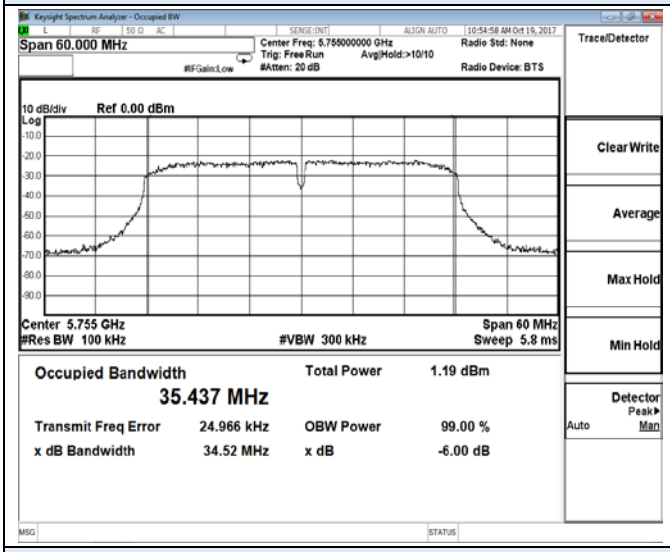
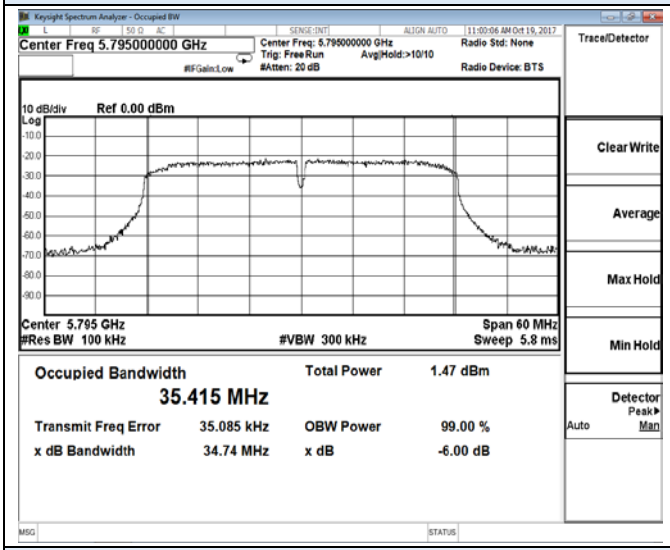
6dB Occupied Bandwidth

Antenna 2

IEEE 802.11n HT40

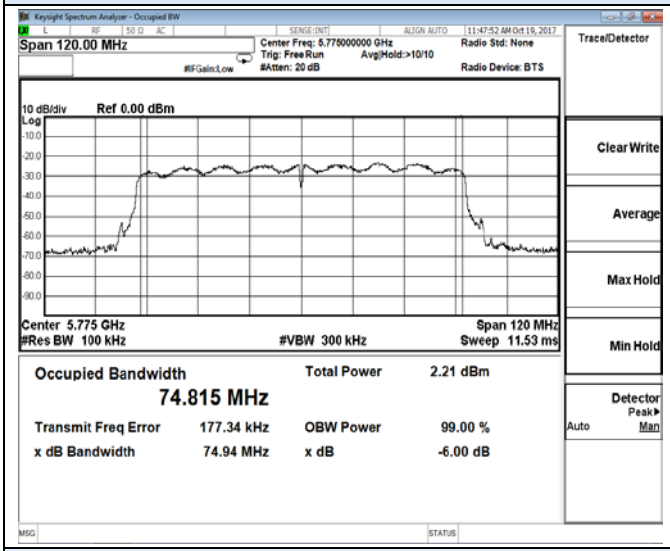


Channel 151 / 5755 MHz



Channel 159 / 5795 MHz

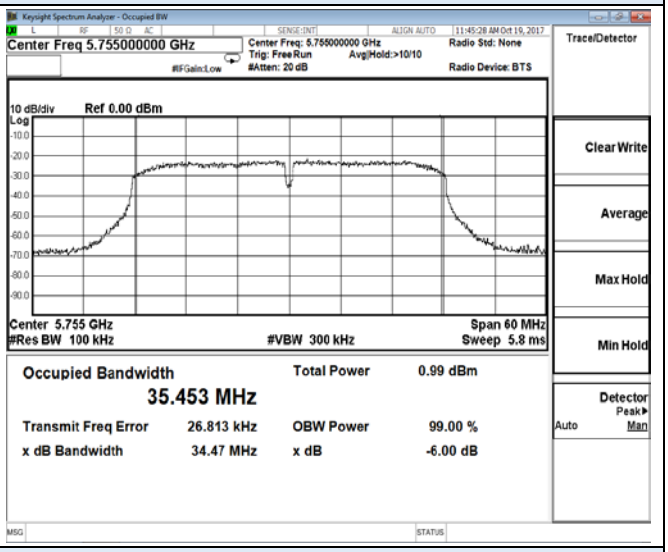
IEEE 802.11ac VHT80



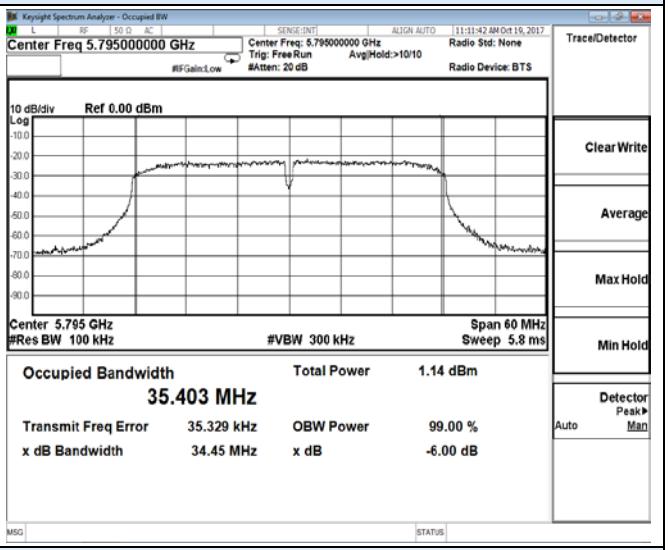
Channel 155 / 5775 MHz

Antenna 2

IEEE 802.11ac VHT40



Channel 151 / 5755 MHz

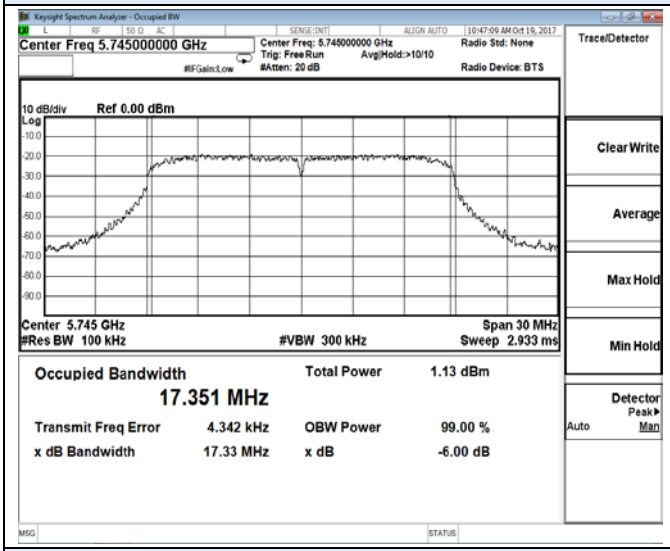


Channel 159 / 5795 MHz

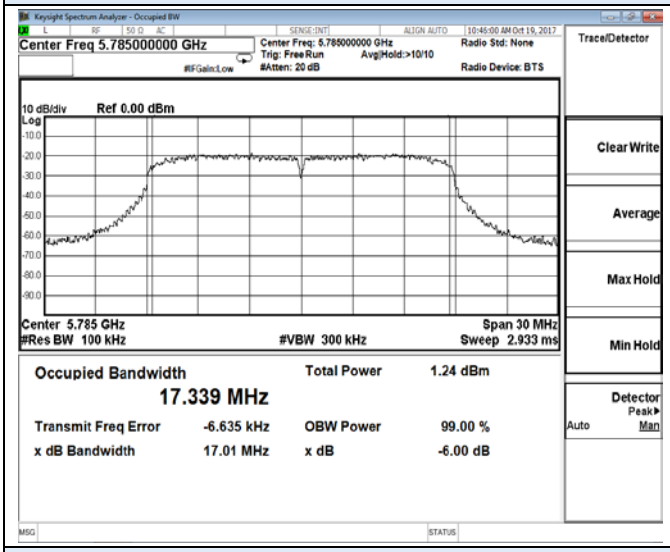
6dB Occupied Bandwidth

Antenna 2

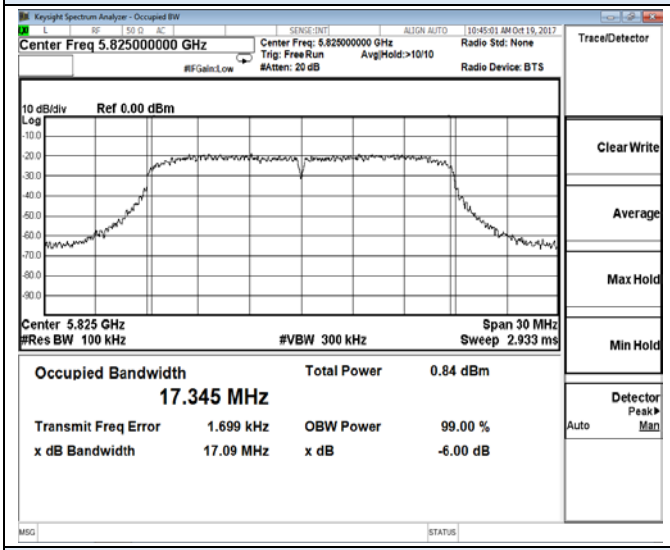
IEEE 802.11ac VHT20



Channel 149 / 5745 MHz



Channel 157 / 5785 MHz



Channel 165 / 5825 MHz

5.5. Radiated Emissions Measurement

5.5.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
\2\ Above 38.6

For transmitters operating in the 5.725-5.85 GHz band:

All emissions shall be limited to a level of −27 dBm/MHz(68.2dBuV/m at 3m) at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz(105.2dBuV/m at 3m) 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(110.8dBuV/m at 3m) 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(122.2dBuV/m at 3m) at the band edge.

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.5.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.5.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 0.8 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

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3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

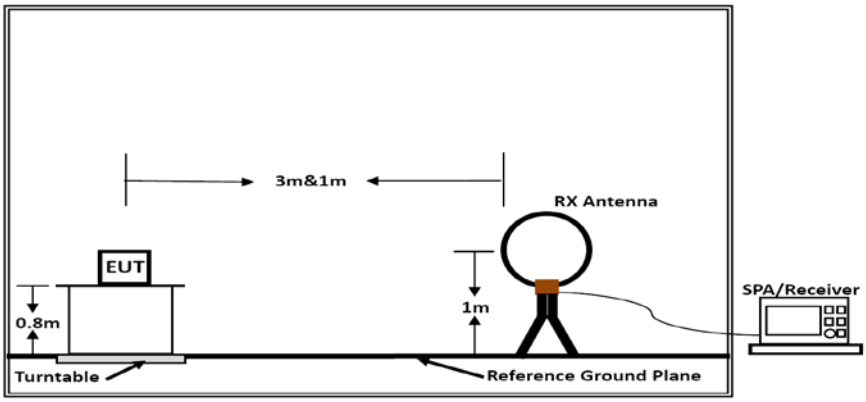
Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

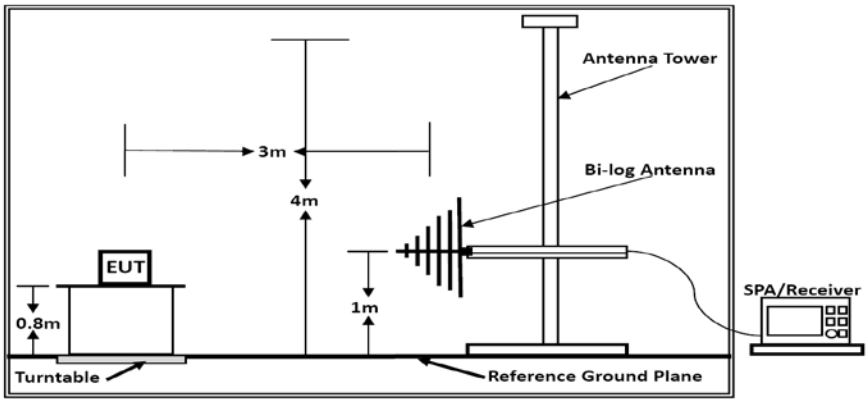
--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

