

Test Report

Product	WiFi Transceiver in Home Monitoring Camera
Name and address of the applicant	Panasonic Corporation of North America Two Riverfront Plaza, 9 th Floor Newark, 07102-5490, NJ, USA
Name and address of the manufacturer	Panasonic Corporation 1-62, 4-chome, Minoshima, Hakata-ku Fukuoka, 812-8531, Japan
Model	KX-HNC500, KX-HNC505C
Rating	Mains (120V ~60Hz, 350mA; 5V _{DC} 1.8A)
Trademark	Panasonic
Serial number	9KCFA000036 and 9KCFA000037
Additional information	WiFi 2.4GHz/5GHz, Bluetooth Low Energy
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Industry Canada RSS-247, Issue 2 Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Order number	389657
Tested in period	2020-01-30 to 2020-02-05
Issue date	2020-03-10
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50   An accredited technical test executed under the Norwegian accreditation scheme
 Prepared by [Frode Sveinsen]  Approved by [G.Suhantakumar]	
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1 INFORMATION

1.1 Test Item

Name	Panasonic
Model/version	KX-HNC500 (US Model) KX-HNC505C (Canada Model)
FCC ID	ACJ96NKX-HNC500
ISED ID	216A-KXHNC505
Serial number	Conducted Sample: 9KCFA000037 (MAC: 4C:38:4E:87:37:AC) Radiated Sample: 9KCFA000036 (MAC: 4C:38:4E:87:37:CC)
Hardware identity and/or version	1.00
Software identity and/or version	00.40
Frequency Range	2412 – 2462 MHz
Number of Channels	11
Operating Modes	802.11 b/g/n (HT20 only)
Type of Modulation	DSSS and OFDM
User Frequency Adjustment	None
Rated Output Power	802.11b: 0.094 Watts 802.11g: 0.142 Watts 802.11n: 0.133 Watts
Power Supply	AC Adaptor: PNLV251 (120V ~60Hz, 350mA; 5V _{DC} 1.8A)
Antenna Connector	None (Internal Antennas)
Number of Antennas	1
Antenna Diversity Supported	No
Smart Antennas Supported	No
Desktop Charger	N/A
Interfaces	None

Description of Test Item

The EUT is a Window Mounted Home Monitoring Camera with WiFi and Bluetooth LE.

The models KX-HNC500 and KX-HNC505C are identical.

1.2 Normal test condition

Temperature: 20 - 24 °C
Relative humidity: 20 - 50 %
Normal test voltage: 120 V 60 Hz

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen

1.4 Description of modification for Modification Filing

Not applicable.

1.5 Family List Rational

Not Applicable.

1.6 Antenna Requirement

Is the antenna detachable?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

Type of antenna connector: N/A

Ref. FCC §15.203

1.7 Worst-Case Configuration and Mode

Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

The worst case data rates were:

802.11b mode : 11 Mbps
802.11g mode : 54 Mbps
802.11n HT20 mode : MCS7

EUT Operating Modes

Description of operating modes	Continuous TX, 2.4 GHz Mode
Additional information	The EUT was transmitting continuously in test-mode during all measurements.

1.8 Comments

The measurements were done with the EUT powered by 115 V AC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

This report covers the 2.4 GHz WLAN part of the EUT. 5 GHz WLAN and Bluetooth LE are covered by separate reports.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and ISSED RSS-247 Issue 2 and RSS-GEN Issue 5.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were performed in a semi-anechoic chamber at measuring distances of 3m.

A description of the test facility is on file with the FCC and ISSED.

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

DTS Equipment Code

☐ Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 2, RSS-GEN Issue 5 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	Complies
Occupied Bandwidth	N/A	6.7 (RSS-GEN)	Complies
DTS Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	Complies
Power Spectral Density	15.247(d)	5.2 (2) (RSS-247)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	Complies

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.207

ISED RSS-GEN Issue 5, Clause 7.2 / 8.8

Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN

Test Results: Complies

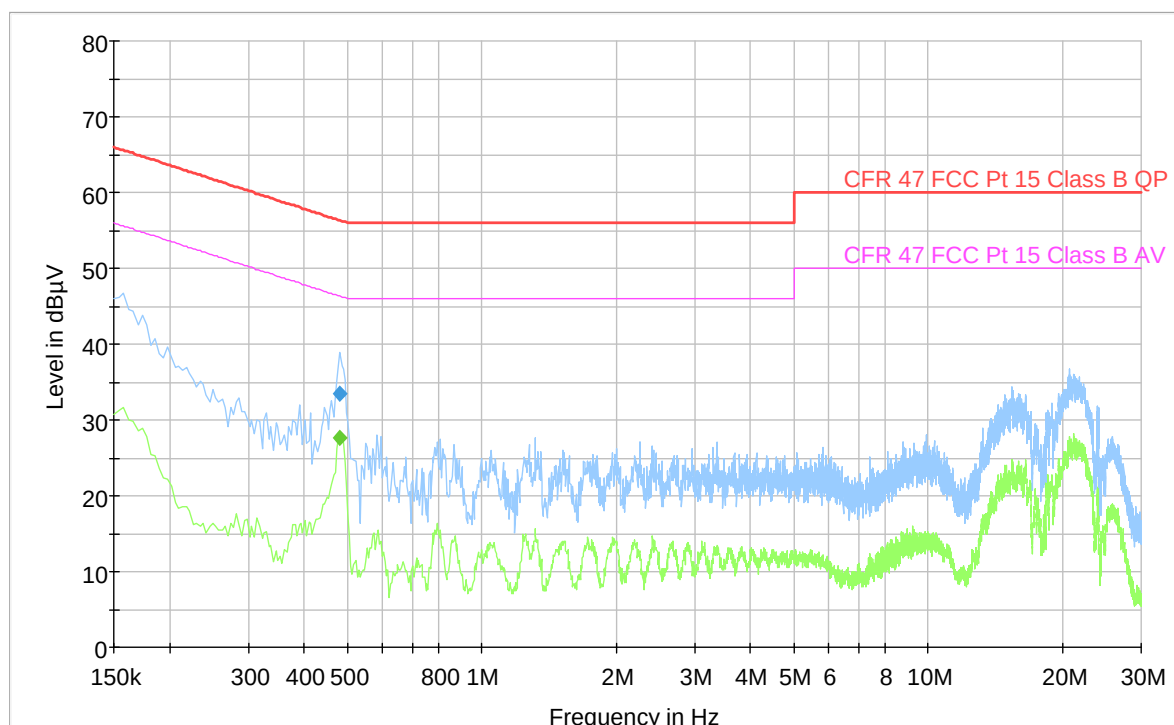
Measurement Data: See attached plots

Highest measured value (L1 and N):

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.480	---	27.63	46.34	18.71	1000	9	N	OFF
0.480	33.54	---	56.34	22.80	1000	9	N	OFF

AC Adaptor, 120 V 60 Hz

Full Spectrum



3.2 Occupied Bandwidth (99% BW)

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.2

Test Results: Complies

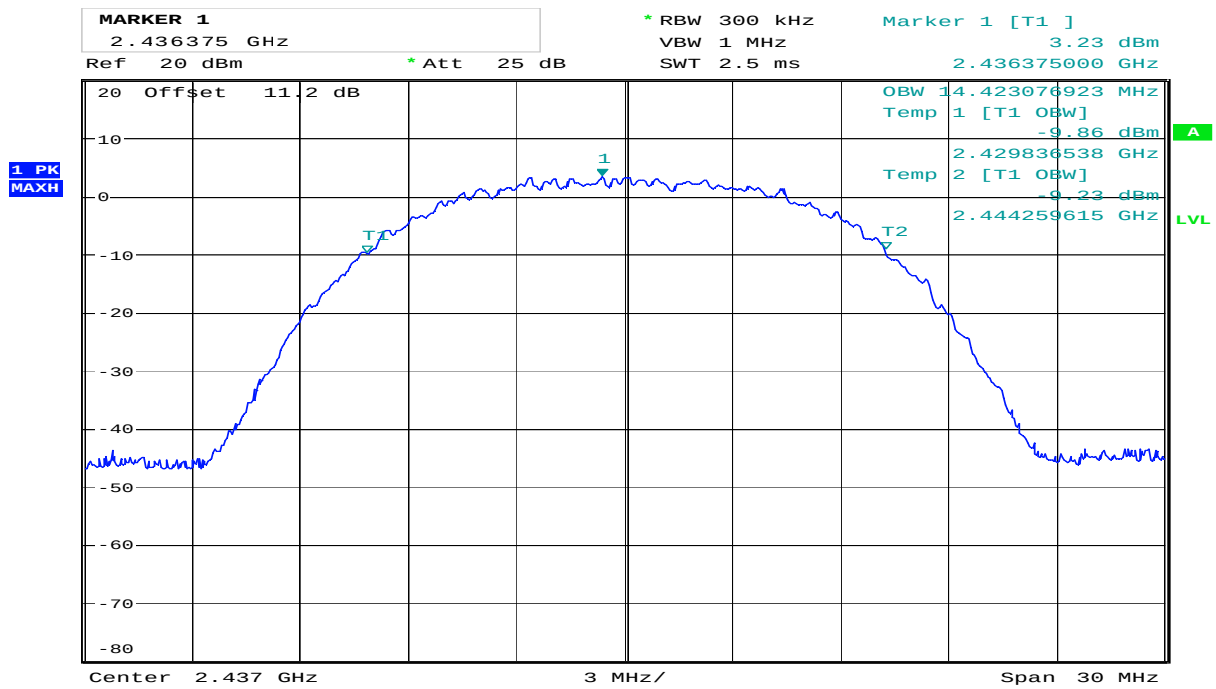
Measurement Data:

Modulation type and bitrate	Occupied Bandwidth (99% BW) (MHz)
	Ch 06, 2437 MHz
802.11b, 11 Mbps	14.4 MHz
802.11g, 54 Mbps	16.6 MHz
802.11n, MCS7	17.8 MHz

See attached plots

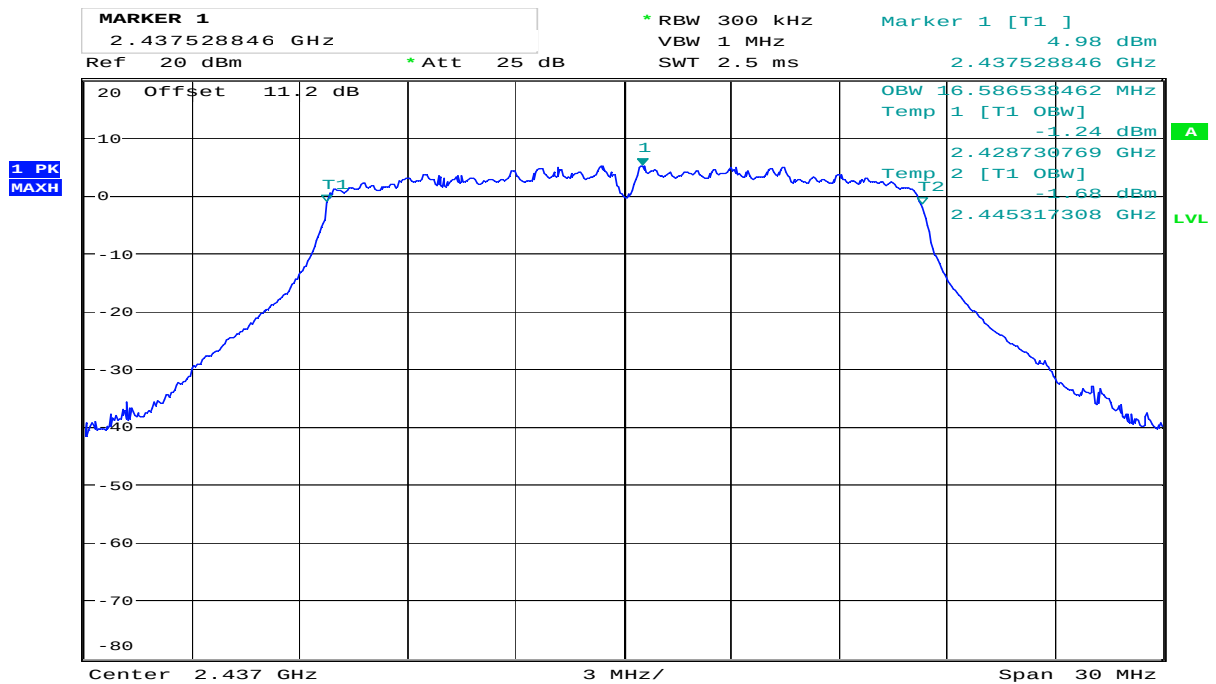
Requirements:

No requirements for Digital Transmission Systems.



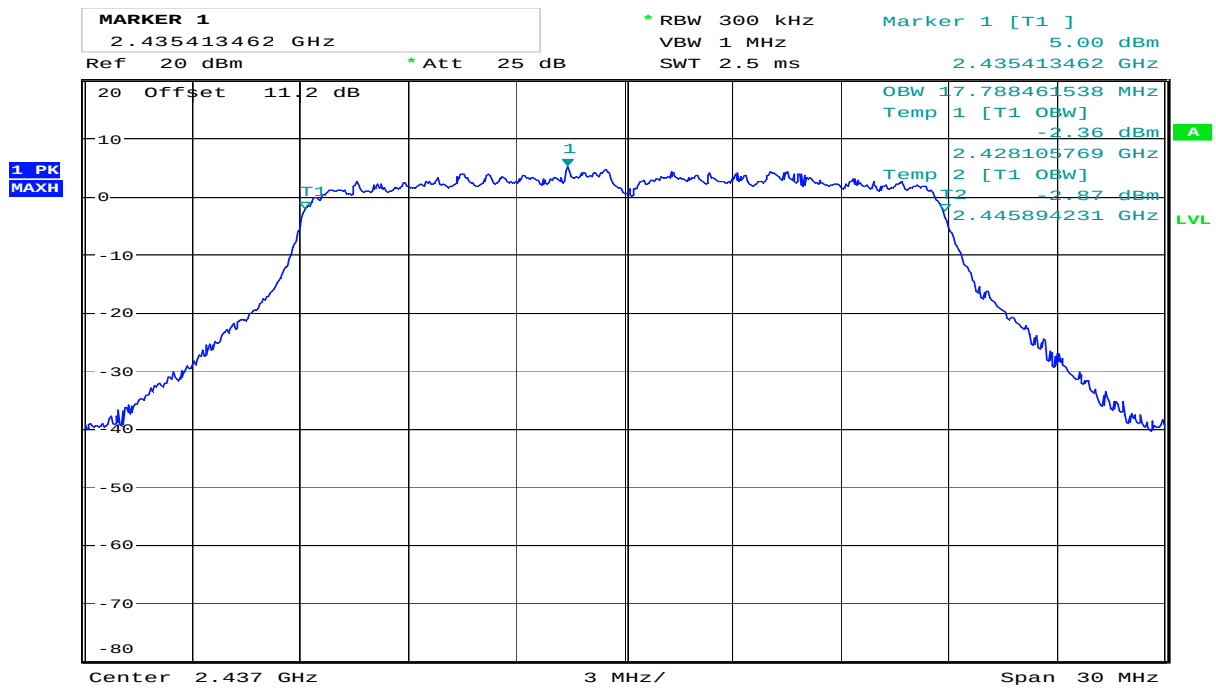
Date: 30. JAN. 2020 16:17:48

Occupied Bandwidth, 2437 MHz, 802.11b, 11Mbps



Date: 30. JAN. 2020 16:11:06

Occupied Bandwidth, 2437 MHz, 802.11g, 54Mbps



Date: 30. JAN. 2020 16:13:40

Occupied Bandwidth, 2437 MHz, 802.11n, MCS7

3.3 DTS Bandwidth

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 2, Clause 5.2 (a)

Measurement procedure: ANSI C63.10-2013 Clause 11.8

Test Results: Complies

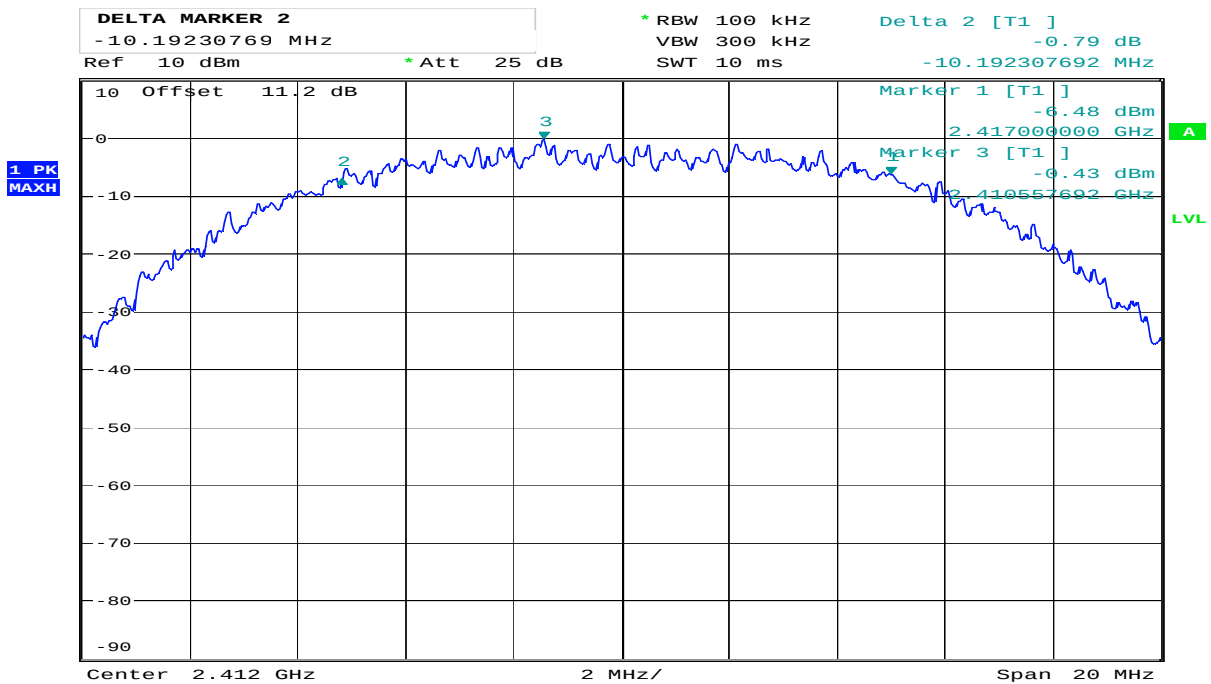
Measurement Data:

Modulation type and bitrate	Measured DTS Bandwidth (MHz)		
	Ch 01, 2412 MHz	Ch 06, 2437 MHz	Ch 11, 2462 MHz
802.11b, 11 Mbps	10.2	16.2	17.4
802.11g, 54 Mbps	10.4	16.2	17.3
802.11n, MCS7	10.3	16.2	17.4

Power supply variation within 85 % to 115% of nominal value has no influence on measured value.

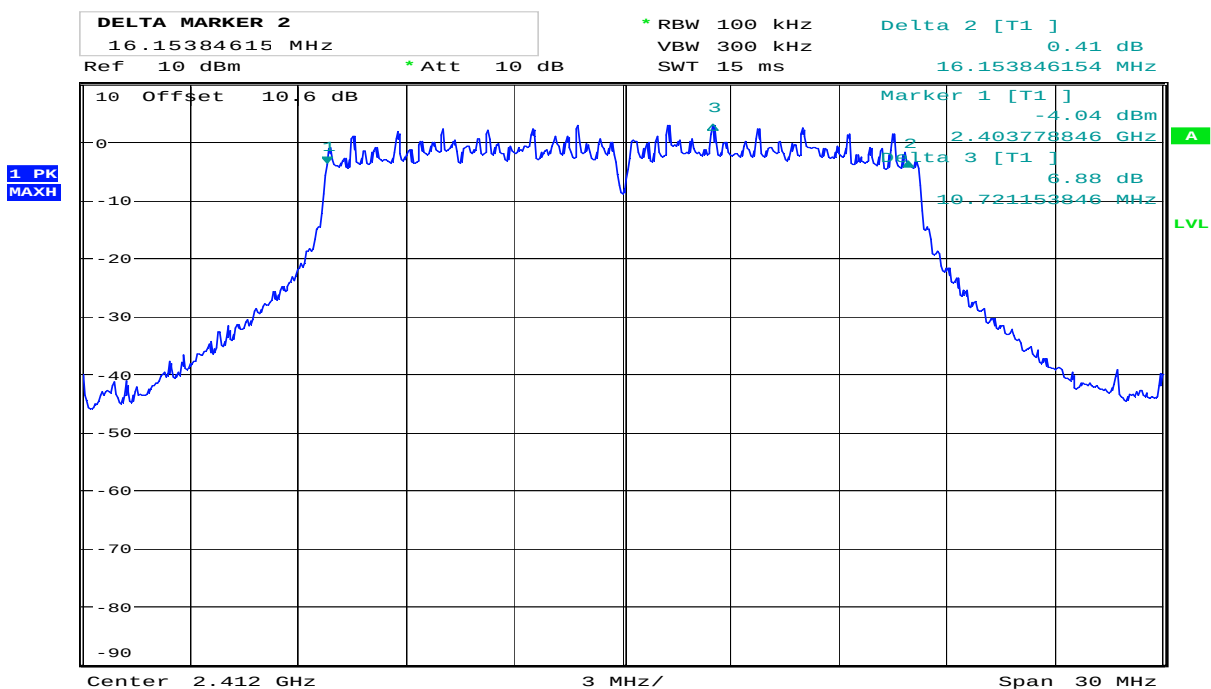
Requirements:

For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.



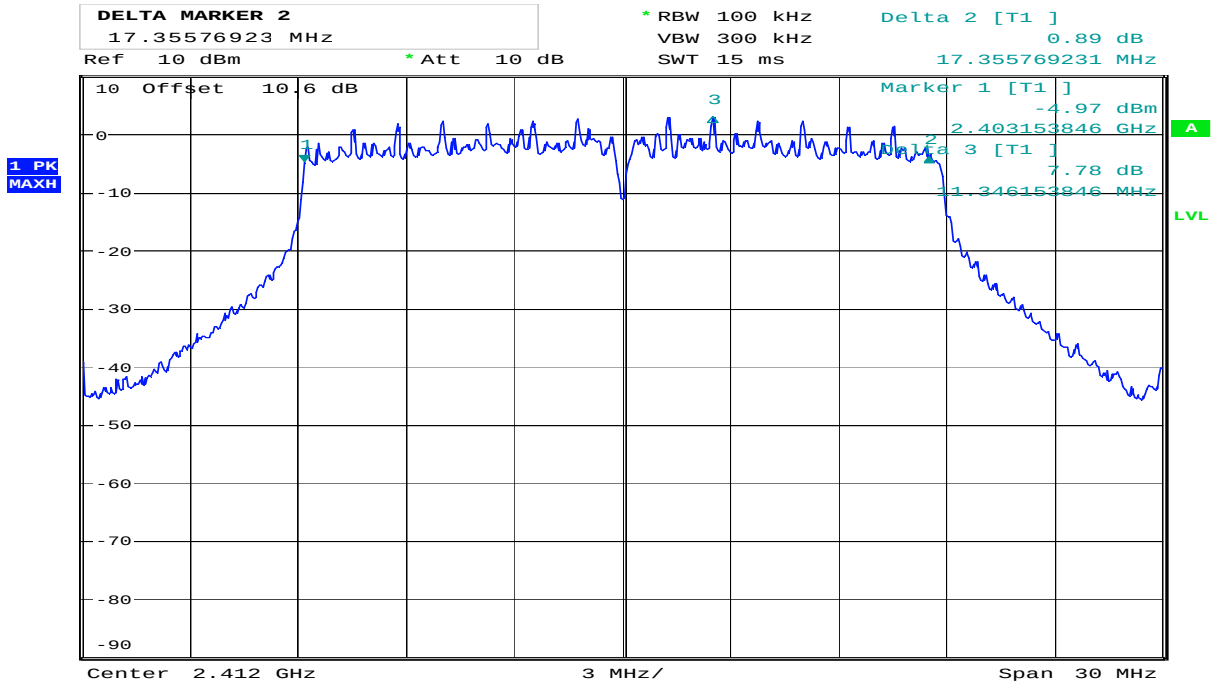
Date: 30.JAN.2020 16:32:20

DTS Bandwidth, 2412 MHz, 802.11b, 11Mbps



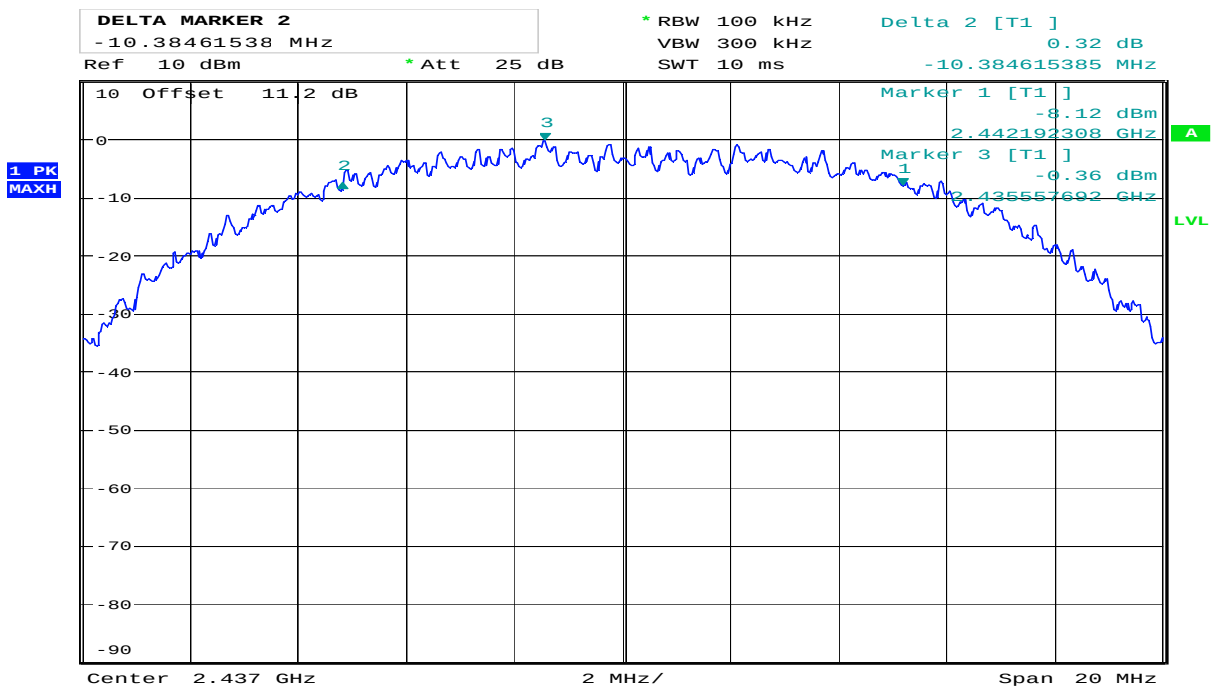
Date: 5.FEB.2020 12:34:01

DTS Bandwidth, 2412 MHz, 802.11g, 54Mbps



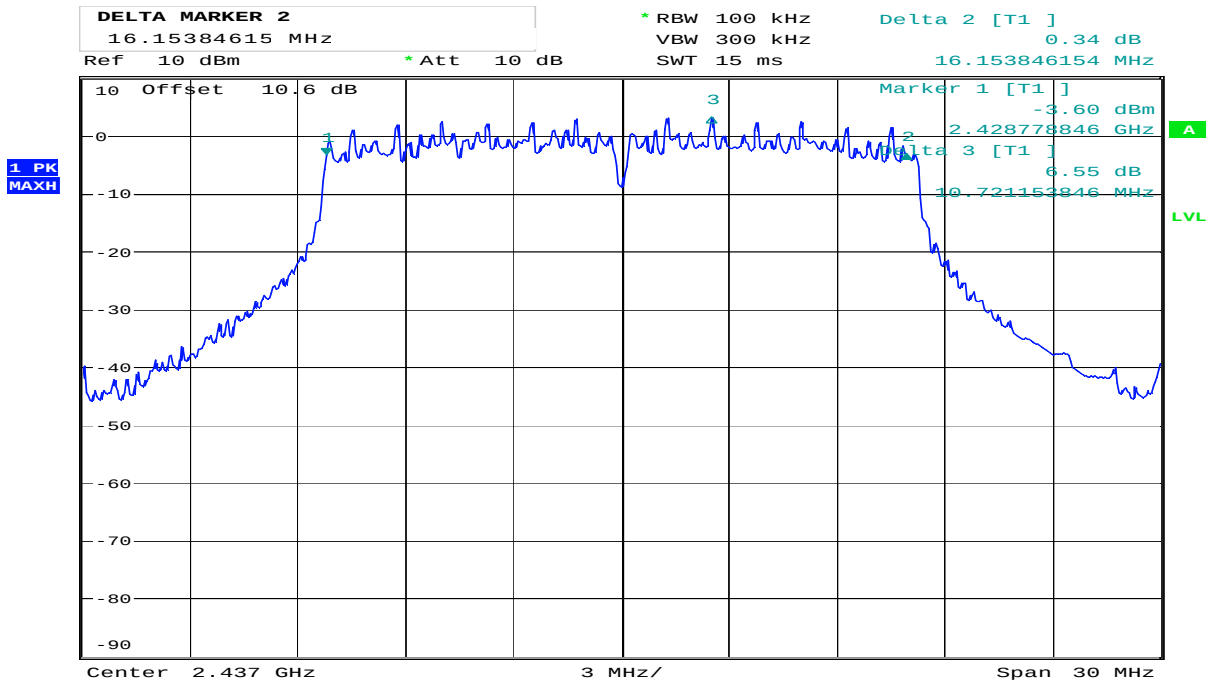
Date: 5.FEB.2020 12:40:47

DTS Bandwidth, 2412 MHz, 802.11n, MCS7



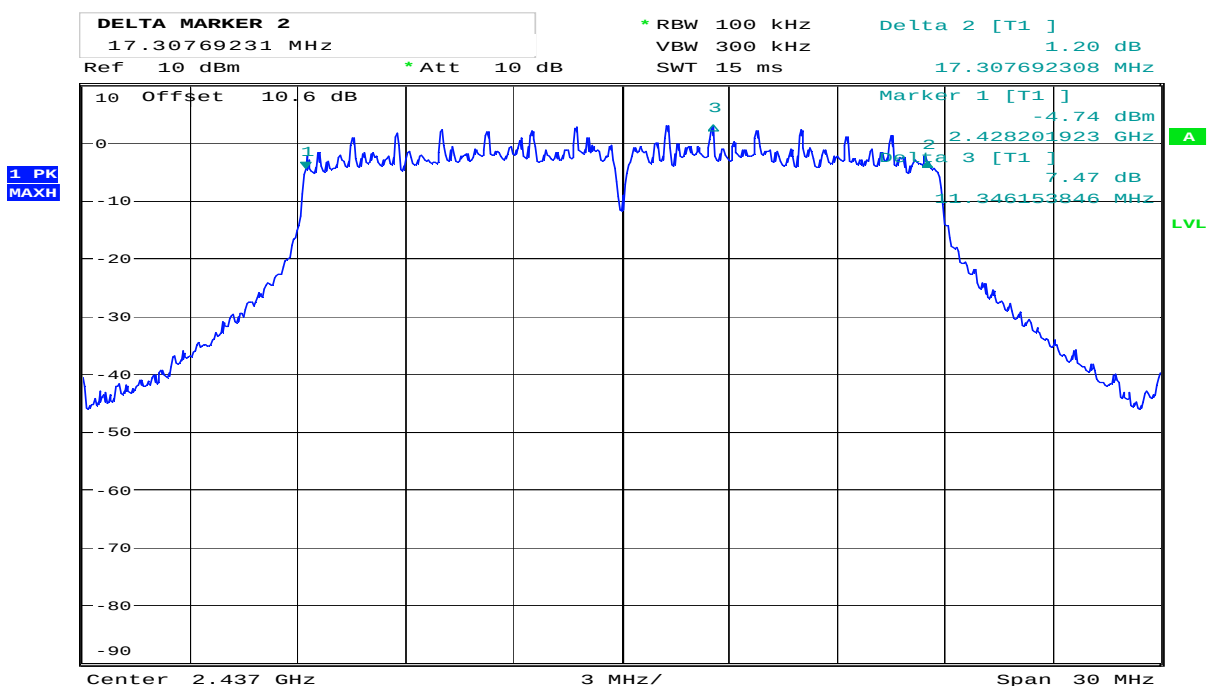
Date: 30.JAN.2020 16:30:14

DTS Bandwidth, 2437 MHz, 802.11b, 11Mbps



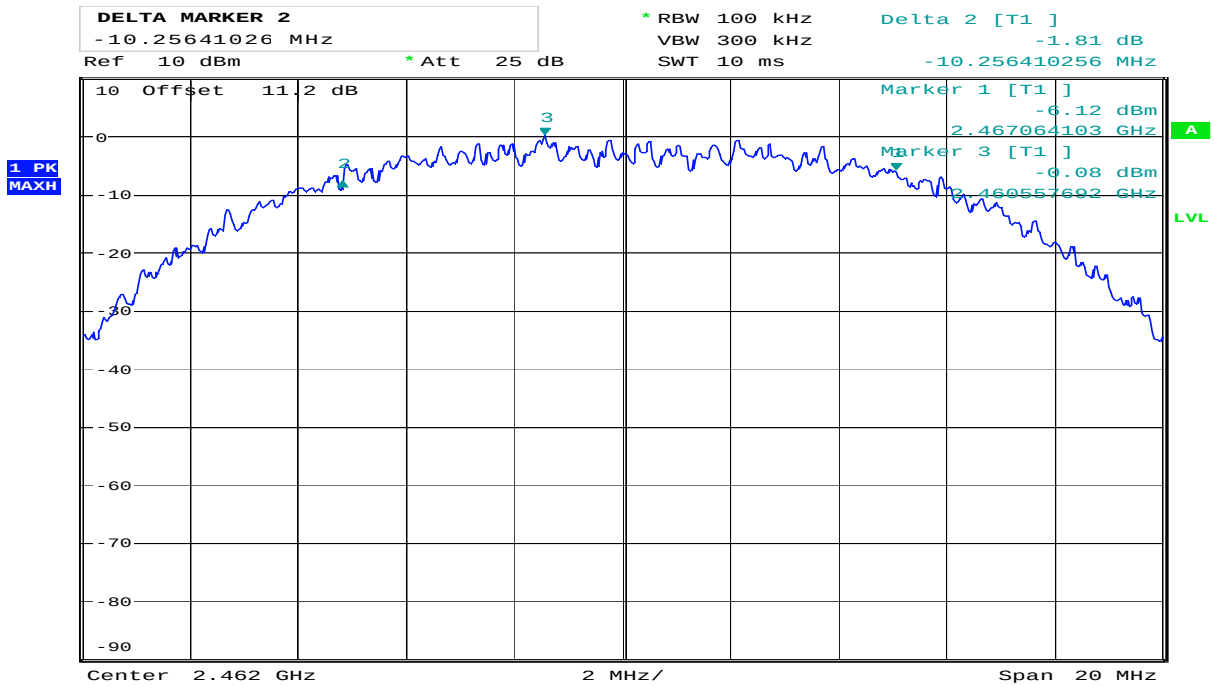
Date: 5.FEB.2020 12:32:45

DTS Bandwidth, 2437 MHz, 802.11g, 54Mbps



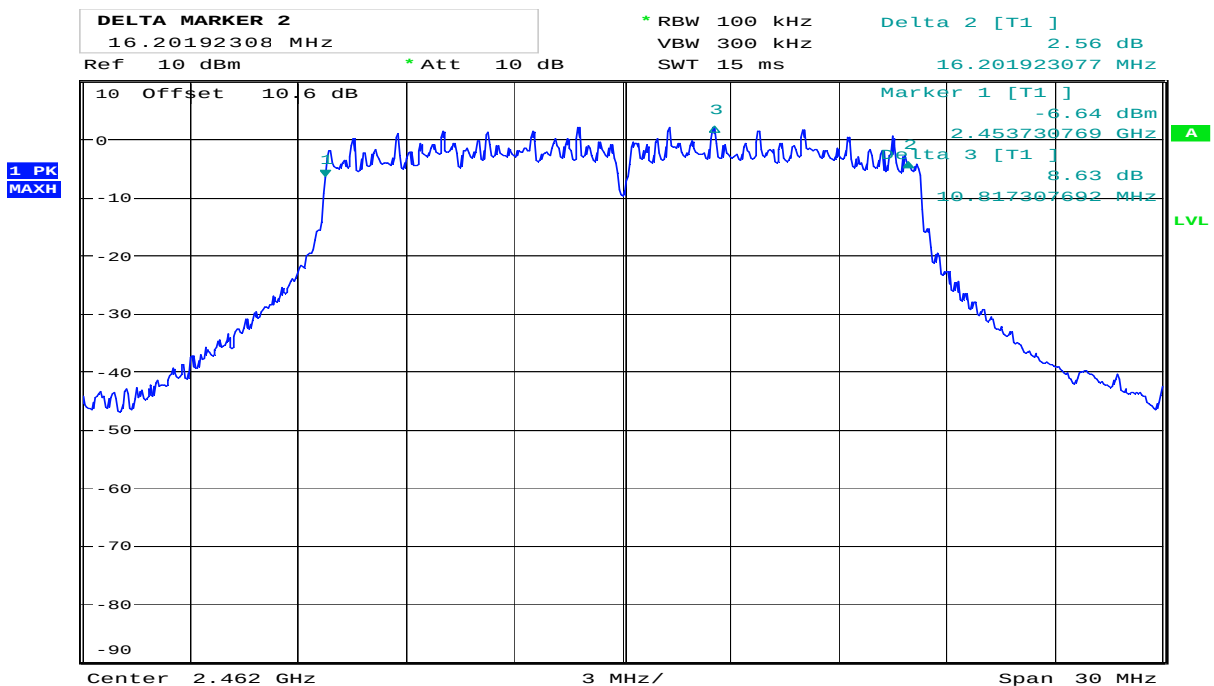
Date: 5.FEB.2020 12:39:20

DTS Bandwidth, 2437 MHz, 802.11n, MCS7



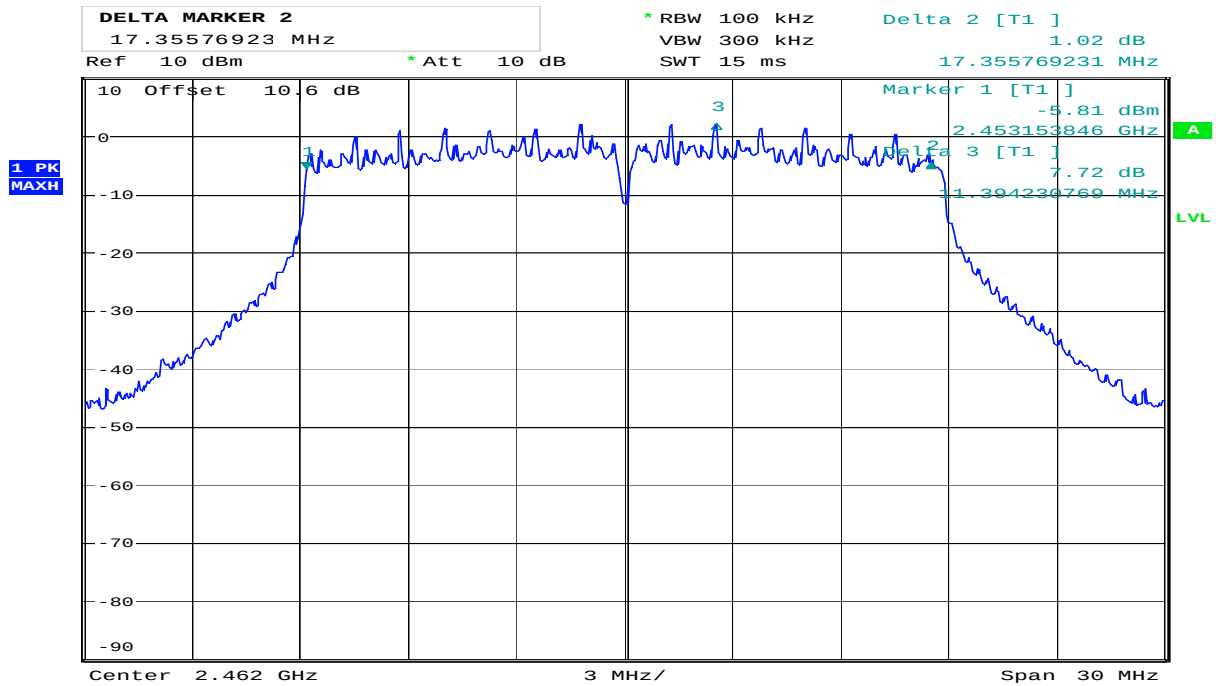
Date: 30.JAN.2020 16:28:06

DTS Bandwidth, 2462 MHz, 802.11b, 11Mbps



Date: 5.FEB.2020 12:35:31

DTS Bandwidth, 2462 MHz, 802.11g, 54Mbps



Date: 5.FEB.2020 12:36:55

DTS Bandwidth, 2462 MHz, 802.11n, MCS7

3.4 Peak Power Output

FCC Part 15.247 (b)

ISED Canada RSS-247 Issue 2, Clause 5.4

Measurement procedure: ANSI C63.10-2013 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

Carrier Frequency	Maximum Conducted Output Power, Watts		
	802.11b, 11 Mbps	802.11g, 54 Mbps	802.11n, MCS7
2412 MHz	0.088	0.137	0.128
2437 MHz	0.090	0.142	0.133
2462 MHz	0.094	0.137	0.126

Carrier Frequency	Maximum EIRP, Watts		
	802.11b, 11 Mbps	802.11g, 54 Mbps	802.11n, MCS7
2412 MHz	0.069	0.186	0.192
2437 MHz	0.047	0.164	0.164
2462 MHz	0.038	0.116	0.116

Carrier Frequency	Maximum Antenna Gain, dBi		
	802.11b, 11 Mbps	802.11g, 54 Mbps	802.11n, MCS7
2412 MHz	-1.1	-0.8	-0.4
2437 MHz	-2.8	-1.5	-1.6
2462 MHz	-3.9	-2.9	-2.7

Output Power reported is Maximum Peak Power

The Integrated Band Power Method was used to measure Output Power

Radiated Power was calculated from measured Field Strength using the method described in FCC KDB 412172 D01.

Antenna Gain is less than 6 dBi.

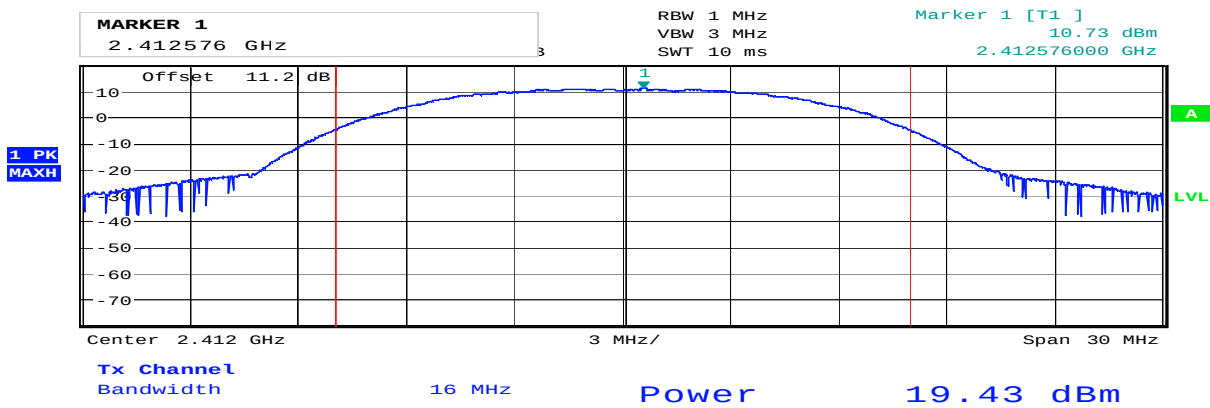
See attached plots.

