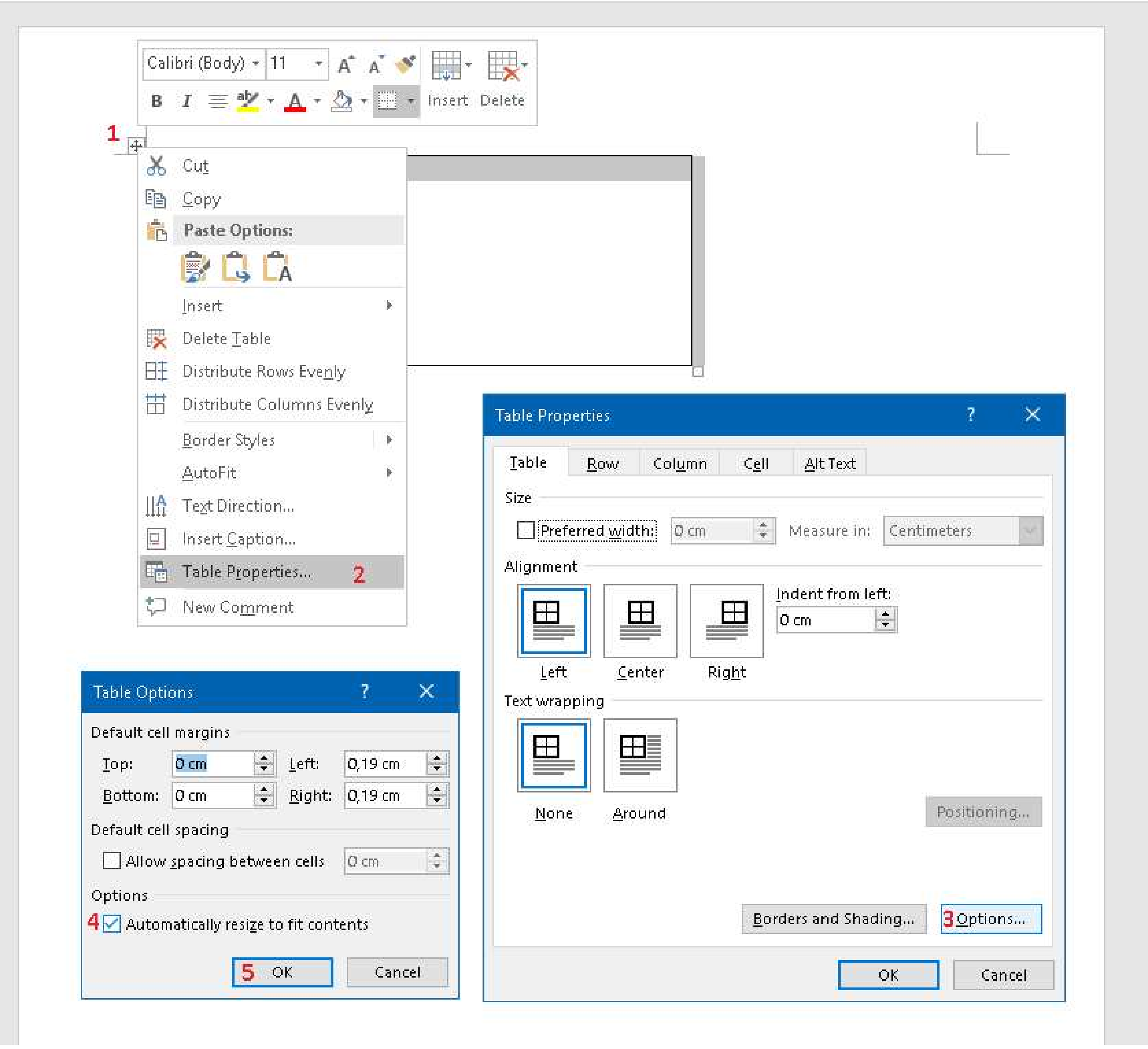
It is not possible to call macro functions that require an argument, so only 'argument-less' macro functions can be called.

13.4.6.4 Table Formatting

The report generator will also use the formatting and settings, that are present in the template document. This does allow to define how inserted tables are formatted in the final report. To make this possible, the table code should be placed in a table in the template. In Microsoft Word, you then can set the border styles of the outer table.

13.4.6.5 Specific graph sizes

It is also possible to specify the size of the graph in the report generator template. This can be done by including a table in the report generator template, where the report generator code for the graph is placed in a cell of that table. By disabling the auto resizing of the table cell, the final report will contain the graph with the specified size. In the screenshot below, you will find how to disable auto resizing of the table.



13.4.7 Microsoft Excel report generator editor

The Microsoft Excel report generator editor allows that Microsoft Excel reports can be generated. A normal Microsoft Excel file can be specified as the template file for the report generator, and all the available RadiMation® report generator codes can be used in that template file.
Values that are inserted in the generated in Microsoft Excel report are always using the US English formatting, to prevent problems with the interpretation of the values, if Microsoft Excel is using different Culture settings. If additional formulas and calculations are performed in the generated Microsoft Excel report, the formulas should be aware that the values are inserted in the US English format, and may need to be converted to the local format.

13.4.7.1 Table-inclusion modes

The report generator has several modes to include a table into the final report if the Microsoft Excel report generator editor is used. These are the:

- Row insert mode
- Cell insert mode
- Overwrite mode
- Sheet insert mode

Each mode works differently and has its own advantages. Please read the descriptions of these modes to decide which mode suits your intentions.

13.4.7.2 Row insert mode

The 'row insert mode' is the default mode used by the report generator.
For example:

- An Excel-sheet contains a report generator code for a table with 10 rows and 5 columns.
- When the code is detected, 9 rows are inserted below the cell containing the code. (Together creating a '10 row area'.)
- After the new rows have been added, the table is inserted at the cell where the code is detected, overwriting the '10 rows and 5 columns area' connected to this starting cell.

Because additional rows are inserted before the table is included, the content/codes below the starting cell are shifted down (and not overwritten).
This mode can be activated by including the following report generator code:
"||RunMacro(CELL_PASTE_MODE_ROWS)||"

13.4.7.3 Cell insert mode

The 'cell insert mode' is very similar to the 'row insert mode' in that new cells are inserted before the table is included. The difference however is that the surrounding content is not just moved down, but also to the right. Meaning that, ones the table is inserted, any content that was placed next to the starting cell will now be present next to the table. This can be useful if calculations should be performed on the data that is present in the inserted table.
For example:

- An Excel-sheet contains a report generator code for a table with 10 rows and 5 columns.
- When the code is detected, a block of 9 rows and 4 columns is inserted to the right and below the cell containing the code. (Together creating a '10 row, 5 column area'.)
- After the new rows and columns have been added, the table is inserted at the cell where the code is detected, overwriting the '10 rows and 5 columns area' connected to this starting cell.

Because additional rows and columns are inserted before the table is included, the content/codes below the starting cell are shifted down and to the right (and not overwritten).
This mode can be activated by including the following report generator code:
"||RunMacro(CELL_PASTE_MODE_CELLS)||"

13.4.7.4 Overwrite mode

In the 'overwrite mode' a table is inserted at the cell where the code is detected, overwriting the cells that are to the right and below this starting cell.
For example:

- An Excel-sheet contains a report generator code for a table with 10 rows and 5 columns.
- When the code is detected, the table is inserted at the cell where the code is detected, overwriting the '10 rows and 5 columns area' connected to this starting cell.

Because of this the content of other cells (below and next to the starting cell) can be lost if the inserted table is bigger than expected.
This mode can be activated by including the following report generator code:
"||RunMacro(CELL_PASTE_MODE_OVERWRITE)||"

13.4.7.5 Sheet insert mode

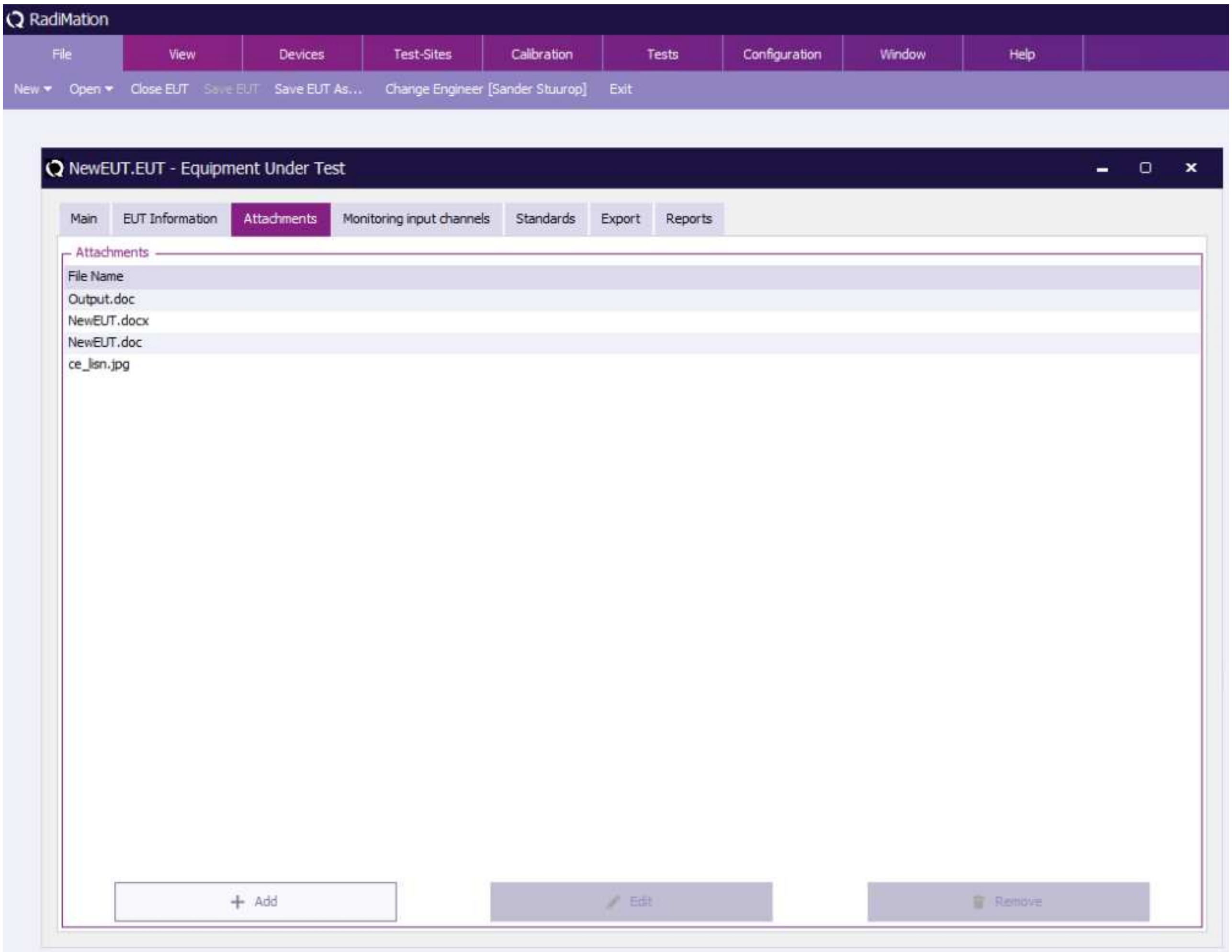
If, in the 'sheet insert mode', a report generator code is detected that will result in the inclusion of a table, then a new worksheet will be created after the active worksheet. The table will be inserted at the 'A1' cell of the newly created worksheet, overwriting the cells that are to the right and below the 'A1' cell.
This means that each table will be placed on a new worksheet. 'Non-table' content (such as graphs or text) that follows after the table will be placed on the same worksheet as the table.
This mode can be activated by including the following report generator code:
"||RunMacro(CELL_PASTE_MODE_SHEET)||"

13.4.7.6 Inclusion of other files

When the "||InsertFile(<OTHER EXCEL WORKBOOK>)||" code is used, the contents from the other specified Microsoft Excel workbook or worksheet will be included in the generated report. The complete contents of the other document will be inserted at the location of the report generator code. The size of the 'to be inserted' data is determined, starting at the 'A1' cell until the last filled cell. This data is then inserted at the location of the keyword, using the selected table-inclusion mode. To prevent that unnecessary worksheets are included in the report, a check is done which prevents that empty worksheets are inserted.
The filename of a Bitmap, JPEG or PNG file can also be specified as part of the "||InsertFile(<PICTURE FILENAME>)||" report generator code. The corresponding picture will then be loaded from the specified disk location and will be included at the location of the report generator code. This function is similar to the 'Insert Picture, From File' action of Microsoft Excel.

13.4.7.7 Inclusion of EUT attachments

Pictures, Microsoft Excel documents and other files can also be attached to the EUT document, on the **Attachments** tab. These attachments can also be included in the generated report using the code "||EUT|ATTACHMENT <FILENAME> CONTENTS||". The '<FILENAME>' part should be the name of the attachment. It is also possible to use the code "||EUT|ATTACHMENT 1 CONTENTS||", where the "1" is the number of the attachment, but can be any number. The complete contents of the attachment will be inserted at the location of the report generator code.



13.4.7.8 Macros

With the report generator code "||RunMacro(<MACRO NAME>)||" it is possible to start a predefined macro function. The '<MACRO NAME>' may be:

- A macro defined by Microsoft Excel
- The name of a public function in a public macro module
- A macro name predefined by the Microsoft Excel report generator editor, which can be:
- CELL_PASTE_MODE_CELLS
- CELL_PASTE_MODE_SHEET
- CELL_PASTE_MODE_OVERWRITE
- CELL_PASTE_MODE_ROWS

It is not possible to call macro functions that require an argument, so only 'argument-less' macro functions can be called.

13.4.8 SQL queries on tables

The report generator of RadiMation supports the usage of SQL Queries on tables that are provided by the report generator. This makes it possible to include a customised table in the final report.
In combination with the 'SQL' queries, more advanced table configurations are possible, such as:

- Changing the order of the columns in the table
- Hiding selected columns from the table
- Changing the sorting of the rows, based on a specific column

- Filtering of the rows, based on the data that is included

The most simple SQL statement is:

```
SELECT * FROM <TABLE>
```

Where '<TABLE>' is an existing report generator code that includes a table in the report. This simple SQL statement can be extended with:

- An optional 'WHERE' clause that defines an additional filter that should be used on the rows.
- An optional 'ORDER BY' clause that specifies any specific ordering of the rows.

The names of the columns that can be used in the SQL queries are the same as they names that appear in the header row of the generated table itself. Any column name that includes a space, should be included in '[ ]' brackets.

The general keywords can't be used for selection within a table. For an example of keywords used within the table selection see the Radiated Emission Table

The report generator is passing the SQL statements and the table data itself through an internal SQLite database engine. Because the SQLite database engine is used, almost all variations of the SQL queries are supported.

13.4.8.1 Examples

Only the frequencies above 50 MHz are included:

```
||SELECT * FROM AD CHANNEL 4,3,2,1 LIST WHERE Frequency  > 50E6||
```

Only the frequencies between 1 Hz and 20 MHz are included, where the AD-channel was measured out of the specified range ('TABLE'), and the table is reverse-sorted on the frequency column.

```
||SELECT *  FROM AD CHANNEL 8,7,6,5,4,3,2,1 TABLE WHERE FREQUENCY >= 1 and
FREQUENCY <= 20E6 order by Frequency desc||
```

Include the 'EQUIPMENT TABLE' including all the columns (also the hidden columns)

```
||SELECT ALL FROM EQUIPMENT TABLE||
```

13.4.8.2 Inserting the Peak Limit into the table (example)

This is a step by step example to learn how to configure a table. For this example we start with the code "||SELECT ALL FROM PEAKTABLE||" in a template.

This code give us all the know information in one table. (The following table has been generated with a multiband test.)

PeakNumber	PeakNumber_RAW	Frequency	Frequency_RAW	Peak	Peak_RAW	PeakLimit	PeakLimit_RAW	PeakDifference	PeakDifference_RAW	PeakCorrection	PeakCorrection_RAW	PeakStatus	PeakStatus_RAW	Status	Status_RAW	Angle	Angle_RAW	Height	Height_RAW	Polarization	Polarization_RAW
1	1	829,92 M	829,92 MHz	80 dBµV	80 dBµV	60 dBµV	60 dBµV	20 dB	20 dB	0,00 dB	0,00 dB	Fail	Fail	Fail	Fail	0 Degree	0 Degree	1 m	1 m	Horizontal	Horizontal

H
z

Instead of the previous table, we would like to create one with the following information:

- Peak Number
- Frequency
- Peak
- Peak Limit
- Peak difference to the limit
- Peak status
- Peak status overall

When you try to do this with the following code …

```
||SELECT Peak Number,Frequency,Peak,Peak Limit,Peak Difference,Peak Sta-
tus,Status FROM PEAKTABLE||
```

… you find out that it does not work.

The reason for this, as stated earlier, is that any column name that include a space, should be included in '[ ]'.

When you alter the code with that in mind, you end up with the code …

```
||SELECT [Peak Number],Frequency,Peak,[Peak Limit],[Peak Difference],[Peak
Status],Status FROM PEAKTABLE||
```

… which does work.

The resulting table will look like this:

Peak Number	Frequency	Peak	Peak Limit	Peak Difference	Peak Status	Status
1	829,92 MHz	80 dBµV	60 dBµV	20 dB	Fail	Fail

13.4.8.3 Limit the results

To limit the results (e.g. by ‘5’), use:

```
||SELECT [Peak Number],Frequency,Peak,[Peak Limit],[Peak Difference],[Peak
Status],Status FROM PEAKTABLE LIMIT 5||
```

13.4.8.4 Sorting

To sort the results (e.g. descending by angle), use:

```
||SELECT [Peak Number],Frequency,Peak,[Peak Limit],[Peak Difference],[Peak
Status],Status FROM PEAKTABLE ORDER BY Angle DESC||
```

13.5 Keywords Overview

13.6 EUT

13.6.1 Common

Keyword	Description
||EUT|FILENAME||	The filename of the EUT
||EUT|BRAND||	The brand of the EUT specified in the EUT Window
||EUT|CONDITION UPON RECEPTION||	The condition of reception of the EUT specified in the EUT Window
||EUT|DATE OF RECEIPT||	The date of reception of the EUT specified in the EUT Window
||EUT|DATE OF MEASUREMENT||	The date of measurement of the EUT specified in the EUT Window
||EUT|DIMENSIONS||	The dimensions of the EUT specified in the EUT Window

<table>
<tr><td>||EUT|EMISSION STANDARD||</td><td>The emission standard of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|ENVIRONMENT||</td><td>The environment of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|IMMUNITY STANDARD||</td><td>The immunity standard of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|NAME||</td><td>The name of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|ORDER NUMBER||</td><td>The order number of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|PCB RELEASE||</td><td>The PCB release of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|PERIPHERAL EQUIPMENT||</td><td>The peripheral equipment of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|PLACE MEASURMENT||</td><td>The place of measurment of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|RADIMATION VERSION||</td><td>The RadiMation® version</td></tr>
<tr><td>||EUT|RATED POWER||</td><td>The rated power of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|SERIAL NUMBER||</td><td>The serial number of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|TEST SETUP TYPE||</td><td>The test setup type of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|SOFTWARE RELEASE||</td><td>The software release of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|TYPE NUMBER||</td><td>The type number of the EUT specified in the EUT Window</td></tr>
<tr><td>||EUT|VOLTAGE SUPPLY||</td><td>The voltage supply of the EUT specified in the EUT Window</td></tr>
</table>

13.6.2 Client Address Information

<table>
<tr><th>Keyword</th><th>Description</th></tr>
<tr><td>||EUT|CLIENT ADDRESS||</td><td>The address of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT CAPACITY||</td><td>The capacity of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT CITY||</td><td>The city of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT COMPANY||</td><td>The client name specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT CONTACT PERSON||</td><td>The contact person of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT COUNTRY||</td><td>The country of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT EMAIL ADDRESS||</td><td>The email address of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT FAX NUMBER||</td><td>The fax number of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT STATE||</td><td>The state of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT TELEPHONE NUMBER||</td><td>The telephone number of the client specified in the EUT Window</td></tr>
<tr><td>||EUT|CLIENT ZIP CODE||</td><td>The ZIP code of the client specified in the EUT Window</td></tr>
</table>

13.6.3 Manufacturer Address Information

<table>
<tr><th>Keyword</th><th>Description</th></tr>
<tr><td>||EUT|MANUFACTURER ADDRESS||</td><td>The address of the manufacturer specified in the EUT Window</td></tr>
<tr><td>||EUT|MANUFACTURER CITY||</td><td>The city of the manufacturer specified in the EUT Window</td></tr>
<tr><td>||EUT|MANUFACTURER COMPANY||</td><td>The manufacturer name specified in the EUT Window</td></tr>
</table>

||EUT|MANUFACTURER CONTACT PERSON||	The contact person of the manufacturer specified in the EUT Window
||EUT|MANUFACTURER COUNTRY||	The country of the manufacturer specified in the EUT Window
||EUT|MANUFACTURER EMAIL ADDRESS||	The email address of the manufacturer specified in the EUT Window
||EUT|MANUFACTURER FAX NUMBER||	The fax number of the manufacturer specified in the EUT Window
||EUT|MANUFACTURER STATE||	The state of the manufacturer specified in the EUT Window
||EUT|MANUFACTURER TELEPHONE NUMBER||	The telephone number of the manufacturer specified in the EUT Window
||EUT|MANUFACTURER ZIP CODE||	The ZIP code of the manufacturer specified in the EUT Window

13.6.4 Test Site Address Information

Keyword	Description
||EUT|TEST SITE ADDRESS||	The address of the test site specified in the EUT Window
||EUT|TEST SITE CITY||	The city of the test site specified in the EUT Window
||EUT|TEST SITE COMPANY||	The test site name specified in the EUT Window
||EUT|TEST SITE CONTACT PERSON||	The contact person of the test site specified in the EUT Window
||EUT|TEST SITE COUNTRY||	The country of the test site specified in the EUT Window
||EUT|TEST SITE EMAIL ADDRESS||	The email address of the test site specified in the EUT Window
||EUT|TEST SITE FAX NUMBER||	The fax number of the test site specified in the EUT Window
||EUT|TEST SITE STATE||	The state of the test site specified in the EUT Window
||EUT|TEST SITE TELEPHONE NUMBER||	The telephone number of the test site specified in the EUT Window
||EUT|TEST SITE ZIP CODE||	The ZIP code of the test site specified in the EUT Window

13.6.5 Cable information

Keyword	Description
||EUT|CABLE TABLE||	A table with the cable information specified in the EUT Window
||EUT|CABLE X PORT TYPE||	The port type of cable X in the EUT window (X starting from 1)
||EUT|CABLE X CABLE TYPE||	The cable type of cable X in the EUT window (X starting from 1)
||EUT|CABLE X CABLE LENGTH||	The cable length of cable X in the EUT window (X starting from 1)
||EUT|CABLE X FIXING SHIELD||	The fixing shield of cable X in the EUT window (X starting from 1)
||EUT|CABLE X LOAD AT PORT||	The load at port of cable X in the EUT window (X starting from 1)

13.6.6 Standards Information

Keyword Description ||EUT|PRODUCT STANDARD ...|| Specifications of the used Product Standard ||EUT|BASIC STANDARD ...|| Specifications of the used Basic Standard

Where ... is one of the following parameters:

Parameter	Description
DATEOFRELEASE	Release date of the standard
DESCRIPTION	String containing official name / scope
FILELOCATION	The location of the file associated with the standard
LANGUAGE	The language in which the standard is described
NOTE	Additional note to the standard
OFFICIALNAME	The official name of the standard
REFERRED STANDARDS	A string of referred standards, separated by a "," (Only applicable to product standards)
SCOPE	The scope of the standard
STANDARDISATIONINSTITUTE	Description of Measurement equipment given by the user
TABLE	Table of the used standards

Some examples:

```
||EUT|PRODUCT STANDARD REFERRED STANDARDS||
||EUT|PRODUCT STANDARD DESCRIPTION||
||EUT|SELECT * FROM [BASIC STANDARD TABLE]||
||EUT|SELECT ALL FROM [BASIC STANDARD TABLE]||
||EUT|SELECET [OFFICIAL NAME] FROM [BASIC STANDARD TABLE]||
```

13.7 Configuration

13.7.1 Report Generator

Keyword	Description
COMNAME	Internal COM Name selected report generator
DESCRIPTION	Selected report generator
EXTENSION	Report generator extension
CHECKEXTENSION	Report generator should check extension
EDITOR	Report generator
STARTDELETEBLOCK()	Start block to remove unused keywords
ENDDELETEBLOCK()	End block to remove unused keywords
RemoveIllegalCodes(TRUE)	Removal illegal keywords

13.7.2 Directories

Keyword	Description
||Configuration|DEVICEDRIVERFILESDIRECTORY||	CONFDVDR directory
||Configuration|CALFILESDIRECTORY||	CAL Files directory
||Configuration|EUTFILESDIRECTORY||	EUT Files directory
||Configuration|TSFFILESDIRECTORY||	TSF Files directory
||Configuration|SEQFILESDIRECTORY||	SEQ Files directory
||Configuration|CORFILESDIRECTORY||	COR Files directory
||Configuration|DIRECTORIES||	All directories

13.7.3 Units

Keyword	Description
||Configuration|CURRENT||	Current
||Configuration|EMISSION AMPLITUDE||	Emission
||Configuration|FIELD||	Electrical Field

||Configuration|FREQUENCY||	Frequency
||Configuration|POWER||	Power
||Configuration|VOLTAGE||	Voltage
||Configuration|UNITS||	All units

13.7.4 General

Keyword	Description
||Configuration|CURRENTUSERNAME||	Current username
||Configuration|RADIMATION VERSION||	The RadiMation® version

13.8 EUT Calibration

EUT's can be calibrated in multiple ways:

- Attenuation / Gain
- Amplifier linearity
- Gain compression
- Harmonics
- S Parameter
- Antenna scan
- Antenna
- Field strength

The available report generator codes for those calibrations are listed in the sections below.

13.8.1 Amplifier Linearity

Keyword	Description
DESCRIPTION	Test level to calibrate with
TEST-TYPE	Signal gen, forward-power or net-power
START FREQUENCY	Start frequency of the calibration
STOP FREQUENCY	End frequency of the calibration
FREQUENCY STEP	Step size
CALIBRATION FILE	Used Calibration file
ALL GRAPHS	Output graph

13.8.2 Gain compression

Keyword	Description
START FREQUENCY	Start frequency of the calibration
STOP FREQUENCY	End frequency of the calibration
STEP	Step size specifically for using log step in %
CALIBRATION METHOD	Signal gen, forward-power or net-power
TABLE	Output table
GRAPH	Output graph
POWER TABLE	Table with all the compression power levels for every frequency

13.8.3 Harmonics

Keyword	Description
START FREQUENCY	Start frequency of the calibration
STOP FREQUENCY	End frequency of the calibration

STEP	Step size specifically for using log step in %
CALIBRATION METHOD	Signal gen, forward-power or net-power
TABLE	Output table
GRAPH	Output graph
POWER TABLE	Specific table for harmonics

13.8.4 S Parameter

The xx after the S must be replaced by the appropriate test number: 11, 12, 21 or 22.

Keyword	Description
ALL GRAPHS	All available graphs plotted in one graph
Sxx PRESCAN GRAPH	Prescan Graph
Sxx MAGNITUDE AVG GRAPH	Magnitude Average Graph
Sxx MAGNITUDE MAX GRAPH	Magnitude Maximum Graph
Sxx MAGNITUDE MIN GRAPH	Magnitude Minimum Graph
Sxx MAGNITUDE STDDEV GRAPH	Magnitude Standard Deviation Graph
Sxx IMPEDANCE AVG GRAPH	Graph with the average of the measured impedance
Sxx IMPEDANCE MAX GRAPH	Graph with the max-hold of the measured impedance
Sxx IMPEDANCE MIN GRAPH	Graph with the min-hold of the measured impedance
Sxx IMPEDANCE STDDEV GRAPH	Graph with the Standard Deviation of the measured impedance

It is also possible to retrieve the data as table

Keyword	Description
S11 TABLE	All columns default visible
Select * FROM S11 TABLE	Using sql to retrieve all values
Select IMPEDANCE FROM S11 TABLE	Because we added impedance later, it is not visible by default

13.8.5 Antenna scan

To request the data as table from an antenna scan use the following code

Keyword	Description
POWER TABLE	Default table with frequency, signal power and forward power.
SELECT ALL FROM [Power Table]	To request all possible columns

13.9 Radiated Immunity

13.9.1 Calibration

Keyword	Description
NUMBER OF EVENTS	The number of events that occur during a test
EVENTS	Table of events which occur during a test

13.9.2 Uniform Field Area Calculation

Keyword	Description
NUMBER OF EVENTS	The number of events that occur during a test
TEST START TIME	The date and time at which the test is started
TEST STOP TIME	The date and time at which the test is stopped

TEST DATE	The date at which the test is performed
TEST ENGINEER	The name of the test engineer
TEST TIME	The time at which the test is performed
TEST SITE NAME	The name of the test equipment list
AVERAGE FIELD GRAPH	The graph representing the average field graph
CALCULATED FIELD GRAPH	The graph representing the calculated field graph
ERROR GRAPH	The graph representing the error graph
FIELD GRAPH x	The graph representing the field graph of field strength sensor number [x], where x is a number between 1 and 8
FORWARD POWER GRAPH	The graph representing the forward power graph
NET POWER GRAPH	The graph representing the net-power power graph
POINT 16 ERROR GRAPH x	The graph representing the error graph of point number [x], where x is a number between 1 and 16
POINT 16 FIELD GRAPH x	The graph representing the field graph of point number [x], where x is a number between 1 and 16
POINT 16 POWER GRAPH x	The graph representing the power graph of point number [x], where x is a number between 1 and 16
REFLECTED POWER GRAPH	The graph representing the reflected power graph
SIGNAL POWER GRAPH	The graph representing the signal power graph
AMPLIFIER PROTECTION MODE	The Amplifier Protection mode: Signal Power, Forward Power and / or Reflected Power.
AVERAGE FIELD	Which probes are selected for the calculation of the average field
CURRENT MEASURED	Indication whether or not the current is measured: Yes / No
DESCRIPTION	The description of the Test Setup File (TSF)
DISTANCE	The distance between the antenna and the EUT in meters [m]
DWELL TIME	The dwell time in seconds [s]
FIELD TEST LEVEL	The field strength level in the unit selected by the user
FORWARD POWER MEASURED	Indication whether or not the forward power is measured: Yes / No
FREQUENCY CHANGE MODE	The method used to change frequency: Stress Method, Ramp Method, Constant Method or Fast Constant Method.
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
MAIN VOLTAGE	The mains voltage during the test in Volt [V]
NET POWER MEASURED	Indication whether or not the net-power power is measured: Yes / No
NOTE	Note or remark made during the test
POLARIZATION	Antenna polarisation: Horizontal or Vertical
PRESSURE	Air Pressure during the test in milliBar [mbar]
RECALCULATE AVERAGE	Indication whether or not the average is recalculated: Yes / No
REFLECTED POWER MEASURED	Indication whether or not the reflected power is measured: Yes / No
START FREQUENCY	The start frequency in megahertz [MHz]
STOP FREQUENCY	The stop frequency in megahertz [MHz]
FREQUENCY STEP	The linear frequency step in megahertz [MHz]
LOGARITHMIC STEP	The logarithmic frequency step in a percentage of the previous step
LOGARITHMIC STEP FROM	The frequency the test was started from to calculate the proper logarithmic step size

STEP	A textual description of the used frequency step, also containing if it is linear or logarithmic step size
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TSF FILENAME	The filename of the TSF file
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test
FIELD UNIT	The selected unit for field strength: [dBuV/m], [dBmV/m], [dBV/m], [uV/m], [mV/m] or [V/m]
POWER UNIT	The selected unit for power: [dBuW], [dBm], [dBmW], [dBW], [uW], [mW] or [W]
VOLTAGE UNIT	The selected unit for voltage: [dBuVrms], [dBmVrms], [dBVrms], [uVrms], [mVrms] or [Vrms]

13.9.3 Equipment for Uniform Field Area calculation

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: AMPLIFIER BRAND returns the brand name of the amplifier.

Keyword	Description
AMPLIFIER ...	Specifications of the used Amplifier
ANTENNA ...	Specifications of the used Antenna
COUPLER ...	Specifications of the used Coupler
FIELD SENSOR x ...	Specifications of the used Field Sensor number [x], where x is a number between 1 and 8
FORWARD POWER METER ...	Specifications of the used Forward Power Meter
REFLECTED POWER METER ...	Specifications of the used Reflected Power Meter
SIGNAL GENERATOR ...	Specifications of the used Signal Generator

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.9.4 Radiated Immunity Tests

Keyword	Description

"keyword or name of photo"	The name or keyword of the photo
NUMBER OF EVENTS	The number of events that occur during a test
TEST START TIME	The date and time at which the test is started
TEST STOP TIME	The date and time at which the test is stopped
TEST DATE	The date at which the test is performed
TEST ENGINEER	The name of the test engineer
TEST TIME	The time at which the test is performed
TEST SITE NAME	The name of the test equipment list
AD GRAPH x	The graph representing the A/D graph of channel number [x], where x is a number between 1 and 8
AVERAGE FIELD GRAPH	The graph representing the average field graph
CALCULATED FIELD GRAPH (1)	The graph representing the calculated field graph
CURRENT GRAPH	The graph representing the current graph
FIELD GRAPH x	The graph representing the field graph of field strength sensor number [x], where x is a number between 1 and 8
FORWARD POWER GRAPH	The graph representing the forward power graph
NET POWER GRAPH	The graph representing the net-power power graph
REFLECTED POWER GRAPH	The graph representing the reflected power graph
SIGNAL POWER GRAPH	The graph representing the signal power graph
AMPLIFIER PROTECTION MODE	The Amplifier Protection mode: Signal Power, Forward Power and or Reflected Power.
AVERAGE FIELD	Which probes are selected for the calculation of the average field
CALCULATED FIELD MEASURED(1)	Indication whether or not the calculated power is measured: Yes / No
CALIBRATION FILE (1)	The name of the calibration file used for the test
CALIBRATION METHOD	The calibration method used: Signal Generator Level, Forward Power or Net-Power
CURRENT LIMIT	The Current limit in Ampere [A]
CURRENT MEASURED	Indication whether or not the current is measured: Yes / No
CURRENT UNIT	The selected current unit: [dBuA],[dBmA], [dBA], [uA], [mA] or [A]
DESCRIPTION	The description of the Test Setup File (TSF)
DISTANCE	The distance between the antenna and the EUT in meters [m]
DWELL TIME	The dwell time in seconds [s]
FIELD TEST LEVEL (2)	The field strength level in the unit selected by the user
FORWARD POWER MEASURED	Indication whether or not the forward power is measured: Yes / No
FREQUENCY CHANGE MODE	The method used to change frequency: Stress Method, Ramp Method, Constant Method or Fast Constant Method.
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
MAIN VOLTAGE	The mains voltage during the test in Volt [V]
MODULATION	The type of modulation: none, Internal AM, External AM or Pulse
MODULATION CONSERVATION	Indication whether peak conservation is used: Power, Voltage, none
MODULATION DEPTH	Modulation depth in percentage of the carrier [%]

MODULATION DUTY CYCLE	The duty cycle of the pulse modulation as a percentage [%]
MODULATION FREQUENCY	The modulation frequency in Hertz [Hz]
MODULATION SIGNAL	The type of modulation signal: Sine Wave or Square Wave
NET POWER MEASURED	Indication whether or not the net-power power is measured: Yes / No
NOTE	Note or remark made during the test
POLARIZATION	Antenna polarisation: Horizontal or Vertical
PRESSURE	Air Pressure during the test in milliBar [mbar]
REFLECTED POWER MEASURED	Indication whether or not the reflected power is measured: Yes / No
START FREQUENCY	The start frequency in megahertz [MHz]
STOP FREQUENCY	The stop frequency in megahertz [MHz]
FREQUENCY STEP	The linear frequency step in megahertz [MHz]
LOGARITHMIC STEP	The logarithmic frequency step in a percentage of the previous step
LOGARITHMIC STEP FROM	The frequency the test was started from to calculate the proper logarithmic step size
STEP	A textual description of the used frequency step, also containing if it is linear or logarithmic step size
TAKE START PICTURE	Indication whether or not to take a photo at the start of the test: Yes/No
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TSF FILENAME	The filename of the TSF file
USE CURRENT LIMIT	Is the current limit used: Yes / No
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test
MANUAL MODE	Table containing the information collected during a manual mode session
FIELD UNIT	The selected unit for field strength: [dBuV/m], [dBmV/m], [dBV/m], [uV/m], [mV/m] or [V/m]
POWER UNIT	The selected unit for power: [dBuW], [dBm], [dBmW], [dBW], [uW], [mW] or [W]
VOLTAGE UNIT	The selected unit for voltage: [dBuVrms], [dBmVrms], [dBVrms], [uVrms], [mVrms] or [Vrms]

1) Substitution Method only 2) Substitution Method and Fixed Field Method only

13.9.5 Equipment for Radiated Immunity Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: AMPLIFIER SERIAL NUMBER returns the serial number of the amplifier.

Keyword	Description
AD CONVERTOR ...	Specifications of the used A/D Converter
AMPLIFIER ...	Specifications of the used Amplifier
ANTENNA ...	Specifications of the used Antenna
CABLE x ...	Specifications of the used Cable number [x], where x is a number between 1 to 8
COUPLER ...	Specifications of the used Coupler
CURRENT SENSOR ...	Specifications of the used Current Sensor

FIELD SENSOR x ...	Specifications of the used Field Sensor number [x], where x is a number between 1 and 8
FORWARD POWER METER ...	Specifications of the used Forward Power Meter
REFLECTED POWER METER ...	Specifications of the used Reflected Power Meter
SENSOR POWER METER ...	Specifications of the used Sensor Power Meter
SIGNAL GENERATOR ...	Specifications of the used Signal Generator

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.10 Conducted Immunity

13.10.1 Calibration

Keyword	Description
NUMBER OF EVENTS	The number of events that occur during a test
TEST START TIME	The date and time at which the test is started
TEST STOP TIME	The date and time at which the test is stopped
TEST DATE	The date at which the test is performed
TEST ENGINEER	The name of the test engineer
TEST TIME	The time at which the test is performed
TEST SITE NAME	The name of the test equipment list
AMPLIFIER PROTECTION MODE	The Amplifier Protection mode: Signal Power, Forward Power and / or Reflected Power.
CALIBRATION METHOD	The calibration method used: Signal Generator Level, Forward Power or Net-Power
CURRENT MEASURED	Indication whether or not the current is measured: Yes / No
CURRENT TEST LEVEL	The current test level in Ampere [A]
CURRENT UNIT	The selected current unit: [dBuA], [dBmA], [dBA], [uA], [mA] or [A]
DESCRIPTION	The description of the Test Setup File (TSF)
DISTANCE	The distance between the antenna and the EUT in meters [m]
DWELL TIME	The dwell time in seconds [s]
FORWARD POWER MEASURED	Indication whether or not the forward power is measured: Yes / No

FREQUENCY CHANGE MODE	The method used to change frequency: Stress Method, Ramp Method, Constant Method or Fast Constant Method.
HUMIDITY	Relative Humidity during the test in percentage rel. Humidity [%RH]
MAIN VOLTAGE	The mains voltage during the test in Volt [V]
NET POWER MEASURED	Indication whether or not the net-power power is measured: Yes / No
NOTE	Note or remark made during the test
POLARIZATION	Antenna polarisation: Horizontal or Vertical
PRESSURE	Air Pressure during the test in milliBar [mbar]
REFLECTED POWER MEASURED	Indication whether or not the reflected power is measured: Yes / No
START FREQUENCY	The start frequency in megahertz [MHz]
STOP FREQUENCY	The stop frequency in megahertz [MHz]
FREQUENCY STEP	The linear frequency step in megahertz [MHz]
LOGARITHMIC STEP	The logarithmic frequency step in a percentage of the previous step
LOGARITHMIC STEP FROM	The frequency the test was started from to calculate the proper logarithmic step size
STEP	A textual description of the used frequency step, also containing if it is linear or logarithmic step size
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TSF FILENAME	The filename of the TSF file
USE CURRENT TEST LEVEL	Indication the current test level is used: Yes / No
USE VOLTAGE TEST LEVEL	Indication the voltage test level is used: Yes / No
VOLTAGE TEST LEVEL	The voltage test level in the unit selected by the user
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test
POWER UNIT	The selected unit for power: [dBuW], [dBm], [dBmW], [dBW], [uW], [mW] or [W]
VOLTAGE UNIT	The selected unit for voltage: [dBuVrms], [dBmVrms], [dBVrms], [uVrms], [mVrms] or [Vrms]

13.10.2 Equipment for Calibration

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: COUPLER TYPE returns the type of the coupler.

Keyword	Description
AMPLIFIER ...	Specifications of the used Amplifier
ANTENNA ...	Specifications of the used Antenna
CABLE x ...	Specifications of the used Cable number [x], where x is a number between 1 to 8
CLAMP ...	Specifications of the used Clamp
CLAMP RESISTANCE	The resistance in Ohm (Ω) of the clamp
COUPLER ...	Specifications of the used Coupler
CURRENT SENSOR ...	Specifications of the used Current Sensor
FORWARD POWER METER ...	Specifications of the used Forward Power Meter
JIG ...	Specifications of the used Calibration Jig

REFLECTED POWER METER ...	Specifications of the used Reflected Power Meter
SENSOR POWER METER ...	Specifications of the used Sensor Power Meter
SIGNAL GENERATOR ...	Specifications of the used Signal Generator

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.10.3 Conducted Immunity Tests

Keyword	Description
"keyword or name of photo"	The name or keyword of the photo
NUMBER OF EVENTS	The number of events that occur during a test
TEST START TIME	The date and time at which the test is started
TEST STOP TIME	The date and time at which the test is stopped
TEST DATE	The date at which the test is performed
TEST ENGINEER	The name of the test engineer
TEST TIME	The time at which the test is performed
TEST SITE NAME	The name of the test equipment list
AD GRAPH x	The graph representing the A/D graph of channel number [x], where x is a number between 1 and 8
CALCULATED CURRENT GRAPH (1)	The graph representing the current graph
CALCULATED VOLTAGE GRAPH (1)	The graph representing the calculated voltage graph
CURRENT GRAPH	The graph representing the current graph
FIELD GRAPH x	The graph representing the field graph of field strength sensor number [x], where x is a number between 1 and 8
FORWARD POWER GRAPH	The graph representing the forward power graph
NET POWER GRAPH	The graph representing the net-power power graph
REFLECTED POWER GRAPH	The graph representing the reflected power graph
SIGNAL POWER GRAPH	The graph representing the signal power graph
VOLTAGE GRAPH	The graph representing the voltage graph

CALIBRATED POWER GRAPH	The graph representing the calibrated power limitation graph
CALIBRATED POWER LIMIT GRAPH	The graph representing the calibrated power limitation graph
AMPLIFIER PROTECTION MODE	The Amplifier Protection mode: Signal Power, Forward Power and / or Reflected Power.
CALIBRATION FILE (1)	The name of the calibration file used for the test
CALIBRATION METHOD	The calibration method used: Signal Generator Level, Forward Power or Net-Power
CURRENT LIMIT	The Current limit in Ampere [A]
CURRENT MEASURED	Indication whether or not the current is measured: Yes / No
CURRENT TEST LEVEL	The current test level in Ampere [A]
CURRENT UNIT	The selected current unit: [dBuA],[dBmA], [dBA], [uA], [mA] or [A]
DESCRIPTION	The description of the Test Setup File (TSF)
DISTANCE	The distance between the antenna and the EUT in meters [m]
DWELL TIME	The dwell time in seconds [s]
FORWARD POWER MEASURED	Indication whether or not the forward power is measured: Yes / No
FREQUENCY CHANGE MODE	The method used to change frequency: Stress Method, Ramp Method, Constant Method or Fast Constant Method.
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
MAIN VOLTAGE	The mains voltage during the test in Volt [V]
MODULATION	The type of modulation: none, Internal AM, External AM or Pulse
MODULATION CONSERVATION	Indication whether peak conservation is used: Power, Voltage, none
MODULATION DEPTH	Modulation depth in percentage of the carrier [%]
MODULATION DUTY CYCLE	The duty cycle of the pulse modulation as a percentage [%]
MODULATION FREQUENCY	The modulation frequency in Hertz [Hz]
MODULATION SIGNAL	The type of modulation signal: Sine Wave or Square Wave
NET POWER MEASURED	Indication whether or not the net-power power is measured: Yes / No
NOTE	Note or remark made during the test
POLARIZATION	Antenna polarisation: Horizontal or Vertical
PRESSURE	Air Pressure during the test in milliBar [mbar]
REFLECTED POWER MEASURED	Indication whether or not the reflected power is measured: Yes / No
START FREQUENCY	The start frequency in megahertz [MHz]
STOP FREQUENCY	The stop frequency in megahertz [MHz]
FREQUENCY STEP	The linear frequency step in megahertz [MHz]
LOGARITHMIC STEP	The logarithmic frequency step in a percentage of the previous step
LOGARITHMIC STEP FROM	The frequency the test was started from to calculate the proper logarithmic step size
STEP	A textual description of the used frequency step, also containing if it is linear or logarithmic step size
TAKE START PICTURE	Indication whether or not a photo is taken at the start of the test: Yes/No
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TSF FILENAME	The filename of the TSF file

USE CURRENT LIMIT	Is the current limit used: Yes / No
USE CURRENT TEST LEVEL (2)	Indication the current test level is used: Yes / No
USE VOLTAGE TEST LEVEL (6)	Indication the voltage test level is used: Yes / No
VOLTAGE TEST LEVEL (6)	The voltage test level in the unit selected by the user
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test
MANUAL MODE	Table containing the information collected during a manual mode session
POWER UNIT	The selected unit for power: [dBuW], [dBm], [dBmW], [dBW], [uW], [mW] or [W]
VOLTAGE UNIT	The selected unit for voltage: [dBuVrms], [dBmVrms], [dBVrms], [uVrms], [mVrms] or [Vrms]
POWER TEST LEVEL (3)	The power test level in the unit selected by the user
STEP DOWN (4)	The number of dB's the test level is stepped down during a minimum performance test
TOLERANCE (5)	The maximum allowable tolerance of the test-level

1) Fixed Generator method and Minimum Performance Level Method excluded 2) Substitution method and Fixed Current Method only 3) Fixed Generator level method only 4) Minimum Performance test method only 5) Fixed Current method and Minimum Performance test method only 6) Substitution method only

13.10.4 Equipment for Conducted Immunity Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: ANTENNA DESCRIPTION returns the description of the antenna.

Keyword	Description
AD CONVERTOR ...	Specifications of the used A/D Converter
AMPLIFIER ...	Specifications of the used Amplifier
ANTENNA ...	Specifications of the used Antenna
CABLE x ...	Specifications of the used Cable number [x], where x is a number between 1 to 8
CLAMP ...	Specifications of the used Clamp
CLAMP RESISTANCE	The resistance in Ohm (Ω) of the clamp
COUPLER ...	Specifications of the used Coupler
CURRENT SENSOR ...	Specifications of the used Current Sensor
FORWARD POWER METER ...	Specifications of the used Forward Power Meter
REFLECTED POWER METER ...	Specifications of the used Reflected Power Meter
SENSOR POWER METER ...	Specifications of the used Sensor Power Meter
SIGNAL GENERATOR ...	Specifications of the used Signal Generator

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user

DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.11 Pulsed Immunity

13.11.1 ESD Test

Keyword	Description
NEG AIR MEASURED POINT x	Indication a Negative Air Discharge is performed at point number [x]: Yes / No
NEG AIR RESULT POINT x	Results of Negative Air Discharge at point number [x]: pass or fail
NEG CONTACT MEASURED POINT x	Indication a Negative Contact Discharge is performed at point number [x]: Yes / No
NEG CONTACT RESULT POINT x	Results of Negative Contact Discharge at point number [x]: pass or fail
NUMBER OF EVENTS	The number of events that occur during a test
POS AIR MEASURED POINT x	Indication a Positive Air Discharge is performed at point number [x]: Yes / No
POS AIR RESULT POINT x	Results of Positive Air Discharge at point number [x]: pass or fail
POS CONTACT MEASURED POINT x	Indication a Positive Contact Discharge is performed at point number [x]: Yes / No
POS CONTACT RESULT POINT x	Results of Positive Contact Discharge at point number [x]: pass or fail
TEST START TIME	The time at which the test is stopped
TEST STOP TIME	The time at which the test is started
TEST SITE NAME	The name of the test equipment list
AMPLITUDE POINT x	Amplitude of pulse performed at point number [x] in [V]
CONFIGURATION TIME	The date and time when the TSF file is saved
DESCRIPTION	Description of the Test Setup File (TSF)
DISCHARGE INTERVAL	The interval of the discharge in seconds.
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
MAIN VOLTAGE	Mains Voltage during the test in Volt [V]
NEG AIR LEVEL POINT x	Level of the Negative Air Discharge at point number [x] in [V]
NEG CONTACT LEVEL POINT x	Level of the Negative Contact Discharge at point number [x] in [V]
NOTE	Note or remark made during the test
NOTE POINT x	Note or remark for point number [x]

NUMBER OF DISCHARGES	The number of discharges
PERFORMANCE CRITERIA CUSTOMER	The performance criteria according to the customer
PERFORMANCE CRITERIA PRODUCT STANDARD	The performance criteria according to the product standard
POS AIR LEVEL POINT x	Level of the Positive Air Discharge at point number [x] in [V]
POS CONTACT LEVEL POINT x	Level of the Positive Contact Discharge at point number [x] in [V]
PRESSURE	Air Pressure during the test in MilliBar [mbar]
TDURATION POINT x	Duration of pulse at point number [x] in milliseconds [ms]
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TEST ENGINEER	The name of the test engineer
TESTPOINT DESCRIPTION POINT nr	Position at EUT where discharge was applied
TRISE POINT x	Rise time of pulse at point number [x] in milliseconds [ms]
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test
POS HCP MEASURED POINT X	Indication a Positive HCP Discharge is performed at point number [x]: Yes / No
NEG HCP MEASURED POINT X	Indication a Negative HCP Discharge is performed at point number [x]: Yes / No
POS HCP RESULT POINT X	Results of Positive HCP Discharge at point number [x]: pass or fail
NEG HCP RESULT POINT X	Results of Negative HCP Discharge at point number [x]: pass or fail
POS HCP LEVEL POINT X	Level of the Positive HCP Discharge at point number [x] in [V]
NEG HCP LEVEL POINT X	Level of the Negative HCP Discharge at point number [x] in [V]
POS HCP NOTE POINT X	Note or remark for the Positive HCP Discharge at point number [x]
NEG HCP NOTE POINT X	Note or remark for the Negative HCP Discharge at point number [x]
POS VCP MEASURED POINT X	Indication a Positive VCP Discharge is performed at point number [x]: Yes / No
NEG VCP MEASURED POINT X	Indication a Negative VCP Discharge is performed at point number [x]: Yes / No
POS VCP RESULT POINT X	Results of Positive VCP Discharge at point number [x]: pass or fail
NEG VCP RESULT POINT X	Results of Negative VCP Discharge at point number [x]: pass or fail
POS VCP LEVEL POINT X	Level of the Positive VCP Discharge at point number [x] in [V]
NEG VCP LEVEL POINT X	Level of the Negative VCP Discharge at point number [x] in [V]
POS VCP NOTE POINT X	Note or remark for the Positive VCP Discharge at point number [x]
NEG VCP NOTE POINT X	Note or remark for the Negative VCP Discharge at point number [x]

13.11.2 Equipment for ESD Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: ESDGUN BRAND returns the brand name of the ESD gun.

Keyword	Description
ESDGUN ...	Specifications of the used ESD Gun

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.11.3 EFT Test

Keyword	Description
(L1-L2)/PE RESULT	Results on (L1-L2)/PE: Pass or Fail
CAPCLAMP RESULT	Results on Capacitive Clamp: Pass or Fail
L1 RESULT	Results on L1: Pass or Fail
L1/L2 RESULT	Results on L1/L2: Pass or Fail
L1/PE RESULT	Results on L1/PE: Pass or Fail
L2 RESULT	Results on L2: Pass or Fail
L2/PE RESULT	Results on L2/PE: Pass or Fail
NUMBER OF EVENTS	The number of events that occur during a test
PE RESULT	Results on PE (Protective Earth): Pass or Fail
TEST START TIME	The time at which the test is stopped
TEST STOP TIME	The time at which the test is started
TEST SITE NAME	The name of the test equipment list
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment

SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment
(L1-L2)/PE MEASURED	(L1-L2)/PE Measured: Yes / No
AMPLITUDE	Amplitude of burst in Volt [V]
CAPCLAMP MEASURED	Capacitive Clamp Measured: Yes / No
CONFIGURATION TIME	The date and time when the TSF file is saved
DESCRIPTION	Description of the Test Setup File (TSF)
DURATION	Duration of test in milliseconds [ms]
FREQUENCY	Frequency of burst in Hertz [Hz]
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
L1 MEASURED	L1 Measured: Yes / No
L1/L2 MEASURED	L1/L2 Measured: Yes / No
L1/PE MEASURED	L1/PE Measured: Yes / No
L2 MEASURED	L2 Measured: Yes / No
L2/PE MEASURED	L2/PE Measured: Yes / No
MAIN VOLTAGE	Mains Voltage during the test in Volt [V]
NOTE	Note or remark made during the test
NOTE (L1-L2)/PE	Notes or remarks for (L1-L2)/PE
NOTE CAPCLAMP	Notes or remarks for Capacitive Clamp
NOTE L1	Notes or remarks for L1
NOTE L1/L2	Notes or remarks for L1/L2
NOTE L1/PE	Notes or remarks for L1/PE
NOTE L2	Notes or remarks for L2
NOTE L2/PE	Notes or remarks for L2/PE
NOTE PE	Notes or remarks for PE
PE MEASURED	PE Measured: Yes / No
PRESSURE	Air Pressure during the test in milliBar [mbar]
TBURST	Duration of burst in milliseconds [ms]
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TEST ENGINEER	The name of the test engineer
TPERIOD	Duration of period in milliseconds [ms]
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test

For every possible line the following items are available:

Keyword	Description
MEASURED	If the line was measured
RESULT	The result on this line
AMPLITUDE	The amplitude on this line
NOTE	The note that is related to this line

So for example code ||<testname>|L1 / L2 RESULT|| is valid.

13.11.4 Equipment for EFT Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: EFTGENERATOR TYPE returns the type of the EFT generator.

Keyword	Description
EFTGENERATOR ...	Specifications of the used EFT Generator

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.11.5 Surge Test

Keyword	Description
(L1-L2)/PE MEASURED	(L1-L2)/PE measured: Yes / No
(L1-L2)/PE RESULT	Results of Surge Test at (L1-L2)/PE: pass or fail
L1/L2 MEASURED	Indication whether or not L1/L2 is measured: Yes / No
L1/L2 RESULT	Results of Surge Test at L1/L2: pass or fail
L1/PE MEASURED	Indication whether or not L1/PE is measured: Yes / No
L1/PE RESULT	Results of Surge Test at L1/PE: pass or fail
L2/PE MEASURED	Indication whether or not L2/PE is measured: Yes / No
L2/PE RESULT	Results of Surge Test at L2/PE: pass or fail
NUMBER OF EVENTS	The number of events that occur during a test
TEST START TIME	The time at which the test is stopped
TEST STOP TIME	The time at which the test is started
TEST SITE NAME	The name of the test equipment list
CINTSETTINGS (L1-L2)/PE	Internal Capacitance for (L1-L2)/PE
CINTSETTINGS L1/L2	Internal Capacitance for L1/L2
CINTSETTINGS L1/PE	Internal Capacitance for L1/PE
CINTSETTINGS L2/PE	Internal Capacitance for L2/PE
CONFIGURATION TIME	The date and time when the TSF file is saved
DESCRIPTION	Description of the Test Setup File (TSF)
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
MAIN VOLTAGE	Mains Voltage during the test in Volt [V]
NOTE	Note or remark made during the test
NOTE (L1-L2)/PE	Note or remark for Surge Test at (L1-L2)/PE
NOTE L1/L2	Note or remark for Surge Test at L1/L2
NOTE L1/PE	Note or remark for Surge Test at L1/PE
NOTE L2/PE	Note or remark for Surge Test at L2/PE
PHASE (L1-L2)/PE	Phase angle between L1 - L2 and PE in degrees: 0, 90, 270, random
PHASE L1/L2	Phase angle between L1 and L2 in degrees: 0, 90, 270, random

PHASE L1/PE	Phase angle between L1 and PE in degrees: 0, 90, 270, random
PHASE L2/PE	Phase angle between L2 and PE in degrees: 0, 90, 270, random
POLARISATION OF (L1-L2)/PE TESTLEVEL	Polarisation of test voltage at (L1-L2)/PE: Positive, Negative or both
POLARISATION OF L1/L2 TESTLEVEL	Polarisation of test voltage at L1/L2: Positive, Negative or both
POLARISATION OF L1/PE TESTLEVEL	Polarisation of test voltage at L1/PE: Positive, Negative or both
POLARISATION OF L2/PE TESTLEVEL	Polarisation of test voltage at L2/PE: Positive, Negative or both
PRESSURE	Air Pressure during the test in milliBar [mbar]
RINTSETTINGS (L1-L2)/PE	Internal Resistance for (L1-L2)/PE
RINTSETTINGS L1/L2	Internal Resistance for L1/L2
RINTSETTINGS L1/PE	Internal Resistance for L1/PE
RINTSETTINGS L2/PE	Internal Resistance for L2/PE
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TEST ENGINEER	The name of the test engineer
TESTLEVEL (L1-L2)/PE	Test level at (L1-L2)/PE in kilo Volt [kV]
TESTLEVEL L1/L2	Test level at L1/L2 in kilo Volt [kV]
TESTLEVEL L1/PE	Test level at L1/PE in kilo Volt [kV]
TESTLEVEL L2/PE	Test level at L2/PE in kilo Volt [kV]
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test

For every available line the following codes can be applied:

Keyword	Description
MEASURED	If the selected line was measured
RESULT	The result of the measurement
POSITIVE TEST LEVEL	The positive test level(Yes / No)
NEGATIVE TEST LEVEL	The negative testlevel(Yes / No)
CI	The capacity used for this line configuration
RI	The resistance used for this line configuration
Test Level	The test level used for this line configuration
Note	The note that applies to this line configuration
PHASE 0	Phase 0 measured (Yes / No)
PHASE 90	Phase 90 measured (Yes / No)
PHASE 270	Phase 270 measured (Yes / No)
PHASE RANDOM	Phase random measured (Yes / No)

13.11.6 Equipment for Surge Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: SURGEGENERATOR ID returns the internal ID of the Surge generator.

Keyword	Description
SURGEGENERATOR ...	Specifications of the used Surge Generator

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment

CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.12 Pulsed Immunity Multi Band Tests

13.12.1 All Pulsed Immunity MB Tests share the following codes:

Keyword	Description
TestRepeatCount	Count to repeat all the sequences (Whole test)
CABLE CABLELENGTH	Length of the cable
CABLE DESCRIPTION	User description of the cable
CABLE FIXINGSHIELD	Fixing shield of the cable
CABLE LOADATPORT	Data port of the cable
CABLE MAXCABLELENGTH	Specified maximum cable length
CABLE NOTE	User note of the cable
CABLE PORTTYPE	Used Port Type of the cable
CABLE TYPEOFCABLE	Cable type

13.12.1.1 Band Specific Codes

For the multiband tests, multiple settings are set for each band. To acquire the values for each band, the keyword must contain the selected band.
BAND + X + <Setting>
The X should contain the number of the selected band.

Keyword	Description
BAND1 SequenceNumber	The number of the sequence.
BAND1 TestSiteName	The selected test site with the used devices specified for the first sequence of the test.
BAND1 TestNote	The user typed note for the first sequence of the test.
BAND1 TestStatus	The test pass state specified for the first sequence of the test.

There are multiple Pulsed Immunity MB test which each have their own settings and keywords.

13.12.2 EFT

Keyword	Description
BAND1 Line	Selected line coupling.

BAND1 BurstDuration	The selected burst duration specified in the first sequence of the test.
BAND1 BurstPeriod	The selected burst period specified in the first sequence of the test.
BAND1 SequenceDuration	The selected sequence duration specified in the first sequence of the test.
BAND1 Polarity	The selected polarity of the VoltageTestLevel.
BAND1 VoltageTestLevel	The voltage test level specified in the first sequence of the test
BAND1 PulserepetitionRate	The pulse repetition rate specified in the first sequence of the test.
BAND1 RepeatCount	The ammount the sequence is repeated.
BAND1 Test note	The note specified for each band.

13.12.3 Surge

Keyword	Description
BAND1 Line	The selected line specified in the first sequence of the test.
BAND1 VoltageTestLevel	The voltage test level specified in the first sequence of the test.
BAND1 Polarity	The polarity specified in the first sequence of the test.
BAND1 RI	The impedance specified in the first sequence of the test.
BAND1 CI	The capacitance specified in the first sequence of the test.
BAND1 PulseRepetitionTime	The pulse repetition time specified in the first sequence of the test.
BAND1 PulseCount	The pulse count specified in the first sequence of the test.
BAND1 PhaseAngles	The pulse angles specified in the first sequence of the test.
BAND1 Test note	The note specified for each band.

13.12.4 VDI

Keyword	Description
BAND1 Changedvoltage	The changed voltage for the dips specified for the first sequence of the test
BAND1 Decreasevoltagetime	The switch time from regular voltage to the dip voltage
BAND1 Dipcount	The ammount of dips per sequence
BAND1 Increasevoltagetime	The time to switch from dip voltage to regular voltage
BAND1 Line	The selected line coupling on which the dip will occur
BAND1 Locationtypetext	The AC or DC mode
BAND1 Phaseangles	The angle on which the dip will initiate
BAND1 Ratedvoltage	The regular voltage
BAND1 Reducedvoltagetime	The time that the voltage is at reduced voltage
BAND1 Repetitiontime	The duration of one sequence
BAND1 Repeatcount	The ammount the sequence will be repeated
BAND1 Test note	The note specified for each band.

13.12.5 Pulsed Immunity MB Example

To remove keywords of unused sequences, the start and end deleteblock codes can be used:
||STARTDELETEBLOCK()||
Band 1 notes: ||BAND1 TestNote||

||ENDDELETEBLOCK()||
||STARTDELETEBLOCK()||
Band 2 notes: ||BAND2 TestNote||
||ENDDELETEBLOCK()||
||STARTDELETEBLOCK()||
Band 3 notes: ||BAND3 TestNote||
||ENDDELETEBLOCK()||
||STARTDELETEBLOCK()||
Band 4 notes: ||BAND4 TestNote||
||ENDDELETEBLOCK()||

If only 2 sequences are available in the test, only 2 sequences bands will be seen in the Report output.

13.13 Radiated Emission

Note: The pass/fail criteria, shown in the tables of the report generator, do not take the measure uncertainty of the test setup into account.

13.13.1 Radiated Emission Tests

Keyword	Description
"keyword or name of photo"	The name or keyword of the photo
NUMBER OF EVENTS	The number of events that occur during a test
PEAK DETECTION COUNT	The number of detected peaks
TEST START TIME	The time at which the test is stopped
TEST STOP TIME	The time at which the test is started
MAX HOLD GRAPH	The max hold graph of the all the traces
MAX HOLD PEAKS GRAPH	The max hold graph of all the traces and markers
MAX PEAK GRAPH	The max hold graph of the Peak trace
MAX AVERAGE GRAPH	The max hold graph of the Average trace
MAX QUASI PEAK GRAPH	The max hold graph of the Quasi Peak trace
MAX RMS GRAPH	The max hold graph of the RMS trace
ATTENUATOR	The attenuation of the attenuator in dB
ATTENUATOR MODE	The Attenuator Mode: Auto, Coupled or Manual
AVERAGE DETECTOR	Indication whether or not the Average detector is measured: Yes / No
AVERAGE MEASURE TIME	The measurement time of the average peak detector in seconds [s]
AVERAGE OBSERVATION TIME	The observation time per average peak in seconds [s]
AVERAGE TRACE	Indication whether or not the Average trace is measured: Yes / No
BELOW LIMITLINE OFFSET	The level of peaks to detect in dB below the limit line
CONFIGURATION TIME	The date and time when the TSF file is saved
CURRENT UNIT	The selected unit for current: [dBuA], [dBmA], [dBA], [uA], [mA] or [A]
DB/DIV	N/A
DB/DIV MODE	N/A
DESCRIPTION	Description of the Test Setup File (TSF)

DISTANCE	The distance between the antenna and the EUT in meters [m]
OPTIMIZE ANGLE OPTIMIZE AREA	The angle optimization area.
OPTIMIZE ANGLE STEP SIZE	The step size of the angle optimization.
OPTIMIZE HEIGHT OPTIMIZE AREA	The height optimization area.
OPTIMIZE HEIGHT STEP SIZE	The step size of the height optimization.
END ANGLE	The stop position in degrees
HEIGHT STEPS	The number of steps between the minimum height and the maximum height
HIGHEST HEIGHT	The maximum height of the antenna tower in meters [m]
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
INTERNAL PREAMPLIFIER	The amplification of the internal pre amplifier in [dB]
INTERNAL PREAMPLIFIER MODE	The Internal Pre Amplifier Mode: Auto, Coupled or Manual
LOWEST HEIGHT	The minimum height of the antenna tower in meters [m]
MAIN VOLTAGE	Mains Voltage during the test in Volt [V]
MAXIMUM PEAK COUNT	The maximum number of peaks to be detected
MEASURE TIME	The measure time in milliseconds [ms]
MEASURE TIME MODE	The Mode: Auto, Coupled or Manual
NOTE	Note or remark made during the test
NUMBER OF ANGLES	The number of steps between the start position and the stop position
PEAK DETECTOR	Indication whether or not the Peak detector is measured: Yes / No
PEAK MEASURE TIME	The measurement time of the peak detector in seconds [s]
PEAK OBSERVATION TIME	The observation time per peak in seconds [s]
PEAK SEARCH	Indication whether or not a peak search is performed: Yes / No
PEAK TRACE	Indication whether or not the Peak trace is measured: Yes / No
PEAKSWEEPS	Number of peak sweeps performed
Keyword	Description
POINT X FREQUENCY	The frequency of point X in the peak list (X starting from 1)
POINT X PEAK	The peak value of point X in the peak list (X starting from 1)
POINT X QUASI PEAK	The quasi peak value of point X in the peak list (X starting from 1)
POINT X AVERAGE	The average value of point X in the peak list (X starting from 1)
POLARIZATION	The polarization of the antenna: horizontal, vertical or both
PRESSURE	Air Pressure during the test in milliBar [mbar]
QUASIPEAK DETECTOR	Indication whether or not the Quasi peak detector is measured: Yes/No
QUASIPEAK MEASURE TIME	The measurement time of the quasi peak detector in seconds [s]
QUASIPEAK OBSERVATION TIME	The observation time per quasi peak in seconds [s]
QUASIPEAK TRACE	Indication whether or not the Quasi peak trace is measured: Yes / No
RBW	The Radio Bandwidth in kilo Hertz [kHz]
RBW MODE	The RBW Mode: Auto, Coupled or Manual
RECEIVER DATA SAVE MODE	Indication whether all data is saved or only the test results
REFERENCE LEVEL	The reference level in the unit selected by the user
REFERENCE LEVEL MODE	The Reference Level Mode: Auto, Coupled or Manual
RMS DETECTOR	Indication whether or not the RMS detector is measured: Yes / No

RMS MEASURE TIME	The measurement time of the RMS peak detector in seconds [s]
RMS OBSERVATION TIME	The observation time per RMS peak in seconds [s]
RMS TRACE	Indication whether or not the RMS trace is measured: Yes / No
START ANGLE	The start position in degrees
START FREQUENCY	The start frequency in megahertz [MHz]
FREQUENCY STEP	The step frequency in kilo Hertz [kHz]
STEP FREQUENCY MODE	The Step frequency Mode: Auto, Coupled or Manual
STOP FREQUENCY	The stop frequency in megahertz [MHz]
SWEEP TIME	The sweep time in milliseconds [ms]
SWEEP TIME MODE	The Sweep Time Mode: Auto, Coupled or Manual
TAKE START PICTURE	Indication whether or not a picture is taken at the start of the test: Yes / No
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TEST ENGINEER	The name of the test engineer
TEST SITE NAME	The name of the test equipment list
USE INTERNAL PREAMP	N/A
USE START STOP FREQUENCY	Yes / No, if Yes: Start/Stop if No: Frequency list is used.
VBW	The Video Bandwidth in kilo Hertz [kHz]
VBW MODE	The Video Bandwidth Mode: Auto, Coupled or Manual
EMISSION TABLE	Table of detected peaks and per peak: frequency, level(s), limit value, pass/fail, location
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test

Following keywords are applicable for the GTEM Method only:

Keyword	Description
EUT HEIGHT	The height of the EUT in meters [m]
SEPTUM HEIGHT	The height of the septum in meters [m]

13.13.2 Radiated Emission Table

Each keyword can also be accessed in RAW format, which generally implies that only the RAW data (without unit) is retrieved. To retrieve the RAW value, extend the keyword by applying "_RAW" (without any white space) to this keyword. E.g. "PEAK_RAW". The LIMIT, DIFFERENCE and STATUS keywords are only available when a valid LLF is present for those peaks. Otherwise, no calculations of these values can be made.
Following keywords are only applicable for the Table information:

Keyword	Description
EMISSION TABLE	The selection of the Emission Table
SELECTED	The selection of the peak(s)
PEAK NUMBER	The number of the peak(s)
FREQUENCY	The frequency of the peak(s)
PEAK	The measurement value of the peak(s)
PEAK LIMIT	The limit value of the peak(s)
PEAK DIFFERENCE	The difference value between the measured peak(s) value and the limit value.
PEAK CORRECTION	The correction value of the peak(s)
PEAK STATUS	The status of the peak(s): Pass / Fail
AVERAGE	The average measurement value of the peak(s)
AVERAGE LIMIT	The average limit value of the peak(s)

AVERAGE DIFFERENCE	The average difference value between the measured average(s) value and the limit value.
AVERAGE CORRECTION	The average correction value of the peak(s)
AVERAGE STATUS	The average status of the peak(s): Pass / Fail
QUASI-PEAK	The Quasi-peak measurement value of the peak(s)
QUASI-PEAK LIMIT	The Quasi-peak limit value of the peak(s)
QUASI-PEAK DIFFERENCE	The Quasi-peak difference value between the measured Quasi-peak(s) value and the limit value.
QUASI-PEAK CORRECTION	The Quasi-peak correction value of the peak(s)
QUASI-PEAK STATUS	The Quasi-peak status of the peak(s): Pass / Fail
RMS	The RMS measurement value of the peak(s)
RMS LIMIT	The RMS limit value of the peak(s)
RMS DIFFERENCE	The RMS difference value between the measured RMS(s) value and the limit value.
RMS CORRECTION	The RMS correction value of the peak(s)
RMS STATUS	The RMS status of the peak(s): Pass / Fail
STATUS	The overall status of the peak(s): Pass / Fail
ANGLE	The angle of the peak(s) in degrees
HEIGHT	The height of the peak(s) in meters [m]
POLARIZATION	The polarization of the peak(s)

13.13.3 Radiated Emission Burst

Following keywords are applicable for the Burst Method only:

Keyword	Description
BURST GRAPH	The graph plot
CARRIER FREQUENCY	The carrier frequency in [MHz]
BURST TRIGGER LEVEL	The burst trigger level in [dBm]
BURST MEASURE TIME	The burst measure time in seconds [s]
BURST SAMPLE RATE	The burst sample rate
BURST MINIMUM GAP TIME	The burst gap time in milli seconds [ms]
BURST THRESHOLD LEVEL	The burst threshold level in [dBc]
ANTENNA ASSEMBLY	The Antenna assembly gain in [dBi]
BEAMFORMING GAIN	The Beamforming gain in [dB]
MAXIMUM EIRP	The Maximum E.I.R.P. in [dBm]
MEDIUM UTILISATION	The Medium Utilisation in percentage [%]
DUTY CYCLE	The Duty Cycle in percentage [%]
MINIMUM GAP TIME	The minimum Gap time in seconds [s]
MAXIMUM SEQUENCE TIME	The Maximum Sequency time in seconds [s]
RMS	The RMS value in [dBm]

13.13.4 Equipment for Radiated Emission Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: ANTENNA TOWER BRAND returns the brand name of the antenna tower.

Keyword	Description
ANTENNA ...	Specifications of the used Antenna
ANTENNA TOWER ...	Specifications of the used Antenna Tower
CABLE x ...	Specifications of the used Cable number [x], where x is a number between 1 to 8
NUMBER OF DETECTORS	The number of detectors the Receiver is able to handle simultaneously
PRE AMPLIFIER ...	Specifications of the used Pre Amplifier
RECEIVER TYPE	The type of receiver: Spectrum Analyser, Measurement Receiver or Scanning Receiver
SPECTRUM ANALYZER ...	Specifications of the used Spectrum Analyser or Measurement Receiver
TURN TABLE ...	Specifications of the used Turntable

Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user
DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.14 Conducted Emission

Note: The pass/fail criteria, shown in the tables of the report generator, do not take the measure uncertainty of the test setup into account.

