EMI Automotive Band Evaluation

Application Note

Products:

- R&S®EMC32
- R&S®EMC32-K51

EMI Automotive Band Evaluation extension is an on-board EMI measurement sequence in broadband and communications frequency bands for automotive and aerospace applications. This application notes shows how to configure, run, and automatically document tests in a sequence coming with EMC32-K51.

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1 Overview EMI Automotive Band Evaluation

EMI Automotive is the solution for a special measurement task. EMI disturbance signals generated from car components have to be measured with on-board communication antennas in their frequency bands. The frequency bands as well as the bandwidth of the antennas may overlap in the frequency domain. This short description shows why the task is not solvable by a standard EMI Scan, EMI Sweep or EMI Auto Test template.
Sequenced definition of frequency sub ranges in hardware setups and Scan/Sweep templates cannot overlap. This task is EMC32 Sequencer related.
EMI Automotive Band Evaluation Test Template now is optimized to generate the particular kind of test demanded by the standards with extreme flexibility in configuration of the test and the related test report without usage of the EMC32 Sequencer.
EMI Automotive Band Evaluation Test Template

- defines sub ranges correspondent to the Band related frequency definition and
- uses the appropriate antenna specified for this Band per sub range in a dedicates hardware setup called Test Setup;
- includes a simplified data reduction from auto test to find maxima, and
- extends the report to show a separate graphic for each sub range.

The extension “EMI Automotive Band Evaluation” or short “EMI Automotive” therefore matches two different demands:

- it is closely related to automotive and avionic needs, and
- it is a kind of sequencer for EMI Tests.

The standard applications are on-board EMI measurement sequences in broadband and communications frequency bands for automotive and aerospace applications.

1.1 Test Method

The tests are intended to provide protection for receivers installed in a vehicle from disturbances produced by components/modules in the same vehicle.
The receiver types to be protected are, for example, broadcast receivers (sound and television), land mobile radio, radio telephone, amateur, citizens' radio, Satellite Navigation (GPS, etc.) and Bluetooth. The test method is described in CISPR 25 in chapter 5: “Measurement of emissions received by an antenna on the same vehicle”.
EMI Automotive Test is based on devices in the Device List and an EMI Automotive Test Template. To achieve a maximum in flexibility the test template editor allows all kinds of settings and changings which in all other tests are subject to the Hardware-Setup. EMI Automotive test template works comparable to a test sequence, so it is possible to do sub ranges with overlapping frequency ranges.

1.2 Standards related to EMI Band Evaluation

CISPR 25: “Vehicles, boats and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers”; Edition 3.0 2008-03. CISPR 25 describes the test method and gives a set of limit lines.

Frequency MHz	Antenna type
0,15 to 6,2	1 m monopole
26 to 54	Loaded quarter-wave monopole
68 to 1 000	Quarter-wave monopole
1 000 to 2 500	As recommended by the vehicle manufacturer

Figure 1: Antenna types

Service / Band [a]	Frequency MHz	Terminal disturbance voltage at receiver antenna terminal in dB (µV)		
		Peak	Quasi-peak	Average
BROADCAST				
LW [b]	0,15 - 0,30	26	13	6
MW [b]	0,53 - 1,8	20	7	0
SW [b]	5,9 - 6,2	20	7	0
FM [b]	76 - 108	26	13	6
TV Band I [c]	41 - 88	16	-	6
TV Band III [c]	174 - 230	16	-	6
DAB III	171 - 245	10	-	0

Figure 2: Example for limits of disturbance – Complete vehicle; CISPR 25

EMV-Anforderungen: Erstellt von AUDI, BMW, Daimler (Mercedes-Benz Cars), Porsche und VW; Edition V1.01: 2009-04-07
GMW3097: General Specification for Electrical / Electronic Components and Subsystems, Electromagnetic Compatibility (EMC); February 2004
Ford Motor Company, Component and Subsystem, Electromagnetic Compatibility: Worldwide Requirements and Test Procedures, ES-XW7T-1A278-AC; Date Issued: October 10 2003

2 Configuration of EMI Automotive Band Evaluation Test

The above referenced standards define several test methods to prove EMC to be compliant with the standards:

- Conducted emissions from components/modules:
  - Voltage method with Artificial Network (AN-Test)
  - Capacitive Voltage Method with Capacitive Coupling Clamp (CV-Test)
  - Current Probe Method (CP-Test, optional)
- Radiated emissions from components/modules:
  - Radiated EMI Measurement of emissions received by an antenna on the same vehicle
  - ALSE method, (Absorber Lined Shielded Enclosure)
  - TEM cell method (TEM-Test, optional)
  - Stripline method (SL-Test, optional).

Though the test procedures are divided in conducted and radiated emissions we can concentrate on one test method to show how to use these new kinds of templates. We select the test procedure for on-board emissions measured with build-in car antennas

(Radiated EMI Measurement of emissions received by an antenna on the same vehicle, Figure 4). EMC32-K51 provides a conducted and a radiated emission test with the same icons in the Test Setup as we know from other EMC32 extensions. The difference is that the hardware setup is not found in the System folder below the sub-folder Hardware Setups but is integrated into the EMI Automotive Test Template itself. To configure a test we have to start as usual with the Device List, where we have to define all devices we need for the new test. As we said we will concentrate on radiated test

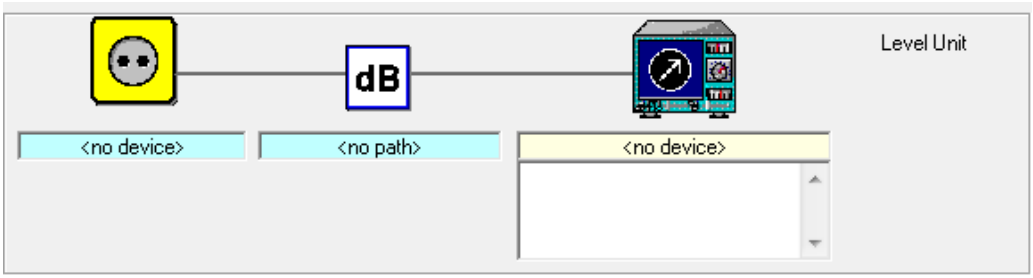


Figure 3: Hardware Setup for conducted EMI Automotive test

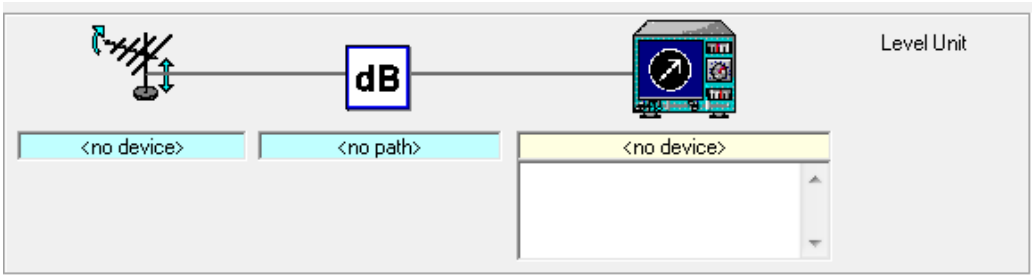


Figure 4: Hardware Setup for radiated EMI Automotive test

2.1 Populating the Device List

Radiated EMI Automotive tests need the following devices:

- EMI Test Receiver or Spectrum Analyzer
- Antennas (given as car antennas or antennas acc. Figure 1)
- Switch Unit to connect automatically the band related antenna with the receiver.
- Signal Paths between antennas and the receiver.

The Device List opens via Menu: “Extras > Device List …” or function key “F9”. An example of a properly filled Device List is shown in Figure 5. Some of the devices need further configuration. The path configurations of the switch unit have to be done in the properties of the switch unit in the Device List itself, the settings of the EMI test receiver are only accessible in the EMI Automotive test template editor.

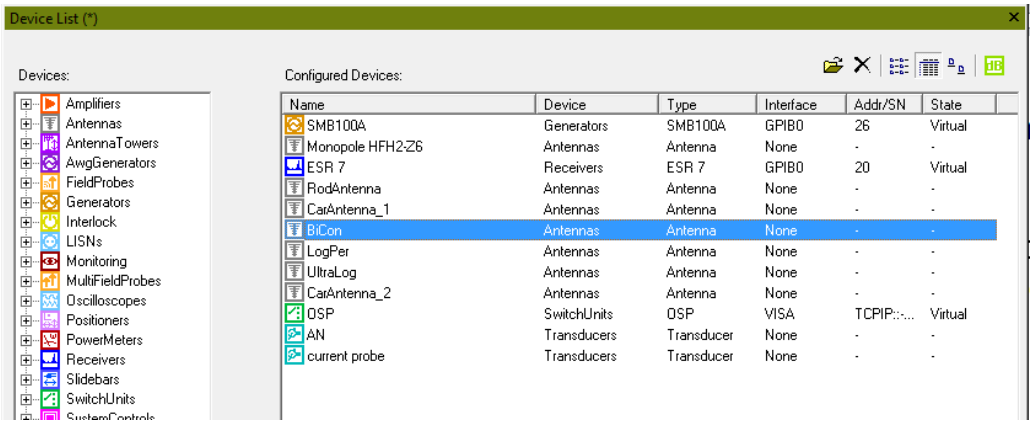


Figure 5: Device List with example devices used in this App Note

The switch unit (Figure 6) should have all paths needed prepared It depends on the switch unit whether the user can edit the paths directly or he has to import them, like OSP. After that we can use them in the hardware setup placed behind the tab “Test Setup” of the EMI Automotive template editor.

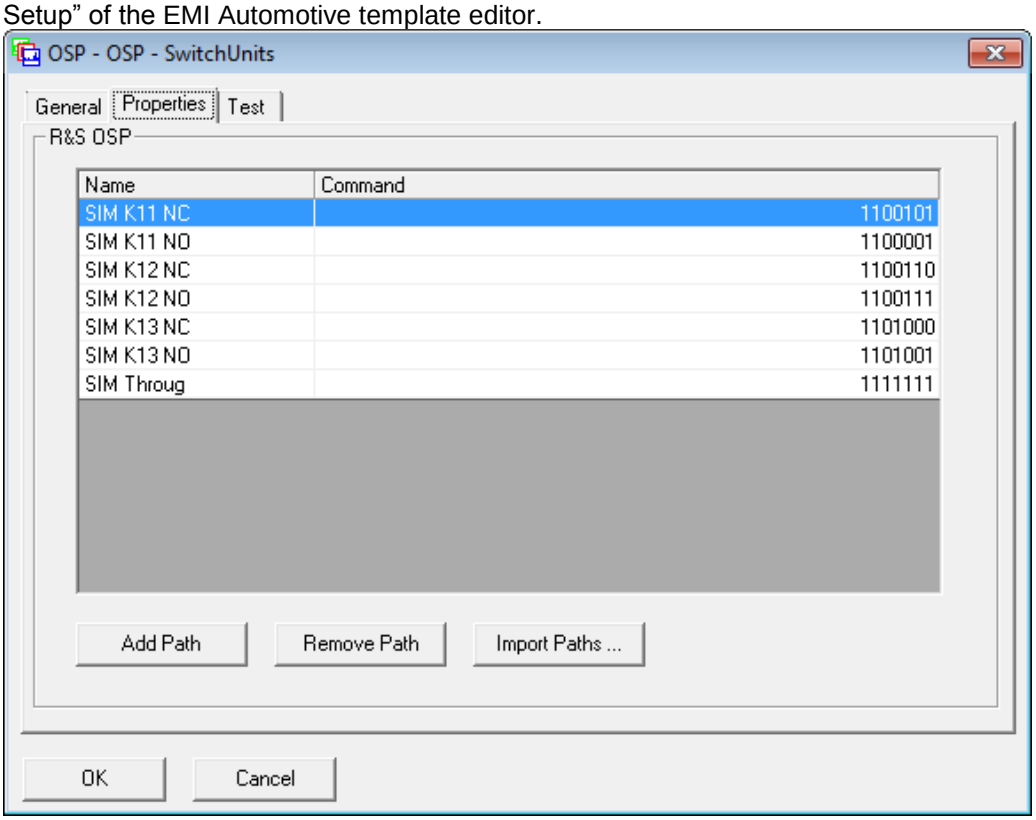


Figure 6: OSP with settings for paths as an example for a switch unit

2.2 EMI Automotive Test Template Editor explained

In order to create a new test case a Template Editor shall be configured according to the test requirement.

2.2.1 How to open a new EMI Automotive template in the editor

Follow the steps mentioned below in order to create a new EMI Automotive Test Template.
Open an existing EMI Automotive Template Editor via the EMC32 file explorer. i.e. System Folder >> Test Templates >> EMI Automotive:

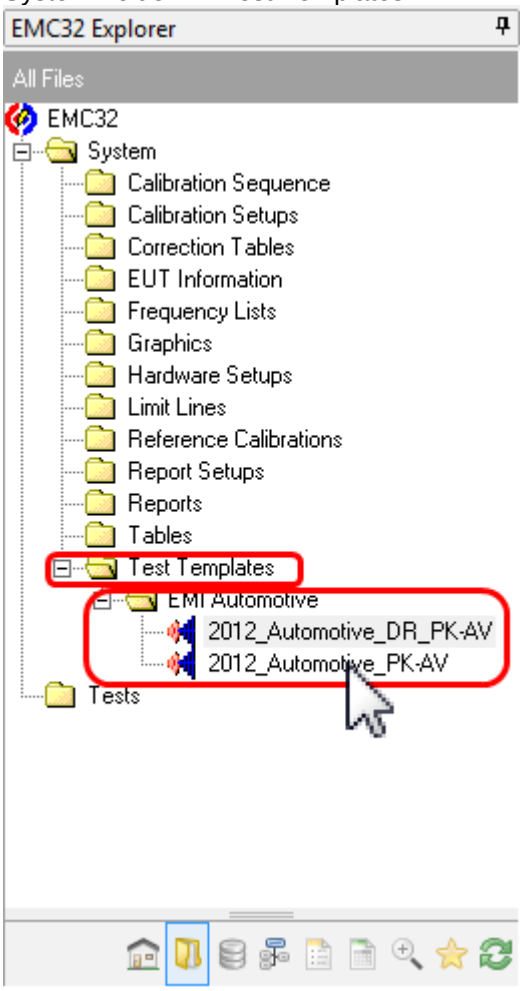


Figure 7: A mouse click on an existing file open the template editor with this EMI Automotive Test Template

Or create a new template by either of the following steps:

1. Create a template from the main template folder “Test Templates” in Explorer, this is the only way to create template if the sub folder “EMI Automotive” exists not yet (top of Figure 8).
2. Create a template from the sub template folder “EMI Automotive” in Explorer (buttom of Figure 8).

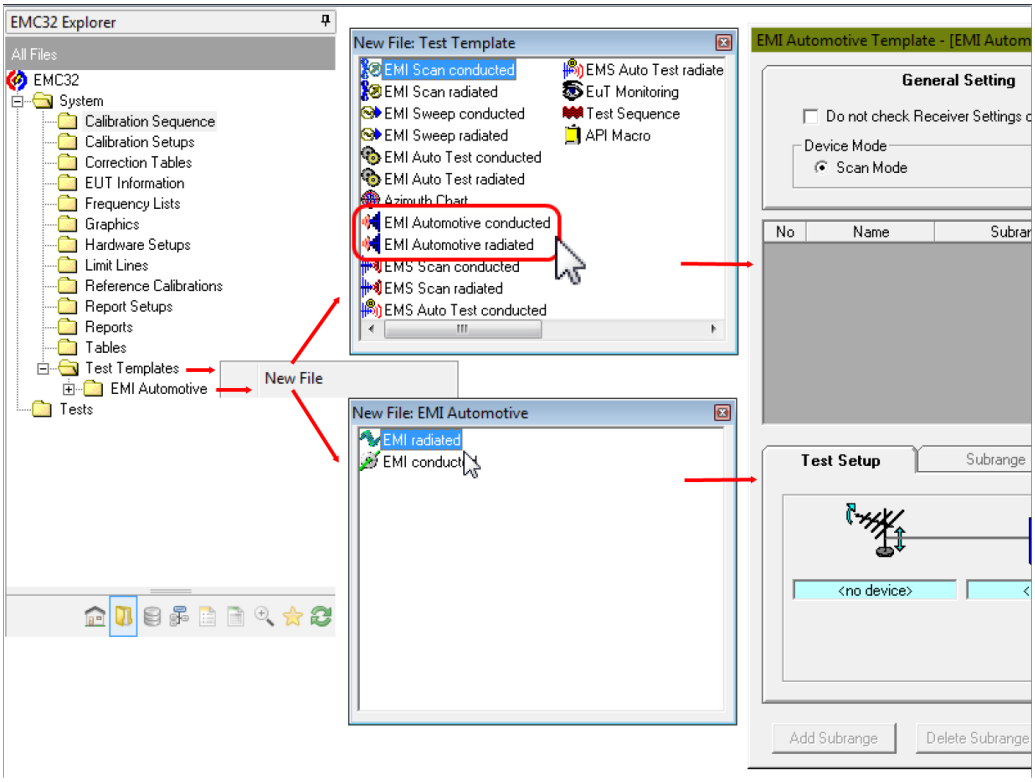


Figure 8: Two possibilities to create a new empty test template

3. Creating template from the main Menu Tool Bar
   Creating template from the main Toolbar

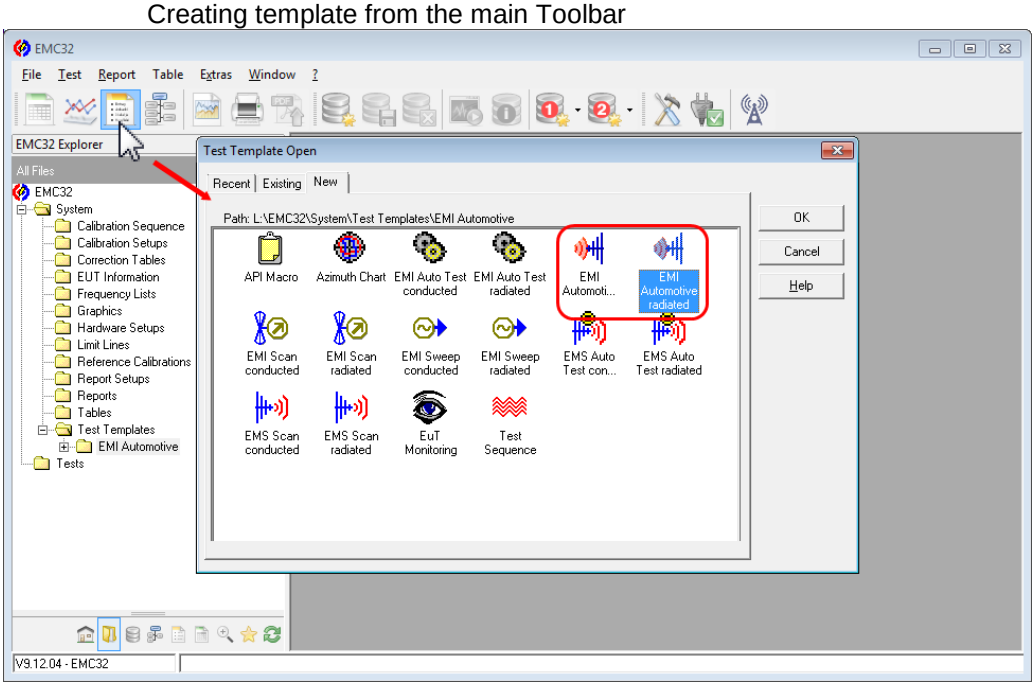


Figure 9: Generation a new template via icon "Test Template new/open ..."

After following the above steps a Template Editor window will be opened.

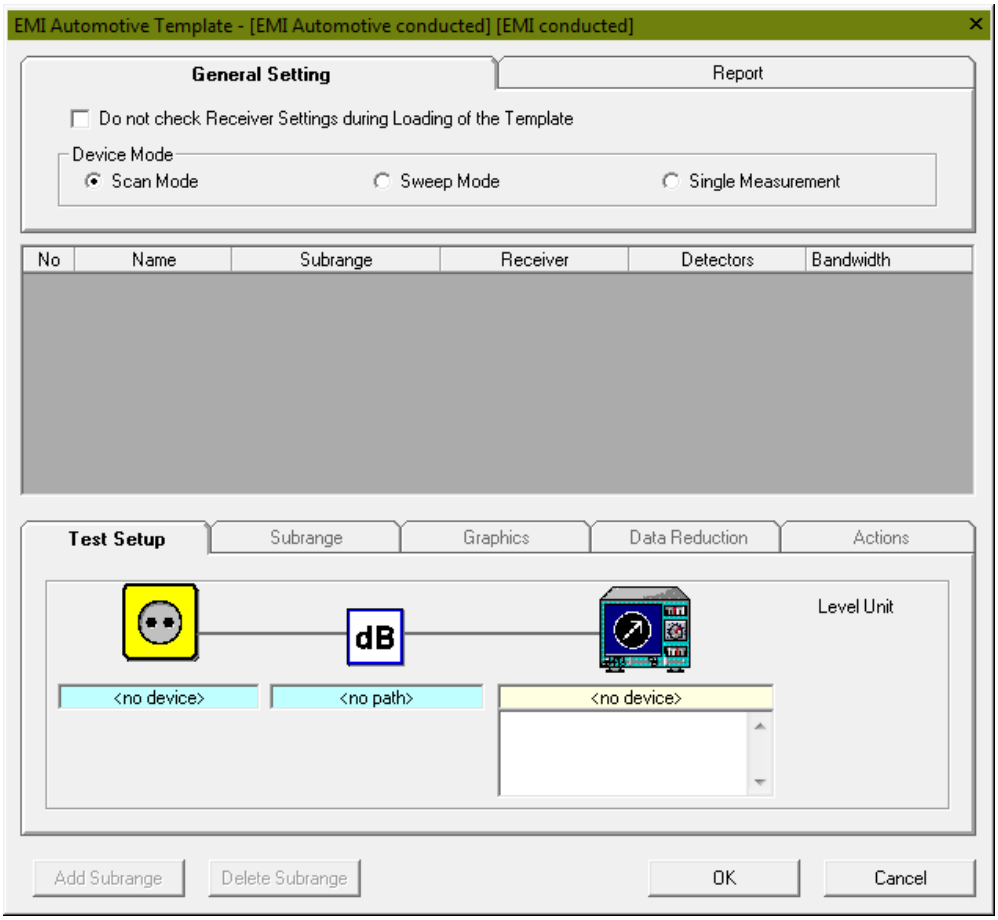


Figure 10: EMI Automotive conducted Test Template Editor

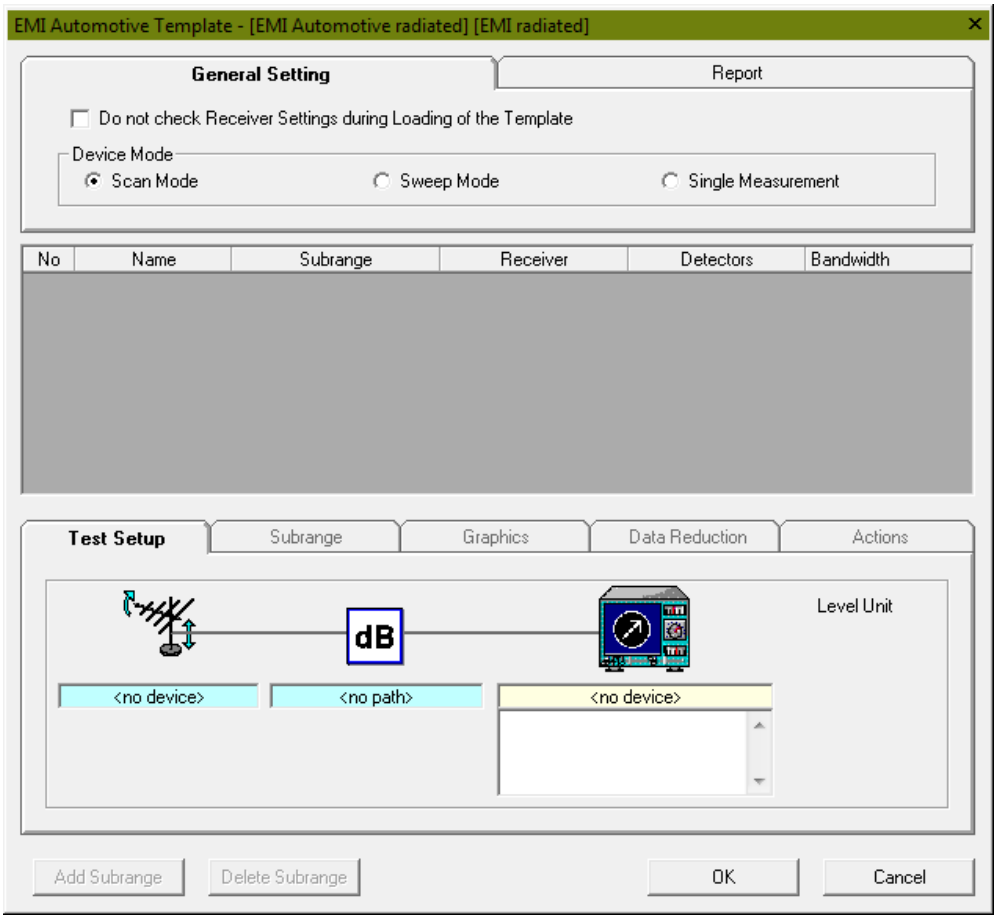


Figure 11: EMI Automotive radiated Test Template Editor

2.2.2 Configuration of an EMI Automotive radiated test template

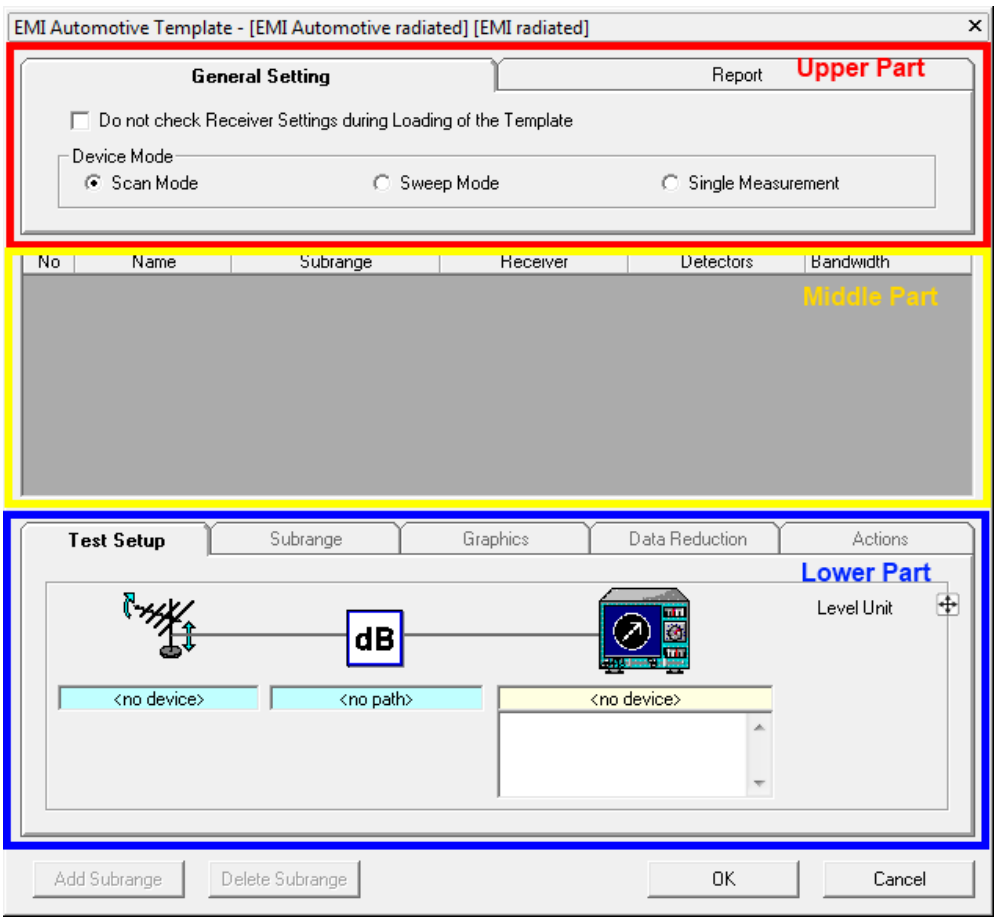


Figure 12: The three parts of the Template editor

2.2.2.1 The upper part of the template editor

The upper part contains a tab structure in which the general settings, valid for the whole frequency range, that means for all defined sub-ranges are done. This part consists of two tabs; General Settings and Report.

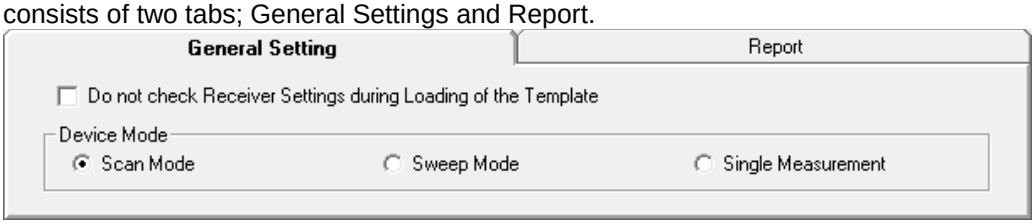


Figure 13: General settings for all sub-ranges listed in the middle part

In the ***General Settings*** tab (Table 2-1) Receiver Check and Device Mode can be defined. Never change the Device Mode in a given Template, otherwise all sub ranges in the middle part of the template will be deleted. The template offers three device modes but one of them, the “Single Measurement” mode is very specific, it is a customer solution which description is not part of this application note.

Table 2-1: General Settings

Receiver Check	If untagged the Receiver Settings will be checked during Loading of the Template. This improves the loading speed but reduces the security.
Device Mode	Here the operating mode of the selected measurement device "Test Receiver" or "Spectrum Analyzer" is chosen: *Scan Mode:* In all sub-ranges the receiver is in Test Receiver Mode *Sweep Mode:* In all sub-ranges the receiver is in Spectrum Analyzer Mode *Single measurement:* This is a customer specific mode, which expects additional requirements (customer specific devices and / or actions referencing the frequency list) In this mode the frequency steps are not defined by the receiver device (like a scan mode) but by an additional frequency list, that is not referenced in the template itself. One measurement value will be done for every frequency of the frequency list. In the case there is no frequency list given this mode works like Scan Mode.

The next tab allows some setting for the report.

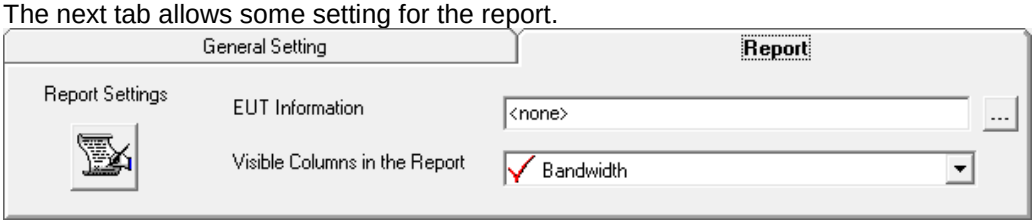
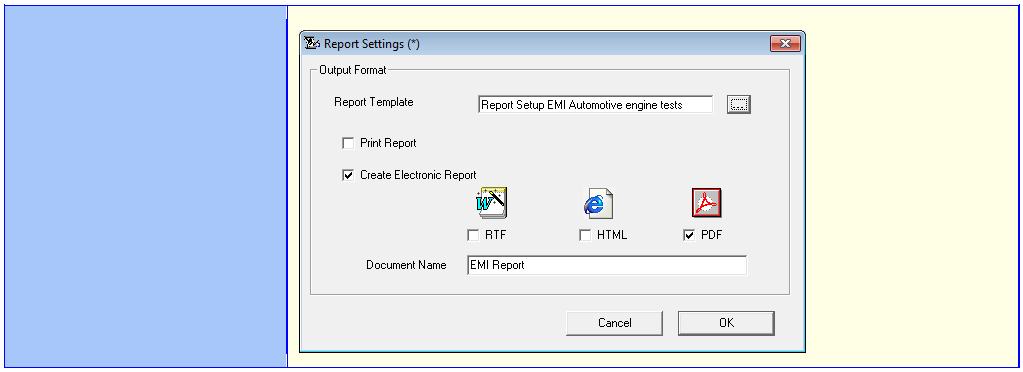


Figure 14: Report settings

Detailed setting like configuration of content and design are possible in the report generator, which is described later.

Table 2-2: Report settings

EUT Information	An EUT Information file can be referenced and so included into the Report.
Visible Columns in the Report	The drop down list allows to select and de-select columns of the result tables in the report. Only checked columns will be shown.
Report Settings 	A click on this icon pops up the standard setting for reports



2.2.2.2 The middle part of the template editor

The middle part contains a table, which gives an overview over all defined sub-ranges for the EMI Automotive measurement. It is used for displaying a list of sub-ranges. The settings of the currently selected (active) sub-range in the sub-range list can be changed in the lower part of the editor.

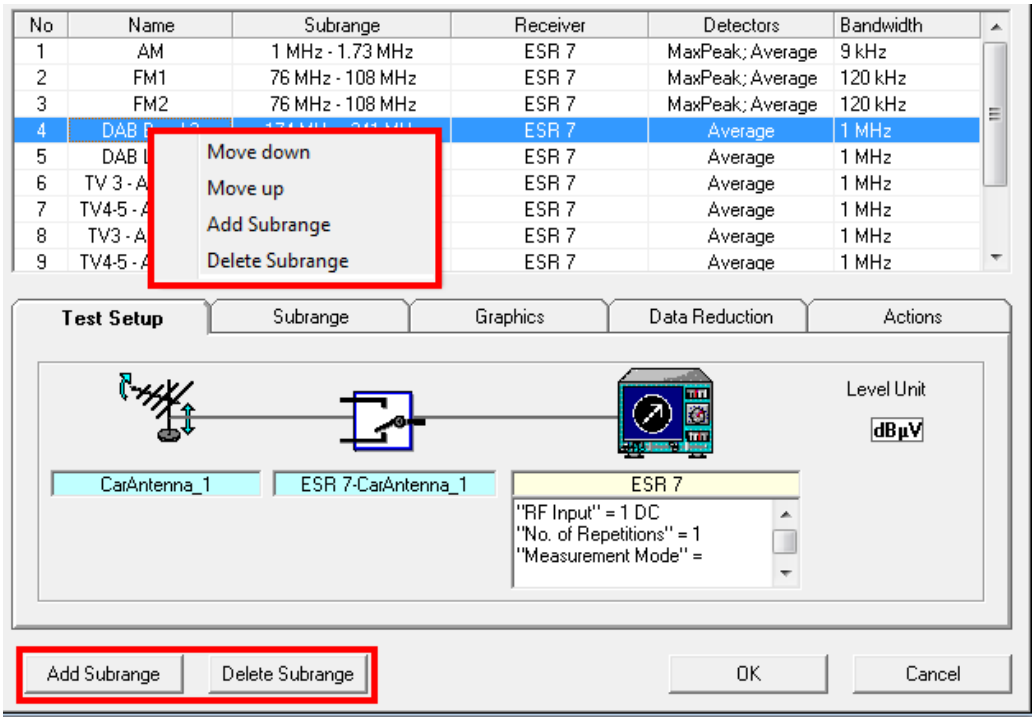


Figure 15: The pop-up menu and the two buttons allow basic changes

2.2.2.3 The lower part of the template editor

The lower part is the most important one and consists of five tabs: Test Setup, Sub-ranges, Graphics, Data Reduction and Actions. The parameters for each band related test (here: sub-range) need to be configured with appropriate setting in all five tabs as required by the test case.
How to configure the test cases in the lower part of the template editor is topic of chapter 3.

3 Configuration of Test Cases in the Editor

Now we will do all the settings in the lower part of the EMI Automotive Test Template editor which define an individual test case. The tab structure in the lower part of the editor is used to display the settings of the currently selected (active) sub range in the sub range list.
The setup shown in the Test Setup shall be configured prior to the other tabs of this sub range.
In the Test Setup tab, the following can be defined in sequence:

- Define the Transducer from the available list
- Define the appropriate Signal Path
- Define the Receiver and it's parameters.

3.1 Function of the mouse buttons in the editor

The functionality of the mouse buttons is the same as we know from the Hardware Setups for other test types.

A right click when the mouse pointer shows a hand symbol on a device icon opens a selection of all available devices. The currently selected device is marked with a tick.

A left click when the mouse pointer shows a hand symbol on the icon opens an editor window with the properties of the device.

Stopping mouse movement in a text box when the mouse pointer forms an insert symbol shows a pop-up with the full content of the parameter set of the device.
The following procedure can be used to configure the device. A device is displayed by means of an icon and a text box containing the selected device's name. If the device has to be programmed in the context of the template, the mouse pointer changes when passing over the device icon and a corresponding help text ("Tip Tool Text") appears below the mouse pointer.
Clicking with the left mouse button on the icon at this point will open the device specific Settings Dialog. Finally, closing the Settings Dialog with OK will show a summary of the settings in the text box below the device icon. When opening the template editor again later on, the fact that such a settings summary text is displayed will proof that valid device settings have already been defined.

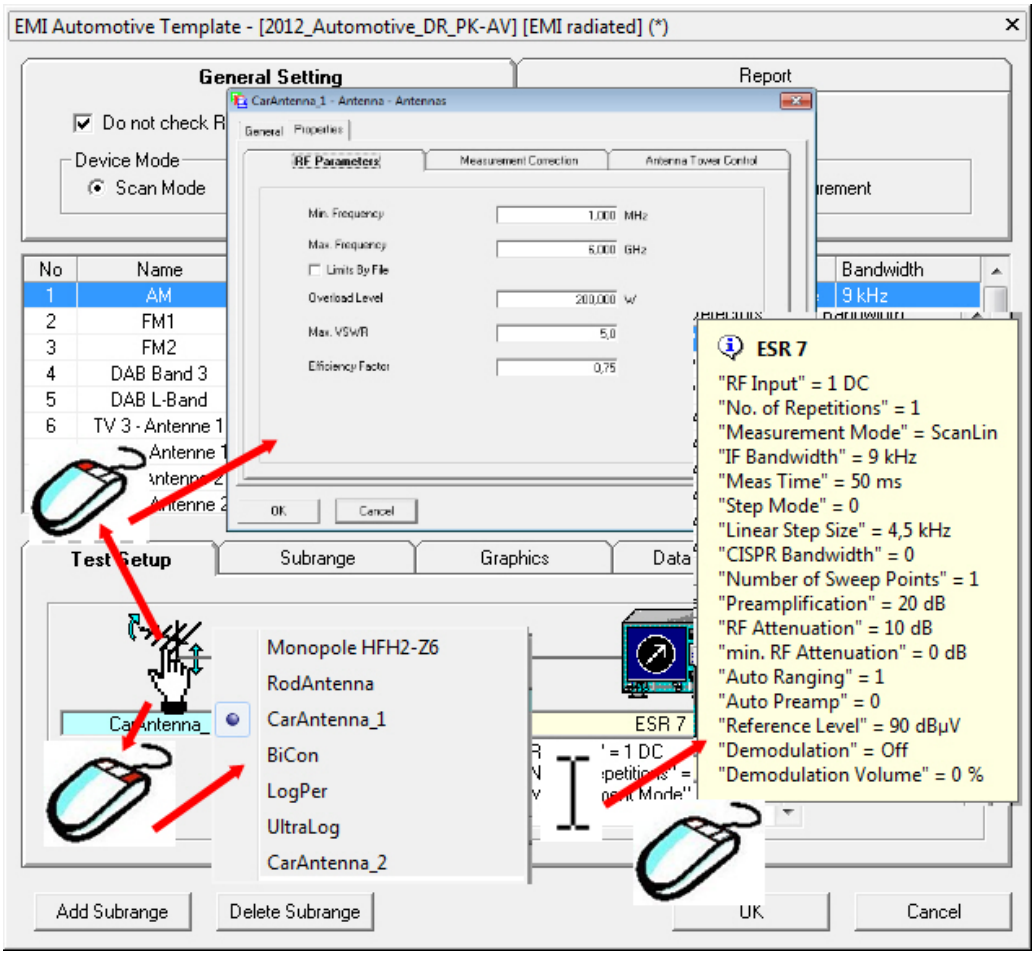


Figure 16: Mouse functions in the editor

3.2 Setting in Test Setup tab

Figure 17 shows the Test Setup tab with settings.

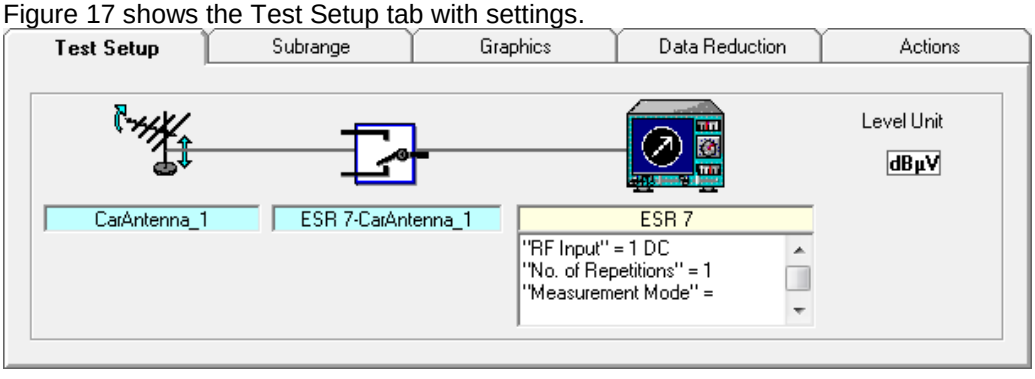
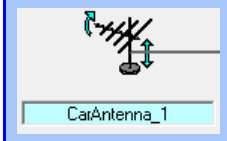
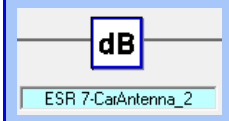
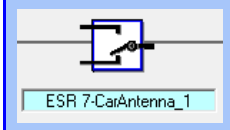
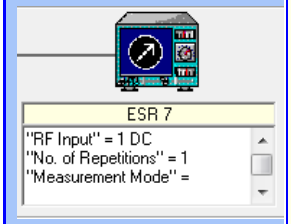


Figure 17: Test Setup tab

Table 3-1: Icons of the Test Setup tab

Transducer 	**Right click:** Available are all transducer and antenna devices depending whether this is a conducted or radiated measure. Note: the antenna does not support polarization settings. **Left click:** The properties editor of the transducer pops up, the dedicated dialogs are shown in Figure 18
SignalPath  	**Right click:** The name of the SignalPath will be automatically generated after choosing both a transducer and a receiver by right-clicks of the mouse. Alternatively an existing signal path may be selected.**Left click:** The properties editor of the SignalPath pops up (Figure 19).
Receiver 	Receiver parameters can't be configured before defining the other devices). After selecting the receiver, the parameters (e.g. IF BW, step size...) of the receiver can be set here by clicking the mouse button on the receiver.**Right click:** From the pop up list of receivers an appropriate device is chosen.**Left click:** The properties of the receiver has to be set as shown in Figure 20.
	This read only icon shows the Level Unit, the unit of the measured signal. The setting is done in Measurement Correction tab in Figure 18

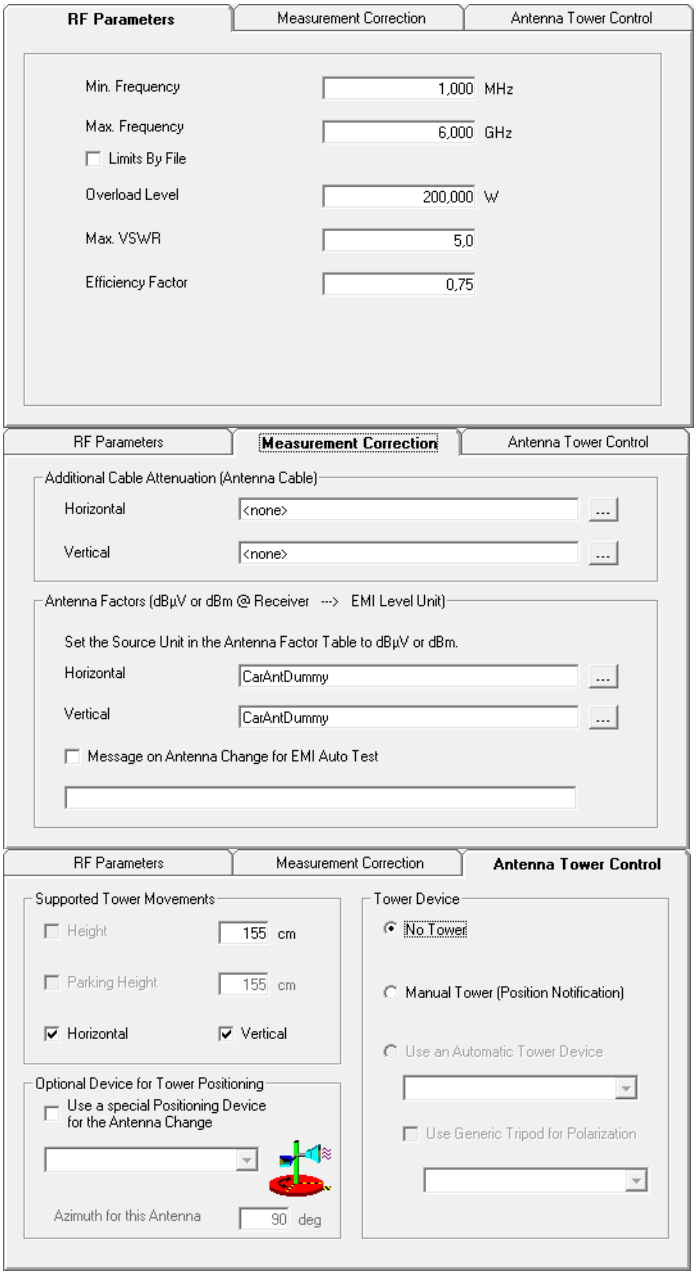


Figure 18: Three dialogs to define the antenna(s)

Dialog defining the switched signal path from test receiver to the antenna.

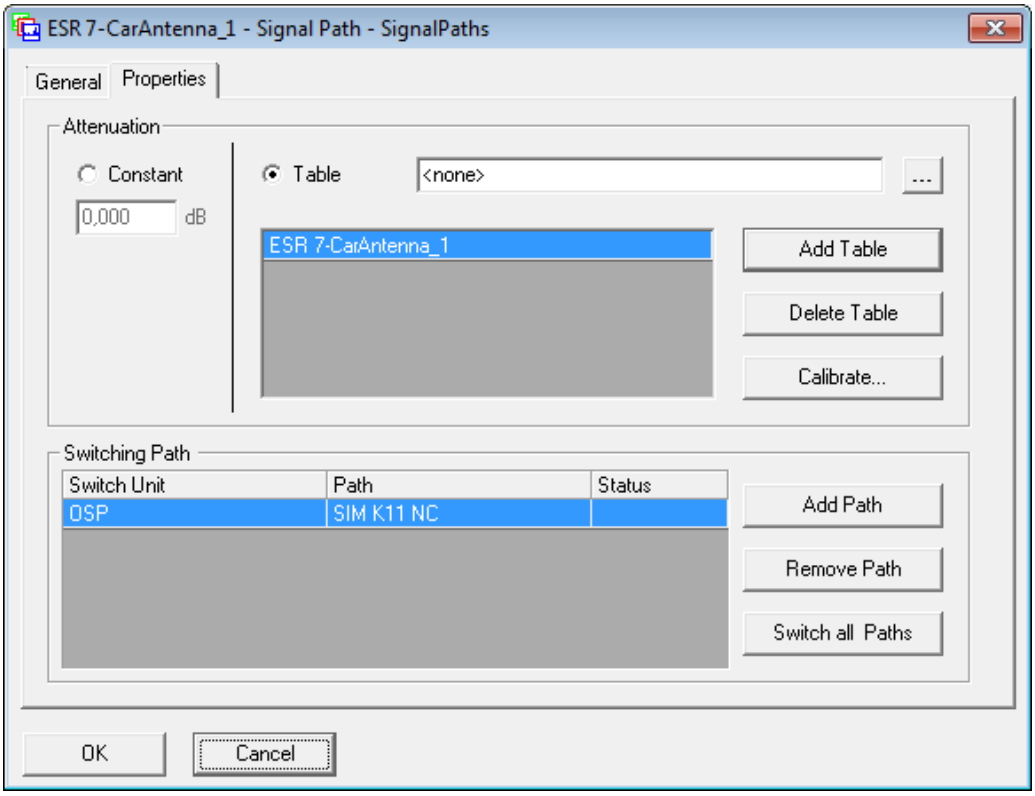


Figure 19: Dialog to define the signal path

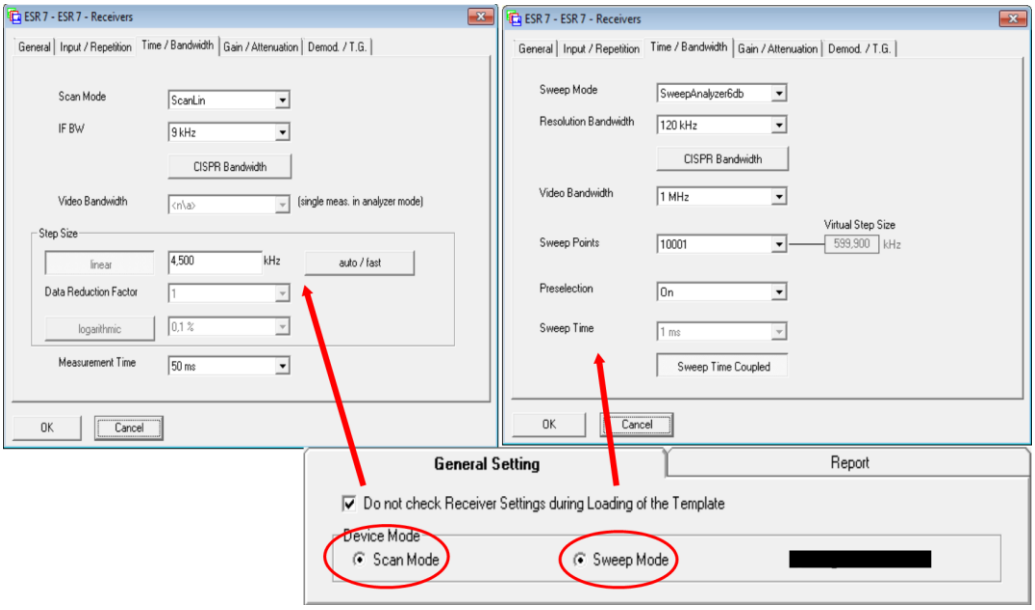


Figure 20: Receiver settings according to the chosen mode

3.3 Settings in Subrange tab

In the ***Subrange*** tab, the following parameters can be set:

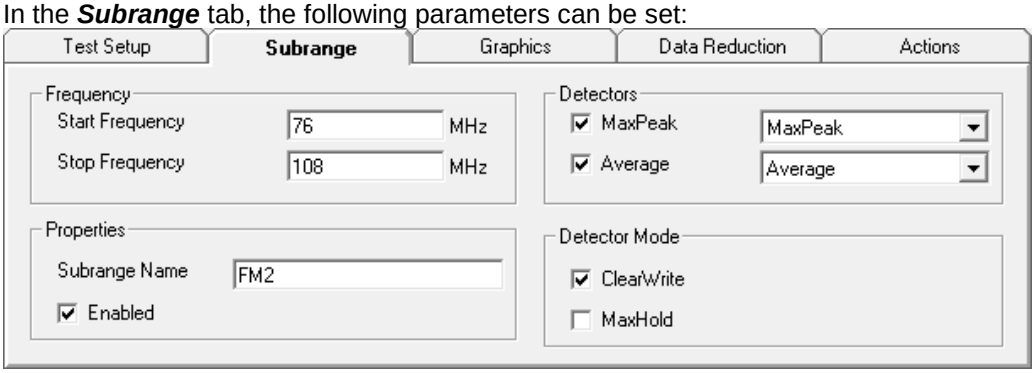


Figure 21: Settings of the Subrange tab

Table 3-2: Setting in the Subrange tab

Frequency	Start and stop **frequency** for this subrange. The stop frequency must always be higher than the start frequency.
Properties	**Subrange Name**: Individual name can be defined here for the subrange or band **Enabled**: • Checked: Measurement defined in this subrange will be carried out during test run, • Unchecked: Measurement defined in this subrange will be skipped during test run
Detectors	If one or both **detectors** should be used for this subrange. If only one detector is selected it will be used for this subrange automatically.
Detector Mode	Allows to check ClearWrite and / or Maxhold • **ClearWrite**: New measurement value overwrites the old one, and • **MaxHold**: New measurement value is stored if it is higher than the old one

If QuasiPeak has to be taken as Detector with a minimum measurement time of 1s it depends on the frequency range a Band covers and the step size given in the standard how long the test for this Band lasts. Therefore the usage of TD-Scan offered with Test Receivers families ESU, ESRP or ESR which is switched on in the receiver settings tab Time / Bandwidth (Figure 22) allows extremely shorted test durations.

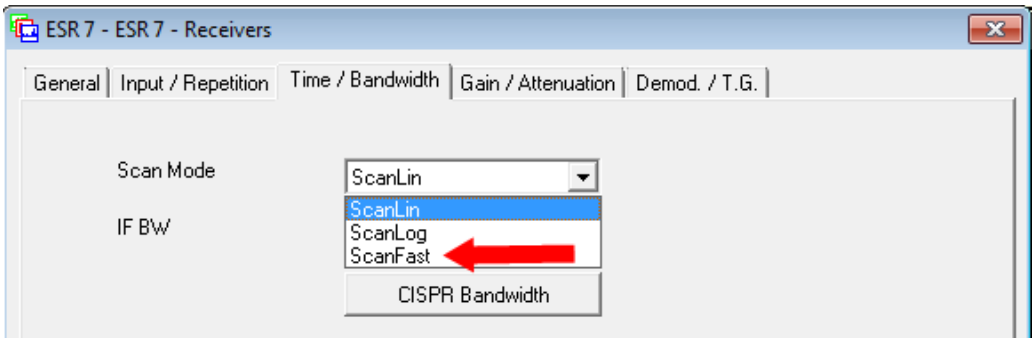


Figure 22: Switching the Test Receiver to Time Domain Scan (TD-Scan: FFT Mode) use ScanFast as Scan Mode

3.4 Settings in Graphics tab

In the Graphics tab the following parameters con be set.

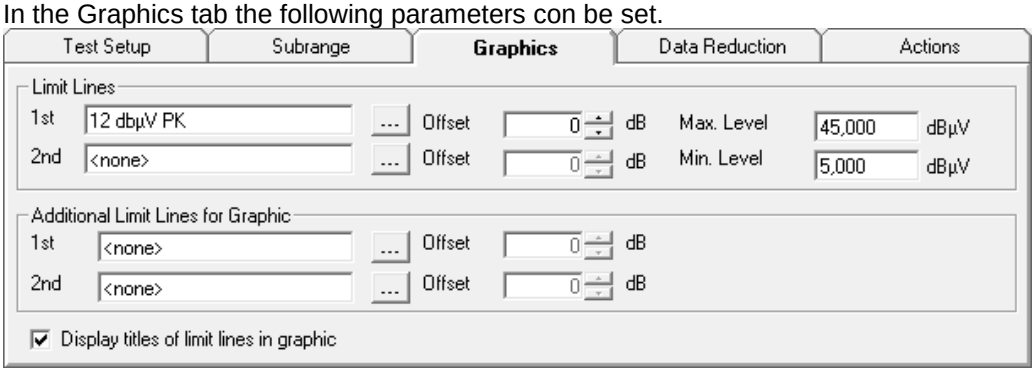
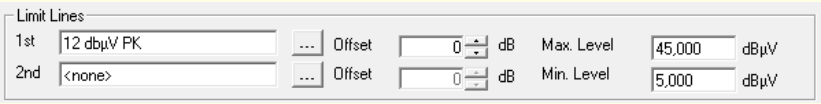
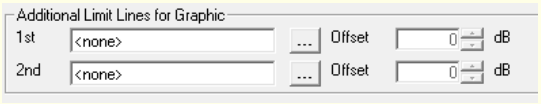
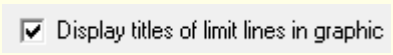


Figure 23: Settings of the Graphics tab

Limit Lines	Defines the limit lines which shall be displayed for each of the two detectors. These two Limit Lines are taken for Data Reduction.  For each limit line optionally an **offset** may be applied (thus the copy of the limit line added to the appropriate EMI test will be corrected by the defined offset value).

	Min / Max Level: Here the maximum and minimum value for the Y-Axis of the graphic will be defined.
Additional Limit Lines for Graphic	Defines two additional limit lines which shall be displayed only for each of the two detectors.  For each limit line optionally an **offset** may be applied (thus the copy of the limit line added to the appropriate EMI test will be corrected by the defined offset value).
Display titles of limit lines in graphic	Displays the titles of the limit lines extended with the offset if different from 0. 

3.5 Settings in Data Reduction tab

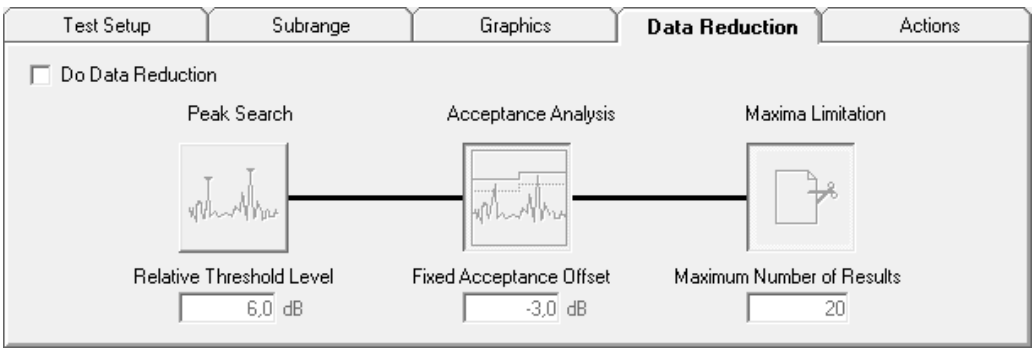


Figure 24: Do Data Reduction unchecked grays out all settings

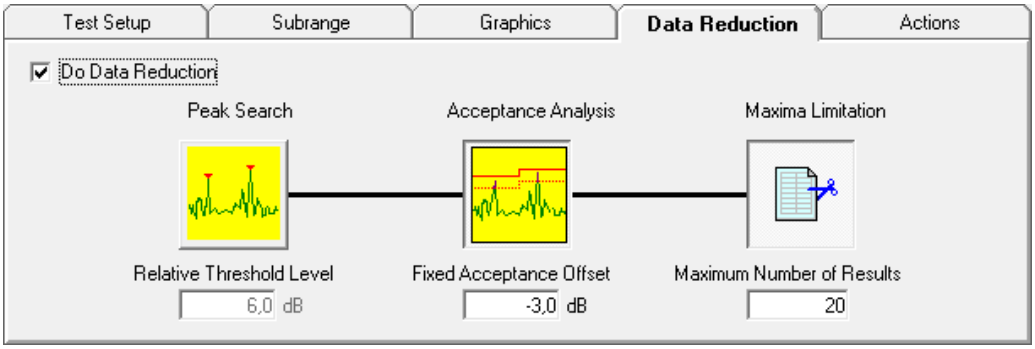


Figure 25: Do Data Reduction checked allows editing

Data reduction allows three different kinds of settings:

- Evaluation part 1: **Peak Search**
  In the first part of evaluation a peak search will be performed. This part helps to find the highest narrowband signals in the measured frequency range.
- Evaluation part 2: **Acceptance Analysis**
  The results from the peak search algorithms in part 1 may be reduced by the following functions: For the acceptance analysis you can (optionally) select for each detector a limit line (tab: Graphics, Figure 23). Each limit line may be optionally shifted by the defined Offset value (thus EMC32 will add the offset value to the copy of the original limit line in the current test.)
  The Additional Limit Lines for Graphic are only displayed in the result graphic but are not used for data reduction or evaluation purpose.
- Evaluation part 3: **Maxima Limitation**
  In the third evaluation part a maxima limitation will be performed. This part helps to reduce the found critical frequencies to a reasonable number for further evaluation.

3.6 Settings in Actions tab

Action tab shows the same functionality as known from other templates.

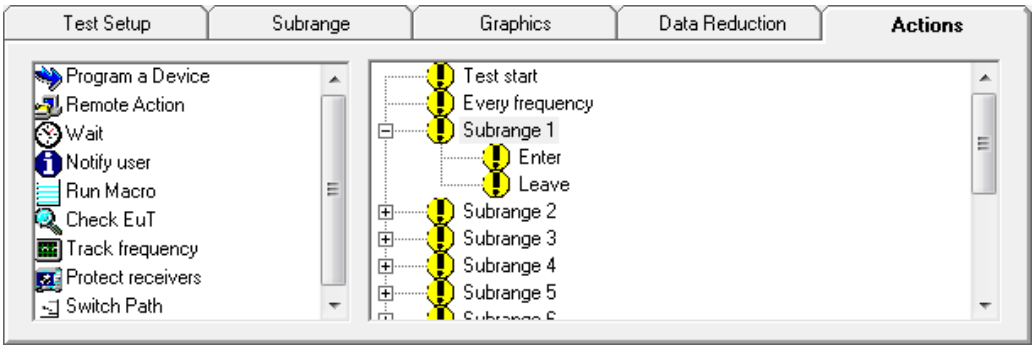


Figure 26: Action tab in EMI Automotive template

3.7 Close the editor and save the template

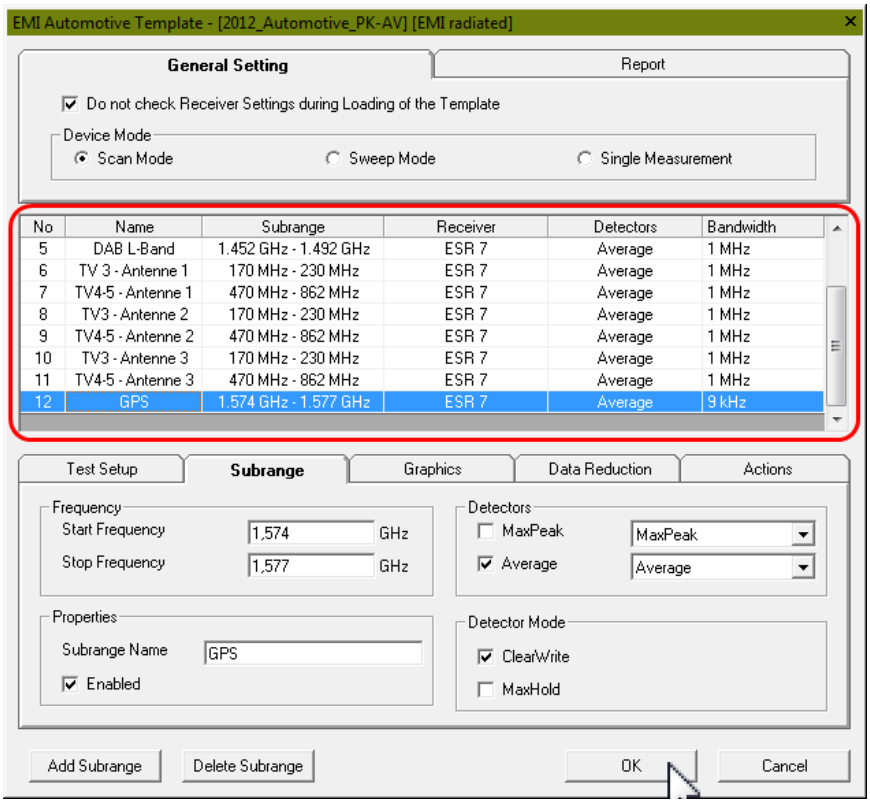


Figure 27: Last Step is to save the ready for testing template

When all sub ranges are filled with correct parameters we can save the EMI Automotive Test Template by clicking the OK Button. In the Save File Dialog we can choose an appropriate name for the template, which is now ready for use.

4 Running an EMI Band Evaluation Test

As usual for EMC32 there are several ways to start a new test.

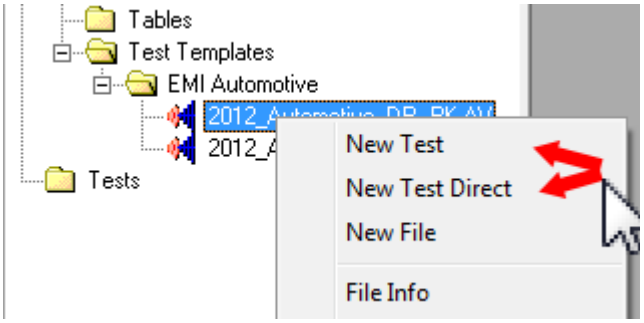


Figure 28: Several possibilities to start a new test directly or via the new test editor

The New Test Editor gives additional freedom to change parameters of the Test Template for one test (Figure 30).
Any setting regarding report setup or EUT Information file is no longer taken from the settings in the template but from the New Test Editor.

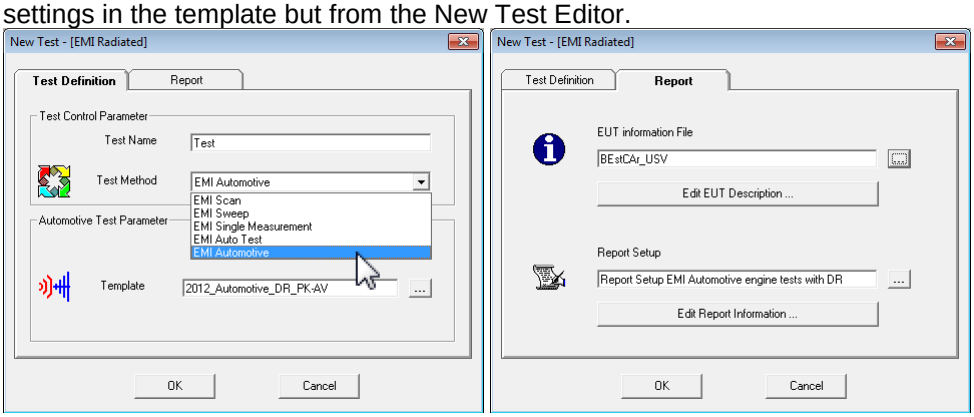


Figure 29: Start a new test choosing the Test Mode: EMI Automotive and an appropriate Test Template in the New Test Editor

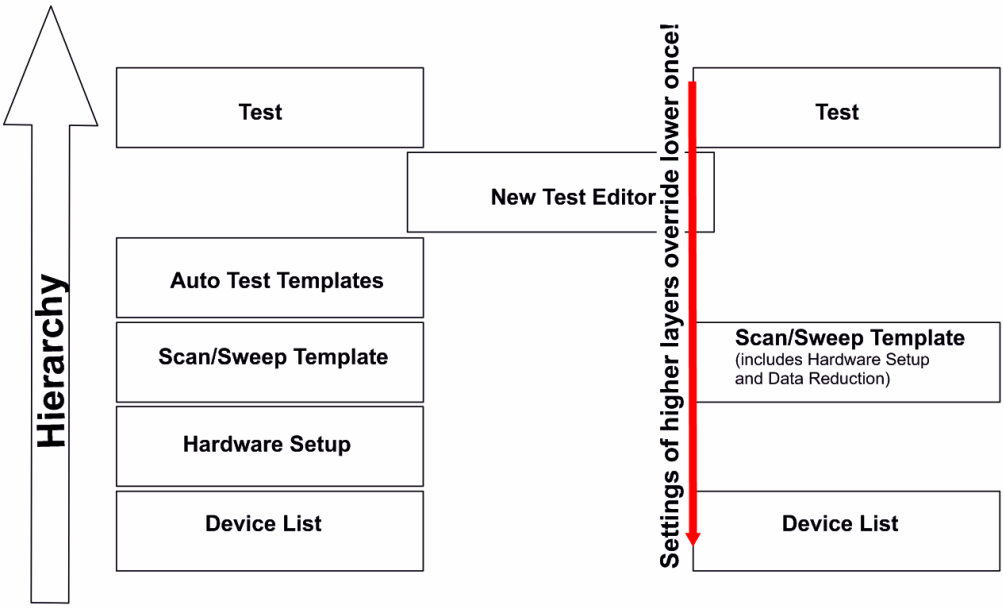


Figure 30: Settings in the New Test Editor overrides those from template

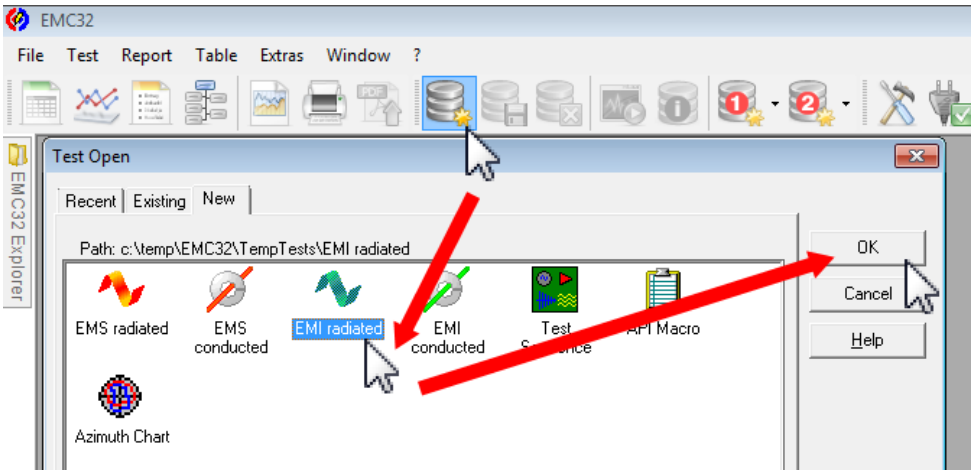


Figure 31: Start a new test via the Tool Bar

To run the test we have to switch to Measurement mode.

4.1 Measurement Mode

The measurement mode is used for performing test runs and acquiring measurement data.
After selecting a test from Test Template, the template will be open in Analysis mode. When pressing the "Switch to measurement mode" or F4 button. It will leave the analysis mode and will switch to Measurement Mode.

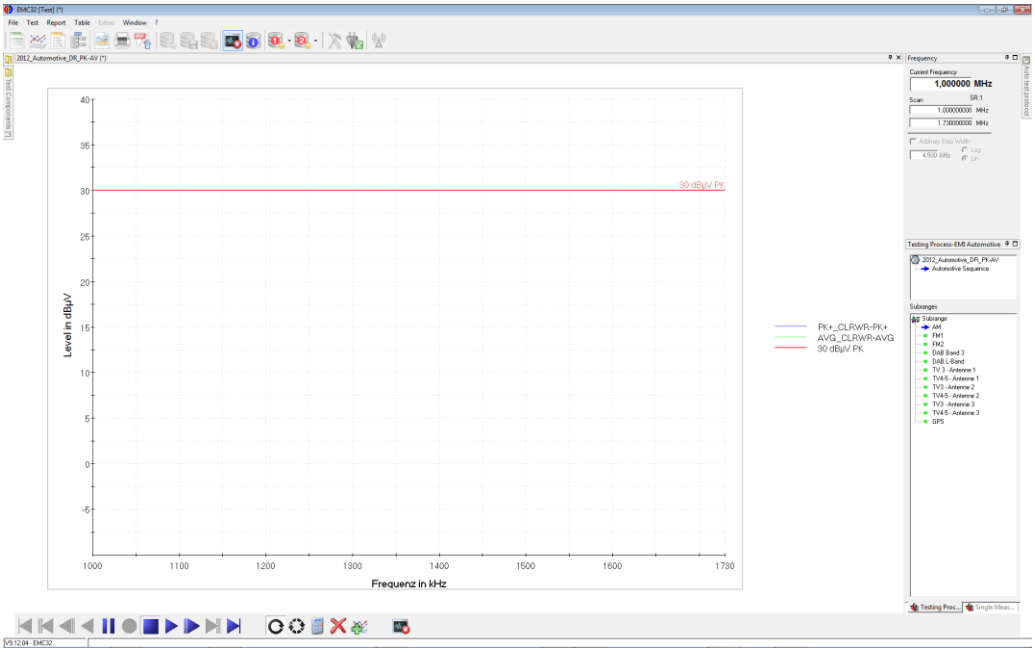


Figure 32: Starting a New Test

Before we run the test only one empty graphics is shown. In measurement mode, the file explorer and Test component explorer, which are visible in analysis mode, will be hidden. Both explorers can be faded in when placing the mouse cursor on one of the explorers tear off buttons. When the cursor is removed the explorer will be faded out once again.

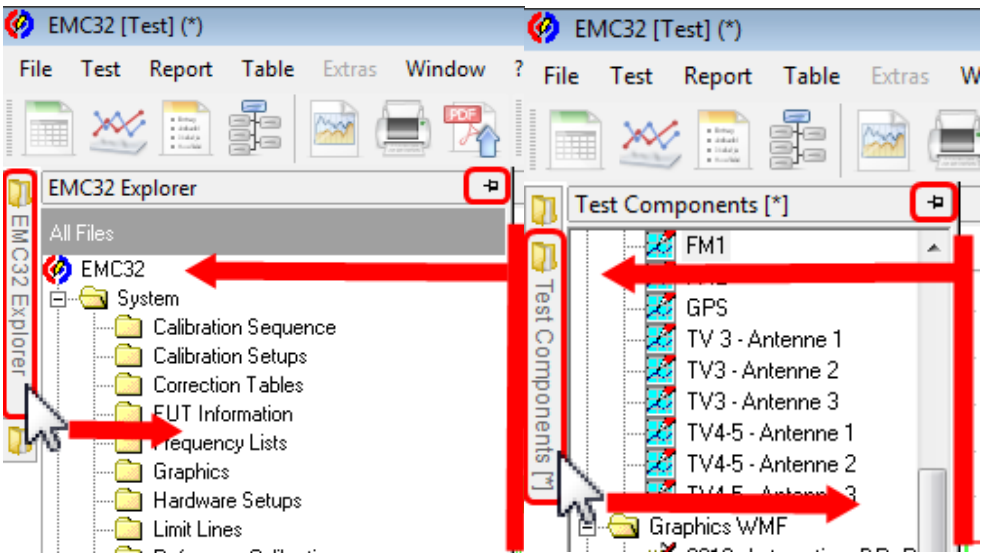


Figure 33: As long as the Explorer is unpinned the EMC32 Explorer OR the Test Components is visible during mouse pointer is resting on the dedicated tear-off button

4.1.1 Start a Test

The start of a test is a simple mouse click with the left mouse button on the start icon, Figure 34.

Figure 34: Video recorder like control bar

4.1.2 Screen elements:

In the upper graphics area all measured frequency bands are shown in the tree view style and can be shown easily by clicking on the appropriate tab. In the lower graphics area the currently measured band is shown.
Further mode there is Frequency Test control, which shows the current measured frequency as well as the Arbitrary Step Width.

Figure 35: During test run each subrange when executed gathers the data in a separate table and graphic

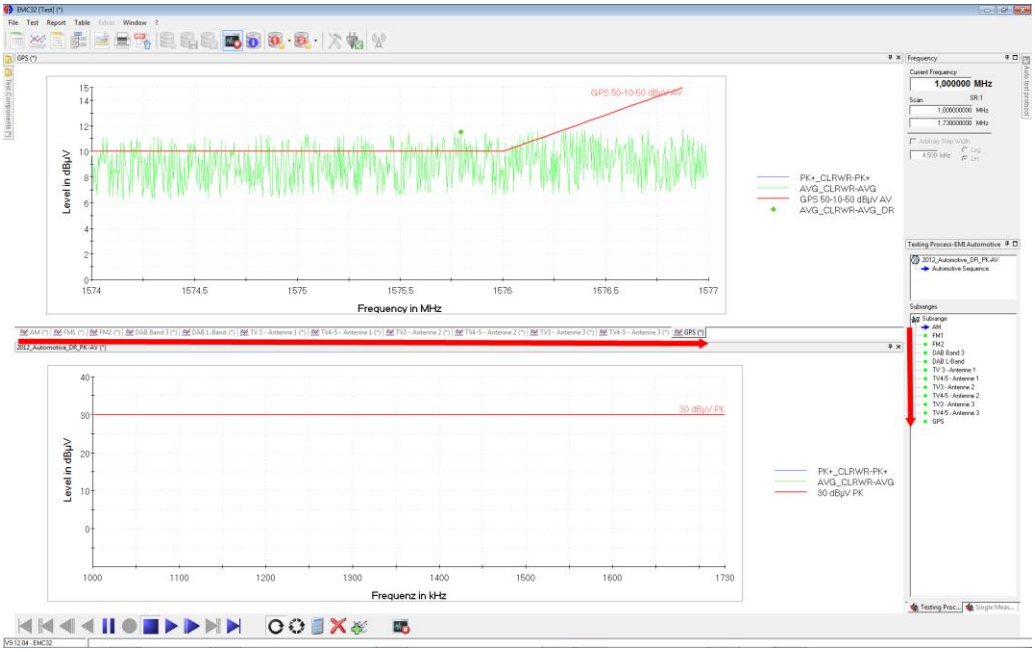


Figure 36: Each individual Band (Subrange) is represented by one graphics, visible after a click on the tab

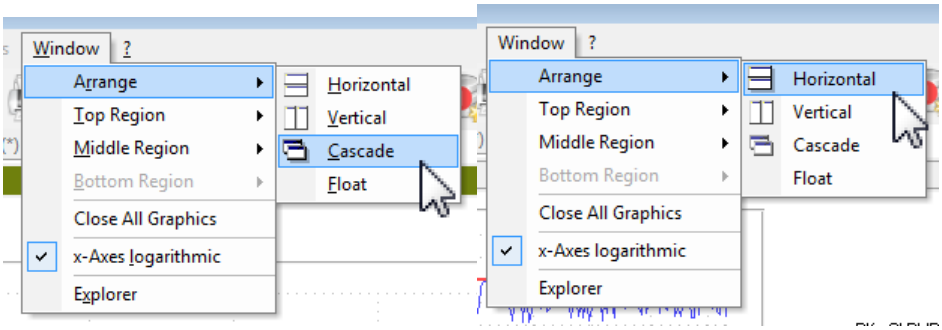


Figure 37: Configuration of the graphics display, all shown (Horizontal, Vertical) or only one visible (Cascade), all other are in the background, selectable by tabs

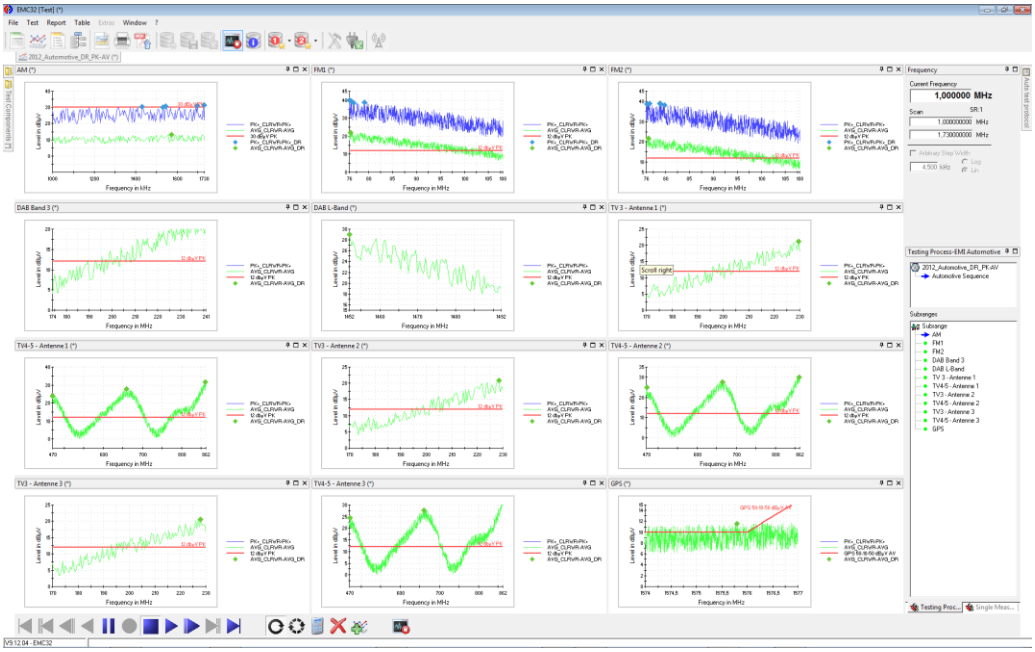


Figure 38: The frequency control and the Test Process EMI Automotive are visible on the right side of the screen

4.2 Test Control Bar

The test control toolbar is located at the bottom of the main window. It contains buttons which look like the ones of a video player. Different functions can be performed with the help of these buttons e.g. test can be started or stopped etc. Functions of these buttons are mentioned below.

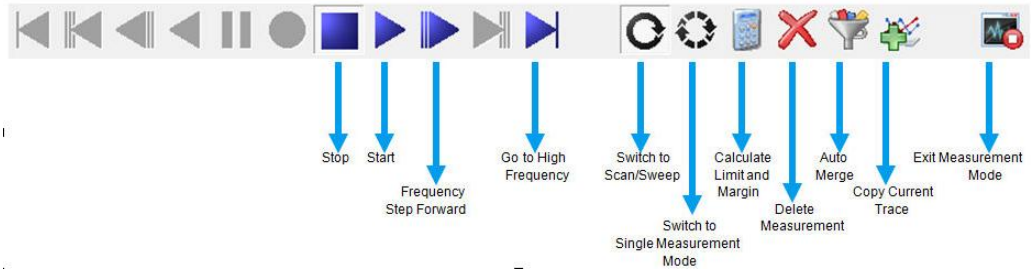


Figure 39: Test Control Toolbar before start

Figure 40: Test Control Toolbar during test run

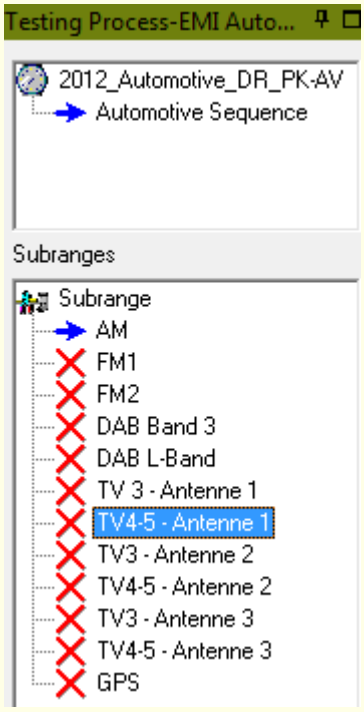
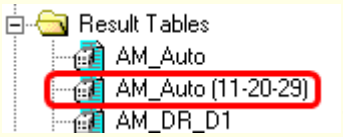
Alternatively to clicking on one of the symbols in the toolbar the following functions can be controlled via the keyboard during a single measurement:

Table 4-1: Detailed description of Control Toolbar

Button	Description
Stop 	A running test is stopped by clicking on this button.
Start 	The test will be started, by clicking on the Start button, at the start frequency defined in the frequency control. The measurement will be started and will gradually increase towards stop frequency; as soon as the stop frequency is reached the test will be stopped. The start and stop frequencies can be defined in the Test Template as well.
Pause 	A running test can be paused by clicking on the Pause button. Note: This button will be used as Start button for a single measurement test. A continuous measurement will be started at the current frequency.
Frequency Step Forward 	The function of this button is to increase the frequency step by step. The Step Size is defined in the Device Setting of the Test template. By clicking on this button the frequency will jump to the next frequency. e.g. if the Step size is 60kHz then the next frequency will be 120kHz and so on. After defining the frequency in the test template and after executing the test, the start frequency will jump to next frequency automatically as defined but in case to a start the test at frequency other than defined frequency then it starts the test from the frequency, which closer to the Step size frequency. The gradual increase or decrease of the frequency is dependent on the Step size. e.g. Defined start frequency in the Test Template is 30MHz. But need to measure at start frequency of 170MHz --> the test will not start at 170MHz but it will start at 169.98MHz or if in case the start frequency is 190MHz then it will start at 190.02MHz. This function can be utilized only for the single measurement test.
Go to High Frequency 	By clicking this button the frequency will jump to the Stop frequency, which is the highest most frequency defined in the Test Template e.g. If Stop frequency is : 2GHz then by pressing this button it will jump to stop/high frequency.
Frequency Step backward	The function of this button is to decrease the frequency step by step. The Step Size is defined in the Device Setting of the Test template. By clicking on this button the frequency will jump to the previous frequency.

	
Go to Lowest Frequency 	By clicking this button the frequency will jump to the Start frequency, which is the lowest most frequency defined in the Test Template e.g. if Start Frequency equals 30MHz then by pressing this button it will jump to start/lowest frequency 30MHz.
Switch to Automatic Scan / Sweep 	By clicking this button it will switch to automatic Scan / Sweep measurement. Switching to this mode the whole range of the frequency shall be scanned or swept as defined in the test template.
Switch to Single Measurement 	By pressing this button the mode will be switched to the single measurement mode, where one measurement will be done for each single frequency. Switching to the single measurement in only possible while the test is stopped.
Calculate Limit and Margin 	By clicking this button, a dialog window will be opened. This dialog window provides all necessary options to calculate limit and margin values for a result table which will be available after the measurement. The option which are available in the dialog window are: 1. Result type ○ Spectrum:this is the resultant spectrum produced after the test. ○ Single Measurement results: the result of a single measurement. ○ From this Test: This dialog will select the table from the current test. **2. Evaluation Column** ○ A detector trace column, from the resultant table (single or scan/sweep results, evaluation results), can be selected here. **3. Limit Lines** ○ From this Test: Use limit line column from the limit lines table of current measurement. ○ Global: Limit lines defined from the Global Standards. **4. Output File:** ○ A name can be give to the output file which will be generated after

	the calculation or limit and margin. The method is defined as followed • A specific column, which shall be compared, can be selected from Resultant table. This shall be done in Evaluation column dialog • Select the pre-defined limit lines table either from limit lines table used in the current test or from the Global limit lines. This shall be done in the Limit Lines dialog. • Column (from the resultant table) will be compared and added to the pre-defined limits column in the limit line table. • The margin to the limit line will be calculated and a new table will be created with margin result. • The destination file (Output File) can be used again as an input file (select 'From this test' as the result type) if limit and margin values need be calculated for more than one detector trace.
Delete Measurement 	If the measurement run is stopped the current measurement result can be deleted by clicking this button. All graphics and tables (active tables) are cleared.
Copy Current Trace 	The measurement results trace(s) from a current sweep or scan test will be overwritten when repeating the same measurement. To save certain results you can use the function 'copy current trace' on the toolbar. This way the current result file will automatically be renamed to "Result Table (<time>)" or any name can be selected and will be added to the diagram.

	  The resultant table shall be stored in the Result Table folder adding the current time in the file name.
Exit Measurement Mode 	By clicking this button the test will Exit the measurement mode.
Store a Single Measurement Result 	By clicking this button the measurement will be saved/recorded at the selected frequency. Another frequency can be selected, where measurement shall be performed, by clicking on Frequency Step Forward Button .

4.3 Test Results

After the execution of the test, result tables will be generated for every Band (subrange) as defined in the Test Template.

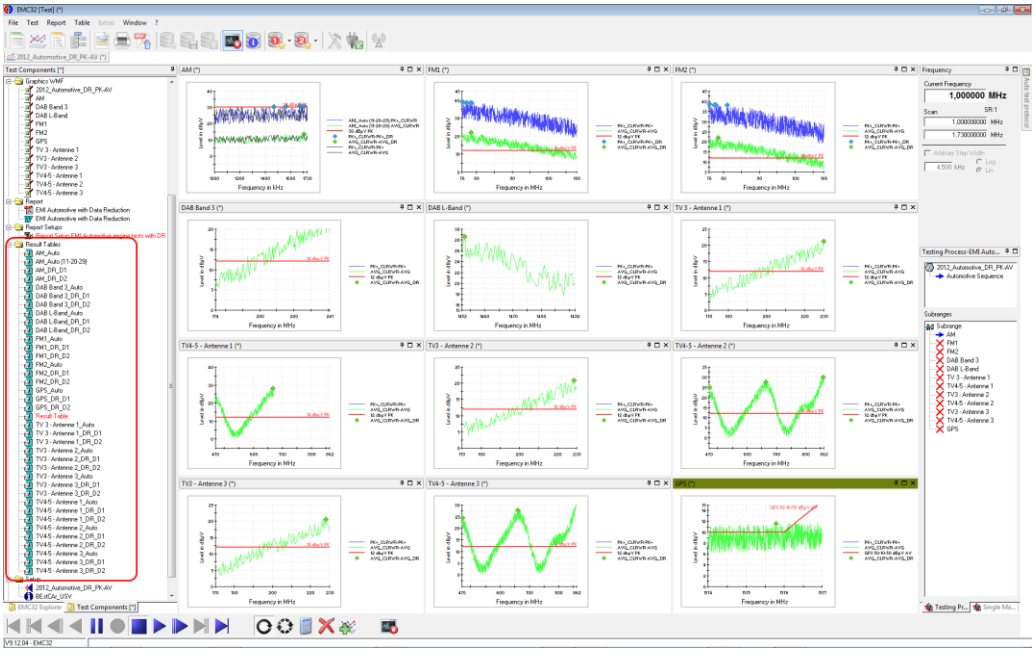


Figure 41: After end of test all data are collected in result tables including tables with the outcome of data reduction per Band

Table 4-2: Description of the naming convention for tables

Table name	Description
<Sub-range name>_Auto	This table contains the measurement values
<Sub-range name>_DR_D1	This table contains the result of the Data Reduction acc. to limit line 1 and detector 1 (if data reduction is enabled)
<Sub-range name>_DR_D2	This table contains the result of the Data Reduction acc. to limit line 2 and detector 2 (if data reduction is enabled)
Result Table	Active table for the next measurement. After test stop this table is empty.

Table 4-3: Naming convention for graphics

Graphics name	Description
<Sub-range name>	For each sub-range one graphics is generated
<Test template name>	This graphics is ready to take over the trace of the next measurement. It is only visible in measurement mode, in analysis mode it can be floating.

5 Creating Reports

We start with an empty Report setup in the report generator.

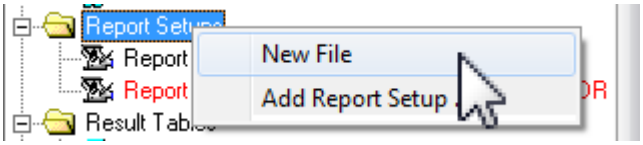


Figure 42: In the Test Component tab of the EMC32 Explorer we start the Report Generator with an empty Report

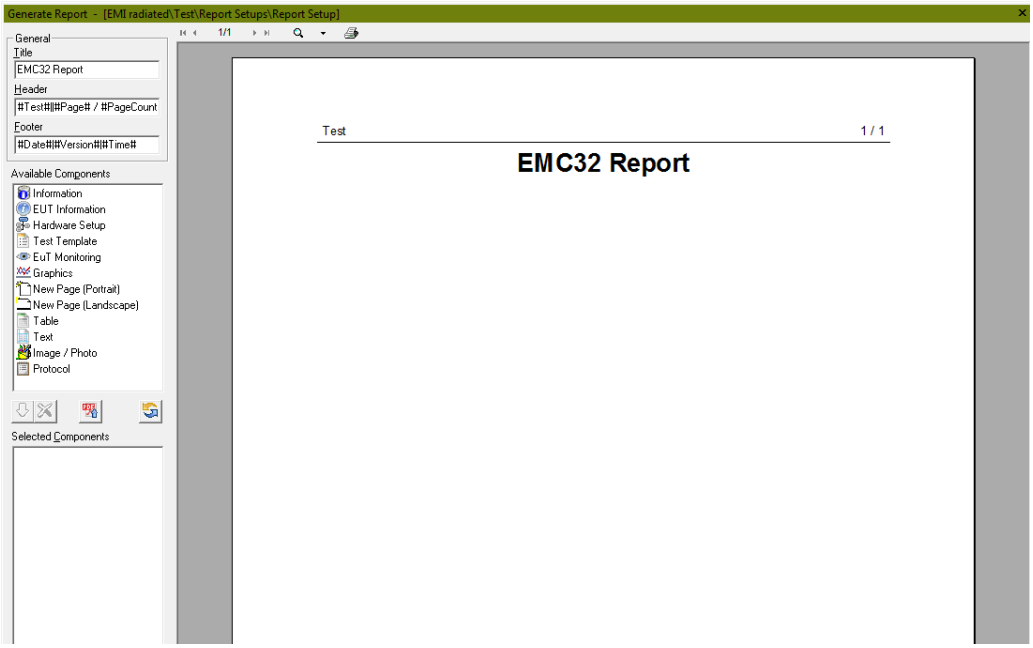


Figure 43: The empty Report Setup

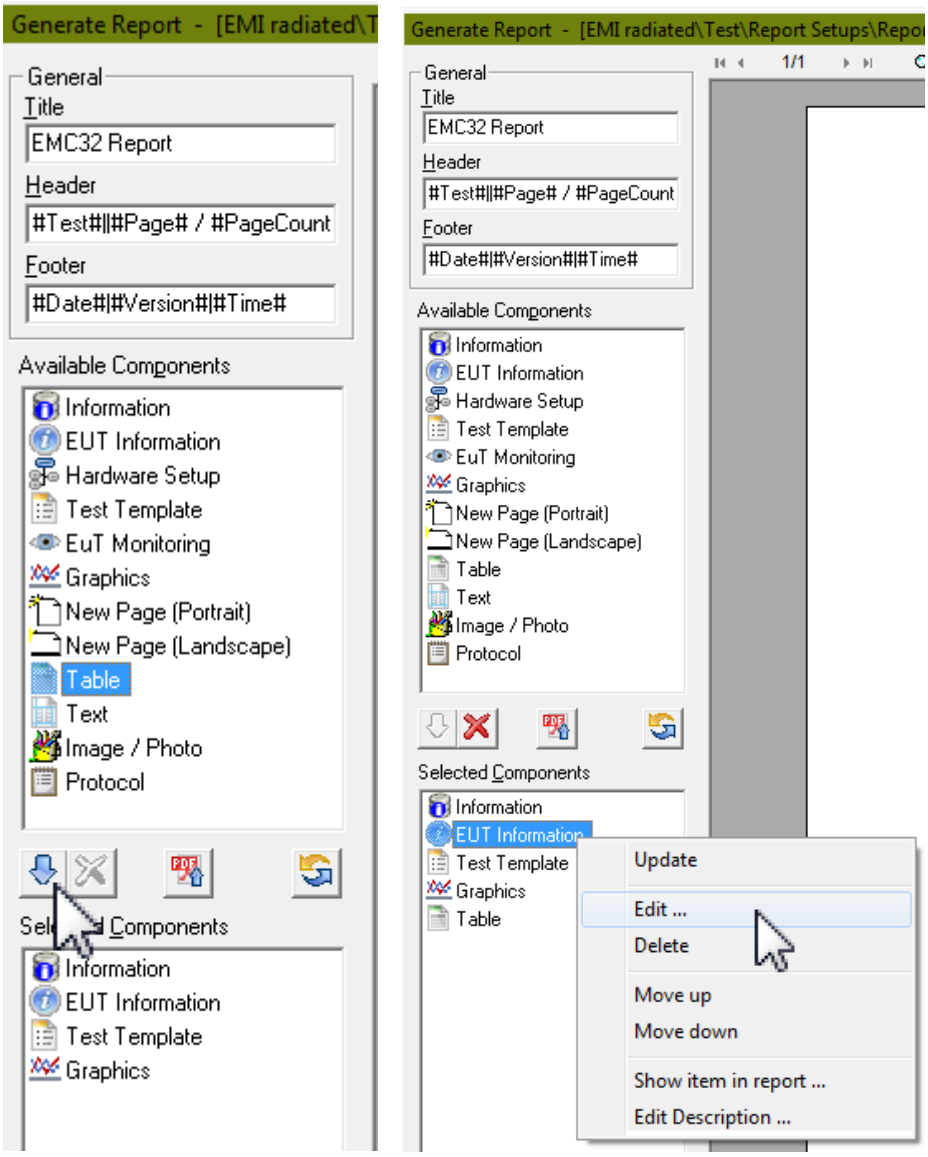


Figure 44: The left side allows to select components out of the available components and to edit their properties

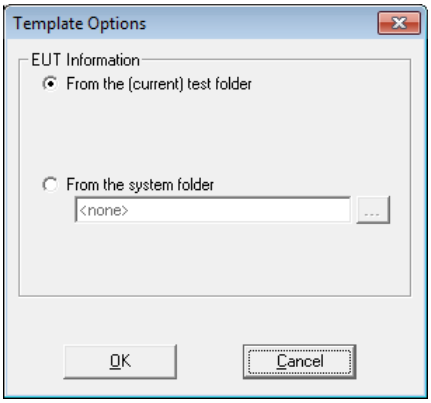


Figure 45: Properties of EUT information

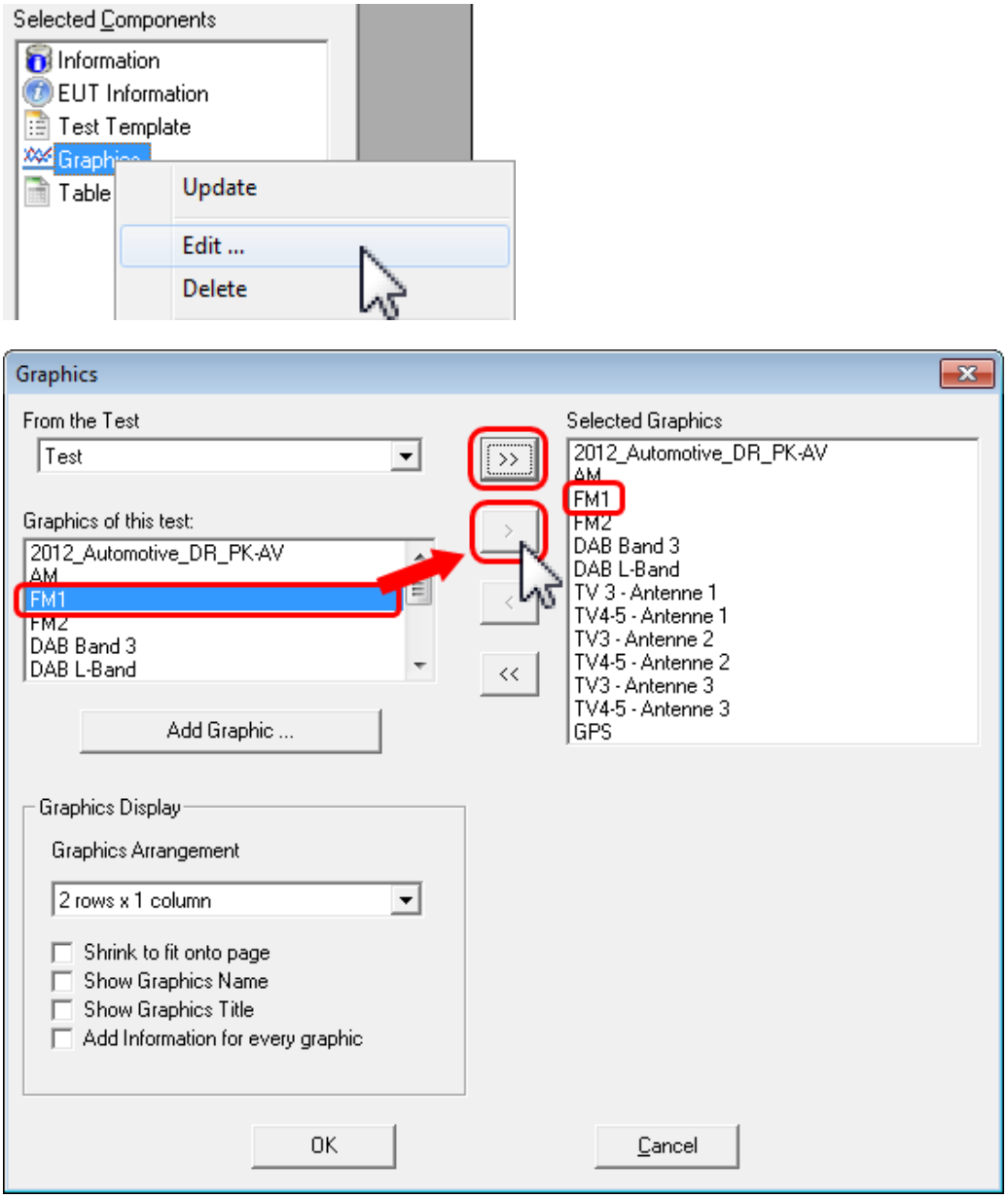


Figure 46: The properties allow selecting single graphics as well as all graphics by click on upper button

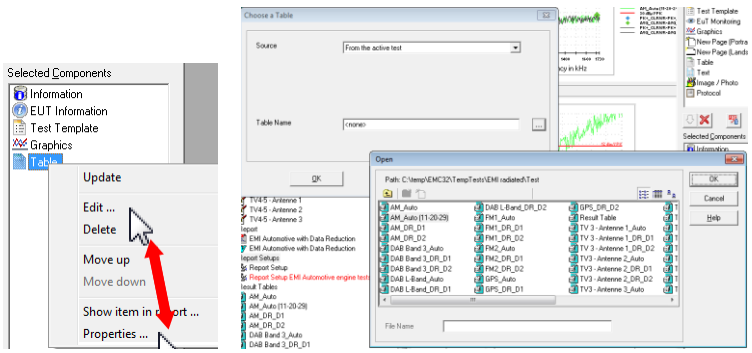


Figure 47: Select a table

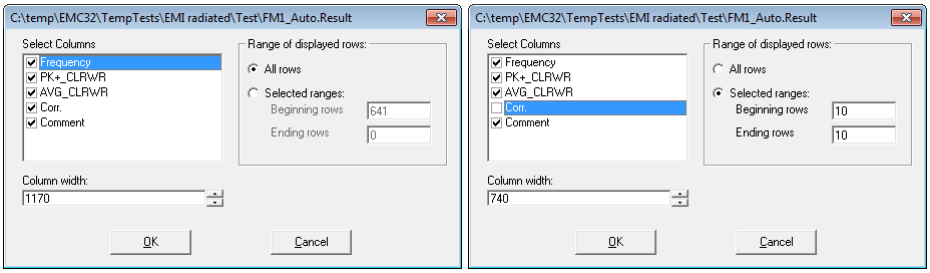


Figure 48: Properties of tables

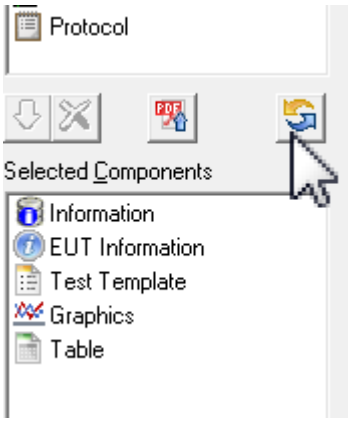


Figure 49: One mouse click on refresh generates a preview of the report setup

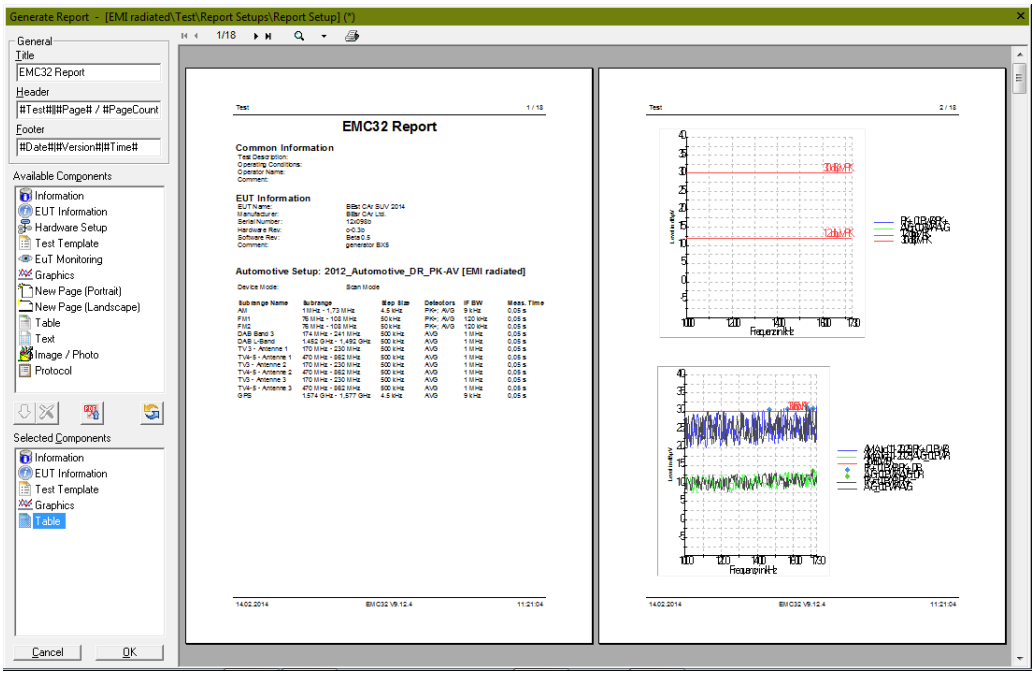


Figure 50: Preview of the test report

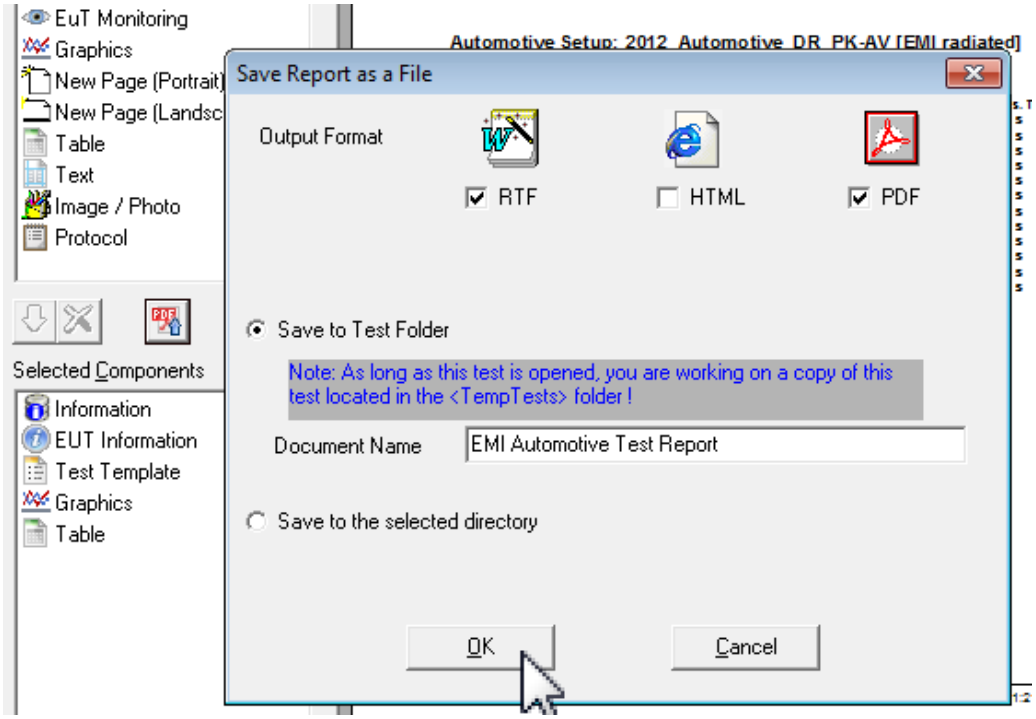


Figure 51: Publishing the report

6 Literature

7 Additional Information

7.1 Short history of EMC32-K51

EMC32-K51 started as an EMC32-EB option. It expands the software with the GMW3091/GMW3097 Band Evaluation function that allows to do an evaluation on EMI component test measurement tables and includes the results in the report of EMI measurement data as described in the standard GMW3097; Feb. 2004.
With EMC32 Version 9.00 EMC32-K51 emerged as a bundle of EMI tests defined in a template editor which is well adapted for high degrees of freedom in combining the editors for hardware setups and EMI test templates in one test sequencer. So it is possible to do sub ranges with overlapping frequency ranges.
Such EMI tests are requested by several standards (e.g. Ford ES-XW7T-1A278-AC, GMW 3091, GMW 3097, and German Car Manufacturers EMC Standard: EMC Requirements (OEM harmonized), Edition V1.01: 2009-04-07) . The test described in EN55025:2008 Ed.3 / CISPR 25:2008 Ed. 3
Both EMI Automotive template editors (radiated and conducted) implement devices the same way. Instead of referencing a Hardware Setup the user has to define device settings with the tab Test Setup. Existing EMI Hardware Setups cannot be referenced in the editor, they have to be described for each Subrange (Band, Figure 2) separately (tab: Test Setup, Figure 10, Figure 11).
This application note describes the usage of the new EMI Automotive test template based Band Evaluation.

7.2 Switching to Measurement Mode

Before executing a test the mode shall be switched from evaluation mode to measurement mode. This can be done in either of the ways:

1. **Switched to Measurement Mode Automatically on execution of the Test.**
   The mode will be switched to measurement mode as soon as the test is selected, from the Test Template, for execution. This can be done if the option "Do not Activate Measurement Mode on New Test" is not selected in the "Option: File/Test" from the menu (**Error! Reference source not found.**).

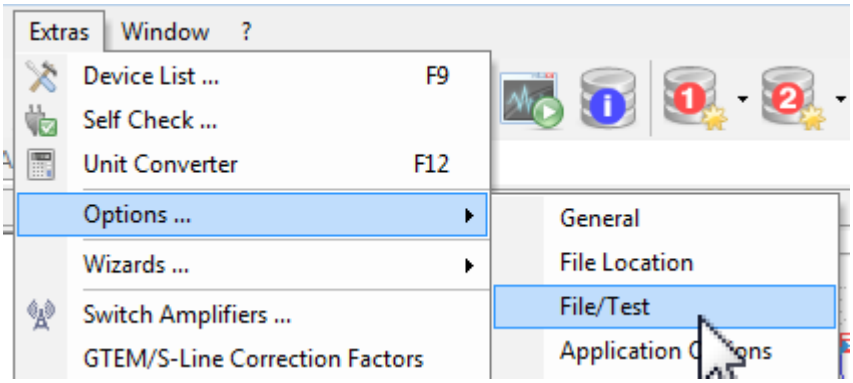


Figure 52: How to change start conditions

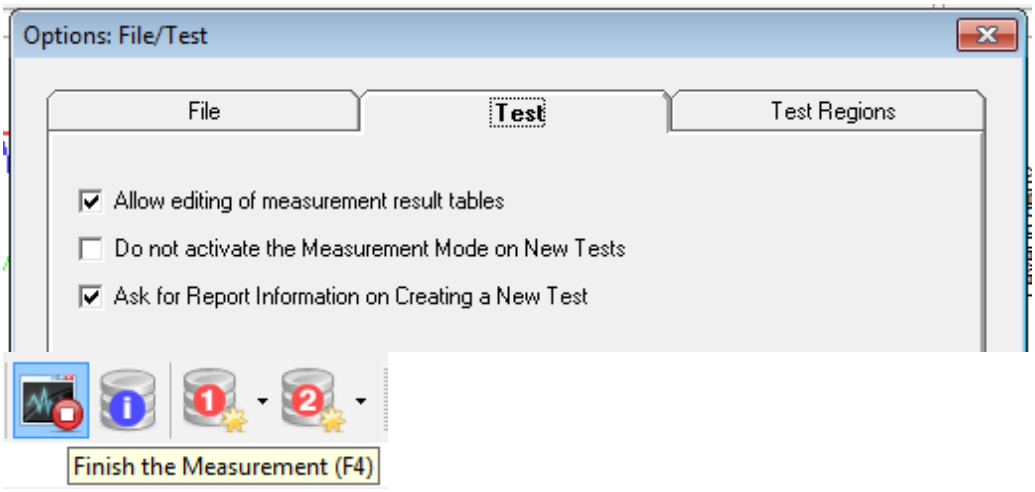


Figure 53: If "Do not activate the Measurement Mode on New tests" is unchecked the tool Bar allows to leave Measurement Mode

2 **Switched to Measurement Mode Manually on execution of the Test.**
The test will be started in the analysis mode and will not be in Measurement mode. This can be done if the option "Do not Activate Measurement Mode on New Test" is selected in the "Option: File/Test" from the menu (**Error! eference source not found.**).

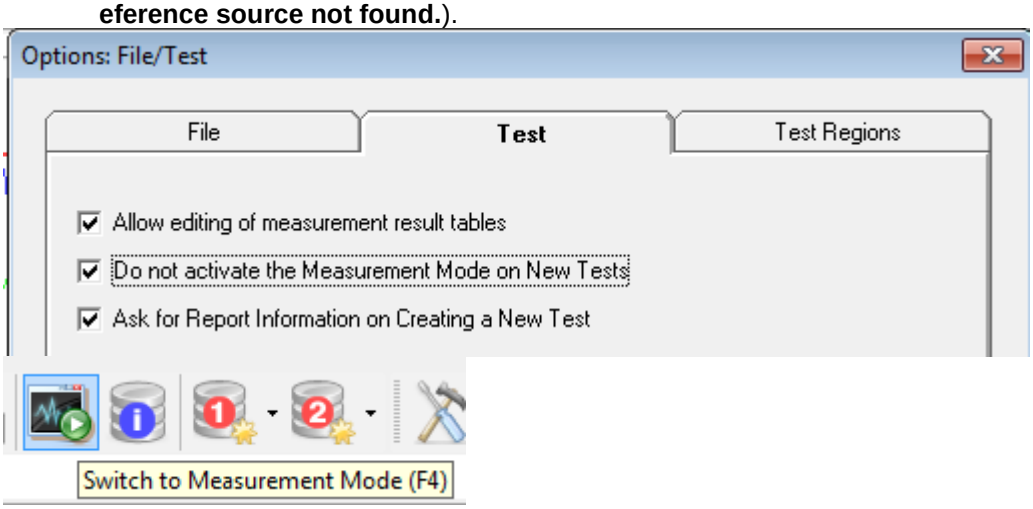


Figure 54: If "Do not activate the Measurement Mode on New tests" is checked the tool Bar allows to enter Measurement Mode

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