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Test Report

Report Number:

F200776E4

Equipment under Test (EUT):

Pac 6500

Applicant:

Dräger Safety AG & Co. KGaA

Manufacturer:

Dräger Safety AG & Co. KGaA



Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

- [1] **ANSI C63.10-2013**, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
- [2] **FCC CFR 47 Part 15**, Radio Frequency Devices
- [3] **558074 D01 15.247 Meas Guidance v05r02 (April 2019)**, GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
- [4] **RSS-247, Issue 2 (2017-02)** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- [4] **RSS-Gen, Issue 5 (2019-03)** General Requirements for Compliance of Radio Apparatus

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

Tested and
written by:

Paul Neufeld

Name



Signature

16.02.2021

Date

Reviewed
and approved
by:

Bernd Steiner

Name



Signature

16.02.2021

Date

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1 Identification

1.1 Applicant

| | |
|--|------------------------------|
| Name: | Dräger Safety AG & Co. KGaA |
| Address: | Revalstrasse 1, 23560 Lübeck |
| Country: | Germany |
| Name for contact purposes: | Mr. Lutz RÜFFERT |
| Phone: | +49 451 882 1623 |
| Fax: | - |
| eMail Address: | Lutz.rueffert@draeger.com |
| Applicant represented during the test by the following person: | - |

1.2 Manufacturer

| | |
|--|------------------------------|
| Name: | Dräger Safety AG & Co. KGaA |
| Address: | Revalstrasse 1, 23560 Lübeck |
| Country: | Germany |
| Name for contact purposes: | Mr. Lutz RÜFFERT |
| Phone: | +49 451 882 1623 |
| Fax: | - |
| eMail Address: | Lutz.rueffert@draeger.com |
| Applicant represented during the test by the following person: | - |

1.3 Test Laboratory

The tests were carried out by:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DakkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Accreditation designation number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

| EUT | |
|---------------------------------------|---|
| Test object: * | Portable single gas monitor |
| PMN / Model name: * | Pac 6500 |
| FCC ID: * | X6O-BT005 |
| IC: * ISED Certification number: * | 5895F-BT005 |
| Serial number: * | Internal antenna with direct test mode: ARNF-0075* ¹ Temporary antenna connector with direct test mode: ARND-0294* ¹ |
| PCB identifier: * | 8328687_6 |
| Hardware version: * HVIN: * | BT005 |
| Software version: * FVIN: * | - |

* Declared by the applicant

*¹ Serial number as marked on the PCB (not the housing)

Note: PHOENIX Testlab GmbH does not take samples. The samples used for the tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

| EUT data | | | | | | |
|--|-------------------------------------|---------------------|--------------------|---------------------|--------------------|---------------------|
| Power supply EUT: * | DC (by internal battery) | | | | | |
| Supply voltage EUT: * | U _{nom} = | 3.6 V _{DC} | U _{min} = | 2.6 V _{DC} | U _{max} = | 3.7 V _{DC} |
| Temperature range: * | -40 °C to +55 °C | | | | | |
| Lowest / highest internal clock frequency: * | 32.768 kHz / 2480 MHz (in BLE mode) | | | | | |

| Ports / Connectors | | | | |
|--------------------|-----|-----------|--------------------|----------------------|
| Identification | | | Length during test | Shielding (Yes / No) |
| | EUT | Ancillary | | |
| None | | | | |

| Bluetooth® Low Energy radio mode | | |
|----------------------------------|--|----------------------------|
| Fulfils radio specification: * | Bluetooth Low Energy™ 5.2 (only 1 Mbit/s PHY supported by EUT) | |
| Radio chip: * | nRF52832, Nordic Semiconductors | |
| Antenna type: * | Ceramic Antenna | |
| Antenna name: * | - | |
| Antenna gain: * | Peak: | 2.0 dBi (Typical) |
| Antenna connector: * | None (Temporary antenna connector only provided for test purposes) | |
| Conducted output power: | BLE 1 M PHY | 0 dBm |
| Type of modulation: * | BLE 1 M PHY | GFSK |
| Operating frequency range: * | BLE 1 M PHY | 2402 – 2480 MHz |
| Number of channels: * | BLE 1 M PHY | 40 (2 MHz channel spacing) |

| Bluetooth® LE frequencies | | | | |
|---------------------------|-----|----------|-----|----------|
| Channel 00 | RX | 2402 MHz | TX | 2402 MHz |
| ... | ... | ... | ... | ... |
| Channel 19 | RX | 2440 MHz | TX | 2440 MHz |
| ... | ... | ... | ... | ... |
| Channel 39 | RX | 2480 MHz | TX | 2480 MHz |

1.5.1 Ancillary Equipment / Equipment used for testing

| Equipment used for testing | |
|--------------------------------|---|
| Cables (connected to the EUT): | FTDI cable (TTL-232-3V3) *1 |
| Fibre optic converter: | Opto USB2.0, MK Messtechnik (PM. No. 482617) *2 |
| PC: | Raspberry Pi 3 Model B V1.2*1 |

*1 Provided by the applicant

*2 Provided by the laboratory

1.6 Dates

| | |
|---------------------------------|------------|
| Date of receipt of test sample: | 02.11.2020 |
| Start of test: | 05.11.2020 |
| End of test: | 15.12.2020 |

2 Operational States

2.1 Description of function of the EUT

The EUT is a gas measuring device that can incorporate different sensor types for various gases. The measured gas concentration can be transferred to an ancillary device with the aid of the integrated Bluetooth® Low Energy 5.2 transceiver. As declared by the applicant, the final firmware will only support the tested 1 Mbit/s.

The EUT:



2.2 The following states were defined as the operating conditions

During all tests, the EUT was supplied by its internal battery.

2.2.1 Radio test

For the radio tests the following settings were used:

A special EUT with regulatory radio firmware was used for the radio tests.

A connection to the EUT was established via delivered FTDI (UART to USB) cable with the aid of USB to FO converter. All relevant RF-parameter could be set via console at a delivered Raspberry Pi.

Following parameter were set according to the applicant:

Default mode LE 1M PHY, 0 dBm transmit power

a. hcitool -i hci1 cmd 0x08 0x31 0x00 0x01 0x01

Min Channel (2402 MHz) long packet 240 byte payload

a. hcitool -i hci1 cmd 0x08 0x1e 0x00 0xF0 0x07

Mid Channel (2440 MHz) long packet 240 byte payload

a. hcitool -i hci1 cmd 0x08 0x1e 0x13 0xF0 0x07

Max Channel (2480 MHz) long packet 240 byte payload

a. hcitool -i hci1 cmd 0x08 0x1e 0x27 0xF0 0x07

2.2.2 Operation modes

| Operation mode # | Radio technology | Frequency [MHz] | Channel / Band | Modulation / Mode | Data rate | Power setting |
|------------------|------------------|-----------------|----------------|-------------------|-----------|---------------|
| 1 | BLE | 2402 | 0 | GFSK | 1 Mbit/s | 0 dBm |
| 2 | BLE | 2440 | 19 | GFSK | 1 Mbit/s | 0 dBm |
| 3 | BLE | 2480 | 39 | GFSK | 1 Mbit/s | 0 dBm |
| 4 | BLE | 2402 | 0 | GFSK | 1 Mbit/s | +4 dBm |
| 5 | BLE | 2440 | 19 | GFSK | 1 Mbit/s | +4 dBm |
| 6 | BLE | 2480 | 39 | GFSK | 1 Mbit/s | +4 dBm |

The maximum output power of the Radio chip is +4 dBm (typical)

3 Additional Information

Object of this test report is the BLE radio part of the EUT only.

The tested sample was not labeled as required by the FCC.

The radiated tests were done with a sample modified as shown below, which was modified in a way it could operate in radio test mode. The FTDI connector shown below will not be present in the final EUT.



The antenna port conducted tests were done with a sample with a temporary SMA antenna connector. The modified EUT is shown below:



After the radiated tests were completed with output +4 dBm, the applicant decided to reduce the output power to 0 dBm. Where the conducted tests are done with 0 dBm, the radiated have not been repeated and remain valid for the reduced output power.

4 Overview

| Application | Frequency range [MHz] | FCC 47 CFR Part 15 section [2] | RSS-247 [4] RSS-Gen [5] | Status | Refer page |
|-------------------------------------|-----------------------|--|----------------------------|------------------------------|------------|
| Maximum peak conducted output power | 2400.0 - 2483.5 | 15.247 (b) (3), (4) | 5.4 (d) [4] | Passed | 14 |
| Maximum conducted output power | 2400.0 - 2483.5 | 15.247 (b) (3), (4) | 5.4 (d) [4] | Passed | 14 |
| DTS Bandwidth / 99% Bandwidth | 2400.0 - 2483.5 | 15.247 (a) (2) | 5.2 (a) [4] | Passed | 19 |
| Peak Power Spectral Density | 2400.0 - 2483.5 | 15.247 (e) | 5.2 (b) [4] | Passed | 22 |
| Average Power Spectral Density | 2400.0 - 2483.5 | 15.247 (e) | 5.2 (b) [4] | Passed | 22 |
| Band edge compliance | 2400.0 - 2483.5 | 15.247 (d) 15.205 (a) 15.209 (a) | 5.5 [4] | Passed | 23 |
| Maximum unwanted emissions | 0.009 – 26,500 | 15.247 (d) 15.205 (a) 15.209 (a) | 8.9 [5] | Passed | 27 |
| Conducted emissions on supply line | 0.15 - 30 | 15.207 (a) | 8.8 [4] | Not applicable* ¹ | |
| Antenna Requirement | - | 15.203 15.247 (b) | 5.4 (f) (ii) [4] | Passed* ² | - |

*¹ Not applicable because the EUT is powered with an internal battery without the possibility to charge by connecting to the public mains power grid directly or via charger.

*² Fixed Antenna, gain below 6 dBi, no power reduction necessary.

5 Results

5.1 Duty cycle

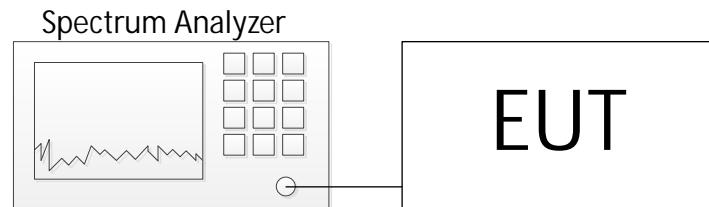
5.1.1 Method of measurement (conducted)

The EUT was measured conducted on a sample with an antenna connector, which was provided by the applicant.

Acceptable measurement configurations

According to [3] chapter 6 method b), which is equal to method described in chapter 11.6 b) of document [1] was used to perform the following test.