13.14.1 Conducted Emission Tests

Keyword	Description
"keyword or name of photo"	The name or keyword of the photo
NUMBER OF EVENTS	The number of events that occur during a test
PEAK DETECTION COUNT	The number of detected peaks
TEST START TIME	The time at which the test is stopped
TEST STOP TIME	The time at which the test is started
TEST SITE NAME	The name of the test equipment list
MAX HOLD GRAPH	The max hold graph of the all the traces
MAX HOLD PEAKS GRAPH	The max hold graph of all the traces and markers
MAX PEAK GRAPH	The max hold graph of the Peak trace
MAX AVERAGE GRAPH	The max hold graph of the Average trace
MAX QUASI PEAK GRAPH	The max hold graph of the Quasi Peak trace
MAX RMS GRAPH	The max hold graph of the RMS trace

ATTENUATOR	The attenuation of the attenuator in dB
ATTENUATOR MODE	The Attenuator Mode: Auto, Coupled or Manual
AVERAGE DETECTOR	Indication whether or not the average detector is measured: Yes / No
AVERAGE MEASURE TIME	The measurement time of the average peak detector in seconds [s]
AVERAGE OBSERVATION TIME	The observation time per average peak in seconds [s]
AVERAGE TRACE	Indication whether or not the average trace is measured: Yes / No
BELOW LIMITLINE OFFSET	The level of peaks to detect in dB below the limit line
CONFIGURATION TIME	The date and time when the TSF file is saved
CURRENT UNIT	The selected unit for current: [dBuA], [dBmA], [dBA], [uA], [mA] or [A]
DB/DIV	N/A
DB/DIV MODE	N/A
DESCRIPTION	Description of the Test Setup File (TSF)
EMISSION OPTIMIZING METHOD	N/A
HUMIDITY	Relative Humidity during the test in percentage relative Humidity [%RH]
INTERNAL PREAMPLIFIER	The amplification of the internal pre amplifier in [dB]
INTERNAL PREAMPLIFIER MODE	The Internal Pre Amplifier Mode: Auto, Coupled or Manual
LISN LINE	Which LISN line is used: Neutral, Phase 1, Phase 2 or Phase 3
MAIN VOLTAGE	Mains Voltage during the test in Volt [V]
MAXIMUM PEAK COUNT	The maximum number of peaks to be detected
MEASURE TIME	The measure time in milliseconds [ms]
MEASURE TIME MODE	The Mode: Auto, Coupled or Manual
NOTE	Note or remark made during the test
PEAK DETECTOR	Indication whether or not the Peak detector is measured: Yes / No
PEAK MEASURE TIME	The measurement time of the peak detector in seconds [s]
PEAK OBSERVATION TIME	The observation time per peak in seconds [s]
PEAK TRACE	Indication whether or not the Peak trace is measured: Yes / No
PEAKSWEEPS	Number of peak sweeps performed
PRESSURE	Air Pressure during the test in milliBar [mbar]
QUASIPEAK DETECTOR	Indication whether or not the Quasi peak detector is measured: Yes / No
QUASIPEAK MEASURE TIME	The measurement time of the quasi peak detector in seconds [s]
QUASIPEAK OBSERVATION TIME	The observation time per quasi peak in seconds [s]
QUASIPEAK TRACE	Indication whether or not the Quasi peak trace is measured: Yes / No
Keyword	Description
RBW	The Radio Bandwidth in kilo Hertz [kHz]
RBW MODE	The RBW Mode: Auto, Coupled or Manual
RECEIVER DATA SAVE MODE	Indication whether all data is saved or only the test results
REFERENCE LEVEL	The reference level in the unit selected by the user
REFERENCE LEVEL MODE	The Reference Level Mode: Auto, Coupled or Manual
RMS DETECTOR	Indication whether or not the RMS detector is measured: Yes / No
RMS MEASURE TIME	The measurement time of the RMS peak detector in seconds [s]

RMS OBSERVATION TIME	The observation time per RMS peak in seconds [s]
RMS TRACE	Indication whether or not the RMS trace is measured: Yes / No
START FREQUENCY	The start frequency in megahertz [MHz]
FREQUENCY STEP	The step frequency in kilo Hertz [kHz]
STEP FREQUENCY MODE	The Step frequency Mode: Auto, Coupled or Manual
STOP FREQUENCY	The stop frequency in megahertz [MHz]
SWEEP TIME	The sweep time in milliseconds [ms]
SWEEP TIME MODE	The Sweep Time Mode: Auto, Coupled or Manual
TAKE START PICTURE	Indication whether or not a picture is taken at the start of the test: Yes / No
TEMPERATURE	Temperature during the test in degrees Celsius [oC]
TEST ENGINEER	The name of the test engineer
USE INTERNAL PREAMP	N/A
USE START STOP FREQUENCY	Yes / No, if Yes: Start/Stop if No: Frequency list is used.
VBW	The Video Bandwidth in kilo Hertz [kHz]
VBW MODE	The Video Bandwidth Mode: Auto, Coupled or Manual
EMISSION TABLE	Table of detected peaks and per peak: frequency, level(s), limit value, location
EQUIPMENT TABLE	A table containing all used equipment
EVENTS	Table of events which occur during a test
ABSORBING CLAMP ... (1)	Specifications of the used Absorbing Clamp
CLAMP MOVER ... (1)	Specifications of the used Clamp Mover
LARGEST DISTANCE	The maximum distance of the clamp in meters [m]
SMALLEST DISTANCE	The minimum distance of the clamp in meters [m]
STEPS	The number of steps between the minimum distance and the maximum distance

1) Absorbing clamp method only

13.14.2 Equipment for Conducted Emission Tests

The equipment keyword consists of two parts: the keyword and a parameter. For each keyword all parameters are valid.
Example: CABLE 5 BRAND returns the brand name of cable nr. 5.

Keyword	Description
CABLE x ...	Specifications of the used Cable number [x], where x is a number between 1 to 8
LISN ...	Specifications of the used LISN
NUMBER OF DETECTORS	The number of detectors the Receiver is able to handle simultaneously
PRE AMPLIFIER ...	Specifications of the used Pre Amplifier
RECEIVER TYPE	The type of receiver: Spectrum Analyser, Measurement Receiver or Scanning Receiver
SPECTRUM ANALYZER ...	Specifications of the used Spectrum Analyser or Measurement Receiver

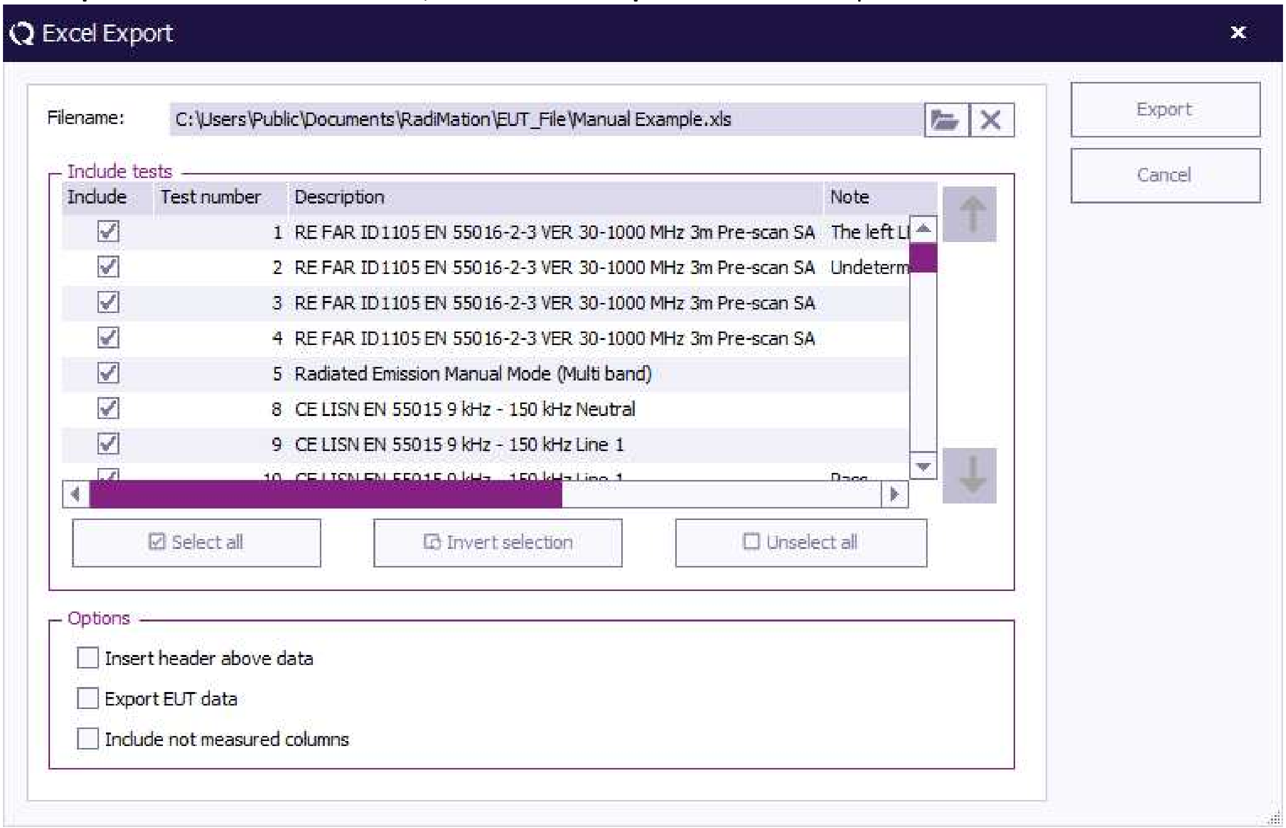
Where ... is one of the following parameters:

Parameter	Description
BRAND	Brand of Measurement equipment
CALIBRATION EXPIRES	Date when calibration expires of equipment, given by the user
DESCRIPTION	Description of Measurement equipment given by the user

DEVICE DRIVER DLL	N/A
DEVICE DRIVER NAME	The internal name of the device driver
HARDWARE VERSION	Hardware version of Measurement equipment
ID	Internal ID of Measurement equipment
INI FILE NAME	N/A
NAME	Name of Measurement equipment
SERIAL NUMBER	Serial number of Measurement equipment
SOFTWARE VERSION	Software version of Measurement equipment
SUPPORTED DEVICE TYPES	N/A
TYPE	Type of Measurement equipment

13.15 Excel Exporter

The EUT data can be exported to Microsoft Excel with the Excel Exporter. Press the **Export** button on the **Reports** tab of the EUT window, and the **Excel Export** window will open:



13.15.1 Selecting filename

To select the filename you want to use to save the information, press the 'select file' button next to the red cross. A 'save' window will appear, allowing you to select the path and filename. After closing the save window the name will be displayed on the export window.

13.15.2 Selecting tests to be exported

You can select or deselect a test (that is to be exported) by checking or un-checking the checkbox in front of the name of the test. Press **Select all** to select all the tests, press **Unselect all** to deselect all the tests and press **Invert selection** to invert the selection. (This means that all the selected tests will be deselected, and all the deselect tests will be selected.)

13.15.3 Changing the test order

The ‘export module’ exports all the selected tests, starting from the first test at the top and ending with the last test at the bottom of the list. This order is not mandatory and can be changed. To change this order, select the test you want to move and press the ‘arrow up’  or ‘arrow down’  button to move the test up or down in the list.

13.15.4 Export options

There are some options that can be selected when exporting the test information:

Insert header above data	With ‘insert header above data’ you can insert headers above every exported column. (For example for the signal generator level, forward power and reflected power for immunity test.)
Export EUT data	’Export EUT data’ allows you to select the EUT data that is to be exported. Only the EUT information stored in the top test can be exported.
Include not measured columns	’Include not measured columns’ allows you to select the ‘not measured’ columns that are to be exported. If you want to run a macro after exporting, it may be easier to export all the columns. You can then use the same macro for a signal level, forward power level and net power level test. It is not possible to have RadiMation® run the macro automatically after the export. Deselecting ‘exporting not measured columns’ will result in faster exporting of the information.

13.15.5 Performing the export

Once the **Export** button is pressed, all the raw data of the selected tests will be exported to the selected Excel file.
The exported data, its format and the amount of data that is exported, depends on the selected tests. When the data has been exported, the **Excel Export** window will close.

Warning: Microsoft Excel needs to be installed on the PC to export the EUT information. This should be version 'Microsoft Excel 97' or newer.

13.16 Command Line Interface (CLI)

Since RadiMation® version 2020.1.1 it is possible to automatically generate a report from the command line. This can be accomplished by calling RADICLI.EXE, which is available in the same directory in which RadiMation is also installed.

```
"C:\Program Files (x86)\Raditeq\RadiMation\Version x.y.z\radicli.exe"
```

To generate a report from the command line, pass at least the verb "generatereport", eut filename, template filename and the report filename.

Warning: For now the verb "generatereport" is optional to use, but the command line interface will be extended in the future with more verbs and then the verb "generatereport" will be mandatory.

For example, after starting a command prompt go to the path:

```
CD "C:\Program Files (x86)\Raditeq\RadiMation\Version x.y.z\"
```

Then to generate a report, use the following command as an example:

```
RADICLI.EXE generatereport --eut "C:\EUT_Files\eutfile.eut" --template
"C:\templates\template.txt" --report "C:\reports\report.txt"
```

The possible arguments are:

Argument	Description
generatereport	Required verb that specifies that a report should be generated from the command line interface.
--eut <eutfilename>	Required argument that specifies the EUT filename that should be used to generate the report.
--template <templatefilename>	Required argument that specifies the template filename to use.
--report <reportfilename>	Required argument that specifies the report filename to use.
--reportforeachtest	Optional argument that specifies that a report is generated for each test individually. This will result in multiple reports being generated. A report generator code can be specified in the <reportfilename> to have a dynamic report filename. See the example below this table.
--testnumbers <t1[;t2][;t3][...]>	Optional argument that specifies a ';' separated list of one or more testnumbers (t1, t2, t3, ...) for the tests (and their order) that should be included in the generated report.
--removeillegalcodes	Optional argument that specifies that report generator codes that are not replaced to an actual value will be removed from the generated report.
--help	Shows all the possible command line arguments that can be used.

Example that generates a report for each test:

```
RADICLI.EXE generatereport --eut eutfile.eut --template template.txt --re-
port report||testnumber||.txt --reportforeachtest
```

Example that only includes the tests with the testnumber 3, 2 and 4 in the report:

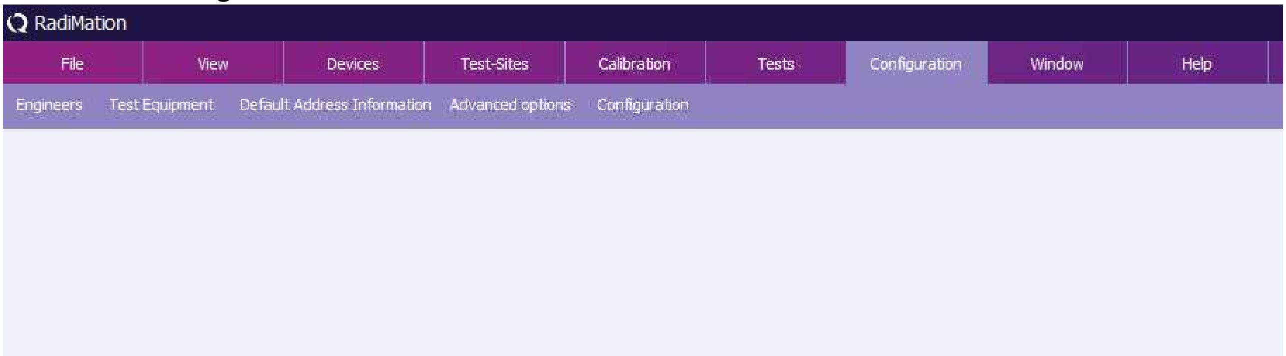
```
RADICLI.EXE generatereport --eut eutfile.eut --template template.txt --re-
port report.txt --testnumbers "3;2;4"
```

RadiMation® EMC software
------- Configuration -------

Table of contents:

Configuration
The global configuration of RadiMation® is available in the menu

- **Configuration**



The configured global RadiMation® configuration will be used as the configuration for future use. This configuration is independent of the actual Windows User Account that is logged on to the Microsoft Windows PC. The configured global RadiMation® configuration is shared and accessible for all Windows User Accounts that have access to the PC.
The following paragraphs will explain all the possible configurations.

Warning: To prevent unauthorised individuals from changing the global RadiMation® configurations, a password protection can be used for specific engineers. The password is activated by default for the "**Administrator**" engineer with the password "**Radimation**". This password protection can be switched off, changed and configured in the menu

- **Configuration**
  - **Engineers**
    - **Edit**

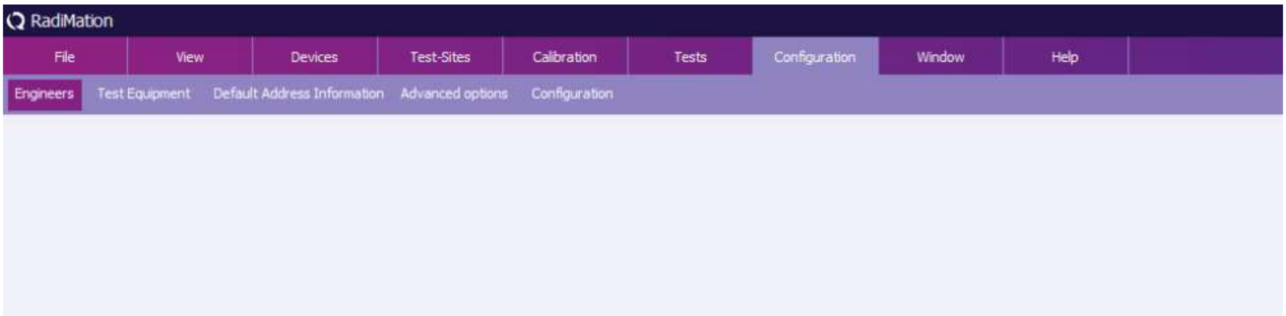
14.1 Engineers

An unlimited number of Engineers can be added, each with an unique name. For each engineer different permissions can be assigned which give them the right to modify specific parts of the RadiMation® configuration.
There is no relation between the Engineer in RadiMation® and the Windows Logon account. Also the password that can be configured for the engineer in RadiMation® is not linked and also not synchronized with the Windows User account password.
For each test, the name and password settings of the test engineer performing the current test can be selected. Also during the startup of RadiMation® the actual Engineer that is going to start tests can be selected. Switching between the active engineers while RadiMation® is running can be done through the menu:

- **File**
  - **Change Engineer**

To add, delete or edit the names and permissions of the test engineers, go to the **Engineers window**, which can be accessed in the menu:

- **Configuration**
  - **Engineers**



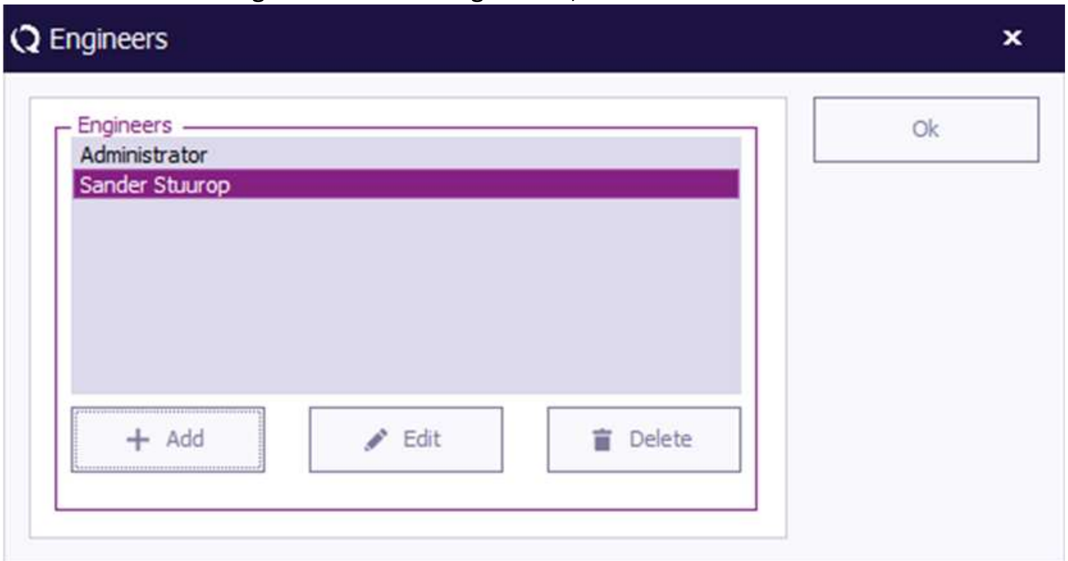
The Engineers window will open and show the current configured list of engineers.

14.1.1 Test engineer settings

To leave the 'Engineers' window, click **OK**.

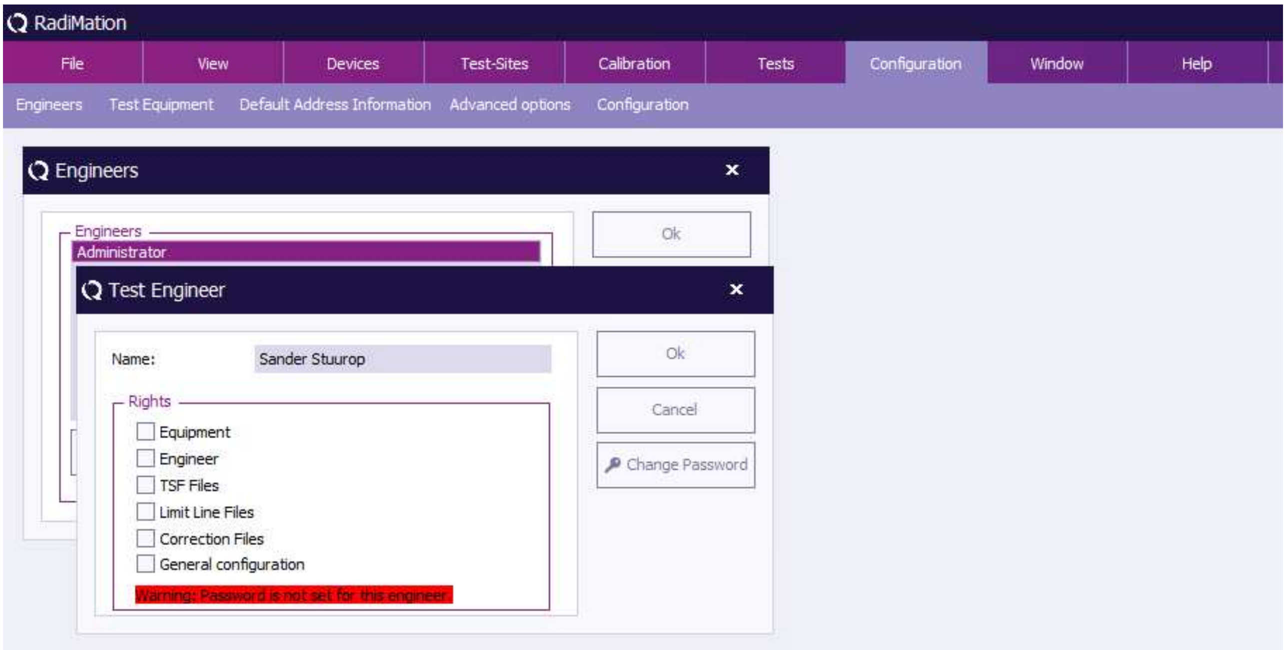
14.1.1.1 Adding an engineer

To add a new test engineer to the configuration, click **Add**.



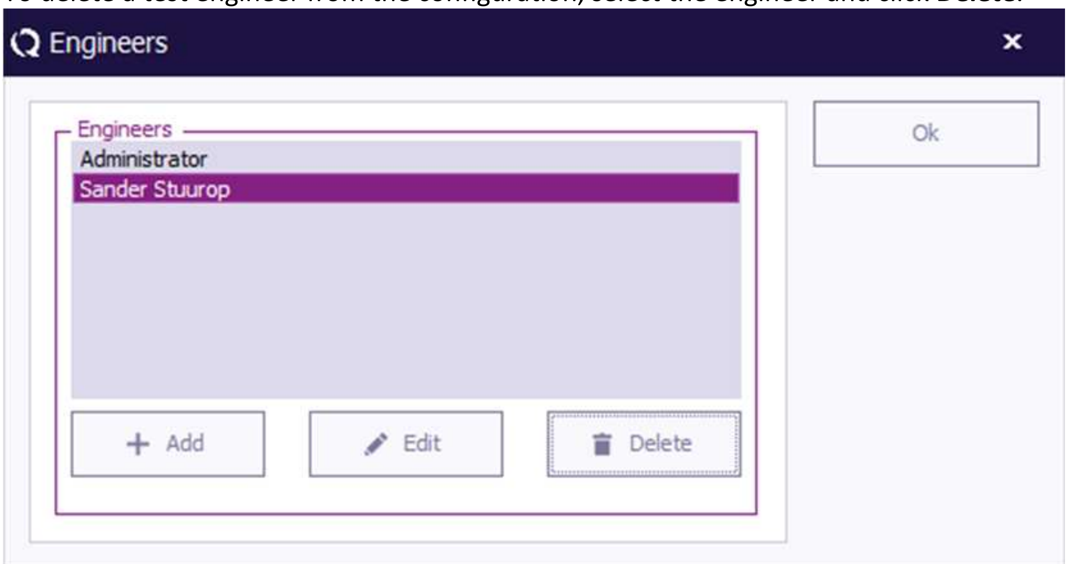
Enter the name and set the rights of the new engineer, then click **OK**. You will be returned to the 'Engineers' window.

The new engineer will not have a protection password (yet), this can be enabled by clicking **Change Password**. Please read the paragraph 'Password protection' (located further down) for more information.

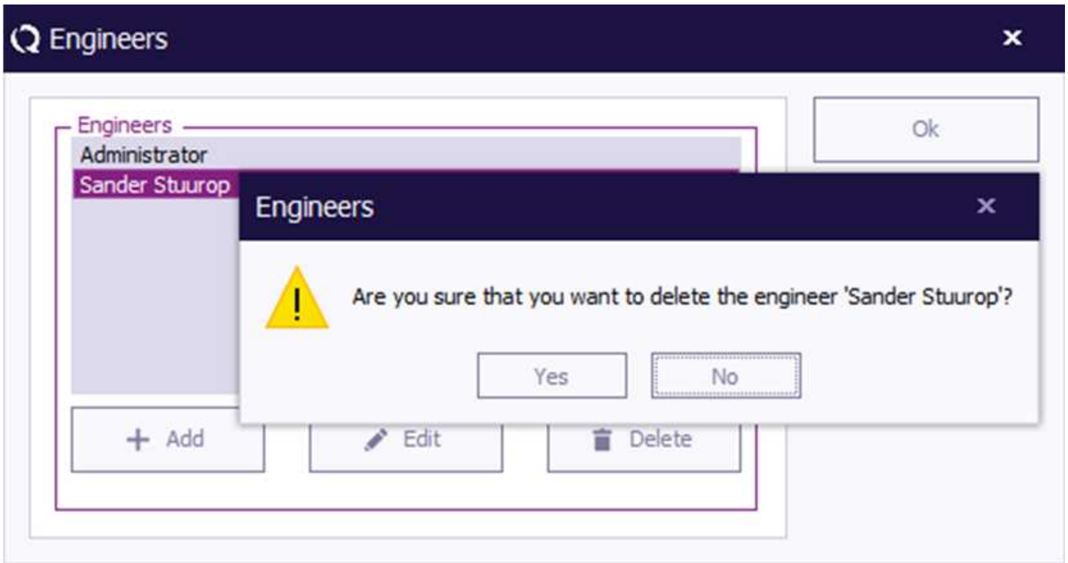


14.1.1.2 Deleting an engineer

To delete a test engineer from the configuration, select the engineer and click **Delete**.

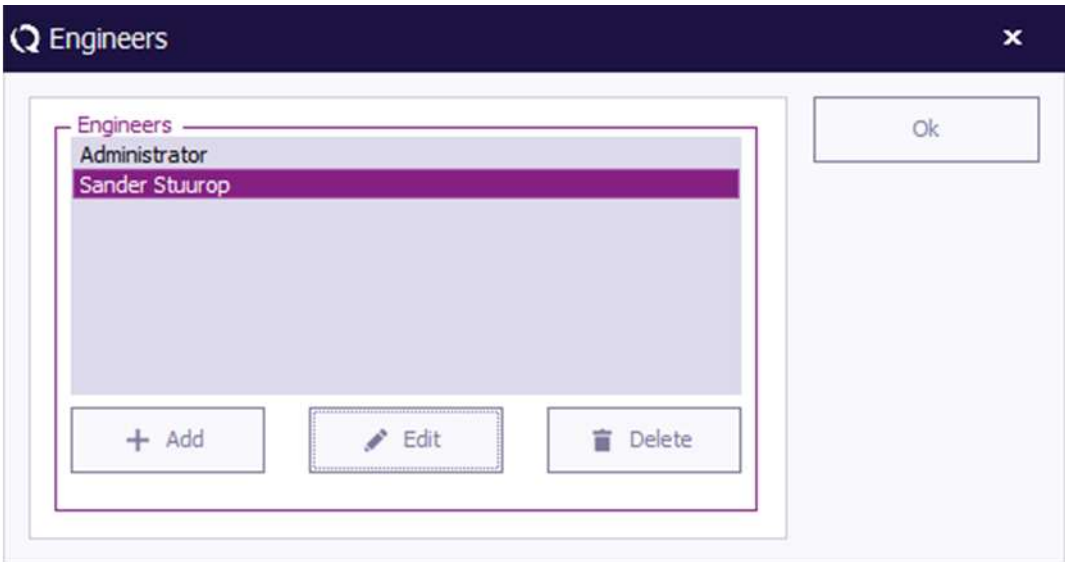


To confirm that you want to delete the engineer from the configuration list, click **Yes**.
If you do not want to delete this engineer from the list, click **No** or **Cancel**. You will be returned to the 'Engineers' window.

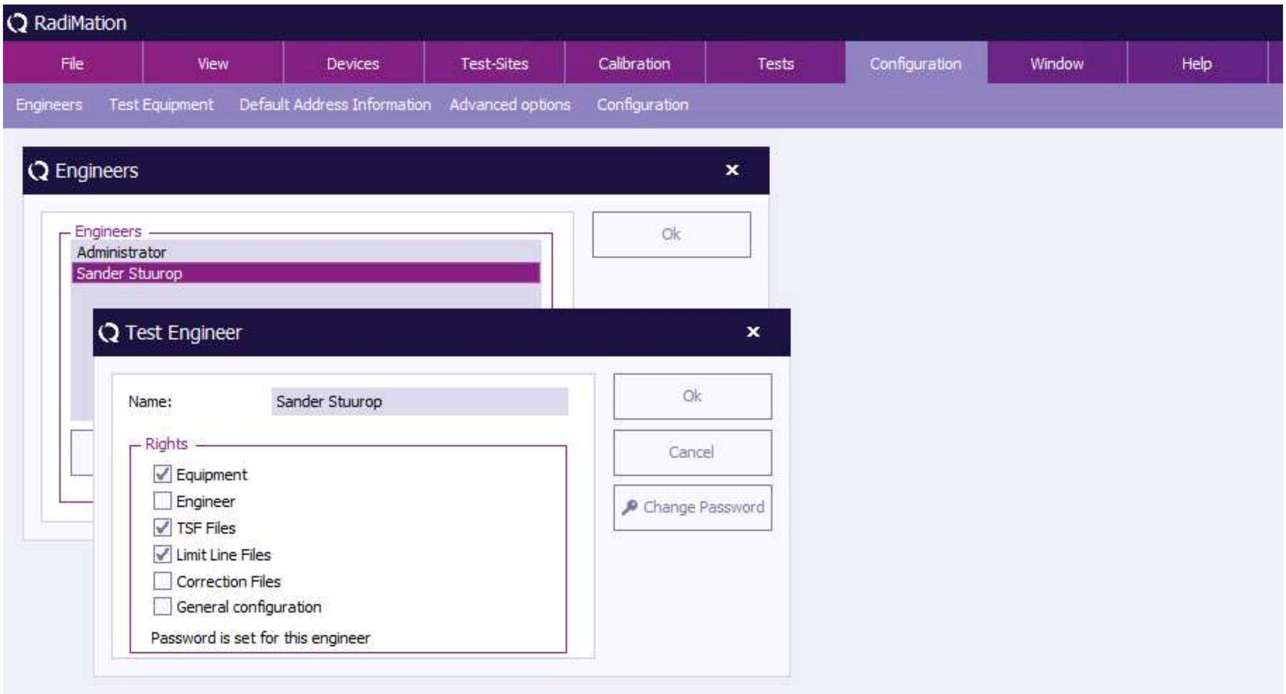


14.1.1.3 Editing engineer settings

To edit the name, rights and/or password of an engineer in the configuration, select the engineer and click **Edit**.



Make the desired changes in the 'Test Engineer' window and click **OK**.
If you want to undo or cancel your changes, click **Cancel**. You will be returned to the 'Engineers' window.

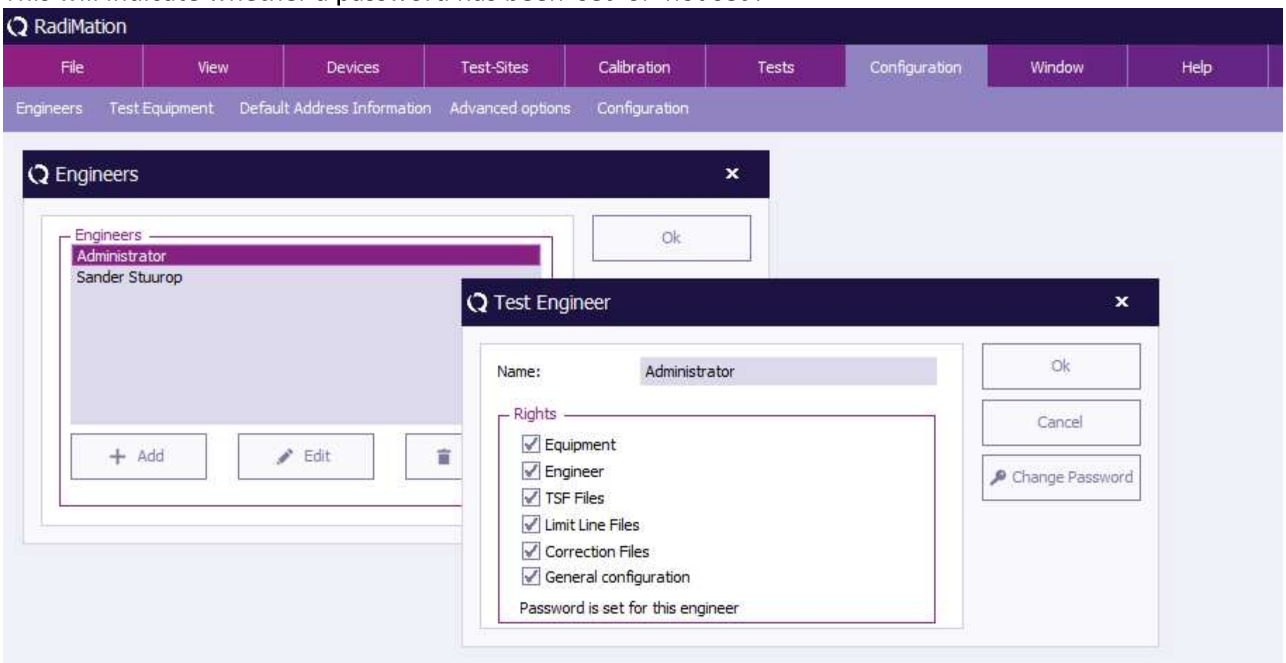


14.1.2 Password protection

RadiMation® allows you to protect a number of configurations with a password. This password can be enabled, disabled or changed in the '**Test Engineer' window**.

- The password is standard turned on for the default used test engineer 'Administrator'.
- The default password is **Radimation**.

The current password setting for the selected engineer is displayed at the bottom of this window. This will indicate whether a password has been 'set' or 'not set'.



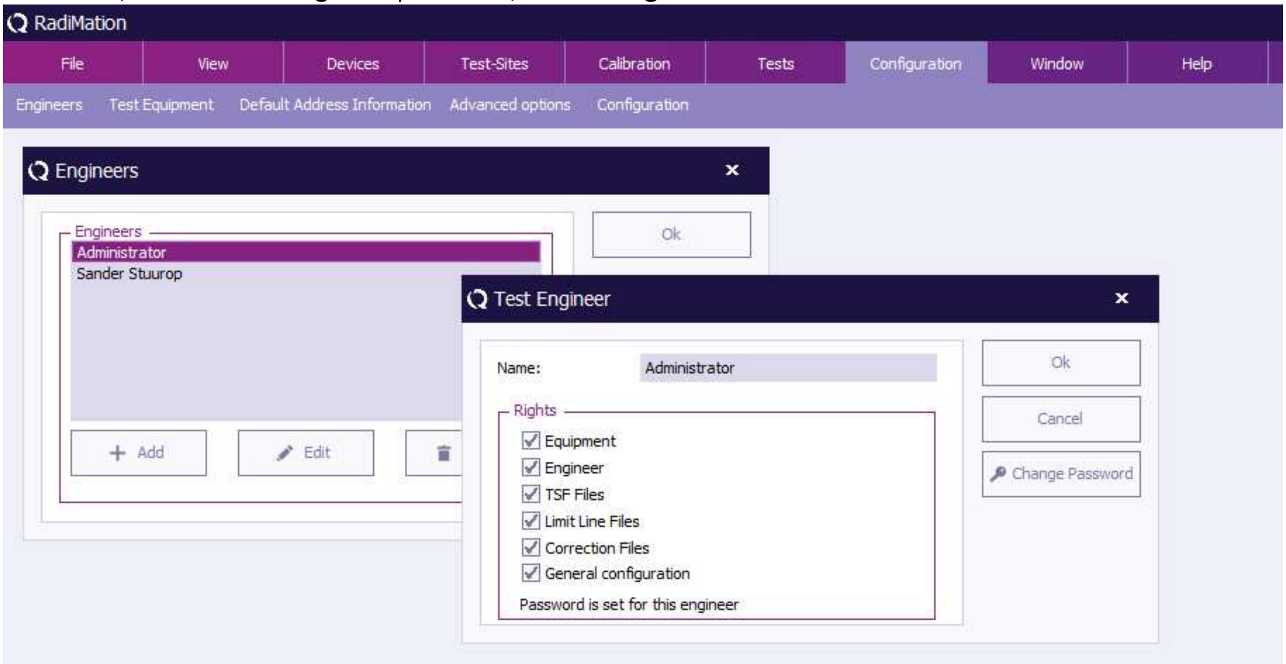
14.1.2.1 Rights

The password protection can be enabled or disabled for the following items.

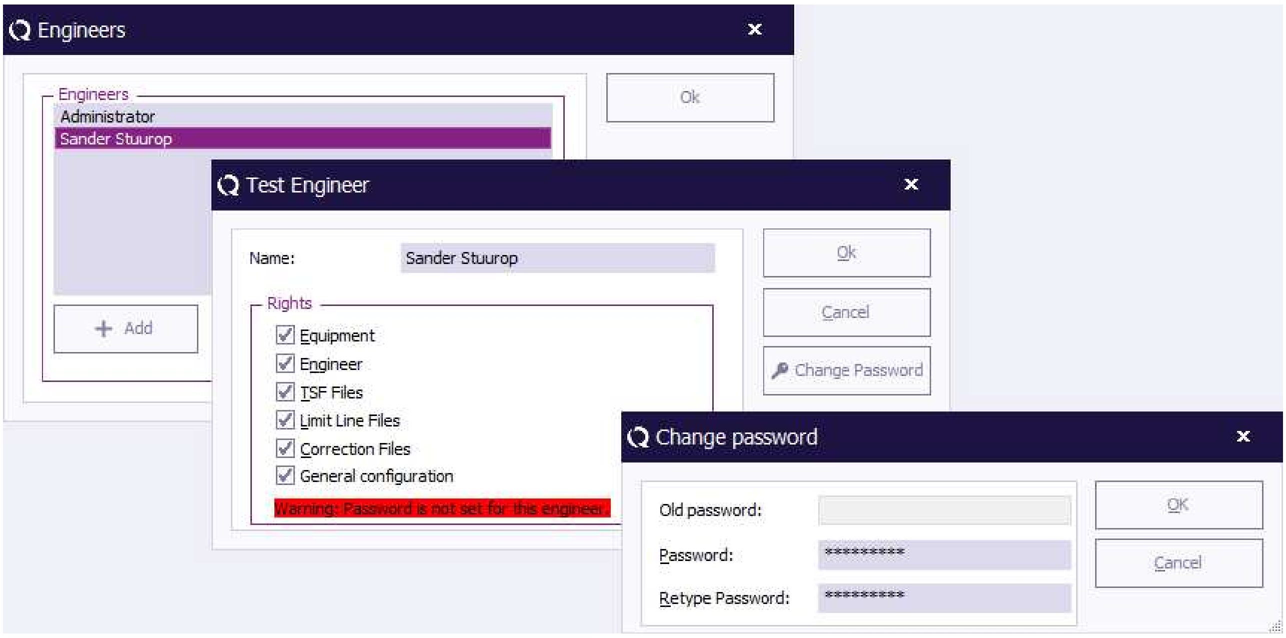
- **Equipment** Prevents unauthorized changes to test equipment configuration.
- **Engineer** Prevents unauthorized changes to test engineers configuration.
- **TSF Files** Prevents unauthorized changes to Test Setup Files (TSF) files.
- **Limit Line** Prevents unauthorized changes to Limit Line Files (LLF) files.
- **Correction File** Prevents unauthorized changes to correction files.
- **General Configuration** Prevents unauthorized changes to the general configuration.

14.1.2.2 Change password

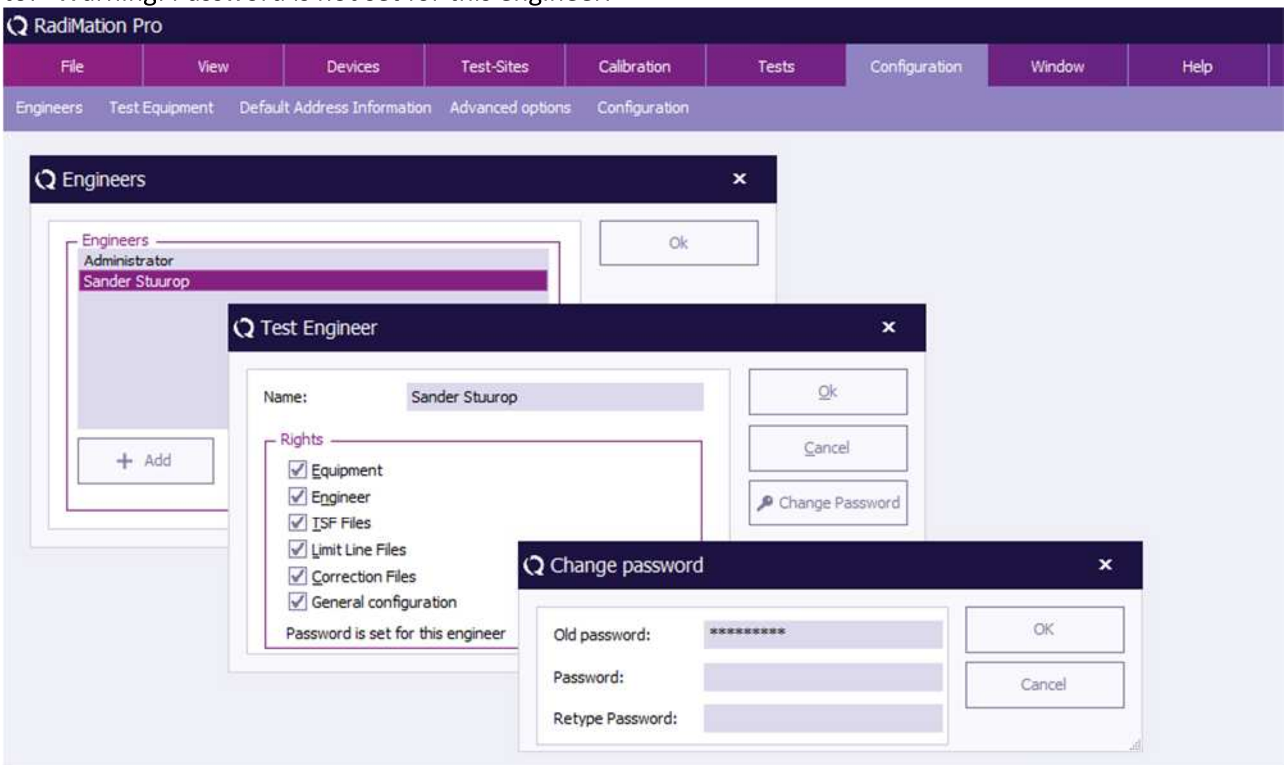
To enable, disable or change the password, click **Change Password**.



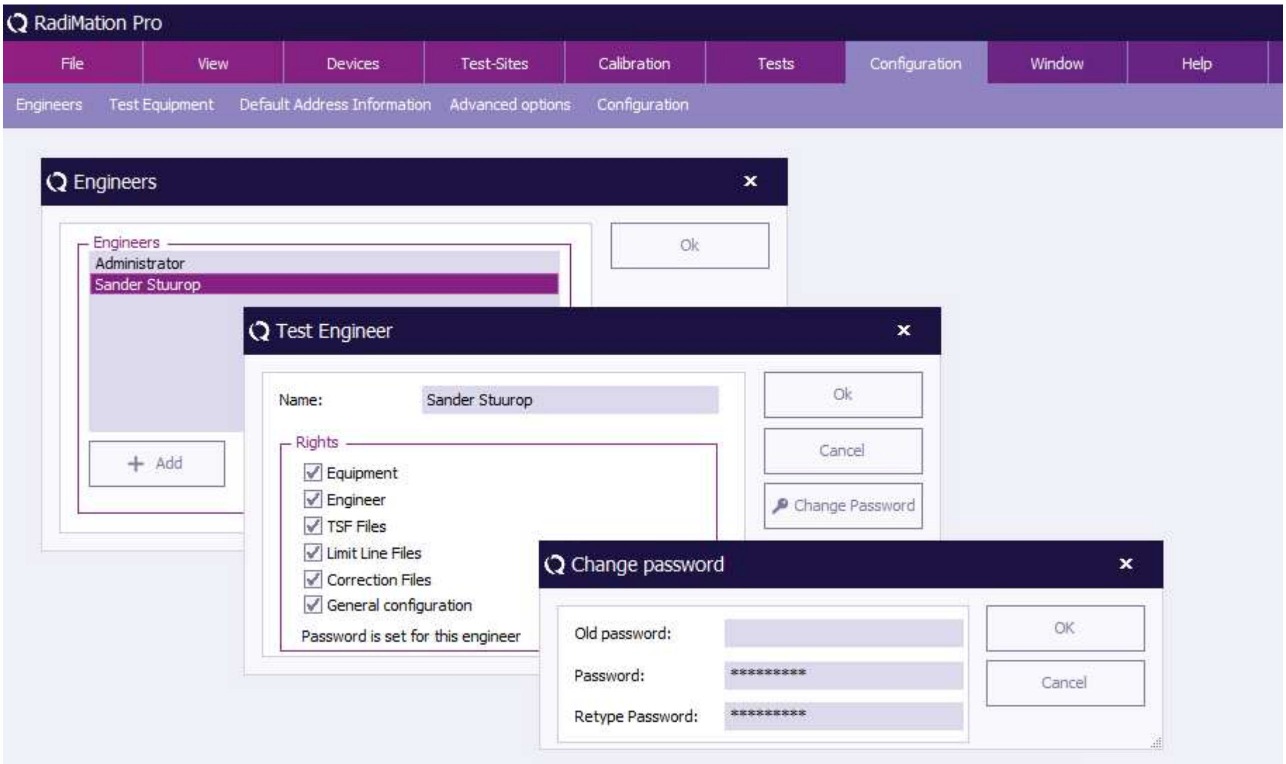
To change the password, enter the old password and the new password (twice), then click **OK**. You will be returned to the 'Test Engineer' window.



To disable the password, enter the old password and leave the two new password fields empty, then click **OK**. You will be returned to the 'Test Engineer' window, and the password indication will change to: “Warning: Password is not set for this engineer.”



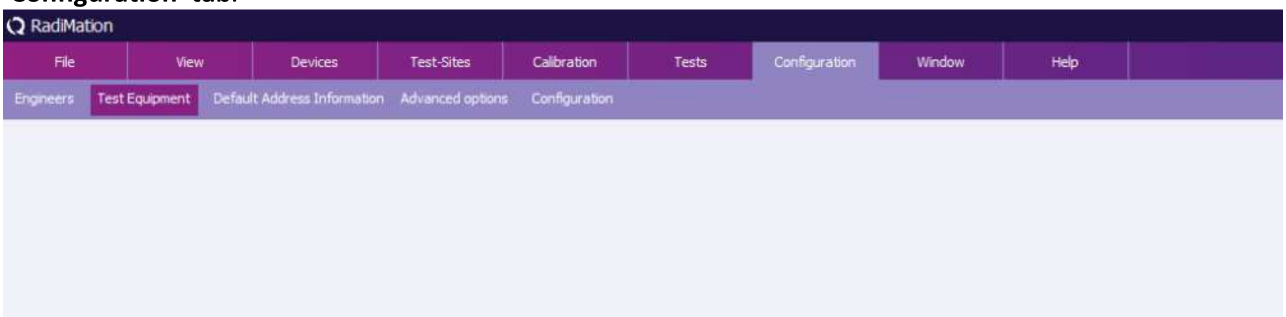
To enable the password, enter the new password (twice), then click **OK**. You will be returned to the 'Test Engineer' window, and the password indication will change to: “Password is set for this engineer.”



To leave the 'Engineers' window, click **OK**.

14.2 Test Equipment

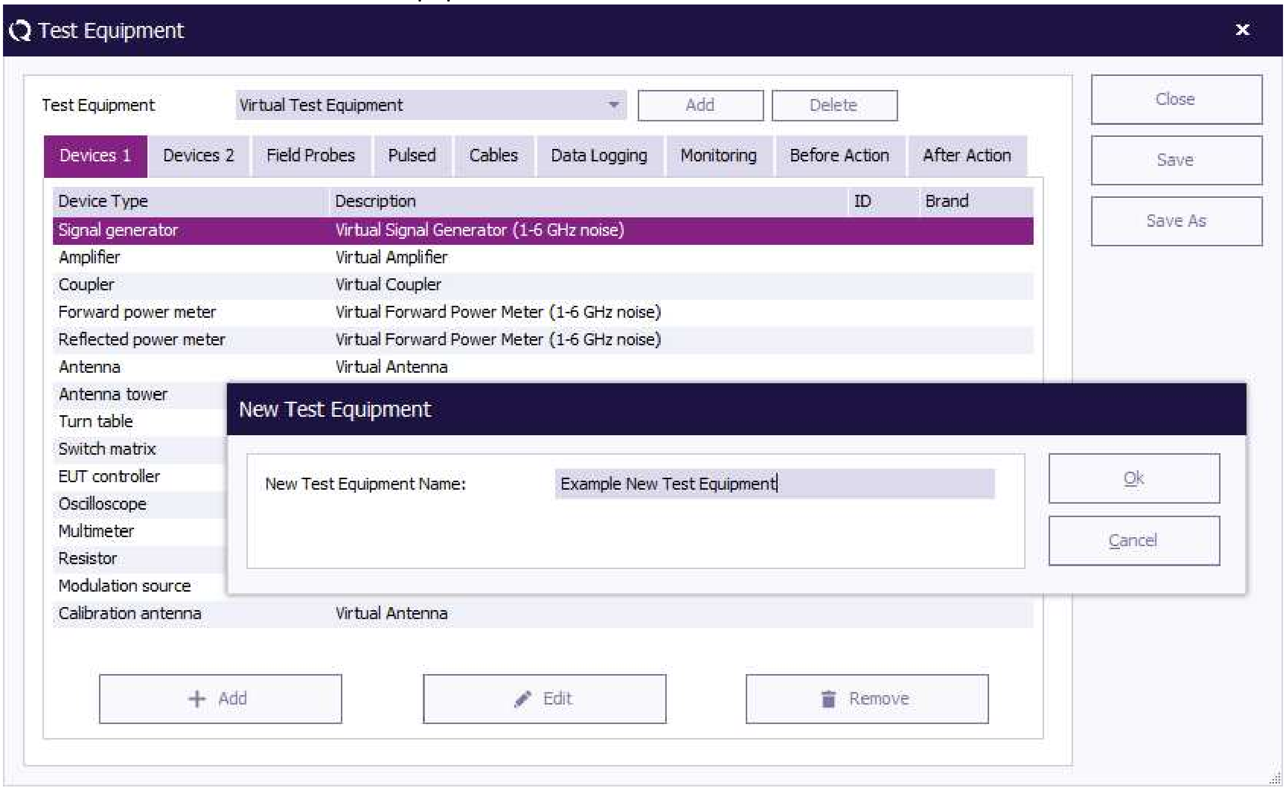
The test equipment configuration contains a list of all the test equipment used during a test. The software uses this list to determine which device drivers should be used to control the test equipment. RadiMation® allows you to configure specific test equipment lists for each type of test as well as different test equipment lists for the same type of tests. (This can be useful if you have, for example, more than one signal generator to perform conducted immunity tests with).
In the **'Test Equipment' window** a set of test equipment will be selected. When a calibration file is generated, RadiMation® will record this test equipment configuration together with the calibration data. When a substitution test is started, the test equipment selected for the substitution test will be compared with the test equipment used (as recorded) during the calibration test. If the equipment does not match, an error message will be displayed.
The error message window will ask you to abort the test or to ignore the error message and continue the test with different test equipment. To achieve maximum accuracy, the same test equipment should be used (whenever possible) during both the calibration and the substitution tests.
To add, modify or delete test equipment lists, go to the **'Test Equipment' window** in the **'Configuration' tab**.



The 'Test Equipment' window will open and show the current configured list of test equipment. To leave the 'Test Equipment' window, click **'Close'** .

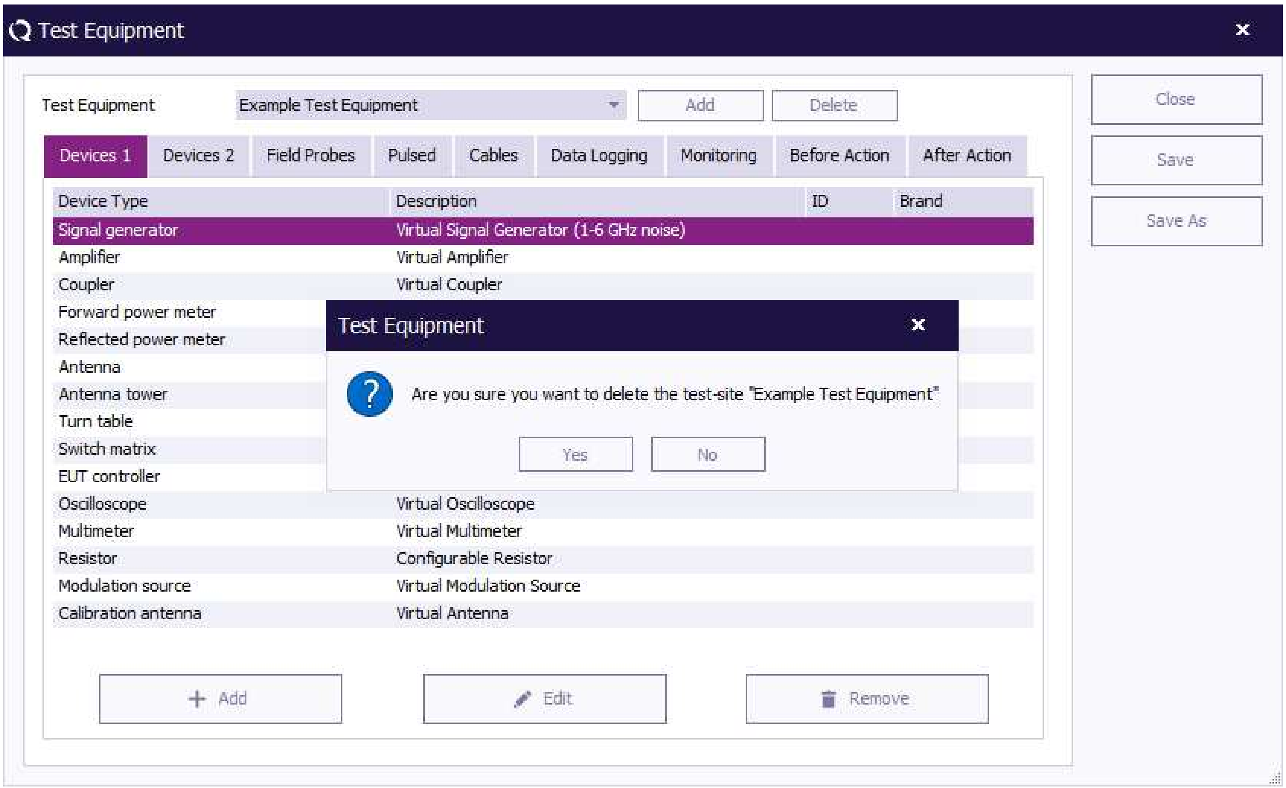
14.2.1 Adding test equipment

To add a (set of) test equipment to the configuration, click the **'Add'** button in the top of the window. The 'New Test Equipment' window will appear.
Enter a name for the new test equipment in the **'New Test Equipment'** window (e.g. Example Test Equipment).
Click **'OK'** to confirm the name of the new test equipment, or click **'Cancel'** to cancel the new name.
You will be returned to the 'Test Equipment' window.



14.2.2 Deleting test equipment

To delete a (set of) test equipment from the configuration, select the **Test Equipment** from the pull down menu and click the **'Delete' button** in the top of the window. A confirmation window will appear.
Click **'Yes'** to remove the device from the list, click **'Cancel'** to cancel. You will be returned to the 'Test Equipment' window.



14.2.3 Editing test equipment

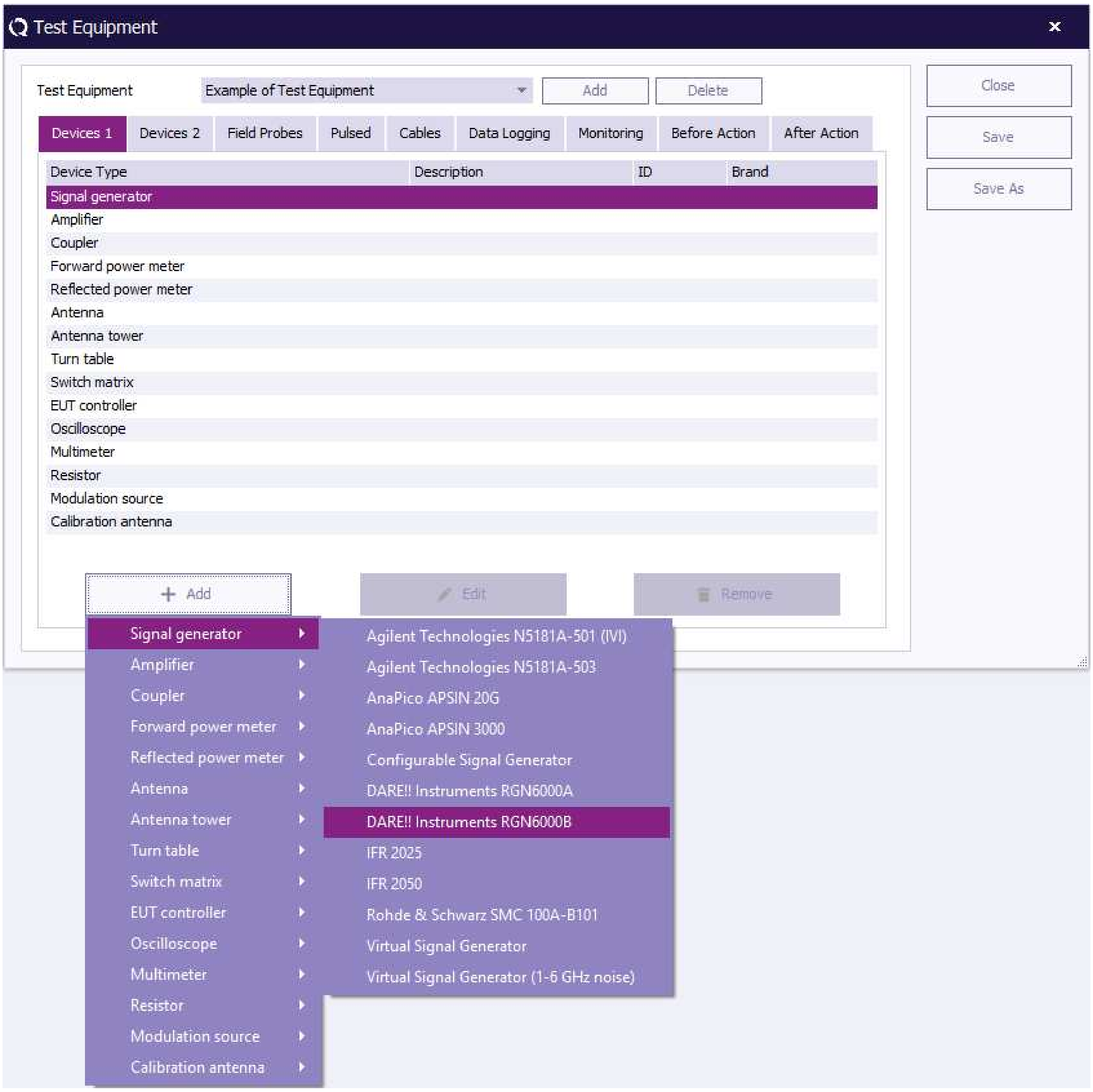
To configure the equipment of a test, select the desired **Test Equipment** from the pull down menu (e.g. Example Test Equipment).
Specify the equipment for the test by adding, editing and/or removing devices under the designated tabs. (This is described further below.)

14.2.4 Devices 1 & 2

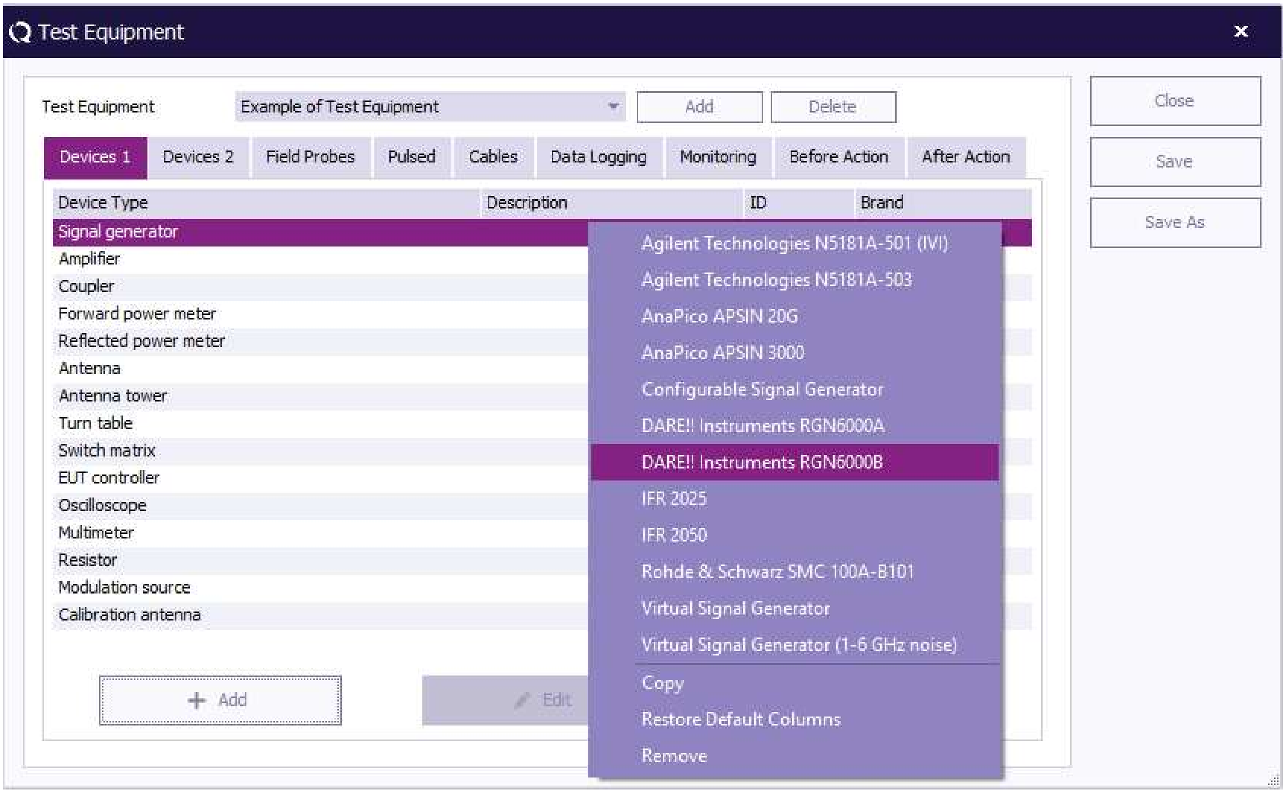
Under the tabs 'Devices 1' and 'Devices 2' the devices of the (selected) test equipment set can be added, edited and/or removed.

14.2.4.1 Adding devices

To add a device, click **'Add'** (at the bottom left of the window), a menu will open below the button to show the available devices for each Device Type.
Select and click on the desired device. The device will then appear in the equipment overview.

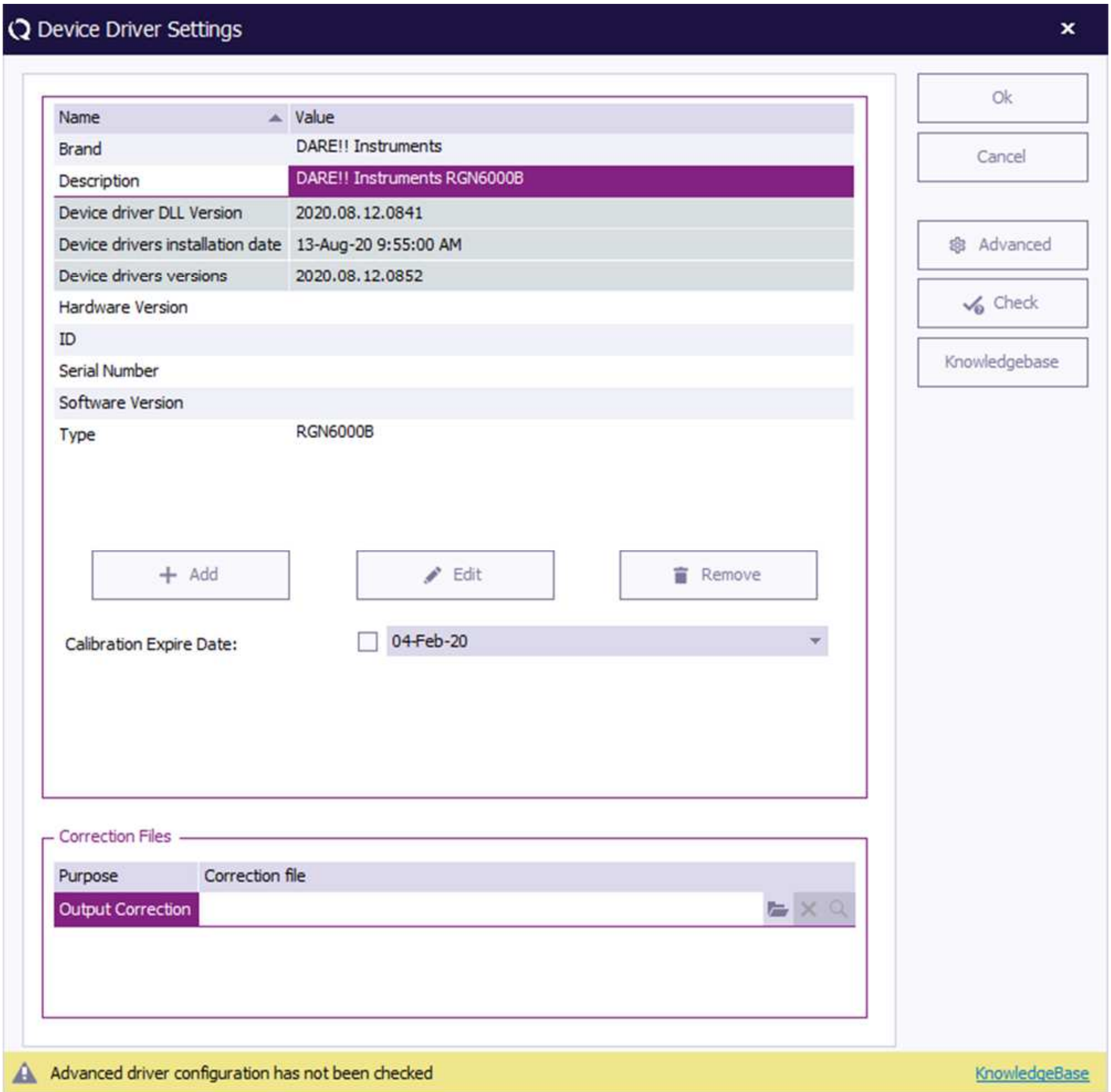


Another way to add a device is to click the desired **Device Type** in the 'Test Equipment' overview.
A menu will open (at your mouse point) with the available devices for that Device Type.
Select and click on the desired device. The device will then appear in the equipment overview.



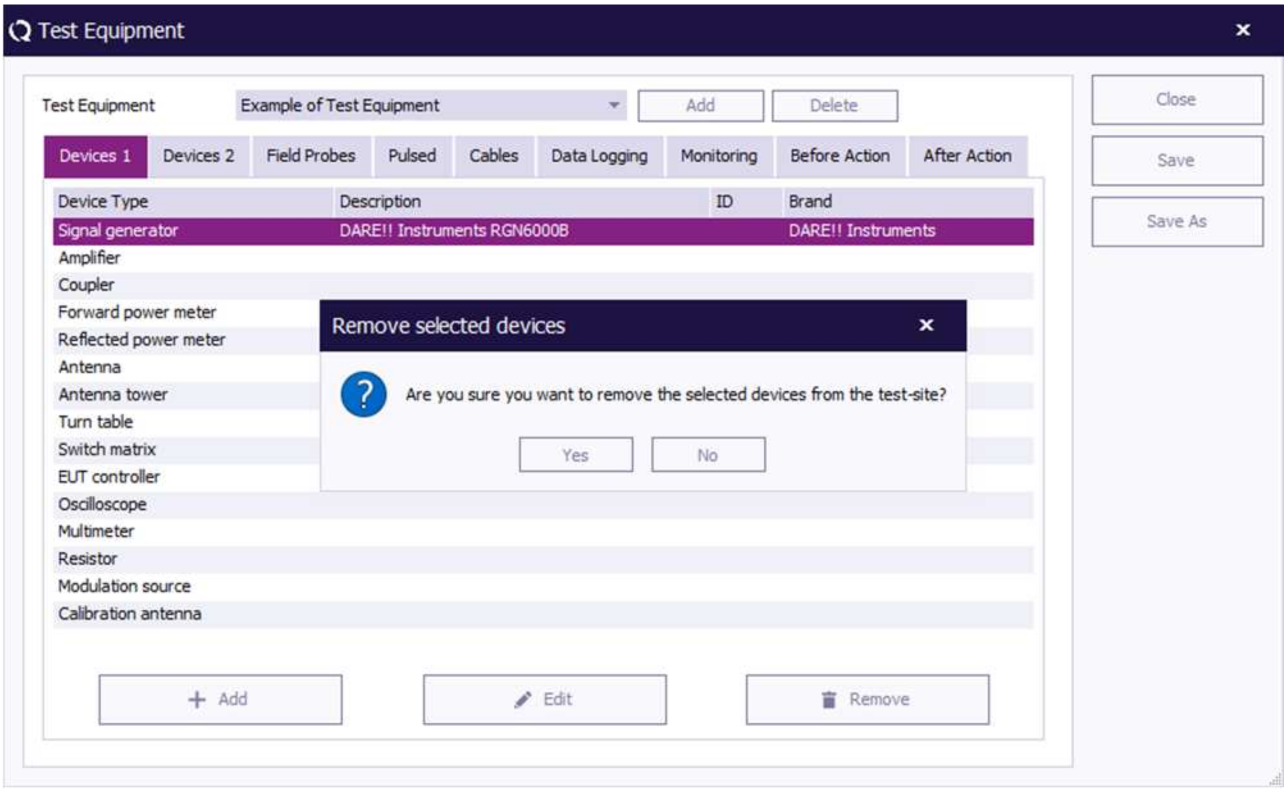
14.2.4.2 Editing devices

To edit a device, select the device and click **'Edit'** . The Device Driver Settings window will appear. Edit the settings as desired. To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the 'Test Equipment' window.