Requirements:

The maximum peak output power shall not exceed the following limits:

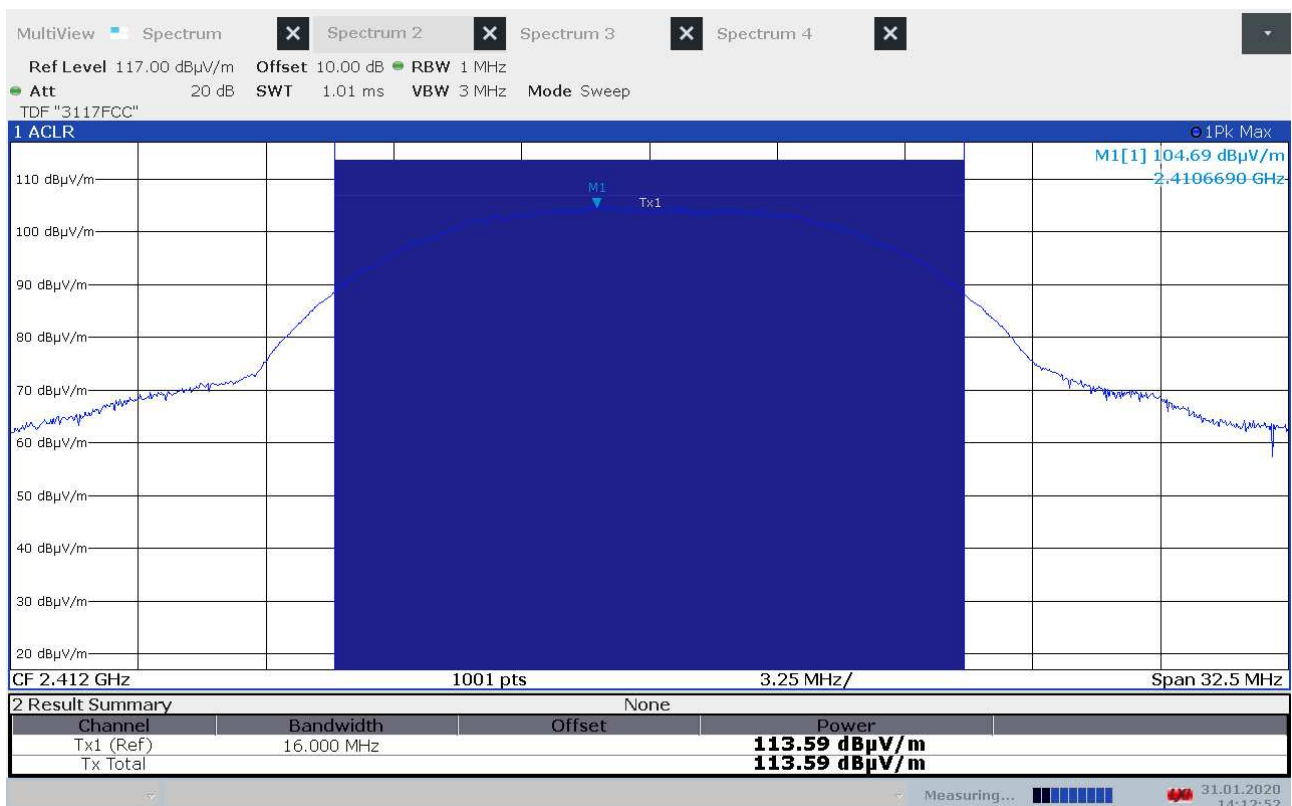
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

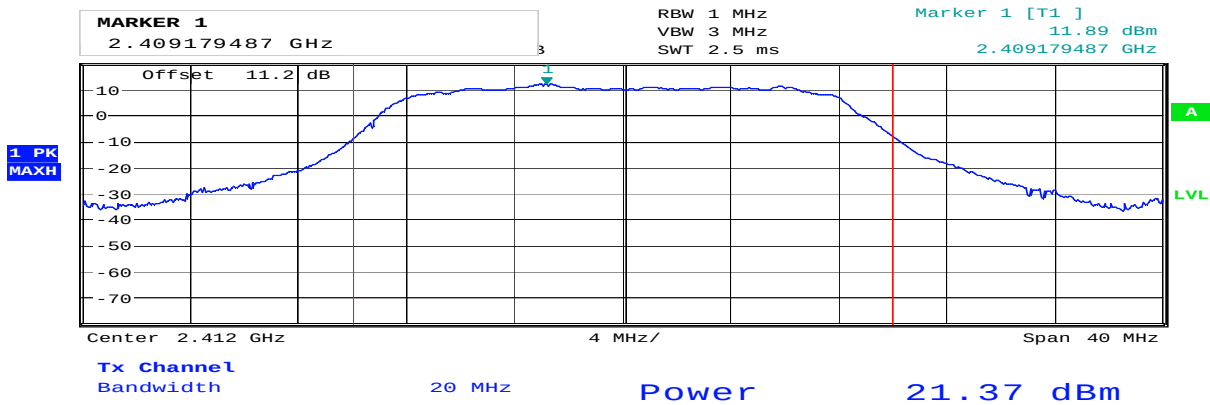


Date: 30. JAN. 2020 15:44:19

Conducted Output Power, 2412 MHz, 802.11b, 11Mbps

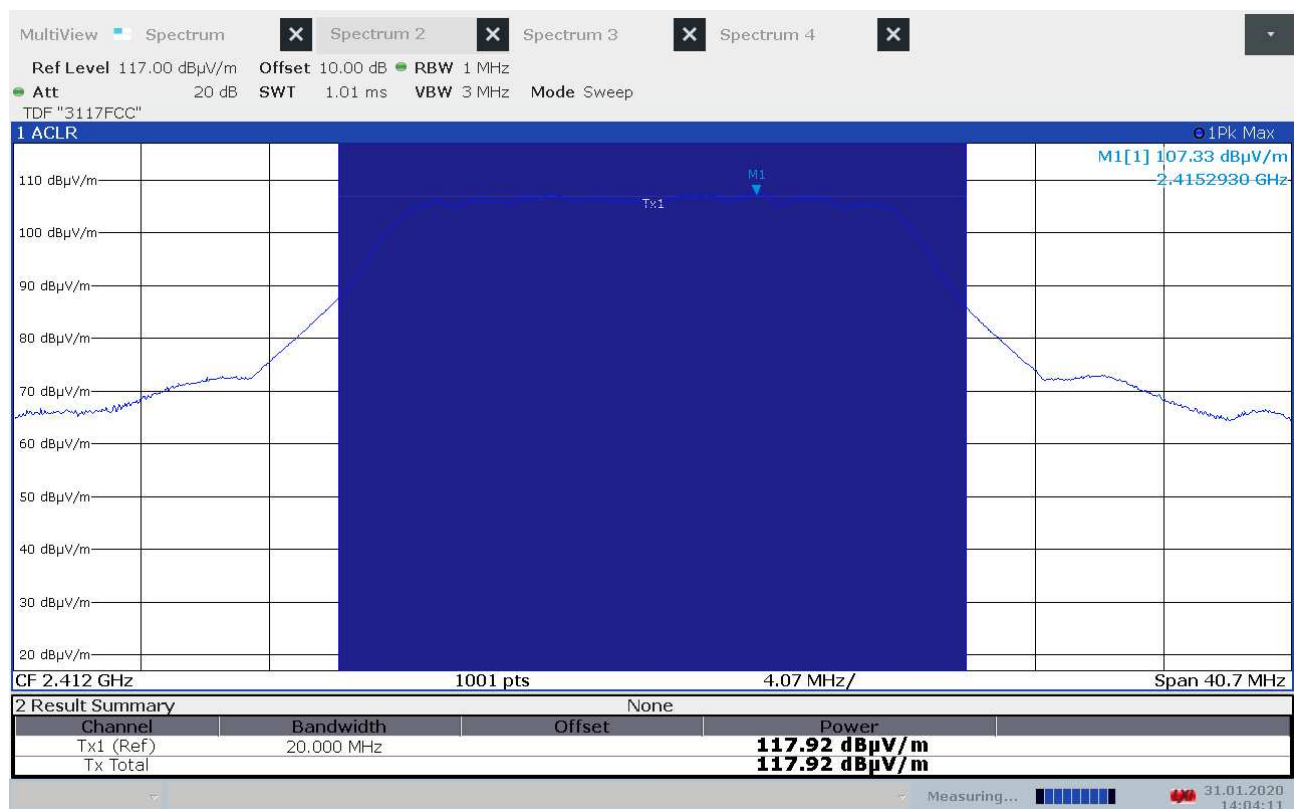


Radiated Output Power, 2412 MHz, 802.11b, 11Mbps (Max: HP)

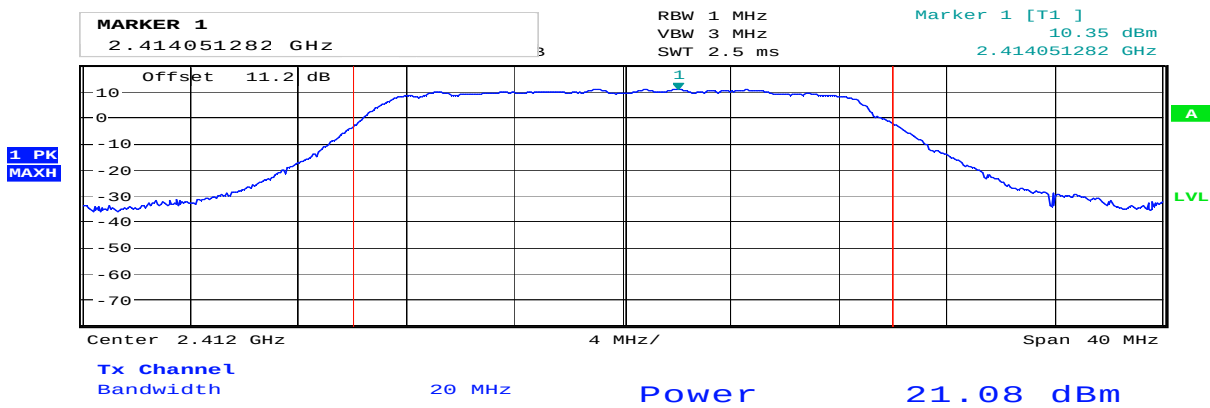


Date: 30. JAN. 2020 15:32:36

Conducted Output Power, 2412 MHz, 802.11g, 54Mbps

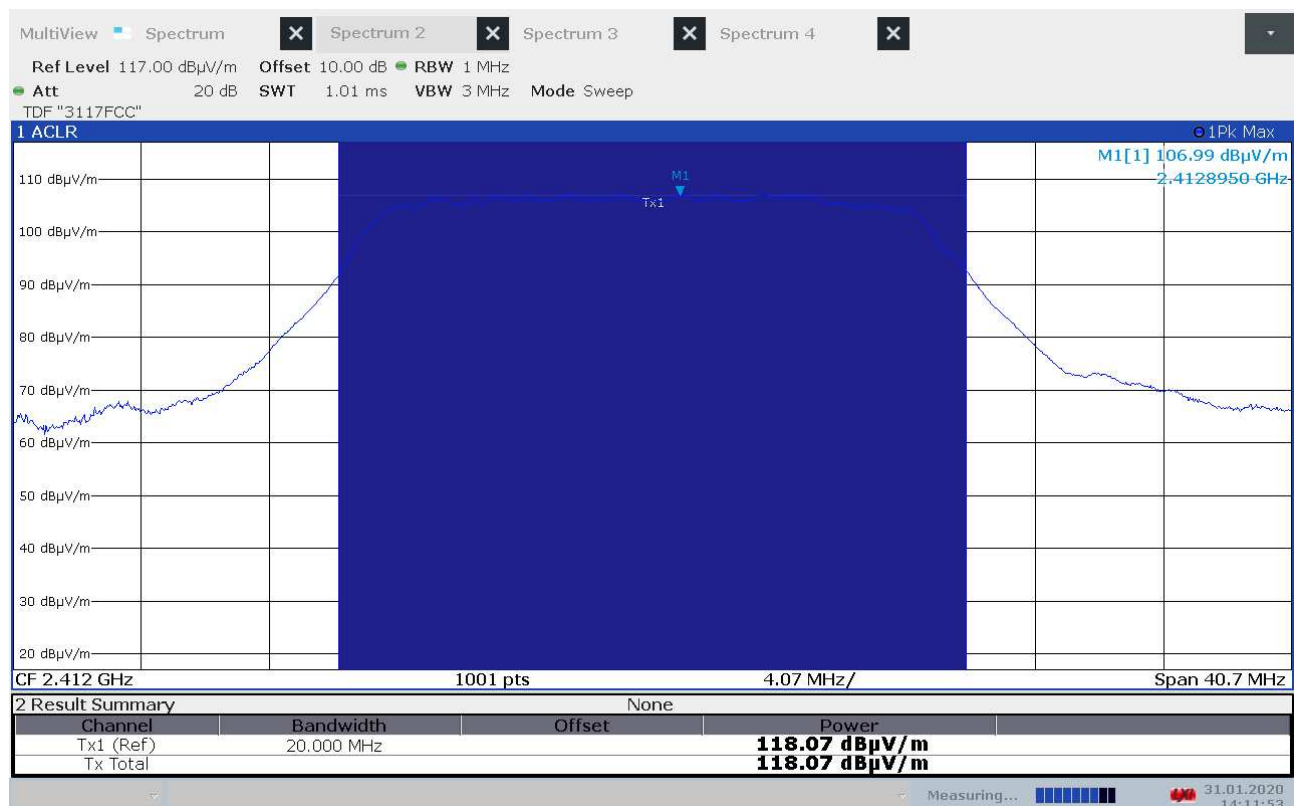


Radiated Output Power, 2412 MHz, 802.11g, 54Mbps (Max: HP)

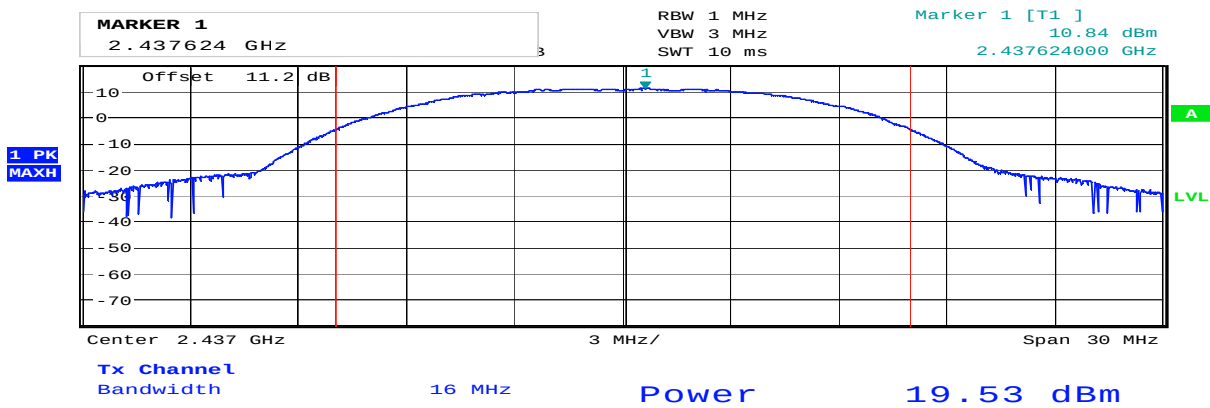


Date: 30. JAN. 2020 15:34:13

Conducted Output Power, 2412 MHz, 802.11n, MCS7

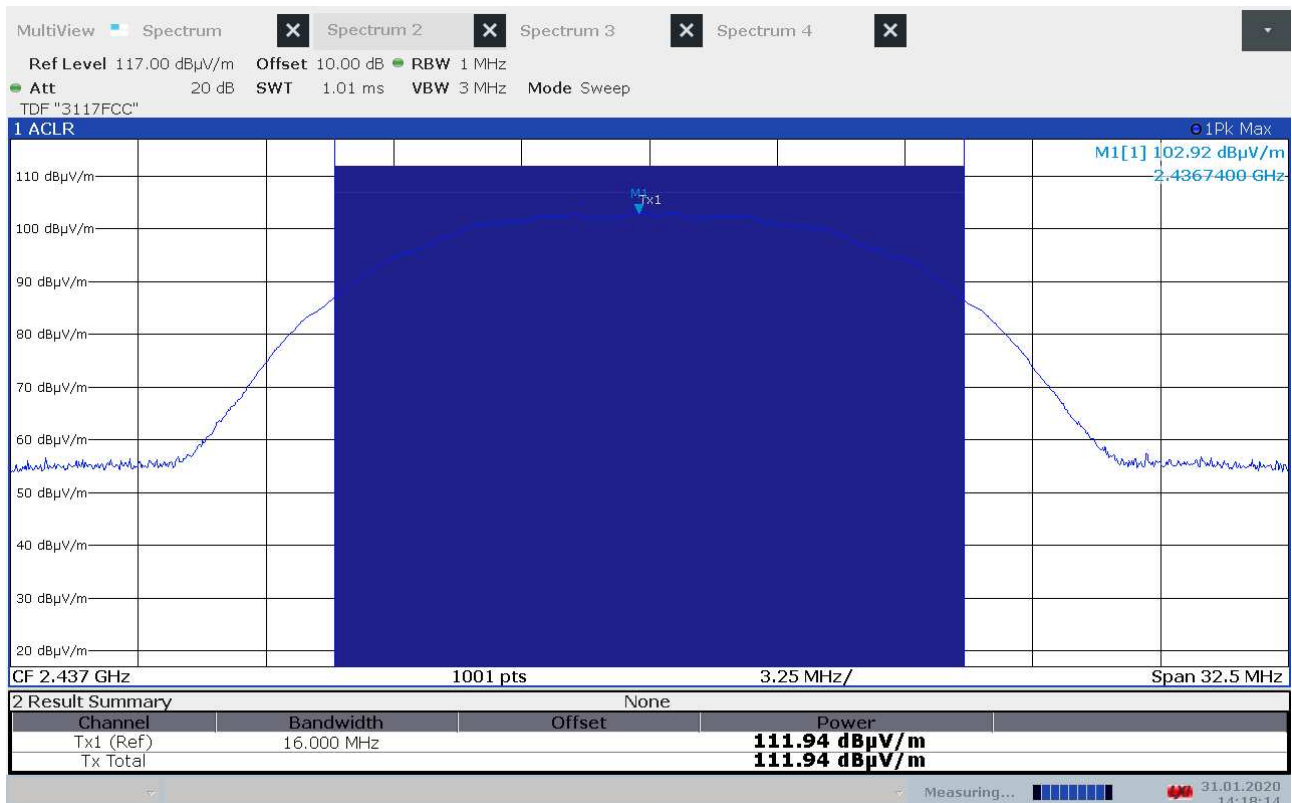


Radiated Output Power, 2412 MHz, 802.11n, MCS7 (Max: HP)

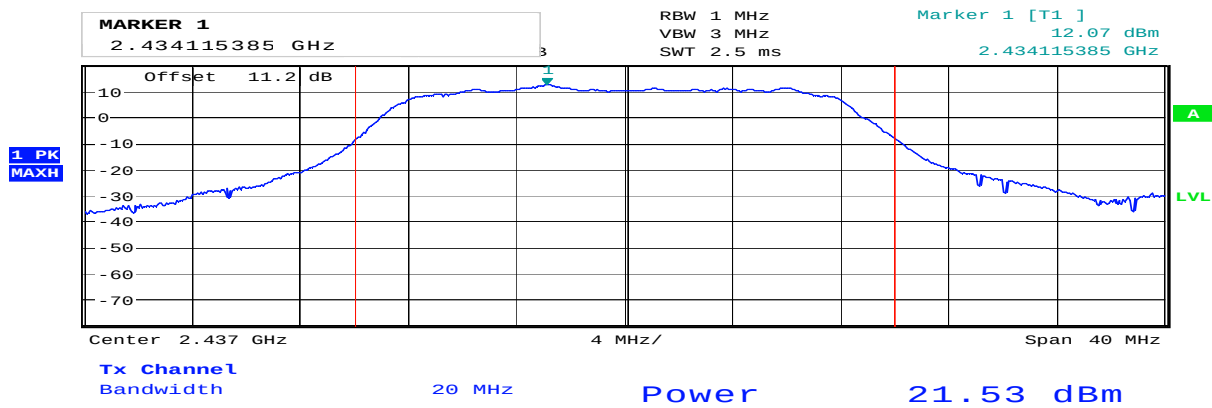


Date: 30. JAN. 2020 15:45:26

Conducted Output Power, 2437 MHz, 802.11b, 11Mbps

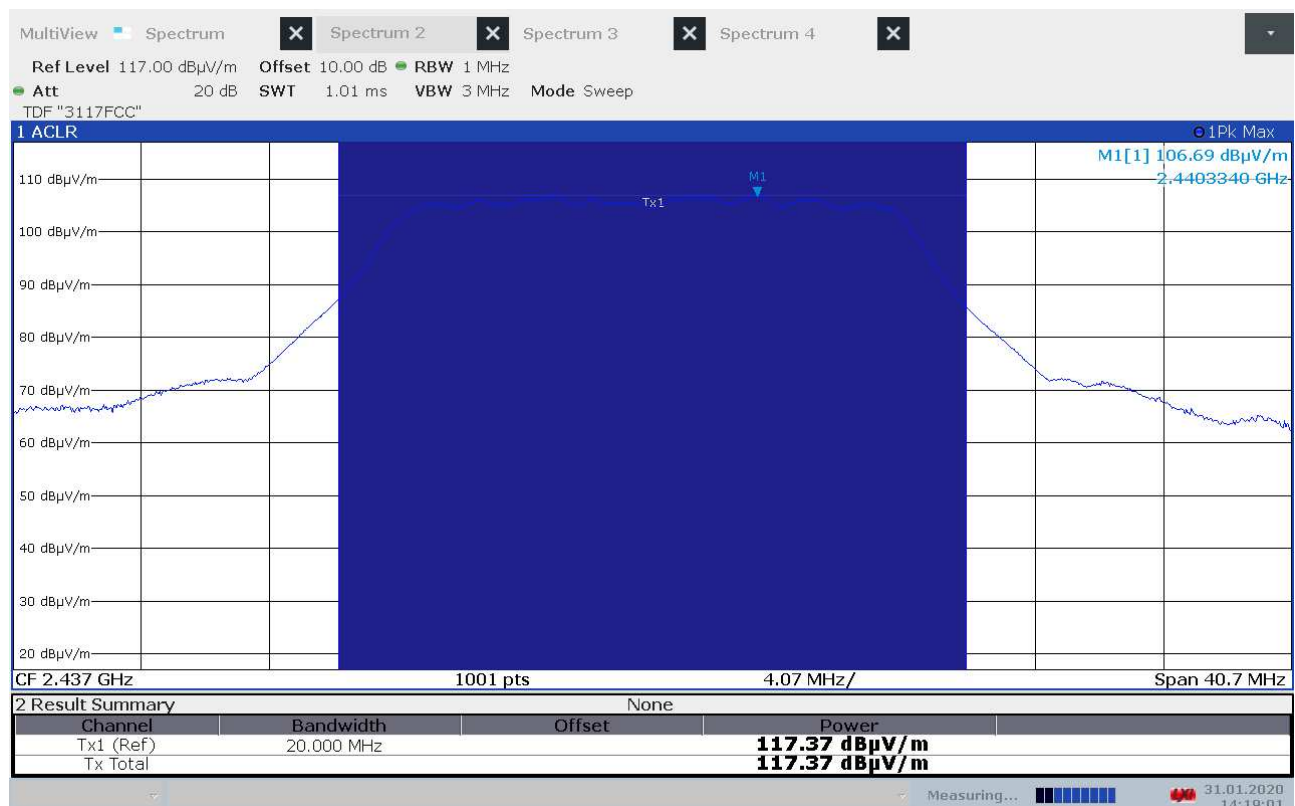


Radiated Output Power, 2437 MHz, 802.11b, 11Mbps (Max: HP)

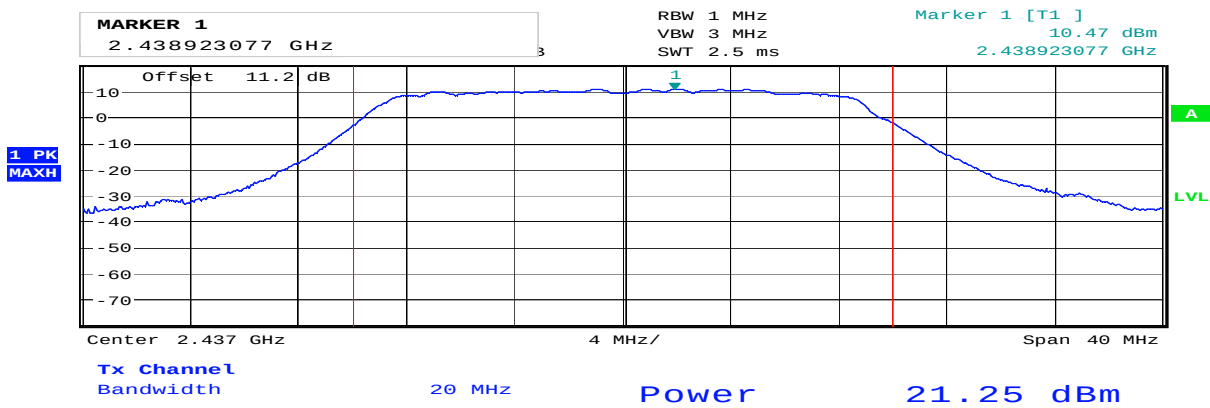


Date: 30. JAN. 2020 15:35:58

Conducted Output Power, 2437 MHz, 802.11g, 54Mbps

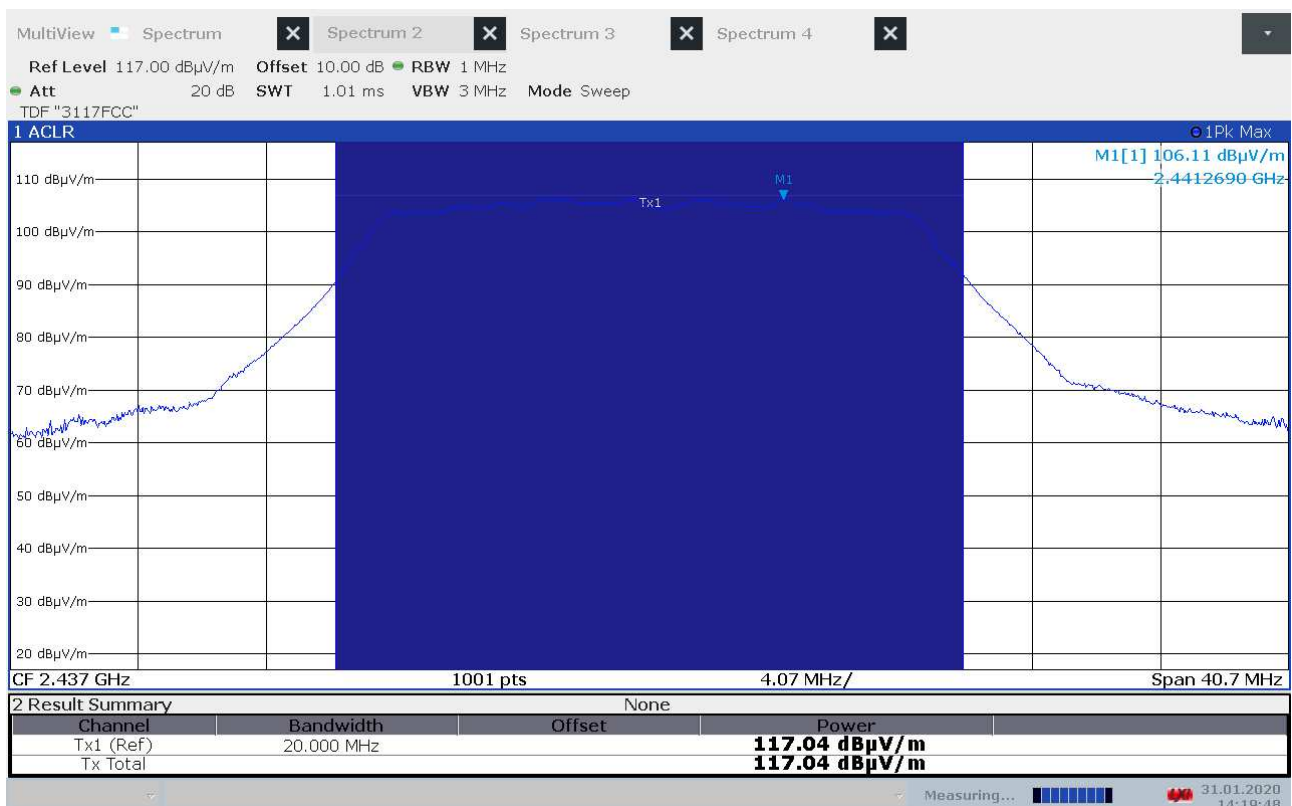


Radiated Output Power, 2437 MHz, 802.11g, 54Mbps (Max: HP)

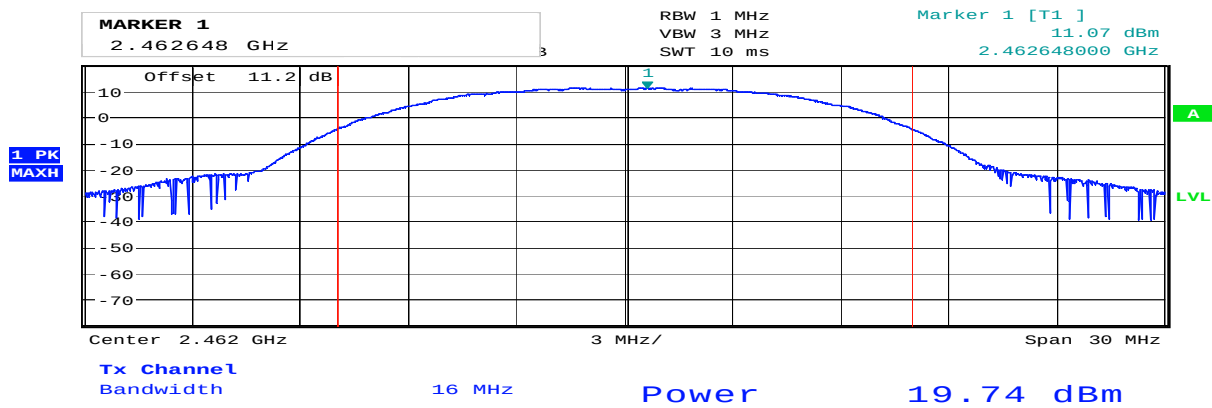


Date: 30. JAN. 2020 15:37:06

Conducted Output Power, 2437 MHz, 802.11n, MCS7

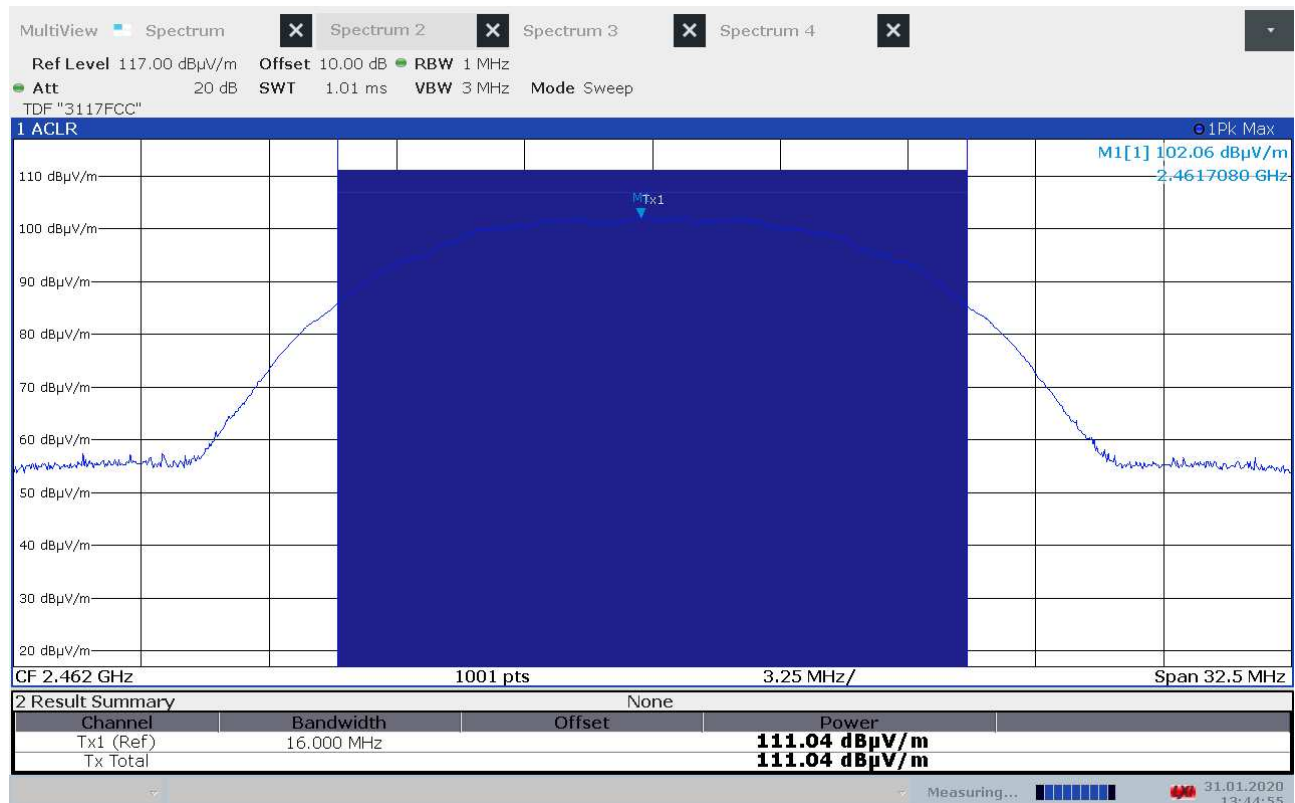


Radiated Output Power, 2437 MHz, 802.11n, MCS7 (Max: HP)

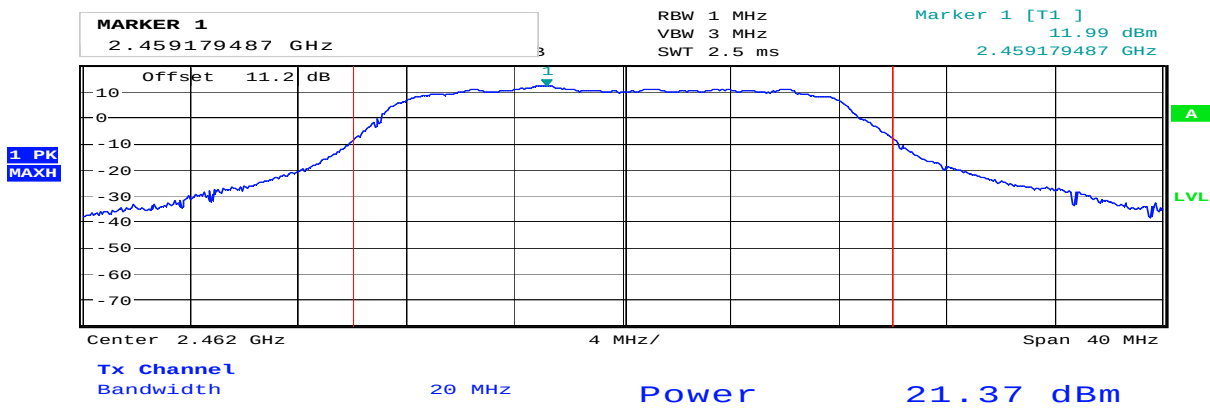


Date: 30. JAN. 2020 15:46:08

Conducted Output Power, 2462 MHz, 802.11b, 11Mbps

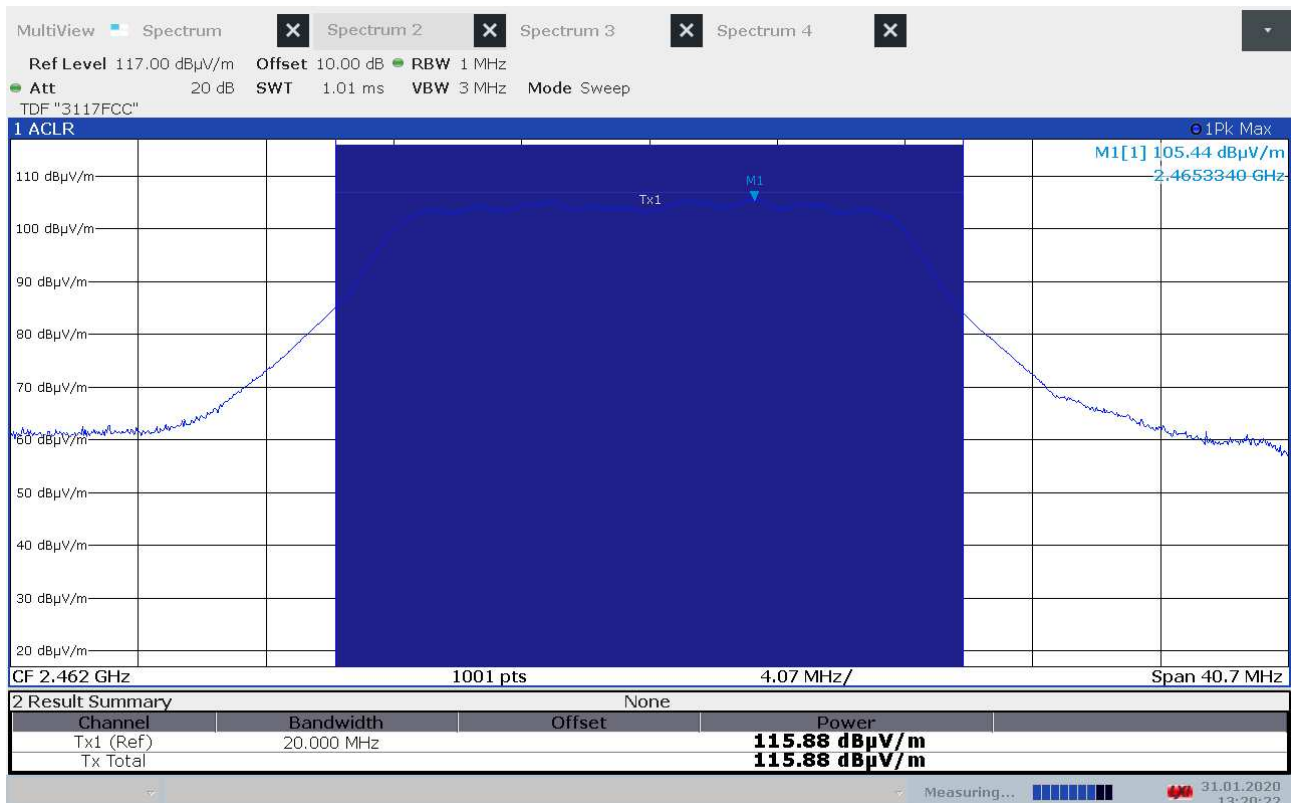


Radiated Output Power, 2462 MHz, 802.11b, 11Mbps (Max: HP)

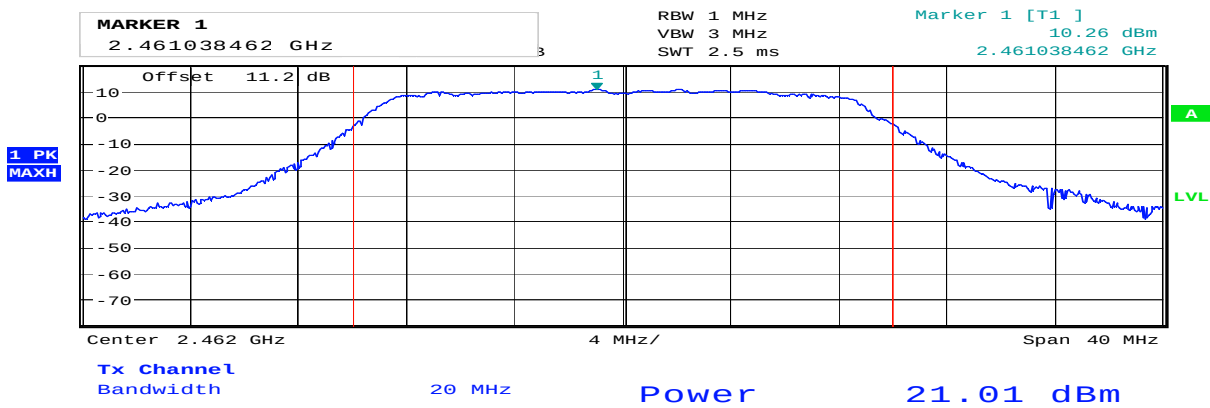


Date: 30. JAN. 2020 15:38:41

Conducted Output Power, 2462 MHz, 802.11g, 54Mbps

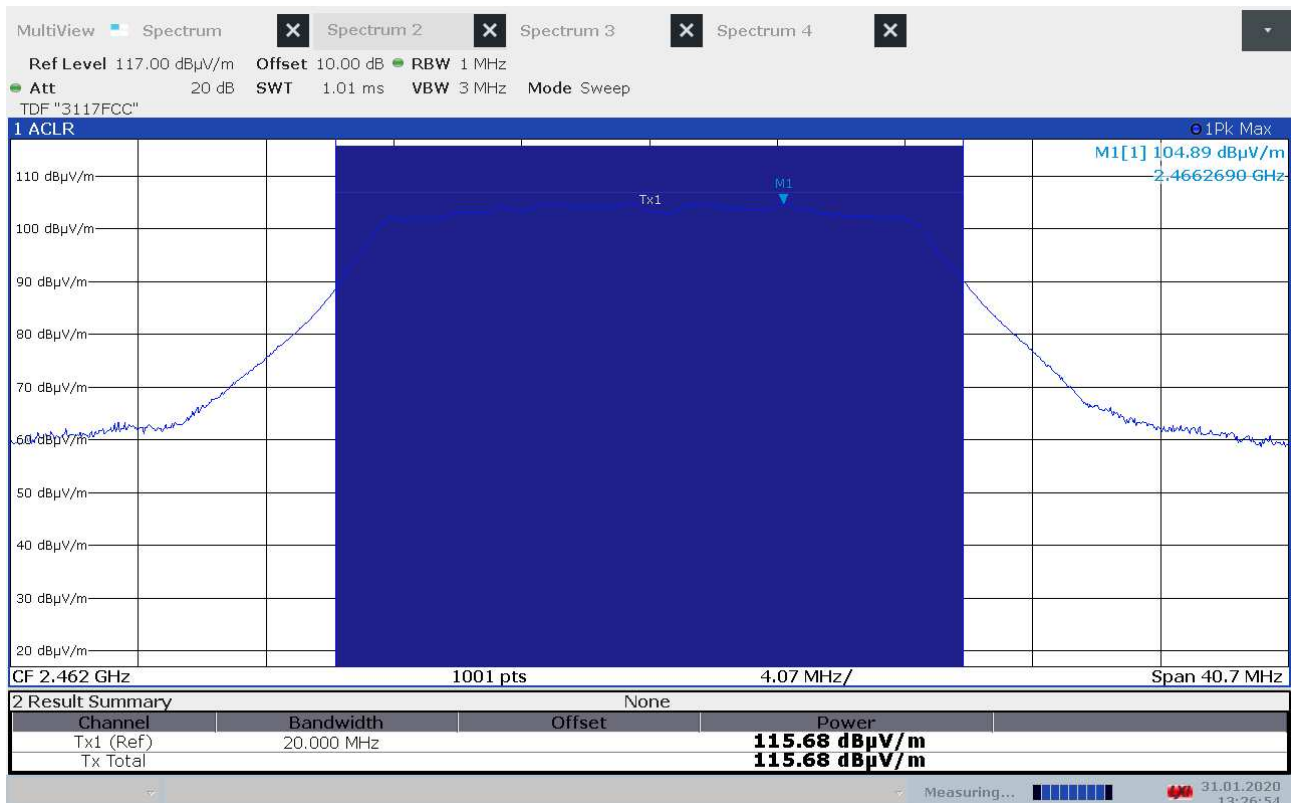


Radiated Output Power, 2462 MHz, 802.11g, 54Mbps (Max: HP)



Date: 30. JAN. 2020 15:40:25

Conducted Output Power, 2462 MHz, 802.11n, MCS7



Radiated Output Power, 2462 MHz, 802.11n, MCS7 (Max: HP)

3.5 Conducted Emissions at Antenna Connector

FCC Part 15.247 (d)

ISED Canada RSS-247 Issue 2, Clause 5.5

Measurement procedure: ANSI C63.10-2013 Clause 11.11

Test Results: Complies

Measurement Data:

Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
2412 MHz	> 50	> 30	Pass
2437 MHz	> 50	> 30	Pass
2462 MHz	> 50	> 30	Pass

Measured with Peak Detector

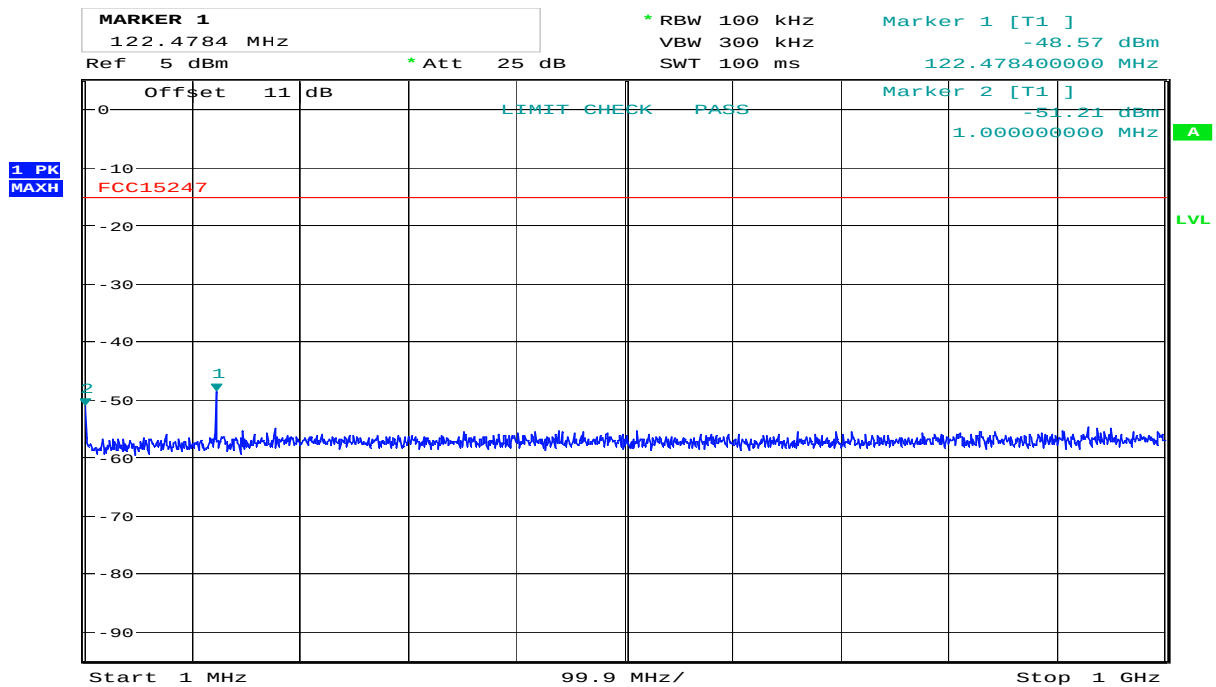
RF conducted power to 25 GHz: see attached plots.

