

Königswinkel 10
32825 Blomberg, Germany
Phone: +49 (0) 52 35 / 95 00-0
Fax: +49 (0) 52 35 / 95 00-10
office@phoenix-testlab.de
www.phoenix-testlab.de

Test Report

Report Number:

F200549E2

Equipment under Test (EUT):

omlox SmartAntenna

Applicant:

BeSpoon SAS

Manufacturer:

BeSpoon SAS



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] **393764 D01 UWB FAQ v02**, ULTRA-WIDEBAND (UWB) DEVICES FREQUENTLY ASKED QUESTIONS

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:

Thomas KÜHN



17.11.2020

Name

Signature

Date

Reviewed and
approved by:

Bernd STEINER



17.11.2020

Name

Signature

Date

This test report is only valid in its original form.

Any reproduction of its contents in extracts without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents:

| | Page |
|---|------|
| 1 Identification | 4 |
| 1.1 Applicant..... | 4 |
| 1.2 Manufacturer | 4 |
| 1.3 Test laboratory | 4 |
| 1.4 EUT (Equipment Under Test)..... | 5 |
| 1.5 Technical data of equipment..... | 5 |
| 1.6 Dates | 6 |
| 2 Operational states | 6 |
| 3 Additional information | 7 |
| 4 Overview..... | 7 |
| 5 Test results | 8 |
| 5.1 10 dB bandwidth | 8 |
| 5.1.1 Method of measurement (10 dB bandwidth)..... | 8 |
| 5.1.2 Test results (10 dB bandwidth) | 9 |
| 5.2 Peak level of transmission | 12 |
| 5.2.1 Method of measurement (peak level of transmission)..... | 12 |
| 5.2.2 Test results (peak level of transmission) | 12 |
| 5.3 Radiated emissions..... | 15 |
| 5.3.1 Method of measurement (radiated emissions) | 15 |
| 5.3.2 Test results (radiated emissions) | 20 |
| 5.3.2.1 Preliminary radiated emission measurement (9 kHz to 40 GHz) | 20 |
| 5.3.2.2 Final radiated emission measurement (30 MHz to 1 GHz) | 42 |
| 5.3.2.3 Final radiated emission measurement (1 GHz to 40 GHz)..... | 43 |
| 5.4 Conducted emissions on power supply lines (150 kHz to 30 MHz)..... | 45 |
| 5.4.1 Method of measurement | 45 |
| 5.4.2 Test results (conducted emissions on power supply lines) | 46 |
| 6 Test equipment and ancillaries used for tests..... | 47 |
| 7 Test site Validation | 48 |
| 8 Report history | 48 |
| 9 List of annexes | 48 |

1 Identification

1.1 Applicant

| | |
|--|---|
| Name: | BeSpoon SAS |
| Address: | 17 rue du lac Saint-André – Savoie Technolac – BP10402 73372 Le Bourget du Lac |
| Country: | France |
| Name for contact purposes: | Mr. Jean-Marie ANDRE |
| Phone: | +33 458 82 88 86 |
| Fax: | +33 458 82 88 83 |
| eMail Address: | contact@bespoon.com |
| Applicant represented during the test by the following person: | --- |

1.2 Manufacturer

| | |
|---|---|
| Name: | BeSpoon SAS |
| Address: | 17 rue du lac Saint-André – Savoie Technolac – BP10402 73372 Le Bourget du Lac |
| Country: | France |
| Name for contact purposes: | Mr. Jean-Marie ANDRE |
| Phone: | +33 458 82 88 86 |
| Fax: | +33 458 82 88 83 |
| eMail Address: | contact@bespoon.com |
| Manufacturer represented during the test by the following person: | --- |

1.3 Test laboratory

The tests were carried out at:

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 Designation Number DE0004, FCC Test Firm Registration Number 469623.

1.4 EUT (Equipment Under Test)

| | |
|--|-----------------------------|
| Test object: * | Tag for indoor localization |
| Model name: * | omlox SmartAntenna |
| FCC ID: * | 2AVYU-OMLOX-ST |
| Serial number: * | 1910154B00400036 |
| PCB identifier: * | 1901154A00102B90 |
| Hardware version: * | Rev F |
| Software version: * | 3.0.3 |
| Lowest / highest internal frequency: * | 32 kHz / 4500 MHz |

*: Declared by the applicant.

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

1.5 Technical data of equipment

| | |
|-----------|---------------------------------------|
| Channel 1 | $f_c = 3.575$ GHz, 500 MHz bandwidth |
| Channel 4 | $f_c = 4.000$ GHz, 500 MHz bandwidth |
| Channel 3 | $f_c = 4.500$ GHz, 500 MHz bandwidth |
| Channel 4 | $f_c = 4.000$ GHz, 1000 MHz bandwidth |

| | | | | | |
|--------------------------|---|---------------------|-------------|---------------------|---------------------------------|
| Rated rf-output power: * | -41.3 dBm (e.i.r.p.) | | | | |
| Antenna type: * | Internal PCB antenna only | | | | |
| Antenna gain: * | 2 dBi | | | | |
| Antenna connector: * | None | | | | |
| Number of channels: * | 4 | | | | |
| Supply voltage EUT: * | $U_{nom} =$ | 5.0 V _{DC} | $U_{min} =$ | 3.1 V _{DC} | $U_{max} =$ 5.5 V _{DC} |
| Temperature range: * | -10 °C to 55 ° | | | | |
| Ancillary used for test: | Samsung S9 mobile phone with the app nRF Connect V4.24.1, Laptop PC Siemens Fujitsu Lifebook with putty and Samsung travel adapter ETA0U83EWE (used or conducted emissions on power supply only); all provided by the laboratory. | | | | |

* declared by the applicant.

| Identification | Connector | | Length * |
|----------------|------------|------------|-------------|
| | EUT | Ancillary | |
| USB | USB type C | USB type A | 3 m / 80 cm |
| - | - | - | - |

*: Length during the test if not otherwise specified.

1.6 Dates

| | |
|---------------------------------|------------|
| Date of receipt of test sample: | 28.09.2020 |
| Start of test: | 29.09.2020 |
| End of test: | 06.10.2020 |

2 Operational states

The EUT is an indoor UWB transceiver device, which is intended to be used as indoor locating device.

All measurements were carried out with an unmodified test sample mounted with a test software.

The UWB operation mode could be selected via a Bluetooth connection to a mobile phone with the app nRF Connect V4.24.1. After the operation mode is selected, the Bluetooth operation of the EUT was switched off with the help of terminal software (Putty) on a laptop PC, which was connected via a USB to fiber optics converter the USB line of the EUT.

During all measurements except to the conducted emission measurement on the power supply line, the EUT was supplied by a fully charged battery of the USB to fiber optics converter. The Bluetooth operation and the data connection to the laptop PC was disabled during all measurements as well as the data connection to the laptop PC, which was interrupted by switching off the USB to fiber optics converter at the laptop PC side.

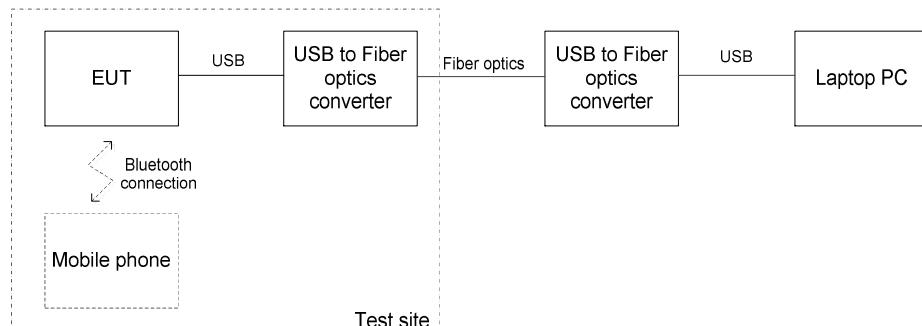
During the conducted emission measurement on the power supply line, the EUT was connected to an AC/DC adaptor, the EUT was set to operation via Bluetooth. The Bluetooth operation was not disabled during this measurement. The AC/DC adaptor was powered by an AC mains network with 120 V_{AC} / 60 Hz.

Because the EUT has no connector, all measurements were carried out radiated.

The transmit power level could be adjusted with the test software on the mobile phone. The following power levels were used to reach the documented results:

| Channel No. | Power setting |
|-------------|---------------|
| 1 | +1 |
| 2 | +3 |
| 3 | 0 |
| 4 | +4 |

Test setup radiated tests:



3 Additional information

The EUT contains also a Bluetooth Low Energy transceiver, which will be certified under another FCC 47 CFR Part 15 section. The measurement results for this rule section are documented under PHOENIX TESTLAB GmbH test report reference F200549E1. Object of this test report is the UWB-part of the EUT only.

The tested sample was not labeled as required by FCC.

To reach the documented results the following register settings were used:

cd: 2F; ce: 1C; cf: 04; d2: 29; d0: 0 and d1: 15.

4 Overview

| Application | Frequency range [MHz] | FCC 47 CFR Part 15 section [2] | Status | Refer page |
|------------------------------------|-----------------------|--|-----------|------------|
| 10 dB bandwidth | 3100 - 10600 | 15.517 (b) | Passed | 8 et seq. |
| Peak level of transmission | 3100 - 10600 | 15.517 (e) | Passed | 12 et seq. |
| Radiated emissions (transmitter) | 0.009 - 40000 | 15.517 (c) 15.517 (d) 15.205 (a) 15.209 (a) | Passed | 15 et seq. |
| Conducted emissions on supply line | 0.15 - 30 | 15.207 (a) | Passed | 45 et seq. |
| Antenna requirement | - | 15.517 (a) (3) | Passed *1 | - |

*1: As declared by the applicant, the EUT is intended to be used with the internal PCB antenna only. No external antennas could be connected to the EUT. The internal UFL-connector is intended for test purposes only. Therefore, the Antenna requirement could be regarded as fulfilled.

5 Test results

5.1 10 dB bandwidth

5.1.1 Method of measurement (10 dB bandwidth)

The calibration of the spectrum analyser has to be checked with the help of a known signal from a signal generator. The EUT has to be connected to the spectrum analyser via a low loss cable. If the EUT is not equipped with an antenna connector, a temporary antenna connector has to be installed. The EUT has to be switched on and the hopping function has to be disabled, the transmitter shall work with its maximum data rate.

The following spectrum analyser settings according to [1] shall be used:

- Span: App. 2 to 5 times the 20 dB bandwidth, centered on the actual hopping channel.
- Resolution bandwidth: 1 MHz.
- Video bandwidth: \geq the RBW.
- Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation.
- Sweep time: 1 ms / sweep point.
- Detector function: Peak.
- Trace mode: Max hold.

After trace stabilization the marker shall be set on the signal peak. The first display line has to be set on this value. The second display line has to be set 10 dB below the first line (or the peak marker). The frequency lines shall be set on the intersection points between the second display line and the measured curve.

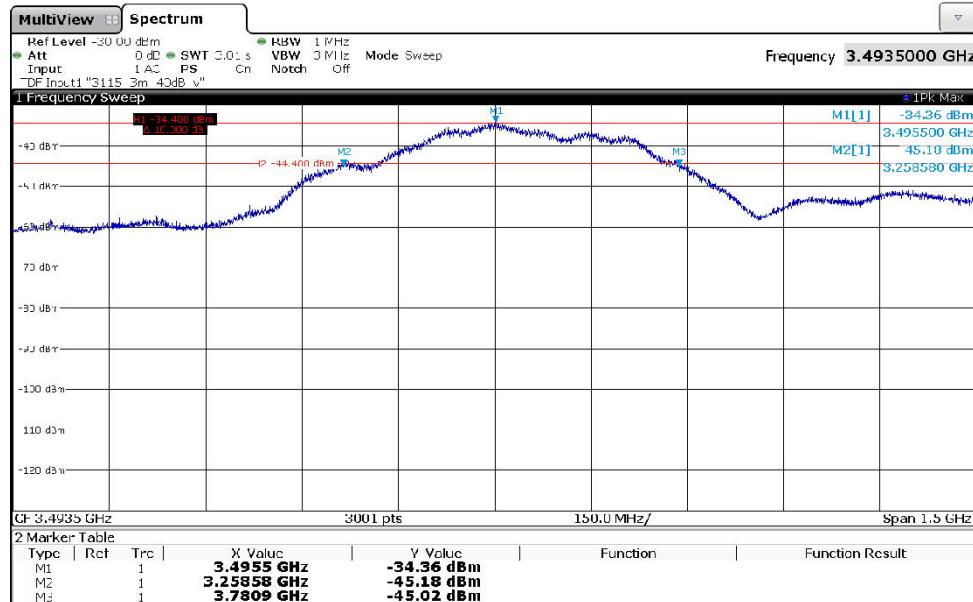
Test set-up:



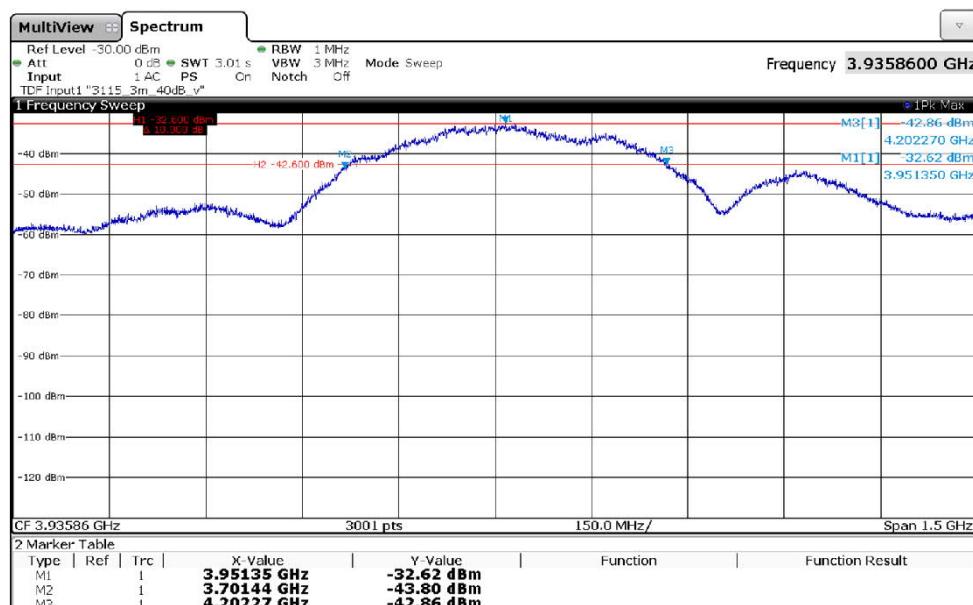
5.1.2 Test results (10 dB bandwidth)

| | |
|---------------------|-------|
| Ambient temperature | 22 °C |
| Relative humidity | 44 % |

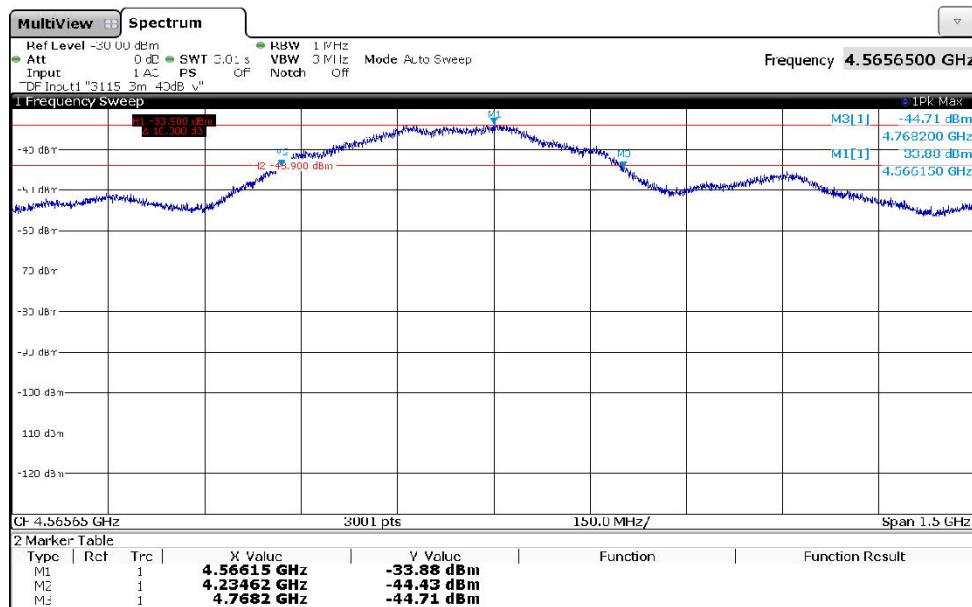
200549_1.png: 10 dB bandwidth on channel 1:



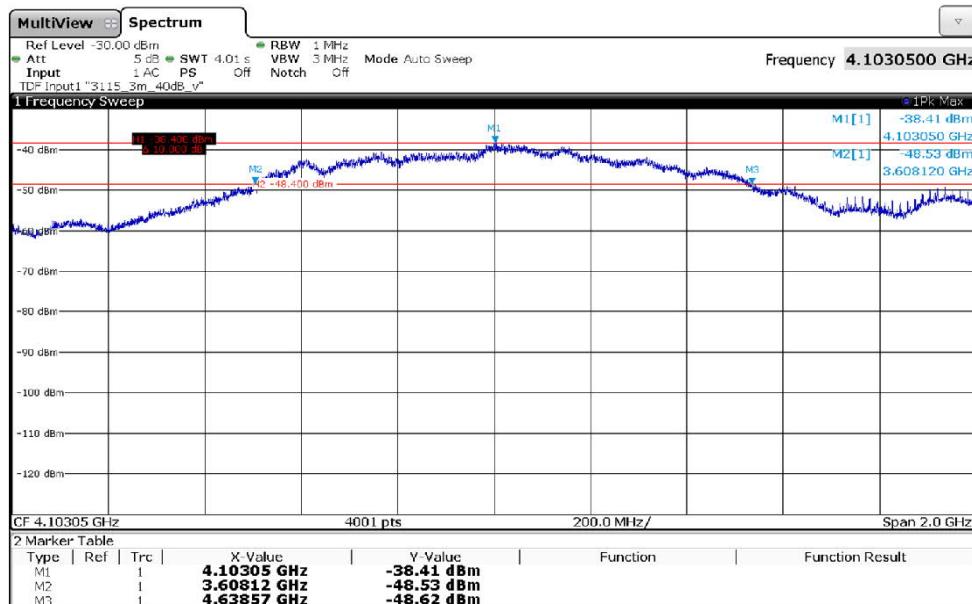
200549_3.png: 10 dB bandwidth on channel 2:



200549_5.png: 10 dB bandwidth on channel 3:



200549_7.png: 10 dB bandwidth on channel 4:



| Channel number | Higher frequency f_H [MHz] | Lower frequency f_L [MHz] | 10 dB bandwidth $f_H - f_L$ [GHz] | Center frequency $(f_H + f_L)/2$ [MHz] | Fractional bandwidth |
|-------------------------|------------------------------|-----------------------------|-----------------------------------|--|----------------------|
| 1 | 3780.900 | 3258.580 | 522.320 | 3519.740 | 0.148 |
| 2 | 4202.270 | 3701.440 | 500.830 | 3951.855 | 0.126 |
| 3 | 4768.200 | 4234.620 | 533.580 | 4501.410 | 0.119 |
| 4 | 4638.570 | 3608.120 | 1030.450 | 4123.345 | 0.250 |
| Measurement uncertainty | | | +0.66 dB / -0.72 dB | | |

Test: Passed

Test equipment used (refer clause 6):

12 - 19

5.2 Peak level of transmission

5.2.1 Method of measurement (peak level of transmission)

Because of the integral antenna the peak level of transmission was measured radiated. The method of measurement is described under clause 5.3.1 (final measurement (1 GHz to 26.5 GHz)) of this test report with the exception that a peak detector and a resolution bandwidth of 50 MHz within a 50 MHz span centered at highest detected average emission level.

5.2.2 Test results (peak level of transmission)

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 22 °C | Relative humidity | 44 % |
|---------------------|-------|-------------------|------|

200549_2.png: Peak level of transmission on channel 1:



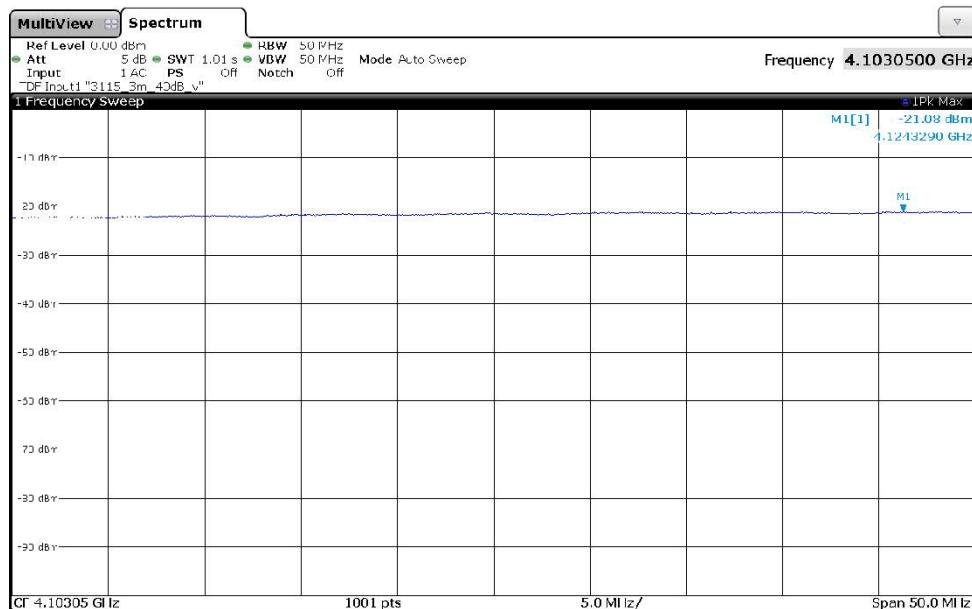
200549_4.png: Peak level of transmission on channel 2:



200549_6.png: Peak level of transmission on channel 3:



200549_8.png: Peak level of transmission on channel 4:



| Channel No. | Channel frequency [GHz] | Frequency of max. level [GHz] | Bandwidth [kHz] | Height [cm] | Turn table [deg] | Turn device [deg] | Pol. | Peak level (EIRP) [dBm] | Limit [dBm] | Margin [dB] |
|-------------------------|-------------------------|-------------------------------|-----------------|-------------|------------------|-------------------|-------|-------------------------|-------------|-------------|
| 1 | 3575 | 3494.351 | 50000 | 150 | 223 | -5 | Vert. | -17.5 | 0.0 | 17.5 |
| 2 | 4000 | 3947.754 | 50000 | 150 | 228 | 3 | Vert. | -16.3 | 0.0 | 16.3 |
| 3 | 4500 | 4555.511 | 50000 | 150 | 202 | 6 | Vert. | -17.0 | 0.0 | 17.0 |
| 4 | 4000 | 4124.329 | 50000 | 150 | 216 | 6 | Vert. | -21.1 | 0.0 | 21.1 |
| Measurement uncertainty | | | | | | | | ±5.5 dB | | |

Test: Passed

Test equipment used (refer clause 6):

12 – 19

5.3 Radiated emissions

5.3.1 Method of measurement (radiated emissions)

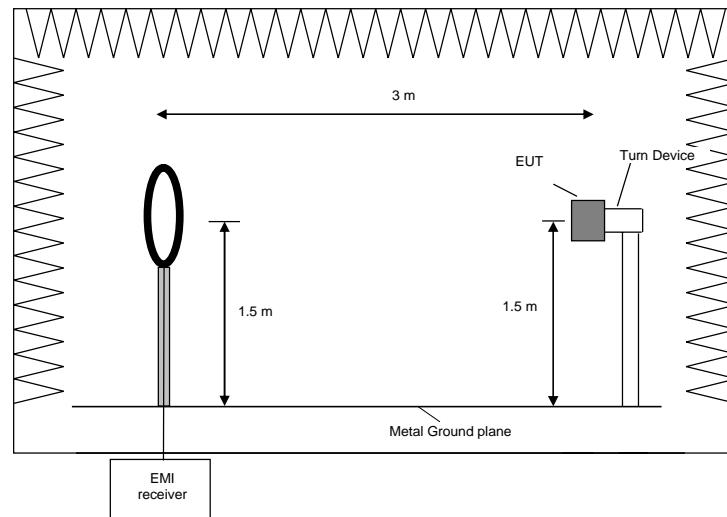
The radiated emission measurement is subdivided into five stages.

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

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser 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 analyser will be set to the following values:

| Frequency range | Resolution bandwidth |
|-------------------|----------------------|
| 9 kHz to 150 kHz | 300 Hz |
| 150 kHz to 30 MHz | 10 kHz |



Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 30 MHz.

The following procedure will be used:

- 1) Monitor the frequency range at horizontal polarisation 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) Make a hardcopy of the spectrum.
- 5) Measure the frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
- 6) Repeat steps 1) to 5) with the other orthogonal axes of the EUT.
- 7) Rotate the measuring antenna and repeat steps 1) to 5).

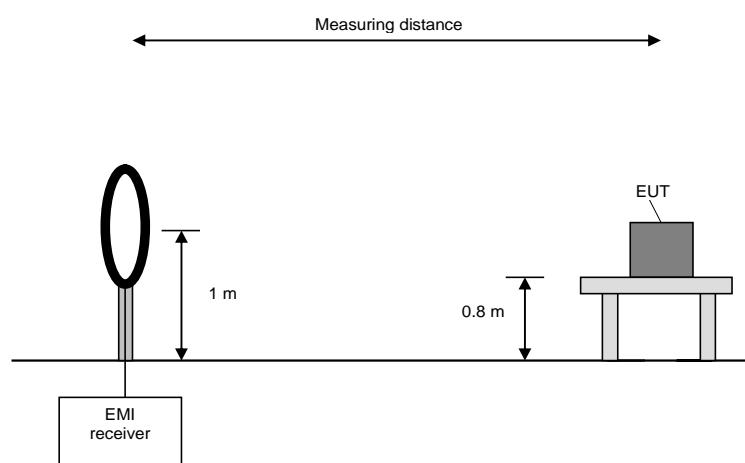
Final measurement (9 kHz to 30 MHz):

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 whichever is appropriate. In the case where larger measuring distances were required the results will be extrapolated based on the values measured on the closer distances according to [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak.

On the during the preliminary measurement detected frequencies 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 |



Final measurement procedure:

The following procedure will be used:

- 1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
- 2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
- 3) Rotate the measuring antenna to find the maximum and note the value.
- 4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
- 5) Repeat steps 1) to 4) with the other orthogonal axes of the EUT (only if the EUT is a module or is used in a handheld application).

Preliminary and final measurement (30 MHz to 1 GHz)

The EUT is measured in the frequency range from 30 MHz to 1 GHz inside a semi anechoic chamber with a metal ground plane, which has been validated to the requirements of [1]. It is placed on a 3D-positioner to allow different positions at a distance of 3 meters from the receiving antenna. Both polarizations (vertical and horizontal) have been evaluated and the turn table has been turned to 360° to maximize the emissions. The receiving antenna is raised from 1 to 4 m.

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 in two axes.
4. Repeat 1) to 2) with the horizontal 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 (30 MHz to 1 GHz only).
6. The highest values for each frequency will be saved by the software, including the antenna height, measurement antenna polarization and turntable azimuth for that value.

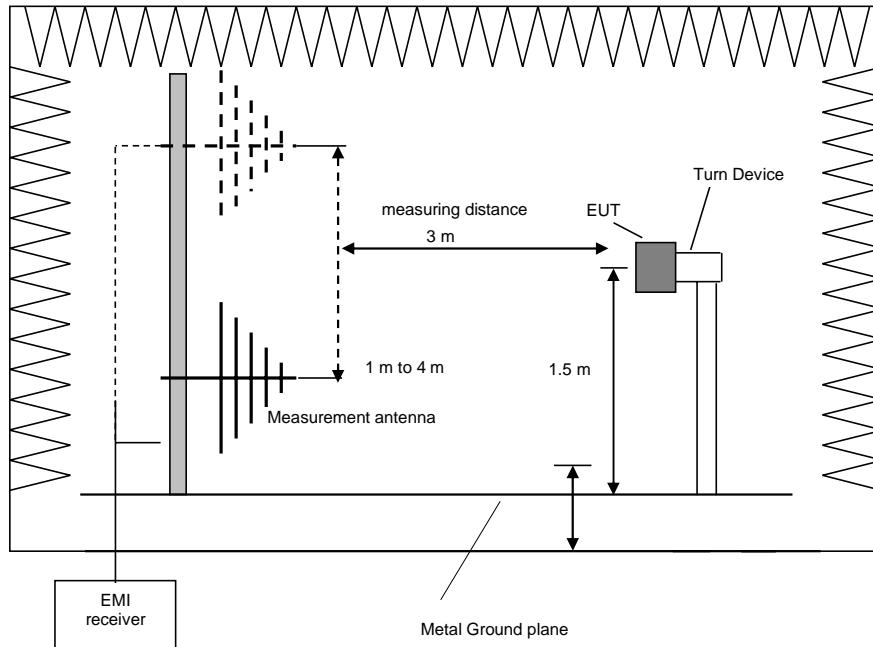
Procedure final measurement:

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 RBW with +/- 10 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 position (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 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 +/- 25° from the 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.
8. For frequencies above 960 MHz the measured field strength is converted to an EIRP value

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

| Frequency range | Resolution bandwidth |
|-----------------|----------------------|
| 30 MHz to 1 GHz | 100 kHz |



Test setup for measurements below 1 GHz

Preliminary and final measurement (1 GHz to 40 GHz)

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

Procedure preliminary measurement:

The frequency range will be divided into different sub ranges depending on the frequency range of the used horn antenna. 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 26.5 GHz | 1 MHz |
| 26.5 GHz to 40 GHz | 1 MHz |

Prescans were performed in the frequency range 1 to 40 GHz.

The following procedure will be used:

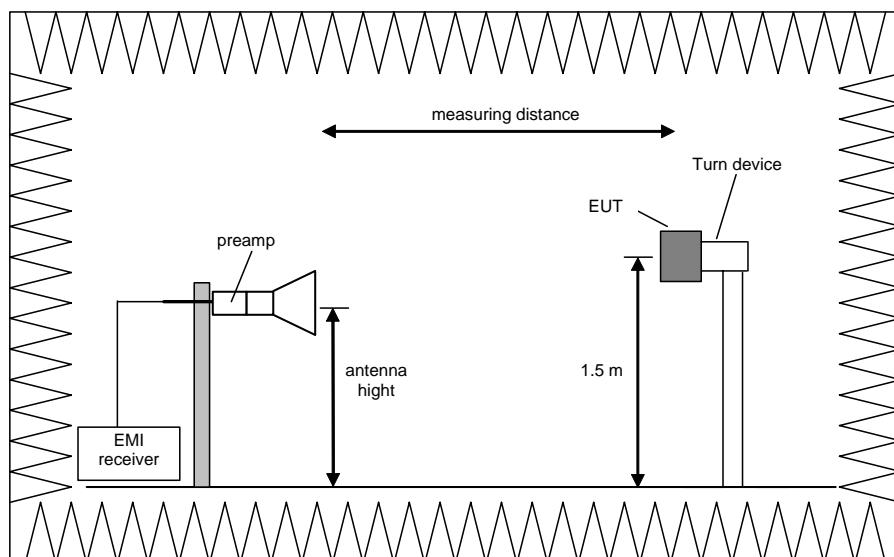
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 ° with peak or RMS detector of the spectrum analyser (depending of the noise floor and the applicable limit).
2. Rotate the EUT by 360° to maximize the detected signals.
3. Repeat 1) to 2) with the vertical polarisation 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.

Procedure final measurement:

The measurements were performed in the frequency range 1 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 RMS average detector activated.
- 4) Rotate the turntable from 0° to 360° to find the EUT angle 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.
- 7) Replace the EUT by a substitution antenna, which is fed by a signal generator.
- 8) Carry out a substitution for each frequency detected during the steps 5) to 6).
- 9) Calculate the EIRP values with the help of the final measurement and the substitution results.



Test setup for measurements from 1 GHz to 40 GHz

5.3.2 Test results (radiated emissions)

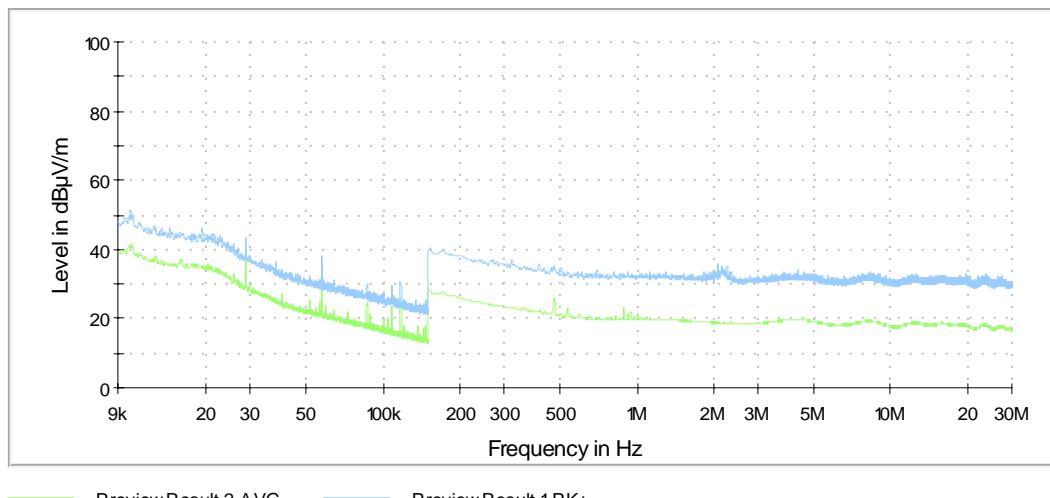
5.3.2.1 Preliminary radiated emission measurement (9 kHz to 40 GHz)

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 22 °C | Relative humidity | 50 % |
|---------------------|-------|-------------------|------|

- Position of EUT: The EUT was set-up on a turn device of a height of 1.5 m. The distance between EUT and antenna was 3 m (9 kHz to 1 GHz), 1 m (1 GHz to 3.1 GHz and 10.6 GHz to 40 GHz) and 3 m (3.1 GHz to 10.6 GHz).
- Cable guide: For detail information of test set-up refer to the pictures in annex A of this test report.
- Test record: All results are shown in the following.
- Supply voltage: During all measurements the EUT was supplied with 5.0 V_{DC} via the USB to fiber optic converter.
- Frequency range: The preliminary measurement was carried out in the frequency range 9 kHz to 40 GHz according to [2].
- Remark: As the measurements have shown, no emissions above the noise floor of the measurement system were emitted by the EUT below 1 GHz. Therefore the measurements below 1 GHz were carried out in operation mode 2, because of the highest transmit power.

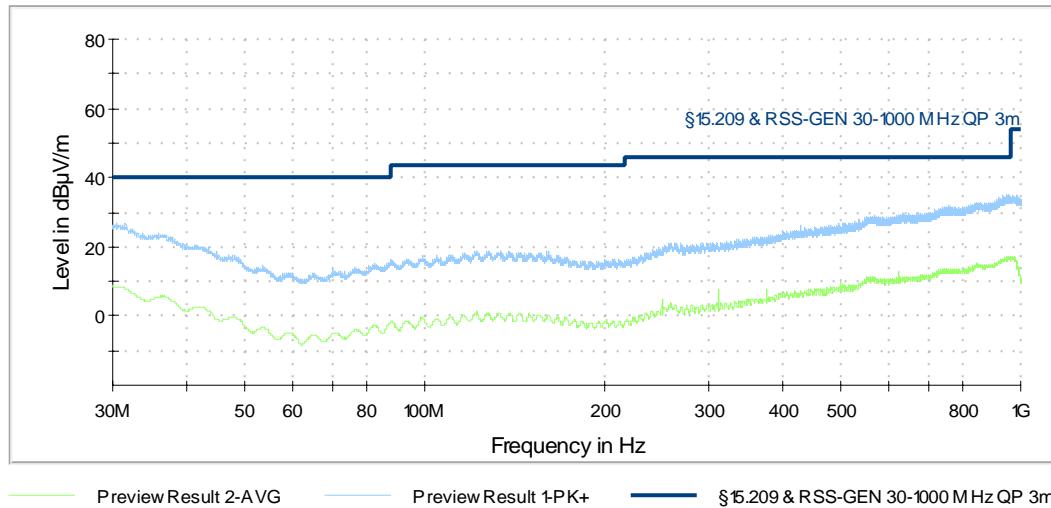
Transmitter independent emissions below 1 GHz:

200549_UWB_9k_30M_2: Spurious emissions from 9 kHz to 30 MHz (operation mode 1):



All emissions were below -51.7 dB μ V/m (measured with peak detector at 3 m distance), which is the noise floor of the measuring system. So no final measurement was carried out on the outdoor test site.

200549_UWB_30M_1G_2: Spurious emissions from 30 MHz to 1 GHz (operation mode 2):



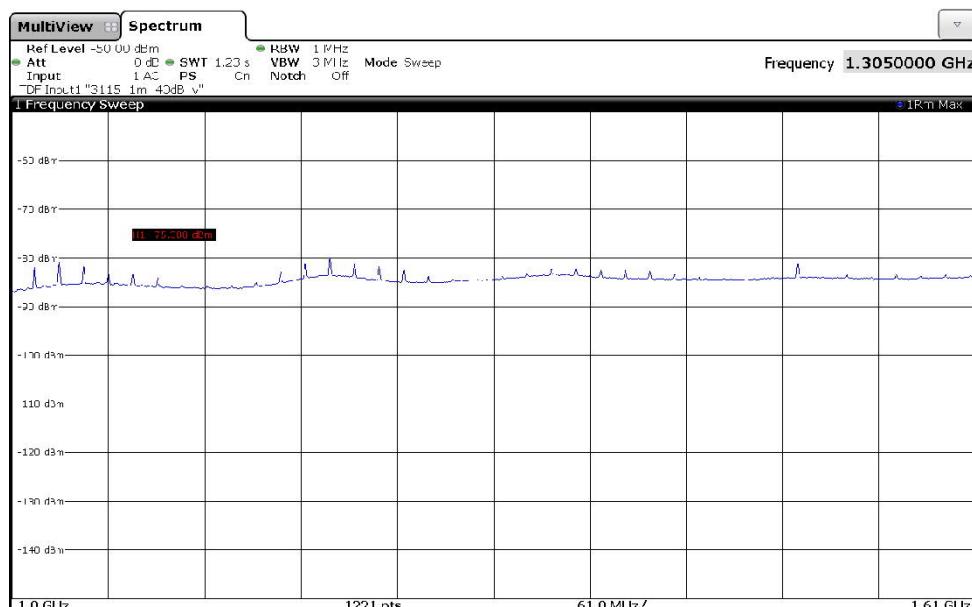
The following frequency was found in the frequency range 960 MHz to 1 GHz:

- 972.665 MHz (highest peak, noise floor of the measuring system).

On this frequency a final measurement has to be carried out. The result is presented in the following.

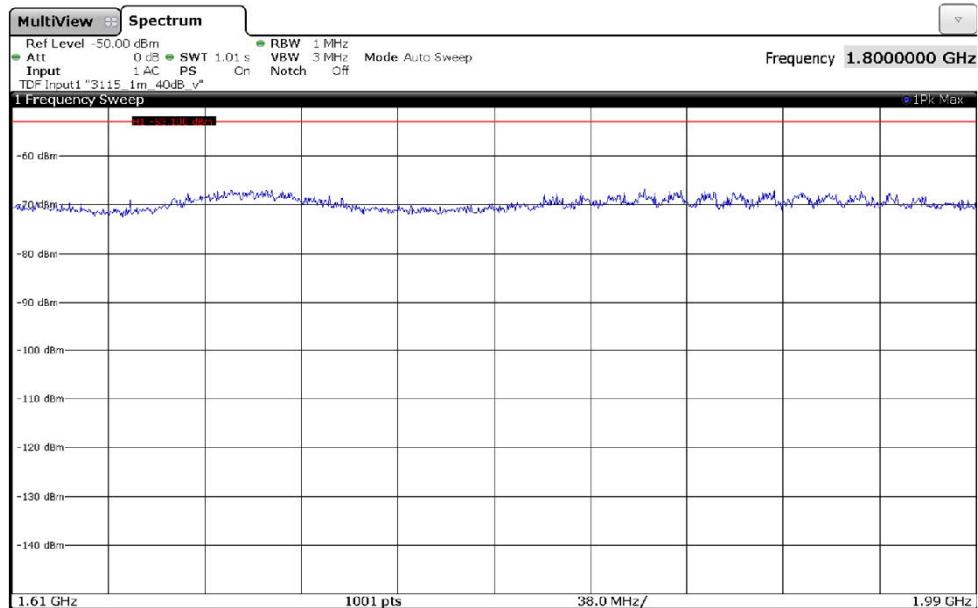
Transmitter operates on channel 1 (operation mode 1):

200549_13.png: Transmitter spurious emissions from 1 GHz to 1.61 GHz (operation mode 1):



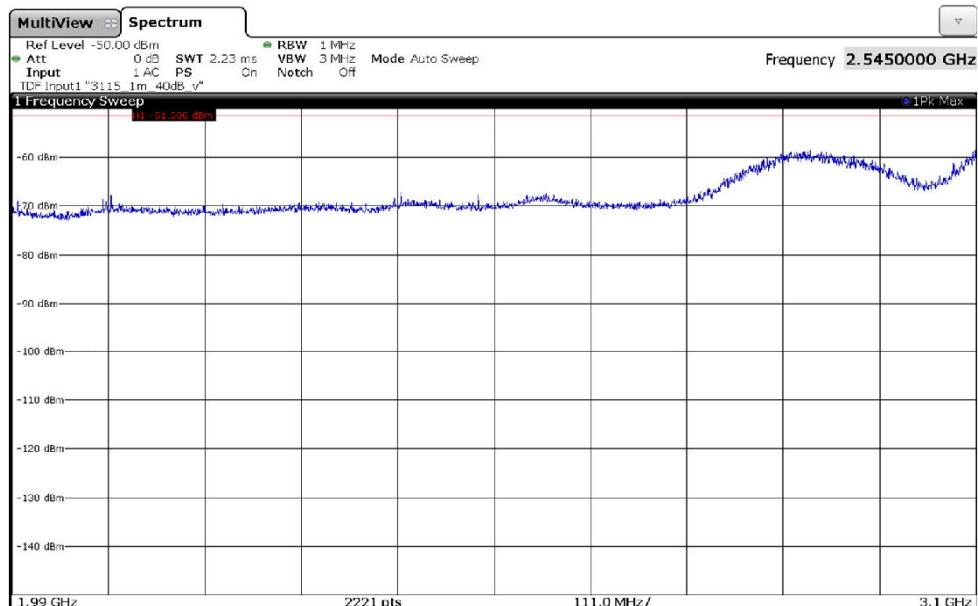
All emissions were below -78.0 dBm. This value is already below the rms AV-limit of -75.3 dBm.

200549_14.png: Transmitter spurious emissions from 1.61 GHz to 1.99 GHz (operation mode 1):



All emissions were below -67.0 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -53.3 dBm.

200549_15.png: Transmitter spurious emissions from 1.99 GHz to 3.1 GHz (operation mode 1):

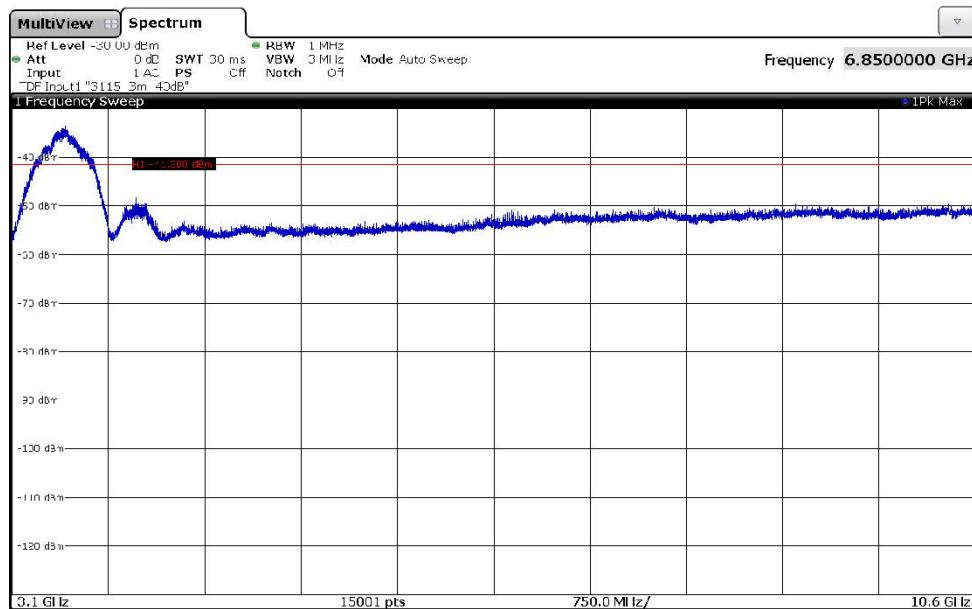


The following frequencies were found:

- 2891.300 MHz and 3099.250 MHz.

On these frequencies a final measurement has to be carried out. The result is presented in the following.

200549_12.png: Transmitter spurious emissions from 3.1 GHz to 10.6 GHz (operation mode 1):

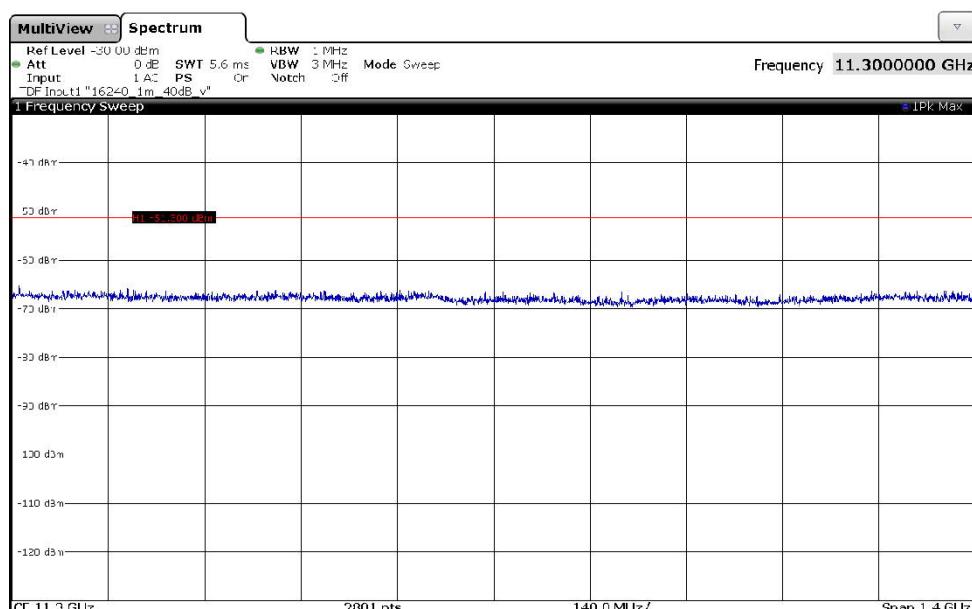


The following frequencies were found:

- 3495.500 MHz (wanted signal) and 4014.940 MHz.

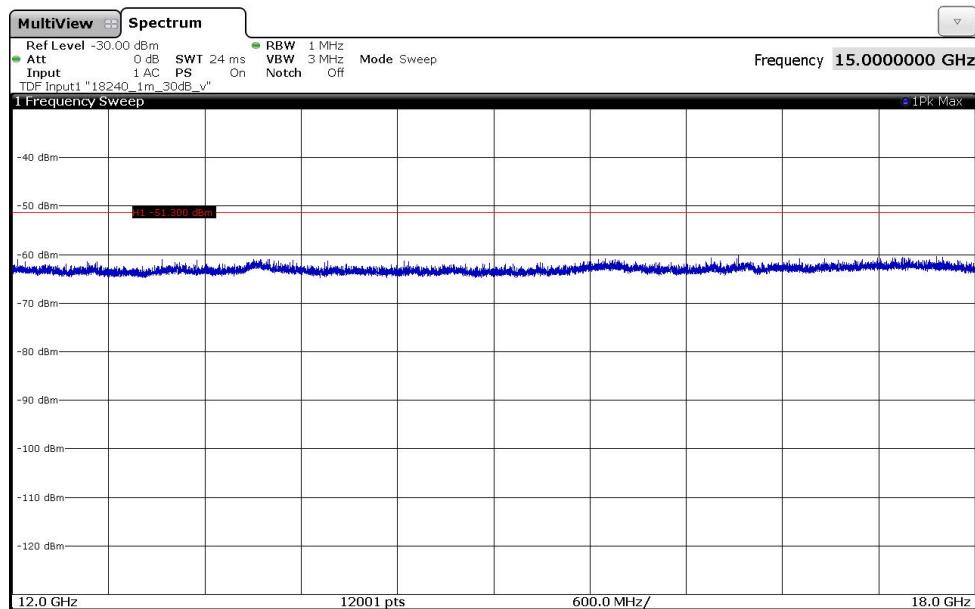
On these frequencies a final measurement has to be carried out. The result is presented in the following. All other emissions were below -49.7 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -41.3 dBm.

200549_33.png: Transmitter spurious emissions from 10.6 GHz to 12 GHz (operation mode 1):



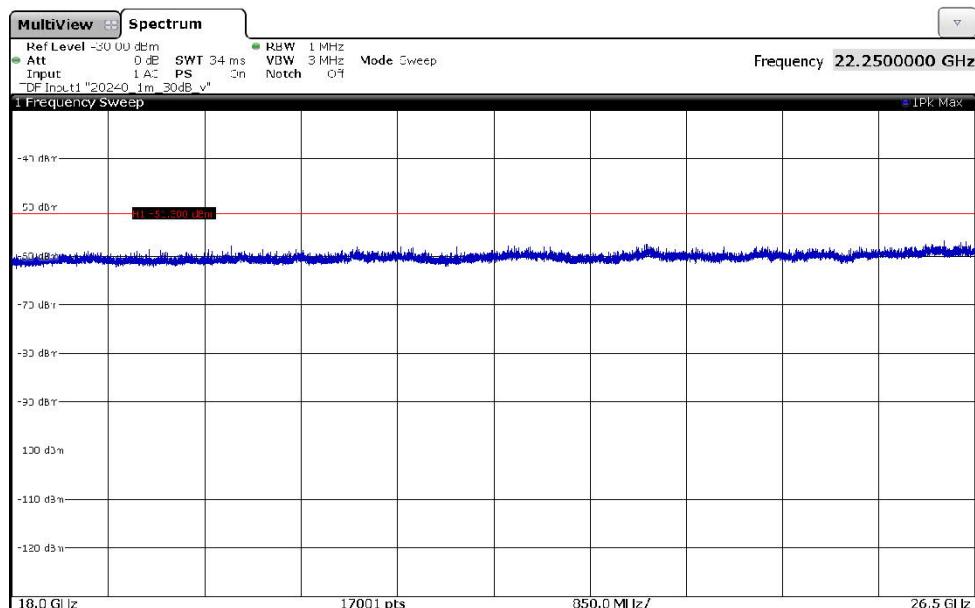
All emissions were below -65.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_42.png: Transmitter spurious emissions from 12 GHz to 18 GHz (operation mode 1):



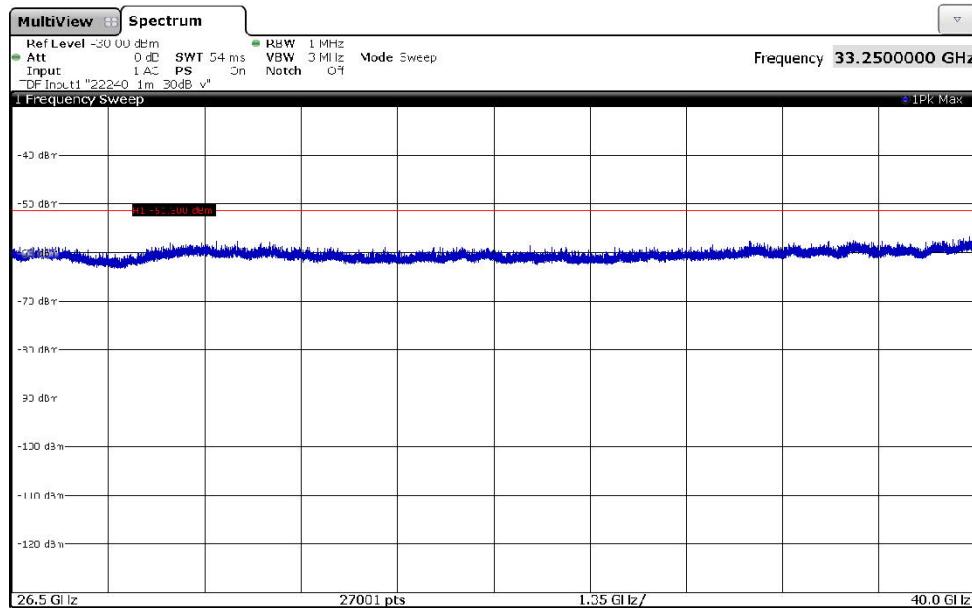
All emissions were below -60.2 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_41.png: Transmitter spurious emissions from 18 GHz to 26.5 GHz (operation mode 1):



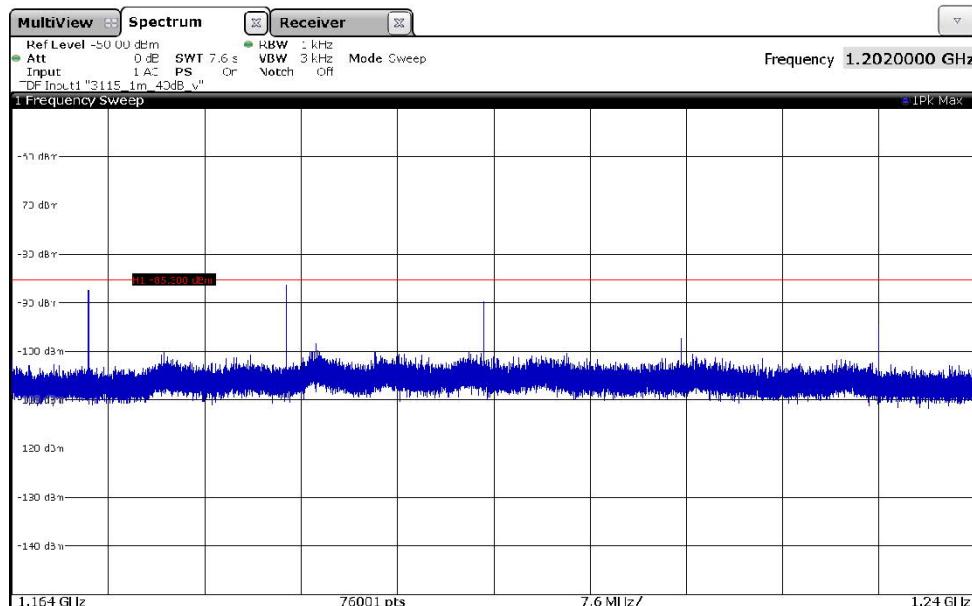
All emissions were below -56.8 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_40.png: Transmitter spurious emissions from 26.5 GHz to 40 GHz (operation mode 1):



All emissions were below -56.9 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_16.png: Transmitter spurious emissions from 1.164 GHz to 1.240 GHz (operation mode 1):

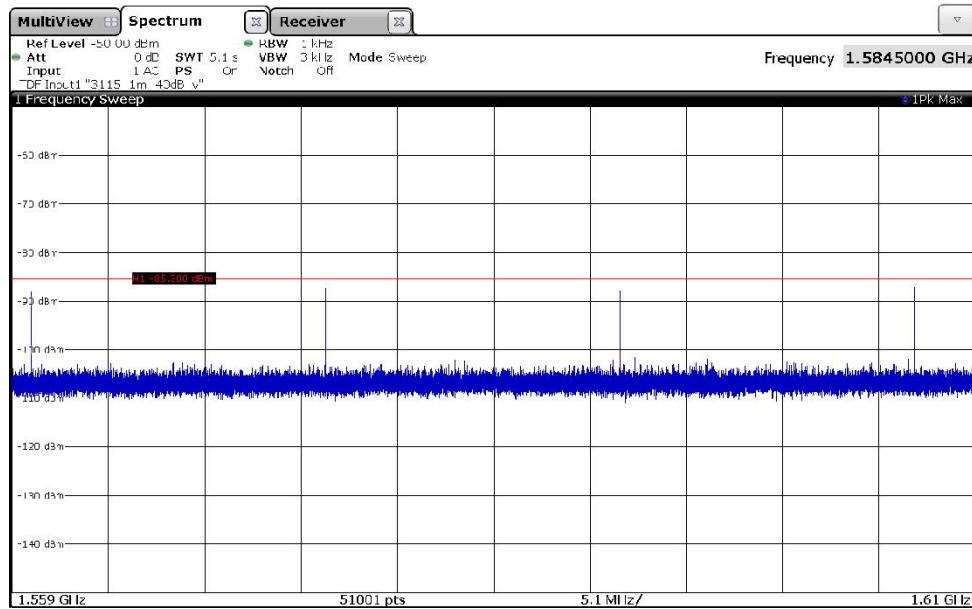


The following frequencies were found:

- 1170.000 MHz, 1185.600 MHz, 1201.200 MHz, 1216.800 MHz and 1232.400 MHz.

On these frequencies a final measurement has to be carried out. The result is presented in the following.

200549_17.png: Transmitter spurious emissions from 1.559 GHz to 1.610 GHz (operation mode 1):



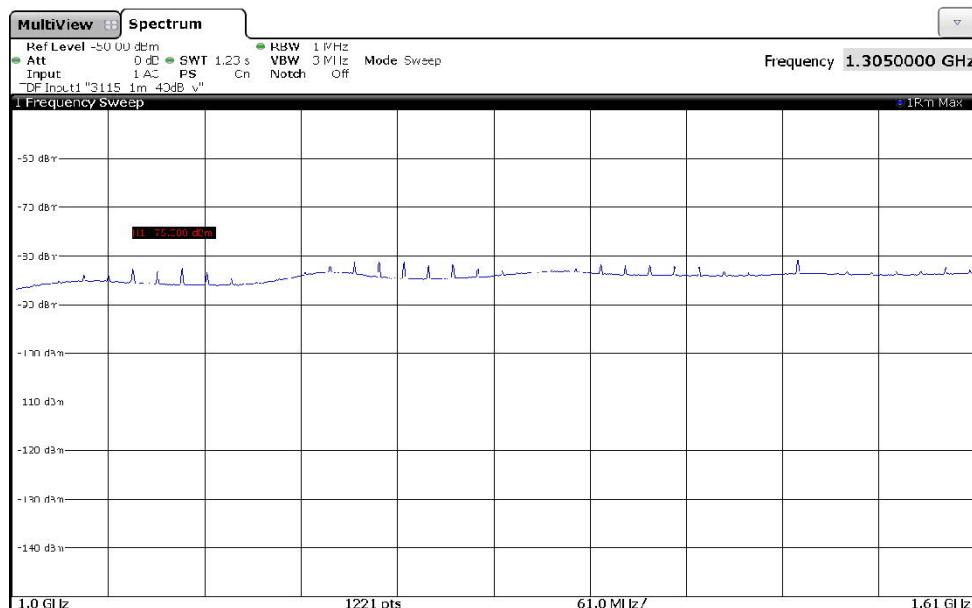
The following frequencies were found:

- 1560.000 MHz, 1575.600 MHz, 1591.200 MHz and 1606.800 MHz.

On these frequencies a final measurement has to be carried out. The result is presented in the following.

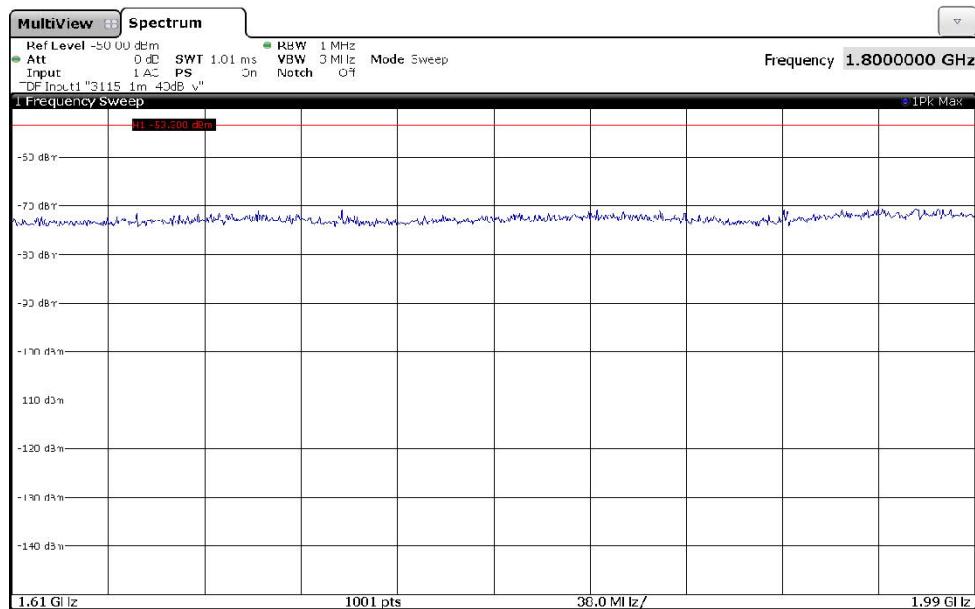
Transmitter operates on channel 2 (operation mode 2):

200549_24.png: Transmitter spurious emissions from 1 GHz to 1.61 GHz (operation mode 2):



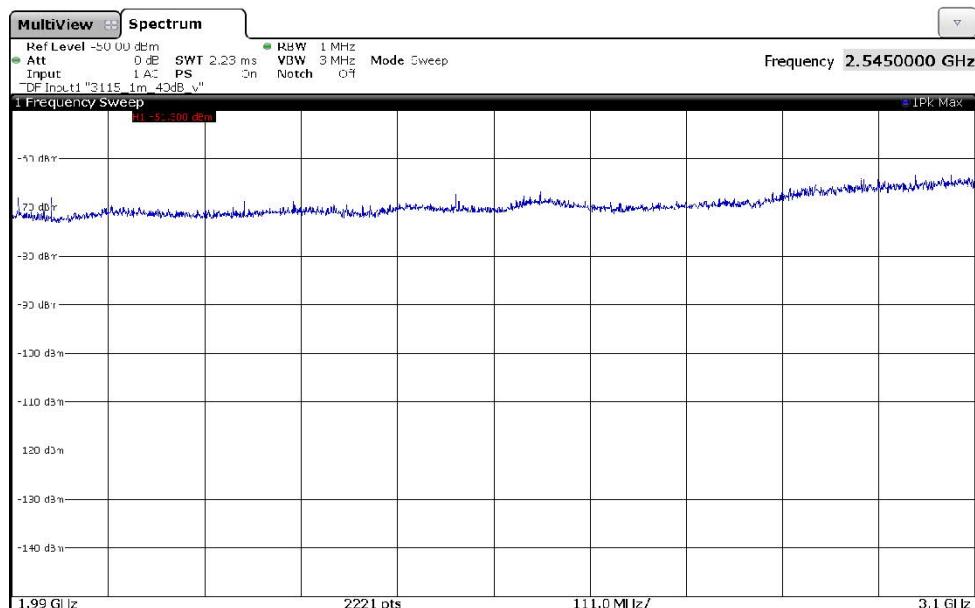
All emissions were below -80.8 dBm. This peak value is already below the rms AV-limit of -75.3 dBm.

200549_25.png: Transmitter spurious emissions from 1.61 GHz to 1.99 GHz (operation mode 2):



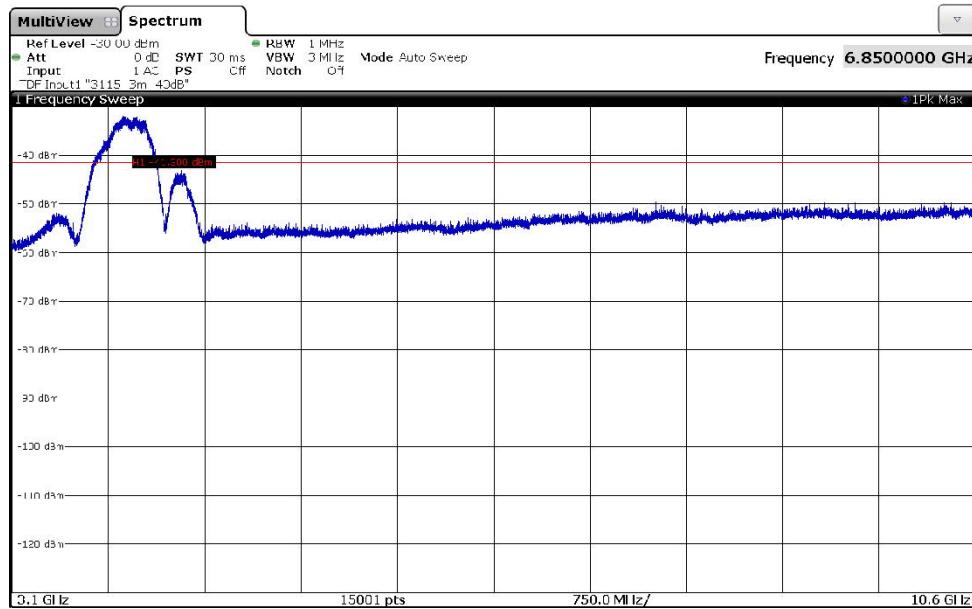
All emissions were below -70.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -53.3 dBm.

200549_26.png: Transmitter spurious emissions from 1.99 GHz to 3.1 GHz (operation mode 2):



All emissions were below -63.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm.

200549_11.png: Transmitter spurious emissions from 3.1 GHz to 10.6 GHz (operation mode 2):

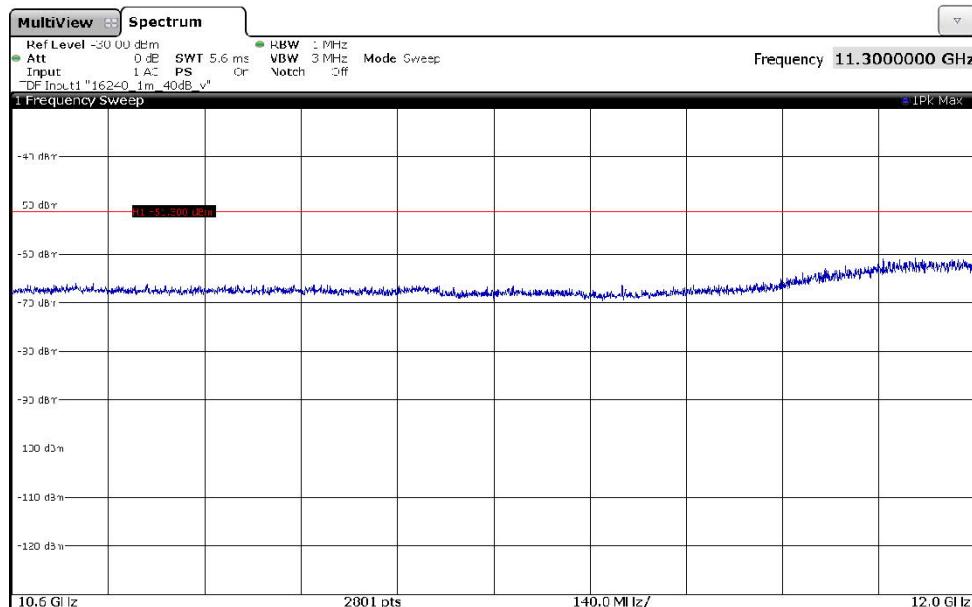


The following frequencies were found:

- 3951.350 MHz (wanted signal) and 4419.660 MHz.

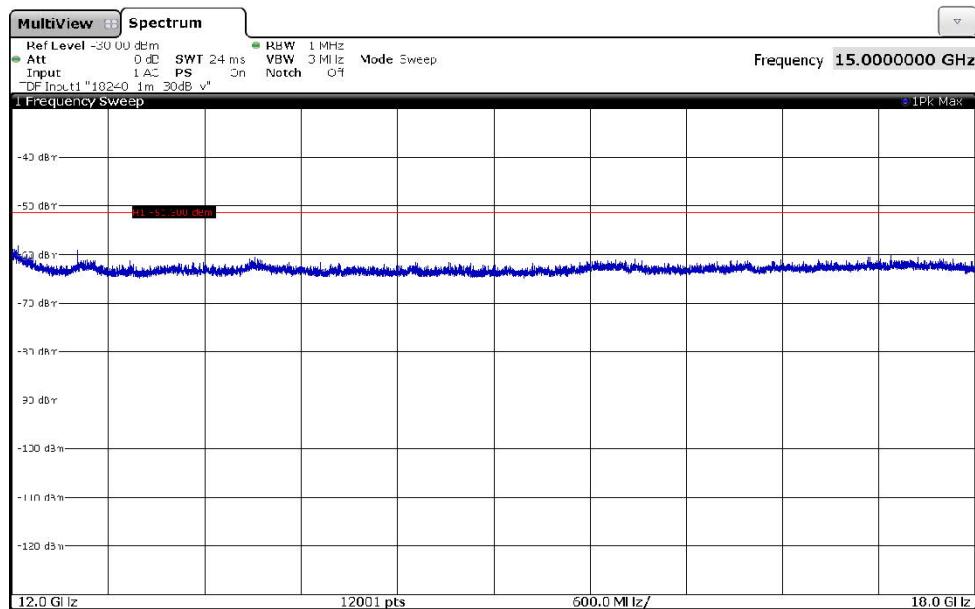
On these frequencies a final measurement has to be carried out. The result is presented in the following. All other emissions were below -49.7 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -41.3 dBm.

200549_34.png: Transmitter spurious emissions from 10.6 GHz to 12 GHz (operation mode 2):



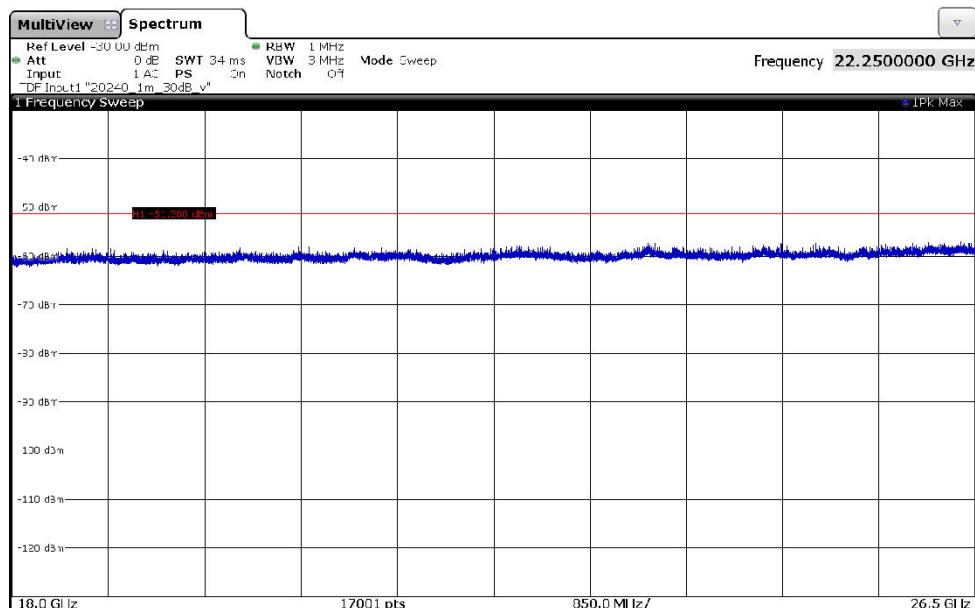
All emissions were below -60.9 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_43.png: Transmitter spurious emissions from 12 GHz to 18 GHz (operation mode 2):



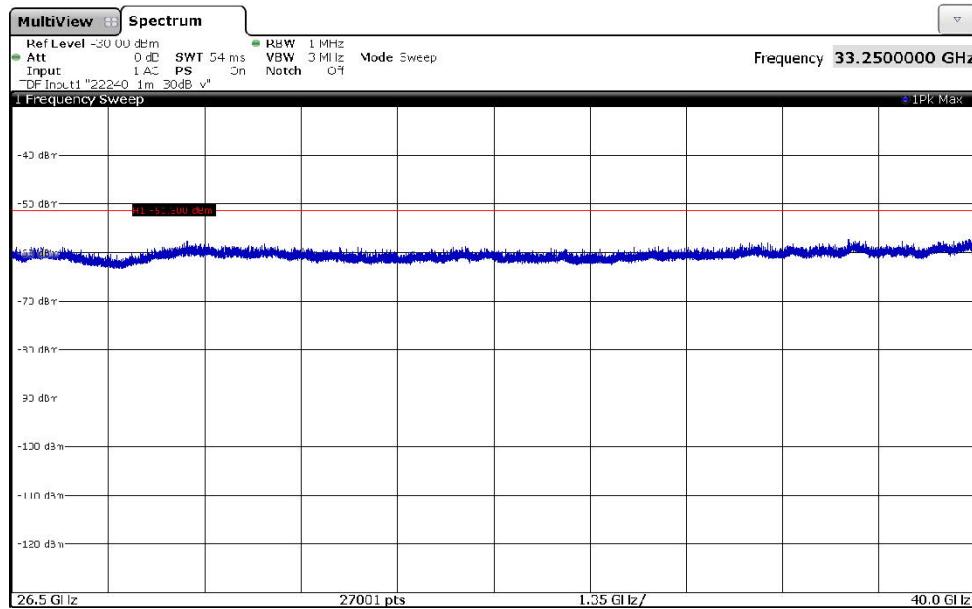
All emissions were below -58.2 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_44.png: Transmitter spurious emissions from 18 GHz to 26.5 GHz (operation mode 2):



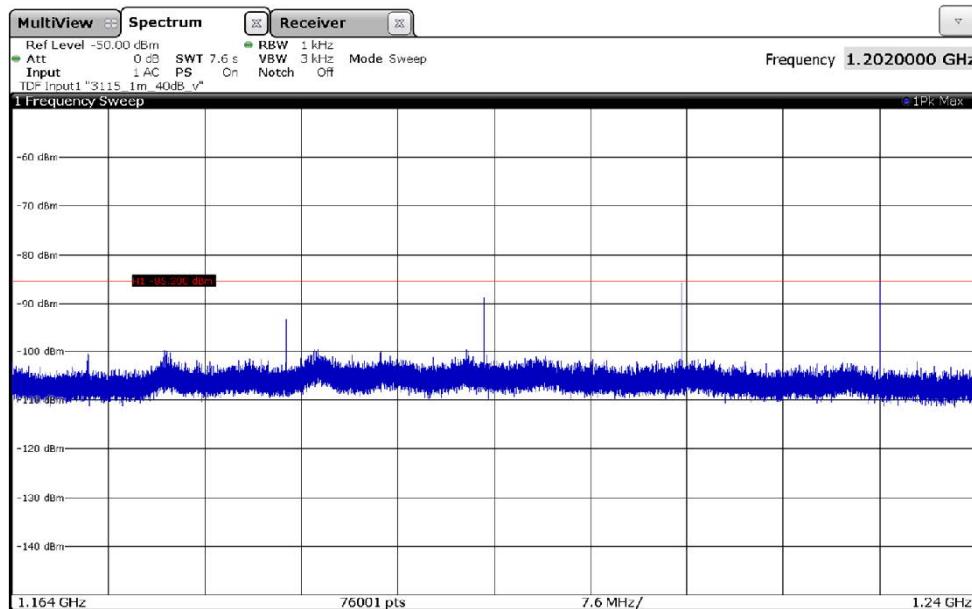
All emissions were below -57.1 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_45.png: Transmitter spurious emissions from 26.5 GHz to 40 GHz (operation mode 2):



All emissions were below -56.2 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_18.png: Transmitter spurious emissions from 1.164 GHz to 1.240 GHz (operation mode 2):

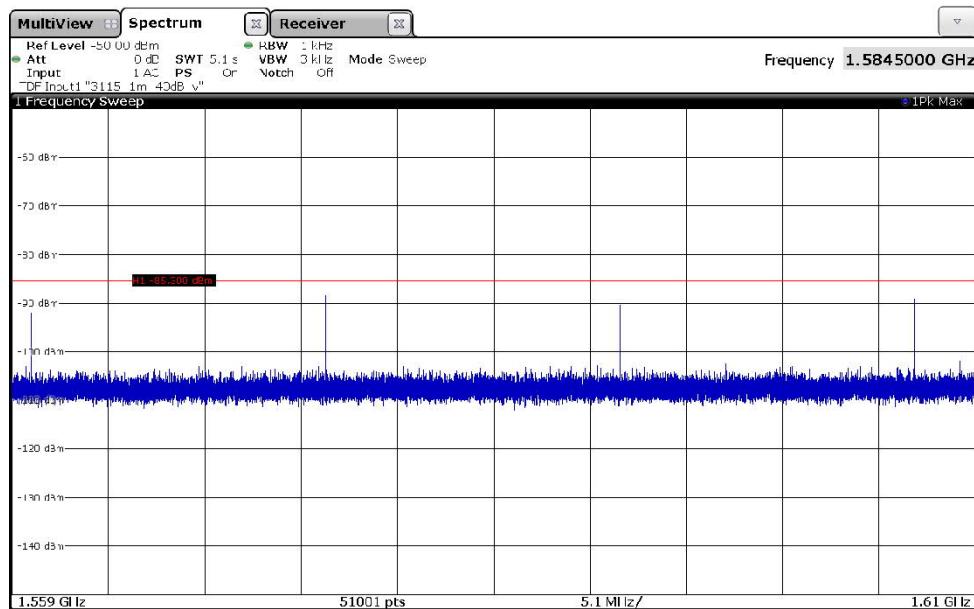


The following frequencies were found:

- 1201.200 MHz, 1216.800 MHz and 1232.400 MHz.

On these frequencies a final measurement has to be carried out. The result is presented in the following. All other emissions were below -93.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -85.3 dBm.

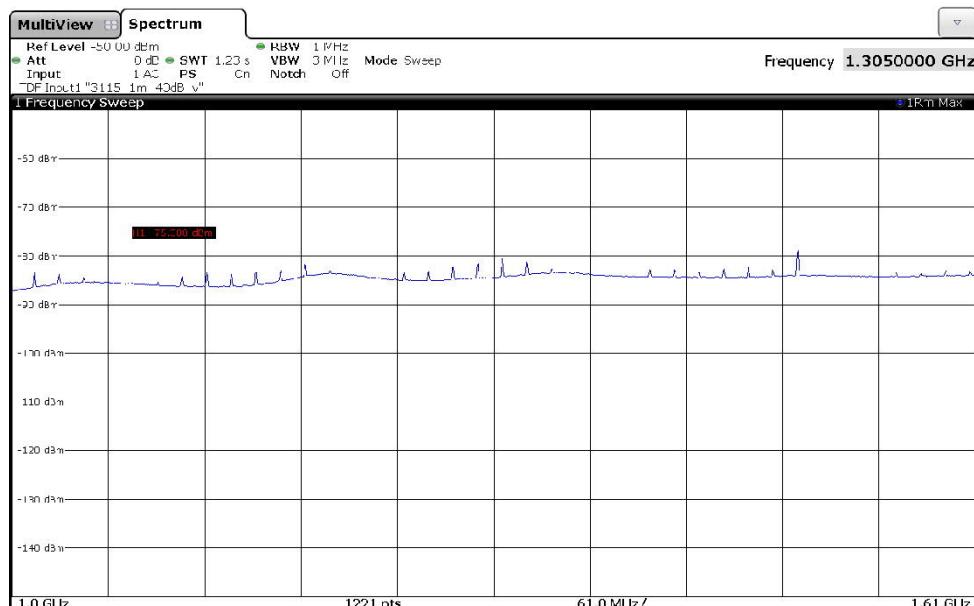
200549_19.png: Transmitter spurious emissions from 1.559 GHz to 1.610 GHz (operation mode 2):



All emissions were below -88.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -85.3 dBm. Therefore, no final measurement was carried out in this frequency range.

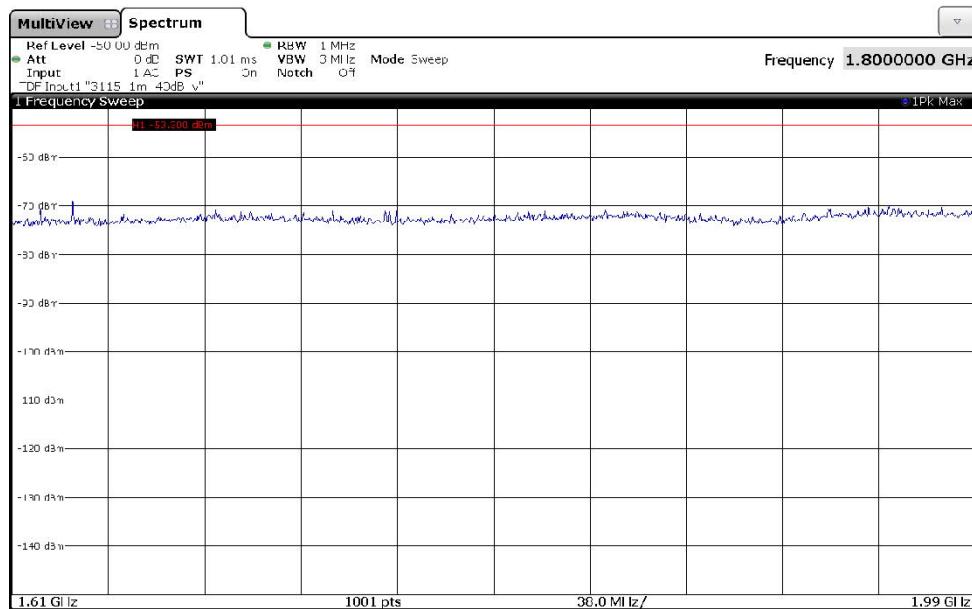
Transmitter operates on channel 3 (operation mode 3):

200549_27.png: Transmitter spurious emissions from 1 GHz to 1.61 GHz (operation mode 3):



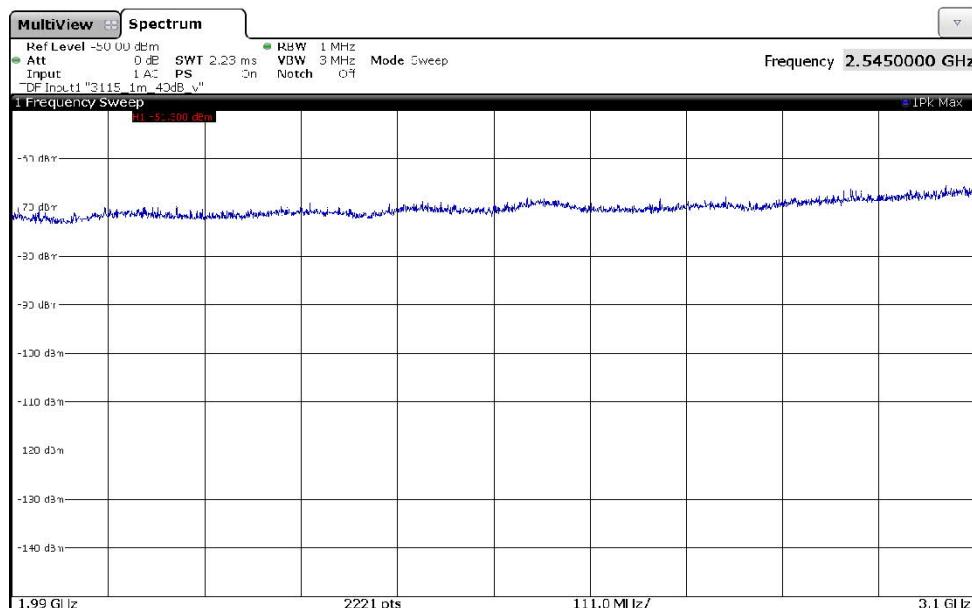
All emissions were below -79.0 dBm. This peak value is already below the rms AV-limit of -75.3 dBm.

200549_28.png: Transmitter spurious emissions from 1.61 GHz to 1.99 GHz (operation mode 3):



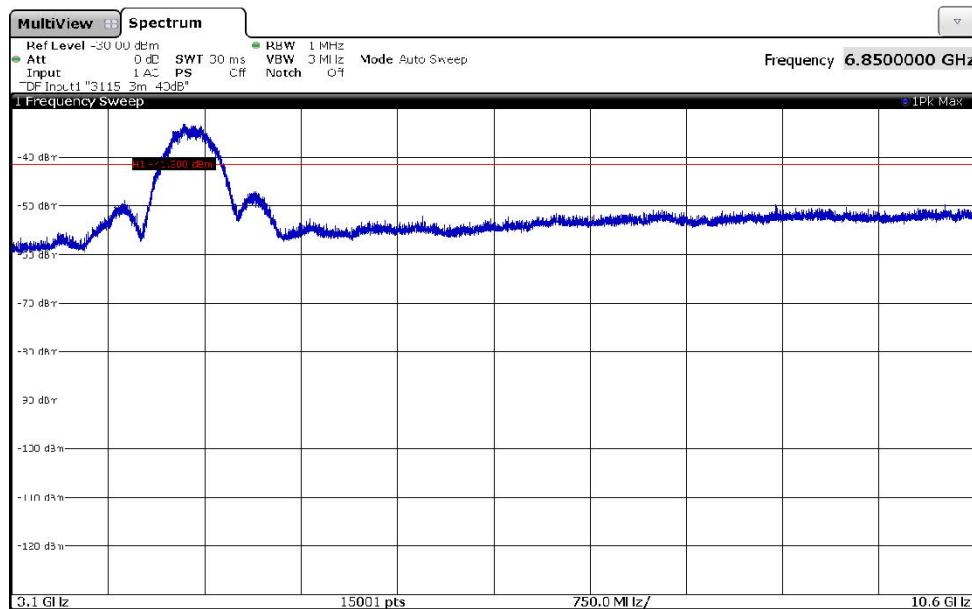
All emissions were below -69.1 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -53.3 dBm.

200549_29.png: Transmitter spurious emissions from 1.99 GHz to 3.1 GHz (operation mode 3):



All emissions were below -65.6 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm.

200549_10.png: Transmitter spurious emissions from 3.1 GHz to 10.6 GHz (operation mode 3):

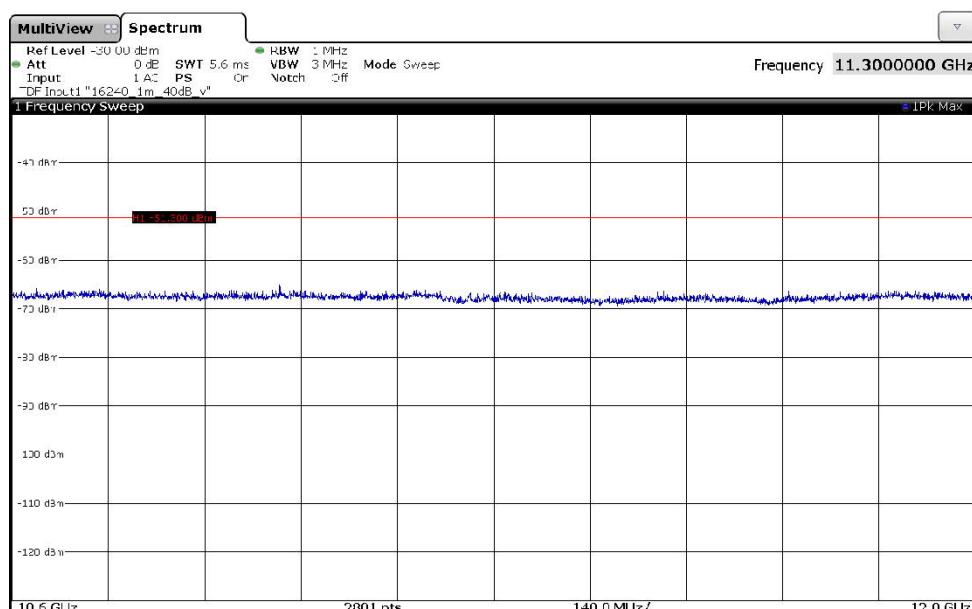


The following frequencies were found:

- 4566.150 MHz (wanted signal) and 5012.020 MHz.

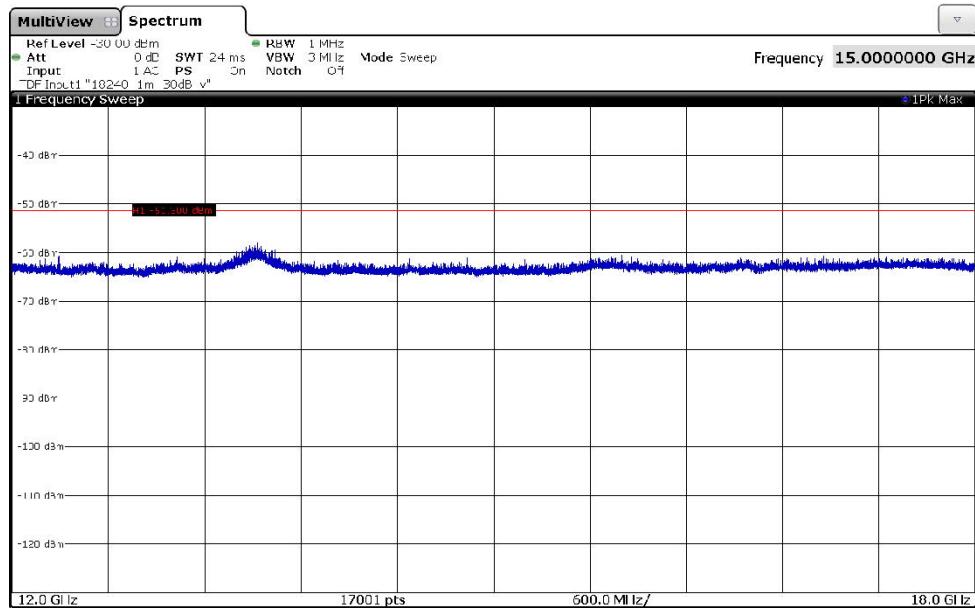
On these frequencies a final measurement has to be carried out. The results are presented in the following. All other emissions were below -49.8 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -41.3 dBm.

200549_35.png: Transmitter spurious emissions from 10.6 GHz to 12 GHz (operation mode 3):



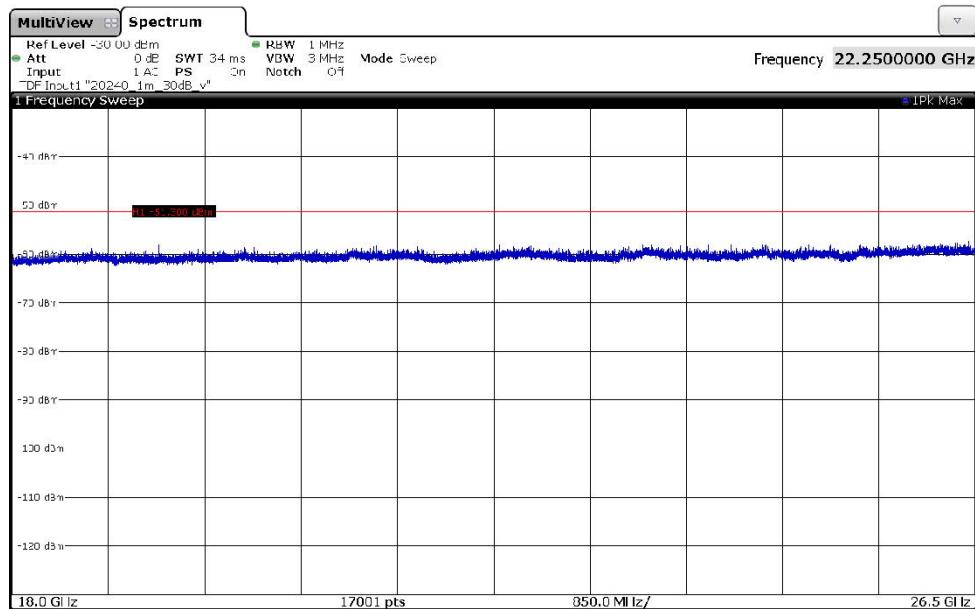
All emissions were below -65.2 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_48.png: Transmitter spurious emissions from 12 GHz to 18 GHz (operation mode 3):



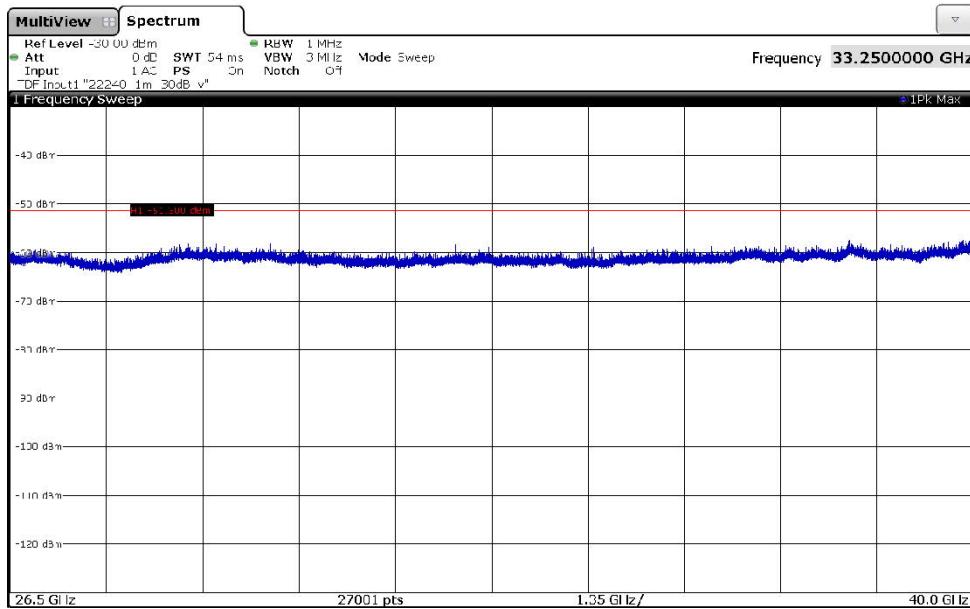
All emissions were below -58.0 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_47.png: Transmitter spurious emissions from 18 GHz to 26.5 GHz (operation mode 3):



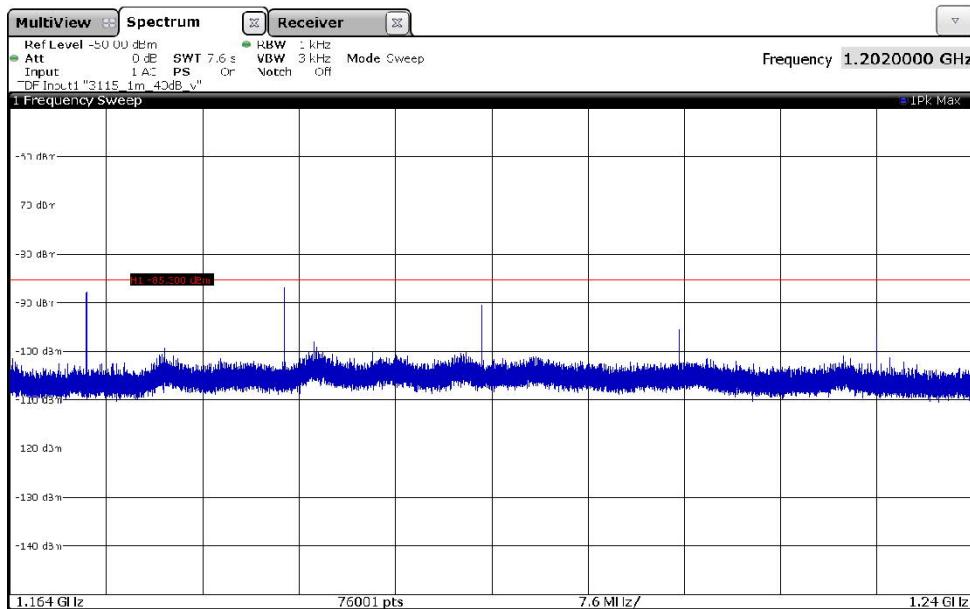
All emissions were below -57.3 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_46.png: Transmitter spurious emissions from 26.5 GHz to 40 GHz (operation mode 3):



All emissions were below -57.3 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_20.png: Transmitter spurious emissions from 1.164 GHz to 1.240 GHz (operation mode 3):

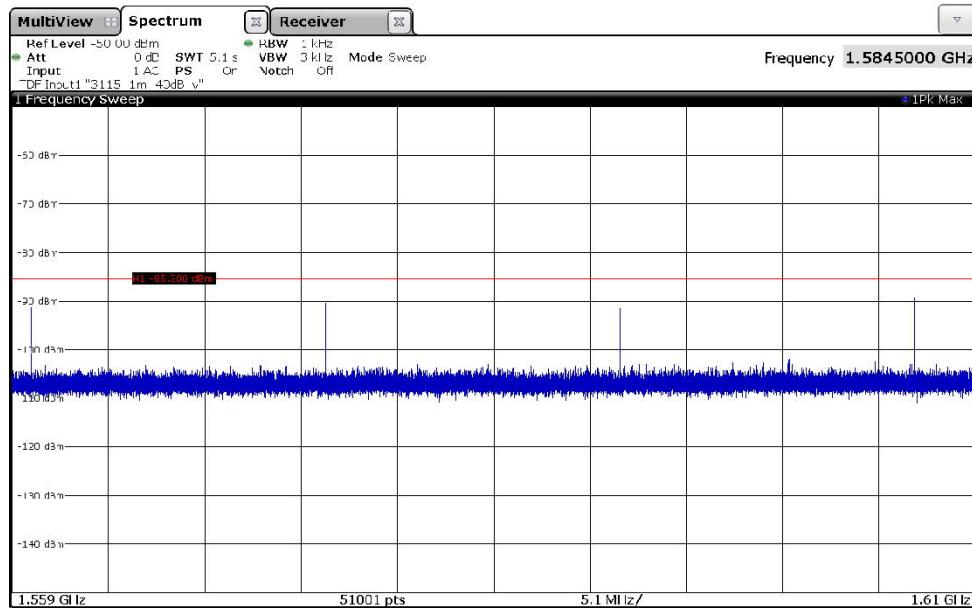


The following frequencies were found:

- 1170.000 MHz and 1185.600 MHz.

On these frequencies a final measurement has to be carried out. The result is presented in the following. All other emissions were below -90.7 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -85.3 dBm.

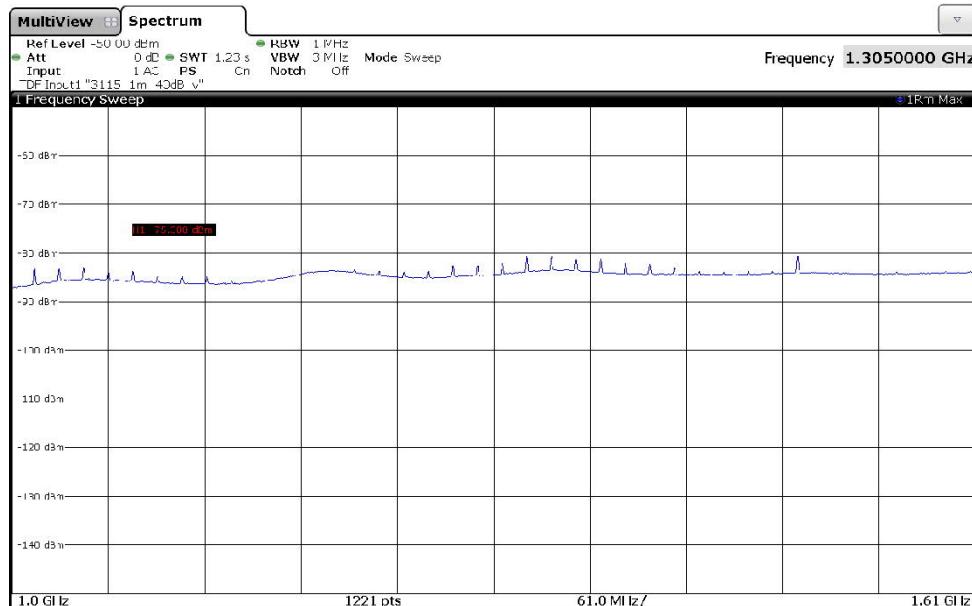
200549_21.png: Transmitter spurious emissions from 1.559 GHz to 1.610 GHz (operation mode 3):



All emissions were below -89.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -85.3 dBm. Therefore, no final measurement was carried out in this frequency range.

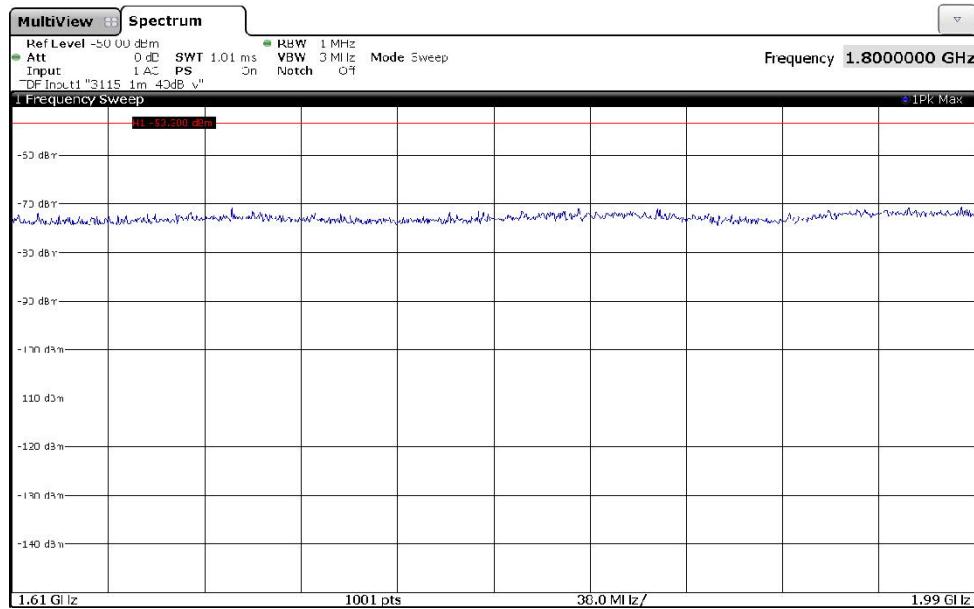
Transmitter operates on channel 4 (operation mode 4):

200549_30.png: Transmitter spurious emissions from 1 GHz to 1.61 GHz (operation mode 4):



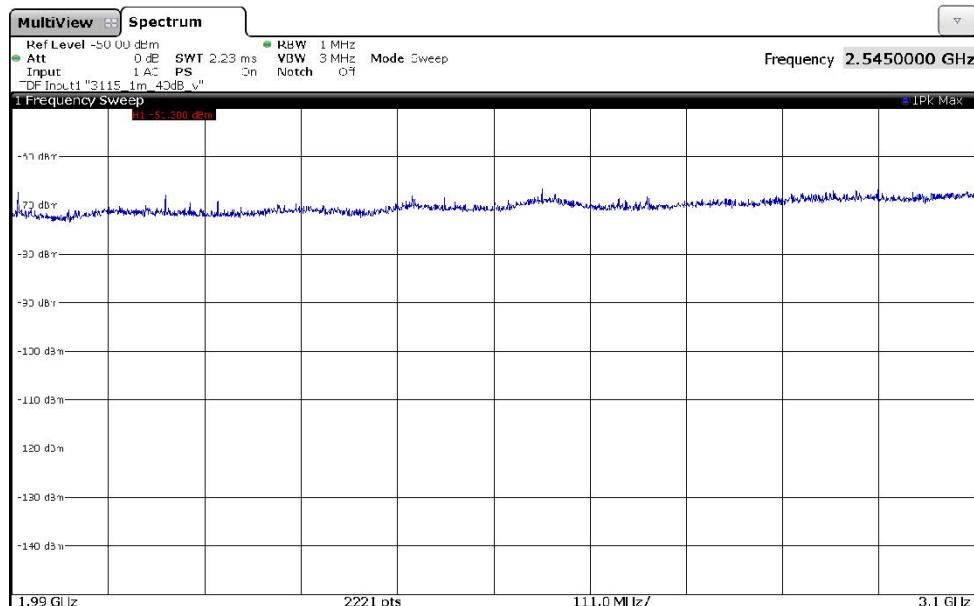
All emissions were below -80.6 dBm. This peak value is already below the rms AV-limit of -75.3 dBm.

200549_31.png: Transmitter spurious emissions from 1.61 GHz to 1.99 GHz (operation mode 4):



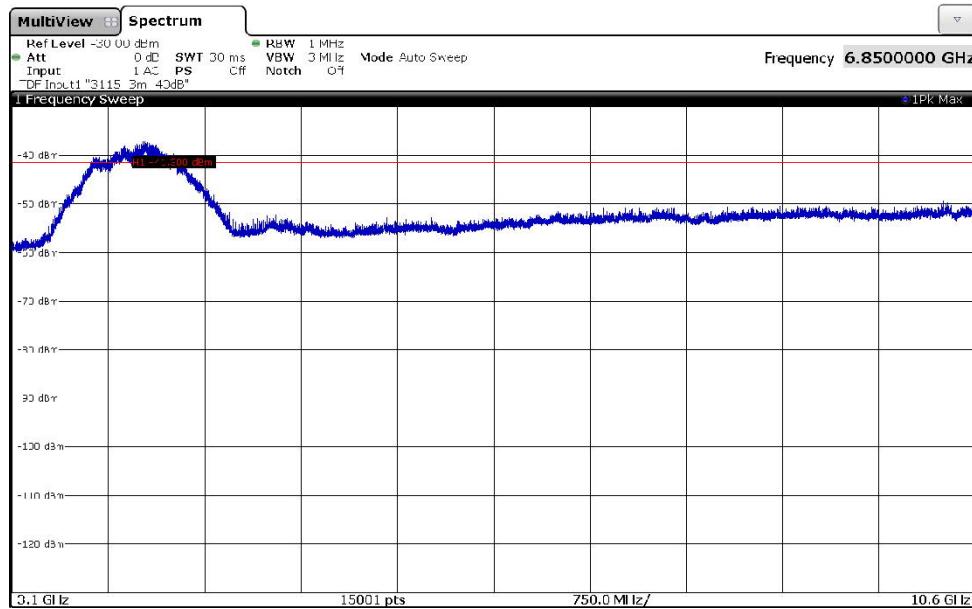
All emissions were below -70.3 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -53.3 dBm.

200549_32.png: Transmitter spurious emissions from 1.99 GHz to 3.1 GHz (operation mode 4):



All emissions were below -66.6 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm.

200549_9.png: Transmitter spurious emissions from 3.1 GHz to 10.6 GHz (operation mode 4):

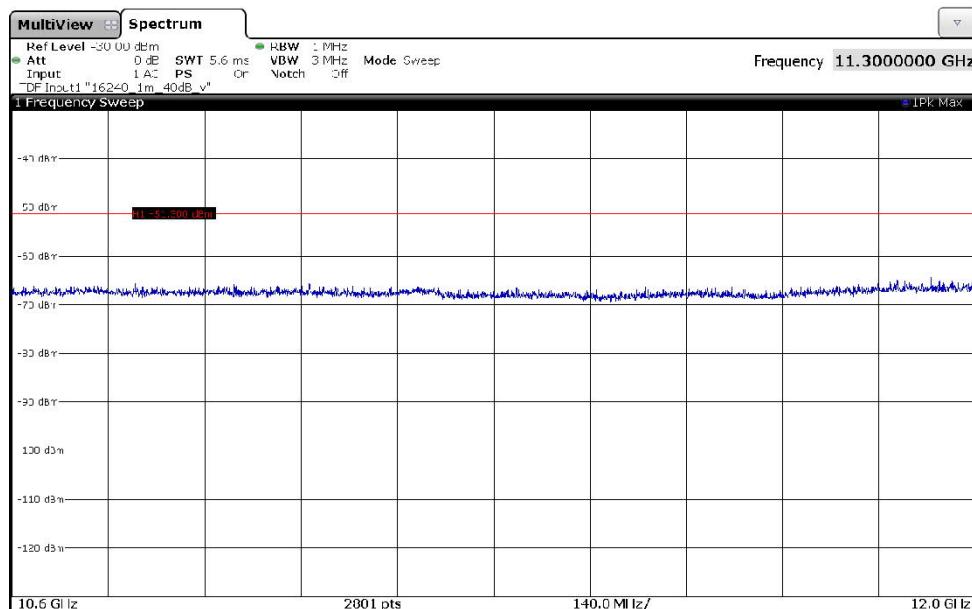


The following frequency was found:

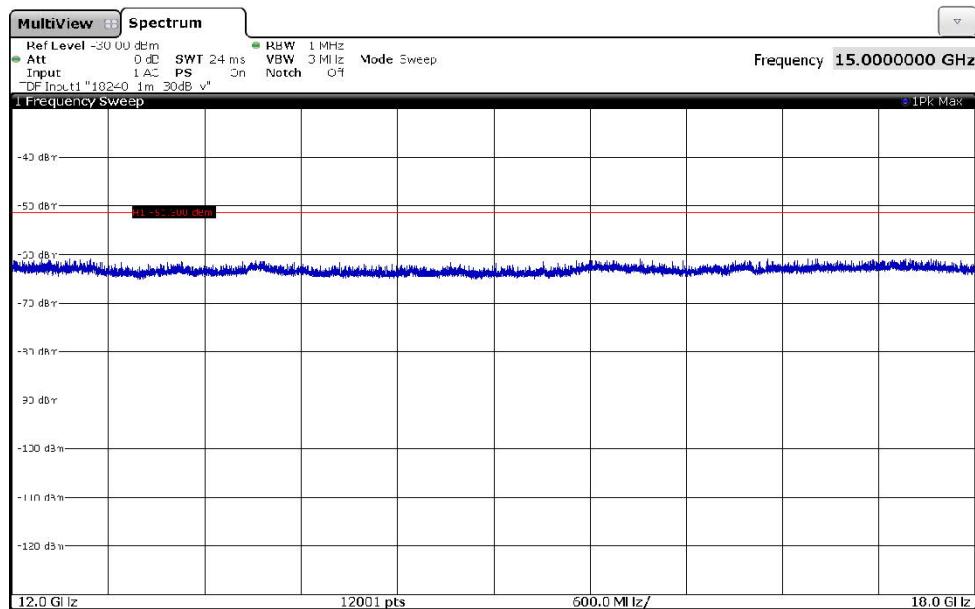
- 4103.050 MHz (wanted signal).

On this frequency a final measurement has to be carried out. The result is presented in the following. All other emissions were below -49.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -41.3 dBm.

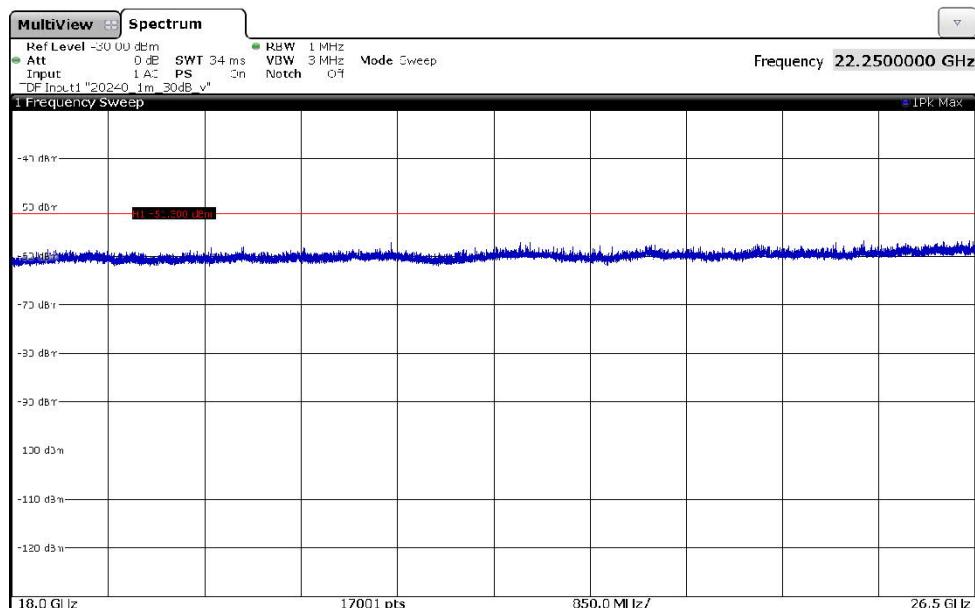
200549_36.png: Transmitter spurious emissions from 10.6 GHz to 12 GHz (operation mode 4):



All emissions were below -64.5 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

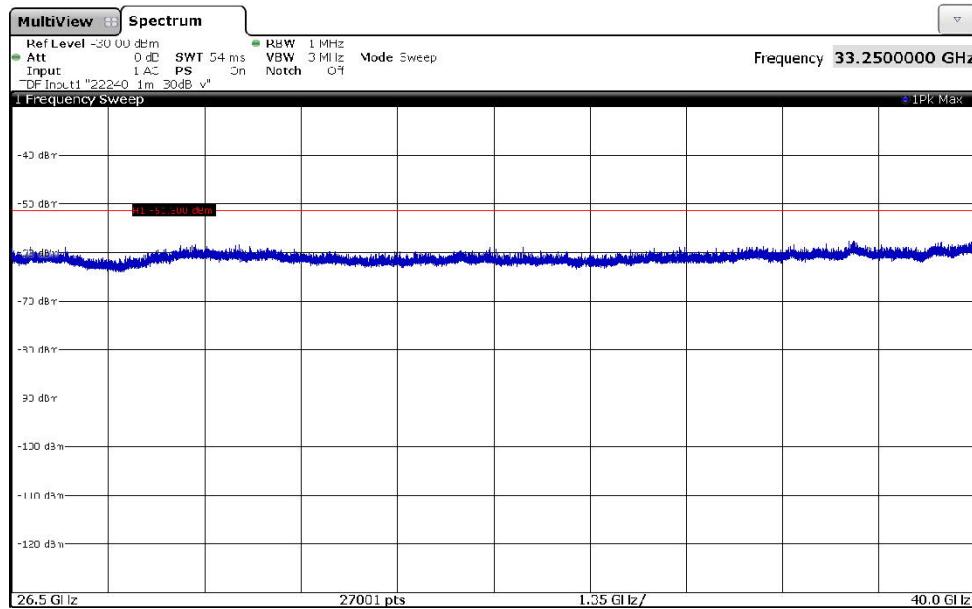
200549_38.png: Transmitter spurious emissions from 12 GHz to 18 GHz (operation mode 4):


All emissions were below -60.8 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_37.png: Transmitter spurious emissions from 18 GHz to 26.5 GHz (operation mode 4):


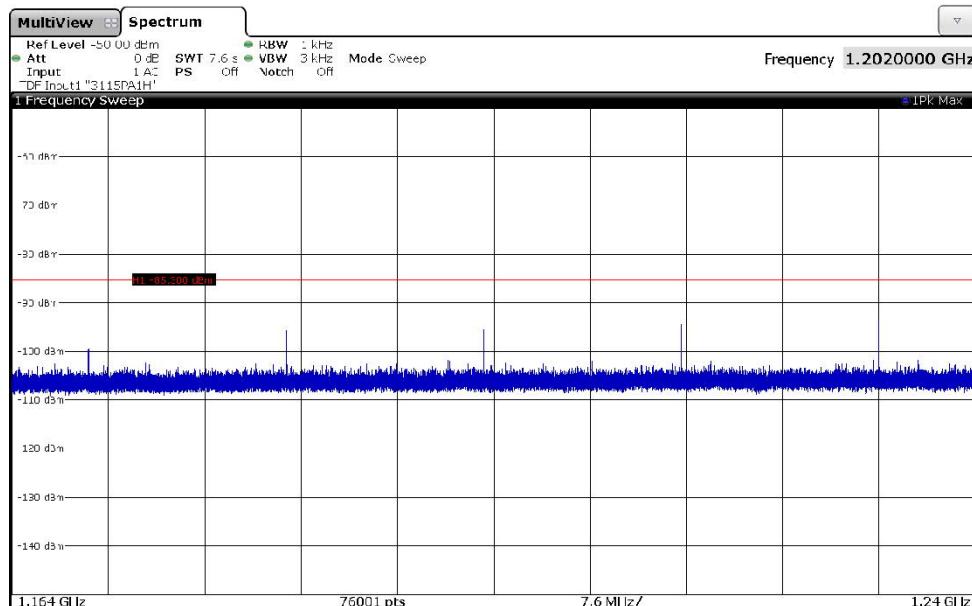
All emissions were below -56.8 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_39.png: Transmitter spurious emissions from 26.5 GHz to 40 GHz (operation mode 4):



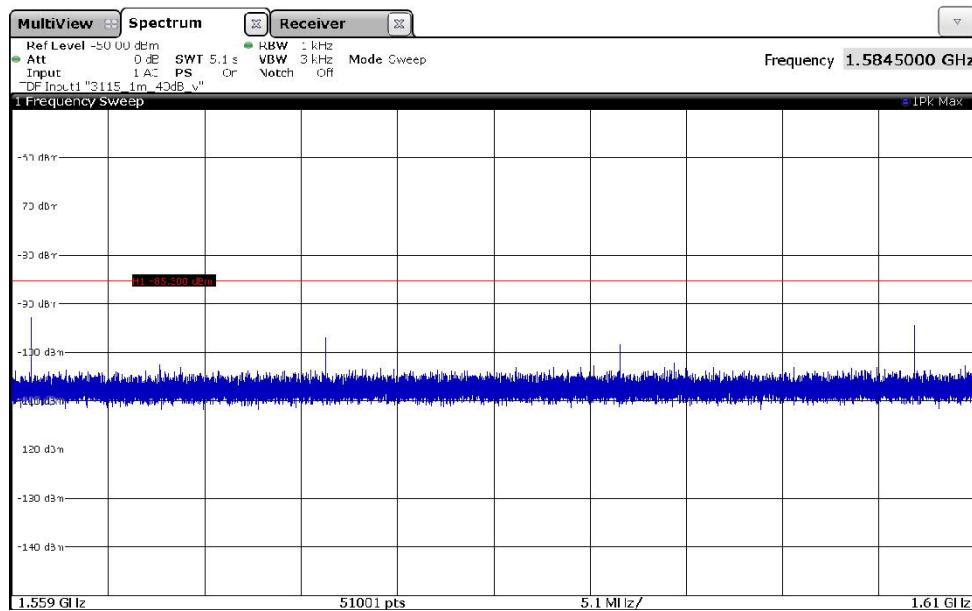
All emissions were below -57.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -51.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_22.png: Transmitter spurious emissions from 1.164 GHz to 1.240 GHz (operation mode 4):



All emissions were below -92.4 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -85.3 dBm. Therefore, no final measurement was carried out in this frequency range.

200549_23.png: Transmitter spurious emissions from 1.559 GHz to 1.610 GHz (operation mode 4):



All emissions were below -92.8 dBm (measured with peak detector). This peak value is already below the rms AV-limit of -85.3 dBm. Therefore, no final measurement was carried out in this frequency range.

Test equipment used (refer clause 6):

1 – 33

5.3.2.2 Final radiated emission measurement (30 MHz to 1 GHz)

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 21 °C | Relative humidity | 47 % |
|---------------------|-------|-------------------|------|

Position of EUT: The EUT was set-up on a turn device of a height of 1.5 m. The distance between EUT and antenna was 3 m.

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

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied by a fully charged battery.

Test results: The test results from above 960 MHz and below 1 GHz were calculated with the following formula:

$$\text{Result [dB}\mu\text{V/m]} = \text{reading [dB}\mu\text{V]} + \text{correction [dB]} (\text{cable loss antenna factor}) + 6 \text{ dB (used attenuator)} - 95.2 \text{ dB (according to 15.503 (k) [2])}$$

The results of the standard subsequent measurement inside a semi anechoic chamber are indicated in the table below. The limits as well as the measured results (levels) refer to the above-mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

The measurement time with the final detector is 1 second.

Result measured with the RMS detector above 960 MHz and below 1 GHz:

| Frequency [MHz] | Result [dBm] | Limit [dBm] | Margin [dB] | Readings [dB]\mu V | Correction [dB] | Conversion from dB\mu V/m to dBm | Height [cm] | Azimuth [deg] | Elevation [deg] | Pol. |
|-------------------------|-----------------|----------------|----------------|-----------------------|--------------------|-------------------------------------|----------------|------------------|--------------------|-------|
| 972.665 * | -76.3 | -75.3 | 1.0 | -18.9 | 33.8 | 95.2 | 184 | 201 | 0 | Vert. |
| Measurement uncertainty | | | | | ±5.5 dB | | | | | |

*: Highest peak (noise floor of the measuring system) with in the frequency range 960 MHz to 1 GHz.

Test: Passed

Test equipment used (refer clause 6):

1 – 11

5.3.2.3 Final radiated emission measurement (1 GHz to 40 GHz)

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 22 °C | Relative humidity | 46 % |
|---------------------|-------|-------------------|------|

Position of EUT: The EUT was set-up on a turn device of a height of 1.5 m. The distance between EUT and antenna was 1 m.

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

Test record: All results are shown in the following.

Supply voltage: During all measurements the EUT was supplied with 5.0 V_{DC} via the USB to fiber optic converter.

| Transmit on channel 1 | | | | | | | | |
|-------------------------|--------------------------|-------------|-------------|-------------------|-------|---------------|-----------------|-------------|
| Frequency [MHz] | Result RMS average [dBm] | Limit [dBm] | Margin [dB] | Bandwidth * [kHz] | Pol. | Azimuth [deg] | Elevation [deg] | Test result |
| 1170.000 | -86.9 | -85.3 | 1.6 | 1 | Hor. | 270 | 136 | Passed |
| 1185.600 | -86.4 | -85.3 | 1.1 | 1 | Hor. | 270 | 136 | Passed |
| 1201.200 | -90.1 | -85.3 | 4.8 | 1 | Hor. | 270 | 136 | Passed |
| 1216.800 | -96.4 | -85.3 | 11.1 | 1 | Hor. | 270 | 136 | Passed |
| 1232.400 | -95.0 | -85.3 | 9.7 | 1 | Hor. | 270 | 136 | Passed |
| 1560.000 | -87.5 | -85.3 | 2.2 | 1 | Hor. | 270 | 136 | Passed |
| 1575.600 | -87.3 | -85.3 | 2.0 | 1 | Hor. | 270 | 136 | Passed |
| 1591.200 | -88.0 | -85.3 | 2.7 | 1 | Hor. | 270 | 136 | Passed |
| 1606.800 | -87.2 | -85.3 | 1.9 | 1 | Hor. | 270 | 136 | Passed |
| 2891.300 | -66.4 | -51.3 | 5.1 | 1000 | Vert. | 237 | 0 | Passed |
| 3099.250 | -66.3 | -51.3 | 5.0 | 1000 | Vert. | 223 | -5 | Passed |
| 3495.500 | -42.6 | -41.3 | 1.3 | 1000 | Vert. | 223 | -5 | Passed |
| 4014.940 | -63.3 | -41.3 | 22.0 | 1000 | Hor. | 88 | 6 | Passed |
| Transmit on channel 2 | | | | | | | | |
| Frequency [MHz] | RMS average [dBm] | Limit [dBm] | Margin [dB] | Bandwidth * [kHz] | Pol. | Azimuth [deg] | Elevation [deg] | Test result |
| 1201.200 | -89.1 | -85.3 | 3.8 | 1 | Hor. | 270 | 136 | Passed |
| 1216.800 | -86.0 | -85.3 | 0.7 | 1 | Hor. | 270 | 136 | Passed |
| 1232.400 | -85.6 | -85.3 | 0.3 | 1 | Hor. | 270 | 136 | Passed |
| 3951.350 | -41.4 | -41.3 | 0.1 | 1000 | Vert. | 228 | 3 | Passed |
| 4419.660 | -53.8 | -41.3 | 12.5 | 1000 | Vert. | 230 | 4 | Passed |
| Measurement uncertainty | | | | ±4.7 dB | | | | |

*: The measuring receiver bandwidth

| Transmit on channel 3 | | | | | | | | |
|-----------------------|-------------------|-------------|-------------|-------------------|-------|---------------|-----------------|-------------|
| Frequency [MHz] | RMS average [dBm] | Limit [dBm] | Margin [dB] | Bandwidth * [kHz] | Pol. | Azimuth [deg] | Elevation [deg] | Test result |
| 1170.000 | -88.2 | -85.3 | 2.9 | 1 | Hor. | 270 | 136 | Passed |
| 1185.600 | -87.2 | -85.3 | 1.9 | 1 | Hor. | 270 | 136 | Passed |
| 4566.150 | -41.7 | -41.3 | 0.4 | 1000 | Vert. | 202 | 6 | Passed |
| 5012.020 | -57.4 | -41.3 | 16.1 | 1000 | Vert. | 202 | 6 | Passed |
| Transmit on channel 4 | | | | | | | | |
| Frequency [MHz] | RMS average [dBm] | Limit [dBm] | Margin [dB] | Bandwidth * [kHz] | Pol. | Azimuth [deg] | Elevation [deg] | Test result |
| 4103.050 | -46.7 | -41.3 | 5.4 | 1000 | Vert. | 216 | 6 | Passed |

| | |
|-------------------------|---------|
| Measurement uncertainty | ±4.7 dB |
|-------------------------|---------|

*: The measuring receiver bandwidth

Test equipment used (refer clause 6):

| |
|------------------|
| 12 – 19, 21 – 32 |
|------------------|

5.4 Conducted emissions on power supply lines (150 kHz to 30 MHz)

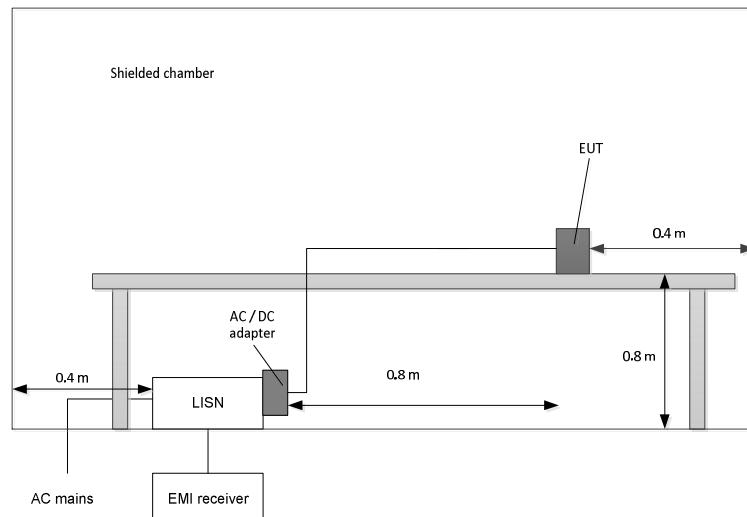
5.4.1 Method of measurement

This test will be carried out in a shielded chamber. Tabletop devices will be set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The setup of the Equipment under test will be in accordance to [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the applicable limit, this emission will be measured with the average and quasi-peak detector on all lines.

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

Test setup for measurement with the EUT supplied via USB:



5.4.2 Test results (conducted emissions on power supply lines)

| | | | |
|---------------------|-------|-------------------|------|
| Ambient temperature | 22 °C | Relative humidity | 44 % |
|---------------------|-------|-------------------|------|

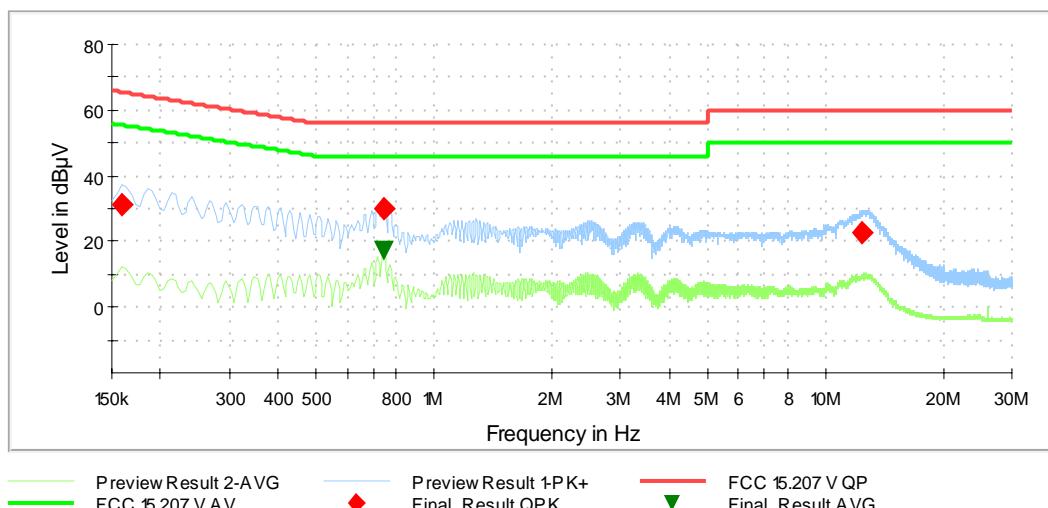
Position of EUT: The EUT was set-up on a non-conducting table of a height of 0.8 m.

Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: During this test the EUT was powered with 5.0 V_{DC} by the Samsung travel adapter ETA0U83EWE, which was itself supplied with 120 V_{AC} / 60 Hz.

The curves in the diagram only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by  the average measured points with .



| Frequency [MHz] | QuasiPeak [dBμV] | Average [dBμV] | Limit [dBμV] | Margin [dB] | Meas. Time [ms] | Bandwidth [kHz] | Line | PE | Corr. [dB] |
|-------------------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|-----|------------|
| 0.159900 | 31.4 | --- | 65.5 | 34.1 | 5000 | 9 | N | GND | 9.8 |
| 0.743100 | --- | 17.1 | 46.0 | 28.9 | 5000 | 9 | N | FLO | 9.9 |
| 0.743100 | 30.0 | --- | 56.0 | 26.0 | 5000 | 9 | N | FLO | 9.9 |
| 12.462000 | 22.6 | --- | 60.0 | 37.4 | 5000 | 9 | L1 | FLO | 10.7 |
| Measurement uncertainty | | | | | | | | | |
| ±2.8 dB | | | | | | | | | |

Test: Passed

Test equipment used (refer clause 6):

33 – 39

6 Test equipment and ancillaries used for tests

| No. | Test equipment | Type | Manufacturer | Serial No. | PM. No. | Cal. Date | Cal. due |
|-----|----------------------------------|--------------------------|--------------------|--------------------------|---------|---------------------------|----------|
| 1 | Semi anechoic chamber M276 | SAC5-2 | Albatross Projects | C62128-A540-A138-10-0006 | 483227 | Calibration not necessary | |
| 2 | RF Switch Matrix | OSP220 | Rohde & Schwarz | | 482976 | Calibration not necessary | |
| 3 | Turntable | TT3.0-3t | Maturo | 825/2612/.01 | 483224 | Calibration not necessary | |
| 4 | Controller | NCD | Maturo | 474/2612.01 | 483226 | Calibration not necessary | |
| 5 | Positioner | TG1.5-10kg | Maturo | 110/2648.01 | 483042 | Calibration not necessary | |
| 6 | Antenna support | BAM 4.5-P-10kg | Maturo | 222/2612.01 | 483225 | Calibration not necessary | |
| 7 | System software EMC32 M276 | EMC32 | Rohde & Schwarz | 100970 | 482972 | Calibration not necessary | |
| 8 | Antenna (Bilog) | CBL6111D | Schaffner | 22921 | 482978 | 27.03.2018 | 03.2021 |
| 9 | 6 dB attenuator | WA2-6 | Weinschel | - | 482793 | Calibration not necessary | |
| 10 | EMI Test receiver ESW | ESW44 | Rohde & Schwarz | 101828 | 482979 | 12.04.2019 | 04.2021 |
| 11 | Cable C417 | Sucoflex 118 | Huber+Suhner | 500654/118 | - | Calibration not necessary | |
| 12 | Fully anechoic chamber M20 | B83117-E2439-T232 | Albatross Projects | 103 | 480303 | Calibration not necessary | |
| 13 | EMI Receiver / Spectrum Analyser | ESW44 | Rohde & Schwarz | 101635 | 482467 | 18.02.2020 | 02.2022 |
| 14 | Antenna (Horn) | 3115 | EMCO | 9609-4918 | 480183 | 05.02.2018 | 02.2021 |
| 15 | Antenna (Horn) | 3115 | EMCO | 6761 | 480368 | 06.02.2020 | 02.2023 |
| 16 | Antenna support | BAM 4.5-P-10kg | Maturo | 222/2612.01 | 483225 | Calibration not necessary | |
| 17 | Swept CW generator | 83650L | Agilent | 3844A00554 | 480333 | 18.02.2020 | 02.2021 |
| 18 | RF-cable No.3 | Sucoflex 106B | Suhner | 0563/6B | 480670 | Calibration not necessary | |
| 19 | RF-cable No.36 | Sucoflex 106B | Suhner | 0587/6B | 480865 | Calibration not necessary | |
| 20 | RF-cable 40 | Sucoflex 106B | Suhner | 0708/6B | 481330 | Calibration not necessary | |
| 21 | Standard gain horn antenna | 14240-20 | Flann | 209388 | 481596 | Calibration not necessary | |
| 22 | Standard gain horn antenna | 16240-20 | Flann | 135671 | 480513 | Calibration not necessary | |
| 23 | Standard gain horn antenna | 18240-20 | Flann | 483 | 480294 | Calibration not necessary | |
| 24 | Standard gain horn antenna | 18240-20 | Flann | 482 | 480295 | Calibration not necessary | |
| 25 | Standard gain horn antenna | 20240-20 | Flann | 411 | 480297 | Calibration not necessary | |
| 26 | Standard gain horn antenna | 22240-20 | Flann | 469 | 480299 | Calibration not necessary | |
| 27 | Preamplifier 100 MHz – 16 GHz | AFS6-00101600-23-10P-6-R | MITEQ | 2011215 | 482333 | 13.02.2020 | 02.2022 |
| 28 | Preamplifier 12 GHz - 18 GHz | JS3-12001800-16-5A | MITEQ | 571667 | 480343 | 13.02.2020 | 02.2022 |
| 29 | Preamplifier 18 GHz - 26 GHz | JS4-18002600-20-5A | MITEQ | 658697 | 480342 | 13.02.2020 | 02.2022 |

| No. | Test equipment | Type | Manufacturer | Serial No. | PM. No. | Cal. Date | Cal. due |
|-----|------------------------------|----------------------|-----------------|------------------|---------|---------------------------|----------|
| 30 | Preamplifier 26 GHz - 40 GHz | JDM2-26004000-25-10P | MITEQ | 128746 | 482806 | 17.02.2020 | 02.2022 |
| 31 | RF-cable 1 m | Insulated Wire Inc. | Insulated Wire | KPS-1533-400-KPS | 480300 | Calibration not necessary | |
| 32 | RF-cable 2m | Insulated Wire Inc. | Insulated Wire | KPS-1533-800-KPS | 480302 | Calibration not necessary | |
| 33 | Shielded chamber M4 | - | Siemens | B83117-S1-X158 | 480088 | Calibration not necessary | |
| 35 | EMI Receiver | ESIB 26 | Rohde & Schwarz | 1088.7490 | 481182 | 12.02.2020 | 02.2022 |
| 36 | LISN | NSLK8128 | Schwarzbeck | 8128161 | 480138 | 11.02.2020 | 02.2022 |
| 37 | Transient Limiter | CFL 9206A | Teseq | 38268 | 481982 | Calibration not necessary | |
| 38 | Software | EMC32 | Rohde & Schwarz | 100061 | 481022 | Calibration not necessary | |
| 39 | AC source | AC6803A | Keysight | JPVJ002509 | 482350 | Calibration not necessary | |

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 C63.4-2014 | 19.09.2019 | 18.09.2021 |
| Fully anechoic chamber M20 | 480303 | 1 -18 GHz | SVSWR | CISPR 16-1-4 Amd. 1 | 13.07.2018 | 12.07.2021 |
| Shielded chamber M4 | 480088 | 9 kHz – 30 MHz | GND-Plane | ANSI C63.4-2014 | 06.11.2018 | 05.11.2020 |

8 Report history

| Report Number | Date | Comment |
|---------------|------------|------------------|
| F191161E2 | 17.11.2020 | Document created |
| | | |
| | | |
| | | |

9 List of annexes

Annex A

Test setup photos

14 pages