14.2.4.3 Removing devices

To remove a device, select the device and click **'Remove'** . A confirmation window will appear. Click 'Yes' to remove the device from the list, click **'Cancel'** to cancel. You will be returned to the 'Test Equipment' window.

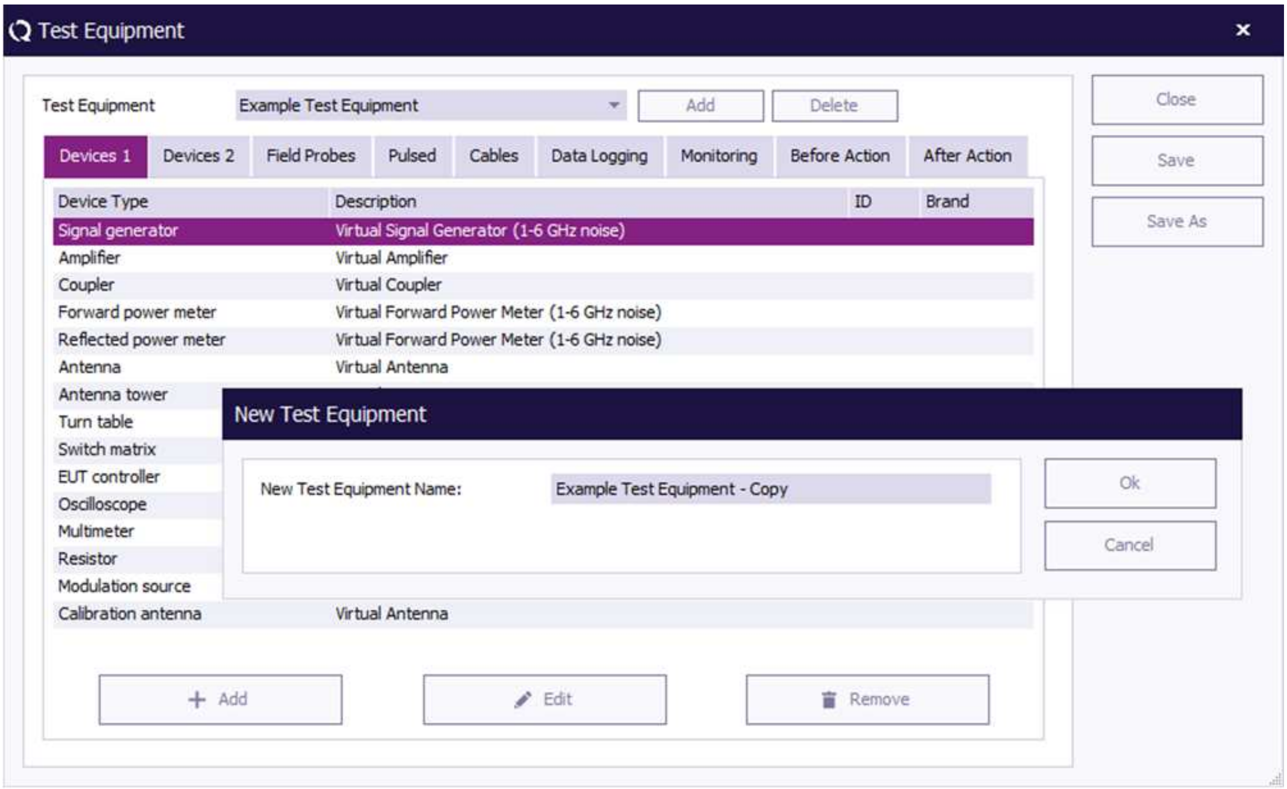


14.2.5 Saving test equipment

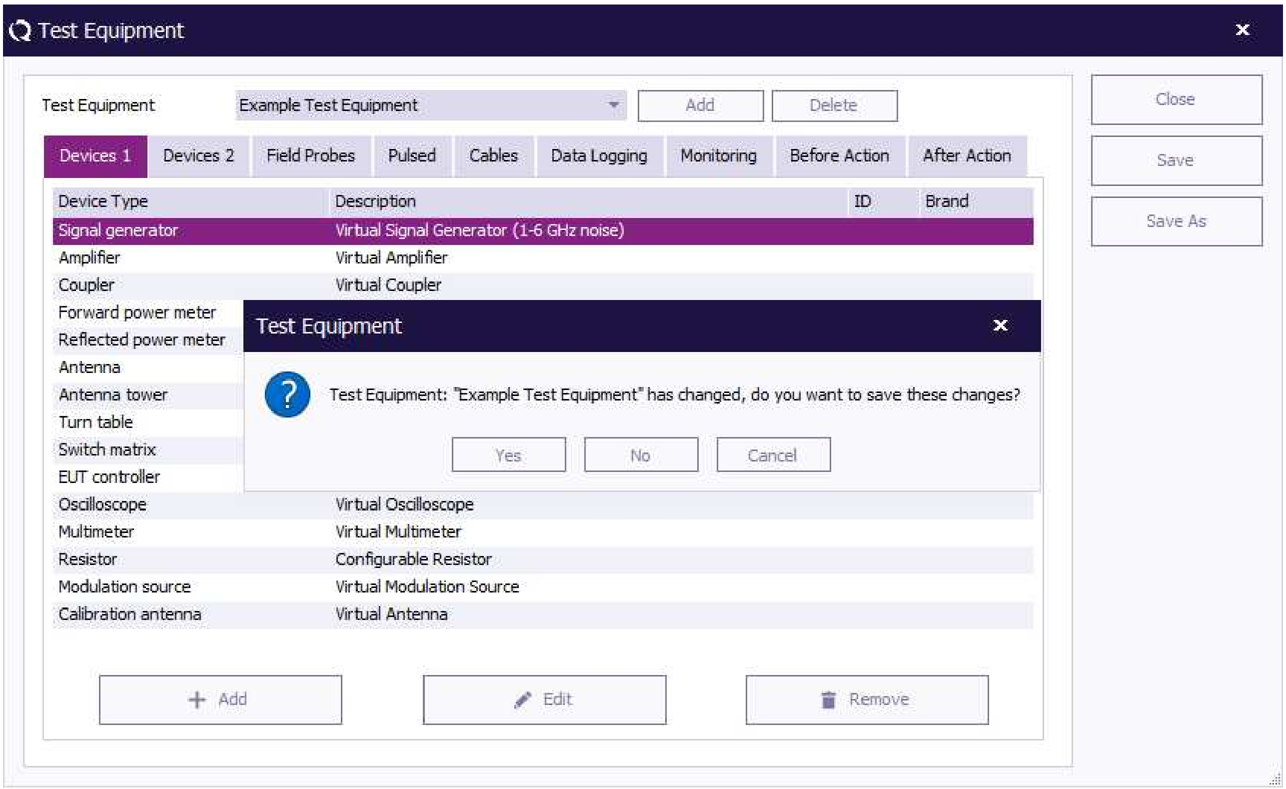
To save the changes made in the test equipment list, click **'Save'** (you will remain in the 'Test Equipment' window).

14.2.5.1 Save As

To save the test equipment list under a new name, click **'Save As'** .
Enter a new name for the test equipment in the **'New Test Equipment' window** (e.g. Example Test Equipment 2).
Click **'OK'** to confirm the name of the new test equipment, or click **'Cancel'** to cancel the new name.
You will be returned to the 'Test Equipment' window.



To close the 'Test Equipment' window, click **'Close'** .
If you have not saved the changes to the test equipment list, a dedicated window will appear asking you to save these changes.
To save the changes, click **'Yes'** , to not save the changes, click **'No'** . The 'Test Equipment' window will close.



14.3 Before Actions & After Actions

The before and after actions of a testsite are designed to be triggered when the testsite is activated (before actions) or deactivated (after actions). These before and after actions can be seen as like switching relays to desired positions when a testsite is activated, and switching the relays to a default position again when the testsite is deactivated.
When a testsite is used in two consecutive bands, the after and before actions are not executed, because there is no change in the activated testsite. When a test with 3 bands is configured, and the first and third band are using the same testsite, while another testsite is selected for the second band, then the after and before actions will be executed when the test is switching from band 1 to band 2, and again when the test is switching from band 2 to band 3.

14.3.1 Before Action

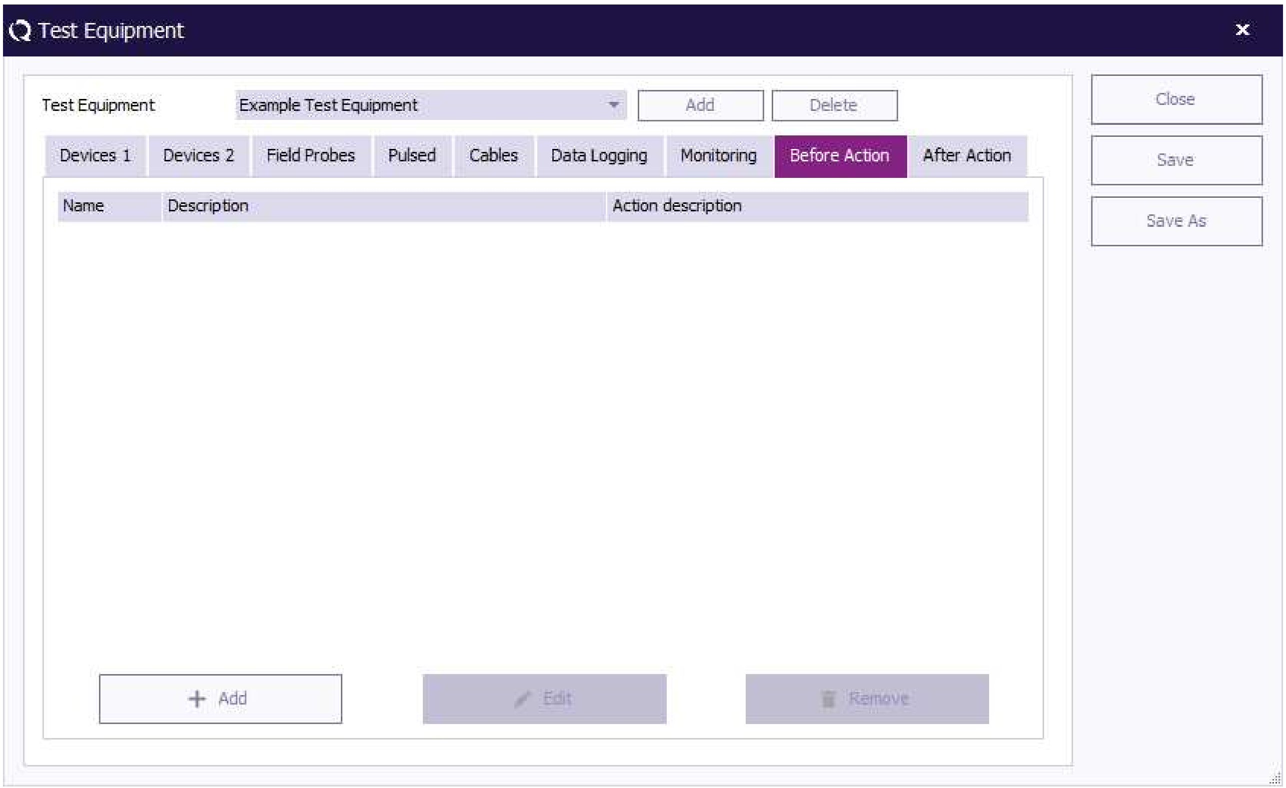
Under the tab 'Before Action' any and all actions that the end-user wants to have carried out before the equipment of the selected 'test equipment' is initialized can be specified.
'Before actions' can be used to:

- Turn on a manual controlled amplifier.
- Manually change antenna height or polarization.
- Connect cables or create a specific measurement setup.

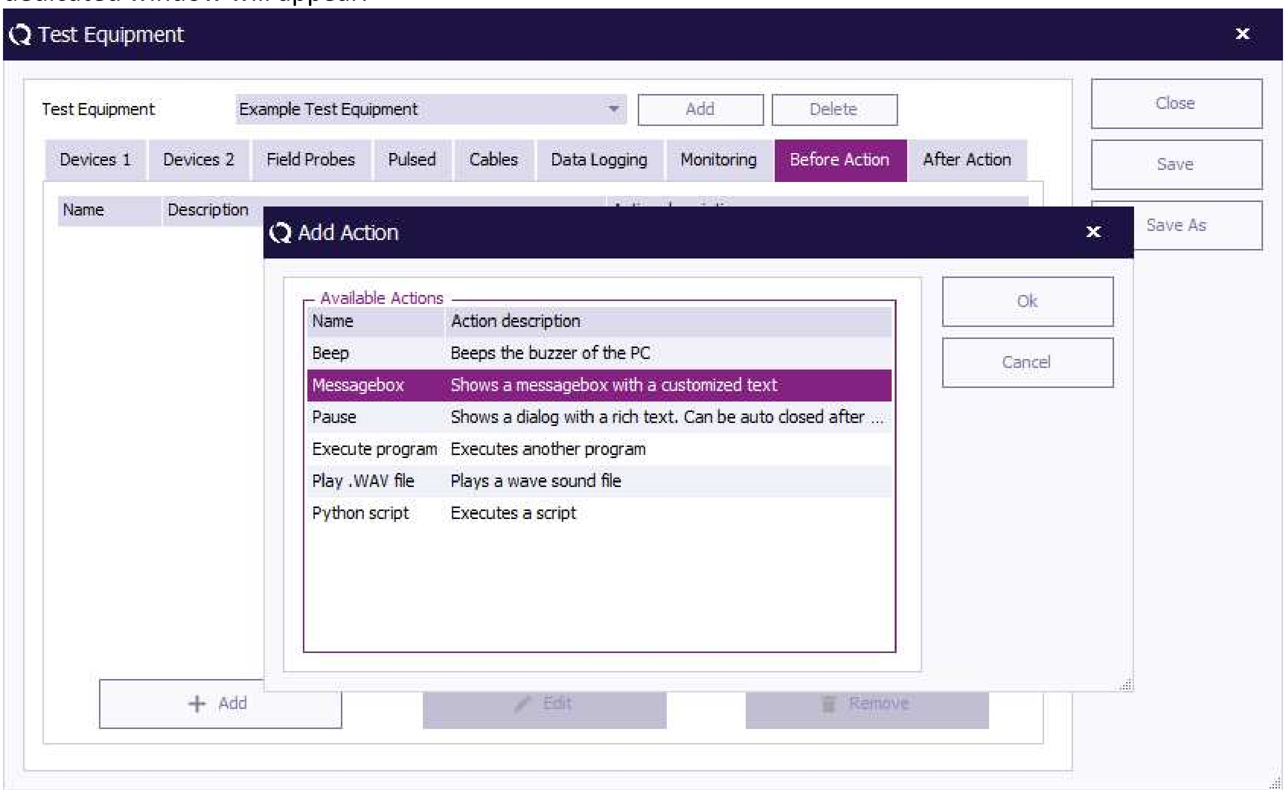
(It is also possible to specify actions that should be carried out after the equipment of the selected Test Equipment is disabled. This functionality is called 'After Action'.)
The easiest way to explain this function is with an example:

14.3.1.1 Example

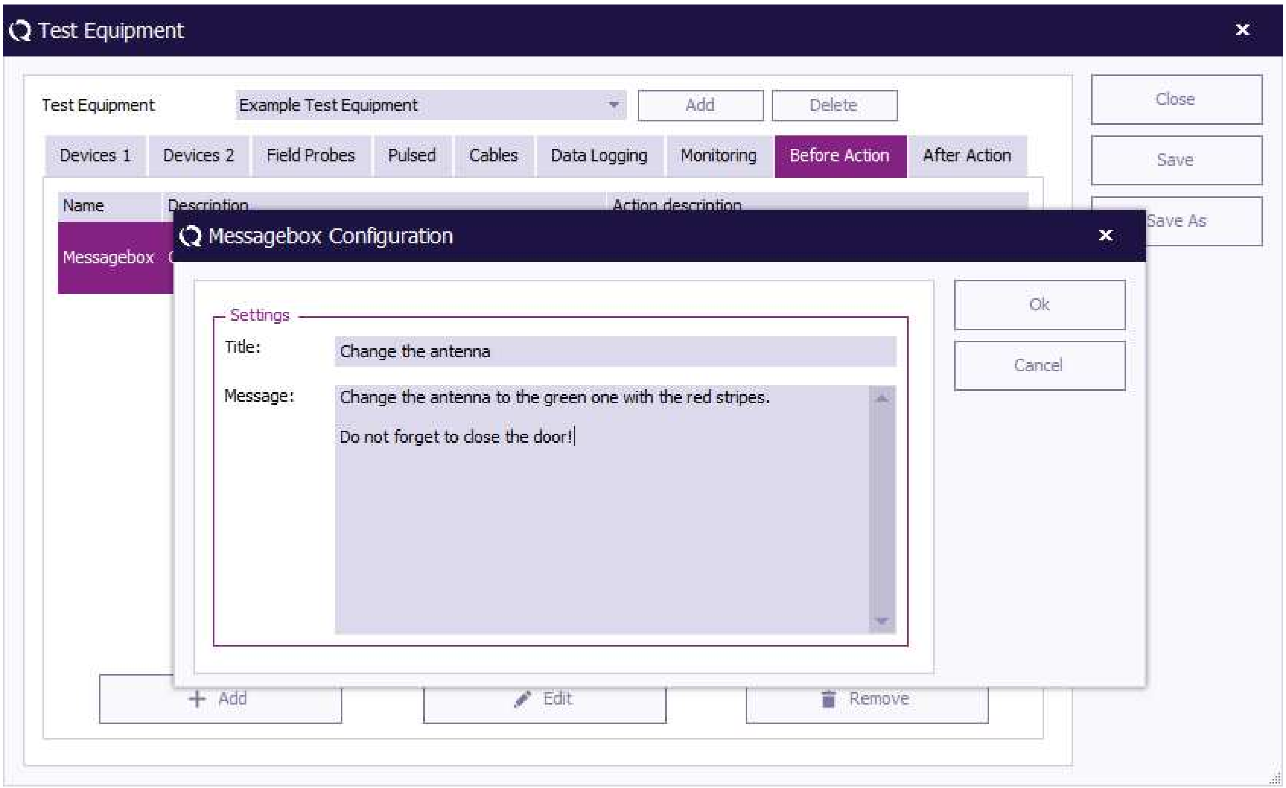
RadiMation® needs to be configured for people who do not perform EMC measurements every day. To make sure the engineers do not forget to use the right equipment and procedure, the manager has decided to incorporate a reminder in the test setup.
This is done by adding a message in the 'Before Action' configuration:
1. Open the 'Test Equipment' window, select the desired test equipment set and open the **'Before Action' tab**.
2. Press the **'Add'** button at the bottom left of the 'Before Action' tab to open the 'Add Action' window.



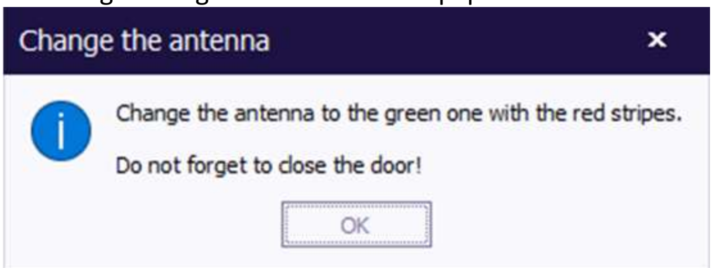
3. Select the **'Messagebox' option** and click **'OK'** (or double click on the 'Messagebox' option). A dedicated window will appear.



4. Configuring the desired text in the 'Messagebox Configuration' window and click **'OK'** . You will be returned to the 'Test Equipment' window.



The message has now been added to the configuration. As a result, RadiMation® will prompt the following message before the test equipment is initialized:



14.3.2 After Action

Under the tab 'After Action' any and all actions that the end-user wants to have carried out after the equipment of the selected 'test equipment' is disabled can be specified.
'After actions' can be used to:

- Manually turn off the amplifier.
- Play a Wav file (as an auditory signal) to alert the user that the measurement is done.

(It is also possible to specify actions that should be carried out before the equipment of the selected Test Equipment is initialized. This functionality is called 'Before Action'.)

14.4 Default address information

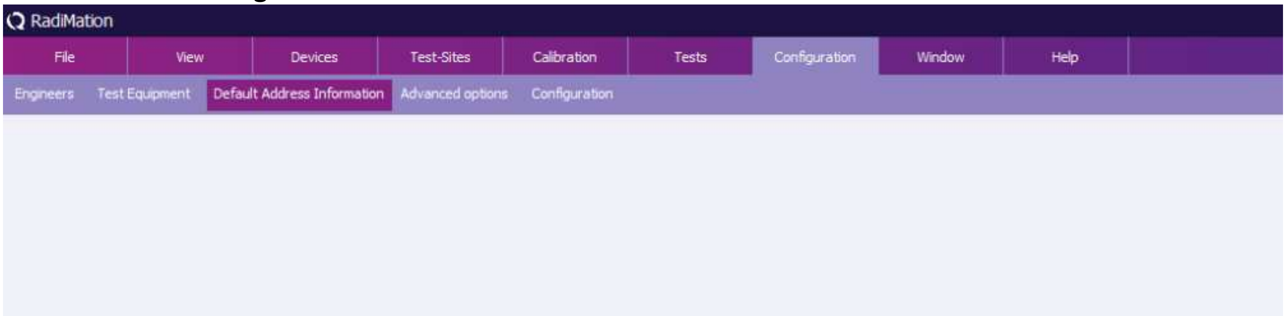
When you make a new EUT file the name and address information of the producer, test house and client can be entered separately.
In many situations one or more of this information will be the same for different EUT files (i.e.: when a test house owns the software, the test house data will always be the same).

To prevent users from having to enter repetitive data input, RadiMation® provides the option to set default address information for:

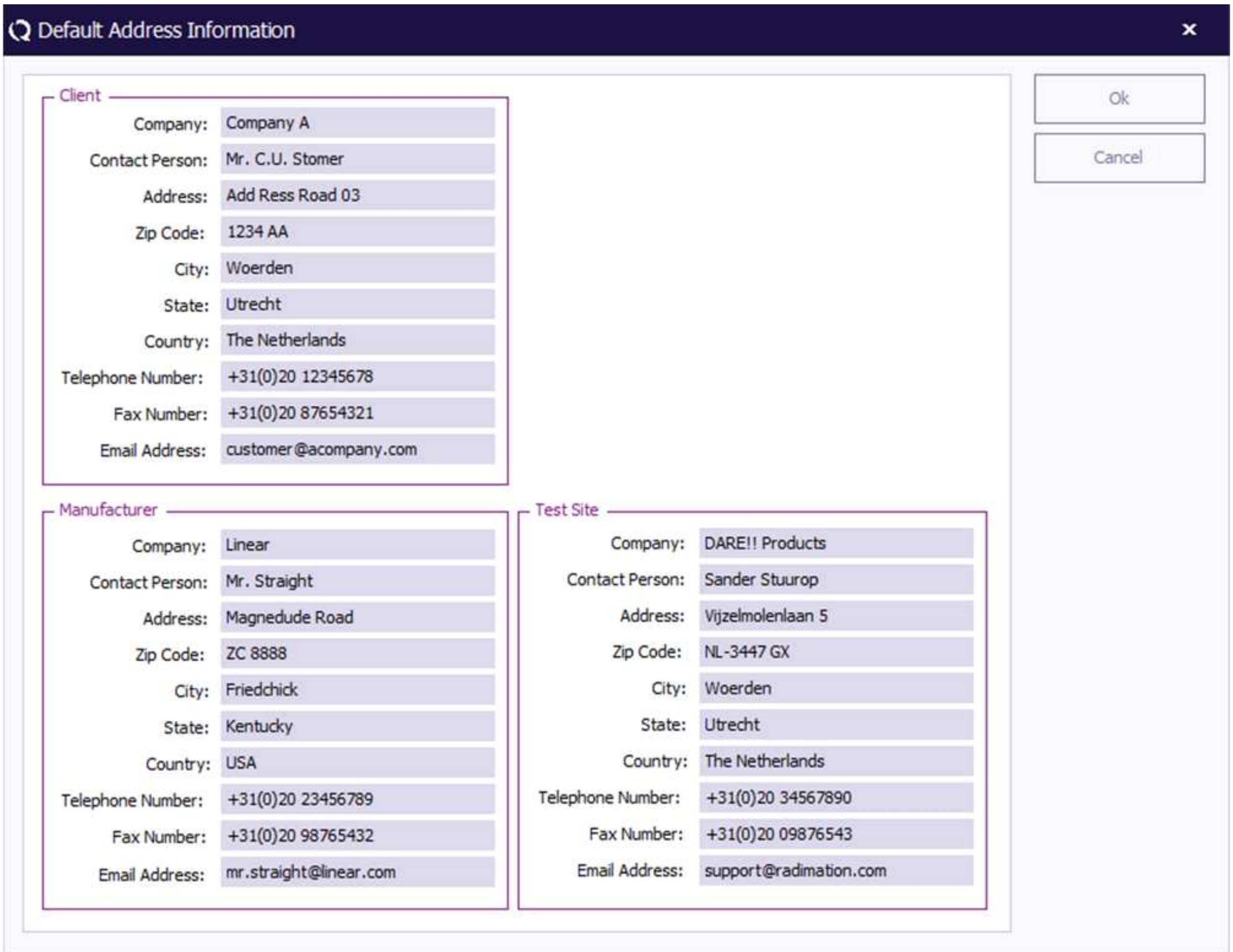
- The default client
- The default manufacturer
- The default test site

Data entered under **'Default Address Information'** , will automatically be entered in the EUT window and therefore only needs to be entered once.

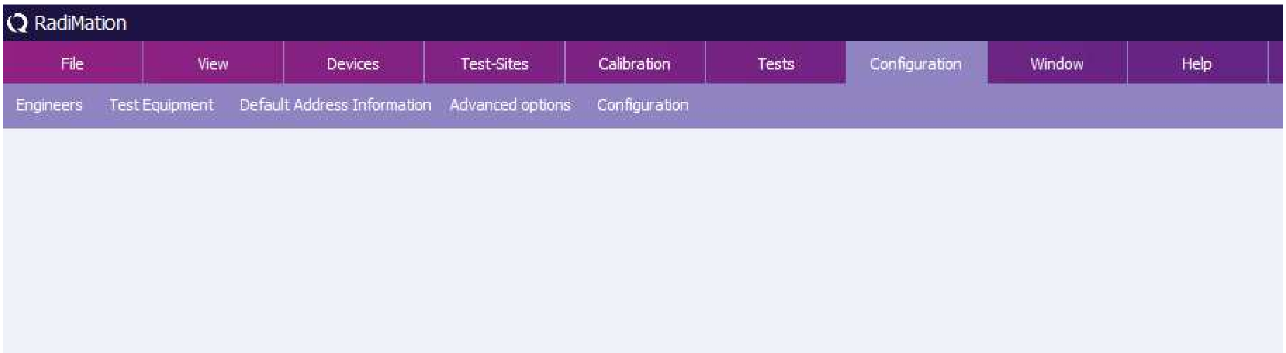
To add, modify or delete the default address information, go to the **'Default Address Information' window** in the **'Configuration' tab**.



Enter the desired information as shown in the example below.
To confirm the data input, click **'OK'** , to cancel the data input, click **'Cancel'** . The 'Default Address Information' window will close.



14.5 Advanced options



There are a several advanced options in RadiMation®, that allow to tune or optimize some specific settings. Making changes to one or more of those settings, can have a major influence in the correct functioning of the software. Changes to one or more of these advanced options are only needed to circumvent a specific situation. Before changes can be made, a specific password should be specified. The required password is not related to any of the passwords of existing engineers. If it is necessary to make a change to one or more of the advanced options, the password will be provided to the end-user by the reseller or Raditeq If the password is specified correctly, a configuration window is shown that includes a table to review and edit the list of advanced options.

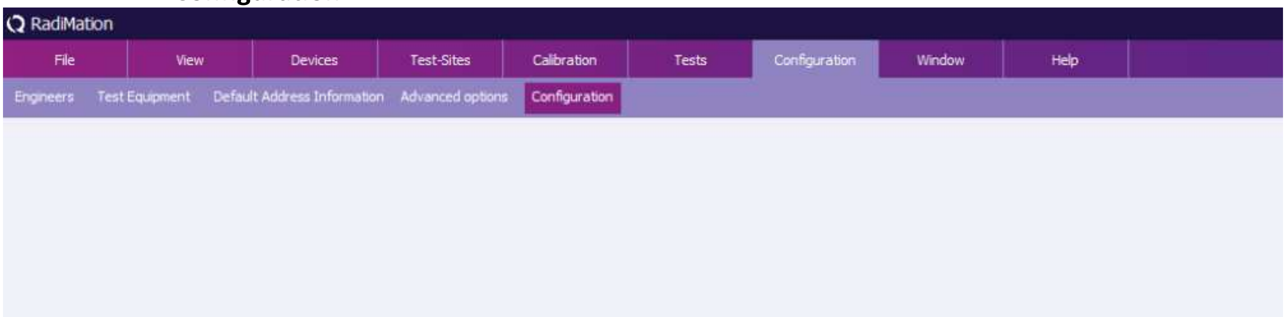
14.6 Configuration

RadiMation® allows the user to define an extensive default configuration. This includes the settings for the:

1. Units
2. Directories
3. Device Drivers
4. Graphs
5. Database
6. Language
7. Measurement settings
8. Product standards
9. Basic standards
10. Enhanced Status Window

Each of these settings are available on a specific tab in the global configuration which can be accessed through the menu:

- **Configuration**
  - **Configuration**



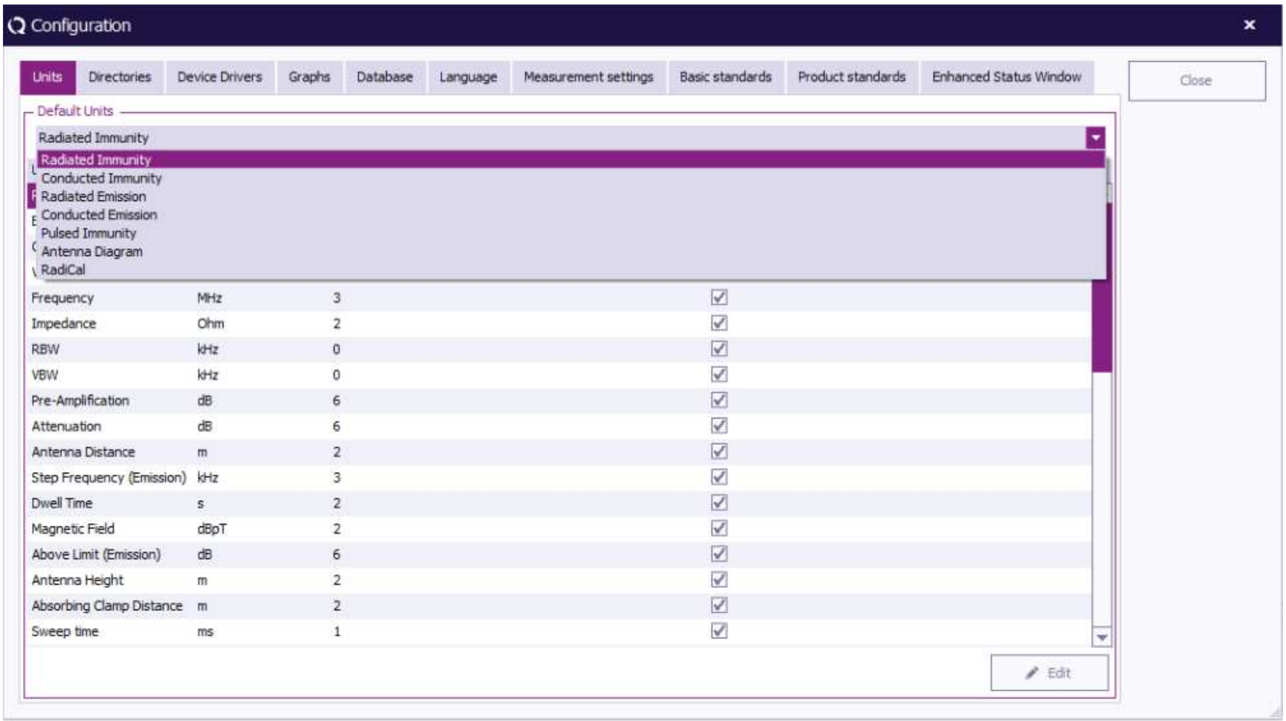
14.6.1 1. Units configuration

The default settings for the different units can be set in the **'Units' tab**. These units are used throughout the software package and can be changed at any time during measurements and viewing.
It is possible to define different units for different tests. The following can be selected:

- Radiated Immunity
- Conducted Immunity
- Radiated Emission
- Conducted Emission
- Pulsed Immunity
- Antenna Diagram
- RadiCal

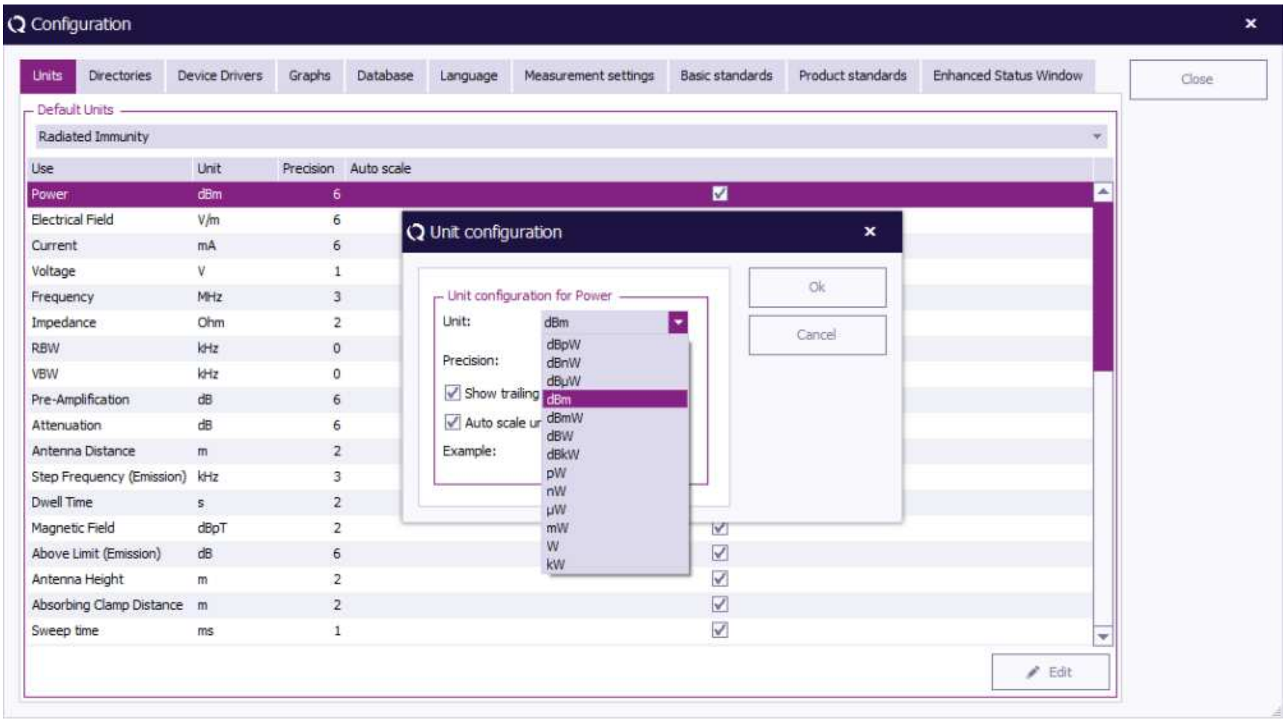
14.6.1.1 Changing unit settings

To change the settings of a unit, choose the desired test (e.g. Radiated Immunity) from the drop down menu in the **'Units' tab**.



Select the measurement (e.g. Power) and click **'Change'** .

The 'Unit configuration' **window** will appear, allowing you to change the parameters of the unit. To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the 'Configuration' window.



Click **'Close'** to leave the 'Configuration' window.

14.6.2 2. Directories configuration

The RadiMation® software can use different directories to store different files.
The location of the Device Driver Configuration Files can be specified:

- Device Driver Configuration Files (CONFDVDR),

The location of the following data file types can be specified:

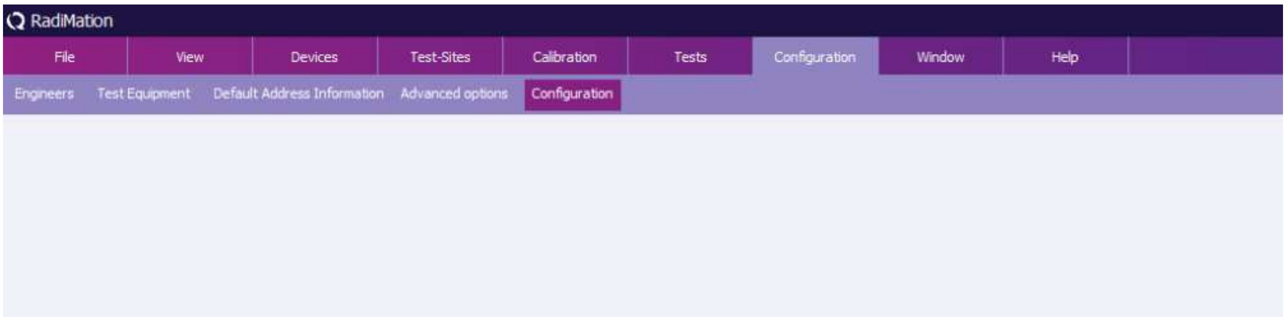
- Equipment Under Test Data files (*.EUT files),
- Correction files (*.COR files)
- Calibration files (*.CAL files),
- Configuration files (*.TSF files),
- Sequence files (*.SEQ files),
- Limit line files (*.LLF files).
- Printout files (*.DOC files).

The different file types are described in Chapter 18 “RadiMation® file types and locations”.
For each data type the default location can be entered through the configuration. The path name can link to a directory on a local or on a shared network drive. Selecting a network location will allow you to store data (e.g. EUT data) on a computer network, making it more accessible. This will allow you to configure RadiMation®, to make use of a networked configuration with multiple test PC's, sharing the same configuration.

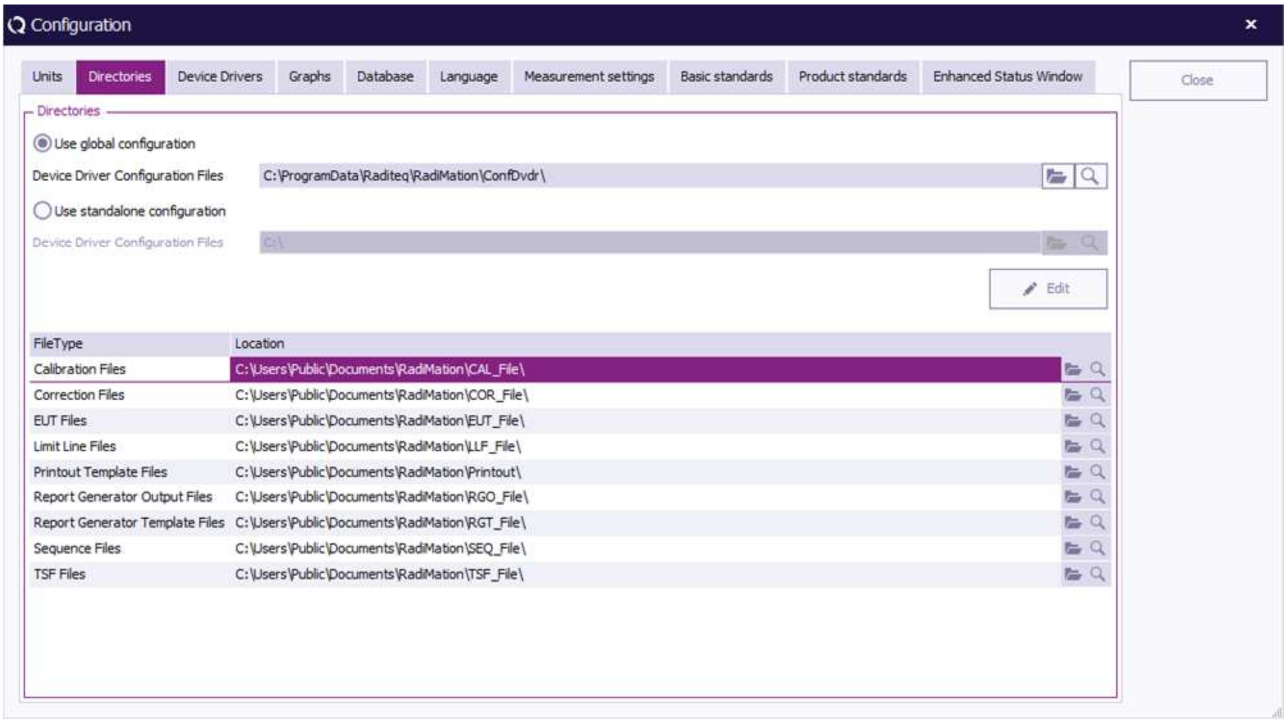
14.6.2.1 Open the 'Directories' configuration screen

Open the directory configuration by selecting from the menu:

- **Configuration**
  - **Configuration**



Go to the **Directories** tab.



14.6.2.2 Modifying the 'Device Driver Configuration Files' directory

With the **Use Global Configuration** option, it is possible to share the configuration with other versions of RadiMation on the same computer. This is the default setting.
With the **Use standalone configuration** option, it is possible to create an version specific isolated configuration directory with it's own content only used for this version of RadiMation. This can for example be used to verify and validate another RadiMation® version without influencing another RadiMation® version.
The location of the **Device Driver Configuration Files** can by changed by clicking on the '**Open Folder' icon**. A **'Browse For Folder'** window will appear, allowing to select an existing device driver configuration files directory. If an empty or an invalid device driver configuration files directory is selected, an error will be shown, and the original selected directory will remain selected.

14.6.2.3 Creating a new 'Device Driver Configuration Files' folder

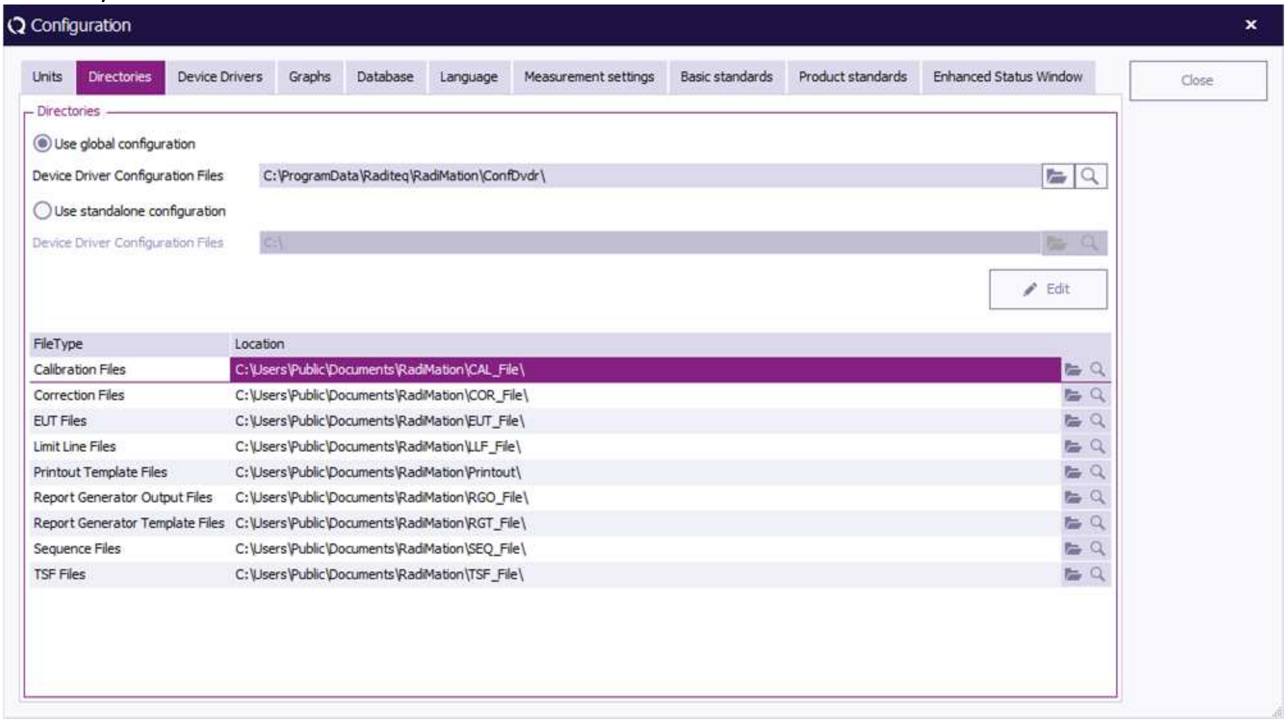
When it's needed to create a new **Device Driver Configuration Files** folder, click **Edit** and select **Create and set new folder**. A directory chooser will be prompted to create and / or select a new empty folder. The selected folder should be completely empty otherwise it cannot be initialized to become a **Device Driver Configuration Files** directory.

14.6.2.4 Duplicating a 'Device Driver Configuration Files' folder

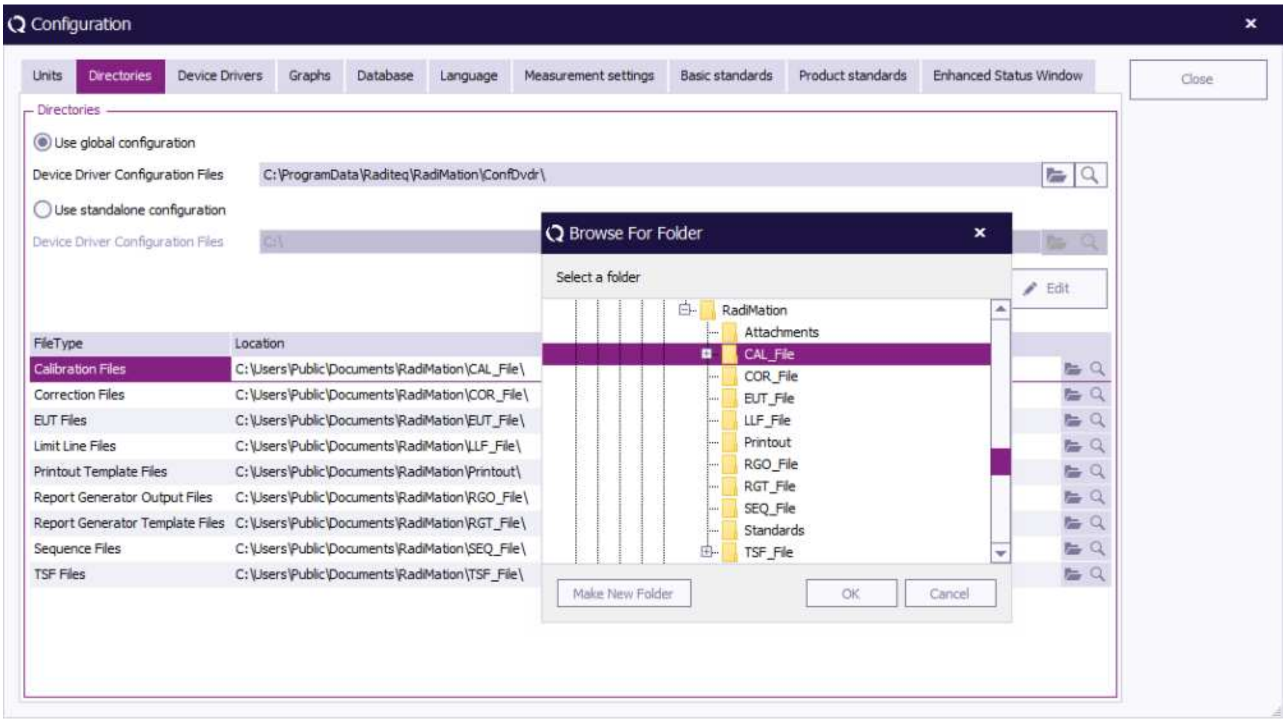
It is possible to duplicate an existing configuration folder, by clicking on **Edit** and either choose **Duplicate and set from current global folder** or **Duplicate and set from current standalone folder**. A directory chooser will be prompted to create and / or select a new empty folder to copy the content of the source configuration to. After the duplication of the folder, the new **Device Driver Configuration Files** directory will be selected.

14.6.2.5 Change the path for a file type

Select the directory that you wish to change and click on the **Open Folder** icon to select a different directory.



The **Browse For Folder** window will appear, allowing you to select (or make) a new folder in your directory.
To confirm your change, click **Select folder**, or to cancel your change, click **Cancel**. You will be returned to the **Configuration** window.



Click **Close** to leave the **Configuration** window.

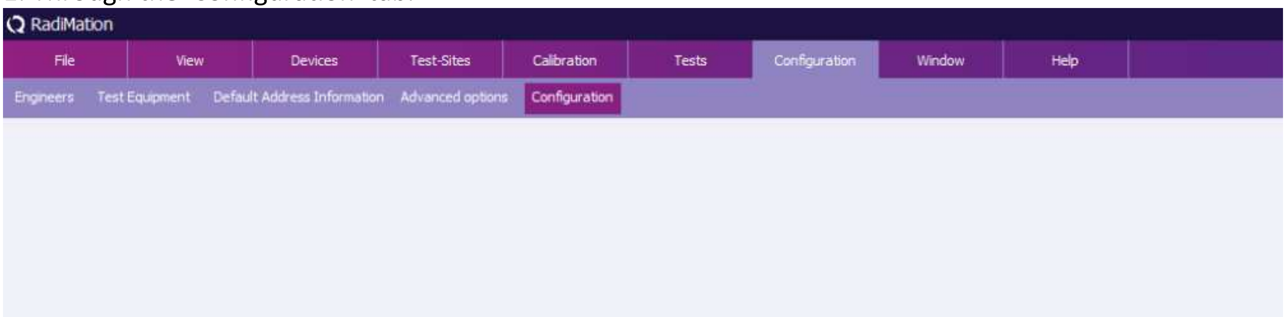
14.6.3 3. Device Driver configuration

Device drivers let your software know which equipment has to be used and controlled during EMC tests. In RadiMation®, these device drivers only need to be configured to the customer requirements once. During the configuration of the device driver, information such as the IEEE address or RS232 COM-port has to be entered.

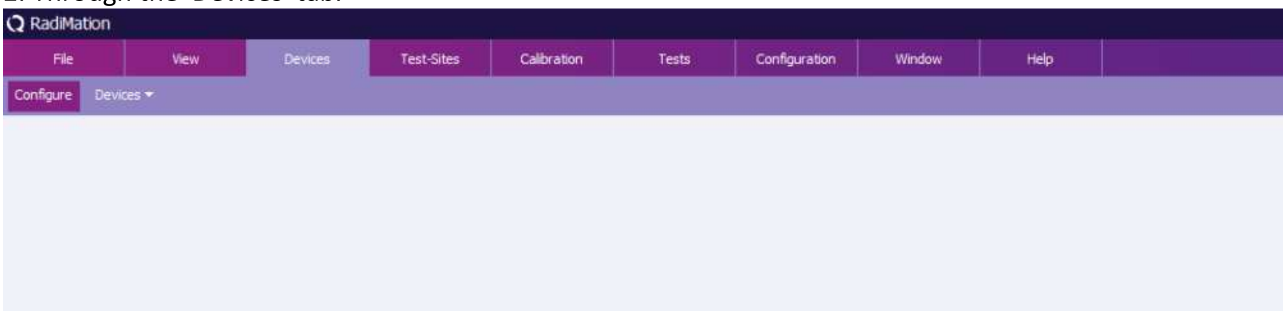
You can configure the device drivers in the **'Device Drivers' tab** of the **'Configuration' window**.

This window can be accessed in one of two ways:

1. Through the 'Configuration' tab.

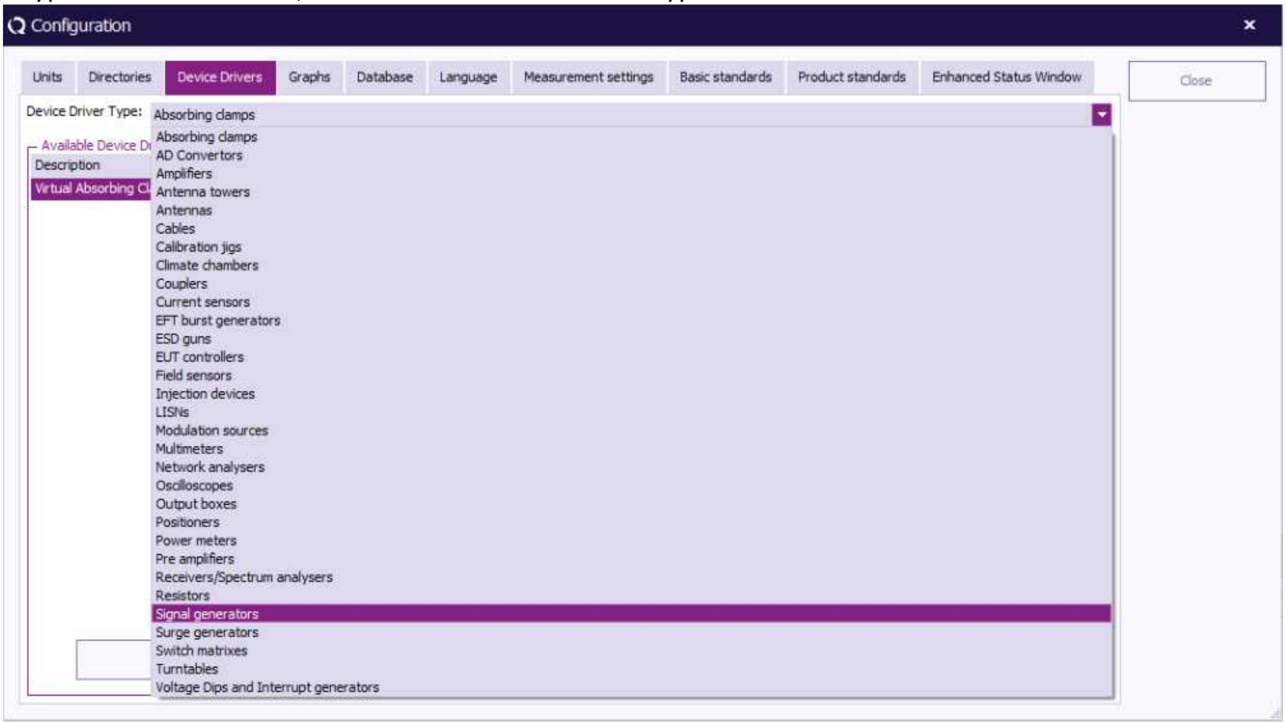


2. Through the 'Devices' tab.



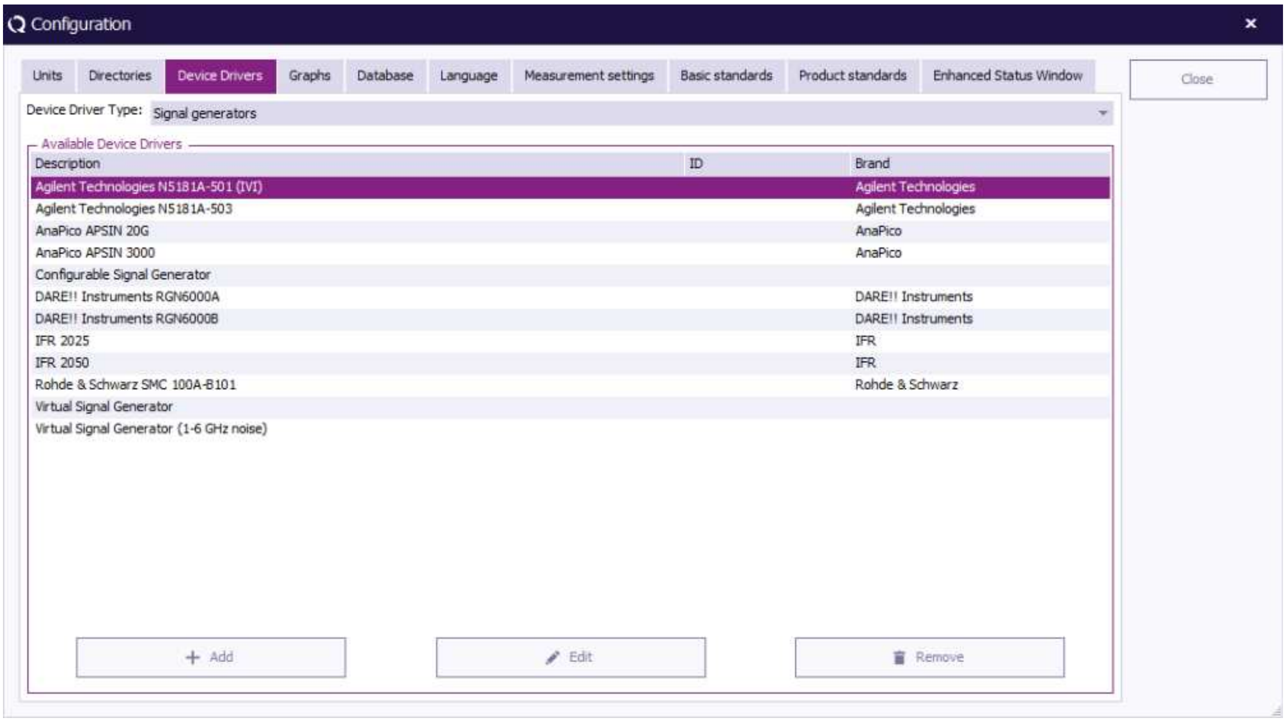
14.6.3.1 Select a device driver type

The first step to create or configure a device driver is to select the required **'Device Driver Type'** (e.g. Signal Generator). This can be done from the drop-down menu in the 'Configuration' window. One's a type has been selected, the available drivers for that type will be shown.

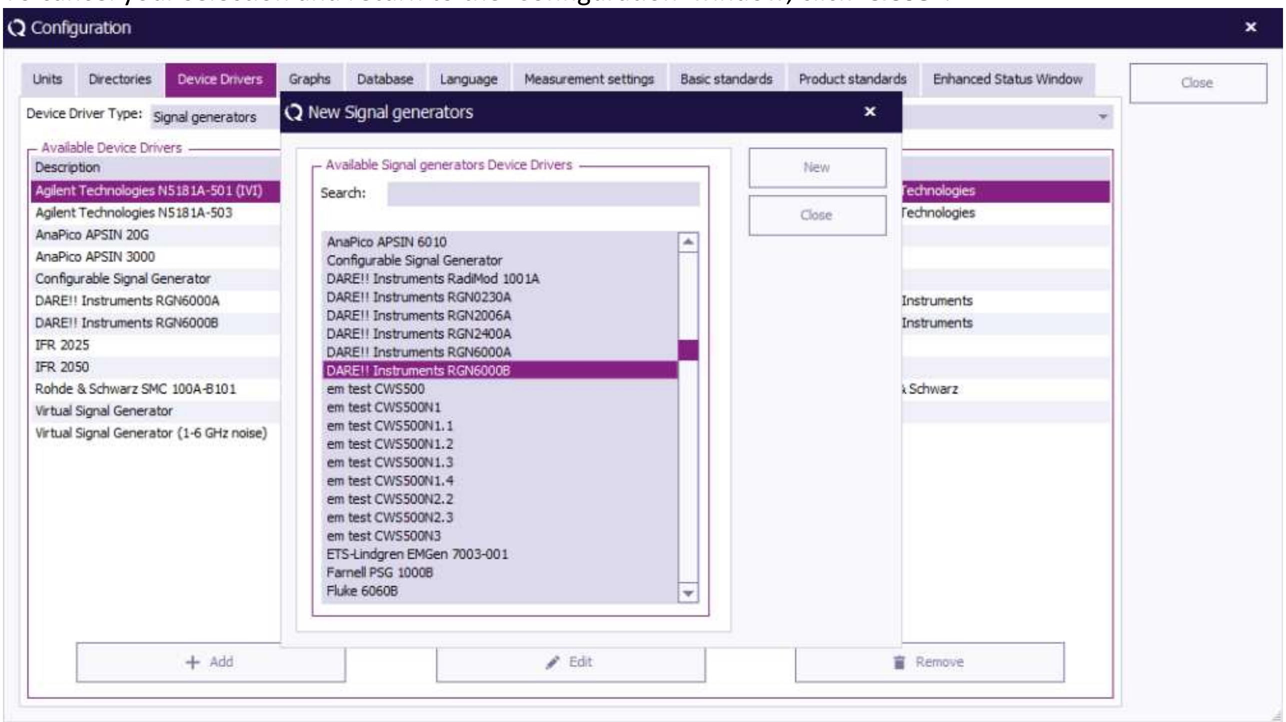


14.6.3.2 Adding a new device driver

To create a new RadiMation® device driver, select the desired **'Device Driver Type'** (e.g. Signal Generator) and click **'Add'** . A dedicated window will appear.

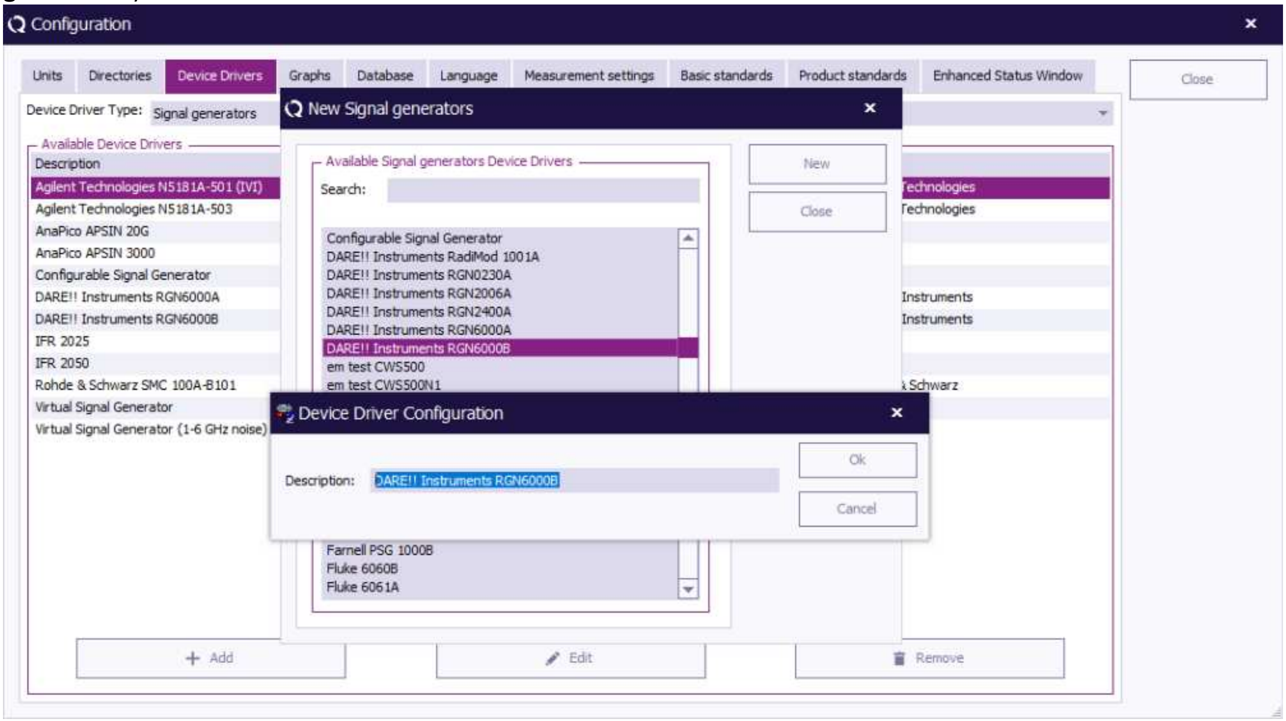


Select a new device driver (in the scroll menu or through the search function) in the new window and click **'New'** . The 'Device Driver Configuration' will appear.
To cancel your selection and return to the 'Configuration' window, click **'Close'** .



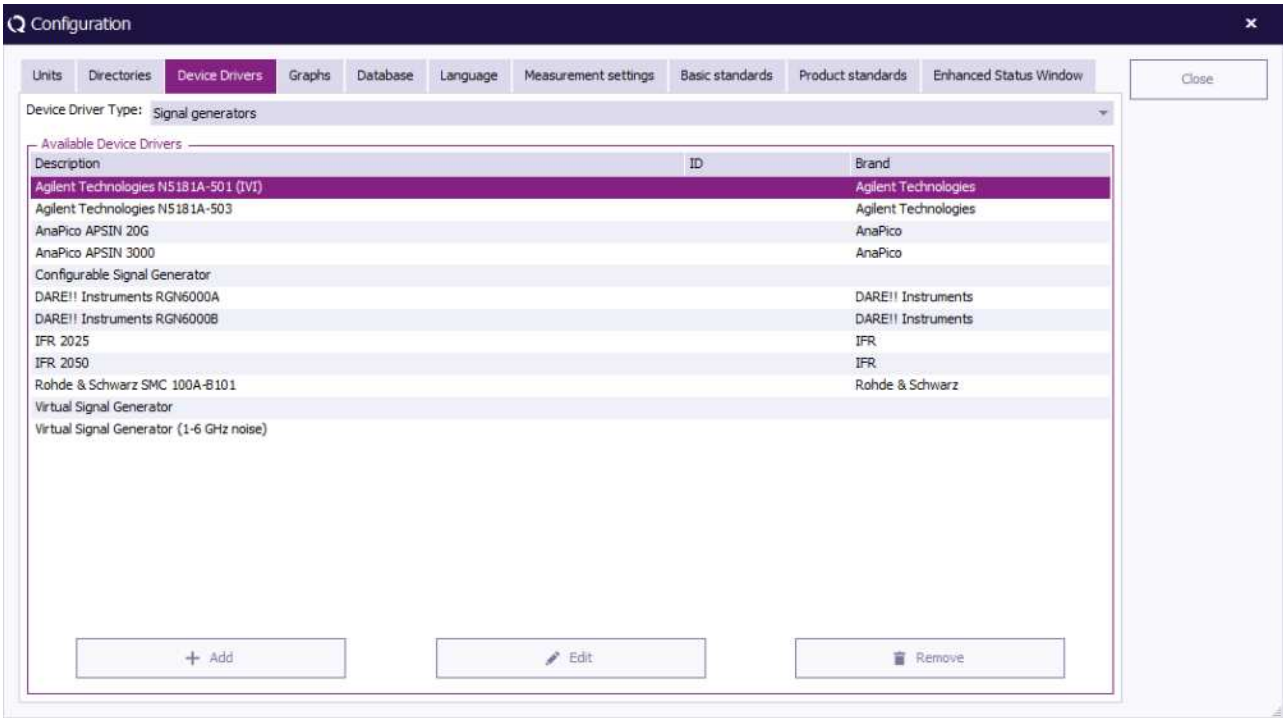
In the **'Device Driver Configuration' window** the name/description of the chosen device driver can be changed.
To confirm your changes (or the provided description), click **'OK'** , the 'Device Driver Settings' window will appear. This window will allow you to edit the information on this device driver. More information about editing device driver settings (and this window) is available further below.

To cancel your changes, click **'Cancel'** . You will be returned to the previous window (e.g. New Signal generators).



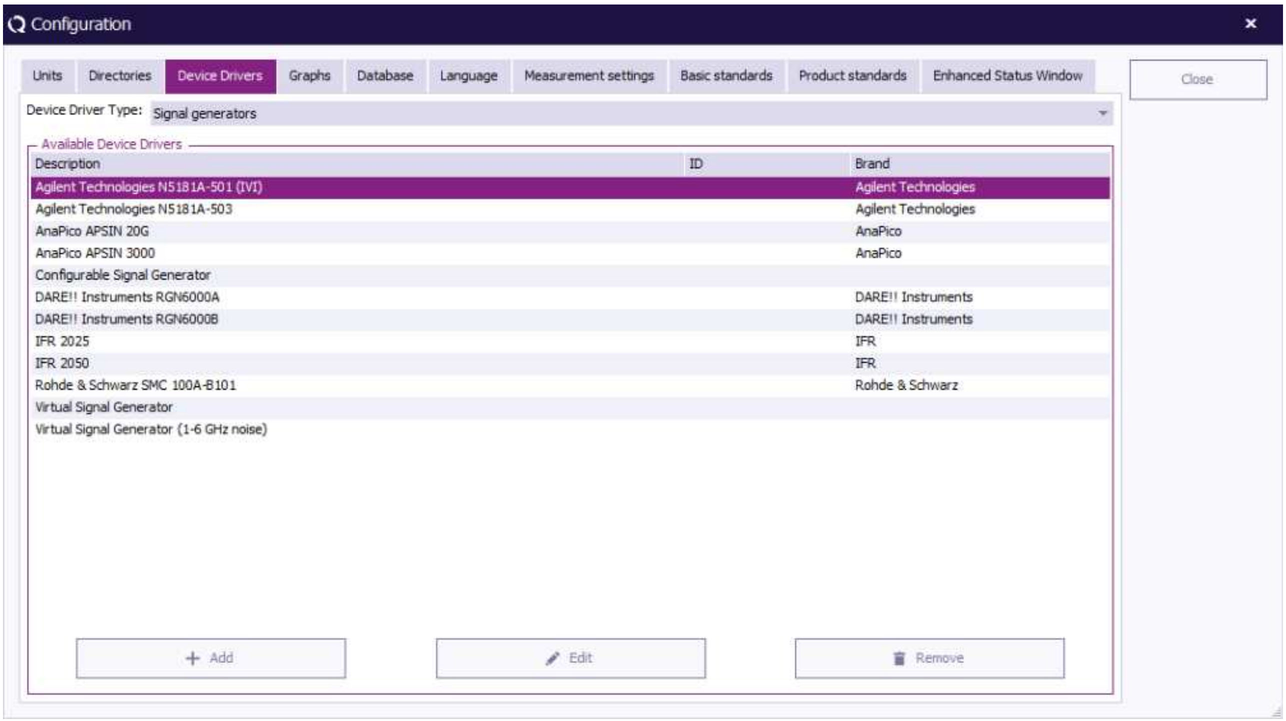
14.6.3.3 Editing a device driver

To edit an existing device driver, select the desired (device driver) type and device driver, then click **'Edit'** . The 'Device Driver Settings' window will appear. More information about this window is available further below.

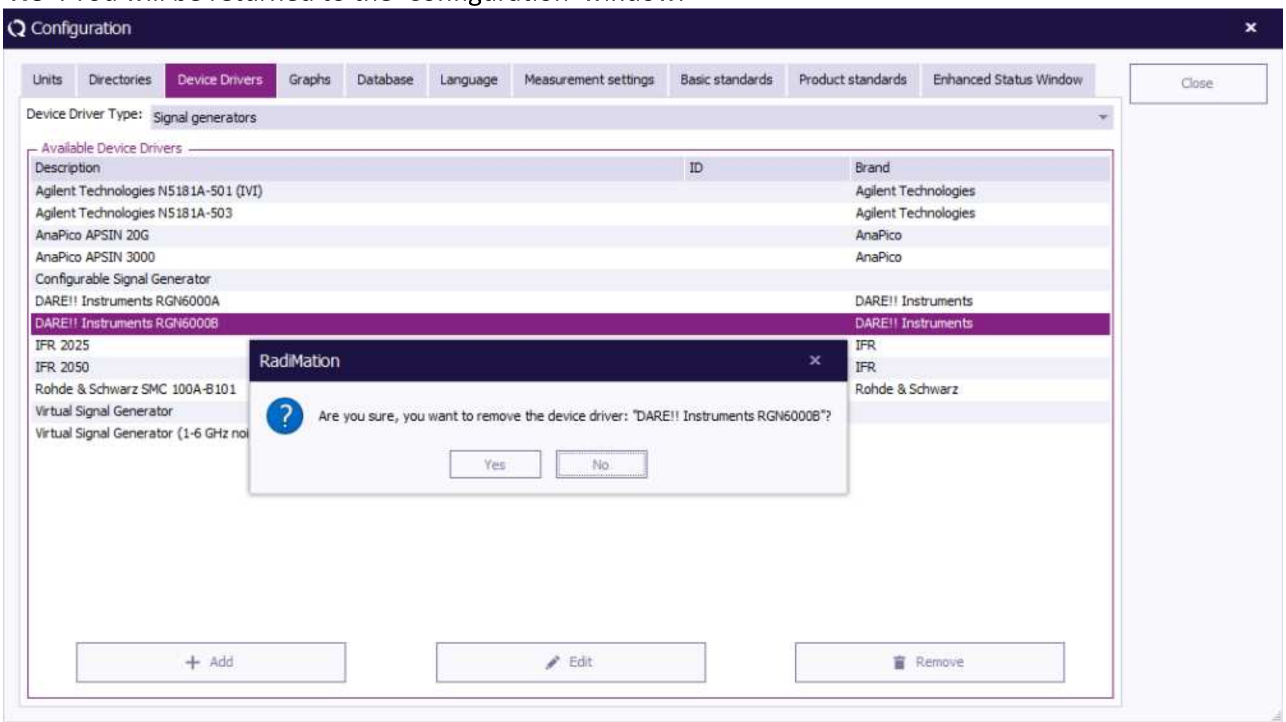


14.6.3.4 Removing a device driver

To remove an existing device driver, select the desired (device driver) type and device driver, then click **'Remove'** .