Limit

Peak measurement	RMS averaging
20 dBc or more in 100 kHz bandwidth	30 dBc or more in 100 kHz bandwidth

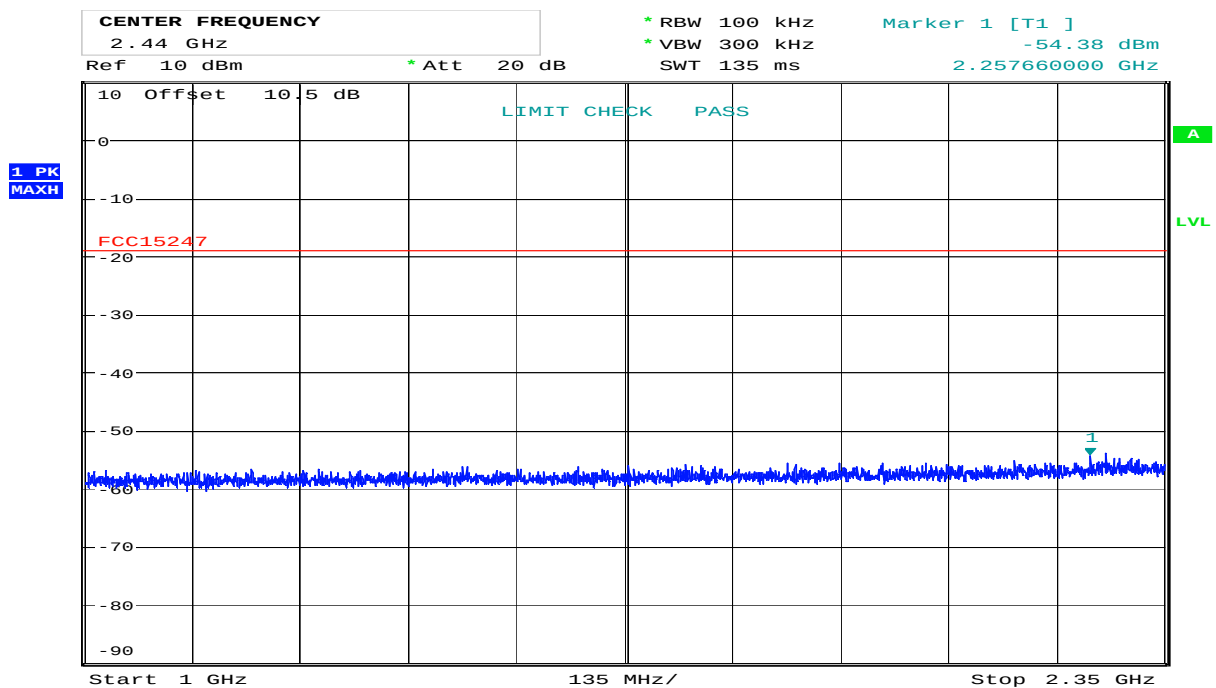
Detector type shall be the same as used for measuring Output Power.

Attenuation below the general limits specified in part 15.209(a) is not required.



