

Wireless test report – 397261-1TRFWL

Applicant:

Eurotech SpA

Product name:

Dynagate-10-06

Model:

Dygate-10-06-35

Model variant:

Dygate-10-06-34

FCC ID:

UKMMRG1012

IC Registration number:

21442-MRG1012

Specifications:

◆ **FCC 47 CFR Part 15 Subpart C, §15.247**

Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

◆ **RSS-247, Issue 2, Feb 2017, Section 5**

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs)
and Licence-Exempt Local Area Network (LE-LAN) Devices

5) Standard specifications for frequency hopping systems and digital transmission systems operating in the
bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz

Date of issue: **June 18, 2020**

Tested by

(name, function and
signature)

D. Guarnone

(project handler) Signature:



Reviewed by

(name, function and
signature)

R. Giampaglia

(verifier) Signature:



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The test report merely corresponds to the tested sample.

The phase of sampling / collection of equipment under test is carried out by the customer.

Test location(s)

| | |
|--------------|---|
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| Website | www.nemko.com |
| Site number | FCC: 682159; IC: 9109A (10 m semi anechoic chamber) |

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Spa ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

| | |
|--------------|--|
| Company name | Eurotech SpA |
| Address | Via Fratelli Solari 3/a 33020 Amaro, UD, Italy |

1.2 Test specifications

| | |
|---|--|
| FCC 47 CFR Part 15, Subpart C, Clause 15.247 RSS-247, Issue 2, Feb 2017, Section 5 | Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |
|---|--|

1.3 Test methods

| | |
|---|--|
| 558074 D01 15.247 Meas Guidance v05r02 | Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the fcc rules |
| ANSI C63.10 v2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
| RSS-Gen, Issue 5, Mar 2019, Amendment 1 | General Requirements for Compliance of Radio Apparatus |

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.5 Exclusions

None

1.6 Test report revision history

| Revision # | Date of issue | Details of changes made to test report |
|---------------|---------------|--|
| 397261-1TRFWL | June 18, 2020 | |

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Table 2.1-1: FCC general requirements results

| Part | Test description | Verdict |
|------------|------------------------------|---------|
| §15.207(a) | Conducted limits | Pass |
| §15.31(e) | Variation of power source | Pass |
| §15.31(m) | Number of tested frequencies | Pass |
| §15.203 | Antenna requirement | Pass |

Notes: EUT is an AC powered device.

2.2 FCC Part 15 Subpart C, intentional radiators test results for frequency hopping spread spectrum systems

Table 2.2-1: FCC 15.247 results for FHSS

| Part | Test description | Verdict |
|--------------------|---|----------------|
| §15.247(a)(1)(i) | Requirements for operation in the 902–928 MHz band | Not applicable |
| §15.247(a)(1)(ii) | Requirements for operation in the 5725–5850 MHz band | Not applicable |
| §15.247(a)(1)(iii) | Requirements for operation in the 2400–2483.5 MHz band | Not applicable |
| §15.247(b)(1) | Maximum peak output power in the 2400–2483.5 MHz band and 5725–5850 MHz band | Not applicable |
| §15.247(b)(2) | Maximum peak output power in the 902–928 MHz band | Not applicable |
| §15.247(c)(1) | Fixed point-to-point operation with directional antenna gains greater than 6 dBi | Not applicable |
| §15.247(c)(2) | Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams | Not applicable |
| §15.247(d) | Spurious emissions | Not applicable |
| §15.247(f) | Time of occupancy for hybrid systems | Not applicable |

2.3 FCC Part 15 Subpart C, intentional radiators test results for digital transmission systems (DTS)

Table 2.3-1: FCC 15.247 results for DTS

| Part | Test description | Verdict |
|---------------|---|----------------|
| §15.247(a)(2) | Minimum 6 dB bandwidth | Pass |
| §15.247(b)(3) | Maximum peak output power in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands | Pass |
| §15.247(c)(1) | Fixed point-to-point operation with directional antenna gains greater than 6 dBi | Not applicable |
| §15.247(c)(2) | Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams | Not applicable |
| §15.247(d) | Spurious emissions | Pass |
| §15.247(e) | Power spectral density | Not performed |
| §15.247(f) | Time of occupancy for hybrid systems | Not applicable |

2.4 RSS-Gen, Issue 5, Amendment 1, test results

Table 2.4-1: RSS-Gen results

| Part | Test description | Verdict |
|------|---|----------------|
| 7.3 | Receiver radiated emission limits | Not applicable |
| 7.4 | Receiver conducted emission limits | Not applicable |
| 6.9 | Operating bands and selection of test frequencies | Pass |
| 8.8 | AC power-line conducted emissions limits | Pass |

Notes: ¹ According to sections 5.2 and 5.3 of RSS-Gen, Issue 5, Amendment 1 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.
EUT is an AC powered device.

2.5 ISED RSS-247, Issue 2, test results for frequency hopping spread spectrum systems (FHSS)

Table 2.5-1: RSS-247 results for FHSS

| Part | Test description | Verdict |
|---------|--|----------------|
| 5.1 (a) | Bandwidth of a frequency hopping channel | Not applicable |
| 5.1 (b) | Minimum channel spacing | Not applicable |
| 5.1 (c) | Systems operating in the 902–928 MHz band | Not applicable |
| 5.1 (d) | Systems operating in the 2400–2483.5 MHz band | Not applicable |
| 5.1 (e) | Systems operating in the 5725–5850 MHz band | Not applicable |
| 5.3 | Hybrid Systems | |
| 5.3 (a) | Digital modulation turned off | Not applicable |
| 5.3 (b) | Frequency hopping turned off | Not applicable |
| 5.4 | Transmitter output power and e.i.r.p. requirements | |
| 5.4 (a) | Systems operating in the 902–928 MHz band | Not applicable |
| 5.4 (b) | Systems operating in the 2400–2483.5 MHz band | Not applicable |
| 5.4 (c) | Systems operating in the 5725–5850 MHz | Not applicable |
| 5.4 (e) | Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band | Not applicable |
| 5.4 (f) | Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams | Not applicable |
| 5.5 | Unwanted emissions | Not applicable |

Notes: None

2.6 ISED RSS-247, Issue 2, test results for digital transmission systems (DTS)

Table 2.6-1: RSS-247 results for DTS

| Part | Test description | Verdict |
|---------|--|----------------|
| 5.2 (a) | Minimum 6 dB bandwidth | Pass |
| 5.2 (b) | Maximum power spectral density | Not performed |
| 5.3 | Hybrid Systems | |
| 5.3 (a) | Digital modulation turned off | Not applicable |
| 5.3 (b) | Frequency hopping turned off | Not applicable |
| 5.4 | Transmitter output power and e.i.r.p. requirements | |
| 5.4 (d) | Systems employing digital modulation techniques | Pass |
| 5.4 (e) | Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band | Pass |
| 5.4 (f) | Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams | Not applicable |
| 5.5 | Unwanted emissions | Pass |

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

| | |
|------------------------|-----------------------------------|
| Receipt date | May 18, 2020 |
| Nemko sample ID number | 397261 sample 1/12 and sample 1/1 |

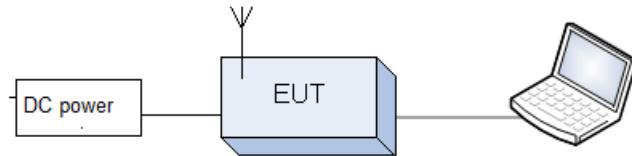
3.2 EUT information

| | |
|---------------|--------------------------|
| Product name | Dynagate 10-06 |
| Model | Dygate 10-06-35 |
| Model variant | Dygate 10-06-34 |
| Serial number | H120CRA0003, H120CRA0005 |

3.3 Technical information

| | |
|---|---|
| RSS number and Issue number | RSS-247 Issue 2, Feb 2017 |
| Frequency band | 2400 to 2483.5 MHz |
| Frequency Min (MHz) | 2412 |
| Frequency Max (MHz) | 2462 |
| RF power Min (W), Conducted | N/A |
| RF power Max (W), Conducted/ERP/EIRP | 0.027 W (14.3 dBm) |
| Field strength, Units @ distance | N/A |
| Measured BW (kHz) (6 dB) | 10.8 MHz |
| Calculated BW (kHz), as per TRC-43 | N/A |
| Type of modulation | 802.11b/g/n |
| Emission classification (F1D, G1D, D1D) | 18M2W7D |
| Transmitter spurious, Units @ distance | 53.63 dB μ V/m @ 3 m (@ 4874 MHz) |
| Power requirements | 24 V _{DC} , via 120 V _{AC} adapter or battery |
| Antenna information | The EUT uses a unique antenna coupling. |

3.4 EUT setup diagram



3.5 Product description and theory of operation

The DynaGATE 10-06 is a Multi-service IoT Edge Gateway, designed to deliver LTE connectivity with 2G/3G fallback to automotive and lightly rugged applications.

It is based on the NXP i.MX 6UltraLite Cortex-A7 processor family, with 512MB of RAM, 4GB of eMMC, and a user-accessible MicroSD and dual Micro-SIM slots.

The DynaGATE 10-06 offers the following wired connectivity capabilities: 2x Fast Ethernet, 2x CAN bus, 2x USB 2.0 for maintenance, 1x Ignition Key Input (surge protected), 1x Isolated Digital Input, 1x Isolated Digital Output, 1x Isolated Odometer Input, 1x Isolated Forward Input; it also includes the following serial ports (not isolated, surge protected): 1x RS-485, 1x RS-232.

It also offers a wide range of wireless connectivity capabilities: it can integrate an internal LTE Cat 1 modem (2G/3G fallback) with dual Micro-SIM support, 802.11 b/g/n Wi-Fi, and Bluetooth 4.2 BLE; and internal 72-channel GNSS provides precise geolocation capabilities. A rechargeable internal 2000 mA/h battery provides uninterrupted operation for up to 5 minutes in case of power failure and permits a safe shutdown.

3.6 EUT sub assemblies

Table 3.6-1: EUT sub assemblies

| Description | Brand name | Model/Part number | Serial number |
|-------------|------------|-------------------|---------------|
| | | | |
| | | | |

3.7 EUT exercise details

EUT was set to continuously transmit mode during tests, by test software provided by client.

The EUT runs a Linux operating system which allows for the testing to be performed using engineering test tools and scripts. Communication with the EUT is via a serial console or Ethernet connection which provides a Linux command line interface for execution of the test tools/scripts. These tools/scripts configure the radio modules to enable continuous transmission with the ability to adjust modulation, frequency and output power as required.

Linux operating system version: 4.9.57-eurotech-ti.

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

The EUT has three WIFI 2.4 GHz standard; 802.11b standard is chosen to be the representative worst-case due to higher output power.

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

In the laboratory, the following ambient conditions are respected for each test reported below:

| | |
|-------------------|-----------------|
| Temperature | 18 – 33 °C |
| Relative humidity | 25 – 70 % |
| Air pressure | 860 – 1060 mbar |

The following instruments are used to monitor the environmental conditions:

| Equipment | Manufacturer | Model no. | Asset no. | Cal date | Next cal. |
|--------------------------------|--------------|-----------|--------------|----------|-----------|
| Thermo-hygrometer data loggers | Testo | 175-H2 | 20012380/305 | 2019-01 | 2021-01 |
| Thermo-hygrometer data loggers | Testo | 175-H2 | 38203337/703 | 2019-01 | 2021-01 |
| Barometer | Castle | GPB 3300 | 072015 | 2019-12 | 2020-12 |

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

| EUT | Type | Test | Range | Measurement Uncertainty | Notes |
|-------------|-----------|---|----------------------|-------------------------|-------|
| Transmitter | Conducted | Frequency error | 0.001 MHz ÷ 40 GHz | 0.08 ppm | (1) |
| | | | 0.009 MHz ÷ 30 MHz | 1.1 dB | (1) |
| | | Carrier power | 30 MHz ÷ 18 GHz | 1.5 dB | (1) |
| | | RF Output Power | 18 MHz ÷ 40 GHz | 3.0 dB | (1) |
| | | | 40 MHz ÷ 140 GHz | 5.0 dB | (1) |
| | | Adjacent channel power | 1 MHz ÷ 18 GHz | 1.4 dB | (1) |
| | | | 0.009 MHz ÷ 18 GHz | 3.0 dB | (1) |
| | | Conducted spurious emissions | 18 GHz ÷ 40 GHz | 4.2 dB | (1) |
| | | | 40 GHz ÷ 220 GHz | 6.0 dB | (1) |
| | | Intermodulation attenuation | 1 MHz ÷ 18 GHz | 2.2 dB | (1) |
| | | Attack time – frequency behaviour | 1 MHz ÷ 18 GHz | 2.0 ms | (1) |
| | | Attack time – power behaviour | 1 MHz ÷ 18 GHz | 2.5 ms | (1) |
| | | Release time – frequency behaviour | 1 MHz ÷ 18 GHz | 2.0 ms | (1) |
| | | Release time – power behaviour | 1 MHz ÷ 18 GHz | 2.5 ms | (1) |
| | | Transient behaviour of the transmitter – Transient frequency behaviour | 1 MHz ÷ 18 GHz | 0.2 kHz | (1) |
| | | Transient behaviour of the transmitter – Power level slope | 1 MHz ÷ 18 GHz | 9% | (1) |
| | | Frequency deviation - Maximum permissible frequency deviation | 0.001 MHz ÷ 18 GHz | 1.3% | (1) |
| | | Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz | 0.001 MHz ÷ 18 GHz | 0.5 dB | (1) |
| | | Dwell time | - | 3% | (1) |
| | | Hopping Frequency Separation | 0.01 MHz ÷ 18 GHz | 1% | (1) |
| | | Occupied Channel Bandwidth | 0.01 MHz ÷ 18 GHz | 2% | (1) |
| | | Modulation Bandwidth | 0.01 MHz ÷ 18 GHz | 2% | (1) |
| | Radiated | Radiated spurious emissions | 0.009 MHz ÷ 26.5 GHz | 6.0 dB | (1) |
| | | | 26.5 GHz ÷ 66 GHz | 8.0 dB | (1) |
| | | | 66 GHz ÷ 220 GHz | 10 dB | (1) |
| | | Effective radiated power transmitter | 10 kHz ÷ 26.5 GHz | 6.0 dB | (1) |
| | | | 26.5 GHz ÷ 66 GHz | 8.0 dB | (1) |
| | | | 66 GHz ÷ 220 GHz | 10 dB | (1) |

| EUT | Type | Test | Range | Measurement Uncertainty | Notes |
|----------|-----------|------------------------------|----------------------|-------------------------|-------|
| Receiver | Radiated | Radiated spurious emissions | 0.009 MHz ÷ 26.5 GHz | 6.0 dB | (1) |
| | | | 26.5 GHz ÷ 66 GHz | 8.0 dB | (1) |
| | | | 66 GHz ÷ 220 GHz | 10 dB | (1) |
| | Conducted | Sensitivity measurement | 1 MHz ÷ 18 GHz | 6.0 dB | (1) |
| | | Conducted spurious emissions | 0.009 MHz ÷ 18 GHz | 3.0 dB | (1) |
| | | | 18 GHz ÷ 40 GHz | 4.2 dB | (1) |
| | | | 40 GHz ÷ 220 GHz | 6.0 dB | (1) |

NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: Equipment list

| Equipment | Manufacturer | Model no. | Asset no. | Cal cycle | Next cal. |
|----------------------------------|-----------------|------------------------------|-------------|-----------|-----------|
| EMI receiver (20 Hz ÷ 8 GHz) | Rohde & Schwarz | ESU8 | 100202 | 2020-01 | 2021-01 |
| EMI receiver (20 Hz ÷ 8 GHz) | Rohde & Schwarz | ESW44 | 101620 | 2019-08 | 2020-08 |
| Trilog Antenna (30 MHz ÷ 7 GHz) | Schwarzbeck | VULB 9162 | 9162-025 | 2018-07 | 2021-07 |
| Bilog antenna (1 ÷ 18 GHz) | Schwarzbeck | STLP 9148 | 9148-123 | 2018-07 | 2021-07 |
| Preamplifier (1 ÷ 18 GHz) | Schwarzbeck | BBV 9718 | 9718-137 | 2019-09 | 2020-09 |
| Horn antenna (18 ÷ 40 GHz) | A.H. System | SAS-574 | 558 | 2020-01 | 2023-01 |
| Preamplifier (18 ÷ 40 GHz) | Miteq | JS44-18004000-35-8P-R | 1.627 | 2019-09 | 2020-09 |
| Controller | Maturo | FCU3.0 | 10041 | NCR | NCR |
| Tilt antenna mast | Maturo | TAM4.0-E | 10042 | NCR | NCR |
| Turntable | Maturo | TT4.0-5T | 2.527 | NCR | NCR |
| Semi-anechoic chamber | Nemko | 10m semi-anechoic chamber | 530 | 2019-09 | 2021-09 |
| Shielded room | Siemens | 10m control room | 1947 | NCR | NCR |
| LISN three phase (9 kHz ÷30 MHz) | Rohde & Schwarz | ESH2-Z5 | 872 460/041 | 2019-09 | 2020-09 |
| Shielded room | Siemens | Conducted emission test room | 1862 | NCR | NCR |

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 15.31(e) Variation of power source

8.1.1 Definitions and limits

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

8.1.2 Test date

Start date April 9, 2020

8.1.3 Observations, settings and special notes

None

8.1.4 Test data

EUT Power requirements:

| | | | |
|---|--|--|---|
| If EUT is an AC or a DC powered, was the noticeable output power variation observed? | <input checked="" type="checkbox"/> AC | <input type="checkbox"/> DC | <input type="checkbox"/> Battery |
| If EUT is battery operated, was the testing performed using fresh batteries? | <input type="checkbox"/> YES | <input checked="" type="checkbox"/> NO | <input type="checkbox"/> N/A |
| If EUT is rechargeable battery operated, was the testing performed using fully charged batteries? | <input type="checkbox"/> YES | <input type="checkbox"/> NO | <input checked="" type="checkbox"/> N/A |

8.2 FCC 15.31(m) and RSS-Gen 6.9 Number of frequencies

8.2.1 Definitions and limits

FCC:

Measurements on intentional radiators or receivers shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table.

ISED:

Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in table below. The frequencies selected for measurements shall be reported in the test report.

Table 8.2-1: Frequency Range of Operation

| Frequency range over which the device operates (in each band) | Number of test frequencies required | Location of measurement frequency inside the operating frequency range |
|---|-------------------------------------|--|
| 1 MHz or less | 1 | Center (middle of the band) |
| 1–10 MHz | 2 | 1 near high end, 1 near low end |
| Greater than 10 MHz | 3 | 1 near high end, 1 near center and 1 near low end |

Note: "near" means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

8.2.2 Test date

Start date April 9, 2020

8.2.3 Observations, settings and special notes

None

8.2.4 Test data

Table 8.2-2: Test channels selection

| Modulation | Start of Frequency range, MHz | End of Frequency range, MHz | Frequency range bandwidth, MHz | Low channel, MHz | Mid channel, MHz | High channel, MHz |
|------------|-------------------------------|-----------------------------|--------------------------------|------------------|------------------|-------------------|
| 802.11b | 2400 | 2483.5 | 83.5 | 2412 | 2437 | 2462 |

8.3 FCC 15.203 and RSS-Gen, section 6.8 Antenna requirement

8.3.1 Definitions and limits

FCC:

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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

ISED:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report.

