



EMI - TEST REPORT

- FCC Part 15.247, RSS-247 -

Type / Model Name : AudioLink (market name), Wireless Relay (internal development name)

Product Description : Audio streaming accessory for MED-EL audio processors including a
2.4 GHz proprietary transceiver

Applicant : MED-EL Elektromedizinische Geraete GmbH

Address : Fuerstenweg 77a

6020 INNSBRUCK, AUSTRIA

Manufacturer : MED-EL Elektromedizinische Geraete GmbH

Address : Fuerstenweg 77a

6020 INNSBRUCK, AUSTRIA

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : **T44784-00-00KS**

27. May 2019

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
without the written permission of the test laboratory.

FCC ID: VNP-AL

IC: 11986A-AL

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2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.2 General remarks

The EUT contains a 2.4 GHz transceiver with integral antenna. The transceiver operates in the frequency band 2.400 GHz - 2.4835 GHz.

2.3 Equipment type

2.4 GHz transceiver

2.4 Short description of the equipment under test (EUT)

The AudioLink is a multifunctional battery powered body worn accessory to the MED-EL CI System that provides wireless connectivity options for MED-EL CI systems. It communicates over a proprietary low power 2.4 GHz link to supported MED-EL audio processors (e.g. SONNET & SONNET 2) and has a Bluetooth classic module integrated for connectivity to common mobile devices. From such Bluetooth devices the AudioLink can receive audio signals which are streamed to the MED-EL audio processor or control data like remote control commands e.g. from the FineTuner App. It also provides a user interface, a USB charging connector and an audio jack.

Test samples:

| SN EUT | CBA | RF Transceiver FW | Main Controller FW | Tests |
|--------|-----------|-------------------|--------------------|--|
| #1 | AL-000066 | rev. 1.0.0 | rev. 1.0.0 | Conducted measurements MB, CPC, SEC |
| #2 | AL-000077 | rev. 1.0.0 | rev. 1.0.0 | Conducted measurements MB, CPC, SEC |
| #3 | AL-000080 | rev. 1.0.0 | rev. 1.0.0 | Radiated measurements MB, SER3, SER2, DC |
| #4 | AL-000081 | rev. 1.0.0 | rev. 1.0.0 | Radiated measurements MB, SER3, SER2, DC |

Note: The specially prepared sample #1 for conducted tests and has been used for testing. Sample #2 is a replacement to #1. Sample #3 has been used for radiated tests. Sample #4 is a replacement to #3.

2.5 Variants of the EUT

None.

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2.6 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

| Channel | Centre frequency (MHz) | Channel | Centre frequency (MHz) | Channel | Centre frequency (MHz) |
|---------|------------------------|---------|------------------------|---------|------------------------|
| 1 | 2404 | 14 | 2430 | 27 | 2456 |
| 2 | 2406 | 15 | 2432 | 28 | 2458 |
| 3 | 2408 | 16 | 2434 | 29 | 2460 |
| 4 | 2410 | 17 | 2436 | 30 | 2462 |
| 5 | 2412 | 18 | 2438 | 31 | 2464 |
| 6 | 2414 | 19 | 2440 | 32 | 2466 |
| 7 | 2416 | 20 | 2442 | 33 | 2468 |
| 8 | 2418 | 21 | 2444 | 34 | 2470 |
| 9 | 2420 | 22 | 2446 | 35 | 2472 |
| 10 | 2422 | 23 | 2448 | 36 | 2474 |
| 11 | 2424 | 24 | 2450 | 37 | 2476 |
| 12 | 2426 | 25 | 2452 | 38 | 2478 |
| 13 | 2428 | 26 | 2454 | 39 | 2480 |

Note: the marked frequencies are determined for final testing.

2.7 EUT operation modes

The equipment under test was operated during the measurement under the following conditions:

- Cont. TX at CH1, CH19 and CH39 (the EUT uses GFSK and provides following data rate: 2 Mbps)

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2.8 Antenna

The following antenna shall be used with the EUT:

| Number | Characteristic | Type | Plug | Frequency range (GHz) | Gain (dBi) |
|--------|----------------|------|------|-----------------------|------------|
| 1 | Omni | PCB | None | 2.4 | 1.0 |

2.9 Power supply system utilised

Power supply voltage, V_{nom} : 3.2 VDC – 4.2 VDC Battery powered
 Power supply voltage (alternative) : 5 VDC USB powered

2.10 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- Power supply Model : Supplied by manufacturer
- FTDI-USB cable Model : FTDI FT2232H Mini Module
- _____ Model : _____

2.11 Determination of worst case conditions for final measurement

Measurements have been made in all three orthogonal axes of the EUT to locate at which position the EUT produces the maximum of the emissions.

As worst case, the following channels and test modes are selected for the final test:

| Standard | Available channels | Tested channels | Power setting | Modulation | Modulation Type | Data rate |
|-------------|--------------------|-----------------|---------------|------------|-----------------|-----------|
| Proprietary | 1 to 39 | 1, 19, 39 | -4 dBm | DSSS | GFSK | 2 Mbps |

2.11.1 Test jig

No test jig is used.

2.11.2 Test software

The test software for the EUT provides the special test modes continuous TX unmodulated (CW), continuous TX modulated (bursts) and the channel settings.

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3 TEST RESULT SUMMARY

Operating in the 2400 MHz – 2483.5 MHz:

| FCC Rule Part | RSS Rule Part | Description | Result |
|---------------|-----------------|-------------------------------------|----------------|
| 15.207(a) | RSS-Gen, 8.8 | AC power line conducted emissions | passed |
| 15.247(a)(2) | RSS-247, 5.2(a) | -6 dB EBW | passed |
| 15.247(b)(3) | RSS-247, 5.4(d) | Maximum peak conducted output power | passed |
| 15.247(b)(4) | RSS-247, 5.4(d) | Defacto limit | passed |
| 15.247(d) | RSS-247, 5.5 | Unwanted emission, radiated | passed |
| 15.247(d) | RSS-Gen, 8.10 | Emissions in restricted bands | passed |
| 15.247(e) | RSS-247, 5.2(b) | PSD | passed |
| 15.35(c) | RSS-Gen, 6.10 | Pulsed operation | passed |
| 15.203 | - | Antenna requirement | passed |
| - | RSS-Gen, 6.11 | Transmitter frequency stability | not applicable |
| - | RSS-Gen, 6.6 | 99 % Bandwidth | passed |

The mentioned RSS Rule Parts in the above table are related to:
 RSS-Gen, Issue 5, April 2018
 RSS-247, Issue 2, February 2017

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 01 February 2019

Testing concluded on : 08 March 2019

Checked by:

Tested by:

 Klaus Gegenfurtner
 Teamleader Radio

 Hermann Smetana
 Radio Team

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

| Measurement Type | Range | Confidence Level | Calculated Uncertainty |
|-----------------------------------|------------------------|------------------|--------------------------|
| AC power line conducted emissions | 0.15 MHz to 30 MHz | 95% | ± 3.29 dB |
| EBW and OBW | 2400 MHz to 30000 MHz | 95% | ± 2.5 x 10 ⁻⁷ |
| Output power ERP, radiated | 1000 MHz to 7000 MHz | 95% | ± 2.71 dB |
| Field strength of the fundamental | 1000 MHz to 7000 MHz | 95% | ± 2.71 dB |
| Power spectral density | 2400 MHz to 3000 MHz | 95% | ± 0.62 dB |
| Spurious Emissions, conducted | 9 kHz to 10000 MHz | 95% | ± 2.15 dB |
| Spurious Emissions, conducted | 10000 MHz to 40000 MHz | 95% | ± 3.47 dB |
| Spurious Emissions, radiated | 9 kHz to 30 MHz | 95% | ± 3.53 dB |
| Spurious Emissions, radiated | 30 MHz to 1000 MHz | 95% | ± 4.44 dB |
| Spurious Emissions, radiated | 1000 MHz to 30000 MHz | 95% | ± 2.34 dB |
| Spurious Emissions, radiated | 30000 MHz to 40000 MHz | 95% | ± 5.13 dB |

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4.4 Measurement protocol for FCC and ISED

4.4.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

**FCC: DE 0011
ISED: DE0009**

4.4.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

4.4.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2.2 Radiated emission (electrical field 30 MHz - 1 GHz)

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.

The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

| | | | | | | | | |
|-----------|--------|---|--------|---|----------|---|----------|--------|
| Frequency | Level | + | Factor | = | Level | - | Limit | = |
| Delta | | | | | | | | |
| (MHz) | (dBµV) | | (dB) | | (dBµV/m) | | (dBµV/m) | (dB) |
| 719.0 | 75.0 | + | 32.6 | = | 107.6 | - | 110.0 | = -2.4 |

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4.4.2.3 Radiated emission (electrical field 1 GHz - 40 GHz)

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table, 1.5 metre above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyzer set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

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5 TEST CONDITIONS AND RESULTS

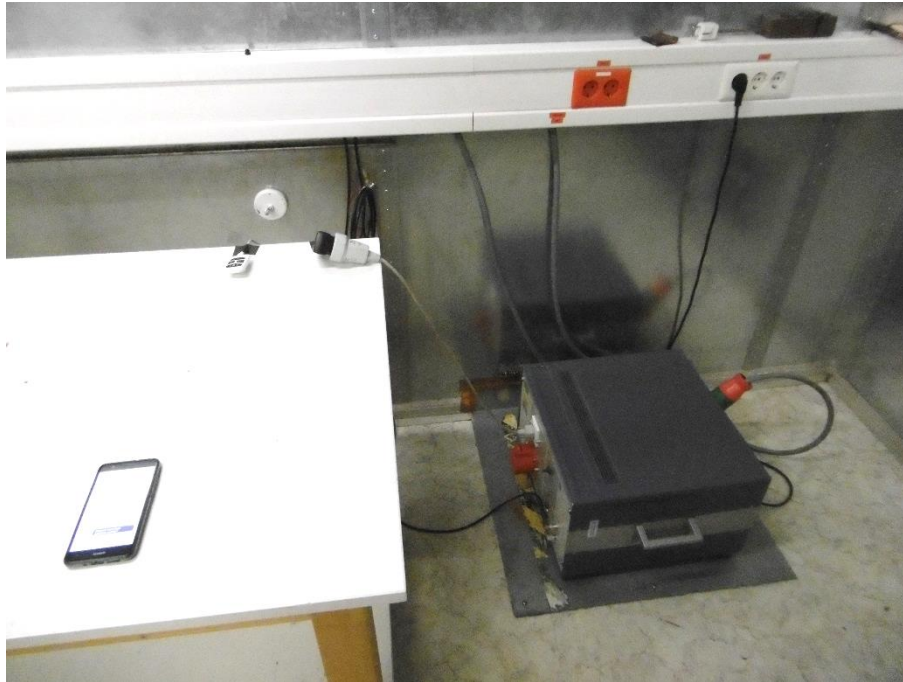
5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits under FCC 15.207(a).

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz
 Min. limit margin -19.5 dB at 0.290 MHz

Limit according to FCC Part 15, Section 15.207(a):

| Frequency of Emission (MHz) | Conducted Limit (dBµV) | |
|-----------------------------|------------------------|------------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols

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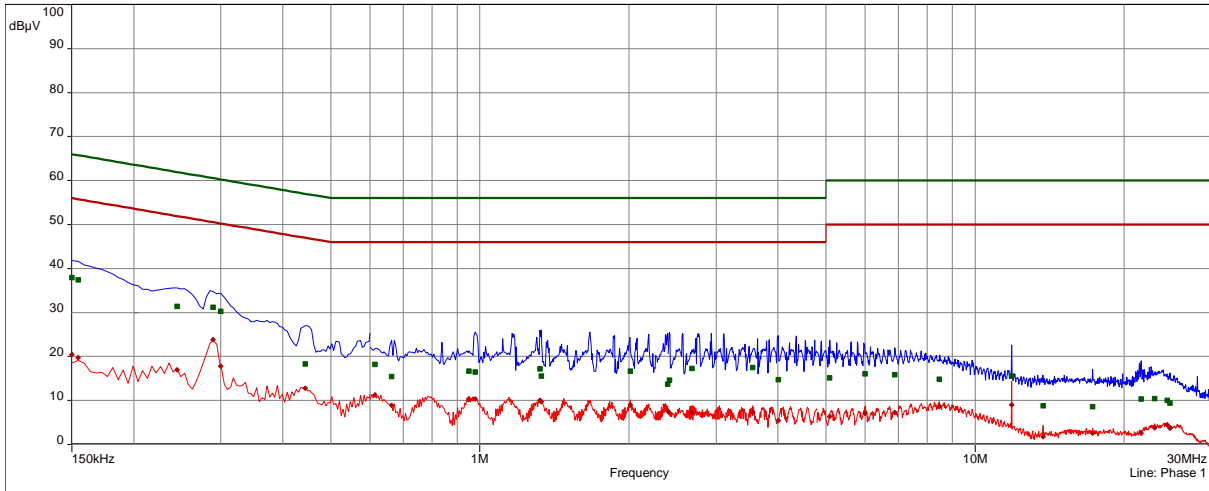
IC: 11986A-AL

5.1.6 Test protocol

Test point: L1
 Operation mode: Transmission 2.4 GHz
 Remarks:

Result: passed

- CISPR 22/CISPR22 B - Average/
- CISPR 22/CISPR22 B - QPeak/
- Meas.Peak (Phase 1)
- Mes. CISPR AVG (Phase 1)
- QuasiPeak (Finals) (Phase 1)
- ◆ CISPR AV (Finals) (Phase 1)



