FCC LISTED, REGISTRATION NUMBER: 720267

IC LISTED REGISTRATION NUMBER IC 4621A-1

Informe de ensayo nº:
Test report No:

NIE: 40260RRF.002

Test report

USA FCC Part 15.247, 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.
License-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.
General Requirements and Information for the Certification of Radio Apparatus.

Identificación del objeto ensayado.....: Identification of item tested	Fitness Monitor Bluetooth Low Energy
Marca .....: Trade	ADIDAS
Modelo y/o referencia tipo .....: Model and /or type reference	IOL90
Other identification of the product .....:	Comercial name: MICOACH FIT SMART FCC ID: ZLGFS IC: 9722B-FS
Final HW version .....:	B2.0
Final SW version .....:	0.10.2
Serial number.....:	D10914170000324, D10914170000325
Características .....: Features	Bluetooth Low Energy, rechargeable battery
Peticionario .....: Applicant	Adidas AG World of sports, ADI-DASSLER-STRASEE 1, D-91074 HERZOGENAURACH. GERMANY. VAT: DE132490588 Contact person: Simon Drabble Telephone/Fax: +49 160 8 84 2687 / +49 9132 84 5773 e-mail: simon.drabble@adidas.com
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.247 10-1-12 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 10-1-12 Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 8 (December 2010). CANADA RSS-Gen Issue 3 (December 2010). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013. ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.

Resultado.....: Summary	IN CONPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por Alejandro Llamas Rodríguez Fecha: 2014.06.10 11:10:18 +02'00'
Fecha de realización .....: Date of issue	2014-06-10
Formato de informe No. .....: Report template No	FDT08_15

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Competences and guarantees

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless 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: IC 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless 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 AT4 wireless at the time of performance of the test.

AT4 wireless 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 AT4 wireless.

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 AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
40260B/010	Fitness monitor	IOL90	D10914170000325	2014-05-14

1. Sample M/01 has undergone following test(s).

   All radiated tests indicated in appendix A.

Sample M/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
40260B/003	Fitness monitor	IOL90	D10914170000324	2014-05-14

1. Sample M/02 has undergone the test(s) specified in subclause "Test method requested".

   All conducted tests indicated in appendix A.

Test sample description

The test sample consists of a fitness monitor with Bluetooth Low Energy.

Test samples supplier

Elektrobit Wireless Communications Oy

Tutkijantie, 8. FI-90590 Oulu. FINLAND.

VAT: FI 17375650

Contact person: Tuomo Väinämö

Telephone: +358 40 344 3416 / e-mail: tuomo.vainamo@elektrobit.com

Testing period

The performed test started on 2014-05-15 and finished on 2014-05-29.

The tests have been performed at AT4 wireless.

Environmental conditions

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

Temperature	Min. = 21.9 ºC Max. = 23.8 ºC
Relative humidity	Min. = 39.7 % Max. = 42.2 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. = 20.2 ºC Max. = 21.6 ºC
Relative humidity	Min. = 43.5 % Max. = 54.0 %
Air pressure	Min. = 1010 mbar Max. = 1012 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

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

Temperature	Min. = 19.7 ºC Max. = 21.4 ºC
Relative humidity	Min. = 41.9 % Max. = 52.3 %
Air pressure	Min. = 1016 mbar Max. = 1016 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

Remarks and comments

1: Used instrumentation:

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum Analyzer Agilent E4440A	2014/05	2016/05
2.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
3.	DC power supply R&S NGPE 40/40	2011/11	2014/11

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2013/11	2016/11
5.	Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J	2011/09	2014/09
6.	EMI Test Receiver R&S ESU 26	2013/08	2015/08
7.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
8.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2014/02	2015/02
9.	RF pre-amplifier 1-18 GHz Schwarzbeck BBV 9718	2014/02	2015/02
10.	RF pre-amplifier Miteq JS4-12002600-30-5A.	2012/07	2014/07

Testing verdicts

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

FCC PART 15 PARAGRAPH / RSS-210		VERDICT			
		NA	P	F	NM
Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a)	6 dB Bandwidth		P		
Section 15.247 Subclause (b) / RSS-210 A8.4. (4)	Maximum output power and antenna gain		P		
Section 15.247 Subclause (d) / RSS-210 A8.5. conducted	Emission limitations (Transmitter)		P		
Section 15.247 Subclause (d) / RSS-210 A8.5. compliance	Band-edge emissions (Transmitter)		P		
Section 15.247 Subclause (e) / RSS-210 A8.2. (b)	Power spectral density		P		
Section 15.247 Subclause (d) / RSS-210 A8.5.	Emission limitations radiated (Transmitter)		P		

Appendix A – Test result

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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 Gain for antenna (maximum) = 0 dBi

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2440 MHz

Highest 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 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-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 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 (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º 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.

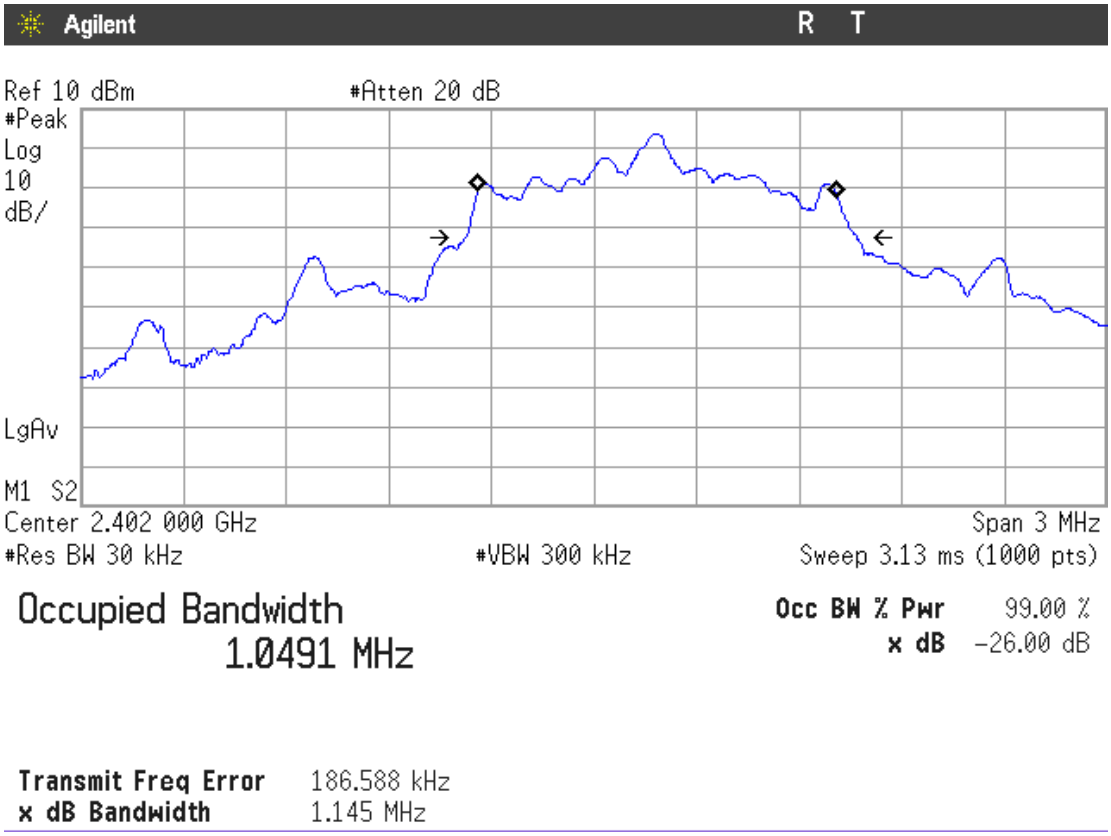
Occupied Bandwidth

RESULTS

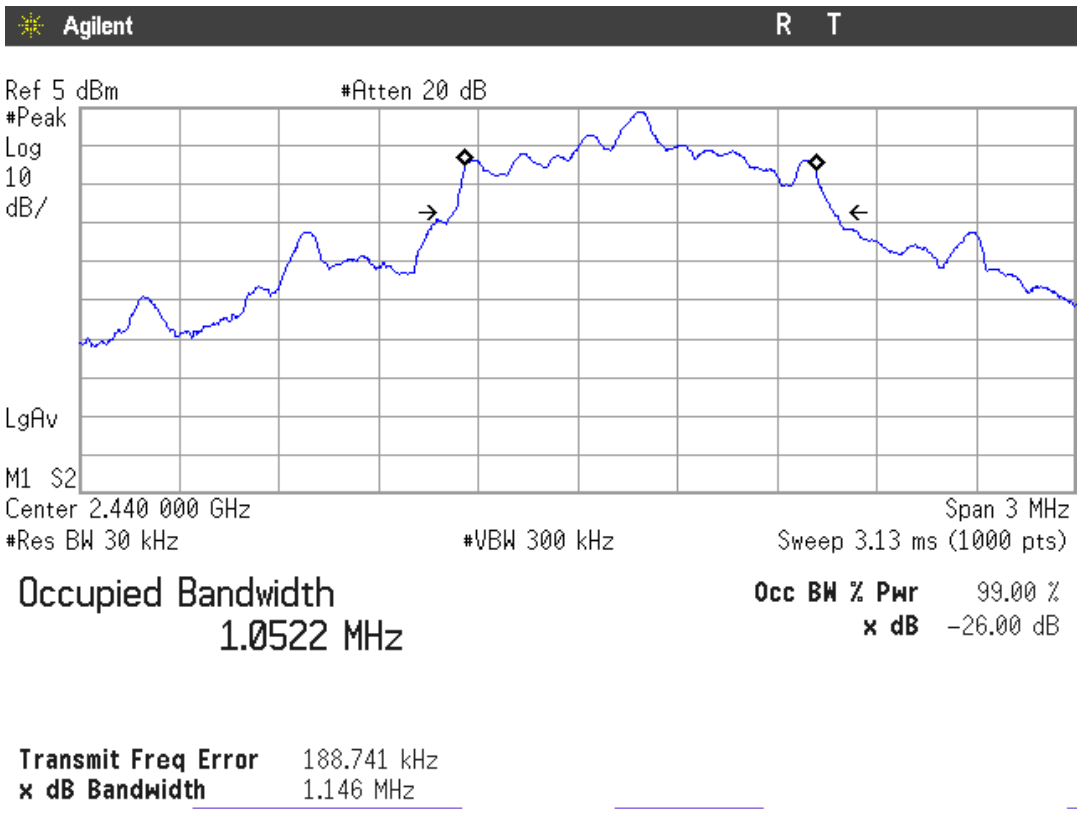
(see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	1.0491	1.0522	1.0479
-26 dBc bandwidth (MHz)	1.1450	1.1460	1.1510
Measurement uncertainty (kHz)	±21.7		

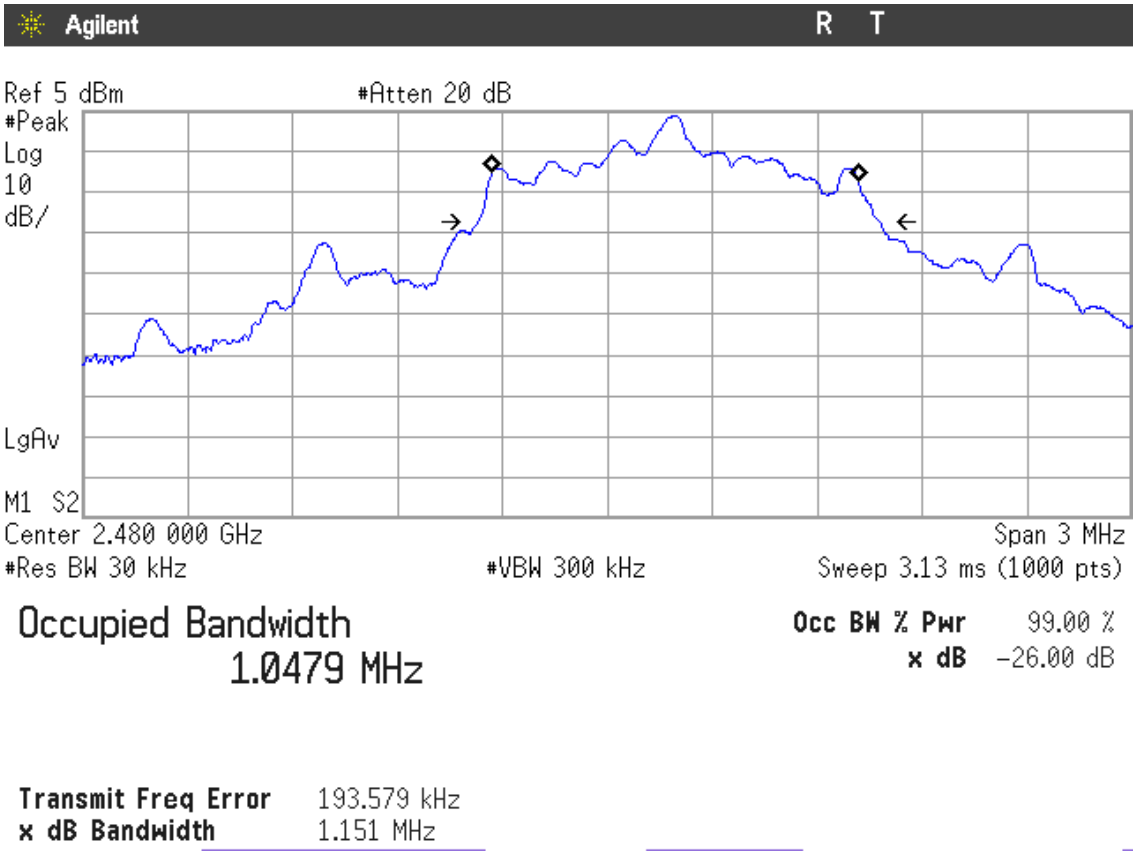
Lowest Channel



Middle Channel



Highest channel



Section 15.247 Subclause (a) (2) / RSS-210 A8.2. (a). 6 dB Bandwidth

SPECIFICATION

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

RESULTS

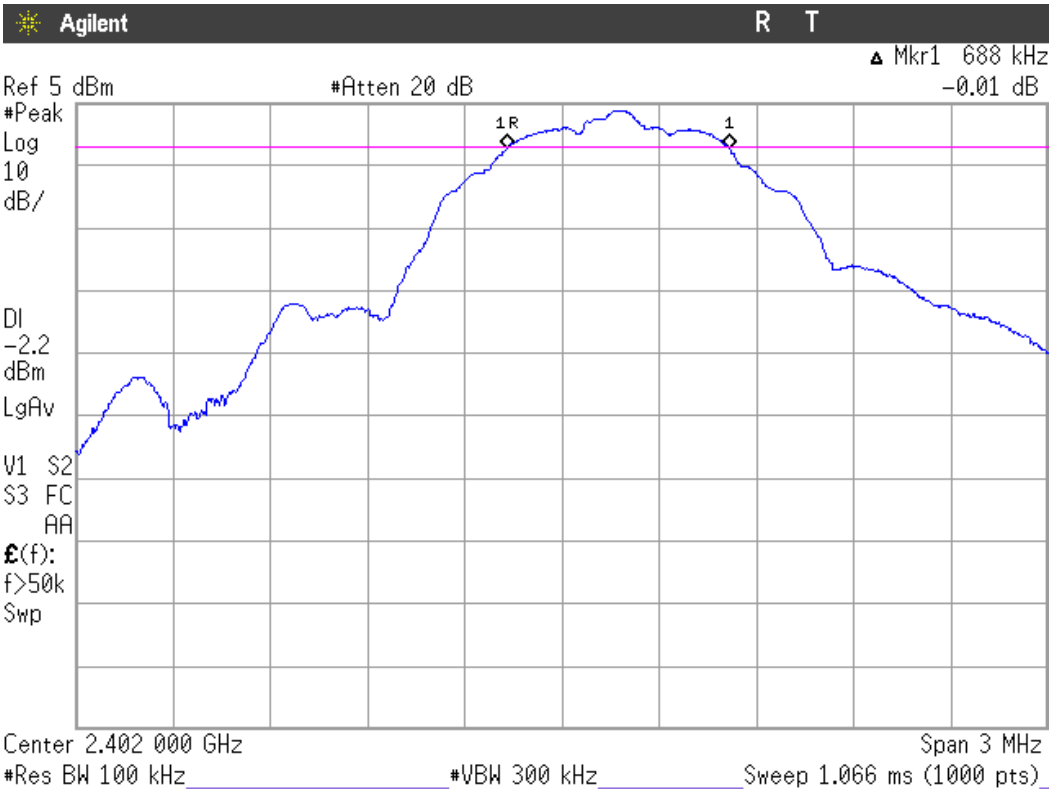
6 dB Bandwidth (see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6 dB Spectrum bandwidth (kHz)	688.0	685.0	666.7
Measurement uncertainty (kHz)	±21.7		

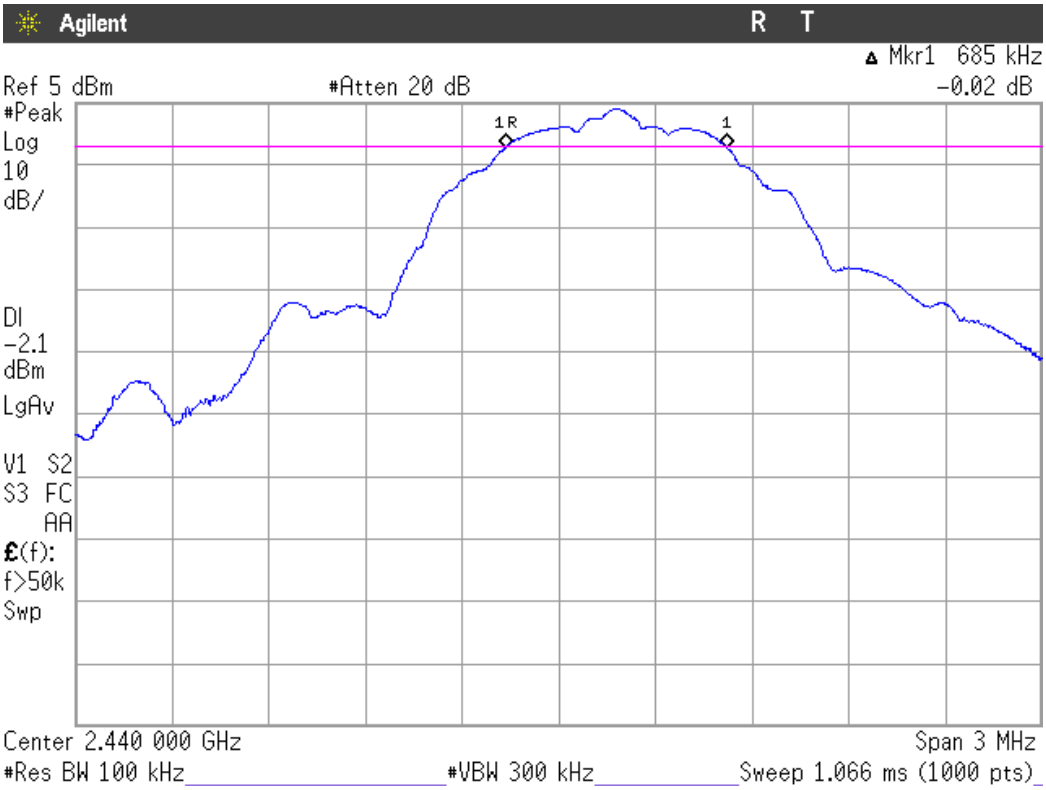
Verdict: PASS

6 dB BANDWIDTH.

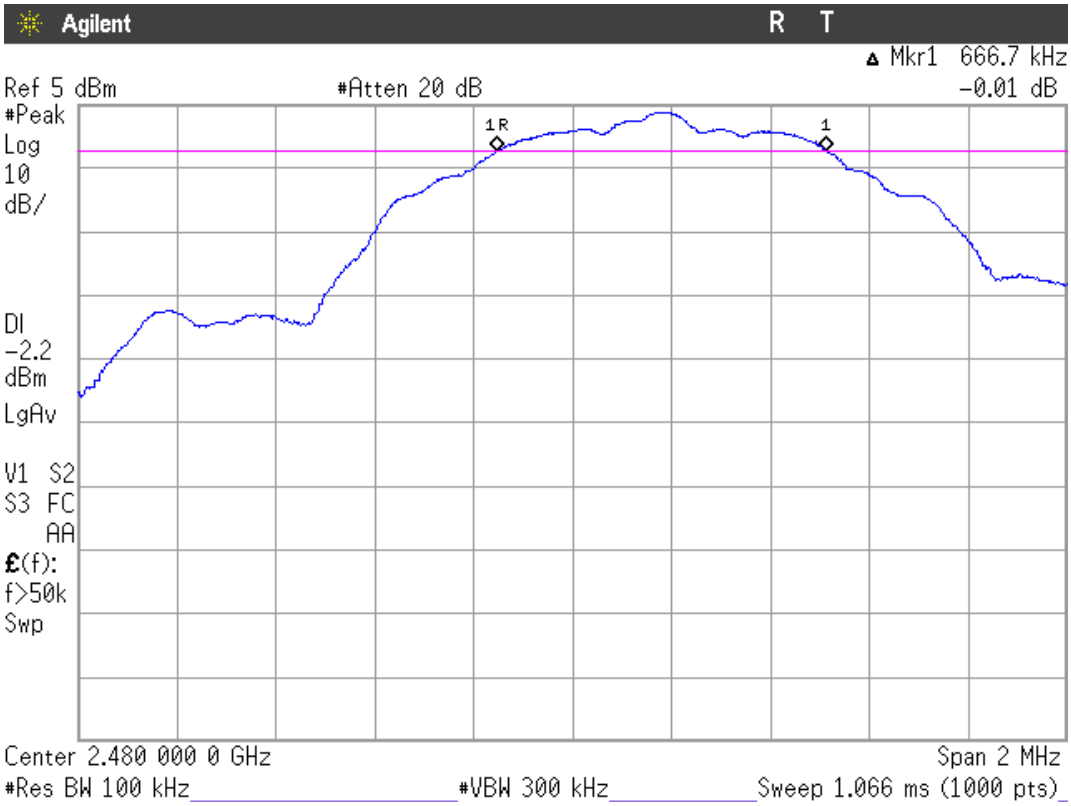
Lowest Channel



Middle Channel



Highest Channel



Section 15.247 Subclause (b) / RSS-210 A8.4. (4). 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 was measured using the method according to point 9.1.1. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013.

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

MAXIMUM OUTPUT POWER. See next plots.

Maximum declared antenna gain: 0 dBi.

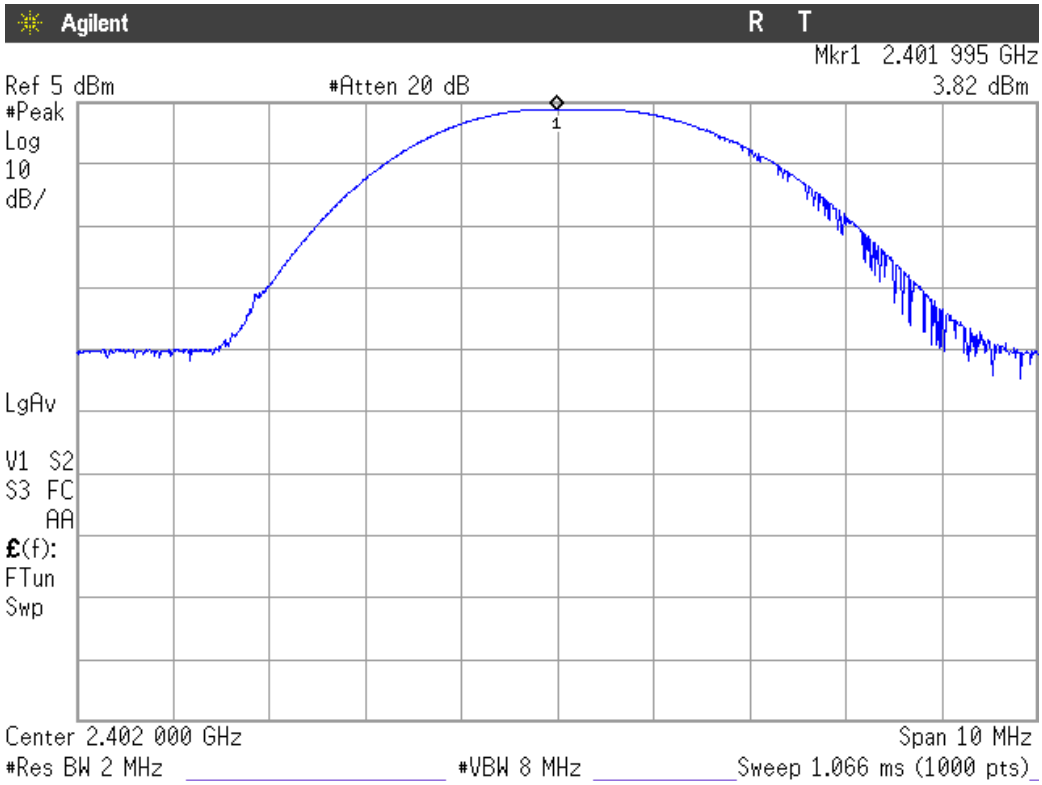
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	3.82	3.94	3.79
Maximum EIRP power (dBm)	3.82	3.94	3.79
Measurement uncertainty (dB)	±1.5		

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.

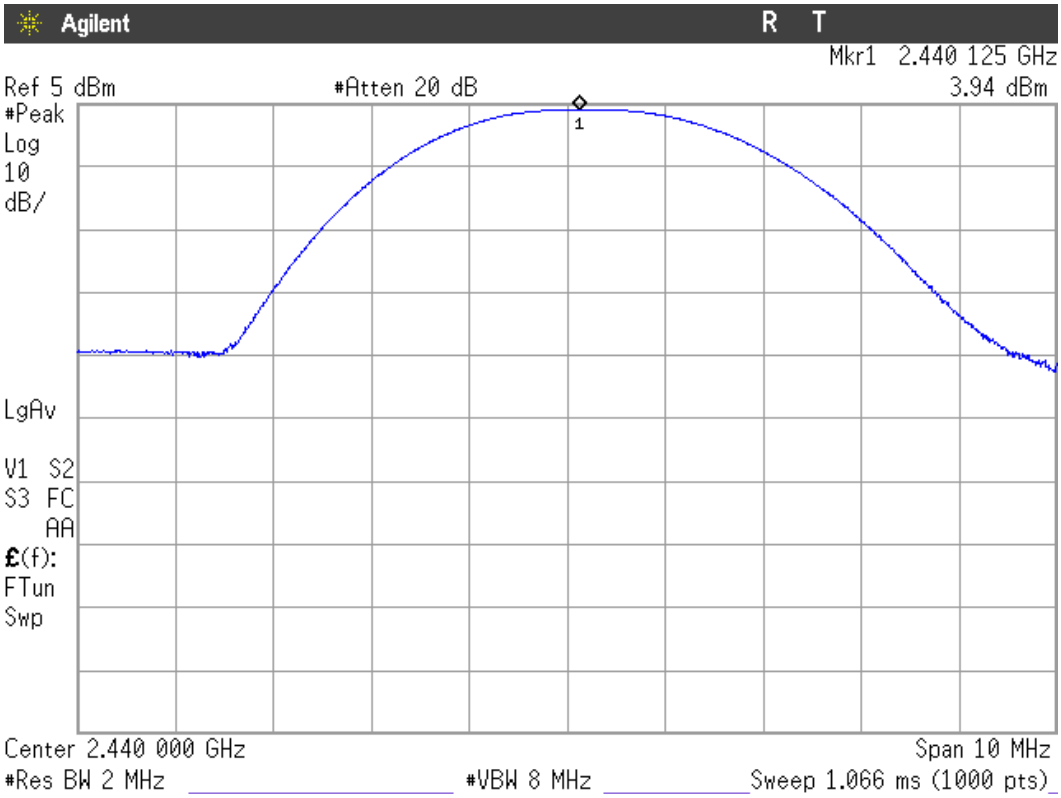
Verdict: PASS

CONDUCTED PEAK POWER.

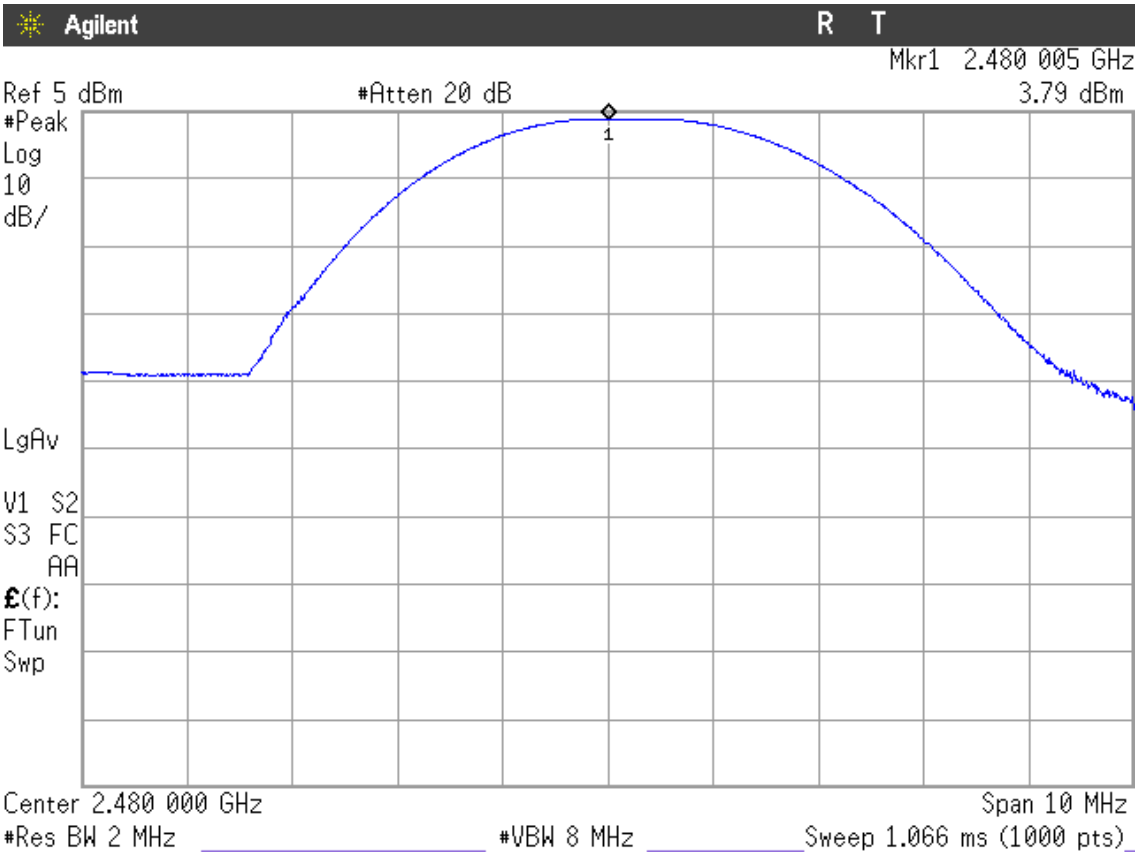
Lowest frequency



Middle frequency



Highest frequency



Section 15.247 Subclause (d) / RSS-210 A8.5. Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

Reference Level Measurement

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Reference Level Measurement (dBm)	3.80	3.89	3.77
Measurement uncertainty (dB)	±1.5		

Lowest frequency 2402 MHz

All peaks are more than 20 dB below the limit.

Middle frequency 2440 MHz

All peaks are more than 20 dB below the limit.

Highest frequency 2480 MHz

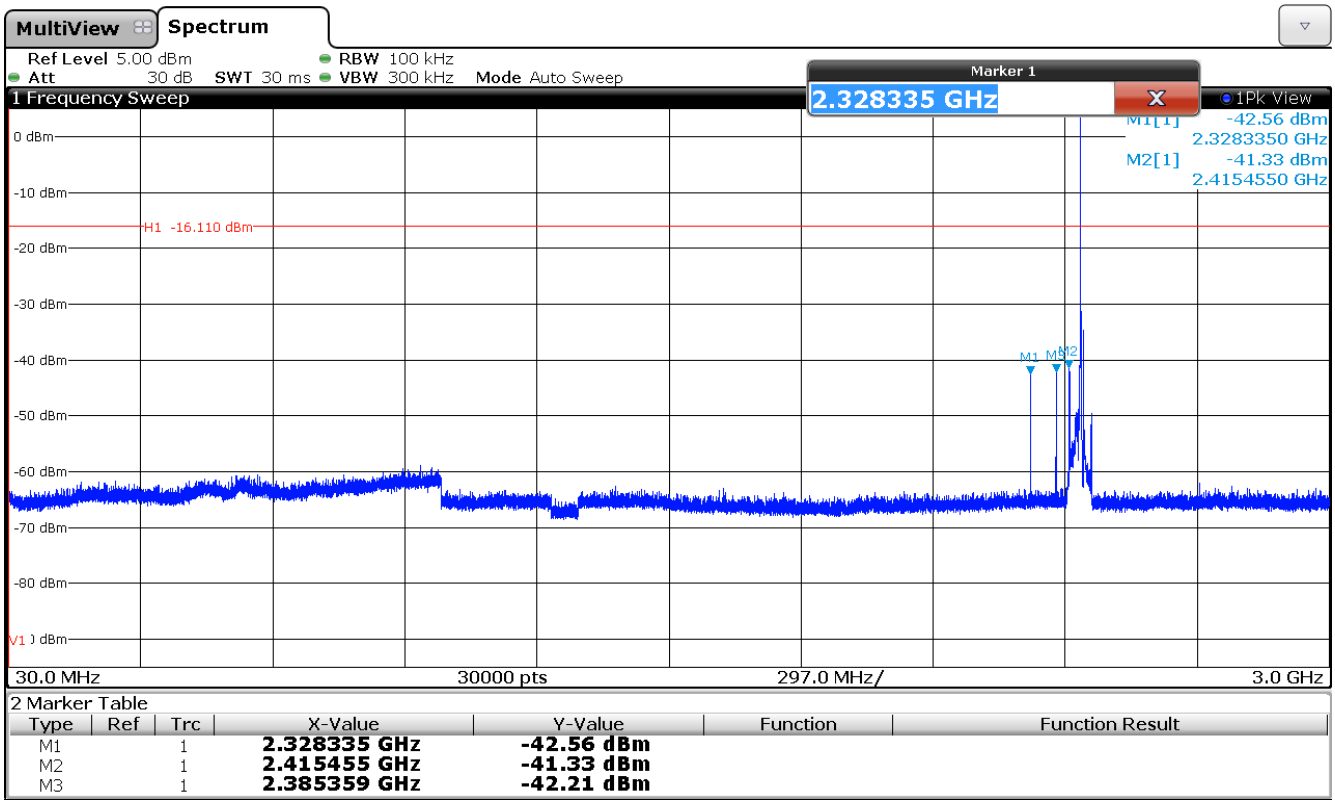
All peaks are more than 20 dB below the limit.

Verdict: PASS

See next plot of worst case: Middle frequency 2440 MHz.

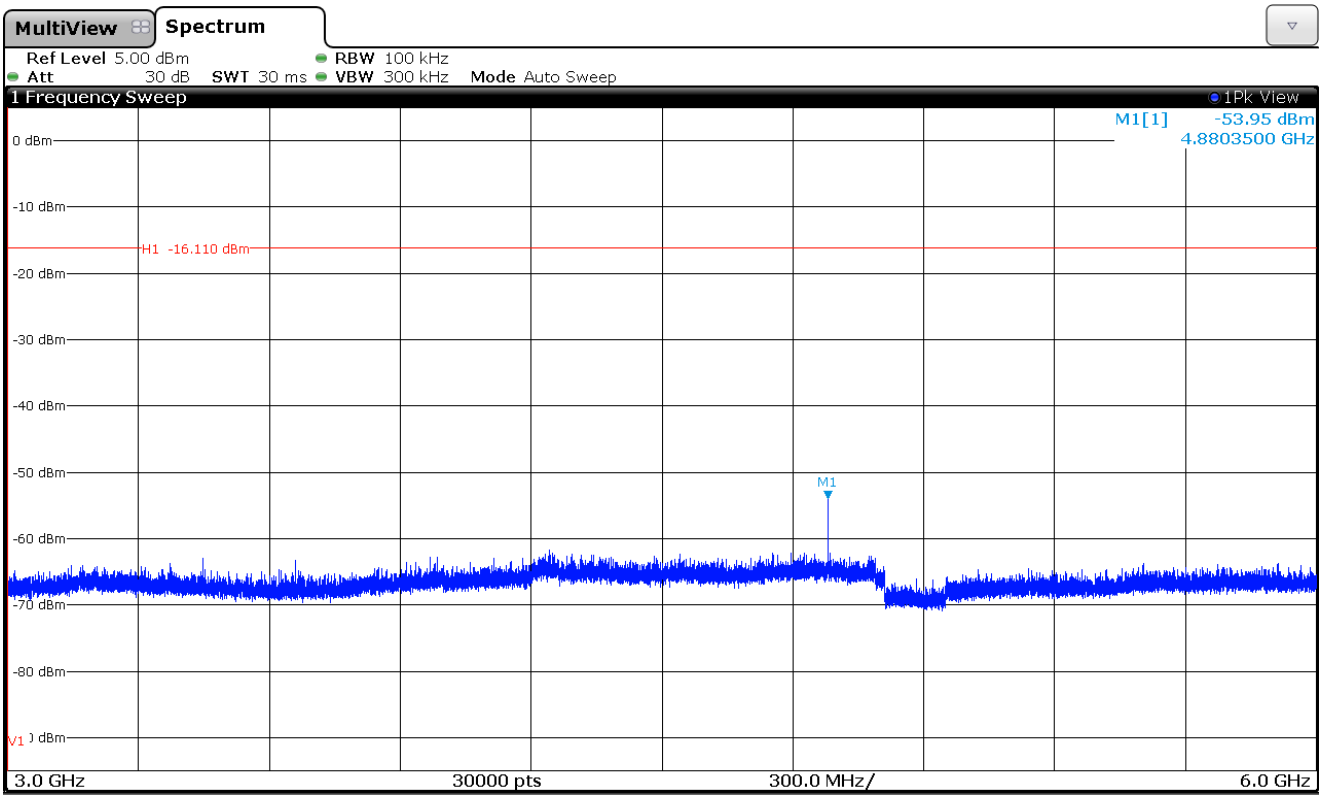
Number of sweep points: 30,000.

Plot 30 MHz to 3 GHz:

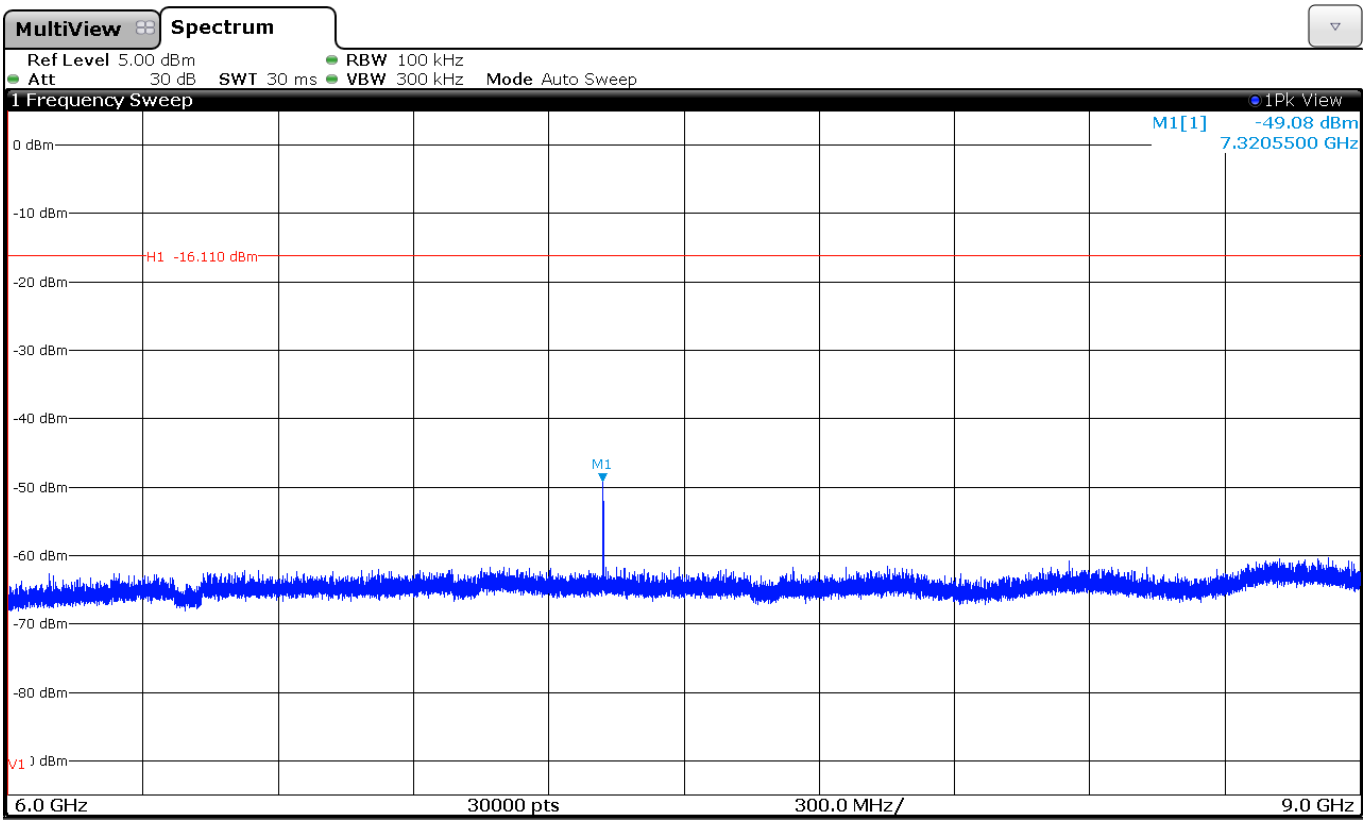


Note: The peak above the limit is the carrier frequency.

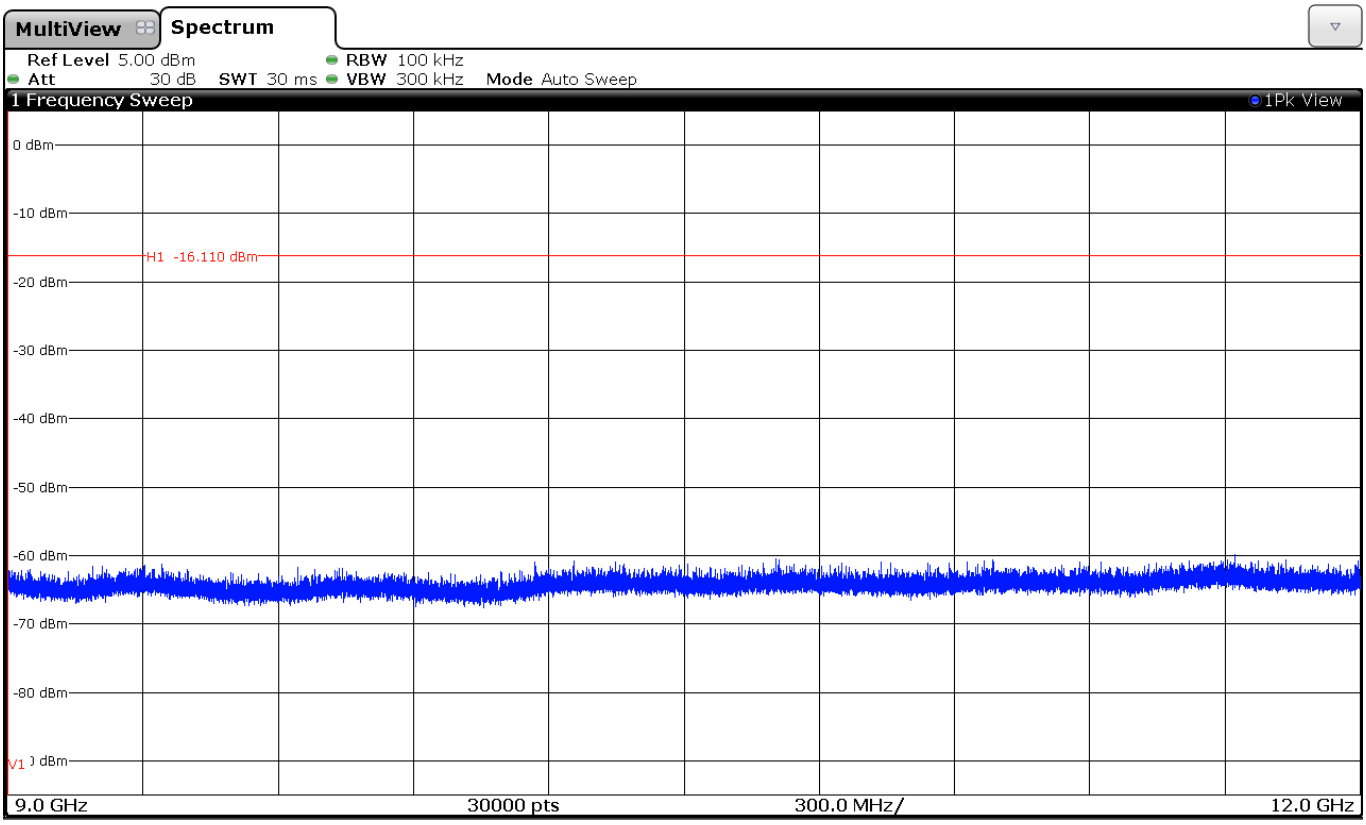
Plot 3 GHz to 6 GHz:



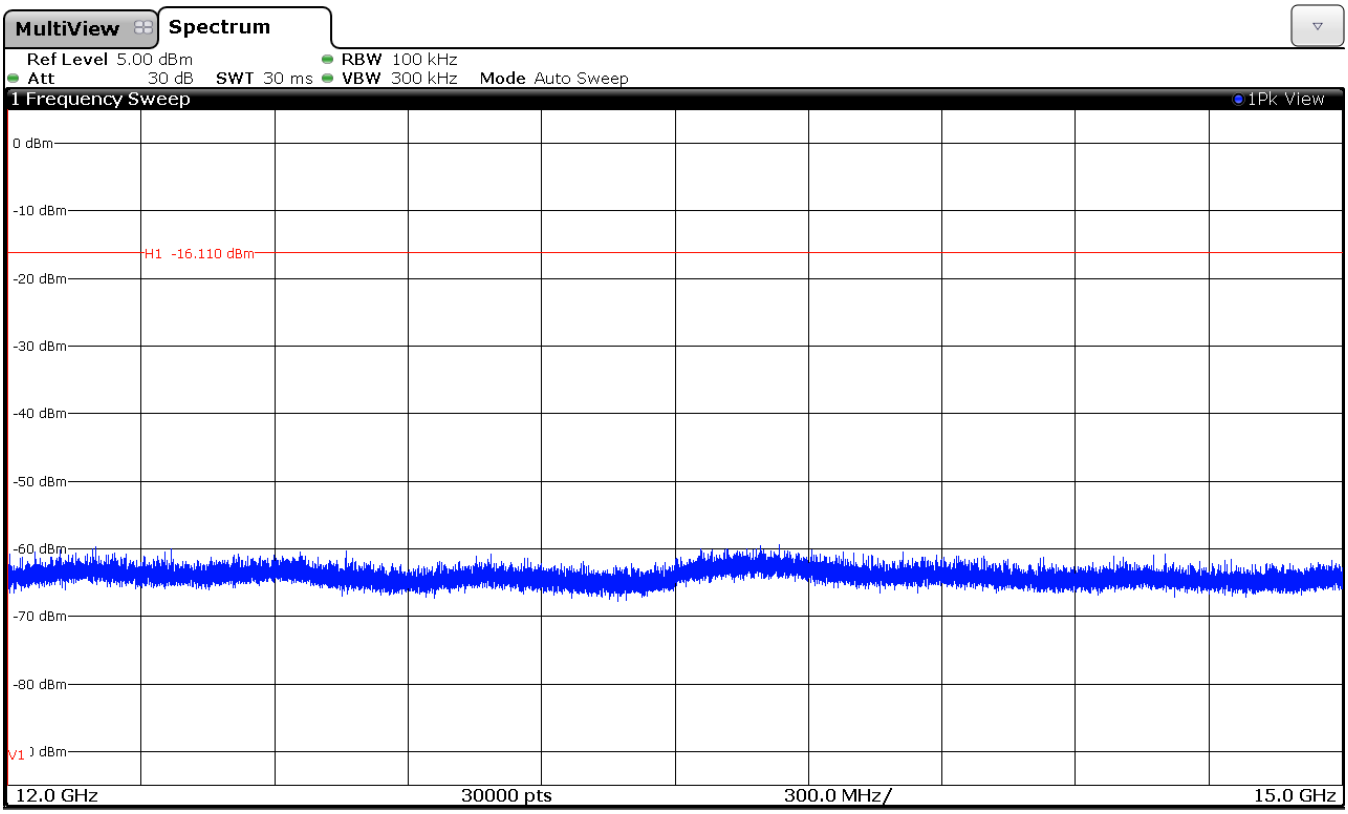
Plot 6 GHz to 9 GHz:



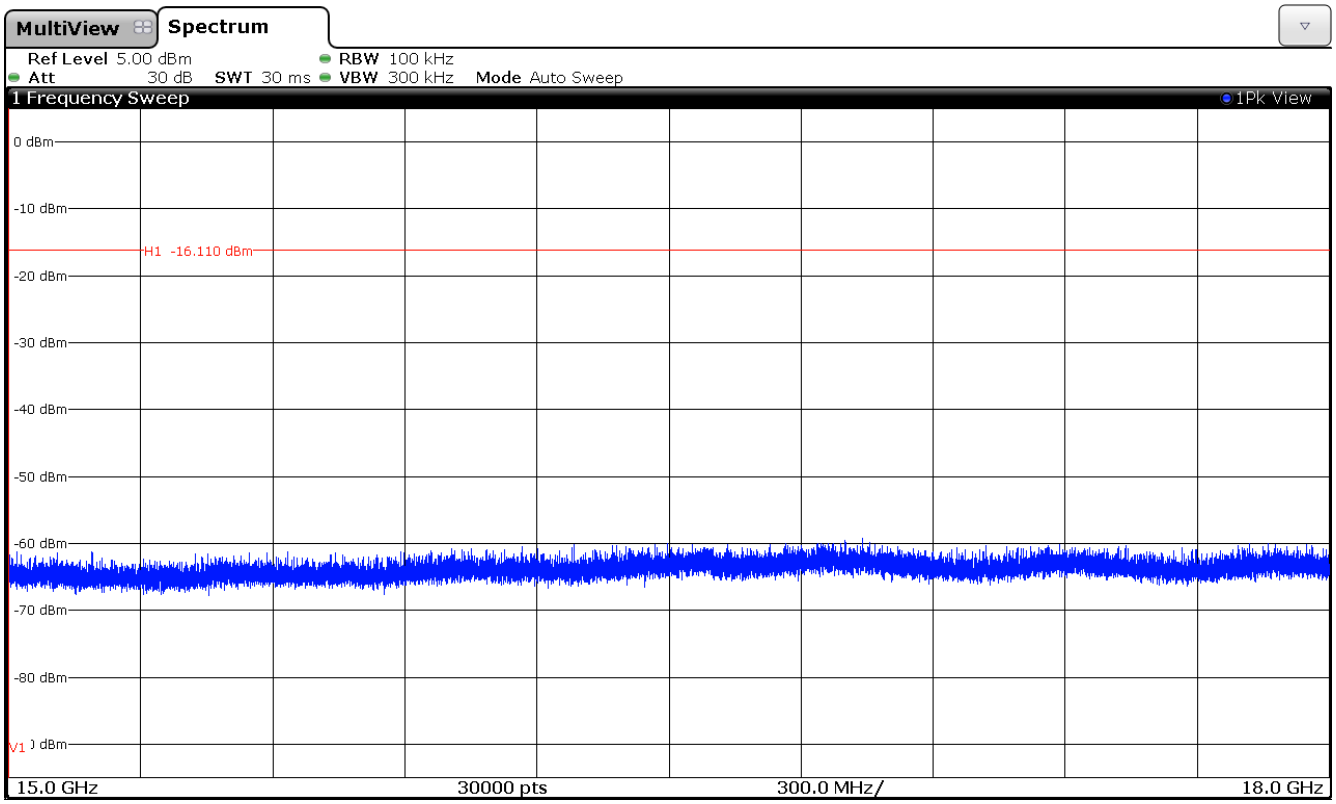
Plot 9 GHz to 12 GHz:



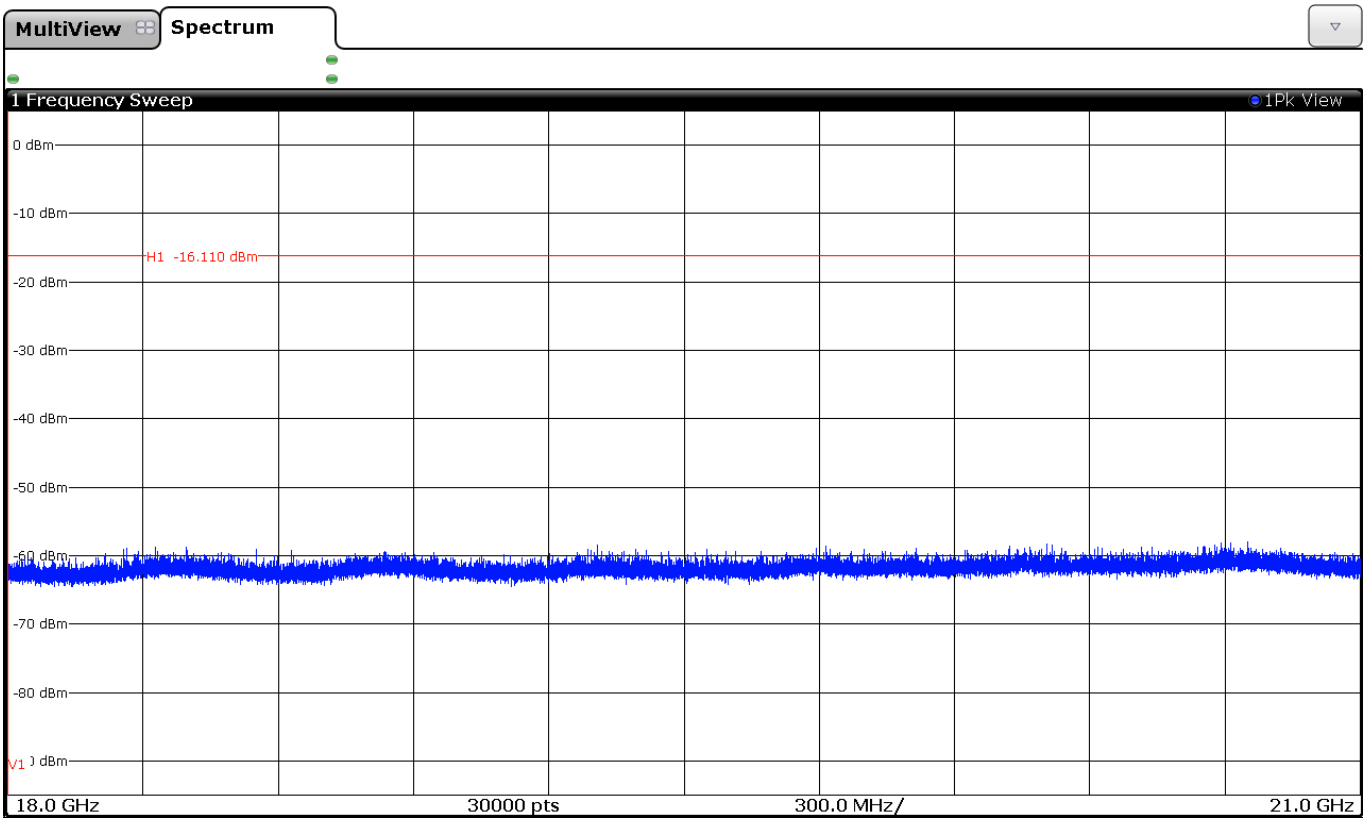
Plot 12 GHz to 15 GHz:



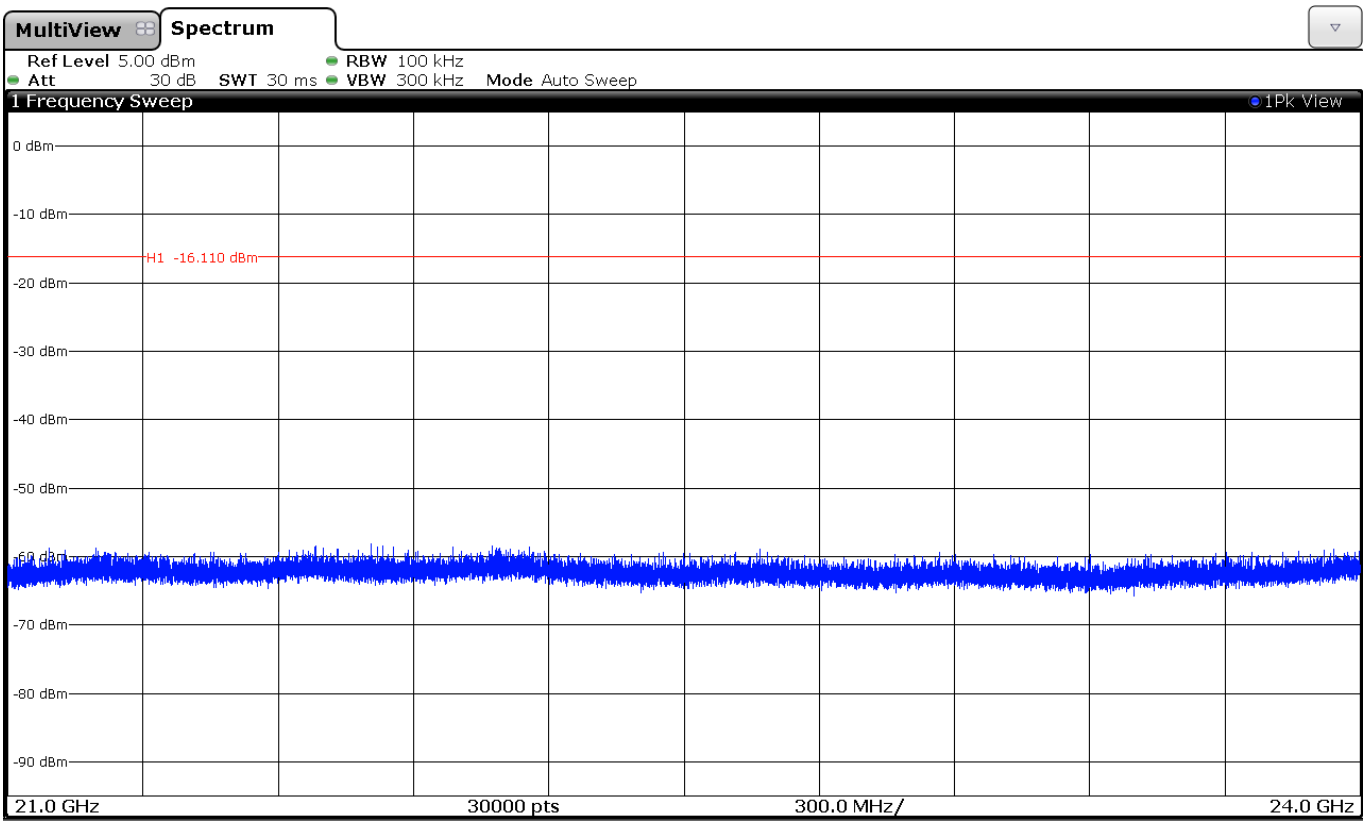
Plot 15 GHz to 18 GHz:



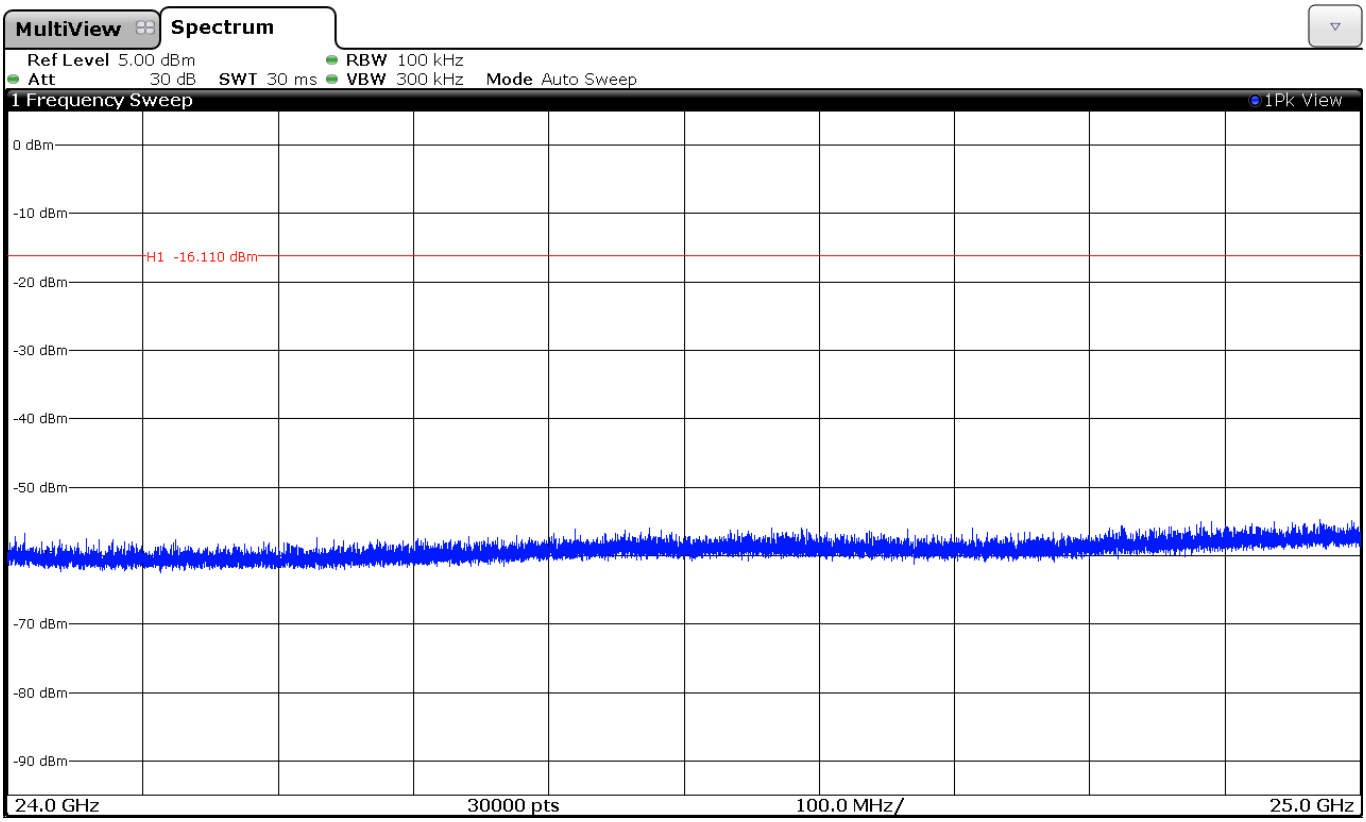
Plot 18 GHz to 21 GHz:



Plot 21 GHz to 24 GHz:



Plot 24 GHz to 25 GHz:



Section 15.247 Subclause (d) / RSS-210 A8.5. Band-edge emissions compliance (Transmitter)

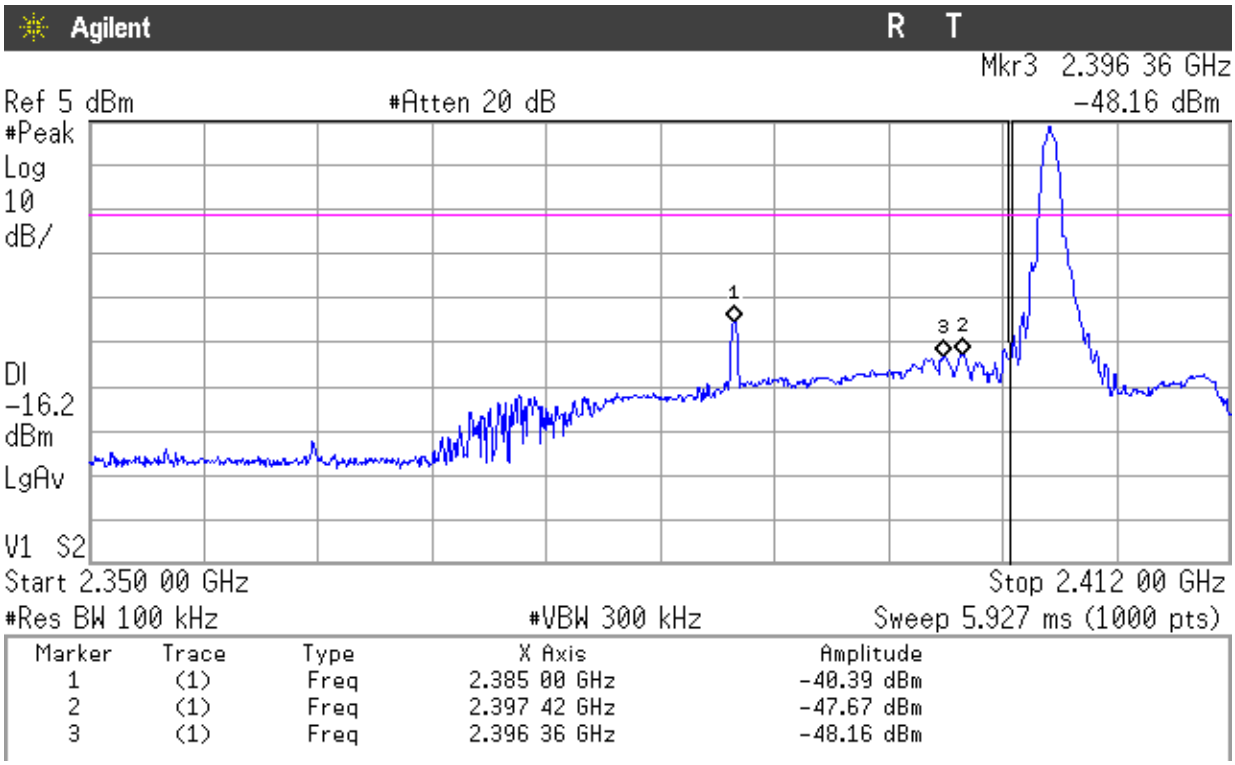
SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

1. LOW FREQUENCY SECTION. CONDUCTED.

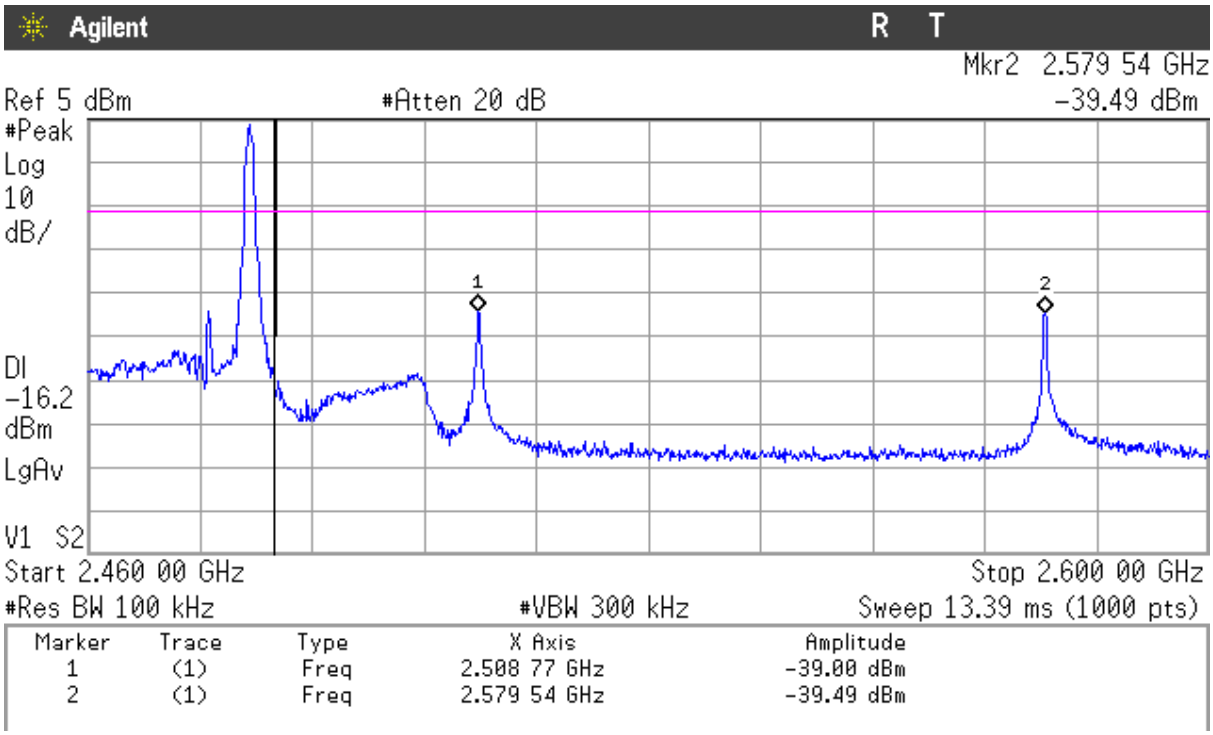
See next plot.



Verdict: PASS

2. HIGH FREQUENCY SECTION. CONDUCTED.

See next plot.



Verdict: PASS

Section 15.247 Subclause (e) / RSS-210 A8.5. 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 PKPSD (Peak PSD) according to point 10.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r01 dated 09/04/2013.

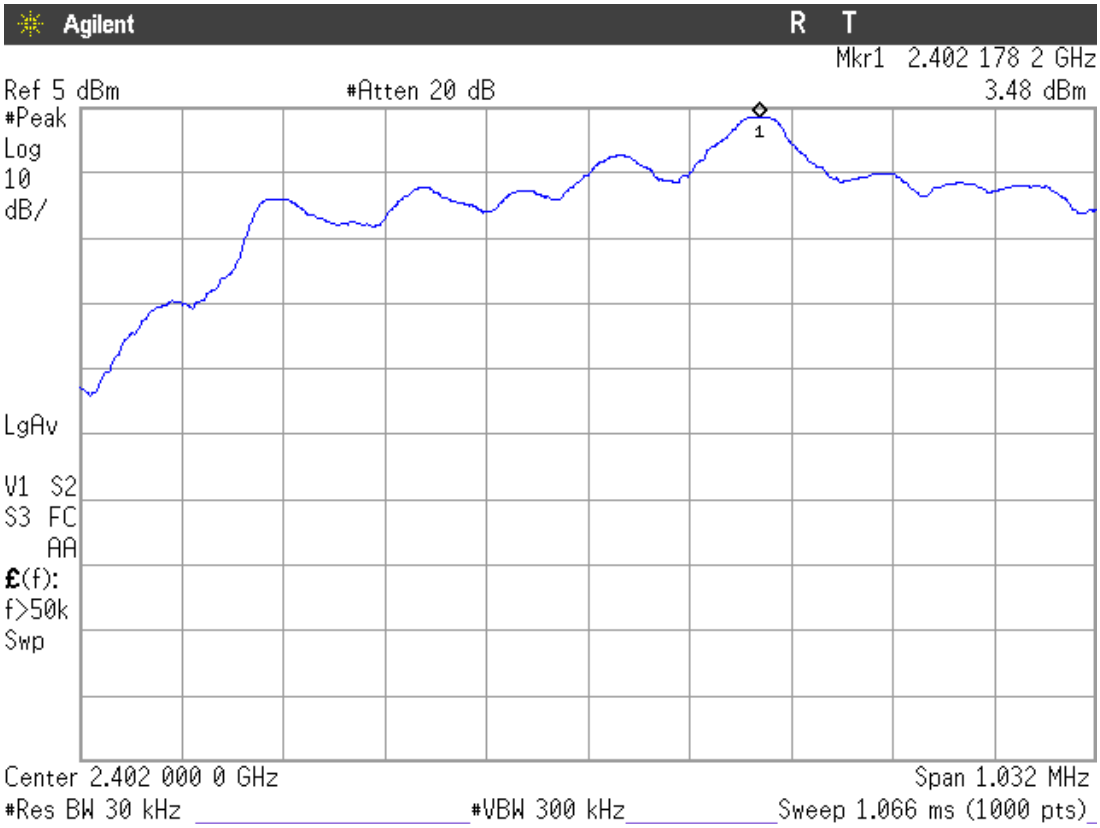
Power spectral density (see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	3.48	3.65	3.57
Measurement uncertainty (dB)	±1.5		

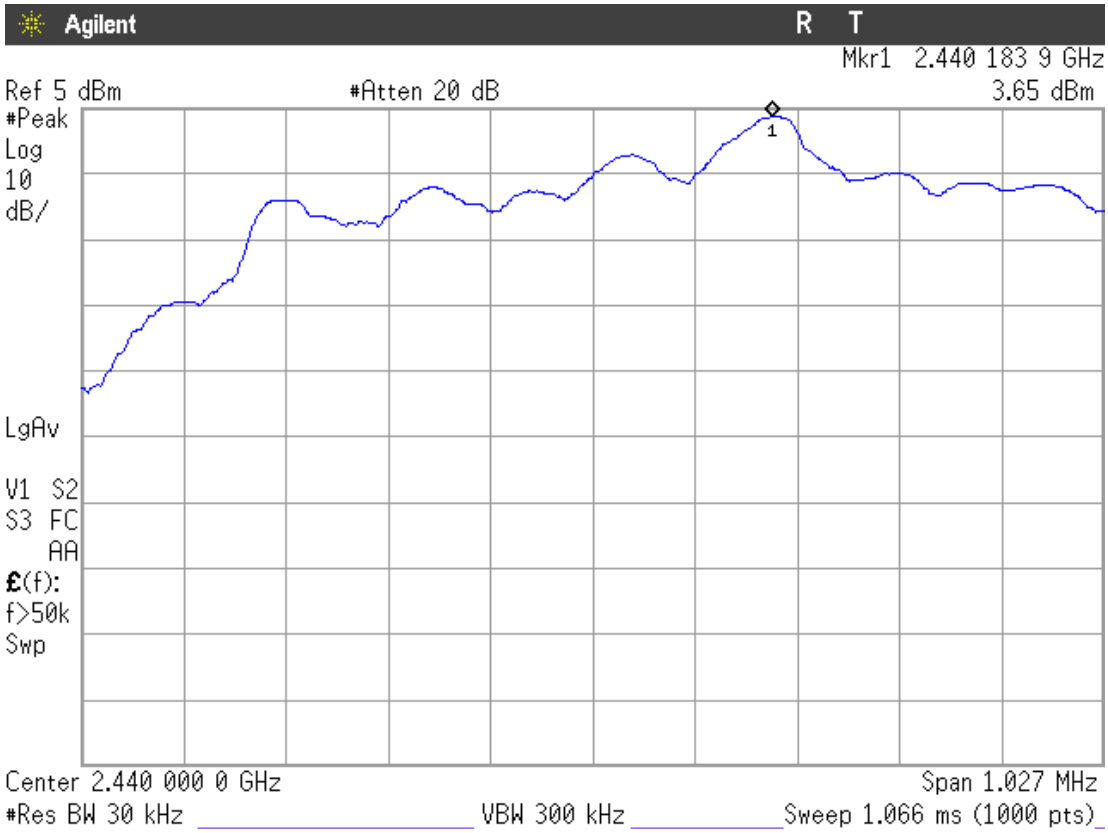
Verdict: PASS

Power spectral density.

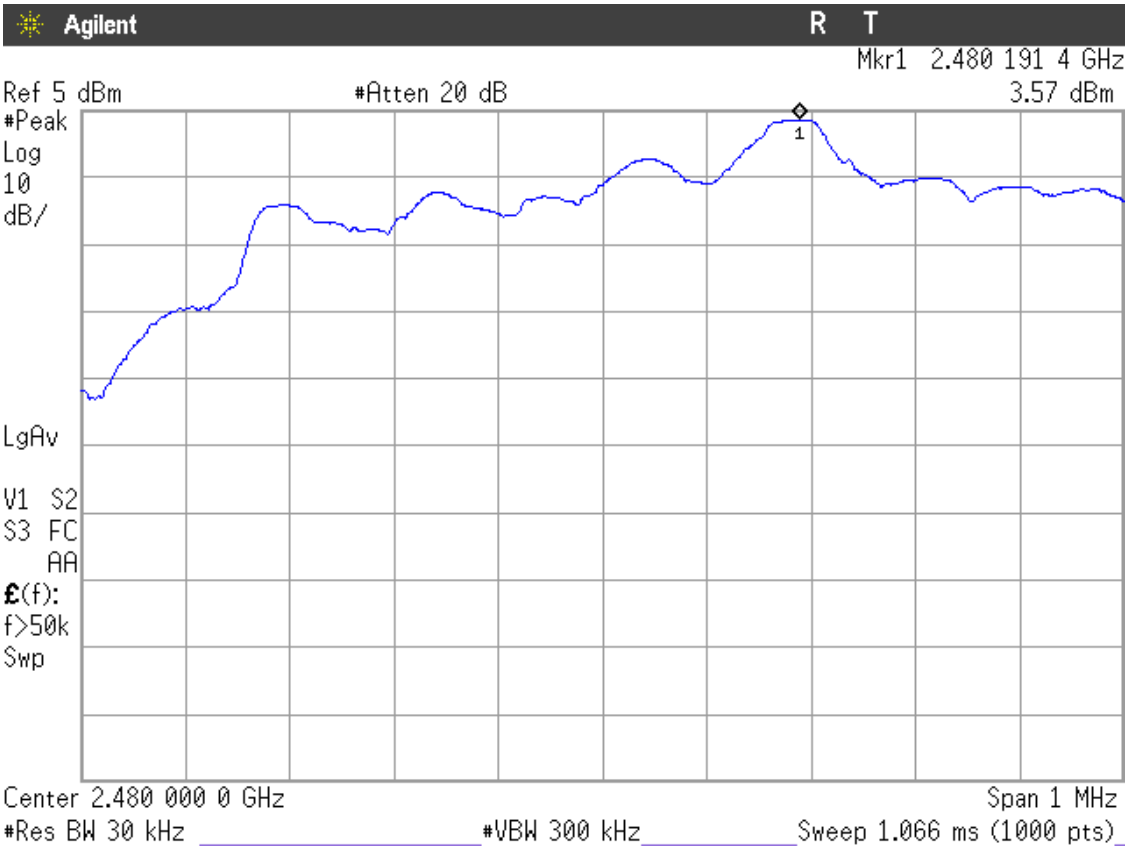
Lowest Channel



Middle Channel



Highest Channel



Section 15.247 Subclause (d) / RSS-210 A8.5. Emission limitations radiated (Transmitter)

SPECIFICATION

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

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
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

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.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º 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-25 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.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

Frequency range 30 MHz-1000 MHz.

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

All peaks are more than 20 dB below the limit.

Frequency range 1 GHz-25 GHz

The results in the next tables show the maximum measured levels in the 1-25 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.

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.34689	V	Peak	50.16	± 4.09
2.46633	V	Peak	54.20	± 4.09
		Average	36.21	± 4.09
2.48433	V	Peak	52.69	± 4.09
2.48487	V	Peak	53.66	± 4.09
7.2066	V	Peak	41.14	± 4.09

2. CHANNEL: MIDDLE (2440 MHz).

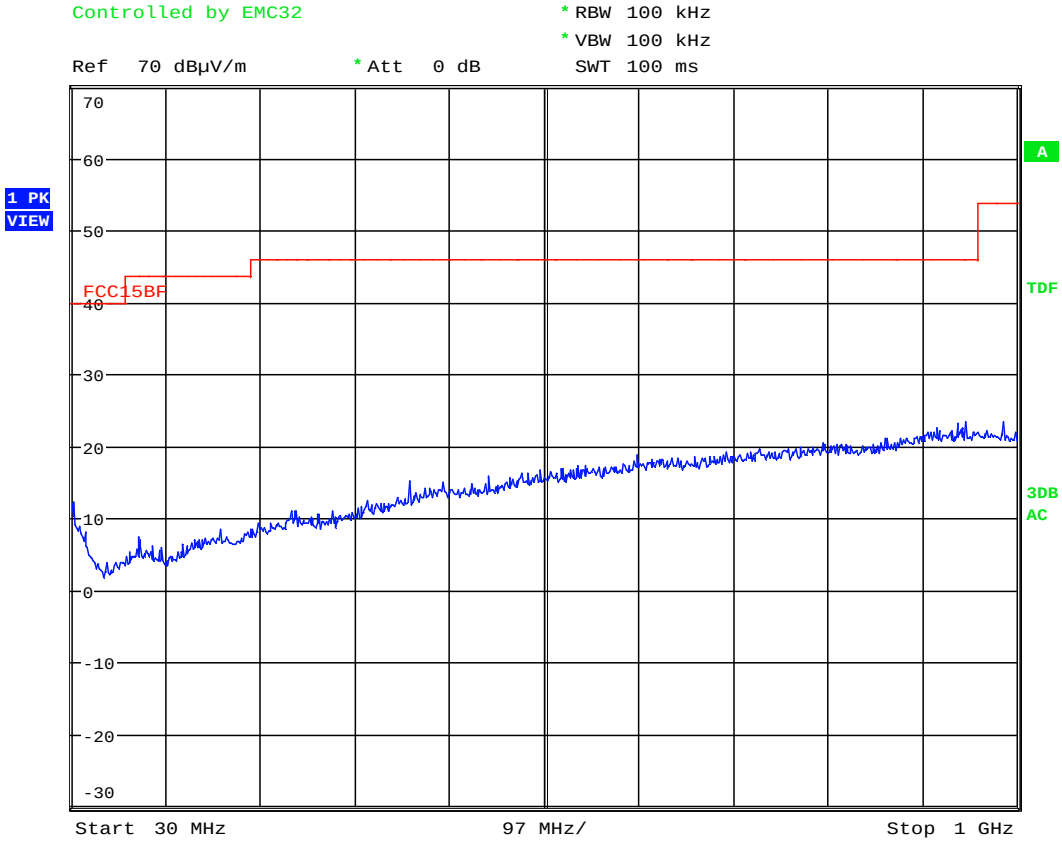
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.34711	V	Peak	50.85	± 4.09
2.34767	V	Peak	50.76	± 4.09
2.40433	V	Peak	52.91	± 4.09
2.46700	V	Peak	54.24	± 4.09
		Average	36.70	± 4.09
2.48433	V	Peak	52.96	± 4.09
2.48437	V	Peak	53.99	± 4.09
7.31910	V	Peak	46.28	± 4.09

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.37599	V	Peak	48.21	± 4.09
2.46633	V	Peak	54.71	± 4.09
		Average	36.72	± 4.09
2.52900	V	Peak	54.34	± 4.09
		Average	35.60	± 4.09
2.49567	V	Peak	54.55	± 4.09
		Average	36.14	± 4.09
2.48454	V	Peak	54.14	± 4.09
		Average	35.40	± 4.09
2.48989	V	Peak	53.89	± 4.09
2.49540	V	Peak	54.78	± 4.09
		Average	36.29	± 4.09
7.44090	V	Peak	46.31	± 4.09

Verdict: PASS

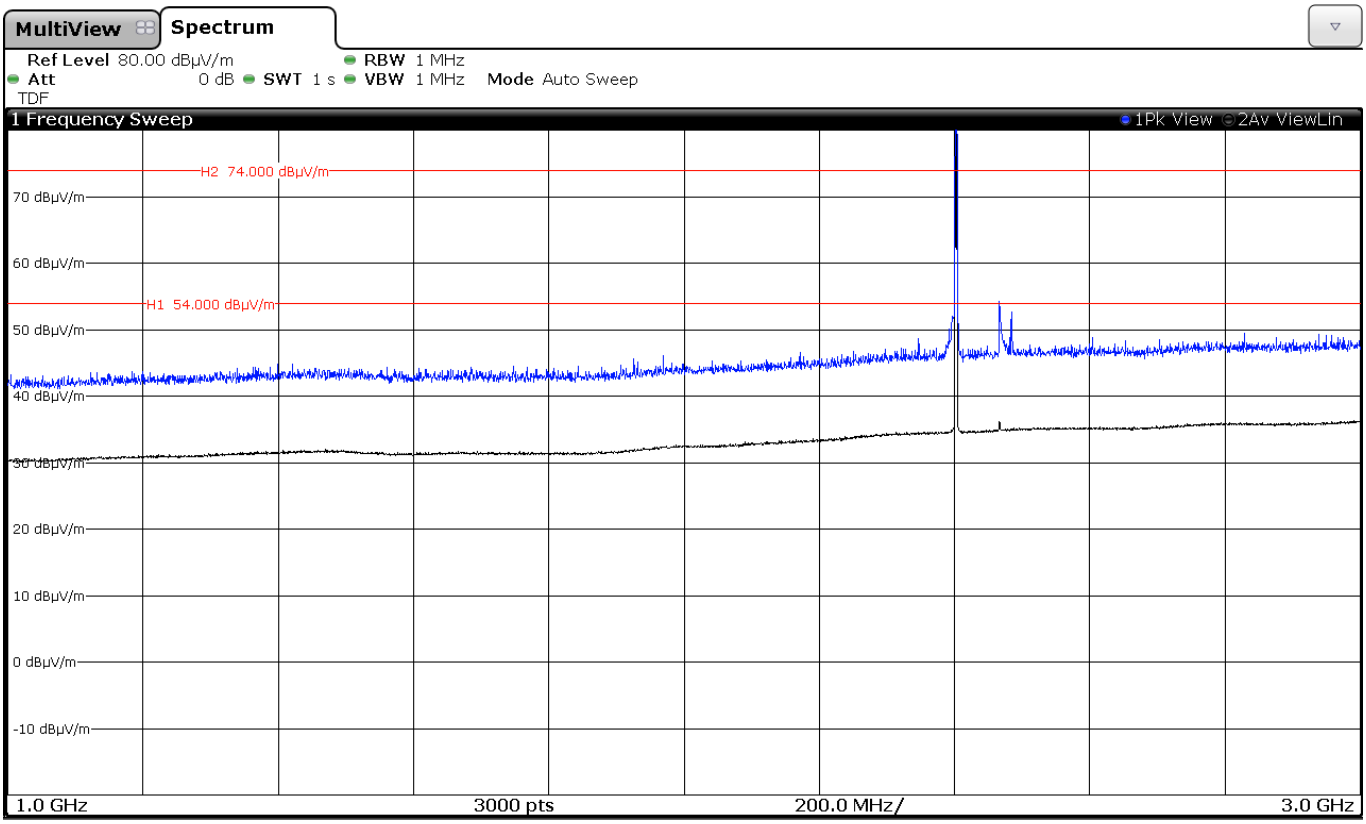
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

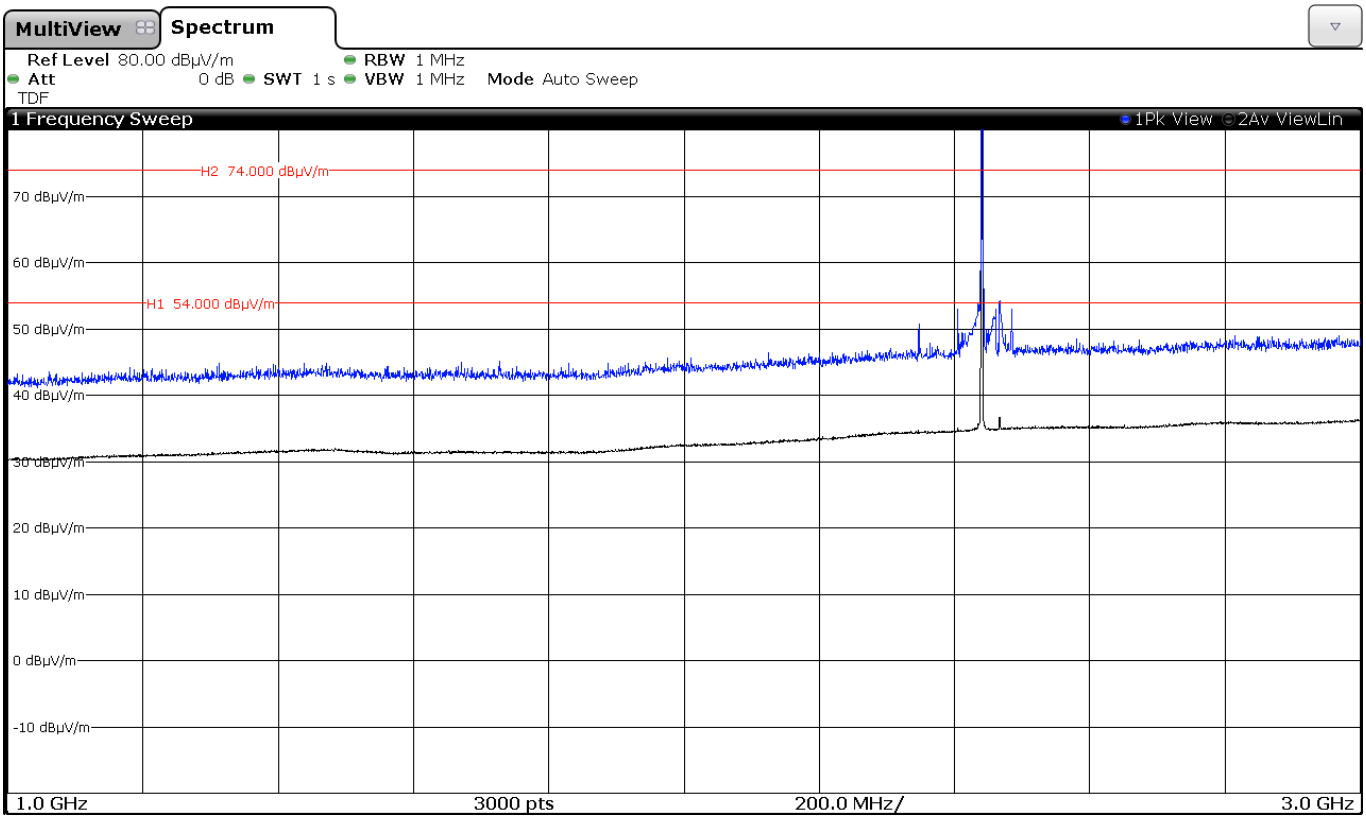
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: Lowest (2402 MHz).



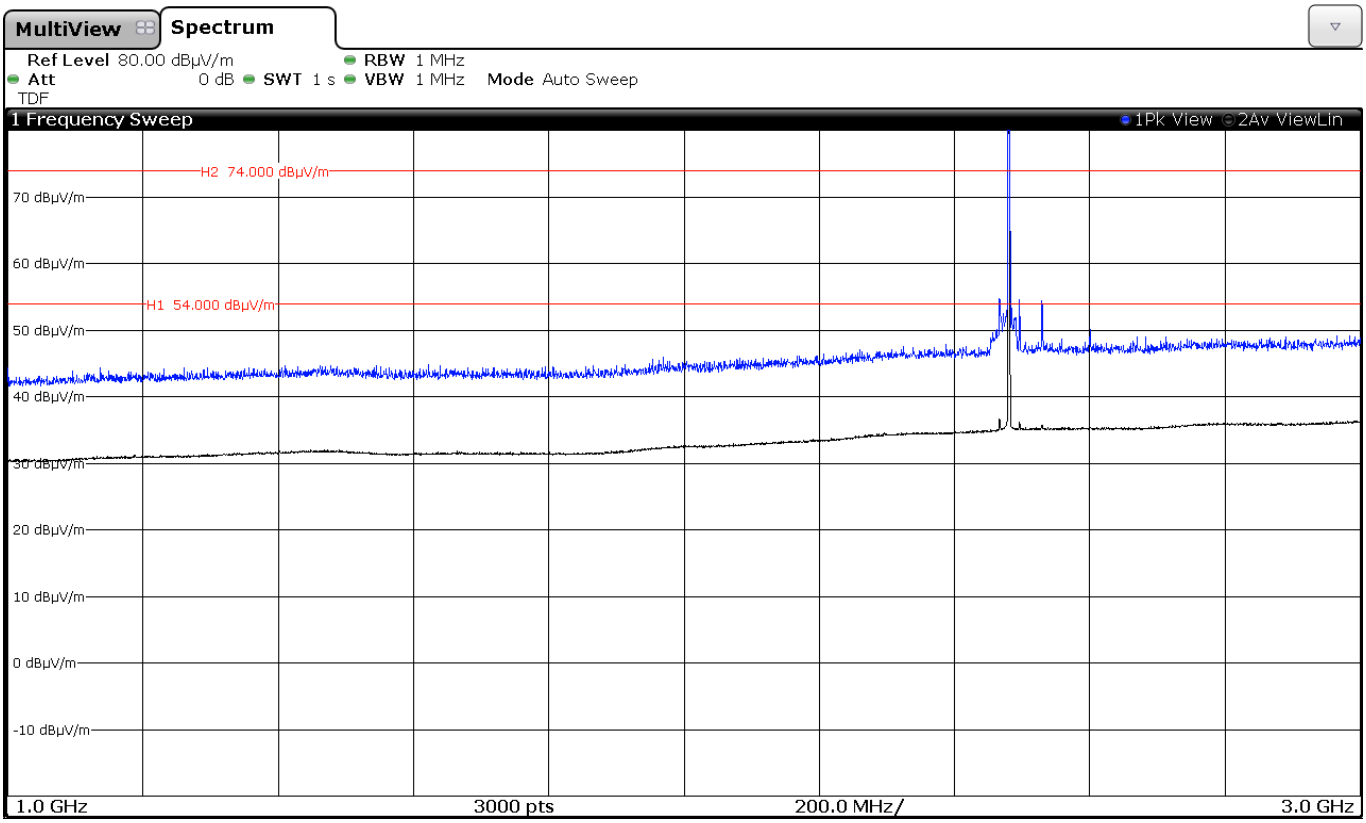
Note: The peak shown in the plot above the limit is the carrier frequency.

CHANNEL: Middle (2440 MHz).



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

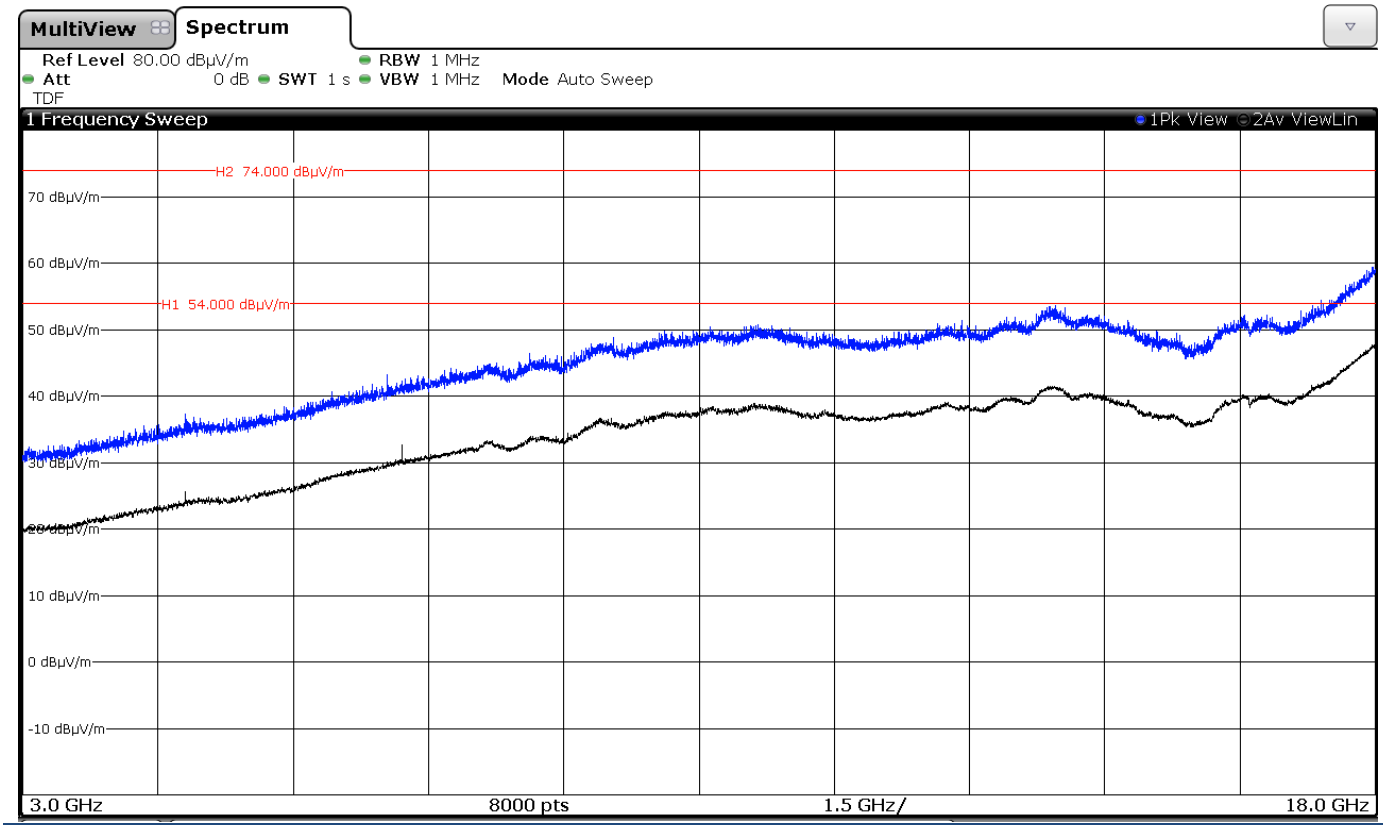
CHANNEL: Highest (2480 MHz).



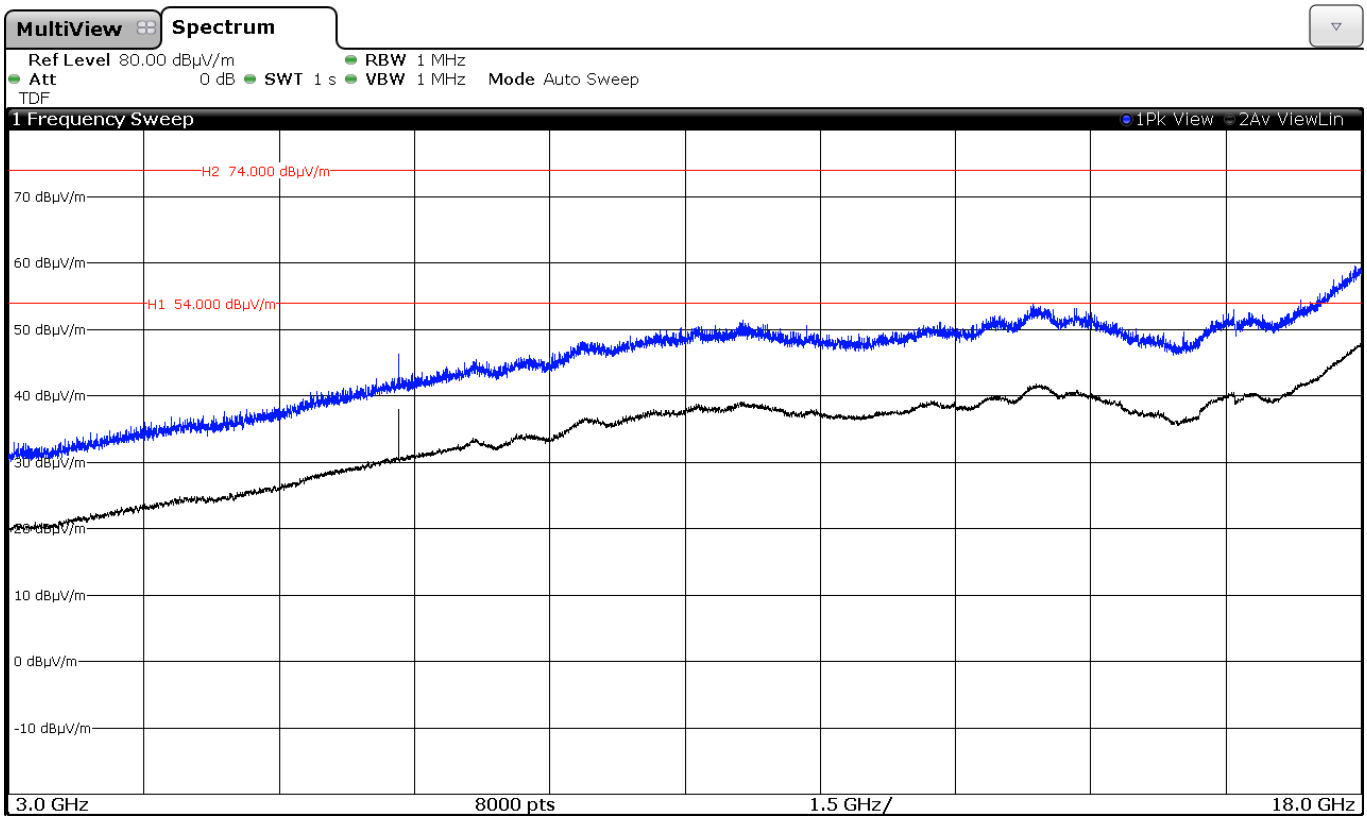
Note: The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 18 GHz.

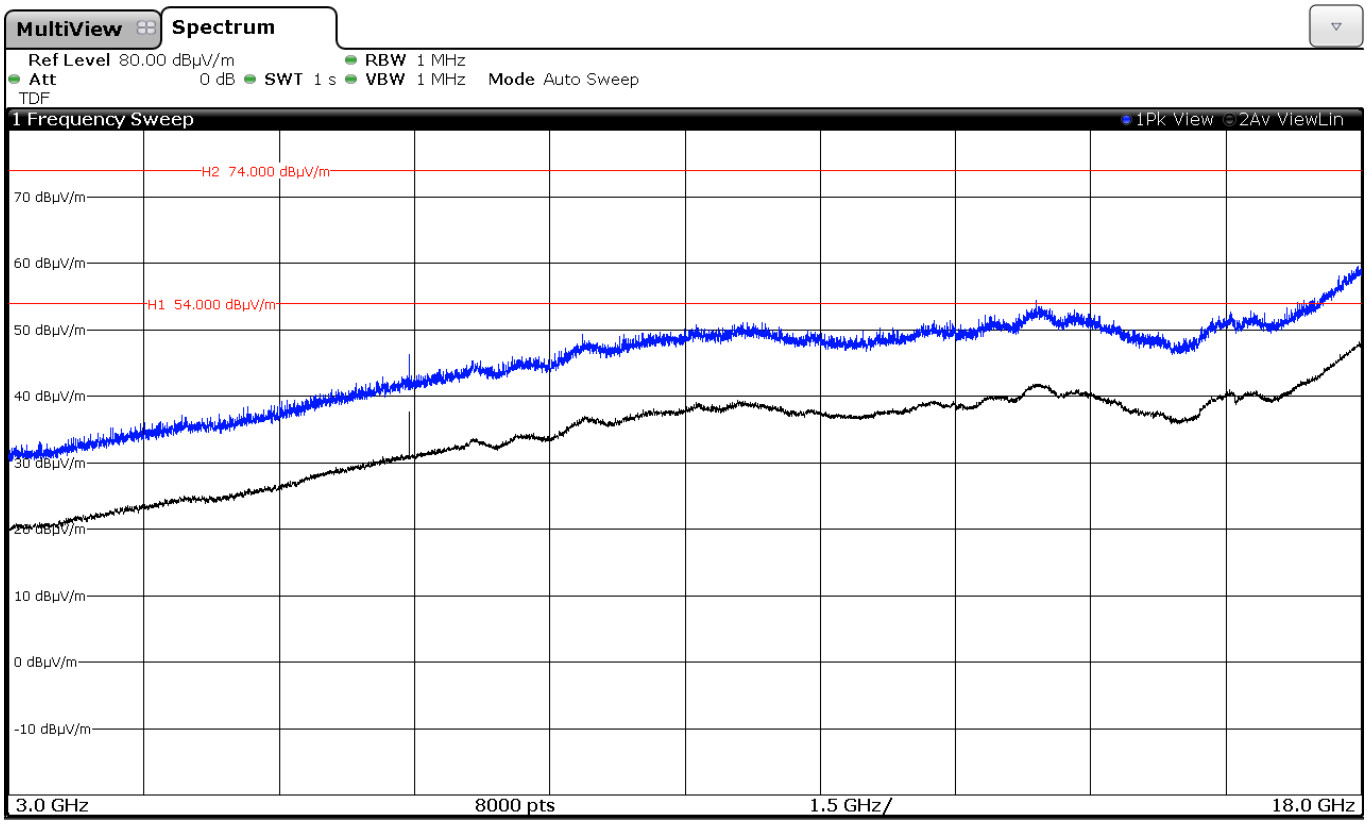
CHANNEL: Lowest (2402 MHz).



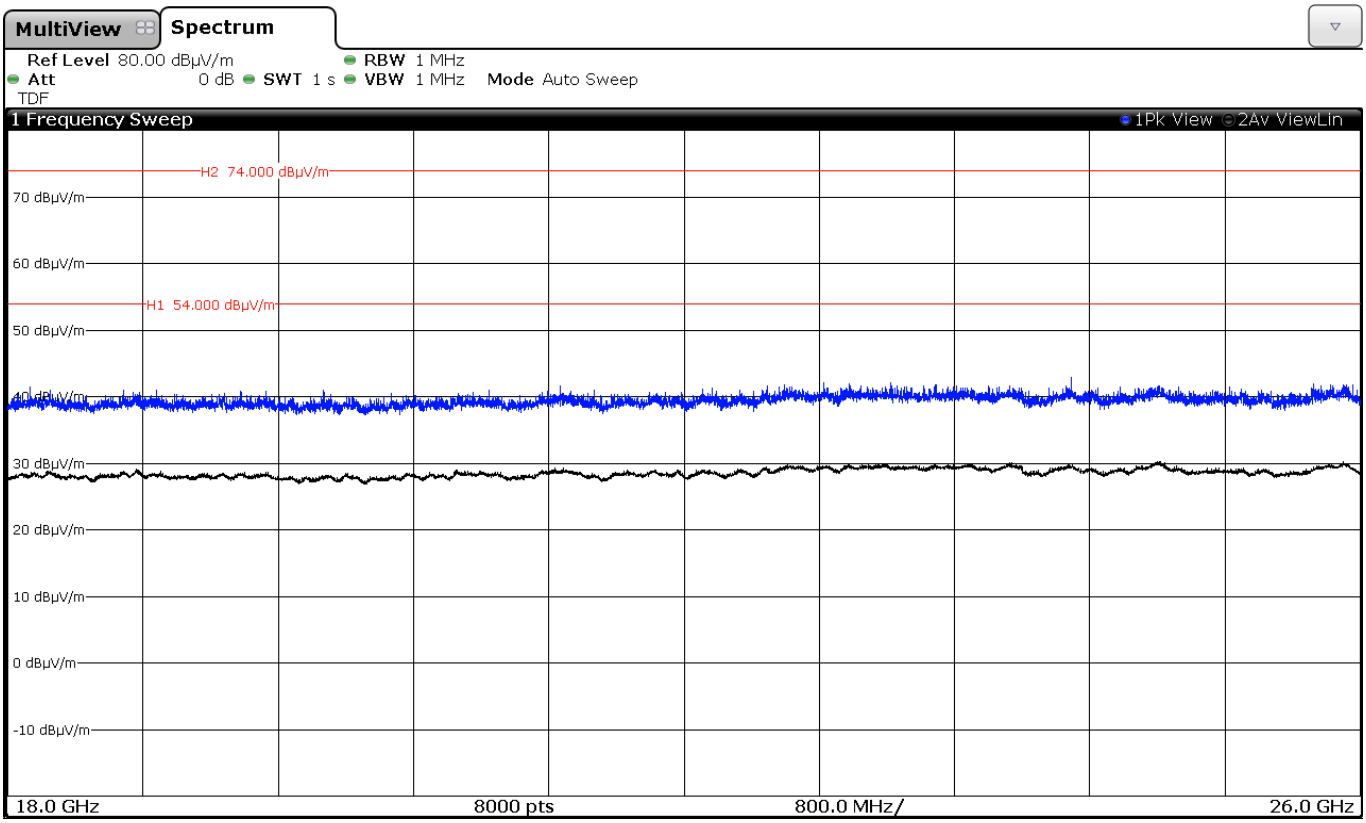
CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).



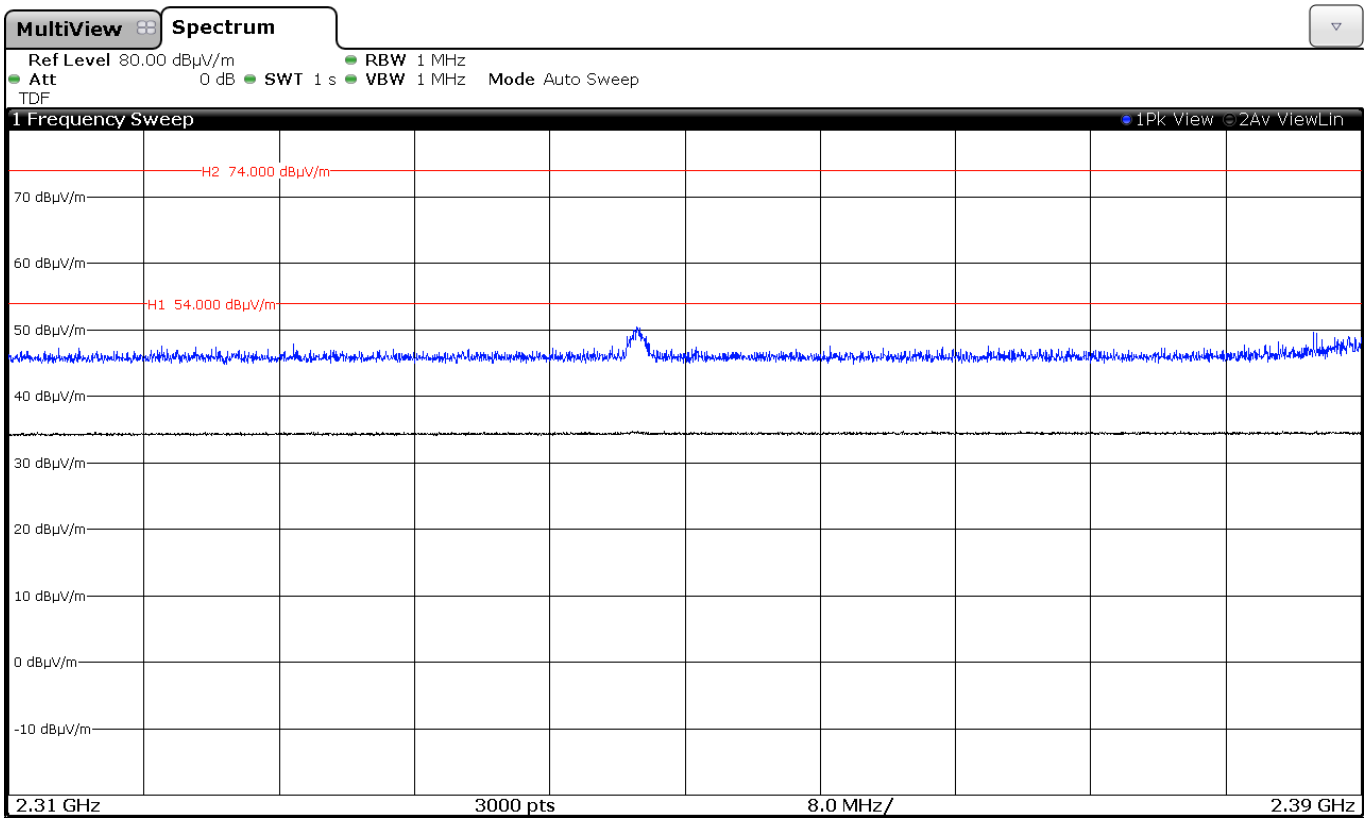
FREQUENCY RANGE 18 GHz to 26 GHz.



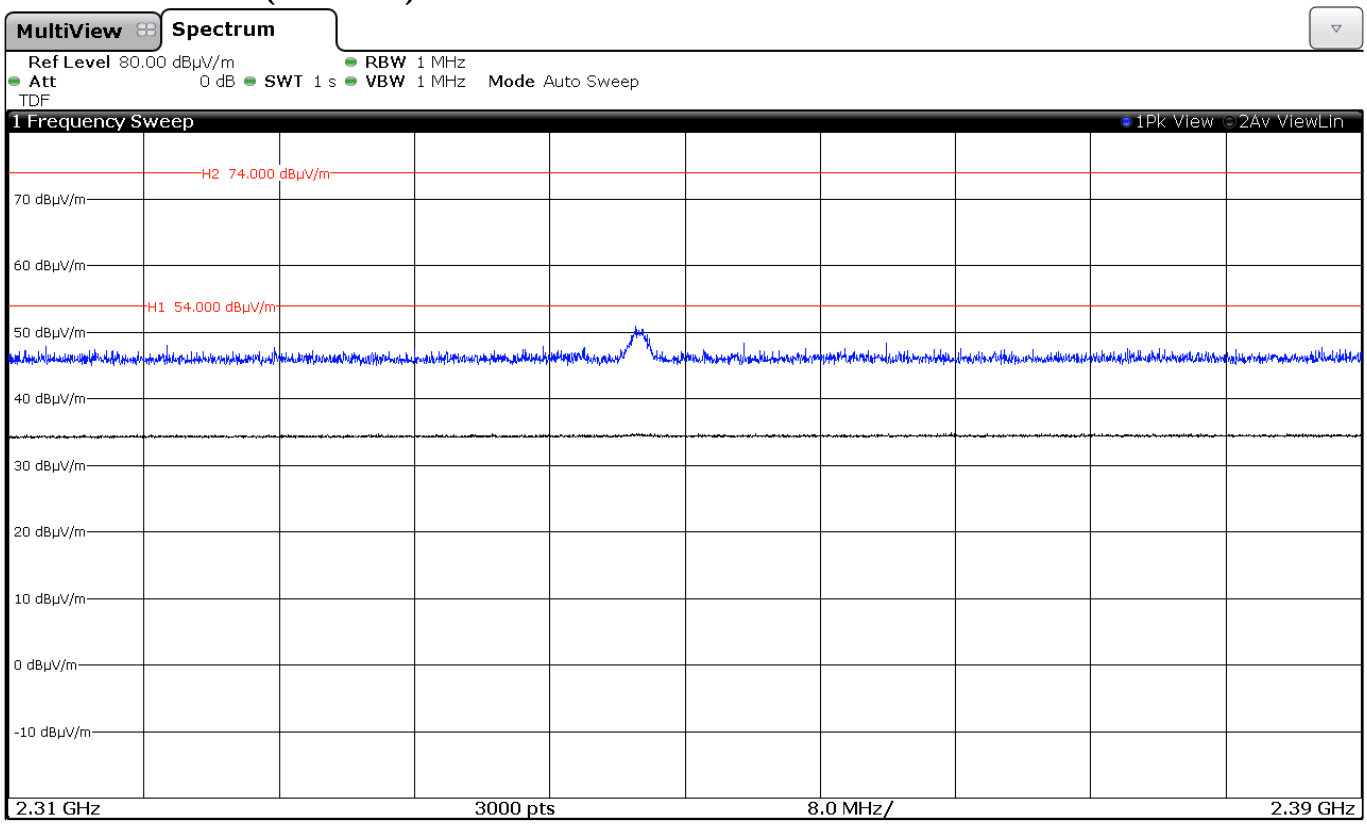
(This plot is valid for all three channels).

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

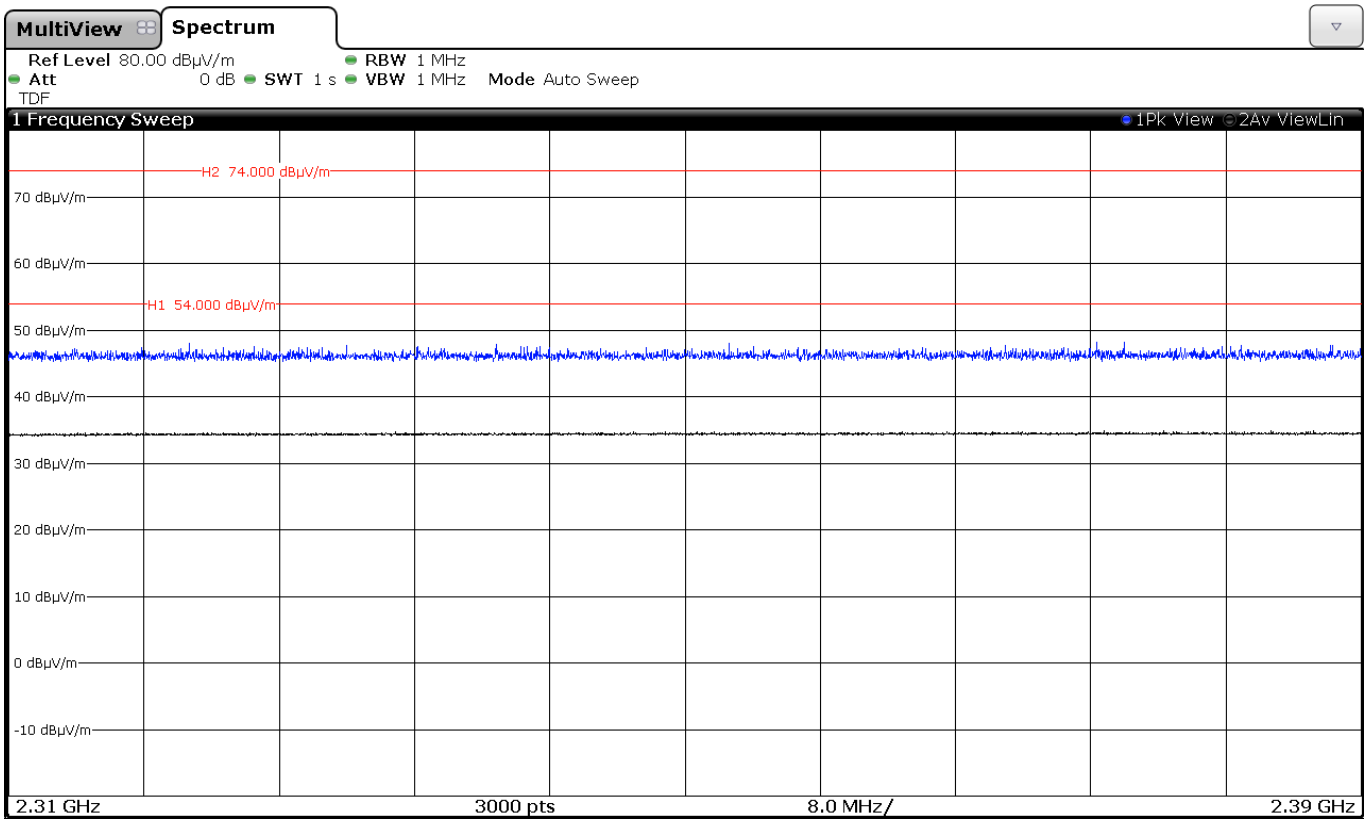
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).

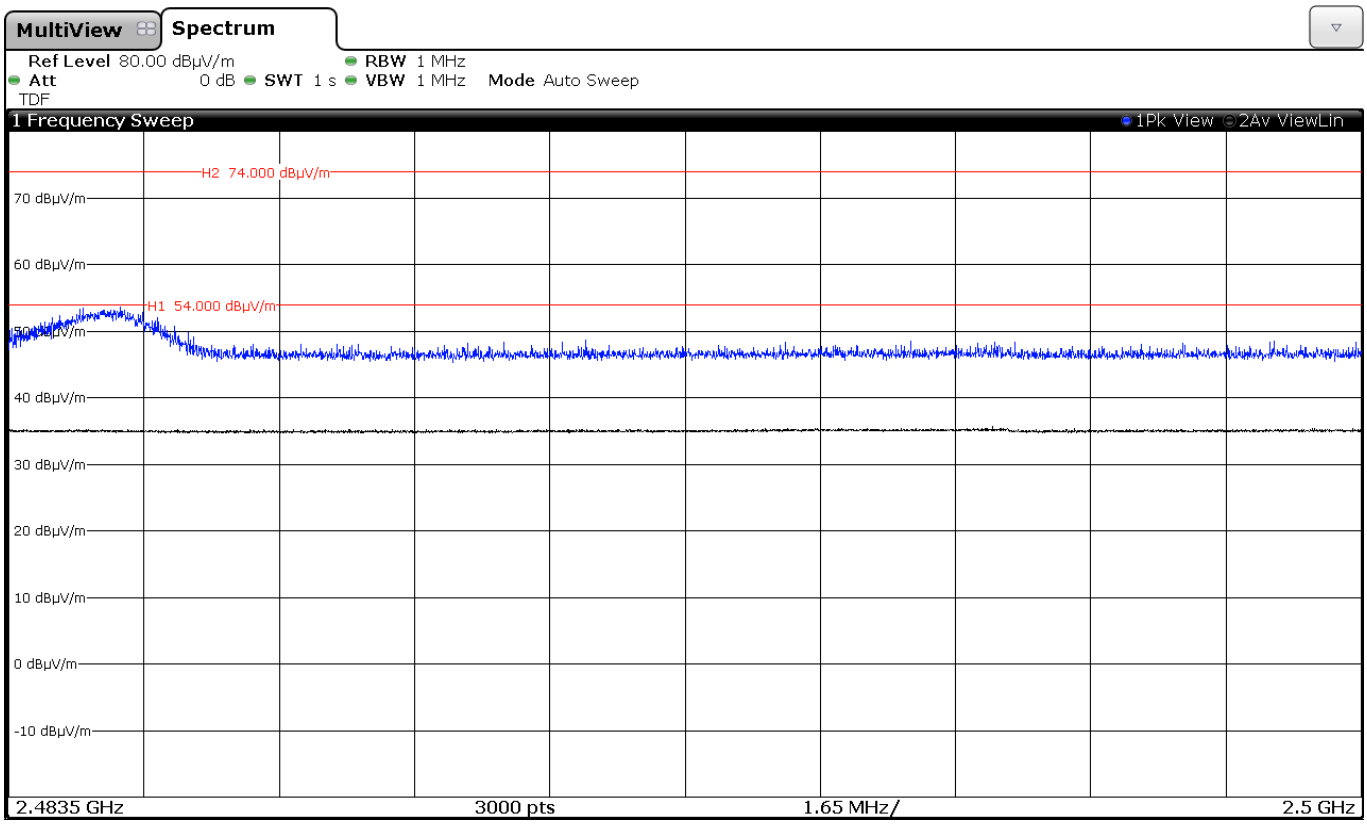


CHANNEL: Highest (2480 MHz).

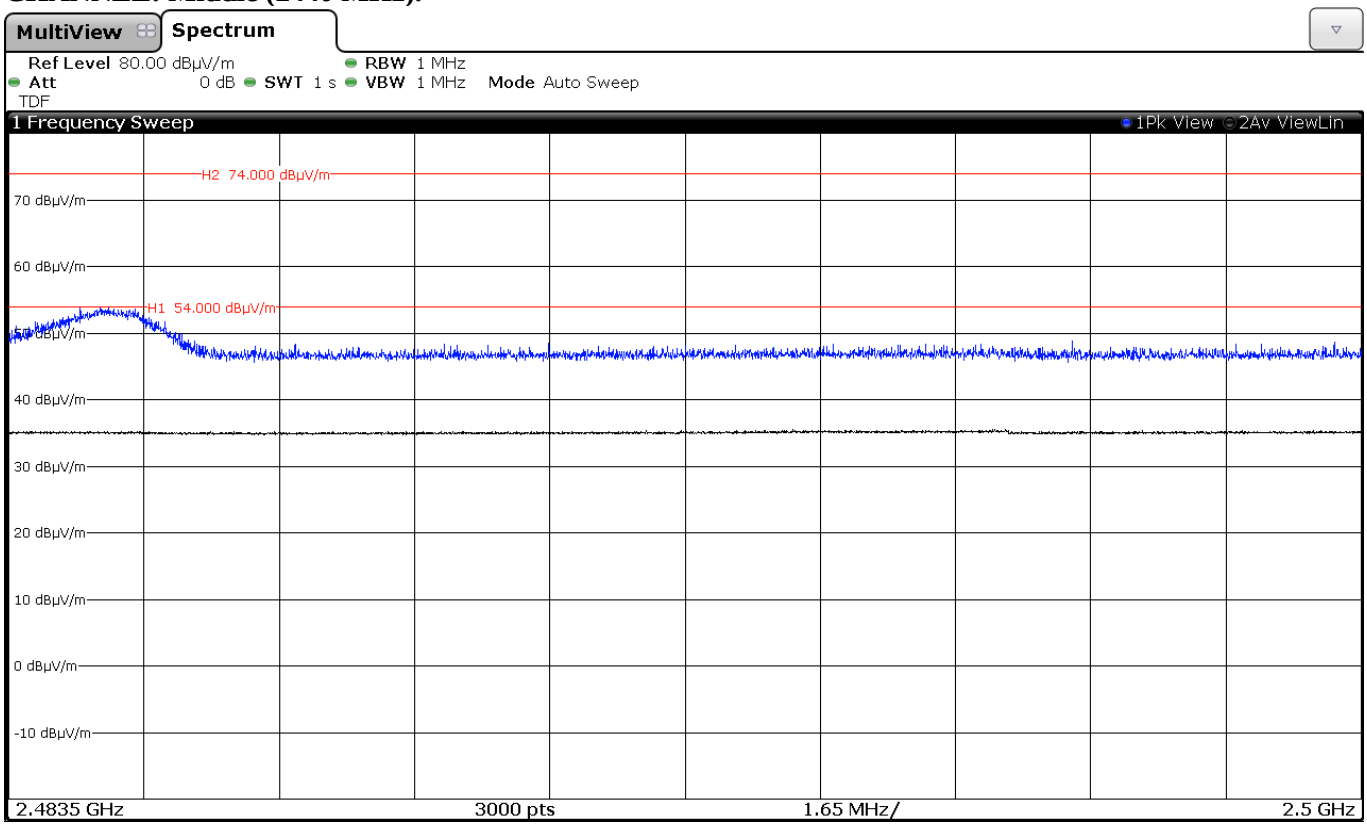
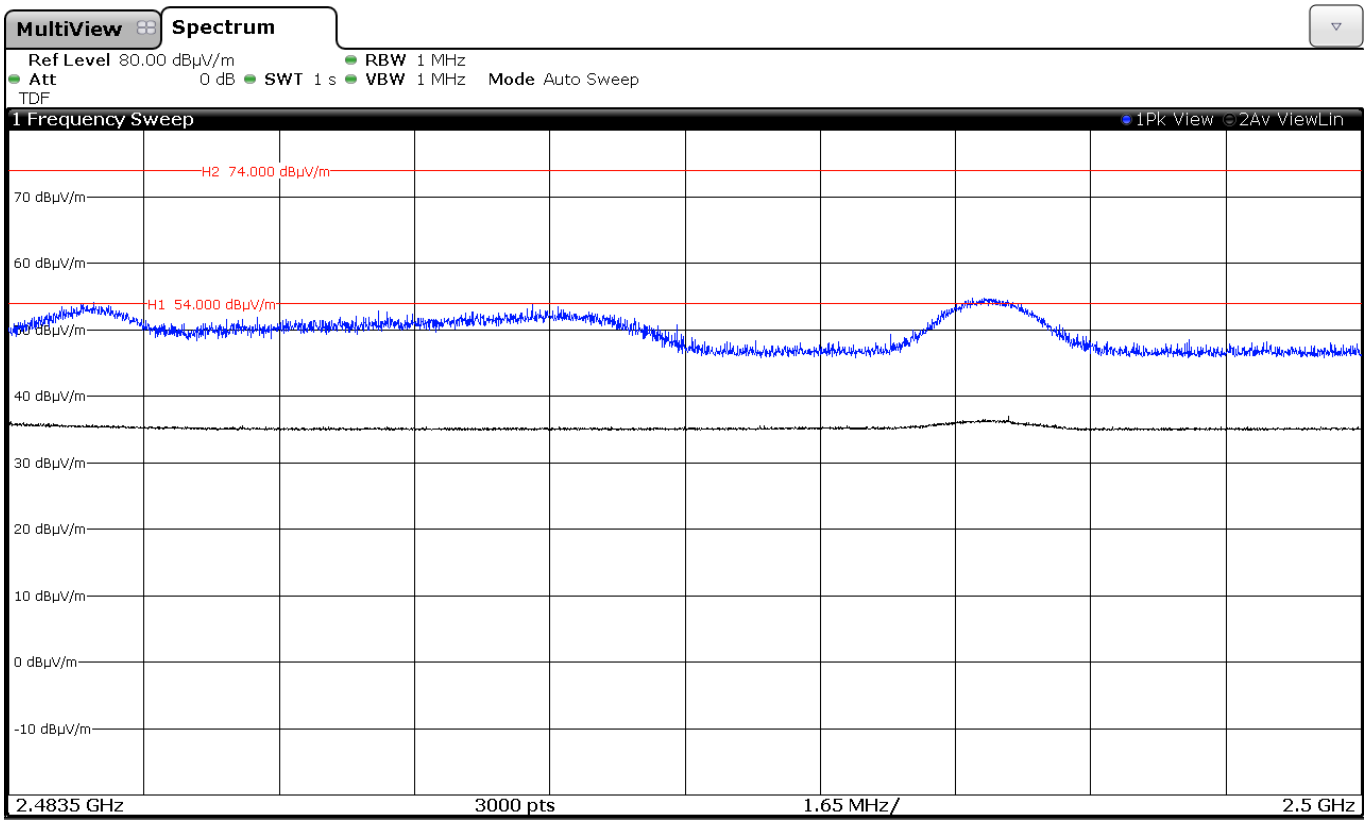


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).