A confirmation window will appear. To remove the selected device driver, click **'Yes'** , to cancel, click **'No'** . You will be returned to the 'Configuration' window.

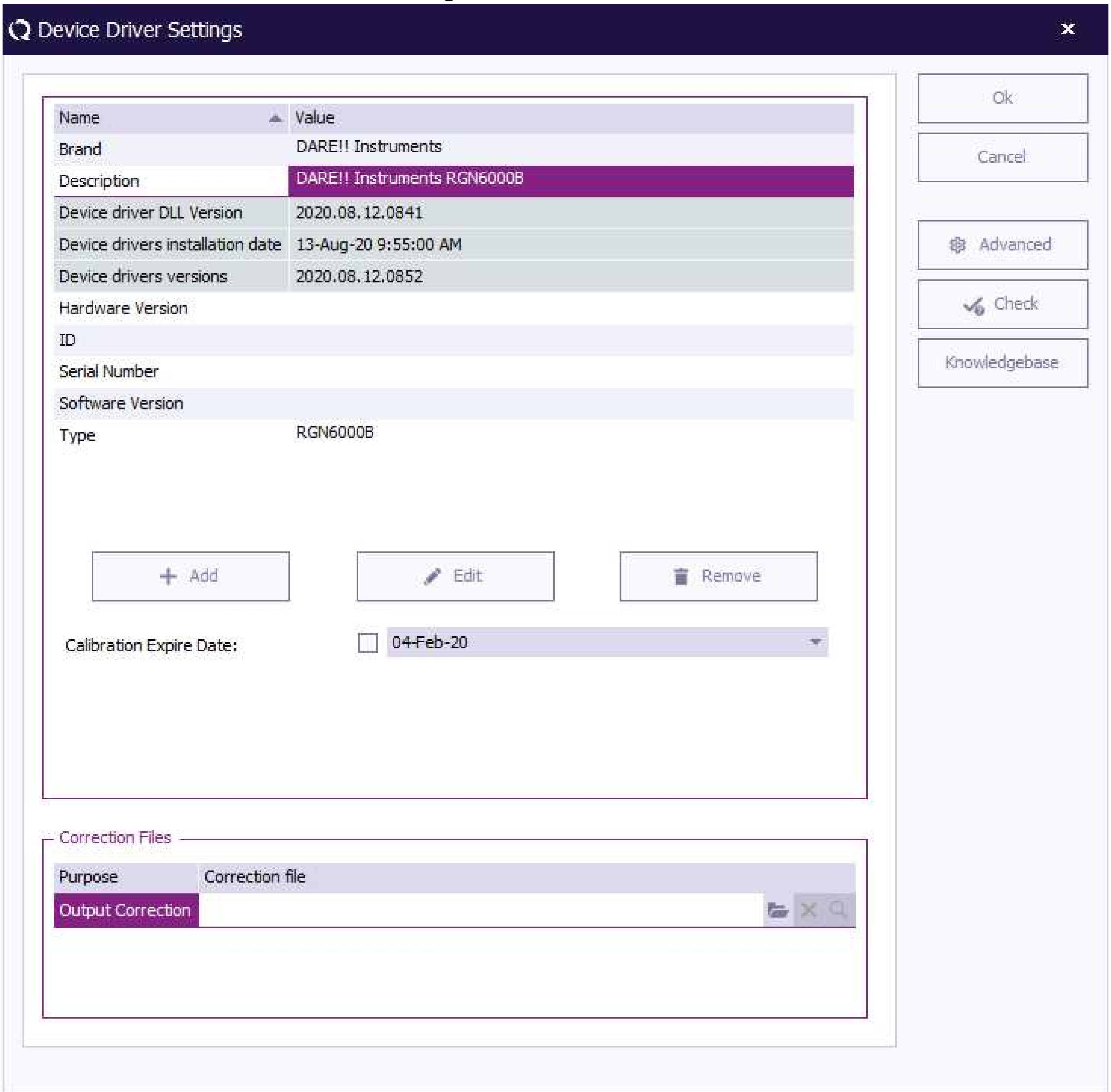


14.6.4 Device Driver Settings

The 'Device Driver Settings' window contains information on the selected device driver. In this window the generic settings for that driver can be added, edited and removed.

14.6.4.1 Confirm settings

To confirm the (current/new) settings, click **'OK'** . To cancel changes made during editing, click **'Cancel'** . You will be returned to the 'Configuration' window.



14.6.4.2 Fixed information

The 'Device Driver Settings' window contains a minimum list of 'fixed information'. Although these settings cannot be removed, part of their information can be altered. These settings include:

- **Brand** — Shows the brand of the device. This information can be changed/viewed in this cell and can be used in the report generator.

- **Description** — Shows the description of the device. This information can be changed/viewed in this cell and can be used in the report generator. Changing the description does not result in losing the device in the test sites. The description is automatically updated in the test site information. If a report is generated from a test done prior to the description change the old description will be inserted.

- **Device driver DLL Version** — Shows the exact version of the DLL in which the device driver is contained. This is a unique identifier that specifies the version of the device driver. The contents of this cell cannot be changed. (More information on this data cell is explained further below in the paragraph ‘Storing the driver version in the test file’.)

- **Device drivers installation date** — Shows the date and time of the last update/installation of the device drivers. The contents of this cell cannot be changed. (More information on this data cell is explained further below in the paragraph ‘Storing the driver version in the test file’.)

- **Device drivers versions** — Shows the version number of the last update/installation of the device drivers. The contents of this cell cannot be changed. (More information on this data cell is explained further below in the paragraph ‘Storing the driver version in the test file’.)

- **Hardware version** — Shows the hardware version of the device. This information can be changed/viewed in this cell and can be used in the report generator.

- **ID** — Shows the internally used ID of the device. This information can be changed/viewed in this cell and can be used in the report generator. The main function of this window is to link your measurement to your devices for easier reproduction.

- **Serial number** — Shows the serial number of the device. This information can be changed/viewed in this cell and can be used in the report generator.

- **Software version** — Shows the software version of the device. This information can be changed/viewed in this cell and can be used in the report generator.

- **Type** — Shows the type of the device. This information can be changed/viewed in this cell and can be used in the report generator.

14.6.4.3 Additional options

The 'Device Driver Settings' window provides additional options besides changing/viewing the 'fixed information', such as:

- **Add** — The ‘’’ ‘Add’ button’’’ can be used to add additional information items to the general device driver settings. The additional items will be shown in the list.

Additional information items can be used to note the storage location, the location of the user manual, etc.

- **Edit** The ''' 'Edit' button''' can be used to edit the information of a selected item. Information items that cannot be modified cannot be edited.

- **Remove** The ''' 'Remove' button''' can be used to remove a selected information item from the list. Only additional information items can be removed. Fixed information items, as described previously, cannot be removed.

- **Zero Interval** When the **Zero interval** is activated, it is possible to specify a time period in minutes, in which a device does not need to be 're-zero-ed'. For accurate measurements it is necessary that Power Meters and Field Sensors are zero-ed. A zero operation generally takes several seconds to be completed and it may be valid for a few hours. To prevent that a device is 're-zero-ed' during each test initialization, it is possible to set a zero interval in minutes. When a test is initialized and the device is already zero-ed within the specified zero interval, no zero will be performed at that time. Specifying and activating the zero interval can be a significantly reduce the time that is needed to initialize each test.
This setting is only available for power meter and field strength sensor devices.

- **Calibration Expire Date** This field can be used to set the date on which the device needs to be re-calibrated. Depending upon the setting in the configuration window, RadiMation® will use this date to give warnings/notifications on the recalibration. When you press the 'calendar icon' to the right of this field a small window will appear, allowing you to select the new date.

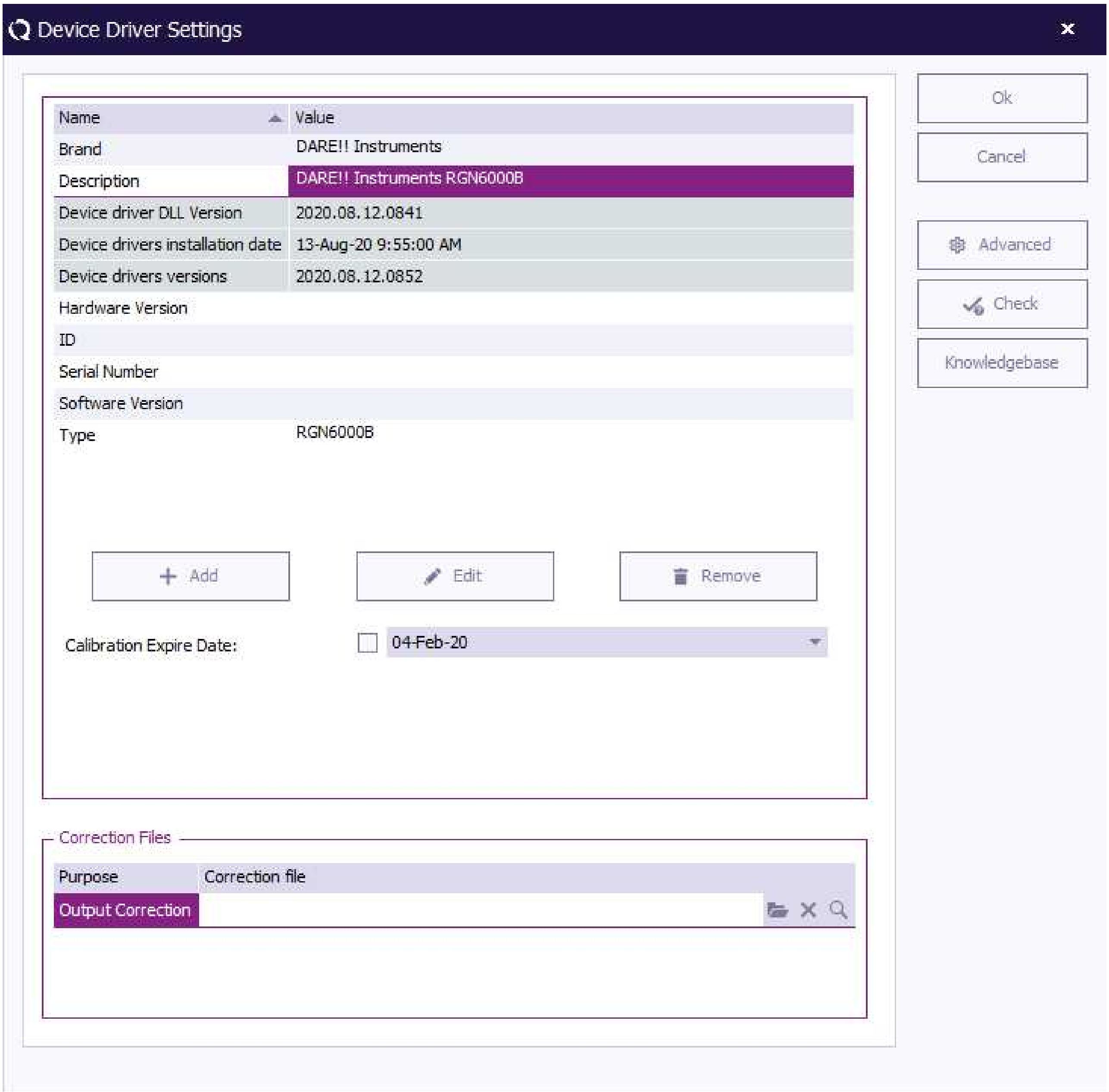
- **Advanced** The ''' 'Advanced' button''' can be used to open the advanced menu of the device driver. In chapter 15, the paragraph 'Device specific configuration' will explain this menu for every device type. Please note that the configuration does not apply on the configurable or virtual drivers. Please view the paragraphs about 'Configurable devices' or 'Virtual devices' (also in chapter 15) for these devices.

- **Check** The ''' 'Check' button''' can be used to check if the device is connected. This check is the same as the check that is performed during each test initialization. This check can be used to determine if the correct addressing is set, and whether communication with the device is possible. (This option is explained further below in the paragraph 'Checking the device connection'.)

- **Knowledgebase** The ''' 'Knowledgebase' button''' can be used to open a new web-browser window which will show the RadiWiki page about that device driver. That RadiWiki page can contain additional information or a detailed explanation of all the advanced settings.

14.6.4.4 Checking the device connection

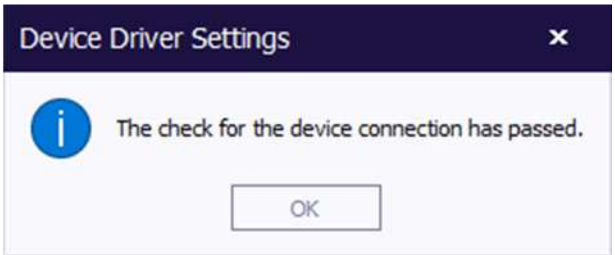
The 'Device Driver Settings' window contains a 'Check' button that can be used to check whether the device driver is correctly connected to the PC.



When the 'Check' button is clicked, the following actions are performed:

1. RadiMation tries to load the DLL of the device driver
2. RadiMation tries to create an instance of the device driver
3. The settings (as configured under 'Advanced') are loaded
4. The device driver is instructed to check if the (hardware) device itself is working correctly
5. The device driver instance is removed from memory again

If one of these steps is unsuccessful, an error message will be shown. If all the steps are successful, a message will be shown that the device connected has passed the check. (See the image below.)



This is a very helpful tool because it is a fast method to check whether the advanced settings (especially the (GPIB) address) of the device are set correctly. If this 'Check' is successful, the 'device check' during the test initialization (which performs the same check) will also be successful.
The check that is performed depends on the implemented device driver. For example, some devices (like antenna's, couplers, LISN's, injection clamps, etc.) cannot be checked for the correct connection to the PC (done at step 4), because there is no connection at all. In addition, some device drivers assume that the LASER of the device is activated before the check is successful. Despite these deviations, the 'Check' functionality will still work and show the message displayed above, as long as the device driver passes the (appropriate) check.

14.6.4.5 Storing the driver version in the test file

For quality accreditation reasons it is necessary to store the version numbers of the hardware, firmware and software of the equipment used to perform EMC measurements. RadiMation® uses device drivers to control this equipment. Because these device drivers greatly influence the overall (and correct) functioning of the EMC measurement, it is important that the version of these device driver is stored together with the measurements results of each test.
RadiMation® can store all this information, most of which is also automatically determined by the program itself. This information (including the device driver version) is shown in the 'Device Driver Settings' window. (As explained further above in the paragraph 'Fixed information'.)

About the device driver information:
The numbers of the device drivers system and/or the used .dll version number of a specific device are always (slightly) different by default. An example situation is included below.

- The value of the **'Device driver DLL Version'** shows the date and time on which this specific .dll was compiled. (For example: 2013.07.11.1405. The date of the used .dll for this specific device is June 11, 2013 at 14:05 pm.)
- The value of the **'Device drivers installation date'** shows when the device driver setup was installed by the end-user for the specific version of RadiMation that is currently running. (For example: 12.07.2013 08:37:00. The install date is June 12, 2013 at 08:37 am.)
- The value of the **'Device drivers versions'** shows which device driver version you are currently running. This is the date and time when all the device driver DLL's are packaged into the DRIVERS.EXE. (For example: 2013.07.11.1414. The date of the device drivers system is June 11, 2013 at 14:14 pm.)

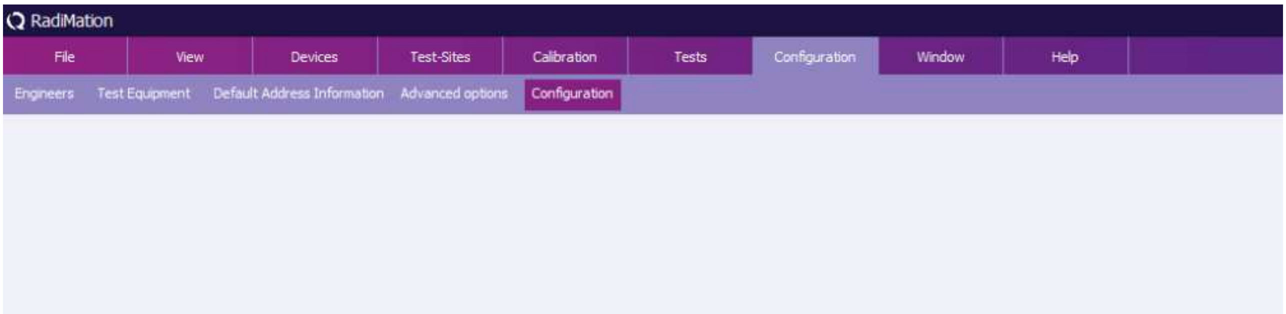
Now we can conclude that:

- The Device Drivers version that is being used is 2013.07.11.1414
- The used .dll version of this specific device is 2013.07.11.1405
- The latest device drivers setup is installed on June 12, 2013 at 08:37 am.

It happens very often that a Device driver DLL is modified multiple times in a day. By including the time in the version number it is possible to determine exactly which DLL version is used. It is also possible that (in specific situations) a DLL is provided without using an updated DRIVERS.EXE package. In that situation the 'Device driver DLL Version' can be newer than the 'Device drivers versions'.

14.6.5 4. Graphs configuration

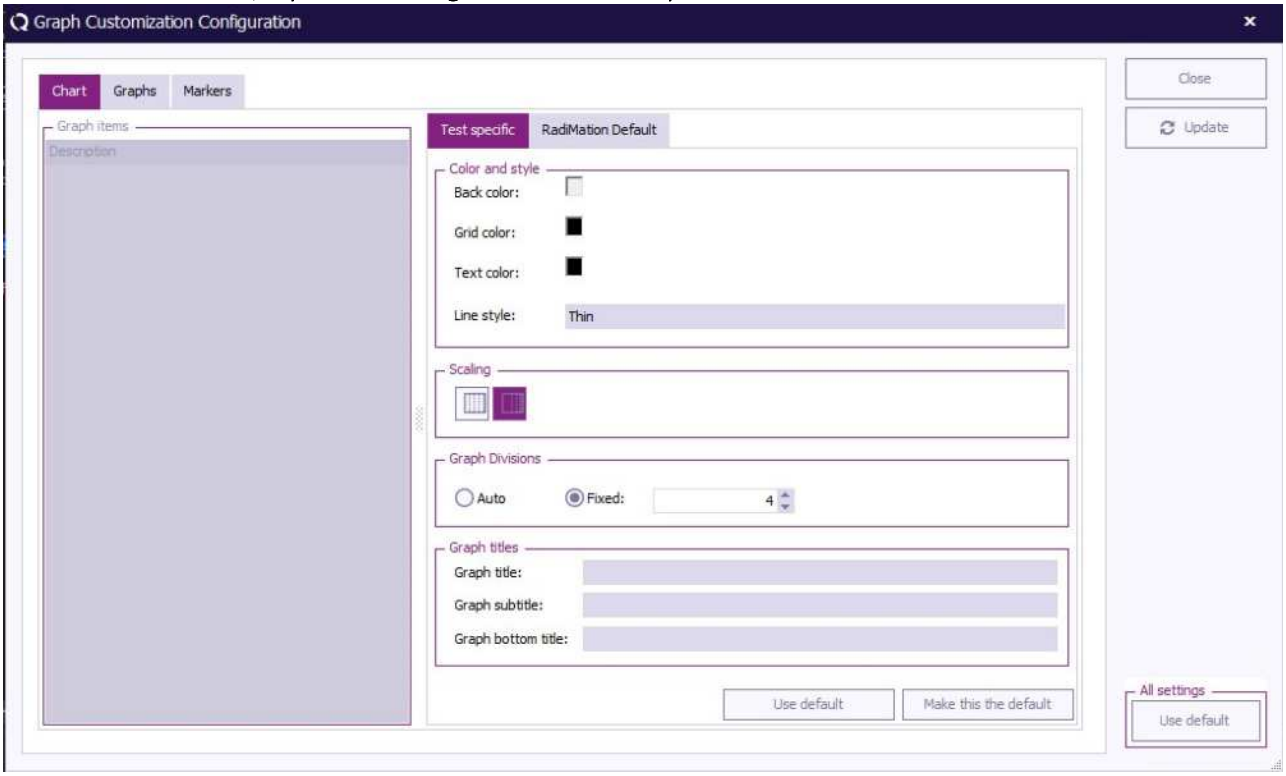
RadiMation® allows you to customize the way graphics are displayed on your screen.
To configure the style of the shown graphs, go to the **'Configuration' window** in the **'Configuration' tab**.



An example graph is shown in the **'Graphs' tab** that is created with the current settings. To change these graph settings, click **'Customize'** .

The '**Graph Customization Configuration' window** contains three tabs; **'Chart'** , **'Graph'** and **'Markings'** .

The **'Chart' tab** contains the settings related to the overall graph and can be used to determine the colors, layout and titles.
The **'Graph' tab** contains the settings related to the graph lines shown in the graph and can be used to determine the colors, scaling and layout of each and every shown graph line.
The **'Markers' tab** contains the settings related to the markers on the graph and can be used to determine the colors, style and scaling of each and every shown marker.



To change the graph settings, select a graph (component) in the left section of the window, then make the desired changes in the right section of the window.
Click **'Update'** to update the graph settings without closing the '**Graph Customization Configuration' window**. This will allow you to see the effect of the new settings and make additional changes.
Click **'Close'** to update (and save) the graph settings and close the '**Graph Customization Configuration' window**. You will be returned to the **'Configuration' window**.
The selected settings in the '**Graph Customization Configuration' window** are used as the RadiMation® default settings. It is still possible to overrule these settings for individual tests to more specific settings.
Click **'Restore factory default'** to return to the factory settings.

14.6.6 5. Database configuration

14.6.6.1 Introduction

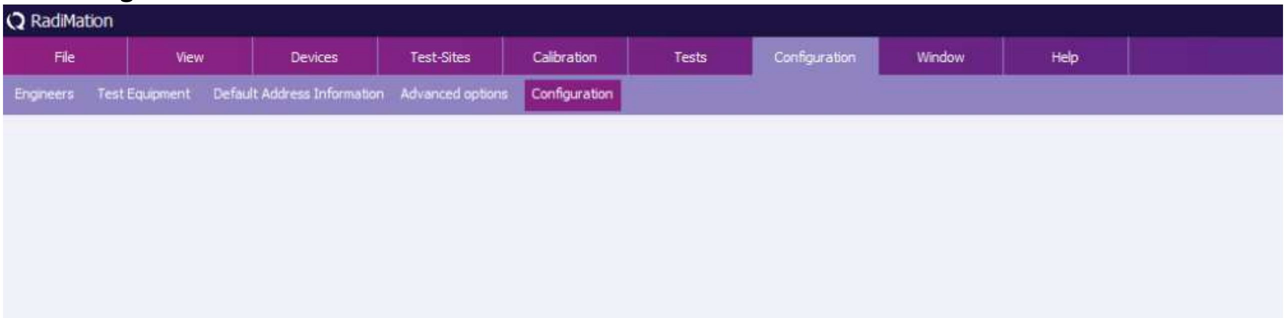
RadiMation® can retrieve customer information (such as name and address) from external databases, for example from your company's customer relationship management (CRM) database.
This option is called **Customer database** and will reduce the need to manually enter large amounts of customer information in RadiMation®.
Customer database can interface with several external databases, such as:

- text based files (through ODBC)
- MySQL

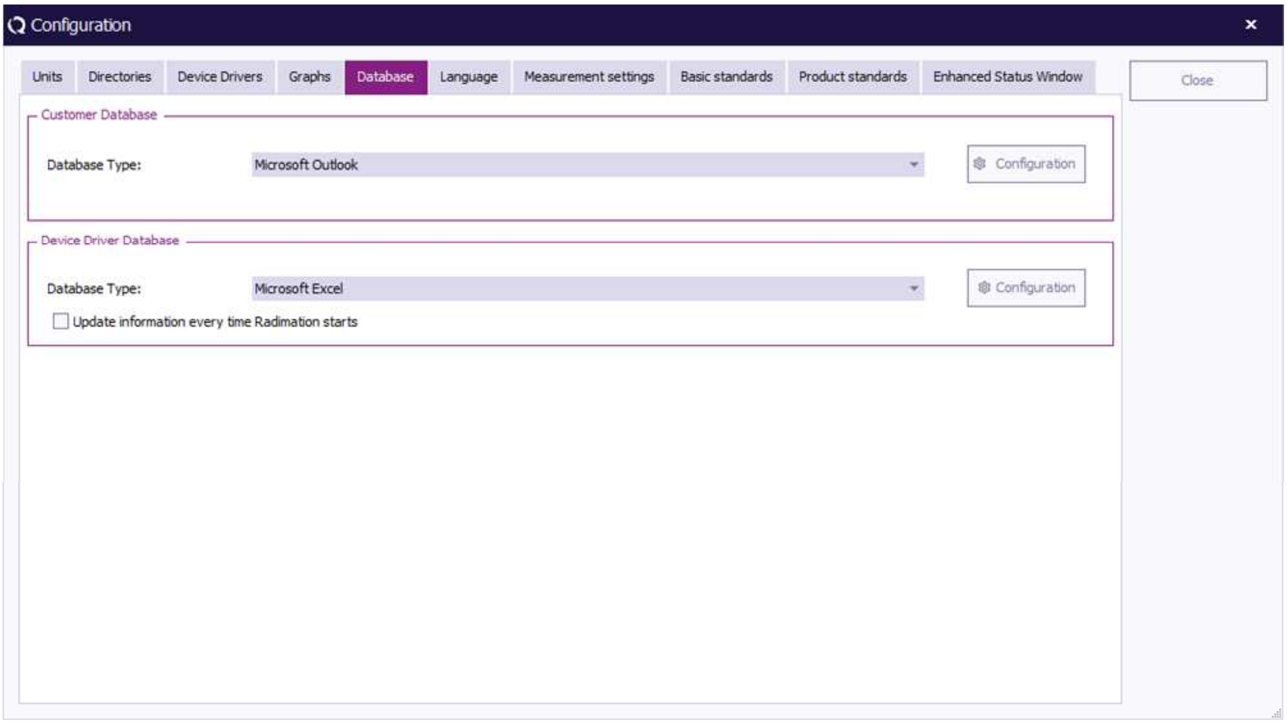
- MSSQL
- Microsoft Access database
- ODBC
- Act! 6

14.6.6.2 Changing the customer database driver

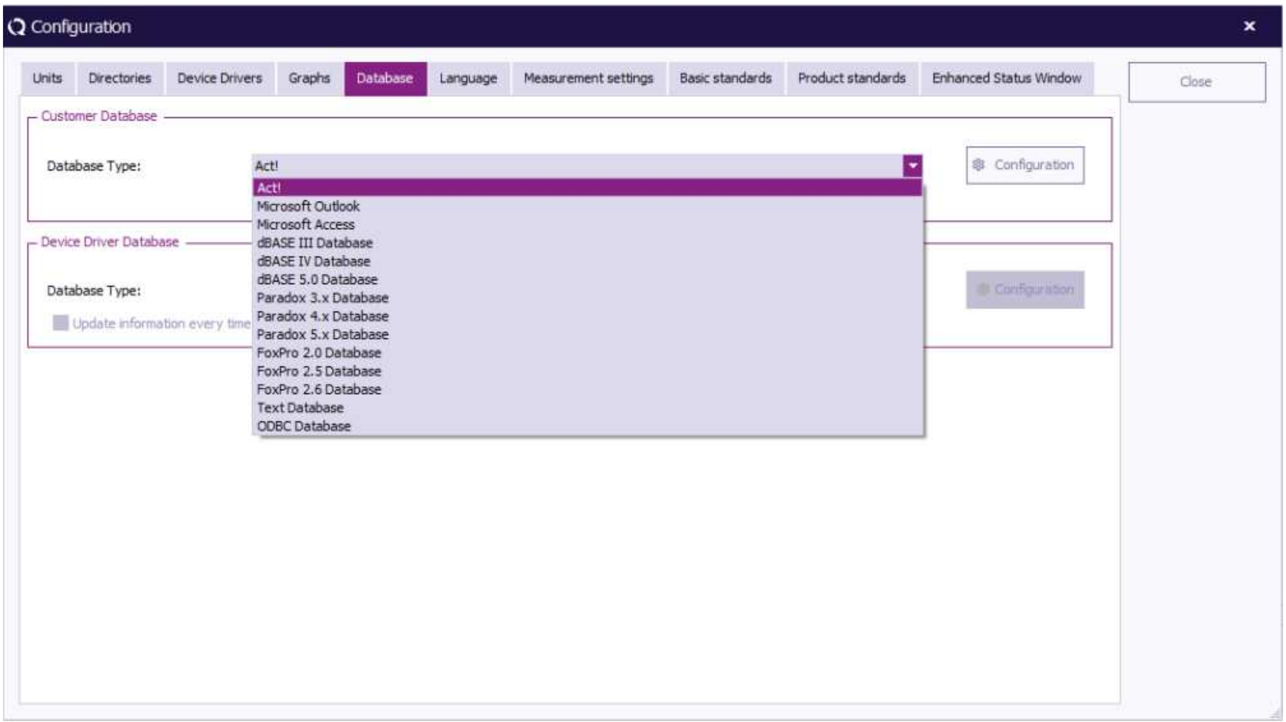
To configure RadiMation® to support your customer database, go to the **'Configuration' window** in the **'Configuration' tab**.



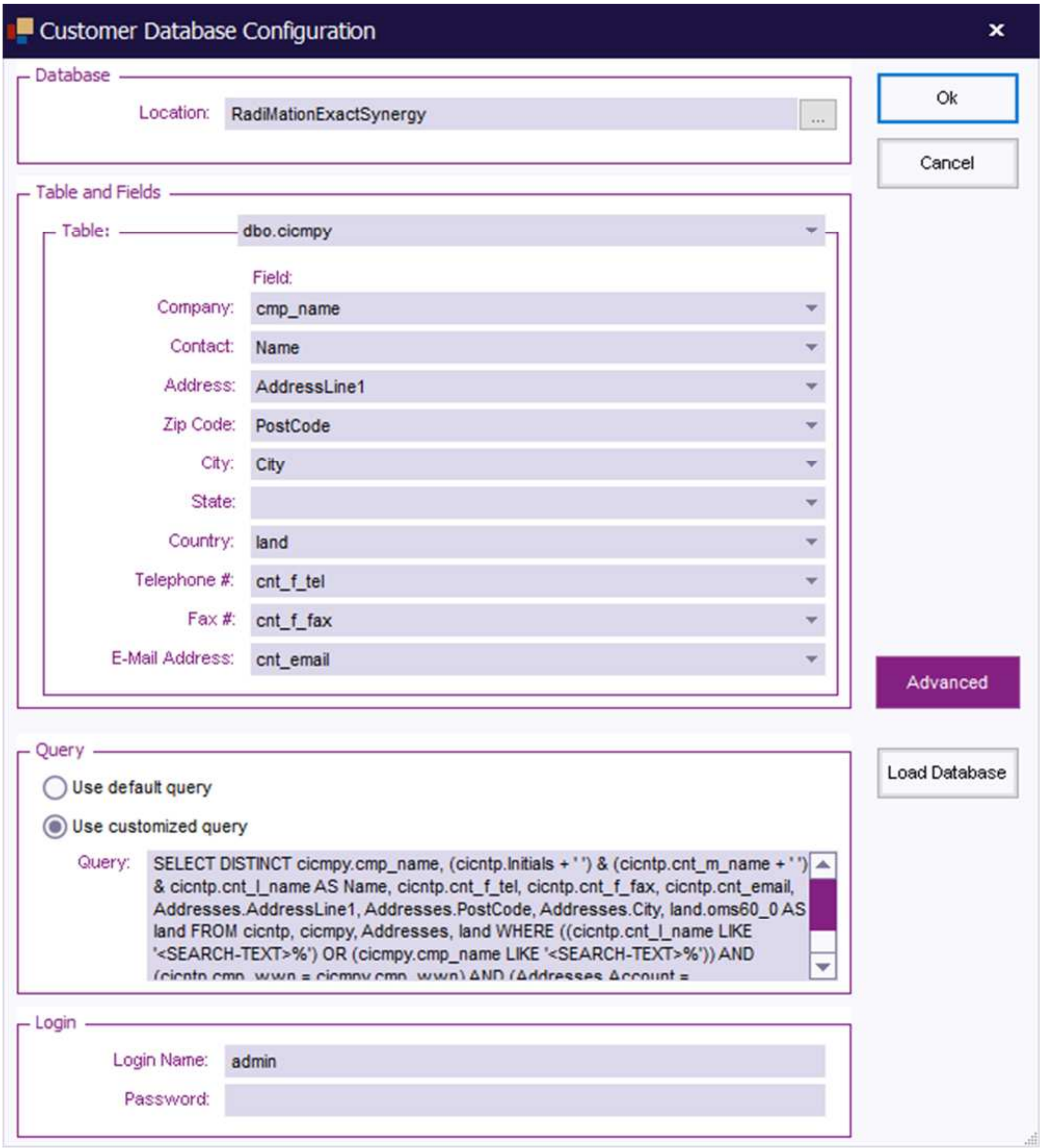
Go to the **'Database' tab** to select and/or change the **Customer Database** and **Device Driver Databases**.



To select a **Customer Database**, select a database type from the pull-down menu.

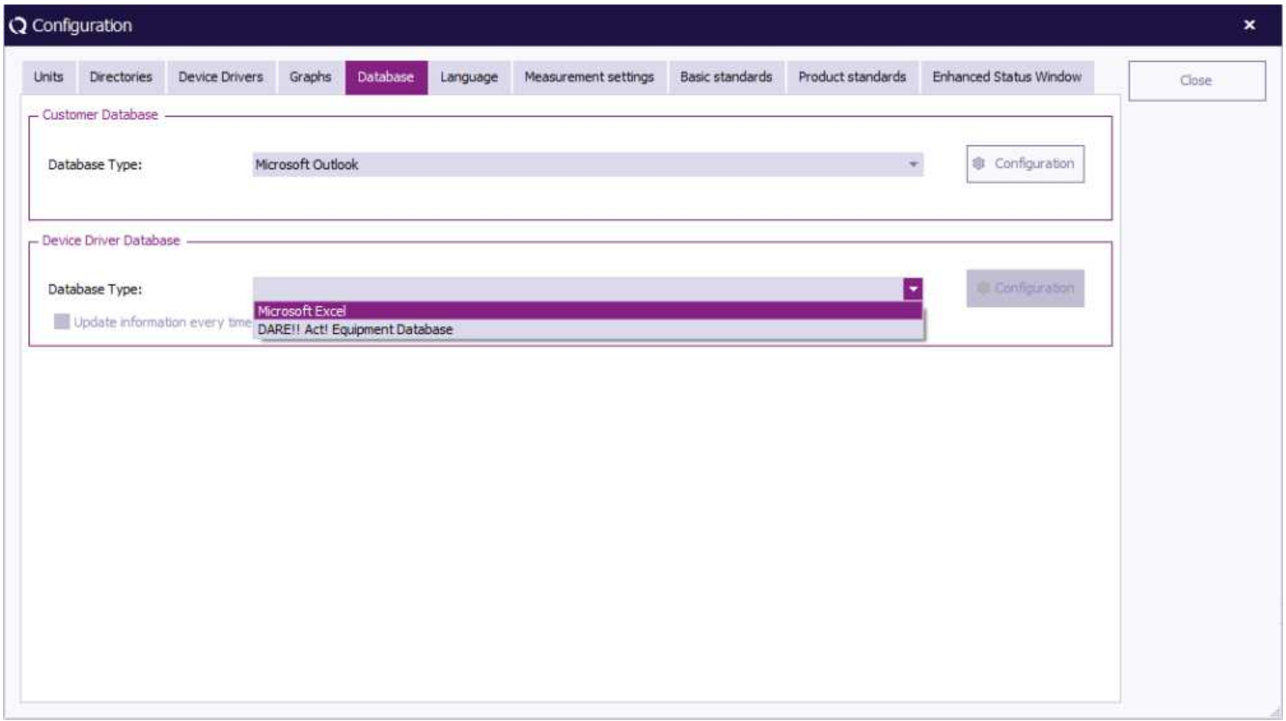


To see and/or change more detailed settings (of the selected database type), click **'Configuration'** . The '**Customer database configuration' window** will appear. (This window can differ depending on the selected database type).

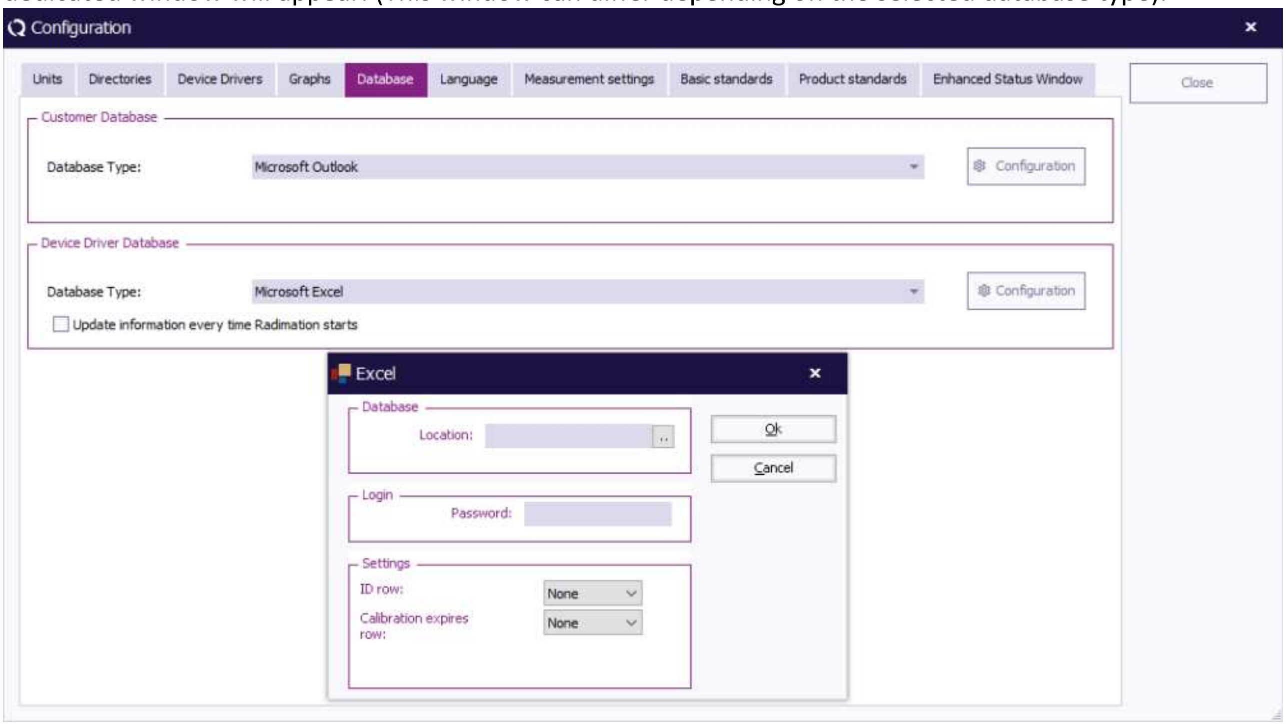


To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.
For more detailed information on the Database Configuration settings, go to Chapter 14 “Database Configuration”. Information on the settings of the different database types can be found in the paragraphs that follow “Database Configuration”.

To select a **Device Driver Database**, select a database type from the pull-down menu.



To see and/or change more detailed settings (of the selected database type), click **'Configuration'** . A dedicated window will appear. (This window can differ depending on the selected database type).



To confirm your changes, click **'OK'** , to cancel your changes, click **'Cancel'** . You will be returned to the **'Configuration' window**.
Click **'Close'** to leave the **'Configuration' window**.

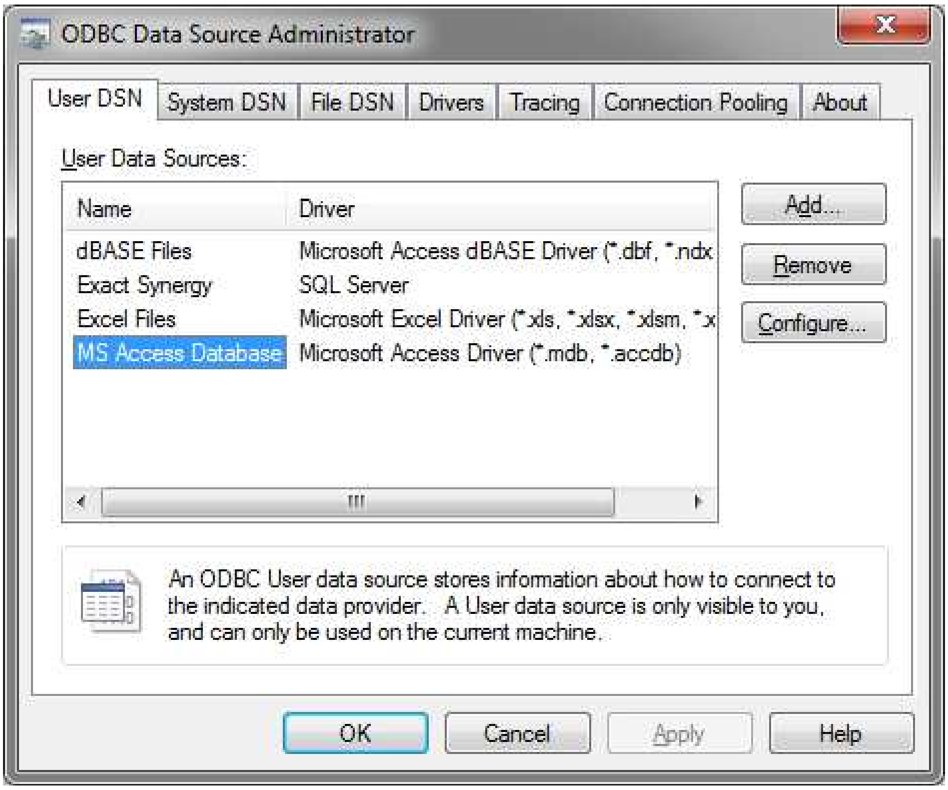
14.6.7 Additional Setup for ODBC Connected databases

Text, CSV, Excel, MSSQL and MySQL dabase files need some additional setup before they can be used. The reason for this is that RadiMation® uses ODBC to connect and read out thoes databases. This additional setup of an ODBC connection must be performed before the database driver can be configured in RadiMation®. The configuration of the ODBC connection should be done within the Microsoft Windows operating system.

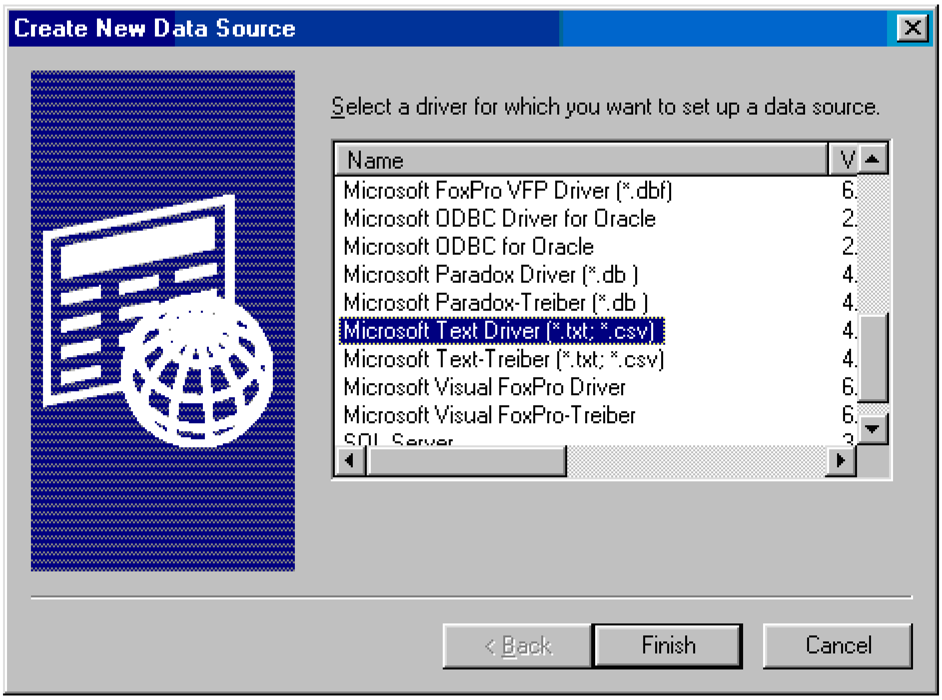
Select

- **Start**
  - **Settings**
    - **Control Panel**
      - **ODBC Data Sources**

Now the ODBC Data Source Administrator dialog will be shown, which can be used to manage the available ODBC Data Sources.



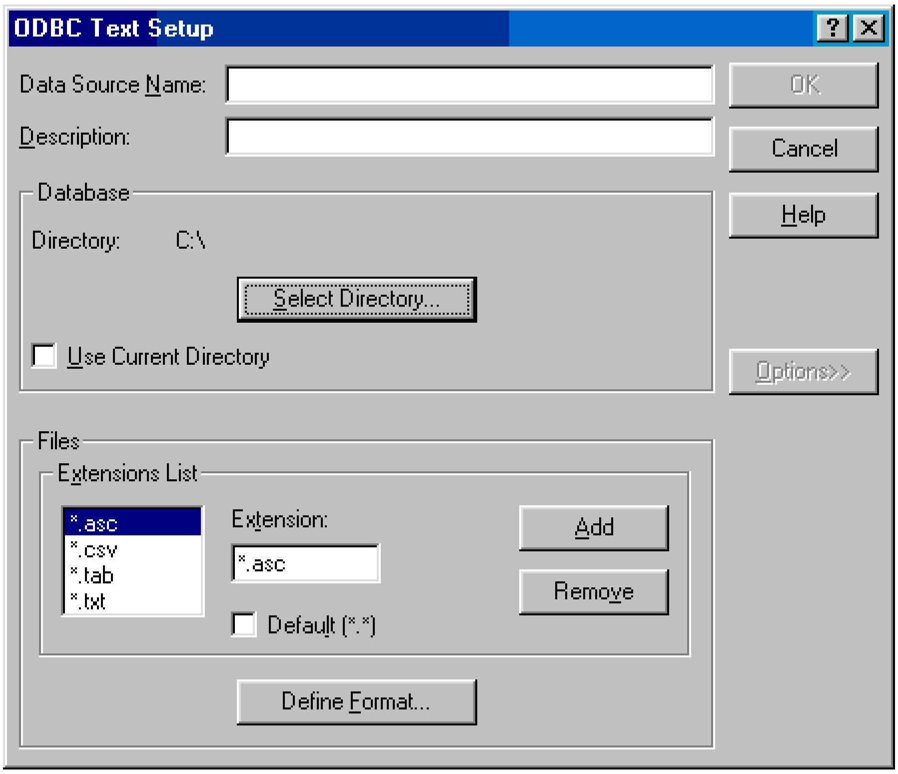
Then Select **Add...** to add a new ODBC Data Source.



Depending on the required Database connection, the correct driver should be selected. The selected driver will be used to create a new Data Source when the **Finish** button is pressed. Depending on the selected ODBC driver, a specific driver configuration window will appear. This driver specific configuration window has to be configured to further finalize the ODBC connection with the correct parameters.

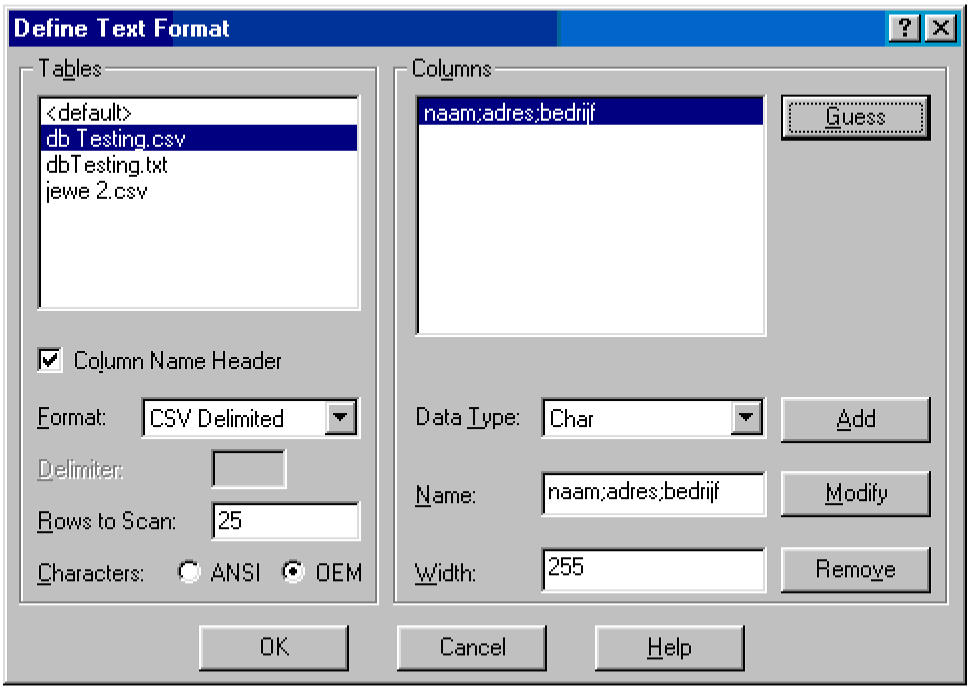
14.6.7.1 ODBC text and CSV database files

If the **Microsoft Text Driver (*.txt,*.csv)** is selected, it will show the **ODBC text setup** dialog.
The **ODBC text setup** dialog is used to configure the ODBC driver for a text based database.

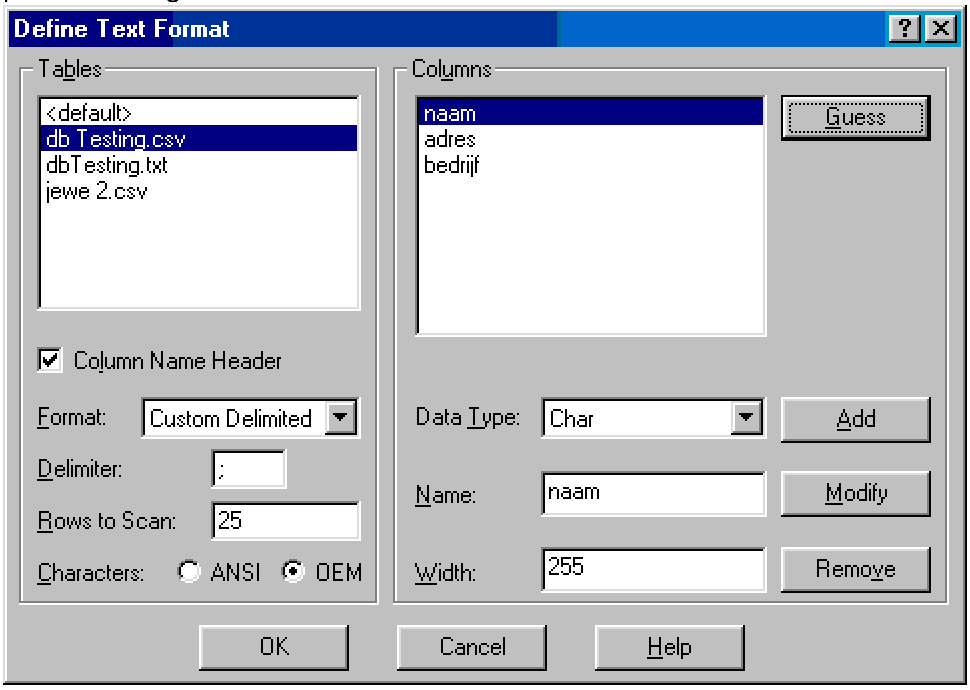


In this window we need to set several items:

- **Data Source Name** — This just a name for the setup you are making, name this Radimation, or another descriptive name for the used database
- **Select Directory...** — Allows to select the directory in which the text based database files are stored
- **Use Current Directory** — Overrules the selected directory to use the current directory. It is best to turn this checkbox off, and select a specific directory by using the **Select Directory...** button
- **Extensions List** — Shows a list of filename extensions which will be used to determine the correct text files. Remove *.asc and *.tab from the extentions list
- **Define Format...** — Will show the **Define Text Format** dialog, which can be used to define the format of the database as it is maintained in the text file



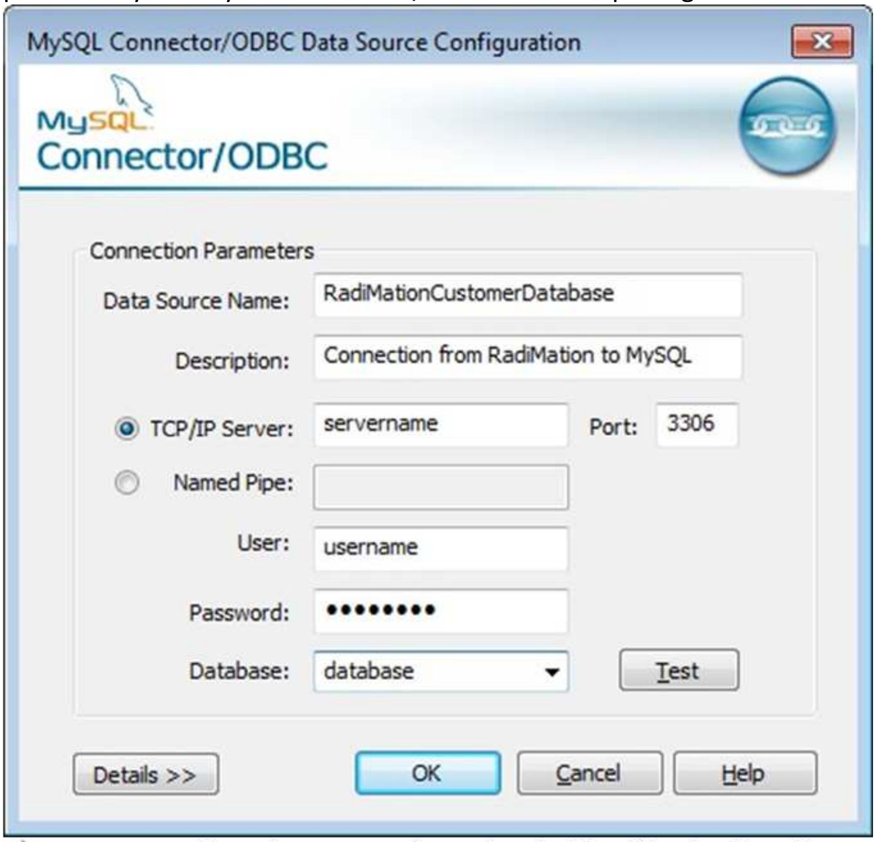
Select the file you want to use, check the **Column Name Header** checkbox and select the format. Press **Guess** button to see if the column headers from your database are set correctly. In the screenshot above the columns are not set correctly. The .csv file format is different, to solve this press the **Format** combobox and select **Custom Delimited**. Insert ';' in the delimiter textbox and press **Guess** again.



Now everything is set correctly, close all windows by pressing the **Ok** button on every window. Once the ODBC Data Source connection is correctly configured, the configuration of the customer database in RadiMation® can be performed.

14.6.7.2 MySQL ODBC database

If the **MySQL ODBC Driver** is selected, it will show the **MySQL Connector/ODBC Data Source Configuration** dialog.
The **MySQL Connector/ODBC Data Source Configuration** dialog allows you to configure the details of an ODBC connection to a MySQL database. This dialog is not part of RadiMation®, but it is provided by the MySQL Connector/ODBC software package.



- **Data Source Name**: An unique name that uniquely identifies the Data Source from the other available Data Sources.
- **Description**: Any additional information regarding the Data Source
- **TCP/IP Server**: The name (or IP address) of the MySQL server, to which a connection should be made
- **Port**: The port-number to which the which the connection should be made. By default this is port-number 3306
- **User**: The name of the MySQL user that should be used to connect to the MySQL Server
- **Password**: The password of the MySQL user that should be used to connect to the MySQL Server
- **Database**: The name of the MySQL database that should be connected to

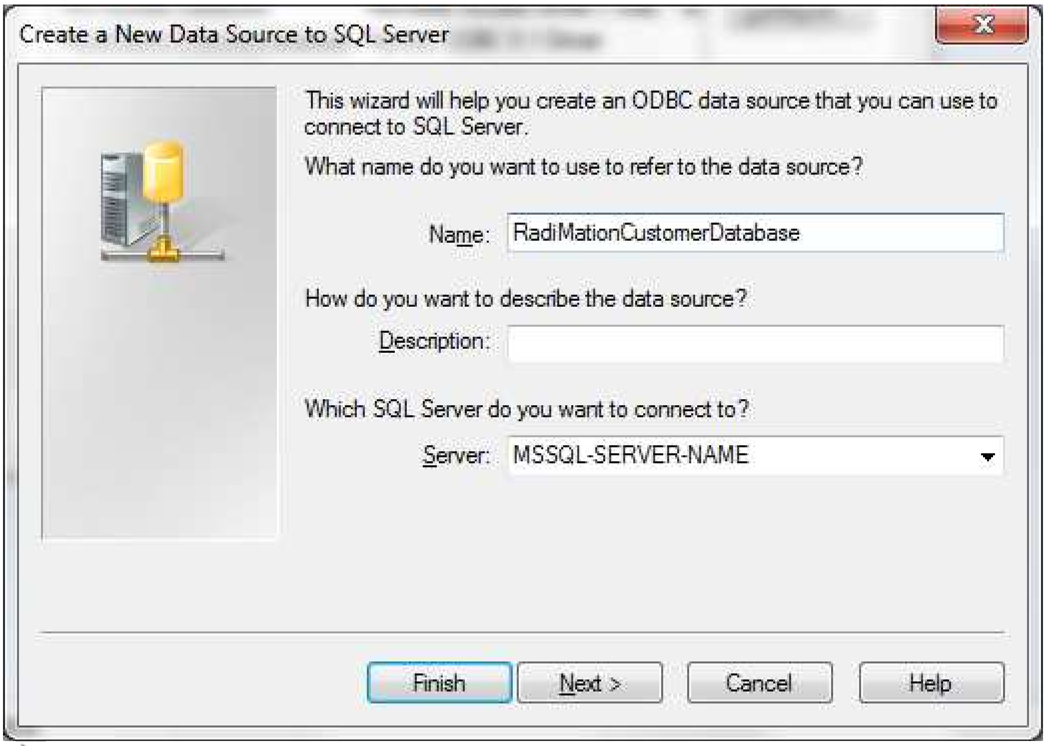
➢ **Test** Will perform a connection test to the specified MySQL server and Database

➢ **Details >>** Will show additional configuration details for the MySQL connection. Your MySQL database administrator can help you with setting this details.

Once the MySQL ODBC Data Source connection is correctly configured, the configuration of the customer database in RadiMation® can be performed.

14.6.7.3 MSSQL ODBC database

If the **SQL Server** driver is selected, it will show the **SQL Server ODBC Driver Configuration** dialog. The **SQL Server ODBC Driver Configuration** dialog allows you to configure the details of an ODBC connection to a MSSQL database. This dialog is not part of RadiMation®, but it is provided by Microsoft.

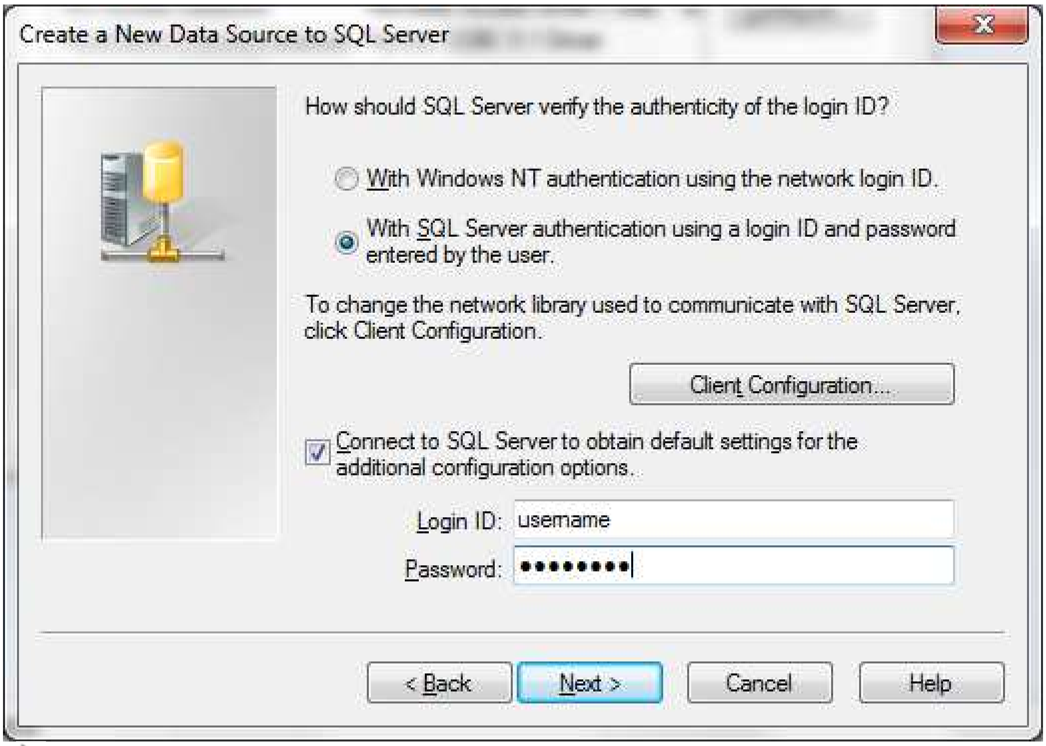


➢ **Name** An unique name that uniquely identifies the Data Source from the other available Data Sources.

➢ **Description** Any additional information regarding the Data Source

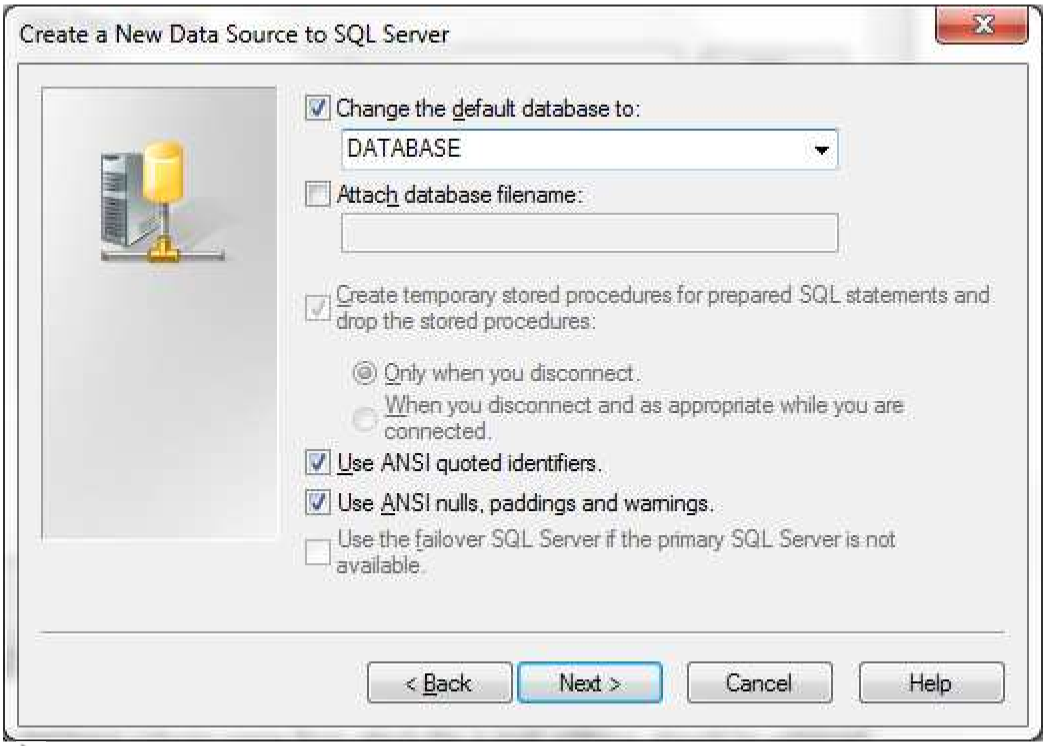
➢ **Server** The name (or IP address) of the MSSQL server, to which a connection should be made

When the **Next >** button is pressed, a second configuration dialog is shown.



- **Windows NT Authentication** Select this option to use the credential of the logged in user to connect to the MSSQL server.
- **SQL Server Authentication** Select this option to use a SQL Server specific username and password to connect to the MSSQL server.
- **Client Configuration...** Will show additional configuration details for the MSSQL connection. Your MSSQL database administrator can help you with setting this details.
- **Login ID** The name of the MSSQL user that should be used to connect to the MSSQL Server
- **Password** The password of the MSSQL user that should be used to connect to the MSSQL Server

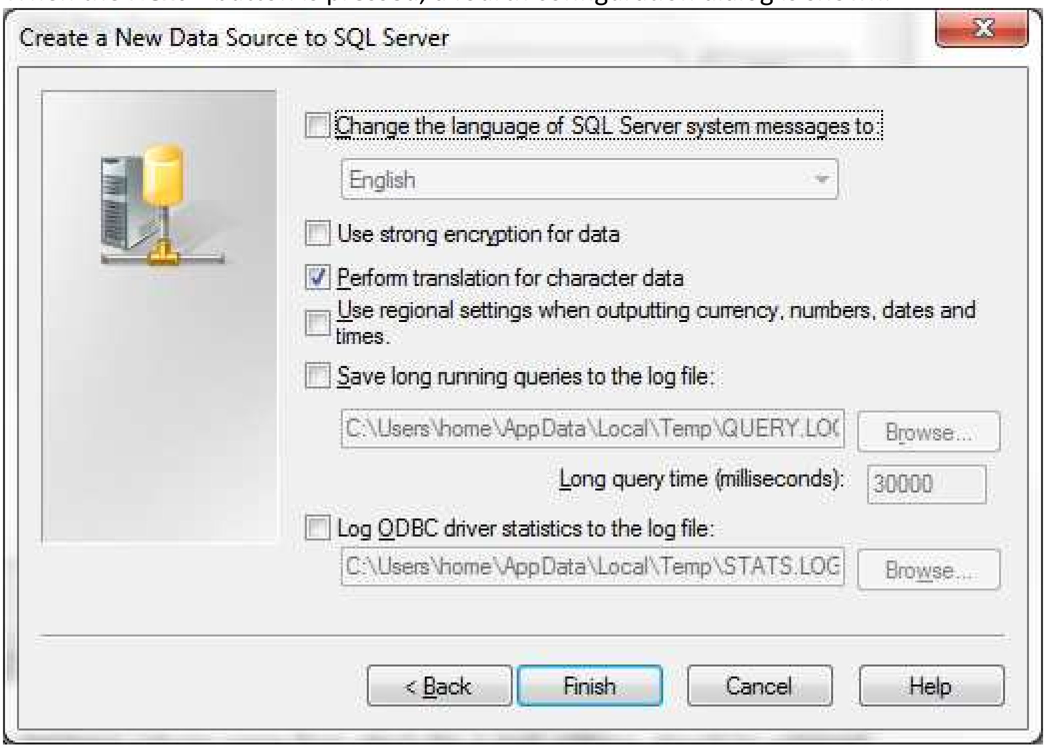
When the **Next >** button is pressed, a third configuration dialog is shown.



➢ **Change default database**	Enable the option, and specify or select the name of the database on the MSSQL Server that should be used.

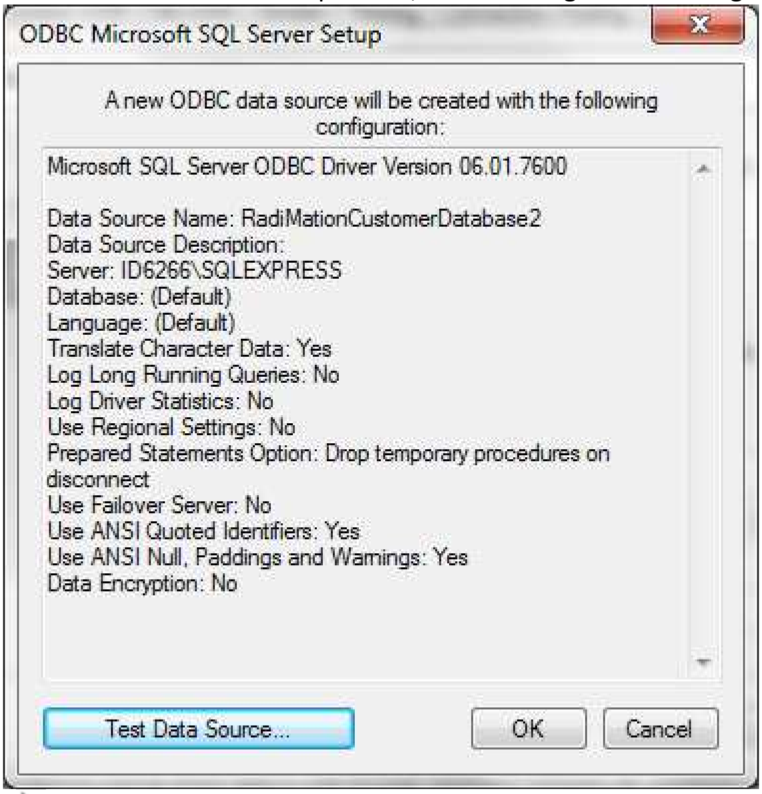
All other parameters should be left on their default value, or they should be set accoording to the instructions of your MSSQL database administrator.

When the **Next >** button is pressed, a fourth configuration dialog is shown.



All arameters should be left on their default value, or they should be set accoording to the instructions of your MSSQL database administrator.

When the **Finish** button is pressed, a final configuration dialog is shown.



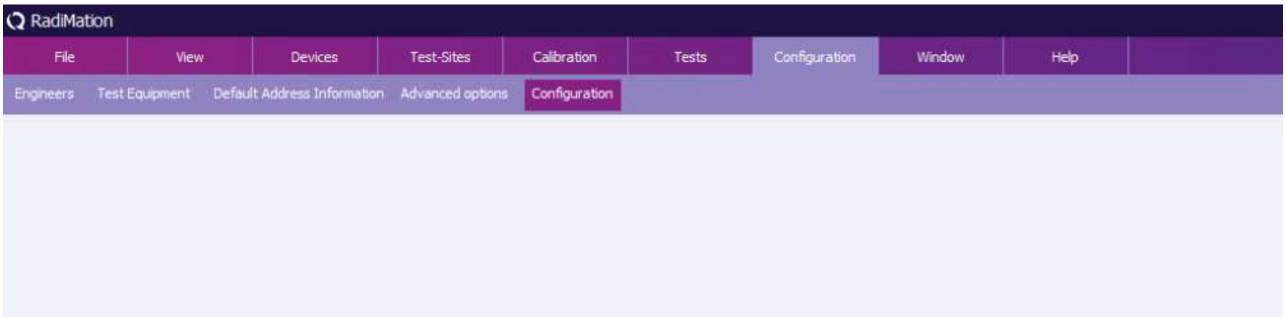
- **Test Data Source...** Will perform a connection test, to determine if a connection with the MSSQL server can be established, using the configured parameters. A confirmation or error dialog with some additional information will be shown.
- **Ok** Stores the configured ODBC connection.
- **Cancel** Closes the dialogs without creating an ODBC connection.

Once the MSSQL ODBC Data Source connection is correctly configured, the configuration of the customer database in RadiMation® can be performed.

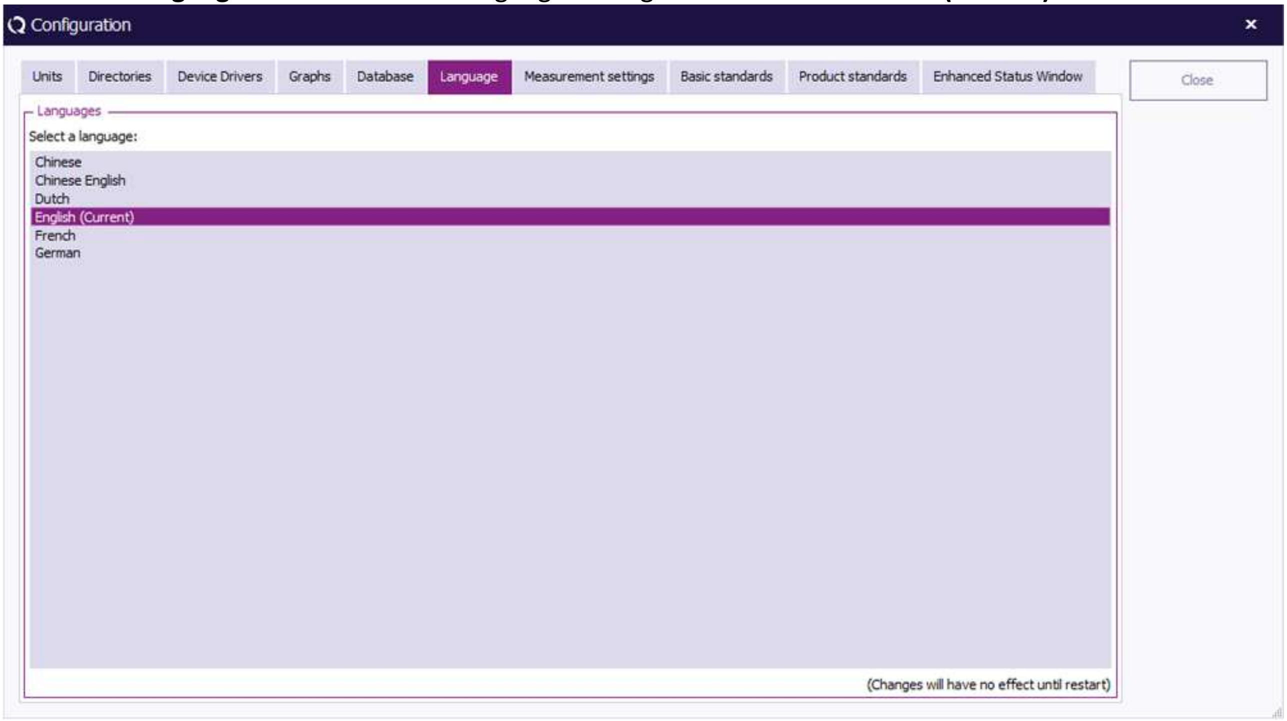
14.6.8 6. Language Selection

RadiMation® supports multi-language use. This means that the software package can be operated in several language.
In addition, the multi- language support allows for easy translation from English to most other languages.
Please contact your local reseller for the availability of your required language driver.

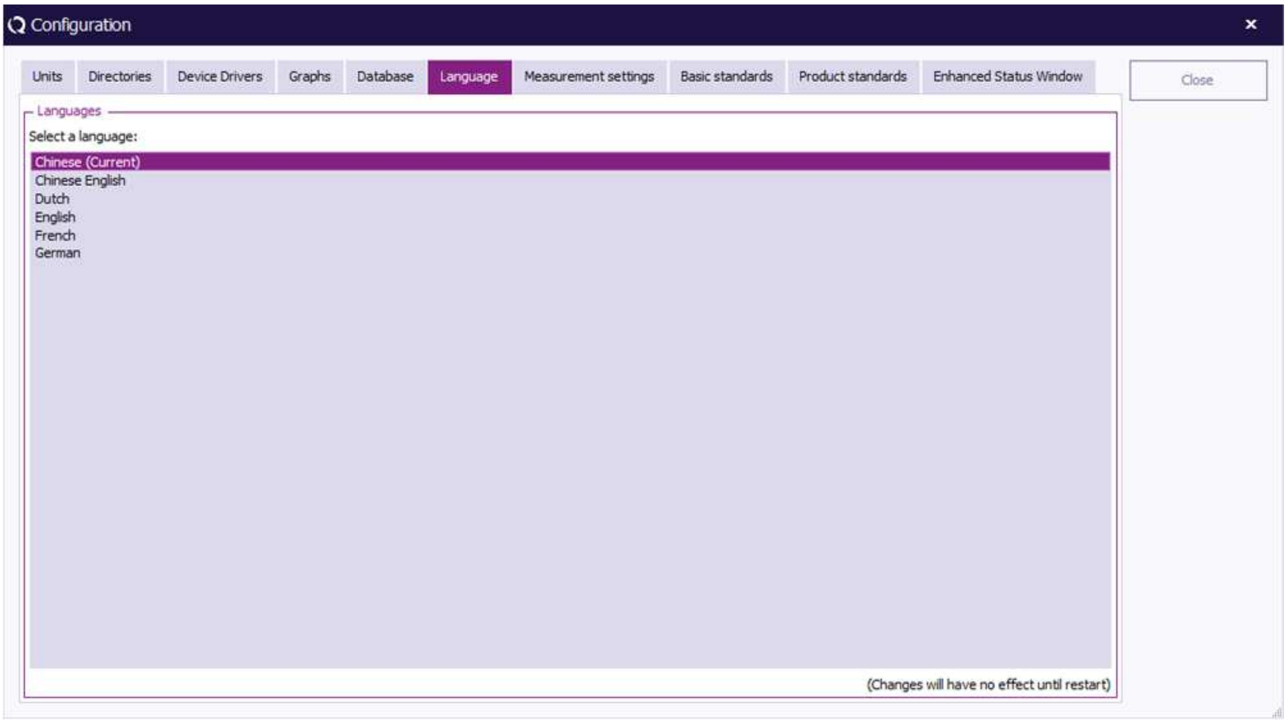
The default language of RadiMation® is UK English.
To change the language settings, go to the **'Configuration' window** in the **'Configuration' tab**.



Go to the **'Language' tab**. The current language setting is marked with the text **(current)**.

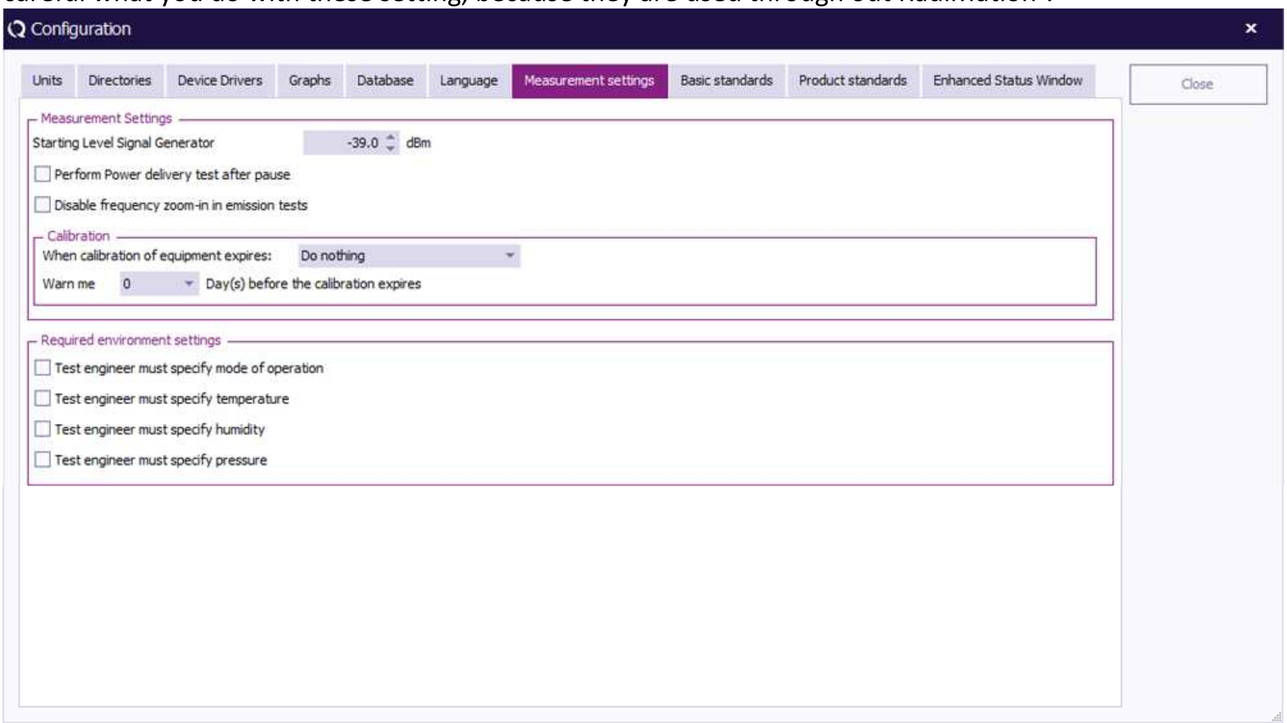


To change the language setting, select one of the other languages, click **'Close'** (to leave the **'Configuration' window**) and restart RadiMation®.
The selected language will only be active after RadiMation® is restarted.



14.6.9 7. Measurement Settings

With measurement settings you can change the behavior of the software at certain points. Be very careful what you do with these setting, because they are used through out RadiMation®.



14.6.9.1 Starting level signal generator

With the 'Starting Level Signal Generator' you can define the level of the signal generator at the start of an immunity test.

14.6.9.2 Perform power delivery test after pause

'Perform Power delivery test after pause' is very helpful if you chose to change the RF path during the pause.
For example:

- Changing the antenna. It will show high refelected power if the antenna is not correctly connected.
- Changing the switch matrix to ensure a safe working area while changing something on the EUT. It will show you whether or not you are injecting power inside the chamber.

14.6.9.3 Disable frequency zoom-in in emission tests

'Disable frequency zoom-in in emission tests' can be used to decrease the measuring time by not trying to pin point the most accurate frequency. This can be a very useful option for labs that are only interested in the overall envelope of the emission.

Warning: Disabling the 'zoom-in in emission tests' in combination with analysers will very likely result in an incorrect measurement.

14.6.9.4 Calibration

The 'Calibration' field can be used to specify the behavior of the software with regards to the calibration date of the equipment. This may vary between 'a simple warning message' and 'stopping measurements from being done'.

14.6.9.5 Required environment settings

With the required environment settings you can force the test engineer to fill in specific Environmental Data settings. The first test done with a new EUT document requires the engineer to fill in the requested information. The second time a button will appear that will allow you to automatically fill in the same information as used in the previous test.

14.6.10 8. Product Standard

14.6.10.1 Introduction

Product Standards describe the requirements (e.g. dimensional, technical, etc.) and the methods of testing (as well as grading, marking, etc.) of a product.
The objective of these standards is to define and impose 'standards' that will ensure that the product in question will not represent harm or hazard to consumers.
Because the standards with regards to product testing can be relevant to RadiMation® users, RadiMation® offers the possibility to add this documentation to your configuration.

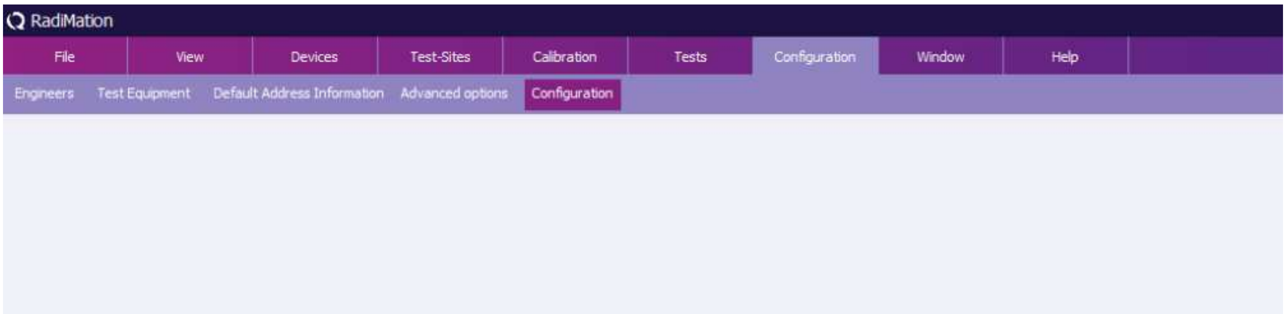
There are many Product Standards for individual products and product types. These, in turn, often refer to multiple Basic Standards.
Where a Product Standard describes all the tests that should be performed on a EUT, a Basic Standard only describes one single test.
For example:

The Product Standard for product X describes four different requirements/tests that the product needs to comply with.
These four tests are described in four Basic Standards, where each basic standard describes the requirements for one test.

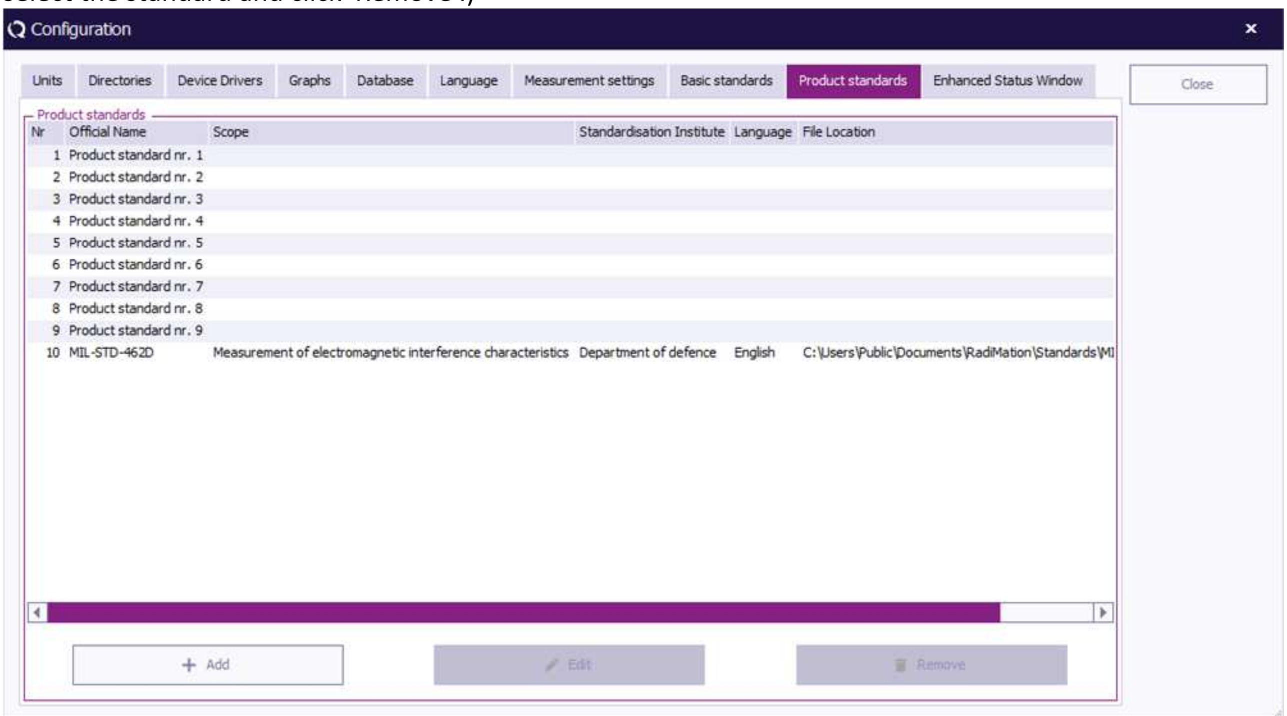
Basic Standards can also be added to RadiMation®.
In addition, one single Technical Setup File (TSF) can be generated for each Basic Standard, configured to perform the test as described in the standard.

14.6.10.2 Adding a Product Standard

To add a Product Standard to RadiMation®, go to the **'Configuration' window** in the **'Configuration' tab**.

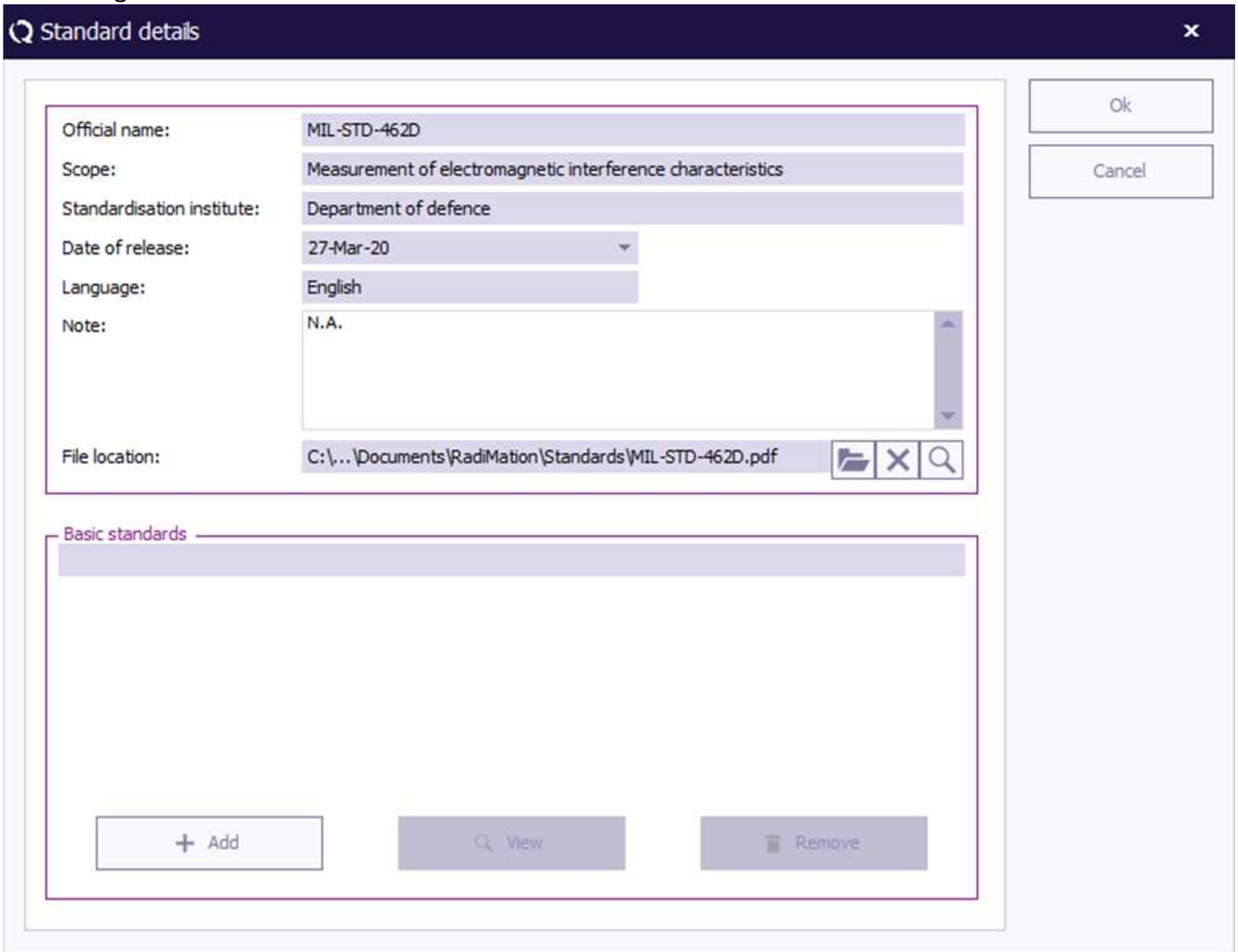


Select the **'Product standards' tab** and click **'Add'** .
(To edit a Product Standard, select the standard and click 'Edit'. To remove a Product Standard, select the standard and click 'Remove'.)



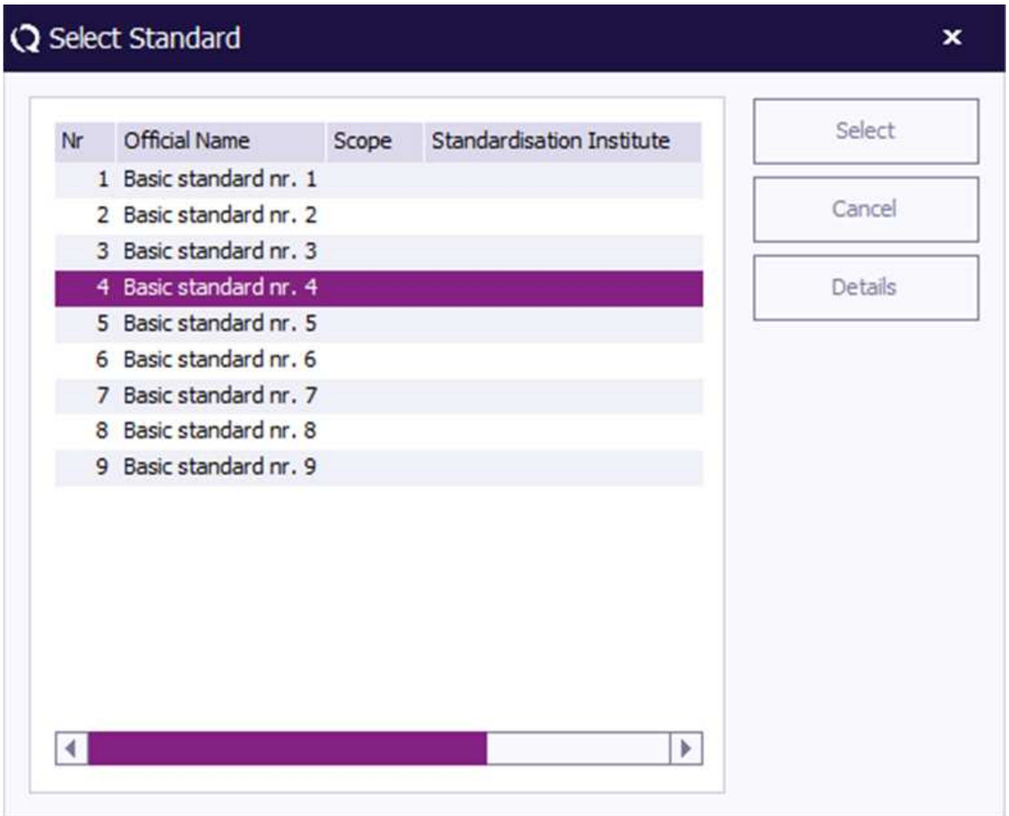
Insert the required information in the **'Standard details' window** (as visible in the example below).
Please note that the **Official name** can only be inserted the first time and has to be unique.

In addition, it is possible to link a file to the standard in the **File location** field. For example a PDF, DOC or HTML file that describes the standard.
RadiMation® will open the file (with the default reader for this file type) when the engineer selects the magnifying glass button next to that field.
To confirm your data input, click **'OK'** , to cancel your input, click **'Cancel'** . You will be returned to the 'Configuration' window.



14.6.10.3 Add(ing) Basic Standard(s)

To add a Basic Standard to the product standard, click **'Add'** . The 'Select Standard' window will appear.
Select one or more Basic Standards (hold the 'Ctrl' key to select multiple standards) and click **'Select'** .
To cancel your selection, click **'Cancel'** . You will be returned to the 'Standard details' window.
To see the details of a Basic Standard, double click the standard or click 'Details'.



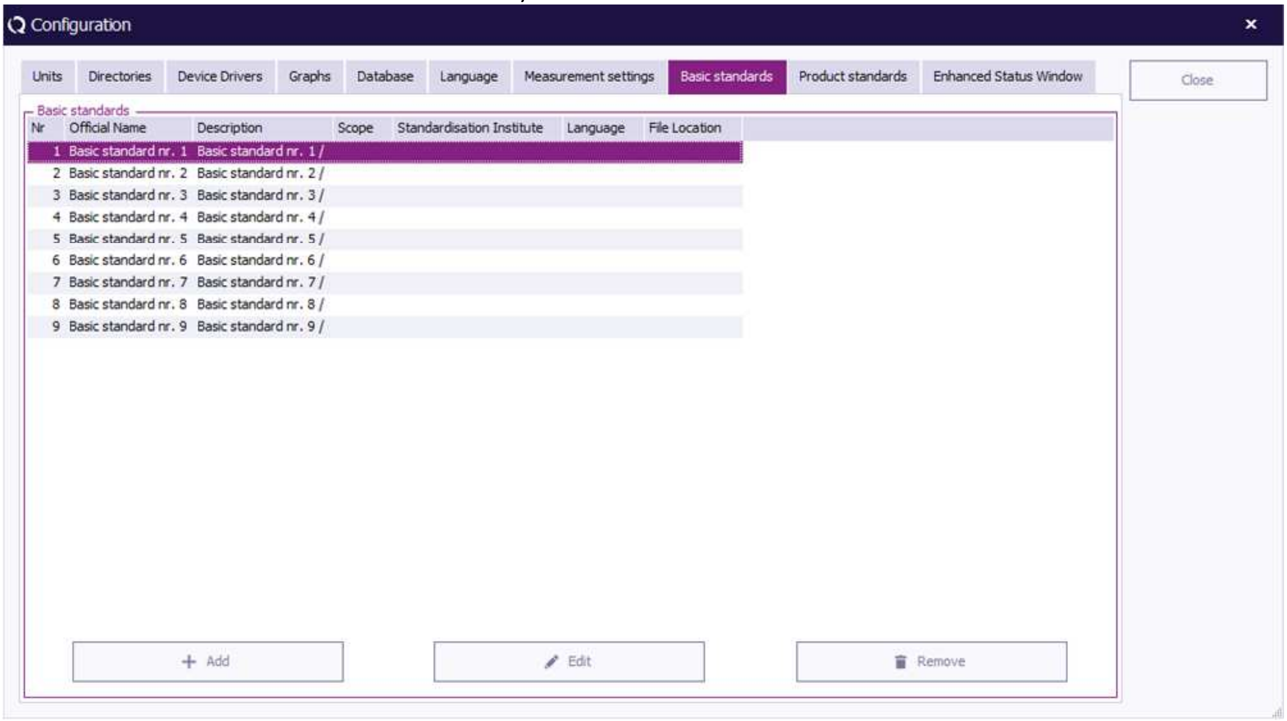
Note: When a product standard is selected or added in the 'EUT' window, the data of that standard is copied into the EUT Document. At that moment a copy of the data of the standard from the configuration is made. This means that, if the configuration of a standard in the 'Configuration' window of RadiMation® is changed, the data in the EUT file will still have the old data of the standard!!! This is as it should be, because this is the information of the standard that is used at the time that the EUT was tested.

14.6.11 9. Basic Standard

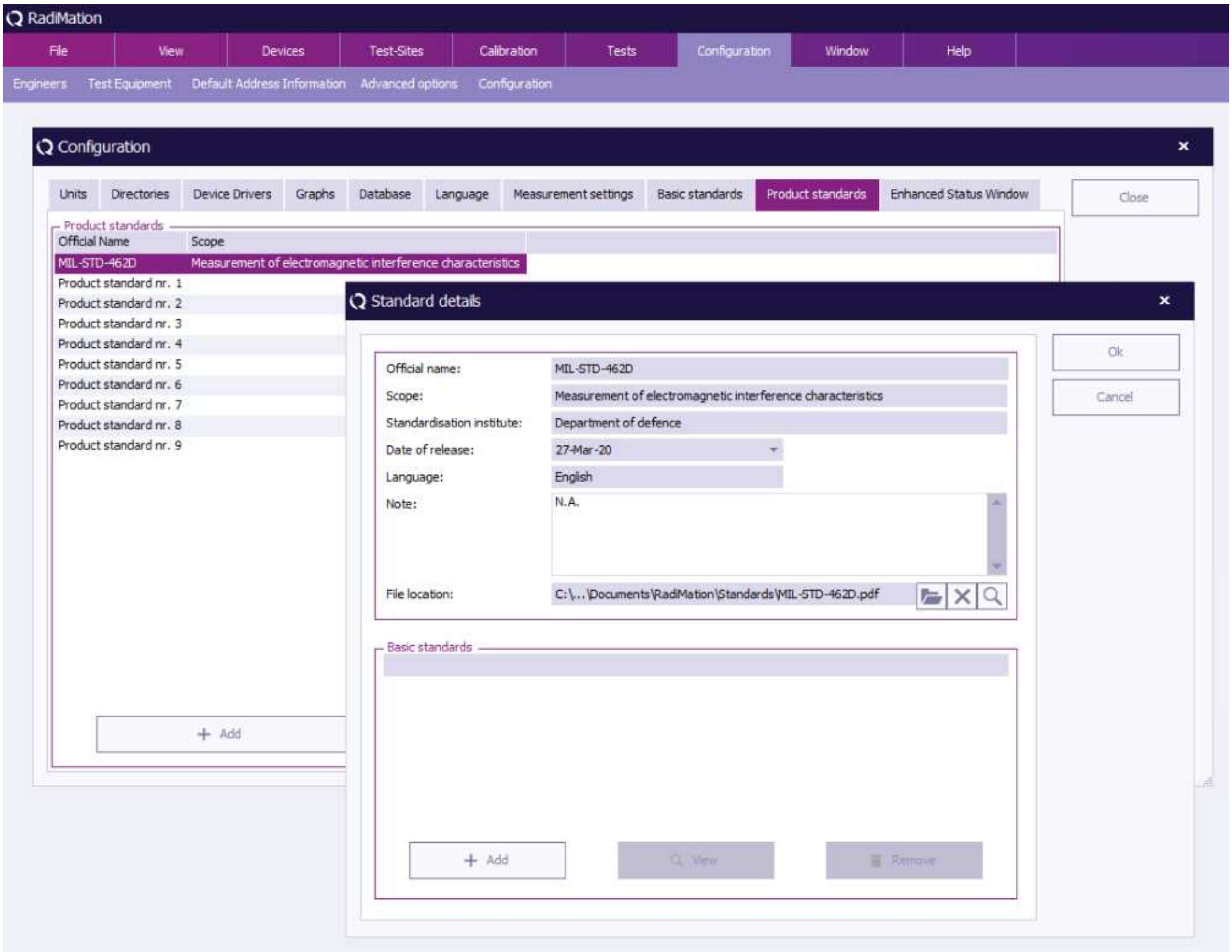
To add a Basic Standard to RadiMation®, go to the **'Configuration' window** in the **'Configuration' tab**.

Select the **'Basic standards' tab** and click **'Add'** .
(To edit a Basic Standard, select the standard and click 'Edit'. To remove a Basic Standard, select the standard and click 'Remove'.

Please note that removing a Basic Standard from the list will also remove any references of this standard entered in the Product Standards.)



Insert the required information in the **'Standard details' window** (as visible in the example below).
Please note that the **Official name** can only be inserted the first time and has to be unique.
In addition, it is possible to link a file to the standard in the **File location** field. For example a PDF, DOC or HTML file that describes the standard.
RadiMation® will open the file (with the default reader for this file type) when the engineer selects the magnifying glass button next to that field.
To confirm your data input, click **'OK'** , to cancel your input, click **'Cancel'** . You will be returned to the 'Configuration' window.



14.7 Correction files

Correction files can be used to correct the frequency response of cables, generators, clamps, antenna's, couplers etc. When the frequency response of a device is known, the operator can create a new correction file and assign it to the device.

14.7.1 Creating correction files

To create a correction file, select

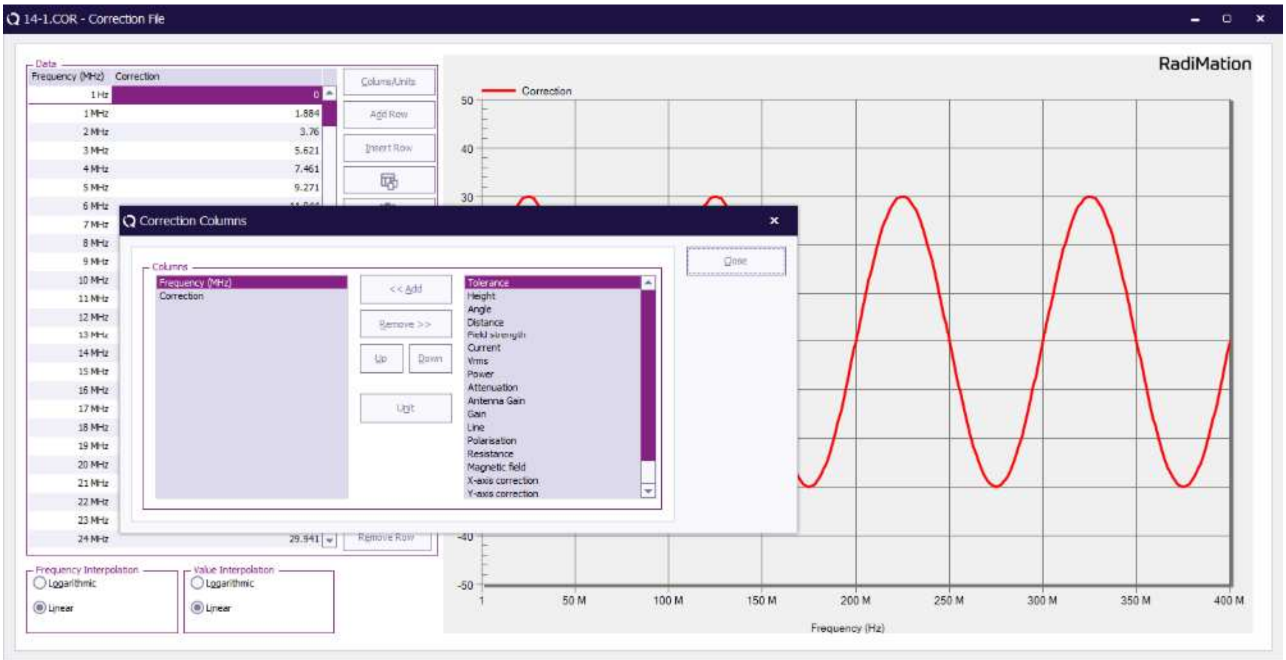
- **File**
  - **New**
    - **Correction file**

The window below will be displayed.

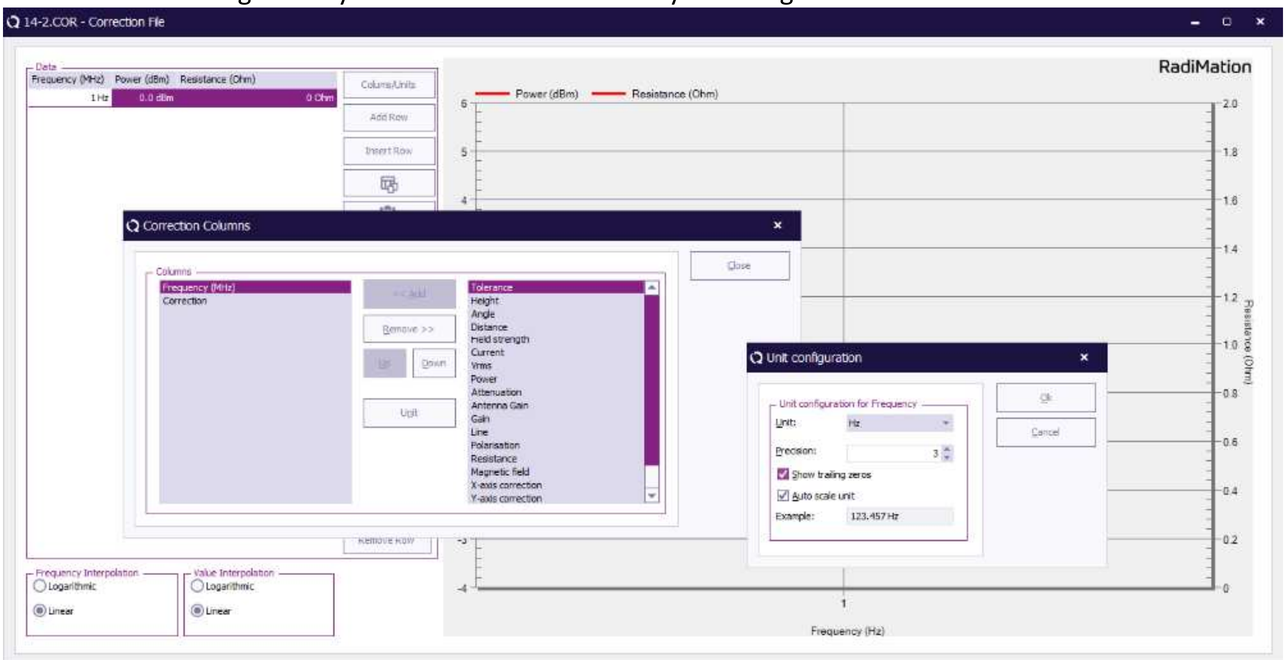
The first step is to define the columns in the table by pushing the Columns/Units button. A selection box appears and columns can be added or removed. Based on the use of the correction file the proper columns should be selected. For example an amplifier correction file will have two columns one frequency column and one power column. In the case of a radiated emission test three columns are required specifying frequency, correction, angle and height. For most columns, a unit can be specified. Values that are specified in this column will be interpreted as being values in the selected unit.

14.7.2 Adding and removing columns

Correction files are being used to correct for different devices. Look at the end of this chapter for more specific information regarding correction and the correct use in Radimation (What columns to use, what units to use etc).
You can have multiple columns, add/remove columns by using the columns/units button.



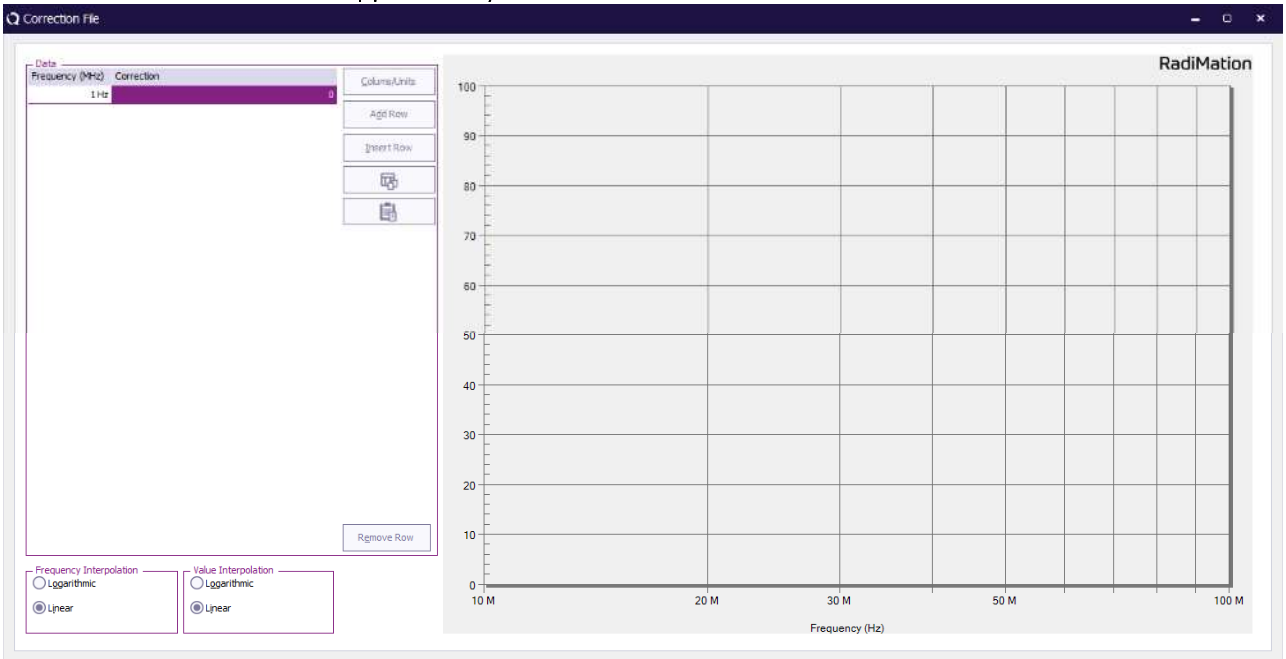
When you have added a column, you will se it on the left-hand side in the list Columns. You can define the unit being used by the column. This is done by selecting the column and click units.



As an example I have selected the frequency column and here you can define what unit you are using. This is specific for all the different categories.
You will see all units that are normally used to describe the values for the specific category.

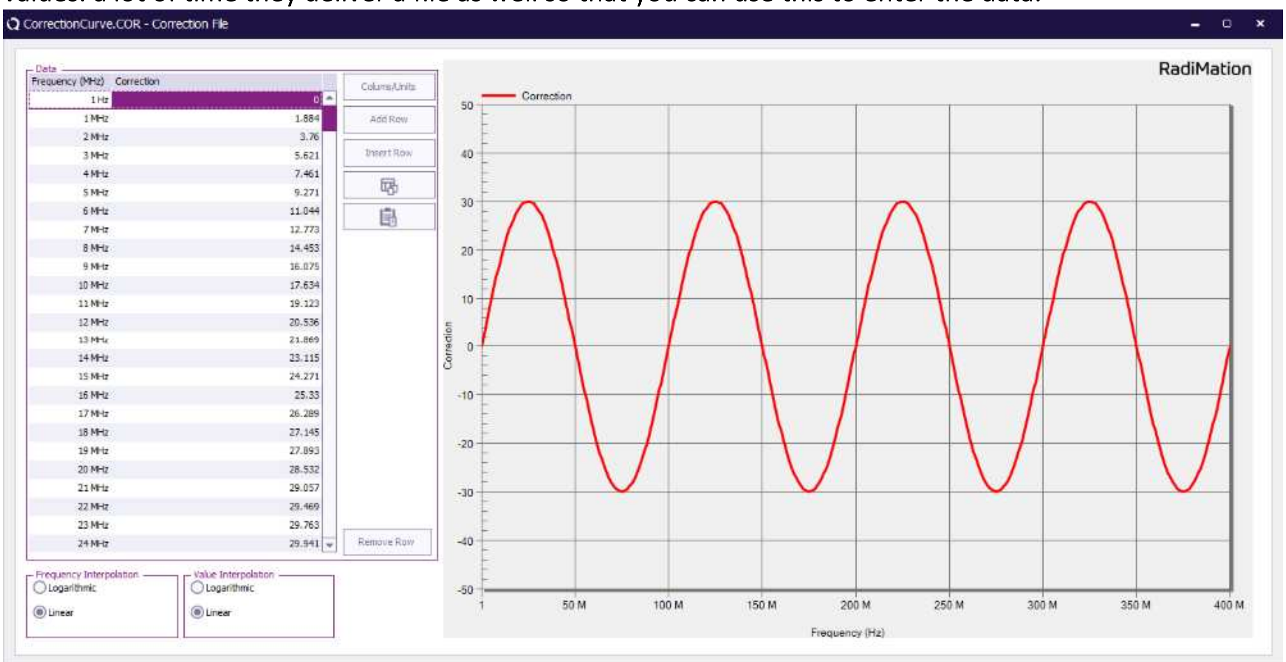
14.7.2.1 Entering data points

Data points can be entered manually and via lists. To enter data points manually, press the “Add row" button. A new line will appear and you can enter values in the columns.



When a data point is incorrect, it can be removed by selecting the data point and pressing the “Remove row” button. To insert a row use "insert row.

Correction files often contain many points which take a lot of time to enter manually. Equipment manufacturers or calibration facilities often deliver a correction sheet that contains the correction values. a lot of time they deliver a file as well so that you can use this to enter the data.

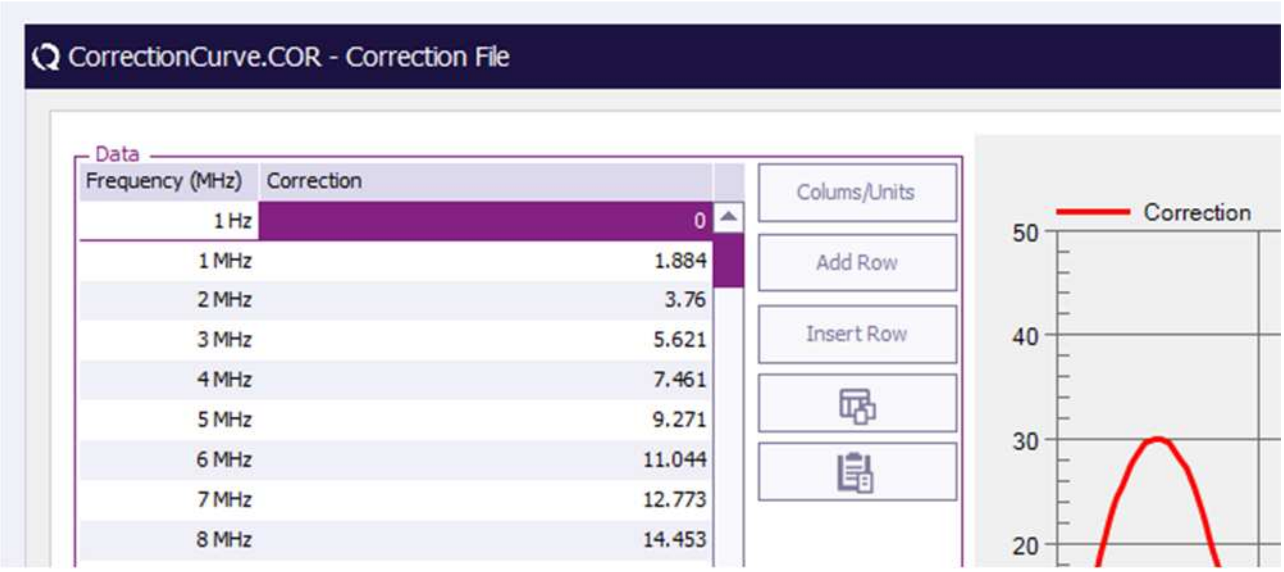


To facilitate this you have two buttons to import and export from the clipboard. This also makes it easy to transfer the data to excel and use calculations if needed.

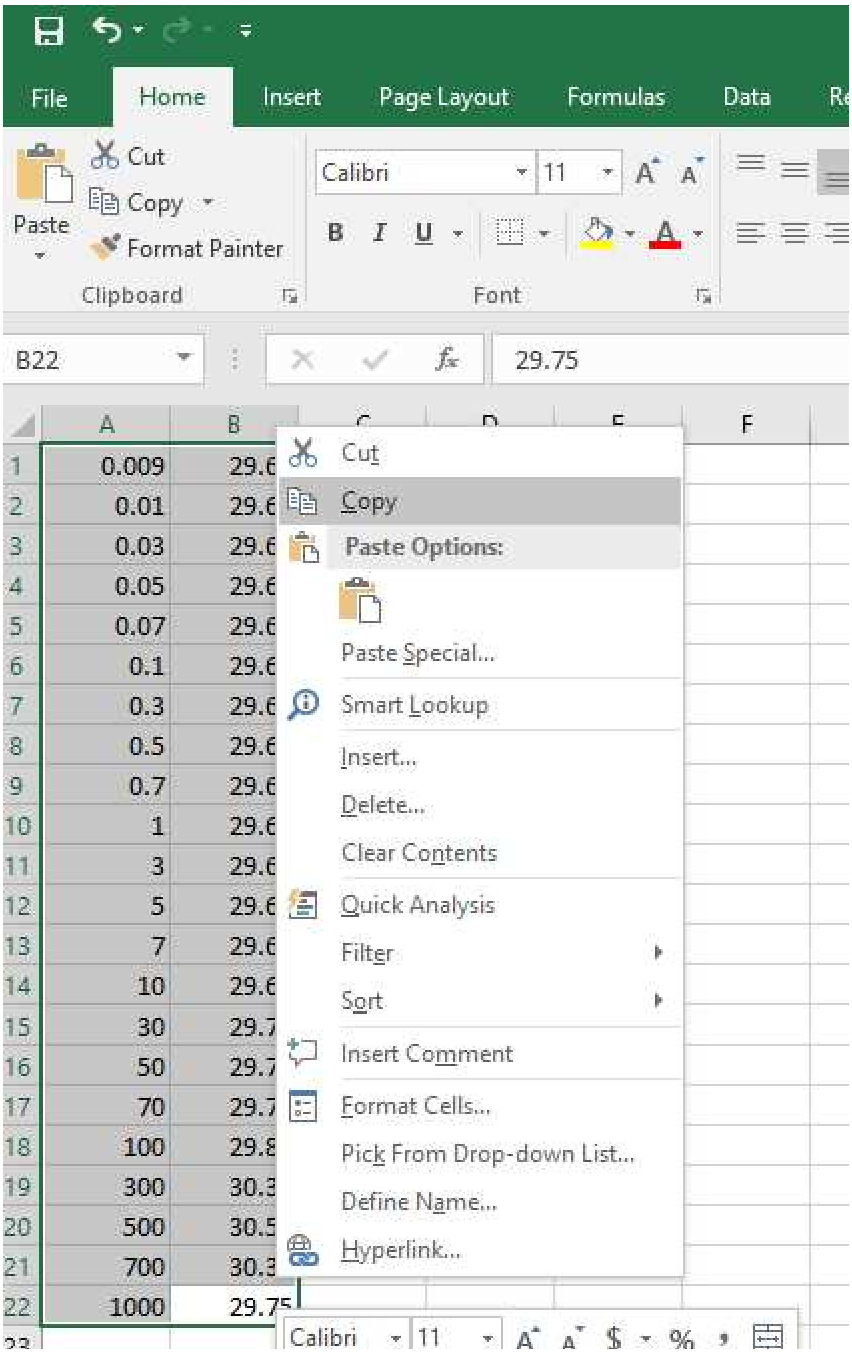
This can be done from excel files, text files, pdf files etc. In the example above you need two rows: Frequency and Correction. To be able to use the file that has been given by the manufacture to insert the correction data most of the time you have to edit it a bit. In this example this means that you must make sure that the list you are copying to the clipboard looks as follows:

9 29.69 10 29.68 etc.

To copy from excel/text file to clipboard or the other way around use the following buttons:



Below you see the list that was used to copy into the correction file to create the correction file that you see in the example above. In this example I have used excel because it is easy to remove columns etc.



This can also be done in a text editor just make sure that the information is in nice columns and separated by a space like so:
9 29.69 10 29.68

14.7.2.2 Linear/Logarithmic interpolation

The user can select either linear or logarithmic frequency interpolation. This choice is dependent on the applicable standard.

14.7.3 Saving correction files

To save the new correction file please select:

- **File**

➢ **Save correction file**

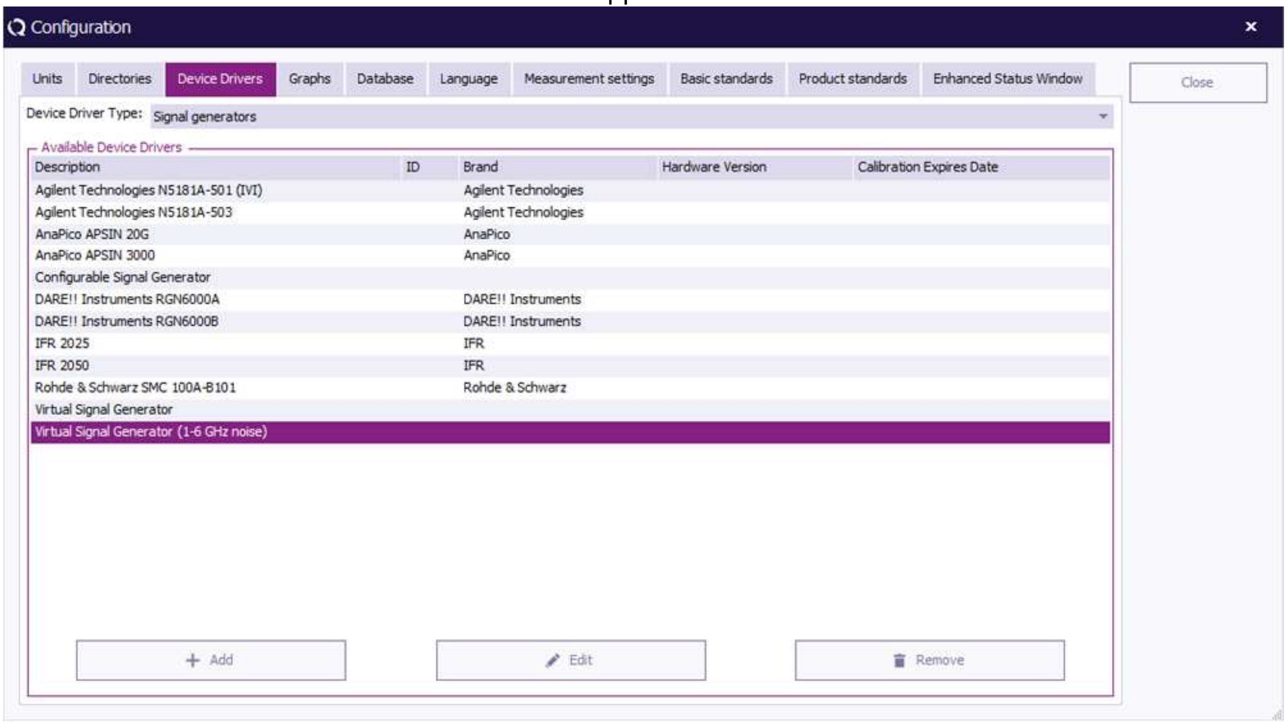
RadiMation® will prompt you to enter a filename for the correction file.

14.7.4 Attaching correction files

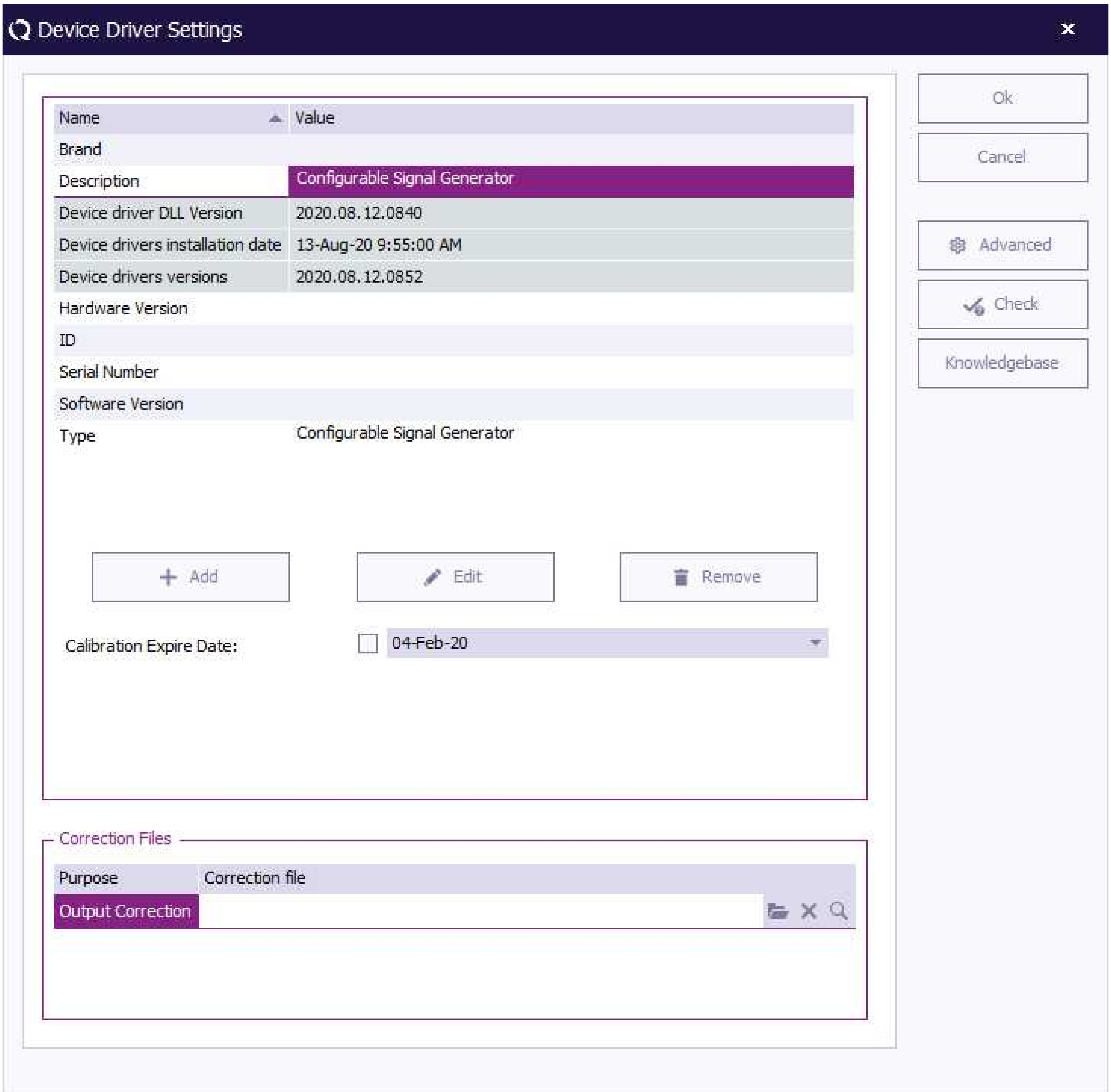
Most correction files are used for correcting a measured value of a device driver. The made correction file should therefore be 'attached' to the correct device driver.
You can attach a correction file to a device driver in the configuration screen. You can access the configuration screen by selecting

➢ **Configuration**
  ➢ **configuration**

in the main menu. The window shown below will appear.



You can select the type of device you want in the box that is situated top right. The big window will display all currently configured device drivers, like in the picture all configured Signal Generators. To edit the configuration of a device, select the device in the list and press Edit.
Now you get the configuration window of this specific device driver.



In the lower part of this window, the made correction file(s) can be selected, for one of the specified uses. The RadiMation® software will use the specified correction files, every time when the device driver is used during a test. In this example it is possible to link an 'Output correction' file to correct the output level of this Signal generator. Depending on the type of the device driver, different uses of the correction files are available. Remark: it depends on the driver and the used correction 'link', which columns are required and therefore which correction files are acceptable to be used.

14.8 Correction file uses

Correction files can be used in many situations. The type and number of columns that should be used in the correction file is depending on the in which the correction file is used.

14.8.1 Absorbing clamp: Clamp loss

The power loss inside an absorbing clamp can be corrected inside the software. A correction file with the loss should be attached to the device driver of the absorbing clamp. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Attenuation

Or

- Frequency
- Gain

The values in the correction column should be expressed in dB. The values of the correction and attenuation column, are added to the measured emission level. The values in the gain column are subtracted from the measured emission level. In this way the real emission level can be calculated.

14.8.2 Amplifier: Maximum Input

The input level of an amplifier can be protected to never be above a certain power level. A correction file with the maximum input level should be attached to the device driver of the amplifier. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Power

The values in the correction column should be expressed in dBm. The value specified in the correction or power column is the maximum allowed input power of the amplifier. During the regulation of the test-level the regulation is ensuring that the amplifier input power will not become higher than the maximum input power as specified in the correction file.
If no correction file is selected for the 'Maximum Input' of an amplifier device driver, RadiMation will limit the amplifier input power to 0 dBm. 0 dBm is very often the power level that is allowed as maximum amplifier input power without damaging the amplifier. If an amplifier is allowed to have a maximum input power above 0 dBm, a correction file with the allowed value should explicitly be selected for the 'Maximum Input'.

14.8.3 Amplifier: Maximum Forward

The forward power level of an amplifier can be protected to never be above a certain power level. A correction file with the maximum forward power level should be attached to the device driver of the amplifier. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Power

The values in the correction column should be expressed in dBm. The value specified in the correction or power column is the maximum allowed forward power. During the regulation of the test-level the forward power level is measured and the regulation is ensuring that the forward power will not become higher than the maximum forward power as specified in the correction file.

14.8.4 Amplifier: Maximum Reflected

The reflected power level of an amplifier can be protected to never be above a certain power level. A correction file with the maximum reflected power level should be attached to the device driver of the amplifier. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Power

The values in the correction column should be expressed in dBm. The value specified in the correction or power column is the maximum allowed reflected power. During the regulation of the test-level the reflected power level is measured and the regulation is ensuring that the reflected power will not become higher than the maximum reflected power as specified in the correction file.

14.8.5 Antenna: Antenna Factor

For converting the reading dBuV into dBuV/m the antenna factor is needed. This is expressed as dB/m.
The correction file should contain the columns:

- Frequency
- Correction

Where the correction column is the antenna factor. The values are added to the calculation to account for the non-linearity in the antenna.

14.8.6 Antenna: Magnetic Flux Density (pT/A) correction

During immunity measurements when a magnetic field has to be generated, this correction file is used to determine the current that should be generated during the magnetic field generation loop antenna. A correction file with the correction factor should be attached to the device driver of the antenna. The correction file should contain the columns:

- Frequency
- Correction

The value specified in the correction column should be expressed in pT/A. The values in the correction column are multiplied with the generated current to calculate the generated magnetic field in picoTesla (pT).
This correction is primarily used during the MIL-STD-461 RS101 magnetic field tests. In the MIL-STD 461, this correction value is specified as 9.5x10^7 pT/A.

14.8.7 Antenna: Magnetic Field Factor (dBpT/uV) correction

During emission measurements when the measured emission values have to be shown in magnetic field (Tesla) units, the correction factor should be configured in the software. A correction file with the correction factor should be attached to the device driver of the antenna. The correction file should contain the columns:

- Frequency
- Correction

The value specified in the correction column should be expressed in dBpT/uV. The values in the correction column are added to the measured emission levels from the measurement receiver to calculate the correct to be displayed emission values in a Tesla unit.
This same correction is also used during the MIL-STD-461 RS101 Magnetic Field calibration for the 'calibration antenna'.

14.8.8 Antenna: Reflection coefficient

The Reflection coefficient is used to correct the calculated required netto power in Watts for horn antennas to a calculated required forward power level in Watts. The Reflection coefficient is expressed as a unit less number.
The correction file should contain the columns:

- Frequency
- Correction

Where the correction column is the Reflection coefficient.

14.8.9 Antenna: Antenna Gain

The Antenna Gain correction is used to correct the calculated logarithmic gain for horn antennas based on their horn dimensions. This value is used by the calculations applicable to the calculated electrical field test levels.
The Antenna Gain is expressed in dB(i)
The correction file should contain the columns:

- Frequency
- Antenna gain

14.8.10 Antenna: GpsHt - AntHeight

This correction is only available when the Antenna Diagram module is activated. The height distance between the GPS receiver and the Antenna can be corrected by a correction file. A correction file with the height distance should be attached to the device driver of the antenna. The correction file should contain the column:

- Height

Only one row should be present in the correction file. If multiple rows are available, only the height value of the first row will be used. The value of the height column, is subtracted from the height received by the GPS receiver. The result is the exact height of the receiving antenna for the antenna diagram measurements.

14.8.11 Antenna: Ant Gain vs Angle

This correction is only available when the Antenna Diagram module is activated. The antenna gain is depend on the measuring angle during antenna diagram measurements. A correction file can be used to specify the AntennaGain depending on the receiving angle. This correction file should be attached to the device driver of the antenna. The correction file should contain the columns:

- Angle
- Attenuation

The value of the attenuation column is added to the measured radiated power.

14.8.12 Cable: Cable loss

The power loss inside a cable can be corrected inside the software. A correction file with the cable loss should be attached to the device driver of the cable. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Attenuation

Or

- Frequency
- Gain

The values in the correction column should be expressed in dB. Cable device drivers can be used in different parts of a test-site setup. But they all have in common that an 'interesting' power-level is attenuated by the cable before it is measured by a measuring device (most of the time a powermeter, receiver or an analyser). The values of the correction and attenuation column are therefore added to the measured powerlevel. The values in the gain column are inverted before they are added to the measured powerlevel.

14.8.13 Calibration Jig: Transfer correction

The transfer factor of a calibration jig can be corrected inside the software. A correction file with the correction should be attached to the device driver of the calibration jig. The correction file should contain the columns:

- Frequency
- Correction

The value specified in the correction column should be expressed in dB and the value is added to the typical transfer factor of a calibration jig. For example: A calibration jig is used with a typical transfer factor of 9.6 dB (correction for 150 Ω to 50 Ω). A correction file with a frequency and correction column is connected to the device driver. The value specified in the correction column for 1.23 MHz. is 0.3 dB. Then the software will use a total transfer factor for the calibration jig of 9.9 dB.

If the jig is not "Configurable" there is a default correction factor of 9.5 dB (theoretical value). We will explain how the presence of a correction factor is it taken into account by RadiMation and how this value is used by an example. For instance we have the following situation: At 150 kHz the real total correction factor of the jig is 10 dB. When this value is saved in the correction file, what will be the behavior of RadiMation? Will it now take the 10 dB as the total transfer correction? The answer is that the correction value will be added, but RadiMation will use this specified 10 dB correction on top of the internal correction value. In this case it is not correct and a correction of app. 0,5 should have been used.

There are two categories of Injection devices:

- 50 Ohm. (E.g. Luthi CR 100 A, Tegam 95241, FCC BCICF)
- 150 Ohm. (E.g. Luthi EM 101, MEB KAL-M2, MEB KAL-KEMZ, FCC F-203I-CF-23mm)

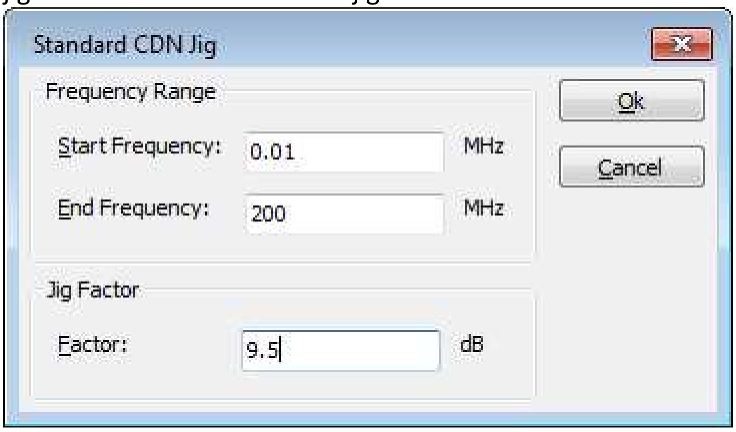
Depending on the used injection device, a matching calibration jig is necessary to correctly calibrate the injection device. Based on the impedance of the injection device, the calibration jig should be corrected with a value. In RadiMation we use the principle that we already programmed the correct correction value in the device driver of the calibration jig. This simplifies the implementation of our software, as you only have to select the correct device driver, and RadiMation automatically knows the correct correction value for the calibration jig.

This implies that:

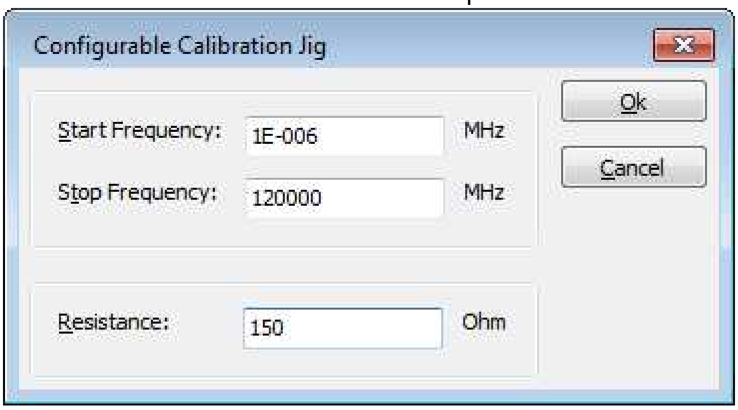
- The device drivers for the calibration jigs for the 50 Ohm injection devices already have an internal correction factor of 0 dB.
- The device drivers for the calibration jigs for the 150 Ohm injection devices already have an internal correction factor of 9.5 dB (9.5424 dB to be more exact).

We are aware that it is not very clearly visible which correction factor is used inside a device driver of the calibration jig. That is why the newer device drivers, report the frequency range and the correction factor that is programmed inside the RadiMation device driver of a calibration jig. When you want to retrieve this information (shown in a 1 digit precision) just press the 'Advanced' button on the device driver configuration window.

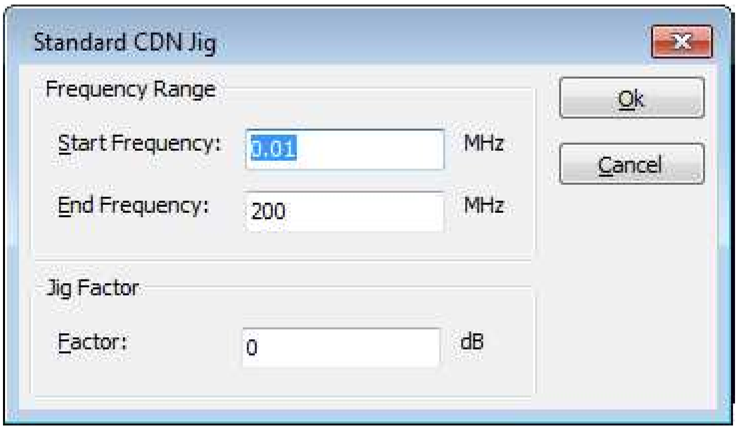
In this example we are using a jig for a CDN where the jig has 100 Ohm resistors in the connection. In this case a 150 Ohm system (as the 100 Ohm resistors are in series with the coax which already has a 50 Ohm resistance) is used.
The calibration jig value (as a factor or as a resistance) is only used for a conversion of the impedance of the CDN to the 50 Ohm typical impedance of the coax cables and powermeters. In some RadiMation device drivers a resistance should be specified, and in other device drivers a calibration jig factor should be specified. If a resistance should be specified in a device driver, the calibration jig factor is calculated using the formula:
calibration jig factor = 20 * log10(<resistance [Ohm]> / 50)
For a 150 Ohm system the correct jig transfer factor is 9.5 dB. Depending on the selected calibration jig device driver a calibration jig factor of 9.5 dB should be selected:



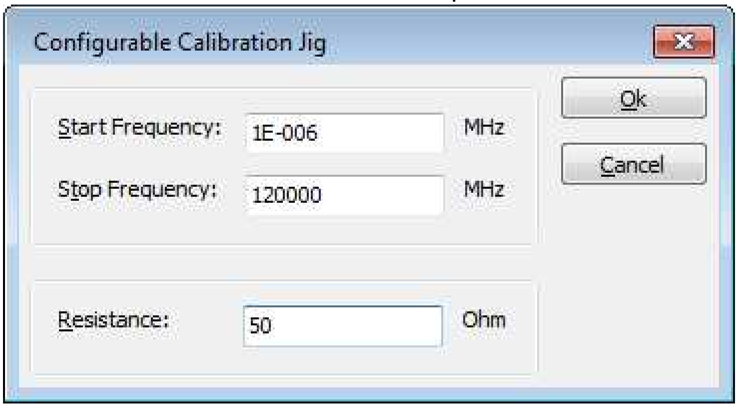
or a resistance of 150 Ohm should be specified for the 150 Ohm system:



For a 50 Ohm system, (where no 100 Ohm resistors are included in the calibration jig) the calibration jig factor should be 0 dB:



or a resistance of 50 Ohm should be specified:



14.9 Using a transfer correction file provided by the supplier

Sometimes a file with values for the transfer correction is delivered by the manufacturer. It is unusual and does not happen that often. If you would like to use the transfer file provided by the manufacturer you have to set the correction factor described above to zero dB. The correction file is then attached directly to the jig. However you should then use a congifurable driver for the jig where you manually set the transfer factor to 0dB. If you use the original driver then the correction factor is added with the programmed factor for that driver.
Normally it is not needed to add this transfer file and using the correct driver for the jig should have the correct factor already added nominally. It is also unusual for manufacturers to add the transfer factor but sometimes this is delivered.

14.9.1 Coupler: Forward Correction

The forward power attenuation of a coupler can be corrected by a correction file. A correction file with the correction should be attached to the device driver of the coupler. The correction file should contain the columns:

- Frequency
- Correction. The values in the 'Correction' column should be expressed in dB, and these values are added to the typical attenuation of the coupler.

Or

- Frequency
- Attenuation. The values in the 'Attenuation' column are added to the typical attenuation of the coupler.

Or

- Frequency
- Gain. The values specified in the 'Gain' column are subtracted from the typical attenuation of the coupler.

For example: A coupler is used with a typical forward attenuation of 60 dB. A correction file with a frequency and attenuation column is connected to the device driver. The value specified in the attenuation column for 100 MHz is 1.3 dB. Then the software will use a value of 61.3 dB for the total attenuation of the coupler.

14.9.2 Coupler: Reflected Correction

The reflected power attenuation of a coupler can be corrected by a correction file. A correction file with the correction should be attached to the device driver of the coupler. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Attenuation

Or

- Frequency
- Gain

The value specified in the gain column is substracted from the typical attenuation of the coupler. The values in the correction or attenuation column is added to the typical attenuation of the coupler. For example: A coupler is used with a typical reflected attenuation of 40 dB. A correction file with a frequency and attenuation column is connected to the device driver. The value specified in the attenuation column for 130 kHz. is 0.13 dB. Then the software will use a value of 40.13 dB for the total attenuation of the coupler.

14.9.3 Current sensor: impedance

The impedance of a current sensor is very important to calculate the correct measured current. The impedance is current sensor and frequency dependant. Before a current sensor can be used, an impedance correction file should be attached to the device driver of the current sensor. The value specified in the correction file is used to correctly calculate the current flowing through the current sensor. The correction file should contain the columns:

- Frequency
- Correction. The values in the 'Correction' column should be expressed in Ohm (Ω).

Or

- Frequency
- Resistance. The values in the 'Resistance' column will use the unit that is configured for the 'Resistance' column.

