

Test Report

Product	Collaboration end-point		
Name and address of the applicant	Cisco Systems Norway AS Philip Pedersens vei 1 1366 Lysaker, Norway		
Name and address of the manufacturer	Cisco Systems, Inc. 170 West Tasman Drive San Jose CA 95134, USA		
Model Number	TTC60-31 TTC60-32		
Rating	3.5 - 2.5A 100-240V AC 50/60Hz 4.5 - 3.5A 100-240V AC 50/60Hz		
Trademark	Cisco		
Serial number	WZS2442J006 (for TTC60-31)		
Additional information	WiFi, Bluetooth		
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	406072		
Tested in period	2020-11-20 to 2020-11-25		
Issue date	2021-09-03		
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.Suhanthakumar]	
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1 INFORMATION

1.1 Test Item

Name	Cisco
Marketing Name	Webex Board Pro 55 Webex Board Pro 75
Model Number	TTC60-31 TTC60-32
FCC ID	LDKNVTX21737
ISED ID	2461N-NVTX21737
Serial number	WZS2442J006
Hardware identity and/or version	DV1
Software identity and/or version	S01845-1.23.0
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 802.11n (20/40/80 MHz BW)
Type of Modulation	Digital (OFDM - Orthogonal frequency-division multiplexing)
Conducted Output Power	5180 – 5240 MHz: 39.9 mW 5260 – 5320 MHz: 83.2 mW 5500 – 5720 MHz: 85.3 mW 5745 – 5825 MHz: 83.4 mW
Antenna Connector	None
Number of Antennas	2
Antenna Diversity Supported	Yes
Smart Antennas Supported	Yes
TPC Supported	Not implemented. Not required when EIRP is below 500 mW
DFS Supported	Client Device without Radar Detection
Ad-hoc Mode	EUT does not support Ad-hoc mode in the DFS bands*
Hotspot Mode	EUT does not support Hotspot Mode*
Power Supply	Mains Powered

* EUTs that support Ad-hoc or Hotspot mode in the DFS Bands are considered Master Devices

Description of Test Item

The EUT is a radio module with WiFi and BT/BLE module in a collaboration end-point system.

This 5 GHz WiFi part has been tested as a U-NII system.

The radio is a certified module NVIDIA P3310 (Cisco FCC ID: LDKNVTX21737, Nvidia FCC ID: VOB-P3310).

The module is identical, but the antennas are changed, and power levels are reduced for some channels.

All tests were performed on a TTC60-31.

1.3 Normal test conditions

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

The EUT was powered from a regulated Power Source during all tests.
 The values are the limit registered during the test period.

1.4 Test Engineer(s)

Frode Sveinsen

1.5 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

1.6 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, MIMO
 802.11n HT40 mode : MCS0, MIMO
 802.11n HT80 mode : MCS0, MIMO

1.7 EUT Operating Modes

Description of operating modes	Continuous TX, 5 GHz 20/40/80 MHz Mode
Additional information	EUT was controlled from a computer and programmed with test scripts from Putty.

1.8 Comments

It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

This report covers only radiated emissions tests, all other tests are covered by UL test report no: 11526345-E4V3.

1.9 EUT Power Levels

Channel	Freq (MHz)	11a	11n HT20	11n HT40	11ac HT80	11ac HT160
36	5180	12.5	6.5			
40	5200	12.0	6.5			
44	5220	12.0	6.5			
48	5240	12.0	6.5			
52	5260	15.5	14.0			
56	5280	15.5	14.0			
60	5300	15.5	14.0			
64	5320	15.5	14.0			
100	5500	15.0	14.0			
104	5520	15.0	14.0			
108	5540	15.0	14.0			
112	5560	15.0	14.0			
116	5580	15.0	14.0			
120	5600	D	D			
124	5620	D	D			
128	5640	D	D			
132	5660	14.0	12.5			
136	5680	13.5	12.5			
140	5700	10.5	9.0			
144	5720	D	D			
149	5745	14.0	12.5			
153	5765	14.5	12.5			
157	5785	15.5	14.0			
161	5805	15.5	14.0			
165	5825	15.5	14.0			
38	5190			8.5		
46	5230			9.0		
54	5270			13.0		
62	5310			6.0		
102	5510			6.0		
110	5550			12.0		
118	5590			D		
126	5630			D		
134	5670			11.5		
142	5710			D		
151	5755			9.0		
159	5795			13.5		
42	5210				6.5	
58	5290				5.5	
106	5530				9.0	
122	5610				D	
138	5690				D	
155	5775				10.5	
50	5250					D
114	5550					D

D = Disabled/ Not Used

ISED Canada require that all channels in the TDWR Band (5.60-5.65 GHz) are disabled, also on client devices

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 ISED 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.

- | | |
|--|---|
| <input type="checkbox"/> New Submission | <input checked="" type="checkbox"/> Production Unit |
| <input checked="" type="checkbox"/> Class II Permissive Change | <input type="checkbox"/> Pre-production Unit |
| NII Equipment Code | <input type="checkbox"/> 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)	N/T
Maximum Output Power	15.407(a)	6.2	Complies
Power Spectral Density	15.407(a)	6.2	N/T
Emission Bandwidth	15.407(a)(2)	6.2	N/T
Unwanted Emissions	15.407(b)	6.2	Complies
Discontinuation of Transmission	15.407(c)	6.3	N/T ¹
6 dB Bandwidth	15.407(e)	6.2.4	N/T
Transmit Power Control	15.407(h)	6.2.3	N/A ²
Dynamic Frequency Selection	15.407(h)	6.3	N/T 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.

Revision history

Revision	Date	Comment	Sign
00	2021-03-26	First edition	FS
01	2021-09-03	Updated model numbers	FS

3 TEST RESULTS

3.1 Maximum Output Power, EIRP

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 Field Strength (dB μ V/m)		Maximum e.i.r.p. (dBm)	
		802.11a 6M	802.11n MCS0	802.11a 6M	802.11n MCS0
36	5180	118.1	111.7	22.9	16.5
64	5320	112.0	110.6	16.8	15.4
100	5500	121.9	111.6	26.7	16.4
140	5700	101.7	101.4	6.5	6.2
149	5745	106.0	104.6	10.8	9.4
165	5825	106.0	104.7	10.8	9.5
		802.11n HT40	802.11ac HT80	802.11n HT40	802.11ac HT80
38	5190	104.0		8.8	
62	5310	104.2		9.0	
102	5510	102.3		7.1	
134	5670	105.6		10.4	
149	5755	100.7		5.5	
159	5795	106.3		11.1	
42	5210		101.0		5.8
58	5290		100.4		5.2
155	5775		102.2		7.0

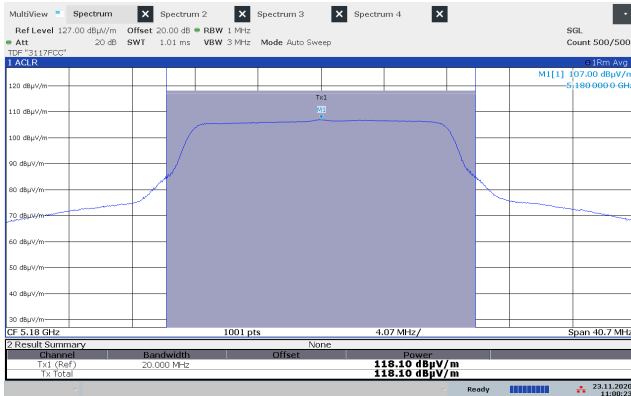
The EUT operates continuously; therefore, method SA-1 of ANSI C63.10-2013 clause 12.3 was used.

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

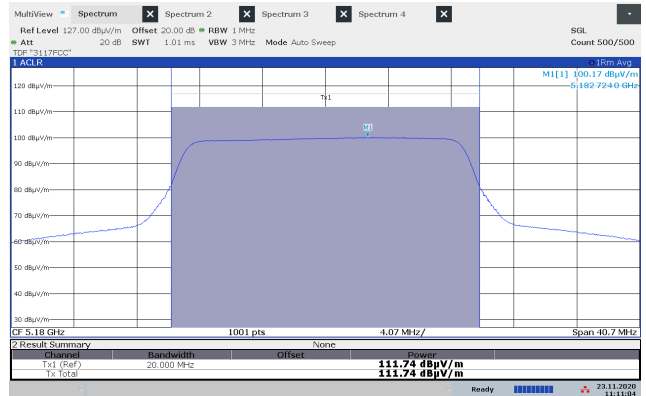
This is an indoor device with directional Antenna Gain less than 6 dBi.

Limits for Indoor Device:

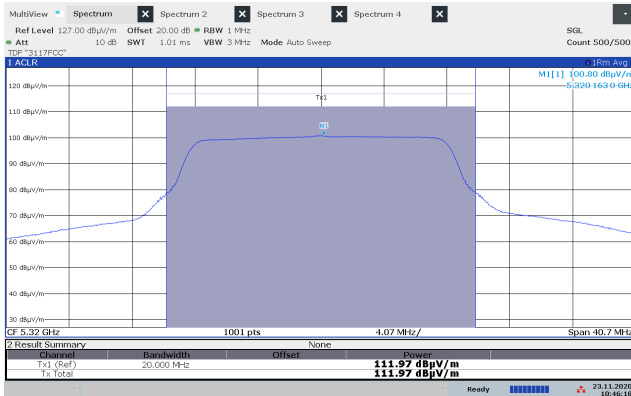
Frequency Band	FCC 15.407(a)	ISED RSS-247 Issue 2
5150 – 5250 MHz	Less than 250 mW (24 dBm) for client device Less than 1 W (30 dBm) for master device	Less than the lesser of 200 mW e.i.r.p. or $10 + 10 \log_{10} B$ dBm e.i.r.p.
5250 – 5350 MHz 5470 – 5725 MHz	Less than the lesser of 250 mW (24 dBm) 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	
	<i>B</i> is the 26dB emission bandwidth in MHz	<i>B</i> is the 99% emission bandwidth in MHz



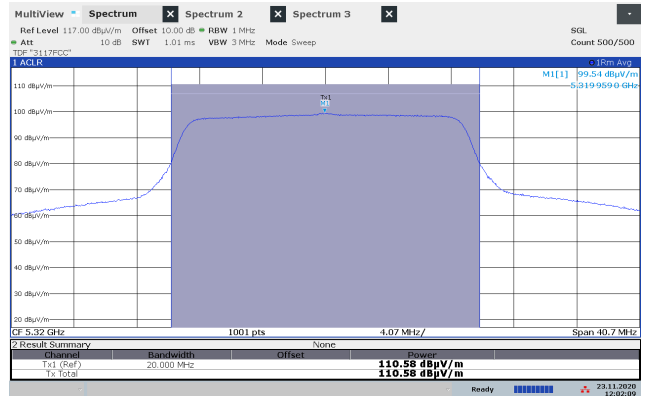
EIRP, 5180 MHz, 802.11a, 6Mb



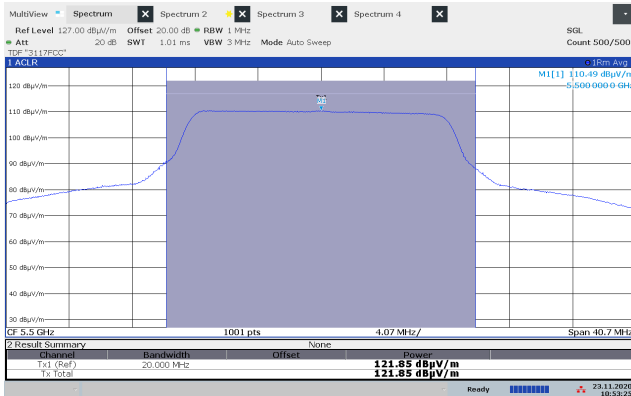
EIRP, 5180 MHz, 802.11n, HT20



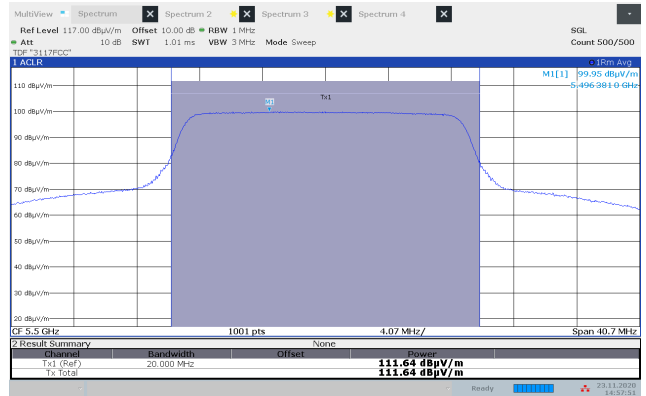
EIRP, 5320 MHz, 802.11a, 6Mb



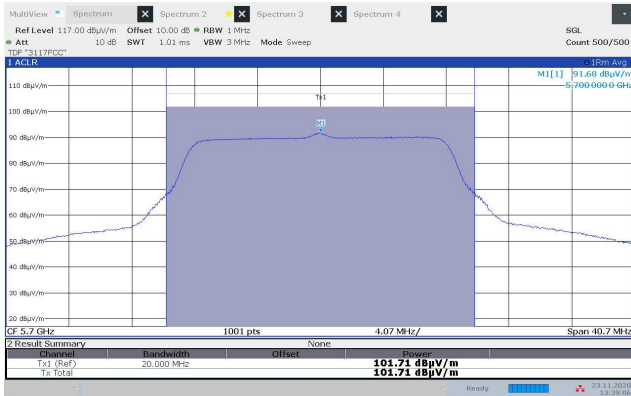
EIRP, 5320 MHz, 802.11n, HT20



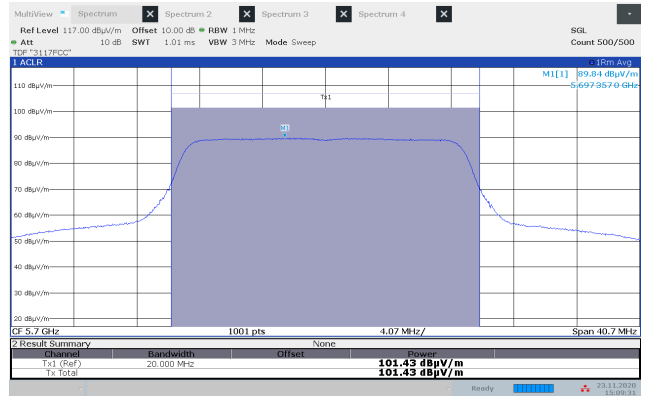
EIRP, 5500 MHz, 802.11a, 6Mb



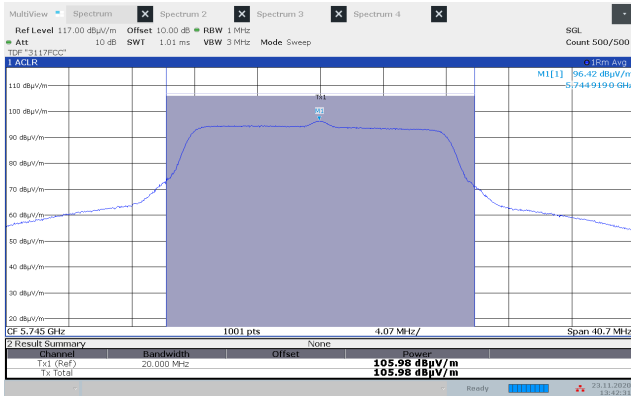
EIRP, 5500 MHz, 802.11n, HT20



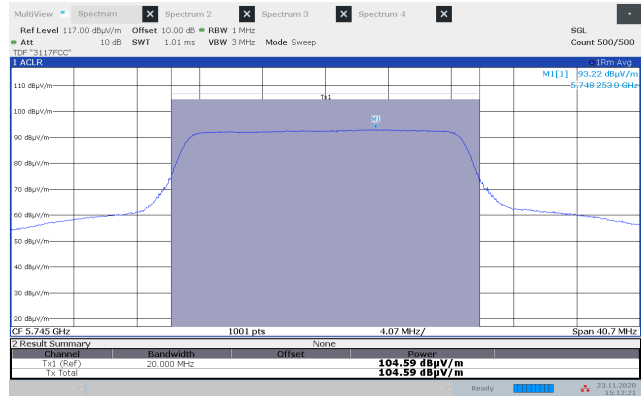
EIRP, 5700 MHz, 802.11a, 6Mb



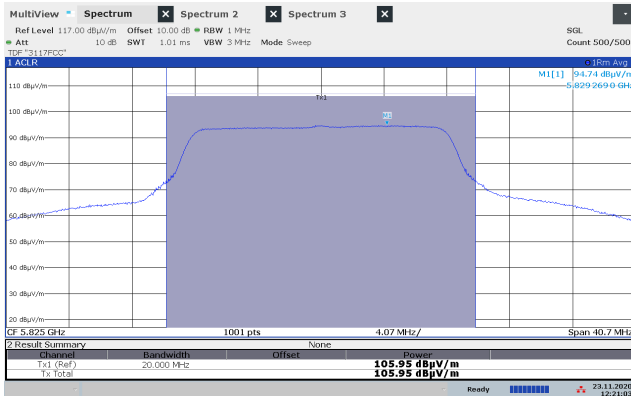
EIRP, 5700 MHz, 802.11n, HT20



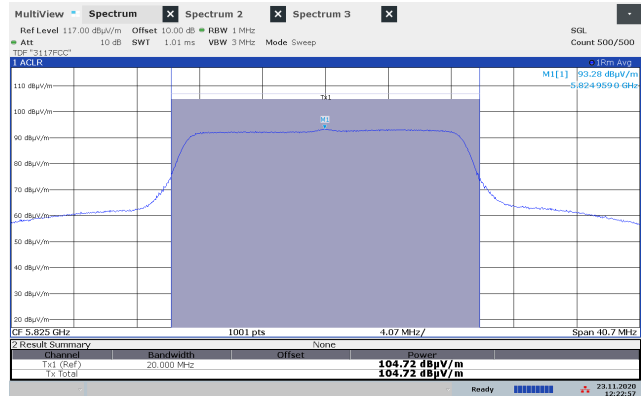
EIRP, 5745 MHz, 802.11a, 6Mb



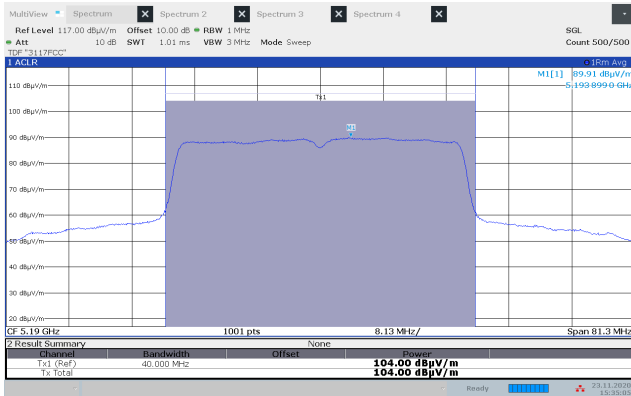
EIRP, 5745 MHz, 802.11n, HT20



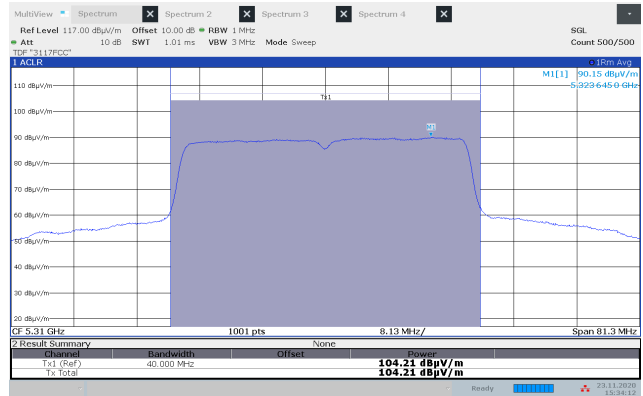
EIRP, 5825 MHz, 802.11a, 6Mb



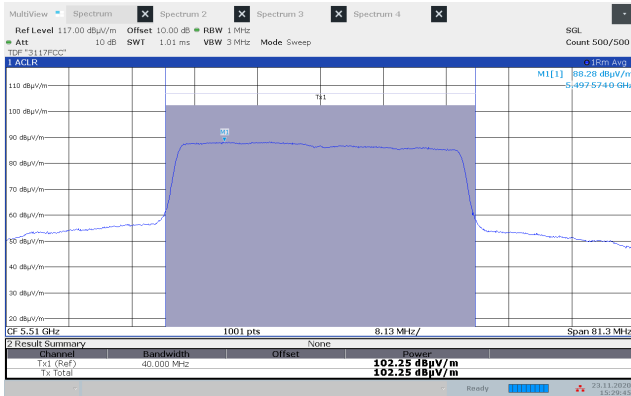
EIRP, 5825 MHz, 802.11n, HT20



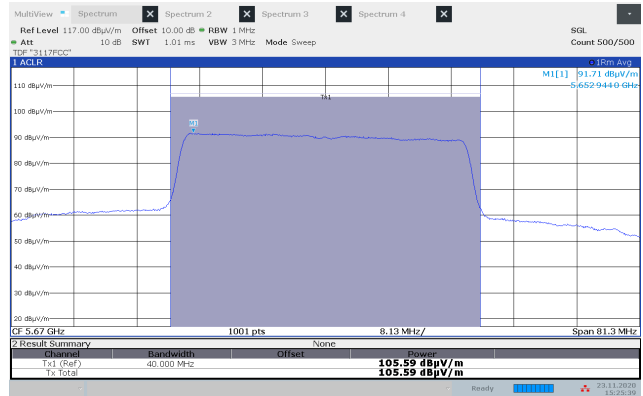
EIRP, 5825 MHz, 802.11a, 6Mb



EIRP, 5825 MHz, 802.11n, HT20

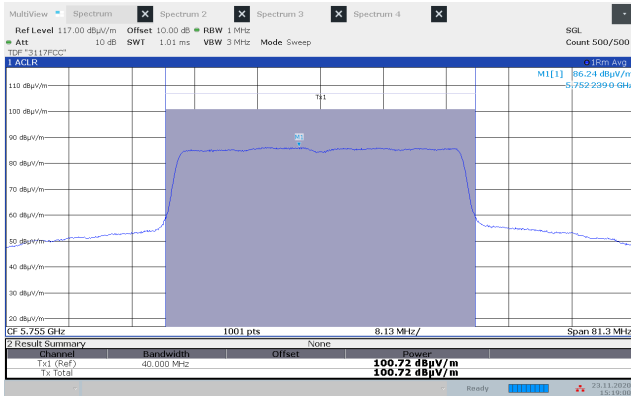


EIRP, 5190 MHz, 802.11n, HT40

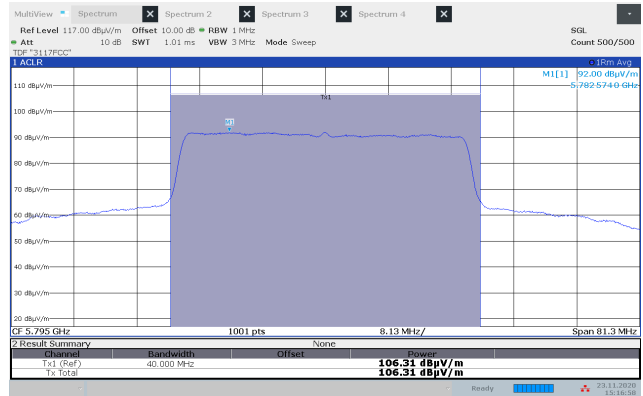


EIRP, 5310 MHz, 802.11n, HT40

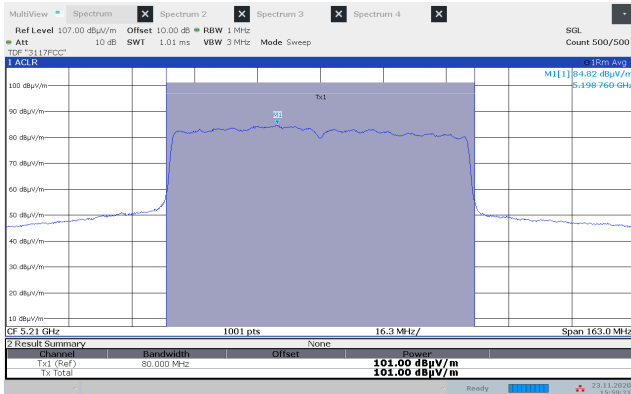
EIRP, 5510 MHz, 802.11n, HT40



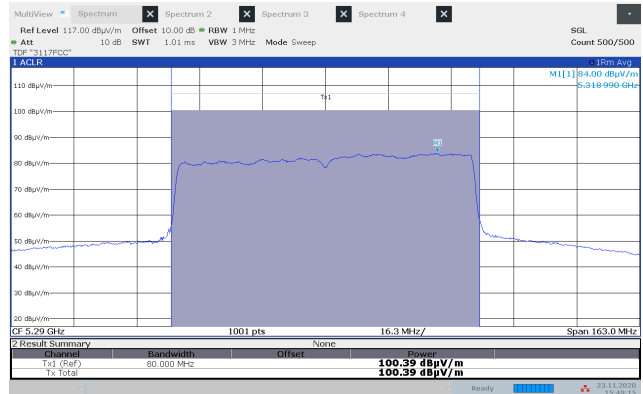
EIRP, 5755 MHz, 802.11n, HT40



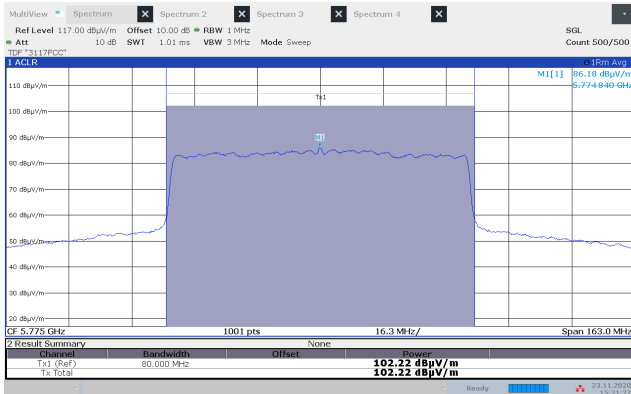
EIRP, 5795 MHz, 802.11n, HT40



EIRP, 5211 MHz, 802.11ac, HT80



EIRP, 5290 MHz, 802.11ac, HT80



EIRP, 5775 MHz, 802.11ac, HT80

3.2 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 6Mb	802.11n HT20	802.11n HT40	802.11ac HT80
36	5180	5150	60.8	54.0		
64	5320	5350	65.1	65.6		
100	5500	5470	66.3	67.1		
140	5700	5725	55.9	56.9		
149	5745	5650	< -40	< -40		
149	5745	5700	< -45	< -45		
165	5825	5875	< -45	< -45		
165	5825	5925	< -40	< -40		
38	5190	5150			65.3	
62	5310	5350			66.5	
102	5510	5470			67.2	
134	5670	5725			58.6	
151	5755	5650			< -40	
151	5755	5700			< -45	
159	5795	5875			< -45	
159	5795	5925			< -40	
42	5210	5150				61.9
58	5290	5350				62.9
106	5530	5470				65.0
155	5775	5650				< -40
155	5775	5700				< -45
155	5775	5875				< -45
155	5775	5925				< -40

The measurement was performed radiated.

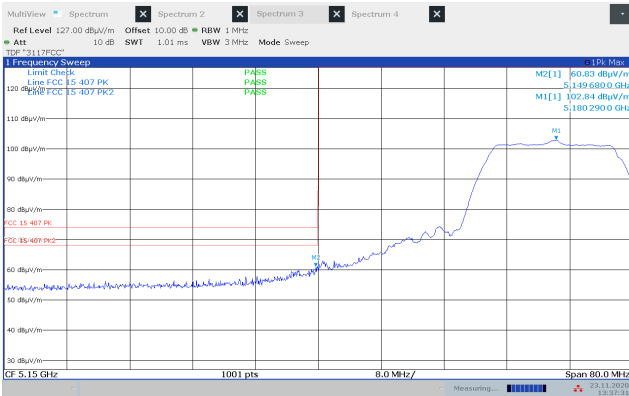
EIRP values were calculated from field strength using the method in KDB 412172 D01.

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

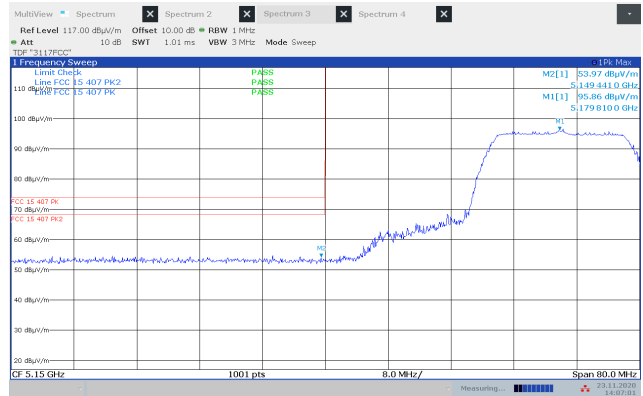
Limits:

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)

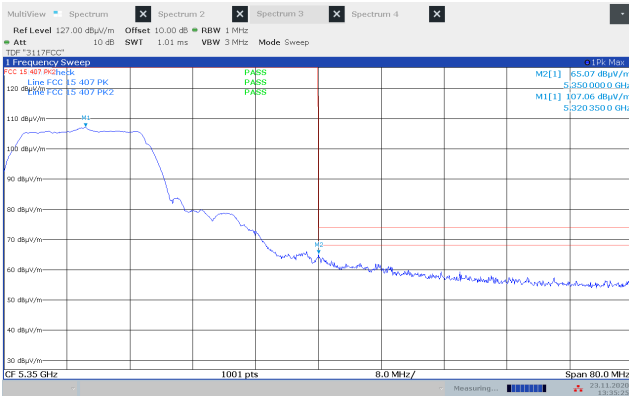
Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.



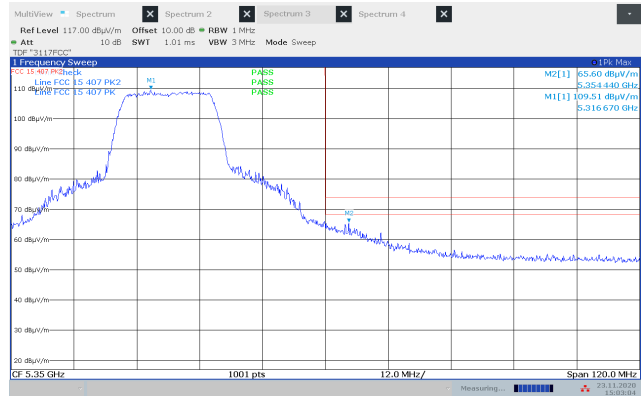
Band Edge 5150 MHz, ch036, 802.11a 6Mb, Radiated, Max



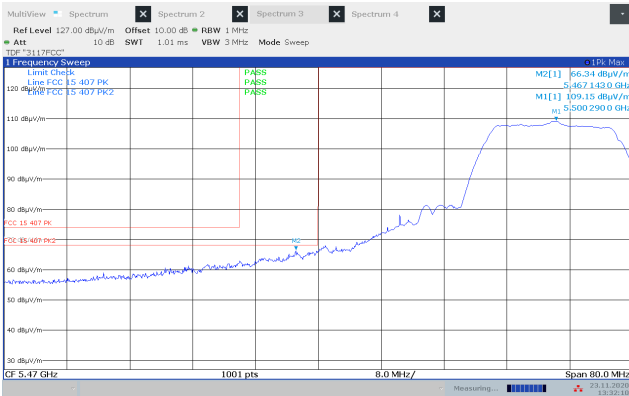
Band Edge 5150 MHz, ch036, 802.11n HT20, Radiated, Max



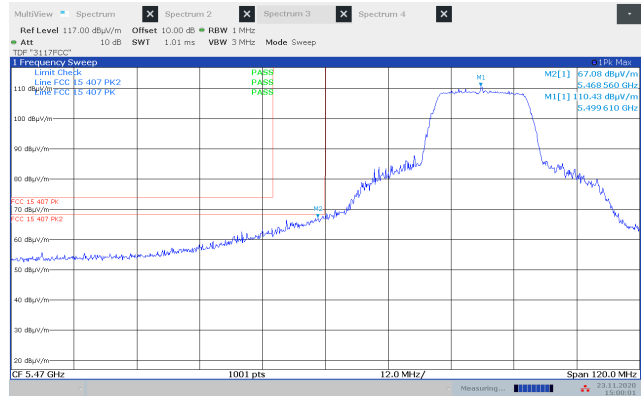
Band Edge 5350 MHz, ch064, 802.11a 6Mb, Radiated, Max



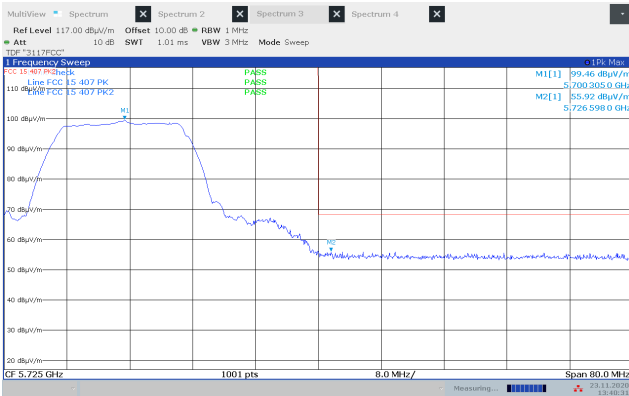
Band Edge 5350 MHz, ch064, 802.11n HT20, Radiated, Max



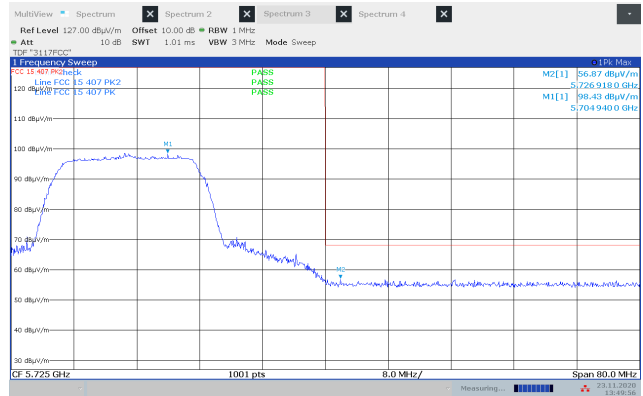
Band Edge 5470 MHz, ch100, 802.11a 6Mb, Radiated, Max



Band Edge 5470 MHz, ch100, 802.11n HT20, Radiated, Max



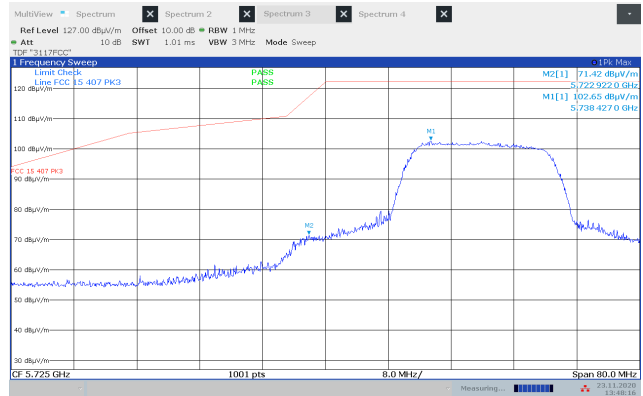
Band Edge 5725 MHz, ch140, 802.11a 6Mb, Radiated, Max



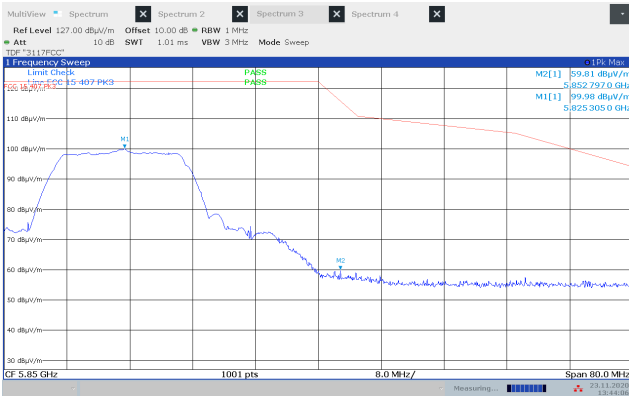
Band Edge 5725 MHz, ch140, 802.11n HT20, Radiated, Max



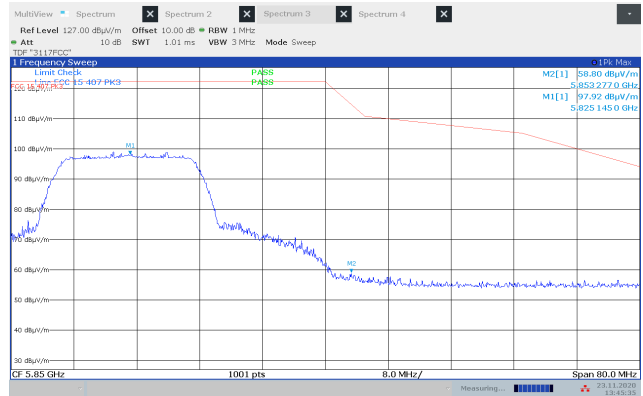
Band Edge 5725 MHz, ch149, 802.11a 6Mb, Radiated, Max



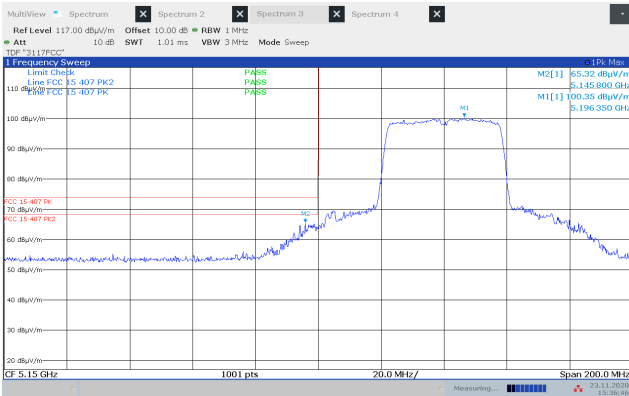
Band Edge 5725 MHz, ch149, 802.11n HT20, Radiated, Max



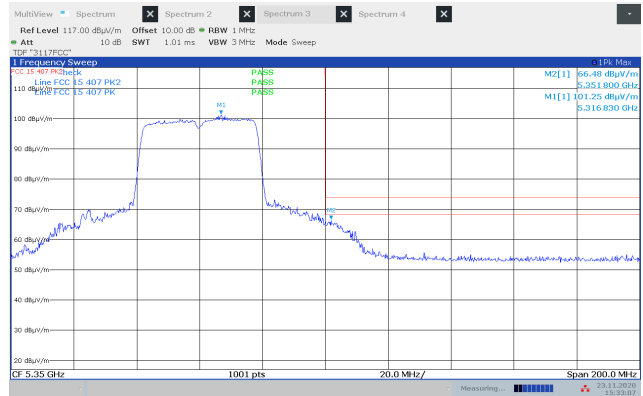
Band Edge 5850 MHz, ch165, 802.11a 6Mb, Radiated, Max



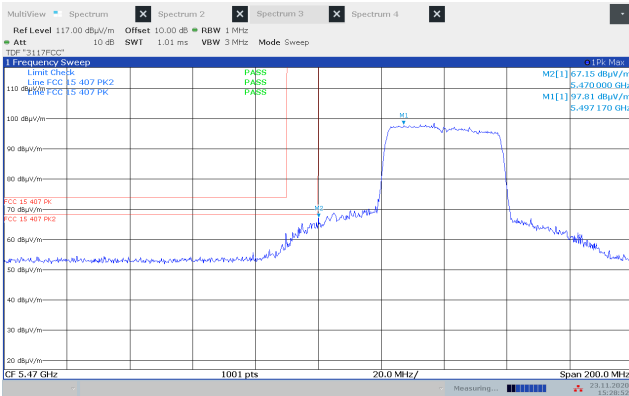
Band Edge 5850 MHz, ch165, 802.11n HT20, Radiated, Max



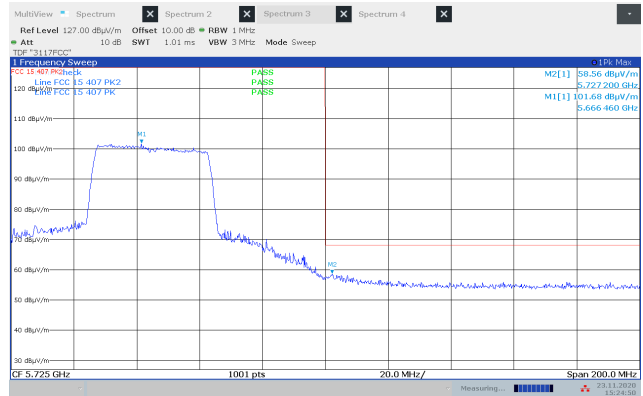
Band Edge 5150 MHz, ch038, 802.11n HT40, Radiated, Max



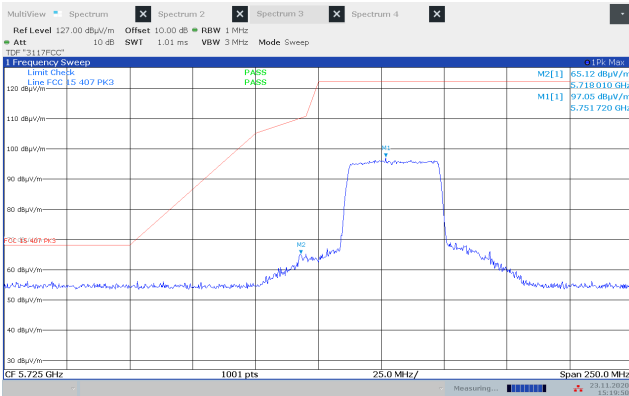
Band Edge 5350 MHz, ch062, 802.11n HT40, Radiated, Max



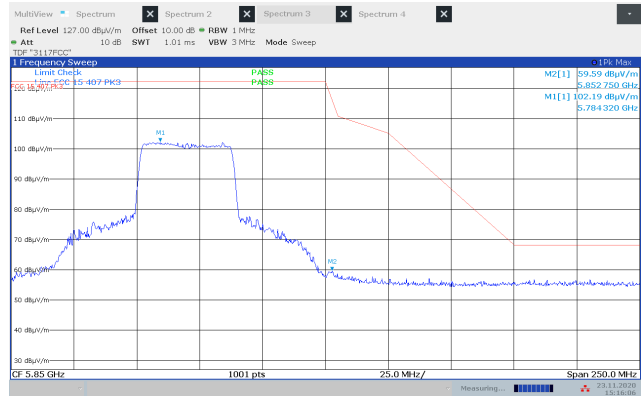
Band Edge 5470 MHz, ch102, 802.11n HT40, Radiated, Max



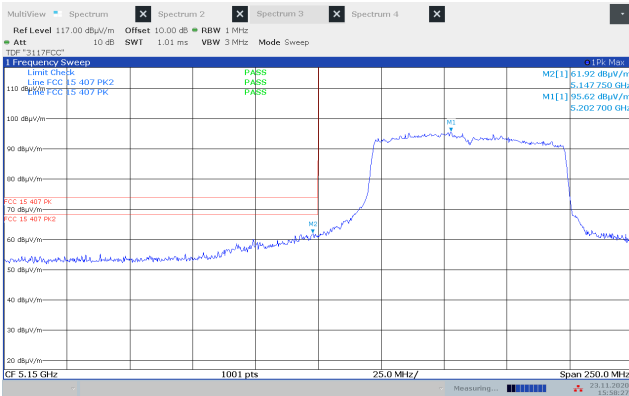
Band Edge 5725 MHz, ch134, 802.11n HT40, Radiated, Max



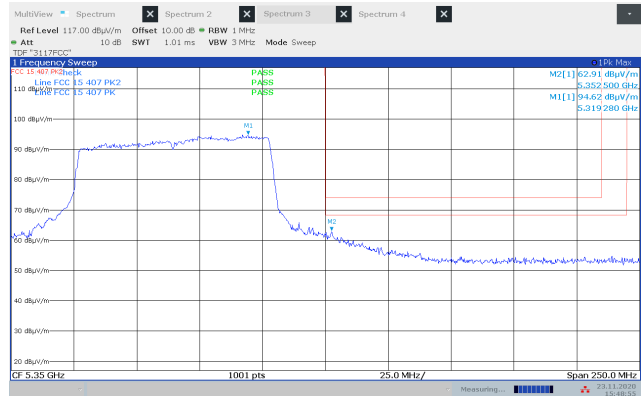
Band Edge 5725 MHz, ch151, 802.11n HT40, Radiated, Max



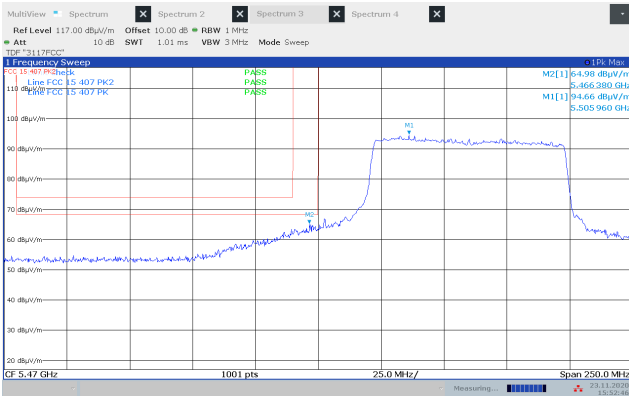
Band Edge 5850 MHz, ch159, 802.11n HT40, Radiated, Max



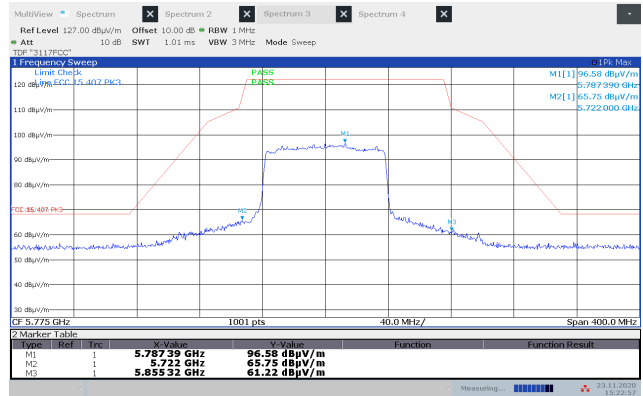
Band Edge 5150 MHz, ch042, 802.11ac HT80, Radiated, Max



Band Edge 5350 MHz, ch058, 802.11ac HT80, Radiated, Max



Band Edge 5470 MHz, ch106, 802.11ac HT80, Radiated, Max



Band Edge 5725/5850 MHz, ch155, 802.11ac HT80, Radiated, Max

3.3 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.

3.4 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: QuasiPeak (Peak for Pre-Scan)

Measuring distance 3m

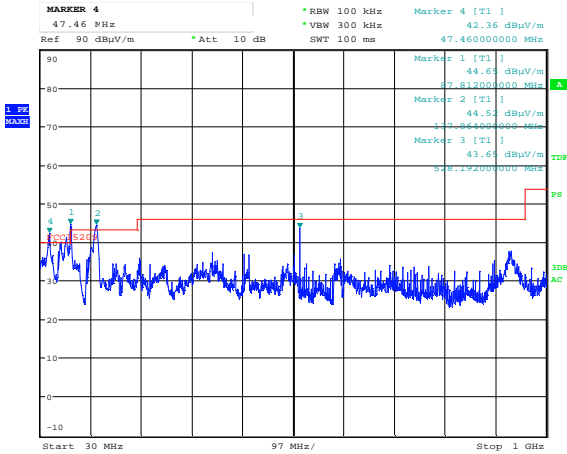
Tested in test mode with EUT transmitting on Ch 60.

Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	5300	802.11a 6Mbps	≤ 36.2	40.0	≥ 3.8
88 – 216	5300	802.11a 6Mbps	≤ 42.0	43.5	≥ 1.5
216 – 960	5300	802.11a 6Mbps	≤ 39.2	46.0	≥ 6.8
960 – 1000	5300	802.11a 6Mbps	< 40	54.0	> 14
47.5	5300	802.11a 6Mbps	36.2	40.0	3.8
88.8	5300	802.11a 6Mbps	42.0	43.5	1.5
135.5	5300	802.11a 6Mbps	41.8	43.5	1.7
528.0	5300	802.11a 6Mbps	39.2	46.0	6.8
694.3	5300	802.11a 6Mbps	38.7	46.0	7.3
893.2	5300	802.11a 6Mbps	38.8	46.0	7.2

See attached plots.

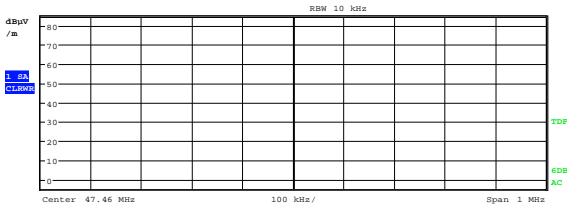
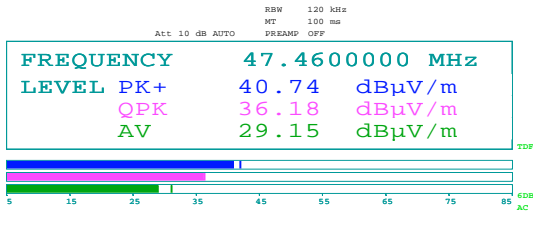
Requirements/Limit

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		



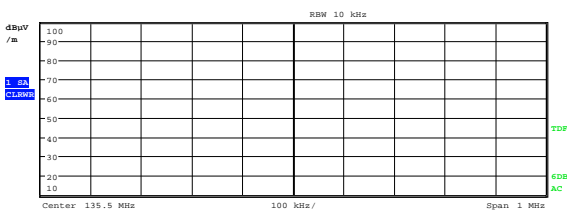
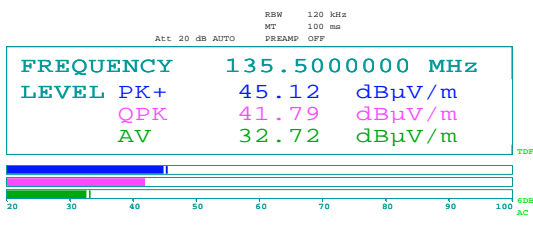
Date: 24.NOV.2020 15:16:51

Radiated Emissions 30-1000 MHz, Ch60, VP



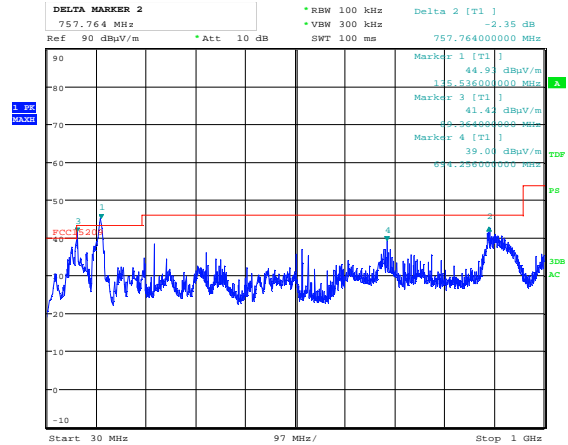
Date: 24.NOV.2020 15:32:50

Radiated Emissions 47.46 MHz, VP



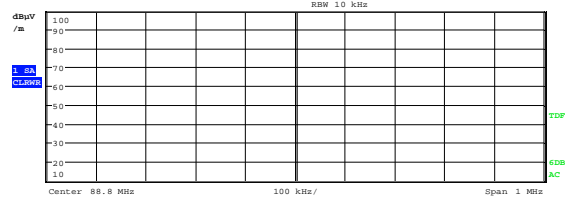
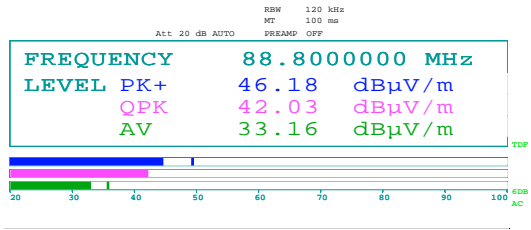
Date: 24.NOV.2020 16:03:44

Radiated Emissions 135.5 MHz, HP



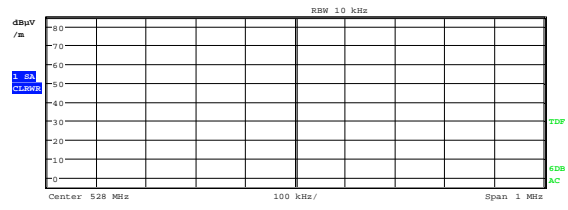
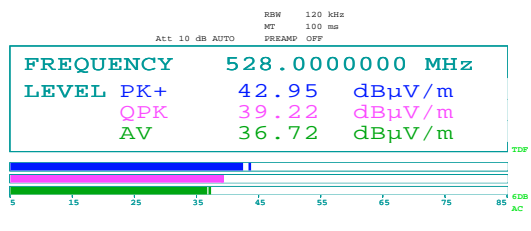
Date: 24.NOV.2020 15:08:39

Radiated Emissions 30-1000 MHz, Ch60, HP



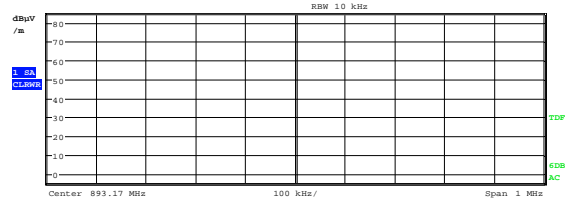
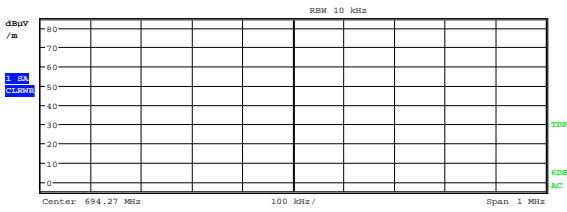
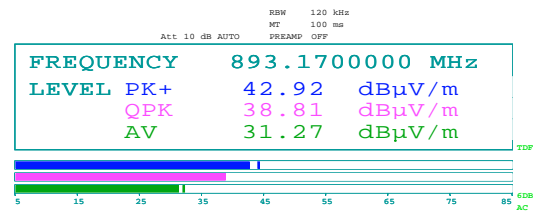
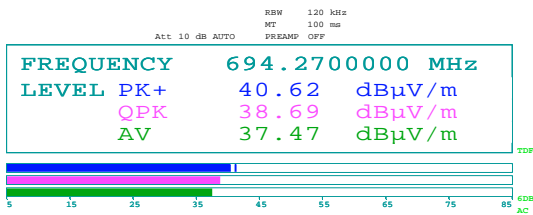
Date: 24.NOV.2020 15:47:57

Radiated Emissions 88.8 MHz, VP



Date: 24.NOV.2020 16:18:37

Radiated Emissions 528.0 MHz, HP



Date: 24.NOV.2020 16:29:39

Date: 24.NOV.2020 16:47:02

Radiated Emissions 694.27 MHz, HP

Radiated Emissions 893.17 MHz, HP

3.5 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 up to 18 GHz, 1m above 18 GHz.

RBW/VBW = 1MHz/3MHz

Carrier Frequency (MHz)	Measured Frequency (GHz)	Modulation	Measured Emissions (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
			Peak	Average	Peak	Average	Peak	Average
5180	5150	802.11a 6Mbps	60.8	48.2	74	54	13.2	5.8
5180	5150	802.11n MCS0	54.0	45.6	74	54	20.0	8.4
5190	5150	802.11n HT40	65.3	50.6	74	54	8.7	3.4
5210	5150	802.11n HT80	61.9	48.4	74	54	12.1	5.6
5320	5350	802.11a 6Mbps	65.1	51.2	74	54	8.9	2.8
5320	5350	802.11n MCS0	65.6	52.6	74	54	8.4	1.4
5310	5350	802.11n HT40	66.5	51.8	74	54	7.5	2.2
5290	5350	802.11n HT80	62.9	49.7	74	54	11.1	4.3
5500	5470/5460	802.11a 6Mbps	66.3	49.6	74	54	7.7	4.4
5500	5470/5460	802.11n MCS0	67.1	50.1	74	54	6.9	3.9
5510	5470/5460	802.11n HT40	67.2	46.7	74	54	6.8	7.3
5530	5470/5460	802.11n HT80	65.0	49.7	74	54	9.0	4.3
Any	1350	Any	59.4	56.3	74	54	14.6	-2.3
Any	2971	Any	65.8	45.1	74	54	8.2	8.9
Any	4050	Any	59.0	56.8	74	54	15.0	-2.8
Any	5942	Any	66.9	52.6	74	54	7.1	1.4
Any	8911	Any	54.6	44.6	74	54	19.4	9.4
Any	15660	Any	61.7	48.3	74	54	12.3	5.7
Any	15900	Any	61.1	48.4	74	54	12.9	5.6
Any	Any other	Any	<60	<40	74	54	> 10	> 10

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

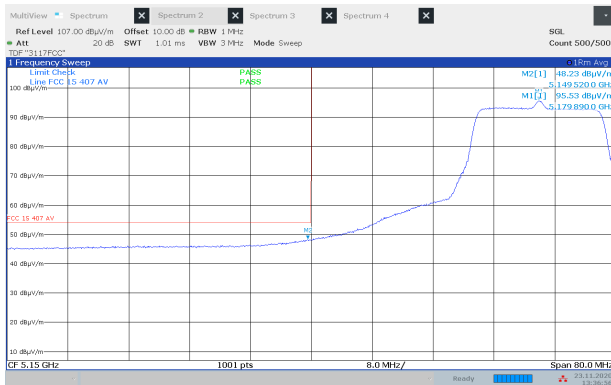
Only harmonics that fall in the restricted bands (ref. §15.205) have been measured.

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

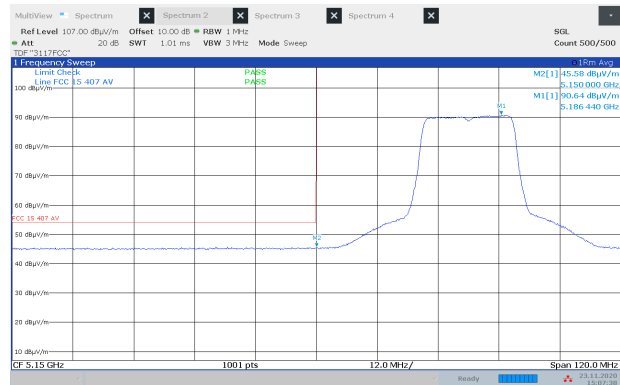
See attached plots.

Requirements/Limit

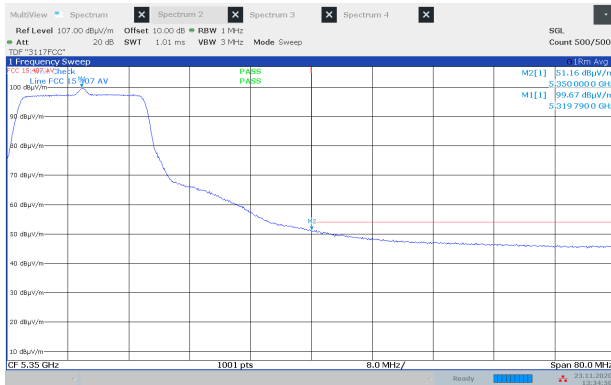
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector (dBµV/m)	Peak Detector (dBµV/m)
1 – 40 GHz	54.0	74.0



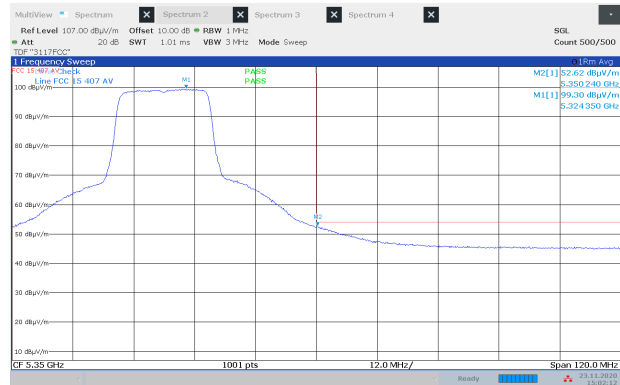
Band Edge, 5150 MHz, Ch036, 802.11a 6M, AV, Max



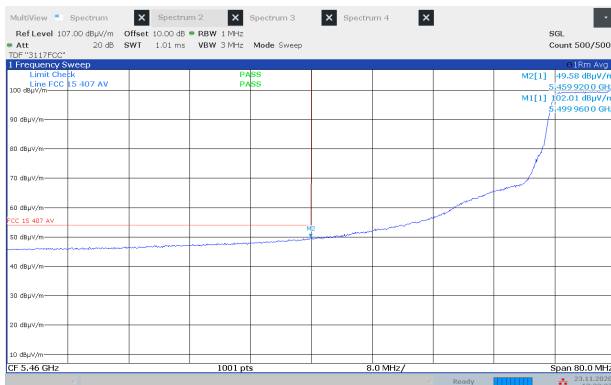
Band Edge, 5150 MHz, Ch036, 802.11n HT20, AV, Max



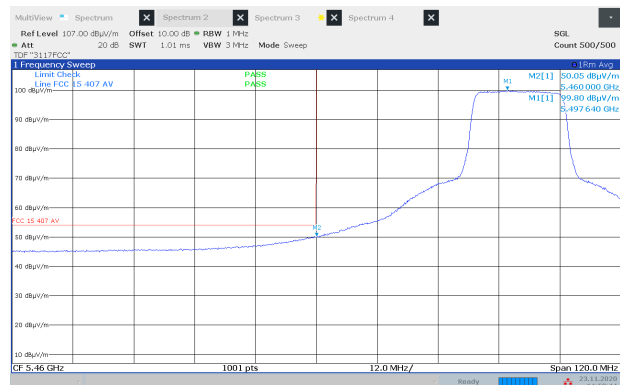
Band Edge, 5350 MHz, Ch064, 802.11a 6M, AV, Max



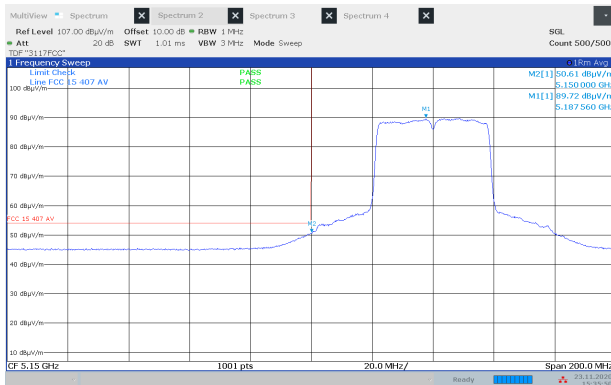
Band Edge, 5350 MHz, Ch064, 802.11n HT20, AV, Max



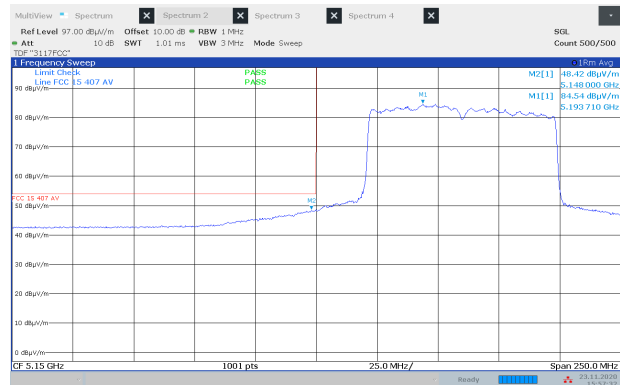
Band Edge, 5460 MHz, Ch100, 802.11a 6M, AV, Max



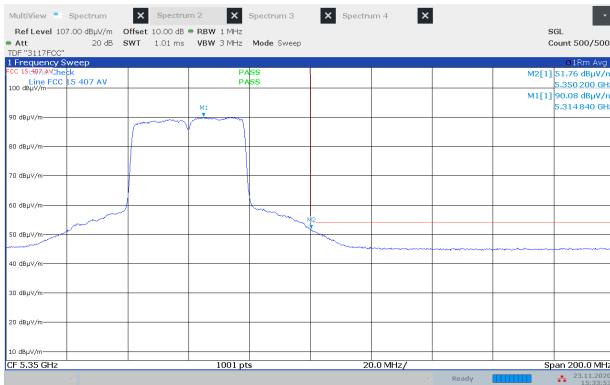
Band Edge, 5460 MHz, Ch100, 802.11n HT20, AV, Max



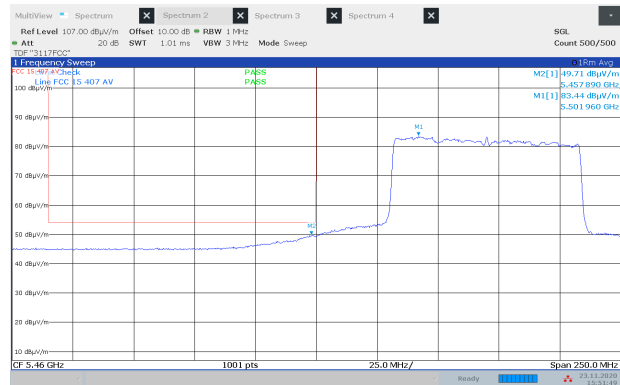
Band Edge, 5150 MHz, Ch038, 802.11n HT40, AV, Max



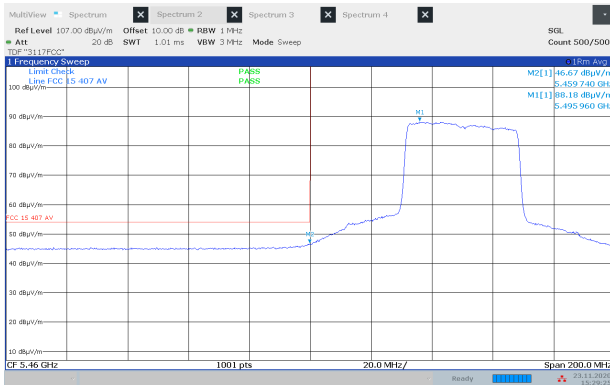
Band Edge, 5150 MHz, Ch042, 802.11ac HT80, AV, Max



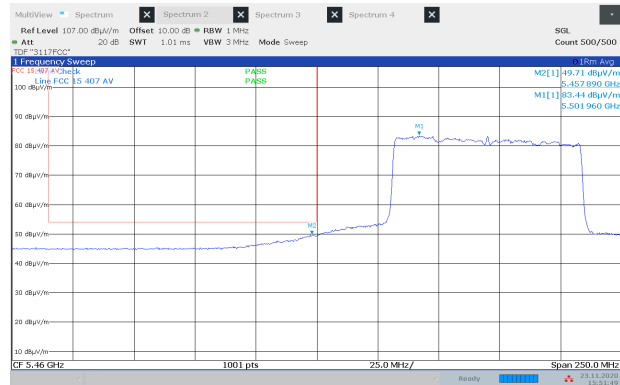
Band Edge, 5350 MHz, Ch062, 802.11n HT40, AV, Max



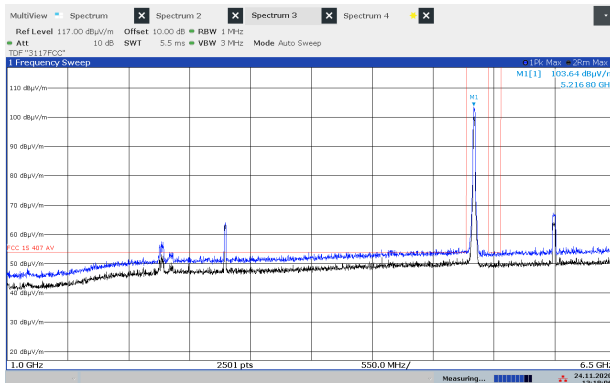
Band Edge, 5350 MHz, Ch058, 802.11ac HT80, AV, Max



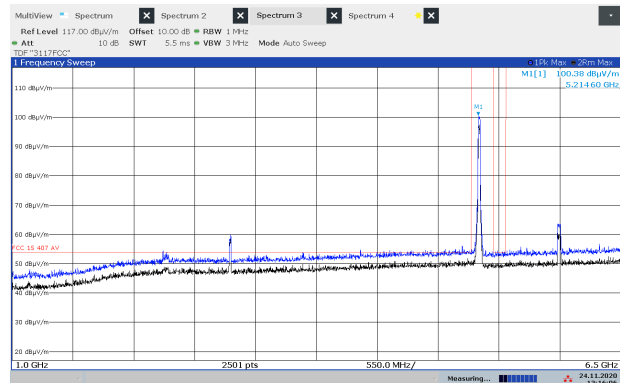
Band Edge, 5460 MHz, Ch102, 802.11n HT40, AV, Max



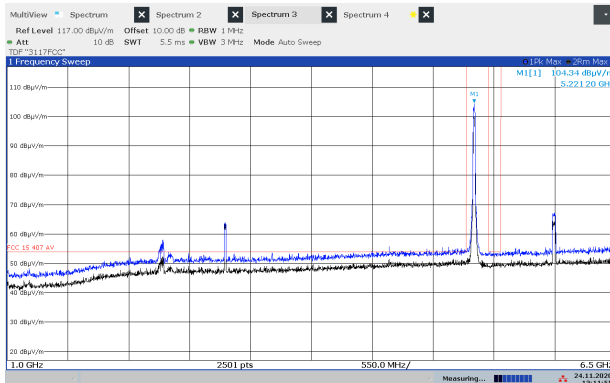
Band Edge, 5460 MHz, Ch106, 802.11n HT80, AV, Max



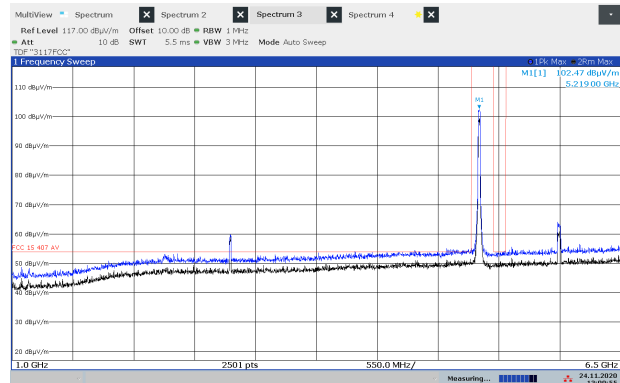
Radiated Emissions 1-6.5 GHz, Ch44, 802.11a 6M, Ant 0, HP



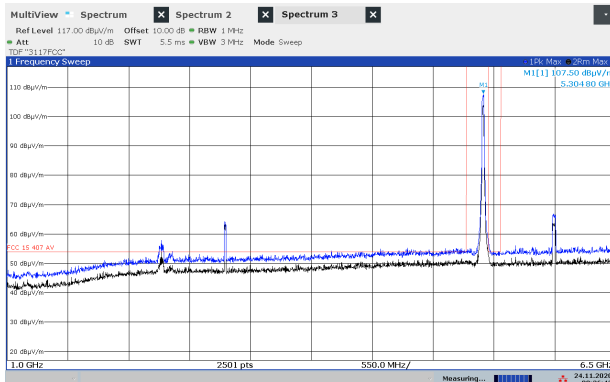
Radiated Emissions 1-6.5 GHz, Ch36, 802.11a 6M, Ant 0, VP



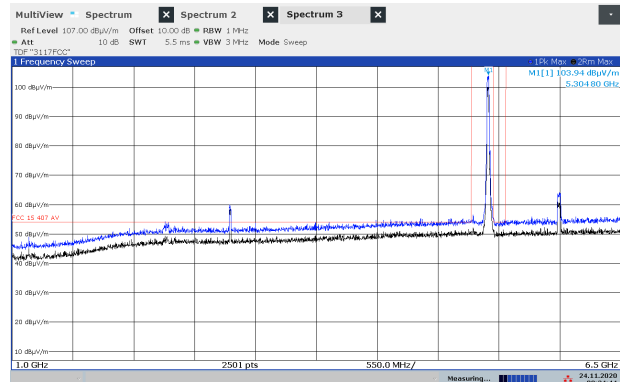
Radiated Emissions 1-6.5 GHz, Ch44, 802.11a 6M, Ant 1, HP



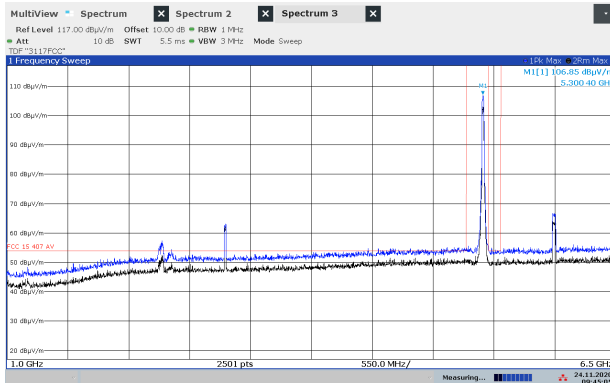
Radiated Emissions 1-6.5 GHz, Ch48, 802.11a 6M, Ant 1, VP



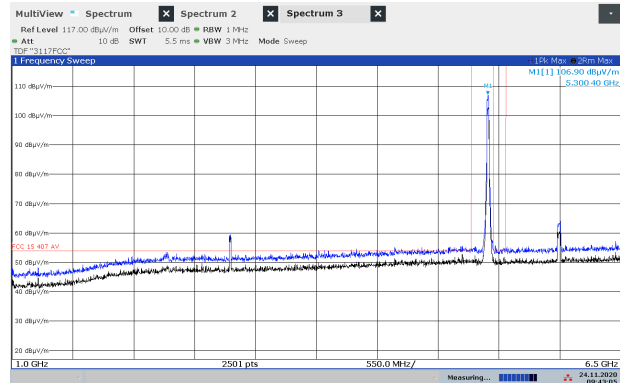
Radiated Emissions 1-6.5 GHz, Ch60, 802.11a 6M, Ant 0, HP



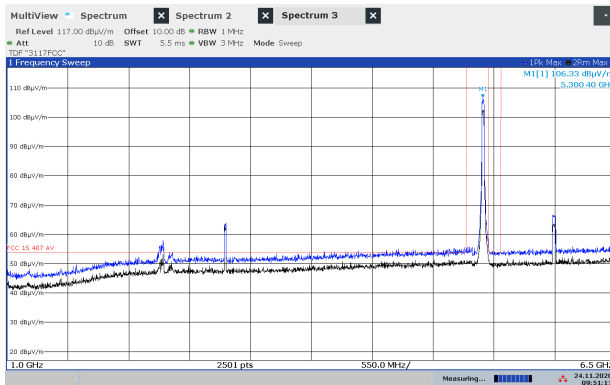
Radiated Emissions 1-6.5 GHz, Ch60, 802.11a 6M, Ant 1, VP



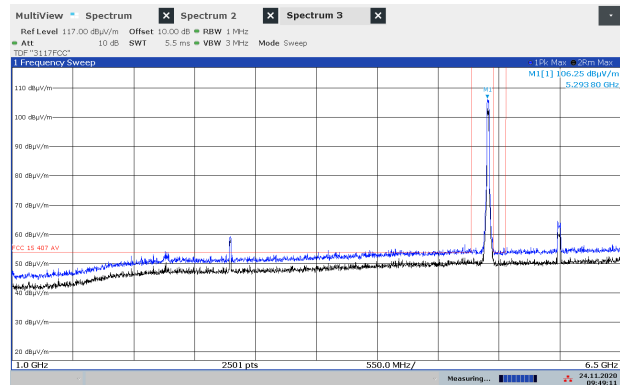
Radiated Emissions 1-6.5 GHz, Ch60, 802.11a 6M, Ant 1, HP



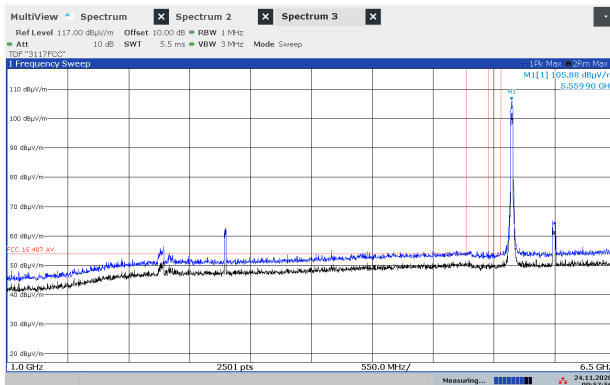
Radiated Emissions 1-6.5 GHz, Ch60, 802.11a 6M, Ant 1, VP



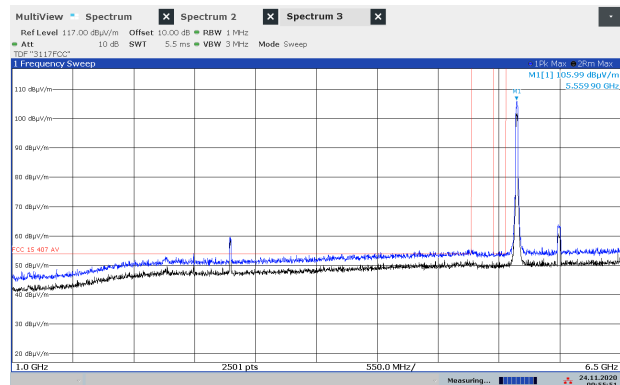
Radiated Emissions 1-6.5 GHz, Ch60, 802.11n MCS0, MIMO, HP



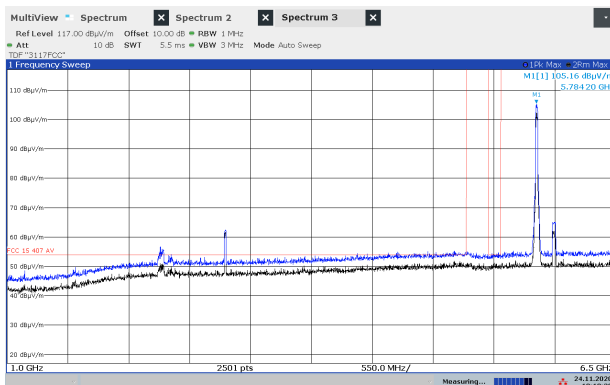
Radiated Emissions 1-6.5 GHz, Ch60, 802.11n MCS0, MIMO, VP



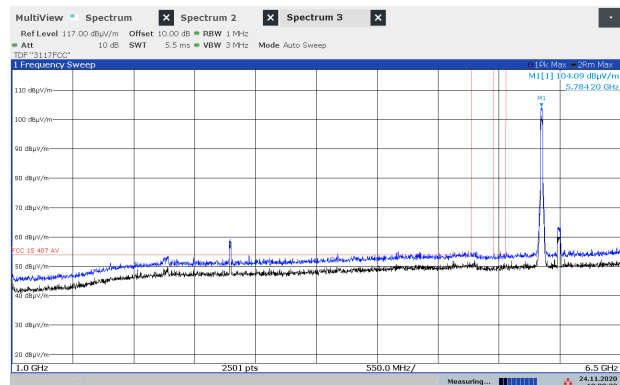
Radiated Emissions 1-6.5 GHz, Ch112, 802.11n MCS0, MIMO, HP



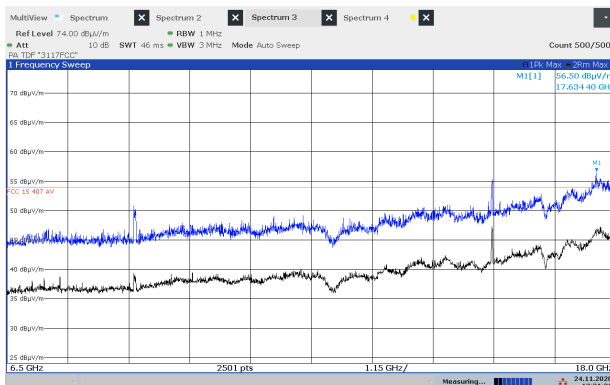
Radiated Emissions 1-6.5 GHz, Ch112, 802.11n MCS0, MIMO, VP



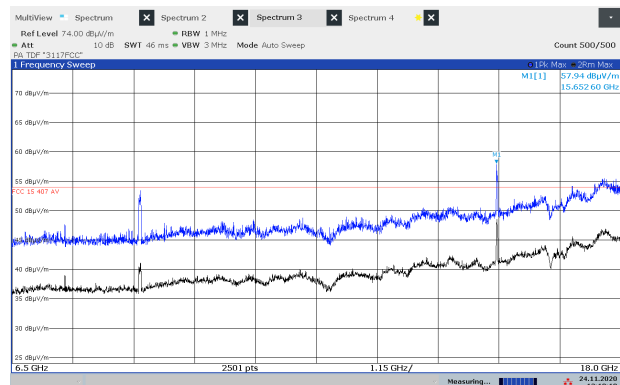
Radiated Emissions 1-6.5 GHz, Ch157, 802.11n MCS0, MIMO, HP



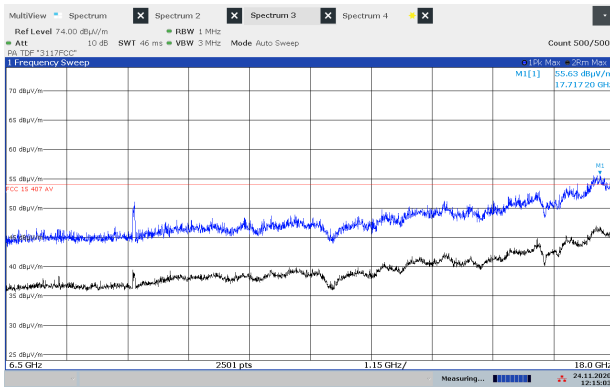
Radiated Emissions 1-6.5 GHz, Ch157, 802.11n MCS0, MIMO, VP



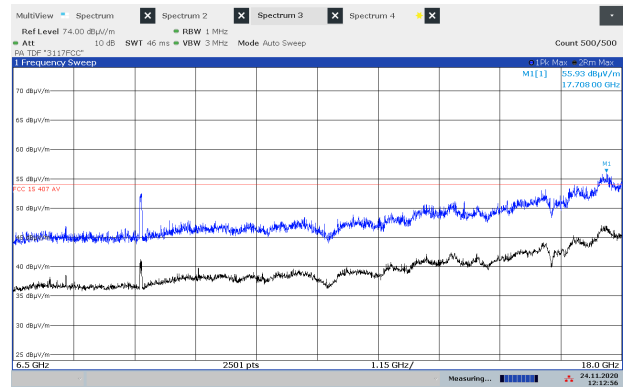
Radiated Emissions 6.5-18 GHz, Ch44, 802.11a 6M, Ant 0, HP



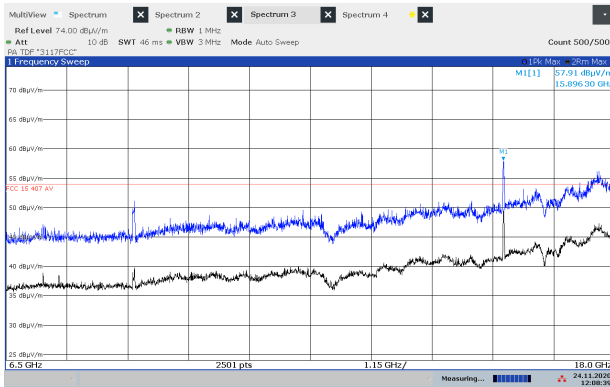
Radiated Emissions 6.5-18 GHz, Ch44, 802.11a 6M, Ant 0, VP



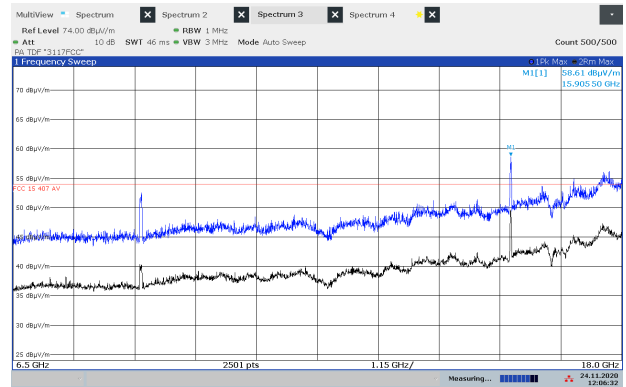
Radiated Emissions 6.5-18 GHz, Ch44, 802.11n MCS0, MIMO, HP



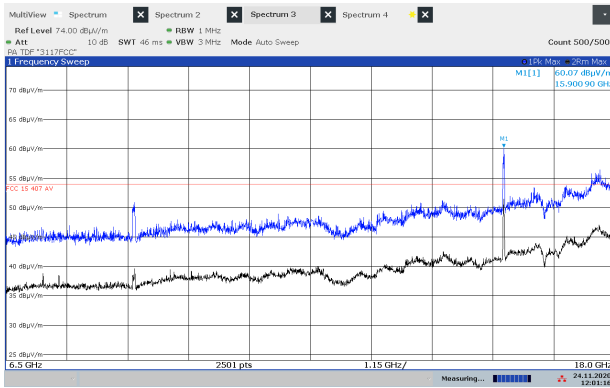
Radiated Emissions 6.5-18 GHz, Ch44, 802.11n MCS0, MIMO, VP



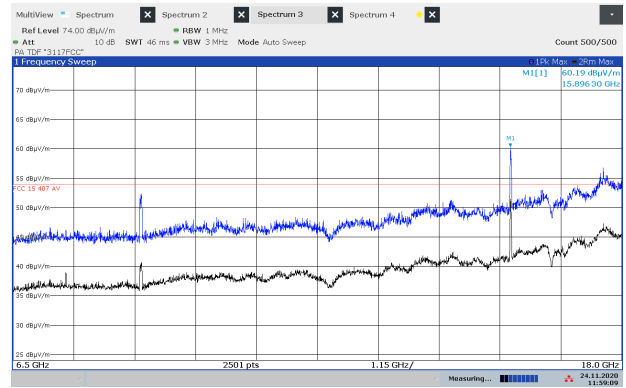
Radiated Emissions 6.5-18 GHz, Ch60, 802.11a 6M, Ant 0, HP



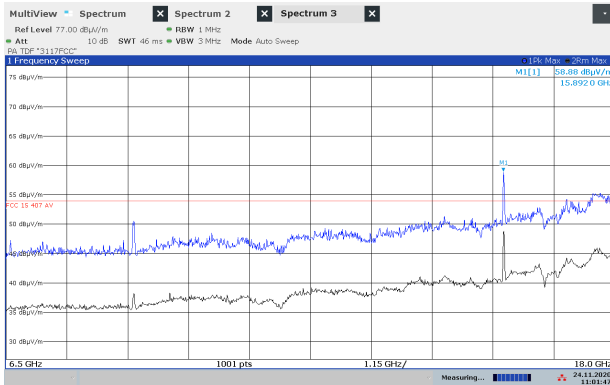
Radiated Emissions 6.5-18 GHz, Ch60, 802.11a 6M, Ant 0, VP



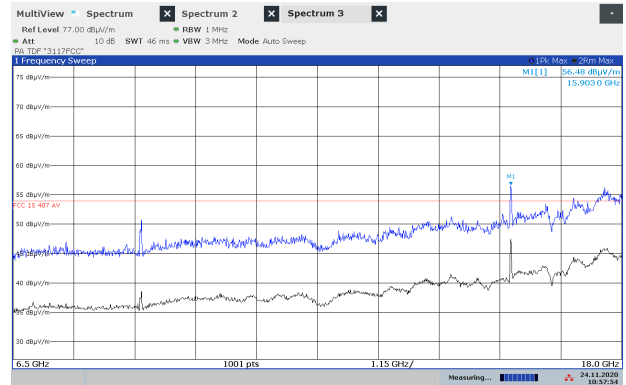
Radiated Emissions 6.5-18 GHz, Ch60, 802.11a 6M, Ant 1, HP



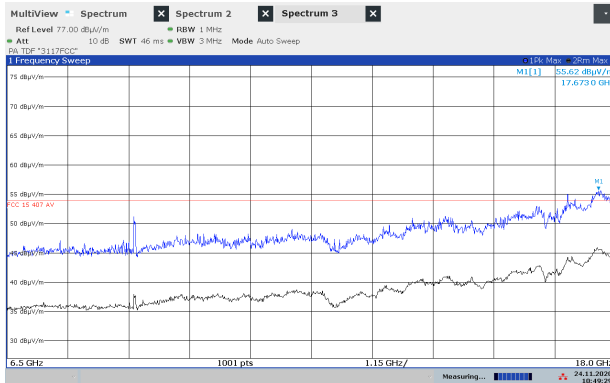
Radiated Emissions 6.5-18 GHz, Ch60, 802.11a 6M, Ant 1, VP



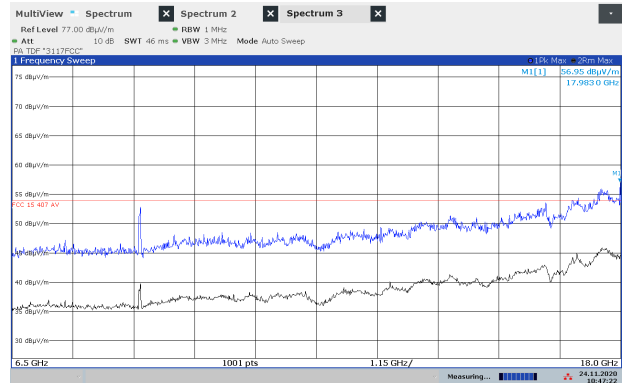
Radiated Emissions 6.5-18 GHz, Ch60, 802.11n MCS0, MIMO, HP



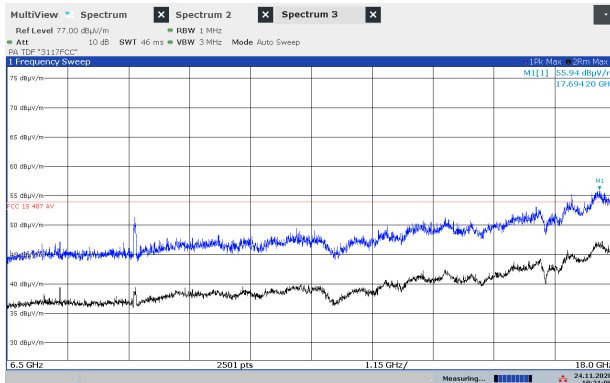
Radiated Emissions 6.5-18 GHz, Ch60, 802.11n MCS0, MIMO, VP



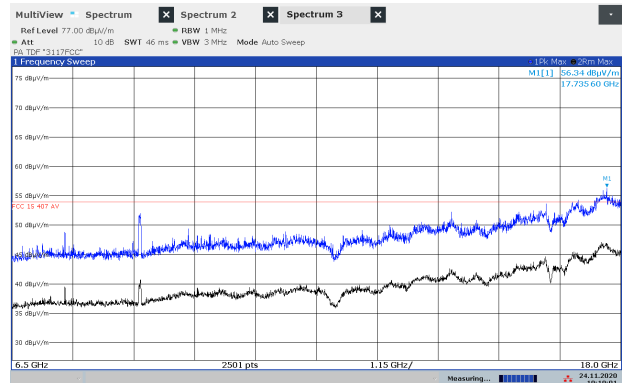
Radiated Emissions 6.5-18 GHz, Ch112, 802.11n MCS0, MIMO, HP



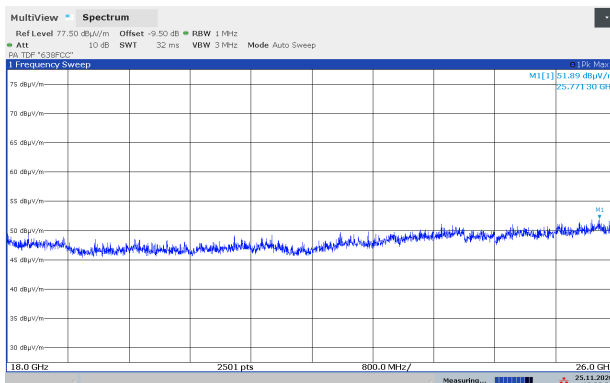
Radiated Emissions 6.5-18 GHz, Ch112, 802.11n HT40, MIMO, VP



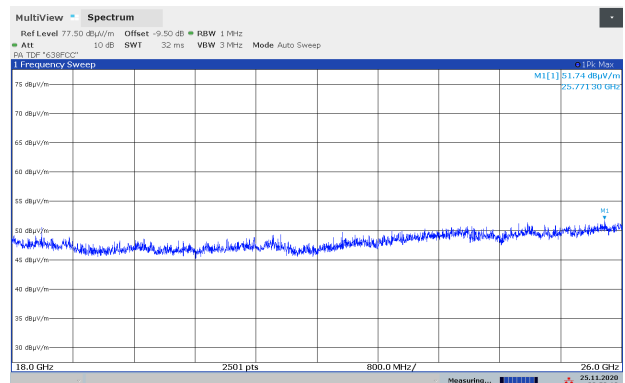
Radiated Emissions 6.5-18 GHz, Ch157, 802.11n MCS0, MIMO, HP



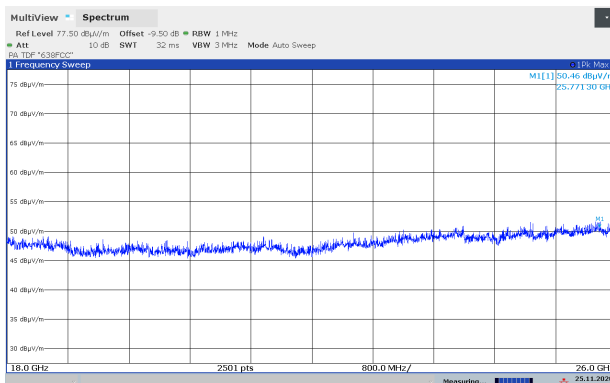
Radiated Emissions 6.5-18 GHz, Ch157, 802.11n MCS0, MIMO, VP



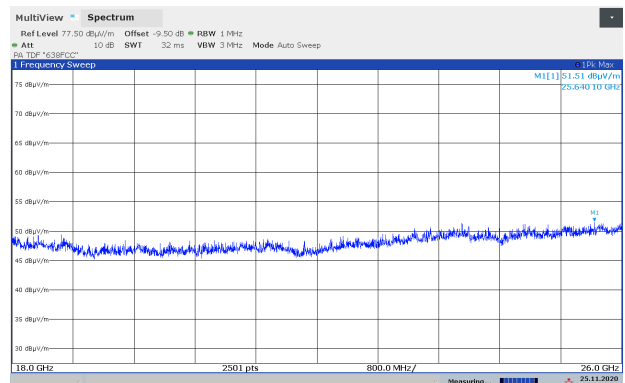
Emissions 18-26 GHz, Ch060, 802.11n MCS0, MIMO, HP, @1m



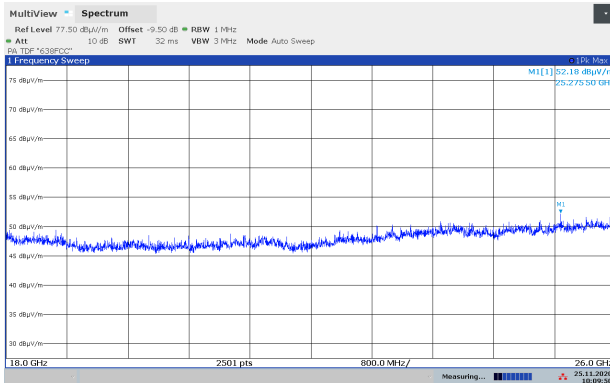
Emissions 18-26 GHz, Ch060, 802.11n MCS0, MIMO, VP, @1m



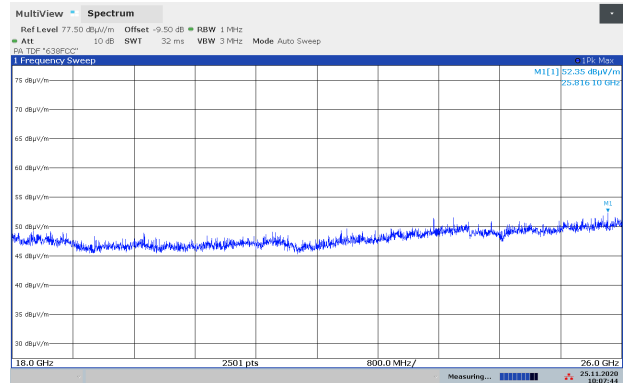
Emissions 18-26 GHz, Ch112, 802.11n MCS0, MIMO, HP, @1m



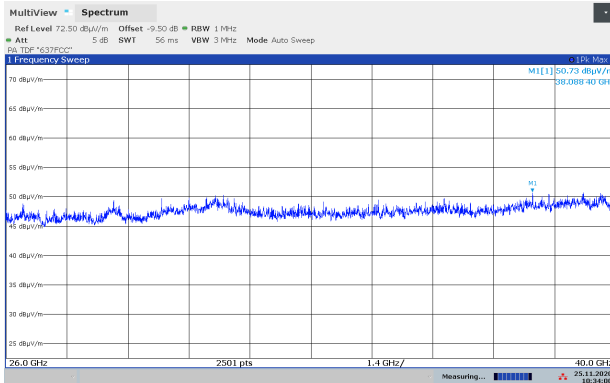
Emissions 18-26 GHz, Ch112, 802.11n MCS0, MIMO, VP, @1m



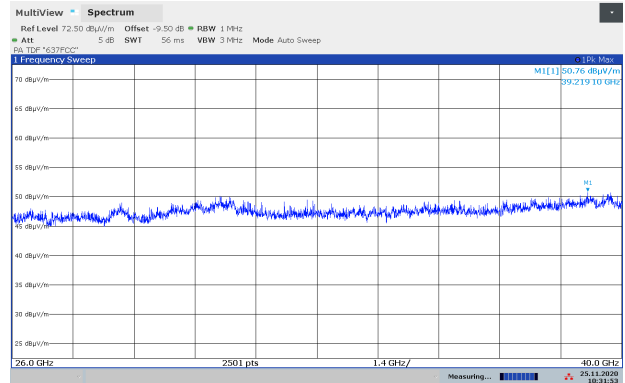
Emissions 18-26 GHz, Ch157, 802.11n MCS0, MIMO, HP, @1m



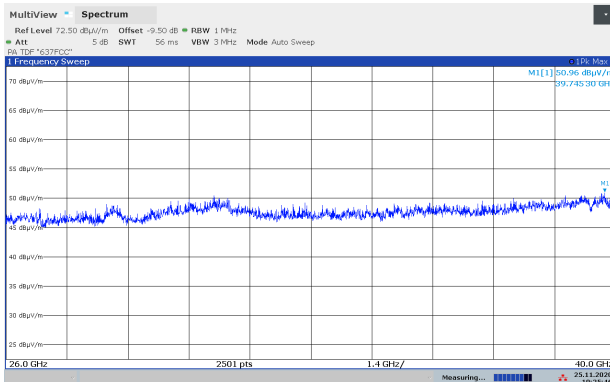
Emissions 18-26 GHz, Ch157, 802.11n MCS0, MIMO, VP, @1m



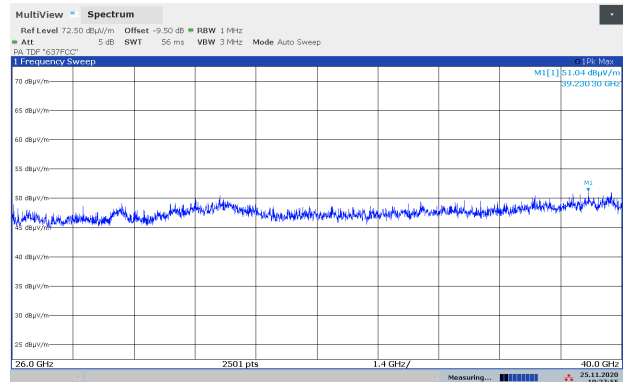
Emissions 26-40 GHz, Ch060, 802.11n MCS0, MIMO, HP, @1m



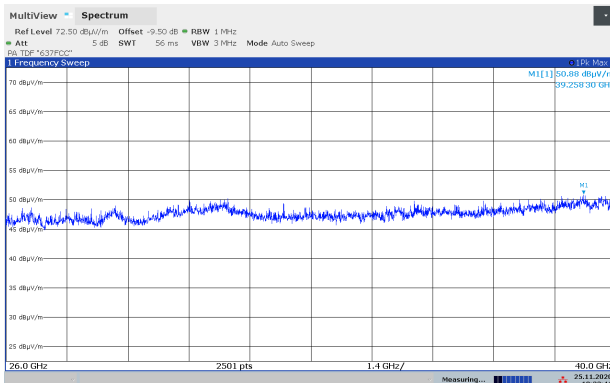
Emissions 26-40 GHz, Ch060, 802.11n MCS0, MIMO, VP, @1m



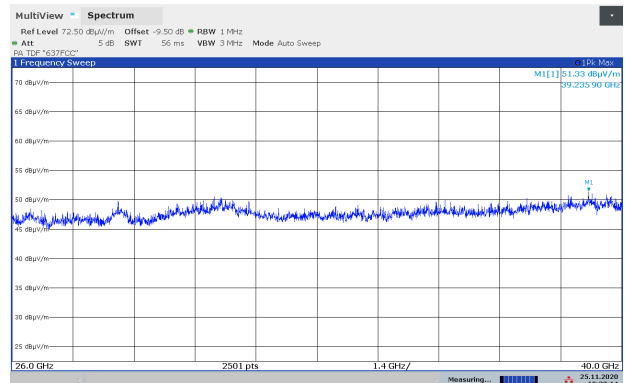
Emissions 18-26 GHz, Ch112, 802.11n MCS0, MIMO, HP, @1m



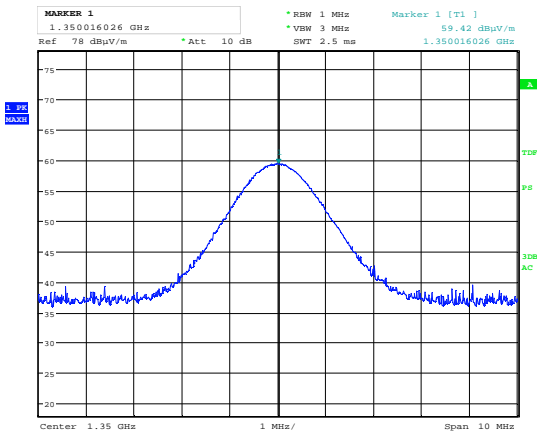
Emissions 18-26 GHz, Ch112, 802.11n MCS0, MIMO, VP, @1m



Emissions 18-26 GHz, Ch157, 802.11n MCS0, MIMO, HP, @1m

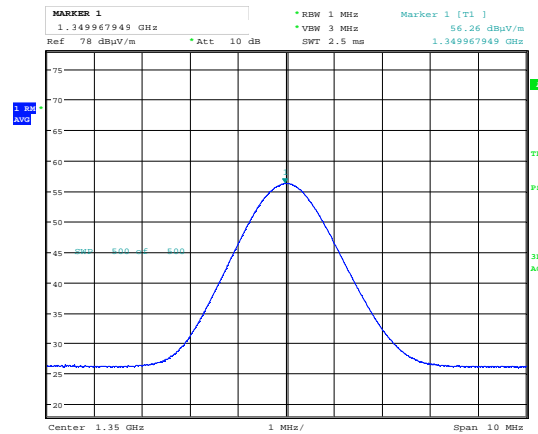
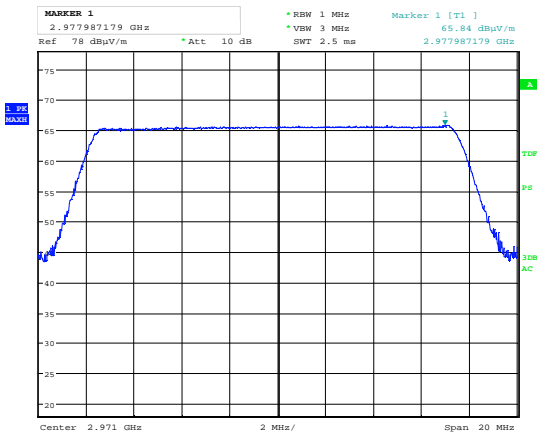


Emissions 18-26 GHz, Ch157, 802.11n MCS0, MIMO, VP, @1m



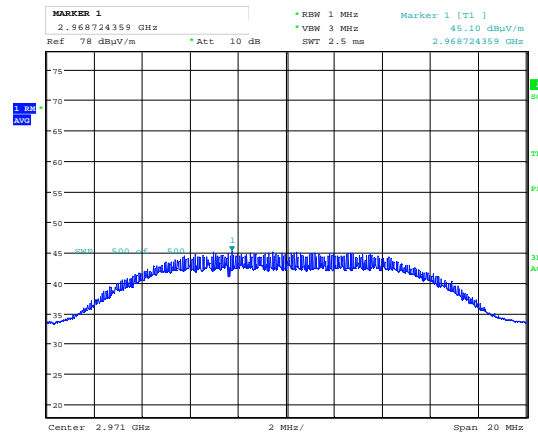
Date: 20.NOV.2020 10:26:54

Radiated Emissions 1350 MHz, Peak



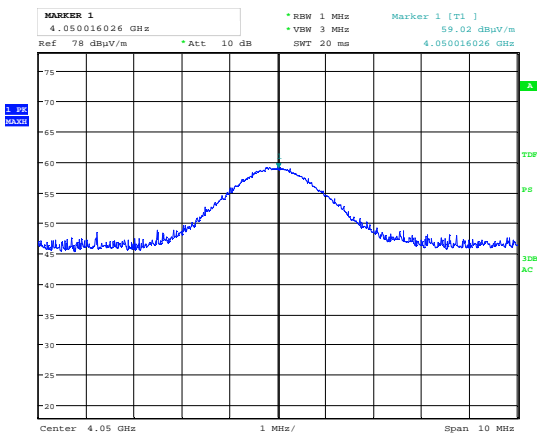
Date: 20.NOV.2020 10:26:24

Radiated Emissions 1350 MHz, Av



Date: 20.NOV.2020 10:43:12

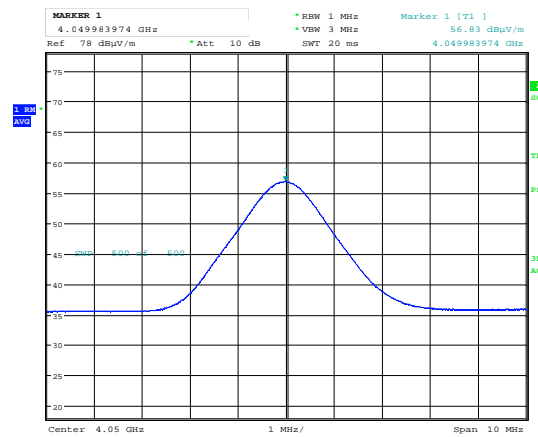
Radiated Emissions 2971 MHz, Peak



Date: 20.NOV.2020 10:58:26

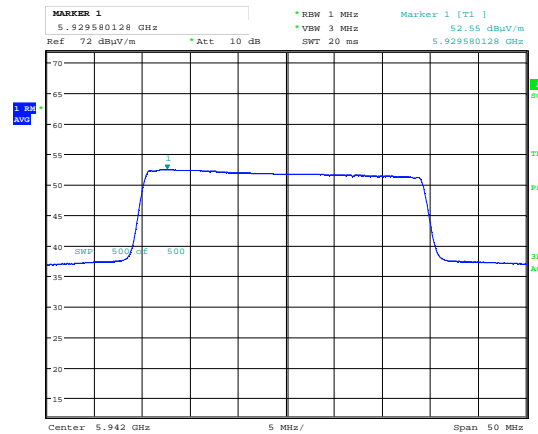
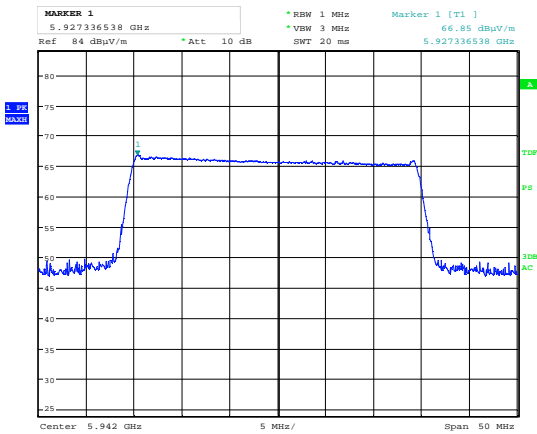
Radiated Emissions 4050 MHz, Peak

Radiated Emissions 2971 MHz, Av



Date: 20.NOV.2020 10:59:22

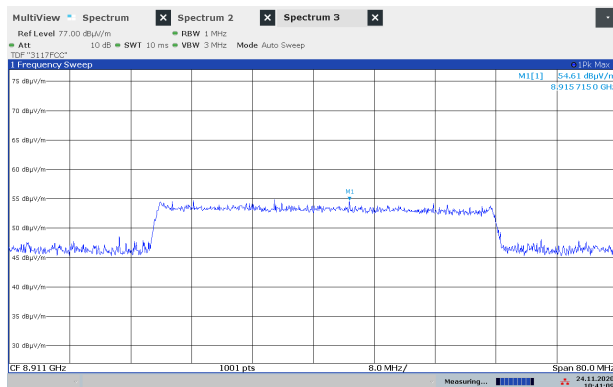
Radiated Emissions 4050 MHz, Av



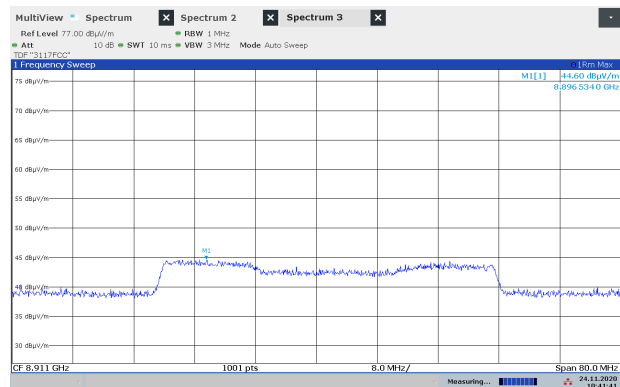
Date: 20.NOV.2020 11:13:13

Date: 20.NOV.2020 11:14:29

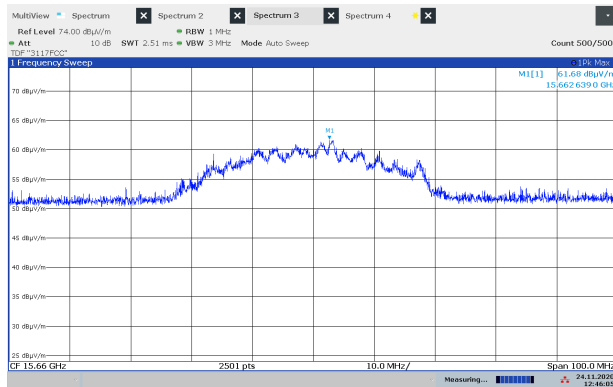
Radiated Emissions 5942 MHz, Peak



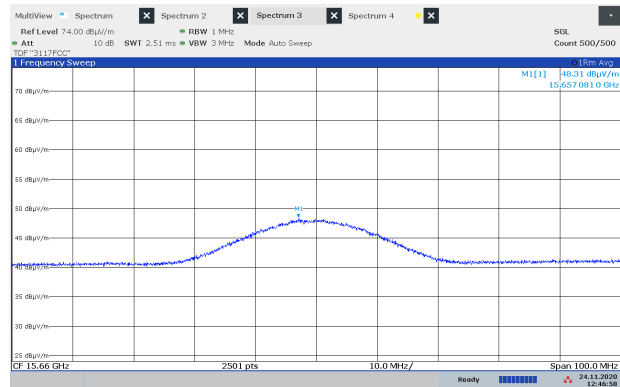
Radiated Emissions 5942 MHz, AV



Radiated Emissions 8911 MHz, Ch157, 802.11n MCS0, MIMO, Peak

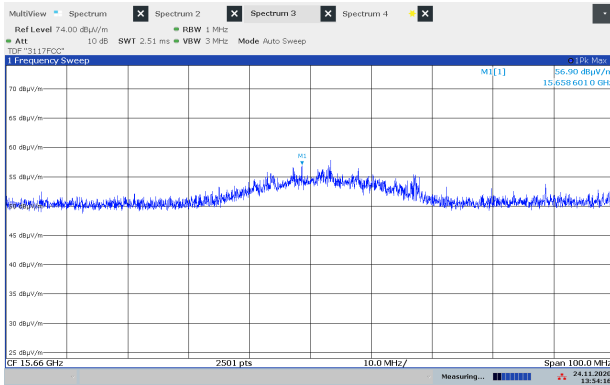


Radiated Emissions 8911 MHz, Ch157, 802.11n MCS0, MIMO, AV

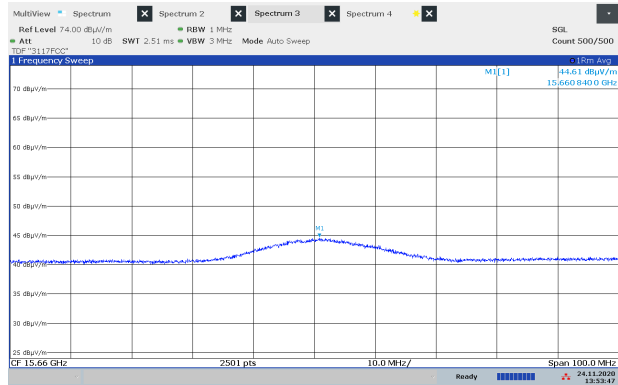


Radiated Emissions 15.66 GHz, Ch44, 802.11a, 6M, Ant 0, Peak

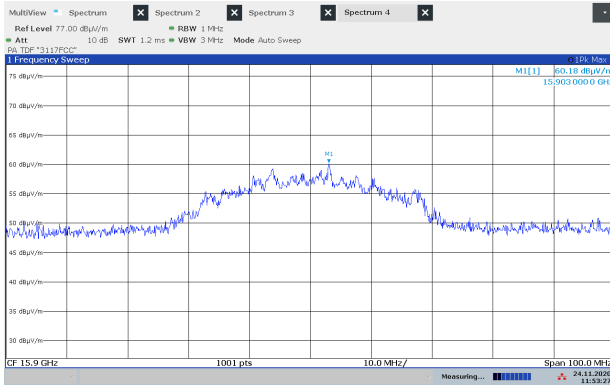
Radiated Emissions 15.66 GHz, Ch44, 802.11a, 6M, Ant 0, AV



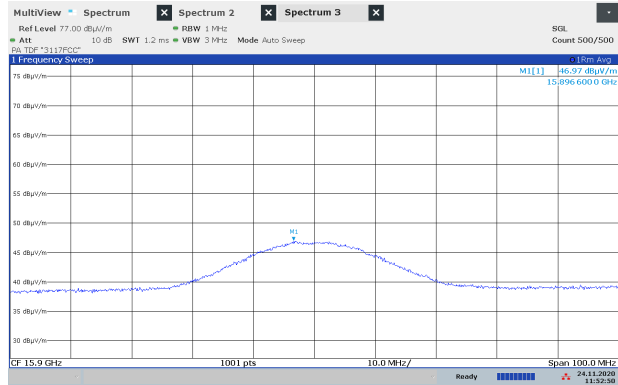
Radiated Emissions 15.66 GHz, Ch44, 802.11a, 6M, Ant 1, Peak



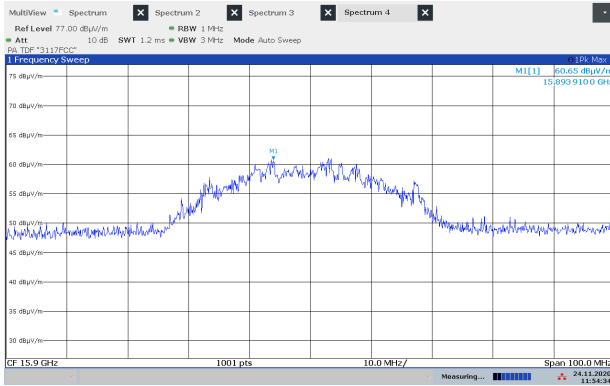
Radiated Emissions 15.66 GHz, Ch44, 802.11a, 6M, Ant 1, AV



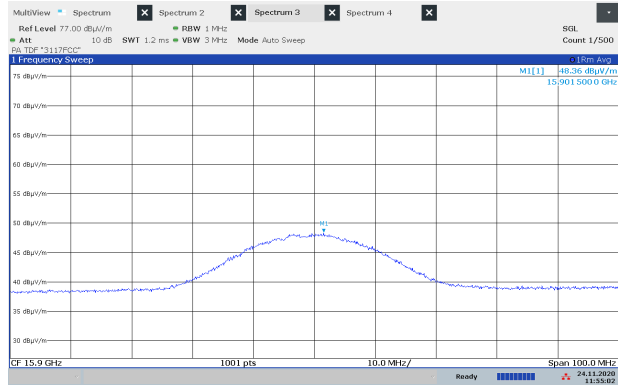
Radiated Emissions 15.90 GHz, Ch60, 802.11a, 6M, Ant 0, Peak



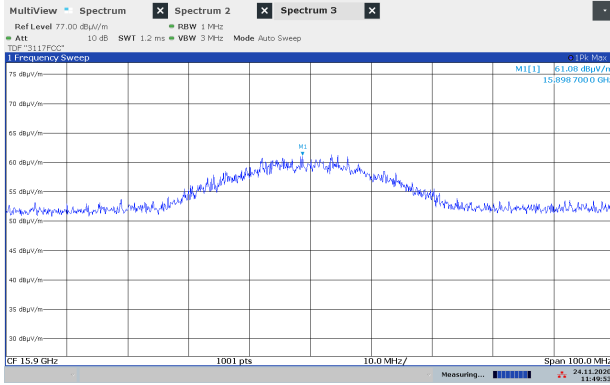
Radiated Emissions 15.90 GHz, Ch60, 802.11a, 6M, Ant 0, AV



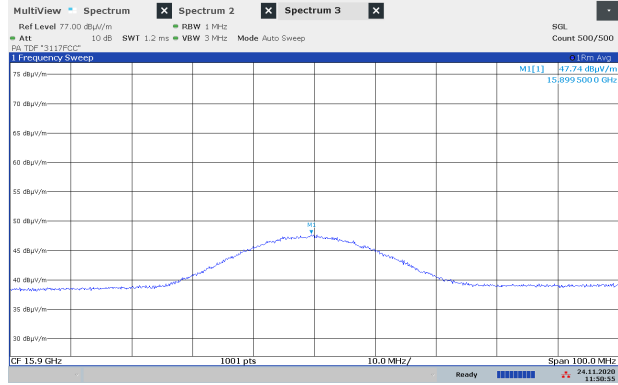
Radiated Emissions 15.90 GHz, Ch60, 802.11a, 6M, Ant 1, Peak



Radiated Emissions 15.90 GHz, Ch60, 802.11a, 6M, Ant 1, AV



Radiated Emissions 15.90 GHz, Ch60, 802.11n MCS0, MIMO, Peak



Radiated Emissions 15.90 GHz, Ch60, 802.11n MCS0, MIMO, AV

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	2020-10	2021-10
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2020-03	2021-03
3	6810-17B	Attenuator	Suhner	LR 1669	2020-08	2021-08
4	N0324415	BandStop Filter	Microwave Circuits	LR 1760	COU	
5	WLK5-1100-1485-7000-40SS	Low Pass Filter	Wainwright Inst.	LR 1761	COU	
6	VULB 9163	BiLog Antenna	Schwarzbeck	LR 1616	2020-01	2023-01
7	317	Preamplifier	Sonoma Inst.	LR 1687	2020-08	2021-08
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2020-08	2021-08
9	3115	Horn Antenna	EMCO	LR 1330	2016-10	2021-10
10	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2020-08	2021-08
11	Model 638	Antenna Horn	Narda	LR 1480	N/A	
12	Model 87 V	Multimeter	Fluke	LR 1599	2019-02	2021-02
14	6812B	AC Power Source	Agilent	LR 1515	COU	
15	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2019-11	2021-11
16	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2019-10	2021-10
17	Model V637	Horn Antenna	Narda	LR 099	N/A	
18	JS4-20004000	Preamplifier	Miteq	LR 1591	2020-08	2021-08
19	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	
20	SF102/1000MM	RF Cable	Suhner	SN 50113/2	COU	
21	SF102/2000MM	RF Cable	Suhner	SN 500100/2	COU	

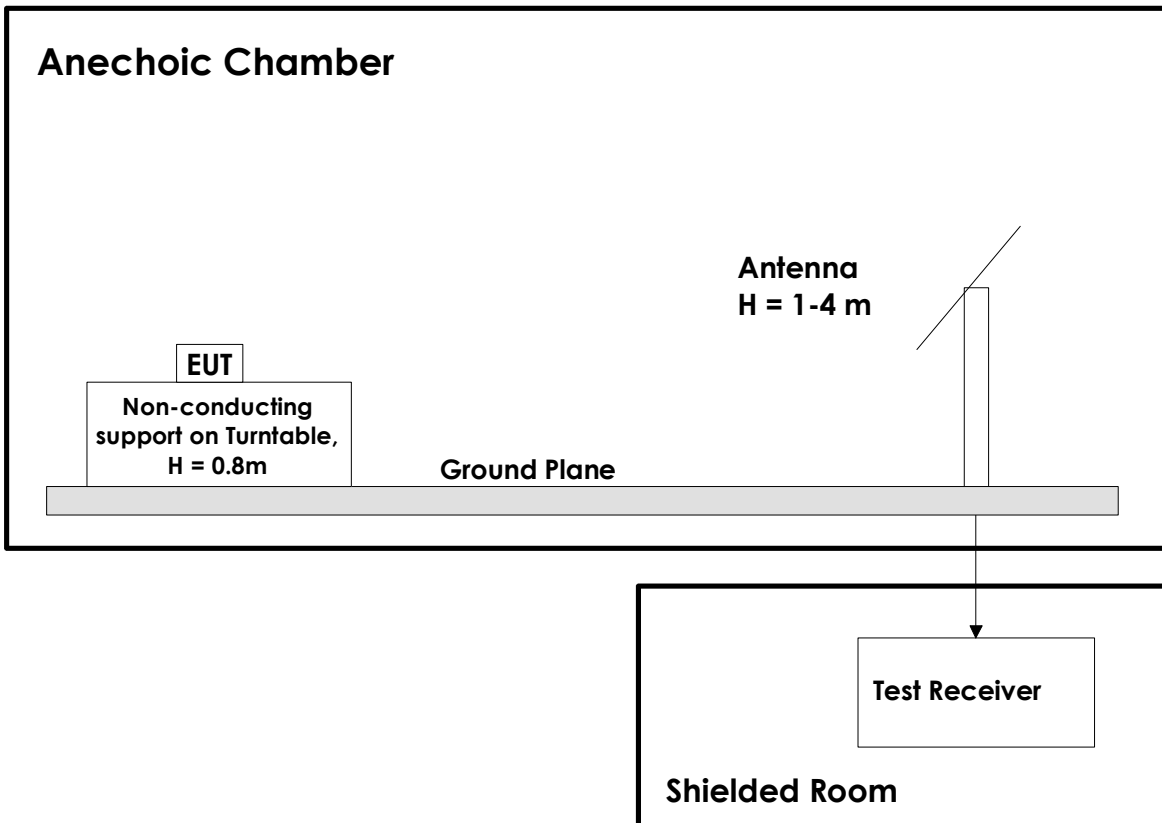
Note: COU – calibrate on use; N/A – Not Applicable

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

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.40.10	Power Line Conducted test software
2	Nemko AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. Measuring distance is 3m for all frequencies.

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.