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Phillips Lifeline TEST REPORT

SCOPE OF WORK

EMC TESTING – MHB 3.0

REPORT NUMBER

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EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 104038541LEX-003.6

Project Number: G104038541

Report Issue Date: 9/8/2021

Model(s) Tested: MHB 3.0

Standards: Title 47 CFR Part 15E for 5GHz Bands
RSS-247 Issue 2
RSS-Gen Issue 5

Tested by:
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Client:
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Report prepared by



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Report reviewed by



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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
6	Receiver Spurious Emissions (ANSI C63.4: 2014)	Pass
7	Transmitter Spurious Emissions (FCC Part 15.407(d), RSS-247 Issue 2 § 5.5)	Pass
8	Output Power (FCC Part 15.407(b)(3), RSS-247 Issue 2 § 6.2(d))	Pass
9	Occupied Bandwidth (FCC Part 15.407, RSS-247 Issue 2 § 6.2(a))	Pass
10	Power Spectral Density (FCC Part 15.407(b)(3), RSS-247 Issue 2 § 6.2(d))	Pass
11	Antenna Requirement (FCC Part 15.203, RSS-Gen Issue 5 § 6.8)	Pass
12	Dynamic Frequency Selection (FCC Part 15.407(h), RSS-247 Issue 2 § 6.3)	Pass (Tested at Menlo Park)



3 Client Information

This product was tested at the request of the following:

Client Information	
Client Name:	Phillips Lifeline
Address:	11 Lawrence St Framingham, MA 01702 USA
Contact:	Bill Bekdash
Email:	Bill.bekdash@phillips.com
Manufacturer Information	
Manufacturer Name:	Phillips Lifeline
Manufacturer Address:	11 Lawrence St Framingham, MA 01702 USA



4 Description of Equipment under Test and Variant Models

Equipment Under Test	
Product Name	MHB 3.0
Model Numbers	7250MHB
Receive Date	12/15/2020
Test Start Date	1/24/2021
Test End Date	5/1/2021
Device Received Condition	Good
Test Sample Type	Production
Input Rating	3.7V, 0.5A Battery: 3.7V, 2.5AH
Frequency Band(s)	U-NII-1, 5150 – 5250MHz U-NII-2A, 5250 – 5350MHz U-NII-3, 5725 – 5850MHz
Transmission Mode(s)	Wi-Fi: 802.11a, 802.11n, 802.11nHT40 (DTS)
Description of Equipment Under Test (provided by client)	
The 7250MHB Mobile Help Buttons is a wearable PERS (Personal Emergency Response System) device. The 7250MHB device provides cellular telephone speakerphone technology for communication with a PERS call center when the user requires assistance. The 7250MHB is configured to use 4G LTE cellular communication. The 7250MHB device provides automatic fall detection, allow the user to manually signal for assistance, and use GPS and Wi-Fi technology to automatically establish the user's location.	

4.1 Variant Models:

There were no variants covered by this evaluation.



5 System Setup and Method

5.1 Method:

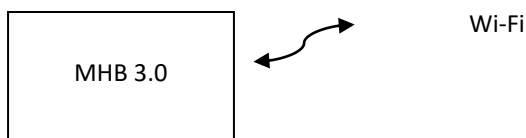
Configuration as required by ANSI C63.4: 2014 and ANSI C63.10:2013

No.	Descriptions of EUT Exercising
5	Transmitting an 802.11n signal on low, middle, or high channel
6	Transmitting an 802.11nHT40 signal on low, middle, or high channel
7	Transmitting an 802.11a signal on, middle, or high channel
8	Idle, not transmitting.

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	None used				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	-	-

5.2 EUT Block Diagram:





6 Receiver Spurious Emissions

6.1 Test Method

Tests are performed in accordance with ANSI C63.4: 2014

TEST SITE: 10m ALSE

Site Designation: 10m Chamber

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucisp
Radiated Emissions, 10m	30-1000 MHz	3.9dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.0dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.7dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.7dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.7dB	5.5 dB

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required.



6.2 Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$
$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$



6.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde&Schwarz	ESU40	10/5/2020	10/5/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Horn Antenna (1-18GHz)	3780	ETS	3117	6/18/2020	6/18/2021
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time of Use
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Coaxial Cable	3074			12/21/2020	12/21/2021
Preamplifier	3918	Rhode & Schwarz	TS-PR18	12/21/2021	12/21/2021
Coaxial Cable	2588			12/21/2020	12/21/2021
Coaxial Cable	2593			12/21/2020	12/21/2021
Coaxial Cable	2592			12/21/2020	12/21/2021
Coaxial Cable	3339			12/21/2020	12/21/2021

6.4 Software Utilized

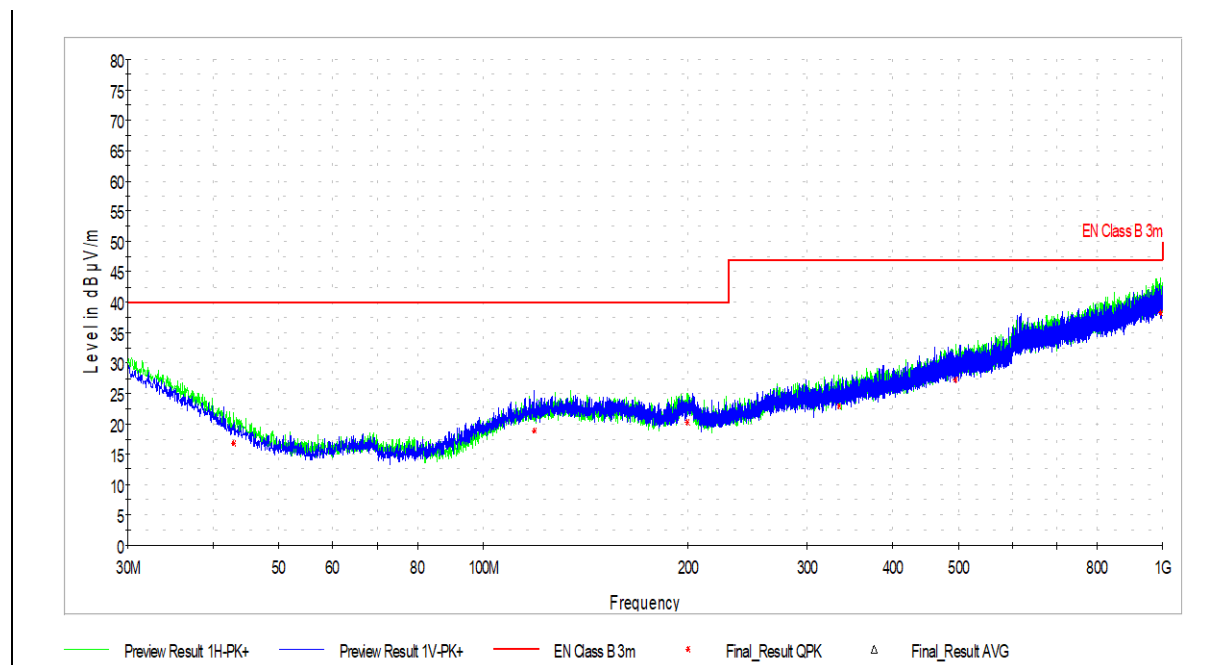
Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

6.5 Test Results

The sample tested was found to be **compliant**.

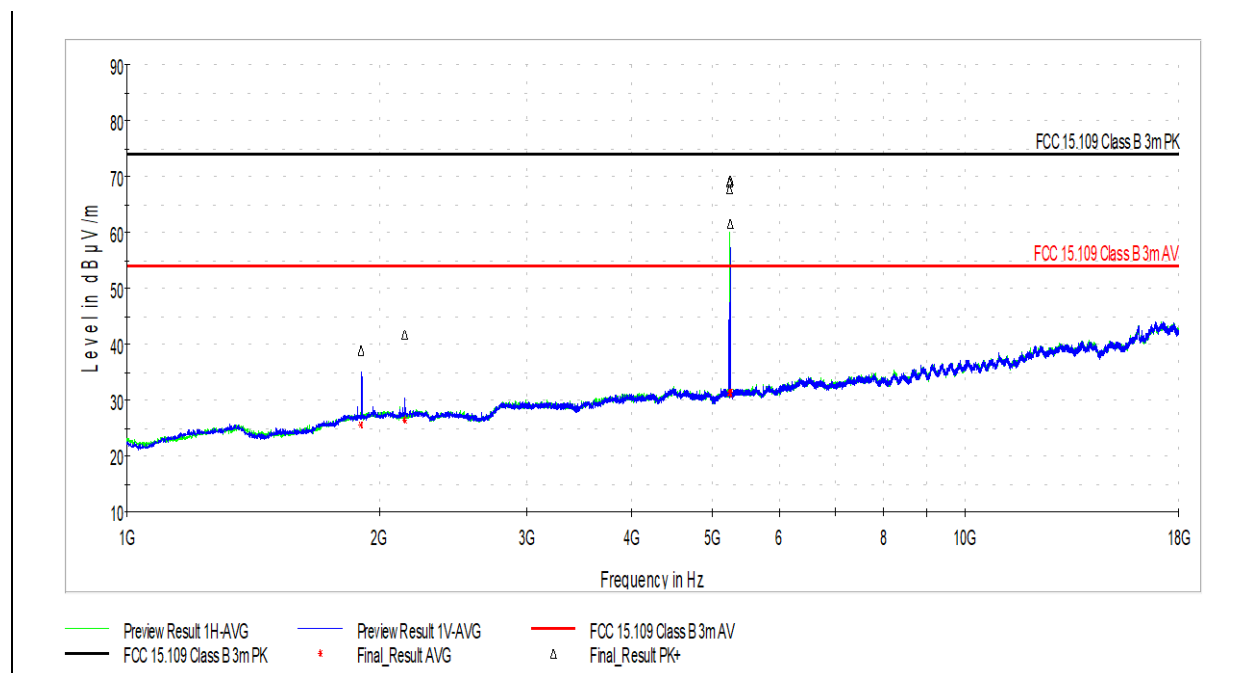
6.6 Test Conditions

Test Personnel:	Brandon Norris	Test Date:	2/9/2021
Supervising/Reviewing Engineer:			FCC Part 15.209 /
(Where Applicable)	NA	Limit Applied:	FCC Part 15.109 Class B
	FCC Part 15.247		
Product Standard:	RSS-247 Issue 2	Ambient Temperature:	22.6C
Input Voltage:	Battery	Relative Humidity:	63.0%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	983.0mbar

**6.7 Test Data: 30MHz – 1GHz**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
42.879445	16.69	40.00	23.31	120.000	131.1	H	0.0	19.5
118.808889	18.94	40.00	21.06	120.000	142.1	V	27.0	21.8
199.318889	20.34	40.00	19.66	120.000	224.9	H	56.0	22.0
334.202778	22.85	47.00	24.15	120.000	314.6	H	320.0	24.8
495.222778	27.33	47.00	19.67	120.000	320.0	H	31.0	29.0
992.293889	38.34	47.00	8.66	120.000	118.7	H	109.0	38.2

Deviations, Additions, or Exclusions: None

**6.8 Test Data: 1GHz – 18GHz**

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1901.000000	38.78	73.98	35.20	1000.000	176.0	V	331.0	3.9
2145.000000	41.76	73.98	32.22	1000.000	152.0	V	13.0	3.9
5231.500000	69.07	73.98	4.91	1000.000	410.0	V	308.0	9.9
5234.000000	67.81	73.98	6.17	1000.000	186.0	H	340.0	9.8
5242.500000	61.59	73.98	12.39	1000.000	372.0	V	235.0	9.9
5248.000000	69.42	73.98	4.56	1000.000	410.0	V	333.0	9.9

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1901.000000	25.48	53.98	28.50	1000.000	176.0	V	331.0	3.9
2145.000000	26.41	53.98	27.57	1000.000	152.0	V	13.0	3.9
5231.500000	31.44	53.98	22.54	1000.000	410.0	V	308.0	9.9
5234.000000	31.27	53.98	22.71	1000.000	186.0	H	340.0	9.8
5242.500000	31.09	53.98	22.89	1000.000	372.0	V	235.0	9.9
5248.000000	31.35	53.98	22.63	1000.000	410.0	V	333.0	9.9

Deviations, Additions, or Exclusions: None



7 Transmitter Spurious Emissions

7.1 Test Limits

§ 15.407(b): Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
 - (ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

7.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.12.1 Radiated emission measurements.



7.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	3900	Rohde&Schwarz	ESU40	10/5/2020	10/5/2021
Magnetic Loop Antenna	2366	ETS	6502	7/17/2020	7/17/2021
Bilog Antenna (30MHz-1GHz)	7085	SunAR	JB6	9/4/2020	9/4/2021
Horn Antenna (1-18GHz)	3780	ETS	3117	6/18/2020	6/18/2021
Horn Antenna (18-40GHz)	3779	ETS	3116c	7/23/2020	7/23/2021
System Controller	4096	ETS Lindgren	2090	Verify at Time of Use	Verify at Time of Use
System Controller	3957	Sunol Sciences	SC99V	Verify at Time of Use	Verify at Time of Use
Coaxial Cable	3074			12/21/2020	12/21/2021
Preamplifier	3918	Rhode & Schwarz	TS-PR18	12/21/2021	12/21/2021
Coaxial Cable	2588			12/21/2020	12/21/2021
Coaxial Cable	2593			12/21/2020	12/21/2021
Coaxial Cable	2592			12/21/2020	12/21/2021
Coaxial Cable	3339			12/21/2020	12/21/2021
Preamplifier (18-40GHz)	3921	Rohde & Schwarz	TS-PR40	12/21/2020	12/21/2021
Coaxial Cable (40GHz)	7020			12/21/2020	12/21/2021
Coaxial Cable (40GHz)	7021			12/21/2020	12/21/2021

7.4 Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	Version 9.15.02

7.5 Test Results

The sample tested was found to be **compliant**. The data presented represents the worst case emissions with the device positioned in three orthogonal positions. All observed emissions outside of the band of operation were attenuated by at least 20dB.

7.6 Test Conditions

Test Personnel:	Brandon Norris	Test Date:	3/8/2021-3/14/2021
Supervising/Reviewing Engineer:			FCC Part 15.209 in Restricted
(Where Applicable)	NA	Limit Applied:	Bands from FCC Part 15.205
	FCC Part 15.247		
Product Standard:	RSS-247 Issue 2	Ambient Temperature:	24.3C
Input Voltage:	Battery	Relative Humidity:	45.7%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	982.7mbar

**7.7 Spurious Emissions (9kHz – 30MHz)**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.496787	48.67	73.68	25.01	9.000	315.0	12.0
2.178044	33.51	69.54	36.03	9.000	0.0	11.7
4.127074	27.97	69.54	41.57	9.000	73.0	11.5
6.216574	24.61	69.54	44.93	9.000	0.0	11.4
8.292904	22.96	69.54	46.58	9.000	331.0	11.3
8.363140	22.05	69.54	47.49	9.000	46.0	11.3
8.385088	22.79	69.54	46.75	9.000	126.0	11.3
12.520191	19.19	69.54	50.35	9.000	170.0	11.2
13.393743	19.61	69.54	49.93	9.000	0.0	11.2
16.422640	19.44	69.54	50.10	9.000	26.0	11.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Azimuth (deg)	Corr. (dB)
0.496787	36.25	73.68	37.43	9.000	315.0	12.0
2.178044	21.71	69.54	47.83	9.000	0.0	11.7
4.127074	16.39	69.54	53.15	9.000	73.0	11.5
6.216574	13.24	69.54	56.30	9.000	0.0	11.4
8.292904	11.16	69.54	58.38	9.000	331.0	11.3
8.363140	10.79	69.54	58.75	9.000	46.0	11.3
8.385088	10.82	69.54	58.72	9.000	126.0	11.3
12.520191	8.23	69.54	61.31	9.000	170.0	11.2
13.393743	8.23	69.54	61.31	9.000	0.0	11.2
16.422640	7.15	69.54	62.39	9.000	26.0	11.2

Note: testing represents the worst case emissions from all modes of operation. Tested at 3m

**7.8 Wi-Fi, 802.11a****7.8.1 Channel 36**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
8429.500000	47.24	73.98	26.74	1000.000	100.0	H	263.0	14.8
10979.000000	50.86	73.98	23.12	1000.000	410.0	V	302.0	18.8
12115.500000	51.71	73.98	22.27	1000.000	410.0	V	214.0	20.1
16087.500000	56.34	73.98	17.64	1000.000	410.0	H	330.0	25.1
17774.000000	56.34	73.98	17.64	1000.000	410.0	H	80.0	25.4

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
8429.500000	33.76	53.98	20.22	1000.000	100.0	H	263.0	14.8
10979.000000	37.26	53.98	16.72	1000.000	410.0	V	302.0	18.8
12115.500000	38.78	53.98	15.20	1000.000	410.0	V	214.0	20.1
16087.500000	42.83	53.98	11.15	1000.000	410.0	H	330.0	25.1
17774.000000	43.18	53.98	10.80	1000.000	410.0	H	80.0	25.4

7.8.2 Channel 44

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.921667	32.98	40.00	7.02	120.000	100.2	V	204.0	21.8
108.085000	32.91	43.52	10.61	120.000	254.7	H	270.0	20.4
113.689445	31.47	43.52	12.05	120.000	249.1	H	259.0	21.3
119.994445	35.54	43.52	7.98	120.000	255.4	H	182.0	21.7
137.993333	27.31	43.52	16.21	120.000	189.7	H	170.0	21.7
240.058889	34.09	46.02	11.93	120.000	130.1	H	86.0	21.4

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7171.500000	53.60	88.23	34.63	1000.000	292.0	V	0.0	13.1
10978.500000	50.73	73.98	23.25	1000.000	410.0	H	184.0	18.8
12105.000000	52.23	73.98	21.75	1000.000	410.0	H	249.0	20.4
12311.000000	52.37	73.98	21.61	1000.000	410.0	H	119.0	20.3
16116.000000	55.98	73.98	18.00	1000.000	410.0	V	146.0	25.2
17727.500000	56.52	73.98	17.46	1000.000	410.0	H	12.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7171.500000	32.98	68.23	35.25	1000.000	292.0	V	0.0	13.1
10978.500000	37.24	53.98	16.74	1000.000	410.0	H	184.0	18.8
12105.000000	39.11	53.98	14.87	1000.000	410.0	H	249.0	20.4
12311.000000	38.85	53.98	15.13	1000.000	410.0	H	119.0	20.3
16116.000000	42.94	53.98	11.04	1000.000	410.0	V	146.0	25.2
17727.500000	43.34	53.98	10.64	1000.000	410.0	H	12.0	25.3

**7.8.3 Channel 48**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7436.000000	53.92	73.98	20.06	1000.000	410.0	V	240.0	13.1
11170.500000	50.36	73.98	23.62	1000.000	410.0	H	0.0	18.4
11899.000000	51.65	73.98	22.33	1000.000	410.0	H	311.0	19.6
12309.500000	51.88	73.98	22.10	1000.000	410.0	H	329.0	20.3
16114.500000	55.77	73.98	18.21	1000.000	410.0	H	252.0	25.3
17771.000000	56.24	73.98	17.74	1000.000	410.0	H	212.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7436.000000	44.46	53.98	9.52	1000.000	410.0	V	240.0	13.1
11170.500000	36.72	53.98	17.26	1000.000	410.0	H	0.0	18.4
11899.000000	38.23	53.98	15.75	1000.000	410.0	H	311.0	19.6
12309.500000	38.73	53.98	15.25	1000.000	410.0	H	329.0	20.3
16114.500000	42.94	53.98	11.04	1000.000	410.0	H	252.0	25.3
17771.000000	43.13	53.98	10.85	1000.000	410.0	H	212.0	25.3

7.8.4 Channel 52

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7190.500000	50.62	88.23	37.61	1000.000	331.0	V	74.0	13.0
8249.000000	47.83	73.98	26.15	1000.000	100.0	H	0.0	14.9
10972.500000	50.60	73.98	23.38	1000.000	100.0	H	0.0	18.7
12318.500000	52.54	73.98	21.44	1000.000	100.0	H	172.0	20.4
16095.000000	56.40	73.98	17.58	1000.000	100.0	H	0.0	25.3
17718.000000	56.30	73.98	17.68	1000.000	301.0	H	216.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7190.500000	33.79	68.23	34.44	1000.000	331.0	V	74.0	13.0
8249.000000	34.19	53.98	19.79	1000.000	100.0	H	0.0	14.9
10972.500000	37.15	53.98	16.83	1000.000	100.0	H	0.0	18.7
12318.500000	38.76	53.98	15.22	1000.000	100.0	H	172.0	20.4
16095.000000	42.96	53.98	11.02	1000.000	100.0	H	0.0	25.3
17718.000000	43.24	53.98	10.74	1000.000	301.0	H	216.0	25.3

**7.8.5 Channel 60**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.975556	30.55	40.00	9.45	120.000	100.4	V	210.0	21.7
108.031111	34.48	43.52	9.04	120.000	261.3	H	278.0	20.4
113.635556	29.02	43.52	14.50	120.000	242.7	H	259.0	21.2
119.994445	35.60	43.52	7.92	120.000	248.7	H	178.0	21.7
240.328333	25.95	46.02	20.07	120.000	130.1	H	66.0	21.4
611.622778	31.67	46.02	14.35	120.000	213.5	H	220.0	31.6

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7193.500000	47.02	88.23	41.21	1000.000	189.0	V	36.0	13.1
8189.000000	47.10	73.98	26.88	1000.000	100.0	H	328.0	14.7
10974.500000	50.82	73.98	23.16	1000.000	100.0	H	176.0	18.7
12027.000000	51.48	73.98	22.50	1000.000	100.0	H	234.0	19.6
16094.500000	57.05	73.98	16.93	1000.000	100.0	H	258.0	25.2
17820.500000	56.26	73.98	17.72	1000.000	100.0	H	58.0	25.1

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7193.500000	32.95	68.23	35.28	1000.000	189.0	V	36.0	13.1
8189.000000	33.90	53.98	20.08	1000.000	100.0	H	328.0	14.7
10974.500000	37.18	53.98	16.80	1000.000	100.0	H	176.0	18.7
12027.000000	38.29	53.98	15.69	1000.000	100.0	H	234.0	19.6
16094.500000	42.93	53.98	11.05	1000.000	100.0	H	258.0	25.2
17820.500000	42.71	53.98	11.27	1000.000	100.0	H	58.0	25.1

7.8.6 Channel 64

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7178.500000	48.23	88.23	40.00	1000.000	255.0	V	336.0	13.1
8225.000000	47.56	73.98	26.42	1000.000	100.0	H	80.0	15.0
9140.000000	48.91	73.98	25.07	1000.000	100.0	H	318.0	16.5
13005.500000	52.70	88.23	35.53	1000.000	100.0	H	231.0	21.1
16107.000000	57.01	73.98	16.97	1000.000	100.0	V	296.0	25.3
17701.500000	56.41	73.98	17.57	1000.000	100.0	V	0.0	24.9

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7178.500000	32.56	68.23	35.67	1000.000	255.0	V	336.0	13.1
8225.000000	34.34	53.98	19.64	1000.000	100.0	H	80.0	15.0
9140.000000	35.49	53.98	18.49	1000.000	100.0	H	318.0	16.5
13005.500000	39.52	68.23	28.71	1000.000	100.0	H	231.0	21.1
16107.000000	42.95	53.98	11.03	1000.000	100.0	V	296.0	25.3
17701.500000	42.87	53.98	11.11	1000.000	100.0	V	0.0	24.9

**7.8.7 Channel 149**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3589.000000	51.14	88.23	37.09	1000.000	314.0	V	292.0	6.9
3830.000000	45.58	73.98	28.40	1000.000	100.0	H	66.0	8.4
4784.000000	50.88	73.98	23.10	1000.000	220.0	V	341.0	9.3
12308.500000	52.82	73.98	21.16	1000.000	410.0	V	236.0	20.2
16108.000000	56.43	73.98	17.55	1000.000	410.0	H	328.0	25.3
17779.000000	56.58	73.98	17.40	1000.000	410.0	H	241.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3589.000000	29.57	68.23	38.66	1000.000	314.0	V	292.0	6.9
3830.000000	34.88	53.98	19.10	1000.000	100.0	H	66.0	8.4
4784.000000	30.24	53.98	23.74	1000.000	220.0	V	341.0	9.3
12308.500000	38.90	53.98	15.08	1000.000	410.0	V	236.0	20.2
16108.000000	42.88	53.98	11.10	1000.000	410.0	H	328.0	25.3
17779.000000	43.19	53.98	10.79	1000.000	410.0	H	241.0	25.3

7.8.8 Channel 157

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1440.000000	39.57	73.98	34.41	1000.000	346.0	H	196.0	0.8
2396.500000	60.29	88.23	27.94	1000.000	219.0	V	348.0	5.3
3596.500000	51.94	88.23	36.29	1000.000	278.0	V	0.0	6.9
3856.500000	43.62	73.98	30.36	1000.000	410.0	H	217.0	8.4
4787.000000	51.13	73.98	22.85	1000.000	219.0	V	349.0	9.3
11576.000000	53.33	73.98	20.65	1000.000	326.0	V	269.0	18.6

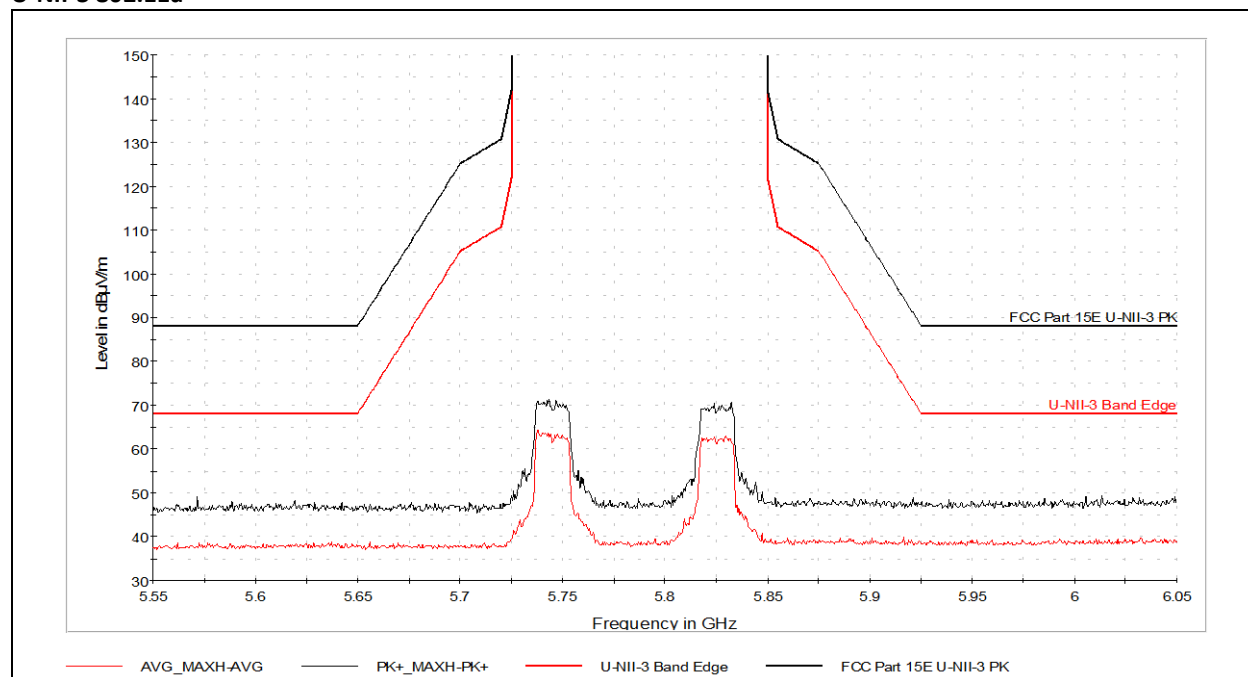
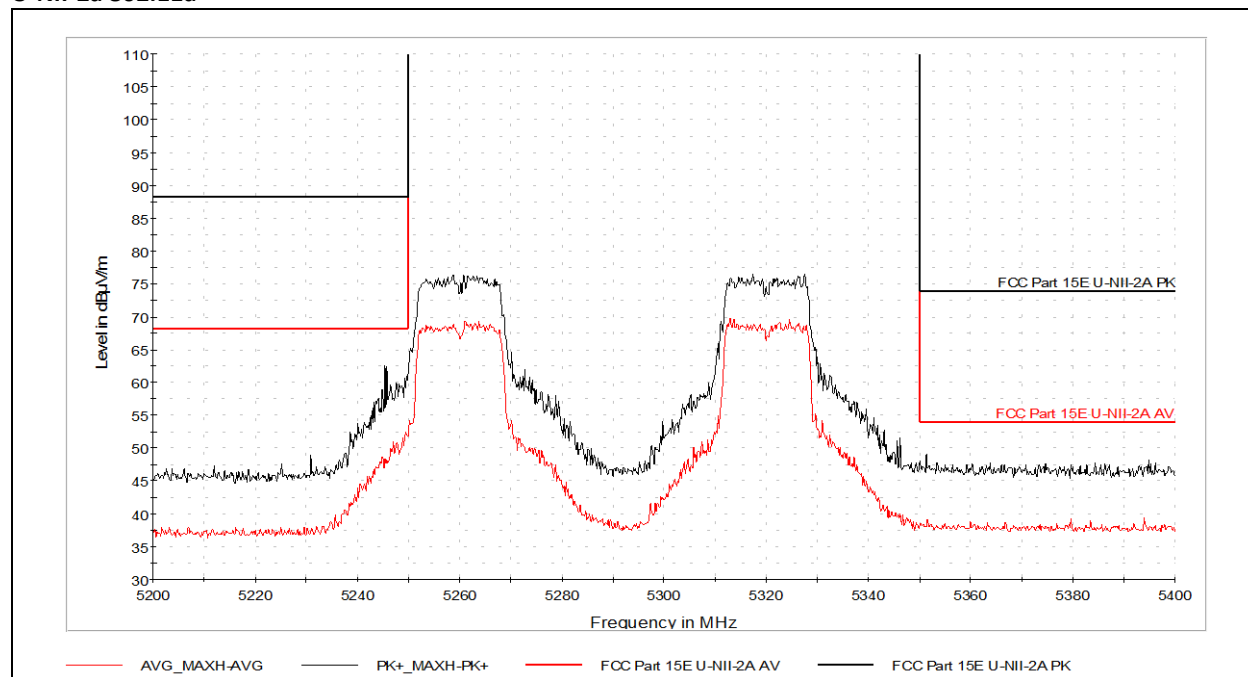
Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1440.000000	31.02	53.98	22.96	1000.000	346.0	H	196.0	0.8
2396.500000	31.34	68.23	36.89	1000.000	219.0	V	348.0	5.3
3596.500000	29.50	68.23	38.73	1000.000	278.0	V	0.0	6.9
3856.500000	31.12	53.98	22.86	1000.000	410.0	H	217.0	8.4
4787.000000	29.97	53.98	24.01	1000.000	219.0	V	349.0	9.3
11576.000000	39.12	53.98	14.86	1000.000	326.0	V	269.0	18.6

**7.8.9 Channel 165**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
74.458333	34.18	40.00	5.82	120.000	399.9	H	185.0	15.5
74.943333	34.52	40.00	5.48	120.000	400.1	H	200.0	15.5
259.890000	35.38	46.02	10.64	120.000	106.1	H	250.0	22.3
263.985556	35.50	46.02	10.52	120.000	100.0	H	259.0	22.8
609.628889	31.69	46.02	14.33	120.000	142.4	H	36.0	31.6
986.096667	38.26	53.98	15.72	120.000	105.6	H	74.0	38.1

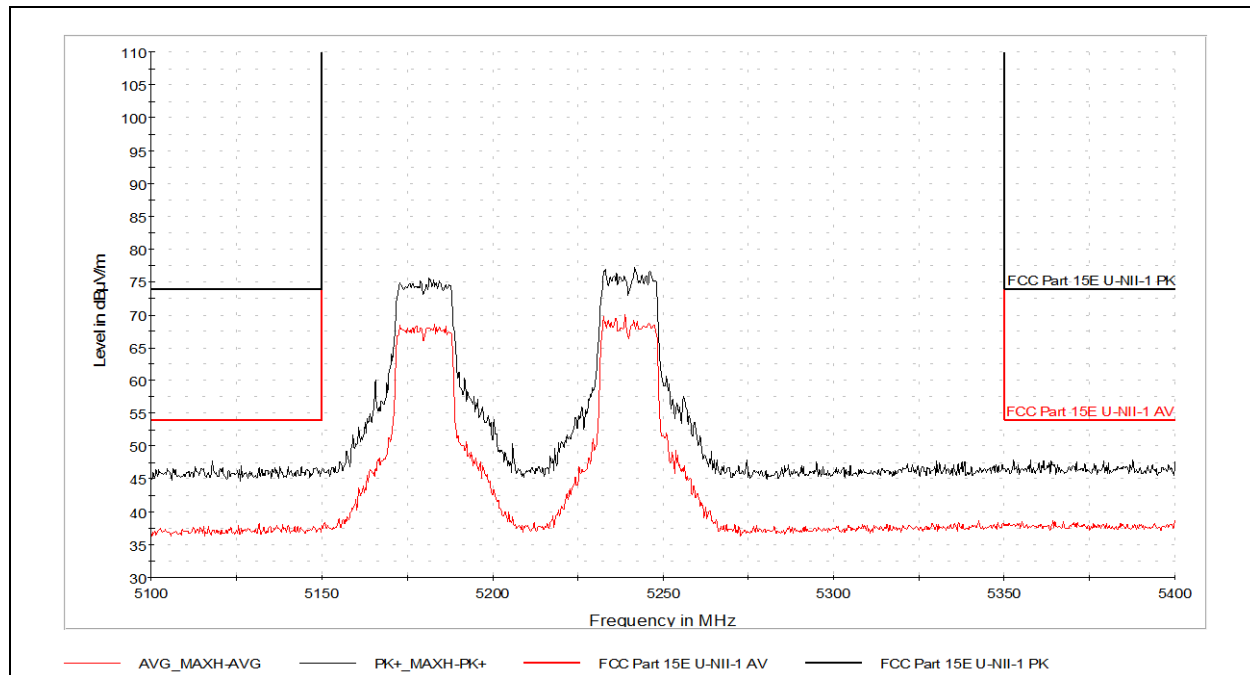
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1507.500000	40.12	73.98	33.86	1000.000	410.0	V	295.0	0.3
2391.500000	61.17	88.23	27.06	1000.000	320.0	V	0.0	5.3
3590.500000	53.79	88.23	34.44	1000.000	350.0	V	35.0	6.9
4000.000000	48.88	73.98	25.10	1000.000	369.0	H	-1.0	8.5
4115.500000	42.75	73.98	31.23	1000.000	410.0	H	58.0	8.5
11650.500000	52.01	73.98	21.97	1000.000	410.0	V	0.0	19.1
17782.000000	56.38	73.98	17.60	1000.000	410.0	H	168.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1507.500000	23.15	53.98	30.83	1000.000	410.0	V	295.0	0.3
2391.500000	28.76	68.23	39.47	1000.000	320.0	V	0.0	5.3
3590.500000	28.64	68.23	39.59	1000.000	350.0	V	35.0	6.9
4000.000000	32.75	53.98	21.23	1000.000	369.0	H	-1.0	8.5
4115.500000	29.84	53.98	24.14	1000.000	410.0	H	58.0	8.5
11650.500000	38.26	53.98	15.72	1000.000	410.0	V	0.0	19.1
17782.000000	43.12	53.98	10.86	1000.000	410.0	H	168.0	25.3

**7.8.10 Emissions at the band edge****U-NII-3 802.11a****U-NII-2a 802.11a**



U-NII-1 802.11a



**7.9 Wi-Fi, 802.11n****7.9.1 Channel 36**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1328.000000	36.46	73.98	37.52	1000.000	410.0	V	0.0	1.3
2747.000000	39.20	73.98	34.78	1000.000	100.0	V	273.0	6.1
3988.500000	42.94	73.98	31.04	1000.000	410.0	V	323.0	8.7
4937.500000	43.85	73.98	30.13	1000.000	410.0	H	64.0	10.1
12104.000000	52.34	73.98	21.64	1000.000	410.0	H	76.0	20.4
16092.000000	56.00	73.98	17.98	1000.000	410.0	V	102.0	25.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1328.000000	22.48	53.98	31.50	1000.000	410.0	V	0.0	1.3
2747.000000	26.25	53.98	27.73	1000.000	100.0	V	273.0	6.1
3988.500000	28.96	53.98	25.02	1000.000	410.0	V	323.0	8.7
4937.500000	30.05	53.98	23.93	1000.000	410.0	H	64.0	10.1
12104.000000	39.23	53.98	14.75	1000.000	410.0	H	76.0	20.4
16092.000000	42.89	53.98	11.09	1000.000	410.0	V	102.0	25.2

7.9.2 Channel 44

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.191111	31.08	40.00	8.92	120.000	104.8	V	188.0	21.6
108.031111	34.38	43.52	9.14	120.000	272.3	H	270.0	20.4
113.851111	32.96	43.52	10.56	120.000	254.7	H	259.0	21.3
114.066667	30.38	43.52	13.14	120.000	249.3	H	256.0	21.3
119.994445	35.76	43.52	7.76	120.000	266.6	H	186.0	21.7
609.844444	31.64	46.02	14.38	120.000	208.0	H	192.0	31.6

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7175.500000	48.27	88.23	39.96	1000.000	151.0	V	344.0	13.1
8928.500000	48.56	88.23	39.67	1000.000	100.0	H	208.0	16.3
11185.000000	50.24	73.98	23.74	1000.000	100.0	H	293.0	18.7
11907.000000	51.12	73.98	22.86	1000.000	100.0	V	203.0	19.4
15825.000000	53.88	73.98	20.10	1000.000	100.0	H	0.0	22.9
17717.000000	57.10	73.98	16.88	1000.000	100.0	V	228.0	25.1

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7175.500000	32.66	68.23	35.57	1000.000	151.0	V	344.0	13.1
8928.500000	35.19	68.23	33.04	1000.000	100.0	H	208.0	16.3
11185.000000	37.08	53.98	16.90	1000.000	100.0	H	293.0	18.7
11907.000000	38.02	53.98	15.96	1000.000	100.0	V	203.0	19.4
15825.000000	40.70	53.98	13.28	1000.000	100.0	H	0.0	22.9
17717.000000	43.21	53.98	10.77	1000.000	100.0	V	228.0	25.1

**7.9.3 Channel 48**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7189.000000	56.09	88.23	32.14	1000.000	313.0	V	349.0	13.0
7532.500000	46.97	73.98	27.01	1000.000	100.0	V	0.0	13.3
8254.500000	47.13	73.98	26.85	1000.000	100.0	H	252.0	14.8
9158.500000	47.98	73.98	26.00	1000.000	100.0	V	288.0	16.3
12318.500000	51.53	73.98	22.45	1000.000	100.0	H	244.0	20.4
16096.500000	56.39	73.98	17.59	1000.000	100.0	H	233.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7189.000000	33.45	68.23	34.78	1000.000	313.0	V	349.0	13.0
7532.500000	33.40	53.98	20.58	1000.000	100.0	V	0.0	13.3
8254.500000	34.03	53.98	19.95	1000.000	100.0	H	252.0	14.8
9158.500000	35.01	53.98	18.97	1000.000	100.0	V	288.0	16.3
12318.500000	38.82	53.98	15.16	1000.000	100.0	H	244.0	20.4
16096.500000	42.97	53.98	11.01	1000.000	100.0	H	233.0	25.3

7.9.4 Channel 52

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7185.000000	46.92	88.23	41.31	1000.000	255.0	V	298.0	13.0
7590.000000	46.39	73.98	27.59	1000.000	100.0	H	0.0	13.3
11411.000000	50.00	73.98	23.98	1000.000	100.0	V	231.0	18.8
12144.500000	52.19	73.98	21.79	1000.000	100.0	H	211.0	20.1
15828.500000	53.68	73.98	20.30	1000.000	100.0	H	278.0	22.9
17719.500000	56.35	73.98	17.63	1000.000	410.0	H	294.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7185.000000	32.61	68.23	35.62	1000.000	255.0	V	298.0	13.0
7590.000000	32.74	53.98	21.24	1000.000	100.0	H	0.0	13.3
11411.000000	36.88	53.98	17.10	1000.000	100.0	V	231.0	18.8
12144.500000	38.79	53.98	15.19	1000.000	100.0	H	211.0	20.1
15828.500000	40.73	53.98	13.25	1000.000	100.0	H	278.0	22.9
17719.500000	43.31	53.98	10.67	1000.000	410.0	H	294.0	25.3

**7.9.5 Channel 60**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.598333	31.61	40.00	8.39	120.000	100.4	V	202.0	22.0
108.031111	26.51	43.52	17.01	120.000	272.9	H	256.0	20.4
113.851111	33.75	43.52	9.77	120.000	249.0	H	256.0	21.3
119.994445	36.35	43.52	7.17	120.000	243.1	H	184.0	21.7
125.760556	29.04	43.52	14.48	120.000	237.1	H	155.0	22.0
168.117222	31.48	43.52	12.04	120.000	189.9	H	148.0	21.3

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7200.000000	47.80	88.23	40.43	1000.000	366.0	V	80.0	13.1
8210.500000	47.68	73.98	26.30	1000.000	100.0	H	1.0	14.8
10975.000000	51.39	73.98	22.59	1000.000	100.0	H	196.0	18.7
12363.500000	52.23	73.98	21.75	1000.000	410.0	H	202.0	20.6
16092.000000	56.38	73.98	17.60	1000.000	149.0	H	33.0	25.2
17578.000000	55.84	88.23	32.39	1000.000	410.0	H	260.0	25.4

Frequency (MHz)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7200.000000	33.58	68.23	34.65	1000.000	366.0	V	80.0	13.1
8210.500000	34.06	53.98	19.92	1000.000	100.0	H	1.0	14.8
10975.000000	37.03	53.98	16.95	1000.000	100.0	H	196.0	18.7
12363.500000	38.77	53.98	15.21	1000.000	410.0	H	202.0	20.6
16092.000000	42.75	53.98	11.23	1000.000	149.0	H	33.0	25.2
17578.000000	42.97	68.23	25.26	1000.000	410.0	H	260.0	25.4

**7.9.6 Channel 64**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7185.500000	54.76	88.23	33.47	1000.000	410.0	V	36.0	13.0
7974.000000	47.24	88.23	40.99	1000.000	100.0	H	245.0	14.4
11870.000000	51.36	73.98	22.62	1000.000	410.0	H	78.0	19.4
12557.500000	52.40	73.98	21.58	1000.000	410.0	H	0.0	20.5
16077.000000	56.14	73.98	17.84	1000.000	175.0	H	43.0	25.0
17573.000000	56.03	88.23	32.20	1000.000	410.0	H	202.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7185.500000	33.30	68.23	34.93	1000.000	410.0	V	36.0	13.0
7974.000000	33.29	68.23	34.94	1000.000	100.0	H	245.0	14.4
11870.000000	37.91	53.98	16.07	1000.000	410.0	H	78.0	19.4
12557.500000	38.65	53.98	15.33	1000.000	410.0	H	0.0	20.5
16077.000000	42.51	53.98	11.47	1000.000	175.0	H	43.0	25.0
17573.000000	42.90	68.23	25.33	1000.000	410.0	H	202.0	25.3

7.9.7 Channel 149

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3586.500000	50.70	88.23	37.53	1000.000	371.0	V	24.0	7.0
3830.000000	44.25	73.98	29.73	1000.000	100.0	H	66.0	8.4
4000.000000	47.61	73.98	26.37	1000.000	372.0	H	0.0	8.5
4793.500000	44.21	73.98	29.77	1000.000	410.0	V	46.0	9.3
11489.000000	52.25	73.98	21.73	1000.000	307.0	V	246.0	18.7
17781.500000	56.90	73.98	17.08	1000.000	410.0	H	312.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3586.500000	29.50	68.23	38.73	1000.000	371.0	V	24.0	7.0
3830.000000	31.85	53.98	22.13	1000.000	100.0	H	66.0	8.4
4000.000000	33.92	53.98	20.06	1000.000	372.0	H	0.0	8.5
4793.500000	30.38	53.98	23.60	1000.000	410.0	V	46.0	9.3
11489.000000	38.30	53.98	15.68	1000.000	307.0	V	246.0	18.7
17781.500000	43.12	53.98	10.86	1000.000	410.0	H	312.0	25.3

7.9.8 Channel 157

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
108.031111	33.25	43.52	10.27	120.000	260.8	H	248.0	20.4
119.940556	35.74	43.52	7.78	120.000	249.3	H	31.0	21.7
168.009445	32.79	43.52	10.73	120.000	142.2	H	252.0	21.3
240.005000	44.88	46.02	1.14	120.000	118.2	H	64.0	21.4
244.423889	35.04	46.02	10.98	120.000	118.4	H	74.0	21.5
246.471667	34.28	46.02	11.74	120.000	118.6	H	73.0	21.4



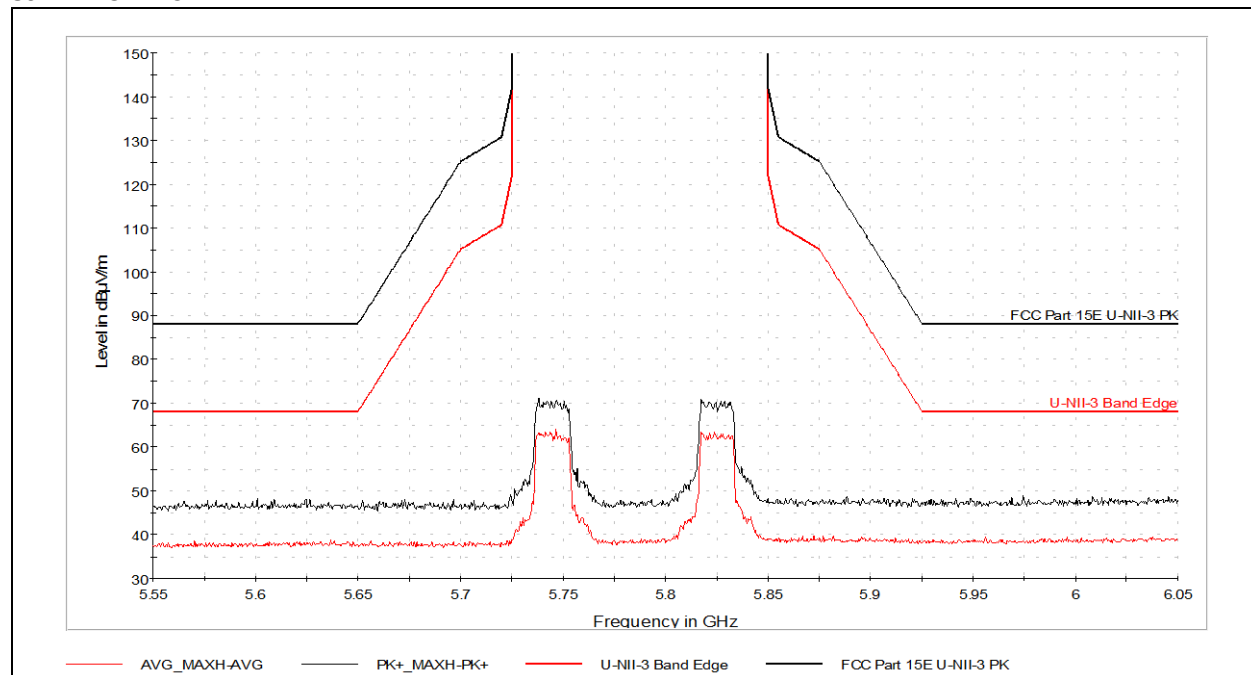
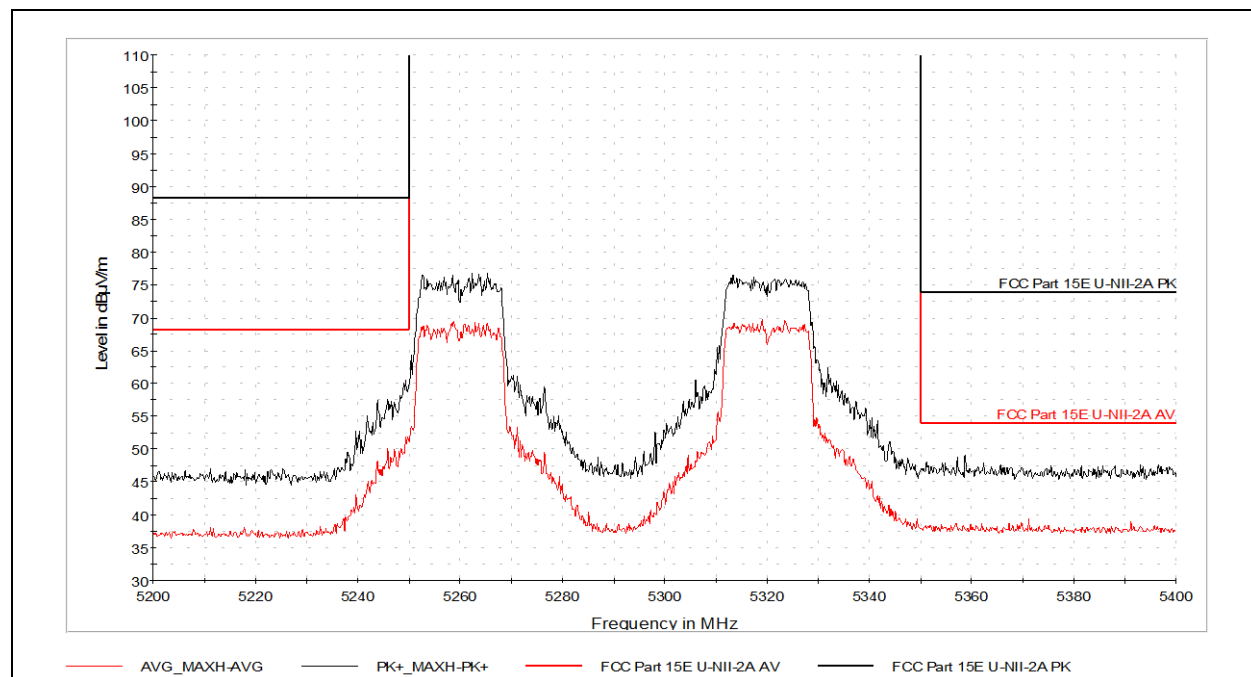
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3591.500000	52.24	88.23	35.99	1000.000	410.0	V	31.0	6.9
4000.000000	46.23	73.98	27.75	1000.000	297.0	H	13.0	8.5
4740.000000	43.51	73.98	30.47	1000.000	410.0	V	49.0	9.4
7516.000000	46.74	73.98	27.24	1000.000	410.0	V	56.0	13.1
11192.500000	50.46	73.98	23.52	1000.000	410.0	V	68.0	18.7
12317.000000	52.46	73.98	21.52	1000.000	410.0	H	169.0	20.4

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
3591.500000	29.39	68.23	38.84	1000.000	410.0	V	31.0	6.9
4000.000000	31.35	53.98	22.63	1000.000	297.0	H	13.0	8.5
4740.000000	30.38	53.98	23.60	1000.000	410.0	V	49.0	9.4
7516.000000	33.21	53.98	20.77	1000.000	410.0	V	56.0	13.1
11192.500000	36.88	53.98	17.10	1000.000	410.0	V	68.0	18.7
12317.000000	39.05	53.98	14.93	1000.000	410.0	H	169.0	20.4

7.9.9 Channel 165

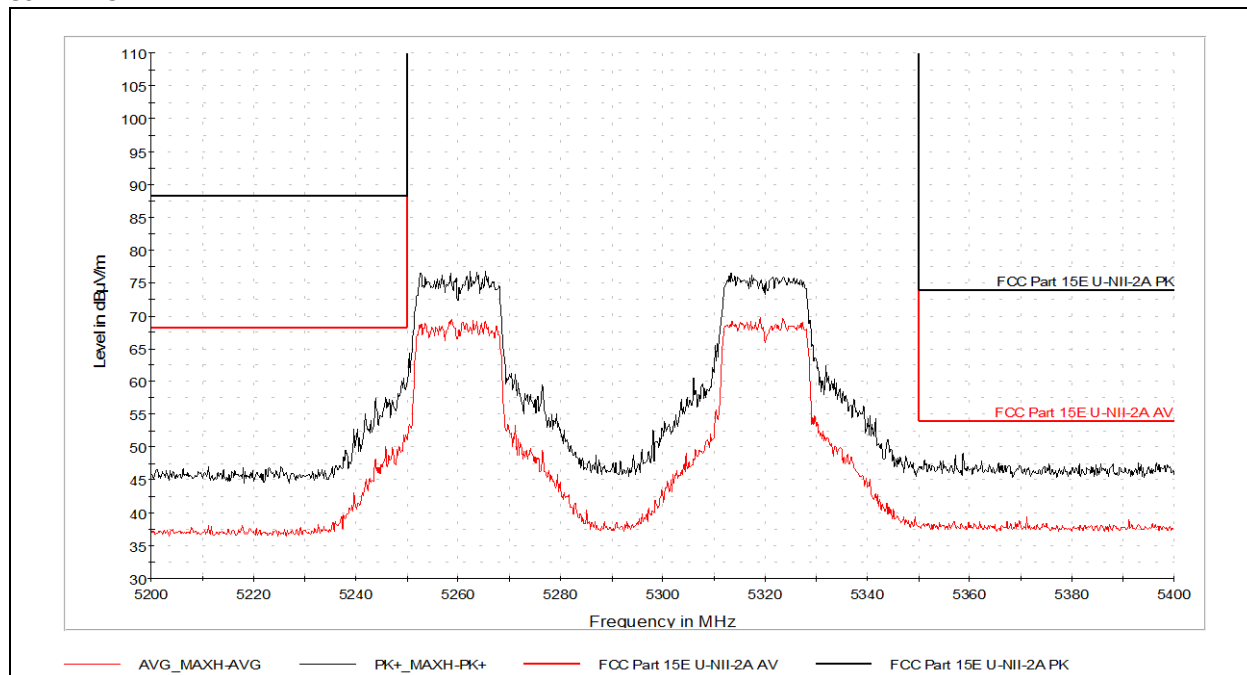
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1488.000000	39.21	73.98	34.77	1000.000	286.0	V	46.0	0.2
3883.500000	44.03	73.98	29.95	1000.000	388.0	H	33.0	8.5
4549.000000	44.12	73.98	29.86	1000.000	410.0	V	348.0	9.0
4778.000000	47.43	73.98	26.55	1000.000	410.0	V	226.0	9.4
8231.000000	47.55	73.98	26.43	1000.000	410.0	V	80.0	14.9
11650.000000	52.14	73.98	21.84	1000.000	100.0	H	45.0	19.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1488.000000	23.42	53.98	30.56	1000.000	286.0	V	46.0	0.2
3883.500000	31.72	53.98	22.26	1000.000	388.0	H	33.0	8.5
4549.000000	30.61	53.98	23.37	1000.000	410.0	V	348.0	9.0
4778.000000	30.32	53.98	23.66	1000.000	410.0	V	226.0	9.4
8231.000000	34.23	53.98	19.75	1000.000	410.0	V	80.0	14.9
11650.000000	38.49	53.98	15.49	1000.000	100.0	H	45.0	19.2

**7.9.10 Emissions at the band edge****802.11n U-NII-3****802.11n U-NII-2A**



802.11n U-NII-1



**7.10 Wi-Fi, 802.11n 40MHz****7.10.1 Channel 38**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.245000	32.20	40.00	7.80	120.000	100.1	V	325.0	21.5
108.031111	34.62	43.52	8.90	120.000	248.9	H	278.0	20.4
112.665556	29.27	43.52	14.25	120.000	273.5	H	264.0	21.1
114.066667	23.19	43.52	20.33	120.000	249.0	H	250.0	21.3
119.940556	31.09	43.52	12.43	120.000	237.1	H	178.0	21.7
608.551111	31.67	46.02	14.35	120.000	118.5	H	100.0	31.6

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7173.500000	53.87	88.23	34.36	1000.000	100.0	V	181.0	13.1
10792.000000	49.83	73.98	24.15	1000.000	100.0	H	294.0	18.7
11949.000000	51.43	73.98	22.55	1000.000	100.0	V	333.0	19.4
12316.500000	52.34	73.98	21.64	1000.000	100.0	H	288.0	20.4
16090.500000	56.44	73.98	17.54	1000.000	100.0	V	109.0	25.2
17777.500000	56.79	73.98	17.19	1000.000	126.0	V	0.0	25.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7173.500000	33.07	68.23	35.16	1000.000	100.0	V	181.0	13.1
10792.000000	36.84	53.98	17.14	1000.000	100.0	H	294.0	18.7
11949.000000	38.11	53.98	15.87	1000.000	100.0	V	333.0	19.4
12316.500000	38.75	53.98	15.23	1000.000	100.0	H	288.0	20.4
16090.500000	42.89	53.98	11.09	1000.000	100.0	V	109.0	25.2
17777.500000	43.02	53.98	10.96	1000.000	126.0	V	0.0	25.2

7.10.2 Channel 46

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7177.000000	45.82	88.23	42.41	1000.000	276.0	V	298.0	13.1
7932.500000	45.92	88.23	42.31	1000.000	100.0	V	236.0	14.0
10769.000000	50.11	73.98	23.87	1000.000	100.0	V	277.0	18.8
12360.000000	52.35	73.98	21.63	1000.000	100.0	V	296.0	20.5
16026.000000	55.15	73.98	18.83	1000.000	183.0	H	276.0	24.1
17811.500000	56.37	73.98	17.61	1000.000	410.0	H	282.0	25.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7177.000000	32.59	68.23	35.64	1000.000	276.0	V	298.0	13.1
7932.500000	33.11	68.23	35.12	1000.000	100.0	V	236.0	14.0
10769.000000	36.97	53.98	17.01	1000.000	100.0	V	277.0	18.8
12360.000000	38.73	53.98	15.25	1000.000	100.0	V	296.0	20.5
16026.000000	41.97	53.98	12.01	1000.000	183.0	H	276.0	24.1
17811.500000	42.80	53.98	11.18	1000.000	410.0	H	282.0	25.2

**7.10.3 Channel 54**

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.652222	31.79	40.00	8.21	120.000	105.2	V	210.0	22.0
108.085000	34.45	43.52	9.07	120.000	249.4	H	275.0	20.4
113.905000	31.46	43.52	12.06	120.000	255.1	H	254.0	21.3
119.994445	35.69	43.52	7.83	120.000	249.3	H	174.0	21.7
149.902778	32.49	43.52	11.03	120.000	189.3	H	148.0	21.3
168.063333	34.38	43.52	9.14	120.000	177.3	H	139.0	21.3

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7200.000000	49.42	88.23	38.81	1000.000	345.0	V	93.0	13.1
8215.000000	47.33	73.98	26.65	1000.000	410.0	H	285.0	14.9
11000.000000	50.22	73.98	23.76	1000.000	100.0	V	348.0	18.7
12626.000000	51.97	73.98	22.01	1000.000	410.0	H	0.0	20.7
16026.500000	55.00	73.98	18.98	1000.000	410.0	V	192.0	24.1
17718.500000	56.21	73.98	17.77	1000.000	100.0	H	157.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7200.000000	34.58	68.23	33.65	1000.000	345.0	V	93.0	13.1
8215.000000	34.26	53.98	19.72	1000.000	410.0	H	285.0	14.9
11000.000000	37.09	53.98	16.89	1000.000	100.0	V	348.0	18.7
12626.000000	38.84	53.98	15.14	1000.000	410.0	H	0.0	20.7
16026.500000	42.04	53.98	11.94	1000.000	410.0	V	192.0	24.1
17718.500000	43.12	53.98	10.86	1000.000	100.0	H	157.0	25.3

7.10.4 Channel 62

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7165.500000	52.80	88.23	35.43	1000.000	100.0	V	0.0	13.0
10686.000000	48.93	73.98	25.05	1000.000	100.0	V	31.0	18.0
11028.000000	49.88	73.98	24.10	1000.000	410.0	H	291.0	18.4
12271.000000	51.45	73.98	22.53	1000.000	100.0	V	0.0	19.7
16104.000000	55.87	73.98	18.11	1000.000	100.0	V	266.0	25.3
17598.000000	56.73	88.23	31.50	1000.000	100.0	H	92.0	25.3

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
7165.500000	32.90	68.23	35.33	1000.000	100.0	V	0.0	13.0
10686.000000	36.05	53.98	17.93	1000.000	100.0	V	31.0	18.0
11028.000000	36.85	53.98	17.13	1000.000	410.0	H	291.0	18.4
12271.000000	38.15	53.98	15.83	1000.000	100.0	V	0.0	19.7
16104.000000	42.76	53.98	11.22	1000.000	100.0	V	266.0	25.3
17598.000000	42.88	68.23	25.35	1000.000	100.0	H	92.0	25.3



7.10.5 Channel 151

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
108.031111	32.80	43.52	10.72	120.000	266.7	H	228.0	20.4
119.994445	41.69	43.52	1.83	120.000	249.0	H	27.0	21.7
168.063333	32.16	43.52	11.36	120.000	153.6	H	254.0	21.3
240.005000	44.97	46.02	1.05	120.000	118.5	H	64.0	21.4
246.094445	33.73	46.02	12.29	120.000	118.5	H	73.0	21.4
611.407222	31.76	46.02	14.26	120.000	142.1	H	8.0	31.6

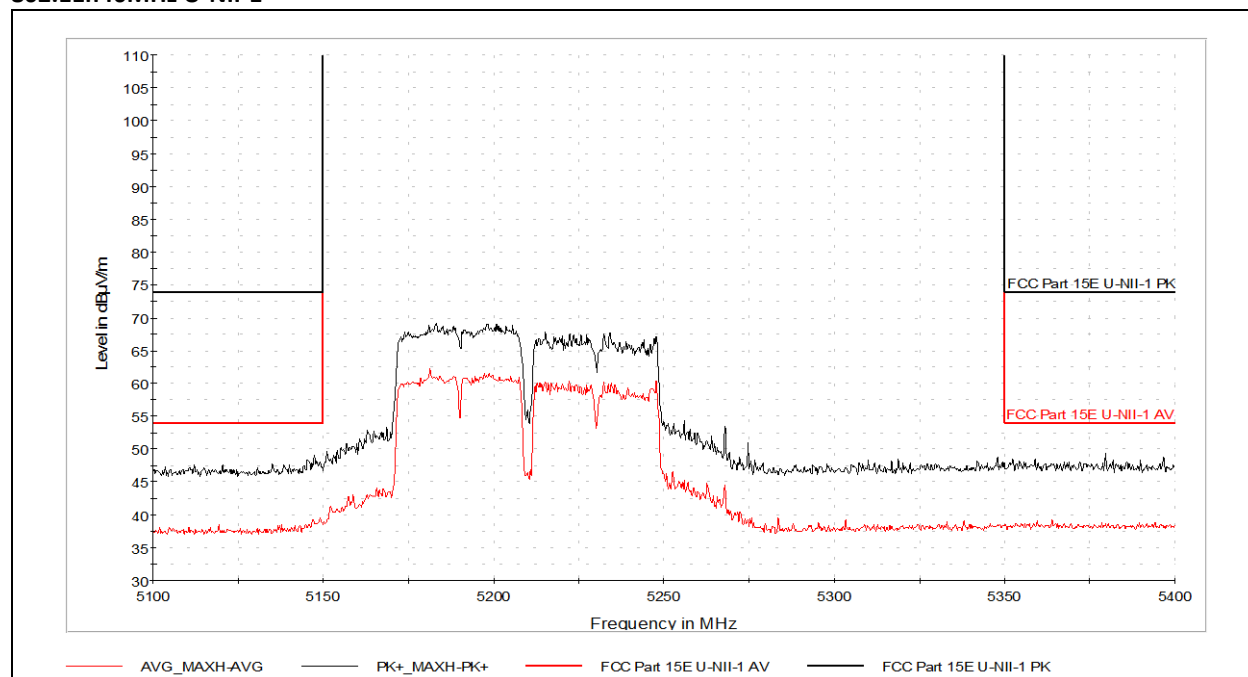
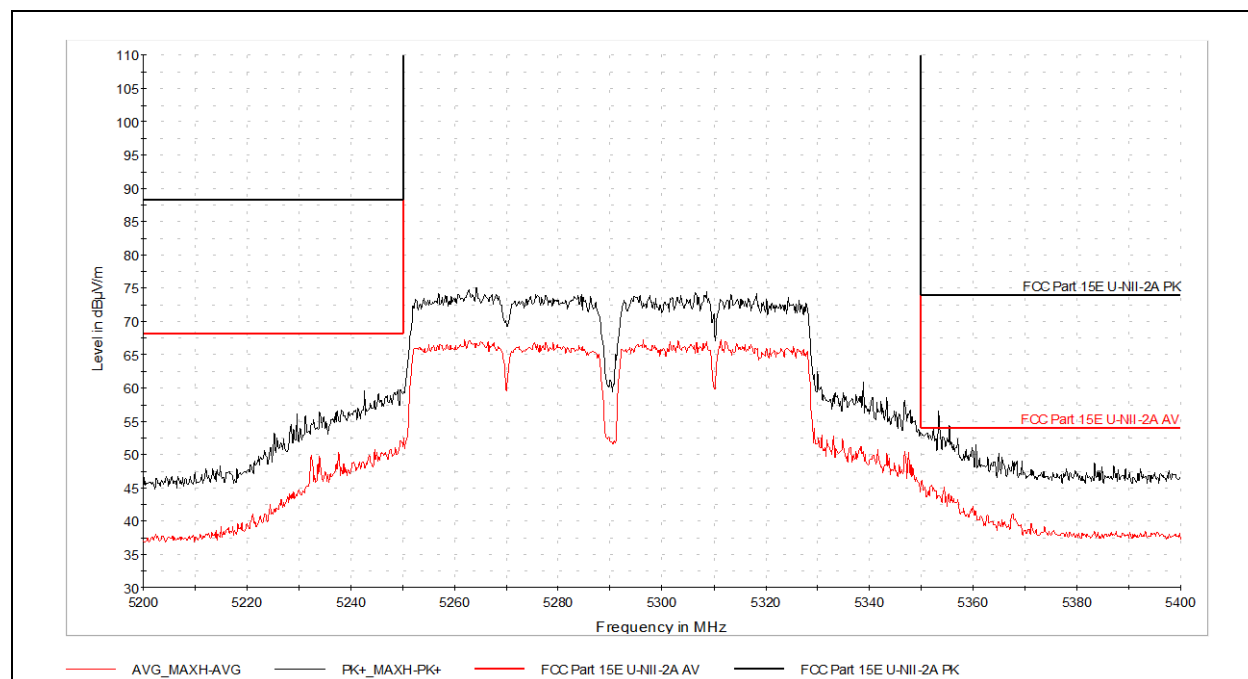
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1199.000000	46.07	73.98	27.91	1000.000	124.0	V	0.0	0.1
1440.000000	36.56	73.98	37.42	1000.000	262.0	H	120.0	0.8
3200.000000	48.94	88.23	39.29	1000.000	116.0	V	261.0	6.5
3836.500000	42.71	73.98	31.27	1000.000	410.0	H	89.0	8.4
4786.000000	46.81	73.98	27.17	1000.000	410.0	V	324.0	9.3
11876.500000	51.40	73.98	22.58	1000.000	410.0	V	309.0	19.5

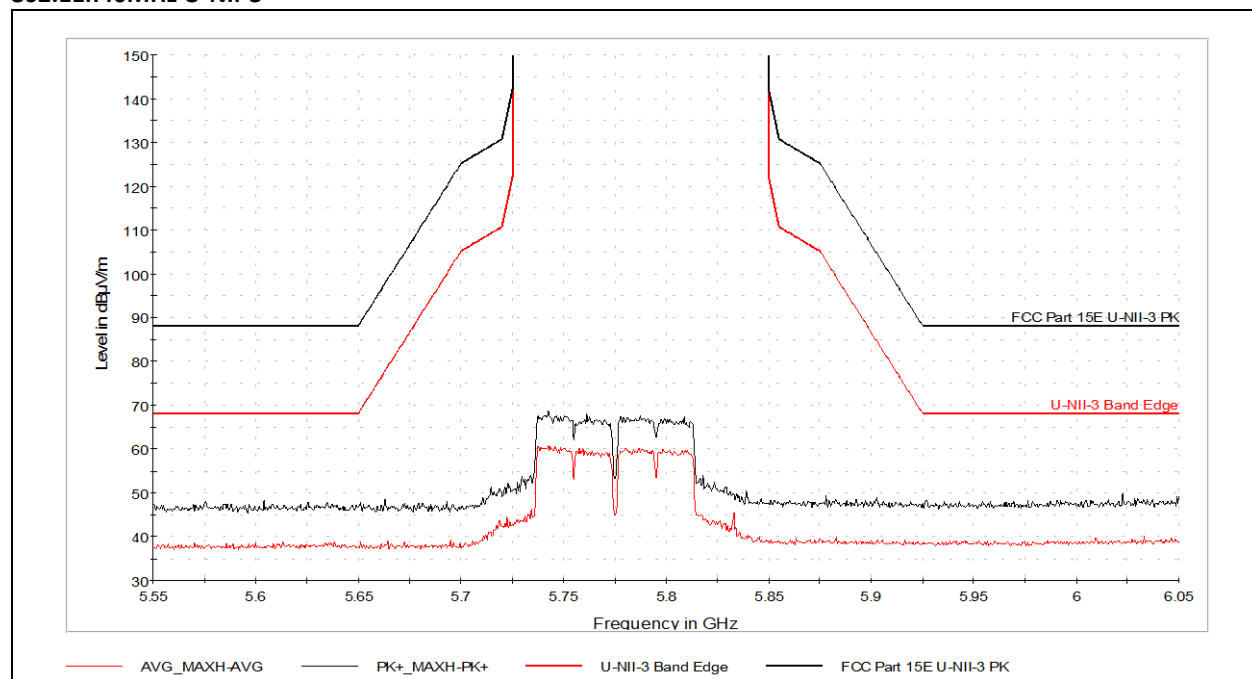
Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1199.000000	24.19	53.98	29.79	1000.000	124.0	V	0.0	0.1
1440.000000	22.93	53.98	31.05	1000.000	262.0	H	120.0	0.8
3200.000000	36.40	68.23	31.83	1000.000	116.0	V	261.0	6.5
3836.500000	29.59	53.98	24.39	1000.000	410.0	H	89.0	8.4
4786.000000	30.04	53.98	23.94	1000.000	410.0	V	324.0	9.3
11876.500000	38.19	53.98	15.79	1000.000	410.0	V	309.0	19.5

**7.10.6 Channel 159**

Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2395.000000	58.86	88.23	29.37	1000.000	192.0	V	336.0	5.3
2750.500000	40.41	73.98	33.57	1000.000	236.0	V	320.0	6.1
3200.000000	47.99	88.23	40.24	1000.000	100.0	V	256.0	6.5
3863.500000	43.59	73.98	30.39	1000.000	410.0	H	77.0	8.3
10755.000000	50.42	73.98	23.56	1000.000	410.0	H	173.0	18.9
12309.000000	52.30	73.98	21.68	1000.000	410.0	V	104.0	20.2

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2395.000000	28.86	68.23	39.37	1000.000	192.0	V	336.0	5.3
2750.500000	27.00	53.98	26.98	1000.000	236.0	V	320.0	6.1
3200.000000	34.63	68.23	33.60	1000.000	100.0	V	256.0	6.5
3863.500000	31.49	53.98	22.49	1000.000	410.0	H	77.0	8.3
10755.000000	37.06	53.98	16.92	1000.000	410.0	H	173.0	18.9
12309.000000	38.85	53.98	15.13	1000.000	410.0	V	104.0	20.2

**7.10.7 Emissions at the band edge****802.11n40MHz U-NII-1****802.11n40MHz U-NII-2A**

**802.11n40MHz U-NII-3**



8 Output Power

8.1 Test Limits

§ 15.407(1)(iv): For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§ 15.407(2): For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§ 15.407(3): For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

RSS-247 6.2.1 (5150 – 5250MHz):

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RSS-247 6.2.2 (5250 – 5350MHz):

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

- a) The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
- b) The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum 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.

**RSS-247 6.2.3 (5470 – 5600MHz and 5650 – 5725MHz):**

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order

8.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 11.9.1.1, and 11.9.1.2.



8.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
Wideband Power Sensor	4022	Rohde & Schwarz	NRP-Z81	10/13/2020	10/13/2021

8.4 Test Results

The device was found to be **compliant**.

8.5 Test Conditions

Test Personnel:	Brandon Norris	Test Date:	9/8/2021
Supervising/Reviewing Engineer:			15.247(b)(1), (3)
(Where Applicable)	NA	Limit Applied:	RSS-247 § 5.4(b), (d)
	FCC Part 15.247		
Product Standard:	RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	Battery	Relative Humidity:	52.2%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

**8.6 Test Data**

Mode	Channel (Frequency)	Peak Output Power (dBm)	Average Output Power (dBm)	Limit (dBm)	Result
802.11a	36	15.41	10.65	30	Pass
	44	15.15	10.47	30	Pass
	48	15.11	10.56	30	Pass
802.11a	52	15.91	11.66	30	Pass
	60	15.81	11.54	30	Pass
	64	15.91	11.68	30	Pass
802.11a	149	14.27	9.76	30	Pass
	157	14.57	9.78	30	Pass
	165	14.57	9.81	30	Pass
802.11n	36	15.11	10.56	30	Pass
	44	14.65	9.45	30	Pass
	48	15.51	9.91	30	Pass
802.11n	52	15.51	10.55	30	Pass
	60	16.11	11.05	30	Pass
	64	16.11	11.71	30	Pass
802.11n	149	14.47	9.05	30	Pass
	157	14.57	9.19	30	Pass
	165	14.67	9.25	30	Pass
802.11n40	38	15.38	11.08	30	Pass
	46	15.91	11.67	30	Pass
802.11n40	54	15.91	12.01	30	Pass
	62	16.41	12.43	30	Pass
802.11n40	151	14.87	10.16	30	Pass
	159	14.37	9.93	30	Pass

Deviations, Additions, or Exclusions: None



9 Occupied Bandwidth

9.1 Test Limits

§ 15.407(e), RSS-247 (6.2.4):

Within the 5725 – 5850GHz band, the minimum 6dB bandwidth of U-NII devices shall be at least 500kHz

9.2 Test Method

Tests are performed in accordance with ANSI C63.10:2013 § 6.9.2 and 11.8.1.

9.3 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde & Schwarz	ES126	10/9/2020	10/9/2021

9.4 Test Results

The device was found to be **compliant**. The 6dB bandwidth was at least 500kHz.

9.5 Test Conditions

Test Personnel:	Brandon Norris	Test Date:	3/12/2021-3/19/2021
Supervising/Reviewing Engineer:			
(Where Applicable)	NA	Limit Applied:	See Above
	FCC Part 15.247		
Product Standard:	RSS-247 Issue 2	Ambient Temperature:	25.6C
Input Voltage:	Battery	Relative Humidity:	52.2%
Pretest Verification w / Ambient			
Signals or BB Source:	Yes	Atmospheric Pressure:	985.4mbar

**9.6 Test Data**

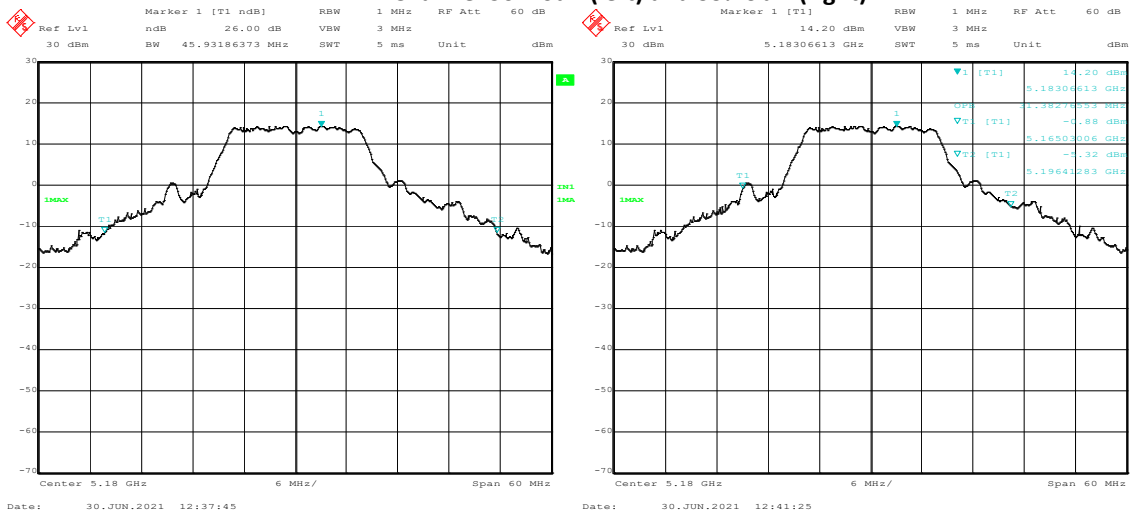
Mode	Channel (Frequency)	6dB BW (MHz)	26dB BW (MHz)	99% BW (MHz)
802.11a	149	16.43		27.66
	157	16.53		31.86
	165	16.53		32.56
802.11a	36		45.9	31.4
	44		45.5	30.2
	48		48.1	32.9
802.11a	52		46.2	31.9
	60		46.1	30.9
	64		48.0	32.6
802.11n	149	16.52		28.62
	157	16.53		28.26
	165	16.63		30.78
802.11n	36		39.9	25.5
	44		45.1	30.7
	48		39.8	24.3
802.11n	52		43.4	29.9
	60		42.9	28.6
	64		43.9	30.1
802.11nHT40	38		110.92	79.66
	46		106.71	75.75
802.11nHT40	54		108.5	76.1
	62		102.2	72.7
802.11nHT40	151	36.70		86.87
	159	36.97		84.77

Deviations, Additions, or Exclusions: None.

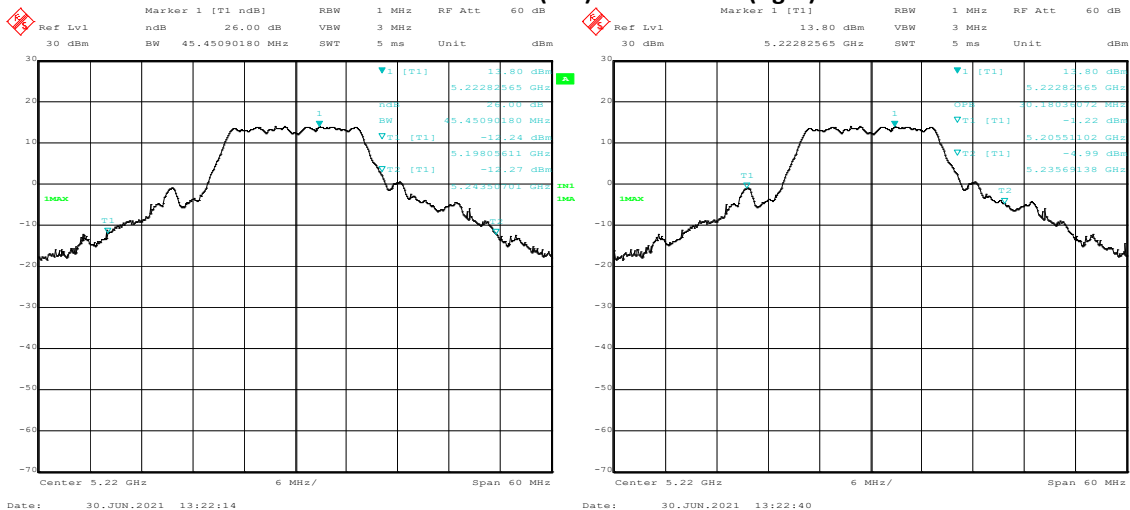


9.6.1 Wi-Fi, 802.11a

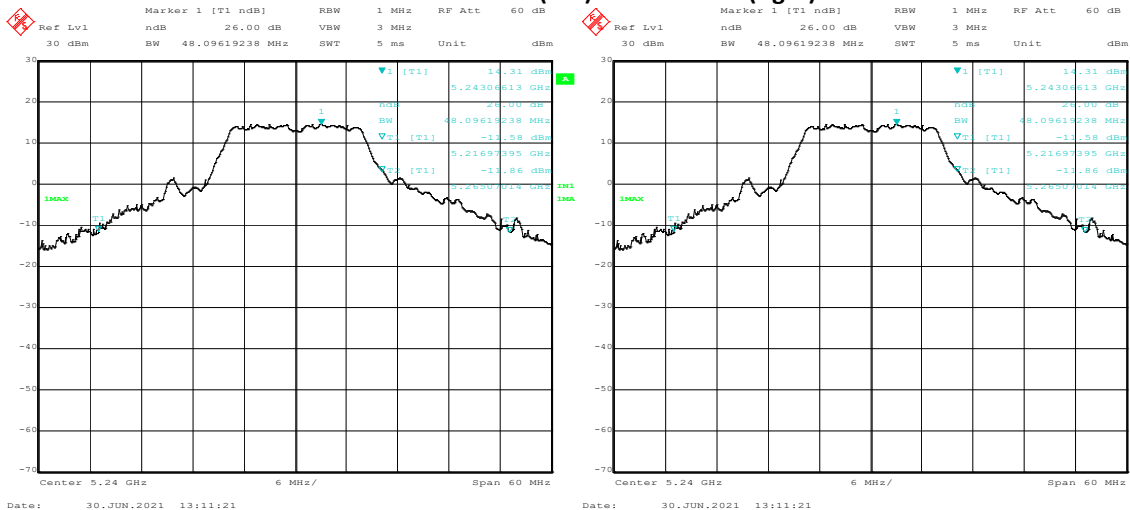
Channel 36 26dB (left) and 99%obw (right)



Channel 44 26dB (left) and 99%obw (right)

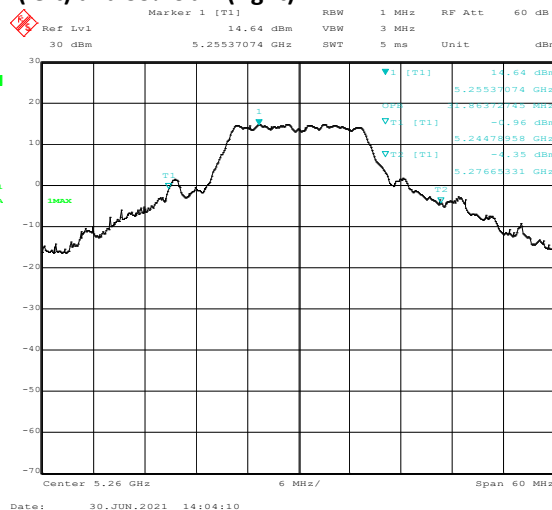
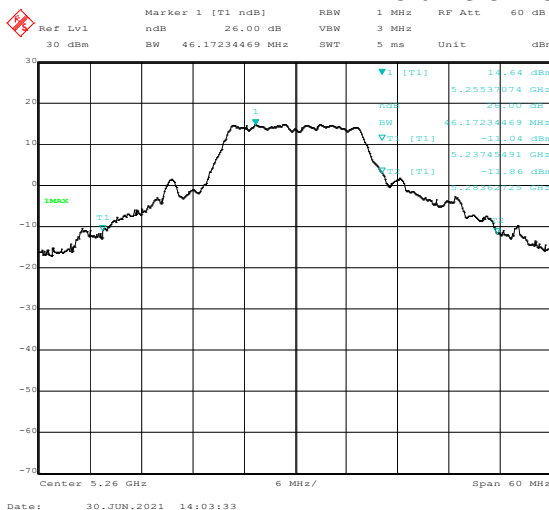


Channel 48 26dB (left) and 99%obw (right)

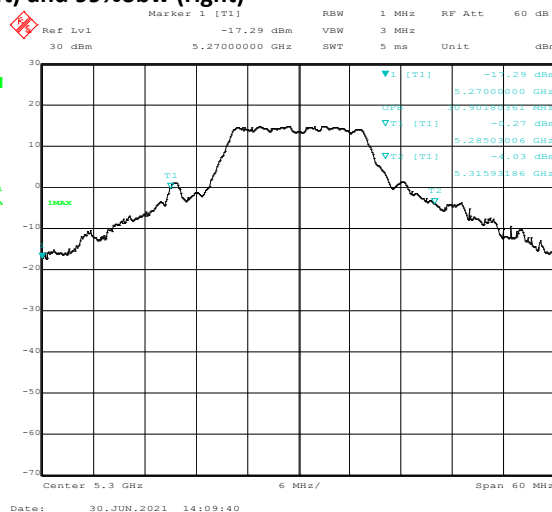
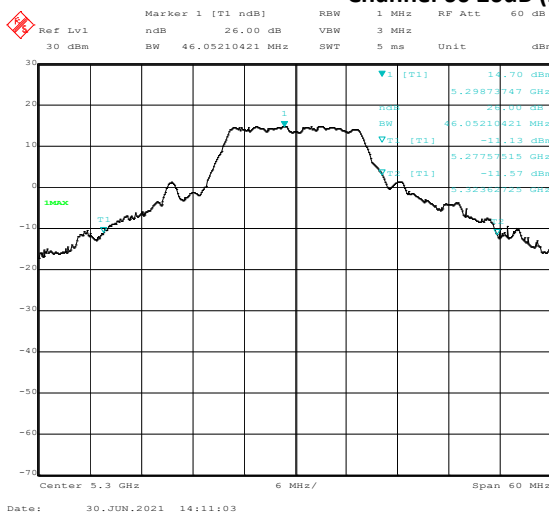




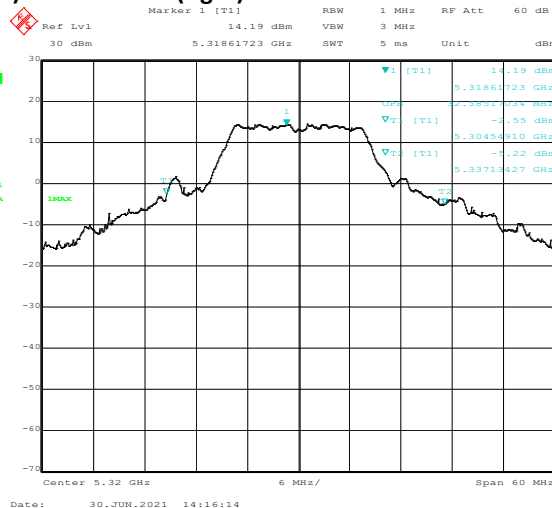
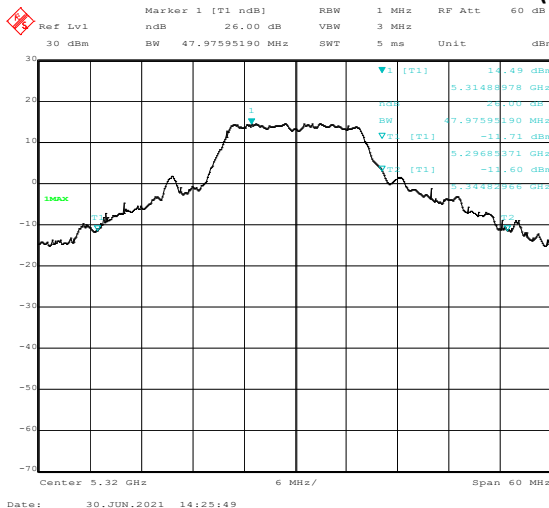
Channel 52 26dB (left) and 99%obw (right)



Channel 60 26dB (left) and 99%obw (right)

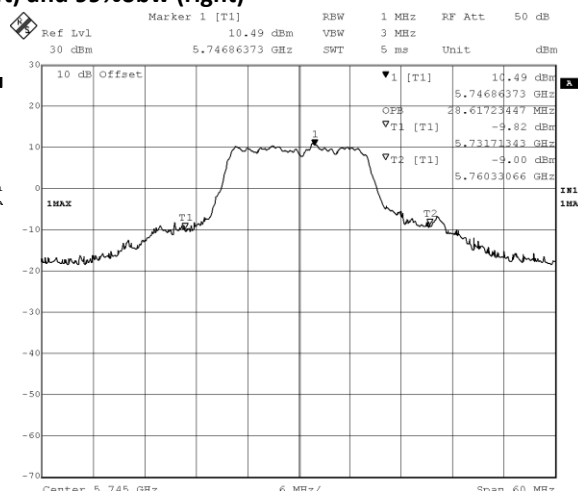
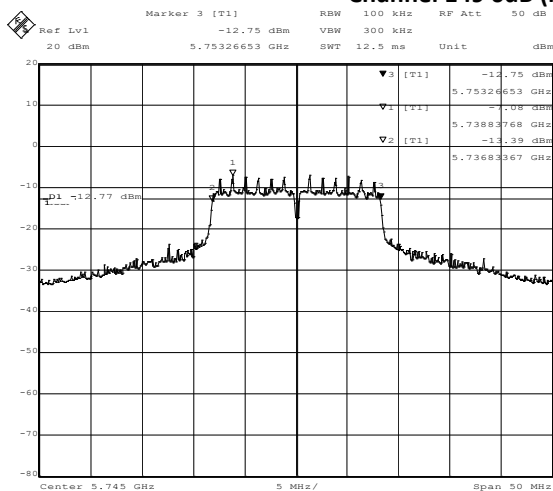


Channel 64 26dB (left) and 99%obw (right)

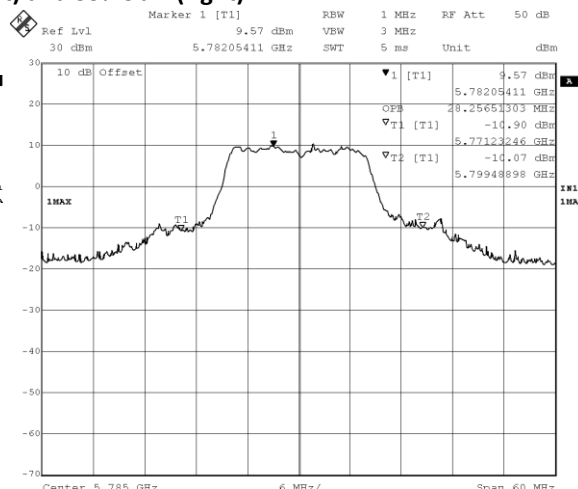
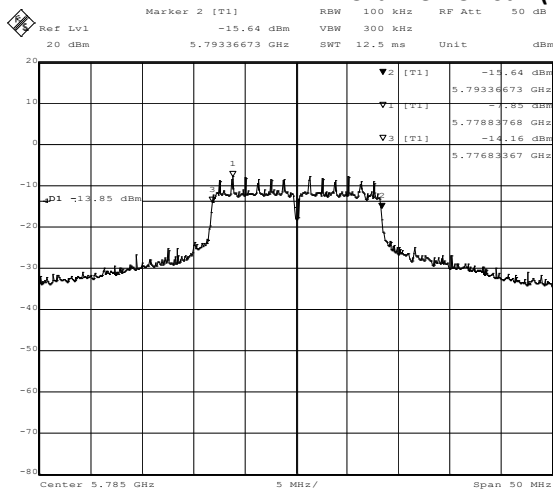




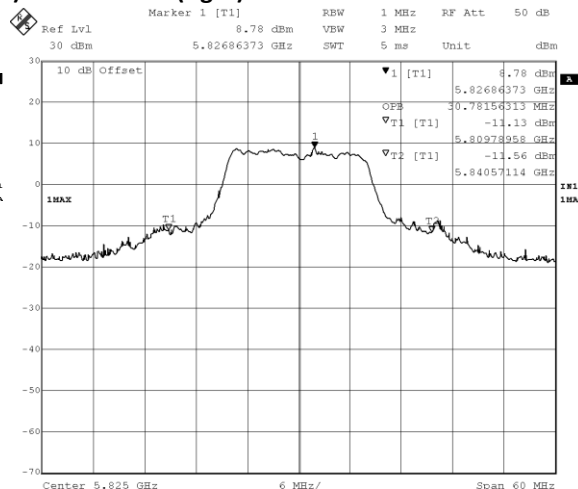
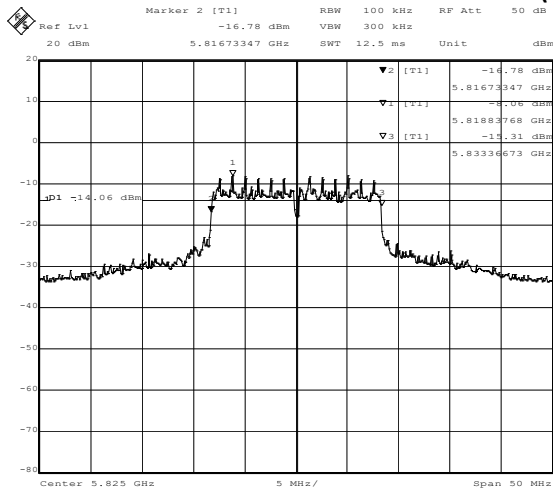
Channel 149 6dB (left) and 99%obw (right)



Channel 157 6dB (left) and 99%obw (right)



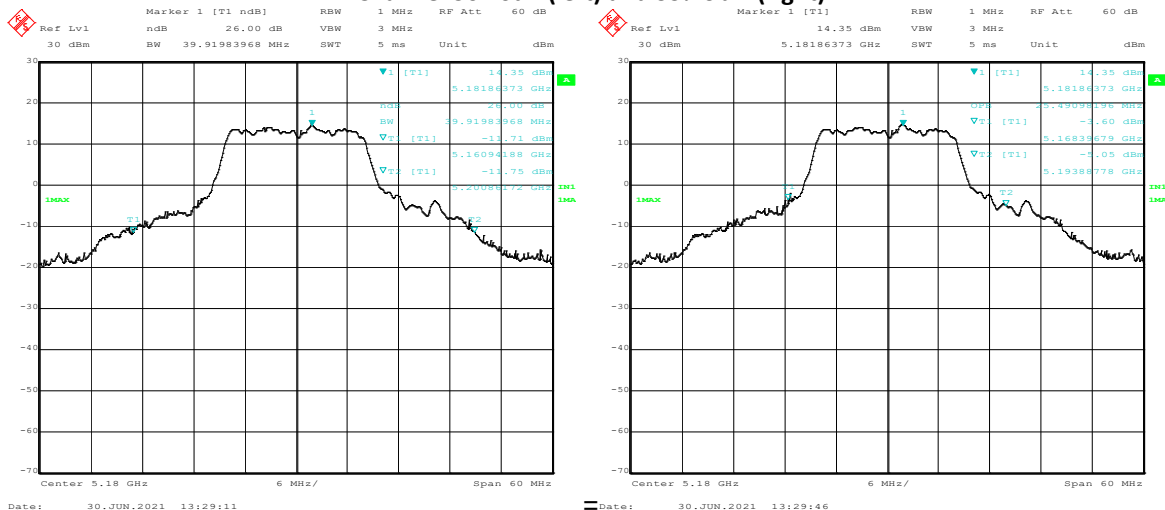
Channel 165 6dB (left) and 99%obw (right)



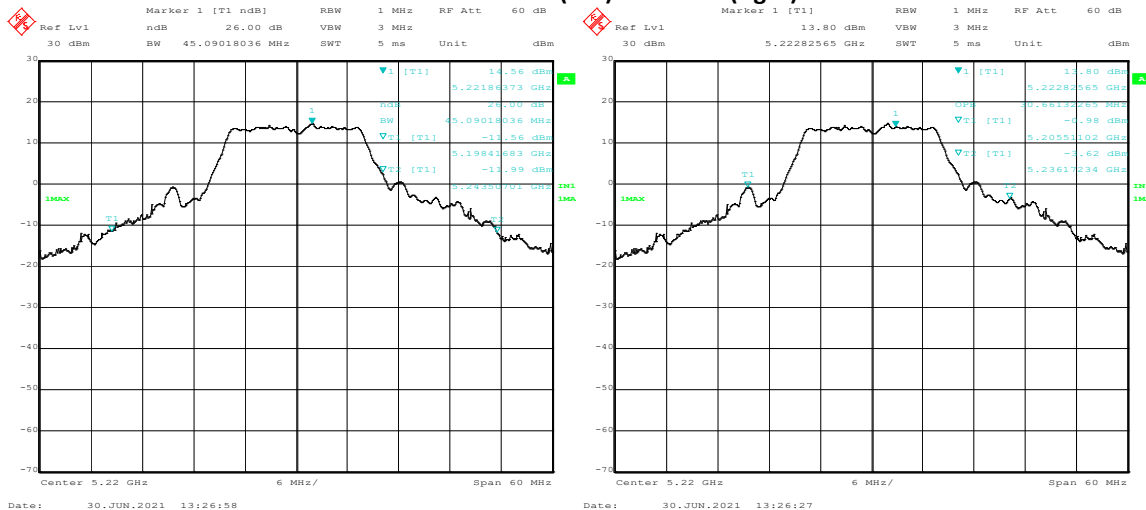


9.6.2 Wi-Fi, 802.11n

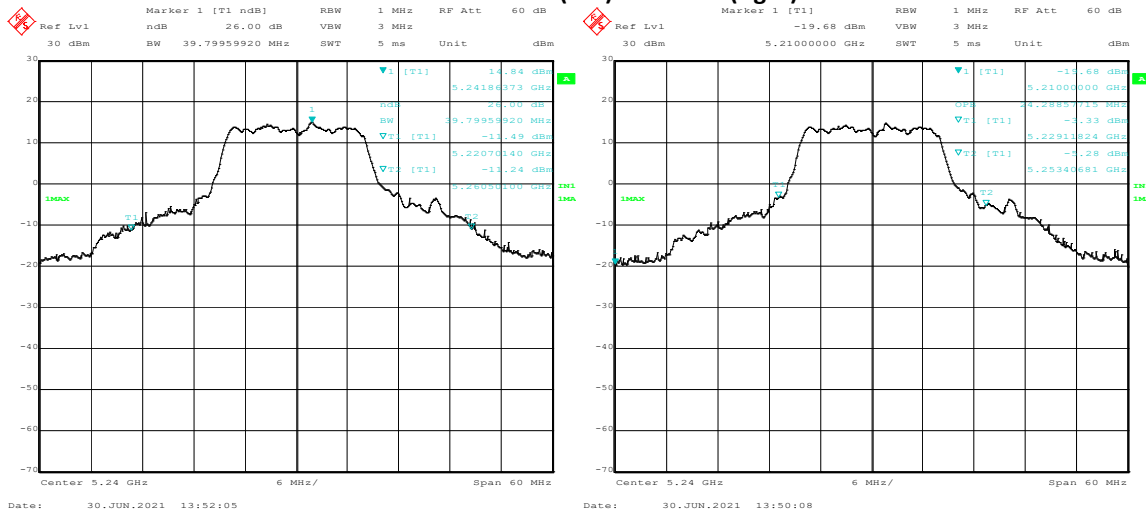
Channel 36 26dB (left) and 99%obw (right)



Channel 44 26dB (left) and 20dB (right)

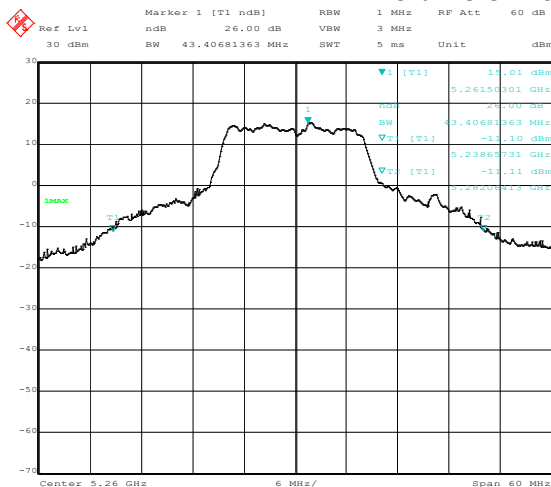


Channel 48 26dB (left) and 20dB (right)

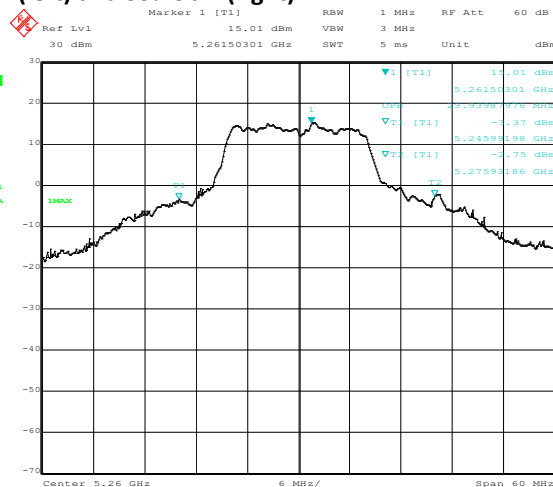




Channel 52 26dB (left) and 99%obw (right)

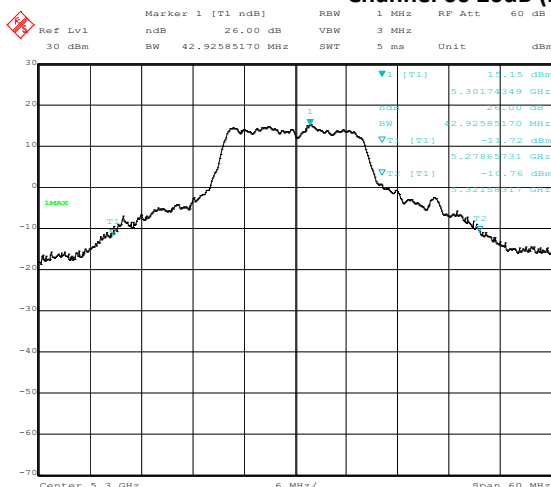


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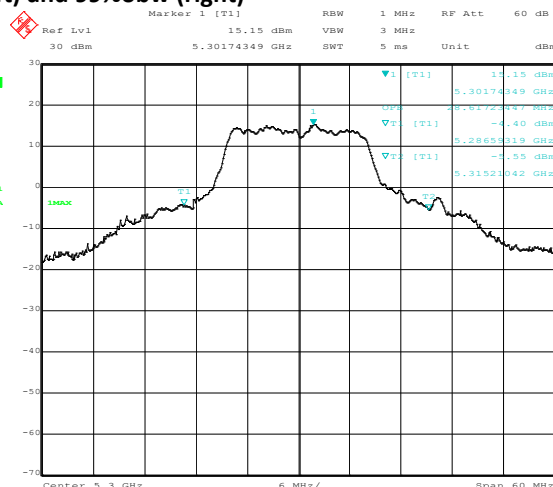


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Channel 60 26dB (left) and 99%obw (right)

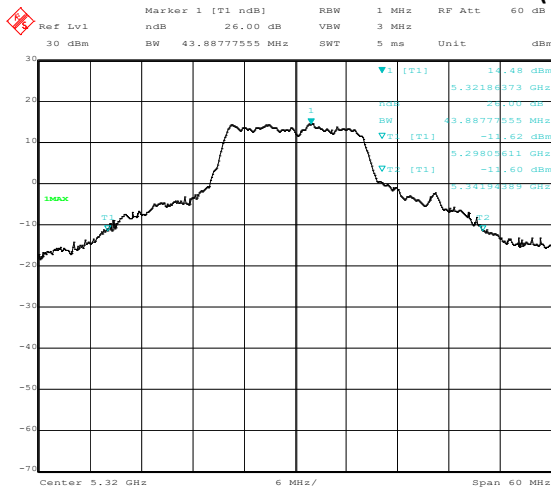


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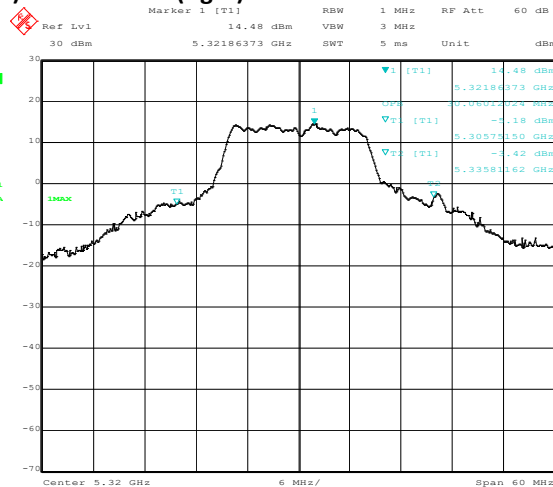


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Channel 64 26dB (left) and 99%obw (right)



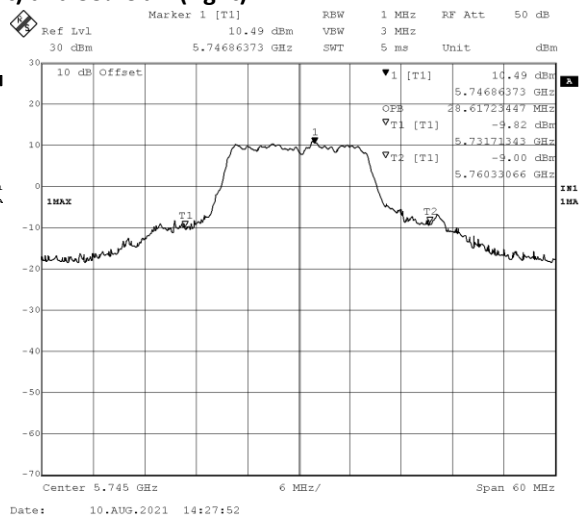
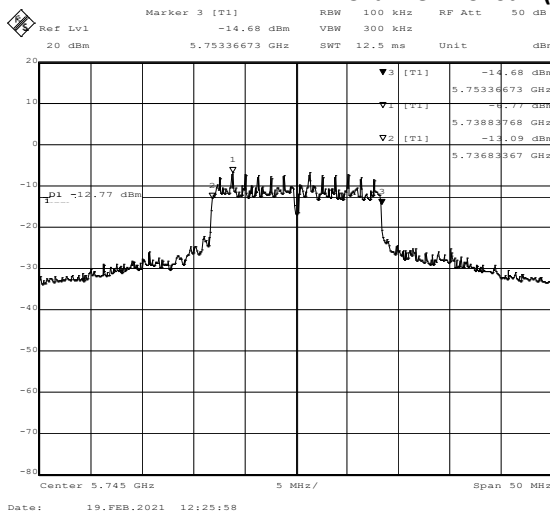
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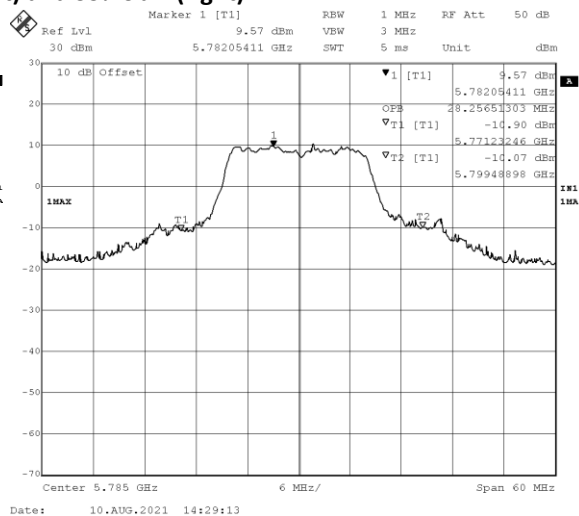
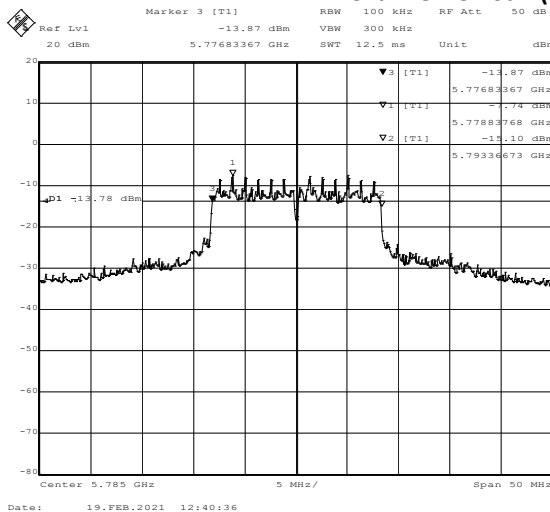
Date: 30.JUN.2021 15:04:05



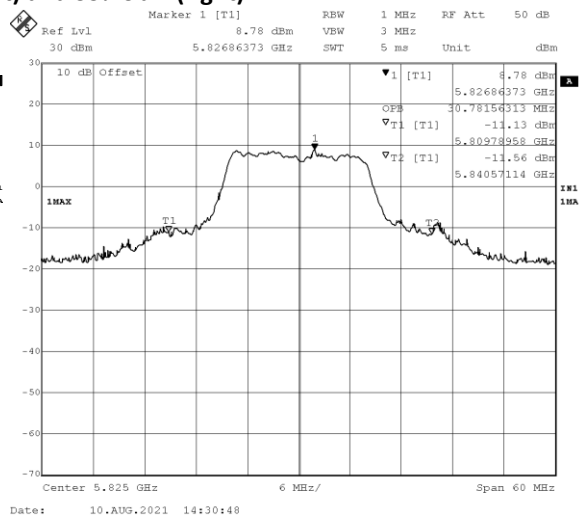
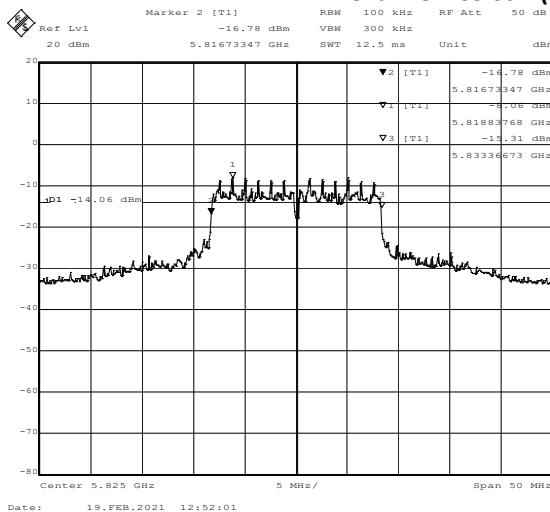
Channel 149 6dB (left) and 99%obw (right)



Channel 157 6dB (left) and 99%obw (right)



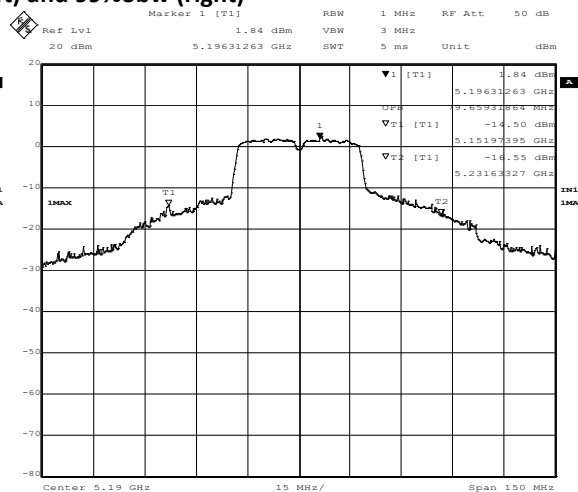
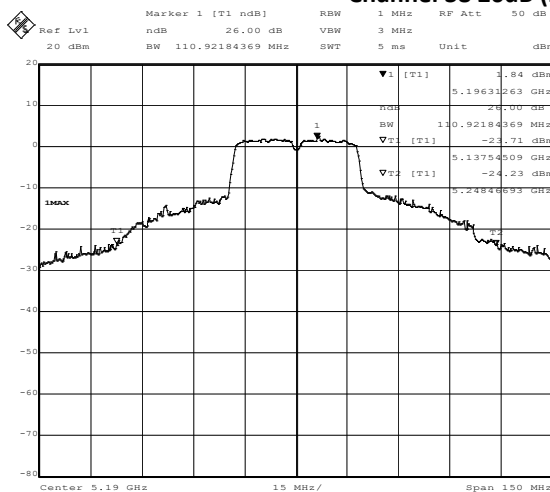
Channel 165 6dB (left) and 99%obw (right)



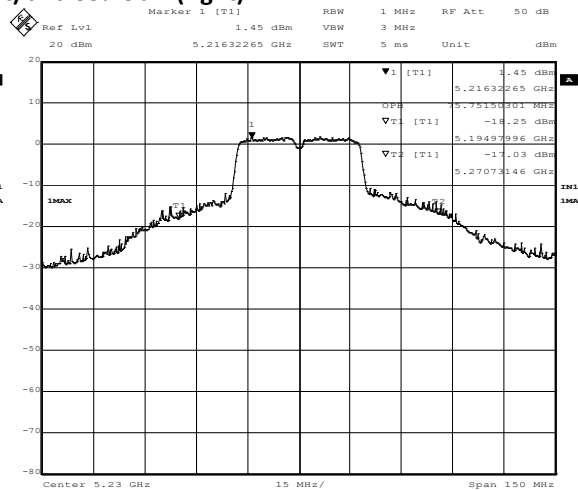
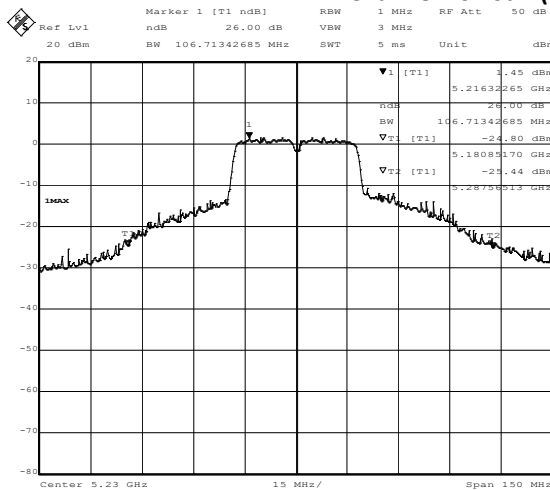


9.6.3 Wi-Fi, 802.11nHT40

Channel 38 26dB (left) and 99%obw (right)

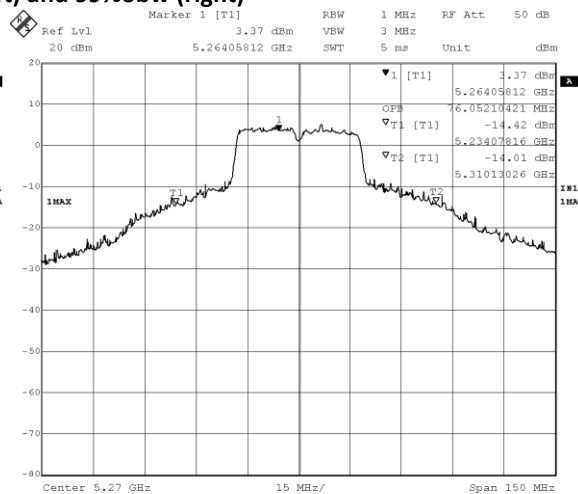
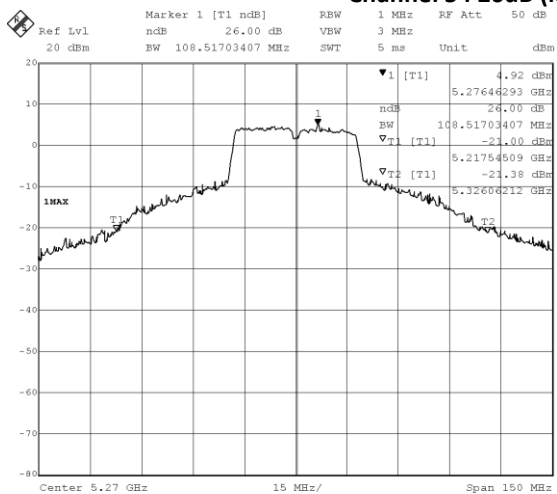


Channel 46 26dB (left) and 99%obw (right)

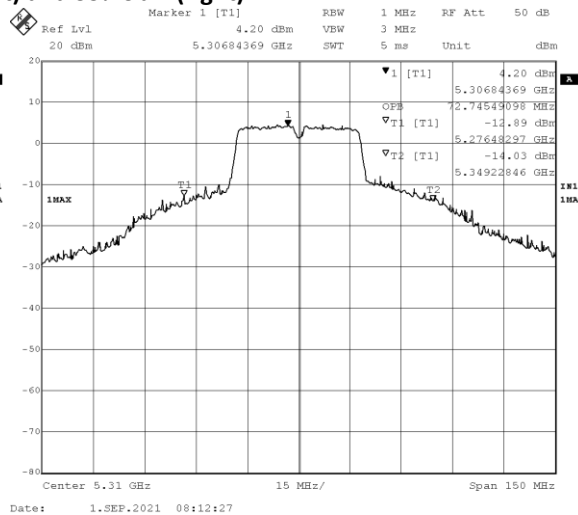
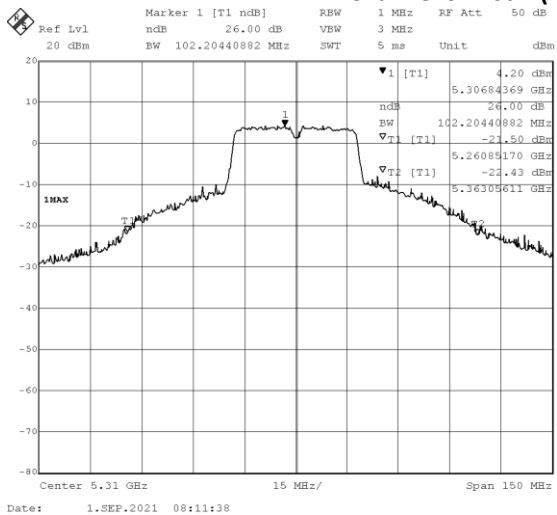


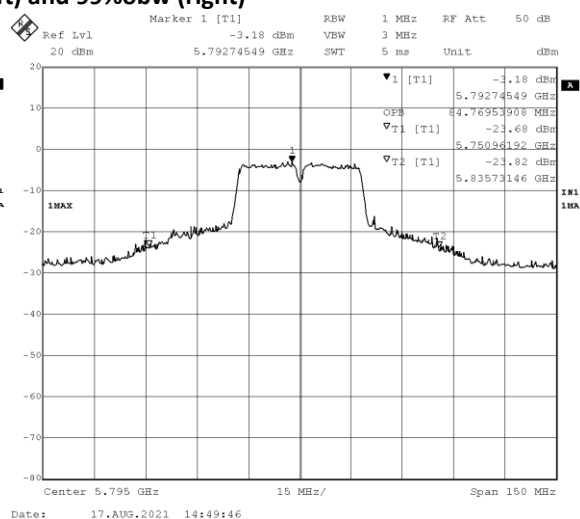


Channel 54 26dB (left) and 99%obw (right)



Channel 62 26dB (left) and 99%obw (right)







10 Power Spectral Density

10.1 Test Limits:

Operating Band (MHz) 15.407 / RSS-247 PSD Limits RSS-247 EIRP Limit

5150 - 5250 11dBm/MHz 10dBm/MHz (EIRP)

5725 - 5825 30dBm/500kHz

5250 - 5350 11dBm/MHz

5470 - 5725 11dBm/MHz

Note: Until further notice, devices operating under RSS-247 shall not be capable of transmitting in the band 5600-5650 MHz. This restriction is for the protection of Environment Canada's weather radars operating in this band.

FCC Power Spectral Density Limits:

§ 15.407(1)(iv): For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§ 15.407(2): For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§ 15.407(3): For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

**RSS-247 6.2.1 (5150 – 5250MHz):**

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement transmitter power control (TPC) in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

For other devices, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

RSS-247 6.2.2 (5250 – 5350MHz):

For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or $1.76 + 10 \log_{10} B$, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

- a) The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;
- b) The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum 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.

RSS-247 6.2.3 (5470 – 5600MHz and 5650 – 5725MHz):

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum 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.

10.2 Test Equipment Used

Description	Asset	Manufacturer	Model	Cal Date	Cal Due
EMI Test Receiver	2327	Rohde & Schwarz	ES126	10/9/2020	10/9/2021

10.3 Test Results

The device was found to be **compliant**. The peak power spectral density was less than 8dBm.

10.4 Test Conditions

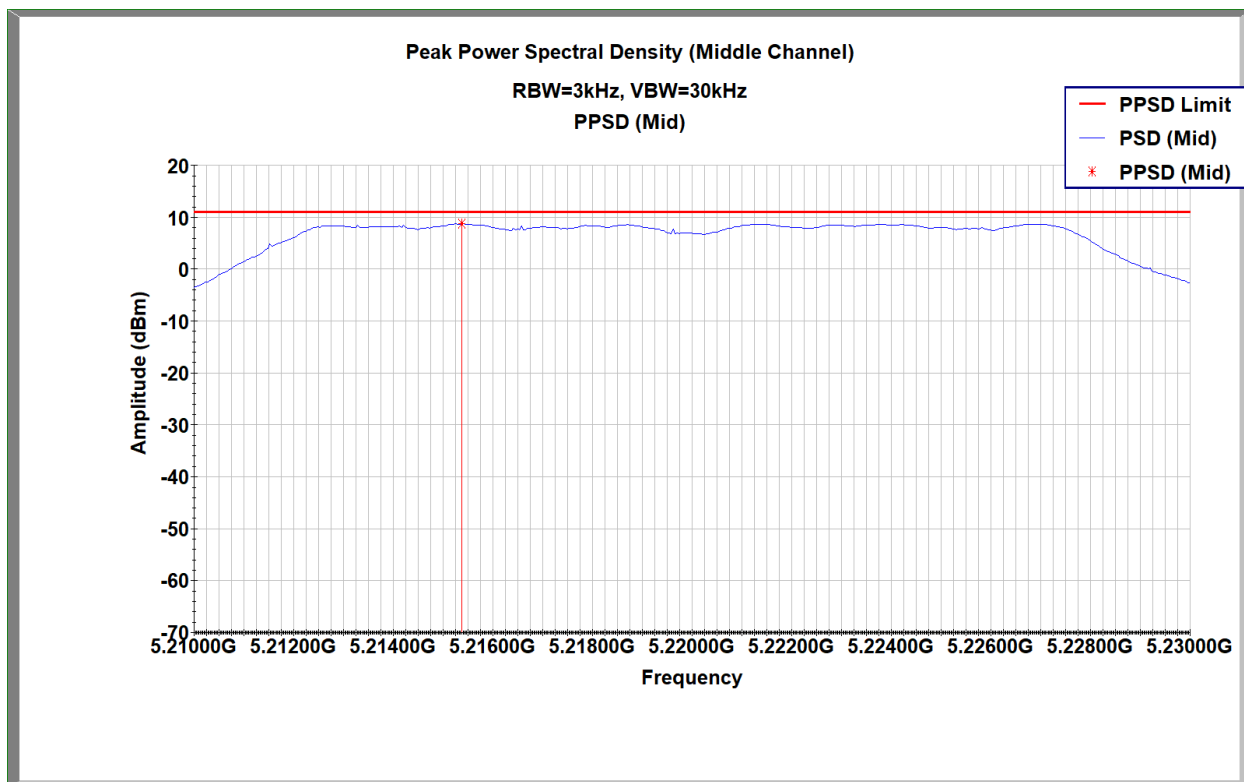
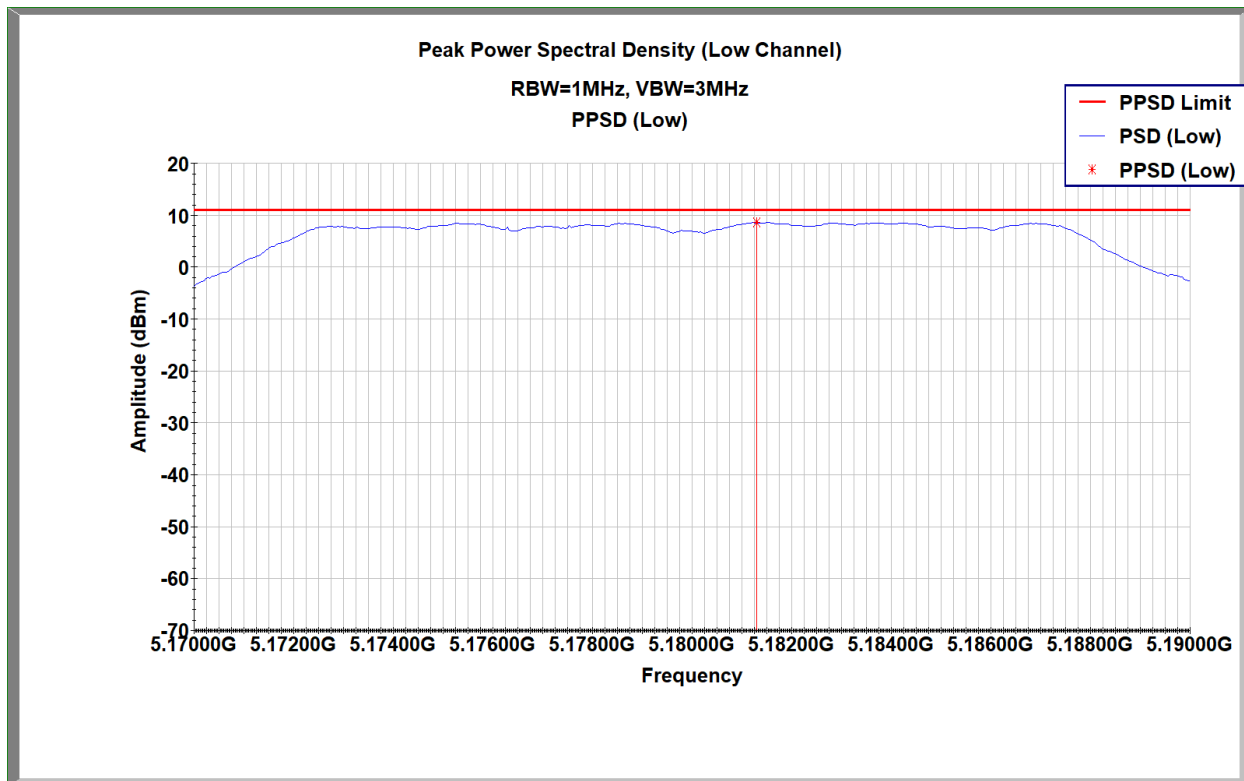
Test Personnel:	Brandon Norris	Test Date:	9/3/2021
Supervising/Reviewing Engineer:		Limit Applied:	See Above
(Where Applicable)	NA	Ambient Temperature:	25.3C
Product Standard:	FCC Part 15.247	Relative Humidity:	57.2%
Input Voltage:	RSS-247 Issue 2	Atmospheric Pressure:	985.4mbar
Pretest Verification w / Ambient	Battery		
Signals or BB Source:	Yes		

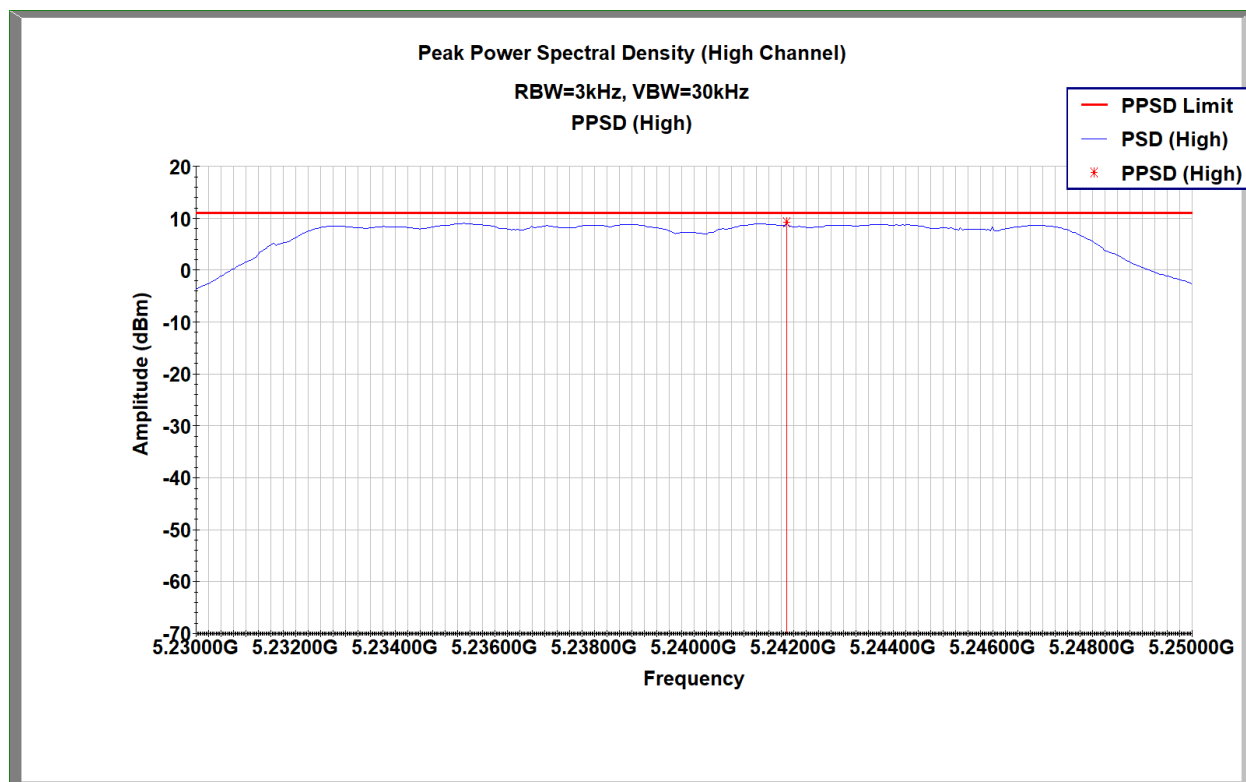
**10.5 Test Results**

Mode	Channel (Frequency)	PPSD (dBm)
802.11a	149	1.611
	157	1.459
	165	0.965
802.11a	36	8.601
	44	8.735
	48	9.222
802.11a	52	9.659
	60	9.137
	64	8.951
802.11n	149	1.572
	157	1.400
	165	1.787
802.11n	36	8.912
	44	9.361
	48	9.801
802.11n	52	9.873
	60	9.584
	64	9.738
802.11nHT40	151	-0.301
	159	-1.051
802.11nHT40	38	6.907
	46	6.742
802.11nHT40	54	7.915
	62	9.584



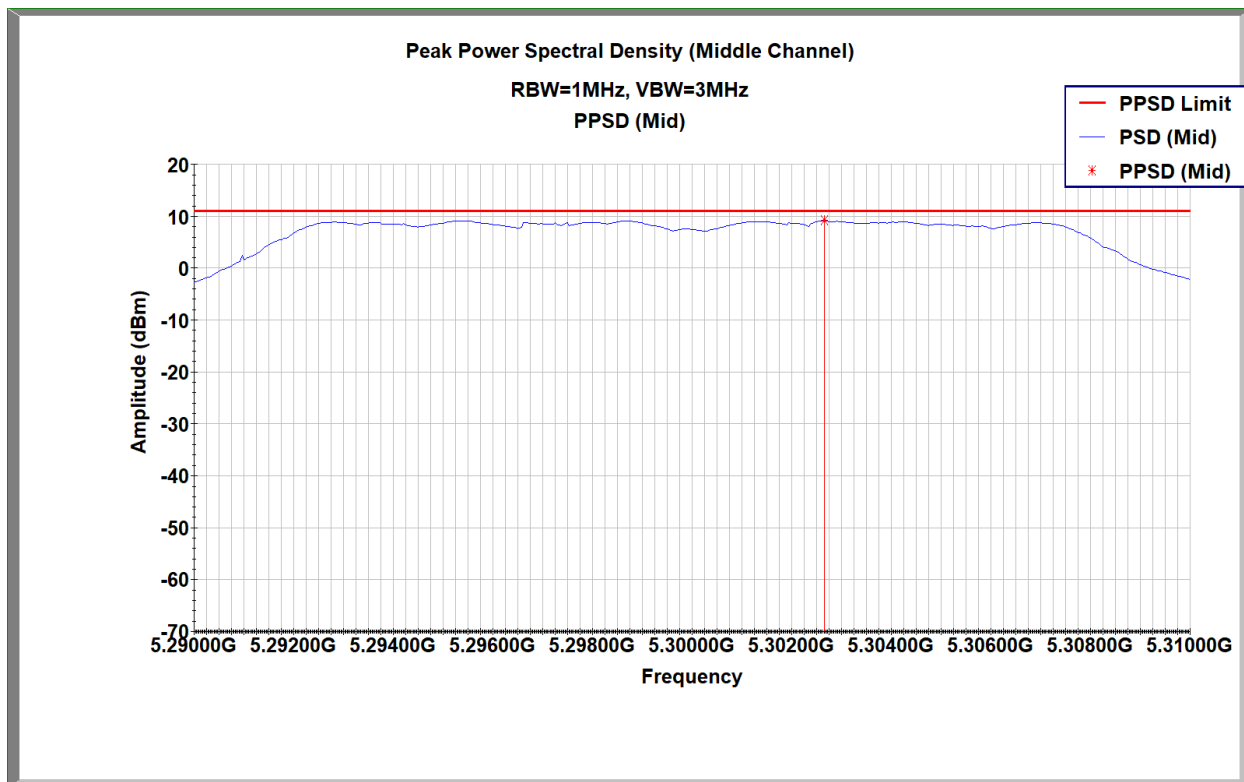
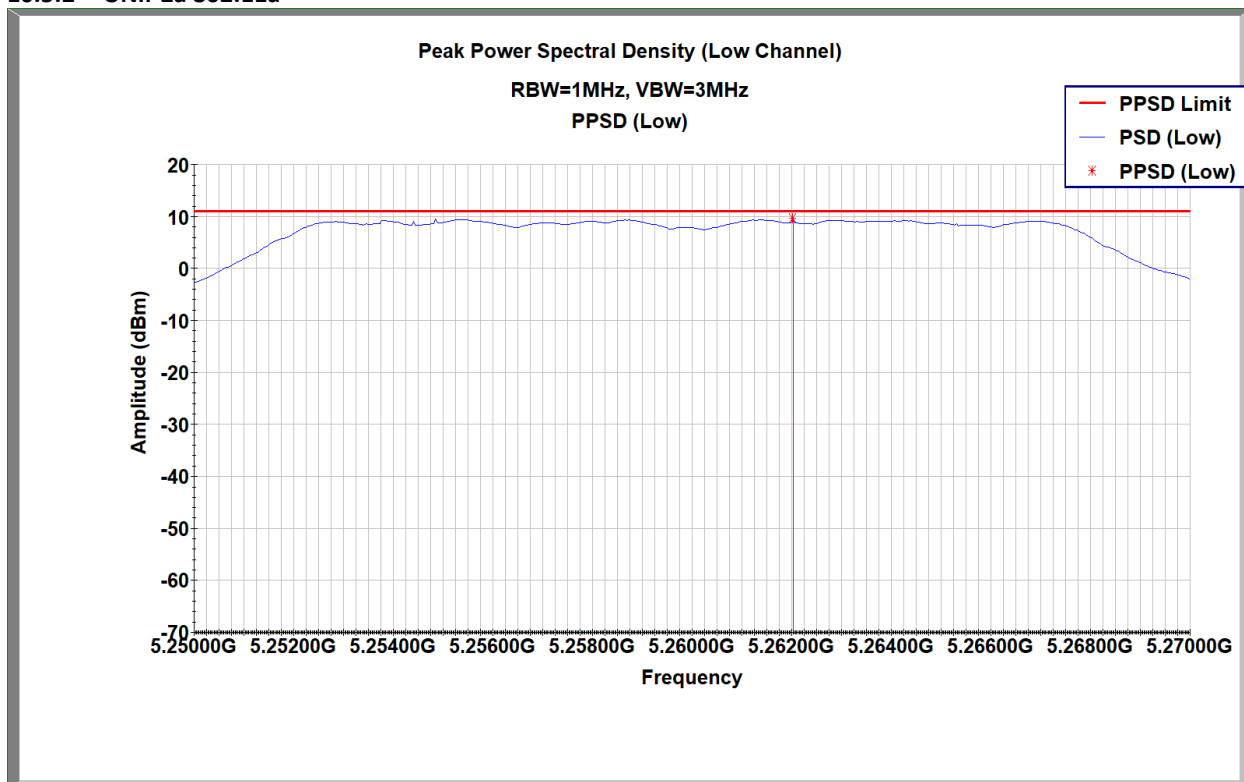
10.5.1 UNII-1 802.11a

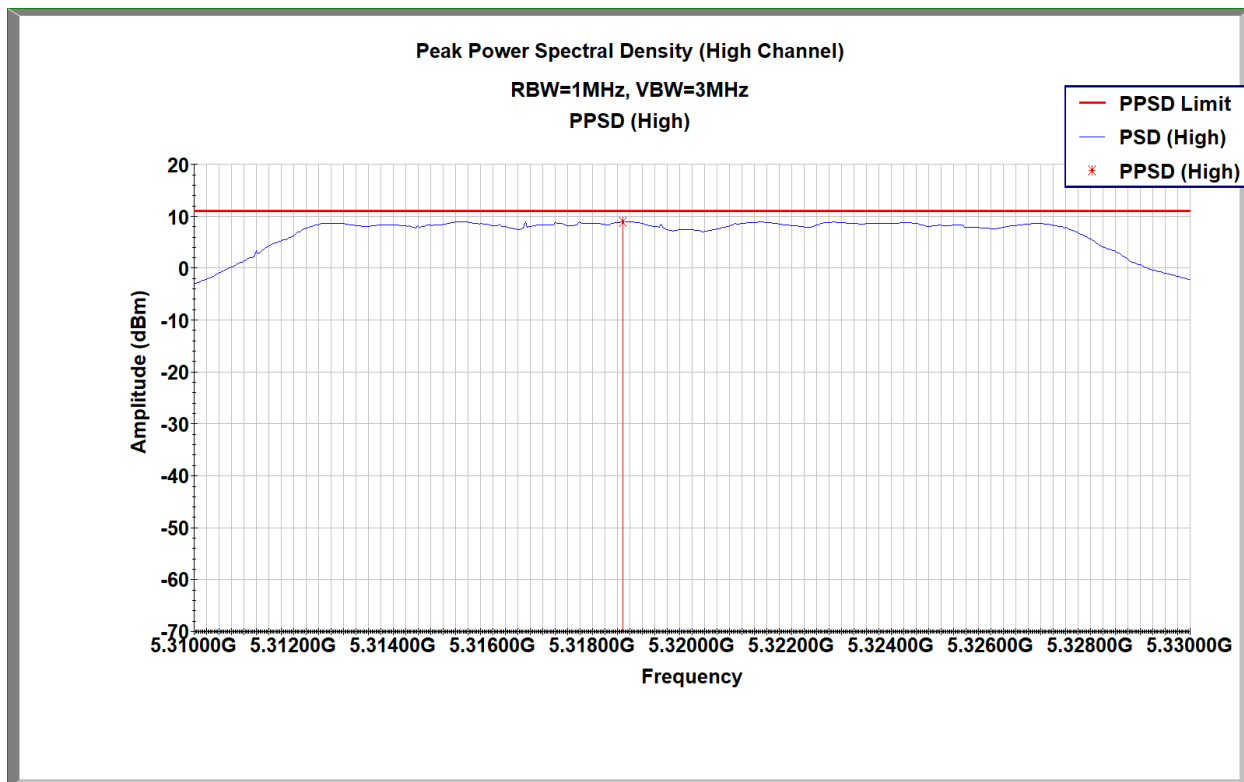




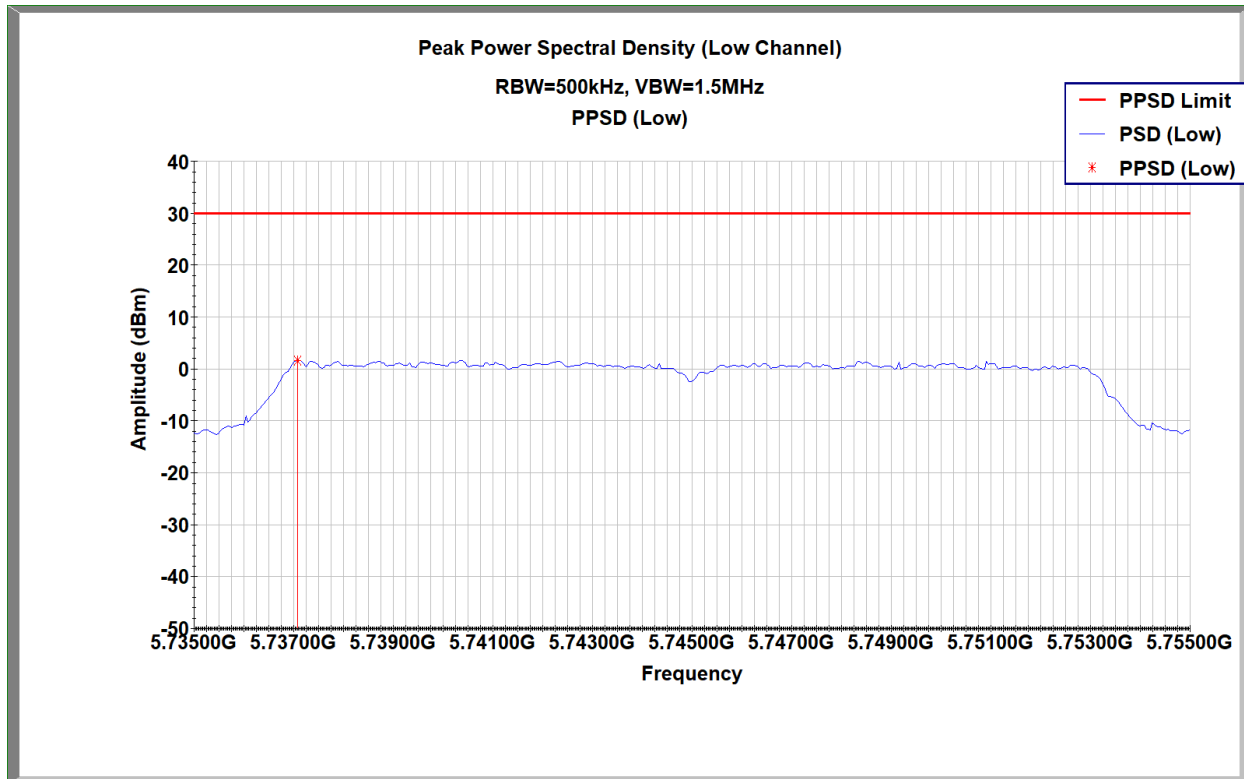


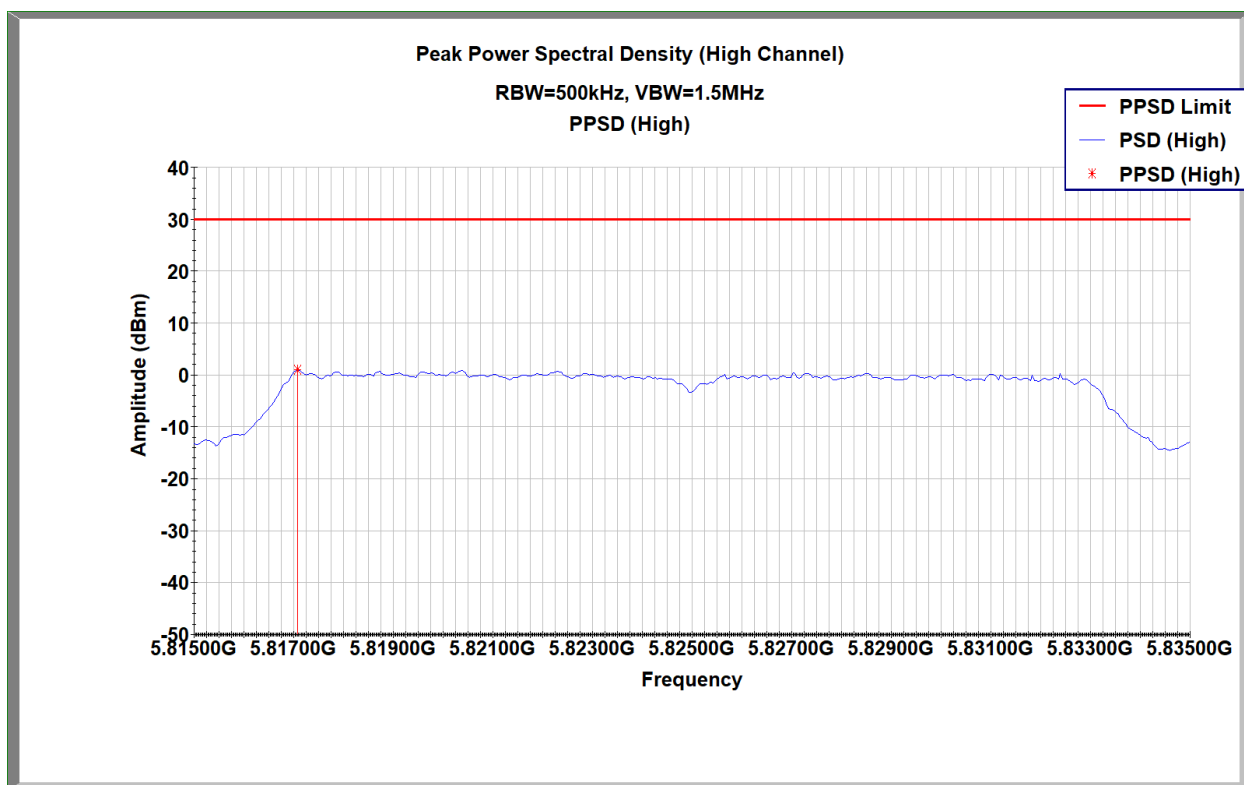
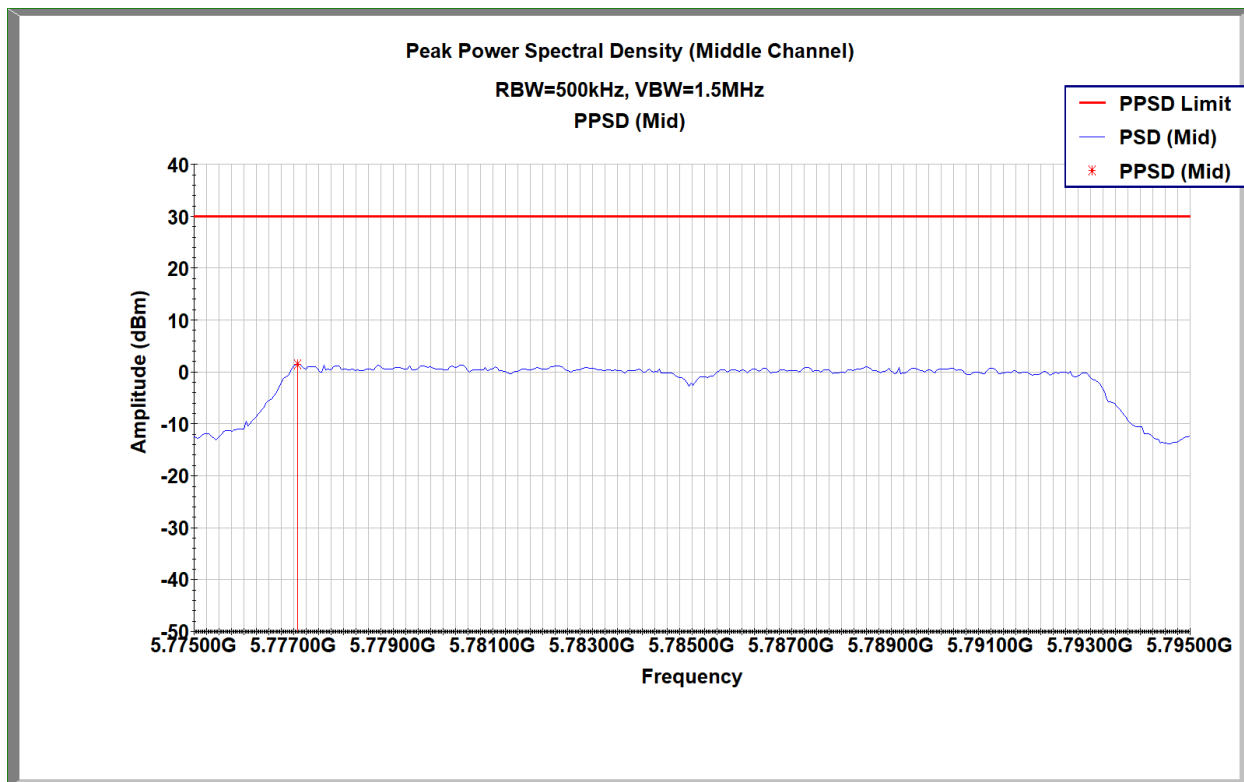
10.5.2 UNII-2a 802.11a





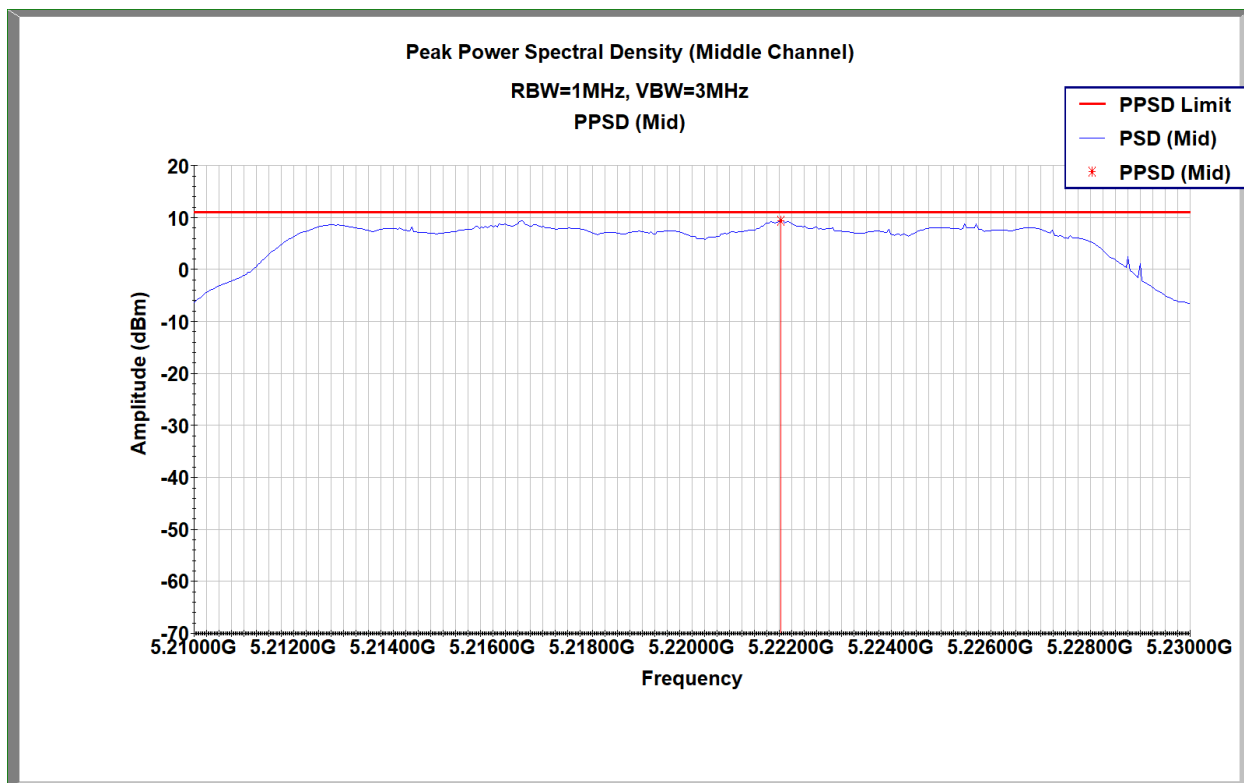
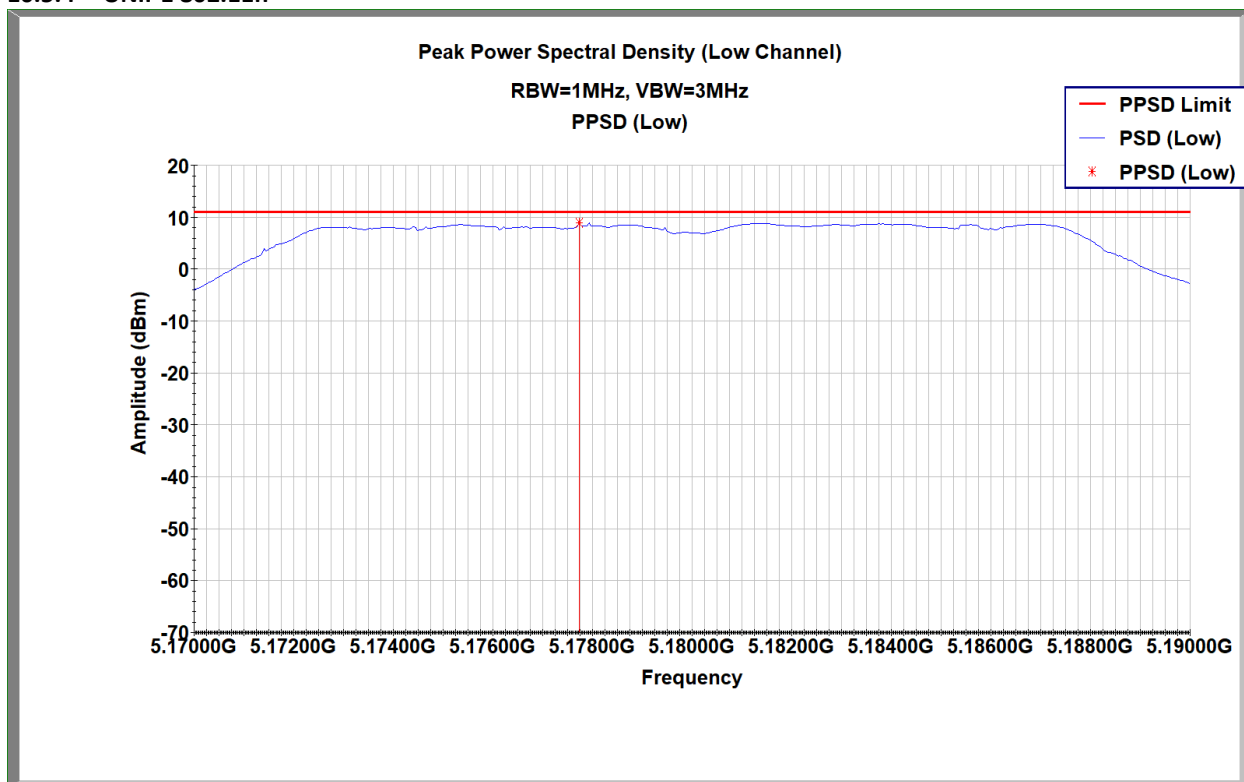
10.5.3 UNII-3 802.11a

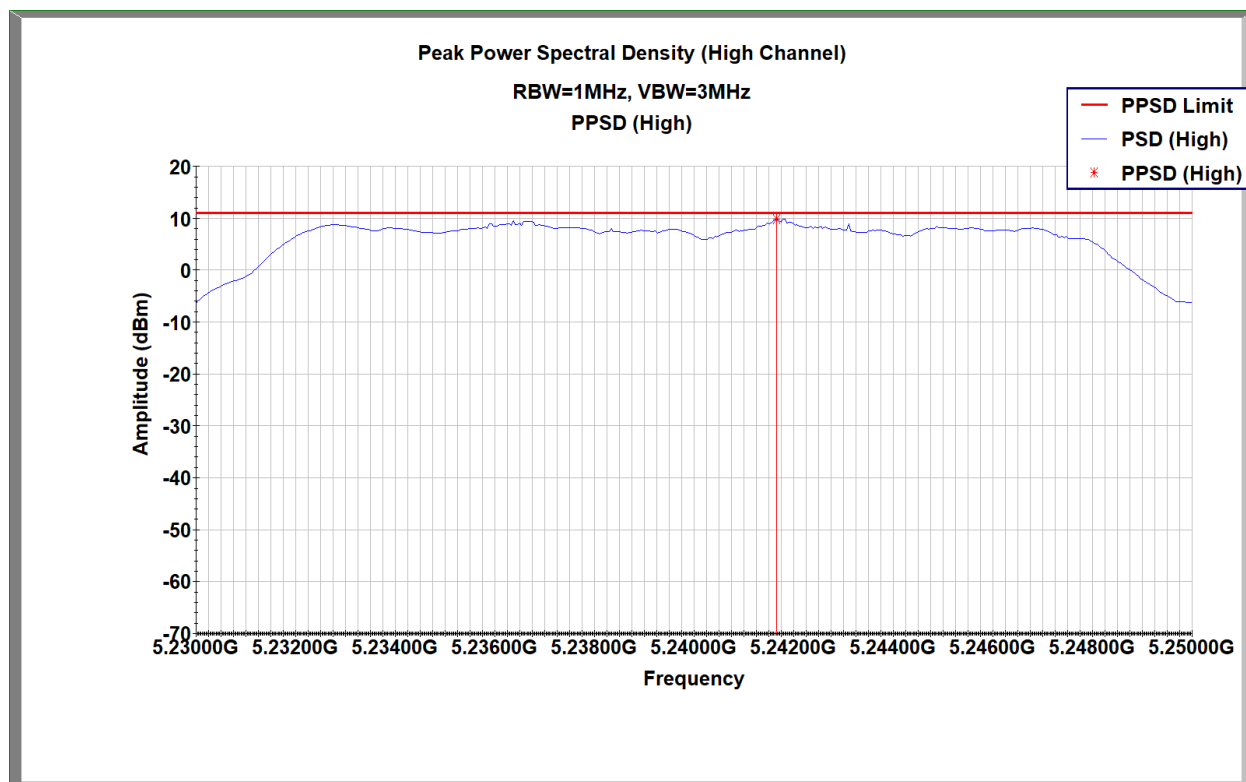






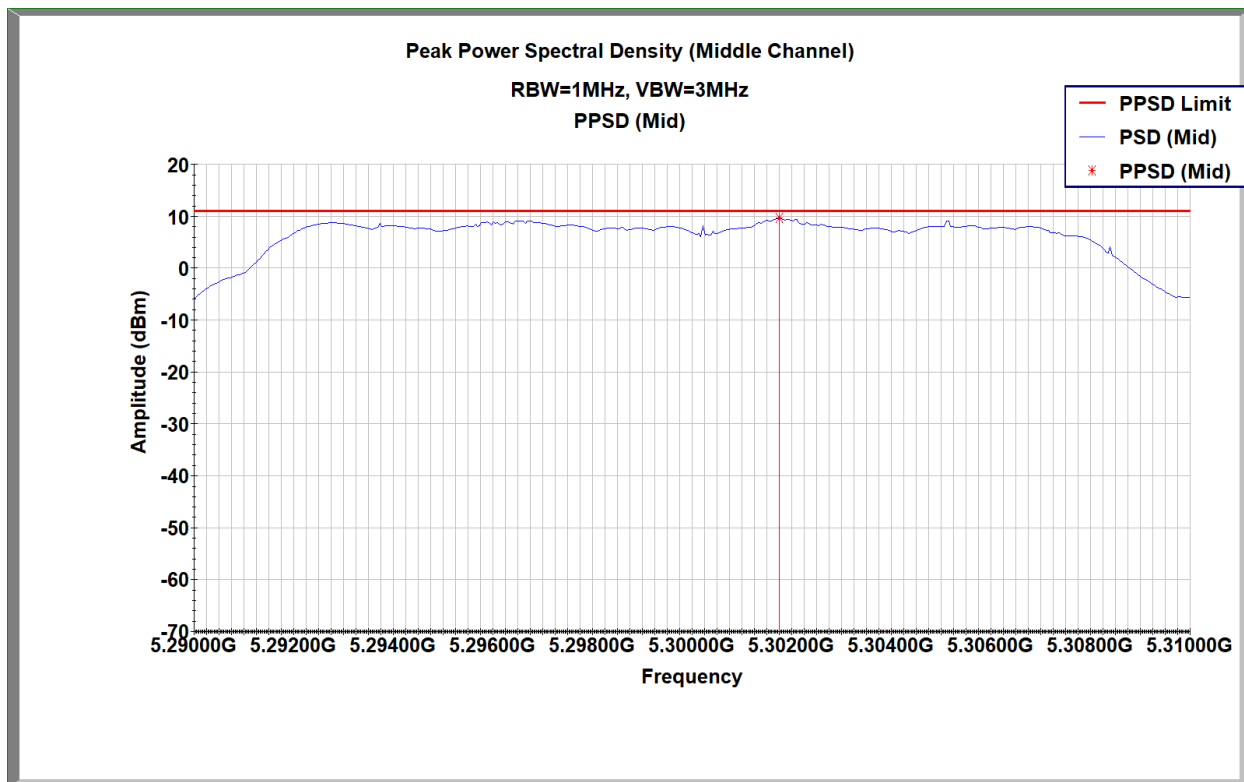
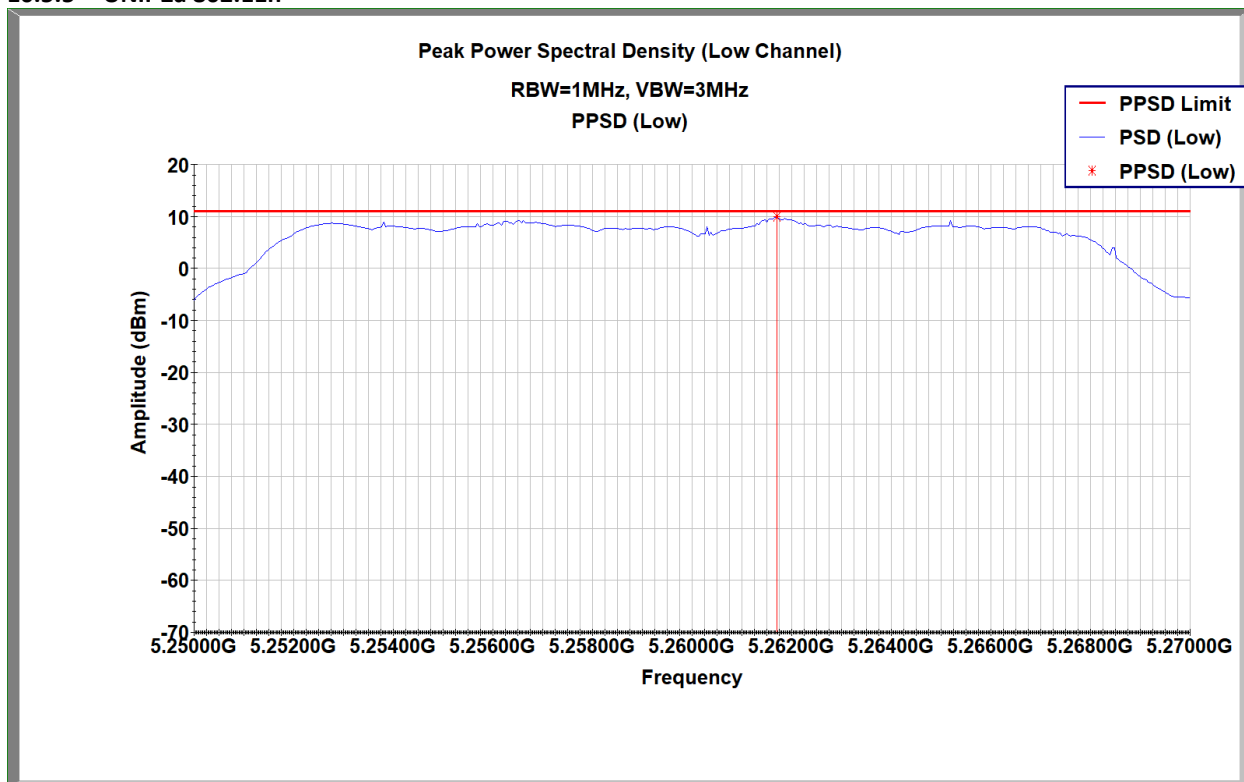
10.5.4 UNII-1 802.11n

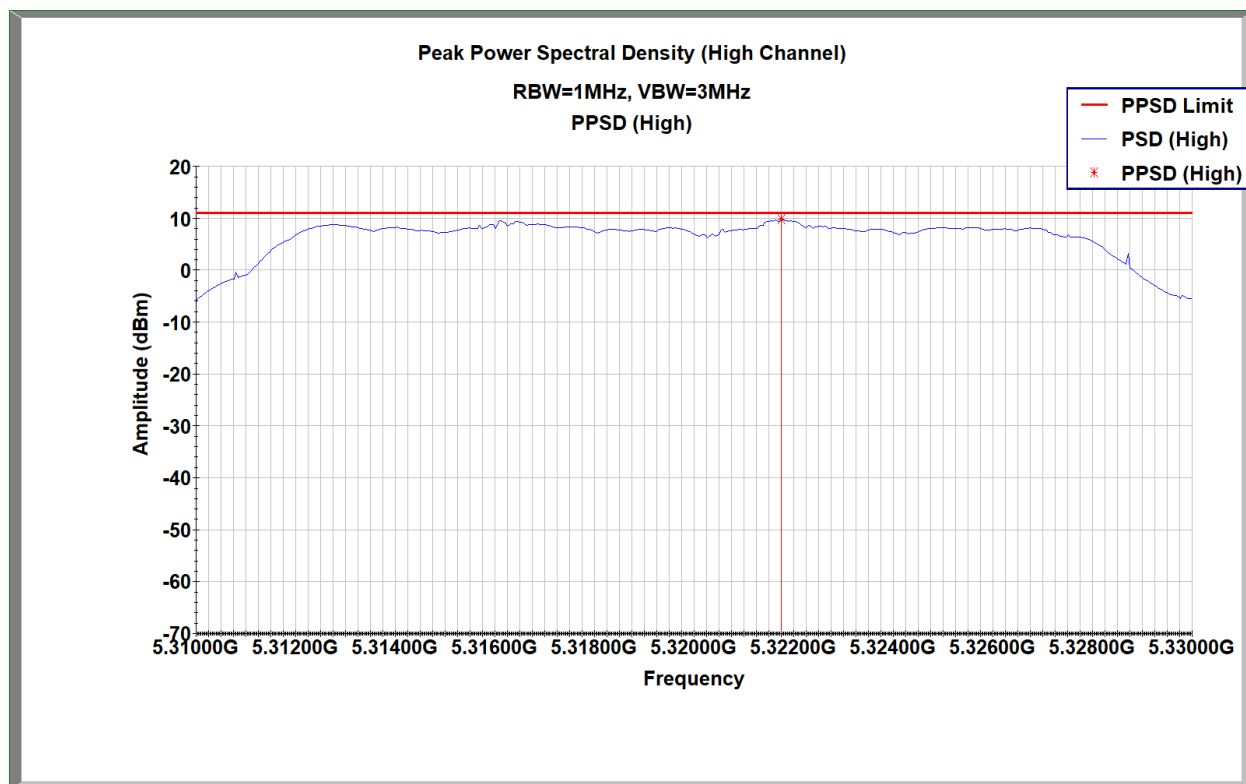






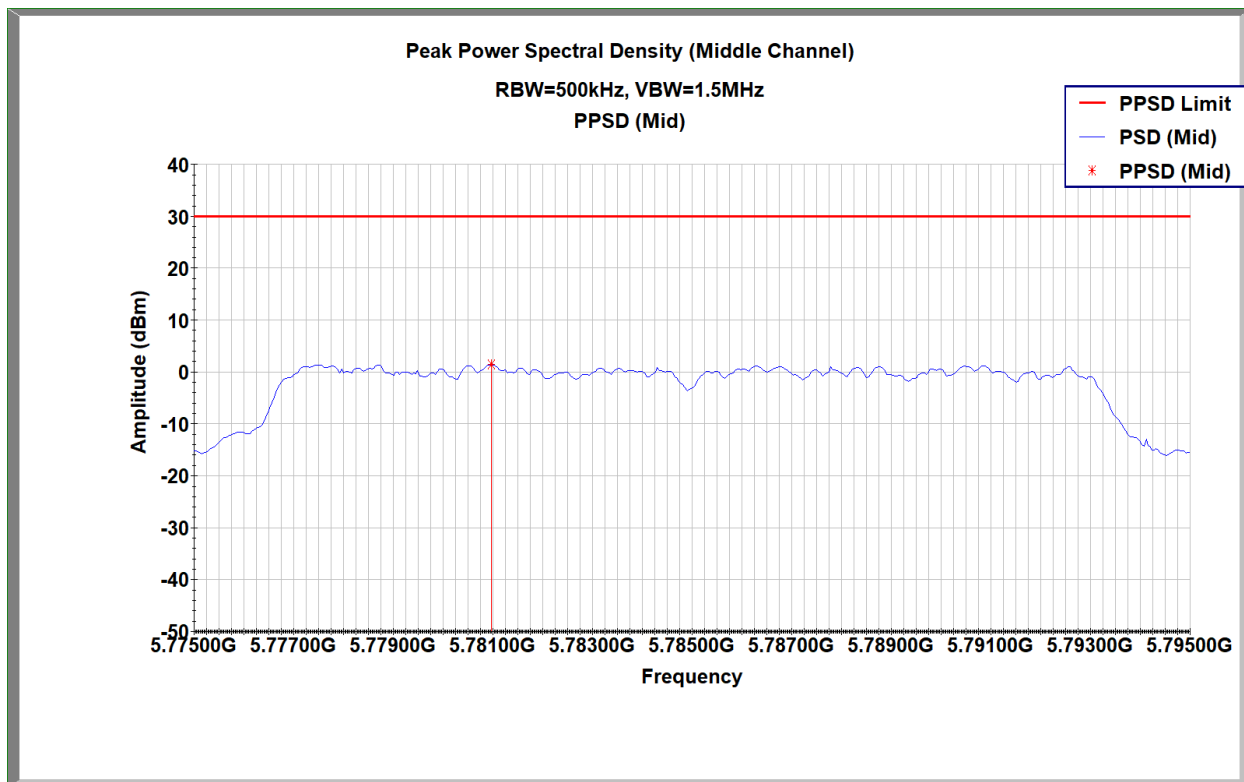
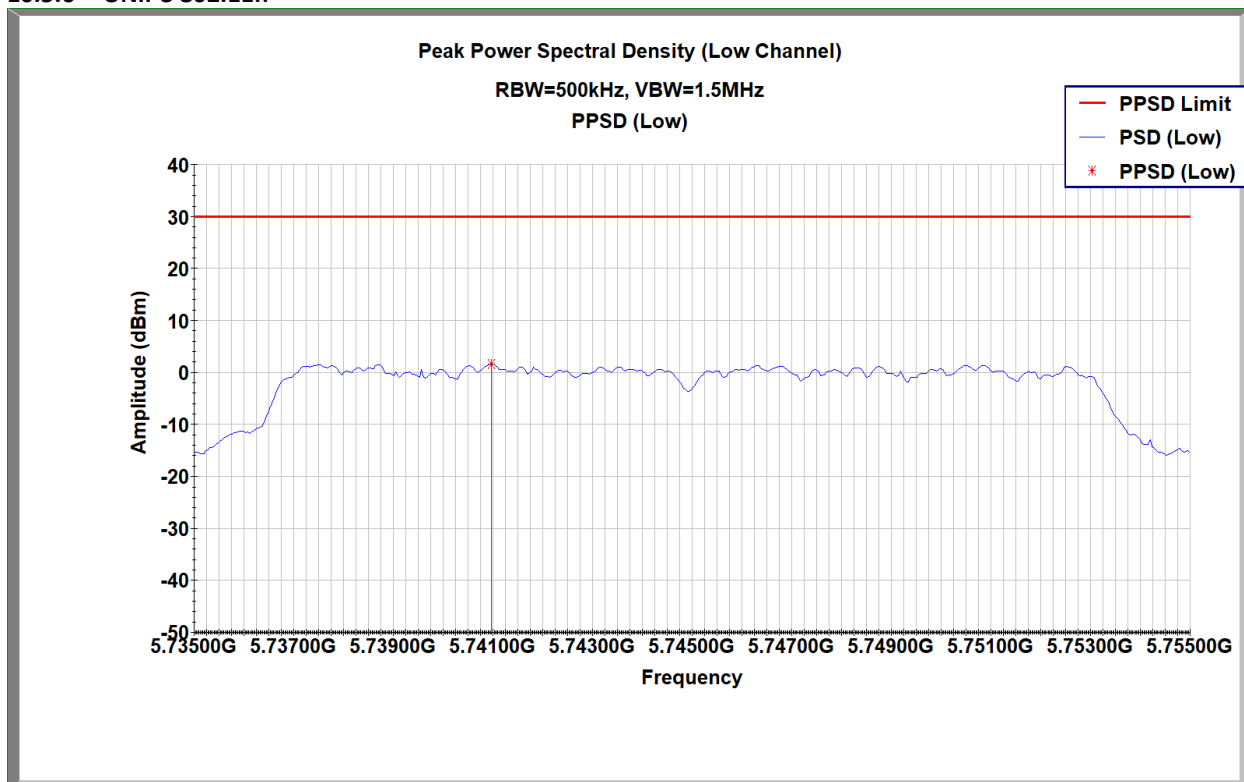
10.5.5 UNII-2a 802.11n

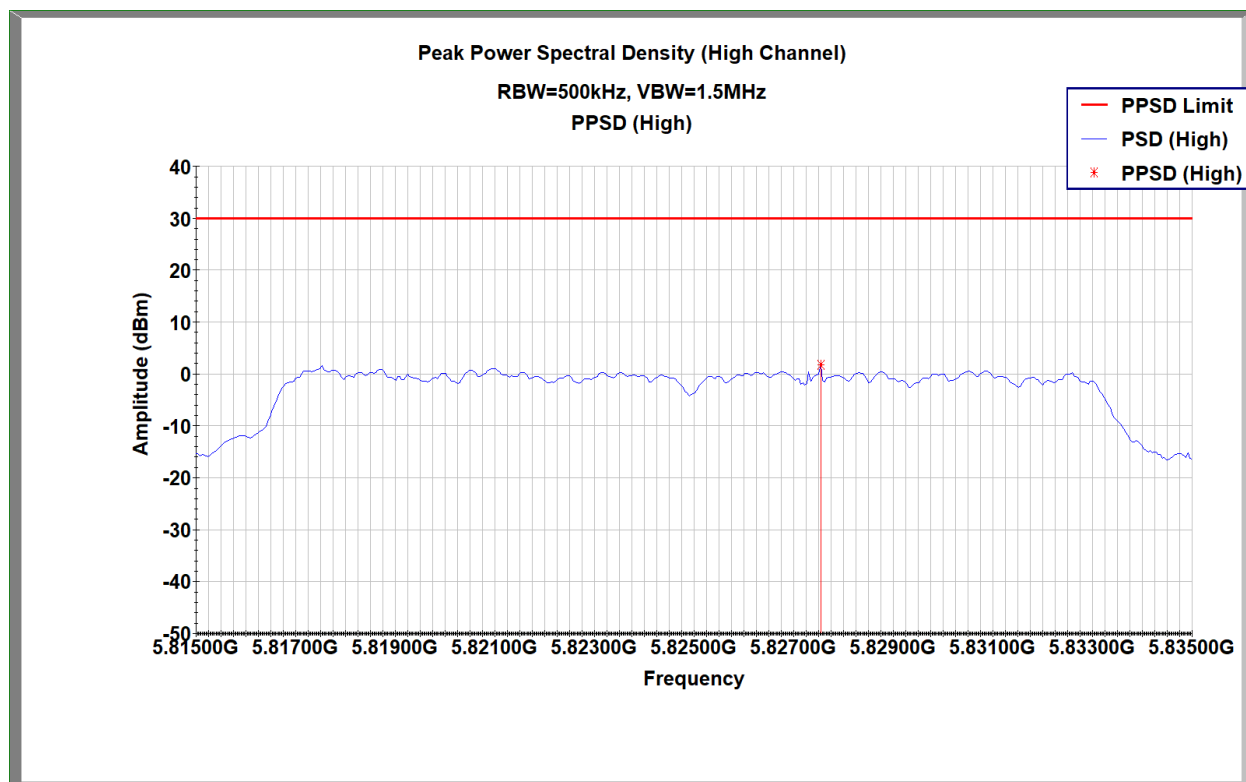






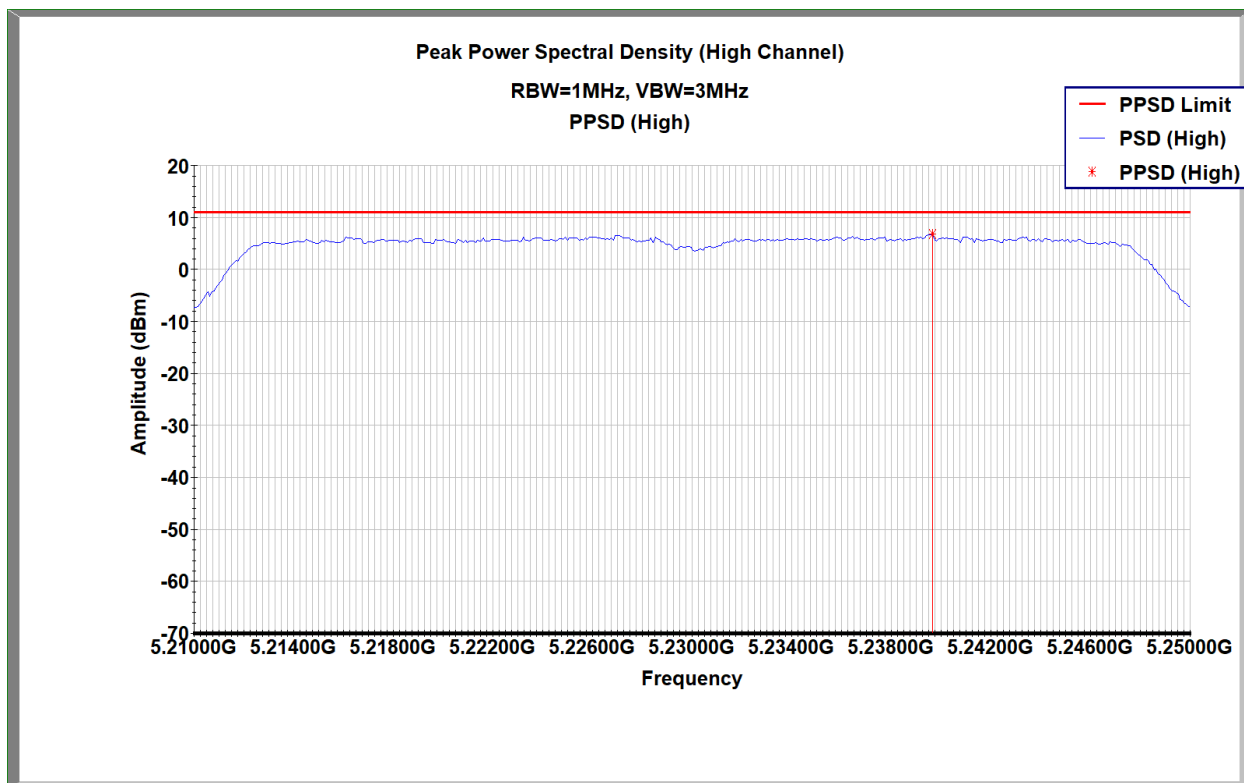
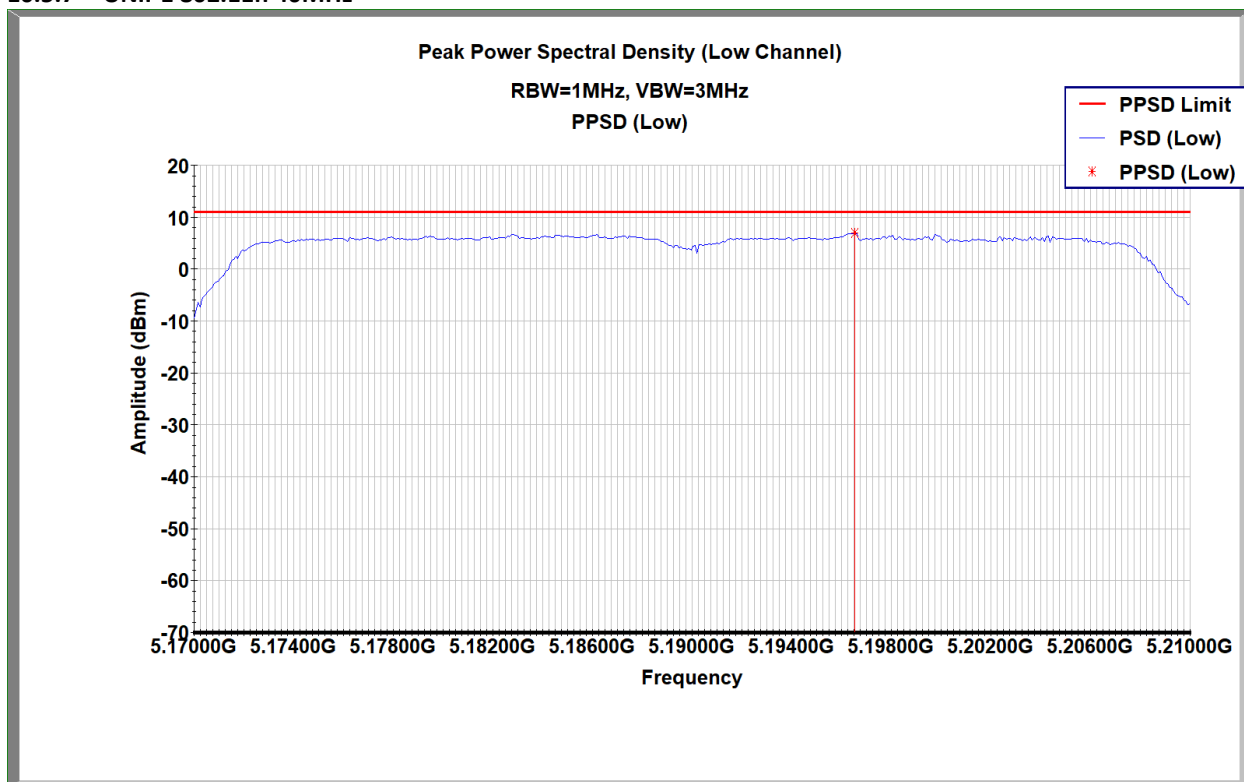
10.5.6 UNII-3 802.11n





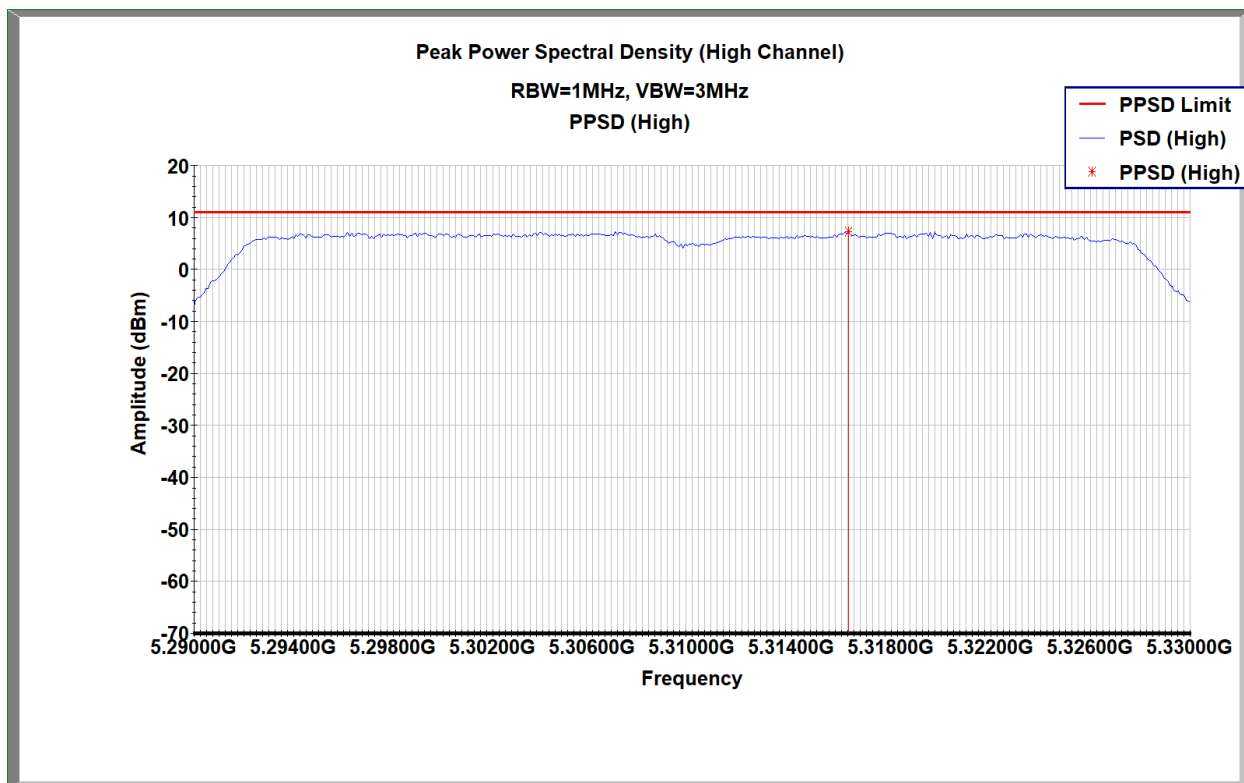
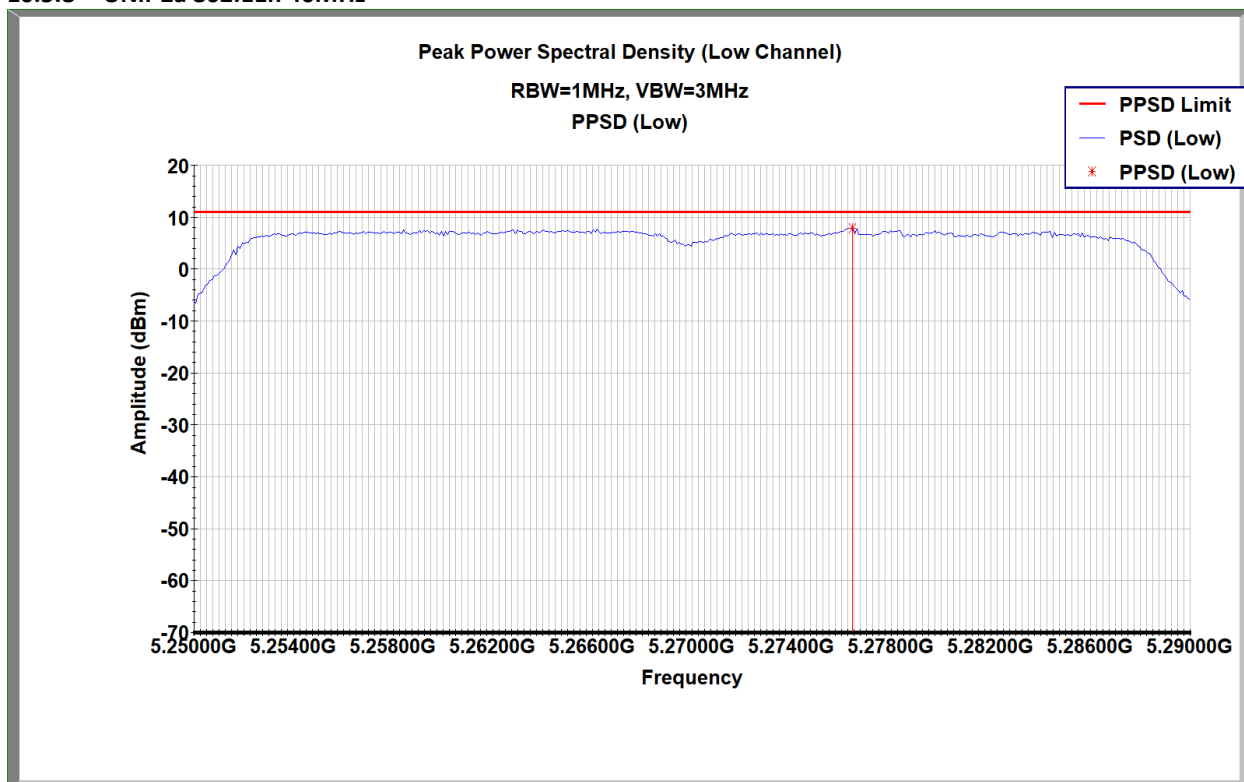


10.5.7 UNII-1 802.11n 40MHz



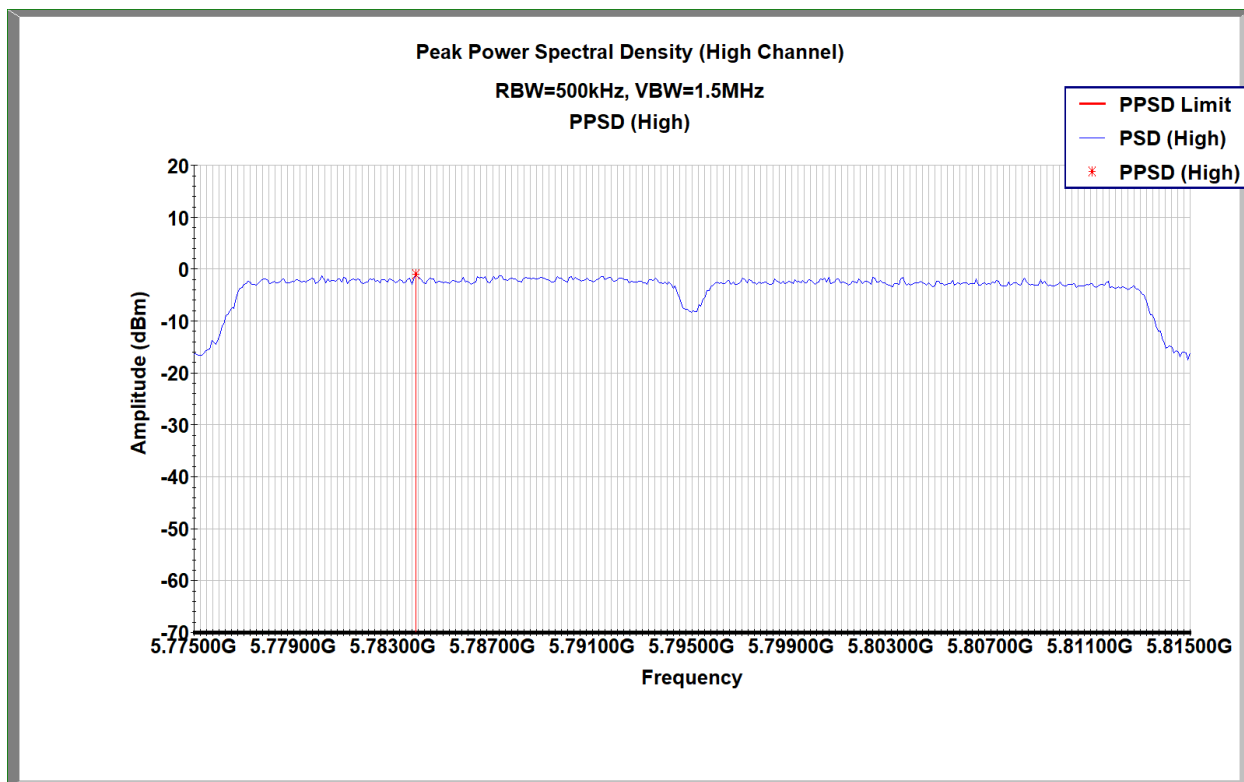
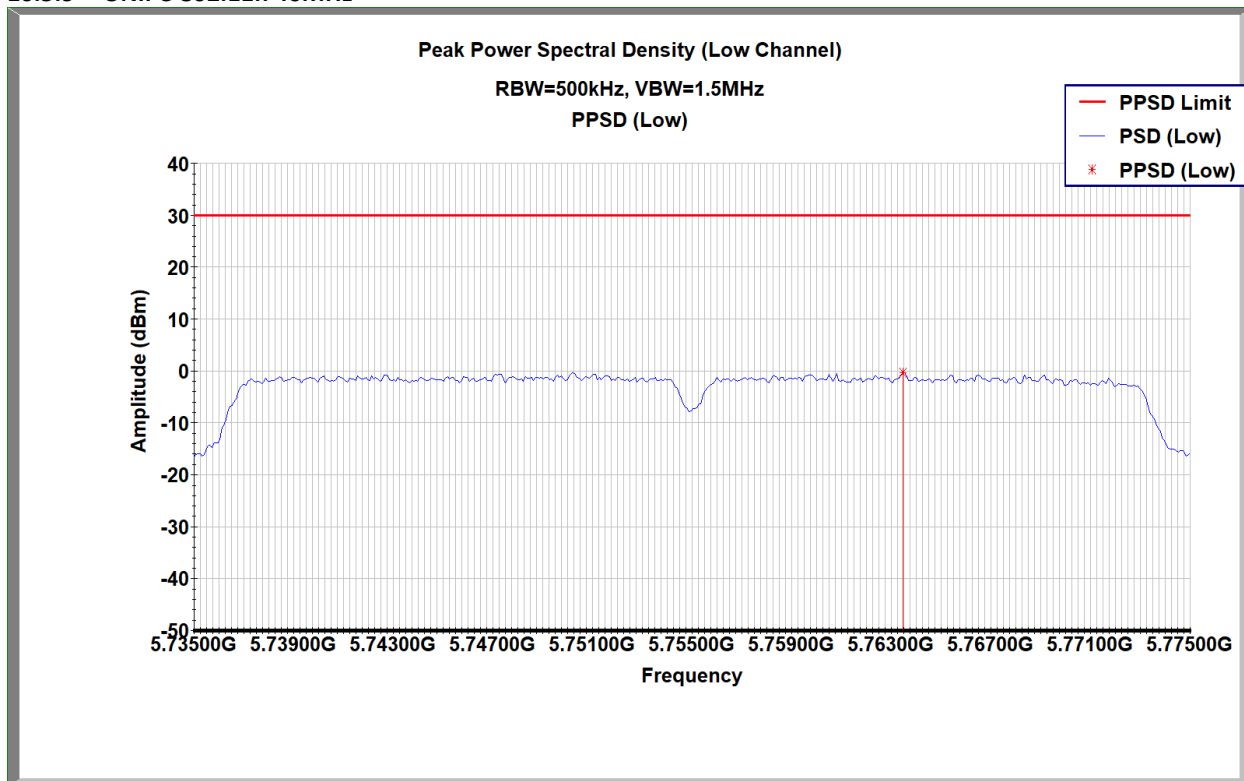


10.5.8 UNII-2a 802.11n 40MHz





10.5.9 UNII-3 802.11n 40MHz





11 Antenna Requirement

11.1 Test Limits

FCC Part 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen Issue 5 § 6.8:

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

11.2 Test Results

The device was found to be **compliant**. The device has an internal, permanently affixed antenna.

**12 Dynamic Frequency Selection (DFS)**

This testing was performed at Intertek Menlo Park: 1365 Adams Ct, Menlo Park, CA 94025.

Tested By	Test Date
Anderson Soungpanya	May 25, 2021

Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
<i>Non-Occupancy Period</i>	Yes	Not Required	Yes
<i>DFS Detection Threshold</i>	Yes	Not Required	Yes
<i>Channel Availability Check Time</i>	Yes	Not Required	Not Required
<i>U-NII Detection Bandwidth</i>	Yes	Not Required	Yes

Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client With Radar Detection
<i>DFS Detection Threshold</i>	Yes	Not Required
<i>Channel Closing Transmission Time</i>	Yes	Yes
<i>Channel Move Time</i>	Yes	Yes
<i>U-NII Detection Bandwidth</i>	Yes	Not Required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	Any single BW mode	Not required

Note: Frequencies selected for statistical performance check should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.



DFS Detection Thresholds for Master or Client Devices with DFS Detection

Maximum Transmit Power	Values (See Notes 1, 2, and 3)
<i>EIRP $\geq$ 200 milliwatt</i>	-64 dBm
<i>EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz</i>	-62 dBm
<i>EIRP < 200 milliwatt that do not meet the power spectral density requirement</i>	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01	

Parameter	Value
<i>Non-Occupancy Period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 Seconds
<i>Channel Move Time</i>	10 seconds (see note 1)
<i>Channel Closing Transmission Time</i>	200 ms + an aggregate of 60 ms over remaining 10 Second period. (see note 1 and 2)
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U-NII 99% transmission power bandwidth. (see note 3)
Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

**12.1 Test Waveform**

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup $\left\lceil \left(\frac{1}{360} \right) \cdot \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\rceil$	60.00%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Burst	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

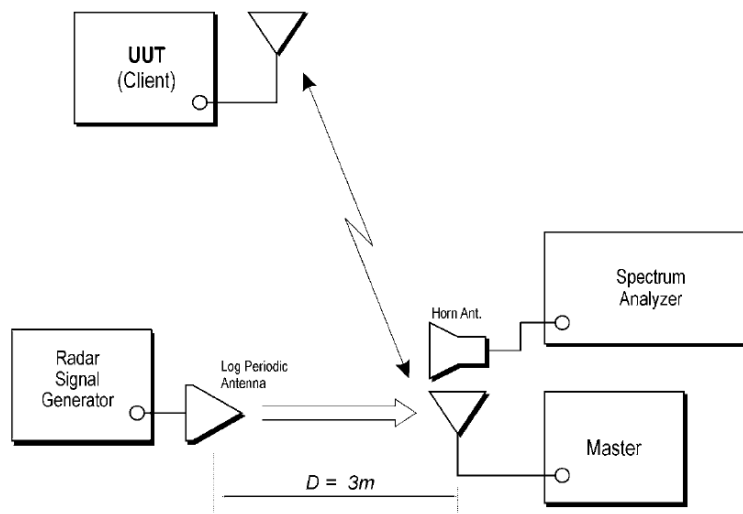
Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

12.2 Procedure

DFS Waveform Calibration

Calibration Procedure

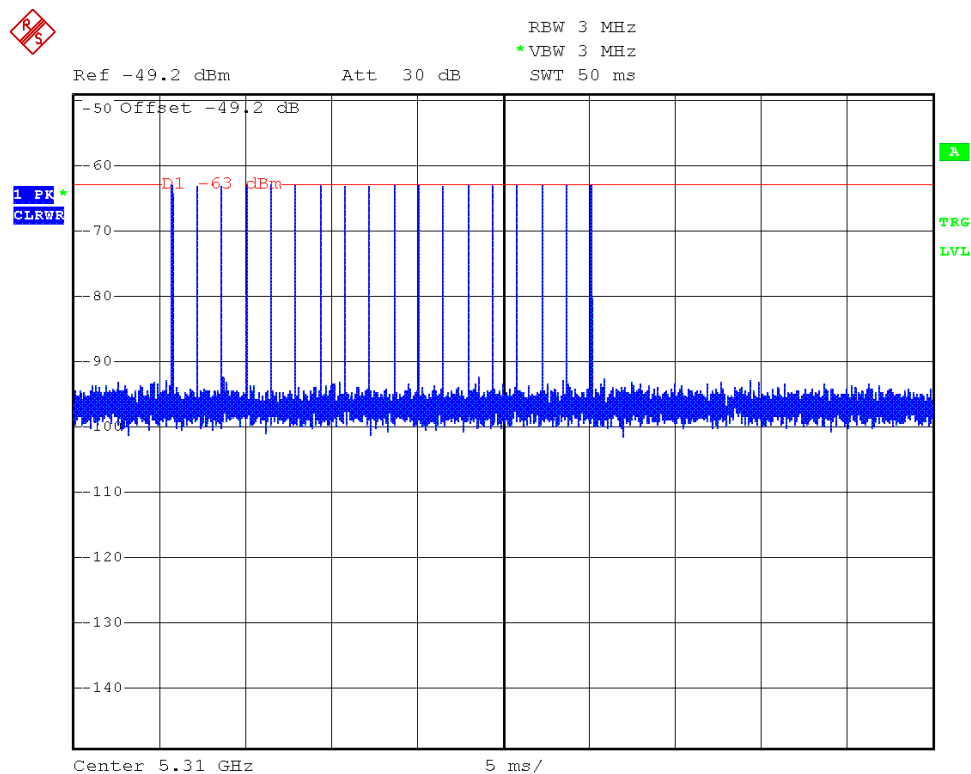
For the DFS signal, horn antenna was attached to a signal generator (RS SMU700A). On the Receive side another horn antenna was attached to a spectrum analyzer with a preamp inline. The spectrum analyzer's resolution bandwidth was set to 3 MHz and the video bandwidth was set to 3 MHz with peak detection. The field was corrected to account for cable loss, antenna gain and preamp. The DFS signal was calibrated to a field strength of -63 dBm. Test wave form 0 was utilized. The calibration setup is diagrammed below along with a setup picture.



Tested By	Test Date
Anderson Soungpanya	May 25, 2021



Radar Type 0 Calibration 5310MHz



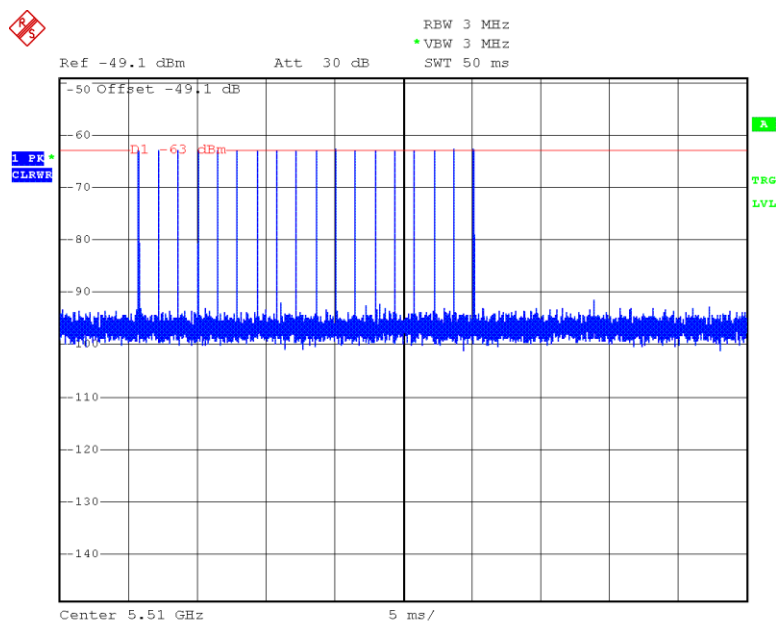
Date: 25.MAY.2021 12:21:39

The Spectrum Analyzer Reference Level Offset is System Gain + Cable Loss

Frequency	Cable loss	System Gain (Preamp and Antenna Gain)	Reference Offset
MHz	dB	dB	dB
5310	5.7	-54.9	-49.2



Radar Type 0 Calibration 5510MHz



Date: 25.MAY.2021 12:25:03

The Spectrum Analyzer Reference Level Offset is System Gain + Cable Loss

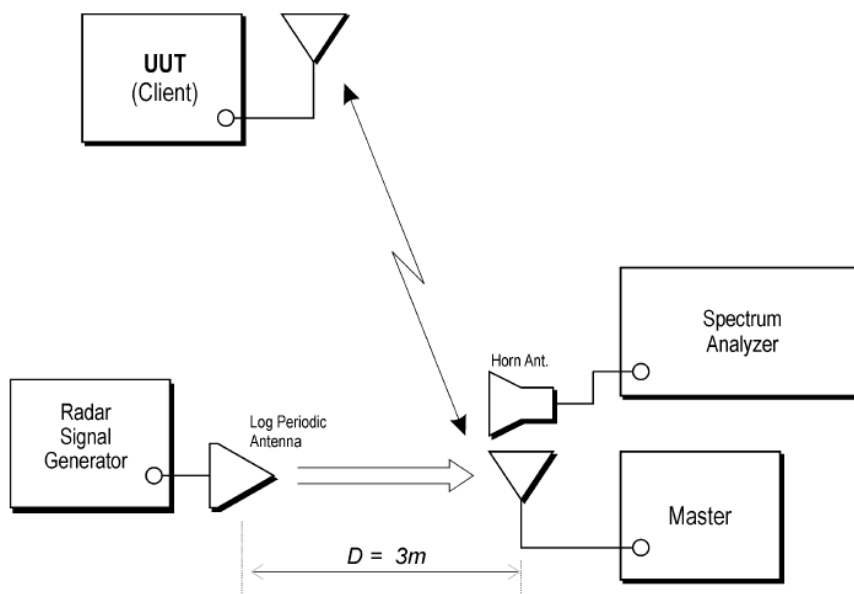
Frequency	Cable loss	System Gain (Preamp and Antenna Gain)	Reference Offset
MHz	dB	dB	dB
5510	5.8	-54.9	-49.1

12.3 DFS Setup & Procedure

Test Procedure

A radiated test method was used and the test setup was made as depicted in the diagram below. DFS testing was setup as a client with injection into the master.

The diagram below depicts the setup of the EUT along with associated support equipment.



Master Description	Model	Serial
Netgear	Nighthawk RAX200 FCC ID: PY318400434	69F31177A0646



Test Procedure Continued

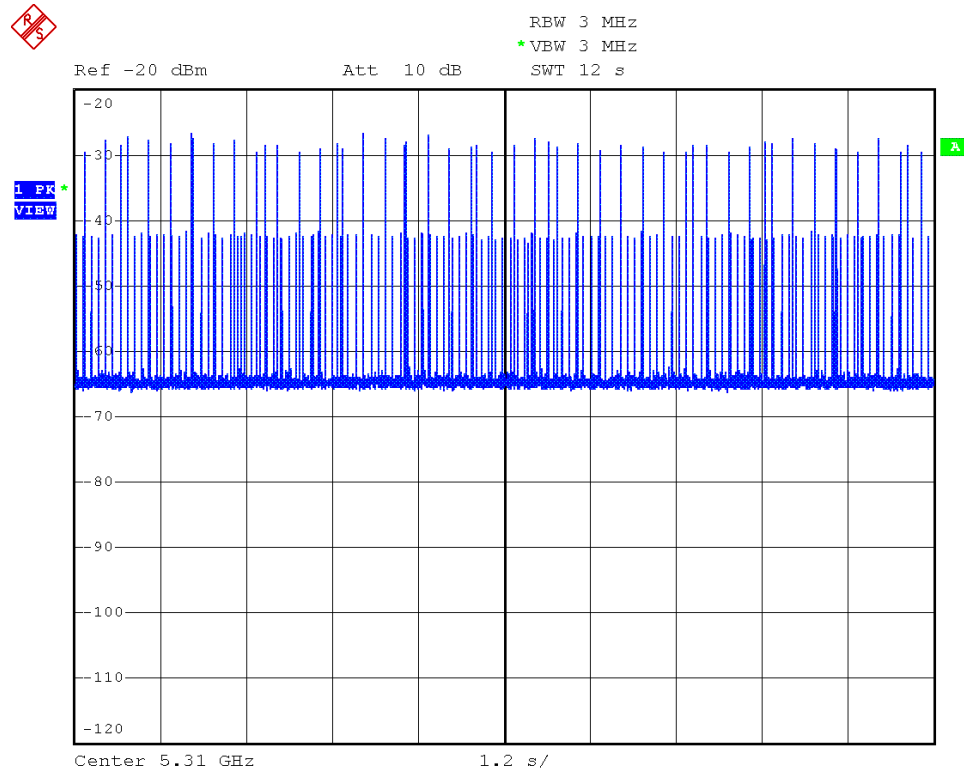
The Master and Client (EUT) were placed on a 80cm table. The simulated radar waveform was transmitted from a horn antenna towards the Master. The signal level of the simulated radar waveform was set 10 dB higher than calibrated level to -53 dBm and was applied to the Master. A horn antenna was connected to the spectrum analyzer and positioned towards the client with a level higher than emissions from the Master.

A Rhode & Schwarz Vector Signal Generator with Pulse Sequencer Software was used to generate the DFS radar signals. A Rhode & Schwarz Spectrum Analyzer was used to monitor the transmissions of the Client. The trigger of the spectrum analyzer was aligned with the end of the radar waveform burst from the signal generator.

Channel closing transmission time and channel move time were measured by applying a radar signal to the Master device. The EUT transmissions were observed while Type 0 Radar waveforms were applied. The time between the end of the applied radar waveform and the final transmission on the channel is the channel move time. The channel closing transmission time comprises only those fragments of the channel move time during which the EUT transmits.

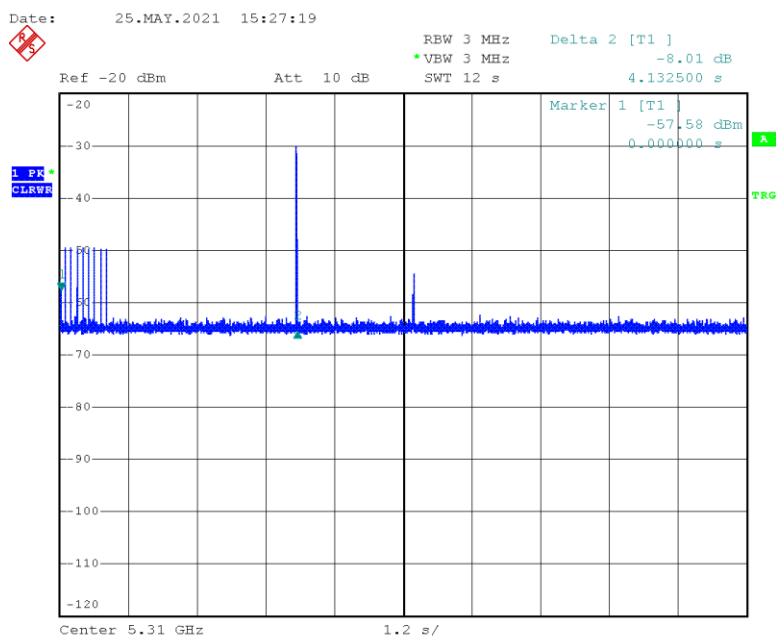
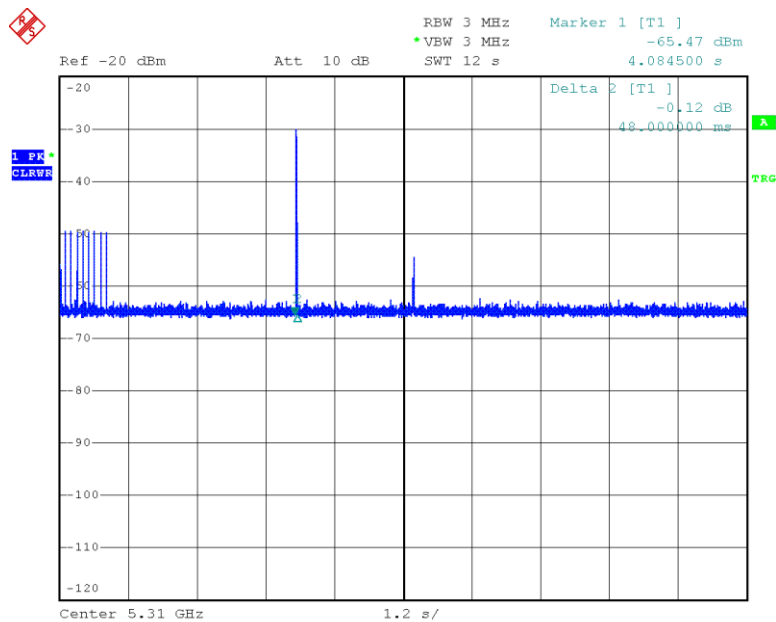
The EUT (client without DFS detection) was configured to communicate with a Master wirelessly. A laptop was also on the network and used to ping the client. The channel load is recorded and presented in test results below.

Channel Load



Date: 25.MAY.2021 13:45:53

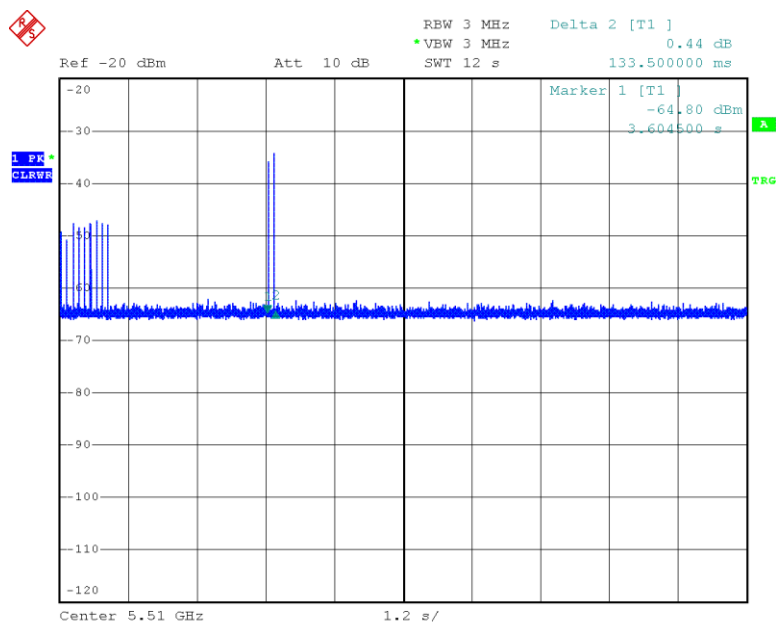
Channel Move and Channel Close Time, @ 5310 MHz, 802.11an 40MHz



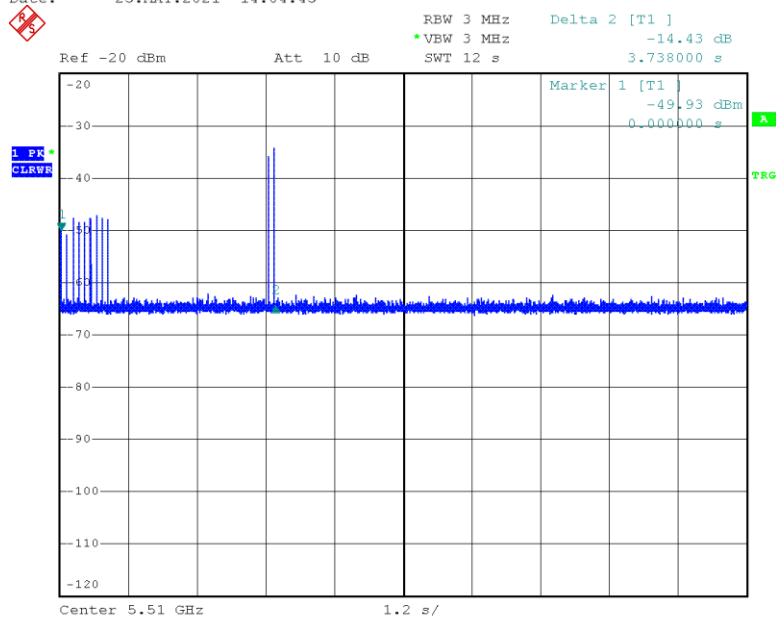
Date: 25.MAY.2021 15:26:33

Frequency	Bandwidth	Channel Closing Transmission Time	Channel Closing Transmission Time Limit	Close Time	Close Time Limit	Results
5310 MHz	40 MHz	48ms	260ms	4.13s	10s	Pass

Channel Move and Channel Close Time, @ 5510 MHz, 802.11an 40MHz



Date: 25.MAY.2021 14:04:45



Date: 25.MAY.2021 14:03:37

Frequency	Bandwidth	Channel Closing Transmission Time	Channel Closing Transmission Time Limit	Close Time	Close Time Limit	Results
5510 MHz	40 MHz	133.5ms	260ms	3.738s	10s	Pass

**12.4 Test Equipment**

Equipment	Manufacturer	Model/Type	Asset No.	Calibration Interval	Cal Due
Spectrum Analyzer	Rohde and Schwarz	FSP40	ITS 001200	12	01/07/2022
Active Horn Antenna (1-18GHz)	ETS-Lindgren	3117-PA	ITS 01365	12	04/20/2022
Horn Antenna (1-18GHz)	ETS-Lindgren	3115	ITS 00982	12	05/13/2022
RF Cable	Megaphase	EMC1-K1K1-236	ITS 01484	12	06/12/2021
Vector Signal Generator	Rohde and Schwarz	SMU200A	ITS 00880	12	12/09/2021



13 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	6/1/2021	104038541LEX-003	BN	BCT	Original Issue
1	8/11/2021	104038541LEX-003.1	BN	BCT	Removed U-NII-2a and U-NII-2c updated obw plots and a few other editorial changes.
2	8/17/2021	104038541LEX-003.2	BN	BCT	Updated obw plots, updated average output power to peak power and a few other editorial changes.
3	8/20/2021	104038541LEX-003.3	BN	BCT	Updated table of content and corrected a few obw measurements
4	9/1/2021	104038541LEX-003.4	BN	BCT	Added back in U-NII 2a
5	9/3/2021	104038541LEX-003.5	BN	BCT	Added back in the DFS data. Updated the PSD plots
6	9/8/2021	104038541LEX-003.6	BN	BCT	Updated the power measurements. Including both peak and average.