14.9.4 Field sensor: Field offset

The measured value of a field sensor, can be corrected by the software. The measured value can be corrected with an offset, or it can be corrected by a multiply factor. Both corrections can also be used together but the multiply correction will be performed first, and after that the offset correction will be added. The correction files with the correction should be attached to the device driver of the field sensor. The correction file for the field offset should contain the columns:

- Frequency
- Correction. The values in the correction column of the offset correction should be expressed in V/m.

To summarize this in an example, let’s assume that the uncorrected field probe measurement at 90 MHz is 10.2 V/m. When a Field offset correction for that same frequency of 2.0 V/m is specified, RadiMation will use a corrected field strength of 12.2 V/m (10.2 V/m + 2.0 V/m).

14.9.5 Field sensor: Field Multiply

The measured value of a field sensor, can be corrected by the software. The measured value can be corrected with an offset, or it can be corrected by a multiply factor. Both corrections can also be used together but the multiply correction will be performed first, and after that the offset correction will be added. The correction files with the correction should be attached to the device driver of the field sensor. The correction file for the multiply should contain the columns:

- Frequency
- Correction. The values in the 'Correction' column should be expressed as x (multiplier).

To summarize this in an example, let’s assume that the uncorrected field probe measurement at 90 MHz is 10.2 V/m. When a Field multiply correction for that same frequency of 1.1x is specified, RadiMation will use a corrected field strength of 11.22 V/m (10.2 V/m * 1.1).

14.9.6 LISN: Amplitude correction

The power loss inside an LISN can be corrected inside the software. A correction file with the correction should be attached to the device driver of the LISN. The correction file should contain the columns:

- Frequency
- Correction

The values in the correction column should be expressed in dB. The values of the correction column are added to the measured emission level. In this way the real emission level can be calculated.

14.9.7 Powermeter: Power correction

The measured power level of a power meter can be corrected with a certain value. A correction file with the correction should be attached to the device driver of the powermeter. The correction file should contain the columns:

- Frequency
- Correction

Or

- Frequency
- Attenuation

Or

- Frequency
- Gain

The values in the correction column should be expressed in dB. The value specified in the attenuation column is subtracted from the measured power level. The values in the correction or gain column is added to the measured power level. For example: A power level of -14.58 dBm is measured with a power-meter. A correction file with a frequency and attenuation column is connected to the device driver. The value specified in the attenuation column for 81.7 MHz. is 0.27 dB. Then the software will use a value of -14.85 dBm as the value that was measured with the power-meter.

14.9.8 Pre amplifier: Amplifier Gain

The gain of an used preamplifier can be corrected inside the software. A correction file with the frequency dependant gain of the preamplifier should be attached to the device driver of the preamplifier. The values in the correction column should be expressed in dB.
Depending on the configuration of the correction file that is selected for the preamplifier, the correct behaviour is used:

- 'Frequency' and 'Correction' column: The values in the 'Correction' column are interpreted as 'gain' values. A positive value is interpreted as a positive amplification of the preamplifier. These 'gain' values will be substracted from the values that are measured with the receiver/analyser.
- 'Frequency' and 'Gain' column: The values in the 'Gain' column are interpreted as 'gain' values. A positive value is interpreted as a positive amplification of the preamplifier. These 'gain' values will be substracted from the values that are measured with the receiver/analyser.
- 'Frequency' and 'Attenuation' column: The values in the 'Attenuation' column are interpreted as 'attenuation' values. A positive value is interpreted as a loss caused by the preamplifier. A negative value is interpreted as a positive amplification of the signal, caused by the preamplifier. These 'attenuation' values will be added to the values that are measured with the receiver/analyser.

14.9.9 Receiver: Amplitude correction

The power loss inside a receiver or a spectrum analyser can be corrected inside the software. A correction file with the loss should be attached to the device driver of receiver of spectrum analyser. The correction file should contain the columns:

- Frequency
- Correction

The values in the correction column should be expressed in dB. The values of the correction column are added to the measured emission level. In this way the real emission level can be calculated.

14.9.10 Resistor: Resistance Correction

The typical value of a used resistor can be corrected by a correction file. A correction file with the correction should be attached to the device driver of the resistor. The correction file should contain the columns:

- Frequency
- Correction

The value specified in the correction column should be expressed in Ohm (Ω). The values in the correction column is added to the typical resistance of the resistor. For example: A resistor of 0.5 Ω is used. A correction file with a frequency and correction column is connected to the device driver. The value specified in the correction column for 594 kHz. is 0.04 Ω. Then the software will use a value of 0.54 Ω for the exact value of its calculations with the resistor.

14.9.11 Signal Generator: Output Correction

The output level of a signal generator can be corrected. A correction file with the correction should be attached to the device driver of the signal generator. The correction file should contain the columns:

- Frequency
- Correction

The values in the correction column should be expressed in dBm. The value specified in the correction column is added to the desired carrier level and then send to the signal generator. For example: a signal generator that outputs 0.2 dB more than is specified on its display, can be corrected with a value of: -0.2

RadiMation® EMC software
------- Device Drivers -------

Table of contents:

Device drivers

15.1 Introduction

Device drivers are available in RadiMation® to make it possible to communicate with thousands of different test and measurement equipment devices. They make the system flexible to use different devices, while the RadiMation® Core stays generic. The RadiMation® Core does not even know how to control specific devices it is controlling, only the type of device, and which device driver to use. The device driver is responsible for the communication between the RadiMation® core and the specific test and measurement equipment, by sending the correct commands to the devices. If for example a new spectrum analyser or signal generator has been acquired, it is only needed to configure the corresponding device driver in the RadiMation® software, and it will be able to use the new device. All the configurations of all the tests will remain the same.
This chapter only describes the device driver specific configuration. All the configuration of the device drivers that are managed by the RadiMation® Core, are described in **Chapter 14: 3. Device Driver configuration**. Also the common device driver settings are described in **Chapter 14: Device Driver Settings**.

15.2 Virtual device drivers

For testing and demonstration purposes, virtual device drivers can be used and added as well. Virtual device drivers are devices that act like normal devices but are emulated by software. These virtual device do not physically exist, and thus do not control any real hardware. If a test site with only virtual devices is created, it can be used to perform completely virtual tests.
Virtual device drivers do not have limitations like normal device drivers (like frequency band, maximum power, sweep times, etc.)
There are several advantages to include and use virtual device drivers. It is mainly used for debugging, investigating and solving software problems, but is has proven to be very useful when used as a temporarily workaround. For example a test site can have an amplifier which is IEEE controlled and one day somebody accidentally destroys the communication between computer and amplifier. To allow the test engineer to still perform some tests, he can select the virtual amplifier device driver as the amplifier to be used in the test site. The test engineer then only has to set the amplifier in operate manually and will be able to perform the tests that day. When the IEEE communication is repaired the original amplifier device driver can be selected in the testsite again.

15.3 Active device drivers and passive device drivers

RadiMation® supports two types of device drivers: active and passive device drivers.
Active devices are test and measurement equipment like powermeter, signal generators, spectrum analysers, field sensors, etc. For these devices the communication settings (like the IEEE address or the serial port) can be set which RadiMation® has to use to be able to communicate with these devices.
Passive devices are test and measurement equipment like couplers, antenna, cables, calibration jigs, current sensors, etc. Passive equipment do also need a device driver. The reason for this is that RadiMation® also has to know a number of details for these devices. Among others, the following information is relevant:

- Usable frequency range
- Maximum input power
- General information of the device, to include a list of used equipment during a test in the report
- Correction files that are relevant for the device

With this information RadiMation® can prevent the test engineer from making large mistakes, like for example using a coupler in an unsupported frequency range.

15.4 Device specific configuration

15.4.1 Signal generator

Pressing advanced will open an IEEE configuration screen. Please view chapter IEEE setting for a complete description. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.2 Amplifier

When an amplifier can be remotely controlled the specific window will appear. Please view chapter IEEE or RS232 setting for a complete description. When the amplifier can not be remotely controlled the message This Device cannot be configured will appear. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting and protecting this device.

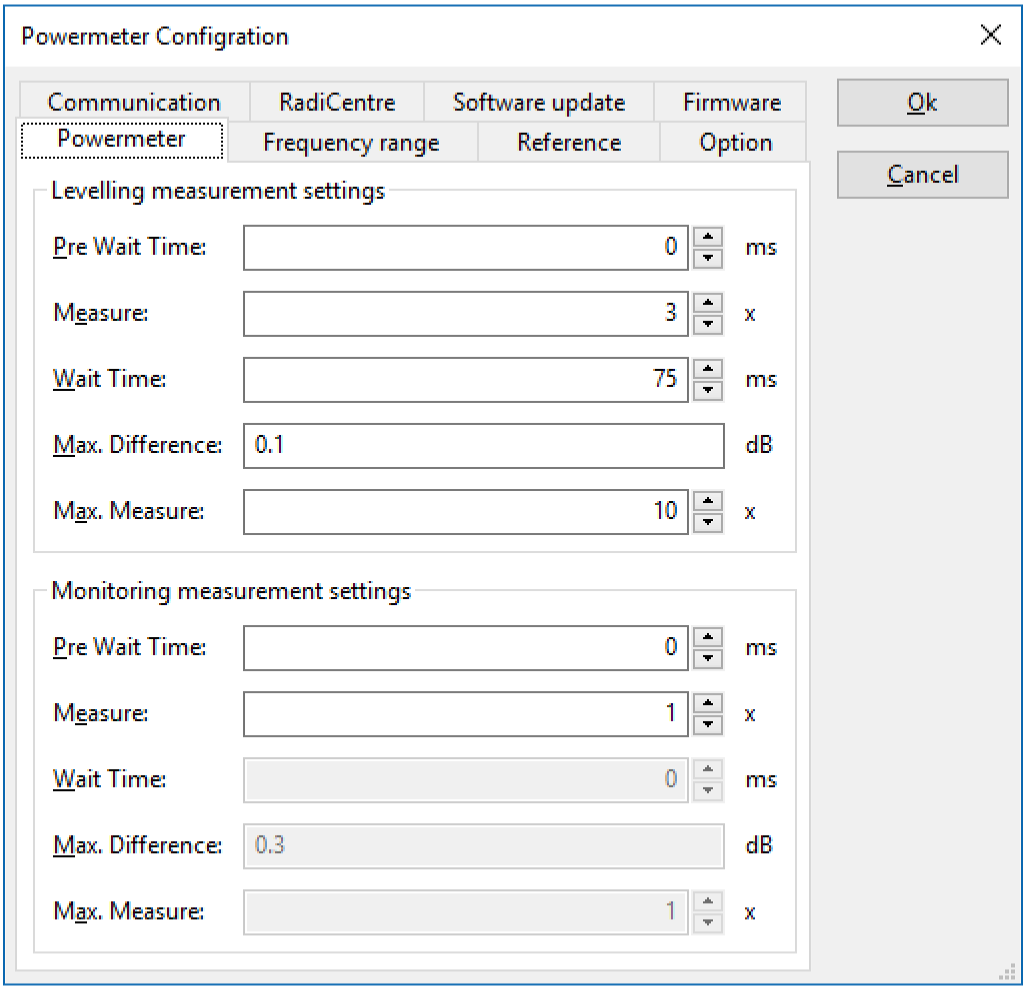
15.4.3 Antenna

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.4 Coupler

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.5 Powermeter



- **Pre Wait time** — The minimum time that should be waited before the measurements starts.
- **Measure** — The minimum amount of measurements that RadiMation® has to perform to determine if the <Max. Difference> condition is met.
- **Wait time** — The minimum time that RadiMation® should be waiting between each measurement.
- **Max. Difference** — The maximum difference that is allowed between the <Measure> measurement value(s); the highest and the lowest values are compared.
- **Max. Measure** — The maximum amount of measurements that *could* be performed by RadiMation®, before there is a final measurement value available (which could meet these conditions, or not).

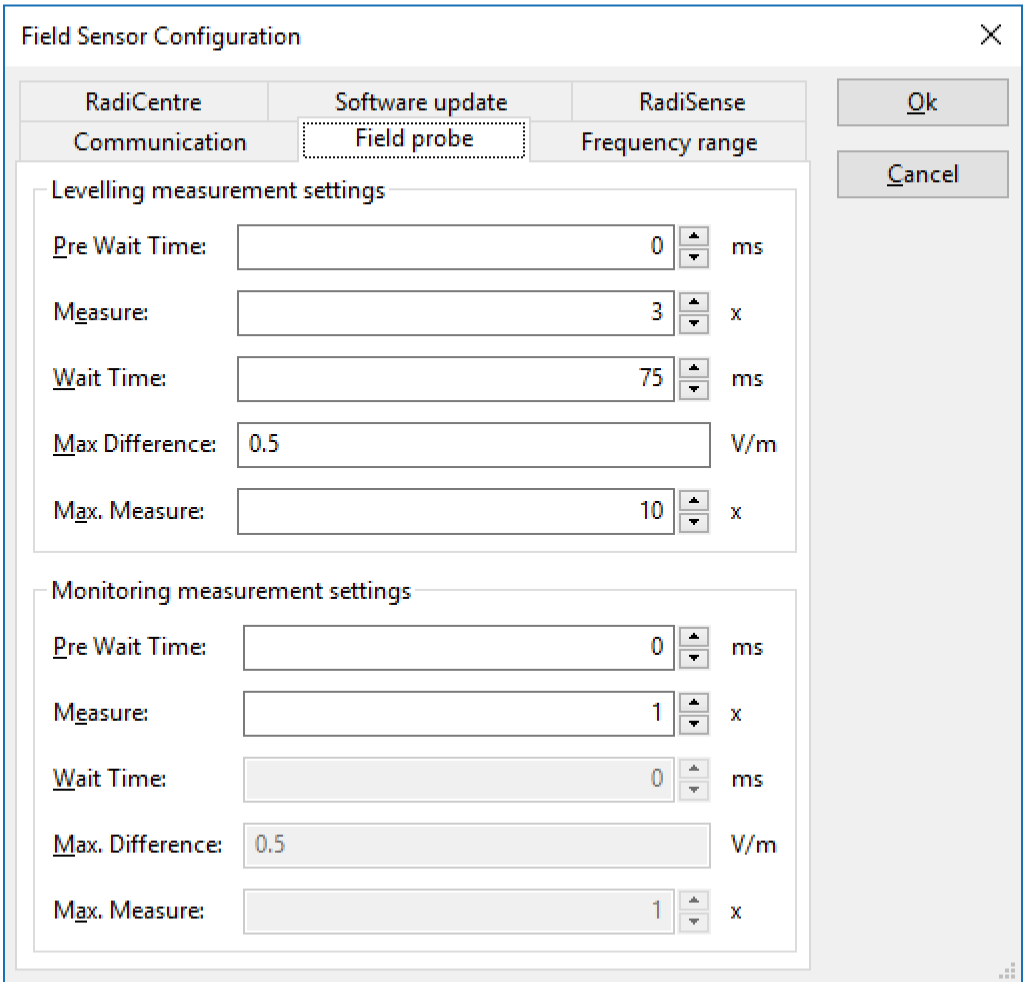
If Measure is set to a value of 1 the Wait time, Max. Difference and Max. Measure settings will be disabled, because only one measurement will be performed.
Now that all windows have been generally explained, the procedure RadiMation® uses is the following. RadiMation® takes the amount of measurements as defined in the Measure window. After

that RadiMation® determines the minimum, maximum and difference. When the difference is equal or smaller then defined in Max difference RadiMation® determines the power. If the difference is greater then defined, RadiMation® takes one new measurement. Replaces the oldest value with the new one. Determines the minimum, maximum and difference again. This continues as long as the difference is larger then defined and the maximum amount of measurement has not yet been reached. If the maximum amount of measurement has been reached the last measurement is taken as the measured value.
See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

Note: **Speed up(1):** Sometimes slower means faster. For instance, if you have a slower powermeter (resistor head) it may be quicker to have a longer waiting time. Because the powermeter has more time to determine the right value, RadiMation® needs less measurements to determine the value. It is up to the engineer to find the right accuracy vs. time setting.
Speed up(2): When using a spectrum analyser a small amount of samples may be sufficient to determine the right amount of power. It is up to the engineer to find the right accuracy vs. time setting.
Measuring: Powermeter who doesn't have a RMS detector, should not be used in Fast constant mode.

15.4.6 Field Sensor

15.4.6.1 Measurement setting panel



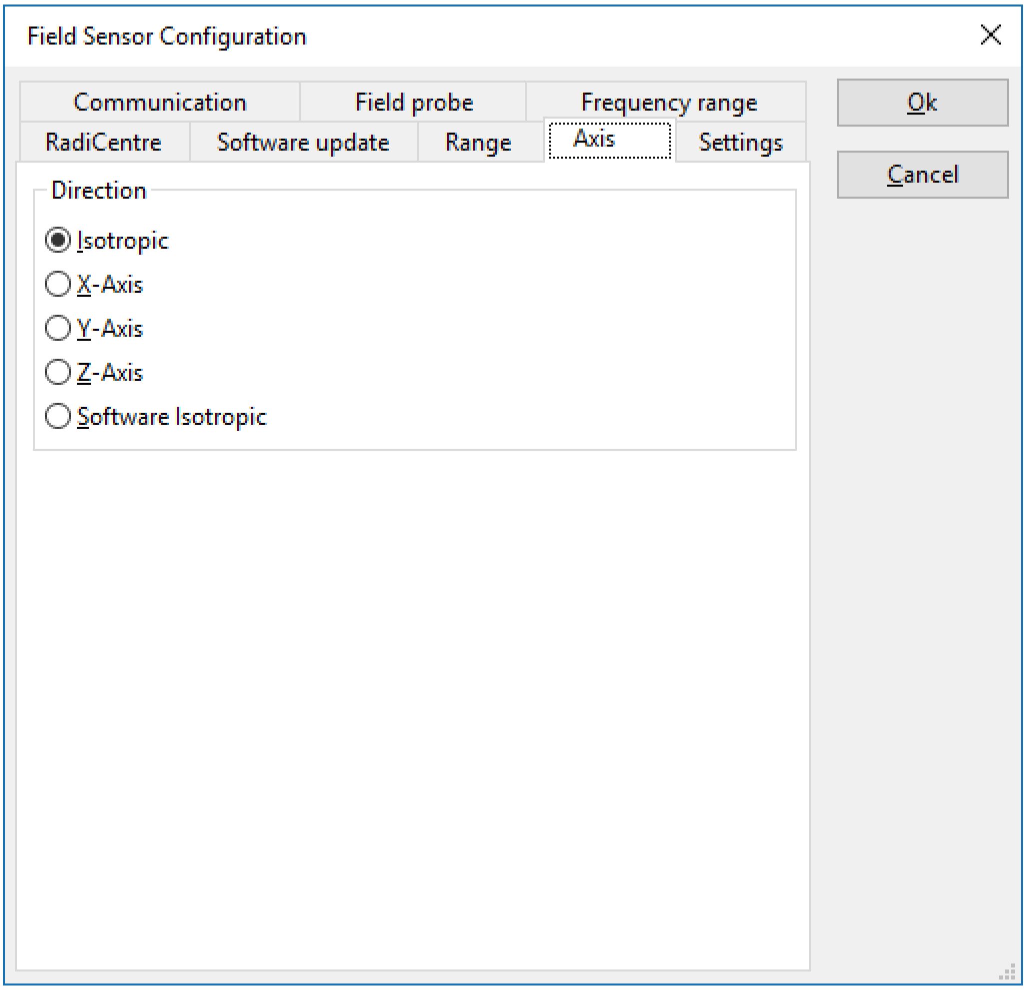
➢ **Pre Wait time**	The minimum time that should be waited before the measurements starts.
➢ **Measure**	The minimum amount of measurements that RadiMation® has to perform to determine if the <Max. Difference> condition is met.
➢ **Wait time**	The minimum time that RadiMation® should be waiting between each measurement.
➢ **Max. Difference**	The maximum difference that is allowed between the <Measure> measurement value(s); the highest and the lowest values are compared.
➢ **Max. Measure**	The maximum amount of measurements that *could* be performed by RadiMation®, before there is a final measurement value available (which could meet these conditions, or not).

If Measure is set to a value of 1 the Wait time, Max. Difference and Max. Measure settings will be disabled, because only one measurement will be performed.

Now that all windows and buttons have been generally explained, the procedure RadiMation® uses is the following. RadiMation® takes the amount of measurements as defined in the Measure window. After that RadiMation® determines the minimum, maximum and difference. When the difference is equal or smaller then defined in Max difference RadiMation® determines the field. If the difference is greater then defined, RadiMation® takes one new measurement. Replaces the oldest value with the new one. Determines the minimum, maximum and difference again. This continues as long as the difference is larger then defined and the maximum amount of measurement has not yet been reached. If the maximum amount of measurement has been reached the last measurement is taken as the measured value.

Note: Speed up: Sometimes slower means faster. For instance, if you have a slower field sensor it may be quicker to have a longer waiting time. Because the field sensor has more time to determine the right value, RadiMation® needs less measurements to determine the value. It is up to the engineer to find the right accuracy vs. time setting.

15.4.6.2 Axis setting panel



The Axis configuration is a generic driver setting panel. There are several (old) field sensors which don't support the read out of an isotropic value: instead they provide the measurements values of all three axes separately. Using the 'Software isotropic' setting in the device driver can then activate that the measurement data of all three axes are being interpret and calculate to the isotropic value and have this isotropic value being return as the measured field strength. When the field sensor already supports the retrieval of the isotropic measurement value, often this value is also returned when the software option is being selected in the device configuration: both isotropic as software isotropic will return the isotropic value of the field sensor. This is depending on the device driver and used equipment.
Normally, this setting is set to 'Isotropic' in case the isotropic value should be returned.

15.4.7 AD converter

When an ad converter can be remotely controlled the specific window will appear. Please view chapter IEEE or RS232 setting for a complete description. When the ad converter can not be remotely controlled the message This Device cannot be configured will appear.

15.4.8 Injection device

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.9 Calibration Jigs

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.10 Current Sensor

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.11 Pre Amplifiers

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.12 Receivers / Spectrum analyser

Pressing advanced will open an IEEE configuration screen. Please view chapter IEEE setting for a complete description. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.13 LISN

When an LISN can be remotely controlled the specific window will appear. Please view chapter IEEE or RS232 setting for a complete description. When the LISN can not be remotely controlled the message This Device cannot be configured will appear. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.14 Turn Table

Pressing advanced will open an IEEE configuration screen. Please view chapter IEEE setting for a complete description.

15.4.15 Antenna Tower

Pressing advanced will open an IEEE configuration screen. Please view chapter IEEE setting for a complete description.

15.4.16 Absorbing Clamps

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.17 Clamp positioner

When a clamp positioner can be remotely controlled the specific window will appear. Please view chapter IEEE or RS232 setting for a complete description. When the clamp positioner can not be remotely controlled the message This Device cannot be configured will appear.

15.4.18 Cables

When pressing advanced the message This Device cannot be configured will appear because this device can not be controlled remotely. See **Chapter 14: Correction files** and **Chapter 14: Correction file uses** for correcting this device.

15.4.19 Switch matrix

When a switch matrix can be remotely controlled the specific window will appear. Please view chapter IEEE or RS232 setting for a complete description. When the switch matrix can not be remotely controlled the message This Device cannot be configured will appear.

15.4.20 EUT Controller

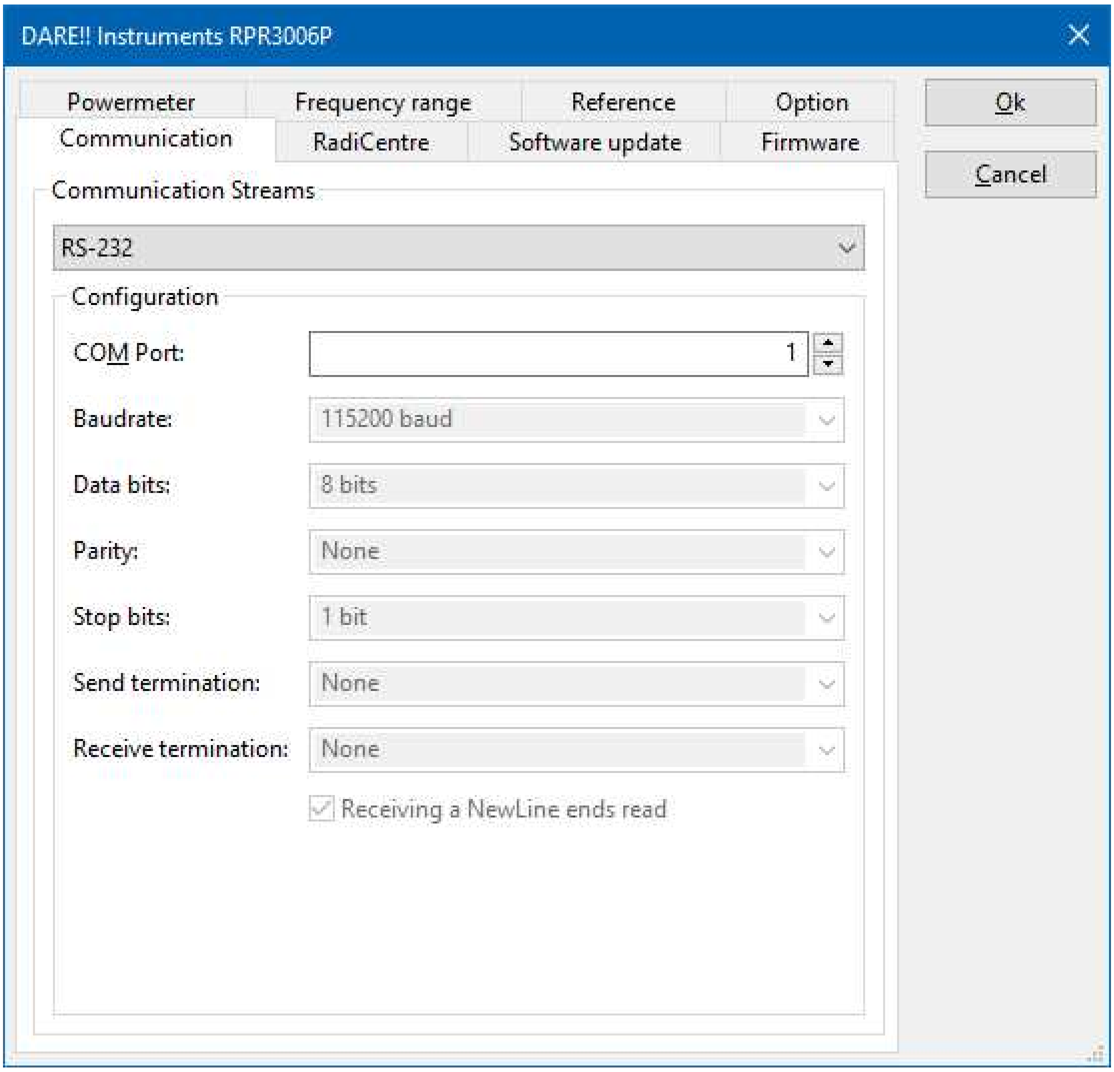
When a EUT Controller can be remotely controlled the specific window will appear. Please view chapter IEEE or RS232 setting for a complete description. When the EUT Controller can not be remotely controlled the message This Device cannot be configured will appear.

15.5 Communication settings

Depending on the brand and model of the device, it may be necessary to specify the parameters for the communication with the device. The GPIB/IEEE 488 and RS232 buses are most commonly used. This section describes which communication buses are supported and which communication parameters can be configured. Not all devices support all the communication buses, so only the applicable communication buses can be selected in the device driver configuration.

15.5.1 RS-232 Setting

The RS-232 Communication settings are used to specify the RS-232 communication parameters, for the communication with a measurement device over RS-232. A lot of modern measurement devices are connected by USB, however very often then a Virtual RS-232 COMPort (VCP) is generated over the USB connection. In that situation also the RS-232 communication settings should configured.



➢ **COM Port** The COM port which RadiMation® has to use to be communicate with the measurement device.

➢ **Baudrate** Allows to configure the baudrate that should be used to communicate with the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

➢ **Data bits** Allows to configure the number of data bits that should be used to communicate with the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

➢ **Parity** Allows to configure the parity bit that should be used to communicate with the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

➢ **Stop bits** Allows to configure the number of stop bits that should be used to communicate with the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

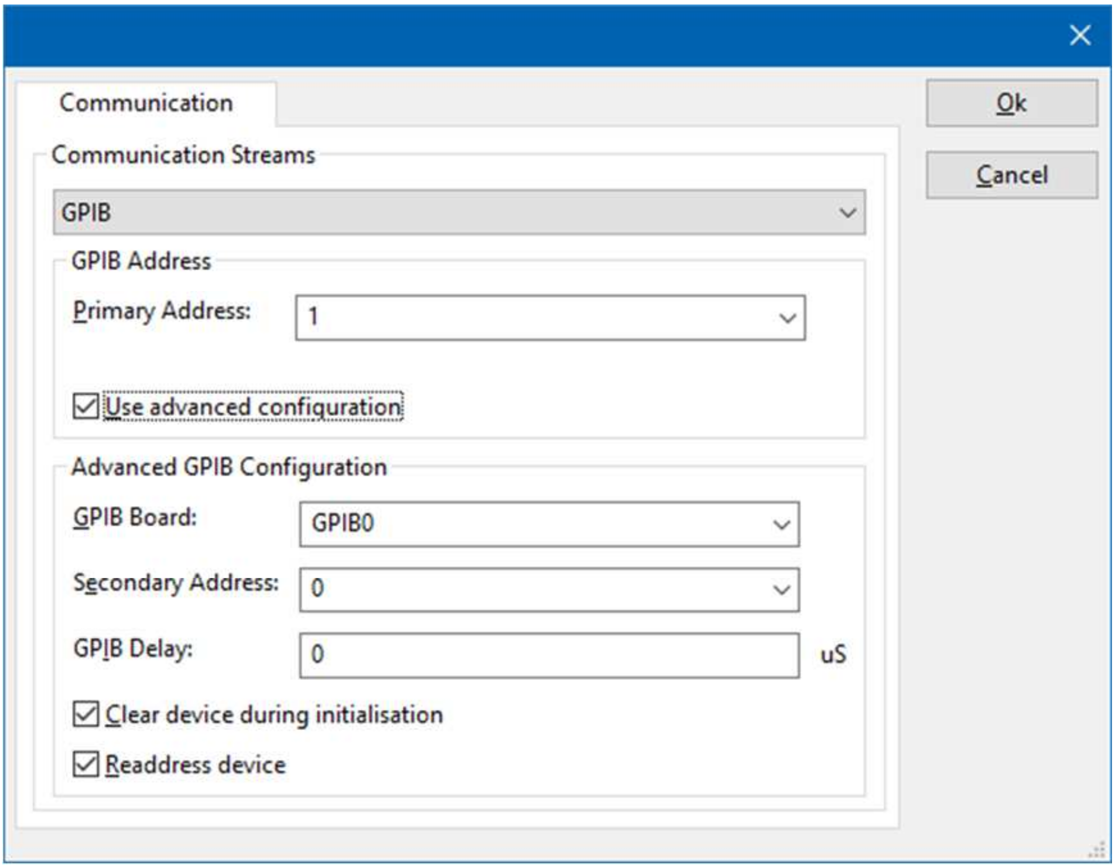
Send termination Allows to configure if and which terminator should be used during data transmissions to the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

Receive termination Allows to configure if and which terminator should be used during the receiving of data from the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

Receiving a NewLine ends read Allows to configure if a read should be ended as soon as the receive terminator is received from the measurement device. This setting can be a fixed device specific value, in which case it cannot be configured and then the setting will be disabled.

15.5.2 GPIB Setting

The GPIB Communication settings are used to specify the GPIB communication parameters, for the communication with a measurement device over GPIB.



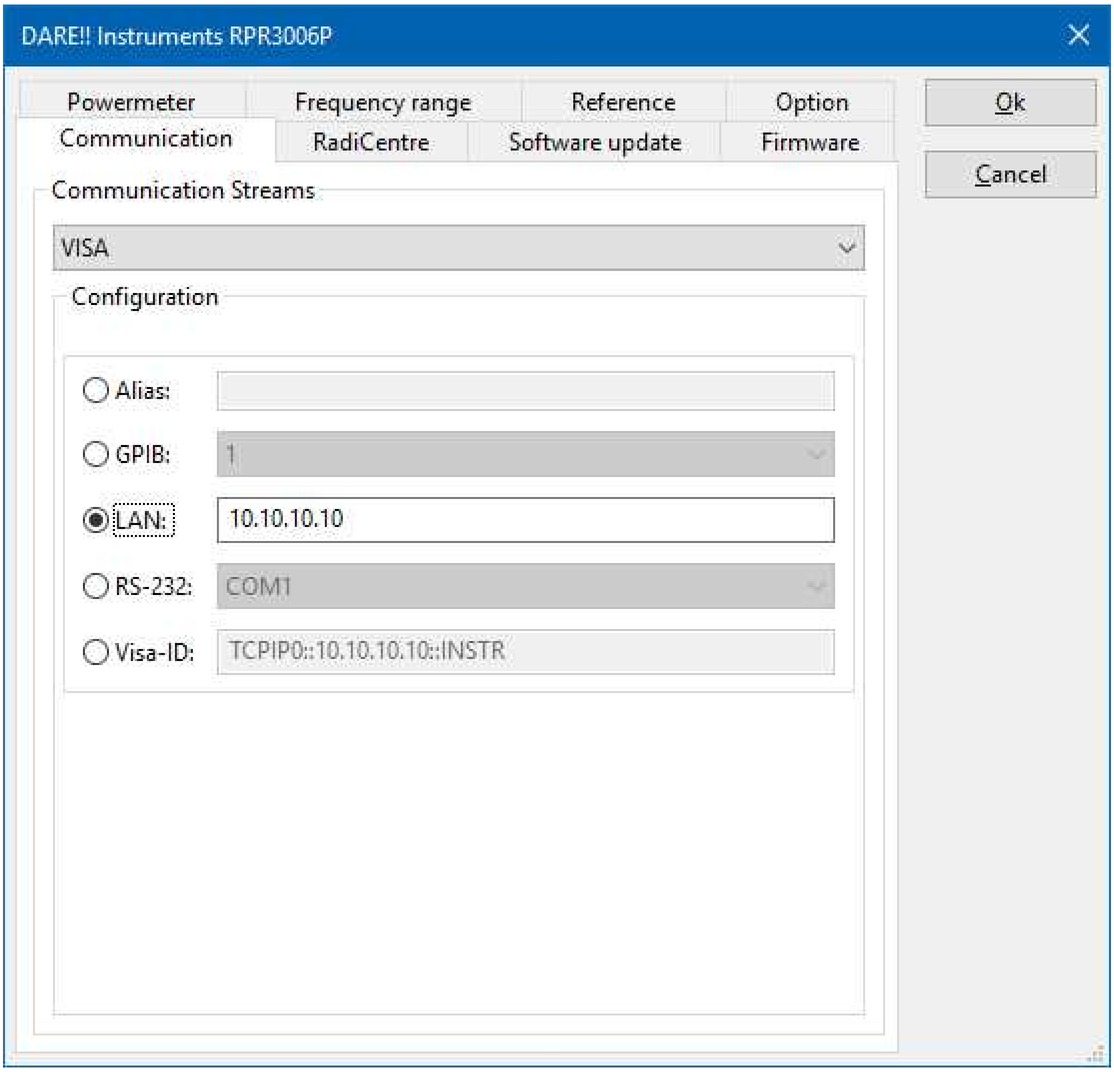
Primary Address The primary address specifies the address of the device, so if the device you want to configure is on address is on 20 you enter 20. Please consult the manual of the device how to determine the GPIB address of the device.

Use advanced configuration Allows the end-user to enables the more advanced configuration parameters. Those advanced option should only be used if the default settings are not sufficient enough.

➢ **GPIB Board**	With GPIB Board you can specify the GPIB board that is used. The default value is 0 and can only be different when multiple GPIB boards are present.
➢ **Secondary Address**	The second address is default 0, and should only be changed when needed. For further information please look in the help of National Instruments 488.2.
➢ **GPIB Delay**	GPIB delay is the delay between GPIB reading and writing actions. Some older IEEE 488.2 machines have difficulty communicating with fast PC's (> 2.5 GHz). This is most of the time noticeable when a driver is sometimes working and some times gives a GPIB (EABO or TIMO) error. These errors are most of the time, generated randomly. Specifying a GPIB delay time of 3000 uSeconds can fix these random errors. Run the test again and see of the problem as disappeared. Is the problem has disappear then your problem was timing, if not please contact your reseller and report the problems you are having.
➢ **Clear device during initialisation**	When checked, a low level GPIB command to reset the device will be send to the device during initialisation.
➢ **Readdress device**	When checked, a low level GPIB command to select the correct address will be transmitted every time a command is send to the device.

15.5.3 VISA Settings

The VISA Communication settings are used to specify the VISA communication parameters, for the communication with a measurement device. The VISA library is a higher level communication library that supports different kind of communication methods. RadiMation® doesn't provide a VISA library itself, and thus requires that a VISA library from another supplier like National Instruments or Keysight Technologies is installed. The VISA manager that is provided by that VISA library can be used to determine the correct VISA resource. The selected VISA configuration thus also has influence if a measurement device is controlled by GPIB, RS-232, LAN, USB-TMC, VXI11, network-socket or another communication method .



- **Alias** Allows to specify a VISA Alias that should be used for the communication with the measurement device. Any Alias that is supported by VISA is accepted. The correct Alias can be determined by using the VISA manager (eg. National Instruments MAX) that is installed on the PC.

- **GPIB** Allows to specify that GPIB should be used for the communication with the measurement device. The GPIB address of the measurement device should be specified.

- **LAN** Allows to specify that a VXI11 or LXI connection should be used for the communication with the measurement device. It is possible to specify the IP-address or the (FQDN) hostname of the measurement device.

- **RS-232** Allows to specify that a RS232 (ASRL in VISA terms) connection should be used for the communication with the measurement device. The COM port of the measurement device should be specified.

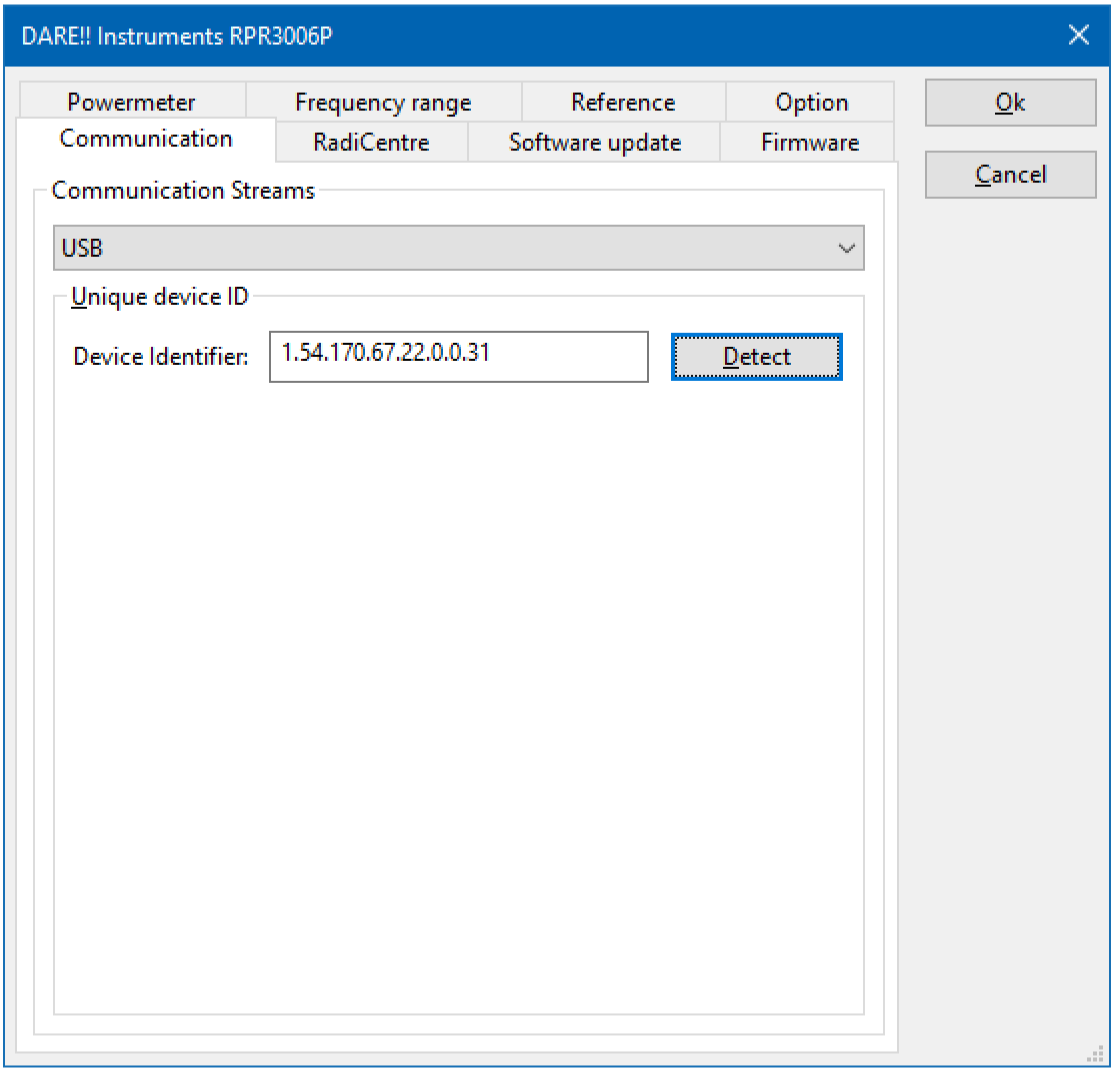
- **Visa-ID** Allows to specify a VISA Identifier that should be used for the communication with the measurement device. Any VISA Identifier that is supported by VISA is accepted.

If one of the other communication methods is selected the corresponding VISA Identifier is also shown in this setting. Often used VISA identifiers are:

- TCPIP[board]::<IP-address>::INSTR: VXI11 or LXI ethernet communication with the device with '<IP-address>'.
- TCPIP[board]::<IP-address>::<port-number>::SOCKET: Raw socket based ethernet communication with on the port '<port-number>' with the the device '<IP-address>'
- GPIB[board]::<primary address>::INSTR: GPIB communication to the GPIB device with the address '<primary address>'
- ASRL<port>::INSTR: Serial communcation on COM-port '<port>'

15.5.4 USB Settings

The USB Communication settings are used to specify that an USB connection to a DARE!! Instruments measurement device is used. It is not possible to use this USB communication setting for devices that simulate a Virtual COMPort (VCP) over an USB connection. The RS232 Settings should be used for such a kind of measurement device.

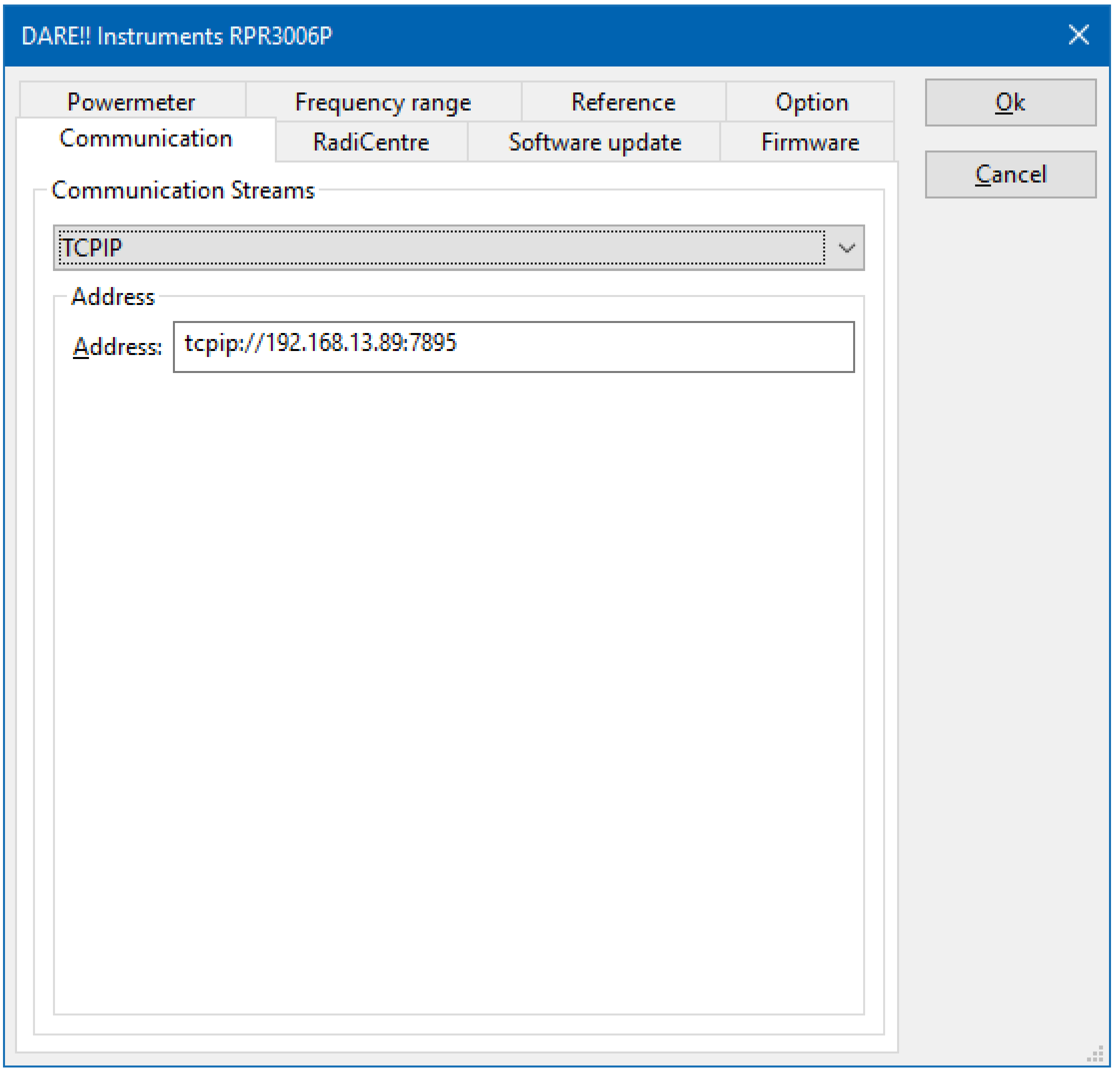


➢ **Device Identifier** The device identifier (which is an unique identifier of 8 groups of digits) that identifies the measurement device that is connected over USB.

➢ **Detect** Will automatically determine the correct **Device Identifier** for the measurement device that is connected.

15.5.5 TCPIP Settings

The TCPIP Communication settings are used to specify that a socket based TCPIP connection to a measurement device should be used.



➢ **Address** Allows to specify the IP-address or the (FQDN) hostname and the socket port number of the measurement device. This is normally done with a string like: "tcpip://<address-or-name>:<port-number>", where '<address-or-name>' is the IP address or hostname, and '<port-number>' is the socket port number on which the connection should be initiated. If the socket port number is a fixed port number, it is already shown as the default value, and it will be automatically added when no socket port number is specified.

15.6 Configurable device drivers

RadiMation® allows the user to create its own device drivers for test and measurement equipment, which is (not yet) implemented in the standard device driver list.
User configurable device drivers are available for nearly all types of test and measurement equipment. However, device drivers for spectrum analysers and (scanning) receivers can not be made with user configurable device drivers because the complexity (and differences between suppliers) of these devices is too high.
To make your own device driver, use the “Device drivers” tab in the “Configuration” > “Configuration” menu and follow the steps below:

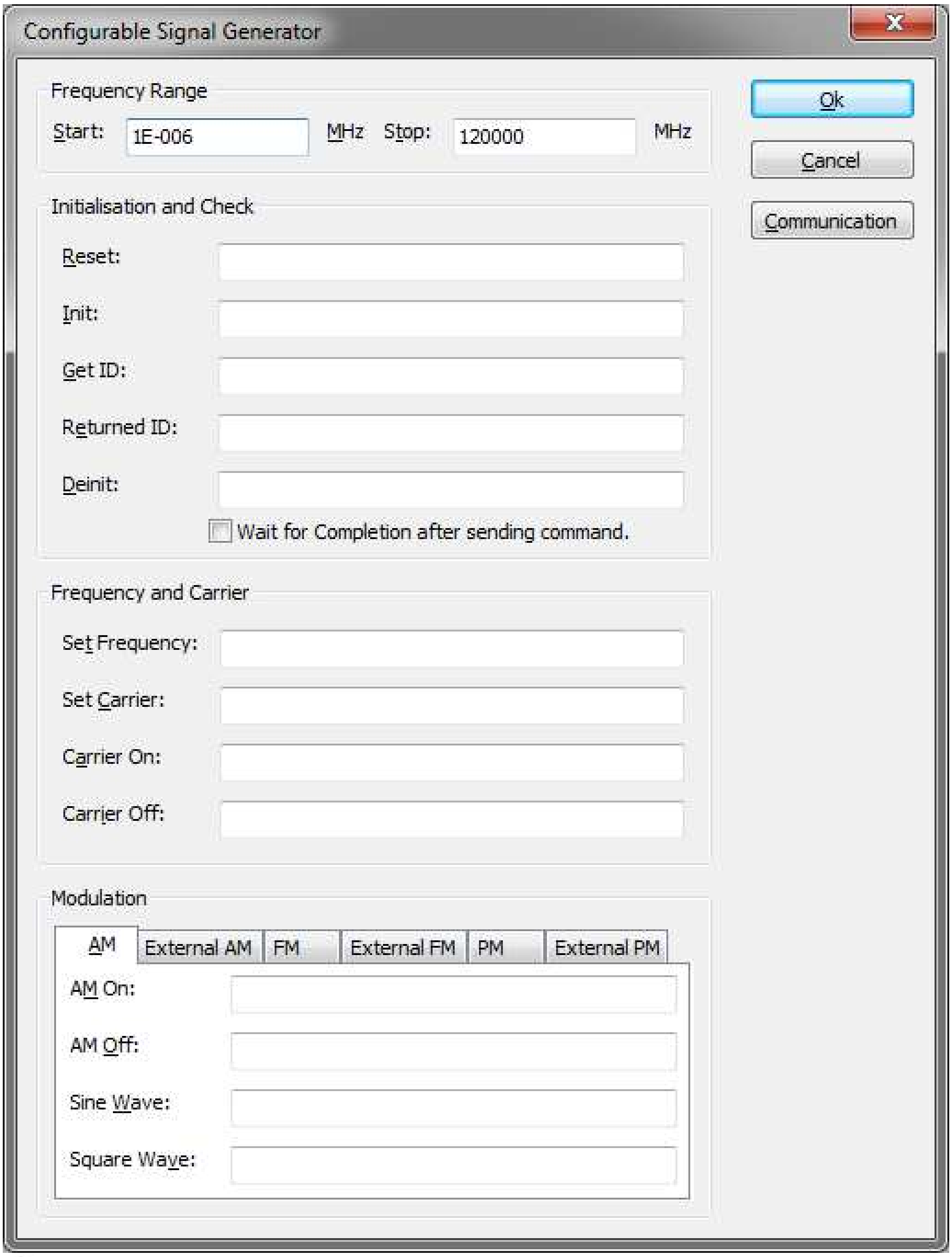
1. In the device driver’s menu, select the required device driver type.
2. Press the “New” button.
3. Select the driver called “Configurable xx” (i.e. if you want to make a signal generator device driver you would select the “Configurable signal generator” device driver).
4. Enter a description for the device driver (for example the type number of the generator) and press OK.
5. The name of the device driver will be added in the available device driver’s list.
6. Select the new device driver from the available device device’s list.
7. Press the “Edit” button.
8. A configuration screen for the device driver will appear. All required control commands for the device must be entered. Refer to the operating manual of the equipment for these codes.

After all codes are entered, the device driver is ready for use. The custom-made device driver can then be used as any other device driver by selecting the driver in the Equipment list.

15.6.1 Generic settings

➢ **Start and stop frequency**	The default value for the start frequency is 1 Hz and for the stop frequency is 120 GHz. The creator of the device is encouraged to set the correct start and stop frequency. If the start and stop frequency are set correctly, RadiMation® can warn the test engineer when he/she want to use the device out of its valid frequency range.
➢ **Reset**	In the reset window you need to specify the string that the software needs to send when it want to reset the device. For example *RST is commonly used reset string. If you don’t know the string then leave this window blank, and make sure that the device in a neutral state.
➢ **Init**	In the init window you need to specify the string that the software needs to send when it want to Init the device. For example *RST is commonly used reset string.
➢ **Get ID**	In the Get ID window you need to specify the string that the software needs to send when it want to get the ID string of the device. For example *IDN? is commonly used Get ID string.
➢ **Returned ID**	In the Returned ID window you need to specify the string that the software will receive so that it know that it has the right device. For example "Hewlett_Packard,8643A," can be used for the Hewlett Packard 8643A. If you leave this window empty then all returned strings are accepted.

15.6.2 Configurable Signal generator



- **Set Frequency** Set Frequency is the string that needs to send to set the signal generator frequency. The unit is in MHZ, so the string should be made for MHz.

Example: “FRQ__freq__MHZ”.
Example: “FRQ__freqHz__HZ”.
Example: “FRQ__freqkHz__KHZ”.
Example: “FRQ__freqMHz__MHZ”.
Example: “FRQ__freqGHz__GHZ”.
__freq__ will be replaced by the value that RadiMation® want to set the signal generator to. The “__” of “__freq__” are two “_”.
All the __freq__ keywords below, can also use the unit specifier: Hz,kHz,MHz and GHz.

- **Set Carrier** Set Carrier is the string that needs to send to set the signal generator carrierlevel. The unit is in dBm, so the string should be made for dBM.

Example: ":SOURCE:POWER __carrier__ DBM".
__carrier__ will be replaced by the value that RadiMation® want to set the signal generator to. The "__" of "__carrier__ " are two "_".

- **Carrier on** Carrier on is the string that needs to send to set the signal generator carrier on.

Example: "OUTPUT ON".

- **Carrier off** Carrier off is the string that needs to send to set the signal generator carrier off.

Example: "OUTPUT OFF".

- **AM on** AM on is the string that needs to send to set the internal AM generator of the signal generator. The unit of frequency is KHz and the unit of Modulation Depth is %.

Example: "SOURCE2:FREQ __freq__ KHZ;SOURCE:AM:DEPTH __depth__ PCT;SOURCE:AM:STATE ON".
__freq__ will be replaced by the frequency and __depth__ by the modulation depth "__freq__ " are two "_".

- **AM off** AM off is the string that needs to send to set the internal am modulation of the signal generator off.

Example: "SOURCE:AM:STATE OFF".

- **External on** External on is the string that needs to send to set the modulator to the external input.

Example: "SOURCE:AM:SOURCE EXT".

- **External off** External off is the string that needs to send to set the modulator to the internal input.

Example: "SOURCE:AM:SOURCE INT".

- **PM on** PM on is the string that needs to send to set the internal PM generator of the signal generator. The unit of frequency is KHz and the unit of duty cycle is %.

Example: "SOURCE2:FREQ __freq__ KHZ;SOURCE:PM:DUTY __duty__ PCT;SOURCE:PM:STATE ON".
__freq__ will be replaced by the frequency and __duty__ by the duty cycle. "__freq__ " are two "_".

- **PM off** PM off is the string that needs to send to set the internal PM modulation of the signal generator off.

Example: "SOURCE:PM:STATE OFF".

- **Sine Wave** Sine wave is the string that needs to be send when RadiMation® wants to set the wave form of the internal source to sine.

Example: "SOURCE2:FUNC SIN"

- **Square Wave** Square wave is the string that needs to be send when RadiMation® wants to set the wave form of the internal source to square.

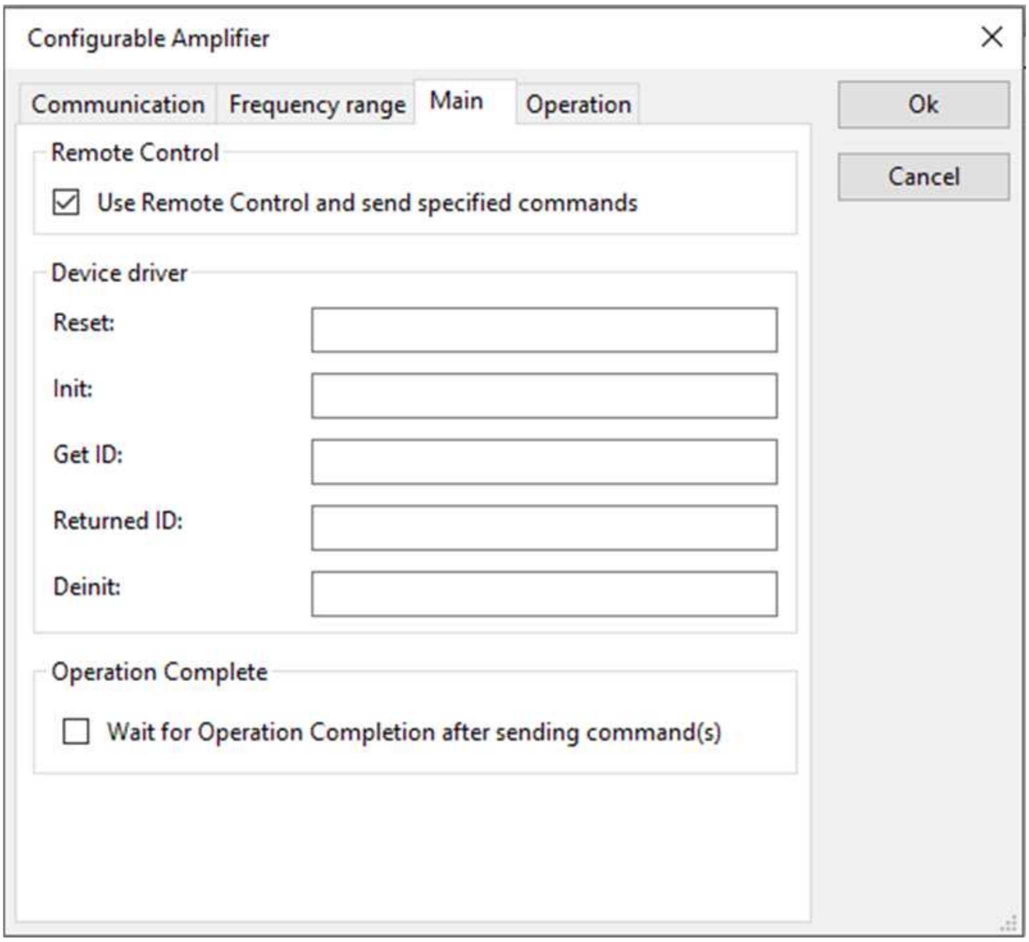
Example: "SOURCE2:FUNC SQU"

15.6.3 Configurable Amplifier

The Configurable Amplifier device driver is a Amplifier which is supported by RadiMation®.
The configurable amplifier device driver can be used to control amplifiers for which no RadiMation® device driver is present yet. By specifying the correct commands, it is possible to send the desired commands to an amplifier. However be aware that this device driver is simple and is not able to perform more complicated tasks. Including delays and sending multiple commands at once is not possible in this device driver, a programmed device driver is needed to achieve that. Also the

retrieval of the actual status of the amplifier is not supported by this configurable device driver, as the interpretation of the correct response should be very versatile.

15.6.4 Main

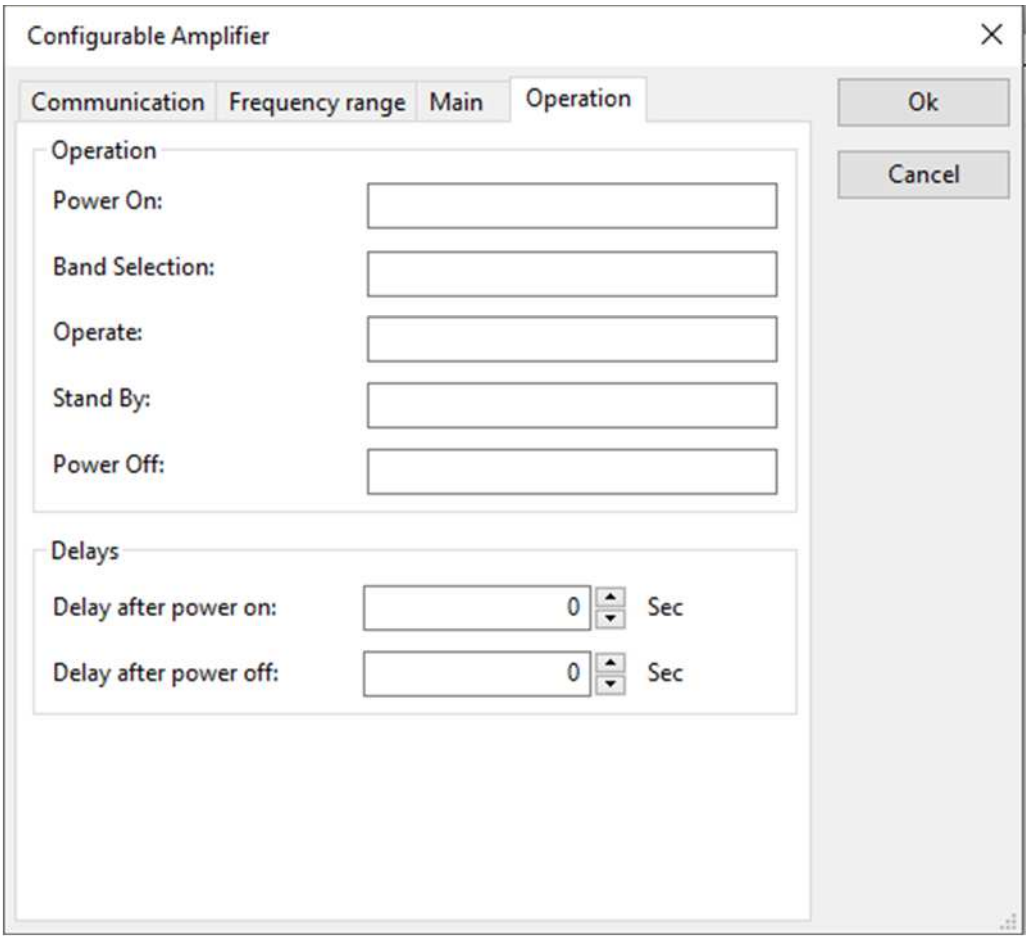


- **Use Remote Control and send specified commands**: If the checkbox is ticked, the remote control of the amplifier will be used by using the specified commands. If the checkbox is not ticked, no commands will be transmitted to the amplifier at all
- **Reset**: The code that needs to be send to the device to initialize it in a defined state. When left blank, no command will be send.
- **Init**: The Init code that needs to be send to device. When left blank, no command will be send.
- **Get ID**: The code that needs to be send to device to get the identification back. A common used SCPI command is *IDN?. When left blank, no command will be send.
- **Returned ID**: The code that is send back as a return on the Get ID code. When left blank, no check will be performed.

Deinit The Deinit code that needs to be send to device. When left blank, no command will be send.

Wait for Operation Completion after sending command(s) If the checkbox is checked, every transmitted command will include a check to determine if the execution of the command is finished.

15.6.5 Operation



Power On The power on code that needs to be send to device. When left blank, no command will be send.

Band Selection The band select code that needs to be send to device. When left blank, no command will be send.

Operate The operate code that needs to be send to device. When left blank, no command will be send.

- **Standby** The standby code that needs to be send to device. When left blank, no command will be send.

- **Power Off** The power off code that needs to be send to device. When left blank, no command will be send.

- **Delay after power on** The time that must be waited after sending the power on command.

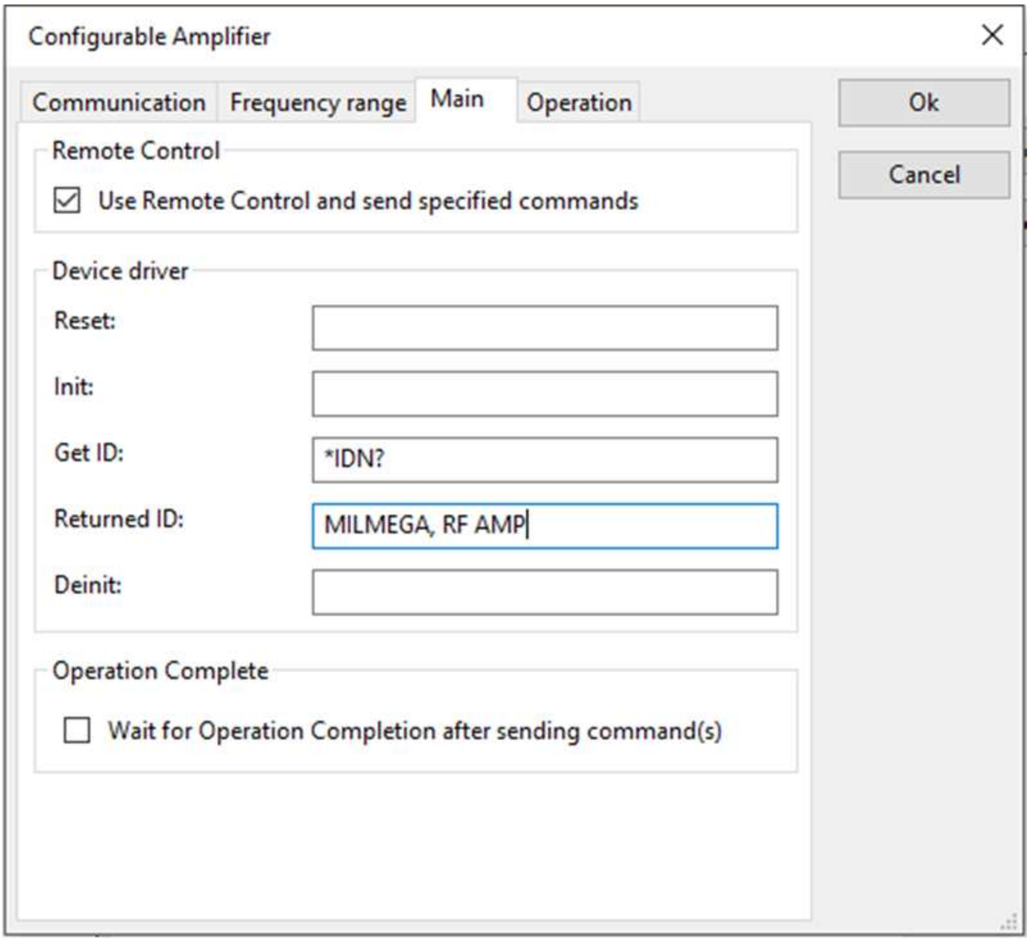
- **Delay after power off** The time that must be waited after sending the power off command.

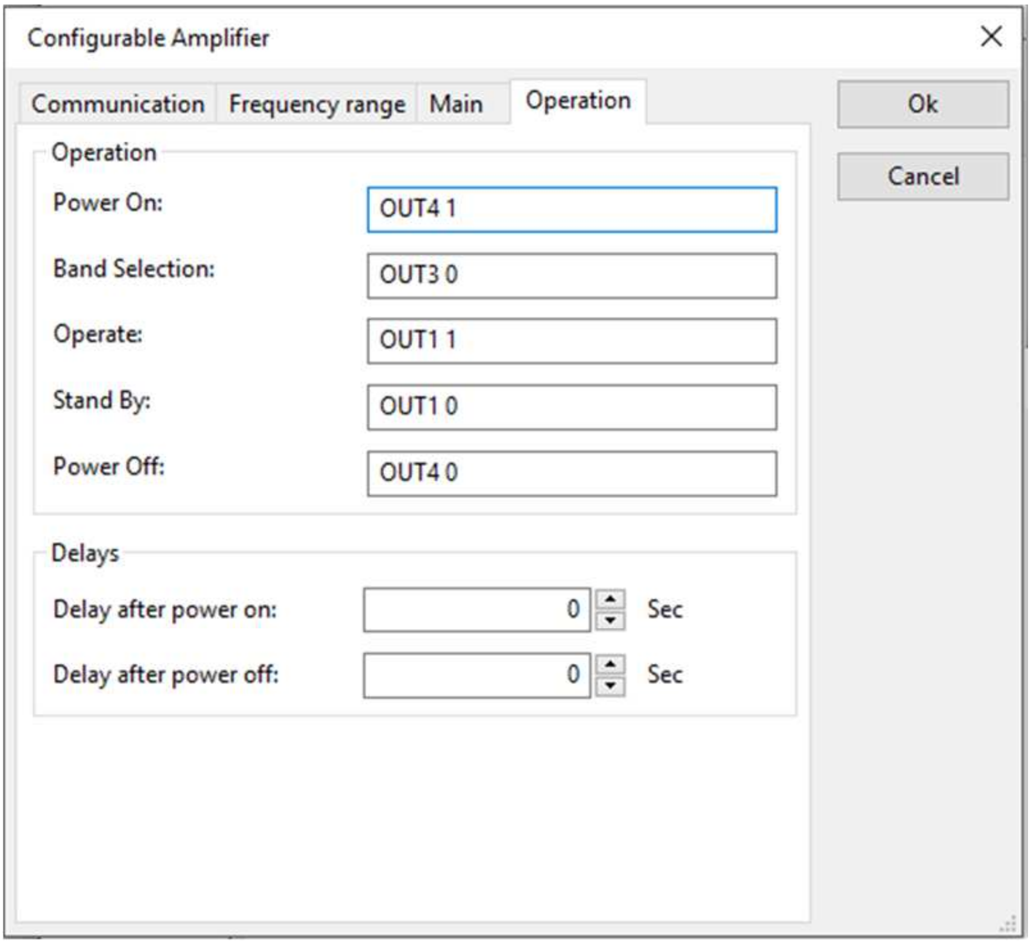
15.6.6 Example

For this example the driver will be used to control the Milmega Controller AC-001.
Summary of control commands of Milmega Controller AC-001

Description	Command	Parameters
Standby / Operate	OUT1	0 = RF STANDBY 1 = RF ON
Band Selection	OUT3	0 = BAND 1 1 = BAND 2
Power off / on	OUT4	0 = LINE STANDBY 1 = LINE ON

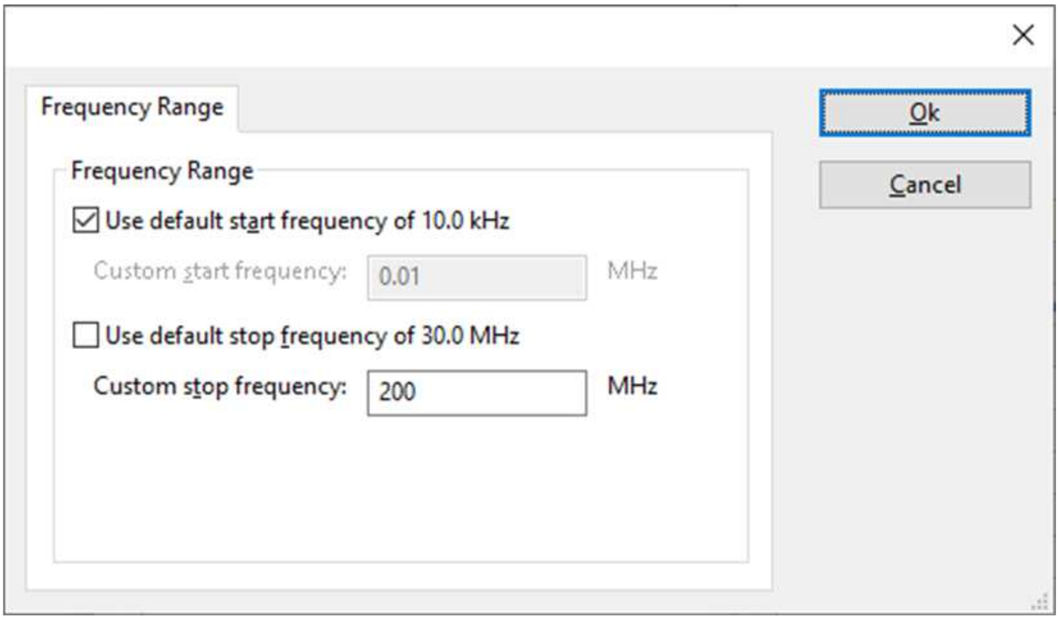
These commands for the Milmega AC-001 controller can be implemented in the Configurable Amplifier device driver by specifying the codes, as in the following screenshots:


Configurable Amplifier
Communication
Frequency range
Main
Operation
Ok
Cancel
Remote Control
Use Remote Control and send specified commands
Device driver
Reset:
Init:
Get ID:
*IDN?
Returned ID:
MILMEGA, RF AMP
Deinit:
Operation Complete
Wait for Operation Completion after sending command(s)



15.6.7 Configurable Antenna

The Configurable Antenna device driver is a Antenna which is supported by RadiMation®.
The Configurable Antenna device driver can be used to create a device driver for an antenna, even if no device driver is available for that antenna in RadiMation®.