Test Setup:

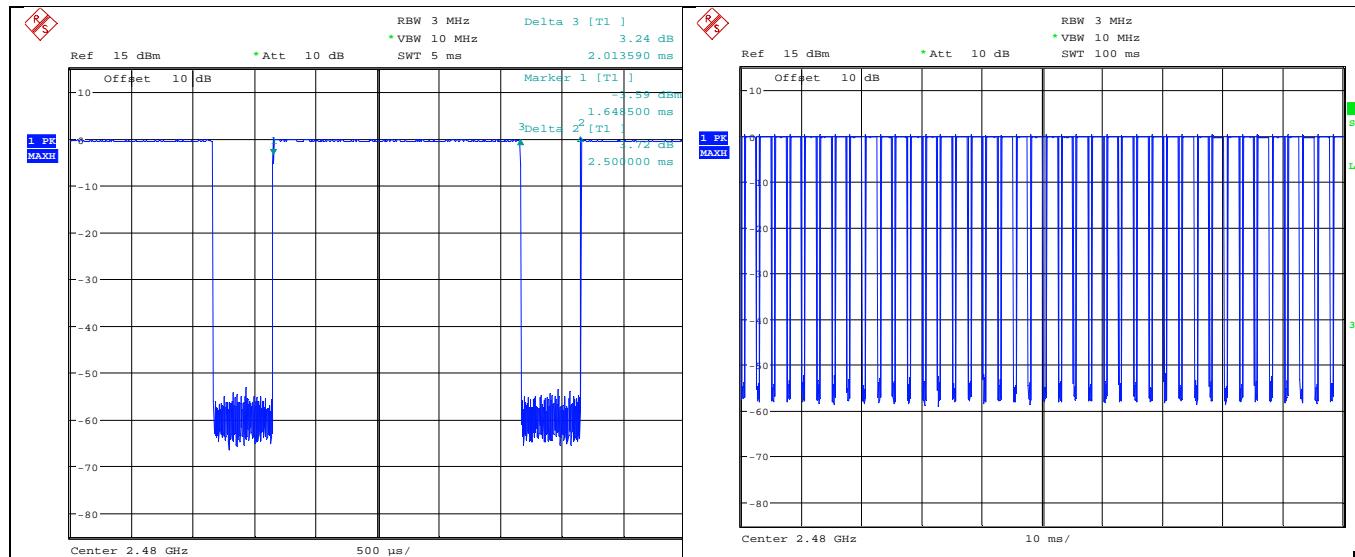


Only one representative plot is provided.

5.1.2 Test results

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 53 % |

| | |
|-----------|------------|
| Date | 15.12.2020 |
| Tested by | B. ROHDE |



| Operation mode | TX_on [μs] | TX_ges [μs] | RBW [MHz] | 50/T [kHz] | 50/T < RBW? |
|----------------|------------|-------------|-----------|------------|-------------|
| BLE 1 Mbit/s | 2014 | 2500 | 3 | 25 | Yes |

| Operation mode | Sweep points | Sweep time [μs] | Meas points | Meas points >100? | Duty cycle % | DCCF [dB] |
|----------------|--------------|-----------------|-------------|-------------------|--------------|-----------|
| BLE 1 Mbit/s | 10001 | 3000 | 8334 | Yes | 81 | 0.94 |

The DCCF (duty cycle correction factor) is calculated by:

$$DCCF = 10 * \log_{10} \left(\frac{1}{\text{Duty cycle}} \right)$$

Therefore, for average measurements a correction factor of 0.94 dB is used for all tests in test mode 1 -3.

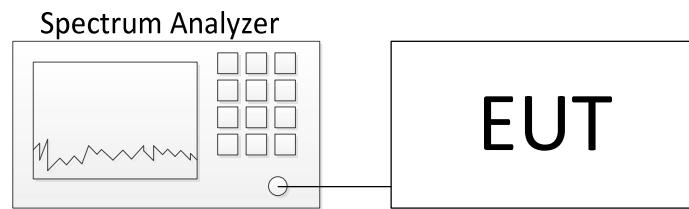
| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 1 |

5.1 Maximum conducted output power

5.1.1 Method of measurement (conducted)

The measurements were done conducted at the antenna connectors.

Test Setup:



Acceptable measurement configurations

See 8.3 of document [3] for details.

For the **Maximum peak conducted output power** the Procedure **11.9.1.1** in [1] was used.

For the **Maximum conducted average output power** the Procedure **11.9.2.2.4** in [1] was used.

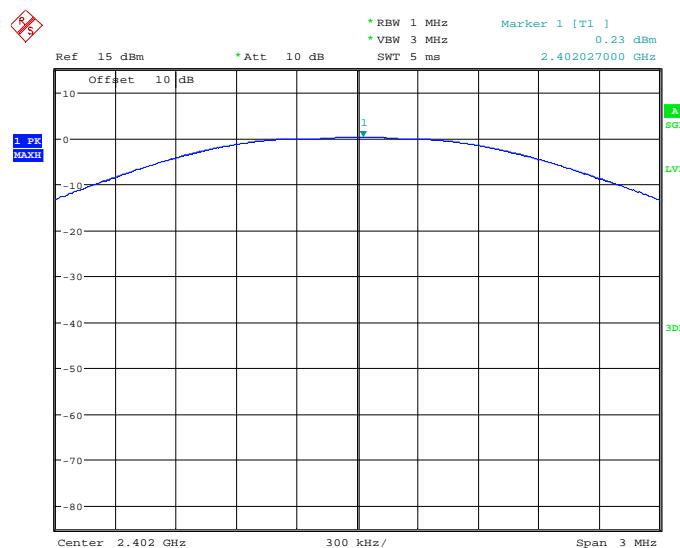
Only one representative plot for each measurement configuration is provided.

5.1.2 Test results

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 53 % |

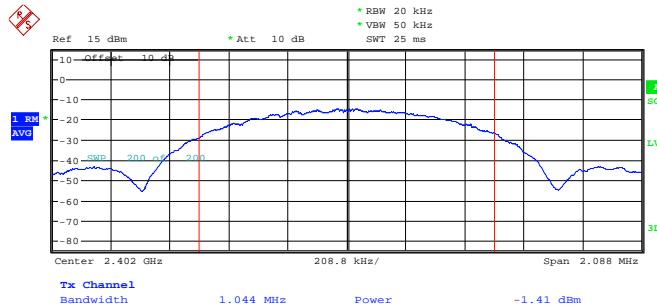
| | |
|-----------|------------|
| Date | 15.12.2020 |
| Tested by | B. ROHDE |

Maximum peak conducted output power:



| Operation mode | Reading [dBm] | Corr. Fact. [dB] | Peak output power [dBm] | Limit [dBm] | Result |
|----------------|---------------|------------------|-------------------------|-------------|--------|
| 1 | 0.2 | 0.2 | 0.4 | 30 | passed |
| 2 | 0.2 | 0.2 | 0.4 | 30 | passed |
| 3 | 0.1 | 0.2 | 0.3 | 30 | passed |

Maximum average conducted output power:



| Operation mode | Reading [dBm] | Corr. Fact. [dB] | Power [dBm] | DCCF [dB] | Power Incl. DCCF [dBm] | Limit [dBm] | Result |
|----------------|---------------|------------------|-------------|-----------|------------------------|-------------|--------|
| 1 | -1.4 | 0.2 | -1.2 | 0.9 | -0.3 | 30.0 | passed |
| 2 | -1.4 | 0.2 | -1.2 | 0.9 | -0.3 | 30.0 | passed |
| 3 | -1.5 | 0.2 | -1.3 | 0.9 | -0.4 | 30.0 | passed |

Test equipment (please refer to chapter 6 for details)

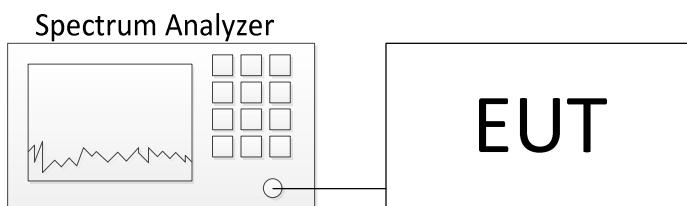
1

5.1 DTS Bandwidth / 99% Bandwidth

5.1.1 Method of measurement (conducted)

The measurements were done conducted at the antenna connector.

Test Setup:



Acceptable measurement configurations

See chapter 8.2 of document [3]

For the **DTS bandwidth** the Procedure **11.8.1** in [1] was used.

For the **Occupied bandwidth – 99% Bandwidth** the Procedure **6.9.3** in [1] was used.

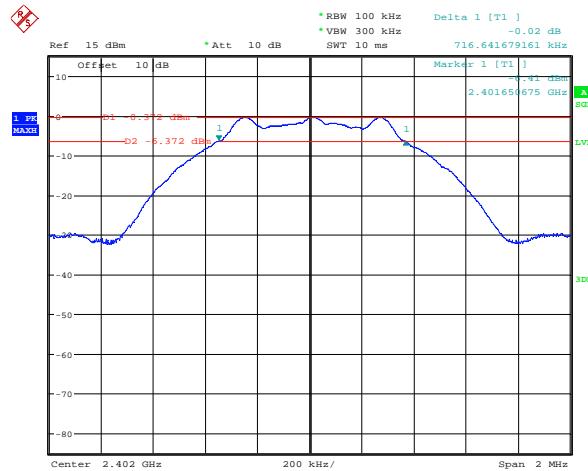
Only one representative plot for each measurement configuration is provided.