8.3.2 Test date

Start date April 9, 2020

8.3.3 Observations, settings and special notes

None

8.3.4 Test data

Must the EUT be professionally installed?

YES NO

Does the EUT have detachable antenna(s)?

YES NO

If detachable, is the antenna connector(s) non-standard?

YES NO N/A

8.4 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits

8.4.1 Definitions and limits

FCC:

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 in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which 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 in table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Table 8.4-1: Conducted emissions limit

| Frequency of emission, MHz | Quasi-peak | Conducted limit, dB μ V | Average** |
|-------------------------------|------------|-----------------------------|-----------|
| 0.15–0.5 | 66 to 56* | 56 to 46* | 56 to 46* |
| 0.5–5 | 56 | 46 | 46 |
| 5–30 | 60 | 50 | 50 |

Note: * - The level decreases linearly with the logarithm of the frequency.

** - A linear average detector is required.

8.4.2 Test date

Start date

June 04, 2020

8.4.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

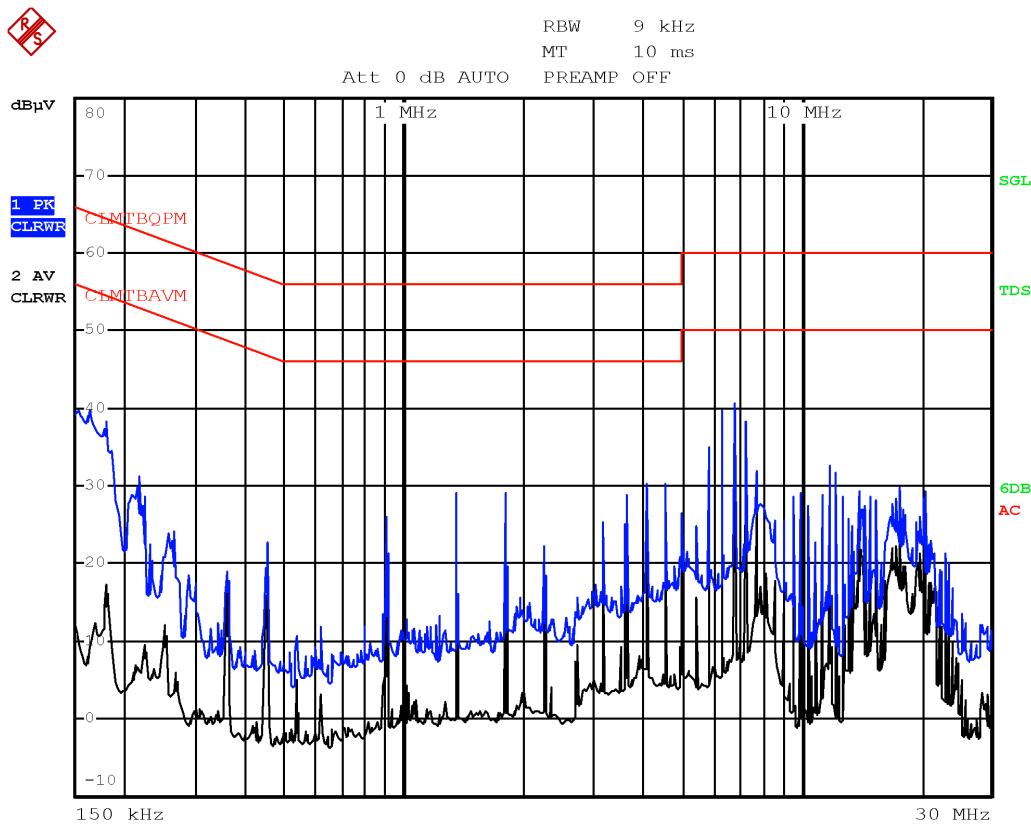
Receiver settings for preview measurements:

| | |
|----------------------|------------------|
| Resolution bandwidth | 9 kHz |
| Video bandwidth | 30 kHz |
| Detector mode | Peak and Average |
| Trace mode | Max Hold |
| Measurement time | 100 ms |

Receiver settings for final measurements:

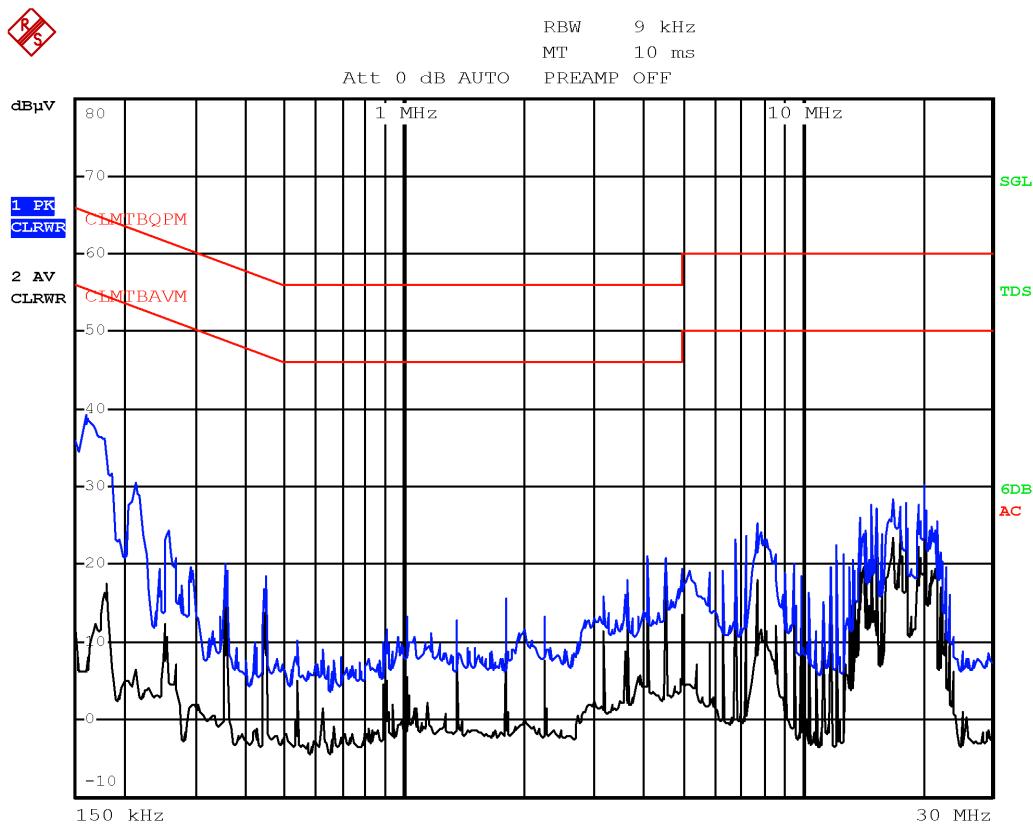
| | |
|----------------------|------------------------|
| Resolution bandwidth | 9 kHz |
| Video bandwidth | 30 kHz |
| Detector mode | Quasi-Peak and Average |
| Trace mode | Max Hold |
| Measurement time | 100 ms |

8.4.4 Test data



Plot 8.4-1: Conducted emissions on phase line

| Frequency (MHz) | Level (dBμV) | Limit (dBμV) | Margin (dB) | Detector |
|-----------------|--------------|--------------|-------------|----------|
| -- | -- | -- | -- | -- |



Plot 8.4-2: Conducted emissions on neutral line

| Frequency (MHz) | Level (dB μ V) | Limit (dB μ V) | Margin (dB) | Detector |
|-----------------|--------------------|--------------------|-------------|----------|
| -- | -- | -- | -- | -- |

8.5 FCC 15.247(a)(2) and RSS-247 5.2(a) Minimum 6 dB bandwidth for DTS systems

8.5.1 Definitions and limits

FCC:

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.

ISED:

The minimum 6 dB bandwidth shall be 500 kHz.

8.5.1 Test date

Start date Junel 19, 2020

8.5.2 Observations, settings and special notes

Spectrum analyser settings:

| | |
|----------------------|--|
| Resolution bandwidth | 100 kHz |
| Video bandwidth | $\geq 3 \times$ RBW |
| Frequency span | 30 MHz for 20 MHz channel; 80 MHz for 40 MHz channel |
| Detector mode | Peak |
| Trace mode | Max Hold |

8.5.3 Test data

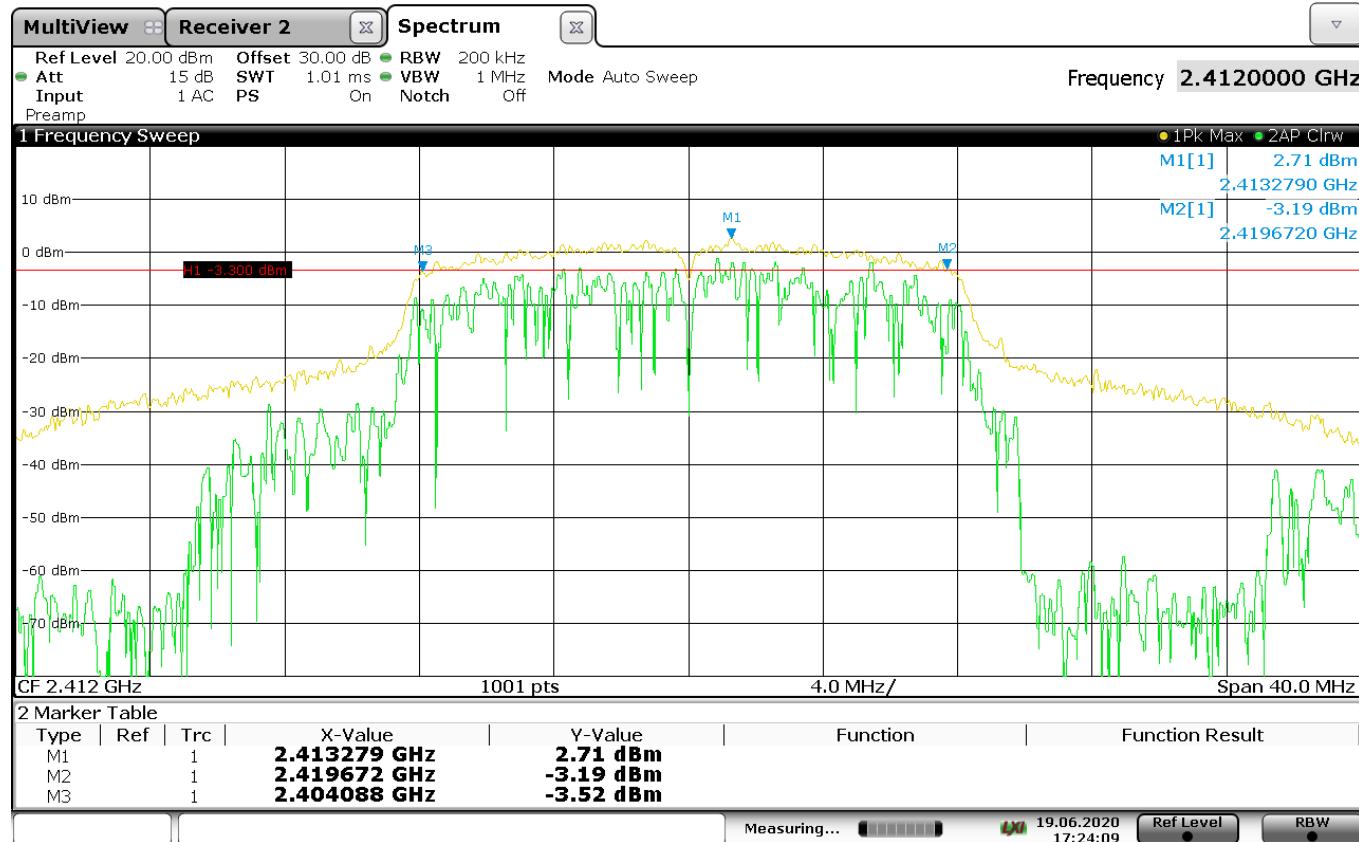
Table 8.5-1: 6 dB bandwidth results

| Modulation | Frequency, MHz | 6 dB bandwidth, MHz | Limit, MHz | Margin, MHz |
|------------|----------------|---------------------|------------|-------------|
| 802.11b | 2412 | 14.79 | 0.5 | 14.29 |
| | 2437 | 15.65 | 0.5 | 15.15 |
| | 2462 | 15.92 | 0.5 | 15.42 |

Table 8.5-2: 99% occupied bandwidth results

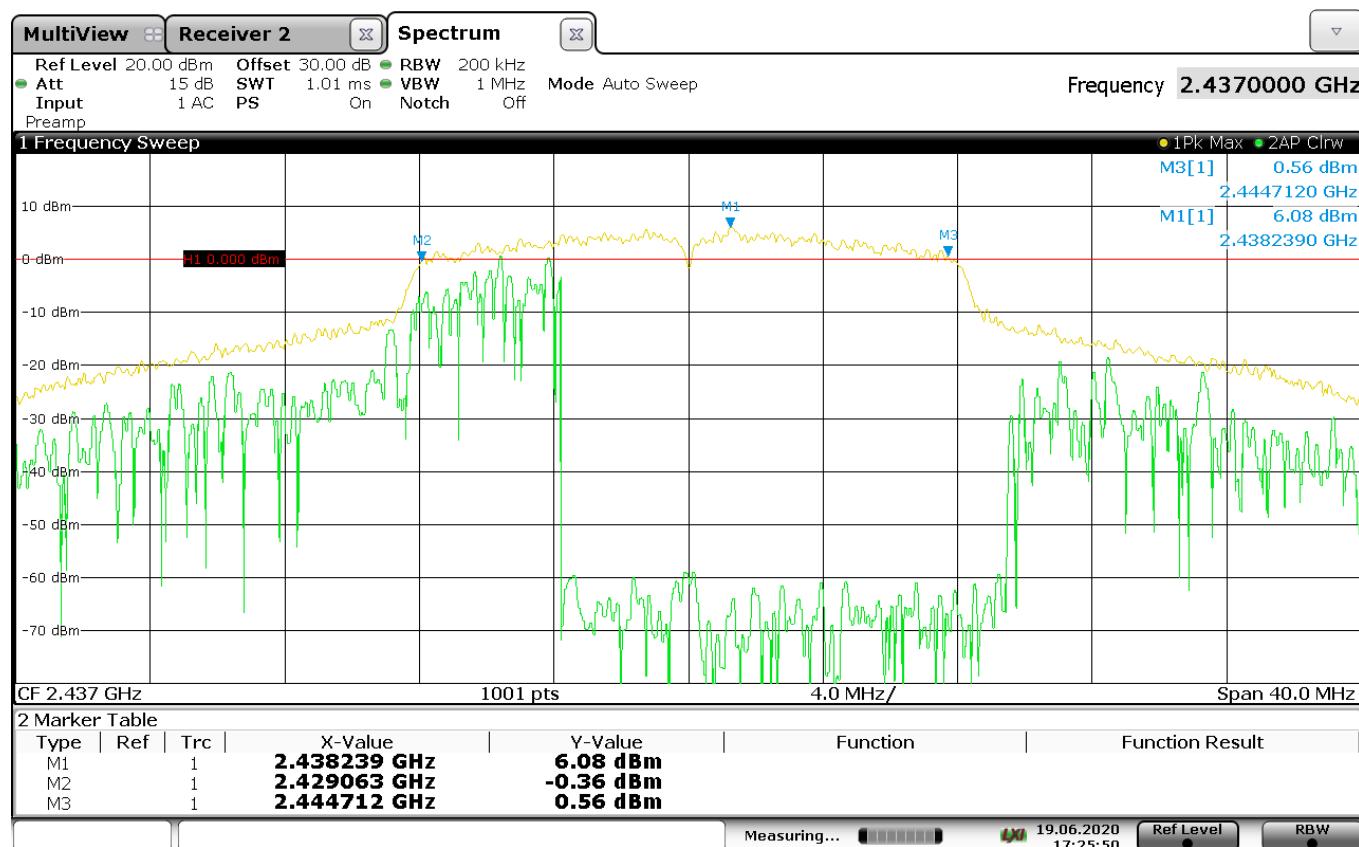
| Modulation | Frequency, MHz | 99% occupied bandwidth, MHz |
|------------|----------------|-----------------------------|
| 802.11b | 2412 | 16.32 |
| | 2437 | 18.19 |
| | 2462 | 16.31 |

Note: there is no 99% occupied bandwidth limit in the standard's requirements, the measurement results provided for information purposes only.



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6 dB bandwidth on 802.11g, channel LOW



6 dB bandwidth on 802.11g, channel MID



Figure 8.5-1: 6 dB bandwidth on 802.11b, channel HIGH

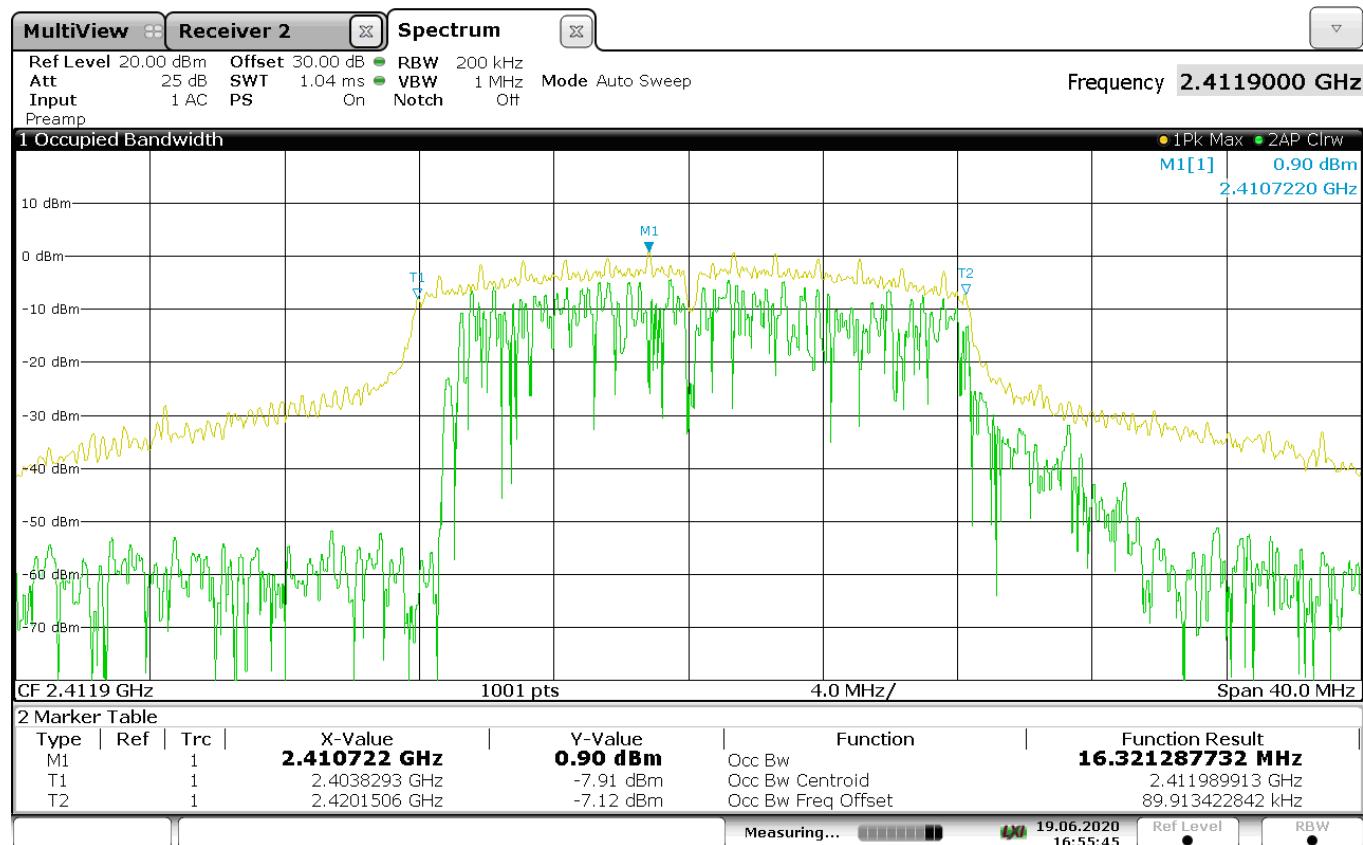


Figure 8.5-2: 99% bandwidth on 802.11g, channel LOW

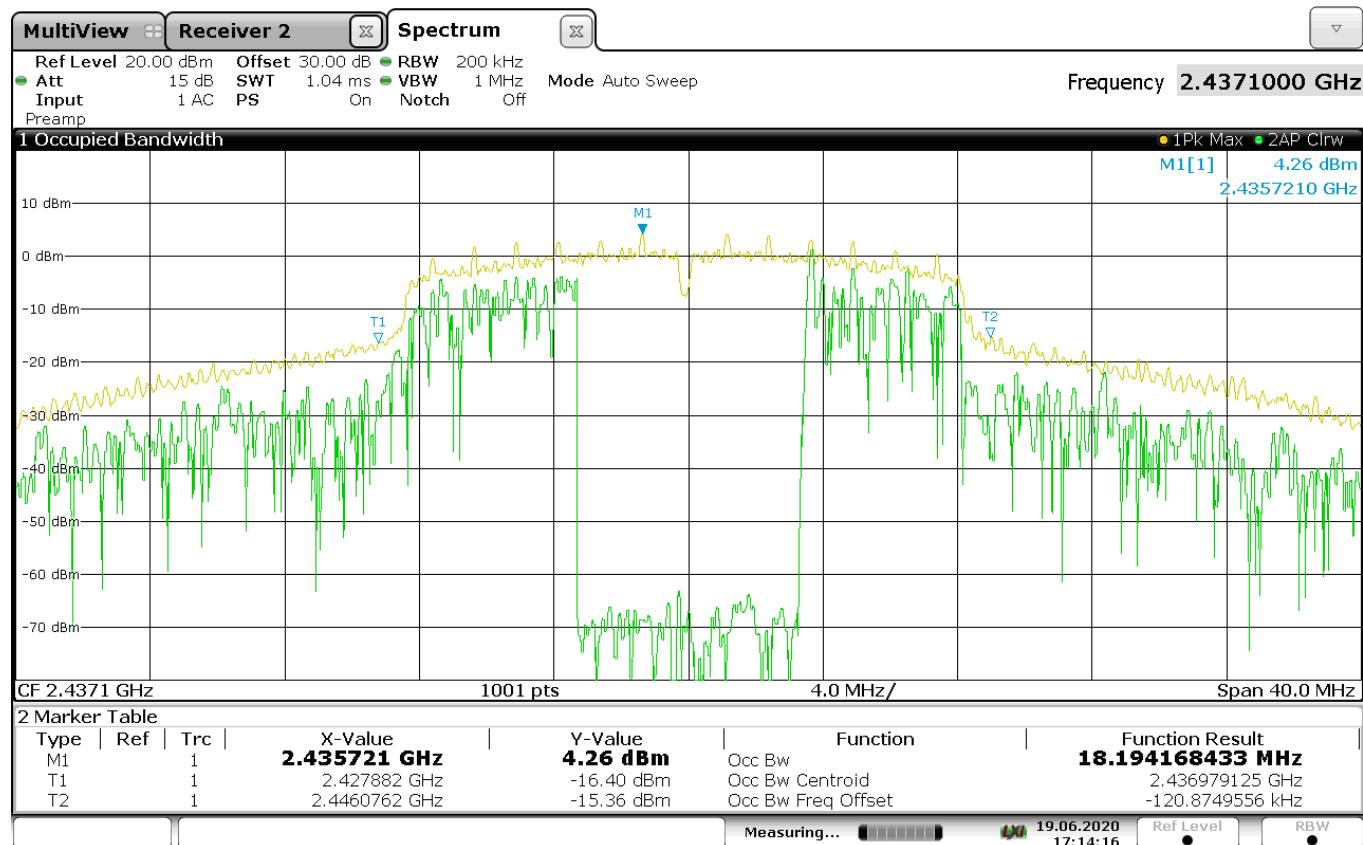


Figure 8.5-3: 99% bandwidth on 802.11g, channel MID



Figure 8.5-4: 99% bandwidth on 802.11b, channel HIGH

8.6 FCC 15.247(b) and RSS-247 5.4 (d) Transmitter output power and e.i.r.p. requirements for DTS in 2.4 GHz

8.6.1 Definitions and limits

FCC:

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

- (3) For systems using digital modulation in the 2400–2483.5 MHz band: 1 W (30 dBm). As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
- (4) The conducted output power limit specified in paragraph (b) of this section 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 the intentional radiator shall be reduced below the stated values in paragraphs (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.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

- (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.
- (ii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.
- (2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:
 - (i) Different information must be transmitted to each receiver.
 - (ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:
 - (A) The directional gain shall be calculated as the sum of $10 \log$ (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.
 - (B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.
 - (iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.
 - (iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

ISED:

d. For DTSS employing digital modulation techniques operating in the 2400–2483.5 MHz band, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

e. Fixed point-to-point systems in the 2400–2483.5 MHz band are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.

f. Transmitters operating in the band 2400–2483.5 MHz, may employ antenna systems that emit multiple directional beams simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers, provided that the emissions comply with the following:

i Different information must be transmitted to each receiver.

ii If the transmitter employs an antenna system that emits multiple directional beams, but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device (i.e. the sum of the power supplied to all antennas, antenna elements, staves, etc., and summed across all carriers or frequency channels) shall not exceed the applicable output power limit specified in sections 5.4(b) and 5.4(d). However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

iii If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the applicable power limit specified in sections 5.4(b) and 5.4(d). If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the applicable limit specified in sections 5.4(b) and 5.4(d). In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the applicable limit specified in sections 5.4(b) and 5.4(d) by more than 8 dB.

iv Transmitters that transmit a single directional beam shall operate under the provisions of sections 5.4(b), 5.4(d) and 5.4(e).

8.6.1 Test date

Start date

June 03, 2020

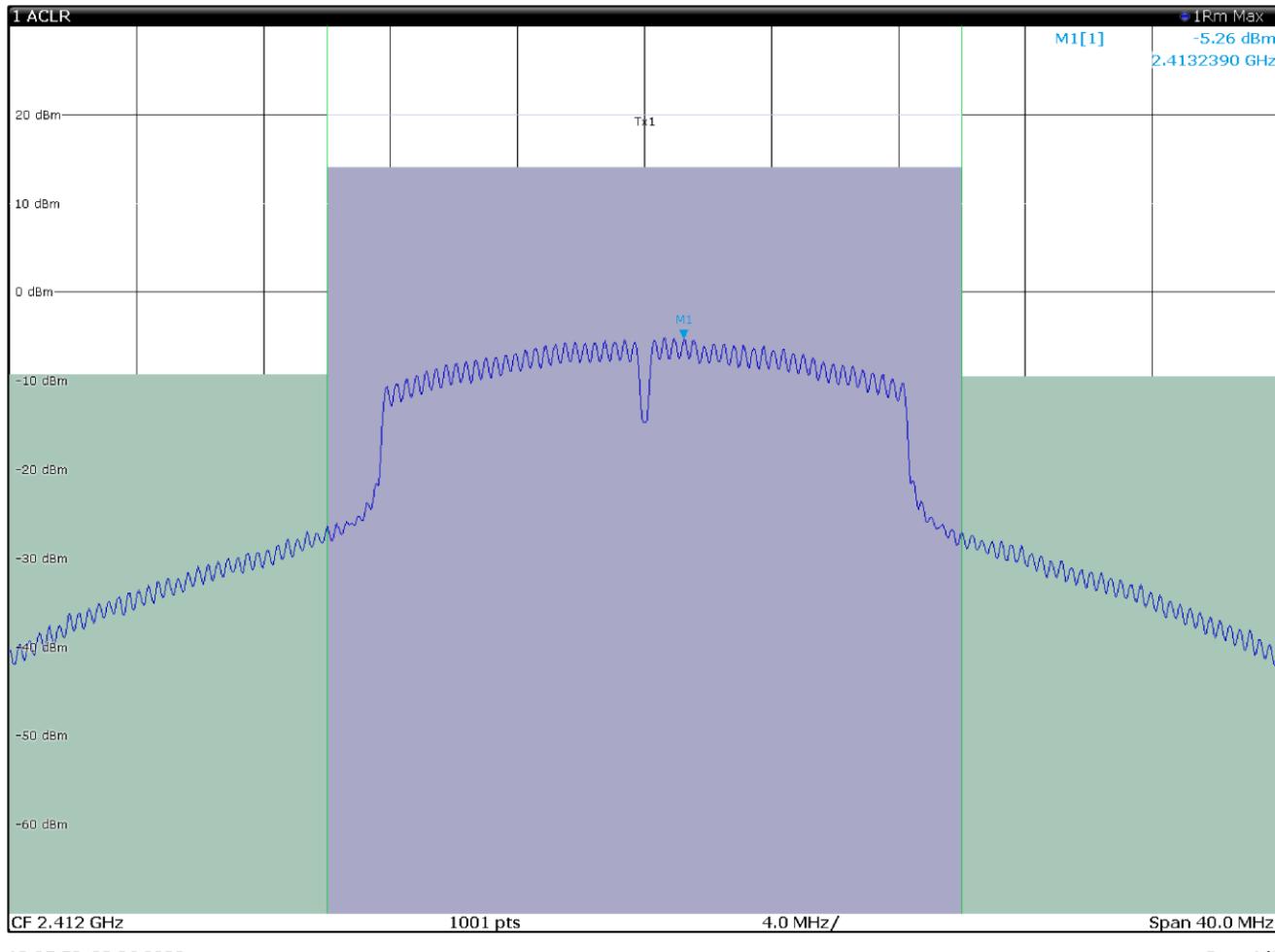
8.6.2 Observations, settings and special notes

The test was performed using Integrated band power method. Tests were performed with highest and lowest data rates, only the worst cases were presented.

8.6.3 Test data

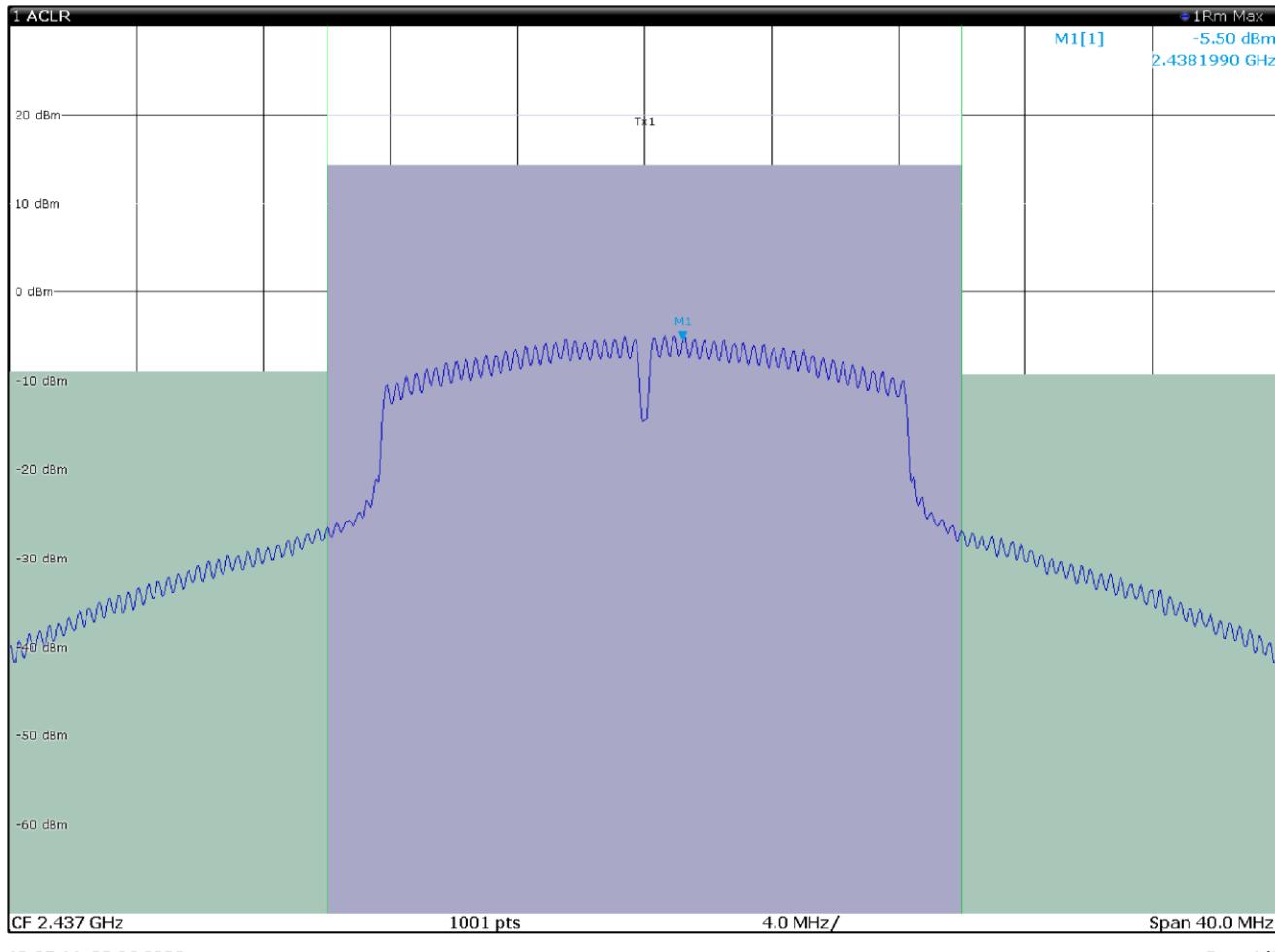
Table 8.6-1: Output power measurements results

| Modulation | Frequency, MHz | Conducted output power, dBm | | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|------------|-------------------|-----------------------------|-------|------------|----------------------|--------------|--------------------|--------------------|
| | | Measured | Limit | | | | | |
| 802.11g | 2412 | 14.0 | 30.0 | -16.0 | 1.7 | 15.7 | 36.0 | -20.3 |
| | 2437 | 14.3 | 30.0 | -15.7 | 1.7 | 16.0 | 36.0 | -20.0 |
| | 2462 | 11.9 | 30.0 | -18.1 | 1.7 | 13.6 | 36.0 | -22.4 |



| 2 Result Summary | | | | | |
|-------------------|------------|--------------|--|------------------|------------------|
| Channel Tx1 (Ref) | | WLAN 802.11a | | | |
| Bandwidth | 20.000 MHz | Offset | | Power | |
| Channel Adj | 20.000 MHz | 20.000 MHz | | 14.00 dBm | 14.00 dBm |
| | | | | Lower | -9.29 dBm |
| | | | | Upper | -9.56 dBm |

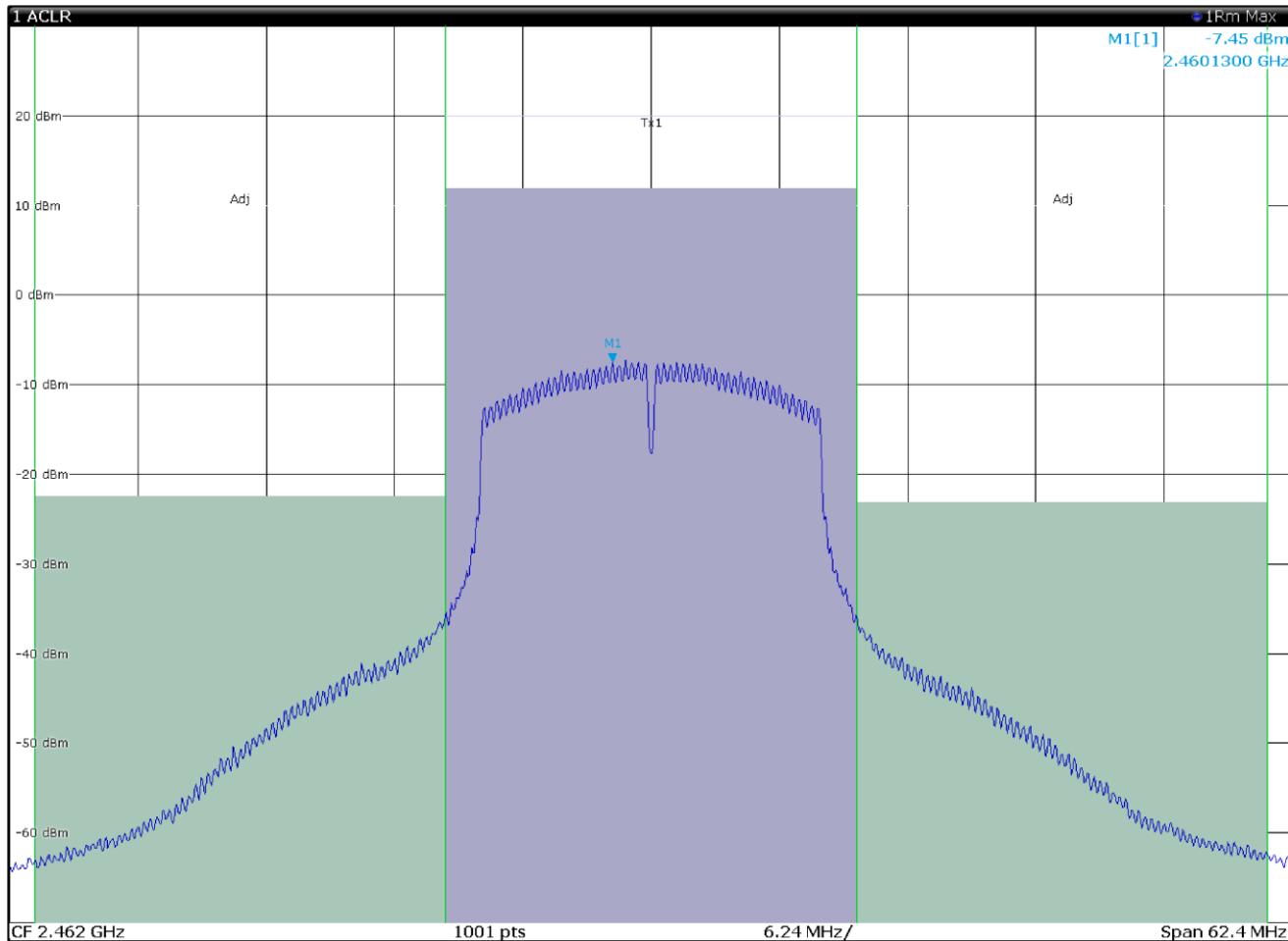
Figure 8.6-1: Output power of WiFi 802.11b, channel LOW



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| 2 Result Summary | | | | | |
|-------------------|----------------------|-------------------|-----------------|-----------------|--|
| WLAN 802.11a | | | | | |
| Channel Tx1 (Ref) | Bandwidth 20.000 MHz | Offset | Power 14.28 dBm | | |
| Tx Total | | | 14.28 dBm | | |
| Channel Adj | Bandwidth 20.000 MHz | Offset 20.000 MHz | Lower -9.05 dBm | Upper -9.28 dBm | |

Figure 8.6-2: Output power of WiFi 802.11b, channel MID



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| 2 Result Summary | | | | |
|-------------------|----------------------|--------------|-------------------|---|
| Channel Tx1 (Ref) | Bandwidth 20.000 MHz | WLAN 802.11a | Offset | Power 11.90 dBm |
| Tx Total | | | | 11.90 dBm |
| Channel Adj | Bandwidth 20.000 MHz | | Offset 20.000 MHz | Lower -22.43 dBm Upper -23.17 dBm |

Figure 8.6-3: Output power of WiFi 802.11b, channel HIGH

8.7 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) unwanted emissions

8.7.1 Definitions and limits

FCC:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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)).

ISED:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.7-1: FCC §15.209 and RSS-Gen – Radiated emission limits

| Frequency, MHz | Field strength of emissions | | Measurement distance, m |
|-------------------|-----------------------------|-----------------------------------|-------------------------|
| | µV/m | dBµV/m | |
| 0.009–0.490 | 2400/F | 67.6 – 20 × log ₁₀ (F) | 300 |
| 0.490–1.705 | 24000/F | 87.6 – 20 × log ₁₀ (F) | 30 |
| 1.705–30.0 | 30 | 29.5 | 30 |
| 30–88 | 100 | 40.0 | 3 |
| 88–216 | 150 | 43.5 | 3 |
| 216–960 | 200 | 46.0 | 3 |
| above 960 | 500 | 54.0 | 3 |

Notes: In the emission table above, the tighter limit applies at the band edges.

For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.7-2: ISED restricted frequency bands

| MHz | MHz | MHz | GHz |
|-------------------|---------------------|---------------|-------------|
| 0.090–0.110 | 12.57675–12.57725 | 399.9–410 | 7.25–7.75 |
| 0.495–0.505 | 13.36–13.41 | 608–614 | 8.025–8.5 |
| 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 | |
| 8.41425–8.41475 | 167.72–173.2 | 3500–4400 | |
| 12.29–12.293 | 240–285 | 4500–5150 | Above 38.6 |
| 12.51975–12.52025 | 322–335.4 | 5350–5460 | |

Note: Certain frequency bands listed in Table 8.7-2 and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Table 8.7-3: FCC restricted frequency bands

| 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 |
| 13.36–13.41 | | | |

8.7.1 Test date

Start date April 14, 2020

8.7.2 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.

EUT was set to transmit continuously. Tests were performed with EUT set to highest and lowest data rate, different antenna configurations and modulation schemes were investigated, only the worst case are presented. Radiated measurements were performed at a distance of 3 m. Since fundamental power was tested using the maximum peak conducted output power procedure to demonstrate compliance, the spurious emissions limit is -20 dBc/100 kHz.

Spectrum analyzer settings for conducted spurious emissions measurements:

| | |
|-----------------------|----------|
| Resolution bandwidth: | 100 kHz |
| Video bandwidth: | 300 kHz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

Spectrum analyzer settings for radiated measurements within restricted bands below 1 GHz:

| | |
|-----------------------|----------|
| Resolution bandwidth: | 100 kHz |
| Video bandwidth: | 300 kHz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

Spectrum analyzer settings for peak radiated measurements within restricted bands above 1 GHz:

| | |
|-----------------------|----------|
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

Spectrum analyzer settings for average conducted measurements within restricted bands above 1 GHz:

| | |
|-----------------------|-----------------------|
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Detector mode: | power averaging (RMS) |
| Trace mode: | averaging (RMS) |

Spectrum analyzer settings for average radiated measurements within restricted bands above 1 GHz:

| | |
|-----------------------|----------|
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 10 Hz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

8.7.4 Test data

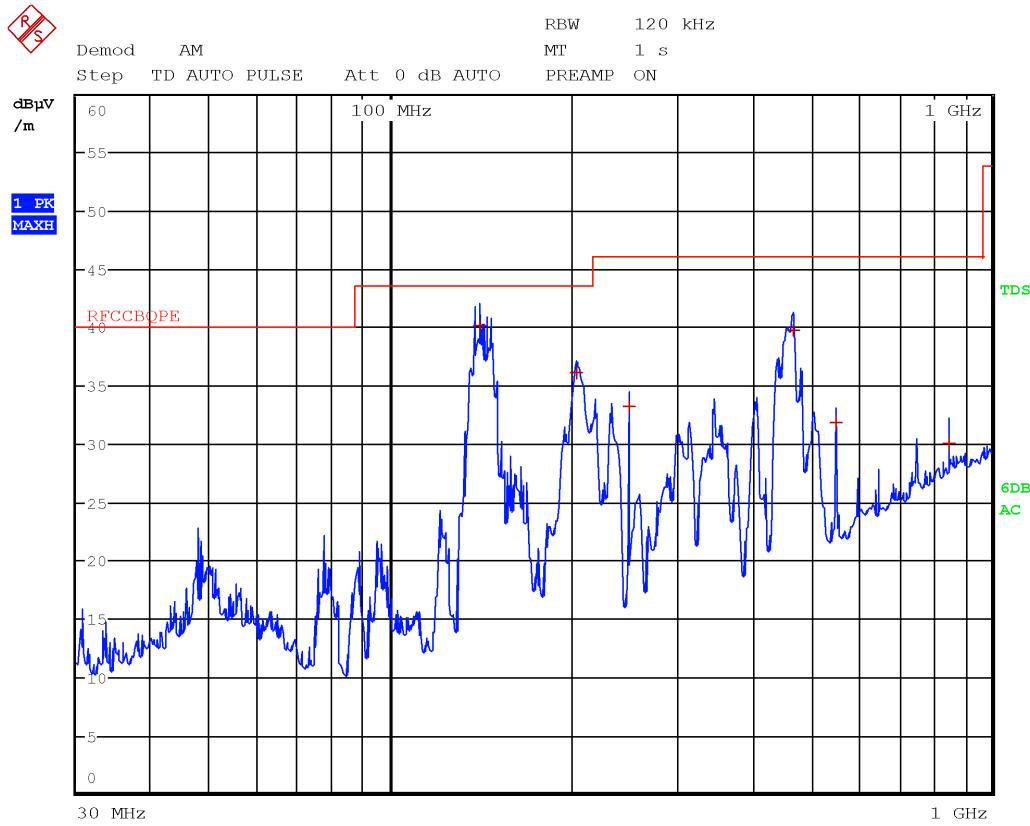


Figure 8.7-1: Radiated spurious emissions 30 to 1000 MHz, Mid channel with antenna in horizontal polarization

| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector |
|-----------------|----------------|----------------|-------------|----------|
| 140.9100 | 40.1 | 43.5 | -3.4 | QP |
| 204.3900 | 36.2 | 43.5 | -7.3 | QP |
| 250.0200 | 33.3 | 46.0 | -12.7 | QP |
| 467.4300 | 39.8 | 46.0 | -6.2 | QP |
| 550.0200 | 31.9 | 46.0 | -14.1 | QP |
| 850.0200 | 30.1 | 46.0 | -15.9 | QP |

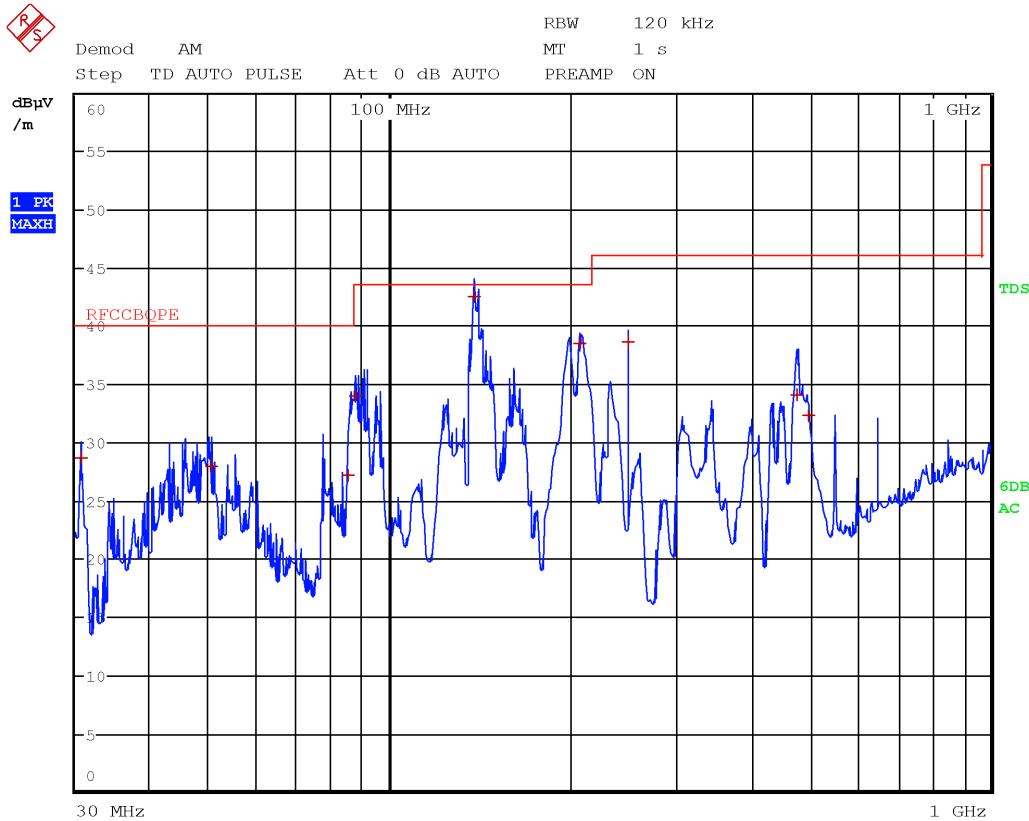
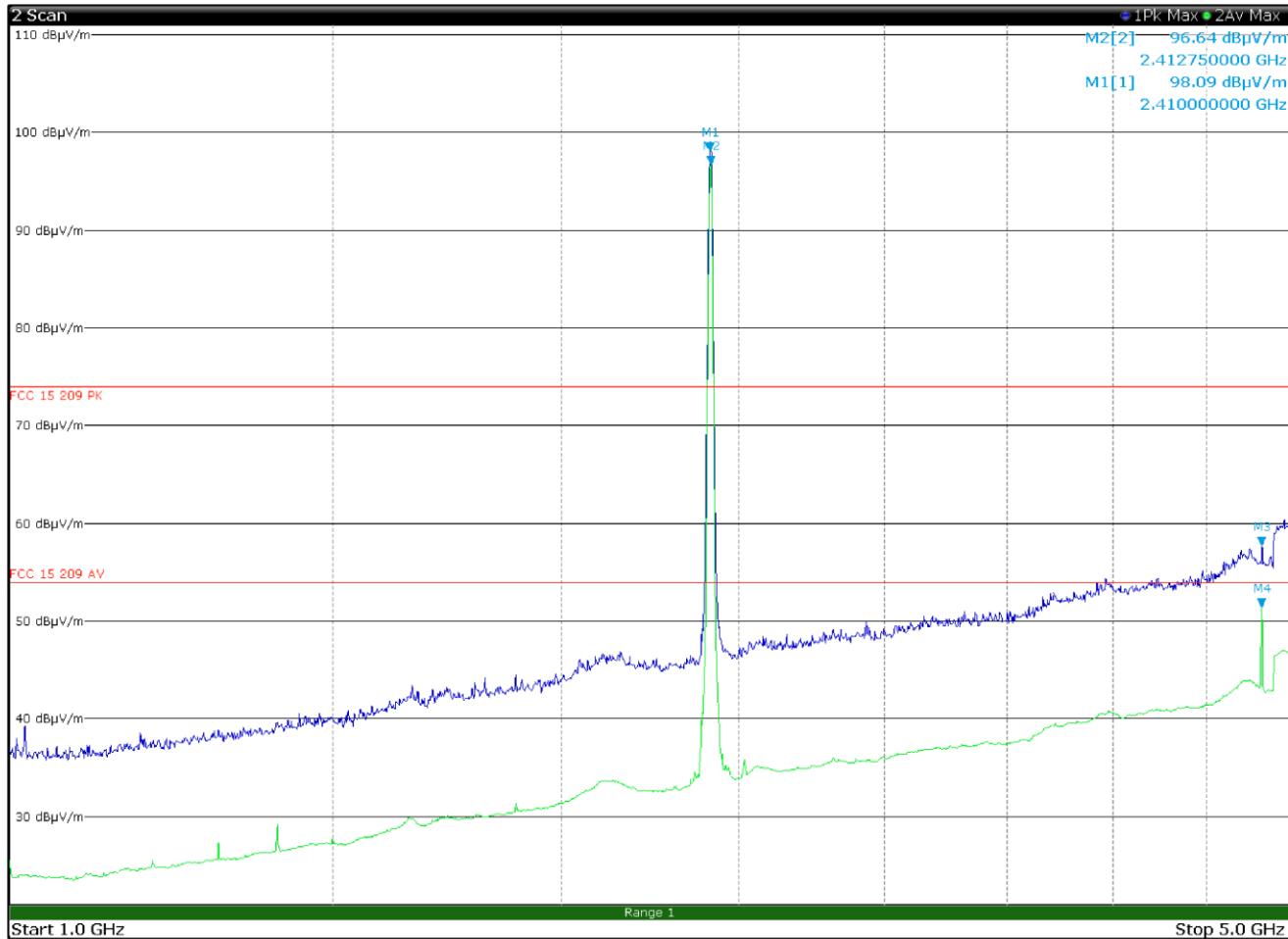


Figure 8.7-2: Radiated spurious emissions 30 to 1000 MHz, Mid channel with antenna in vertical polarization

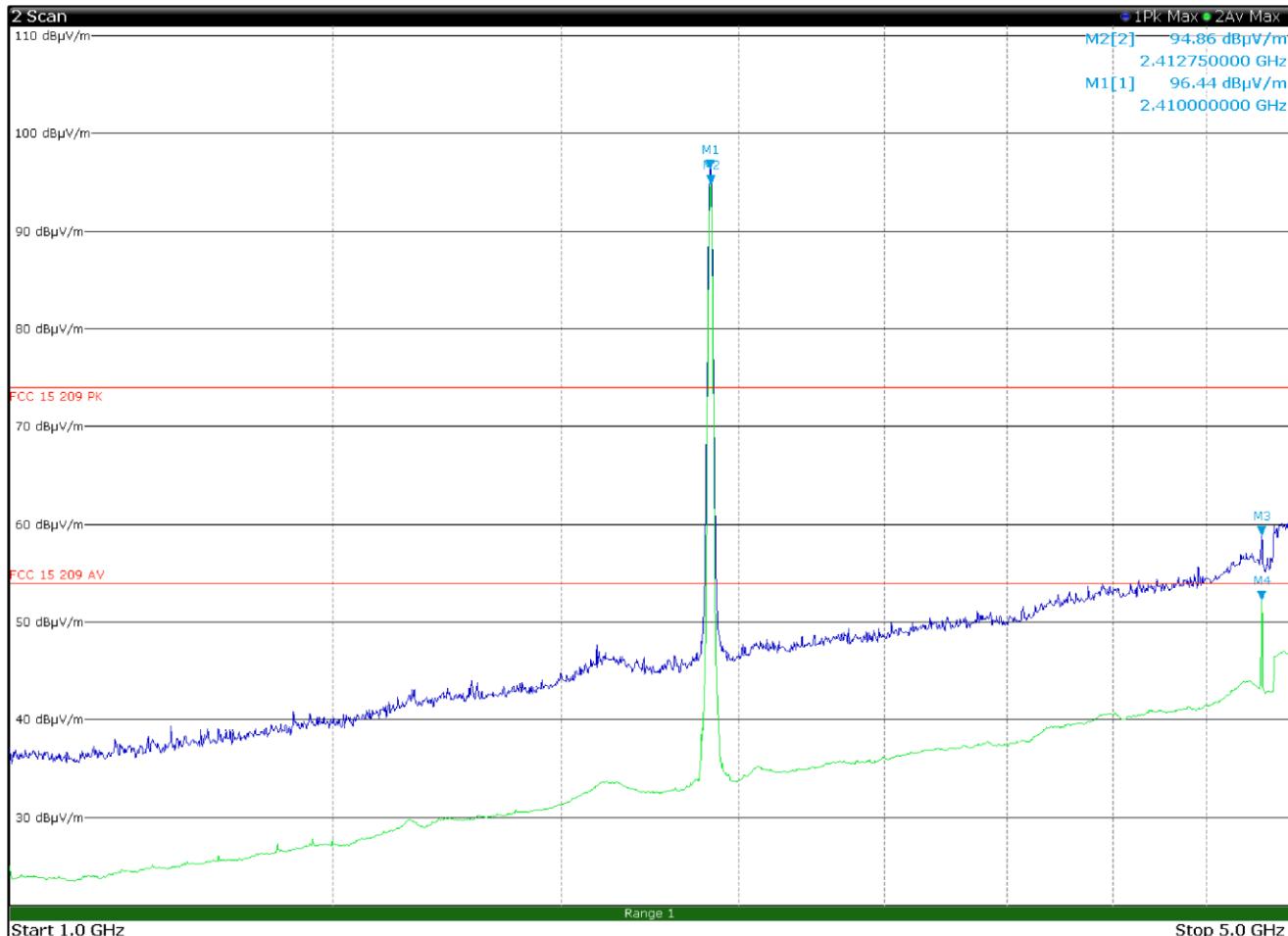
| Frequency (MHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector |
|-----------------|----------------|----------------|-------------|----------|
| 30.6300 | 28.7 | 40.0 | -11.3 | QP |
| 50.4300 | 28.0 | 40.0 | -12.0 | QP |
| 85.4700 | 27.3 | 40.0 | -12.7 | QP |
| 87.6600 | 34.0 | 40.0 | -6.0 | QP |
| 138.5700 | 42.5 | 43.5 | -1.0 | QP |
| 207.8700 | 38.5 | 43.5 | -5.0 | QP |
| 250.0200 | 38.7 | 46.0 | -7.3 | QP |
| 476.6100 | 34.2 | 46.0 | -11.8 | QP |
| 496.7400 | 32.4 | 46.0 | -13.6 | QP |



| 3 Marker Table | | | | | |
|----------------|------|-----|-----|-------------|--------------------|
| Wnd | Type | Ref | Trc | X-value | Y-value |
| Scan | M1 | | 1 | 2.41 GHz | 98.09 dB μ V/m |
| Scan | M2 | | 2 | 2.41275 GHz | 96.64 dB μ V/m |
| Scan | M3 | | 1 | 4.824 GHz | 57.69 dB μ V/m |
| Scan | M4 | | 2 | 4.824 GHz | 51.39 dB μ V/m |

Figure 8.7-3: Radiated spurious emissions 1 to 5 GHz, Low channel with antenna in horizontal polarization

Limit exceeded by the carrier

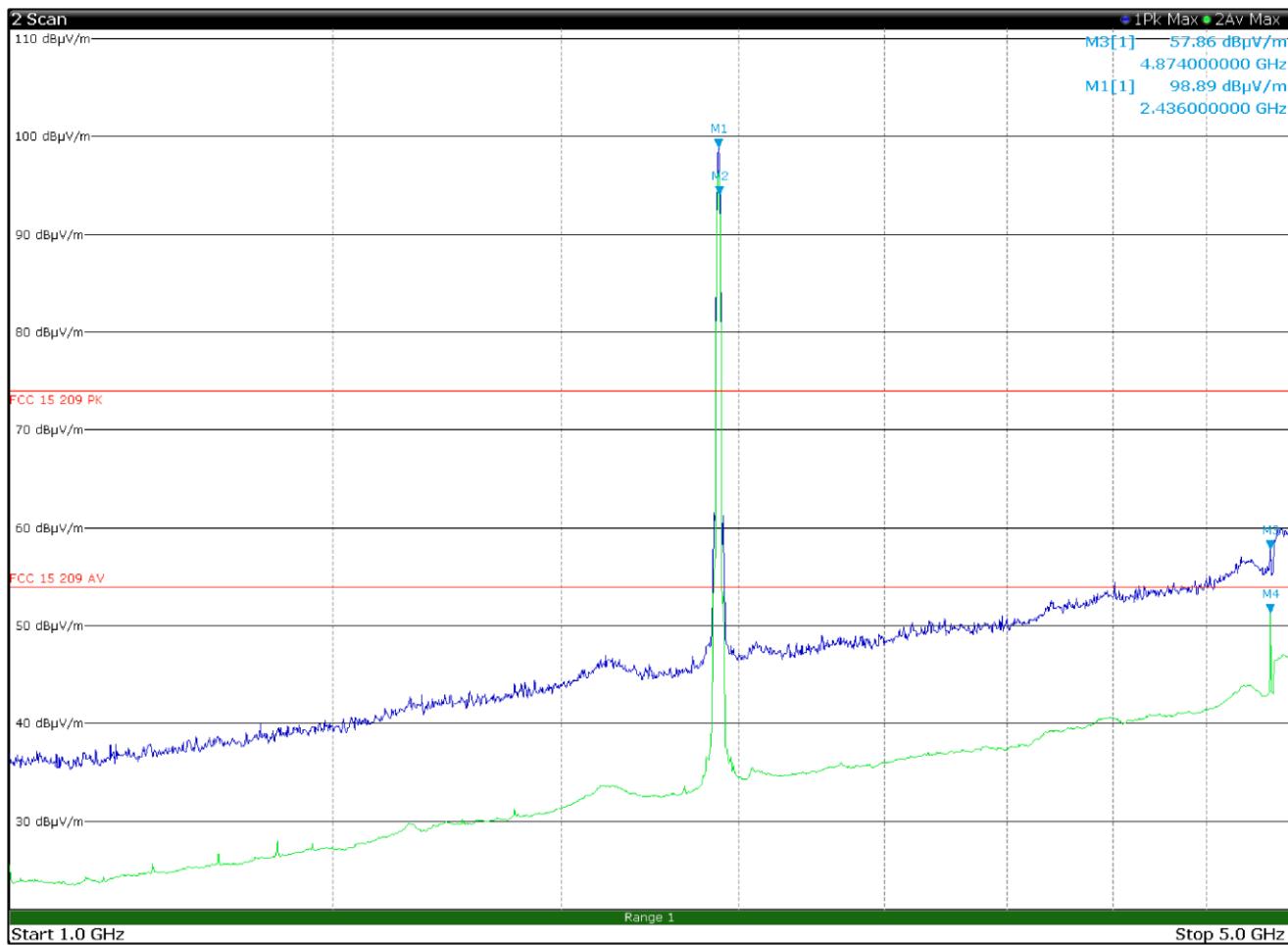


3 Marker Table

| Wnd | Type | Ref | Trc | X-value | Y-value |
|------|------|-----|-----|-------------|--------------------|
| Scan | M1 | | 1 | 2.41 GHz | 96.44 dB μ V/m |
| Scan | M2 | | 2 | 2.41275 GHz | 94.86 dB μ V/m |
| Scan | M3 | | 1 | 4.824 GHz | 58.87 dB μ V/m |
| Scan | M4 | | 2 | 4.824 GHz | 52.28 dB μ V/m |

Figure 8.7-4: Radiated spurious emissions 1 to 5 GHz, Low channel with antenna in vertical polarization

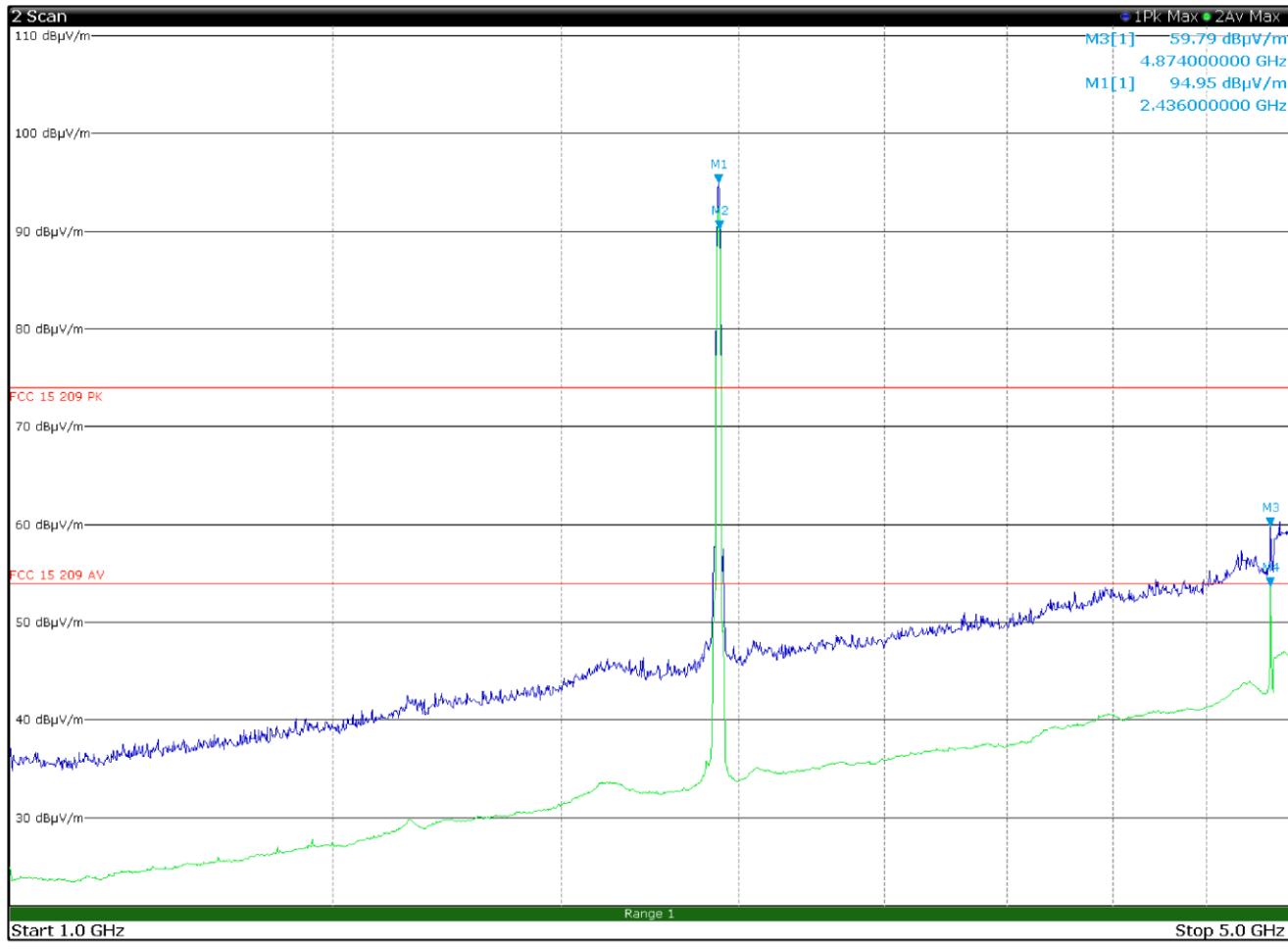
Limit exceeded by the carrier



| 3 Marker Table | | | | | |
|----------------|------|-----|-----|-------------|--------------------|
| Wnd | Type | Ref | Trc | X-value | Y-value |
| Scan | M1 | | 1 | 2.436 GHz | 98.89 dB μ V/m |
| Scan | M2 | | 2 | 2.44075 GHz | 94.02 dB μ V/m |
| Scan | M3 | | 1 | 4.874 GHz | 57.86 dB μ V/m |
| Scan | M4 | | 2 | 4.874 GHz | 51.33 dB μ V/m |

Figure 8.7-5: Radiated spurious emissions 1 to 5 GHz, Mid channel with antenna in horizontal polarization

Limit exceeded by the carrier

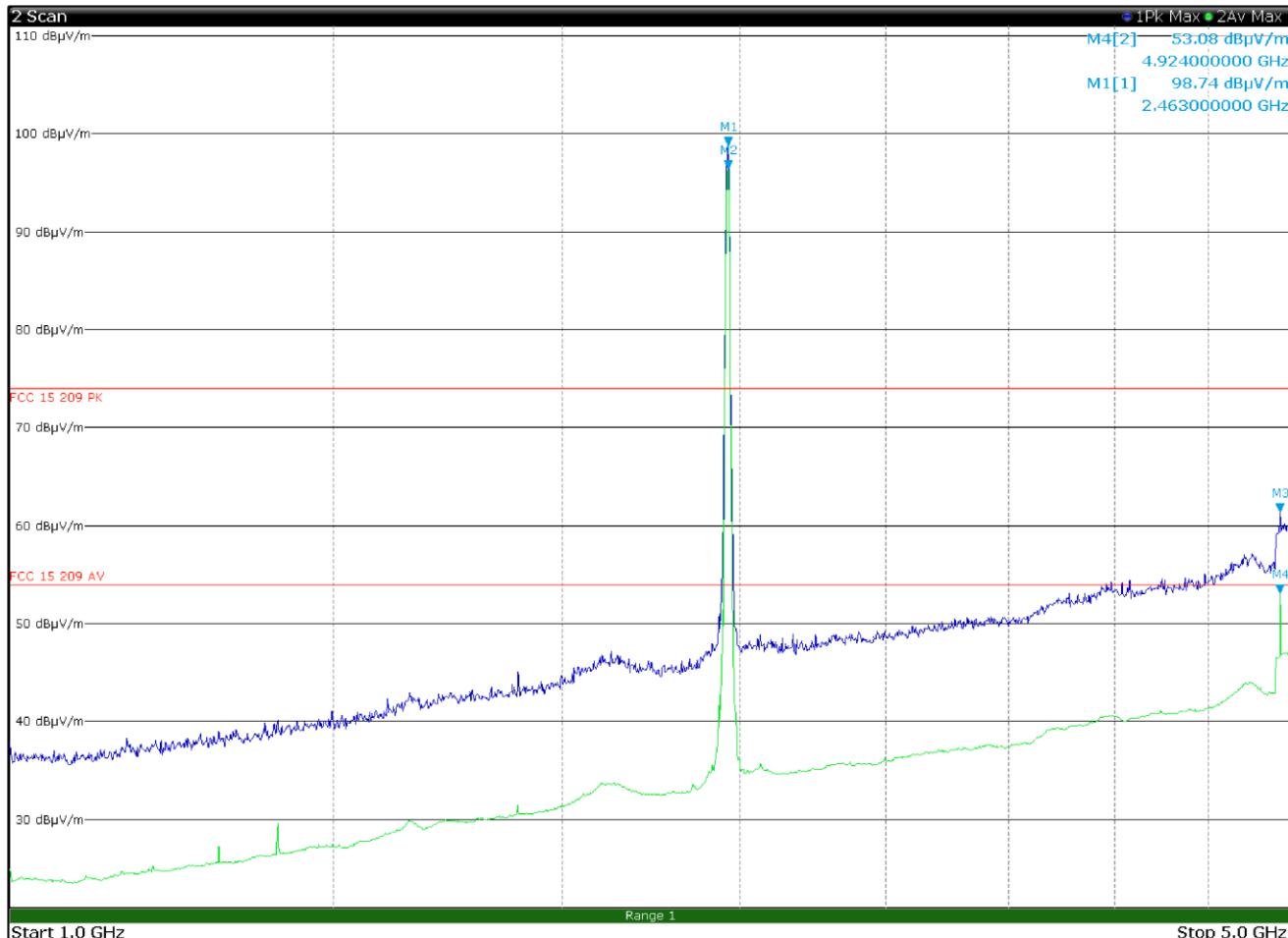


3 Marker Table

| Wnd | Type | Ref | Trc | X-value | Y-value |
|------|------|-----|-----|-------------|--------------------|
| Scan | M1 | | 1 | 2.436 GHz | 94.95 dB μ V/m |
| Scan | M2 | | 2 | 2.44075 GHz | 90.15 dB μ V/m |
| Scan | M3 | | 1 | 4.874 GHz | 59.79 dB μ V/m |
| Scan | M4 | | 2 | 4.874 GHz | 53.63 dB μ V/m |

Figure 8.7-6: Radiated spurious emissions 1 to 3.6 GHz, Mid channel with antenna in vertical polarization

Limit exceeded by the carrier

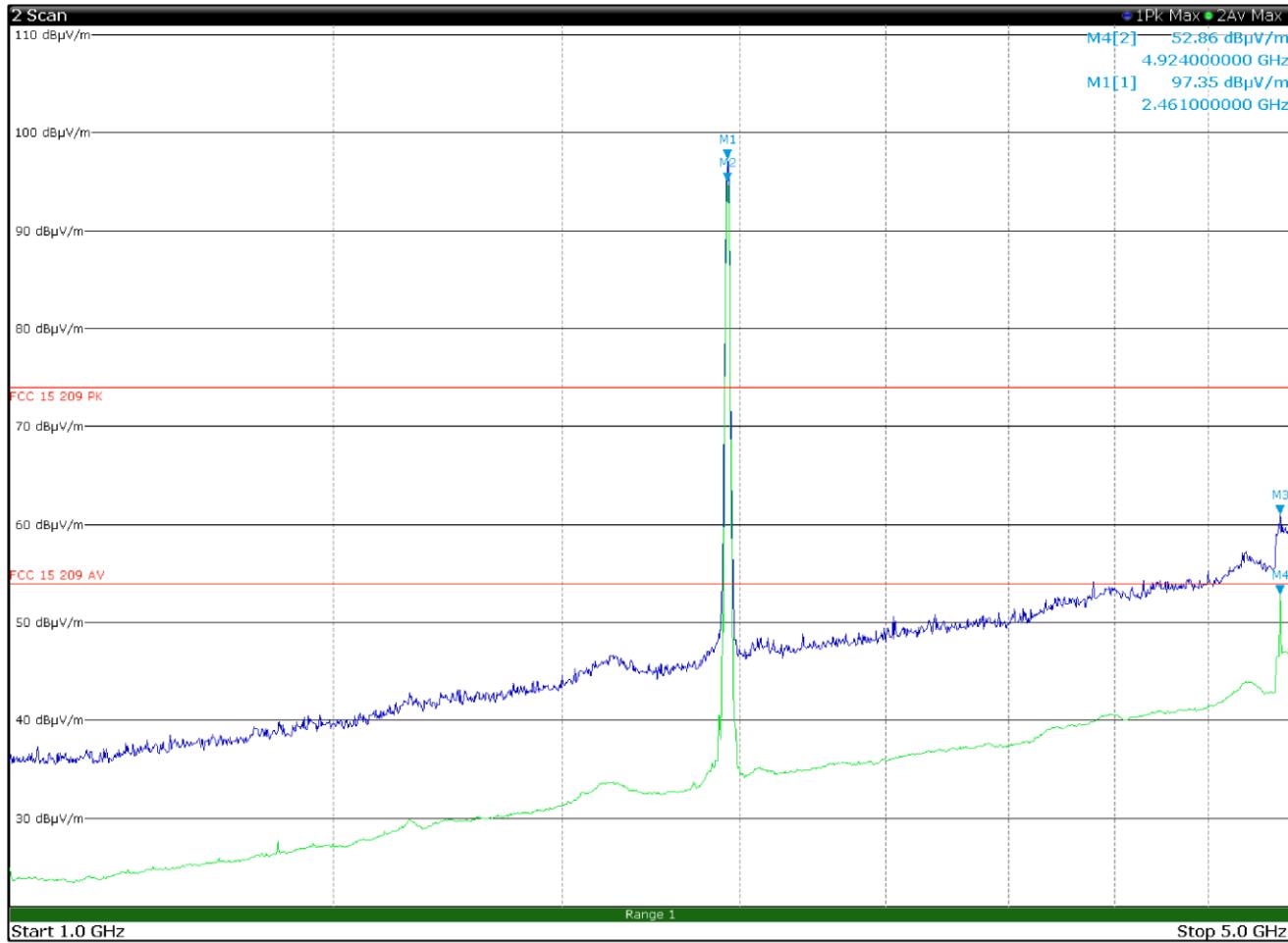


3 Marker Table

| Wnd | Type | Ref | Trc | X-value | Y-value |
|------|------|-----|-----|-------------|--------------------|
| Scan | M1 | | 1 | 2.463 GHz | 98.74 dB μ V/m |
| Scan | M2 | | 2 | 2.46275 GHz | 96.42 dB μ V/m |
| Scan | M3 | | 1 | 4.92375 GHz | 61.4 dB μ V/m |
| Scan | M4 | | 2 | 4.924 GHz | 53.08 dB μ V/m |

Figure 8.7-7: Radiated spurious emissions 1 to 5 GHz, High channel with antenna in horizontal polarization

Limit exceeded by the carrier



| 3 Marker Table | | | | | |
|----------------|------|-----|-----|-------------|--------------------|
| Wnd | Type | Ref | Trc | X-value | Y-value |
| Scan | M1 | | 1 | 2.461 GHz | 97.35 dB μ V/m |
| Scan | M2 | | 2 | 2.46125 GHz | 52.86 dB μ V/m |
| Scan | M3 | | 1 | 4.924 GHz | 61.09 dB μ V/m |
| Scan | M4 | | 2 | 4.924 GHz | 52.86 dB μ V/m |

Figure 8.7-8: Radiated spurious emissions 1 to 5 GHz, High channel with antenna in vertical polarization

Limit exceeded by the carrier

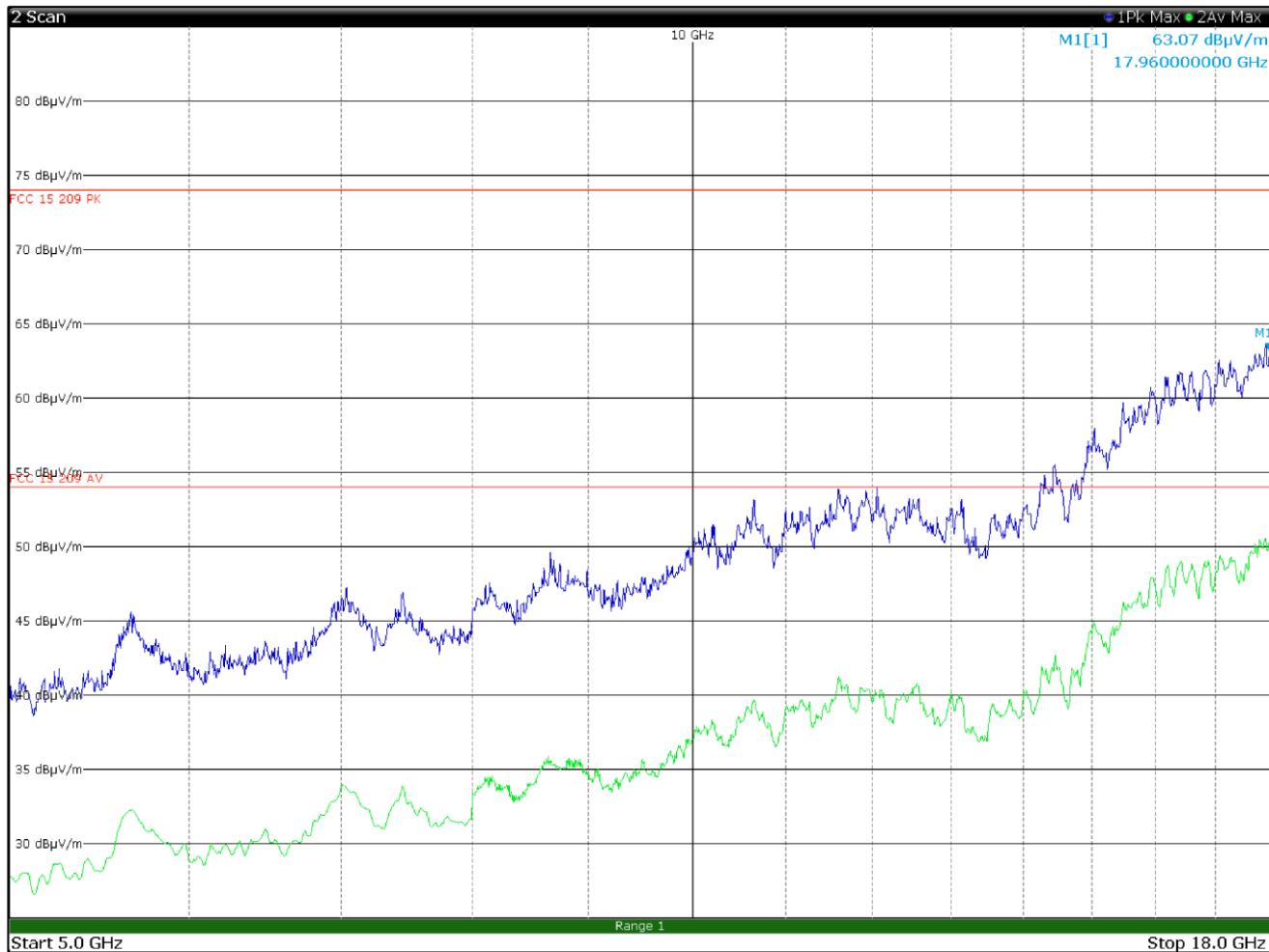


Figure 8.7-9: Radiated spurious emissions 5 to 18 GHz, Low channel with antenna in horizontal polarization

| Frequency (GHz) | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Detector |
|-----------------|----------------------|----------------------|-------------|----------|
| -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- |

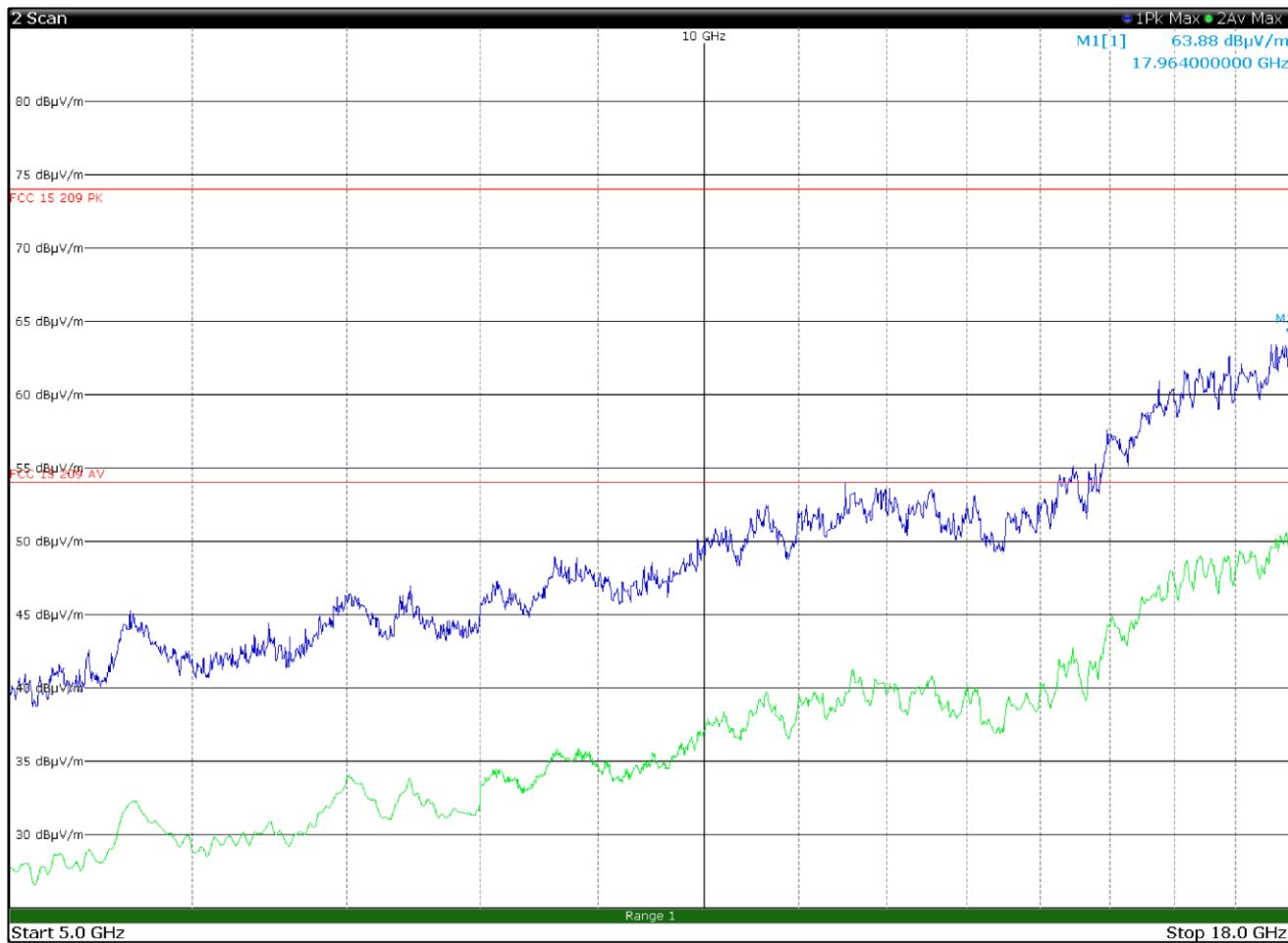


Figure 8.7-1: Radiated spurious emissions 3.6 to 18 GHz, Low channel with antenna in vertical polarization

| Frequency (GHz) | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Detector |
|-----------------|----------------------|----------------------|-------------|----------|
| -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- |

Figure 8.7-2: Radiated spurious emissions 5 to 18 GHz, Mid channel with antenna in horizontal polarization

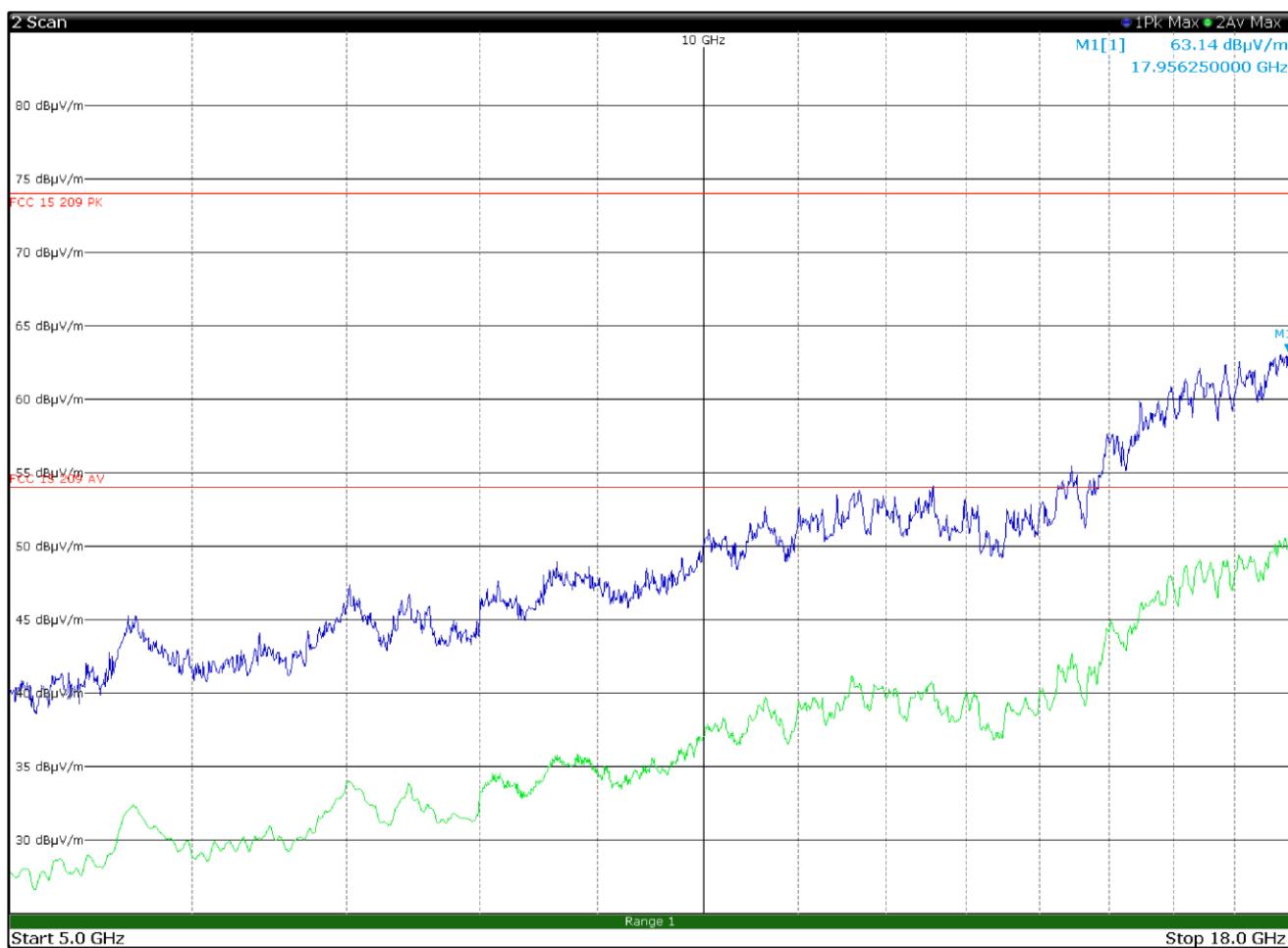


Figure 8.7-3: Radiated spurious emissions 5 to 18 GHz, Mid channel with antenna in horizontal polarization

| Frequency (GHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector |
|-----------------|----------------|----------------|-------------|----------|
| -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- |

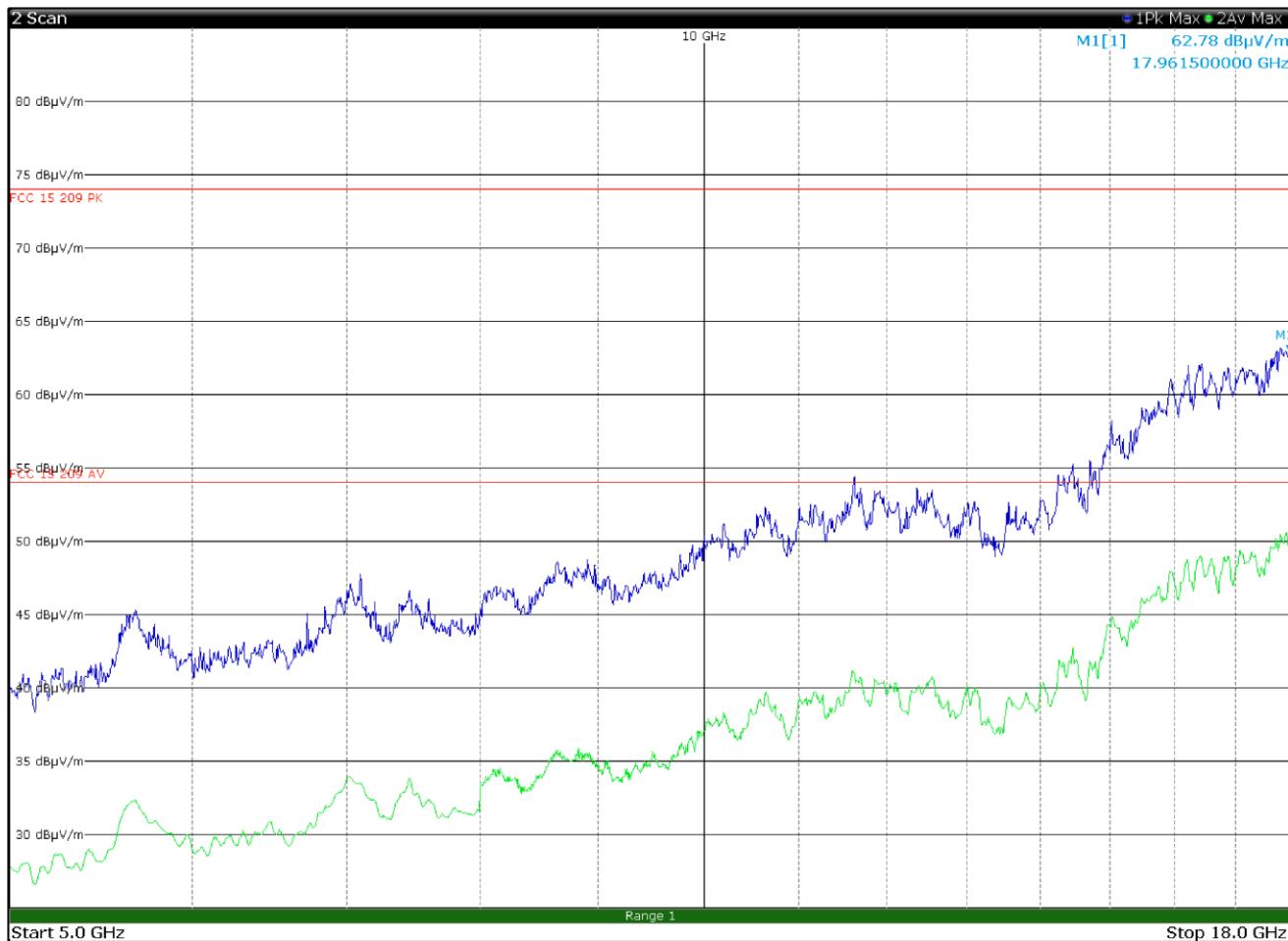


Figure 8.7-4: Radiated spurious emissions 5 to 18 GHz, Mid channel with antenna in vertical polarization

| Frequency (GHz) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector |
|-----------------|----------------|----------------|-------------|----------|
| -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- |

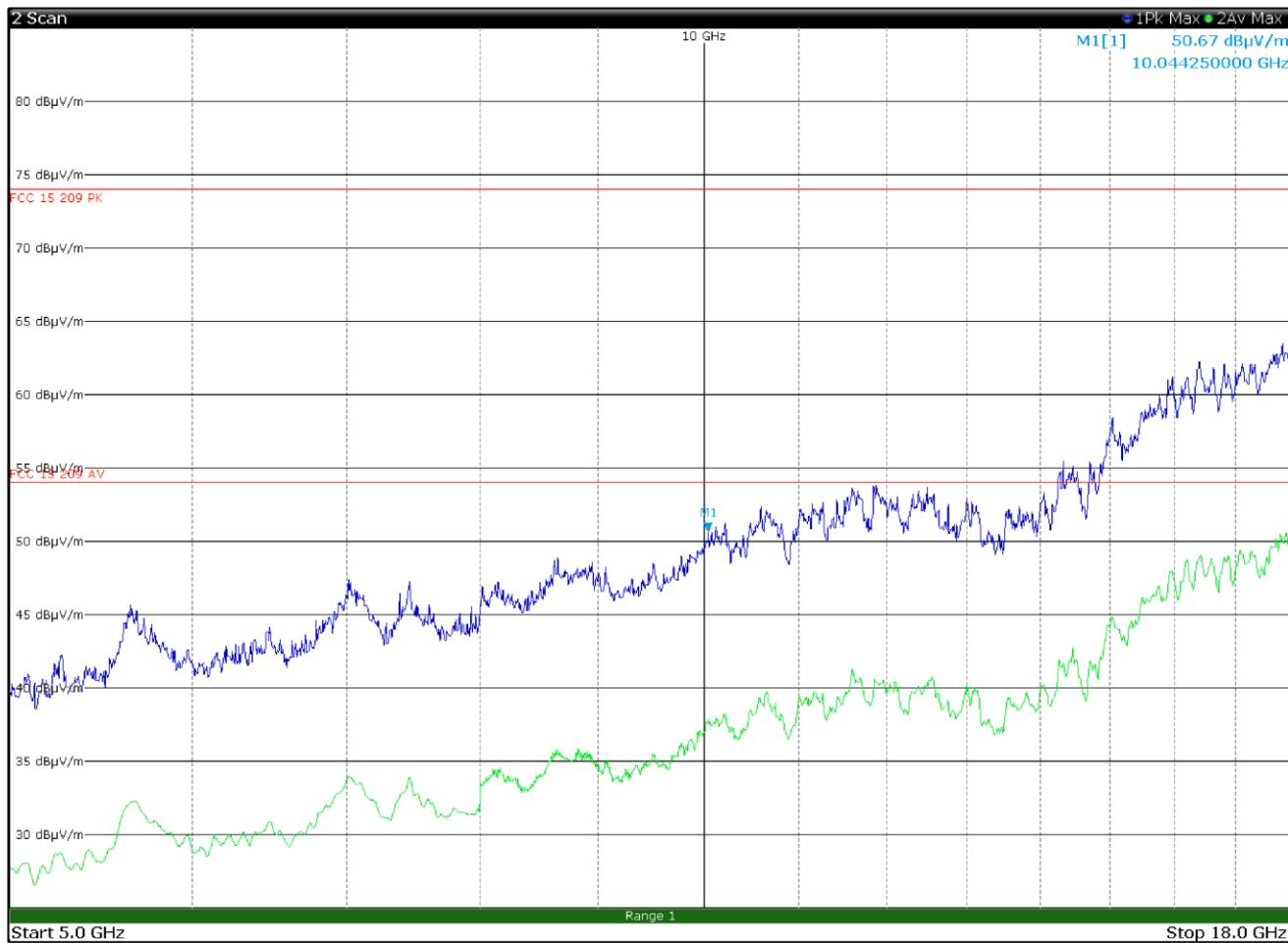


Figure 8.7-5: Radiated spurious emissions 5 to 18 GHz, High channel with antenna in horizontal polarization

| Frequency (GHz) | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Detector |
|-----------------|----------------------|----------------------|-------------|----------|
| -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- |

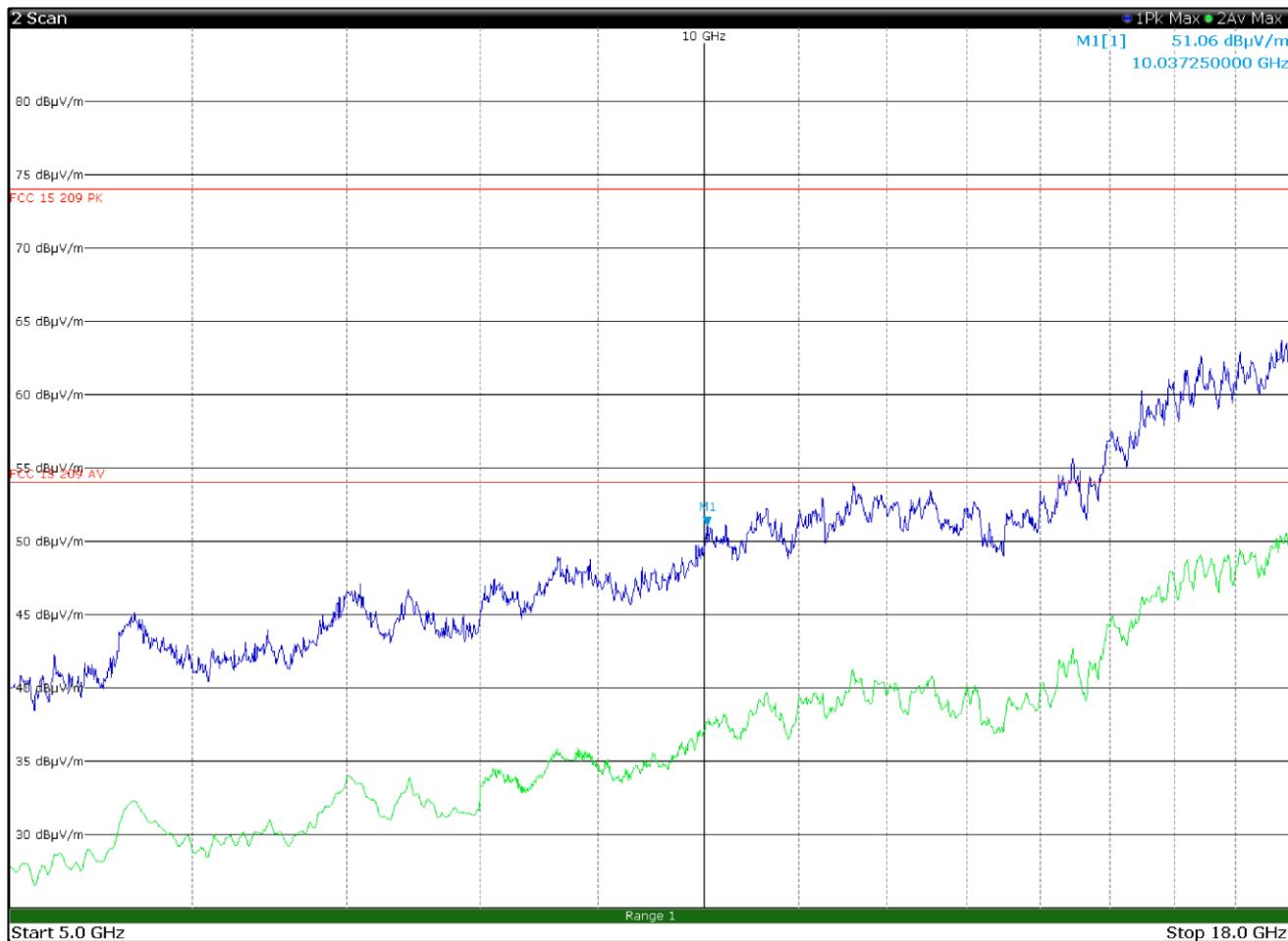


Figure 8.7-6: Radiated spurious emissions 5 to 18 GHz, High channel with antenna in vertical polarization

| Frequency (GHz) | Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Detector |
|-----------------|----------------------|----------------------|-------------|----------|
| -- | -- | -- | -- | -- |
| -- | -- | -- | -- | -- |

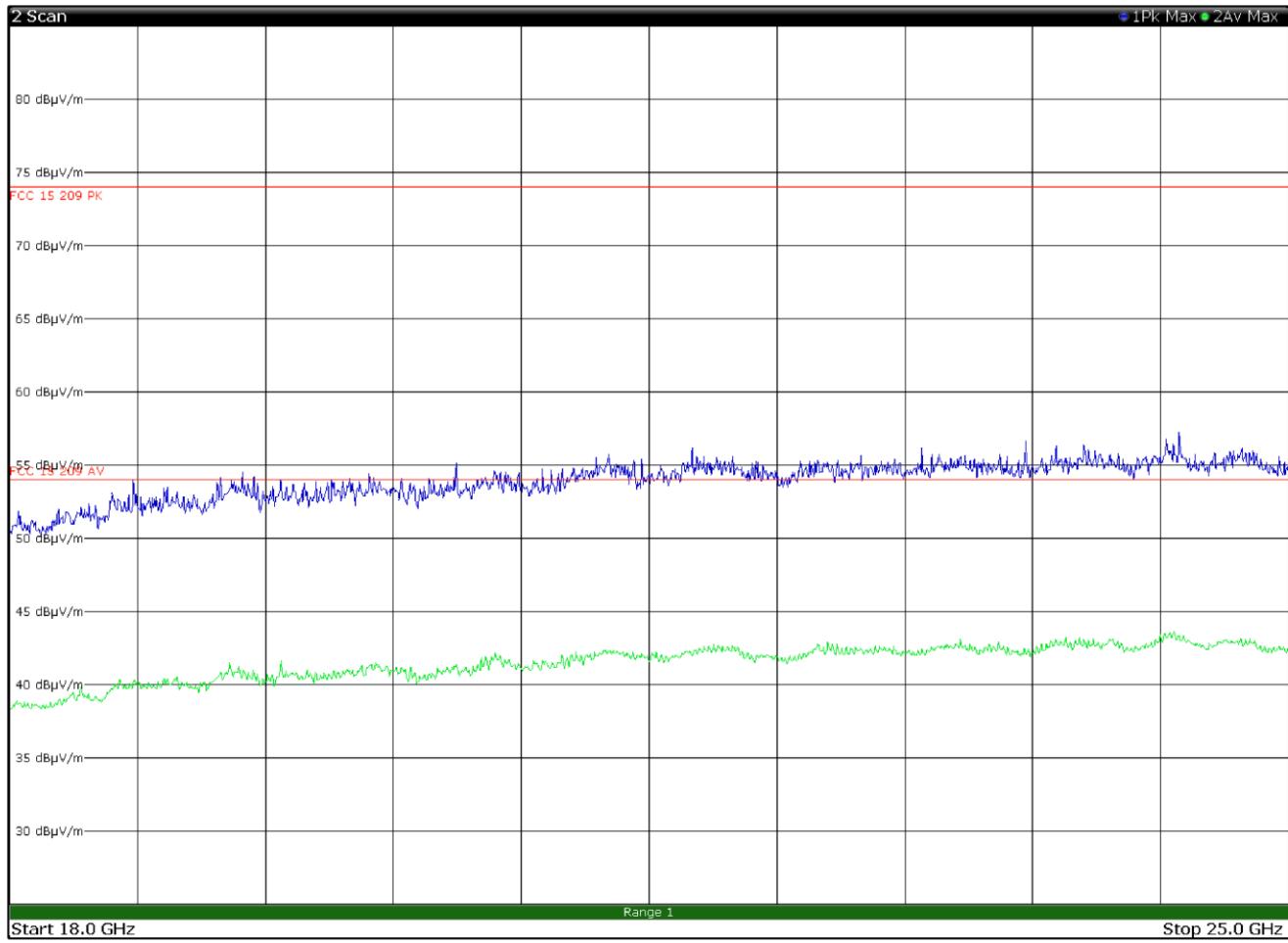


Figure 8.7-7: Radiated spurious emissions 18 to 25 GHz, Low channel with antenna in horizontal polarization

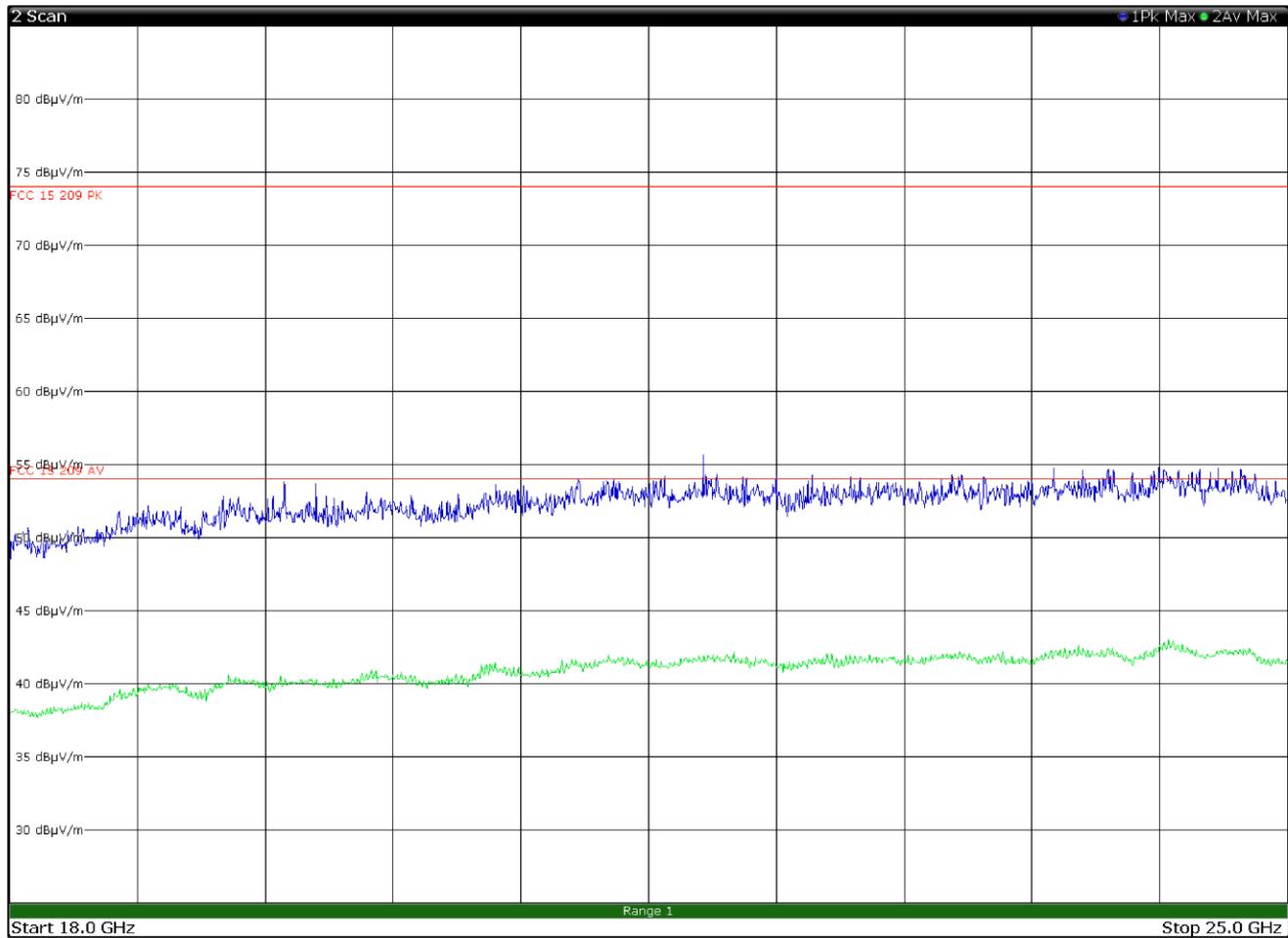


Figure 8.7-8: Radiated spurious emissions 18 to 25 GHz, Low channel with antenna in vertical polarization

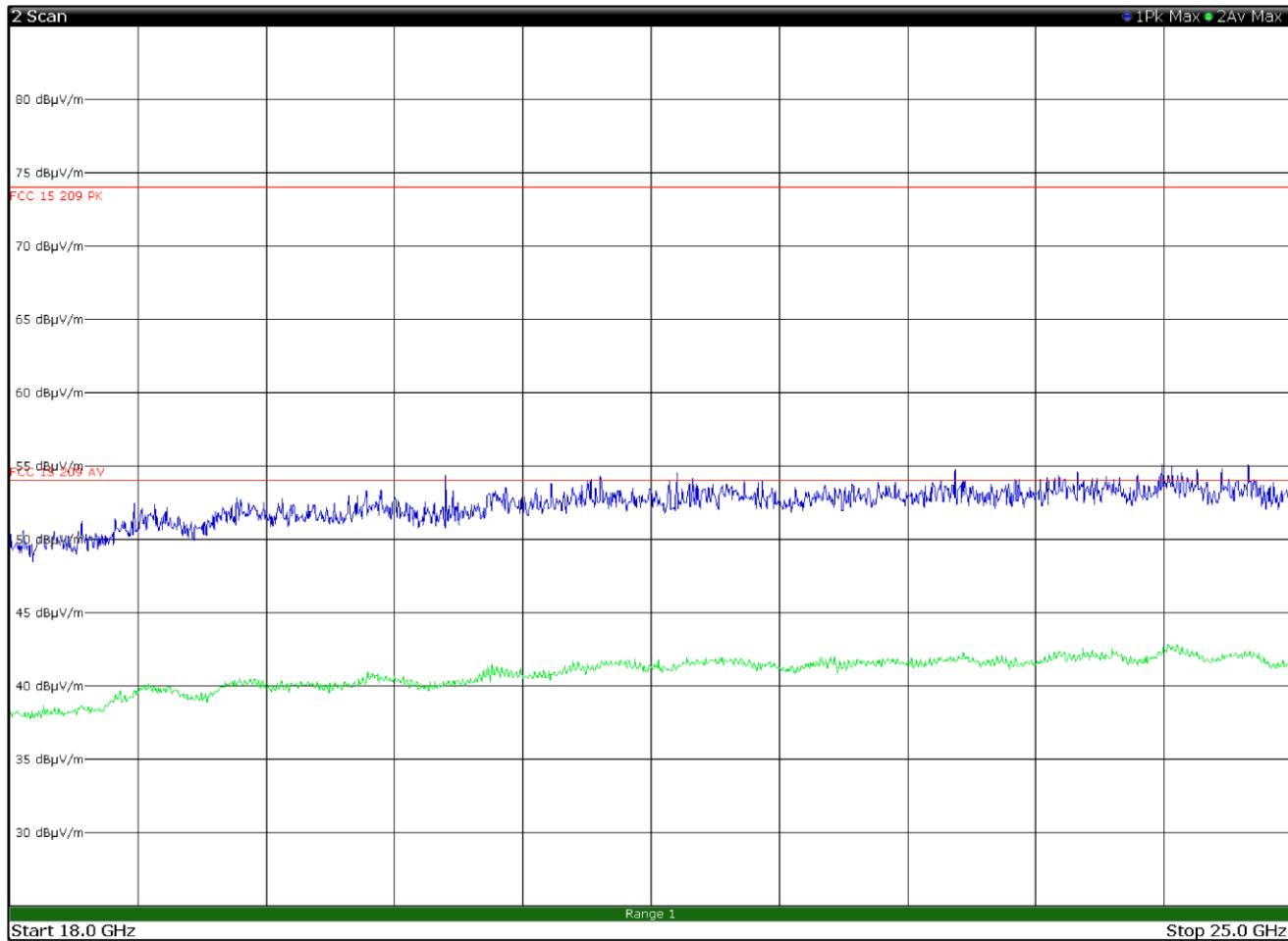


Figure 8.7-9: Radiated spurious emissions 18 to 25 GHz, Mid channel with antenna in horizontal polarization

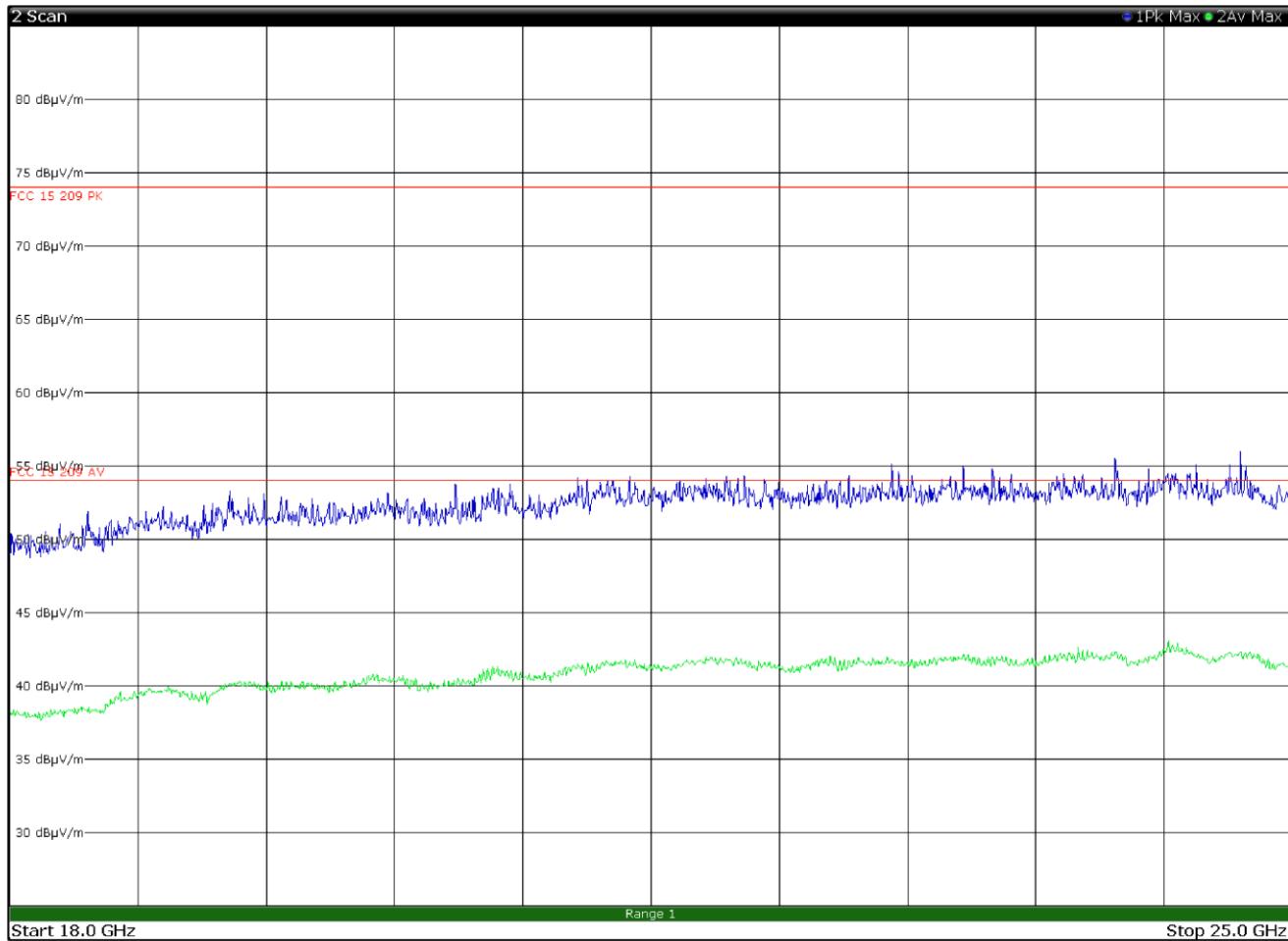


Figure 8.7-10: Radiated spurious emissions 18 to 25 GHz, Mid channel with antenna in vertical polarization

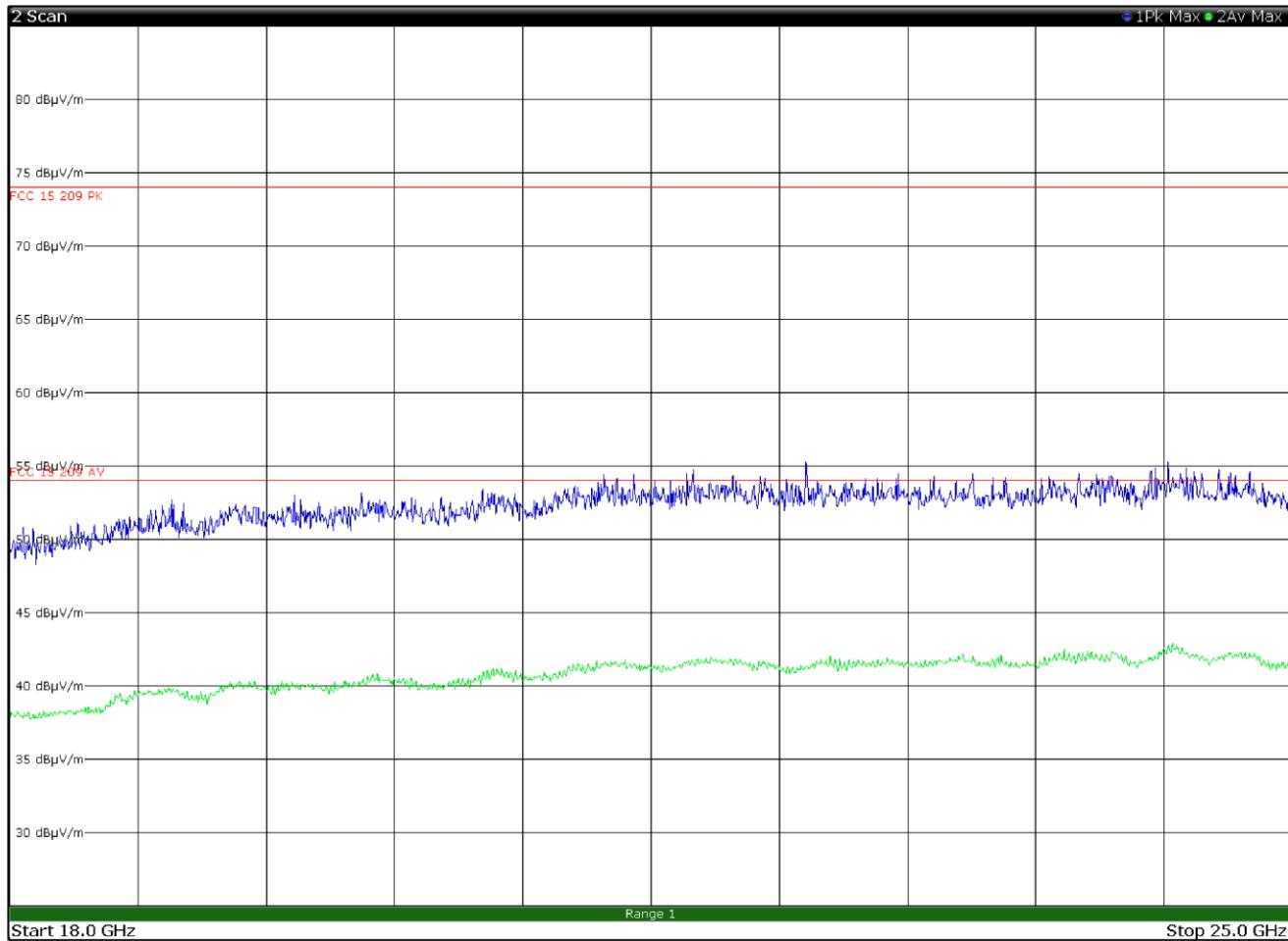


Figure 8.7-11: Radiated spurious emissions 18 to 25 GHz, High channel with antenna in horizontal polarization

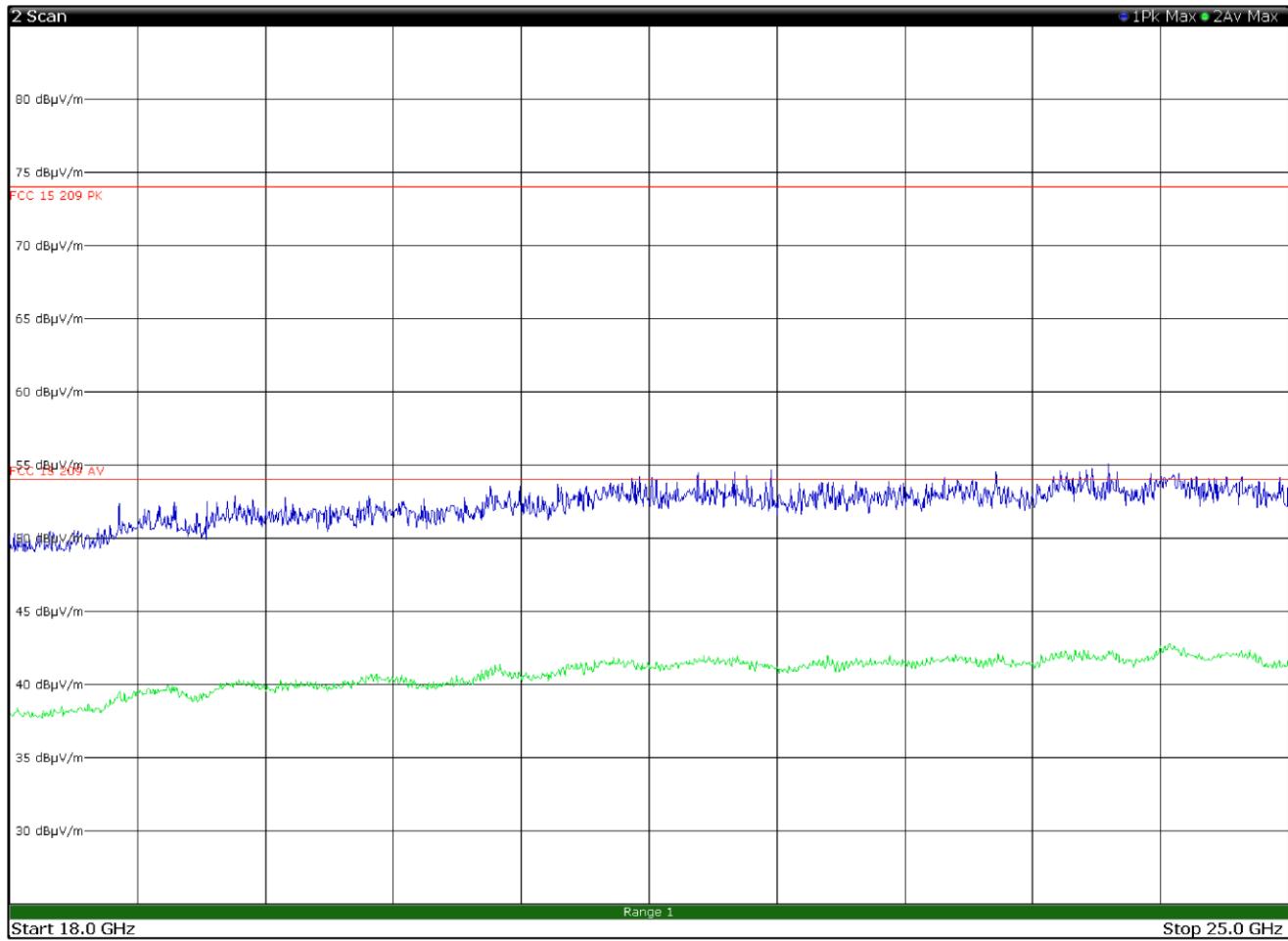
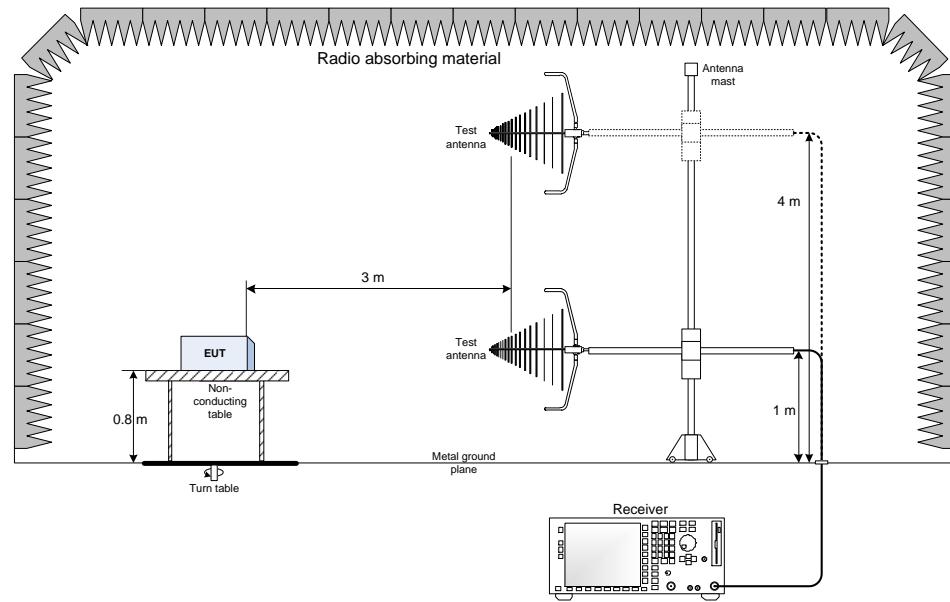


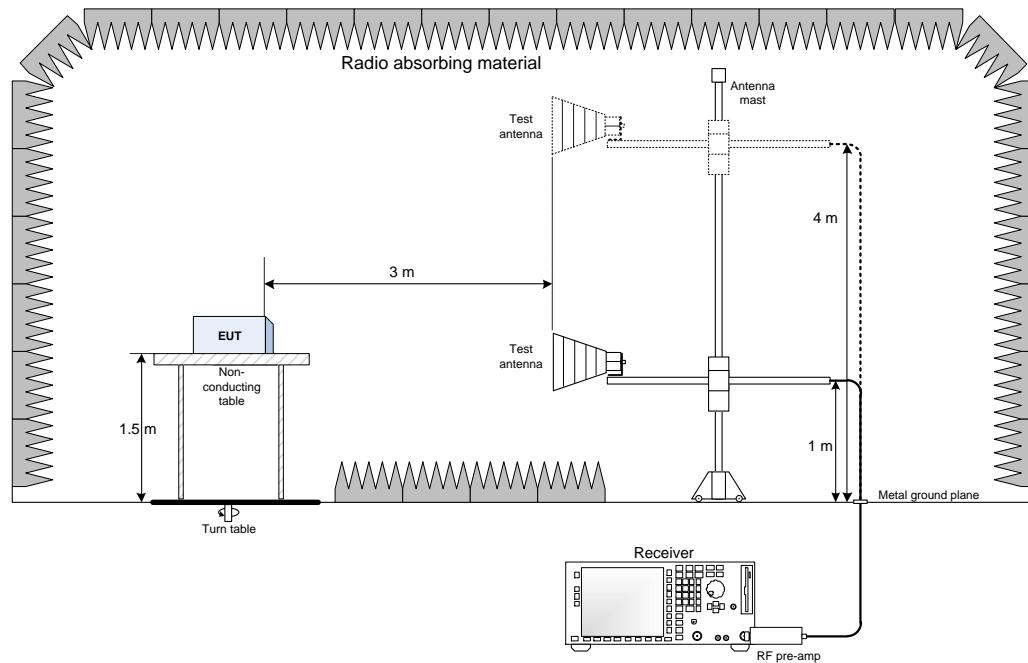
Figure 8.7-12: Radiated spurious emissions 18 to 25 GHz, High channel with antenna in vertical polarization

Section 9. Block diagrams of test set-ups

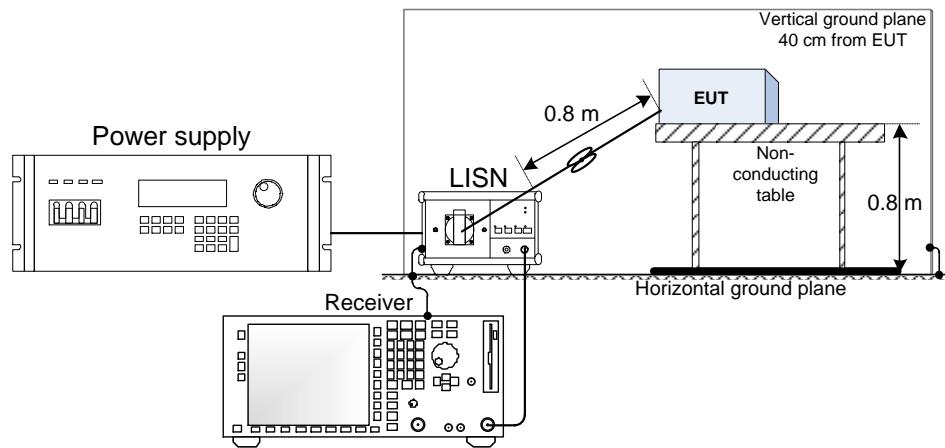
9.1 Radiated emissions set-up for frequencies below 1 GHz



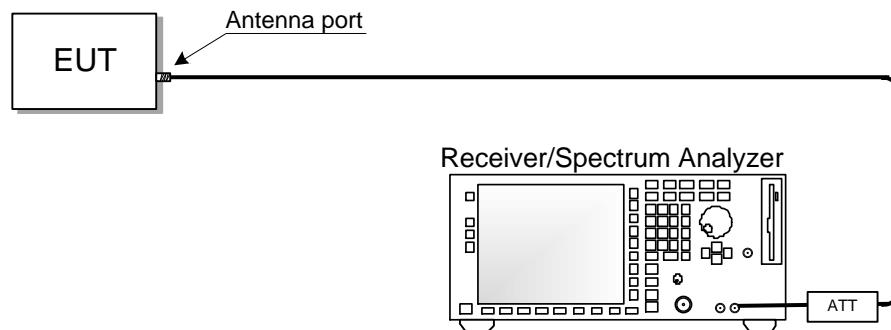
9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Conducted emissions set-up

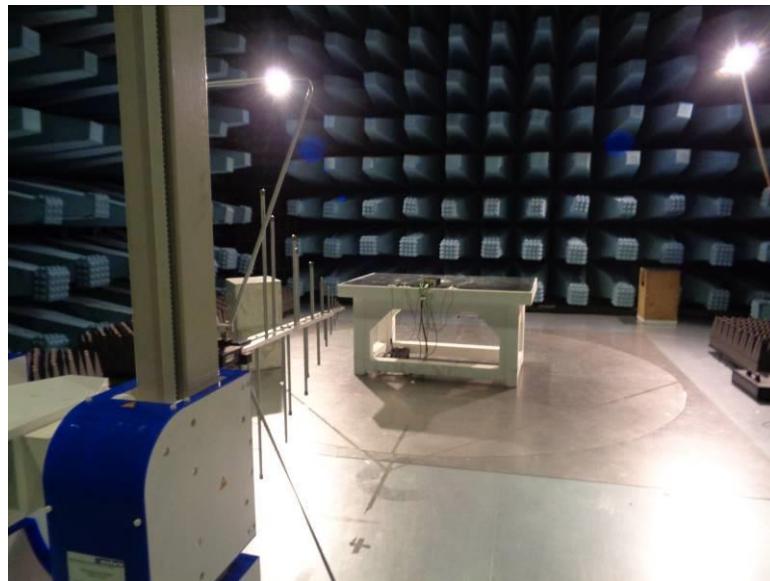


9.4 Antenna port set-up



Section 10. Photos

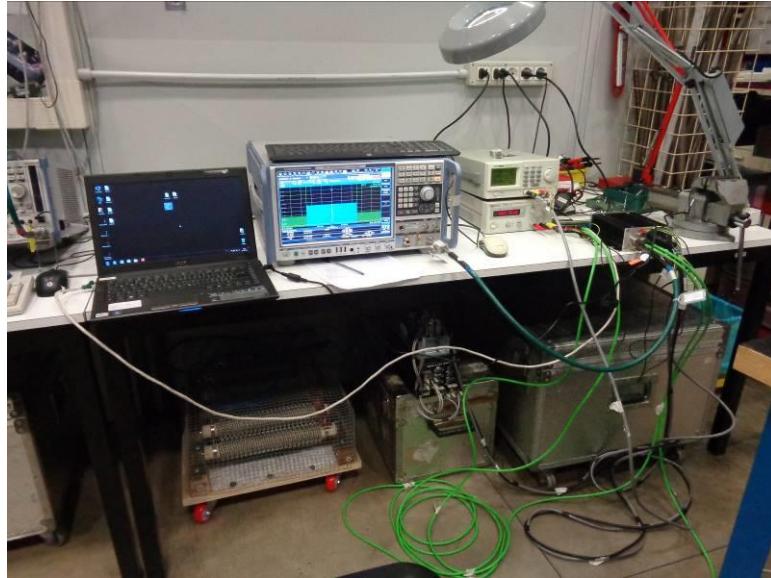
10.1 Photos of the test set-up



Radiated emission below 1 GHz



Radiated emission above 1 GHz



Conducted emission on the antenna port



Conducted emission on the AC Mains

10.2 Photos of the EUT







(End of report)