



Test report No:
NIE: 60506RRF.001

Test report

USA FCC Part 15.247, 15.209, 15.207

CANADA RSS-247, RSS-Gen

Radio Frequency Devices. Operation within the bands 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.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Power meter
(*) Trademark	ROTOR INspider
(*) Model and /or type reference tested	ROT117
Other identification of the product	FCC ID: R3AROT117 IC: 10992A-ROT117 HW Version: 1.000 SW Version: 1.000
(*) Features	ANT+ and Bluetooth Smart
Manufacturer	ROTOR COMPONENTES TECNOLÓGICOS S.L. C/ Miño 14, 28864, Ajalvir (Madrid), Spain
Test method requested, standard	USA FCC Part 15.247 (10-1-18 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-18 Edition): Radiated emission limits; general requirements. USA FCC Part 15.207 (10-1-18 Edition): Conducted emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE

Approved by (name / position & signature)	José Carlos Luque RF Lab. Supervisor
Date of issue	2019-09-04
Report template No	FDT08_22 (*) "Data provided by the client"

Index

Competences and guarantees4

General conditions.....4

Uncertainty.....4

Data provided by the client4

Usage of samples5

Test sample description6

Identification of the client7

Testing period and place7

Document history.....7

Environmental conditions7

Remarks and comments.....8

Testing verdicts.....9

Summary9

Appendix A: Test results. Bluetooth Low Energy10

Appendix B: Test results. ANT+42

Competences and guarantees

DEKRA Testing and Certification is a testing laboratory accredited by the National Accreditation Body (ENAC - Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

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 is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

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

DEKRA Testing and Certification 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 at the time of performance of the test.

DEKRA Testing and Certification is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

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

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification S.A.U.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

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 power meter for bicycles that provides power and cadence values among other metrics.

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 N°	Description	Model	Serial N°	Date of reception
60506/003	Power meter	ROT117	32	2019/06/25

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

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

Control N°	Description	Model	Serial N°	Date of reception
60506/001	Power meter	ROT117	12	2019/06/06
60506/002	USB Cable	--	--	2019/06/06

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

Test sample description

Ports.....:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	-		☐	☐	☐		
	-		☐	☐	☐		
Supplementary information to the ports.....:	-						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☒	DC: 3.7V Lithium Battery					
Rated Power	5mW						
Clock frequencies	32MHz						
Other parameters.....:	-						
Software version	1.000						
Hardware version.....:	1.000						
Dimensions in cm (W x H x D)....:	11 x 11 x 2 cm						
Mounting position.....:	☒	Other: On a bike.					
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

ROTOR COMPONENTES TECNOLÓGICOS S.L.

C/ Miño 14, 28864 Ajalvir (Madrid), Spain

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-06-24
Date (finish)	2019-06-28

Document history

Report number	Date	Description
60506RRF.001	2019-09-04	First release

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: Verónica García, Ignacio Cabra and Nicolás Salguero.

Used instrumentation:

Conducted Measurements:

	Last Calibration	Due Calibration
1. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2017/07	2019/07

Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2018/10	2020/10
3. RF Pre-amplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/08
4. Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2017/09	2020/09
5. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2018/02	2020/02
6. RF Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/04	2020/04
7. Low Noise Amplifier G>30dB, 18 - 40 GHz BONN ELEKTRONIK BLMA 1840-1M	2018/02	2020/02
8. Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
9. Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
10. RF Pre-amplifier, 40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2019/04	2020/04

Testing verdicts

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

Summary

1. Bluetooth Low Energy

FCC PART 15.247 PARAGRAPH			
Requirement – Test case		Verdict	Remark
Section 15.247 Subclause (a) (2) / RSS-247 5.2. (a)	6 dB Bandwidth	P	
Section 15.247 Subclause (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	P	
Section 15.247 Subclause (d) / RSS-247 5.5	Emission limitations conducted (Transmitter)	P	
Section 15.247 Subclause (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	
Section 15.247 Subclause (e) / RSS-247 5.2. (b)	Power spectral density	P	
Section 15.247 Subclause (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
Section 15.207 / RSS-Gen 8.8.	Conducted limits	N/A	
<u>Supplementary information and remarks:</u>			
None.			

2. ANT+

FCC PART 15.247 PARAGRAPH			
Requirement – Test case		Verdict	Remark
Section 15.247 Subclause (a) (2) / RSS-247 5.2. (a)	6 dB Bandwidth	P	
Section 15.247 Subclause (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	P	
Section 15.247 Subclause (d) / RSS-247 5.5	Emission limitations conducted (Transmitter)	P	
Section 15.247 Subclause (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	
Section 15.247 Subclause (e) / RSS-247 5.2. (b)	Power spectral density	P	
Section 15.247 Subclause (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
Section 15.207 / RSS-Gen 8.8.	Conducted limits	N/A	
<u>Supplementary information and remarks:</u>			
None.			

Appendix A: Test results. Bluetooth Low Energy

TEST CONDITIONS	12
Occupied Bandwidth	14
FCC Section 15.247 Subclause (a) (2) / RSS-247 Clause 5.2 (a) 6 dB Bandwidth.....	16
FCC Section 15.247 Subclause (b) / RSS-247 Clause 5.4 (d) Maximum output power and antenna gain	18
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations conducted (Transmitter).....	21
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Band-edge emissions compliance (Transmitter) ..	24
FCC Section 15.247 Subclause (e) / RSS-247 5.2. (b) Power spectral density	26
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations radiated (Transmitter)	29

TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	3.7 Vdc
Type of Power Supply:	Battery.
Type of Antenna:	External (Monopole $\lambda/4$).
Maximum Declared Antenna Gain:	+3 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 directly connected to the spectrum analyzer.



RADIATED MEASUREMENTS

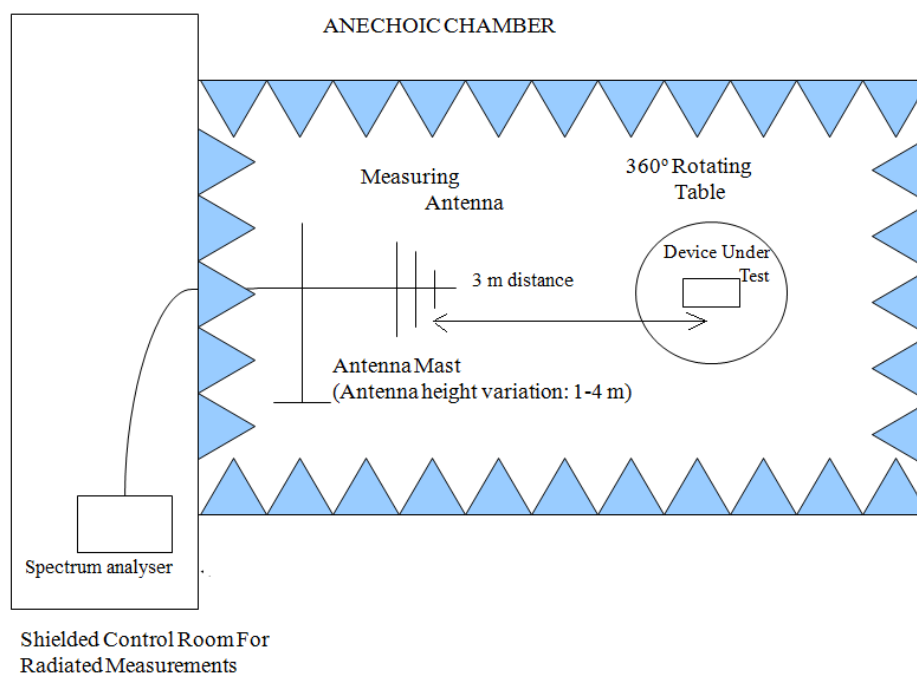
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) is situated at a distance of 3 m and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

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.

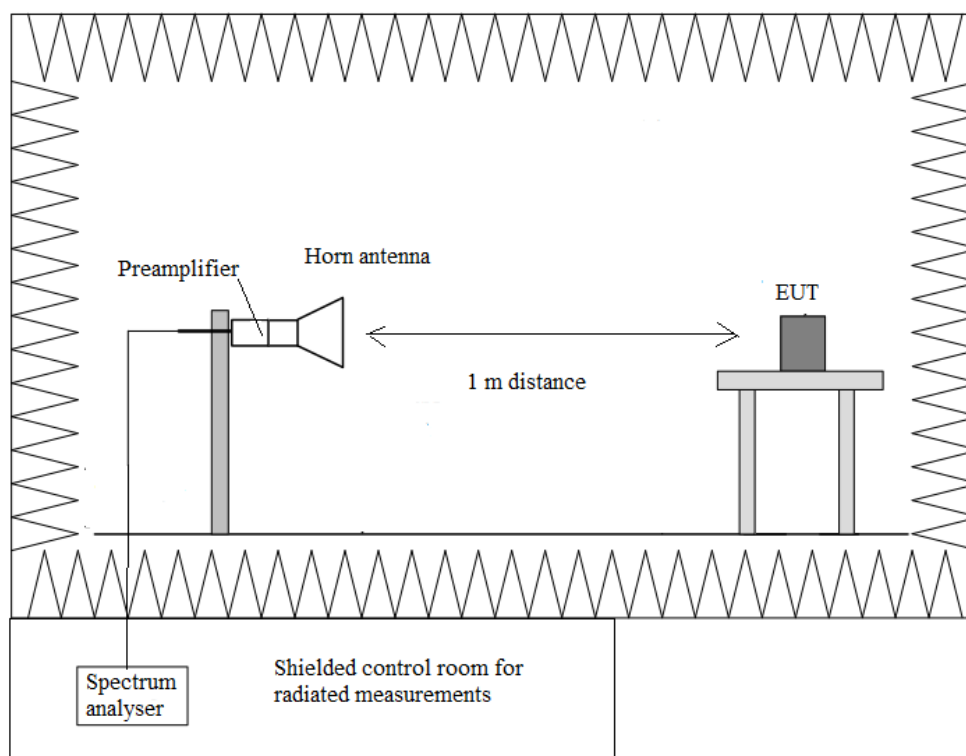
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup $f > 1$ GHz:

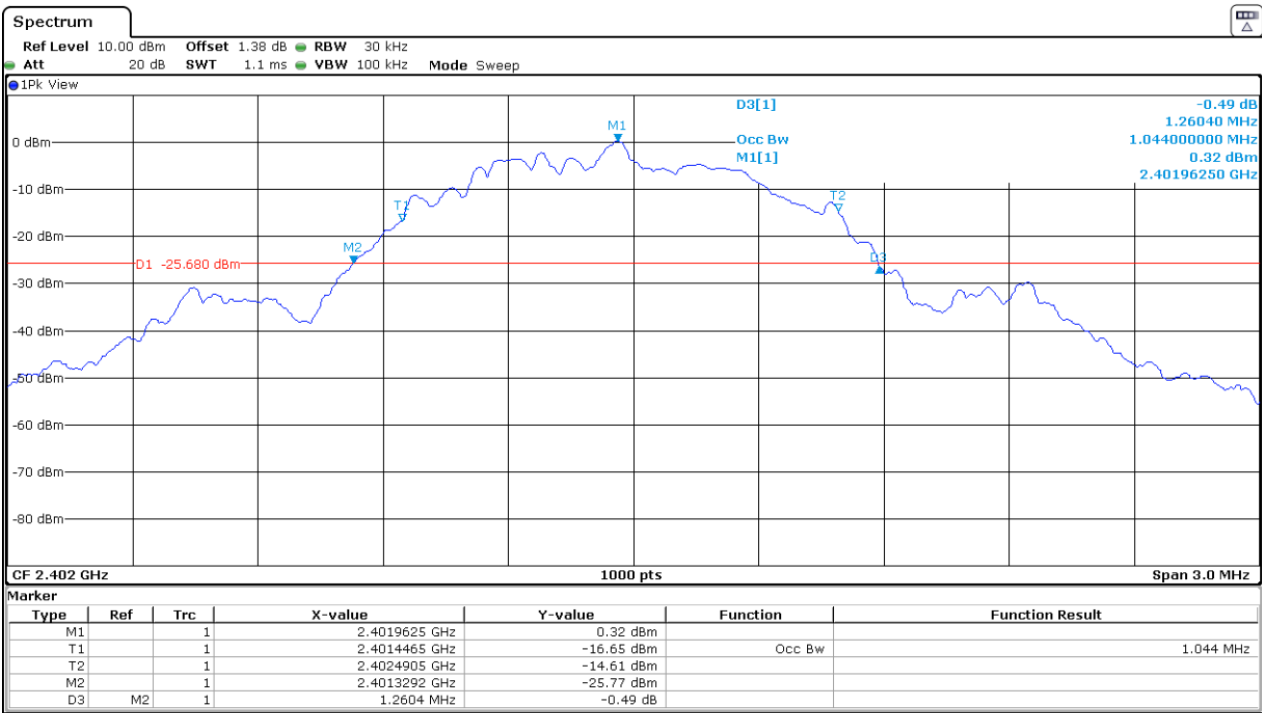


Occupied Bandwidth

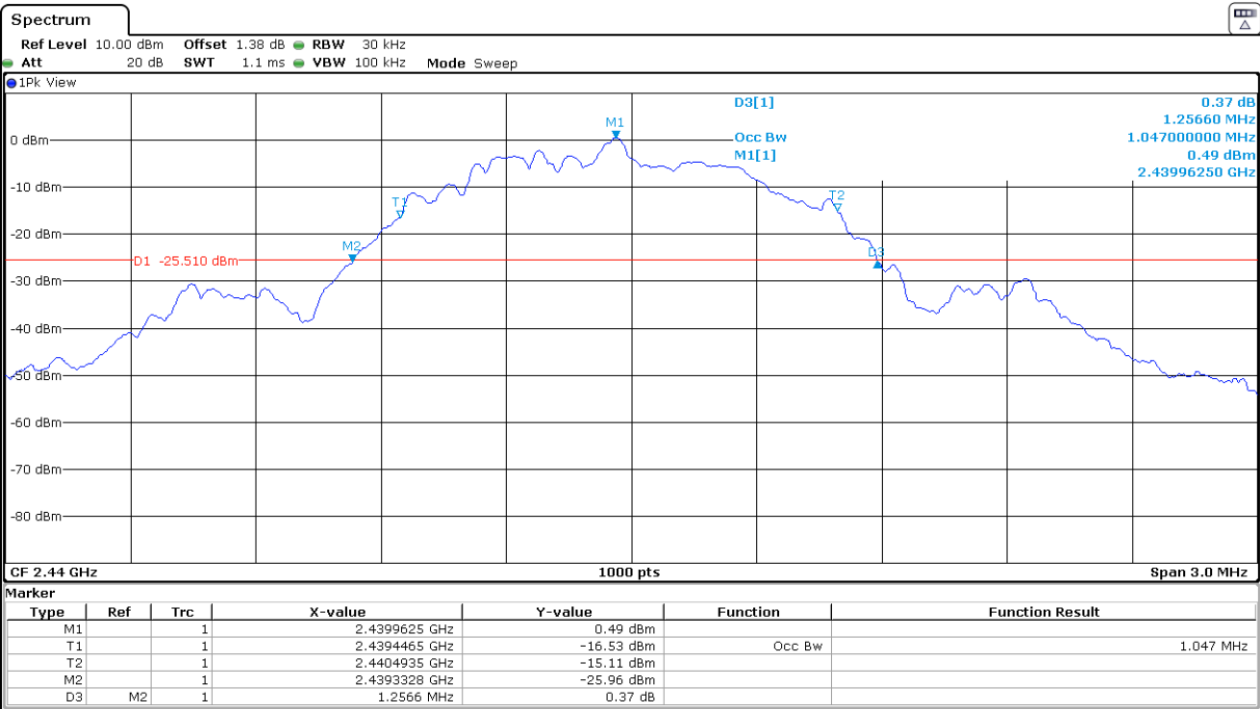
RESULTS:

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
99% bandwidth (MHz)	1.044	1.047	1.044
Measurement uncertainty (kHz)	<± 1.80		

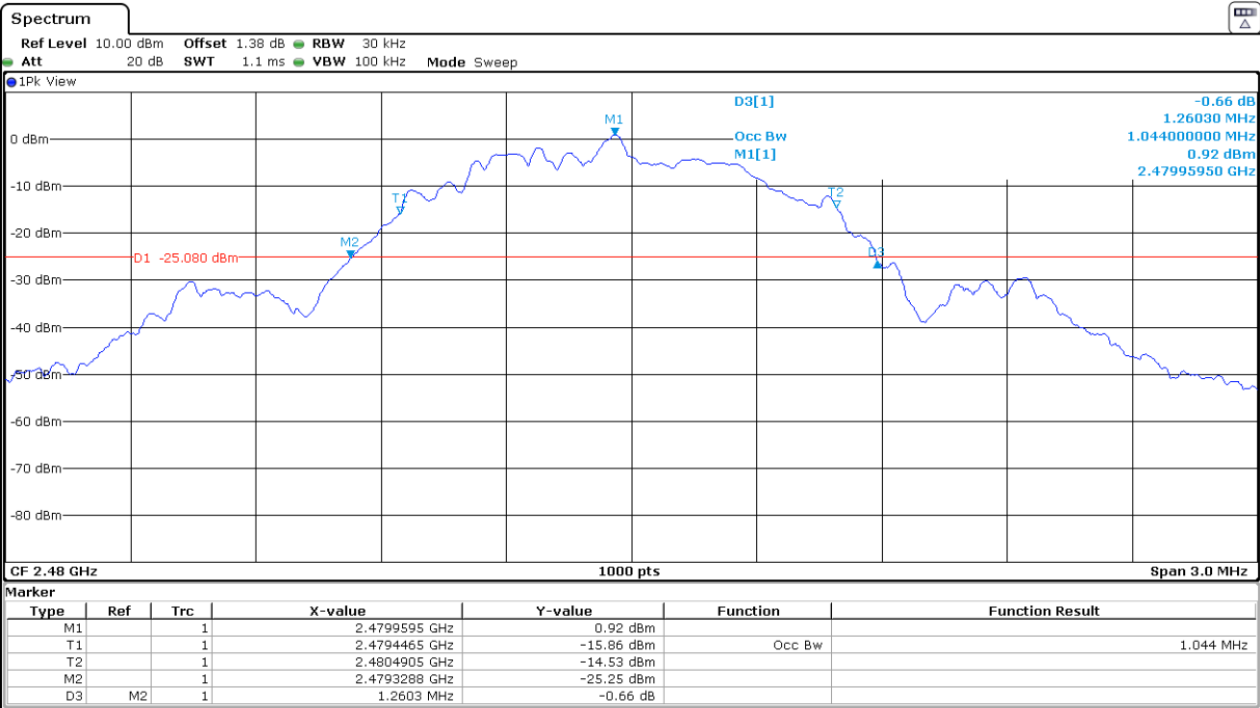
- Low Channel:



- Middle Channel:



- High Channel:



FCC Section 15.247 Subclause (a) (2) / RSS-247 Clause 5.2 (a) 6 dB Bandwidth.