5.1.2 Test results

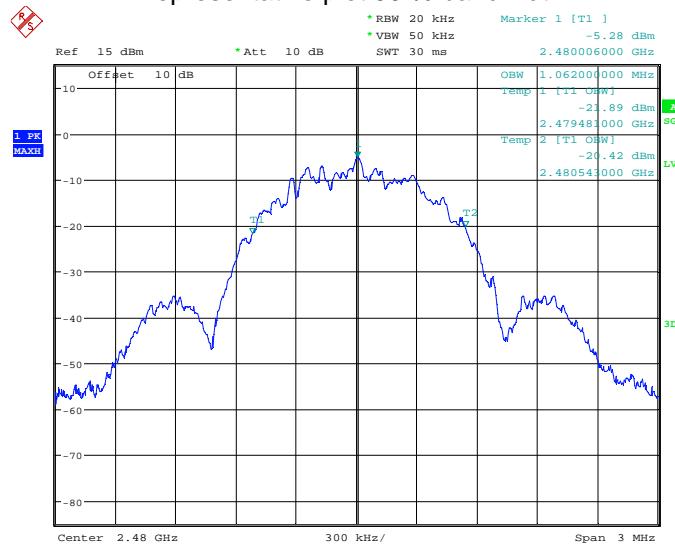
| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 53 % |

| | |
|-----------|------------|
| Date | 15.12.2020 |
| Tested by | B. ROHDE |

Representative plot DTS bandwidth



Representative plot 99 % bandwidth



| OP mode | Center Frequency [MHz] | Minimum 6-dB Bandwidth Limit [kHz] | 6 dB Bandwidth [kHz] | 99 % Bandwidth [kHz] | Result |
|---------|---------------------------|--|-------------------------|----------------------------|--------|
| 1 | 2402 | 500 | 716.6 | 1056.0 | Passed |
| 2 | 2440 | 500 | 713.6 | 1059.0 | Passed |
| 3 | 2480 | 500 | 707.6 | 1062.0 | Passed |

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
|--|

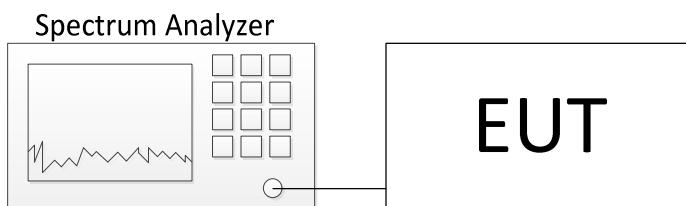
| |
|---|
| 1 |
|---|

5.2 Power spectral density

5.2.1 Method of measurement (conducted)

The measurements were done conducted at the antenna connector.

Test Setup:



Acceptable measurement configurations

See chapter 8.4 of document [3]

For the **Maximum peak power spectral density level in the fundamental emission** the Procedure **11.10.2** in [1] was used.

For the **Maximum average power spectral density level in the fundamental emission** the Procedure **11.10.5** in [1] was used.

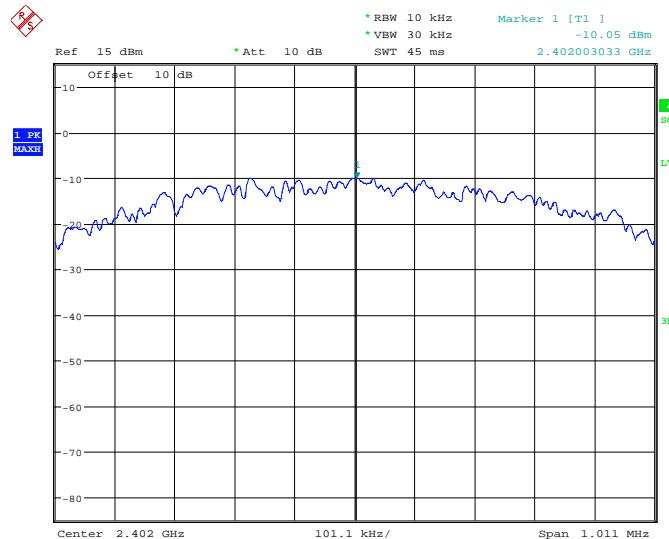
Only one representative plot for each measurement configuration is provided.

5.2.2 Test results

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 53 % |

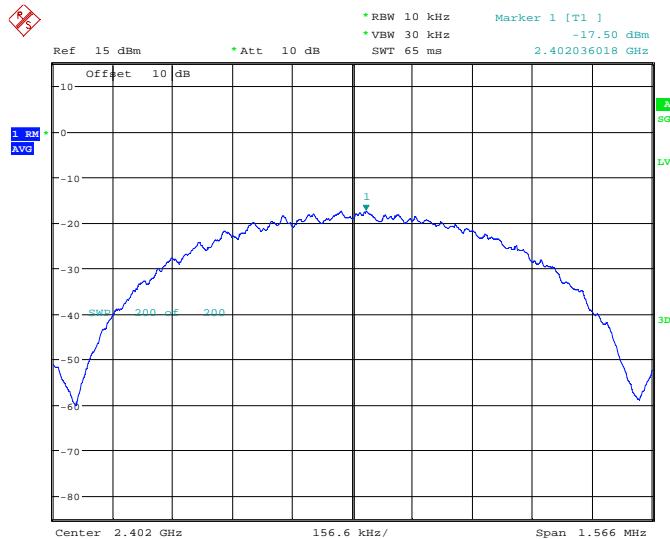
| | |
|-----------|------------|
| Date | 15.12.2020 |
| Tested by | B. ROHDE |

Maximum peak power spectral density level in the fundamental emission:



| OP mode | Peak Frequency [MHz] | Reading dBm / 10kHz | Corr. Fact. [dB] | PPSD [dBm / 10 kHz] | PSD Limit [dBm / 3 kHz] | Result |
|---------|----------------------|---------------------|------------------|---------------------|-------------------------|--------|
| 1 | 2402.003 | -10.1 | 0.2 | -9.9 | 8 | Passed |
| 2 | 2439.824 | -10.1 | 0.2 | -9.9 | 8 | Passed |
| 3 | 2479.824 | -10.2 | 0.2 | -10.0 | 8 | Passed |

Maximum average power spectral density level in the fundamental emission:



| OP mode | Peak Frequency [MHz] | Reading [dBm / 10kHz] | Corr. Fact. [dB] | DCCF [dB] | Result incl. DCCF [dBm / 10 kHz] | PSD Limit [dBm / 3 kHz] | Result |
|---------|----------------------|-----------------------|------------------|-----------|----------------------------------|-------------------------|--------|
| 1 | 2402.036 | -17.5 | 0.2 | 0.9 | -16.4 | 8 | Passed |
| 2 | 2440.035 | -17.5 | 0.2 | 0.9 | -16.4 | 8 | Passed |
| 3 | 2479.971 | -17.5 | 0.2 | 0.9 | -16.4 | 8 | Passed |

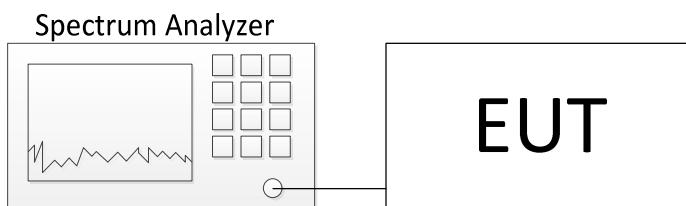
| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 1 |

5.3 Band edge

5.3.1 Method of measurement (conducted)

The measurements were done conducted at the antenna connector.

Test Setup:



Acceptable measurement configurations

See chapter 8.7 of document [3].

For the **Band-edge testing (unrestricted bands)** the Procedure 6.10.4 in [1] was used, see remarks of #59, table A2 of document [1].

For the **Band-edge testing (restricted bands)** the tests were done radiated.

Only one representative plot is provided.

5.3.2 Method of measurement (radiated)

The EUT was measured radiated in an anechoic chamber. For test setup and measurement configuration see 5.4.1

For the **Band-edge testing (restricted bands)** the 15.209 limits apply.

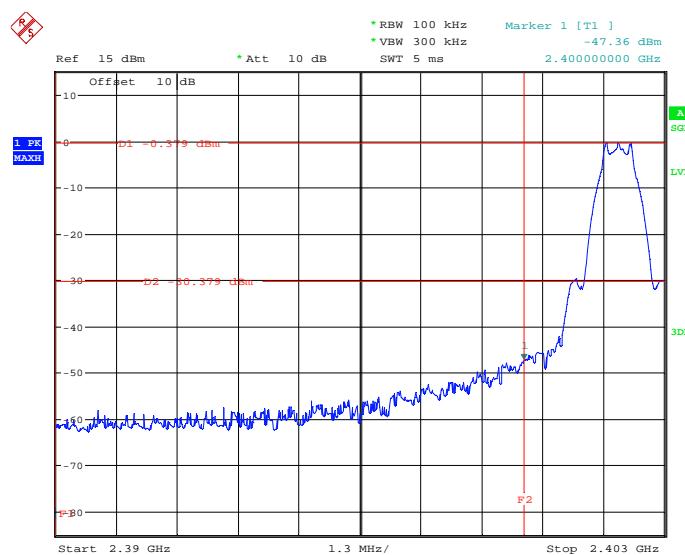
Only one representative plot is provided.

5.3.3 Test results

5.3.3.1 Band-edge testing (unrestricted bands; conducted):

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 53 % |

| | |
|-----------|------------|
| Date | 15.12.2020 |
| Tested by | B. ROHDE |



| Operation mode | Frequency [MHz] | Reference Level [dBm] | Limit [dBm] | Emission Level [dBm] | Margin [dB] | Result |
|----------------|-----------------|-----------------------|-------------|----------------------|-------------|--------|
| 1 | 2400.000 | -0.4 | -30.4 | -47.4 | 17.0 | Passed |

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
|--|

| |
|---|
| 1 |
|---|

5.3.3.2 Band-edge testing (restricted bands; radiated):

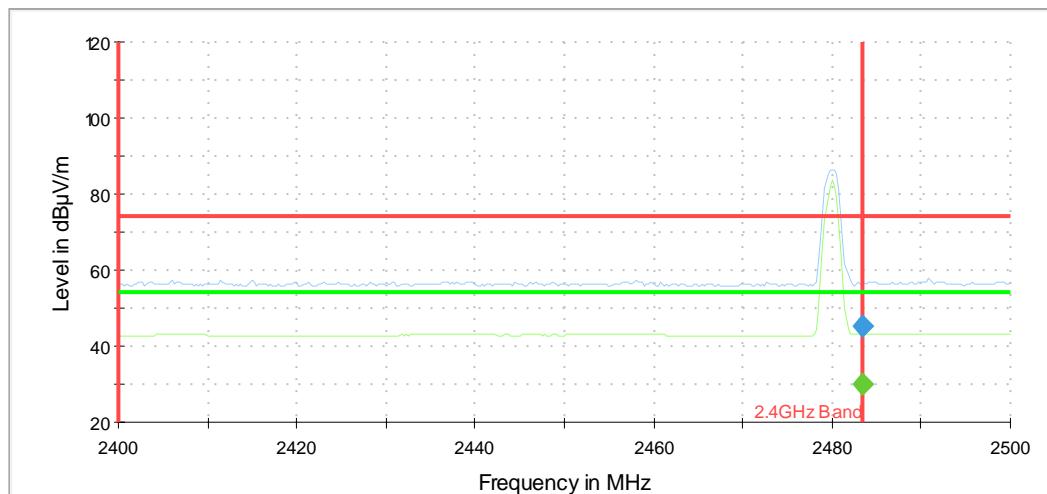
| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 31 % |

| | |
|-----------|------------|
| Date | 05.11.2020 |
| Tested by | B. ROHDE |

Operation mode 1:

Not tested, no emissions in the restricted band

Operation mode 3:



| Frequency [MHz] | Result (Pk) [dBμV/m] | Result (Av) [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Correction [dB] | Elevation [deg] | Azimuth [deg] | Pol. | Result |
|-------------------------|----------------------|----------------------|----------------|-------------|-----------------|-----------------|---------------|------|--------|
| 2483.500 | --- | 30.7 | 54 | 23.3 | 34.0 | 120 | 277 | H | Passed |
| 2483.500 | 45.0 | --- | 74 | 29.0 | 33.1 | 120 | 277 | H | Passed |
| Measurement uncertainty | | | | | +/- 4.79 dB | | | | |

Test equipment (please refer to chapter 6 for details)

2 - 9

5.4 Maximum unwanted emissions Maximum unwanted emissions

5.4.1 Method of measurement (radiated)

The radiated emission measurement is subdivided into six stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out on an outdoor test site without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A preliminary and final measurement carried out in a semi anechoic chamber with a varying antenna height in the frequency range 30 MHz to 1 GHz.
- A preliminary and final measurement carried out in a semi anechoic chamber with ground absorbers with a varying antenna height in the frequency range above 1 GHz.

