5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices
4	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under Section 15.247 of the FCC rules

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: 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, 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. **15.247(b) (4) requirement:** The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
EUT Antenna:
Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 2 dBi.

5.3 CONDUCTED PEAK OUTPUT POWER

Test Requirement: FCC 47 CFR Part 15 Subpart C Section15.247 (b)(3)

Test Method: ANSI C63.10-2013 Clause 11.9.1.3

Limit: For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Test Procedure:
1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
2. Measure out each test modes' peak or average output power, record the power level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.5.3 for details.

Instruments Used: Refer to section 3 for details

Test Results:

Mode	Channel/ Frequency (MHz)	Maximum Conducted Peak Power (dBm)	Maximum Conducted AVG Power (dBm)	Limit (dBm)	Pss / Fail
IEEE 802.11b	1(2412)	16.62	13.89	30	Pass
	6(2437)	16.16	13.17	30	Pass
	11(2462)	15.73	12.99	30	Pass
IEEE 802.11g	1(2412)	18.41	9.42	30	Pass
	6(2437)	17.91	8.96	30	Pass
	11(2462)	19.66	8.48	30	Pass
IEEE 802.11n-HT20	1(2412)	18.59	9.04	30	Pass
	6(2437)	17.79	8.81	30	Pass
	11(2462)	17.76	8.54	30	Pass

Note: The antenna gain of 2 dBi less than 6dBi maximum permission antenna gain value based on 1 watt (30dBm) peak output power limit.

5.46 DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2)

Test Method: ANSI C63.10-2013 Clause 11.8.1

Limit: For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

Test Procedure: Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 x RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

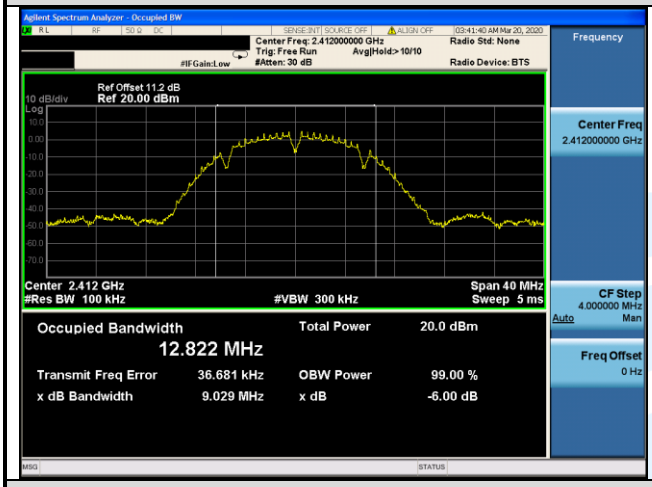
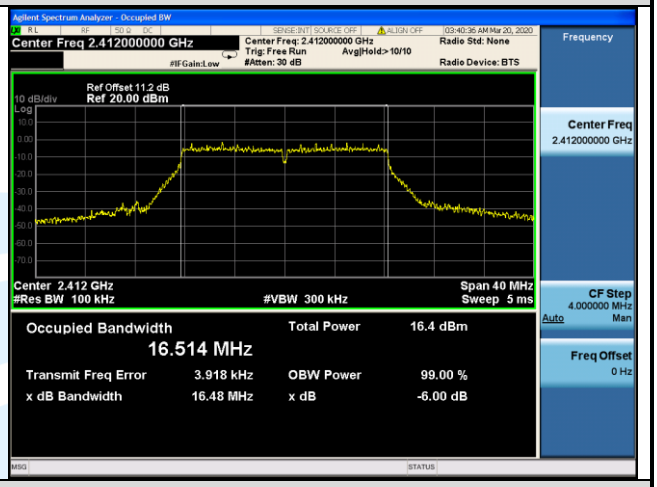
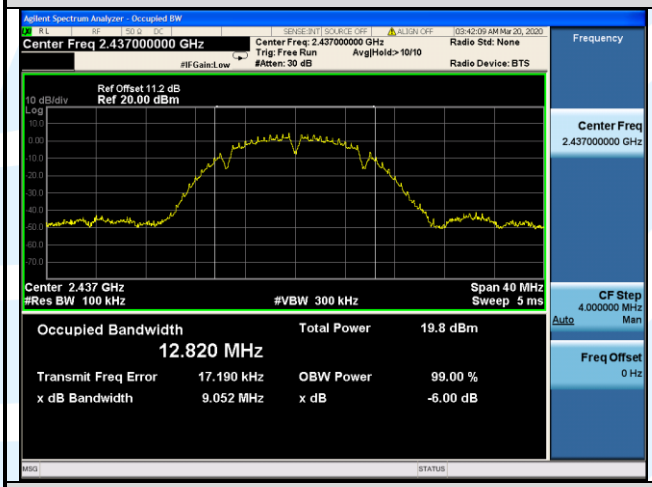
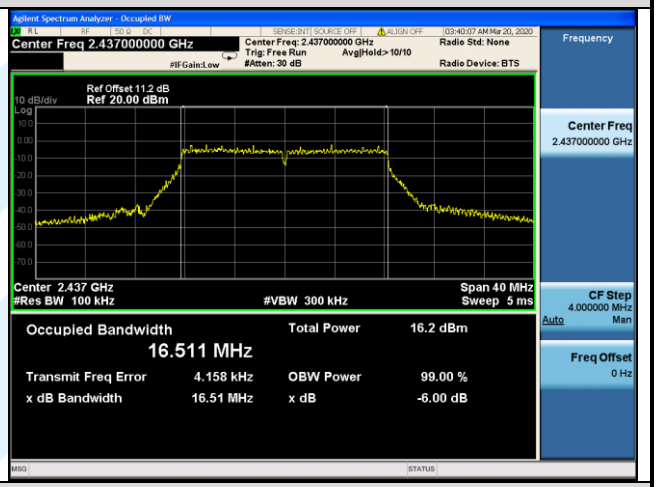
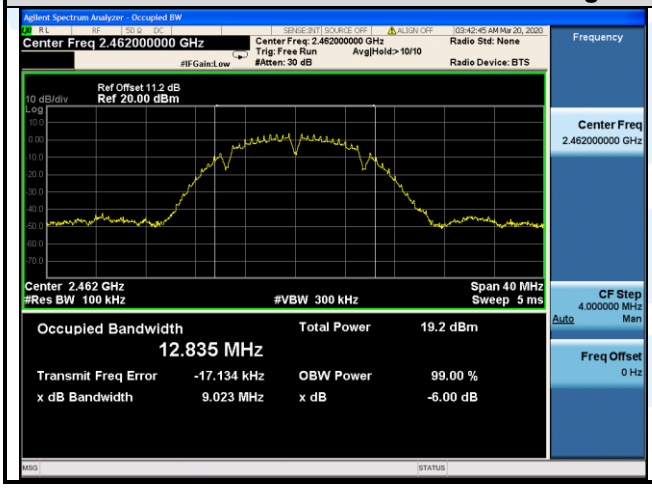
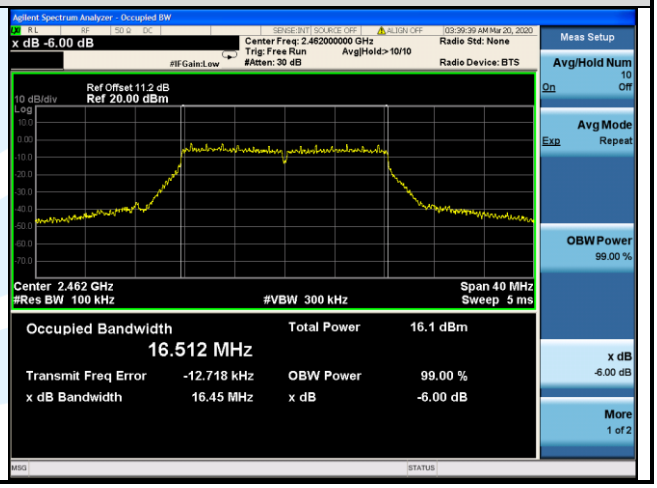
Test Setup: Refer to section 4.5.3 for details.

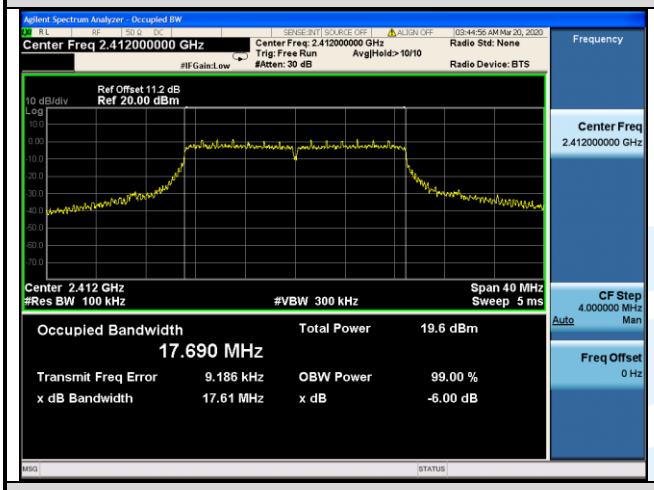
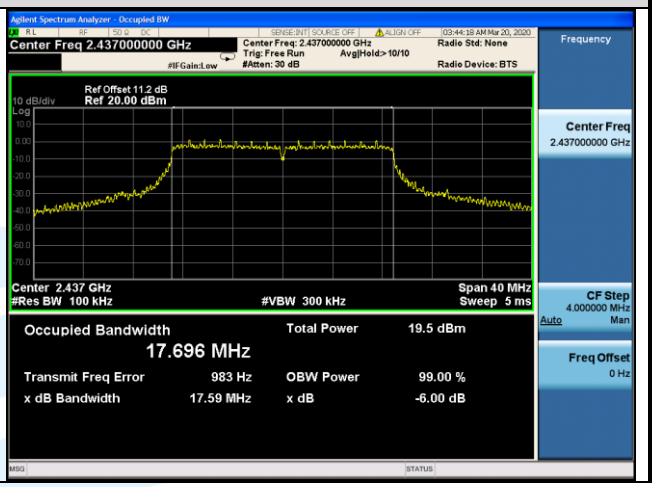
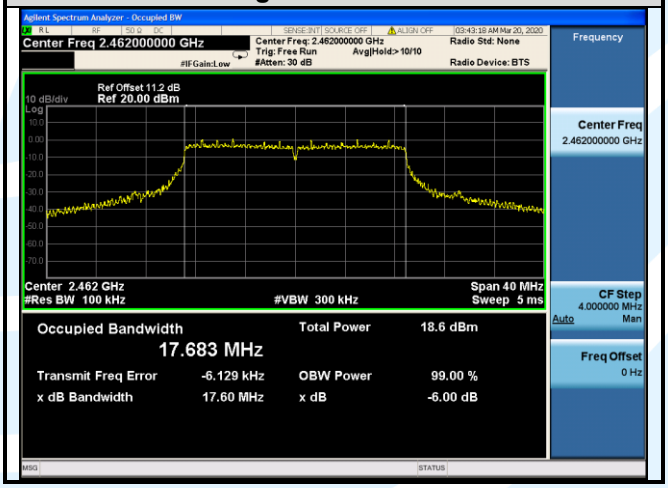
Instruments Used: Refer to section 3 for details

Test Results:

Mode	Channel/ Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth Limit	Pass / Fail
IEEE 802.11b	1(2412)	9.03	12.822	> 500 kHz	Pass
	6(2437)	9.05	12.820	> 500 kHz	Pass
	11(2462)	9.02	12.835	> 500 kHz	Pass
IEEE 802.11g	1(2412)	16.48	16.512	> 500 kHz	Pass
	6(2437)	16.51	16.511	> 500 kHz	Pass
	11(2462)	16.45	16.512	> 500 kHz	Pass
IEEE 802.11n-HT20	1(2412)	17.61	17.690	> 500 kHz	Pass
	6(2437)	17.59	17.696	> 500 kHz	Pass
	11(2462)	17.60	17.683	> 500 kHz	Pass

The test plots as follows:

IEEE 802.11b	IEEE 802.11g
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

IEEE 802.11n-HT20	
Lowest Channel	Middle Channel
	
Highest Channel	
	

5.5 POWER SPECTRAL DENSITY

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247 (e)

Test Method: ANSI C63.10-2013 Clause 11.10.2

Limit: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Test Procedure: Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

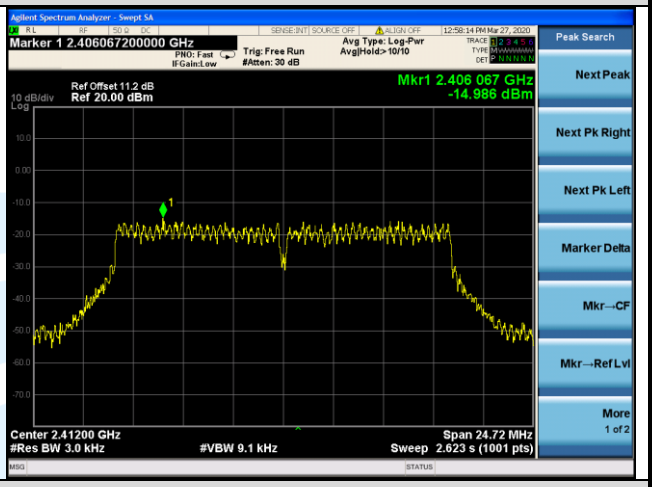
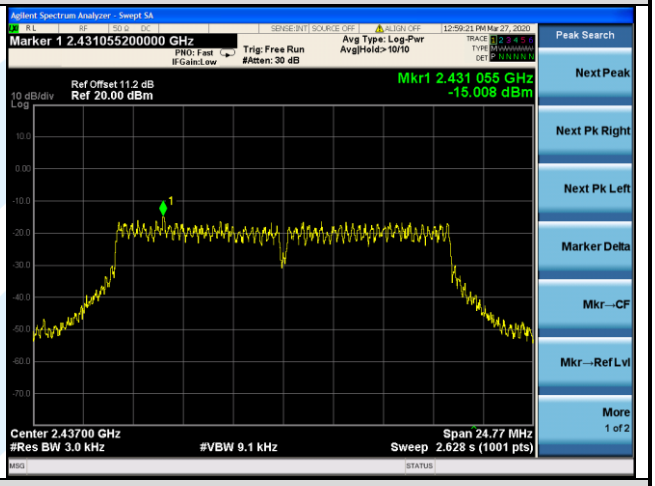
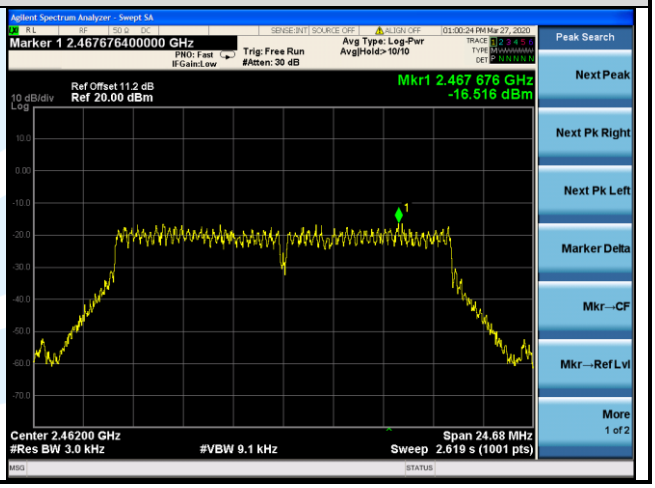
Test Setup: Refer to section 4.5.3 for details.

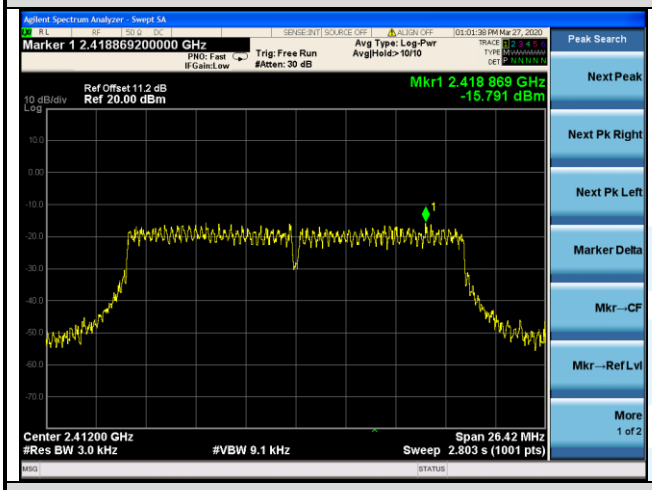
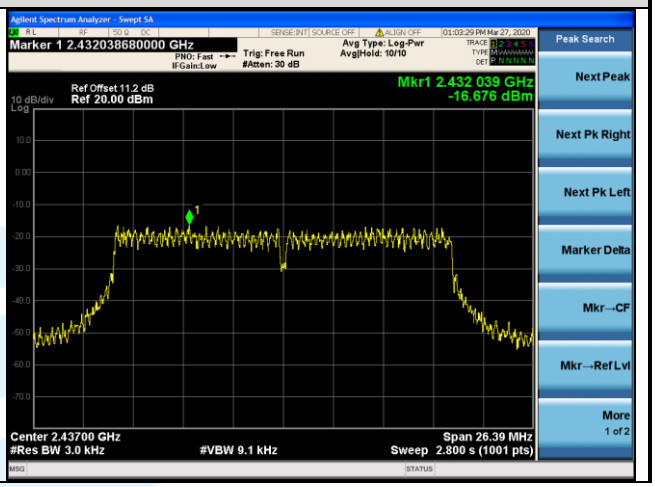
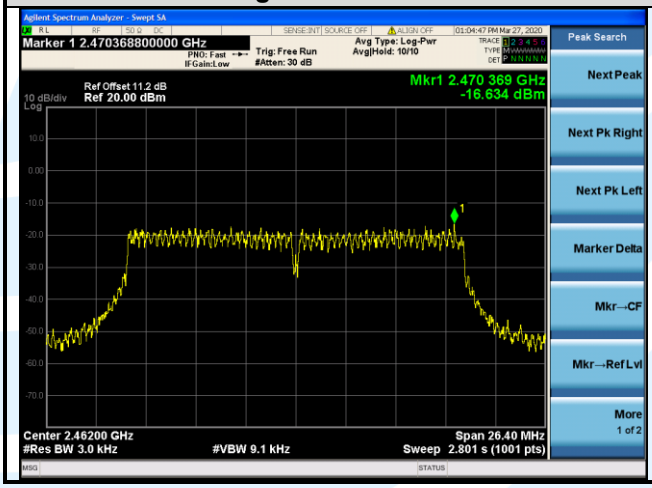
Instruments Used: Refer to section 3 for details

Test Results:

Mode	Channel/ Frequency (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
IEEE 802.11b	1(2412)	-9.243	8	Pass
	6(2437)	-9.052	8	Pass
	11(2462)	-9.663	8	Pass
IEEE 802.11g	1(2412)	-14.986	8	Pass
	6(2437)	-15.008	8	Pass
	11(2462)	-16.516	8	Pass
IEEE 802.11n-HT20	1(2412)	-15.791	8	Pass
	6(2437)	-16.676	8	Pass
	11(2462)	-16.634	8	Pass

The test plots as follows:

IEEE 802.11b	IEEE 802.11g
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

IEEE 802.11n-HT20	
Lowest Channel	**Middle Channel**
	
Highest Channel	
	

5.6 CONDUCTED OUT OF BAND EMISSION

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.247(d)

Test Method: ANSI C63.10-2013 Clause 11.11

Limit: In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

Test Procedure: Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

Step 1:Measurement Procedure REF

a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.
j) Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Step 2:Measurement Procedure OOBE

a) Set RBW = 100 kHz.
b) Set VBW ≥ 300 kHz.
c) Detector = peak.
d) Sweep = auto couple.
e) Trace Mode = max hold.
f) Allow trace to fully stabilize.
g) Use the peak marker function to determine the maximum amplitude level.

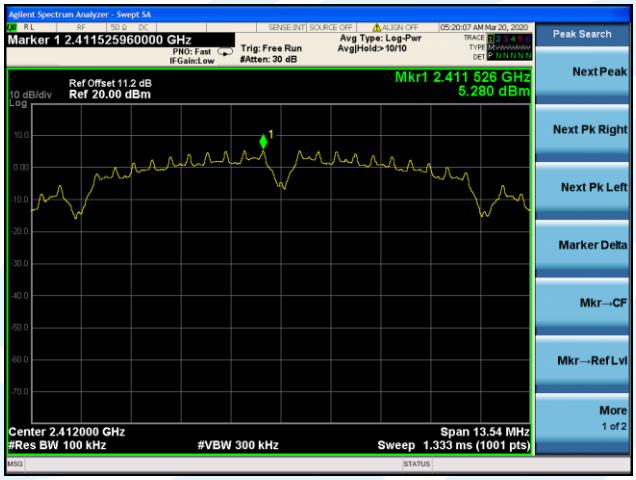
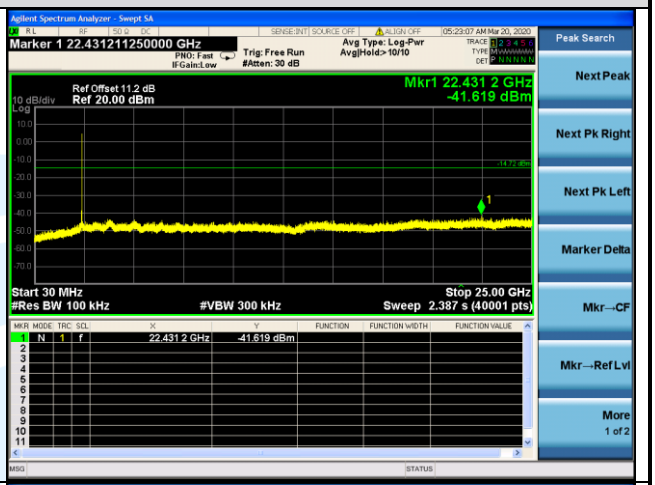
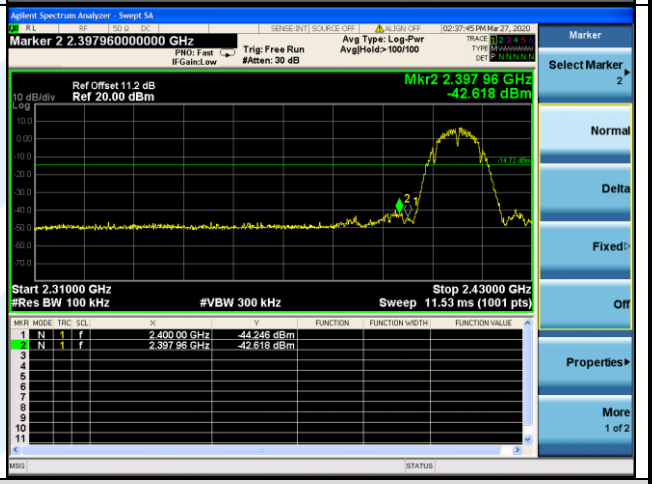
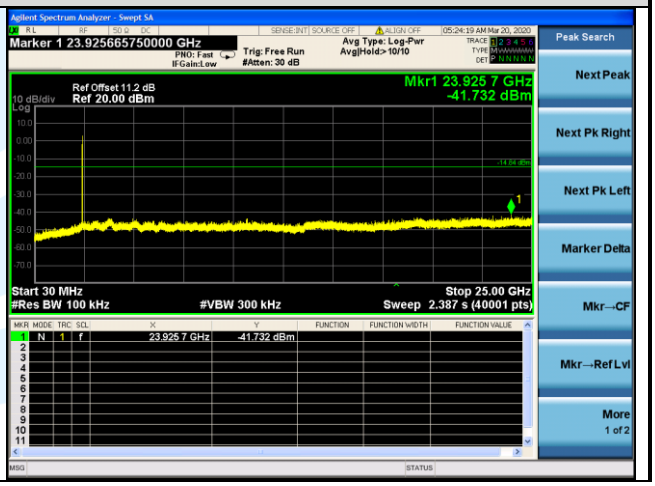
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

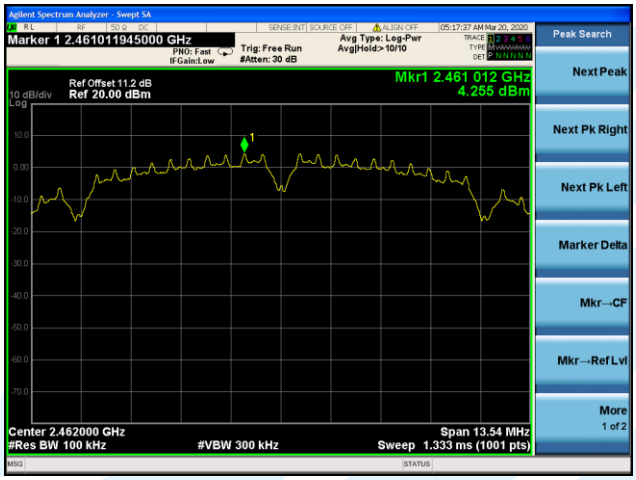
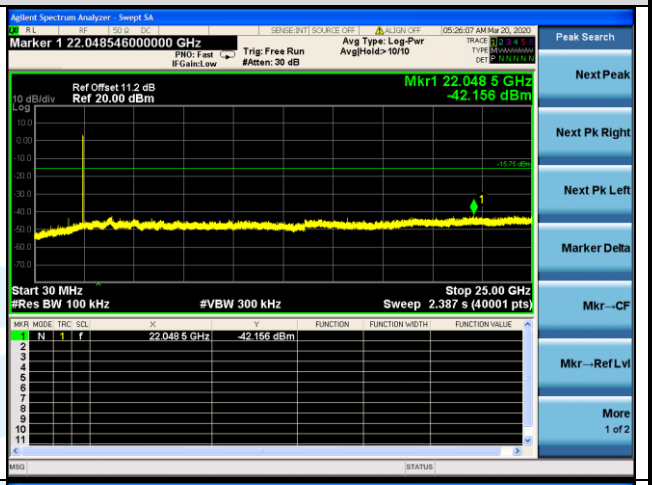
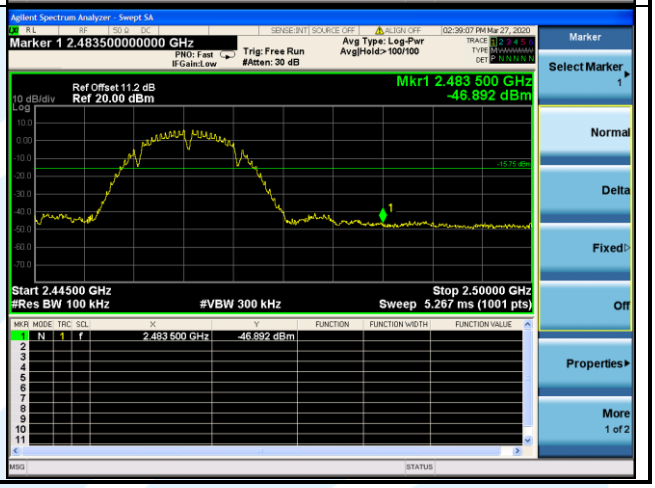
Test Setup: Refer to section 4.5.3 for details.

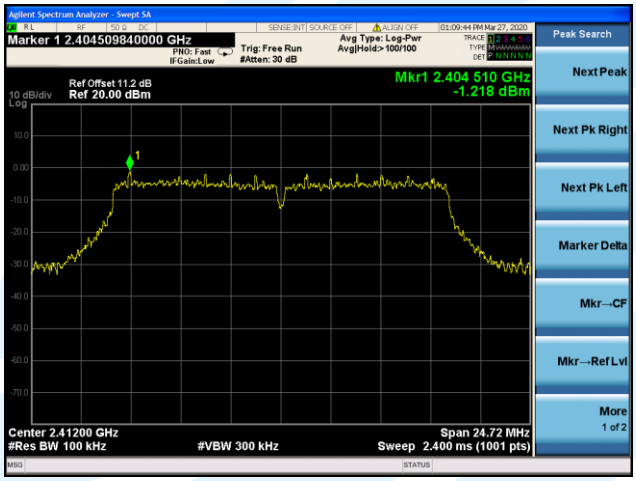
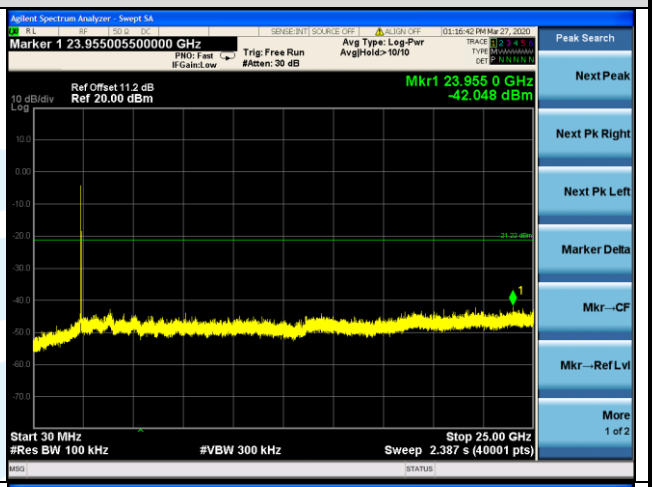
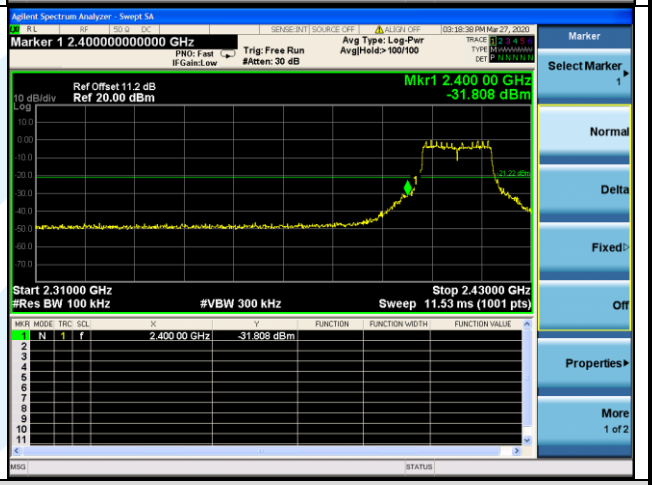
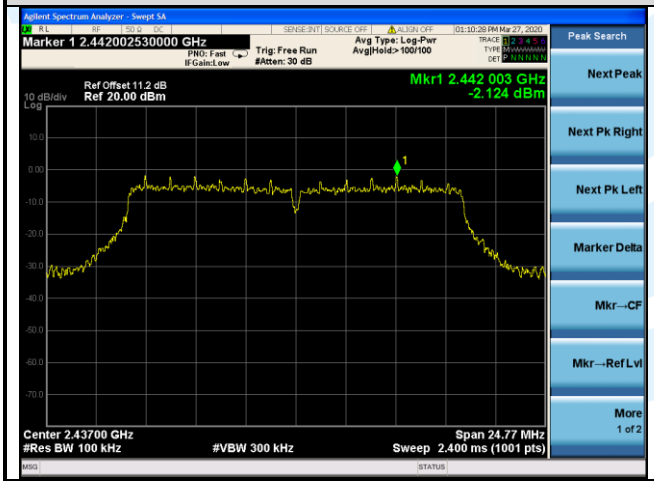
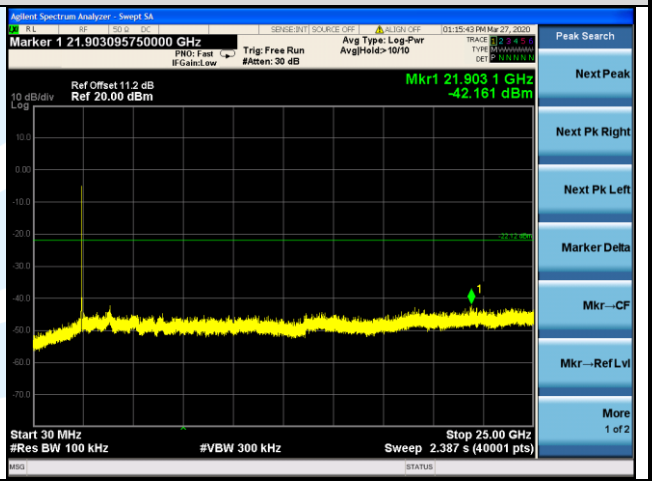
Instruments Used: Refer to section 3 for details

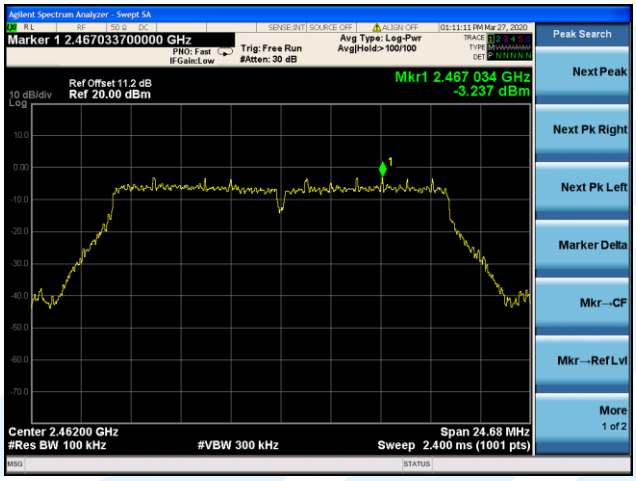
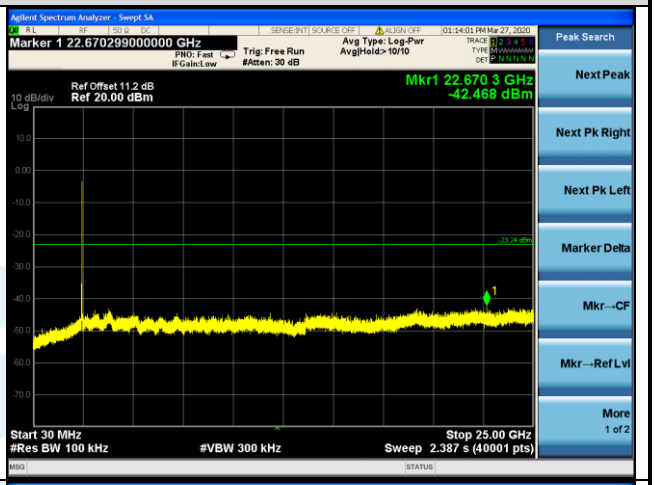
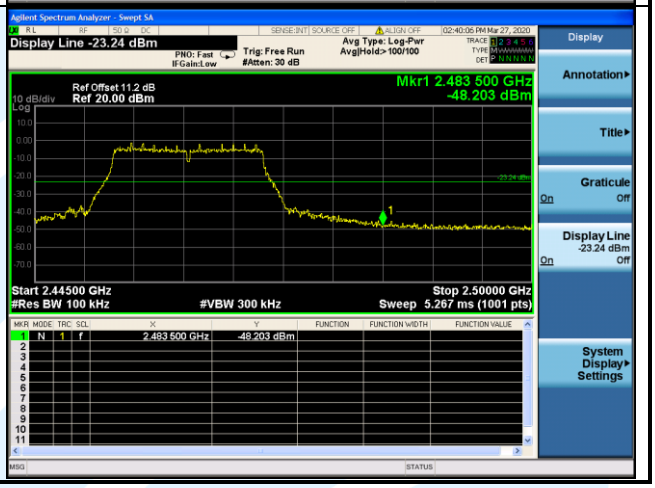
Test Results: Pass

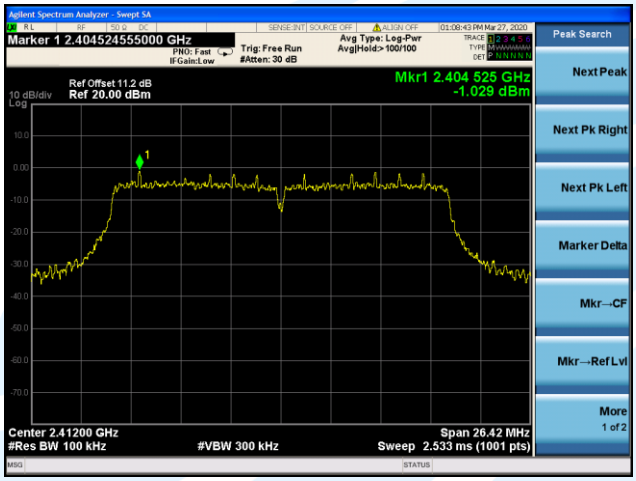
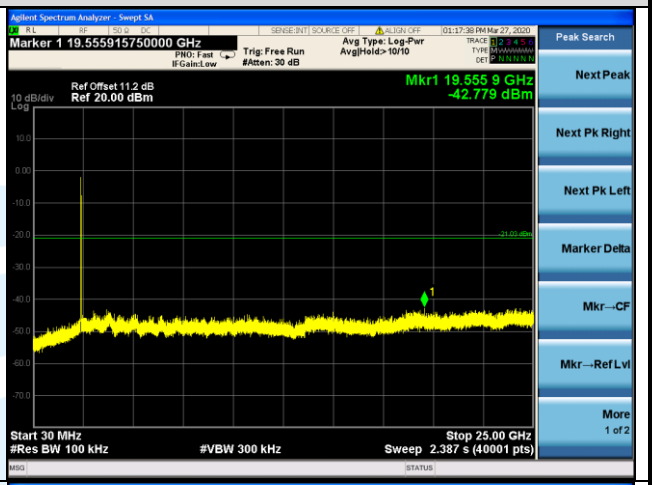
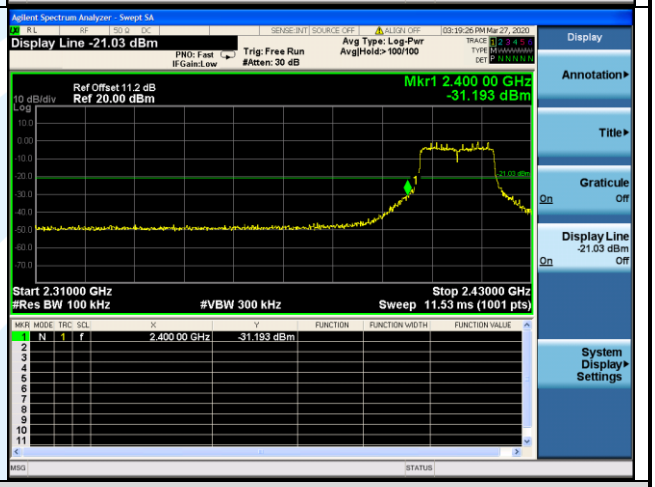
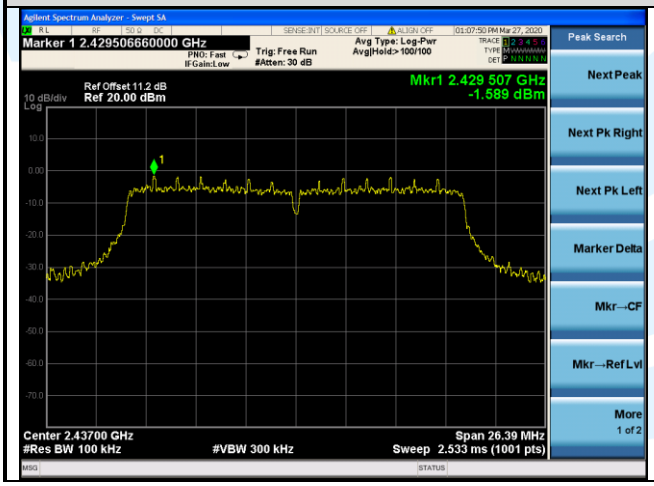
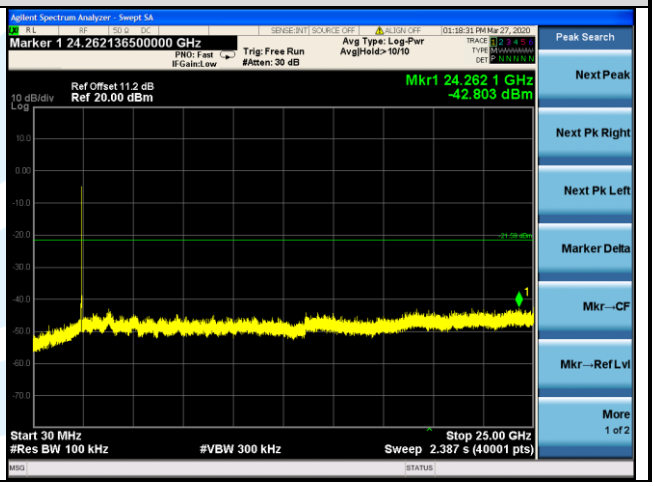
The test plots as follows:

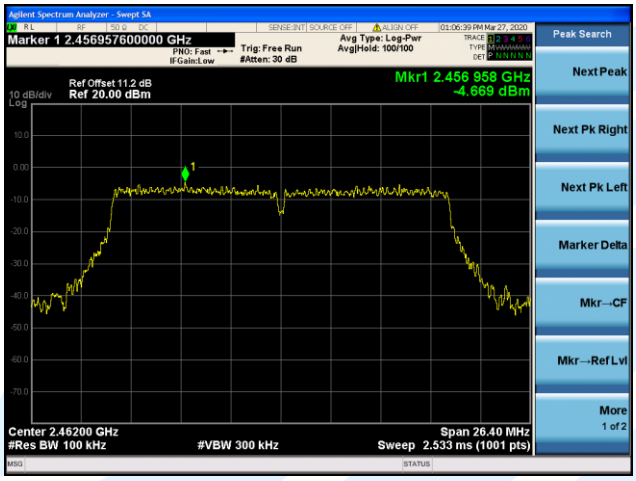
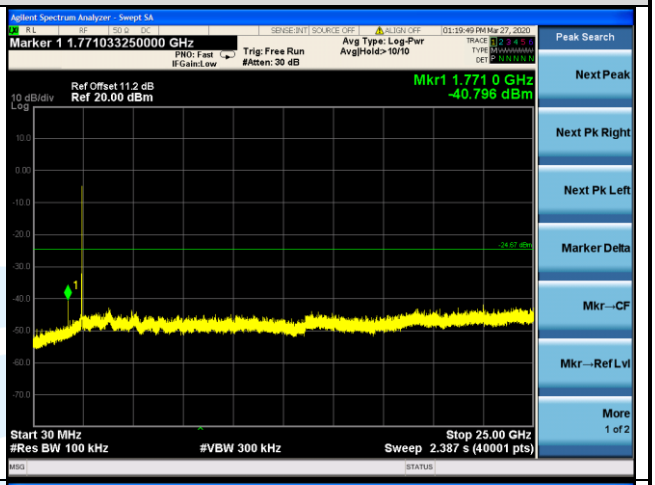
IEEE 802.11b	
In-Band Reference Level	**Out of Band Emission**
Lowest Channel	
	
	
Middle Channel	
	

Highest Channel	
	
	

IEEE 802.11g	
In-Band Reference Level	**Out of Band Emission**
Lowest Channel	
	
	
Middle Channel	
	

Highest Channel	
	
	

IEEE 802.11n-HT20	
In-Band Reference Level	**Out of Band Emission**
Lowest Channel	
	
	
Middle Channel	
	

Highest Channel	
	
	

5.7 RADIATED SPURIOUS EMISSIONS

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209

Test Method: ANSI C63.10-2013 Clause 11.11 & Clause 11.12

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

2. Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
2) Test the EUT in the lowest channel ,middle channel, the Highest channel

3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

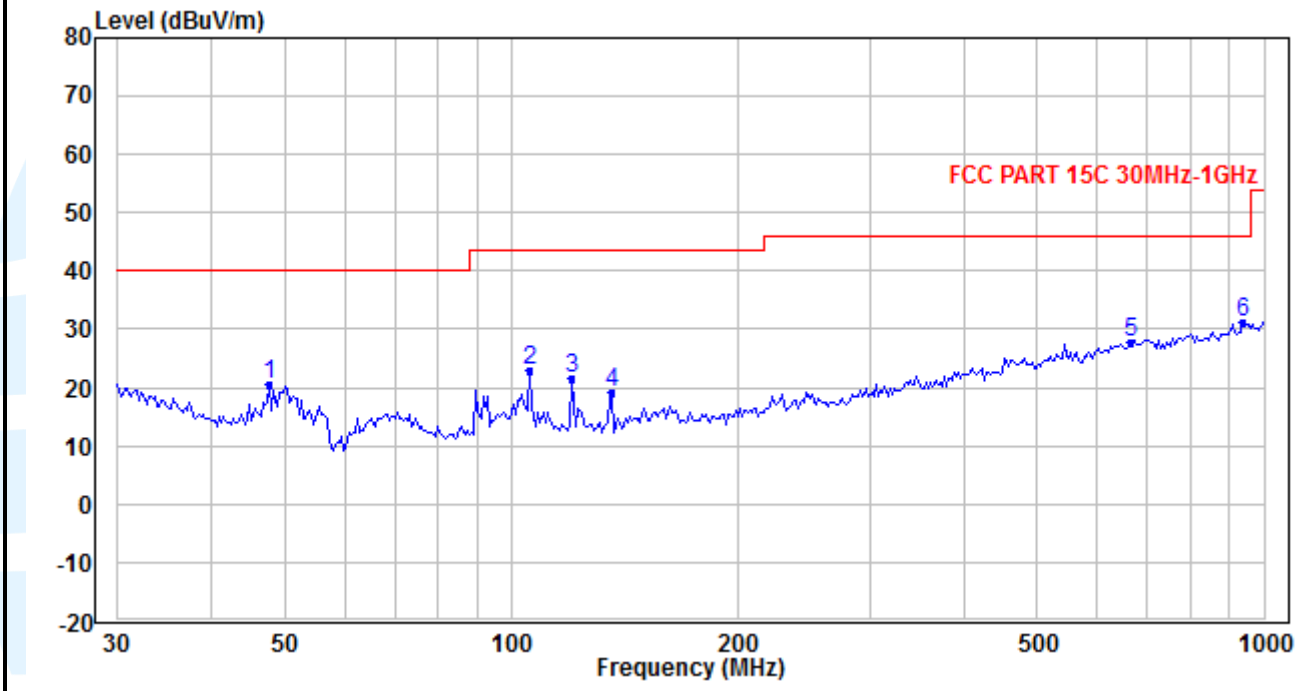
The measurement data as follows:

Radiated Emission Test Data (9 KHz ~ 30 MHz):
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (30 MHz ~ 1 GHz):

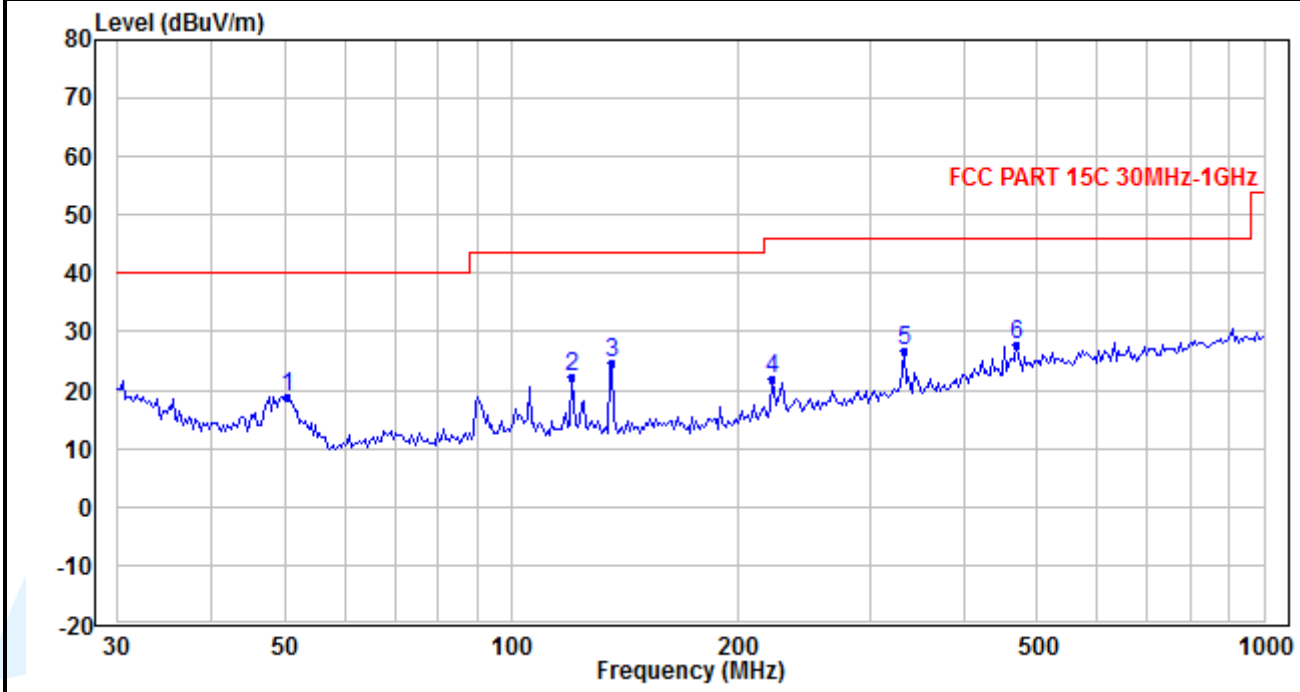
Worst-Case Configuration

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	47.703	34.16	-13.73	20.43	40.00	-19.57	QP
2	105.537	35.32	-12.42	22.90	43.50	-20.60	QP
3	120.612	34.35	-12.70	21.65	43.50	-21.85	QP
4	135.916	31.59	-12.45	19.14	43.50	-24.36	QP
5	665.261	25.92	1.84	27.76	46.00	-18.24	QP
6	938.714	25.38	5.73	31.11	46.00	-14.89	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	50.461	33.94	-15.01	18.93	40.00	-21.07	QP
2	120.612	35.12	-12.70	22.42	43.50	-21.08	QP
3	135.916	37.16	-12.45	24.71	43.50	-18.79	QP
4	222.281	31.11	-9.07	22.04	46.00	-23.96	QP
5	331.786	32.31	-5.51	26.80	46.00	-19.20	QP
6	468.165	30.00	-2.38	27.62	46.00	-18.38	QP

Radiated Emission Test Data (Above 1GHz):

IEEE 802.11b_ Channel 1:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4824.00	43.72	4.41	48.13	74.00	-25.87	Peak	Horizontal
2	4824.00	29.13	4.41	33.54	54.00	-20.46	Average	Horizontal
3	7236.00	38.20	6.68	44.88	74.00	-29.12	Peak	Horizontal
4	7236.00	26.18	6.68	32.86	54.00	-21.14	Average	Horizontal
5	4824.00	41.96	4.05	46.01	74.00	-27.99	Peak	Vertical
6	4824.00	26.54	4.05	30.59	54.00	-23.41	Average	Vertical
7	7236.00	37.16	6.38	43.54	74.00	-30.46	Peak	Vertical
8	7236.00	25.89	6.38	32.27	54.00	-21.73	Average	Vertical

IEEE 802.11b_ Channel 6:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4874.00	42.56	4.32	46.88	74.00	-27.12	Peak	Horizontal
2	4874.00	25.82	4.32	30.14	54.00	-23.86	Average	Horizontal
3	7311.00	37.18	6.74	43.92	74.00	-30.08	Peak	Horizontal
4	7311.00	25.01	6.74	31.75	54.00	-22.25	Average	Horizontal
5	4874.00	40.58	3.95	44.53	74.00	-29.47	Peak	Vertical
6	4874.00	25.96	3.95	29.91	54.00	-24.09	Average	Vertical
7	7311.00	36.36	6.44	42.80	74.00	-31.20	Peak	Vertical
8	7311.00	25.33	6.44	31.77	54.00	-22.23	Average	Vertical

IEEE 802.11b_ Channel 11:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4924.00	42.52	4.23	46.75	74.00	-27.25	Peak	Horizontal
2	4924.00	26.38	4.23	30.61	54.00	-23.39	Average	Horizontal
3	7386.00	37.21	6.80	44.01	74.00	-29.99	Peak	Horizontal
4	7386.00	25.95	6.80	32.75	54.00	-21.25	Average	Horizontal
5	4924.00	41.76	3.85	45.61	74.00	-28.39	Peak	Vertical
6	4924.00	26.02	3.85	29.87	54.00	-24.13	Average	Vertical
7	7386.00	38.54	6.50	45.04	74.00	-28.96	Peak	Vertical
8	7386.00	26.58	6.50	33.08	54.00	-20.92	Average	Vertical

IEEE 802.11g_ Channel 1:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4824.00	42.15	4.41	46.56	74.00	-27.44	Peak	Horizontal
2	4824.00	29.57	4.41	33.98	54.00	-20.02	Average	Horizontal
3	7236.00	37.14	6.68	43.82	74.00	-30.18	Peak	Horizontal
4	7236.00	25.74	6.68	32.42	54.00	-21.58	Average	Horizontal
5	4824.00	38.59	4.05	42.64	74.00	-31.36	Peak	Vertical
6	4824.00	27.63	4.05	31.68	54.00	-22.32	Average	Vertical
7	7236.00	37.67	6.38	44.05	74.00	-29.95	Peak	Vertical
8	7236.00	26.39	6.38	32.77	54.00	-21.23	Average	Vertical

IEEE 802.11g_ Channel 6:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4874.00	40.23	4.32	44.55	74.00	-29.45	Peak	Horizontal
2	4874.00	28.21	4.32	32.53	54.00	-21.47	Average	Horizontal
3	7311.00	37.55	6.74	44.29	74.00	-29.71	Peak	Horizontal
4	7311.00	25.56	6.74	32.30	54.00	-21.70	Average	Horizontal
5	4874.00	37.88	3.95	41.83	74.00	-32.17	Peak	Vertical
6	4874.00	25.12	3.95	29.07	54.00	-24.93	Average	Vertical
7	7311.00	37.30	6.44	43.74	74.00	-30.26	Peak	Vertical
8	7311.00	26.43	6.44	32.87	54.00	-21.13	Average	Vertical

IEEE 802.11g_ Channel 11:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4924.00	41.24	4.23	45.47	74.00	-28.53	Peak	Horizontal
2	4924.00	28.25	4.23	32.48	54.00	-21.52	Average	Horizontal
3	7386.00	37.29	6.80	44.09	74.00	-29.91	Peak	Horizontal
4	7386.00	26.16	6.80	32.96	54.00	-21.04	Average	Horizontal
5	4924.00	38.67	3.85	42.52	74.00	-31.48	Peak	Vertical
6	4924.00	26.72	3.85	30.57	54.00	-23.43	Average	Vertical
7	7386.00	39.05	6.50	45.55	74.00	-28.45	Peak	Vertical
8	7386.00	26.09	6.50	32.59	54.00	-21.41	Average	Vertical

IEEE 802.11n-HT20_ Channel 1:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4824.00	41.52	4.41	45.93	74.00	-28.07	Peak	Horizontal
2	4824.00	29.33	4.41	33.74	54.00	-20.26	Average	Horizontal
3	7236.00	38.33	6.68	45.01	74.00	-28.99	Peak	Horizontal
4	7236.00	26.18	6.68	32.86	54.00	-21.14	Average	Horizontal
5	4824.00	37.26	4.05	41.31	74.00	-32.69	Peak	Vertical
6	4824.00	27.01	4.05	31.06	54.00	-22.94	Average	Vertical
7	7236.00	37.99	6.38	44.37	74.00	-29.63	Peak	Vertical
8	7236.00	26.32	6.38	32.70	54.00	-21.30	Average	Vertical

IEEE 802.11n-HT20_ Channel 6:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4874.00	40.29	4.32	44.61	74.00	-29.39	Peak	Horizontal
2	4874.00	28.26	4.32	32.58	54.00	-21.42	Average	Horizontal
3	7311.00	37.81	6.74	44.55	74.00	-29.45	Peak	Horizontal
4	7311.00	26.15	6.74	32.89	54.00	-21.11	Average	Horizontal
5	4874.00	37.69	3.95	41.64	74.00	-32.36	Peak	Vertical
6	4874.00	25.04	3.95	28.99	54.00	-25.01	Average	Vertical
7	7311.00	37.33	6.44	43.77	74.00	-30.23	Peak	Vertical
8	7311.00	25.79	6.44	32.23	54.00	-21.77	Average	Vertical

IEEE 802.11n-HT20_ Channel 11:

No.	Frequency (MHz)	Reading (dBuV/m)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4924.00	38.58	4.23	42.81	74.00	-31.19	Peak	Horizontal
2	4924.00	27.43	4.23	31.66	54.00	-22.34	Average	Horizontal
3	7386.00	36.54	6.80	43.34	74.00	-30.66	Peak	Horizontal
4	7386.00	25.87	6.80	32.67	54.00	-21.33	Average	Horizontal
5	4924.00	36.76	3.85	40.61	74.00	-33.39	Peak	Vertical
6	4924.00	25.19	3.85	29.04	54.00	-24.96	Average	Vertical
7	7386.00	38.21	6.50	44.71	74.00	-29.29	Peak	Vertical
8	7386.00	26.24	6.50	32.74	54.00	-21.26	Average	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit

5.8 BAND EDGE MEASUREMENTS (RADIATED)

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209

Test Method: ANSI C63.10-2013 Clause 11.13

Limits:

Radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Frequency	Limit (dBμV/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

1. Use radiated spurious emission test procedure described in clause 5.10. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

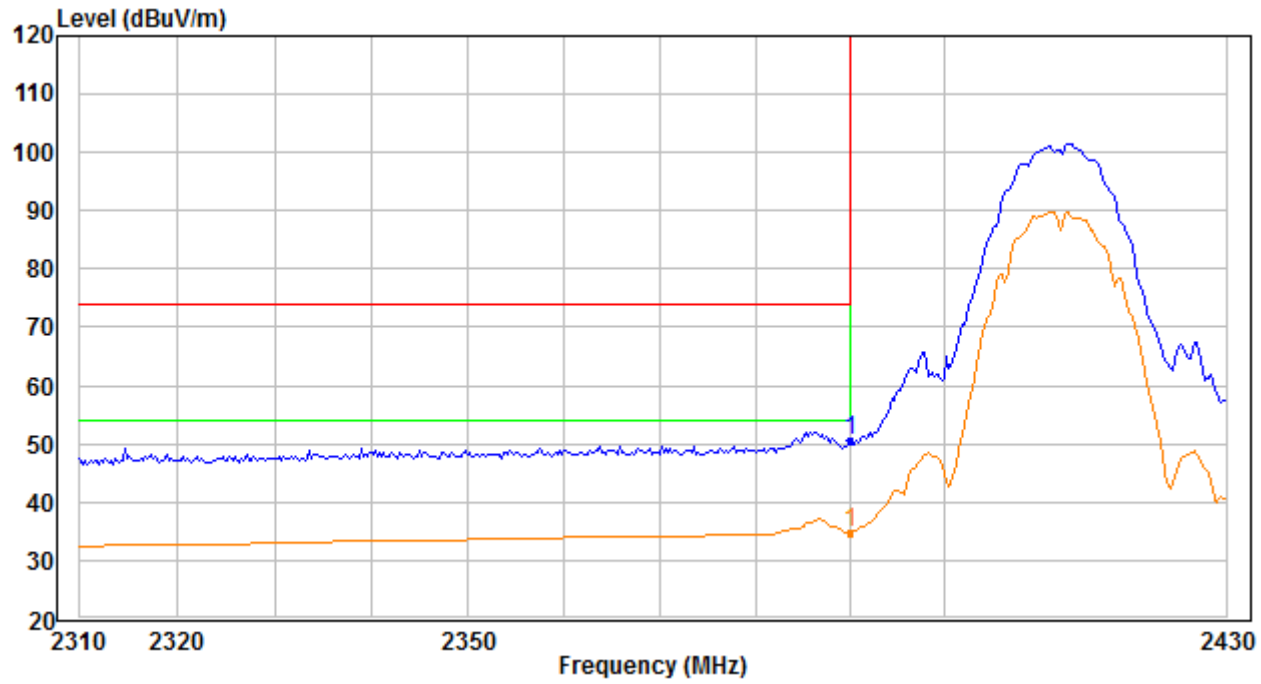
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

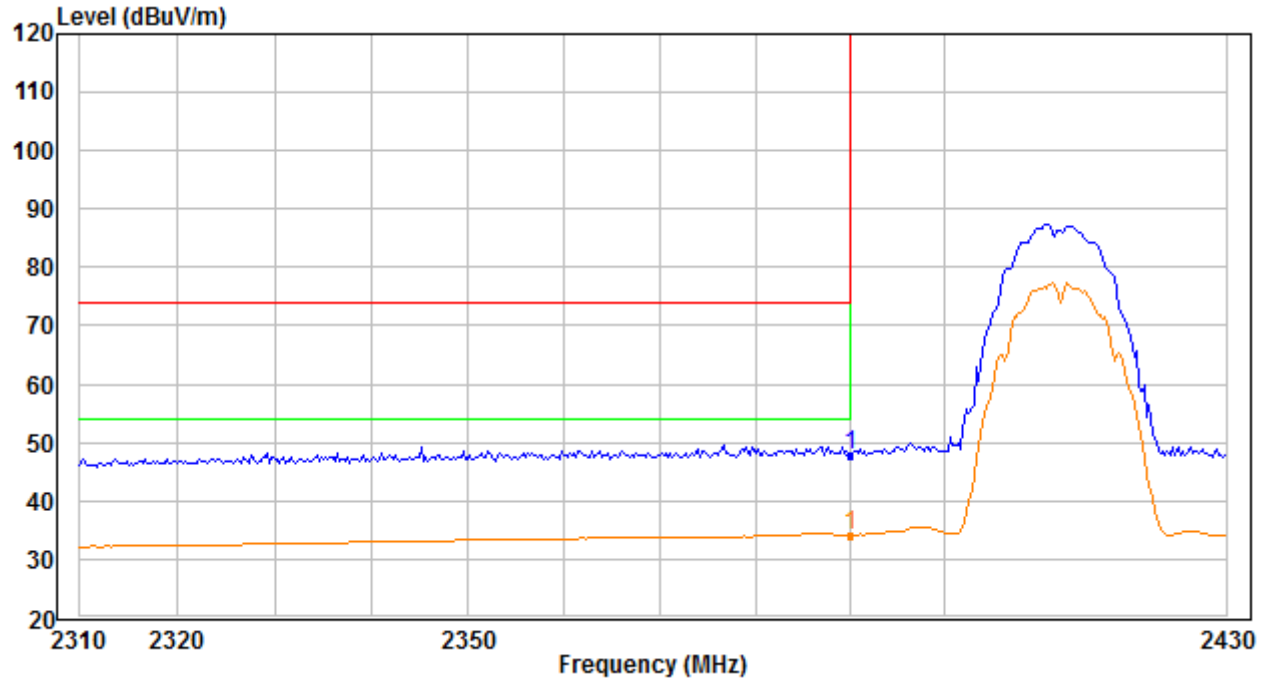
IEEE 802.11b

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



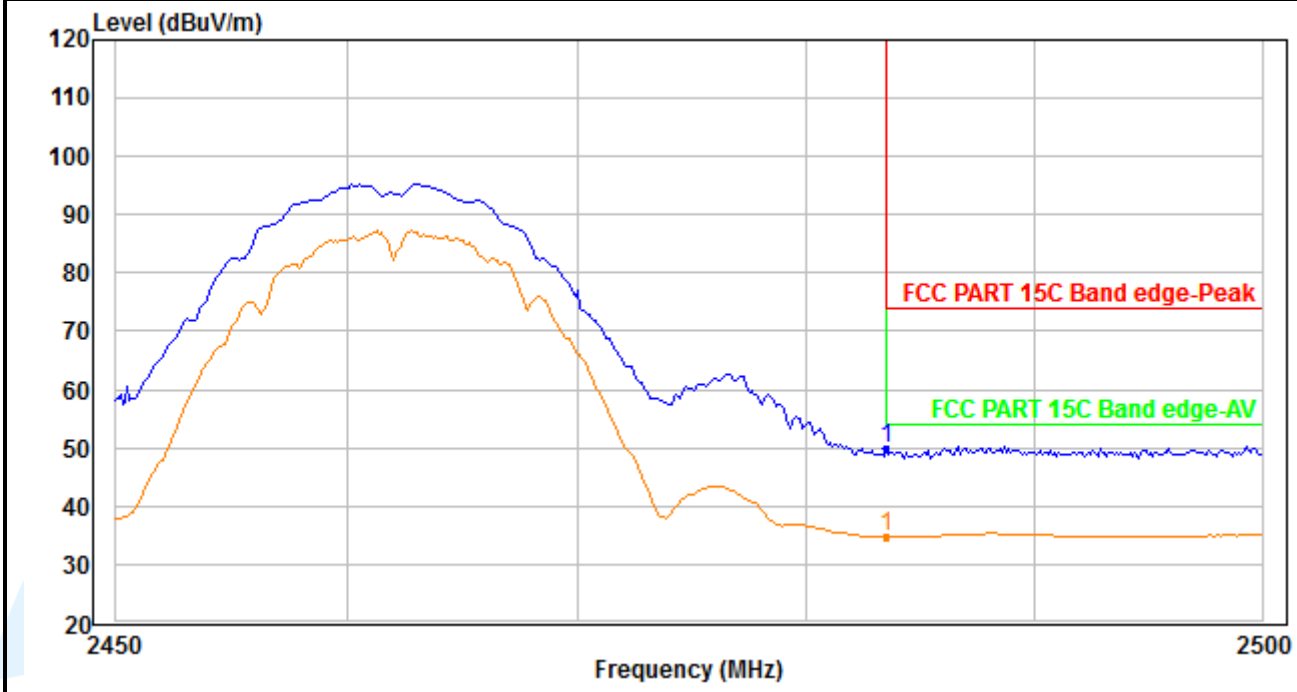
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	50.45	74.00	34.90	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



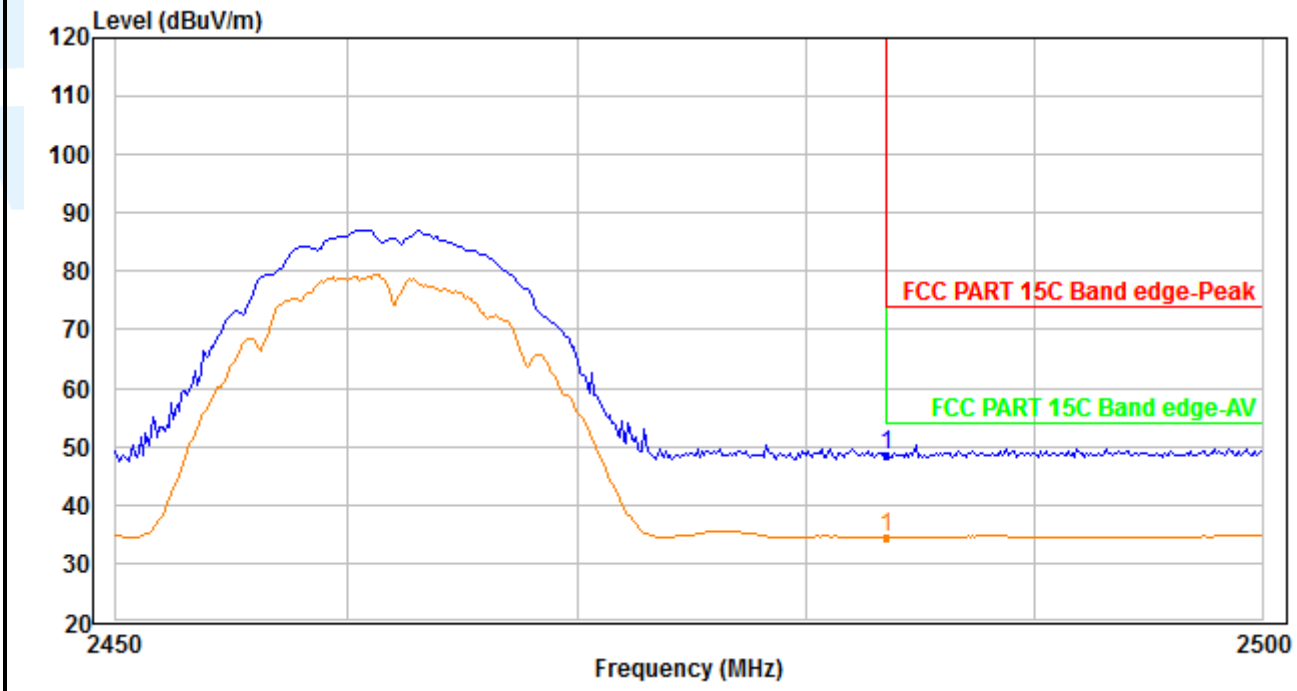
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	47.95	74.00	34.11	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	49.79	74.00	34.88	54.00	Pass

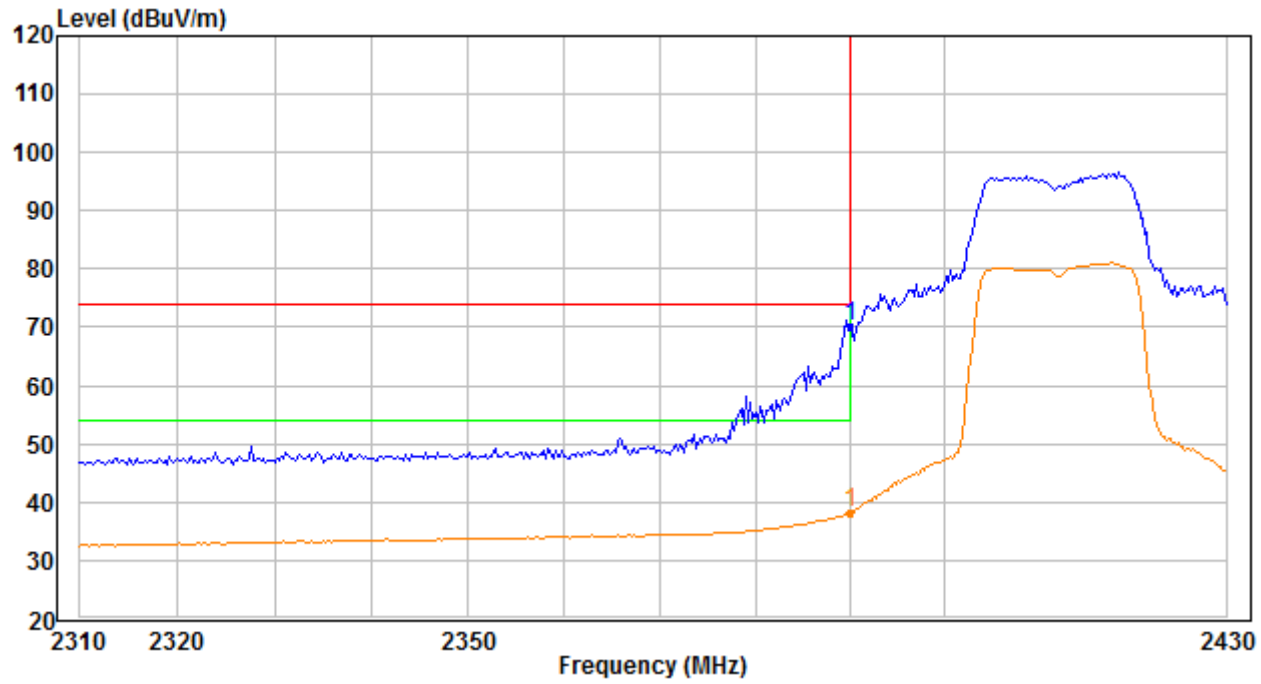
Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	48.62	74.00	34.46	54.00	Pass

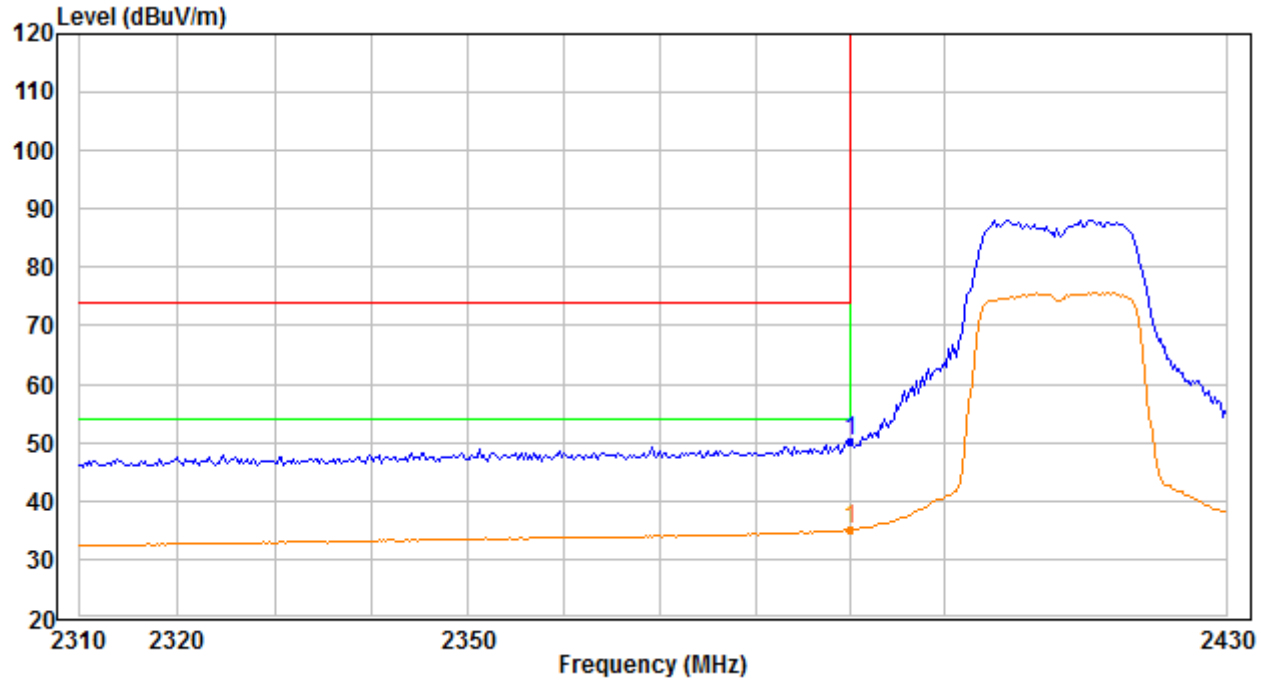
IEEE 802.11g

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



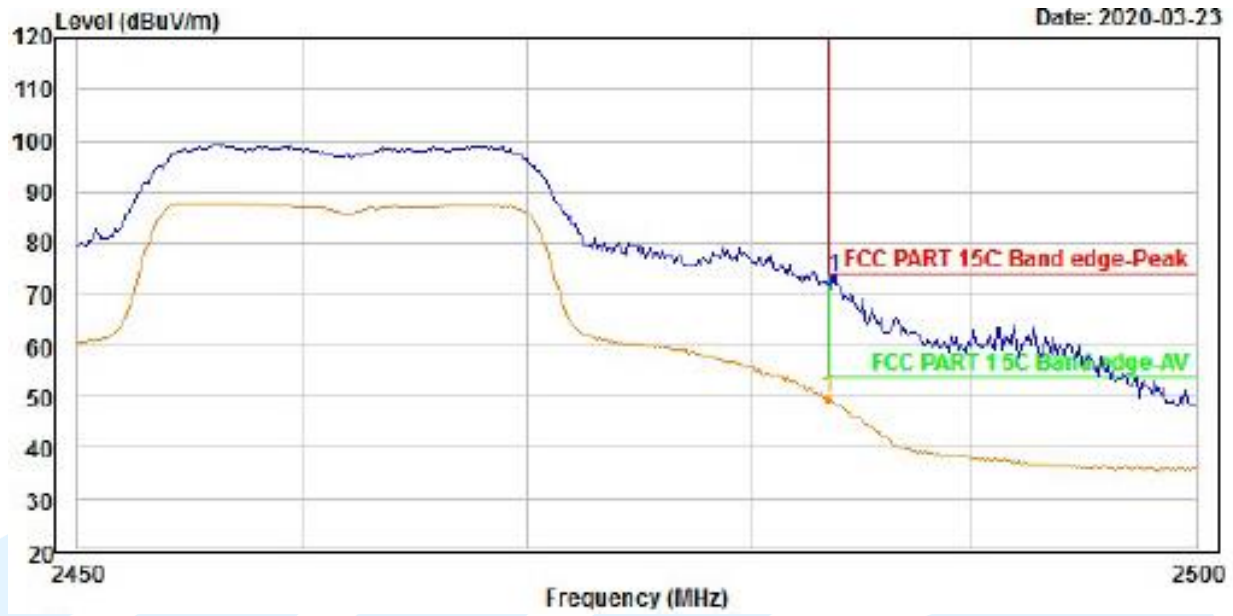
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	70.02	74.00	38.12	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



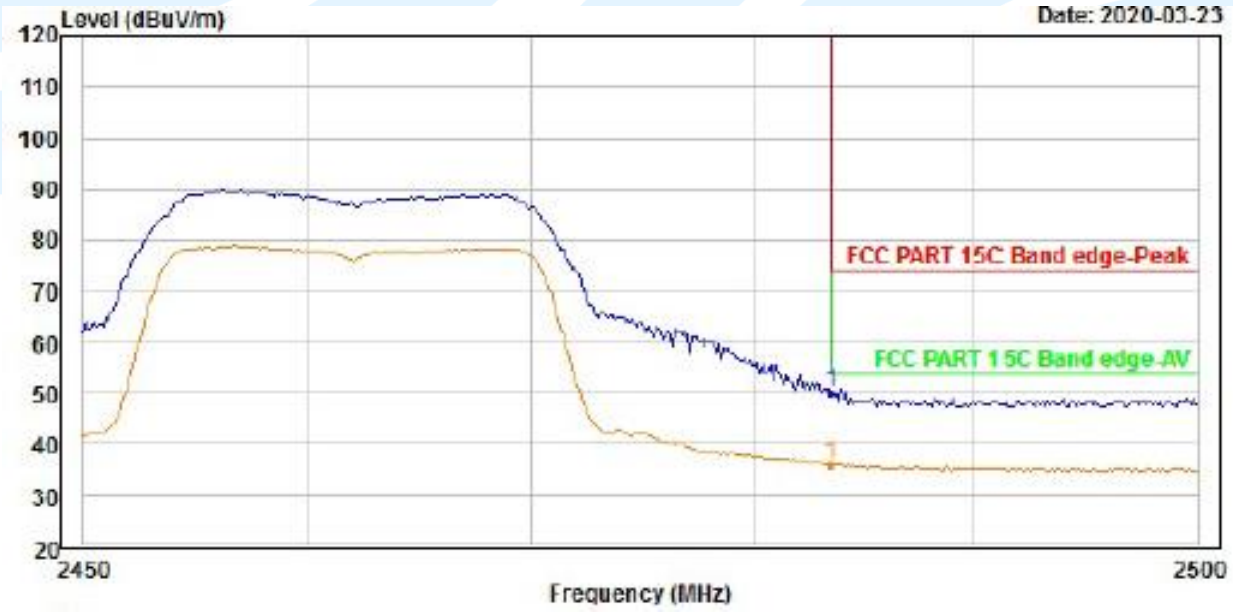
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	50.37	74.00	35.22	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	71.33	74.00	38.99	54.00	Pass

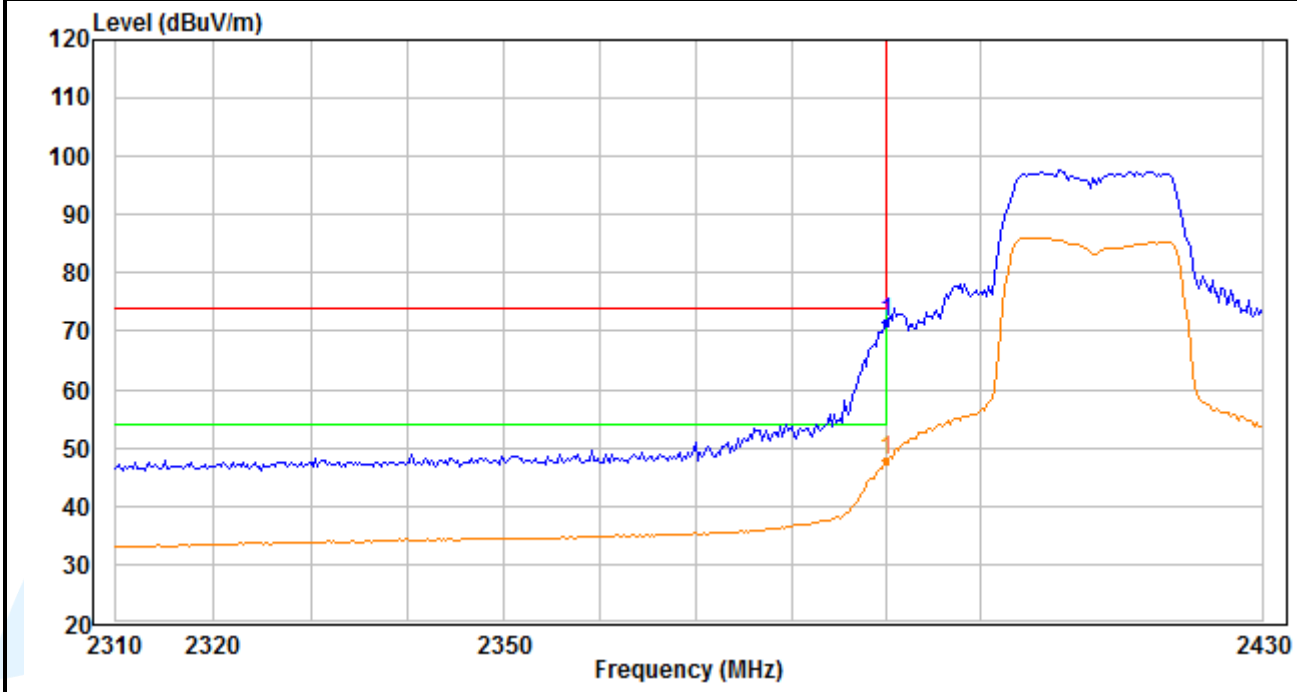
Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	54.10	74.00	35.36	54.00	Pass

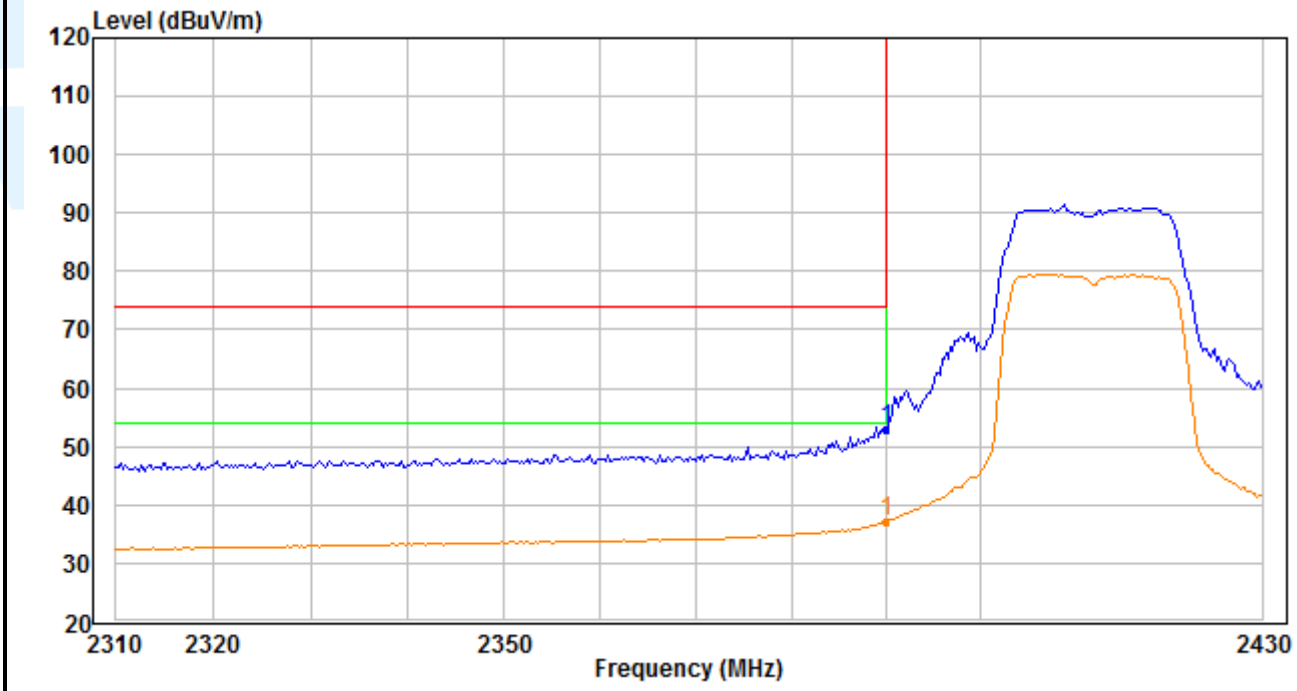
IEEE 802.11n-HT20

Test Channel:	Lowest Channel	Ant. Polar. :	Horizontal



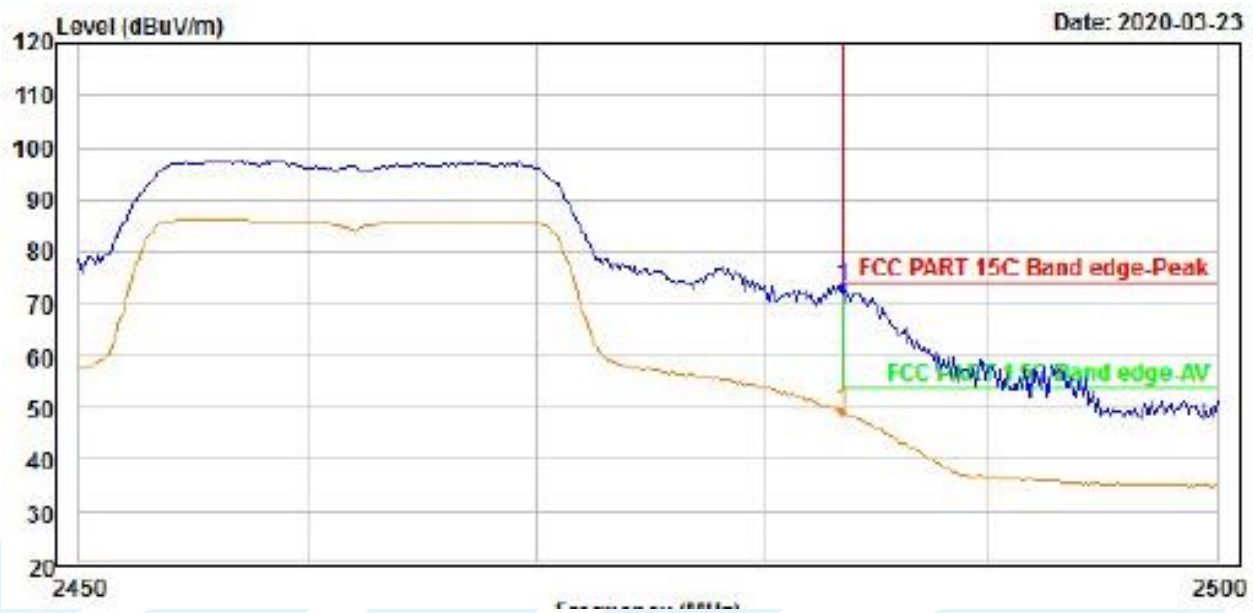
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	71.47	74.00	47.95	54.00	Pass

Test Channel:	Lowest Channel	Ant. Polar. :	Vertical



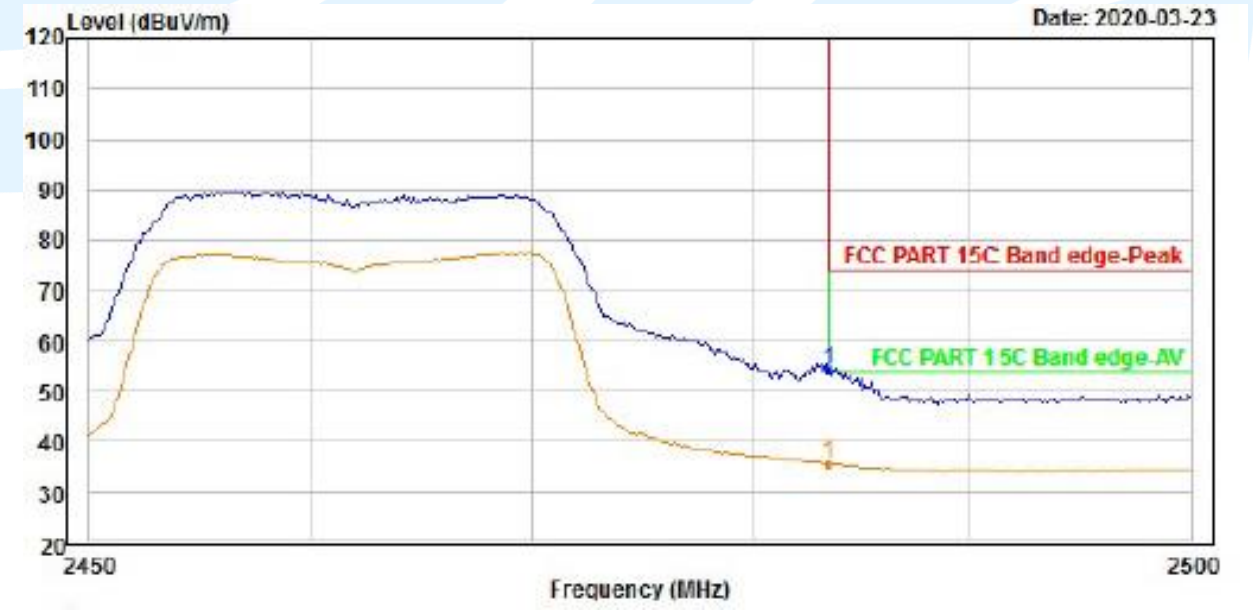
Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2390.0000	52.93	74.00	37.22	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Horizontal



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	73.22	74.00	51.48	54.00	Pass

Test Channel:	Highest Channel	Ant. Polar. :	Vertical



Frequency (MHz)	Peak level (dBuv/m)	Peak Limit (dBuv/m)	AV level (dBuv/m)	AV Limit (dBuv/m)	Conclusion
2483.5000	52.88	74.00	36.80	54.00	Pass

5.9 CONDUCTED EMISSION

Test Requirement: 47 CFR Part 15C Section 15.207

Test Method: ANSI C63.10-2013 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.5.2 for details.

Test Procedures:

Test frequency range :150KHz-30MHz

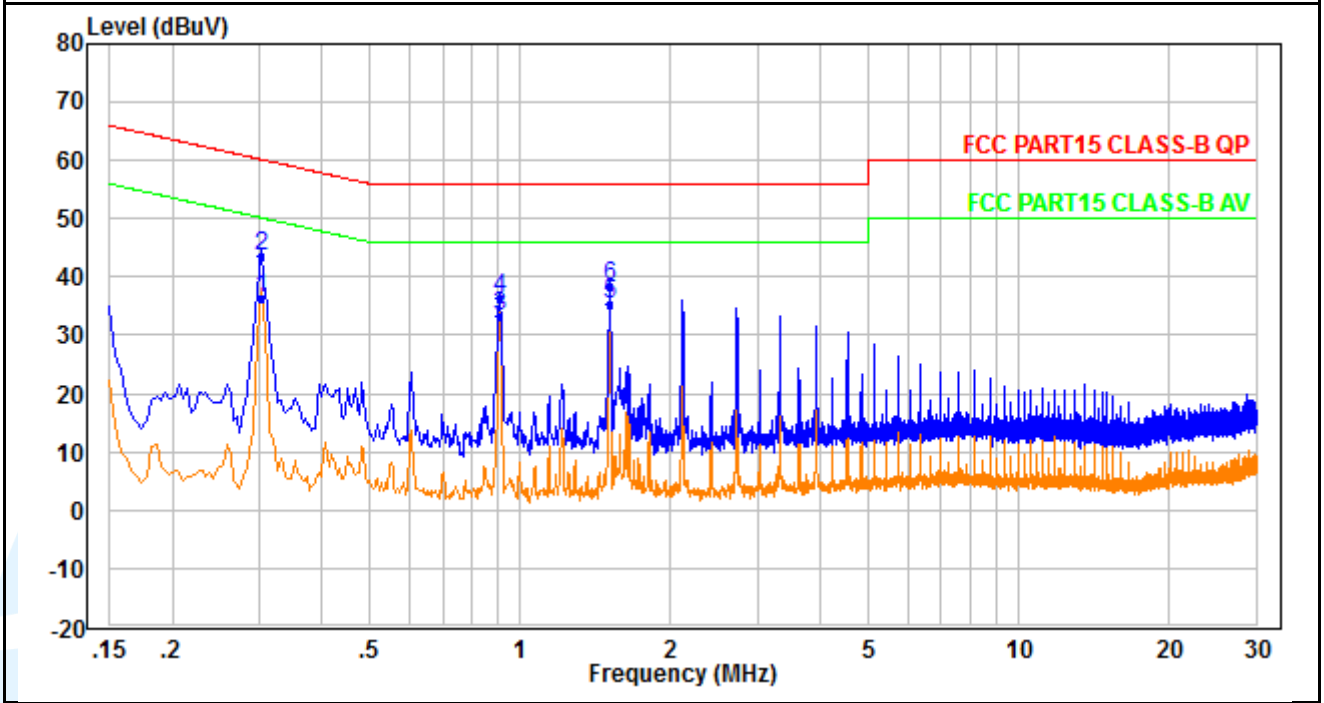
1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

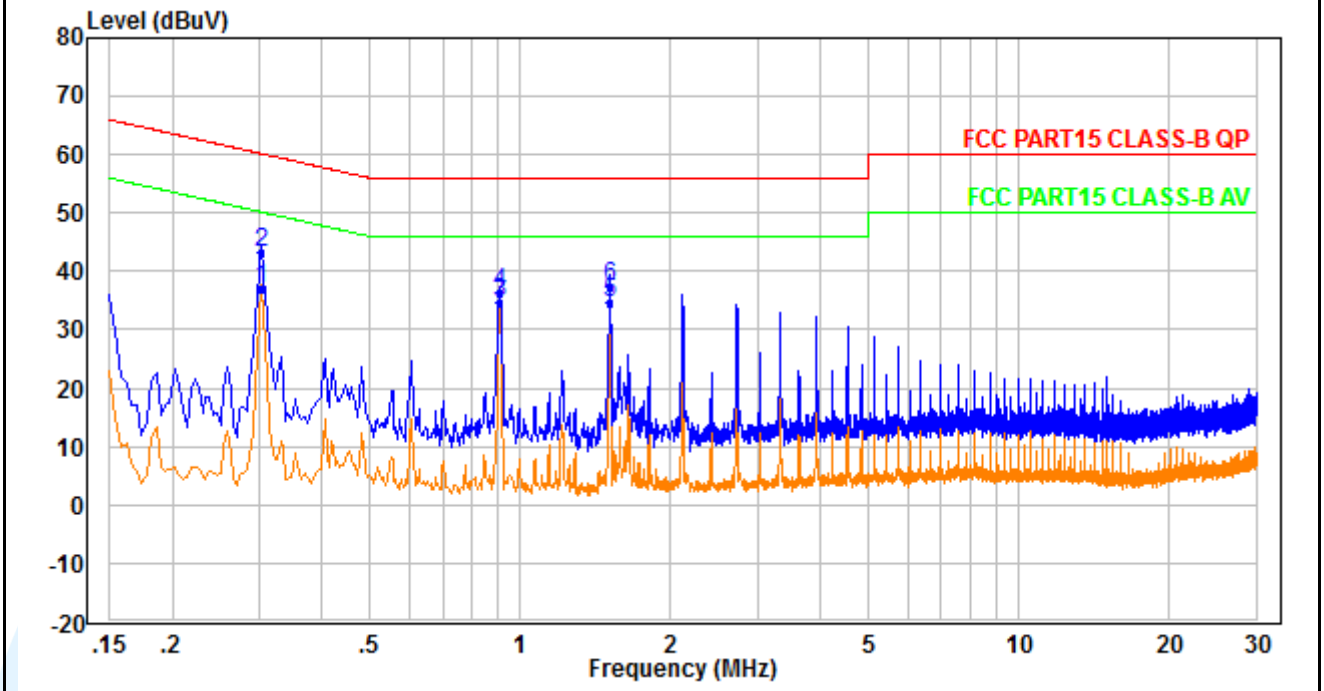
The measurement data as follows:
Quasi Peak and Average:
Mode: WIFI Link

Live Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.302	27.25	9.21	36.46	50.19	-13.73	Average
2	0.302	34.32	9.21	43.53	60.19	-16.66	QP
3	0.906	24.00	9.42	33.42	46.00	-12.58	Average
4	0.906	27.07	9.42	36.49	56.00	-19.51	QP
5	1.514	25.75	9.53	35.28	46.00	-10.72	Average
6	1.514	28.80	9.53	38.33	56.00	-17.67	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.302	27.80	9.19	36.99	50.19	-13.20	Average
2	0.302	34.20	9.19	43.39	60.19	-16.80	QP
3	0.906	25.20	9.42	34.62	46.00	-11.38	Average
4	0.906	27.10	9.42	36.52	56.00	-19.48	QP
5	1.514	25.20	9.53	34.73	46.00	-11.27	Average
6	1.514	27.80	9.53	37.33	56.00	-18.67	QP

Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***