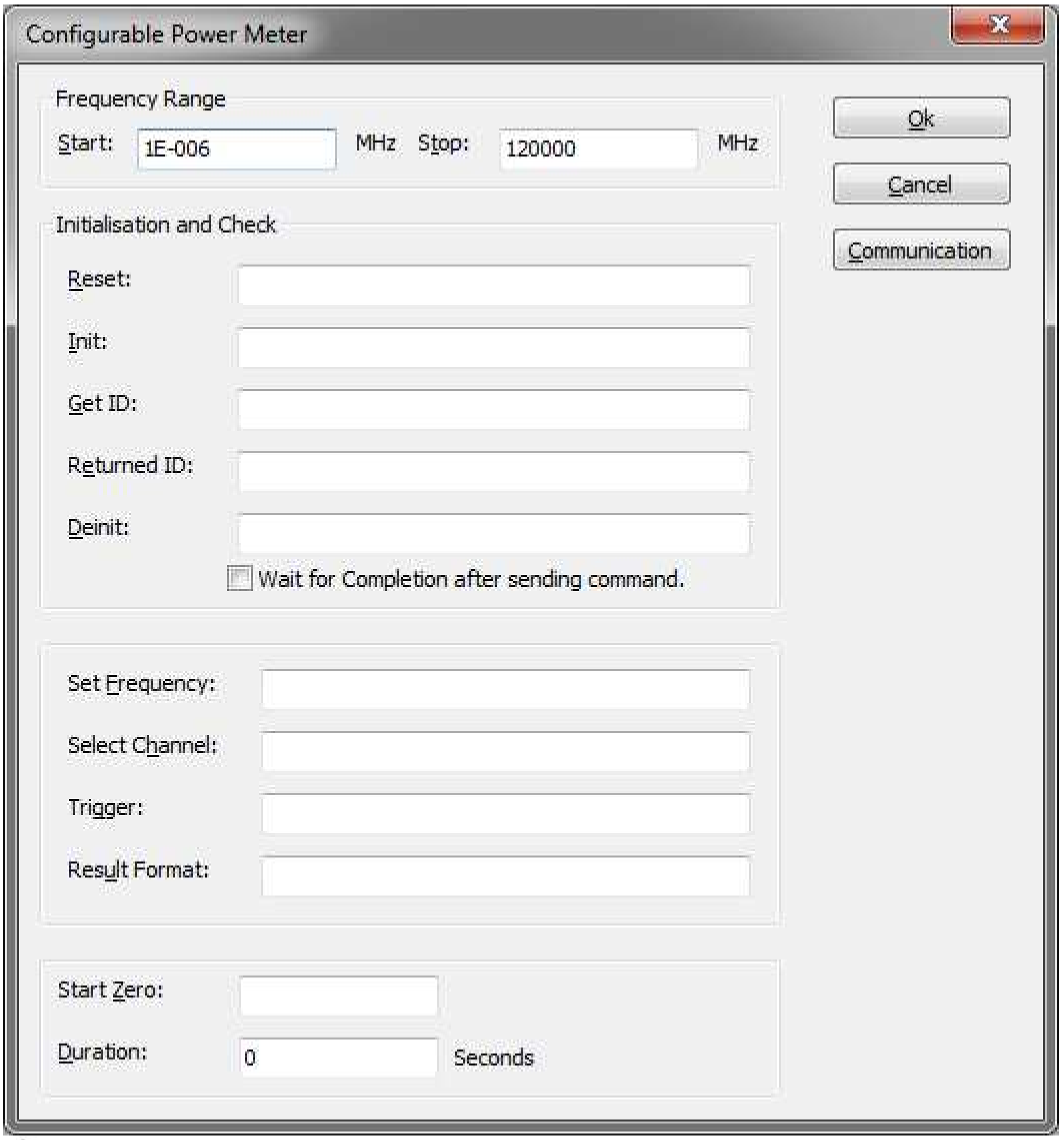


The frequency range of the Chapter 15 as provided by the manufacturer is shown and selected as default. It is possible to overrule these frequencies and to manual adjust the allowed frequency range of the Chapter 15.

➢ **Use default start frequency**	If the checkbox is checked, the default start frequency will be used as the lowest usable frequency in a test for this device.
➢ **Custom start frequency**	If the **Use default start frequency** checkbox is unchecked, another start frequency (expressed in MHz) can be specified. The customized start frequency will then be used as the lowest usable frequency in a test for this device. The customized frequency can be a limitation or an extension of the default start frequency.
➢ **Use default stop frequency**	If the checkbox is checked, the default stop frequency will be used as the highest usable frequency in a test for this device.
➢ **Custom stop frequency**	If the **Use default stop frequency** checkbox is unchecked, another stop frequency (expressed in MHz) can be specified. The customized stop frequency will then be used as the highest usable frequency in a test for this device. The customized frequency can be a limitation or an extension of the default stop frequency.

Be careful changing these setting as RadiMation® is no longer able to verify if the Chapter 15 is used outside frequency range that is specified by the manufacturer. This may result to serious damage of your measurement device.

15.6.8 Configurable Powermeter



- **Set frequency** Set Frequency is the string that needs to send to set the powermeter frequency. The unit is in MHz, so the string should be made for MHz.

Example: “FRQ__freq__MHZ”.
__freq__ will be replaced by the value that RadiMation® want to set the powermeter too. The “__” of “__freq__” are two “_”.

- **Select Channel** Set Select Channel is the string that RadiMation® needs to send to set the powermeter channel. This is only necessary when the powermeter has more the one channel.

Example: “P1,U1”.

- **Trigger** Trigger is the string that RadiMation® needs to send to trigger the powermeter.

Example: “X1”

- **Result Format** Result Format is the string that RadiMation® needs to use to decode the value from the string send by the powermeter. The return value is interpreted in dBm.

Example: “__result__”
__result__ will be replaced by the value that RadiMation® get from the powermeter. The “__” of “__result__” are two “_”.

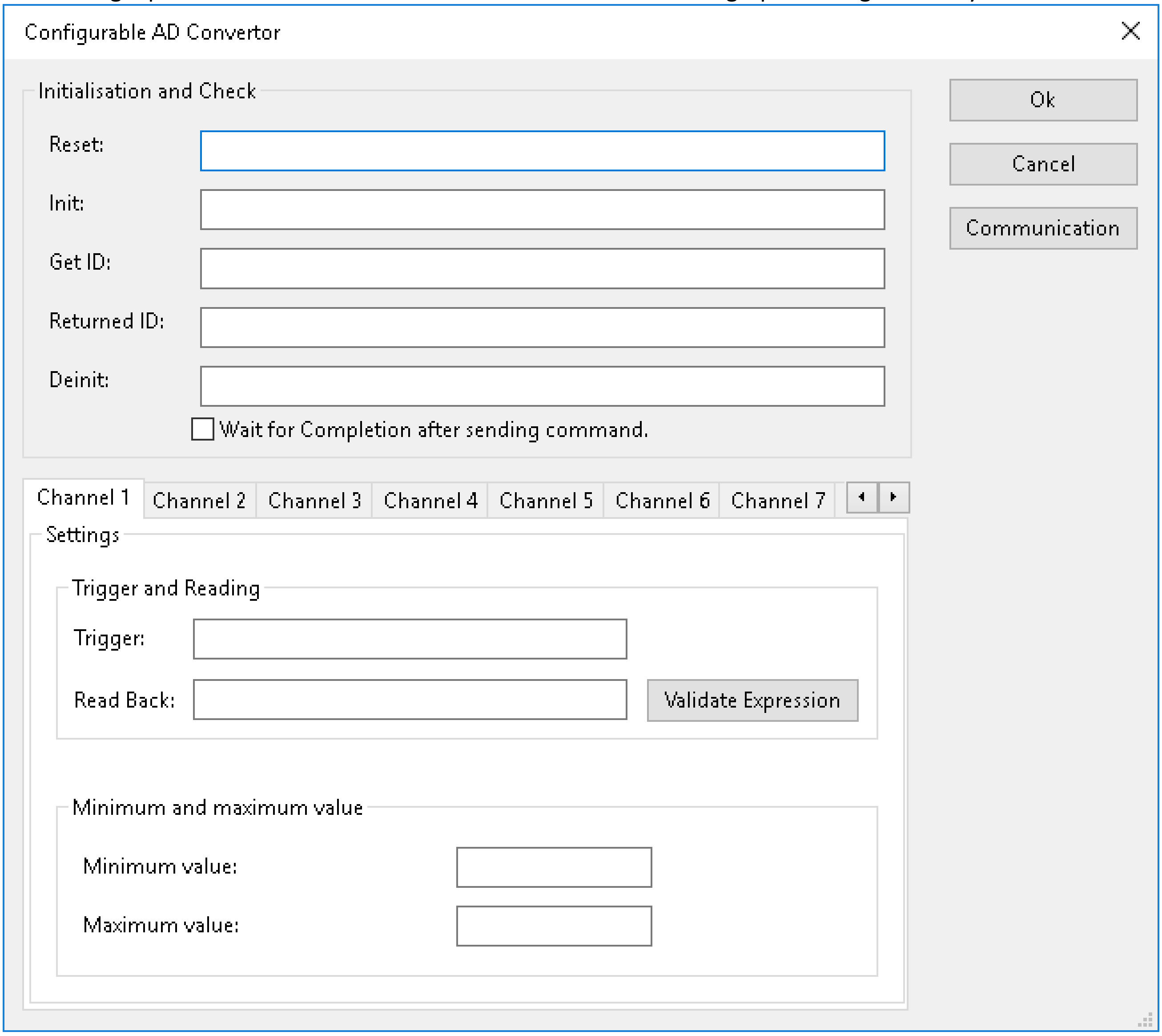
➢ **Start Zero** Start Zero is the string that RadiMation® needs to send to start zeroing the powermeter.

Example: "O1"

➢ **Duration** Duration is the time that RadiMation® waits so that the powermeter can zero properly. Make sure that this time is big enough, an incorrect value may result in unpredictable result.

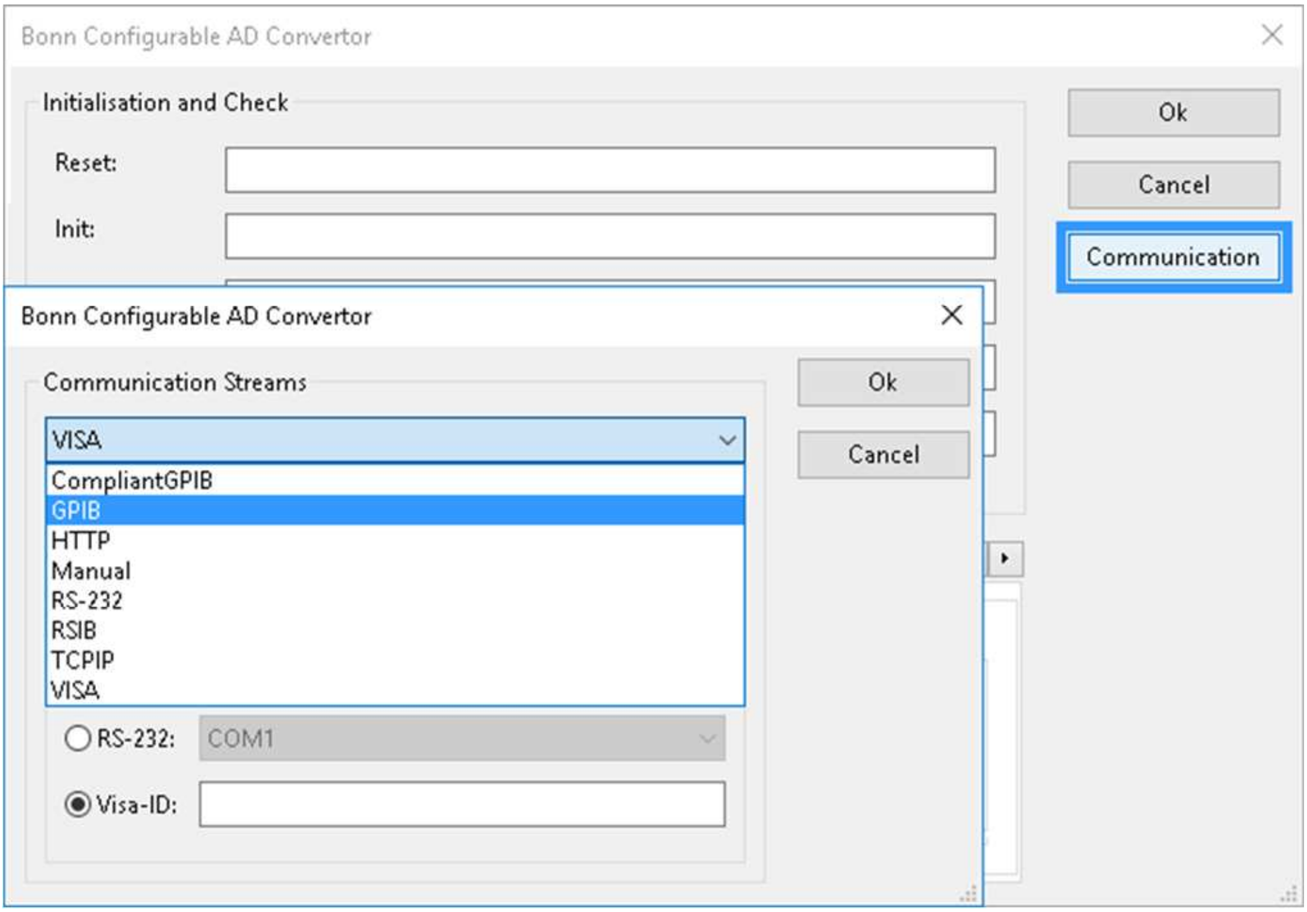
15.6.9 Configurable AD converter

The Configurable AD Convertor device driver is a AD Converter which is supported by RadiMation®. It can be used to control other measurement equipment, for which no RadiMation device driver is available yet. The Configurable AD Convertor allows to retrieve a measurement value from the measurement equipment, where the measured value can then be used in RadiMation as an EUT Monitoring input. These values can thus be measured and shown in graphs during immunity tests.



15.7 Communication

Multiple communication types can be selected for the configurable AD convertor. Depending on the connection that is used, select the correct **Communication Stream**, and configure the parameters correspondingly.
Note that when the selected communication type does not have the option to change the termination character, it will be expected that a new line feed is send by the connected device apppended to each message.



15.8 Initialisation and Check

- **Reset** The reset code that needs to be send to device. When left blank, no command will be send.
- **Init** The command that is send to initialize the configured device. When left blank no command will be send.
- **Get Id** The command that is send to retrieve the ID of the device. This is used to check if the device is connected. A commonly used SCPI command is: *IDN?. When left blank, no command will be send.
- **Returned ID** The identifier is used to check if the correct device driver is selected and the device is connected. Leaving this blank, will skip the device check.

➢**Deinit** Specifies the command that is send when the device is no longer controlled. This can for example be used to put the measurement device is an intrinsic safe state. Leaving this blank, will keep the device in its last state after controlling it.

➢**Wait for Completion after sending command** The checkmark can be enabled so RadiMation® will wait for all the commands to complete, before it continues. This is done by sending SCPI command *OPC? to the device.

15.9 Channels

AD convertors can have multiple channels on which AD values could be read. The Configurable AD Convertor device driver is able to retrieve up to 40 measurement values from the measurement device. For each AD channel, individual commands can be set, specific for the values that should be retrieved.

15.9.1.1 Trigger and Reading

➢**Trigger** A trigger command can be specified to request a measurement from the device. A commonly used SCPI command is: *TRG. When left blank, no command will be send.

➢**Read Back** Different measurement devices will return different messages that contain the measurement value. The configurable AD convertor only needs the numeric value of the measurement device response. The text that is specified in the **Read Back** box, is used as a regular expressions to determine the returned value.
A good regular expression for finding the first number in scientific notation in a text is:
([+-]?[0-9]*\.?[0-9]+([eE][+-]?[0-9]+)?)
For more possibilities see the example section.

➢**Validate Expression** Shows a window where the expected output of the measurement device and a regular expression can be typed. The result of the interpretion will then automatically be shown. This window can be used to test the regular expression, to determine if the expected response results in the desired value.

15.9.1.2 Minimum and maximum value

The minimum and maximum must be set to calculate the raw AD convertor value to a digital value with a specific type.

➢**Minimum value** The lowest value that can be measured with this device. The value must be the same as filled in the EUT window.

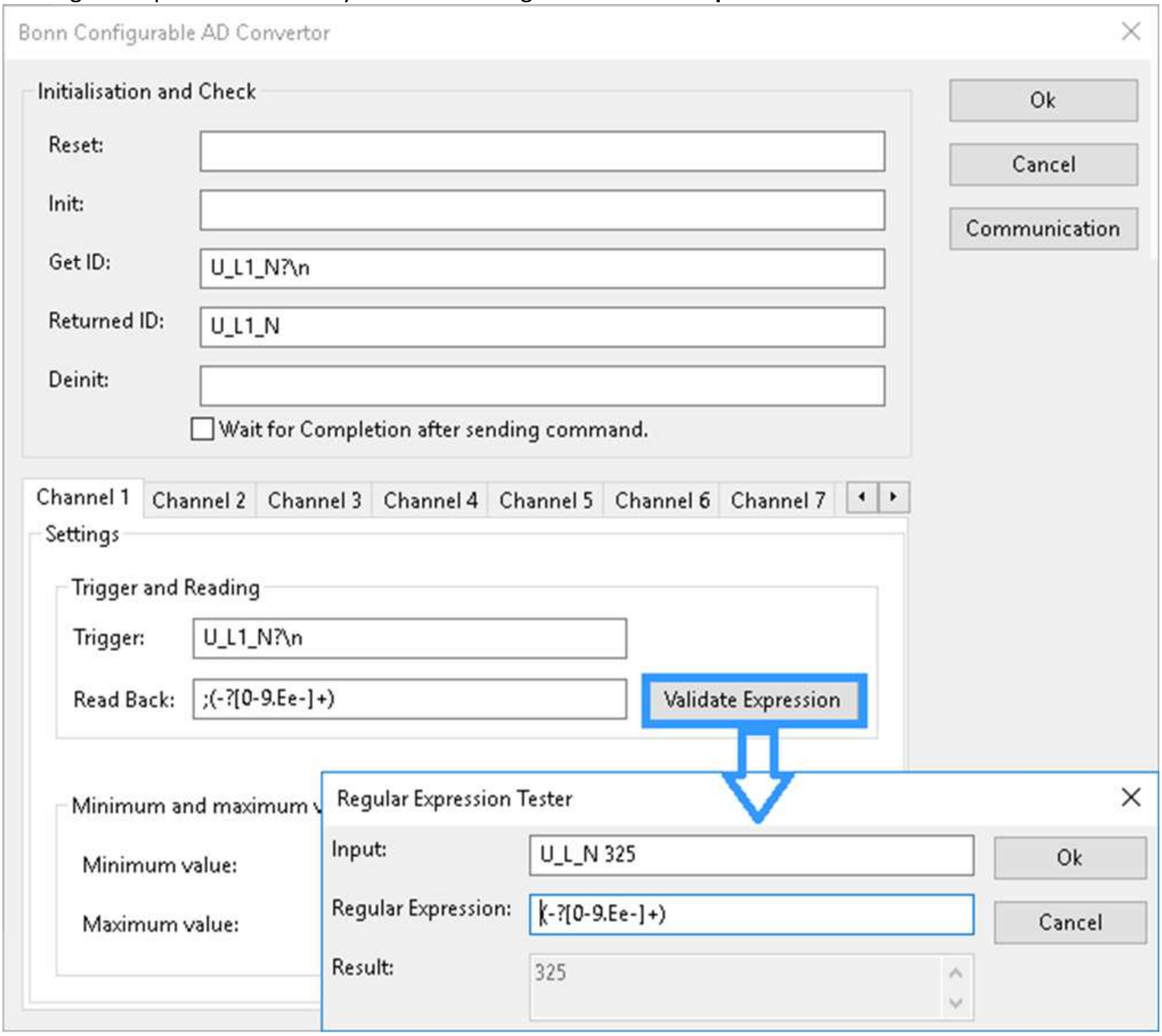
➢**Maximum value** The highest value that can be measured with this device. The value must be the same as filled in the EUT window.

With minimum set to 0 and maximum set to 1, the raw value won't be converted, but instead directly used as it is included in the response.

15.10 Read Back examples

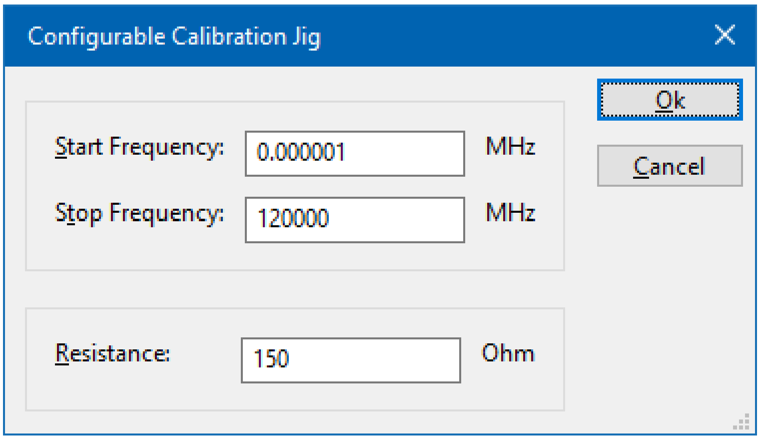
Received information	Regex	RadiMation Readout	Note
U_L_N 325	(-?[0-9.,Ee-]+)	325	Takes the first number.
I_L1;12.34	;(-?[0-9.,Ee-]+)	12.34	Takes the first number after ";".
THD_U_L1;;14,5	;;(-?[0-9.,Ee-]+)	14.5	Takes the first number after ";;".
AC_FREQ;Channel1;1.23E3	;.*;(-?[0-9.,Ee-]+)	1230	Takes the first number after the appearance of a second ";".

The regular expression can always be tested trough the **Validate Expression** function.



15.10.1 Configurable Calibration Jig

The Configurable Calibration Jig device driver is a Calibration Jig which is supported by RadiMation®. It can be used to control other measurement equipment, for which no RadiMation® device driver is available yet. The Configurable Calibration Jig allows to create a device driver to specify the details of a calibration jig that is used to calibrate a CDN or Injection Device. The configured device driver can then be used in RadiMation®, and the calibration jig can thus be used during a conducted immunity calibration.



- **Start Frequency** The lowest usable frequency of the device.
- **Stop Frequency** The highest usable frequency of the device.
- **Resistance** The impedance of the injection system itself, for which the calibration jig is used to calibrate it.
  - In a 150 Ω injection system, thus 150 Ω should be specified, even though the Calibration Jig itself only contain 100 Ω resistors. In a 150 Ω injection system, this is the combination of the 100 Ω resistors in the calibration jig, and the 50 Ω typical impedance of the powermeter or analyser that is connected to the calibration jig.
  - In a 50 Ω injection system, thus 50 Ω should be specified, even though the Calibration Jig itself does not contain any impedance adaption resistors. The impedance of the system itself is then only defined by the 50 Ω typical impedance of the powermeter or analyser that is connected to the calibration jig.

15.10.2 Configurable Current Sensor

Only the start and stop frequency can be set for the amplifier. Chapter generic settings will give more information about the start and stop frequency

15.10.3 Configurable Pre Amplifier

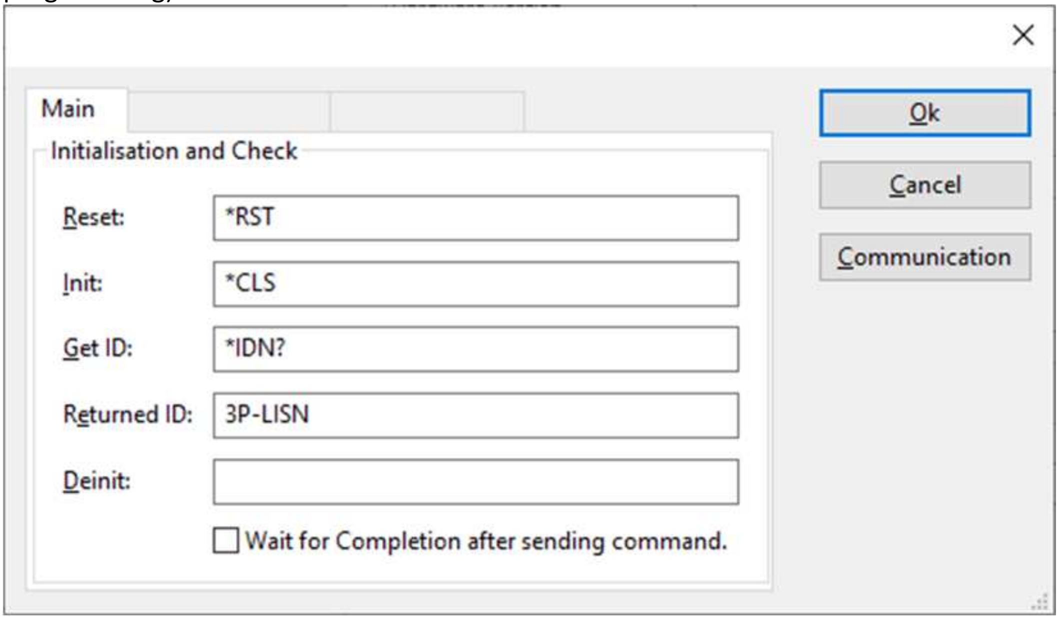
Only the start and stop frequency can be set for the amplifier. Chapter generic settings will give more information about the start and stop frequency

15.10.4 Configurable Receivers / Spectrum analyser

Due to the complexity of controlling analysers and (scanning) receivers, no configurable device driver is available for analyser and (scanning) receivers.

15.10.5 Configurable LISN

The Configurable LISN device driver is a LISN which is supported by RadiMation®.
The Configurable LISN device driver can be used to remote control a LISN, even if no device driver is available for that LISN in RadiMation®. This device driver contains several fields where the correct commands can be specified that should be transmitted to the LISN. These remote control commands are specific for that brand and model of the LISN, and are often available in the (remote programming) manual of the LISN.



- **Reset** — The reset command that needs to be send to device. When left blank, no command will be send.

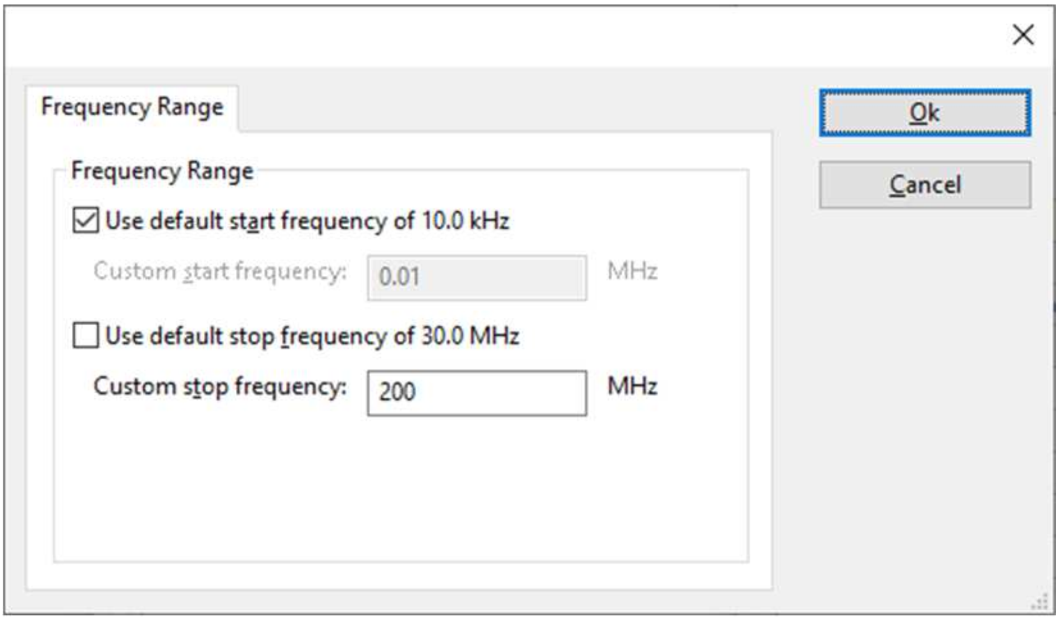
- **Init** — The command that is send to initialize the configured device. When left blank no command will be send.

- **Get ID** — The command that is send to retrieve the identity of the device. This is used to check if the device is connected. A commonly used SCPI command is: *IDN?. When left blank, no command will be send, and the device check is skipped.

- **Returned ID** — A string that is used to check if the correct device driver is selected and the device is connected. The device check consists of a few steps. First the **Get ID** command is transmitted to the device, and the response from the device is then received. The received response is then searched for the string specified at **Returned ID**, and if the string is found it is confirmed that the correct device is connected. The string specified can also be a Regular expression, which is then used to find a match in the response from the device. Leaving this blank, will skip the device check, and it is silently assumed (but not checked) that the correct device is connected.

- **Deinit** Specifies the command that is send when the device is no longer controlled. This can for example be used to put the measurement device is an intrinsic safe state. Leaving this blank, will keep the device in its last state after controlling it.

- **Wait for Completion after sending command** The checkmark can be enabled so RadiMation® will wait for all the commands to complete, before it continues. This is done by sending SCPI command *OPC? to the device.



The frequency range of the Chapter 15 as provided by the manufacturer is shown and selected as default. It is possible to overrule these frequencies and to manual adjust the allowed frequency range of the Chapter 15.

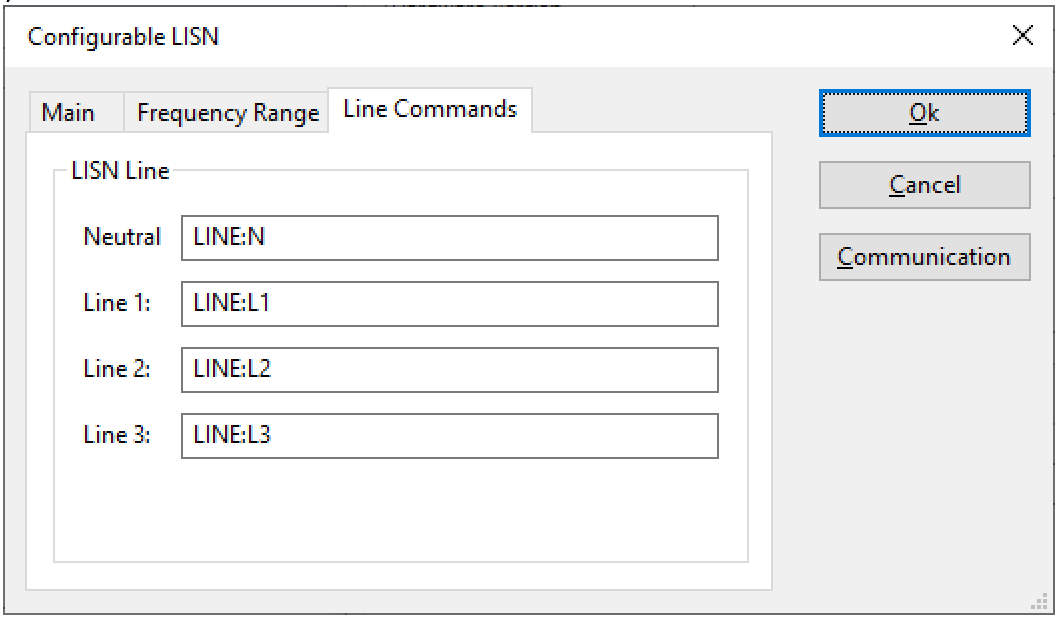
- **Use default start frequency** If the checkbox is checked, the default start frequency will be used as the lowest usable frequency in a test for this device.

- **Custom start frequency** If the **Use default start frequency** checkbox is unchecked, another start frequency (expressed in MHz) can be specified. The customized start frequency will then be used as the lowest usable frequency in a test for this device. The customized frequency can be a limitation or an extension of the default start frequency.

- **Use default stop frequency** If the checkbox is checked, the default stop frequency will be used as the highest usable frequency in a test for this device.

- **Custom stop frequency** If the **Use default stop frequency** checkbox is unchecked, another stop frequency (expressed in MHz) can be specified. The customized stop frequency will then be used as the highest usable frequency in a test for this device. The customized frequency can be a limitation or an extension of the default stop frequency.

Be careful changing these setting as RadiMation® is no longer able to verify if the Chapter 15 is used outside frequency range that is specified by the manufacturer. This may result to serious damage of your measurement device.



- **Neutral** The command that should be transmitted when the 'Neutral' line of the LISN should be selected. If no command is specified, nothing will be transmitted.
- **Line 1** The command that should be transmitted when the 'Line 1' line of the LISN should be selected. If no command is specified, nothing will be transmitted.
- **Line 2** The command that should be transmitted when the 'Line 2' line of the LISN should be selected. If no command is specified, nothing will be transmitted.
- **Line 3** The command that should be transmitted when the 'Line 3' line of the LISN should be selected. If no command is specified, nothing will be transmitted.

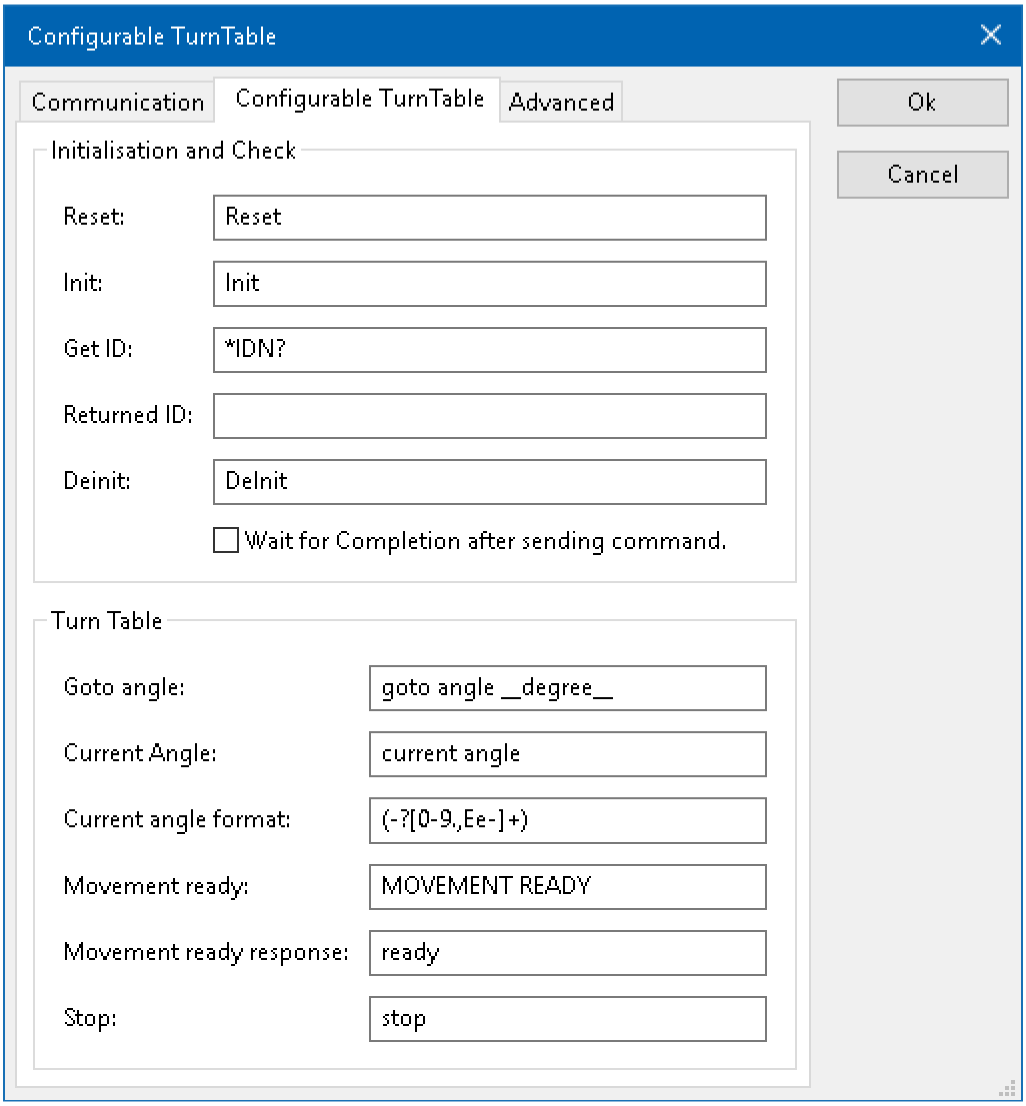
Also the following additional buttons are available in this device driver:

- **Ok** Closes the dialog, where all the changed settings are stored.
- **Cancel** Closes the dialog, where all the changed settings are discarded.
- **Communication** Opens an additional dialog which allows to set the correct communication medium to communicate with the device, including any relevant settings.

15.10.6 Configurable Turn Table

The Configurable TurnTable device driver is a Turn Table which is supported by RadiMation®.
It can be used to control other measurement equipment, for which no RadiMation device driver is available yet. The Configurable Turn Table allows to manual create a device driver to control a Turn Table. The configured device driver can then be used in RadiMation, and the Turn Table can thus be used in immunity and emission tests.

15.11 Configurable commands



- **Reset** The reset code that needs to be send to device. When left blank, no command will be send.

- **Init** The command that is send to initialize the configured device. When left blank no command will be send.

- **Get Id** The command that is send to retrieve the ID of the device. This is used to check if the device is connected. A commonly used SCPI command is: *IDN?. When left blank, no command will be send.

- **Returned ID** The identifier is used to check if the correct device driver is selected and the device is connected. Leaving this blank, will skip the device check.

- **Deinit** Specifies the command that is send when the device is no longer controlled. This can for example be used to put the measurement device is an intrinsic safe state. Leaving this blank, will keep the device in its last state after controlling it.

➢ **Wait for Completion after sending command**	The checkmark can be enabled so RadiMation® will wait for all the commands to complete, before it continues. This is done by sending SCPI command *OPC? to the device.
➢ **Goto angle**	The command that should be send to turn the turn table. The command must include the keyword __angle__, __degree__ or __radian__, which will be replaced by the desired destination angle for the turntable.
➢ **Current Angle**	This is the command to request the current angle of the device.
➢ **Current angle format**	This is a regular expression to obtain the current angle from the response of the Current angle command. See regular expression examples below.
➢ **Movement ready**	This is the command to request the current status of the turn table. This command is used to determine if the turntable is ready with the movement to the destination angle.
➢ **Movement ready response**	This should be the response from the device when the turntable is not moving/rotating anymore.
➢ **Stop**	This is the command to abort/stop any rotation.

15.12 Order of executed commands

This section describes which commands from the Chapter 15 are transmitted to the actual device, when a specific operation in RadiMation® is performed.

15.12.1 Check device

When a check for the connection to the device is performed, the following actions are performed:

1. A connection to the device is opened.
2. If no **Returned ID** is specified, no actual check is performed, and it is assumed that the device is connected. Otherwise:
    1. The command specified at **Get ID** is transmitted (if specified), and the response is read.
    2. The response is compared to the value specified in **Returned ID**, if the response (partially or as a regular expression) matches, the device is assumed to be connected.
3. The connection to the device is closed.

15.12.2 Device is initialised

When a device is initialised to be controlled from RadiMation®, the following actions are performed:

1. A connection to the device is opened.
2. The command specified at **Reset** is transmitted (if specified).
3. The command specified at **Init** is transmitted (if specified).

15.12.3 Device is deinitialised

When a device is deinitialised, the following actions are performed:

1. The command specified at **Deinit** is transmitted (if specified).
2. The connection to the device is closed.

15.12.4 Retrieve the current angle from the turntable

When RadiMation® wants to determine the actual angle from the turntable, the following actions are performed:

1. The command specified at **Current Angle** is transmitted (if specified), and the response is read.
2. The response is interpreted using the regular expression specified at **Current angle format**. The result of the regular expression lookup is converted to a number, and reported back as the actual angle (in degrees) of the turntable to RadiMation®.

15.12.5 Turn the turntable to an angle

When a turntable in RadiMation is being turned to another angle, the following actions are performed:

1. The command specified at **Goto angle** is parsed, and a temporary string replacement is done on the command:

- Every occurrence of __angle__ is replaced by the numeric value of the destination angle in degrees.
- Every occurrence of __degree__ is replaced by the numeric value of the destination angle in degrees.
- Every occurrence of __radian__ is replaced by the numeric value of the destination angle in radians.

2. The temporarily modified command specified at **Goto angle** is transmitted.
3. To determine if the turntable has reached the destination angle or has stopped turning, the following actions are repeated multiple times:
   - The current angle is retrieved as described at 'Retrieve the current angle from the turntable'
   - The command specified at **Movement ready** is transmitted (if specified), and the response is read.
   - The response is compared to the value specified in **Movement ready response**, if the response (partially or as a regular expression) matches, the device is assumed to be ready with the movement.
4. The command specified at **Stop** is transmitted (if specified).

15.13 Regular expression examples

The Chapter 15 uses regular expression on some commands to interpret and parse the response of the actual device.
Some examples are:

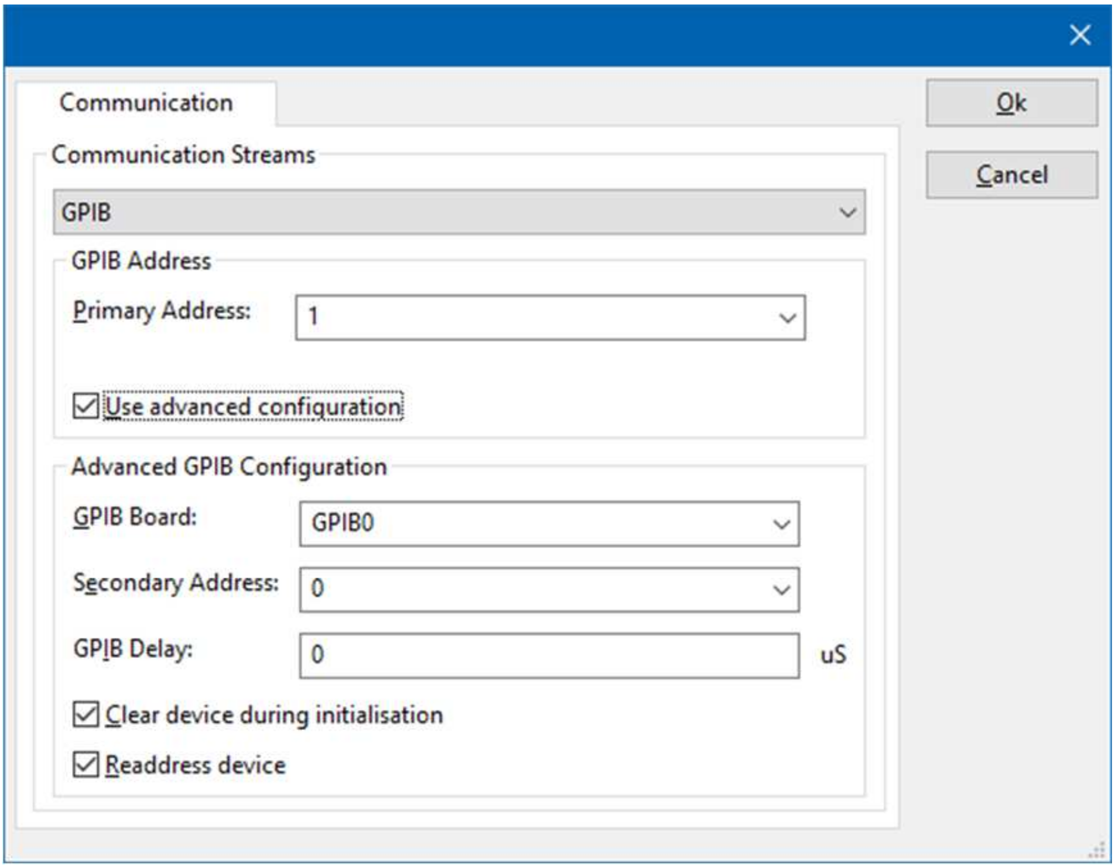
Received information	Regular expression	RadiMation® Readout	Note
U_L_N 325	(-?[0-9.,Ee-]+)	325	Takes the first number.
I_L1;12.34	;(-?[0-9.,Ee-]+)	12.34	Takes the first number after ";".
THD_U_L1;;14,5	;;(-?[0-9.,Ee-]+)	14.5	Takes the first number after ";;".
AC_FREQ;Channel1;1.23E3	;.*;(-?[0-9.,Ee-]+)	1230	Takes the first number after the appearance of a second ";".

15.13.1 Configurable Antenna Tower

The Configurable Antenna Tower device driver is a Antenna Tower which is supported by RadiMation®.
It can be used to control other equipment for which no RadiMation device driver is available yet. The Configurable Antenna Tower allows to manual create a device driver to control a Antenna Tower. The configured device driver can then be used in RadiMation, and the Antenna Tower can thus be used in immunity and emission tests.

The following tabs are available in the advanced configuration of the Configurable Antenna Tower Driver:

15.14 Communication



On the **Communication** tab, the desired communication method can be selected and configured. Depending on the selected method, additional relevant settings are shown and can be configured.

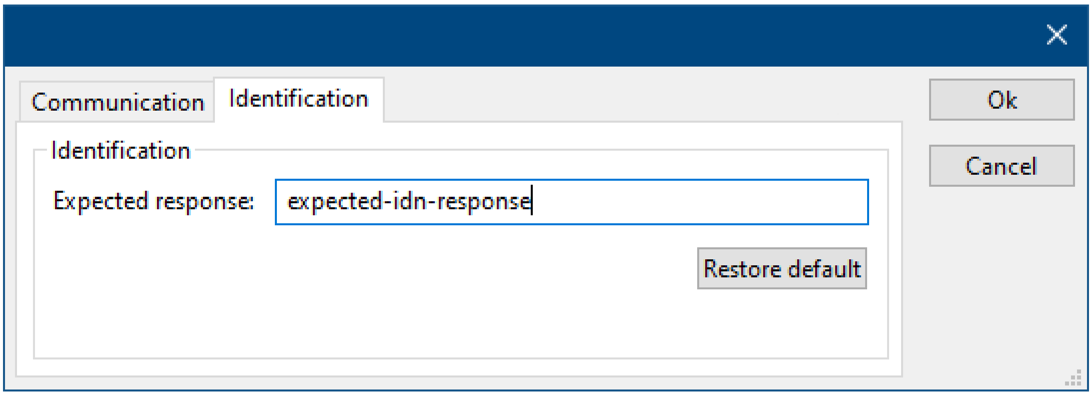
➢ **Communication Streams**

Selects the medium or method that should be used to communicate with the device. Depending on the capabilities of the device this can be one or more of:

- GPIB
- RS-232
- USB
- VISA
- TCPIP

See the Communication Settings in Chapter 15, on how to configure each of these methods.

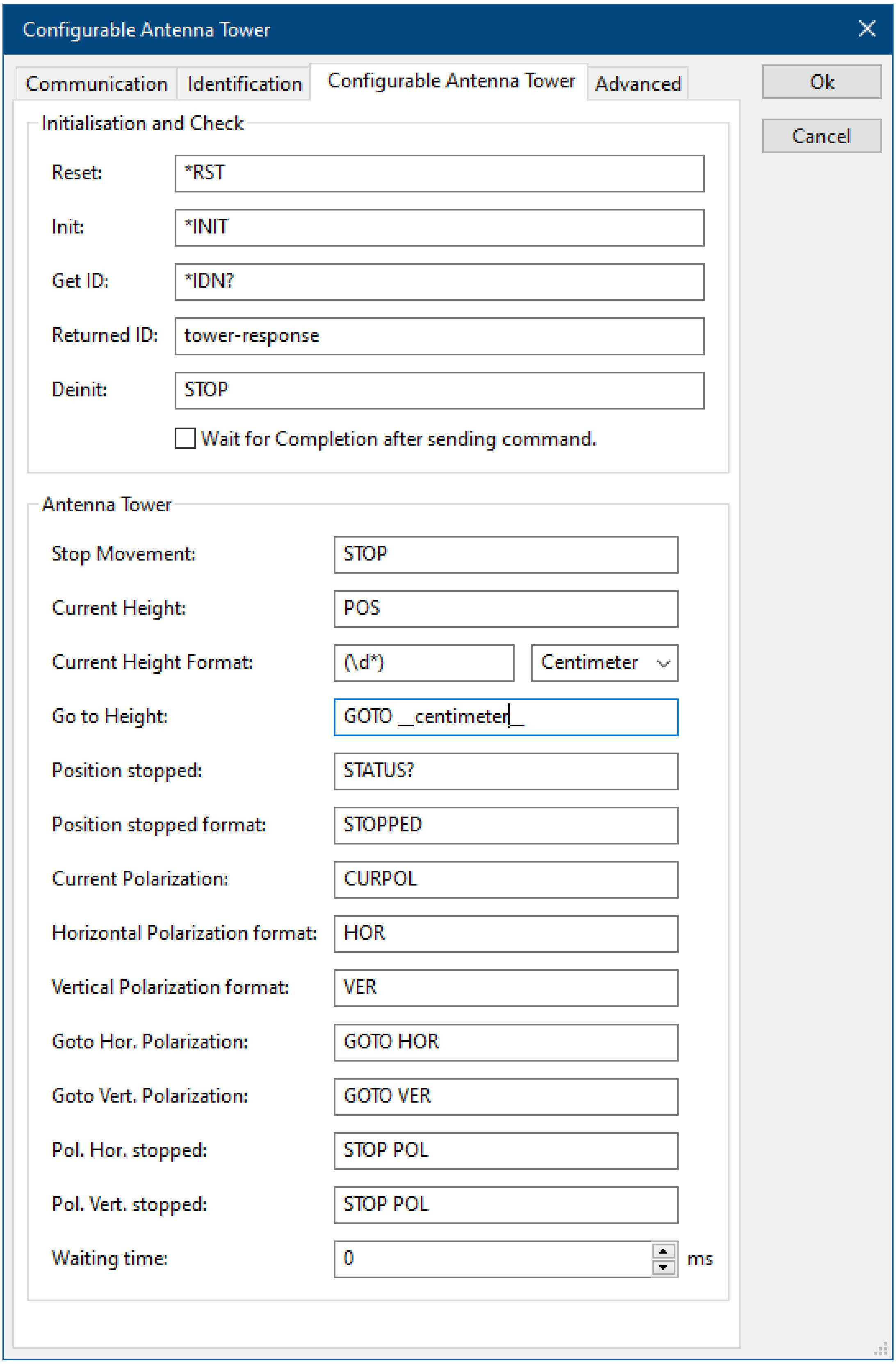
15.15 Identification



On the **Identification** tab, the expected *IDN? response of the test and measurement device can be configured. It is used to determine if the correct test and measurement device is connected.

- **Expected response** – The expected *IDN? response of a device. It can be changed in the case the commands are the same for another device for which no RadiMation® driver is available yet.
- **Restore default** – Restores the original **Exepected response**.

15.16 Configurable Antenna Tower commands



On the **Configurable antenna tower** tab, the specific commands to control an antenna tower can be specified.

15.16.1 Initialisation and Check

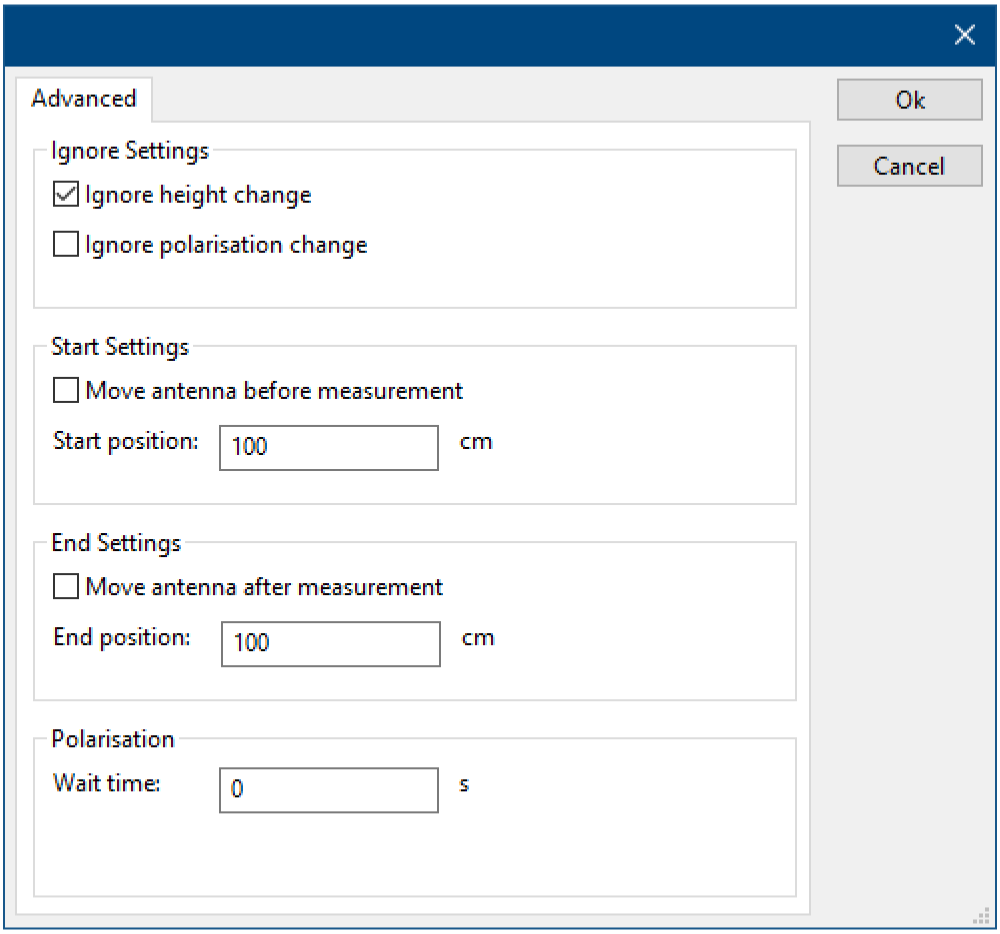
➢ **Reset**	The reset code that needs to be send to device. When left blank, no command will be send.
➢ **Init**	The command that is send to initialize the configured device. When left blank no command will be send.
➢ **Get Id**	The command that is send to retrieve the ID of the device. This is used to check if the device is connected. A commonly used SCPI command is: *IDN?. When left blank, no command will be send.
➢ **Returned ID**	The identifier is used to check if the correct device driver is selected and the device is connected. Leaving this blank, will skip the device check.
➢ **Deinit**	Specifies the command that is send when the device is no longer controlled. This can for example be used to put the measurement device is an intrinsic safe state. Leaving this blank, will keep the device in its last state after controlling it.
➢ **Wait for Completion after sending command**	The checkmark can be enabled so RadiMation® will wait for all the commands to complete, before it continues. This is done by sending SCPI command *OPC? to the device.

15.16.2 Antenna Tower

➢ **Stop Movement**	The command that is send to stop the antenna tower. When left blank, no command will be send.
➢ **Current Height**	The command that is send to request the current height. When left blank no command will be send.
➢ **Current Height Format**	A regular expression to parse the response from the **Current Height** request. The received value will be interpreted as being the the unit in Meter, Centimeter or Millimeter, as selected by the dropdownbox.
➢ **Go to Height**	The command that is send to move the antenna tower to a certain height. The command must include a keyword, __meter__, __centimeter__ or __millimeter__ which will be replaced with the corresponding height for the antenna tower. When left blank, no command will be sent.
➢ **Position stopped**	The command that is send to request the status if the antenna tower is moving. When left blank, no command will be send.
➢ **Position stopped format**	A regular expression which will be matched against the response of the **Position stopped** command. When the result is matching with the response, the tower is stopped.

➢ **Current Polarization**	The command to request the current polarisation. It is mandatory to also supply the format of the polarization in the next fields. When left blank, no command will be sent.
➢ **Horizontal Polarization format**	A regular expression which will be matched against the response of the **Current Polarization** command. When the result is matching the driver reports Horizontal back to RadiMation.
➢ **Vertical Polarization format**	A regular expression which will be matched against the response of the **Current Polarization** command. When the result is matching the driver reports Vertical back to RadiMation.
➢ **Hor. Polarization**	The command that is send to change the polarization to horizontal. When left blank, no command will be send.
➢ **Vert. Polarization**	The command that is send to change the polarization to vertical. When left blank, no command will be send.
➢ **Pol Hor. stopped**	The command that is send after the command **Hor. Polarization** is sent, with a delay of **Waiting time** between the two commands. When left blank, no command will be send.
➢ **Pol Vert. stopped**	The command that is send after the command **Vert. Polarization** is sent, with a delay of **Waiting time** between the two commands. When left blank, no command will be send.
➢ **Waiting time**	The wait time, specified in milli seconds, between the Polarization command and Polarization stopped commands.

15.17 Antenna Tower Advanced



On the **Advanced** tab, more advanced settings regarding the control of the antenna tower can be selected and configured.

➢ **Ignore height change** When checked, no height related commands and changes will be send to the antenna tower. This can for example be checked if the the antenna is mounted on a fixed height tripod.

➢ **Ignore polarisation change** When checked, no polarisation related commands and changes will be send to the Antenna Tower. This can for example be checked if the antenna tower does not have a automatic polariser.

➢ **Move antenna before measurement** When checked, the antenna will be moved to the **Start position** before the actual test is started.

➢ **Start position** The height, specified in centimeters, to which the antenna is moved, before the actual test is started.

➢ **Move antenna after measurement** When checked, the antenna will be moved to the **End position** after the test has finished.

➢ **End position** The height, specified in centimeters, to which the antenna is moved, after the test has finished.

➢ **Wait time** The time, specified in seconds, to wait after a command is issued to change the polarisation. This can for example be used to include an additional delay to ensure that the antenna polariser has reached the final location before the actual test continues.

15.17.1 Configurable Absorbing Clamps

Only the start and stop frequency can be set for the amplifier. Chapter generic settings will give more information about the start and stop frequency

15.17.2 Configurable Clamp positioner

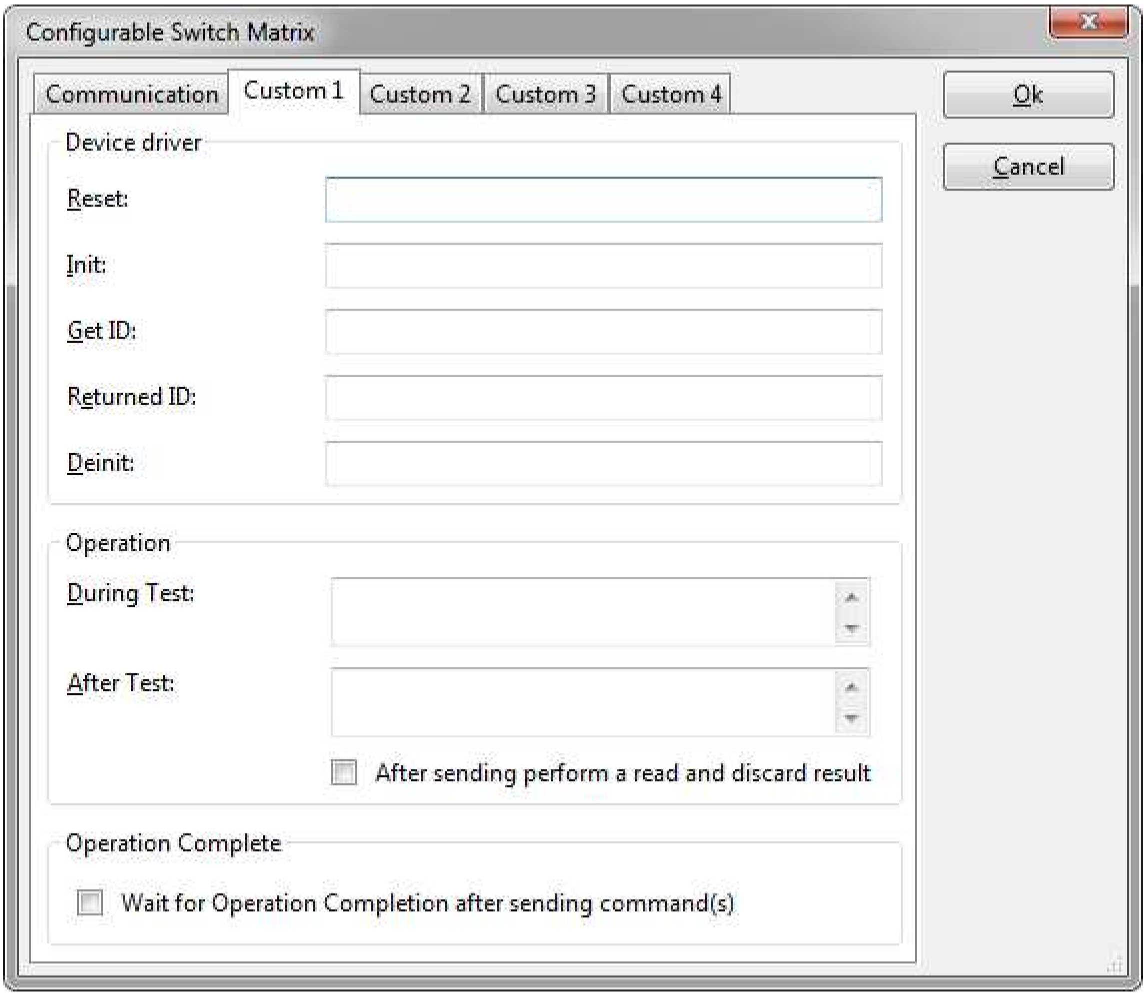
Currently unavailable.

15.17.3 Configurable Cable

Only the start and stop frequency can be set for the amplifier. Chapter generic settings will give more information about the start and stop frequency

15.17.4 Configurable Switch matrix

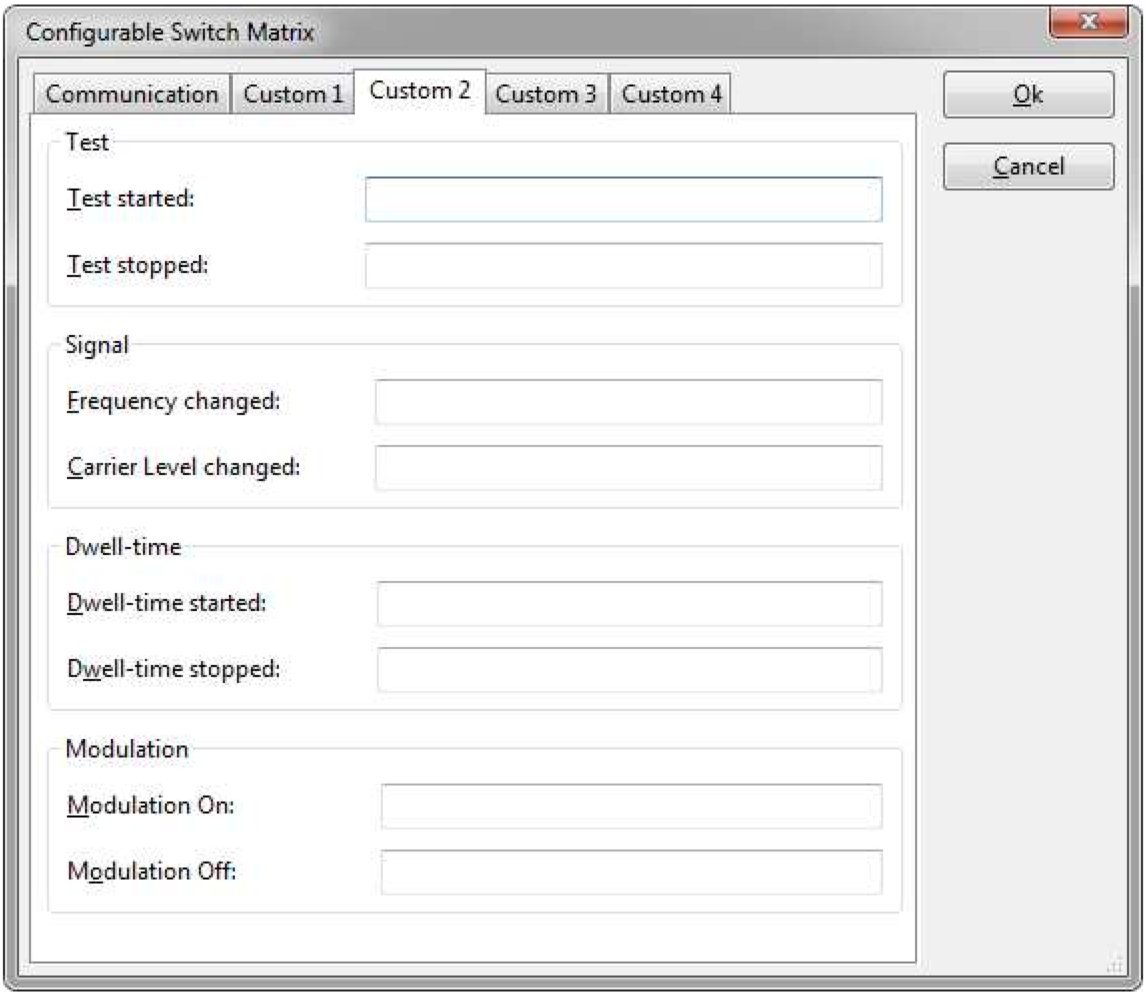
The Configurable Switch Matrix device driver is a Switch Matrix which is supported by RadiMation®.



For all text field applies: when a text field is left empty, no command is being send at that time.

➢ **Device Driver**	➢ **Reset**	Text field to specify the reset command. The command is send to the device during the test initialization.
	➢ **Init**	Text field to specify the initialize command. The command is send to the device during the test initialization.
	➢ **Get ID**	Text field to specify the *IDN? query. The command is send to the device during the device check.
	➢ **Returned ID**	Text field to specify the expected respond to have the Get ID compared with. The string is used during the device check in case a query is specified.
	➢ **Deinit**	Text field to specify the deinitialize command. The command is send to the device during the test deinitialization.
➢ **Operation**	➢ **During Test**	The command is send to the device just before starting the test.

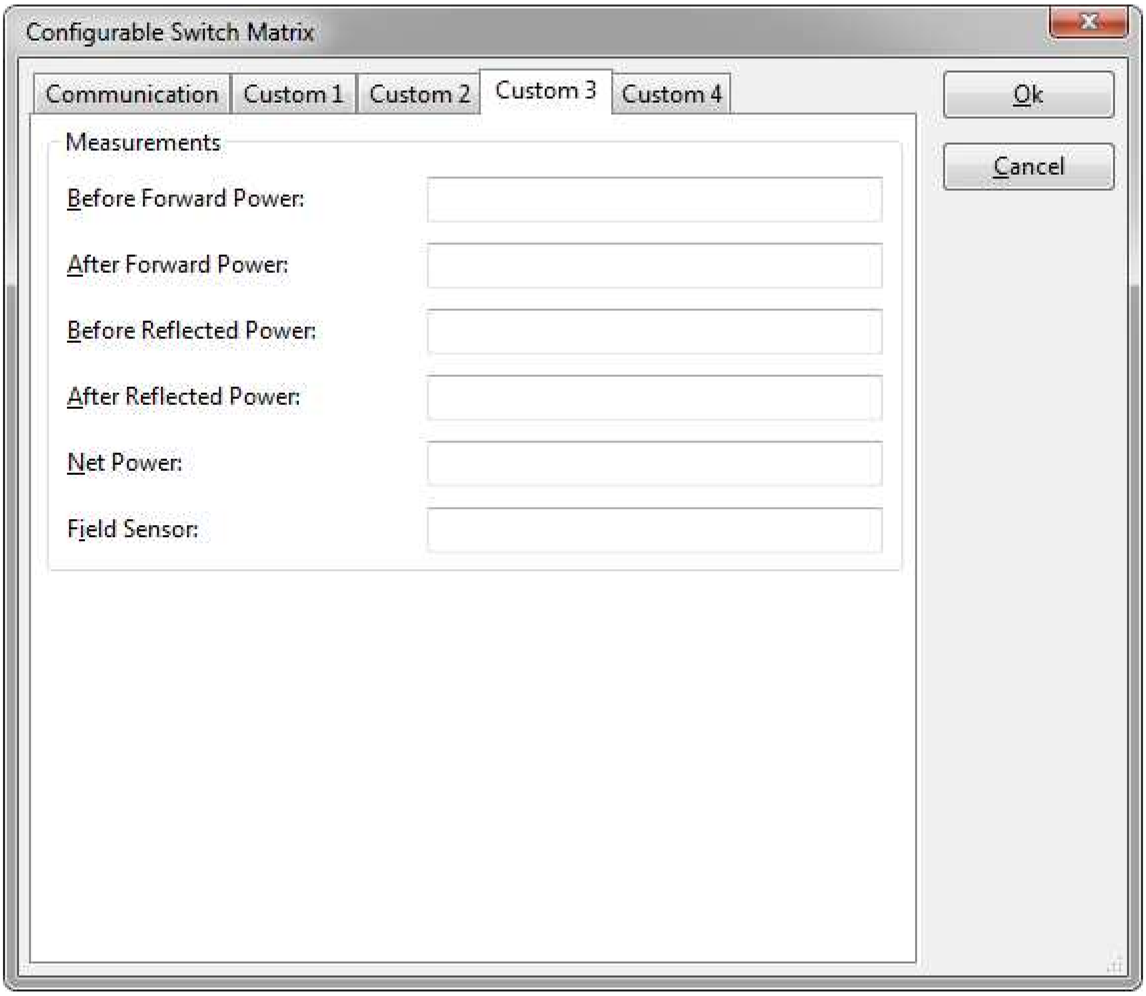
	After Test	The command is send to the device after finishing the test.
	After sending perform a read and discard result	When selected the driver will perform a read after sending the command. Some device need to be read out before sending the next command.
Operation Complete	**Wait for Operation Completion after sending command(s)**	This will append the *OPC? to the commands being send.



The following fields can be specified to send commands at each event. In several of the commands a keyword can be specified, which will be replaced by the actual value.

Test	**Test started**	

	➢ **Test stopped**	
➢ **Signal**	➢ **Frequency changed**	Keyword __freq__ will be replaced by the frequency in MHz.
	➢ **Carrier Level changed**	Keyword __carrier__, will be replaced by the carrier level in dBm.
➢ **Dwell-time**	➢ **Dwell-time started**	
	➢ **Dwell-time stopped**	
➢ **Modulation**	➢ **Modulation on**	
	➢ **Modulation off**	

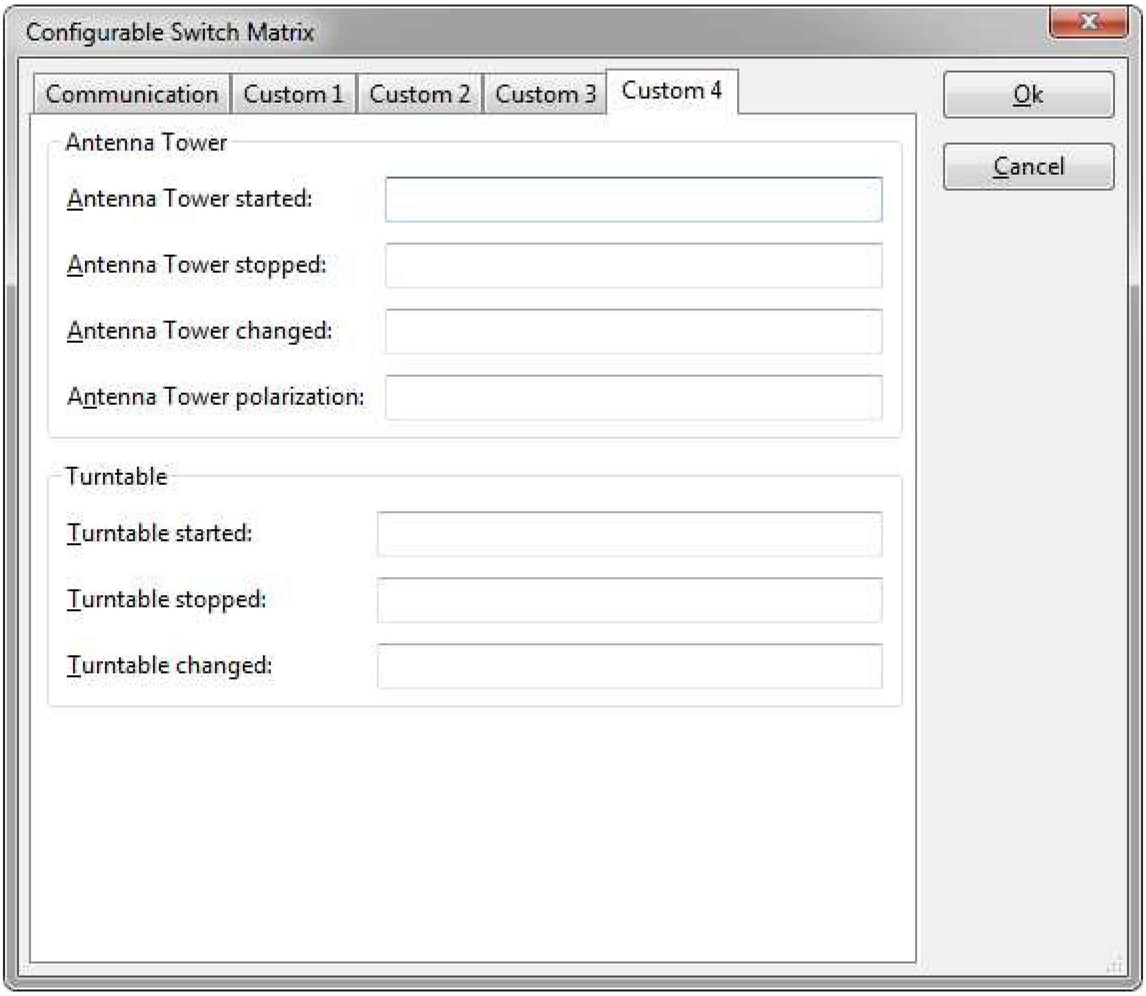


The following fields can be specified to send commands at each event. Depending on the event, the keyword __result__ can be used and is replaced by a value. For example: "My forward power is __result__dBm" will be replaced by: "My forward power is -3.15dBm".

➢ **Measurements**	➢ **Before Forward Power**	
	➢ **After Forward Power**	Keyword __result__ will be replaced by measured Forward power in dBm.
	➢ **Before Reflected Power**	
	➢ **After Reflected Power**	Keyword __result__ will be replaced by measured Reflected power in dBm.

- **Net Forward Power** Keyword __result__ will be replaced by measured Net power in dBm

- **Field Sensor** Keyword __result__ will be replaced by measured Field strength in V/m



The following fields can be specified to send commands at each event.

- **Antenna Tower**
  - **Antenna Tower started**
  - **Antenna Tower stopped**
  - **Antenna Tower changed**

	➢ **Antenna Tower polarization**
➢ **Turntable**	➢ **Turntable started**
	➢ **Turntable stopped**
	➢ **Turntable changed**

In all of the commands, it is also possible to include a keyword to insert the latest known value of another measurement value. Several keywords are available can be included in these commands. When one of these keywords is detected, it will be replaced by the corresponding value.

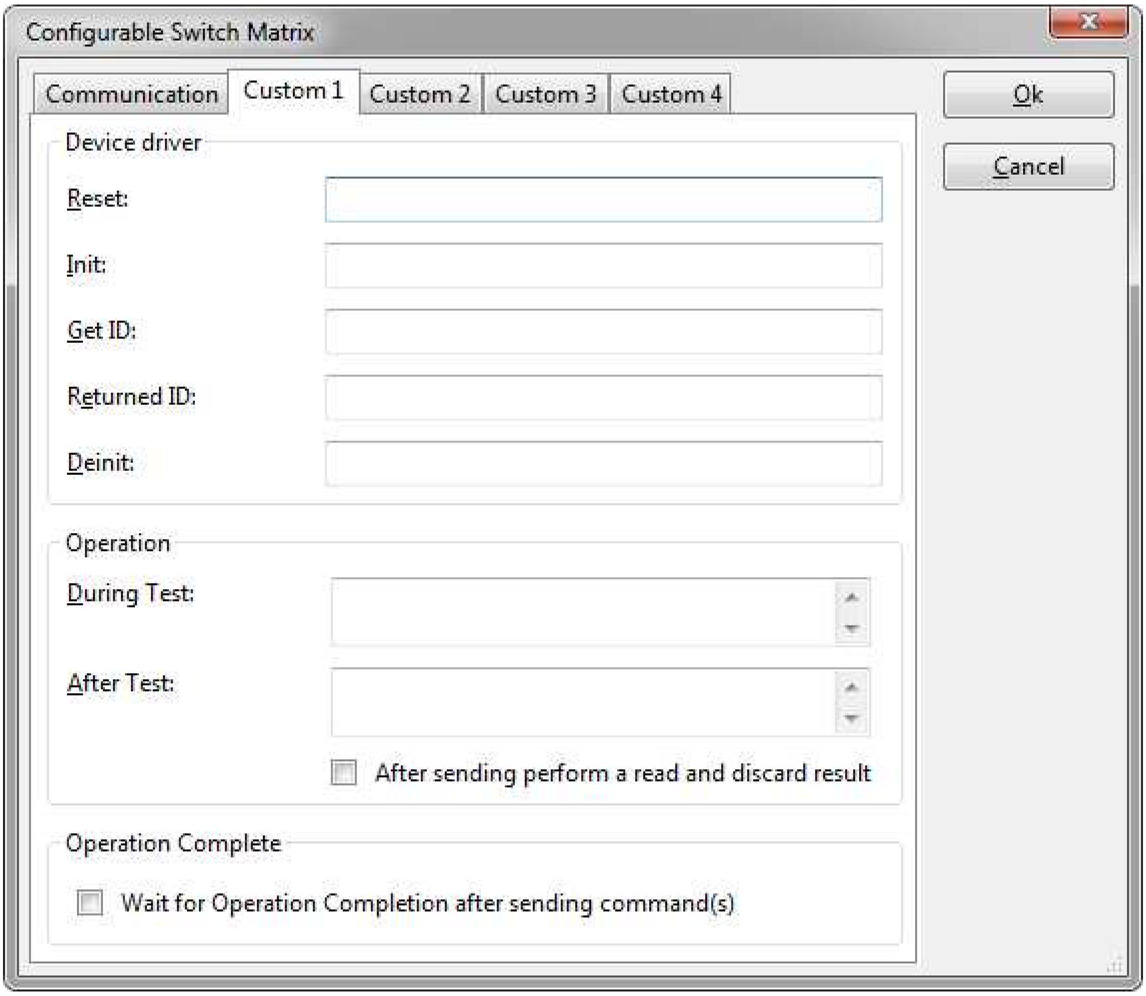
keyword	inserted value
__freq__	the signal generator frequency expressed in MHz
__freqHz__	the signal generator frequency expressed in Hz
__freqkHz__	the signal generator frequency expressed in kHz
__freqMHz__	the signal generator frequency expressed in MHz
__freqGHz__	the signal generator frequency expressed in GHz
__carrier__	the signal generator carrier level expressed in dBm
__carrierdBm__	the signal generator carrier level expressed in dBm
__carrierW__	the signal generator carrier level expressed in Watt
__carriermW__	the signal generator carrier level expressed in milli-Watt
__forward__	the forward power expressed in dBm
__forwarddBm__	the forward power expressed in dBm
__forwardW__	the forward power expressed in Watt
__forwardmW__	the forward power expressed in milli-Watt
__reflected__	the reflected power expressed in dBm
__reflecteddBm__	the reflected power expressed in dBm
__reflectedW__	the reflected power expressed in Watt
__reflectedmW__	the reflected power expressed in milli-Watt
__height__	the height where the antenna is moving to expressed in metre
__heightm__	the height where the antenna is moving to expressed in metre
__heightcm__	the height where the antenna is moving to expressed in centimetre
__angle__	the angle where the turntable is turning to expressed in degrees
__degree__	the angle where the turntable is turning to expressed in degrees
__radian__	the angle where the turntable is turning to expressed in radians

Some remarks should be taken into account with these keywords:

- the keywords are case sensitive,
- the latest known value at that moment will be used,
- if no value is known at all, the keyword will not be replaced, and will remain in the command,
- the values are transmitted in non-scientific notation, and will use a '.' as a decimal point.

15.17.5 EUT Controller

The Configurable EUT Controller device driver is a EUT Controller which is supported by RadiMation®.

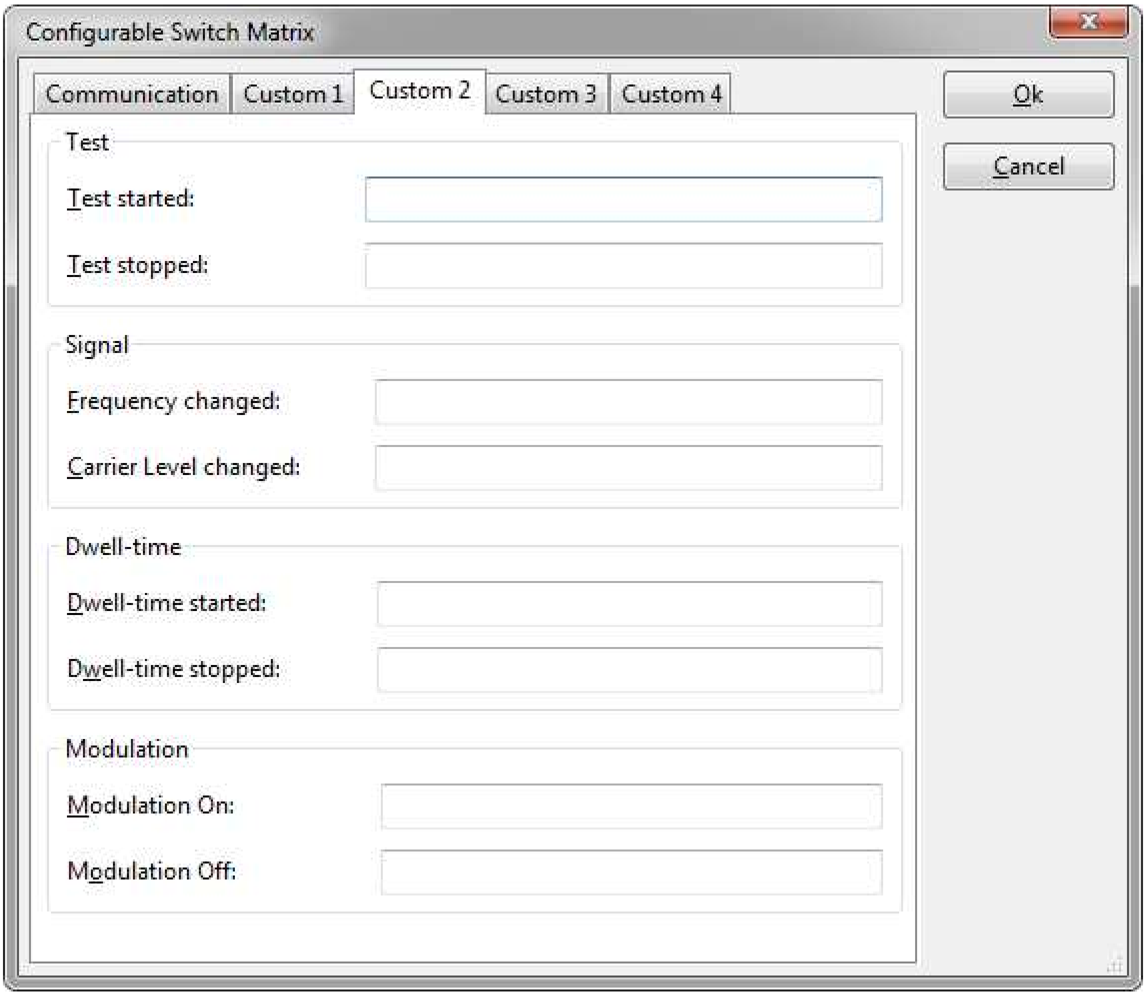


For all text field applies: when a text field is left empty, no command is being send at that time.

➢ **Device Driver**	➢ **Reset**	Text field to specify the reset command. The command is send to the device during the test initialization.
	➢ **Init**	Text field to specify the initialize command. The command is send to the device during the test initialization.
	➢ **Get ID**	Text field to specify the *IDN? query. The command is send to the device during the device check.
	➢ **Returned ID**	Text field to specify the expected respond to have the Get ID compared with. The string is used during the device check in case a query is specified.
	➢ **Deinit**	Text field to specify the deinitialize command. The command is send to the device during the test deinitialization.
➢ **Operation**	➢ **During Test**	The command is send to the device just before starting the test.

- **After Test** — The command is send to the device after finishing the test.
- **After sending perform a read and discard result** — When selected the driver will perform a read after sending the command. Some device need to be read out before sending the next command.

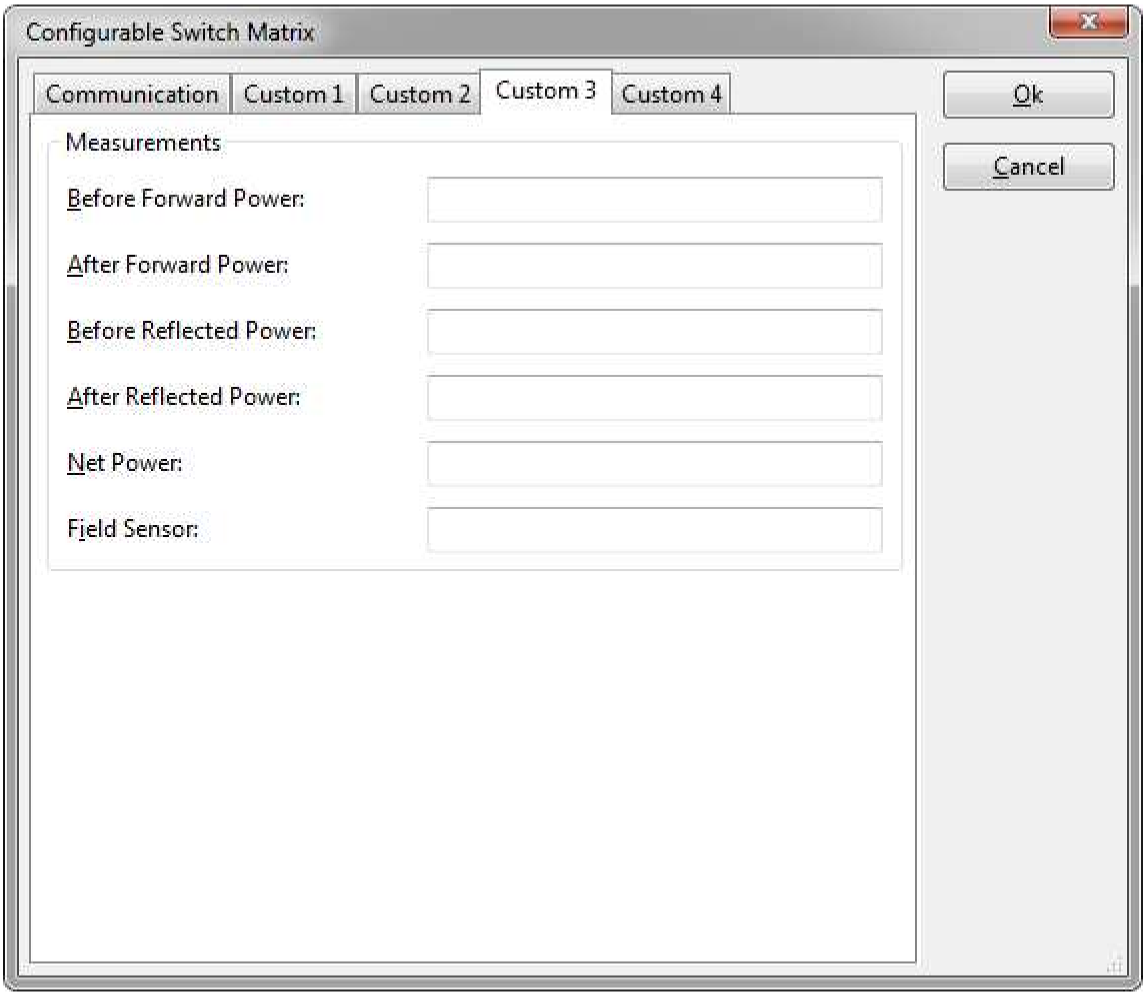
- **Operation Complete**
  - **Wait for Operation Completion after sending command(s)** — This will append the *OPC? to the commands being send.



The following fields can be specified to send commands at each event. In several of the commands a keyword can be specified, which will be replaced by the actual value.

- **Test**
  - **Test started**

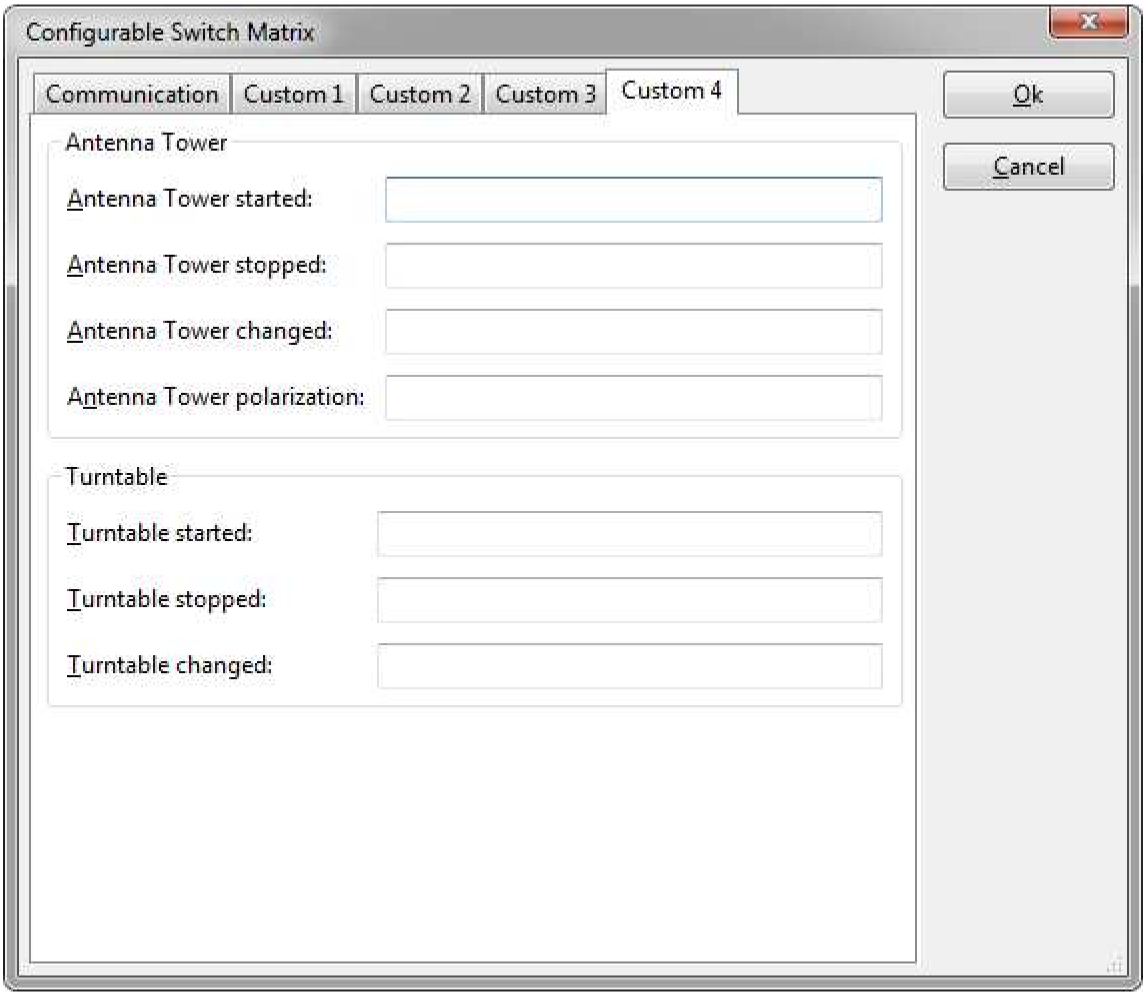
	➢ **Test stopped**	
➢ **Signal**	➢ **Frequency changed**	Keyword __freq__ will be replaced by the frequency in MHz.
	➢ **Carrier Level changed**	Keyword __carrier__, will be replaced by the carrier level in dBm.
➢ **Dwell-time**	➢ **Dwell-time started**	
	➢ **Dwell-time stopped**	
➢ **Modulation**	➢ **Modulation on**	
	➢ **Modulation off**	



The following fields can be specified to send commands at each event. Depending on the event, the keyword __result__ can be used and is replaced by a value. For example: "My forward power is __result__dBm" will be replaced by: "My forward power is -3.15dBm".

- **Measurements**
  - **Before Forward Power**
  - **After Forward Power**: Keyword __result__ will be replaced by measured Forward power in dBm.
  - **Before Reflected Power**
  - **After Reflected Power**: Keyword __result__ will be replaced by measured Reflected power in dBm.

- **Net Forward Power**: Keyword __result__ will be replaced by measured Net power in dBm
- **Field Sensor**: Keyword __result__ will be replaced by measured Field strength in V/m



The following fields can be specified to send commands at each event.

- **Antenna Tower**
  - **Antenna Tower started**
  - **Antenna Tower stopped**
  - **Antenna Tower changed**

	➢ **Antenna Tower polarization**
➢ **Turntable**	➢ **Turntable started**
	➢ **Turntable stopped**
	➢ **Turntable changed**

In all of the commands, it is also possible to include a keyword to insert the latest known value of another measurement value. Several keywords are available can be included in these commands. When one of these keywords is detected, it will be replaced by the corresponding value.

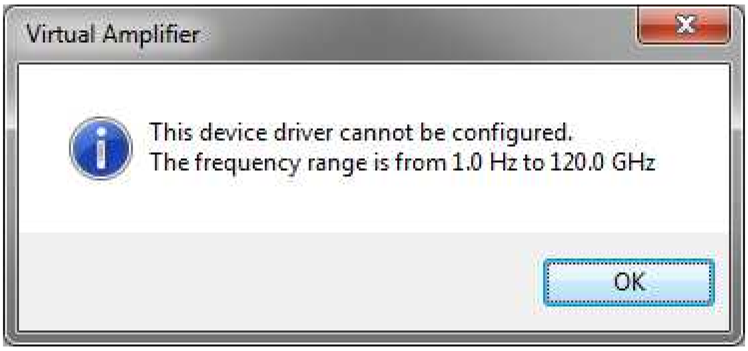
keyword	inserted value
__freq__	the signal generator frequency expressed in MHz
__freqHz__	the signal generator frequency expressed in Hz
__freqkHz__	the signal generator frequency expressed in kHz
__freqMHz__	the signal generator frequency expressed in MHz
__freqGHz__	the signal generator frequency expressed in GHz
__carrier__	the signal generator carrier level expressed in dBm
__carrierdBm__	the signal generator carrier level expressed in dBm
__carrierW__	the signal generator carrier level expressed in Watt
__carriermW__	the signal generator carrier level expressed in milli-Watt
__forward__	the forward power expressed in dBm
__forwarddBm__	the forward power expressed in dBm
__forwardW__	the forward power expressed in Watt
__forwardmW__	the forward power expressed in milli-Watt
__reflected__	the reflected power expressed in dBm
__reflecteddBm__	the reflected power expressed in dBm
__reflectedW__	the reflected power expressed in Watt
__reflectedmW__	the reflected power expressed in milli-Watt
__height__	the height where the antenna is moving to expressed in metre
__heightm__	the height where the antenna is moving to expressed in metre
__heightcm__	the height where the antenna is moving to expressed in centimetre
__angle__	the angle where the turntable is turning to expressed in degrees
__degree__	the angle where the turntable is turning to expressed in degrees
__radian__	the angle where the turntable is turning to expressed in radians

Some remarks should be taken into account with these keywords:

- the keywords are case sensitive,
- the latest known value at that moment will be used,
- if no value is known at all, the keyword will not be replaced, and will remain in the command,
- the values are transmitted in non-scientific notation, and will use a '.' as a decimal point.

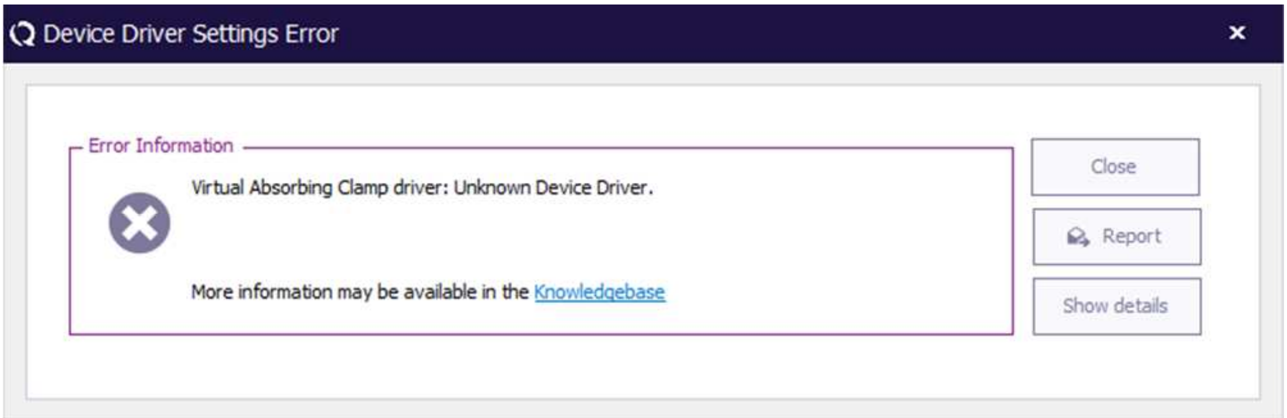
15.18 Messages

15.18.1 This Device cannot be configured



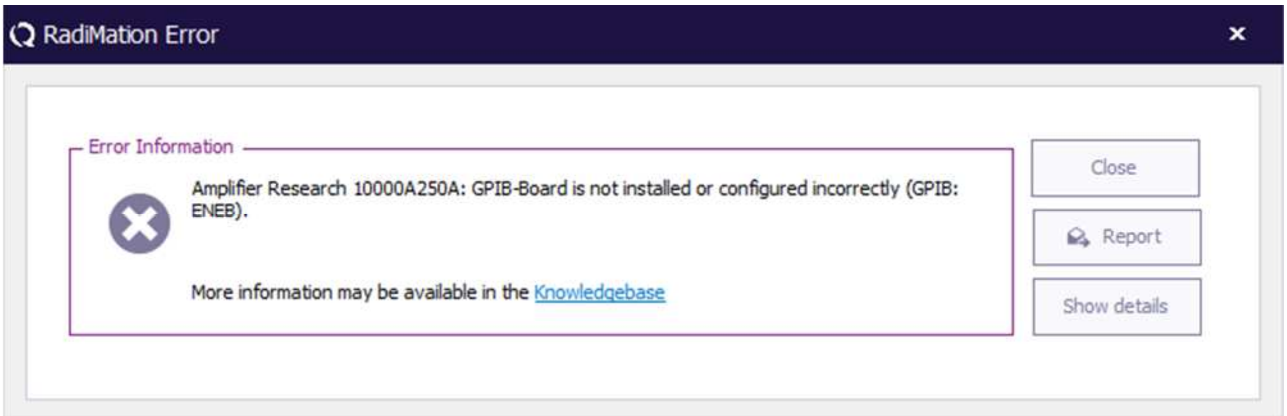
This message box is displayed when you want to edit a device driver that cannot be configured, like a coupler or calibration jig. This does not mean that the device driver is useless. Please see chapter Configurable device drivers vs. none configurable device drivers for explanation. Nowadays also information about the used configuration is showed in this message to the end-user.

15.18.2 Unknown Device Driver



This message box is displayed when RadiMation® is trying to locate a device driver and was unable to find it. If you see this message please contact your reseller and tell him which driver you are trying to use. The reseller will take action so that you will receive the right device driver.

15.18.3 GPIB: Device is not connected



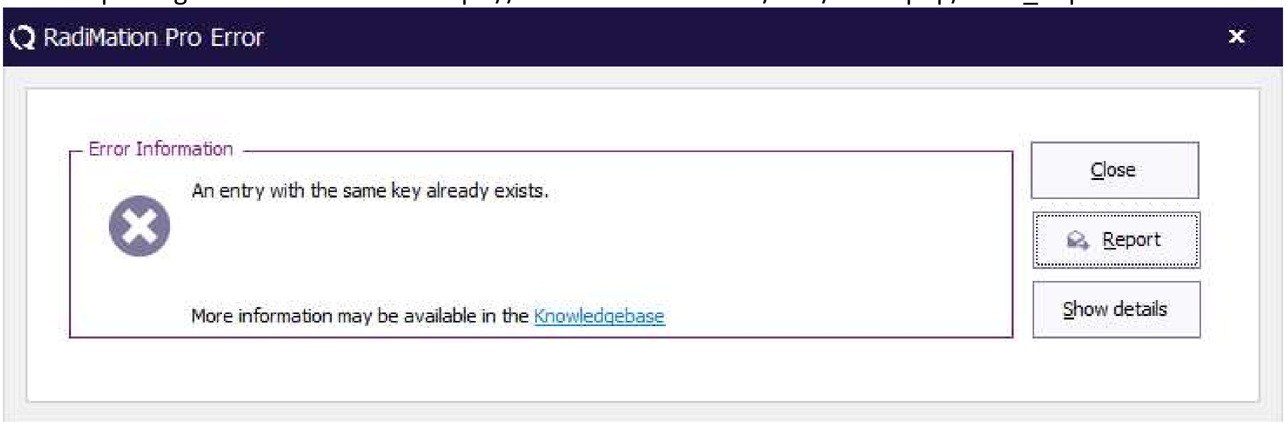
This message box is displayed when RadiMation® is unable to connect to a device when using GPIB. Please check the cable and the GPIB device driver address setting.

15.18.4 Device not connected

This message box is displayed when RadiMation® is unable to connect to the device. Please check cables and device driver settings.

15.19 How to Report an Error

When encountering a problem with the software you might would like to report it to the RadiMation support. The RadiMation error popups, contains detailed section. This can be expanded with details button on the error popup. In the expanded detailed error popup, a Report Error button is present. This allows Error Reporting to the RadiMation support within RadiMation. More information about Error Reporting can be found here: https://wiki.radimation.com/wiki/index.php/Error_Report



15.20 AD convertors

This chapter will describe the currently supported AD convertors, there minimum and maximum value. Some drivers give different information when selecting different AD convertor channels.

15.20.1 National Instruments 6023E 8 Analog inputs

Type of communication: IEEE.
Channels 1:

15.20.2 Hewlett Packard 34401A

Type of communication: IEEE.
Channel 1
Type of measurement: AC Volt
Minimum value: 0Volt
Maximum value: 1 kVolt.

Channel 2:
Type of measurement: AC Current
Minimum value: 0 Amp.
Maximum value: 3 Amp.

Channel 3

Type of measurement: DC Volt
Minimum value: 0Volt
Maximum value: 750 Volt (rms).

Channel 4:
Type of measurement: DC Current
Minimum value: 0 Amp.
Maximum value: 3 Amp. (rms)

Channel 5
Type of measurement: Resistance (Ω)
Minimum value: 0 Ω
Maximum value: 100 MΩ

Channel 6
Type of measurement: Frequency
Minimum value: 0 Hz.
Maximum value: 300 kHz

Channel 7 and 8
Not used

15.20.3 Hewlett Packard 54600

Type of communication: RS 232.
Channel 1:
Type of measurement: V Max.
Minimum value: 0Volt
Maximum value: 1000 Volt.

Channel 2:
Type of measurement: V Min
Minimum value: 0 Volt.
Maximum value: 1000 Volt.

Channel 3
Type of measurement: V Average
Minimum value: 0Volt
Maximum value: 1000 Volt.

Channel 4:
Type of measurement: VPP (peak-peak)
Minimum value: 0 Volt.
Maximum value: 1000 Volt.

Channel 5
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 100 kHz

Channel 6
Type of measurement: Period
Minimum value: 0 ms
Maximum value: 10000 ms

Channel 7
Type of measurement: Rise Time
Minimum value: 0 ms
Maximum value: 10000 ms

Channel 8
Type of measurement: Fall Time
Minimum value: 0 ms
Maximum value: 10000 ms

15.20.4 Hewlett Packard 3562A

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 dB
Maximum value: 100 dB

15.20.5 Hewlett Packard 59313

For all the channels is 0 is maximum negative, 1024 is zero and 2048 is maximum positive.
Type of communication: GPIB
Channel 1
Type of measurement: AD channel 1
Minimum value: 0
Maximum value: 2048

Channel 2:
Type of measurement: AD channel 2
Minimum value: 0
Maximum value: 2048

Channel 3
Type of measurement: AD channel 4
Minimum value: 0
Maximum value: 2048

Channel 4:
Type of measurement: AD channel 8
Minimum value: 0
Maximum value: 2048

Channel 5 to 8
Not used.

15.20.6 Hewlett Packard 59313

For all the channels is 0 is maximum negative, 1024 is zero and 2048 is maximum positive.
Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 Maximum value: 100

15.20.7 Marconi 2305

Type of communication: GPIB
Channel 1
Type of measurement: Frequency
Minimum value: 0
Maximum value: 1000 MHz

Channel 2:
Type of measurement: AM modulation or FM frequency Deviation
Minimum value: 0
Maximum value: 1000

Channel 3 to 8
Not used.

15.20.8 Fluke 45 AC Current

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mA
Maximum value: 10.000 mA

15.20.9 Fluke 45 DC Current

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mA
Maximum value: 10.000 mA

15.20.10 Fluke 45 AC Voltage

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mV
Maximum value: 1.000.000 mV

15.20.11 Fluke 45 DC Voltage

Type of communication: GPIB
Channels

All the channels give the same value back.
Minimum value: 0 mV
Maximum value: 1.000.000 mV

15.20.12 Fluke 45 Frequency

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 Hz
Maximum value: 1.000.000 Hz

15.20.13 Fluke 45 Resistance

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 Ω
Maximum value: 100.000.000 Ω

15.20.14 LeCroy 9304AM Channel A,B,C,D

Select channel A for channel A, channel B for channel B etc etc.
Type of communication: IEEE.
Channel 1
Type of measurement: Minimum value
Minimum value: 0Volt
Maximum value: 353.55 Volt.

Channel 2:
Type of measurement: Maximum value
Minimum value: 0 Volt
Maximum value: 353.55 Volt

Channel 3
Type of measurement: Amplitude
Minimum value: 0Volt
Maximum value: 353.55 Volt

Channel 4:
Type of measurement: Peak to peak
Minimum value: 0 Volt
Maximum value: 707.1 Volt

Channel 5
Type of measurement: RMS
Minimum value: 0 Volt
Maximum value: 250 Volt

Channel 6
Type of measurement: Frequency

Minimum value: 0 Hz.
Maximum value: 200 MHz

Channel 7 and 8
Not used

15.20.15 Fluke 8840A AC Current

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mA
Maximum value: 10.000 mA

15.20.16 Fluke 8840A DC Current

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mA
Maximum value: 10.000 mA

15.20.17 Fluke 8840A AC Voltage

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mV
Maximum value: 1.000.000 mV

15.20.18 Fluke 8840A DC Voltage

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mV
Maximum value: 1.000.000 mV

15.20.19 Hewlett Packard 3478A AC Current

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mA
Maximum value: 10.000 mA

15.20.20 Hewlett Packard 3478A DC Current

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mA

Maximum value: 10.000 mA

15.20.21 Hewlett Packard 3478A AC Voltage

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mV
Maximum value: 300.000 mV

15.20.22 Hewlett Packard 3478A DC Voltage

Type of communication: GPIB
Channels
All the channels give the same value back.
Minimum value: 0 mV
Maximum value: 300.000 mV

15.20.23 Tektronix TDS 400 Series

Type of communication: GPIB
Channels 1 to 4
The value of the selected channel will be given back.
Minimum value: 0
Maximum value: 100

Channels 5 to 8
Not used

15.20.24 Tektronix TDS 500A Series

Type of communication: GPIB
Channels 1 to 4
The value of the selected channel will be given back.
Minimum value: 0
Maximum value: 100

Channels 5 to 8
Not used

15.20.25 Tektronix TDS 600A Series

Type of communication: GPIB
Channels 1 to 4
The value of the selected channel will be given back.
Minimum value: 0
Maximum value: 100

Channels 5 to 8
Not used

15.20.26 Tektronix TDS 3000 Series

Type of communication: GPIB
Channels 1 to 4
The value of the selected channel will be given back.
Minimum value: 0
Maximum value: 100

Channels 5 to 8
Not used

15.20.27 DARE!! Development Radimate 2 and 3

Type of communication: RS 232
Channels 1 to 8
The value of the selected channel will be given back.
Minimum value: 0
Maximum value: 16383

15.20.28 EIP 575

Type of communication: IEEE
Channel 1
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 10 kHz

Channel 2:
Type of measurement: Frequency
Minimum value: 0 Hz.
Maximum value: 100 kHz

Channel 3
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 1 MHz.

Channel 4:
Type of measurement: Frequency
Minimum value: 0 Hz.
Maximum value: 10 MHz.

Channel 5
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 100 MHz

Channel 6
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 1 GHz

Channel 7
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 10 GHz

Channel 8
Type of measurement: Frequency
Minimum value: 0 Hz
Maximum value: 100 GHz

15.20.29 Parallel Port Input 0x3BC and 0x378

Channel 1 to 8
Every channel represents one bit of the 8-bits port.
So when bit 4 is changing then you will see this in channel 4.

RadiMation® EMC software
------- Quality Assurance -------

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Quality assurance

16.1 Quality standards

The use of automatic test software can greatly affect the quality of tests performed in calibration and/or test laboratory. Depending on the software, the tests can be affected either in a positive and a negative way.
On one hand, good quality software can reduce the risks of human errors and increase the quality of work/tests performed. On the other hand, is the software contains errors (and no software validation has been performed), it is very likely that the measurements performed will be incorrect, reducing the quality of the tests performed.

Several documents describe the need for software validation (or, as some documents describe it, first time verification). Both ISO17025 and ISO/IEC Guide 25 recognize the need for software validation. However neither document describe how this software validation should be performed. The document EA/GA(98)95 (version 4, May 1998) “Guidelines for the use of computers and computer systems in accredited laboratories” does describe guidelines for software validation. However this document is currently considered to be ‘informative only’. Raditeq recognize the importance of software validation and has implemented special functionalities into the RadiMation® EMC software package for this purpose. These functionalities make it possible to verify the performance of the test system as a whole and to reproduce specific tests at a later moment.
In addition to the first software verification, every new version of RadiMation® undergoes a software verification specified by a pre-defined test plan. This eliminates the need for test houses to perform a complete software validation process.

The use of the RadiMation® software (by the test houses) also influences the measurement quality and data security of the performed measurements. Because of this we strongly recommend test houses to adhere to the following advice:

1. Make back up files of the measurements results.
2. Install the RadiMation® Software on a local test computer and use a network drive location for the data storage. This network drive can be automatically backed up. (Alternatively, the measurement data can also be stored on a test computer. However, be advised that in this situation special attention should be paid to backing up the measurement data on a regular basis.)
3. Set up access protection for both the computer system and the RadiMation® Software package.
4. Appoint one or more individuals to be responsible for the configuration of the RadiMation® Software (i.e. equipment configuration, TSF file configurations, setting default directories, entering correction and calibration files and appointing new test engineers).

To make sure that the RadiMation® Software is in compliance with ISO17025, ISO/IEC Guide 25 and relevant parts of EA/GA(98)95, several measures have been taken. An overview of these is listed below (more information can be found under 'RadiMation® Quality measures').

1. General measures
2. All relevant data is stored
3. System verification is performed prior to each test
4. Equipment verification is performed prior to each test
5. Software settings verification is performed prior to each test

16.2 RadiMation® Quality measures

16.2.1 General measures

1. The RadiMation® Software package stores all test data. It is not possible to change the measurement data on a later moment, eliminating the possibility to temper with test results. It is possible however to append new test data to a EUT file at a later date. The test results can be viewed at any time.
2. Test data stored in older versions of RadiMation® can be viewed with newer versions, giving access to old test data at any time.

16.2.2 Storage of all relevant data

All the information that is relevant and necessary to reproduce a test is stored. A summary of the items that are recorded during a test are visible below:

1. All the “RAW” measurement date is stored for later evaluation (e.g. all power meter(s), field sensor(s), receiver(s), A/D converter(s) readings, signal generator settings, etc.)
2. All the user configurable settings are stored with the measurement data (TSF file settings).
3. All the correction and calibration files used during the test are copied and stored with the test results.
4. All the test equipment used during the test is stored (Equipment list).
5. The date, time and test engineer name are stored with the measurement data.
6. Error messages (if any), that occurred during the test are stored with the measurement results.

16.2.3 System verification prior to each test

An EMC test set-up consists of a number of different test devices, computers and software packages. To maintain a high level of quality control, it is necessary to perform an overall system verification (including the complete test set-up) on a regular basis.
Because of this RadiMation® performs a number of hardware, software and system verifications at the beginning of each test.

16.2.4 Radiated and conducted immunity tests

1. Prior to each test, the software will perform a power delivery test. During this power delivery test, the software increases the output power of the signal generator and measures the output power of the amplifier with the (forward) power meter. If the software measures a stable reading on the power meter, RadiMation® assumes that all the cables between the signal generator, amplifier, coupler and the power meter are connected correctly.
2. Prior to each test, the software will perform a linearity check. The software generates a stable signal generator output power, measures it on the power meter and then increases the signal generator level with 4 dB steps. If the power meter reading also increases with 4 dB steps, RadiMation® assumes that the amplifier is linear.

16.2.5 Radiated and conducted emission tests

Equipment verification prior to each test:

1. Prior to each test the RadiMation® Software will check if all the required test equipment can be found. If one or more devices are not found, the software will stop and display an error message.
2. Prior to each test the RadiMation® Software will check if communication is possible with all required test equipment (initialization). If one or more devices do not respond correctly, the software will stop and display an error message.

Software settings verification prior to each test:

1. Prior to each test the RadiMation® Software will check if all the user configurable settings of the Technical Set-up File (TSF file) are within the limits of the selected test equipment in the equipment list (e.g. does the antenna cover the required frequency range, etc.).
2. If a test is started that uses a calibration file, the software will verify if the currently selected test equipment (in the equipment list) is the same as the equipment used during the calibration. This is recommended for the accuracy of the test results. If different equipment was used, the software will display a warning, asking the operator to continue (despite the different equipment) or stop the test.

RadiMation® EMC software
------- Quality Statement -------

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Quality Statement

Raditeq is ISO9001 certified by Lloyd's Register which covers all test- and measurement hardware products, RadiMation® software and services that are developed and delivered by our company.
Prior to a new major release of the RadiMation® EMC test software we perform a three stages test procedure to ensure the quality of the new software:

1. Software testing using virtual devices
2. EMC test verification using known artifacts
3. Validation at EMC test laboratories of Raditeq

As each customers EMC test setup is unique, Raditeq recommends a final validation of the new major release of RadiMation® EMC test software by each individual customer themselves, using the specific equipment that is used for EMC testing.
RadiMation® Software package is suitable for use in an ISO17025 accredited test laboratory. Hereby Raditeq can state that our software is in conformity with ISO17025 and ISO/IEC Guide 25.

RadiMation® EMC software
------- Reference Data -------

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18.1 RadiMation® file types and locations

RadiMation® uses different types of file extensions to store different types of data and different sub-directories to store different file types. During the installation of RadiMation® these sub-directories are automatically generated. The exact location of these sub-directories depends on the location where RadiMation® is installed. All the directories are created by default in the main installation directory used for RadiMation®. The default directories can be changed on the **Directories** tab of the **Configuration** window of RadiMation®.

18.1.1 RadiMation® Installation Directory

Depending on the Windows® operating system that is being used (and the language of this operating system), the main installation directory can vary. For example:
The default main installation directory for RadiMation® is: "C:\Program Files\Raditeq\RadiMation\"
The default main installation directory for an Italian operating system is:
"C:\Programmi\Raditeq\RadiMation\"
The main installation directory for RadiMation® can be changed during the installation of the software and can also be different because of the use of an older RadiMation® version.

18.1.2 Equipment Under Test file (*.EUT)

An Equipment Under Test file (or EUT-file) contains information about the EUT. These files are stored from the EUT window. The EUT-file contains basic information about the EUT and does not contain any test results. The test results are stored in the same directory under the same filename, but under a different extension.
The **name and location** of the file can be specified by the user.
The **extension of the test results** is “.T??”.
The **extension of the file** is “.EUT”.
The **default location** to store the EUT-files is: "C:\Users\Public\Documents\RadiMation\EUT_File"

18.1.3 Calibration file (*.CAL)

A Calibration file contains all the information and results of a calibration test/measurement. The calibrations are used during substitution tests to apply the correct power level.
The **name and location** of the file can be specified by the user.
The **extension of the file** is “.CAL”.
The **default location** to store Correction files is: "C:\Users\Public\Documents\RadiMation\CAL_File"

18.1.4 Test Setup File (*.TSF)

A Test Setup File (or TSF-file) contains all the settings required to perform a test. These files can be loaded and stored with the help of the different Test Settings windows. The names of these files is not important because these (names) are not visible to the user. The ‘description’ of these files is visible. The description of the file that the user sees (when selecting a TSF-file) is stored inside the TSF-file and is not relatable to the name of the file.
The **name and location** of the files is managed by the RadiMation® software.

The **extension of the file** is “.TSF”.
The **default location** to store Test Setup Files is: "C:\Users\Public\Documents\RadiMation\TSF_File"

18.1.5 Correction file (*.COR)

A correction file contains all the information of a correction. These files are stored from the Correction editor window. The files are used for different purposes, such as:

- Correction of values measured in a device driver
- Limitation of power for amplifier protection
- Test levels during immunity tests
- Limitation of injected current during immunity tests
- Measured frequencies during emission tests

Different data columns, with an unlimited number of data-rows, can be included in a correction file. This is dependent on the use of the correction file. In addition to the data table, the correction file also remembers how to interpolate between the data-rows.
The **name and location** of the file can be specified by the user.
The **extension of the file** is “.COR”.
The **default location** to store Correction files is:
"C:\Users\Public\Documents\RadiMation\COR_File\"

18.1.6 Limit Line File (*.LLF)

A limit line file contains all the information of a limit line. These files are stored from the limit line editor window. The files are used during emission measurements.
The **name and location** of the file can be specified by the user.
The **extension of the file** is “.LLF”.
The **default location** to store Limit Line Files is: "C:\Users\Public\Documents\RadiMation\LLF_File\"

18.1.7 Sequence file (*.SEQ)

A Sequence file contains the configuration of one or more Test Setup Files (TSF-files). The Sequence file can be used to perform multiple tests automatically (one after the other, in sequence).
The **name and location** of the file can be specified by the user.
The **extension of the file** is “.SEQ”.
The **default location** to store Sequence files is: "C:\Users\Public\Documents\RadiMation\SEQ_File\"

18.1.8 Location file (*.LOC)

A Location file contains information on a ‘to be measured’ antenna tower. These files are stored from the Location window. The file contains basic information on the antenna tower and the ‘to be measured’ frequencies. The Location file does not contain any test results. The test results are stored in a sub-directory with the same name as the Location file. The sub-directory contains the test result files with the same filename but under a different extension. The sub-directory also contains the available Frequency (FRQ-files) and Test Setup files (TSF-files) for the location.
This file type is only available when the Antenna Diagram module is activated.
The **name and location** of the file can be specified by the user.

The **extensions of the test results** are “.T??” and “.M??”.
The **extension of the file** is “.LOC”.
The **default location** to store Location files is: "C:\Program Files\DARE Development\RadiMation\LOC_File\"

18.1.9 Configured Device Drivers (CONFDVDR)

The CONFDVDR sub-directory of the RadiMation® main installation directory contains the complete configuration of the RadiMation® software. This directory can contain the following files:

- **SETTINGS.INI**: The main RadiMation® configuration file. This file contains all the important settings of the software.
- **RDC*.INI**: Each RDC*.INI file, stores the configuration of a configured device driver. All the modifications made on the "Device Drivers" tab of the Configuration window of the software, will be stored in one of the RDC*.INI files.
- **Other files** can be present that store specific configuration items of the RadiMation® software.

The **default location** of the "Configured Device Drivers" directory is:
"C:\ProgramData\Raditeq\RadiMation\ConfDvdr"

18.1.10 Frequency file (*.FRQ)

A Frequency file contains all the information of a ‘to be measured’ frequency. The Frequency files are used during the antenna diagram measurements. The Frequency files that have to be used can be selected in the Location file window.
This file type is only available when the Antenna Diagram module is activated.
The **extension** of the file type is “.FRQ”.
Frequency files should be stored in a sub-directory with the name of the Location file.

18.2 List of abbreviations

This paragraph will describes the commonly used abbreviations in the RadiMation® software.

Abbreviation	Description
AD	Analog to Digital
AGL	Above Ground Level
CAL	Calibration
CE	Conducted Emission
COR	Correction
CI	Conducted Immunity
dB	Decibel
dBm	Power value expressed as dB mW
DGPS	Differential Global Positioning System. An improvement to GPS, where small GPS errors are corrected by a broadcasted radio signal.
DUT	Device Under Test. The same as a EUT. RadiMation® always uses the abbreviation EUT.
ERP	Effectively Radiated Power
EUT	Equipment Under Test
GPIB	General Purpose Industrial Bus: A communication system used to 'remote control' test and measurement equipment.
GPS	Global Positioning System

LLF	Limit Line File
LOC	Location
MB	Multi Band
PC	Personal Computer
PI	Pulsed Immunity
RE	Radiated Emission
RI	Radiated Immunity
RS232	A serial communication system, often used to control small equipment connected to a PC.
SEQ	Sequence
TME	Test and Measurement Equipment.
TSF	Test Setup File
UFA	Uniform Field Area.
USB	Universal Serial Bus: A modern serially controlled communication system, found on all new PC's
VISA	The Virtual Instrument Software Architecture (VISA) is a standard for configuring, programming, and troubleshooting instrumentation systems comprising GPIB, VXI, PXI, Serial, Ethernet, and/or USB interfaces.

RadiMation® EMC software
------- Appendices -------

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19.1 Appendix A: RadiMation® Support Procedure

19.1.1 Definitions

Malfunctions are divided in nine categories and prioritized on their severity:

- **1 - Incorrect Measurement:** RadiMation® software produces incorrect measurement results.
- **2 - Issue with Data Loss:** RadiMation® software contains a problem that resulted in a situation that data is lost.
- **3 - Crash/Issue - No Data Loss:** RadiMation® is aborted during operation without any specific reason or another issue occurred. After a restart, no data is lost.
- **9 - Required device driver:** A device driver for a measurement instrument must be created.
- **4 - Mandatory New Functionality:** Functionality that is currently not implemented, but that is required to provide support for a new standard or measurement method.
- **5 - Unexpected Functionality:** All other cases of malfunction of RadiMation®, where the software functionality is responding differently than expected.
- **6 - Cosmetic:** RadiMation® software functions normal but the lay-out of the tables, graphs or screens are not represented in a proper way. For example when:
- (Parts of) labels or information are not displayed.
- (Parts of) labels or information are overwritten by other labels or other information.
- The screen 'flashes' while writing graphs or other information.
- The manual contains an error or unclear description.
- **7 - Questions:** End-user has a question about the operation of the RadiMation® software.
- **8 - Wish:** RadiMation® software is missing specific functionality which should be evaluated for possible implementation in the future. In this category, there is not a real problem however the end-user requests RadiMation® to function in a different way or requests additional functionality. This can even mean that the actual situation is unworkable for the end-user. This case encompasses situations where certain functionality or part of tests is not supported.

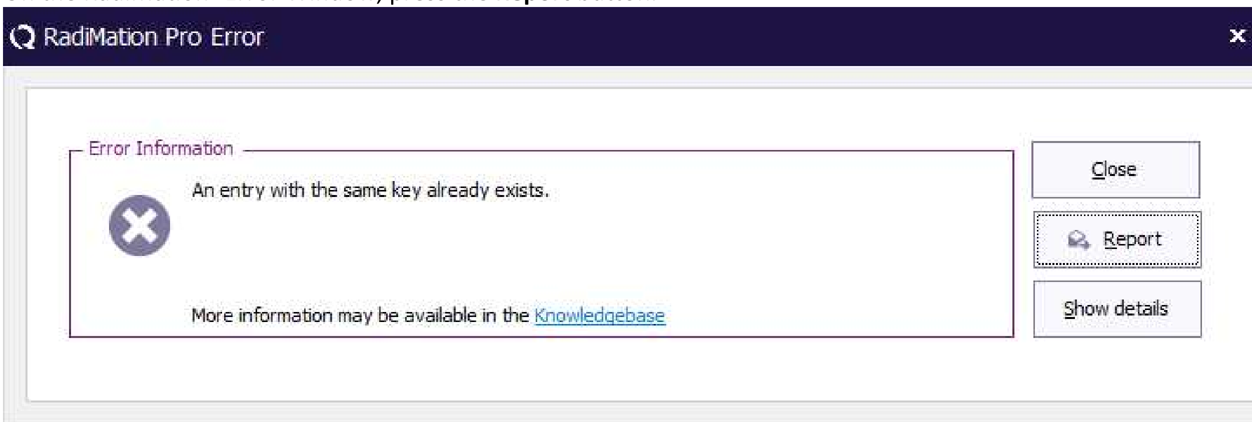
19.1.2 Error report procedure

The goal of the 'Error report procedure' is to support customers as quick and effective as possible. An issue could be a bug or something that is not working correctly, or working differently then expected. The goal of the error report procedure is to accomplish quick and effective support service. In general, a new problem (or issue) can only be solved if our RadiMation® support team will be able to reproduce the problem. The issue report procedure is intended to store and provide all relevant information that is needed to investigate and reproduce the issue.
RadiMation® incorporates the RadiLog automatic logging tool which is automatically running in background and captures all communication. In case of a problematic event, all relevant information can be transferred to the RadiMation® support team by pressing the **Report** button when there is an error. This form can also be accessed manually. It is of course also possible to send us any question directly by e-mailing us at radimation-support@raditeq.com.
Upon receipt of a new reported issue the RadiMation® support team will provide a unique ticket number (#xxxxx). This ticket number should be used during all further communication in relation to the specific ticket.

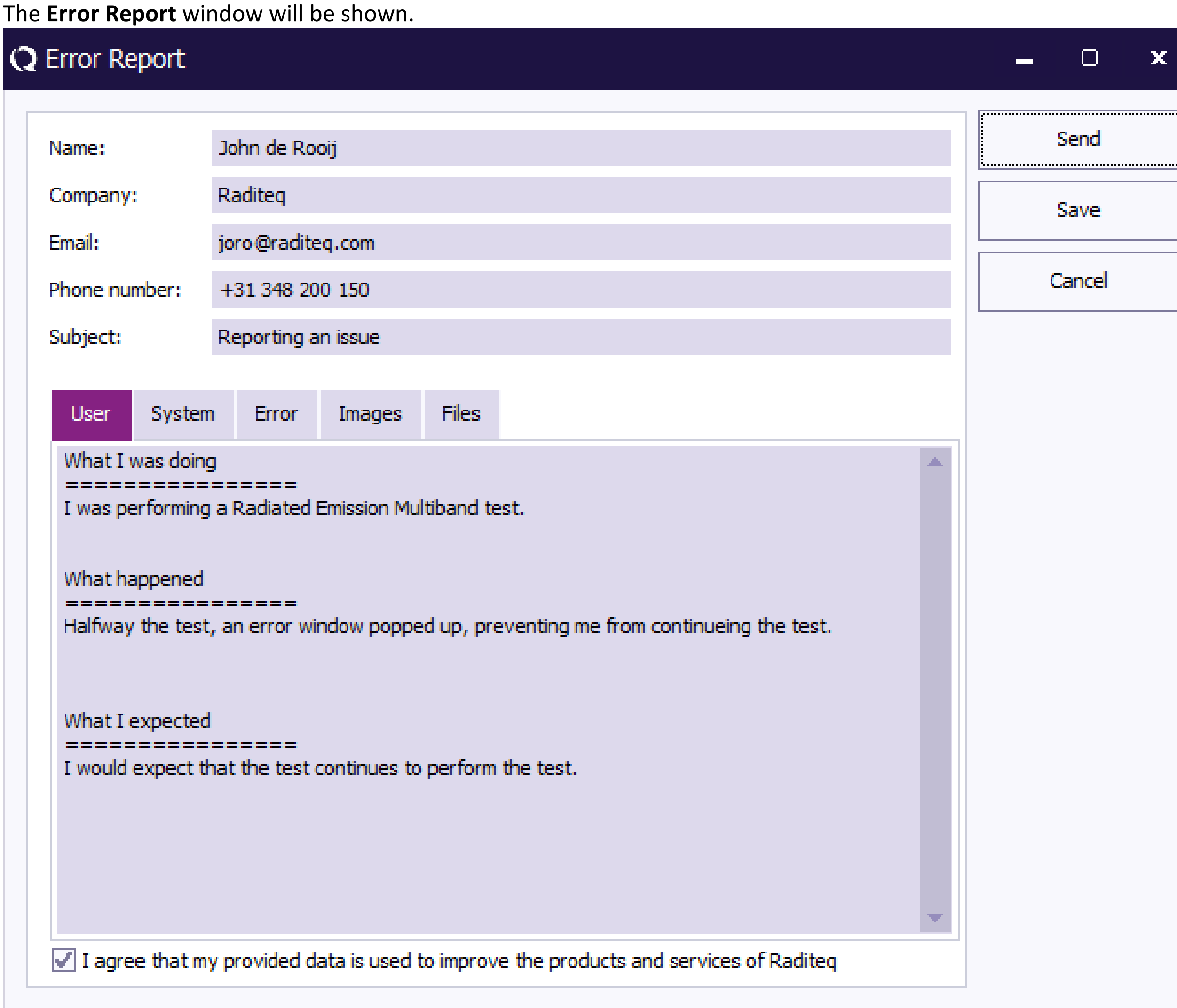
19.1.3 Reporting a problem when an error is shown

When an error is shown within RadiMation®, the error can be directly reported to the RadiMation® support team.

1. On the RadiMation® Error Window, press the **Report** button.



2. The **Error Report** window will be shown.



3. Specify your own contact details, so we know how to contact you for a solution. As seen in the screenshot, you also must check the **I agree that my provided data is used to improve the products and services of Raditeq** checkbox.
4. Ensure that all the fields do contain the correct information. If not all fields are filled you can not send or save the file. When information is missing, a red circle with a cross is displayed. If you hover over it with your mouse it will inform you what is missing in the form.
5. Once the report information is filled in the buttons change colour, the report can now be send to the RadiMation® support team in 2 ways:

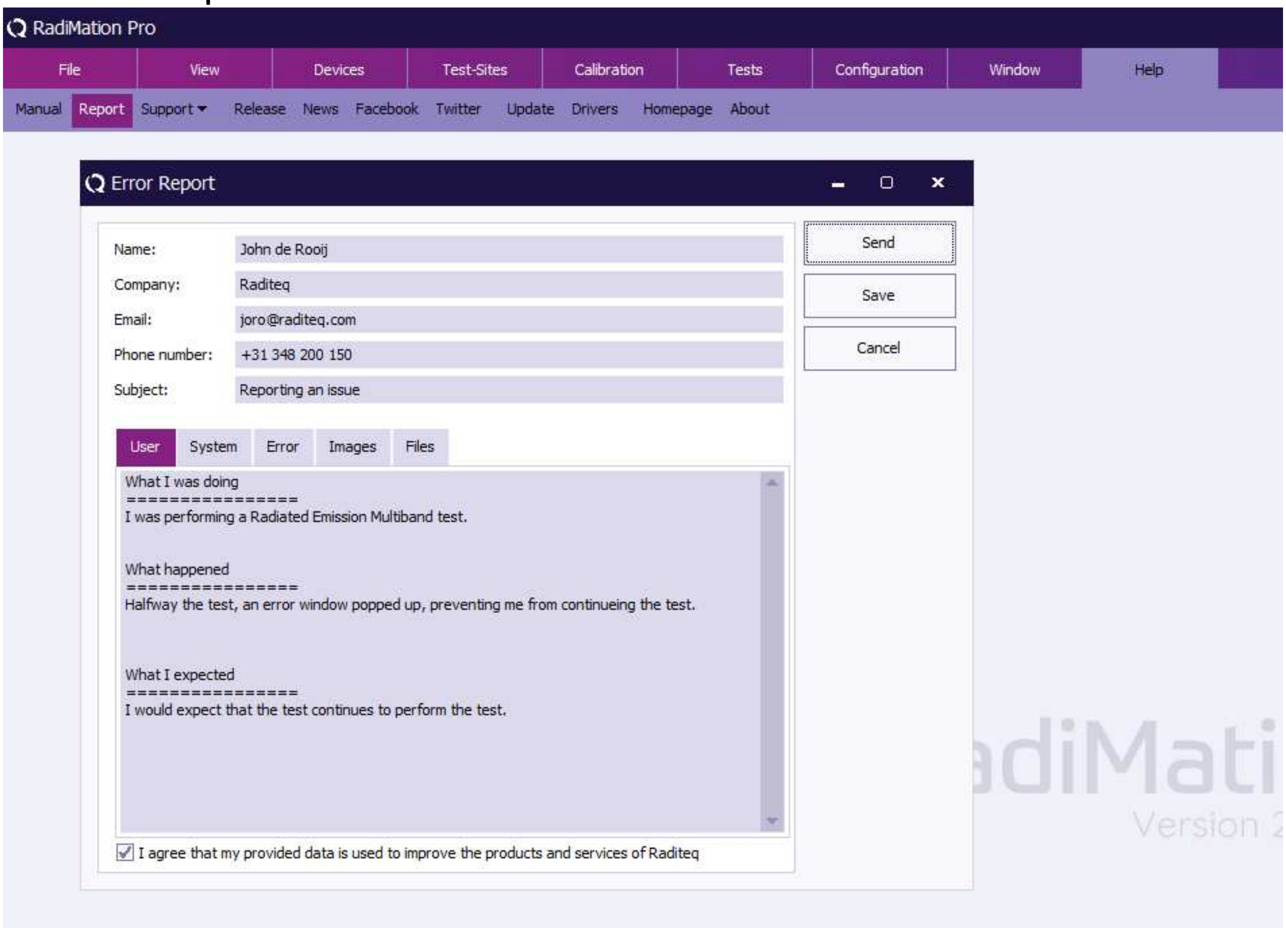
- Send the report automatically using the **Send** button. A message will be shown that the error report is transmitted. You also will receive almost directly an e-mail from our ticket database with the ticket number that has been created for your error report.
- Save the report with the **Save** button, and send the file over email to radimation-support@raditeq.com

The report automatically contains a log of all the recent communication with the test and measurement equipment. That information is very helpful and valuable to be able to resolve your issue.

19.1.4 Manually reporting an issue

If you would like to report a problem with RadiMation® without a RadiMation® error, you can also open the Error Report window from the Help menu:

➢ **Help**
  ➢ **Report** .

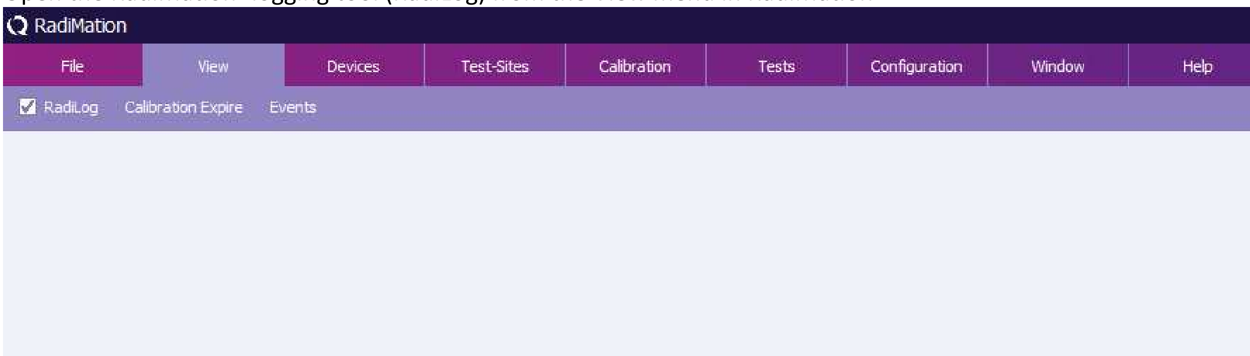


Also if a test is already running, and you would like to report an error related to the running test, but no Error Report window is shown, then it is still possible to use this Help menu. The generated Error Report will then still contain the communication log of the running test.

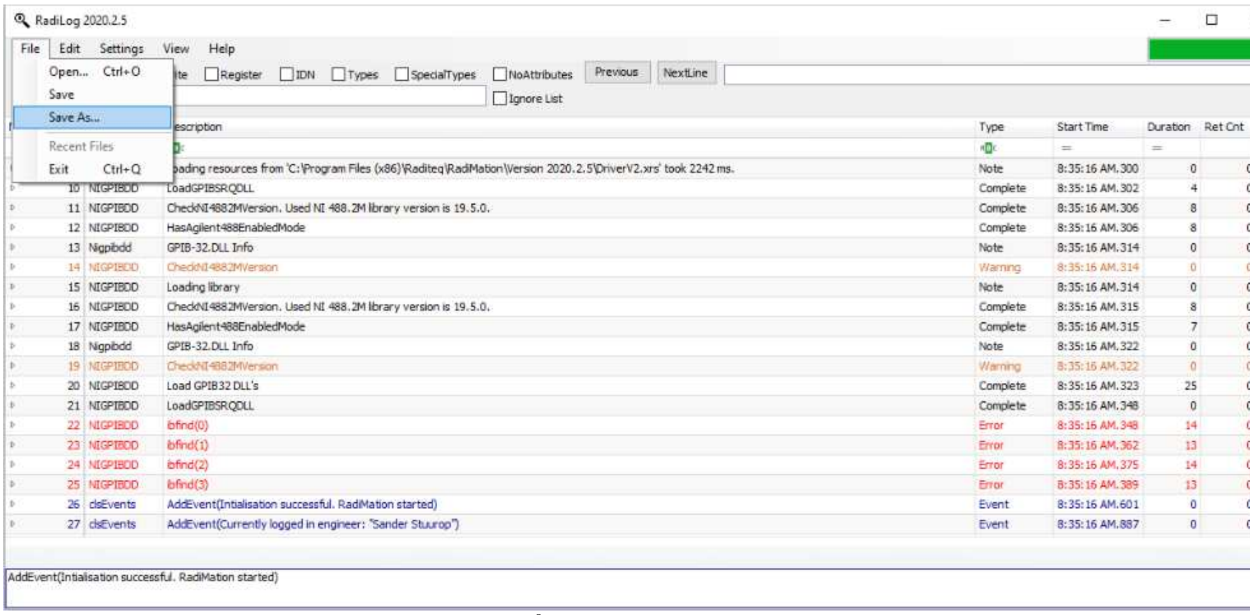
19.1.5 Reporting a RadiLog communication file only

If for some reason the above reporting is not available, the communication log can also be reported manually. Please follow these instructions accordingly:

1. Open the RadiMation® logging tool (RadiLog) from the View menu in RadiMation®



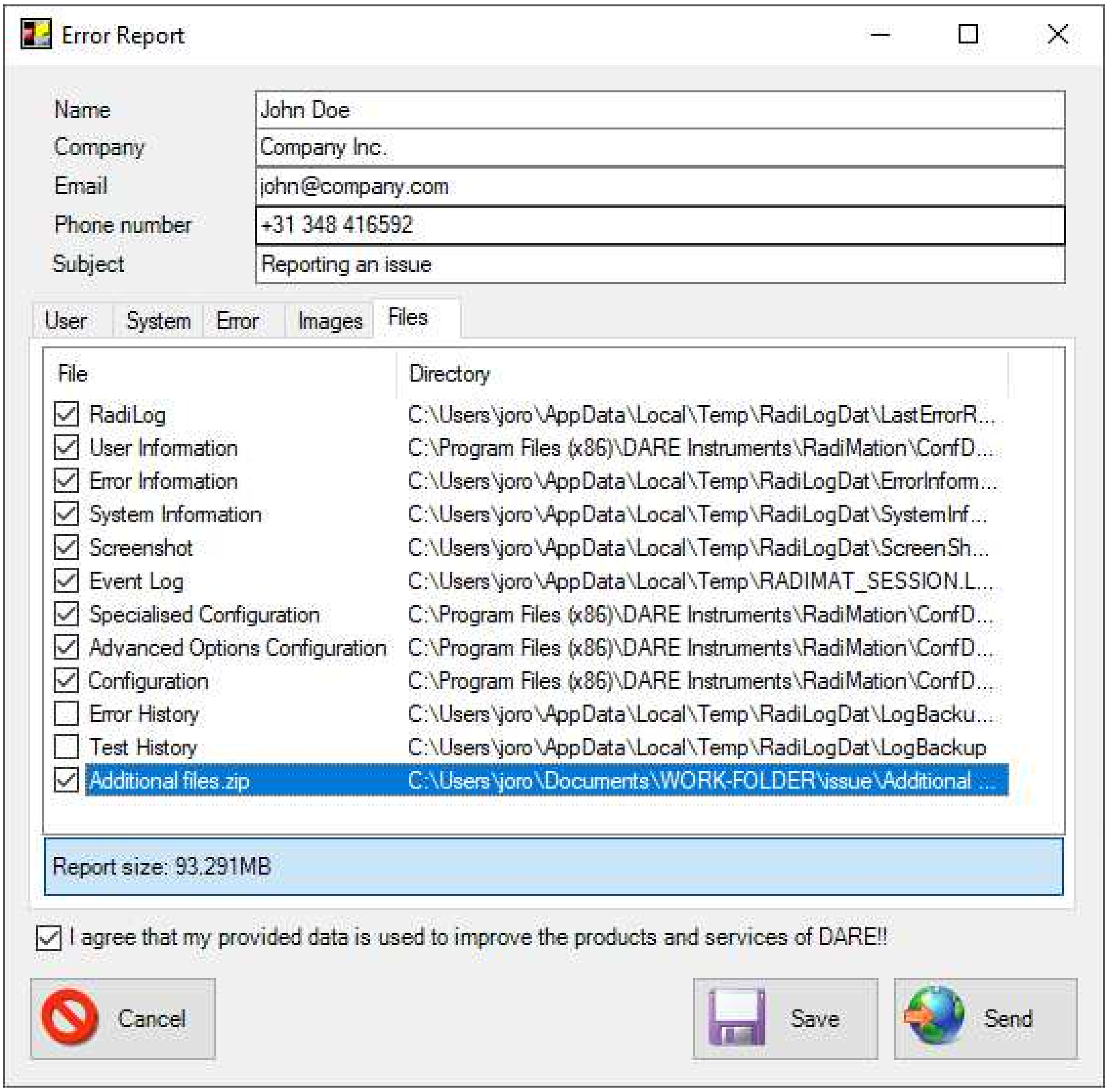
2. While the RadiLog tool is opened, reproduce the error.
3. When the error has been logged, save the log file, by selecting 'File' and 'Save As...' from the menu.



4. Send the .RadiLog file (zipped) to the RadiMation® support e-mail address radimation-support@raditeq.com

19.1.6 Sending larger files

It sometimes is required to send larger or additional files to the RadiMation® support team, however the general limitation for sending files by e-mail is limited to 6 MB files.
The Error Report functionality is able to include larger files (in total up to 100 MB). On the **Files** tab, a list of all the files that are contained in the Error Report is being shown.



Only the files that have a checked checkbox will be included in the transmission.
If one or more additional files should be transmitted to us, it is advised to create a ZIP file which contains all the files that should be included. Then that ZIP file can be drag-and-dropped from a Microsoft Windows Explorer window onto the list of files in the Error Report. The ZIP file will then be added and included in the Error Report that will be transmitted to us. In the example screenshot above, this has been done with the file 'Additional files.zip'.
The total size of all the files in the ErrorReport can be recalculated by clicking on the **Report Size** button.

19.2 Appendix B: Maintenance

The service of solving 'bugs' in the software is covered by the maintenance contract. Depending on the situation it might be necessary for an engineer from Raditeq to supply on-site support. These costs are covered as well, excluding travel and lodging. The service contract entitles the customer to all new push releases for the respective module(s).
Functionality improvements and/or changes to the respective software module(s) that are desired by the customer (and are assessed by Raditeq as functional and commonly applicable), will be implemented in a future release of the software. It is important to keep in mind that improvements and/or changes for one customer should not lead to disadvantages for other customers.

The RadiMation® Support/Upgrade contract is mandatory and should be ordered with each RadiMation® order.

- The minimum duration of this contract is 2 years.
- The first year is free of charge, each subsequent year costs 10% of the software order value.
- the starting date of the support/upgrade contract is the original delivery and/or installation date.
- If a customer does not accept a support/upgrade contact, Raditeq will not provide any software support/upgrade service.

19.2.1 Releases

Releases are divided in major and minor releases, indicated by a release number in the xxxx.yy.zz format. In this format, 'xxxx.yy' indicates the major release version. Where the 'xxxx' specifies in which year the software has been released. The '.yy' indicates if it is the first (.1) or second (.2) major release. The '.zz' specifies the minor release version.
RadiMation® software releases can be downloaded from our website at:
http://download.radimation.com/ .
The changes that are included in each version is available in the release notes of each version, that is available on or [RadiWiki website (http://wiki.radimation.com)].

19.2.1.1 Major release

A major release consists of any and all new functionalities and bug fixes since the previous minor release. As such the major release is a base line release.

19.2.1.2 Minor release

A minor release is provided on top of the major release, to provide fixes for problems that has been found in the major releases. No new functionality will be added in these minor releases.

19.2.2 Release Planning

There will be two major releases of RadiMation® each year. The planning of these two major releases is:

- 1st major: first week of April.
- 2nd major: first week of October.