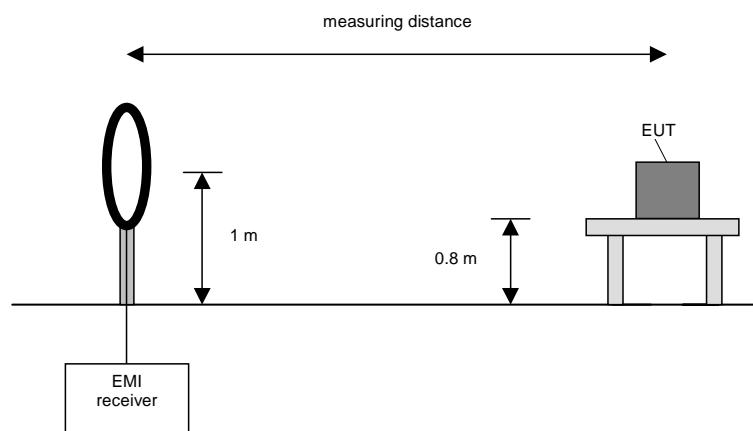
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Tabletop devices will set up on a non-conducting turn device on the height of 0.8 m. Floor-standing devices will be placed directly on the turntable/ground plane. The set-up of the Equipment under test will be in accordance to [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyzer while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to find the maximum emissions.

The resolution bandwidth of the spectrum analyzer will be set to the following values:

| Frequency range | Resolution bandwidth |
|-------------------|----------------------|
| 9 kHz to 150 kHz | 200 Hz |
| 150 kHz to 30 MHz | 9 kHz |



Preliminary measurement procedure:

Pre-scans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

Pre-scans were performed in the frequency range 30 MHz to 1 GHz.

The following procedure will be used:

1. Monitor the frequency range at horizontal polarization and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Repeat 1) to 3) with the vertical polarization of the measuring antenna.
5. Make a hardcopy of the spectrum.
6. Repeat 1) to 5) with the EUT raised by an angle of 0 ° (45°, 90°) according to 6.6.5.4 in [1].
7. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

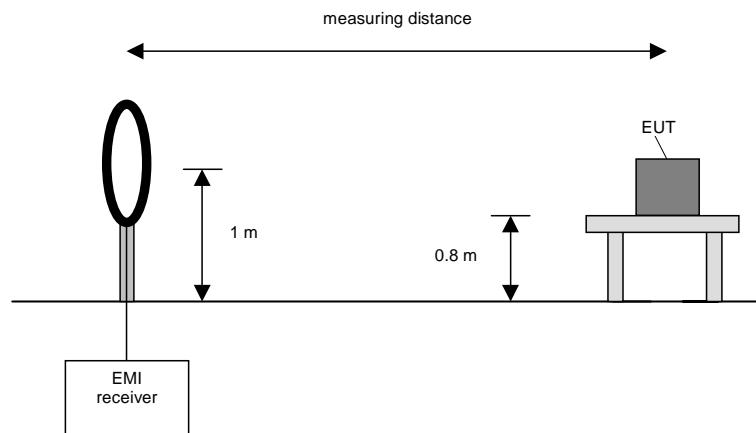
Final measurement (9 kHz to 30 MHz):

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in a measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

On the frequencies, which were detected during the preliminary measurements, the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|-------------------|----------------------|
| 9 kHz to 150 kHz | 200 Hz |
| 150 kHz to 30 MHz | 9 kHz |

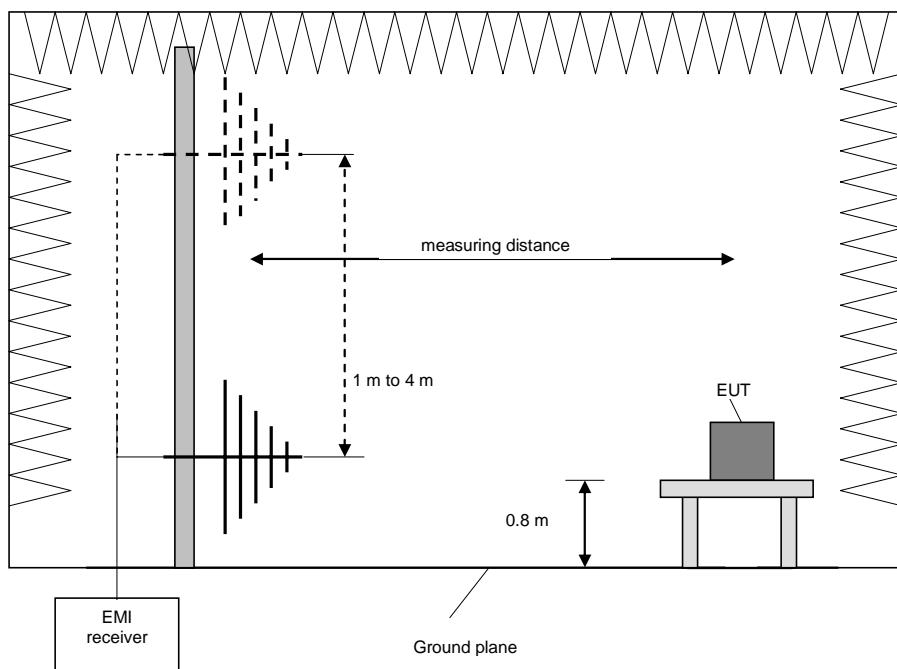


Preliminary and final measurement (30 MHz to 1 GHz)

The preliminary and final measurements were conducted in a semi-anechoic chamber with a metal ground plane. During the test the EUT will be rotated in the range of 0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarization and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Test | Frequency range | Resolution bandwidth | Step size | Measurement time |
|-------------------------|-----------------|----------------------|-----------|------------------|
| Preliminary measurement | 30 MHz to 1 GHz | 120 kHz | 40 kHz | 100 ms |
| Frequency peak search | 3 x RBW | 120 kHz | 10 kHz | 1000 ms |
| Final measurement | 30 MHz to 1 GHz | 120 kHz | - | 5 x 1000 ms |



Procedure preliminary measurement:

The following procedure is used:

1. Set the measurement antenna to 1 m height.
2. Monitor the frequency range at vertical polarization and a EUT azimuth of 0 °.
3. Rotate the EUT by 360° to maximize the detected signals.
4. Repeat 1) to 2) with the vertical polarization of the measuring antenna.
5. Increase the height of the antenna for 0.5 m and repeat steps 2 – 4 until the final height of 4 m is reached.
6. The highest values for each frequency will be saved by the software, including the antenna height, measurement antenna polarization and turntable azimuth for the highest value.

Procedure final measurement:

The following procedure is used:

1. Select the highest frequency peaks to the limit for the final measurement.
2. The software will determine the exact peak frequencies by doing a partial scan with reduced step size with +/- 3 times the RBW of the pre-scan of the selected peaks.
3. If the EUT is portable or ceiling mounted, find the worst case EUT orientation (x,y,z) for the final test.
4. The worst measurement antenna height is found by the measurement software by varying the measurement antenna height by +/- 0.5 m from the worst-case value obtained in the preliminary measurement, and to monitor the emission level.
5. The worst azimuth turntable position is found by varying the turntable azimuth by +/- 30° from the worst-case value obtained in the preliminary measurement, and to monitor the emission level.
6. The final measurement is performed at the worst-case antenna height and the worst-case turntable azimuth.
7. Steps 2 – 6 will be repeated for each frequency peak selected in step 1.

Preliminary and final measurement (1 GHz to 40 GHz)

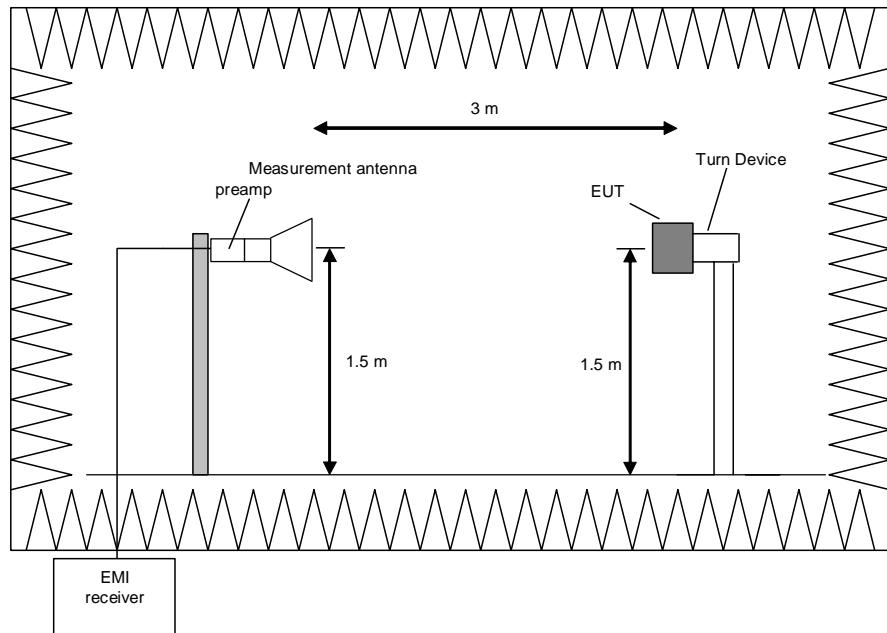
This measurement will be performed in a fully anechoic chamber. Table top devices will set up on a non-conducting turn device on the height of 1.5m. The set-up of the Equipment under test will be in accordance to [1].

Preliminary measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The spectrum analyser set to MAX Hold mode and a resolution bandwidth of 1 MHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated after raising the EUT in 30° steps according 6.6.5.4 in [1].