CISPR 22/CISPR22B

| freq | SR | QP | margin | limit | AV | margin | limit | line | corr |
|--------|----|--------|--------|-------|--------|--------|-------|---------|------|
| MHz | | dB(µV) | dB | dB | dB(µV) | dB | dB | | dB |
| 0.150 | 1 | 38.0 | -28.0 | 66.0 | 20.5 | -35.5 | 56.0 | Phase 1 | 10 |
| 0.155 | 1 | 37.4 | -28.3 | 65.8 | 19.7 | -36.0 | 55.8 | Phase 1 | 10 |
| 0.245 | 1 | 31.5 | -30.5 | 61.9 | 17.0 | -35.0 | 51.9 | Phase 1 | 10 |
| 0.290 | 1 | 31.2 | -29.4 | 60.5 | 23.9 | -26.7 | 50.5 | Phase 1 | 10 |
| 0.300 | 2 | 30.2 | -30.0 | 60.2 | 17.8 | -32.5 | 50.2 | Phase 1 | 10 |
| 0.444 | 2 | 18.3 | -38.7 | 57.0 | 12.8 | -34.2 | 47.0 | Phase 1 | 10 |
| 0.614 | 3 | 18.2 | -37.8 | 56.0 | 11.3 | -34.7 | 46.0 | Phase 1 | 10 |
| 0.663 | 3 | 15.5 | -40.5 | 56.0 | 8.9 | -37.1 | 46.0 | Phase 1 | 10 |
| 0.951 | 3 | 16.7 | -39.3 | 56.0 | 10.2 | -35.8 | 46.0 | Phase 1 | 10 |
| 0.978 | 3 | 16.4 | -39.6 | 56.0 | 10.4 | -35.6 | 46.0 | Phase 1 | 10 |
| 1.322 | 4 | 17.2 | -38.8 | 56.0 | 10.0 | -36.0 | 46.0 | Phase 1 | 10 |
| 1.331 | 4 | 15.6 | -40.5 | 56.0 | 9.7 | -36.3 | 46.0 | Phase 1 | 10 |
| 2.015 | 4 | 16.7 | -39.4 | 56.0 | 9.0 | -37.0 | 46.0 | Phase 1 | 10 |
| 2.397 | 4 | 13.7 | -42.3 | 56.0 | 7.7 | -38.4 | 46.0 | Phase 1 | 10 |
| 2.414 | 5 | 14.7 | -41.3 | 56.0 | 7.1 | -38.9 | 46.0 | Phase 1 | 10 |
| 2.679 | 5 | 17.3 | -38.7 | 56.0 | 7.2 | -38.8 | 46.0 | Phase 1 | 10 |
| 3.552 | 5 | 17.5 | -38.5 | 56.0 | 7.4 | -38.6 | 46.0 | Phase 1 | 10 |
| 4.002 | 5 | 14.7 | -41.3 | 56.0 | 5.4 | -40.6 | 46.0 | Phase 1 | 10 |
| 5.084 | 6 | 15.1 | -44.9 | 60.0 | 6.3 | -43.7 | 50.0 | Phase 1 | 10 |
| 5.997 | 6 | 16.1 | -43.9 | 60.0 | 7.0 | -43.0 | 50.0 | Phase 1 | 11 |
| 6.884 | 6 | 15.9 | -44.1 | 60.0 | 7.3 | -42.7 | 50.0 | Phase 1 | 11 |
| 8.477 | 6 | 14.8 | -45.2 | 60.0 | 8.6 | -41.4 | 50.0 | Phase 1 | 11 |
| 11.855 | 7 | 15.5 | -44.5 | 60.0 | 9.0 | -41.0 | 50.0 | Phase 1 | 11 |
| 13.713 | 7 | 8.8 | -51.2 | 60.0 | 1.8 | -48.3 | 50.0 | Phase 1 | 11 |
| 17.282 | 7 | 8.6 | -51.4 | 60.0 | 2.5 | -47.5 | 50.0 | Phase 1 | 11 |
| 21.648 | 8 | 10.3 | -49.7 | 60.0 | 2.6 | -47.5 | 50.0 | Phase 1 | 12 |
| 23.043 | 8 | 10.5 | -49.5 | 60.0 | 3.8 | -46.2 | 50.0 | Phase 1 | 12 |
| 24.420 | 8 | 10.1 | -49.9 | 60.0 | 4.4 | -45.6 | 50.0 | Phase 1 | 12 |
| 24.740 | 8 | 9.4 | -50.6 | 60.0 | 3.7 | -46.3 | 50.0 | Phase 1 | 12 |

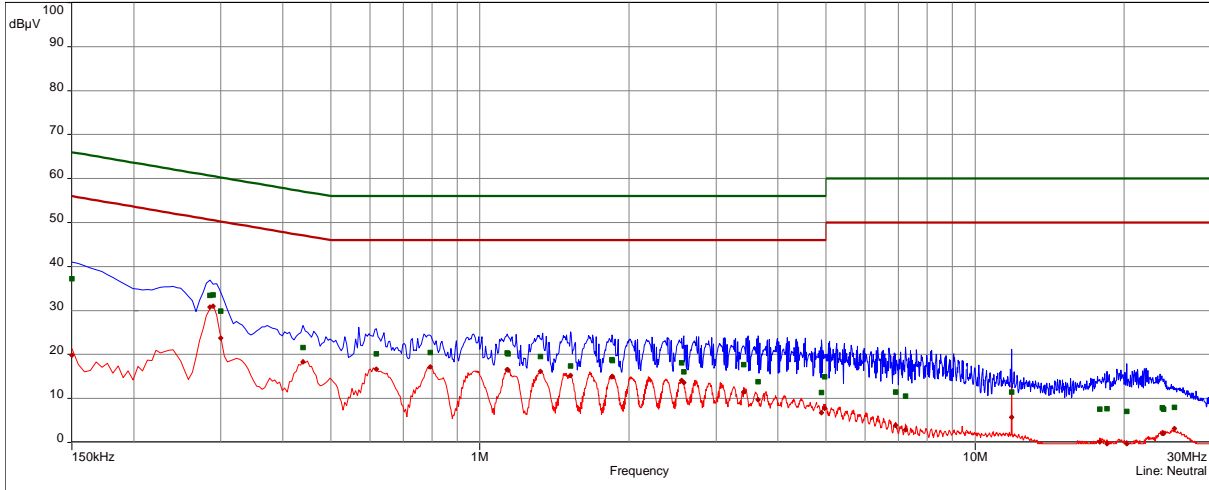
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Test point: N
 Operation mode: Transmission 2.4 GHz
 Remarks:

Result: passed

- CISPR 22/CISPR22 B - Average/
- CISPR 22/CISPR22 B - QPeak/
- Meas.Peak (Neutral)
- Mes. CISPR AVG (Neutral)
- QuasiPeak (Finals) (Neutral)
- CISPR AV (Finals) (Neutral)



CISPR 22/CISPR22B

| freq | SR | QP | margin | limit | AV | margin | limit | line | corr |
|--------|----|--------|--------|-------|--------|--------|-------|---------|------|
| MHz | | dB(µV) | dB | dB | dB(µV) | dB | dB | | dB |
| 0.150 | 9 | 37.2 | -28.8 | 66.0 | 19.8 | -36.2 | 56.0 | Neutral | 10 |
| 0.285 | 9 | 33.5 | -27.2 | 60.7 | 30.8 | -19.9 | 50.7 | Neutral | 10 |
| 0.290 | 9 | 33.5 | -27.0 | 60.5 | 31.0 | -19.5 | 50.5 | Neutral | 10 |
| 0.300 | 10 | 29.8 | -30.4 | 60.2 | 23.7 | -26.5 | 50.2 | Neutral | 10 |
| 0.440 | 10 | 21.6 | -35.5 | 57.1 | 18.3 | -28.7 | 47.1 | Neutral | 10 |
| 0.618 | 11 | 20.1 | -35.9 | 56.0 | 16.7 | -29.3 | 46.0 | Neutral | 10 |
| 0.794 | 11 | 20.4 | -35.6 | 56.0 | 17.2 | -28.8 | 46.0 | Neutral | 10 |
| 1.136 | 11 | 20.3 | -35.7 | 56.0 | 16.6 | -29.4 | 46.0 | Neutral | 10 |
| 1.140 | 11 | 20.1 | -35.9 | 56.0 | 16.5 | -29.5 | 46.0 | Neutral | 10 |
| 1.326 | 12 | 19.5 | -36.5 | 56.0 | 16.2 | -29.8 | 46.0 | Neutral | 10 |
| 1.524 | 12 | 17.4 | -38.6 | 56.0 | 15.2 | -30.8 | 46.0 | Neutral | 10 |
| 1.848 | 12 | 18.9 | -37.1 | 56.0 | 15.0 | -31.0 | 46.0 | Neutral | 10 |
| 1.853 | 12 | 18.7 | -37.3 | 56.0 | 15.0 | -31.0 | 46.0 | Neutral | 10 |
| 2.553 | 13 | 18.1 | -37.9 | 56.0 | 14.1 | -31.9 | 46.0 | Neutral | 10 |
| 2.580 | 13 | 16.1 | -39.9 | 56.0 | 13.6 | -32.4 | 46.0 | Neutral | 10 |
| 3.408 | 13 | 17.7 | -38.3 | 56.0 | 11.5 | -34.5 | 46.0 | Neutral | 10 |
| 3.647 | 13 | 13.8 | -42.2 | 56.0 | 9.7 | -36.3 | 46.0 | Neutral | 10 |
| 4.895 | 14 | 11.4 | -44.6 | 56.0 | 6.7 | -39.3 | 46.0 | Neutral | 10 |
| 4.967 | 14 | 14.9 | -41.1 | 56.0 | 7.7 | -38.3 | 46.0 | Neutral | 10 |
| 6.915 | 14 | 11.5 | -48.5 | 60.0 | 3.9 | -46.1 | 50.0 | Neutral | 11 |
| 7.244 | 14 | 10.6 | -49.5 | 60.0 | 2.9 | -47.2 | 50.0 | Neutral | 11 |
| 11.855 | 15 | 11.4 | -48.6 | 60.0 | 5.7 | -44.3 | 50.0 | Neutral | 11 |
| 17.880 | 15 | 7.5 | -52.5 | 60.0 | 0.2 | -49.8 | 50.0 | Neutral | 11 |
| 18.461 | 15 | 7.7 | -52.3 | 60.0 | -0.3 | -50.3 | 50.0 | Neutral | 11 |
| 20.258 | 16 | 7.1 | -52.9 | 60.0 | -0.5 | -50.5 | 50.0 | Neutral | 11 |
| 23.880 | 16 | 7.9 | -52.1 | 60.0 | 2.1 | -47.9 | 50.0 | Neutral | 11 |
| 24.033 | 16 | 7.5 | -52.5 | 60.0 | 2.0 | -48.0 | 50.0 | Neutral | 11 |
| 25.293 | 16 | 8.0 | -52.0 | 60.0 | 3.2 | -46.8 | 50.0 | Neutral | 11 |

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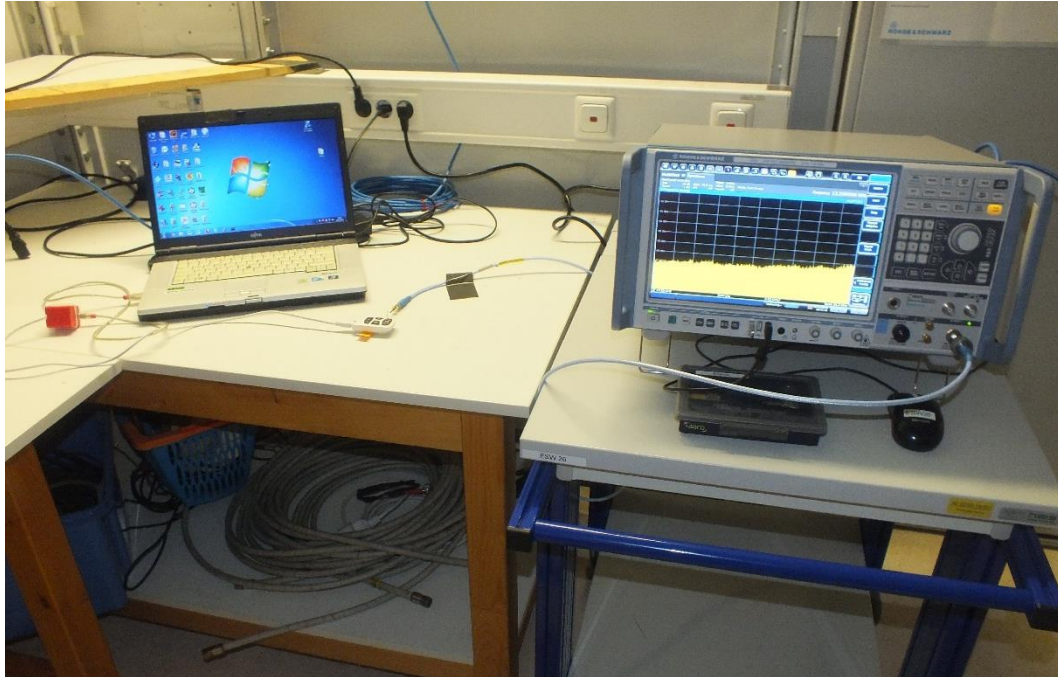
5.2 EBW and OBW

For test instruments and accessories used see section 6 Part **MB**.

5.2.1 Description of the test location

Test location: AREA4

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

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5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser.

Spectrum analyser settings for EBW:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Span: 4 MHz;

Spectrum analyser settings for OBW:

RBW: 1-5% OBW, VBW: 3 RBW, Detector: Max peak, Span: 2 OBW;

5.2.5 Test result

| Channel | Centre frequency (MHz) | 6 dB bandwidth (MHz) | 99% OBW (MHz) | Minimum limit (MHz) |
|---------|---------------------------|-------------------------|------------------|------------------------|
| 1 | 2404 | 0.810 | 1.657 | 0.5 |
| 19 | 2440 | 0.814 | 1.666 | 0.5 |
| 39 | 2480 | 0.824 | 1.672 | 0.5 |

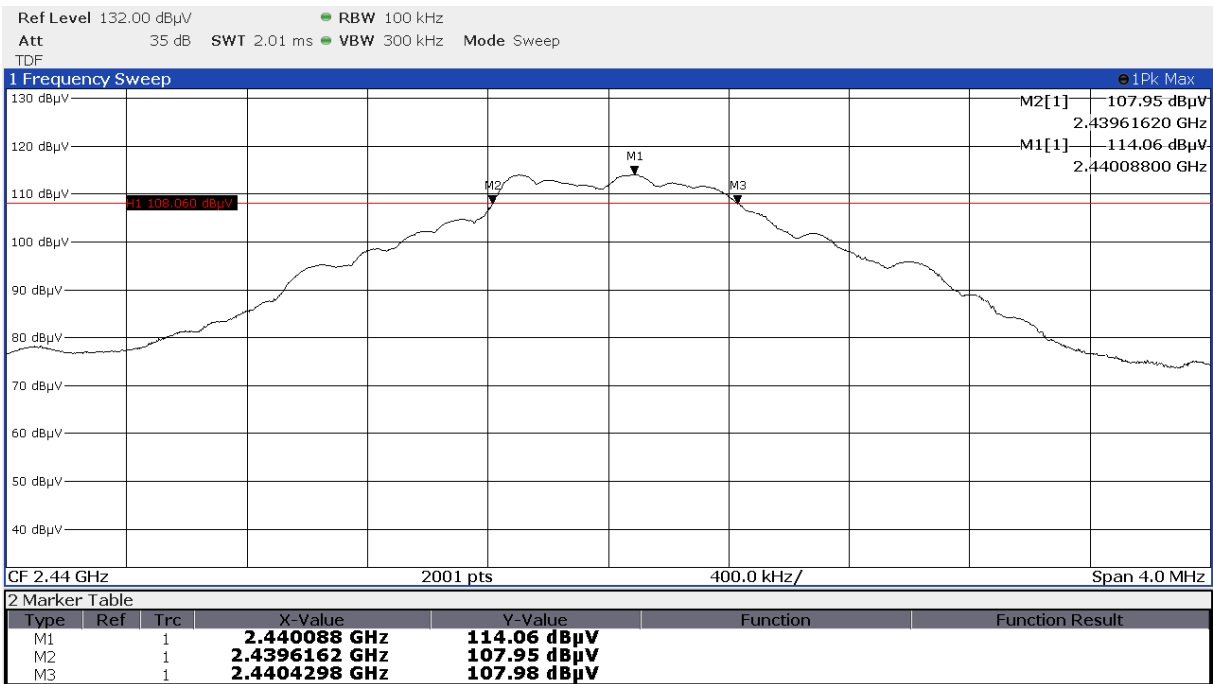
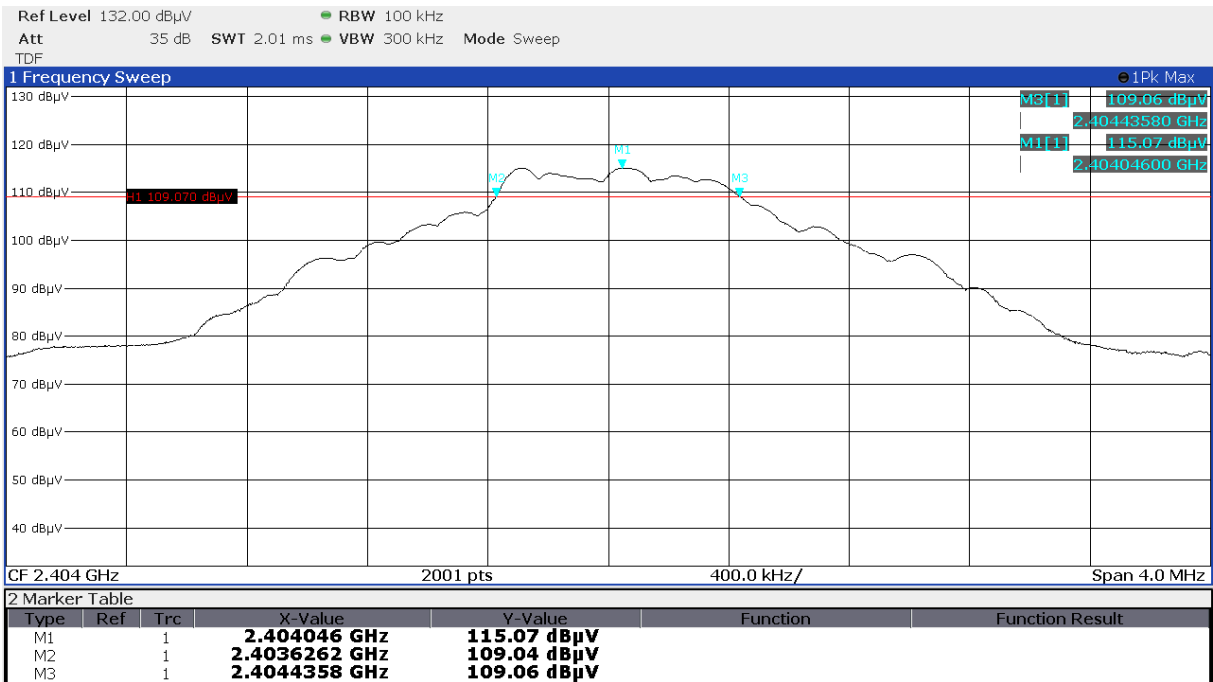
The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols. The RSS Gen defines no limit for the occupied bandwidth!

FCC ID: VNP-AL

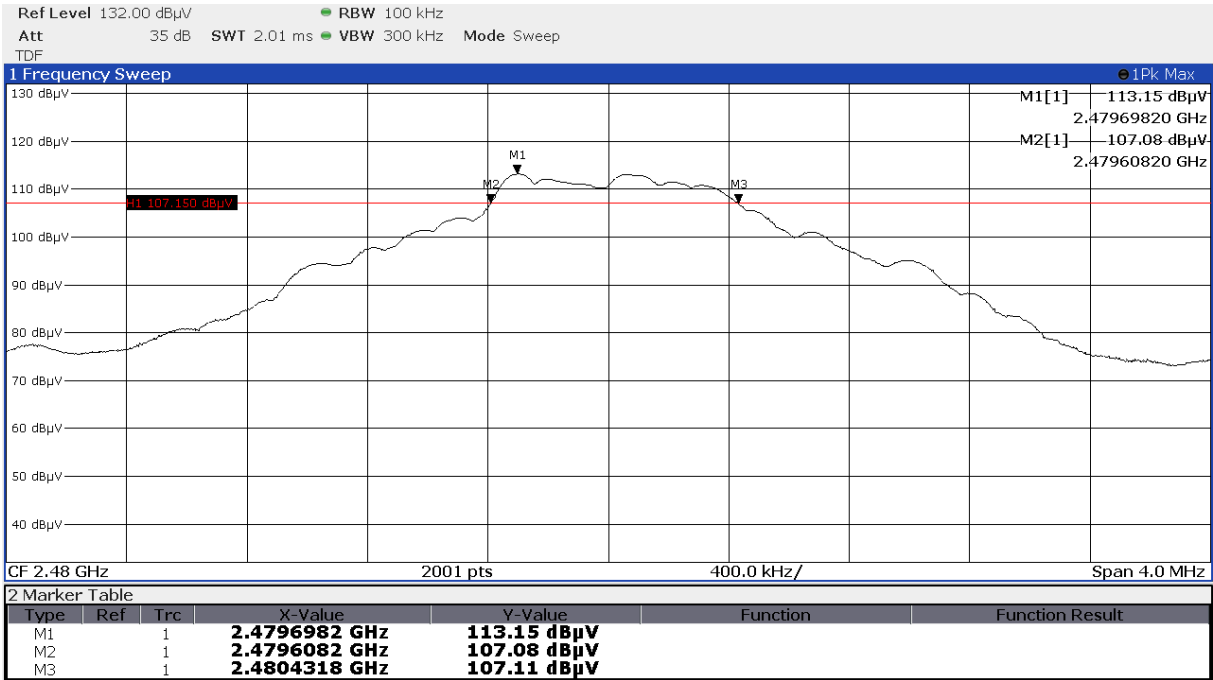
IC: 11986A-AL

5.2.6 Test protocols EBW

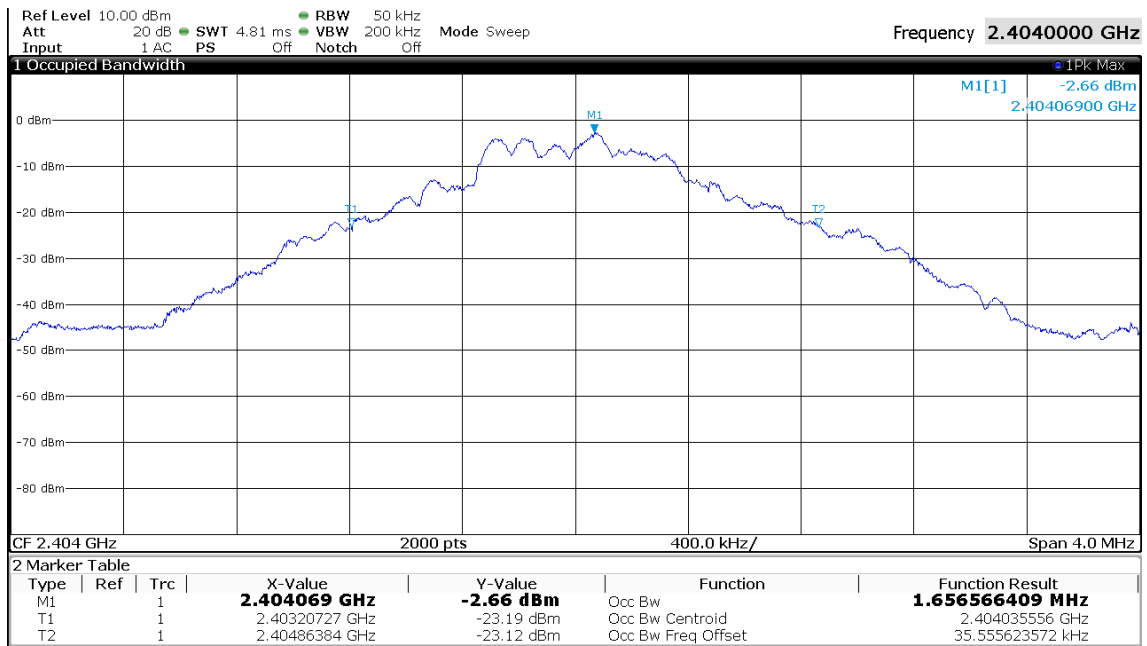


FCC ID: VNP-AL

IC: 11986A-AL

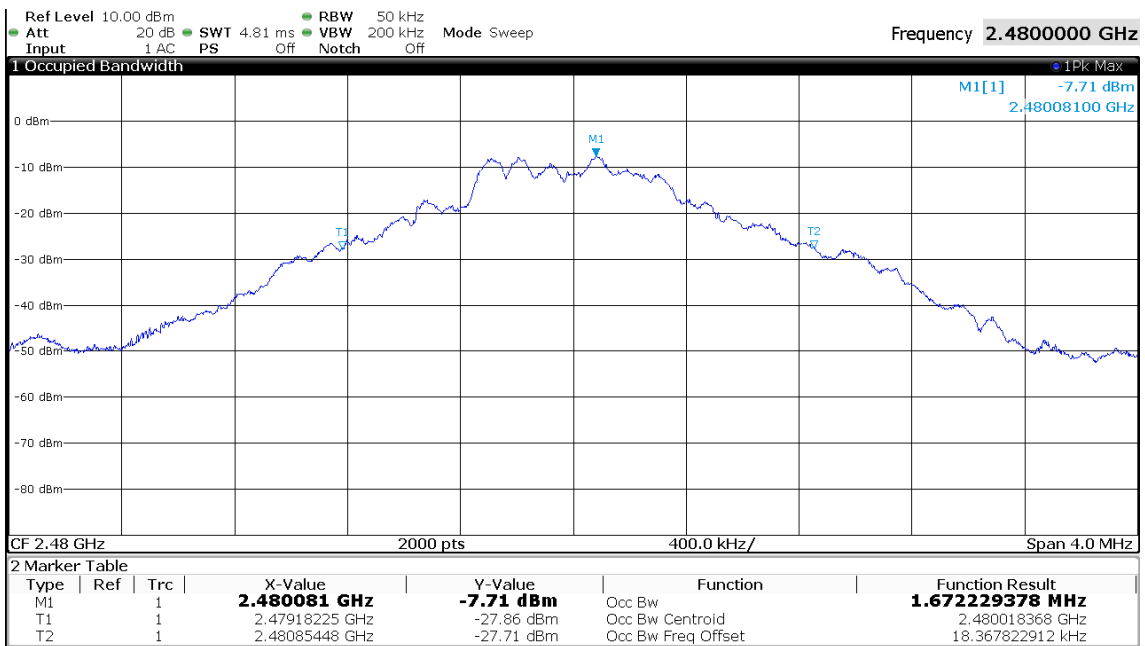
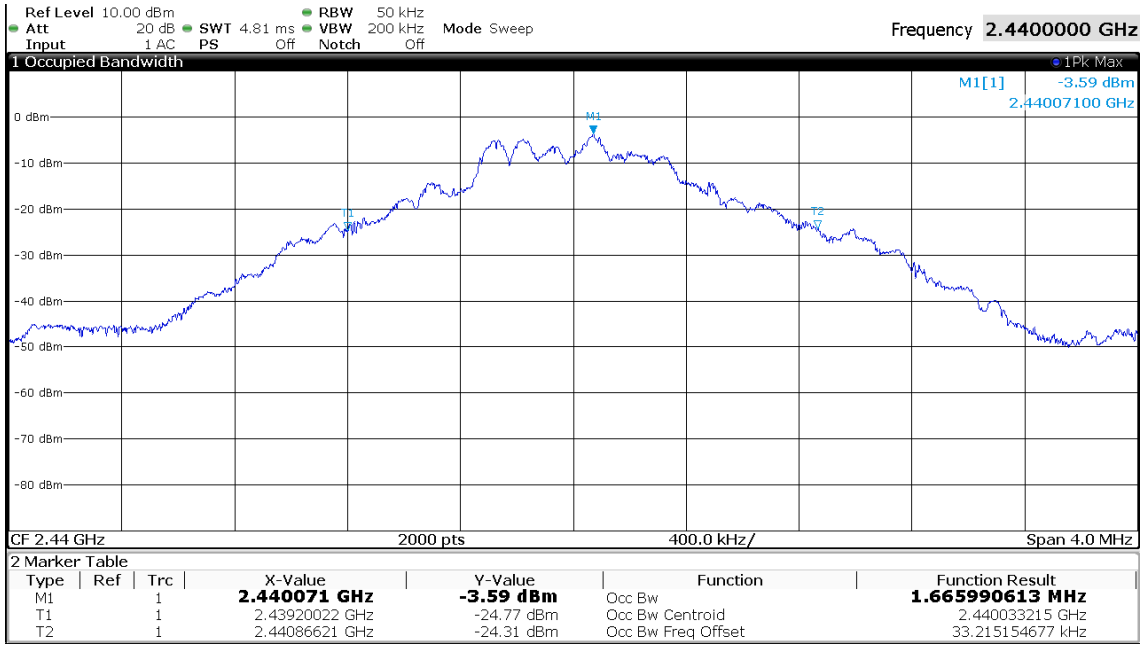


5.2.7 Test protocols OBW



FCC ID: VNP-AL

IC: 11986A-AL



FCC ID: VNP-AL

IC: 11986A-AL

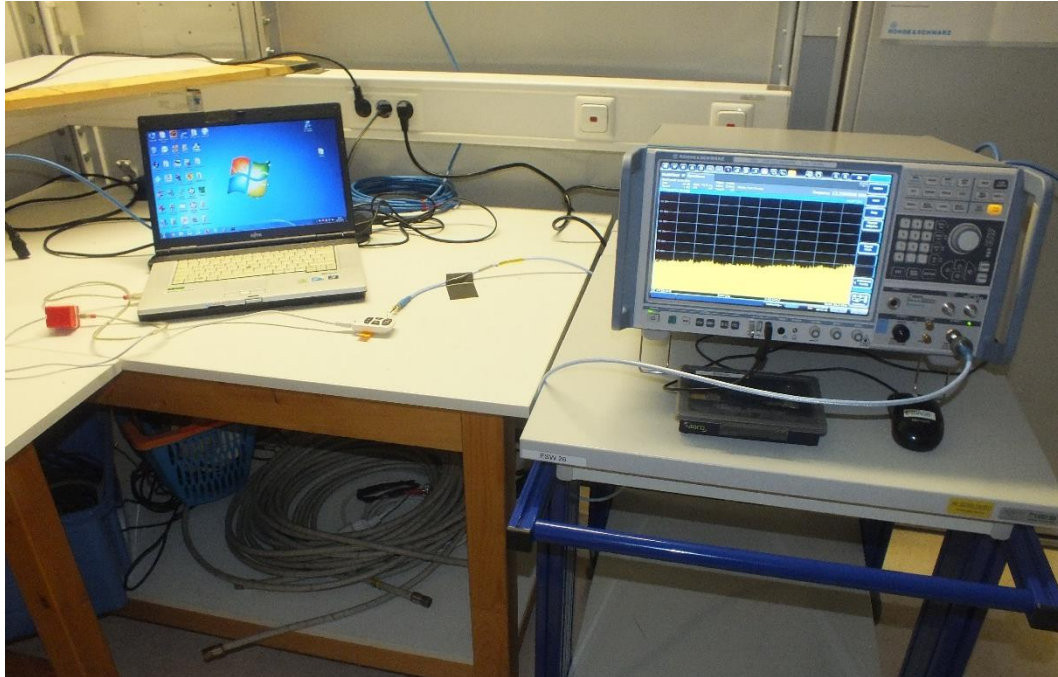
5.3 Maximum peak conducted output power

For test instruments and accessories used see section 6 Part **CPC 3**.

5.3.1 Description of the test location

Test location: AREA4

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

For systems using digital modulation in the 2400 – 2483.5 MHz band, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

5.3.4 Description of Measurement

The maximum peak conducted output power is measured using a peak power meter following the procedure set out in KDB 558074, item 8.3.1. The EUT is set in TX continuous mode while measuring.

Analyser settings:

RBW: 3 MHz, VBW \geq RBW, Detector: Max peak, Trace: Max hold, Sweep time: auto

FCC ID: VNP-AL

IC: 11986A-AL

5.3.5 Test result

| Test results conducted | | A [Pmax] (dBm) | Limit (dBm) | Margin (dB) |
|-------------------------|-----------|-------------------|----------------|----------------|
| Lowest frequency: CH1 | | | | |
| T_{nom} | V_{nom} | 7.6 | 30.0 | -22.4 |
| Middle frequency: CH19 | | | | |
| T_{nom} | V_{nom} | 6.2 | 30.0 | -23.8 |
| Highest frequency: CH39 | | | | |
| T_{nom} | V_{nom} | 5.6 | 30.0 | -24.4 |

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

| Frequency (MHz) | Peak Power Limit | |
|--------------------|------------------|------------|
| | (dBm) | (Watt) |
| 902-928 | 30 | 1.0 |
| 2400-2483.5 | 30 | 1.0 |
| 5725-5850 | 30 | 1.0 |

The requirements are **FULFILLED**.

Remarks: _____

FCC ID: VNP-AL

IC: 11986A-AL

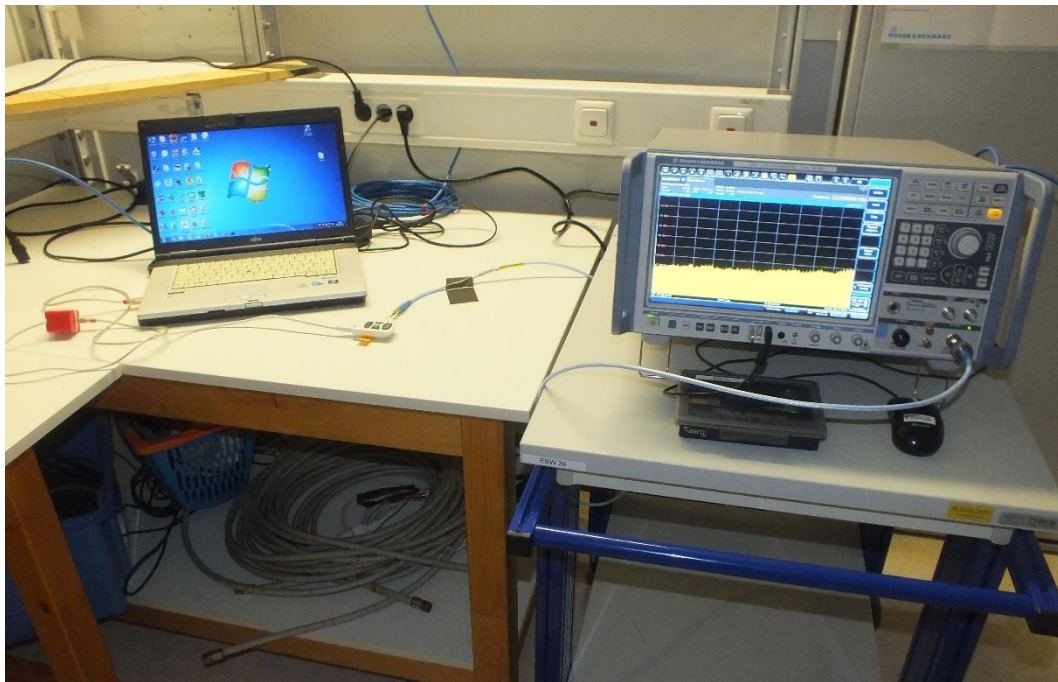
5.4 Power spectral density

For test instruments and accessories used see section 6 Part **CPC 3**.

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

5.4.4 Description of Measurement

The measurement is performed using the procedure 8.4 set out in KDB-558074. The power measurement was done as peak power measurement. Therefore, the PKPSD is measured. The max peak was located and with the spectrum analyser and a marker set to peak.

Spectrum analyser settings:

RBW: 3 kHz, VBW: 10 kHz, Detector: Peak, Sweep time: auto

FCC ID: VNP-AL

IC: 11986A-AL

5.4.5 Test result

| Test results conducted | | PD [Pmax] (dBm/3kHz) | Limit (dBm/3kHz) | Margin (dB) |
|-------------------------|-----------|-------------------------|---------------------|----------------|
| Lowest frequency: CH1 | | | | |
| T_{nom} | V_{nom} | -6.7 | 8.0 | -14.7 |
| Middle frequency: CH19 | | | | |
| T_{nom} | V_{nom} | -7.6 | 8.0 | -15.6 |
| Highest frequency: CH39 | | | | |
| T_{nom} | V_{nom} | -8.4 | 8.0 | -16.4 |

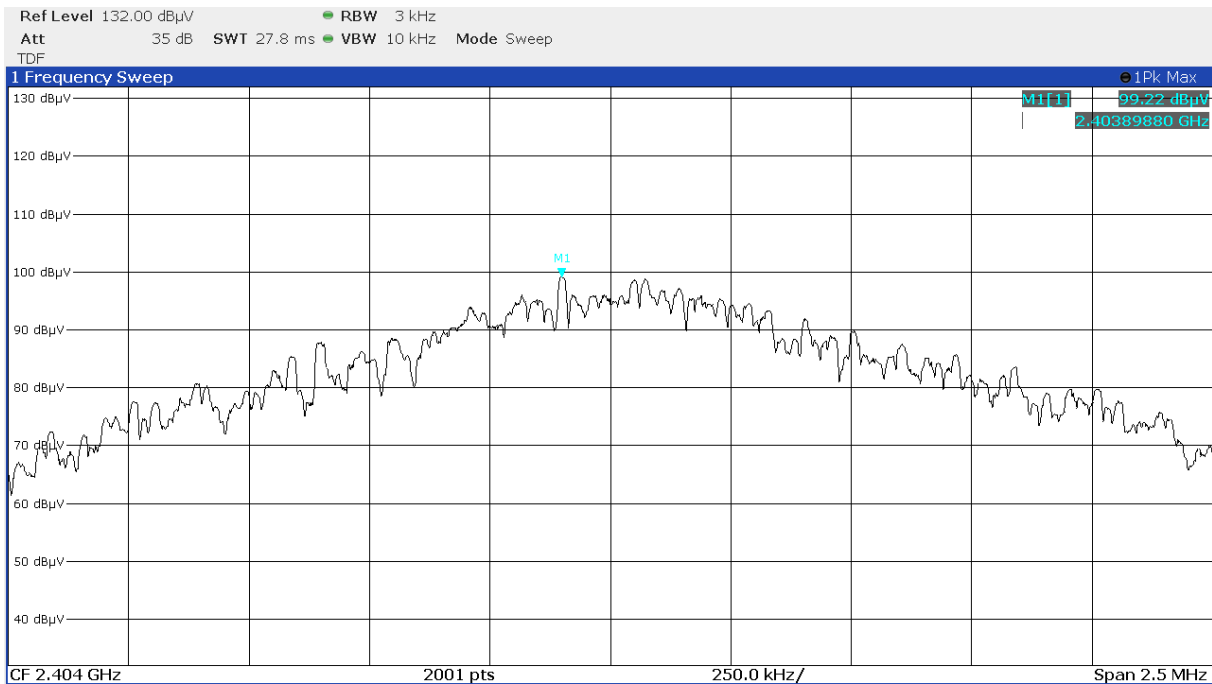
Power spectral density limit according to FCC Part 15, Section 15.247(e):

| Frequency (MHz) | Power spectral density limit |
|--------------------|------------------------------|
| | (dBm/3 kHz) |
| 2400 - 2483.5 | 8 |

The requirements are **FULFILLED**.

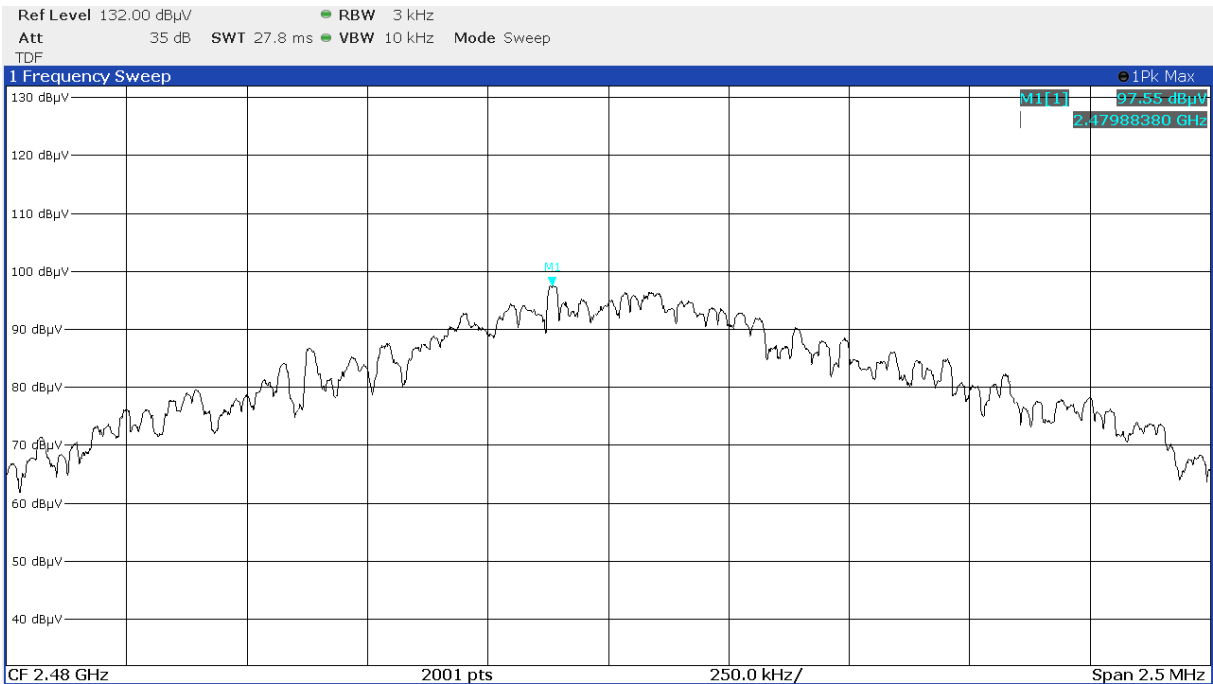
Remarks: The antenna gain of 1 dBi was added to the test result.
For detailed test results please refer to following test protocols.

5.4.6 Power spectral density plots



FCC ID: VNP-AL

IC: 11986A-AL



FCC ID: VNP-AL

IC: 11986A-AL

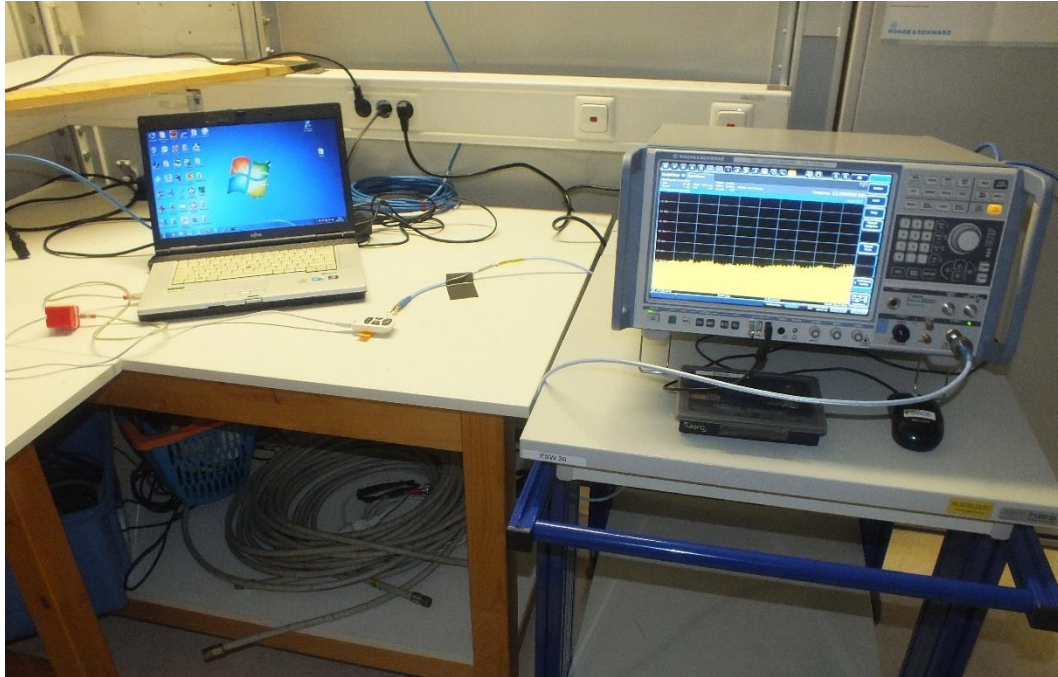
5.5 Unwanted emissions, conducted

For test instruments and accessories used see section 6 Part **SEC 1-3**.

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.5.4 Description of measurement

The spurious emissions are measured conducted using a spectrum analyser in a test setup following the procedures set out in KDB 558074 for DTS equipment. The transmitter is set to the lowest operating frequency, the middle and to the highest operating frequency. The frequency spectrum outside from the operating frequency range (2400 - 2483.5 MHz) is scanned for emissions that exceed the limit. The measurement is performed at normal test conditions in modulated TX continuous mode.

Spectrum analyser search setting:

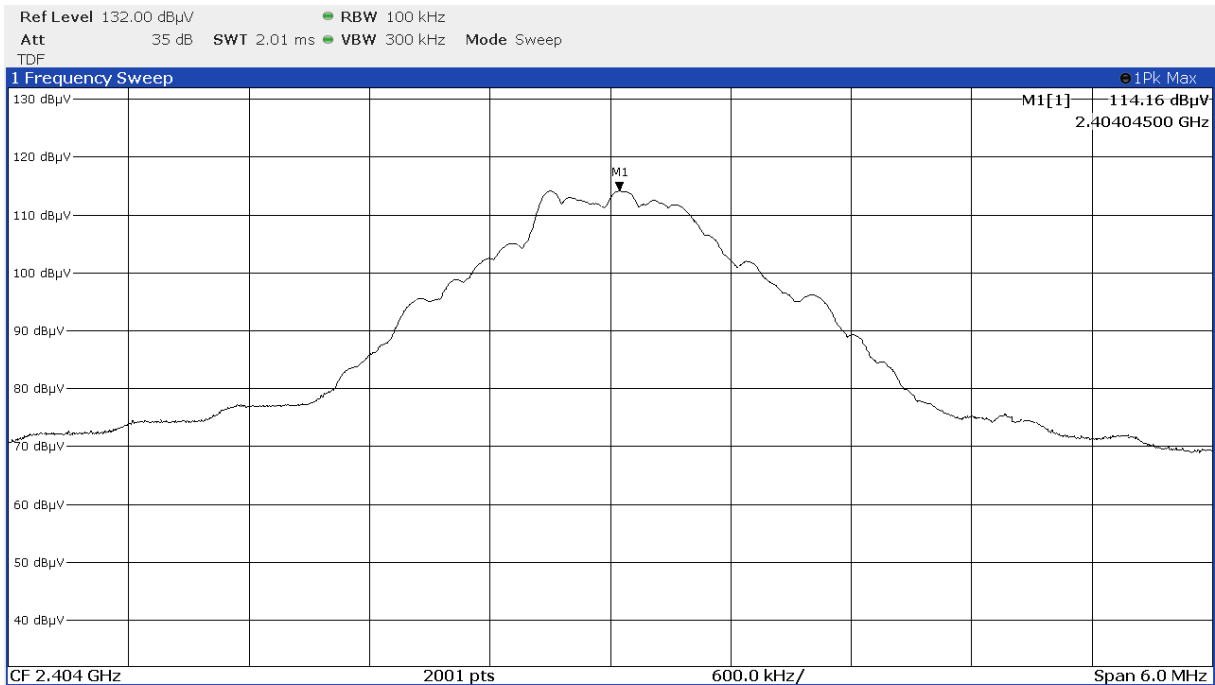
RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace Mode: Max hold

FCC ID: VNP-AL

IC: 11986A-AL

5.5.5 Test result

Determination of the reference level and limit



Highest level of the desired power: 94.16 dBµV

Limit according to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band 2400 – 2483.50 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

| Frequency (MHz) | Spurious emission limit |
|-----------------|--|
| Below 960 | 20 dB below the highest level of the desired power |
| Above 960 | 20 dB below the highest level of the desired power |

The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.
The unwanted emissions conducted have only been performed in the non-restricted frequency range 2390 MHz to 2400 MHz. For all other emissions, please refer to chapter 5.7.

FCC ID: VNP-AL

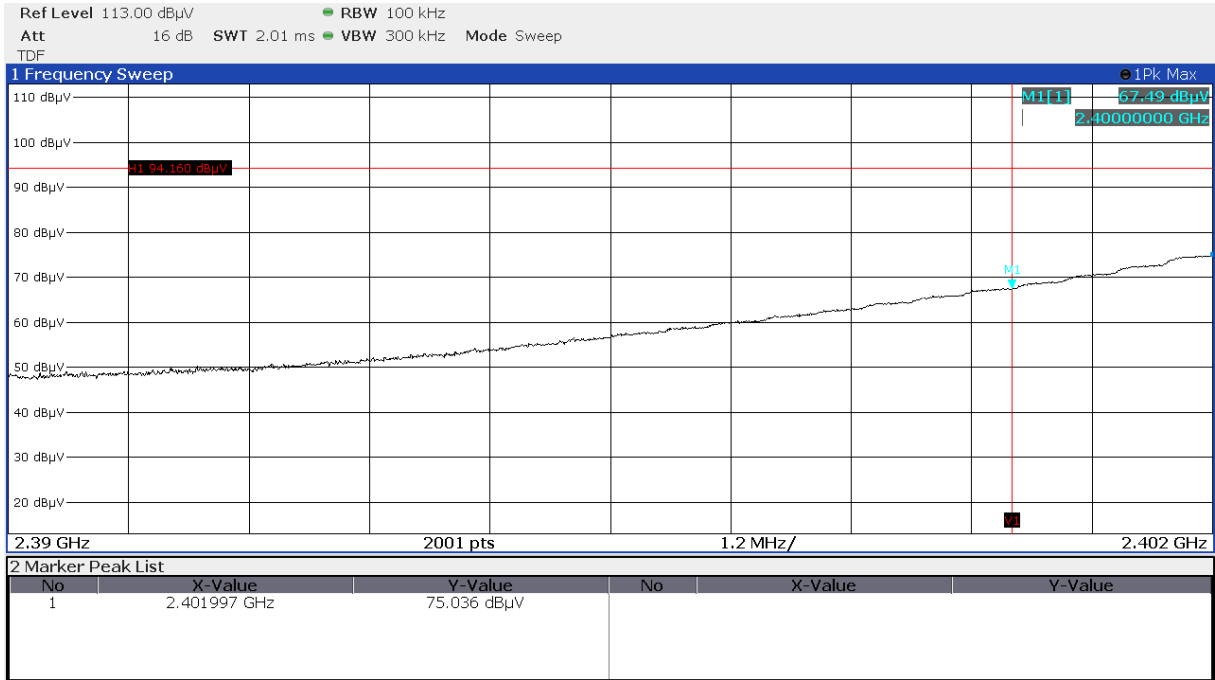
IC: 11986A-AL

5.5.6 Test protocols

Plots of spurious emissions conducted out of operating frequency bands (-20 dBc)

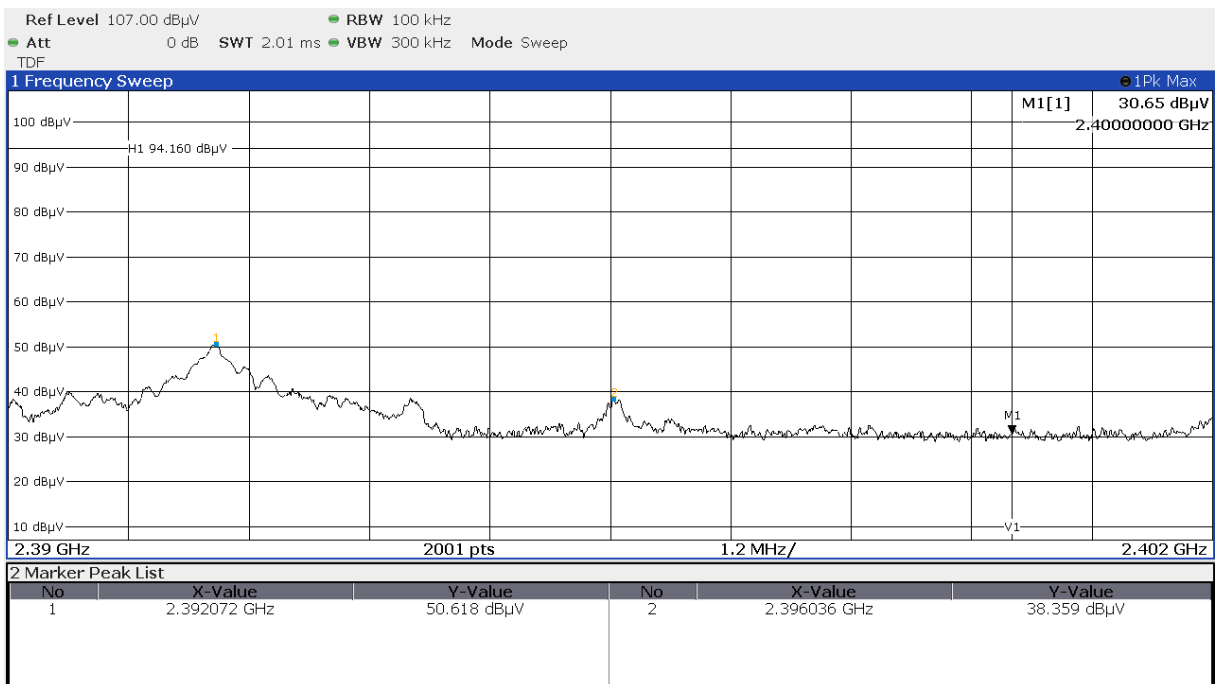
2404 MHz

Spurious emissions conducted from 2.39 GHz – 2.40 GHz including the lower bandedge



2440 MHz

Spurious emissions conducted from 2.39 GHz – 2.40 GHz including the lower bandedge

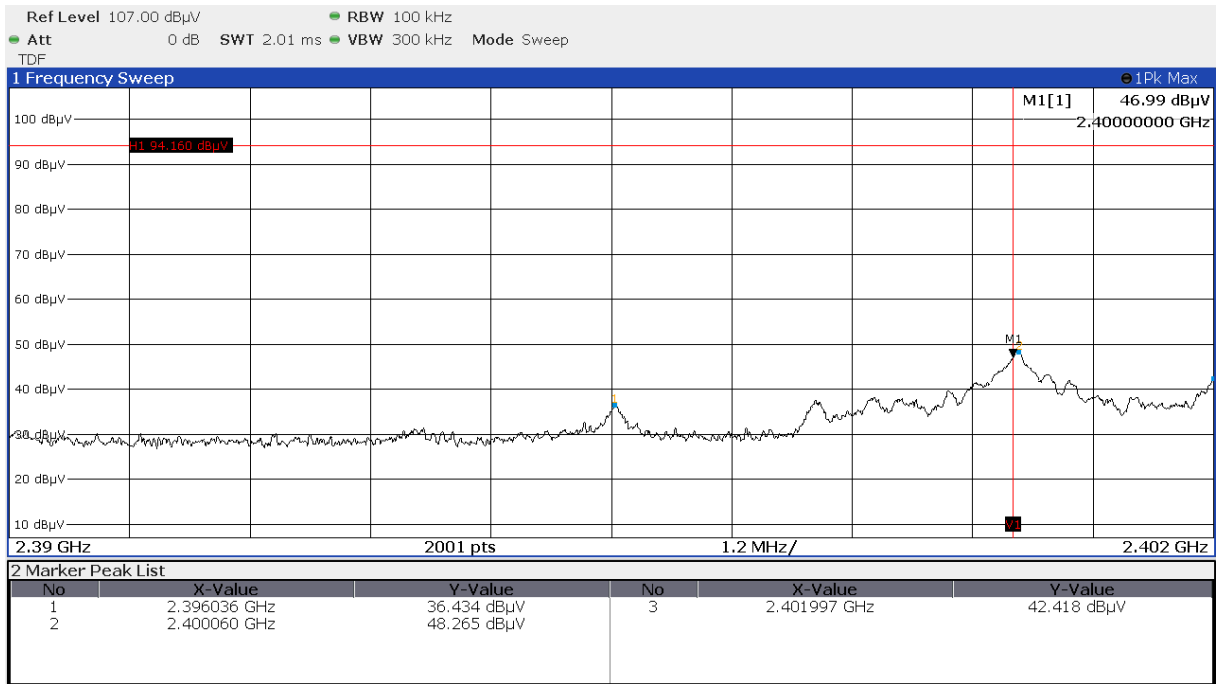


FCC ID: VNP-AL

IC: 11986A-AL

2480 MHz

Spurious emissions conducted from 2.39 GHz – 2.40 GHz including the lower bandedge



FCC ID: VNP-AL

IC: 11986A-AL

5.6 Band edge compliance

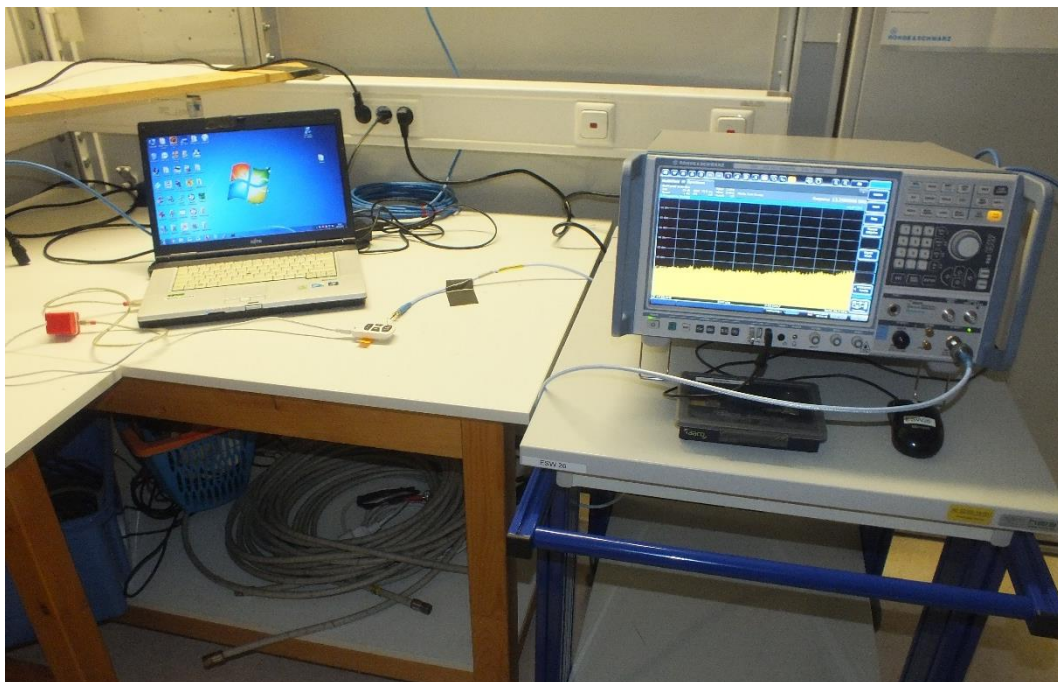
For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: AREA4
Test location: Anechoic chamber 1
Test distance: 3 m

5.6.2 Photo documentation of the test set-up

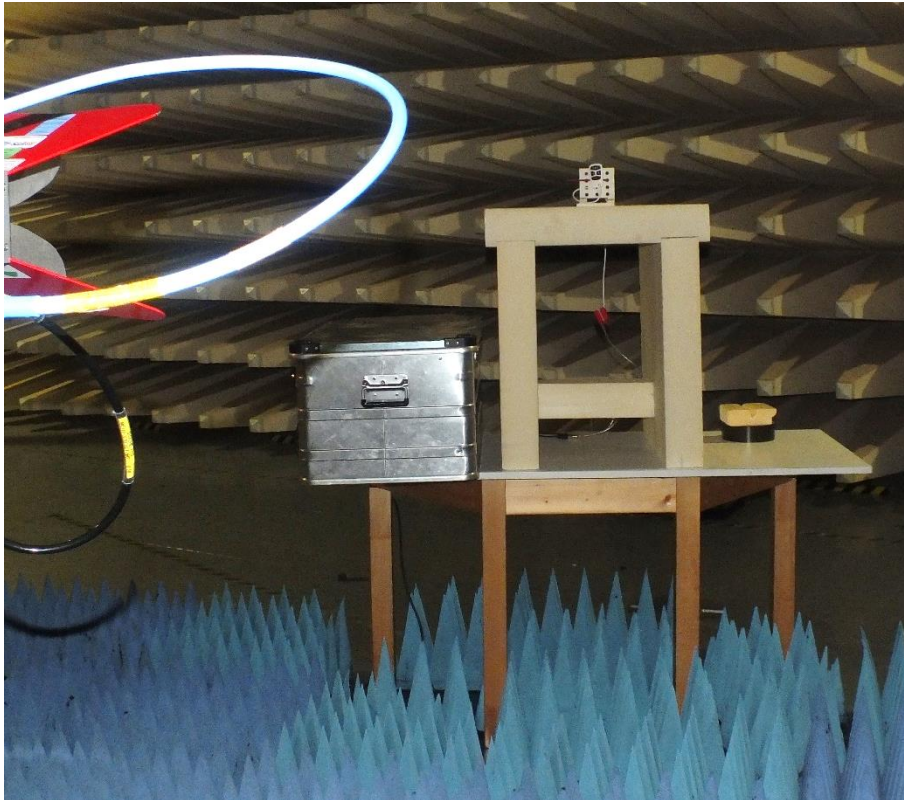
Conducted measurement lower bandedge



FCC ID: VNP-AL

IC: 11986A-AL

Radiated measurement upper bandedge



5.6.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

5.6.4 Description of Measurement

A spectrum analyser is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode at the assigned frequency according to ANSI C63.10.

Spectrum analyser settings non-restricted band:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Trace: Max hold, Sweep: auto

Spectrum analyser settings restricted band:

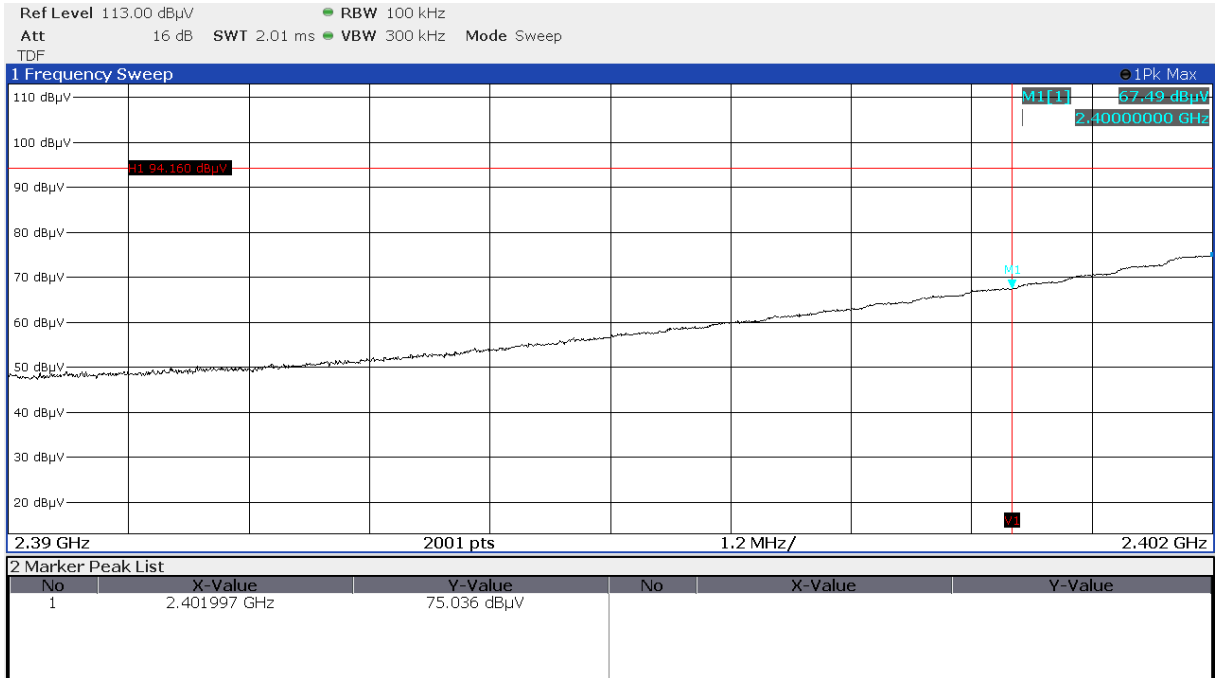
RBW: 1 MHz, VBW: 3 MHz, Detector: Max peak, Trace: Max hold, Sweep: auto

FCC ID: VNP-AL

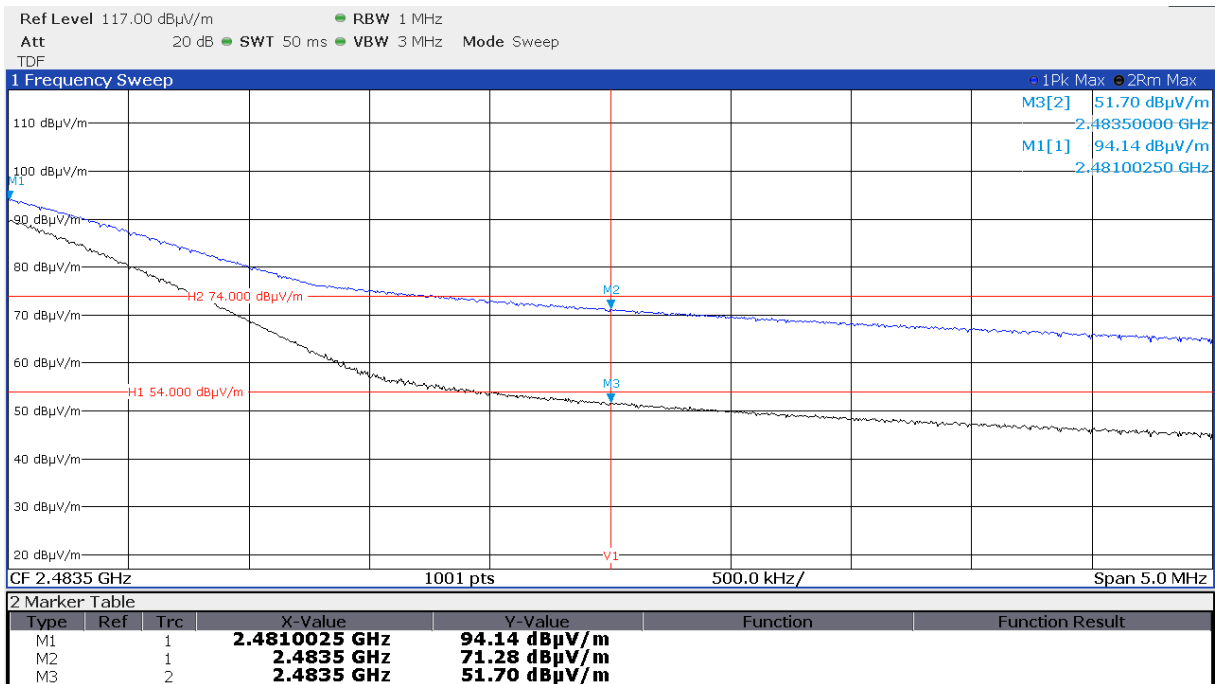
IC: 11986A-AL

5.6.5 Test result

Lower bandedge measurement channel 1



Upper bandedge measurement channel 39



FCC ID: VNP-AL**IC: 11986A-AL**

Limit according to FCC Subpart 15.247(d):

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §15.205(c)).

The requirements are **FULFILLED**.

Remarks:

-

FCC ID: VNP-AL

IC: 11986A-AL

5.7 Unwanted emissions, radiated

For test instruments and accessories used see section 6 Part **SER1**, **SER 2** and **SER 3**.

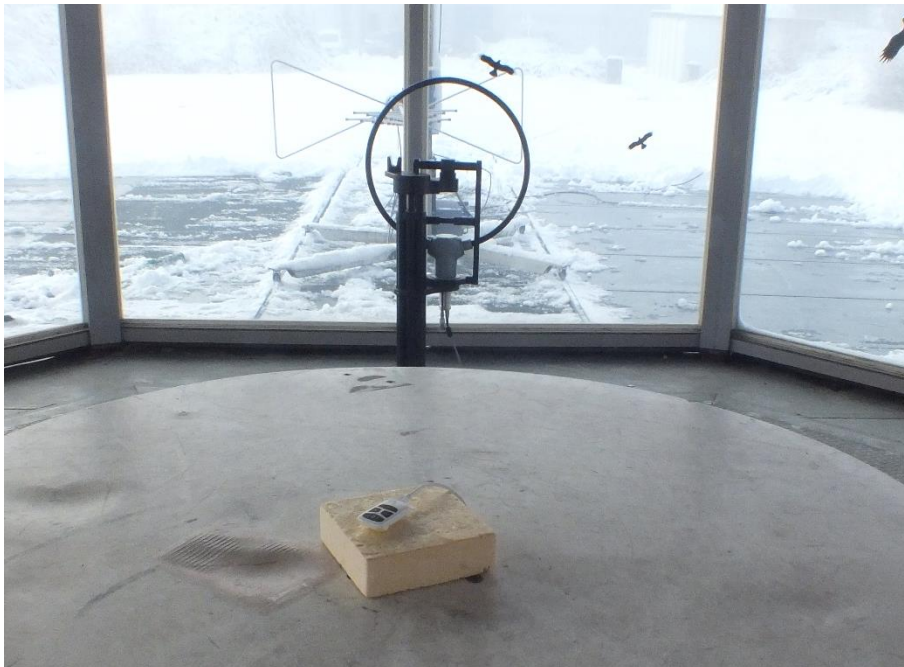
5.7.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1
Test distance: 3 m

5.7.2 Photo documentation of the test set-up

Open area test site

Test setup 9 kHz – 30 MHz



FCC ID: VNP-AL

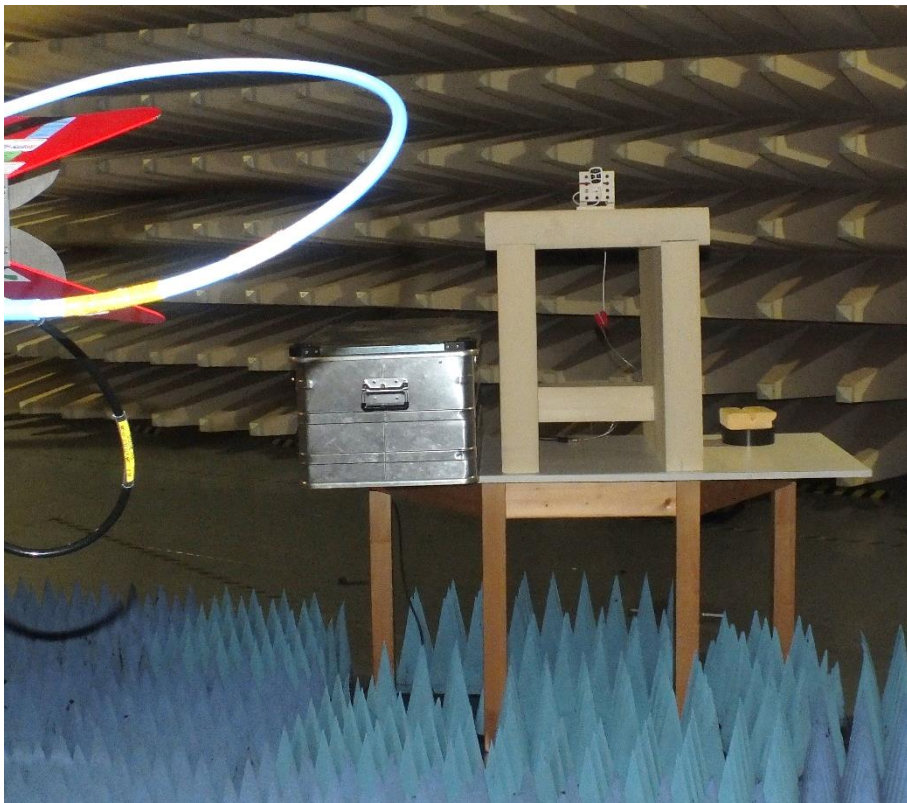
IC: 11986A-AL

Test setup 30 MHz – 1 GHz



Anechoic chamber

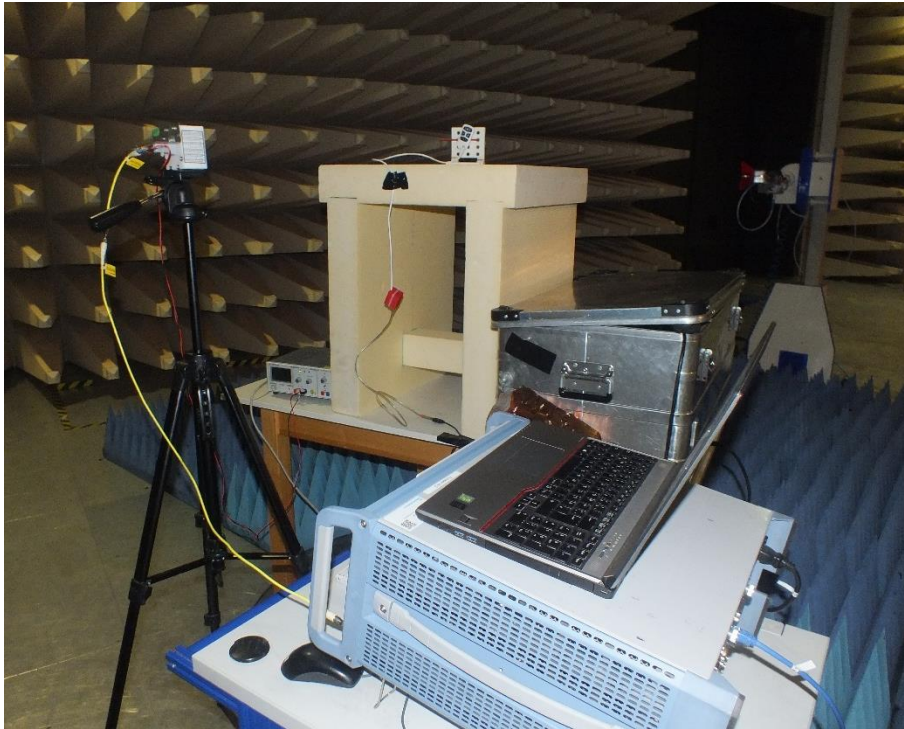
Test setup 1 GHz – 18 GHz



FCC ID: VNP-AL

IC: 11986A-AL

Test setup 18 GHz – 26 GHz



According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.7.3 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

Spectrum analyser settings:

- | | |
|--------------------|--|
| 9 kHz – 150 kHz | RBW: 200 Hz |
| 150 kHz - 30 MHz | RBW: 9 kHz |
| 30 MHz – 1000 MHz: | RBW: 120 kHz |
| 1000 MHz – 25 GHz: | RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Peak |

FCC ID: VNP-AL

IC: 11986A-AL

5.7.4 Test result f < 1000 MHz

| Frequency (MHz) | Reading Vert. (dBµV) | Reading Hor. (dBµV) | Correct. Vert. (dB) | Correct. Hor. (dB) | Level Vert. (dBµV/m) | Level Hor. (dBµV/m) | Limit (dBµV/m) | Dlimit (dB) |
|-----------------|----------------------|---------------------|---------------------|--------------------|----------------------|---------------------|----------------|-------------|
| 43.40 | 6.7 | 5.5 | 14.0 | 12.8 | 20.7 | 18.3 | 40.0 | -19.3 |
| 55.94 | 6.8 | 6.3 | 14.0 | 13.0 | 20.8 | 19.3 | 40.0 | -19.2 |
| 80.00 | 8.2 | 6.4 | 10.4 | 10.1 | 18.6 | 16.5 | 40.0 | -21.4 |

Note: In the frequency range 9 kHz to 1000 MHz no emission could be detected. The frequencies mention the noise level. No difference could be detected between the operating frequencies.

5.7.5 Test result f > 1 GHz

2404 MHz

| Frequency (MHz) | Level PK dB(µV/m) | Level AV dB(µV/m) | Limit PK dB(µV/m) | Margin PK (dB) | Limit AV dB(µV/m) | Margin AV (dB) |
|-----------------|-------------------|-------------------|-------------------|----------------|-------------------|----------------|
| 1440.18 | 41.0 | - | 74.0 | -33.0 | 54.0 | - |
| 4808.72 | 47.7 | - | 74.0 | -26.3 | 54.0 | - |
| 7211.64 | 46.4 | - | 74.0 | -27.6 | 54.0 | - |
| 9615.05 | 56.9 | 46.0 | 74.0 | -17.1 | 54.0 | -7.9 |
| 12018.96 | 50.0 | - | 74.0 | -24.0 | 54.0 | - |
| 14422.38 | 54.4 | 43.6 | 74.0 | -19.6 | 54.0 | -10.4 |
| 16826.29 | 51.3 | 40.5 | 74.0 | -22.7 | 54.0 | -13.5 |
| 19235.16 | 58.9 | - | 84.0 | -25.1 | 64.0 | - |
| 21633.49 | 57.0 | - | 84.0 | -27.0 | 64.0 | - |

Note: only when the peak value exceeds the average value, an average measurement is necessary. The AV value is calculated with the duty cycle correction factor -10.8 dB.

2440 MHz

| Frequency | Level PK | Level AV dB(µV/m) | Limit PK dB(µV/m) | Margin PK (dB) | Limit AV dB(µV/m) | Margin AV (dB) |
|-----------|----------|-------------------|-------------------|----------------|-------------------|----------------|
| 1440.18 | 40.8 | - | 74.0 | -33.2 | 54.0 | - |
| 4879.72 | 42.5 | - | 74.0 | -31.5 | 54.0 | - |
| 7319.13 | 47.6 | - | 74.0 | -26.3 | 54.0 | - |
| 9759.04 | 51.1 | - | 74.0 | -22.9 | 54.0 | - |
| 12198.46 | 50.5 | - | 74.0 | -23.5 | 54.0 | - |
| 14639.37 | 48.8 | - | 74.0 | -25.2 | 54.0 | - |
| 19521.64 | 56.6 | - | 84.0 | -27.4 | 64.0 | - |
| 21957.47 | 56.7 | - | 84.0 | -27.3 | 64.0 | - |

Note: only when the peak value exceeds the average value, an average measurement is necessary. The AV value is calculated with the duty cycle correction factor -10.8 dB.

FCC ID: VNP-AL

IC: 11986A-AL

2480 MHz

| Frequency (MHz) | Level PK dB(μV/m) | Level AV dB(μV/m) | Limit PK dB(μV/m) | Margin PK (dB) | Limit AV dB(μV/m) | Margin AV (dB) |
|--------------------|----------------------|----------------------|----------------------|-------------------|----------------------|-------------------|
| 1439.68 | 46.2 | - | 74.0 | -27.8 | 54.0 | - |
| 4960.72 | 42.6 | - | 74.0 | -31.3 | 54.0 | - |
| 7440.63 | 48.0 | - | 74.0 | -25.9 | 54.0 | - |
| 9918.54 | 50.3 | - | 74.0 | -23.7 | 54.0 | - |
| 12400.45 | 51.8 | - | 74.0 | -22.2 | 54.0 | - |
| 19838.62 | 54.1 | - | 84.0 | -29.9 | 64.0 | - |
| 22320.44 | 55.3 | - | 84.0 | -28.7 | 64.0 | - |

Note: only when the peak value exceeds the average value, an average measurement is necessary. The AV value is calculated with the duty cycle correction factor -10.8 dB.

FCC ID: VNP-AL

IC: 11986A-AL

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

| Frequency (MHz) | Field strength of spurious emissions | | Measurement distance (metres) |
|--------------------|--------------------------------------|----------------|----------------------------------|
| | (μ V/m) | dB(μ V/m) | |
| 0.009-0.490 | 2400/F (kHz) | | 300 |
| 0.490-1.705 | 24000/F (kHz) | | 30 |
| 1.705-30 | 30 | 29.5 | 30 |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

| MHz | MHz | MHz | GHz |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 – 0.110 | 16.42 – 16.423 | 399.9 – 410 | 4.5 – 5.15 |
| 0.495 – 0.505 | 16.69475 – 16.69525 | 608 – 614 | 5.35 – 5.46 |
| 2.1735 – 2.1905 | 16.80425 – 16.80475 | 960 – 1240 | 7.25 – 7.75 |
| 4.125 – 4.128 | 25.5 – 25.67 | 1300 – 1427 | 8.025 – 8.5 |
| 4.17725 – 4.17775 | 37.5 – 38.25 | 1435 – 1626.5 | 9.0 – 9.2 |
| 4.20725 – 4.20775 | 73 – 74.6 | 1645.5 – 1646.5 | 9.3 – 9.5 |
| 6.215 – 6.218 | 74.8 – 75.2 | 1660 – 1710 | 10.6 – 12.7 |
| 6.26775 – 6.26825 | 108 – 121.94 | 1718.8 – 1722.2 | 13.25 – 13.4 |
| 6.31175 – 6.31225 | 123 – 138 | 2200 – 2300 | 14.47 – 14.5 |
| 8.291 – 8.294 | 149.9 – 150.05 | 2310 – 2390 | 15.35 – 16.2 |
| 8.362 – 8.366 | 156.52475 – 156.52525 | 2483.5 – 2500 | 17.7 – 21.4 |
| 8.37625 – 8.38675 | 156.7 – 156.9 | 2690 – 2900 | 22.01 – 23.12 |
| 8.41425 – 8.41475 | 162.0125 – 167.17 | 3260 – 3267 | 23.6 – 24.0 |
| 12.29 – 12.293 | 167.72 – 173.2 | 3332 – 3339 | 31.2 – 31.8 |
| 12.51975 – 12.52025 | 240 – 285 | 3345.8 – 3358 | 36.43 – 36.5 |
| 12.57675 – 12.57725 | 322 – 335.4 | 3600 – 4400 | Above 38.6 |

RSS-Gen, Table 6 – Restricted Frequency Bands

| MHz | MHz | MHz | GHz |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110 | 12.57675 - 12.57725 | 399.9 - 410 | 7.250 - 7.750 |
| 0.495 - 0.505 | 13.36 - 13.41 | 608 - 614 | 8.025 – 8.500 |
| 2.1735 - 2.1905 | 16.42 - 16.423 | 960 - 1427 | 9.0 - 9.2 |
| 3.020 - 3.026 | 16.69475 - 16.69525 | 1435 - 1626.5 | 9.3 - 9.5 |
| 4.125 - 4.128 | 16.80425 - 16.80475 | 1645.5 - 1646.5 | 10.6 - 12.7 |
| 4.17725 - 4.17775 | 25.5 - 25.67 | 1660 - 1710 | 13.25 - 13.4 |
| 4.20725 - 4.20775 | 37.5 - 38.25 | 1718.8 - 1722.2 | 14.47 - 14.5 |
| 5.677 - 5.683 | 73 - 74.6 | 2200 - 2300 | 15.35 - 16.2 |
| 6.215 - 6.218 | 74.8 - 75.2 | 2310 - 2390 | 17.7 - 21.4 |
| 6.26775 - 6.26825 | 108 - 138 | 2483.5 - 2500 | 22.01 - 23.12 |
| 6.31175 - 6.31225 | 149.9 - 150.05 | 2655 - 2900 | 23.6 - 24.0 |
| 8.291 - 8.294 | 156.52475 - 156.52525 | 3260 – 3267 | 31.2 - 31.8 |
| 8.362 - 8.366 | 156.7 - 156.9 | 3332 - 3339 | 36.43 - 36.5 |
| 8.37625 - 8.38675 | 162.0125 - 167.17 | 3345.8 - 3358 | Above 38.6 |
| 8.41425 - 8.41475 | 167.72 - 173.2 | 3500 - 4400 | |
| 12.29 - 12.293 | 240 – 285 | 4500 - 5150 | |
| 12.51975 - 12.52025 | 322 - 335.4 | 5350 - 5460 | |

FCC ID: VNP-AL

IC: 11986A-AL

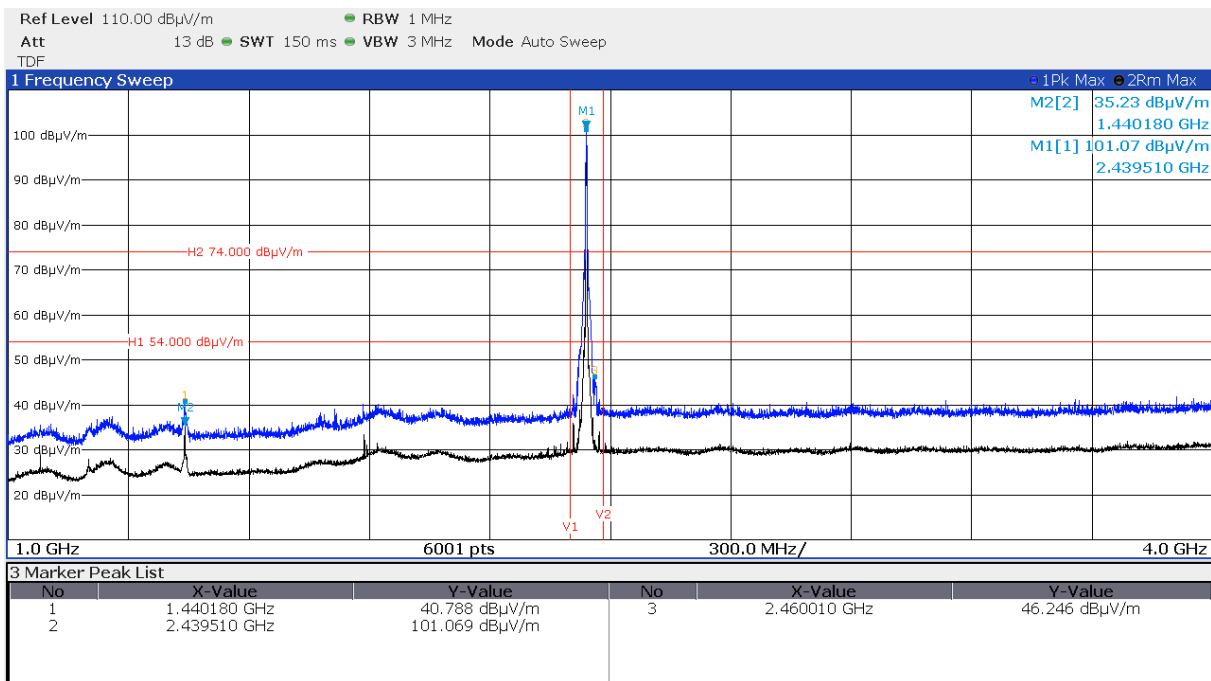
The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic. For detailed test results please see to following test protocol.

5.7.6 Test protocol

2440 MHz only for reference

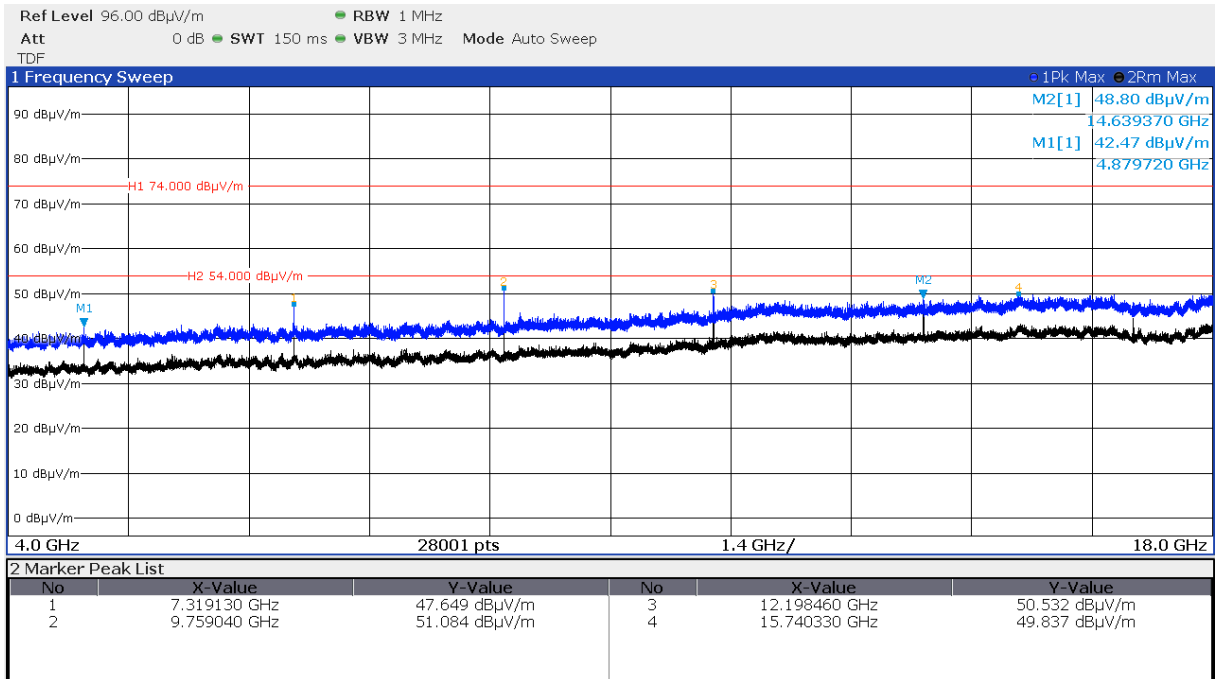
1 GHz to 4 GHz



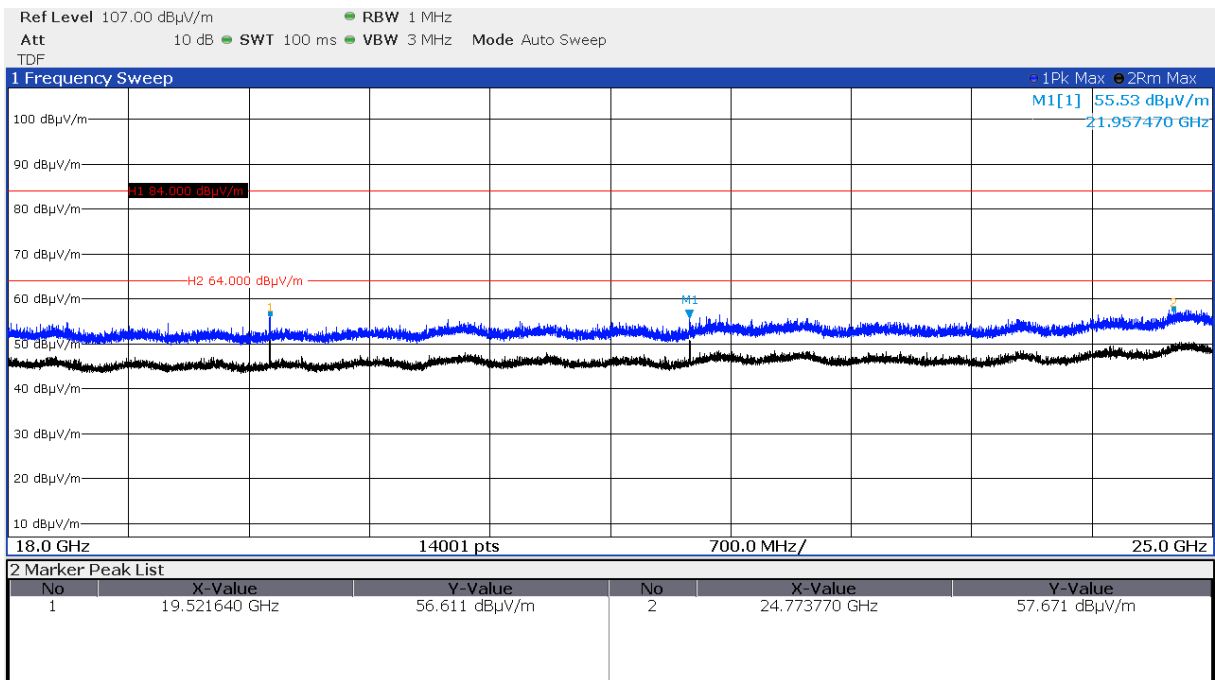
FCC ID: VNP-AL

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4 GHz to 18 GHz



18 GHz to 25 GHz



Remark: All peak emissions were below the limits of part 15.209. The measurement distance was changed to 1 m for this frequency range, therefore the limit line has to be adjusted and was increased by 10 dB.

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5.8 Antenna application

5.8.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The EUT has an integrated antenna. No other antenna can be used with the device.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

5.8.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Remarks: No power reduction results from the defacto limit.

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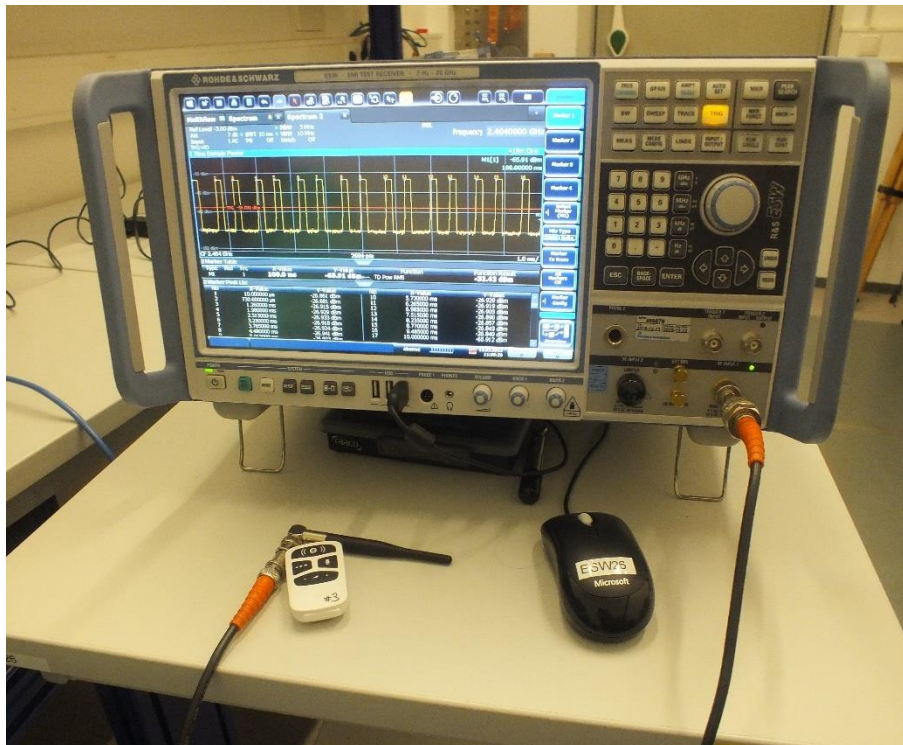
5.9 Correction for pulse operation (duty cycle)

For test instruments and accessories used see section 6 Part DC.

5.9.1 Description of the test location

Test location: AREA4

5.9.2 Photo documentation of the test set-up



5.9.3 Applicable standard

According to FCC Part 15A, Section 15.35(c):

When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

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5.9.4 Description of Measurement

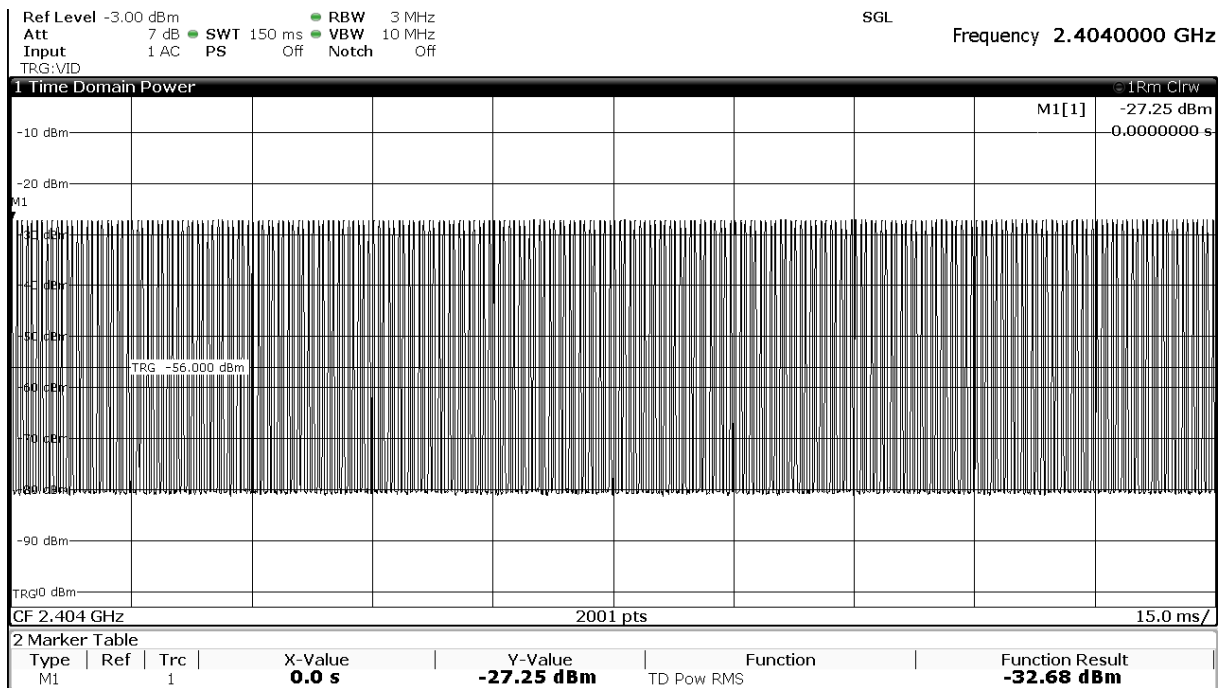
The duty cycle factor (dB) is calculated applying the following formula:

$$KE = 20 \log (t_{iw} / 0.1s)$$

KE: pulse operation correction factor

t_{iw}: pulse duration for one complete pulse track

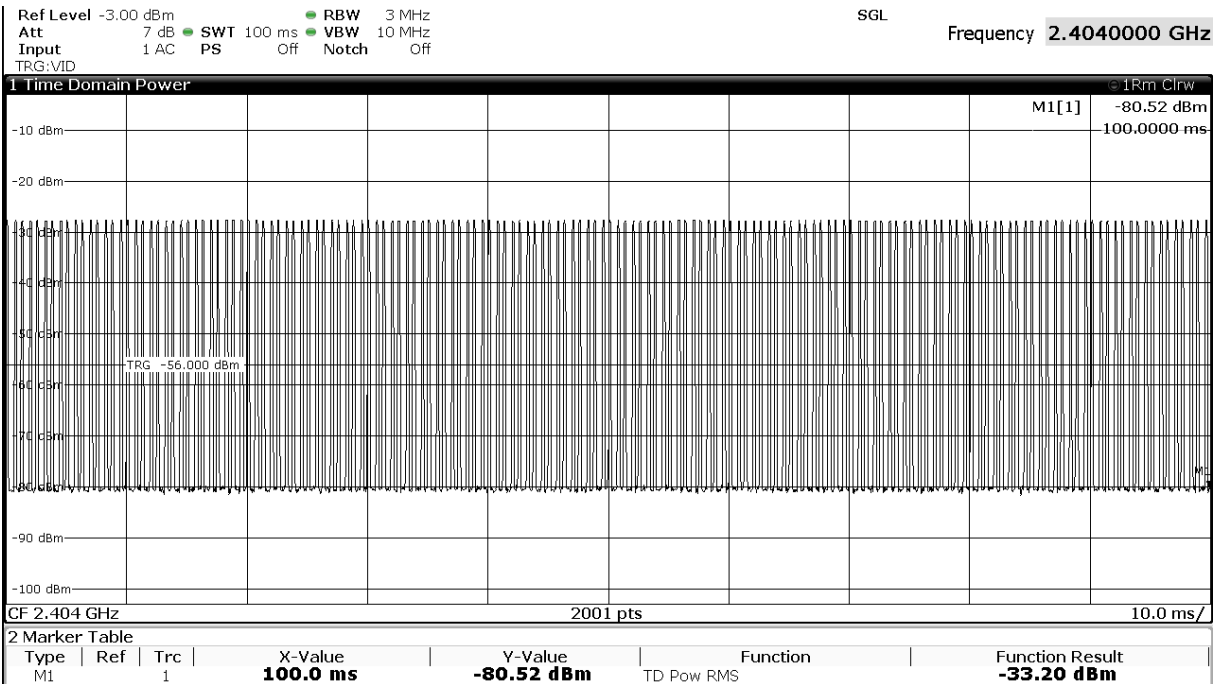
The pulse train exceeds 0.1s. Thus, the field strength is determined during a 100 ms interval.



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5.9.5 Test result



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$$K_E = 20 \log (28.8 \text{ ms} / 100 \text{ ms}) = -10.8 \text{ dB}$$

| | |
|------------------------|-----------|
| Total length of period | 100 ms |
| Max. On time | 28.800 ms |
| DC | 0.2880 |
| Correction factor | -10.8 dB |

Remarks:

-

FCC ID: VNP-AL

IC: 11986A-AL

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

| Test ID | Model Type | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---------|------------------------|-----------------|-------------|-------------|-------------|-------------|
| CPC 3 | ESW26 | 02-02/03-17-002 | 13/12/2019 | 13/12/2018 | | |
| | KK-SF104-11SMA-11N-2M | 02-02/50-14-002 | | | | |
| DC | ESW26 | 02-02/03-17-002 | 13/12/2019 | 13/12/2018 | | |
| | RF Antenna | 02-02/24-05-032 | | | | |
| MB | ESW26 | 02-02/03-17-002 | 13/12/2019 | 13/12/2018 | | |
| | KK-SF104-11SMA-11N-2M | 02-02/50-14-002 | | | | |
| SEC 1-3 | ESW26 | 02-02/03-17-002 | 13/12/2019 | 13/12/2018 | | |
| | KK-SF104-11SMA-11N-2M | 02-02/50-14-002 | | | | |
| SER 1 | ESCI | 02-02/03-15-001 | 11/06/2019 | 11/06/2018 | 15/01/2020 | 15/01/2019 |
| | HFH 2 - Z 2 | 02-02/24-05-020 | 09/08/2020 | 09/08/2017 | | |
| | NW-2000-NB | 02-02/50-05-113 | | | | |
| | KK-EF393/U-16N-21N20 m | 02-02/50-12-018 | | | | |
| | KK-SD_7/8-2X21N-33,0M | 02-02/50-15-028 | | | | |
| | ANT1010A | 02-02/50-16-034 | | | | |
| SER 2 | ESVS 30 | 02-02/03-05-006 | 06/06/2019 | 06/06/2018 | | |
| | VULB 9168 | 02-02/24-05-005 | 18/04/2019 | 18/04/2018 | | |
| | NW-2000-NB | 02-02/50-05-113 | | | | |
| | KK-EF393/U-16N-21N20 m | 02-02/50-12-018 | | | | |
| | KK-SD_7/8-2X21N-33,0M | 02-02/50-15-028 | | | | |
| | | | | | | |
| SER 3 | FSW43 | 02-02/11-15-001 | 19/03/2019 | 19/03/2018 | 12/12/2019 | 12/12/2018 |
| | JS4-18004000-30-5A | 02-02/17-05-017 | | | | |
| | AMF-6D-01002000-22-10P | 02-02/17-15-004 | | | | |
| | 3117 | 02-02/24-05-009 | 08/05/2019 | 08/05/2018 | | |
| | BBHA 9170 | 02-02/24-05-014 | 12/06/2021 | 12/06/2018 | | |
| | KMS102-0.2 m | 02-02/50-11-020 | | | | |
| | 18N-20 | 02-02/50-17-003 | | | | |
| | NMS111-GL200SC01-NMS11 | 02-02/50-17-012 | | | | |
| | BAM 4.5-P | 02-02/50-17-024 | | | | |
| | NCD | 02-02/50-17-025 | | | | |
| | KK-SF106-2X11N-6,5M | 02-02/50-18-016 | | | | |
| MB | FSW43 | 02-02/11-15-001 | 19/03/2019 | 19/03/2018 | 12/12/2019 | 12/12/2018 |
| | JS4-18004000-30-5A | 02-02/17-05-017 | | | | |
| | AMF-6D-01002000-22-10P | 02-02/17-15-004 | | | | |
| | 3117 | 02-02/24-05-009 | 08/05/2019 | 08/05/2018 | | |
| | BBHA 9170 | 02-02/24-05-014 | 12/06/2021 | 12/06/2018 | | |
| | KMS102-0.2 m | 02-02/50-11-020 | | | | |
| | 18N-20 | 02-02/50-17-003 | | | | |
| | NMS111-GL200SC01-NMS11 | 02-02/50-17-012 | | | | |
| | BAM 4.5-P | 02-02/50-17-024 | | | | |
| | NCD | 02-02/50-17-025 | | | | |
| | KK-SF106-2X11N-6,5M | 02-02/50-18-016 | | | | |