5.5.4. Test Setup Layout

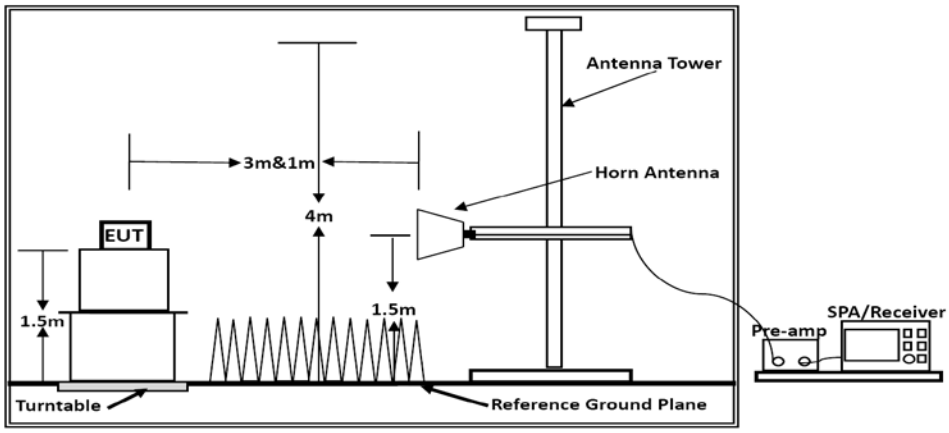
For radiated emissions below 30MHz



Below 30MHz



Below 1GHz



Above 1GHz

Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distanc [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.5.6. Results of Radiated Emissions (9 KHz~30 MHz)

Temperature	25℃	Humidity	60%
Test Engineer	Jayden Zhuo	Configurations	IEEE 802.11a/n/ac

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

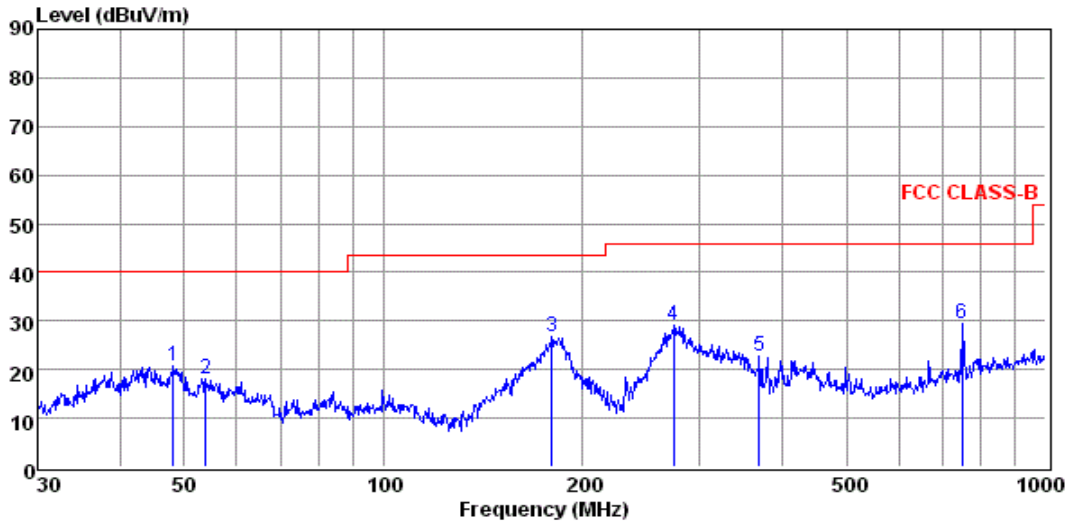
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.4.7. Results of Radiated Emissions (30 MHz~1 GHz)

Temperature	25℃	Humidity	60%
Test Engineer	Jayden Zhuo	Configurations	IEEE 802.11ac VHT20, Low Channel, 5745MHz

Test result for IEEE 802.11ac VHT20 – Low Channel, Combined Antenna0, Antenna 1 and Antenna 2

Horizontal

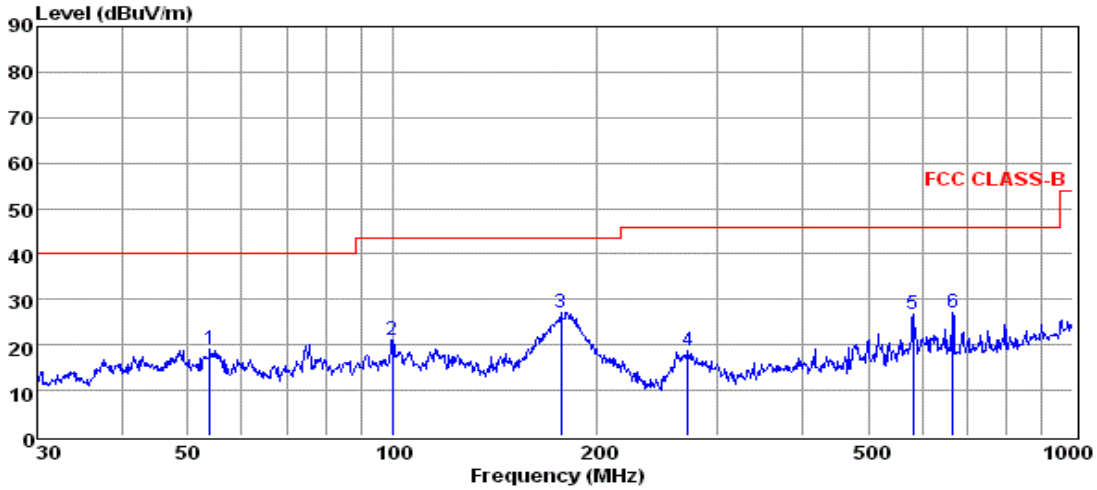


pol: HORIZONTAL

	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	48.16	7.13	0.35	13.36	20.84	40.00	-19.16	QP
2	53.88	4.66	0.46	13.07	18.19	40.00	-21.81	QP
3	179.39	16.19	0.89	9.64	26.72	43.50	-16.78	QP
4	274.19	15.42	1.04	12.49	28.95	46.00	-17.05	QP
5	369.40	6.95	1.22	14.51	22.68	46.00	-23.32	QP
6	747.48	8.28	1.65	19.40	29.33	46.00	-16.67	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Vertical



pol: VERTICAL

	Freq MHz	Reading dBuV	CabLos dB	Antfac dB/m	Measured dBuV/m	Limit dBuV/m	Over dB	Remark
1	53.88	5.48	0.46	13.07	19.01	40.00	-20.99	QP
2	99.88	7.29	0.60	13.15	21.04	43.50	-22.46	QP
3	176.89	16.83	0.73	9.46	27.02	43.50	-16.48	QP
4	271.32	5.44	0.99	12.40	18.83	46.00	-27.17	QP
5	582.74	7.09	1.54	18.13	26.76	46.00	-19.24	QP
6	665.80	6.74	1.55	18.69	26.98	46.00	-19.02	QP

Note: 1. All readings are Quasi-peak values.
2. Measured= Reading + Antenna Factor + Cable Loss
3. The emission that ate 20db blow the offficial limit are not reported

Note:

Pre-scan all modes and recorded the worst case results in this report (IEEE 802.11ac VHT20-Low Channel, Combined Antenna 0, Antenna 1 and Antenna 2).
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

5.5.8. Results for Radiated Emissions (Above 1GHz)

IEEE 802.11a

Antenna 0

Channel 149 / 5745 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.235	60.51	33.23	35.04	3.91	62.61	68.20	-5.59	Peak	Horizontal
17.235	44.89	33.23	35.04	3.91	46.99	54.00	-7.01	Average	Horizontal
17.235	57.14	33.23	35.04	3.91	59.24	68.20	-8.96	Peak	Vertical
17.235	42.32	33.23	35.04	3.91	44.42	54.00	-9.58	Average	Vertical

Channel 157 / 5785 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.355	60.30	33.27	35.15	3.93	62.35	68.20	-5.85	Peak	Horizontal
17.355	43.20	33.27	35.15	3.93	45.25	54.00	-8.75	Average	Horizontal
17.355	60.31	33.27	35.15	3.93	62.36	68.20	-5.84	Peak	Vertical
17.355	41.97	33.27	35.15	3.93	44.02	54.00	-9.98	Average	Vertical

Channel 163 / 5825 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.475	61.23	33.32	35.14	3.97	63.38	68.20	-4.82	Peak	Horizontal
17.475	46.94	33.32	35.14	3.97	49.09	54.00	-4.91	Average	Horizontal
17.475	60.36	33.32	35.14	3.97	62.51	68.20	-5.69	Peak	Vertical
17.475	43.89	33.32	35.14	3.97	46.04	54.00	-7.96	Average	Vertical

IEEE 802.11n HT20

Combined Antenna 0, Antenna 1 and Antenna 2

Channel 149 / 5745 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.235	60.84	33.23	35.04	3.91	62.94	68.20	-5.26	Peak	Horizontal
17.235	43.26	33.23	35.04	3.91	45.36	54.00	-8.64	Average	Horizontal
17.235	56.61	33.23	35.04	3.91	58.71	68.20	-9.49	Peak	Vertical
17.235	40.86	33.23	35.04	3.91	42.96	54.00	-11.04	Average	Vertical

Channel 157 / 5785 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.355	58.85	33.27	35.15	3.93	60.90	68.20	-7.30	Peak	Horizontal
17.355	41.57	33.27	35.15	3.93	43.62	54.00	-10.38	Average	Horizontal
17.355	56.71	33.27	35.15	3.93	58.76	68.20	-9.44	Peak	Vertical
17.355	43.27	33.27	35.15	3.93	45.32	54.00	-8.68	Average	Vertical

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Channel 163 / 5825 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.475	59.41	33.32	35.14	3.97	61.56	68.20	-6.64	Peak	Horizontal
17.475	46.60	33.32	35.14	3.97	48.75	54.00	-5.25	Average	Horizontal
17.475	59.63	33.32	35.14	3.97	61.78	68.20	-6.42	Peak	Vertical
17.475	43.91	33.32	35.14	3.97	46.06	54.00	-7.94	Average	Vertical

IEEE 802.11n HT40

Combined Antenna 0, Antenna 1 and Antenna 2

Channel 151 / 5755 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.265	59.29	33.23	35.04	3.91	61.39	68.20	-6.81	Peak	Horizontal
17.265	43.42	33.23	35.04	3.91	45.52	54.00	-8.48	Average	Horizontal
17.265	58.67	33.23	35.04	3.91	60.77	68.20	-7.43	Peak	Vertical
17.265	41.97	33.23	35.04	3.91	44.07	54.00	-9.93	Average	Vertical

Channel 159 / 5795 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.385	59.23	33.23	35.04	3.91	61.33	68.20	-6.87	Peak	Horizontal
17.385	42.05	33.23	35.04	3.91	44.15	54.00	-9.85	Average	Horizontal
17.385	58.06	33.23	35.04	3.91	60.16	68.20	-8.04	Peak	Vertical
17.385	42.48	33.23	35.04	3.91	44.58	54.00	-9.42	Average	Vertical

IEEE 802.11ac VHT20

Combined Antenna 0, Antenna 1 and Antenna 2

Channel 149 / 5745 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.235	62.46	33.23	35.04	3.91	64.56	68.20	-3.64	Peak	Horizontal
17.235	43.23	33.23	35.04	3.91	45.33	54.00	-8.67	Average	Horizontal
17.235	56.61	33.23	35.04	3.91	58.71	68.20	-9.49	Peak	Vertical
17.235	43.36	33.23	35.04	3.91	45.46	54.00	-8.54	Average	Vertical

Channel 157 / 5785 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.355	58.95	33.27	35.15	3.93	61.00	68.20	-7.20	Peak	Horizontal
17.355	43.43	33.27	35.15	3.93	45.48	54.00	-8.52	Average	Horizontal
17.355	58.05	33.27	35.15	3.93	60.10	68.20	-8.10	Peak	Vertical
17.355	40.45	33.27	35.15	3.93	42.50	54.00	-11.50	Average	Vertical

Channel 163 / 5825 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.475	61.26	33.32	35.14	3.97	63.41	68.20	-4.79	Peak	Horizontal
17.475	44.83	33.32	35.14	3.97	46.98	54.00	-7.02	Average	Horizontal
17.475	58.20	33.32	35.14	3.97	60.35	68.20	-7.85	Peak	Vertical
17.475	45.20	33.32	35.14	3.97	47.35	54.00	-6.65	Average	Vertical

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IEEE 802.11ac VHT40

Combined Antenna 0, Antenna 1 and Antenna 2

Channel 151 / 5755 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.265	58.74	33.23	35.04	3.91	60.84	68.20	-7.36	Peak	Horizontal
17.265	40.37	33.23	35.04	3.91	42.47	54.00	-11.53	Average	Horizontal
17.265	56.87	33.23	35.04	3.91	58.97	68.20	-9.23	Peak	Vertical
17.265	39.08	33.23	35.04	3.91	41.18	54.00	-12.82	Average	Vertical

Channel 159 / 5795 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.385	56.84	33.23	35.04	3.91	58.94	68.20	-9.26	Peak	Horizontal
17.385	42.02	33.23	35.04	3.91	44.12	54.00	-9.88	Average	Horizontal
17.385	57.05	33.23	35.04	3.91	59.15	68.20	-9.05	Peak	Vertical
17.385	38.77	33.23	35.04	3.91	40.87	54.00	-13.13	Average	Vertical

IEEE 802.11ac VHT40

Combined Antenna 0, Antenna 1 and Antenna 2

Channel 155 / 5775 MHz

Freq GHz	Read Level dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured Level dBuV	Limit Line dBuV/m	Over limit dB	Remark	Pol
17.325	59.10	33.27	35.15	3.93	61.15	68.20	-7.05	Peak	Horizontal
17.325	42.24	33.27	35.15	3.93	44.29	54.00	-9.71	Average	Horizontal
17.325	59.36	33.27	35.15	3.93	61.41	68.20	-6.79	Peak	Vertical
17.325	43.06	33.27	35.15	3.93	45.11	54.00	-8.89	Average	Vertical

Notes:

1). Measuring frequencies from 9 KHz ~ 40 GHz, No emission found between lowest internal used/generated frequency to 30MHz.
2). Radiated emissions measured in frequency range from 9 KHz ~ 40 GHz were made with an instrument using Peak detector mode.
3). 18~40GHz at least have 20dB margin. No recording in the test report.
4). Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;
5). Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
6). Pre-scan at Antenna 0, Antenna 1 and Antenna 2 for IEEE 802.11a mode, pre-scan at Antenna 0, Antenna 1, Antenna 2 and Combined Antenna 0, Antenna 1 and Antenna 2 for IEEE 802.11n and IEEE 802.11ac, recorded worst case;

5.6. Power line conducted emissions

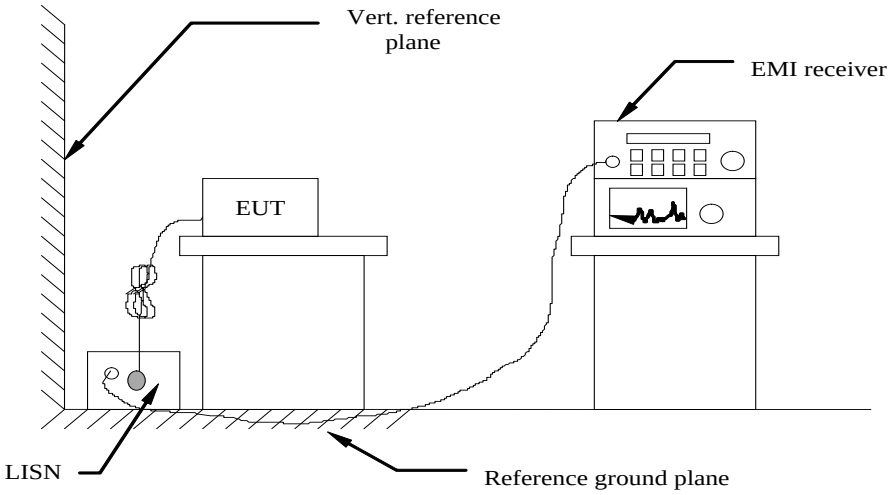
5.6.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	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

* Decreasing linearly with the logarithm of the frequency

5.6.2 Block Diagram of Test Setup



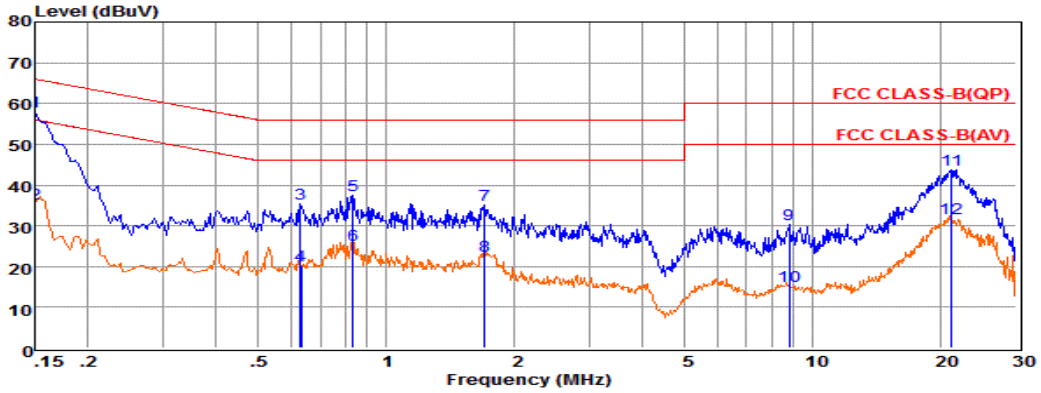
5.6.3 Test Results

PASS.

The test data please refer to following page.

AC Conducted Emission of power by adapter @ AC 120V/60Hz @ IEEE 802.11ac VHT20 (worst case)

Line

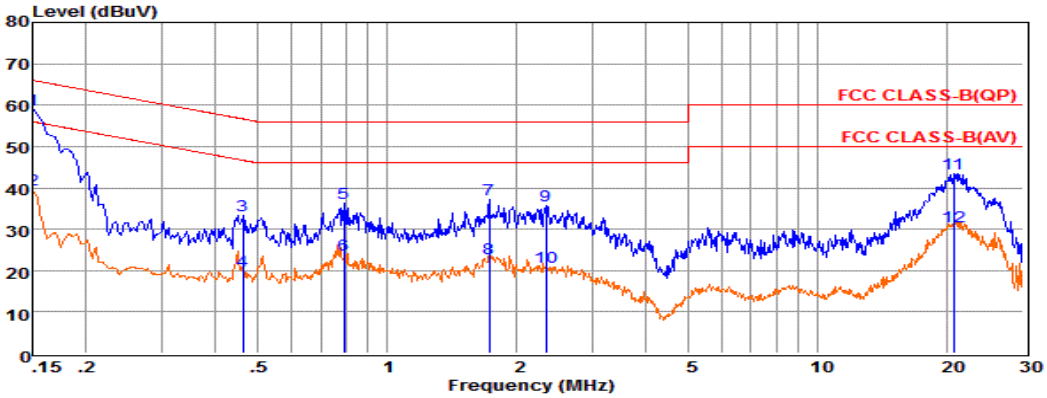


Pol: LINE

	Freq MHz	Reading dBuV	LISNFac dB	CabLos dB	Aux2Fac dB	Measured dB	Limit dBuV	Over dBuV	Remark dB
1	0.15	38.27	9.57	0.02	10.00	57.86	66.00	-8.14	QP
2	0.15	15.93	9.57	0.02	10.00	35.52	55.99	-20.47	Average
3	0.63	15.86	9.63	0.04	10.00	35.53	56.00	-20.47	QP
4	0.63	0.70	9.63	0.04	10.00	20.37	46.00	-25.63	Average
5	0.83	17.90	9.64	0.04	10.00	37.58	56.00	-18.42	QP
6	0.83	5.61	9.64	0.04	10.00	25.29	46.00	-20.71	Average
7	1.70	15.46	9.64	0.05	10.00	35.15	56.00	-20.85	QP
8	1.70	2.91	9.64	0.05	10.00	22.60	46.00	-23.40	Average
9	8.82	10.61	9.69	0.08	10.00	30.38	60.00	-29.62	QP
10	8.82	-4.62	9.69	0.08	10.00	15.15	50.00	-34.85	Average
11	21.15	23.95	9.73	0.12	10.00	43.80	60.00	-16.20	QP
12	21.15	12.12	9.73	0.12	10.00	31.97	50.00	-18.03	Average

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

Neutral



Pol: NEUTRAL

	Freq MHz	Reading dBuV	LISNFac dB	CabLos dB	Aux2Fac dB	Measured dB	Limit dBuV	Over dBuV	Remark dB
1	0.15	39.29	9.70	0.02	10.00	59.01	66.00	-6.99	QP
2	0.15	19.89	9.70	0.02	10.00	39.61	55.99	-16.38	Average
3	0.46	13.78	9.62	0.04	10.00	33.44	56.67	-23.23	QP
4	0.46	0.41	9.62	0.04	10.00	20.07	46.67	-26.60	Average
5	0.79	16.53	9.63	0.04	10.00	36.20	56.00	-19.80	QP
6	0.79	4.23	9.63	0.04	10.00	23.90	46.00	-22.10	Average
7	1.73	17.54	9.63	0.05	10.00	37.22	56.00	-18.78	QP
8	1.73	3.30	9.63	0.05	10.00	22.98	46.00	-23.02	Average
9	2.33	15.88	9.64	0.05	10.00	35.57	56.00	-20.43	QP
10	2.33	1.07	9.64	0.05	10.00	20.76	46.00	-25.24	Average
11	20.70	23.57	9.86	0.12	10.00	43.55	60.00	-16.45	QP
12	20.70	10.60	9.86	0.12	10.00	30.58	50.00	-19.42	Average

Remarks: 1. Measured = Reading + LISNFac + Cable Loss + Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

****Note: Pre-scan all modes and recorded the worst case results in this report (IEEE 802.11ac VHT20 mode).*

5.7 Undesirable Emissions Measurement

5.7.1 Limit

According to ξ15.407 (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:

(a) 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.

(b) 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.

(c) 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.

(d) 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.

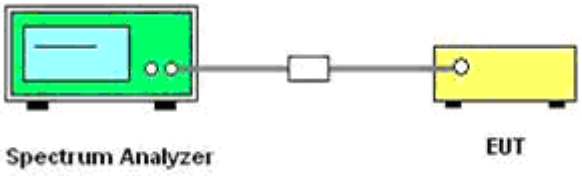
(e) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(f) 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.

(g) The provisions of §15.205 apply to intentional radiators operating under this section.

(h) 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.

5.7.2 Test Configuration



5.7.3 Test Procedure

1. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
2. Set the RBW = 1MHz.
3. Set the VBW ≥ 3MHz
4. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).
6. Set detector = power averaging (rms).
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.

5.7.4 Test Results

Antenna 0

IEEE 802.11a							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-58.225	2.000	-56.225	Peak	-27.000	-29.225	PASS
5700.000	-58.666	2.000	-56.666	Peak	10.000	-66.666	PASS
5720.000	-59.175	2.000	-57.175	Peak	15.600	-72.775	PASS
5725.000	-57.468	2.000	-55.468	Peak	27.000	-82.468	PASS
5850.000	-60.039	2.000	-58.039	Peak	27.000	-85.039	PASS
5855.000	-58.257	2.000	-56.257	Peak	15.600	-71.857	PASS
5875.000	-59.977	2.000	-57.977	Peak	10.000	-67.977	PASS
5925.000	-61.217	2.000	-59.217	Peak	-27.000	-32.217	PASS

IEEE 802.11n HT20							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-61.555	2.000	-59.555	Peak	-27.000	-32.555	PASS
5700.000	-59.141	2.000	-57.141	Peak	10.000	-67.141	PASS
5720.000	-59.514	2.000	-57.514	Peak	15.600	-73.114	PASS
5725.000	-58.396	2.000	-56.396	Peak	27.000	-83.396	PASS
5850.000	-58.362	2.000	-56.362	Peak	27.000	-83.362	PASS
5855.000	-58.165	2.000	-56.165	Peak	15.600	-71.765	PASS
5875.000	-59.309	2.000	-57.309	Peak	10.000	-67.309	PASS
5925.000	-59.084	2.000	-57.084	Peak	-27.000	-30.084	PASS

IEEE 802.11n HT40							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-59.853	2.000	-57.853	Peak	-27.000	-30.853	PASS
5700.000	-57.923	2.000	-55.923	Peak	10.000	-65.923	PASS
5720.000	-57.986	2.000	-55.986	Peak	15.600	-71.586	PASS
5725.000	-57.697	2.000	-55.697	Peak	27.000	-82.697	PASS
5850.000	-58.037	2.000	-56.037	Peak	27.000	-83.037	PASS
5855.000	-56.736	2.000	-54.736	Peak	15.600	-70.336	PASS
5875.000	-56.656	2.000	-54.656	Peak	10.000	-64.656	PASS
5925.000	-58.615	2.000	-56.615	Peak	-27.000	-29.615	PASS

IEEE 802.11ac VHT20							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.024	2.000	-58.024	Peak	-27.000	-31.024	PASS
5700.000	-59.374	2.000	-57.374	Peak	10.000	-67.374	PASS
5720.000	-58.658	2.000	-56.658	Peak	15.600	-72.258	PASS
5725.000	-57.336	2.000	-55.336	Peak	27.000	-82.336	PASS
5850.000	-59.614	2.000	-57.614	Peak	27.000	-84.614	PASS
5855.000	-59.095	2.000	-57.095	Peak	15.600	-72.695	PASS
5875.000	-58.720	2.000	-56.720	Peak	10.000	-66.720	PASS
5925.000	-60.233	2.000	-58.233	Peak	-27.000	-31.233	PASS

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IEEE 802.11ac VHT40							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.047	2.000	-58.047	Peak	-27.000	-31.047	PASS
5700.000	-57.784	2.000	-55.784	Peak	10.000	-65.784	PASS
5720.000	-56.685	2.000	-54.685	Peak	15.600	-70.285	PASS
5725.000	-57.765	2.000	-55.765	Peak	27.000	-82.765	PASS
5850.000	-58.902	2.000	-56.902	Peak	27.000	-83.902	PASS
5855.000	-58.788	2.000	-56.788	Peak	15.600	-72.388	PASS
5875.000	-57.629	2.000	-55.629	Peak	10.000	-65.629	PASS
5925.000	-59.163	2.000	-57.163	Peak	-27.000	-30.163	PASS

IEEE 802.11ac VHT80							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.666	2.000	-58.666	Peak	-27.000	-31.666	PASS
5700.000	-59.193	2.000	-57.193	Peak	10.000	-67.193	PASS
5720.000	-58.303	2.000	-56.303	Peak	15.600	-71.903	PASS
5725.000	-57.956	2.000	-55.956	Peak	27.000	-82.956	PASS
5850.000	-59.717	2.000	-57.717	Peak	27.000	-84.717	PASS
5855.000	-58.342	2.000	-56.342	Peak	15.600	-71.942	PASS
5875.000	-59.065	2.000	-57.065	Peak	10.000	-67.065	PASS
5925.000	-60.913	2.000	-58.913	Peak	-27.000	-31.913	PASS

Antenna 1

IEEE 802.11a							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-59.575	2.000	-57.575	Peak	-27.000	-30.575	PASS
5700.000	-59.404	2.000	-57.404	Peak	10.000	-67.404	PASS
5720.000	-58.176	2.000	-56.176	Peak	15.600	-71.776	PASS
5725.000	-56.808	2.000	-54.808	Peak	27.000	-81.808	PASS
5850.000	-58.297	2.000	-56.297	Peak	27.000	-83.297	PASS
5855.000	-58.257	2.000	-56.257	Peak	15.600	-71.857	PASS
5875.000	-59.516	2.000	-57.516	Peak	10.000	-67.516	PASS
5925.000	-58.995	2.000	-56.995	Peak	-27.000	-29.995	PASS

IEEE 802.11n HT20							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.080	2.000	-58.080	Peak	-27.000	-31.080	PASS
5700.000	-58.786	2.000	-56.786	Peak	10.000	-66.786	PASS
5720.000	-58.324	2.000	-56.324	Peak	15.600	-71.924	PASS
5725.000	-56.980	2.000	-54.980	Peak	27.000	-81.980	PASS
5850.000	-59.932	2.000	-57.932	Peak	27.000	-84.932	PASS
5855.000	-59.952	2.000	-57.952	Peak	15.600	-73.552	PASS
5875.000	-61.635	2.000	-59.635	Peak	10.000	-69.635	PASS
5925.000	-58.185	2.000	-56.185	Peak	-27.000	-29.185	PASS

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IEEE 802.11n HT40							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-59.093	2.000	-57.093	Peak	-27.000	-30.093	PASS
5700.000	-57.923	2.000	-55.923	Peak	10.000	-65.923	PASS
5720.000	-57.986	2.000	-55.986	Peak	15.600	-71.586	PASS
5725.000	-57.551	2.000	-55.551	Peak	27.000	-82.551	PASS
5850.000	-57.756	2.000	-55.756	Peak	27.000	-82.756	PASS
5855.000	-56.736	2.000	-54.736	Peak	15.600	-70.336	PASS
5875.000	-56.656	2.000	-54.656	Peak	10.000	-64.656	PASS
5925.000	-58.566	2.000	-56.566	Peak	-27.000	-29.566	PASS

IEEE 802.11ac VHT20							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.427	2.000	-58.427	Peak	-27.000	-31.427	PASS
5700.000	-59.482	2.000	-57.482	Peak	10.000	-67.482	PASS
5720.000	-59.639	2.000	-57.639	Peak	15.600	-73.239	PASS
5725.000	-57.149	2.000	-55.149	Peak	27.000	-82.149	PASS
5850.000	-59.042	2.000	-57.042	Peak	27.000	-84.042	PASS
5855.000	-58.618	2.000	-56.618	Peak	15.600	-72.218	PASS
5875.000	-58.720	2.000	-56.720	Peak	10.000	-66.720	PASS
5925.000	-58.669	2.000	-56.669	Peak	-27.000	-29.669	PASS

IEEE 802.11ac VHT40							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-58.753	2.000	-56.753	Peak	-27.000	-29.753	PASS
5700.000	-57.536	2.000	-55.536	Peak	10.000	-65.536	PASS
5720.000	-56.380	2.000	-54.380	Peak	15.600	-69.980	PASS
5725.000	-56.611	2.000	-54.611	Peak	27.000	-81.611	PASS
5850.000	-57.812	2.000	-55.812	Peak	27.000	-82.812	PASS
5855.000	-58.780	2.000	-56.780	Peak	15.600	-72.380	PASS
5875.000	-57.629	2.000	-55.629	Peak	10.000	-65.629	PASS
5925.000	-59.078	2.000	-57.078	Peak	-27.000	-30.078	PASS

IEEE 802.11ac VHT80							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-59.443	2.000	-57.443	Peak	-27.000	-30.443	PASS
5700.000	-58.651	2.000	-56.651	Peak	10.000	-66.651	PASS
5720.000	-56.876	2.000	-54.876	Peak	15.600	-70.476	PASS
5725.000	-56.148	2.000	-54.148	Peak	27.000	-81.148	PASS
5850.000	-59.611	2.000	-57.611	Peak	27.000	-84.611	PASS
5855.000	-59.088	2.000	-57.088	Peak	15.600	-72.688	PASS
5875.000	-58.602	2.000	-56.602	Peak	10.000	-66.602	PASS
5925.000	-61.663	2.000	-59.663	Peak	-27.000	-32.663	PASS

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Antenna 2

IEEE 802.11a							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-61.802	2.000	-59.802	Peak	-27.000	-32.802	PASS
5700.000	-58.451	2.000	-56.451	Peak	10.000	-66.451	PASS
5720.000	-59.695	2.000	-57.695	Peak	15.600	-73.295	PASS
5725.000	-58.415	2.000	-56.415	Peak	27.000	-83.415	PASS
5850.000	-59.433	2.000	-57.433	Peak	27.000	-84.433	PASS
5855.000	-60.362	2.000	-58.362	Peak	15.600	-73.962	PASS
5875.000	-60.591	2.000	-58.591	Peak	10.000	-68.591	PASS
5925.000	-59.945	2.000	-57.945	Peak	-27.000	-30.945	PASS

IEEE 802.11n HT20							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.896	2.000	-58.896	Peak	-27.000	-31.896	PASS
5700.000	-60.463	2.000	-58.463	Peak	10.000	-68.463	PASS
5720.000	-58.398	2.000	-56.398	Peak	15.600	-71.998	PASS
5725.000	-58.264	2.000	-56.264	Peak	27.000	-83.264	PASS
5850.000	-58.494	2.000	-56.494	Peak	27.000	-83.494	PASS
5855.000	-60.614	2.000	-58.614	Peak	15.600	-74.214	PASS
5875.000	-59.772	2.000	-57.772	Peak	10.000	-67.772	PASS
5925.000	-60.908	2.000	-58.908	Peak	-27.000	-31.908	PASS

IEEE 802.11n HT40							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.709	2.000	-58.709	Peak	-27.000	-31.709	PASS
5700.000	-58.791	2.000	-56.791	Peak	10.000	-66.791	PASS
5720.000	-57.708	2.000	-55.708	Peak	15.600	-71.308	PASS
5725.000	-58.352	2.000	-56.352	Peak	27.000	-83.352	PASS
5850.000	-58.914	2.000	-56.914	Peak	27.000	-83.914	PASS
5855.000	-58.635	2.000	-56.635	Peak	15.600	-72.235	PASS
5875.000	-59.175	2.000	-57.175	Peak	10.000	-67.175	PASS
5925.000	-59.589	2.000	-57.589	Peak	-27.000	-30.589	PASS

IEEE 802.11ac VHT20							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-59.376	2.000	-57.376	Peak	-27.000	-30.376	PASS
5700.000	-60.351	2.000	-58.351	Peak	10.000	-68.351	PASS
5720.000	-59.277	2.000	-57.277	Peak	15.600	-72.877	PASS
5725.000	-56.132	2.000	-54.132	Peak	27.000	-81.132	PASS
5850.000	-60.764	2.000	-58.764	Peak	27.000	-85.764	PASS
5855.000	-60.403	2.000	-58.403	Peak	15.600	-74.003	PASS
5875.000	-60.395	2.000	-58.395	Peak	10.000	-68.395	PASS
5925.000	-59.849	2.000	-57.849	Peak	-27.000	-30.849	PASS

IEEE 802.11ac VHT40							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-60.577	2.000	-58.577	Peak	-27.000	-31.577	PASS
5700.000	-60.339	2.000	-58.339	Peak	10.000	-68.339	PASS
5720.000	-59.178	2.000	-57.178	Peak	15.600	-72.778	PASS
5725.000	-57.984	2.000	-55.984	Peak	27.000	-82.984	PASS
5850.000	-59.414	2.000	-57.414	Peak	27.000	-84.414	PASS
5855.000	-59.909	2.000	-57.909	Peak	15.600	-73.509	PASS
5875.000	-59.753	2.000	-57.753	Peak	10.000	-67.753	PASS
5925.000	-59.187	2.000	-57.187	Peak	-27.000	-30.187	PASS

IEEE 802.11ac VHT80							
Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
5650.000	-59.425	2.000	-57.425	Peak	-27.000	-30.425	PASS
5700.000	-59.141	2.000	-57.141	Peak	10.000	-67.141	PASS
5720.000	-57.307	2.000	-55.307	Peak	15.600	-70.907	PASS
5725.000	-56.819	2.000	-54.819	Peak	27.000	-81.819	PASS
5850.000	-56.757	2.000	-54.757	Peak	27.000	-81.757	PASS
5855.000	-56.054	2.000	-54.054	Peak	15.600	-69.654	PASS
5875.000	-56.874	2.000	-54.874	Peak	10.000	-64.874	PASS
5925.000	-59.121	2.000	-57.121	Peak	-27.000	-30.121	PASS

Combined Antenna 0, Antenna 1 and Antenna 2

IEEE 802.11n HT20										
Frequency (MHz)	Conducted Power (dBm)				Directional Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
	Antenna 0	Antenna 1	Antenna 2	Sum						
5650.000	-61.555	-60.080	-60.896	-56.030	6.771	-49.259	Peak	-27.000	-22.259	PASS
5700.000	-59.141	-58.786	-60.463	-54.634	6.771	-47.863	Peak	10.000	-57.863	PASS
5720.000	-59.514	-58.324	-58.398	-53.941	6.771	-47.170	Peak	15.600	-62.770	PASS
5725.000	-58.396	-56.980	-58.264	-53.060	6.771	-46.289	Peak	27.000	-73.289	PASS
5850.000	-58.362	-59.932	-58.494	-54.102	6.771	-47.331	Peak	27.000	-74.331	PASS
5855.000	-58.165	-59.952	-60.614	-54.679	6.771	-47.908	Peak	15.600	-63.508	PASS
5875.000	-59.309	-61.635	-59.772	-55.357	6.771	-48.586	Peak	10.000	-58.586	PASS
5925.000	-59.084	-58.185	-60.908	-54.479	6.771	-47.708	Peak	-27.000	-20.708	PASS

IEEE 802.11n HT40										
Frequency (MHz)	Conducted Power (dBm)				Directional Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
	Antenna 0	Antenna 1	Antenna 2	Sum						
5650.000	-59.853	-59.093	-60.709	-55.064	6.771	-48.293	Peak	-27.000	-21.293	PASS
5700.000	-57.923	-57.923	-58.791	-53.422	6.771	-46.651	Peak	10.000	-56.651	PASS
5720.000	-57.986	-57.986	-57.708	-53.120	6.771	-46.349	Peak	15.600	-61.949	PASS
5725.000	-57.697	-57.551	-58.352	-53.082	6.771	-46.311	Peak	27.000	-73.311	PASS
5850.000	-58.037	-57.756	-58.914	-53.437	6.771	-46.666	Peak	27.000	-73.666	PASS
5855.000	-56.736	-56.736	-58.635	-52.510	6.771	-45.739	Peak	15.600	-61.339	PASS
5875.000	-56.656	-56.656	-59.175	-52.574	6.771	-45.803	Peak	10.000	-55.803	PASS
5925.000	-58.615	-58.566	-59.589	-54.127	6.771	-47.356	Peak	-27.000	-20.356	PASS

IEEE 802.11ac VHT20										
Frequency (MHz)	Conducted Power (dBm)				Directional Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
	Antenna 0	Antenna 1	Antenna 2	Sum						
5650.000	-60.024	-60.427	-59.376	-55.149	6.771	-48.310	Peak	-27.000	-21.310	PASS
5700.000	-59.374	-59.482	-60.351	-54.943	6.771	-32.244	Peak	10.000	-42.244	PASS
5720.000	-58.658	-59.639	-59.277	-54.401	6.771	-19.881	Peak	15.600	-35.481	PASS
5725.000	-57.336	-57.149	-56.132	-52.068	6.771	-18.093	Peak	27.000	-45.093	PASS
5850.000	-59.614	-59.042	-60.764	-54.978	6.771	-31.490	Peak	27.000	-58.490	PASS
5855.000	-59.095	-58.618	-60.403	-54.537	6.771	-32.358	Peak	15.600	-47.958	PASS
5875.000	-58.720	-58.720	-60.395	-54.439	6.771	-42.337	Peak	10.000	-52.337	PASS
5925.000	-60.233	-58.669	-59.849	-54.760	6.771	-47.396	Peak	-27.000	-20.396	PASS

IEEE 802.11ac VHT40										
Frequency (MHz)	Conducted Power (dBm)				Directional Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
	Antenna 0	Antenna 1	Antenna 2	Sum						
5650.000	-60.047	-58.753	-60.577	-54.952	6.771	-48.378	Peak	-27.000	-21.378	PASS
5700.000	-57.784	-57.536	-60.339	-53.611	6.771	-48.172	Peak	10.000	-58.172	PASS
5720.000	-56.685	-56.380	-59.178	-52.476	6.771	-47.630	Peak	15.600	-63.230	PASS
5725.000	-57.765	-56.611	-57.984	-52.639	6.771	-45.297	Peak	27.000	-72.297	PASS
5850.000	-58.902	-57.812	-59.414	-53.886	6.771	-48.207	Peak	27.000	-75.207	PASS
5855.000	-58.788	-58.780	-59.909	-54.356	6.771	-47.766	Peak	15.600	-63.366	PASS
5875.000	-57.629	-57.629	-59.753	-53.457	6.771	-47.668	Peak	10.000	-57.668	PASS
5925.000	-59.163	-59.078	-59.187	-54.371	6.771	-47.989	Peak	-27.000	-20.989	PASS

IEEE 802.11ac VHT80										
Frequency (MHz)	Conducted Power (dBm)				Directional Gain (dBi)	EIRP (dBm/1MHz)	Detector	Limit (dBm/1MHz)	Over limit (dB)	Verdict
	Antenna 0	Antenna 1	Antenna 2	Sum						
5650.000	-60.666	-59.443	-59.425	-55.036	6.771	-48.265	Peak	-27.000	-21.265	PASS
5700.000	-59.193	-58.651	-59.141	-54.217	6.771	-47.446	Peak	10.000	-57.446	PASS
5720.000	-58.303	-56.876	-57.307	-52.684	6.771	-45.913	Peak	15.600	-61.513	PASS
5725.000	-57.956	-56.148	-56.819	-52.140	6.771	-45.369	Peak	27.000	-72.369	PASS
5850.000	-59.717	-59.611	-56.757	-53.695	6.771	-46.924	Peak	27.000	-73.924	PASS
5855.000	-58.342	-59.088	-56.054	-52.857	6.771	-46.086	Peak	15.600	-61.686	PASS
5875.000	-59.065	-58.602	-56.874	-53.303	6.771	-46.532	Peak	10.000	-56.532	PASS
5925.000	-60.913	-61.663	-59.121	-55.660	6.771	-48.889	Peak	-27.000	-21.889	PASS

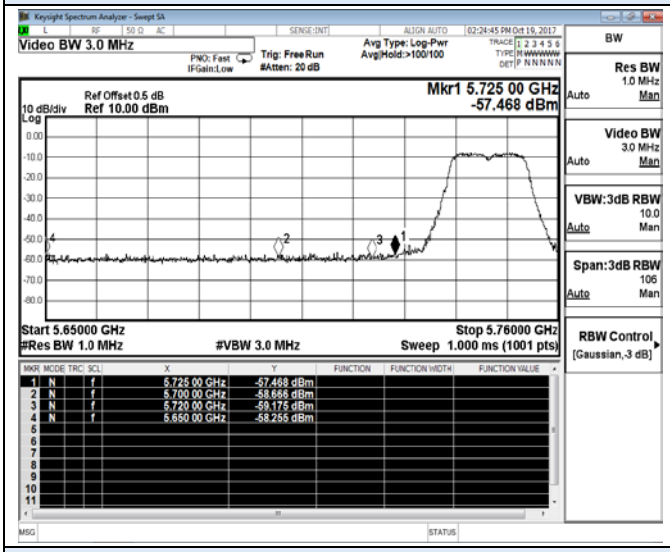
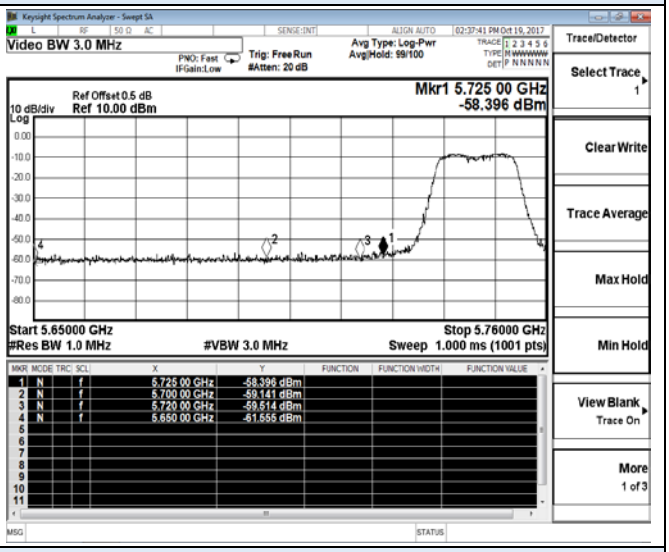
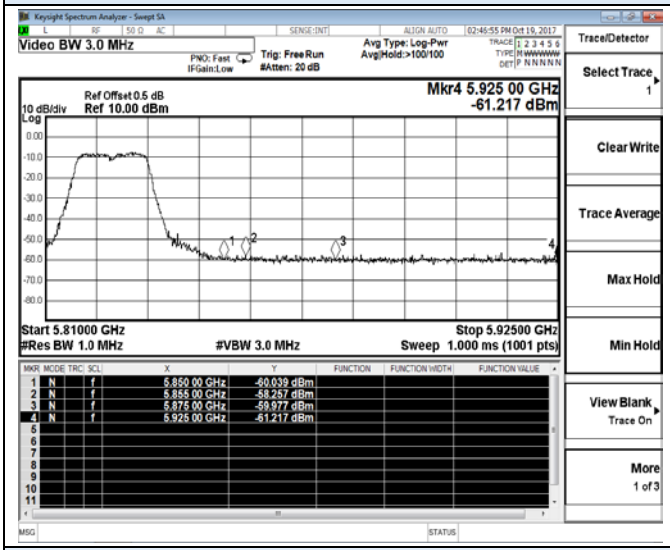
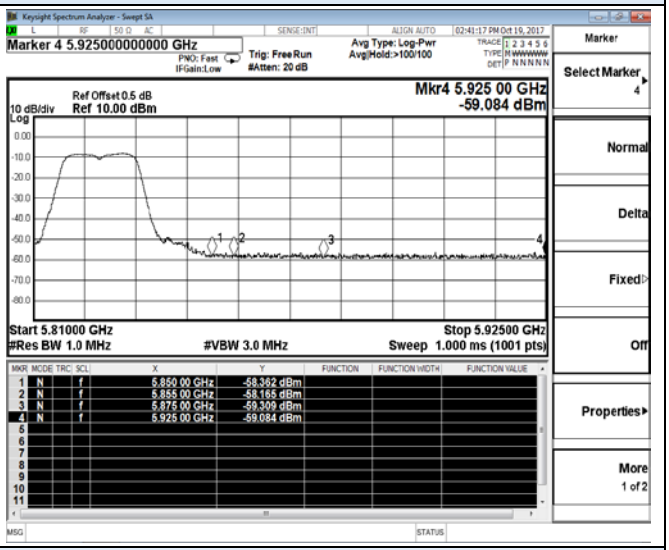
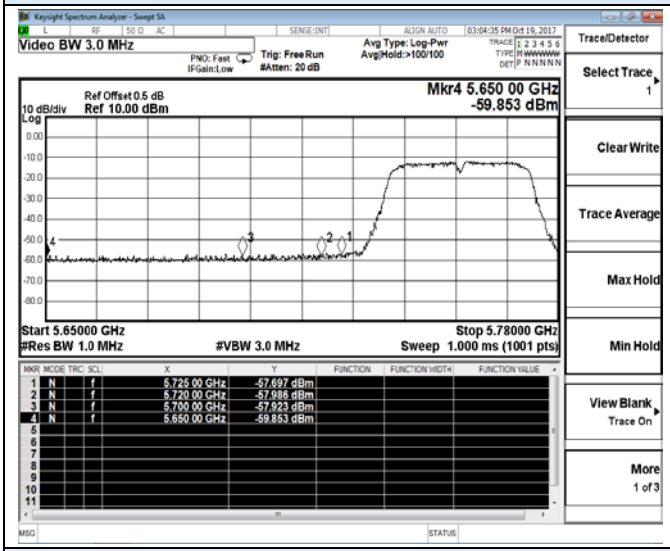
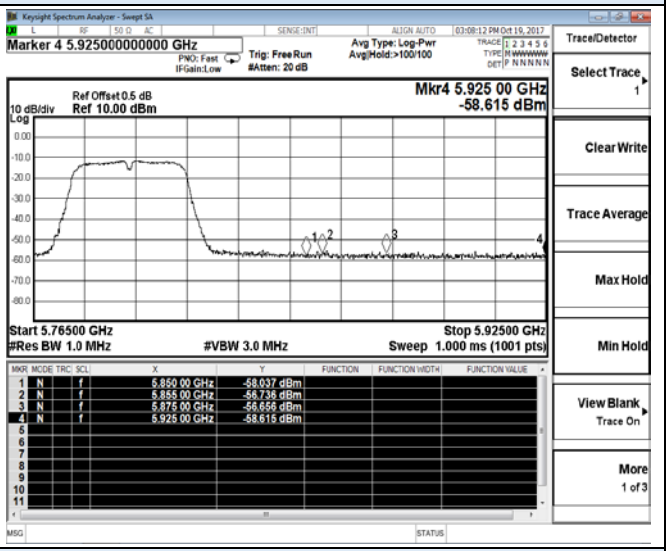
Remark:

1. *Measured unwanted emission at difference data rate for each mode and recorded worst case for each mode.*
2. *Test results including cable loss;*
3. *Worst case data at 6Mbps at IEEE 802.11a; MCS0 at IEEE 802.11n HT20, IEEE 802.11n HT40, IEEE 802.11a VHT20, IEEE 802.11ac VHT40 and IEEE 802.11ac VHT80;*
4. *For MIMO with technology device, The Directional Gain = Gain of individual transmit antennas (dBi) + Array Gain; Array Gain = 10*log (N_{ant}), Where N_{ant} is the number of transmit antennas.*
   *Directional Gain = 2.0 + 10*log (3) = 6.771dBi;*
5. *E.I.R.P = Conducted power + Directional Gain*
6. *EIRP calculation. A value representative of an upper bound on out-of-band antenna gain (in dBi) shall be added to the measured antenna-port conducted emission power to compute EIRP within the specified measurement bandwidth. (For emissions in the restricted bands, additional calculations are required to*

convert EIRP to field strength at the specified distance.) The upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands or 2 dBi, whichever is greater. However, for devices that operate in multiple bands using the same transmit antenna, the highest gain of the antenna within the operating band nearest to the out-of-band frequency being measured may be used in lieu of the overall highest gain when measuring emissions at frequencies within 20% of the absolute frequency at the nearest edge of that band, but in no case shall a value less than 2 dBi be selected.

7. *Over limit = EIRP - Limit*
8. *Please refer to following test plots;*

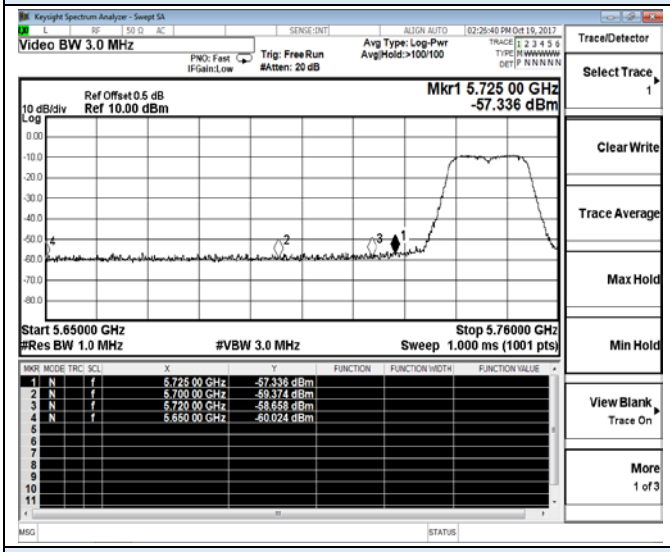
Unwanted emission

Antenna 0	Antenna 0
IEEE 802.11a	IEEE 802.11n HT20
	
Channel 149 / 5745 MHz – Peak	Channel 149 / 5745 MHz – Peak
	
Channel 165 / 5825 MHz – Peak	Channel 165 / 5825 MHz – Peak
IEEE 802.11n HT40	IEEE 802.11n HT40-Chain 0
	
Channel 151 / 5755 MHz – Peak	Channel 159 / 5795 MHz – Peak

Unwanted emission

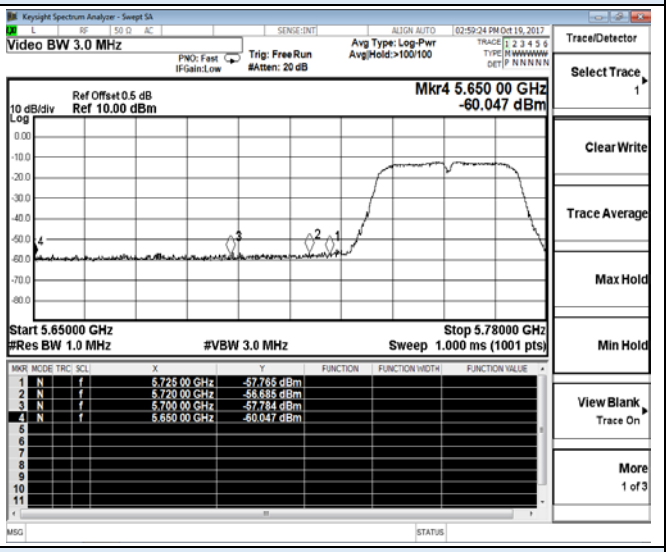
Antenna 0

IEEE 802.11ac VHT20

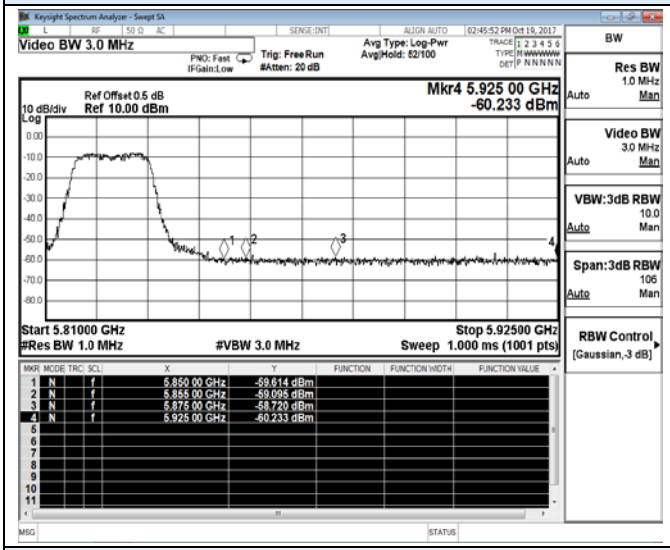


Channel 149 / 5745 MHz – Peak

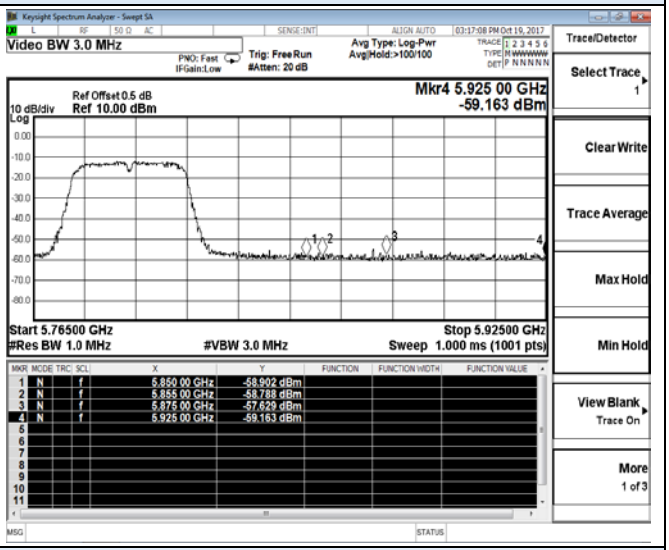
IEEE 802.11ac VHT40



Channel 151 / 5755 MHz – Peak



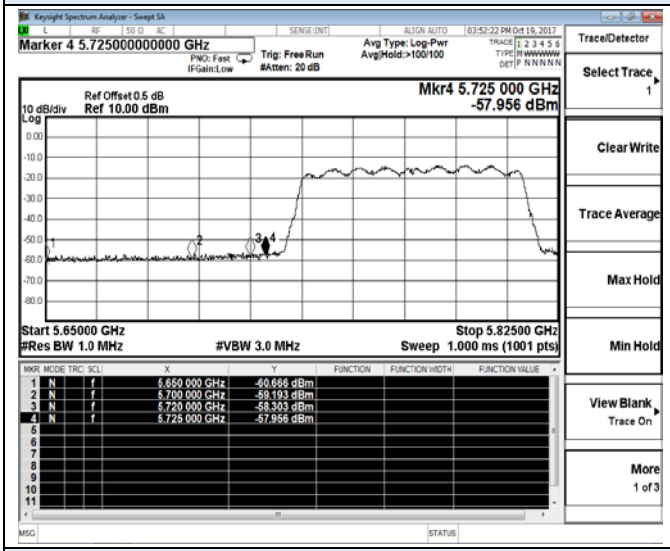
Channel 165 / 5825 MHz – Peak



Channel 159 / 5795 MHz – Peak

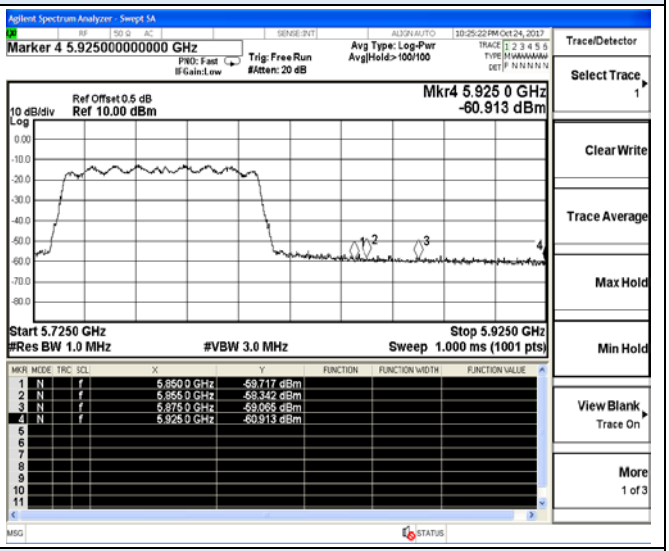
Antenna 0

IEEE 802.11ac VHT80



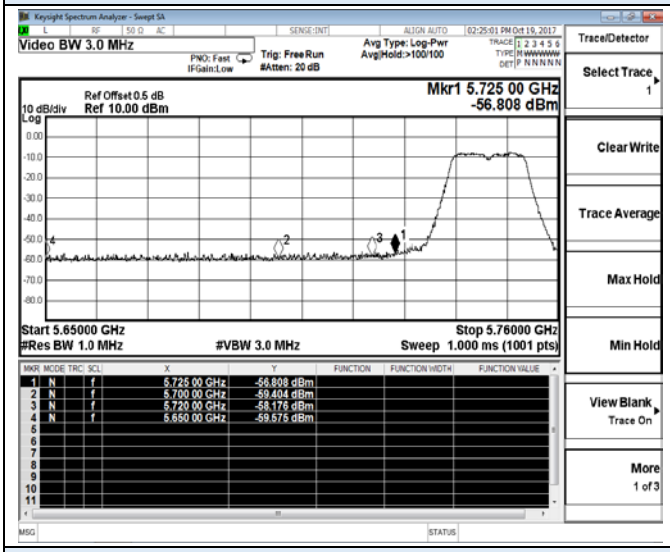
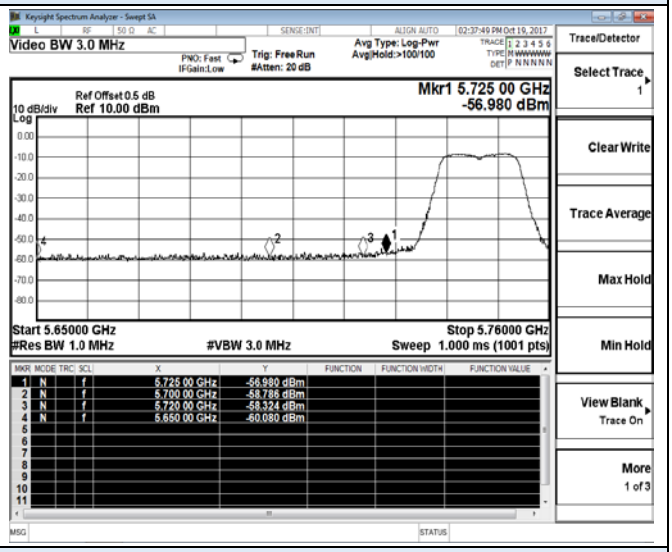
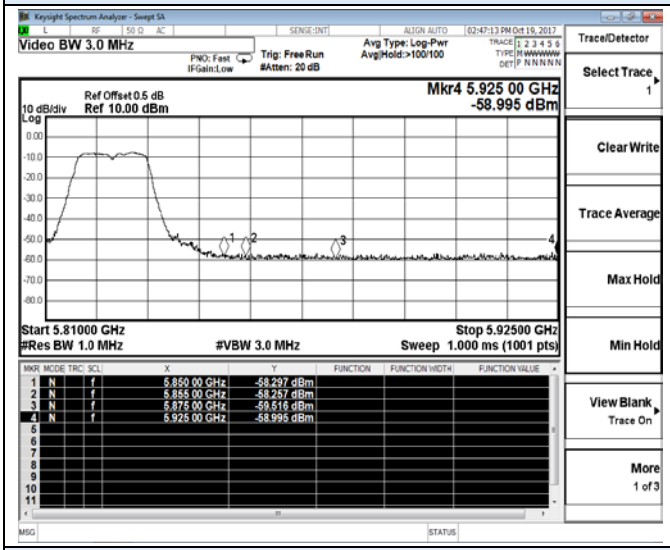
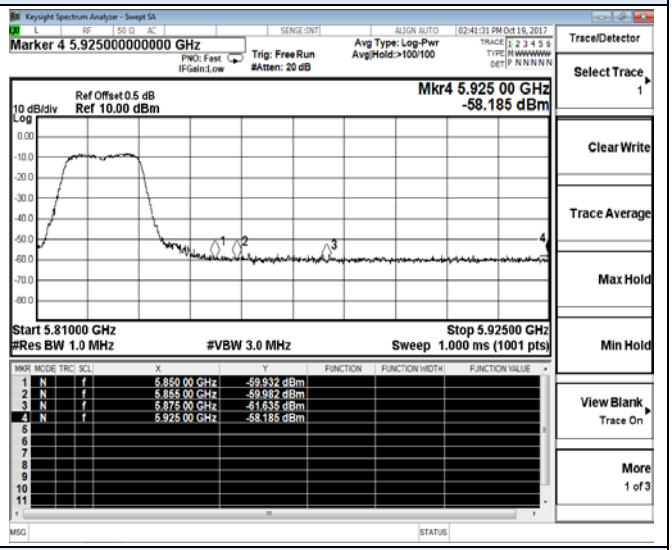
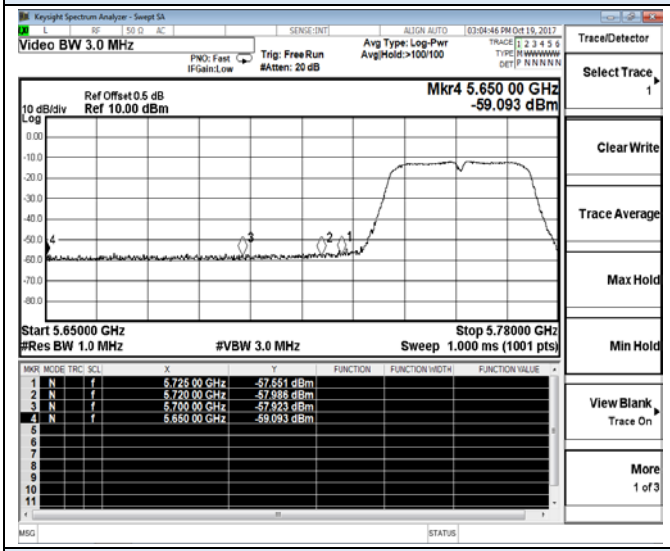
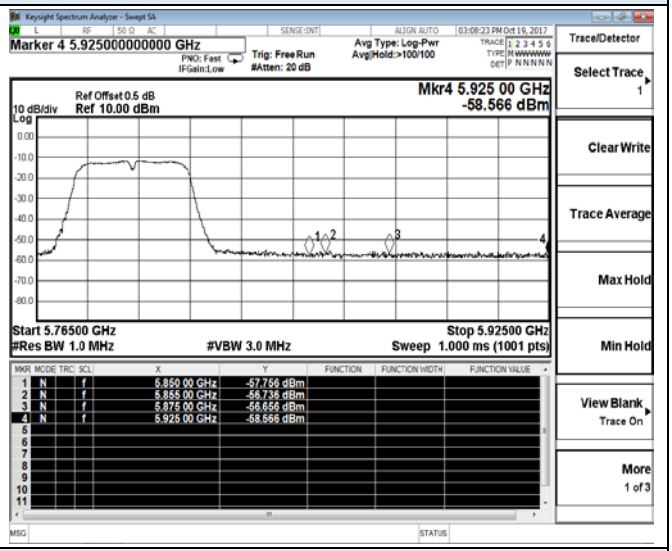
Channel 155 / 5775 MHz – Peak

IEEE 802.11ac VHT80

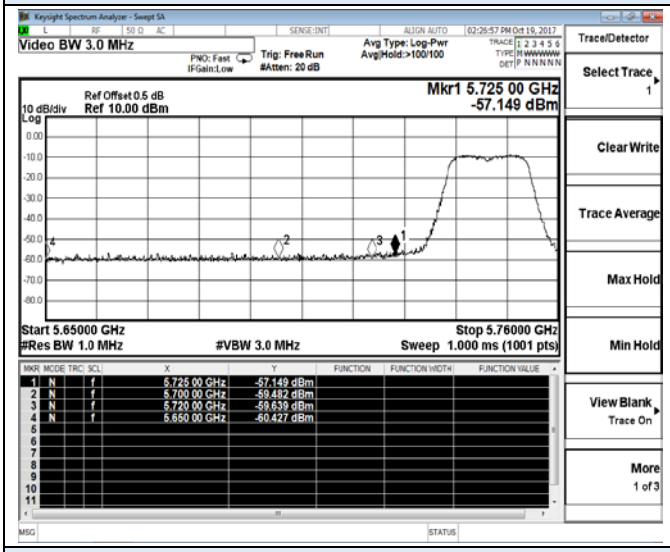
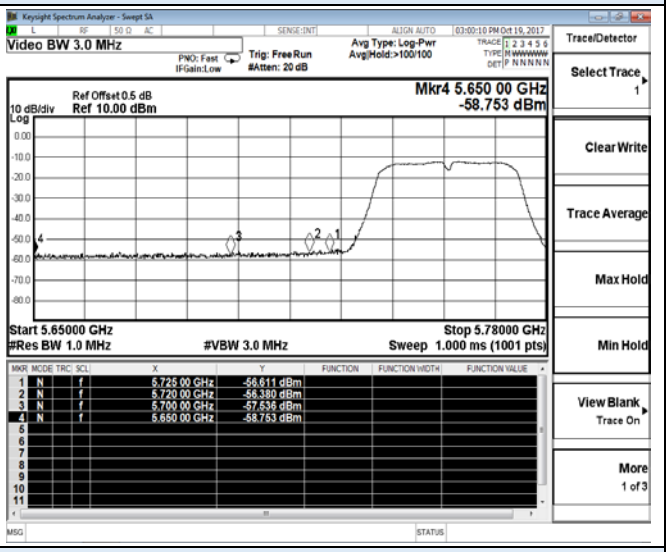
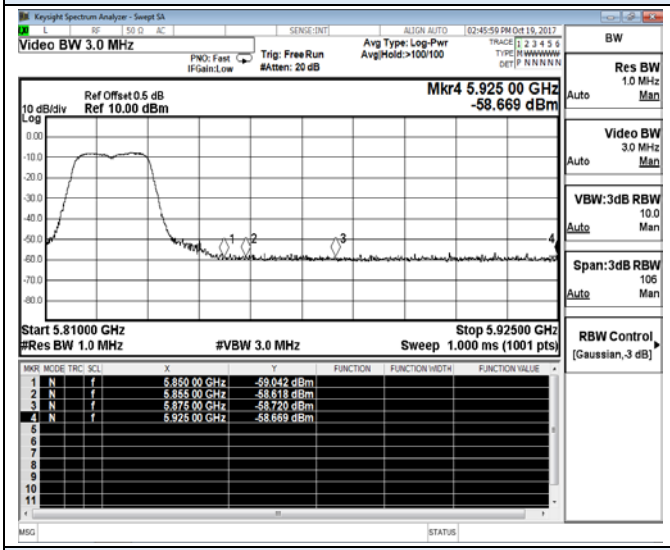
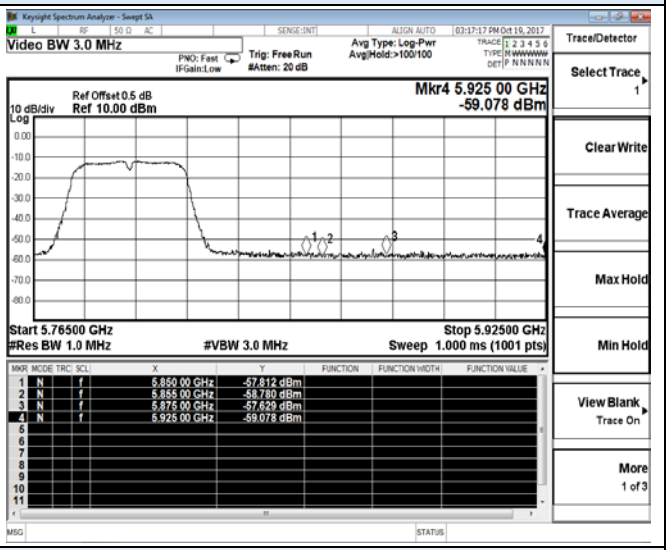
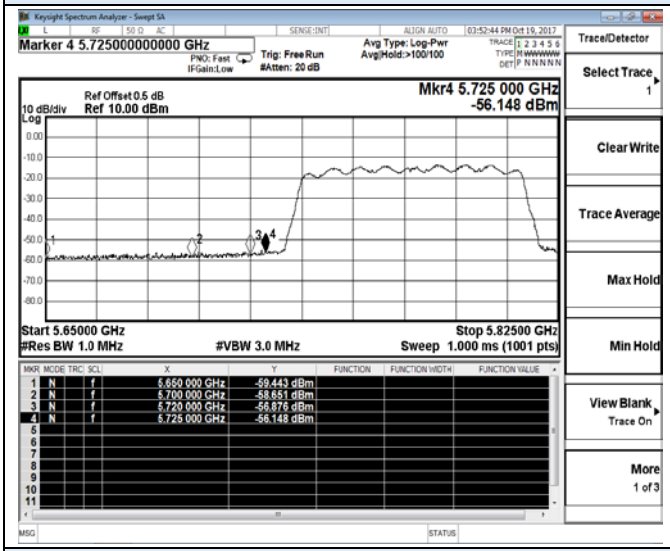
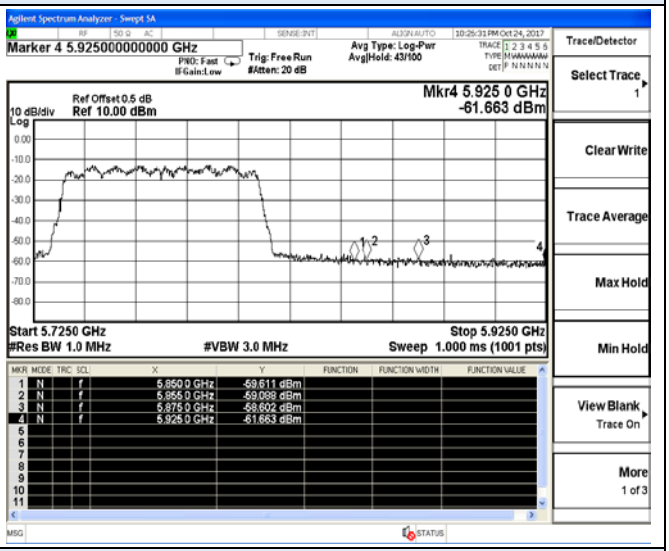


Channel 155 / 5775 MHz – Peak

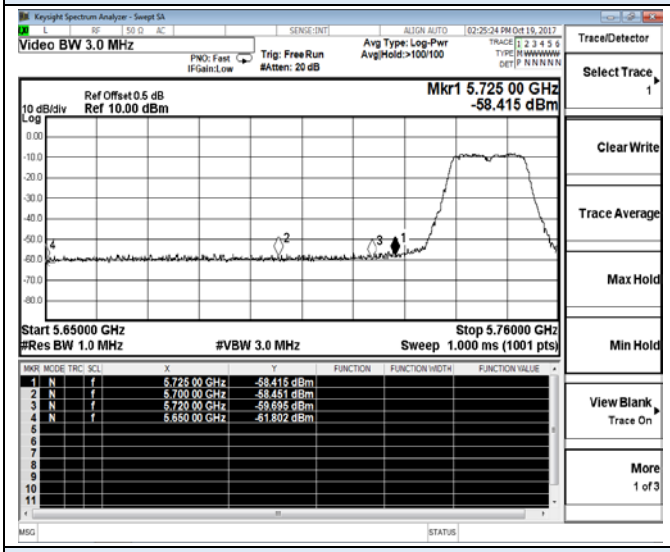
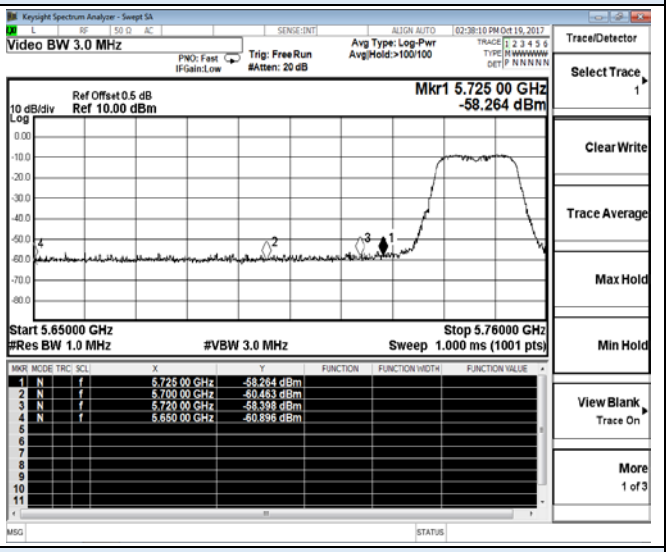
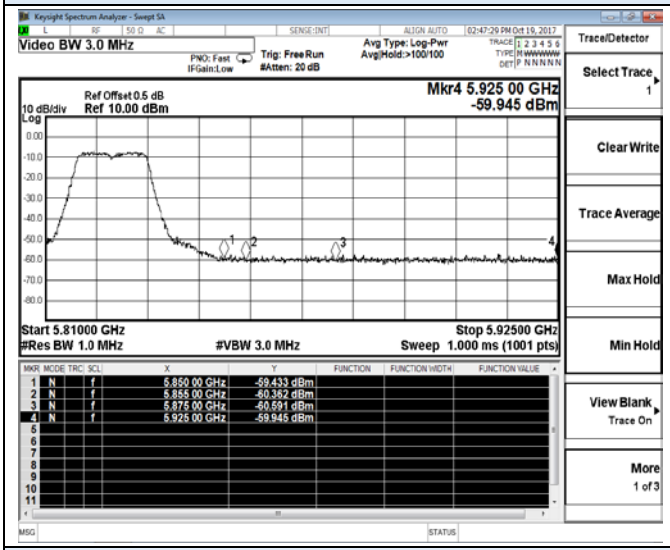
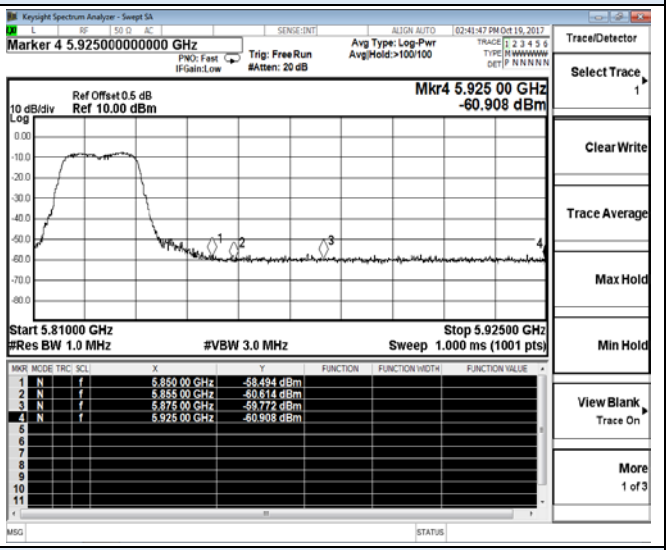
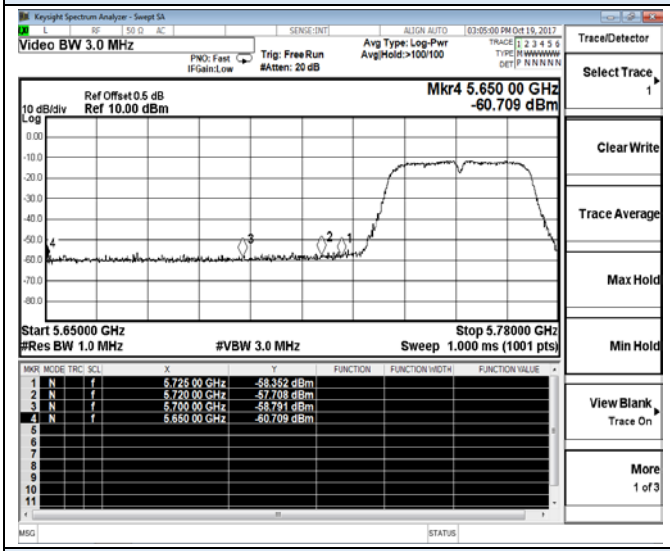
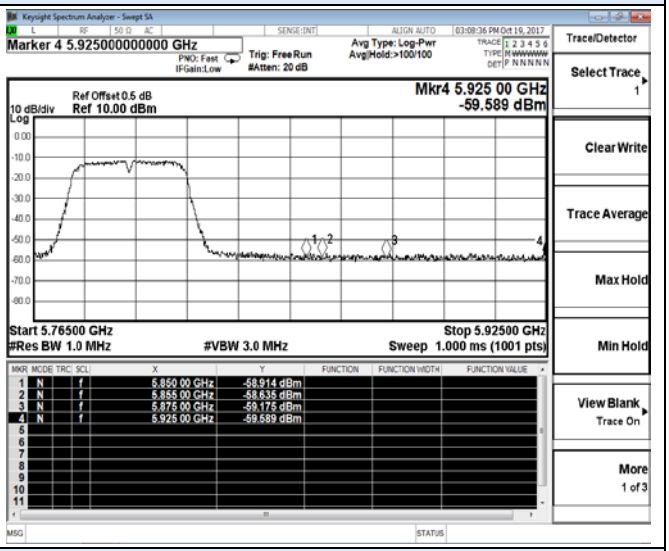
Unwanted emission

Antenna 1	Antenna 1
IEEE 802.11a	IEEE 802.11n HT20
	
Channel 149 / 5745 MHz – Peak	Channel 149 / 5745 MHz – Peak
	
Channel 165 / 5825 MHz – Peak	Channel 165 / 5825 MHz – Peak
IEEE 802.11n HT40	IEEE 802.11n HT40
	
Channel 151 / 5755 MHz – Peak	Channel 159 / 5795 MHz – Peak

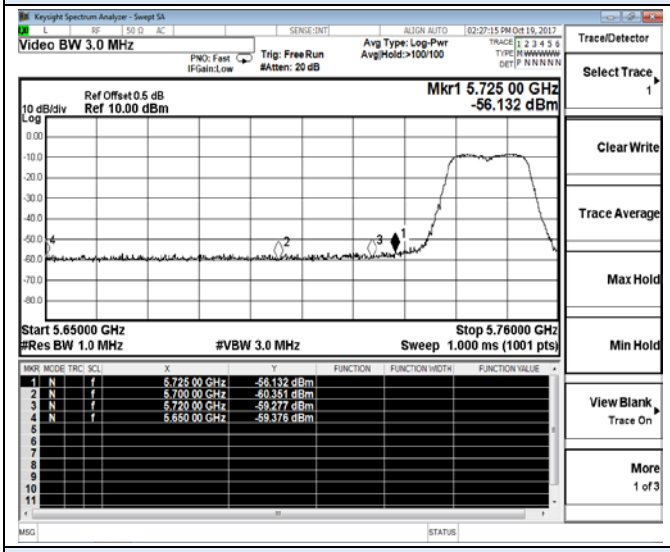
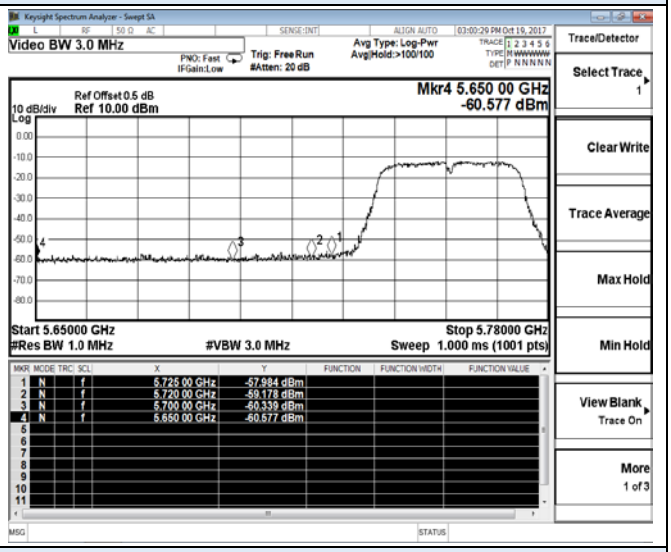
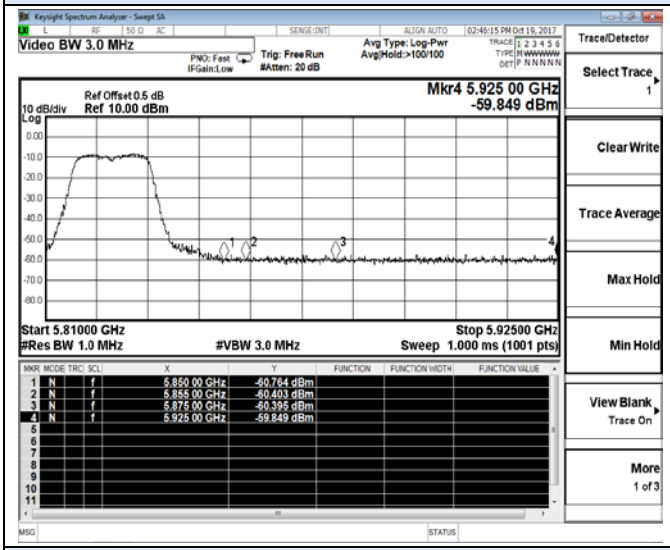
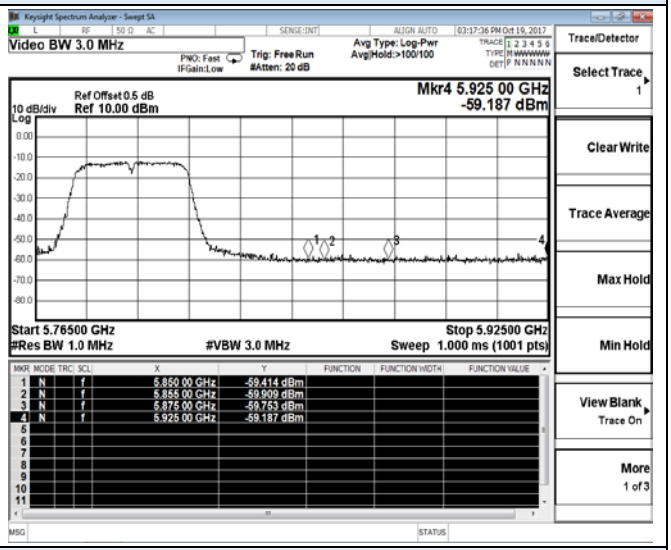
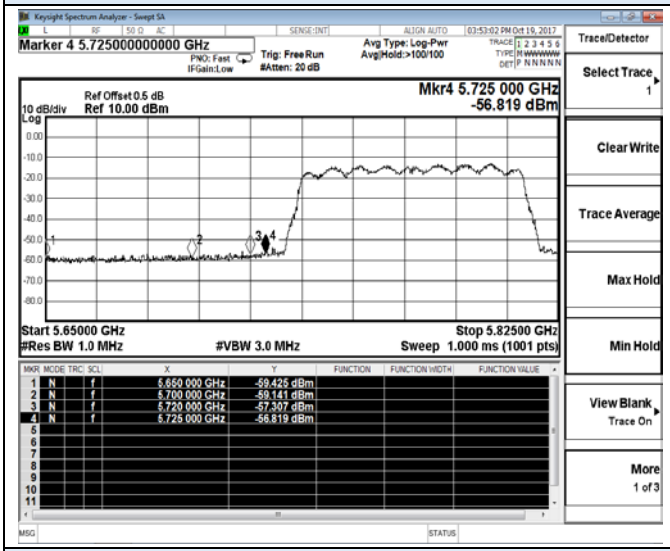
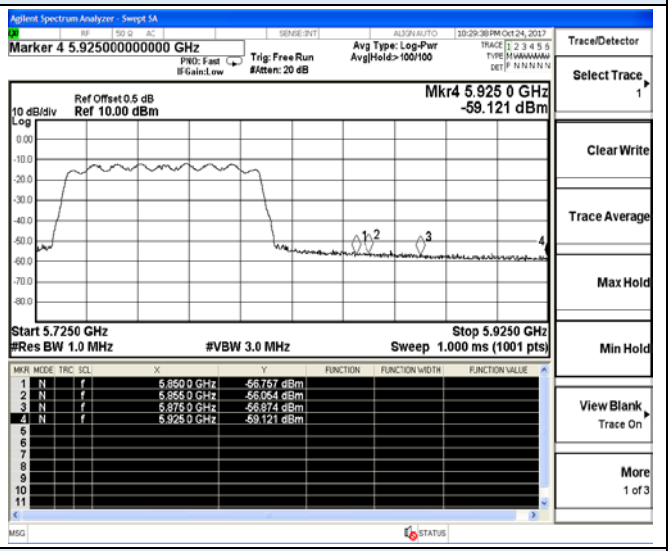
Unwanted emission

Antenna 1	Antenna 1
IEEE 802.11ac VHT20	IEEE 802.11ac VHT40
	
Channel 149 / 5745 MHz – Peak	Channel 151 / 5755 MHz – Peak
	
Channel 165 / 5825 MHz – Peak	Channel 159 / 5795 MHz – Peak
IEEE 802.11ac VHT80	IEEE 802.11ac VHT80
	
Channel 155 / 5775 MHz – Peak	Channel 155 / 5775 MHz – Peak

Unwanted emission

Antenna 2	Antenna 2
IEEE 802.11a	IEEE 802.11n HT20
	
Channel 149 / 5745 MHz – Peak	Channel 149 / 5745 MHz – Peak
	
Channel 165 / 5825 MHz – Peak	Channel 165 / 5825 MHz – Peak
IEEE 802.11n HT40	IEEE 802.11n HT40
	
Channel 151 / 5755 MHz – Peak	Channel 159 / 5795 MHz – Peak

Unwanted emission

Antenna 2	Antenna 2
IEEE 802.11ac VHT20	IEEE 802.11ac VHT40
	
Channel 149 / 5745 MHz – Peak	Channel 151 / 5755 MHz – Peak
	
Channel 165 / 5825 MHz – Peak	Channel 159 / 5795 MHz – Peak
IEEE 802.11ac VHT80	IEEE 802.11ac VHT80
	
Channel 155 / 5775 MHz – Peak	Channel 155 / 5775 MHz – Peak

5.8. Antenna Requirements

5.8.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 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, 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

And according to FCC 47 CFR Section 15.407 (a), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.8.2 Antenna Connected Construction

5.8.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

5.8.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 2.0dBi, and the antenna is a PCB antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.8.2.3. Results: Compliance.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.
Conducted power refers ANSI C63.10:2013 Output power test procedure for NII devices.
Radiated power refers to ANSI C63.10:2013 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep Time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

FCC	ISED
Antenna Gain	
6 dBi	

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For WLAN devices, the OFDM (IEEE 802.11a) mode is used;

Antenna 0

T_{nom}	V_{nom}	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with OFDM modulation		-0.124	-0.089	-0.178
Radiated power [dBm] Measured with OFDM modulation		1.650	1.692	1.614
Gain [dBi] Calculated		1.774	1.781	1.792
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Antenna 1

T_{nom}	V_{nom}	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with OFDM modulation		-0.141	-0.102	-0.173
Radiated power [dBm] Measured with OFDM modulation		1.548	1.694	1.615
Gain [dBi] Calculated		1.689	1.796	1.788
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

Antenna 2

T_{nom}	V_{nom}	Lowest Channel 5745 MHz	Middle Channel 5785 MHz	Highest Channel 5825 MHz
Conducted power [dBm] Measured with OFDM modulation		-0.129	-0.077	-0.154
Radiated power [dBm] Measured with OFDM modulation		1.632	1.706	1.753
Gain [dBi] Calculated		1.761	1.783	1.907
Measurement uncertainty			± 1.6 dB (cond.) / ± 3.8 dB (rad.)	

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	Power Meter	R&S	NRVS	100444	2017-06-17	2018-06-16
2	Power Sensor	R&S	NRV-Z81	100458	2017-06-17	2018-06-16
3	Power Sensor	R&S	NRV-Z32	10057	2017-06-17	2018-06-16
4	ESA-E SERIES SPECTRUM ANALYZER	Agilent	E4407B	MY41440754	2016-11-18	2017-11-17
5	MXA Signal Analyzer	Agilent	N9020A	MY49100040	2017-06-17	2018-06-16
6	SPECTRUM ANALYZER	R&S	FSP	100503	2017-06-17	2018-06-16
7	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17	2018-06-16
8	Positioning Controller	MF	MF-7082	/	2017-06-17	2018-06-16
9	EMI Test Software	AUDIX	E3	N/A	2017-06-17	2018-06-16
10	EMI Test Receiver	R&S	ESR 7	101181	2017-06-17	2018-06-16
11	AMPLIFIER	QuieTek	QTK-A2525G	CHM10809065	2016-11-18	2017-11-17
12	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2017-06-23	2018-06-22
13	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2017-05-02	2018-05-01
14	Horn Antenna	EMCO	3115	6741	2017-06-23	2018-06-22
15	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2017-09-21	2018-09-20
16	Broadband Preamplifier	SCHWARZBECK	BBV 9719	9719-025	2017-09-21	2018-09-20
17	RF Cable-R03m	Jye Bao	RG142	CB021	2017-06-17	2018-06-16
18	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-17	2018-06-16
19	TEST RECEIVER	R&S	ESCI	101142	2017-06-17	2018-06-16
20	RF Cable-CON	UTIFLEX	3102-26886-4	CB049	2017-06-17	2018-06-16
21	10dB Attenuator	SCHWARZBECK	MTS-IMP136	261115-001-0032	2017-06-17	2018-06-16
22	Artificial Mains	R&S	ENV216	101288	2017-06-17	2018-06-16
Note: All equipment is calibrated through GUANGZHOU LISAI CALIBRATION AND TEST CO.,LTD.						

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------