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|-------------------------|----------------------|
| 1 GHz to 4 GHz | 1 MHz |
| 4 GHz to 12 GHz | 1 MHz |
| 12 GHz to 18 GHz | 1 MHz |
| 18 GHz to 25 / 26.5 GHz | 1 MHz |
| 26.5 GHz to 40 GHz | 1 MHz |



Procedure preliminary measurement:

Pre-scans were performed in the frequency range 1 to 40 GHz.

The following procedure will be used:

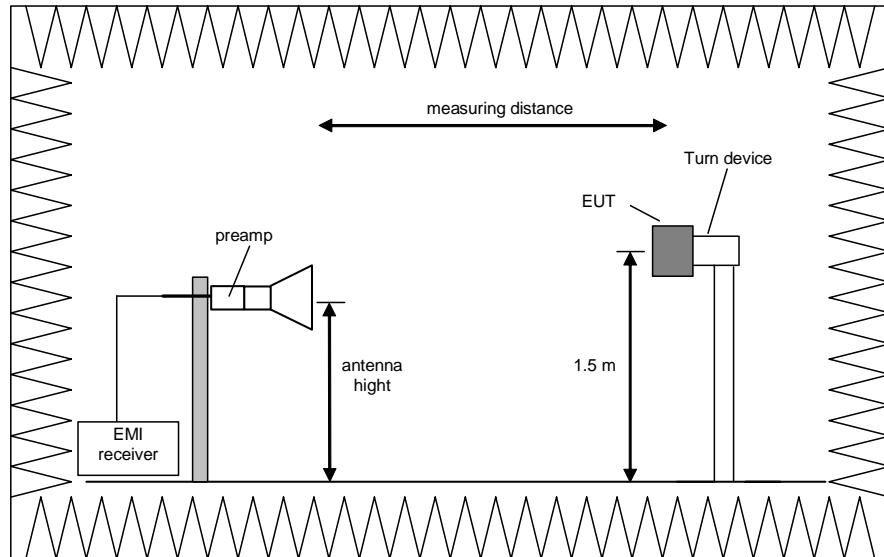
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarisation of the measuring antenna.
4. Make a hardcopy of the spectrum.
5. Repeat 1) to 4) with the EUT raised by an angle of 30° (60°, 90°, 120° and 150°) according to 6.6.5.4 in [1].
6. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
7. The measurement antenna polarisation, with the according EUT position (Turntable and Turn device) which produces the highest emission for each frequency will be used for the final measurement. The six closest values to the applicable limit will be used for the final measurement.

Final measurement (1 GHz to 40 GHz)

The frequency range will be divided into different sub ranges depending of the frequency range of the used antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1 MHz. The measurement will be performed by rotating the turntable through 0 to 360° in the worst-case EUT orientation which was obtained during the preliminary measurements.

The resolution bandwidth of the EMI Receiver will be set to the following values:

| Frequency range | Resolution bandwidth |
|-------------------------|----------------------|
| 1 GHz to 4 GHz | 1 MHz |
| 4 GHz to 12 GHz | 1 MHz |
| 12 GHz to 18 GHz | 1 MHz |
| 18 GHz to 25 / 26.5 GHz | 1 MHz |
| 26.5 GHz to 40 GHz | 1 MHz |



Procedure of measurement:

The measurements were performed in the frequency ranges 1 GHz to 4 GHz, 4 GHz to 12 GHz, 12 GHz to 18 GHz, 18 GHz to 25 /26.5 GHz and 26.5 GHz to 40 GHz.

The following procedure will be used:

- 1) Set the turntable and the turn device to obtain the worst-case emission for the first frequency identified in the preliminary measurements.
- 2) Set the measurement antenna polarisation to the orientation with the highest emission for the first frequency identified in the preliminary measurements.
- 3) Set the spectrum analyser to EMI mode with peak and average detector activated.
- 4) Rotate the turntable from 0° to 360° to find the TT Pos. that produces the highest emissions.
- 5) Note the highest displayed peak and average values
- 6) Repeat the steps 1) to 5) for each frequency detected during the preliminary measurements.

5.4.2 Test results (radiated)

5.4.2.1 Test results (9 kHz – 30 MHz)

| | |
|---------------------|-------|
| Ambient temperature | 23 °C |
| Relative humidity | 70 % |

| | |
|-----------|------------|
| Date | 13.11.2020 |
| Tested by | B. ROHDE |

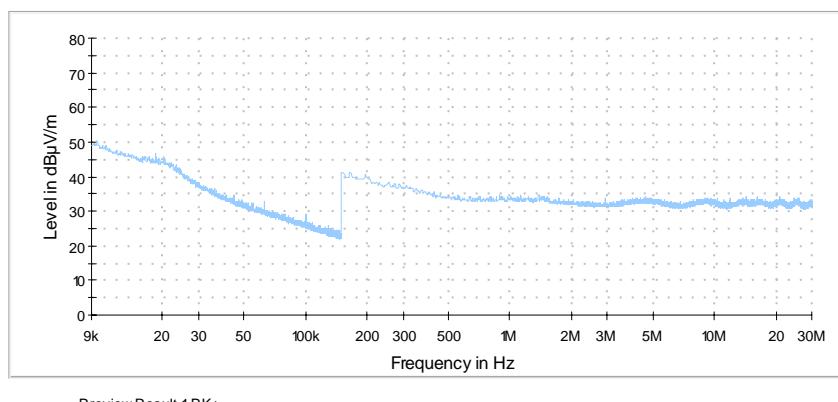
Position of EUT: For tests for f between 9 kHz and 30 MHz, the EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: As shown below

5.4.2.1.1 Plots

9k-30M: Spurious emissions from 9 kHz to 30 MHz (Operation mode 4)



5.4.2.1.2 Result table

All emissions are more the 20 dB from the limit, so no final measurement was conducted.

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 2 - 7, 10 - 11 |

5.4.2.2 Test results (30 MHz – 1 GHz)

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 34 % |

| | |
|-----------|----------------------|
| Date | 09.11.2020 |
| Tested by | B. ROHDE / Y. KHALEK |

Position of EUT: The EUT was set-up on a table with a height of 80 cm. The distance between EUT and antenna was 3 m.

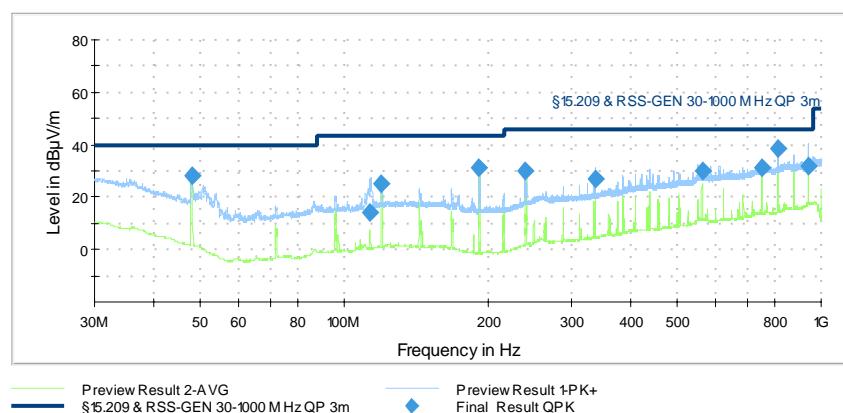
Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Only the worst-case plot is submitted below.

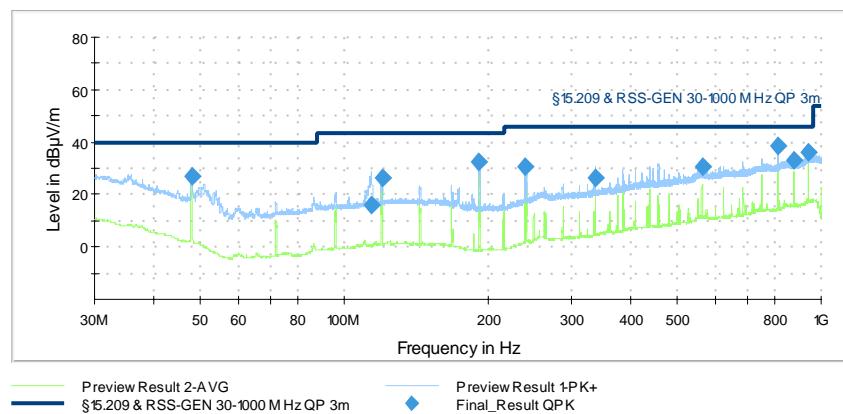
Remark: -

5.4.2.2.1 Plots

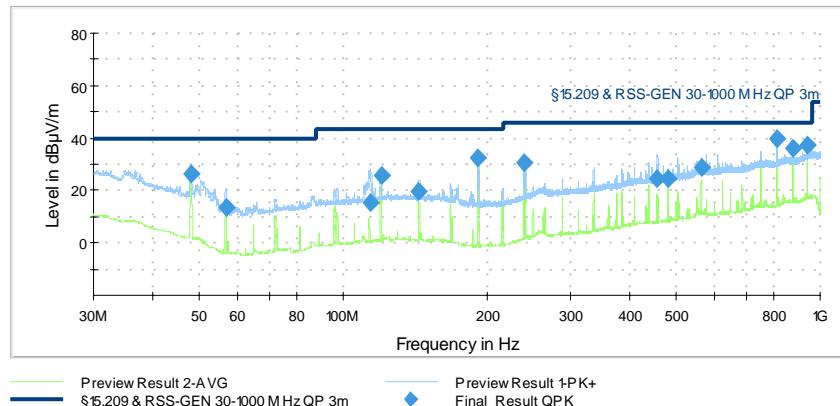
Spurious emissions from 30 MHz to 1 GHz (operation mode 4):



Spurious emissions from 30 MHz to 1 GHz (operation mode 5):



Spurious emissions from 30 MHz to 1 GHz (operation mode 6):



