

Application Note

# CREATING MEASUREMENT REPORTS IN R&S®ELEKTRA

## Products:

- ▶ R&S®ELEKTRA

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<https://www.rohde-schwarz.com/appnote/1SL384>

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# 1 Overview

Measurement reports can be considered the final result of an EMC measurement campaign that has been done for a EUT (equipment under test). All the effort of preparing the tests, setting up the EUT, running tests and evaluating the measurement values is finally shown in the report. Creating reports is therefore an essential step during testing.

The requirements for reports however differ quite much depending on the use case. A report can be created quickly by just copying some charts and tables into an email and sending it the engineer next door. Others need to fill in a predefined form or create similar reports with the same look and feel for hundreds of test campaigns. Commercial test service providers may want to add a lot of details on hundreds of pages, whereas others just need the simple go or no-go result.

For a growing number of users, the paper format is no longer a requirement, as test result processed and made available online in databases.

In order to allow users to quickly generate all of these different reports, ELEKTRA provides several ways or supporting the user.

This application note describes the various methods and their benefits. It is not a how-to step-by-step guide, but shows the principles of operation. Additional details information is of course available in the manual or the online help.



**Press F1 to open the help window with relevant information.**



**For more video tutorials please visit the [ELEKTRA knowledge center](#) on our website.**

## 1.1 Manual Reporting

Manual Reporting is the easiest way to share items, such as graphics and tables, with other users. After having finished the test, these items can be saved in your file system with a right click on the item. You can now include these items in any report document or simply email this to others. Users would normally use this inhouse to quickly share interim results or failures found in the device with R&D.

For more detailed information, please see chapter [2 Manual Reporting](#).

## 1.2 Standard Reporting

ELEKTRA provides a function to generate a test report in a rtf or pdf format. The layout and data to be included in the report is defined within the ELEKTRA software using the report editor.

There are four default report templates available. You can load these templates by using the configuration wizard. Apart from that, you can generate your own report templates by selecting and ordering placeholders for single items. Under "administration → Report settings" there are general settings available, such as font, font size or your company logo. In the second section "Reporting Templates" standard reporting templates for each test type (e.g. CAL, EMI - Electric Field Strength) can be chosen.

Before running a test, select the report template you want to use. If you do not select anything, the standard reporting templates as selected in the administration section will be used. After having finished the test, fill in your report template with the measurement results by clicking on "add report". You can then export it as a pdf or rtf file in your file system. It is automatically stored in the ELEKTRA database.

Standard reporting fits the majority of ELEKTRA users, who want to automatically create a formal report with common data regarding the test and the test results that have been performed in ELEKTRA. Formatting and layout capabilities allow professional EMC reports for a single test or even for a test sequence.

For more detailed information, please see chapter [3 Standard Reporting](#).

## 1.3 Customized Reporting

- ▶ Customized reporting requires R&S@ELEMC-REP

Customized reporting allows using R&S ELEKTRA together with your own external report templates in the (.dotx) format, which is supported by MS Word and other open-document-type editors. This method allows creating a personalized formatting and layout as well as including fixed content and content from other applications into your report document. For each type of test in ELEKTRA, users can define an individual template.

The definition of the report is, compared to standard reporting, not done in ELEKTRA but e.g. in MS Word. The measurement data, such as tables and graphics is simply represented by short XML lines. These are then replaced by ELEKTRA, with real measurement data after running the test and clicking on the "export to doc" button.

Customized reporting not only allows individual formatting and layout of your reports, it also allows users to add additional information from other data sources into the report. ELEKTRA does not touch anything outside the placeholder xml code in the .docx template. For user who do not only want to create an EMC report but also want to include other types of tests or users who do want to create reports with extensive formatting and layout requirements.

For more detailed information, please see chapter [4 Customized Reporting](#) and appendix [A Customized Reporting XML Code example](#).

## 1.4 Automated Data Exchange with external applications

- ▶ The automated data exchange requires R&S®ELEM-C-DEX.

Users who do not only want to create a "paper" report, but want to make measurement details and results available to other (data base) applications and share this data via own online services, can make use of the data exchange option in ELEKTRA. The data stored in ELEKTRA's own data base is available via a REST (Representational State Transfer) Interface. REST is a common client-server interface based on http(s) methods.

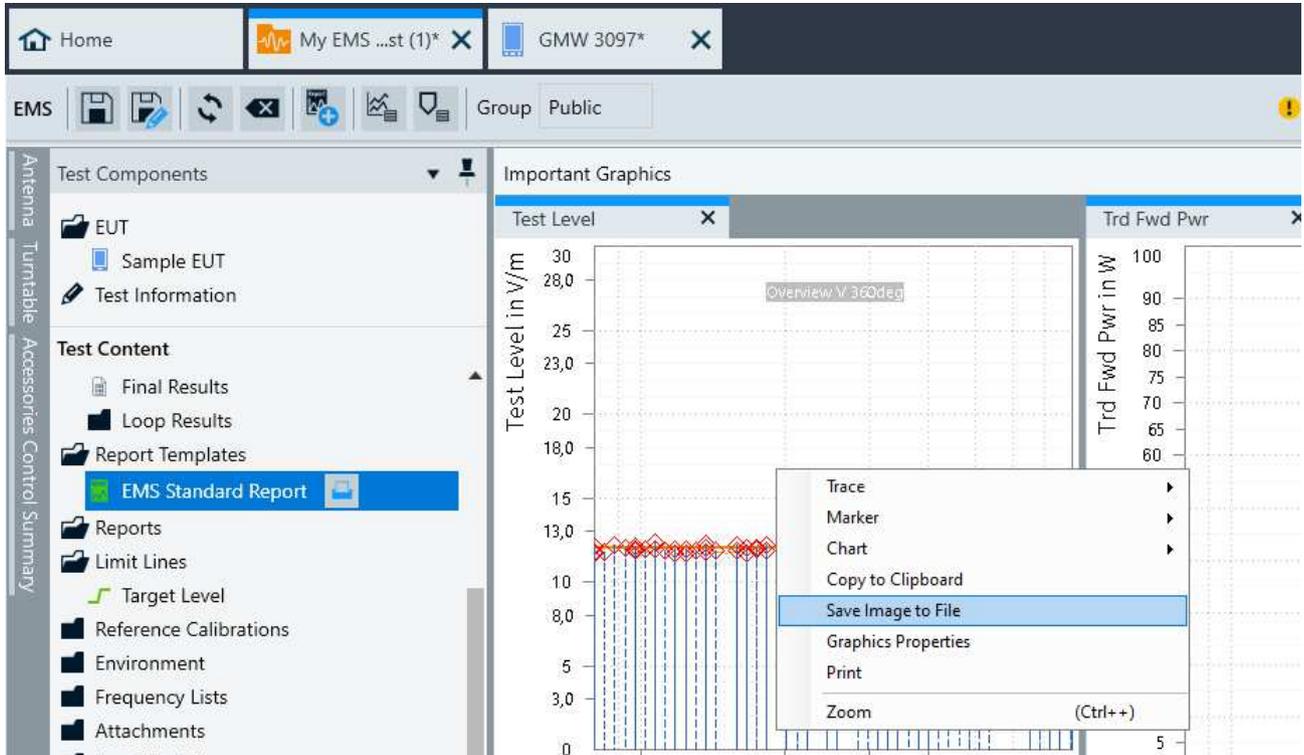
The server application in ELEKTRA starts automatically with ELEKTRA. Users simply have to send commands from their application in order to query data from ELEKTRA.

Any 3rd party application, capable of connecting to a REST server, can then provide reports or process and represent the measurement details and results.

This is the most flexible solution for reporting. Raw data, such as tables and graphics are forwarded to the users own applications. This solution requires a small amount of programming skills.

# 2 Manual Reporting

Manual Reporting is the easiest way to include items showing the results of a test, such as graphics, tables etc. to your report. After having finished the test, these items can be saved in your local library with a right click on the item.



You can now include these items in any report document you want to use. Tables can be exported to a document in .csv format.

Spectrum Overview Table

Name	Rg	Frequency	Test Level	Voltage	VSWR	Ger
Unit		MHz	V/m	V	---	dBr
1	1	80,000	11,7	4,6	2,5	

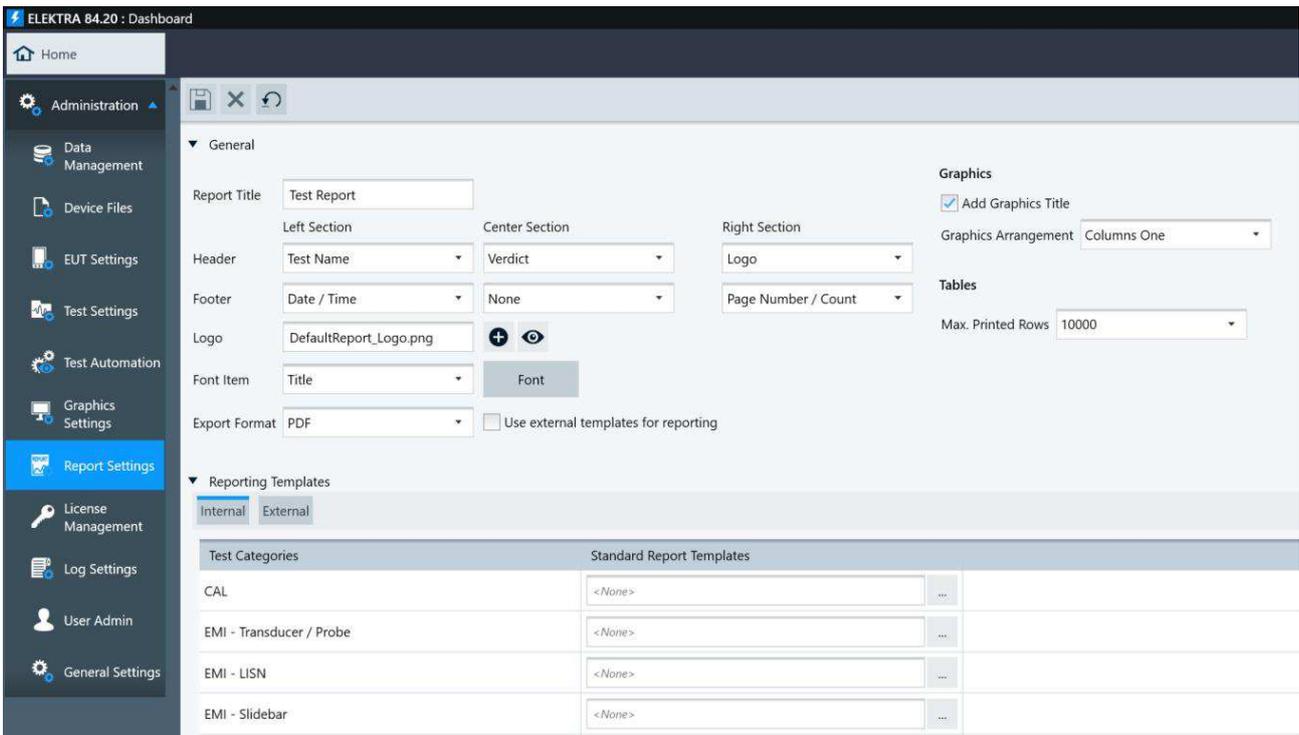
It is not possible to save information about hardware setups, templates, EUTs etc.

# 3 Standard Reporting

ELEKTRA provides a built-in function to generate a test report by defining report templates. There are default templates available as well as the option to generate own report templates with an internal editor in the base software version of ELEKTRA.

## 3.1 Report settings

Navigate in the menu on the left to "Administration → Report settings". In the first section "General", the default design of report templates can be adapted to the user, for example by changing font, font size, contents of footer and header and by adding a company logo.



In the second section "Reporting Templates" a default template for each test category can be set. This template will be used for reporting if you do not select a dedicated report template in the test template before running the test.

Please note that the tab "External" will be available only if there is an active license of the article R&S®ELEMC-REP. For further information please see chapter 4 Customized Reporting.

In the third section "GMW Report Settings", specific settings for tests according to the automotive standard GMW 3097 are available.

## 3.2 Creating Report templates

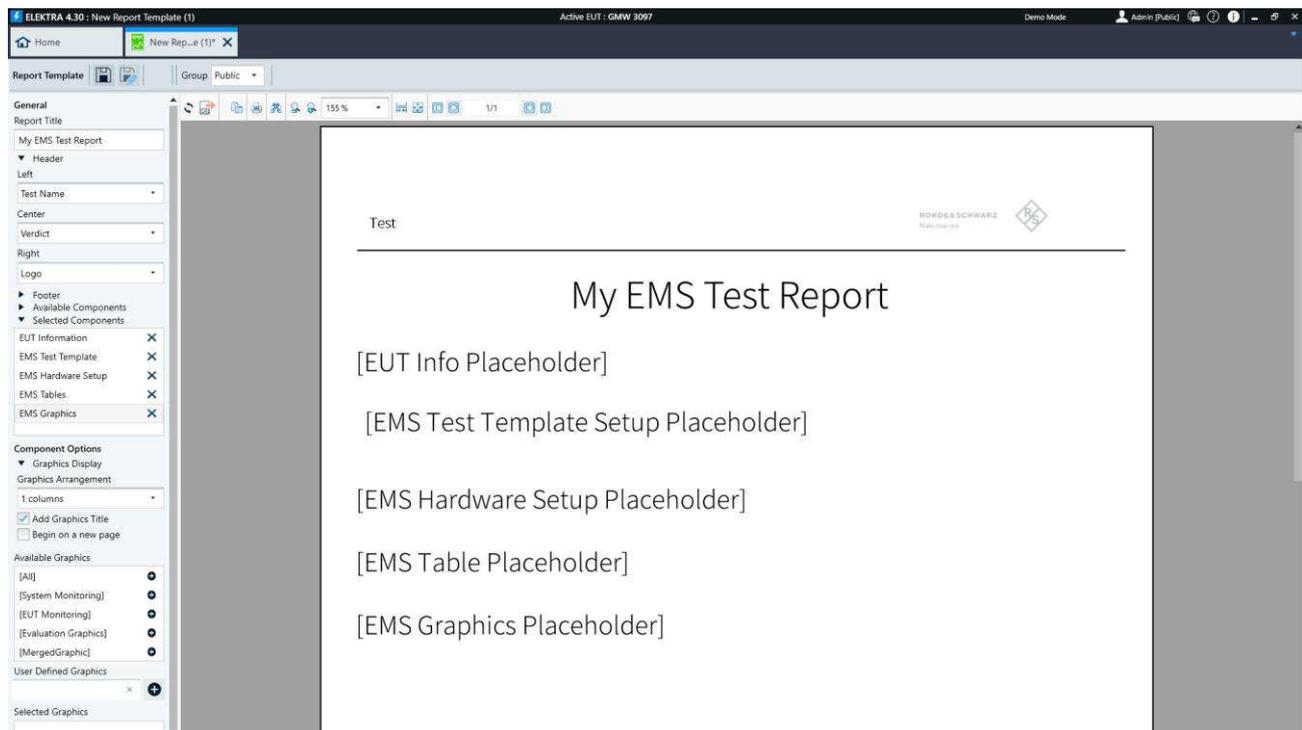
Four pre-configured report templates can be imported and edited from the configuration wizard (see "Common Items for EMI/EMS").

- ▶ CAL Standard Report
- ▶ EMI Standard Report
- ▶ EMI Standard Report (compact)
- ▶ EMS Standard Report

Creating personalized report templates allows you to define the structure and contents of your report. Navigate in the menu on the left to Report Templates and add a new template by clicking on the "+".

A new template will open. In the section on the left you can adapt the footer and header and choose the elements you want to include into your report. You can also select subitems and for example define which columns of the table shall be added to the report.

By clicking on refresh  your settings will be shown on the preview page as placeholders.



Before running a test, select the respecting report template under "General Settings" in the test template.

After having finished the test, generate a report by clicking "Add report"  on the top. In the sidebar under "Component Options" you can choose the available elements, e.g. graphics or tables, that will be shown instead of the placeholder in the report. You can still adapt the elements you want to include or exclude in the side bar. You can then export it as a pdf and attach it to your test in the ELEKTRA database.

An example of a filled report is attached in Appendix 0

Test Report Example.

 Check the [ELEKTRA training video series](#) for a video tutorial about how to create a report.

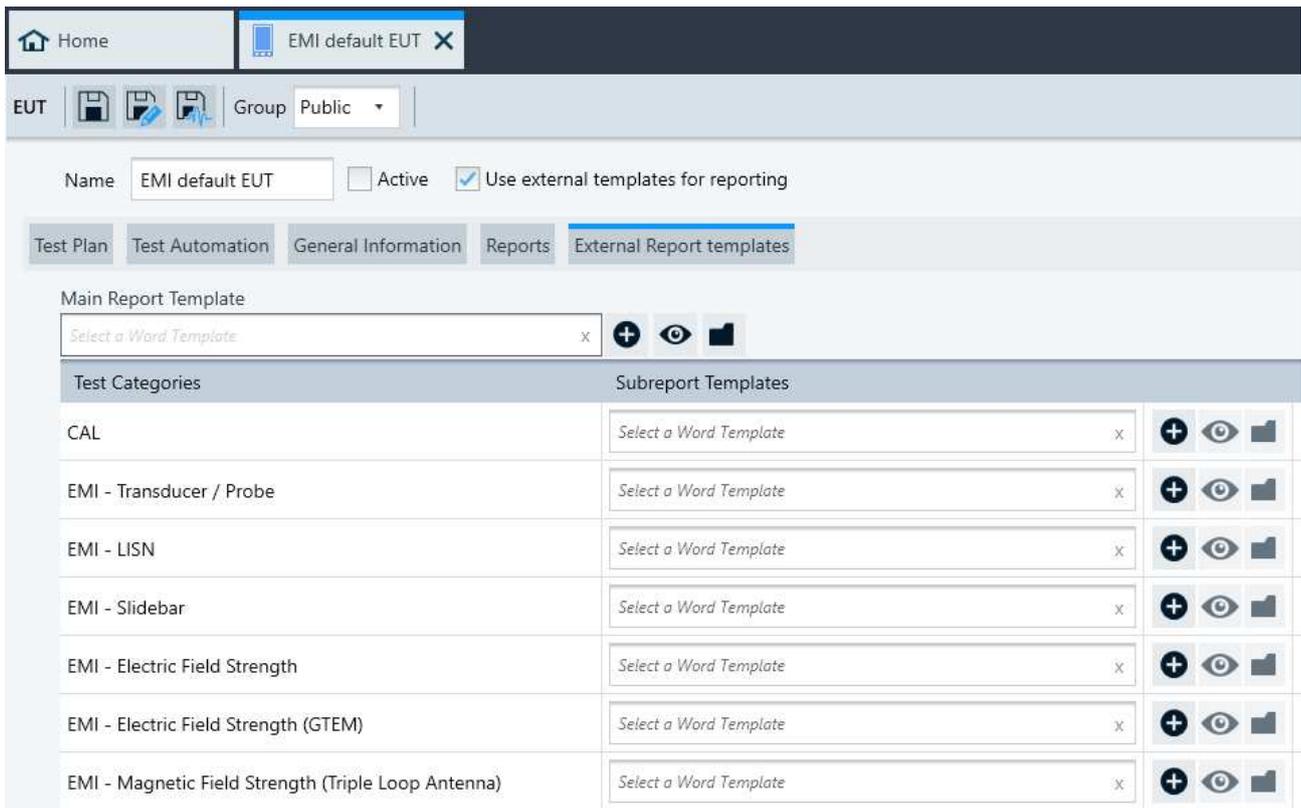
## 4 Customized Reporting

► Requires R&S@ELEM-C-REP

Custom reporting allows using R&S ELEKTRA together with your own external report templates in .dotx format, which is supported by MS Word and other open-document-type editors. This method uses XML code in the .dotx file which will be later on replaced by data from the measurement. It allows creating a personalized format as well as including content from other applications into your reporting document.

You define the report template in your word processing application, not in ELEKTRA.

For custom reporting an external main report template and external subreport templates in .dotx format for all test categories is prepared in advance. After having enabled custom reporting in the EUT description, add your prepared templates in the tab "External Reporting".

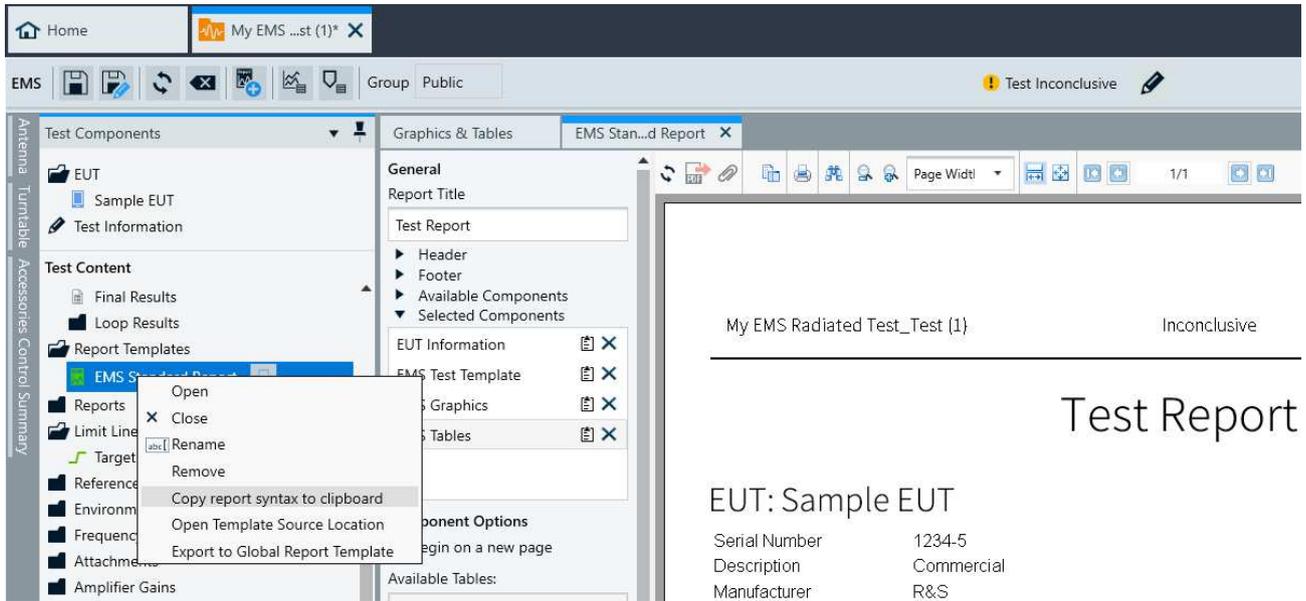


Test Categories	Subreport Templates
CAL	Select a Word Template x + [eye] [folder]
EMI - Transducer / Probe	Select a Word Template x + [eye] [folder]
EMI - LISN	Select a Word Template x + [eye] [folder]
EMI - Slidebar	Select a Word Template x + [eye] [folder]
EMI - Electric Field Strength	Select a Word Template x + [eye] [folder]
EMI - Electric Field Strength (GTEM)	Select a Word Template x + [eye] [folder]
EMI - Magnetic Field Strength (Triple Loop Antenna)	Select a Word Template x + [eye] [folder]

Run the test steps as defined in the "Test Plan" tab and select the steps you want to include into your report by enabling this button . Generate a report of the selected test steps by saving the EUT and clicking on the export to doc button on the bottom.

Report templates can be refined after having conducted a test. With a double-click on the report template in the "Test content" section on the left, the preview will open with a side bar for adjustments. After having

adjusted the template, copy the report syntax to the clipboard with a right click on the report template name on the left.



Open an editor program like MS Word or another compatible open-document-type editor to paste the content of the clipboard into the editor. The "Copy to clipboard" function is also available on the top when creating a report template in ELEKTRA from scratch . Depending on the configuration of your report template, text code in XML format appears, representing the configured report components (graphics, tables). Paste sections of this XML code into your report templates.

```
<ELEKTRA>
  <!--EMI Graphics-->
  <!--Can be used in Subreport template only-->
  <COMPONENT LANDSCAPE="FALSE">GRAPHICS</COMPONENT>
  <!--Substitute with desired Heading Style-->
  <HEADINGSTYLE>HEADINGSTYLE 1</HEADINGSTYLE>
  <ARRANGEMENT ROW="1" COLUMN="1"></ARRANGEMENT>
  <GRAPHICS>
    <GRAPHIC>
      <NAME>Spectrum Overview</NAME>
      <!--For captions, edit the text node, add/delete text nodes as
needed-->
      <CAPTION USEFIGURENAME="FALSE" KEY="FIGURE">
        <TEXT>TEST 1</TEXT>
        <TEXT>TEST 2</TEXT>
      </CAPTION>
    </GRAPHIC>
  </GRAPHICS>
</ELEKTRA>
```

For a full XML code example see appendix [A Customized Reporting XML Code example](#). For more details about how to write XML code for reporting templates, please see the ELEKTRA help under "Creating Customized Reports".

# 5 Data exchange to external applications

- ▶ Requires R&S@ELEMC-DEX

ELEKTRA stores its data in a SQL database and the content of this database is accessible only to ELEKTRA. The ability to query database content with a REST API, for example test result tables, graphics and settings, allows using your own tools for creating reports or integrating test data into other applications.

The REST API is a common database exchange interface and supported by many applications. ELEKTRA allows operations such as create, read, update, delete.



To query items, make sure your firewall settings do not block communication between ELEKTRA and your application.

In our simple example, a result table is queried with MS Excel:

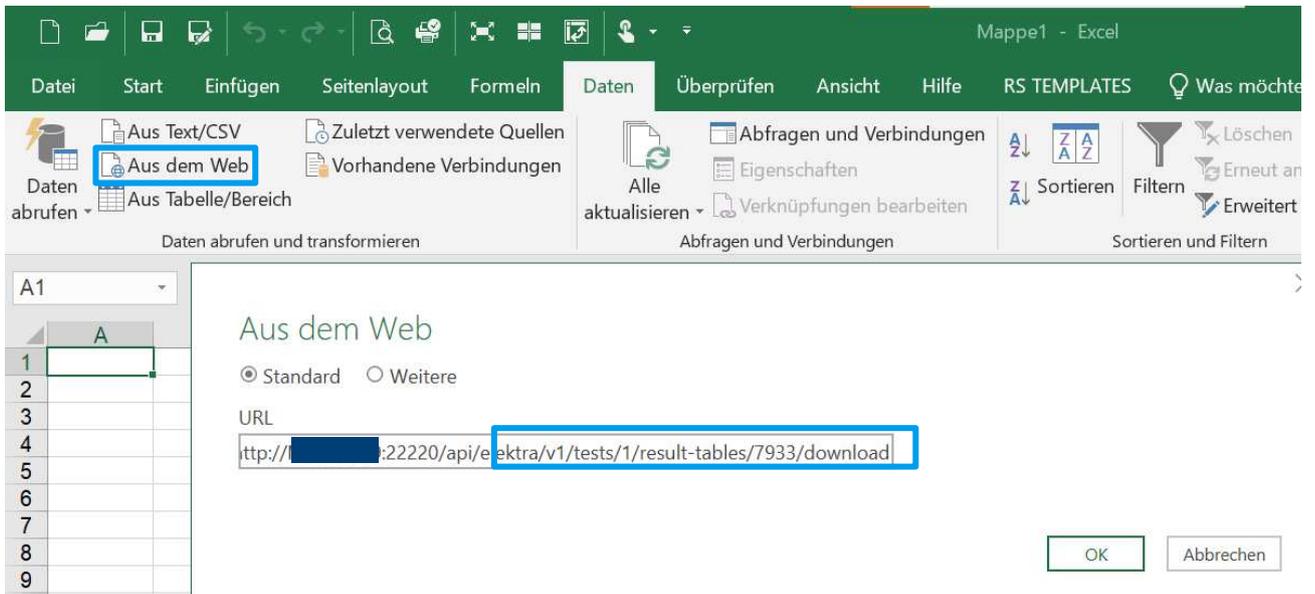
To access database content, make sure that ELEKTRA is running.

- ▶ Navigate to the C:\ProgramData\Rohde-Schwarz\ELEKTRA\x.xx.xx\Logs folder and open the General.x.xx.xx.txt file
- ▶ Search for the string "ELEKTRA API started, API endpoint:" in that file. Behind this string, find a data exchange URL for example "http://localhost:22220/api/elektra/v1".
- ▶ To search for database content and find the exact URLs to query items, copy the URL to your browser.

```
▼<ArrayOfLinkName xmlns:i="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://...>
  ▼<LinkName>
    <href>http://[redacted]:22220/api/elektra/v1/euts</href>
    <name>search all EUT's</name>
  </LinkName>
  ▼<LinkName>
    <href>http://[redacted]:22220/api/elektra/v1/tests</href>
    <name>search all tests</name>
  </LinkName>
  ▼<LinkName>
    <href>http://[redacted]:22220/api/elektra/v1/test-templates</href>
    <name>search all test templates</name>
  </LinkName>
  ▼<LinkName>
    <href>http://[redacted]:22220/api/elektra/v1/hardware-setups</href>
    <name>search all hardware setups</name>
  ...
```

MS Excel allows querying data from web with these URLs. As an example, a final measurement result table of a test is queried. Navigate to the section "tests" → number of the respecting test → result tables and copy the URL of the "final measurement table" into MS Excel and load the data.

```
▼<LinkIdNameUsage>
  <href>http://[redacted]:22220/api/elektra/v1/tests/1/result-tables/7933/download</href>
  <id>7933</id>
  <name>FinalMeasurement</name>
</LinkIdNameUsage>
```



	A	B	C	D	E	F	G	H
1	Rg	Range Name	Frequency	QPK Level	QPK Limit	QPK Margin	PK+ Level	PK-
2			MHz	dB $\mu$ V/m	dB $\mu$ V/m	dB	dB $\mu$ V/m	dB
3	1	LW	0,168	55,05	53,00	-2,05	63,68	66,00
4	1	LW	0,17025	55,47	53,00	-2,47		
5	1	LW	0,20625	64,40	53,00	-11,40	72,14	66,00
6	1	LW	0,2085	62,35	53,00	-9,35	68,32	66,00
7	1	LW	0,24225	59,31	53,00	-6,31	64,66	66,00
8	1	LW	0,2445	72,92	53,00	-19,92	80,66	66,00
9	1	LW	0,2805	58,63	53,00	-5,63	67,18	66,00
10	1	LW	0,285	83,36	53,00	-30,36	88,18	66,00
11								
12								
13								

For detailed information about the interface please check the [YAML document](#).

<http://localhost:22220/api/elektra/v1/document>

## 6 Ordering Information

Designation	Type	Order No.
Extension for customized reporting	R&S®ELEMC-REP	5601.0460.02
Data exchange to external applications	R&S®ELEMC-DEX	5601.0547.02

# 7 Appendix

## A Customized Reporting XML Code example

```
<!--Skeleton Custom Template Syntax..Please adapt as needed-->

<ELEKTRA>
  <!--New Page-->
  <!--Can be used in Main and Subreport template(s)-->
  <COMPONENT>NEWPAGE</COMPONENT>
</ELEKTRA>

<ELEKTRA>
  <!--Verdict Summary-->
  <!--Can be used in Main template only-->
  <COMPONENT>VERDICTSUMMARY</COMPONENT>
  <!--Substitute with desired Table Style-->
  <TABLESTYLE>TABLESTYLE 1</TABLESTYLE>
  <!--Substitute with desired Heading Style-->
  <HEADINGSTYLE>HEADINGSTYLE 1</HEADINGSTYLE>
</ELEKTRA>

<ELEKTRA>
  <!--Device List-->
  <!--Can be used in Main template only-->
  <COMPONENT LANDSCAPE="TRUE">DEVICELIST</COMPONENT>
  <!--Substitute with desired Table Style-->
  <TABLESTYLE>TABLESTYLE 1</TABLESTYLE>
  <!--Substitute with desired Heading Style-->
  <HEADINGSTYLE>HEADINGSTYLE 1</HEADINGSTYLE>
</ELEKTRA>

<ELEKTRA>
  <!--Measurements-->
  <!--Can be used in Main template only-->
  <COMPONENT USEFOLDERSTRUCTURE="TRUE">MEASUREMENTS</COMPONENT>
  <!--Substitute with desired Heading Style-->
  <HEADINGSTYLE>HEADINGSTYLE 1</HEADINGSTYLE>
</ELEKTRA>

<ELEKTRA>
  <!--EMI Graphics-->
  <!--Can be used in Subreport template only-->
  <COMPONENT LANDSCAPE="FALSE">GRAPHICS</COMPONENT>
  <!--Substitute with desired Heading Style-->
  <HEADINGSTYLE>HEADINGSTYLE 1</HEADINGSTYLE>
  <ARRANGEMENT ROW="1" COLUMN="1"></ARRANGEMENT>
  <GRAPHICS>
    <GRAPHIC>
      <NAME>Spectrum Overview</NAME>
      <!--For captions, edit the text node, add/delete text nodes as
needed-->
      <CAPTION USEFIGURENAME="FALSE" KEY="FIGURE">
        <TEXT>TEST 1</TEXT>
        <TEXT>TEST 2</TEXT>
      </CAPTION>
    </GRAPHIC>
  </GRAPHICS>
</ELEKTRA>
```

```

        </GRAPHIC>
    </GRAPHICS>
</ELEKTRA>

<ELEKTRA>
    <!--EMI Tables-->
    <!--Can be used in Subreport template only-->
    <COMPONENT LANDSCAPE="FALSE">TABLES</COMPONENT>
    <!--Substitute with desired Table Style-->
    <TABLESTYLE>TABLESTYLE 1</TABLESTYLE>
    <!--Substitute with desired Heading Style-->
    <HEADINGSTYLE>HEADINGSTYLE 1</HEADINGSTYLE>
    <TABLES>
        <TABLE>
            <NAME>Final Results</NAME>
            <COLUMNS>
                <NAME>[ALL]</NAME>
            </COLUMNS>
            <!--For captions, edit the text node, add/delete text nodes as
needed-->
            <CAPTION USETABLENAME="FALSE" KEY="TABLE">
                <TEXT>TEST 1</TEXT>
                <TEXT>TEST 2</TEXT>
            </CAPTION>
        </TABLE>
    </TABLES>
</ELEKTRA>

```

## B Test Report Example

# Test Report

EUT: GMW 3097

Serial Number

Description

Manufacturer

Software Version

Depth 0 m

Width 0 m

Height 0 m

## Test Information

Description

Test Standard

Test Site

Operator Name

## Hardware Setup(s)

### Broadcast\_Class3\_K51\_Example

#### Frequency Range 150 kHz - 3 GHz

Receiver Receiver [ESW26 Receiver]  
Serial Number:  
Firmware Version:  
Interface: TCPIP  
Address TCPIP0::0.102.72.78::inst0::INSTR

Signal Path Receiver-Automotive Antenna  
Serial Number:  
Attenuation: Constant, 0 dB

Antenna Automotive Antenna [Transmitting and Receiving Antenna (TxRx ANT)]  
Serial Number:  
RF Parameters:  
Max. Input Power: 200 W  
Max. VSWR: 5  
Cable Correction: Fixed Value, 0 dB  
Antenna Factors:  
Antenna Horizontal Factor Table:  
Automotive Antenna  
Antenna Vertical Factor Table:  
Automotive Antenna  
Tower Height Control:  
Fixed: 100 cm  
Tower Polarization Control:  
Automatic Tower: Antenna Tower

**Broadcast\_Class3\_K51\_Example**

**Frequency Range** 150 kHz - 3 GHz

Turntable None

System Control None

## Band #2

Hardware Setup Scheme

EMI Radiated Electric Field Strength [dBµV/m]

Frequency Range	State	Limit Line	Receiver Mode
1: 5,9 - 6,2 MHz : SW	Active	Broadcast_Class3_K51_Example_LL_SR3	Time Domain Scan
2: 76 - 108 MHz : FM	Active	Broadcast_Class3_K51_Example_LL_SR3	Time Domain Scan

**Measurement Steps Performed**

Overview Measurement, Data Reduction

**Overview Measurement**

*Measurement Settings*

Frequency Range	Step Size	Detectors	Meas. BW	Meas. Time	Preamplifier
1: 5,9 - 6,2 MHz : SW	2,25 kHz	PK+, AVG, QPK	9 kHz	1 s	0 dB
2: 76 - 108 MHz : FM	30 kHz	PK+, AVG, QPK	120 kHz	1 s	0 dB

**Final Measurement**

Use Critical Points from Overview Measurement as Final Results

**Hardware Setup (Rg<sub>1</sub> indicates Frequency Range in Template)**

Frequency Range	Receiver	Antenna
Rg <sub>1</sub> : 150 kHz - 3 GHz	Receiver	Automotive Antenna
Rg <sub>2</sub> : 150 kHz - 3 GHz	Receiver	Automotive Antenna

## EMI Final Results (1/2)

Rg	Frequency [MHz]	Range Name	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]	Correction [dB]
1	5,934	SW	57,53	39,00	-18,53							20,00
1	5,936	SW		39,00		60,12	52,00	-8,12	48,49	32,00	-16,49	20,00
1	5,938	SW	56,37	39,00	-17,37	62,27	52,00	-10,27	47,83	32,00	-15,83	20,00
1	6,013	SW	66,66	39,00	-27,66	71,91	52,00	-19,91	58,86	32,00	-26,86	20,00
1	6,015	SW	64,96	39,00	-25,96	72,07	52,00	-20,07	56,91	32,00	-24,91	20,00
1	6,087	SW	72,65	39,00	-33,65	75,96	52,00	-23,96	65,15	32,00	-33,15	20,00
1	6,089	SW	77,55	39,00	-38,55	81,52	52,00	-29,52	69,30	32,00	-37,30	20,00
1	6,163	SW	81,56	39,00	-42,56	87,68	52,00	-35,68	73,13	32,00	-41,13	20,00
1	6,166	SW	85,14	39,00	-46,14	93,16	52,00	-41,16	77,65	32,00	-45,65	20,00

## EMI Final Results (2/2)

Rg	Frequency [MHz]	Polarization	Antenna Height [m]	Meas. BW [kHz]	Meas. Time [ms]	Time of Meas.	Source	Comment
1	5,934	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	5,936	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	5,938	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	6,013	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	6,015	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	6,087	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	6,089	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	6,163	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	
1	6,166	H	1	9,000	1.000,000	29.10.2021 19:03:05	Critical Points	

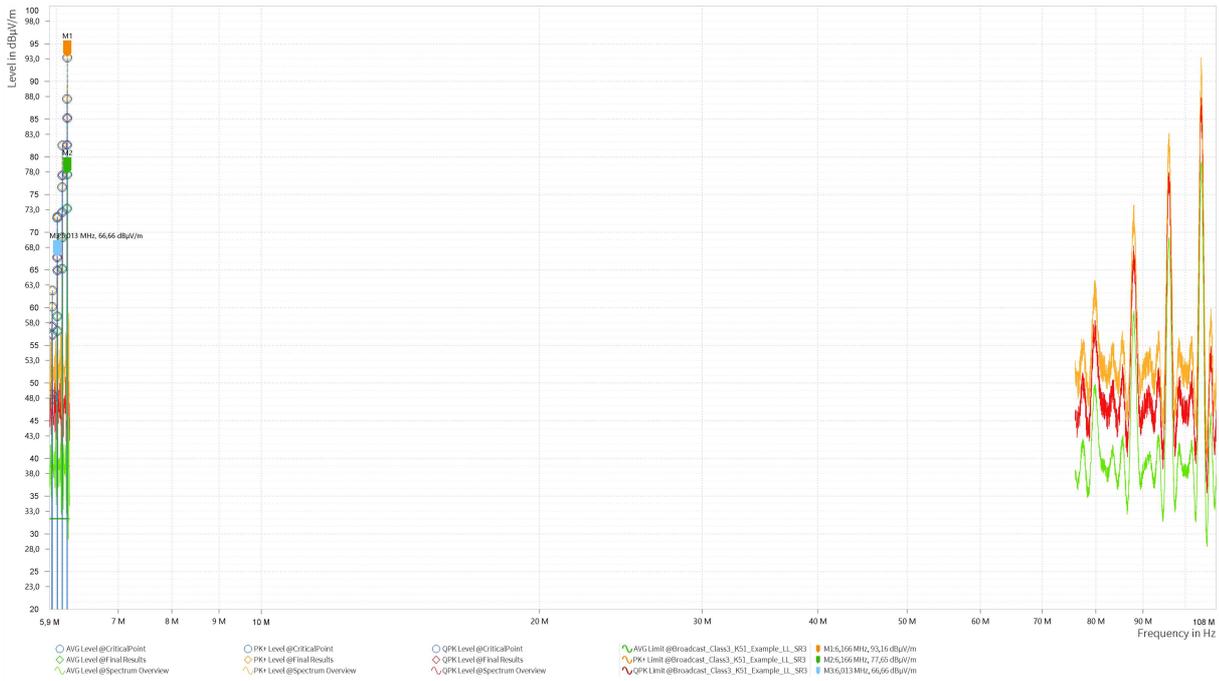
## EMI Critical Points (1/2)

Rg	Frequency [MHz]	Range Name	Process State	QPK Level [dBµV/m]	QPK Limit [dBµV/m]	QPK Margin [dB]	PK+ Level [dBµV/m]	PK+ Limit [dBµV/m]	PK+ Margin [dB]	AVG Level [dBµV/m]	AVG Limit [dBµV/m]	AVG Margin [dB]
1	5,934	SW	DataReduction	57,53	39,00	-18,53						
1	5,936	SW	DataReduction		39,00		60,12	52,00	-8,12	48,49	32,00	-16,49
1	5,938	SW	DataReduction	56,37	39,00	-17,37	62,27	52,00	-10,27	47,83	32,00	-15,83
1	6,013	SW	DataReduction	66,66	39,00	-27,66	71,91	52,00	-19,91	58,86	32,00	-26,86
1	6,015	SW	DataReduction	64,96	39,00	-25,96	72,07	52,00	-20,07	56,91	32,00	-24,91
1	6,087	SW	DataReduction	72,65	39,00	-33,65	75,96	52,00	-23,96	65,15	32,00	-33,15
1	6,089	SW	DataReduction	77,55	39,00	-38,55	81,52	52,00	-29,52	69,30	32,00	-37,30
1	6,163	SW	DataReduction	81,56	39,00	-42,56	87,68	52,00	-35,68	73,13	32,00	-41,13
1	6,166	SW	DataReduction	85,14	39,00	-46,14	93,16	52,00	-41,16	77,65	32,00	-45,65

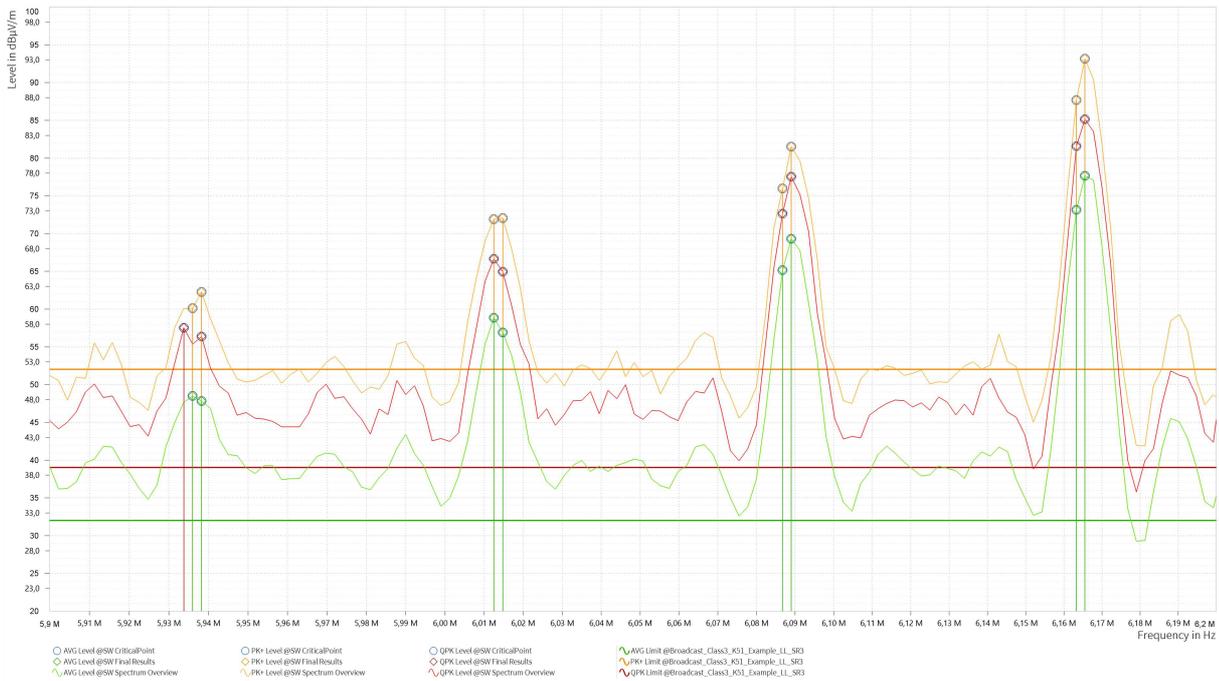
## EMI Critical Points (2/2)

Rg	Frequency [MHz]	Correction [dB]	Polarization	Antenna Height [m]	Source	Comment
1	5,934	20,00	H	1	Subrange Maxima	QPK
1	5,936	20,00	H	1	Subrange Maxima	PK+, AVG
1	5,938	20,00	H	1	Subrange Maxima	QPK, PK+, AVG
1	6,013	20,00	H	1	Subrange Maxima	QPK, PK+, AVG
1	6,015	20,00	H	1	Subrange Maxima	QPK, PK+, AVG
1	6,087	20,00	H	1	Subrange Maxima	QPK, PK+, AVG
1	6,089	20,00	H	1	Subrange Maxima	QPK, PK+, AVG
1	6,163	20,00	H	1	Subrange Maxima	QPK, PK+, AVG
1	6,166	20,00	H	1	Subrange Maxima	QPK, PK+, AVG

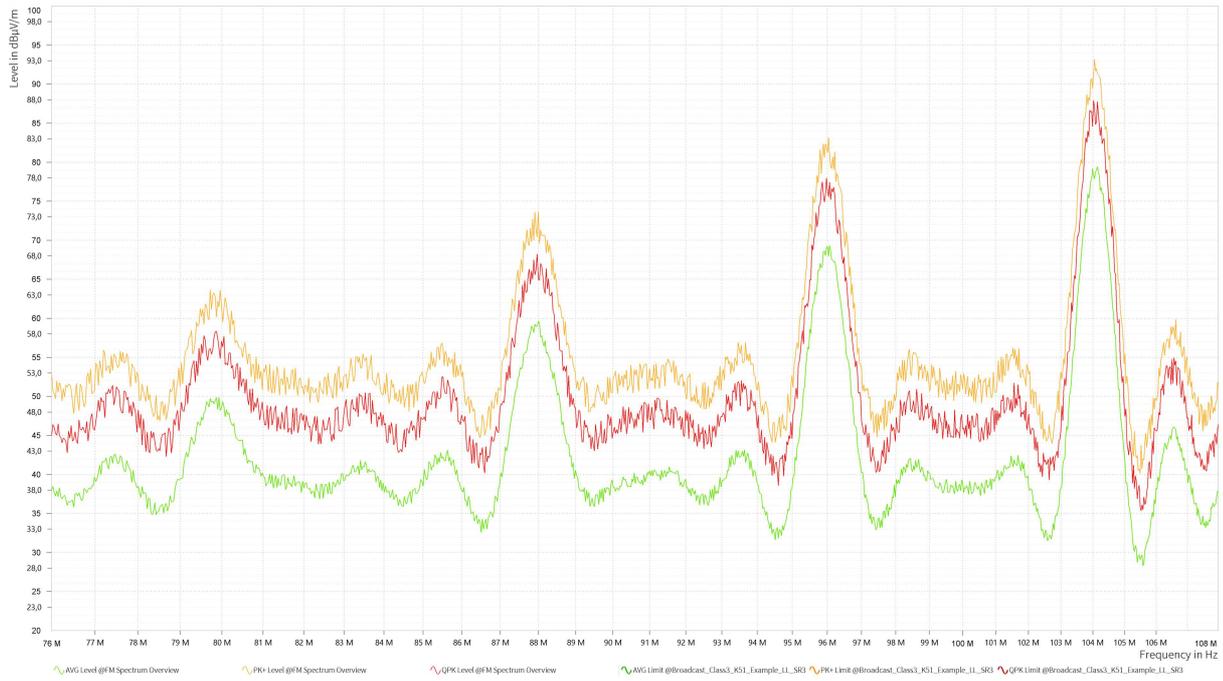
### Spectrum Overview



### SW Spectrum Overview



### FM Spectrum Overview



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