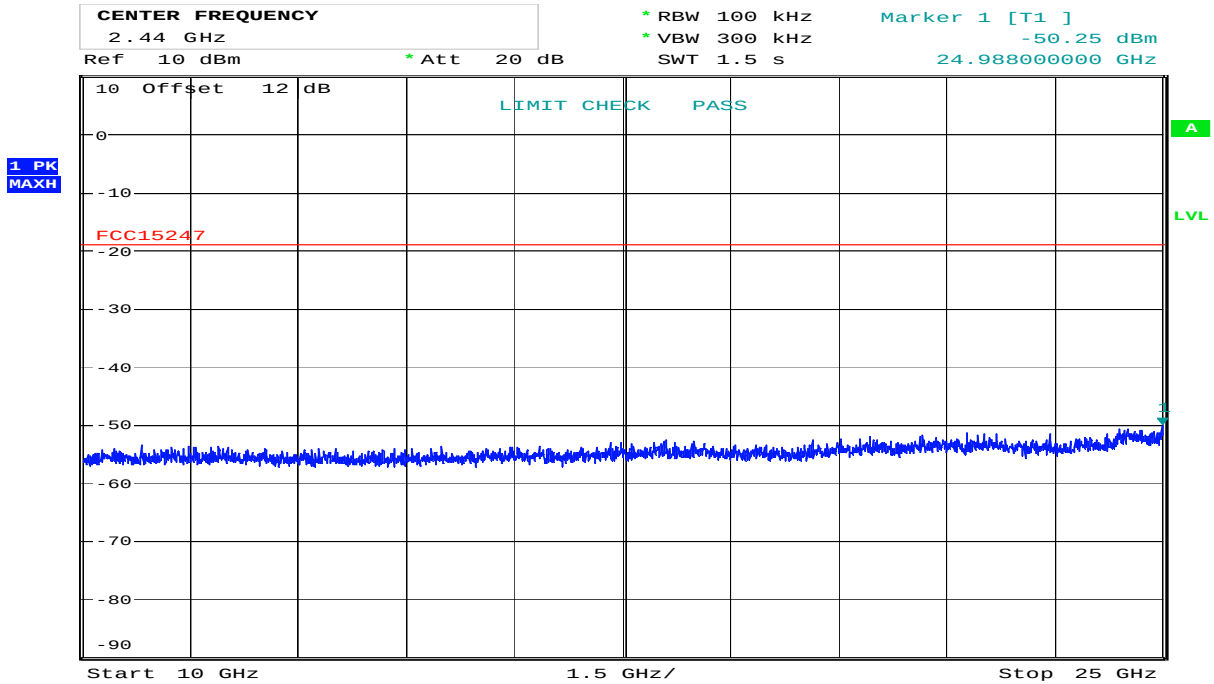
Date: 3.FEB.2020 10:37:23

Conducted Emissions 10 MHz – 1000 GHz, 2437 MHz, 802.11b, 11Mbps



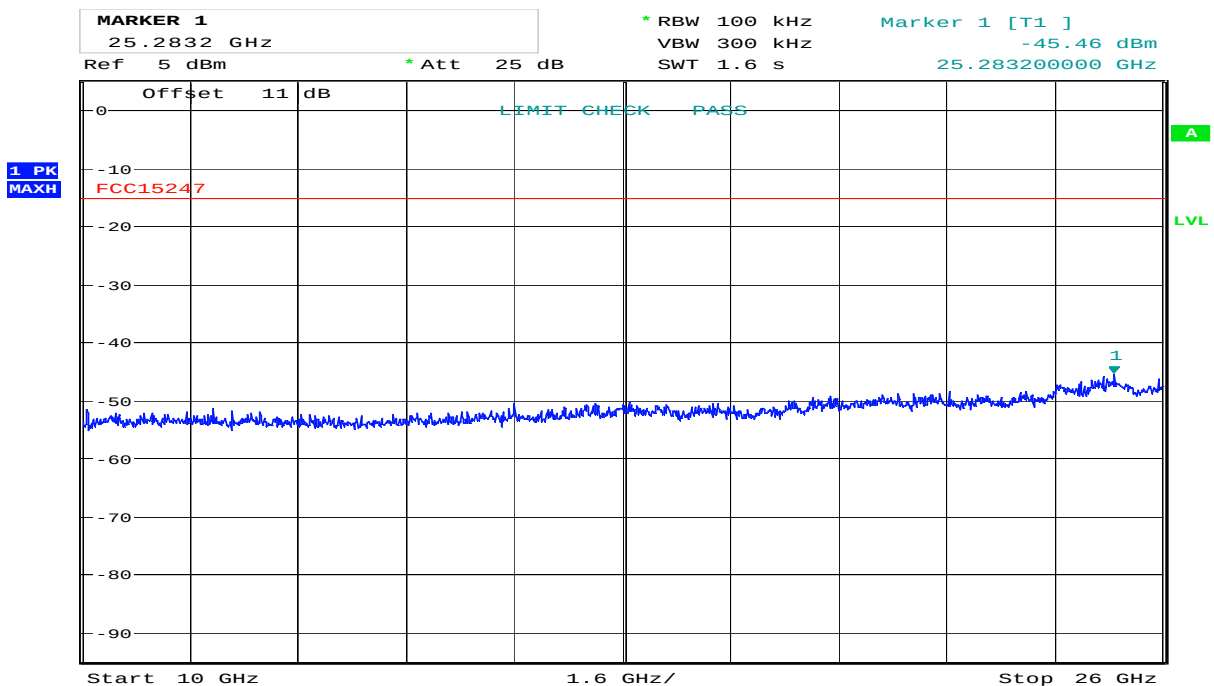
Date: 5.FEB.2020 13:34:51

Conducted Emissions 1000 MHz – 2350 GHz, 2437 MHz, 802.11b, 11Mbps



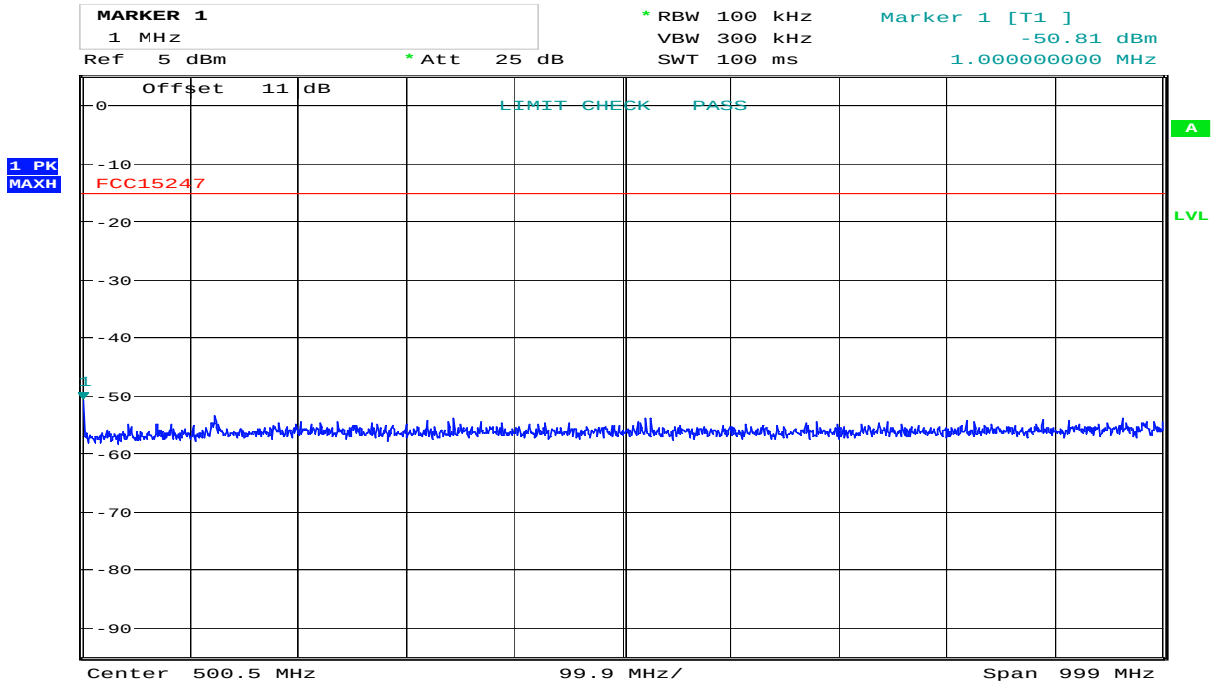
Date: 5.FEB.2020 13:37:13

Conducted Emissions 2550 MHz – 10000 GHz, 2437 MHz, 802.11b, 11Mbps



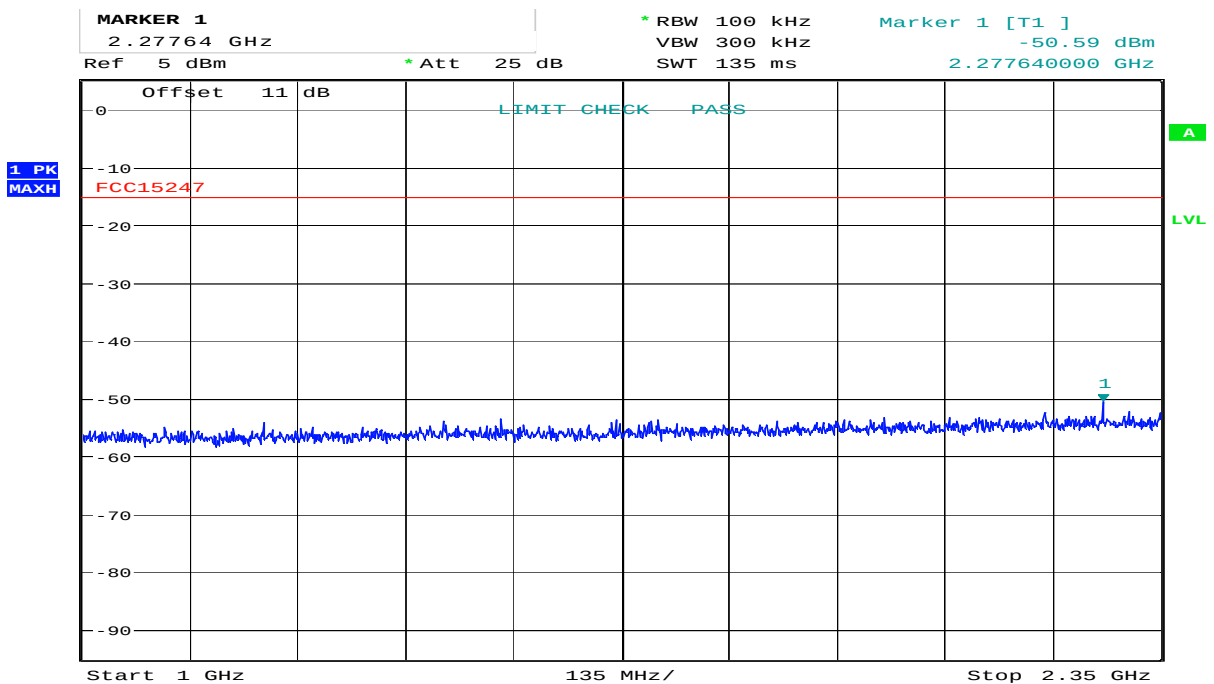
Date: 3.FEB.2020 10:48:16

Conducted Emissions 10000 MHz – 26000 GHz, 2437 MHz, 802.11b, 11Mbps



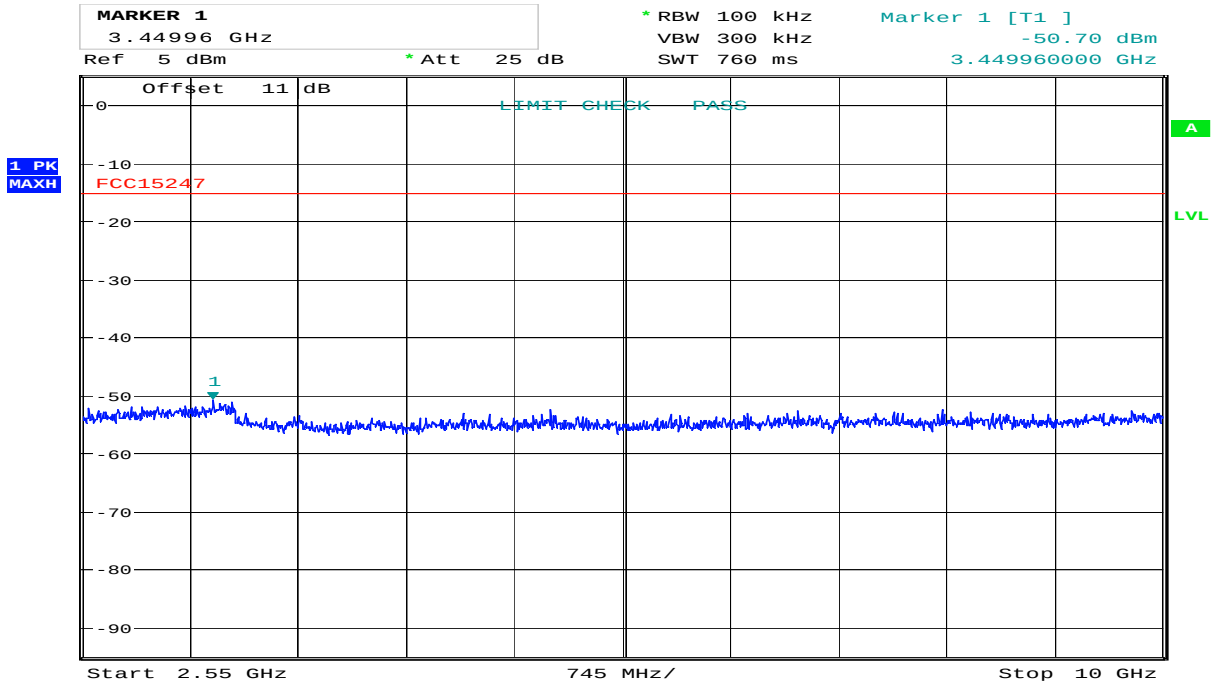
Date: 3.FEB.2020 11:00:45

Conducted Emissions 1 MHz – 1000 GHz, 2437 MHz, 802.11g, 54Mbps



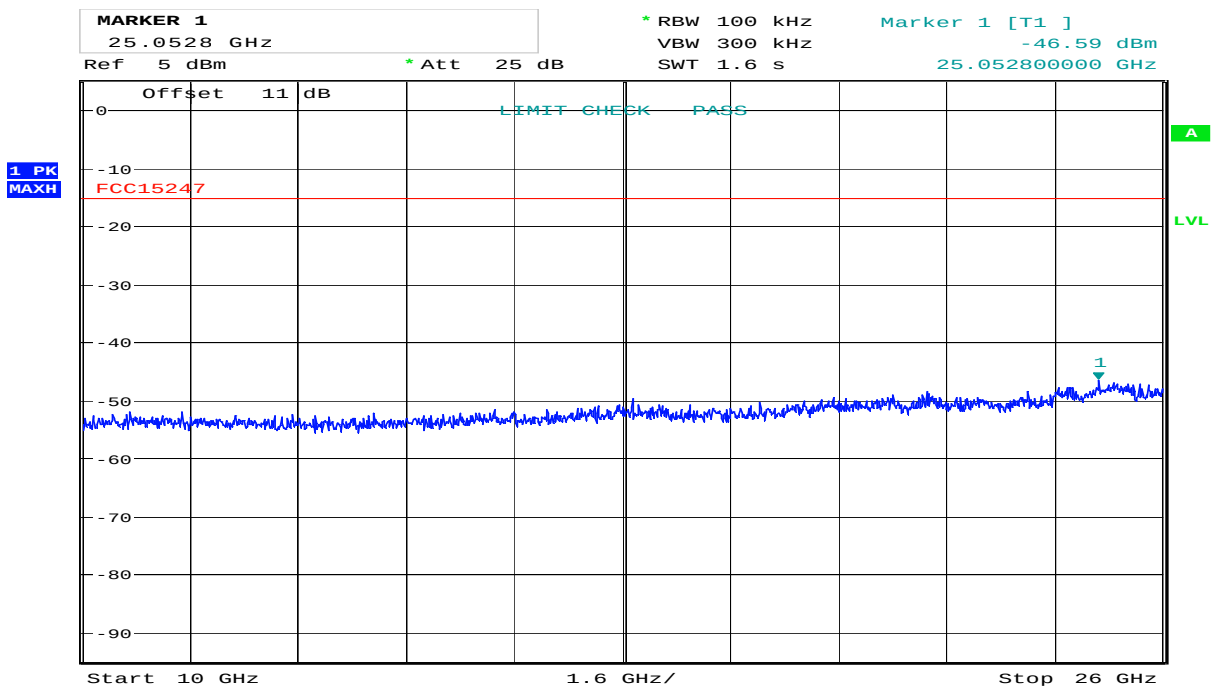
Date: 3.FEB.2020 11:05:00

Conducted Emissions 1000 MHz – 2350 GHz, 2437 MHz, 802.11g, 54Mbps



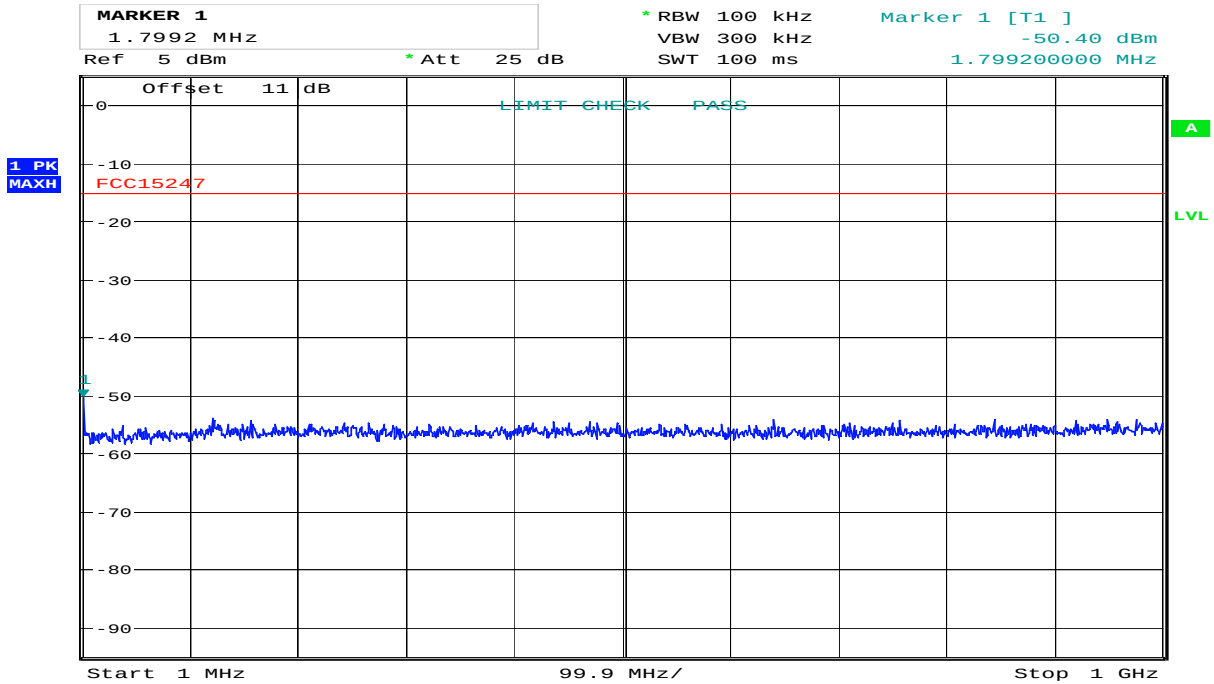
Date: 3.FEB.2020 11:07:45

Conducted Emissions 2550 MHz – 10000 GHz, 2437 MHz, 802.11g, 54Mbps



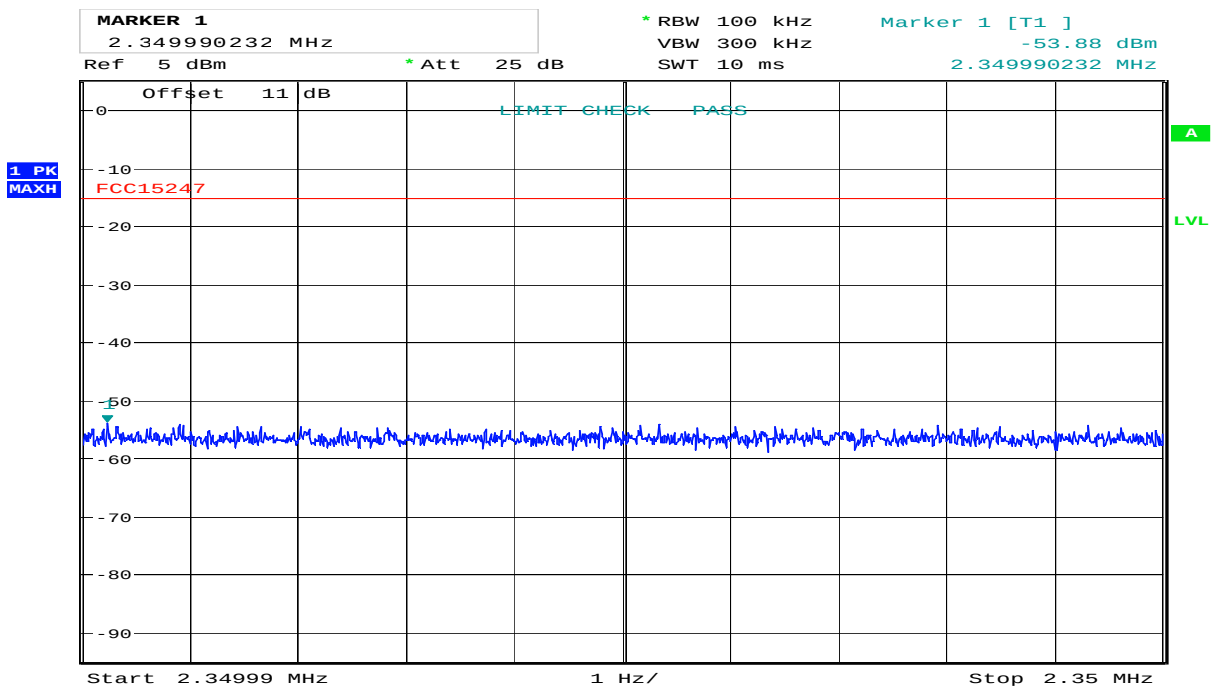
Date: 3.FEB.2020 11:10:18

Conducted Emissions 10000 MHz – 26000 GHz, 2437 MHz, 802.11g, 54Mbps



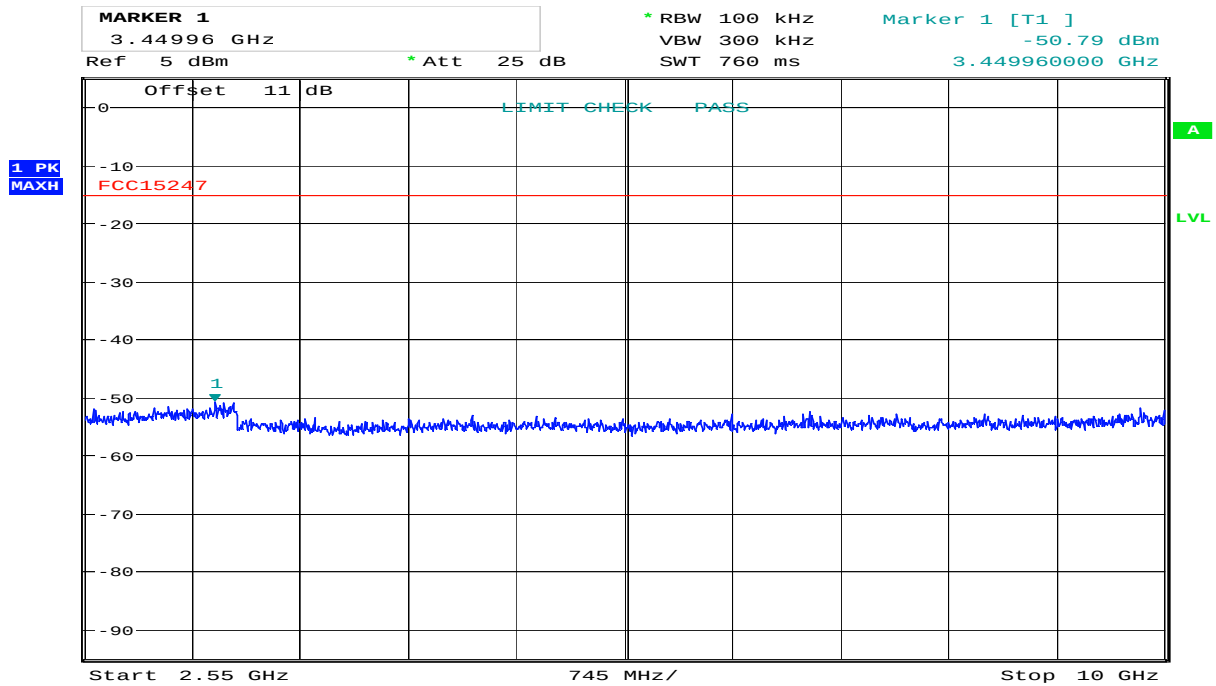
Date: 3.FEB.2020 11:43:24

Conducted Emissions 1 MHz – 1000 GHz, 2437 MHz, 802.11n, MCS7



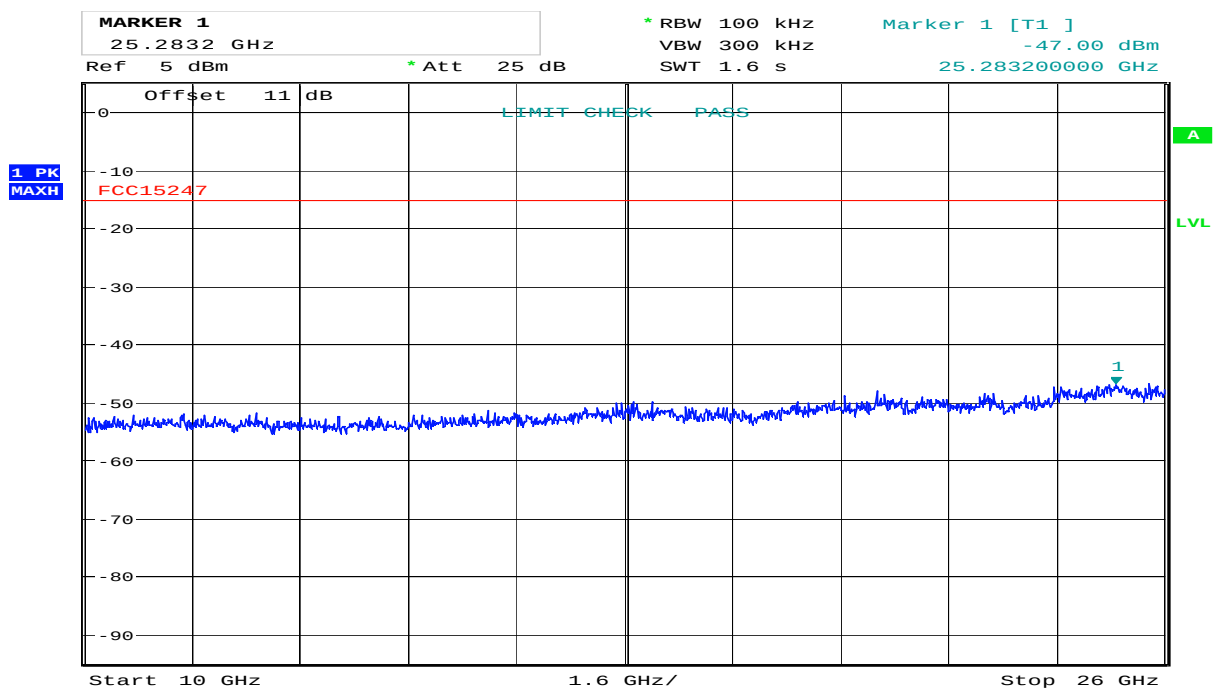
Date: 3.FEB.2020 11:42:31

Conducted Emissions 1000 MHz – 2350 GHz, 2437 MHz, 802.11n, MCS7



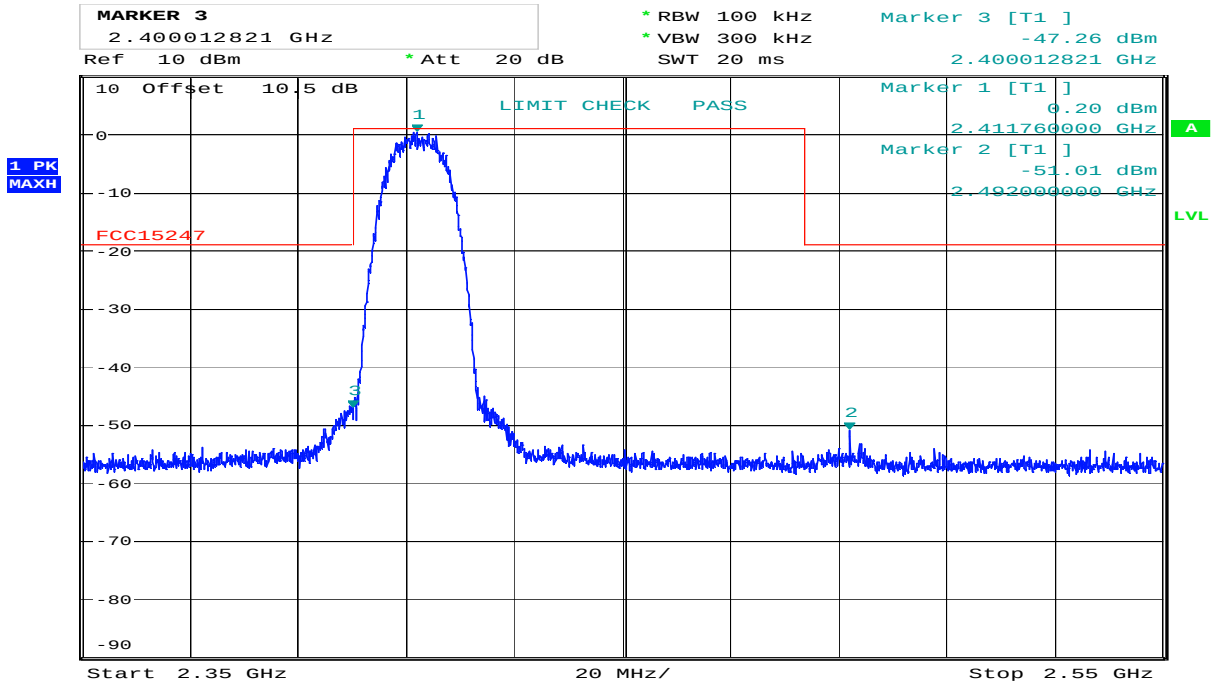
Date: 3.FEB.2020 11:41:48

Conducted Emissions 2550 MHz – 10000 GHz, 2437 MHz, 802.11n, MCS7



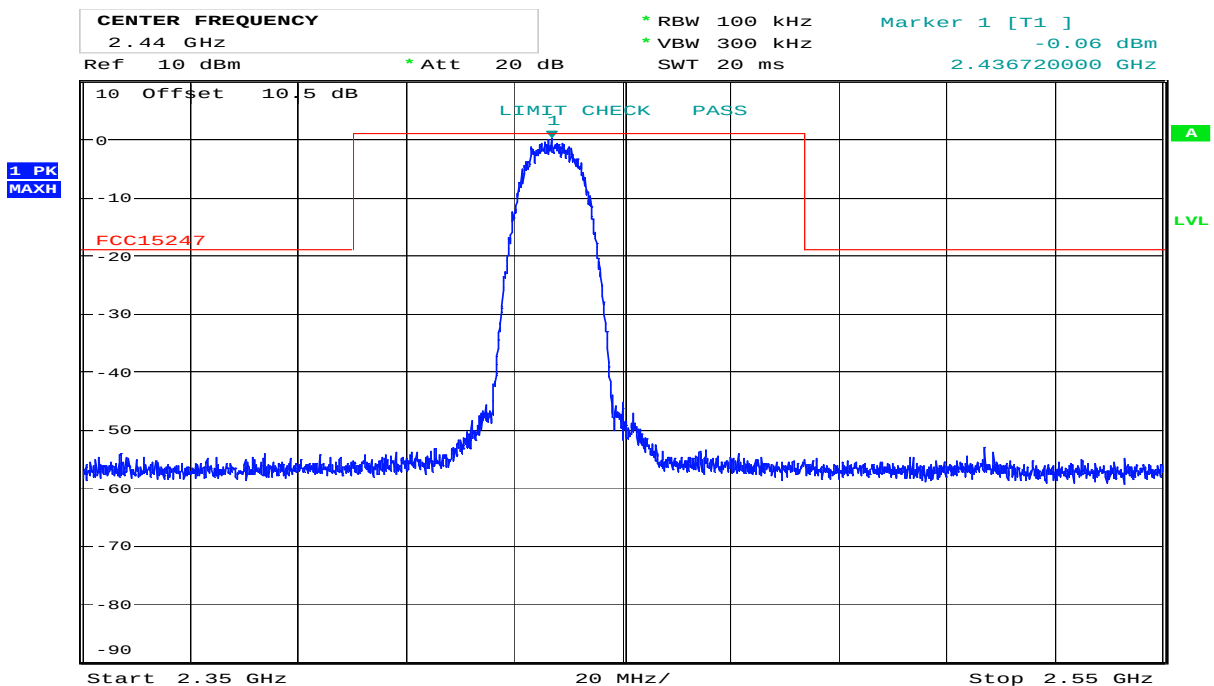
Date: 3.FEB.2020 11:40:54

Conducted Emissions 10000 MHz – 26000 GHz, 2437 MHz, 802.11n, MCS7



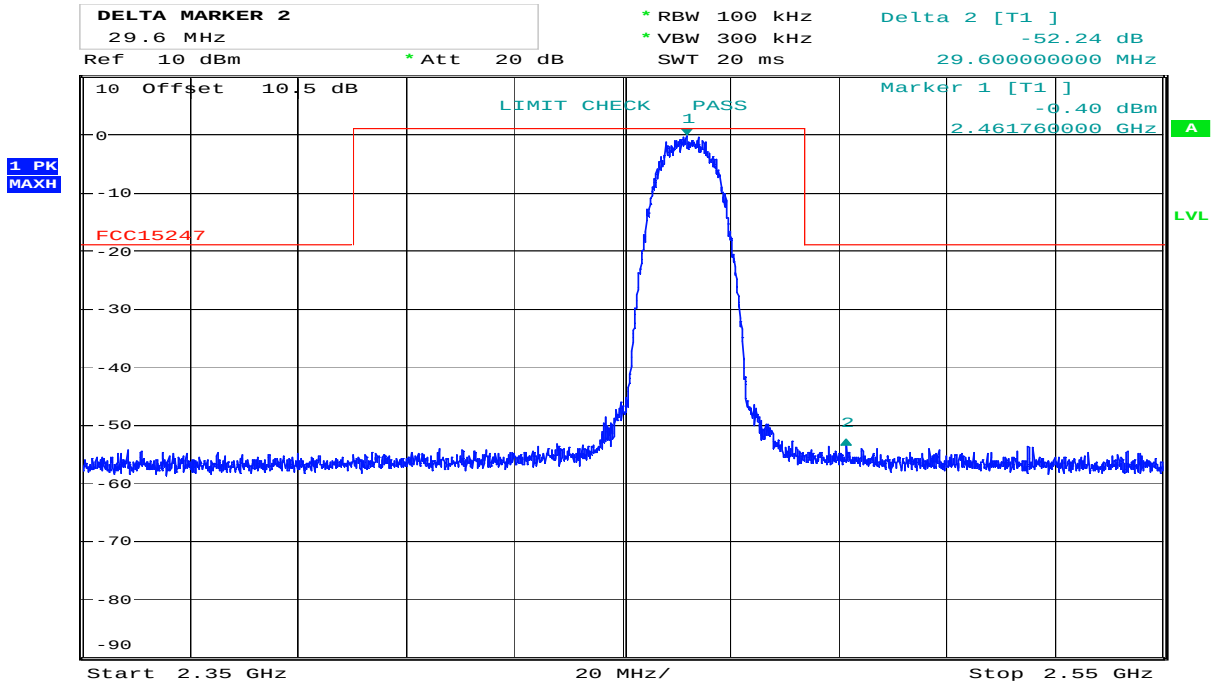
Date: 5.FEB.2020 13:30:35

Conducted Emissions 2350 MHz – 2550 GHz, 2412 MHz, 802.11b, 11Mbps



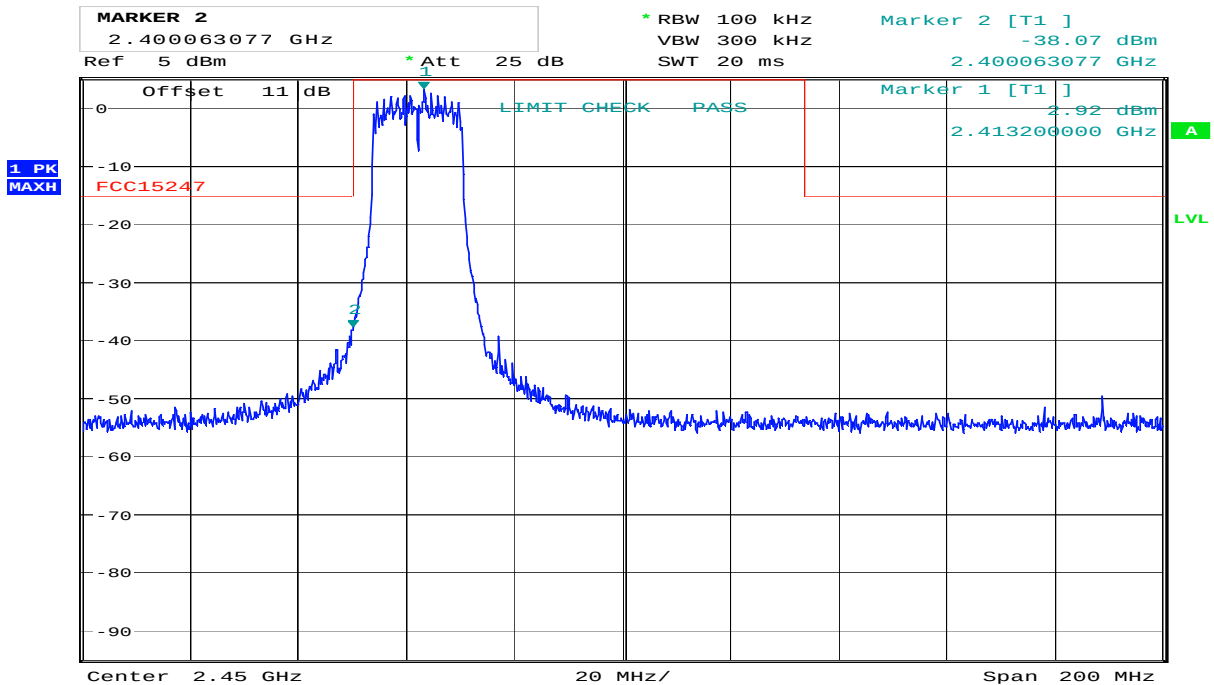
Date: 5.FEB.2020 13:35:58

Conducted Emissions 2350 MHz – 2550 GHz, 2437 MHz, 802.11b, 11Mbps



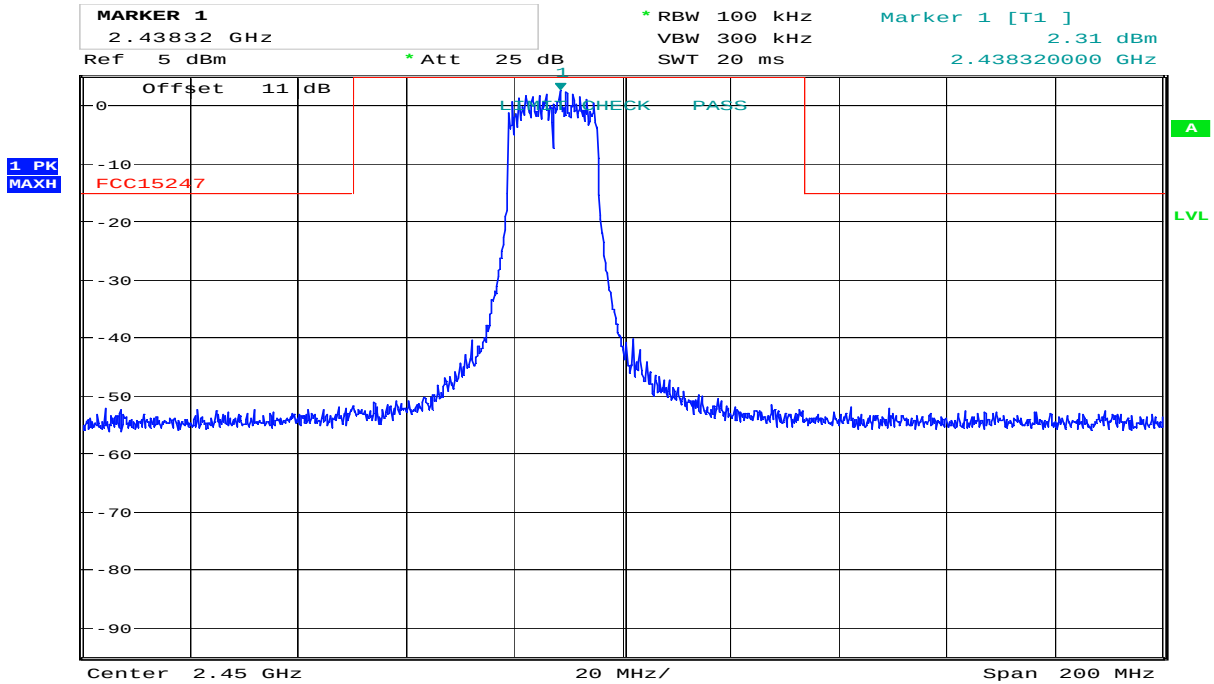
Date: 5.FEB.2020 13:41:27

Conducted Emissions 2350 MHz – 2550 GHz, 2462 MHz, 802.11b, 11Mbps



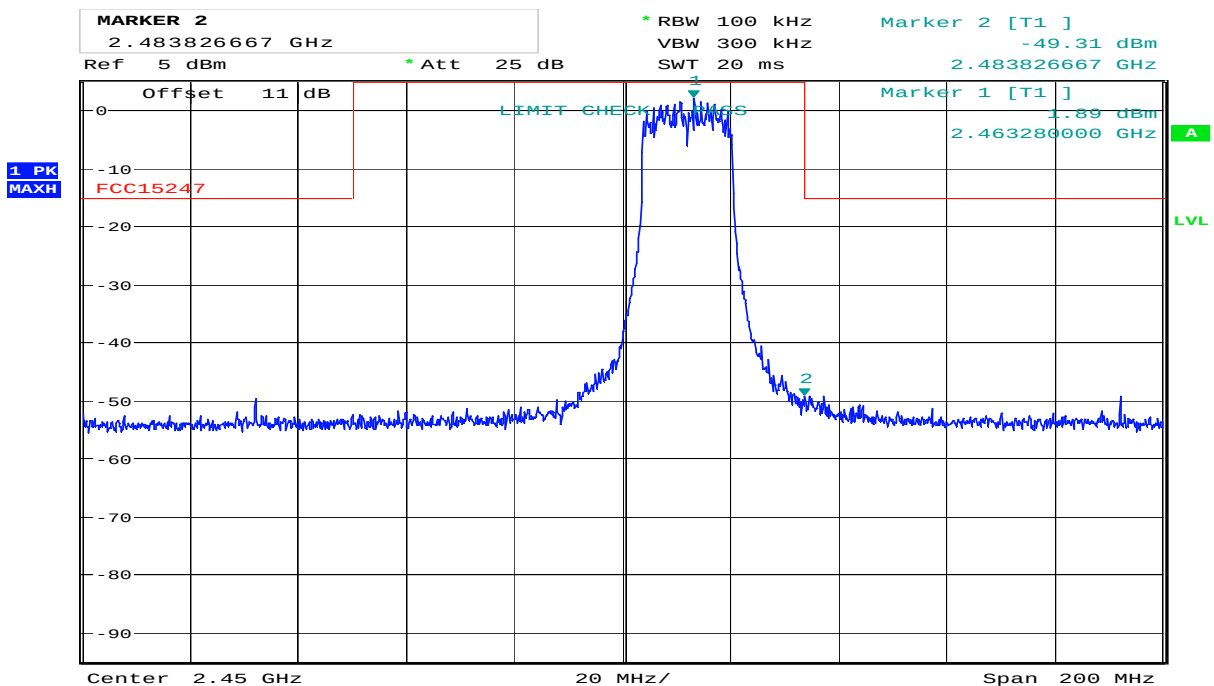
Date: 3.FEB.2020 10:31:57

Conducted Emissions 2350 MHz – 2550 GHz, 2412 MHz, 802.11g, 54Mbps



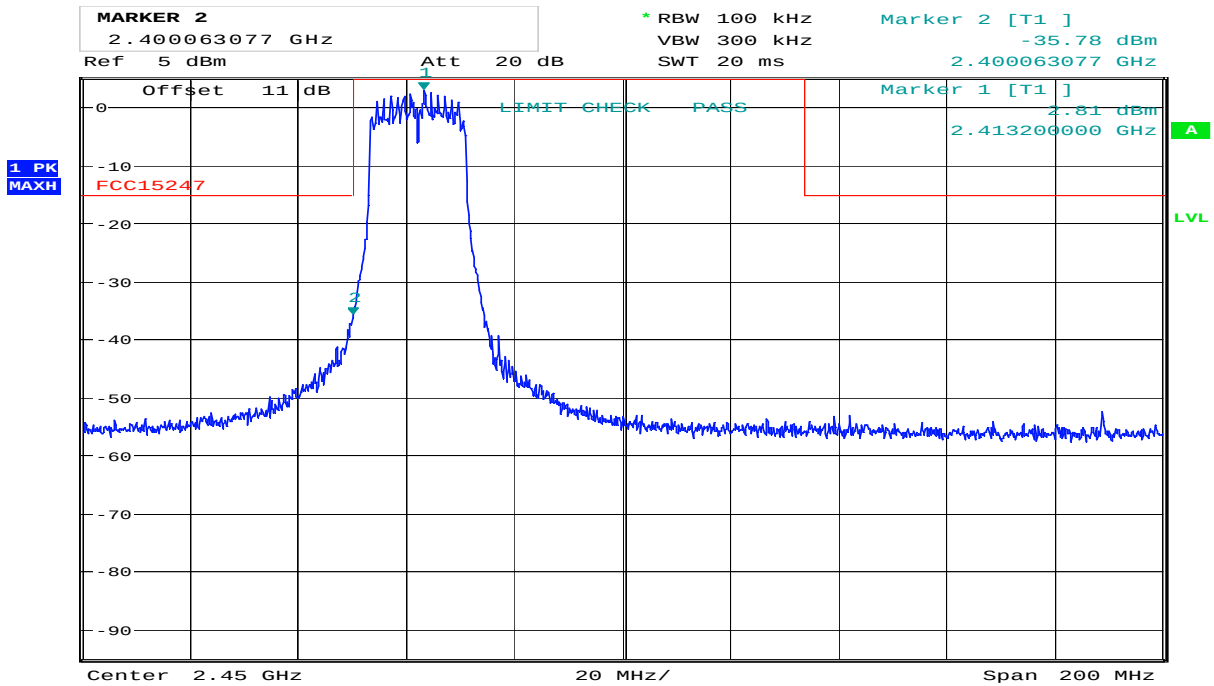
Date: 3.FEB.2020 10:35:54

Conducted Emissions 2350 MHz – 2550 GHz, 2437 MHz, 802.11g, 54Mbps



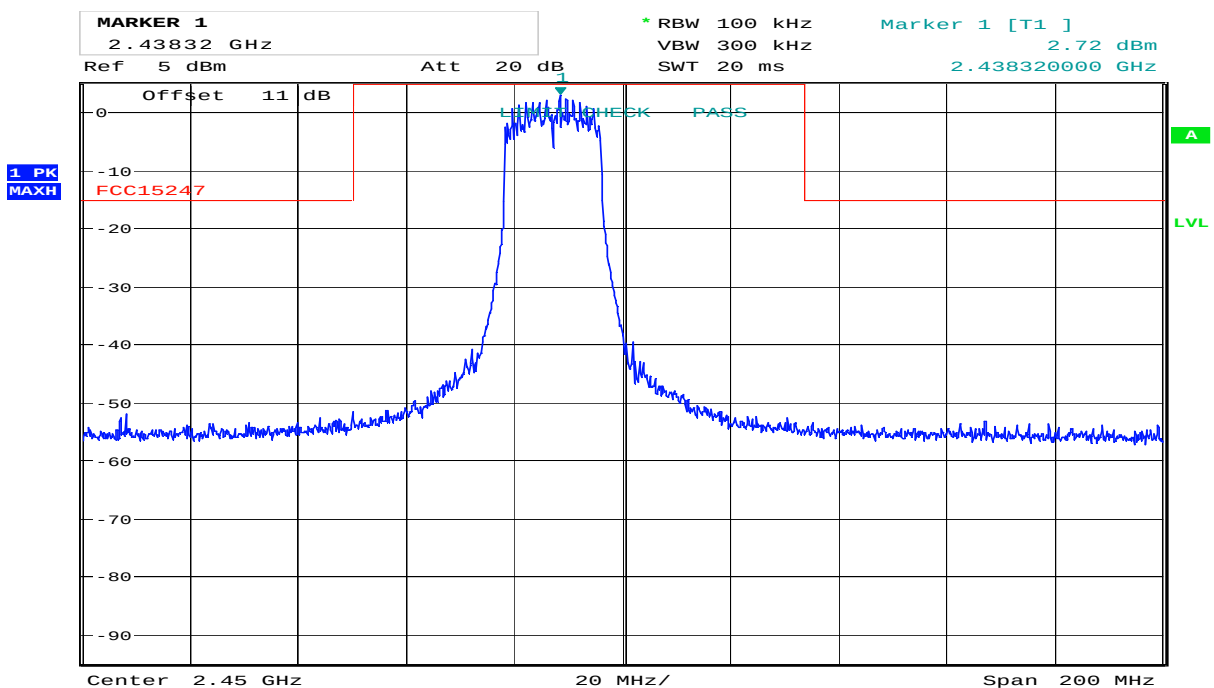
Date: 3.FEB.2020 10:34:41

Conducted Emissions 2350 MHz – 2550 GHz, 2462 MHz, 802.11g, 54Mbps



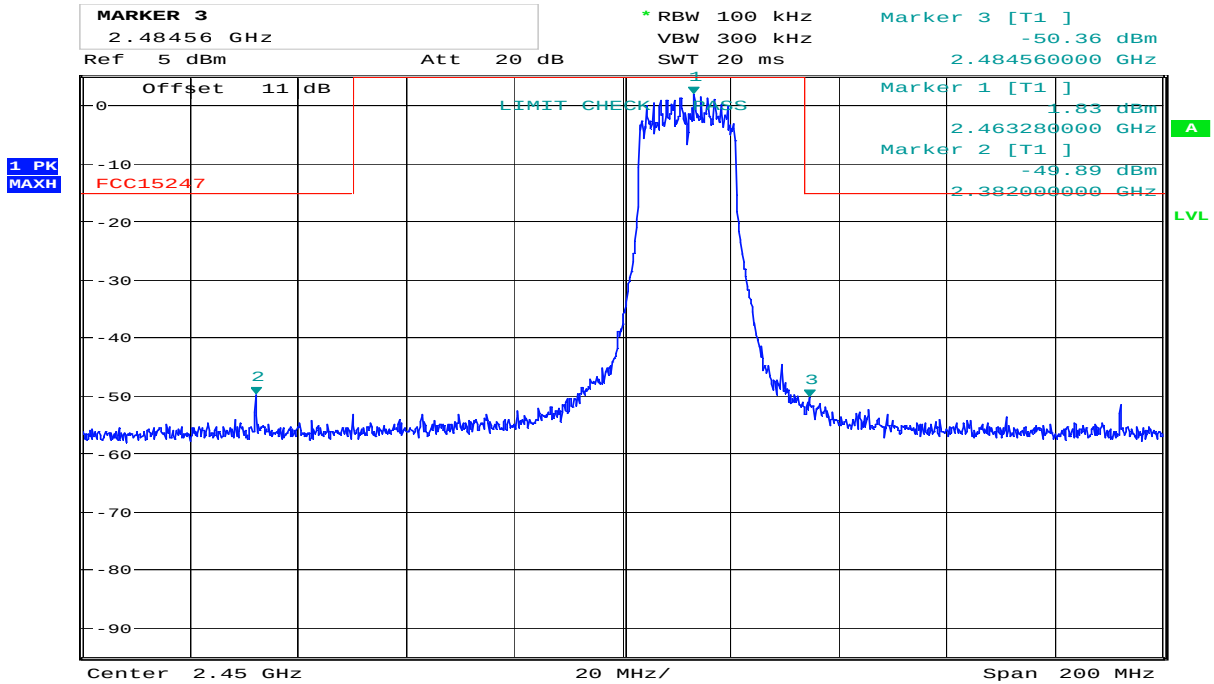
Date: 3.FEB.2020 10:30:44

Conducted Emissions 2350 MHz – 2550 GHz, 2412 MHz, 802.11n, MCS7



Date: 3.FEB.2020 10:28:13

Conducted Emissions 2350 MHz – 2550 GHz, 2437 MHz, 802.11n, MCS7



Date: 3.FEB.2020 10:24:13

Conducted Emissions 2350 MHz – 2550 GHz, 2462 MHz, 802.11n, MCS7

3.6 Restricted Bands of operation

Restricted Bands of operation for FCC and ISSED are defined in FCC Part 15.205 and ISSED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISSED (MHz)	FCC (GHz)	ISSED (GHz)
0.090-0.110		0.96-1.24 1.3-1.427	0.96-1.427
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		2.69-2.9	2.655-2.9
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		3.6-4.4	3.5-4.4
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 123-138	108-138	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISSED, all other frequencies are common.

3.7 Radiated Emissions, Band Edge

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3 / 8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Peak Detector:

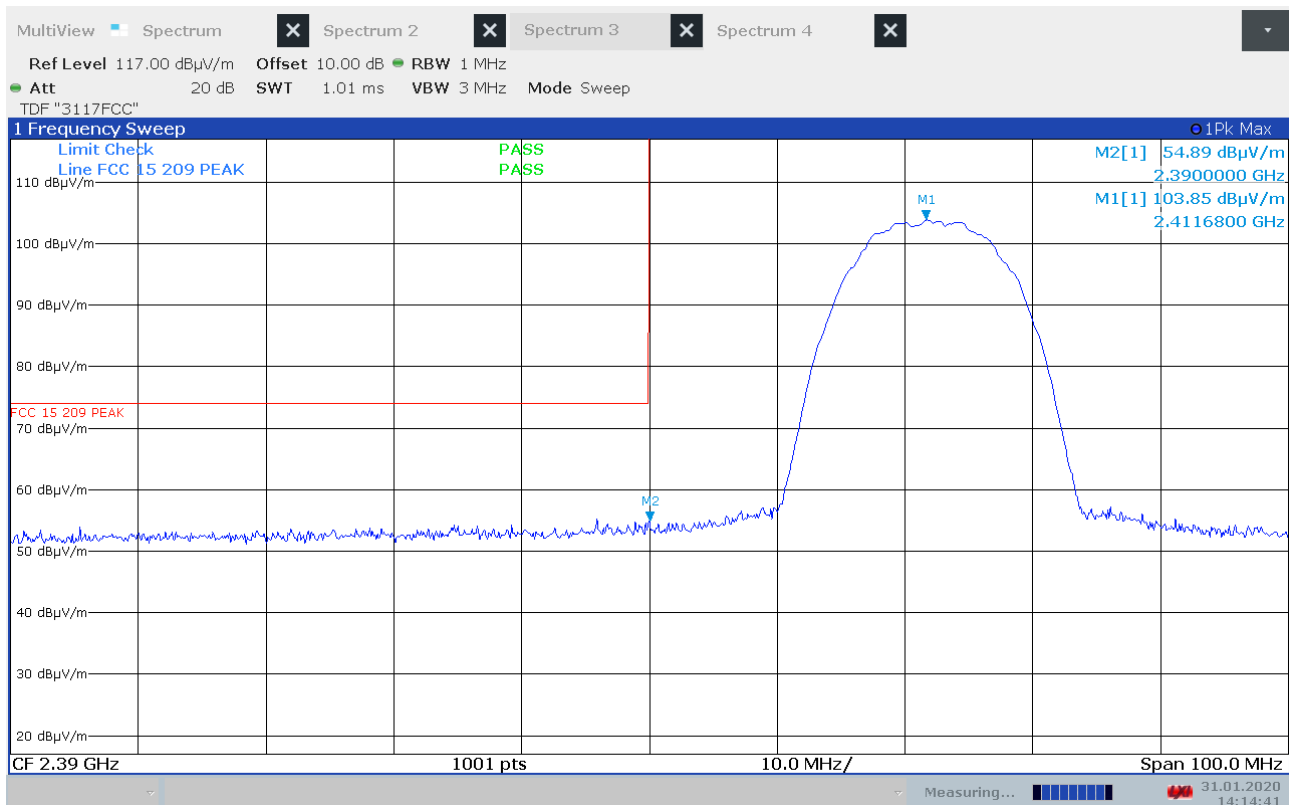
Modulation and Bitrate	Measured field strength (dB μ V/m)		Limit	Margin	
	2390 MHz	2483.5 MHz		dB	
802.11b, 11 Mbps	54.9	54.2	74	19.1	19.8
802.11g, 54 Mbps	60.3	57.1	74	13.7	16.9
802.11n, MCS0	63.6	59.7	74	10.4	14.3

Average Detector:

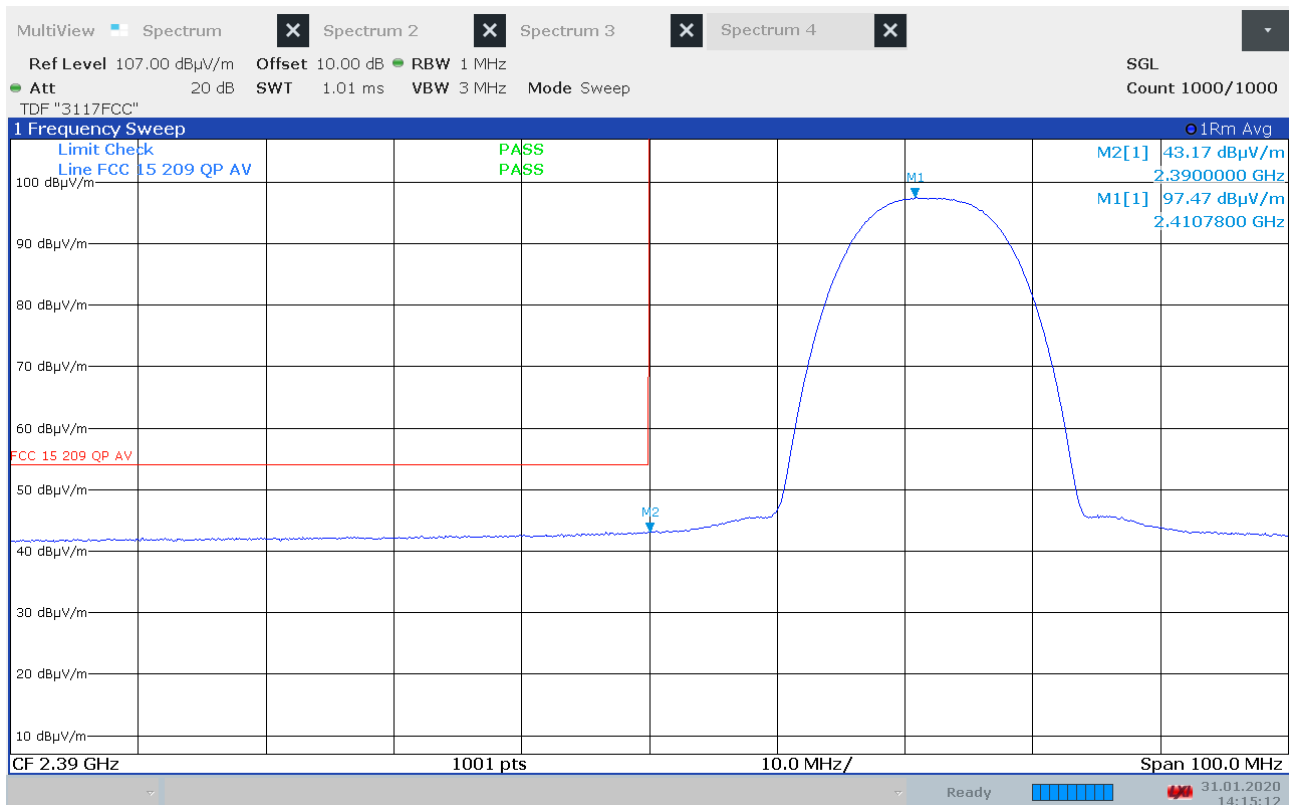
Modulation and Bitrate	Measured field strength (dB μ V/m)		Limit	Margin	
	2390 MHz	2483.5 MHz		dB	
802.11b, 11 Mbps	43.2	43.1	54	10.8	10.9
802.11g, 54 Mbps	46.8	44.5	54	7.2	9.5
802.11n, MCS0	47.0	45.2	54	7.0	8.8

Average values were measured using trace averaging as described in ANSI C63.10-2013 clause 11.12.2.5.1 (Duty Cycle $\approx$ 100%).

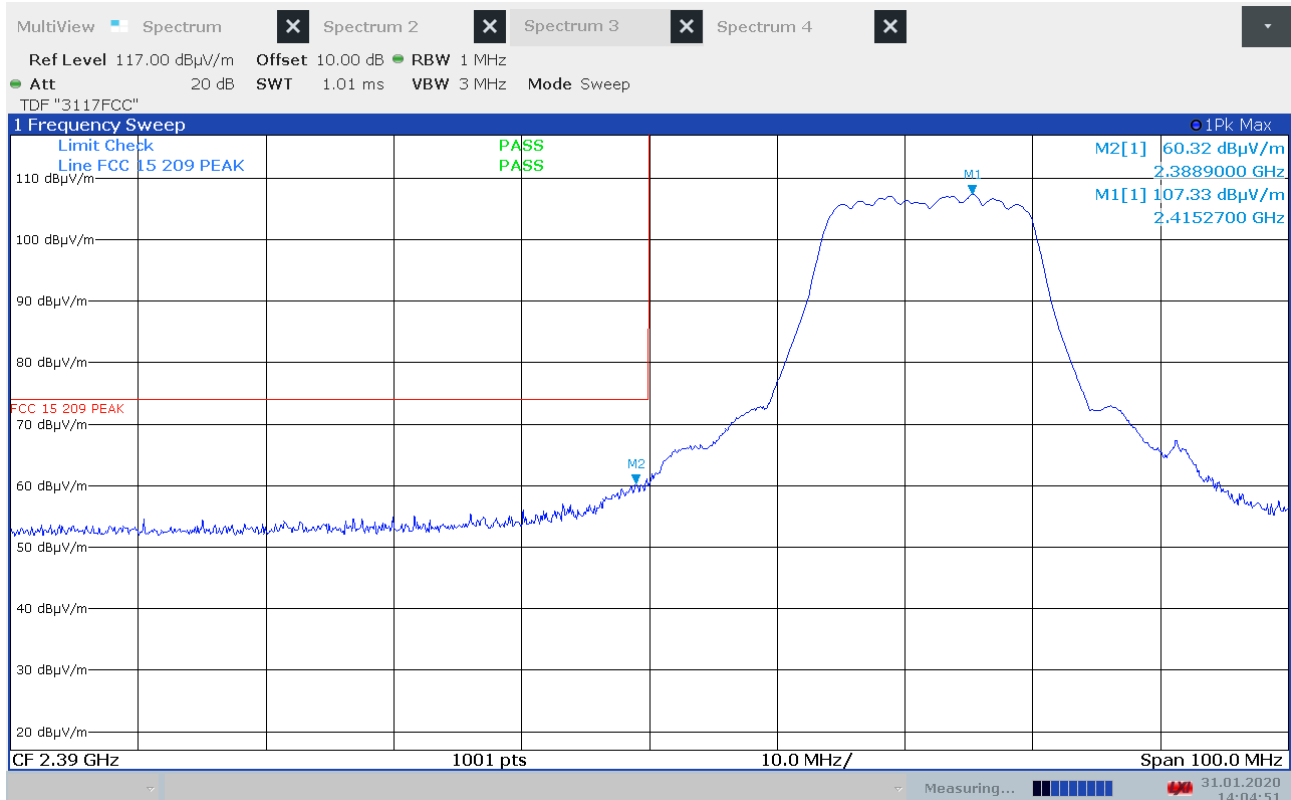
See attached plots.



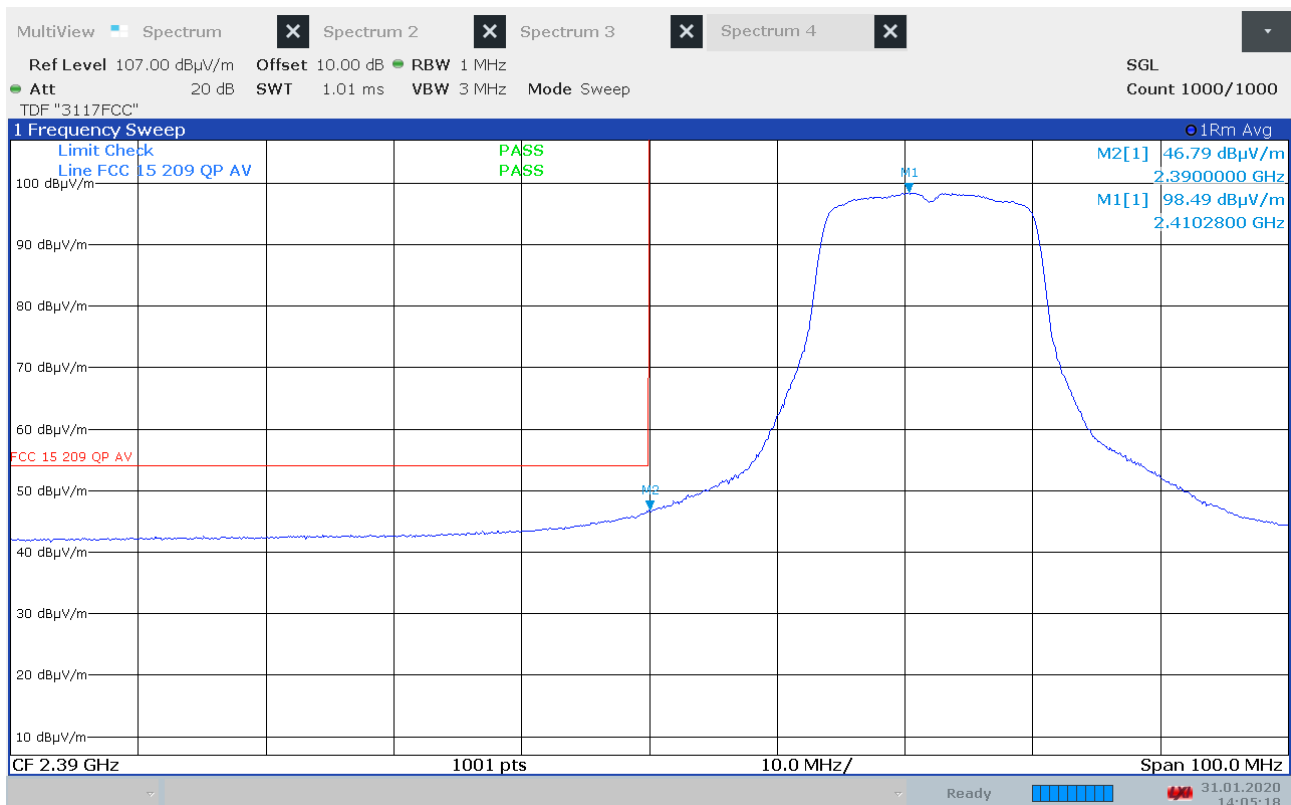
Band Edge, Lower, Peak, 2412 MHz, 802.11b, 11Mbps



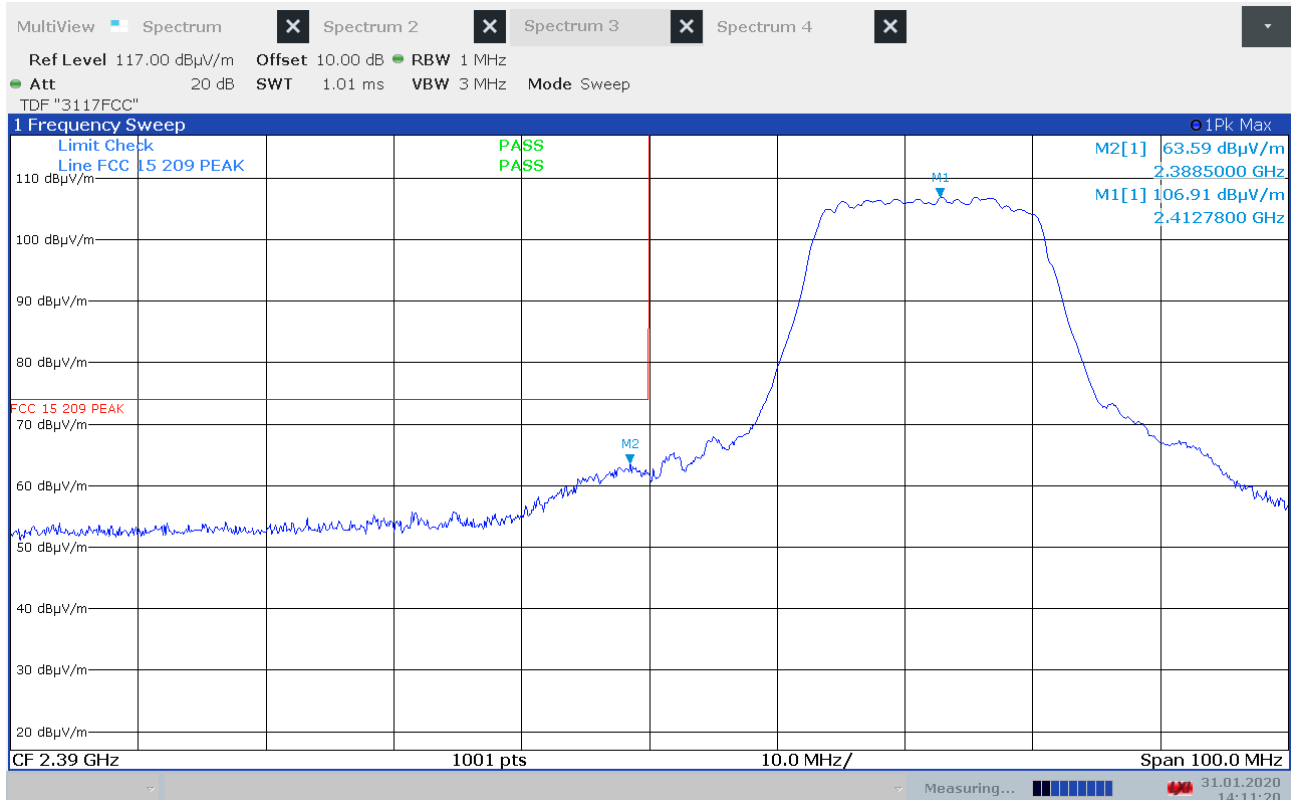
Band Edge, Lower, Average, 2412 MHz, 802.11b, 11Mbps



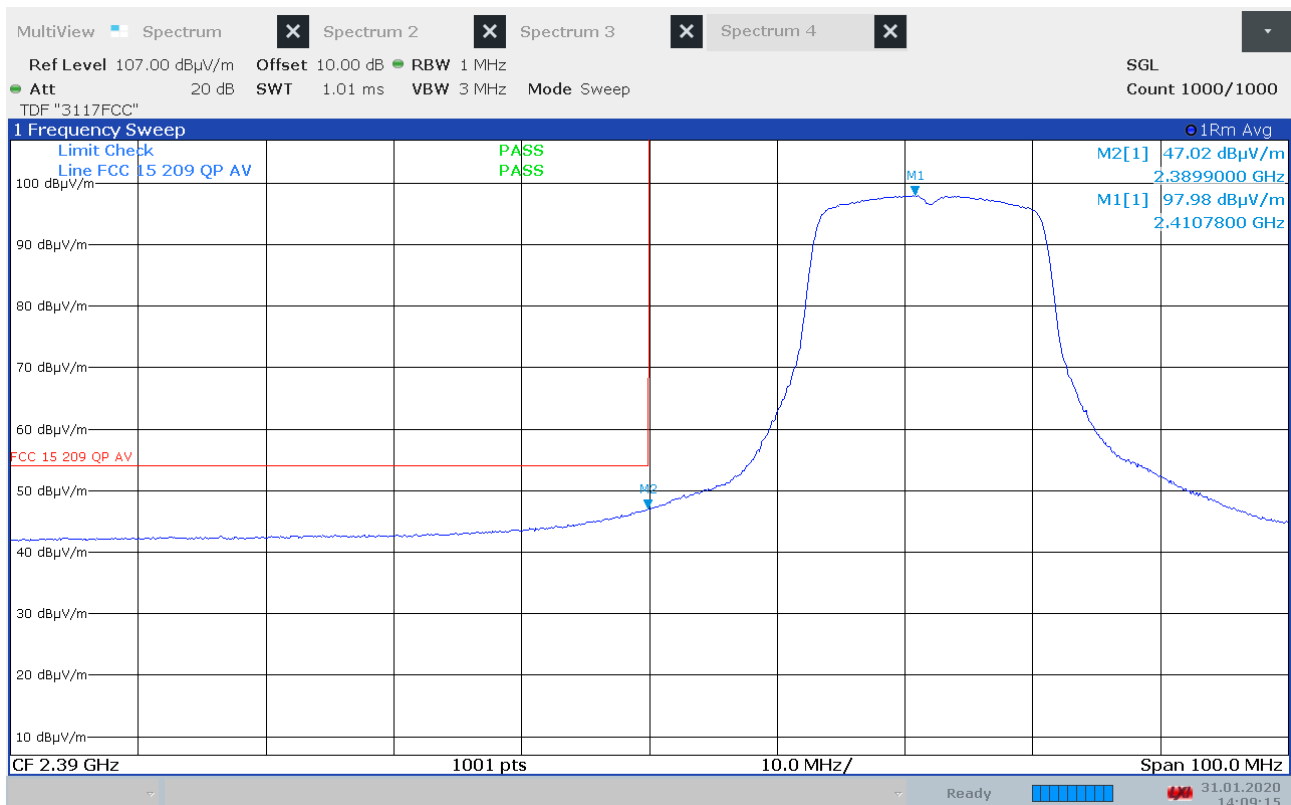
Band Edge, Lower, Peak, 2412 MHz, 802.11g, 54Mbps



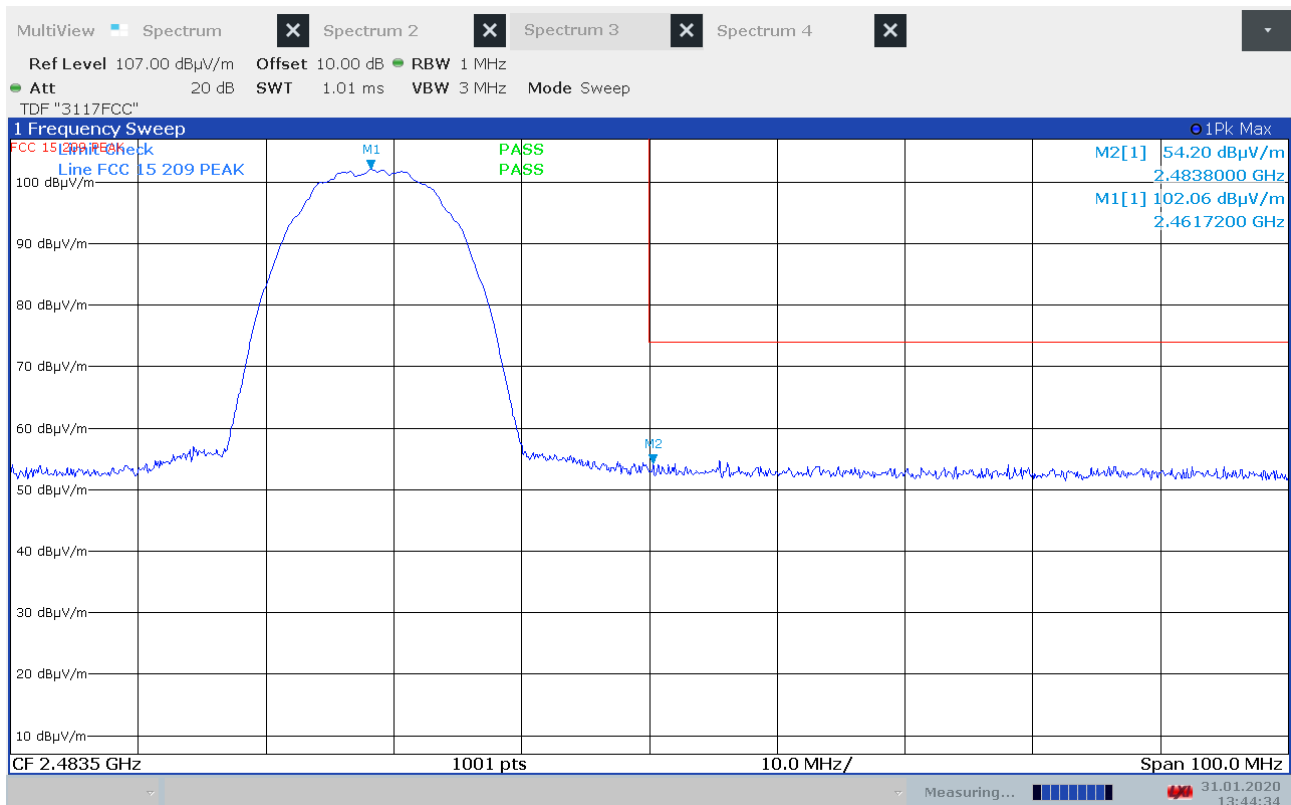
Band Edge, Lower, Average, 2412 MHz, 802.11g, 54Mbps



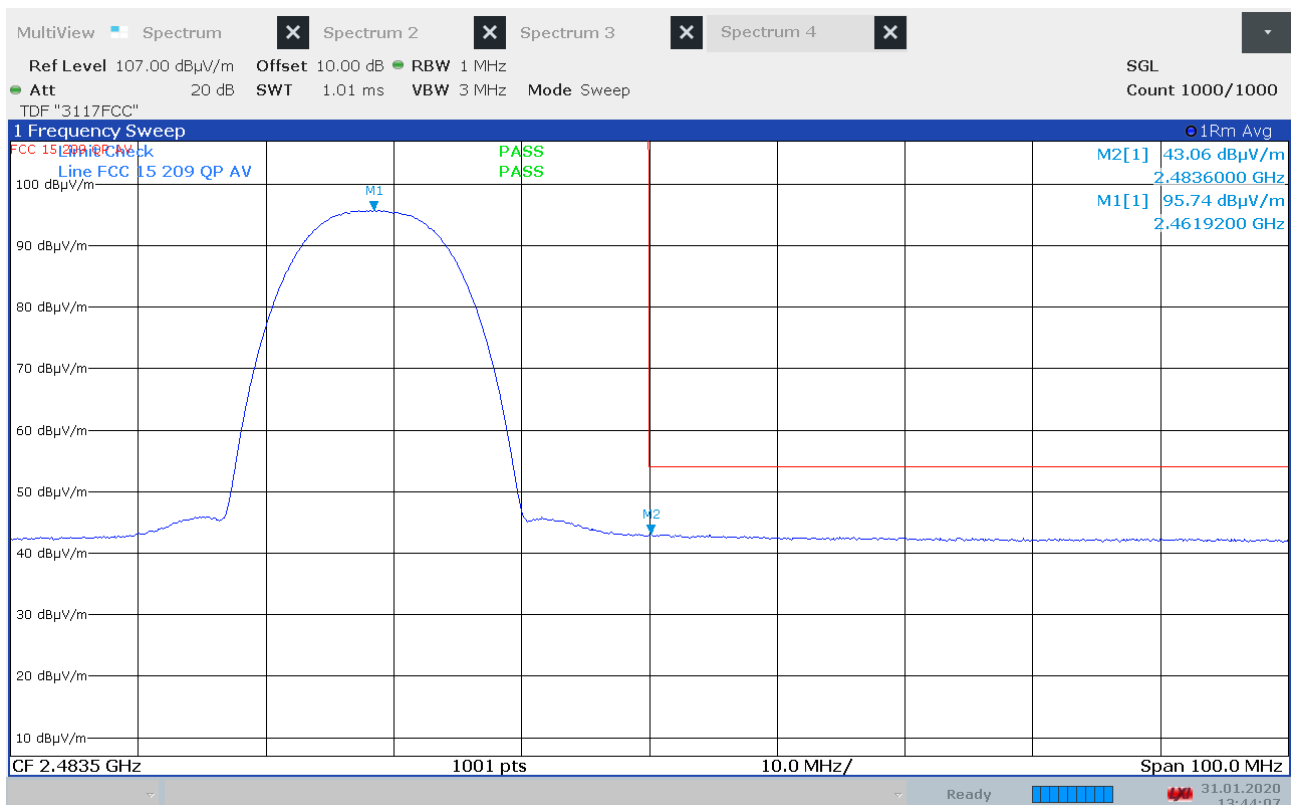
Band Edge, Lower, Peak, 2412 MHz, 802.11n, MCS7



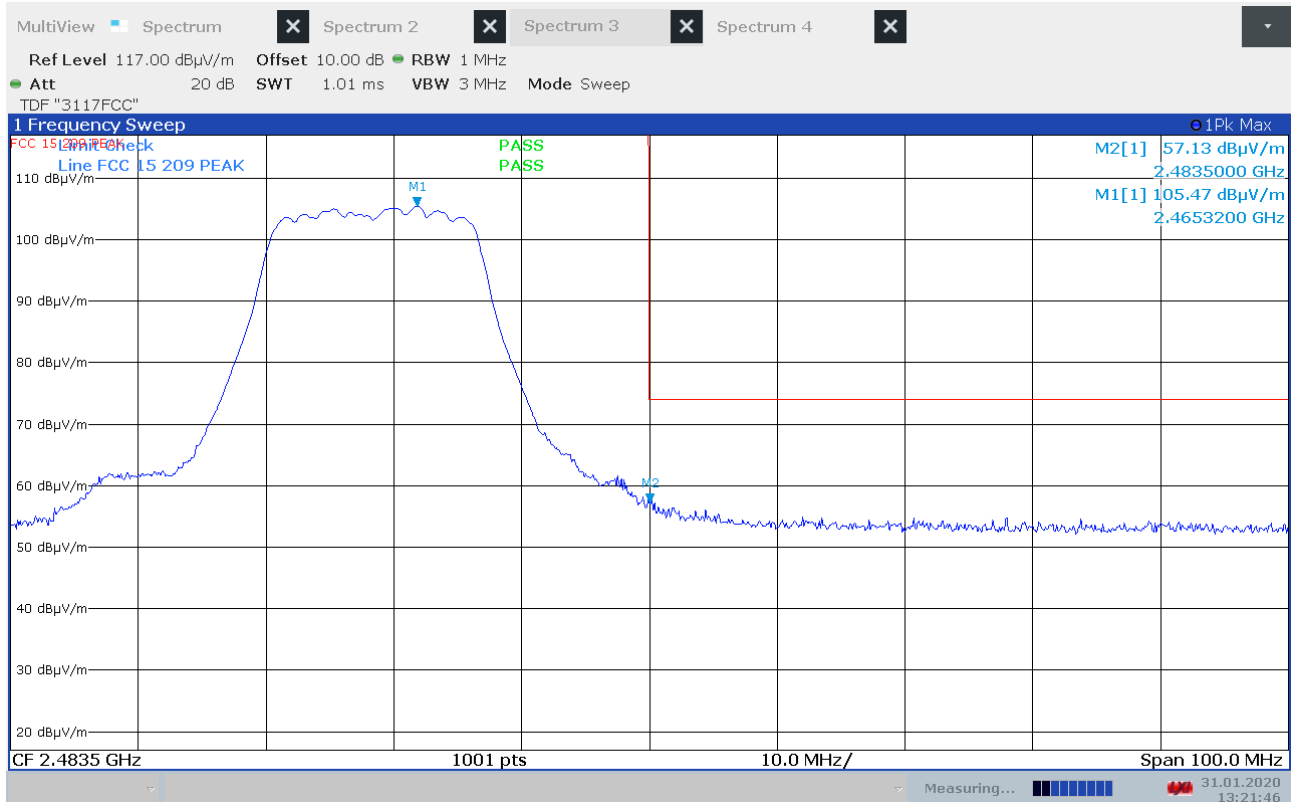
Band Edge, Lower, Average, 2412 MHz, 802.11n, MCS7



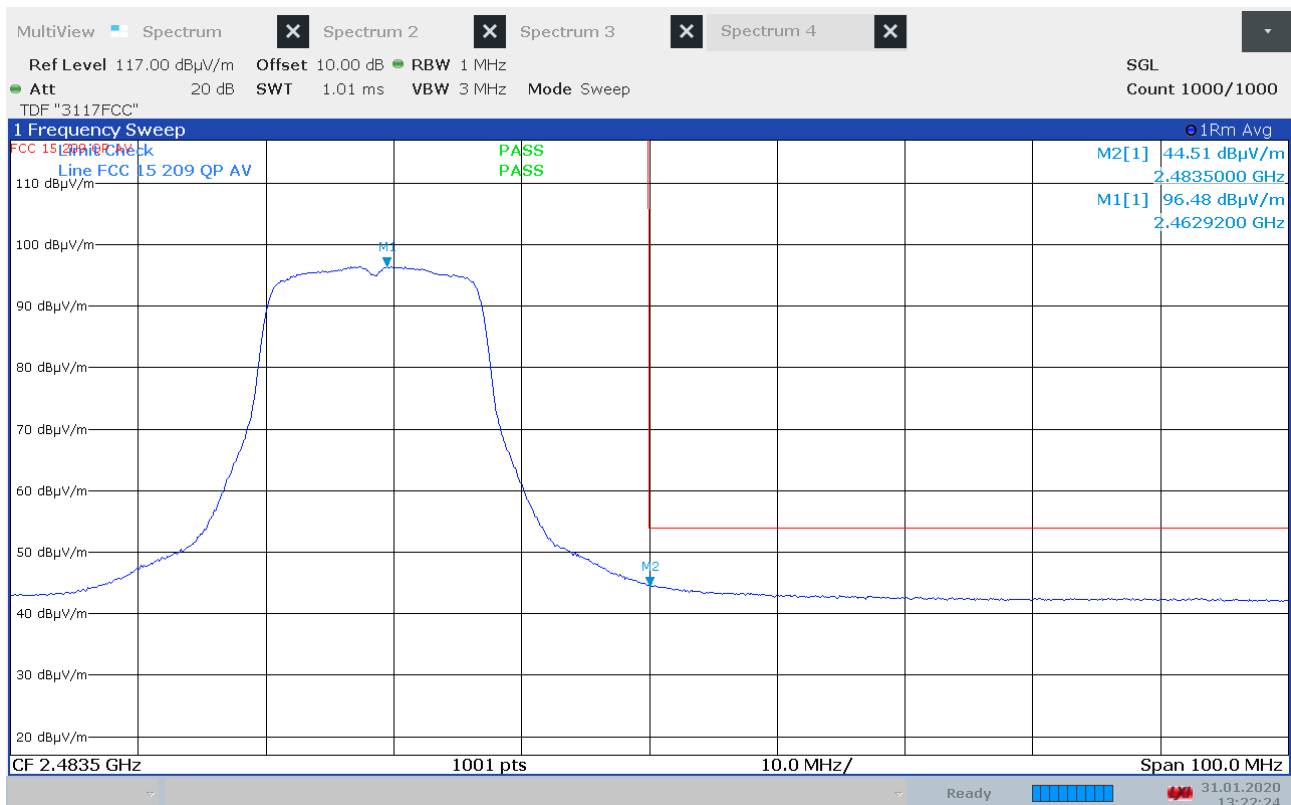
Band Edge, Upper, Peak, 2462 MHz, 802.11b, 11Mbps



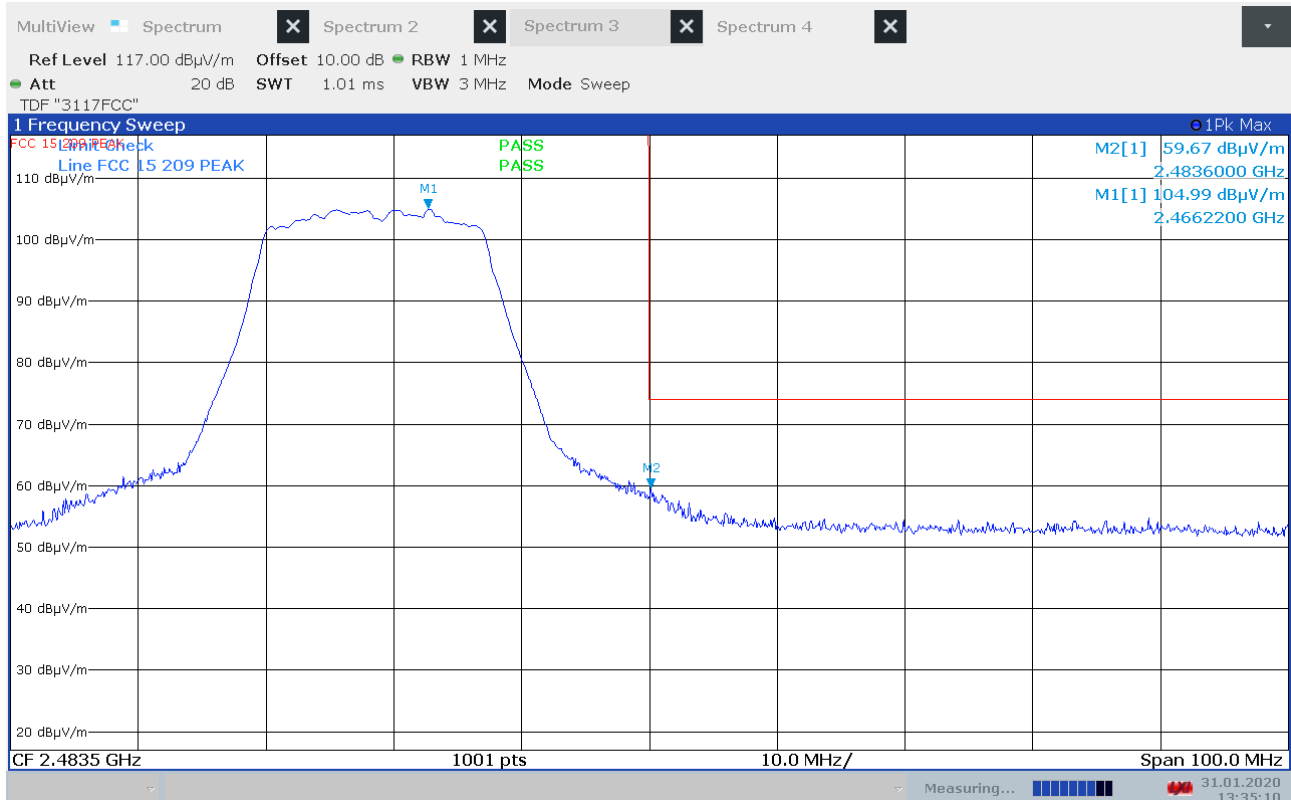
Band Edge, Upper, Average, 2462 MHz, 802.11b, 11Mbps



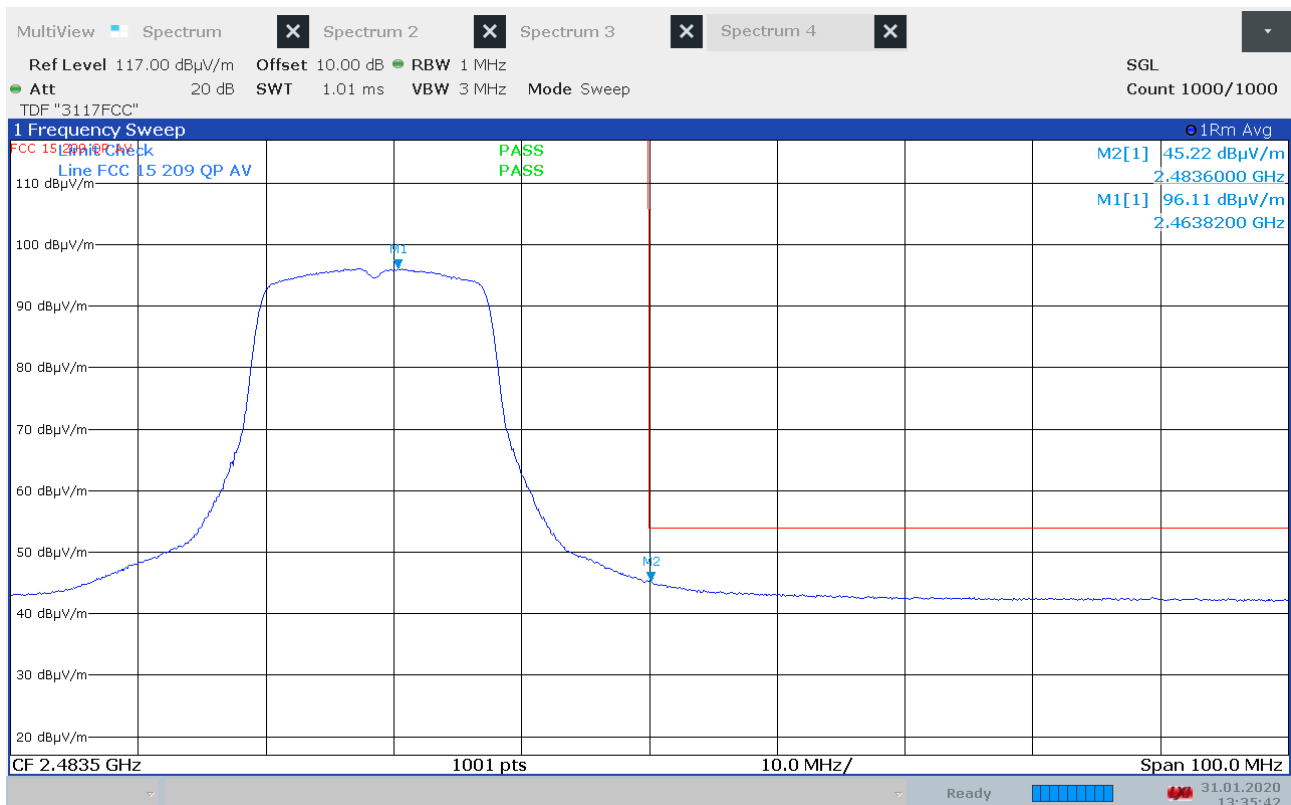
Band Edge, Upper, Peak, 2462 MHz, 802.11g, 54Mbps



Band Edge, Upper, Average, 2462 MHz, 802.11g, 54Mbps



Band Edge, Upper, Peak, 2462 MHz, 802.11n, MCS7



Band Edge, Upper, Average, 2462 MHz, 802.11n, MCS7

3.8 Radiated Emissions, 30 – 1000 MHz.

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Detector: Peak

Measuring distance 3 m

Tested with EUT transmitting on ch06

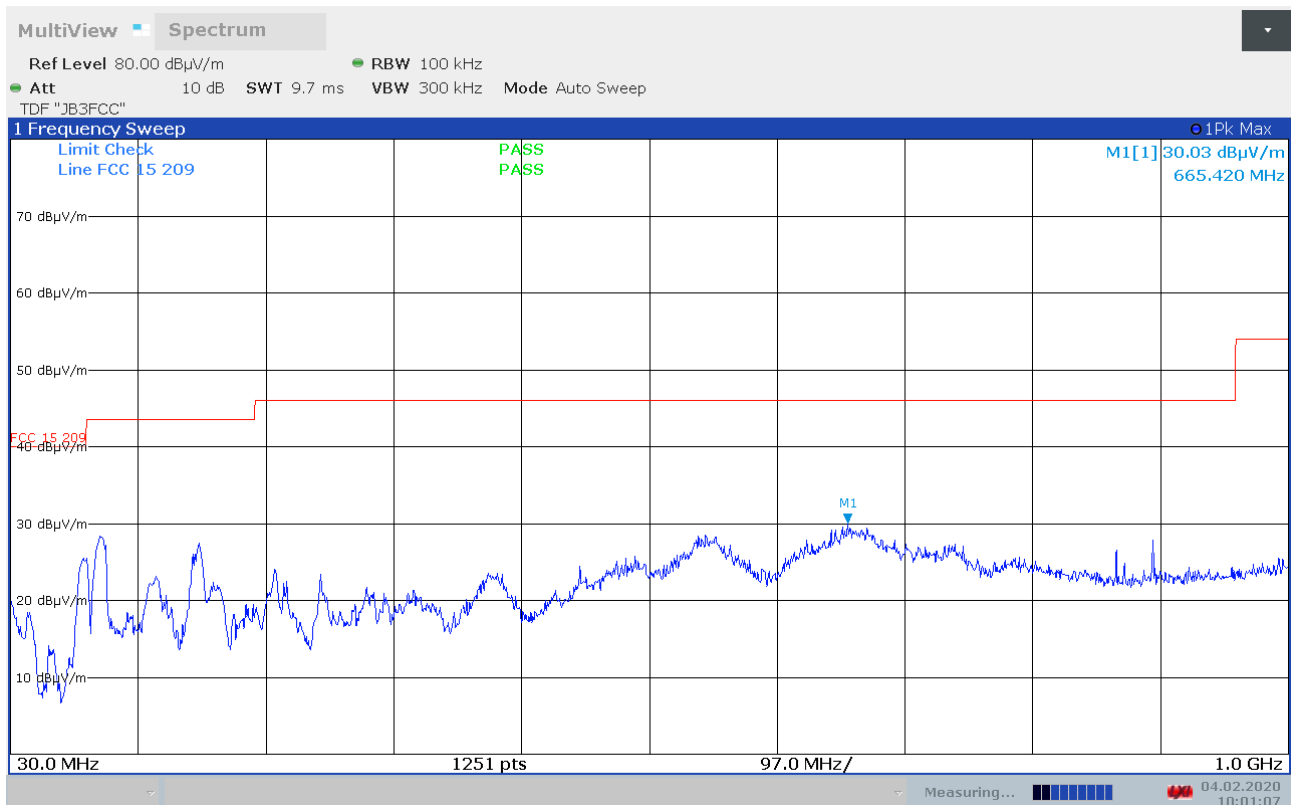
Frequency (MHz)	Measured Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	< 30	40.0	> 10
88 – 216	< 29.5	43.5	> 14
216 – 960	< 30.5	46.0	> 15.5
960 – 1000	< 30	54.0	> 24

No components were detected

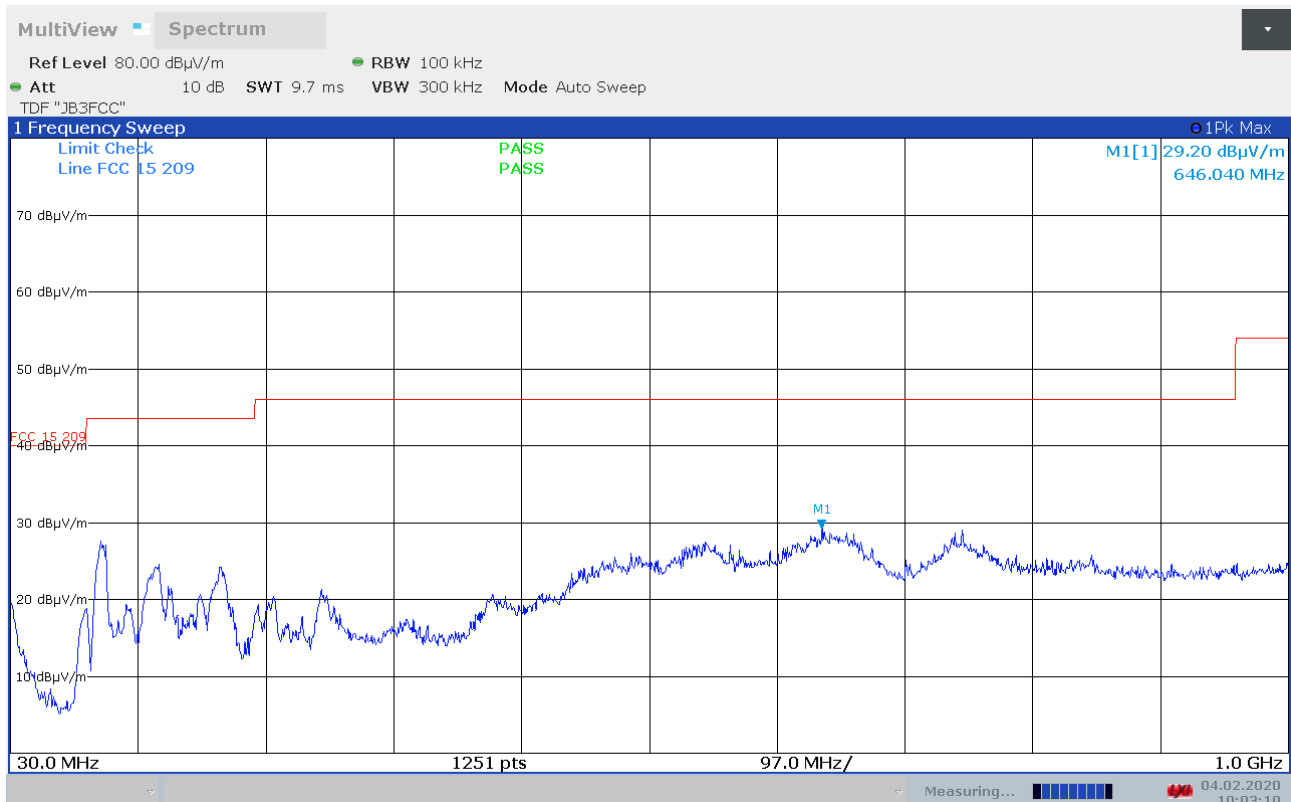
See attached plots

Requirements/Limit

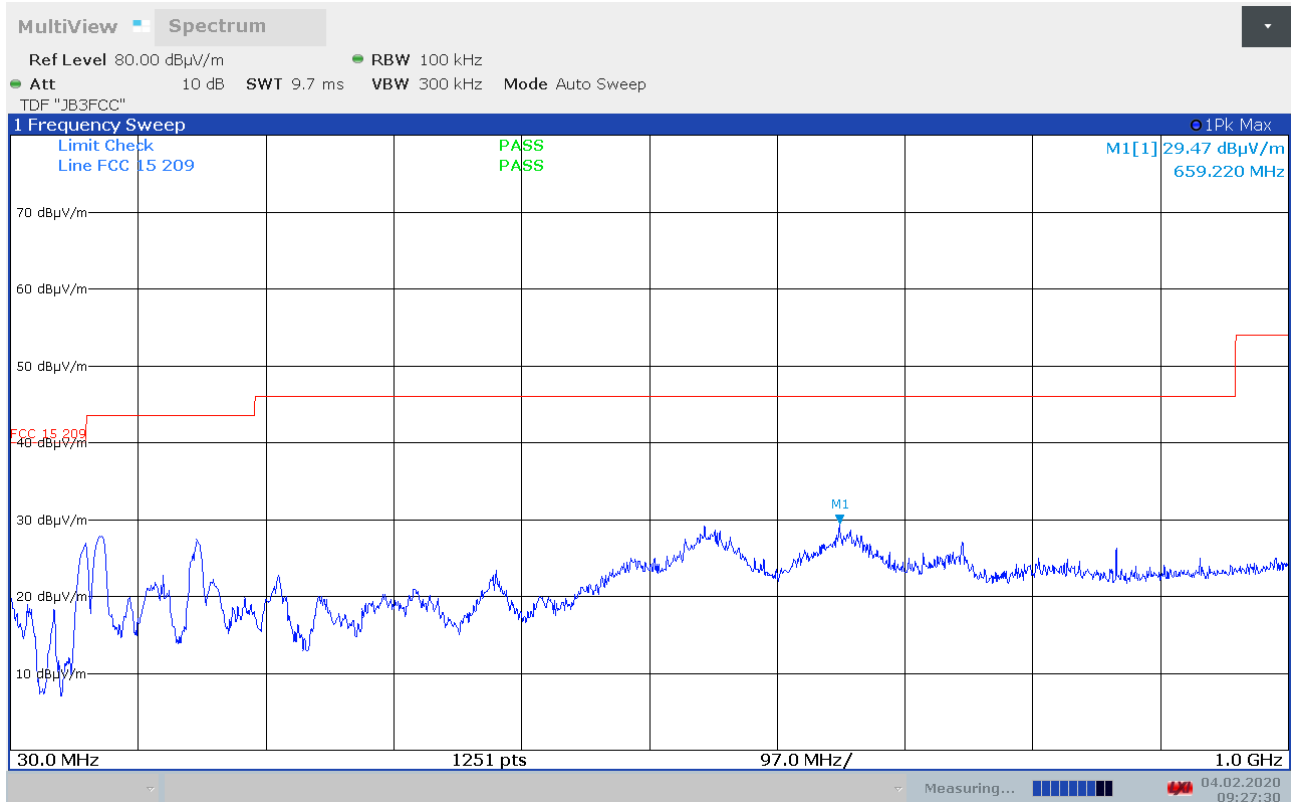
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 µV/m	40.0 dBµV/m
88 – 216 MHz	150 µV/m	43.5 dBµV/m
216 – 960 MHz	200 µV/m	46.0 dBµV/m
960 – 1000 MHz	500 µV/m	54.0 dBµV/m
Limits above are with Quasi Peak Detector		



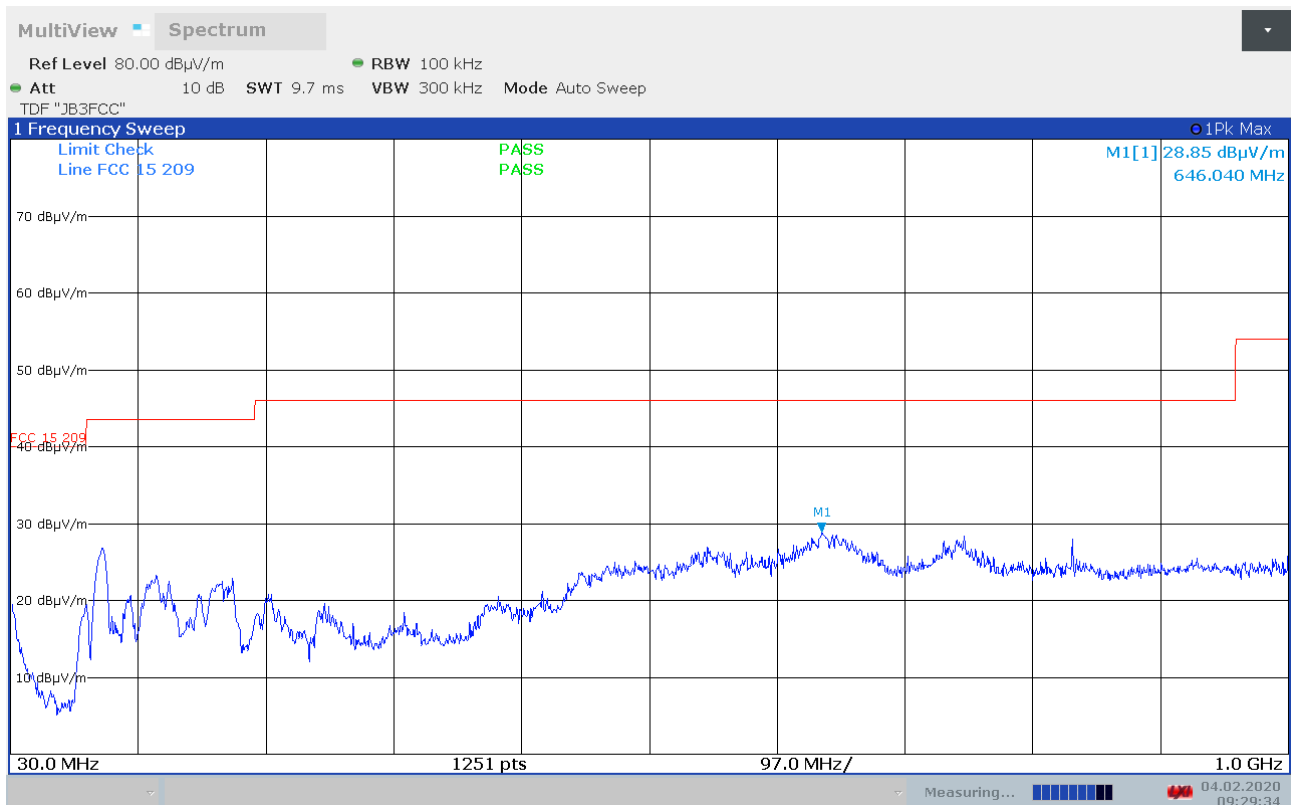
Radiated Emissions, 30 -1000 MHz, 2437 MHz, VP, 802.11b, 1Mbps



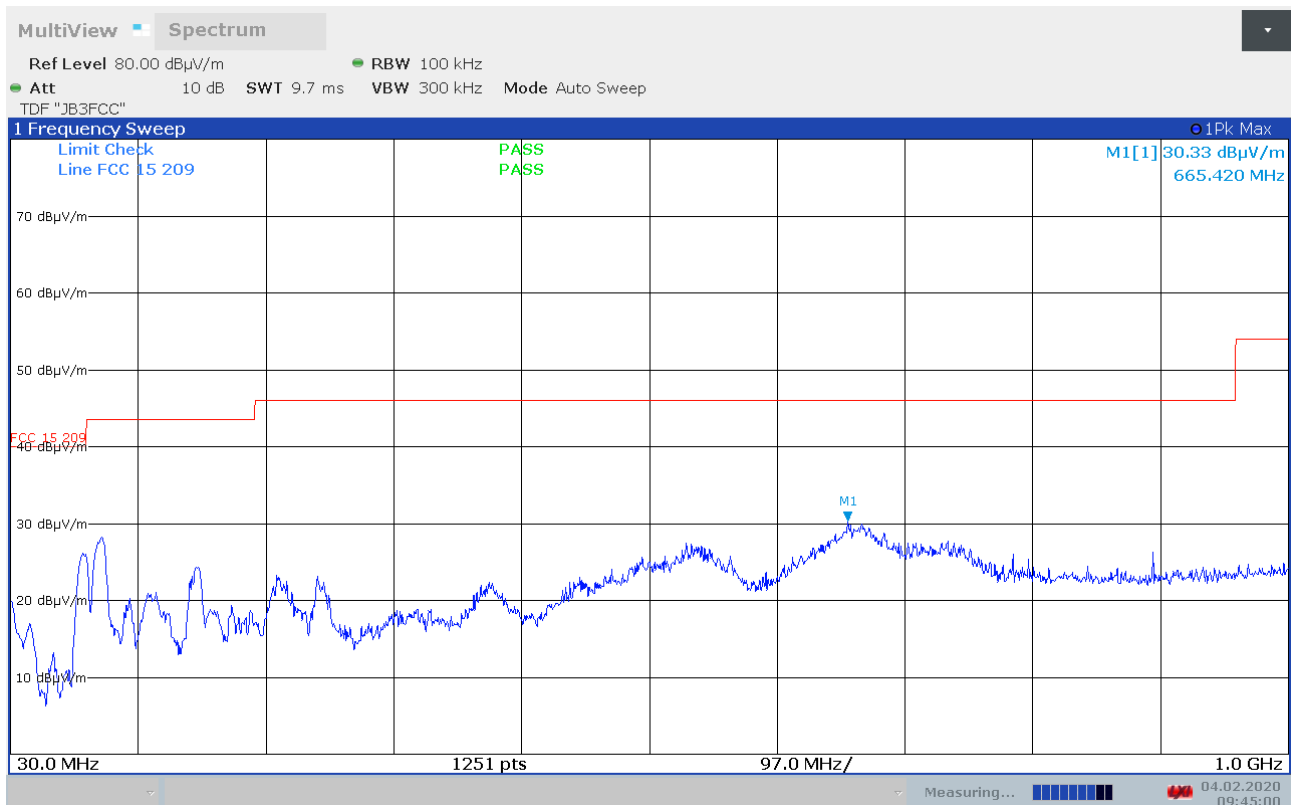
Radiated Emissions, 30 -1000 MHz, 2437 MHz, HP, 802.11b, 1Mbps



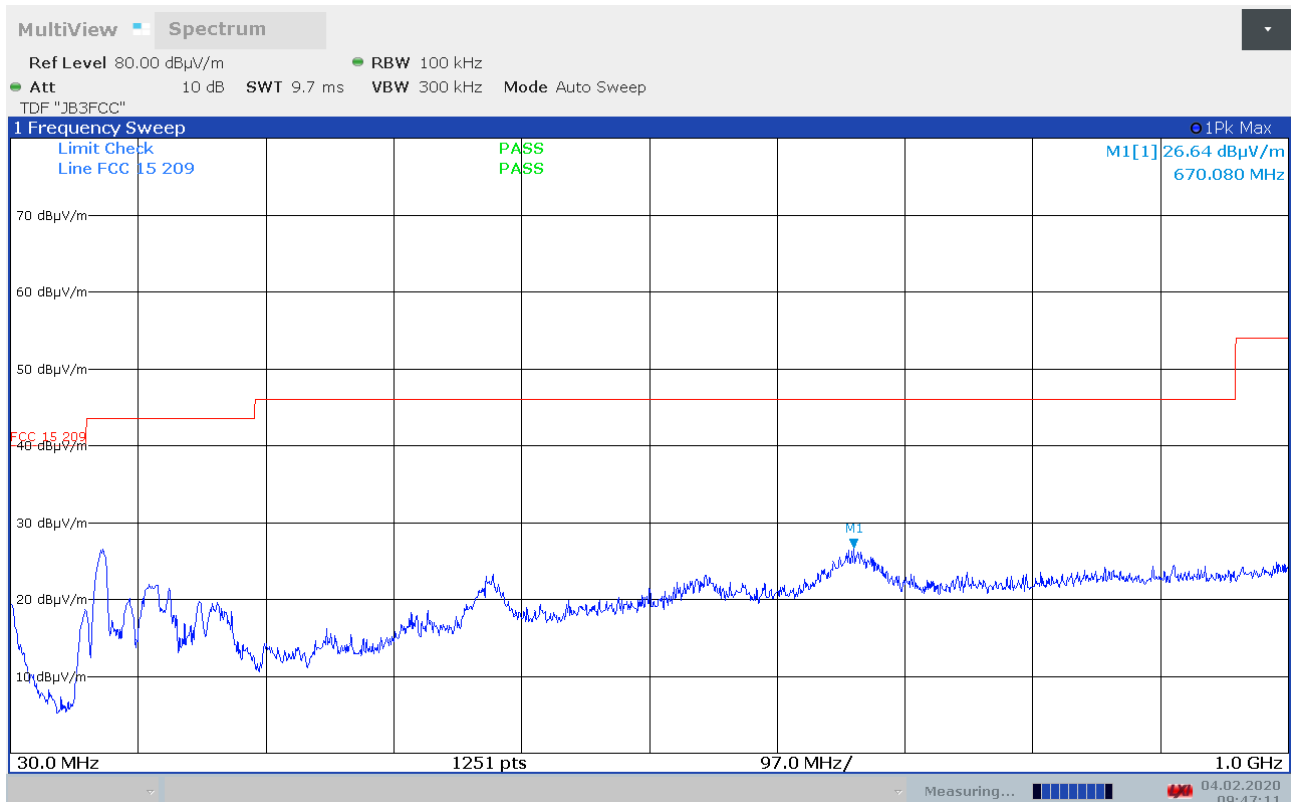
Radiated Emissions, 30 -1000 MHz, 2437 MHz, VP, 802.11g, 54Mbps



Radiated Emissions, 30 -1000 MHz, 2437 MHz, HP, 802.11g, 54Mbps



Radiated Emissions, 30 -1000 MHz, 2437 MHz, VP, 802.11n, MCS7



Radiated Emissions, 30 -1000 MHz, 2437 MHz, HP, 802.11n, MCS7

3.9 Radiated Emissions, 1 – 26 GHz

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 18 GHz)
1m (18 – 26 GHz)

Peak Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Limit	Margin
MHz		dB	dB μ V/m	dB μ V/m	dB
1000 – 4000	L/M/H	0	< 50	74	> 24
4000 – 18000	L/M/H	0	< 54	74	> 20
18000 – 26000	L/M/H	-10.5	< 50	74	> 24

All emissions are below the Average Limit even when measured with Peak Detector.

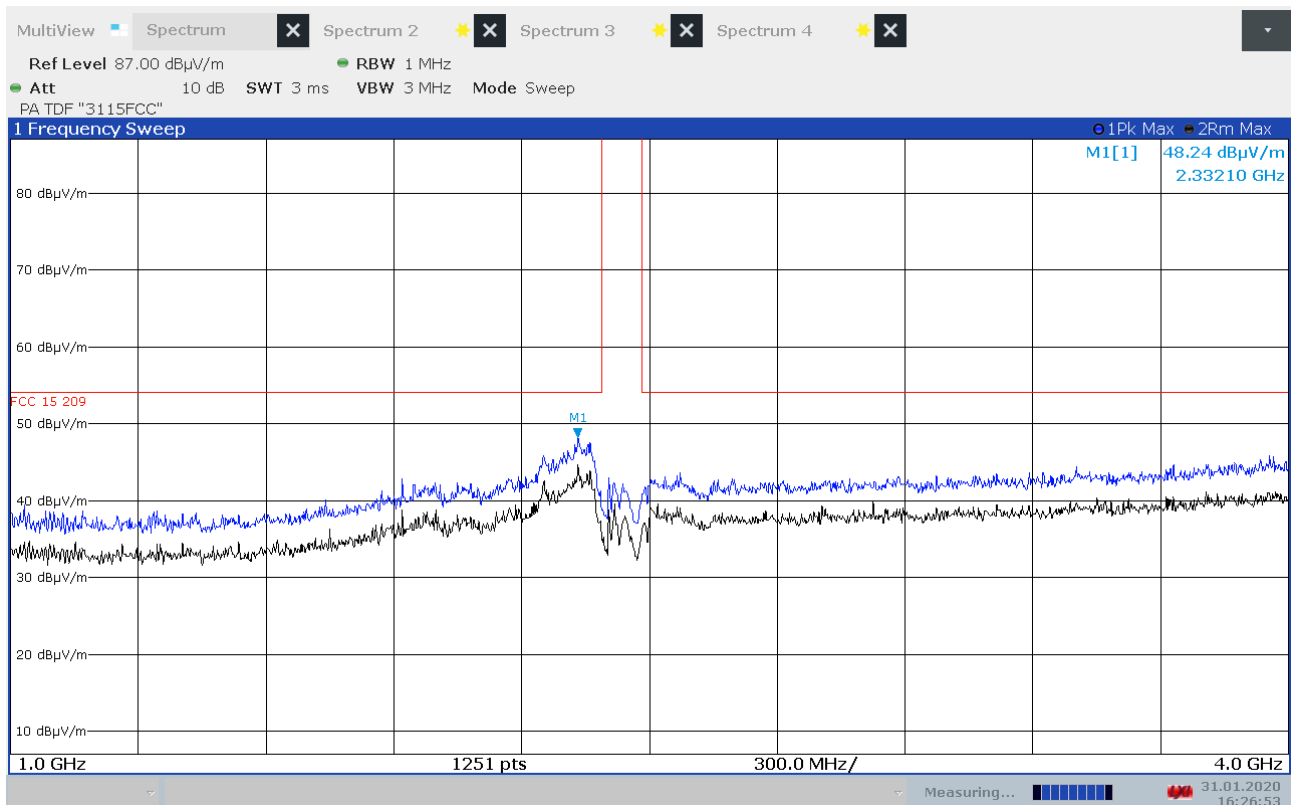
A Band Reject Filter was used for measurements from 1 GHz to 4 GHz and a High Pass Filter was used from 3 GHz to 18 GHz.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

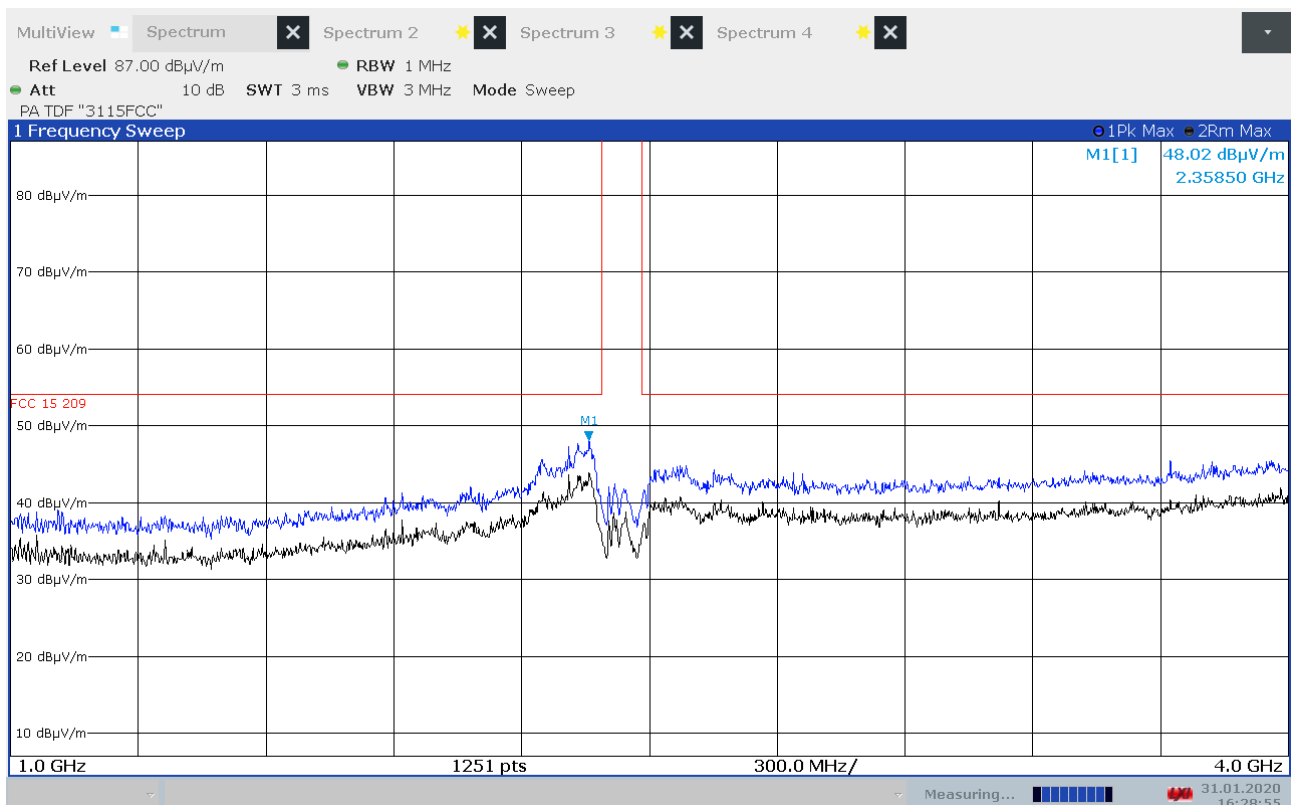
See plots.

Requirements/Limit

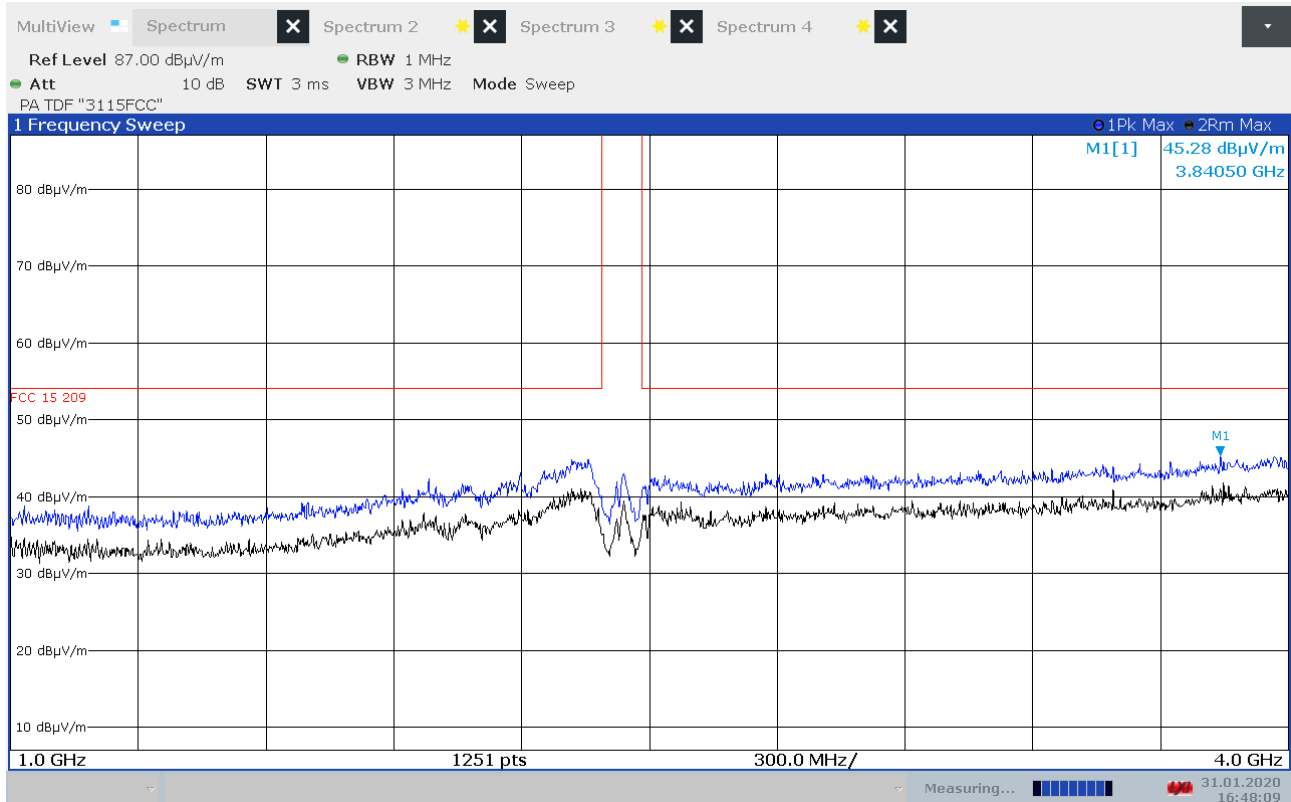
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector	Peak Detector
1 – 26 GHz	54.0 dB μ V/m	74.0 dB μ V/m



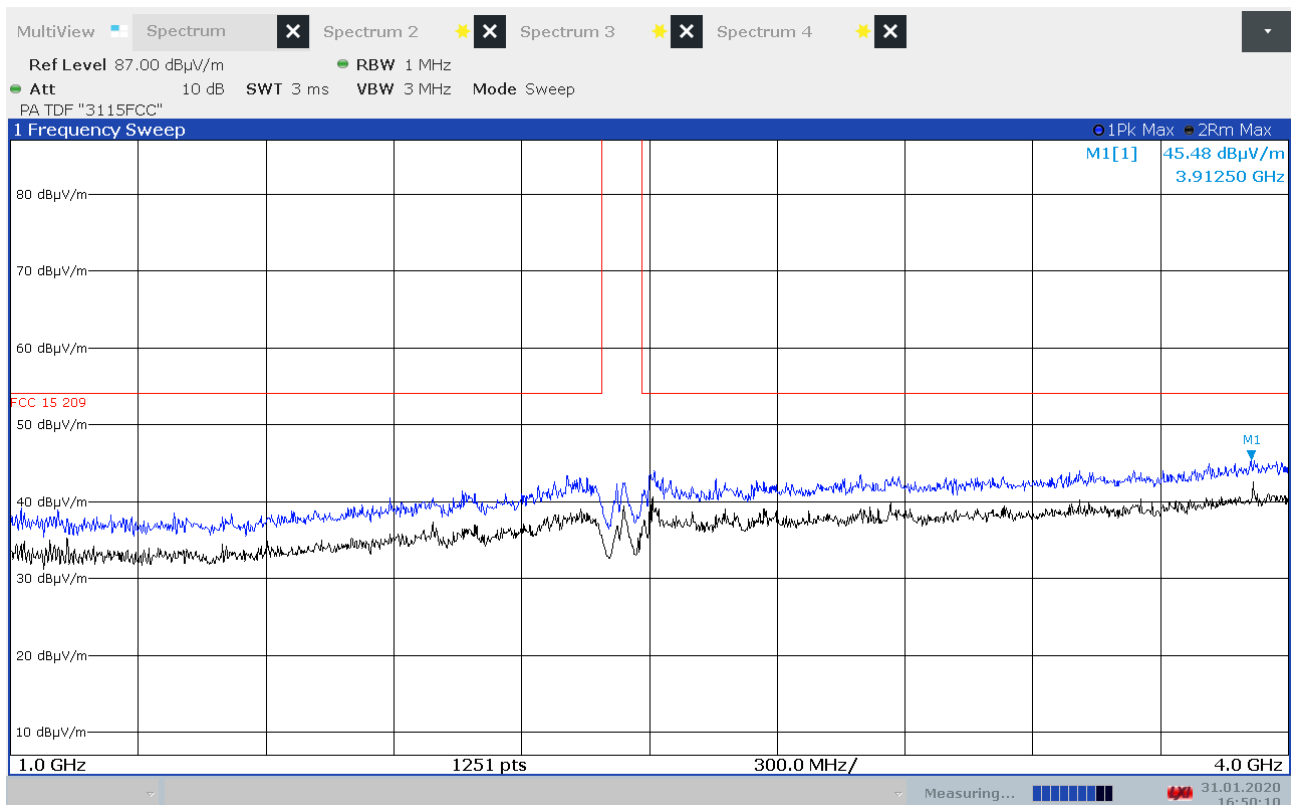
Radiated Emissions, 1000 -4000 MHz, 2412 MHz, VP, 802.11g, 54Mbps



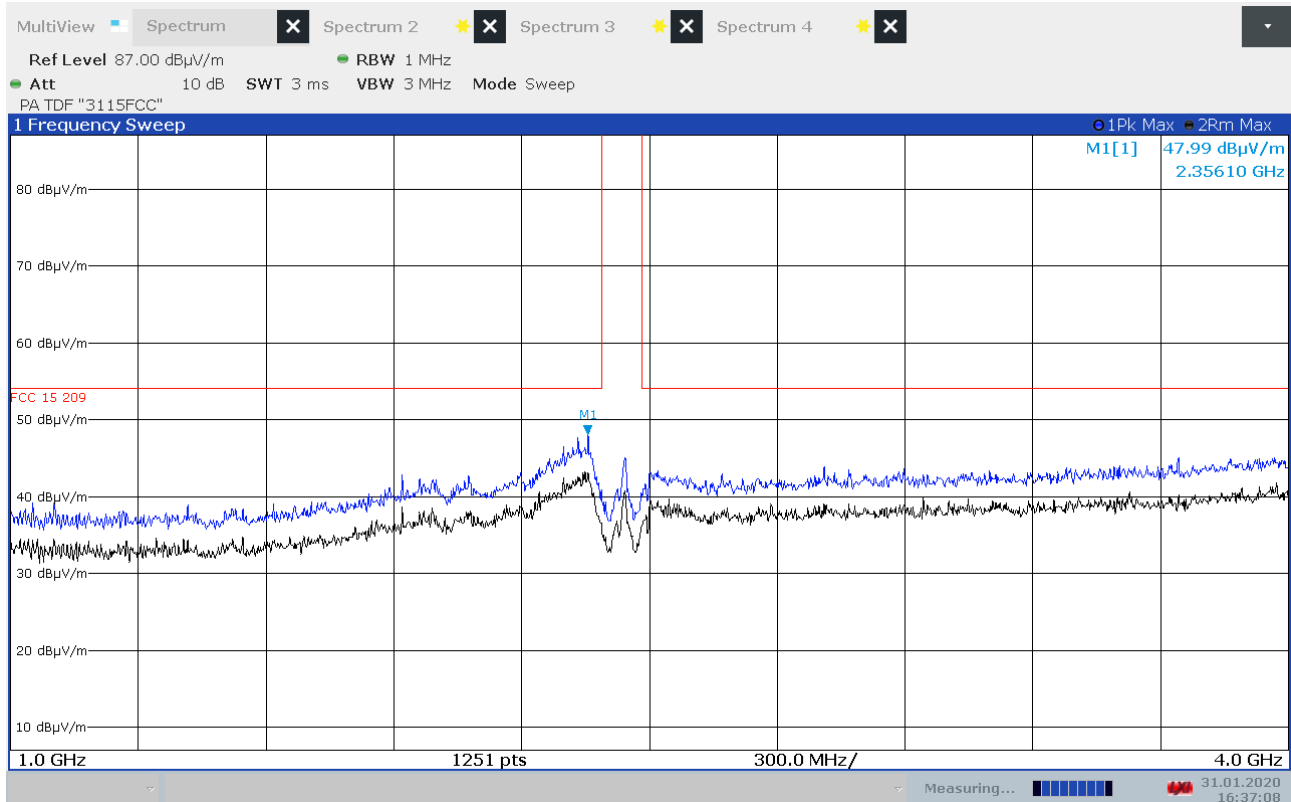
Radiated Emissions, 1000 -4000 MHz, 2412 MHz, HP, 802.11g, 54Mbps



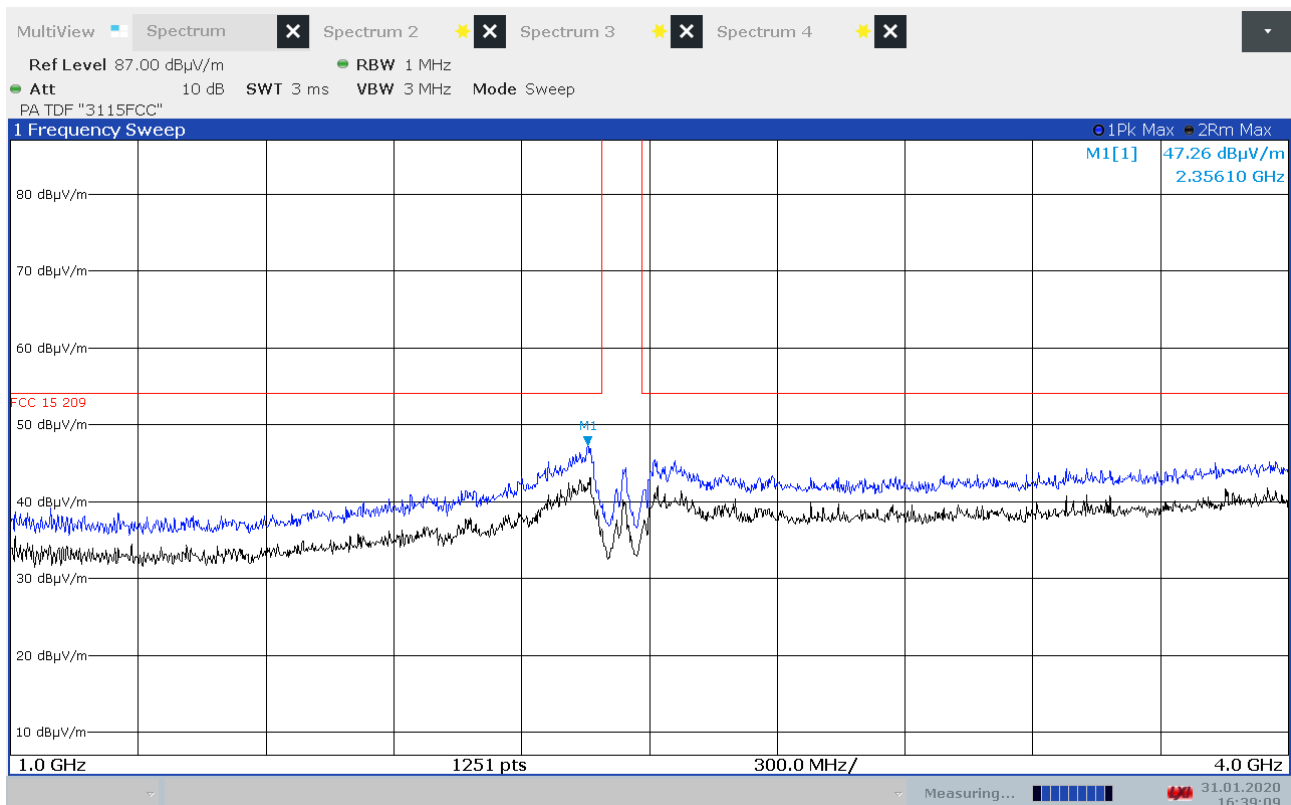
Radiated Emissions, 1000 -4000 MHz, 2437 MHz, VP, 802.11b, 11Mbps



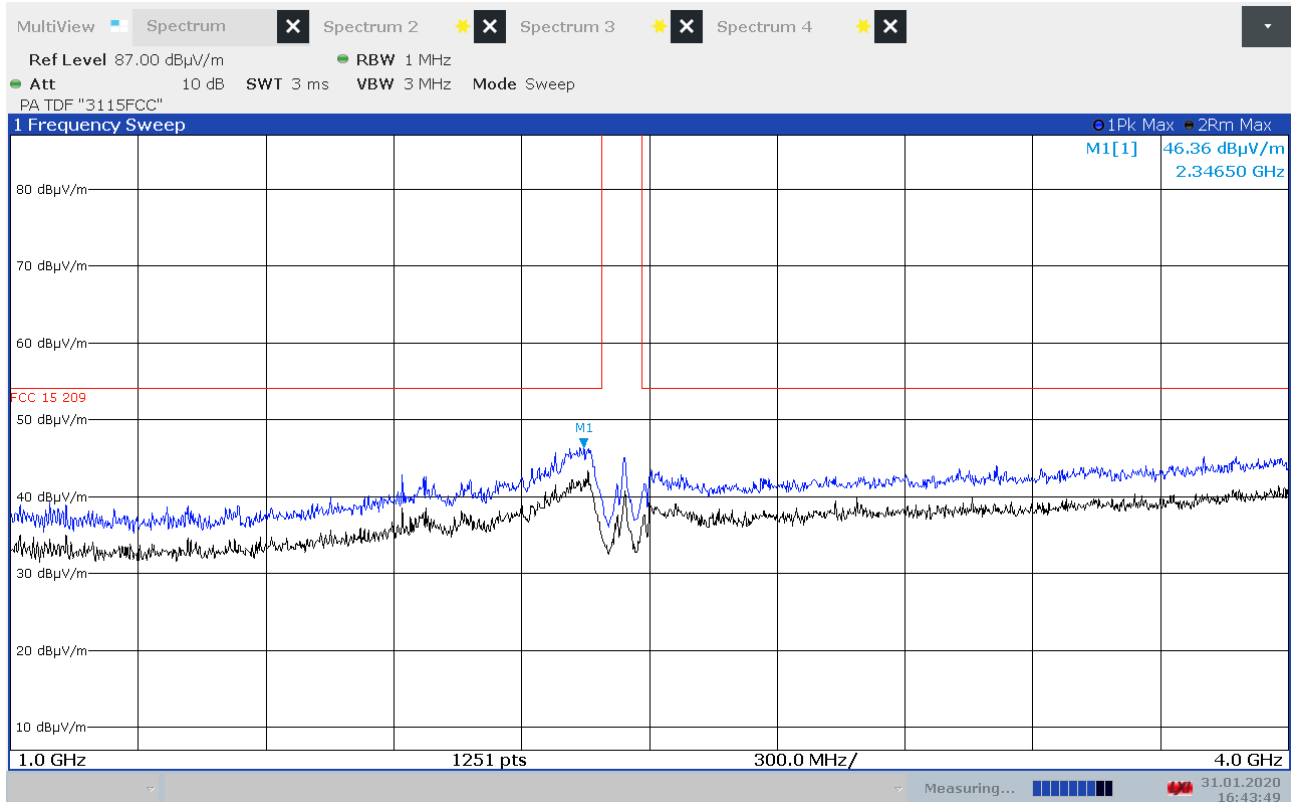
Radiated Emissions, 1000 -4000 MHz, 2437 MHz, HP, 802.11b, 11Mbps



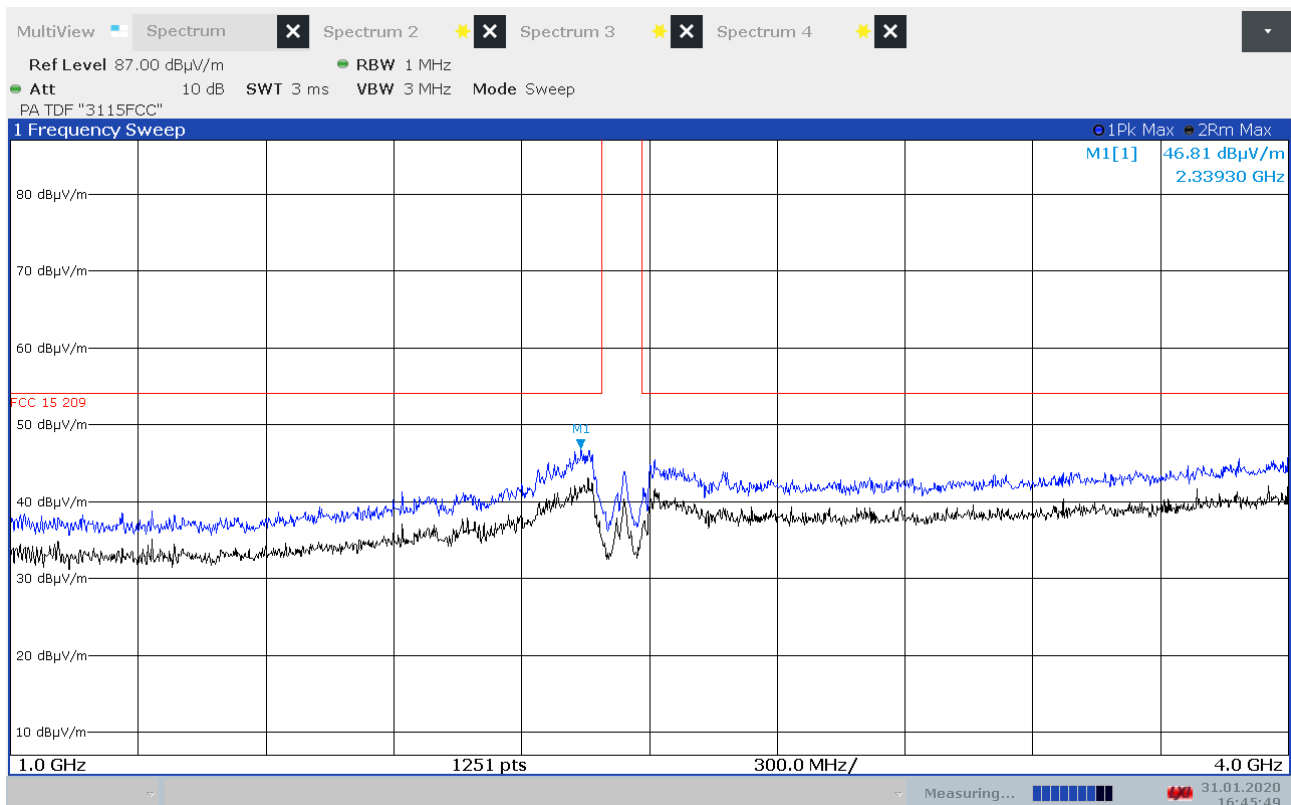
Radiated Emissions, 1000 -4000 MHz, 2437 MHz, VP, 802.11g, 54Mbps



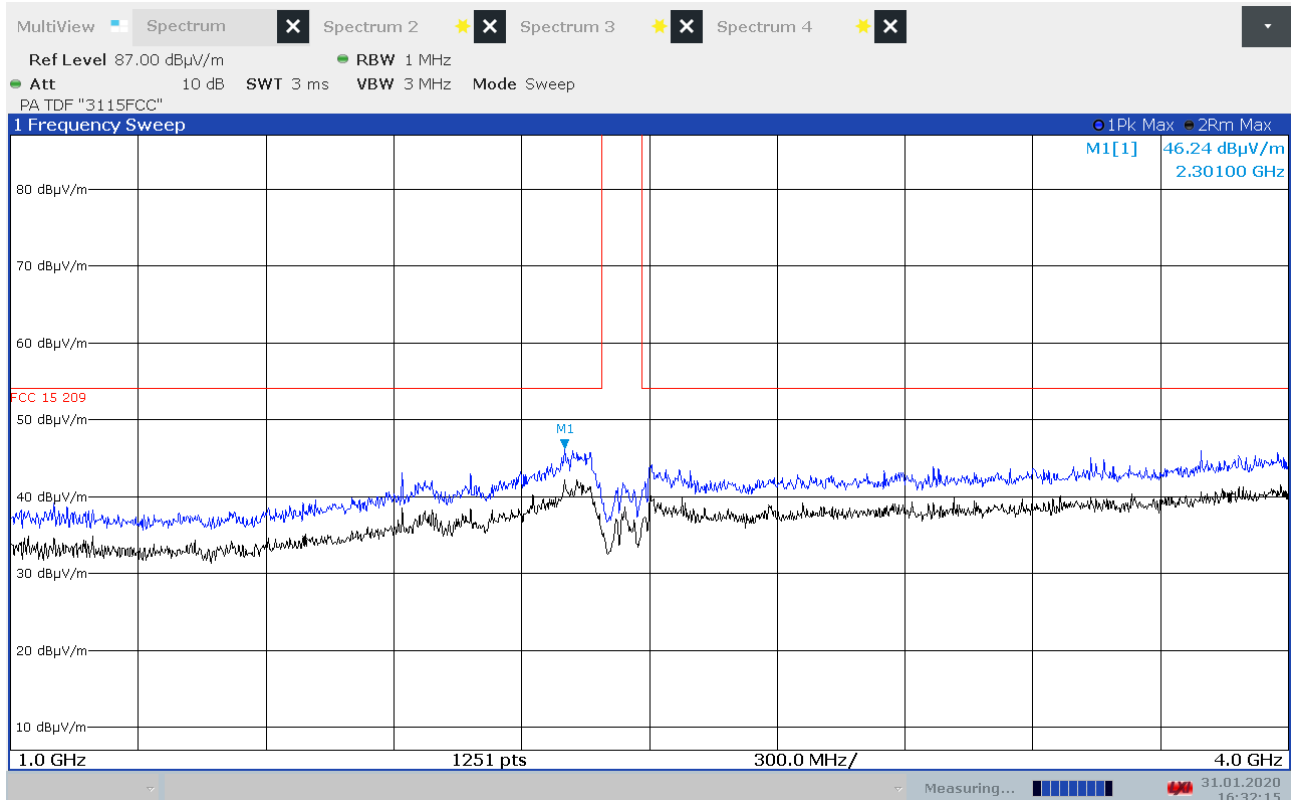
Radiated Emissions, 1000 -4000 MHz, 2437 MHz, HP, 802.11g, 54Mbps



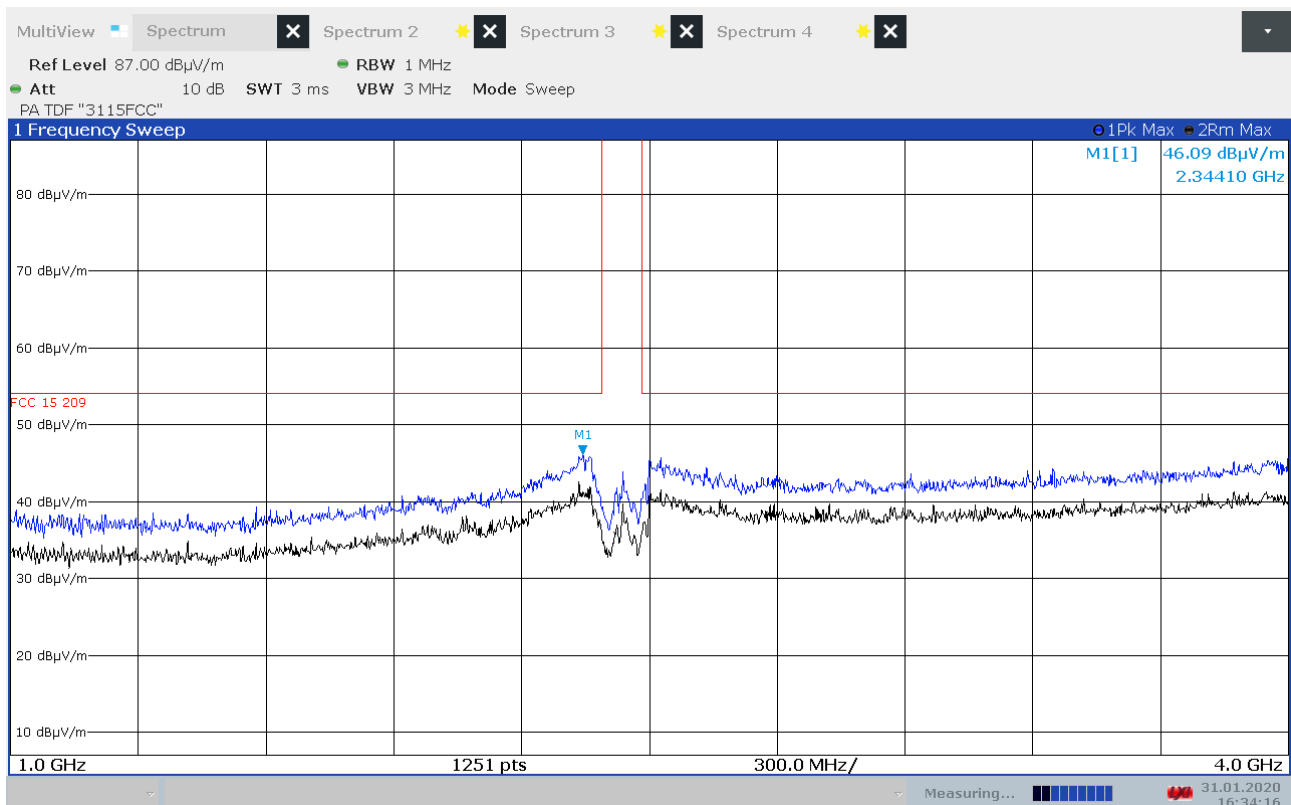
Radiated Emissions, 1000 -4000 MHz, 2437 MHz, VP, 802.11n, MCS7



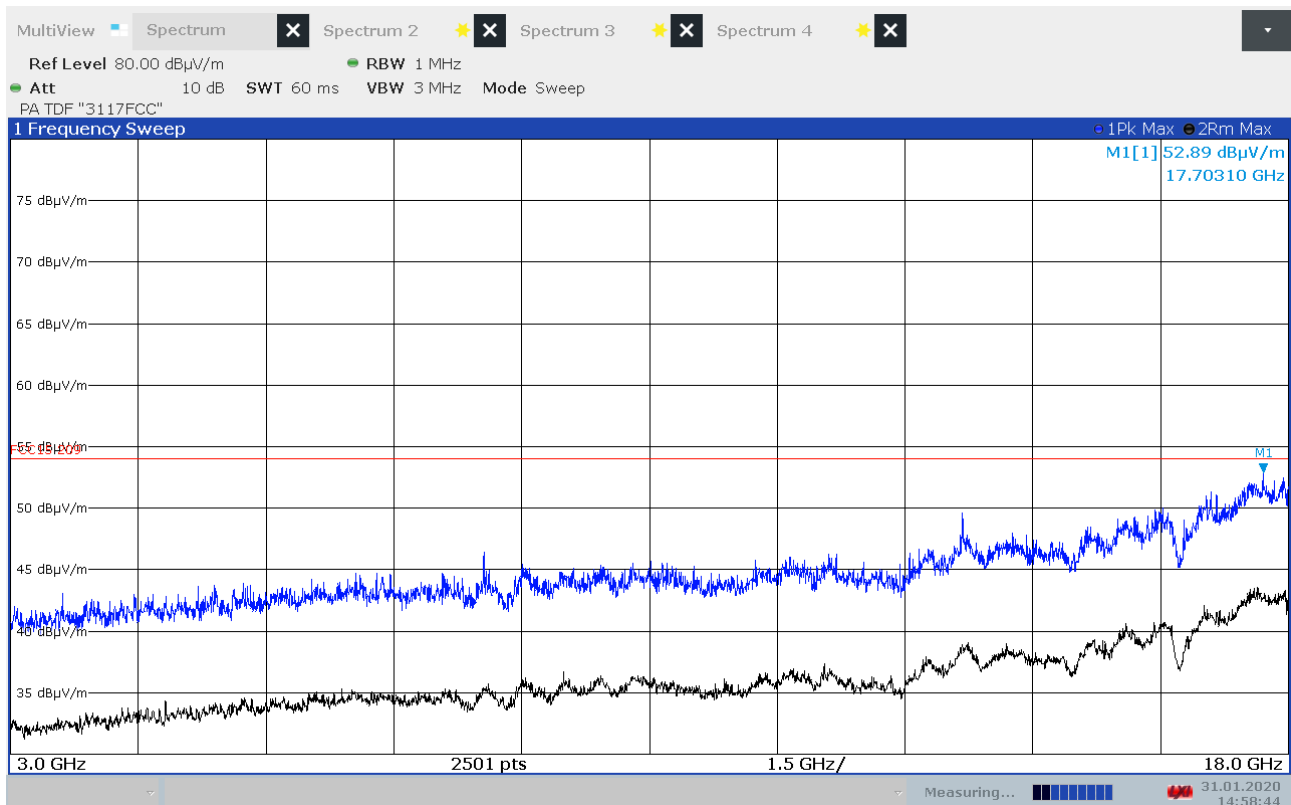
Radiated Emissions, 1000 -4000 MHz, 2437 MHz, HP, 802.11n, MCS7



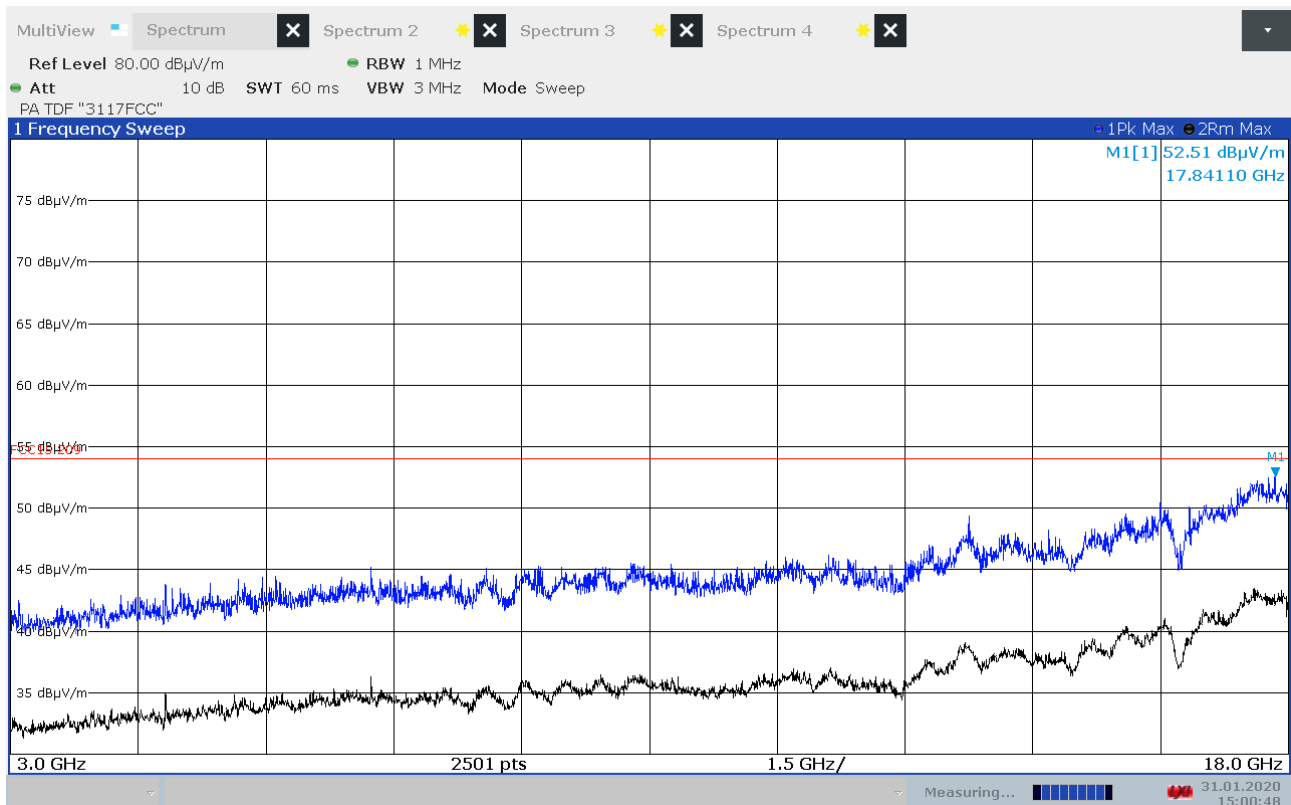
Radiated Emissions, 1000 -4000 MHz, 2462 MHz, VP, 802.11g, 54Mbps



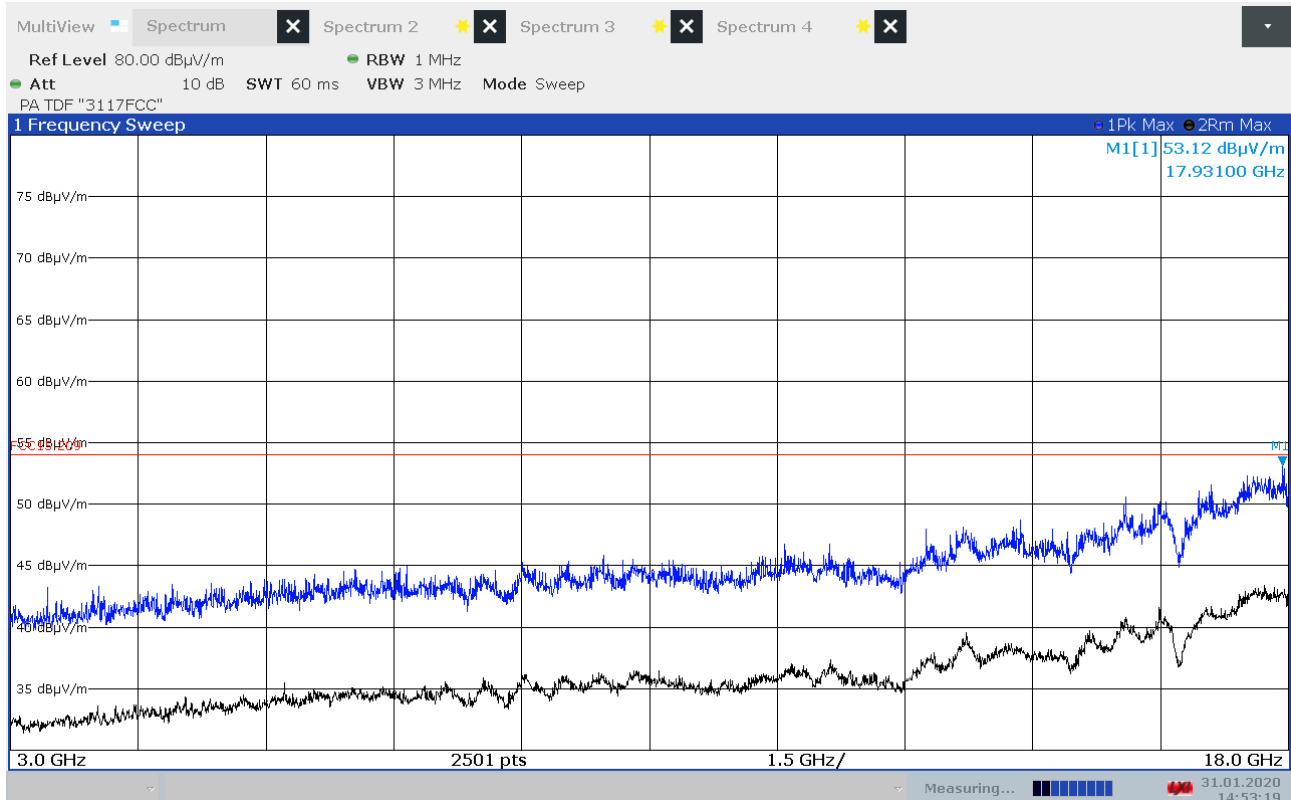
Radiated Emissions, 1000 -4000 MHz, 2462 MHz, HP, 802.11g, 54Mbps



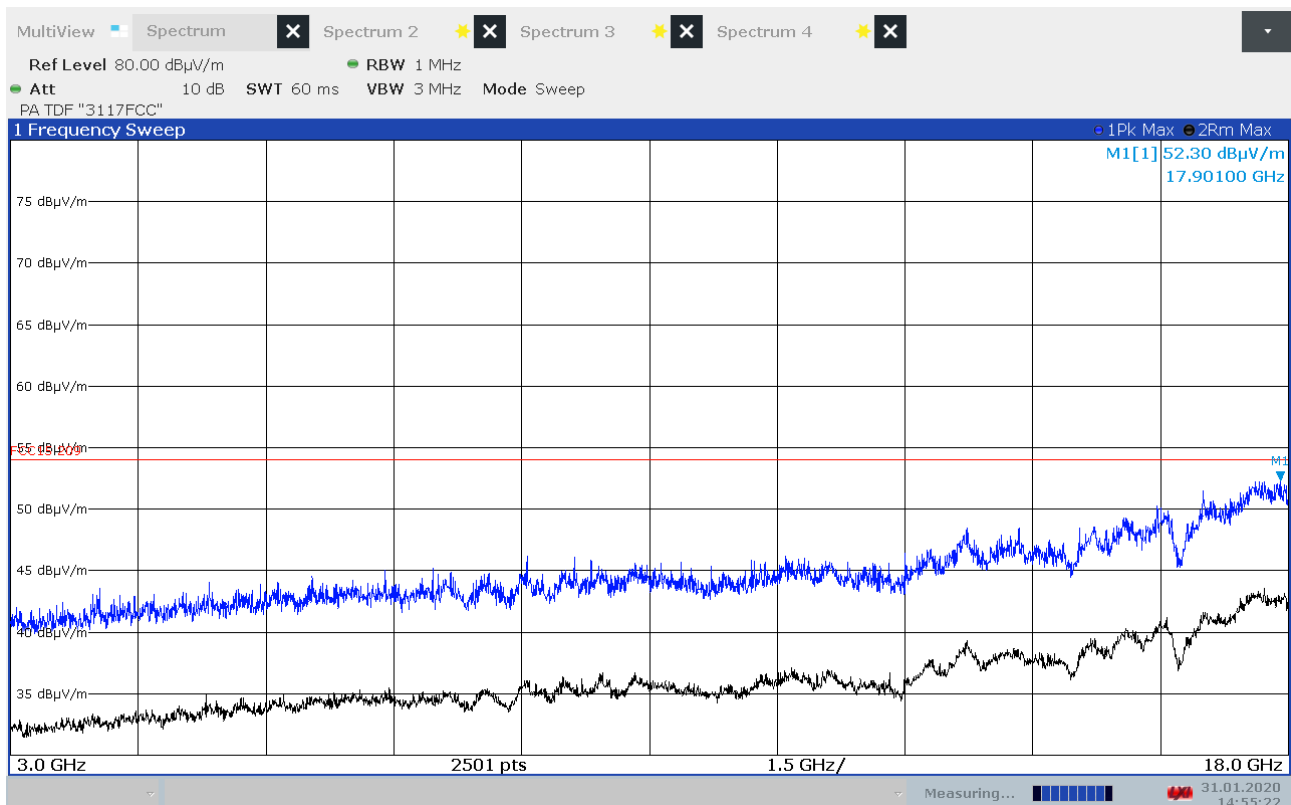
Radiated Emissions, 3000 -18000 MHz, 2412 MHz, VP, 802.11g, 54Mbps



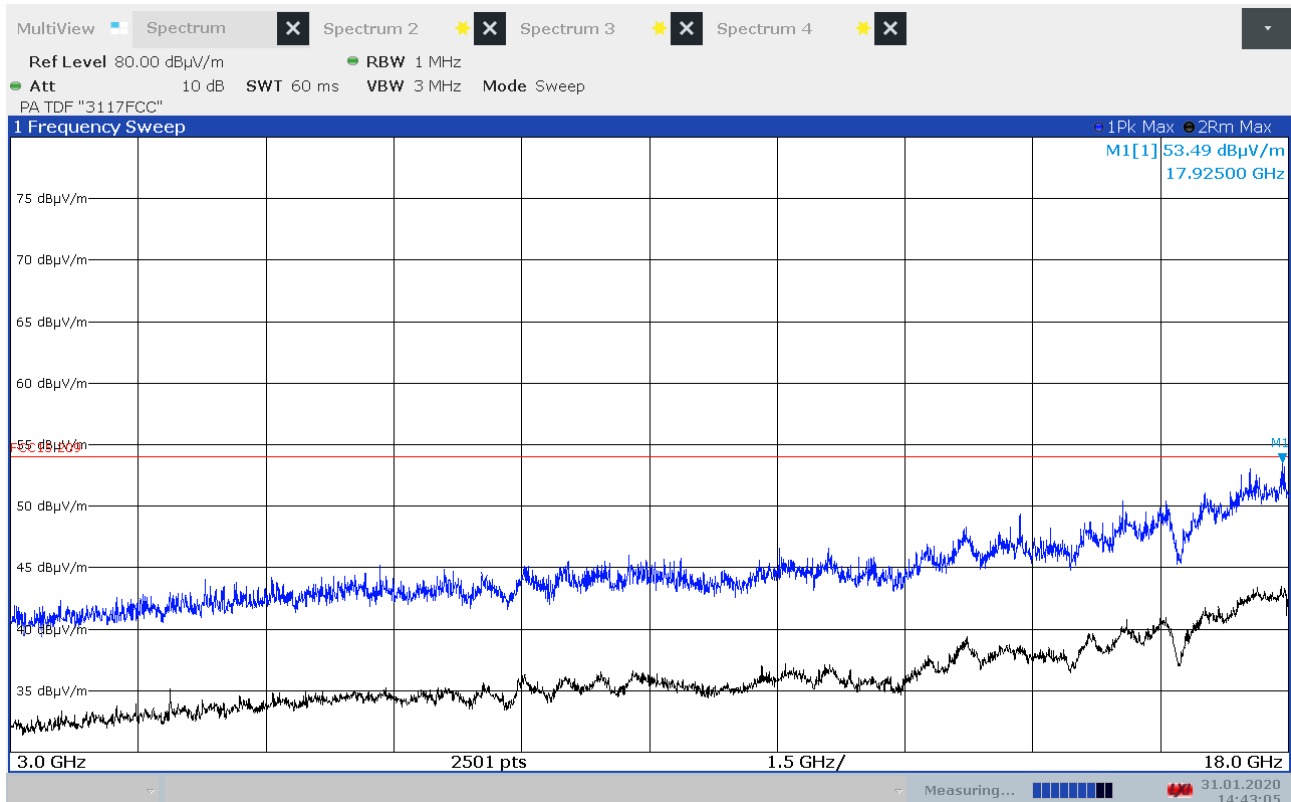
Radiated Emissions, 3000 -18000 MHz, 2412 MHz, HP, 802.11g, 54Mbps



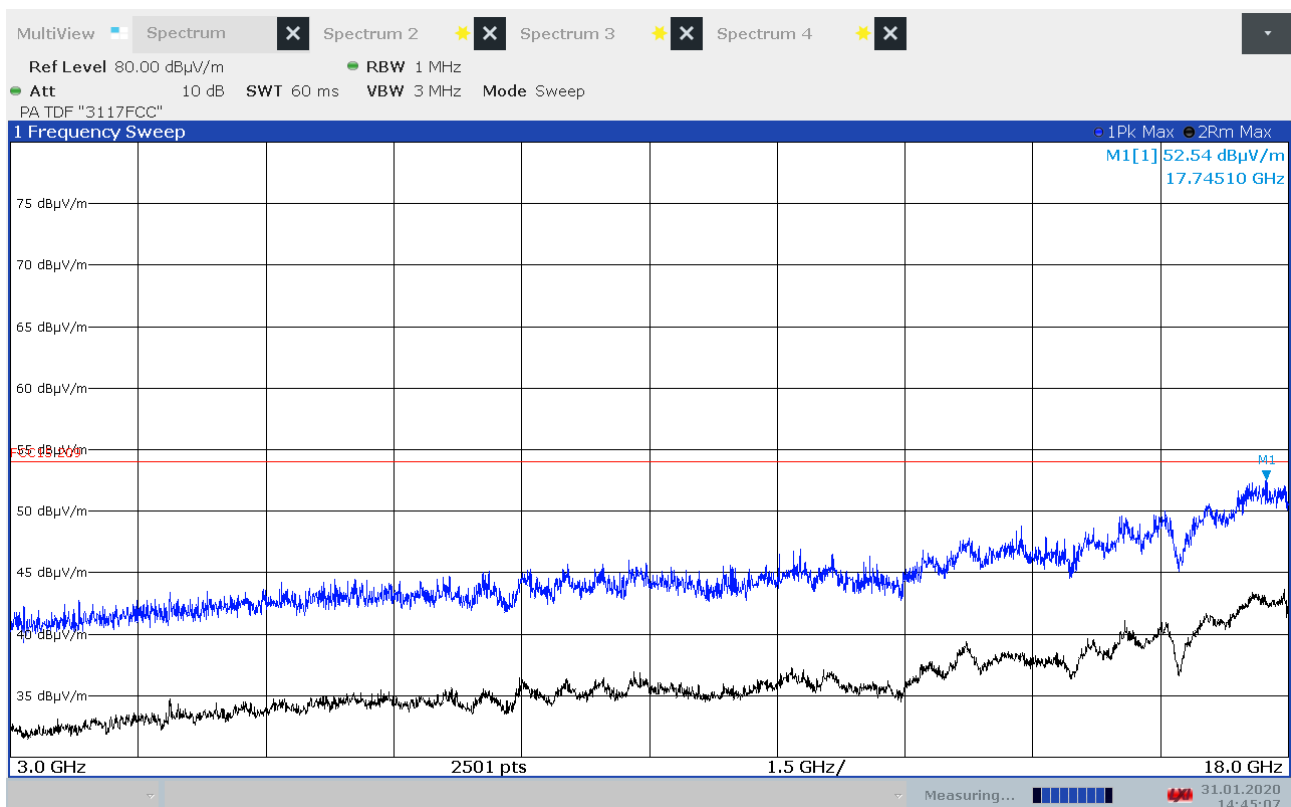
Radiated Emissions, 3000 -18000 MHz, 2437 MHz, VP, 802.11b, 11Mbps



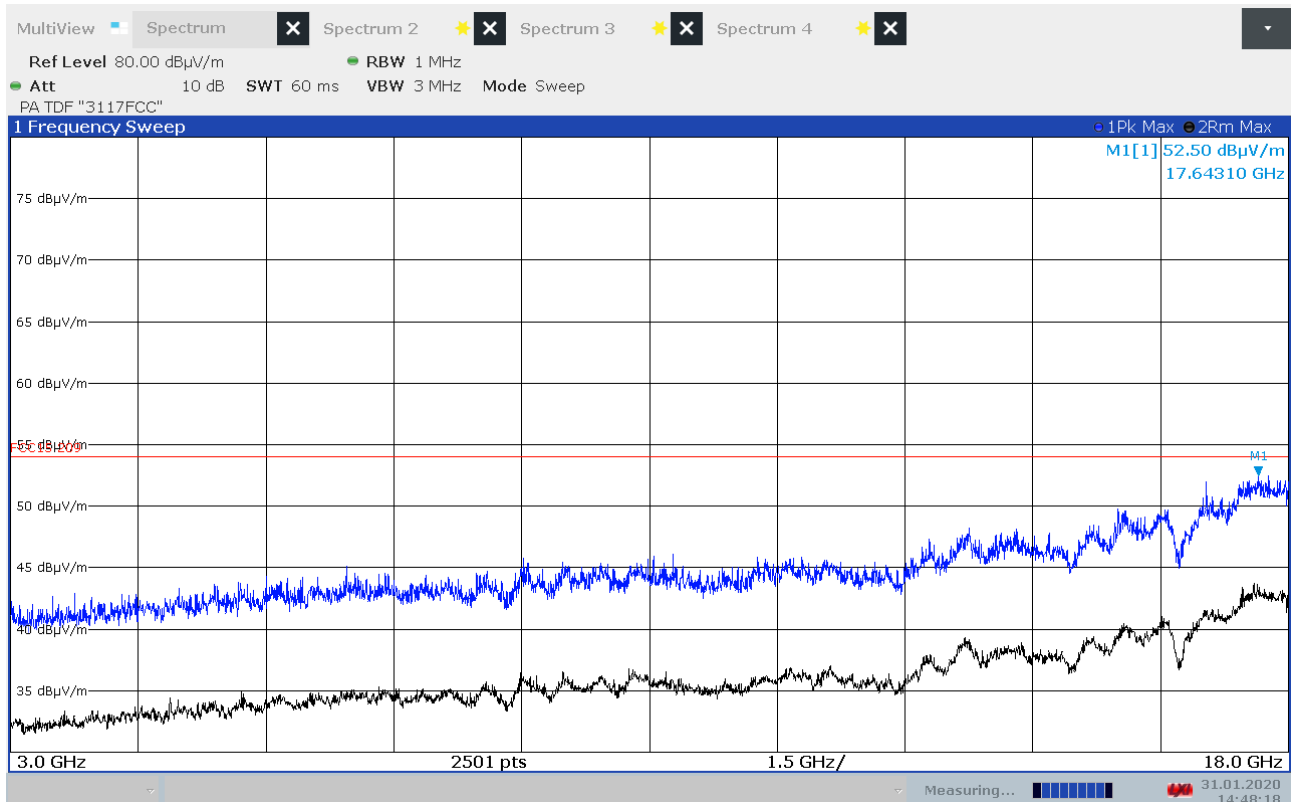
Radiated Emissions, 3000 -18000 MHz, 2437 MHz, HP, 802.11b, 11Mbps



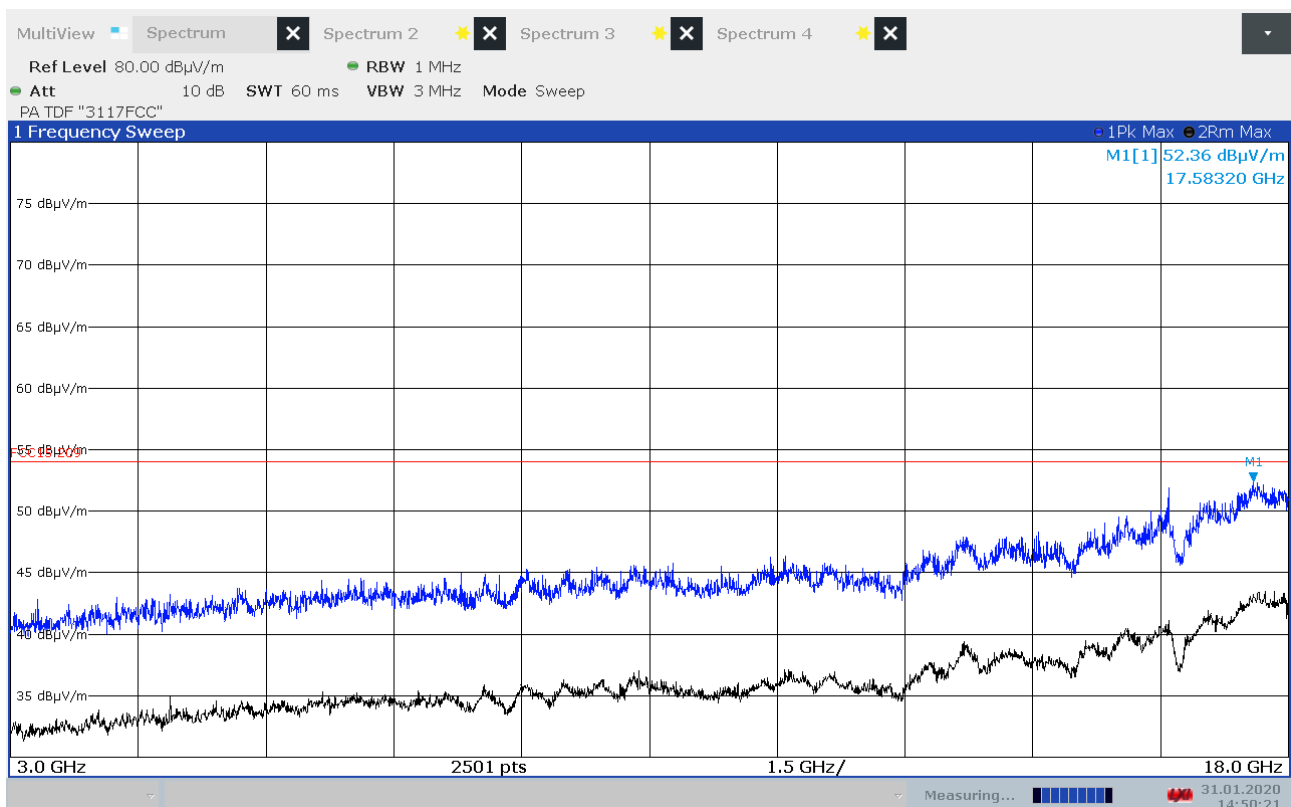
Radiated Emissions, 3000 -18000 MHz, 2437 MHz, VP, 802.11g, 54Mbps



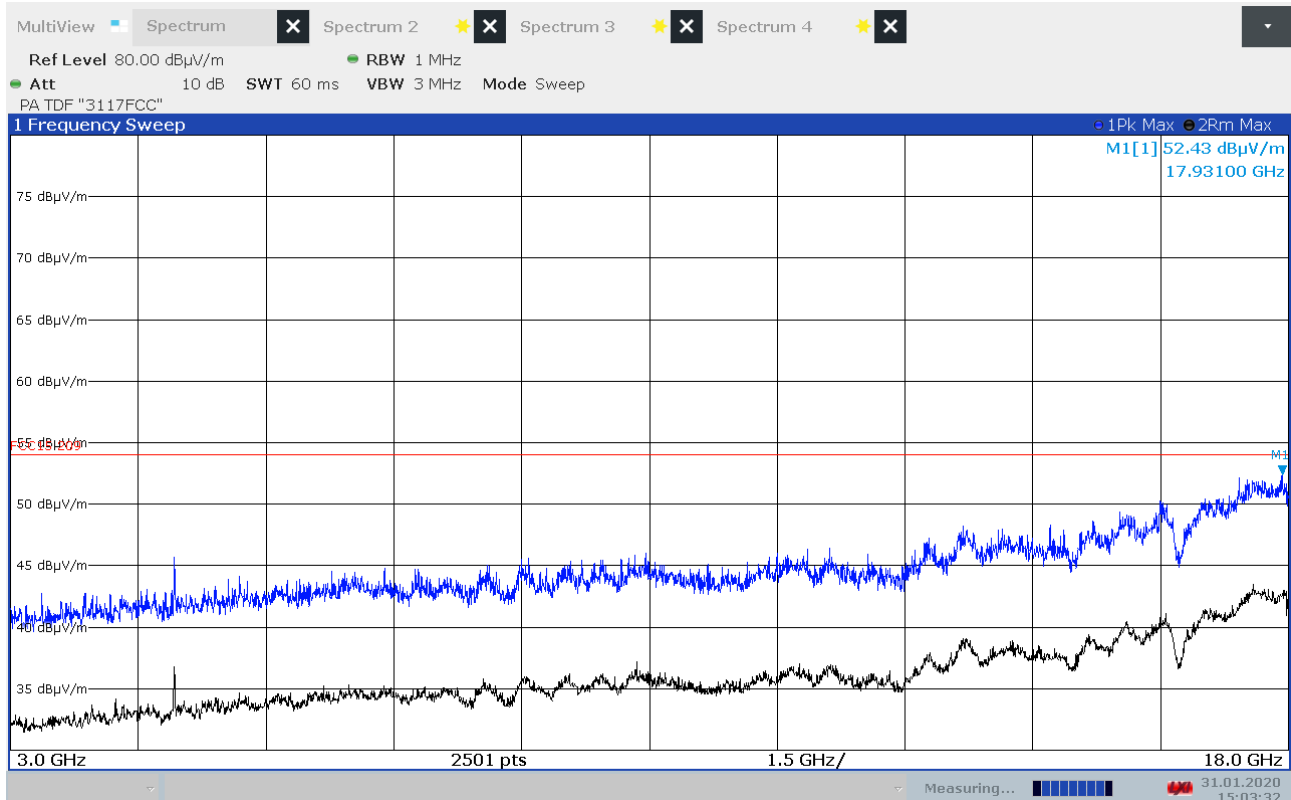
Radiated Emissions, 3000 -18000 MHz, 2437 MHz, HP, 802.11g, 54Mbps



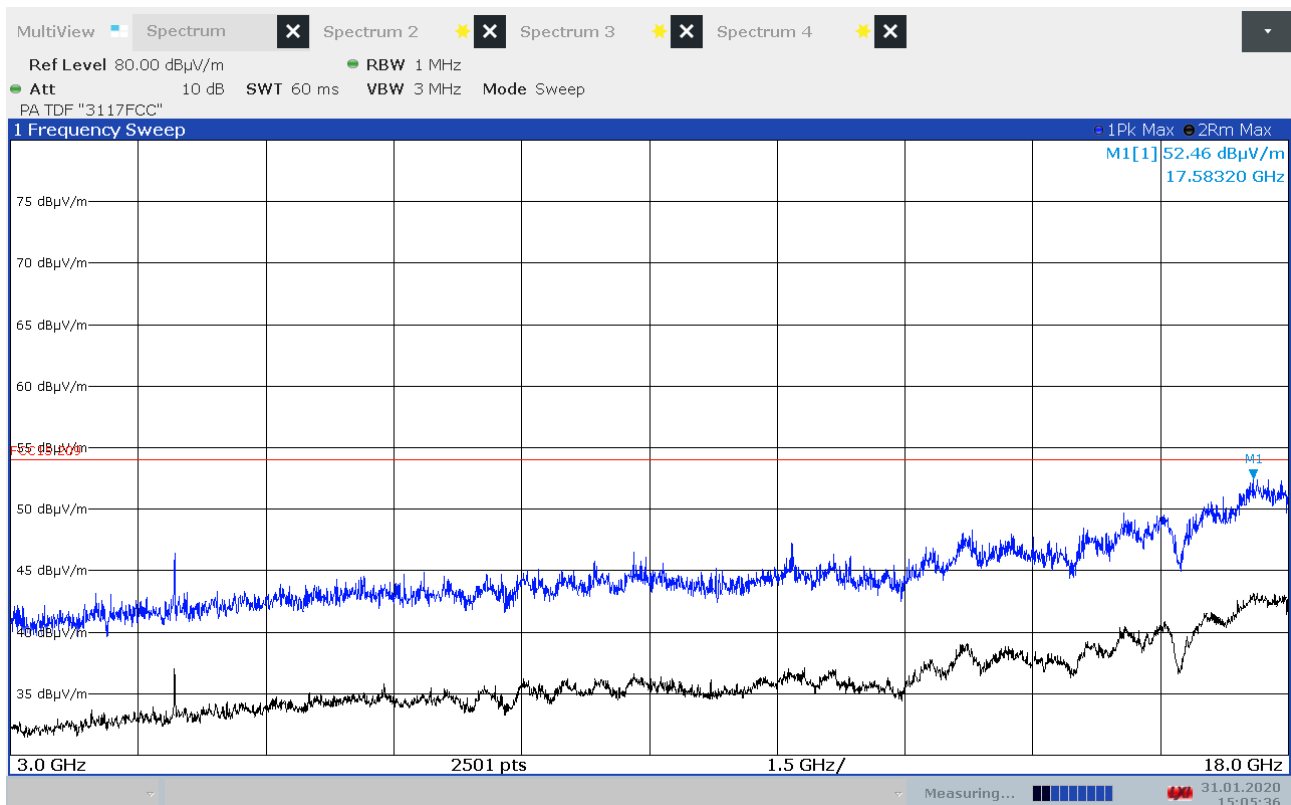
Radiated Emissions, 3000 -18000 MHz, 2437 MHz, VP, 802.11n, MCS7



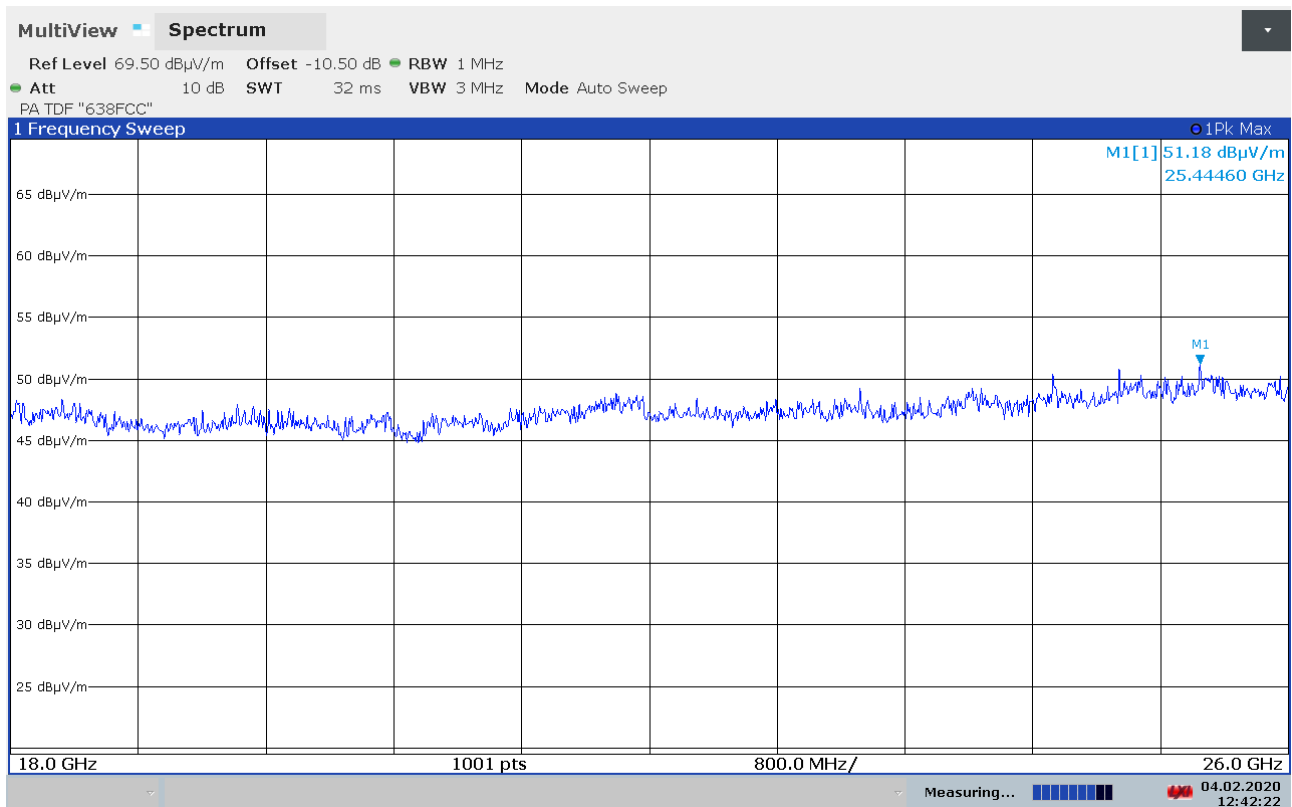
Radiated Emissions, 3000 -18000 MHz, 2437 MHz, HP, 802.11n, MCS7



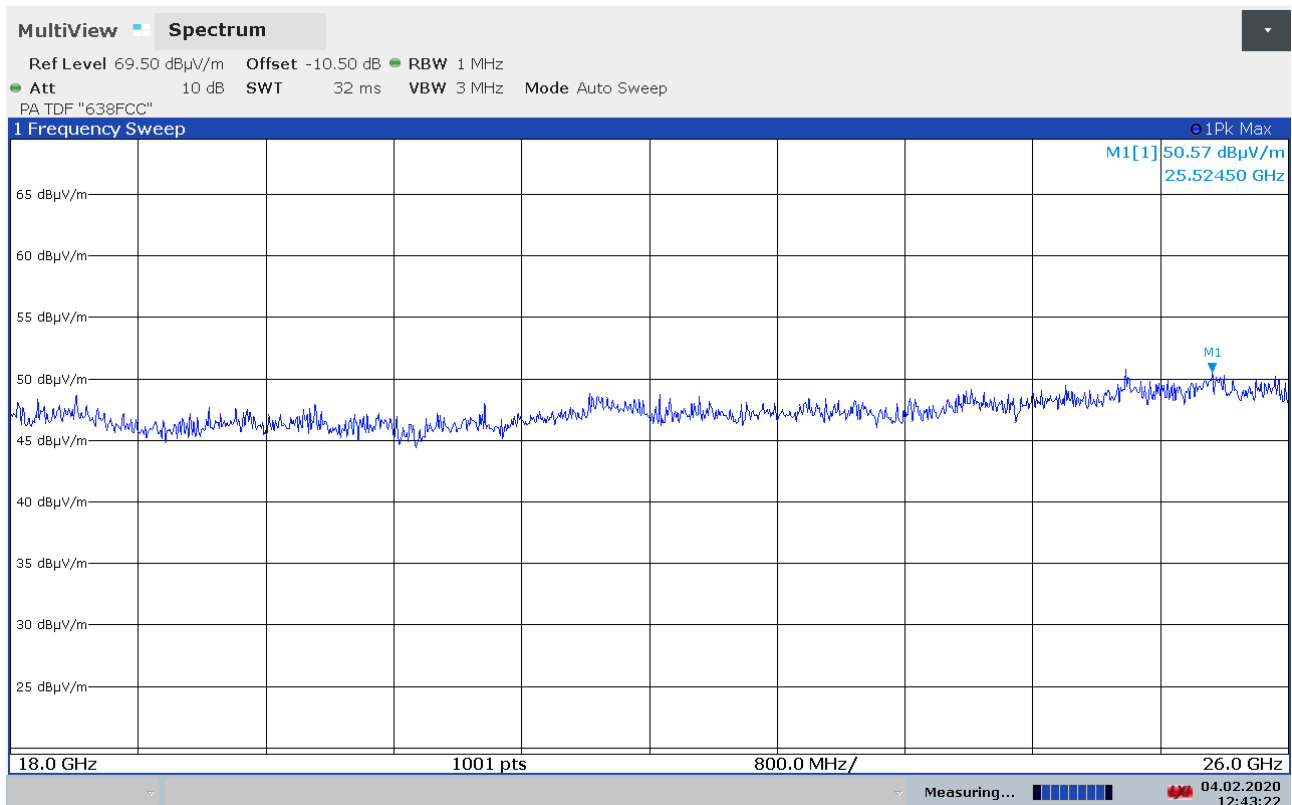
Radiated Emissions, 3000 -18000 MHz, 2462 MHz, VP, 802.11g, 54Mbps



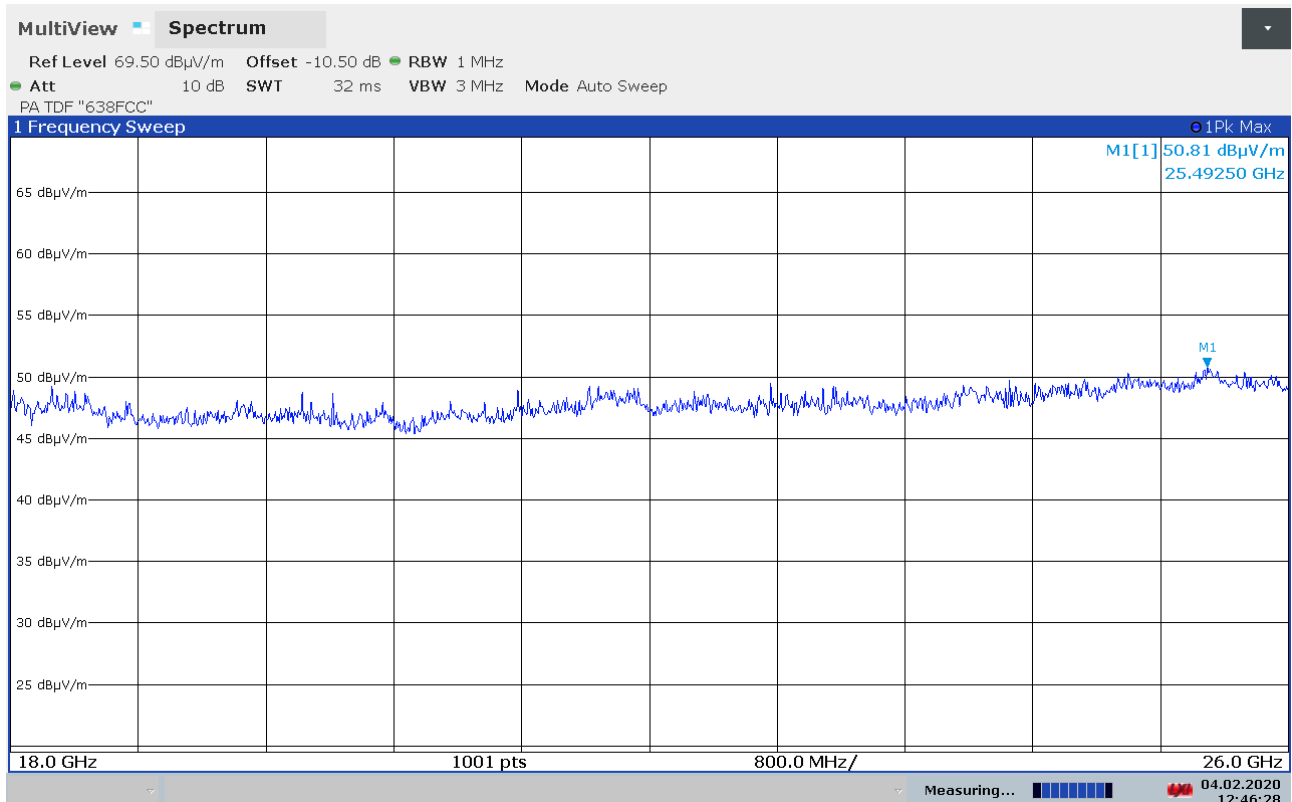
Radiated Emissions, 3000 -18000 MHz, 2462 MHz, HP, 802.11g, 54Mbps



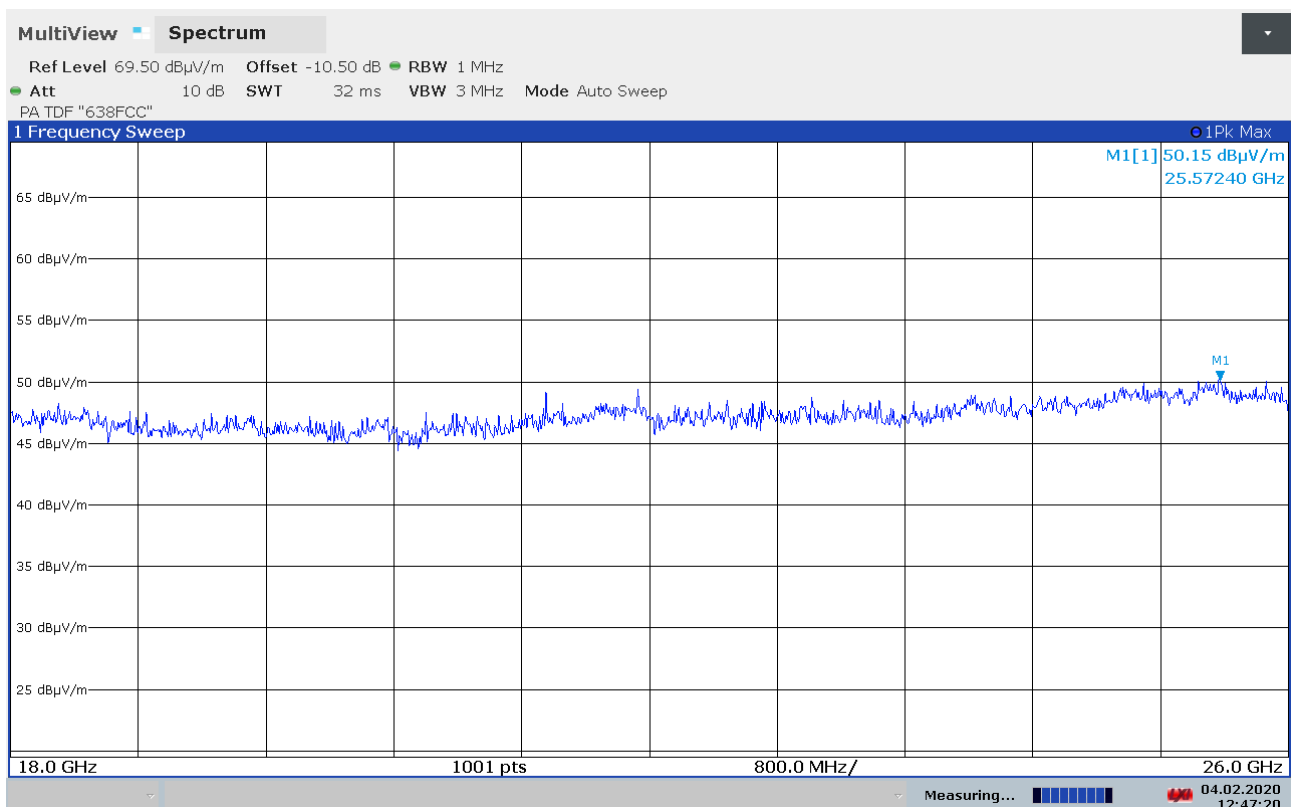
Radiated Emissions, 18 -26 GHz, 2412 MHz, VP, 802.11b, 11Mbps, @1m



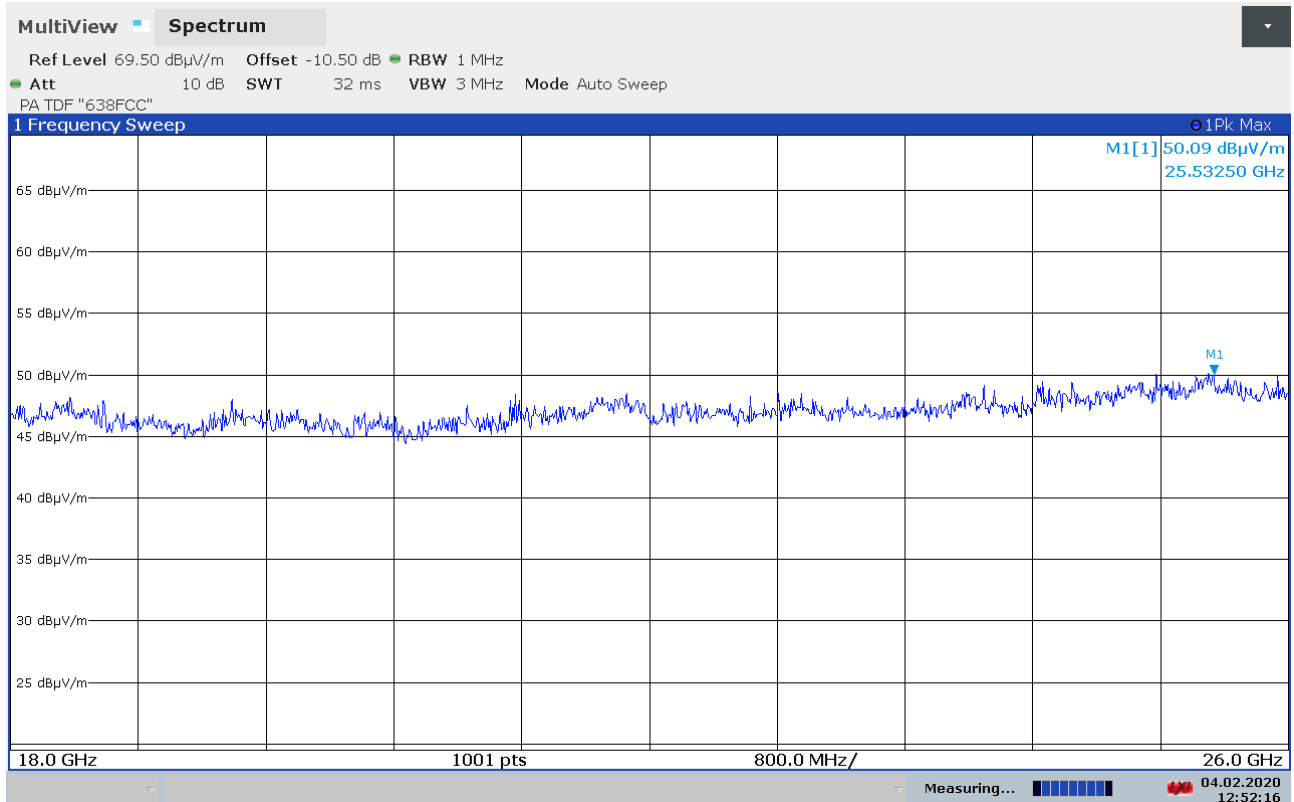
Radiated Emissions, 18 -26 GHz, 2412 MHz, HP, 802.11b, 11Mbps, @1m



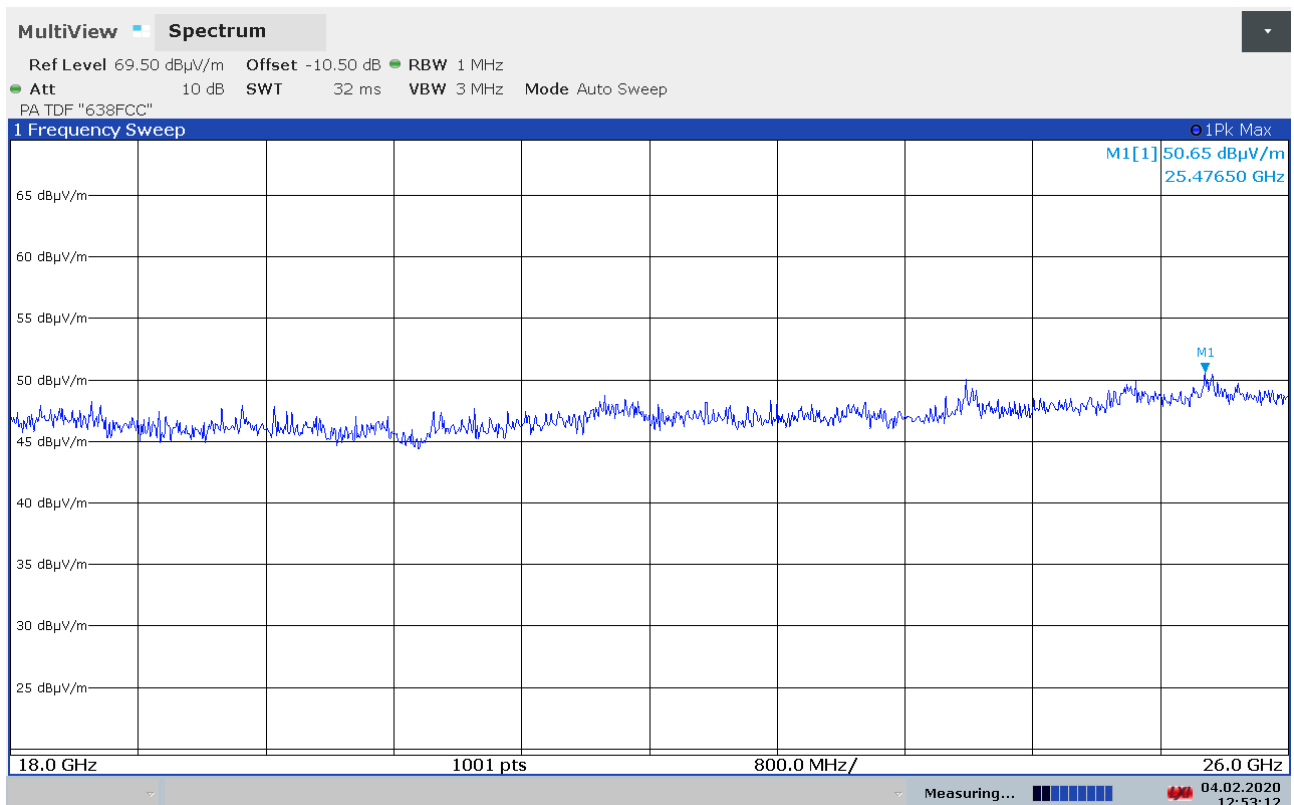
Radiated Emissions, 18 -26 GHz, 2437 MHz, VP, 802.11b, 11Mbps, @1m



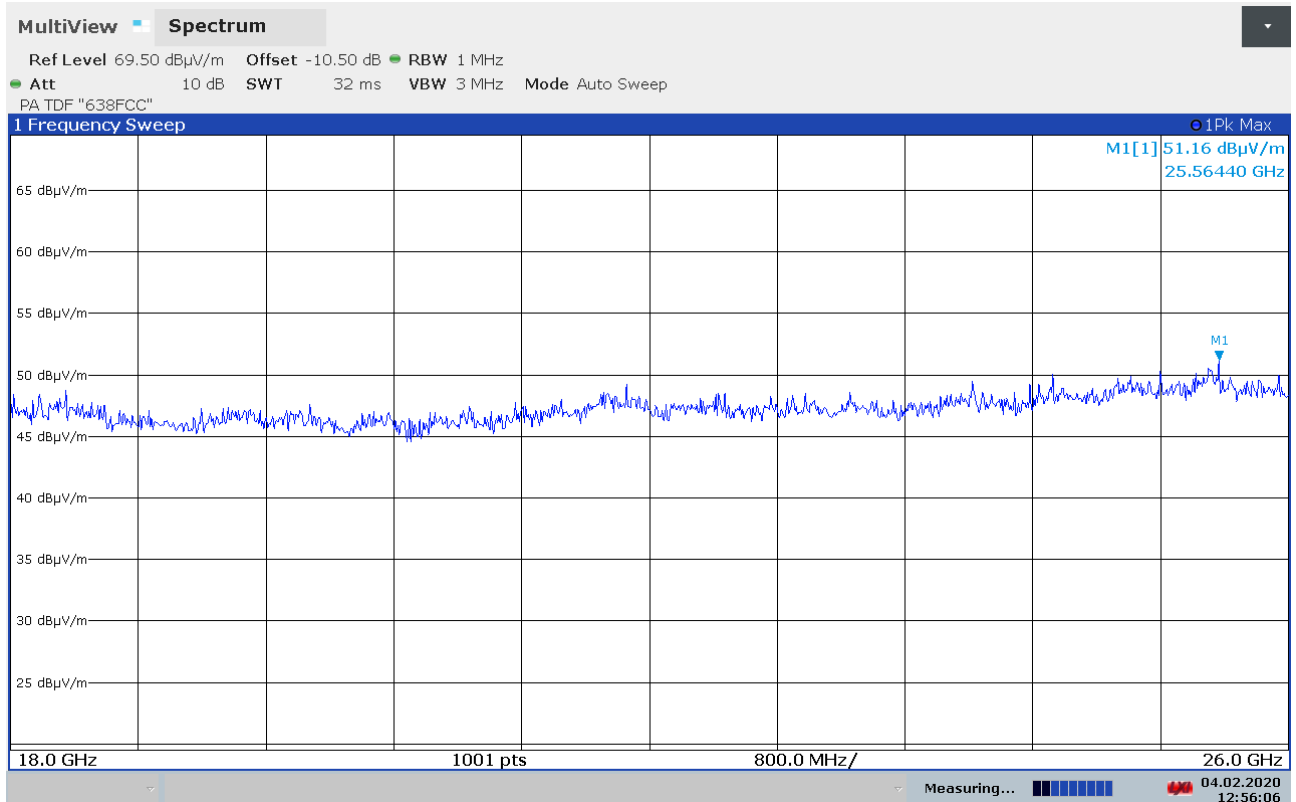
Radiated Emissions, 18 -26 GHz, 2437 MHz, HP, 802.11b, 11Mbps, @1m



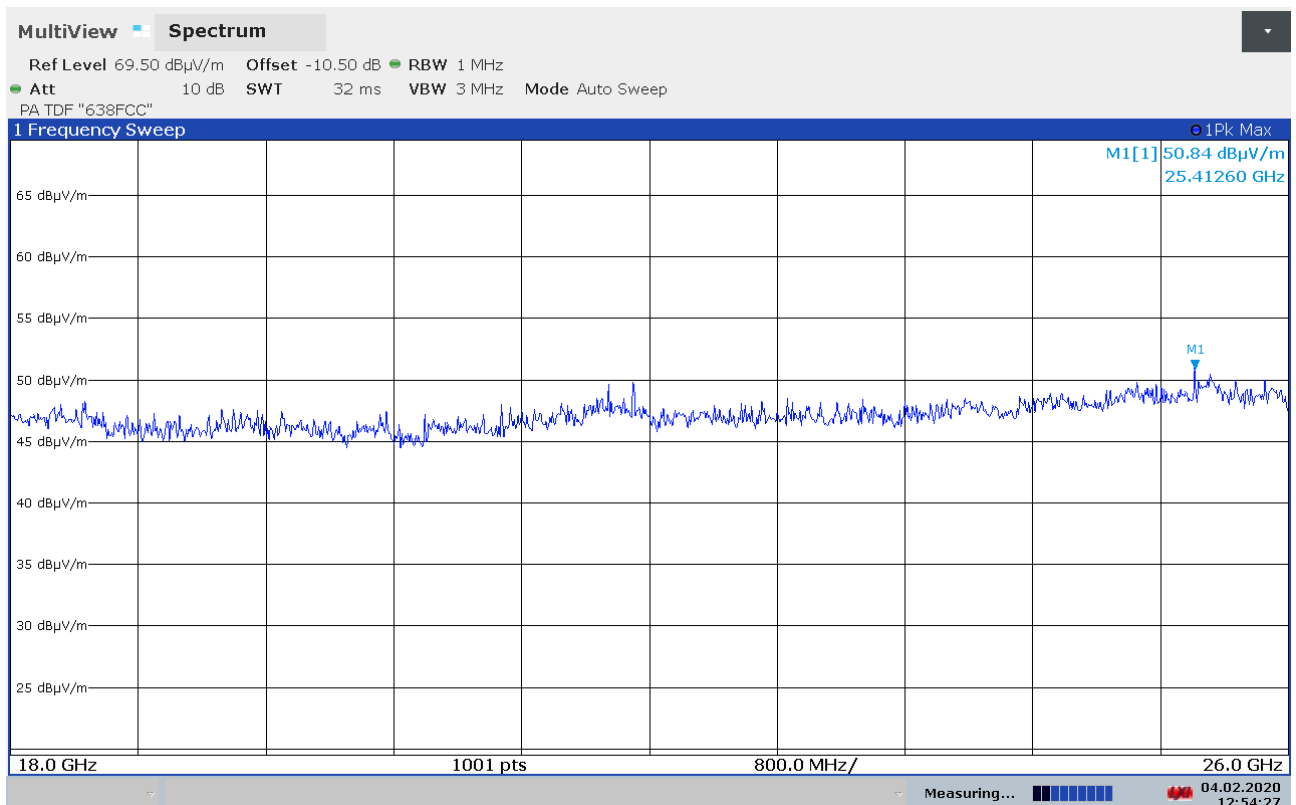
Radiated Emissions, 18 -26 GHz, 2437 MHz, VP, 802.11g, 54Mbps, @1m



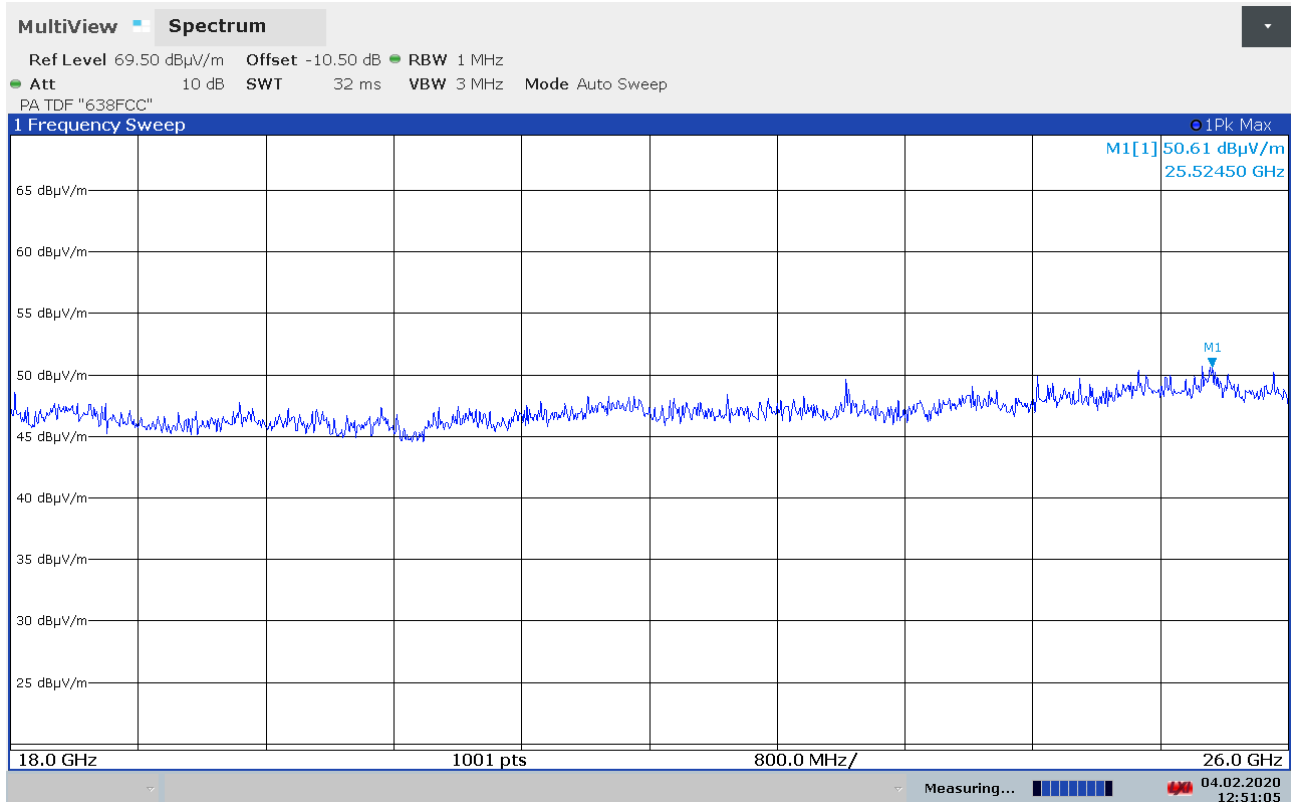
Radiated Emissions, 18 -26 GHz, 2437 MHz, HP, 802.11g, 54Mbps, @1m



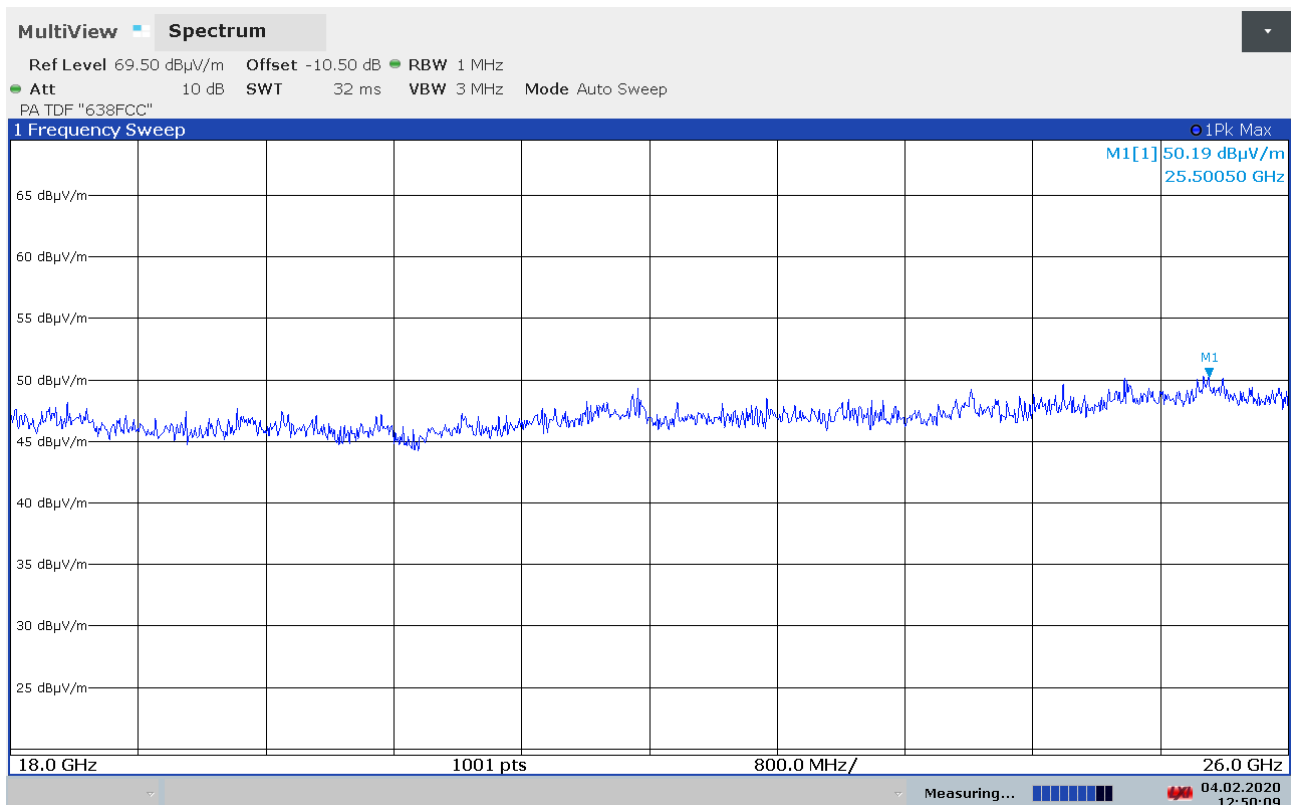
Radiated Emissions, 18 -26 GHz, 2437 MHz, VP, 802.11n, MCS7, @1m



Radiated Emissions, 18 -26 GHz, 2437 MHz, HP, 802.11n, MCS7, @1m



Radiated Emissions, 18 -26 GHz, 2462 MHz, VP, 802.11b, 11Mbps, @1m



Radiated Emissions, 18 -26 GHz, 2462 MHz, HP, 802.11b, 11Mbps, @1m

3.10 Power Spectral Density (PSD)

FCC part 15.247(d)

ISED Canada RSS-247 Issue 2, Clause 5.2 (2)

Measurement procedure: ANSI C63.10-2013 Clause 11.10

Test Results: Complies

Measurement Data:

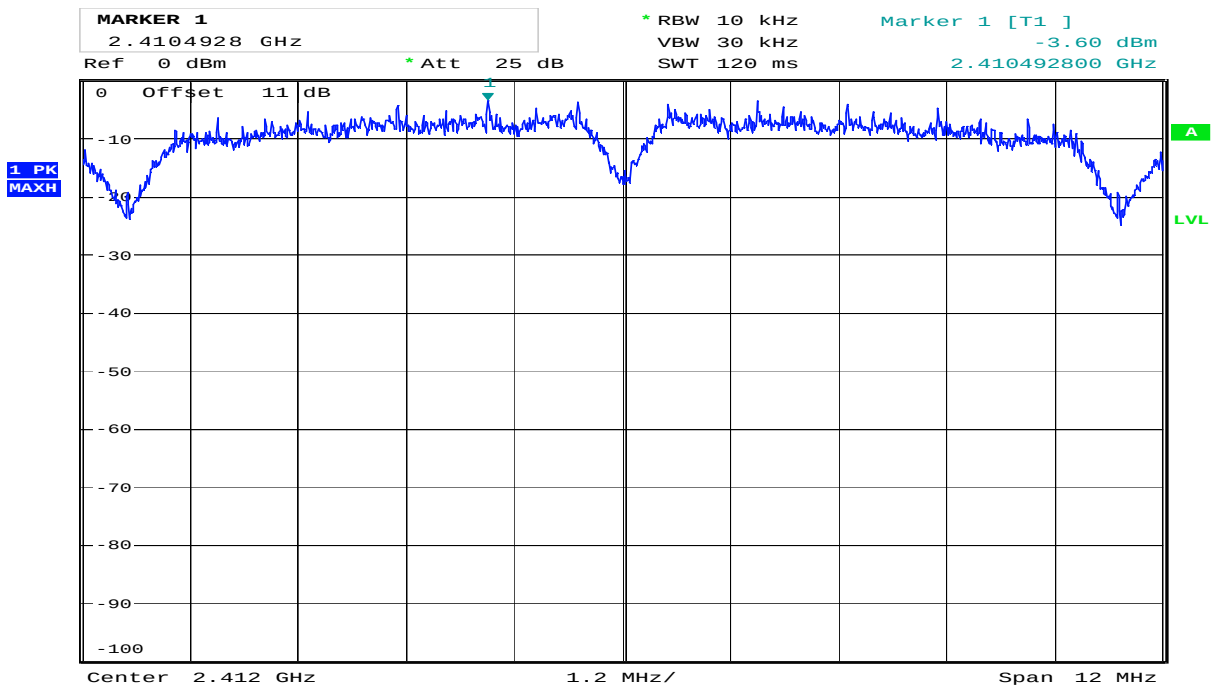
The measurement procedure PKPSD described in ANSI C63.10-2013 was used.

Carrier Frequency (MHz)	Power Spectral Density (dBm/3kHz)		
	802.11b, 1 Mbps	802.11g, 54 Mbps	802.11n, MCS7
2412	-8.8	-12.8	-11.0
2442	-9.0	-13.3	-11.3
2462	-9.6	-14.0	-12.2

The measured values with 10kHz RBW are corrected by a Bandwidth Correction Factor of -5.2 dB.

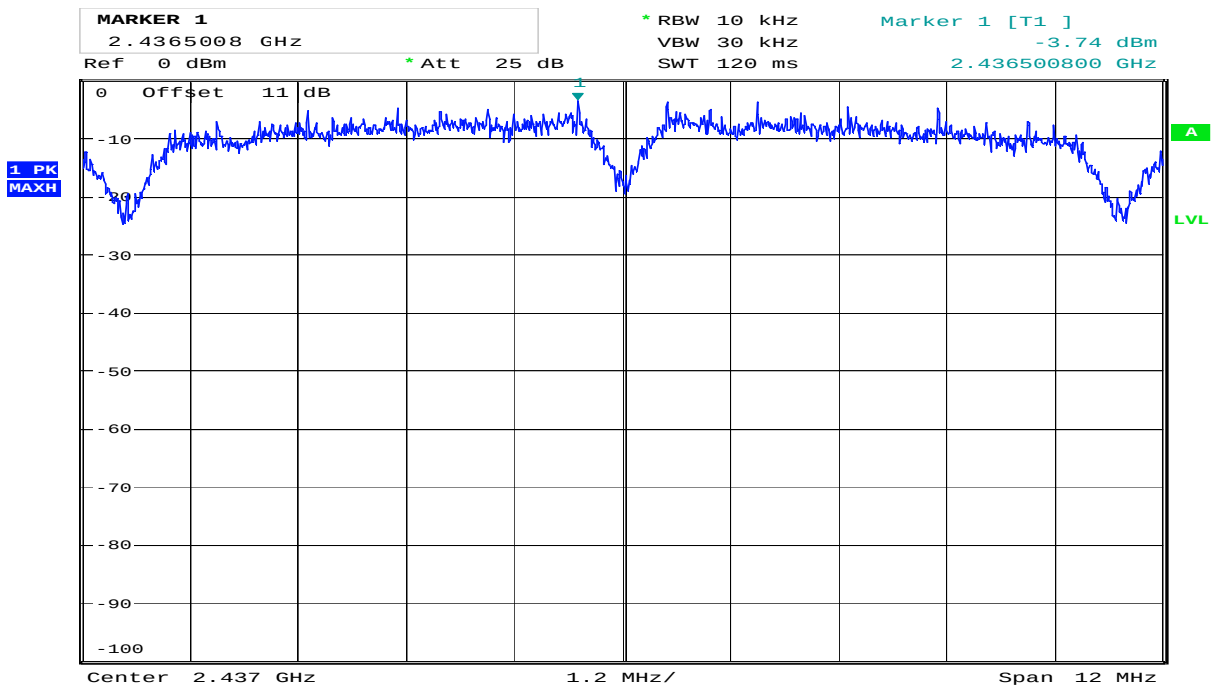
Requirements:

The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band



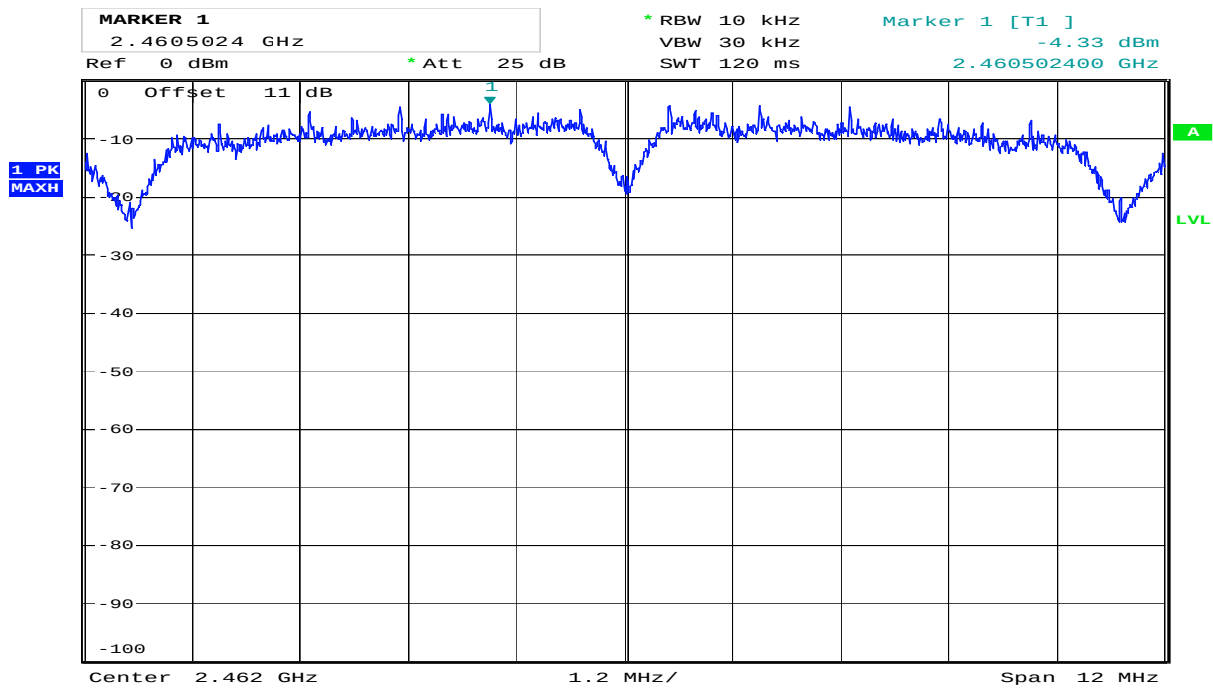
Date: 3.FEB.2020 12:05:15

PSD, 2412 MHz, 802.11b, 1 Mbps



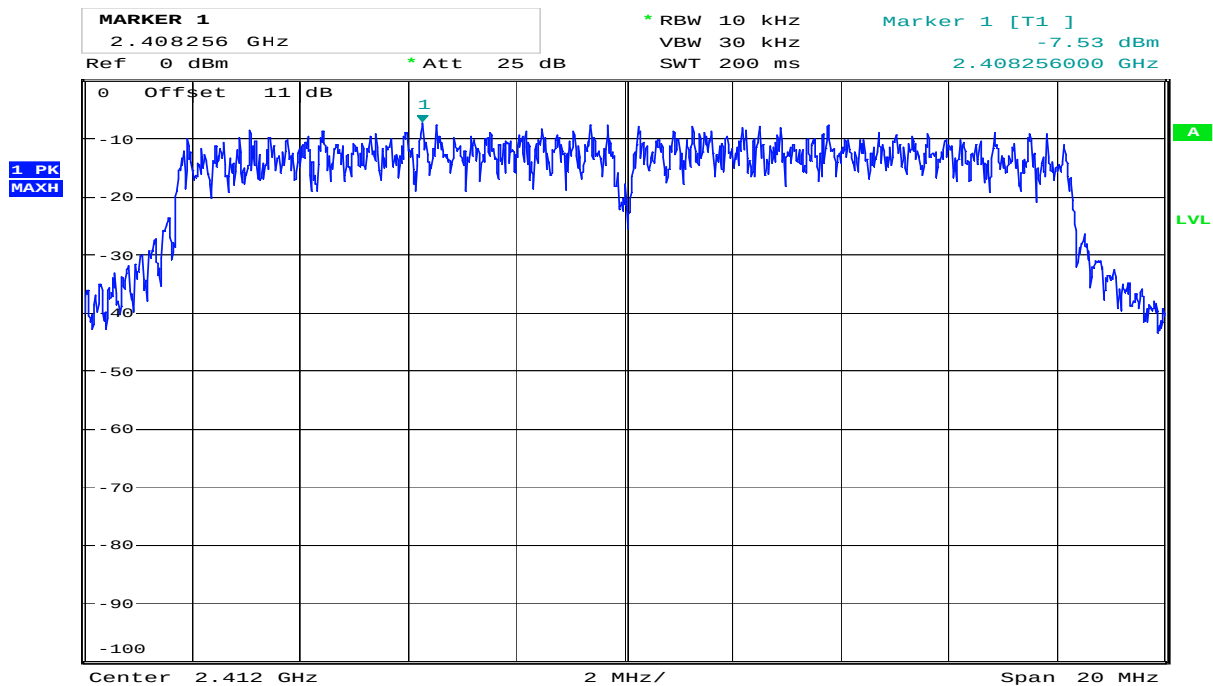
Date: 3.FEB.2020 12:06:48

PSD, 2437 MHz, 802.11b, 1 Mbps



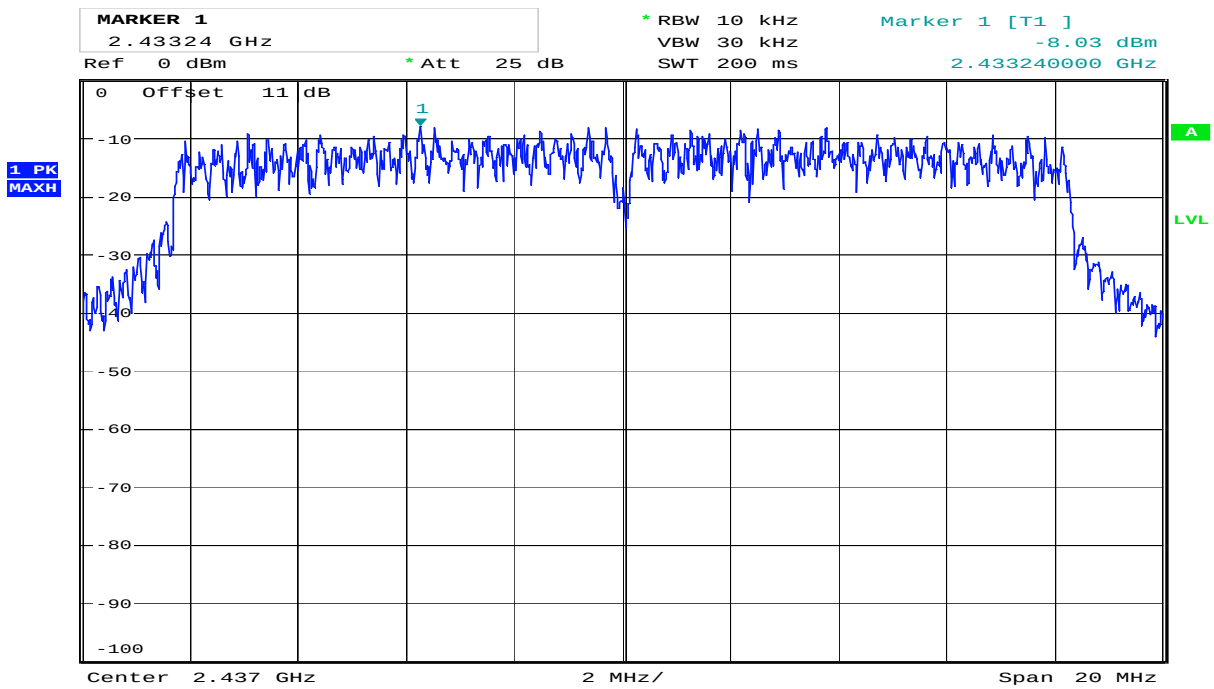
Date: 3.FEB.2020 12:07:36

PSD, 2462 MHz, 802.11b, 1 Mbps



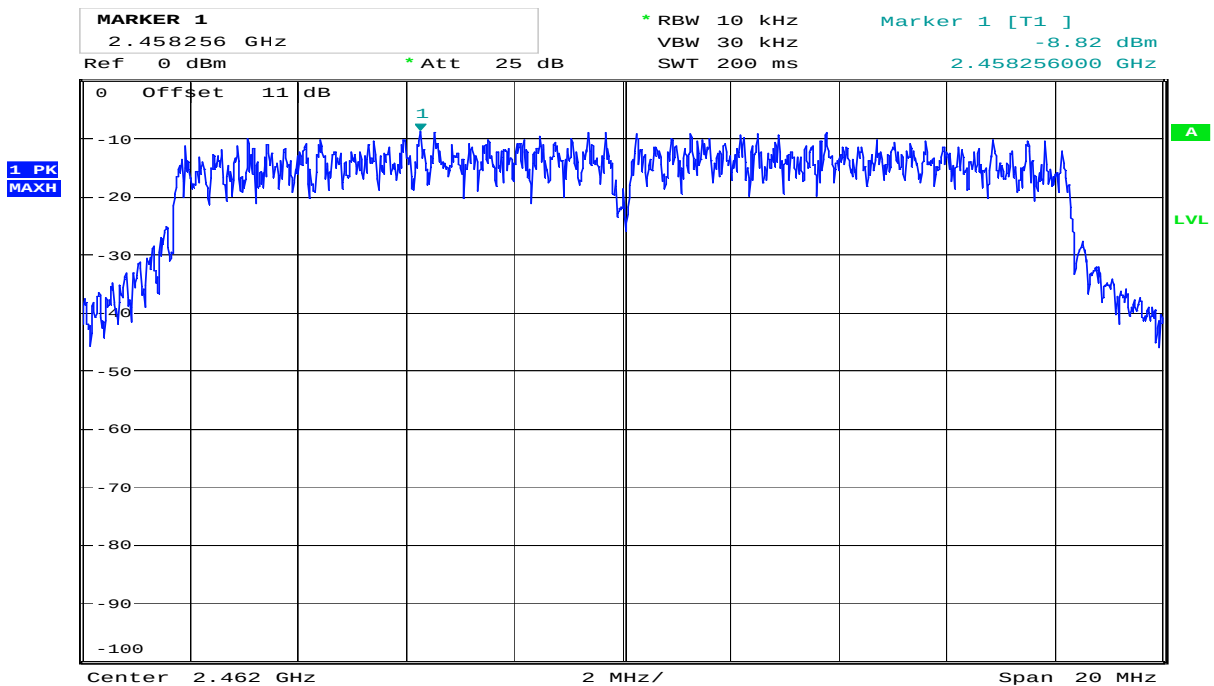
Date: 3.FEB.2020 11:49:41

PSD, 2412 MHz, 802.11g, 54 Mbps



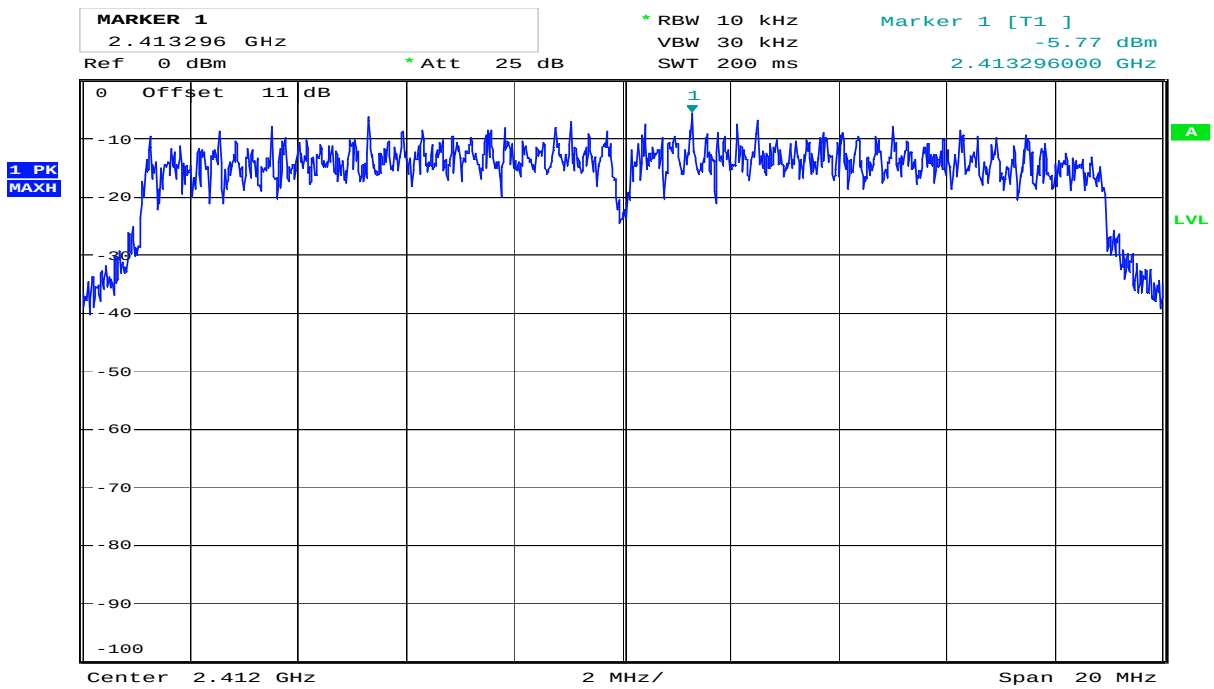
Date: 3.FEB.2020 12:10:39

PSD, 2437 MHz, 802.11g, 54 Mbps



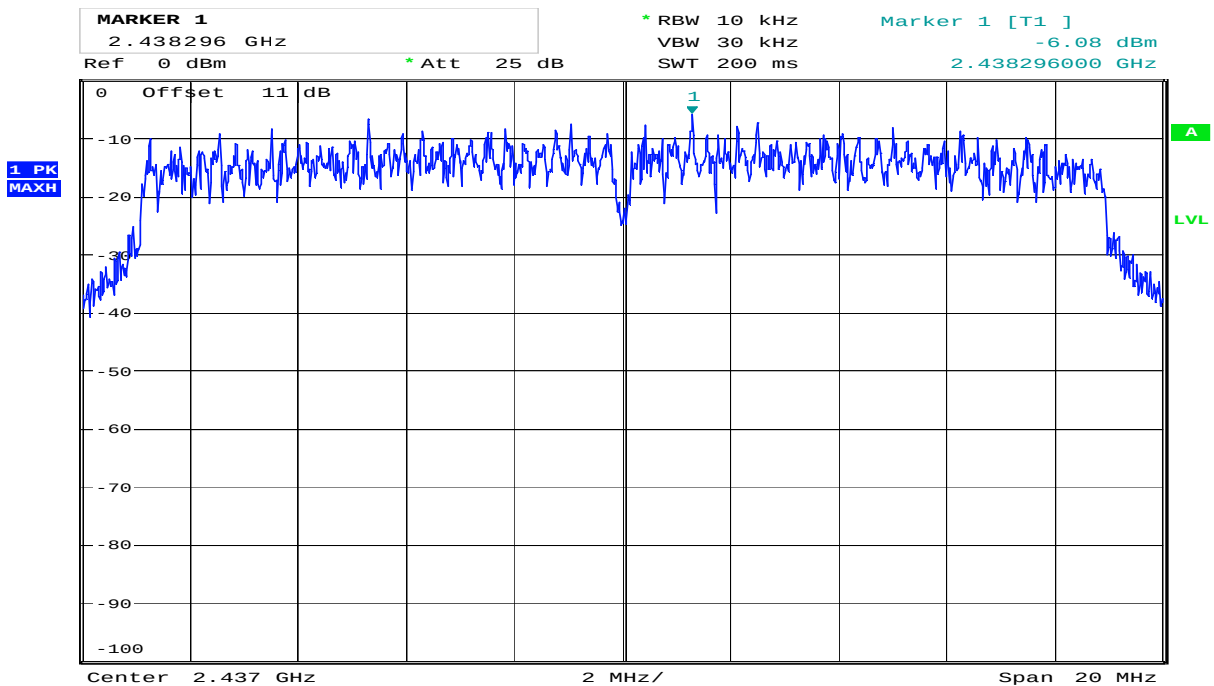
Date: 3.FEB.2020 12:09:38

PSD, 2462 MHz, 802.11g, 54 Mbps



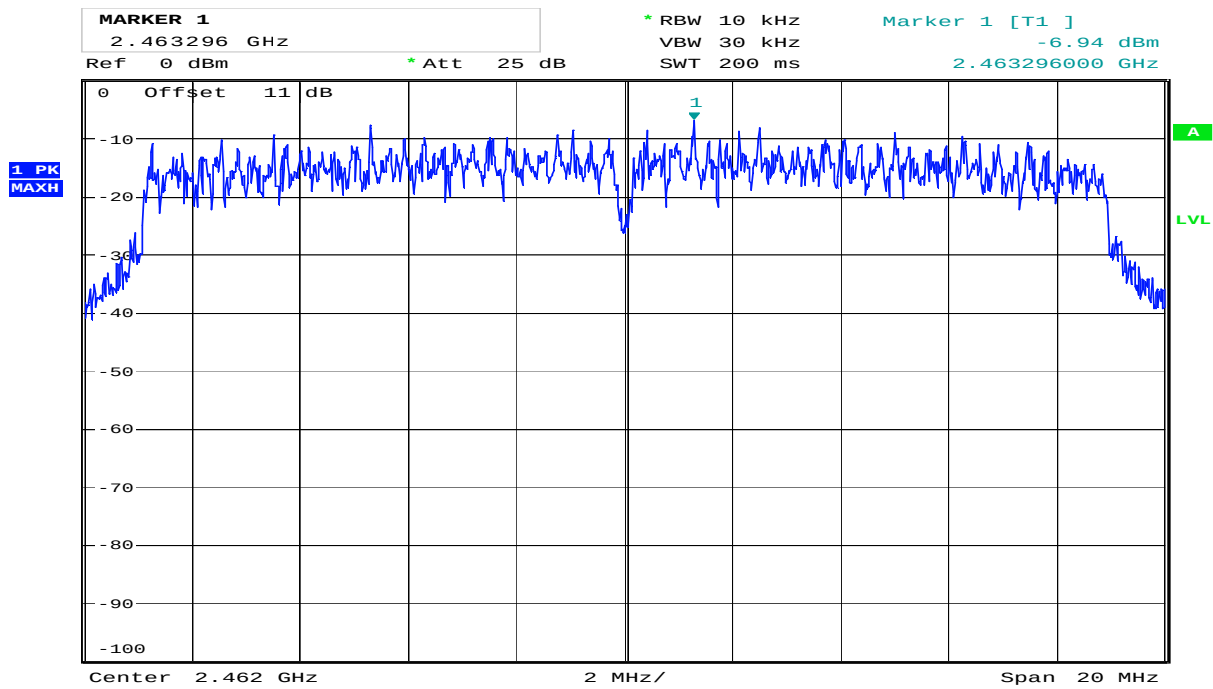
Date: 3.FEB.2020 11:50:52

PSD, 2412 MHz, 802.11n, MCS7



Date: 3.FEB.2020 12:11:19

PSD, 2437 MHz, 802.11n, MCS7



Date: 3.FEB.2020 12:08:43

PSD, 2462 MHz, 802.11n, MCS7

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2020-01	2021-01
2	FSU26	Measuring Receiver	Rohde & Schwarz	LR 1504	2020-01	2021-01
3	6810.17B	Attenuator	Narda	LR 1669	2019-07	2020-07
4	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	2019-07	2020-07
5	JB1	BiLog Antenna	SunAR	LR 1734	2018-05	2021-05
6	317	Preamplifier	Sonoma Inst.	LR 1687	2019-07	2020-07
7	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2019-07	2020-07
8	3115	Horn Antenna	EMCO	LR 1330	2016-10	2021-10
9	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2017-12	2020-12
10	Model 638	Antenna Horn	Narda	LR 1480	2010-06	2020-06
11	Model 87 V	Multimeter	Fluke	LR 1597	2018-02	2020-02
12	6812B	AC Power Source	Agilent	LR 1515	COU	
14	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2019-11	2021-11
15	ESC13	Measuring Receiver	Rohde & Schwarz	N-4259	2019-10	2021-10
16	ST18/SMA/N/72	RF Cable	Suhner	LR 1705	COU	

Note: COU – calibrate on use; N/A – Not Applicable

The software listed below has been used for one or more tests.

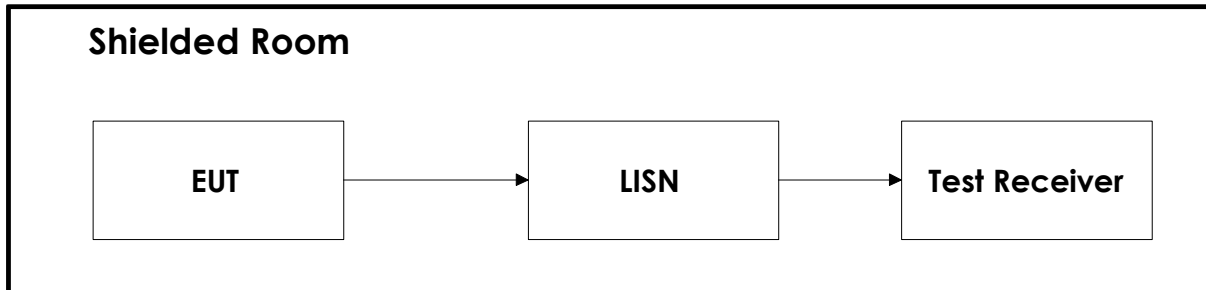
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.10	Power Line Conducted test software
2	Rohde & Schwarz	GPBShot	2.7	Screenshots from R&S Spectrum Analyzers

Revision history

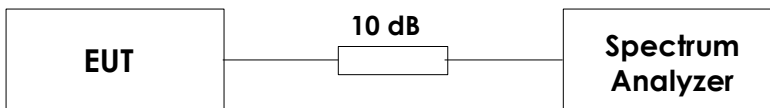
Revision	Date	Comment	Sign
00	2020-03-10	First edition	FS

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission

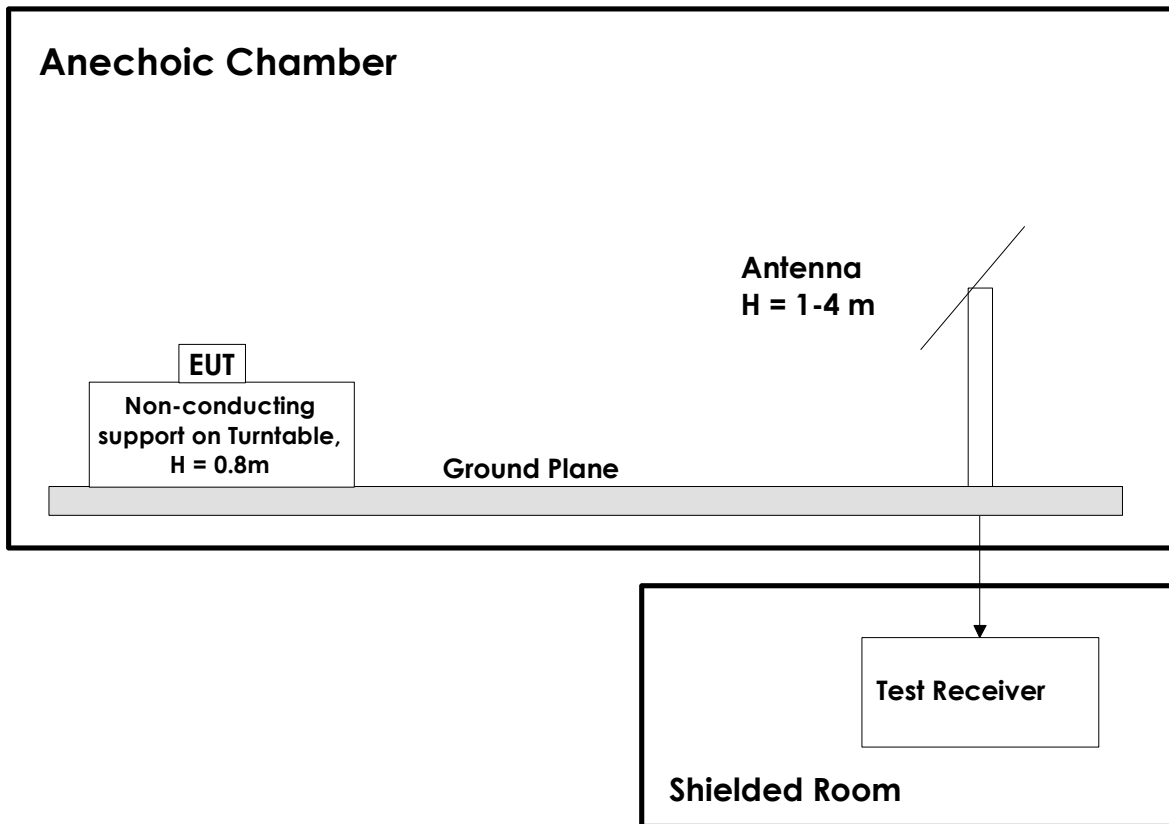


6.2 Conducted Tests



This test set-up is used for all Conducted tests.
For Frequency Stability test the EUT was placed in a climatic chamber.

6.3 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. Measuring distance is 3m for all frequencies below 18 GHz, and 1m above 18 GHz. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna.

All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers.

A pre-amplifier is used for all measurements, and High-Pass filter is used for all harmonics.