5.4.2.2.2 Result tables

Result table (operation mode 4):

| Frequency [MHz] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Readings [dBμV] | Correction [dB/m] | Height [cm] | Azimuth [deg] | Pol. | Result |
|-------------------------|-----------------|----------------|-------------|-----------------|-------------------|-------------|---------------|------|--------|
| 48.010000 | 27.9 | 40 | 12.1 | 9.0 | 18.9 | 100 | 197 | V | Passed |
| 113.690000 | 14.4 | 43.52 | 29.1 | -3.2 | 17.6 | 102 | 197 | V | Passed |
| 119.970000 | 25.1 | 43.52 | 18.4 | 6.8 | 18.3 | 102 | 193 | V | Passed |
| 192.150000 | 31.4 | 43.52 | 12.1 | 15.4 | 15.9 | 100 | 240 | H | Passed |
| 240.400000 | 30.1 | 46.02 | 15.9 | 11.4 | 18.6 | 138 | 91 | H | Passed |
| 335.710000 | 27.0 | 46.02 | 19.0 | 5.3 | 21.7 | 104 | 169 | V | Passed |
| 562.510000 | 30.1 | 46.02 | 15.9 | 1.7 | 28.4 | 315 | 133 | H | Passed |
| 750.000000 | 31.0 | 46.02 | 15.0 | 0.3 | 30.7 | 124 | 176 | V | Passed |
| 812.500000 | 38.5 | 46.02 | 7.5 | 7.6 | 30.8 | 100 | 140 | V | Passed |
| 937.490000 | 32.1 | 46.02 | 13.9 | -1.3 | 33.4 | 100 | 33 | H | Passed |
| Measurement uncertainty | | | | ±5.5 dB | | | | | |

Result table (operation mode 5):

| Frequency [MHz] | Result [dB μ V/m] | Limit [dB μ V/m] | Margin [dB] | Readings [dB μ V] | Correction [dB/m] | Height [cm] | Azimuth [deg] | Pol. | Result |
|-------------------------|--------------------------|-------------------------|----------------|--------------------------|----------------------|----------------|------------------|------|--------|
| 48.060000 | 26.8 | 40 | 13.2 | 8.0 | 18.9 | 102 | 197 | V | Passed |
| 114.030000 | 15.7 | 43.52 | 27.8 | -2.0 | 17.7 | 150 | 180 | V | Passed |
| 120.050000 | 26.2 | 43.52 | 17.3 | 7.9 | 18.3 | 102 | 179 | V | Passed |
| 192.130000 | 32.2 | 43.52 | 11.3 | 16.3 | 15.9 | 159 | 242 | H | Passed |
| 239.770000 | 30.4 | 46.02 | 15.6 | 11.8 | 18.6 | 137 | 254 | H | Passed |
| 335.900000 | 26.4 | 46.02 | 19.6 | 4.7 | 21.7 | 102 | 192 | V | Passed |
| 562.510000 | 30.3 | 46.02 | 15.7 | 1.9 | 28.4 | 315 | 152 | H | Passed |
| 812.500000 | 38.4 | 46.02 | 7.6 | 7.6 | 30.8 | 102 | 135 | V | Passed |
| 875.000000 | 33.2 | 46.02 | 12.8 | 1.5 | 31.8 | 172 | 50 | H | Passed |
| 937.500000 | 36.2 | 46.02 | 9.8 | 2.8 | 33.4 | 143 | 212 | H | Passed |
| Measurement uncertainty | | | | ± 5.5 dB | | | | | |

Result table (operation mode 6):

| Frequency [MHz] | Result [dB μ V/m] | Limit [dB μ V/m] | Margin [dB] | Readings [dB μ V] | Correction [dB/m] | Height [cm] | Azimuth [deg] | Pol. | Result |
|-------------------------|--------------------------|-------------------------|----------------|--------------------------|----------------------|----------------|------------------|------|--------|
| 48.120000 | 26.6 | 40 | 13.4 | 7.8 | 18.8 | 100 | 210 | V | Passed |
| 56.790000 | 13.8 | 40 | 26.2 | 0.3 | 13.4 | 230 | 287 | V | Passed |
| 113.950000 | 15.5 | 43.52 | 28.0 | -2.1 | 17.7 | 115 | 185 | V | Passed |
| 120.040000 | 25.7 | 43.52 | 17.8 | 7.4 | 18.3 | 102 | 180 | V | Passed |
| 143.920000 | 19.5 | 43.52 | 24.0 | 1.0 | 18.5 | 207 | 94 | H | Passed |
| 191.900000 | 32.2 | 43.52 | 11.3 | 16.2 | 15.9 | 184 | 242 | H | Passed |
| 239.940000 | 30.6 | 46.02 | 15.4 | 12.0 | 18.6 | 130 | 274 | H | Passed |
| 456.550000 | 24.6 | 46.02 | 21.4 | -0.5 | 25.1 | 102 | 185 | V | Passed |
| 480.020000 | 24.7 | 46.02 | 21.3 | -1.0 | 25.6 | 104 | 188 | V | Passed |
| 562.510000 | 29.0 | 46.02 | 17.0 | 0.5 | 28.4 | 100 | 103 | V | Passed |
| 812.500000 | 39.6 | 46.02 | 6.4 | 8.8 | 30.8 | 129 | 123 | V | Passed |
| 875.000000 | 36.1 | 46.02 | 9.9 | 4.4 | 31.8 | 170 | 311 | H | Passed |
| 937.500000 | 37.4 | 46.02 | 8.6 | 4.0 | 33.4 | 143 | 229 | H | Passed |
| Measurement uncertainty | | | | ± 5.5 dB | | | | | |

Test equipment (please refer to chapter 6 for details)

12 - 19

5.4.2.3 Test results (above 1 GHz)

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 31 % |

| | |
|-----------|------------|
| Date | 05.11.2020 |
| Tested by | B. ROHDE |

Position of EUT: For tests for f between 1 GHz and the 10th harmonic, the EUT was set-up on a table with a height of 150 cm. The distance between EUT and antenna was 3 m.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

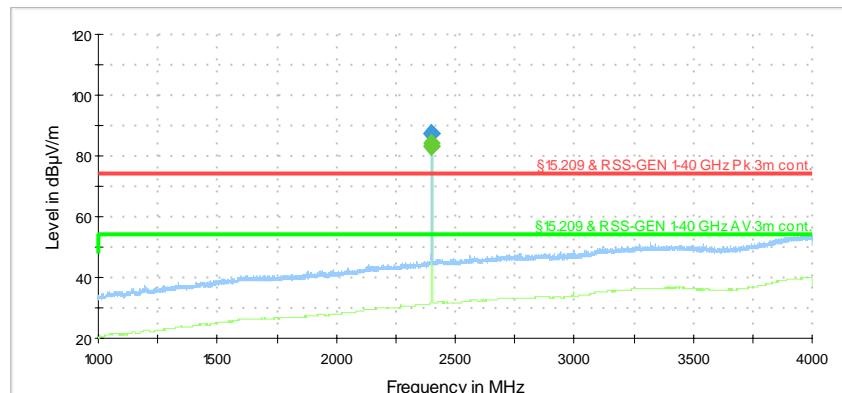
Test record: As submitted below.

Remark: -

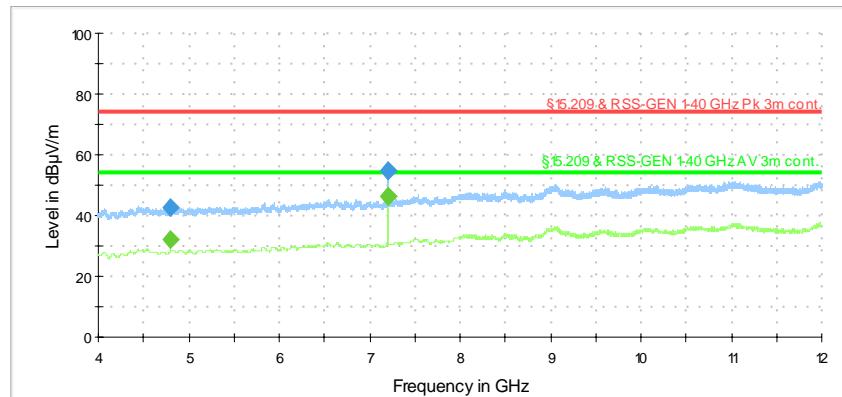
5.4.2.3.1 Plots

5.4.2.3.1.1 Operation mode 4

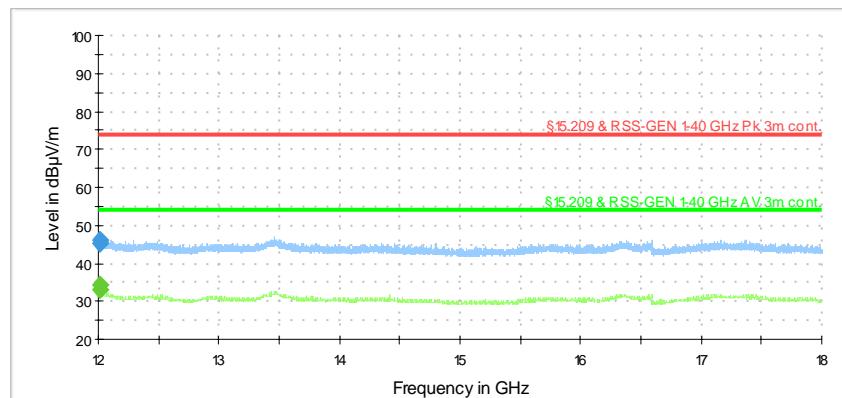
Spurious emissions from 1 GHz to 4 GHz



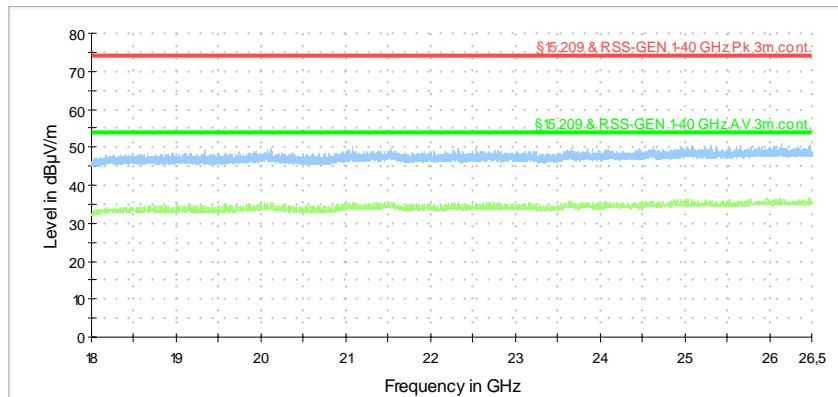
Spurious emissions from 4 GHz to 12 GHz



Spurious emissions from 12 GHz to 18 GHz

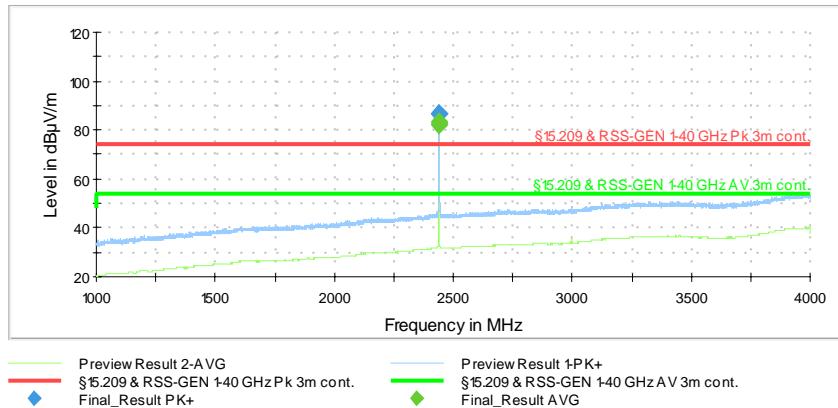


Spurious emissions from 18 GHz to 26.5 GHz

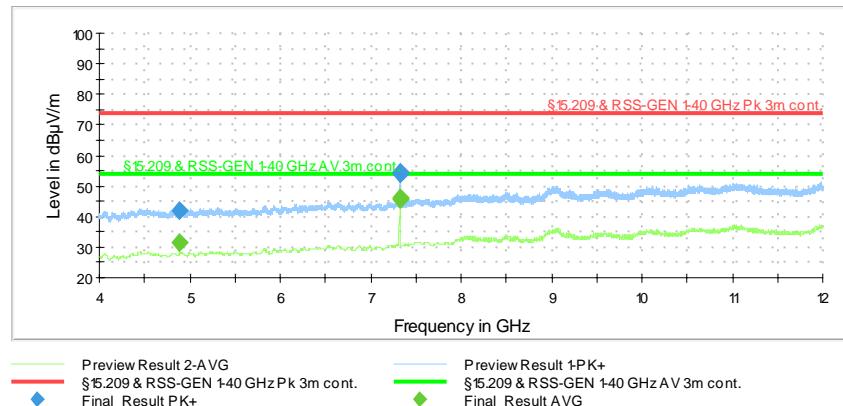


5.4.2.3.1.2 Operation mode 5

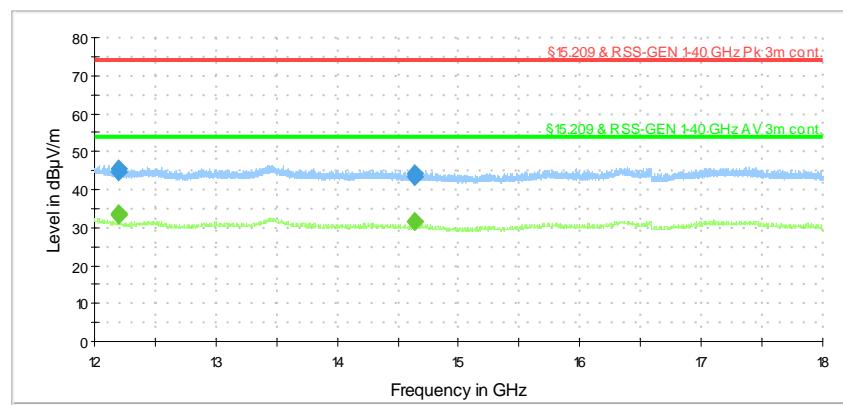
Spurious emissions from 1 GHz to 4 GHz



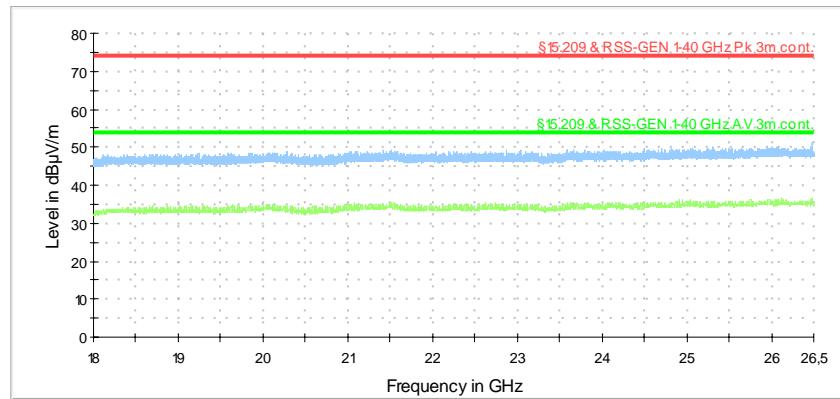
Spurious emissions from 4 GHz to 12 GHz



Spurious emissions from 12 GHz to 18 GHz

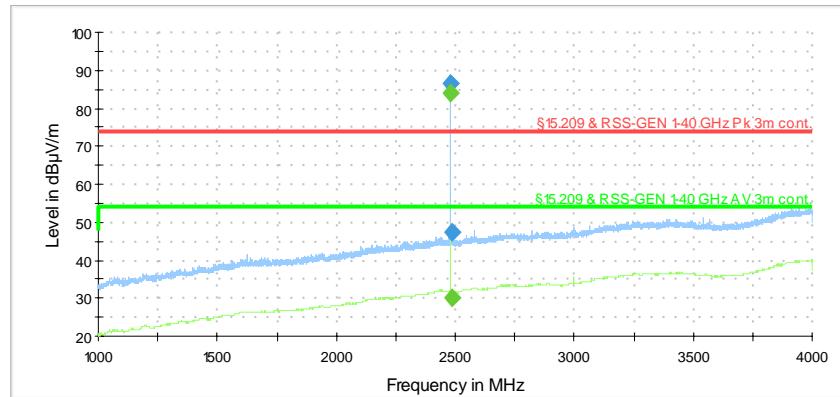


Spurious emissions from 18 GHz to 26.5 GHz

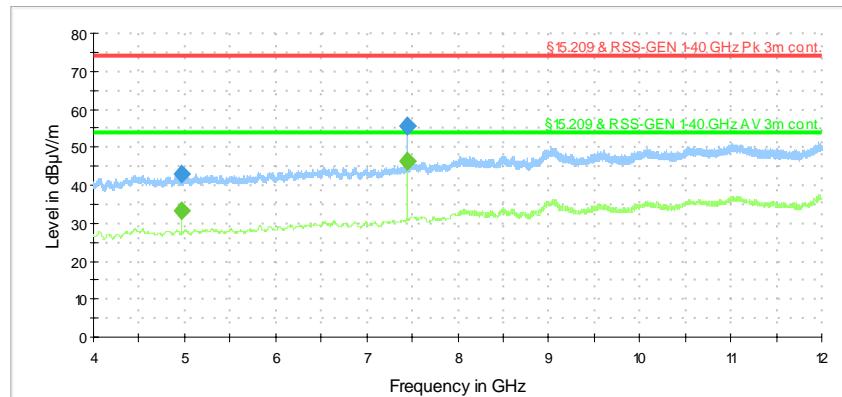


5.4.2.3.1.3 Operation mode 6

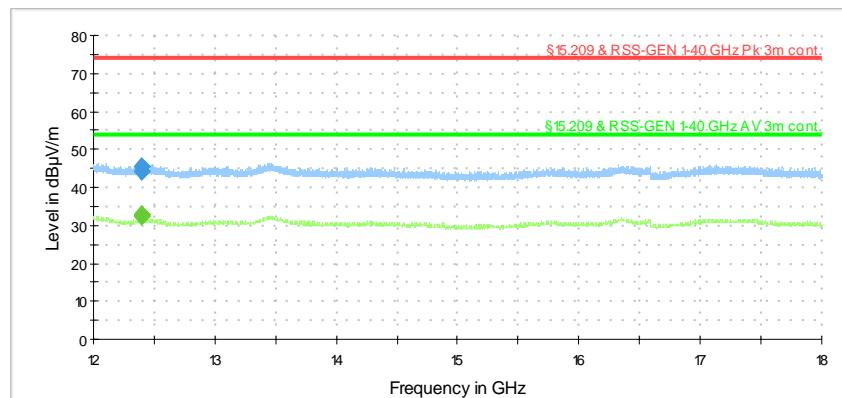
Spurious emissions from 1 GHz to 4 GHz



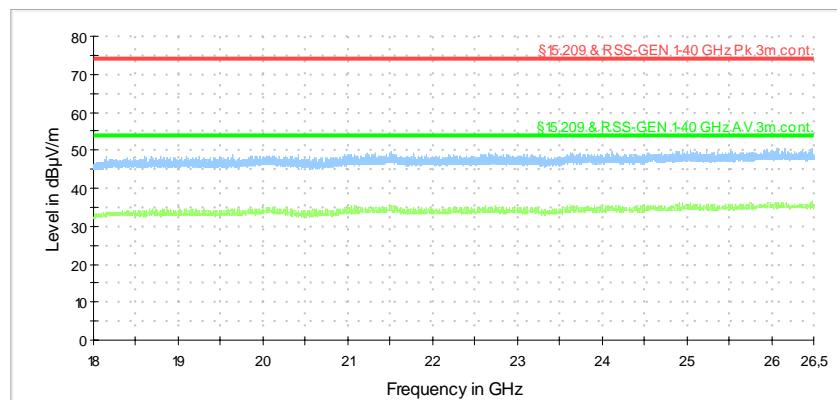
Spurious emissions from 4 GHz to 12 GHz



Spurious emissions from 12 GHz to 18 GHz



Spurious emissions from 18 GHz to 26.5 GHz



5.4.2.3.2 Result tables

Result table operation mode 4:

| Frequency [MHz] | MaxPeak [dB μ V/m] | Average [dB μ V/m] | Limit [dB μ V/m] | Margin (dB) | Pol | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Result |
|-------------------------|---------------------------|---------------------------|-------------------------|----------------|------|------------------|--------------------|---------------|--------|
| 2401.750000 | 87.2 | --- | Fund. | - | 33.1 | 0 | 56 | H | Fund. |
| 2401.750000 | --- | 84.0 | Fund. | - | 34.0 | 0 | 56 | H | Fund. |
| 2402.000000 | --- | 85.3 | Fund. | - | 34.0 | 0 | 56 | H | Fund. |
| 2402.000000 | 87.2 | --- | Fund. | - | 33.1 | 0 | 56 | H | Fund. |
| 2402.250000 | --- | 84.1 | Fund. | - | 34.0 | 0 | 57 | H | Fund. |
| 2402.250000 | 87.3 | --- | Fund. | - | 33.1 | 0 | 57 | H | Fund. |
| 4804.000000 | --- | 33.0 | 54 | 21.0 | -1.5 | 150 | 206 | H | Passed |
| 4804.000000 | 42.6 | --- | 74 | 31.4 | -2.4 | 150 | 206 | H | Passed |
| 7205.500000 | --- | 47.5 | 54 | 6.5 | 4.5 | 60 | 127 | H | Passed |
| 7205.500000 | 54.7 | --- | 74 | 19.3 | 3.6 | 60 | 127 | H | Passed |
| 7206.500000 | --- | 47.4 | 54 | 6.6 | 4.5 | 60 | 128 | H | Passed |
| 7206.500000 | 54.8 | --- | 74 | 19.2 | 3.6 | 60 | 128 | H | Passed |
| 12008.750000 | 45.3 | --- | 74 | 28.7 | 12.1 | 120 | 287 | V | Passed |
| 12008.750000 | --- | 33.9 | 54 | 20.1 | 13.0 | 120 | 287 | V | Passed |
| 12011.250000 | 45.9 | --- | 74 | 28.1 | 12.1 | 0 | 105 | H | Passed |
| 12011.250000 | --- | 35.2 | 54 | 18.8 | 13.0 | 0 | 105 | H | Passed |
| Measurement uncertainty | | | | +/- 4.79 dB | | | | | |

Result table operation mode 5:

| Frequency [MHz] | MaxPeak [dB μ V/m] | Average [dB μ V/m] | Limit [dB μ V/m] | Margin (dB) | Pol | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Result |
|-------------------------|---------------------------|---------------------------|-------------------------|----------------|------|------------------|--------------------|---------------|--------|
| 2439.750000 | 86.6 | --- | Fund. | - | 33.4 | 0 | 55 | H | Fund. |
| 2439.750000 | --- | 83.4 | Fund. | - | 34.3 | 0 | 55 | H | Fund. |
| 2440.000000 | --- | 84.6 | Fund. | - | 34.4 | 0 | 56 | H | Fund. |
| 2440.000000 | 86.6 | --- | Fund. | - | 33.5 | 0 | 56 | H | Fund. |
| 2440.250000 | --- | 83.4 | Fund. | - | 34.4 | 0 | 56 | H | Fund. |
| 2440.250000 | 86.6 | --- | Fund. | - | 33.5 | 0 | 56 | H | Fund. |
| 4880.000000 | --- | 32.3 | 54 | 21.7 | -1.1 | 30 | 137 | H | Passed |
| 4880.000000 | 42.0 | --- | 74 | 32.0 | -2.0 | 30 | 137 | H | Passed |
| 7319.500000 | --- | 46.8 | 54 | 7.2 | 4.9 | 0 | 108 | H | Passed |
| 7319.500000 | 54.2 | --- | 74 | 19.8 | 4.0 | 0 | 108 | H | Passed |
| 7320.500000 | --- | 47.0 | 54 | 7.0 | 4.9 | 0 | 104 | H | Passed |
| 7320.500000 | 54.3 | --- | 74 | 19.7 | 4.0 | 0 | 104 | H | Passed |
| 12199.000000 | 44.6 | --- | 74 | 29.4 | 11.9 | 150 | 232 | V | Passed |
| 12199.000000 | --- | 34.0 | 54 | 20.0 | 12.8 | 150 | 232 | V | Passed |
| 12201.250000 | 45.4 | --- | 74 | 28.6 | 11.9 | 150 | 228 | V | Passed |
| 12201.250000 | --- | 34.6 | 54 | 19.4 | 12.8 | 150 | 228 | V | Passed |
| 14638.500000 | 44.2 | --- | 74 | 29.8 | 11.4 | 0 | 134 | V | Passed |
| 14638.500000 | --- | 32.6 | 54 | 21.4 | 12.3 | 0 | 134 | V | Passed |
| 14641.500000 | 43.5 | --- | 74 | 30.5 | 11.4 | 0 | 140 | V | Passed |
| 14641.500000 | --- | 32.5 | 54 | 21.5 | 12.3 | 0 | 140 | V | Passed |
| Measurement uncertainty | | | | +/- 4.79 dB | | | | | |

Result table operation mode 6:

| Frequency [MHz] | MaxPeak [dB μ V/m] | Average [dB μ V/m] | Limit [dB μ V/m] | Margin (dB) | Pol | Azimuth (deg) | Elevation (deg) | Corr. (dB) | Result |
|-------------------------|---------------------------|---------------------------|-------------------------|----------------|------|------------------|--------------------|---------------|--------|
| 2480.000000 | --- | 84.7 | Fund. | - | 34.0 | 30 | 67 | H | Fund. |
| 2480.000000 | 86.7 | --- | Fund. | - | 33.1 | 30 | 67 | H | Fund. |
| 2483.500000 | 47.6 | --- | 74 | 26.4 | 33.1 | 30 | 68 | H | Passed |
| 2483.500000 | --- | 30.9 | 54 | 23.1 | 34.0 | 30 | 68 | H | Passed |
| 4960.000000 | 43.0 | --- | 74 | 31.0 | -2.1 | 0 | 198 | H | Passed |
| 4960.000000 | --- | 34.1 | 54 | 19.9 | -1.2 | 0 | 198 | H | Passed |
| 7439.250000 | 55.5 | --- | 74 | 18.5 | 4.3 | 120 | 131 | V | Passed |
| 7439.250000 | --- | 47.3 | 54 | 6.7 | 5.2 | 120 | 131 | V | Passed |
| 7440.750000 | 55.4 | --- | 74 | 18.6 | 4.3 | 120 | 131 | V | Passed |
| 7440.750000 | --- | 47.2 | 54 | 6.8 | 5.2 | 120 | 131 | V | Passed |
| 12398.750000 | --- | 33.6 | 54 | 20.4 | 13.0 | 120 | 201 | V | Passed |
| 12398.750000 | 44.4 | --- | 74 | 29.6 | 12.1 | 120 | 201 | V | Passed |
| 12401.250000 | --- | 33.9 | 54 | 20.1 | 13.0 | 120 | 202 | V | Passed |
| 12401.250000 | 45.5 | --- | 74 | 28.5 | 12.1 | 120 | 202 | V | Passed |
| Measurement uncertainty | | | +/- 4.79 dB | | | | | | |

| |
|--|
| Test equipment (please refer to chapter 6 for details) |
| 2 - 10, 20 - 26 |

6 Test Equipment used for Tests

| No. | Test equipment | Type | Manufacturer | Serial No. | PM. No. | Cal. Date | Cal Due |
|-----|----------------------------------|--------------------------|---|--------------------------|---------|---------------------------|---------|
| 1 | Spectrum Analyser | FSU46 | Rohde & Schwarz | 200125 | 480956 | 13.02.2020 | 02.2021 |
| 2 | Fully anechoic chamber M20 | B83117-E2439-T232 | Albatross Projects | 103 | 480303 | Calibration not necessary | |
| 3 | Turntable | DS420 HE | Deisel | 420/620/00 | 480315 | Calibration not necessary | |
| 4 | Antenna support | AS620P | Deisel | 620/375 | 480325 | Calibration not necessary | |
| 5 | Multiple Control Unit | MCU | Maturo GmbH | MCU/043/97110 7 | 480832 | Calibration not necessary | |
| 6 | Positioners | TDF 1.5- 10Kg | Maturo | 15920215 | 482034 | Calibration not necessary | |
| 7 | EMI Receiver / Spectrum Analyser | ESW44 | Rohde & Schwarz | 101635 | 482467 | 18.02.2020 | 02.2022 |
| 8 | RF cable | SF106B/11N/11 N/4500.0 | Huber & Suhner | 500218/6B | 482415 | Calibration not necessary | |
| 9 | Log.-Per. antenna | HL050 | Rohde & Schwarz | 100908 | 482977 | 13.08.2019 | 08.2022 |
| 10 | Testsoftware M20 | EMC32 | Rohde & Schwarz | | 483261 | Calibration not necessary | |
| 11 | Loop antenna | HFH2-Z2 | Rohde & Schwarz | 100417 | 481912 | 05.02.2020 | 02.2021 |
| 12 | RF Switch Matrix | OSP220 | Rohde & Schwarz | | 482976 | Calibration not necessary | |
| 13 | Turntable | TT3.0-3t | Maturo | 825/2612/.01 | 483224 | Calibration not necessary | |
| 14 | Antennasupport | BAM 4.5-P-10kg | Maturo | 222/2612.01 | 483225 | Calibration not necessary | |
| 15 | Controller | NCD | Maturo | 474/2612.01 | 483226 | Calibration not necessary | |
| 16 | Semi Anechoic Chamber M276 | SAC5-2 | Albatross Projects | C62128-A540-A138-10-0006 | 483227 | Calibration not necessary | |
| 17 | Testsoftware 276 | EMC32 | Rohde & Schwarz | 100970 | 482972 | Calibration not necessary | |
| 18 | EMI Testreceiver | ESW44 | Rohde & Schwarz | 101828 | 482979 | 14.11.2019 | 11.2021 |
| 19 | Antenne (Bilog) | CBL6111D | Schaffner Elektrotest GmbH / Teseq GmbH | 22921 | 480674 | 27.03.2018 | 03.2021 |
| 20 | Standard gain horn antenna | 18240-20 | Flann Microwave | 483 | 480294 | Calibration not necessary | |
| 21 | Preamplifier 12 GHz - 18 GHz | JS3-12001800-16-5A | MITEQ Hauppauge N.Y. | 571667 | 480343 | 13.02.2020 | 02.2022 |
| 22 | Standard gain horn antenna | 20240-20 | Flann Microwave | 411 | 480297 | Calibration not necessary | |
| 23 | Preamplifier 18 GHz - 26 GHz | JS4-18002600-20-5A | MITEQ Hauppauge N.Y. | 658697 | 480342 | 13.02.2020 | 02.2022 |
| 24 | Highpass Filter | WHK2.8/18G-10SS | Wainwright Instuments GmbH | 1 | 480867 | Calibration not necessary | |
| 25 | Microwave cable 2m | Insulated Wire Inc. | Insulated Wire | KPS-1533-800-KPS | 480302 | Calibration not necessary | |
| 26 | Preamplifier 100 MHz - 16 GHz | AFS6-00101600-23-10P-6-R | Narda MITEQ | 2011215 | 482333 | 13.02.2020 | 02.2022 |

7 Test site Validation

| Test equipment | PM. No. | Frequency range | Type of validation | According to | Val. Date | Val Due |
|-------------------------------|---------|-----------------|--------------------|---|------------|------------|
| Semi anechoic chamber M276 | 483227 | 30 – 1000 MHz | NSA | ANSI C63.4-2017 | 19.09.2019 | 18.09.2021 |
| Fully anechoic chamber M20 | 480303 | 1 -18 GHz | SVSWR | CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017 | 24.08.2020 | 23.08.2022 |

8 Report History

| Report Number | Date | Comment |
|---------------|------------|---------------------|
| F200776E4 | 16.02.2021 | Initial Test Report |
| - | - | - |
| - | - | - |

9 List of Annexes

| | | |
|---------|-------------------|----------|
| Annex A | Test Setup Photos | 13 pages |
| Annex B | External Photos | 5 pages |
| Annex C | Internal Photos | 8 pages |