




Test report No:
 NIE: 61910RRF.001A1

Test report
USA FCC Part 15.249, 15.209
CANADA RSS-210, RSS-Gen
 Radio Frequency Devices. Operation within the bands 902 - 928 MHz,
 2400 -2483.5 MHz, and 5725 - 5850 MHz.

| | |
|---|---|
| (*) Identification of item tested | Hearing aid |
| (*) Trademark | Phonak |
| (*) Model and /or type reference tested | Phonak Audéo DPM-R |
| (*) Derived model not tested | Phonak Audéo P90-R, Phonak Audéo P90-RT |
| Other identification of the product | HW version: 050-0835-P5 SW version: 067- 1432 FCC ID: KWC-MRP IC: 2262A-MRP |
| (*) Features | BT Classic, BLE, DM and Flora |
| Applicant | SONOVA USA INC. 4520 Weaver Parkway 60555 Warrenville, IL, USA |
| Test method requested, standard | USA FCC Part 15.249 10-1-17 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, 5725 - 5875 MHz, and 24.0 – 24.25 GHz. USA FCC Part 15.209 10-1-17 Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 9 (August 2016). CANADA RSS-Gen Issue 5 (April 2018). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. |
| Summary | IN COMPLIANCE |
| Approved by (name / position & signature) | Rafael López Martín EMC Consumer & RF Lab. Manager  RAFAEL LÓPEZ MARTÍN 2020.04.20 17:57:54 +02'00' |
| Date of issue | 2020-04-20 |
| Report template No | FDT08_22 (*) "Data provided by the client" |

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Competences and guarantees

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DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification S.A.U. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: ISED 4621A-4.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a Hearing aid with wireless connectivity and rechargeable battery.
3. Derived model not tested. These models have been declared by the supplier of the sample as being the same as the model under test.

Date 10. March 2020



To whom this may concern,

We, Sonova AG, hereby declare under our own responsibility that the products listed below have no differences in safety relevant design and charging electronics (components, protection circuit) and no differences in the design of the radiofrequency relevant parts of the product (same radio chip, same antenna)

- Phonak Audéo DPM-R
- Phonak Audéo P90-R
- Phonak Audéo P90-RT

The only difference between these three products is that the Phonak Audéo P90-RT has an additional telecoil mounted.

The schematic, PCB layout, block diagram and rechargeable battery of the devices are described in the technical construction files with the document ID:

- Phonak Audéo DPM-R: PDL-26
- Phonak Audéo P90-R: PDL-516
- Phonak Audéo P90-RT: PDL-517

Faithfully,
2020.03.10 Stäfa



Laurent Vicari
Director Quality Management
& Regulatory Affairs



Glenn Borrett
Senior Regulatory Affairs Manager

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

| Control Nº | Description | Model | Serial Nº | Reception |
|------------|-------------|-----------------------|-----------|------------|
| 61910/001 | Hearing aid | Phonak Audéo DPM-R | --- | 2019-08-30 |

Sample S/01 has undergone the following test(s): All CONDUCTED tests indicated in Appendixes A, B, C and D.

- Sample S/02 is composed of the following elements:

| Control Nº | Description | Model | Serial Nº | Reception |
|------------|-------------|-----------------------|-----------|------------|
| 61910/007 | Hearing aid | Phonak Audéo DPM-R | --- | 2019-08-30 |

Sample S/02 has undergone the following test(s): All RADIATED tests indicated in Appendixes A, B, C and D.

Test sample description

| | | | | | | | |
|---|---|--------------------------------|--------------------------|--------------------------|-----------------------------------|--------------------------|--------------------------|
| Ports..... : | Port name and description | Cable | | | | | |
| | | Specified max length [m] | Attached during test | Shielded | Coupled to patient ⁽³⁾ | | |
| | N/A | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | |
| | | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | |
| Supplementary information to the ports..... : | | | | | | | |
| Rated power supply | Voltage and Frequency | | Reference poles | | | | |
| | | | L1 | L2 | L3 | N | PE |
| | <input type="checkbox"/> | AC: | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | DC: Vnom=3.7 V rechargeable battery; battery charging case supplied by a power supply 5Vdc, 1A | | | | | | |
| Rated Power | | | | | | | |
| Clock frequencies | | | | | | | |
| Other parameters..... : | | | | | | | |
| Software version | 067- 1432 | | | | | | |
| Hardware version..... : | 050-0835-P5 | | | | | | |
| Dimensions in cm (W x H x D)..... : | | | | | | | |
| Mounting position..... : | <input type="checkbox"/> | Table top equipment | | | | | |
| | <input type="checkbox"/> | Wall/Ceiling mounted equipment | | | | | |
| | <input type="checkbox"/> | Floor standing equipment | | | | | |
| | <input type="checkbox"/> | Hand-held equipment | | | | | |
| | <input checked="" type="checkbox"/> | Other: Hearing Aid | | | | | |
| Modules/parts | Module/parts of test item | | Type | Manufacturer | | | |
| | -- | | | | | | |
| Accessories (not part of the test item) | Description | | Type | Manufacturer | | | |
| | -- | | | | | | |
| Documents as provided by the applicant..... : | Description | | File name | Issue date | | | |
| | -- | | | | | | |

⁽³⁾ Only for Medical Equipment

Identification of the client

SONOVA AG
Laubisruetistrasse 28
8712 Staefa, Switzerland

Testing period and place

| | |
|---------------|--|
| Test Location | DEKRA Testing and Certification S.A.U. |
| Date (start) | 2019-09-12 |
| Date (finish) | 2019-09-19 |

Document history

| Report number | Date | Description |
|----------------|------------|---|
| 61910RRF.001 | 2020-01-29 | First release |
| 61910RRF.001A1 | 2020-04-20 | First modification: inclusion of derived model not tested on front page and Declaration of Equivalence letter on page 4. This modification test report cancels and replaces the test report 61910RRF.001 |

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

| | |
|-------------------|------------------------------|
| Temperature | Min. = 15 °C Max. = 35 °C |
| Relative humidity | Min. = 20 % Max. = 75 % |

In the semianechoic chamber, the following limits were not exceeded during the test.

| | |
|-------------------|-------------------------------------|
| Temperature | Min. = 15 °C Max. = 35 °C |
| Relative humidity | Min. = 20 % Max. = 75 % |
| Air pressure | Min. = 860 mbar Max. = 1060 mbar |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

| | |
|-------------------|-------------------------------------|
| Temperature | Min. = 15 °C Max. = 35 °C |
| Relative humidity | Min. = 20 % Max. = 35 % |
| Air pressure | Min. = 860 mbar Max. = 1060 mbar |

Remarks and comments

The tests have been performed by the technical personnel: Jaime Barranquero, Jose Alberto Aranda and Jose Gabriel Pendón.

Used instrumentation:

Conducted Measurements:

| | Last Calibration | Due Calibration |
|--|------------------|-----------------|
| 1. Signal and Spectrum Analyzer 10Hz – 40GHz ROHDE AND SCHWARZ FSV40 | 2019/10 | 2021/10 |

Radiated Measurements:

| | Last Calibration | Due Calibration |
|---|------------------|-----------------|
| 1. Semianechoic Absorber Lined Chamber ETS FACT3 200STP | N.A. | N.A. |
| 2. EMI Test Receiver ROHDE AND SCHWARZ ESR7 | 2018/10 | 2020/10 |
| 3. BiconicalLog antenna ETS LINDGREN 3142E | 2017/09 | 2020/09 |
| 4. RF Pre-amplifier 40 dB, 10 MHz-6 GHz BONN ELEKTRONIK BLNA 0160-01N | 2019/02 | 2020/08 |
| 5. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40 | 2018/02 | 2020/02 |
| 6. RF Pre-amplifier, 30 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-3A | 2019/04 | 2020/04 |
| 7. Broadband Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D | 2018/01 | 2021/01 |
| 8. RF pre-amplifier 18-40 GHz NARDA JS44-18004000-33-8P | 2019/02 | 2020/02 |
| 9. Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170 | 2018/07 | 2021/07 |

Testing verdicts

| | |
|-----------------|-----|
| Not applicable: | N/A |
| Pass: | P |
| Fail: | F |
| Not measured: | N/M |

Summary

1. Bluetooth Low Energy

| FCC PART 15 PARAGRAPH / RSS-210 | | | |
|---|--|---------|--------|
| Requirement – Test case | | Verdict | Remark |
| Section 15.249 Subclause (a) / RSS-210 B.10. (a) | Field strength of fundamental and harmonic emissions | P | |
| Section 15.249 Subclause (d) / RSS-210 B.10. (b) | Emissions radiated outside of the specific frequency bands | P | |
| <u>Supplementary information and remarks:</u> None. | | | |

2. Bluetooth Basic Rate

| FCC PART 15 PARAGRAPH / RSS-210 | | | |
|---|--|---------|--------|
| Requirement – Test case | | Verdict | Remark |
| Section 15.249 Subclause (a) / RSS-210 B.10. (a) | Field strength of fundamental and harmonic emissions | P | |
| Section 15.249 Subclause (d) / RSS-210 B.10. (b) | Emissions radiated outside of the specific frequency bands | P | |
| <u>Supplementary information and remarks:</u> None. | | | |

3. Proprietary protocol DM 2.4 GHz

| FCC PART 15 PARAGRAPH / RSS-210 | | | |
|---|--|---------|--------|
| Requirement – Test case | | Verdict | Remark |
| Section 15.249 Subclause (a) / RSS-210 B.10. (a) | Field strength of fundamental and harmonic emissions | P | |
| Section 15.249 Subclause (d) / RSS-210 B.10. (b) | Emissions radiated outside of the specific frequency bands | P | |
| <u>Supplementary information and remarks:</u> None. | | | |

4. Proprietary protocol Flora 2.4 GHz

| FCC PART 15 PARAGRAPH / RSS-210 | | | |
|---|--|---------|--------|
| Requirement – Test case | | Verdict | Remark |
| Section 15.249 Subclause (a) / RSS-210 B.10. (a) | Field strength of fundamental and harmonic emissions | P | |
| Section 15.249 Subclause (d) / RSS-210 B.10. (b) | Emissions radiated outside of the specific frequency bands | P | |
| <u>Supplementary information and remarks:</u> None. | | | |

Appendix A: Test results. Bluetooth Low Energy

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| Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of fundamental and harmonics emissions | 17 |
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TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 3.7 Vdc
Type of power supply: DC voltage from rechargeable battery.
Type of antenna: Integral antenna.
Declared antenna gain: - 8.5 dBi

TEST FREQUENCIES:

Low Channel: 2402 MHz
Middle Channel: 2440 MHz
High Channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS

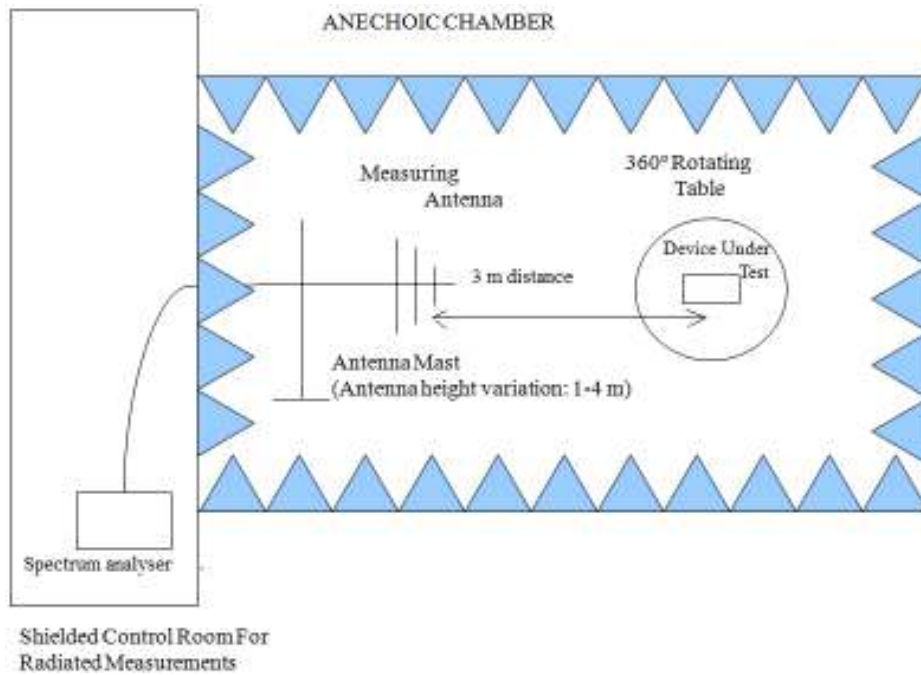
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

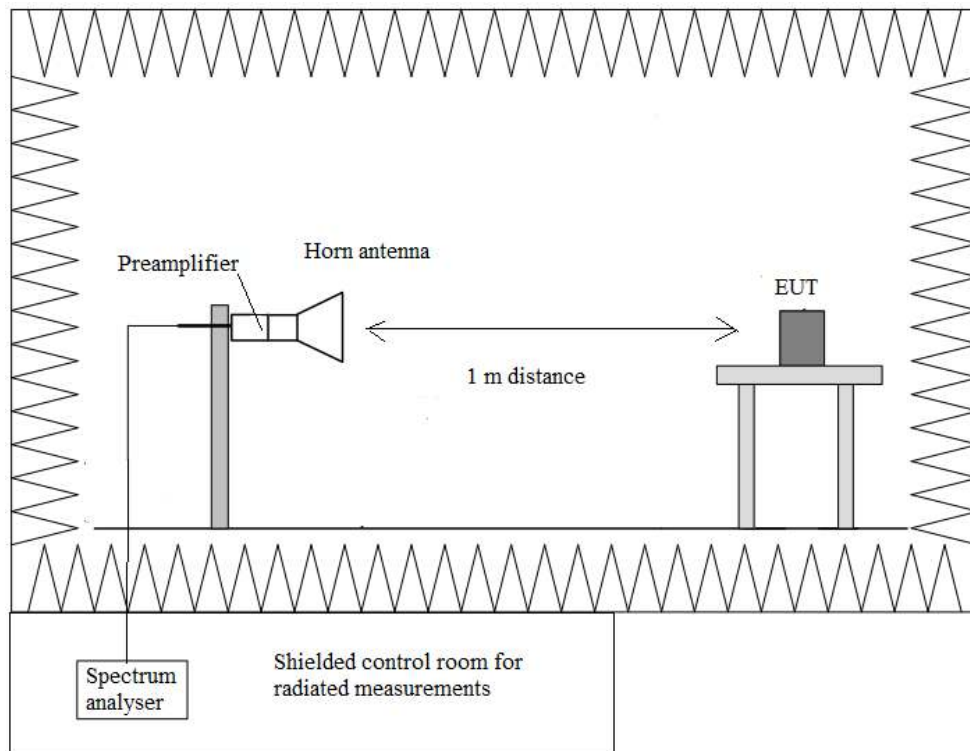
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup $f > 1$ GHz:

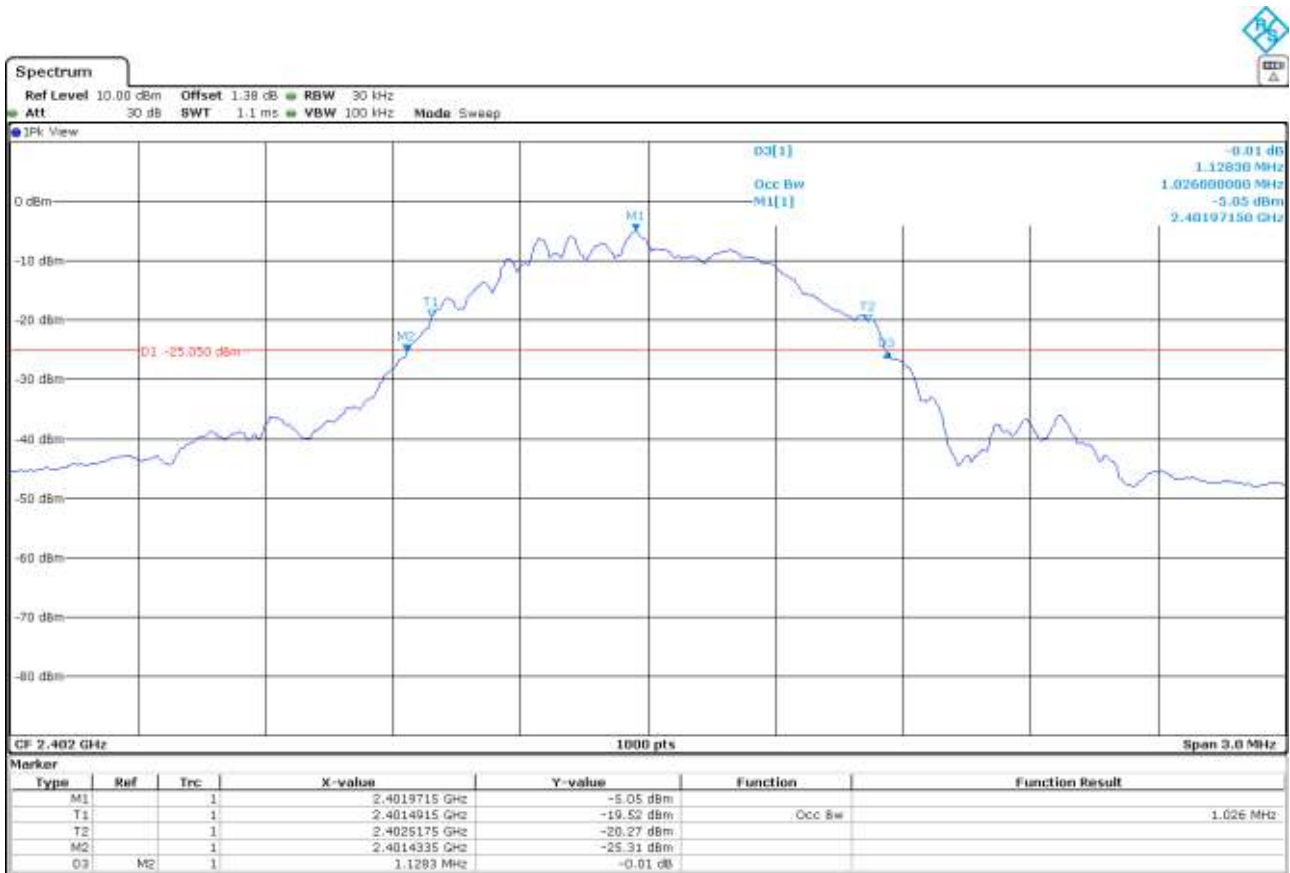


Occupied Bandwidth

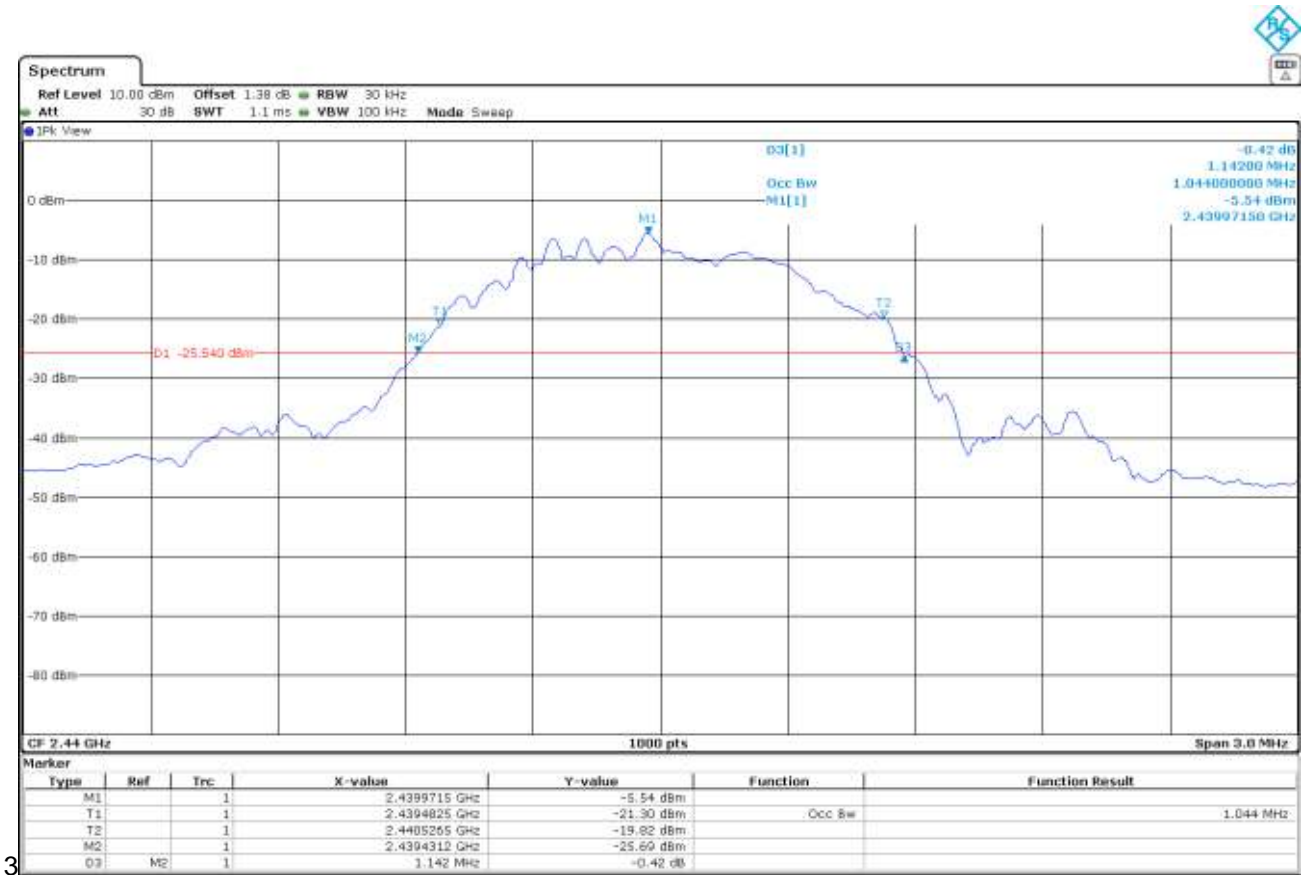
RESULTS:

| | Low Channel 2402 MHz | Middle Channel 2440 MHz | High Channel 2480 MHz |
|-------------------------------|-------------------------|----------------------------|--------------------------|
| 99% Bandwidth (MHz) | 1.026 | 1.044 | 1.065 |
| Measurement Uncertainty (kHz) | <±5.00 | | |

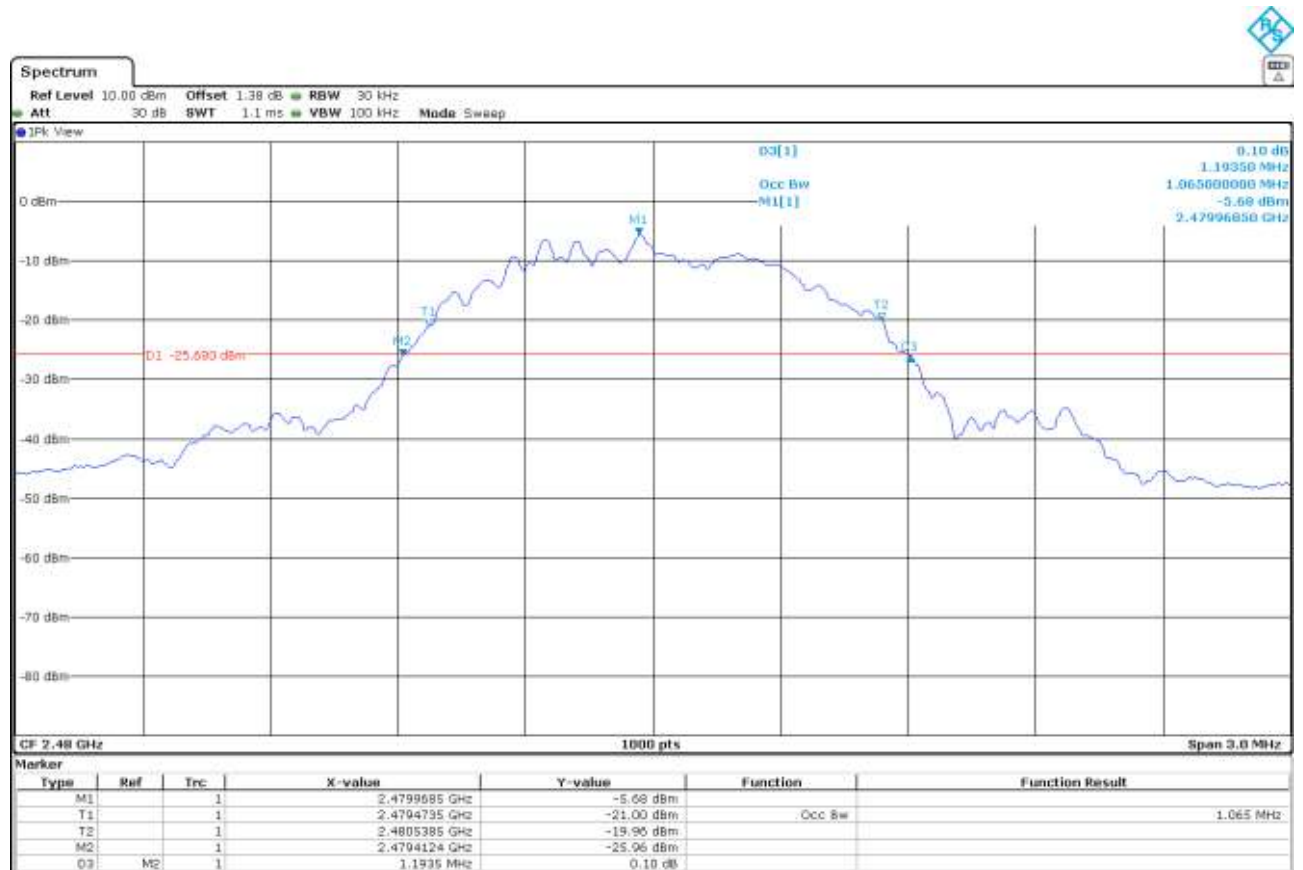
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of fundamental and harmonics emissions

SPECIFICATION:

The field strength of emissions from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of fundamental (mV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|-----------------------------|--------------------------------------|-------------------------|--------------------------|
| 902 - 928 | 50 | 93.98 | 3 |
| 2400 – 2483.5 | 50 | 93.98 | 3 |
| 5725 - 5875 | 50 | 93.98 | 3 |
| 24000-24250 | 250 | 107.96 | 3 |

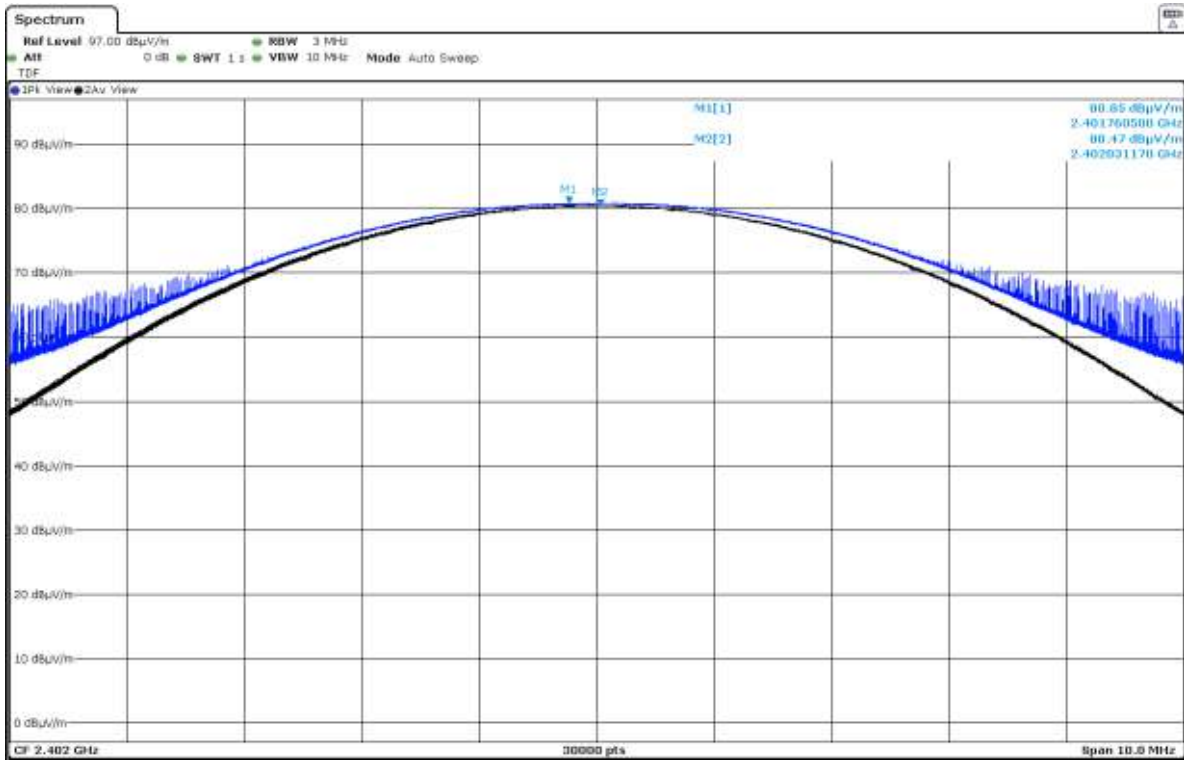
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

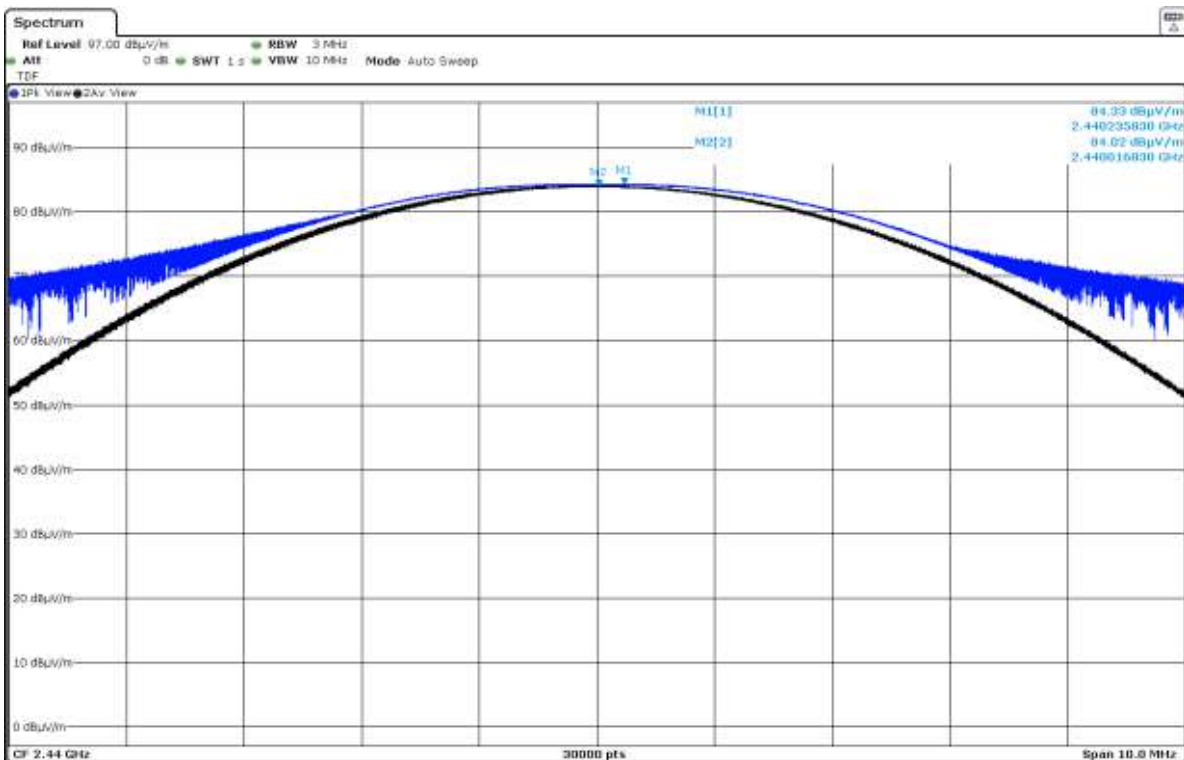
| | Low Channel 2402 MHz | Middle Channel 2440 MHz | High Channel 2480 MHz |
|---------------------------------|-------------------------|----------------------------|--------------------------|
| Average Field Strength (dBµV/m) | 80.47 | 84.02 | 81.73 |
| Peak Field Strength (dBµV/m) | 80.85 | 84.33 | 82.18 |
| Measurement Uncertainty (dB) | <±3.05 | | |

Verdict: PASS

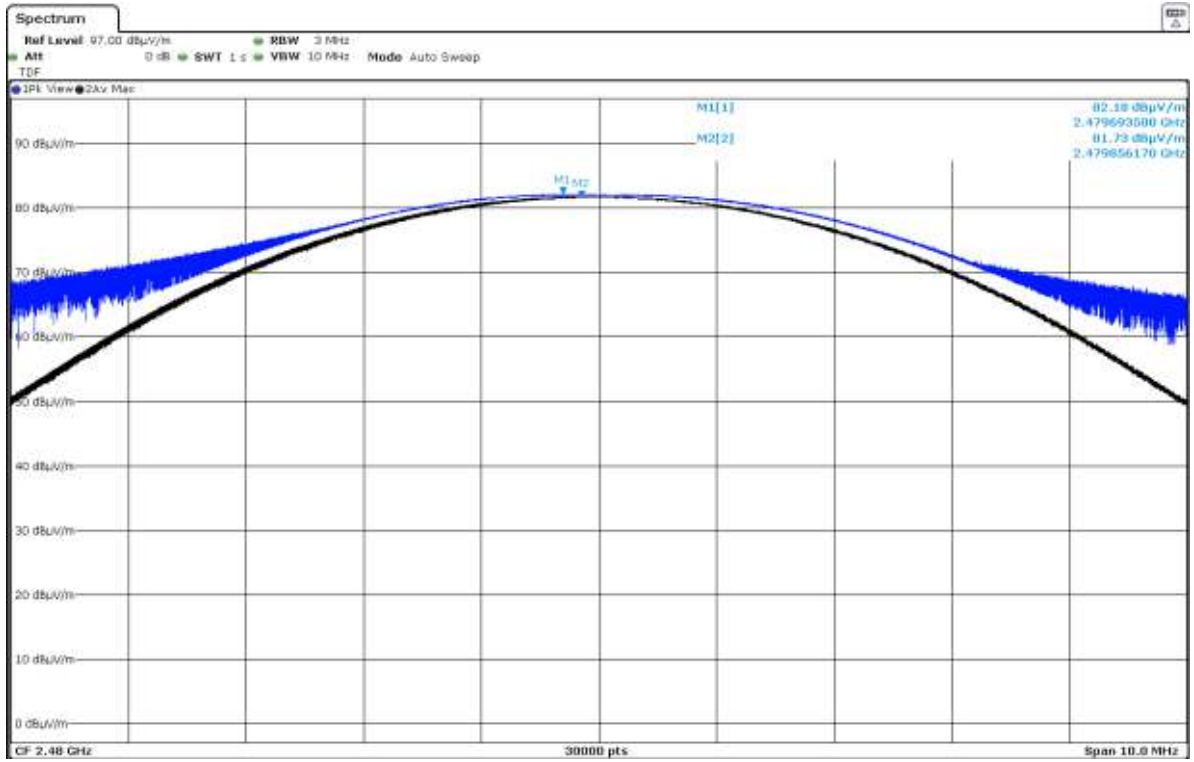
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (d) / RSS-210 B.10. (b) Emissions radiated outside of the specific frequency bands

SPECIFICATION:

The field strength of harmonics from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of harmonics ($\mu\text{V/m}$) | Field strength of harmonics ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------------|---|--|--------------------------|
| 902 - 928 | 500 | 54 | 3 |
| 2400 – 2483.5 | 500 | 54 | 3 |
| 5725 - 5875 | 500 | 54 | 3 |
| 24000-24250 | 2500 | 67.96 | 3 |

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

| Frequency Range (MHz) | Field strength ($\mu\text{V/m}$) | Field strength ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------|------------------------------------|---|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | - | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| 960 - 25000 | 500 | 54 | 3 |

Whichever is the lesser attenuation.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz.

The spurious signals detected do not depend on the operating channel.

No spurious emissions were found at less than 20 dB of the limit.

Frequency range 1 - 26 GHz.

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

Spurious signals with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with average detector for checking compliance with the average limit.

- Low Channel (2402 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 4.80437 | Peak | 39.60 | H | < \pm 3.70 |
| 21.6200 | Peak | 42.47 | H | < \pm 3.70 |

- Middle Channel (2440 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 21.96245 | Peak | 41.27 | H | < \pm 3.70 |

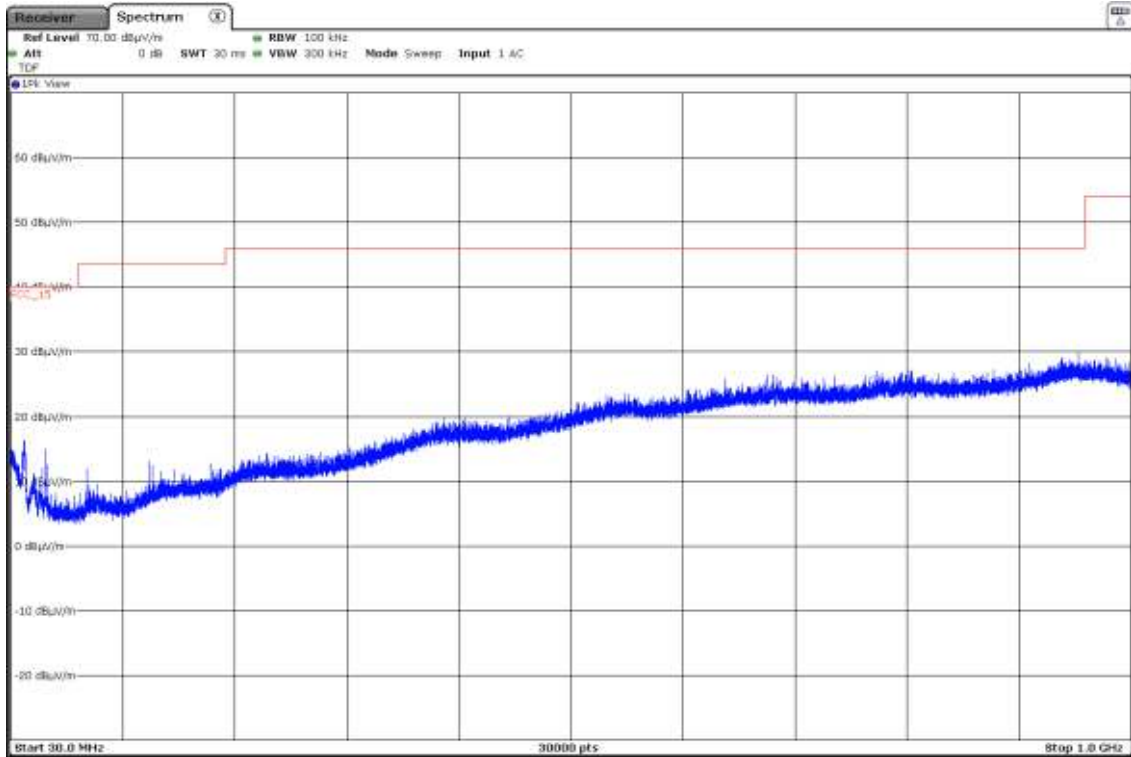
- High Channel (2480 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 2.48350 | Peak | 59.16 | V | < \pm 3.70 |
| | Average | 41.44 | | < \pm 3.70 |
| 4.9607 | Peak | 41.20 | H | < \pm 3.70 |
| 22.32185 | Peak | 43.99 | H | < \pm 3.70 |

Verdict: PASS

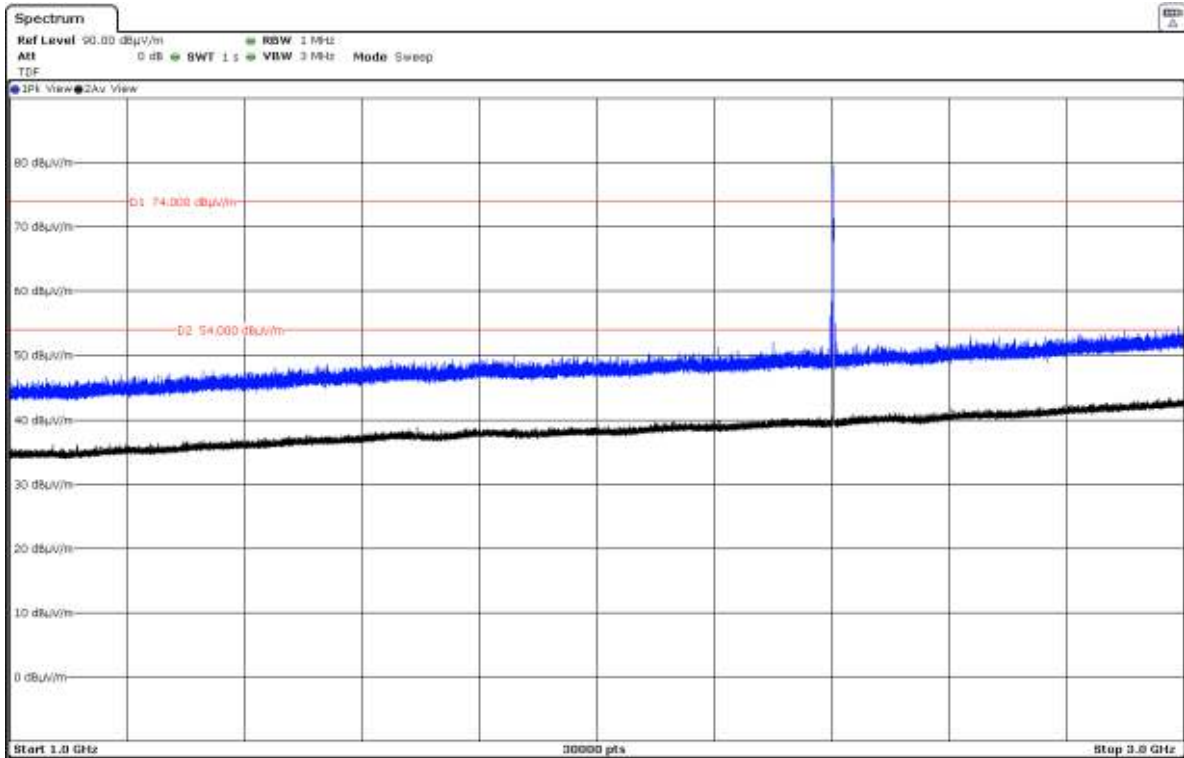
FREQUENCY RANGE 30 MHz - 1 GHz

The spurious signals detected do not depend on the operating channel, so this plot is valid for Low, Middle and High Channels.



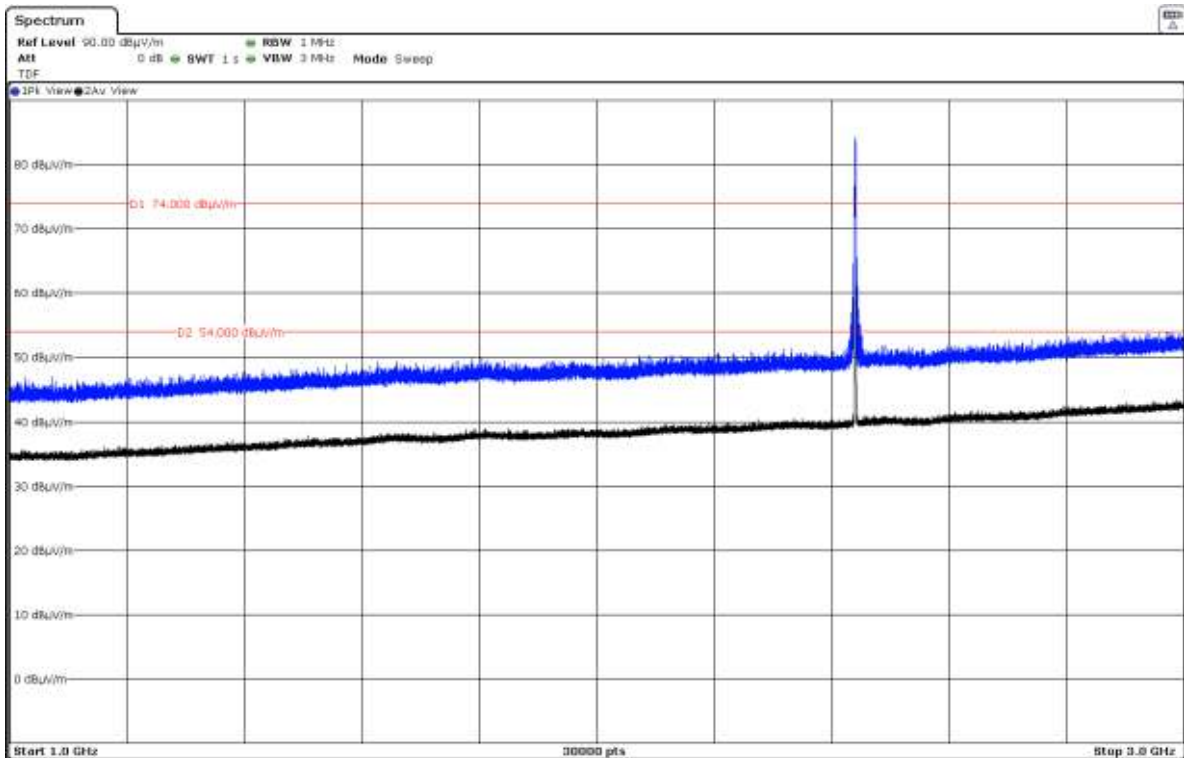
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



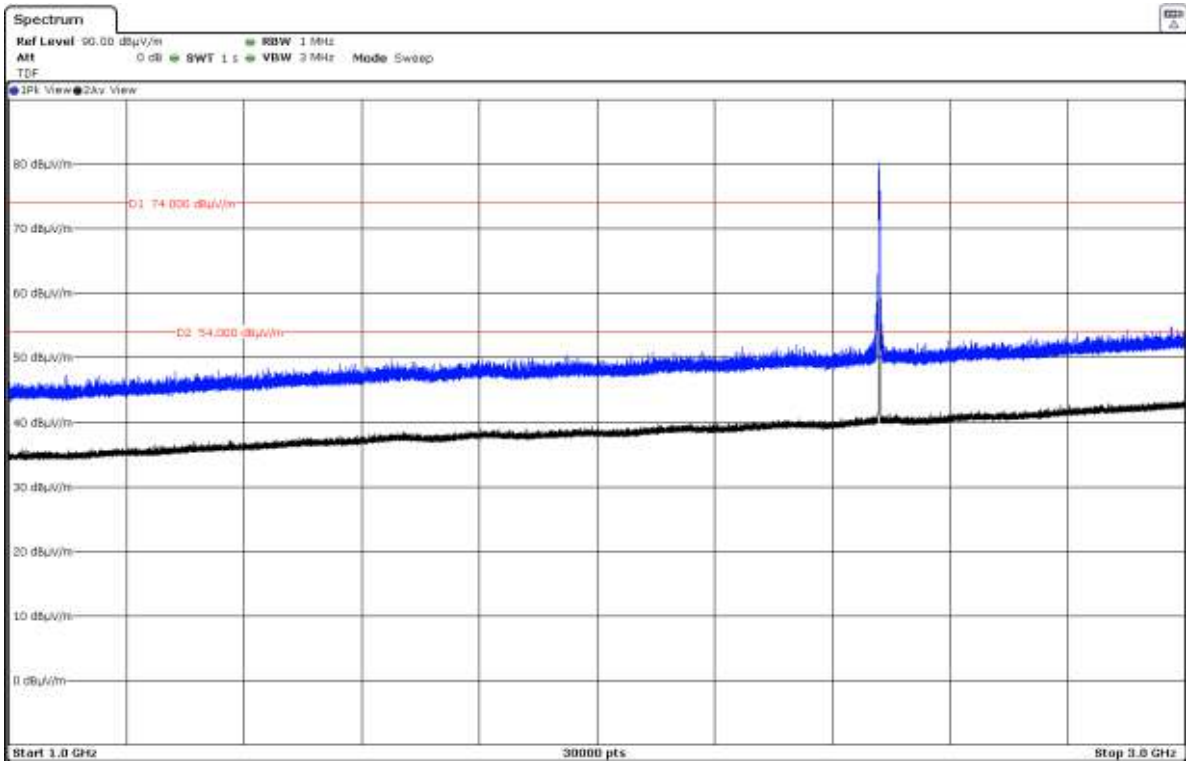
The peak shown in the plot above the limit is the carrier frequency.

- Middle Channel:



The peak shown in the plot above the limit is the carrier frequency.

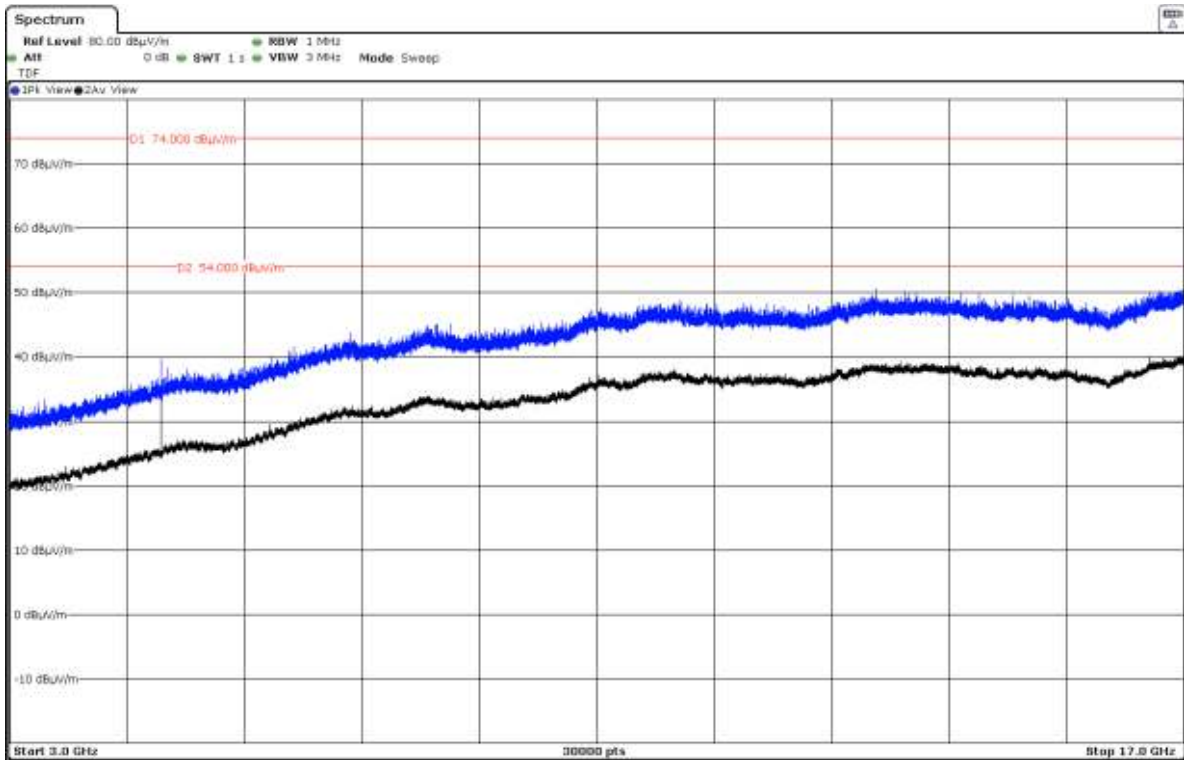
- High Channel:



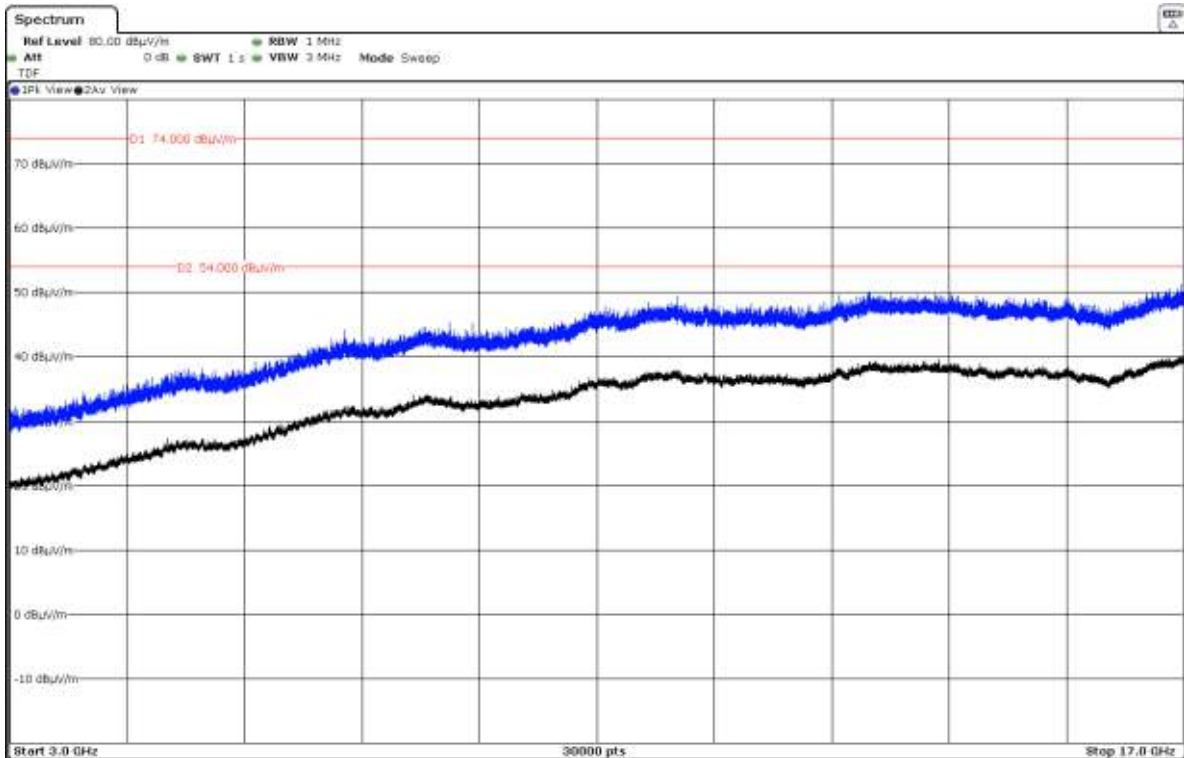
The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

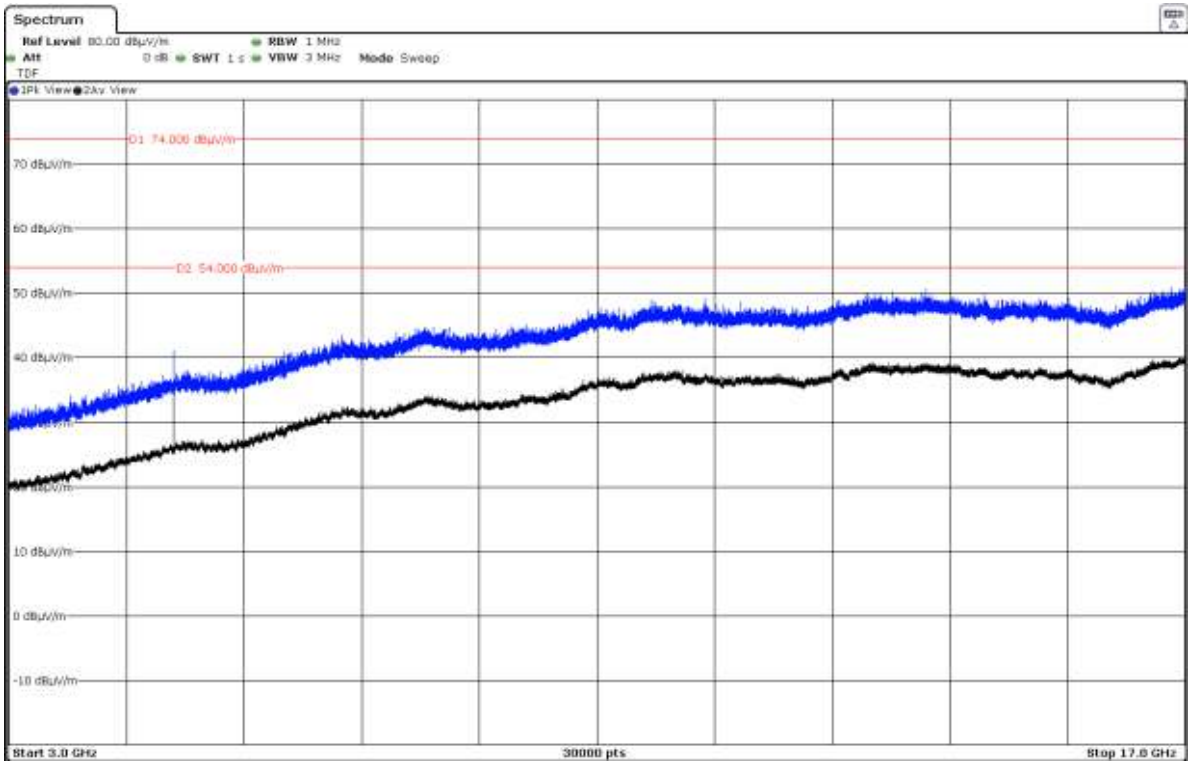
- Low Channel:



- Middle Channel:

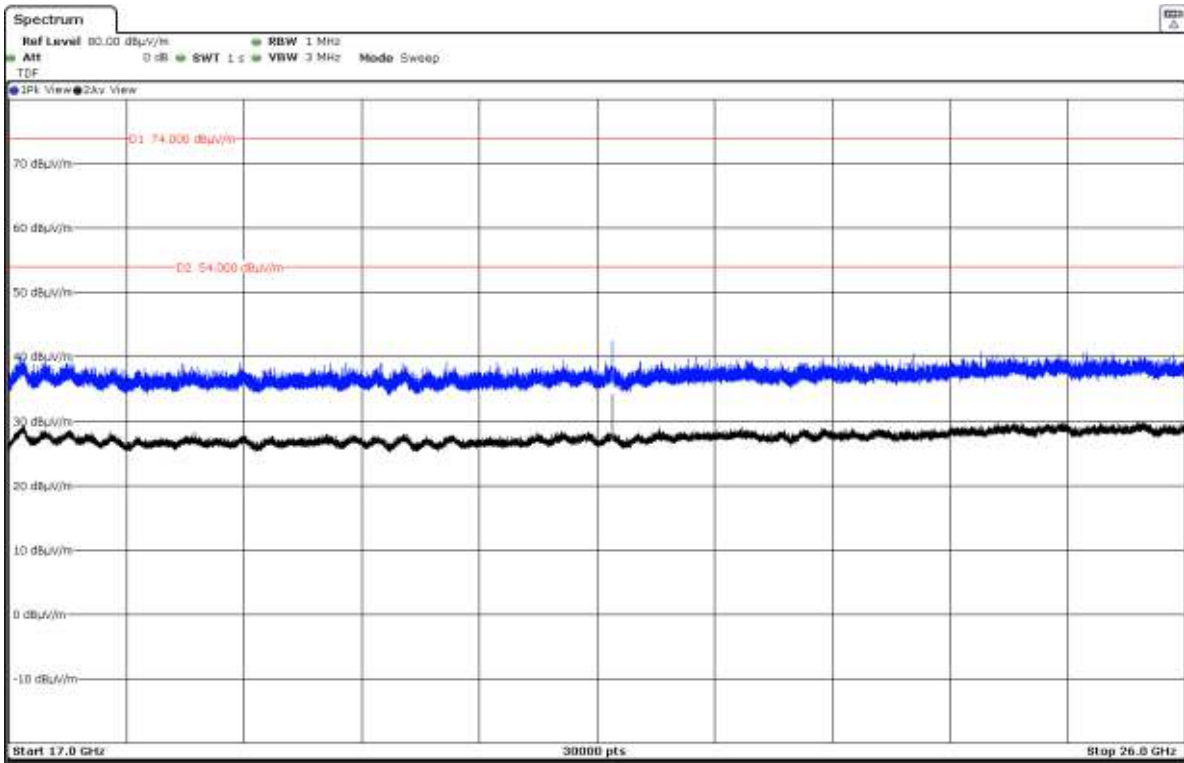


- High Channel:

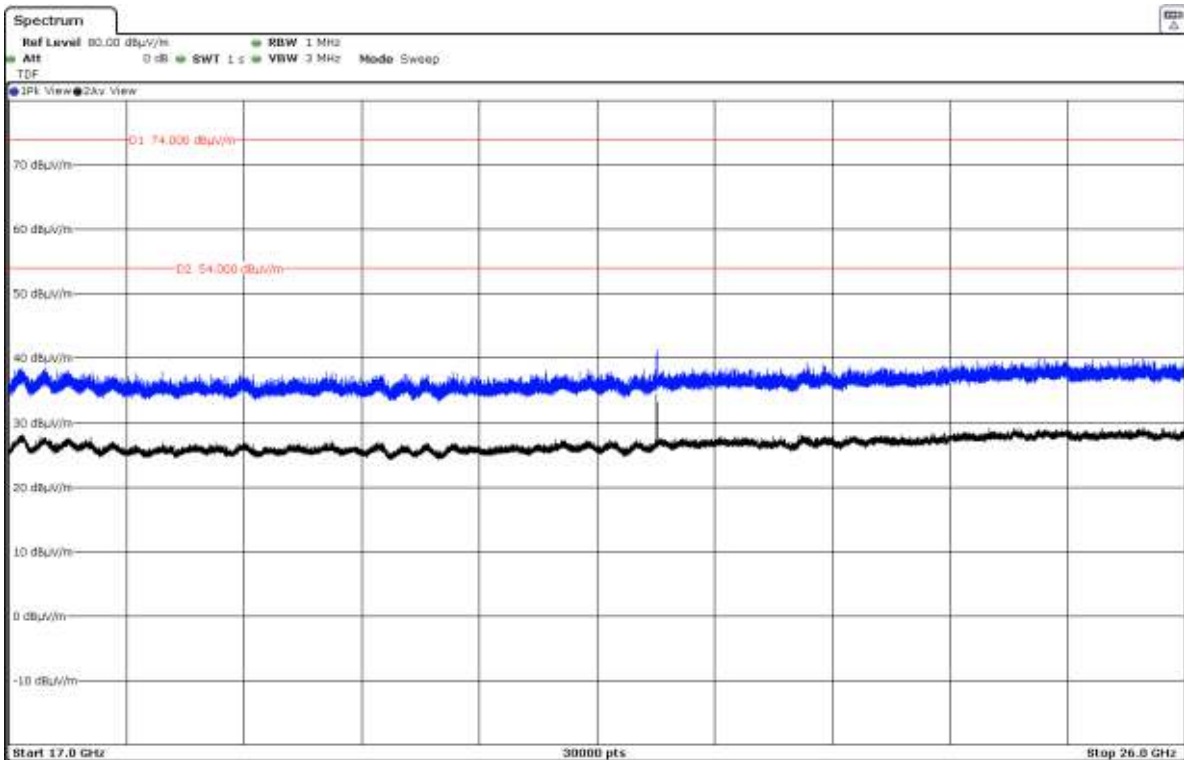


FREQUENCY RANGE 17 - 26 GHz

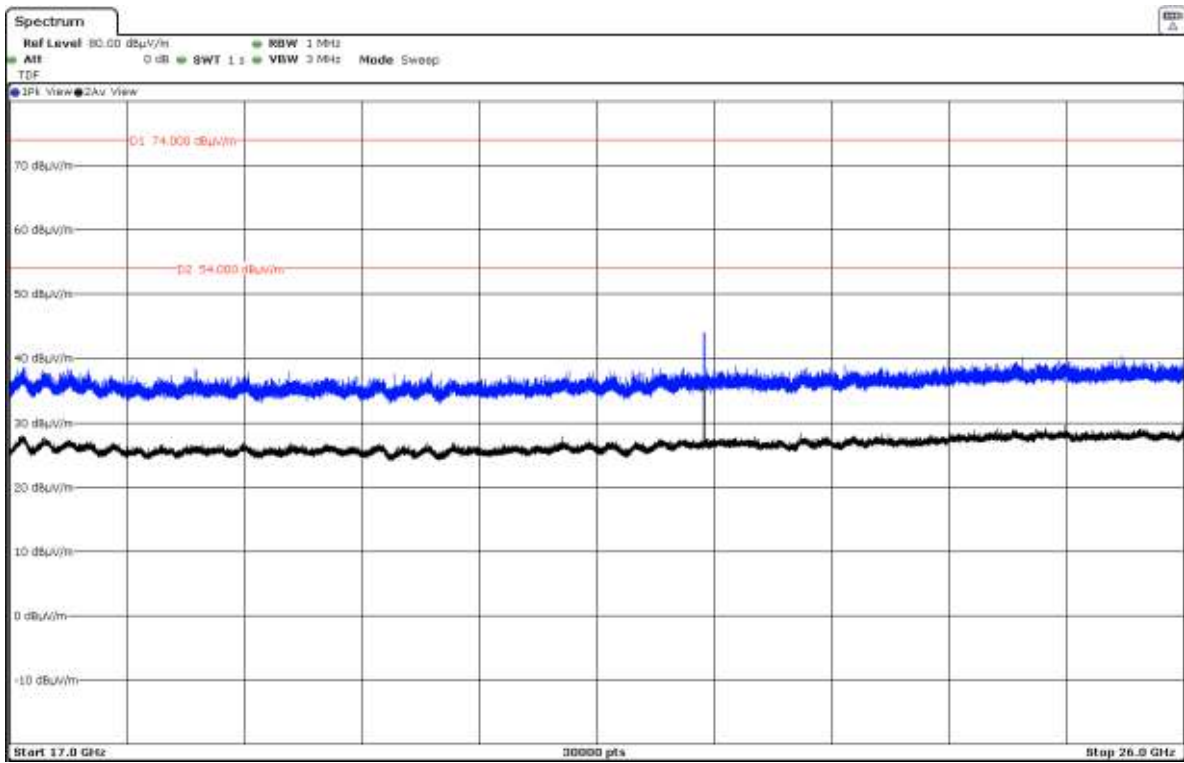
-Low channel:



-Middle channel:

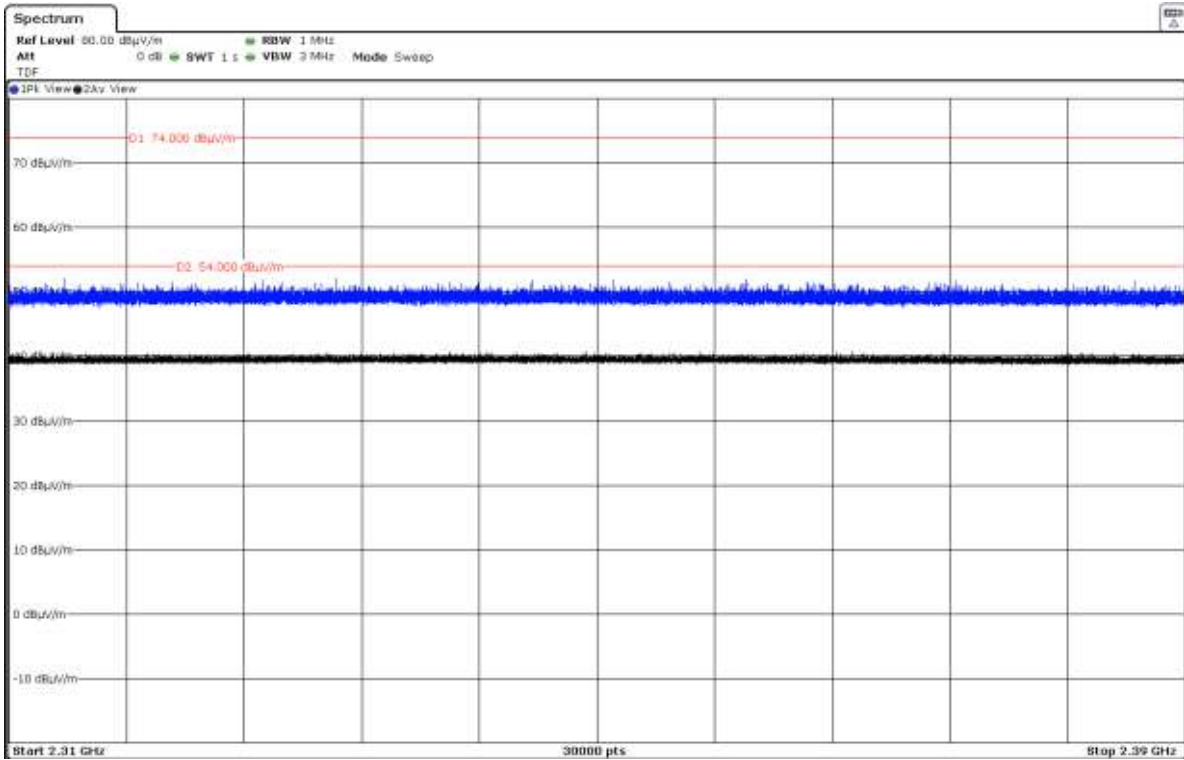


-High channel:

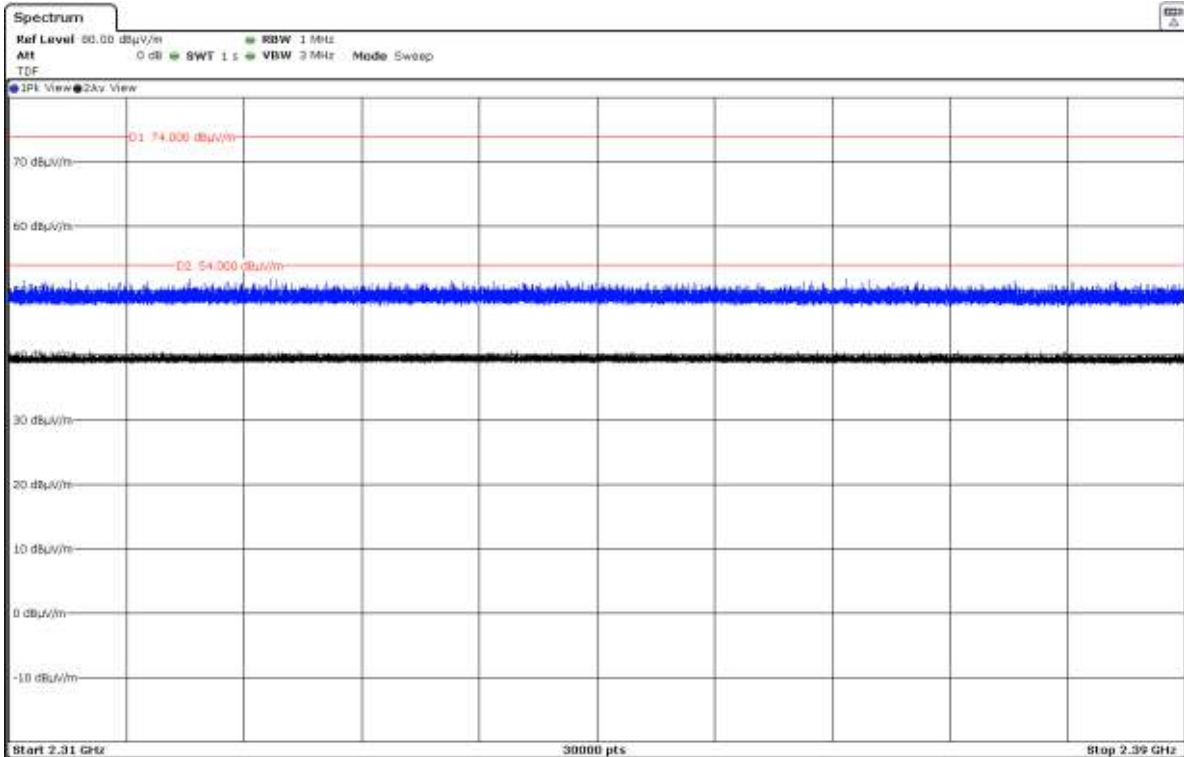


FREQUENCY RANGE 2.31 - 2.39 GHz

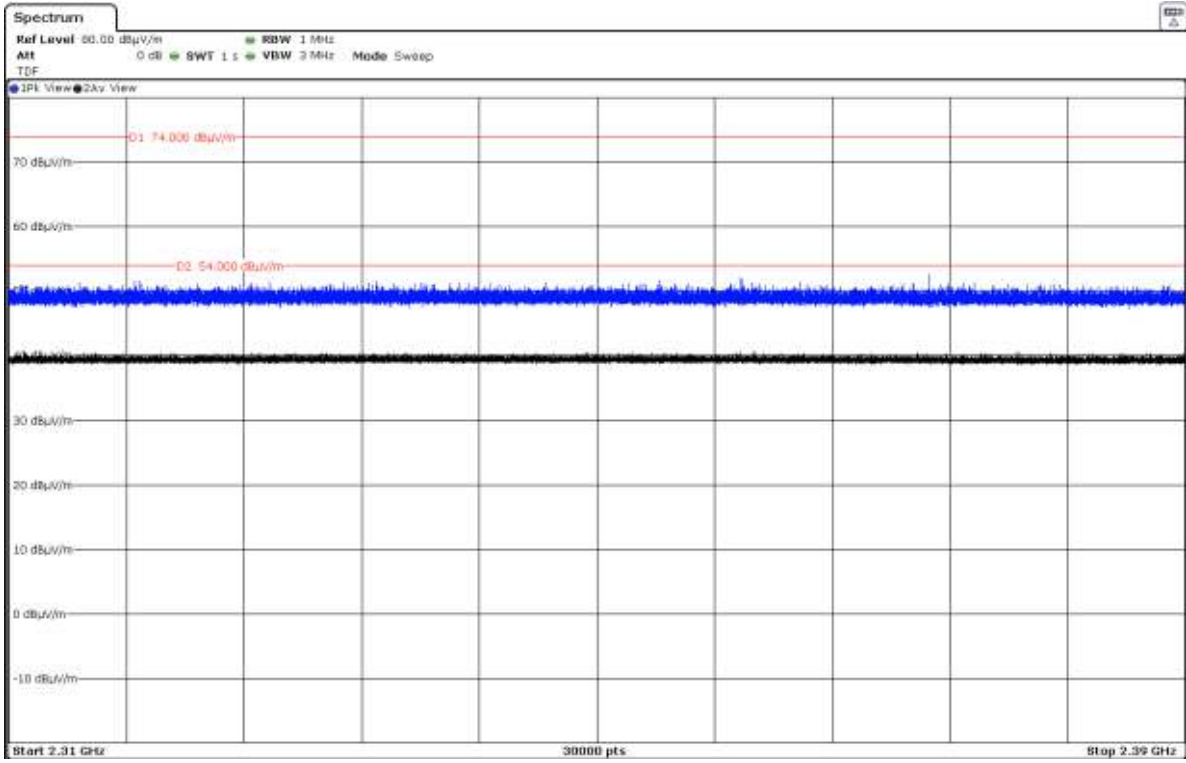
- Low Channel:



- Middle Channel:

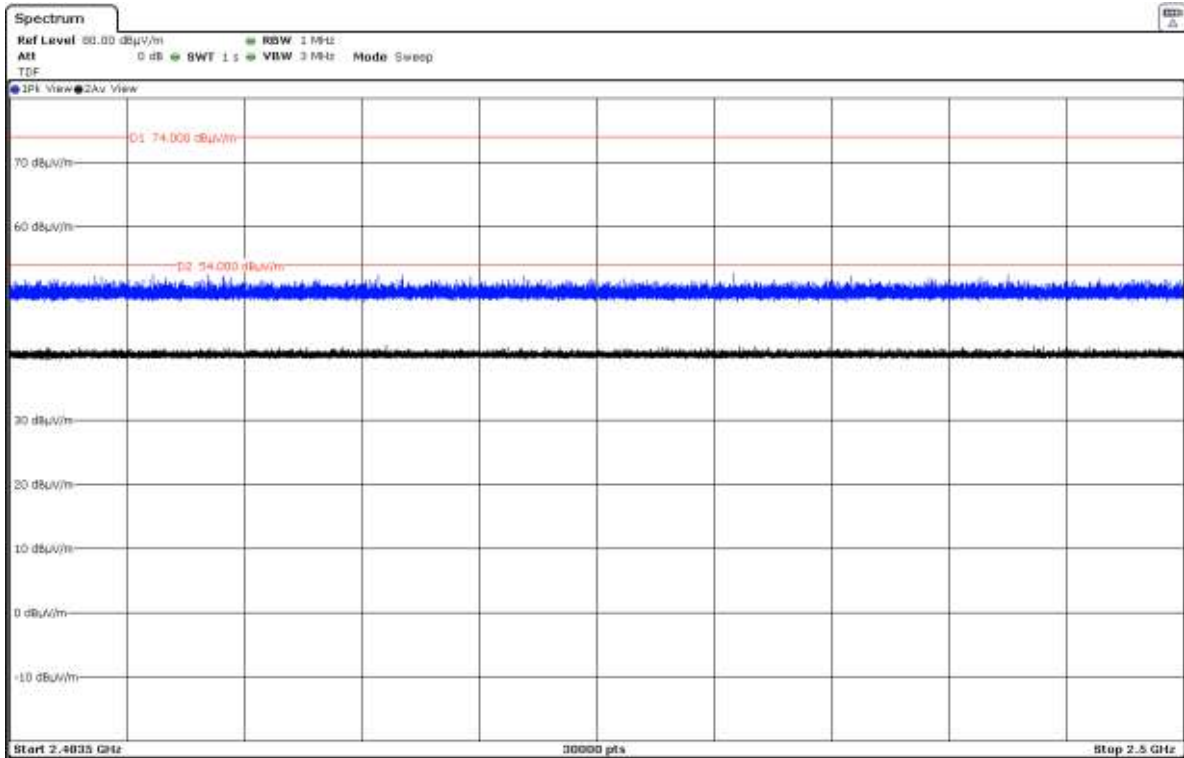


- High Channel:

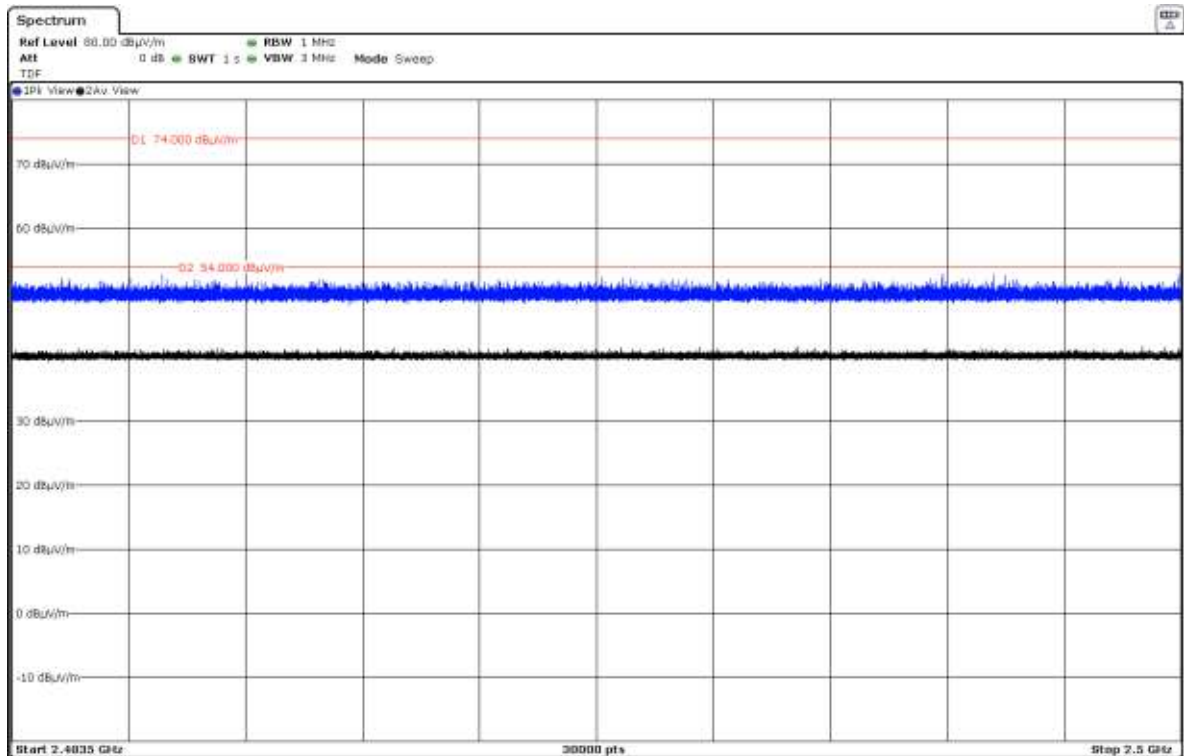


FREQUENCY RANGE 2.4835 - 2.5 GHz

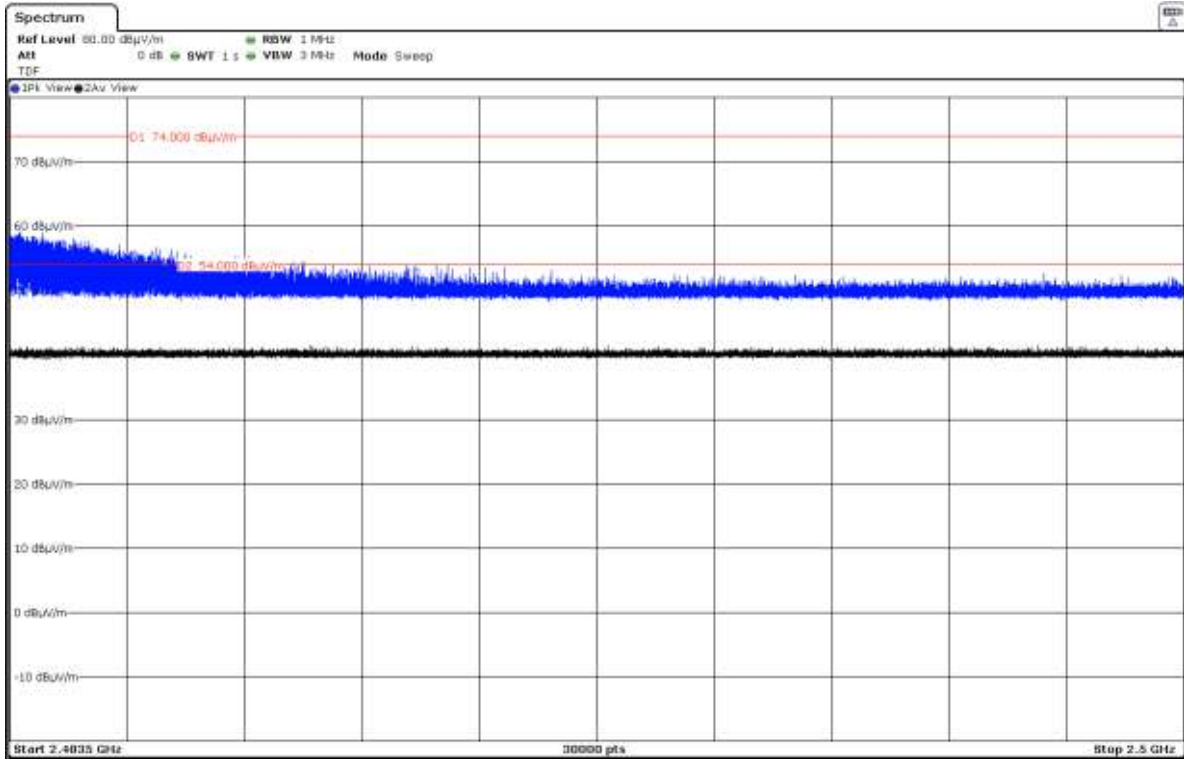
- Low Channel:



- Middle Channel:



- High Channel:



Appendix B: Test results. Bluetooth Basic Rate

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TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 3.7 Vdc
Type of power supply: DC voltage from rechargeable battery.
Type of antenna: Integral antenna.
Declared antenna gain: - 8.5 dBi

TEST FREQUENCIES:

Low Channel: 2402 MHz
Middle Channel: 2441 MHz
High Channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS

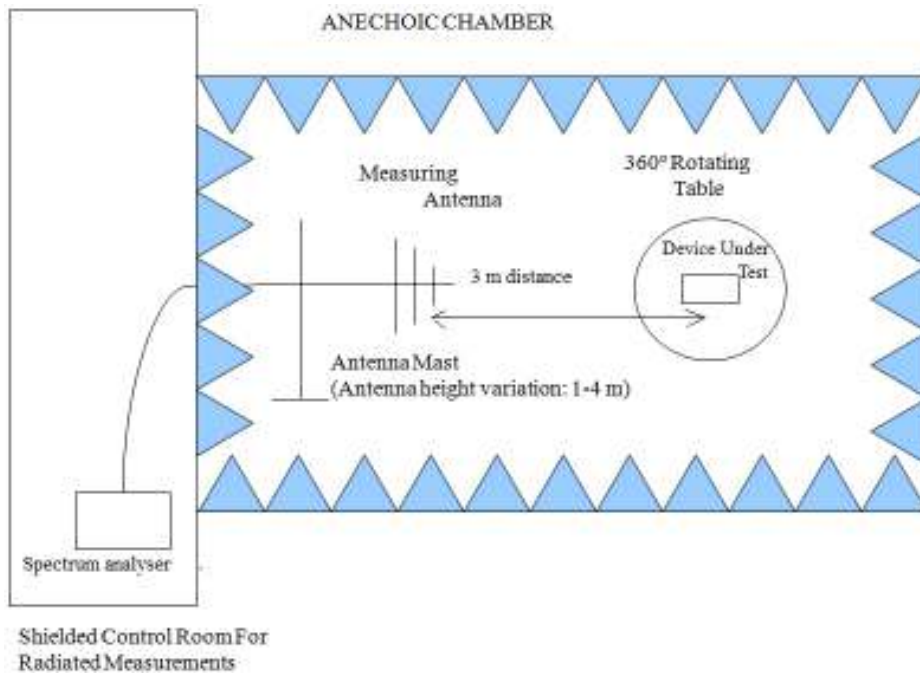
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

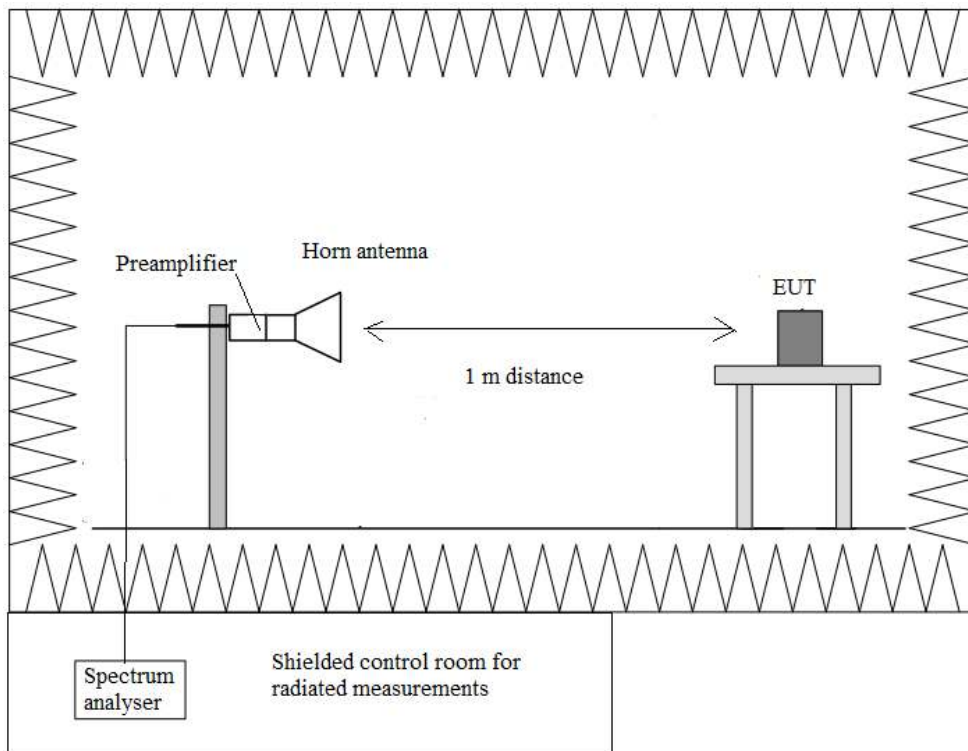
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup $f > 1$ GHz:

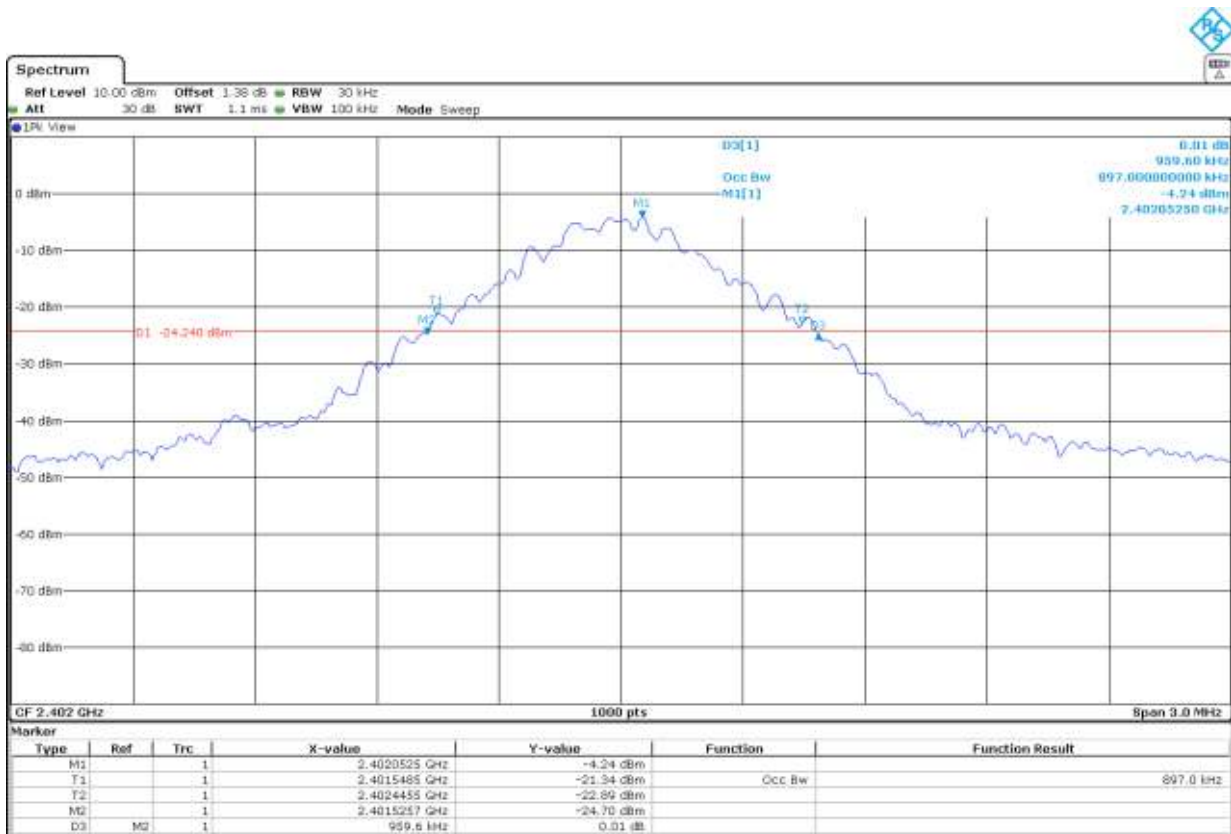


Occupied Bandwidth

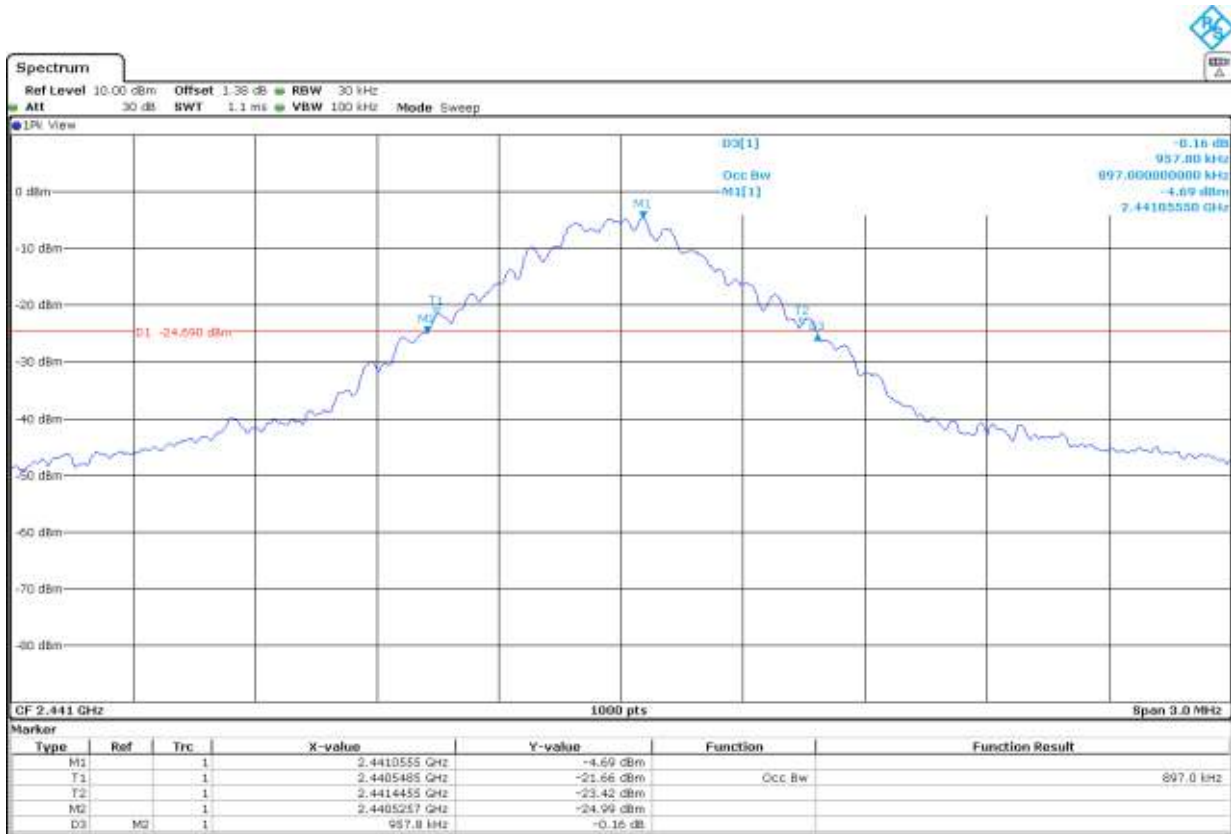
RESULTS:

| | | | |
|-------------------------------|-------------------------|----------------------------|--------------------------|
| | Low Channel 2402 MHz | Middle Channel 2441 MHz | High Channel 2480 MHz |
| 99% Bandwidth (MHz) | 0.897 | 0.897 | 0.897 |
| Measurement Uncertainty (kHz) | <±5.00 | | |

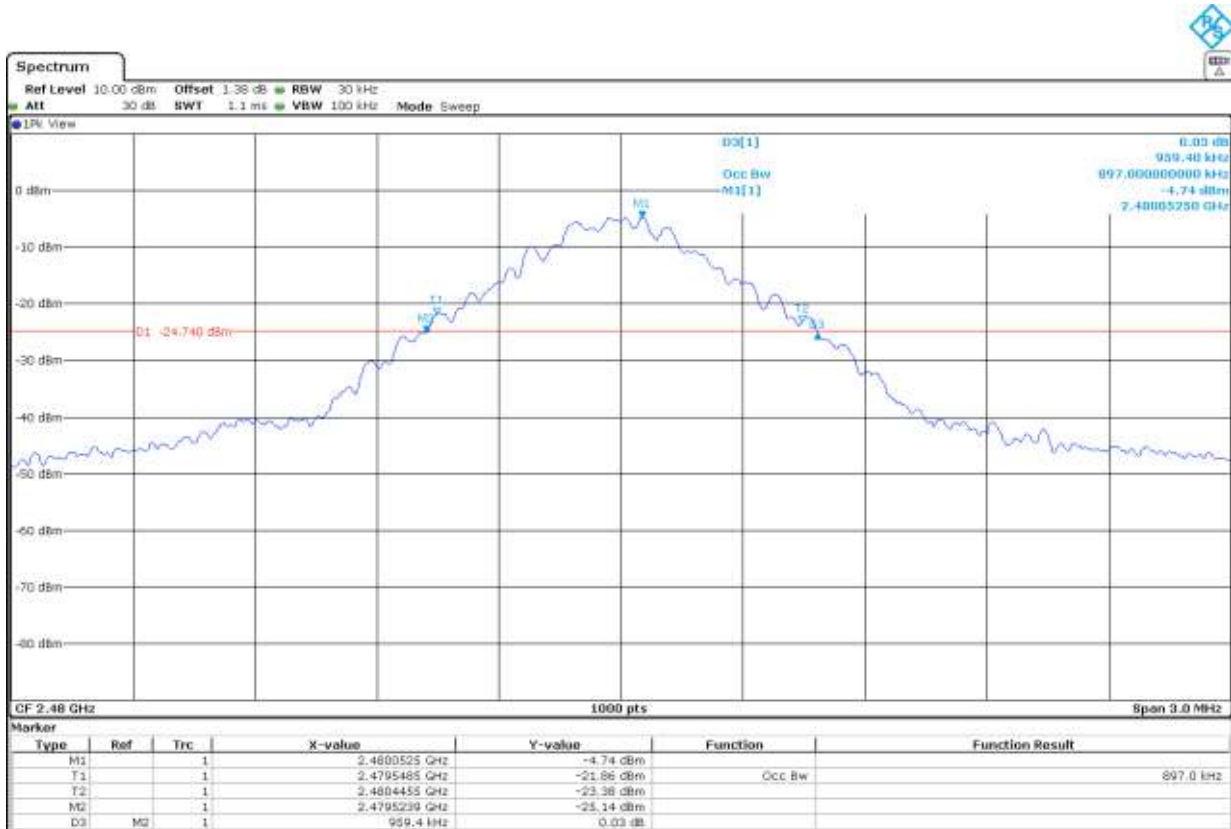
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of fundamental and harmonics emissions

SPECIFICATION:

The field strength of emissions from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of fundamental (mV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|-----------------------------|--------------------------------------|-------------------------|--------------------------|
| 902 - 928 | 50 | 93.98 | 3 |
| 2400 – 2483.5 | 50 | 93.98 | 3 |
| 5725 - 5875 | 50 | 93.98 | 3 |
| 24000-24250 | 250 | 107.96 | 3 |

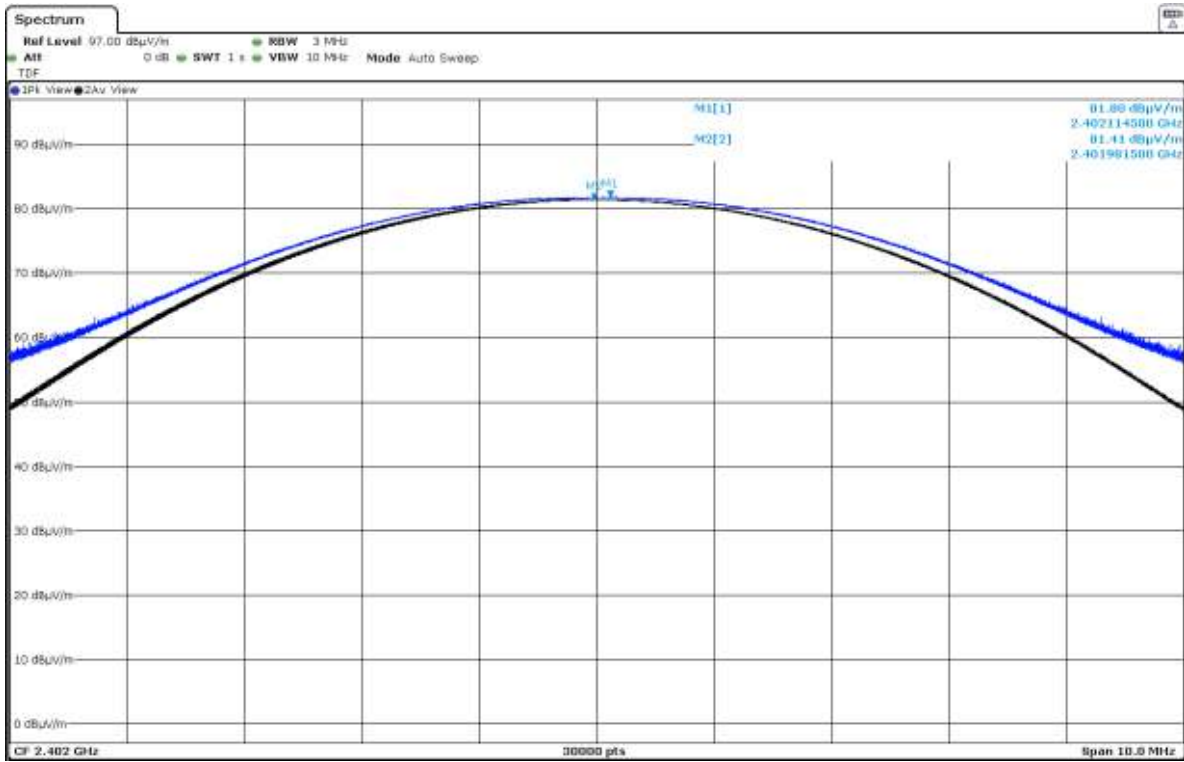
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

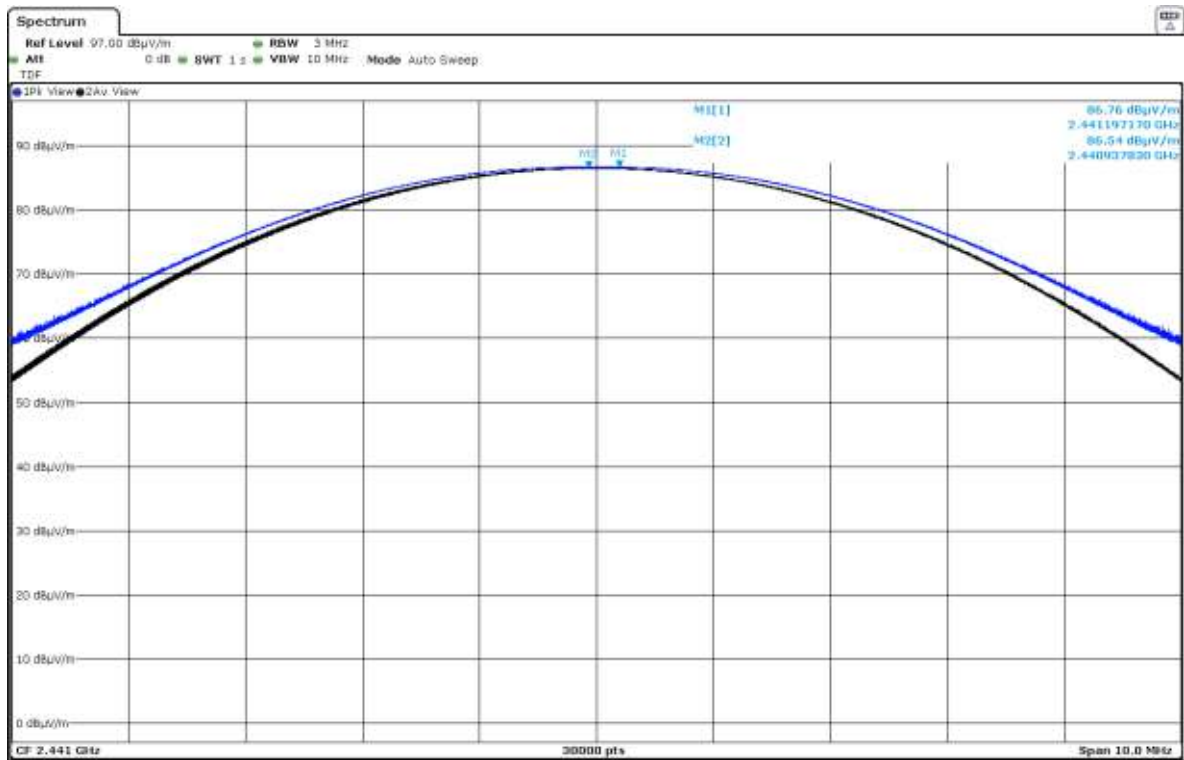
| | Low Channel 2402 MHz | Middle Channel 2441 MHz | High Channel 2480 MHz |
|---------------------------------|-------------------------|----------------------------|--------------------------|
| Average Field Strength (dBµV/m) | 81.41 | 86.54 | 82.89 |
| Peak Field Strength (dBµV/m) | 81.80 | 86.76 | 83.23 |
| Measurement Uncertainty (dB) | <±3.05 | | |

Verdict: PASS

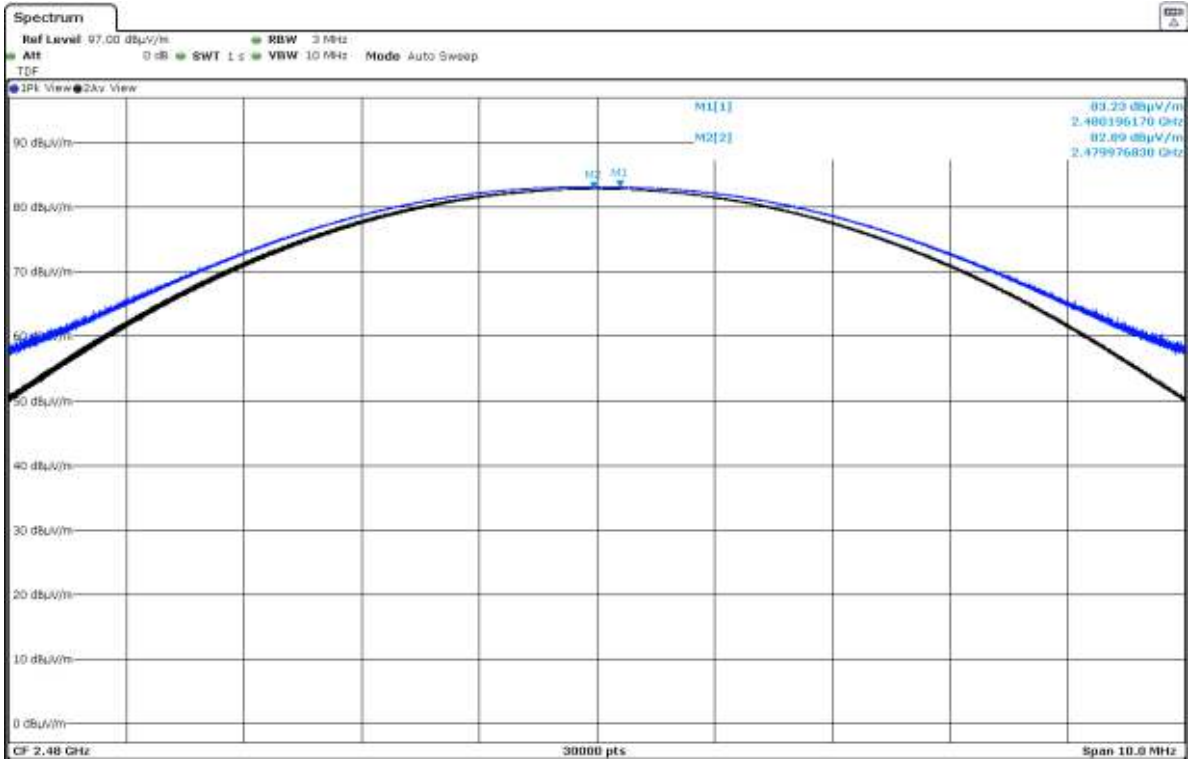
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (d) / RSS-210 B.10. (b) Emissions radiated outside of the specific frequency bands

SPECIFICATION:

The field strength of harmonics from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of harmonics ($\mu\text{V/m}$) | Field strength of harmonics ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------------|---|--|--------------------------|
| 902 - 928 | 500 | 54 | 3 |
| 2400 – 2483.5 | 500 | 54 | 3 |
| 5725 - 5875 | 500 | 54 | 3 |
| 24000-24250 | 2500 | 67.96 | 3 |

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

| Frequency Range (MHz) | Field strength ($\mu\text{V/m}$) | Field strength ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------|------------------------------------|---|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | - | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| 960 - 25000 | 500 | 54 | 3 |

Whichever is the lesser attenuation.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz.

The spurious signals detected do not depend on the operating channel.

No spurious emissions were found at less than 20 dB of the limit.

Frequency range 1 - 26 GHz.

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

Spurious signals with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

- Low Channel (2402 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dBµV/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------|--------------|------------------------------|
| 4.8039 | Peak | 39.89 | H | <±3.70 |
| 21.61835 | Peak | 41.77 | H | <±3.70 |

- Middle Channel (2441 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dBµV/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------|--------------|------------------------------|
| 21.96785 | Peak | 42.53 | H | <±3.70 |

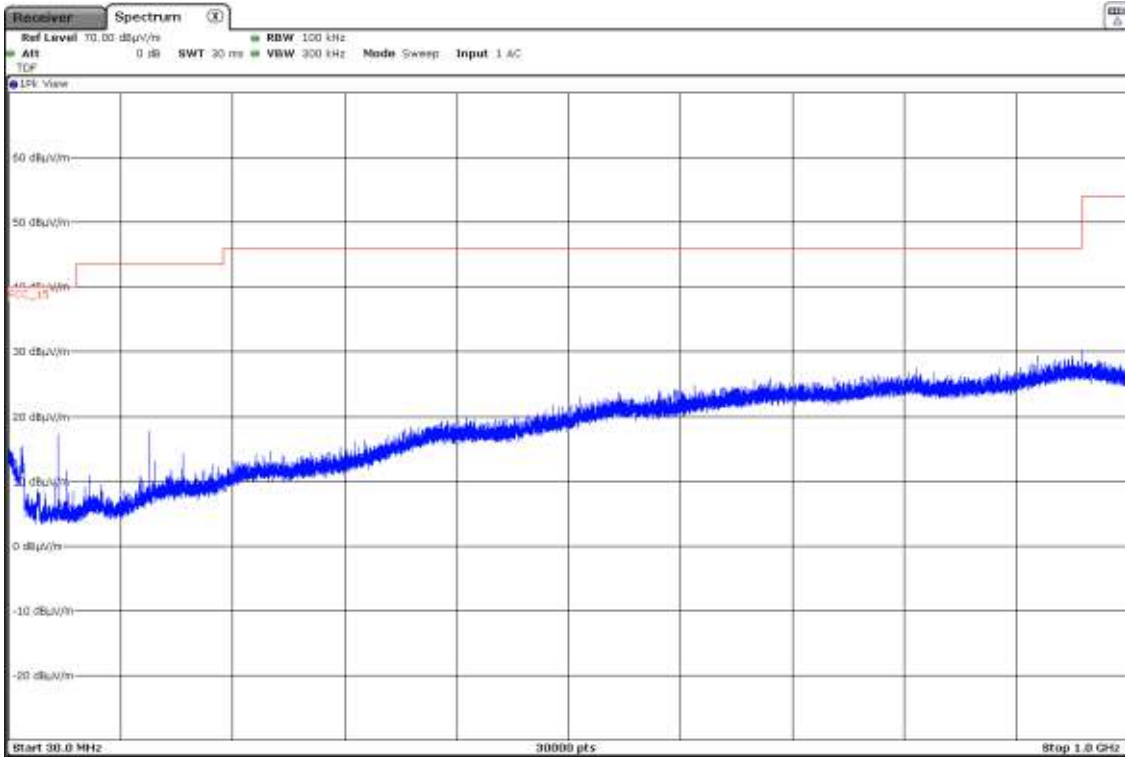
- High Channel (2480 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dBµV/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------|--------------|------------------------------|
| 4.95977 | Peak | 40.93 | H | <±3.70 |
| 22.31855 | Peak | 44.35 | H | <±3.70 |

Verdict: PASS

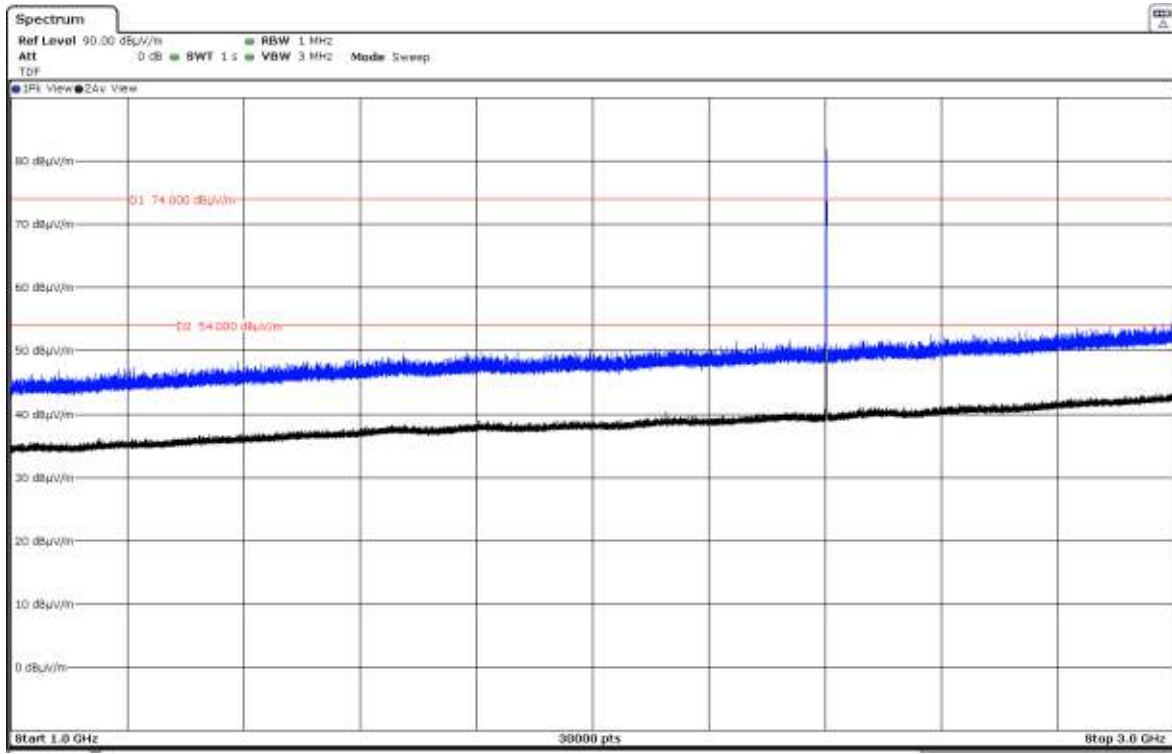
FREQUENCY RANGE 30 MHz - 1 GHz

The spurious signals detected do not depend on the operating channel, so this plot is valid for Low, Middle and High Channels.



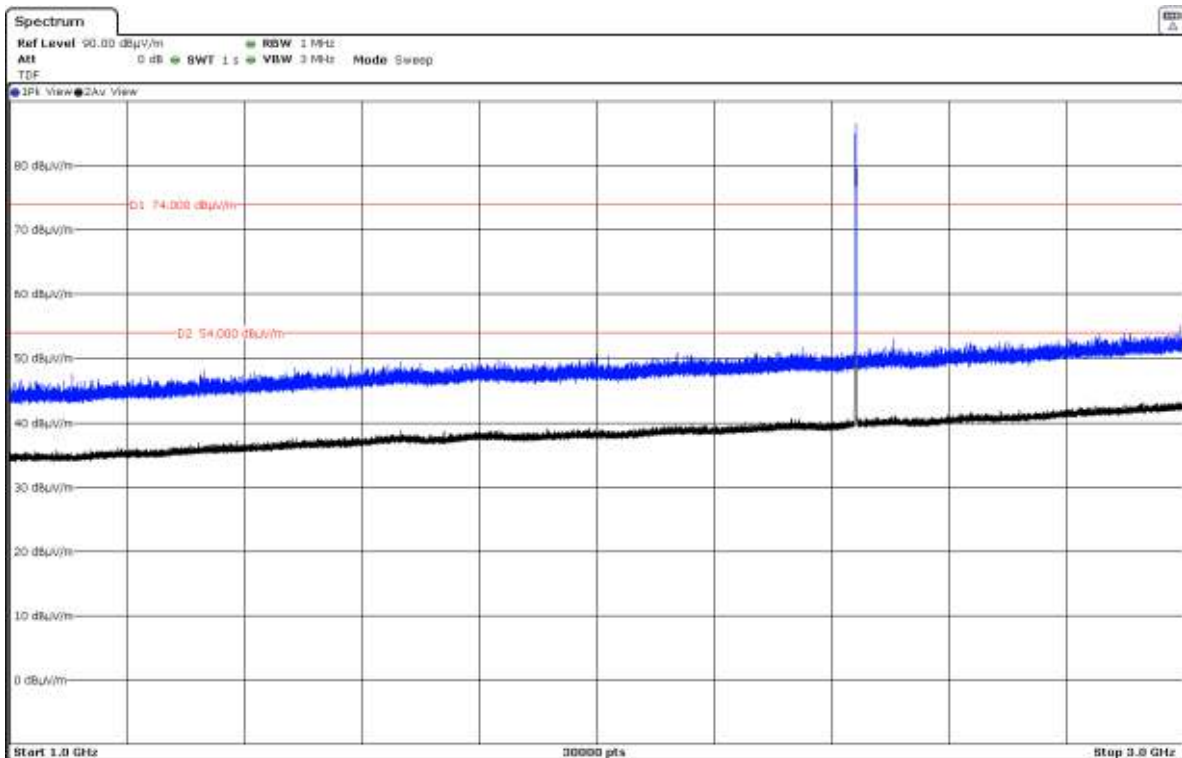
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



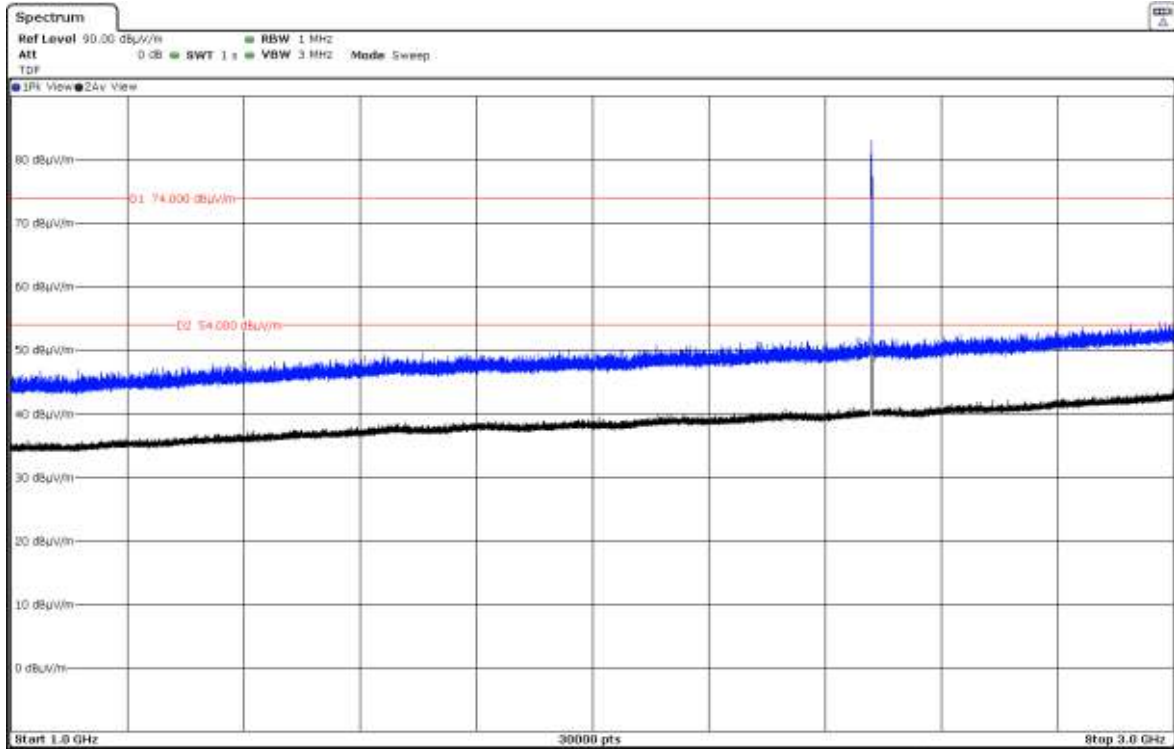
The peak shown in the plot above the limit is the carrier frequency.

- Middle Channel:



The peak shown in the plot above the limit is the carrier frequency.

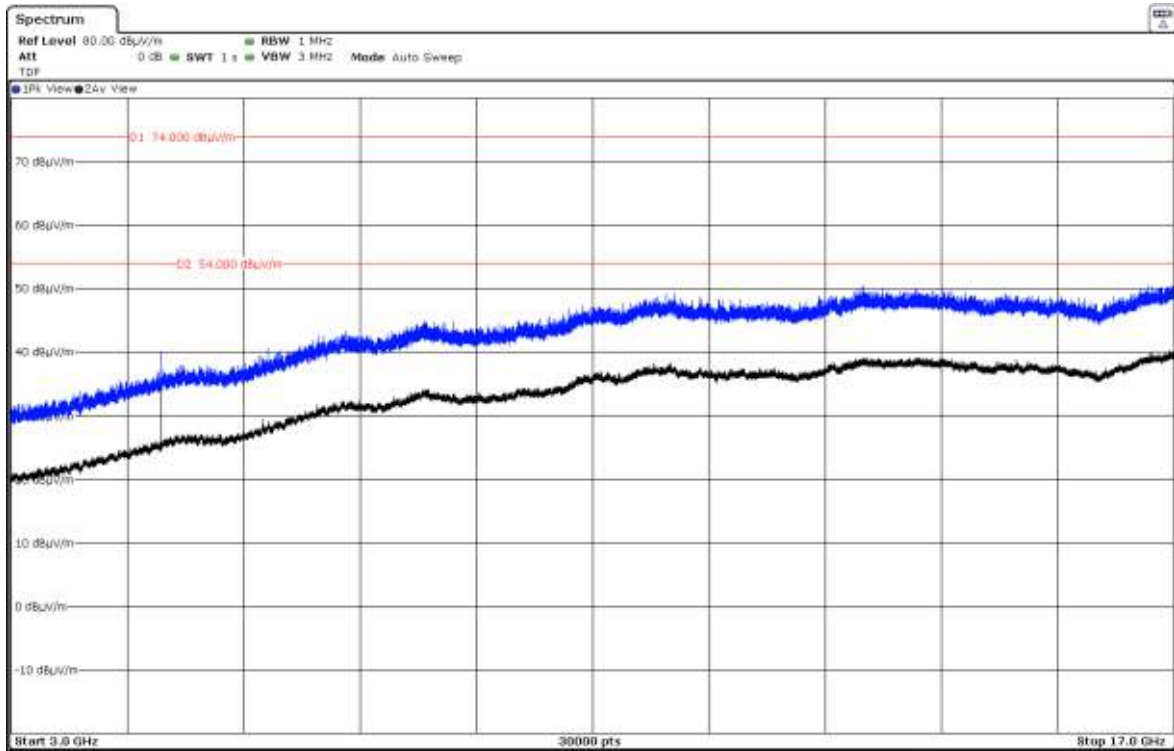
- High Channel:



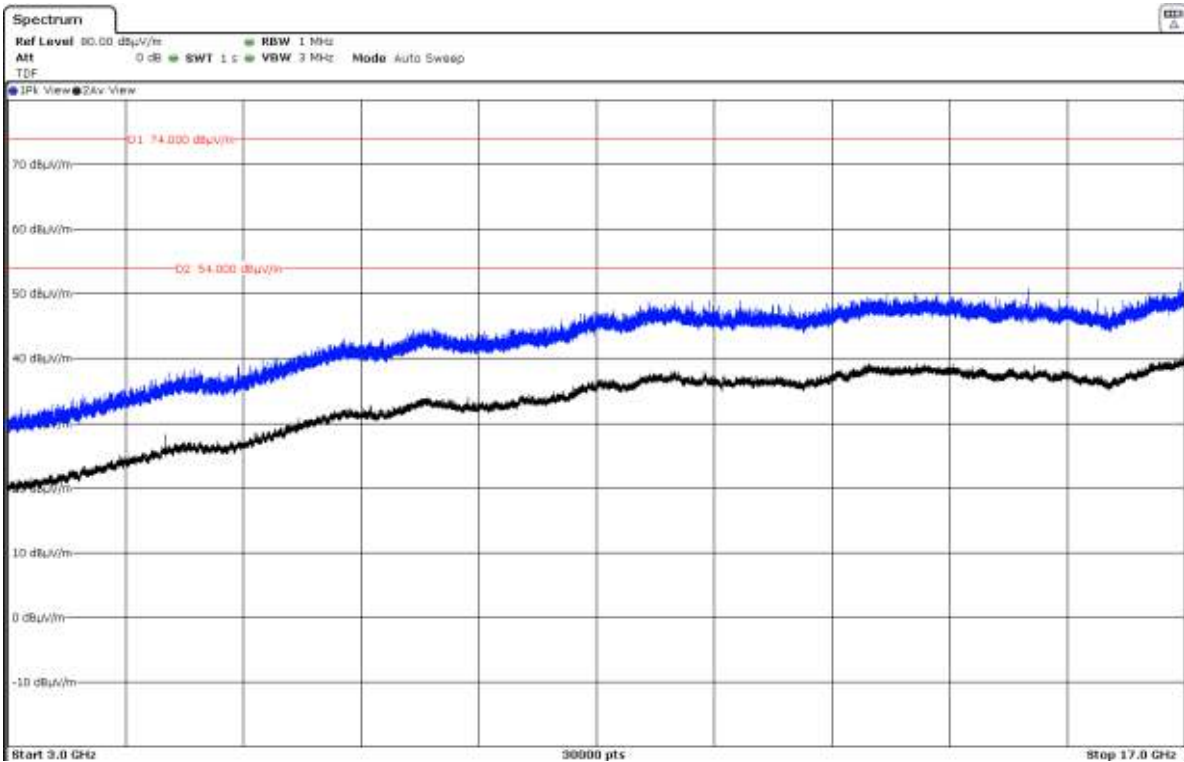
The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

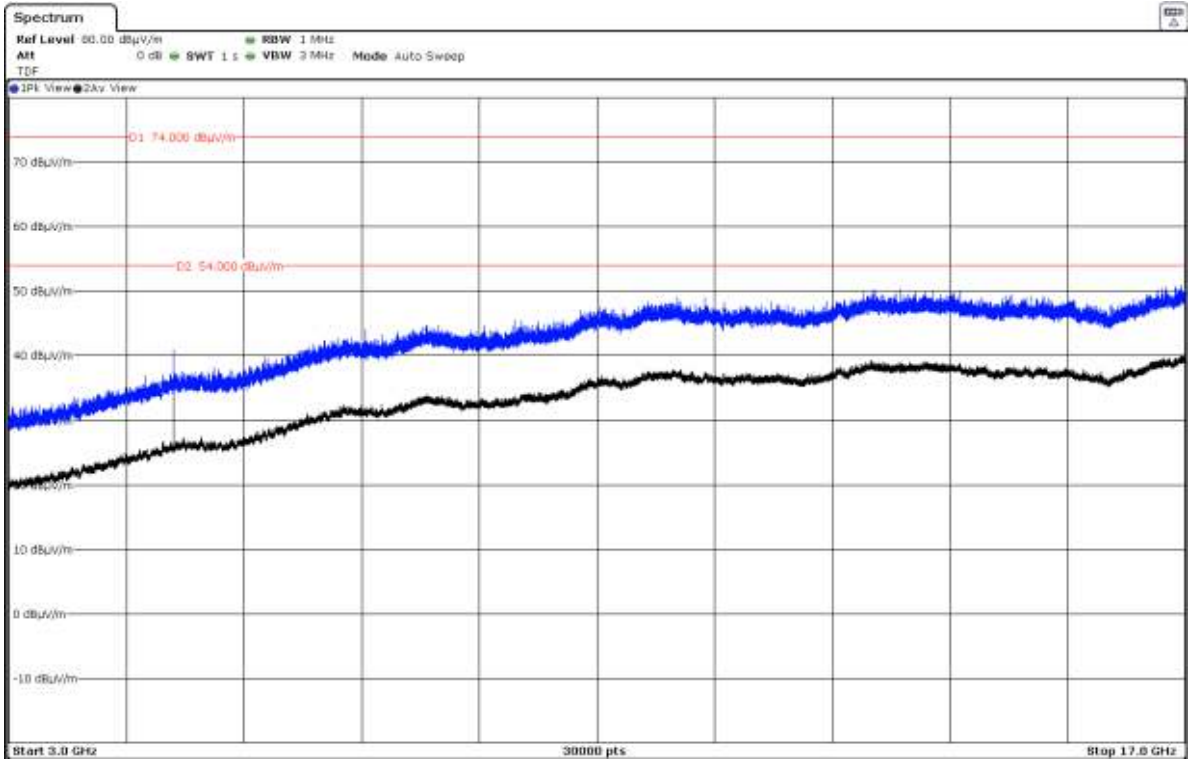
- Low Channel:



- Middle Channel:

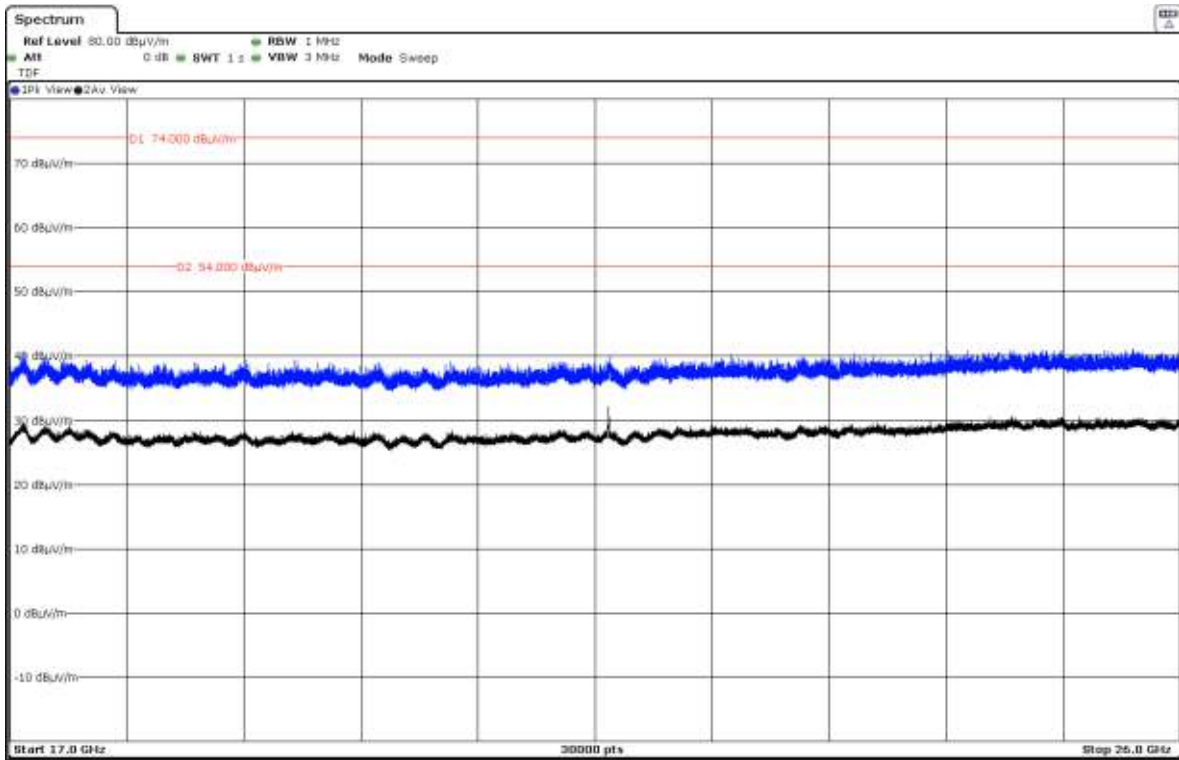


- High Channel:

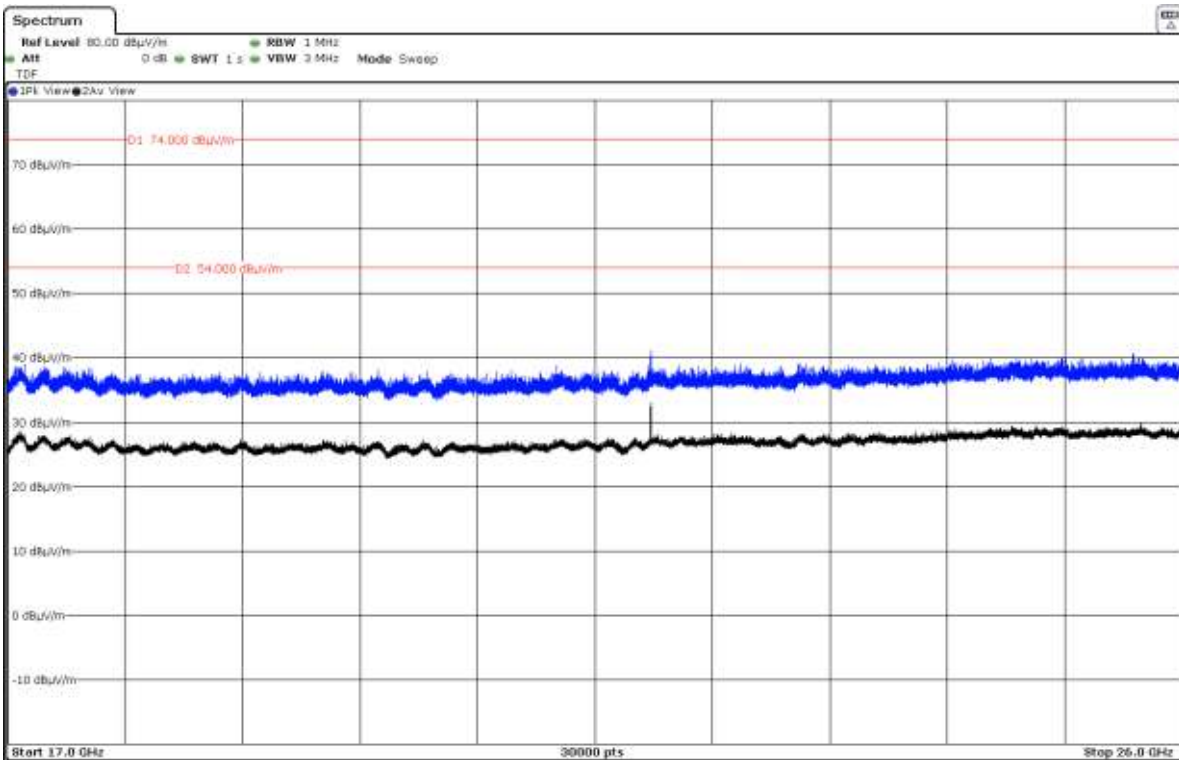


FREQUENCY RANGE 17 - 26 GHz

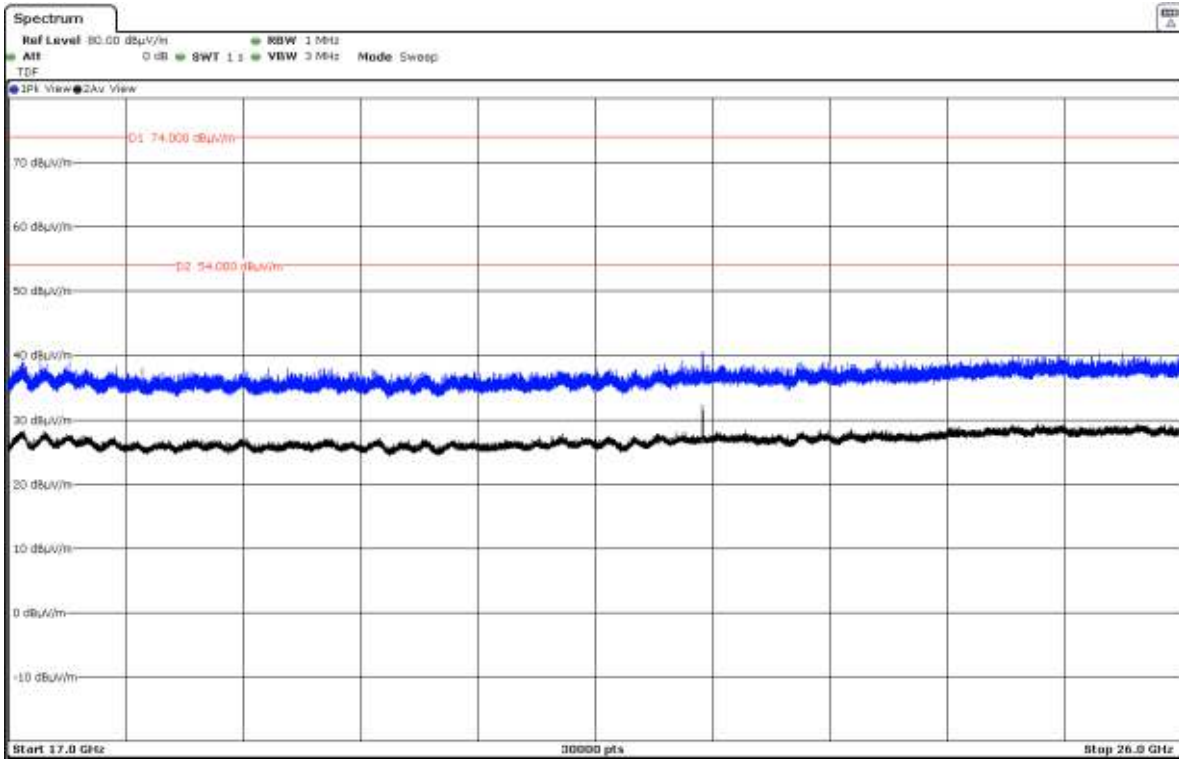
-Low channel:



-Middle channel:

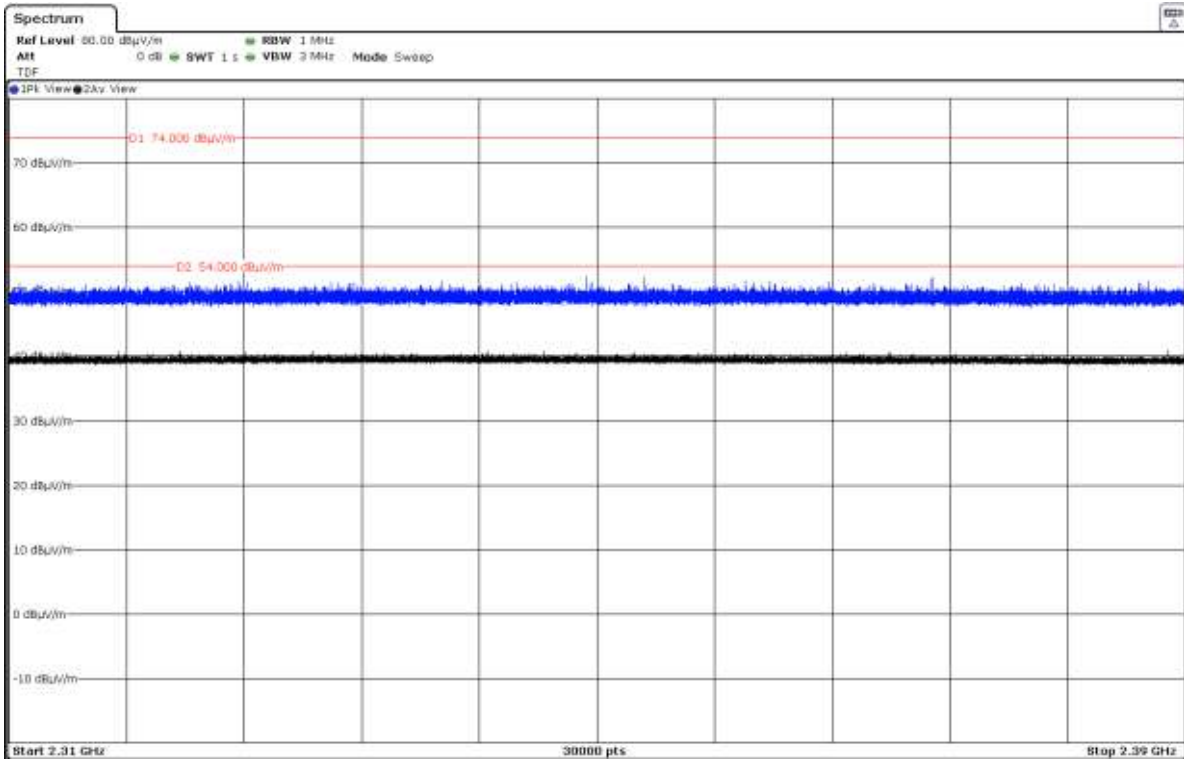


-High channel:

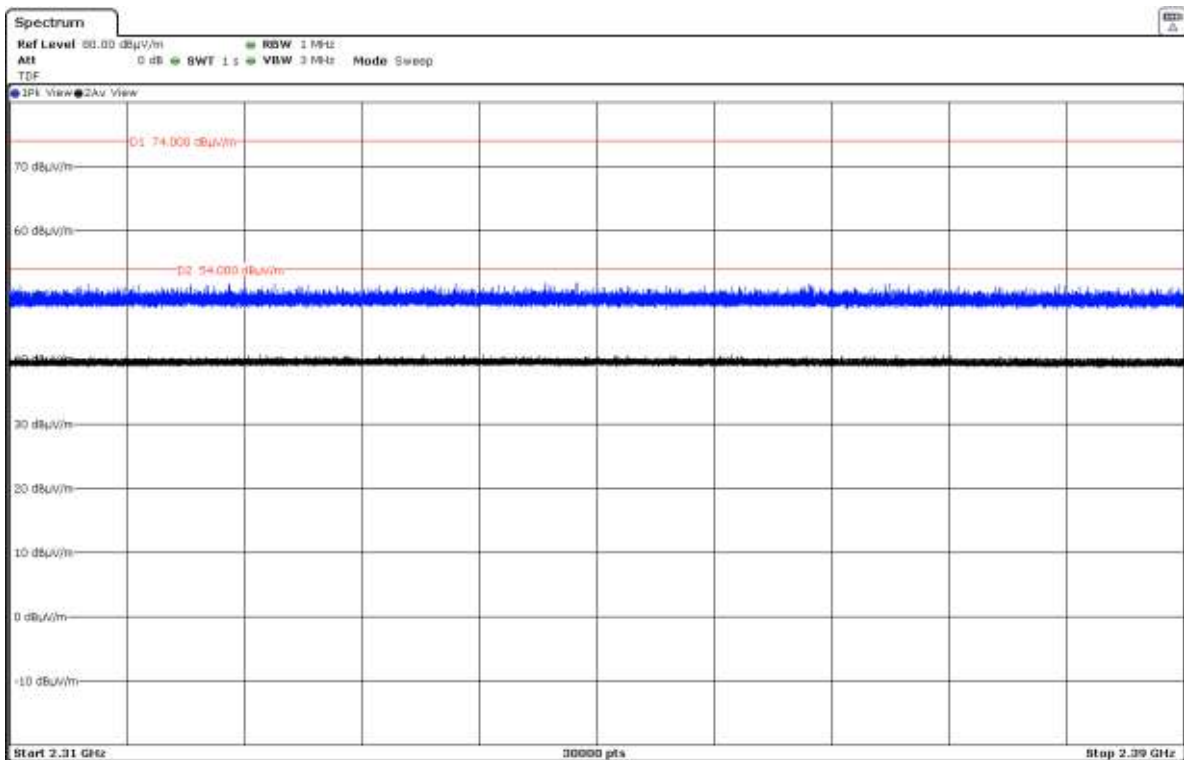


FREQUENCY RANGE 2.31 - 2.39 GHz (Restricted Band 1)

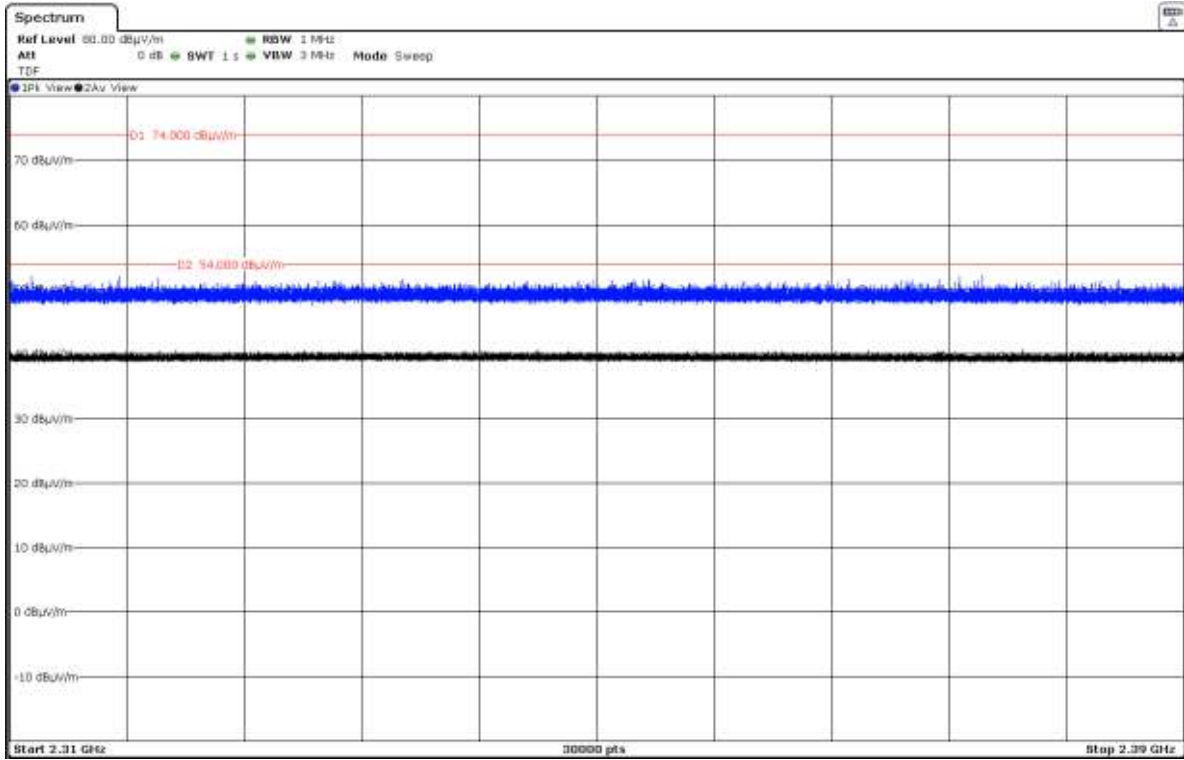
- Low Channel:



- Middle Channel:

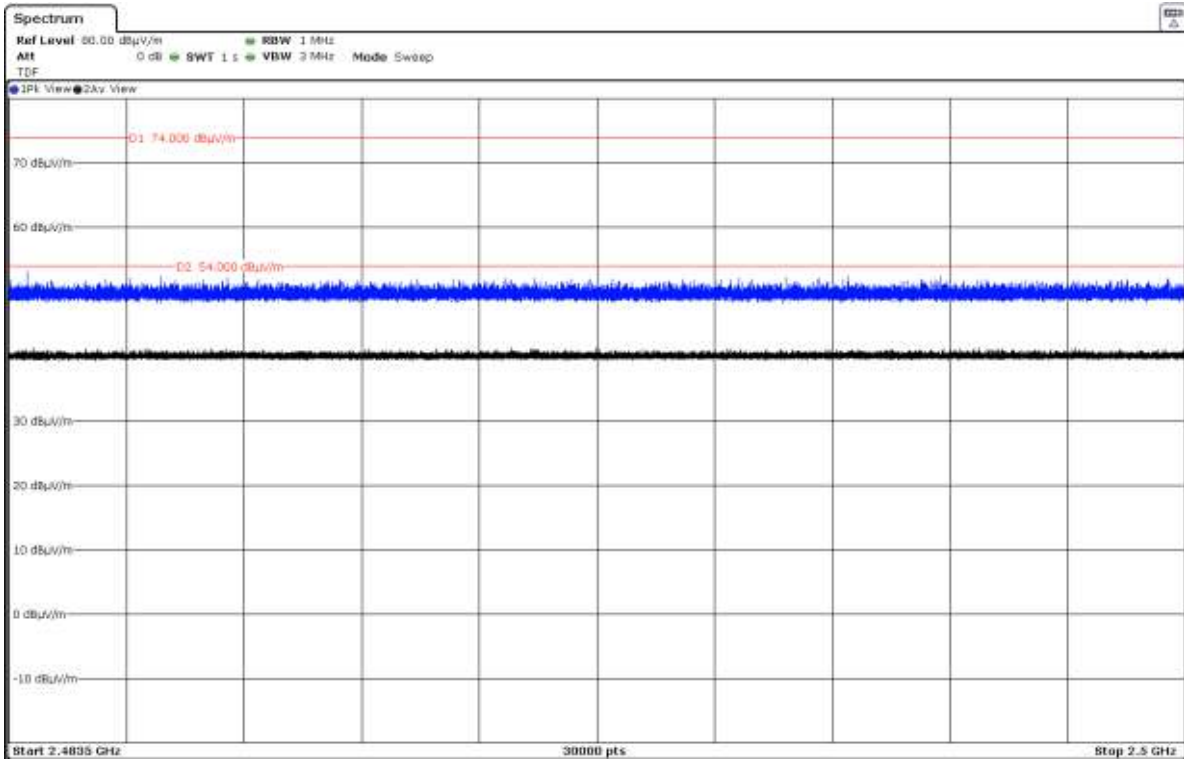


- High Channel:

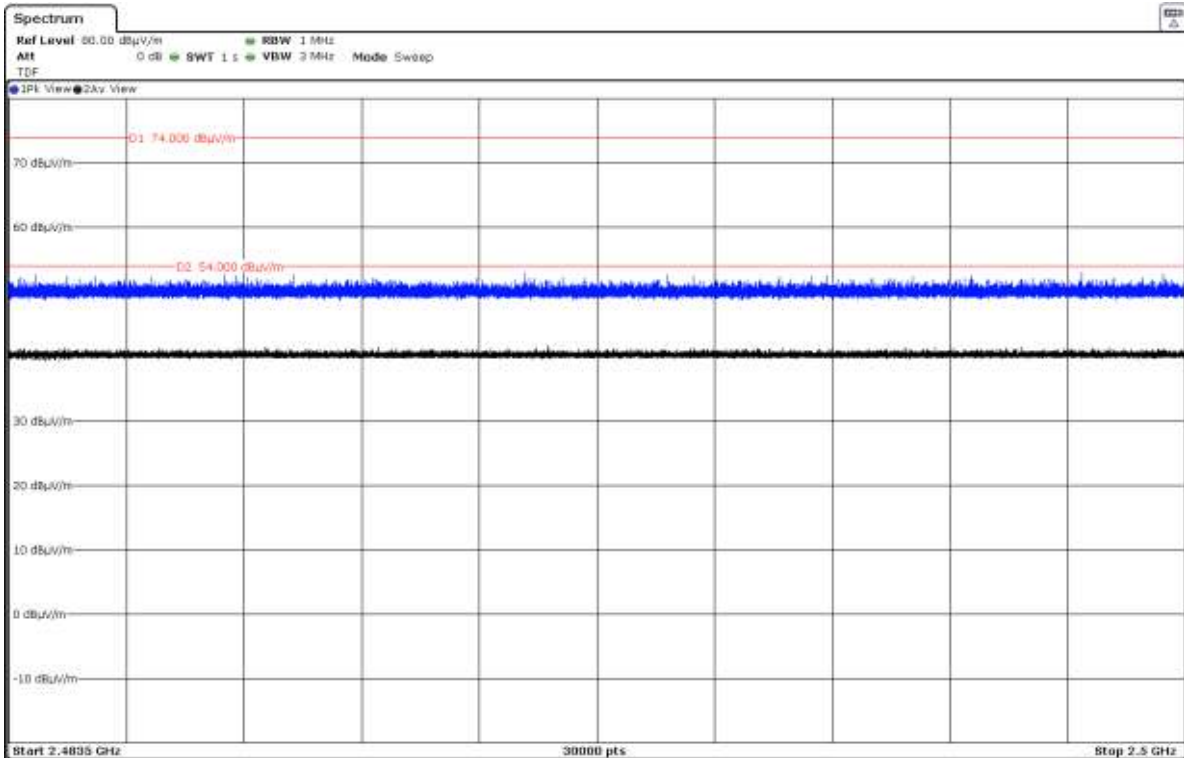


FREQUENCY RANGE 2.4835 - 2.5 GHz (Restricted Band 2)

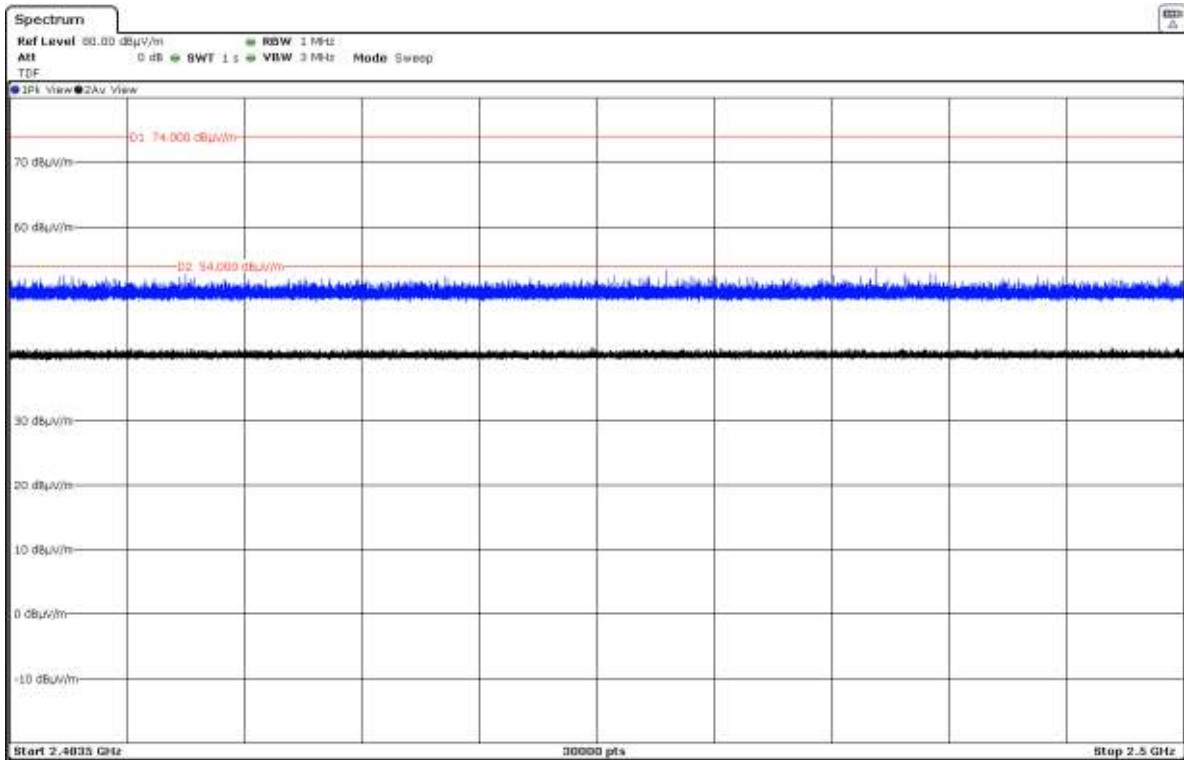
- Low Channel:



- Middle Channel:



- High Channel:



Appendix C: Test results. Proprietary protocol DM

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TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 3.7 Vdc
Type of power supply: DC voltage from rechargeable battery.
Type of antenna: Integral antenna.
Declared antenna gain: - 8.5 dBi

TEST FREQUENCIES:

Low Channel: 2402 MHz
Middle Channel: 2440 MHz
High Channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS

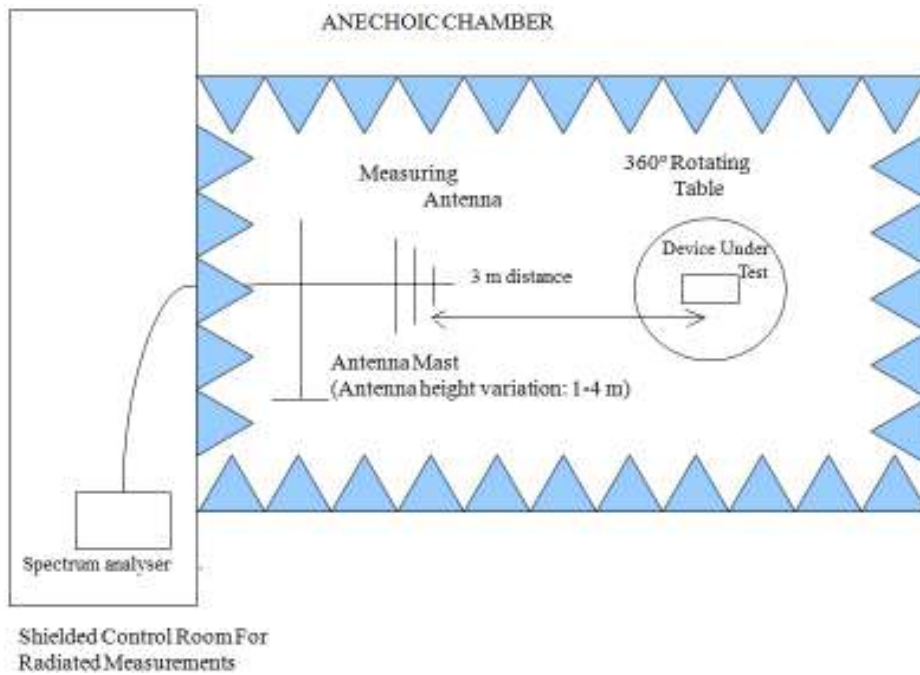
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

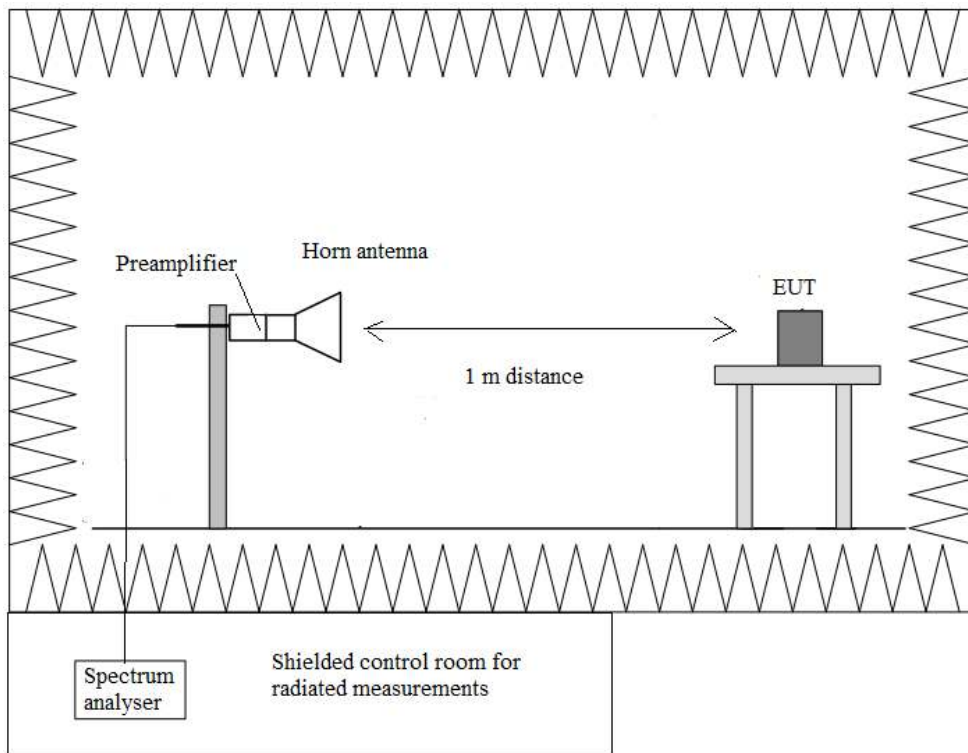
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup $f > 1$ GHz:

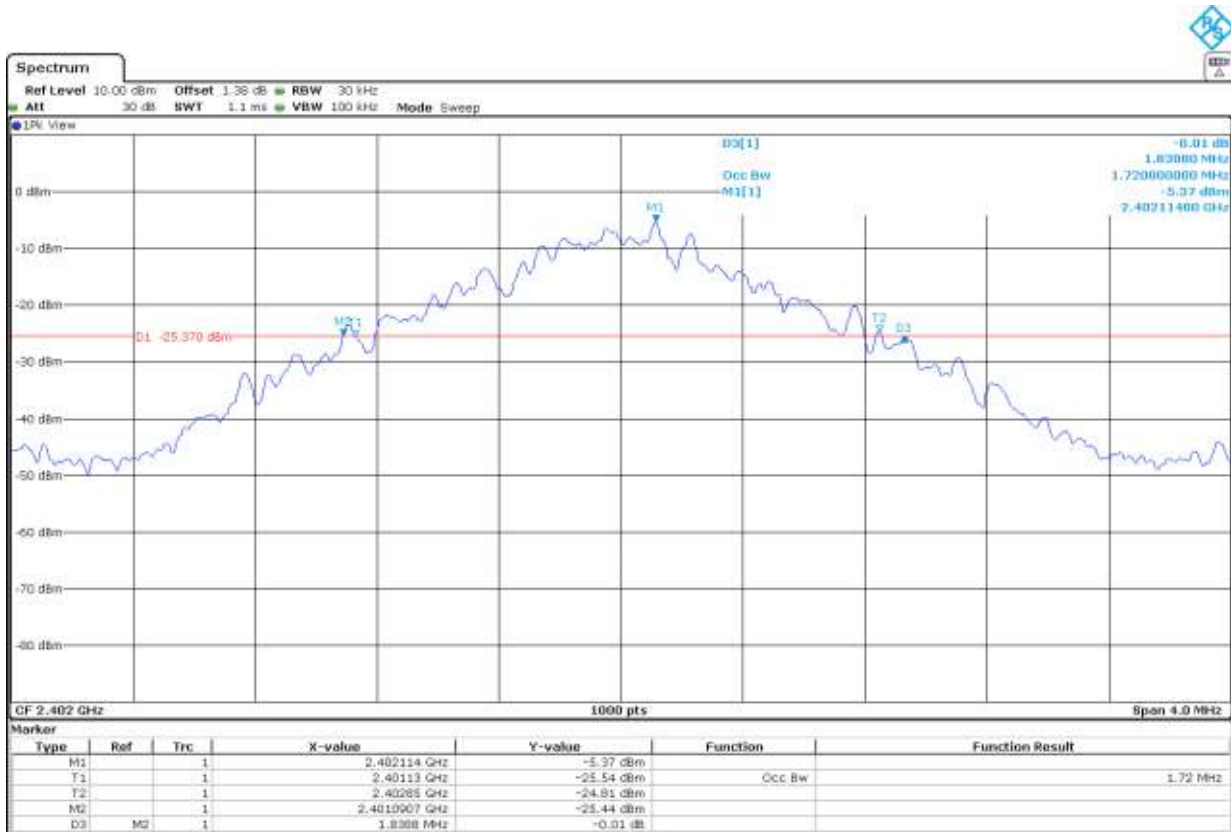


Occupied Bandwidth

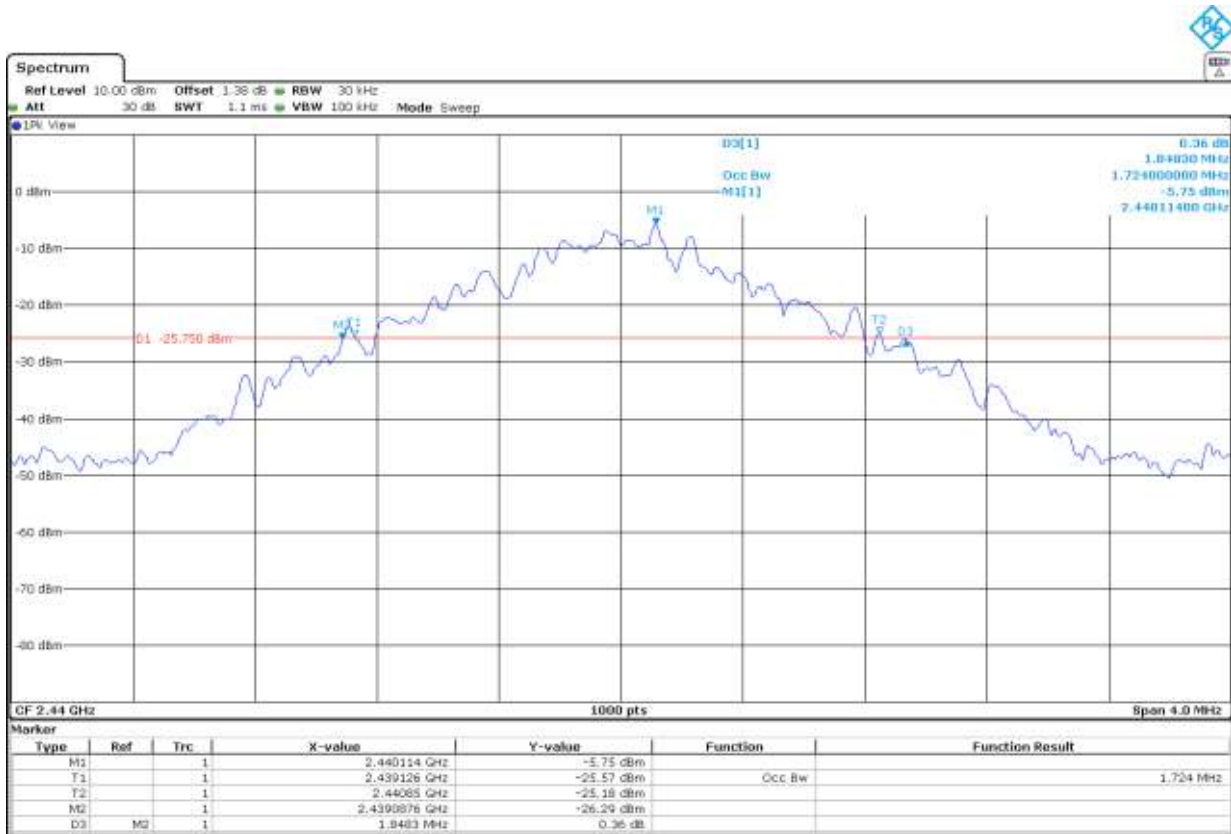
RESULTS:

| | Low Channel 2402 MHz | Middle Channel 2440 MHz | High Channel 2480 MHz |
|-------------------------------|-------------------------|----------------------------|--------------------------|
| 99% Bandwidth (MHz) | 1.720 | 1.724 | 1.724 |
| Measurement Uncertainty (kHz) | <±5.00 | | |

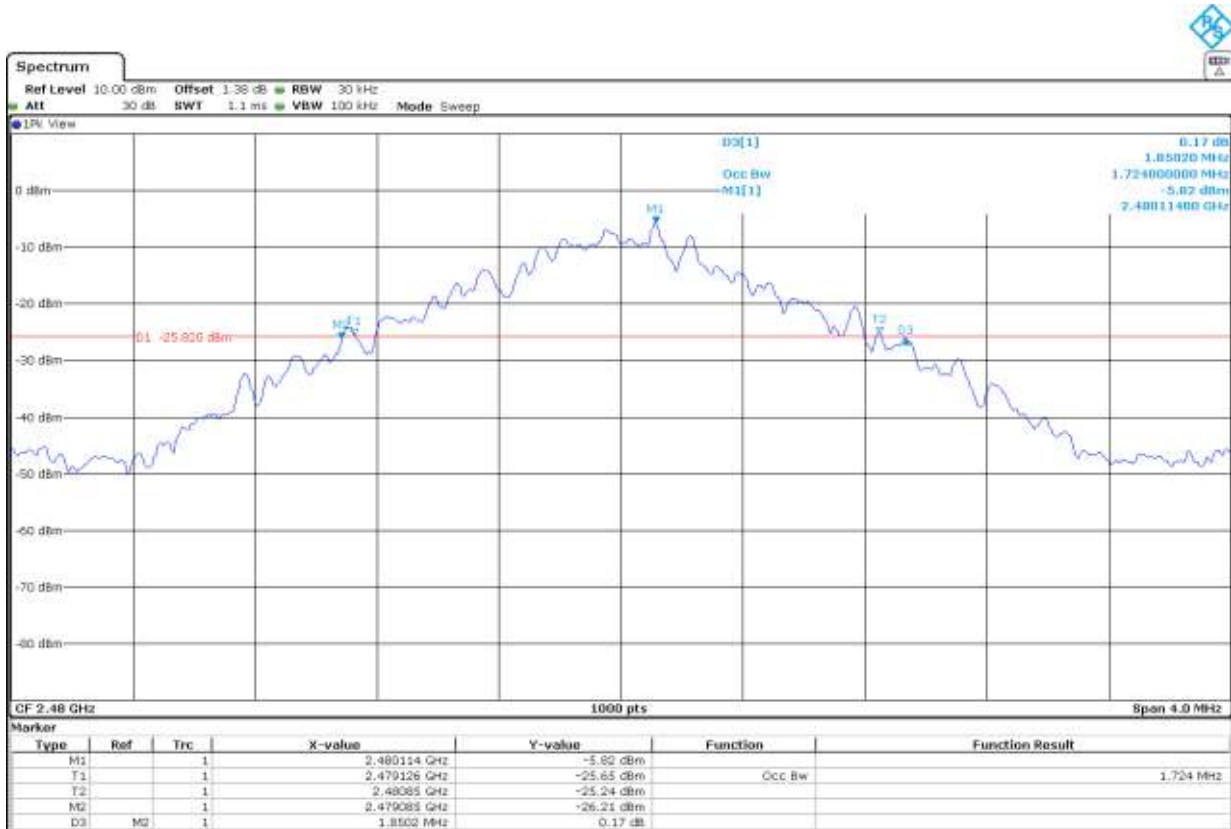
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of fundamental and harmonics emissions

SPECIFICATION:

The field strength of emissions from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of fundamental (mV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|-----------------------------|--------------------------------------|-------------------------|--------------------------|
| 902 - 928 | 50 | 93.98 | 3 |
| 2400 – 2483.5 | 50 | 93.98 | 3 |
| 5725 - 5875 | 50 | 93.98 | 3 |
| 24000-24250 | 250 | 107.96 | 3 |

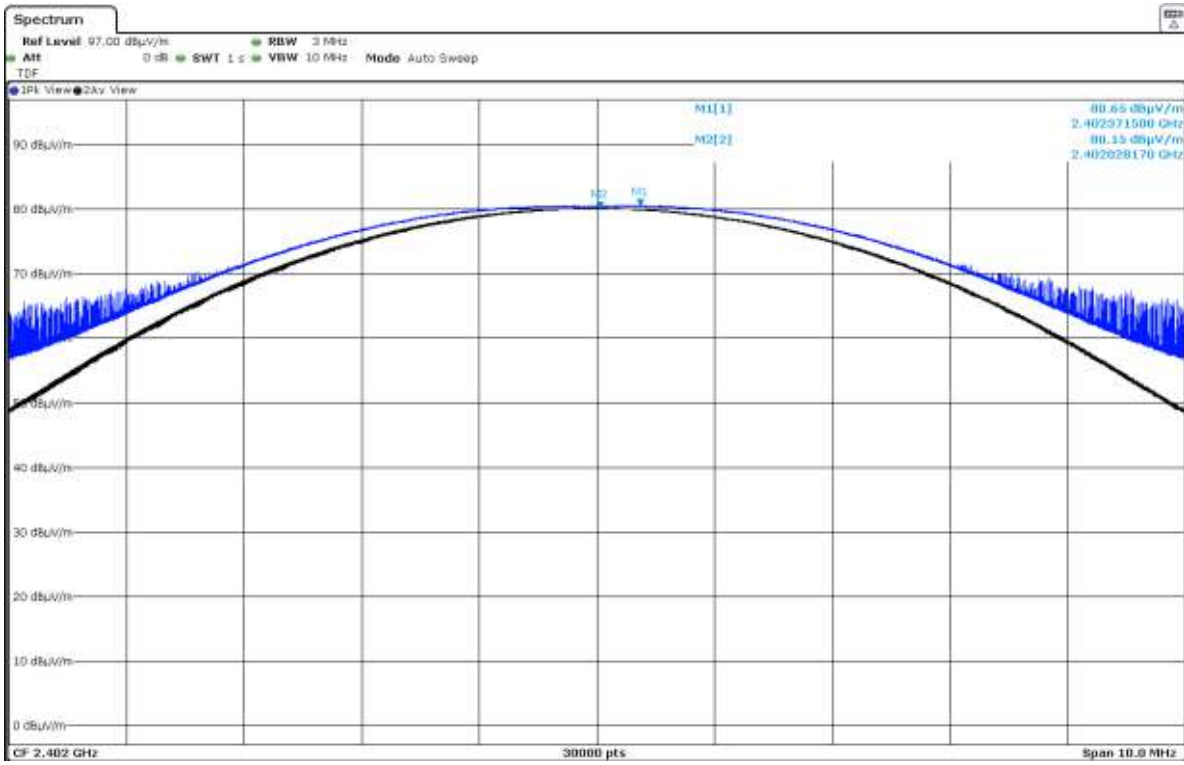
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

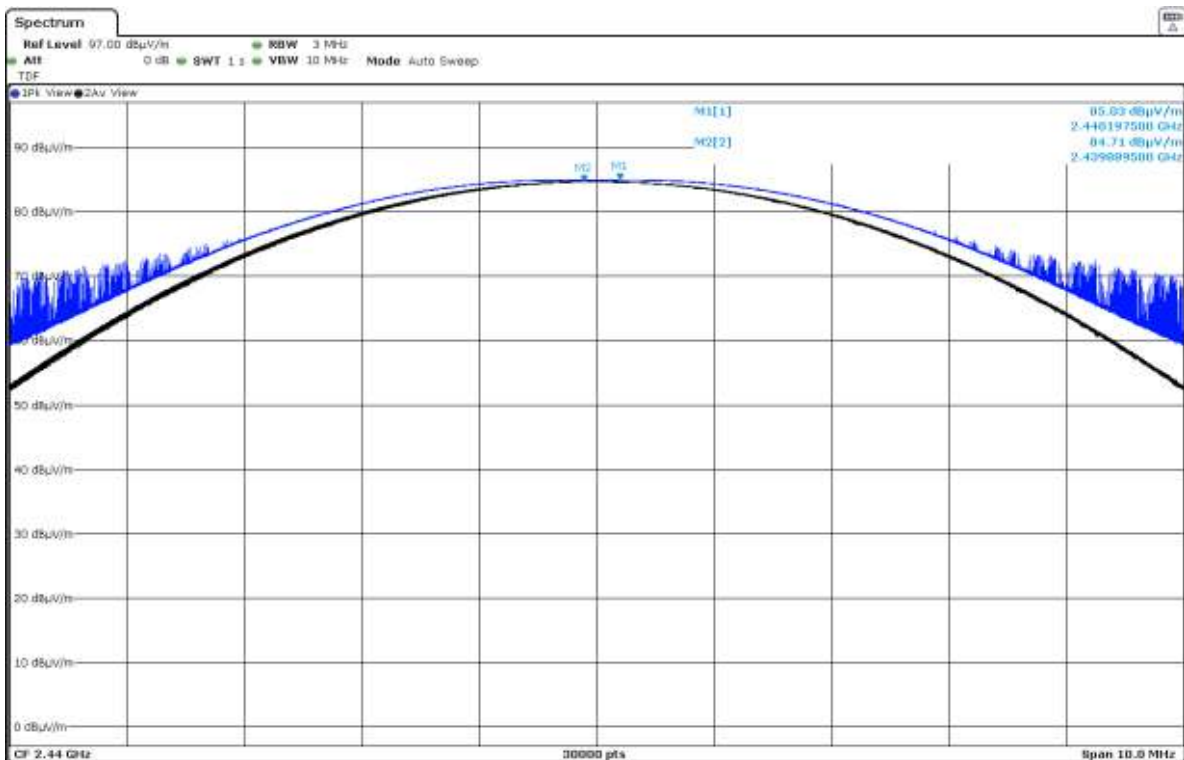
| | Low Channel 2402 MHz | Middle Channel 2440 MHz | High Channel 2480 MHz |
|---------------------------------|-------------------------|----------------------------|--------------------------|
| Average Field Strength (dBµV/m) | 80.15 | 84.71 | 82.65 |
| Peak Field Strength (dBµV/m) | 80.65 | 85.03 | 83.04 |
| Measurement Uncertainty (dB) | <±3.05 | | |

Verdict: PASS

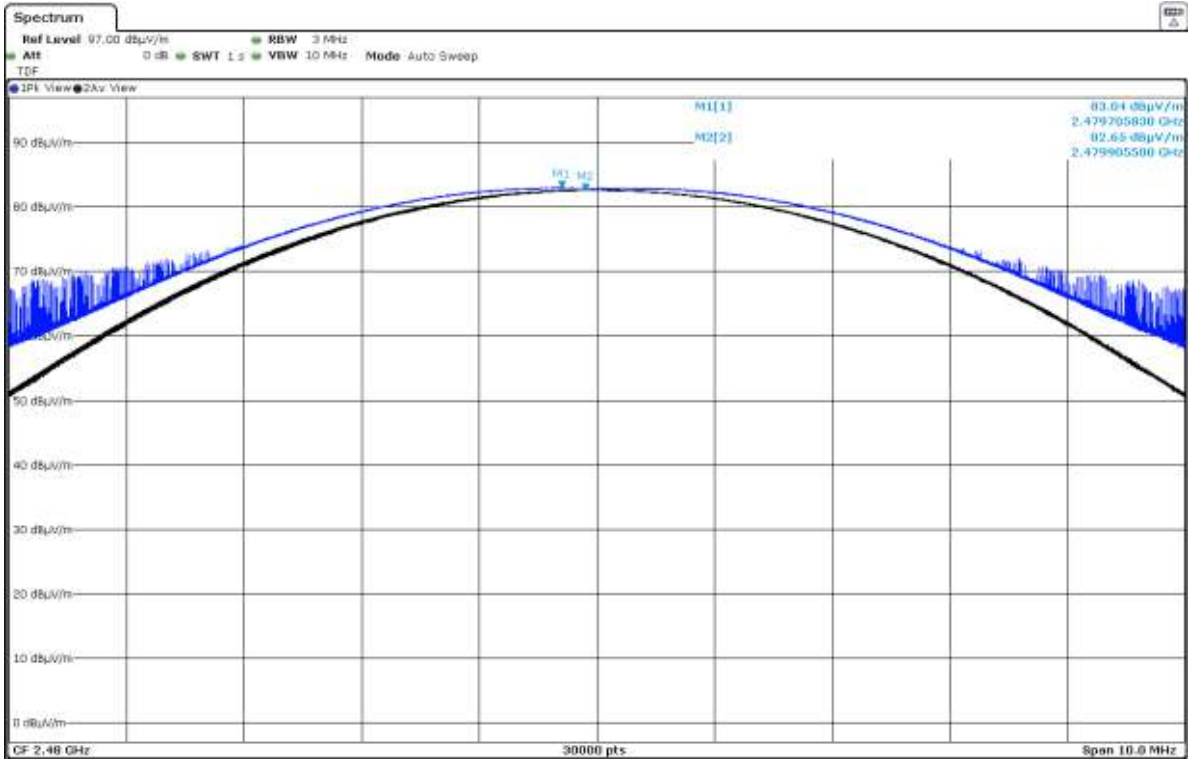
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (d) / RSS-210 B.10. (b) Emissions radiated outside of the specific frequency bands

SPECIFICATION:

The field strength of harmonics from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of harmonics ($\mu\text{V/m}$) | Field strength of harmonics ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------------|---|--|--------------------------|
| 902 - 928 | 500 | 54 | 3 |
| 2400 – 2483.5 | 500 | 54 | 3 |
| 5725 - 5875 | 500 | 54 | 3 |
| 24000-24250 | 2500 | 67.96 | 3 |

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

| Frequency Range (MHz) | Field strength ($\mu\text{V/m}$) | Field strength ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------|------------------------------------|---|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | - | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| 960 - 25000 | 500 | 54 | 3 |

Whichever is the lesser attenuation.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz.

The spurious signals detected do not depend on the operating channel.

No spurious emissions were found at less than 20 dB from the limit.

Frequency range 1 - 26 GHz.

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

Spurious signals with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with average detector for checking compliance with the average limit.

- Low Channel (2402 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 4.80437 | Peak | 40.91 | V | < \pm 3.70 |
| 21.62105 | Peak | 42.87 | H | < \pm 3.70 |

- Middle Channel (2440 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 21.96305 | Peak | 42.67 | H | < \pm 3.70 |

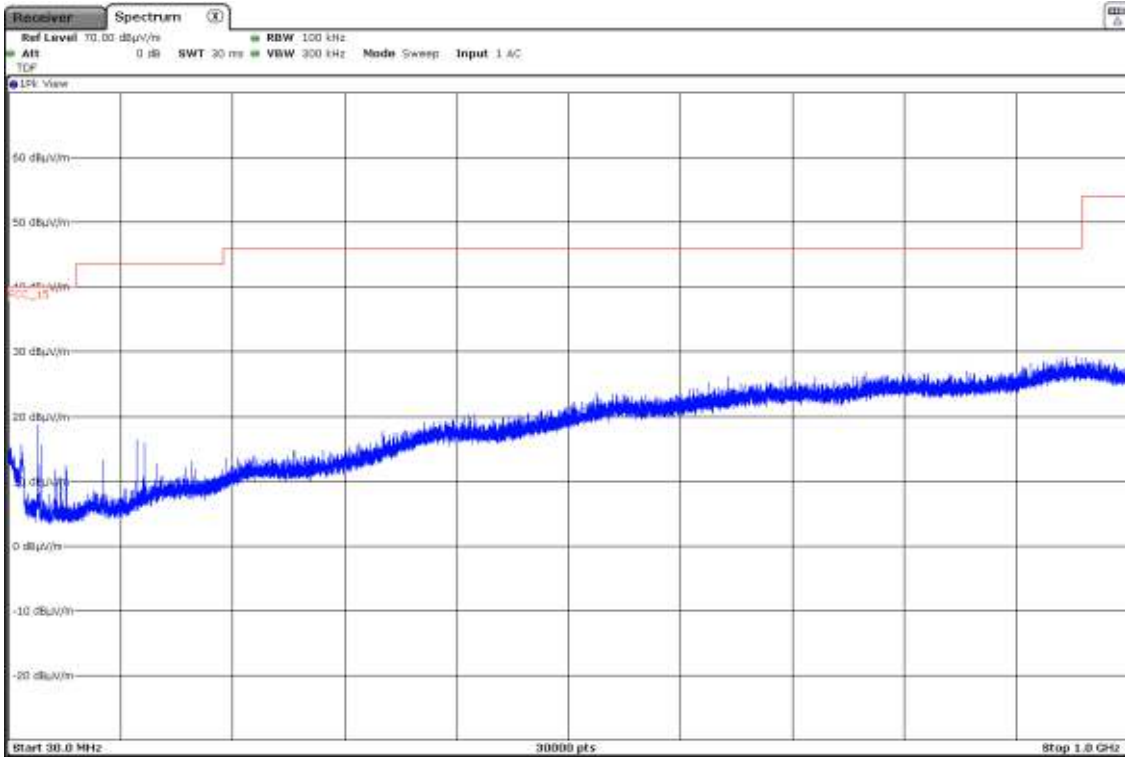
- High Channel (2480 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 2.48358 | Peak | 60.13 | V | < \pm 3.70 |
| | Average | 41.41 | | |
| 4.96023 | Peak | 40.98 | H | < \pm 3.70 |
| 22.32305 | Peak | 43.92 | H | < \pm 3.70 |

Verdict: PASS

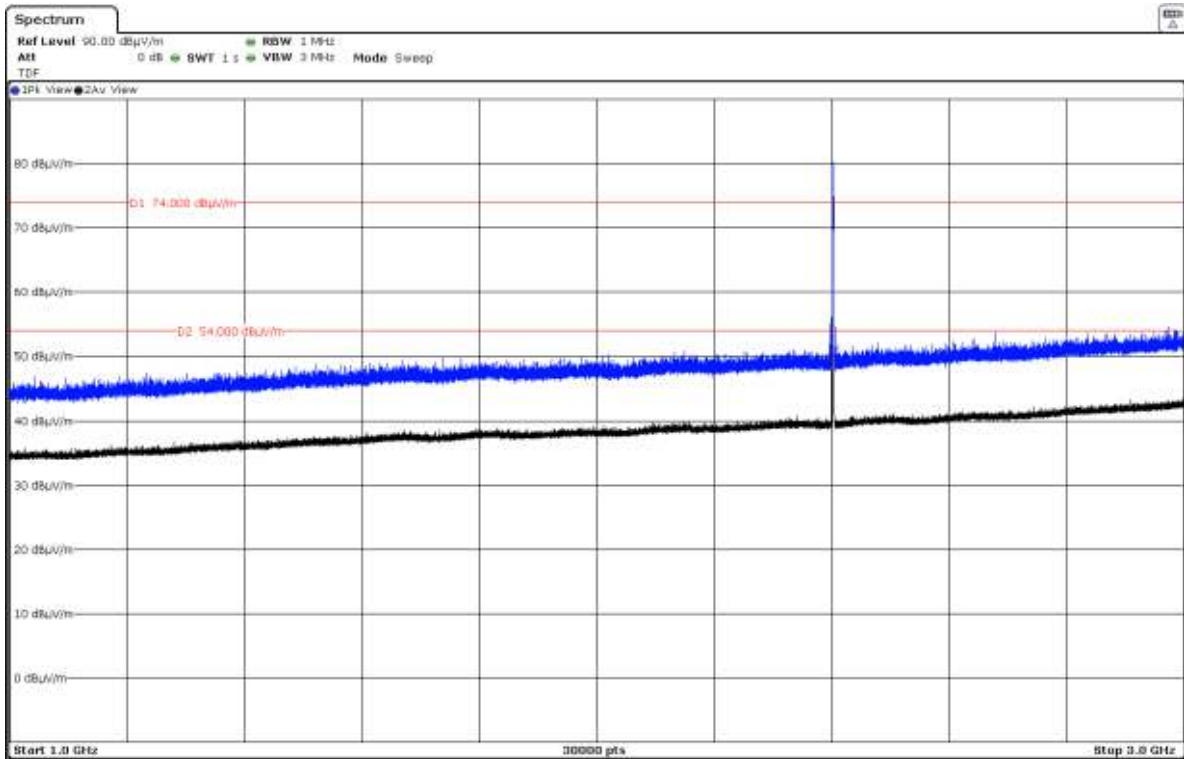
FREQUENCY RANGE 30 MHz - 1 GHz

The spurious signals detected do not depend on the operating channel, so this plot is valid for Low, Middle and High Channels.



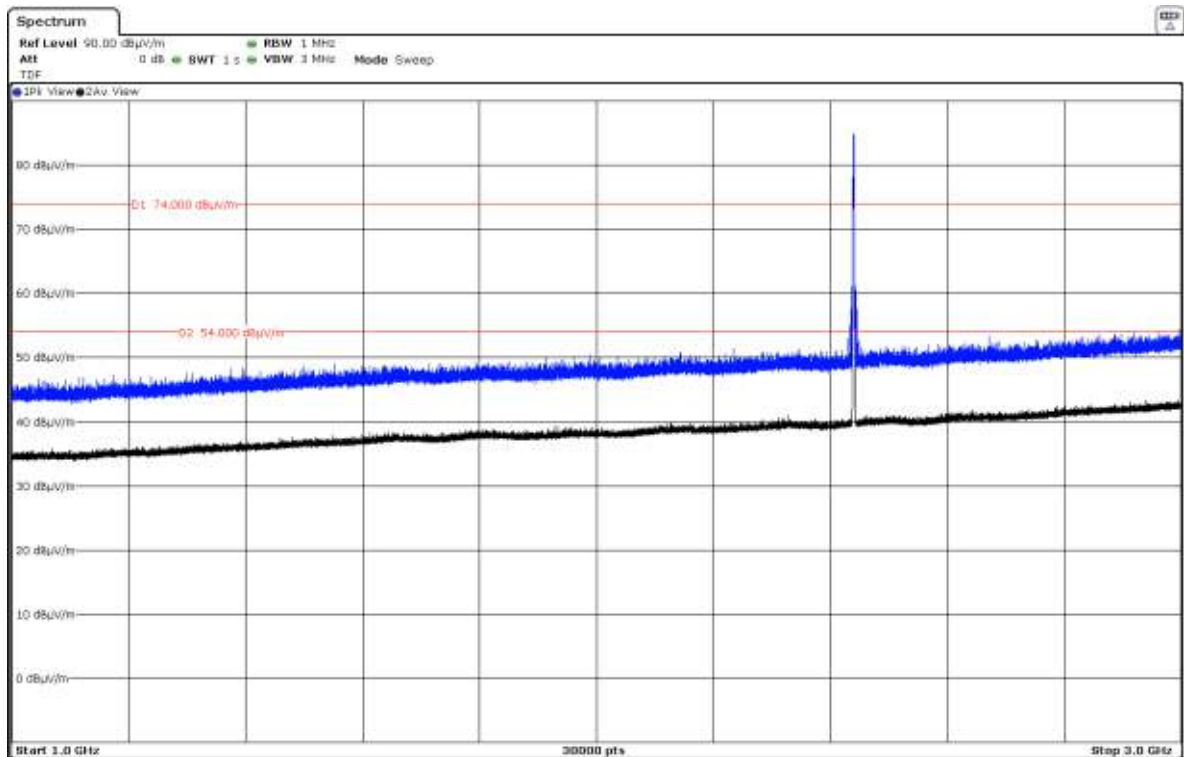
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



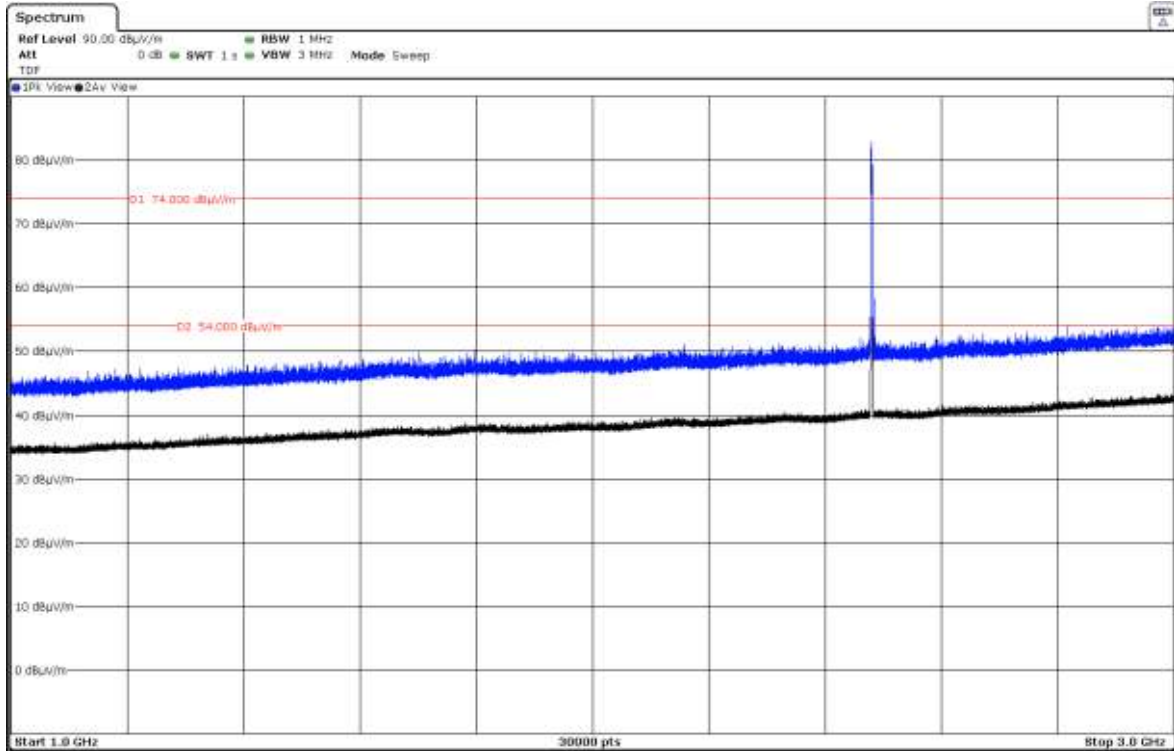
The peak shown in the plot above the limit is the carrier frequency.

- Middle Channel:



The peak shown in the plot above the limit is the carrier frequency.

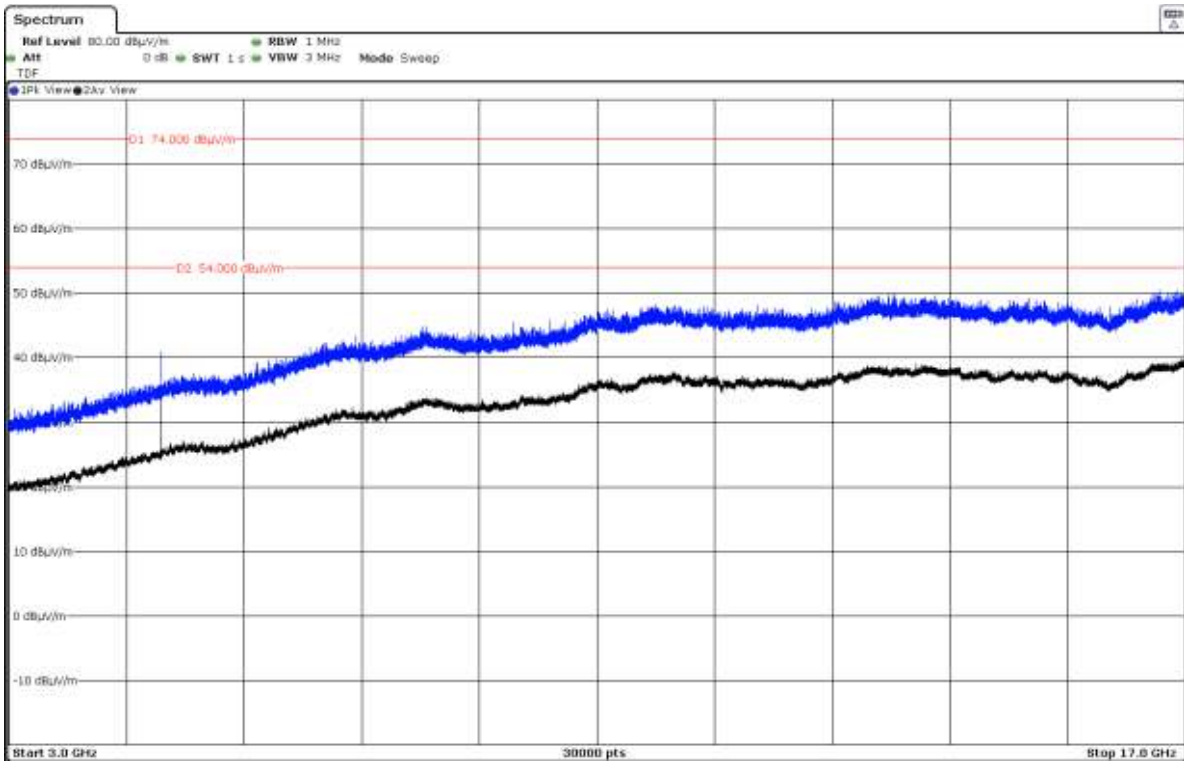
- High Channel:



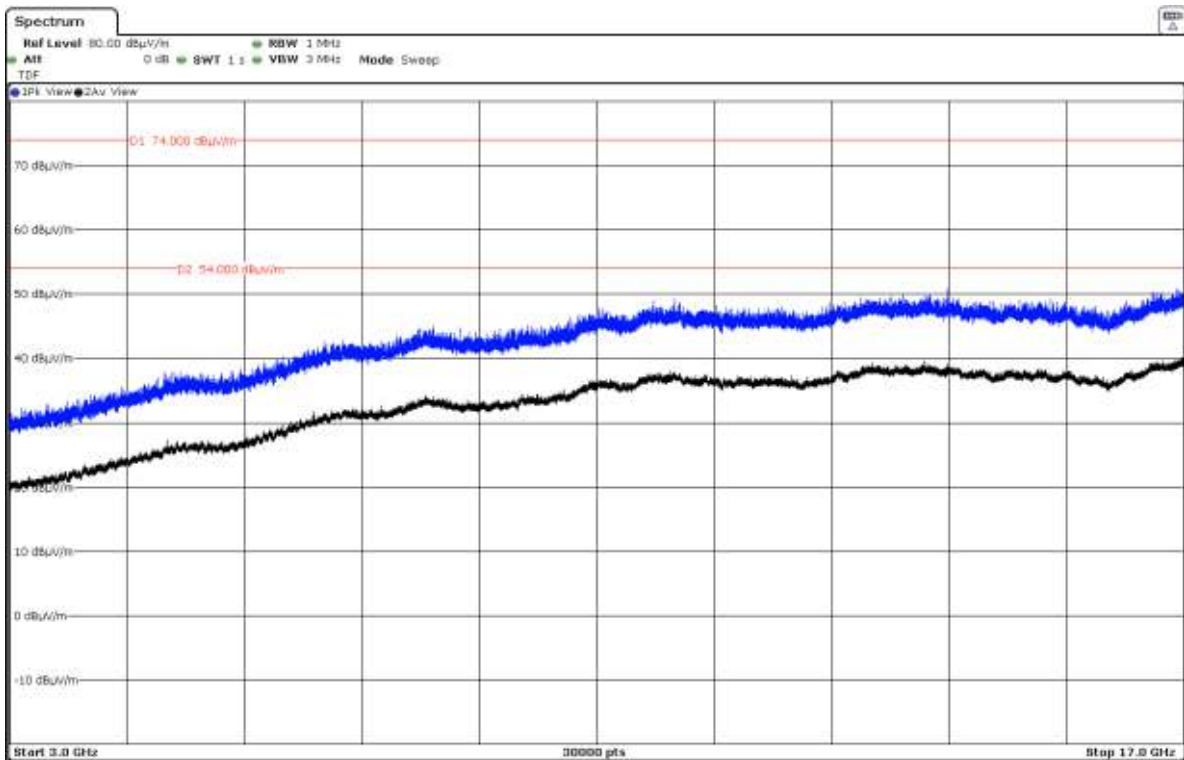
The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

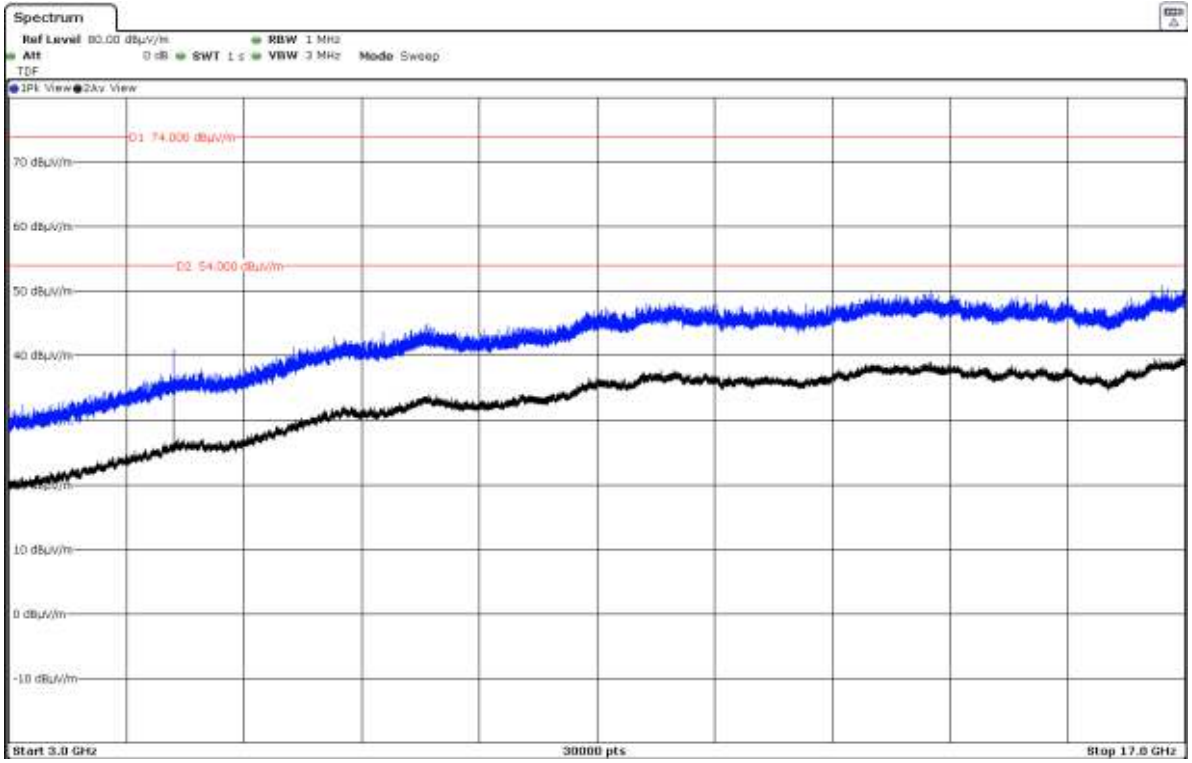
- Low Channel:



- Middle Channel:

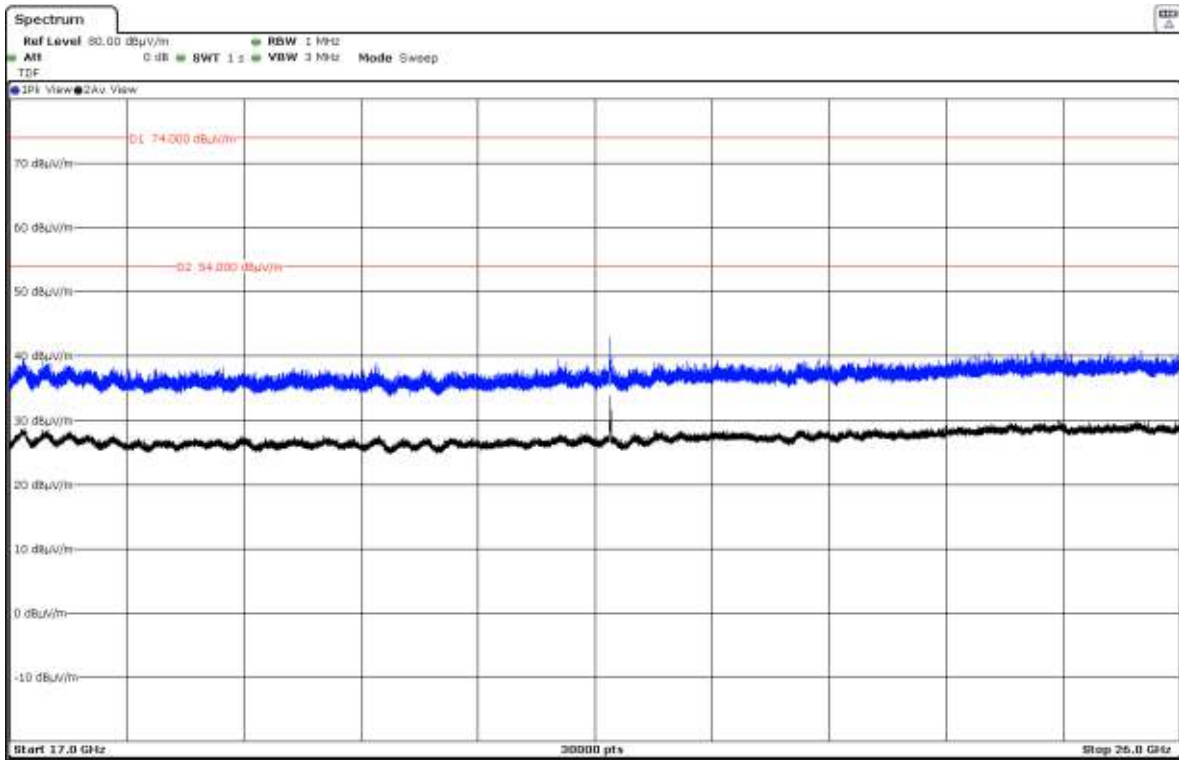


- High Channel:

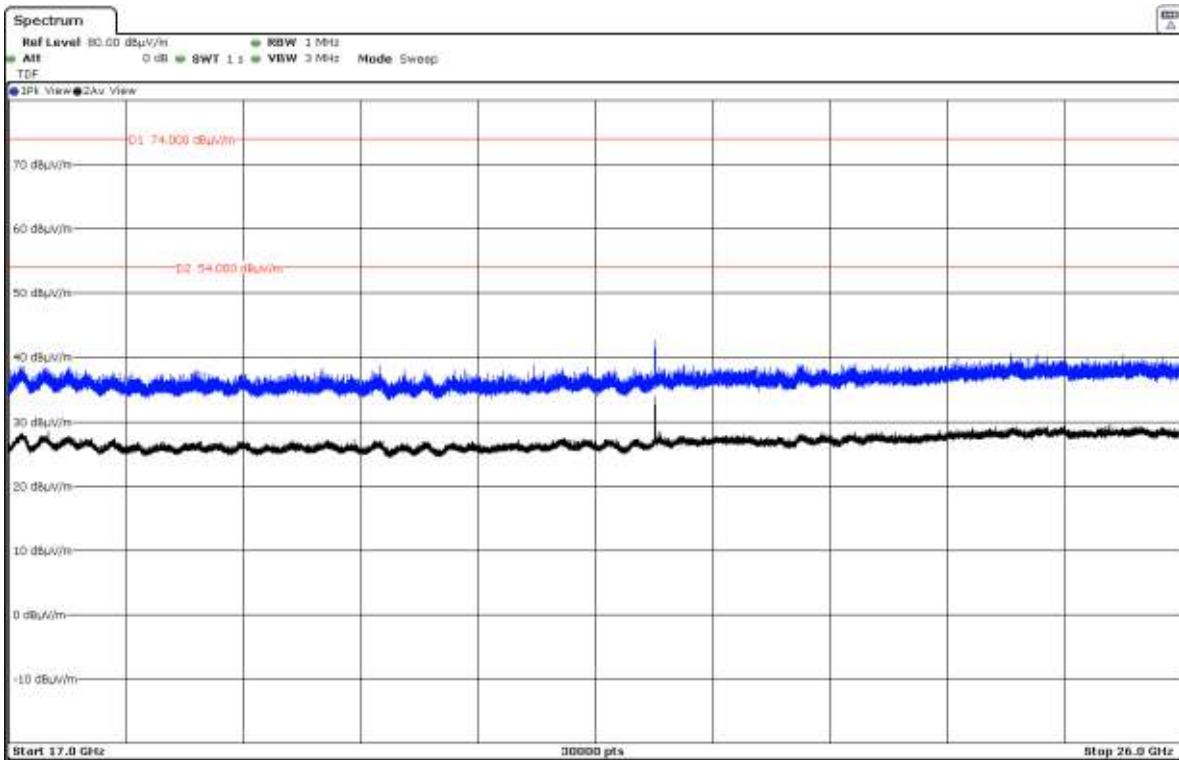


FREQUENCY RANGE 17 - 26 GHz

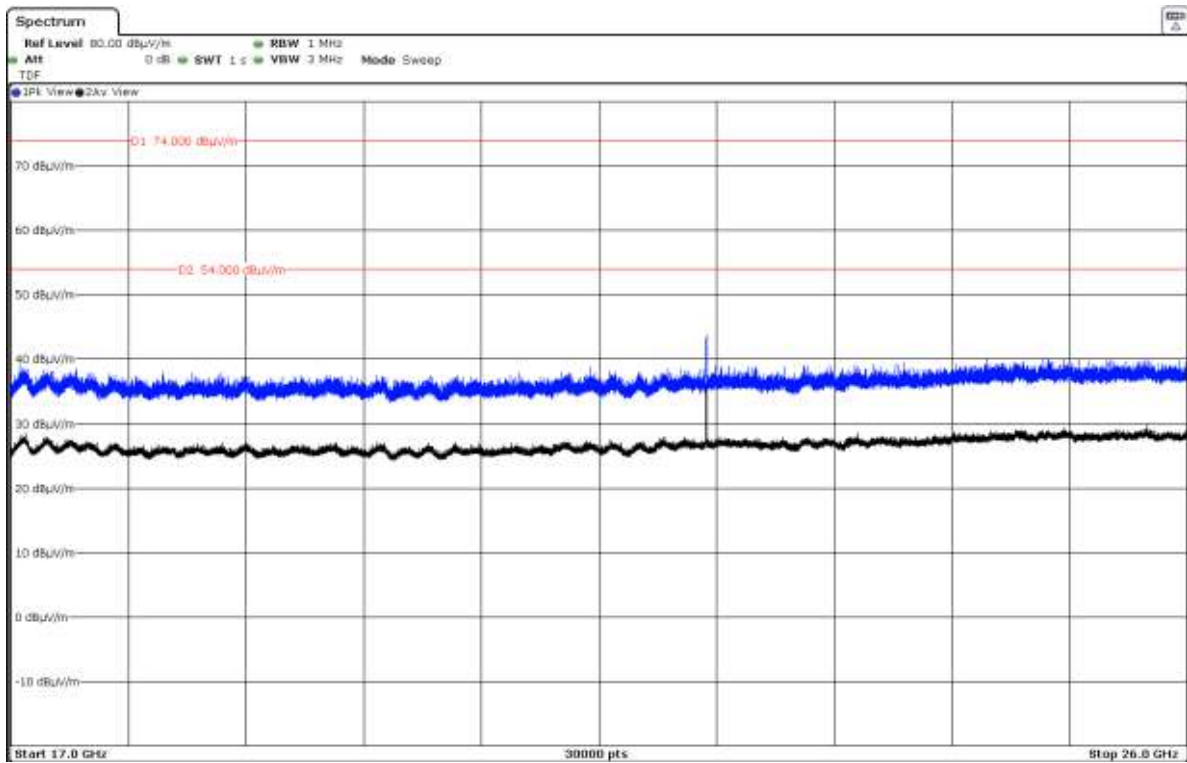
-Low channel:



-Middle channel:

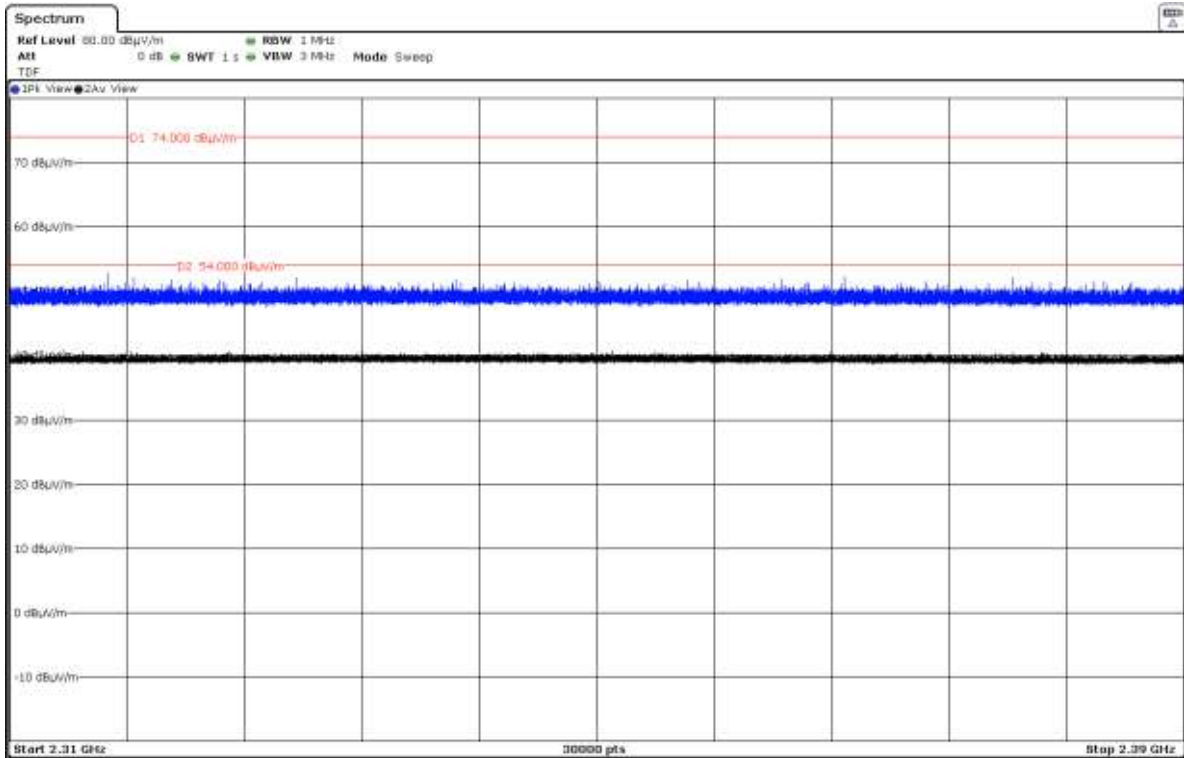


-High channel:

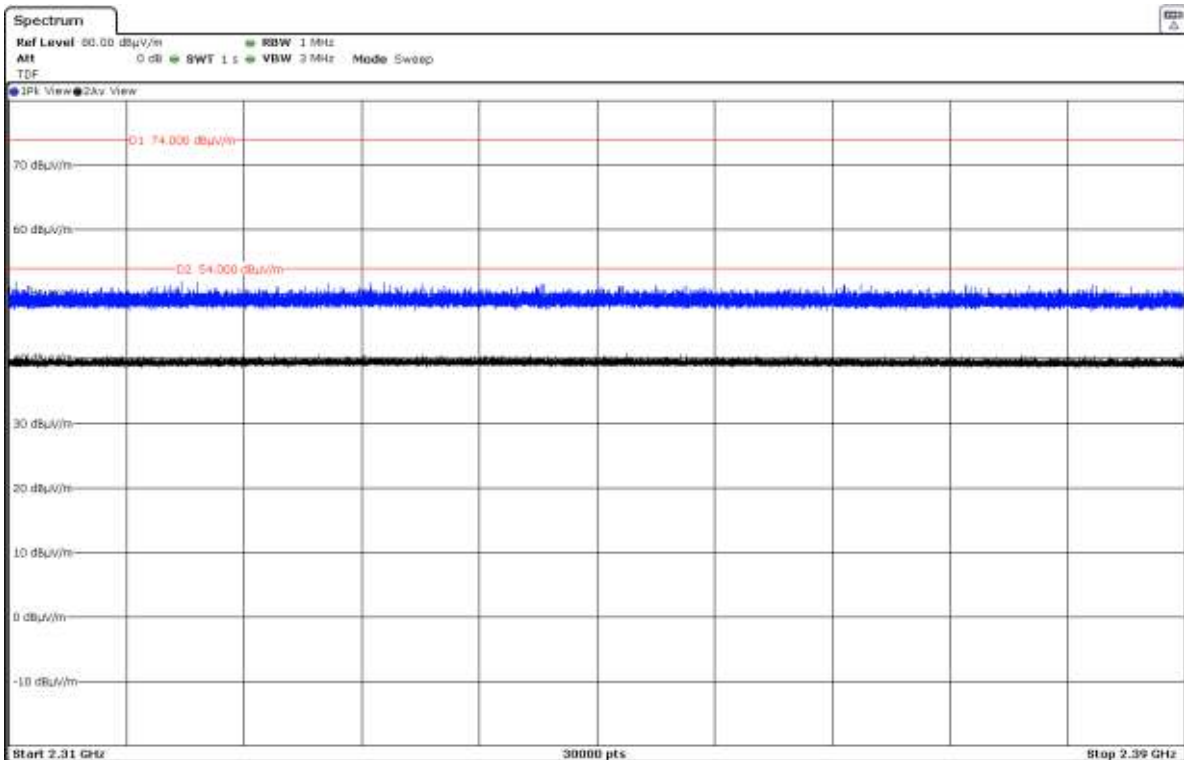


FREQUENCY RANGE 2.31 - 2.39 GHz

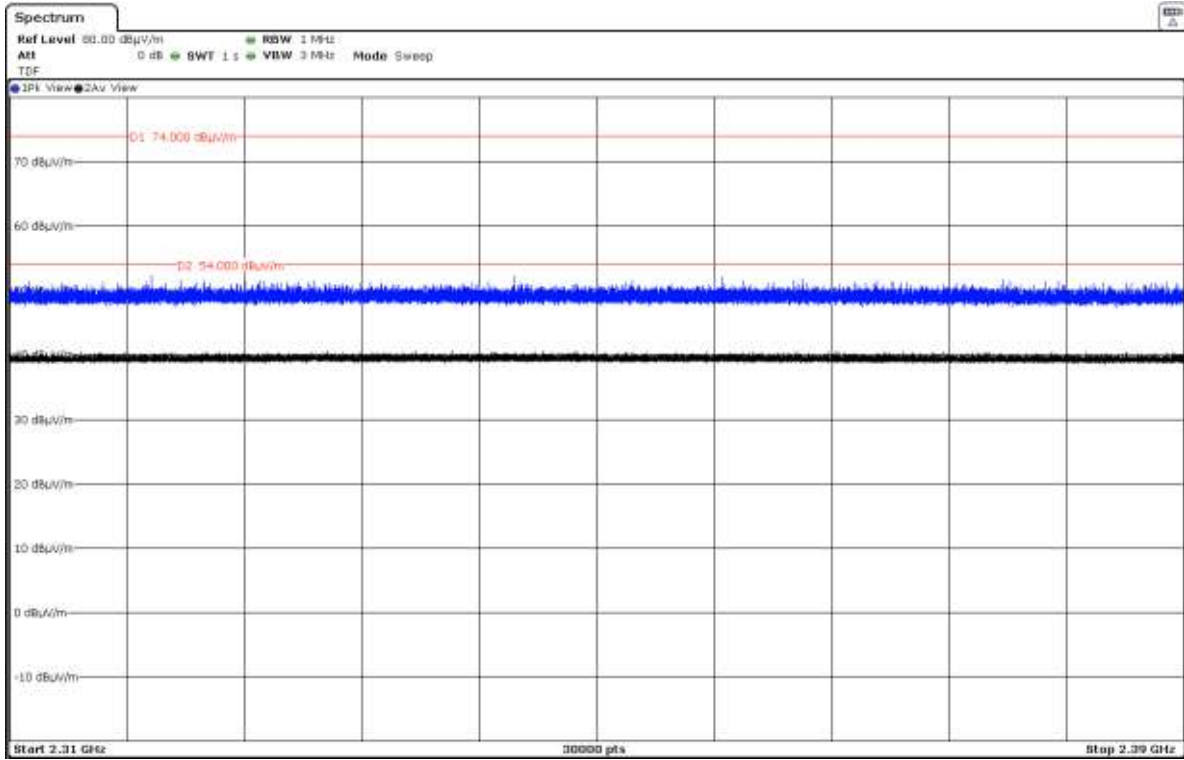
- Low Channel:



- Middle Channel:

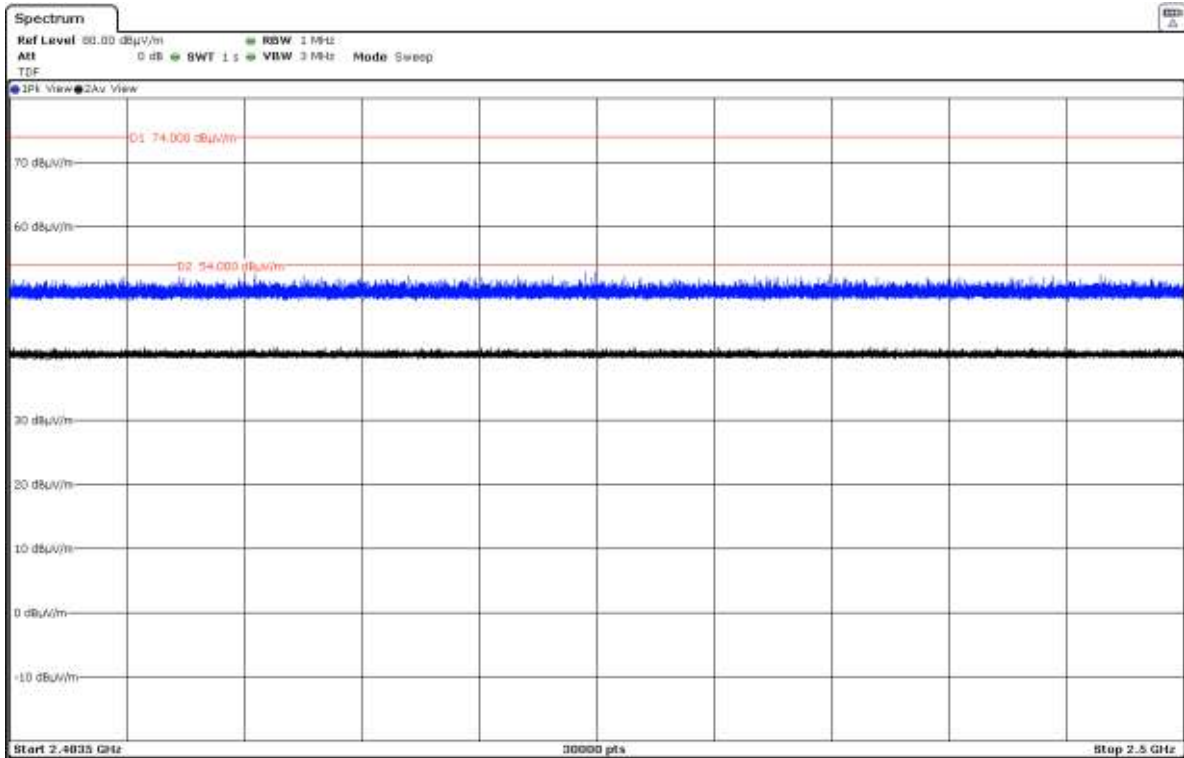


- High Channel:

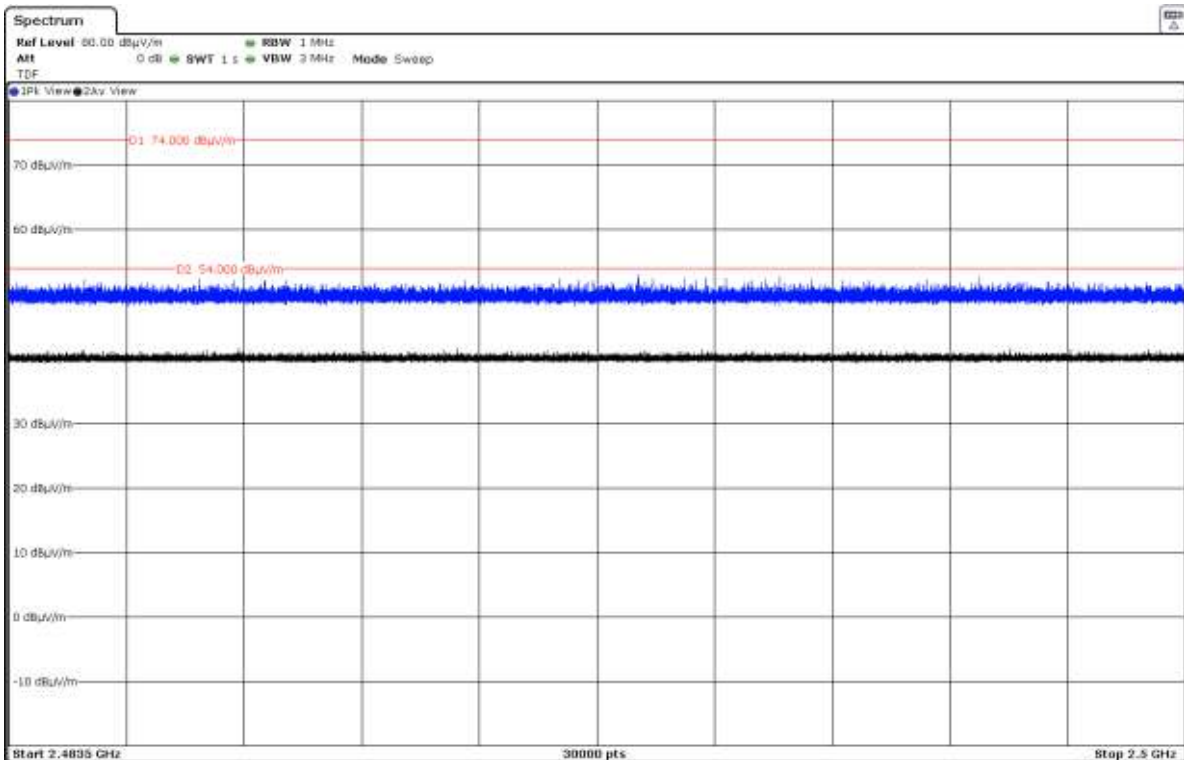


FREQUENCY RANGE 2.4835 - 2.5 GHz

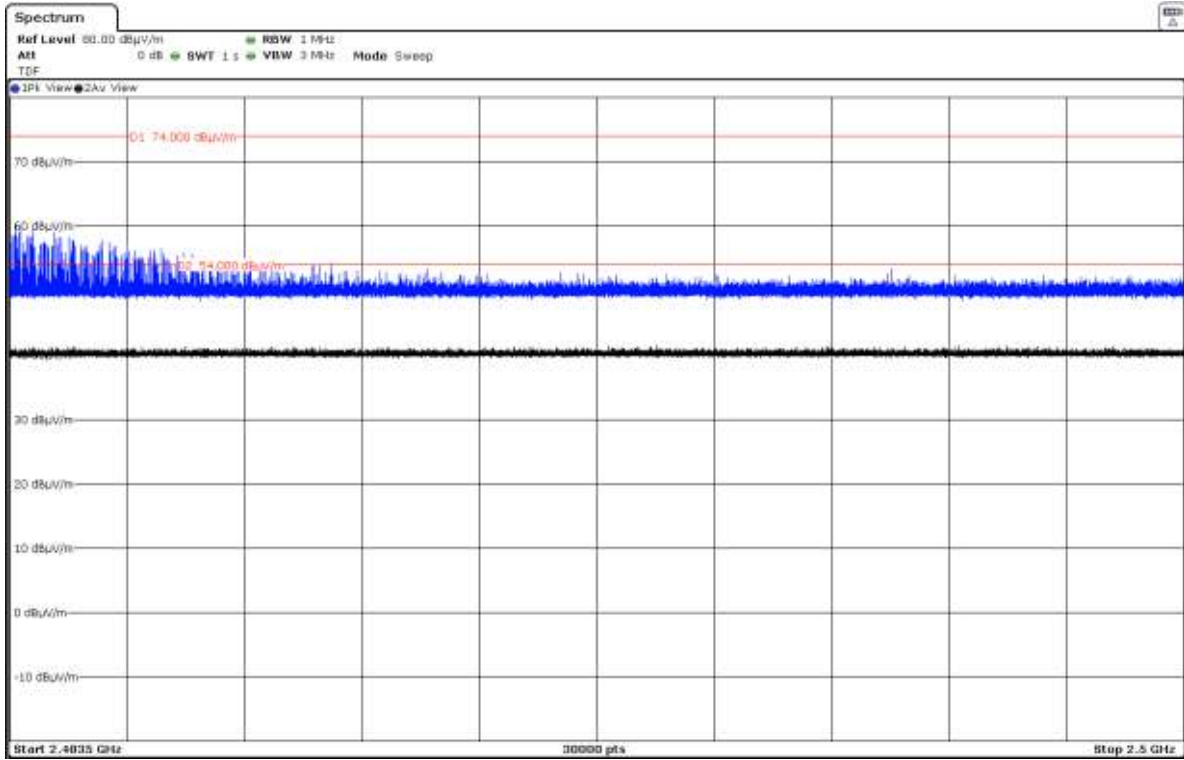
- Low Channel:



- Middle Channel:



- High Channel:



Appendix D: Test results. Proprietary protocol Flora

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TEST CONDITIONS

POWER SUPPLY (V):

V nominal: 3.7 Vdc
Type of power supply: DC voltage from rechargeable battery.
Type of antenna: Integral antenna.
Declared antenna gain: - 8.5 dBi

TEST FREQUENCIES:

Low Channel: 2402 MHz
Middle Channel: 2440 MHz
High Channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS

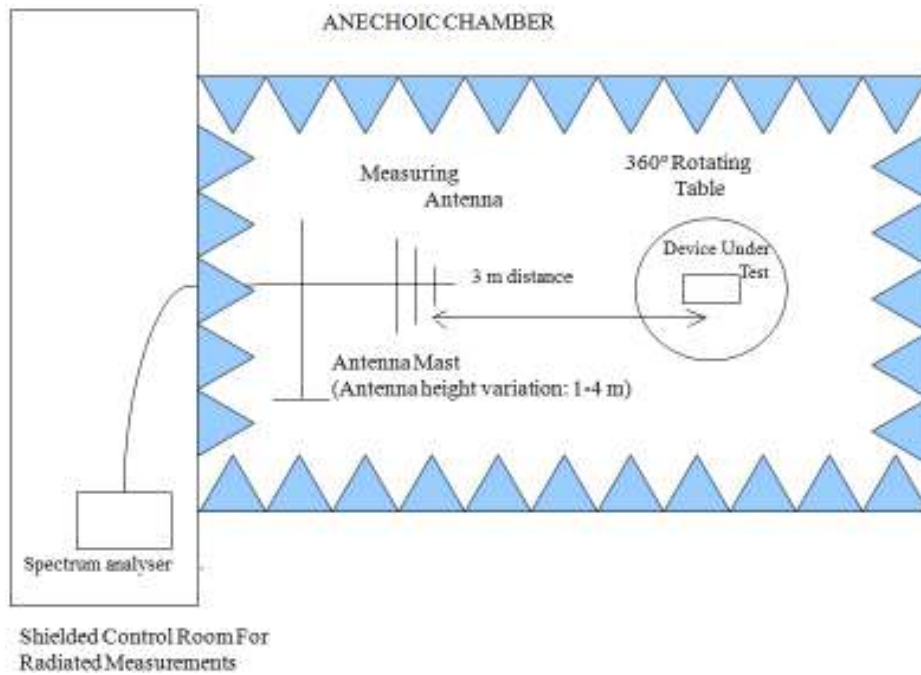
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

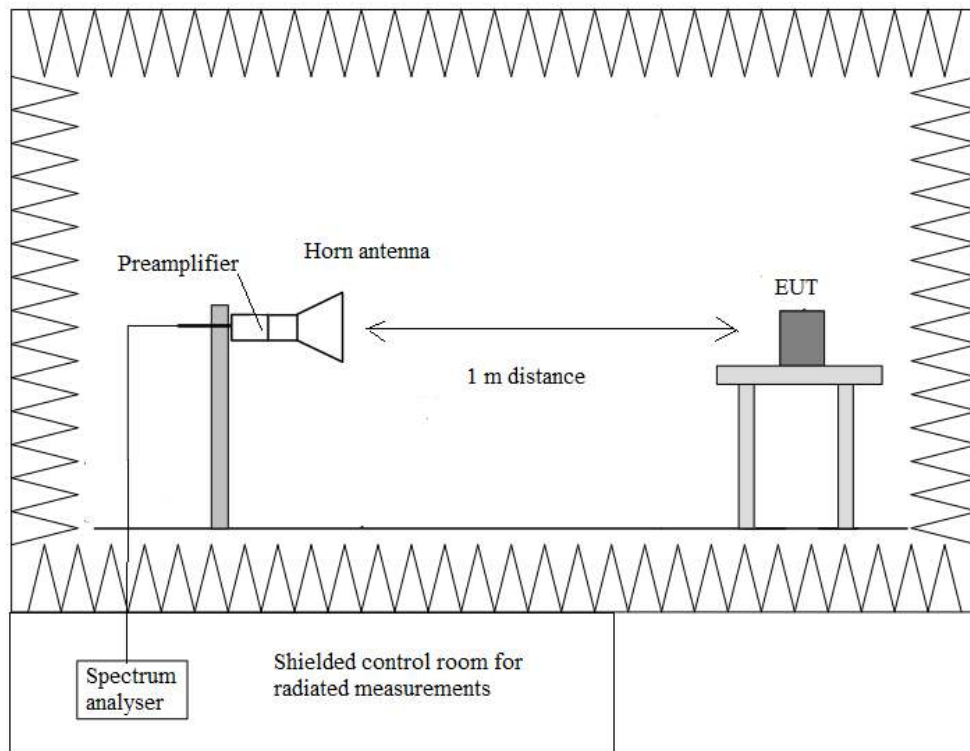
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup $f < 1$ GHz:



Radiated measurements setup $f > 1$ GHz:

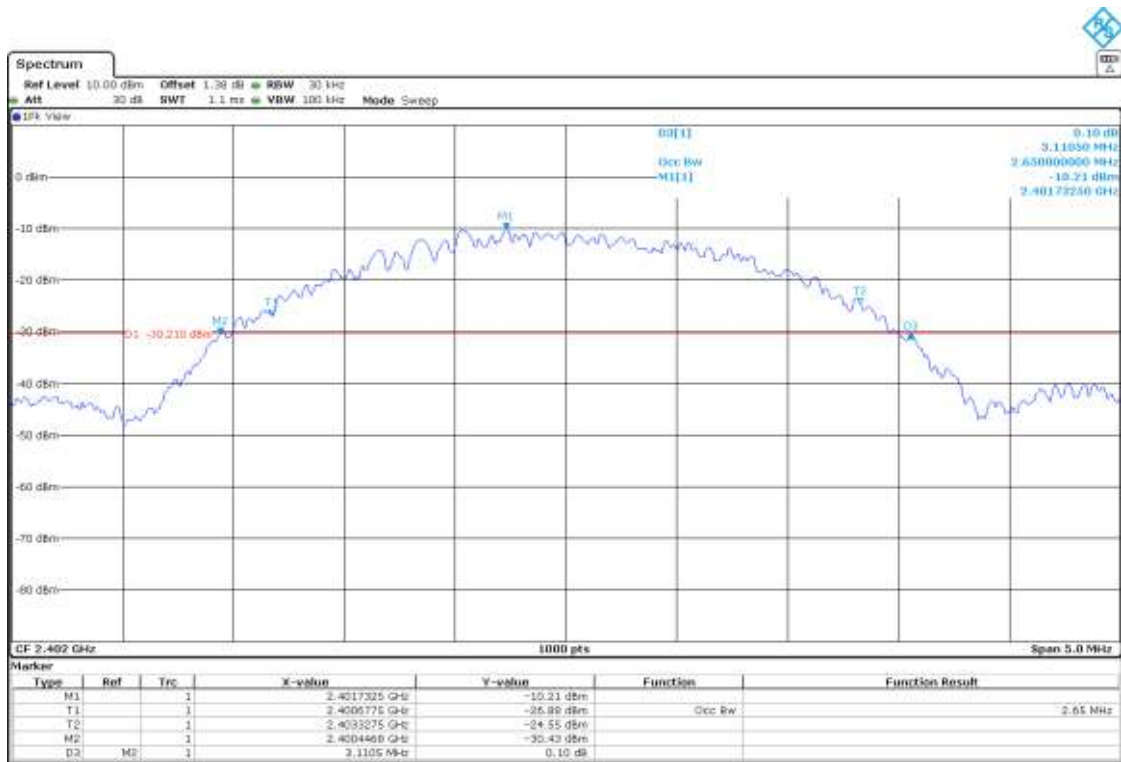


Occupied Bandwidth

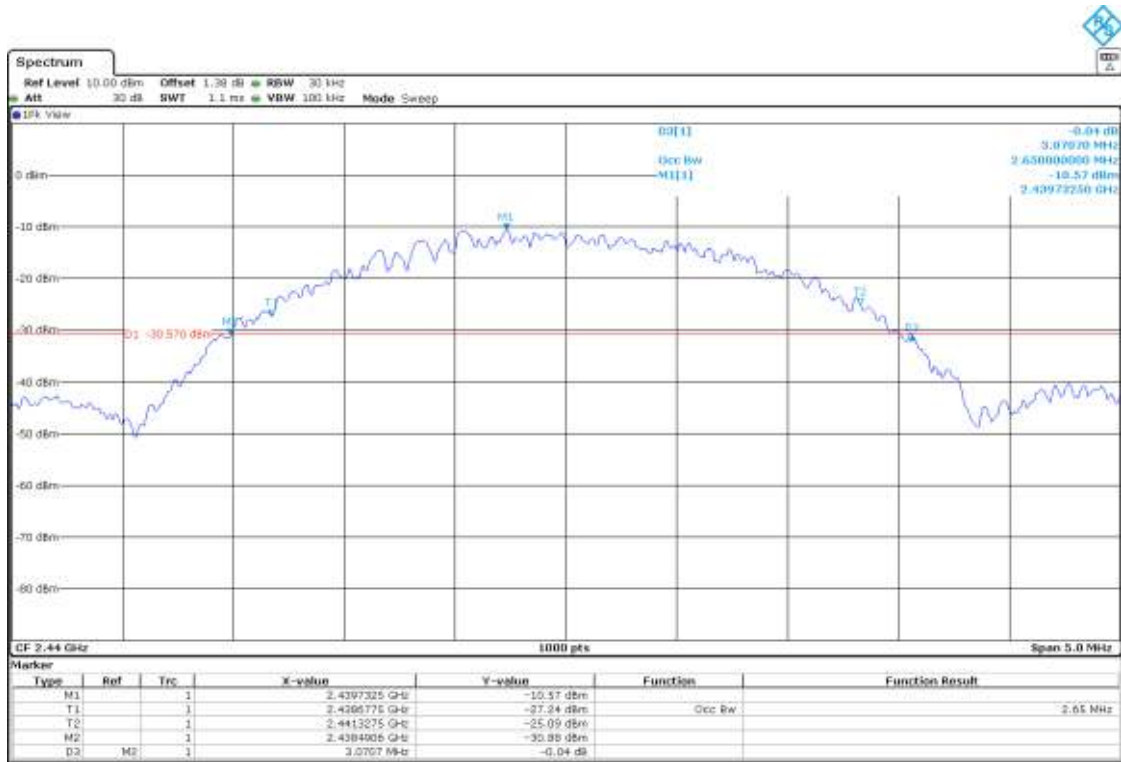
RESULTS:

| | | | |
|-------------------------------|-------------------------|----------------------------|--------------------------|
| | Low Channel 2402 MHz | Middle Channel 2440 MHz | High Channel 2480 MHz |
| 99% Bandwidth (MHz) | 2.65 | 2.65 | 2.66 |
| Measurement Uncertainty (kHz) | <±5.00 | | |

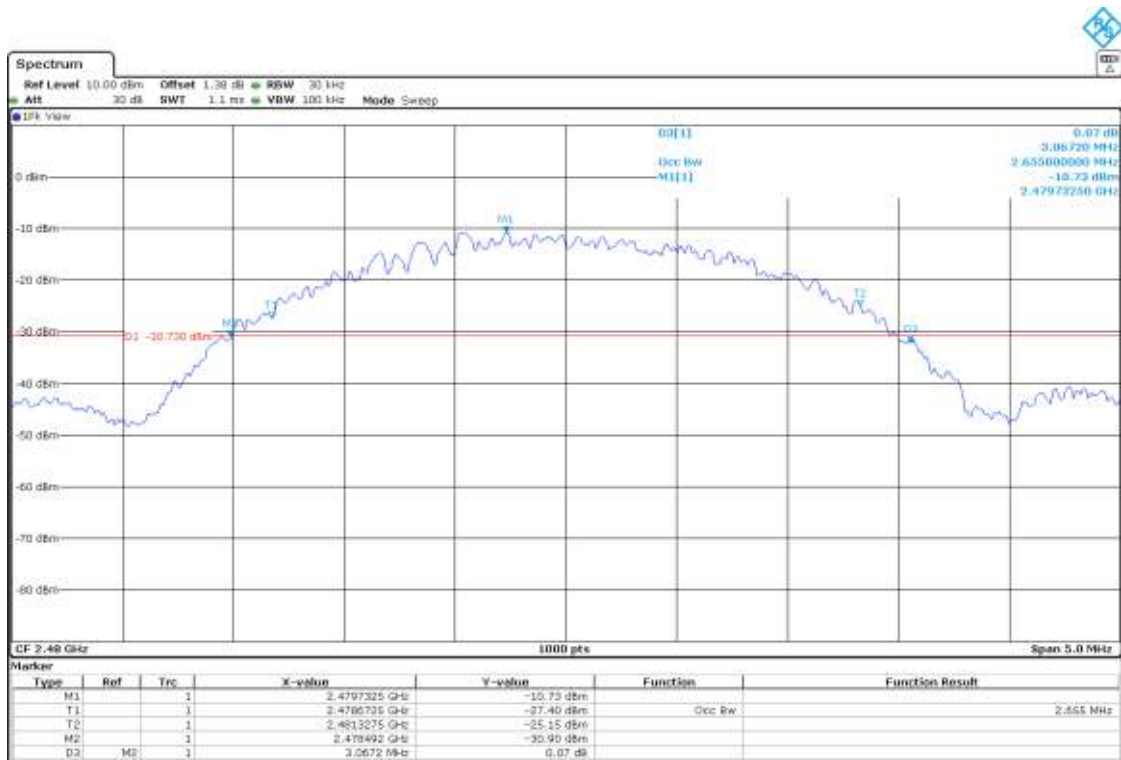
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of fundamental and harmonics emissions

SPECIFICATION:

The field strength of emissions from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of fundamental (mV/m) | Field strength (dBµV/m) | Measurement distance (m) |
|-----------------------------|--------------------------------------|-------------------------|--------------------------|
| 902 - 928 | 50 | 93.98 | 3 |
| 2400 – 2483.5 | 50 | 93.98 | 3 |
| 5725 - 5875 | 50 | 93.98 | 3 |
| 24000-24250 | 250 | 107.96 | 3 |

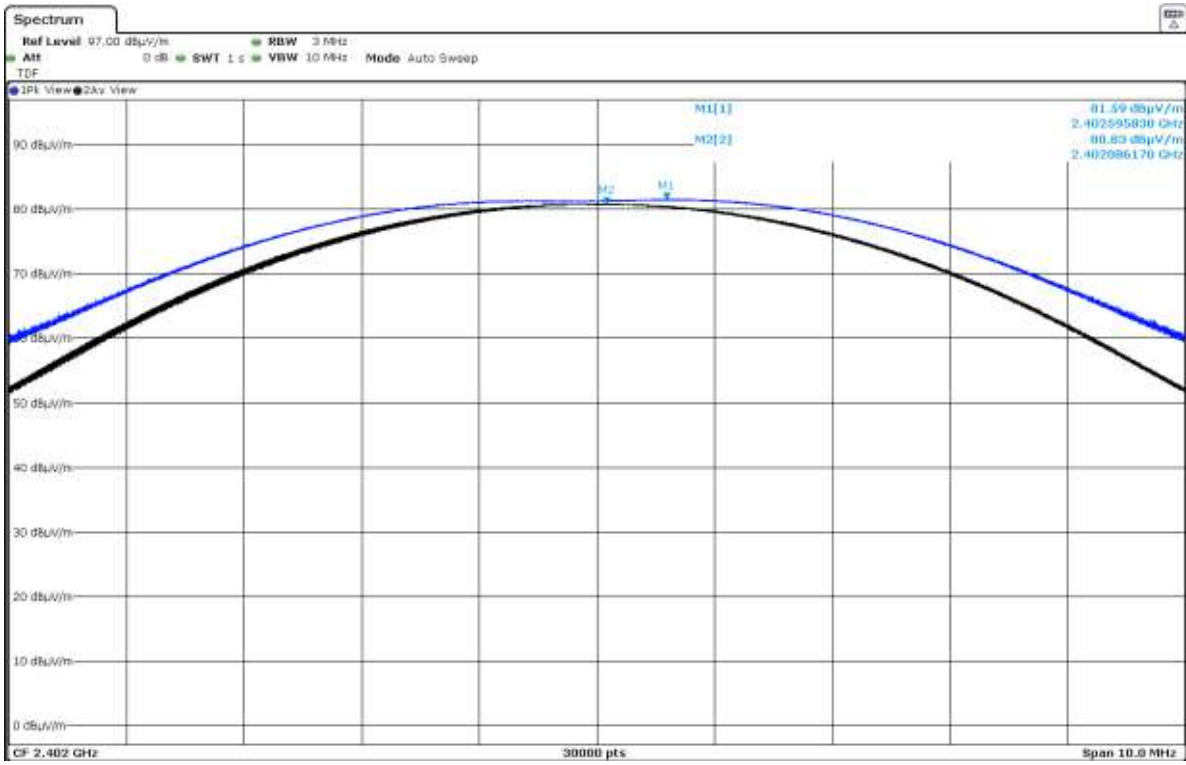
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

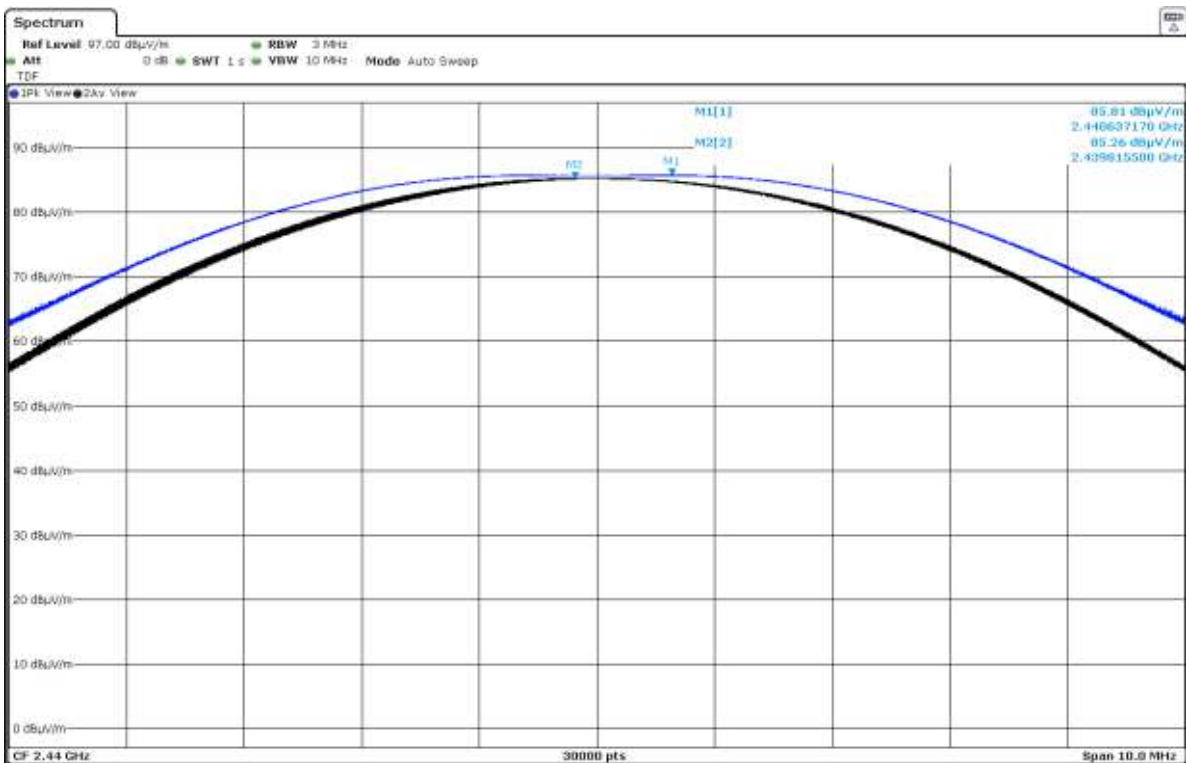
| | Low Channel 2402 MHz | Middle Channel 2440 MHz | High Channel 2480 MHz |
|---------------------------------|-------------------------|----------------------------|--------------------------|
| Average Field Strength (dBµV/m) | 80.83 | 85.26 | 82.96 |
| Peak Field Strength (dBµV/m) | 81.59 | 85.81 | 83.61 |
| Measurement Uncertainty (dB) | <±3.05 | | |

Verdict: PASS

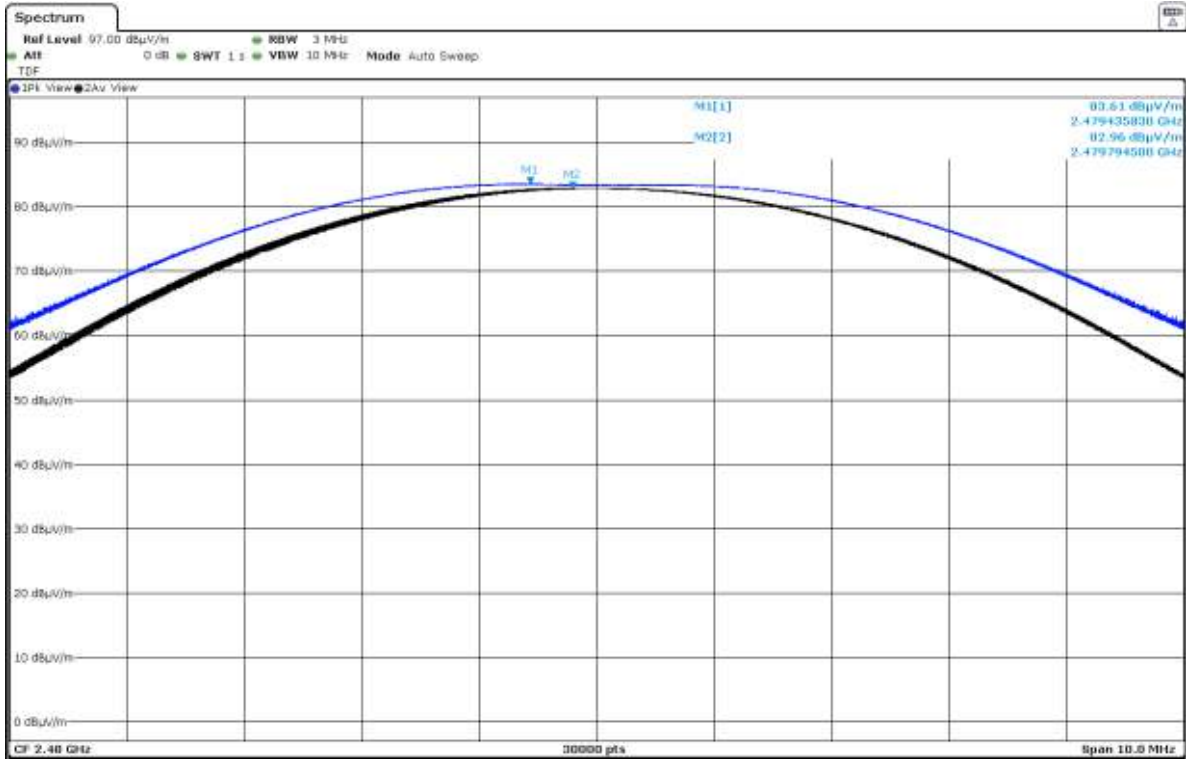
- Low Channel:



- Middle Channel:



- High Channel:



Section 15.249 Subclause (d) / RSS-210 B.10. (b) Emissions radiated outside of the specific frequency bands

SPECIFICATION:

The field strength of harmonics from intentional radiators shall comply with the following

| Fundamental frequency (MHz) | Field strength of harmonics ($\mu\text{V/m}$) | Field strength of harmonics ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------------|---|--|--------------------------|
| 902 - 928 | 500 | 54 | 3 |
| 2400 – 2483.5 | 500 | 54 | 3 |
| 5725 - 5875 | 500 | 54 | 3 |
| 24000-24250 | 2500 | 67.96 | 3 |

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

| Frequency Range (MHz) | Field strength ($\mu\text{V/m}$) | Field strength ($\text{dB}\mu\text{V/m}$) | Measurement distance (m) |
|-----------------------|------------------------------------|---|--------------------------|
| 0.009-0.490 | 2400/F(kHz) | - | 300 |
| 0.490-1.705 | 24000/F(kHz) | - | 30 |
| 1.705 - 30.0 | 30 | - | 30 |
| 30 - 88 | 100 | 40 | 3 |
| 88 - 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| 960 - 25000 | 500 | 54 | 3 |

Whichever is the lesser attenuation.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-26 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz.

The spurious signals detected do not depend on the operating channel.

No spurious emissions were found at less than 20 dB of the limit.

Frequency range 1 - 26 GHz.

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

Spurious signals with peak levels above the average limit (54 dB μ V/m at 3 m) are measured with average detector for checking compliance with the average limit.

- Low Channel (2402 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 4.80297 | Peak | 38.58 | H | < \pm 3.70 |
| 21.61235 | Peak | 41.44 | H | < \pm 3.70 |

- Middle Channel (2440 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 21.96605 | Peak | 41.25 | H | < \pm 3.70 |

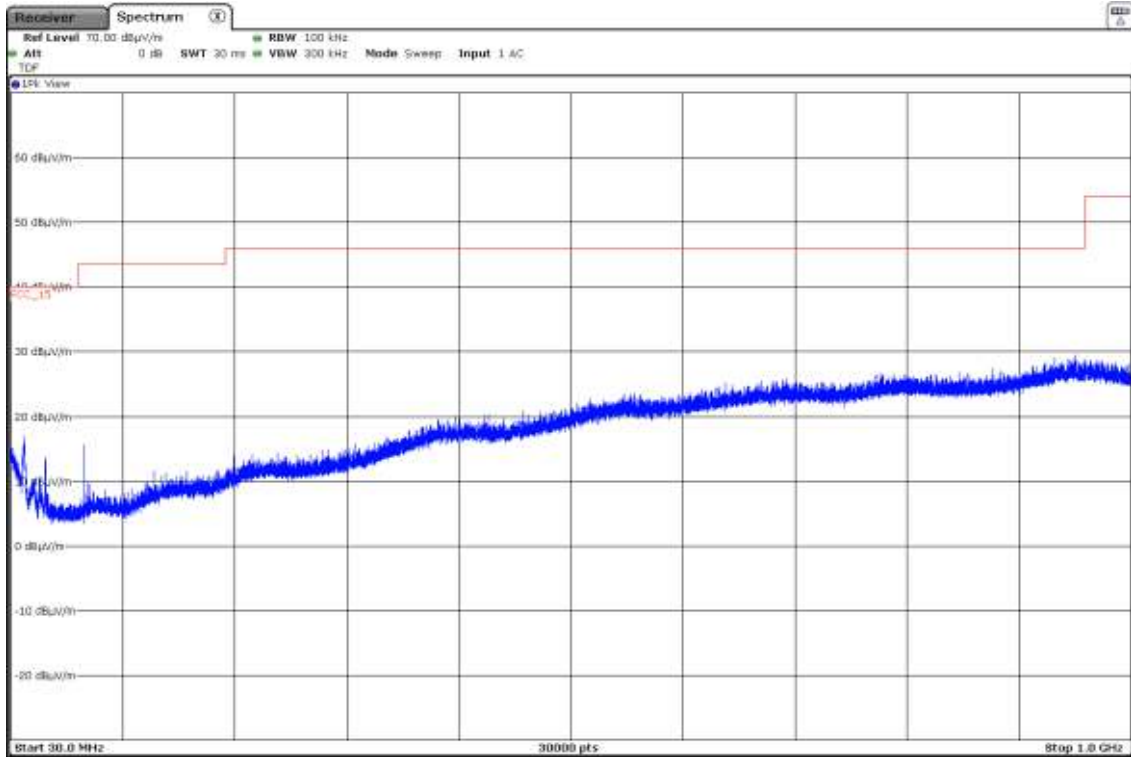
- High Channel (2480 MHz):

| Spurious frequency (GHz) | Detector | Emission Level (dB μ V/m) | Polarization | Measurement Uncertainty (dB) |
|--------------------------|----------|-------------------------------|--------------|------------------------------|
| 4.96023 | Peak | 40.65 | H | < \pm 3.70 |
| 22.32575 | Peak | 43.63 | H | < \pm 3.70 |

Verdict: PASS

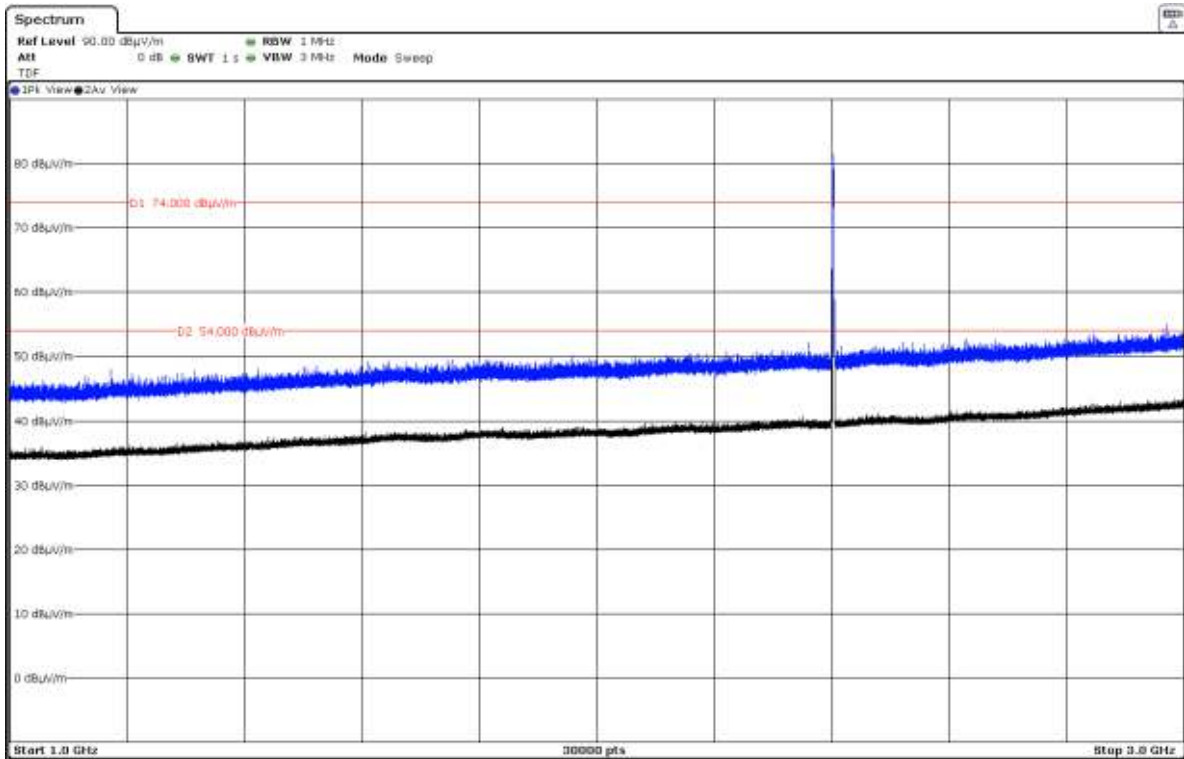
FREQUENCY RANGE 30 MHz - 1 GHz

The spurious signals detected do not depend on the operating channel, so this plot is valid for Low, Middle and High Channels.



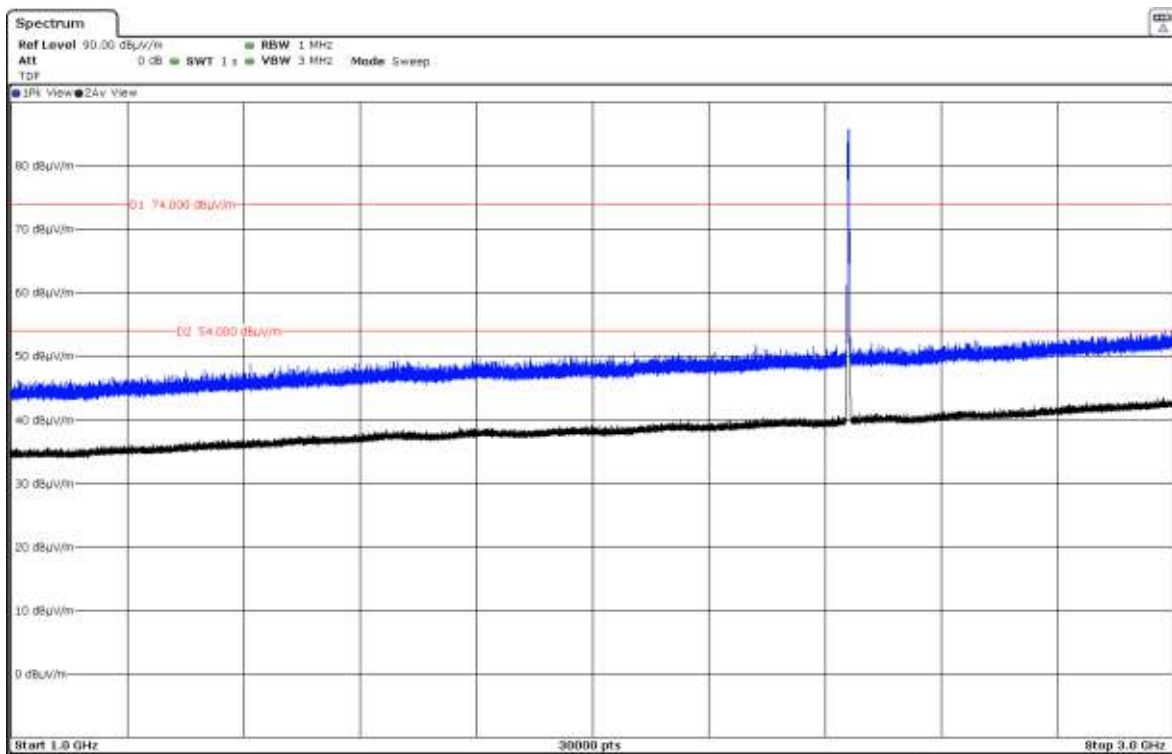
FREQUENCY RANGE 1 - 3 GHz

- Low Channel:



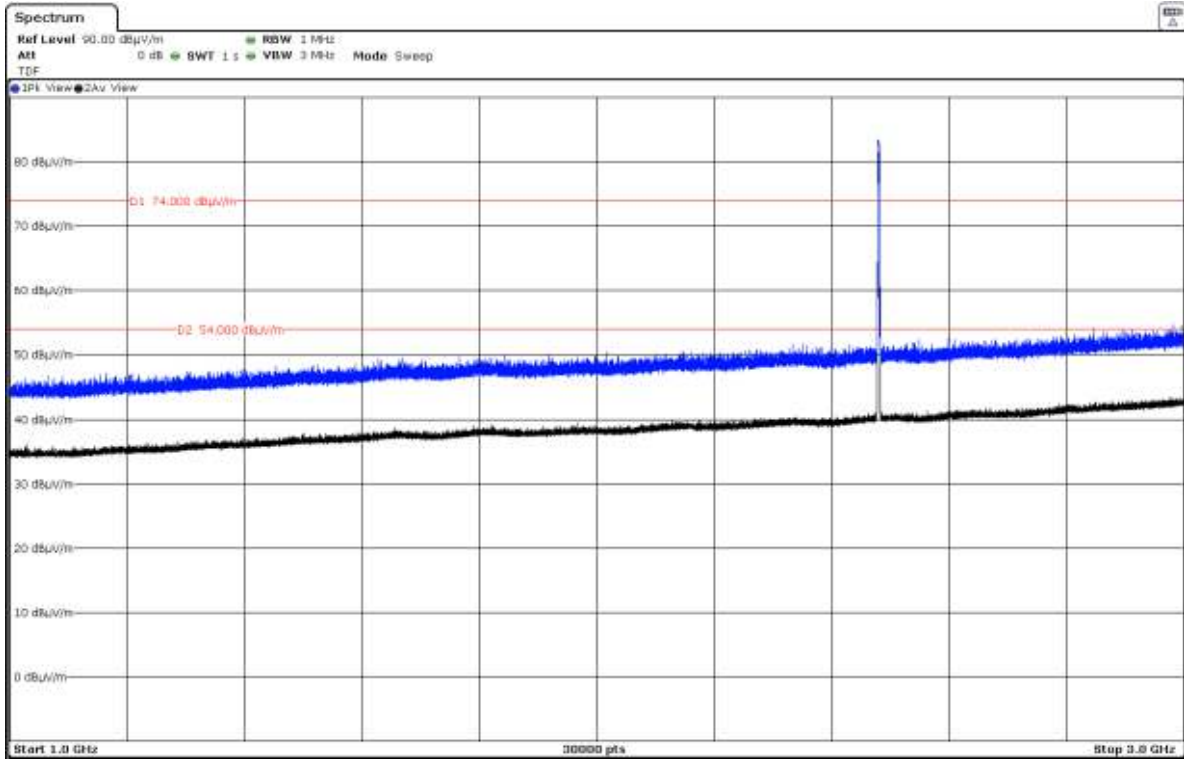
The peak shown in the plot above the limit is the carrier frequency.

- Middle Channel:



The peak shown in the plot above the limit is the carrier frequency.

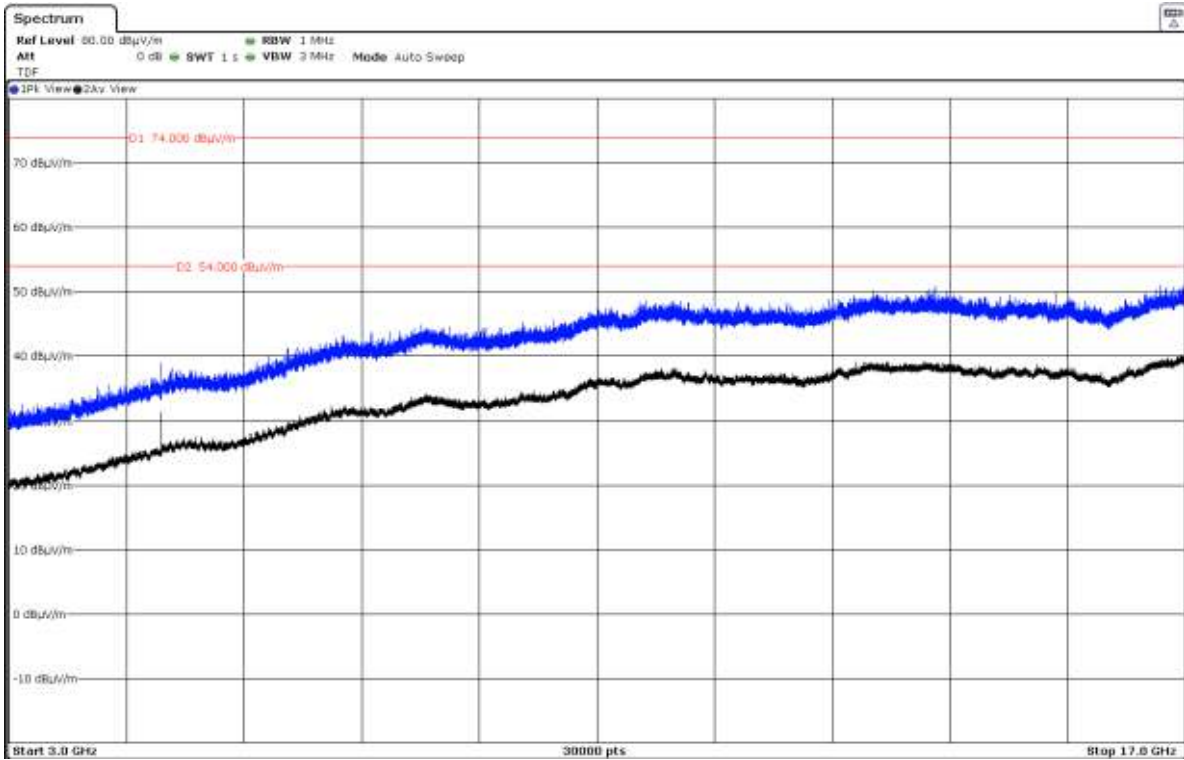
- High Channel:



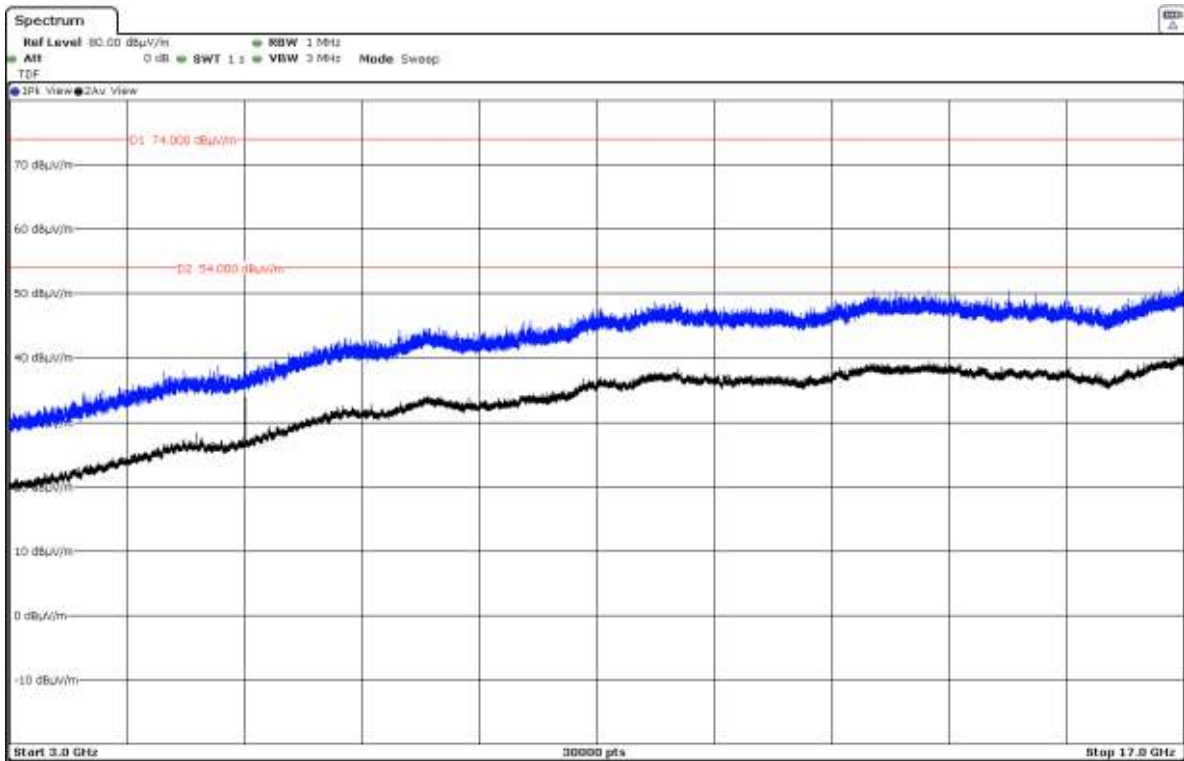
The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz

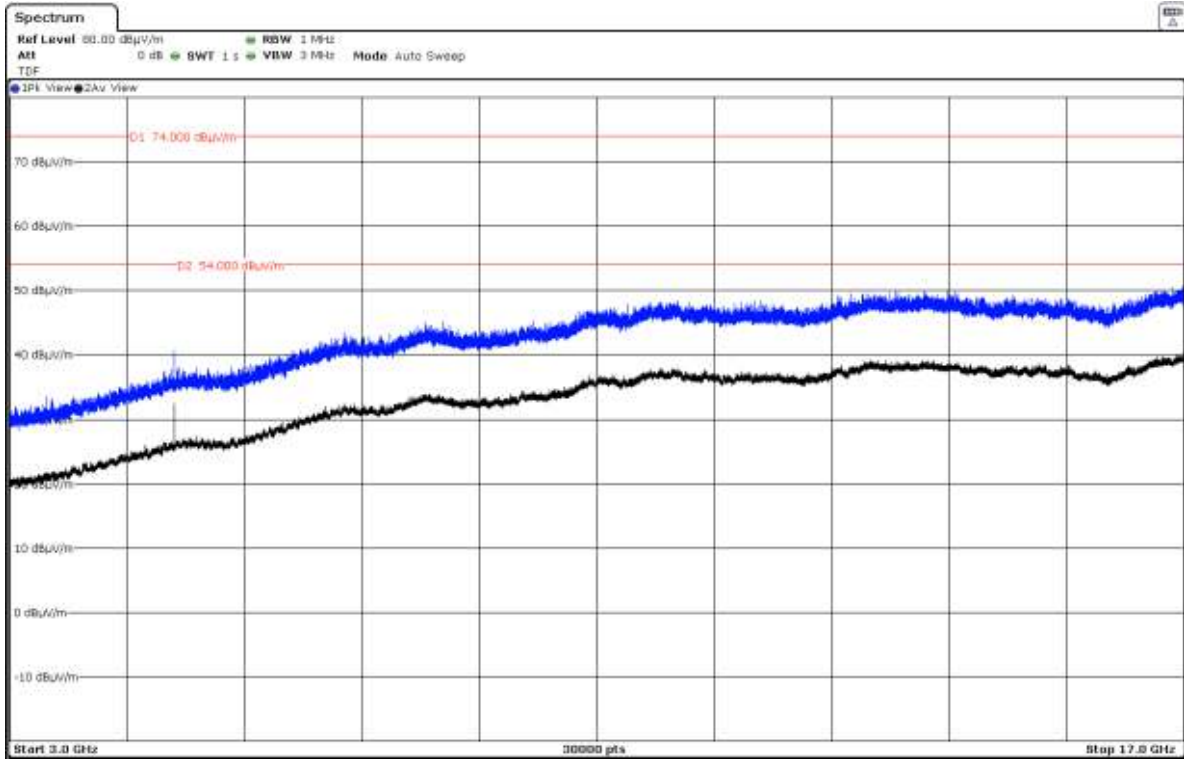
- Low Channel:



- Middle Channel:

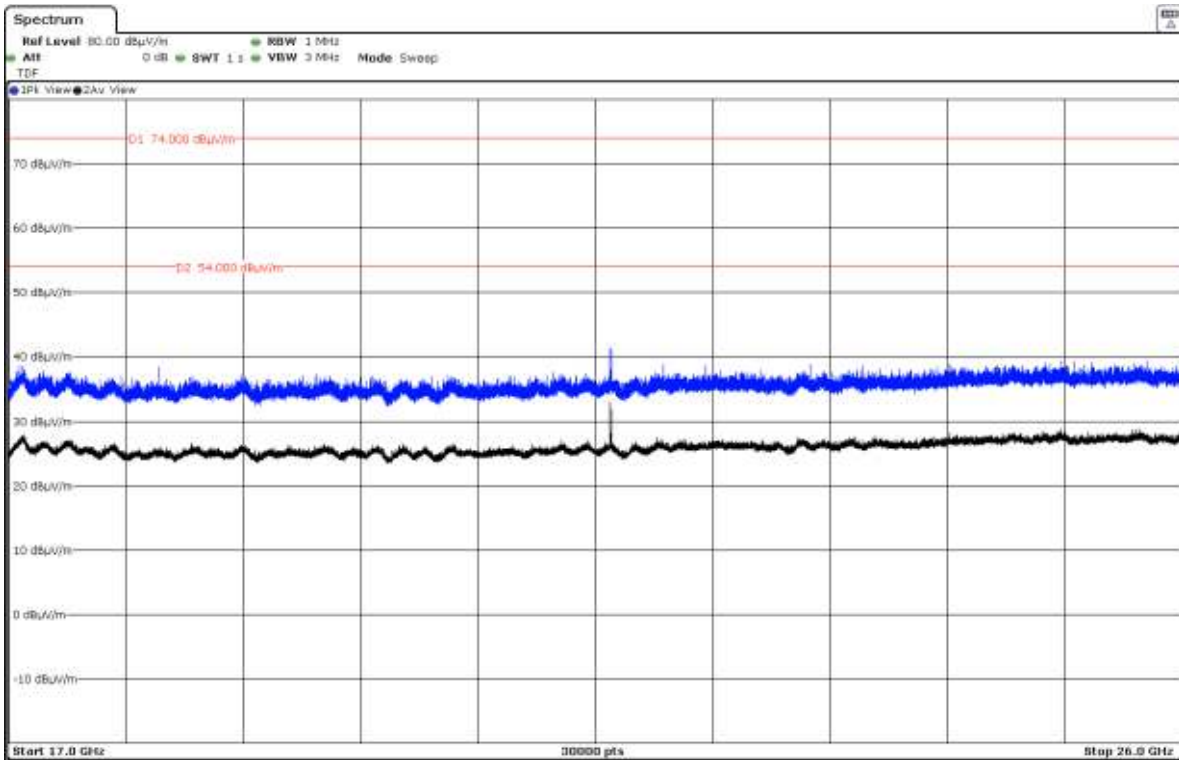


- High Channel:

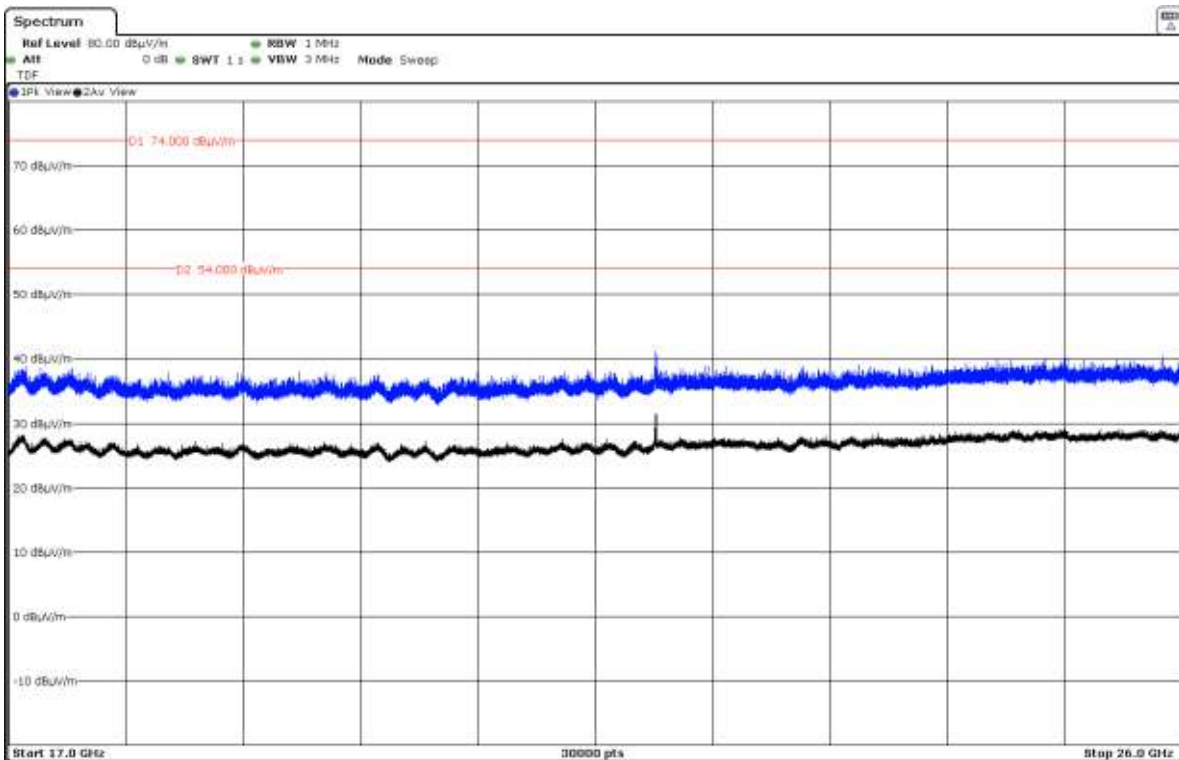


FREQUENCY RANGE 17 - 26 GHz

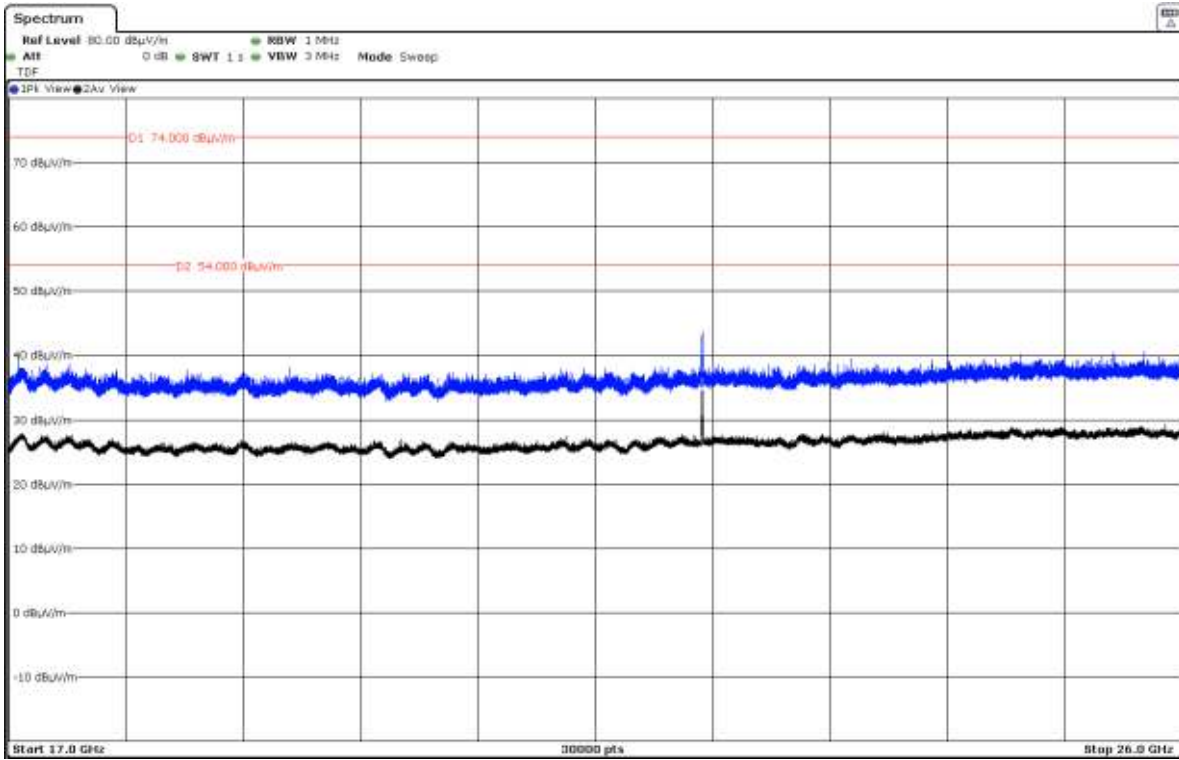
-Low channel:



-Middle channel:

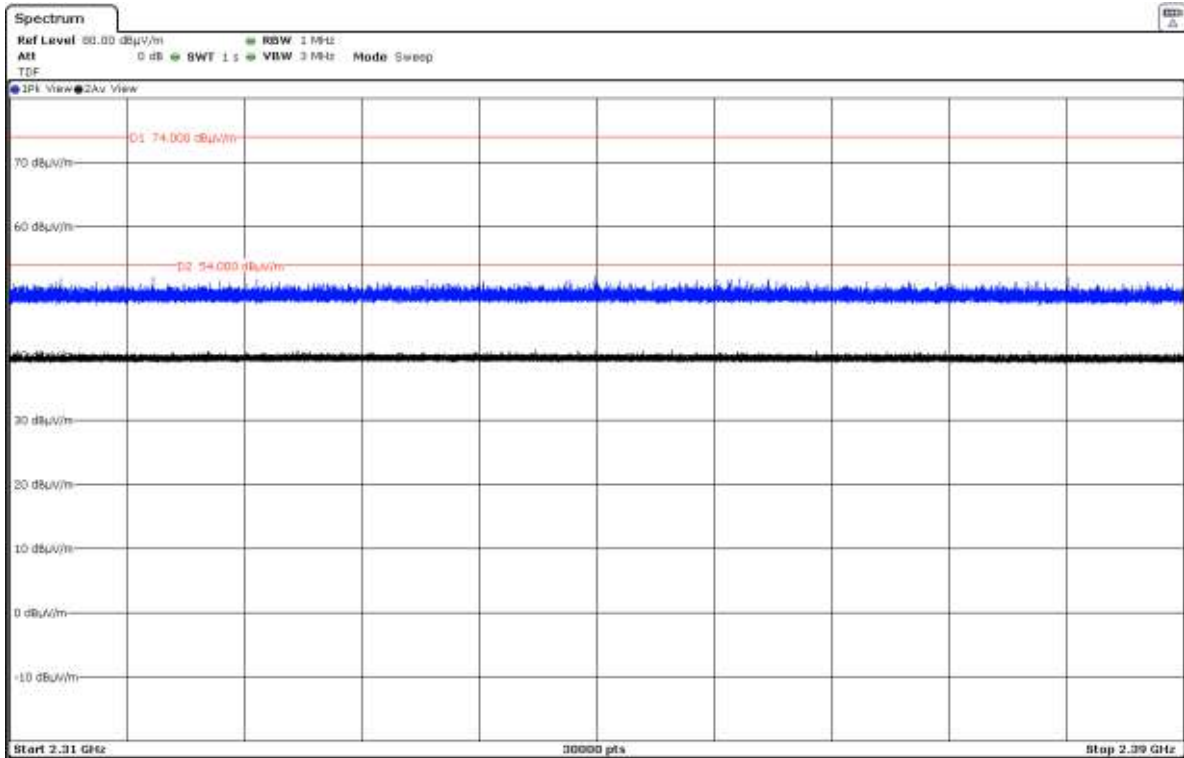


-High channel:

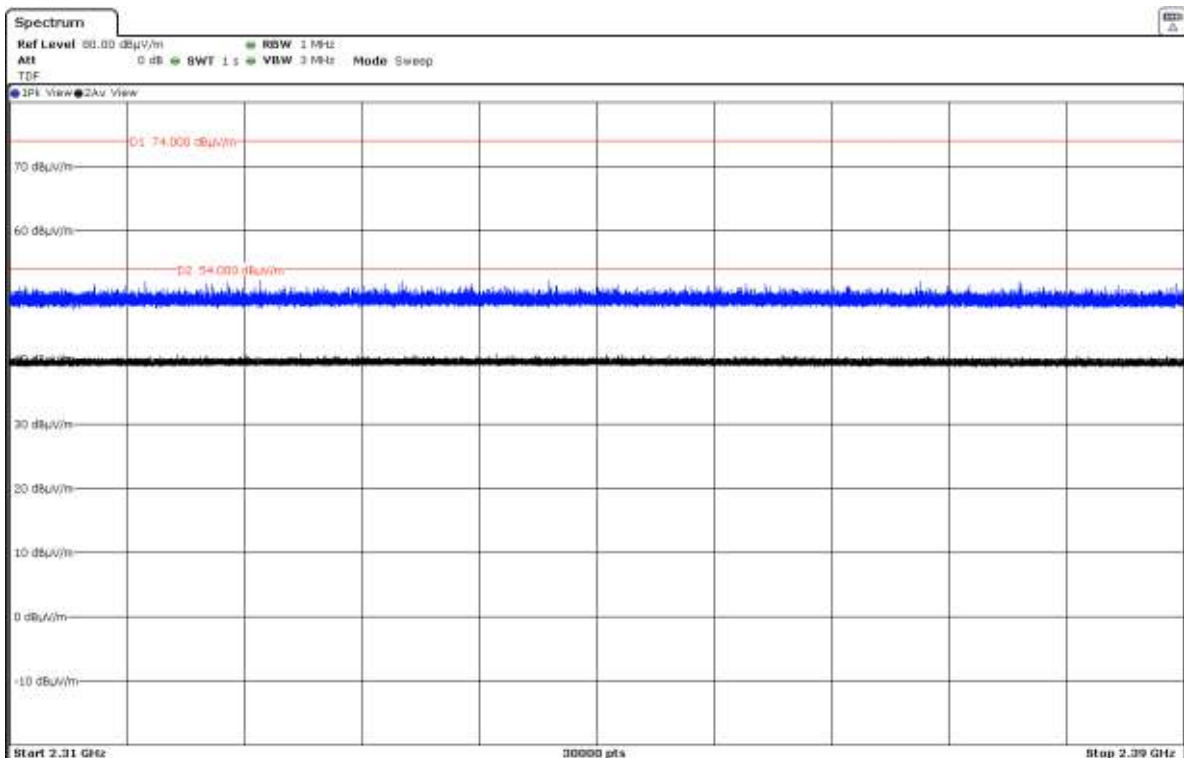


FREQUENCY RANGE 2.31 - 2.39 GHz

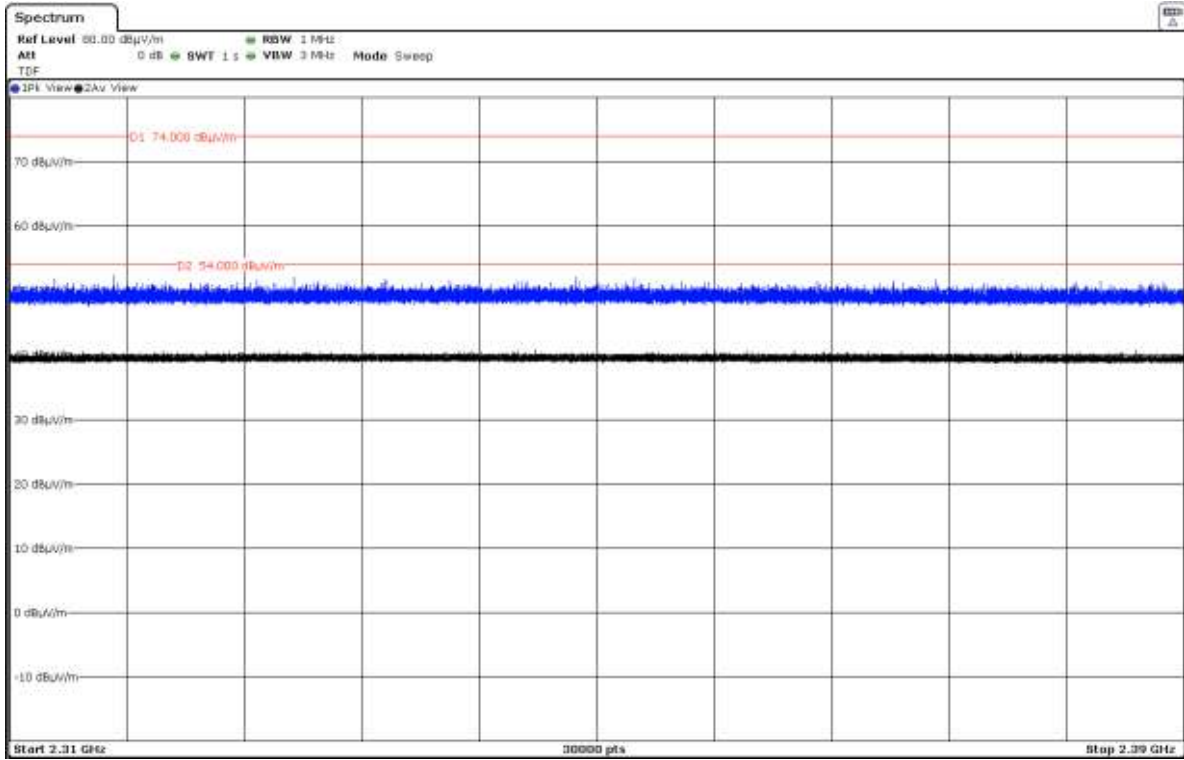
- Low Channel:



- Middle Channel:

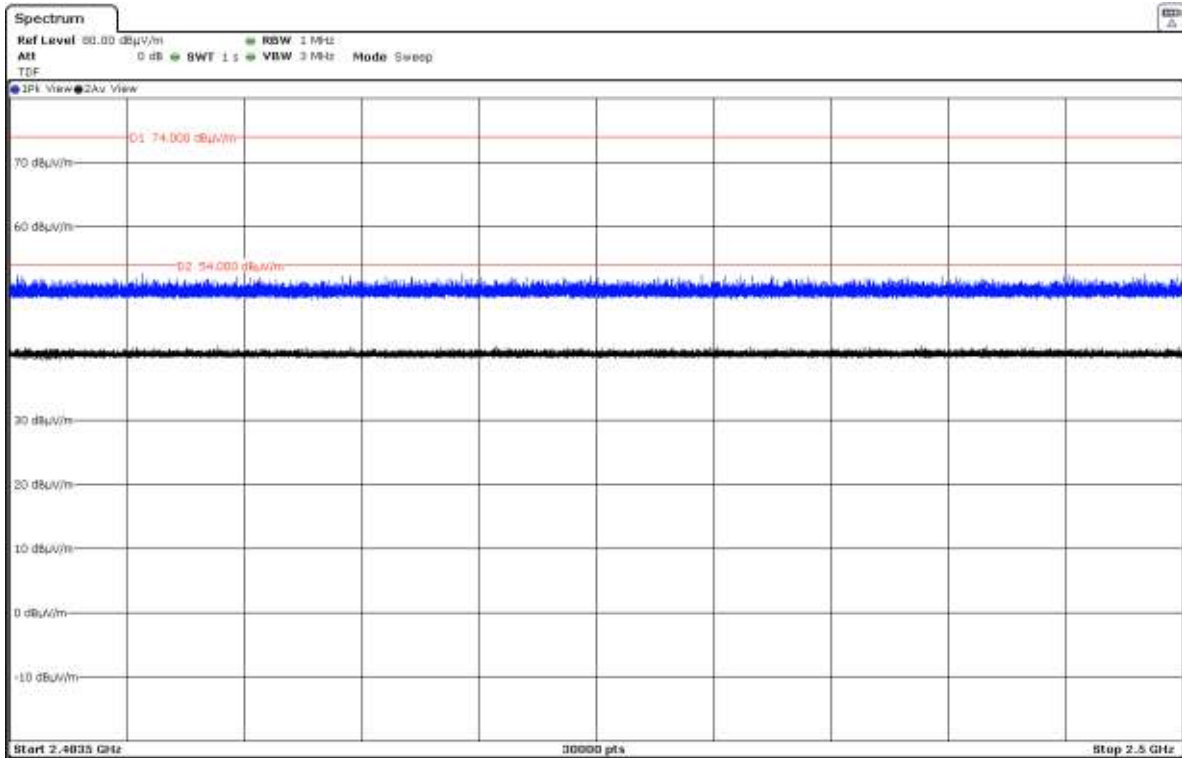


- High Channel:

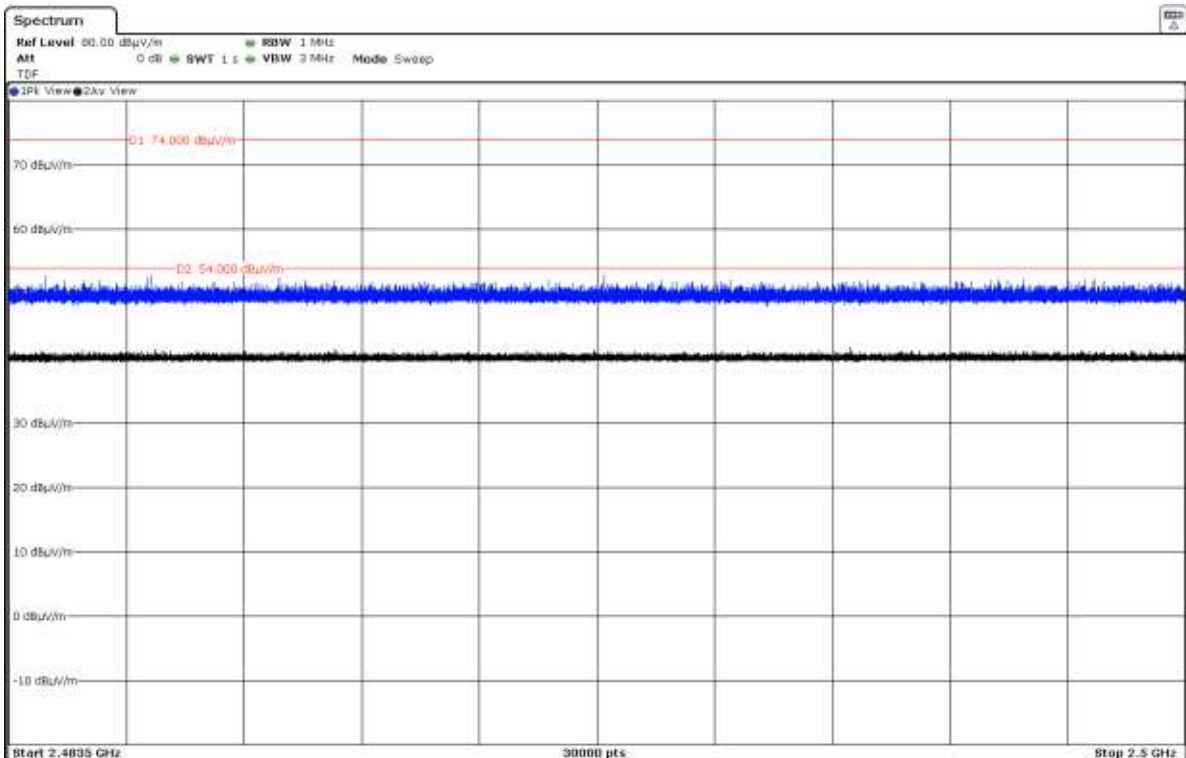


FREQUENCY RANGE 2.4835 - 2.5 GHz

- Low Channel:



- Middle Channel:



- High Channel:

