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GSM Template: Release October, 2018

TEST REPORT

N°: 16310540-783024-A **Version : 02**

Subject	**Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: ETSI EN 301 511 V12.5.1 (Limited Program) Electromagnetic compatibility, Electromagnetic Field (EMF): EN 62311 (2008)**
Issued to	**BDR THERMEA** 57 rue de la gare 67580 - MERTZWILLER France
Apparatus under test	
Product	Control Box
Trade mark	Remeha
Manufacturer	BDR THERMEA
Model under test	Elga Ace Monobloc MB2R + option GTW 30
Serial number	Prototype
Conclusion	See Test Program chapter
Test date	November 8, 2022
Test location	Pulversheim
Sample receipt date	November 7, 2022
Composition of document	27 pages
Document issued on	May 1, 2023

Written by :
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Tests operator

Approved by :
Thomas SUTTER
Technical manager

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Publication history

Version	Date	Author	Modification
01	January 27, 2023	Christophe MASSING	Creation of the document
02	May 1, 2023	Christophe MASSING	Add DCS1800 Chapter

Each *new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.*

SUMMARY

1. TEST PROGRAM

References

- **ETSI EN 301 511 V12.5.1**
- **EN 62311 (2008)**
- **Recommendation N° 1999/519/CE**

Partial transmitter requirement:

Clause (ETSI EN 301 511) Test Description	Test result - Comments
Radiated spurious emissions – Mobile Station allocated a channel	☑ **PASS(1)** ☐ **FAIL** ☐ **NA** ☐ **NP**
Radiated spurious emissions – Mobile Station in idle mode	☑ **PASS(1)** ☐ **FAIL** ☐ **NA** ☐ **NP**
This table is a summary of test report, see conclusion of each clause of this test report for detail.	

(1): Normal condition only. The EUT integrates an assessed RF radio module.

Health requirement:

Clause (EN 62311 (2008)) & Test Description	Test result - Comments
E-Field measurement E-Field calculation	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
This table is a summary of test report, see conclusion of each clause of this test report for detail.	

NA: Not Applicable
PASS: EUT complies with standard's requirement
FAIL: EUT does not comply with standard's requirement
NP: Test Not Performed

2. EQUIPMENT DESCRIPTION

2.1. INFORMATIONS

Customer:

Name	Company
Romain Borne	BDR THERMEA

2.2. IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
Remeha Elga Ace Monobloc MB2R + option GTW 30 Serial Number: Prototype

GTW 30

Elga Ace Monobloc MB2R + option GTW 30

Equipment Under Test

The control box P3-2 updated in final P4 configuration is tested alone, the ODU Midea is emulated thanks to the tool MideaEmulator_v01.07.

- Equipment inside the EUT:

Device	Reference	HW version	SW version
EHC-Base	630619406	255.255	D22.41
SCB-17b	7783513	04.03	02.03
BLE SA STmicro	1	255.111	01.00RC02
MK2.1	7711844	02.01	01.06
GTW-30	7733655	02.05	01.07

- Accessories outside the EUT:

Device	Test focus
External temperature sensor	Mandatory for all test (15m)
System temperature sensor	Mandatory for all test (15m)
Modbus cable	Mandatory for all test (15-30m)
BDR Com	6.1.5.21082
RS-485 USB converter	Mandatory for all test
MB2R Virtual tools	01.07
IXXAT	Optional

Power supply:

During all the tests, EUT is supplied by V_{nom}: VAC
For measurement with different voltage, it will be presented in test method.

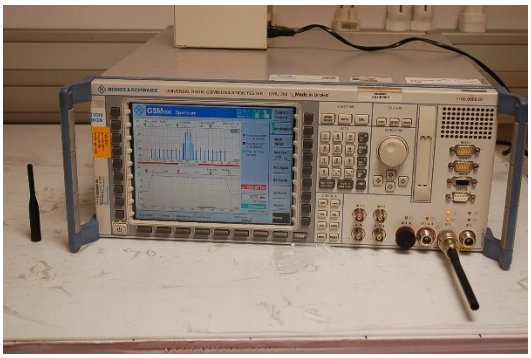
Name	Type	Rating	Reference / Sn	Comments
Mains 230V	☑ AC ☐ DC ☐ Battery	230VAC – 50 Hz	-	-

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared < 3 m	Shielded	Under test	Comments
Mains 230V	230 V – 50 Hz	2	☐	☐	☑	-
External Probe	External probe	3	☐	☐	☑	-
GTW30	MODUS	2	☑	☐	☑	

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Universal Radio Communication Tester	R&S CMU200		



Equipment information:

Hardware Version:			
Software Version:			
Band:	☑ **GSM900** Tx=880 MHz to 915 MHz Rx=925 MHz to 960 MHz	☑ **DCS1800** Tx=1710 MHz to 1785 MHz Rx=1805 MHz to 1880 MHz	
Power Class:	Select Power Class	Select Power Class	
Multislot Class	☑ GPRS Class 3		
	☐ EDGE Select Class		
Antenna Type:	☑ Integral	☑ External	☐ Dedicated
Type of equipment:	☐ Stand-alone	☑ Plug-in	☐ Combined
Standby mode:	☐ Yes	☐ No	
Equipment intended use:	☑ Fixed	☐ Mobile	
Equipment type:	☑ Production model	☐ Pre-production model	
Operating temperature range:	Tnom:	20°C	
Type of power source:	☐ AC power supply	☑ DC power supply	☐ Battery
Operating voltage range:	Vnom:	☑ 24V dc	☐ X Vdc

2.1. *EUT configuration*

Hardware information		
Firmware (if applicable):	**V. :**	-
Software (if applicable):	**V. :**	-

The equipment can be set in following mode:

- MS allocated a channel at power maximum
- MS in idle mode

2.2. Equipment labelling

2.3. Equipment modification

☑ None ☐ Modification:

3. SPURIOUS EMISSIONS (MS ALLOCATED A CHANNEL)

3.1. TEST CONDITIONS

Test performed by : Christophe MASSING
Date of test : November 8, 2022
Ambient temperature : 21 °C
Relative humidity : 30 %

3.2. TEST SETUP

Method of measurement
☑ Effective Radiated Power, cabinet and antenna radiation

Pre-characterization measurement (30 MHz to 1 GHz):
- The Equipment under Test is installed:
☑ FAR ☐ SAR
- Distance between EUT and the measuring antenna is:
☑ 3m
- Choice of measuring antenna:
☑ Bilog
- The setup is 1.55 m above the ground reference plane on an isolating table and the table shall turn on 360°. Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. The pre-characterization graphs are obtained in PEAK detection (worst case).
- The maximum emitted power is measured in opposite to EUT, no height variation.

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr#1	H	GSM900 - TX	0-360°	Middle	See the following results
Emr#2	V	GSM900 - TX	0-360°	Middle	See the following results
Emr#3	H	DCS1800 - TX	0-360°	Middle	See the following results
Emr#4	V	DCS1800 - TX	0-360°	Middle	See the following results

Qualification measurement (30MHz to 1GHz):
- The Equipment under Test is installed:
☑ FAR ☐ SAR
(200 MHz to 1 GHz) (30 MHz to 1 GHz)
- Distance between EUT and the measuring antenna is:
☑ 3 m
- Choice of measuring antenna:
☑ Bilog
- Spectrum analyzer setting: Detector=Peak
RBW=10 kHz VBW=30 kHz between 30 MHz-50 MHz.
RBW=100 kHz VBW=300 kHz between 50 MHz-1 GHz.

- The setup is 1.55 m above the ground reference plane on an insulating support. Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. Continuous linear turntable azimuth search was performed with 360 degrees range. Vertical search was performed between 1 m and 4 m with the measuring antenna.
- Method to determinate the spurious radiated emission:
☑ NSA Method ☐ Substitution Method

Remark: The Normalized Site Attenuation (NSA) is added to the maximum values observed during the azimuth search in order to obtain the spurious radiated emission. For spurious above -6dB from the limit found with the NSA, the Substitution Method is applied.
The substitution antenna replaces the equipment under test for Effective Radiated Power (ERP) measurement. Power is measured for the same level of radiated field strength obtained on the measuring antenna.

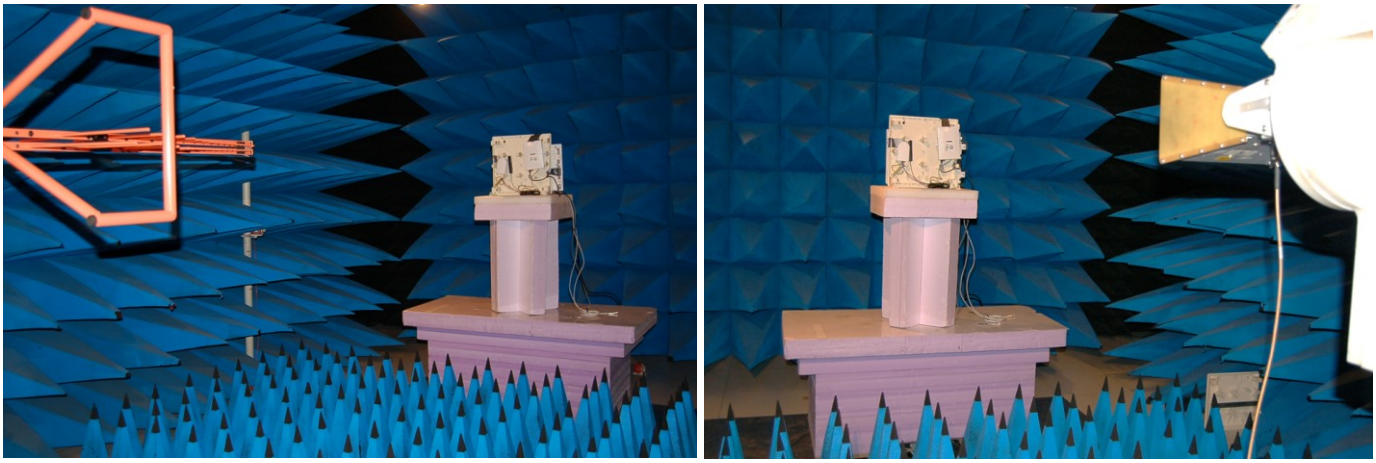
Pre-characterization measurement (1GHz to 4GHz):
- The Equipment under Test is installed:
☑ FAR
-Distance between EUT and the measuring antenna is:
☑ 1.5 m ☐ 1.0 m
- Choice of measuring antenna:
☑ Horn
- Spectrum analyzer setting: Detector=Peak
RBW=100kHz VBW=300kHz

- Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. The EUT is being rotated on 360° during the measurement. During the pre-characterization, a frequency list is created in PEAK detection (worst case).

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr#5	H	GSM900 - TX	0-360°	Middle	See the following results
Emr#6	V	GSM900 - TX	0-360°	Middle	See the following results
Emr#7	H	GSM1800 - TX	0-360°	Middle	See the following results
Emr#8	V	GSM1800 - TX	0-360°	Middle	See the following results

Qualification measurement (1GHz to 4GHz):
- The Equipment under Test is installed:
☑ FAR
-Distance between EUT and the measuring antenna is:
☑ 1.5 m ☐ 1.0 m
- Choice of measuring antenna:
☑ Horn
- Spectrum analyzer setting: Detector=Peak
RBW=100 kHz VBW=300 kHz

- Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. Continuous linear turntable azimuth search was performed with 360 degrees range. Vertical search was performed between 1 m and 4 m with the measuring antenna (SAR).
- Method to determinate the spurious radiated emission:
☑ NSA Method ☑ Substitution Method
Remark: The Normalized Site Attenuation (NSA) is added to the maximum values observed during the azimuth search in order to obtain the spurious radiated emission. For spurious above -6 dB from the limit found with the NSA, the Substitution Method is applied.
The substitution antenna replaces the equipment under test for Effective Radiated Power (ERP) measurement. Power is measured for the same level of radiated field strength obtained on the measuring antenna.



Radiated measurements

Spurious Emissions (MS allocated a channel)

3.3. TEST EQUIPEMENT LIST

Apparatus	Trade Mark	Type	Registration number
Semi-Anechoic room	Siepel	-	D3044022
Spectrum Analyzer	Rohde & Schwarz	FSU	A4060060
Bilog Antenna	Teseq	CBL6143	C2040217
Horn antenna	Emco	3115	C2042044
Horn antenna	Emco	3115	C2042045
Horn Antenna	Raven Engineering	96001	C2042046
Cable	Rohde & Schwarz	N 7m	A5329474
Cable	HP	N 2m	A5329471
Cable	3.5MD TDINOX	SMA 7m	A5329458
Cable	Flex	SMA 2m	A5329567
Cable	Megaphase	SMA 2m	A5329723
Attenuator		20 dB	A7122226
Attenuator	Radiall	10 dB	A7122248
RF Preamplifier	Miteq	1-18GHz	A7086011
RF Preamplifier	LCIE	0.02 – 6 GHz	A7085019
Wattmeter	Rohde & Schwarz	NRVS	A1503018
Power probe	Rohde & Schwarz	NRV-Z51	A1509056
Generator RF	Agilent	E4438C	A5442047
HighPass filter	Wainwright	WHK 1.2/15GHz	A7480060
Bandstop notch filter	Anatech electronics	AE890NS2195	A7480064
Universal radio communication	Rohde & Schwarz	CMU200	A2440004

Note: In our quality system, the test equipment calibration due is more & less 2 months

3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

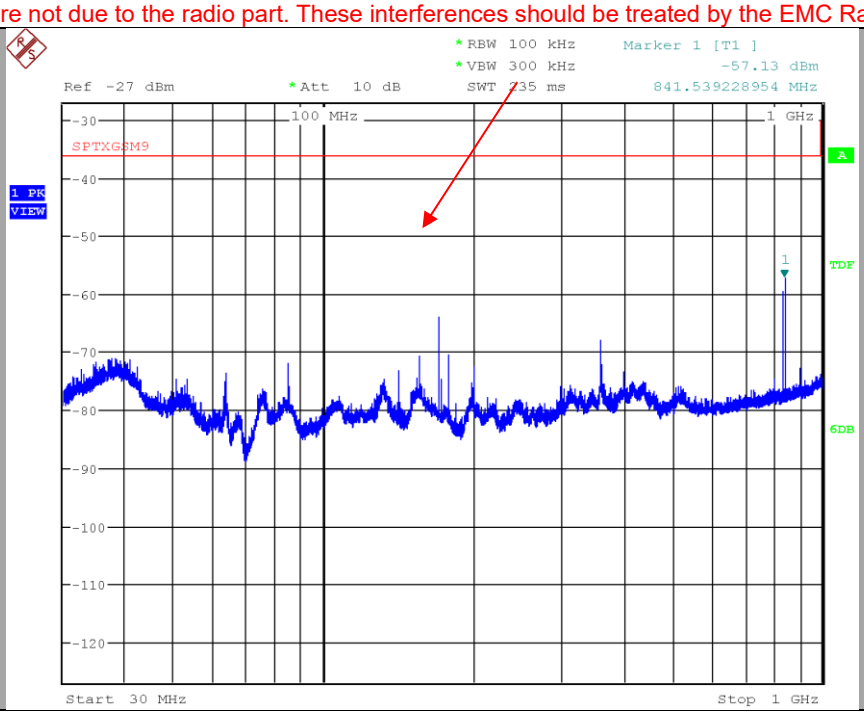
☑ None ☐ Divergence:

3.5. LIMITS

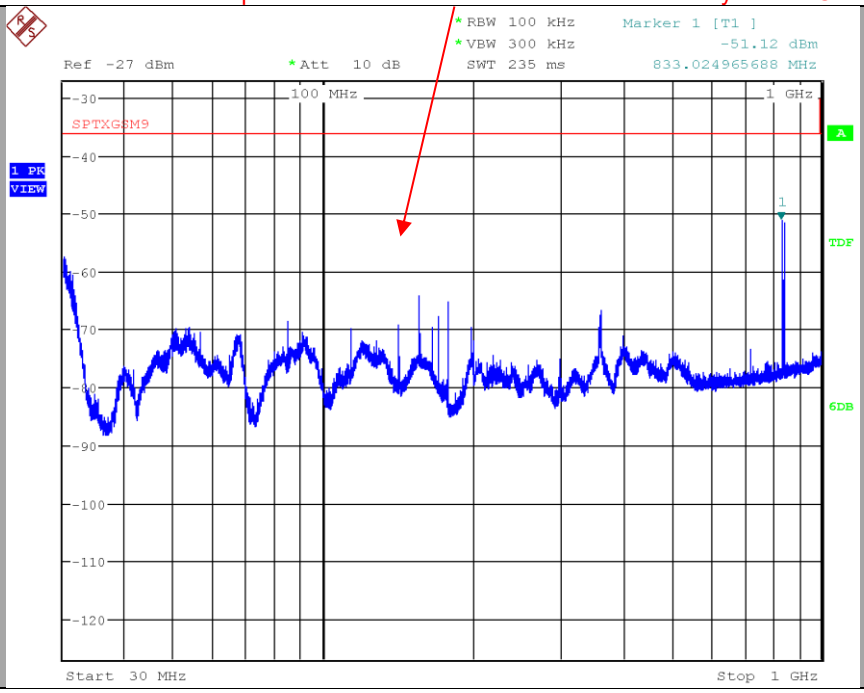
GSM900 radiated	
Frequencies	**Limit**
30 MHz to 1 GHz	-36 dBm
1 GHz to 4 GHz	-30 dBm

3.6. RESULTS

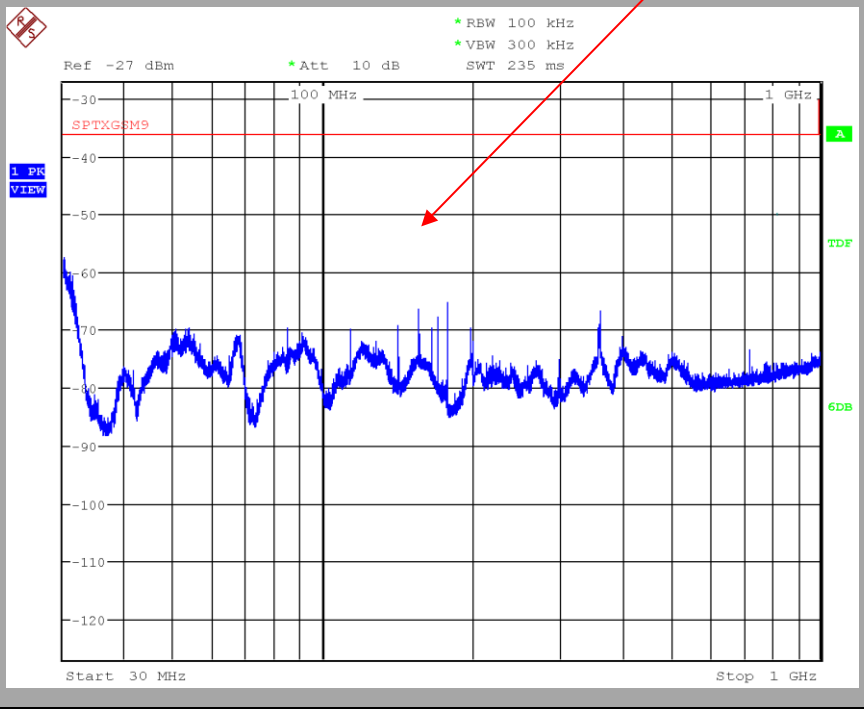
GSM900 Channel 37
Emr#1 - Horizontal
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



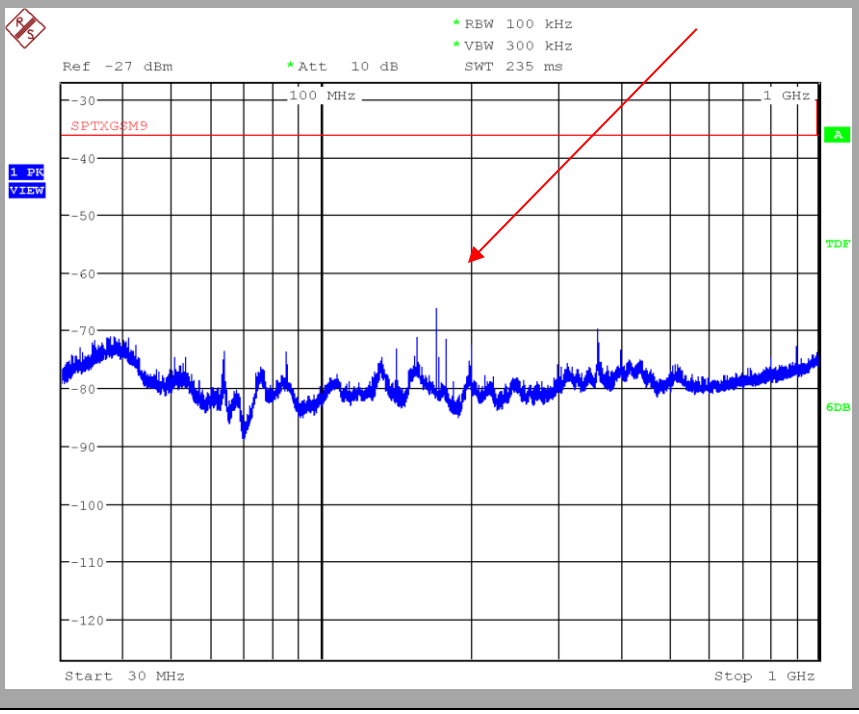
Emr#2 - Vertical
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test

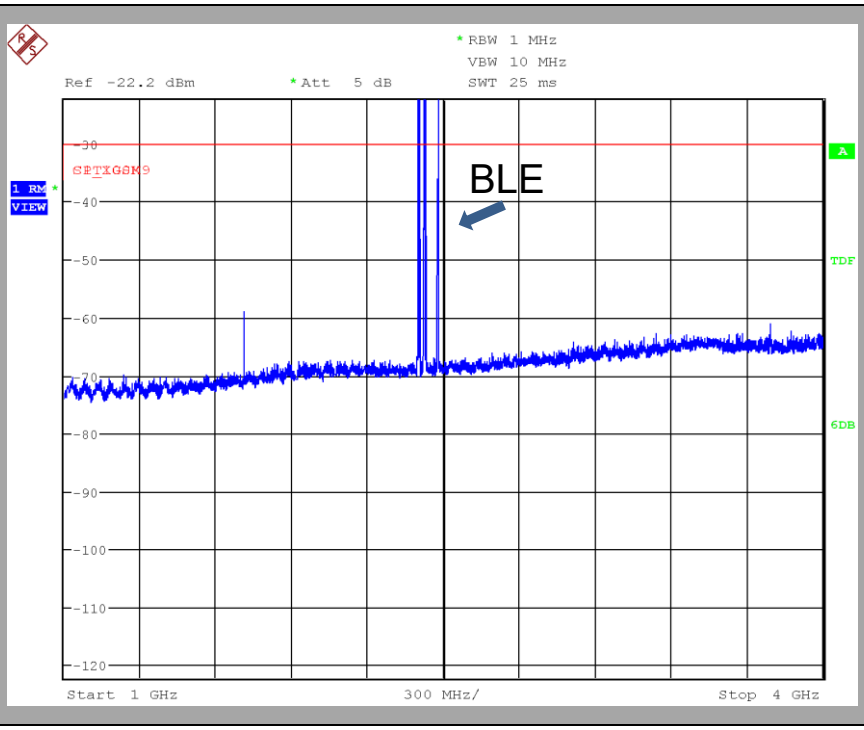
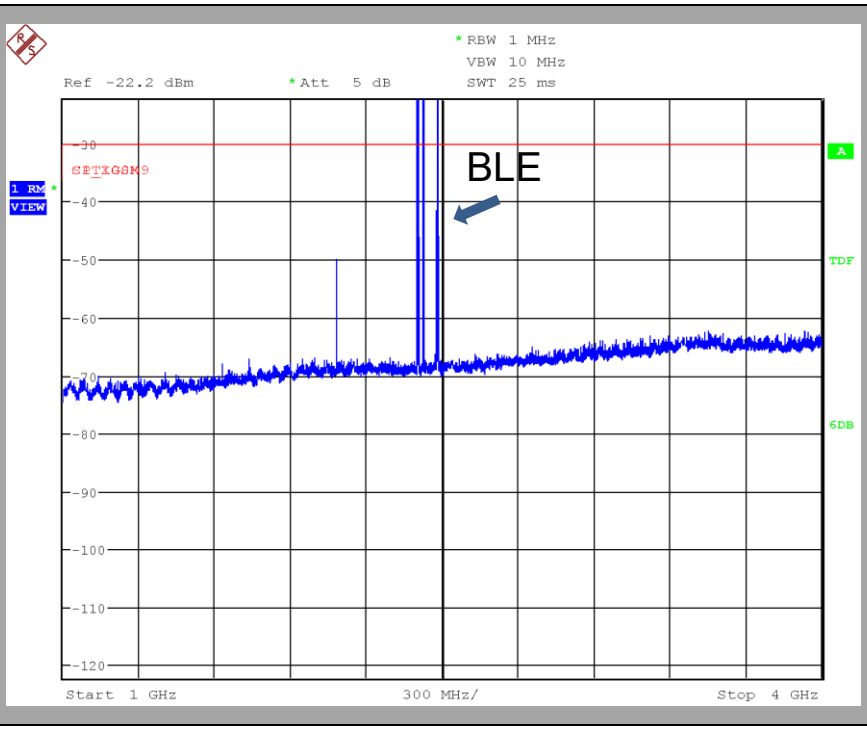


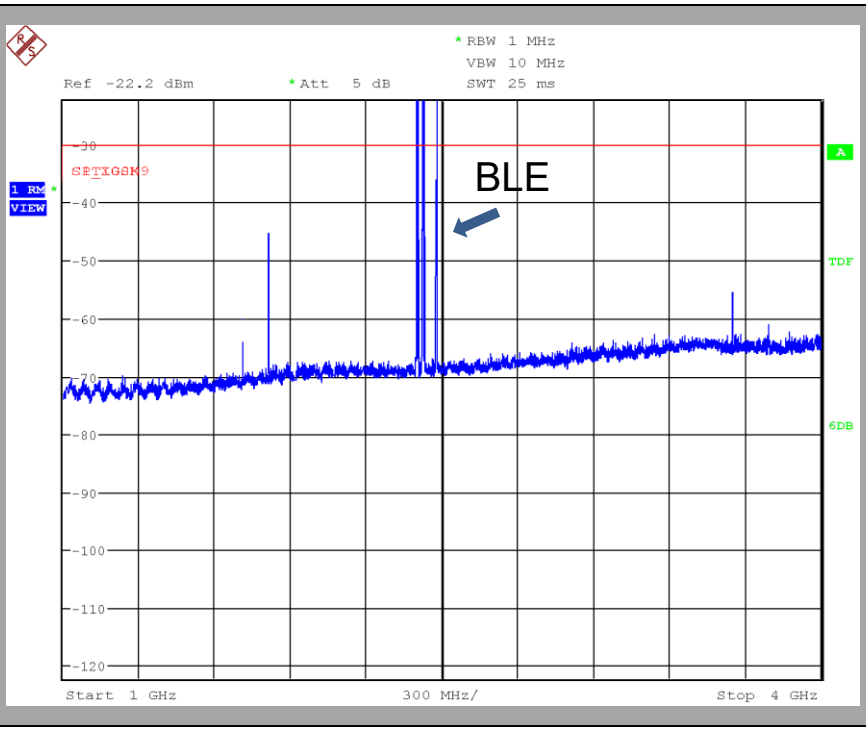
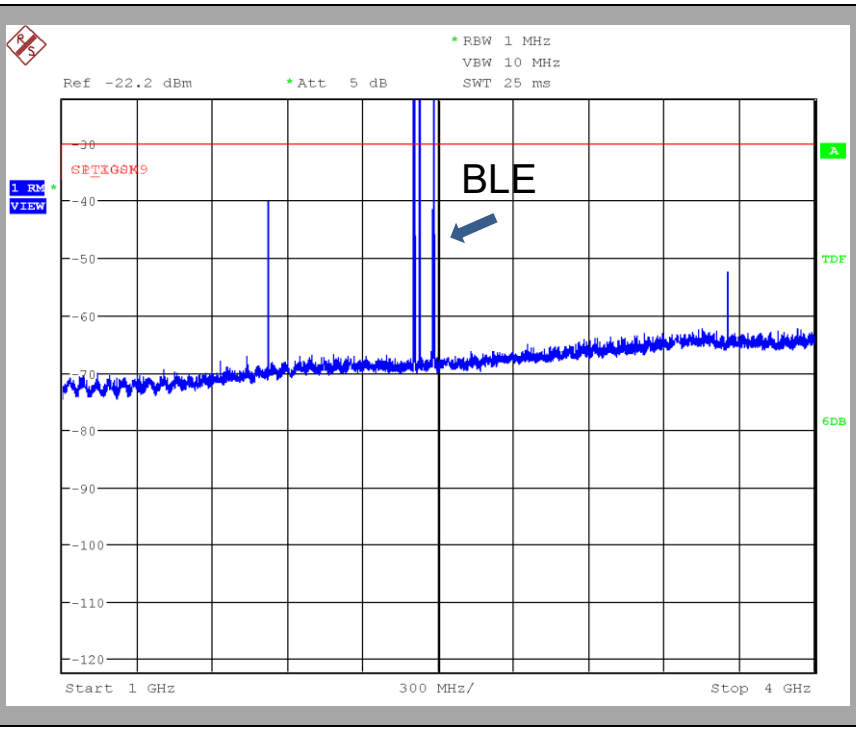
DCS1800 Channel 698
Radiated Spurious
Emr#3 - Vertical
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



Emr#4 - Horizontal
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



GSM900 Channel 37
Emr#5 - Horizontal

Emr#6 - Vertical


DCS1800 Channel 698
Emr#7 - Horizontal

Emr#8- Vertical


GSM900 Channel 37 & DCS1800 Channel 698 radiated

Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)
C37	30 M – 1G	No significant spurious has been observed	-36
C37	2082	-49.89	-30
C37	1712	-58.98	-30
C698	1842	-40.1	-30
C698	3684	-52.3	-30

3.7. CONCLUSION

Measures for transmitter spurious emissions (MS allocated a channel), performed on the sample of the product **Remeha Elga** Ace Monobloc MB2R + option GTW 30, SN: **Prototype** , in configuration and description presented in this test report, show levels **compliant** to the ETSI EN 301 511 V12.5.1 limits.

4. SPURIOUS EMISSIONS (MS IN IDLE MODE)

4.1. TEST CONDITIONS

Test performed by	: Christophe MASSING
Date of test	: November 8, 2022
Ambient temperature	: 21 °C
Relative humidity	: 30 %

4.2. TEST SETUP

Method of measurement

☑ Effective Radiated Power, cabinet and antenna radiation

Pre-characterization measurement (30 MHz to 1 GHz):

- The Equipment under Test is installed:

☑ FAR ☐ SAR

- Distance between EUT and the measuring antenna is:

☑ 3 m

- Choice of measuring antenna:

☑ Bilog

- The setup is 1.55 m above the ground reference plane on an isolating table and the table shall turn on 360°. Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. The pre-characterization graphs are obtained in PEAK detection (worst case).
- The maximum emitted power is measured in opposite to EUT, no height variation.

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr#9	H	GSM900 - TX	Axis XY	Middle	See the following results
Emr#10	V	GSM900 - TX	Axis Z	Middle	See the following results
Emr#11	H	DCS1800 - TX	Axis XY	Middle	See the following results
Emr#12	V	DCS1800 - TX	Axis Z	Middle	See the following results

Qualification measurement (30 MHz to 1 GHz):

- The Equipment under Test is installed:

☐ FAR (200 MHz to 1 GHz) ☐ SAR (30 MHz to 1 GHz)

- Distance between EUT and the measuring antenna is:

☑ 3 m

- Choice of measuring antenna:

☑ Bilog

- Spectrum analyzer setting: Detector=Peak
  RBW=10 kHz VBW=30 kHz between 30 MHz-50 MHz.
  RBW=100 kHz VBW=300 kHz between 50 MHz-1 GHz.

- The setup is 1.55 m above the ground reference plane on an insulating support. Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. Continuous linear turntable azimuth search was performed with 360 degrees range. Vertical search was performed between 1 m and 4 m with the measuring antenna.
- Method to determinate the spurious radiated emission:

☑ NSA Method ☐ Substitution Method

Remark: The Normalized Site Attenuation (NSA) is added to the maximum values observed during the azimuth search in order to obtain the spurious radiated emission. For spurious above -6dB from the limit found with the NSA, the Substitution Method is applied.
The substitution antenna replaces the equipment under test for Effective Radiated Power (ERP) measurement. Power is measured for the same level of radiated field strength obtained on the measuring antenna.

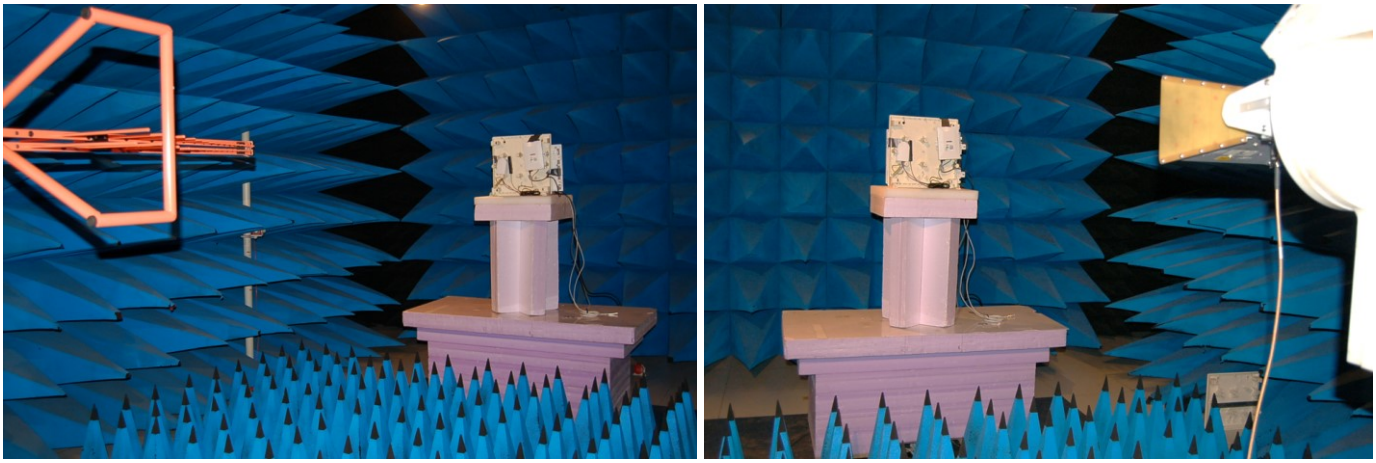
Pre-characterization measurement (1 GHz to 4 GHz):
- The Equipment under Test is installed:
☑ FAR
-Distance between EUT and the measuring antenna is:
☐ 1.5 m ☐ 1.0 m
- Choice of measuring antenna:
☑ Horn
- Spectrum analyzer setting: Detector=Peak
RBW=100 kHz VBW=300 kHz

- Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. The EUT is being rotated on 360° during the measurement. During the pre-characterization, a frequency list is created in PEAK detection (worst case).

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr#13	H	GSM900 - TX	Axis XY	Middle	See the following results
Emr#14	V	GSM900 - TX	Axis Z	Middle	See the following results
Emr#15	H	DCS1800 - TX	Axis XY	Middle	See the following results
Emr#16	V	DCS1800 - TX	Axis Z	Middle	See the following results

Qualification measurement (1 GHz to 4 GHz):
- The Equipment under Test is installed:
☑ FAR
-Distance between EUT and the measuring antenna is:
☑ 1.5 m ☐ 1.0 m
- Choice of measuring antenna:
☑ Horn
- Spectrum analyzer setting: Detector=Peak
RBW=100 kHz VBW=300 kHz

- Test is performed in horizontal (H) and vertical (V) polarization with a measuring antenna. Continuous linear turntable azimuth search was performed with 360 degrees range. Vertical search was performed between 1 m and 4 m with the measuring antenna (SAR).
- Method to determinate the spurious radiated emission:
☑ NSA Method ☐ Substitution Method
Remark: The Normalized Site Attenuation (NSA) is added to the maximum values observed during the azimuth search in order to obtain the spurious radiated emission. For spurious above -6 dB from the limit found with the NSA, the Substitution Method is applied.
The substitution antenna replaces the equipment under test for Effective Radiated Power (ERP) measurement. Power is measured for the same level of radiated field strength obtained on the measuring antenna.



Radiated measurements

Spurious Emissions (MS in idle mode)

4.3. TEST EQUIPMENT LIST

Apparatus	Trade Mark	Type	Registration number
Semi-Anechoic room	Siepel	-	D3044022
Spectrum Analyzer	Rohde & Schwarz	FSU	A4060060
Bilog Antenna	Teseq	CBL6143	C2040217
Horn antenna	Emco	3115	C2042044
Horn antenna	Emco	3115	C2042045
Horn Antenna	Raven Engineering	96001	C2042046
Cable	Rohde & Schwarz	N 7m	A5329474
Cable	HP	N 2m	A5329471
Cable	3.5MD TDINOX	SMA 7m	A5329458
Cable	Flex	SMA 2m	A5329567
Cable	Megaphase	SMA 2m	A5329723
Attenuator		20 dB	A7122226
Attenuator	Radiall	10 dB	A7122248
RF Preamplifier	Miteq	1-18GHz	A7086011
RF Preamplifier	LCIE	0.02 – 6 GHz	A7085019
Wattmeter	Rohde & Schwarz	NRVS	A1503018
Power probe	Rohde & Schwarz	NRV-Z51	A1509056
Generator RF	Agilent	E4438C	A5442047
HighPass filter	Wainwright	WHK 1.2/15GHz	A7480060
Bandstop notch filter	Anatech electronics	AE890NS2195	A7480064
Universal radio communication	Rohde & Schwarz	CMU200	A2440004

Note: In our quality system, the test equipment calibration due is more & less 2 months

4.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

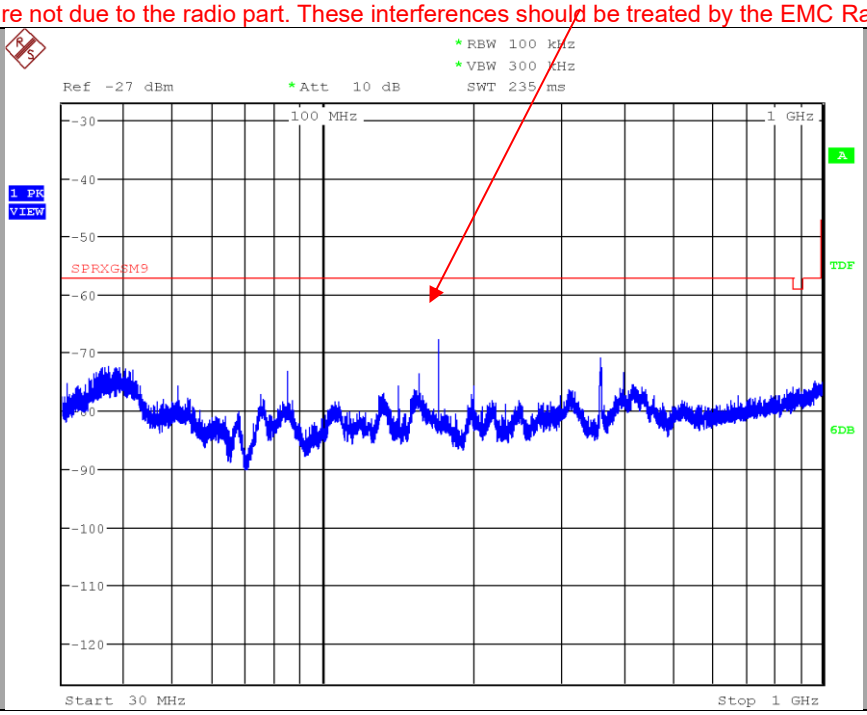
☑ None ☐ Divergence:

4.5. LIMITS

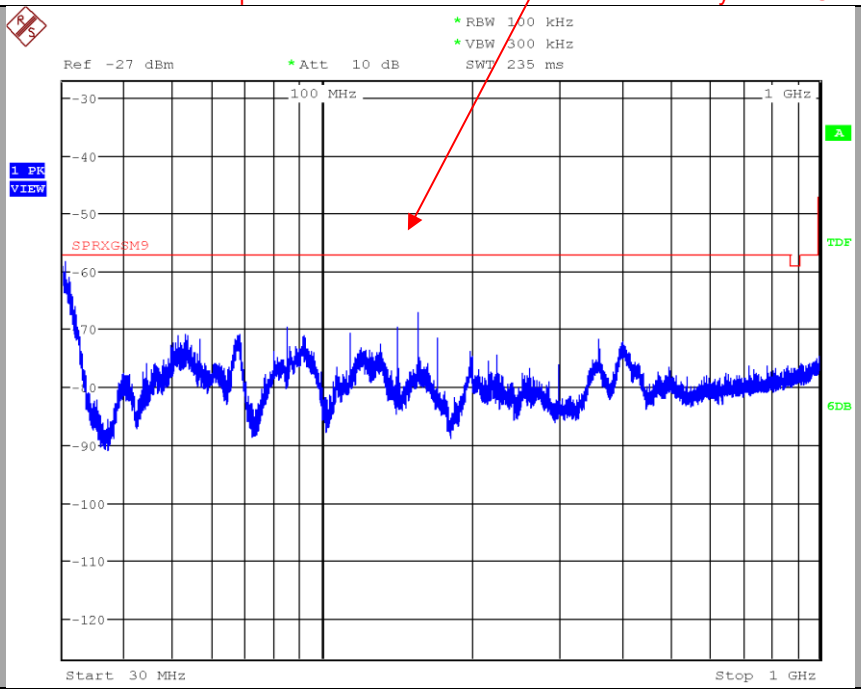
GSM900 & DCS1800	
Frequencies	**Limit**
30 MHz to 880 MHz	-57 dBm
880 MHz to 915 MHz	-59 dBm
915 MHz to 1000 MHz	-57 dBm
1000 MHz to 1710 MHz	-47 dBm
1710 MHz to 1785 MHz	-53 dBm
1785 MHz to 4 GHz	-47 dBm

4.6. RESULTS

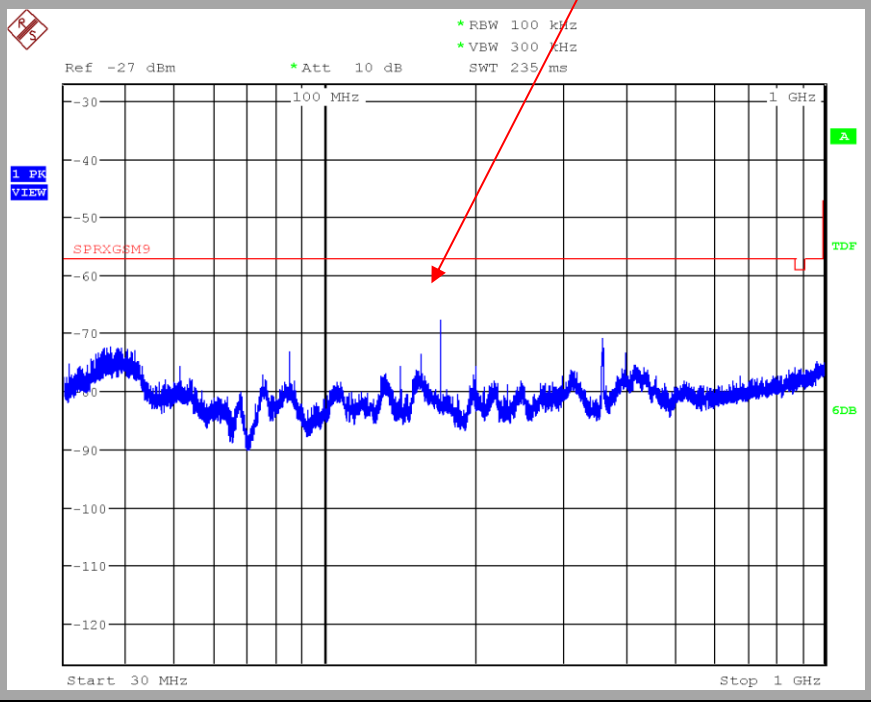
GSM900 Channel 37
Emr#9 - Horizontal
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



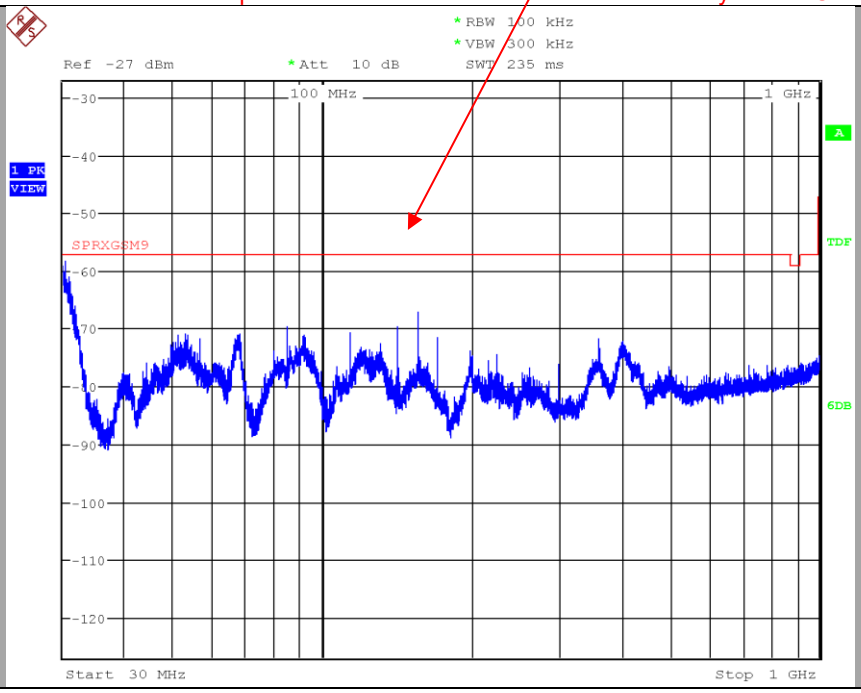
Emr#10 - Vertical
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



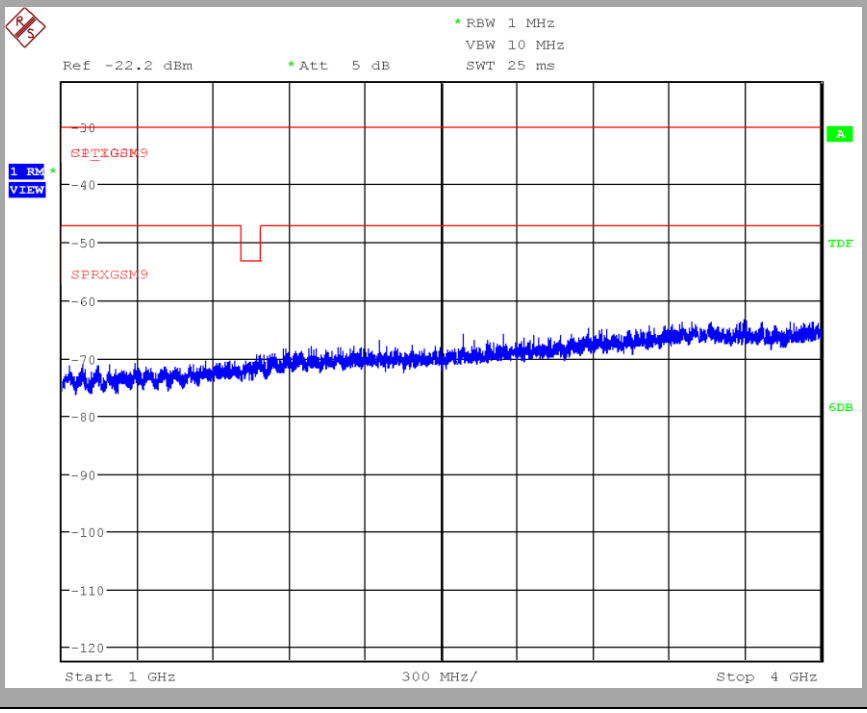
DCS1800 Channel 698
Emr#11 - Horizontal
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



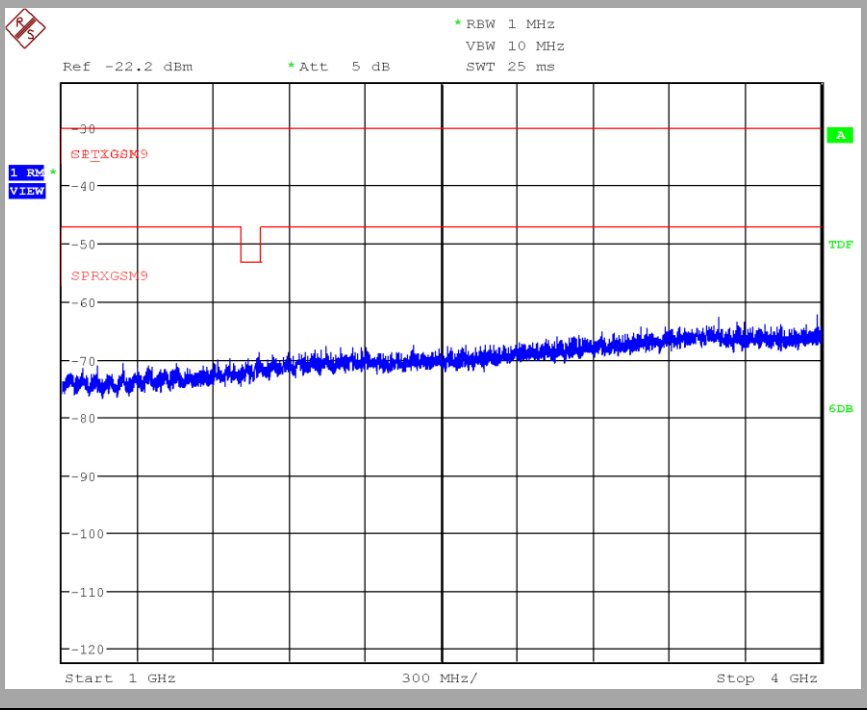
Emr#12 - Vertical
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



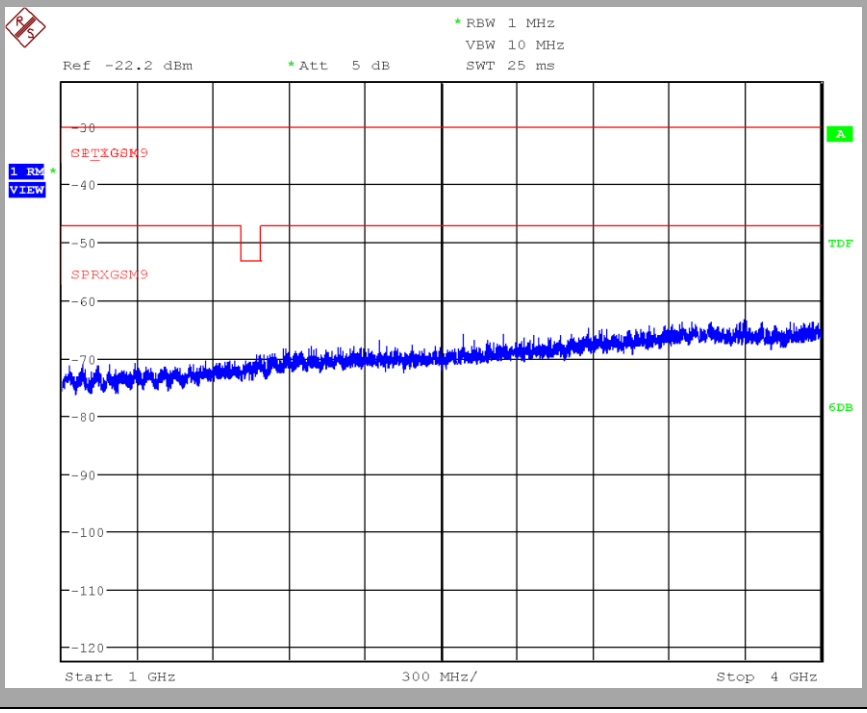
GSM900 Channel 37
Emr#13 - Horizontal
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



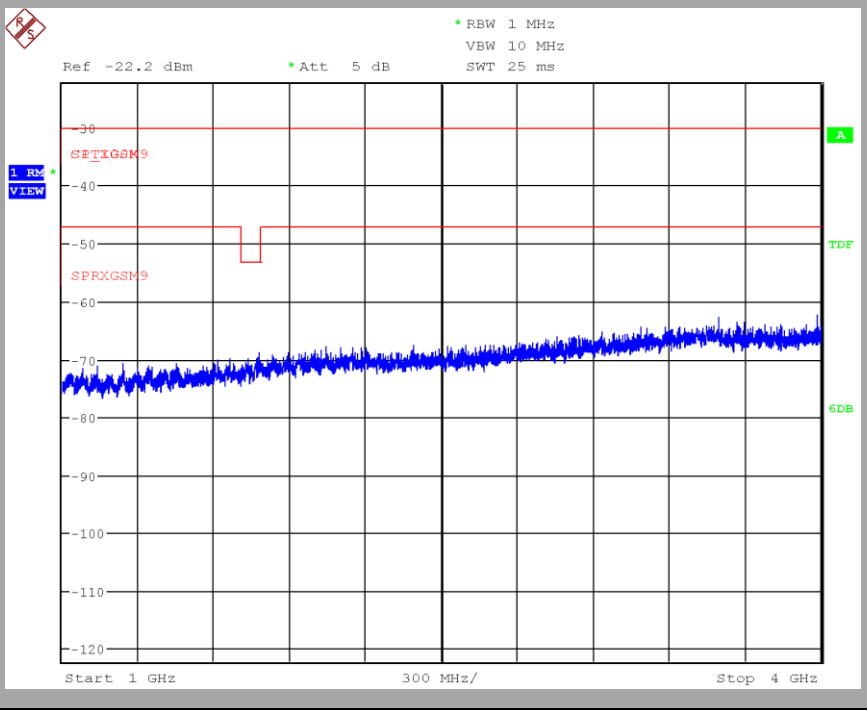
Emr#14 - Vertical
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



DCS1800 Channel 698
Emr#15 - Horizontal
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



Emr#16 - Vertical
Spurious observed are not due to the radio part. These interferences should be treated by the EMC Radiated Emission test



GSM900 Channel 37 & DCS1800 Channel 698 Radiated

Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)
C 37 & C 698	880 - 915	No significant spurious has been observed	-59
C 37 & C 698	30-1000	No significant spurious has been observed	-57
C 37 & C 698	1710 - 1785	No significant spurious has been observed	-53
C 37 & C 698	1000 - 4000	No significant spurious has been observed	-47

4.7. CONCLUSION

Measures for transmitter spurious emissions (MS in idle mode), performed on the sample of the product **Remeha Elga** Ace Monobloc MB2R + option GTW 30, SN: **Prototype** , in configuration and description presented in this test report, show levels **compliant** to the ETSI EN 301 511 V12.5.1 limits.

5. EMF

5.1. TEST CONDITIONS

Test performed by : Christophe MASSING
Date of test : November 8, 2022
Ambient temperature : 21 °C
Relative humidity : 30 %

5.2. TEST SETUP

Qualification measurements in a full anechoic chamber:
☑ Calculation:
With EIRP of EUT measured in this test report maximum reference level is calculated in using following formula and worst distance User-EUT = 0.3 m:

$$E = \frac{\sqrt{30PG_{(\theta,\phi)}}}{r}$$

5.3. LIMITS

The Electric Field shall not exceed 40.7 V/m for GSM900

5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence :

5.5. RESULTS

GSM900	
Temperature	**Tnom**
Channel	37
Frequency (MHz)	942.4
Calculated field at 0.3 m (V/m)	25.8

DCS1800	
Temperature	**Tnom**
Channel	698
Frequency (MHz)	1842.4
Calculated field at 0.3 m (V/m)	25.8

5.6. CONCLUSION

EMF measurement performed on the sample of the product **Elga** Ace Monobloc MB2R + option GTW 30, SN: **Prototype** , in configuration and description presented in this test report, show levels **compliant** to the **EN 62311 (2008)** limits.

6. UNCERTAINTIES CHART

ETSI EN 301 511 V 12.5.1 Kind of test	Wide uncertainty laboratory (k=2) ±x(dB) / (Hz)/ ms	Uncertainty limit
Spurious emission, radiated (Full anechoic chamber above 200MHz)	±3.8 dB	± 6dB
Spurious emission, radiated (Semi anechoic chamber & open test site)	±5.7 dB	± 6dB

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report