Report No. 380626-06-R01

Test Report

Product	DECT Handset with WiFi and Android
Name and address of the applicant	Ascom Sweden AB Grimbodalen 2 SE-41749 Gothenburg, Sweden
Name and address of the manufacturer	Ascom Sweden AB Grimbodalen 2 SE-41749 Gothenburg, Sweden
Model	SH2
Rating	3.8 V_{DC} (Li-Ion Battery, 2935mAh)
Trademark	ASCOM
Serial number	See clause 1.1
Additional information	DECT 6.0, WiFi, Bluetooth
Tested according to	**Parts of FCC Part 15.247** Frequency Hopping Transmitters / Digital Transmission Systems **Parts of 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	380626
Tested in period	2020-06-08 to 2020-06-11 and 2020-06-24 to 2020-06-25
Issue date	2020-06-29
Name and address of the testing laboratory	Instituttveien 6 Kjeller, Norway CAB Number: FCC: NO0001 ISED: NO0470 **An accredited technical test executed under the Norwegian accreditation scheme**

Prepared by [Frode Sveinsen]	Approved by [G.Suhanthakumar]

Template version: C

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1 INFORMATION

1.1 Test Item

Name	**Ascom**
Model/version	**Myco 3**
FCC ID	**BXZSH2D**
ISED ID	**3724B-SH2D**
Serial number	**Radiated Sample: SK00010041** **Conducted Sample: SK00025441**
Hardware identity and/or version	**SH2 P2A**
Software identity and/or version	**SH2_ADAA/2.0.0_alpha6**
Frequency Range	**2412 – 2462 MHz**
Number of Channels	**11**
Channel Separation	**5 MHz**
Operating Modes	**802.11b/g/n (HT20)**
Type of Modulation	**802.11b: DSSS** **802.11g/n: OFDM**
User Frequency Adjustment	**None**
Conducted Output Power	**802.11b: 58 mW** **802.11g: 103 mW** **802.11n HT20: 103 mW** **802.11n HT40: 272 mW**
Power Supply	**Secondary Battery (3.8V Li-Ion, 2935 mAh)**
Desktop Charger	**DC5 with AC adaptor Model No. UBX310-0520**
Antenna Connector	**None**
Number of Antennas	**1**
Diversity or Smart Antennas	**No**

Description of Test Item

The tested device is a DECT Handset with 2.4GHz and 5GHz WiFi, BT, BT Low Energy and NFC.

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	3.8 V_{DC} (Nominal Voltage)

The values are the limit registered during the test period.

All tests were performed with a fully charged battery.

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, Mode and Duty Cycle

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. All measurements were performed with bitrate and duty cycle reported below.

Modulation	Worst Case Bitrate	Duty Cycle
802.11b	1 Mb	100 %
802.11g	6 Mb	100 %
802.11n HT20	MCS0	100 %
802.11n HT40	MCS0	100 %

1.8 EUT Operating Modes

Description of operating modes	Continuous TX, 2.4GHz, IEEE 802.11 b/g/n HT20/HT40
Additional information	A computer was connected by USB to the EUT. The selected channel, modulation, bitrate, bandwidth and output power was then programmed from the WiFi Tool application.

1.9 Power Levels

The WiFi part of the EUT is identical to the WiFi part of the already certified handset (FCC ID: BXZSH2, IC: 3724B-SH2), except the cellular radio is replaced by DECT.

Output Power for 2.4GHz WiFi has been lowered on this model, Output Power values below were used for all tests on this model.

	Modulation and Power Level			
Carrier No	**802.11b**	**802.11g**	**802.11n HT20**	**802.11n HT40**
1 to 11	**14**	**14**	**14**	**-**
3 to 9	**-**	**-**	**-**	**20**

1.10 Comments

All tested parameters are passed.

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and ISED 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 distance of 3m.

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

☒ 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”.

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)	**N/A**[1]
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 (99% BW)	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**

[1] Covered by UPCS test report

Revision history

Revision	Date	Comment	Sign
00	2020-06-18	First edition	FS
01	2020-06-29	Revised with HT40 results	FS

3 TEST RESULTS

3.1 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:

Number of RF channels in use: 11

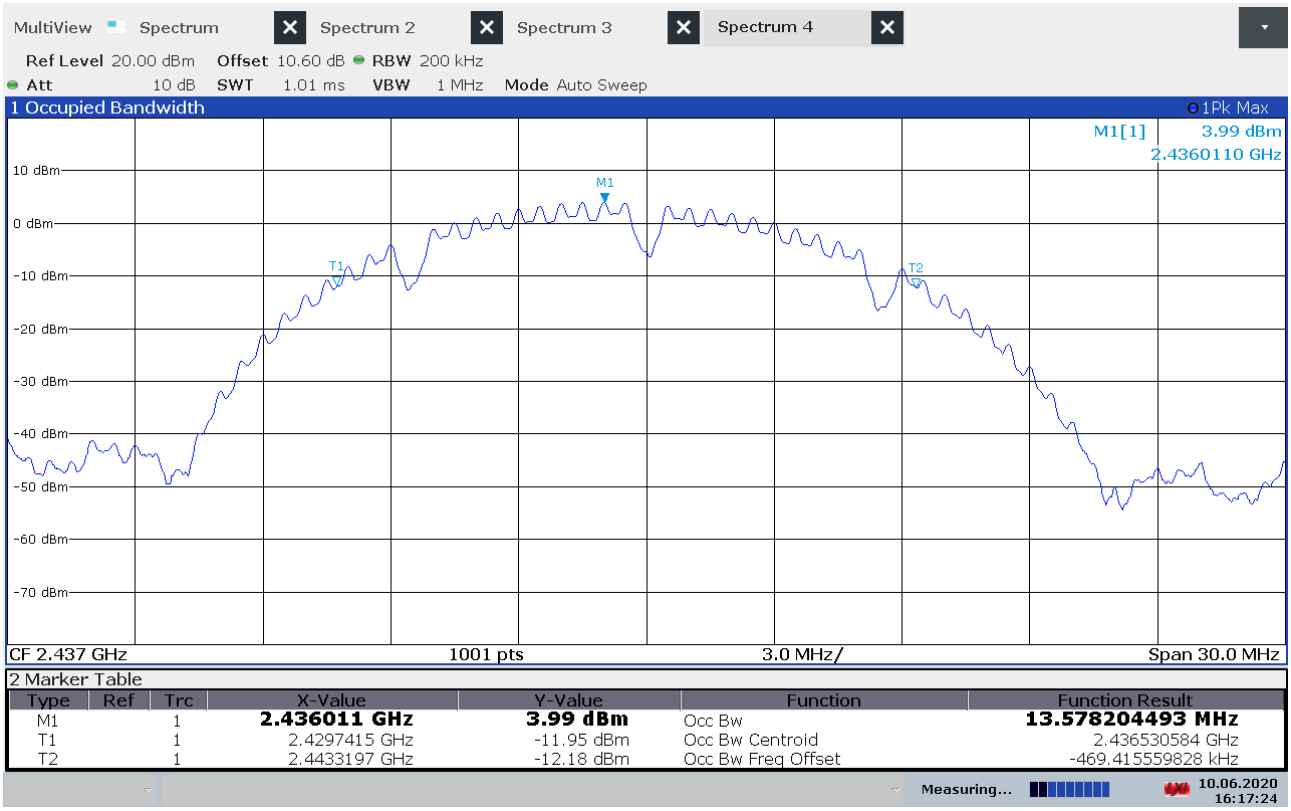
Modulation type and bitrate	Occupied Bandwidth (99% BW)
802.11b, 1 Mbps	13.6 MHz
802.11g, 6 Mbps	16.6 MHz
802.11n, HT20	17.6 MHz
802.11n, HT40	36.3 MHz

Occupied Bandwith is reported for information only.

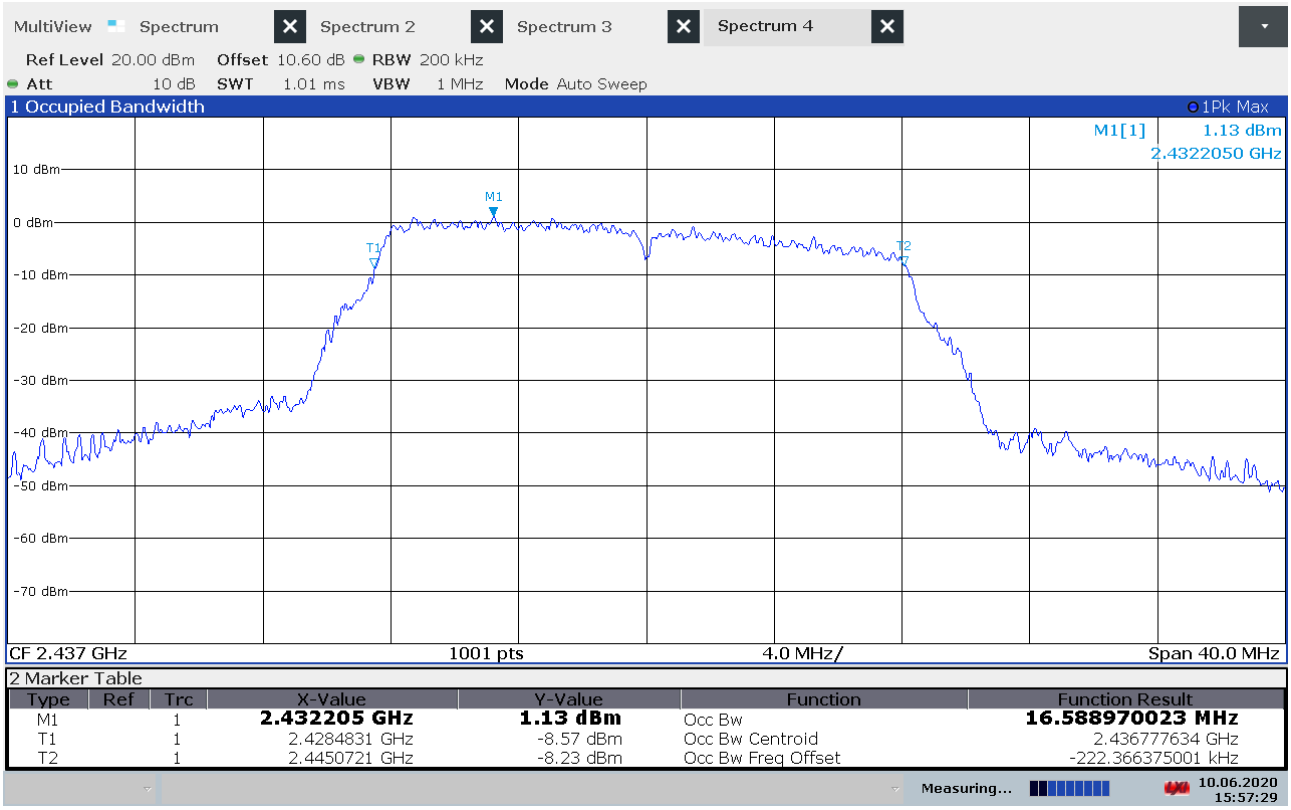
See attached plots

Requirements:

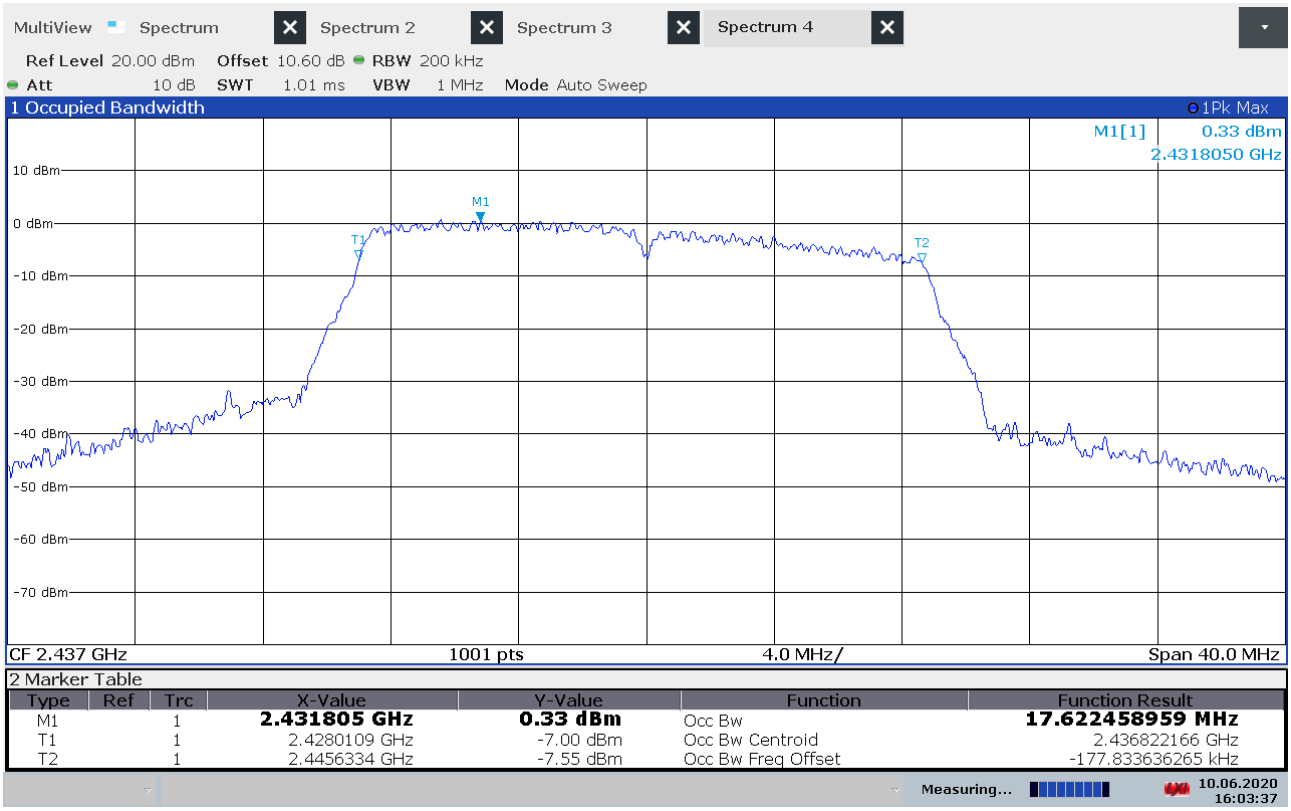
No requirements for Digital Transmission Systems.



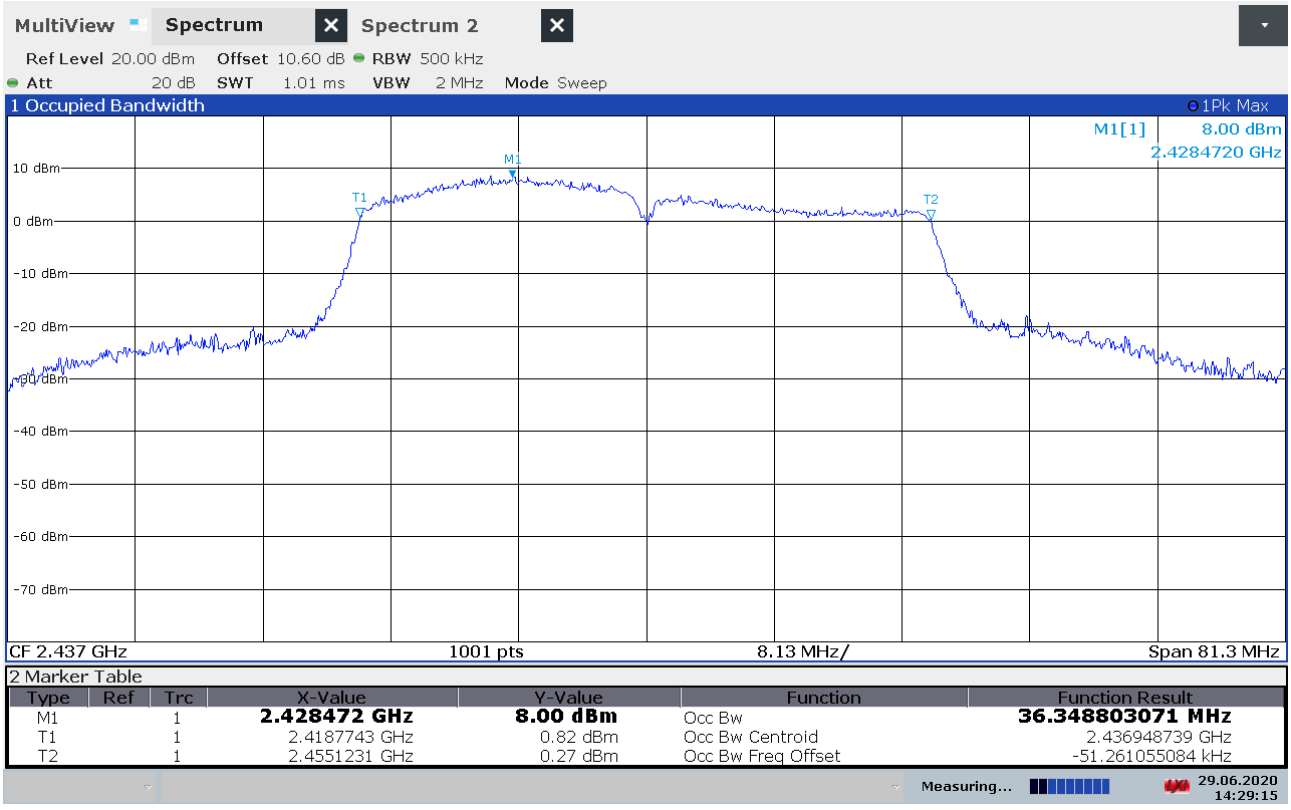
Occupied Bandwidth, 2437 MHz, 802.11b, 1Mbps



Occupied Bandwidth, 2437 MHz, 802.11g, 6Mbps



Occupied Bandwidth, 2437 MHz, 802.11n, MCS0, HT20



Occupied Bandwidth, 2437 MHz, 802.11n, MCS0, HT40

3.2 DTS Bandwidth

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 2, Clause 5.2 (1)

Measurement procedure: **ANSI C63.10-2013 Clause 11.8**

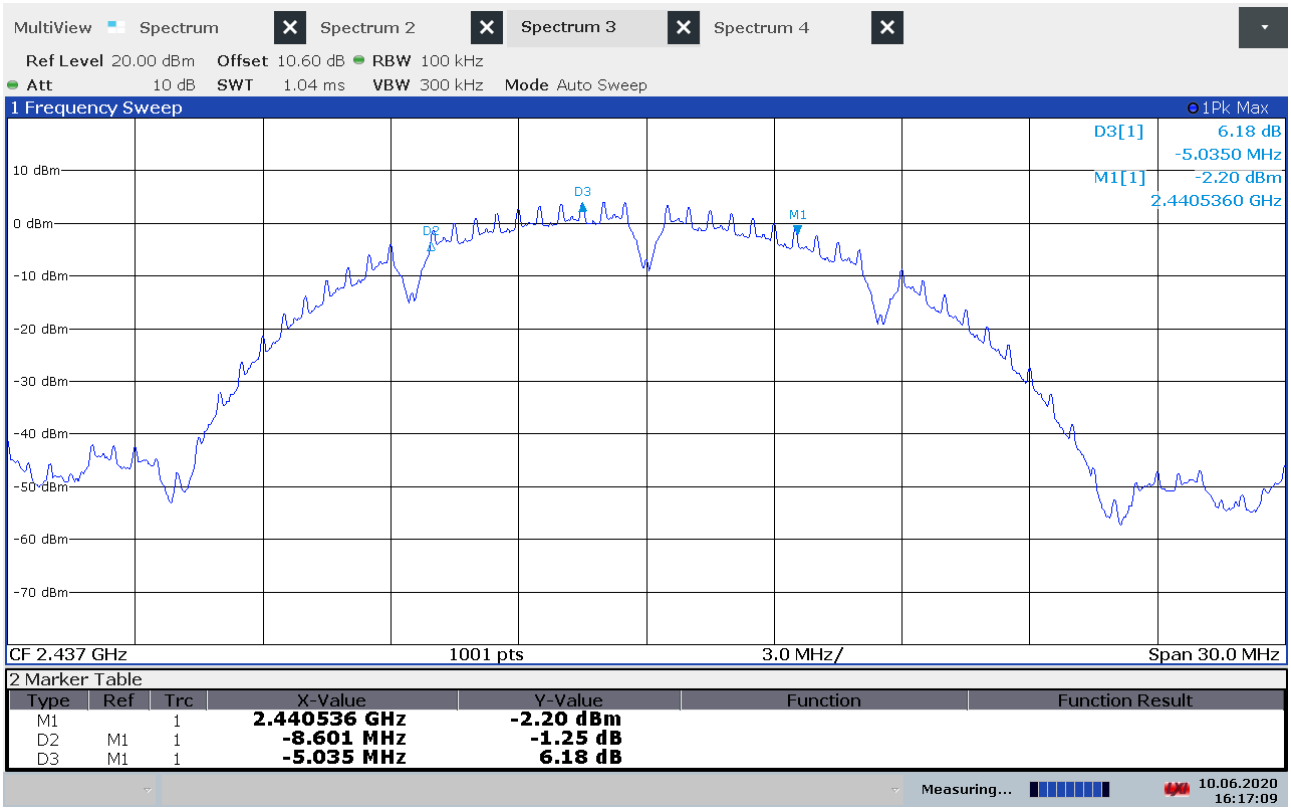
Test Results: **Complies**

Measurement Data:

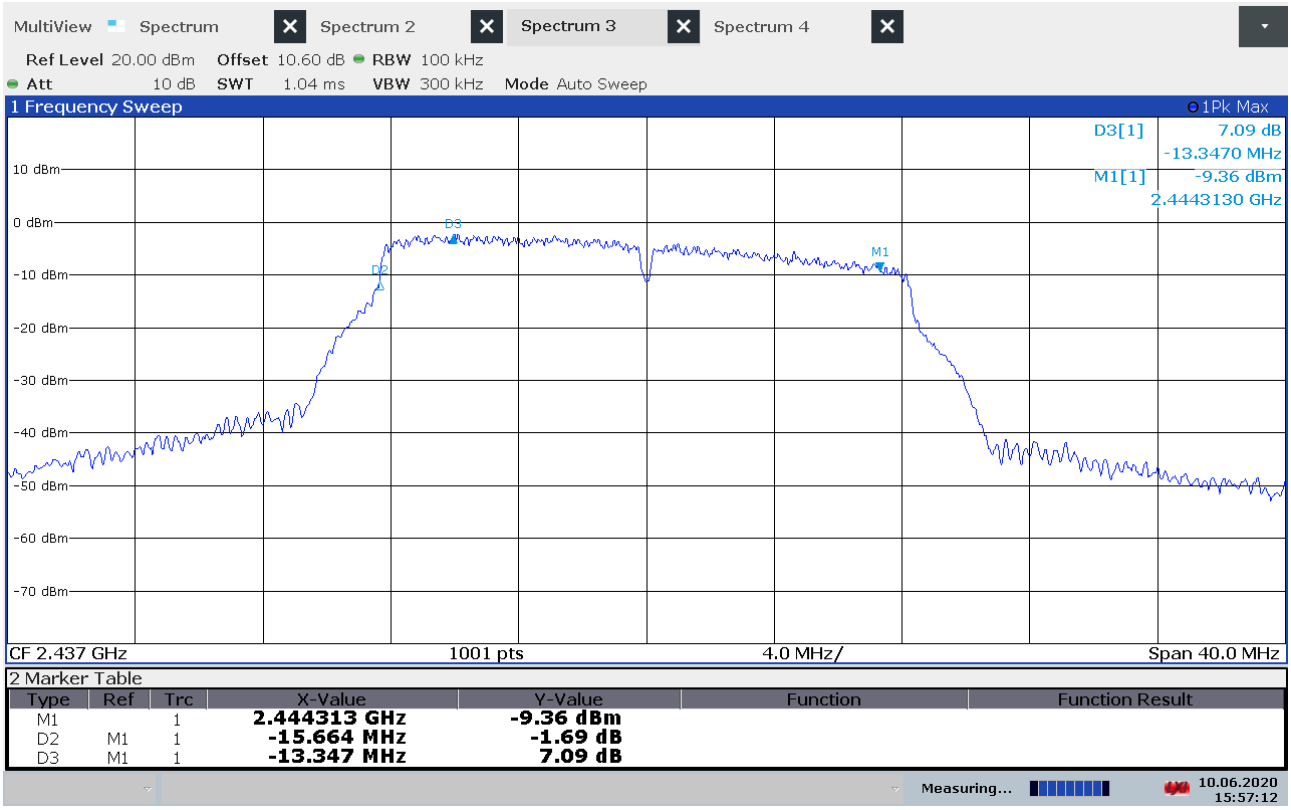
Modulation type and bitrate	Measured DTS Bandwidth
	Ch 06, 2437 MHz
802.11b, 1 Mbps	8.6 MHz
802.11g, 6 Mbps	15.7 MHz
802.11n, HT20	16.3 MHz
802.11n, HT40	36.0 MHz

Requirements:

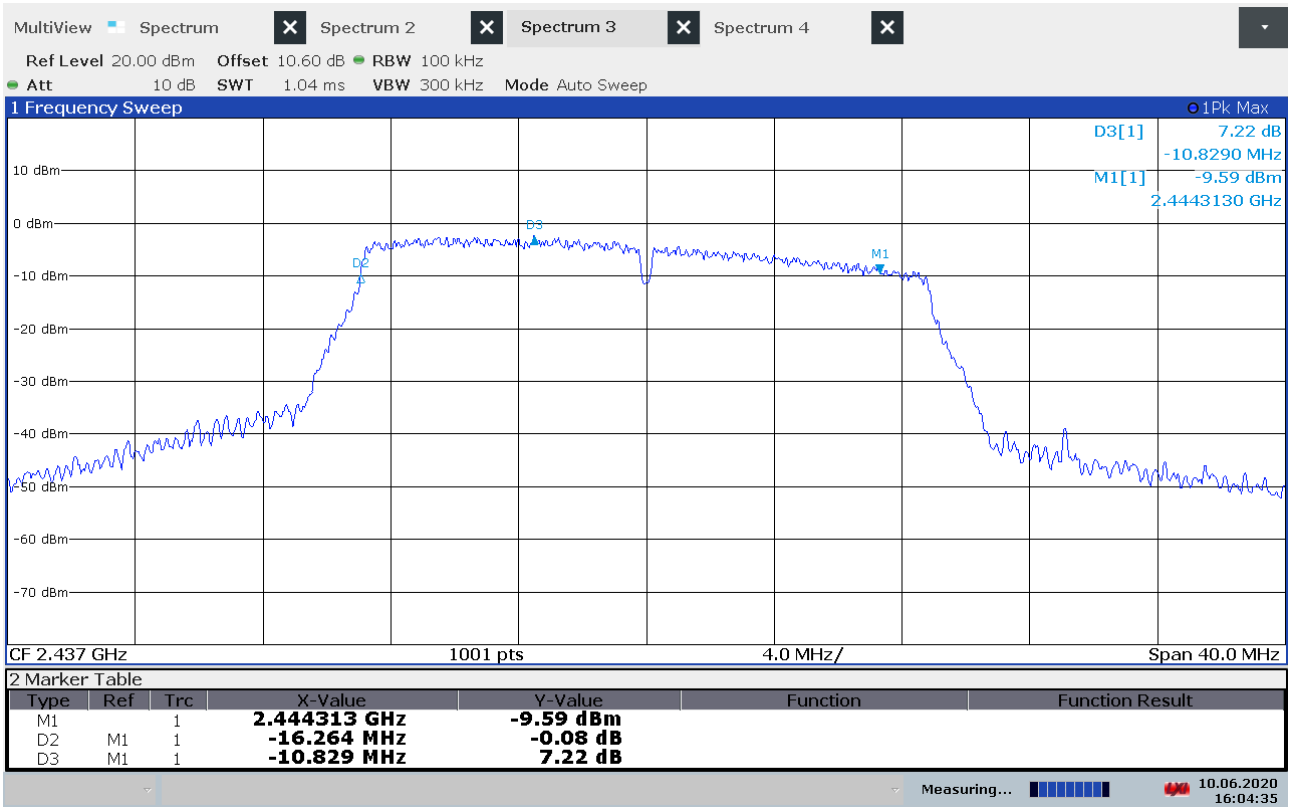
For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth (DTS BW) shall be at least 500 KHz.



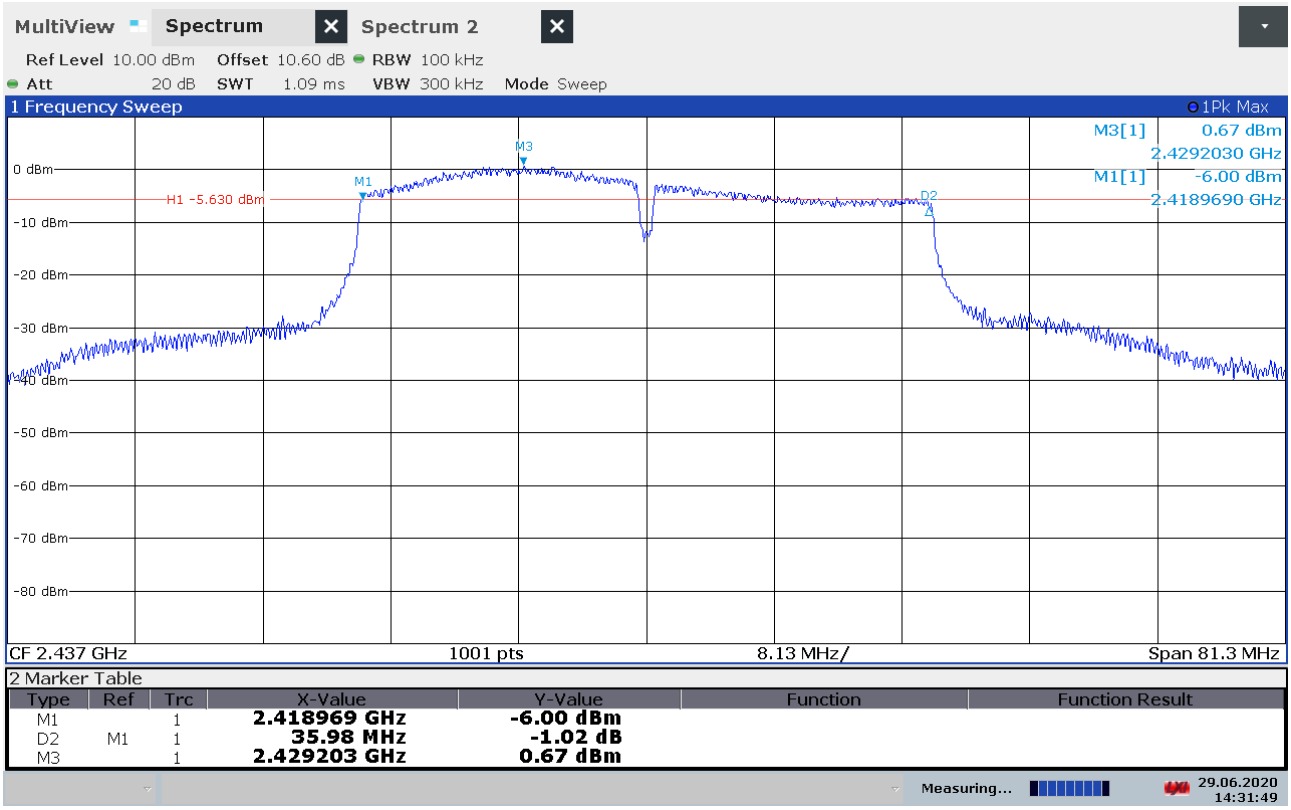
DTS Bandwidth, 2437 MHz, 802.11b, 1Mbps



DTS Bandwidth, 2437 MHz, 802.11g, 6Mbps



DTS Bandwidth, 2437 MHz, 802.11n, HT20



DTS Bandwidth, 2437 MHz, 802.11n, HT40

3.3 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:

Peak Power Levels				
		2412 MHz	2437 MHz	2462 MHz
802.11b 1Mbps	Conducted Power (dBm)	14.5	15.1	17.7
	Conducted Power (mW)	28.1	32.5	58.3
802.11g 6Mbps	Conducted Power (dBm)	17.8	18.3	20.1
	Conducted Power (mW)	60.0	67.8	102.6
802.11n HT20	Conducted Power (dBm)	17.6	18.7	20.1
	Conducted Power (mW)	57.5	74.3	102.6
		2422 MHz	2437 MHz	2452 MHz
802.11n HT40	Conducted Power (dBm)	24.3	24.0	23.5
	Conducted Power (mW)	272	253	224

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

Cable loss and Attenuator is included in the Conducted plots.

Transducer factor is included in the radiated plots.

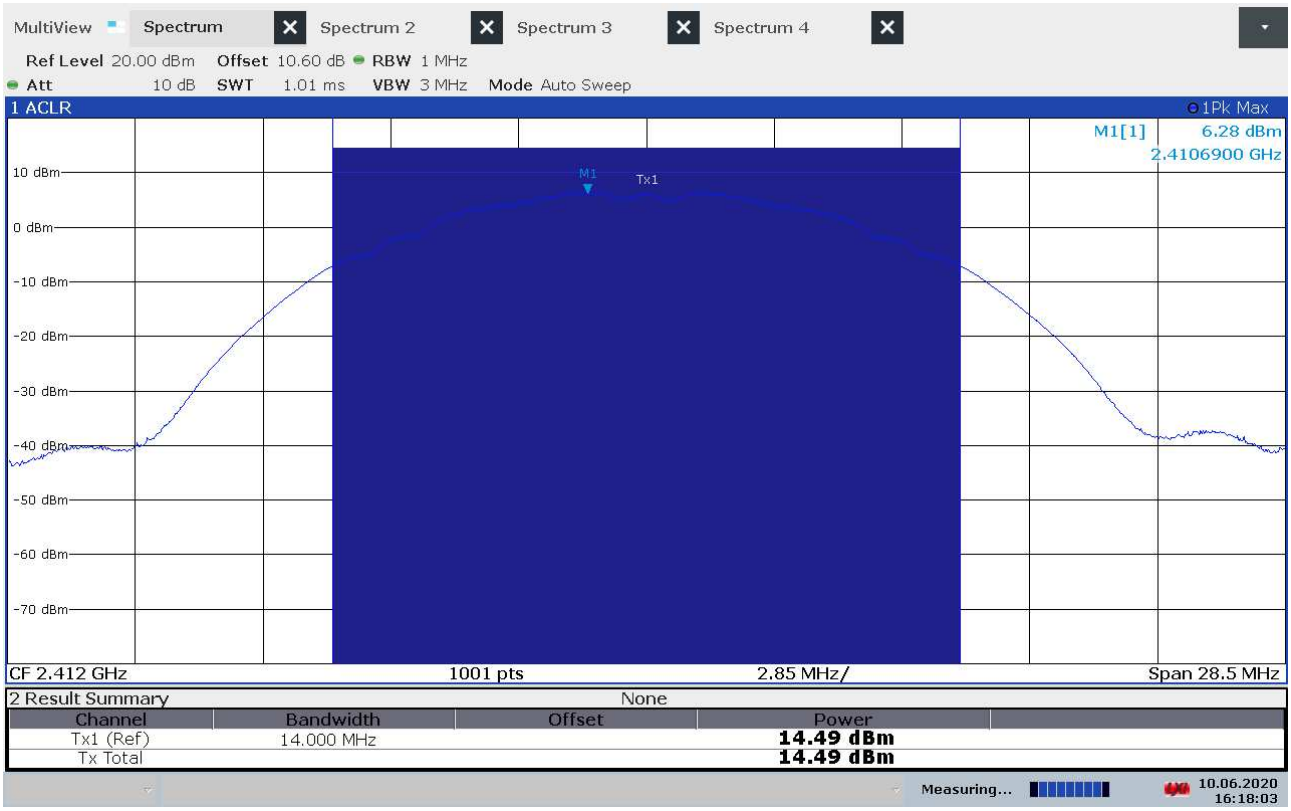
See attached plots

Requirements:

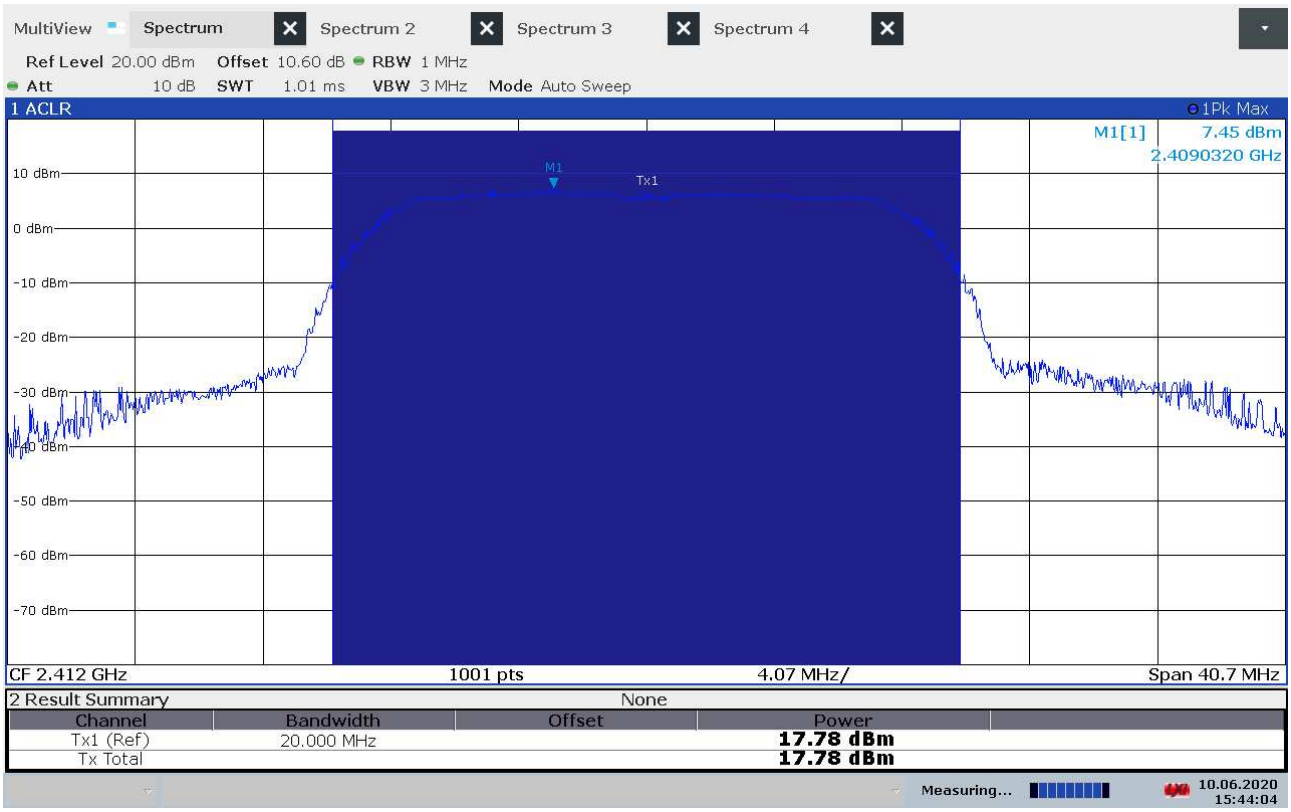
The maximum peak output power shall not exceed the following limits:

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

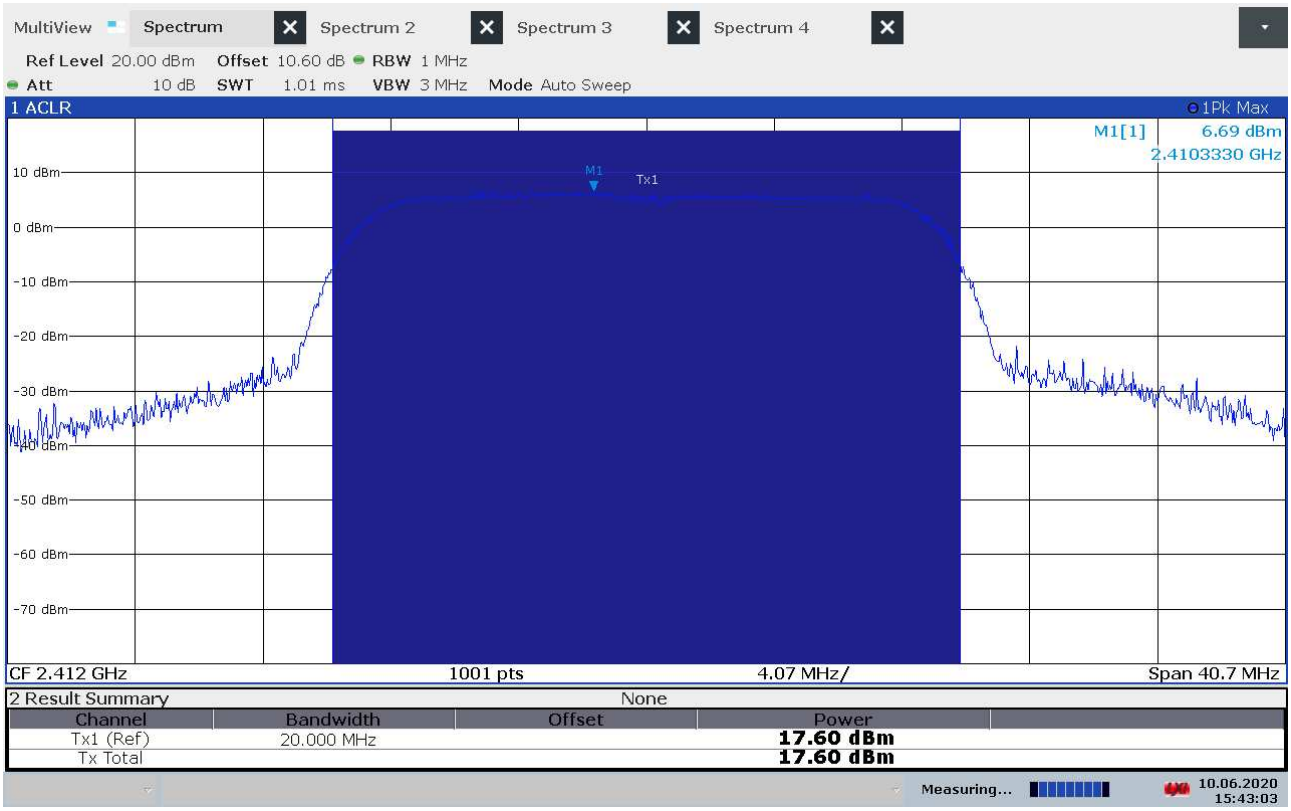
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



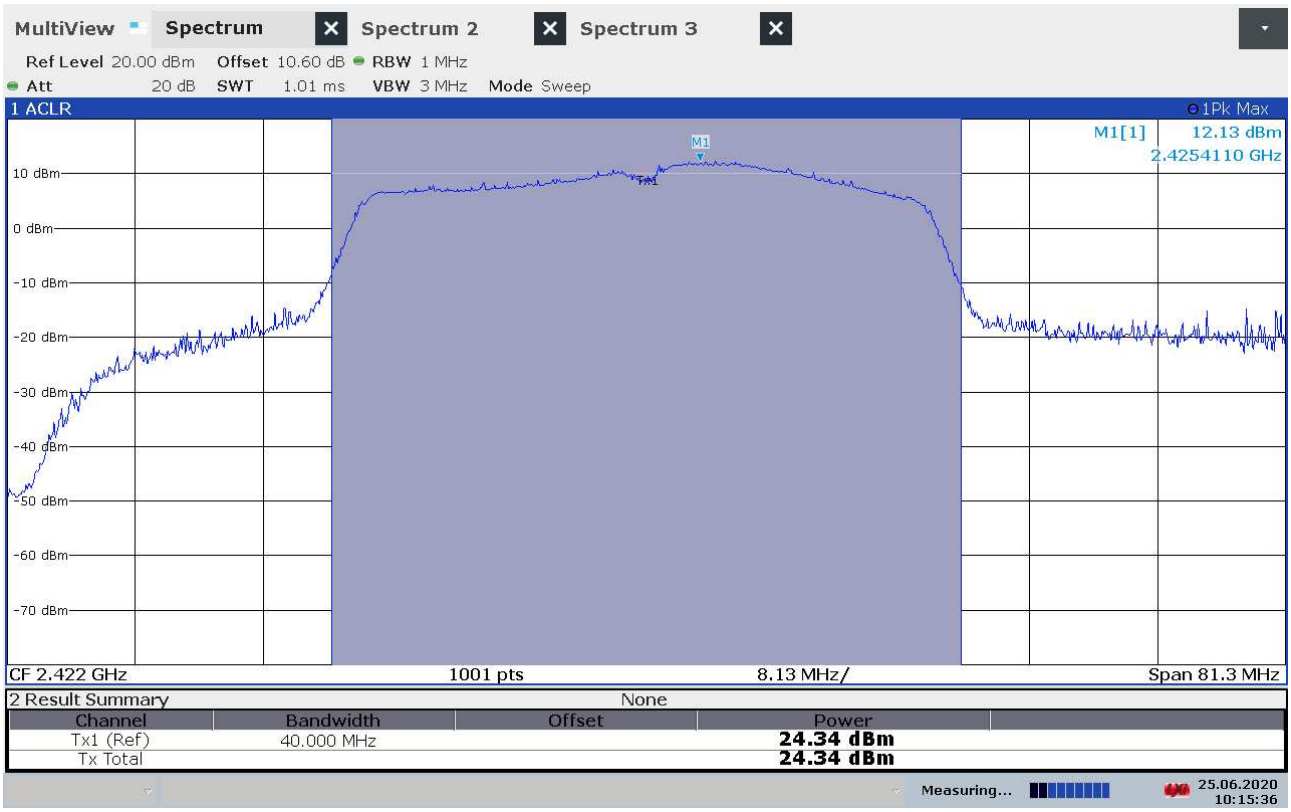
Conducted Output Power, 2412 MHz, 802.11b, 1Mbps



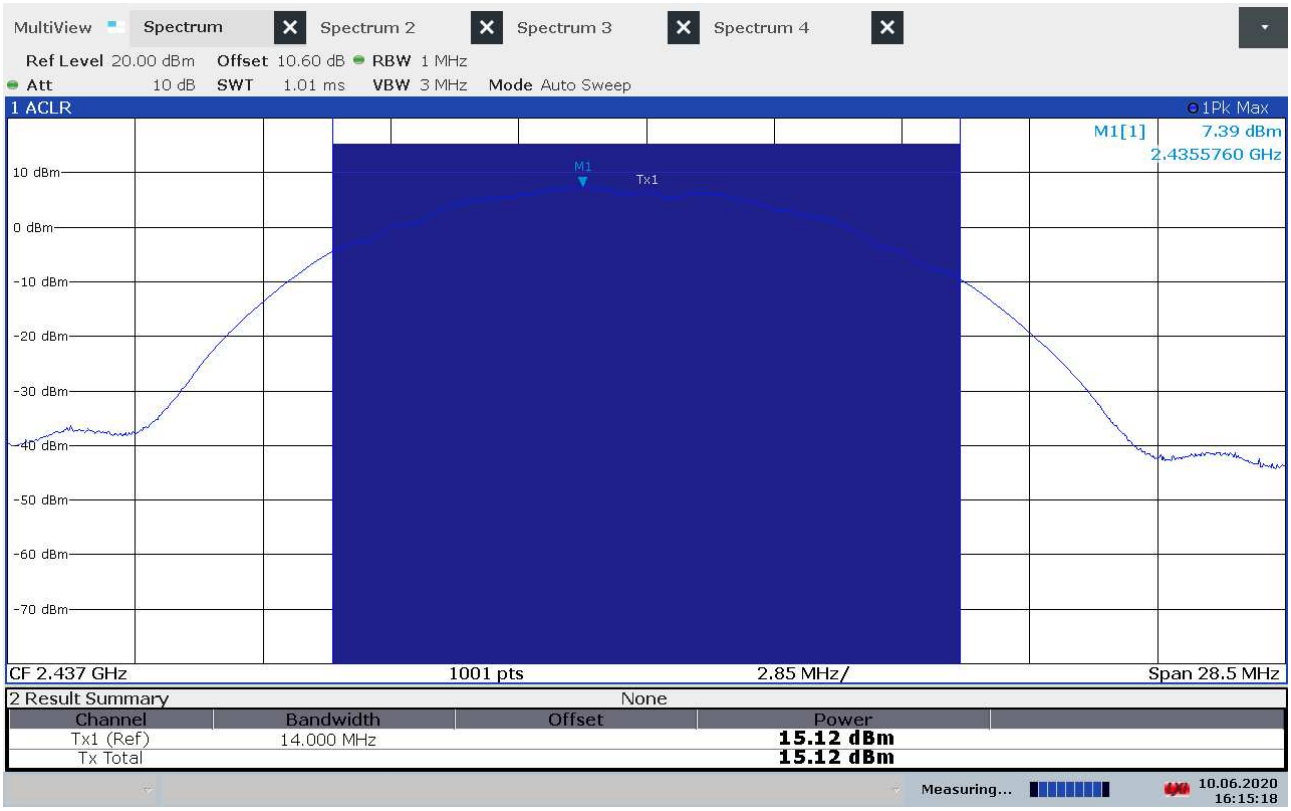
Conducted Output Power, 2412 MHz, 802.11g, 6Mbps



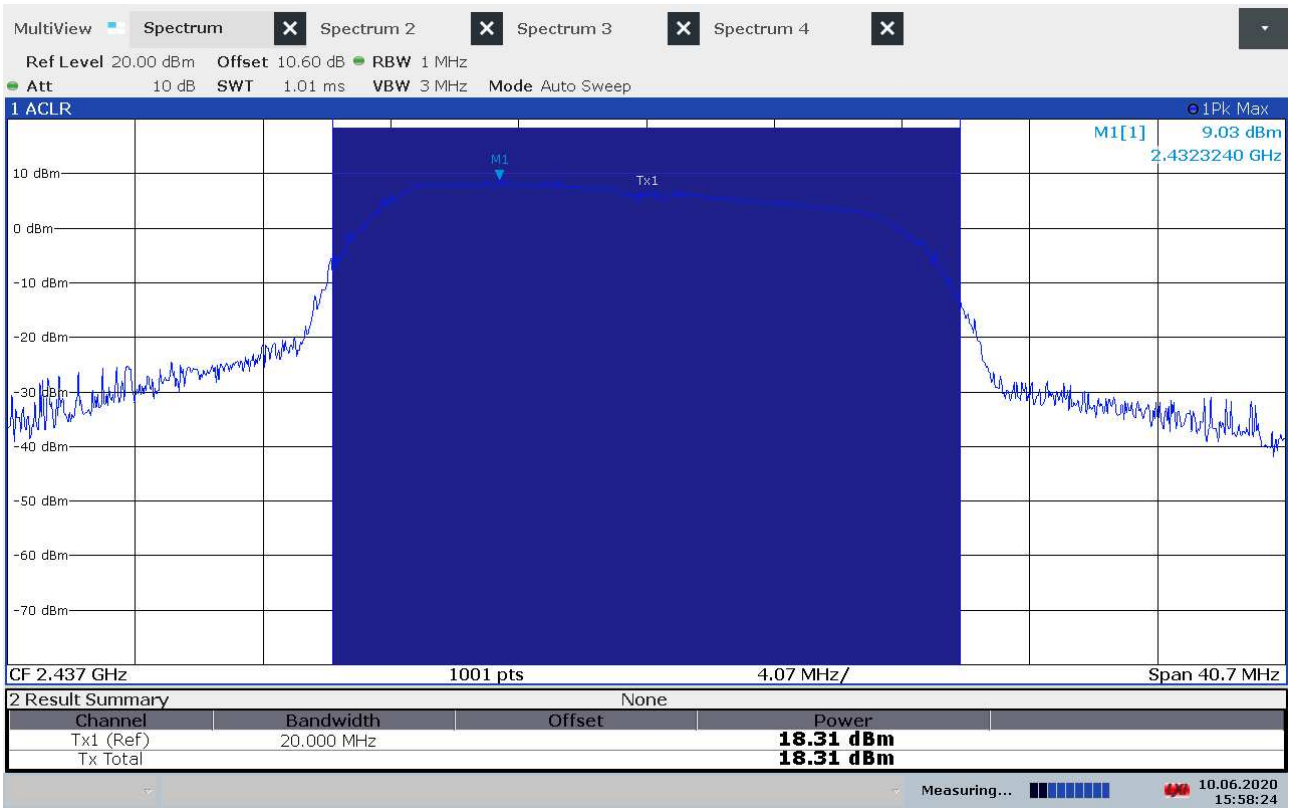
Conducted Output Power, 2412 MHz, 802.11n, MCS0, HT20



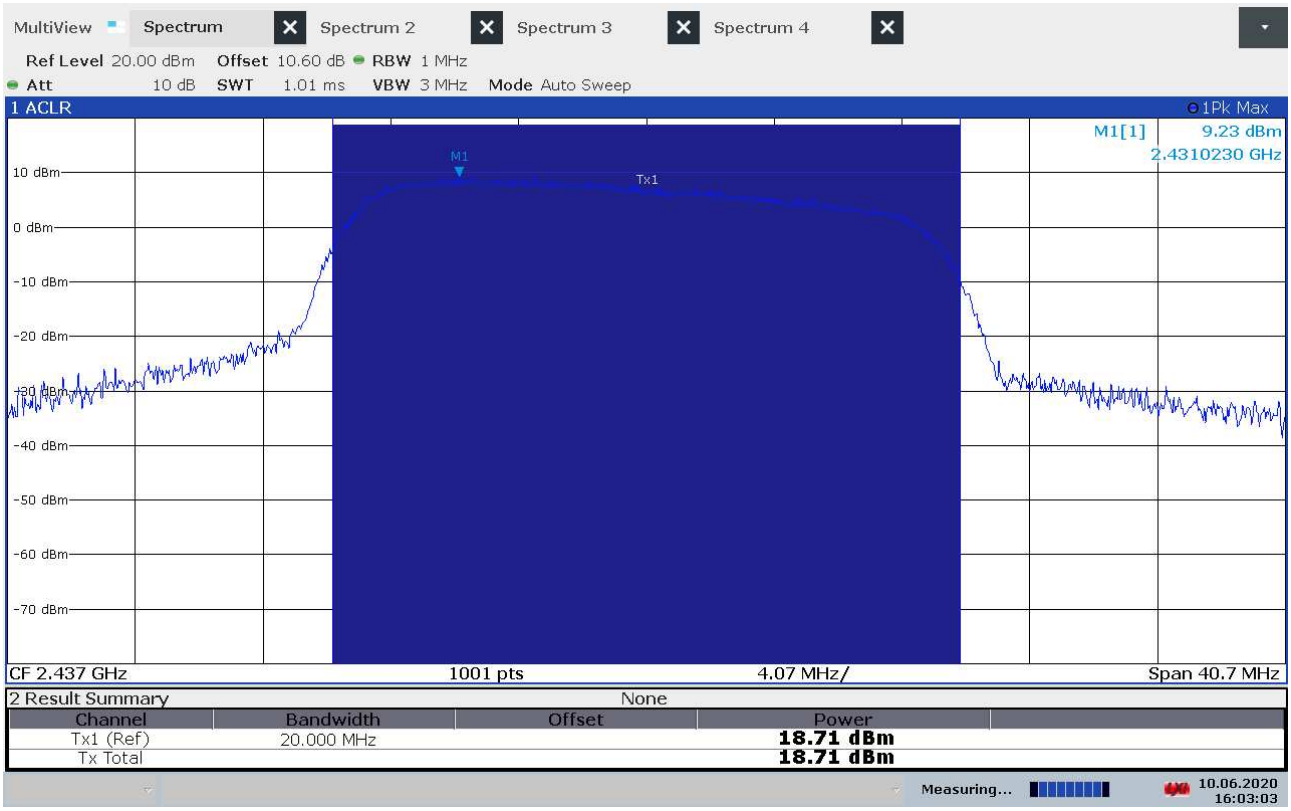
Conducted Output Power, 2422 MHz, 802.11n, MCS0, HT40



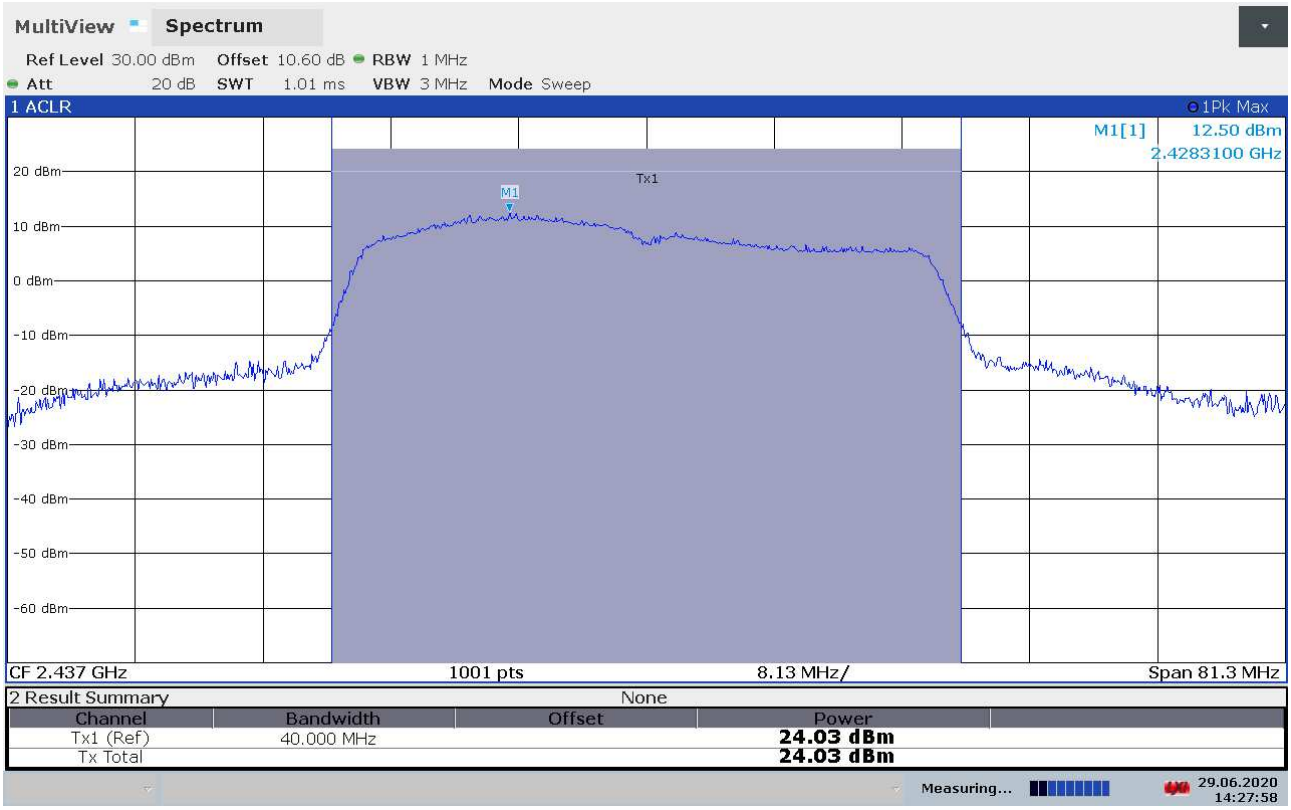
Conducted Output Power, 2437 MHz, 802.11b, 1Mbps



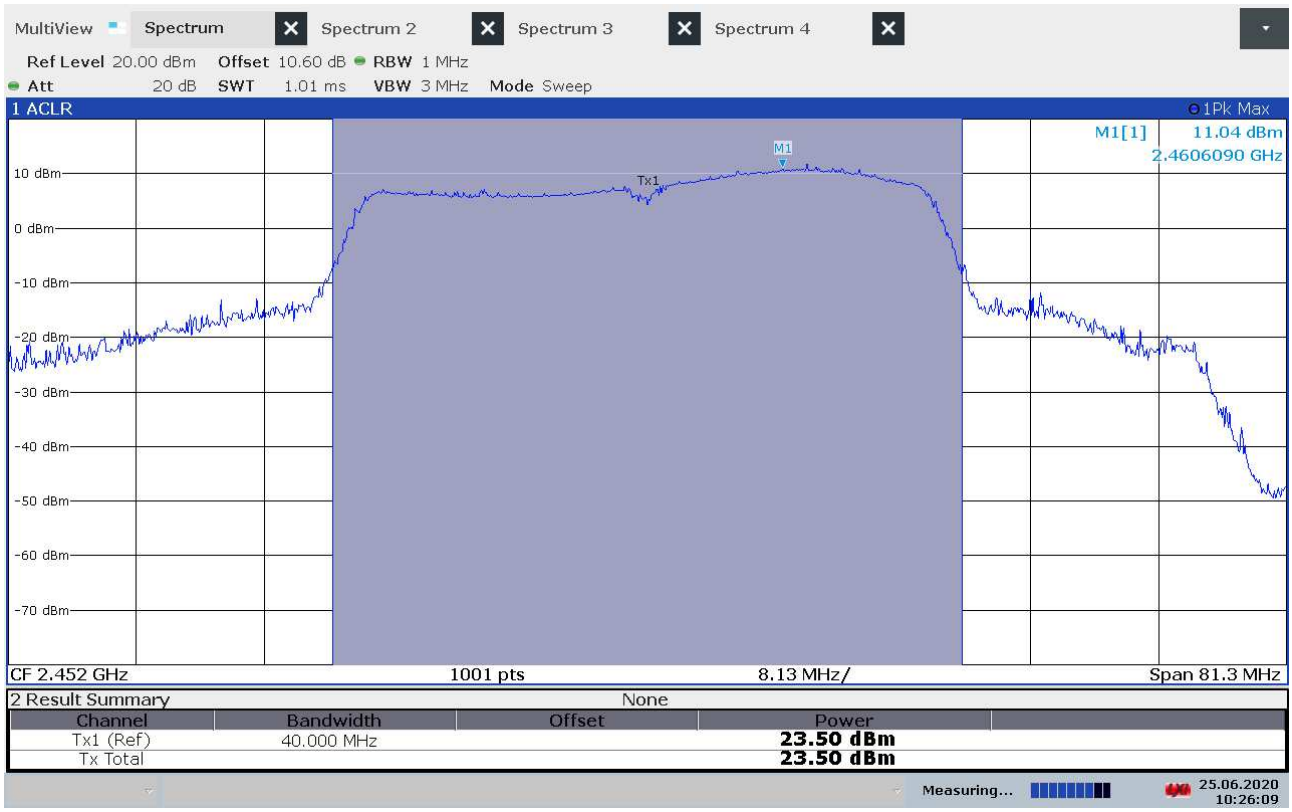
Conducted Output Power, 2437 MHz, 802.11g, 6Mbps



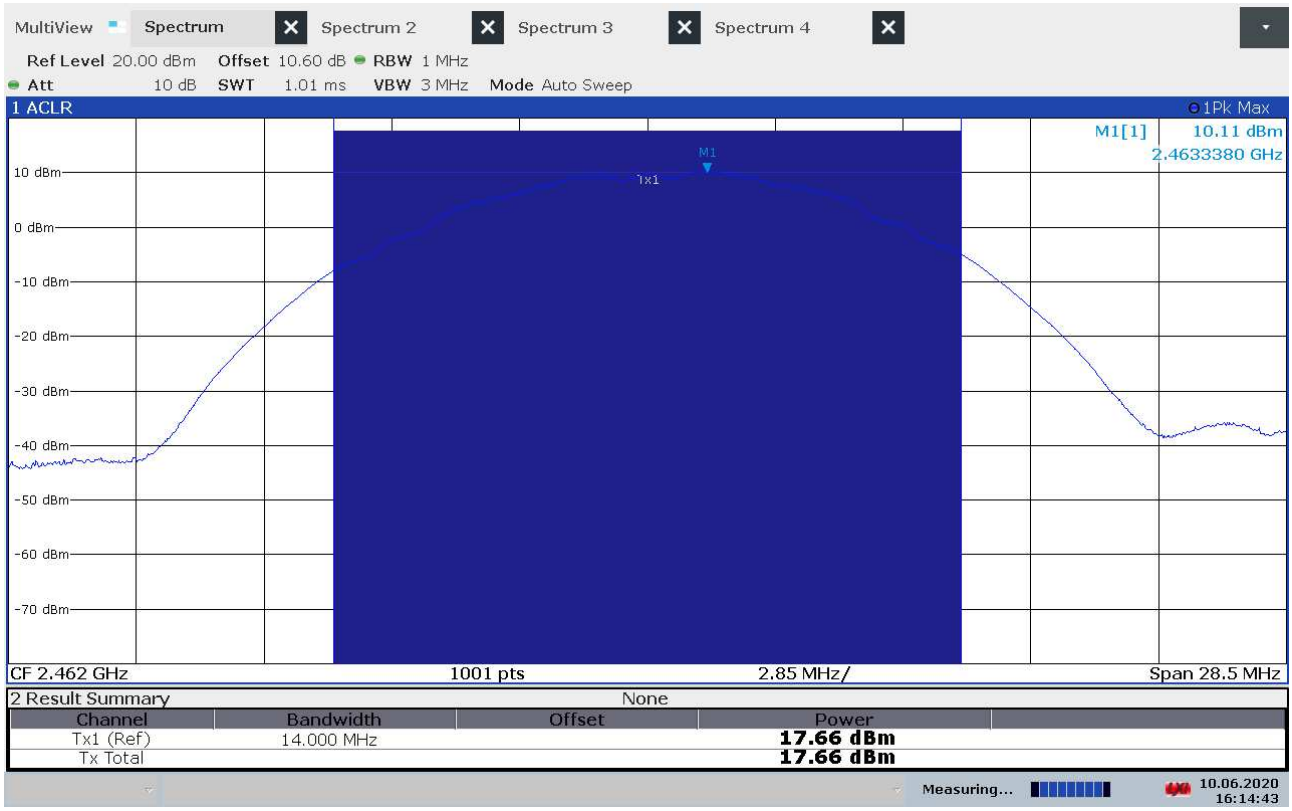
Conducted Output Power, 2437 MHz, 802.11n, HT20



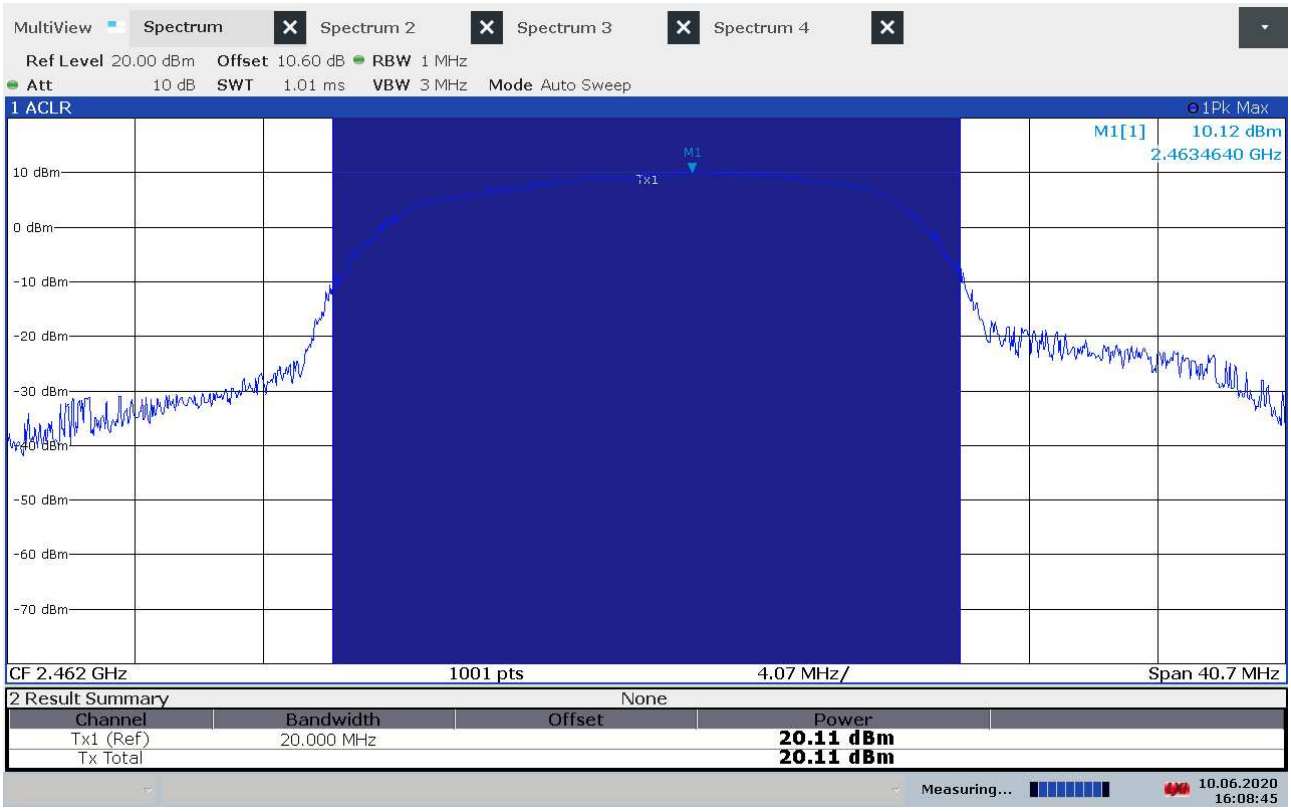
Conducted Output Power, 2437 MHz, 802.11n, HT40



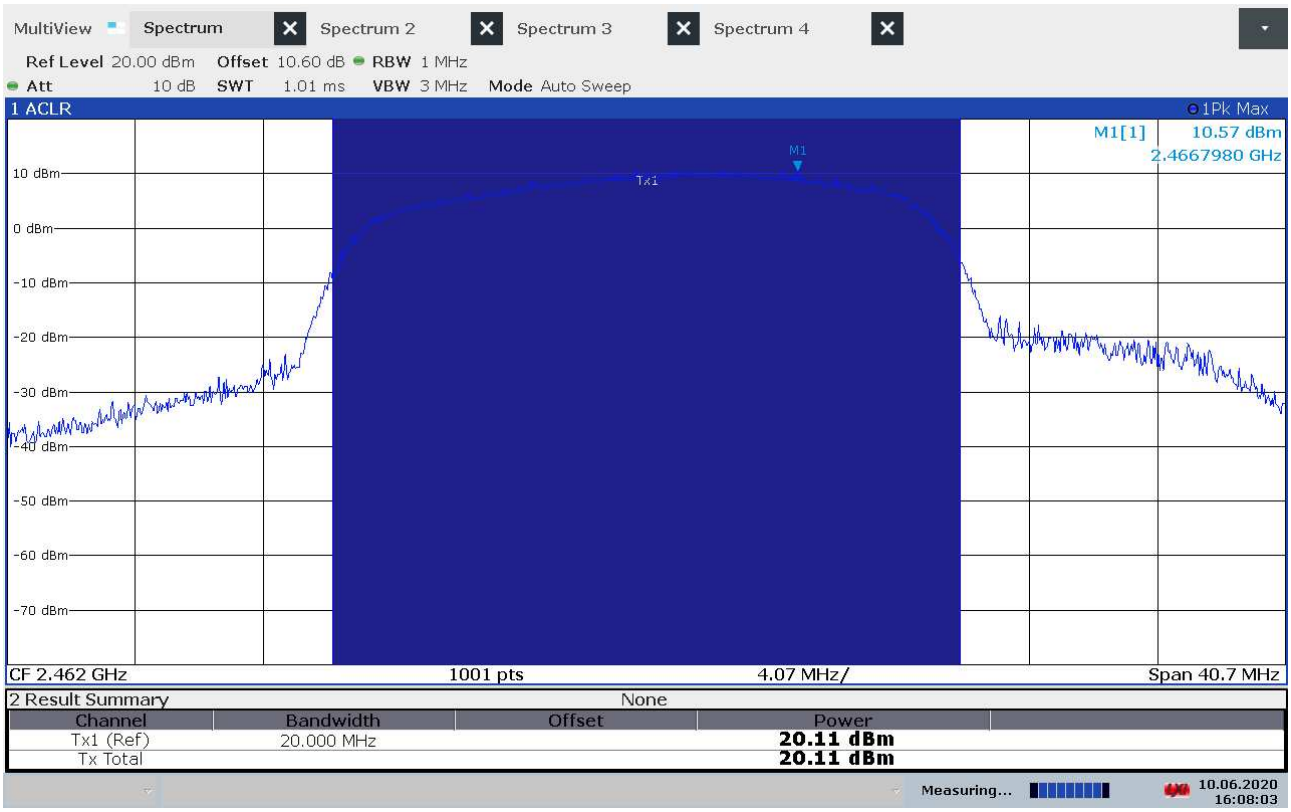
Conducted Output Power, 2452 MHz, 802.11n, HT40



Conducted Output Power, 2462 MHz, 802.11b, 1Mbps



Conducted Output Power, 2462 MHz, 802.11g, 6Mbps



Conducted Output Power, 2462 MHz, 802.11n, MCS0

3.4 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.

All tests are performed with the EUT transmitting at maximum output power.

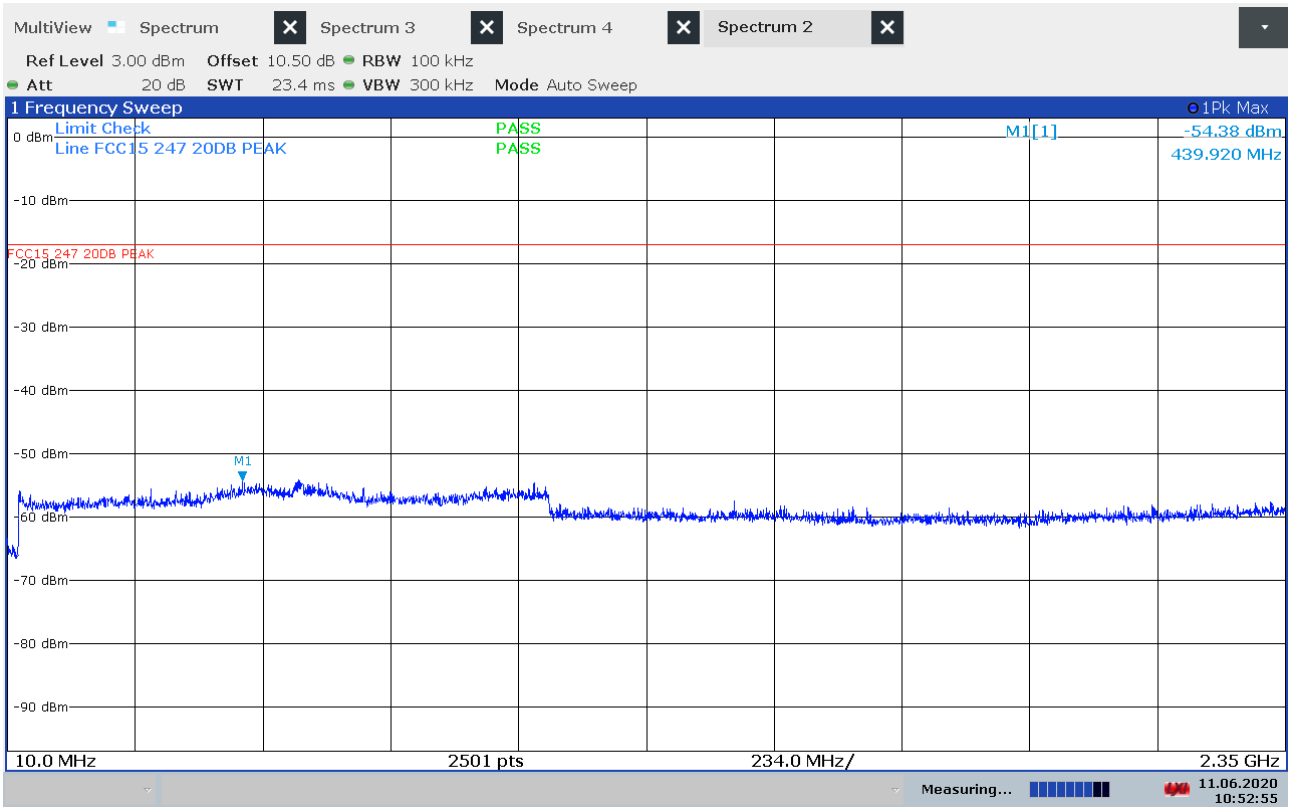
RF conducted power to 25 GHz: see attached plots.

Limit

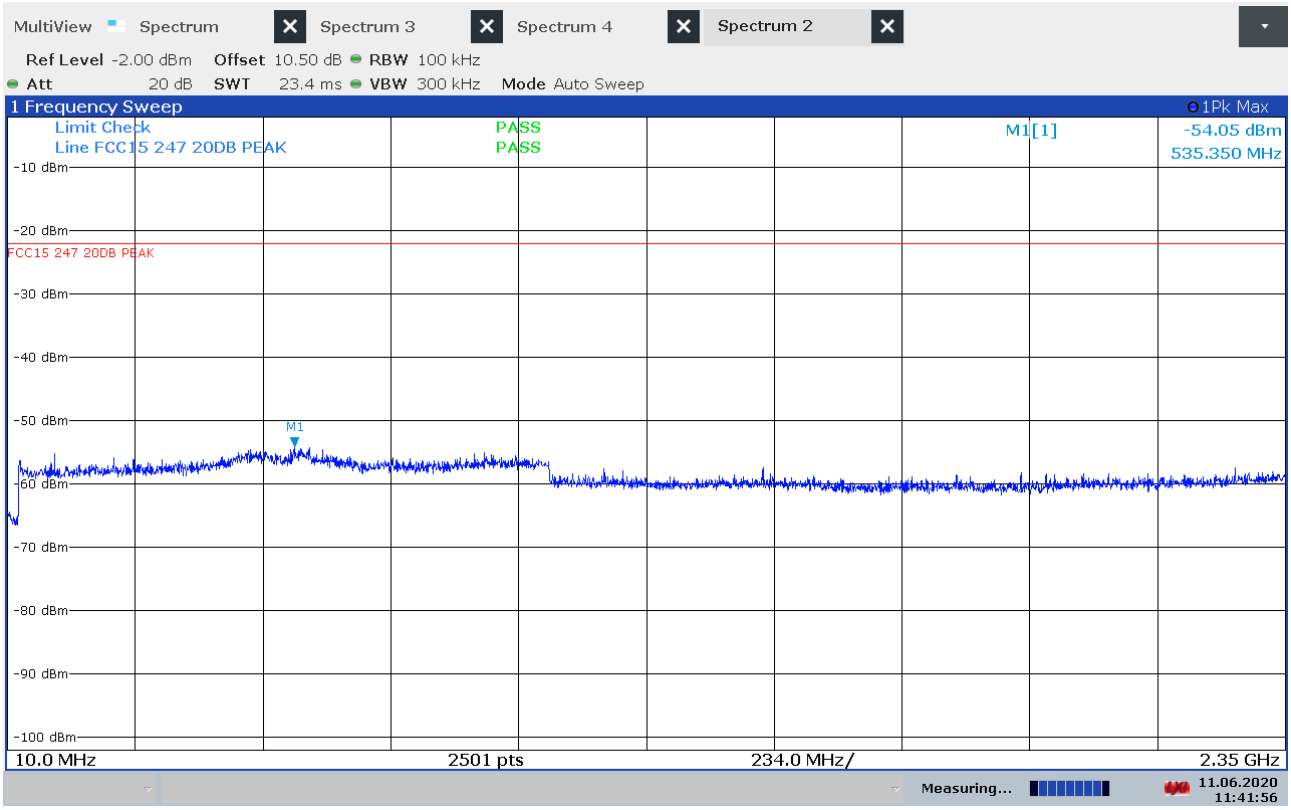
Peak measurement	RMS averaging
20 dBc or more in 100 kHz bandwidth	30 dBc or more in 100 kHz bandwidth

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

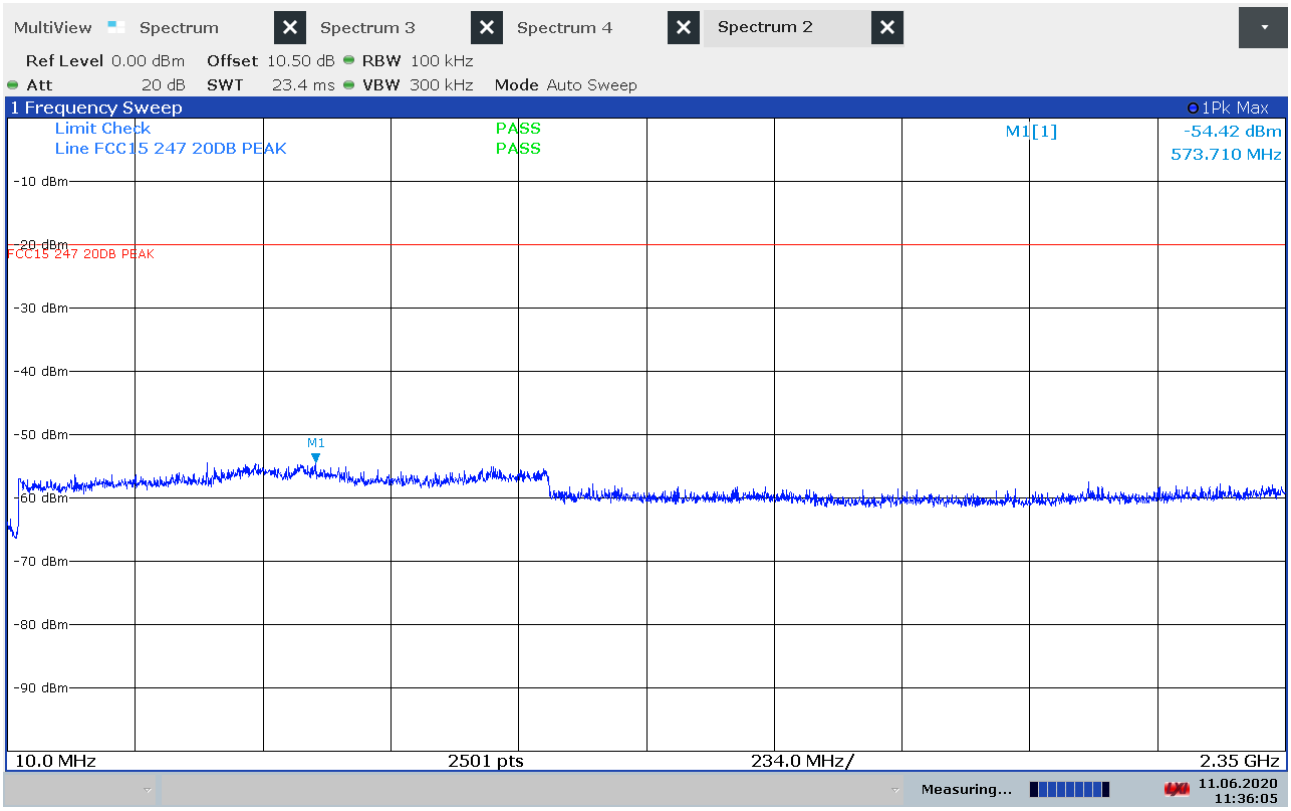
Attenuation below the general limits specified in part 15.209(a) is not required.



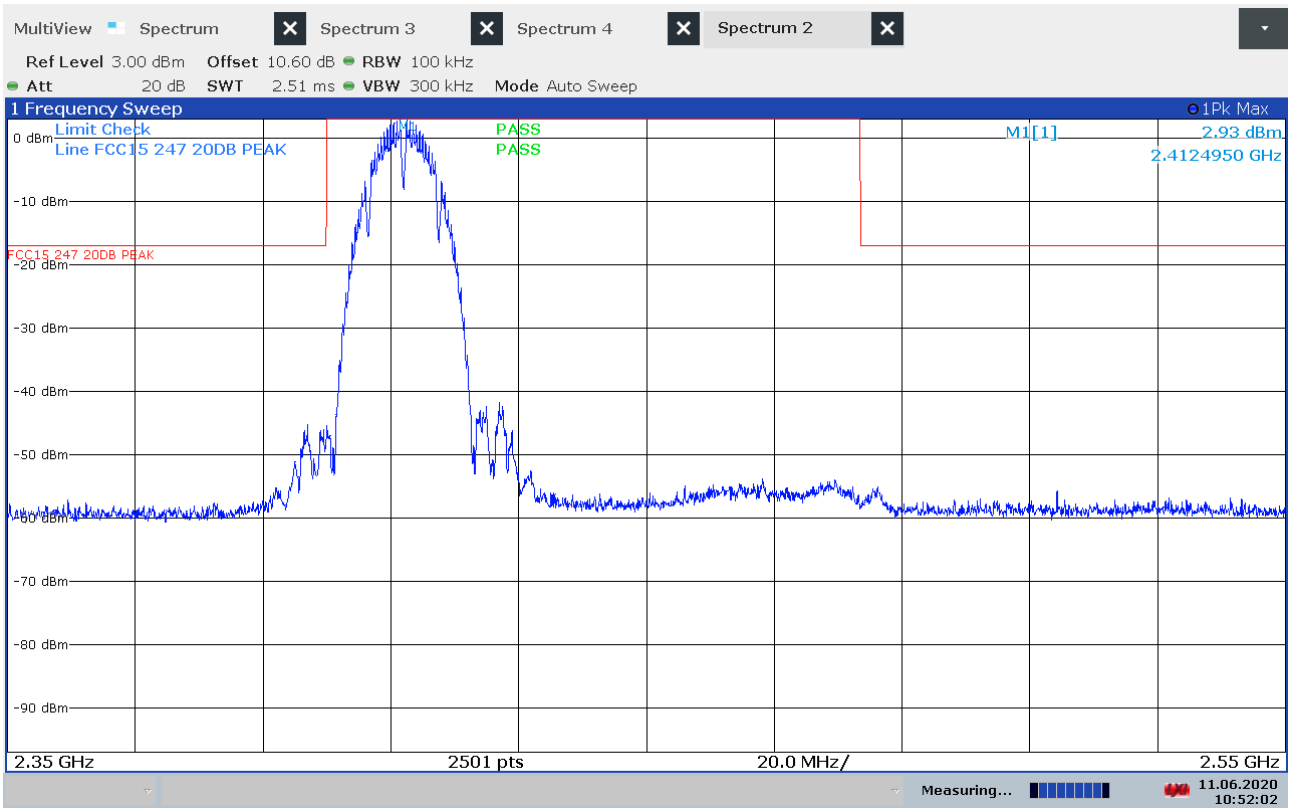
Conducted Emissions, 10 – 2350 MHz, 2412 MHz, 802.11b, 1Mbps



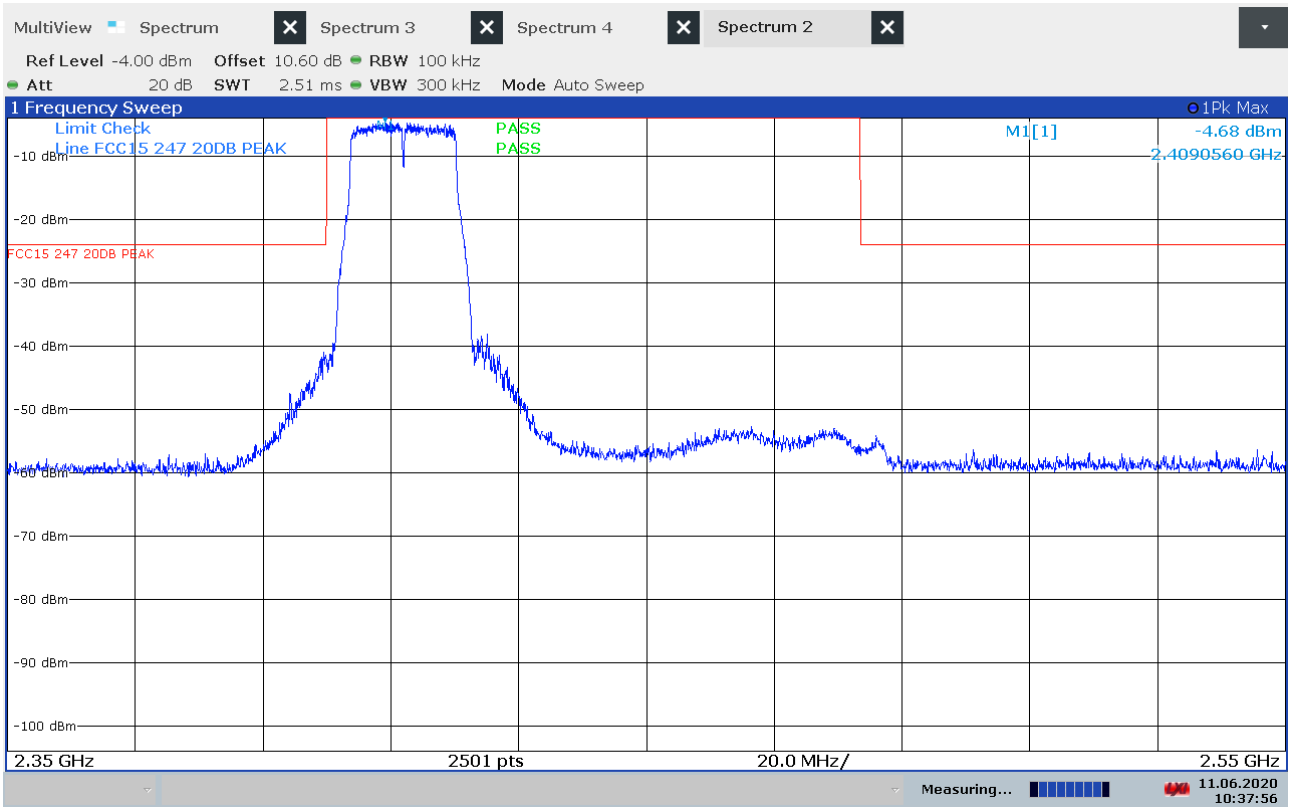
Conducted Emissions, 10 – 2350 MHz, 2437 MHz, 802.11g, 6Mbps



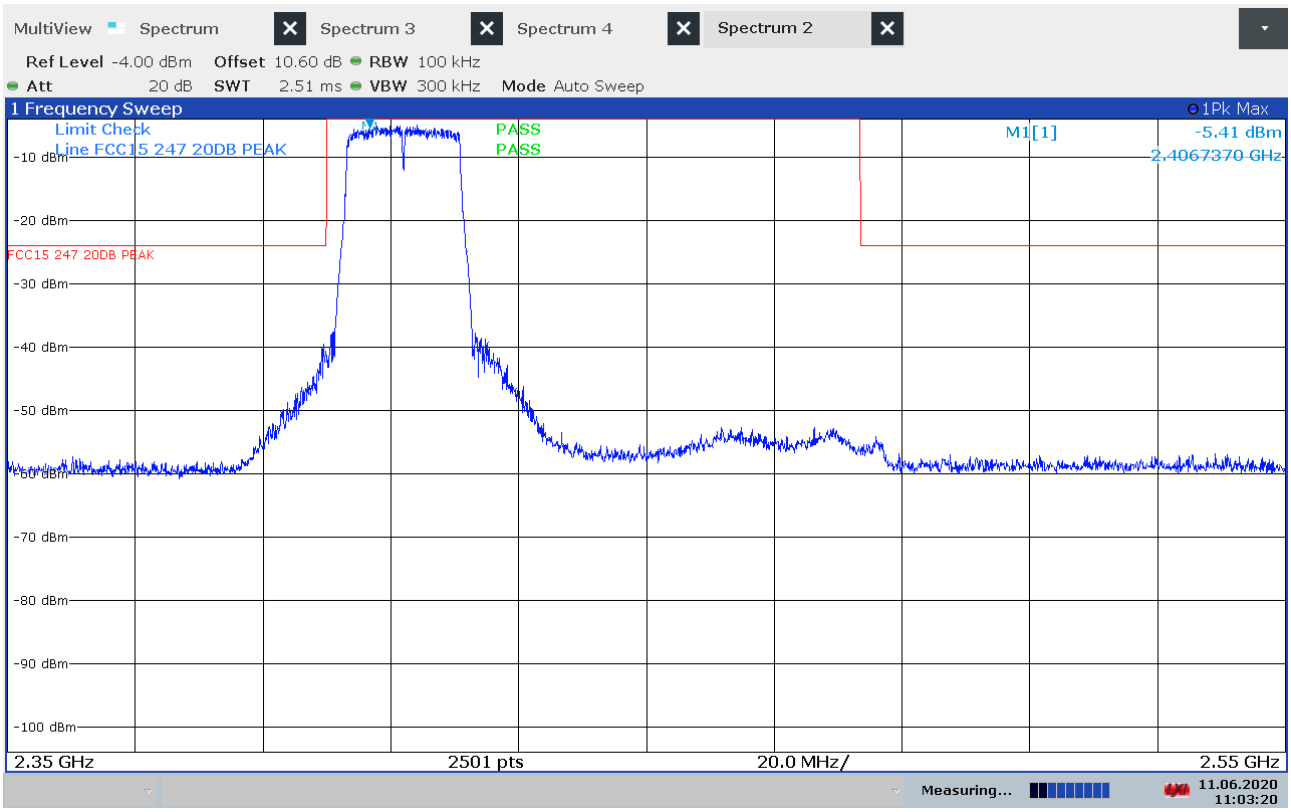
Conducted Emissions, 10 – 2350 MHz, 2462 MHz, 802.11n, MCS0, HT20



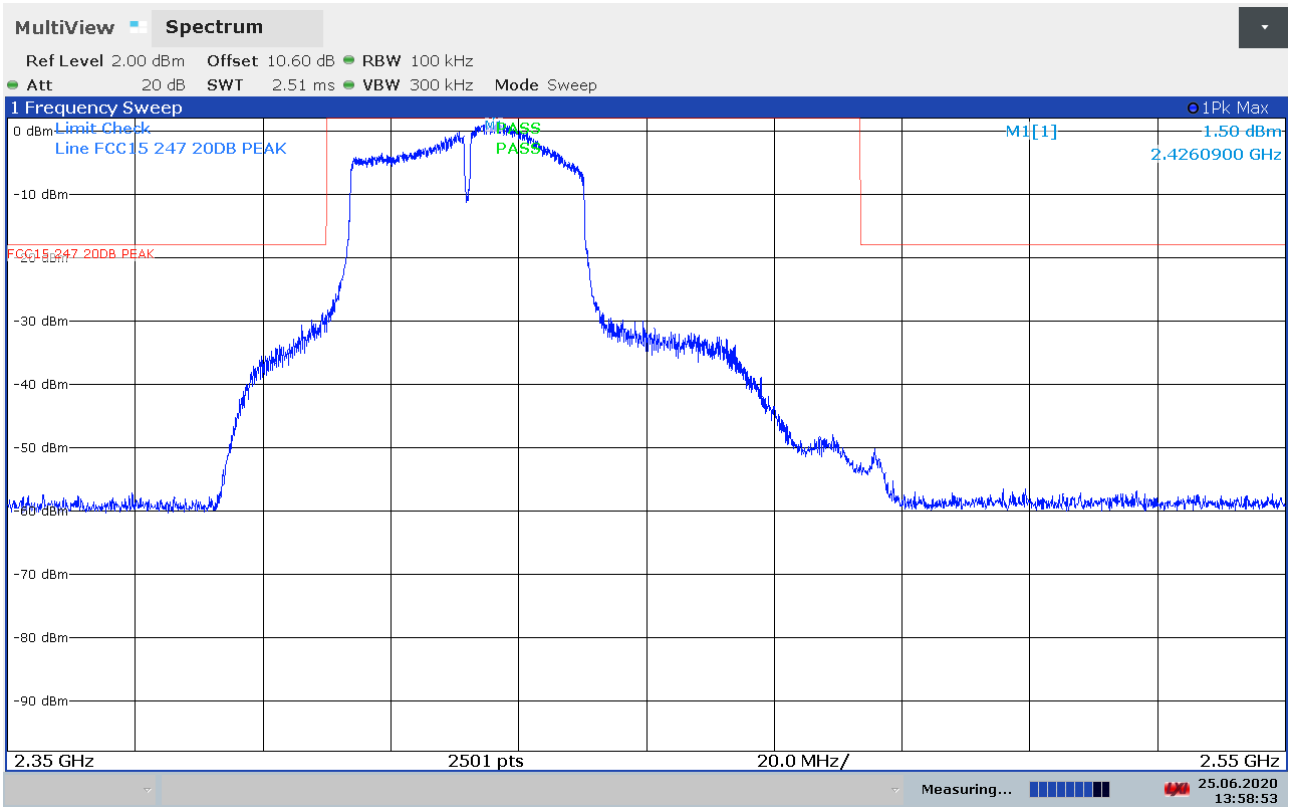
Conducted Emissions, 2350 – 2550 MHz, 2412 MHz, 802.11b, 1Mbps



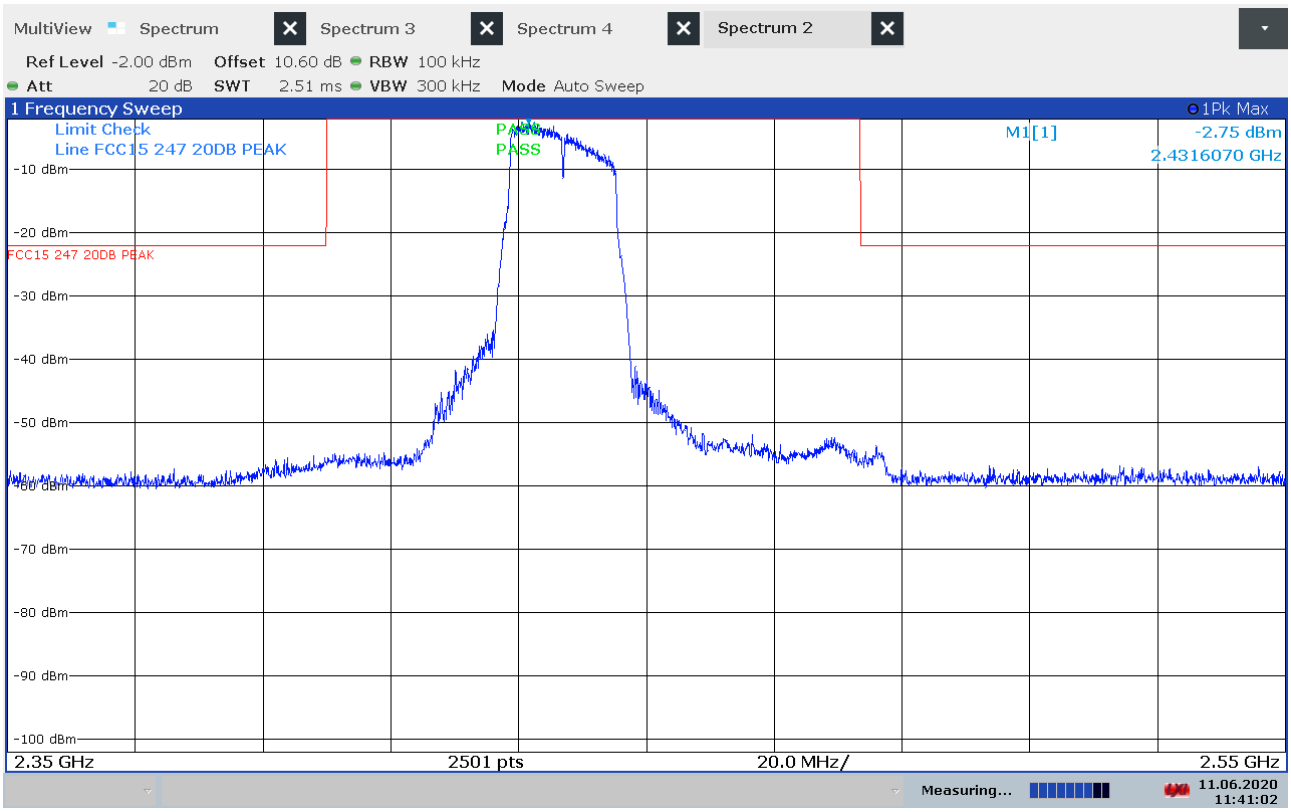
Conducted Emissions, 2350 – 2550 MHz, 2412 MHz, 802.11g, 6Mbps



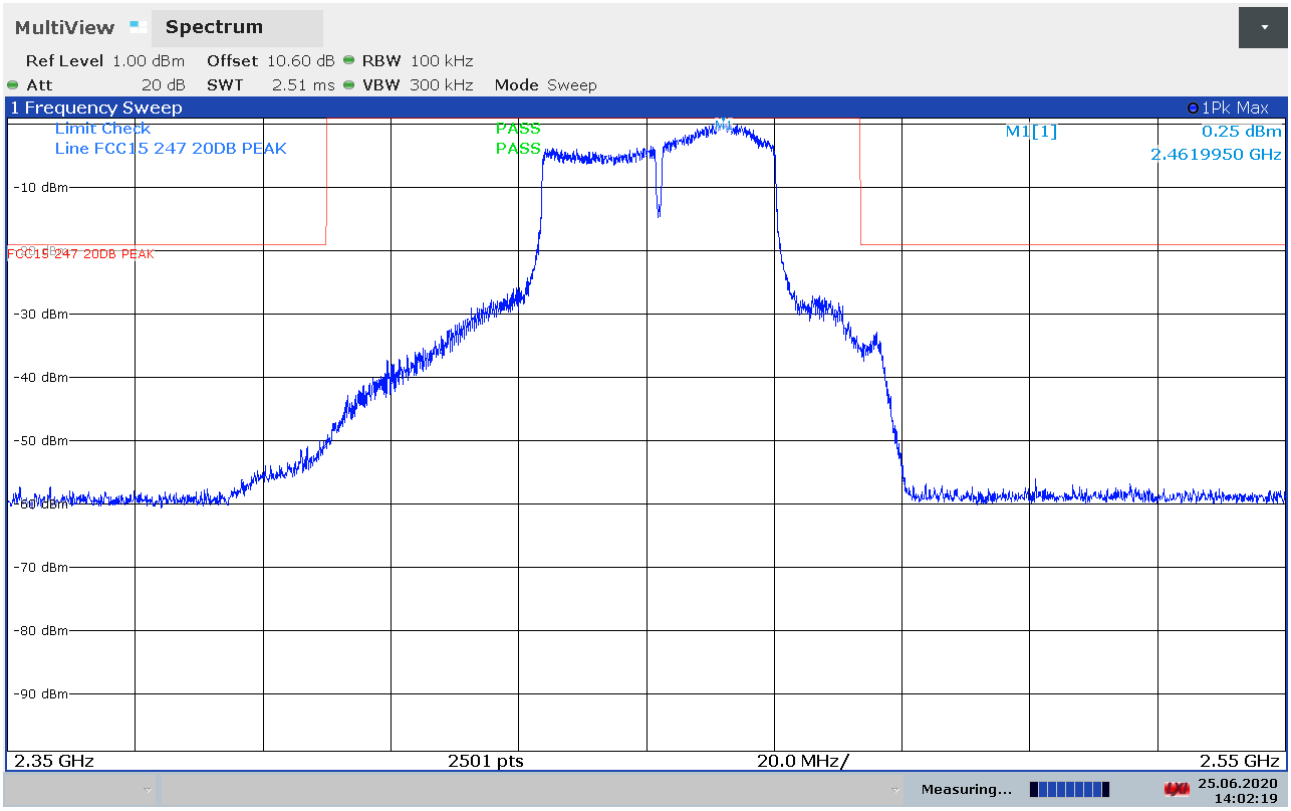
Conducted Emissions, 2350 – 2550 MHz, 2412 MHz, 802.11n, MCS0, HT20



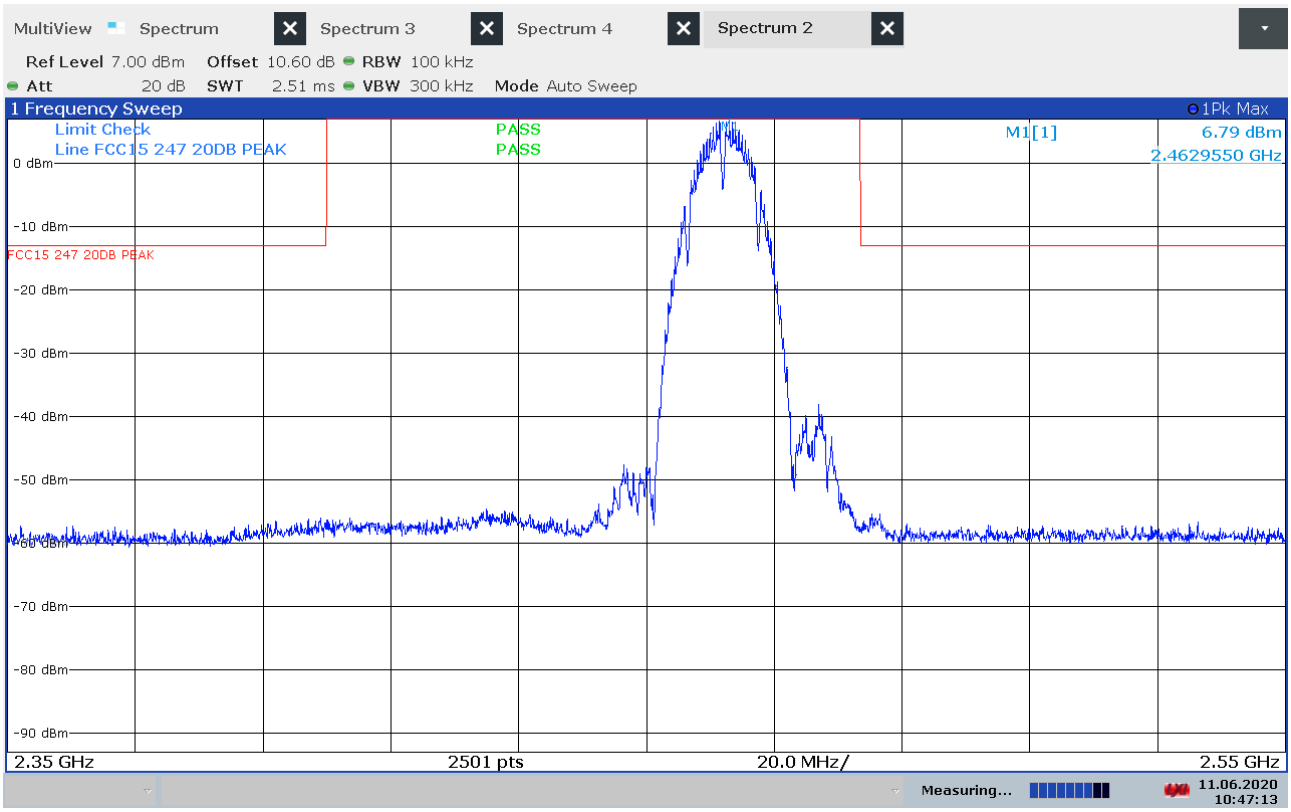
Conducted Emissions, 2350 – 2550 MHz, 2422 MHz, 802.11n, MCS0, HT40



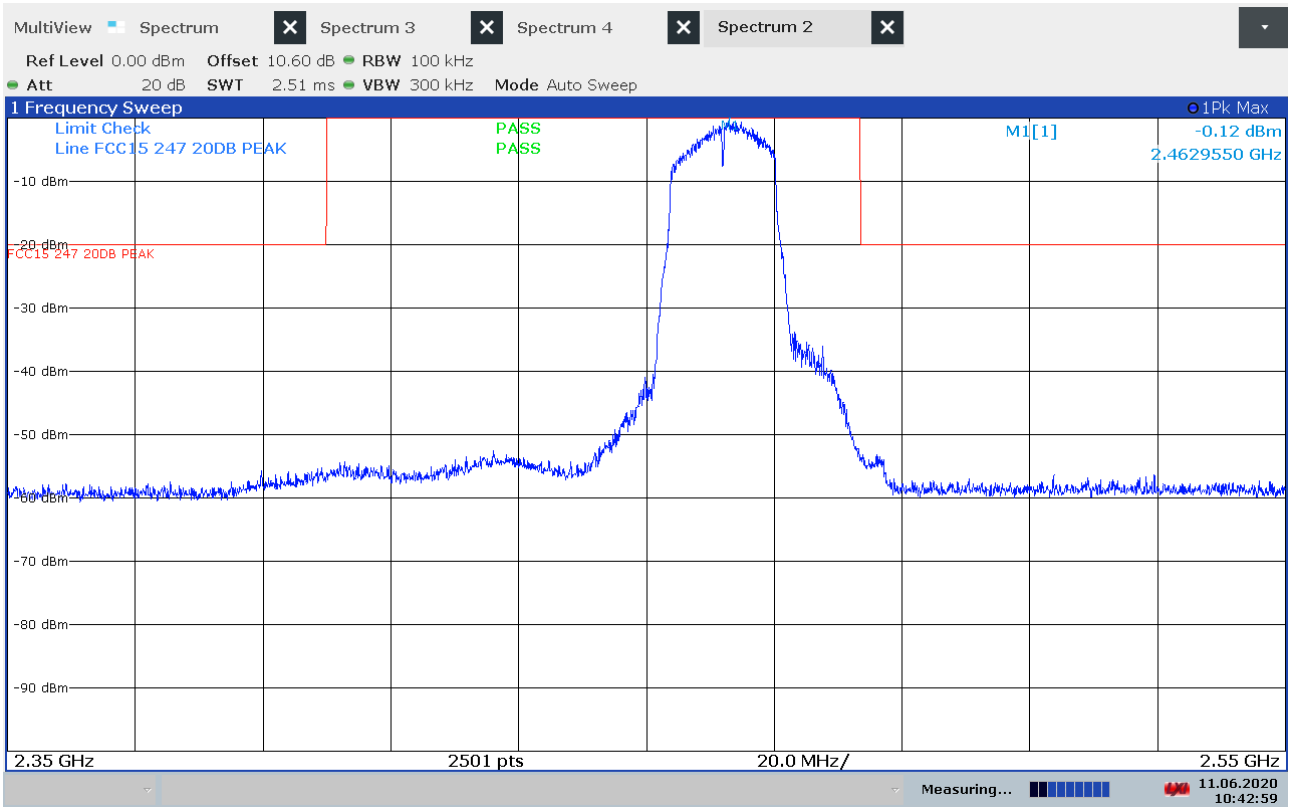
Conducted Emissions, 2350 – 2550 MHz, 2437 MHz, 802.11g, 6Mbps



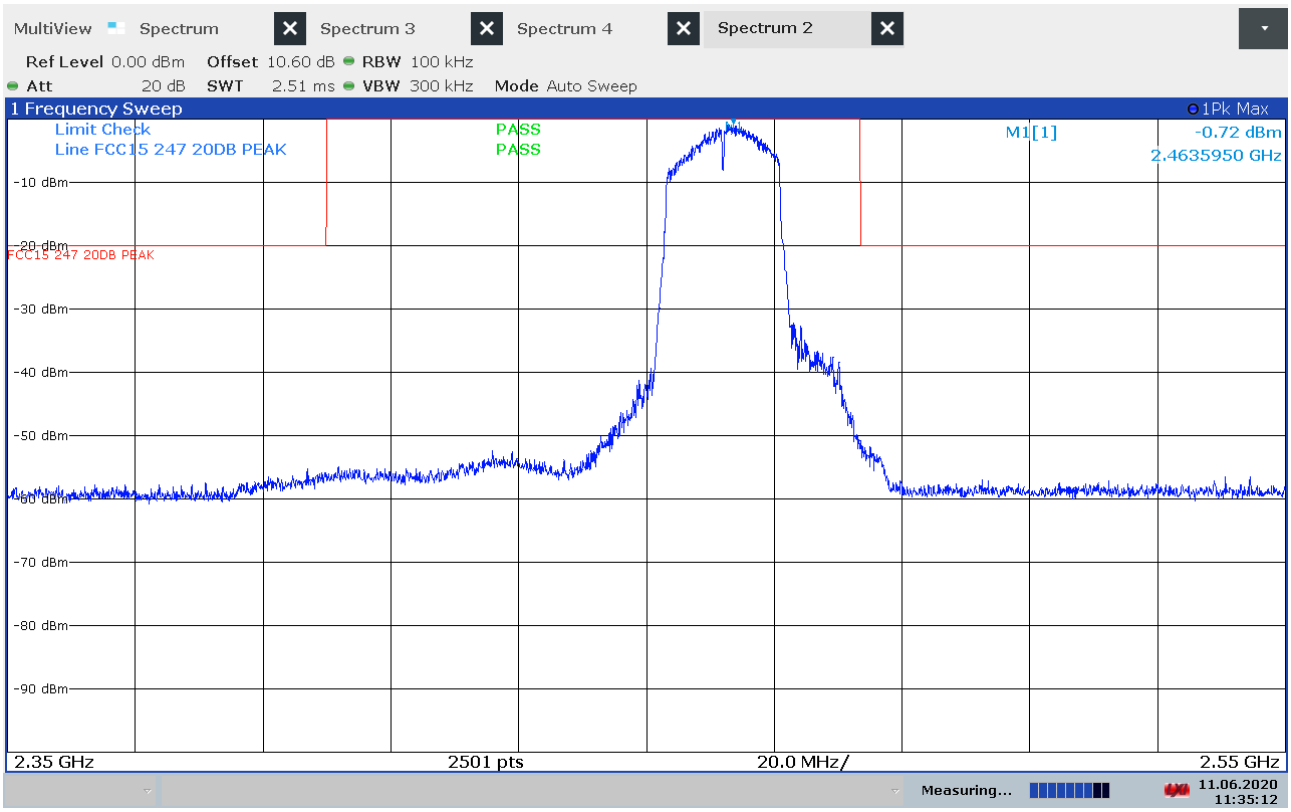
Conducted Emissions, 2350 – 2550 MHz, 2452 MHz, 802. 11n, MCS0, HT40



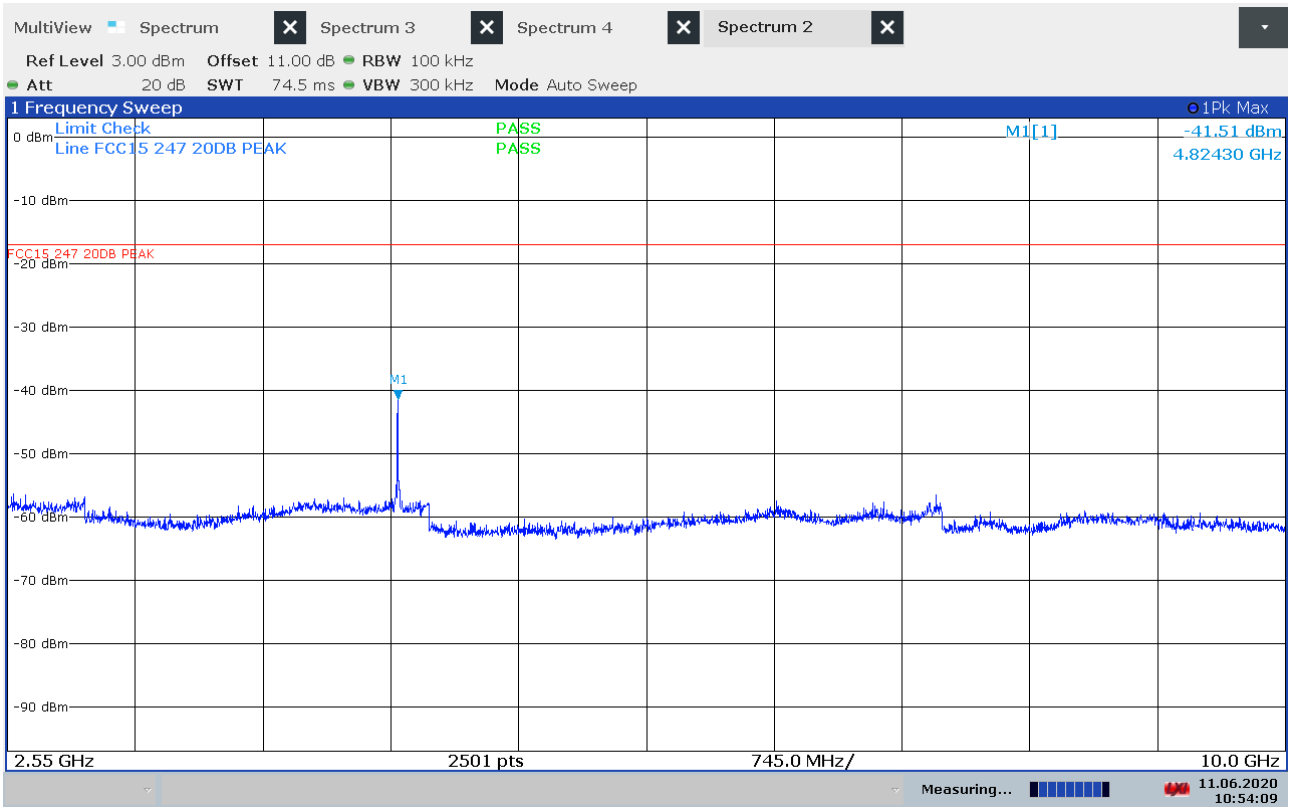
Conducted Emissions, 2350 – 2550 MHz, 2462 MHz, 802.11b, 1Mbps



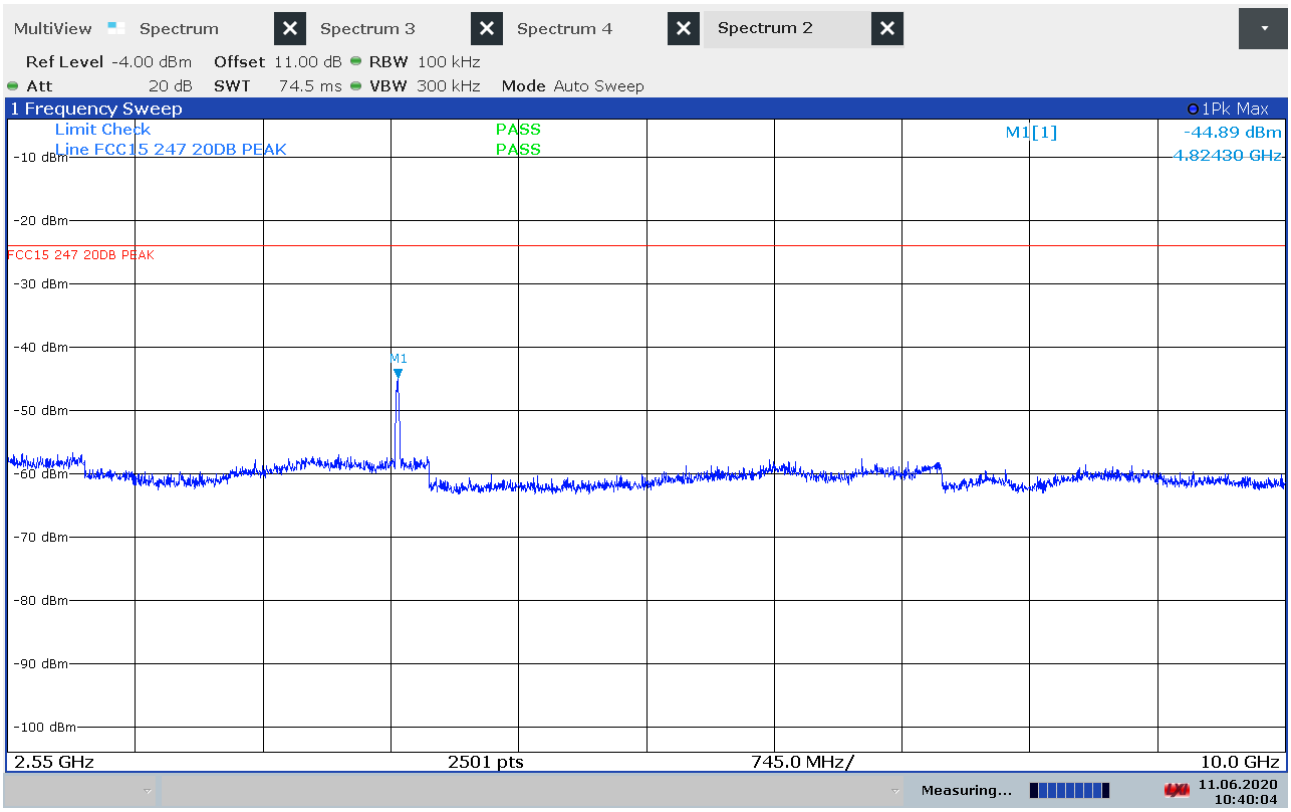
Conducted Emissions, 2350 – 2550 MHz, 2462 MHz, 802.11g, 6Mbps



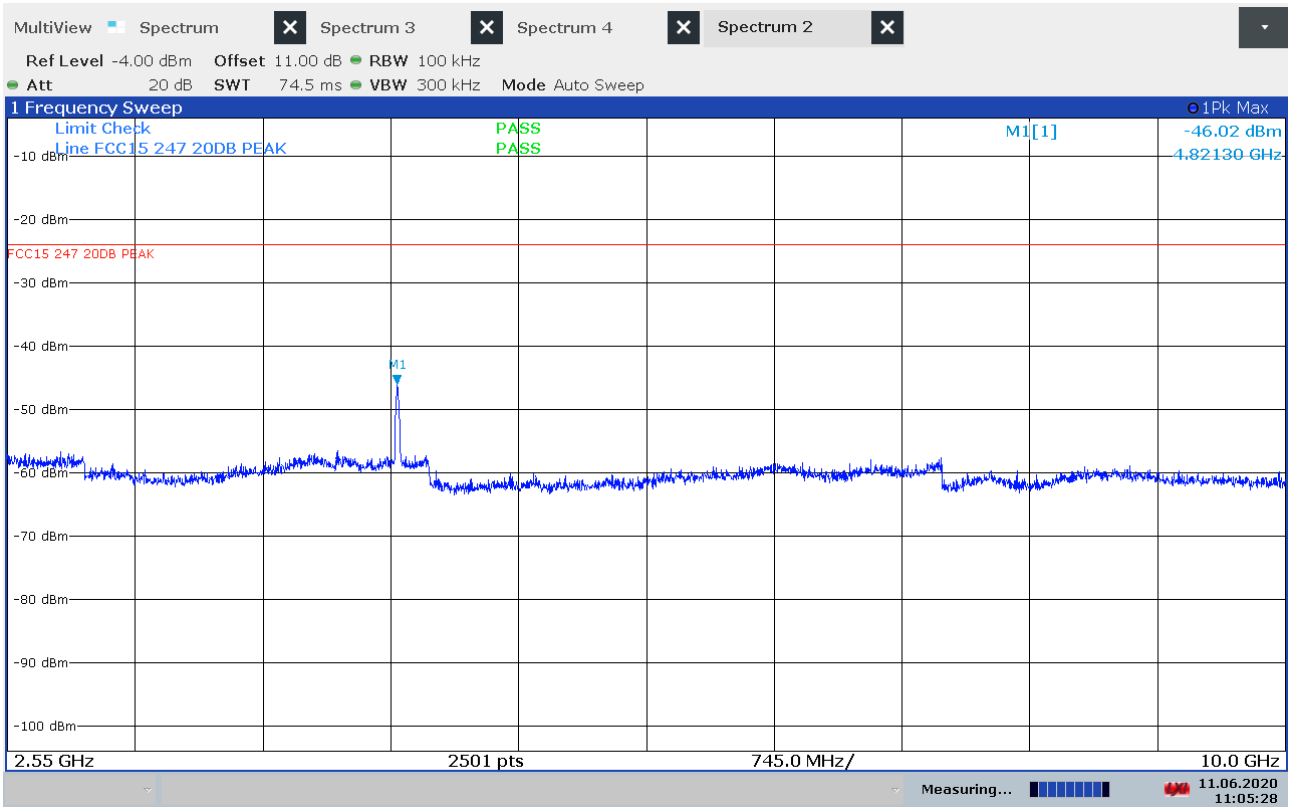
Conducted Emissions, 2350 – 2550 MHz, 2462 MHz, 802.11n, MCS0, HT20



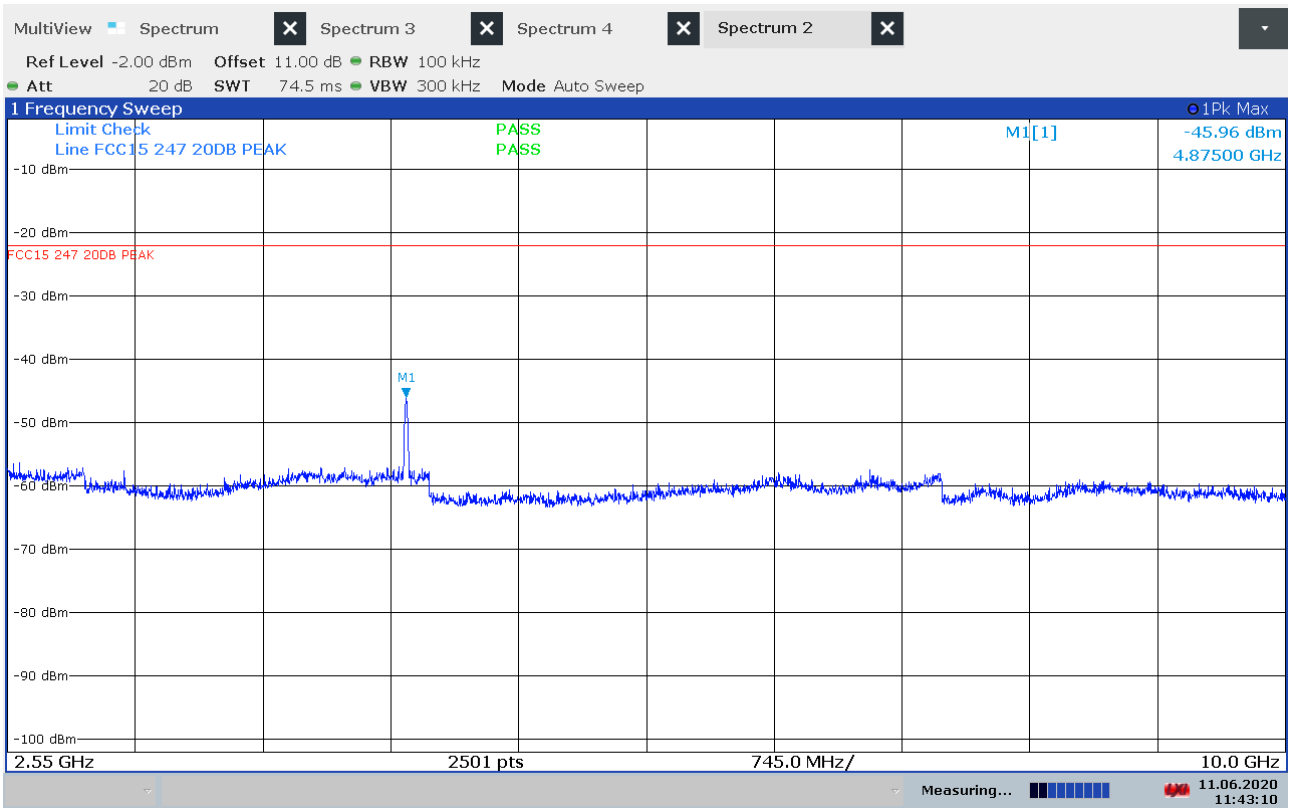
Conducted Emissions, 2550 – 10000 MHz, 2412 MHz, 802.11b, 1Mbps



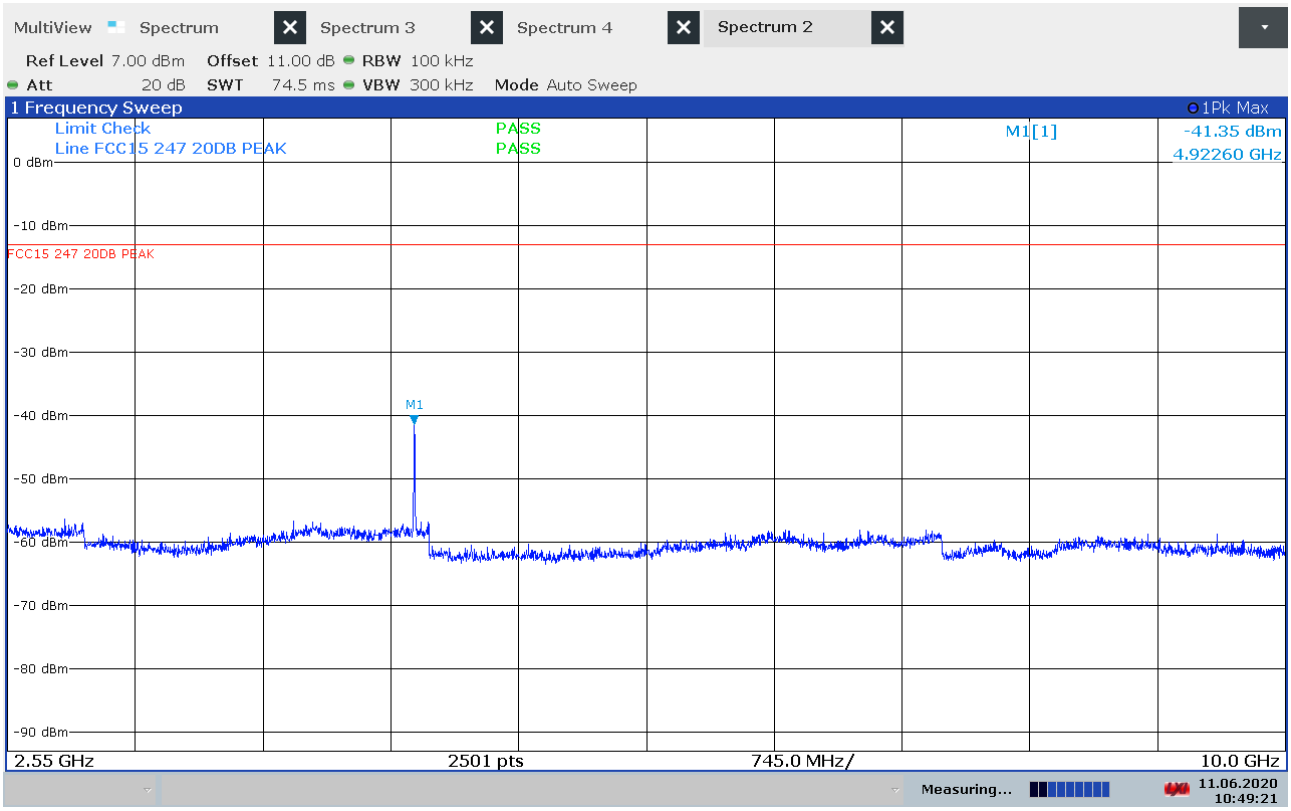
Conducted Emissions, 2550 – 10000 MHz, 2412 MHz, 802.116, 6Mbps



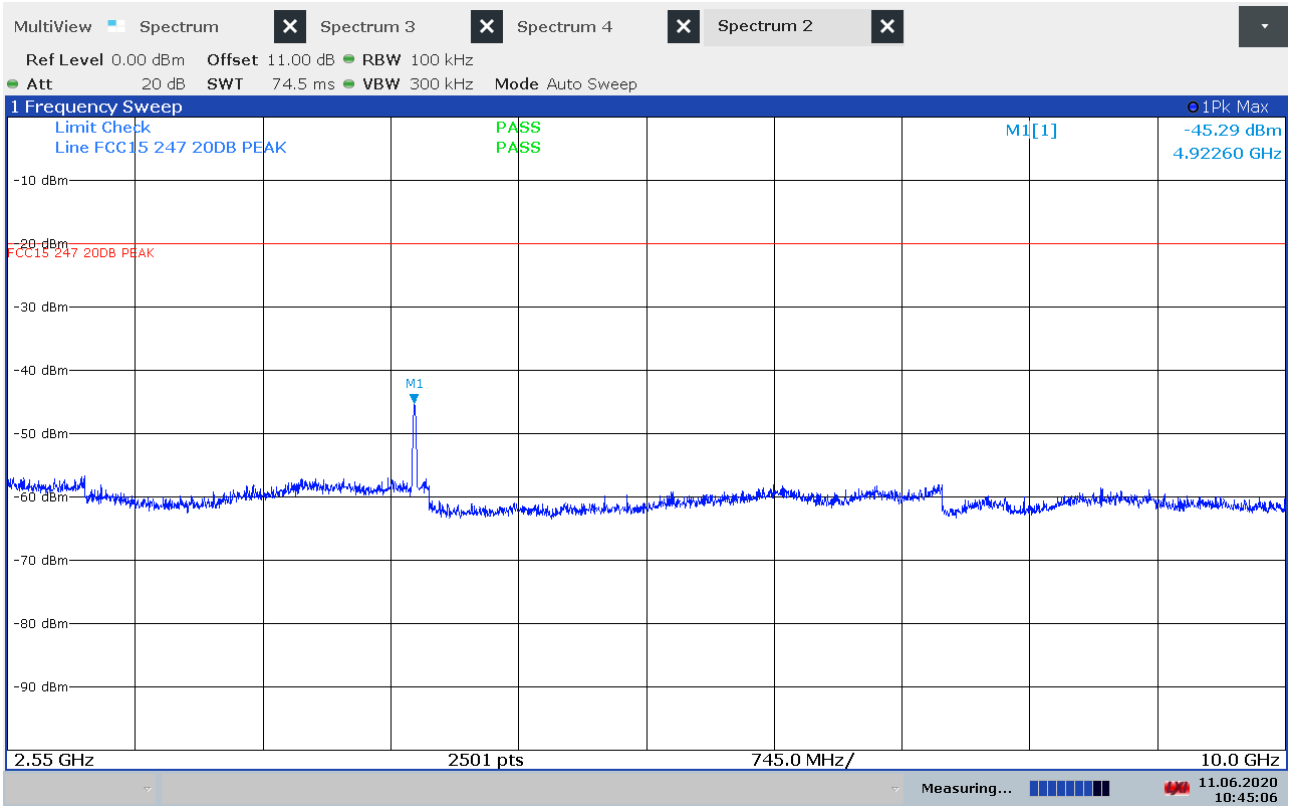
Conducted Emissions, 2550 – 10000 MHz, 2412 MHz, 802.11n, MCS0, HT20



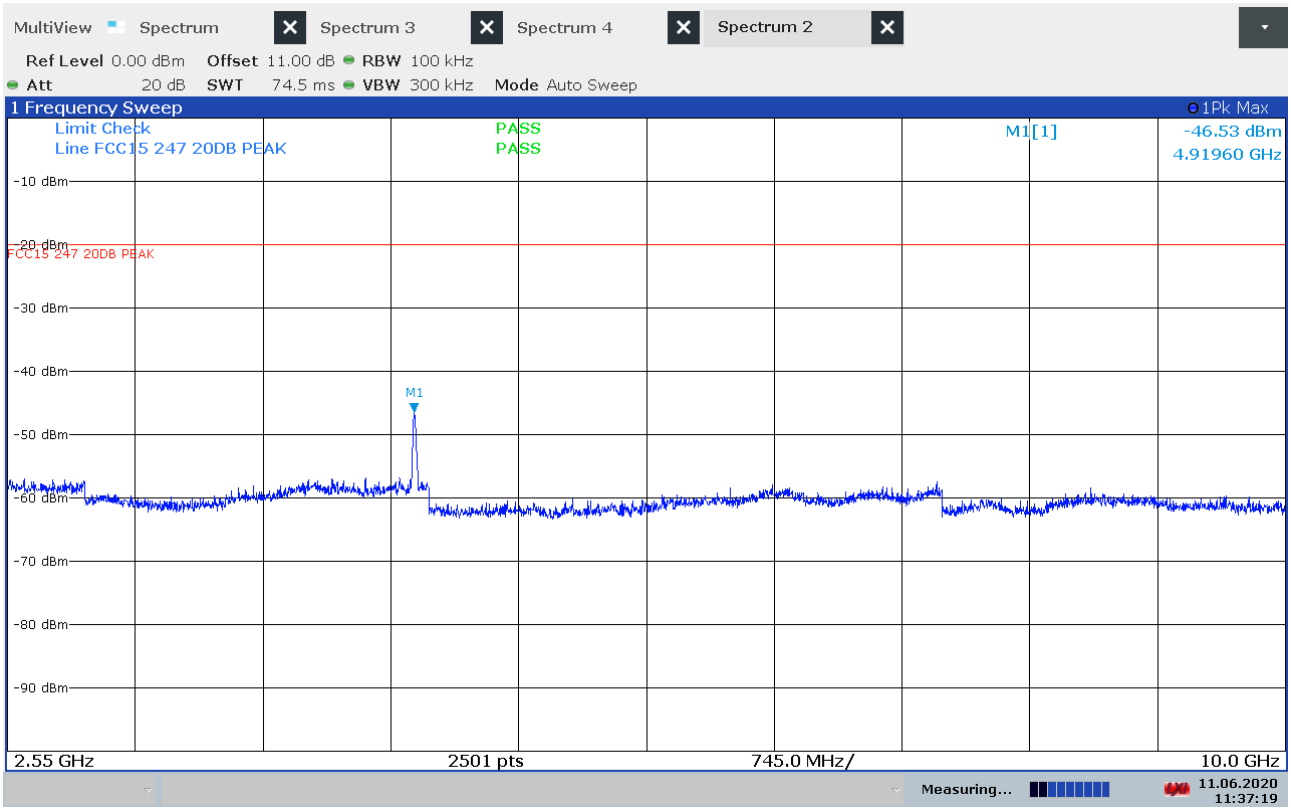
Conducted Emissions, 2550 – 10000 MHz, 2437 MHz, 802.11g, 6Mbps



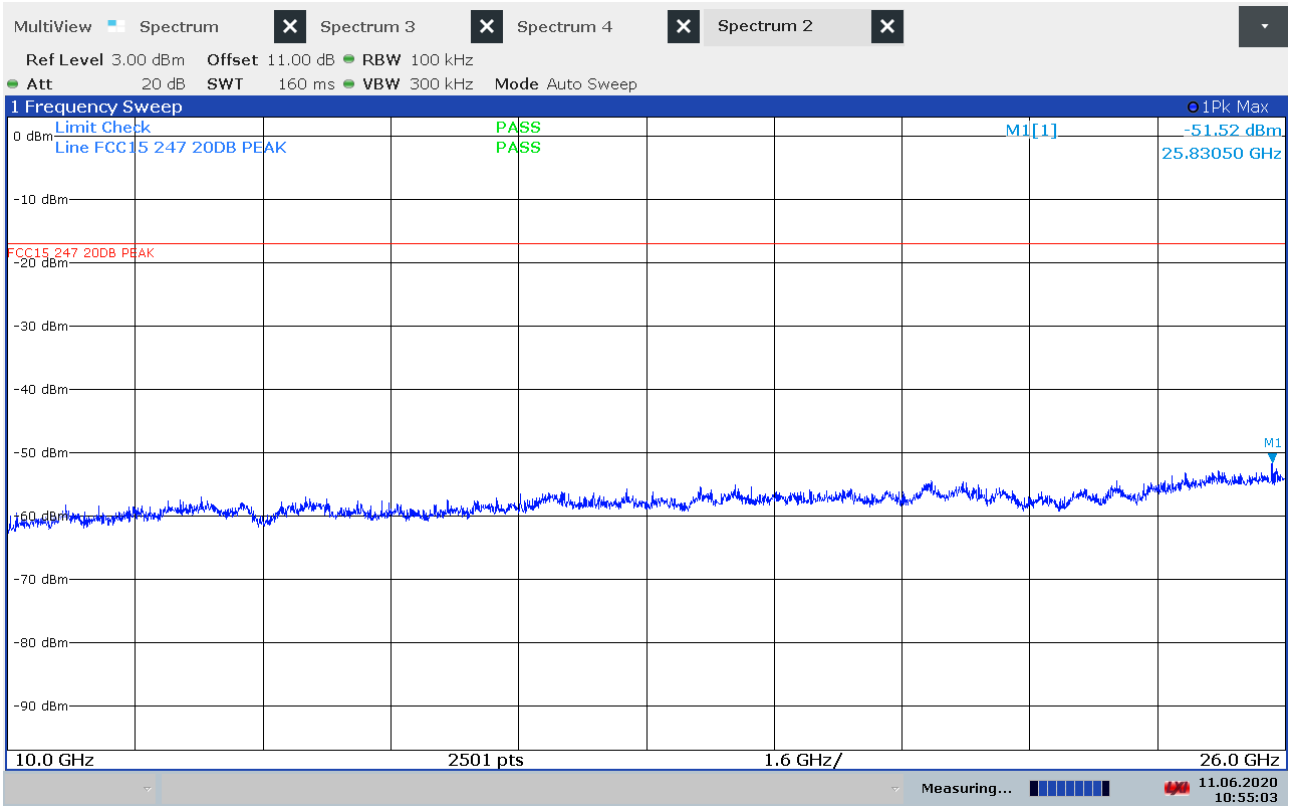
Conducted Emissions, 2550 – 10000 MHz, 2462 MHz, 802.11b, 1Mbps



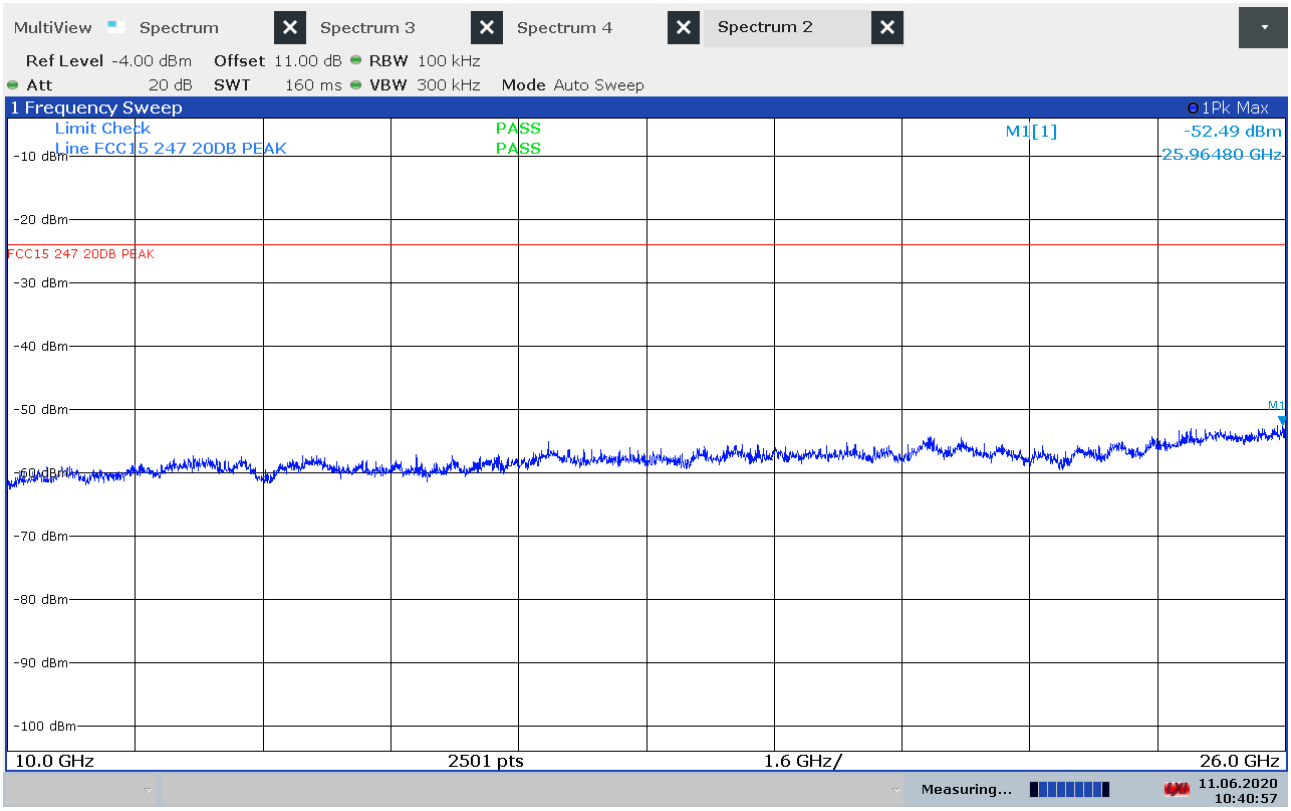
Conducted Emissions, 2550 – 10000 MHz, 2462 MHz, 802.11b, 6Mbps



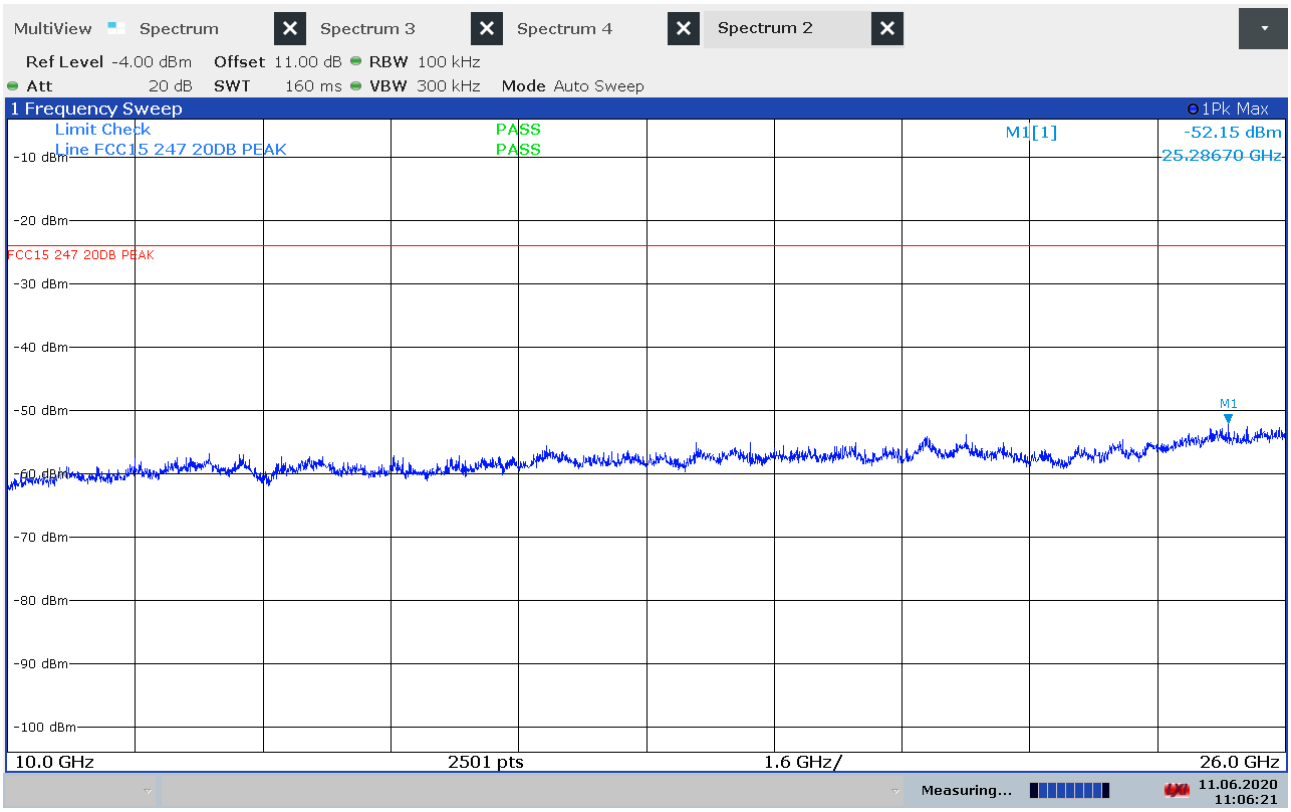
Conducted Emissions, 2550 – 10000 MHz, 2462 MHz, 802.11b, MCS0, HT20



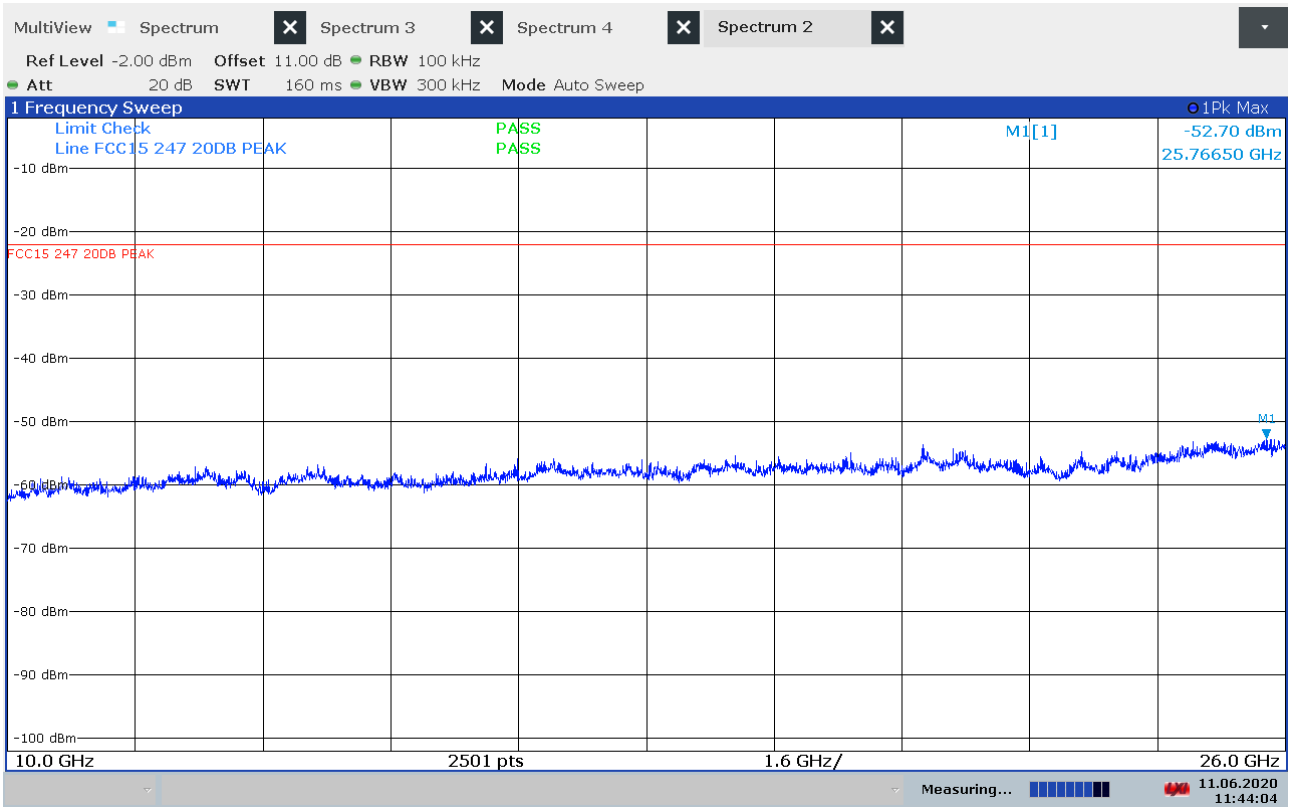
Conducted Emissions, 10000 – 26000 MHz, 2412 MHz, 802.11b, 1Mbps



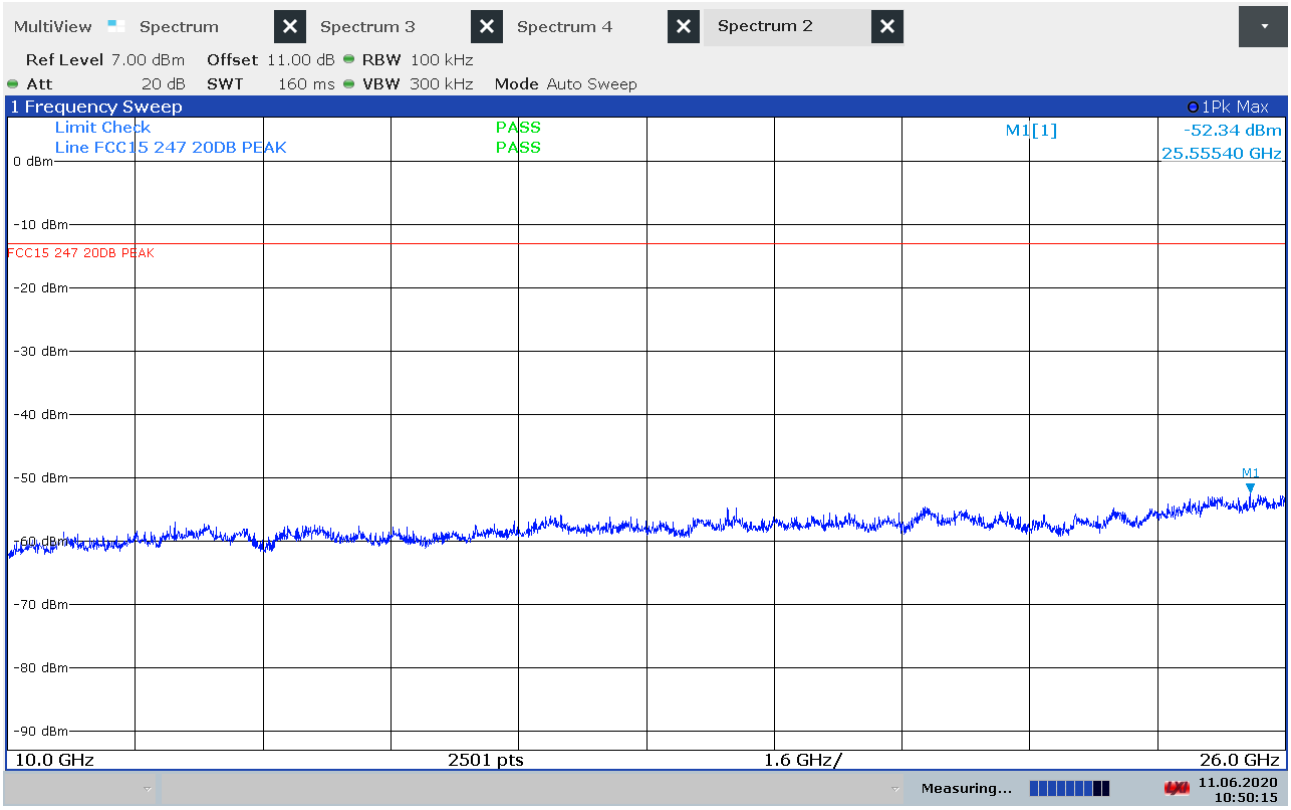
Conducted Emissions, 10000 – 26000 MHz, 2412 MHz, 802.11b, 6Mbps



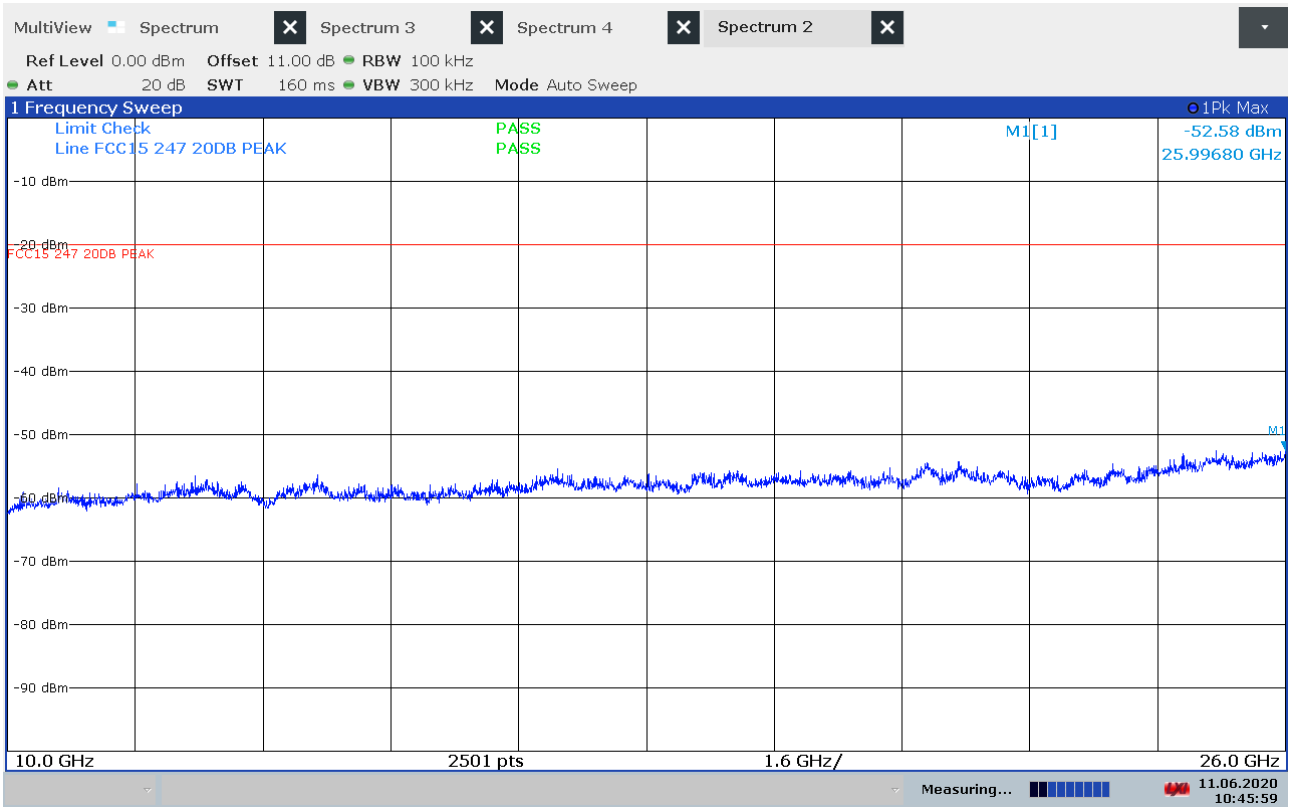
Conducted Emissions, 10000 – 26000 MHz, 2412 MHz, 802.11b, MCS0, HT20



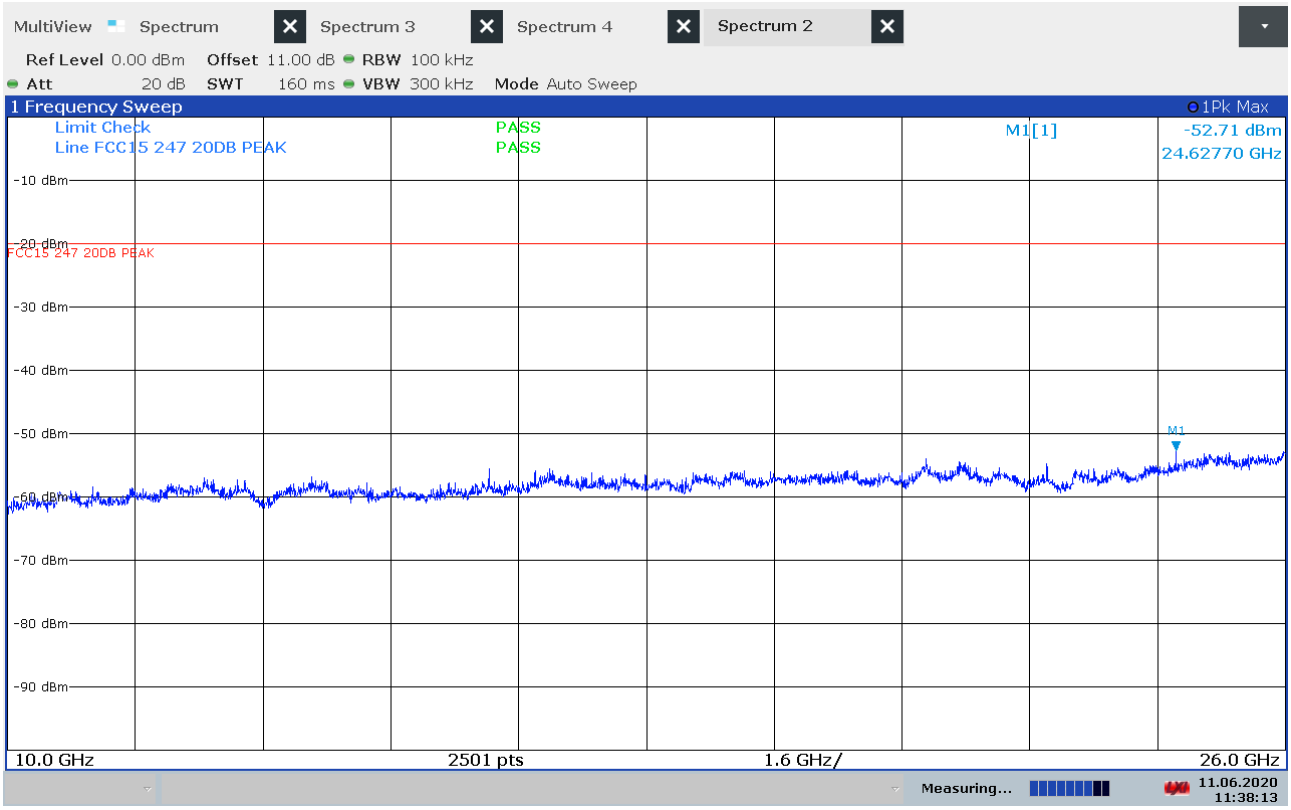
Conducted Emissions, 10000 – 26000 MHz, 2437 MHz, 802.11b, 6Mbps



Conducted Emissions, 10000 – 26000 MHz, 2462 MHz, 802.11b, 1Mbps



Conducted Emissions, 10000 – 26000 MHz, 2462 MHz, 802.11b, 6Mbps



Conducted Emissions, 10000 – 26000 MHz, 2462 MHz, 802.11b, MCS0, HT20

3.5 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED 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)	ISED (MHz)	FCC (GHz)	ISED (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 ISED, all other frequencies are common.

3.6 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

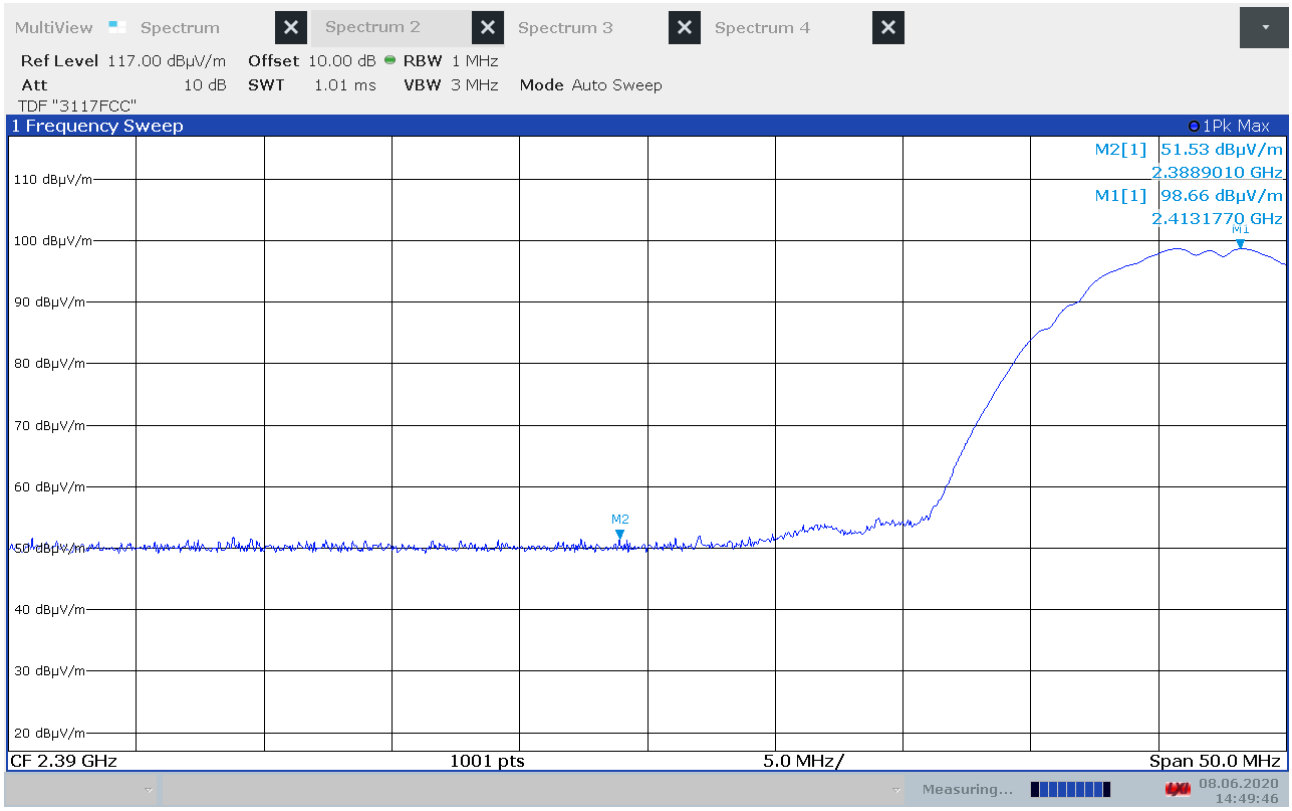
Measurement Data:

Peak Detector					
Modulation and Bitrate	Measured field strength (dBµV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dB	dB	
802.11b, 1 Mbps	51.5	52.9	74	22.5	21.1
802.11g, 6 Mbps	52.3	52.3	74	21.7	21.7
802.11n, MCS0, HT20	51.4	52.2	74	22.6	21.8
802.11n, MCS0, HT40	67.6	66.4	74	6.4	7.6

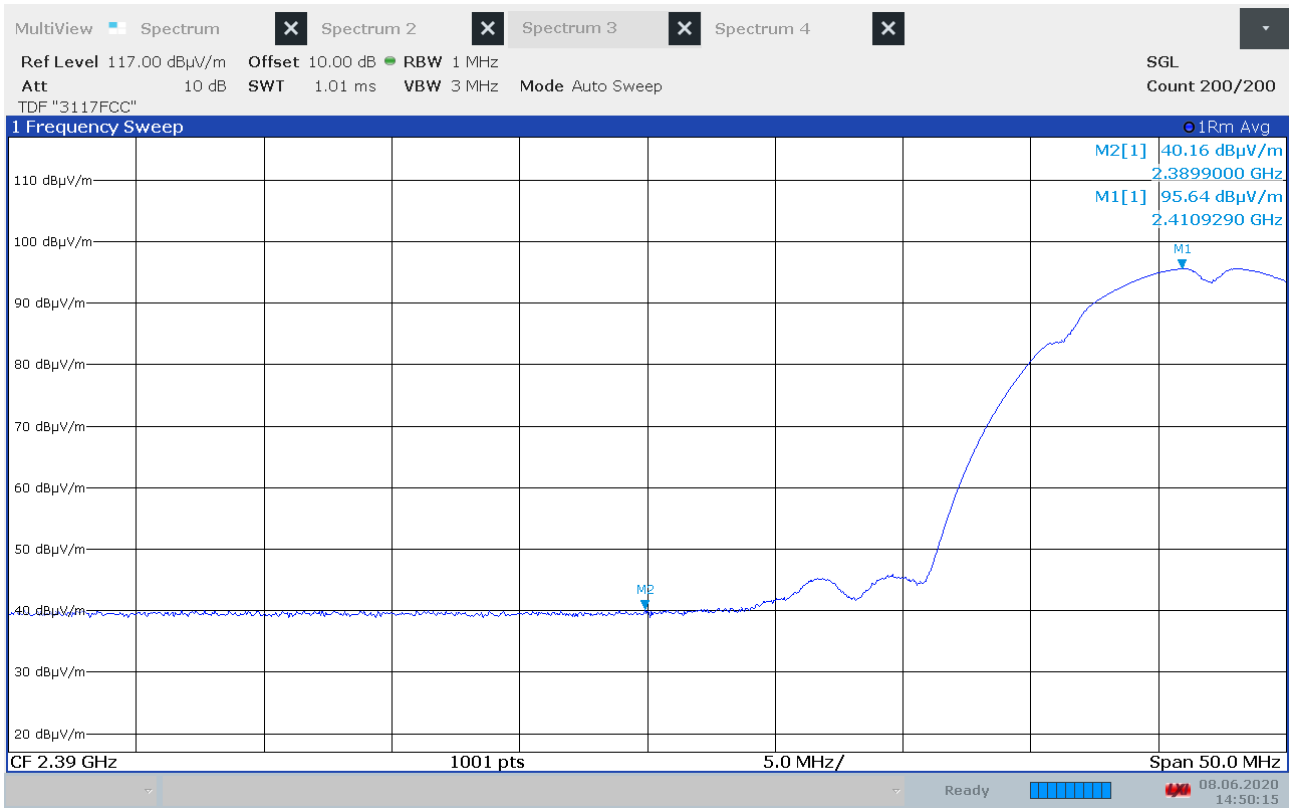
Average Detector					
Modulation and Bitrate	Measured field strength (dBµV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dB	dB	
802.11b, 1 Mbps	40.2	40.3	54	13.8	13.7
802.11g, 6 Mbps	40.1	40.7	54	13.9	13.3
802.11n, MCS0, HT20	40.4	40.8	54	13.6	13.2
802.11n, MCS0, HT40	49.7	52.0	54	4.3	2.0

Average values were measured using method SA-1 (Duty Cycle ≈100%)

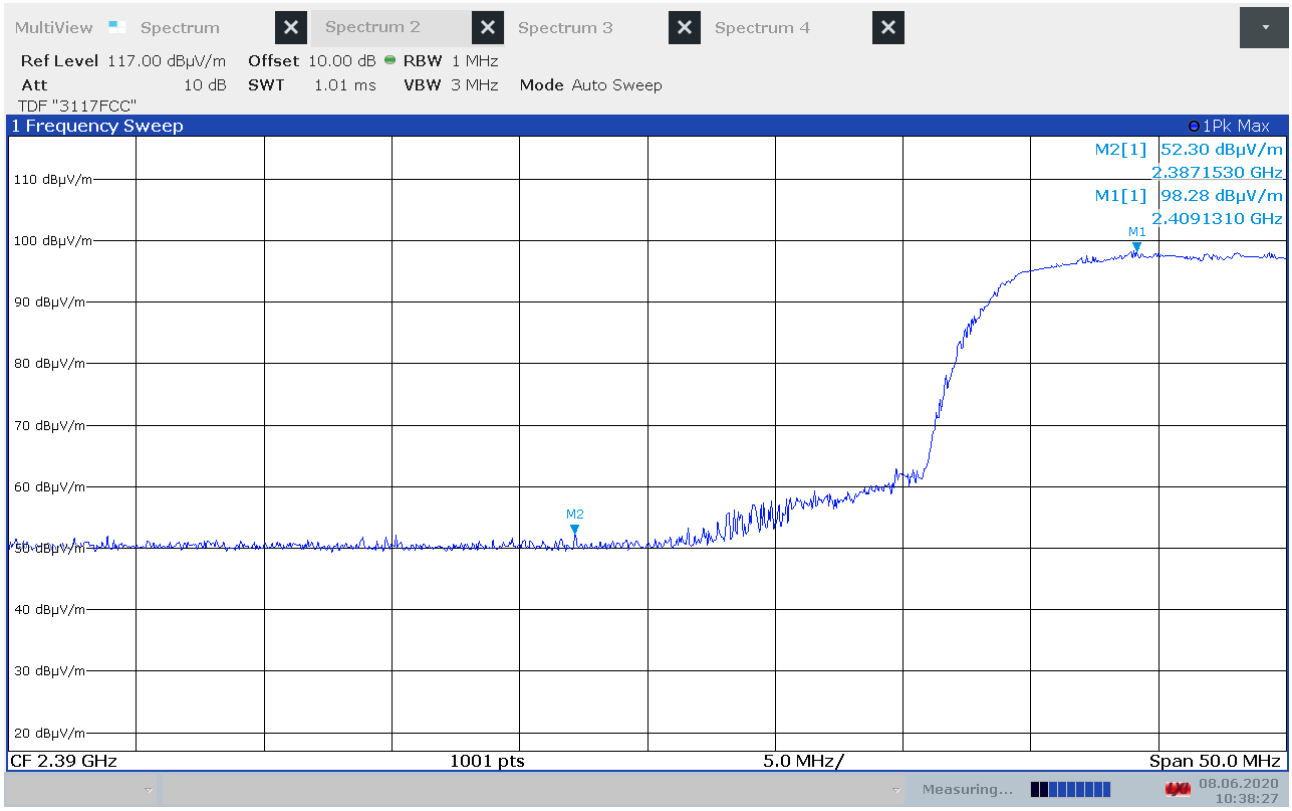
See attached plots



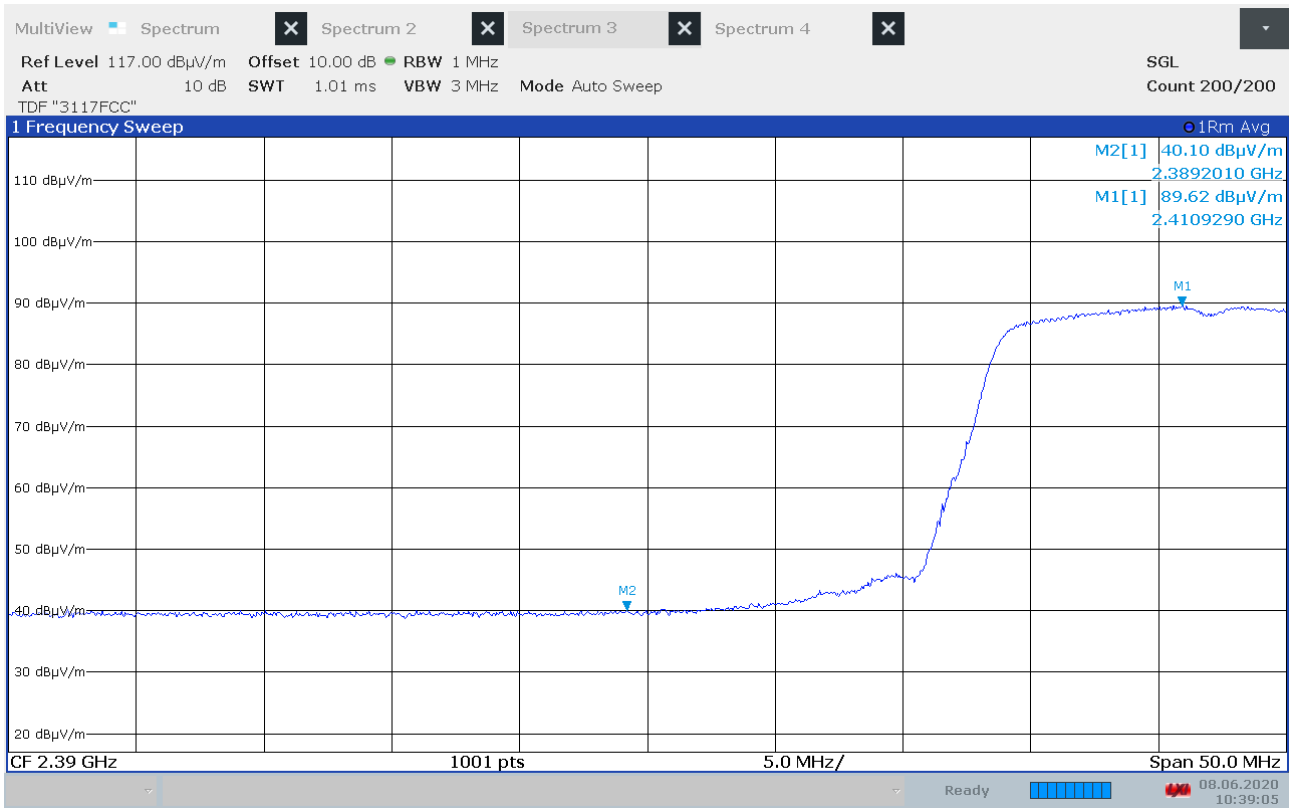
Lower Band Edge, Peak, 2412 MHz, 802.11b, 1Mbps



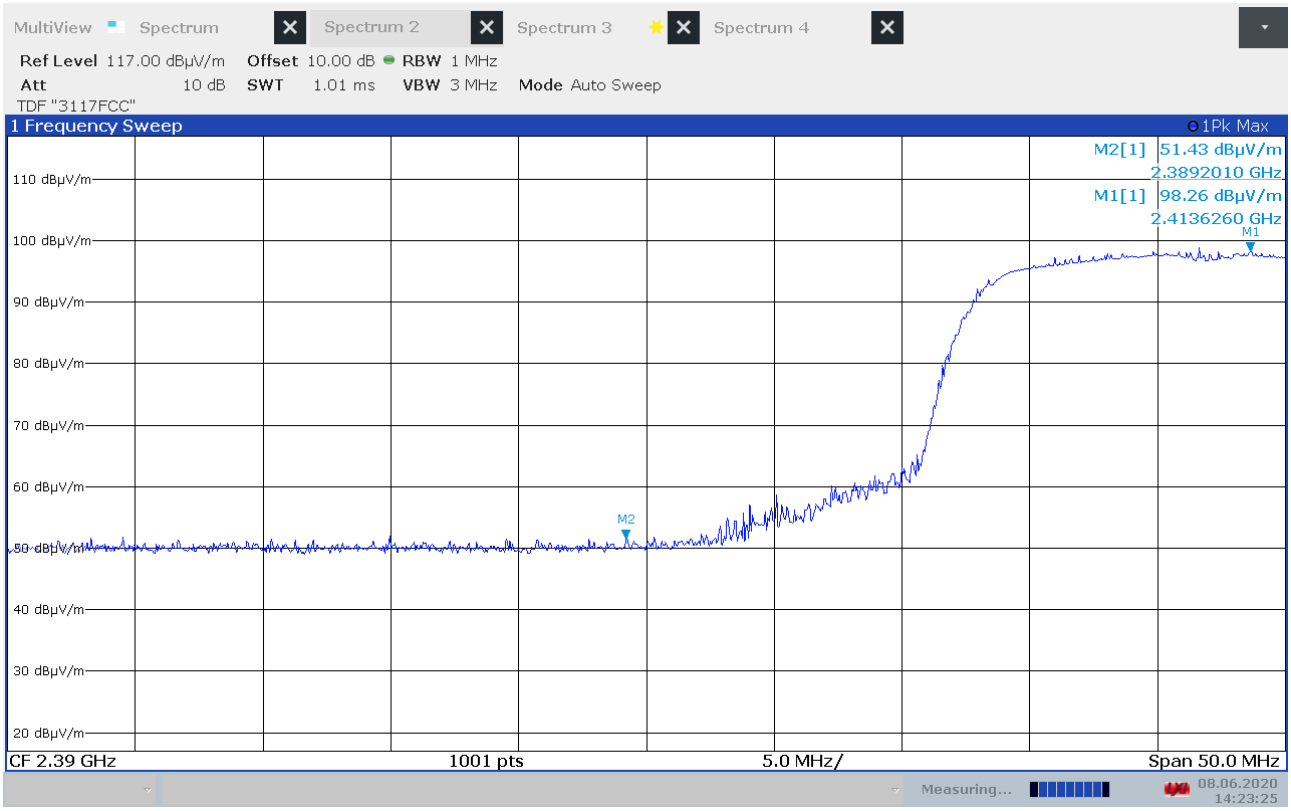
Lower Band Edge, Average, 2412 MHz, 802.11b, 1Mbps



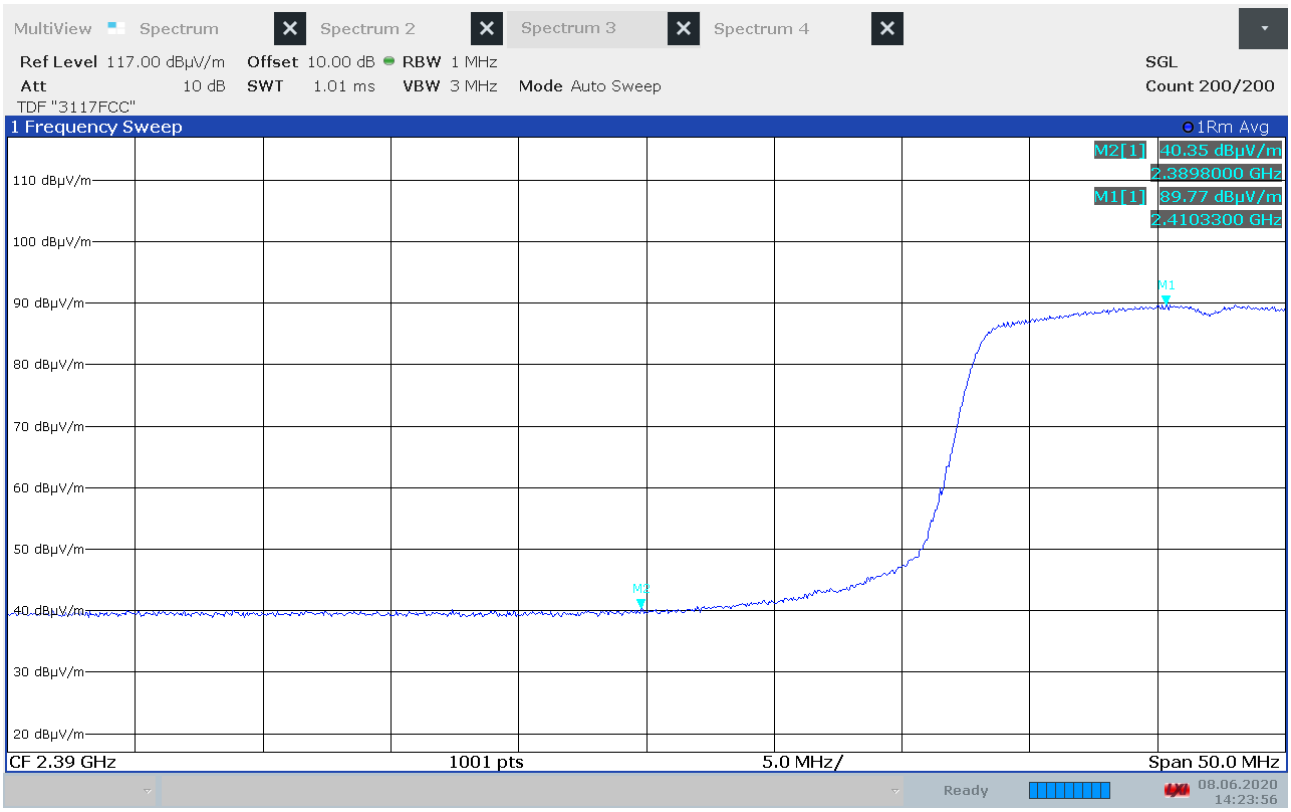
Lower Band Edge, Peak, 2412 MHz, 802.11g, 6Mbps



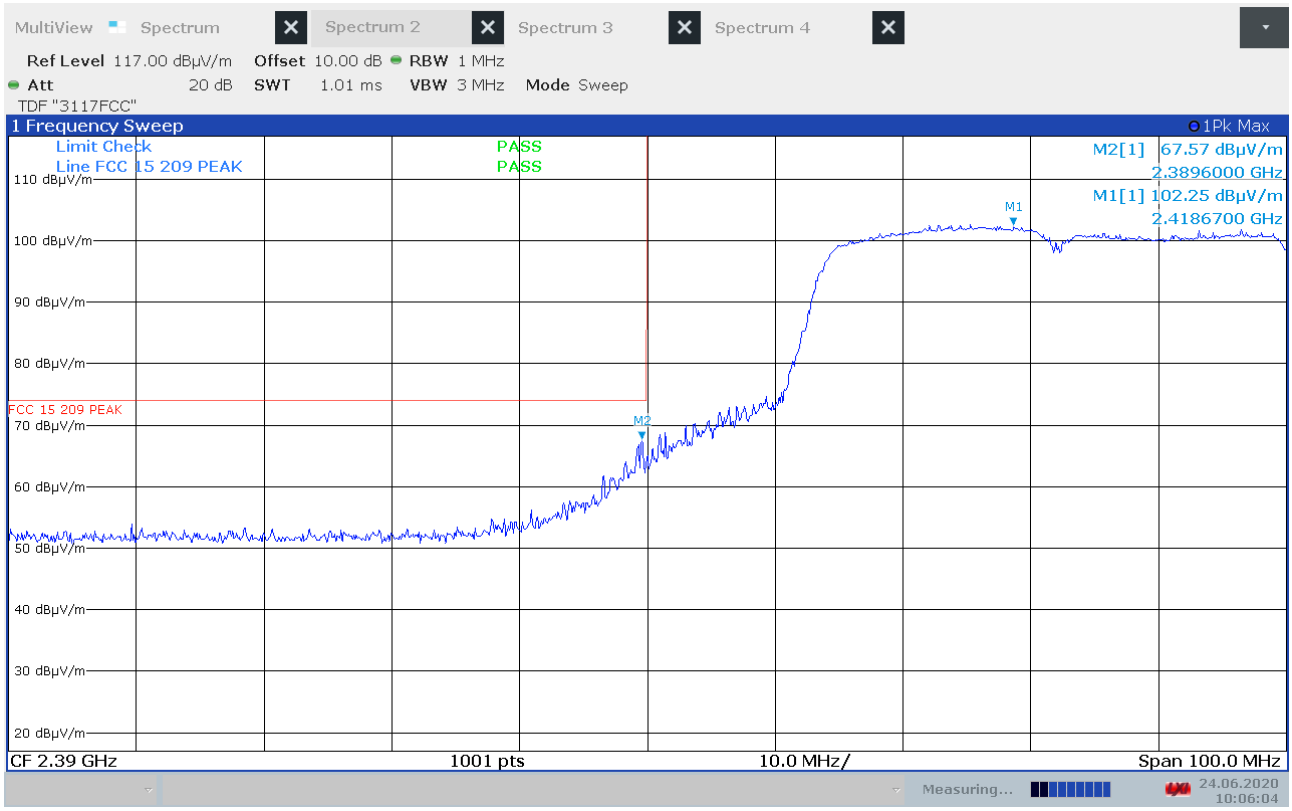
Lower Band Edge, Average, 2412 MHz, 802.11g, 6Mbps



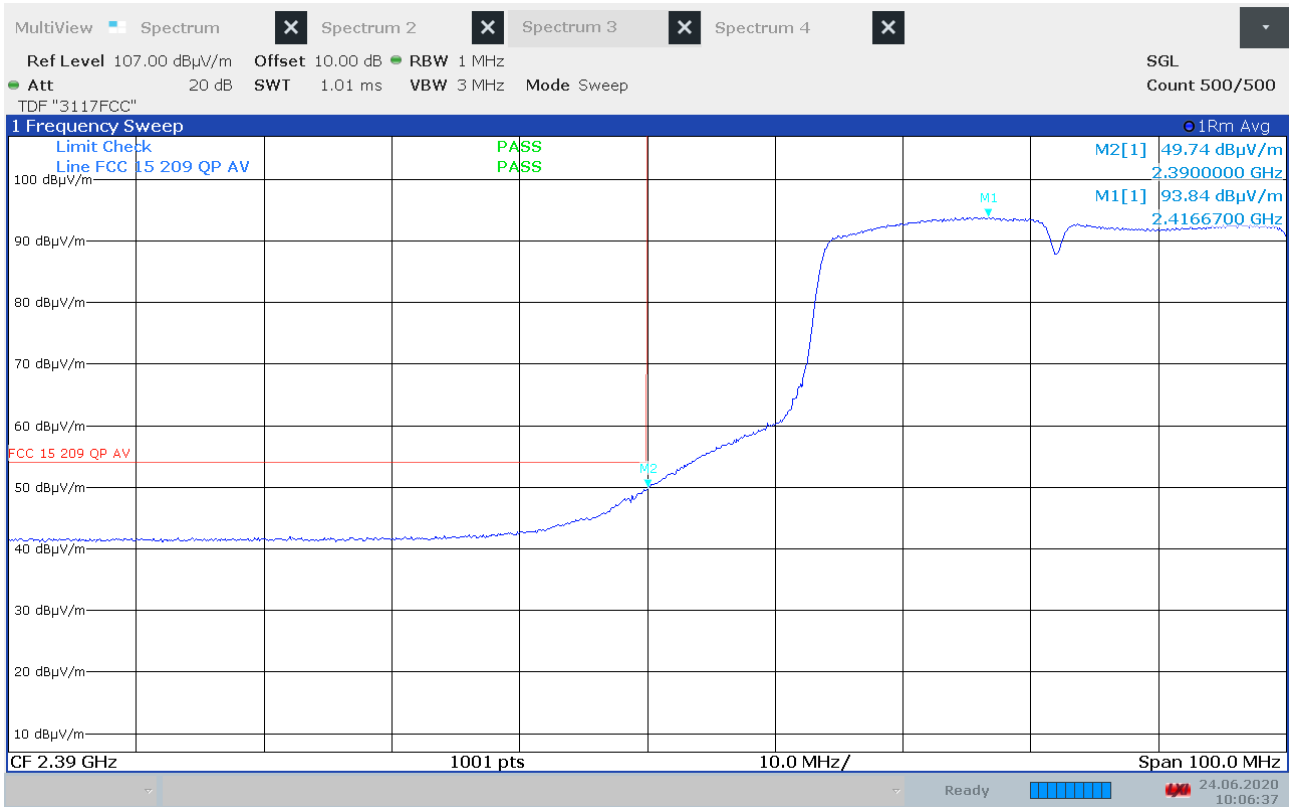
Lower Band Edge, Peak, 2412 MHz, 802.11n, MCS0, HT20



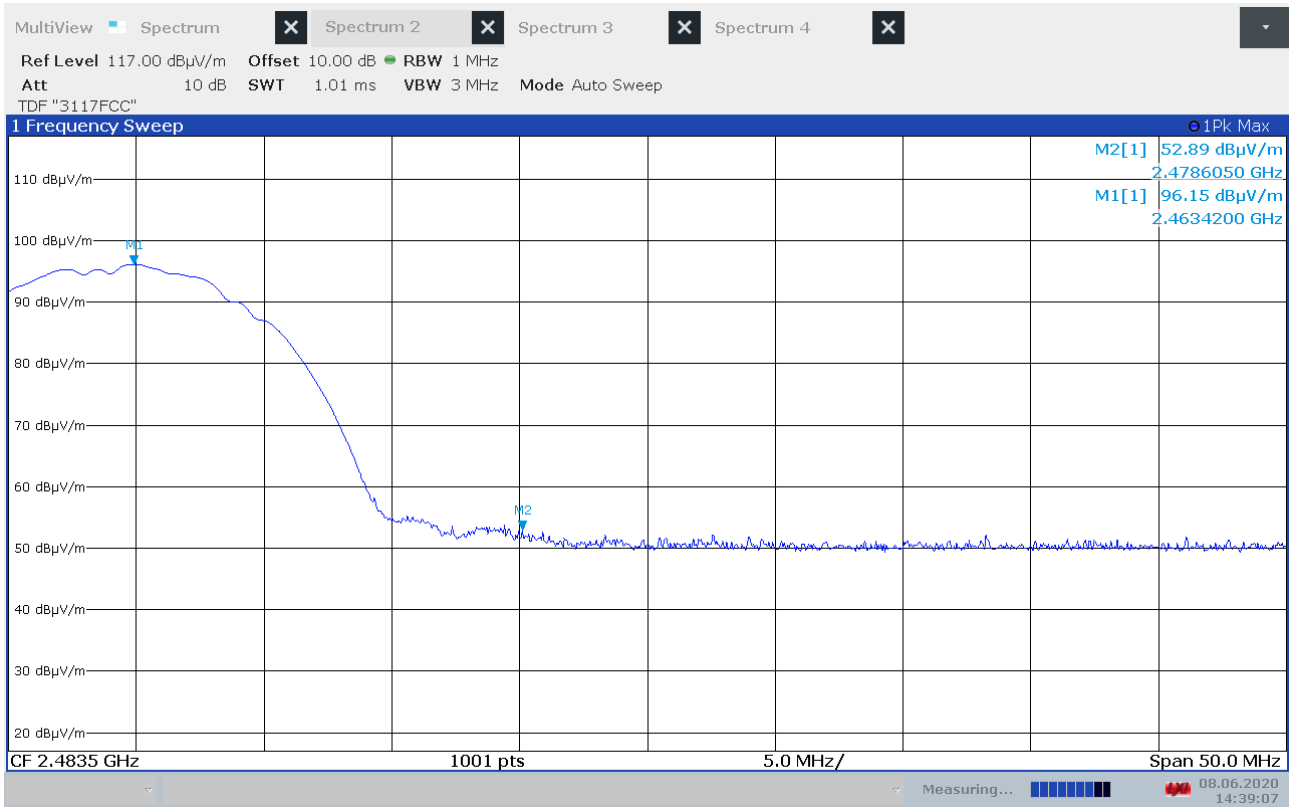
Lower Band Edge, Average, 2412 MHz, 802.11n, MCS0, HT20



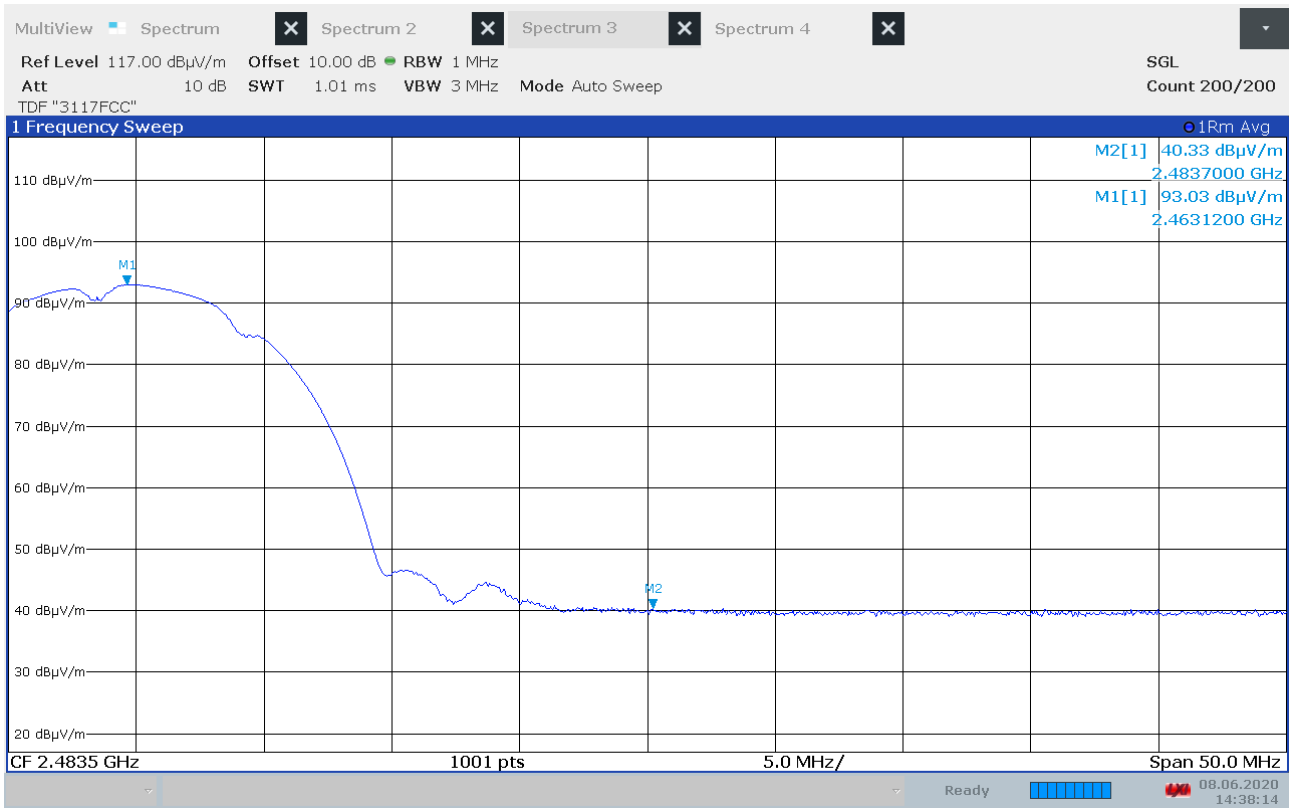
Lower Band Edge, Peak, 2422 MHz, 802.11n, MCS0, HT40



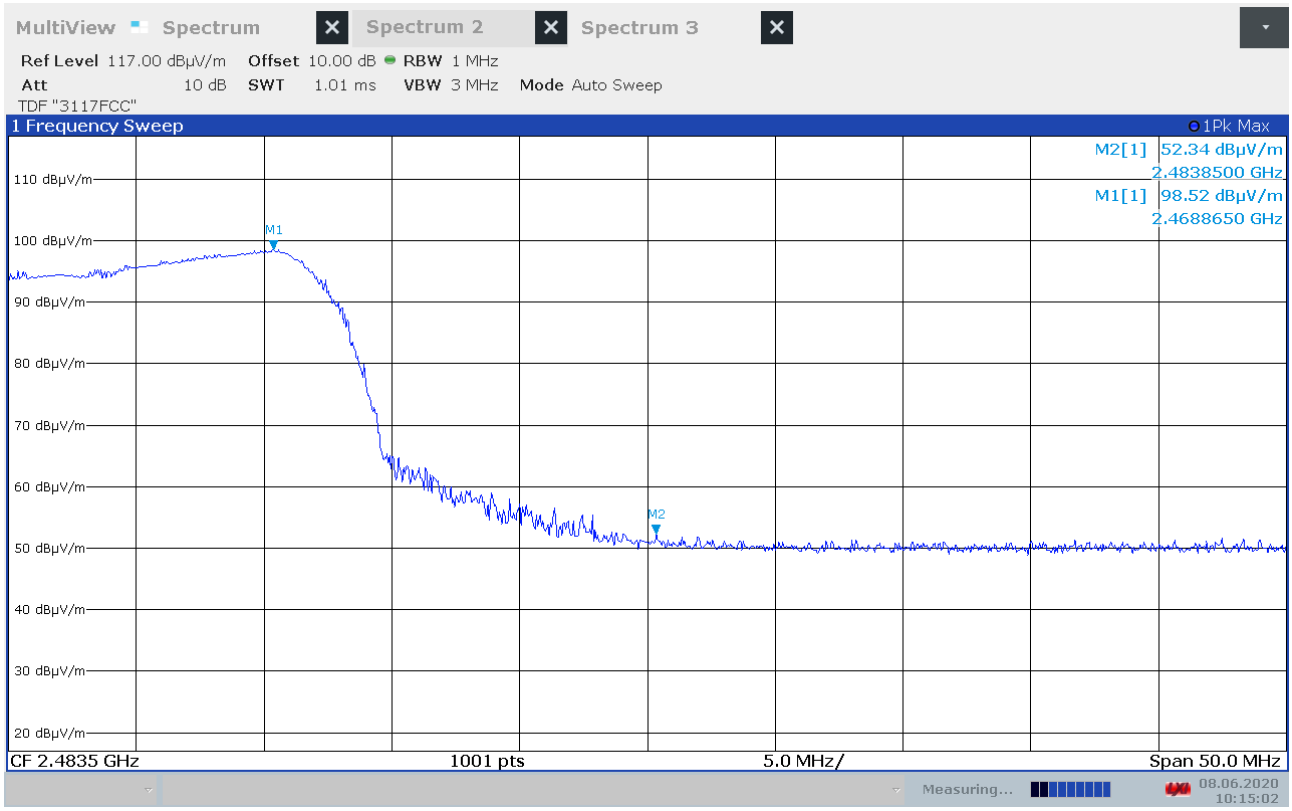
Lower Band Edge, Average, 2422 MHz, 802.11n, MCS0, HT40



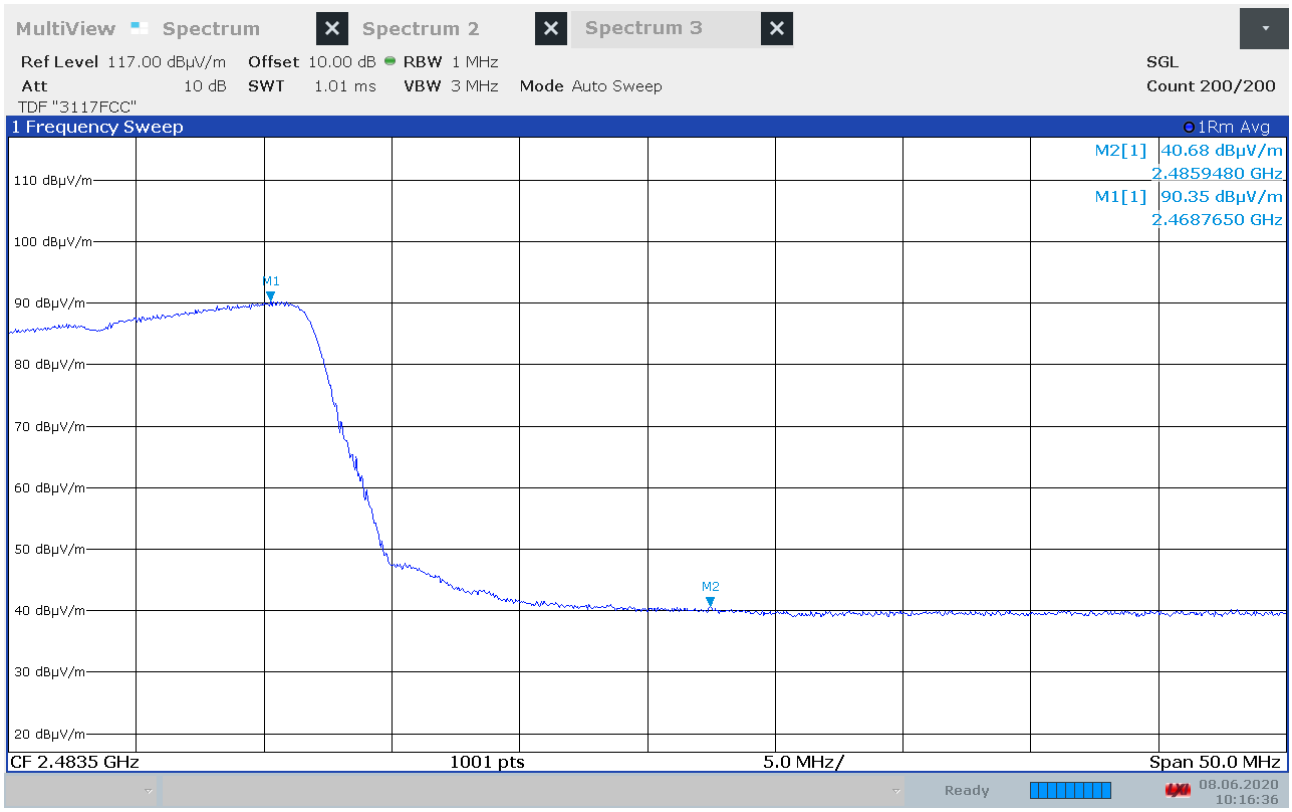
Upper Band Edge, Peak, 2462 MHz, 802.11b, 1Mbps



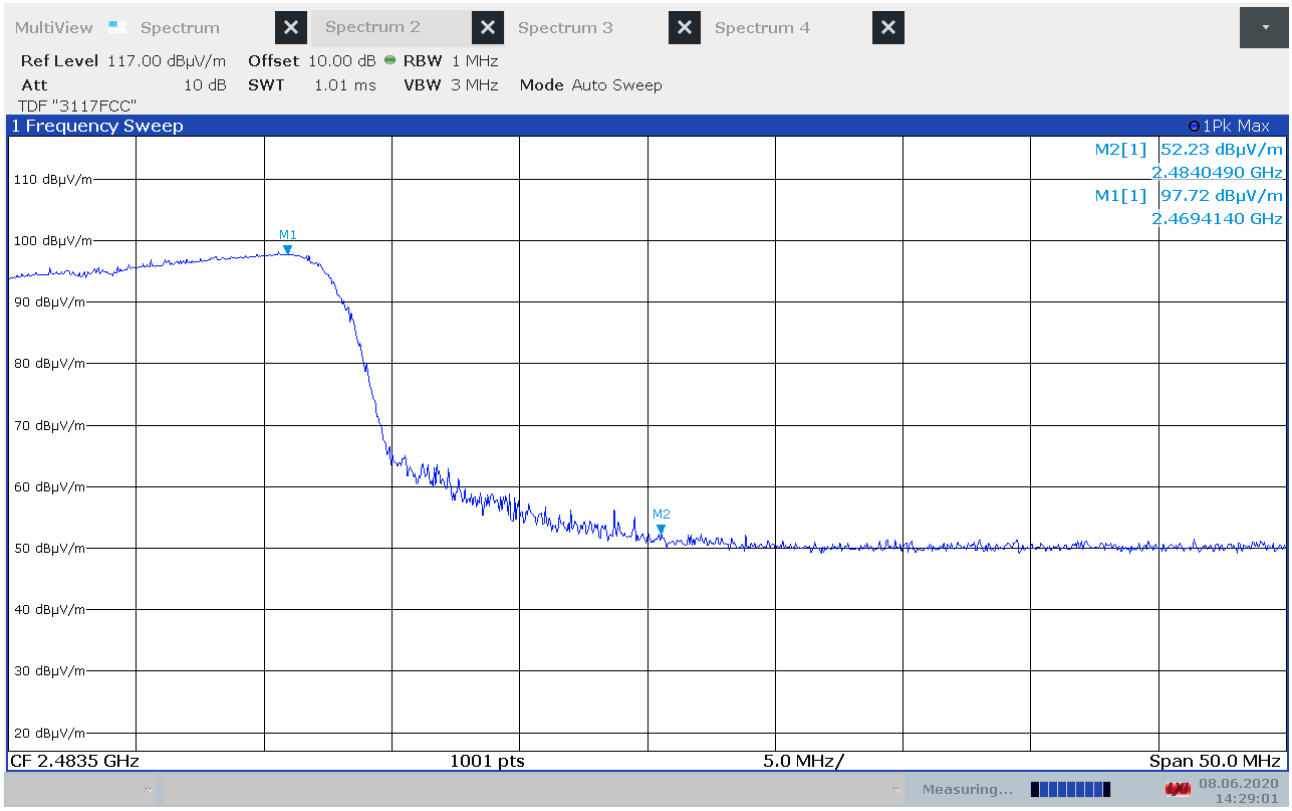
Upper Band Edge, Average, 2462 MHz, 802.11b, 1Mbps



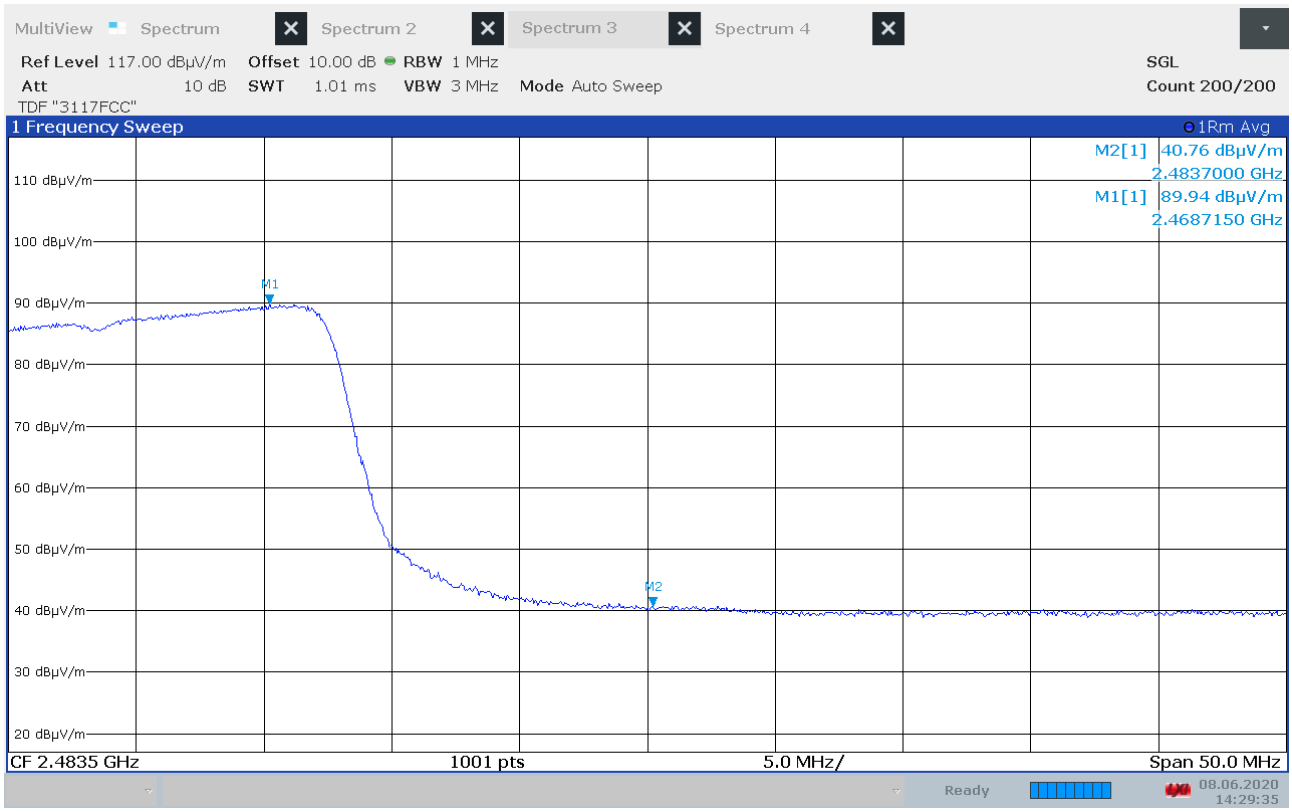
Upper Band Edge, Peak, 2462 MHz, 802.11g, 6Mbps



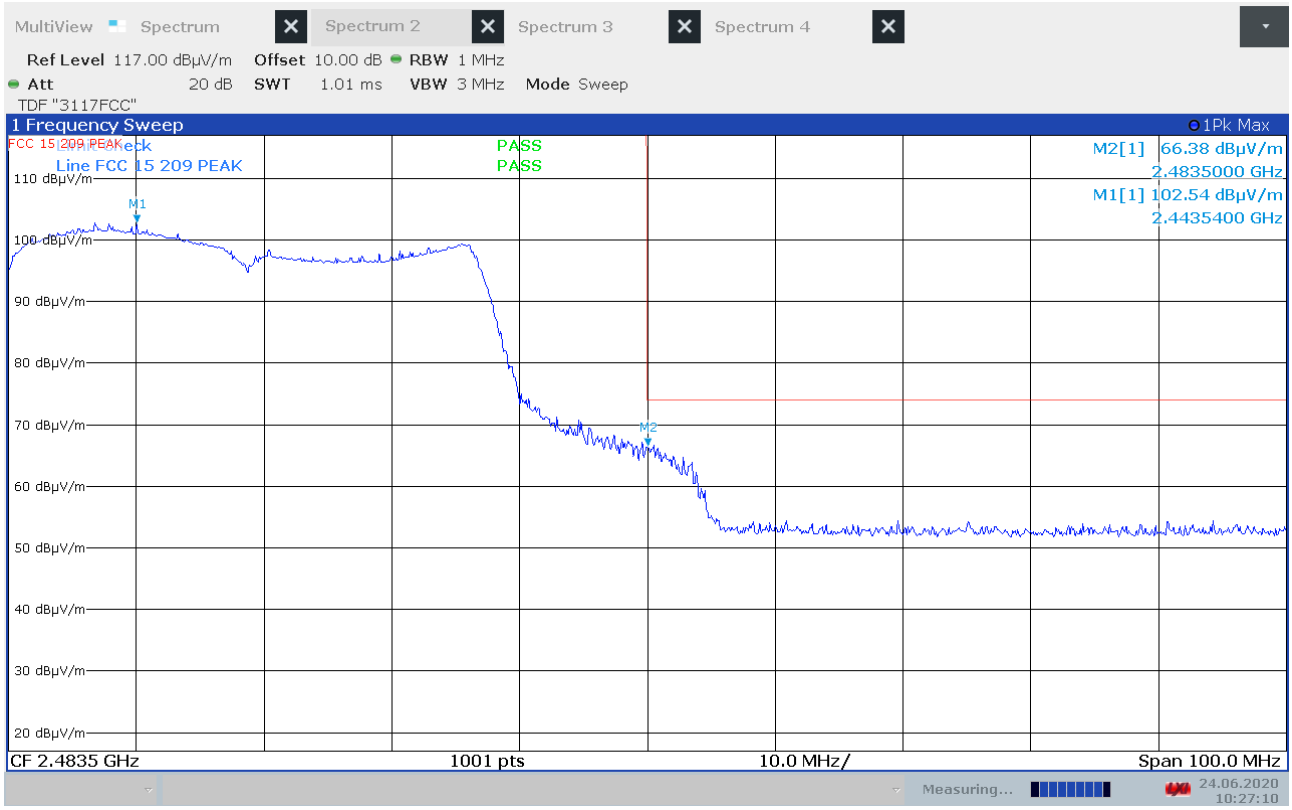
Upper Band Edge, Average, 2462 MHz, 802.11g, 6Mbps



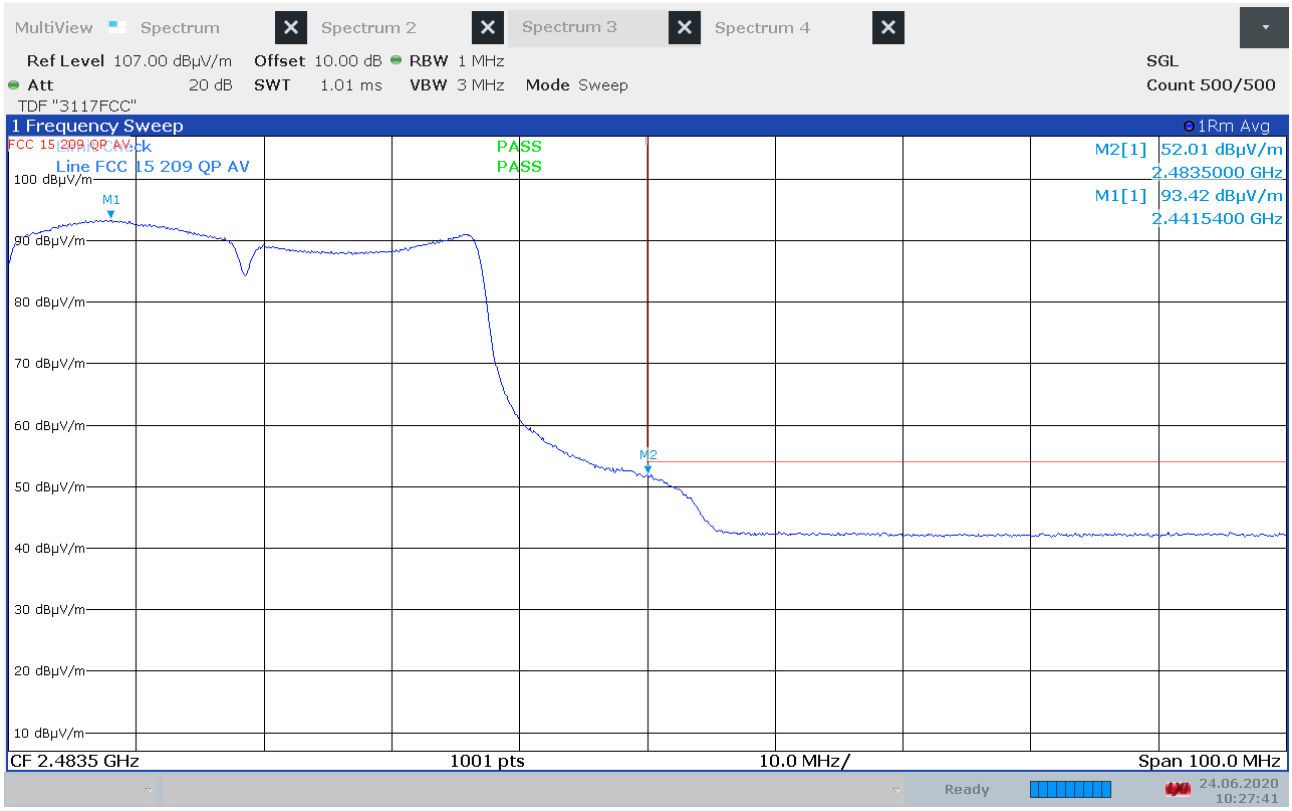
Upper Band Edge, Peak, 2462 MHz, 802.11n, MCS0



Upper Band Edge, Average, 2462 MHz, 802.11n, MCS0



Upper Band Edge, Peak, 2452 MHz, 802.11n, MCS0, HT40



Upper Band Edge, Average, 2452 MHz, 802.11n, MCS0, HT40

3.7 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 3m.

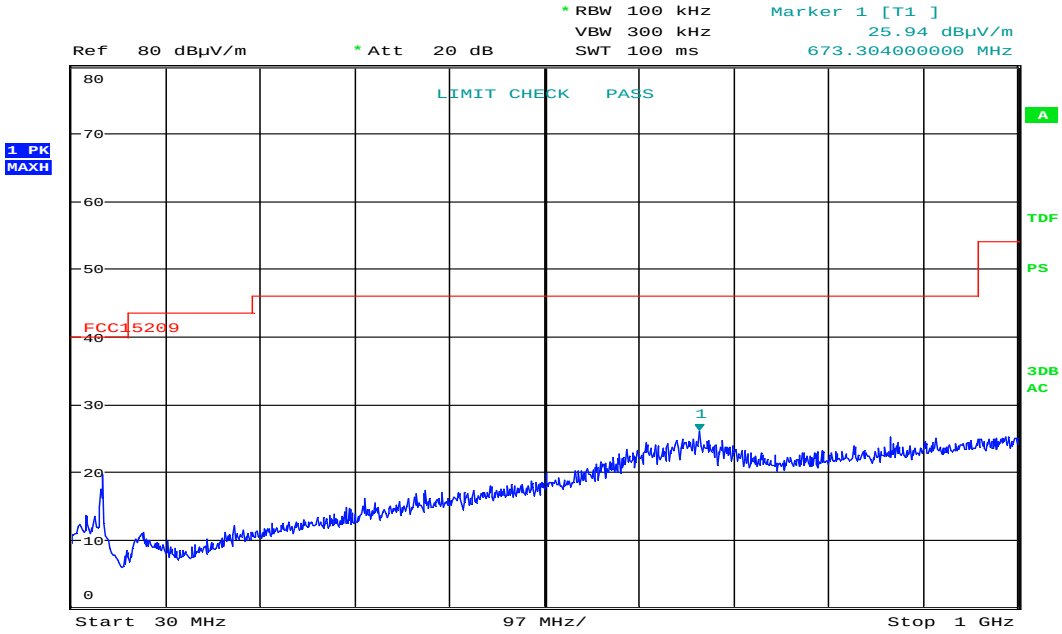
Tested in test mode with EUT transmitting on Ch06 with 802.11g 6Mb.

Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	2437	802.11g 6Mbps	< 20	40.0	> 20
88 – 216	2437	802.11g 6Mbps	< 18.5	43.5	> 25
216 – 960	2437	802.11g 6Mbps	< 26	46.0	> 20
960 – 1000	2437	802.11g 6Mbps	< 30	54.0	> 24

See attached plots.

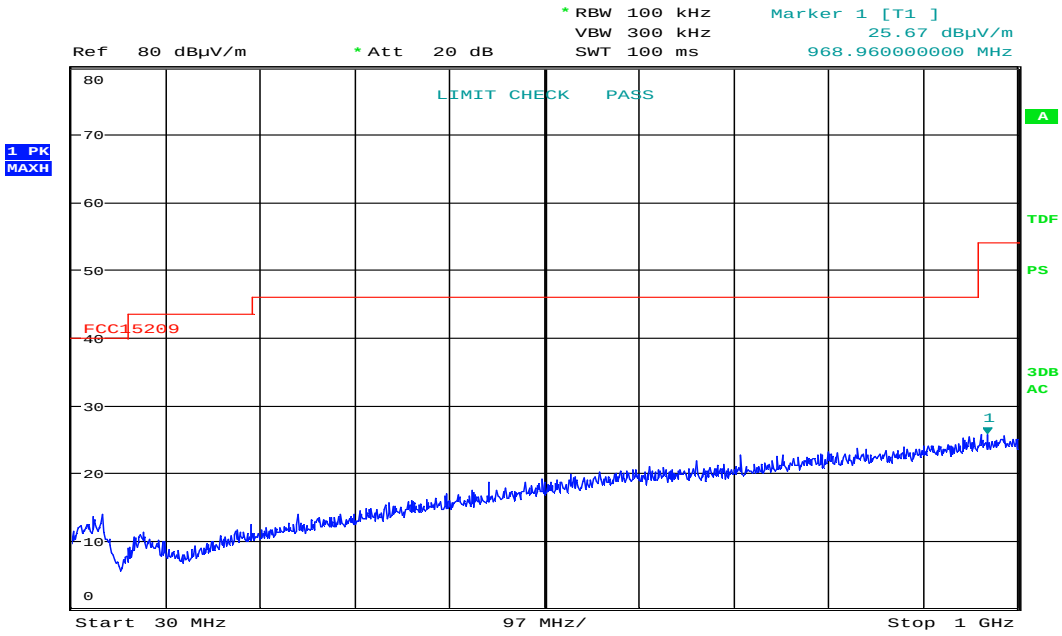
Requirements/Limit

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	



Date: 9.JUN.2020 14:34:50

Radiated Emissions, 30 -1000 MHz, 2437 MHz, VP, 802.11g, 6Mbps



Date: 9.JUN.2020 14:31:56

Radiated Emissions, 30 -1000 MHz, 2437 MHz, HP, 802.11g, 6Mbps

3.8 Radiated Emissions, 1 – 18 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)

Bandwidths: RBW=1MHz / VBW=3MHz

Carrier Frequency (MHz)	Measured Frequency (MHz)	Modulation Scheme	Peak Level (dBµV/m)	Average Level (dBµV/m)	Pk Limit (dBµV/m)	Av Limit (dBµV/m)	Peak Margin (dB)	Av Margin (dB)
2412	4824	802.11b 1Mb	57.0	53.9	74	54	17.0	0.1
		802.11g 6Mb	63.2	48.0	74	54	10.8	6.0
		802.11n HT20	62.5	47.4	74	54	11.5	6.6
2422	4844	802.11n, HT40	61.2	48.7	74	54	12.8	5.3
2437	4874	802.11b 1Mb	55.4	53.0	74	54	18.6	1.0
		802.11g 6Mb	61.8	47.5	74	54	12.2	6.5
		802.11n HT20	61.7	47.1	74	54	12.3	6.9
		802.11n, HT40	62.7	49.9	74	54	11.3	4.1
2452	4904	802.11n, HT40	62.0	50.2	74	54	12.0	3.8
2462	4924	802.11b 1Mb	56.5	53.9	74	54	17.5	0.1
		802.11g 6Mb	61.7	46.5	74	54	12.3	7.5
		802.11n HT20	61.7	46.8	74	54	12.3	7.2
Any	Any	Any	<54	<44	74	54	>20	>10

Measured results are for 802.11b 1Mb, 802.11a 6 Mbps and 802.11n HT20/40, it was checked that other modulations and/or bitrates did not produce higher emissions.

A Band Reject Filter was used for all measurements.

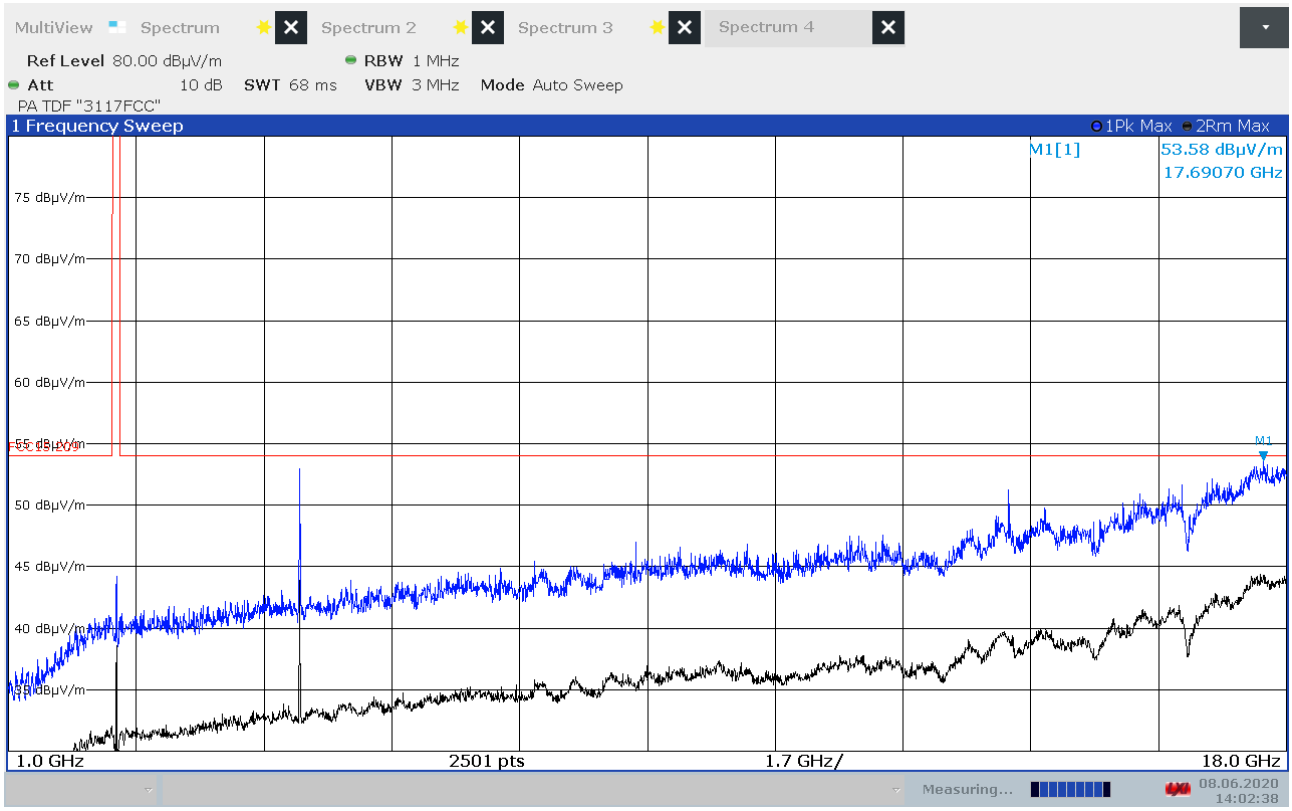
Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer “Transducer factor”.

See attached plots.

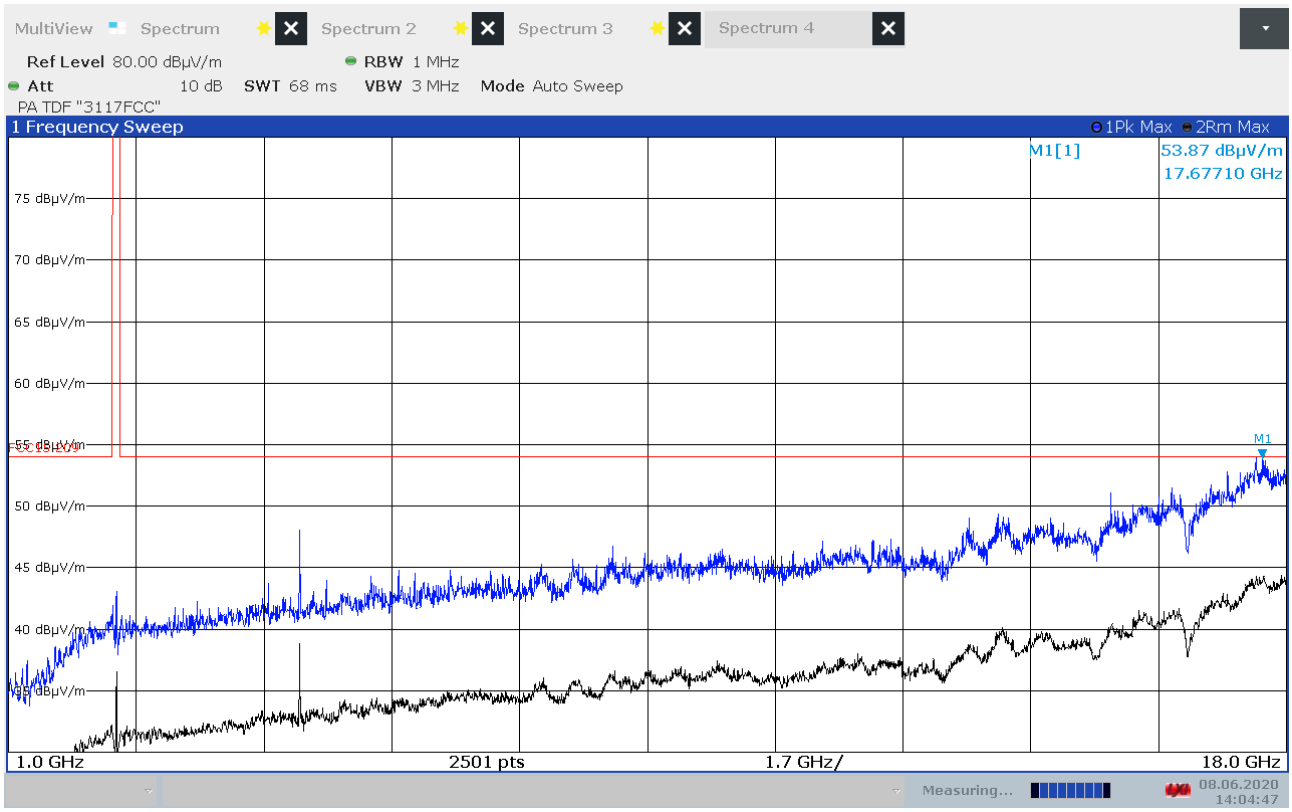
Average Detector values were measured with method SA-1. Duty Cycle was 100% for all measurements.

Requirements/Limit

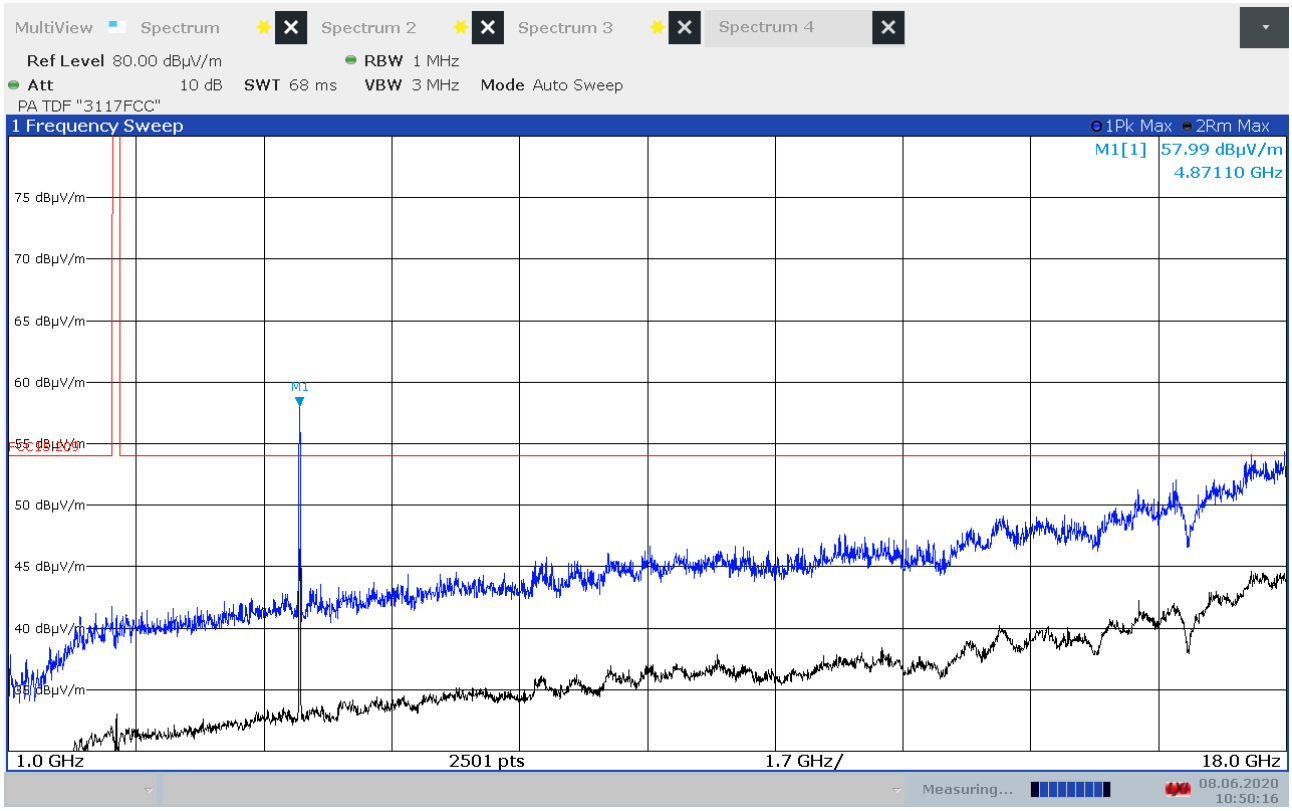
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector	Peak Detector
1 – 25 GHz	54.0 dBµV/m	74.0 dBµV/m



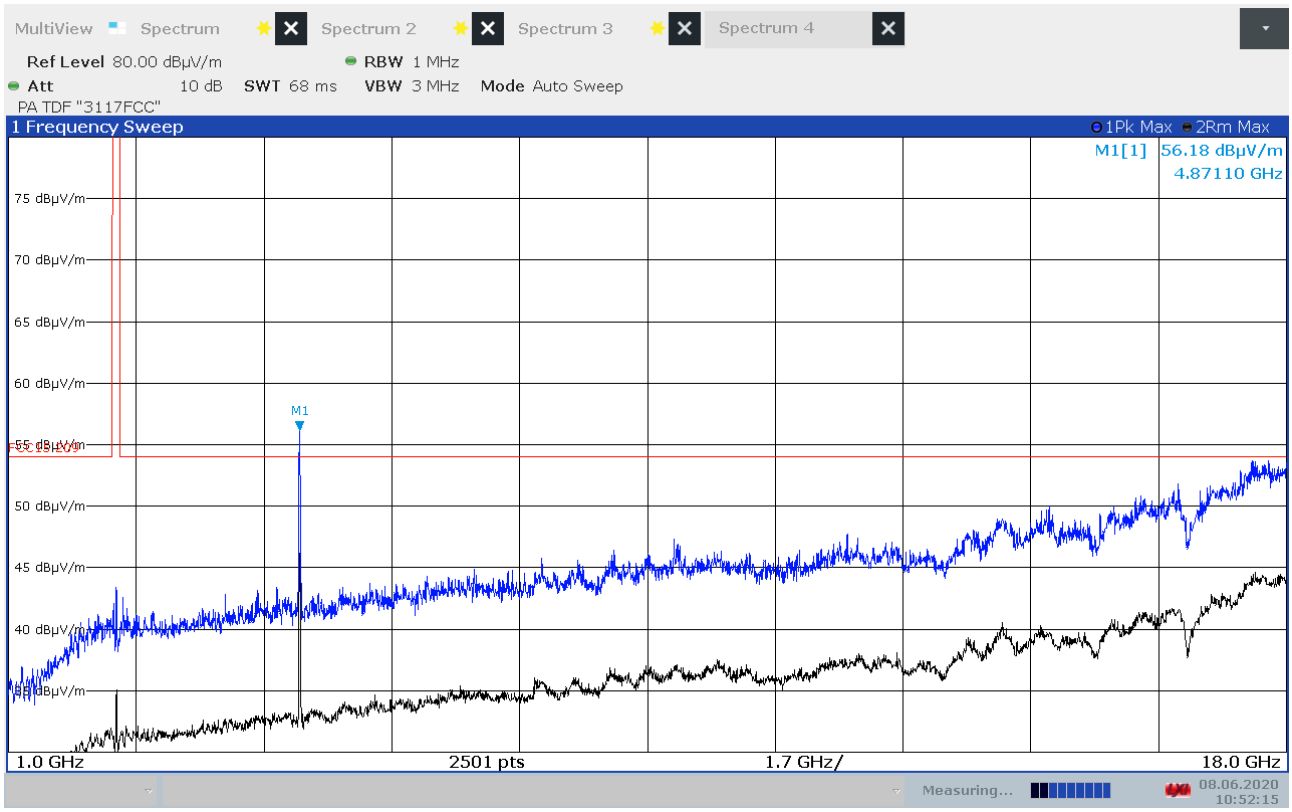
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, VP, 802.11b, 1Mbps



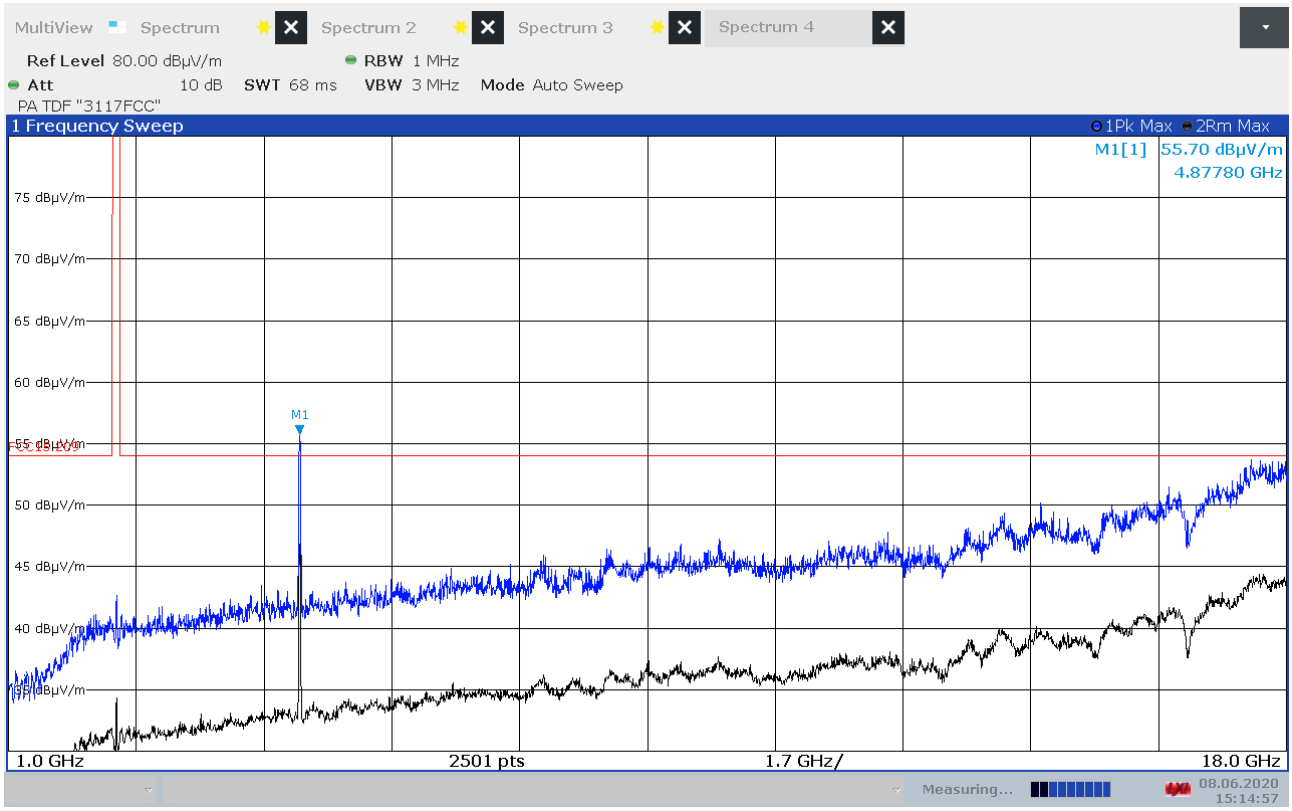
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, HP, 802.11b, 1Mbps



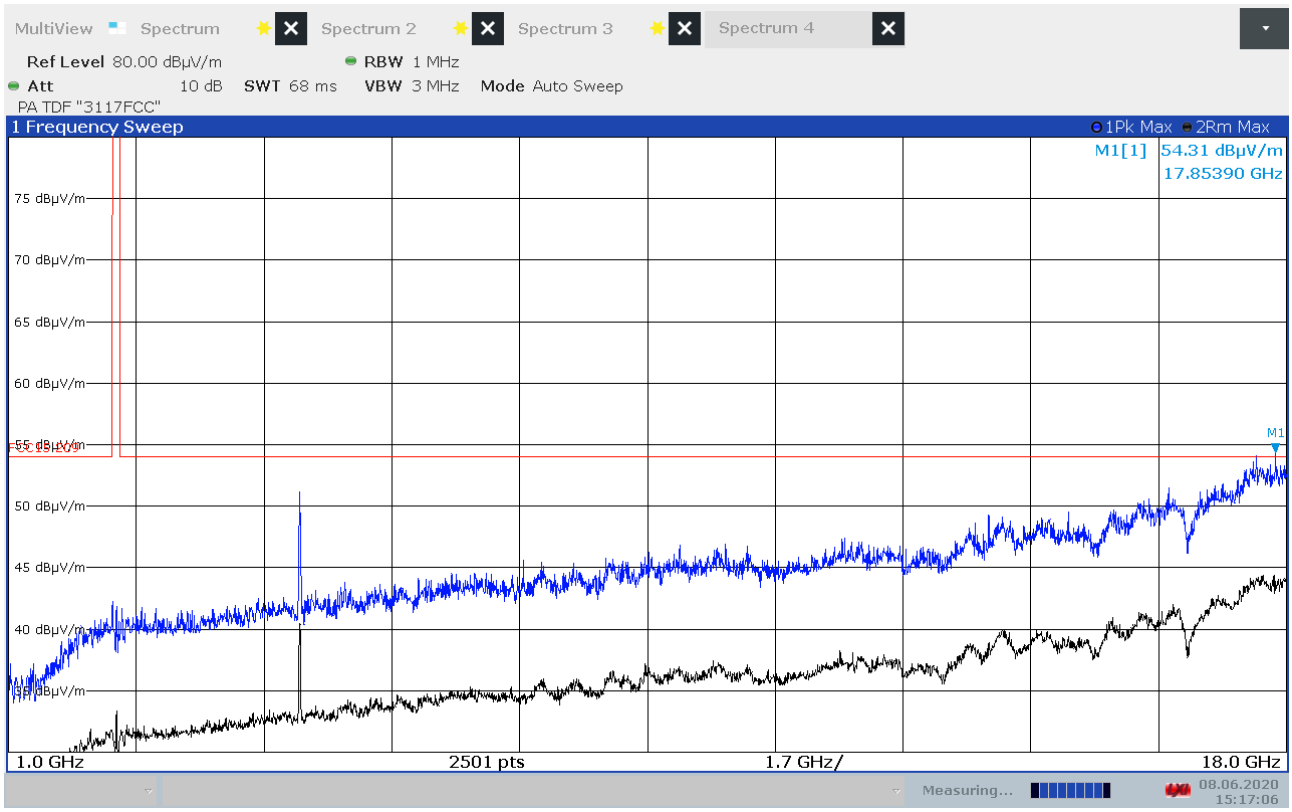
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, VP, 802.11g, 6Mbps



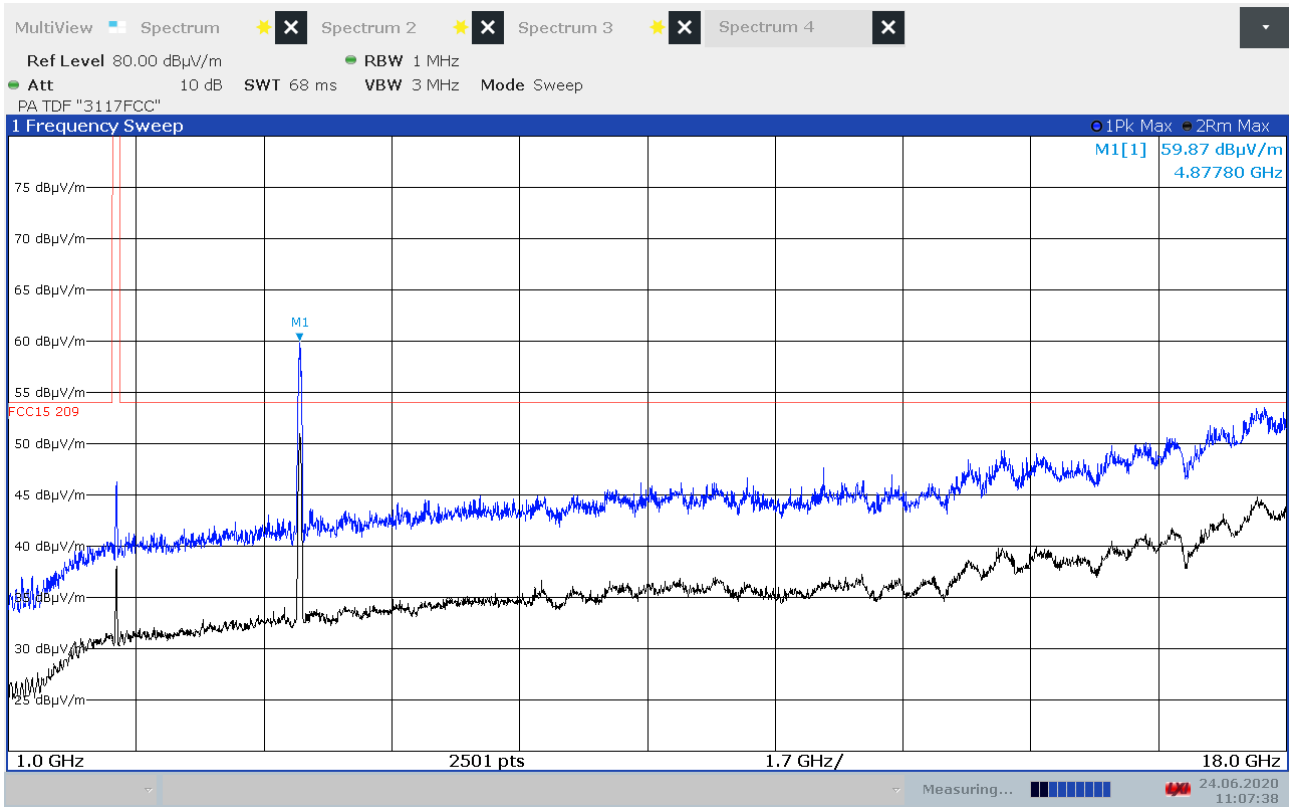
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, HP, 802.11g, 6Mbps



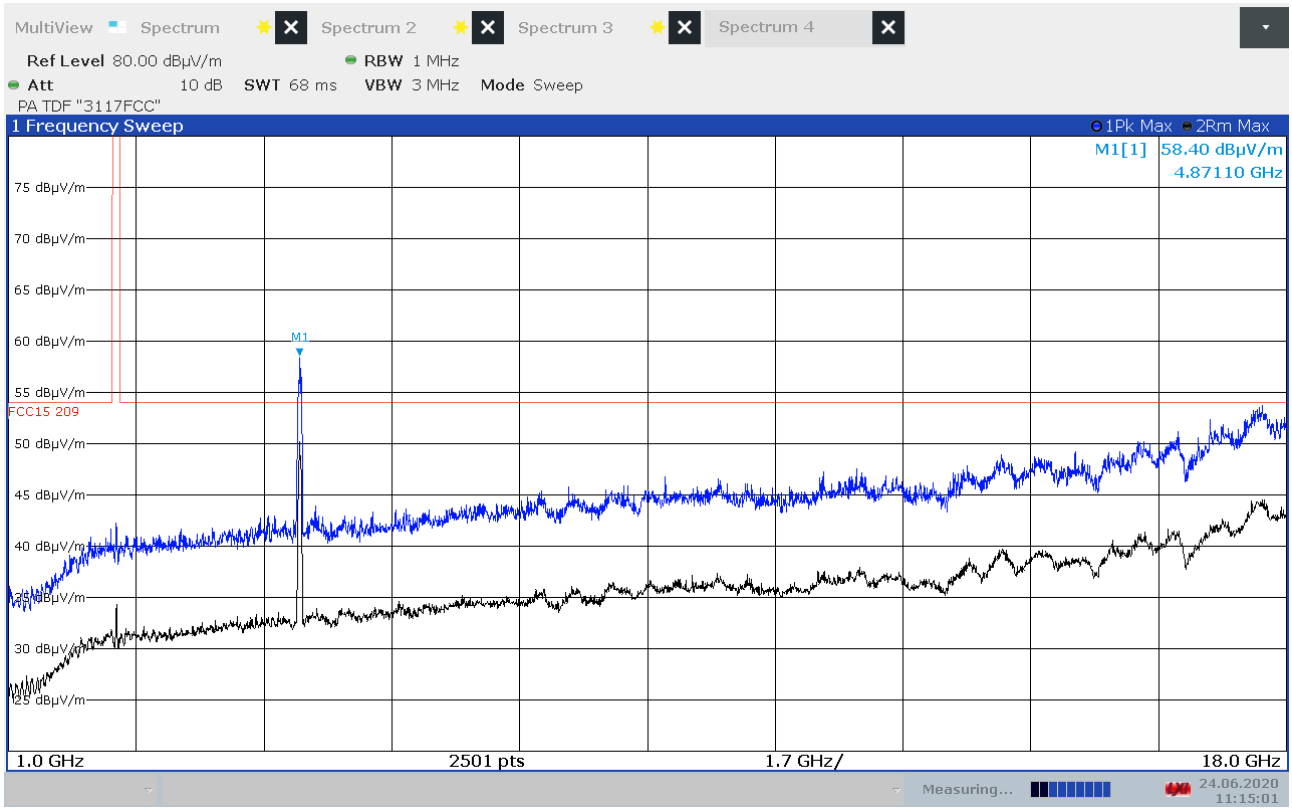
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, VP, 802.11n, MCS0, HT20



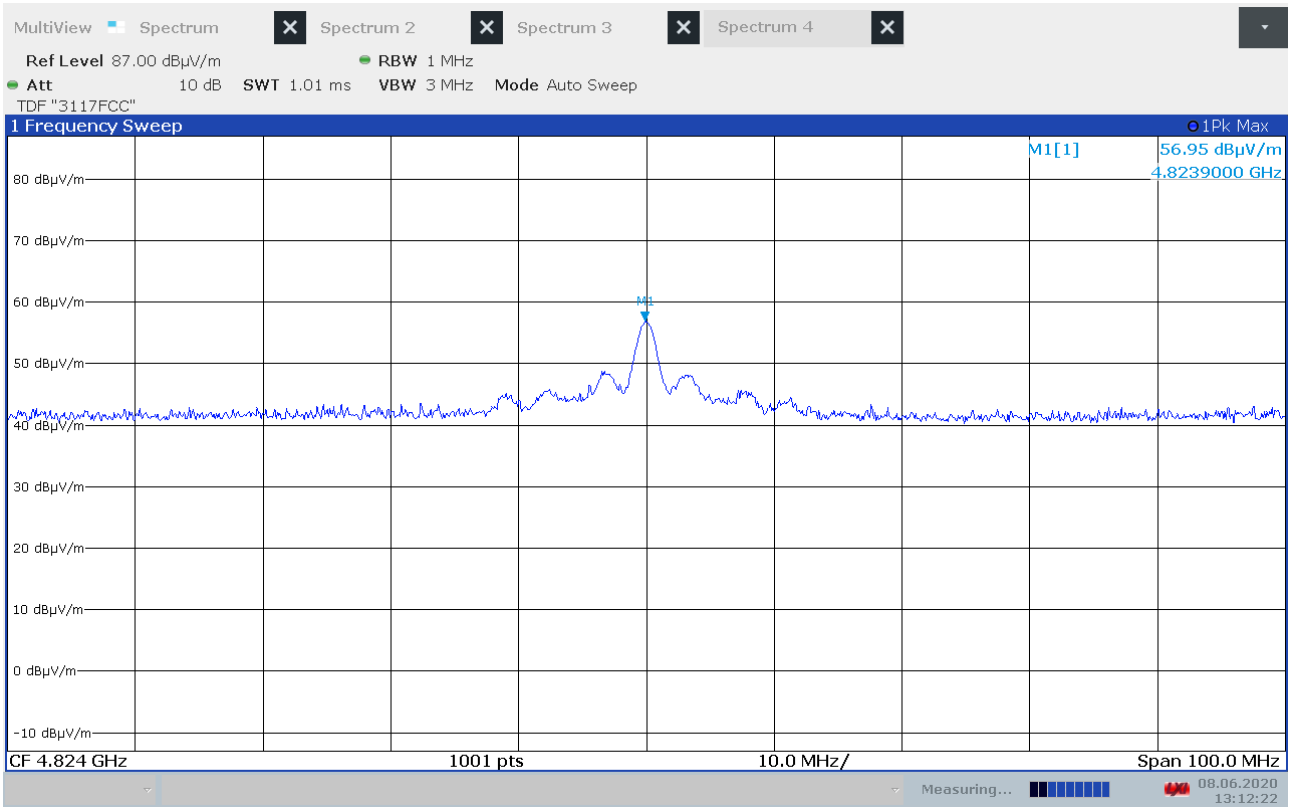
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, HP, 802.11n, MCS0, HT20



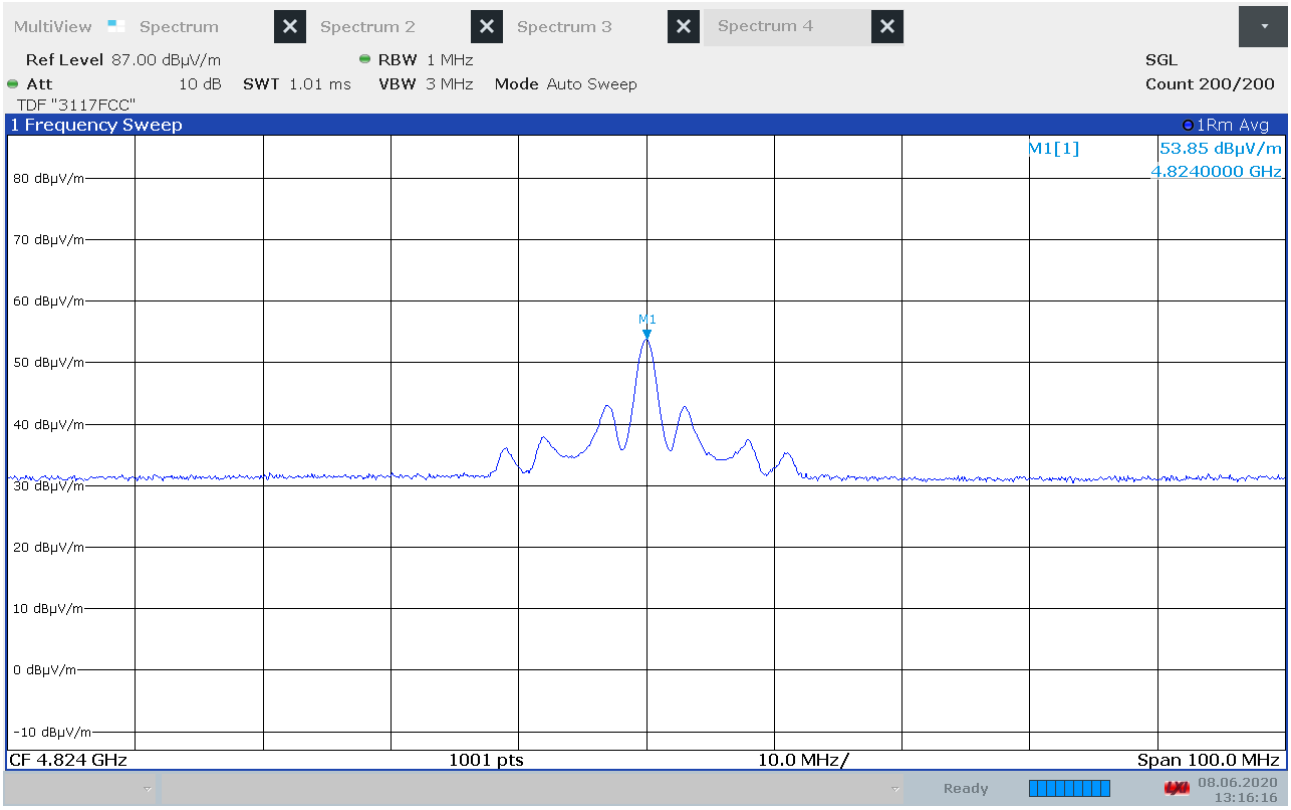
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, VP, 802.11n, MCS0, HT40



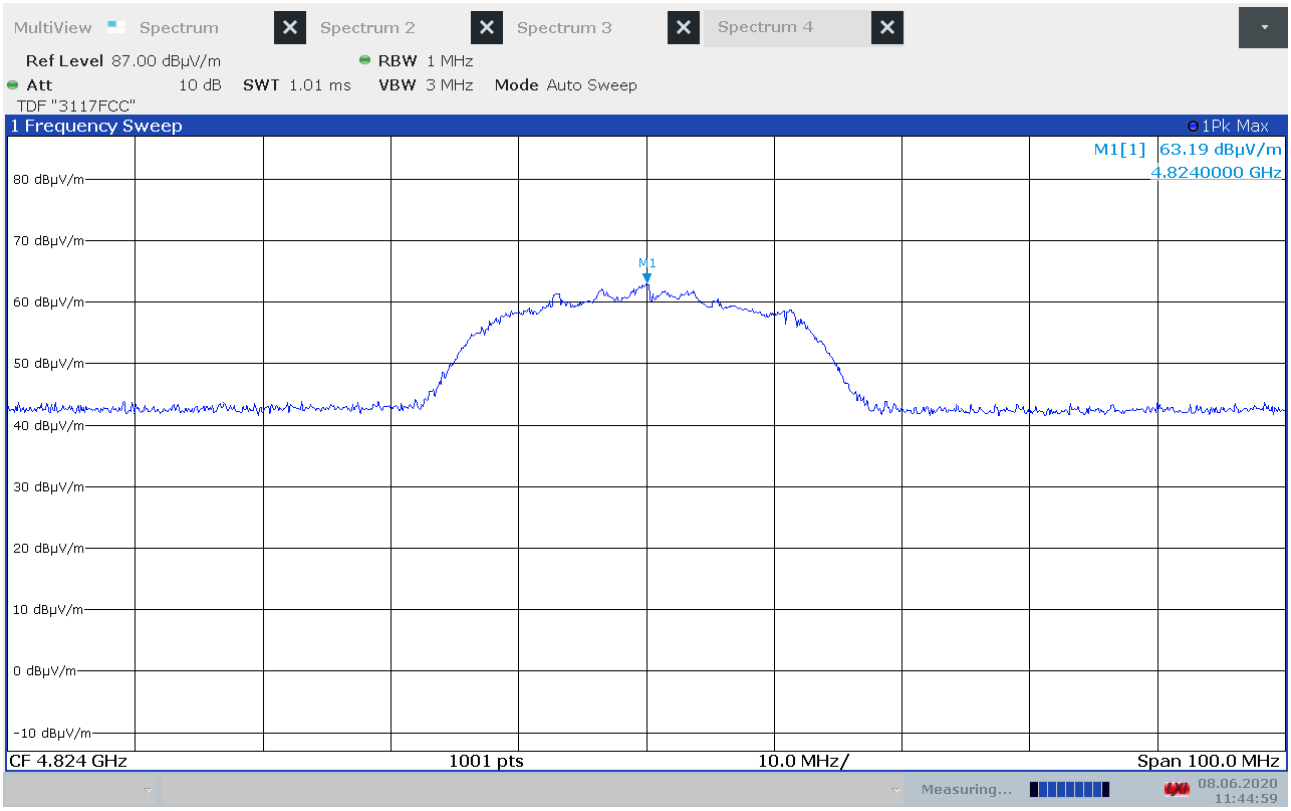
Radiated Emissions, 1000 -18000 MHz, 2437 MHz, HP, 802.11n, MCS0, HT40



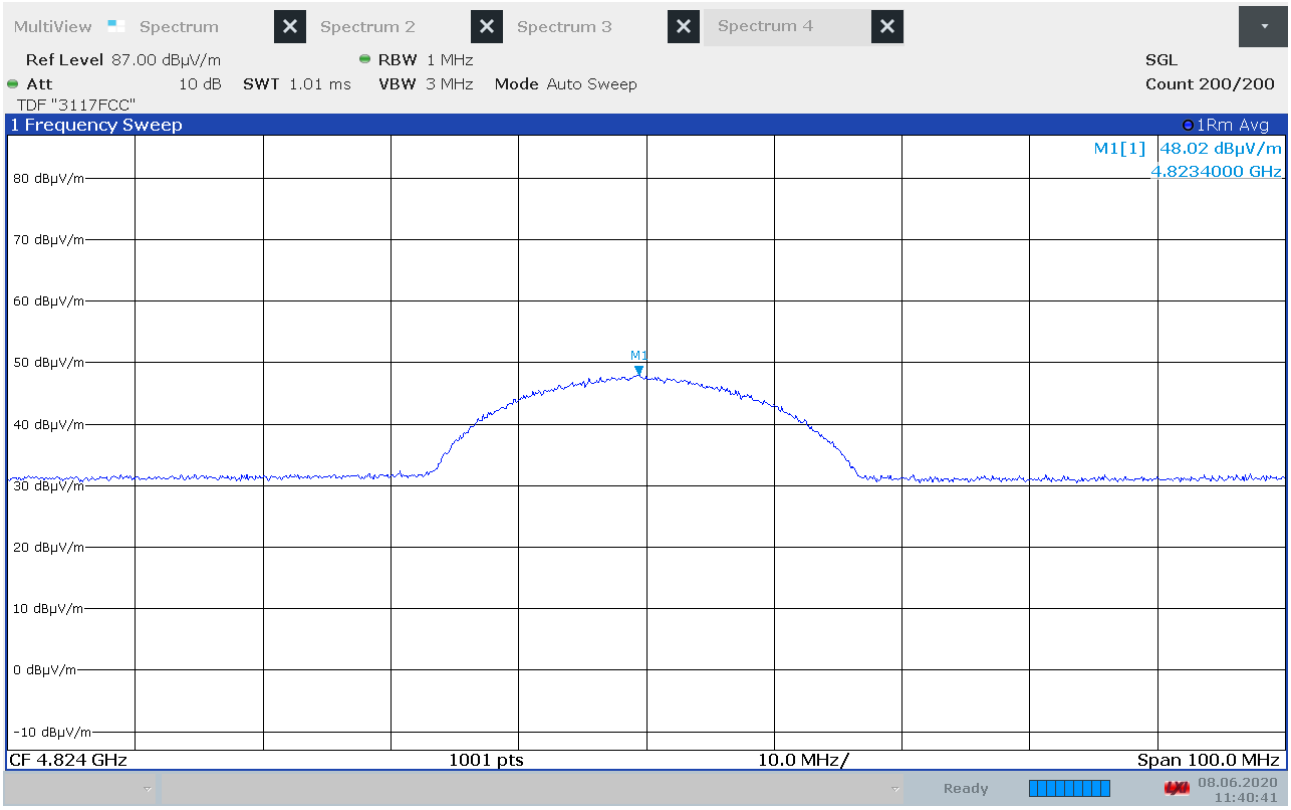
Radiated Emissions, 4824 MHz, Ch01, 802.11b, 1Mb, (Max: EUT H1, VP), Peak



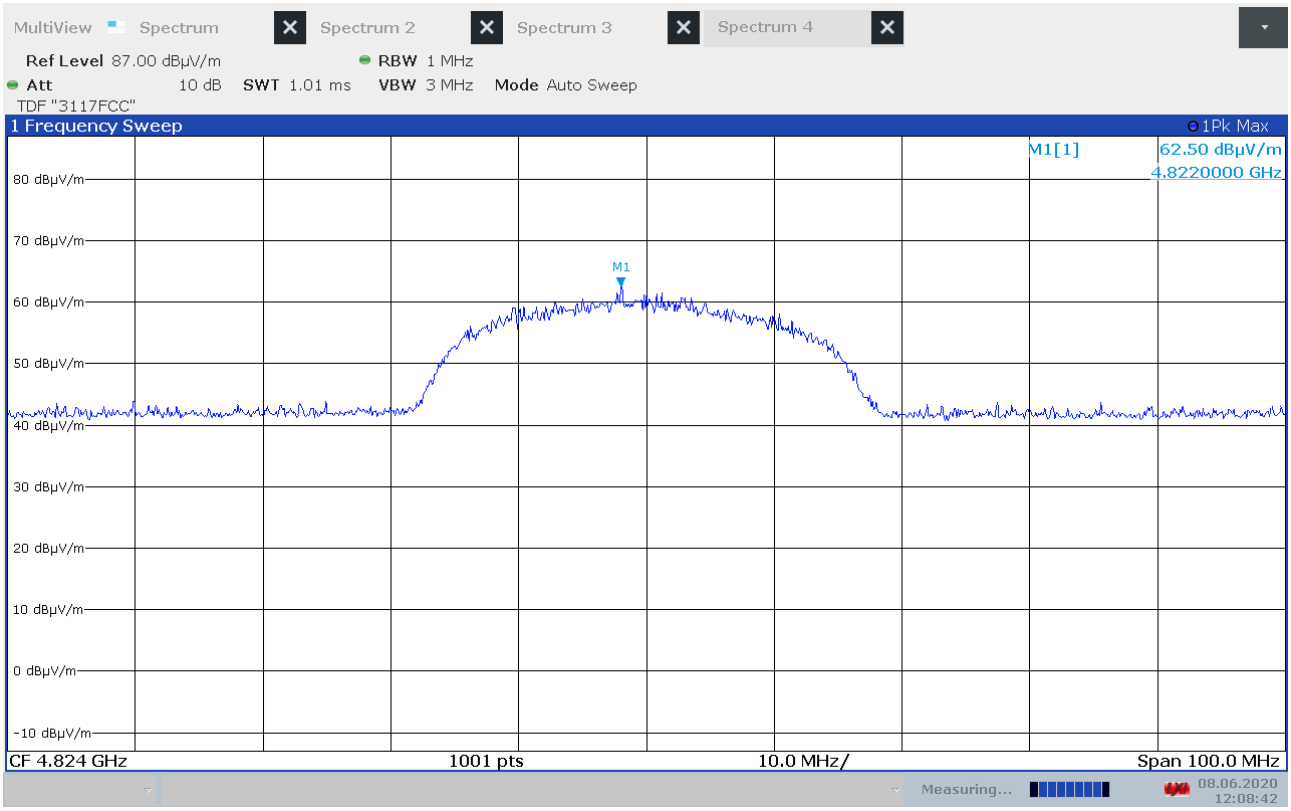
Radiated Emissions, 4824 MHz, Ch01, 802.11b, 1Mb, (Max: EUT H1, VP), Av



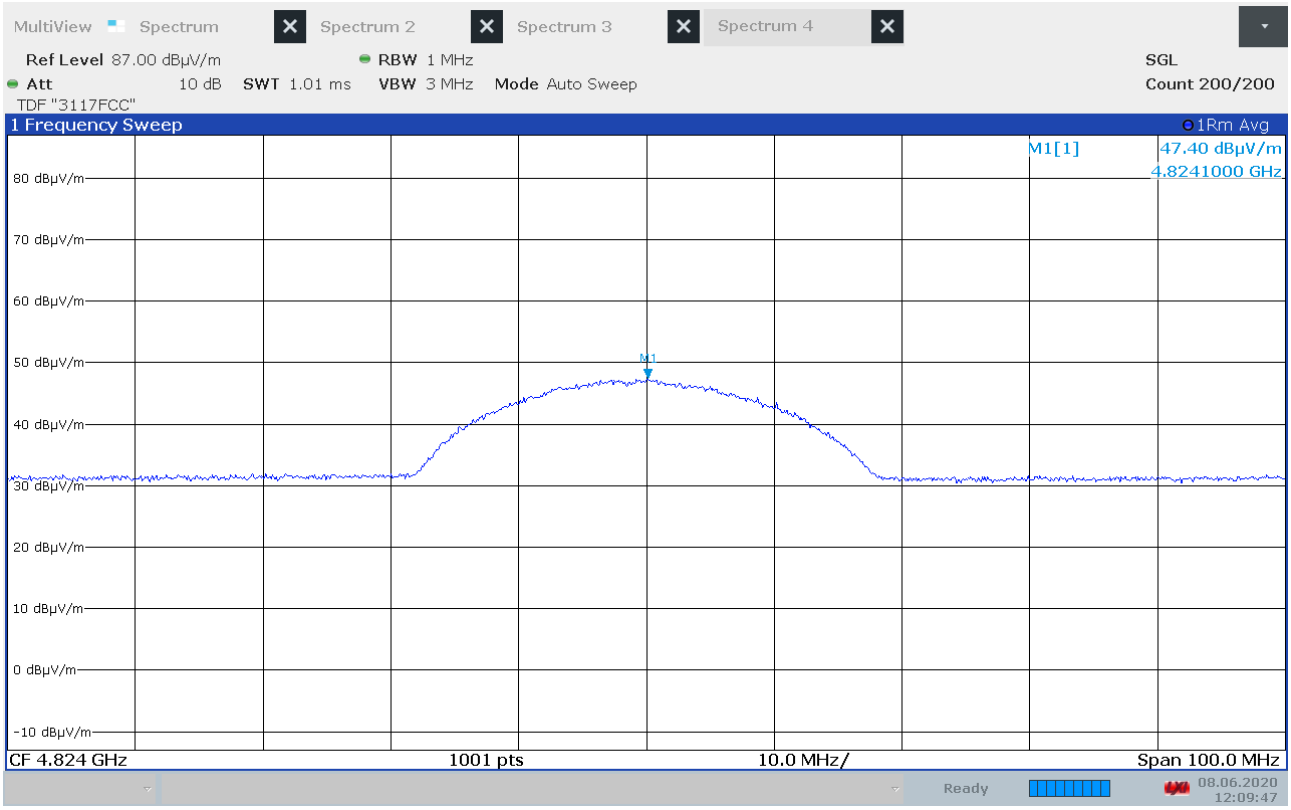
Radiated Emissions, 4824 MHz, Ch01, 802.11g, 6Mb, (Max: EUT H1, VP), Peak



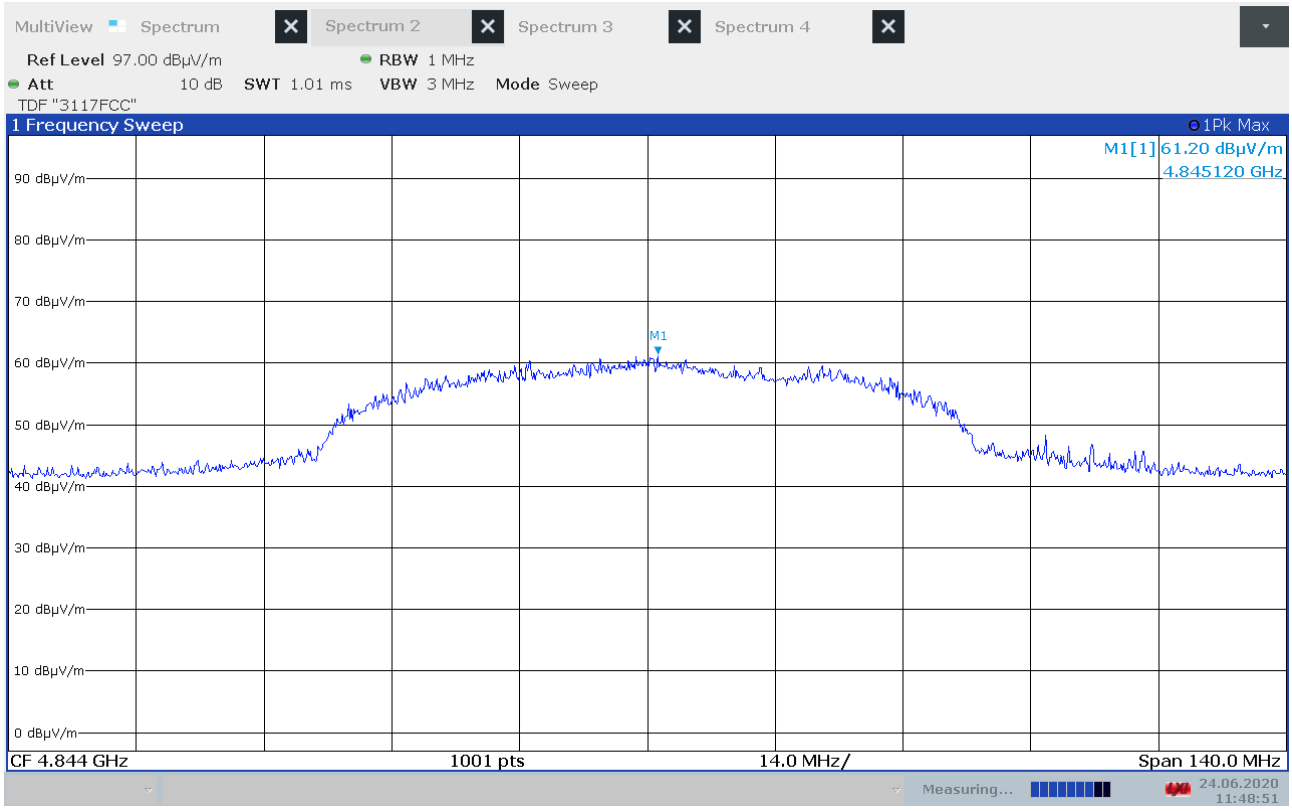
Radiated Emissions, 4824 MHz, Ch01, 802.11g, 6Mb, (Max: EUT H1, VP), Av



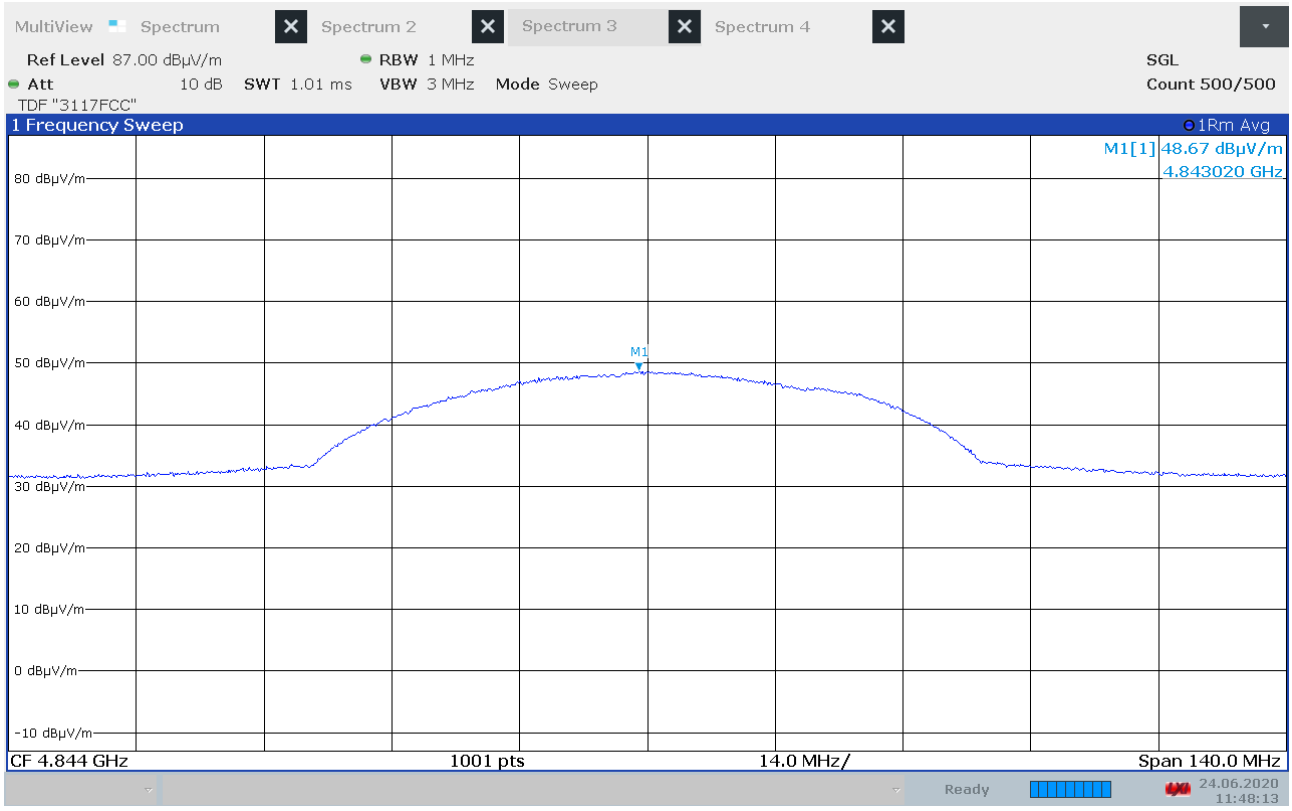
Radiated Emissions, 4824 MHz, Ch01, 802.11n, MCS0 HT20, (Max: EUT H1, VP), Peak



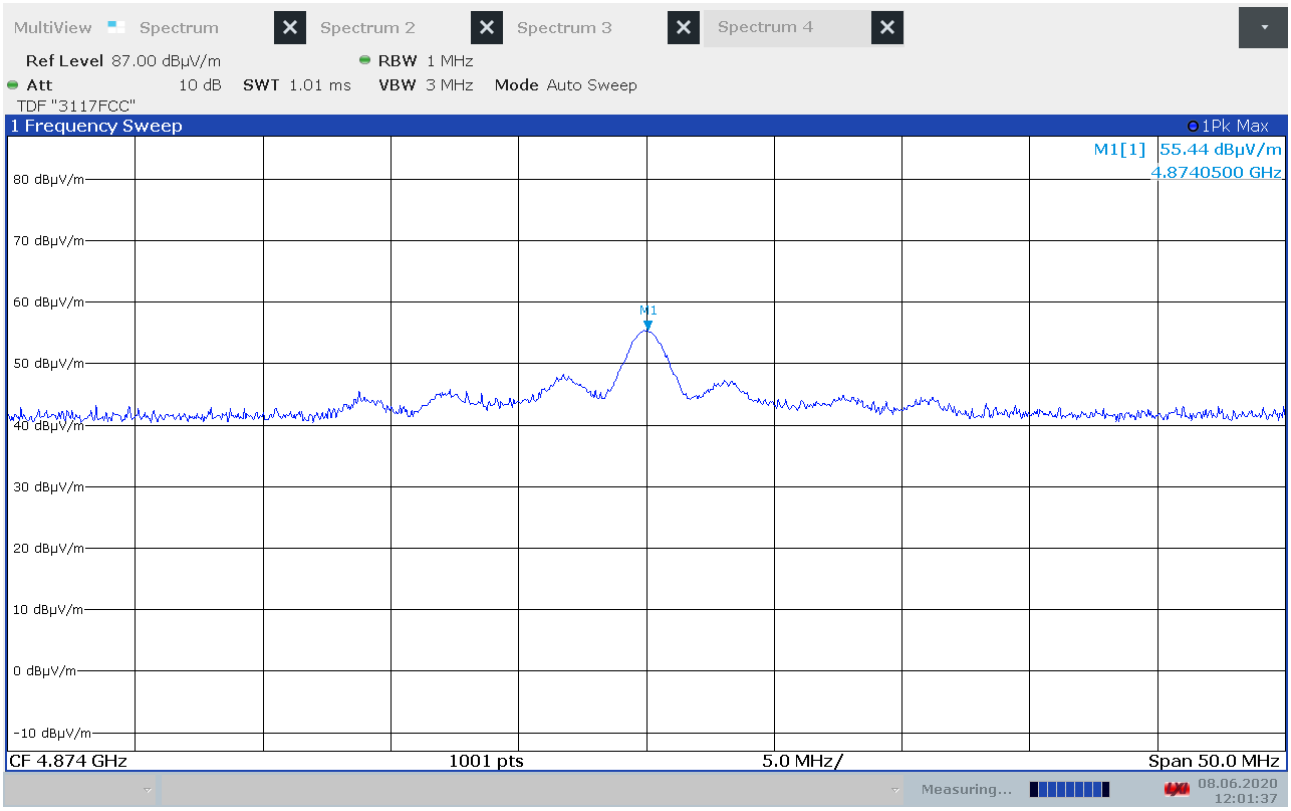
Radiated Emissions, 4824 MHz, Ch01, 802.11n, MCS0 HT20, (Max: EUT H1, VP), Av



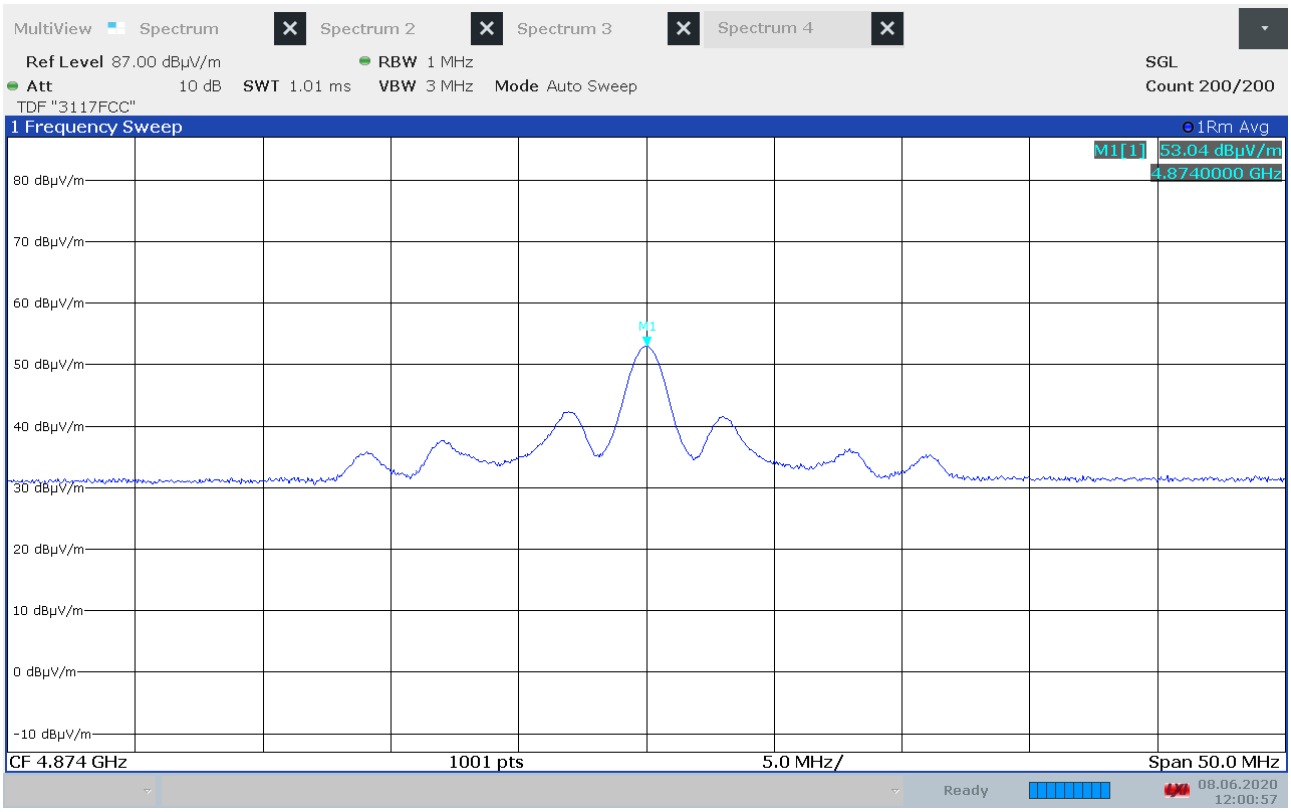
Radiated Emissions, 4844 MHz, Ch03, 802.11n, MCS0 HT40, (Max: EUT H1, VP), Peak



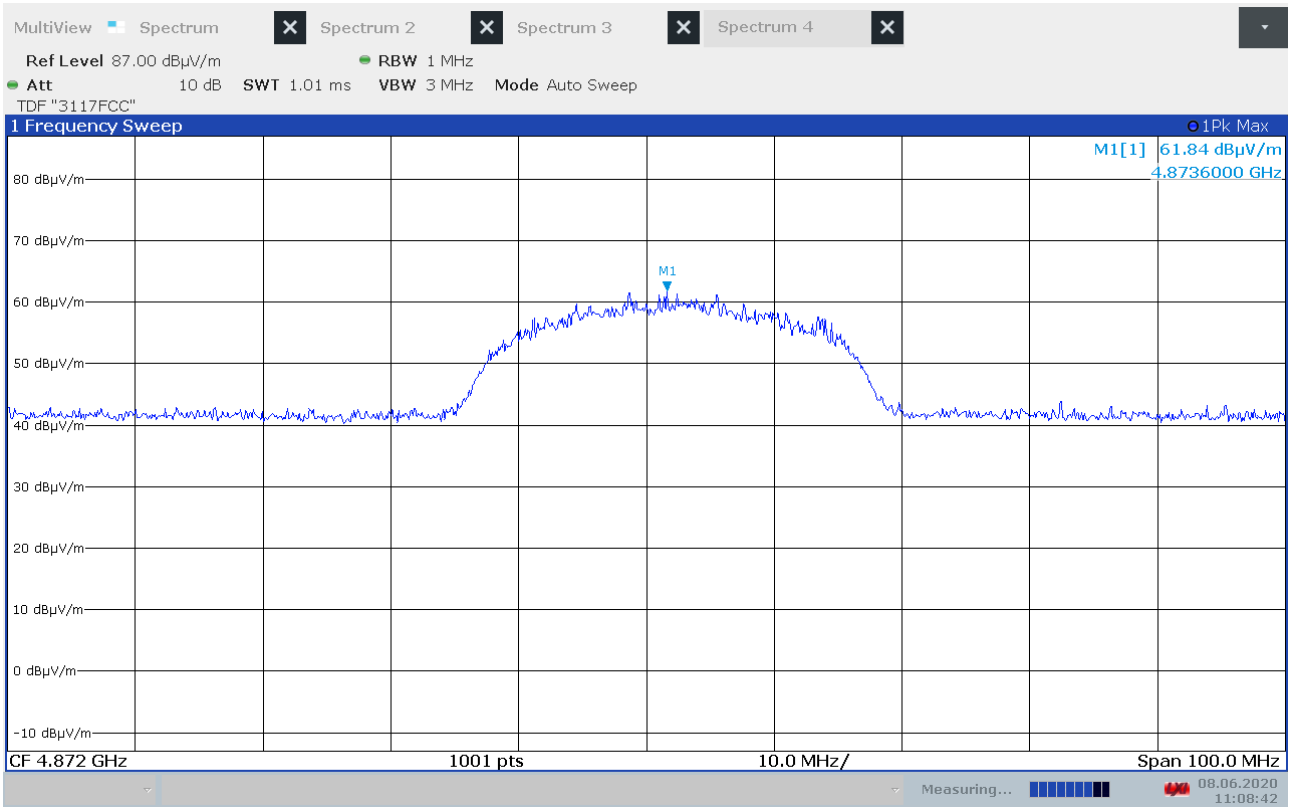
Radiated Emissions, 4844 MHz, Ch03, 802.11n, MCS0 HT40, (Max: EUT H1, VP), Av



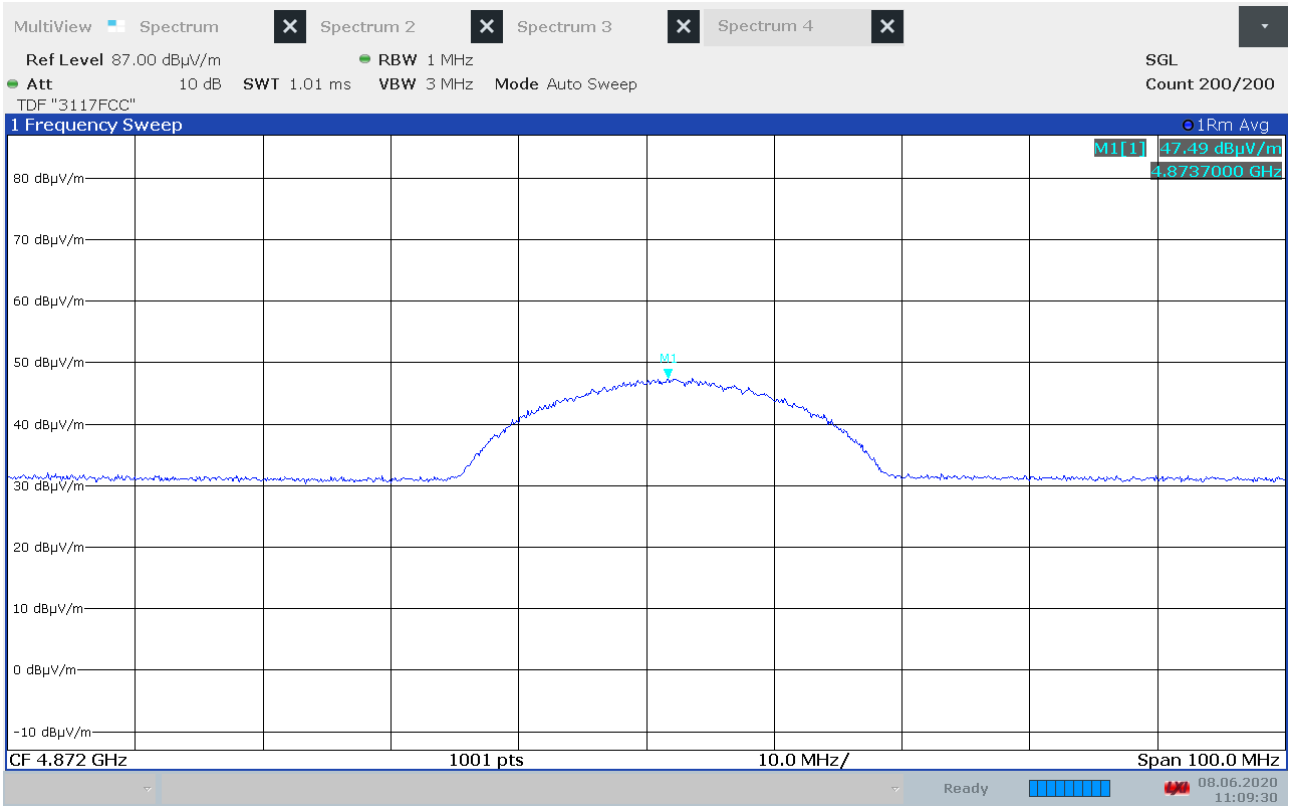
Radiated Emissions, 4874 MHz, Ch06, 802.11b, 1Mb, (Max: EUT H1, VP), Peak



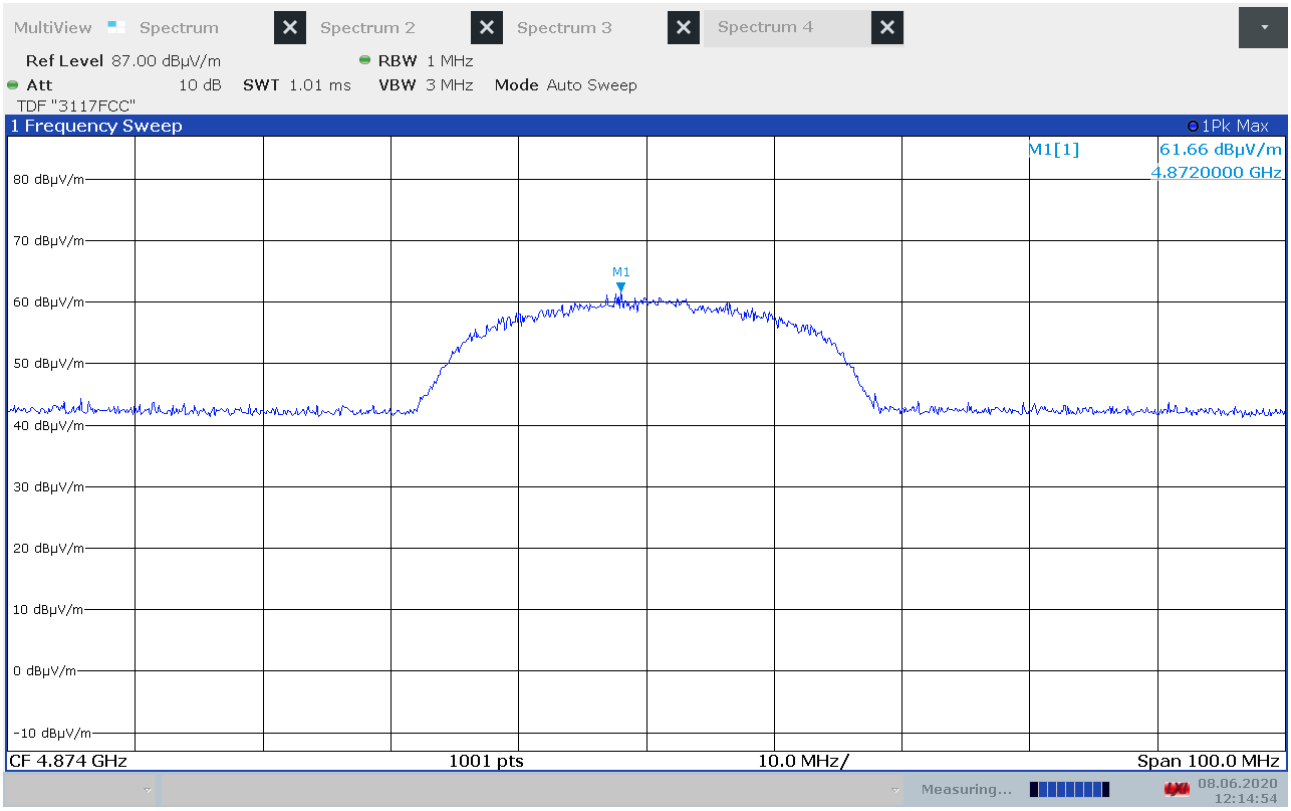
Radiated Emissions, 4874 MHz, Ch06, 802.11b, 1Mb, (Max: EUT H1, VP), Av



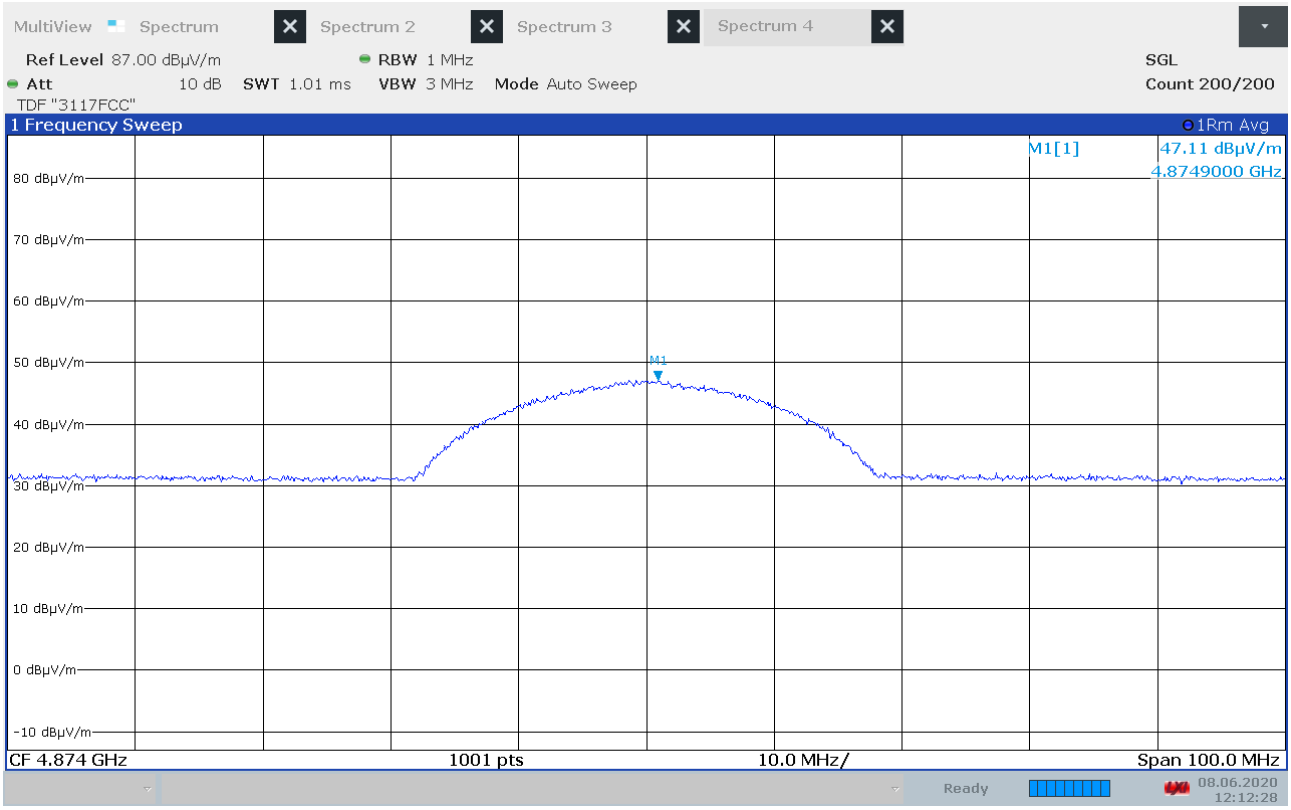
Radiated Emissions, 4874 MHz, Ch06, 802.11g, 6Mb, (Max: EUT H1, VP), Peak



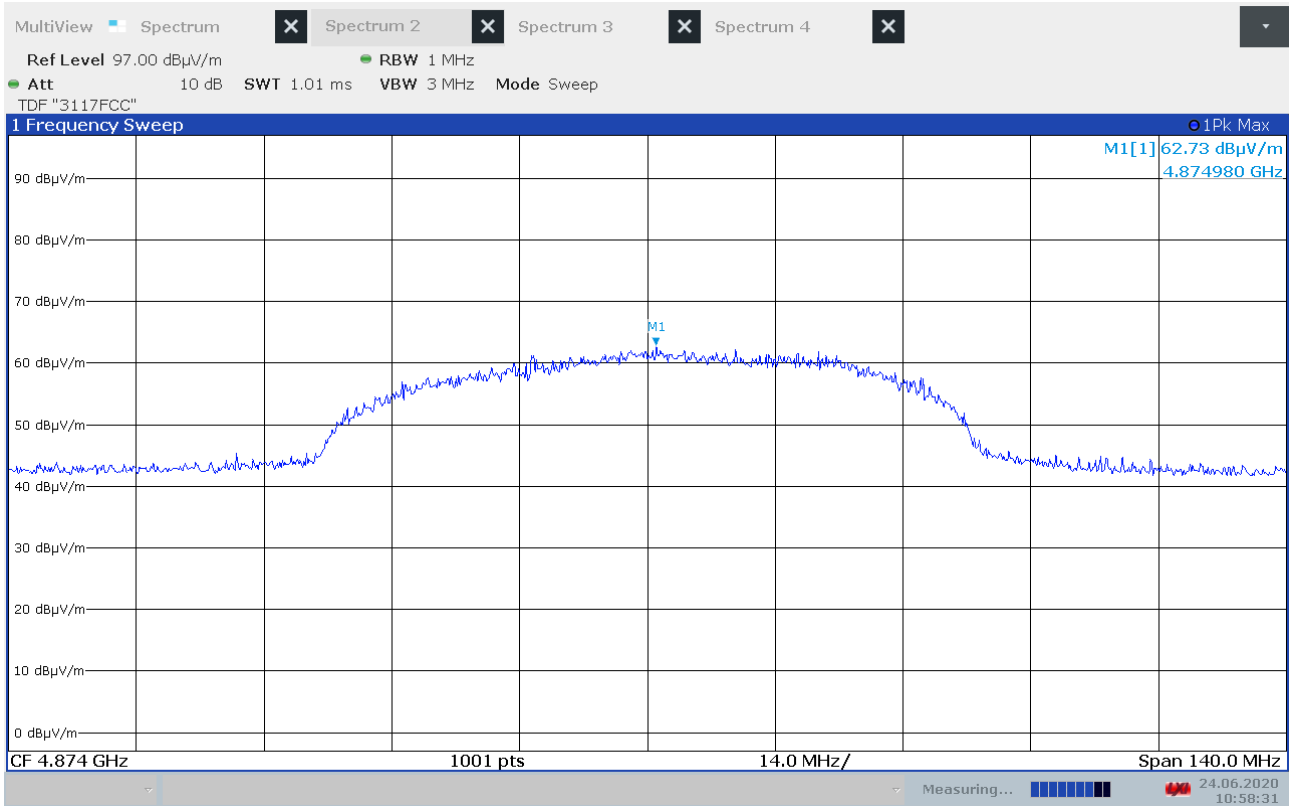
Radiated Emissions, 4874 MHz, Ch06, 802.11g, 6Mb, (Max: EUT H1, VP), Av



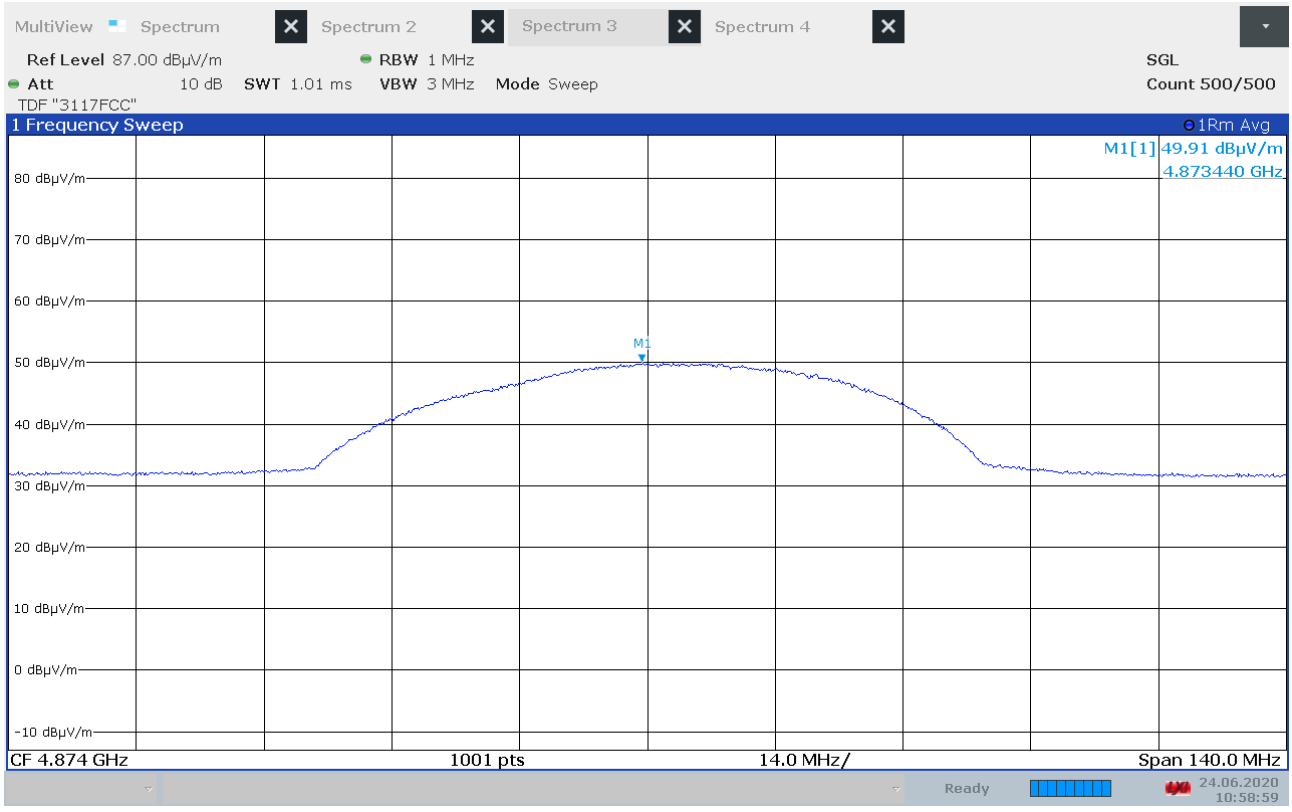
Radiated Emissions, 4874 MHz, Ch06, 802.11n, MCS0 HT20, (Max: EUT H1, VP), Peak



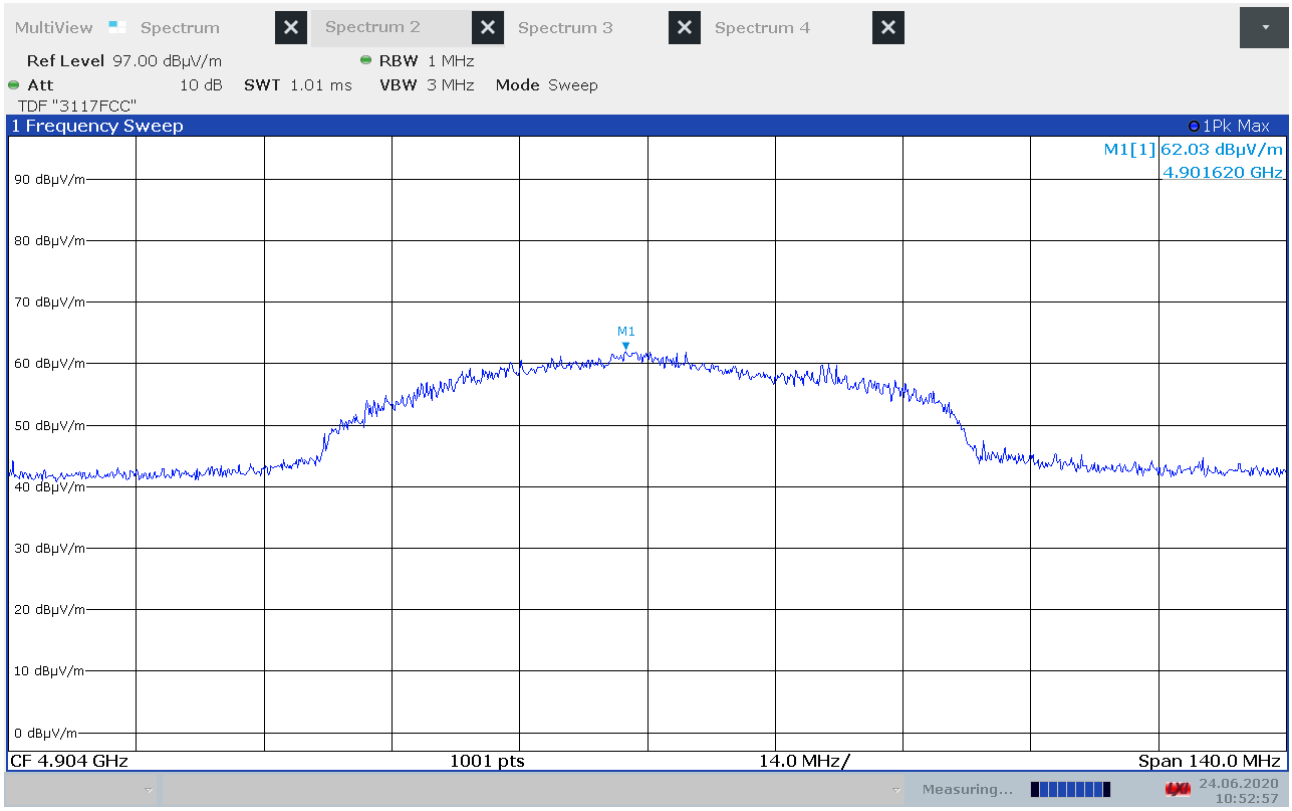
Radiated Emissions, 4874 MHz, Ch06, 802.11n, MCS0 HT20, (Max: EUT H1, VP), Av



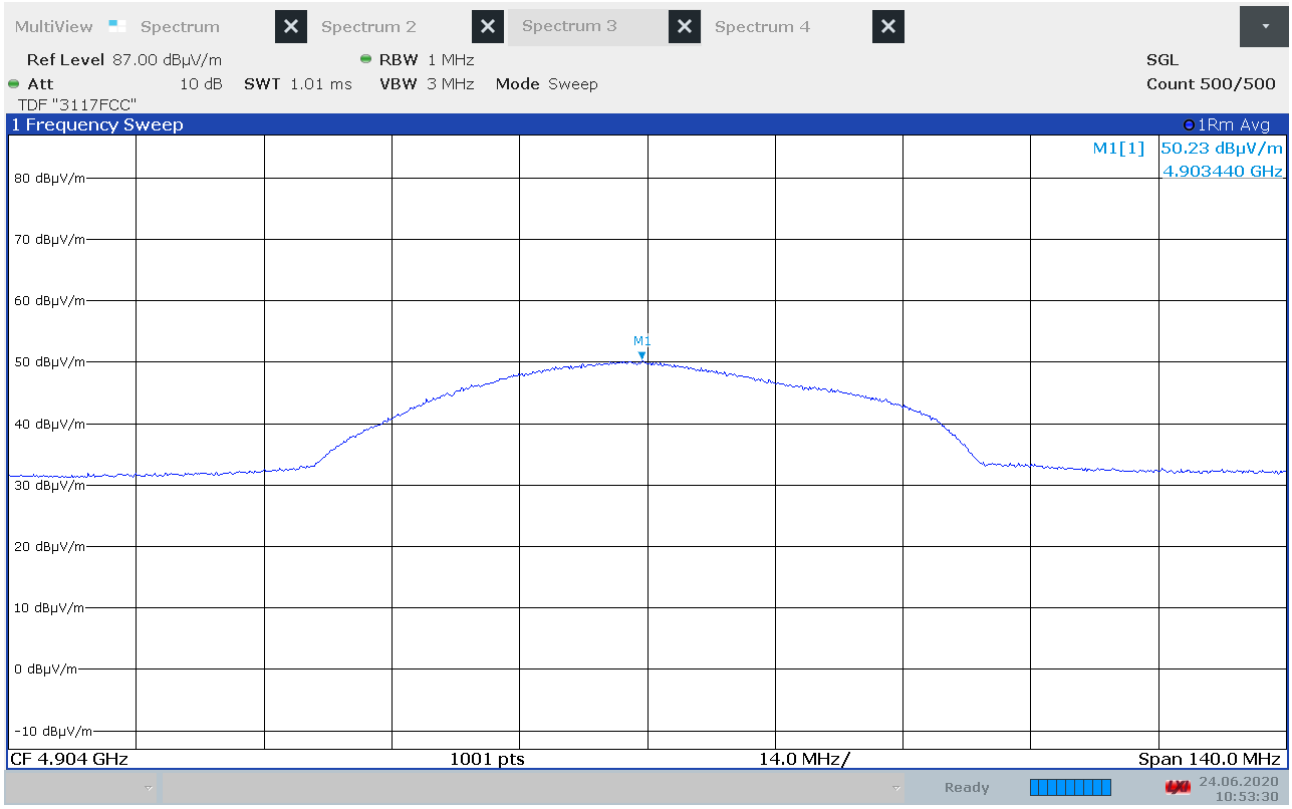
Radiated Emissions, 4874 MHz, Ch06, 802.11n, MCS0 HT40, (Max: EUT H1, VP), Peak



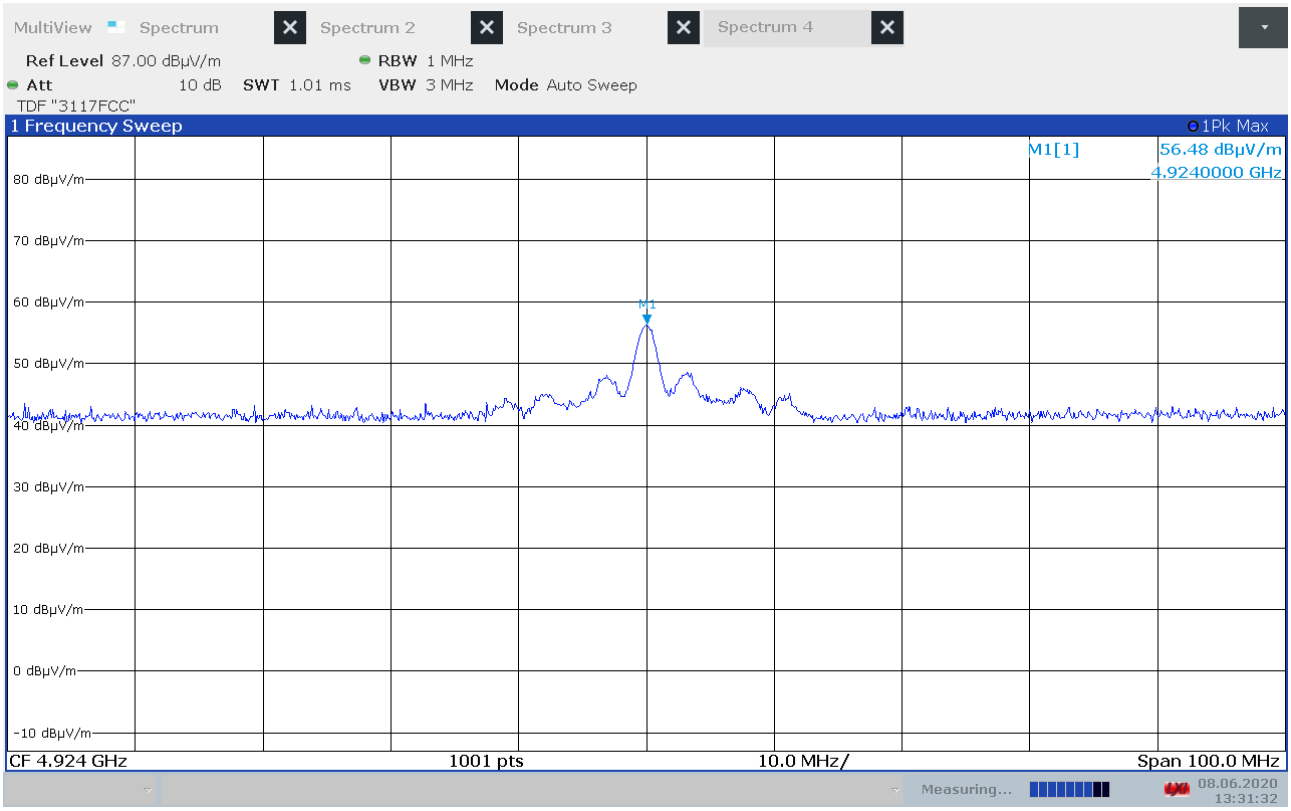
Radiated Emissions, 4874 MHz, Ch06, 802.11n, MCS0 HT40, (Max: EUT H1, VP), Av



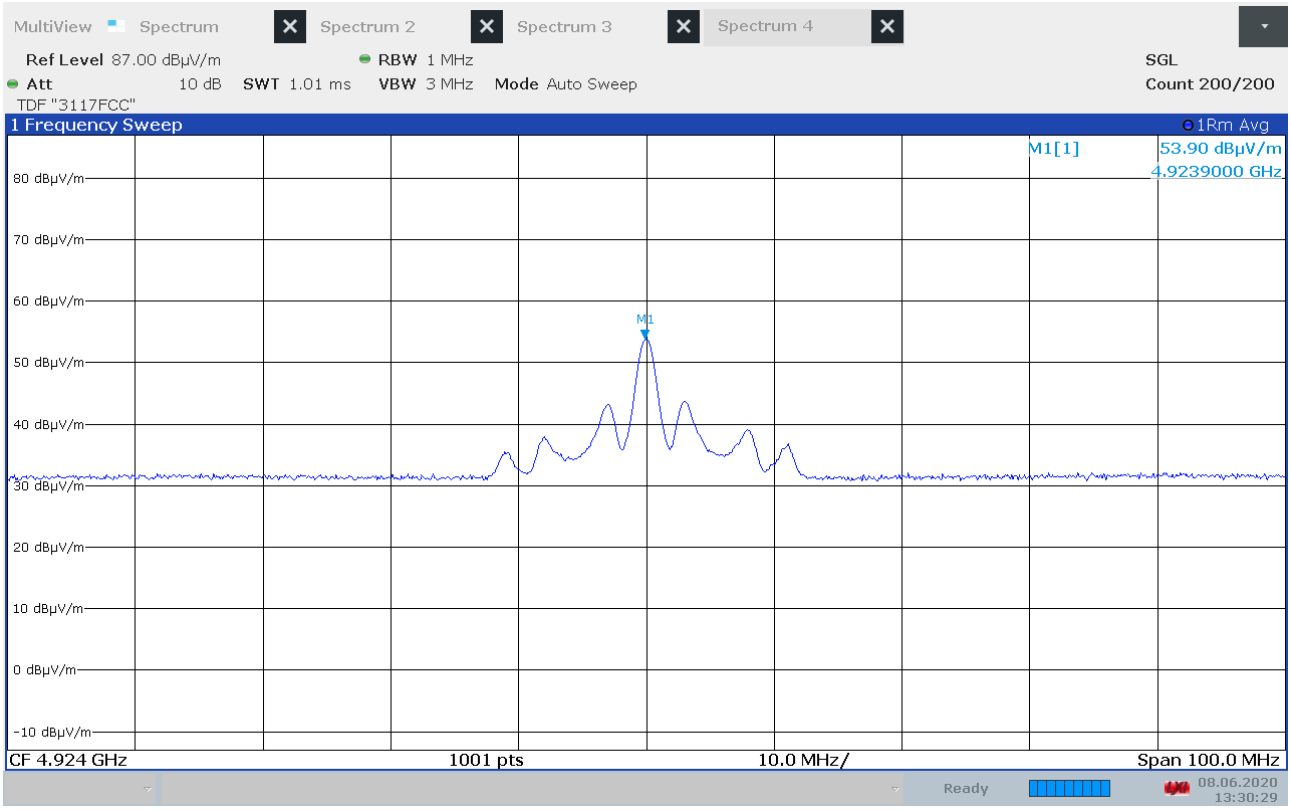
Radiated Emissions, 4904 MHz, Ch06, 802.11n, MCS0 HT40, (Max: EUT H1, VP), Peak



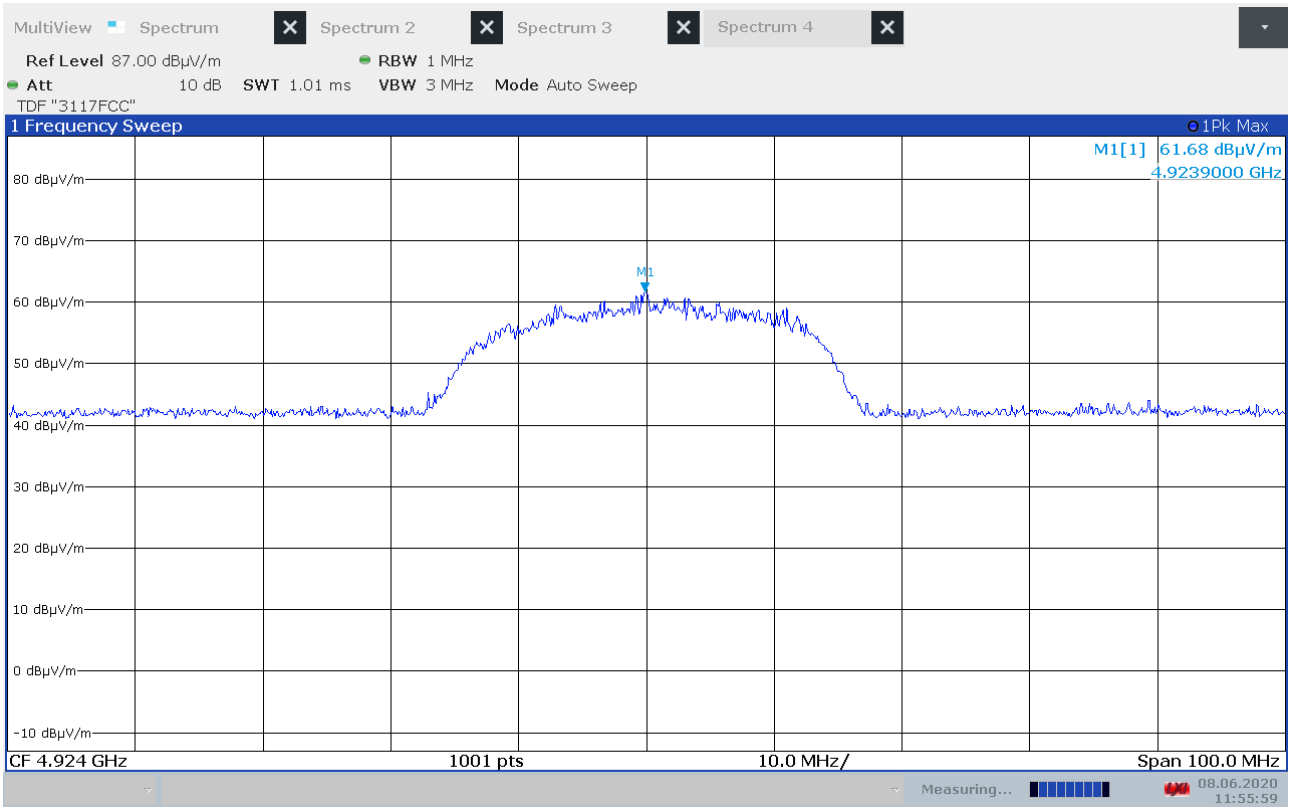
Radiated Emissions, 4904 MHz, Ch06, 802.11n, MCS0 HT40, (Max: EUT H1, VP), Av



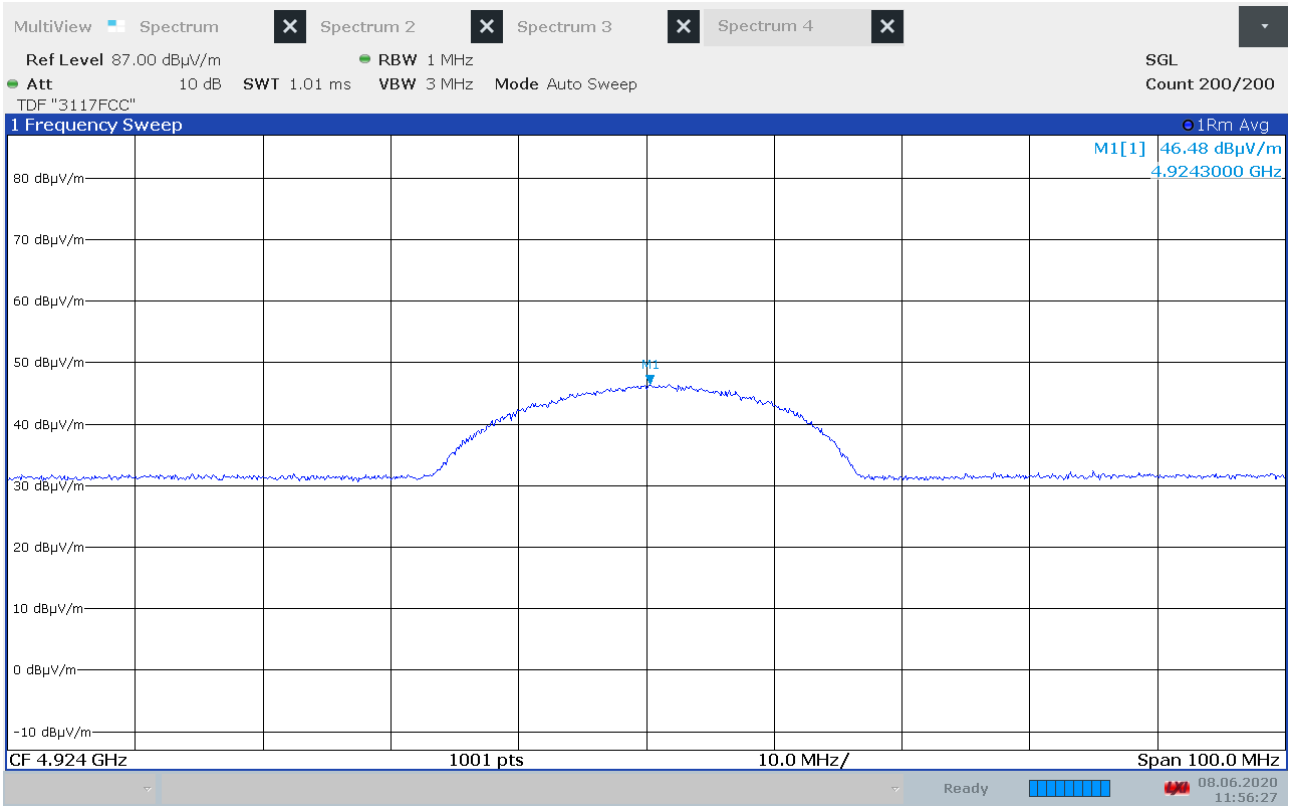
Radiated Emissions, 4924 MHz, Ch11, 802.11b, 1Mb, (Max: EUT H1, VP), Peak



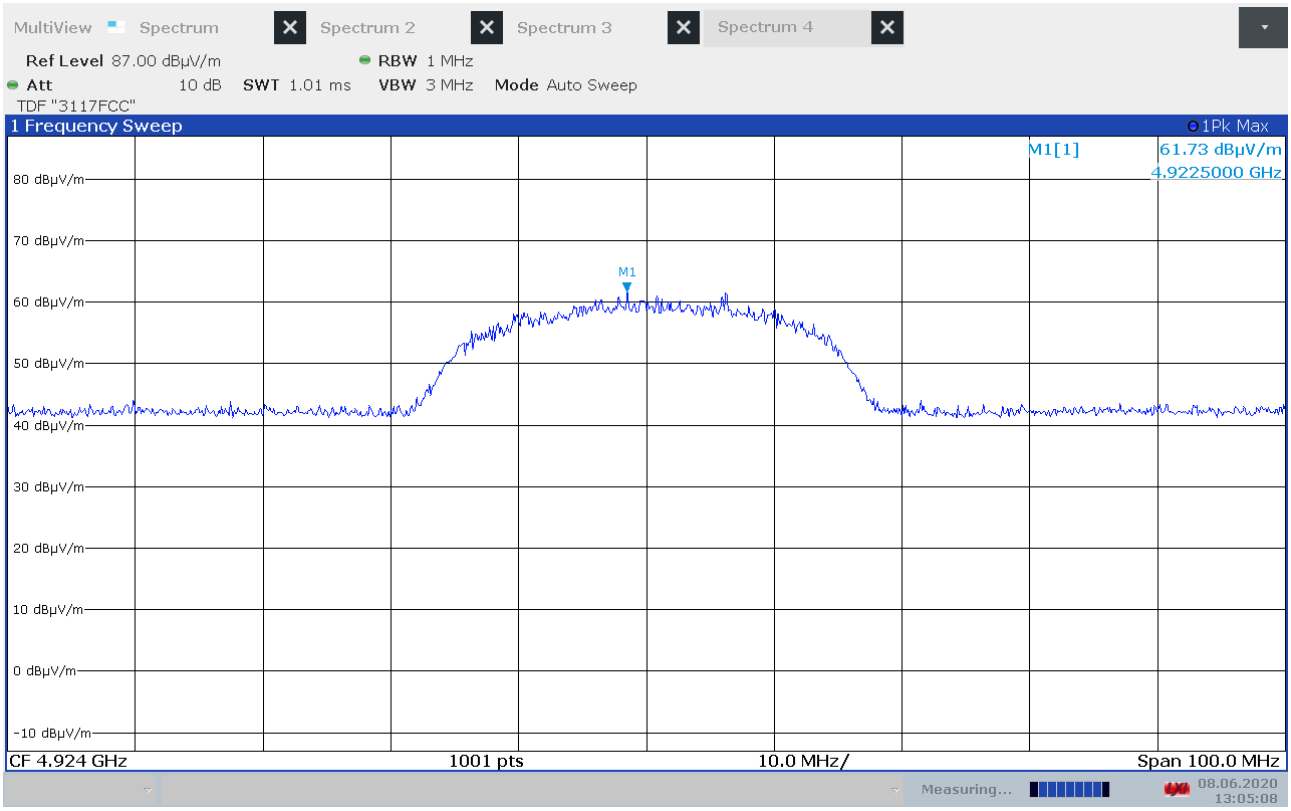
Radiated Emissions, 4924 MHz, Ch11, 802.11b, 1Mb, (Max: EUT H1, VP), Av



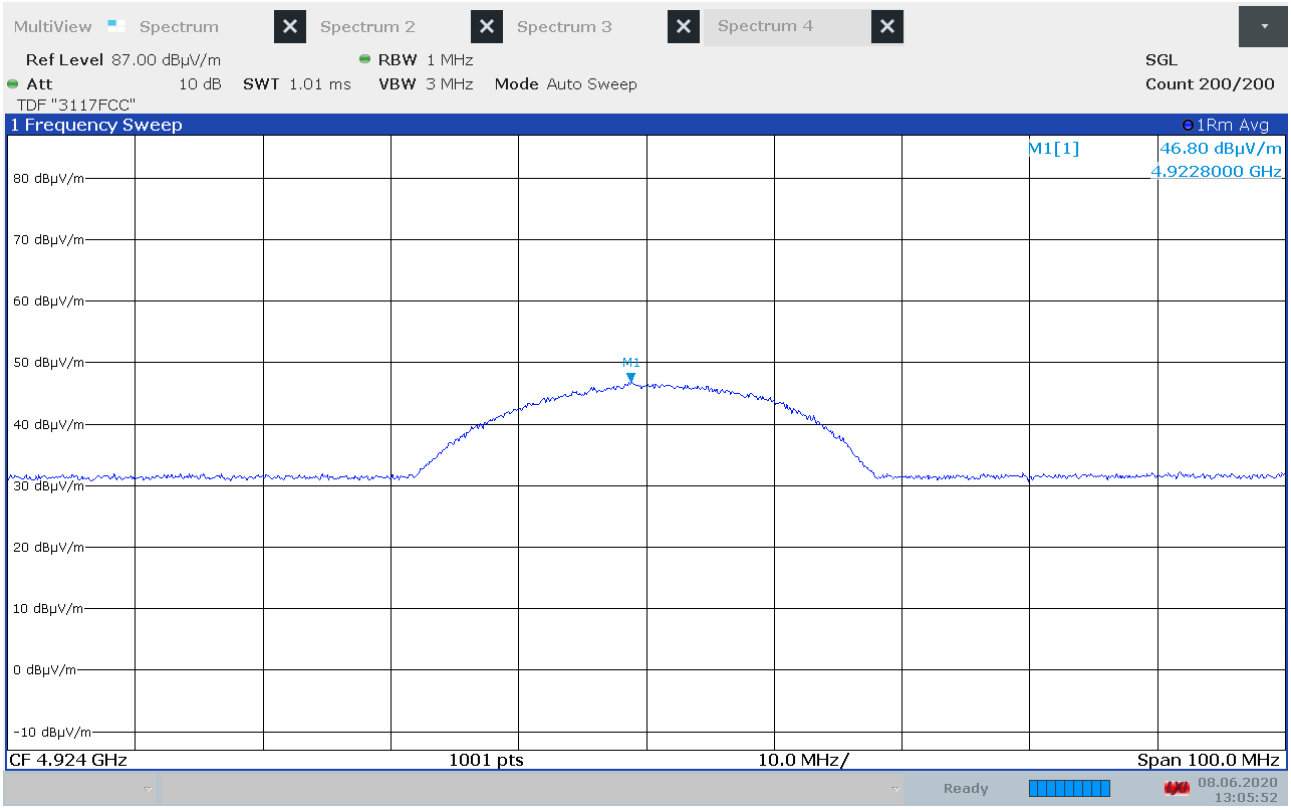
Radiated Emissions, 4924 MHz, Ch11, 802.11g, 6Mb, (Max: EUT H1, VP), Peak



Radiated Emissions, 4924 MHz, Ch11, 802.11g, 6Mb, (Max: EUT H1, VP), Av



Radiated Emissions, 4924 MHz, Ch11, 802.11n, MCS0, (Max: EUT H1, VP), Peak



Radiated Emissions, 4924 MHz, Ch11, 802.11n, MCS0, (Max: EUT H1, VP), Av

3.9 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 procedures PKPSD described in ANSI C63.10-2013 was used.

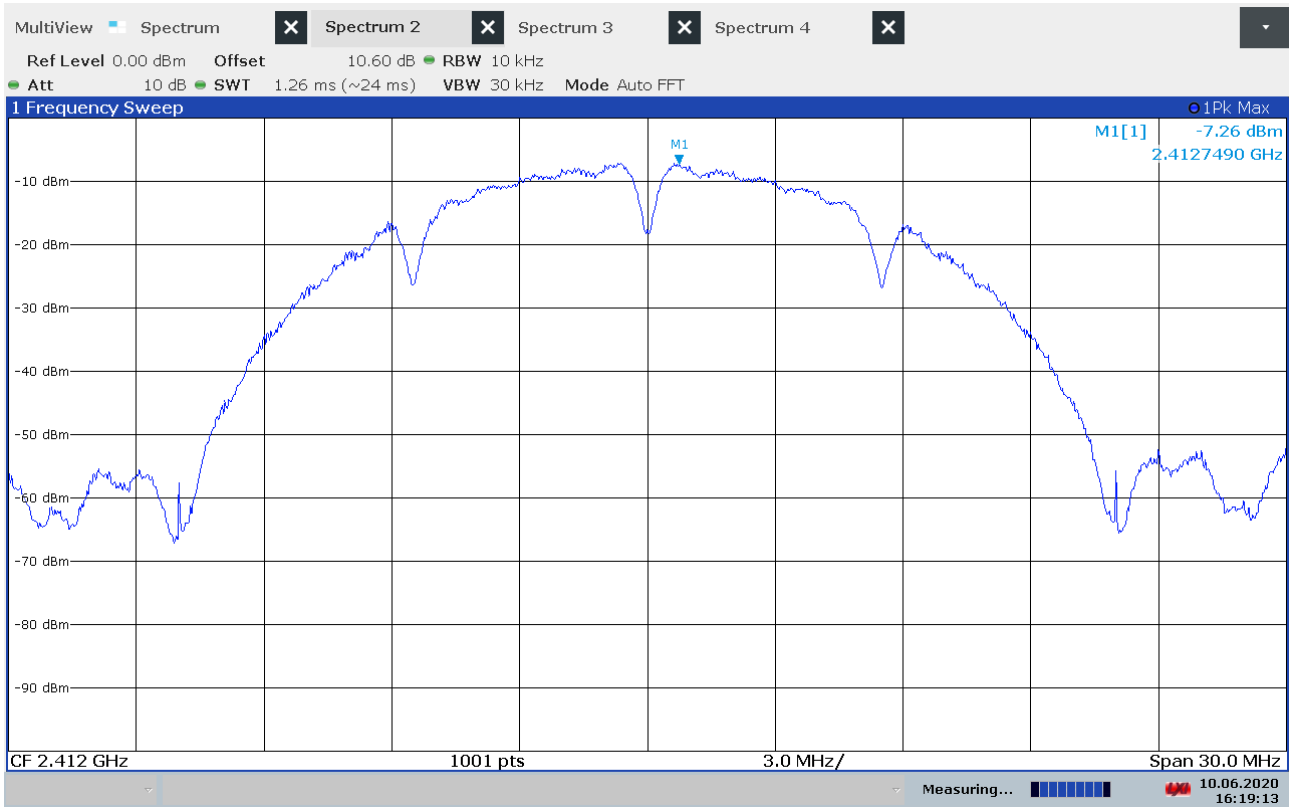
Carrier Frequency (MHz)	Power Spectral Density (dBm/3kHz)			
	802.11b, 11 Mbps	802.11g, 6 Mbps	802.11n, MCS0	
2412	-12.5	-17.2	-17.1	/
2422	/	/	/	-10.6
2437	-10.9	-15.3	-15.3	/
2452	/	/	/	-11.8
2462	-8.0	-13.1	-12.9	/

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

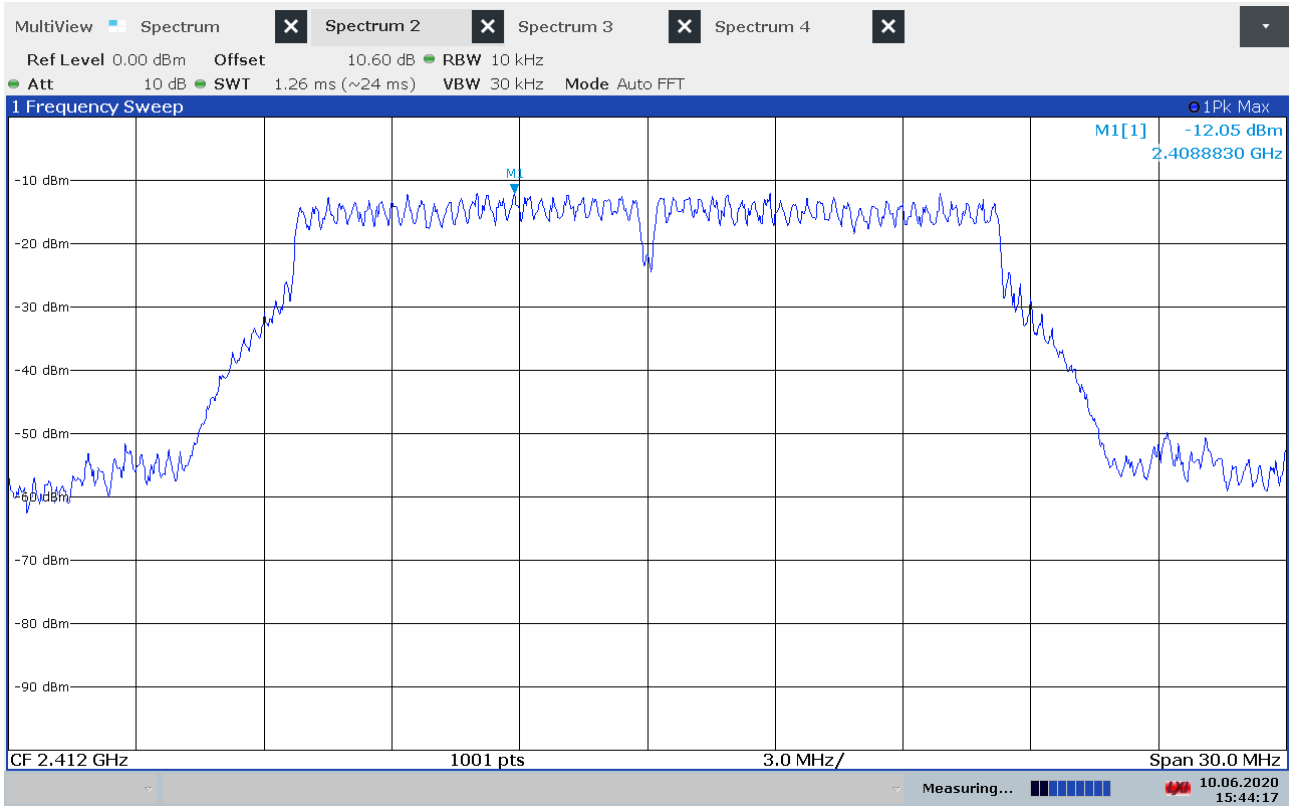
Values measured with 30 kHz RBW are corrected by a Bandwidth Correction Factor of -10 dB.

Requirements:

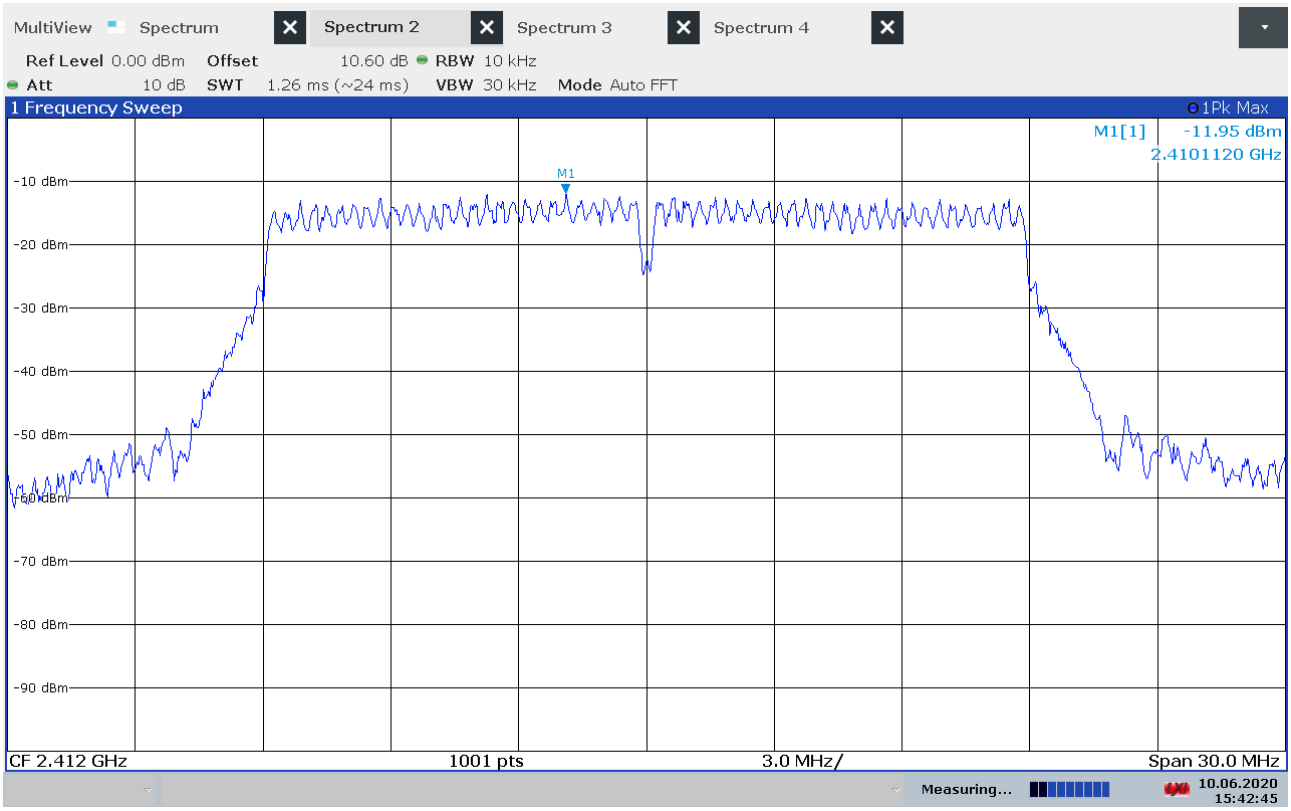
The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band



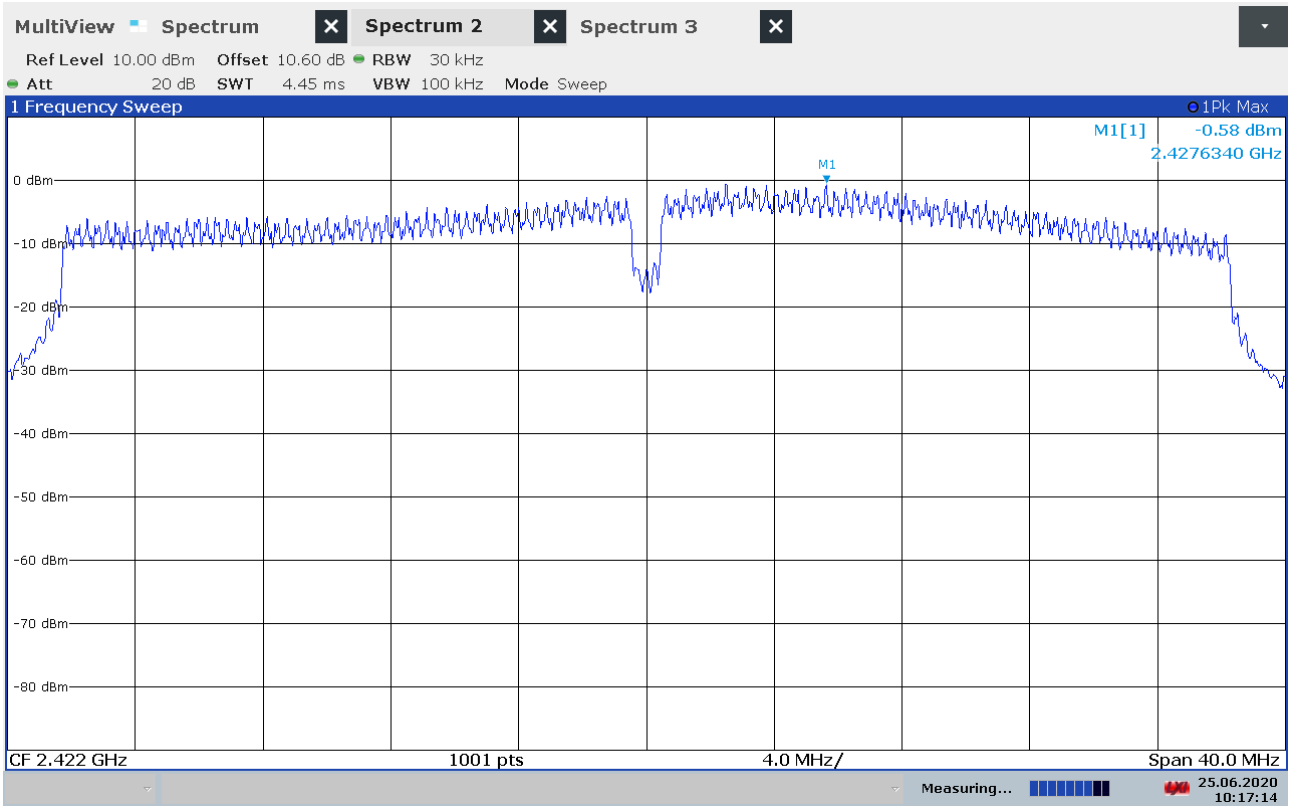
PSD, 2412 MHz, 802.11b, 1Mbps



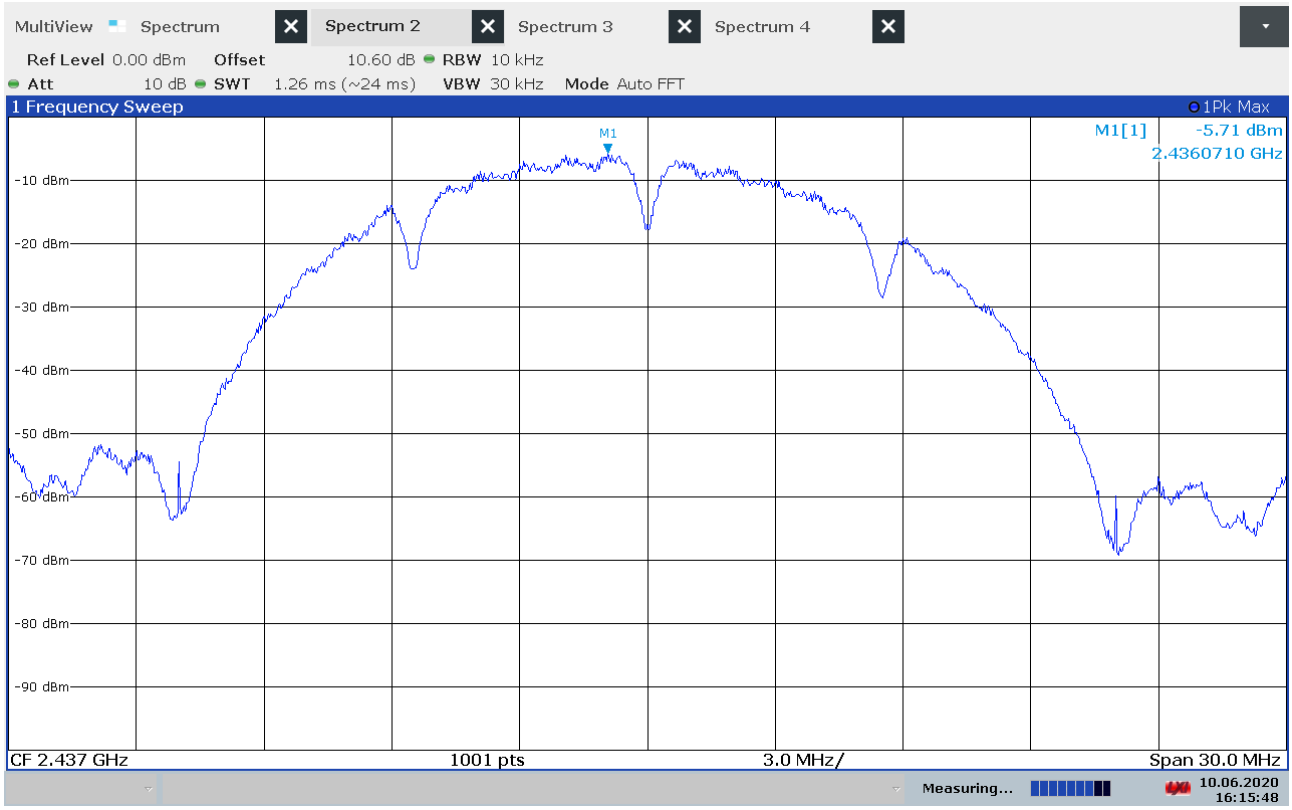
PSD, 2412 MHz, 802.11g, 6Mbps



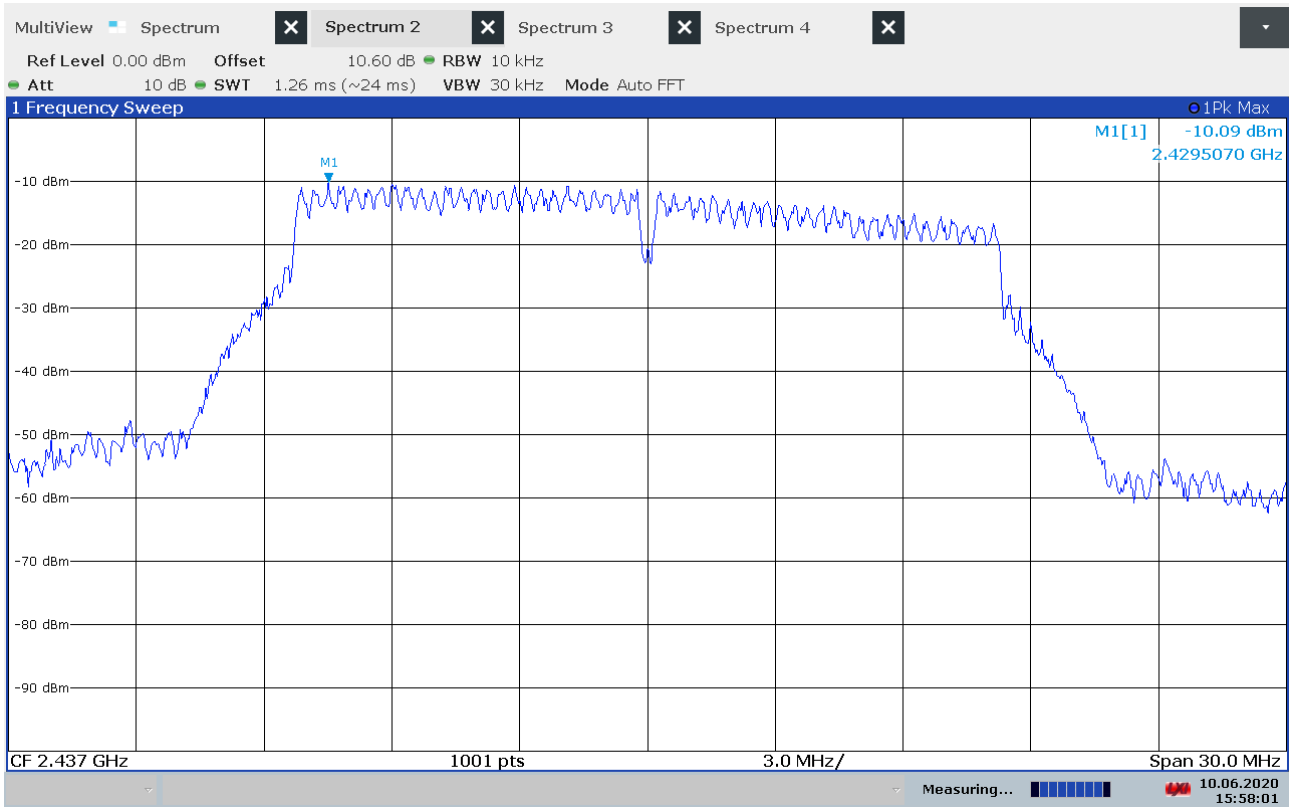
PSD, 2412 MHz, 802.11n, MCS0, HT20



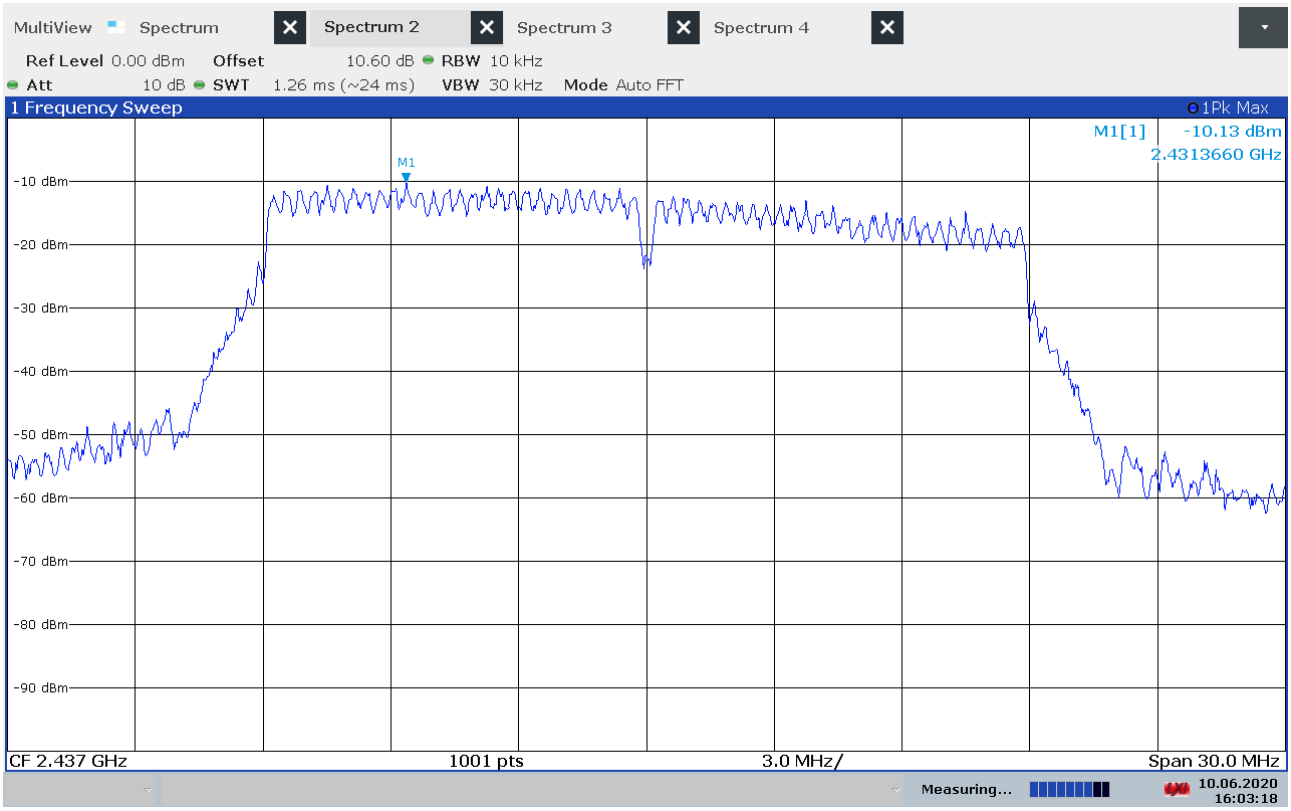
PSD, 2422 MHz, 802.11n, MCS0, HT40



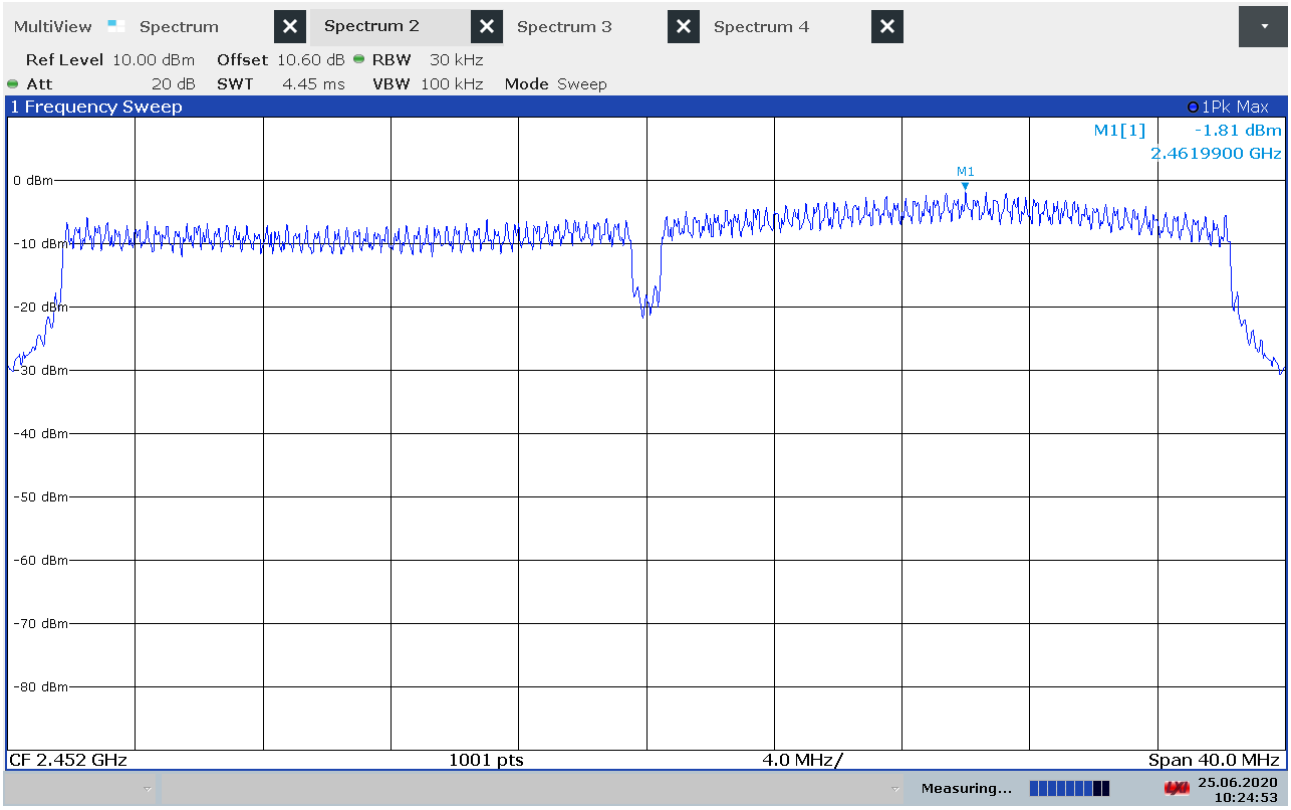
PSD, 2437 MHz, 802.11b, 1Mbps



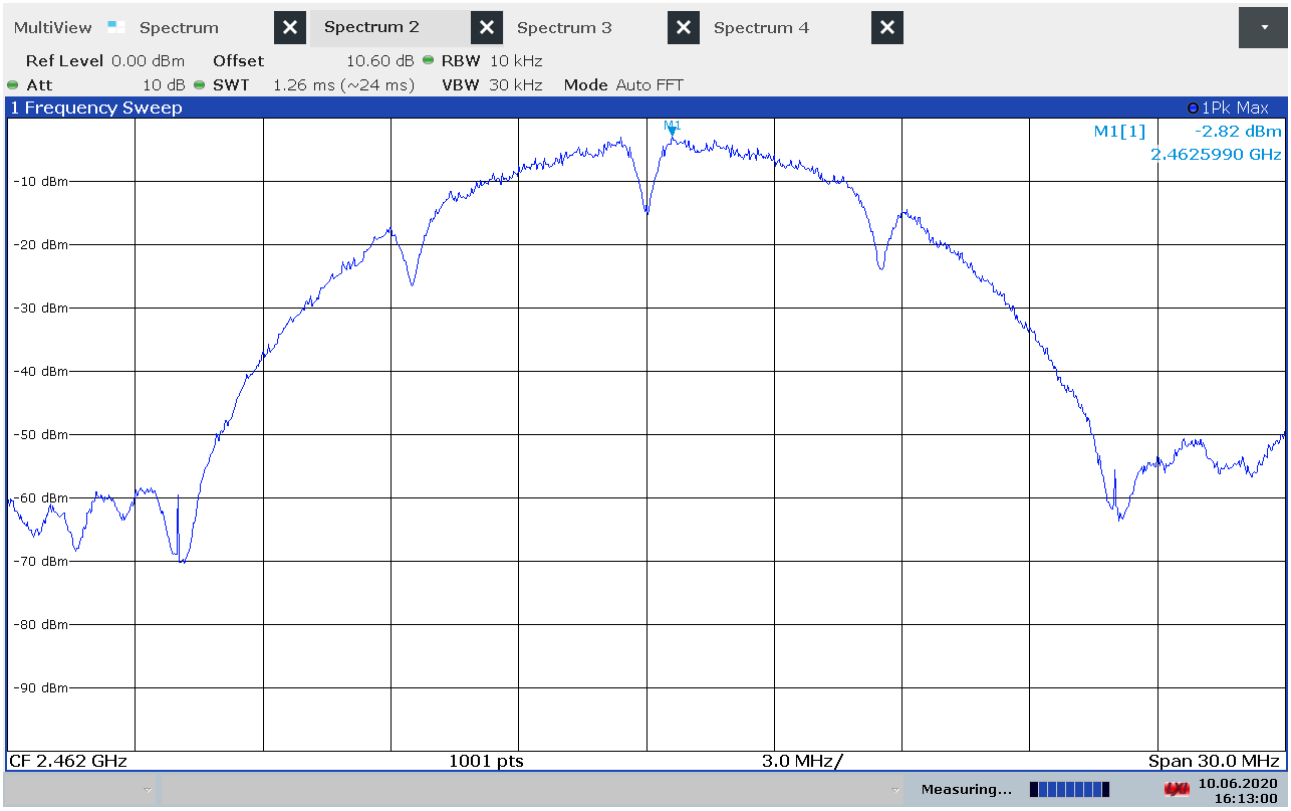
PSD, 2437 MHz, 802.11g, 6Mbps



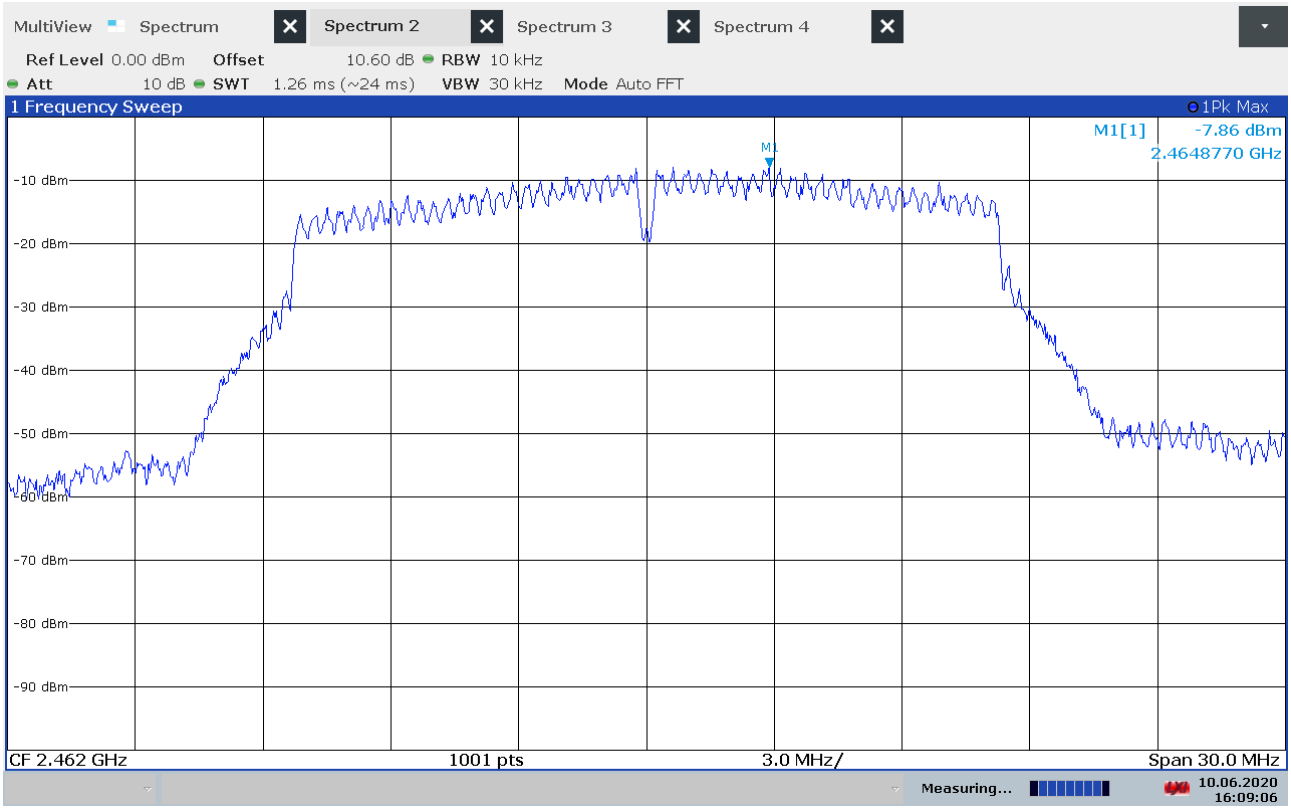
PSD, 2437 MHz, 802.11n, MCS0



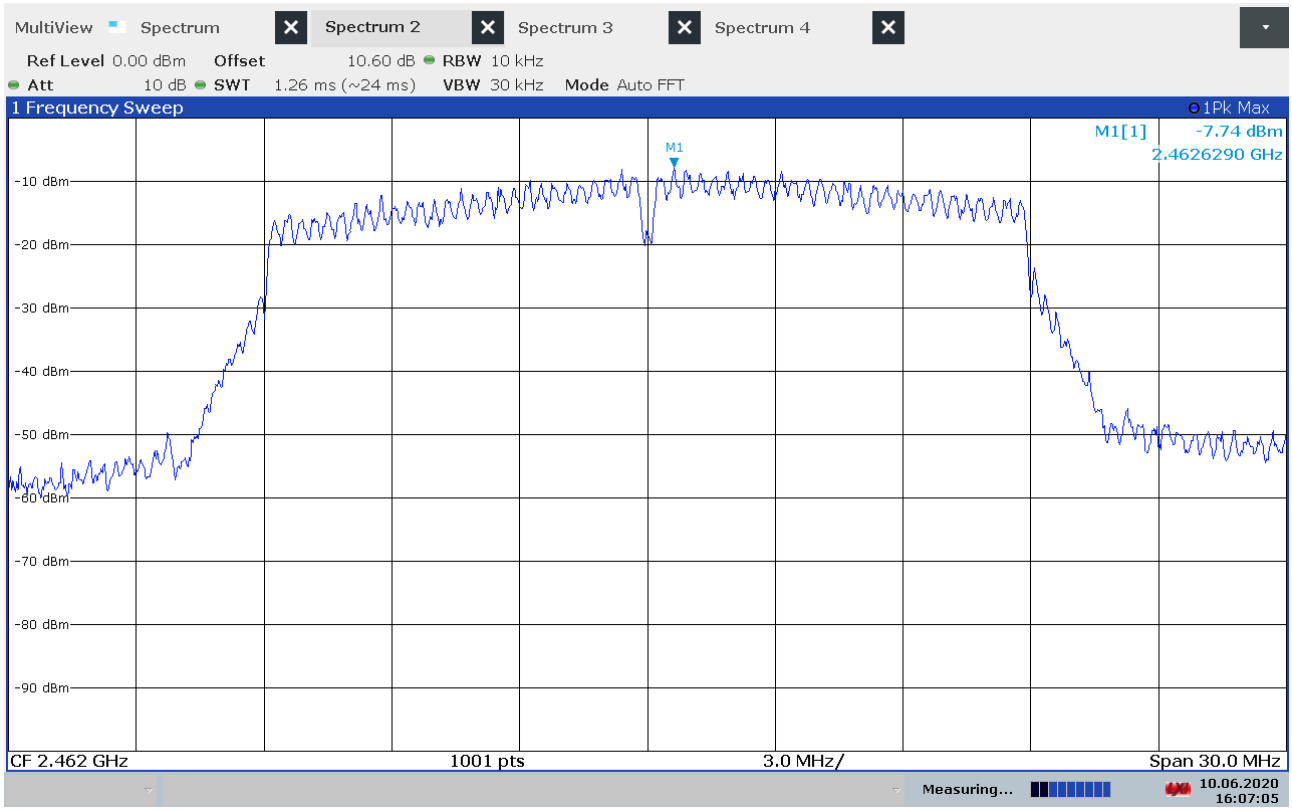
PSD, 2452 MHz, 802.11n, MCS0, HT40



PSD, 2462 MHz, 802.11b, 1Mbps



PSD, 2462 MHz, 802.11g, 6Mbps



PSD, 2462 MHz, 802.11n, MCS0

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	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2020-01	2021-01
3	6810.17B	Attenuator	Suhner	LR 1669	2019-07	2020-07
4	NO324415	Band Reject Filter	Microwave Circuits	LR 1760	COU	
5	VULB 9163	BiLog Antenna	Schwarzbech	LR 1616	2020-01	2023-01
6	317	Preamplifier	Sonoma Inst.	LR 1687	2020-07	2021-07
7	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2017-12	2020-12
8	WLK5-1100-1485-7000-40SS	Low Pass Filter	Wainwright Inst.	LR 1761	COU	
9	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

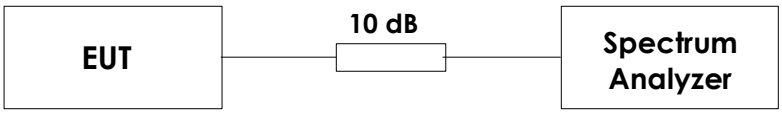
Note: COU – calibrate on use; N/A – Not Applicable

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

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.40.10	Radiated Emission test software
2	Rohde & Schwarz	GPIBShot	2.7	Screenshots from R&S Spectrum Analyzers
3				

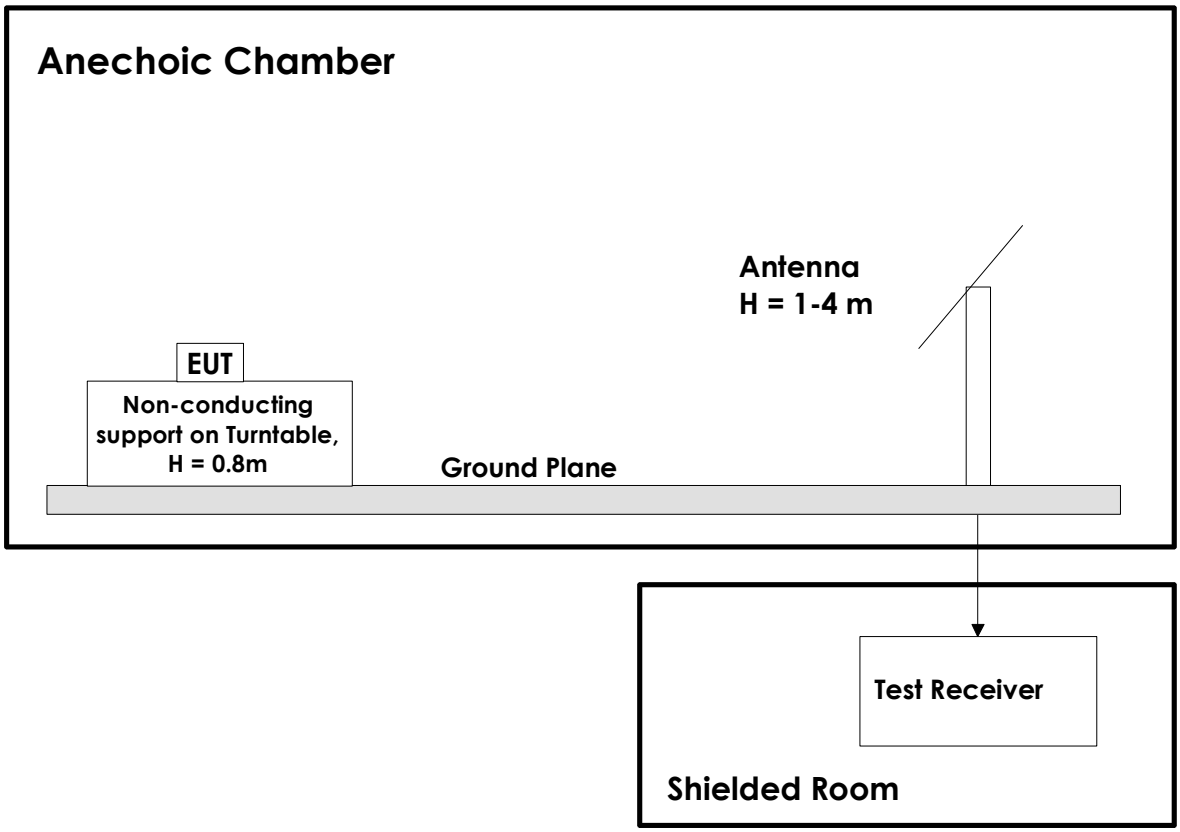
6 BLOCK DIAGRAM

6.1 Conducted Tests



This test set-up is used for all Conducted tests.

6.2 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. Measuring distance is 3m for all frequencies up to 18 GHz. Above 18 GHz measuring distance is 1m.

Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna.

All measurements at 1 GHz 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.

Above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss.