

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 15.407 Unlicensed National Information Infrastructure Devices (U-NII) Industry Canada RSS-247, Issue 2 Licence-Exempt Local Area Network (LE-LAN) Devices
Order number	389657
Tested in period	2020-01-30 to 2020-02-05
Issue date	2020-04-03
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	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 Ranges	U-NII 1 : 5180 – 5240 MHz: 4 channels U-NII 2A : 5260 – 5320 MHz: 4 channels U-NII 2C : 5500 – 5720 MHz: 12 channels U-NII 3 : 5745 – 5825 MHz: 5 channels
Operating Modes	802.11a/n (HT20 only)
Type of Modulation	Digital (OFDM - Orthogonal frequency-division multiplexing)
Conducted Output Power	5180 – 5240 MHz: 14.5 mW 5260 – 5320 MHz: 16.2 mW 5500 – 5720 MHz: 14.8 mW 5745 – 5825 MHz: 10.0 mW
Antenna Connector	None (Integral Antennas)
Number of Antennas	1
Antenna Diversity Supported	No
Smart Antennas Supported	No
TPC Supported	Not implemented, not required when EIRP is below 500 mW
DFS Supported	Client Device without Radar Detection
Power Supply	AC Adaptor: PNLV251 (120V ~60Hz, 350mA; 5V _{DC} 1.8A)
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.

1.3 Normal test conditions

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.

1.4 Test Engineer(s)

Frode Sveinsen

1.5 Description of modification for Modification Filing

Not applicable.

1.6 Family List Rational

Not Applicable.

1.7 Antenna Requirement

Is the antenna detachable? ☐ Yes ☒ No

If detachable, is the antenna connector non-standard? ☐ Yes ☐ No

Type of antenna connector: N/A, Integral Antenna

1.8 Worst-Case Configuration

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:

802.11a mode: 6 Mbps
802.11n HT20 mode: MCS0

EUT Operating Modes

Description of operating modes	Continuous TX, 5 GHz 20 MHz Mode
Additional information	The EUT was transmitting continuously in test-mode during all measurements.

1.9 Comments

The measurements were done with the EUT powered by 120 V 60 Hz. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

This report covers the 5 GHz WLAN part of the EUT, except DFS tests.

DFS tests, 2.4 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 15.407 and ISSED RSS-247 Issue 2.

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 1m and 3m.

☒ New Submission

☐ Class II Permissive Change

NII Equipment Code

☒ Production Unit

☐ Pre-production Unit

☐ 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
Maximum Output Power	15.407(a)	6.2	Complies
Power Spectral Density	15.407(a)	6.2	Complies
Emission Bandwidth	15.407(a)(2)	6.2	Complies
Unwanted Emissions	15.407(b)	6.2	Complies
Discontinuation of Transmission	15.407(c)	6.3	N/T ¹
DTS Bandwidth	15.407(e)	6.2.4	Complies
Transmit Power Control	15.407(h)	6.2.3	N/A ²
Dynamic Frequency Selection	15.407(h)	6.3	Complies ³
Radiated Emissions	15.205 15.209	7.3 (RSS-GEN) 8.9 (RSS-GEN)	Complies

¹ See manufacturers declaration

² Transmit Power Control is not required when Max EIRP is below 500 mW

³ The EUT is a Client Device without Radar Detection. This test is covered by Nemko Canada Test reports no. 392997-1TRFWL and 392997-2TRFWL

Revision history

Revision	Date	Comment	Sign
00	2020-03-10	First edition	FS
01	2020-04-03	Added information to PSD and Unwanted Emissions	FS

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

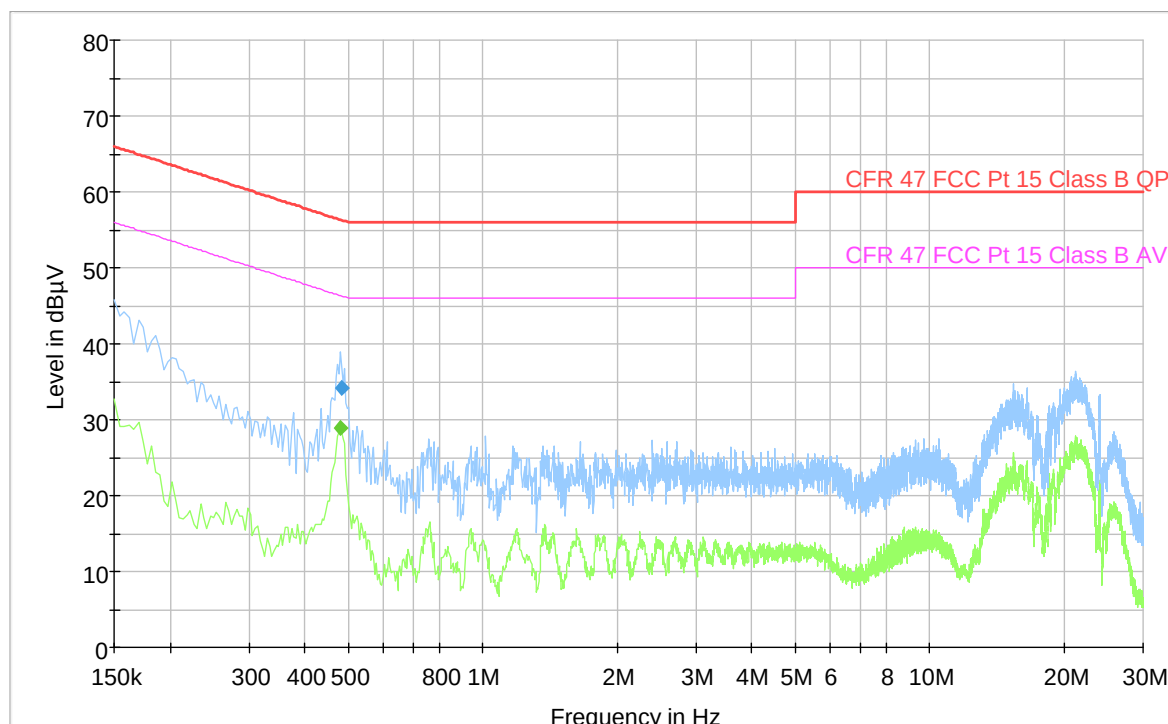
Test Results: Complies

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	---	28.87	46.34	17.47	1000	9	N	OFF
0.484	34.20	---	56.27	22.07	1000	9	N	OFF

Full Spectrum



AC Adaptor PNLV251, 120V 60 Hz

3.2 Maximum Output Power, e.i.r.p.

FCC 15.407 (a)

ISED RSS-247, Issue 2, Clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 12.3, method SA-1

Test Results: Complies

Measurement Data:

Ch. No.	Nominal Frequency (MHz)	Maximum Conducted Output Power (dBm)		Calculated Maximum EIRP (dBm)	
		802.11a, 6 Mbps	802.11n, MCS0	802.11a, 6 Mbps	802.11n, MCS0
36	5180	11.6	11.0	9.6	9.0
40	5200	10.7	10.4	8.7	8.4
48	5240	11.2	10.6	9.2	8.6
52	5260	12.1	11.6	10.1	9.6
60	5280	12.1	11.6	10.1	9.6
64	5320	11.3	10.0	9.3	8.0
100	5500	11.7	11.4	9.7	9.4
116	5580	11.1	10.8	9.1	8.8
140	5700	8.6	8.2	6.6	6.2
144	5720	9.6	9.4	7.6	7.4
149	5745	10.0	9.8	8.0	7.8
157	5785	9.5	9.3	7.5	7.3
165	5825	9.0	8.9	7.0	6.9

EIRP values were calculated from Field Strength values using the method described in KDB 412172 D01.

Manufacturer declared Antenna Gain is -2 dBi.

Limits for Indoor Device:

Frequency Band	FCC 15.407(a)	ISED RSS-247 Issue 2
5150 – 5250 MHz	Less than 250 mW (24 dBm) for client device Less than 1 W (30 dBm) for master device	Less than the lesser of 200 mW e.i.r.p. or $10 + 10 \log_{10} B$ dBm e.i.r.p.
5250 – 5350 MHz 5470 – 5725 MHz	Less than the lesser of 250 mW (24 dBm) or $11 + 10 \log_{10} B$ dBm	Less than the lesser of 250 mW or $11 + 10 \log_{10} B$ dBm, and Less than the lesser of 1 W e.i.r.p. or $17 + 10 \log_{10} B$ dBm e.i.r.p. Devices with e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W
5725 – 5825 MHz	Less than 1 Watt	Less than 1 Watt If Antenna Gain is more than 6 dBi the Power Limit is reduced by the amount exceeding 6 dBi
	If Antenna Gain is more than 6 dBi the Power Limit is reduced by the amount exceeding 6 dBi	
	B is the 26dB emission bandwidth in MHz	B is the 99% emission bandwidth in MHz

3.3 Emission Bandwidth

Para. No.: 15.407(a)(2)

ISED RSS-247, Issue 2, Clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 and 12.4.1

Test Results: Complies

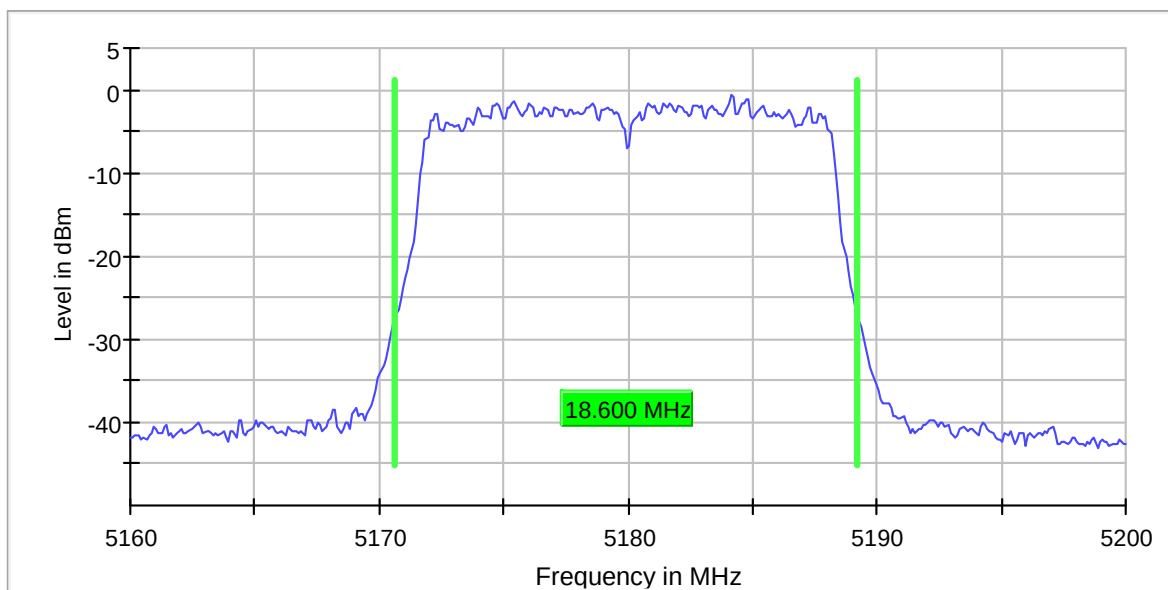
Measurement Data:

Ch. No.	Nominal Frequency (MHz)	FCC 15.407 26dB Bandwidth, Measured Values (MHz)	
		802.11a 6Mbps	802.11n MCS0
36	5180	18.6	19.6
40	5200	18.6	19.5
48	5240	18.6	19.6
52	5260	18.7	19.6
60	5280	18.6	19.6
64	5320	18.7	19.6
100	5500	18.7	19.7
116	5580	18.6	19.6
140	5700	18.6	19.6
144	5720	18.7	19.6

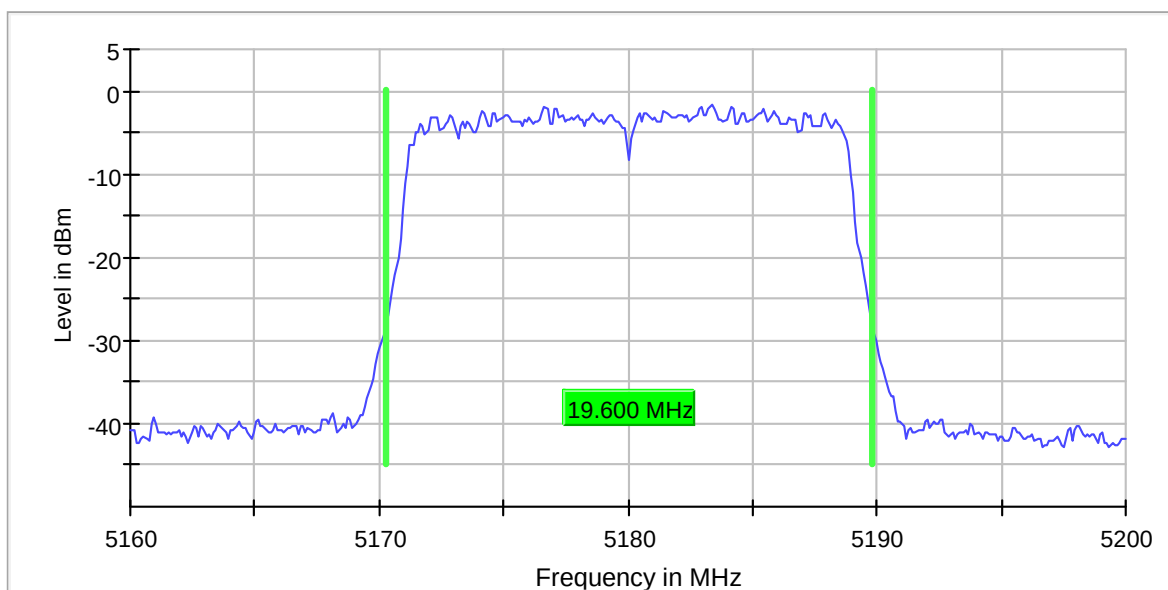
Ch. No.	Nominal Frequency (MHz)	ISED Canada RSS-247 99% Bandwidth, Measured Values (MHz)	
		802.11a 6Mbps	802.11n MCS0
36	5180	16.3	17.6
40	5200	16.3	17.5
48	5240	16.3	17.6
52	5260	16.3	17.5
60	5280	16.3	17.5
64	5320	16.3	17.6
100	5500	16.3	17.5
116	5580	16.3	17.6
140	5700	16.3	17.6
144	5720	16.3	17.6
149	5745	16.3	17.6
157	5785	16.3	17.5
165	5825	16.3	17.5

Limit:

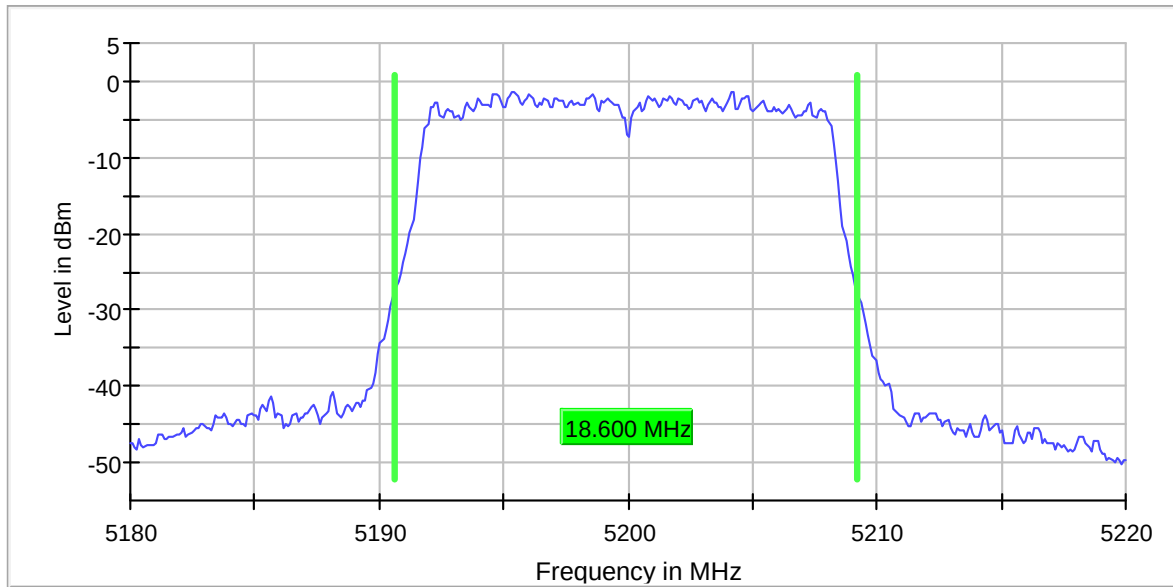
No requirements if all emissions are within the band-edges.



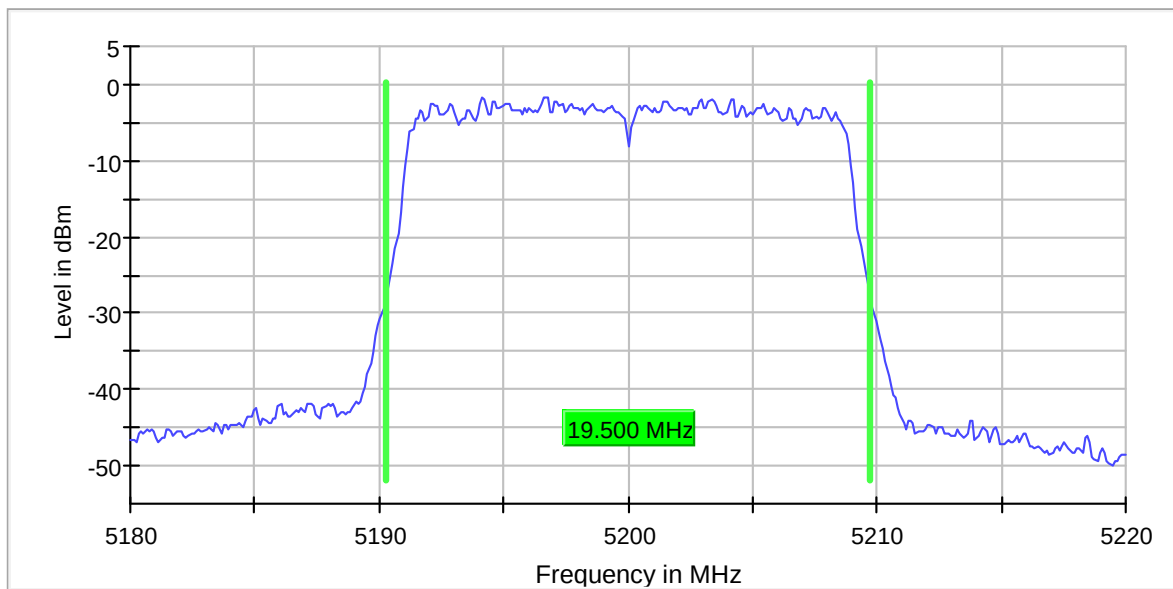
Emission Bandwidth B , 5180 MHz, 802.11a 6Mbps



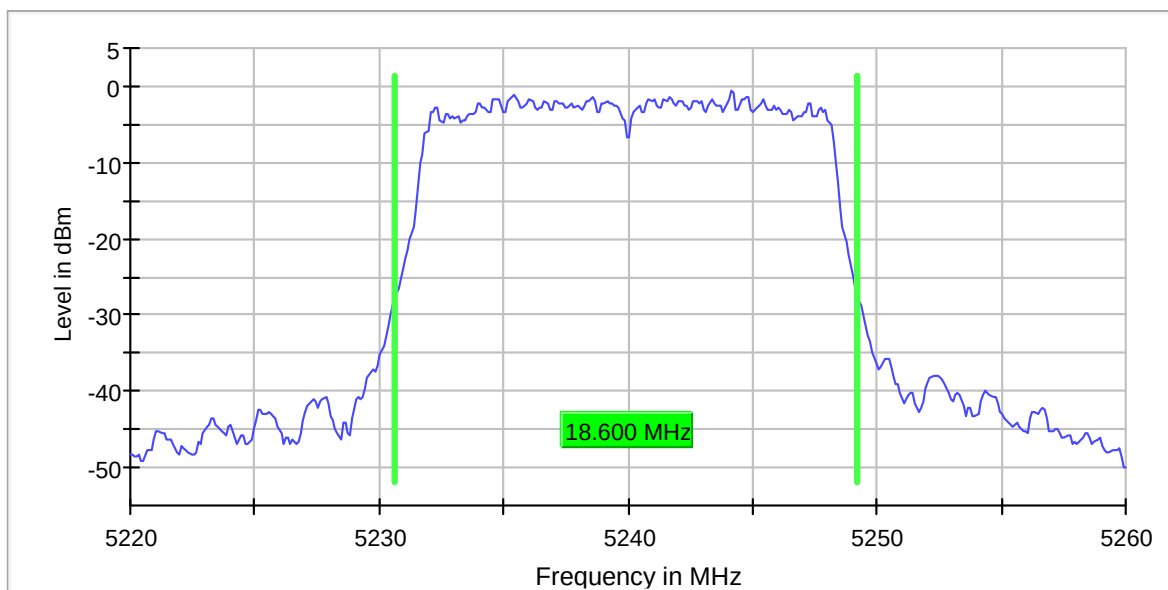
Emission Bandwidth B , 5180 MHz, 802.11n MCS0



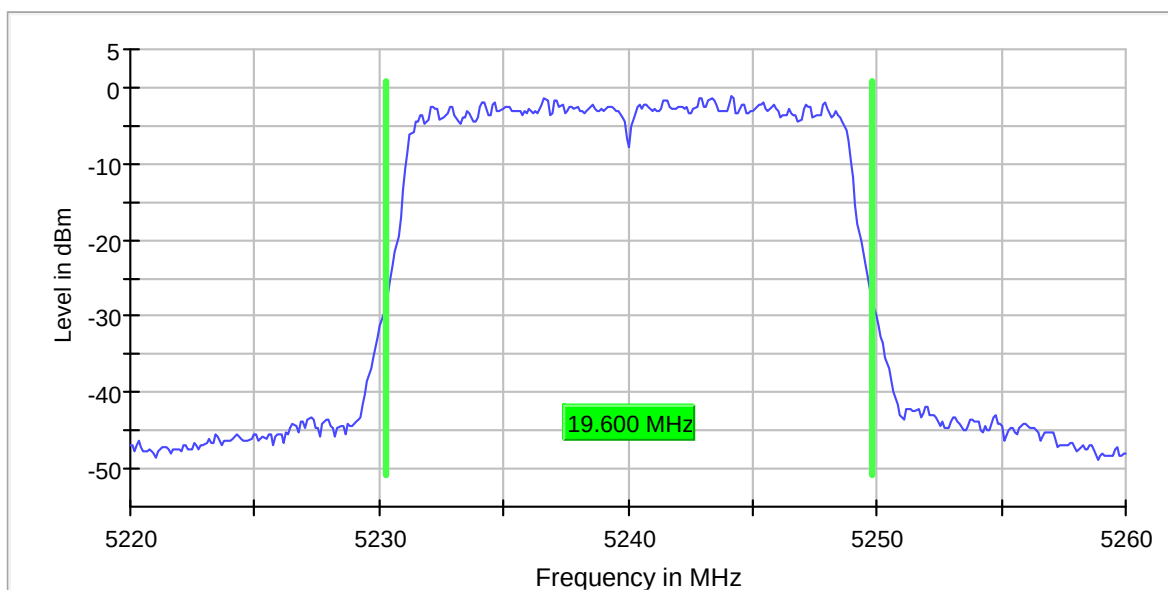
Emission Bandwidth B , 5200 MHz, 802.11a 6Mbps



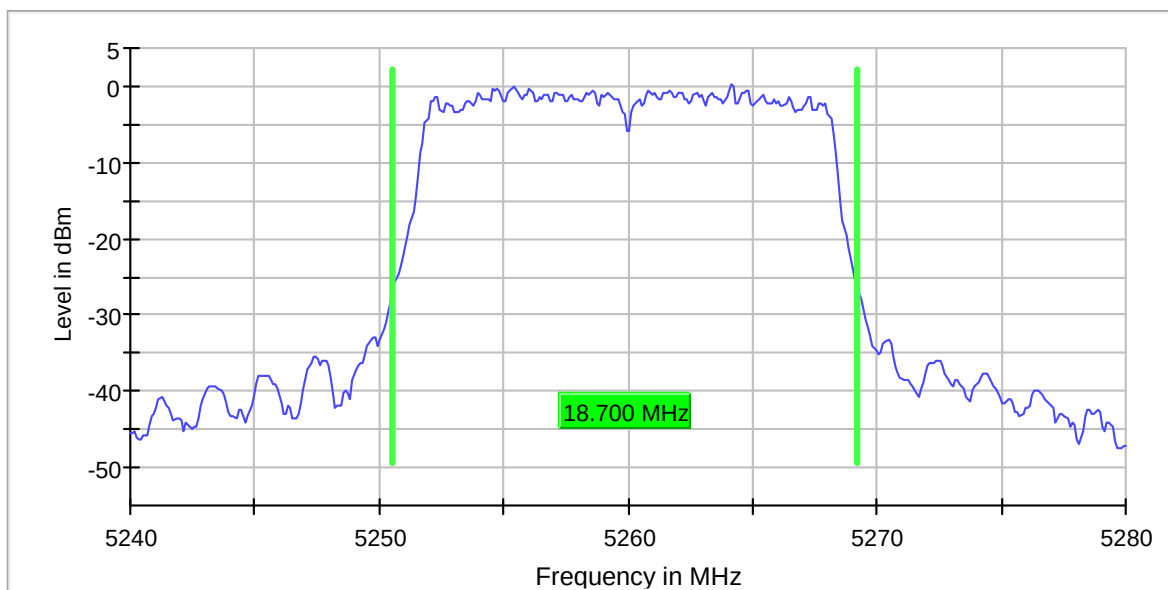
Emission Bandwidth B , 5200 MHz, 802.11n MCS0



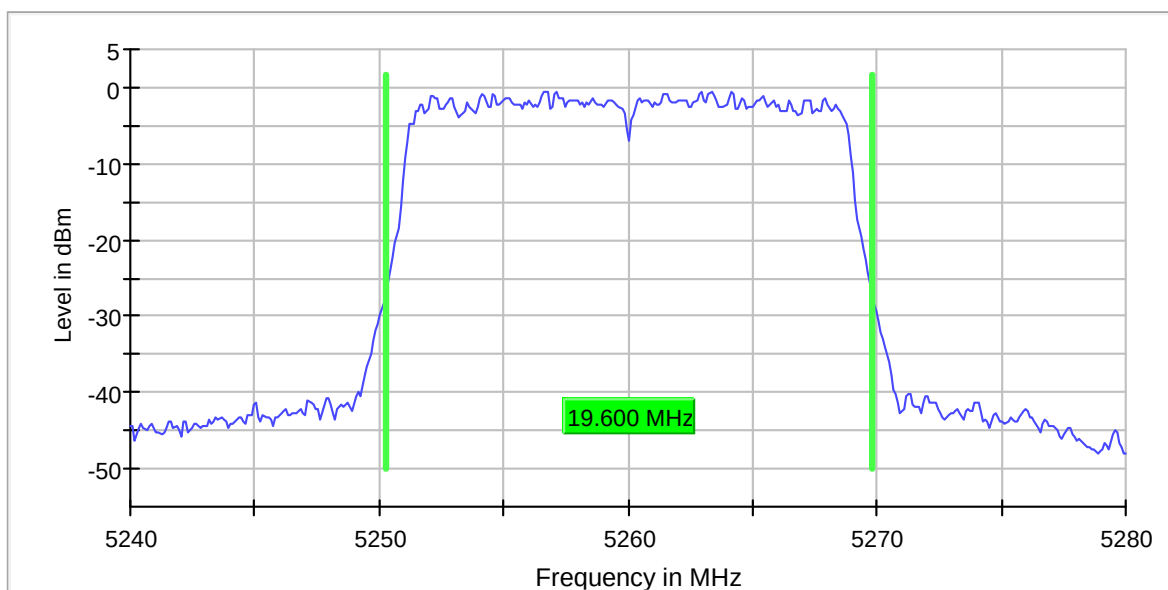
Emission Bandwidth B, 5240 MHz, 802.11a 6Mbps



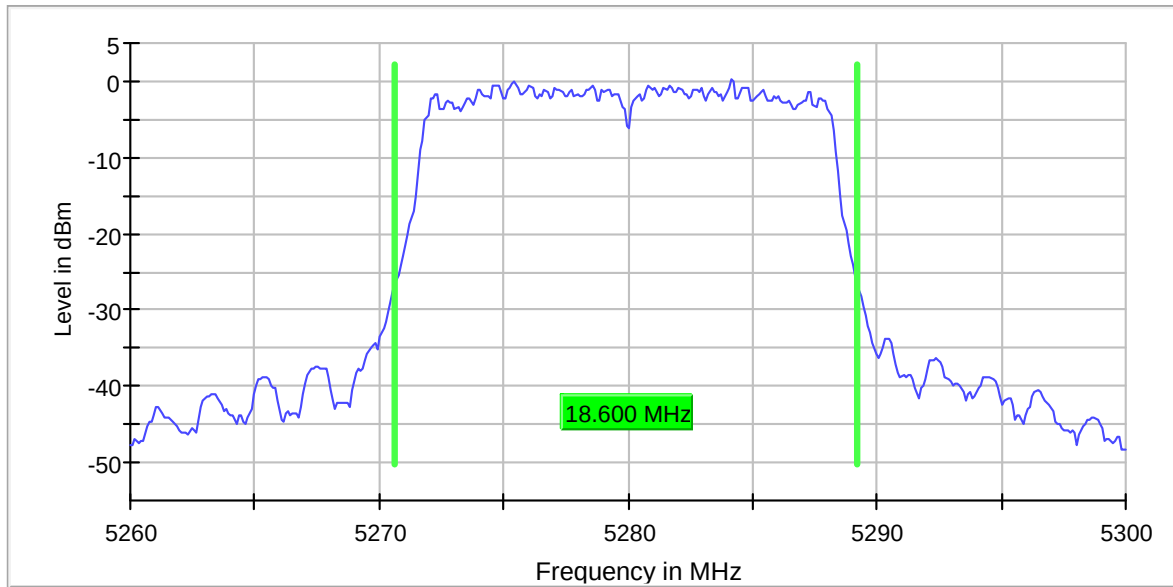
Emission Bandwidth B, 5240 MHz, 802.11n MCS0



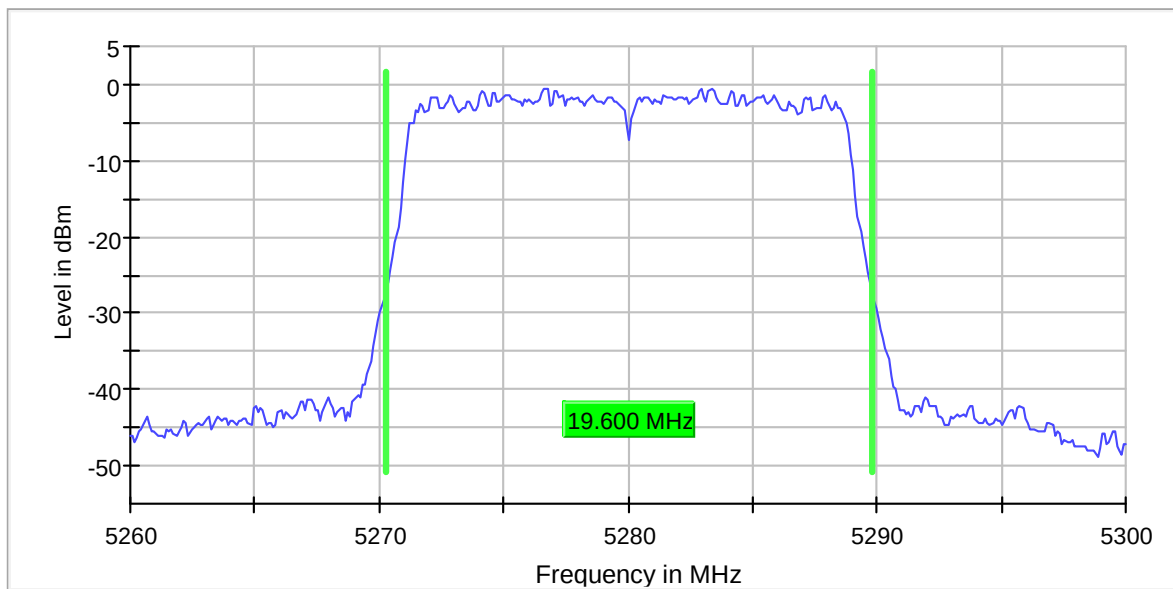
Emission Bandwidth B , 5260 MHz, 802.11a 6Mbps



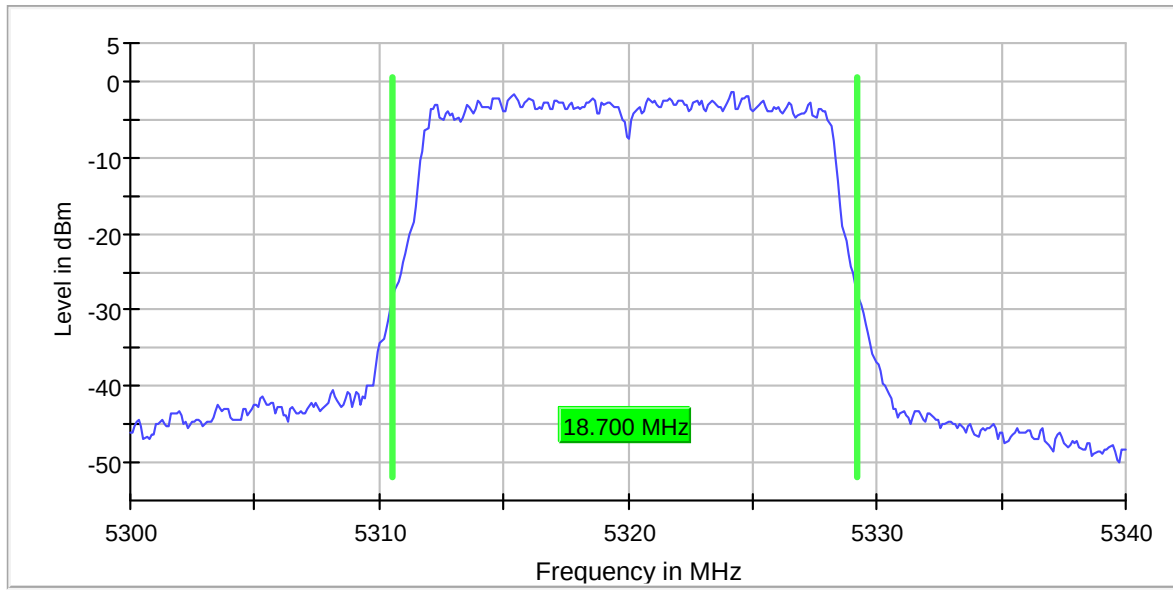
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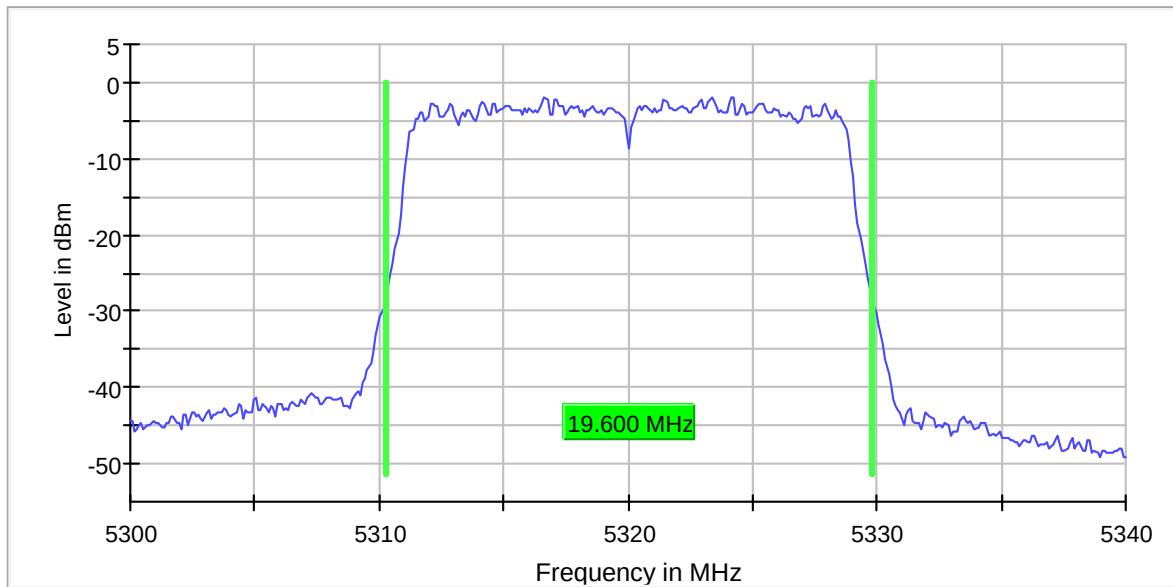
Emission Bandwidth B, 5280 MHz, 802.11a 6Mbps



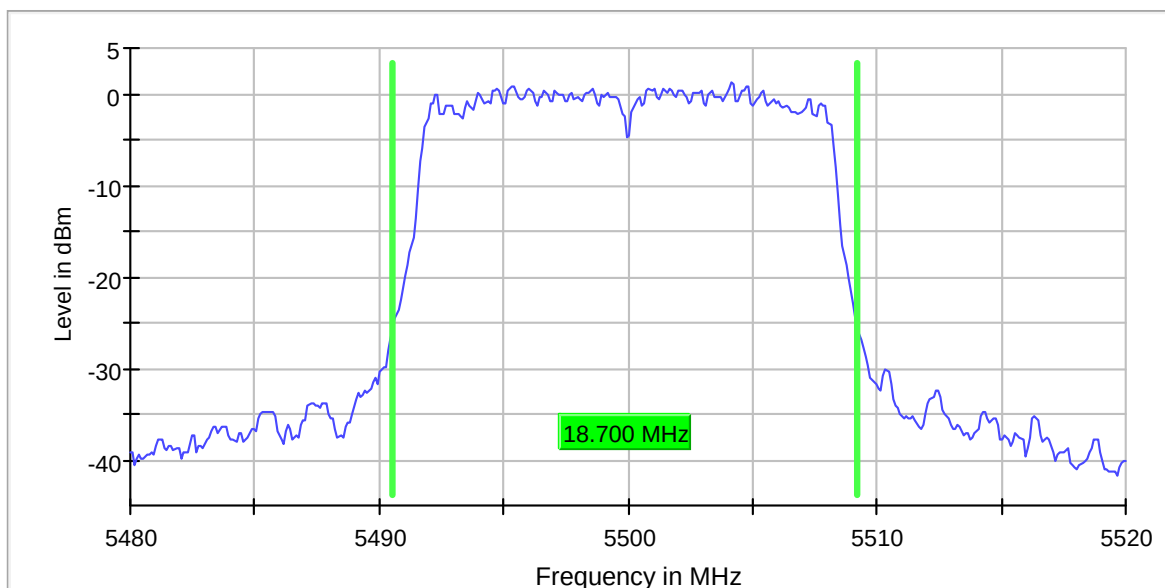
Emission Bandwidth B, 5280 MHz, 802.11n MCS0



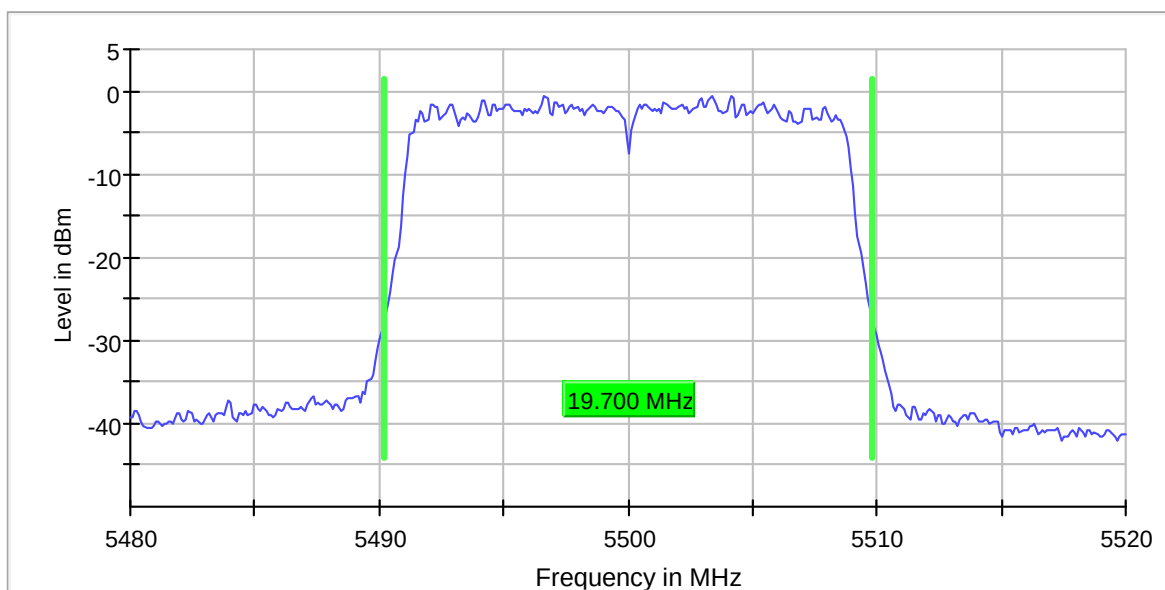
Emission Bandwidth B , 5320 MHz, 802.11a 6Mbps



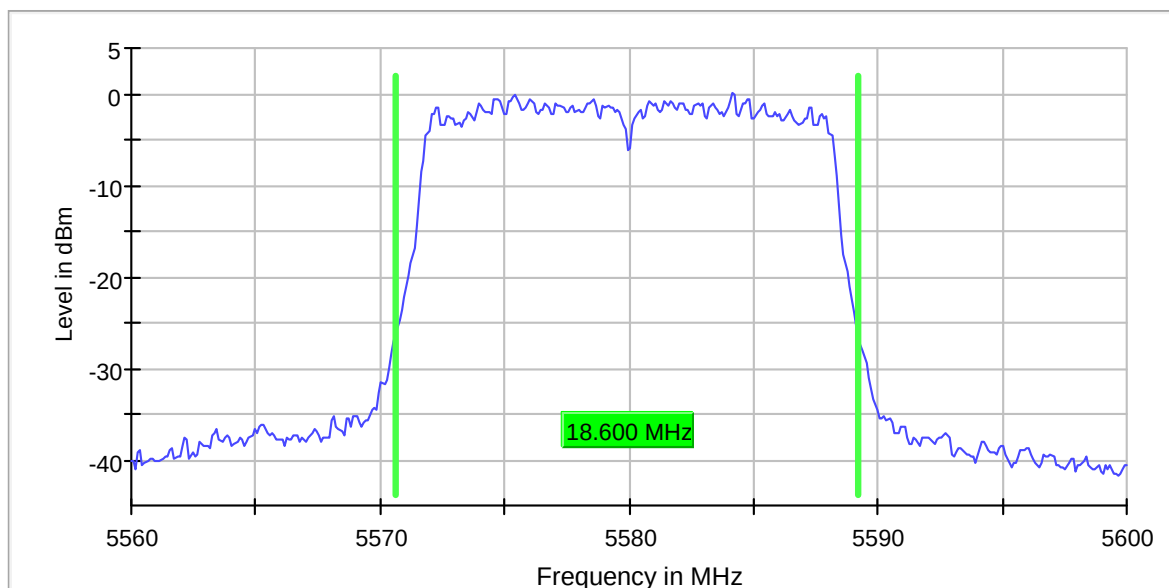
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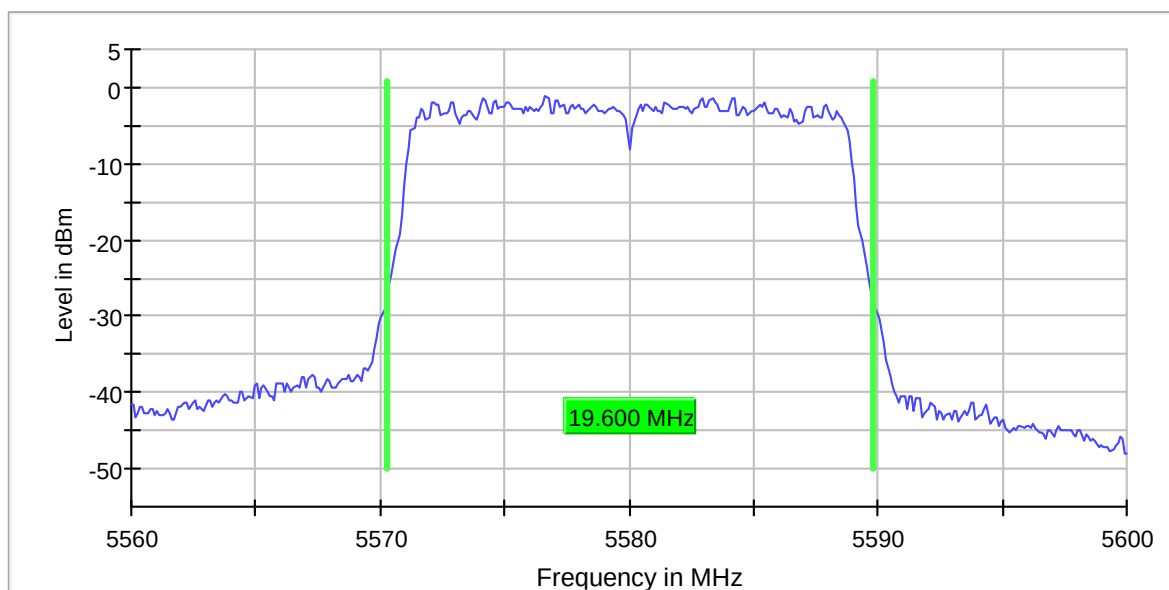
Emission Bandwidth B, 5500 MHz, 802.11a 6Mbps



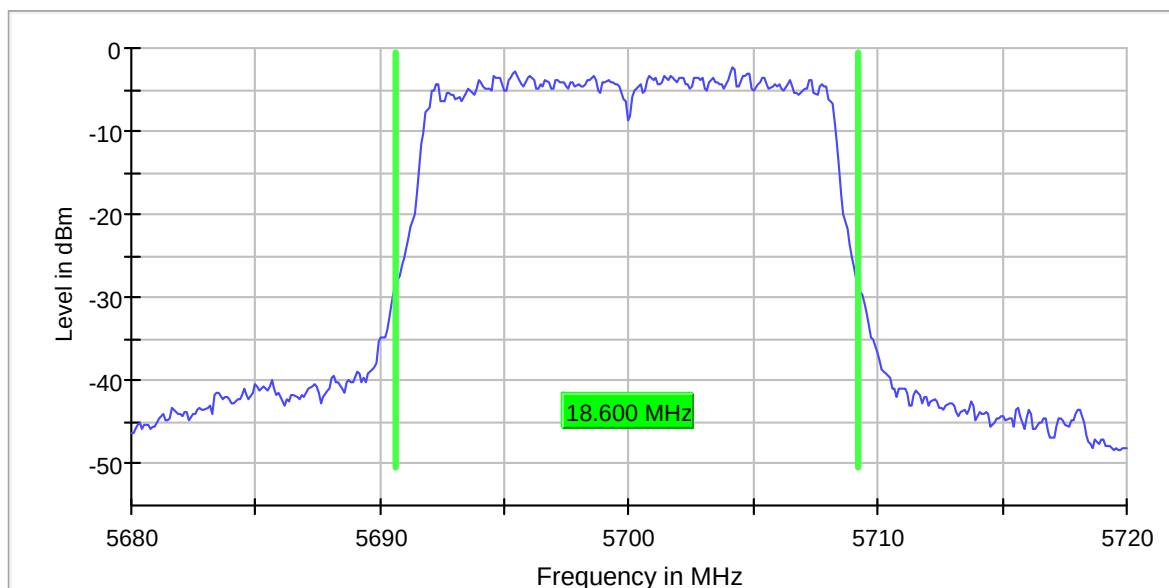
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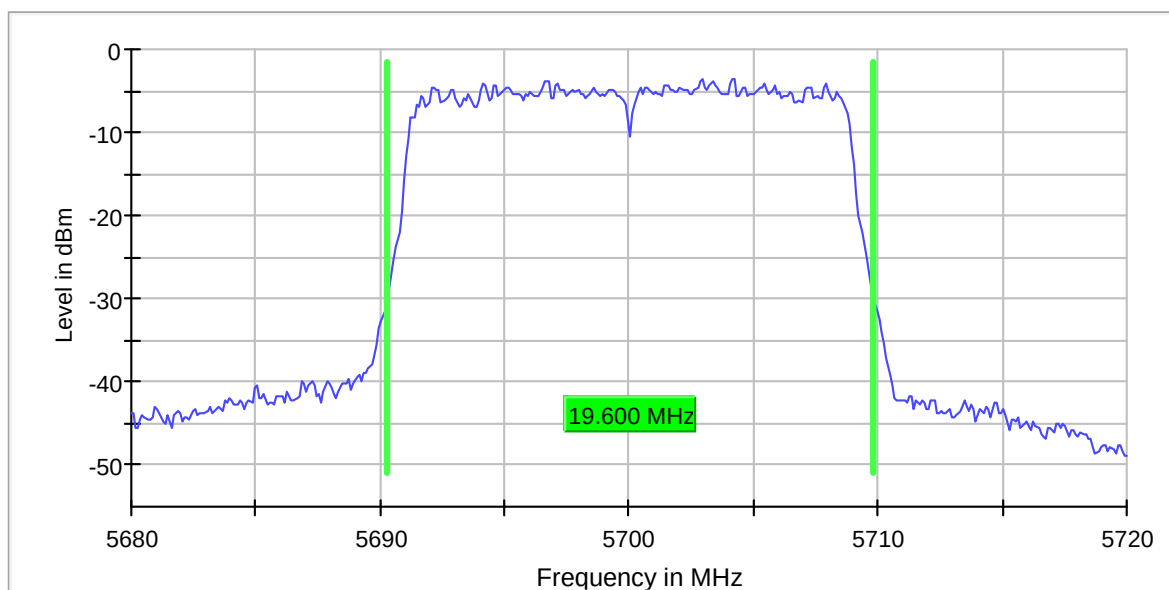
Emission Bandwidth B, 5580 MHz, 802.11a 6Mbps



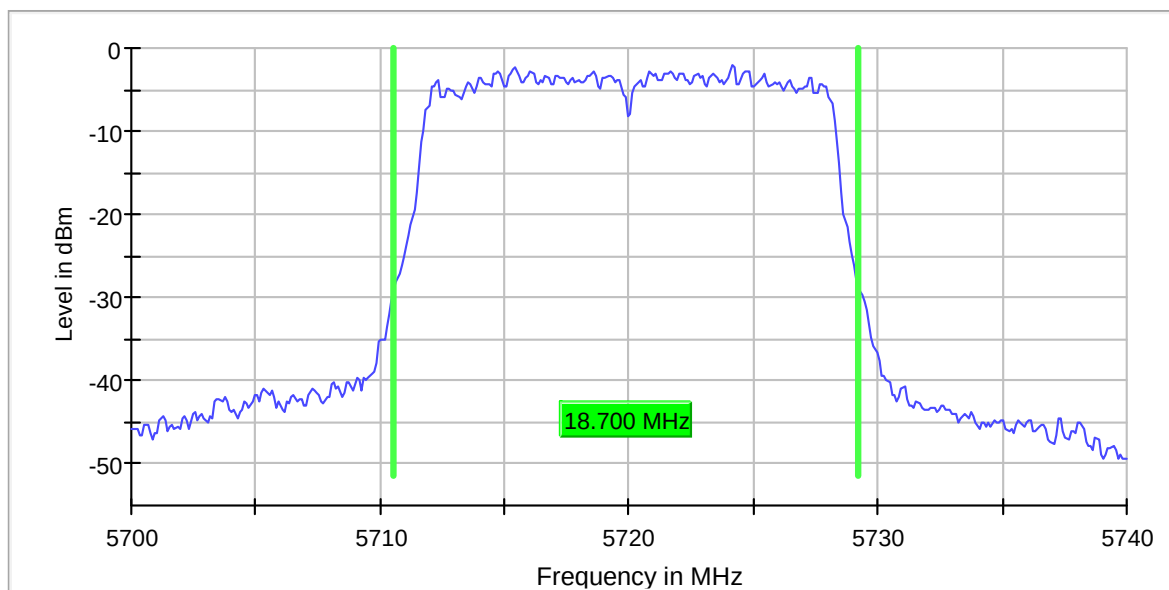
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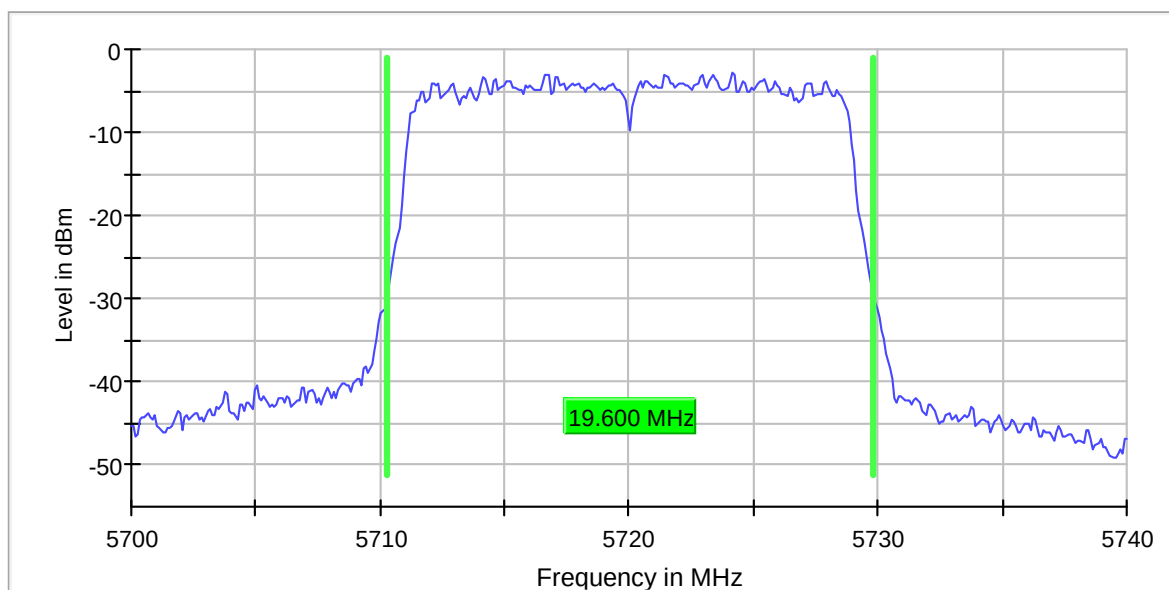
Emission Bandwidth B , 5700 MHz, 802.11a 6Mbps



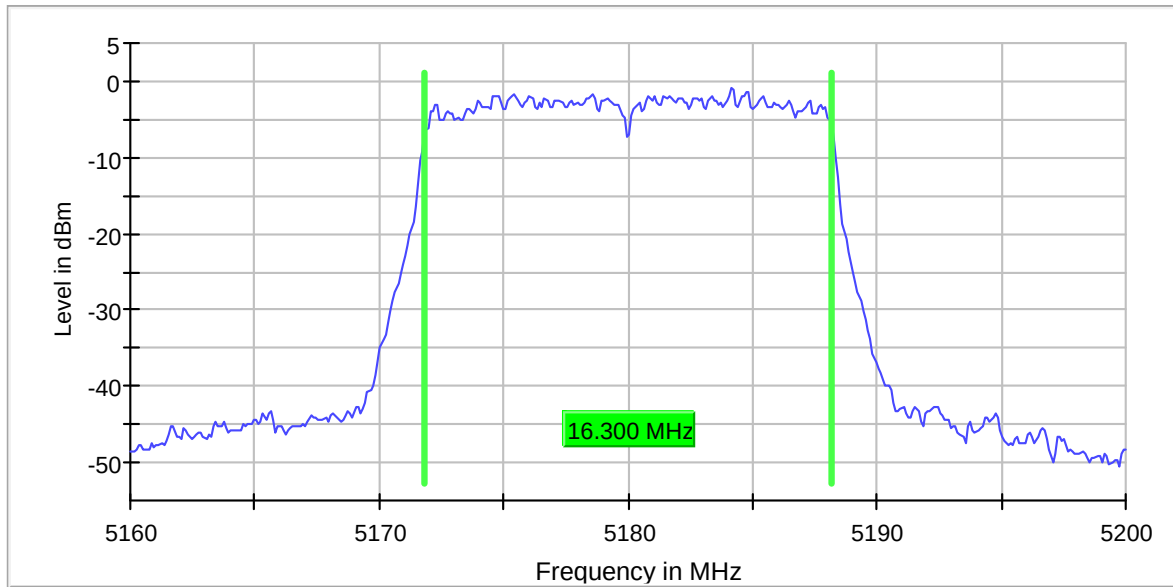
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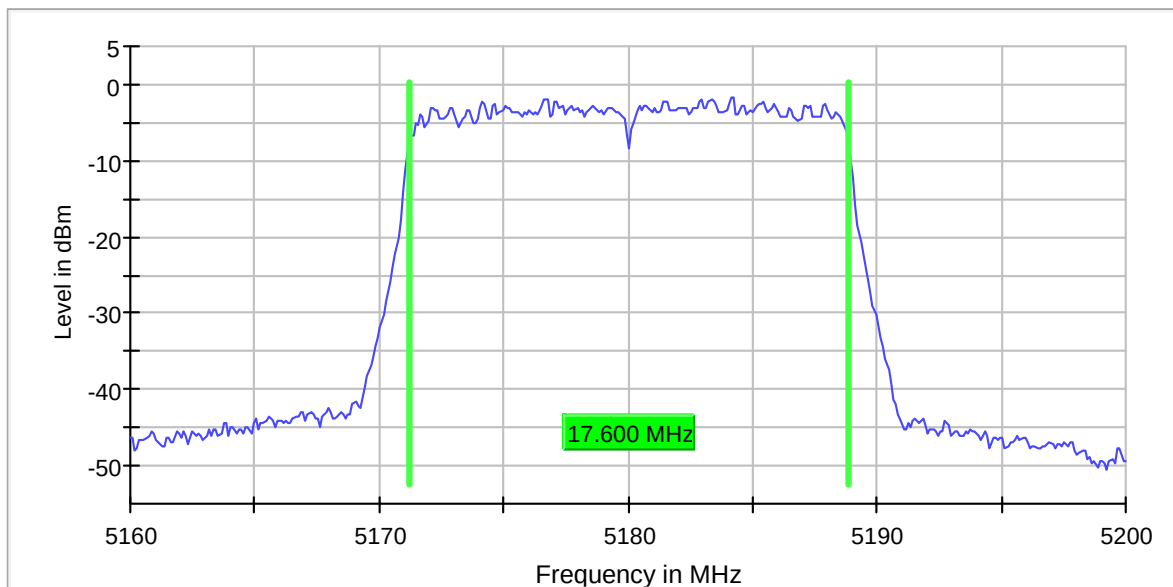
Emission Bandwidth B, 5720 MHz, 802.11a 6Mbps



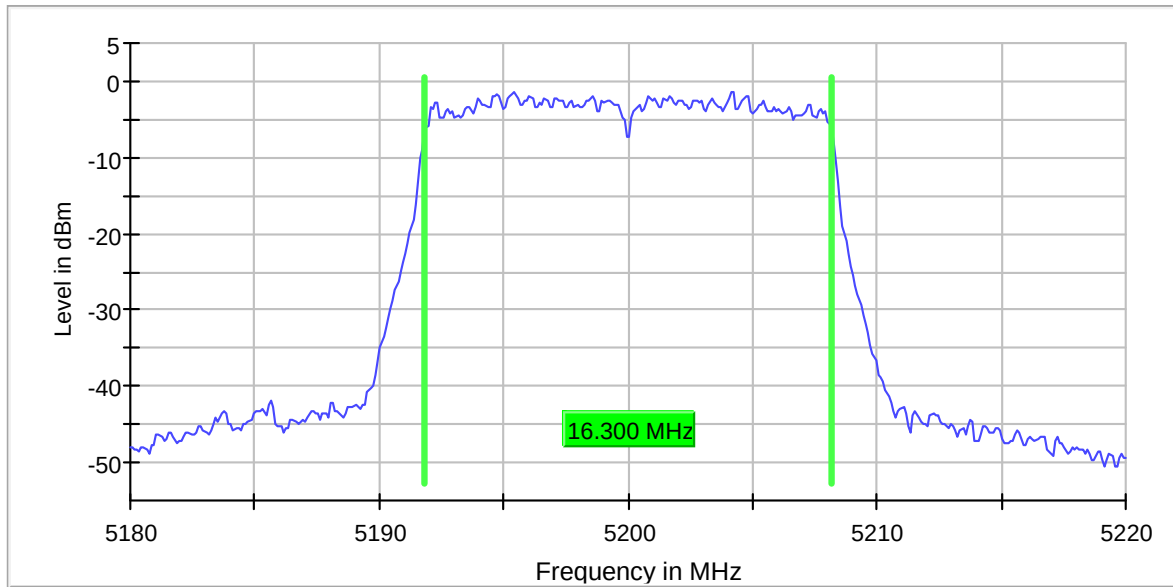
Emission Bandwidth B, 5720 MHz, 802.11n MCS0



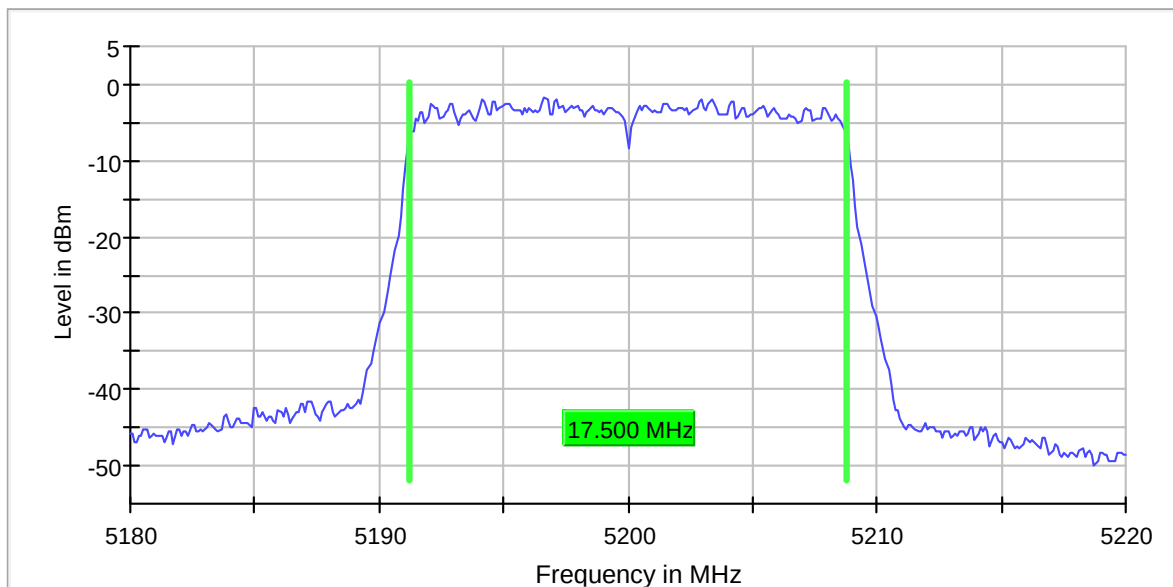
99% Bandwidth, 5180 MHz, 802.11a 6Mbps



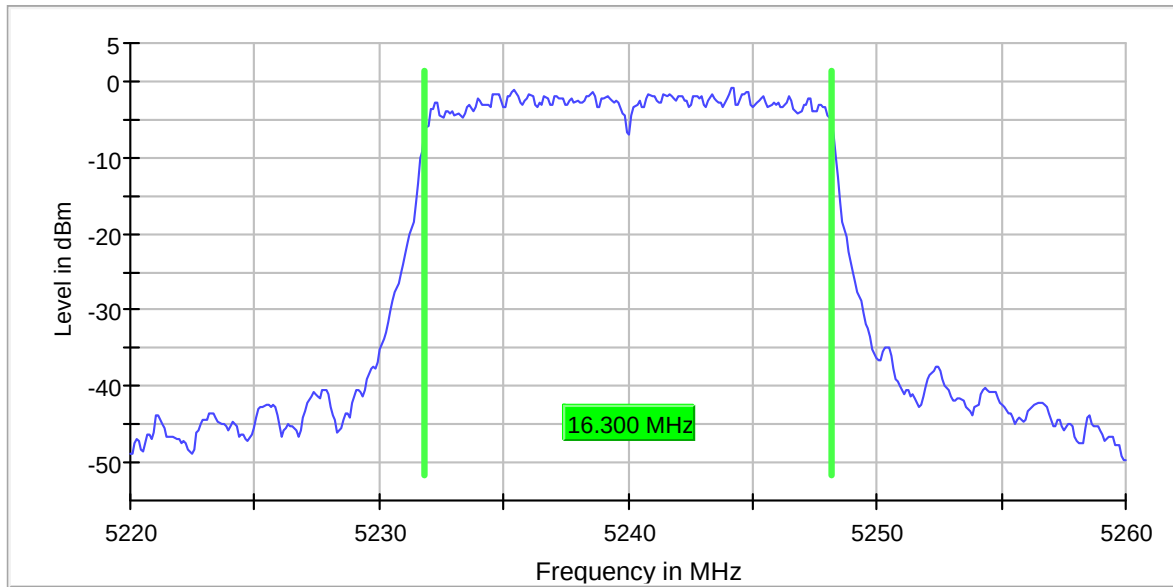
99% Bandwidth, 5180 MHz, 802.11n MCS0



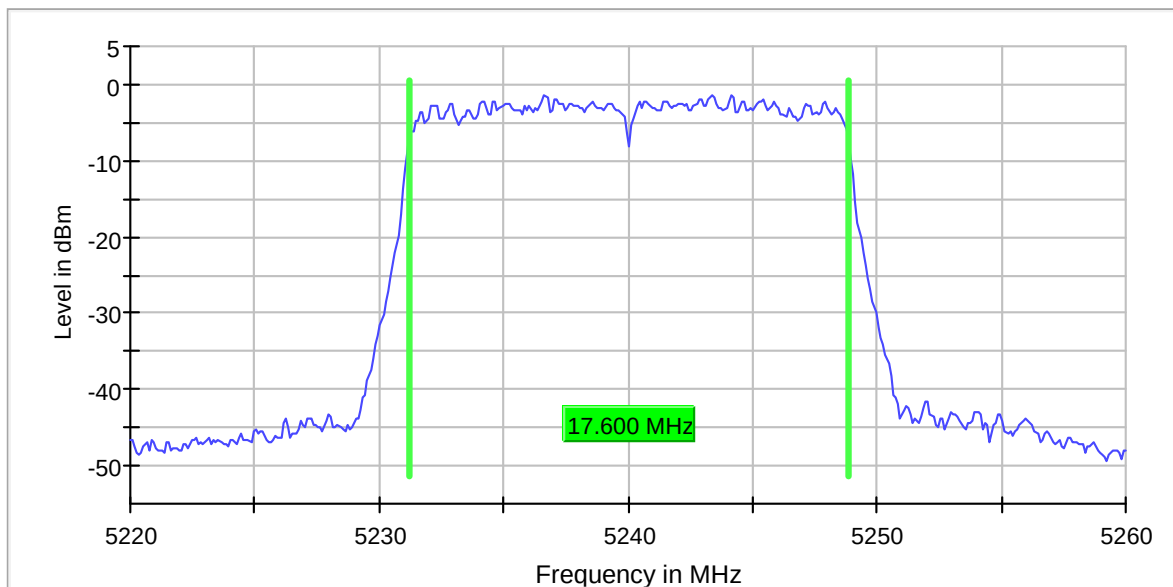
99% Bandwidth, 5200 MHz, 802.11a 6Mbps



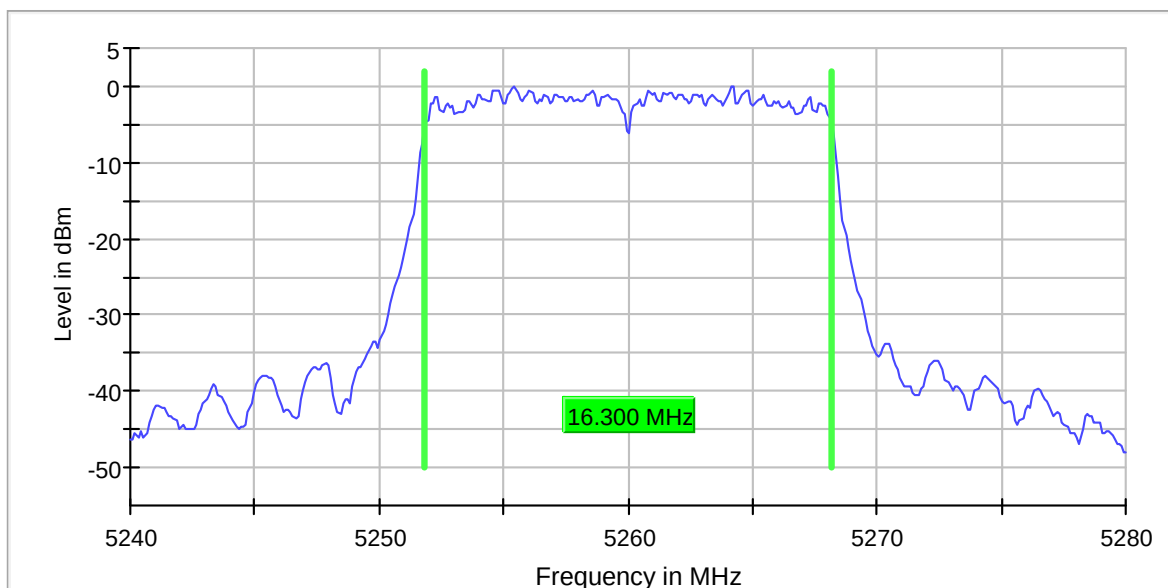
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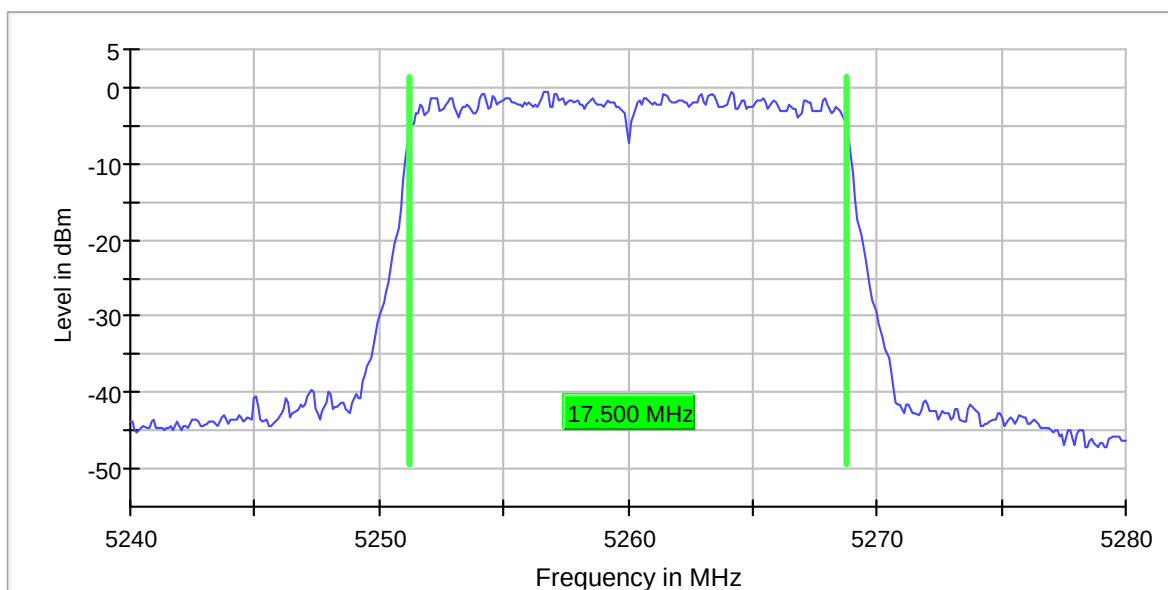
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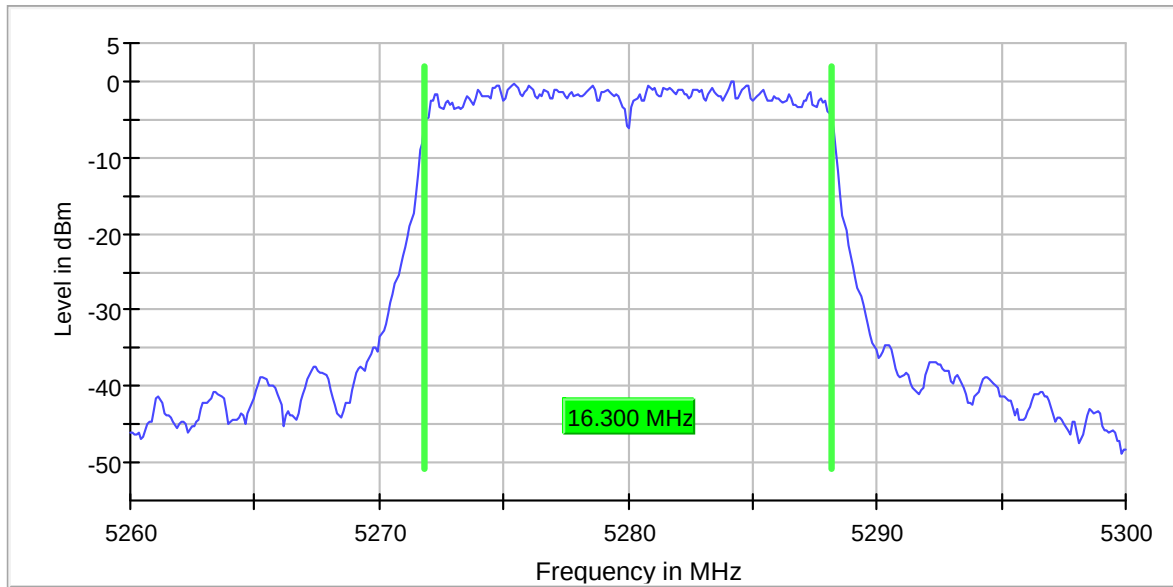
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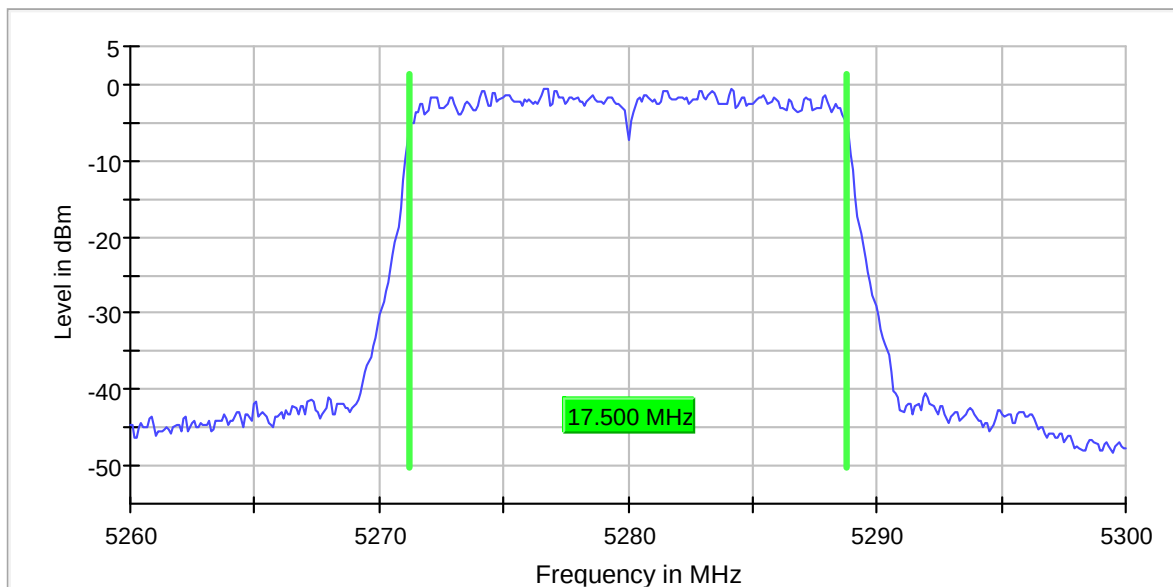
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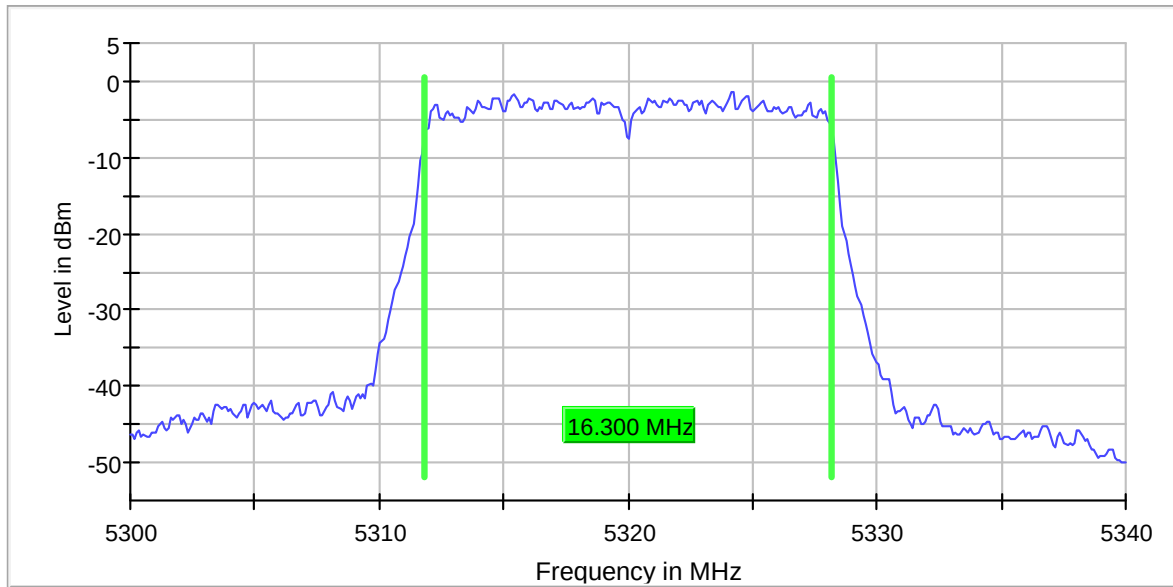
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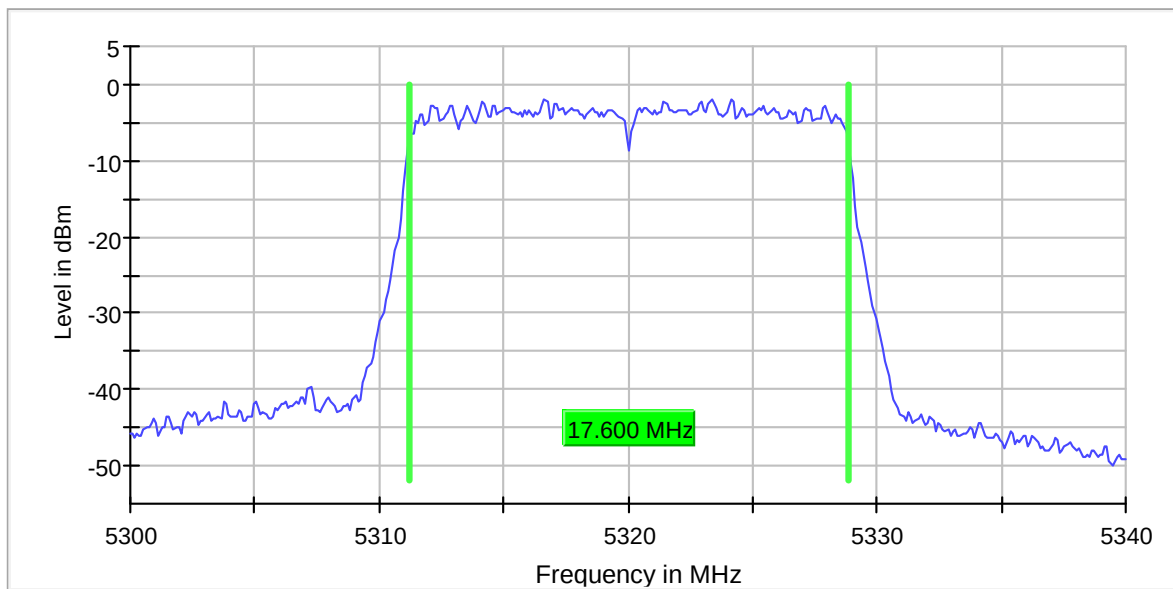
99% Bandwidth, 5280 MHz, 802.11a 6Mbps



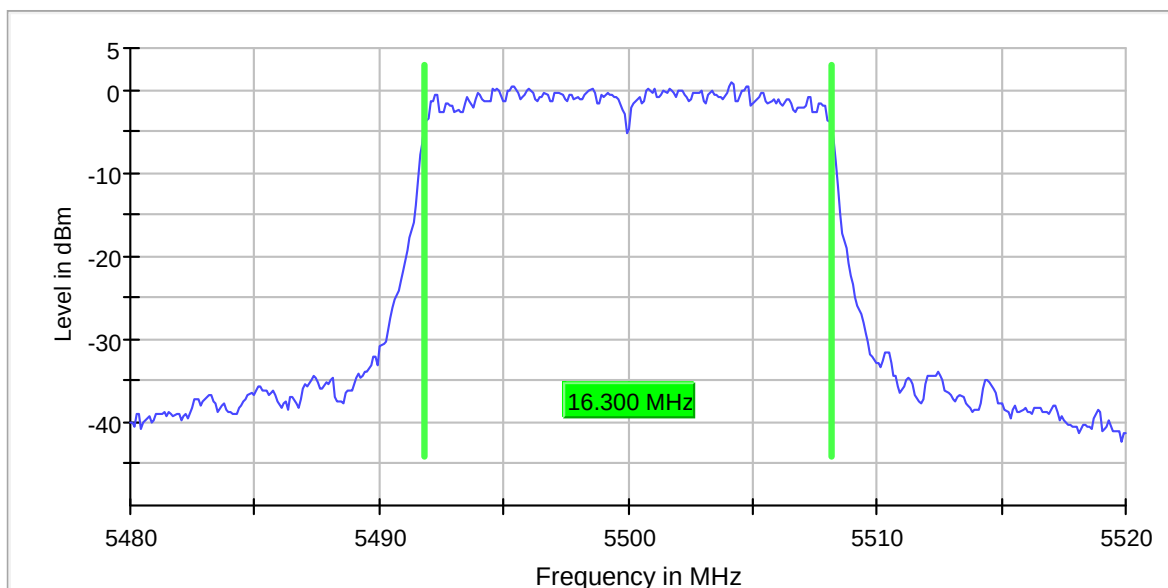
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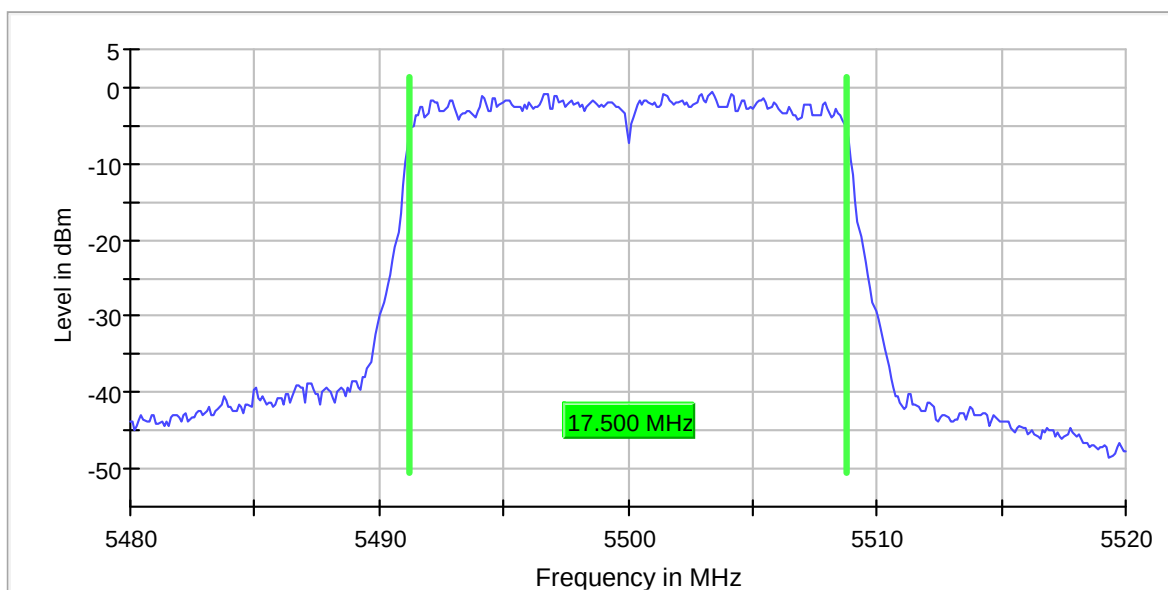
99% Bandwidth, 5320 MHz, 802.11a 6Mbps



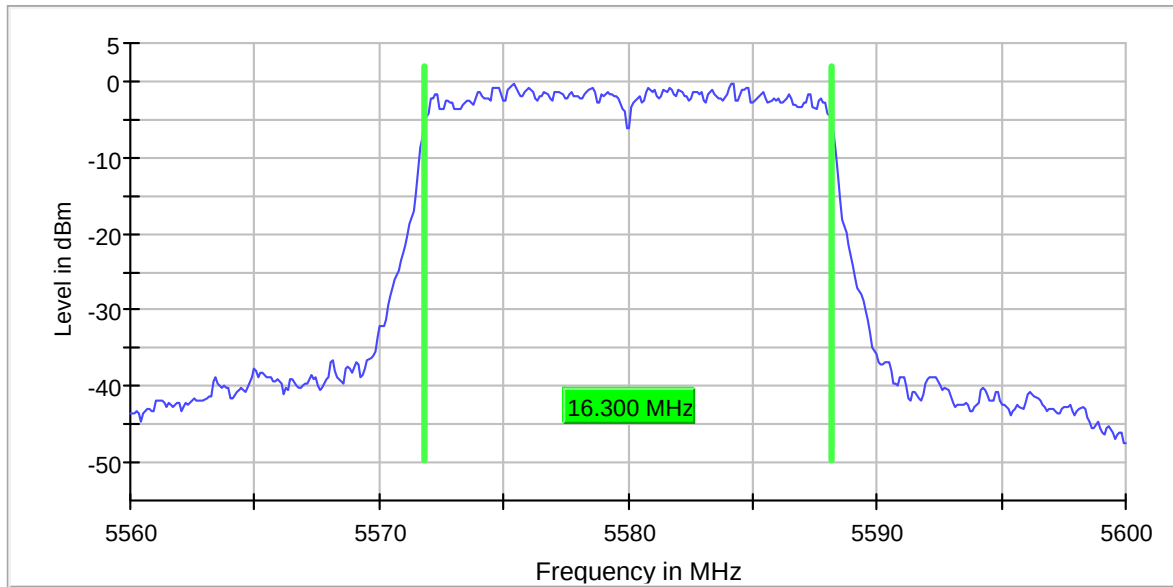
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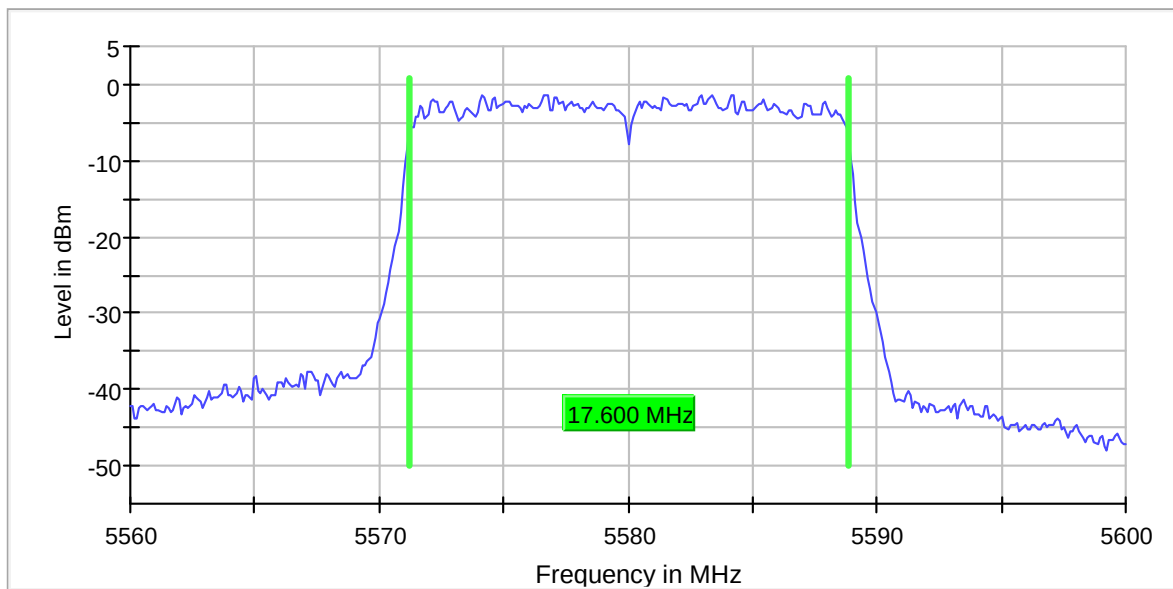
99% Bandwidth, 5500 MHz, 802.11a 6Mbps



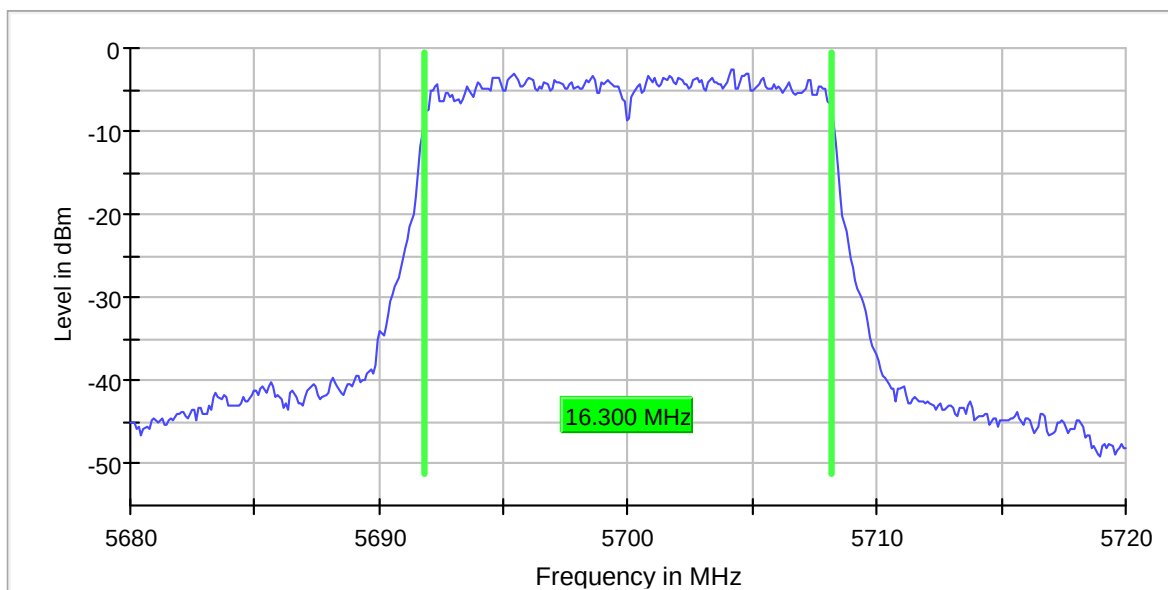
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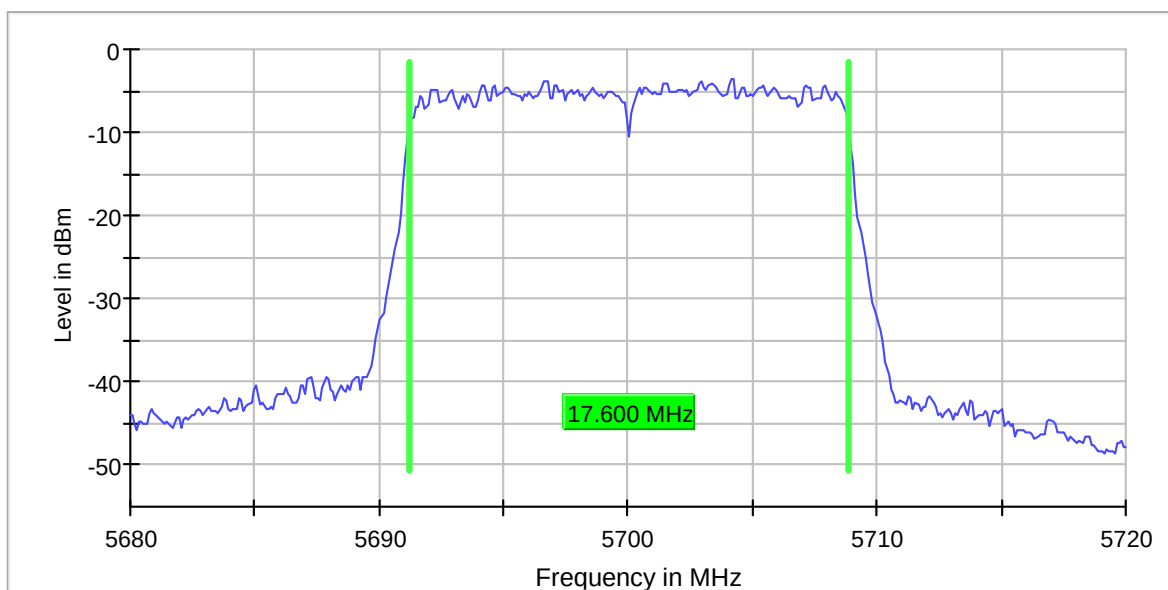
99% Bandwidth, 5580 MHz, 802.11a 6Mbps



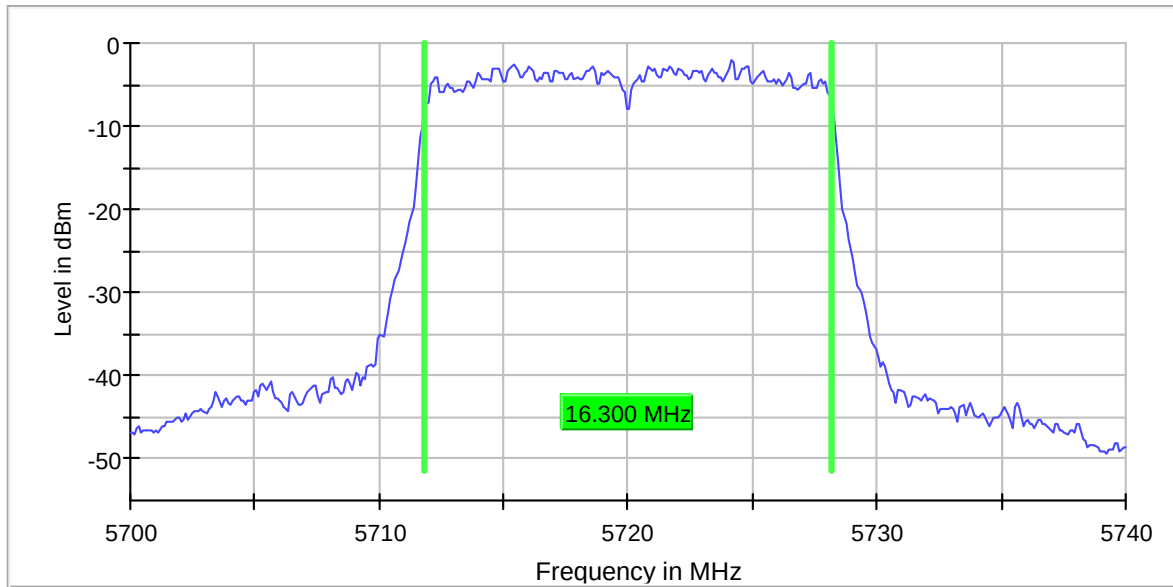
99% Bandwidth, 5580 MHz, 802.11n MCS0



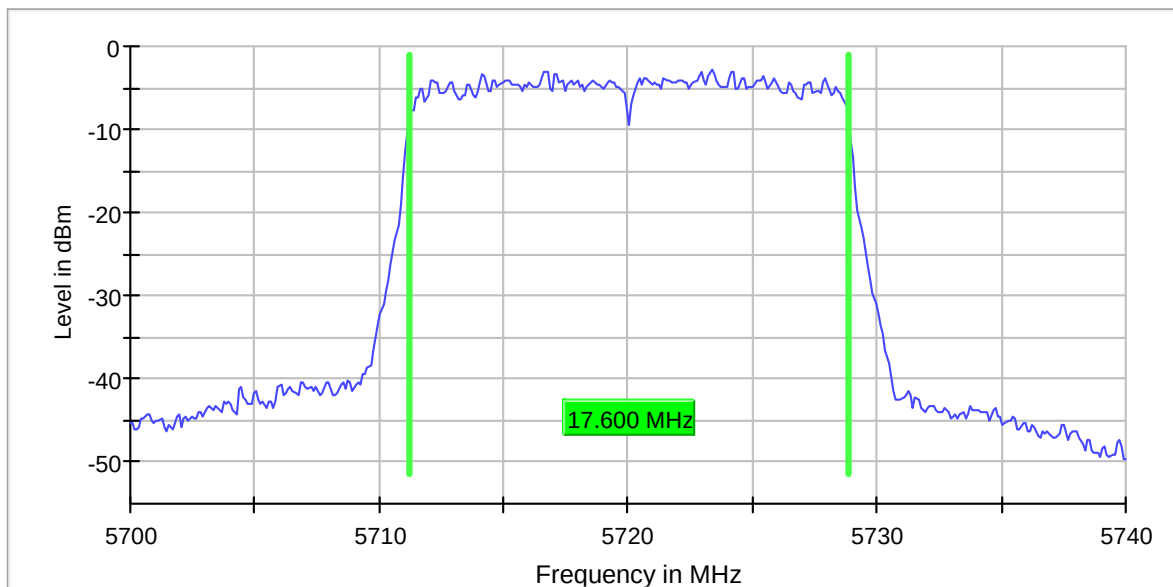
99% Bandwidth, 5700 MHz, 802.11a 6Mbps



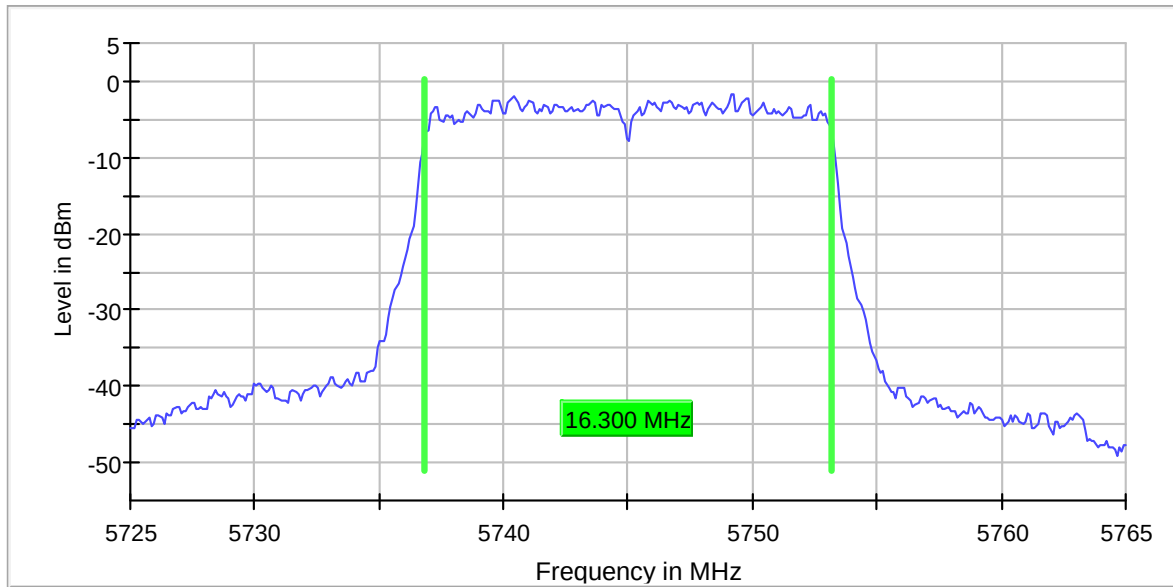
99% Bandwidth, 5700 MHz, 802.11n MCS0



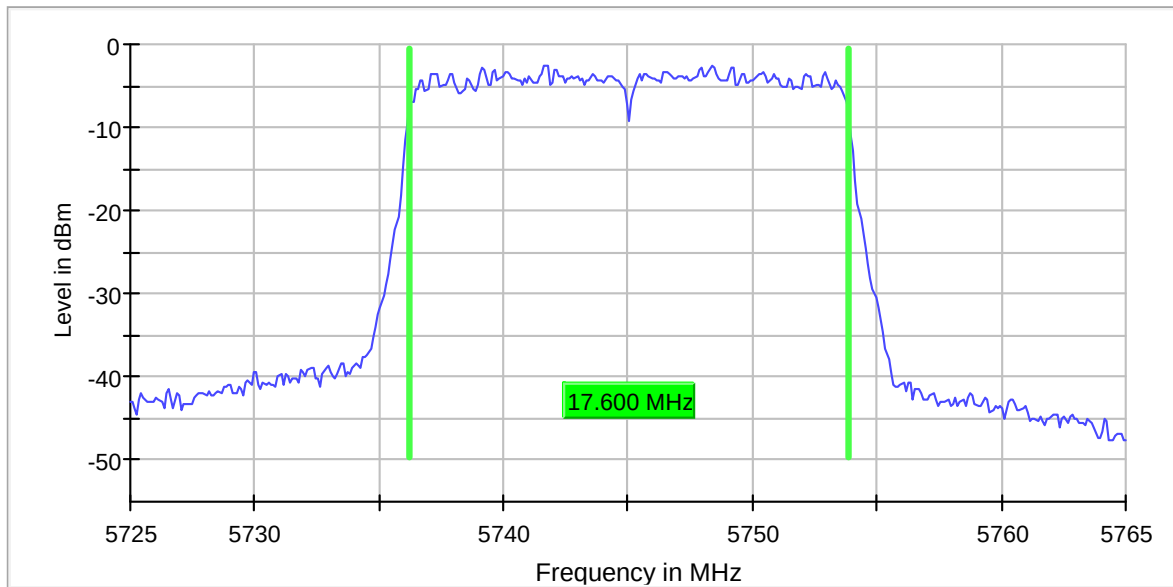
99% Bandwidth, 5720 MHz, 802.11a 6Mbps



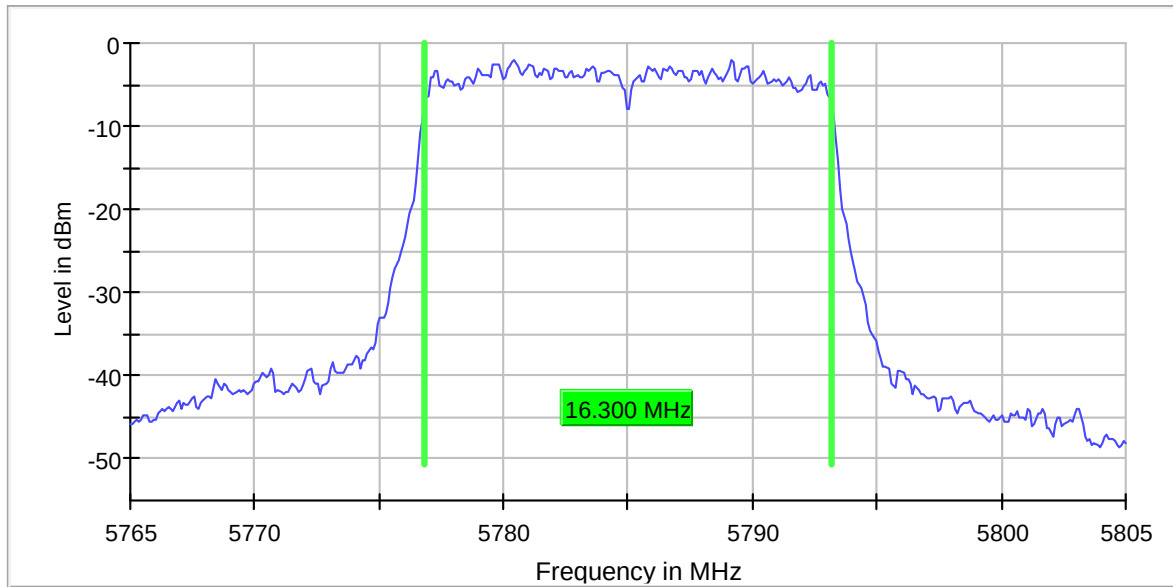
99% Bandwidth, 5720 MHz, 802.11n MCS0



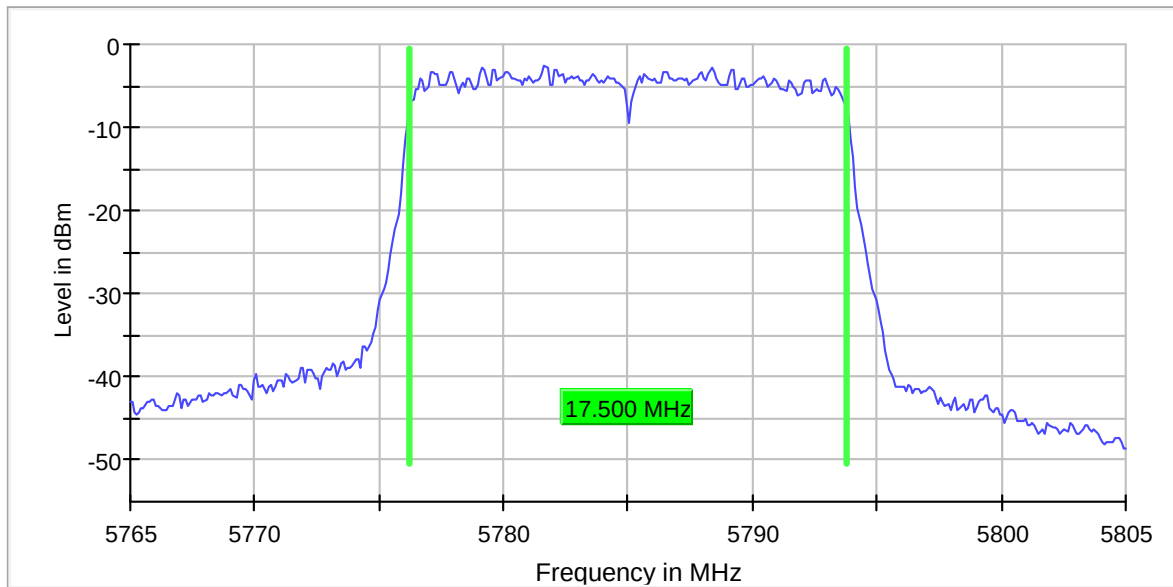
99% Bandwidth B , 5745 MHz, 802.11a 6Mbps



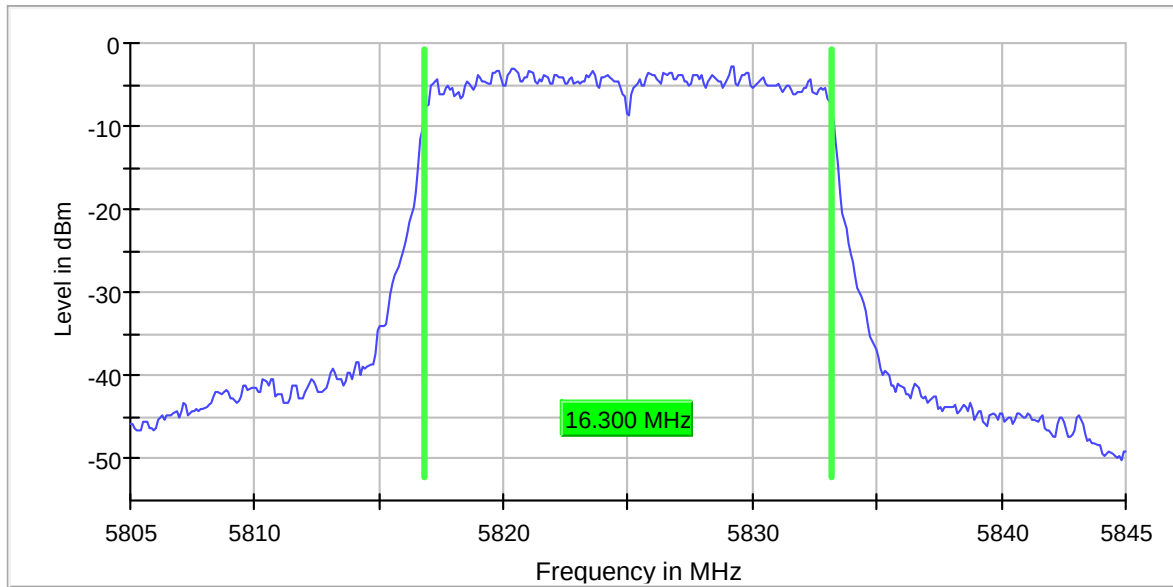
99% Bandwidth B , 5745 MHz, 802.11n MCS0



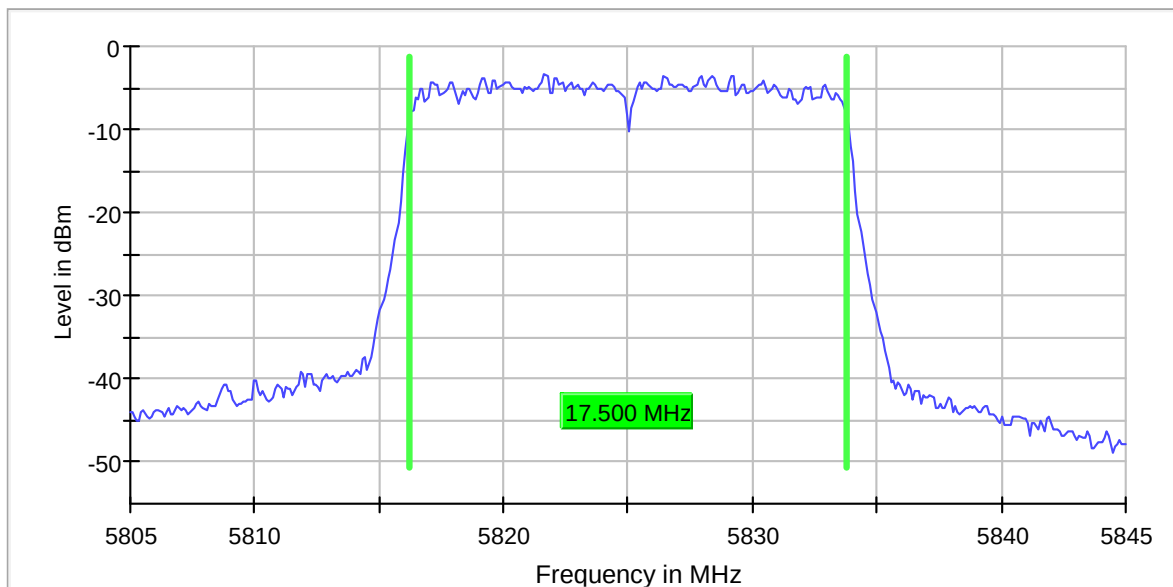
99% Bandwidth B , 5785 MHz, 802.11a 6Mbps



99% Bandwidth B , 5785 MHz, 802.11n MCS0



99% Bandwidth B , 5825 MHz, 802.11a 6Mbps



99% Bandwidth B , 5825 MHz, 802.11n MCS0

3.4 DTS Bandwidth

Para. No.: 15.407(e)

ISED RSS-247, Issue 2, Clause 6.2.4

Measurement procedure: ANSI C63.10-2013 Clause 11.8, Option 1

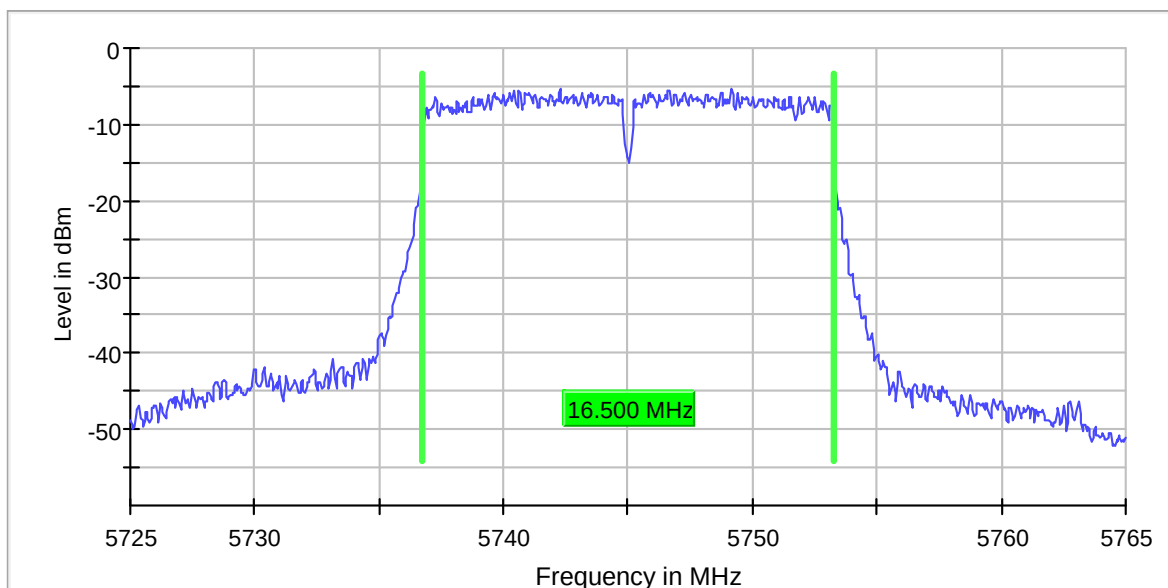
Test Results: Complies

Measurement Data:

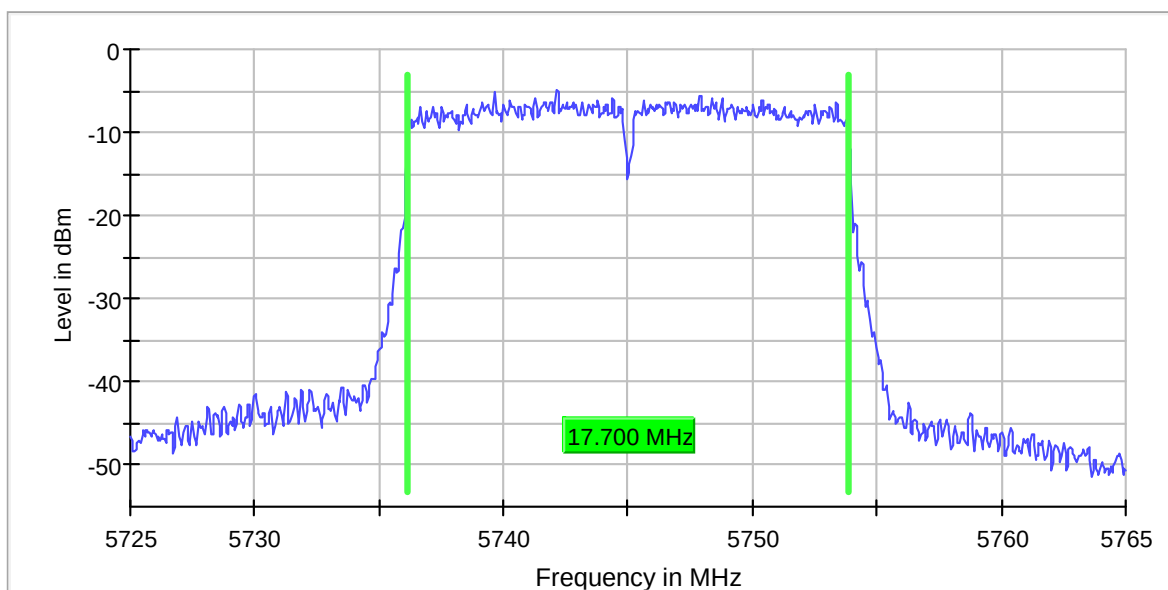
Ch. No.	Nominal Frequency (MHz)	DTS Bandwidth Measured Values (MHz)	
		802.11a 6Mbps	802.11n MCS0
149	5745	16.5	17.7
157	5785	16.5	17.7
165	5825	16.5	17.7

Limit:

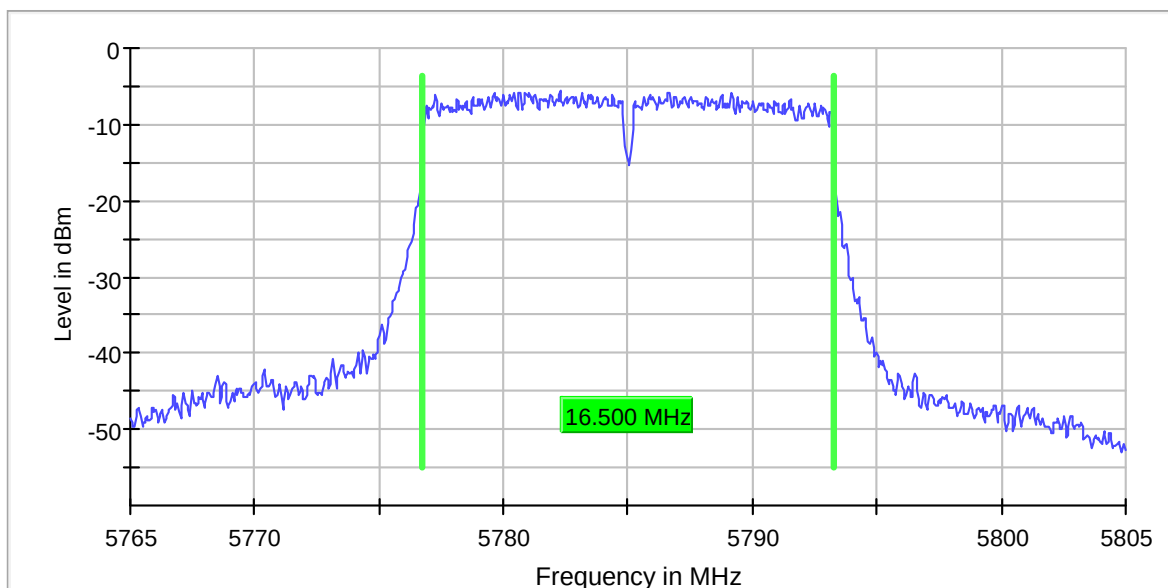
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.



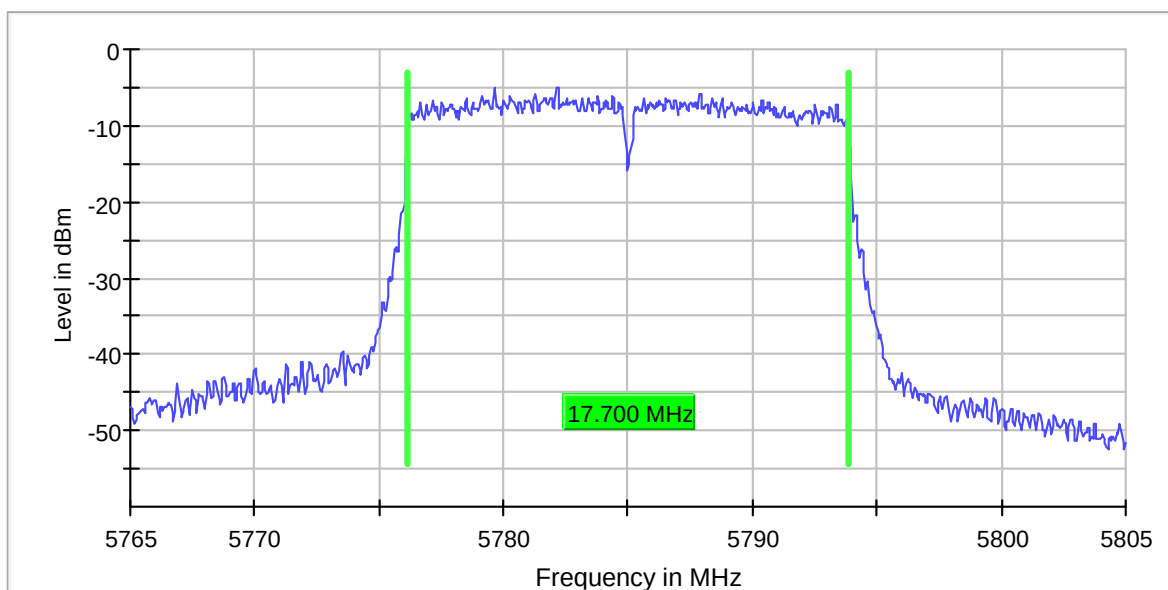
DTS Bandwidth, 5745 MHz, 802.11a 6Mbps



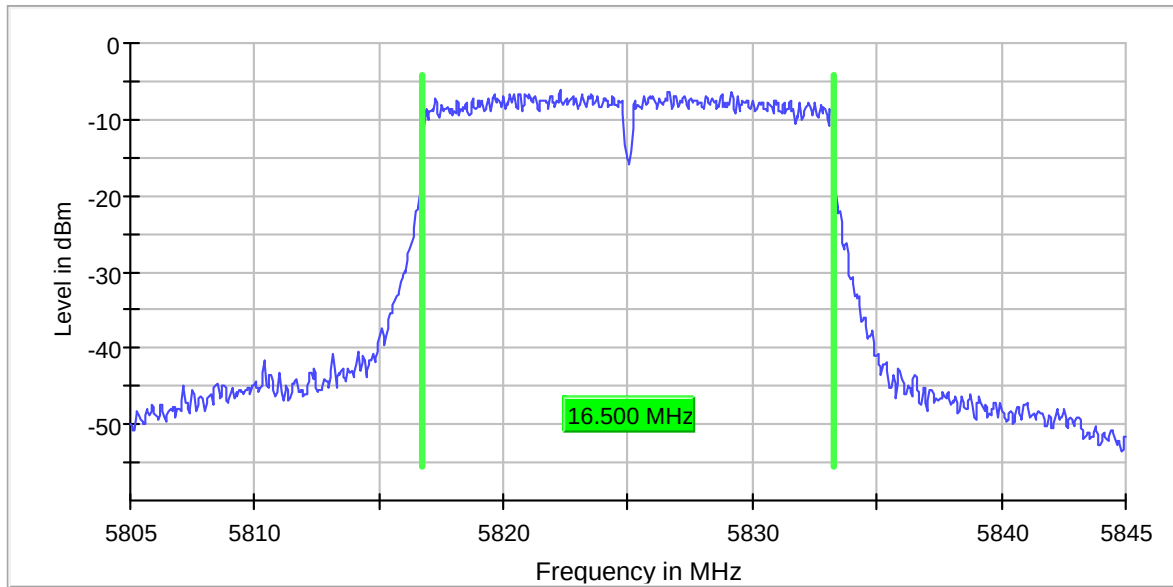
DTS Bandwidth, 5745 MHz, 802.11n MCS0



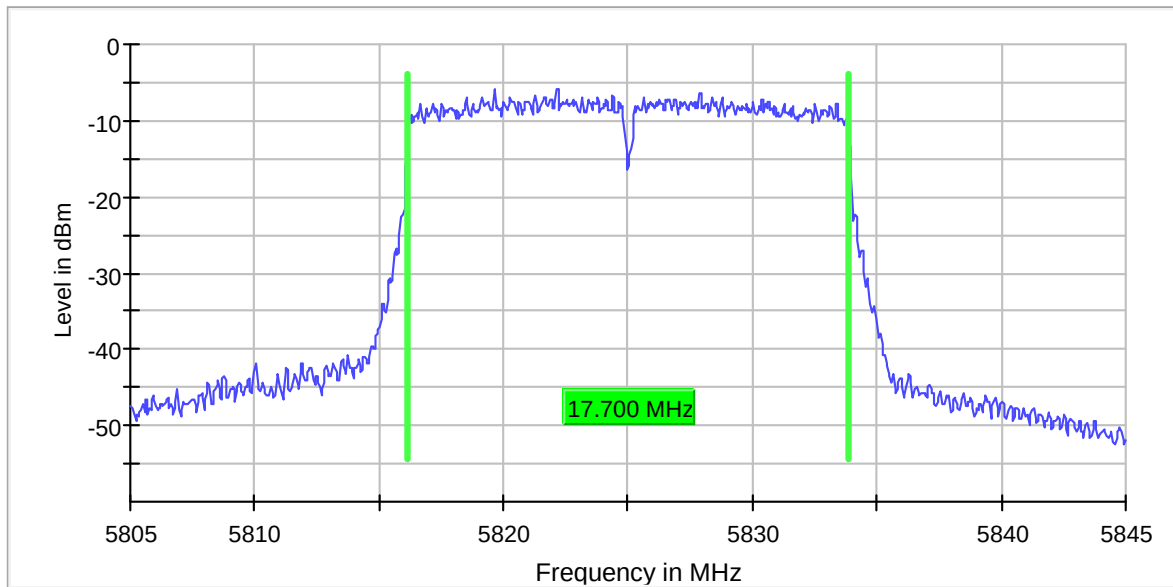
DTS Bandwidth, 5785 MHz, 802.11a 6Mbps



DTS Bandwidth, 5785 MHz, 802.11n MCS0



DTS Bandwidth, 5825 MHz, 802.11a 6Mbps



DTS Bandwidth, 5825 MHz, 802.11n MCS0

3.5 Peak Power Spectral Density

FCC 15.407(a)

ISED RSS-247, Issue 2, Clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 12.5

Test Results: Complies

Measurement Data:

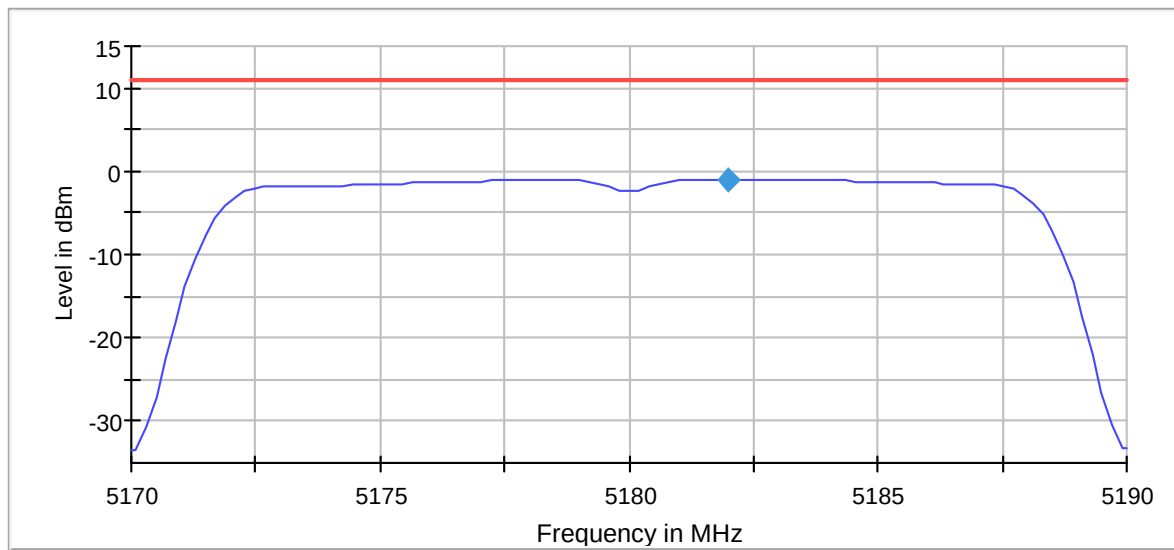
Ch. No.	Nominal Frequency (MHz)	Peak PSD Measured Value (dBm/MHz)	
		802.11a 6Mbps	802.11n MCS0
36	5180	-1.0	0.6
40	5200	-1.1	0.3
48	5240	-0.6	0.7
52	5260	0.3	1.6
56	5280	0.3	1.7
64	5320	-1.1	0.0
100	5500	0.3	1.4
116	5580	-0.3	0.7
140	5700	-2.7	-1.7
144	5720	-2.0	-1.0

Ch. No.	Nominal Frequency (MHz)	Peak PSD Measured Value (dBm/500kHz)	
		802.11a 6Mbps	802.11n MCS0
149	5745	-4.6	-2.5
157	5785	-4.7	-2.6
165	5825	-5.4	-3.4

Antenna Gain is less than 6 dBi for all frequencies above.

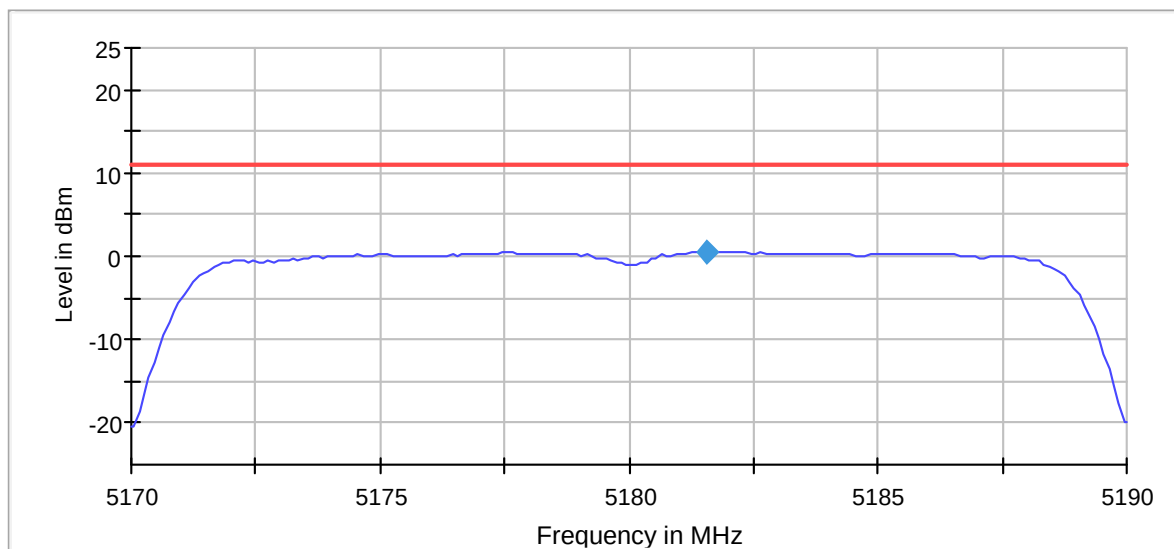
Limits:

Frequency Band	FCC 15.407(a)	RSS-247, Issue 2
5150 – 5250 MHz	Less than 17 dBm/MHz for master device Less than 11 dBm/MHz for client device	Less than 10 dBm/MHz e.i.r.p. (only indoor allowed)
5250 – 5350 MHz	Less than 11 dBm/MHz	Less than 11 dBm/MHz
5470 – 5725 MHz	Less than 11 dBm/MHz	Less than 11 dBm/MHz
5725 – 5825 MHz	Less than 30 dBm/500kHz	Less than 30 dBm/500kHz
	If Antenna Gain is more than 6 dBi the limit above is reduced by the amount exceeding 6 dBi	



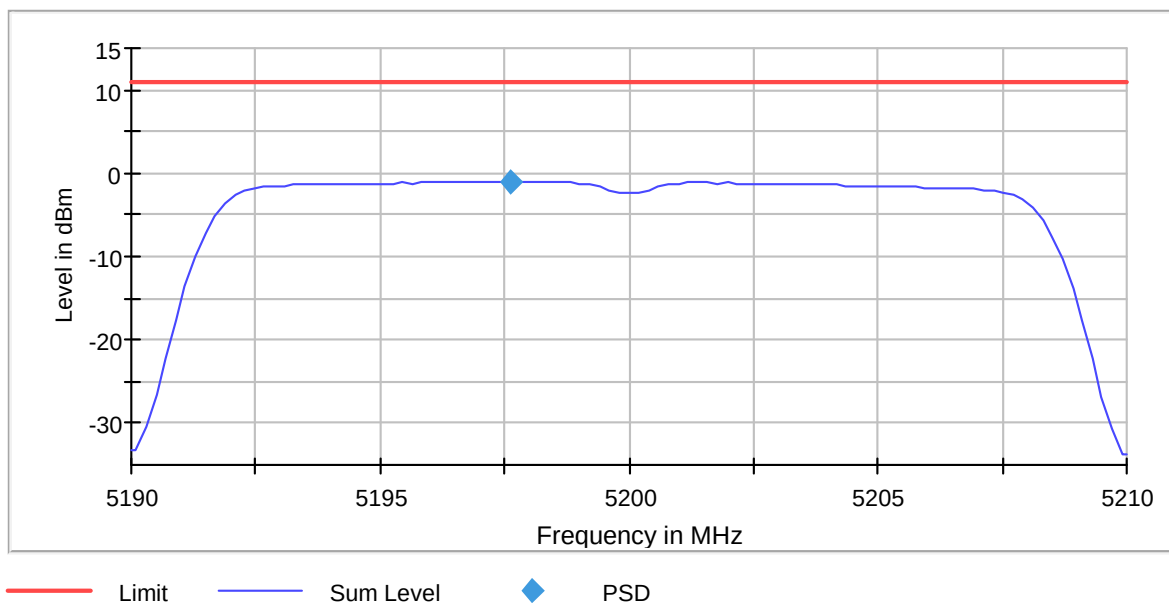
— Limit — Sum Level ◆ PSD

Power Spectral Density, 5180 MHz, 802.11a - 6Mbps

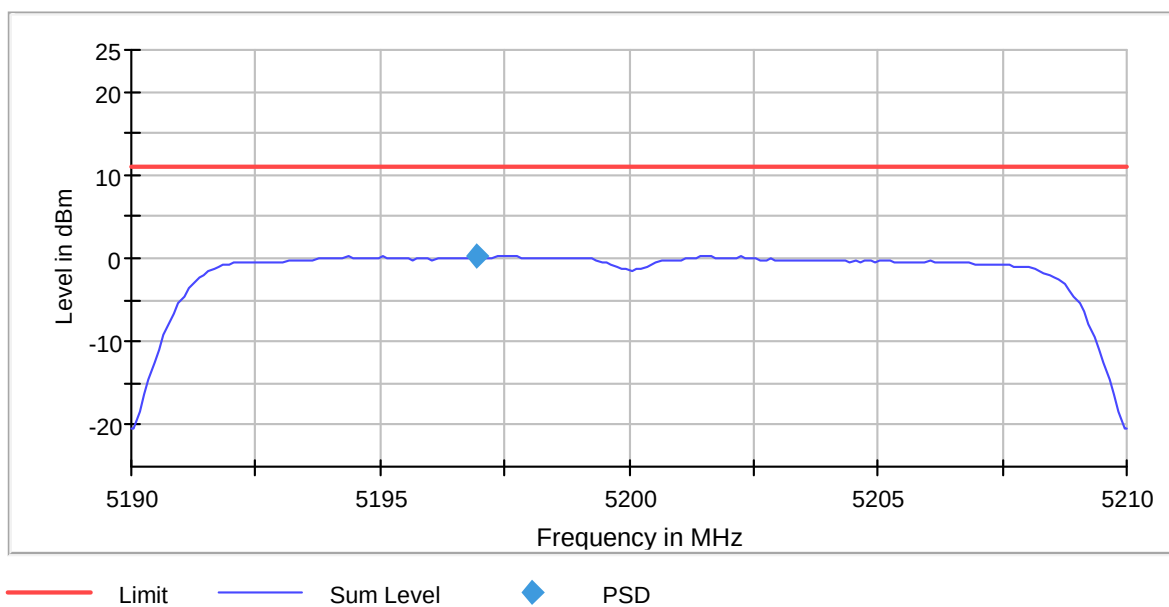


— Limit — Sum Level ◆ PSD

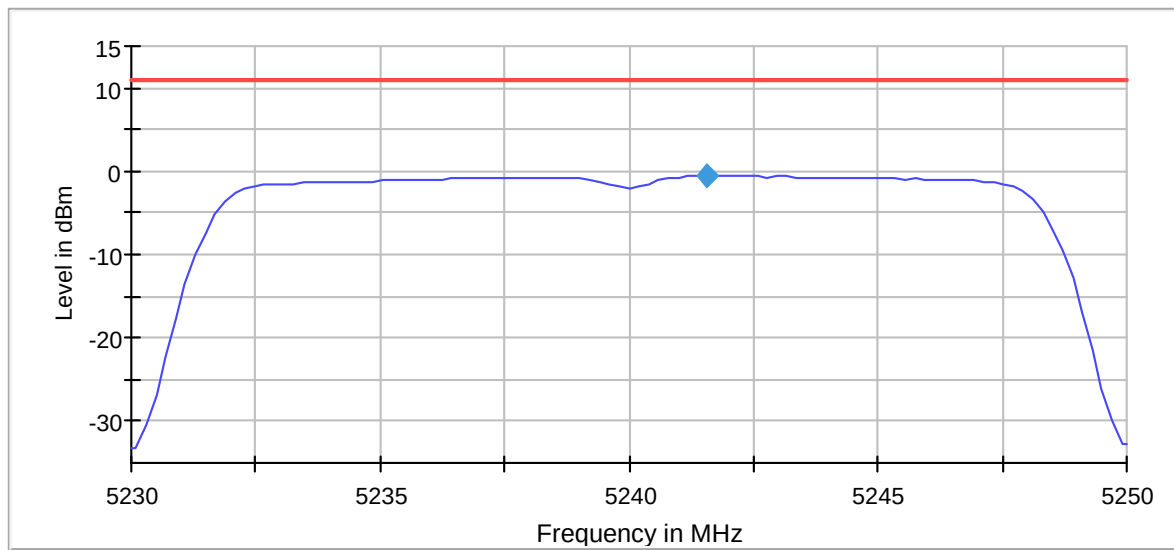
Power Spectral Density, 5180 MHz, 802.11n - MCS0



Power Spectral Density, 5200 MHz, 802.11a - 6Mbps

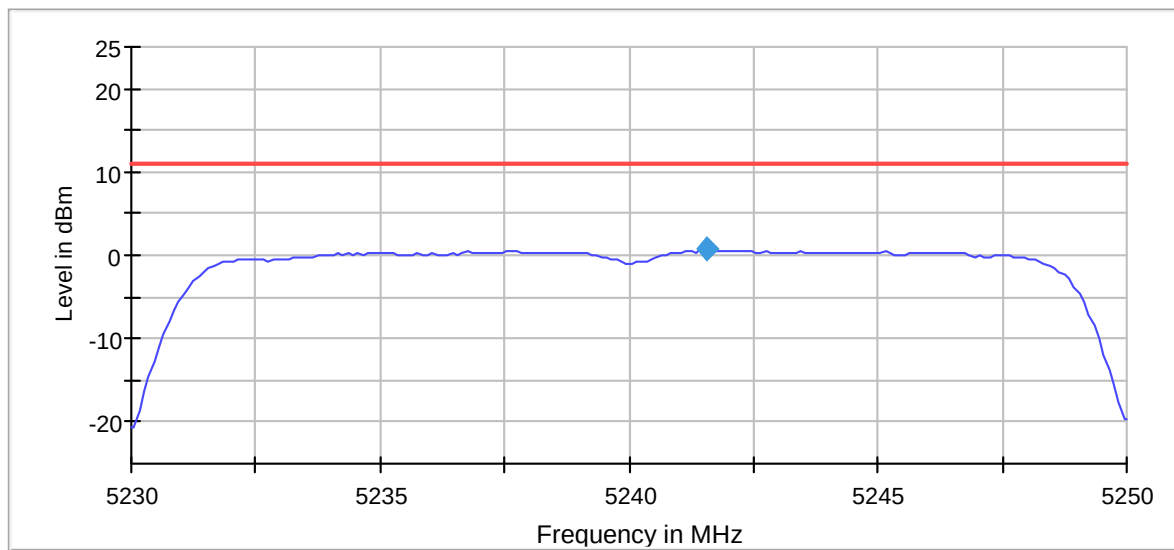


Power Spectral Density, 5200 MHz, 802.11n - MCS0



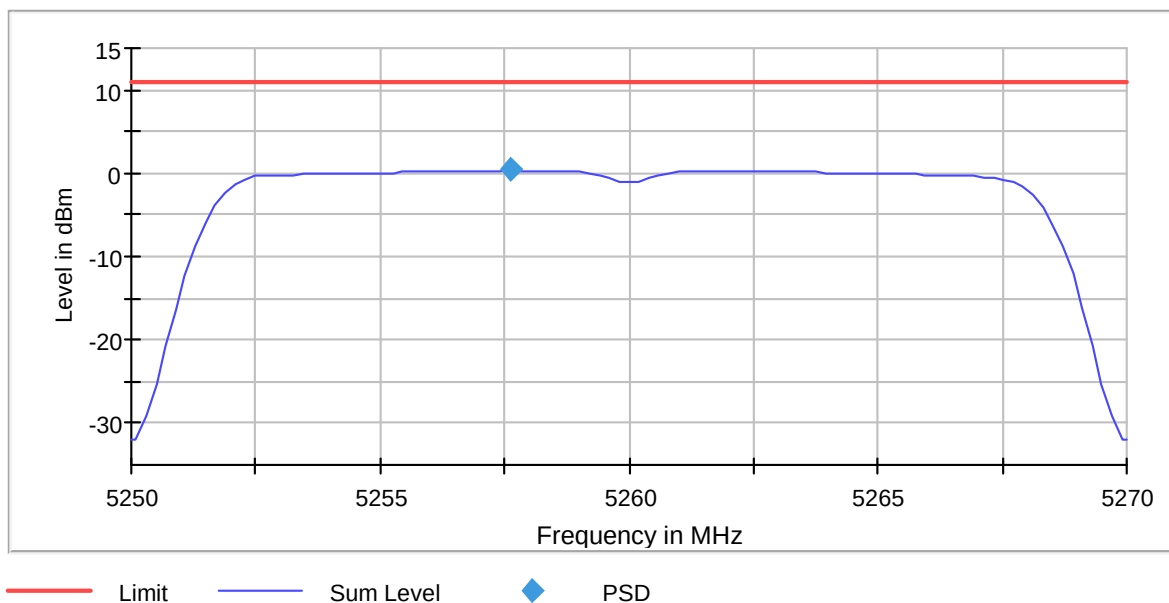
— Limit — Sum Level ◆ PSD

Power Spectral Density, 5240 MHz, 802.11a - 6Mbps

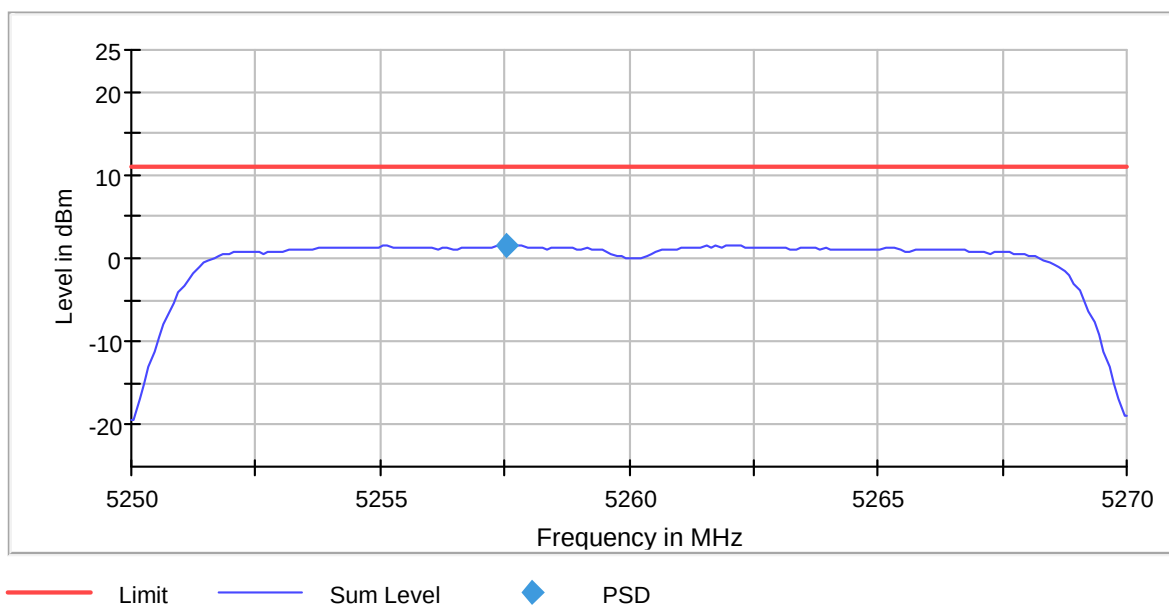


— Limit — Sum Level ◆ PSD

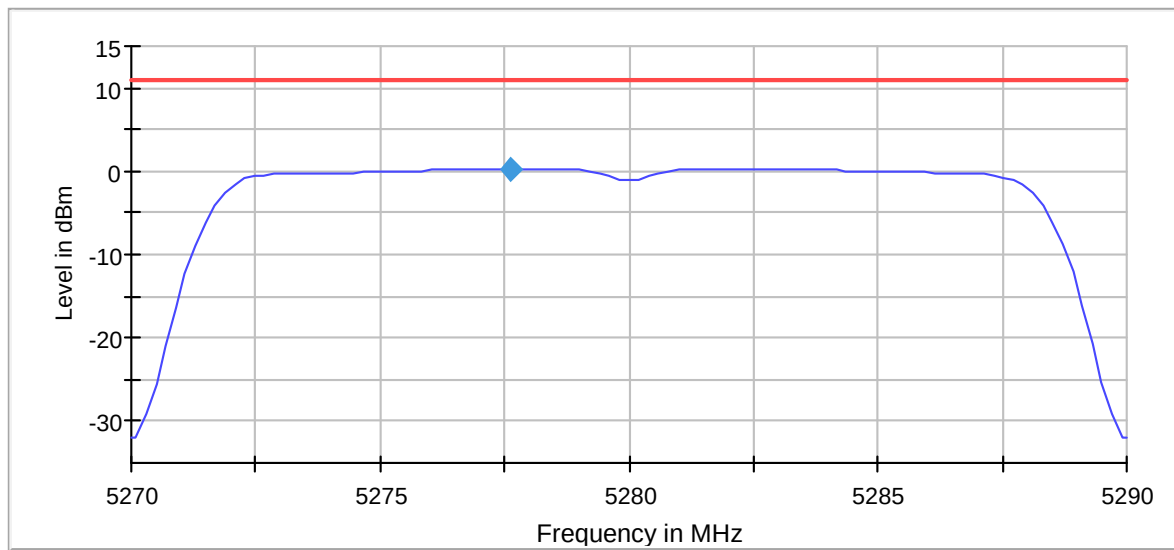
Power Spectral Density, 5240 MHz, 802.11n - MCS0



Power Spectral Density, 5260 MHz, 802.11a - 6Mbps

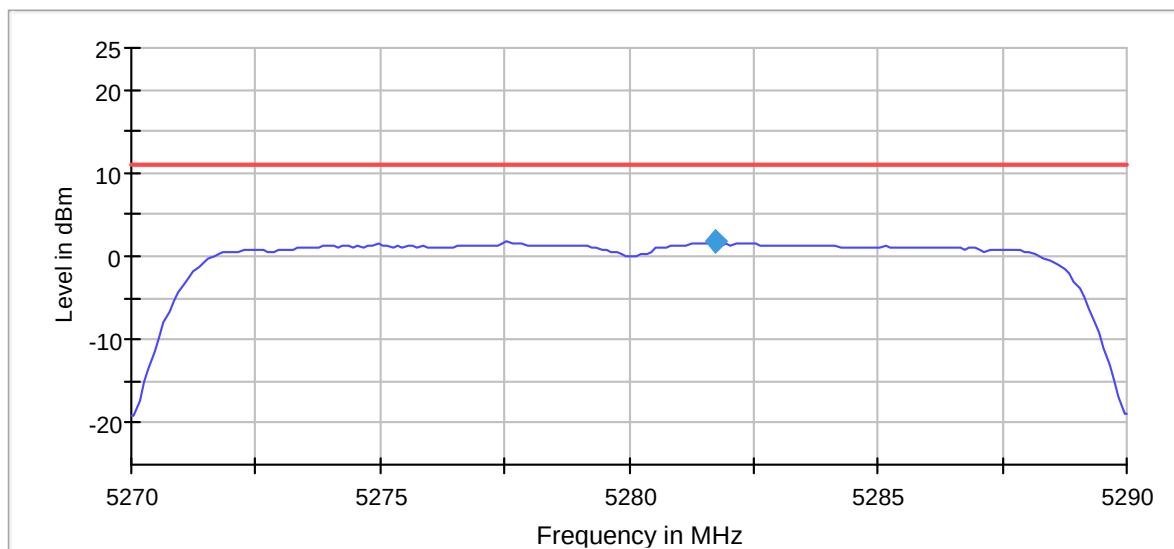


Power Spectral Density, 5260 MHz, 802.11n - MCS0



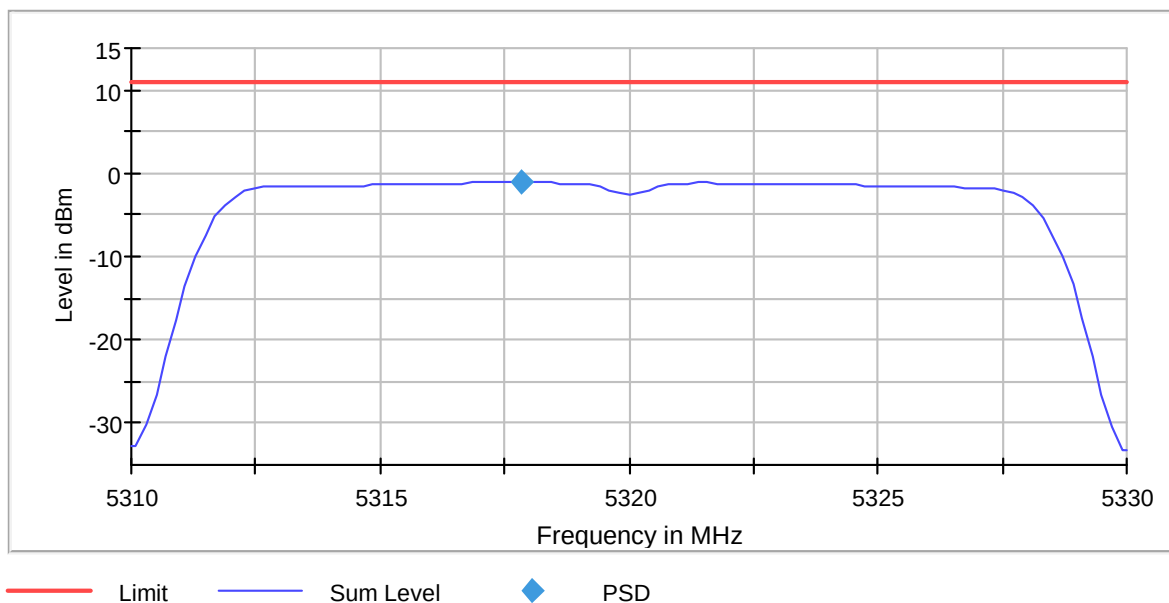
— Limit — Sum Level ◆ PSD

Power Spectral Density, 5280 MHz, 802.11a - 6Mbps

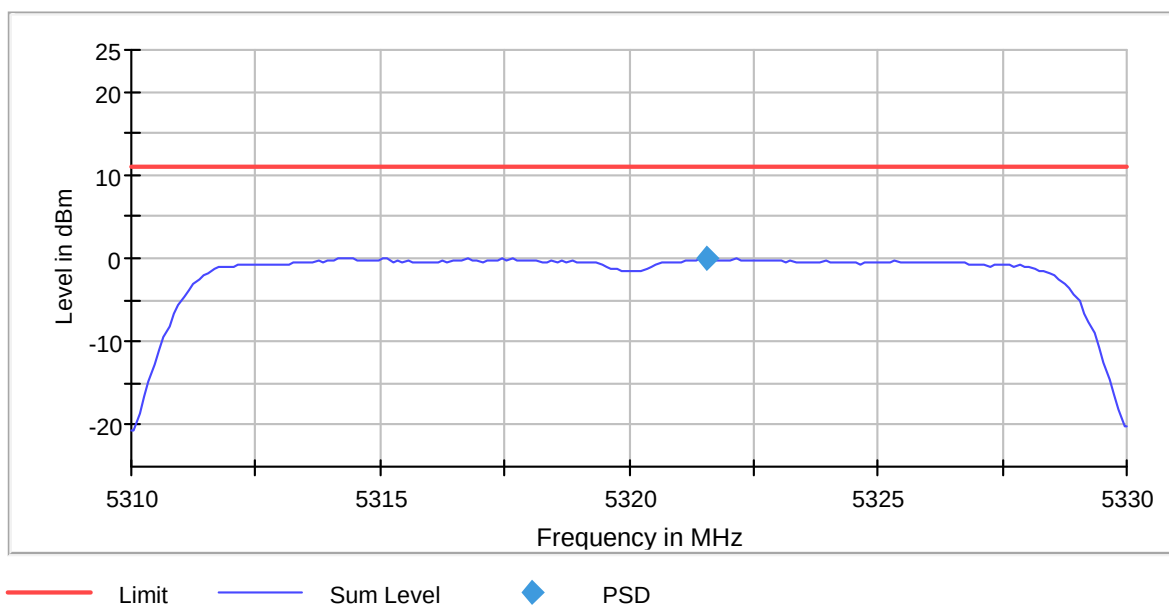


— Limit — Sum Level ◆ PSD

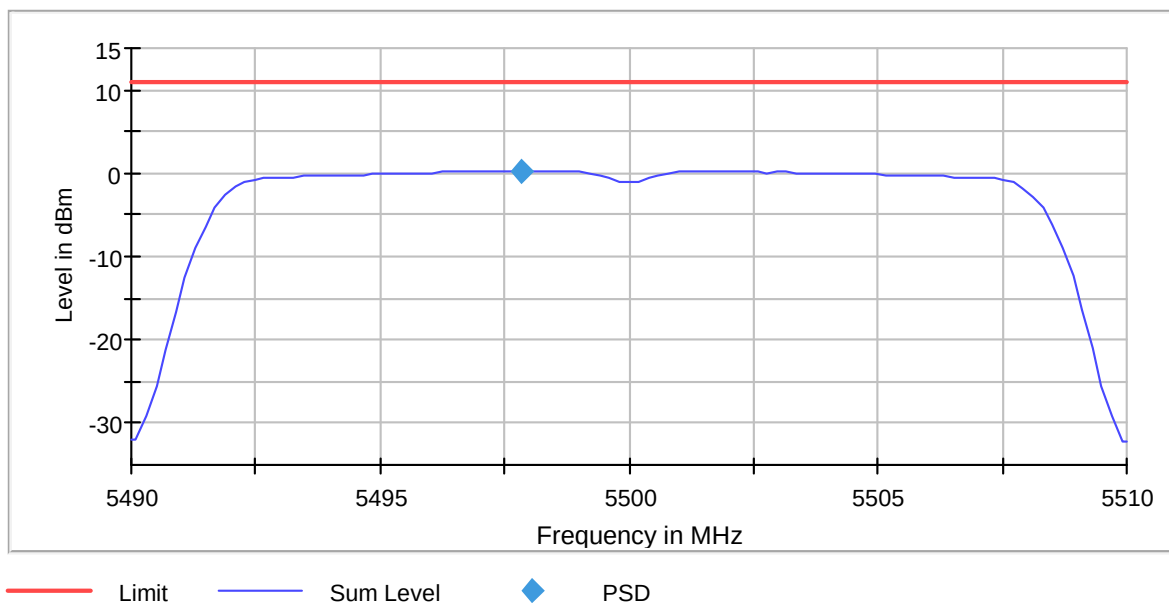
Power Spectral Density, 5280 MHz, 802.11n - MCS0



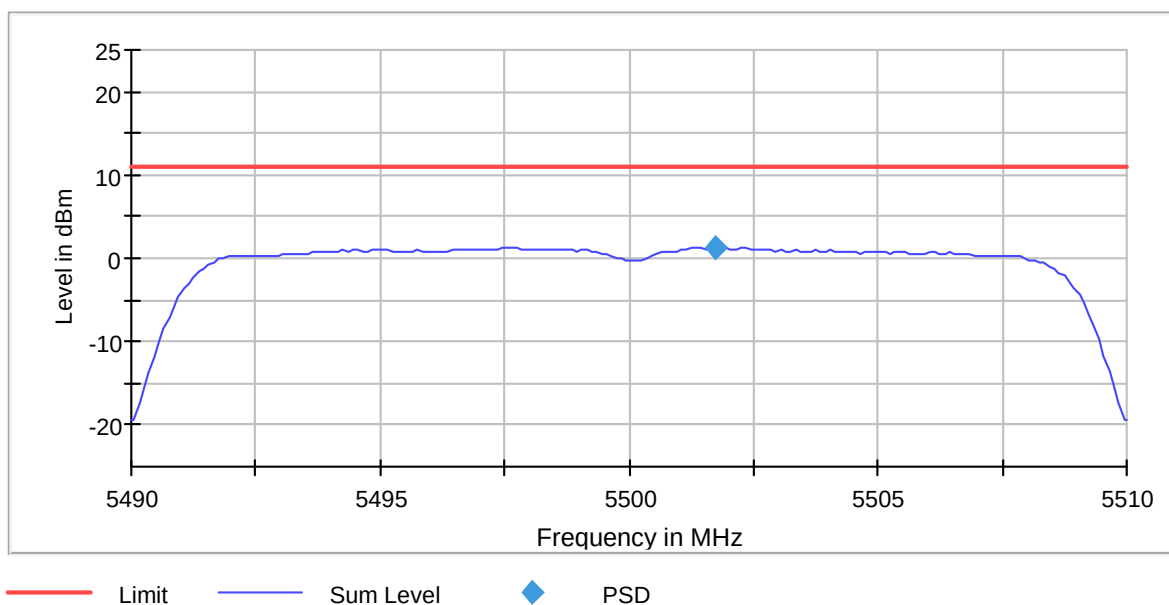
Power Spectral Density, 5320 MHz, 802.11a - 6Mbps



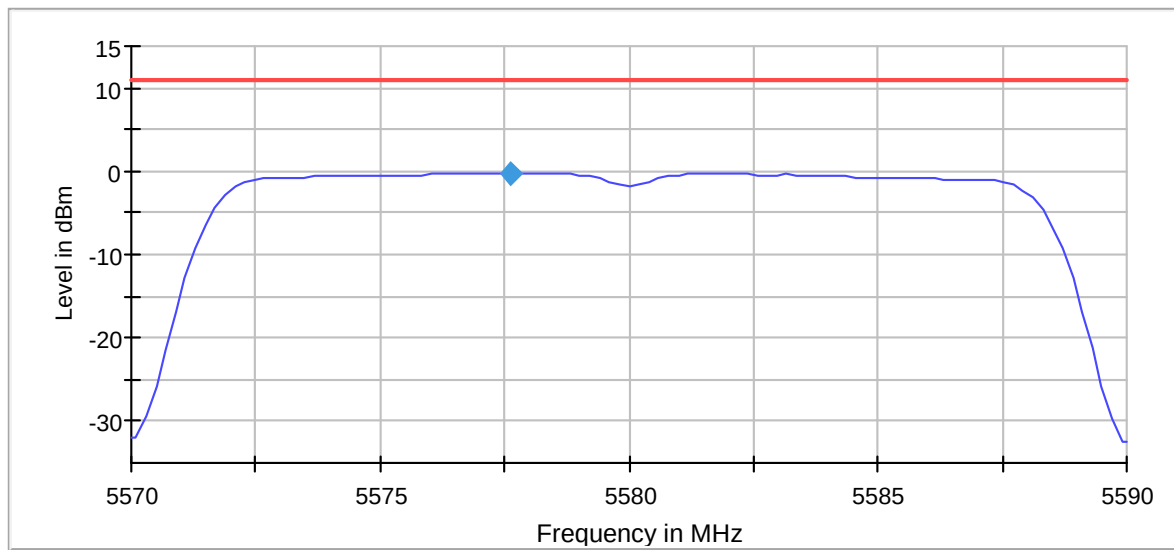
Power Spectral Density, 5320 MHz, 802.11n - MCS0



Power Spectral Density, 5500 MHz, 802.11a - 6Mbps

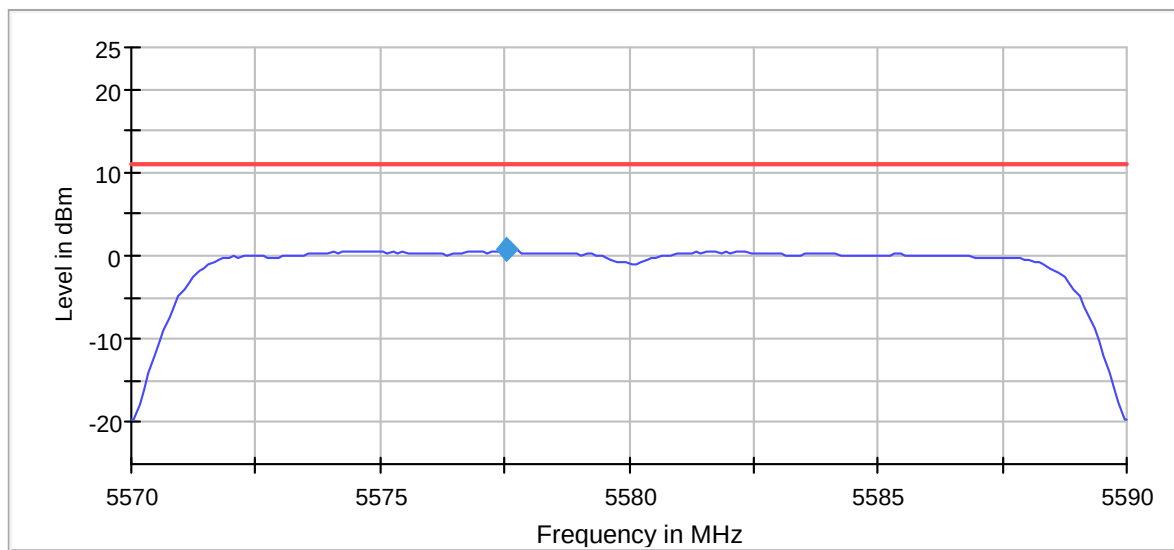


Power Spectral Density, 5500 MHz, 802.11n - MCS0



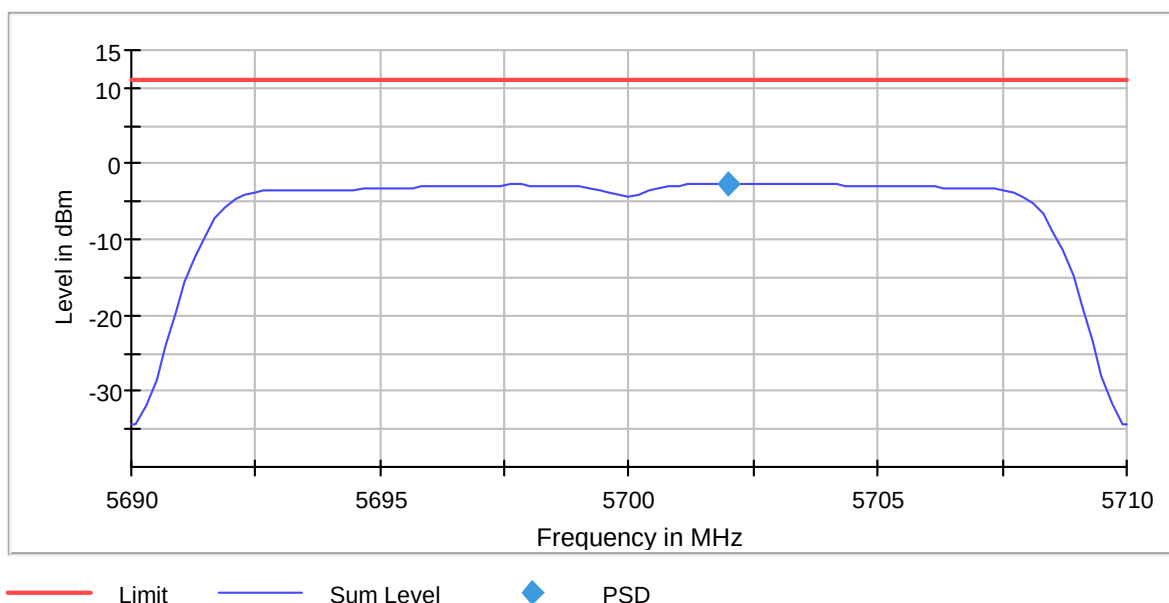
— Limit — Sum Level ◆ PSD

Power Spectral Density, 5580 MHz, 802.11a - 6Mbps

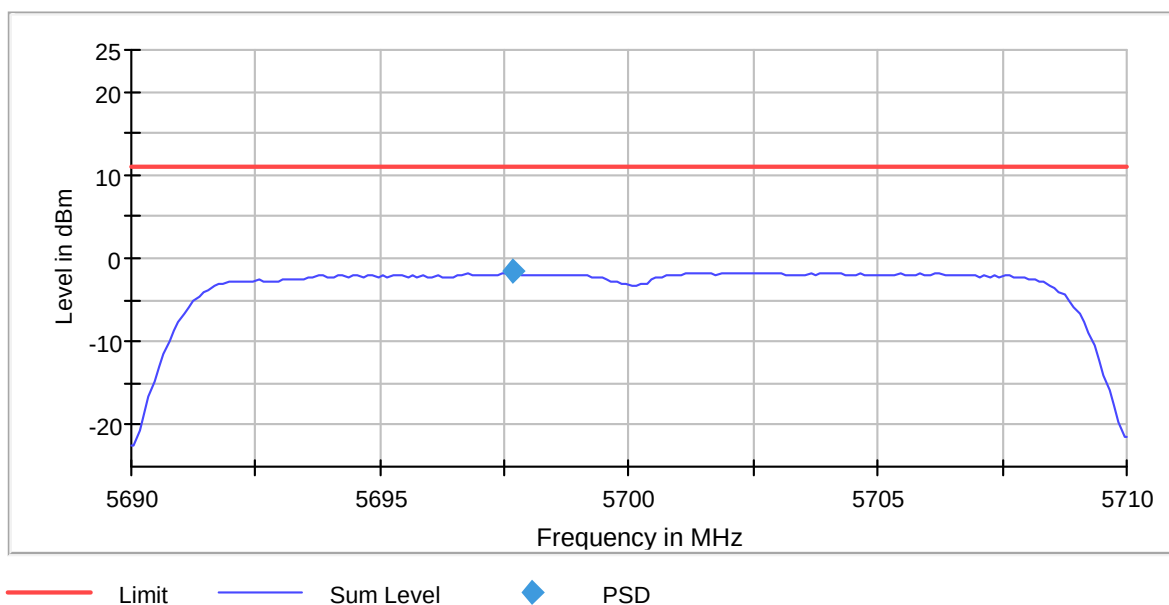


— Limit — Sum Level ◆ PSD

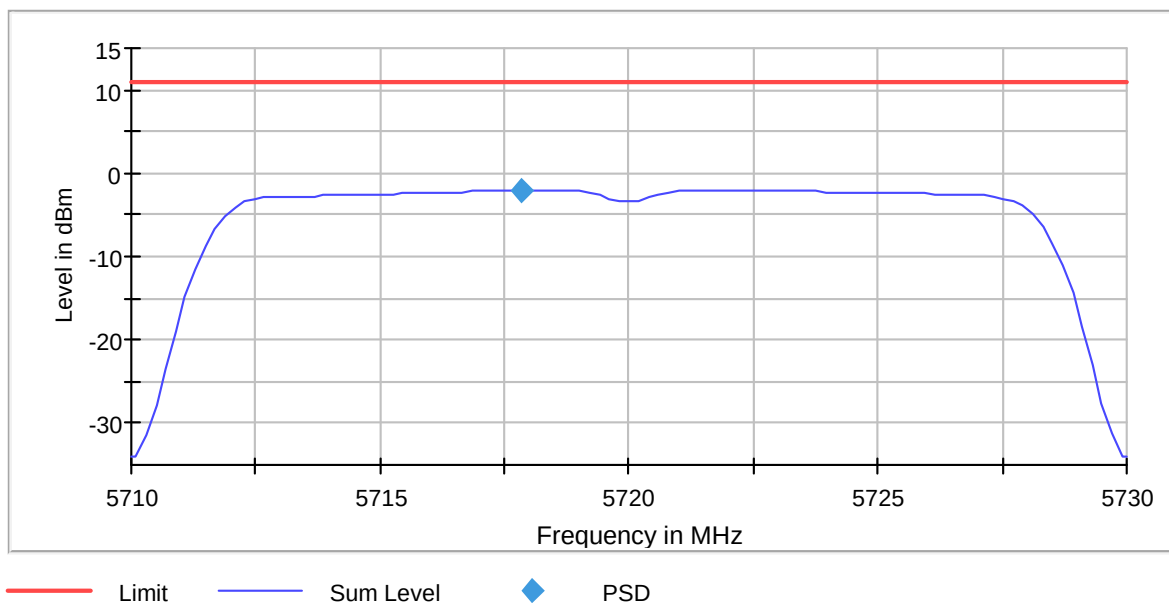
Power Spectral Density, 5580 MHz, 802.11n - MCS0



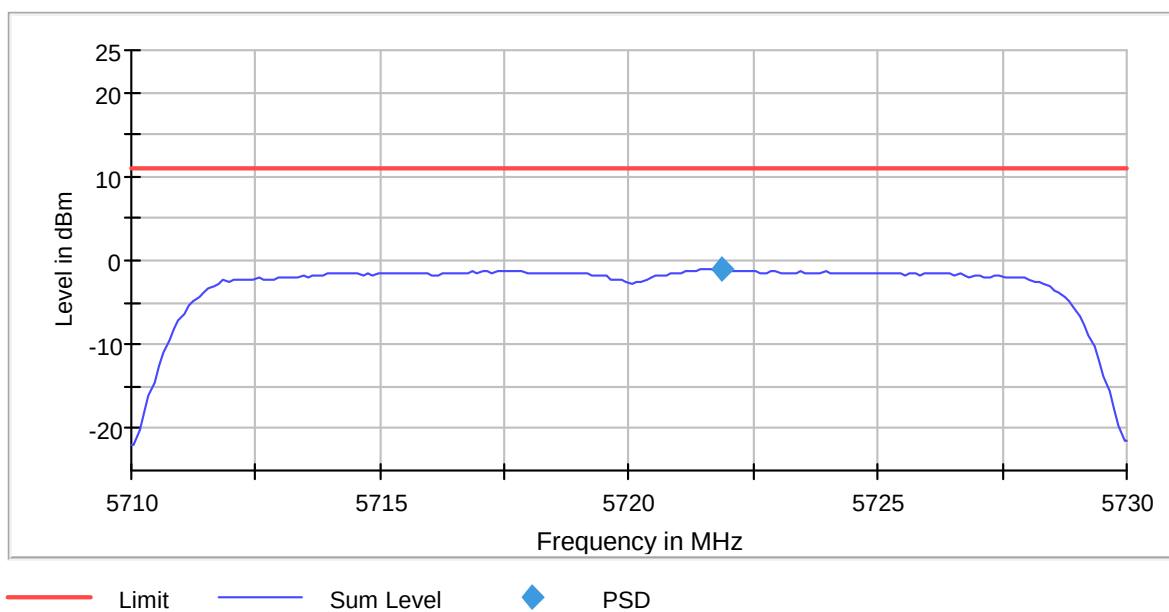
Power Spectral Density, 5700 MHz, 802.11a - 6Mbps



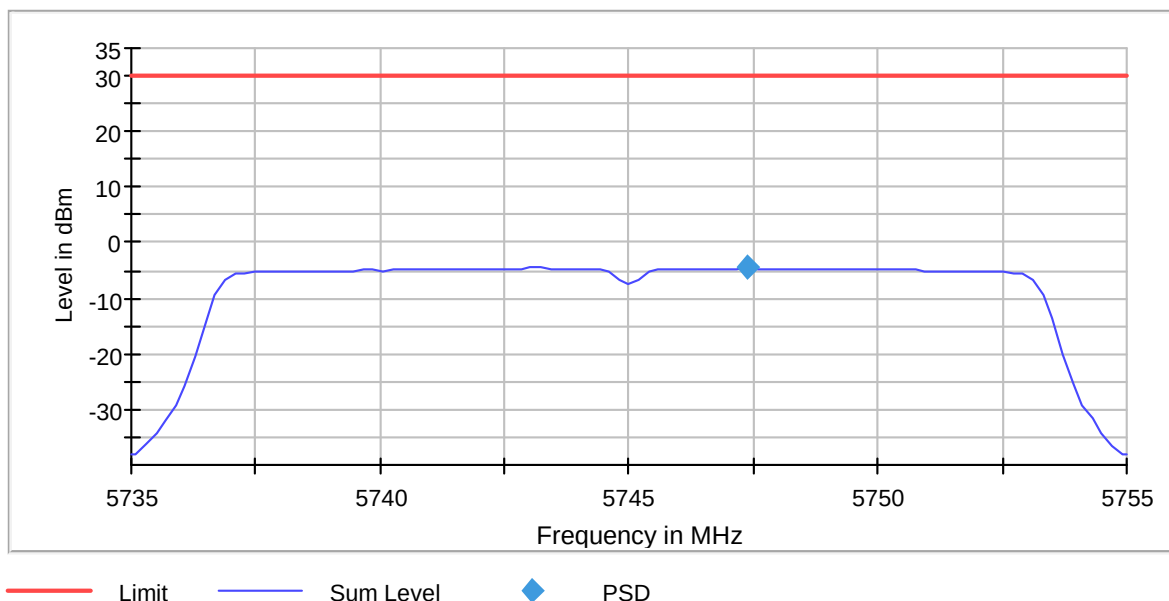
Power Spectral Density, 5700 MHz, 802.11n - MCS0



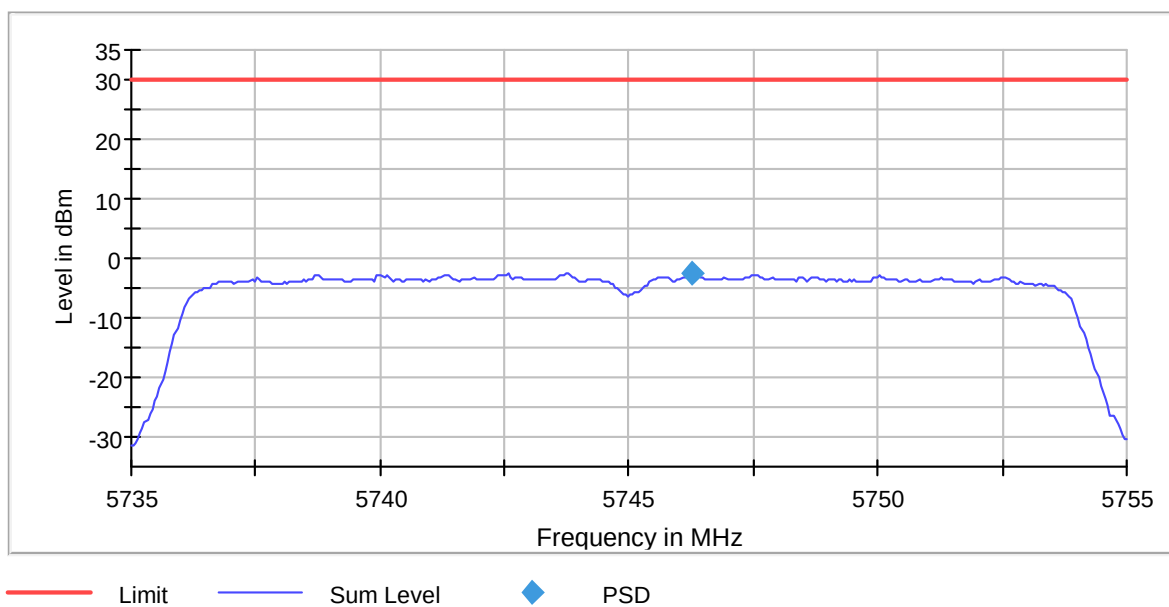
Power Spectral Density, 5720 MHz, 802.11a - 6Mbps



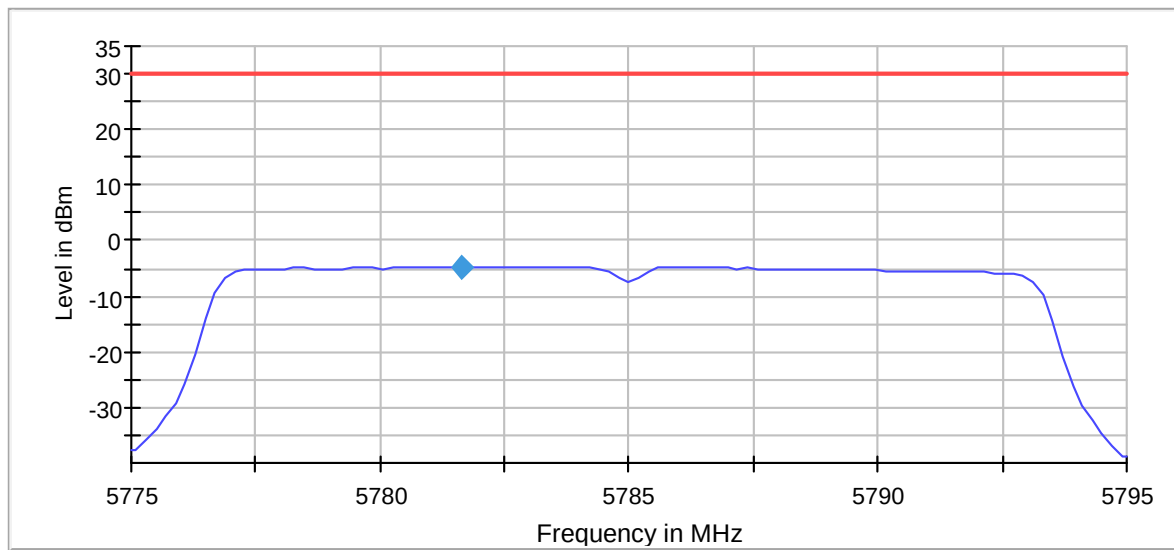
Power Spectral Density, 5720 MHz, 802.11n – MCS0



Power Spectral Density, 5745 MHz, 802.11a - 6Mbps

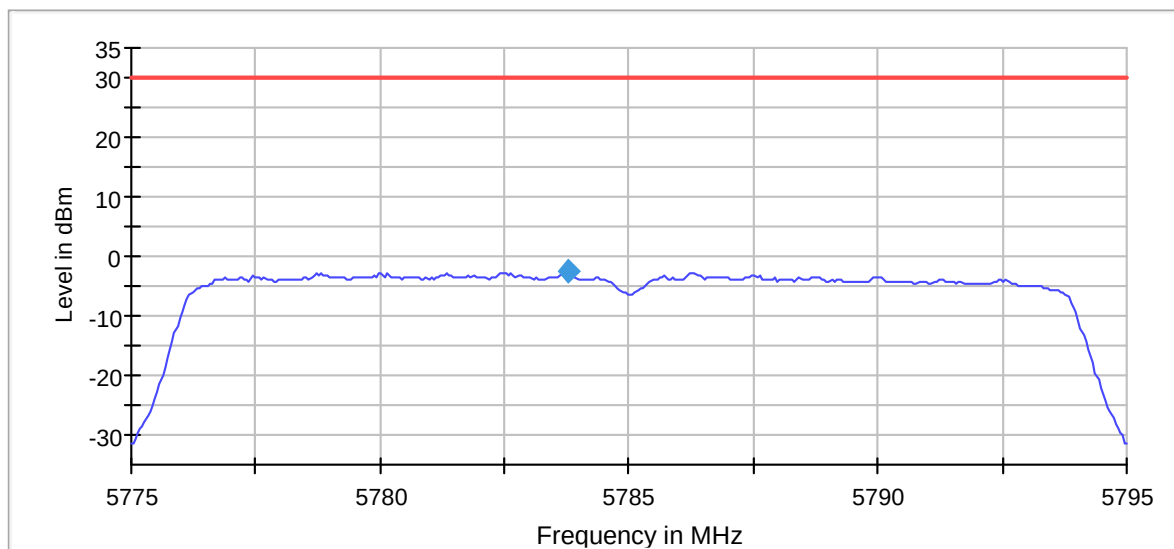


Power Spectral Density, 5745 MHz, 802.11n - MCS0



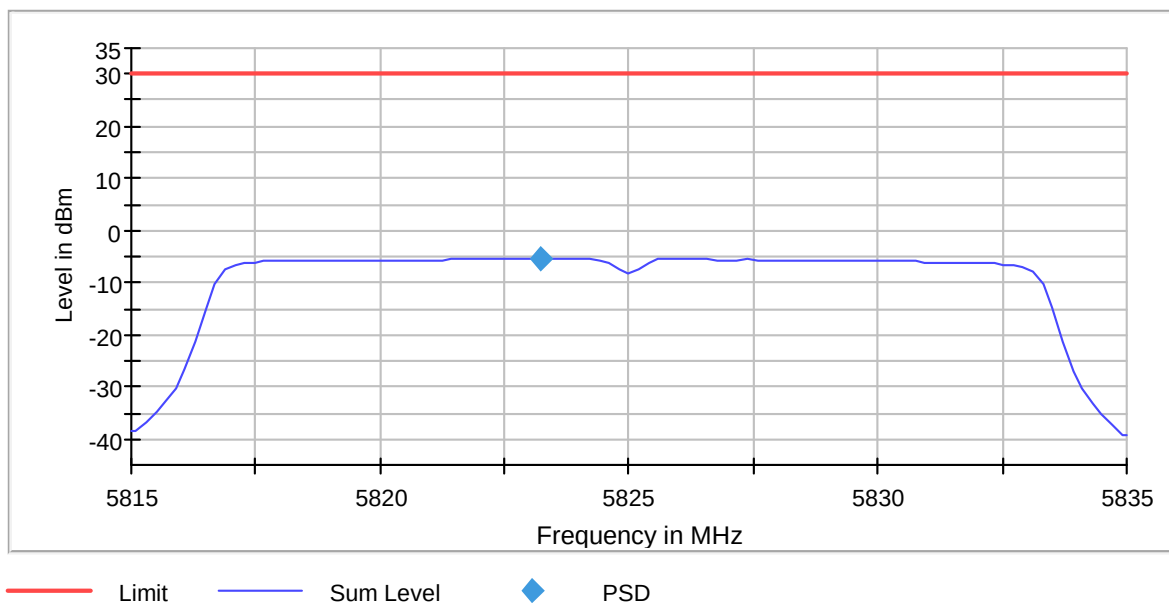
— Limit — Sum Level ◆ PSD

Power Spectral Density, 5785 MHz, 802.11a - 6Mbps

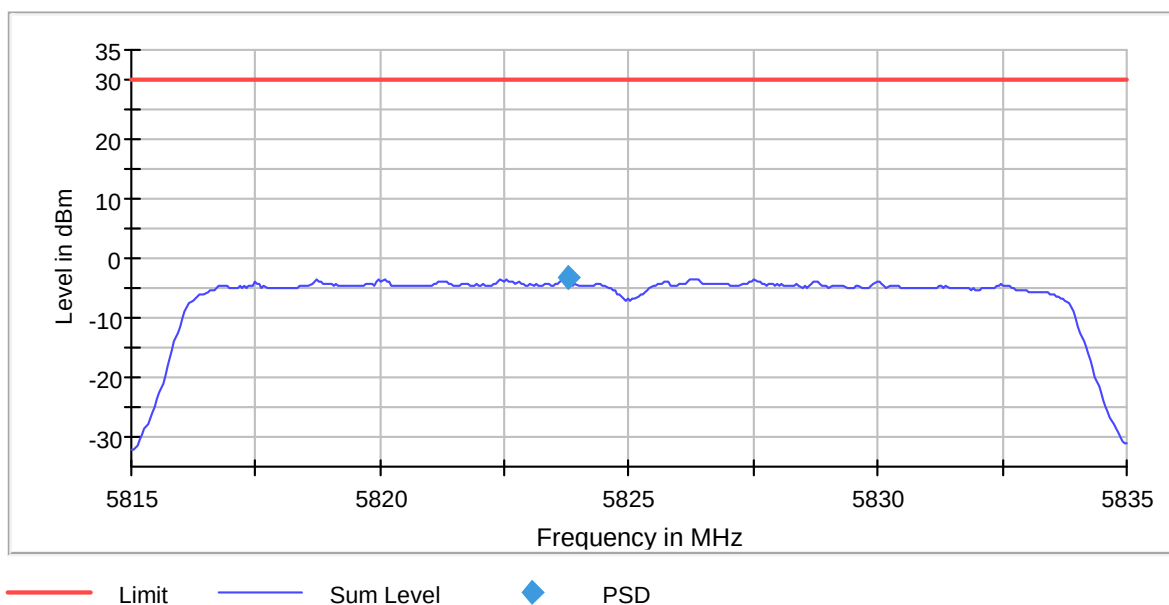


— Limit — Sum Level ◆ PSD

Power Spectral Density, 5785 MHz, 802.11n – MCS0



Power Spectral Density, 5825 MHz, 802.11a - 6Mbps



Power Spectral Density, 5825 MHz, 802.11n – MCS0

3.6 Unwanted Emissions

FCC 15.407 (b)

ISED RSS-247, Issue 2, clause 6.2

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Band Edge Emissions:

Ch. No.	Carrier Frequency (MHz)	Band Edge Frequency (MHz)	Measured Values (dBm/MHz e.i.r.p.)	
			802.11a, 6Mbps	802.11n, MCS0
36	5180	5150	-46.3	-46.5
64	5320	5350	-48.6	-49.3
100	5500	5470	-47.3	-46.0
140	5700	5725	-46.9	-45.7
149	5745	5650	< -50	< -50
149	5745	5700	< -45	< -45
165	5825	5875	< -45	< -45
165	5825	5925	< -50	< -50

All measurements above: RBW = 1 MHz, VBW = 3 MHz, Detector = Peak

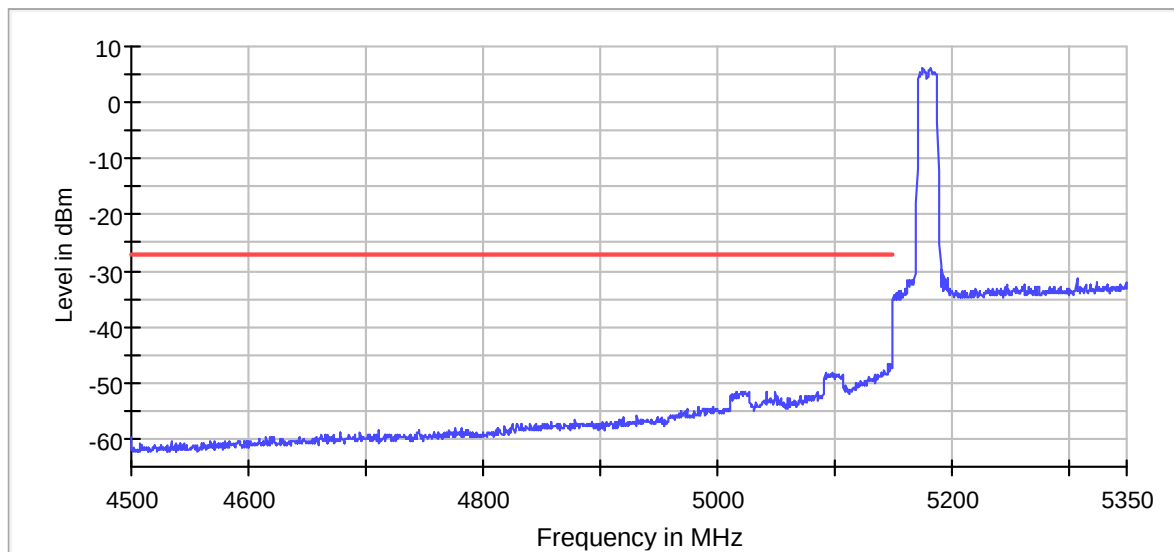
The measurement was performed conducted at the antenna connector.

The tested equipment is for indoor use only, no band-edge requirements apply at 5250 MHz.

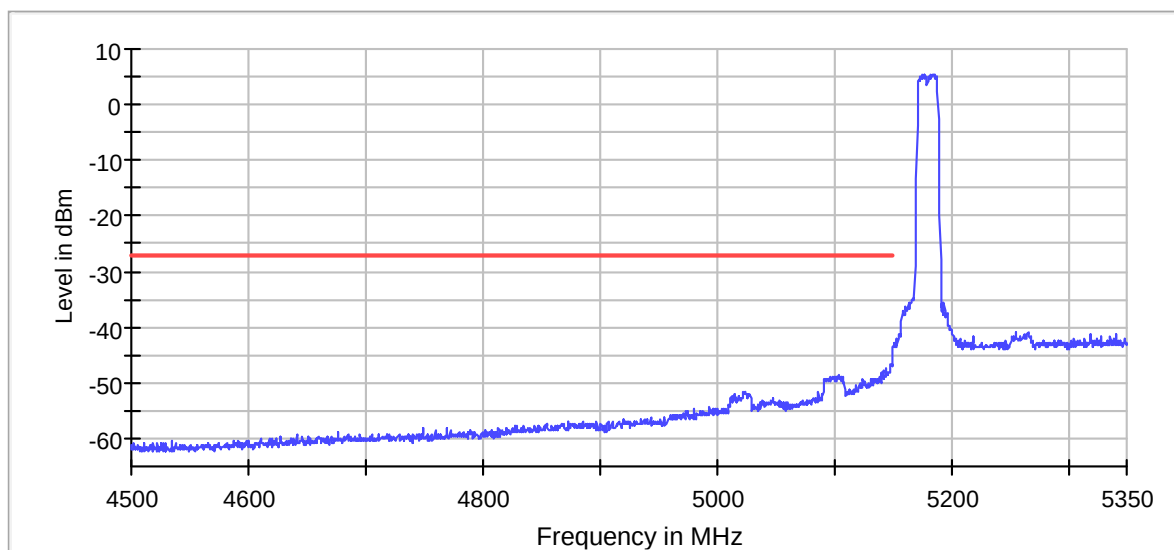
Limits:

Operating Frequency band	Limit for Emissions Outside Operating Frequency Band
5150 – 5250 MHz	-27 dBm/MHz e.i.r.p.
5250 – 5350 MHz	-27 dBm/MHz e.i.r.p.
5470 – 5725 MHz	-27 dBm/MHz e.i.r.p.
5725 – 5825 MHz	See FCC 15.407(b)(4)(i) or 15.407(b)(4)(ii)

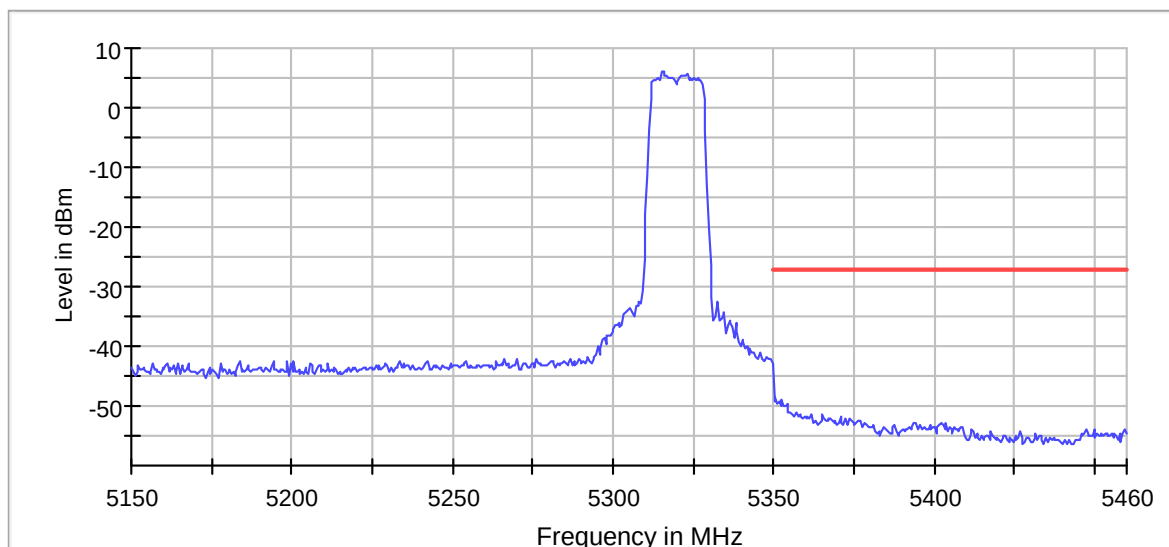
Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.



Unwanted Emissions, Band Edge, 5150 MHz, Ch036, 802.11a 6Mbps

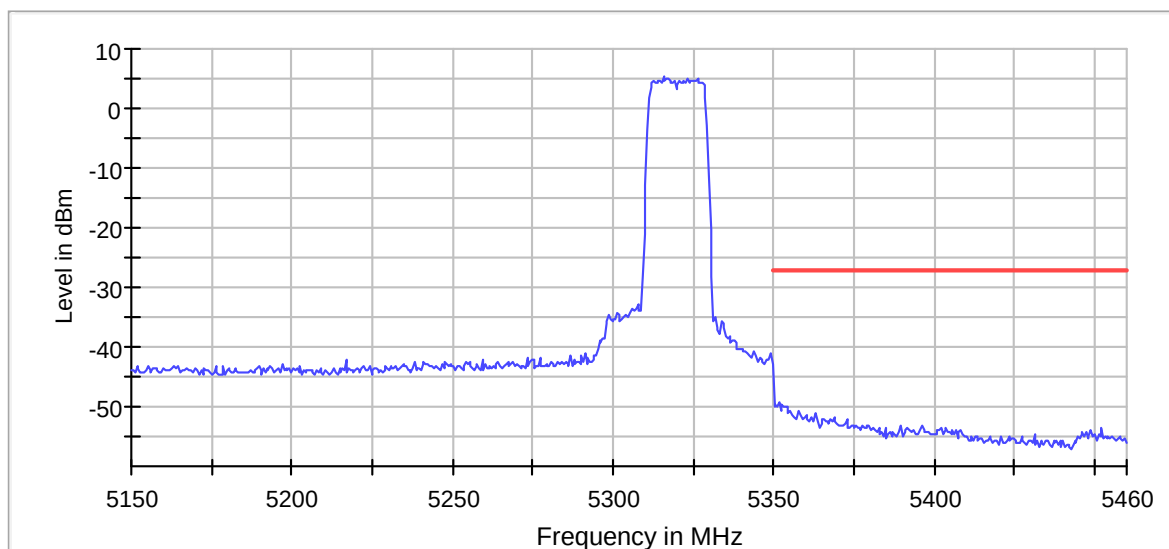


Unwanted Emissions, Band Edge, 5150 MHz, Ch036, 802.11n MCS0



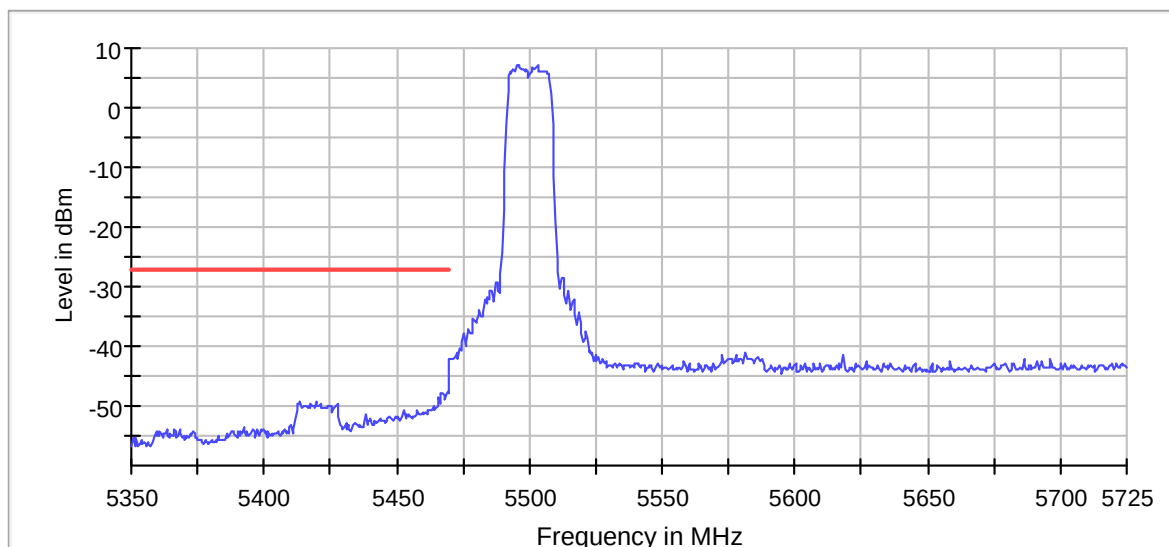
— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5350 MHz, Ch064, 802.11a 6Mbps



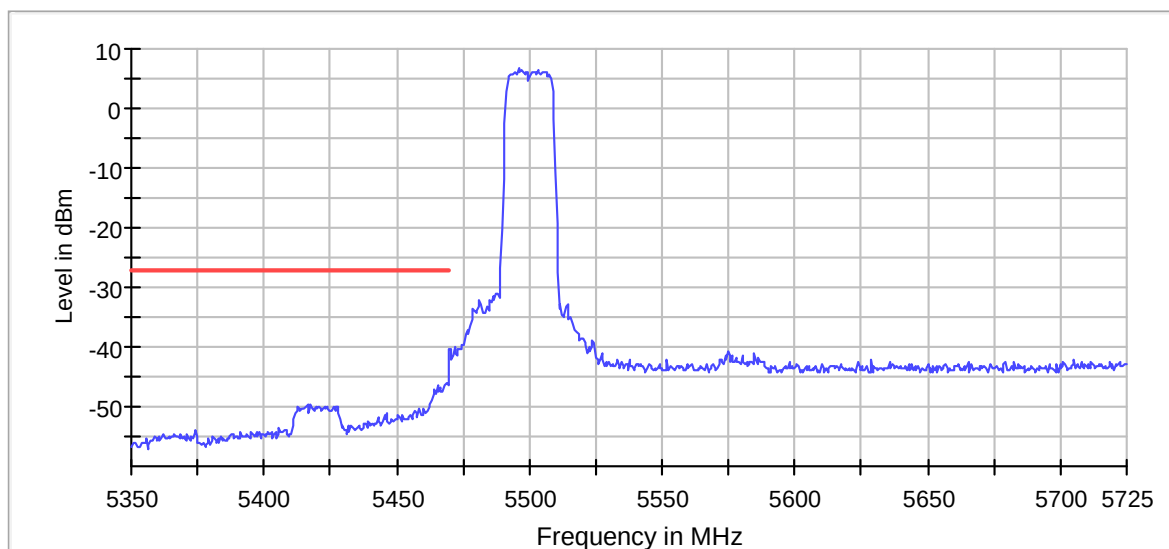
— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5350 MHz, Ch064, 802.11n MCS0



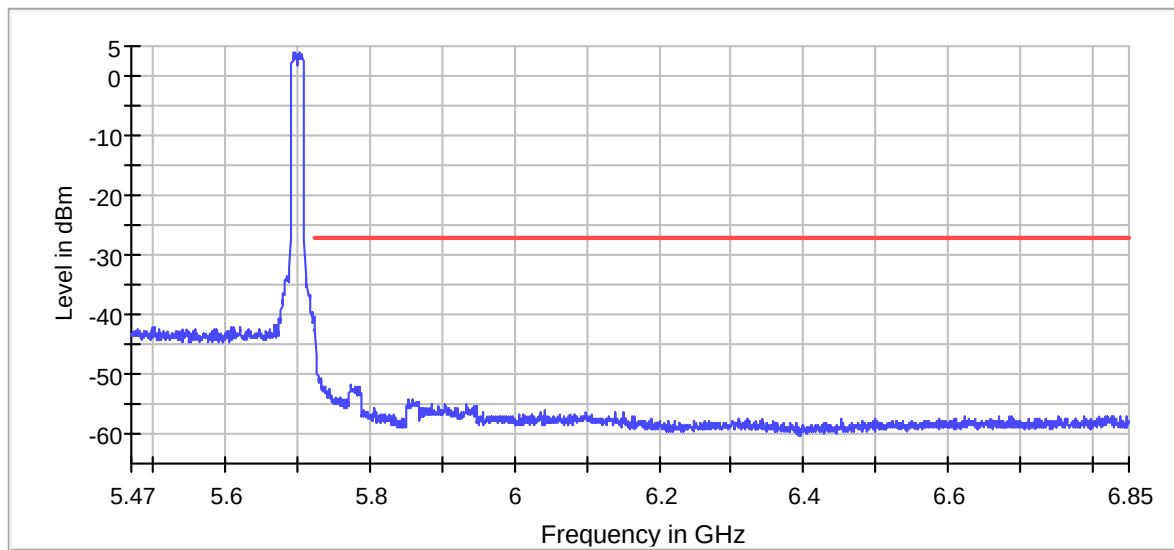
— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5470 MHz, Ch100, 802.11a 6Mbps

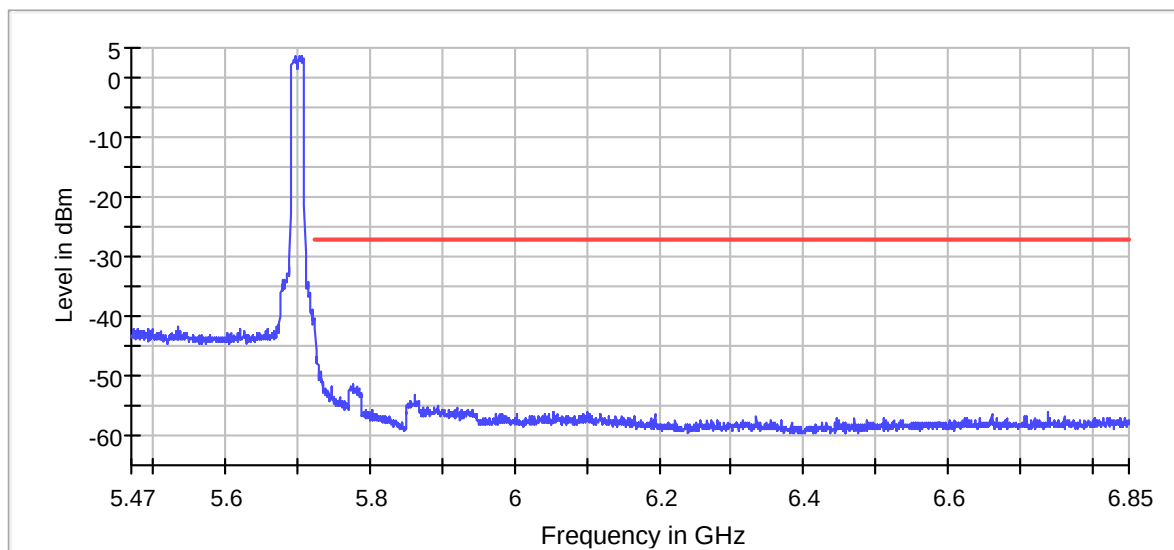


— Limit — Sum Level × Fail

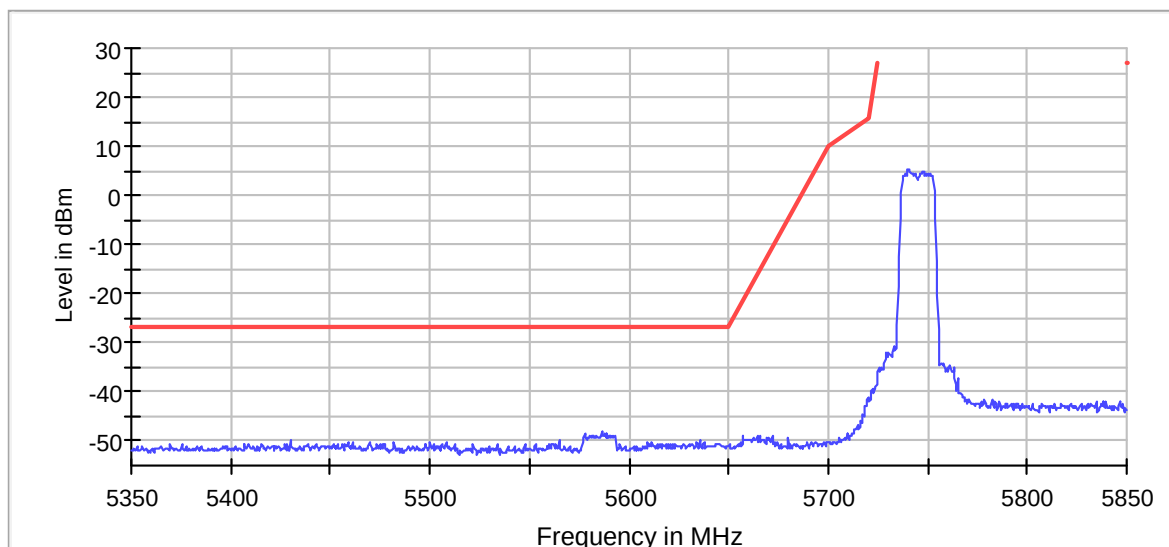
Unwanted Emissions, Band Edge, 5470 MHz, Ch100, 802.11n MCS0



Unwanted Emissions, Band Edge, 5725 MHz, Ch140, 802.11a 6Mbps

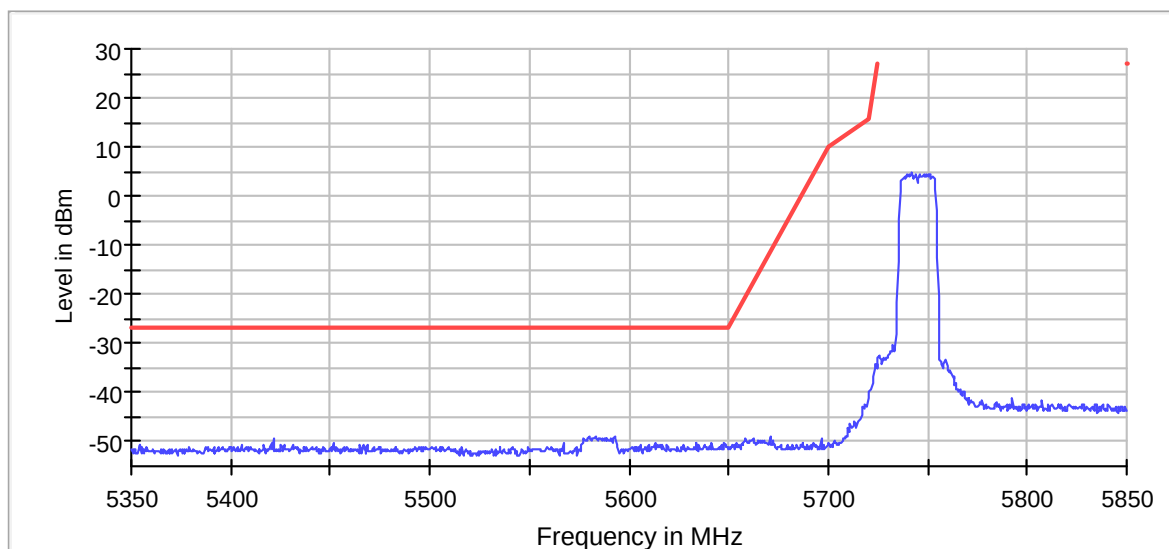


Unwanted Emissions, Band Edge, 5725 MHz, Ch140, 802.11n MCS0



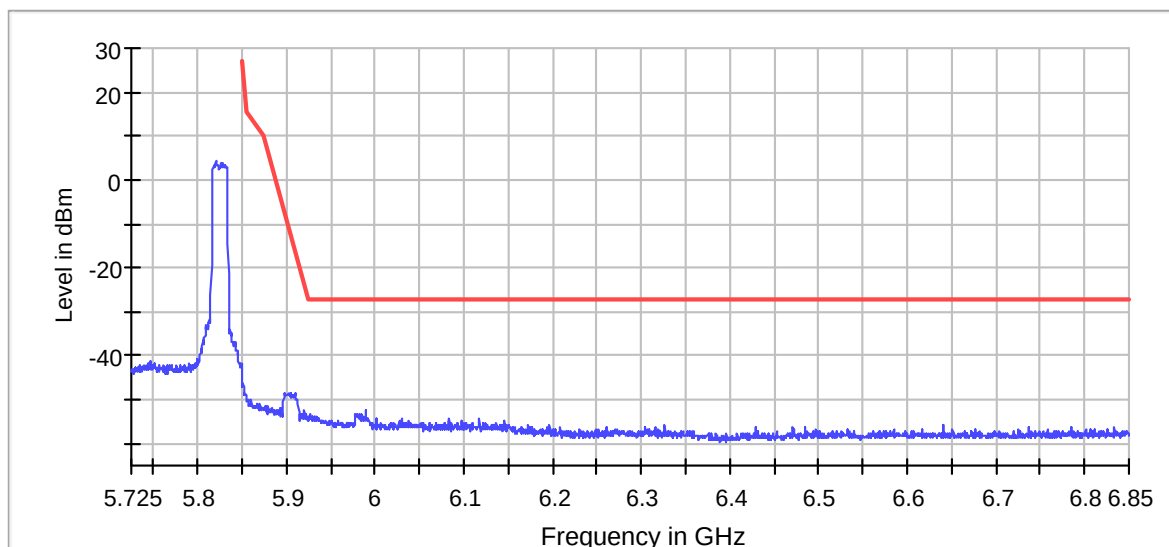
— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5725 MHz, Ch149, 802.11a 6Mbps



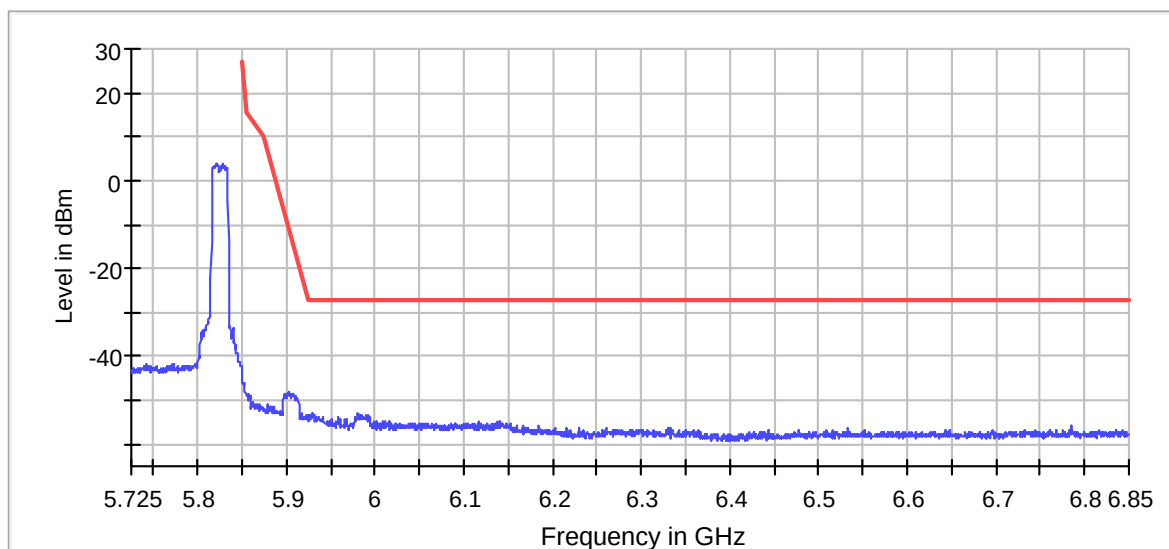
— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5725 MHz, Ch149, 802.11n MCS0



— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5825 MHz, Ch165, 802.11a 6Mbps



— Limit — Sum Level × Fail

Unwanted Emissions, Band Edge, 5825 MHz, Ch165, 802.11n MCS0,

3.7 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.

3.8 Radiated Emissions, 30 – 1000 MHz

FCC 15.205, 15.209, 15.407

ISED RSS-GEN, Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Detector: Peak

Measuring distance 3 m

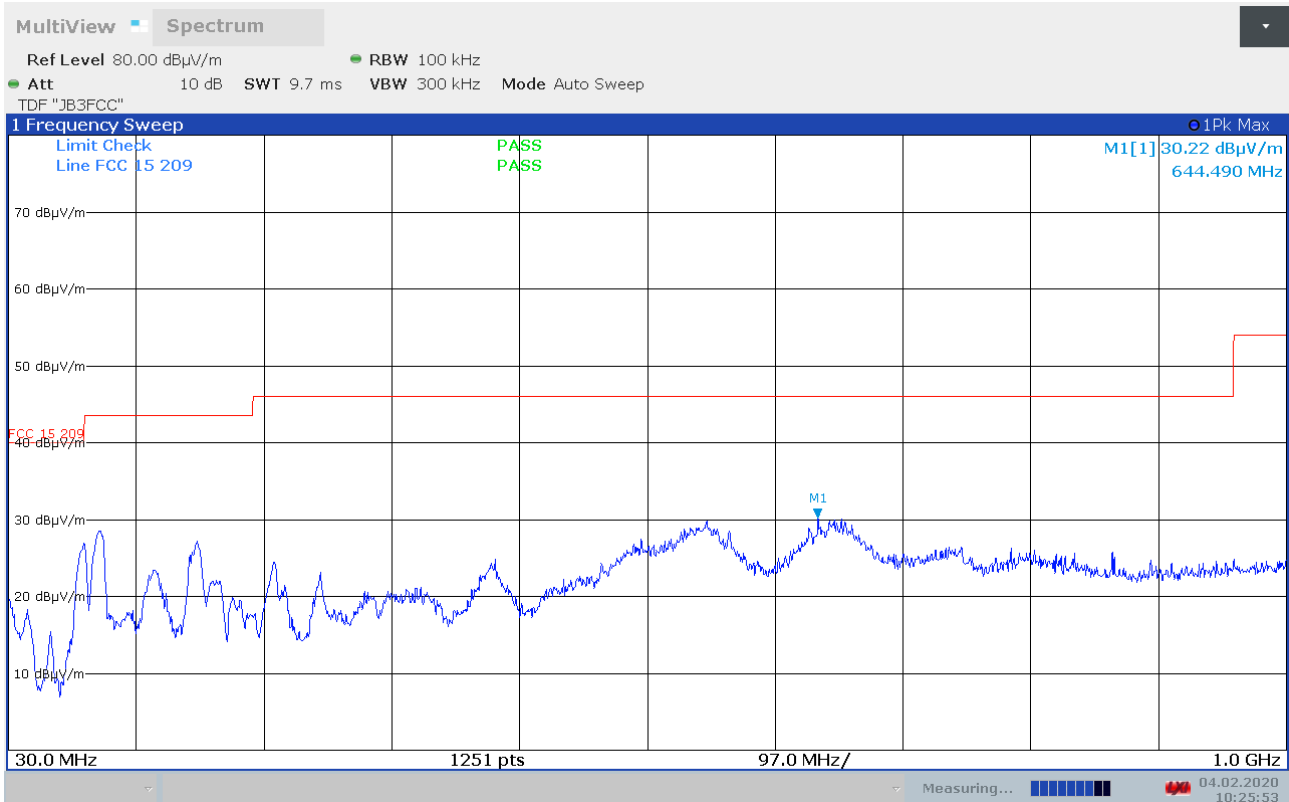
Tested in test mode with EUT transmitting

Measured Frequency (MHz)	Modulation	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30 – 88	802.11a 6Mbps	< 30	40.0	> 10
88 – 216	802.11a 6Mbps	< 29.5	43.5	> 14
216 – 960	802.11a 6Mbps	< 31	46.0	> 15
960 – 1000	802.11a 6Mbps	< 30	54.0	> 24

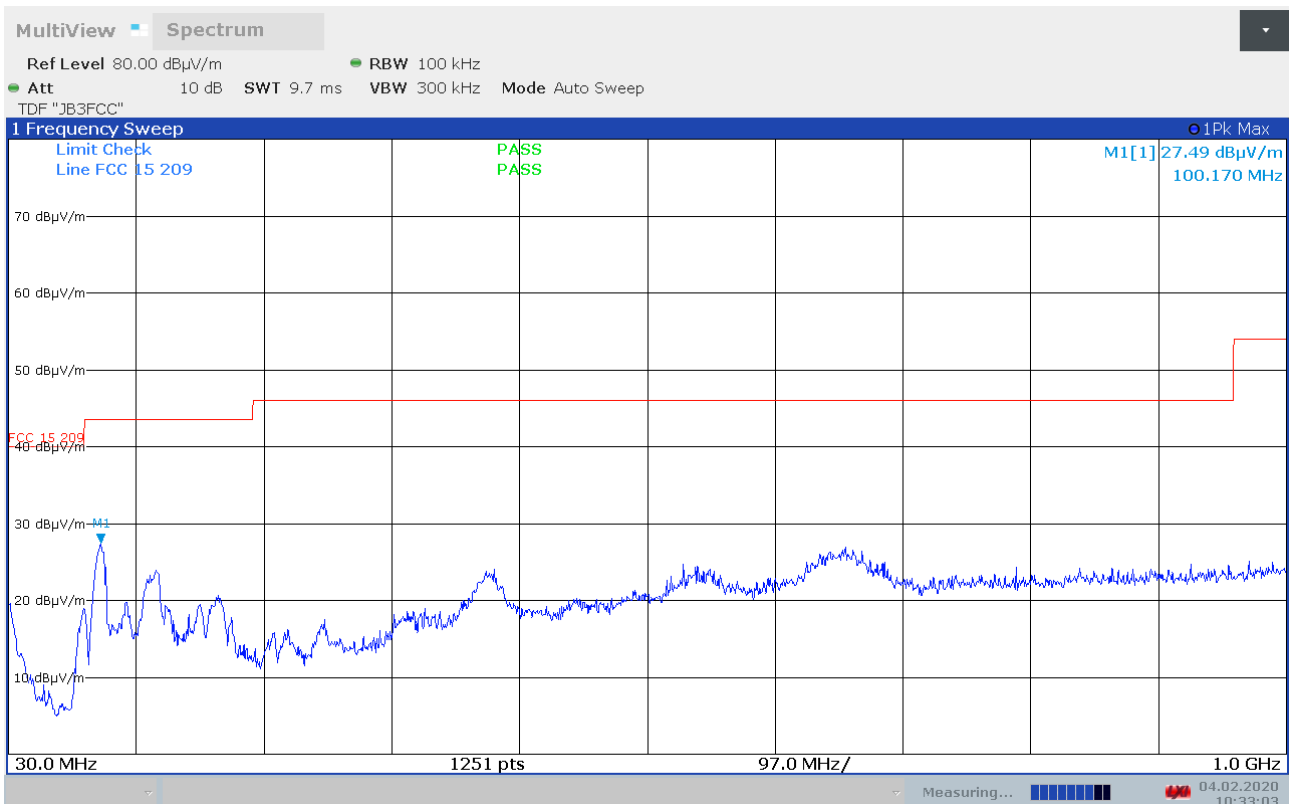
See attached plots.

Requirements/Limit

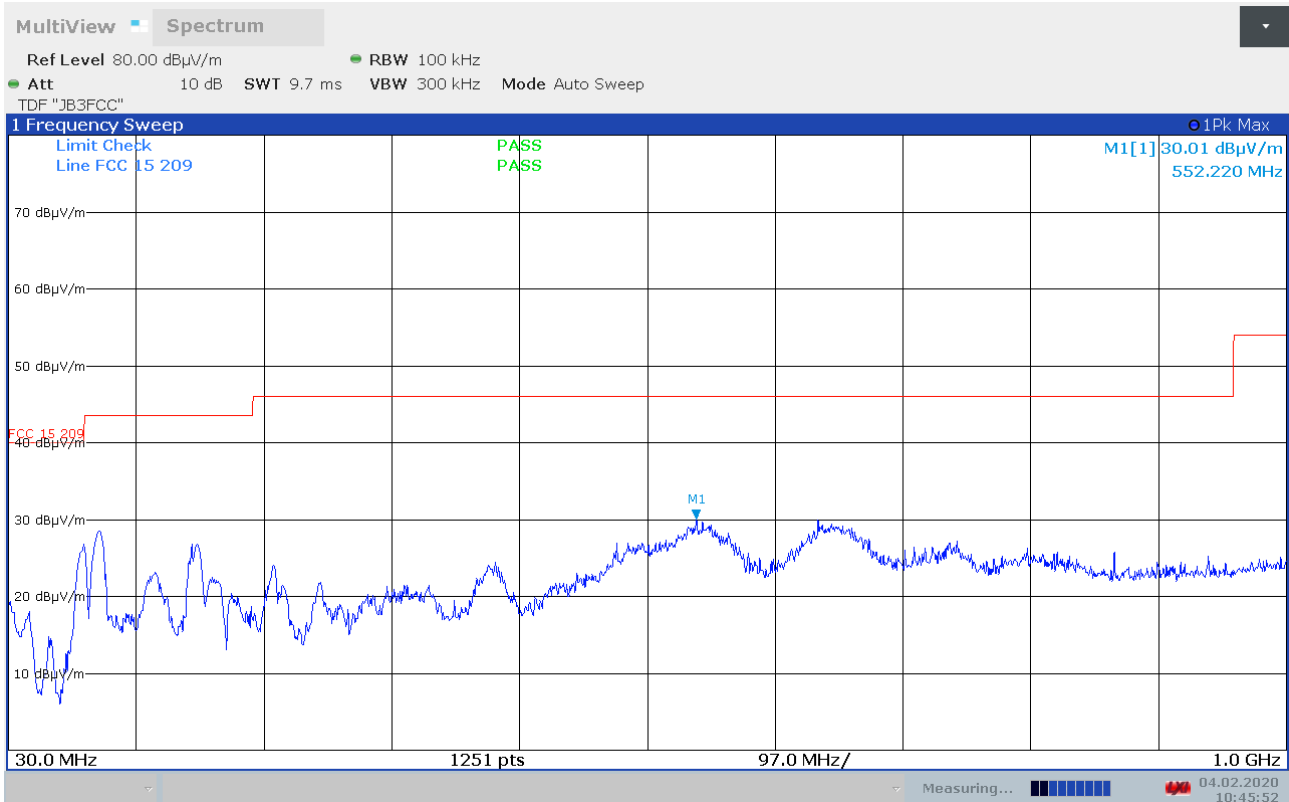
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	Quasi Peak (μ V/m)	Quasi Peak (dB μ V/m)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
960 – 1000	500	54.0



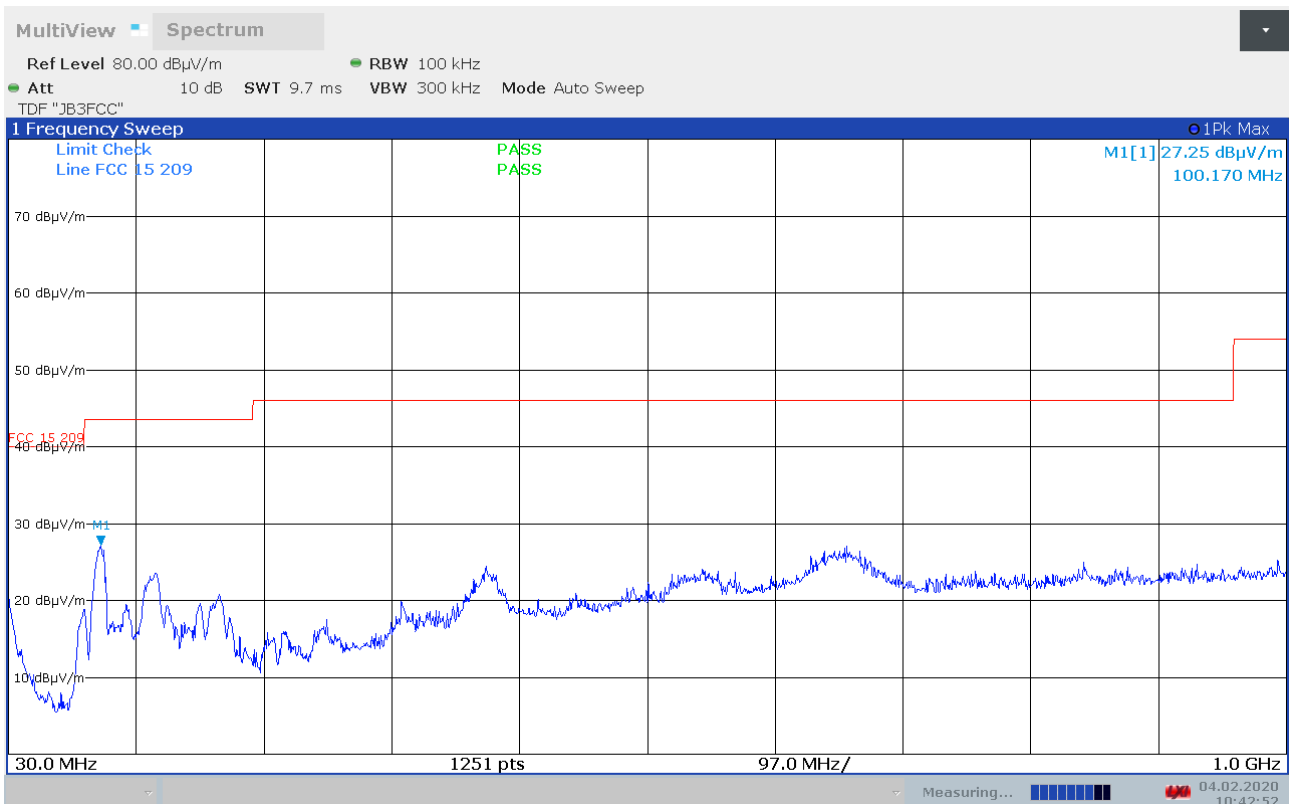
Radiated Emissions, 30 -1000 MHz, 802.11a 6Mbps, EUT V, VP



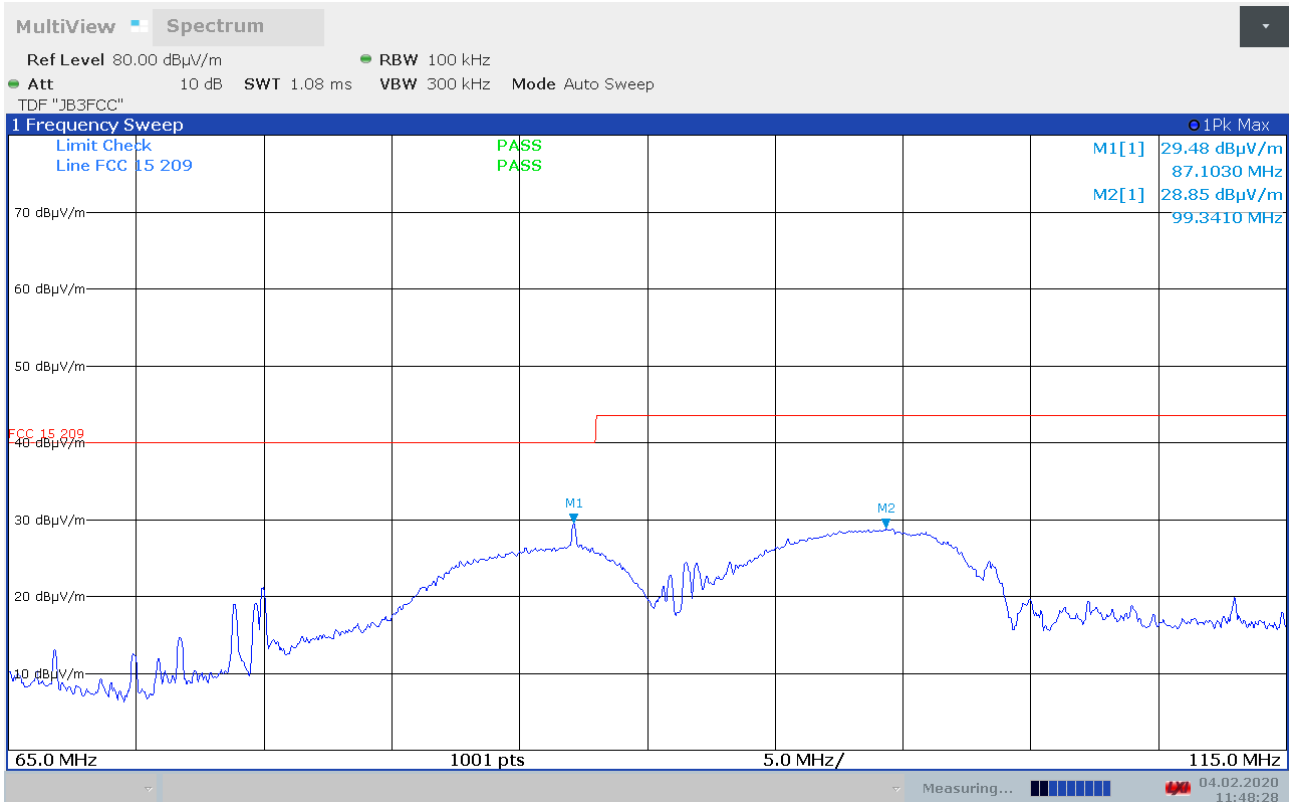
Radiated Emissions, 30 -1000 MHz, 802.11a 6Mbps, EUT V, HP



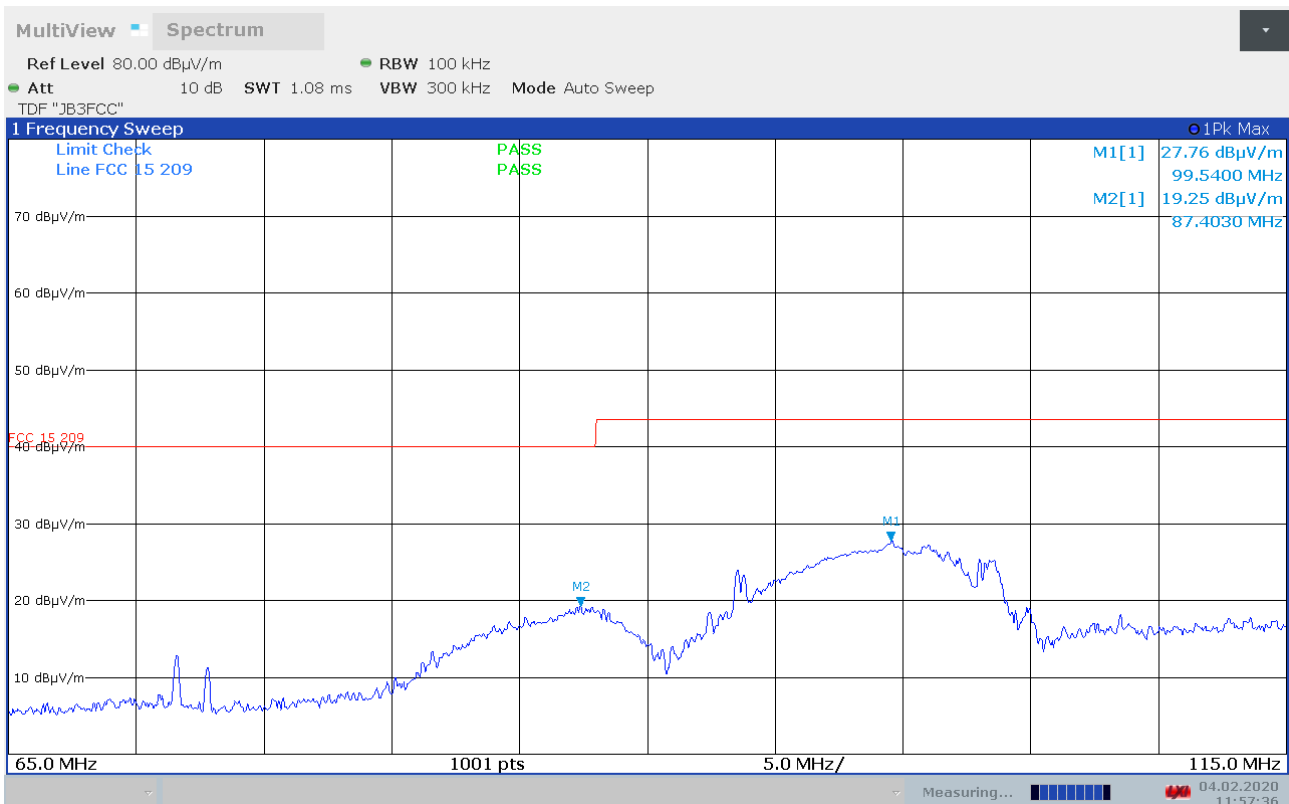
Radiated Emissions, 30 -1000 MHz, 802.11n MCS0, EUT V, VP



Radiated Emissions, 30 -1000 MHz, 802.11n MCS0, EUT V, HP



Radiated Emissions, 65 -115 MHz, 802.11a 6Mbps, EUT V, VP



Radiated Emissions, 65 -115 MHz, 802.11a 6Mbps, EUT V, HP

3.9 Radiated Emissions, 1 – 40 GHz

FCC 15.205, 15.209, 15.407

ISED RSS-GEN, Issue 5, Clause 8.9

Measurement procedure: ANSI C63.10-2013 Clause 12.7

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 - 18 GHz)
1m (18 - 40 GHz)

Detector: Peak

Peak Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5180	5150	802.11a 6Mbps	56.6	74	
5180	5150	802.11n MCS0	57.9	74	
5320	5350	802.11a 6Mbps	55.9	74	
5320	5350	802.11n MCS0	59.3	74	
5500	5460	802.11a 6Mbps	61.2	74	
5500	5460	802.11n MCS0	63.2	74	
Any	Any	Any	< 54	74	

Band Edge values with Peak Detector are reported in clause 2.8

Average Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5180	5150	802.11a 6Mbps	41.4	54	
5180	5150	802.11n MCS0	41.8	54	
5320	5350	802.11a 6Mbps	41.4	54	
5320	5350	802.11n MCS0	41.4	54	
5500	5460	802.11a 6Mbps	40.2	54	
5500	5460	802.11n MCS0	41.2	54	

Measured results are for 802.11a 6Mbps and 802.11n MCS0, it was checked that other modulations and/or bitrates did not produce higher emissions.

A High Pass Filter was used for measurements from 6.5 to 18 GHz.

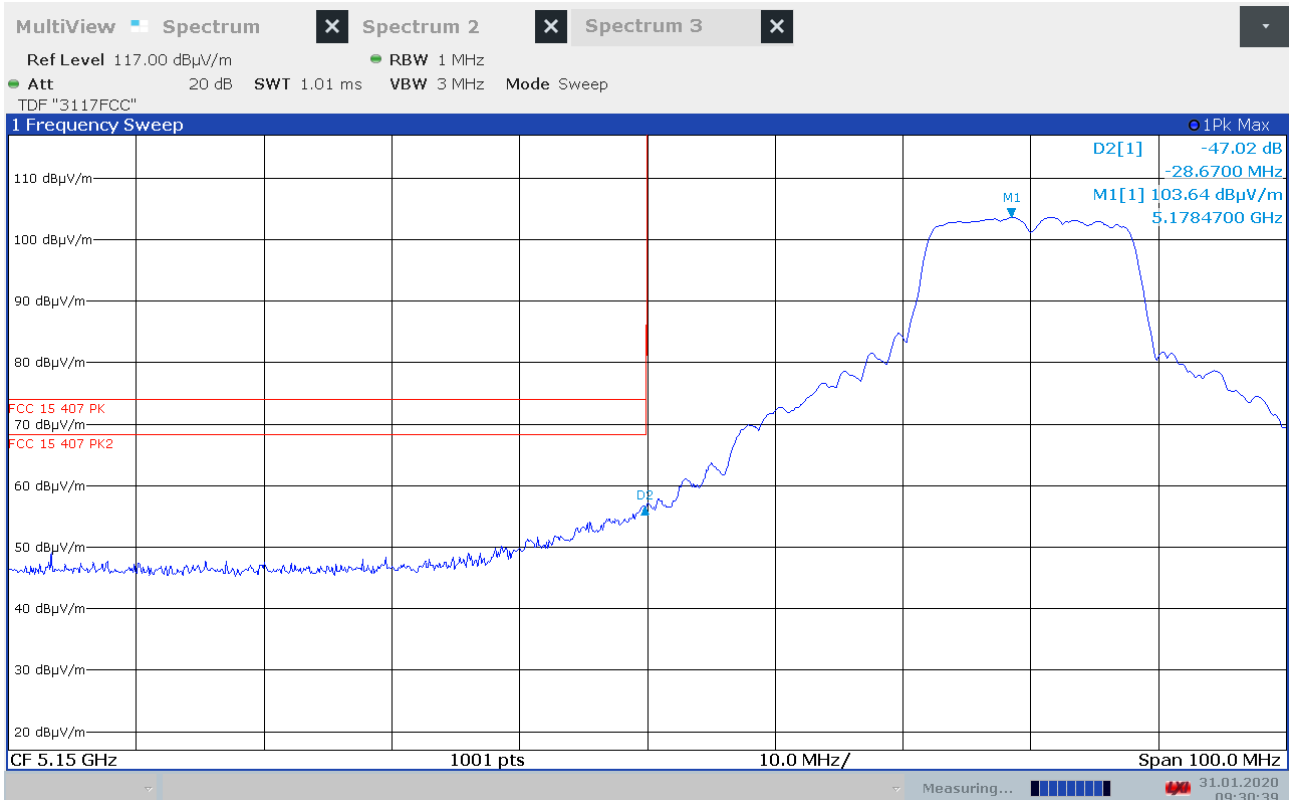
Only harmonics that fall in the restricted bands (ref. §15.205) have been measured.

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

See attached plots.

Requirements/Limit

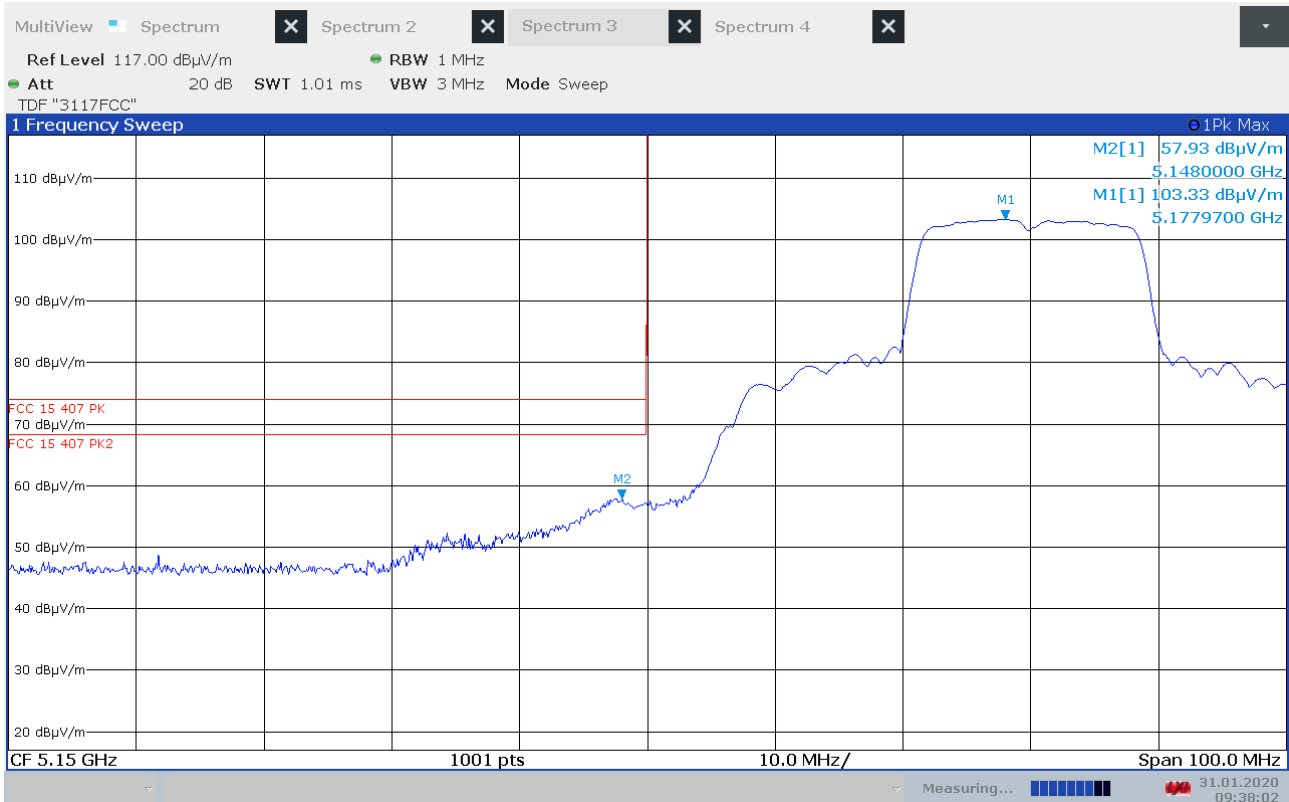
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector (dBμV/m)	Peak Detector (dBμV/m)
1 – 40 GHz	54.0	74.0



Band Edge, 5150 MHz, Ch036, 802.11a 6Mbps, EUT V (Max: HP), Peak



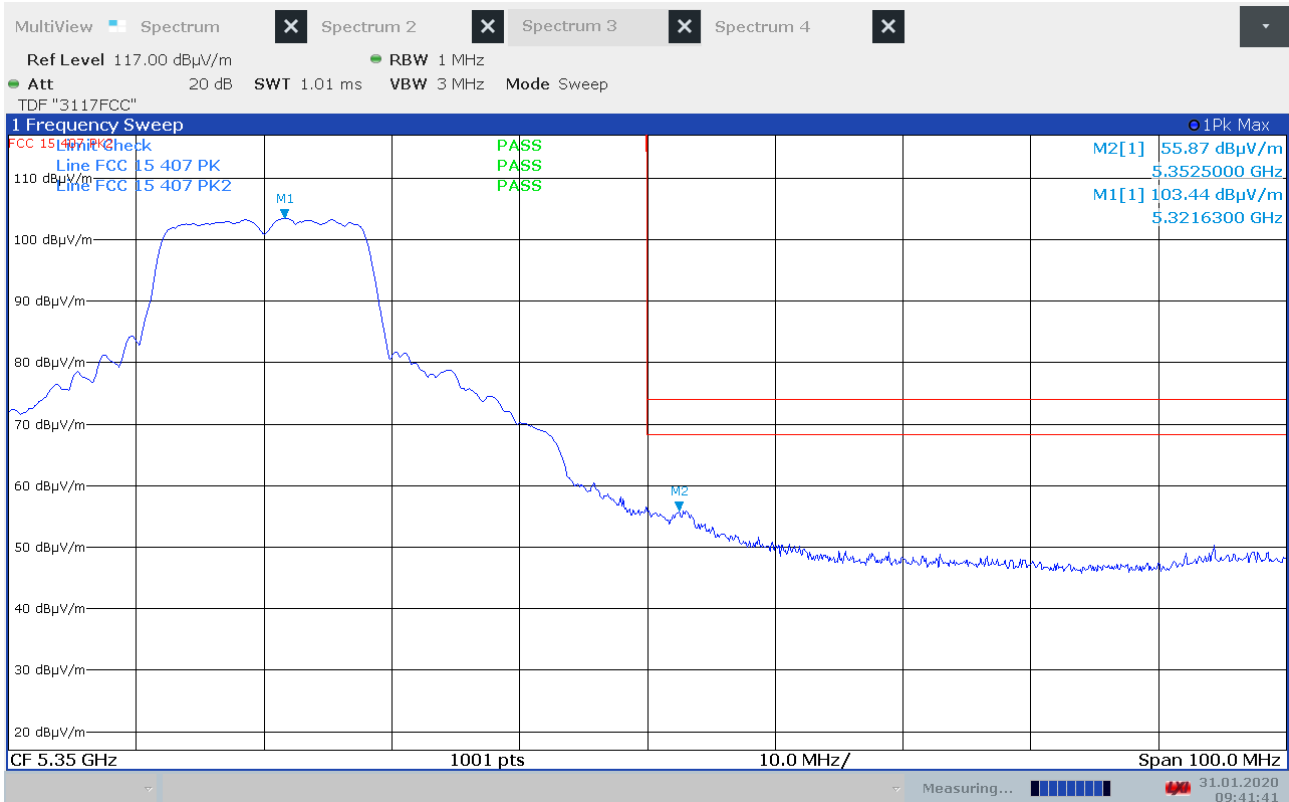
Band Edge, 5150 MHz, Ch036, 802.11a 6Mbps, EUT V (Max: HP), Average



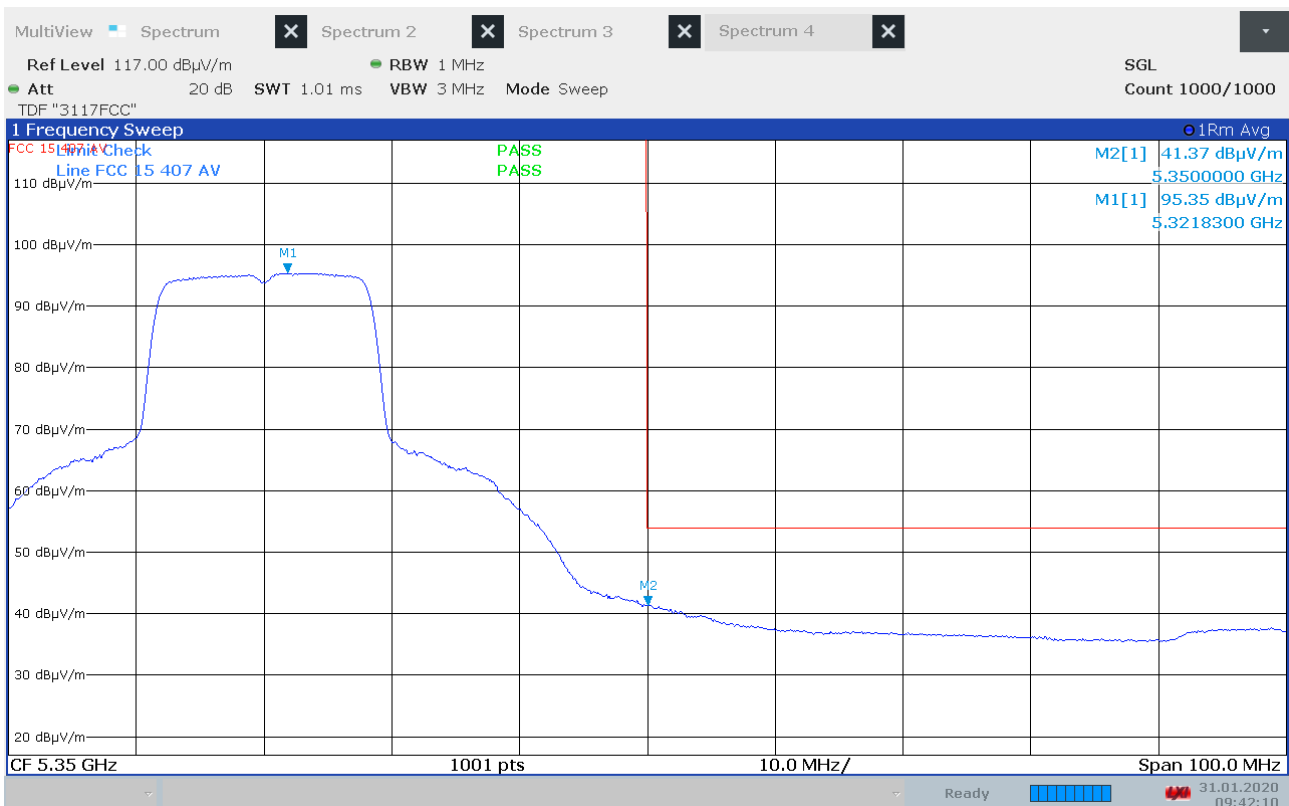
Band Edge, 5150 MHz, Ch036, 802.11n MCS0, EUT V (Max: HP), Peak



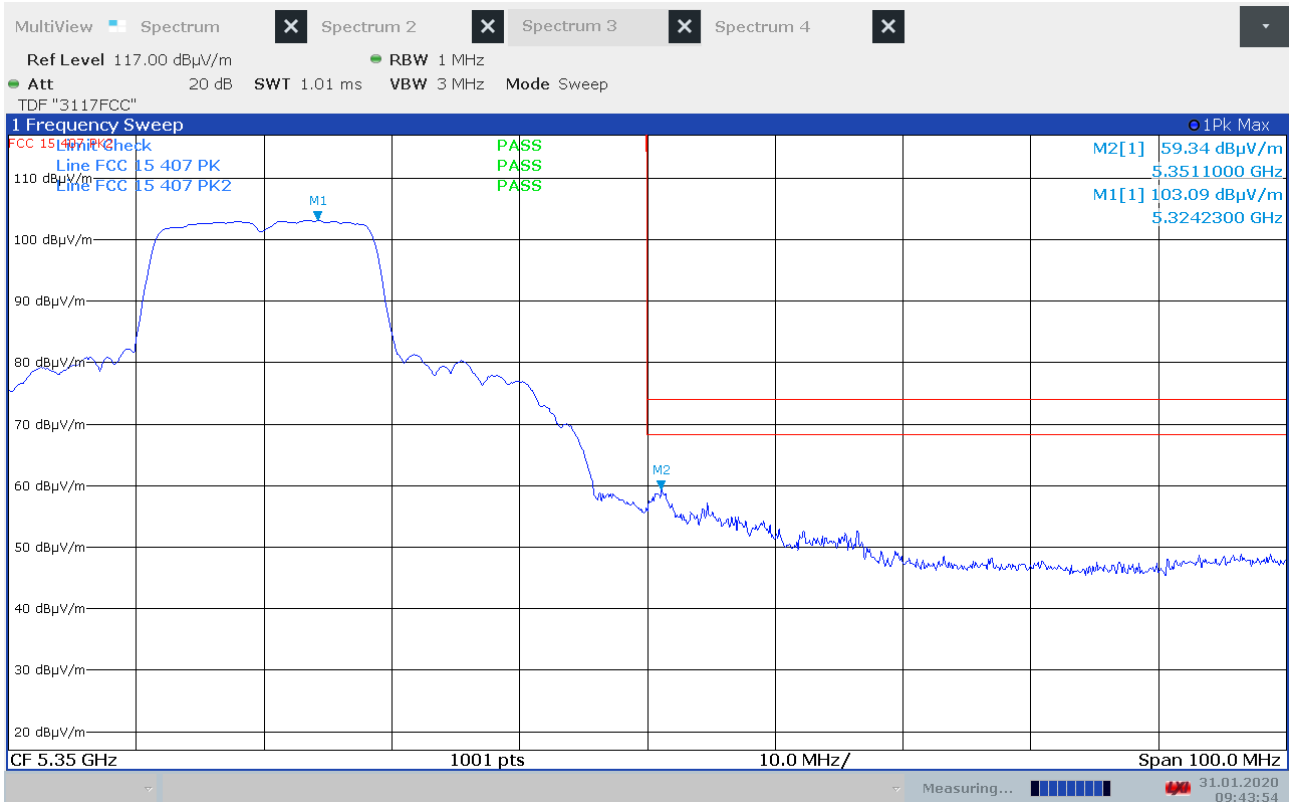
Band Edge, 5150 MHz, Ch036, 802.11n MCS0, EUT V (Max: HP), Average



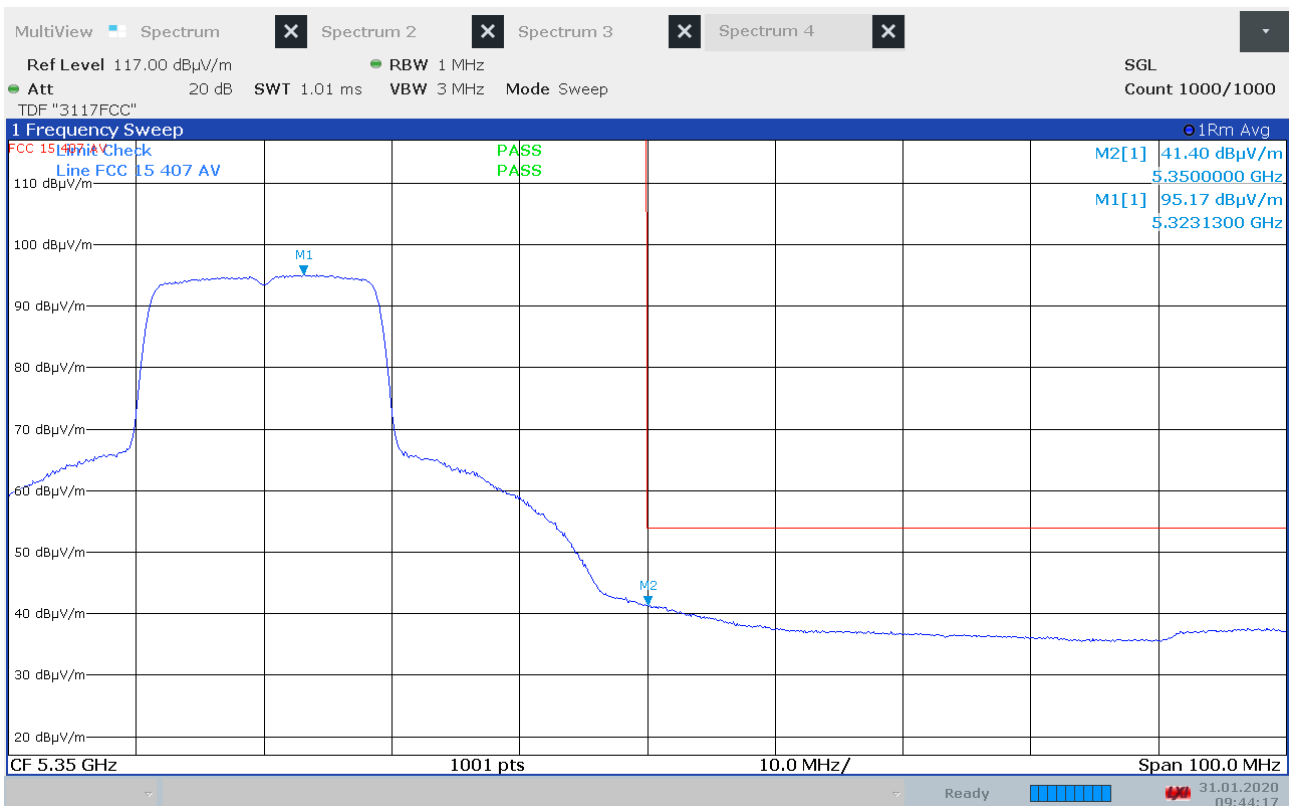
Band Edge, 5350 MHz, ch064, 802.11a 6Mbps, EUT V (Max: HP), Peak



Band Edge, 5350 MHz, ch064, 802.11a 6Mbps, EUT V (Max: HP), Average



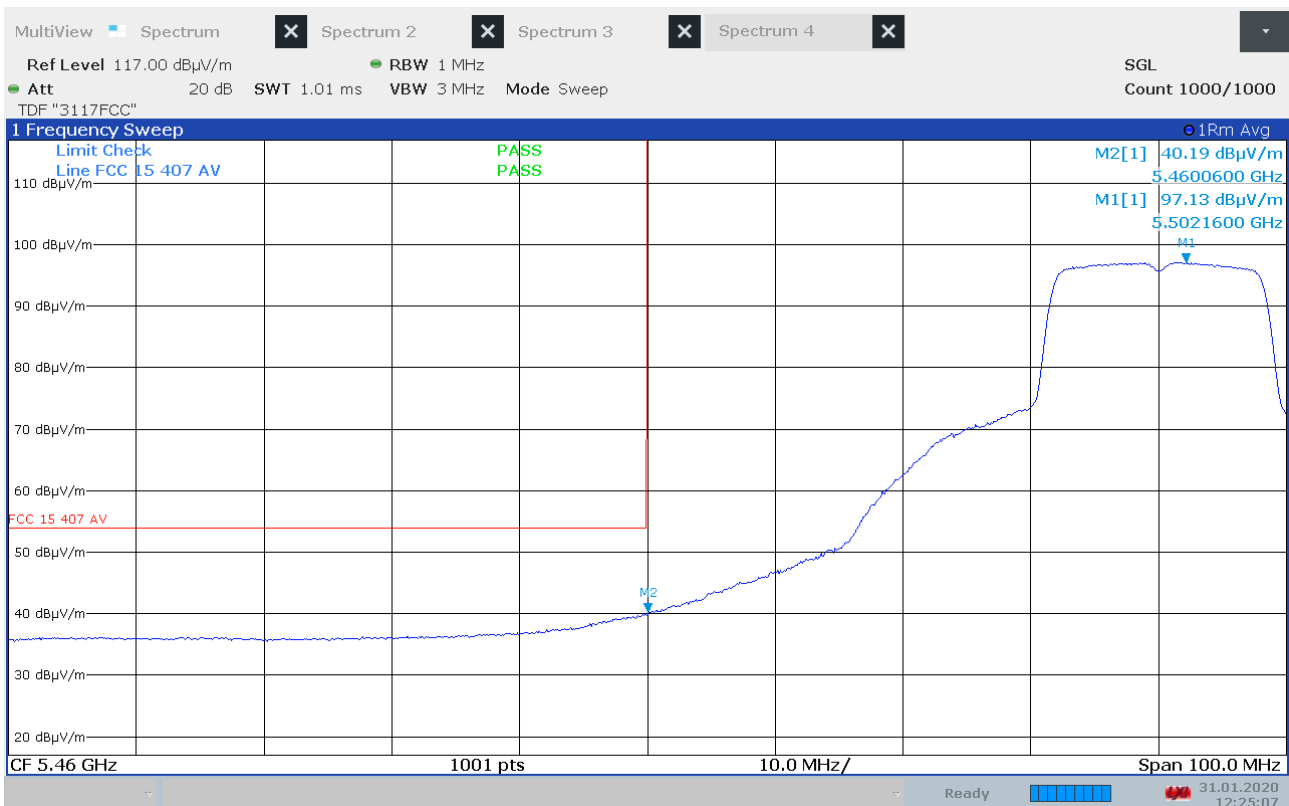
Band Edge, 5350 MHz, ch064, 802.11n MCS0, EUT V (Max: HP), Peak



Band Edge, 5350 MHz, ch064, 802.11n MCS0, EUT V (Max: HP), Average



Band Edge, 5460 MHz, ch100, 802.11a 6Mbps, EUT V (Max: HP), Peak



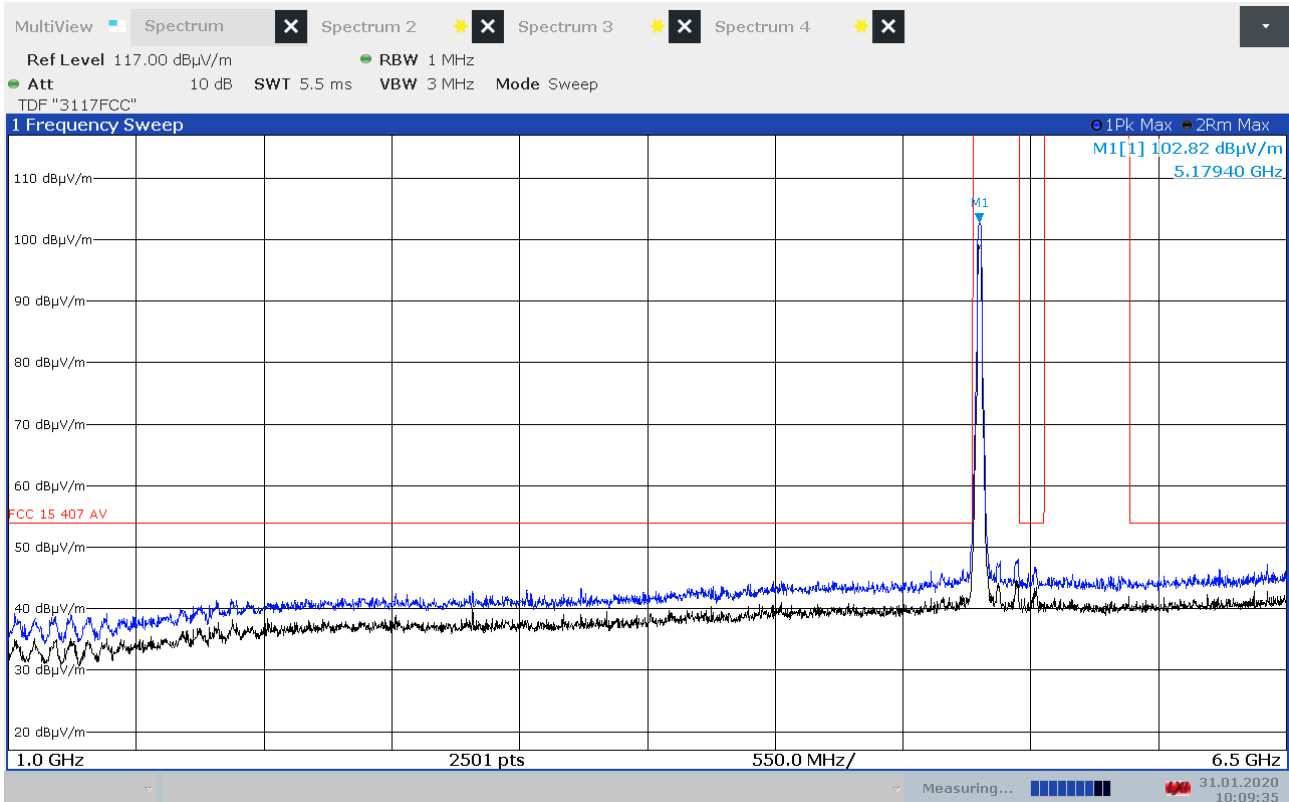
Band Edge, 5460 MHz, ch100, 802.11a 6Mbps, EUT V (Max: HP), Average



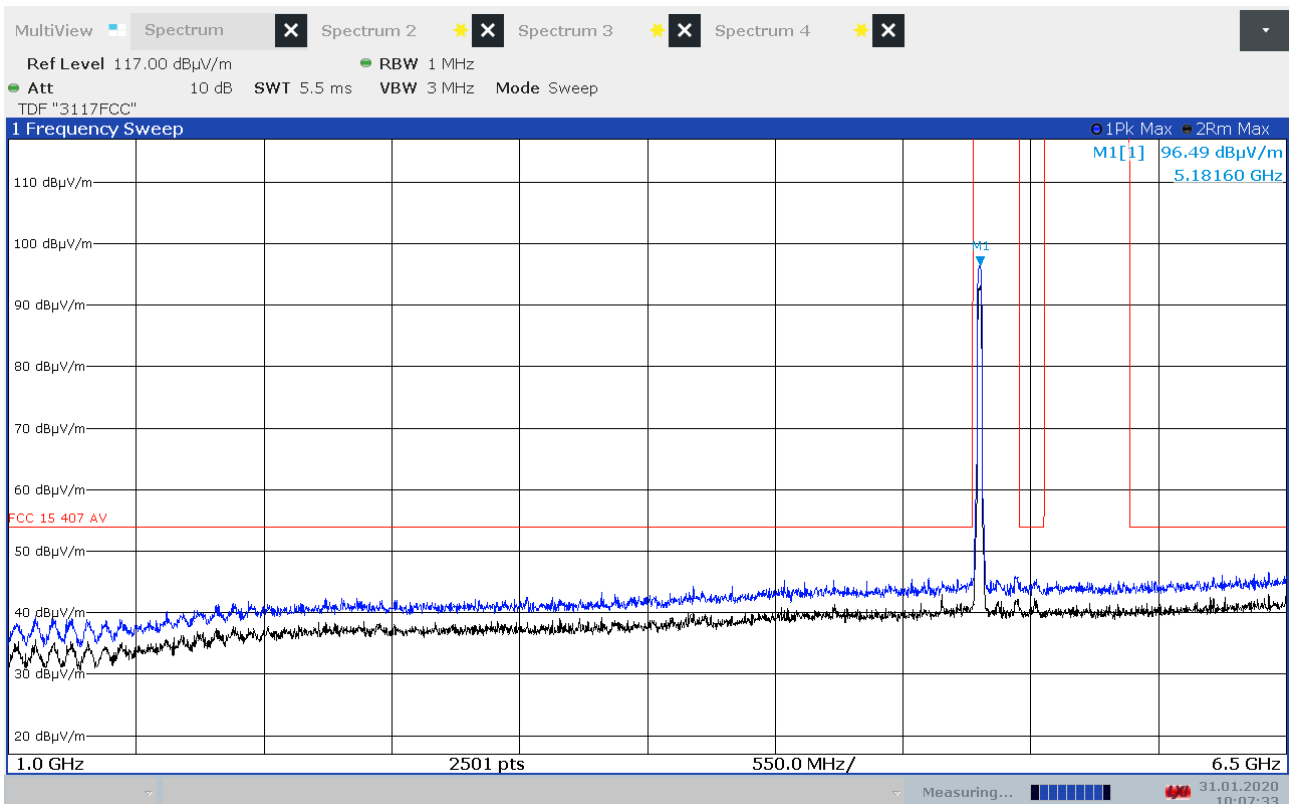
Band Edge, 5460 MHz, ch100, 802.11n MCS0, EUT V (Max: HP), Peak



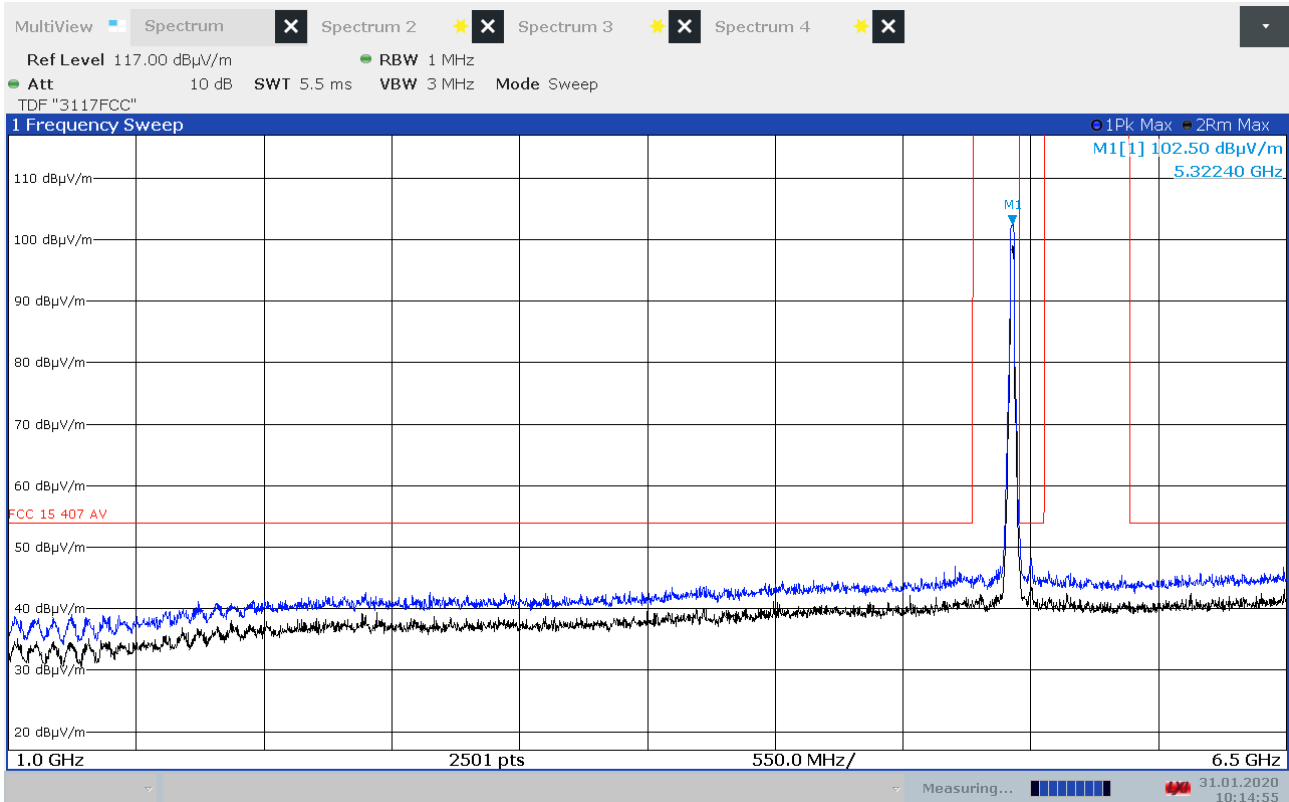
Band Edge, 5460 MHz, ch100, 802.11n MCS0, EUT V (Max: HP), Average



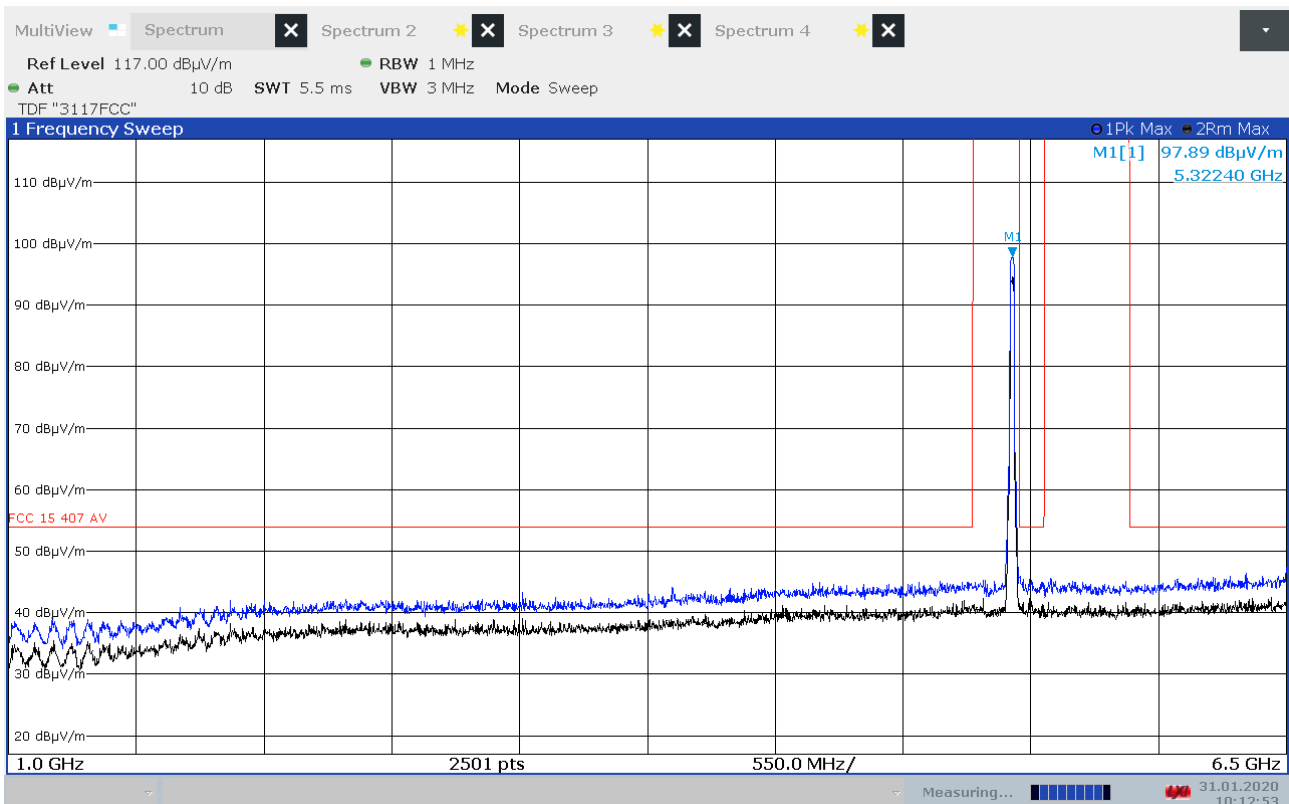
Radiated Emissions, 1000 - 6500 MHz, ch036, 802.11a 6Mbps, EUT V, HP



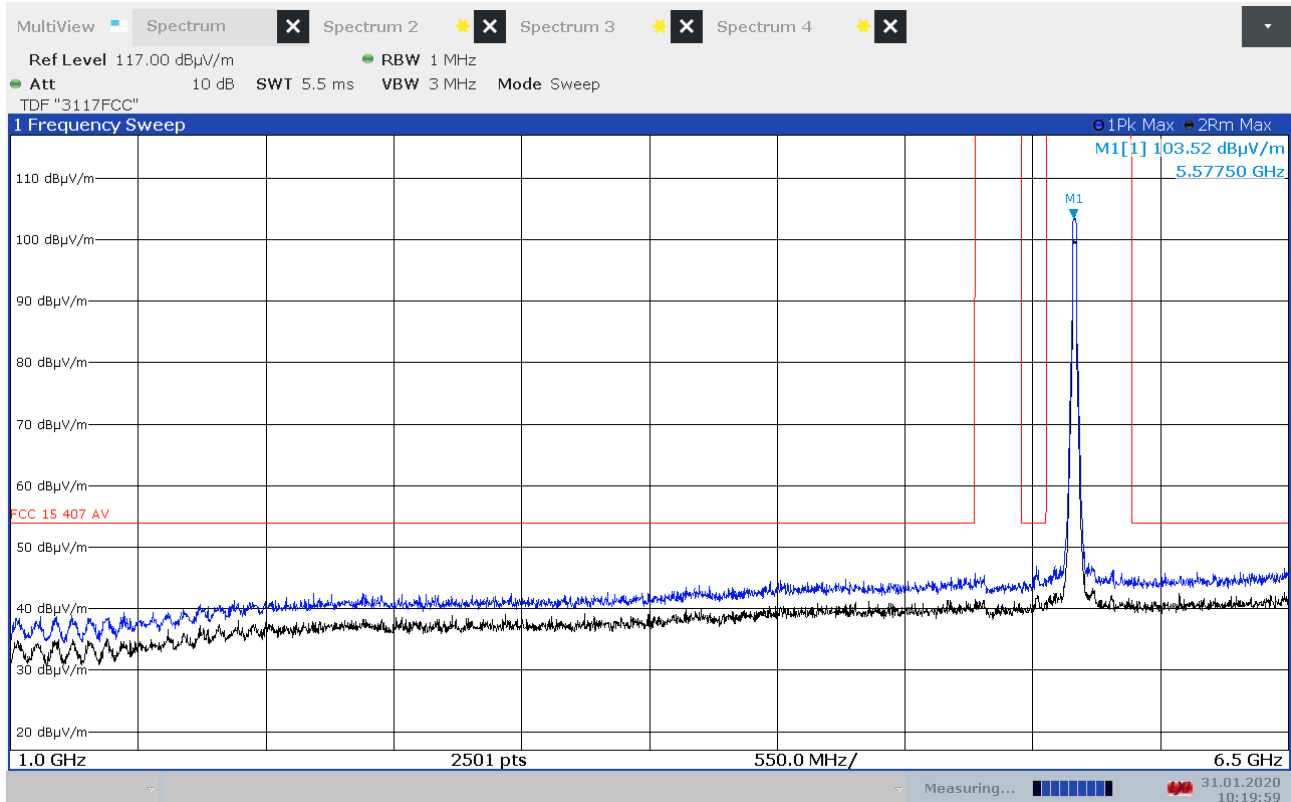
Radiated Emissions, 1000 - 6500 MHz, ch036, 802.11a 6Mbps, EUT V, VP



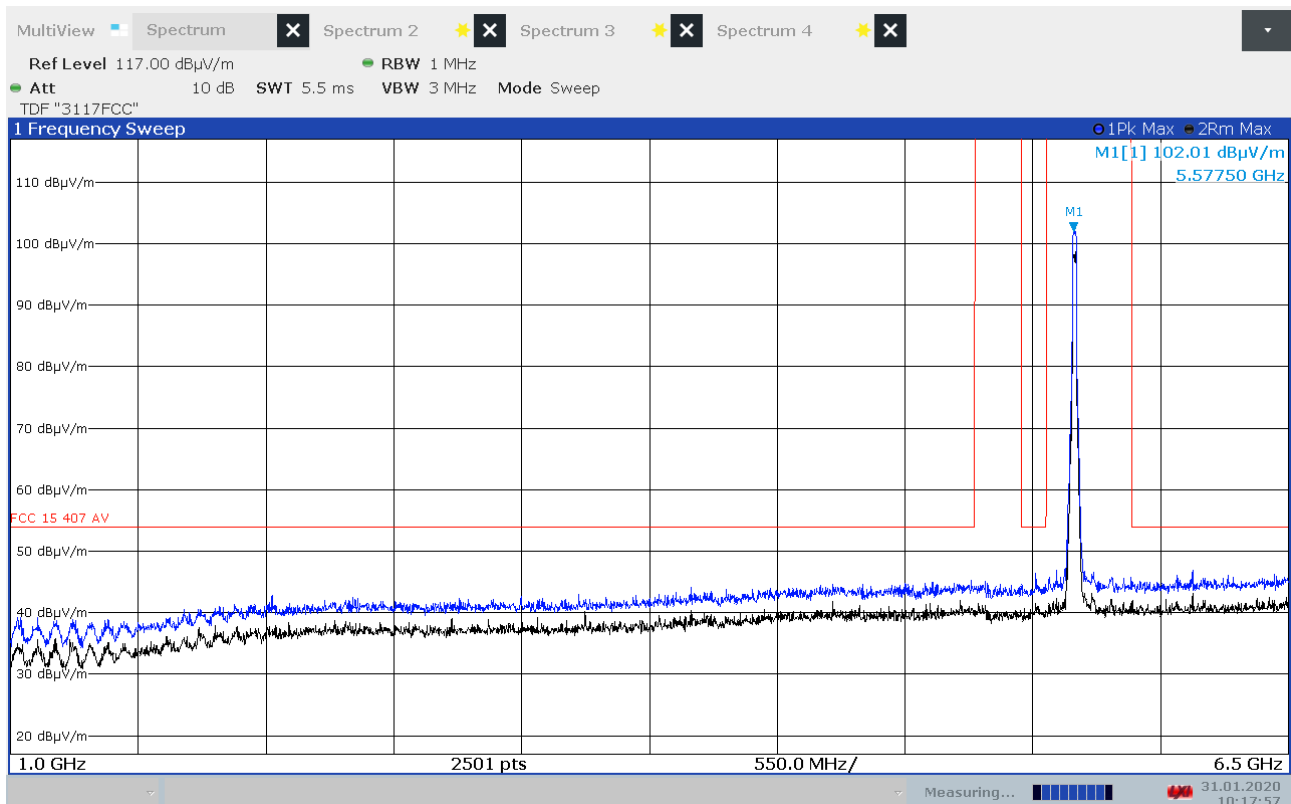
Radiated Emissions, 1000 - 6500 MHz, ch064, 802.11a 6Mbps, EUT V, HP



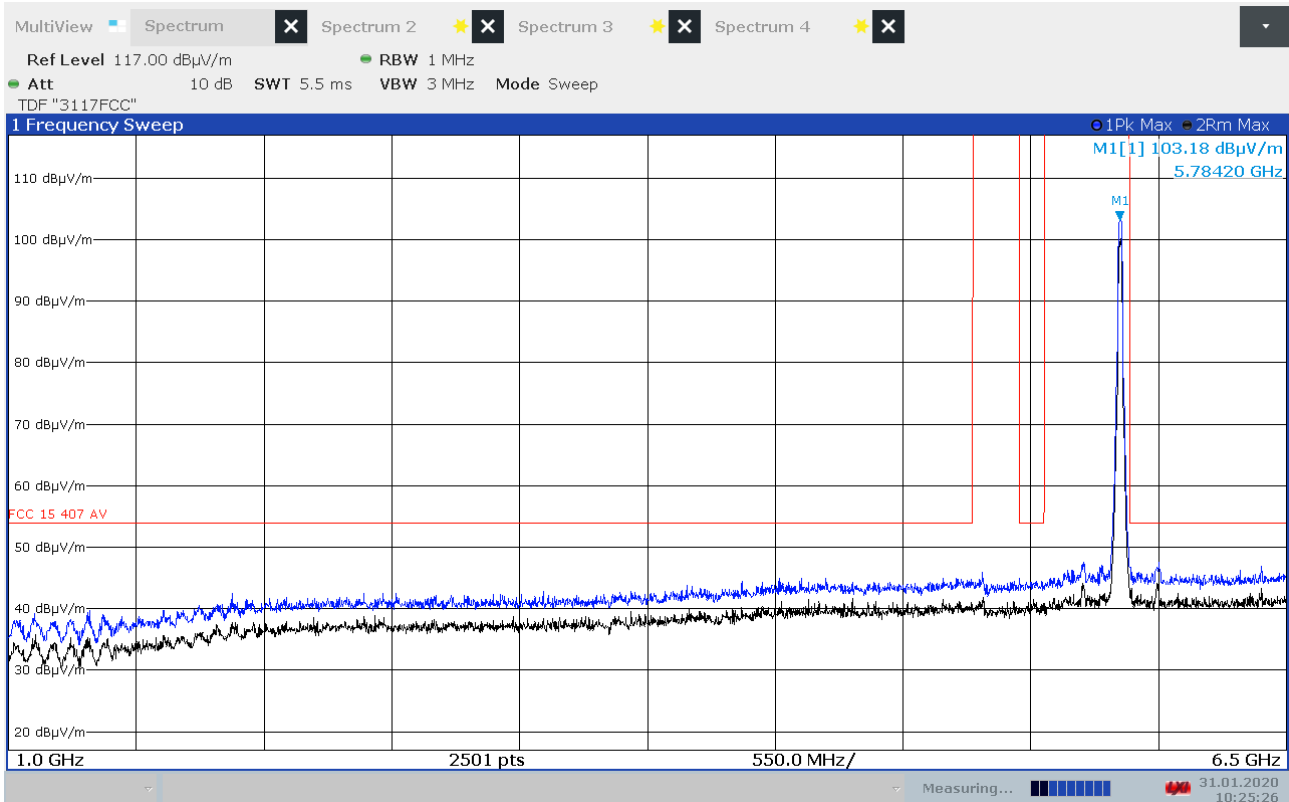
Radiated Emissions, 1000 - 6500 MHz, ch064, 802.11a 6Mbps, EUT V, VP



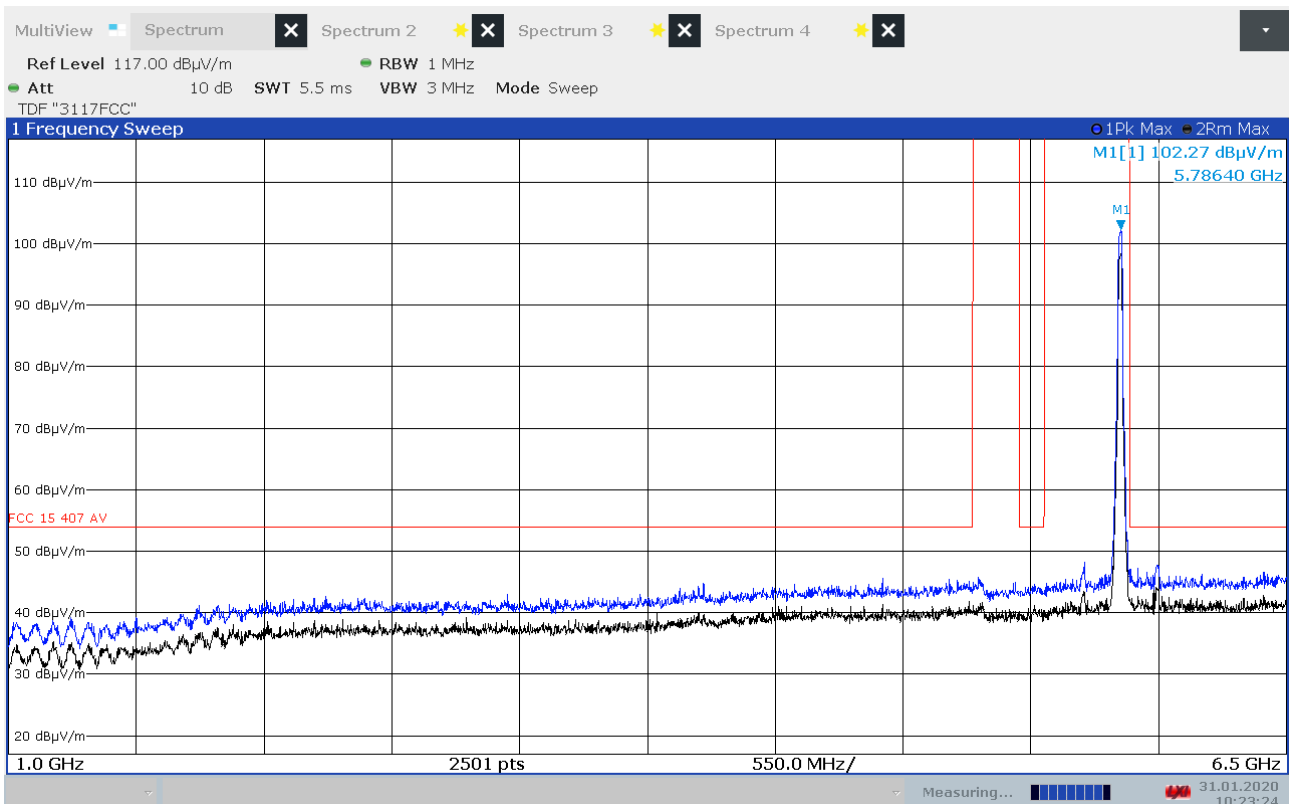
Radiated Emissions, 1000 - 6500 MHz, ch116, 802.11a 6Mbps, EUT V, HP



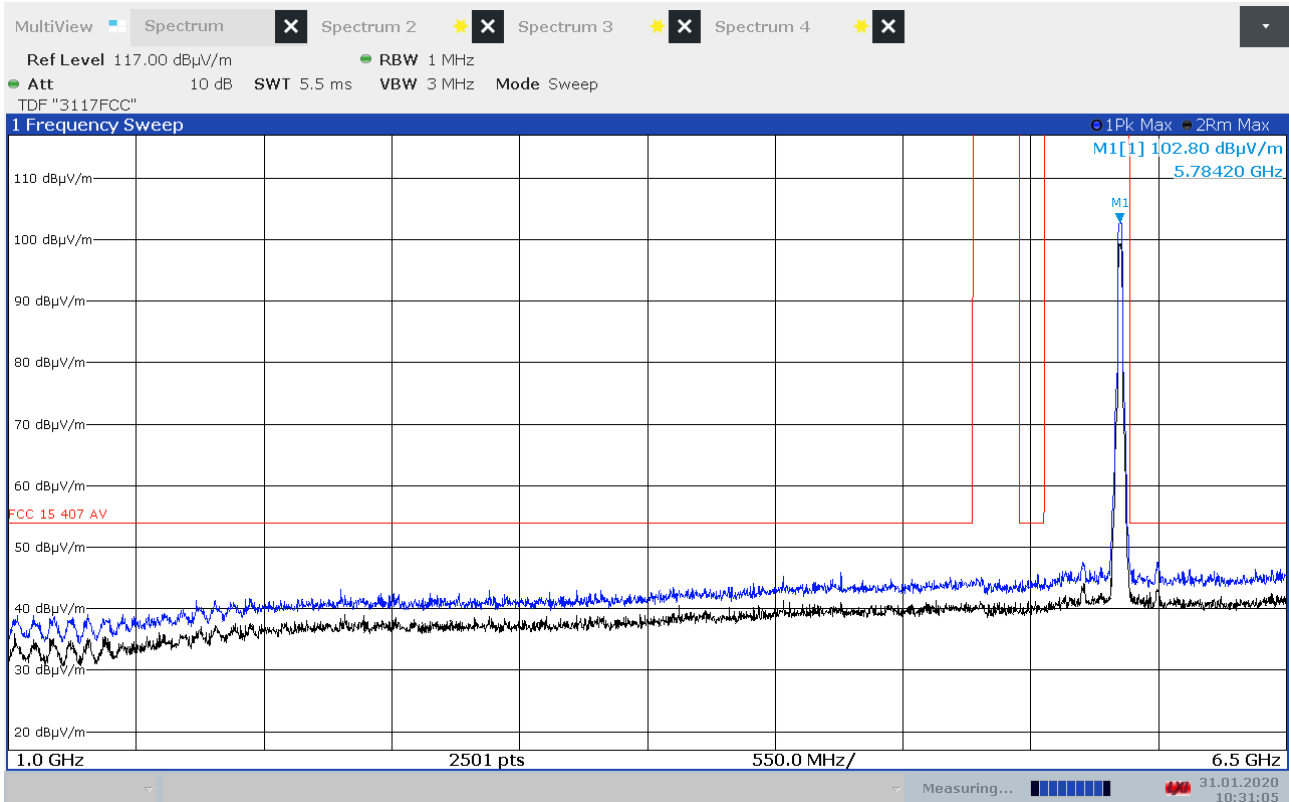
Radiated Emissions, 1000 - 6500 MHz, ch116, 802.11a 6Mbps, EUT V, VP



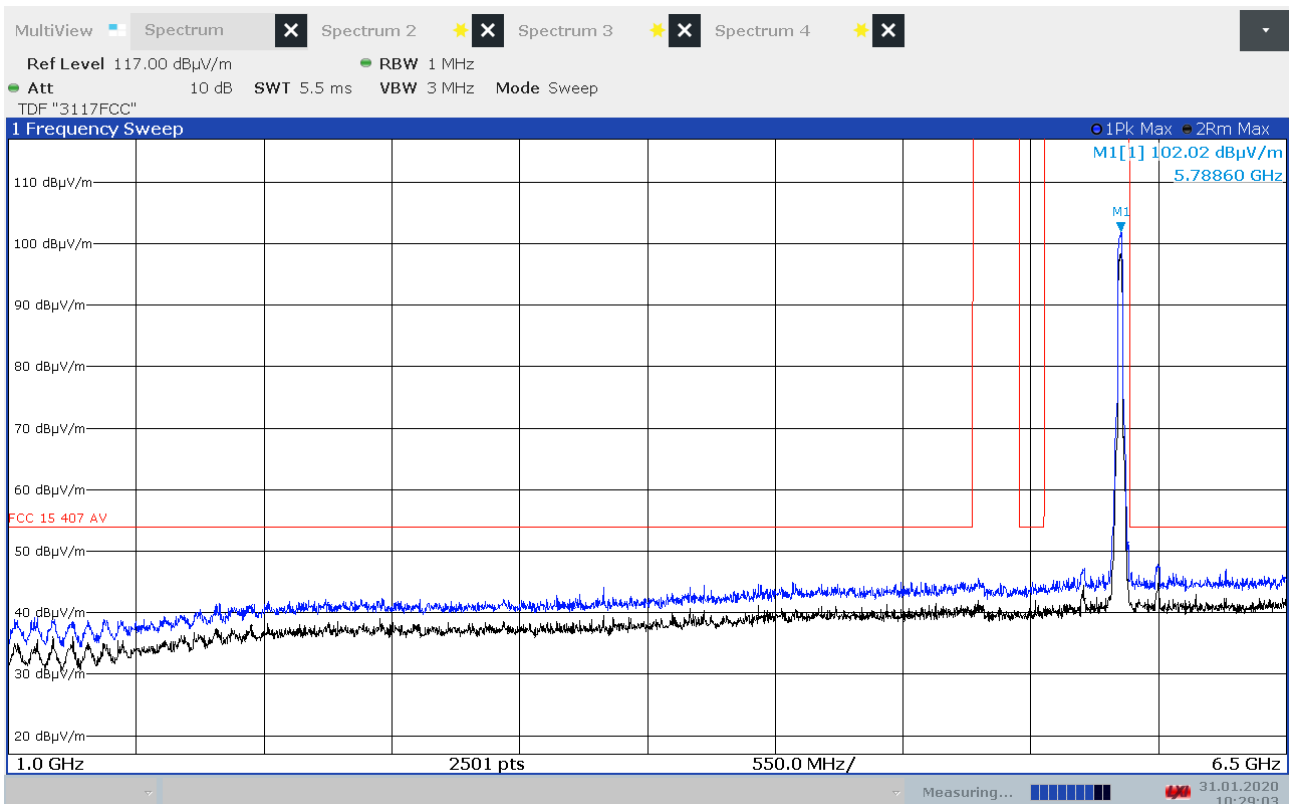
Radiated Emissions, 1000 - 6500 MHz, ch157, 802.11a 6Mbps, EUT V, HP



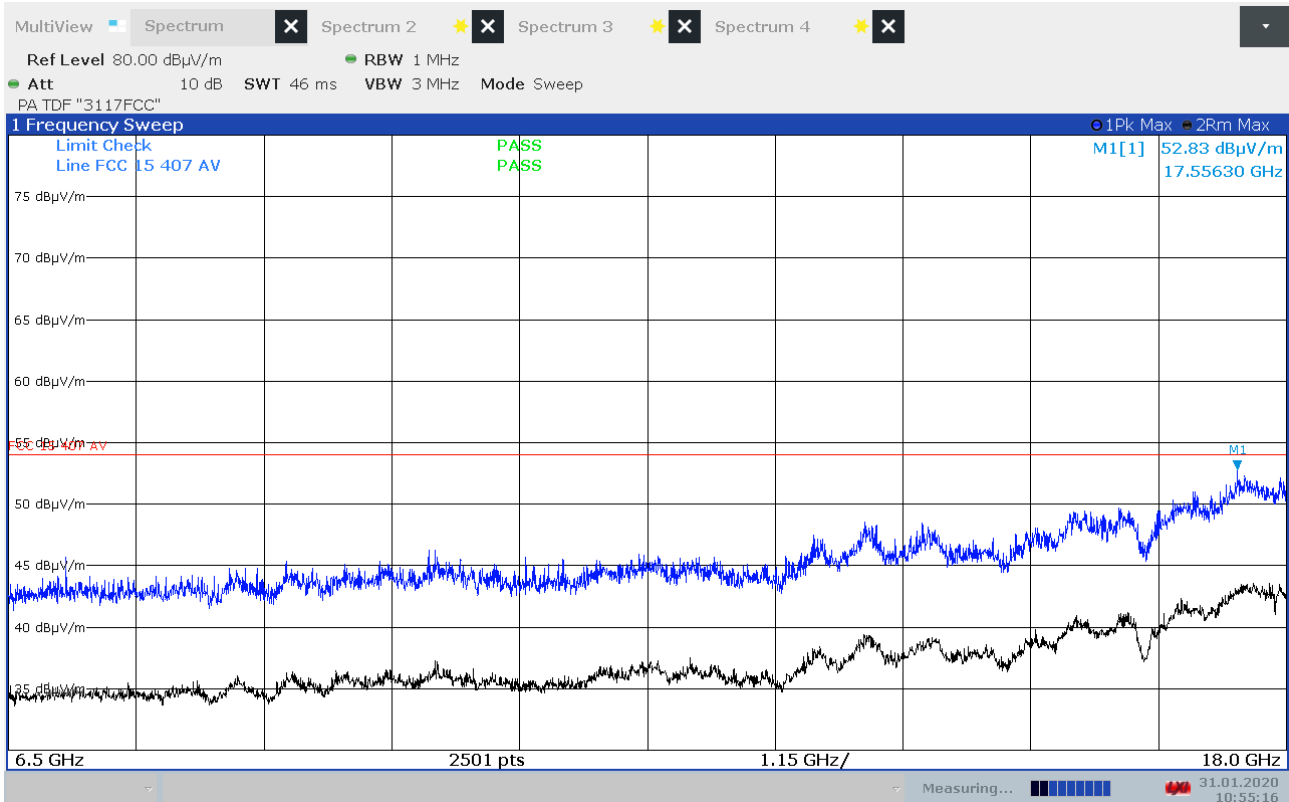
Radiated Emissions, 1000 - 6500 MHz, ch157, 802.11a 6Mbps, EUT V, VP



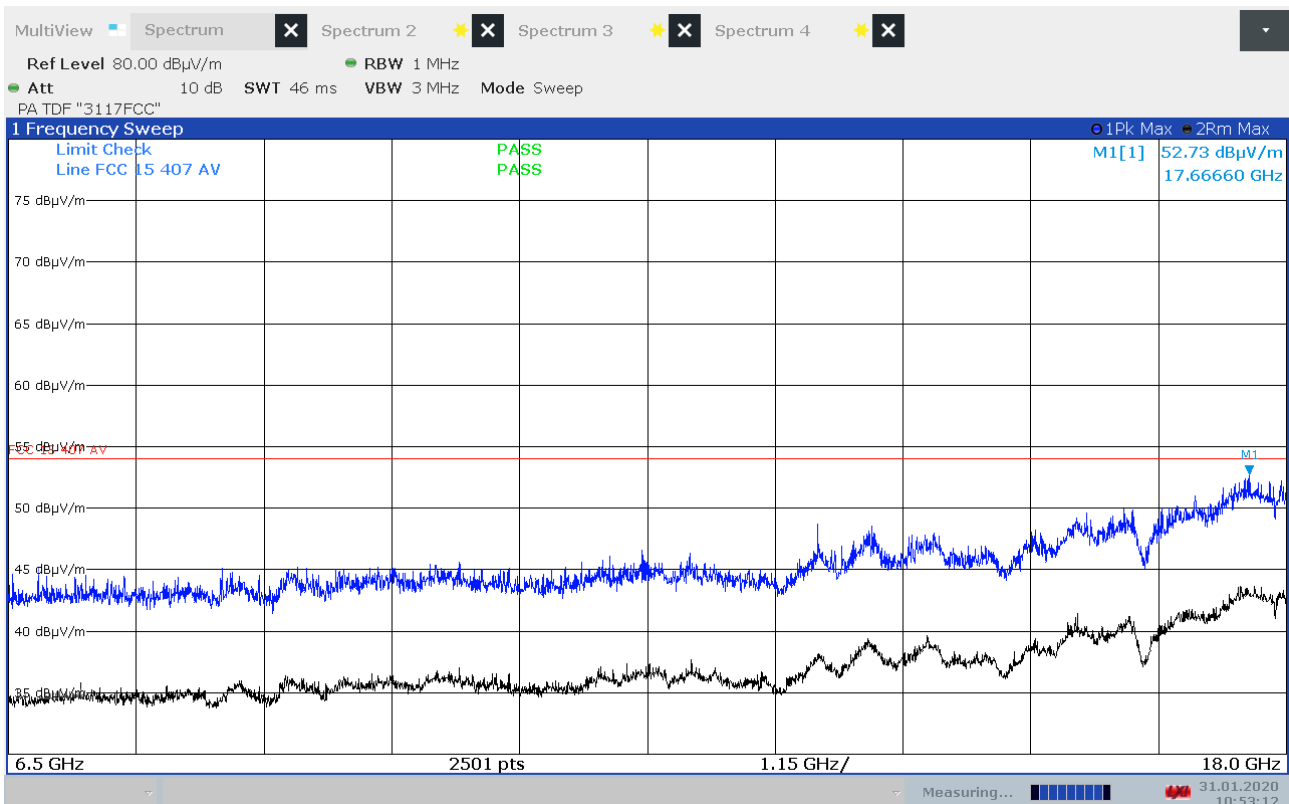
Radiated Emissions, 1000 - 6500 MHz, ch157, 802.11n MCS0, EUT V, HP



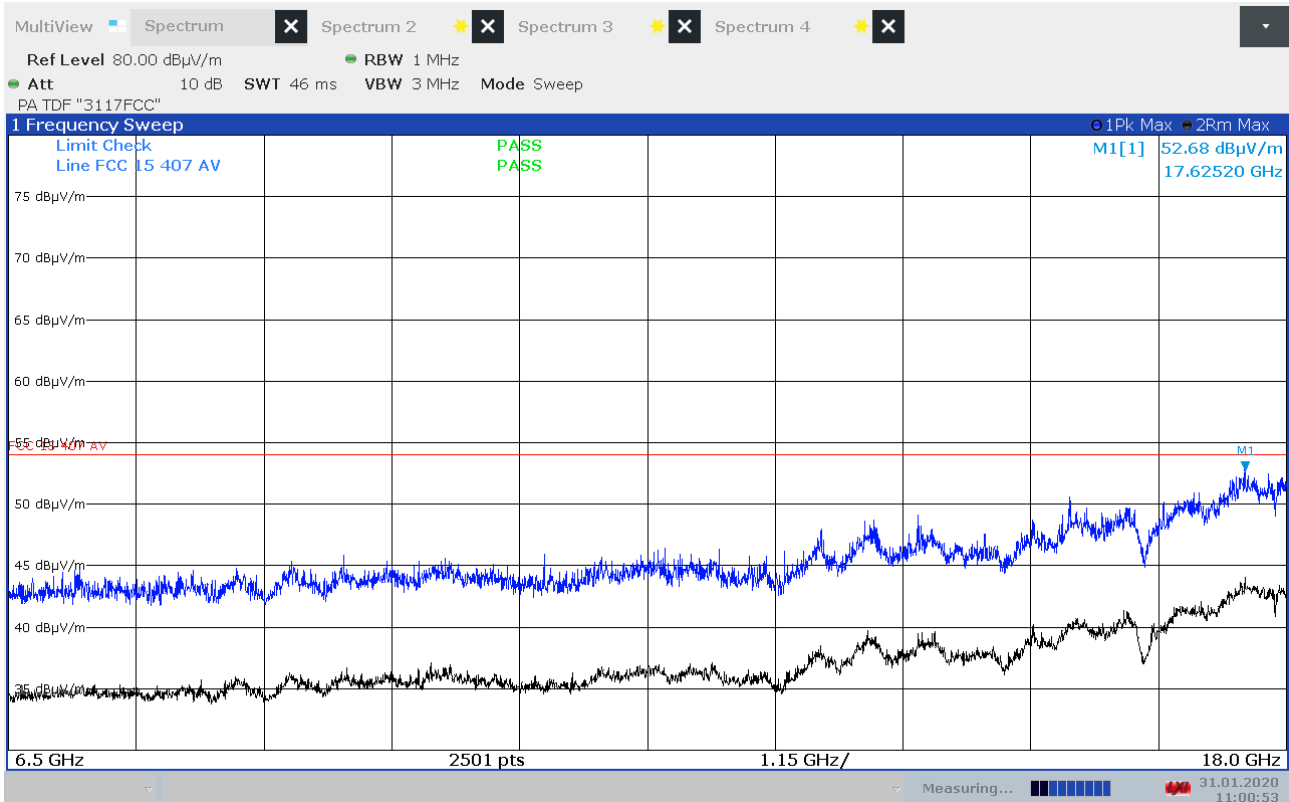
Radiated Emissions, 1000 - 6500 MHz, ch157, 802.11n MCS0, EUT V, VP



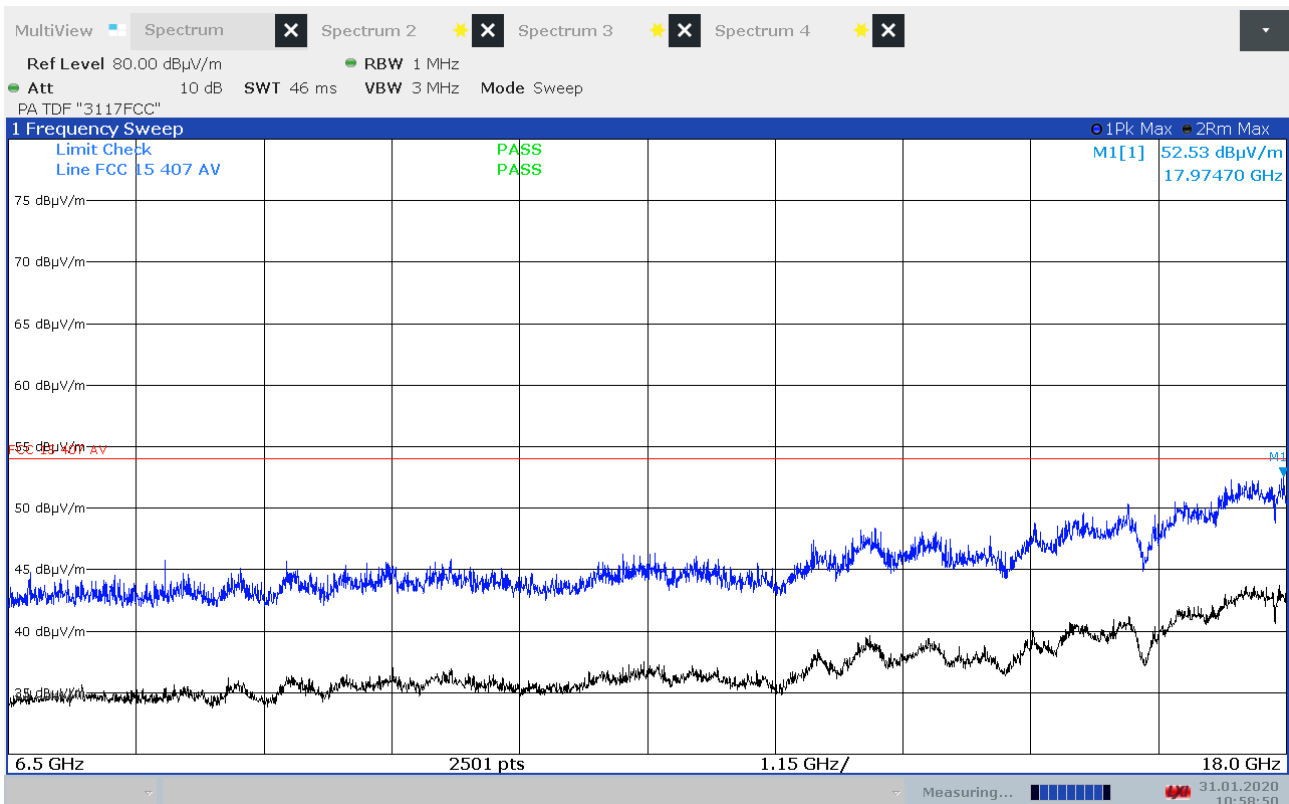
Radiated Emissions, 6500 - 18000 MHz, ch036, 802.11a 6Mbps, EUT V, HP



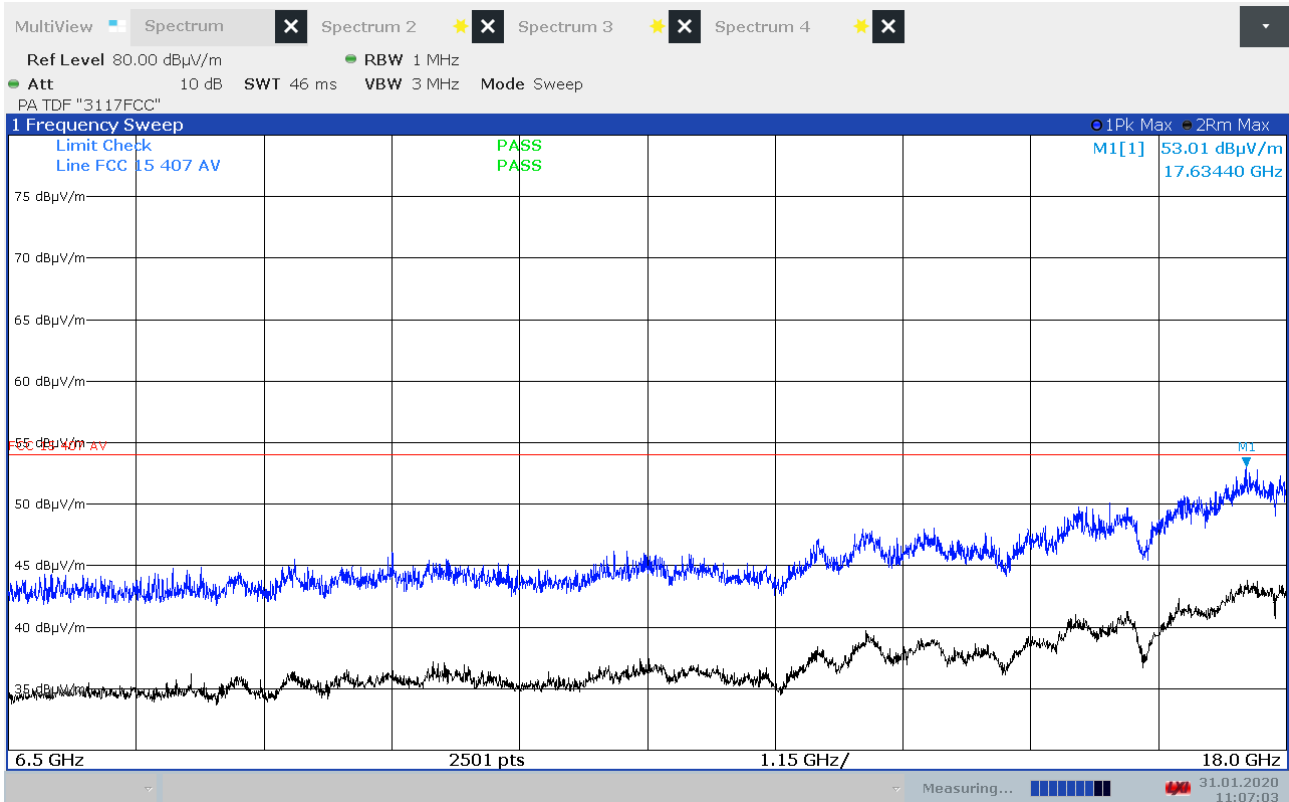
Radiated Emissions, 6500 - 18000 MHz, ch036, 802.11a 6Mbps, EUT V, VP



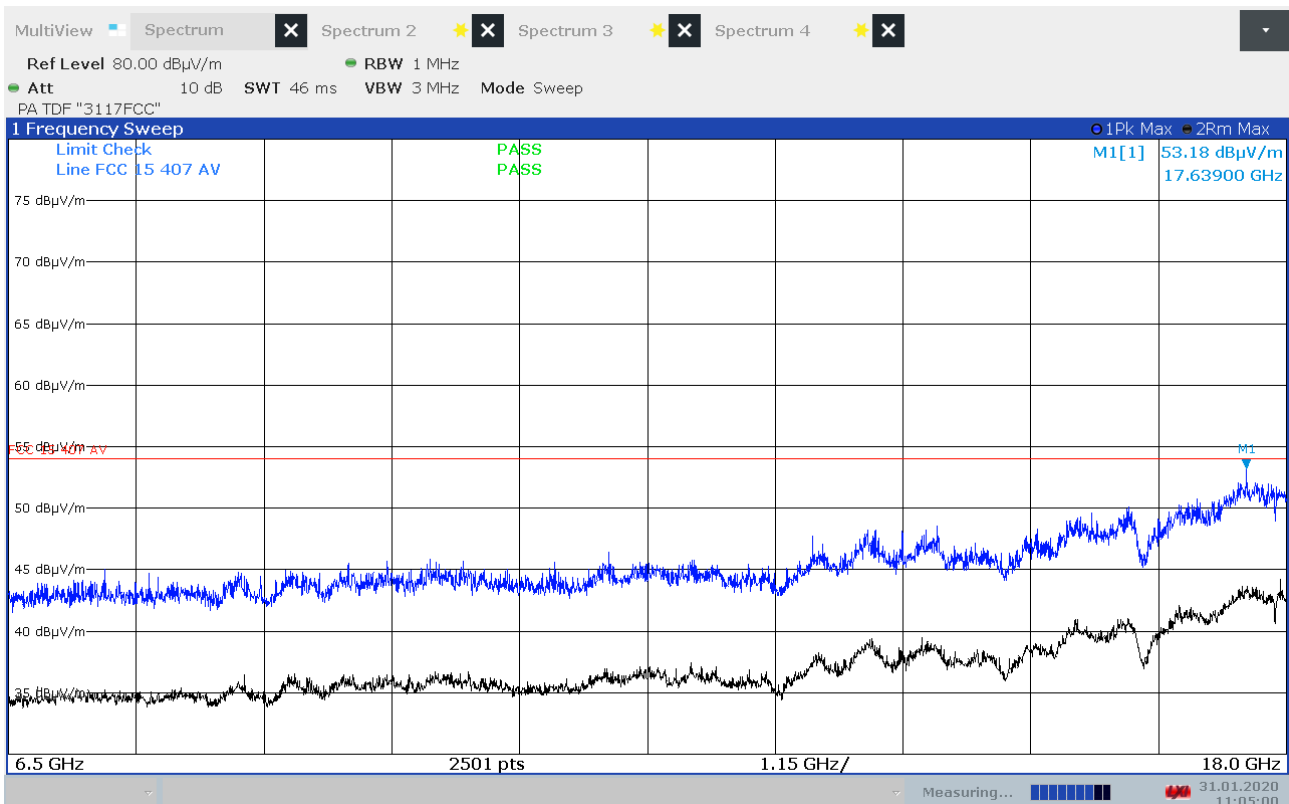
Radiated Emissions, 6500 - 18000 MHz, ch048, 802.11a 6Mbps, EUT V, HP



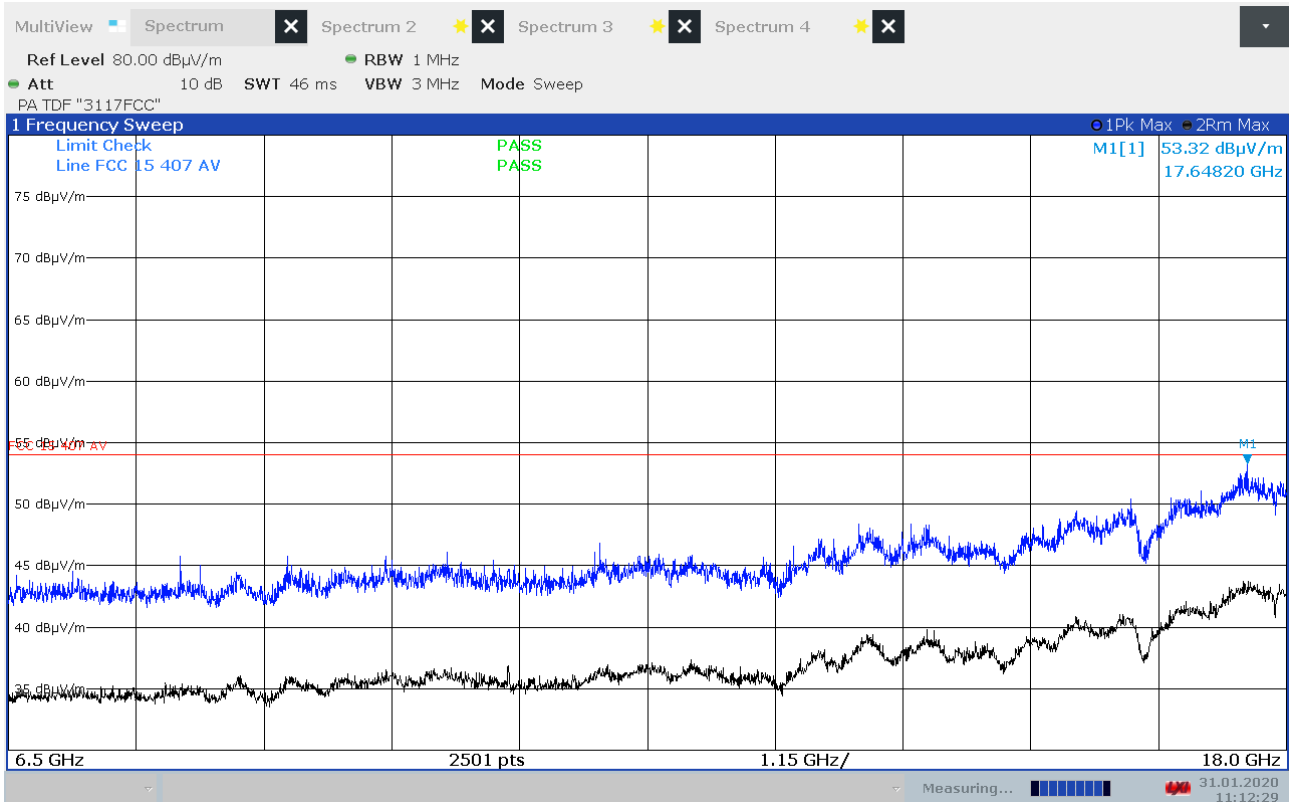
Radiated Emissions, 6500 - 18000 MHz, ch048, 802.11a 6Mbps, EUT V, VP



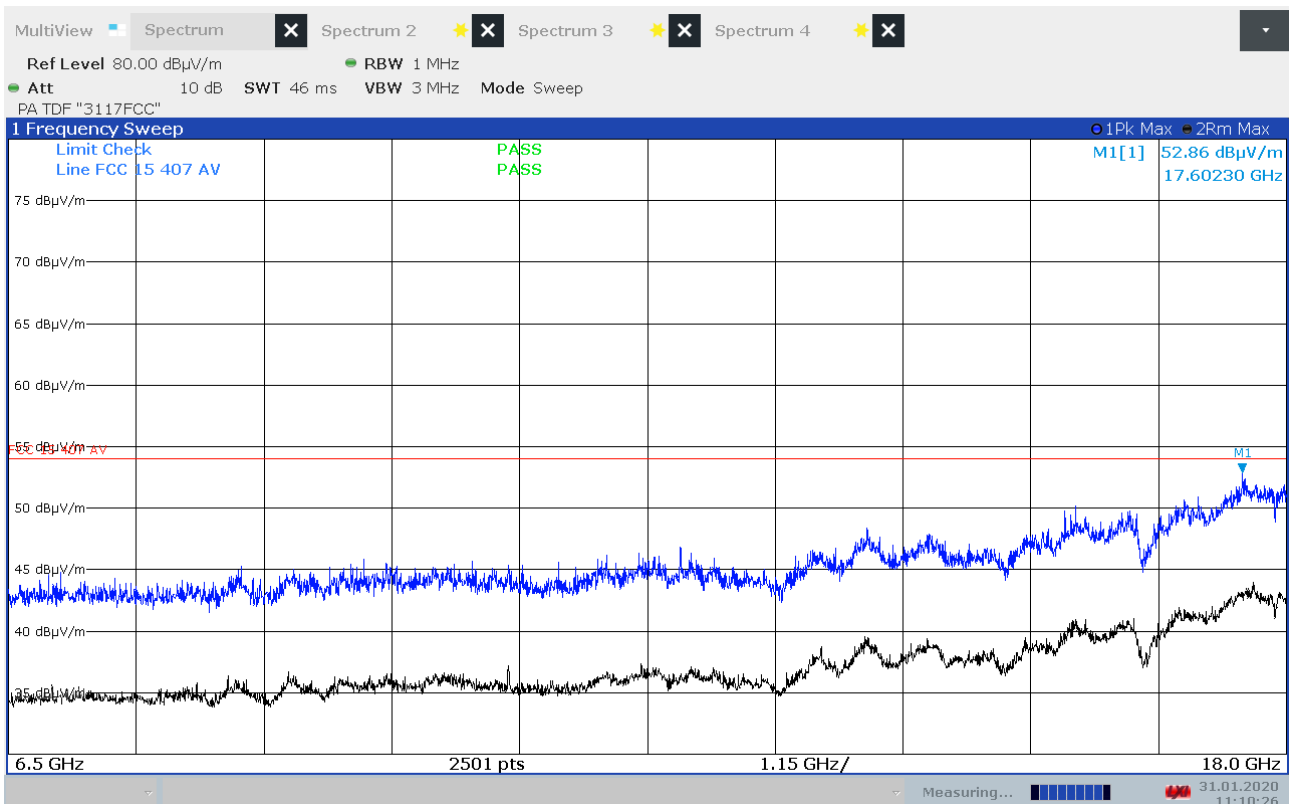
Radiated Emissions, 6500 - 18000 MHz, ch064, 802.11a 6Mbps, EUT V, HP



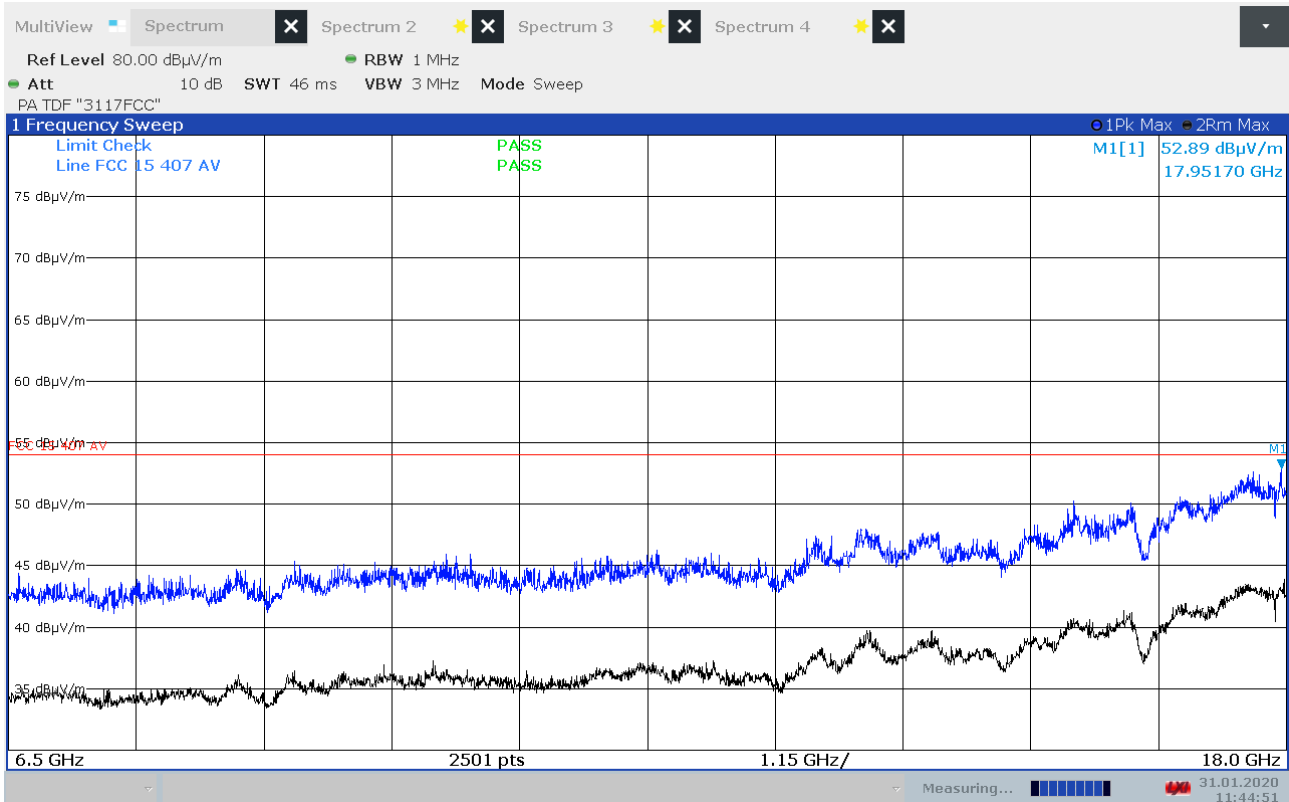
Radiated Emissions, 6500 - 18000 MHz, ch064, 802.11a 6Mbps, EUT V, VP



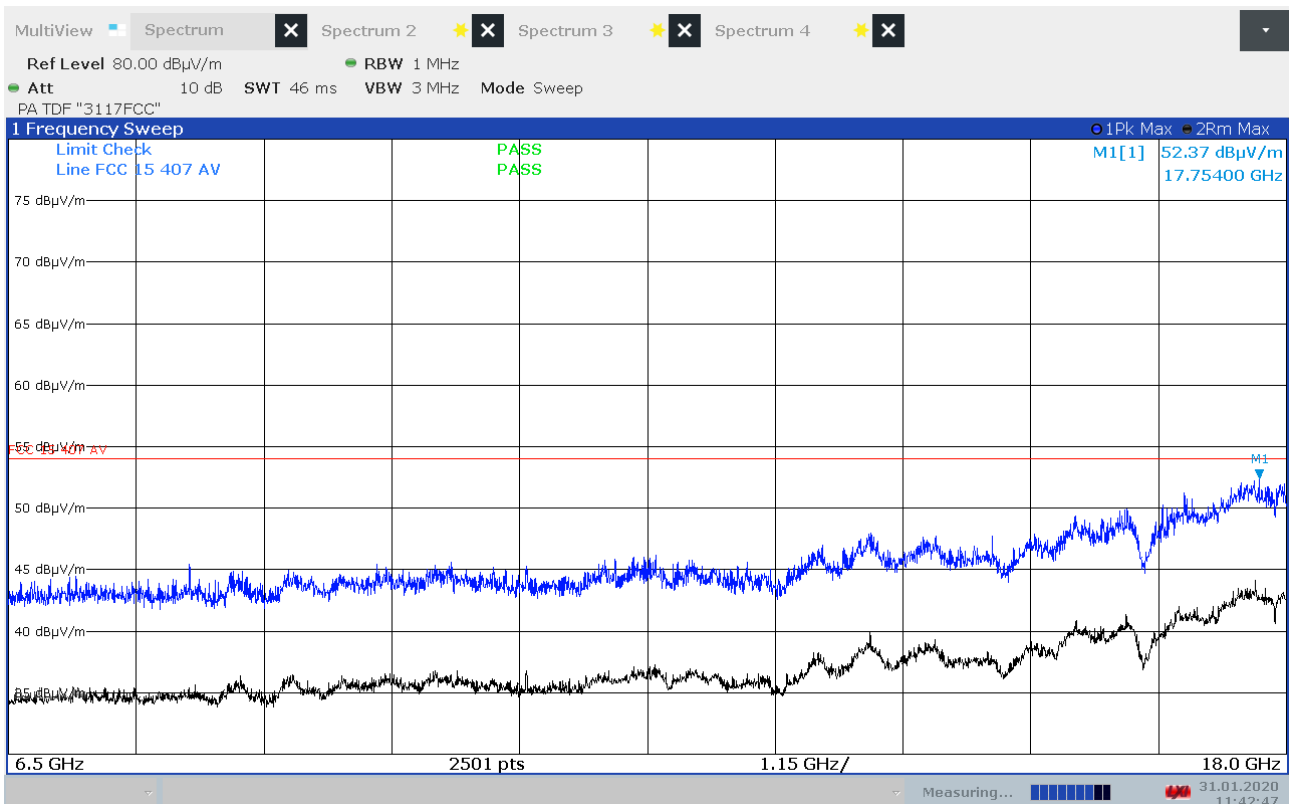
Radiated Emissions, 6500 - 18000 MHz, ch100, 802.11a 6Mbps, EUT V, HP



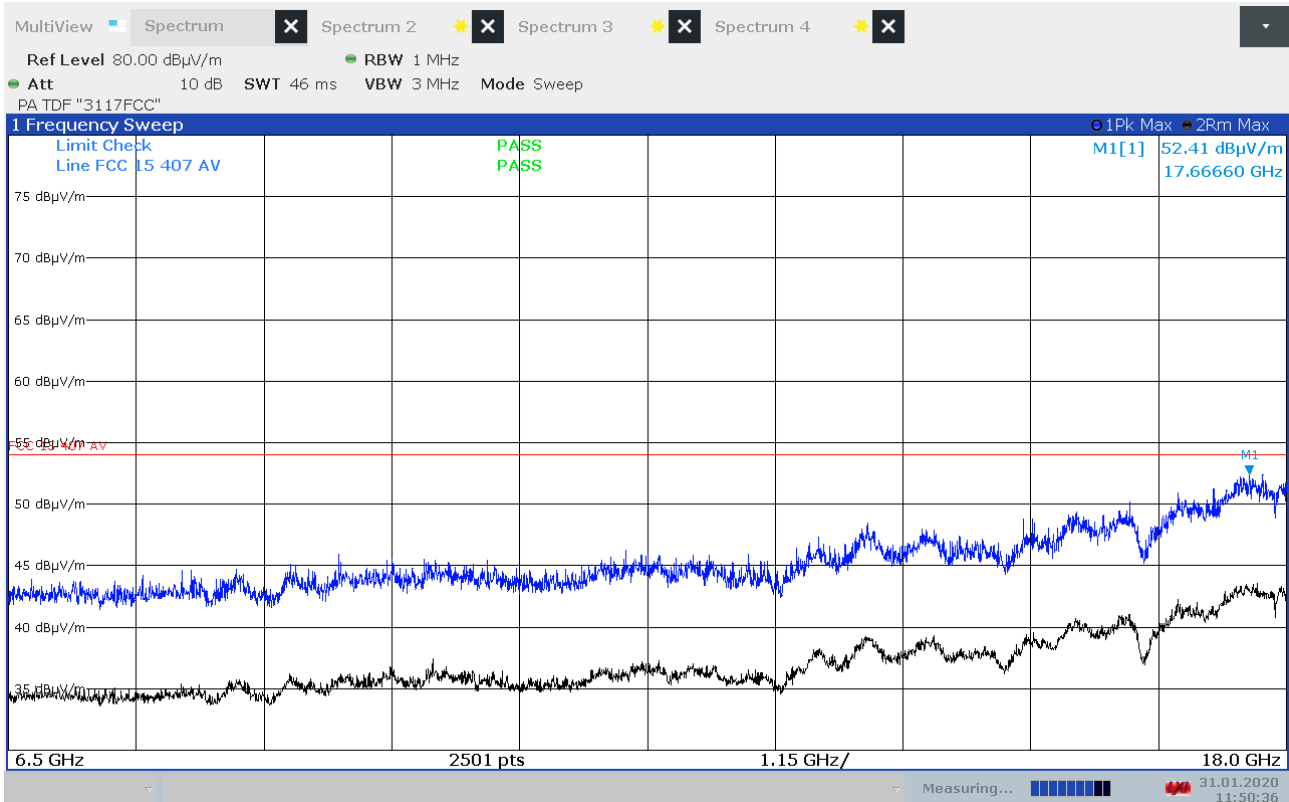
Radiated Emissions, 6500 - 18000 MHz, ch100, 802.11a 6Mbps, EUT V, VP



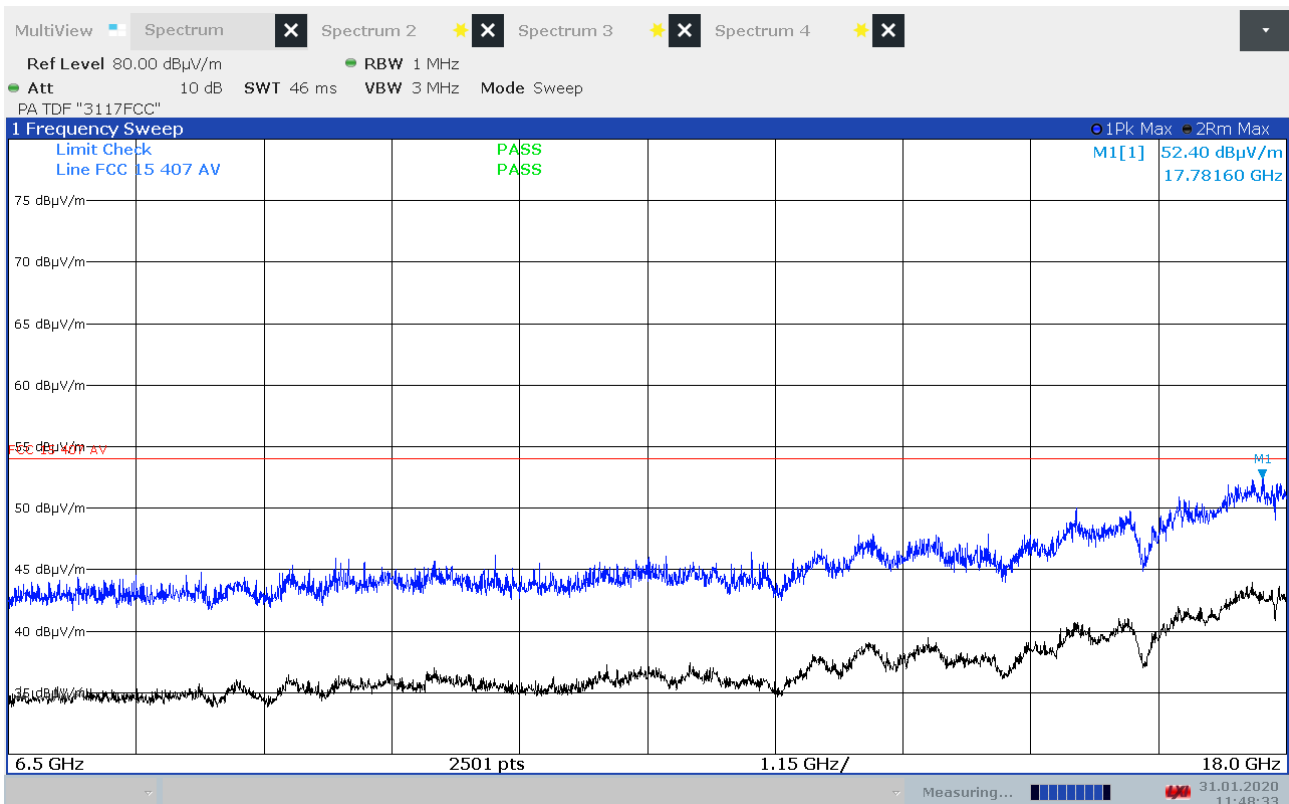
Radiated Emissions, 6500 - 18000 MHz, ch116, 802.11a 6Mbps, EUT V, HP



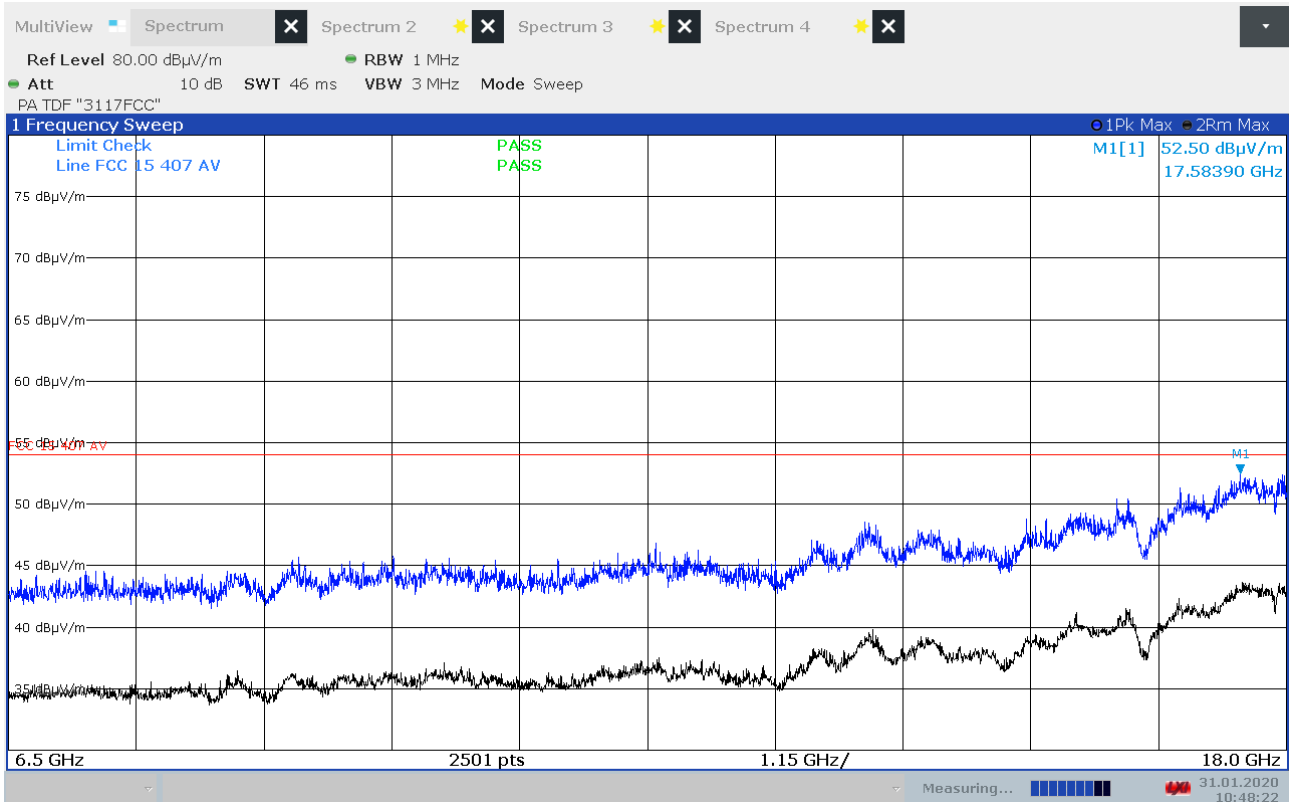
Radiated Emissions, 6500 - 18000 MHz, ch116, 802.11a 6Mbps, EUT V, VP



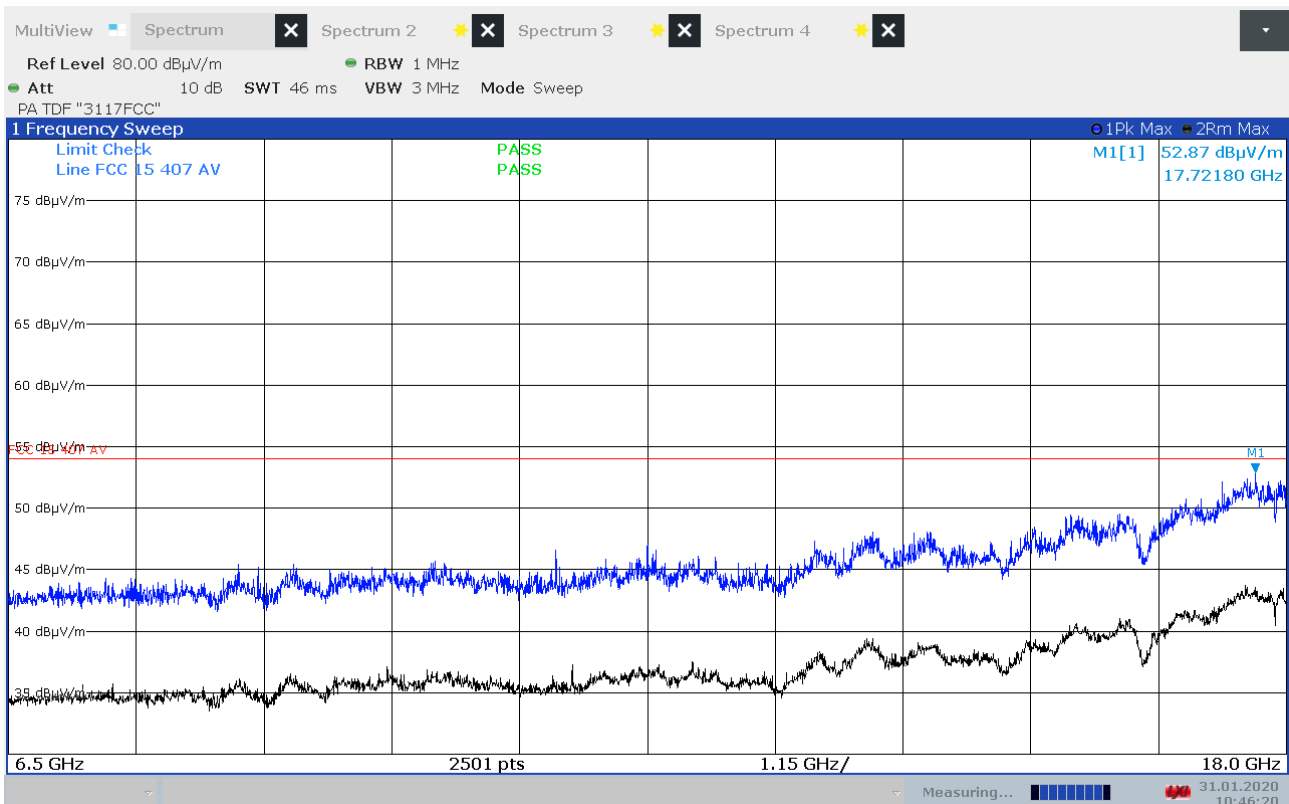
Radiated Emissions, 6500 - 18000 MHz, ch140, 802.11a 6Mbps, EUT V, HP



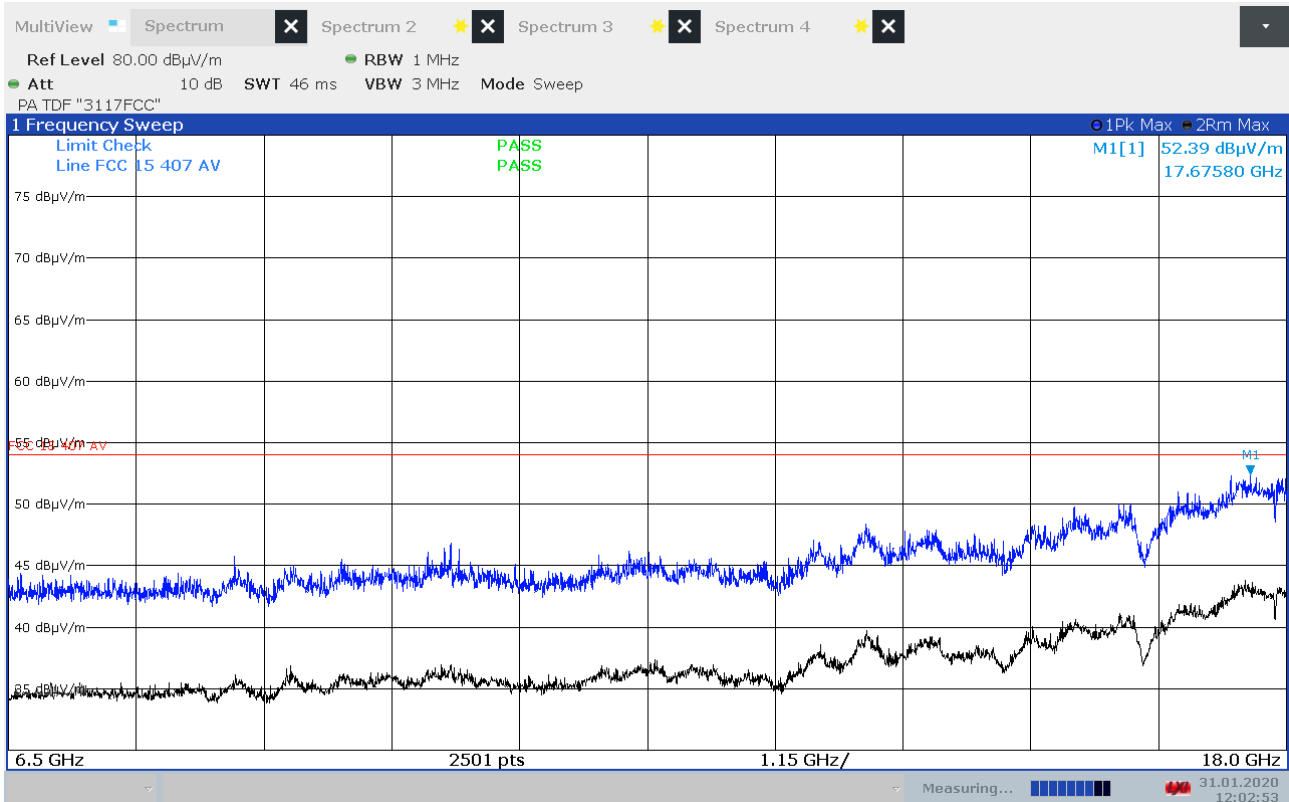
Radiated Emissions, 6500 - 18000 MHz, ch140, 802.11a 6Mbps, EUT V, VP



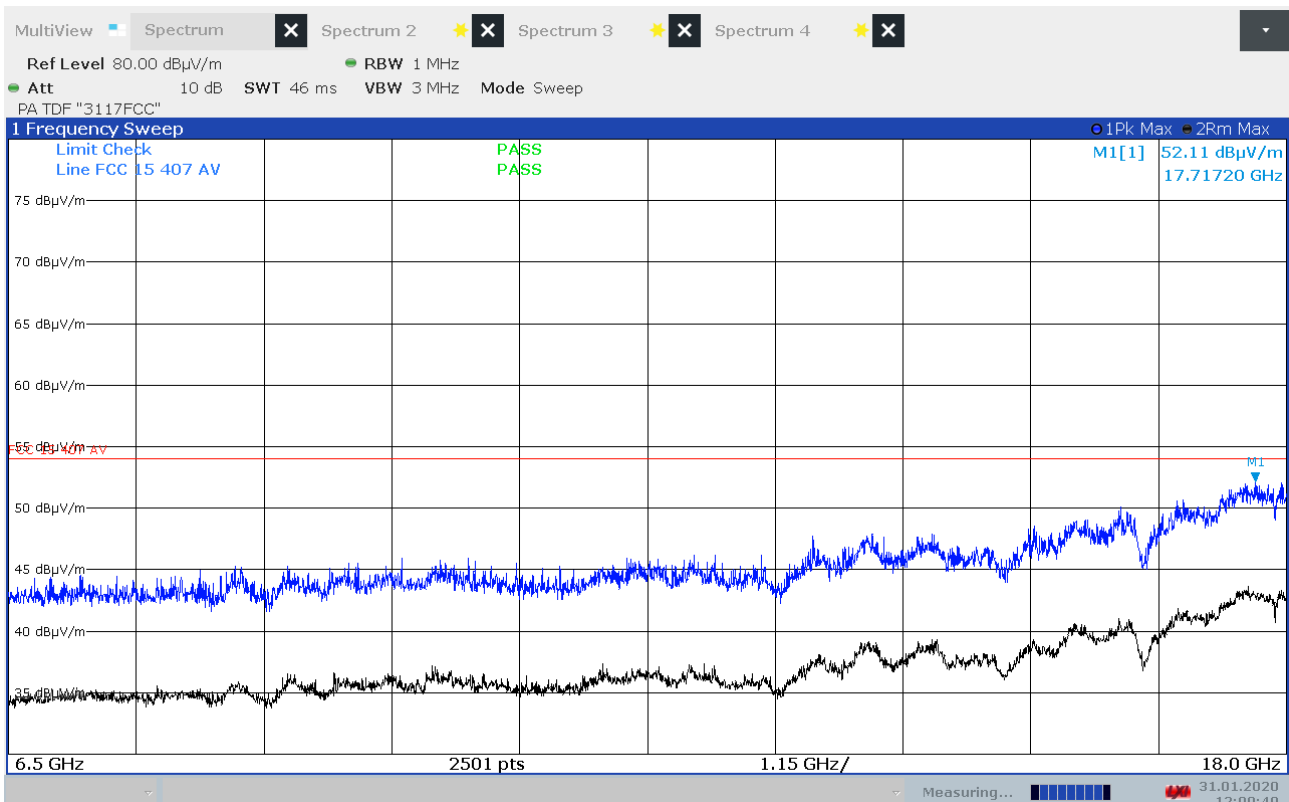
Radiated Emissions, 6500 - 18000 MHz, ch157, 802.11a 6Mbps, EUT V, HP



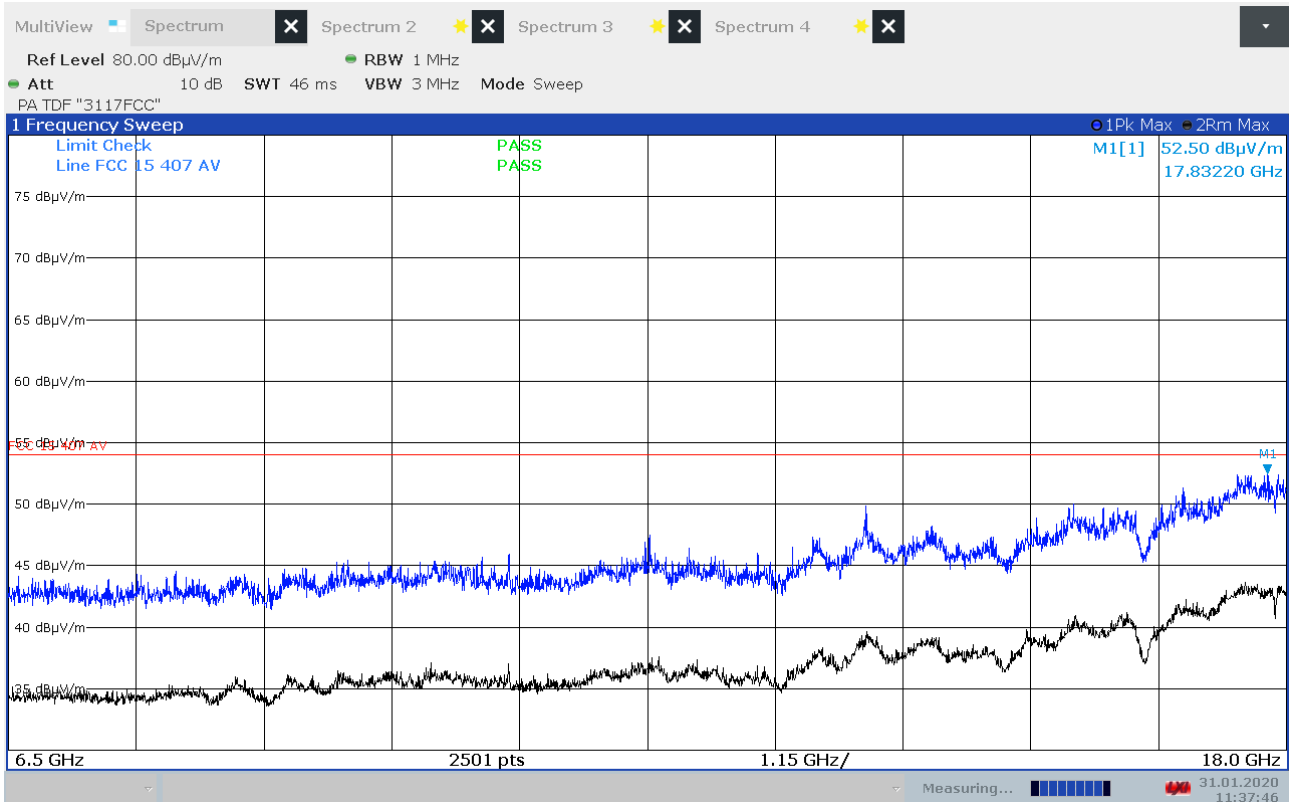
Radiated Emissions, 6500 - 18000 MHz, ch157, 802.11a 6Mbps, EUT V, VP



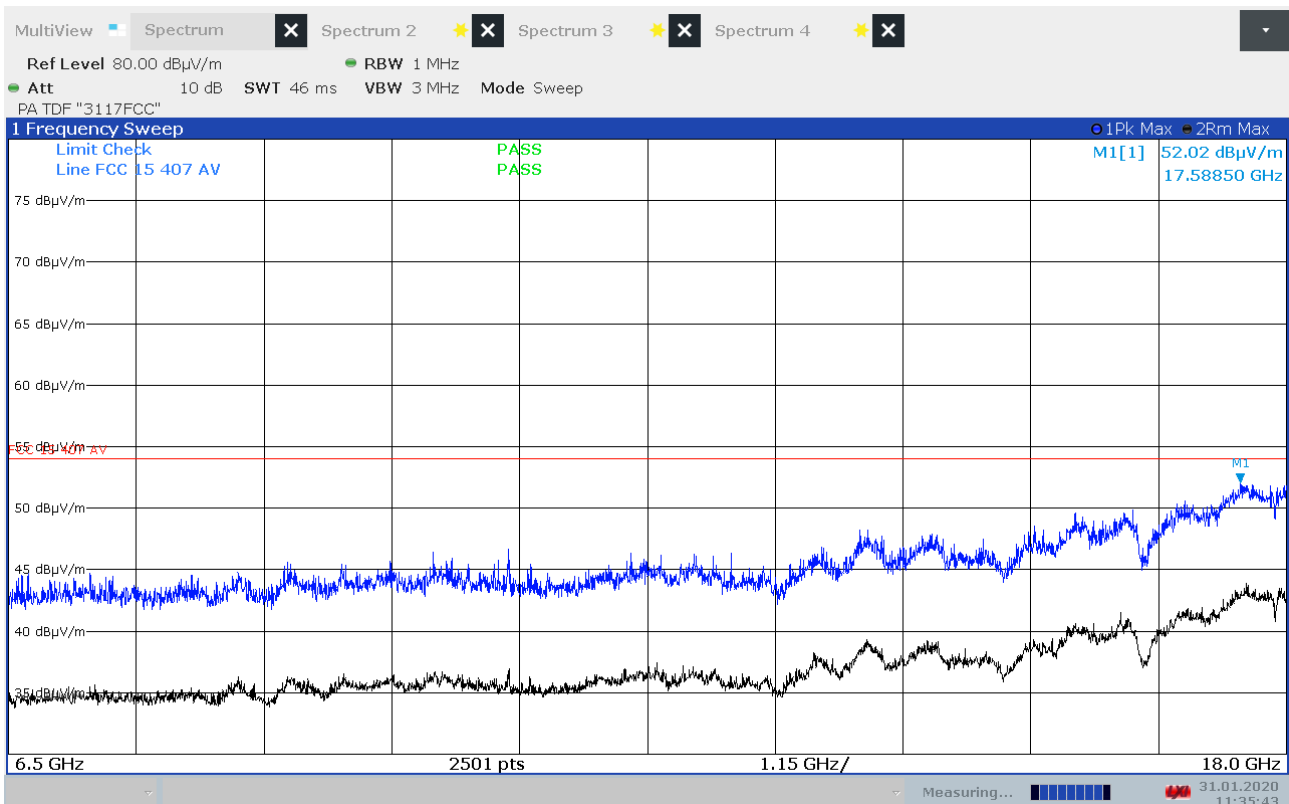
Radiated Emissions, 6500 - 18000 MHz, ch048, 802.11n MCS0, EUT V, HP



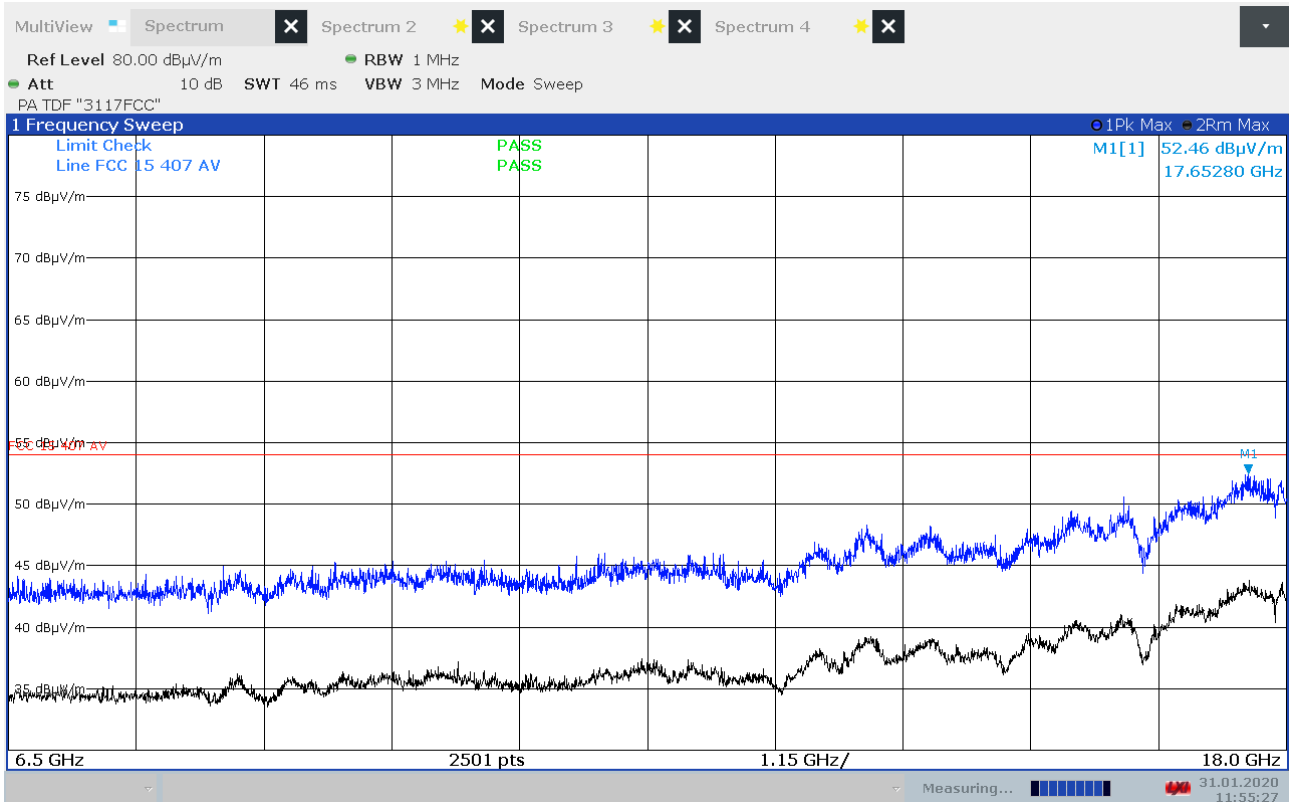
Radiated Emissions, 6500 - 18000 MHz, ch048, 802.11n MCS0, EUT V, VP



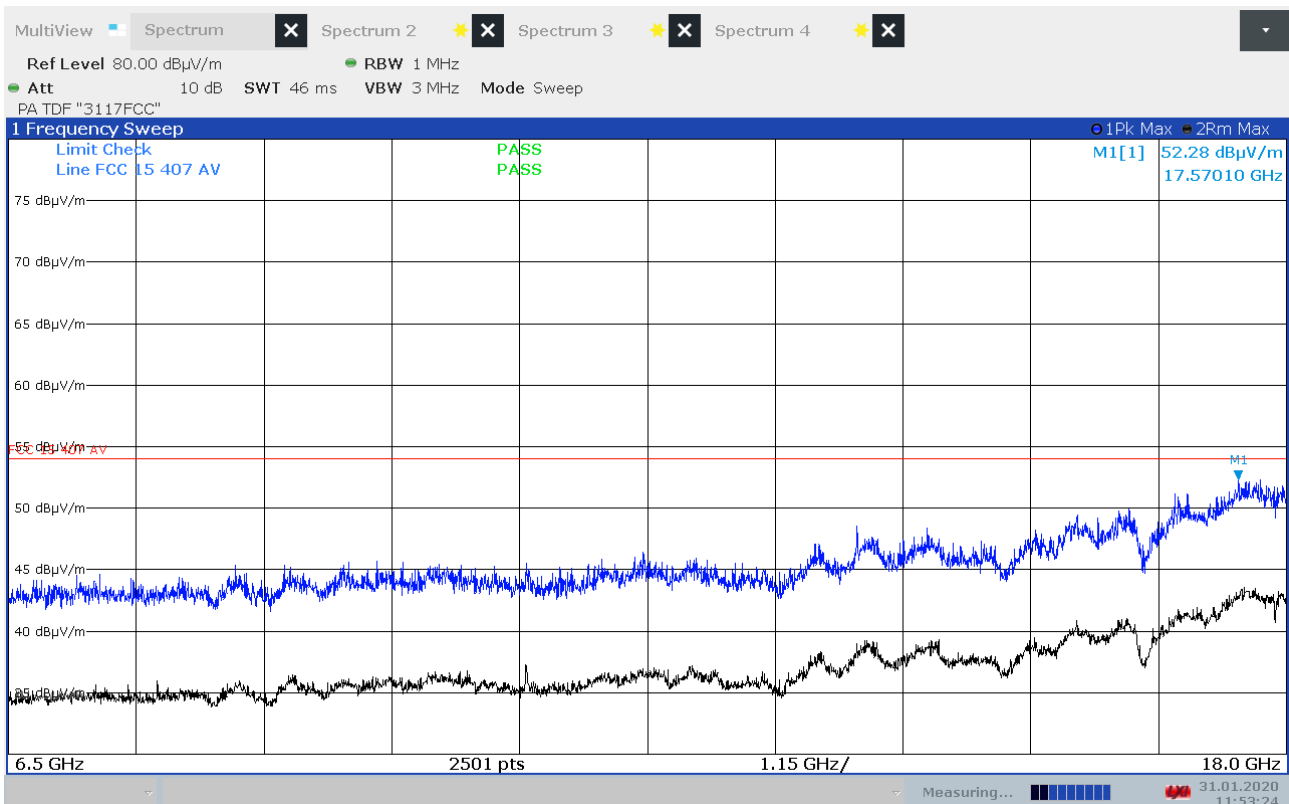
Radiated Emissions, 6500 - 18000 MHz, ch100, 802.11n MCS0, EUT V, HP



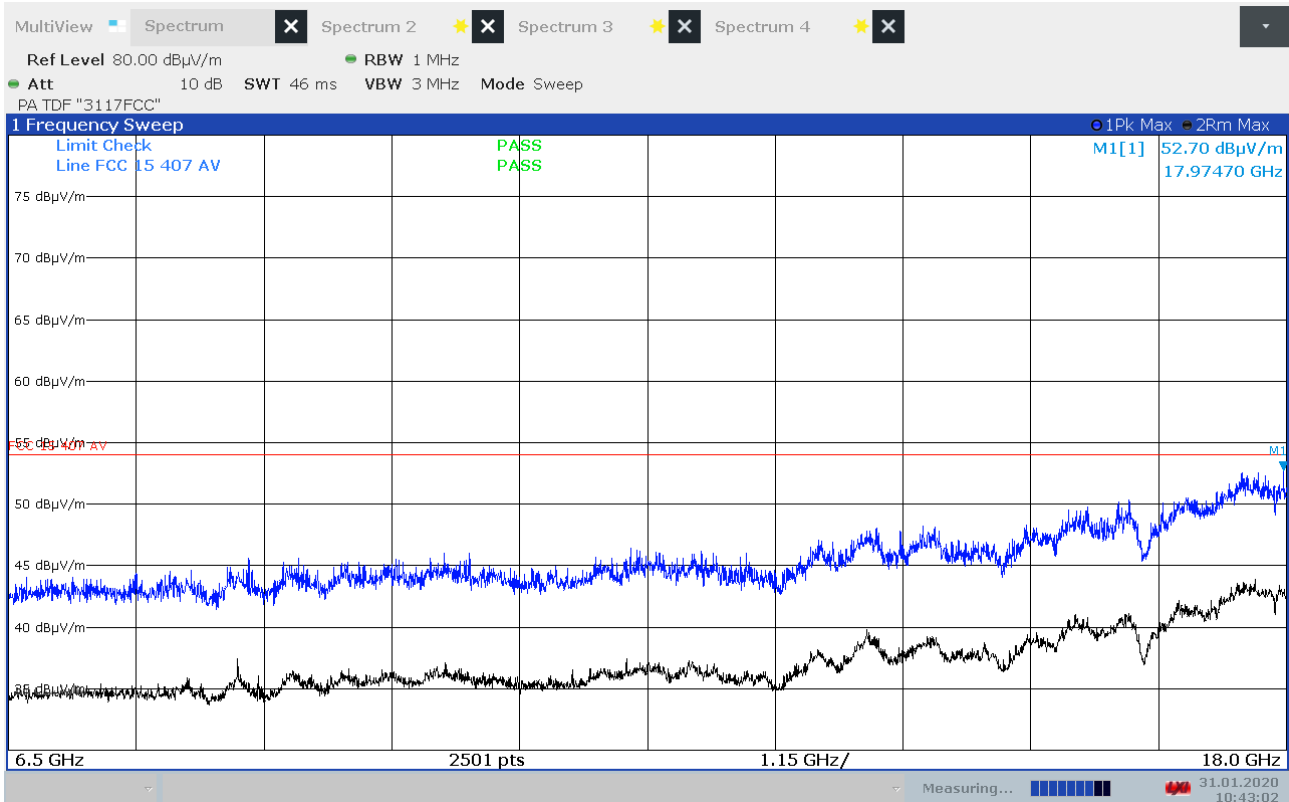
Radiated Emissions, 6500 - 18000 MHz, ch100, 802.11n MCS0, EUT V, VP



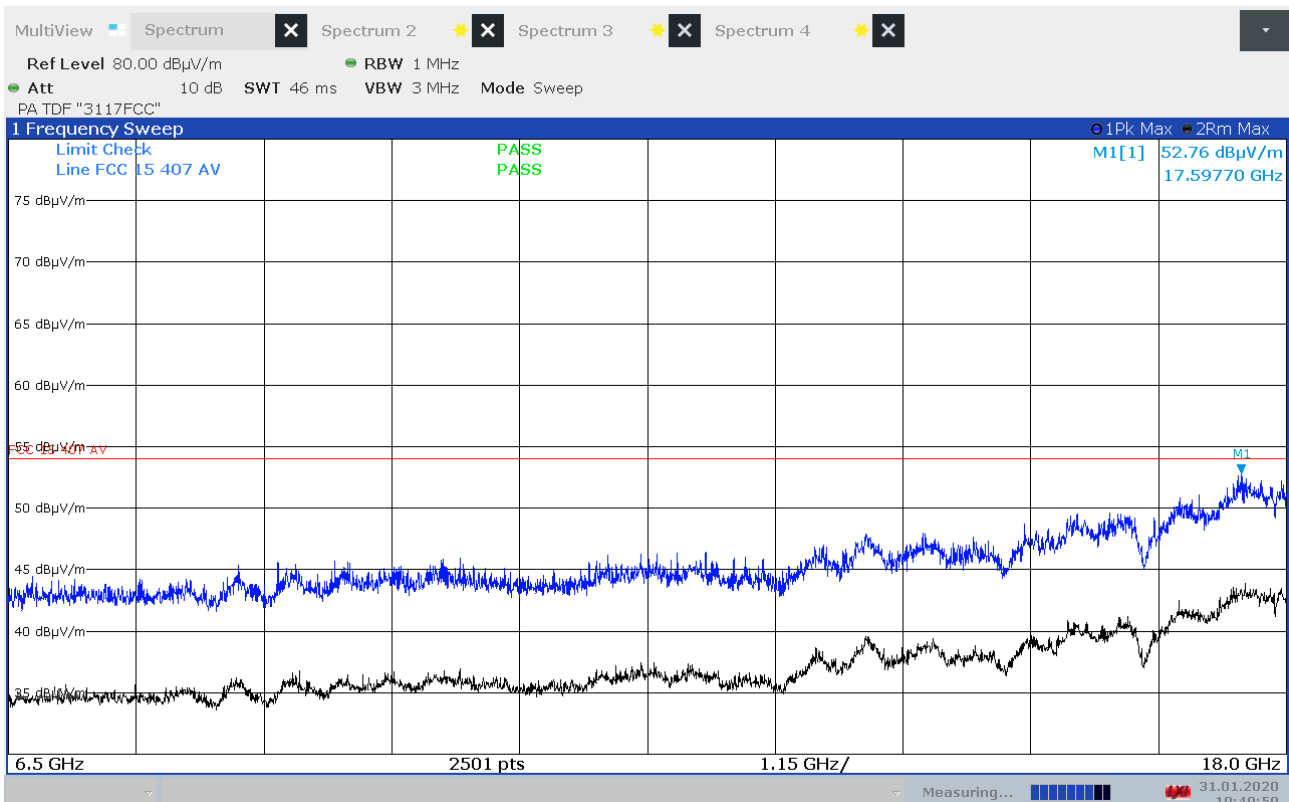
Radiated Emissions, 6500 - 18000 MHz, ch116, 802.11n MCS0, EUT V, HP



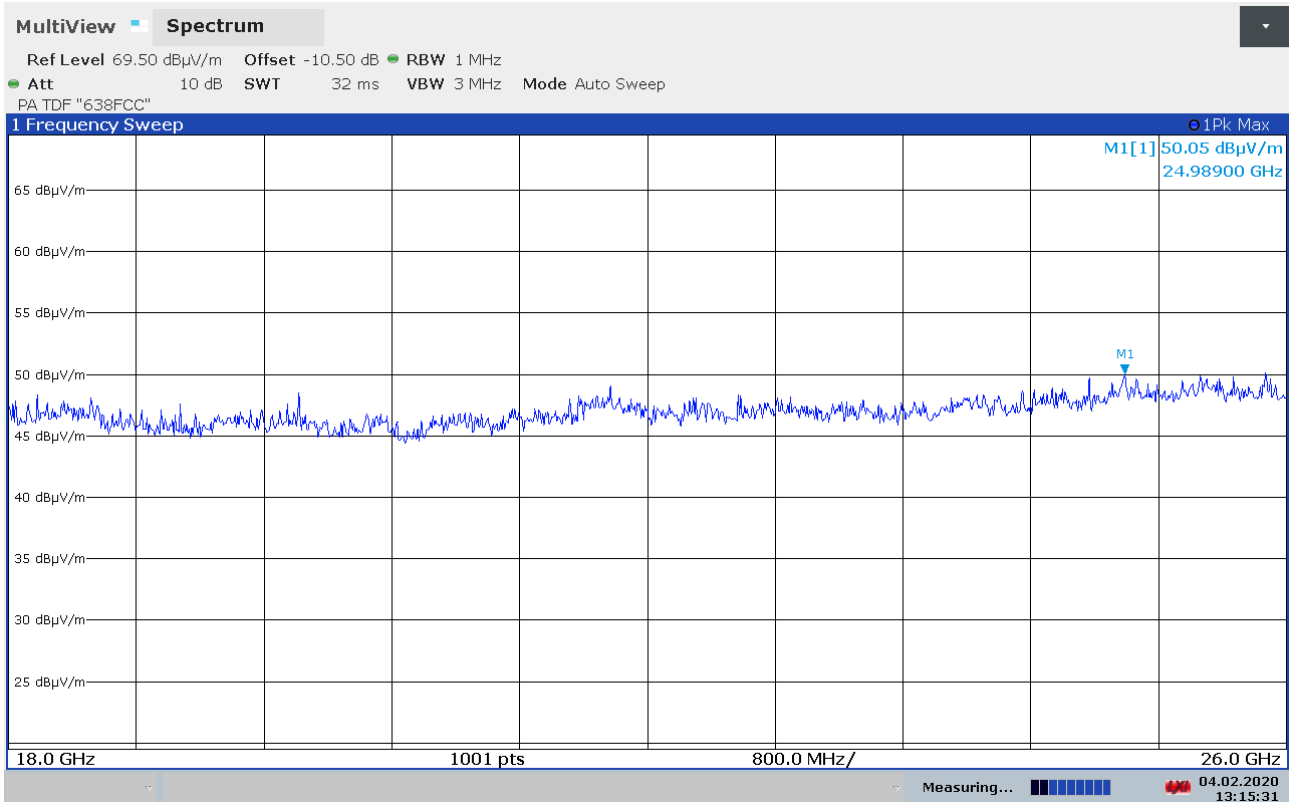
Radiated Emissions, 6500 - 18000 MHz, ch116, 802.11n MCS0, EUT V, VP



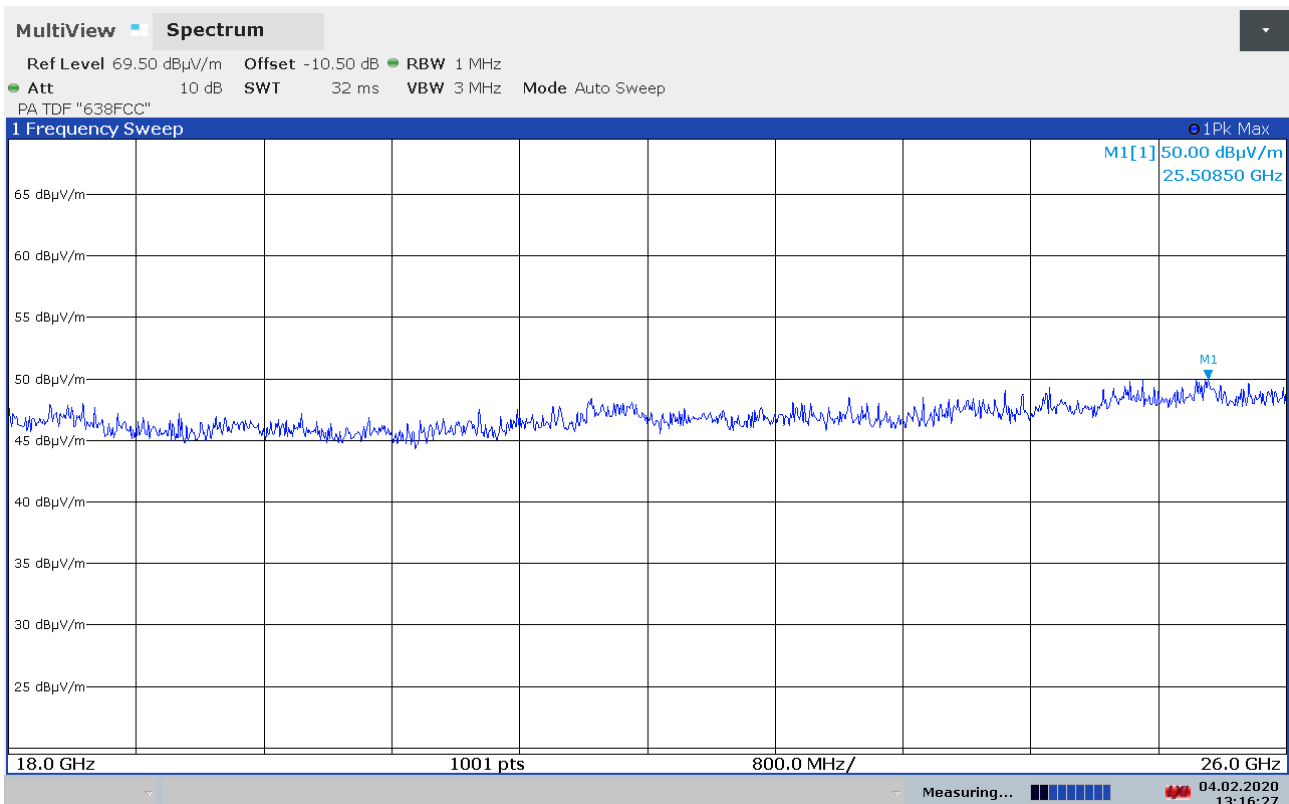
Radiated Emissions, 6500 - 18000 MHz, ch157, 802.11n MCS0, EUT V, HP



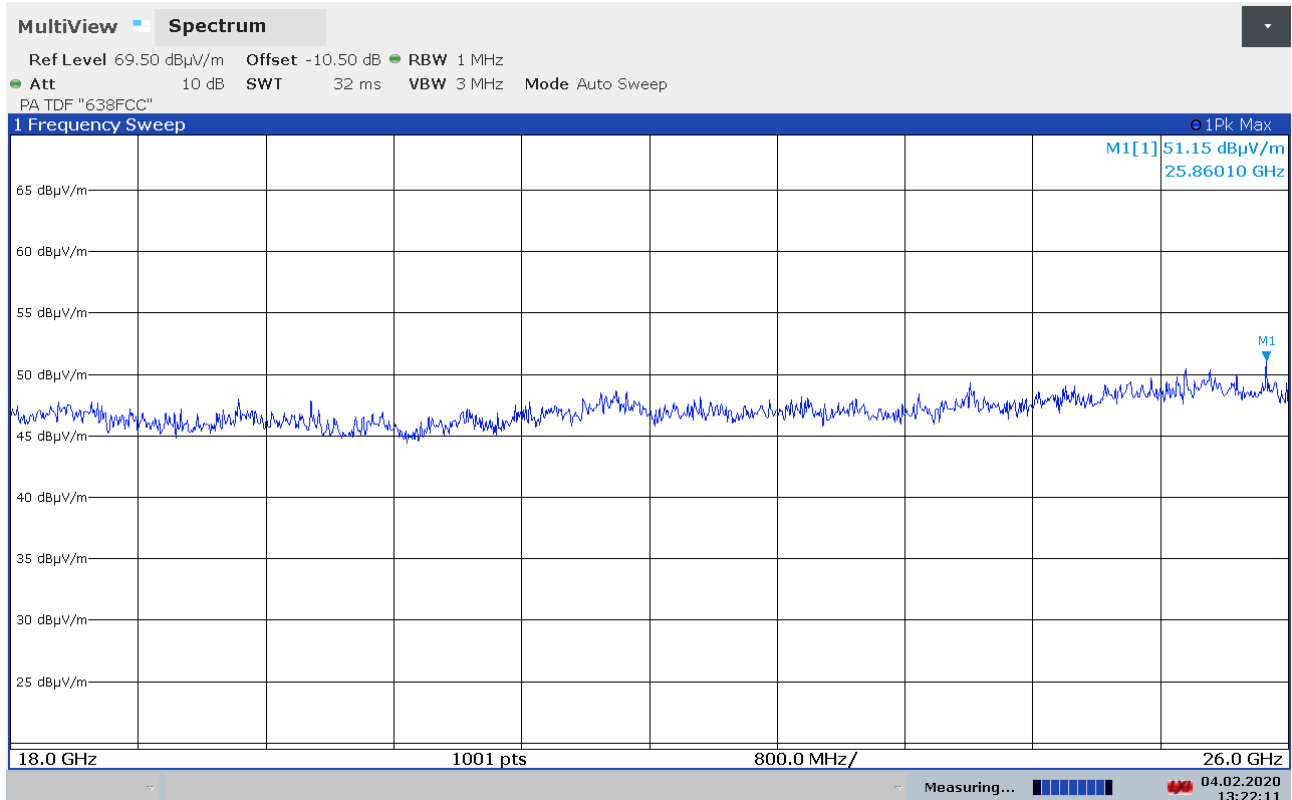
Radiated Emissions, 6500 - 18000 MHz, ch157, 802.11n MCS0, EUT V, VP



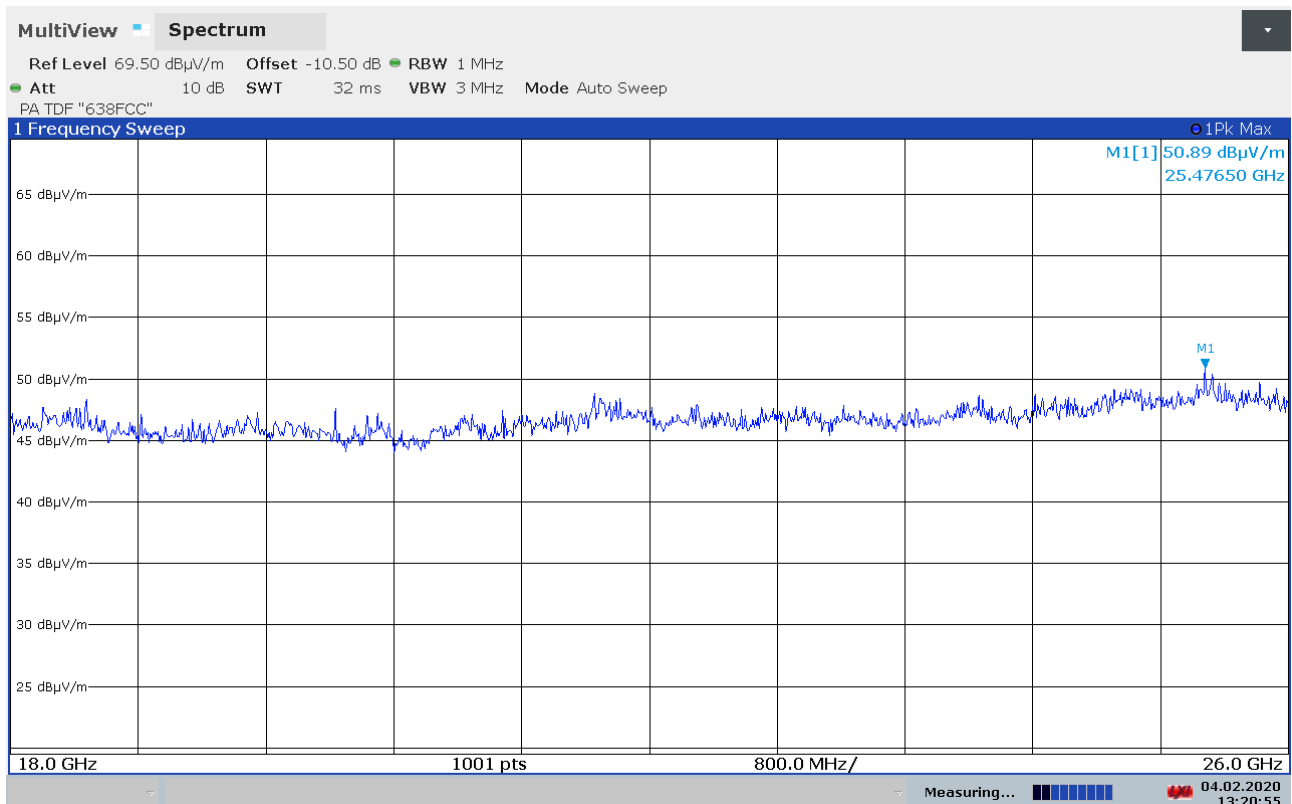
Radiated Emissions, 18 – 26 GHz, Ch048, 802.11a 6Mbps, EUT V, HP, @1m



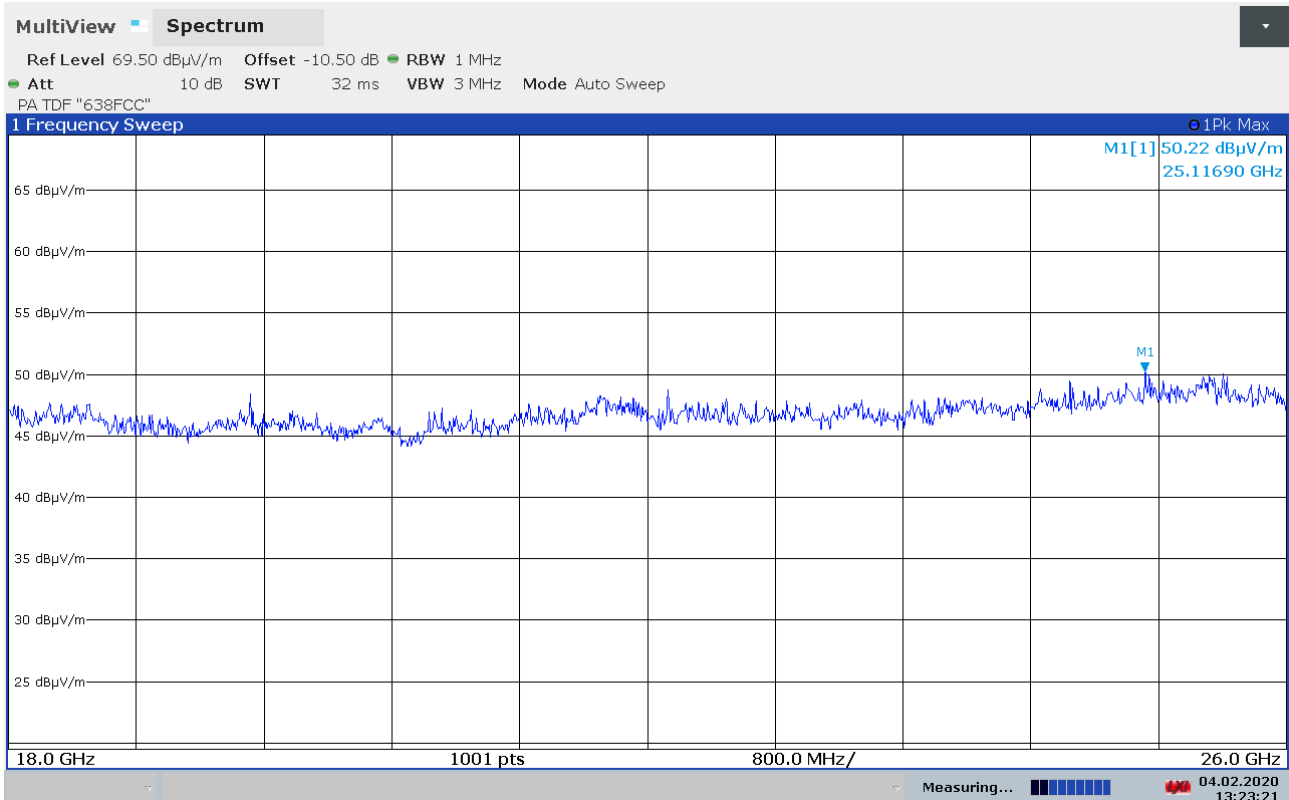
Radiated Emissions, 18 – 26 GHz, Ch048, 802.11n MCS0, EUT V, VP, @1m



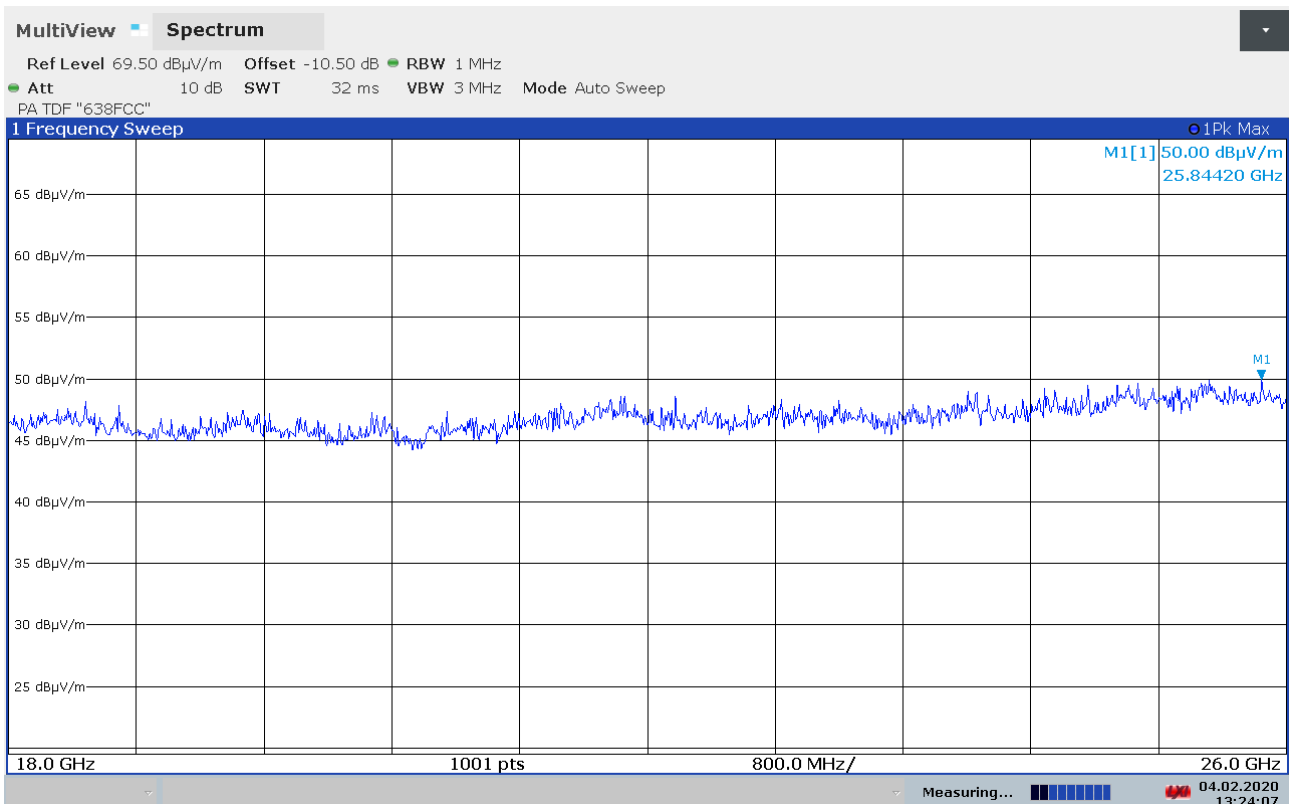
Radiated Emissions, 18 – 26 GHz, Ch116, 802.11a 6Mbps, EUT V, HP, @1m



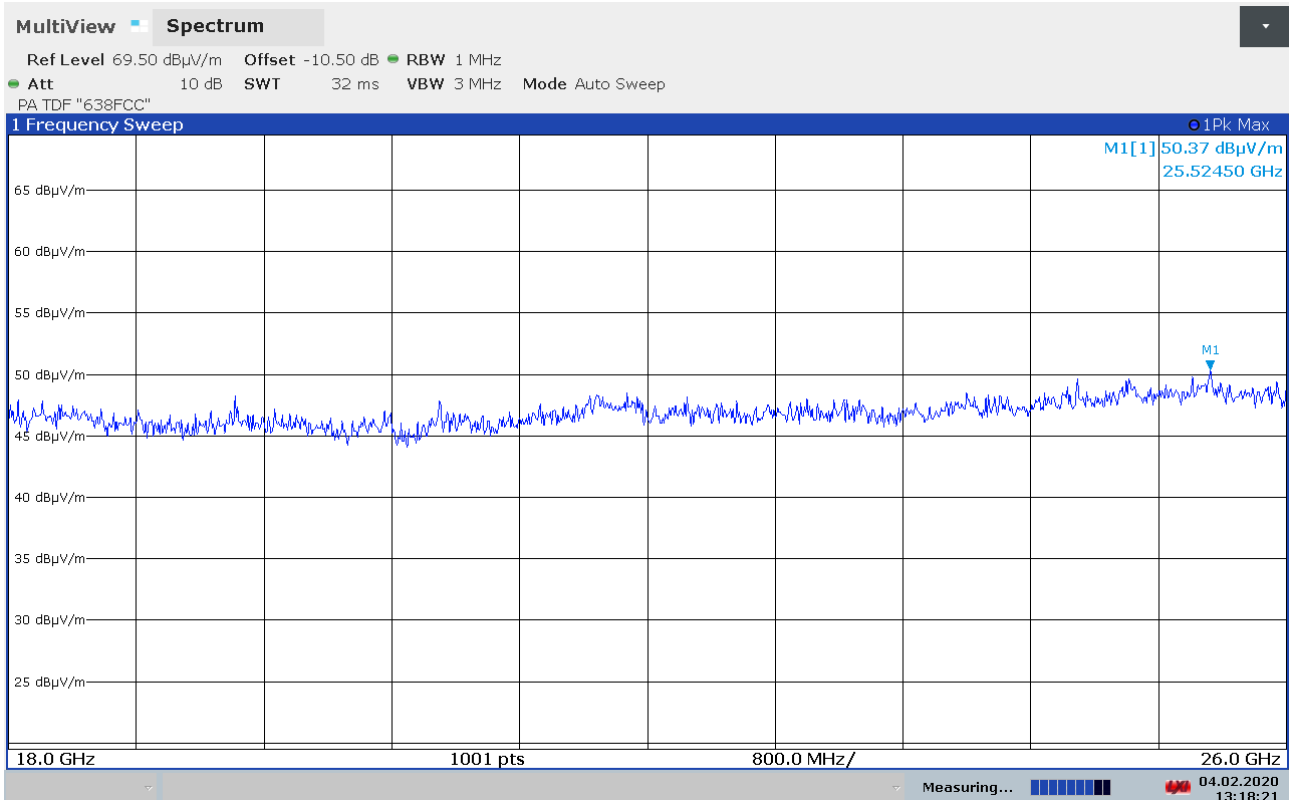
Radiated Emissions, 18 – 26 GHz, Ch116, 802.11n MCS0, EUT V, VP, @1m



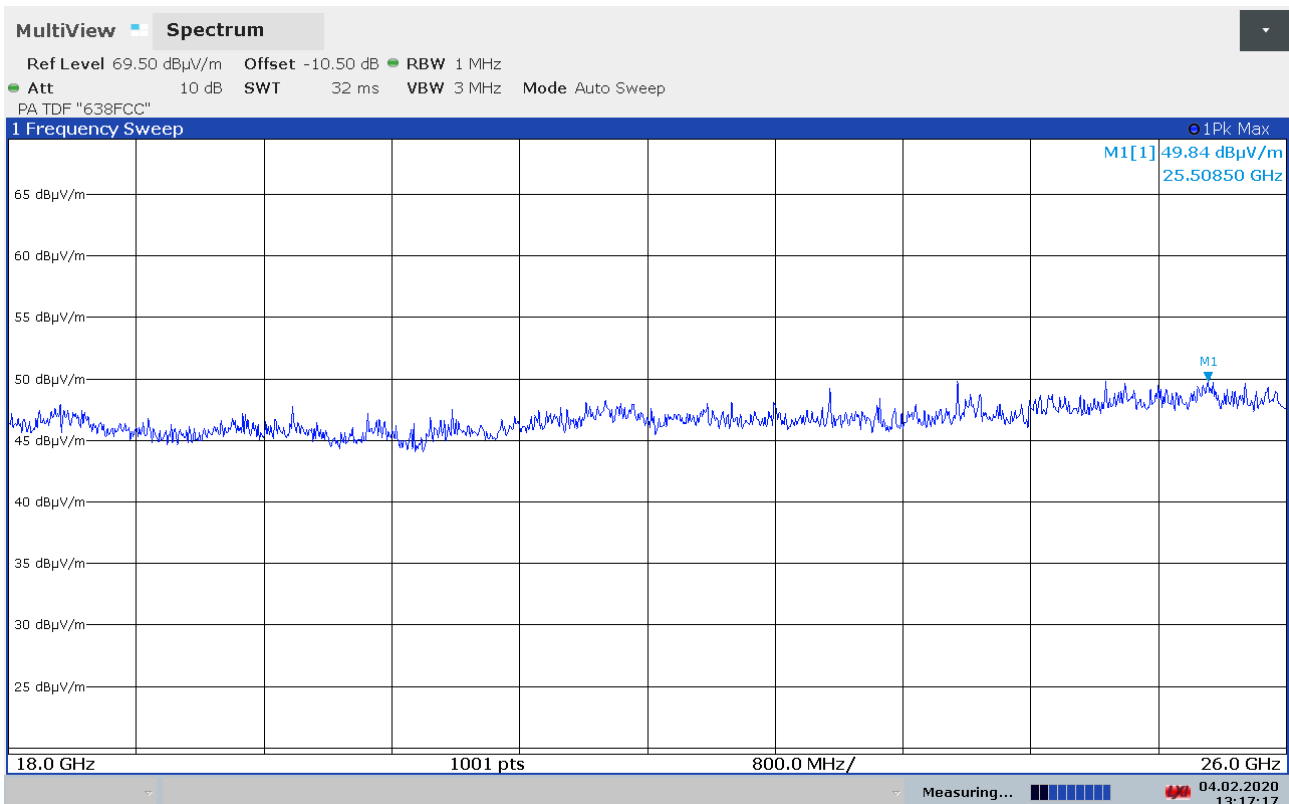
Radiated Emissions, 18 – 26 GHz, Ch157, 802.11a 6Mbps, EUT V, HP, @1m



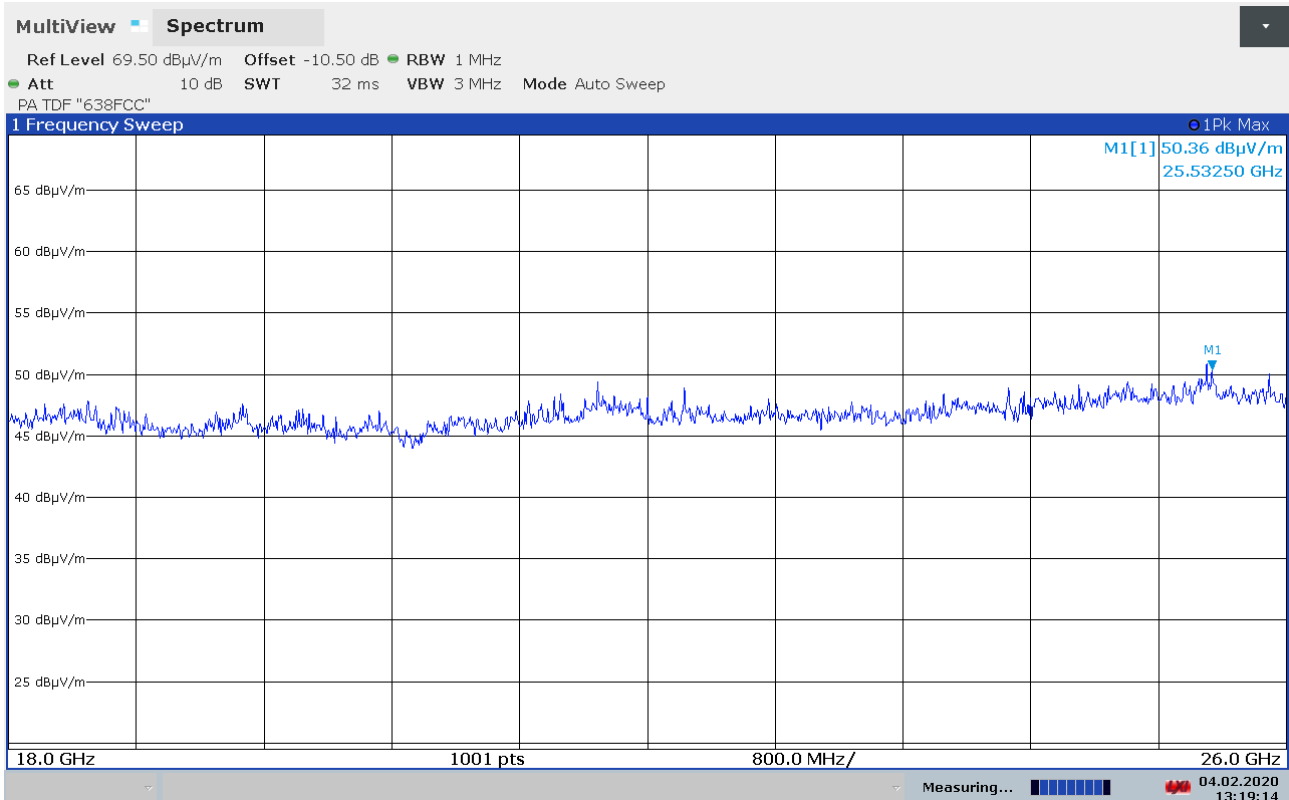
Radiated Emissions, 18 – 26 GHz, Ch157, 802.11n MCS0, EUT V, VP, @1m



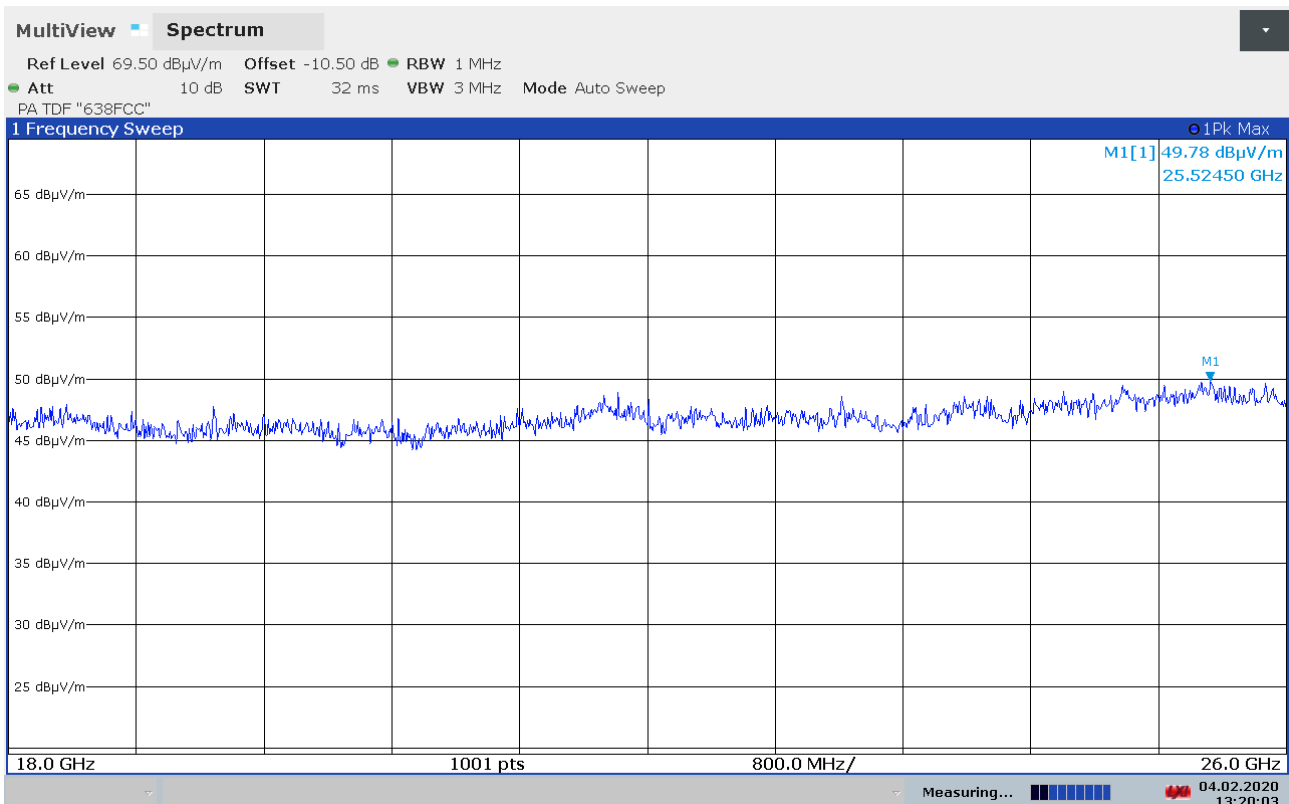
Radiated Emissions, 18 – 26 GHz, Ch048, 802.11n MCS0, EUT V, HP, @1m



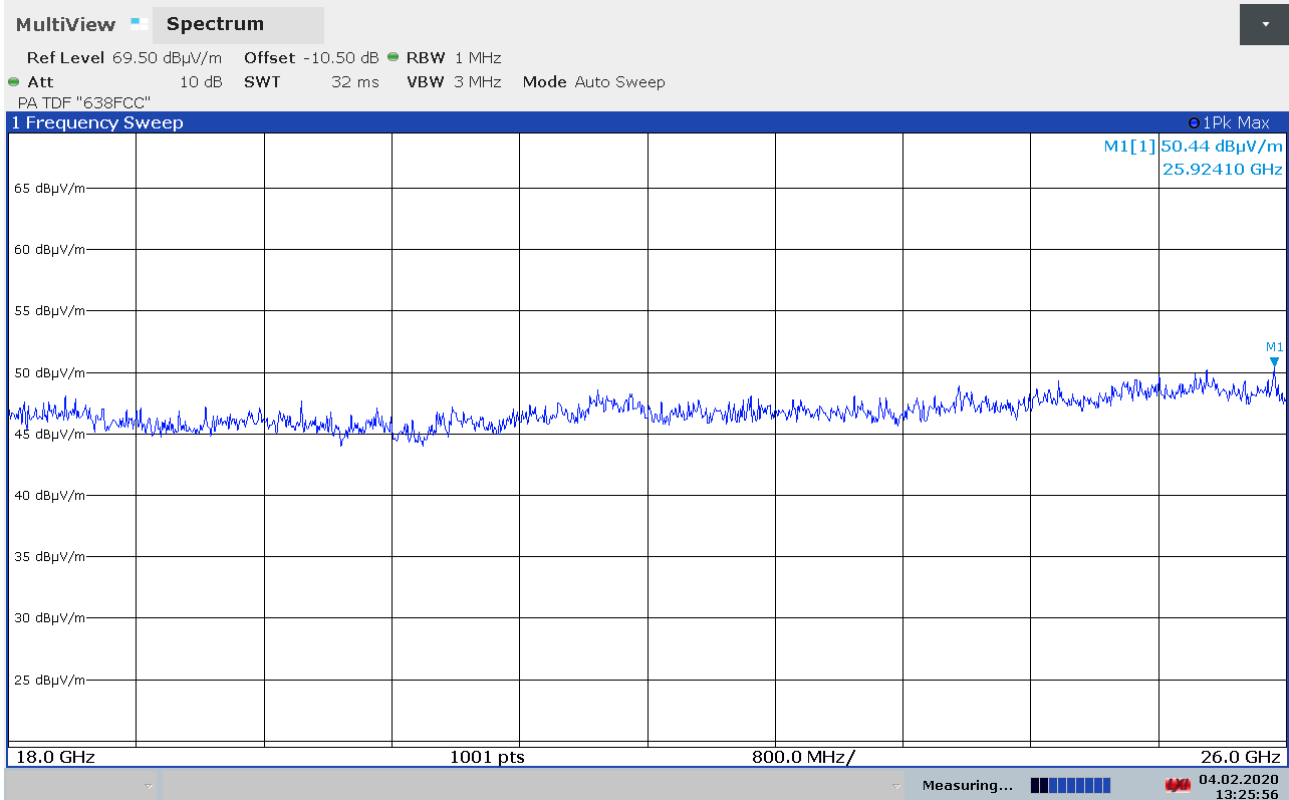
Radiated Emissions, 18 – 26 GHz, Ch048, 802.11n MCS0, EUT V, VP, @1m



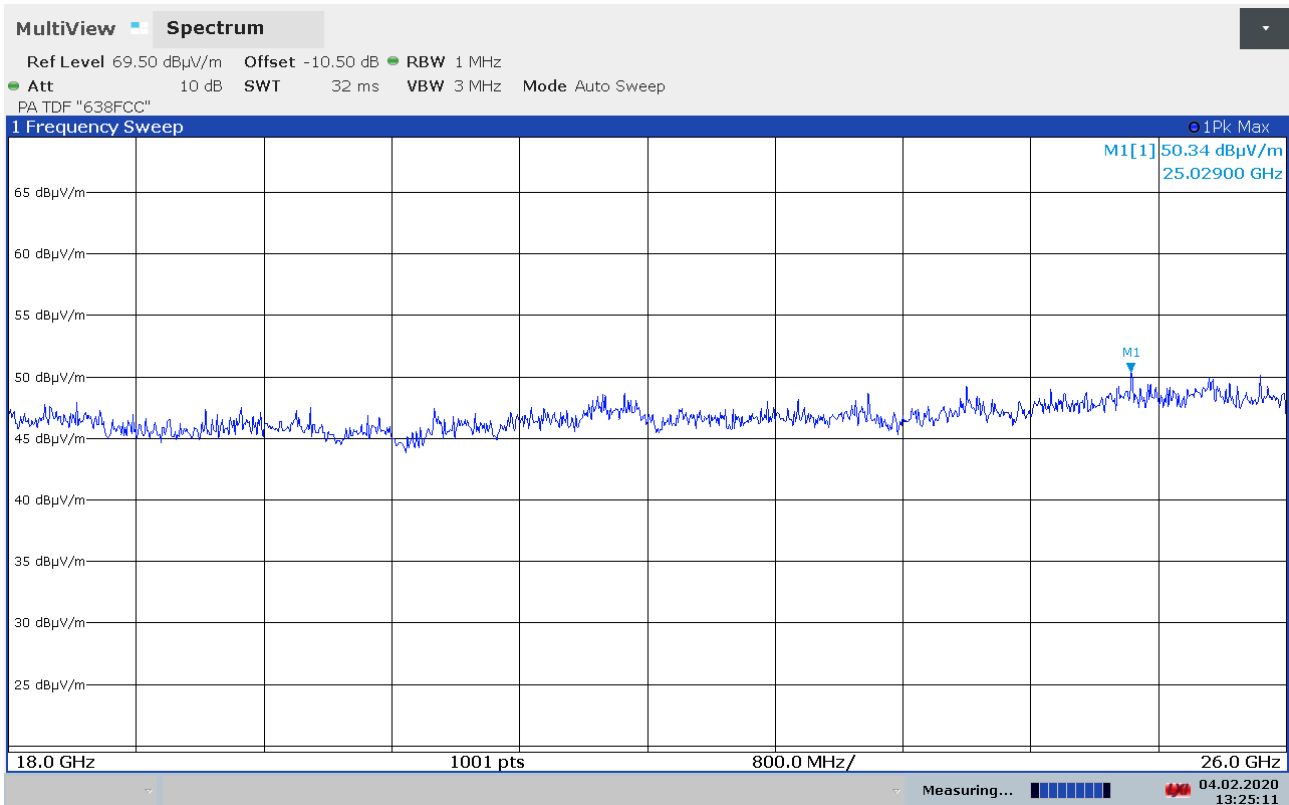
Radiated Emissions, 18 – 26 GHz, Ch116, 802.11n MCS0, EUT V, HP, @1m



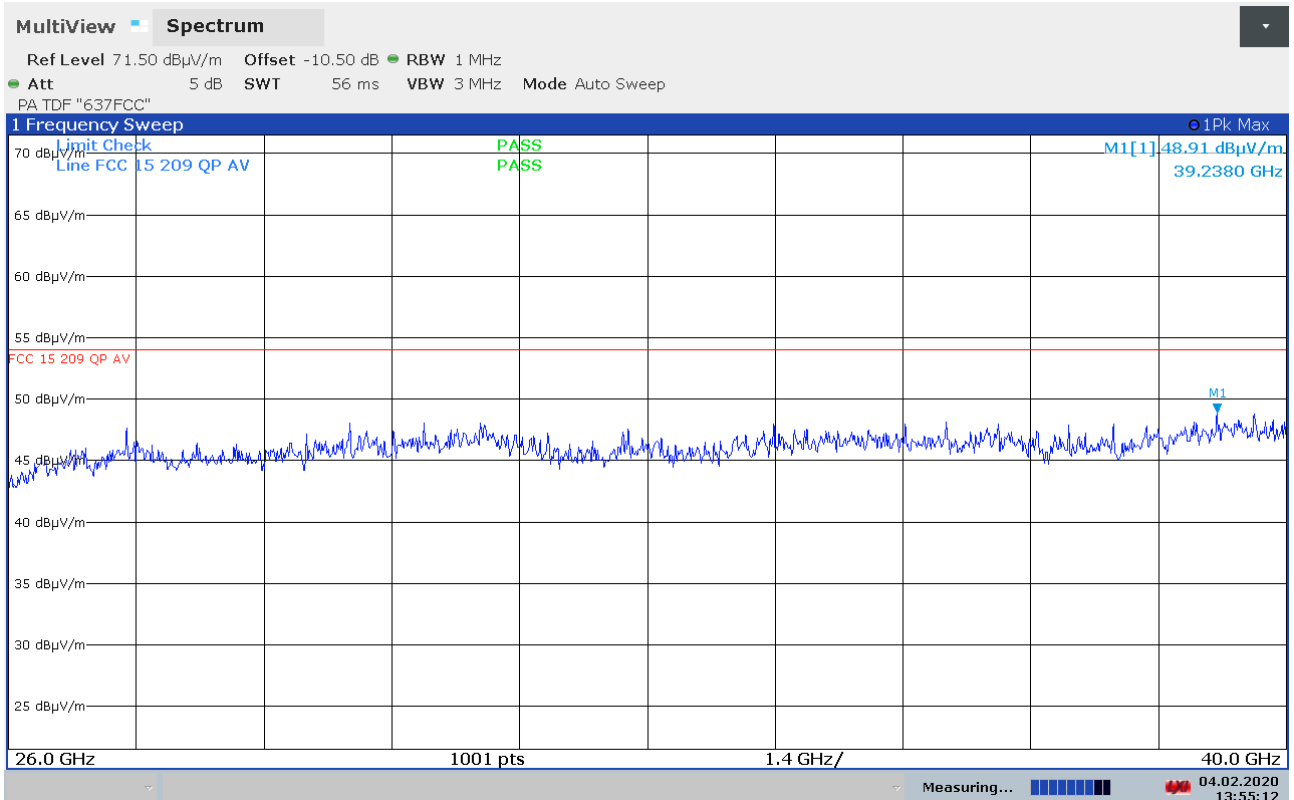
Radiated Emissions, 18 – 26 GHz, Ch116, 802.11n MCS0, EUT V, VP, @1m



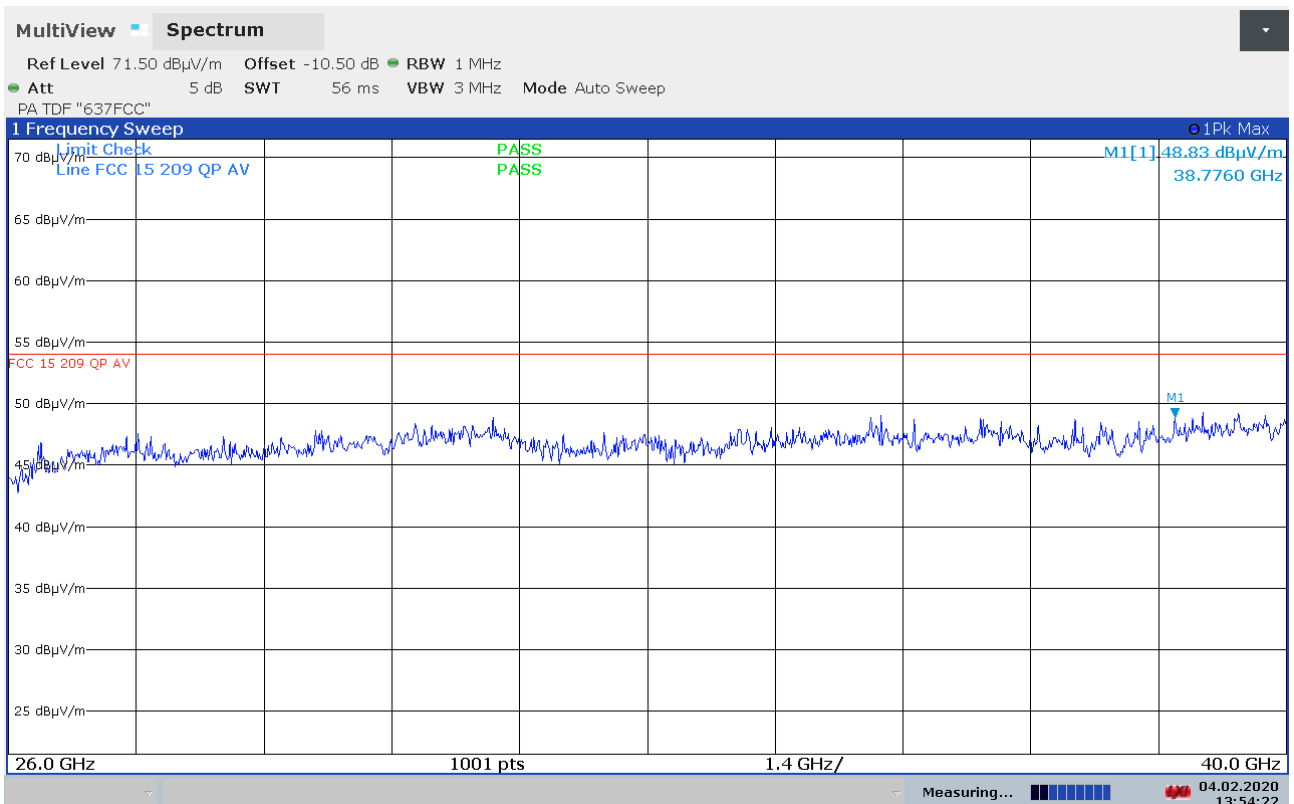
Radiated Emissions, 18 – 26 GHz, Ch157, 802.11n MCS0, EUT V, HP, @1m



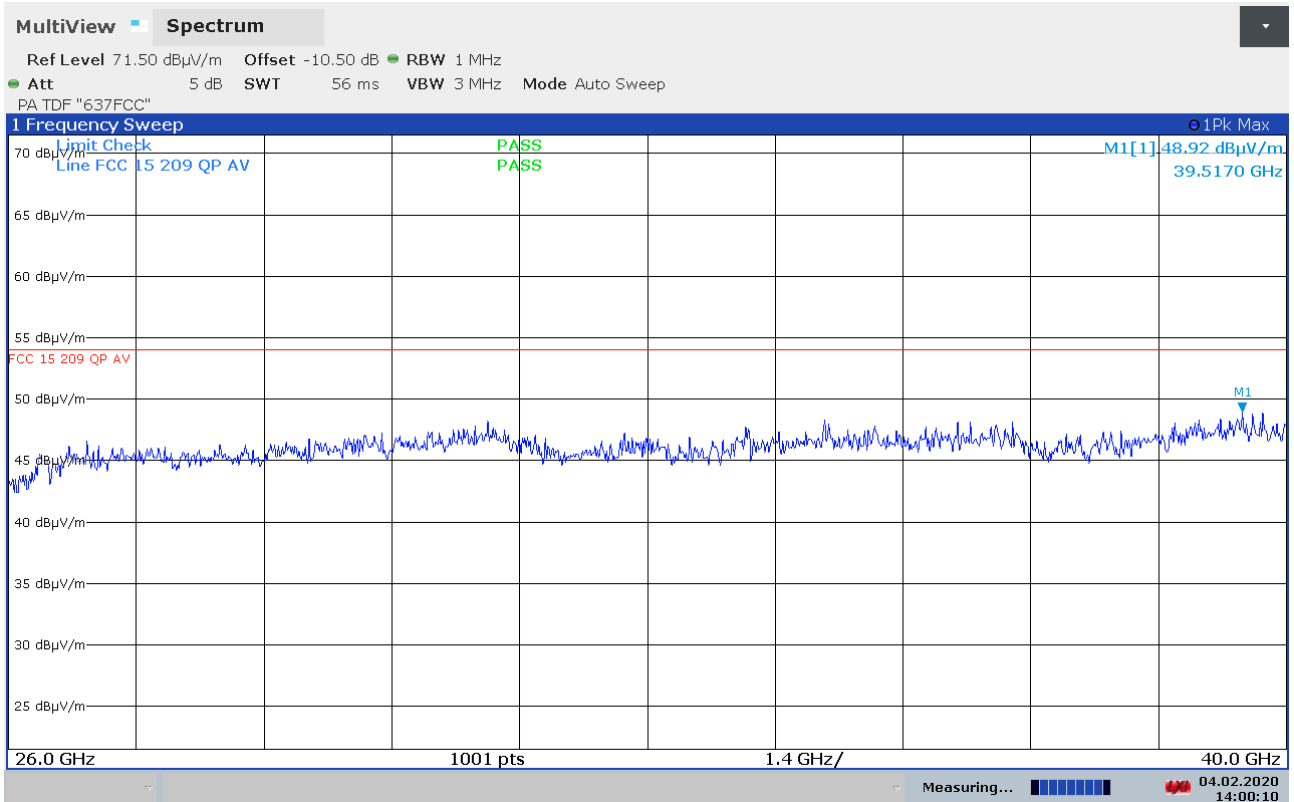
Radiated Emissions, 18 – 26 GHz, Ch157, 802.11n MCS0, EUT V, VP, @1m



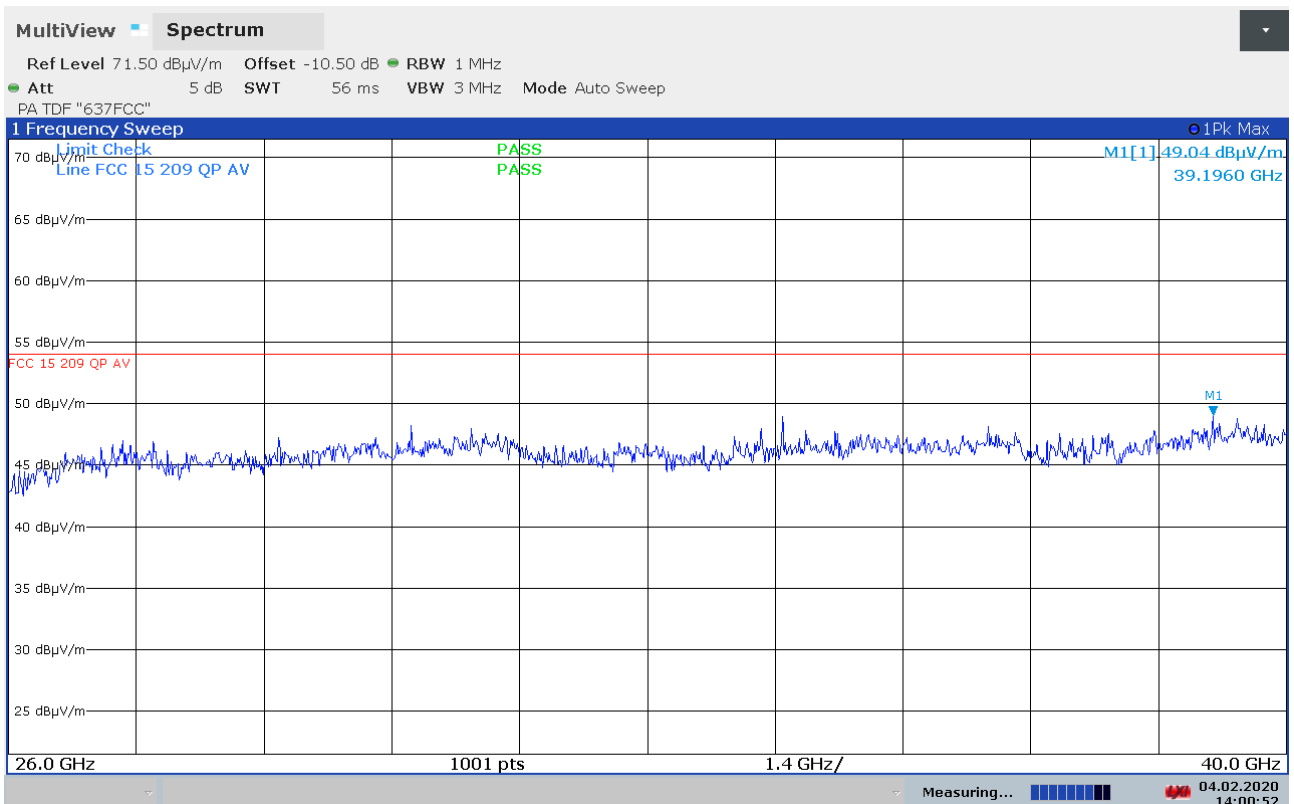
Radiated Emissions, 26 – 40 GHz, Ch048, 802.11a 6Mbps, EUT V, HP, @1m



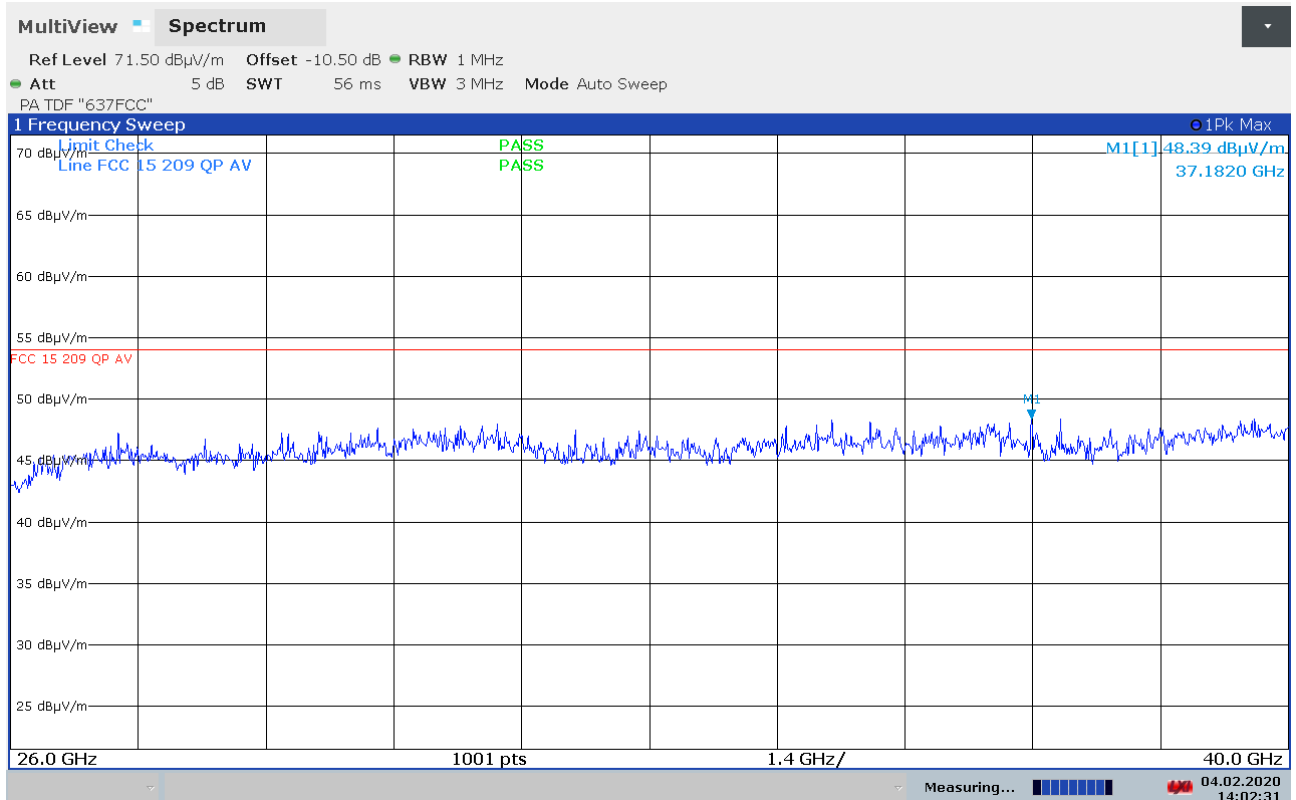
Radiated Emissions, 26 – 40 GHz, Ch048, 802.11n MCS0, EUT V, VP, @1m



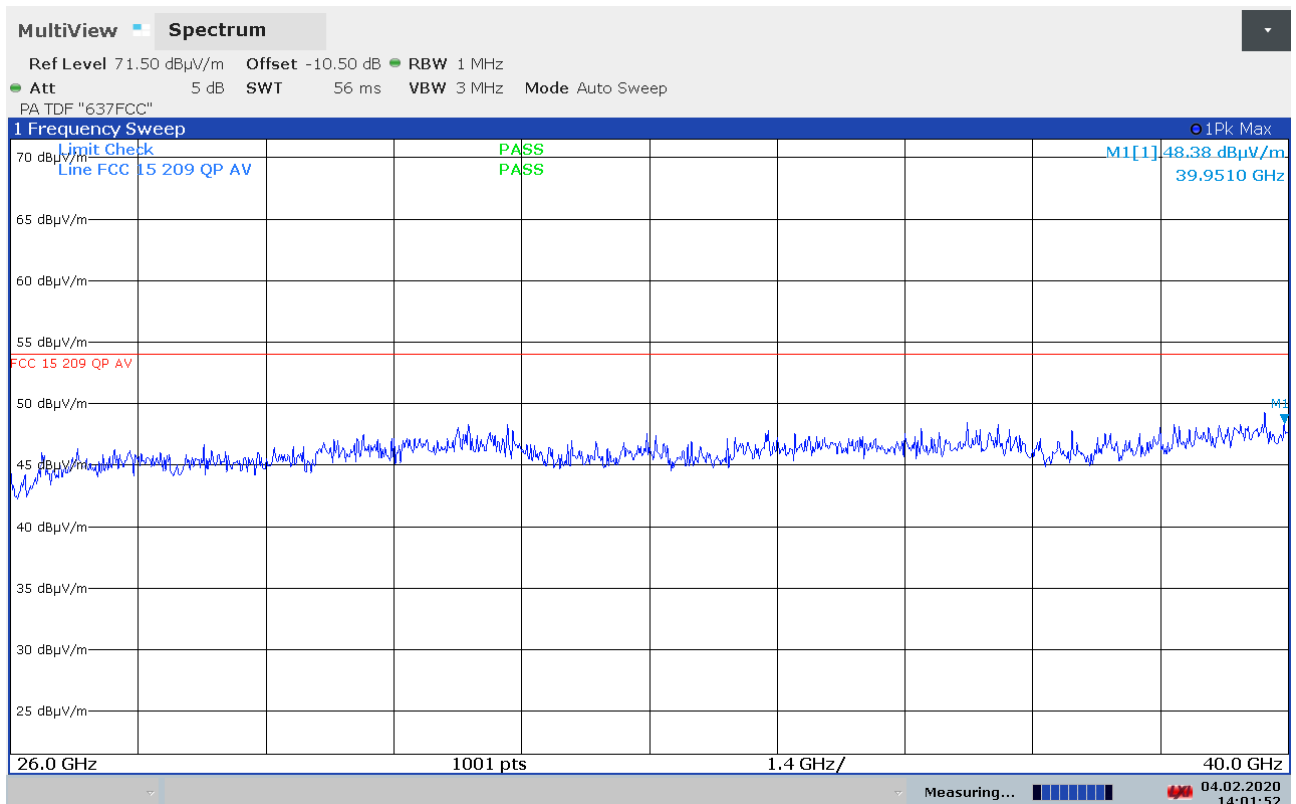
Radiated Emissions, 26 – 40 GHz, Ch116, 802.11a 6Mbps, EUT V, HP, @1m



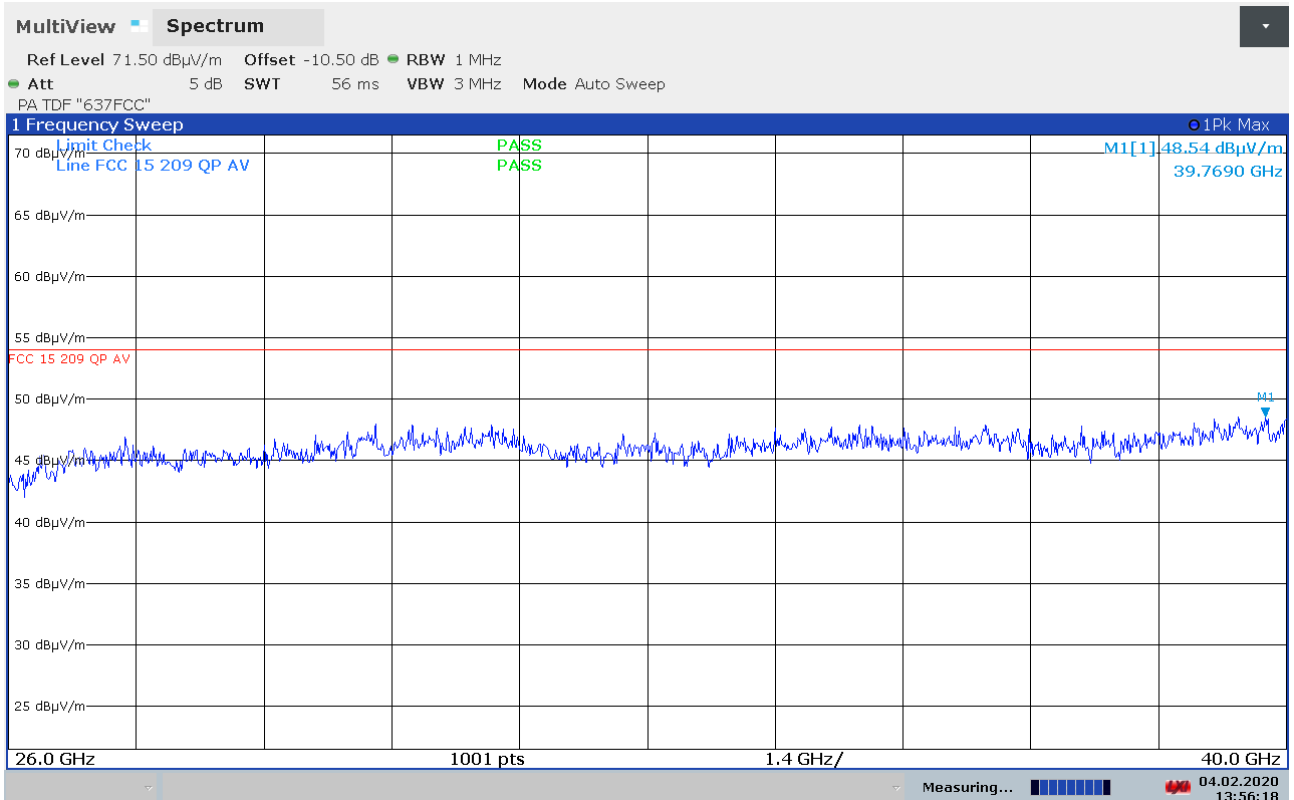
Radiated Emissions, 26 – 40 GHz, Ch116, 802.11n MCS0, EUT V, VP, @1m



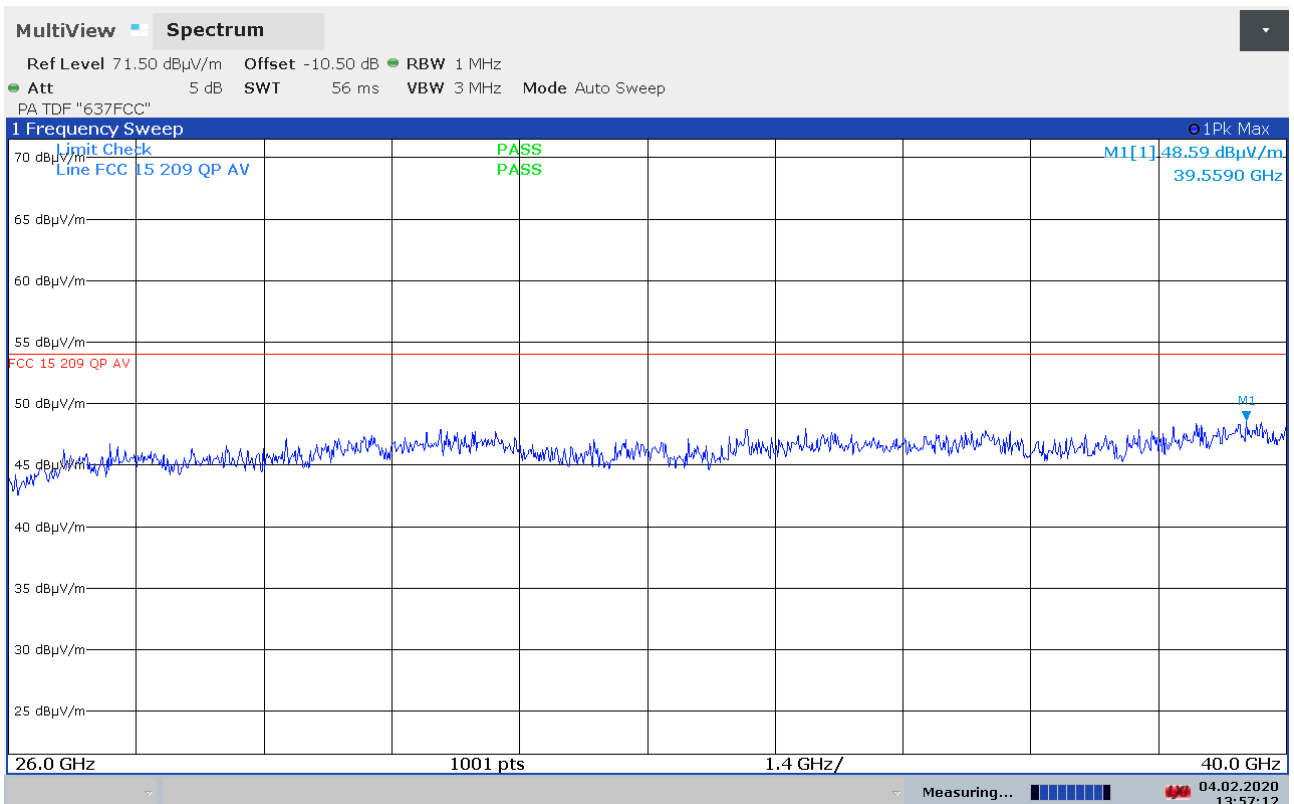
Radiated Emissions, 26 – 40 GHz, Ch157, 802.11a 6Mbps, EUT V, HP, @1m



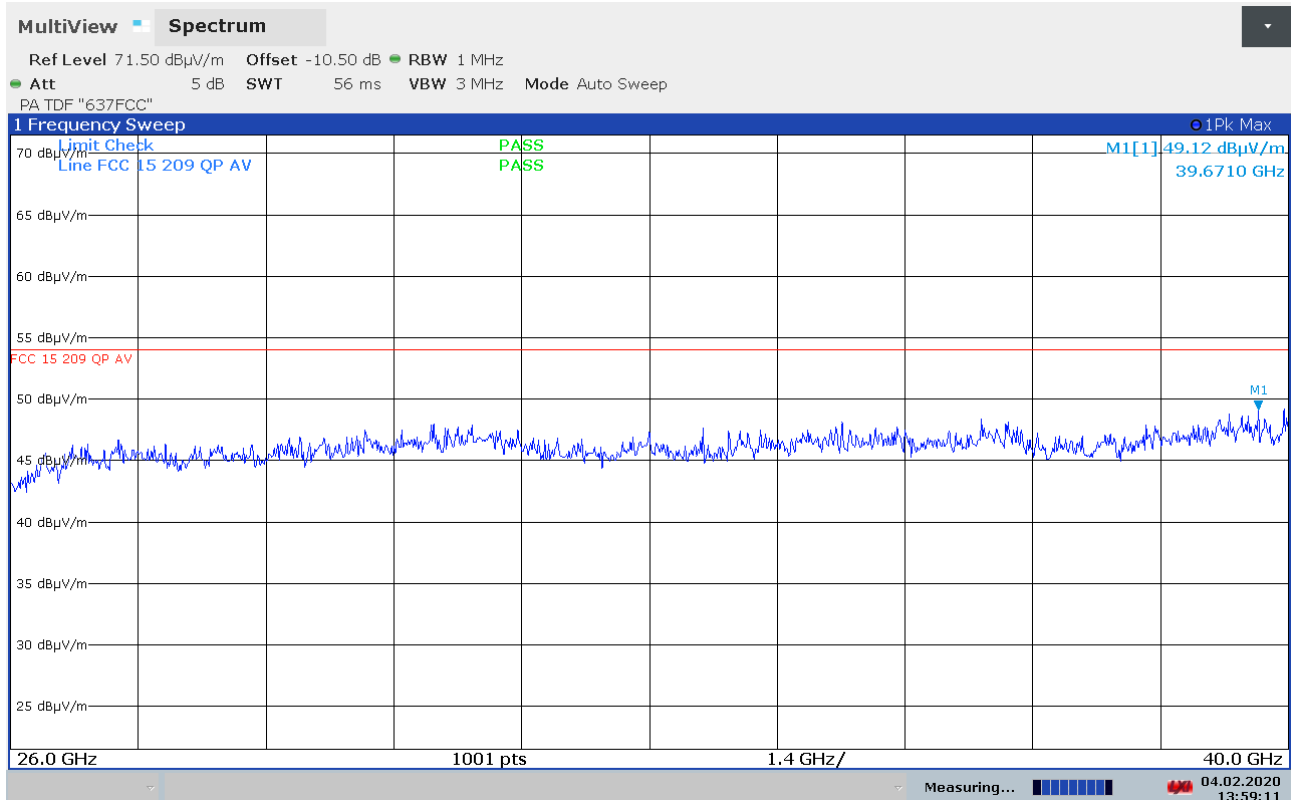
Radiated Emissions, 26 – 40 GHz, Ch157, 802.11n MCS0, EUT V, VP, @1m



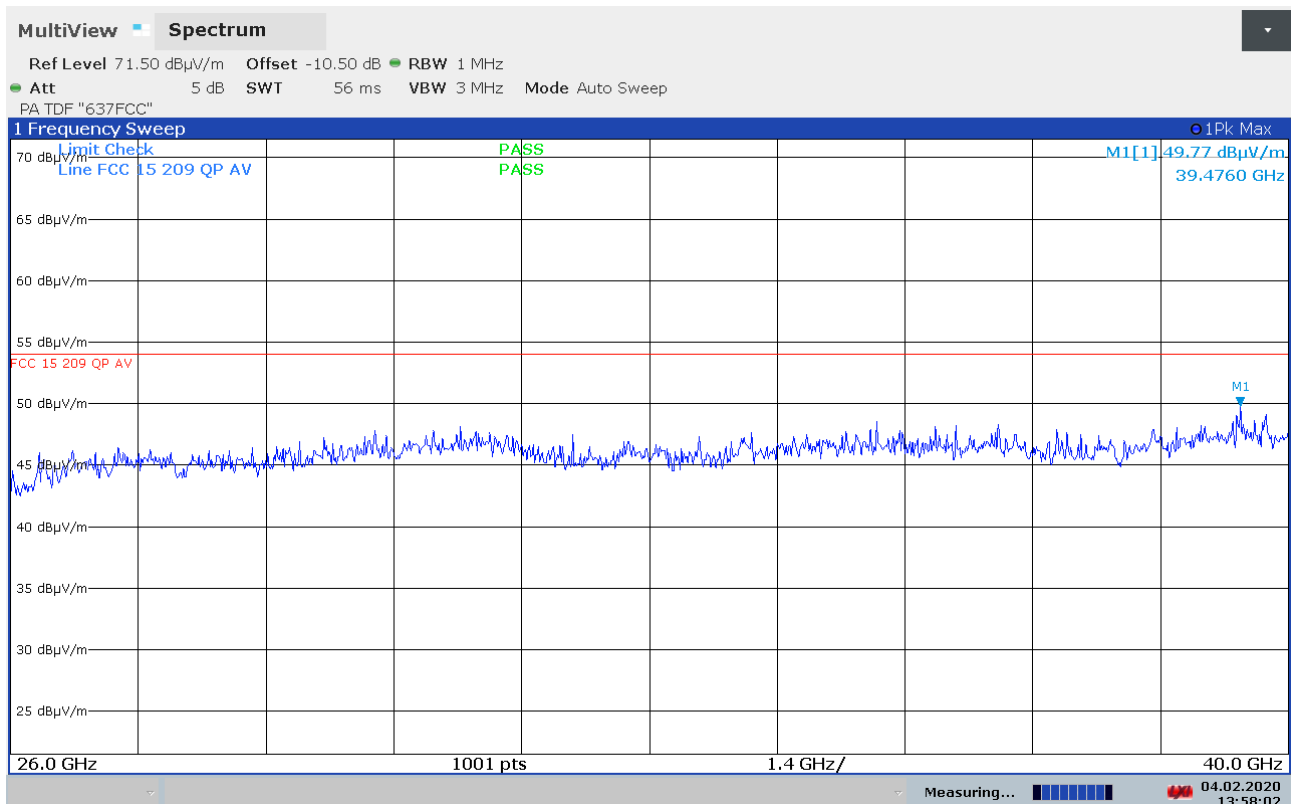
Radiated Emissions, 26 – 40 GHz, Ch048, 802.11n MCS0, EUT V, HP, @1m



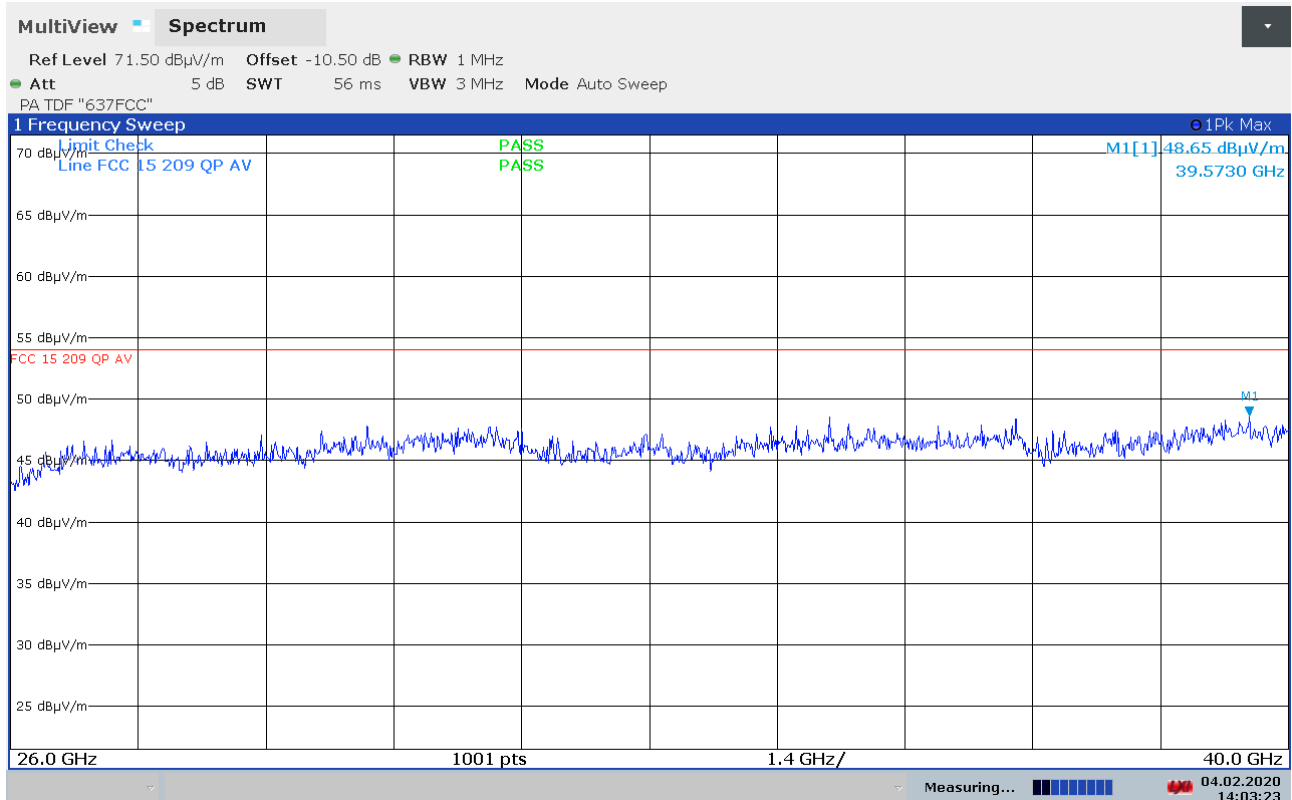
Radiated Emissions, 26 – 40 GHz, Ch048, 802.11n MCS0, EUT V, VP, @1m



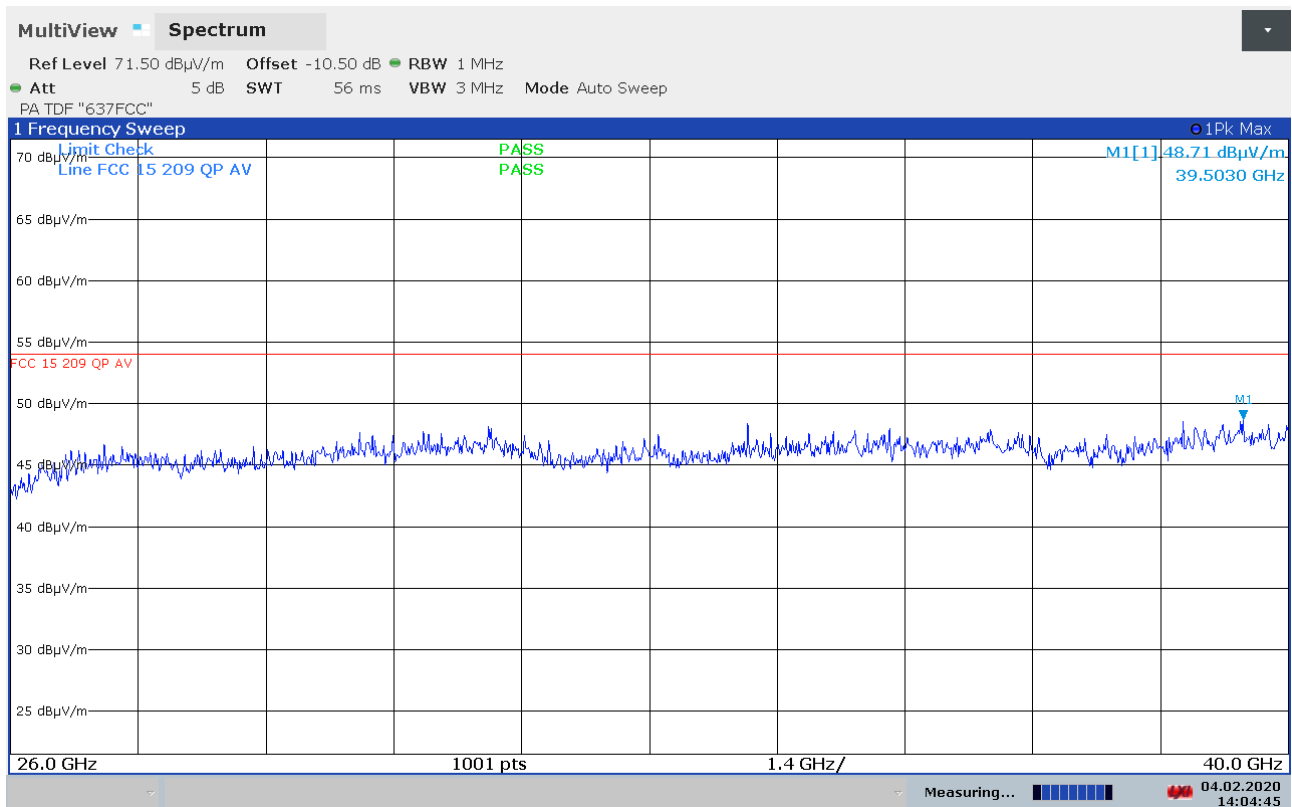
Radiated Emissions, 26 – 40 GHz, Ch116, 802.11n MCS0, EUT V, HP, @1m



Radiated Emissions, 26 – 40 GHz, Ch116, 802.11n MCS0, EUT V, VP, @1m



Radiated Emissions, 26 – 40 GHz, Ch157, 802.11n MCS0, EUT V, HP, @1m



Radiated Emissions, 26 – 40 GHz, Ch157, 802.11n MCS0, EUT V, VP, @1m

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	TS8997	Test System	Rohde & Schwarz		2020-01	2021-01
3	6810-17B	Attenuator	Suhner	LR 1669	2019-07	2020-07
4	WHKX6.5/18G	Highpass Filter	Wainwright Inst.	LR 1619	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	N/A	
11	Model V637	Antenna Horn	Narda	LR 097	N/A	
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	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2019-10	2021-10
16	JS4-20004000	Preamplifier	Miteq	LR 1591	2019-07	2020-07
17	ST18/SMA/N/72	RF Cable	Suhner	LR 1705	COU	
18	OSP-B157W8	8 Port Power Module	Rohde & Schwarz	LR 1657	2018-02	2020-02
19	FSV30	Spectrum Analyzer	Rohde & Schwarz	LR 1654	2020-01	2021-01

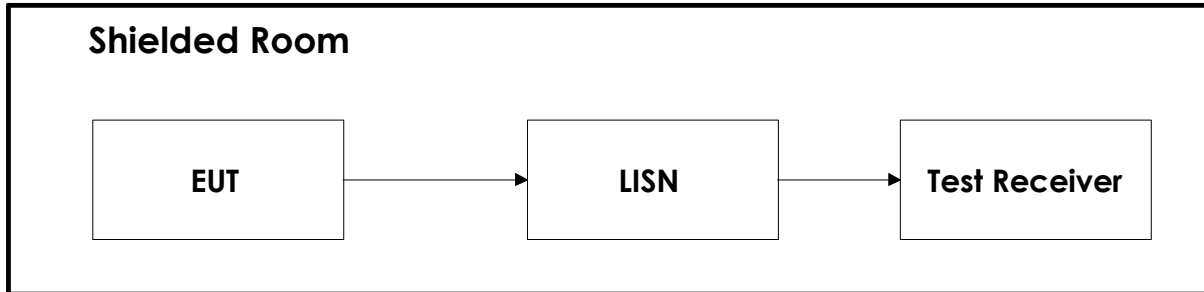
Note: COU – calibrate on use; N/A – Not Applicable

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

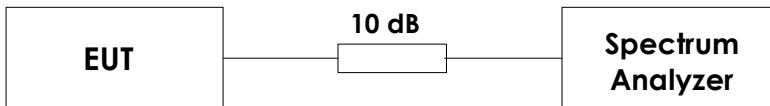
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.10	Power Line Conducted test software
2	Rohde & Schwarz	WMS32 (w/ FCC 15.407 2018 opt)	10.50.10	Radio test software
3	Rohde & Schwarz	GPIBSHOT	2.7	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission

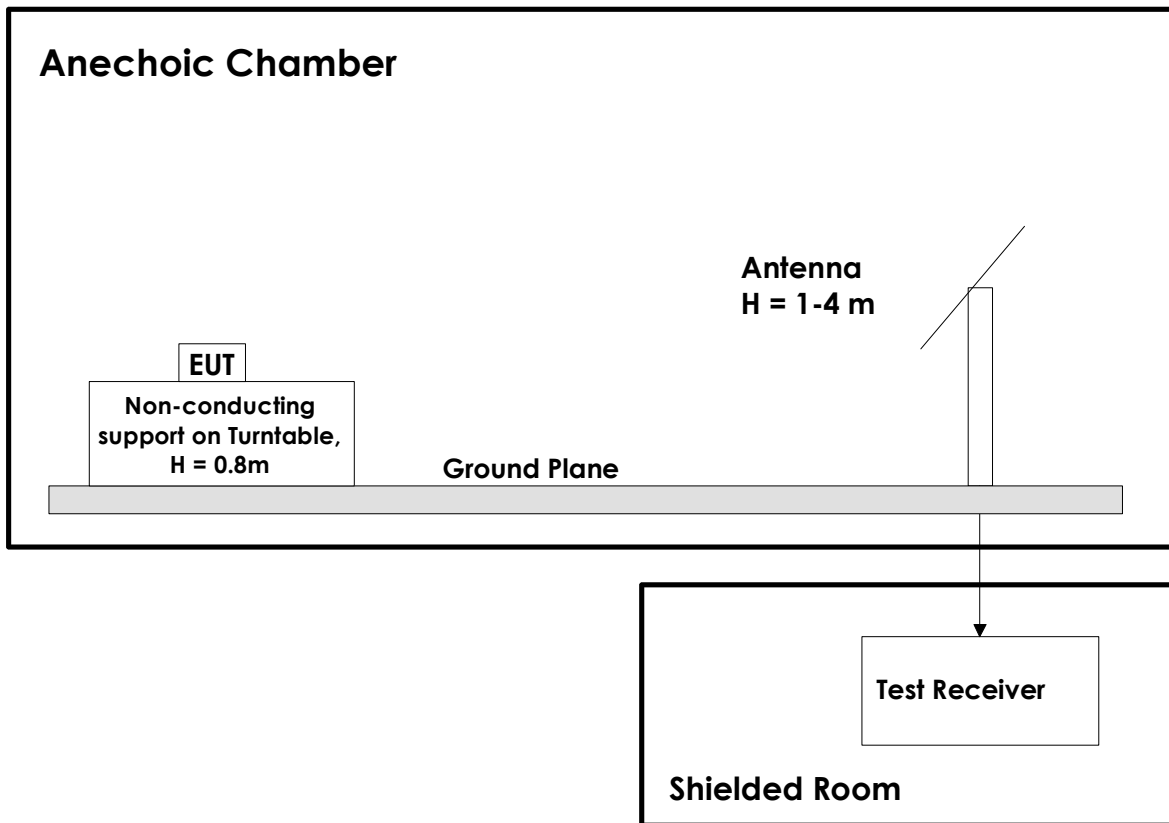


6.2 Conducted Tests



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