SPECIFICATION:

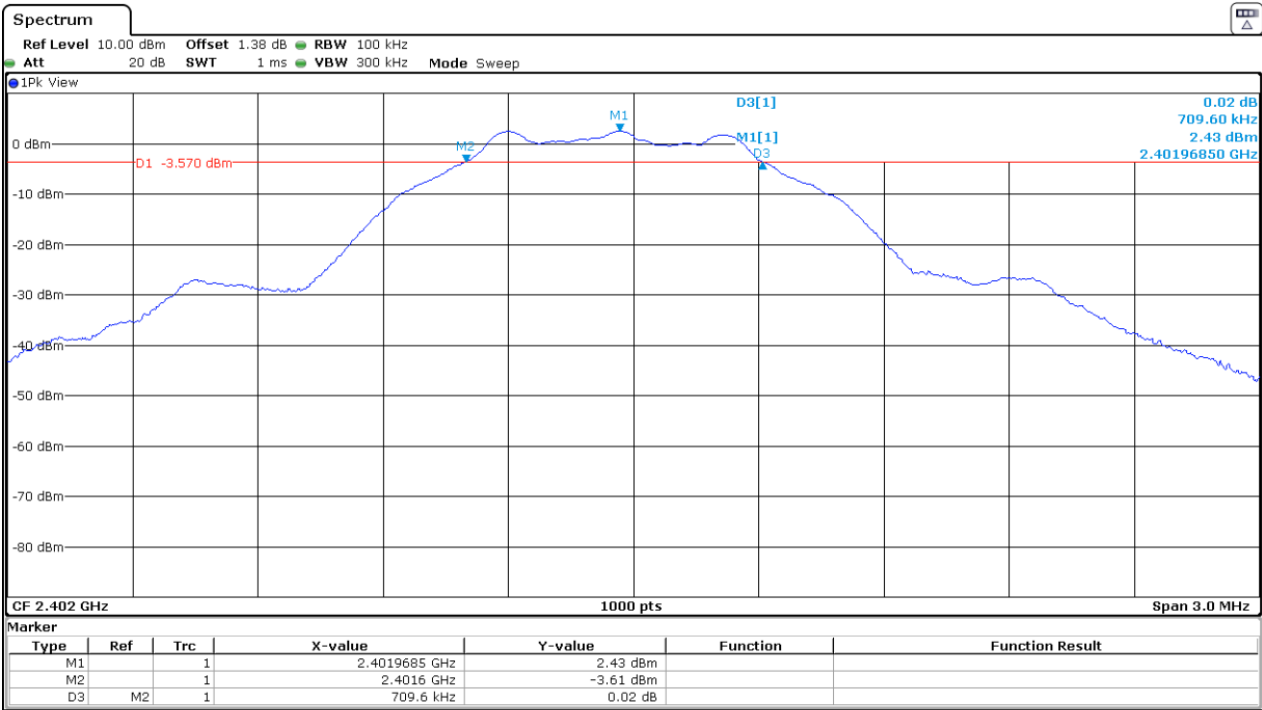
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS:

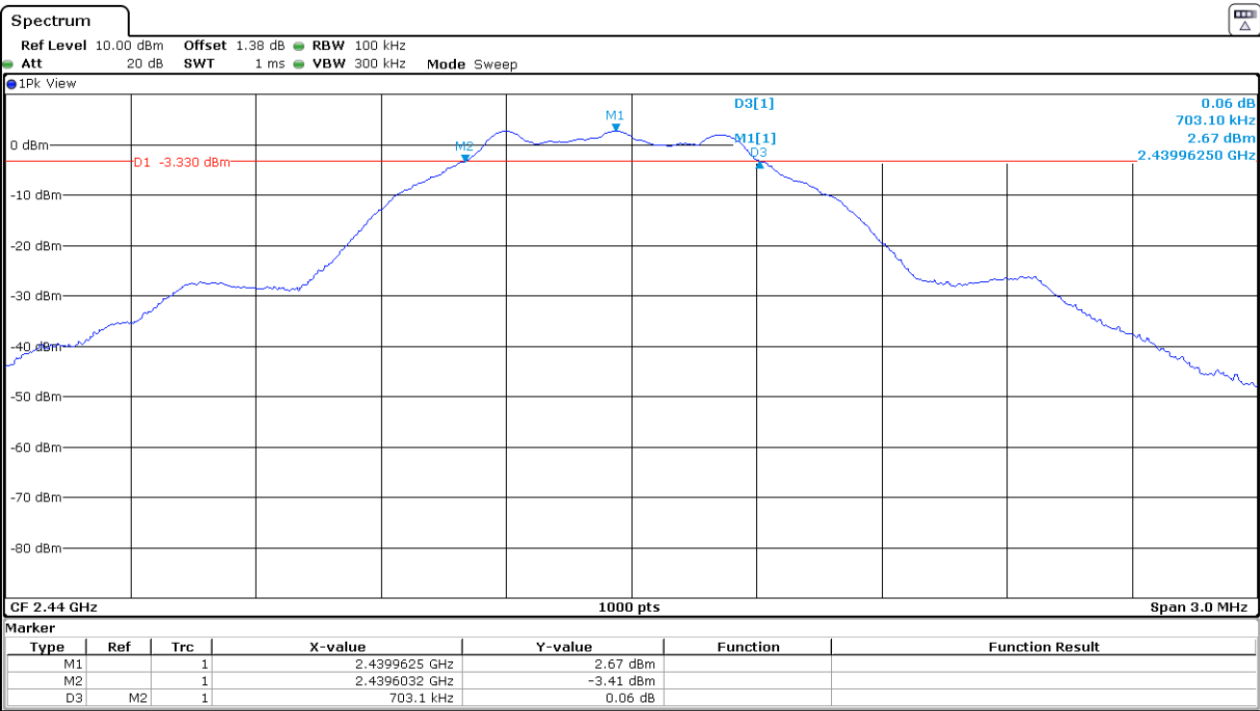
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
6 dB Spectrum bandwidth (MHz)	709.6	703.1	700.85
Measurement uncertainty (kHz)	<±2.50		

Verdict: PASS

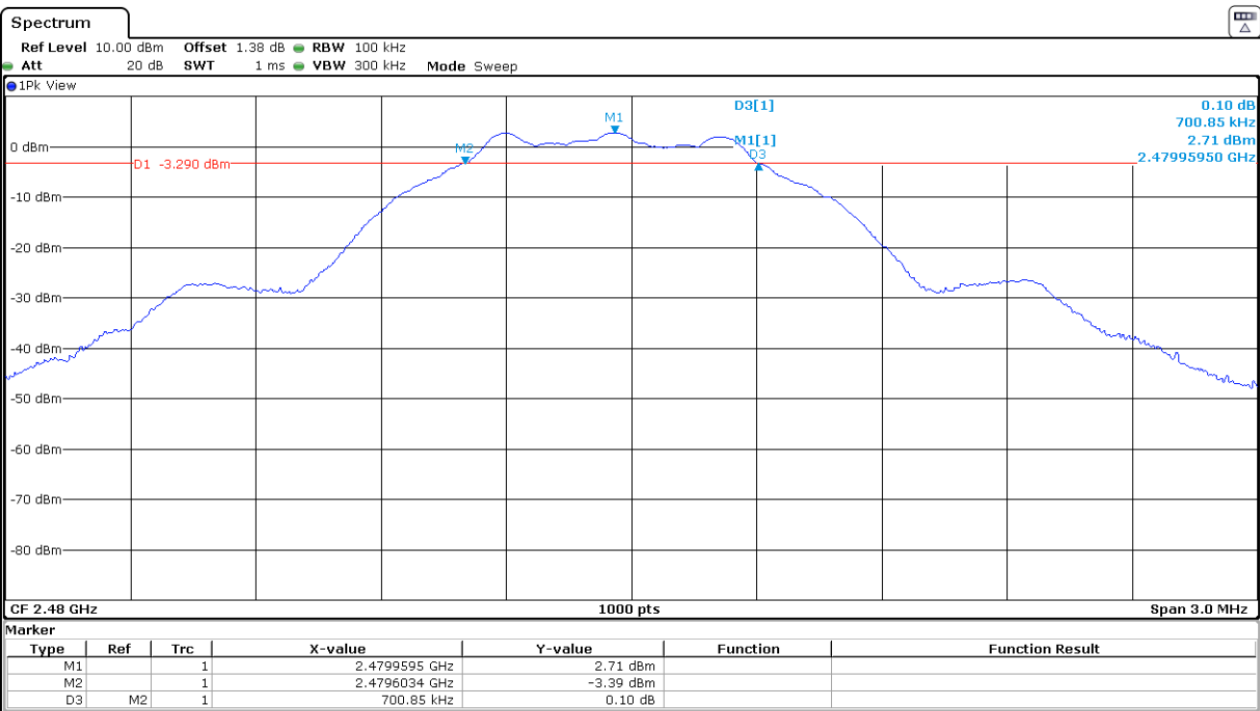
- Low Channel:



- Middle Channel:



- High Channel:



FCC Section 15.247 Subclause (b) / RSS-247 Clause 5.4 (d) Maximum output power and antenna gain

SPECIFICATION:

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS:

The maximum peak conducted output power level in the fundamental emission was measured using the method according to point 11.9.1.1 "RBW $\geq$ DTS bandwidth" of ANSI C.63.10-2013.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

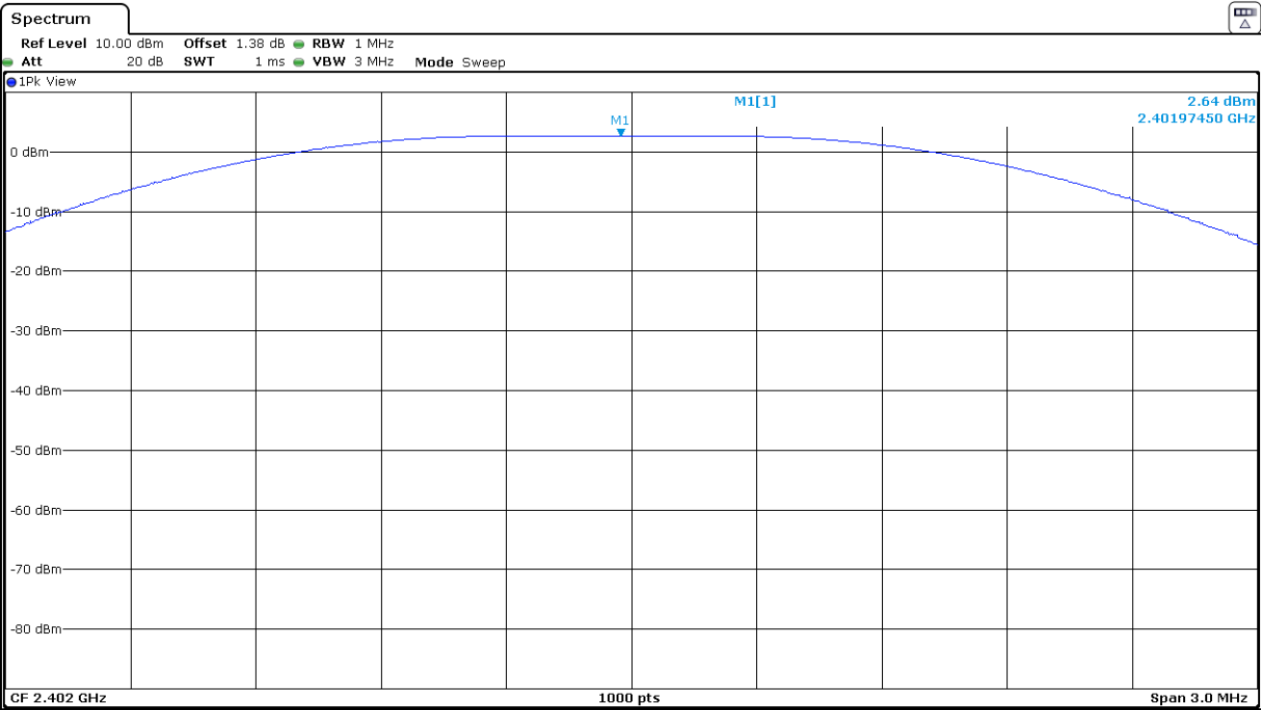
Maximum Declared Antenna Gain: +3 dBi

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	2.64	2.7	3.15
Maximum EIRP Power (dBm)	5.64	5.7	6.15
Measurement uncertainty (dB)	< $\pm$ 1.20		

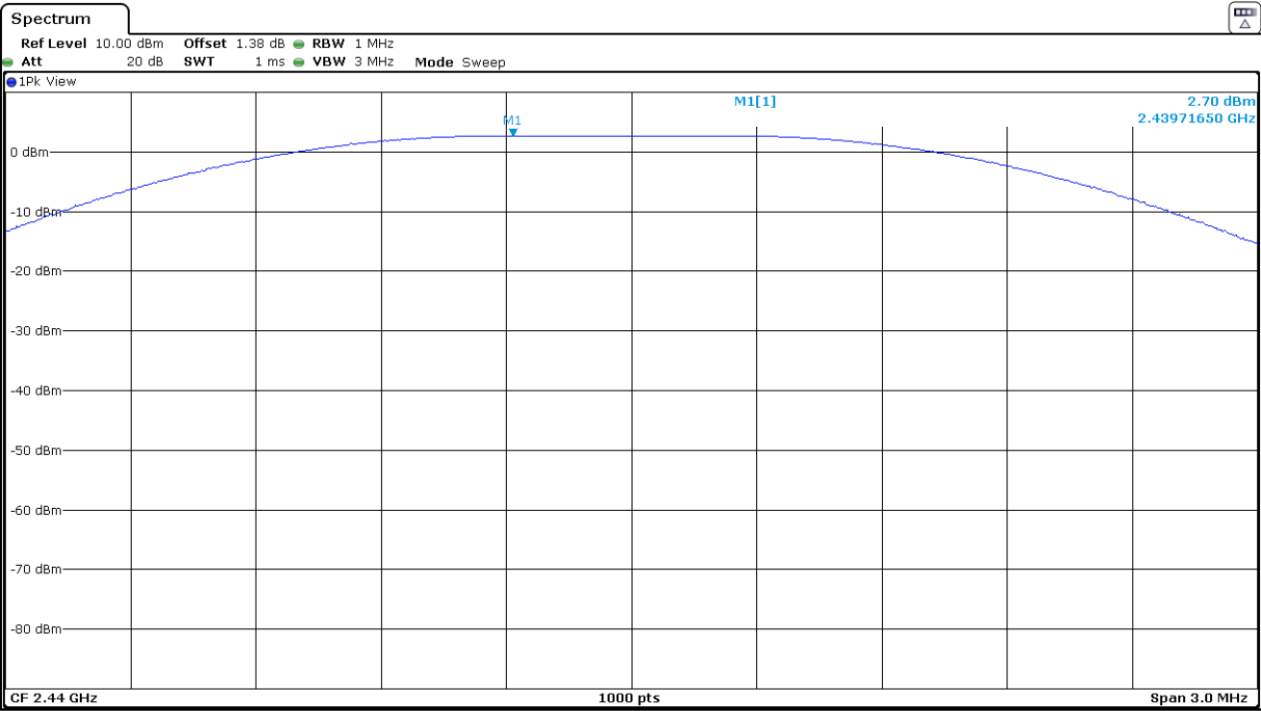
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

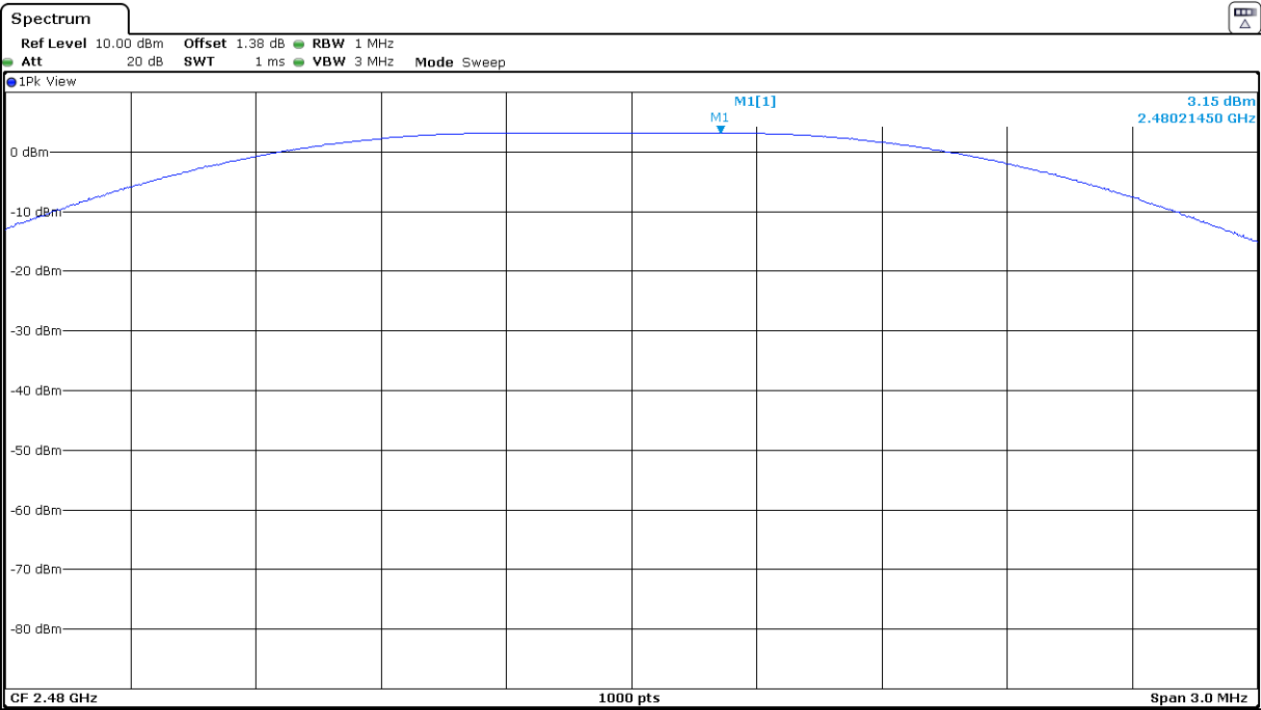
- Low Channel:



- Middle Channel:



- High Channel:



FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations conducted (Transmitter)

SPECIFICATION:

In any 100 kHz bandwidths outside the frequency band in which the 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

RESULTS:

	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Reference Level Measurement (dBm)	2.4	2.67	2.68
Measurement uncertainty (dB)	<±1.20		

- Low Channel:

No spurious peaks found at less than 20 dB respect to the limit.

- Middle Channel:

No spurious peaks found at less than 20 dB respect to the limit.

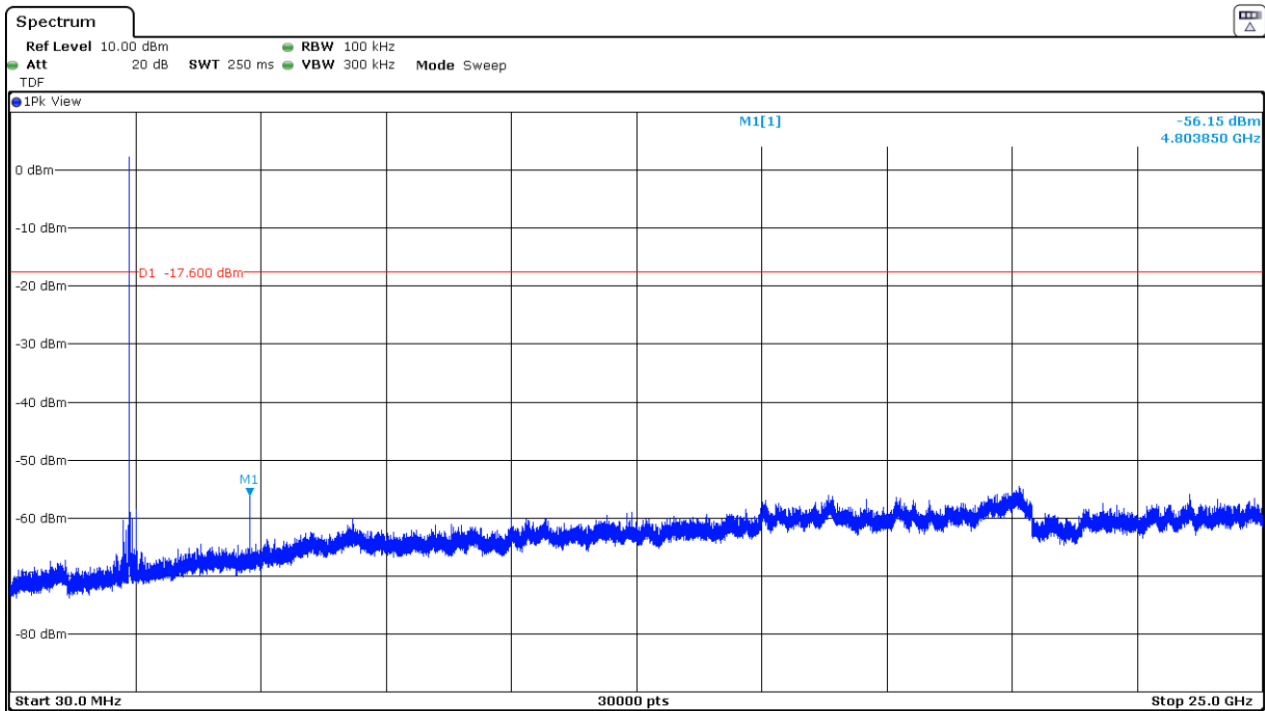
- High Channel:

No spurious peaks found at less than 20 dB respect to the limit.

Measurement uncertainty (dB)	<±1.56
------------------------------	--------

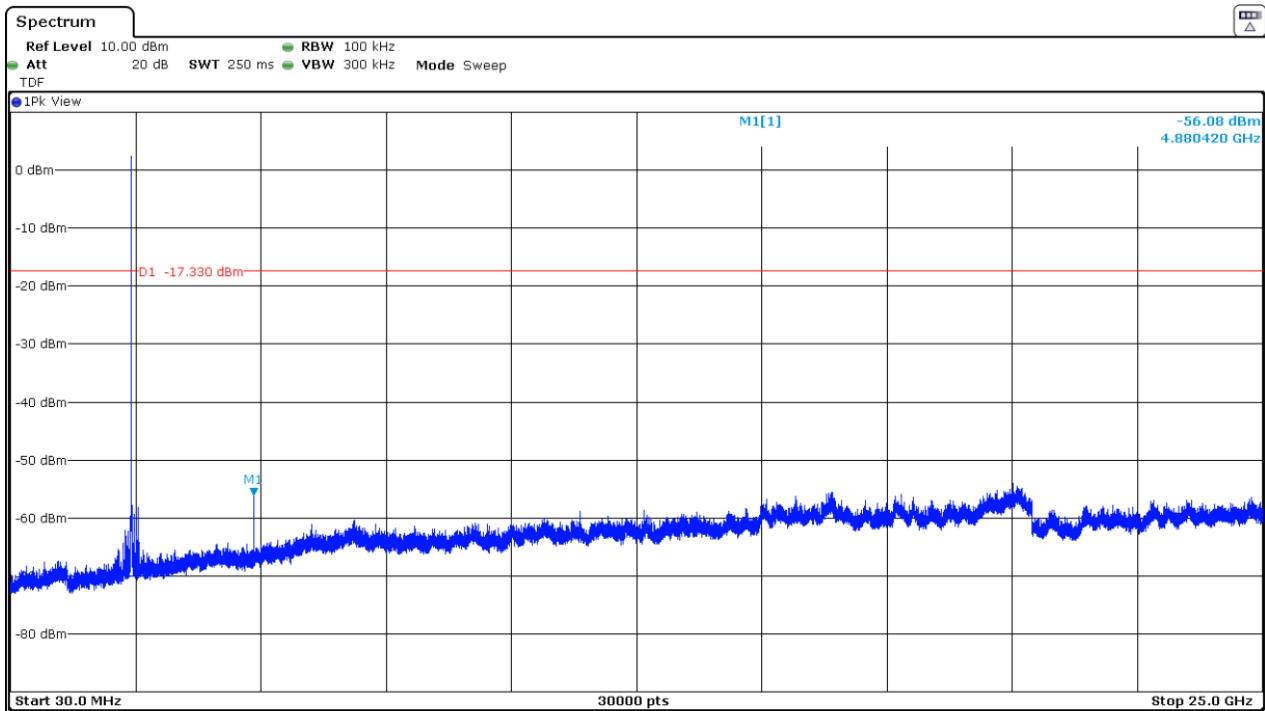
Verdict: PASS

- Low Channel:



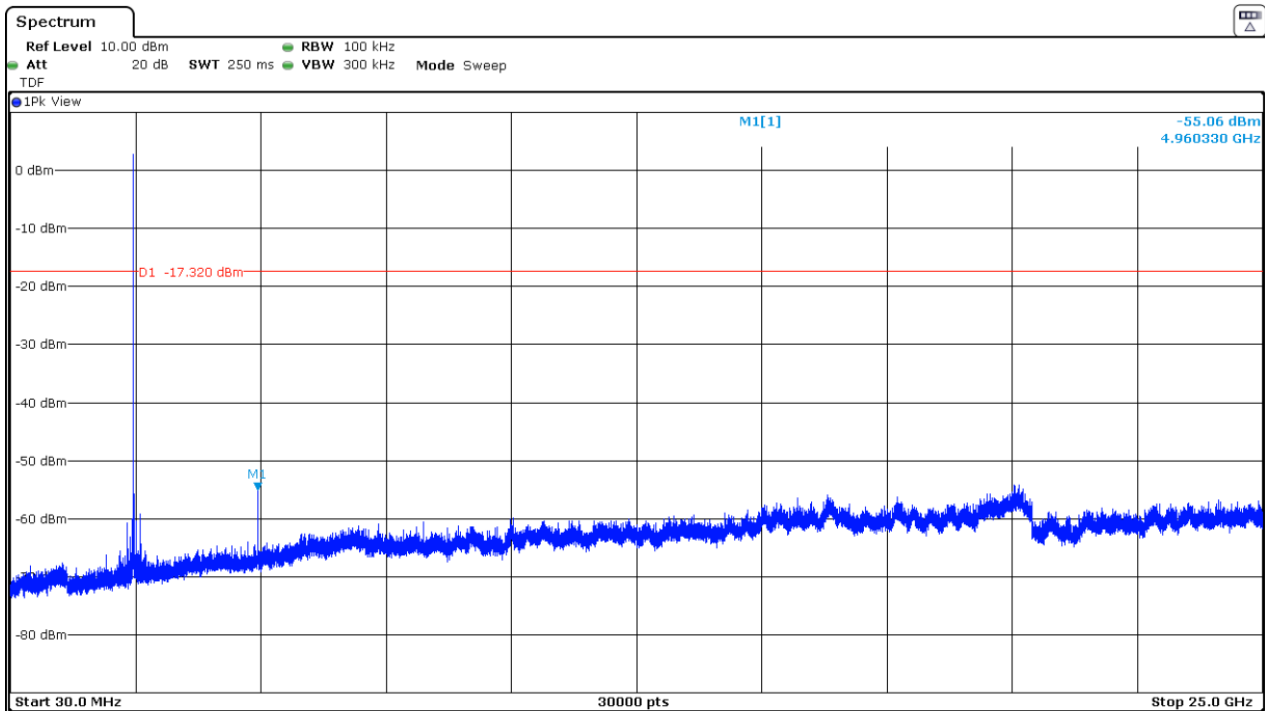
The peak shown in the plot above the limit is the carrier frequency.

- 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.

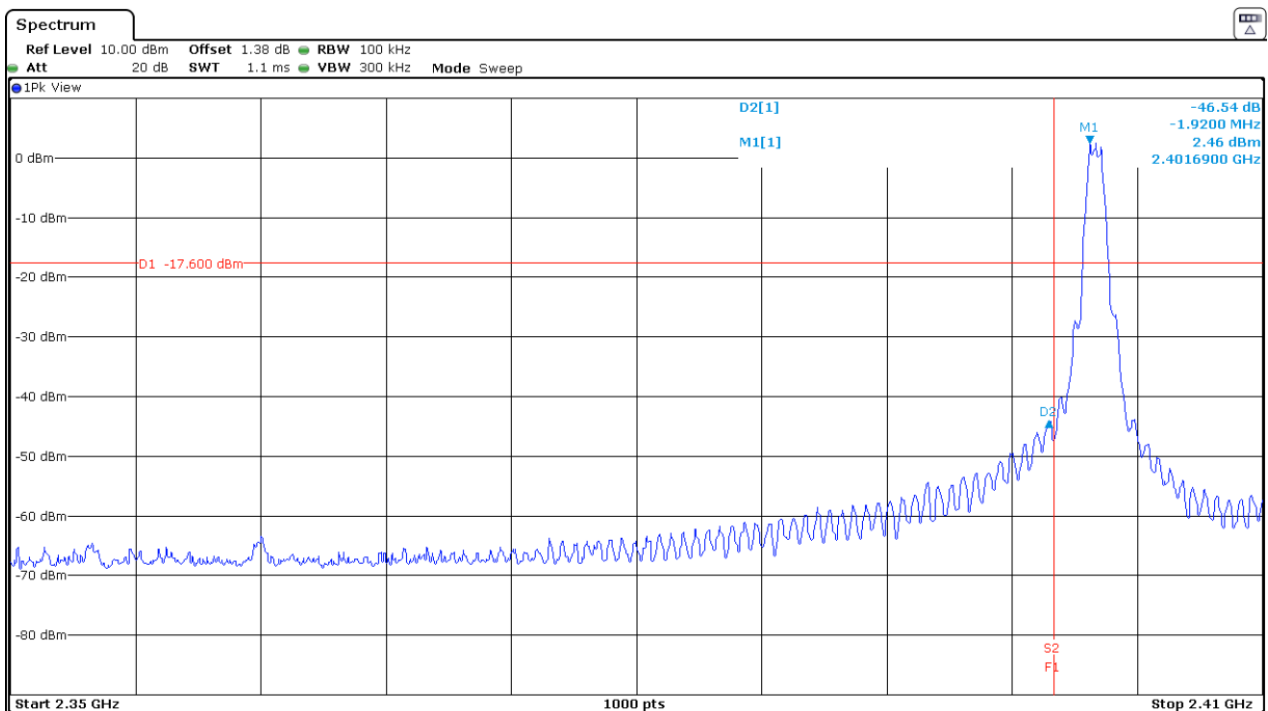
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Band-edge emissions compliance (Transmitter)

SPECIFICATION:

In any 100 kHz bandwidths outside the frequency band in which the 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

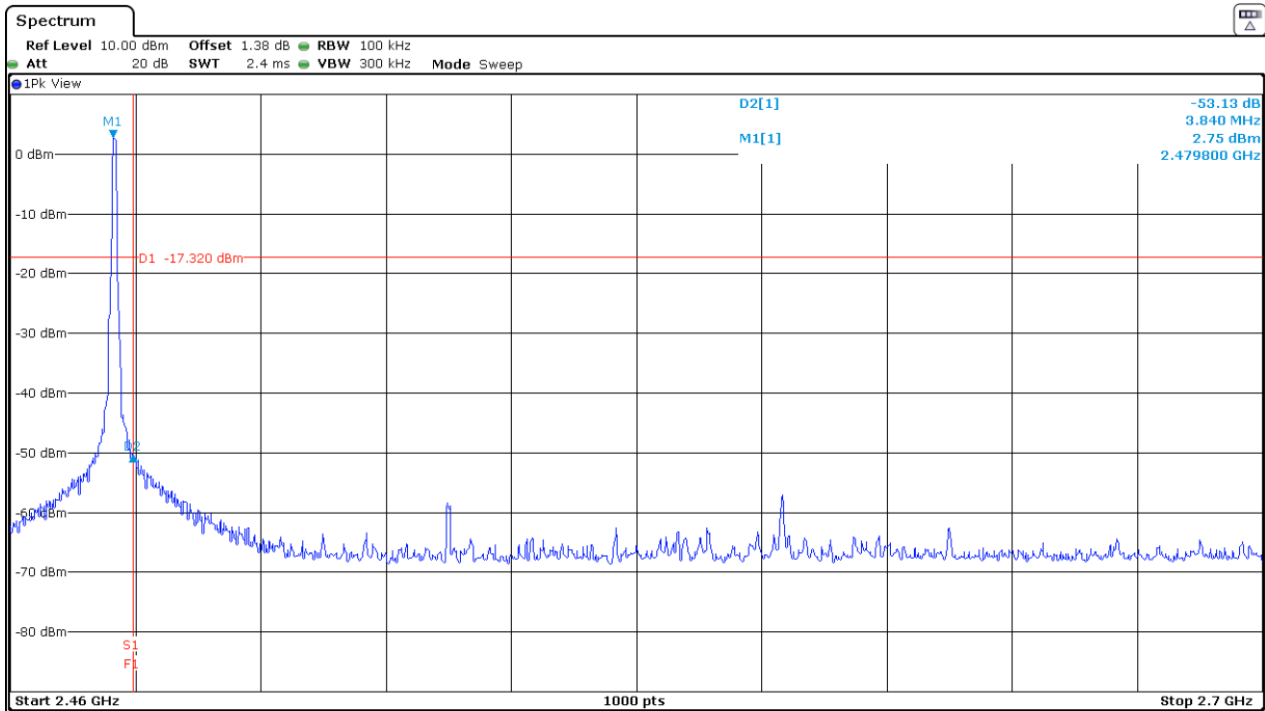
RESULTS:

- Low Channel:



Verdict: PASS

- High Channel:



Verdict: PASS

Measurement uncertainty (dB)	<±1.56
------------------------------	--------

FCC Section 15.247 Subclause (e) / RSS-247 5.2. (b) Power spectral density

SPECIFICATION:

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

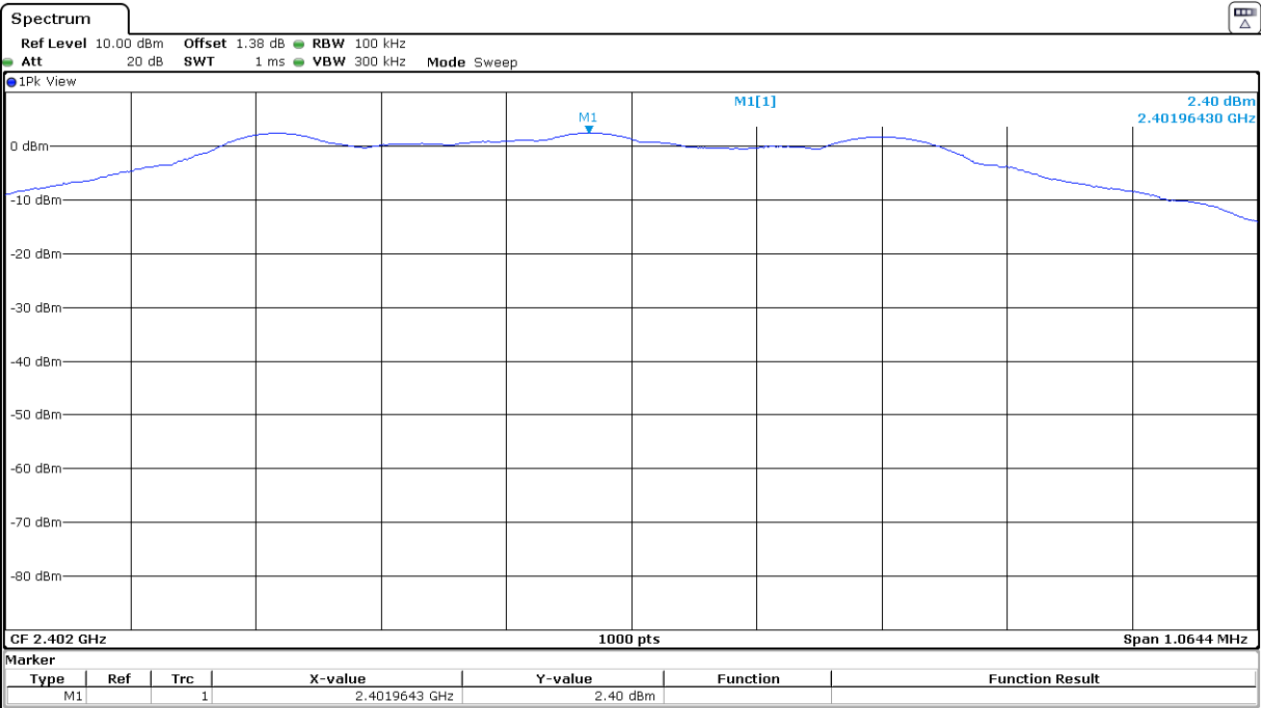
RESULTS:

The maximum power spectral density level in the fundamental emission was measured using the method according to point 11.10.2." Method PKPSD (peak PSD)" of ANSI C.63.10-2013.

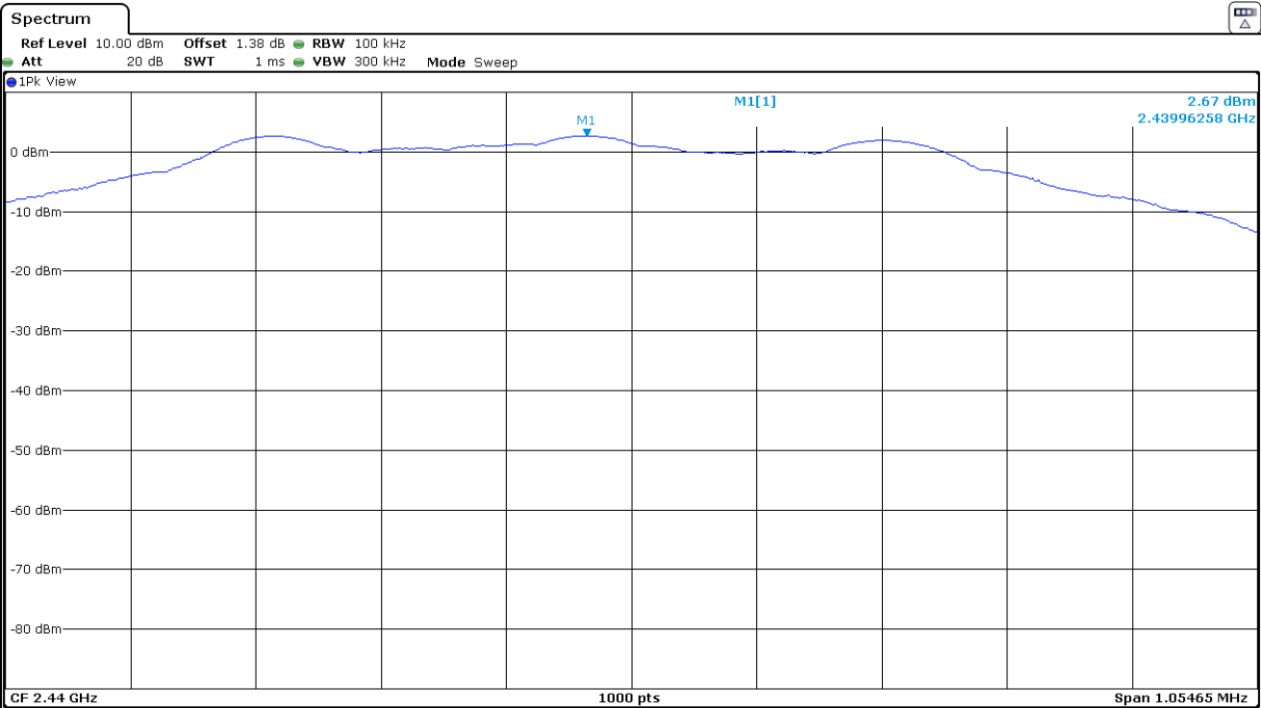
	Low Channel 2402 MHz	Middle Channel 2440 MHz	High Channel 2480 MHz
Power Spectral Density (dBm)	2.4	2.67	2.68
Measurement uncertainty (dB)	<±1.20		

Verdict: PASS

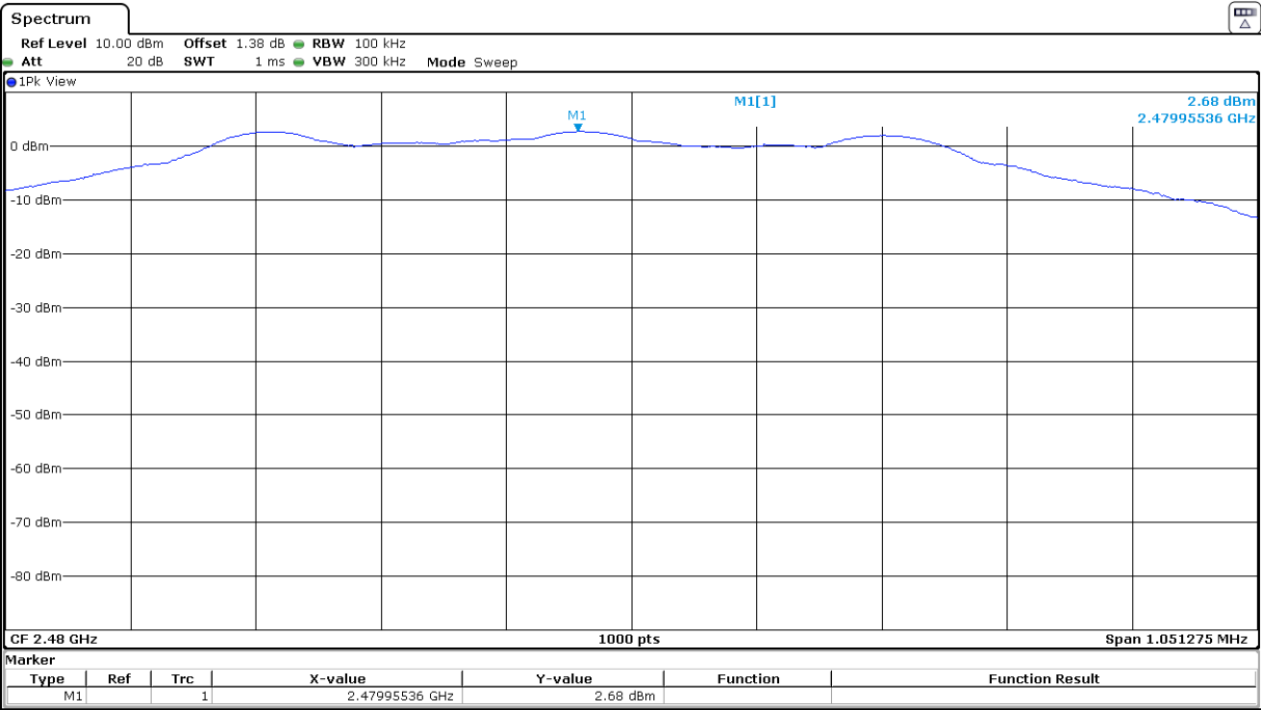
- Low Channel:



- Middle Channel:



- High Channel:



FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations radiated (Transmitter)

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)/RSS-Gen):

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 - 10000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247: Attenuation below the general field strength limits specified in RSS-Gen is not required.

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 frequencies do not depend on the operating channel.

No spurious frequencies detected at less than 20 dB below the limit for neither the Low, Middle and High Channels.

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.

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. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Detector	Emission Level (dB μ V/m)	Polarization	Measurement Uncertainty (dB)
2.36901	Peak	51.94	V	< $\pm$ 3.04
2.49479	Peak	52.95	H	< $\pm$ 3.04
4.80437	Peak	45.13	V	< $\pm$ 4.88
7.20537	Peak	48.55	V	< $\pm$ 4.88

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Detector	Emission Level (dB μ V/m)	Polarization	Measurement Uncertainty (dB)
2.31353	Peak	51.86	H	< $\pm$ 3.04
2.49961	Peak	52.31	V	< $\pm$ 3.04
4.8795	Peak	47.88	V	< $\pm$ 4.88
7.32017	Peak	49.67	V	< $\pm$ 4.88

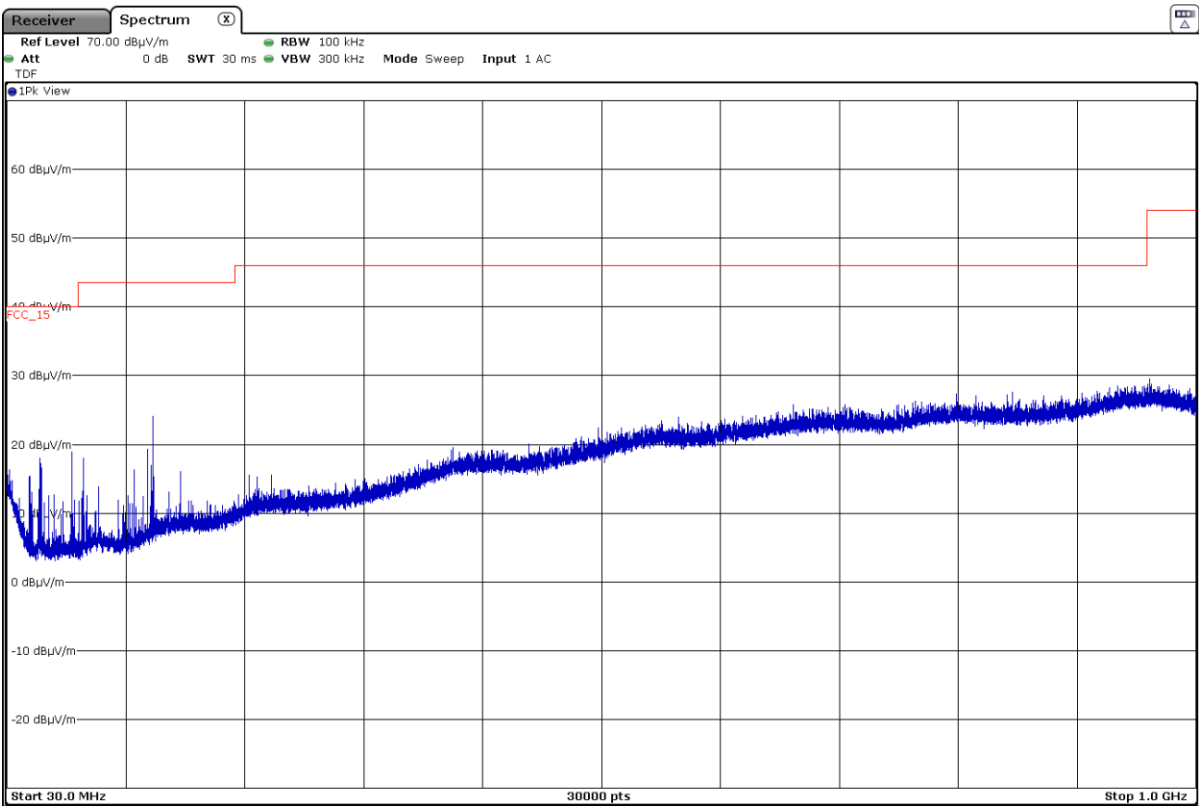
- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Detector	Emission Level (dB μ V/m)	Polarization	Measurement Uncertainty (dB)
2.35463	Peak	52.14	H	< $\pm$ 3.04
2.49430	Peak	52.21	H	< $\pm$ 3.04
4.9593	Peak	45.92	V	< $\pm$ 4.88
7.43917	Peak	50.11	V	< $\pm$ 4.88

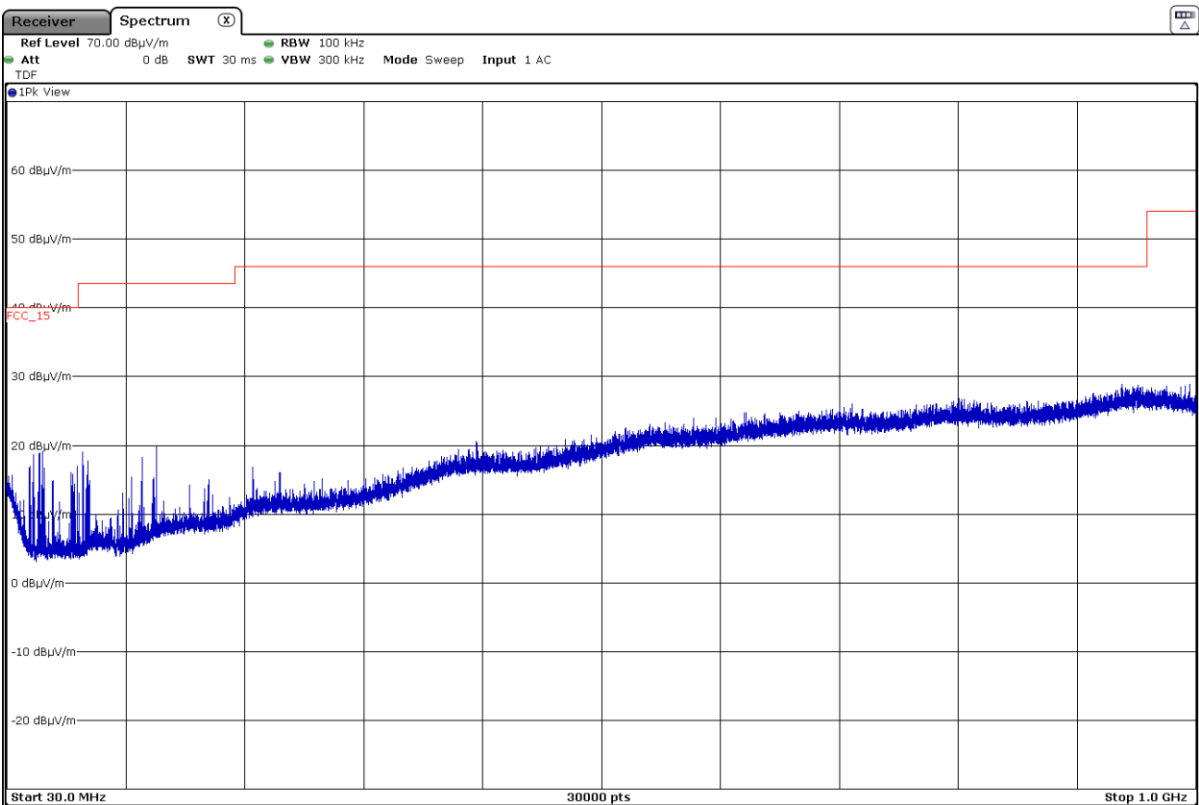
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz:

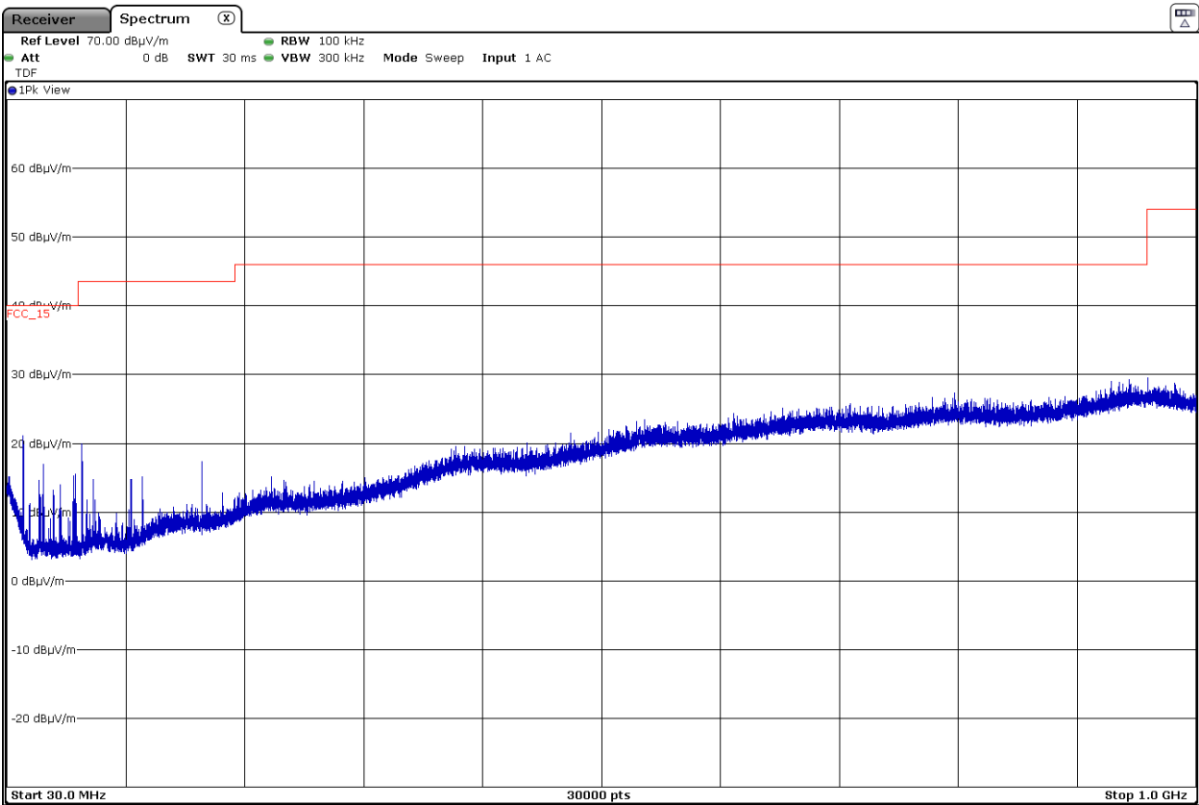
- Low Channel:



- Middle Channel:

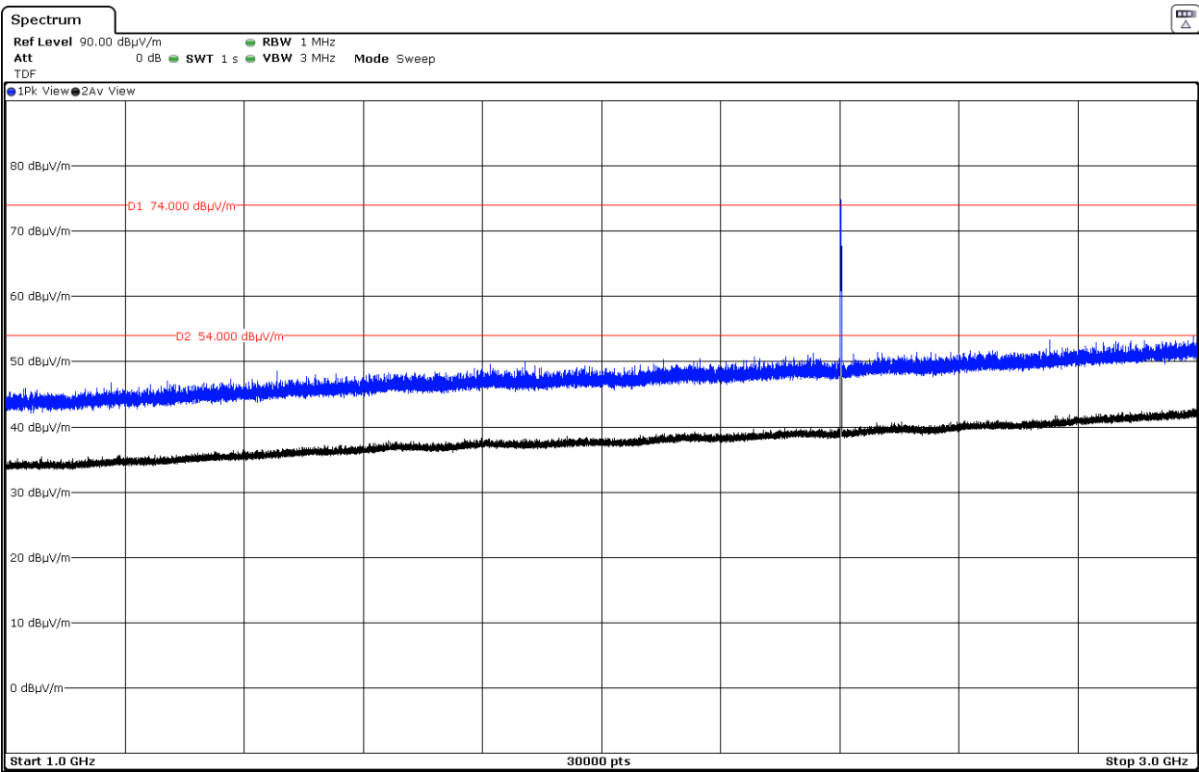


- High Channel:



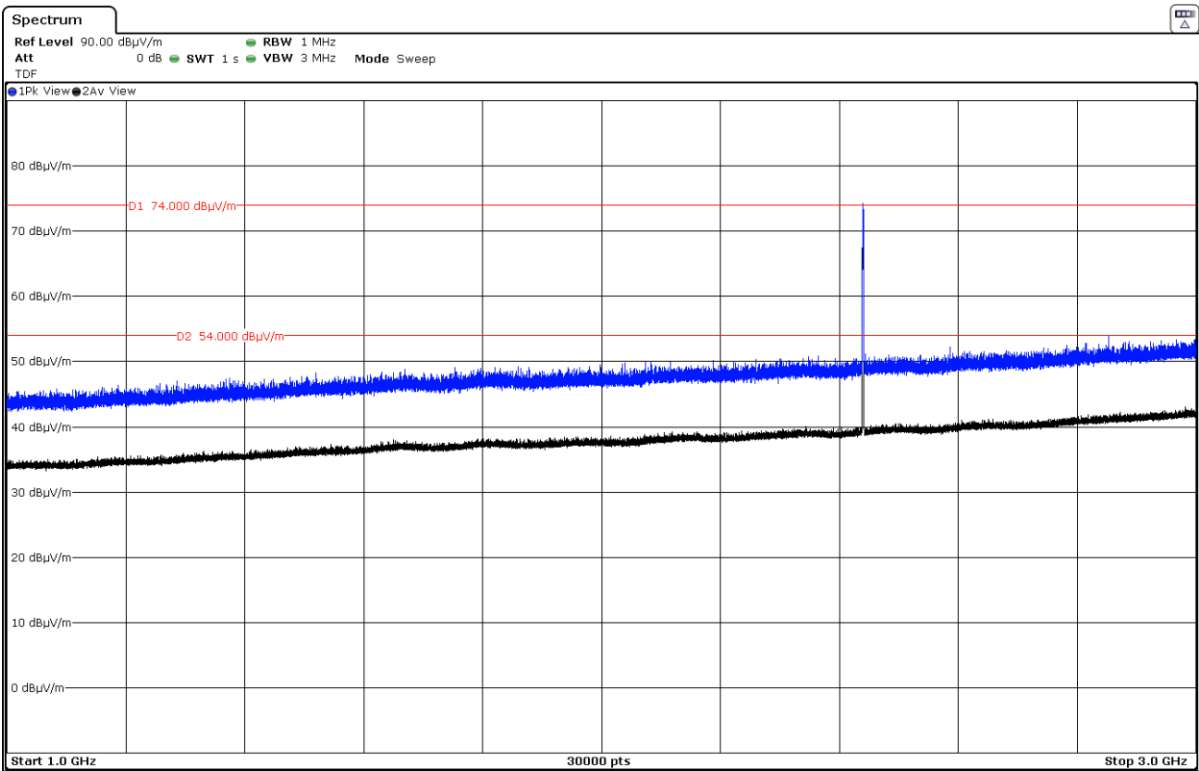
FREQUENCY RANGE 1 - 3 GHz:

- Low Channel:



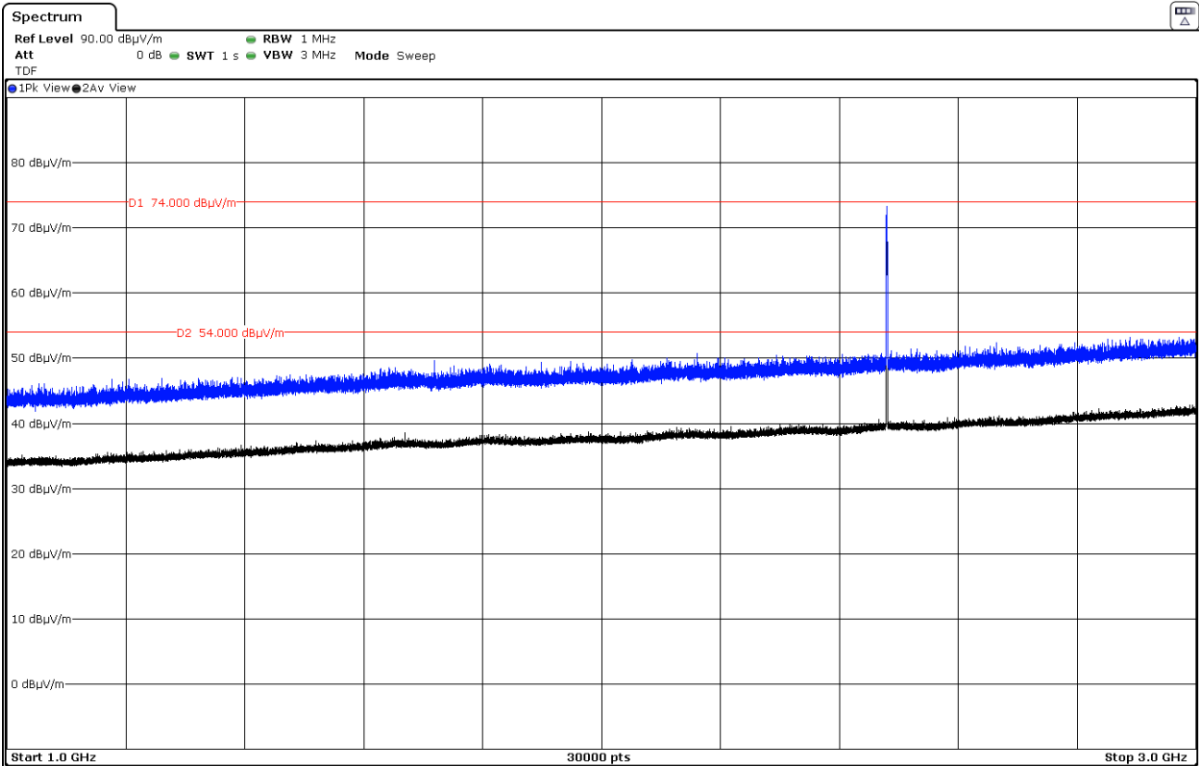
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

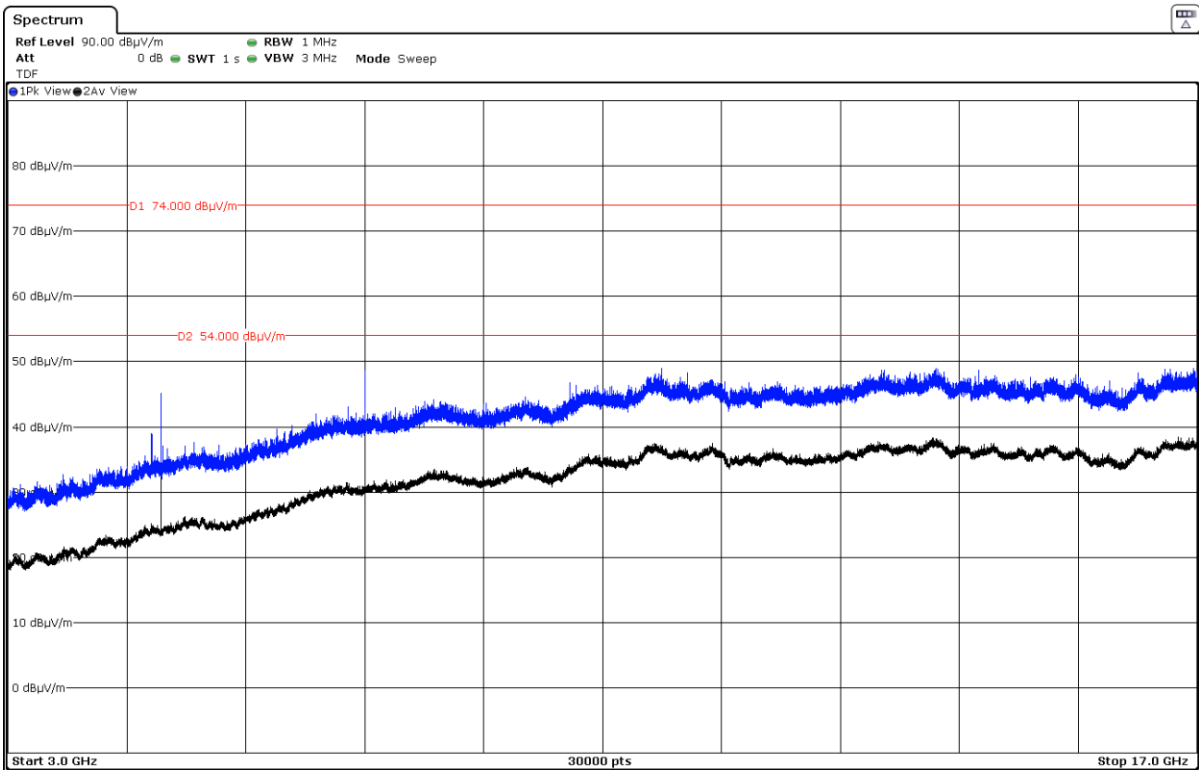
- High Channel:



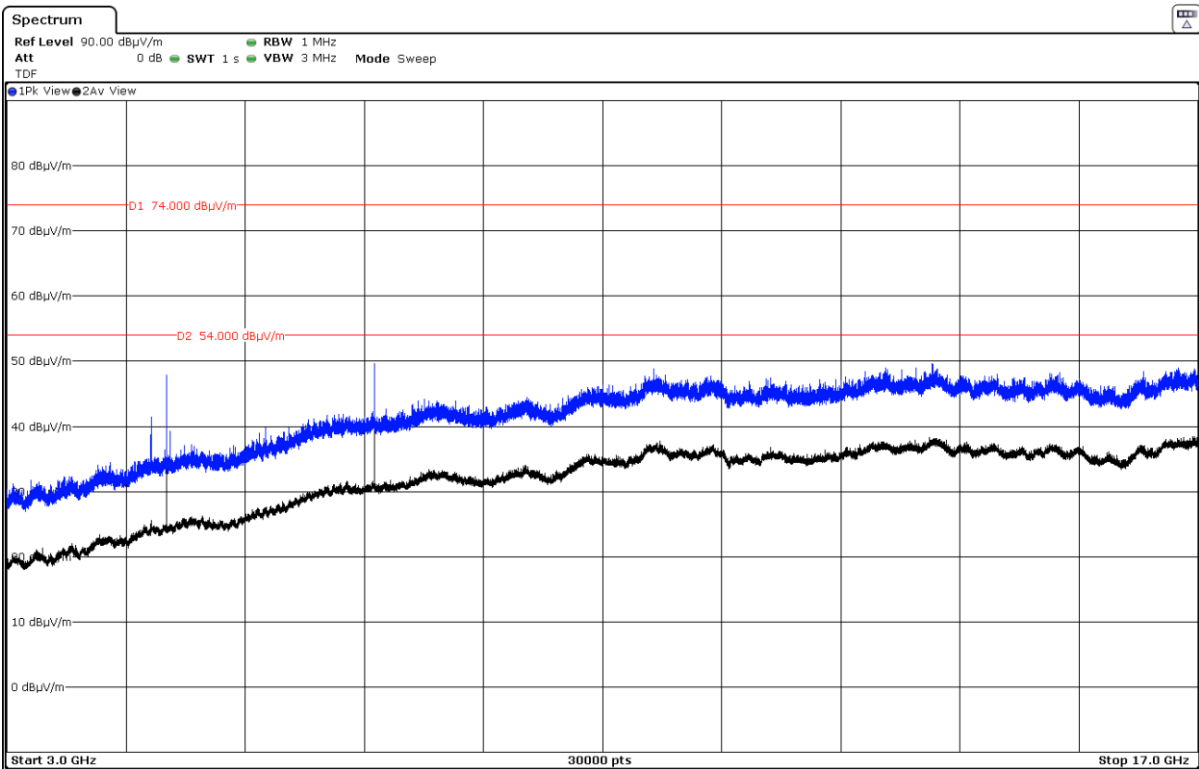
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz:

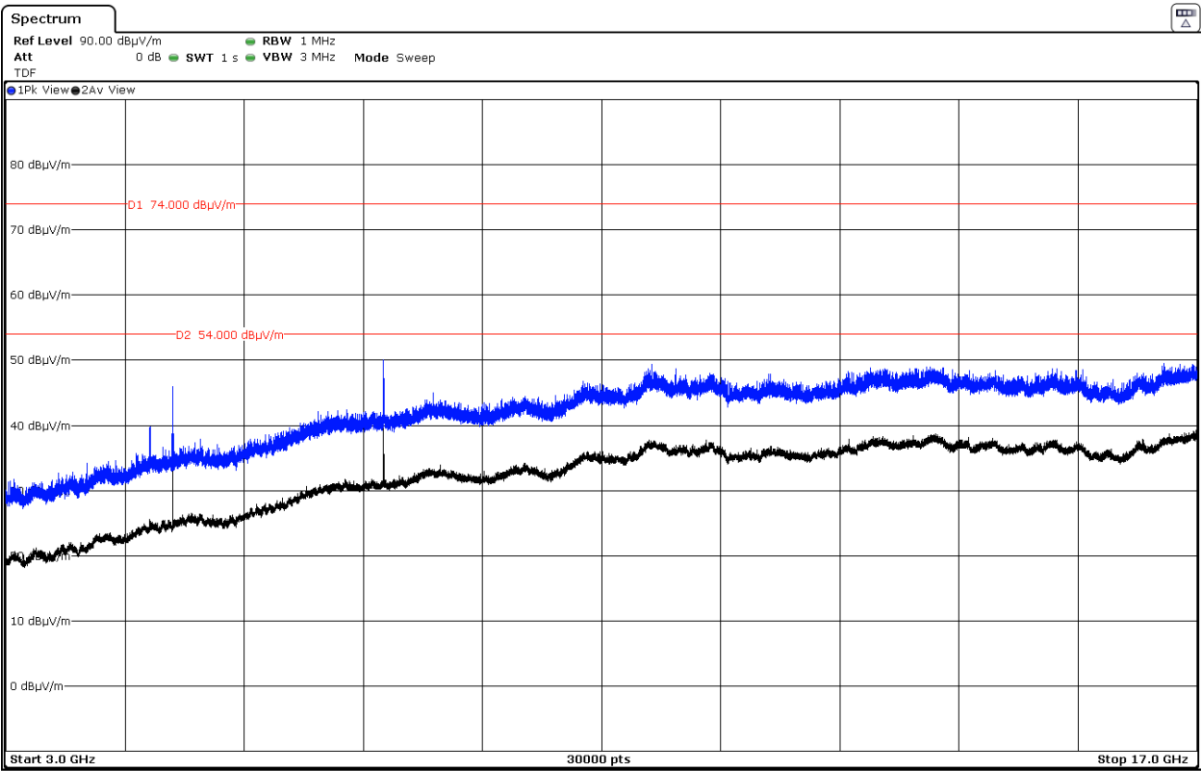
- Low Channel:



- Middle Channel:

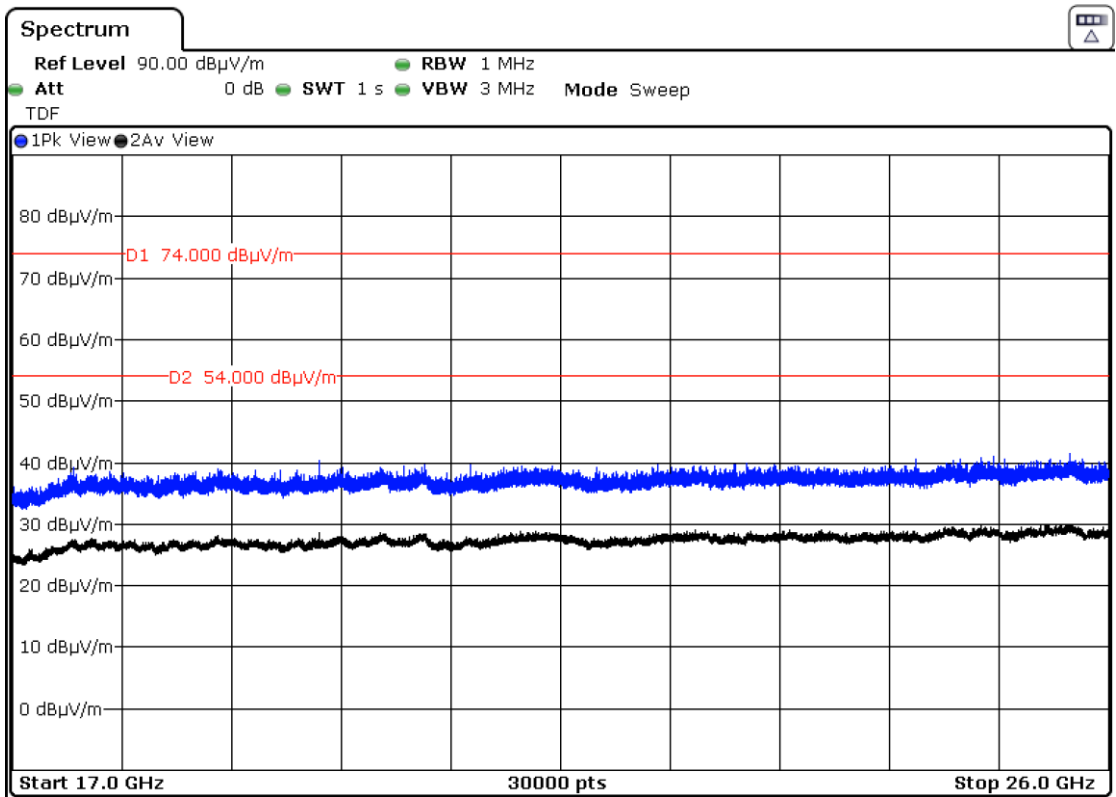


- High Channel:



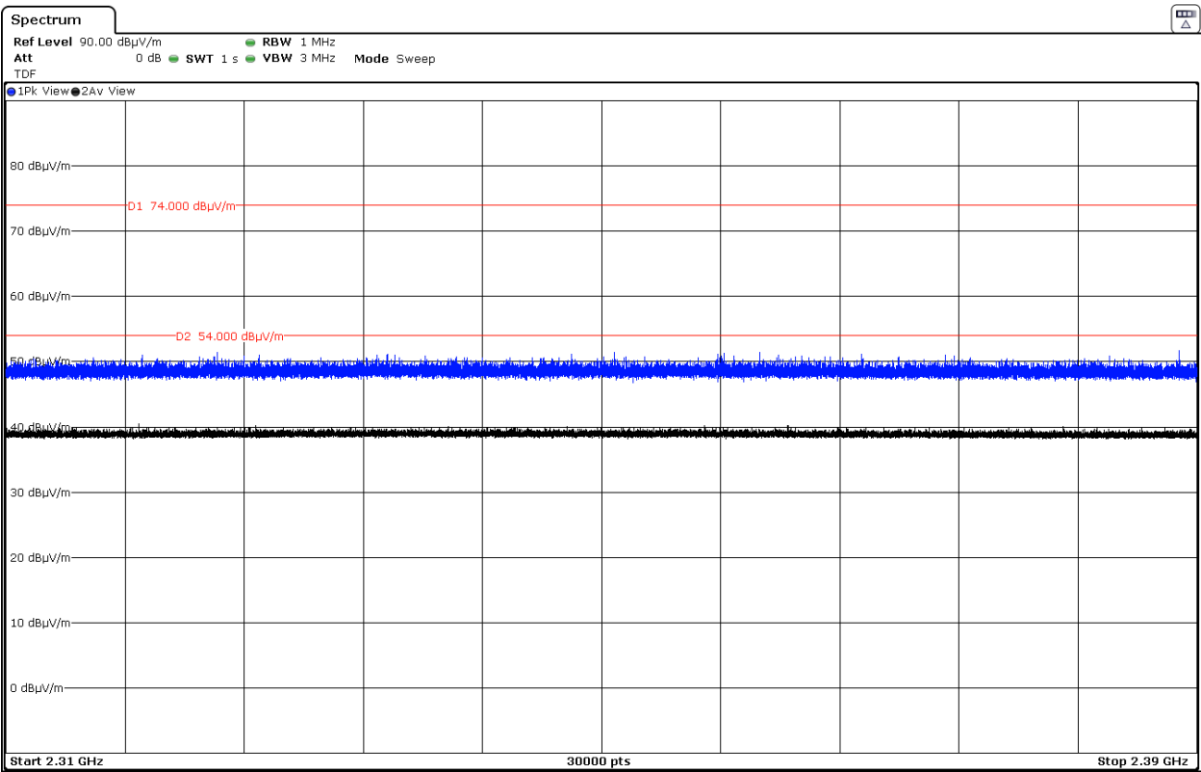
FREQUENCY RANGE 17 - 26 GHz:

This plot is valid for the Low, Middle and High Channels:

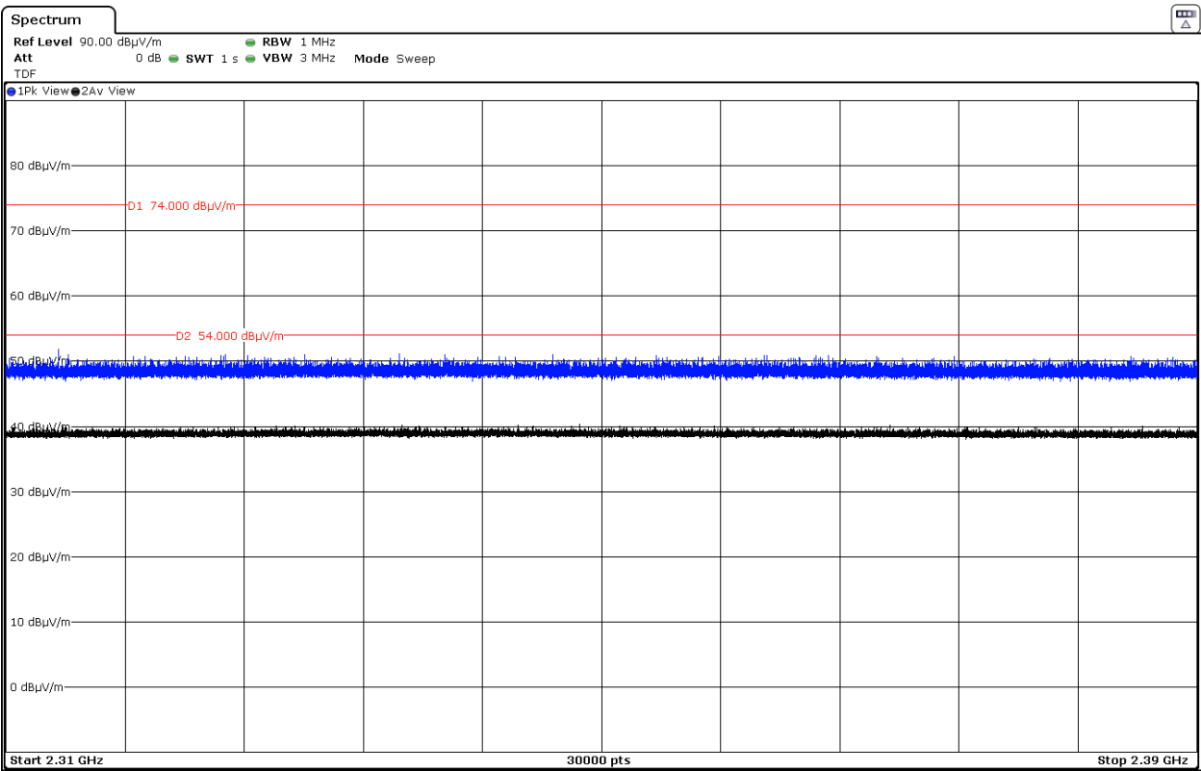


FREQUENCY RANGE 2.31-2.39 GHz (Restricted Band):

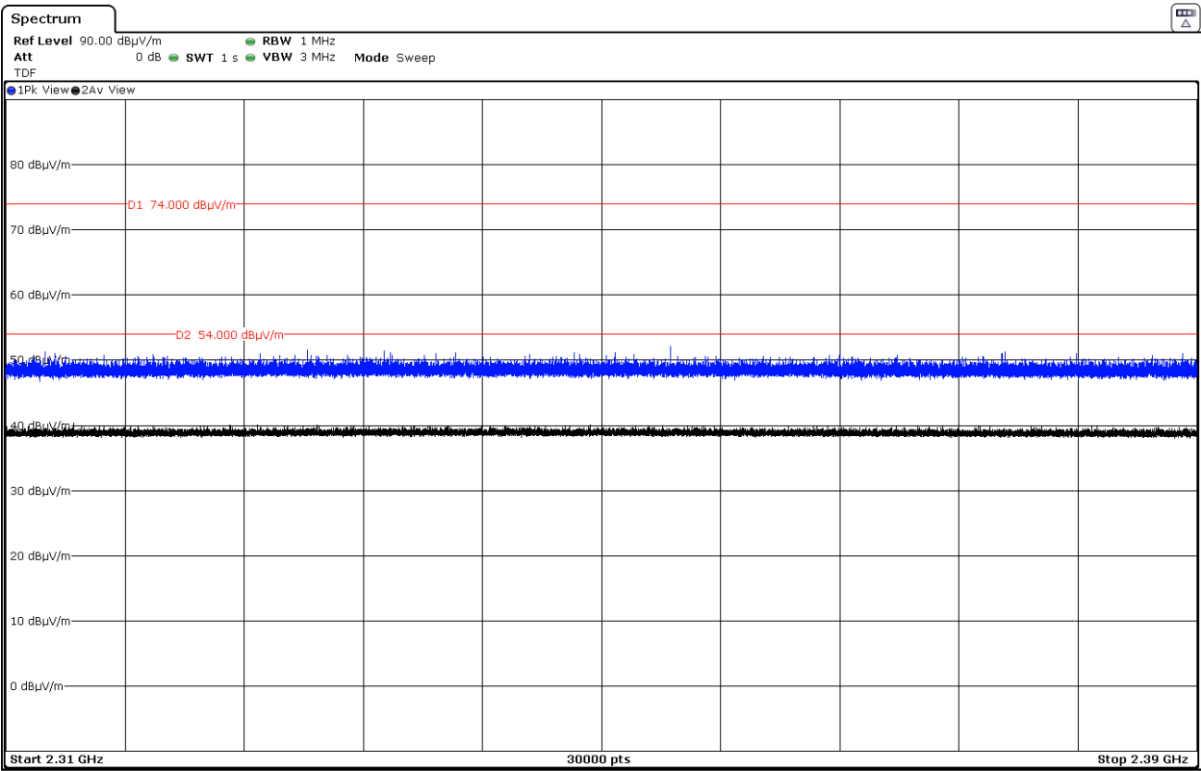
- Low Channel:



- Middle Channel:

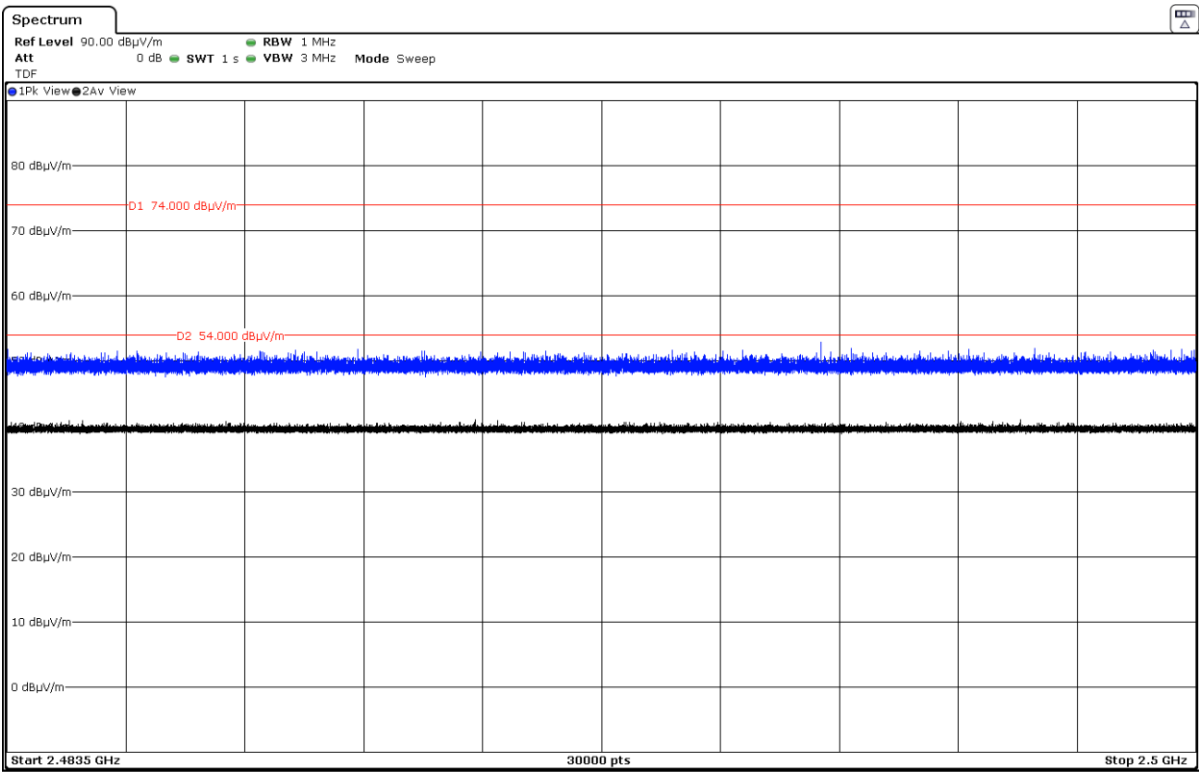


- High Channel:

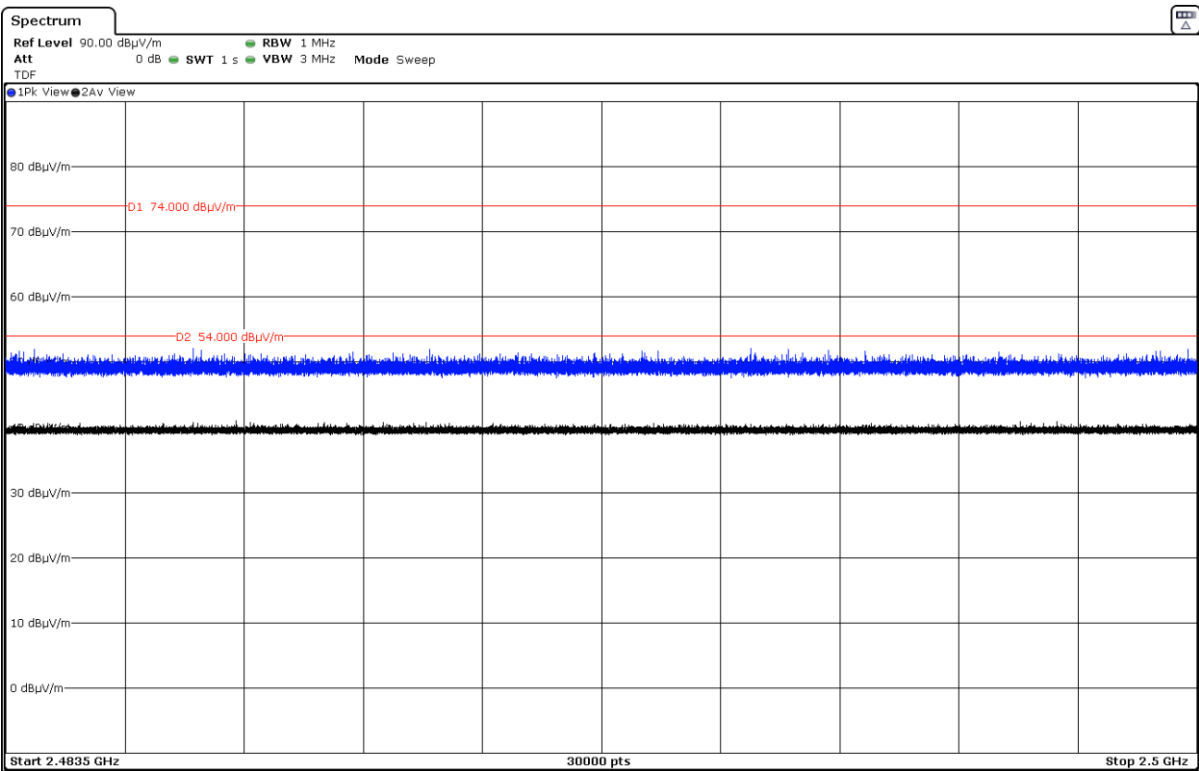


FREQUENCY RANGE 2.4835-2.5 GHz (Restricted Band):

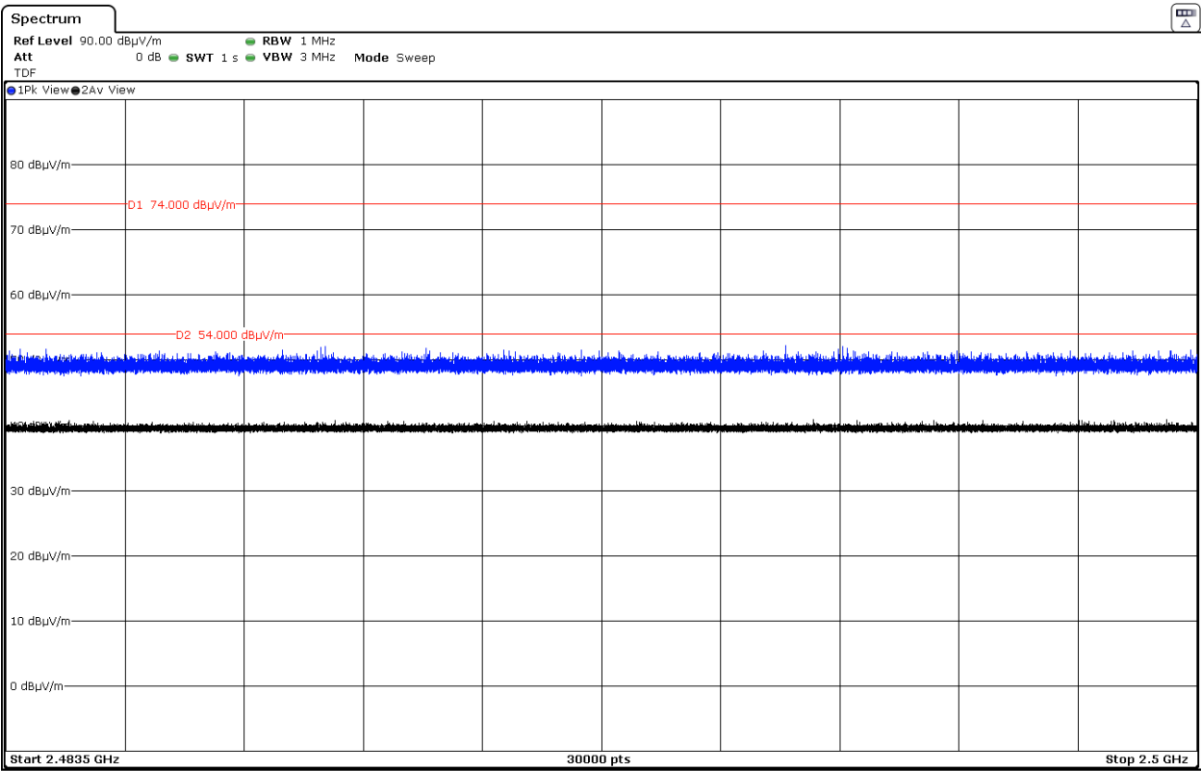
- Low Channel:



- Middle Channel:



- High Channel:



Appendix B: Test results. ANT+

INDEX

TEST CONDITIONS44

Occupied Bandwidth46

FCC Section 15.247 Subclause (a) (2) / RSS-247 Clause 5.2 (a) 6 dB Bandwidth.....47

FCC Section 15.247 Subclause (b) / RSS-247 Clause 5.4 (d) Maximum output power and antenna gain48

FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations conducted (Transmitter).....50

FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Band-edge emissions compliance (Transmitter) ..52

FCC Section 15.247 Subclause (e) / RSS-247 5.2. (b) Power spectral density54

FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations radiated (Transmitter)56

TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	3.7 Vdc
Type of Power Supply:	Battery.
Type of Antenna:	External (Monopole $\lambda/4$).
Maximum Declared Antenna Gain:	+3 dBi

TEST FREQUENCIES:

Low Channel:	Not supported.
Middle Channel:	2457 MHz
High Channel:	Not supported.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer.



RADIATED MEASUREMENTS

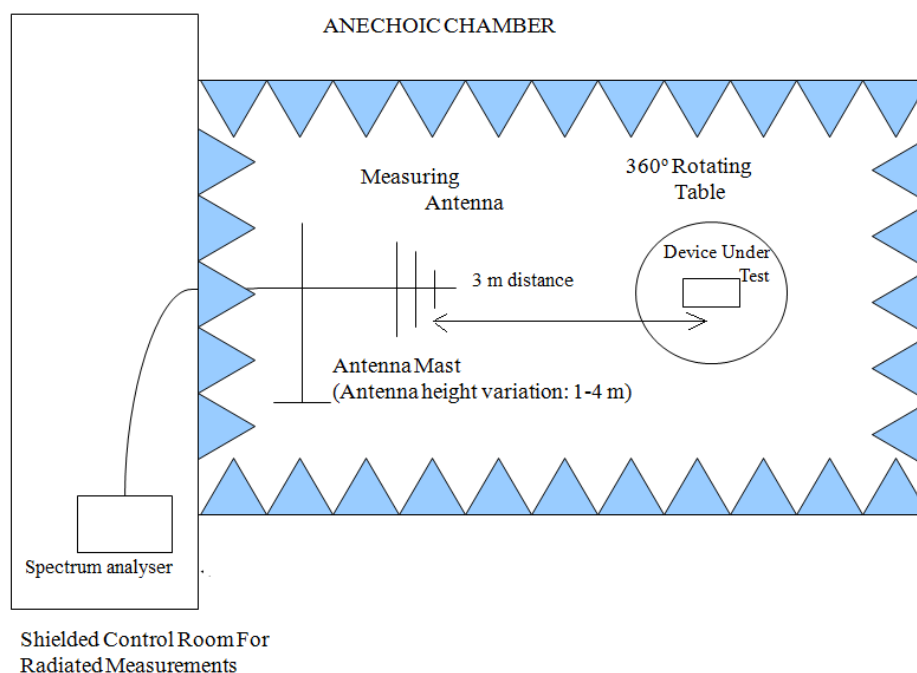
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) is situated at a distance of 3 m and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

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.

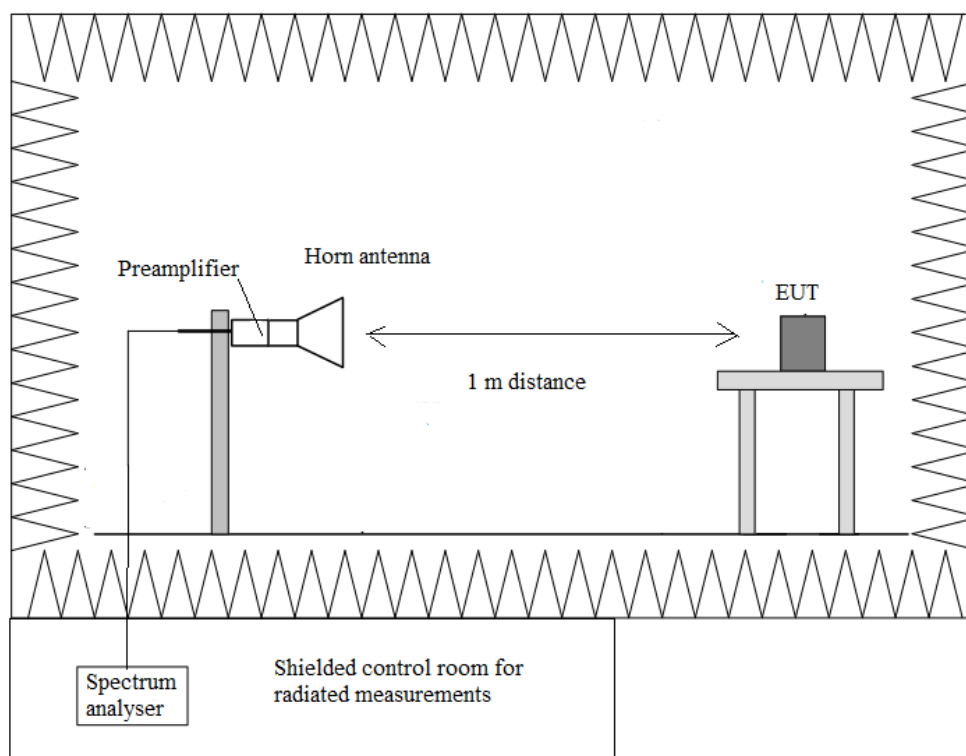
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup $f > 1$ GHz:

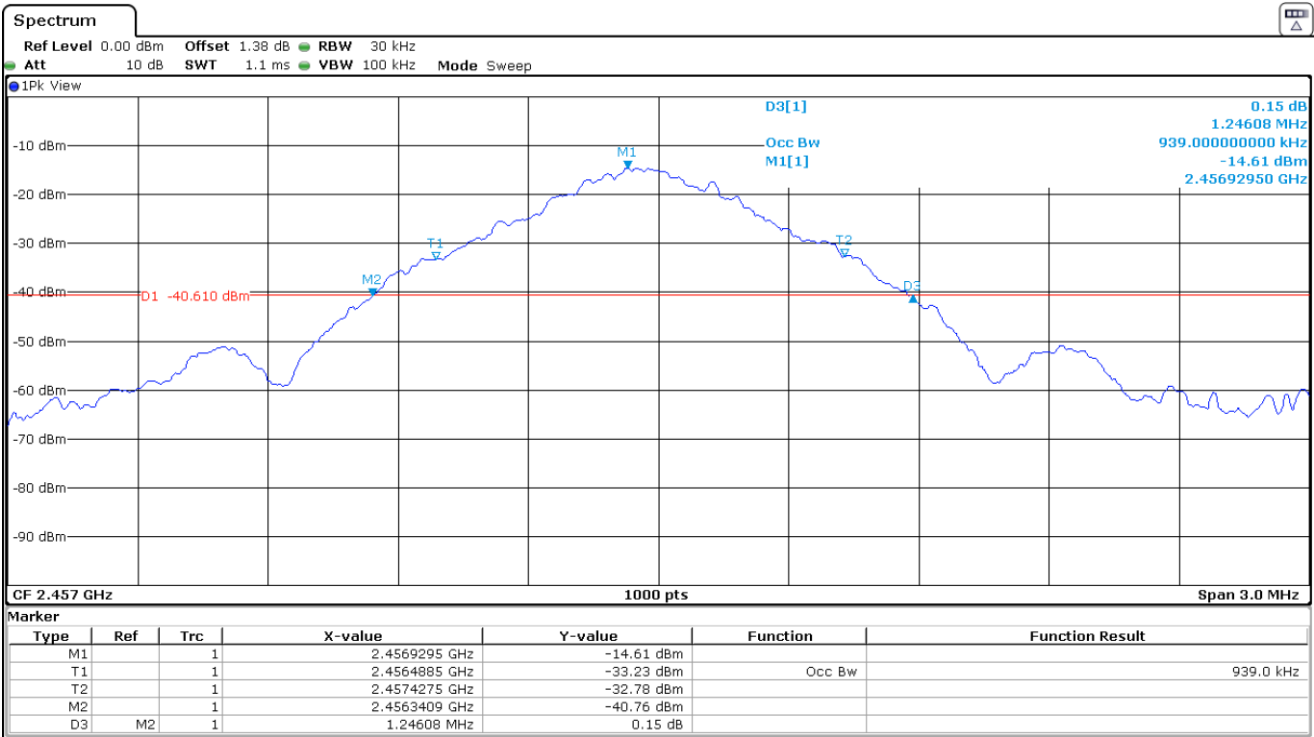


Occupied Bandwidth

RESULTS:

	Middle Channel 2457MHz
99% bandwidth (MHz)	0.939
Measurement uncertainty (kHz)	<± 1.80

- Middle Channel:



FCC Section 15.247 Subclause (a) (2) / RSS-247 Clause 5.2 (a) 6 dB Bandwidth.

SPECIFICATION:

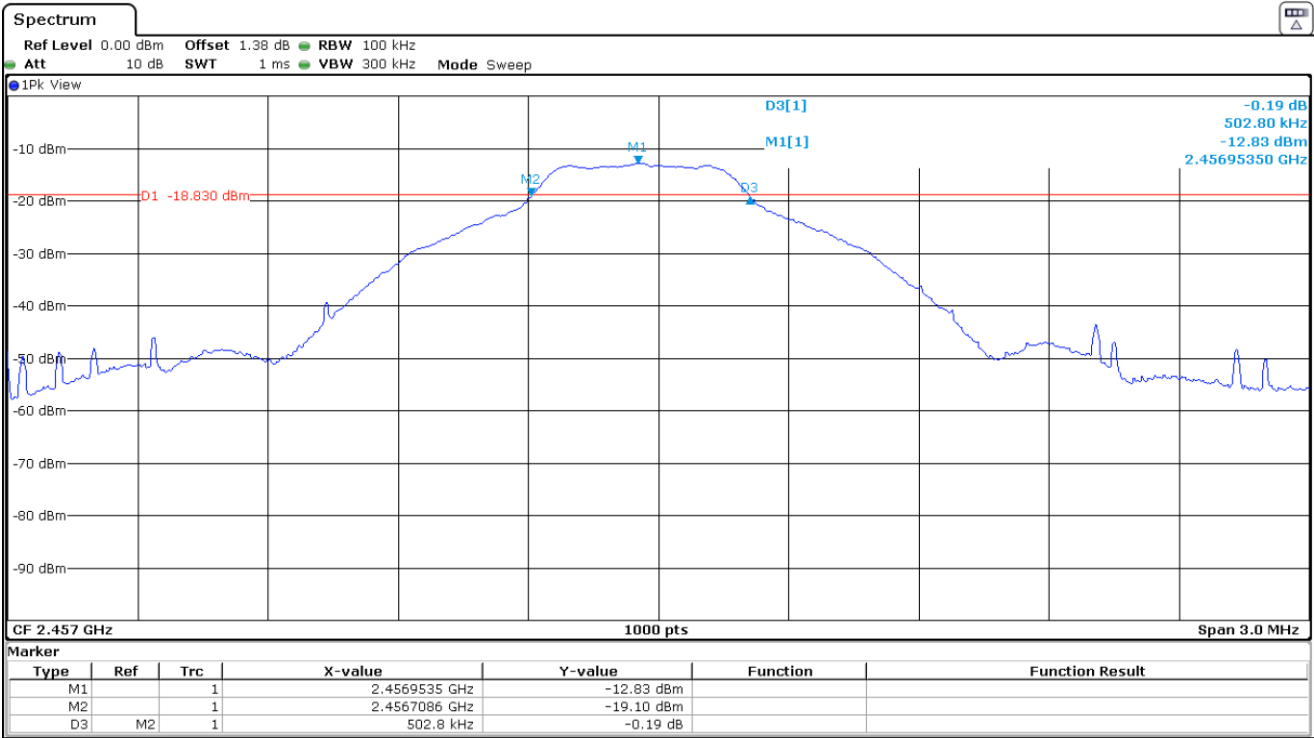
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS:

	Middle Channel 2457 MHz
6 dB Spectrum bandwidth (kHz)	502.8
Measurement uncertainty (kHz)	<±2.50

Verdict: PASS

- Middle Channel:



FCC Section 15.247 Subclause (b) / RSS-247 Clause 5.4 (d) Maximum output power and antenna gain

SPECIFICATION:

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS:

The maximum peak conducted output power level in the fundamental emission was measured using the method according to point 11.9.1.1 "RBW $\geq$ DTS bandwidth" of ANSI C.63.10-2013.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

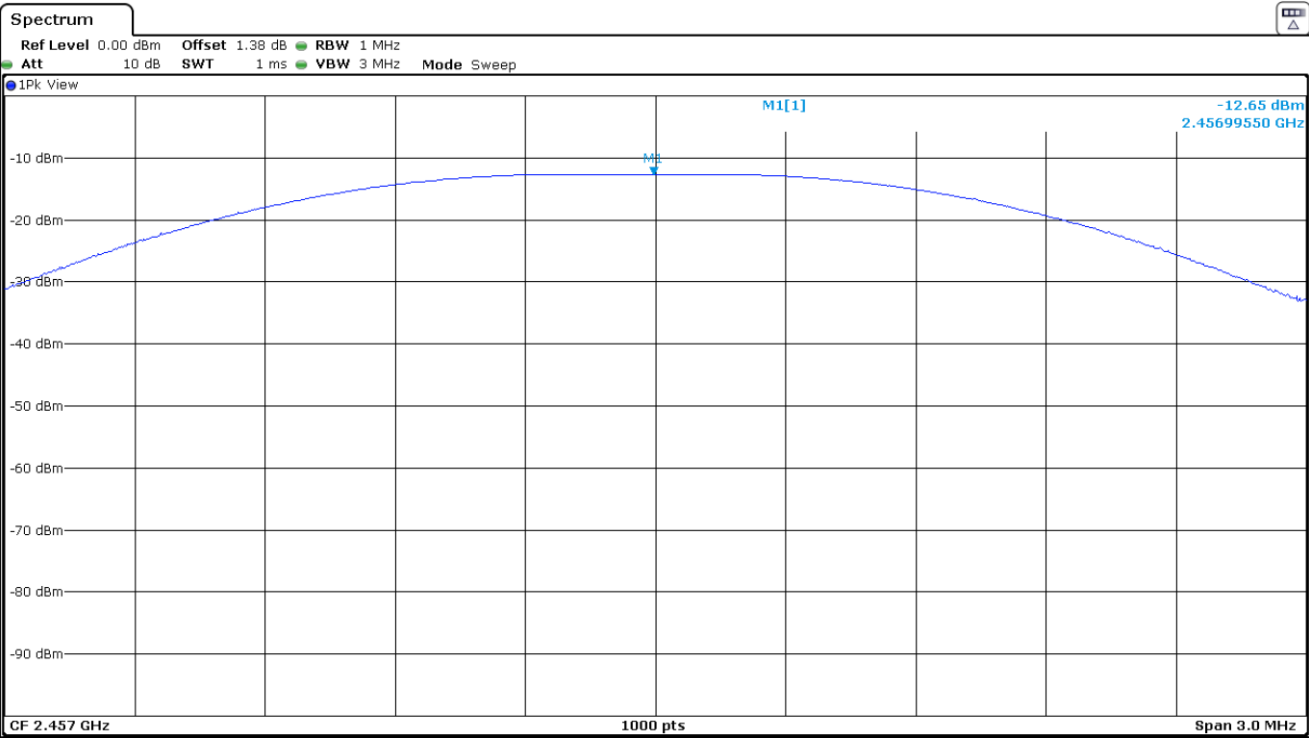
Maximum Declared Antenna Gain: +3 dBi

	Middle Channel 2457 MHz
Maximum Conducted Power (dBm)	-12.65
Maximum EIRP Power (dBm)	-9.65
Measurement uncertainty (dB)	< $\pm$ 1.20

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

- Middle Channel:



FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations conducted (Transmitter)

SPECIFICATION:

In any 100 kHz bandwidths outside the frequency band in which the 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

RESULTS:

	Middle Channel 2457 MHz
Reference Level Measurement (dBm)	-12.79
Measurement uncertainty (dB)	<±1.20

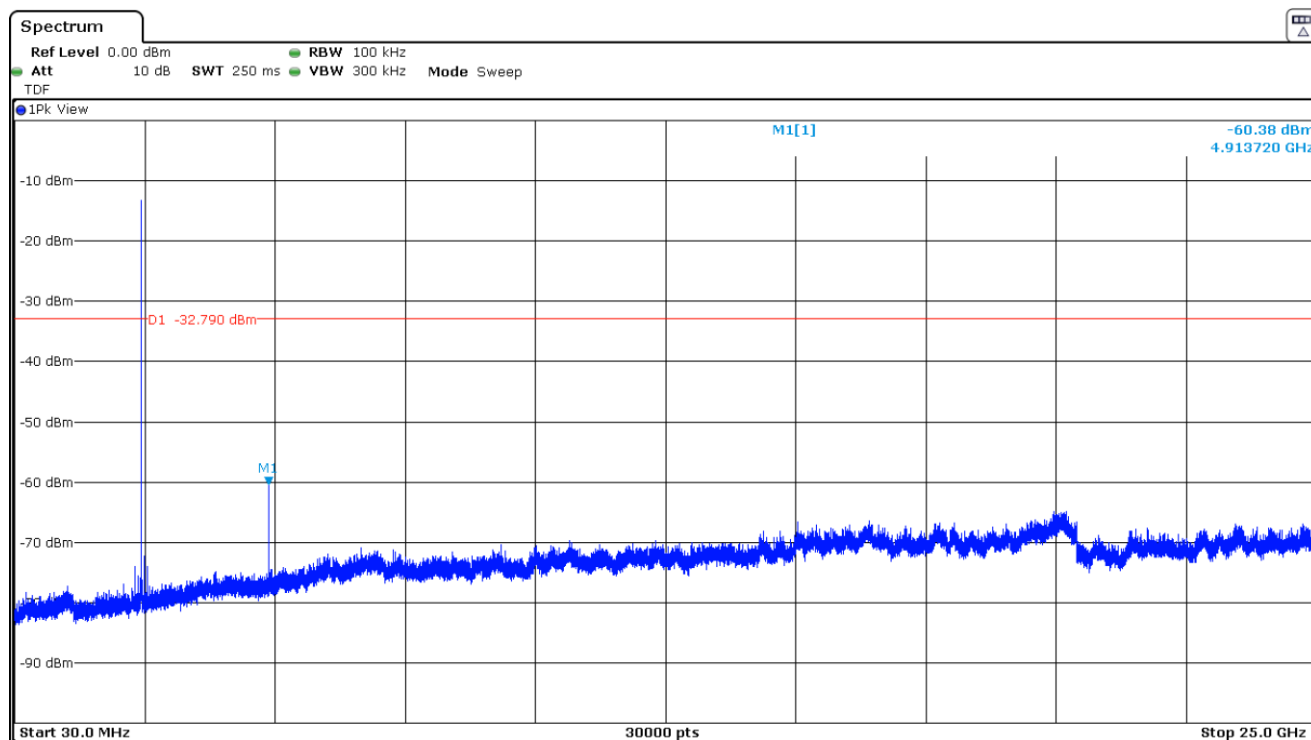
- Middle Channel:

No spurious peaks found at less than 20 dB respect to the limit.

Measurement uncertainty (dB)	<±1.56
------------------------------	--------

Verdict: PASS

- Middle Channel:



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

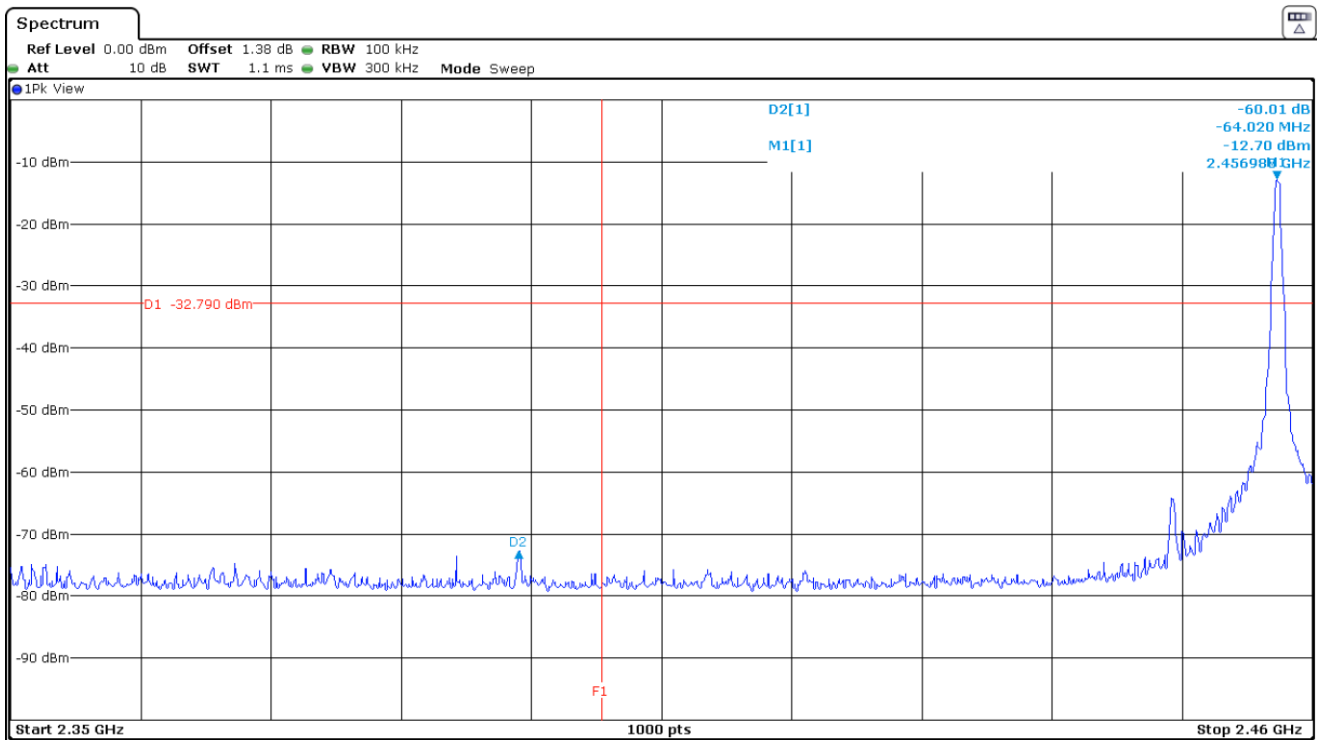
FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Band-edge emissions compliance (Transmitter)

SPECIFICATION:

In any 100 kHz bandwidths outside the frequency band in which the 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

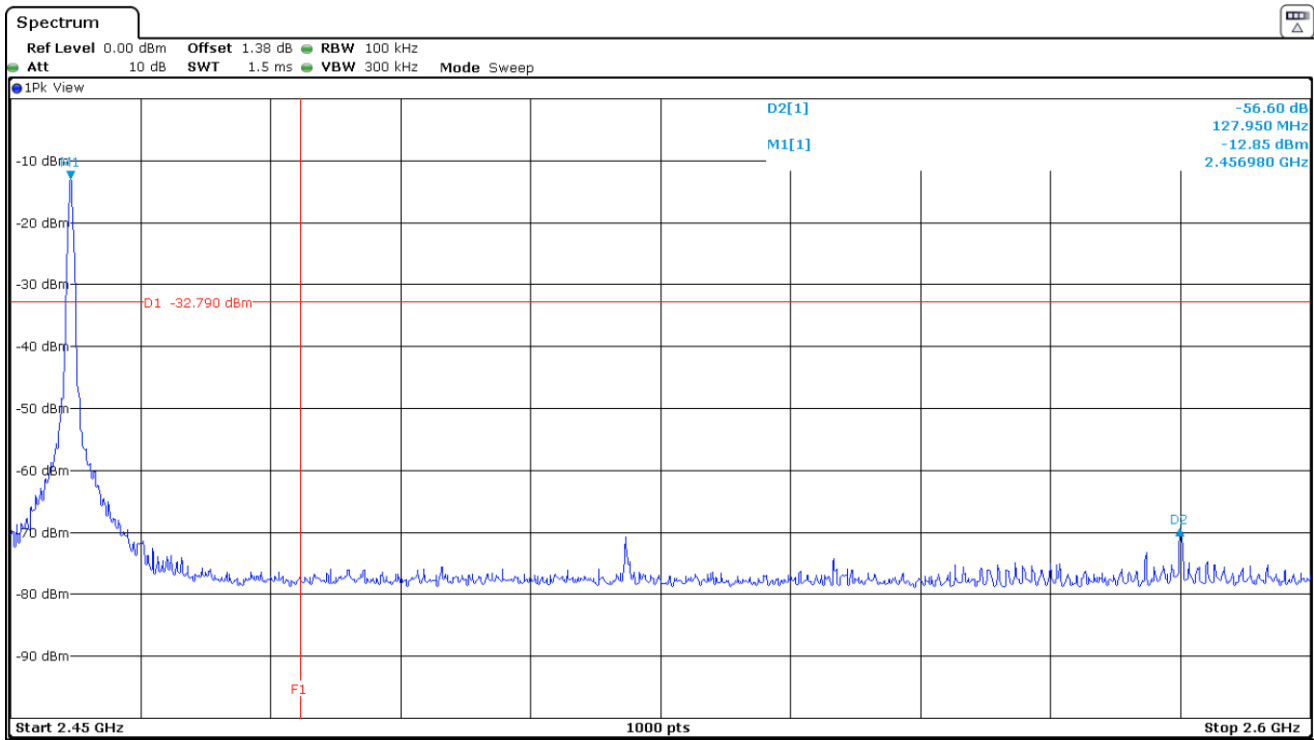
RESULTS:

- Low Band-edge:



Verdict: PASS

- High Band-edge:



Verdict: PASS

Measurement uncertainty (dB)	<±1.56
------------------------------	--------

FCC Section 15.247 Subclause (e) / RSS-247 5.2. (b) Power spectral density

SPECIFICATION:

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

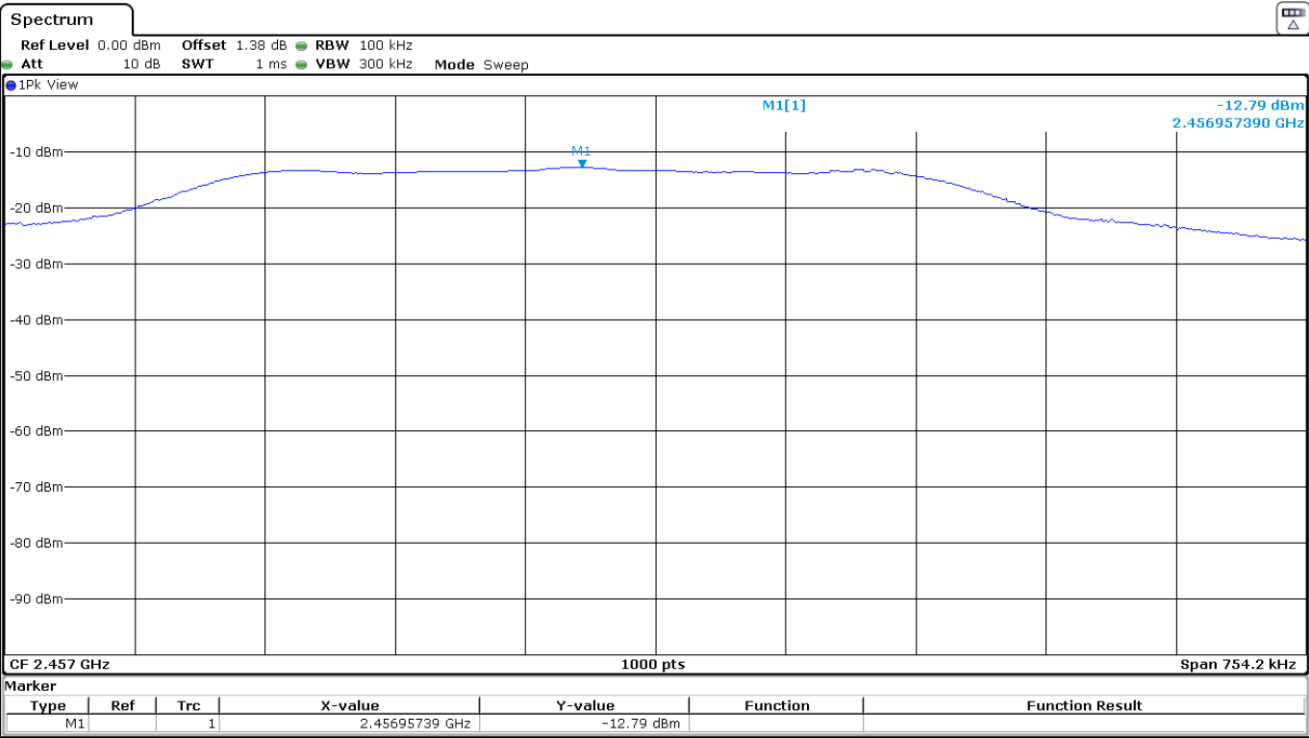
RESULTS:

The maximum power spectral density level in the fundamental emission was measured using the method according to point 11.10.2." Method PKPSD (peak PSD)" of ANSI C.63.10-2013.

	Middle Channel 2457 MHz
Power Spectral Density (dBm)	-12.79
Measurement uncertainty (dB)	<±1.20

Verdict: PASS

- Middle Channel:



FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations radiated (Transmitter)

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)/RSS-Gen):

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 - 10000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247: Attenuation below the general field strength limits specified in RSS-Gen is not required.

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.

This ANT+ radio only has the Middle Channel at 2457 MHz.

Frequency range 30 MHz - 1 GHz:

No spurious frequencies detected at less than 20 dB below 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.

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.

- MIDDLE CHANNEL:

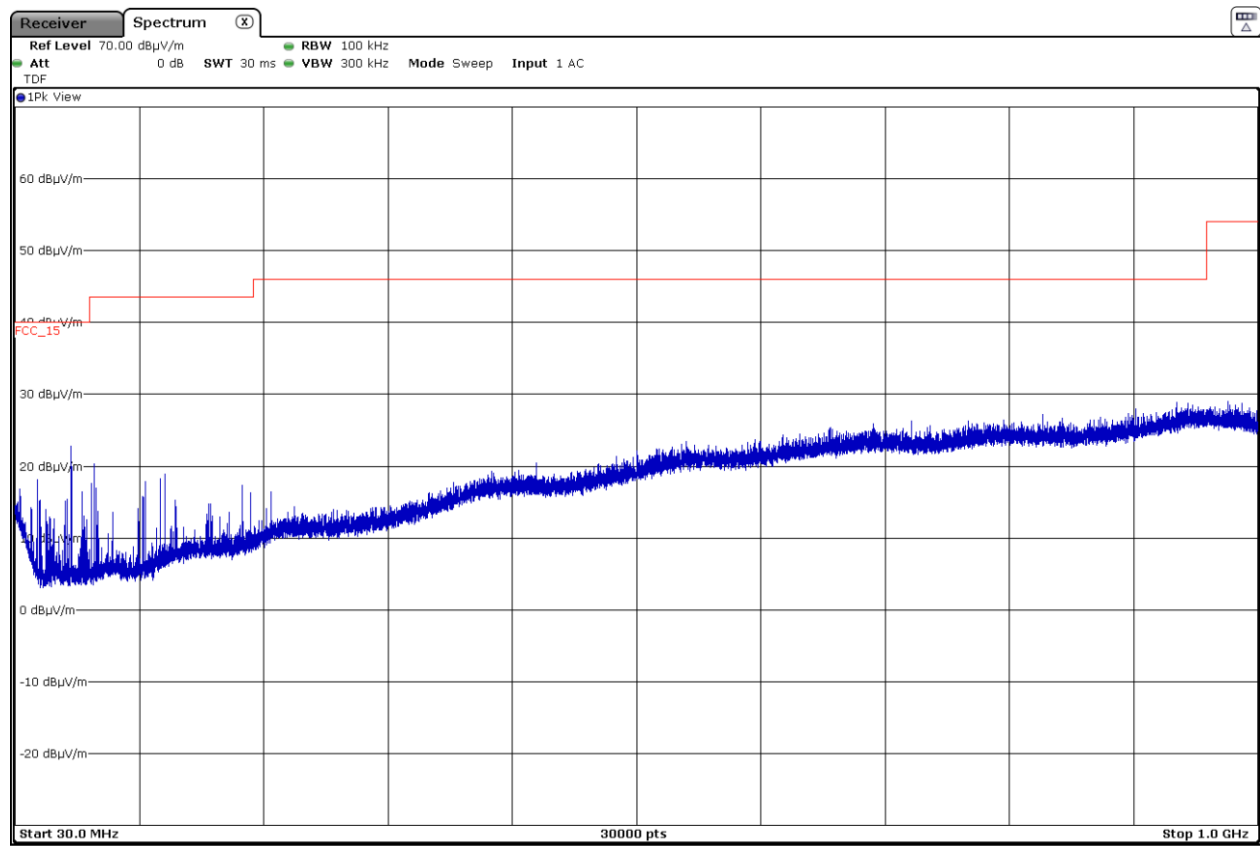
Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Detector	Emission Level (dB μ V/m)	Polarization	Measurement Uncertainty (dB)
2.389132	Peak	51.45	V	< $\pm$ 3.04
2.491835	Peak	51.93	V	< $\pm$ 3.04
4.91403	Peak	44.13	V	< $\pm$ 4.88

Verdict: PASS

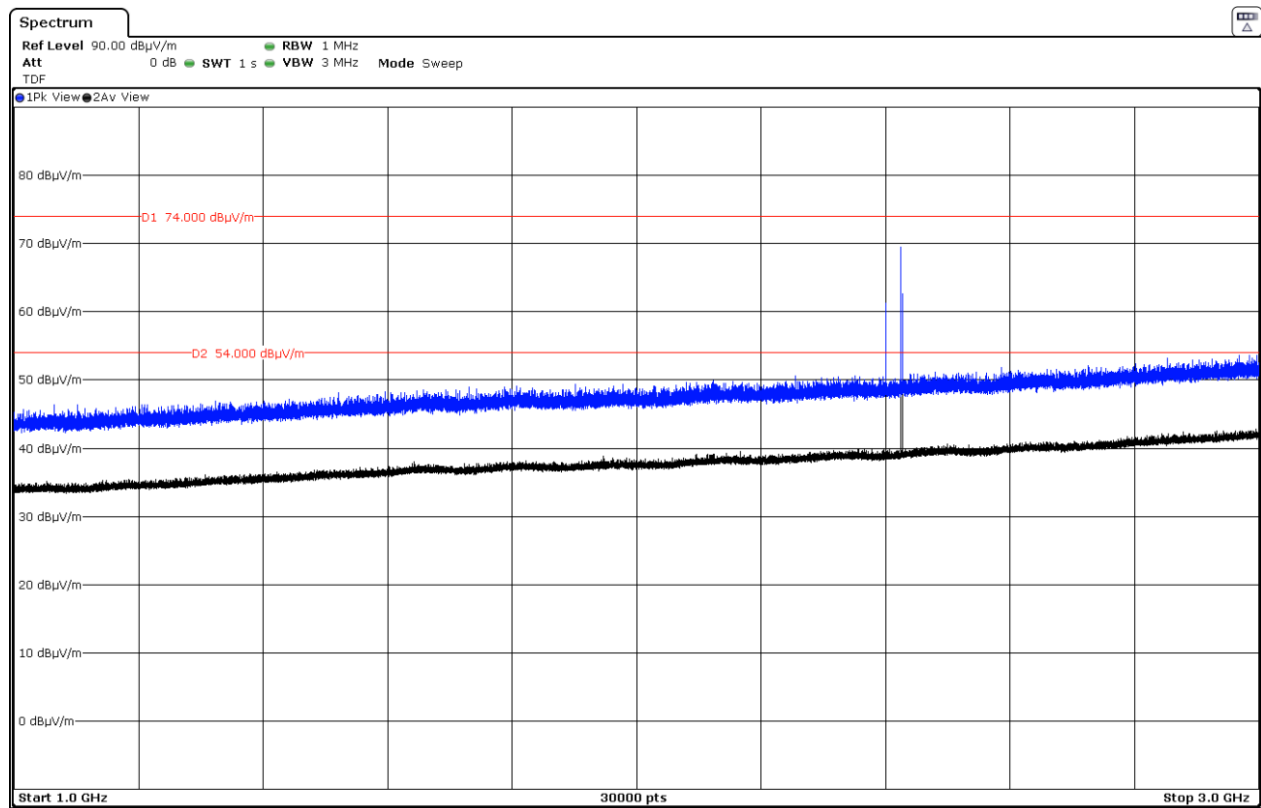
FREQUENCY RANGE 30 MHz - 1 GHz:

- Middle Channel:



FREQUENCY RANGE 1 - 3 GHz:

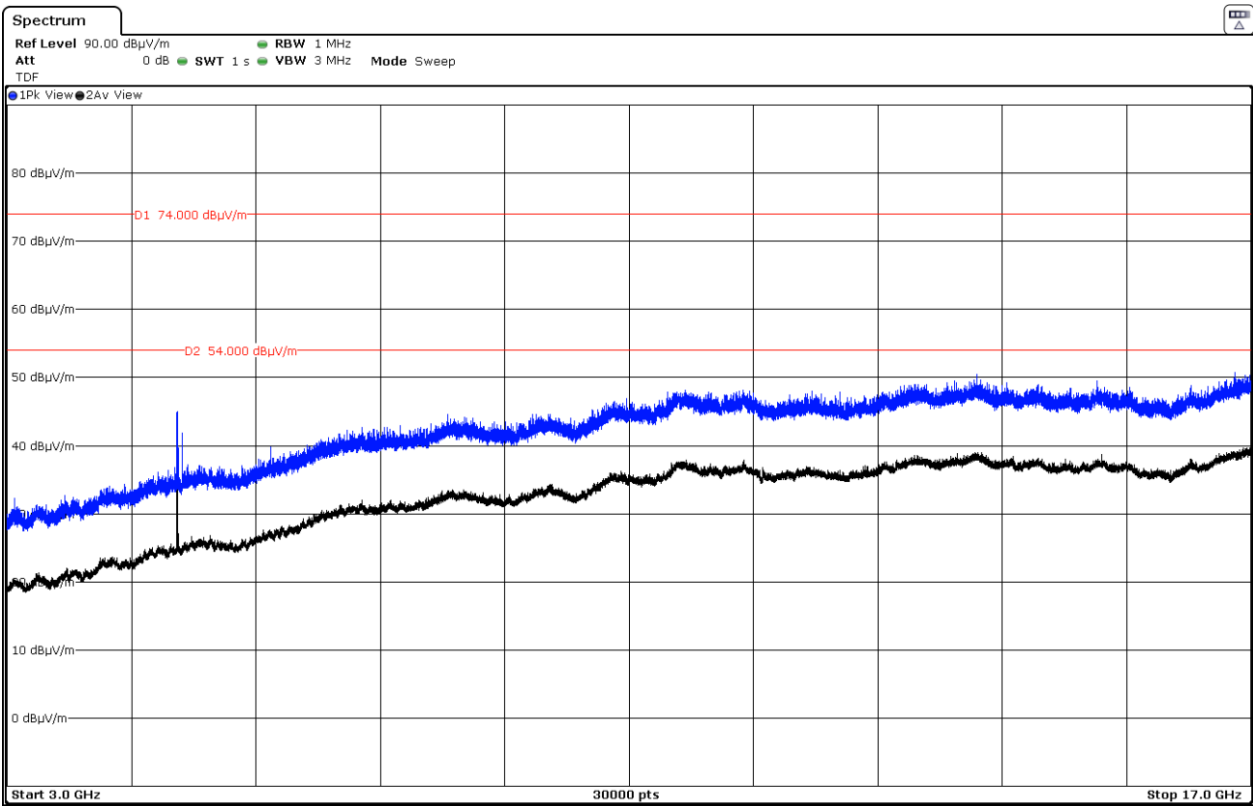
- Middle Channel:



The peak above the limit is the carrier frequency.

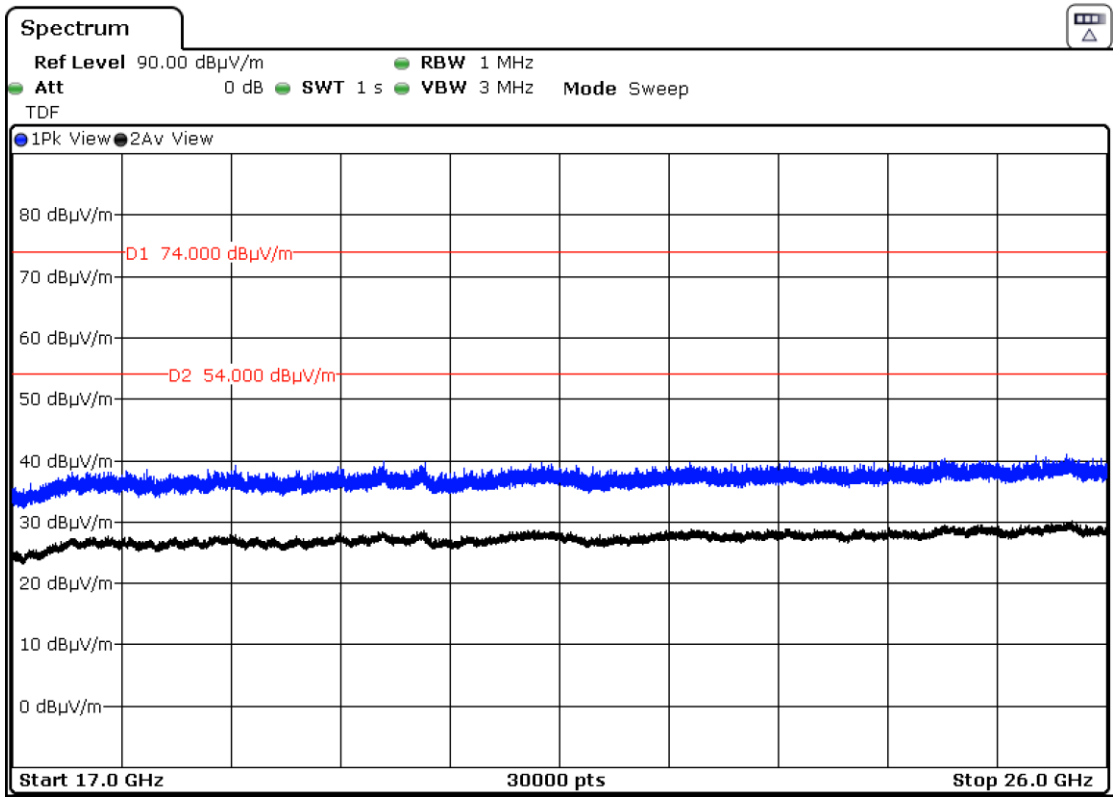
FREQUENCY RANGE 3 - 17 GHz:

- Middle Channel:



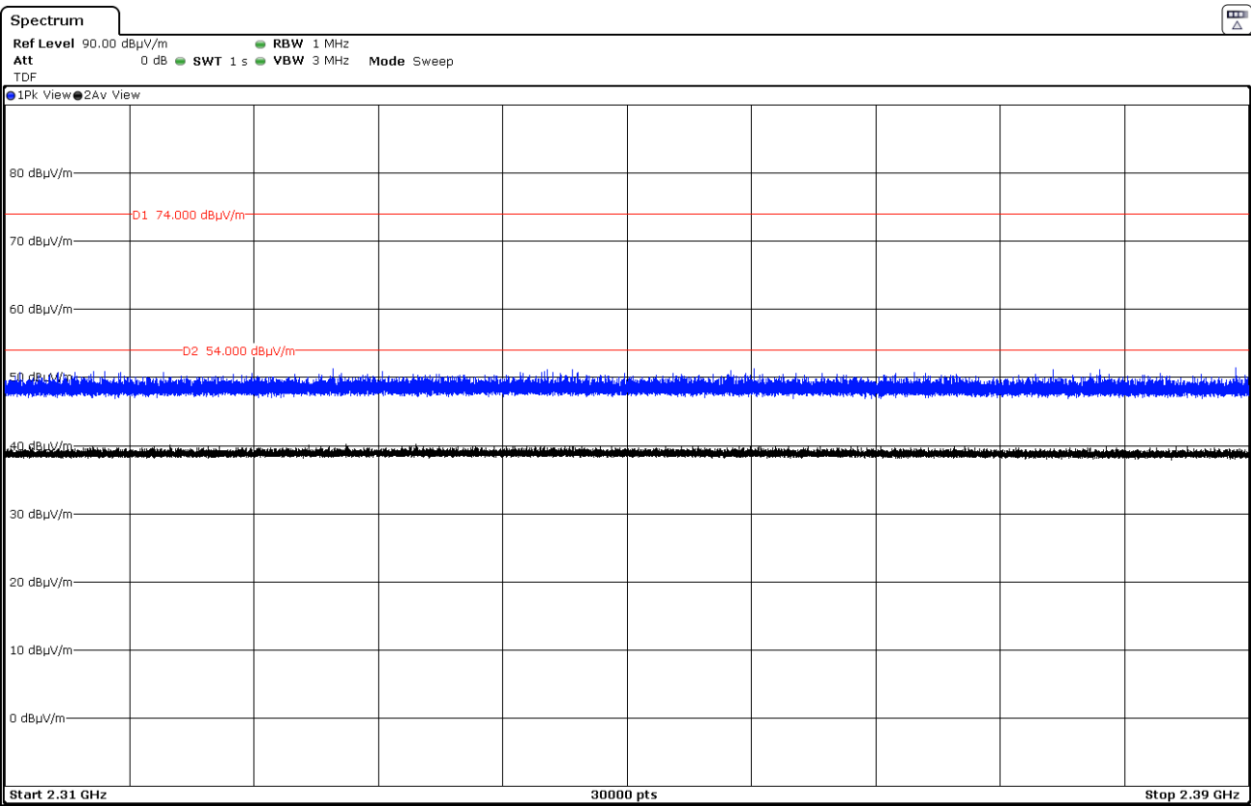
FREQUENCY RANGE 17 - 26 GHz:

- Middle Channel:



FREQUENCY RANGE 2.31-2.39 GHz (Restricted Band):

- Middle Channel:



FREQUENCY RANGE 2.4835-2.5 GHz (Restricted Band):

- Middle Channel:

