802.11ac VHT80

Test Channel	TX Channel 42	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antennal Polarity &Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5150.000	51.49	7.54	59.03	74.00	-14.97	peak	306	47
2	5150.000	36.33	7.54	43.87	54.00	-10.13	AVG	306	47
3 *	5210.000	98.12	8.84	106.96			peak	306	47
4 *	5210.000	75.17	8.84	84.01			AVG	306	47
5	10420.000	35.28	18.06	53.34	68.30	-14.96	peak	100	184
6	15630.000	36.06	22.21	58.27	74.00	-15.73	peak	100	251
7	15630.000	21.03	22.21	43.24	54.00	-10.76	AVG	100	251
Antennal Polarity &Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5150.000	50.70	7.54	58.24	74.00	-15.76	peak	285	86
2	5150.000	35.64	7.54	43.18	54.00	-10.82	AVG	285	86
3 *	5210.000	91.18	8.84	100.02			peak	285	86
4 *	5210.000	74.11	8.84	82.95			AVG	285	86
5	10420.000	35.60	18.06	53.66	68.30	-14.64	peak	100	55
6	15630.000	36.54	22.21	58.75	74.00	-15.25	peak	100	137
7	15630.000	21.08	22.21	43.29	54.00	-10.71	AVG	100	137

1-Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

2-Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).

3-The other emission levels were very low against the limit.

4-Margin value = Emission level – Limit value.

5- " * ": Fundamental frequency.

Test Channel	TX Channel 52	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antennal Polarity &Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5150.000	44.20	7.54	51.74	74.00	-22.26	peak	269	358
2	5150.000	27.08	7.54	34.62	54.00	-19.38	AVG	269	358
3 *	5290.000	100.67	6.54	107.21			peak	269	358
4 *	5290.000	78.09	6.54	84.63			AVG	269	358
5	10580.000	35.14	18.48	53.62	68.30	-14.68	peak	100	112
6	15870.000	36.53	22.15	58.68	74.00	-15.32	peak	100	243
7	15870.000	21.95	22.15	44.10	54.00	-9.90	AVG	100	243
Antennal Polarity &Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5150.000	41.81	7.54	49.35	74.00	-24.65	peak	332	61
2	5150.000	26.42	7.54	33.96	54.00	-20.04	AVG	332	61
3 *	5290.000	95.08	6.54	101.62			peak	332	61
4 *	5290.000	76.60	6.54	83.14			AVG	332	61
5	10580.000	34.54	18.48	53.02	68.30	-15.28	peak	100	125
6	15870.000	35.68	22.15	57.83	74.00	-16.17	peak	100	243
7	15870.000	21.97	22.15	44.12	54.00	-9.88	AVG	100	243

1-Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

2-Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).

3-The other emission levels were very low against the limit.

4-Margin value = Emission level – Limit value.

5- " * ": Fundamental frequency.

Test Channel	TX Channel 106	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antennal Polarity &Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5470.000	54.89	6.50	61.39	68.30	-6.91	peak	386	352
2 *	5530.000	95.57	6.60	102.17			peak	386	352
3 *	5530.000	76.85	6.60	83.45			AVG	386	352
4	11060.000	34.59	19.37	53.96	74.00	-20.04	peak	100	156
5	11060.000	19.77	19.37	39.14	54.00	-14.86	AVG	100	156
6	16590.000	36.76	23.67	60.43	68.30	-7.87	peak	100	273
Antennal Polarity &Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5470.000	46.06	6.50	52.56	68.30	-15.74	peak	387	59
2 *	5530.000	90.12	6.60	96.72			peak	387	59
3 *	5530.000	71.69	6.60	78.29			AVG	387	59
4	11060.000	35.28	19.37	54.65	74.00	-19.35	peak	100	198
5	11060.000	19.89	19.37	39.26	54.00	-14.74	AVG	100	198
6	16590.000	37.01	23.67	60.68	68.30	-7.62	peak	100	140

1-Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

2-Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).

3-The other emission levels were very low against the limit.

4-Margin value = Emission level – Limit value.

5- " * ": Fundamental frequency.

Test Channel	TX Channel 122	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antennal Polarity &Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1 *	5610.000	96.01	6.75	102.76			peak	369	360
2 *	5610.000	76.35	6.75	83.10			AVG	369	360
3	5725.000	39.81	6.96	46.77	68.30	-21.53	peak	369	360
4	11220.000	34.97	19.52	54.49	74.00	-19.51	peak	100	102
5	11220.000	20.10	19.52	39.62	54.00	-14.38	AVG	100	102
6	16830.000	37.28	24.54	61.82	68.30	-6.48	peak	100	248
Antennal Polarity &Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1 *	5610.000	89.59	6.75	96.34			peak	400	58
2 *	5610.000	70.33	6.75	77.08			AVG	400	58
3	5725.000	36.79	6.96	43.75	68.30	-24.55	peak	400	58
4	11220.000	34.26	19.52	53.78	74.00	-20.22	peak	100	215
5	11220.000	20.05	19.52	39.57	54.00	-14.43	AVG	100	215
6	16830.000	37.55	24.54	62.09	68.30	-6.21	peak	100	177

1-Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

2-Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).

3-The other emission levels were very low against the limit.

4-Margin value = Emission level – Limit value.

5- " * ": Fundamental frequency.

Test Channel	TX Channel 155	Detector Function	Peak (PK) Average (AV)
Frequency Range	1GHz ~ 40GHz		

Antennal Polarity &Test Distance: Horizontal at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5725.000	52.35	6.96	59.31	122.20	-62.89	peak	381	360
2 *	5775.000	95.16	7.02	102.18			peak	381	360
3 *	5775.000	76.73	7.02	83.75			AVG	381	360
4	5858.000	43.70	7.22	50.92	109.96	-59.04	peak	381	360
6	11550.000	32.38	19.76	52.14	74.00	-21.86	peak	100	142
7	11550.000	19.74	19.76	39.50	54.00	-14.50	AVG	100	142
8	17325.000	33.20	26.55	59.75	68.30	-8.55	peak	100	263
Antennal Polarity &Test Distance: Vertical at 3 m									
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)
1	5725.000	46.50	6.96	53.46	122.20	-68.74	peak	300	64
2 *	5775.000	89.09	7.02	96.11			peak	300	64
3 *	5775.000	69.06	7.02	76.08			AVG	300	64
4	5850.500	39.87	7.20	47.07	121.06	-73.99	peak	300	64
6	11550.000	33.04	19.76	52.80	74.00	-21.20	peak	100	153
7	11550.000	19.79	19.76	39.55	54.00	-14.45	AVG	100	153
8	17325.000	33.93	26.55	60.48	68.30	-7.82	peak	100	289

1-Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

2-Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).

3-The other emission levels were very low against the limit.

4-Margin value = Emission level – Limit value.

5- " * ": Fundamental frequency.

3.2 Conducted emission measurement

3.2.1 Limits of conducted emission measurement

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

NOTE: 1.The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.2.2 Test instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
EMI Test Receiver Rohde&Schwarz	ESCI3	101418	2019-10-18	2020-10-17
Artificial Mains Network Rohde&Schwarz	ENV216	3560.6550.15	2019-10-18	2020-10-17
Test software FARAD	EZ_EMC V1.1.4.2	N/A	N/A	N/A

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

2. The test was performed in Shielded Room 743.

3.2.3 Test procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

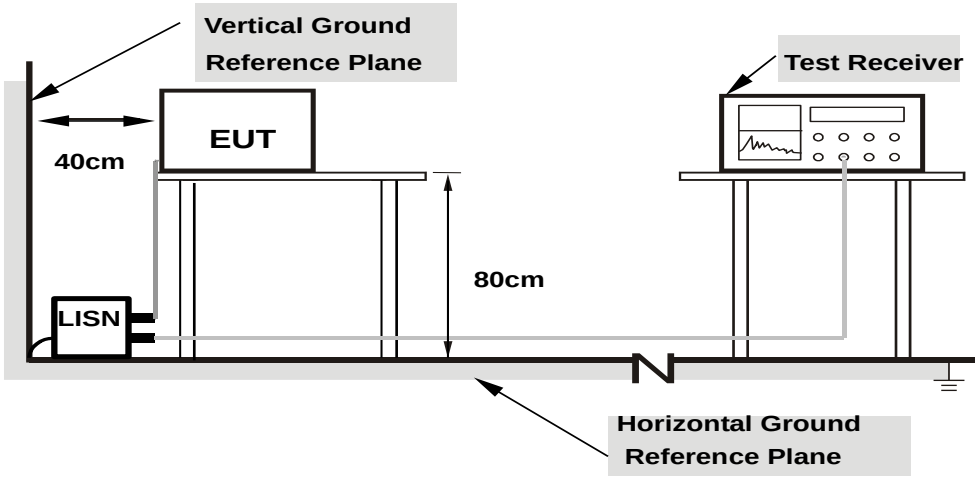
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

Note: All modes of operation were investigated and the worst-case emissions are reported.

3.2.4 Deviation from test standard

No deviation.

3.2.5 Test setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.2.6 EUT operating conditions

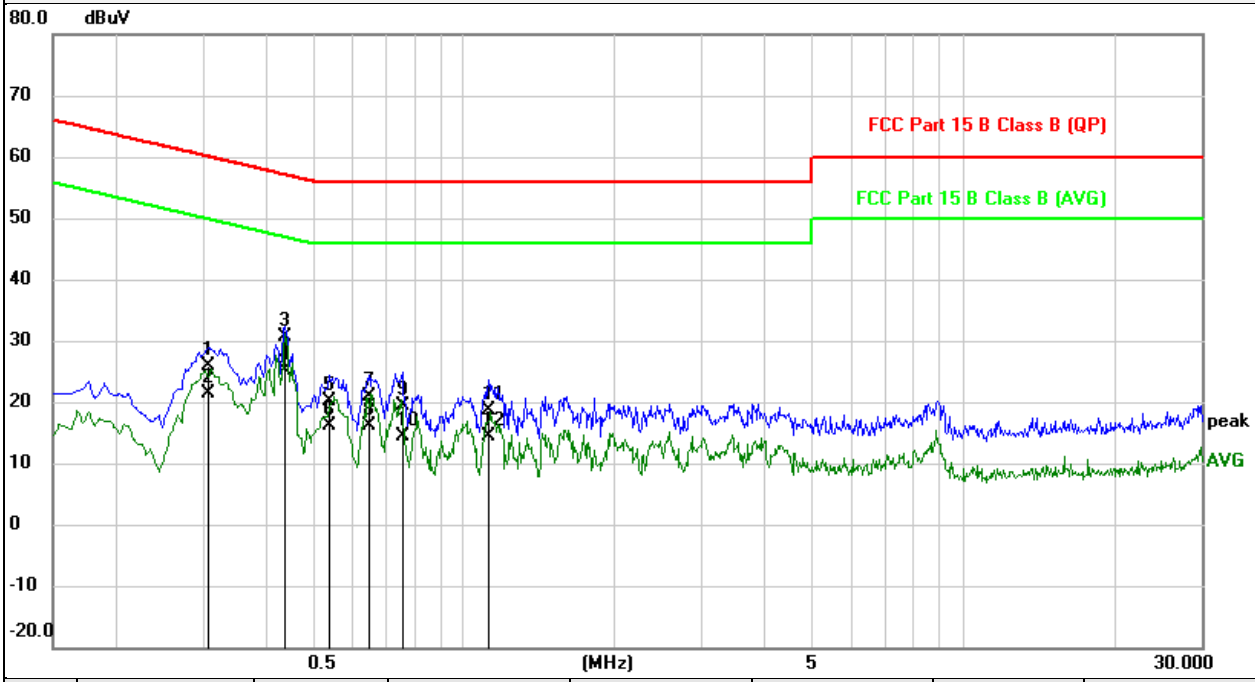
Same as section 2.5

3.2.7 Test results

Conducted worst-case data: 802.11a

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution band width	Quasi-Peak (QP) /Average (AV), 9kHz
Power supply	DC 19V from adapter		

Phase Of Power: Line (L)

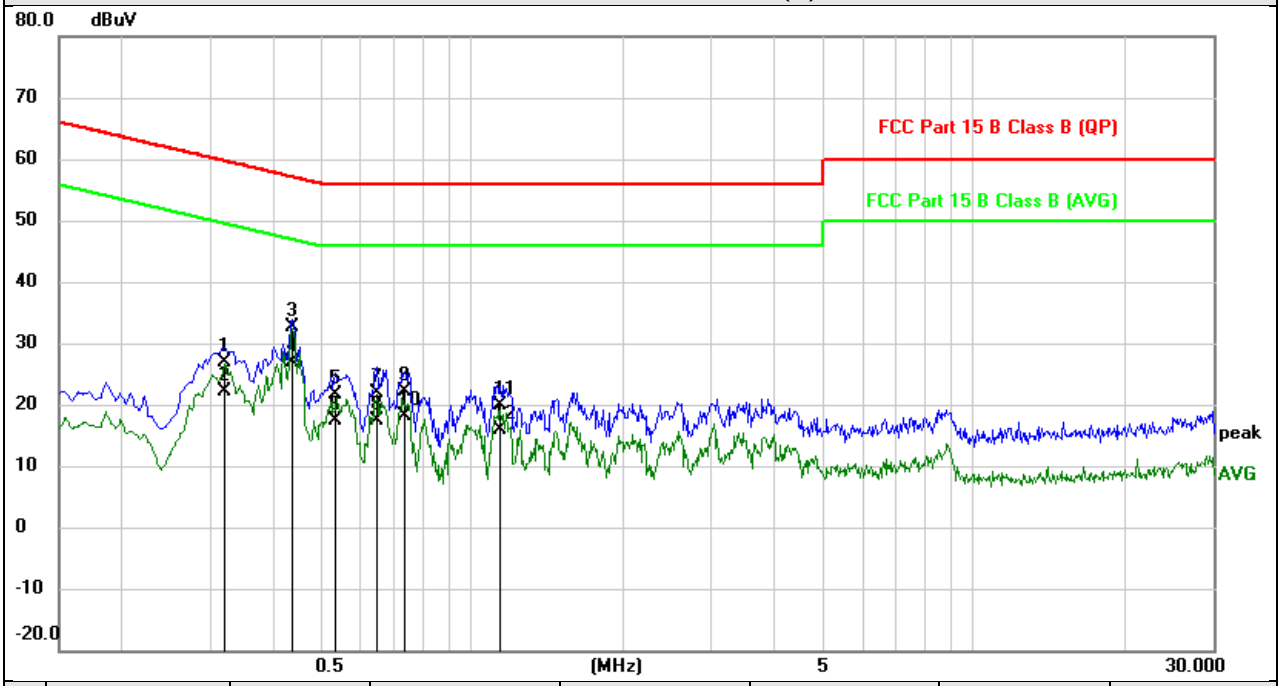


No	Frequency (MHz)	Reading (dBuV)	Correct Factor dB	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Remark Detector
1	0.3075	16.20	9.61	25.81	60.04	-34.23	QP
2	0.3075	11.75	9.61	21.36	50.04	-28.68	AVG
3	0.4380	21.12	9.58	30.70	57.10	-26.40	QP
4	0.4380	15.49	9.58	25.07	47.10	-22.03	AVG
5	0.5370	10.49	9.59	20.08	56.00	-35.92	QP
6	0.5370	6.53	9.59	16.12	46.00	-29.88	AVG
7	0.6450	11.30	9.59	20.89	56.00	-35.11	QP
8	0.6450	6.50	9.59	16.09	46.00	-29.91	AVG
9	0.7530	9.69	9.59	19.28	56.00	-36.72	QP
10	0.7530	4.81	9.59	14.40	46.00	-31.60	AVG
11	1.1220	9.04	9.55	18.59	56.00	-37.41	QP
12	1.1220	4.93	9.55	14.48	46.00	-31.52	AVG

Remarks: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution band width	Quasi-Peak (QP)/Average (AV), 9kHz
Power supply	DC 19V from adapter		

Phase Of Power: NEUTral (N)



No	Frequency (MHz)	Reading (dBuV)	Correct Factor dB	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Remark Detector
1	0.3209	17.28	9.61	26.89	59.68	-32.79	QP
2	0.3209	12.58	9.61	22.19	49.68	-27.49	AVG
3	0.4380	22.97	9.58	32.55	57.10	-24.55	QP
4	0.4380	17.34	9.58	26.92	47.10	-20.18	AVG
5	0.5325	12.04	9.59	21.63	56.00	-34.37	QP
6	0.5325	7.80	9.59	17.39	46.00	-28.61	AVG
7	0.6450	12.37	9.59	21.96	56.00	-34.04	QP
8	0.6450	7.70	9.59	17.29	46.00	-28.71	AVG
9	0.7350	12.65	9.59	22.24	56.00	-33.76	QP
10	0.7350	8.43	9.59	18.02	46.00	-27.98	AVG
11	1.1355	10.32	9.55	19.87	56.00	-36.13	QP
12	1.1355	6.34	9.55	15.89	46.00	-30.11	AVG

Remarks:
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

3.3 Transmit power measurement

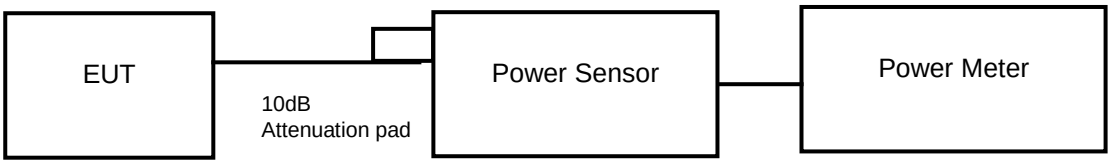
3.3.1 Limits of transmit power measurement

Operation Band	EUT Category		Limit
U-NII-1	-	Outdoor Access Point	1 Watt (30 dBm) (Max. e.i.r.p ≦ 125mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon)
	-	Fixed point-to-point Access Point	1 Watt (30 dBm)
	-	Indoor Access Point	1 Watt (30 dBm)
	√	Mobile and Portable client device	250mW (24 dBm)
U-NII-2A	√		250mW(24dBm) or 11 dBm+10LogB*
U-NII-2C	√		250mW(24dBm) or 11 dBm+10LogB*
U-NII-3	√		1 Watt (30 dBm)

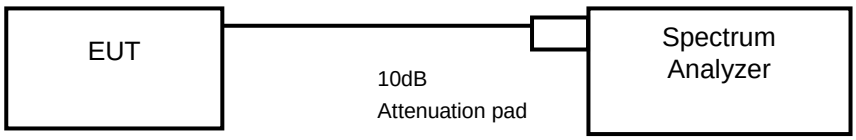
NOTE: 1. Where B is the 26dB emission bandwidth in MHz.

3.3.2 Test setup

For conducted power measurement setup:



For 6/26dB bandwidth test setup



3.3.3 EUT operating conditions

The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.

3.3.4 Test instruments

Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
Spectrum Keysight	N9020A	MY51240612	2020/10/17
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2020/10/17
Power Meter10Hz~18GHz Tonscend	JS0806-2	188060126	2020/10/17
Signal generator Keysight	N5182A	GB40051020	2020/10/17
Signal generator Keysight	N5182A	MY47420944	2020/10/17
Test Software Tonscend	JS0806-2	NA	NA

Note: 3. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

4. The test was performed in Chamber 1.

3.3.5 Test procedure

*For average power measurement:

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

*For 26dB bandwidth measurement:

1) Set RBW = approximately 1% of the emission bandwidth.
2) Set the VBW > RBW.
3) Detector = RMS.
4) Trace mode = max hold.
5) Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

*For 6dB bandwidth measurement:

1) Set RBW = 100 kHz.
2) Set the video bandwidth (VBW) ≥ 3 RBW.
3) Detector = Peak.
4) Trace mode = max hold.
5) Sweep = auto couple.
6) Allow the trace to stabilize.
7) 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.

3.3.6 Deviation from test standard

No deviation.

3.3.7 Test results

Conducted Output power:

802.11a

Channel Number	Freq. (MHz)	AVG. conducted power (dBm)		AVG. conducted power (mW)		Total Max. power output		Limit (dBm)	Pass /Fail
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
36	5180	3.72	4.22	2.355	2.642	4.997	6.99	20.44	Pass
40	5200	4.14	3.83	2.594	2.415	5.010	7.00	20.44	Pass
48	5240	4.57	4.14	2.864	2.594	5.458	7.37	20.44	Pass
52	5260	8.86	9.45	7.691	8.810	16.502	12.18	20.44	Pass
60	5300	8.59	8.11	7.228	6.471	13.699	11.37	20.44	Pass
64	5320	8.31	8.62	6.776	7.278	14.054	11.48	20.44	Pass
100	5500	8.02	8.41	6.339	6.934	13.273	11.23	20.44	Pass
120	5600	8.84	9.06	7.656	8.054	15.710	11.96	20.44	Pass
140	5700	9.44	9.63	8.790	9.183	17.974	12.55	20.44	Pass
149	5745	5.64	5.59	3.664	3.622	7.287	8.63	26.66	Pass
157	5785	4.39	4.53	2.748	2.838	5.586	7.47	26.66	Pass
165	5825	3.22	3.61	2.099	2.296	4.395	6.43	26.66	Pass

For Band 2~Band 3:

Limit = 11dBm+10*log (22.72) =24.56 > 24dBm

Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

802.11n (20MHz)

Channel Number	Freq. (MHz)	AVG. conducted power (dBm)		AVG. conducted power (mW)		Total Max. power output		Limit (dBm)	Pass /Fail
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
36	5180	4.42	4.13	2.767	2.588	5.355	7.29	20.44	Pass
40	5200	4.34	4.43	2.716	2.773	5.490	7.40	20.44	Pass
48	5240	4.12	4.32	2.582	2.704	5.286	7.23	20.44	Pass
52	5260	9.03	9.42	7.998	8.750	16.748	12.24	20.44	Pass
60	5300	7.64	8.22	5.808	6.637	12.445	10.95	20.44	Pass
64	5320	7.82	8.36	6.053	6.855	12.908	11.11	20.44	Pass
100	5500	7.99	8.38	6.295	6.887	13.182	11.20	20.44	Pass
120	5600	8.54	9.16	7.145	8.241	15.386	11.87	20.44	Pass
140	5700	9.38	9.59	8.670	9.099	17.769	12.50	20.44	Pass
149	5745	6.68	6.73	4.656	4.710	9.366	9.72	26.44	Pass
157	5785	4.62	5.12	2.897	3.251	6.148	7.89	26.44	Pass
165	5825	4.25	4.71	2.661	2.958	5.619	7.50	26.44	Pass

For Band 2~Band 3:

Power Limit = 11dBm+10*log (26 BW) > 24dBm

Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

802.11n (40MHz)

Channel Number	Freq. (MHz)	AVG. conducted power (dBm)		AVG. conducted power (mW)		Total Max. power output		Limit (dBm)	Pass /Fail
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
38	5190	2.74	3.06	1.879	2.023	3.902	5.91	20.44	Pass
46	5230	2.95	3.19	1.972	2.084	4.057	6.08	20.44	Pass
54	5270	5.92	6.19	3.908	4.159	8.068	9.07	20.44	Pass
62	5310	4.82	5.11	3.034	3.243	6.277	7.98	20.44	Pass
102	5510	5.38	5.69	3.451	3.707	7.158	8.55	20.44	Pass
118	5590	6.24	6.32	4.207	4.285	8.493	9.29	20.44	Pass
134	5670	4.49	4.83	2.812	3.041	5.853	7.67	20.44	Pass
151	5755	4.22	4.53	2.642	2.838	5.480	7.39	26.44	Pass
159	5795	3.68	3.75	2.333	2.371	4.705	6.73	26.44	Pass

Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

802.11ac (80MHz)

Channel Number	Freq. (MHz)	AVG. conducted power (dBm)		AVG. Conducted power (mW)		Total Max. power output		Limit (dBm)	Pass /Fail
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
42	3.74	3.74	3.95	2.366	2.483	4.849	6.86	20.44	Pass
58	5290	7.49	7.86	5.610	6.109	11.720	10.69	20.44	Pass
106	5530	6.48	6.63	4.446	4.603	9.049	9.57	20.44	Pass
122	5610	6.69	7.10	4.667	5.129	9.795	9.91	20.44	Pass
155	5775	5.15	5.49	3.273	3.540	6.813	8.33	26.66	Pass

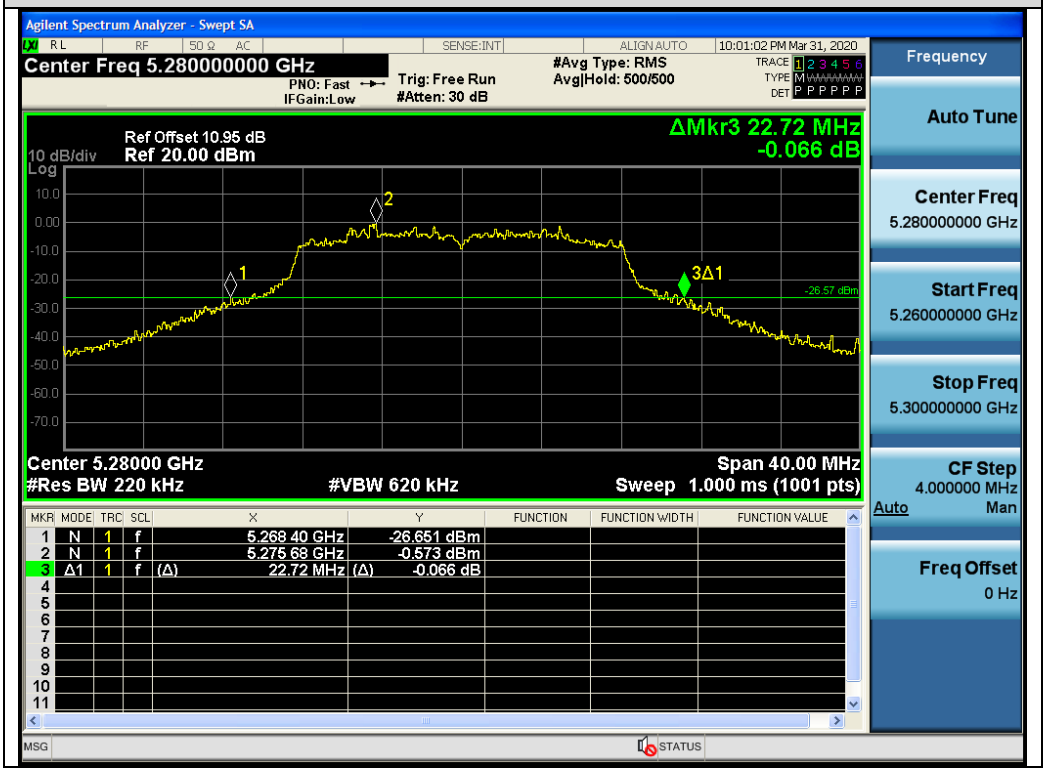
Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

3.3.8 26dB bandwidth for 5150~5725MHz

802.11a

Channel Number	Freq. (MHz)	26dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
36	5180	23.76	24.12	Pass
40	5200	23.76	23.92	Pass
48	5240	23.12	23.72	Pass
52	5260	23.84	24.12	Pass
56	5280	22.75	**22.72**	Pass
64	5320	24.28	23.94	Pass
100	5500	23.55	23.65	Pass
116	5580	23.64	24.20	Pass
140	5700	23.68	23.70	Pass

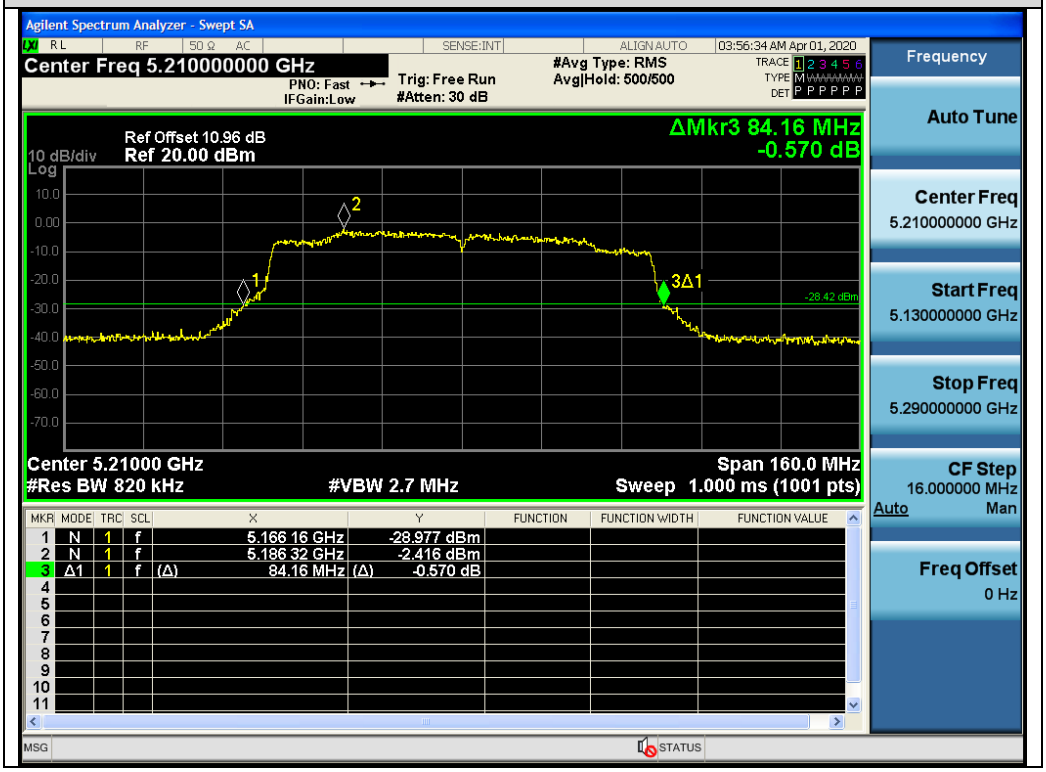
Spectrum plot of worst value



802.11ac (80MHz)

Channel Number	Freq. (MHz)	26dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
42	5210	84.80	**84.16**	Pass
58	5290	84.16	84.16	Pass
106	5530	86.55	87.20	Pass
122	5610	86.24	87.36	Pass

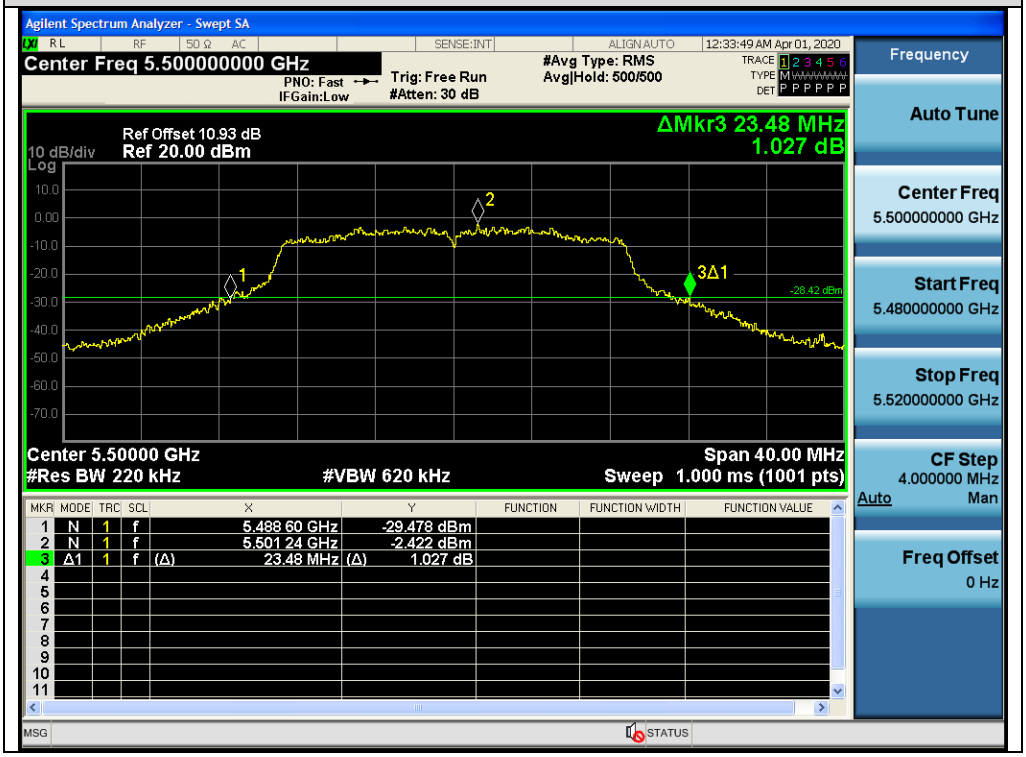
Spectrum plot of worst value



802.11n (20MHz)

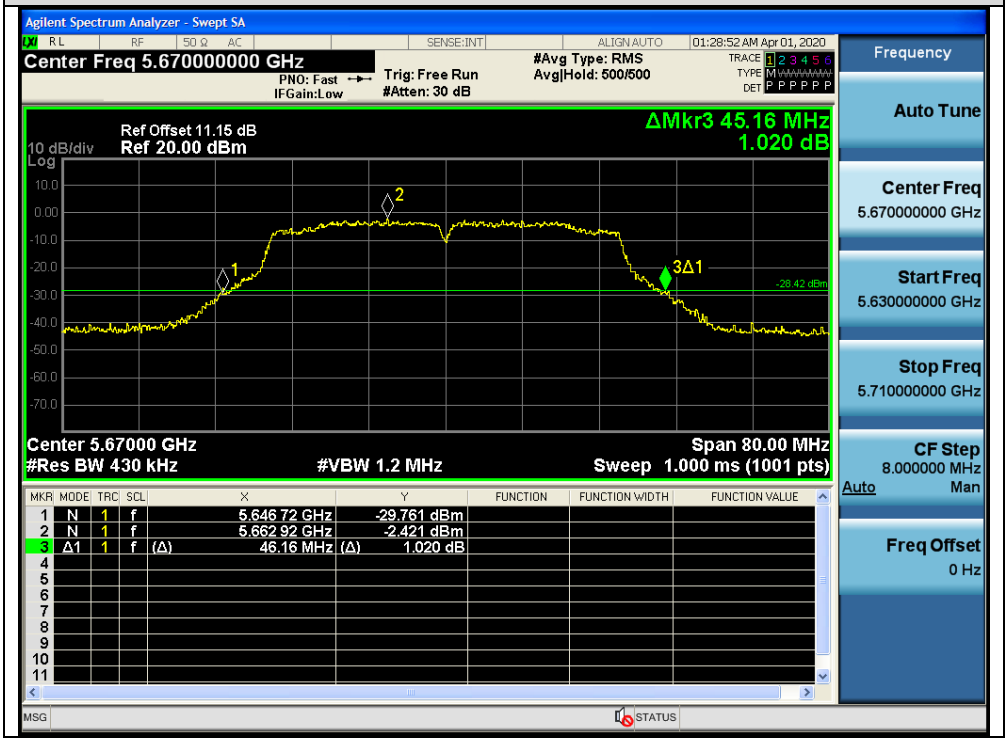
Channel Number	Freq. (MHz)	26dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
36	5180	23.80	23.96	Pass
40	5200	24.48	23.60	Pass
48	5240	24.28	24.08	Pass
52	5260	24.04	24.44	Pass
60	5280	24.32	23.70	Pass
64	5320	24.17	24.84	Pass
100	5500	**23.48**	23.92	Pass
116	5580	23.88	23.55	Pass
140	5700	23,97	24.20	Pass

Spectrum plot of worst value



802.11n (40MHz)

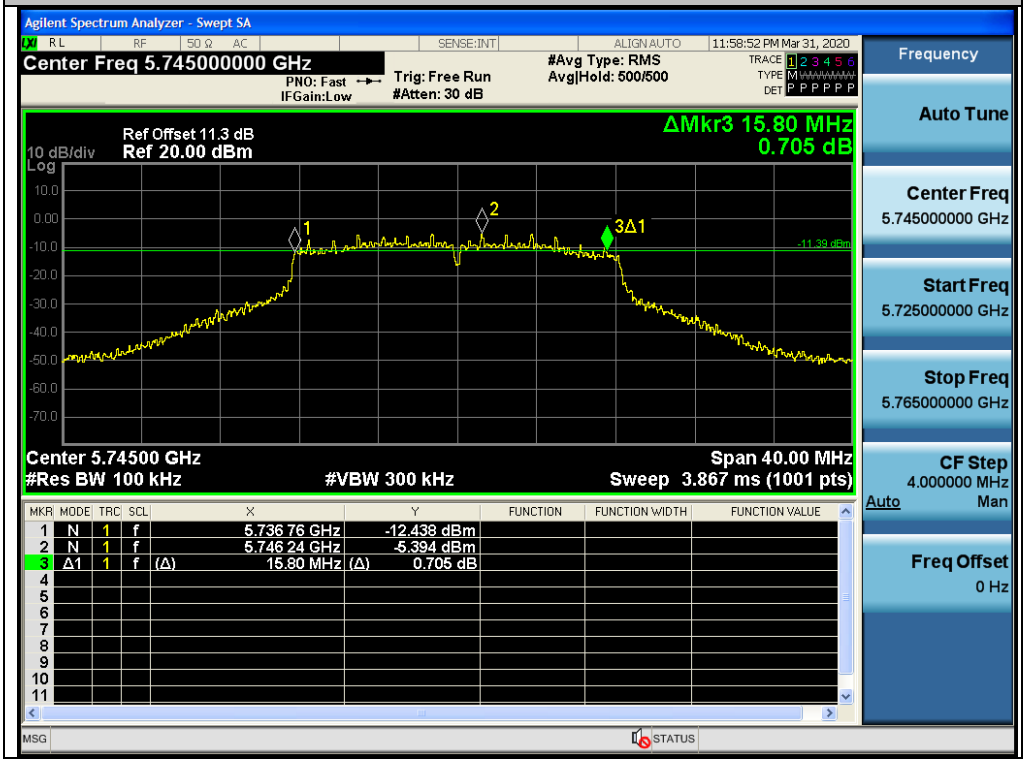
Channel Number	Freq. (MHz)	26dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
38	5190	46.00	45.82	Pass
46	5230	45.92	45.68	Pass
54	5270	45.84	45.37	Pass
62	5310	45.60	46.08	Pass
102	5510	45.52	45.82	Pass
118	5590	45.48	45.44	Pass
134	5670	45.20	**45.16**	Pass
Spectrum plot of worst value				



3.3.9 6dB bandwidth for 5725-5850MHz

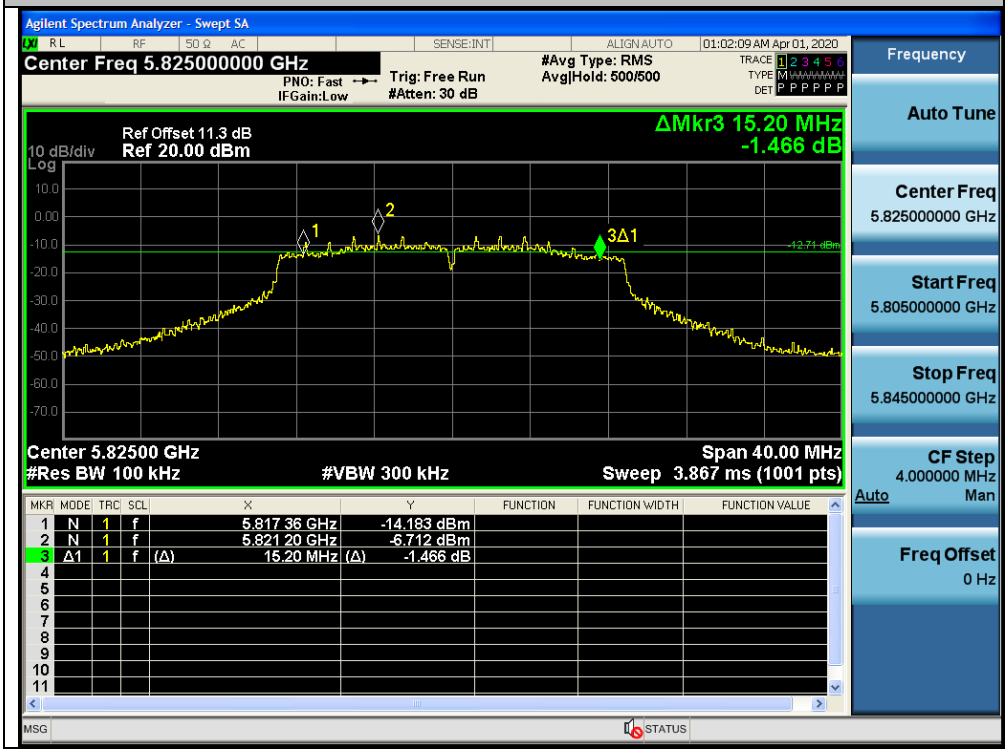
802.11a

Channel Number	Freq. (MHz)	6dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
149	5745	15.66	**15.80**	Pass
157	5785	15.48	15.56	Pass
165	5825	15.36	15.16	Pass
Spectrum plot of worst value				



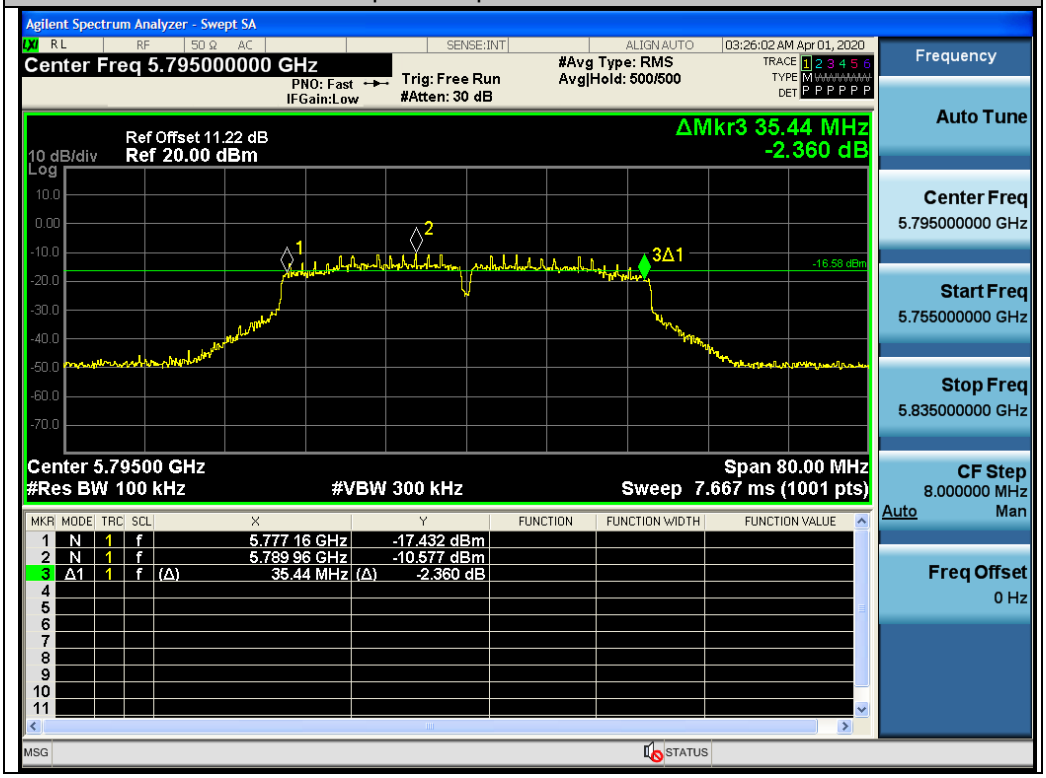
802.11n (20M)

Channel Number	Freq. (MHz)	6dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
149	5745	15.12	15.16	Pass
157	5785	15.10	15.14	Pass
165	5825	15.15	**15.20**	Pass
Spectrum plot of worst value				



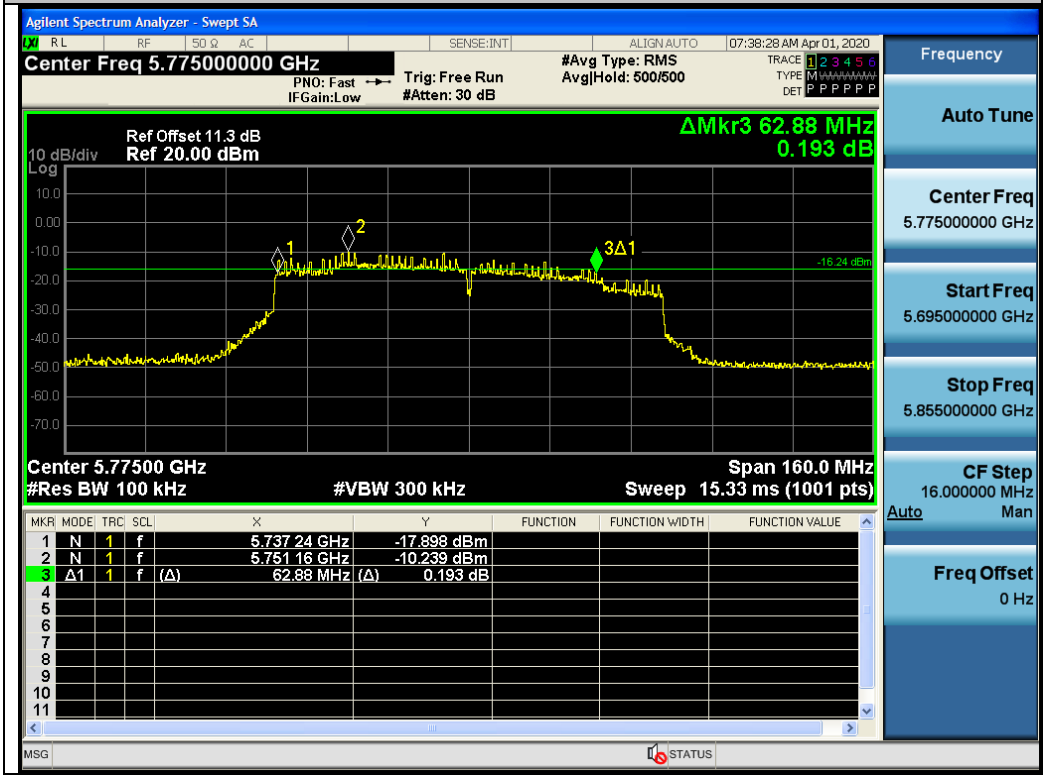
802.11n (40M)

Channel Number	Freq. (MHz)	6dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
151	5755	34.90	34.79	Pass
159	5795	35.44	35.28	Pass
Spectrum plot of worst value				



802.11ac (80MHz)

Channel Number	Freq. (MHz)	6dBc bandwidth (MHz)		Pass /Fail
		Chain 0	Chain 1	
155	5775	62.88	**62.88**	Pass
Spectrum plot of worst value				



3.4 Peak power spectral density measurement

3.4.1 Limits of peak power spectral density measurement

Operation Band	EUT Category		Limit
U-NII-1 5150-5250MHz	-	Outdoor Access Point	17dBm/ MHz
	-	Fixed point-to-point Access Point	
	-	Indoor Access Point	
	√	Mobile and Portable client device	11dBm/ MHz
U-NII-2A 5250-5350MHz	√		11dBm/ MHz
U-NII-2C 5470-5600MHz 5650-5725MHz	√		11dBm/ MHz
U-NII-3 5725-5850MHz	√		30dBm/ 500kHz

Note:

In RSS-247 clause 6.6.2(3) addition requirements, outdoor Access Point (AP) devices operating in the band 5250-5350 MHz with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. at different elevations, where e is the angle above the local horizontal plane (of the Earth) as shown below:

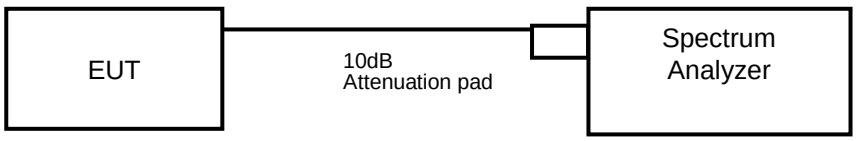
(i)-13 dB(W/MHz) for 0°≤Θ<8°

(i)-13- 0.716 (Θ -8) dB(W/MHz) for 8°≤Θ <40°

(ii)-35.9-1.22 (Θ -40) dB(W/MHz) for 40°≤Θ≤45°

(ii)-42dB(W/MHz) for Θ＞45°

3.4.2 Test setup



3.4.3 Test instruments

Refer to section 3.3.3 to get information of above instrument.

3.4.4 Test procedures

For U-NII-1, U-NII-2A, U-NII-2C band:

Using method SA-2
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 1MHz, Set VBW =3 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value and add 10 log (1/duty cycle)

For U-NII-3 band:

Using method SA-2
1) Set span to encompass the entire emission bandwidth (EBW) of the signal.
2) Set RBW = 300 kHz, Set VBW =1 MHz, Detector = RMS
3) Set Channel power measure = 1MHz
4) Sweep time = auto, trigger set to “free run”.
5) Trace average at least 100 traces in power averaging mode.
6) Record the max value and add 10 log (1/duty cycle)

Duty cycle Factor:

Chain 0 & Chain 1: Duty cycle of test signal<98%

802.11a Duty cycle of test signal is 97.47%, duty cycle factor=10*log (1/0.9747)=0.11dB
802.11n HT20 Duty cycle of test signal is 97.44%, duty cycle factor=10*log (1/0.9744)=0.12dB
802.11n HT40 Duty cycle of test signal is 96.09%, duty cycle factor=10*log (1/0.9608)=0.17dB
802.11ac VHT80 Duty cycle of test signal is 86.96%, duty cycle factor=10*log (1/0.8695)=0.61dB

Operation mode	Duty cycle Factor(dB)	
	Chain 0	Chain 1
802.11a	0.11	0.11
802.11n HT20	0.12	0.12
802.11n HT40	0.17	0.17
802.11ac VHT80	0.61	0.61

3.4.5 Deviation from test standard

No deviation.

3.4.6 EUT operating conditions

Same as 3.3.6

3.4.7 Test results

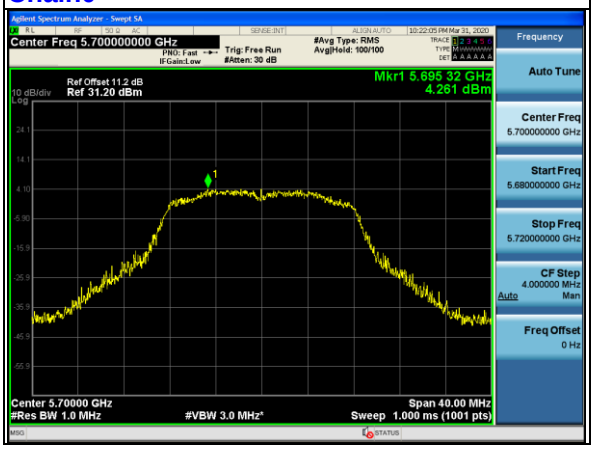
For U-NII-1, U-NII-2A & U-NII-2C，For U-NII-3: 802.11a

Channel Number	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)		Total power density (mW)		Total power density		Total power add dutycycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
36	5180	-3.872	-4.022	0.410	0.396	0.806	-0.94	-0.83	7.44
40	5200	-4.105	-4.091	0.389	0.390	0.778	-1.09	-0.98	7.44
48	5240	-4.141	-4.045	0.385	0.394	0.779	-1.08	-0.97	7.44
52	5260	3.971	4.024	2.495	2.526	5.021	7.01	7.12	7.44
60	5300	3.640	3.924	2.312	2.468	4.780	6.79	6.90	7.44
64	5320	3.457	3.845	2.217	2.424	4.640	6.67	6.78	7.44
100	5500	3.548	3.459	2.264	2.218	4.481	6.51	6.62	7.44
116	5580	3.486	4.221	2.232	2.643	4.875	6.88	6.99	7.44
140	5700	**4.261**	**4.157**	2.667	2.604	5.272	7.22	7.33	7.44

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

Spectrum plot of worst value

Chain0



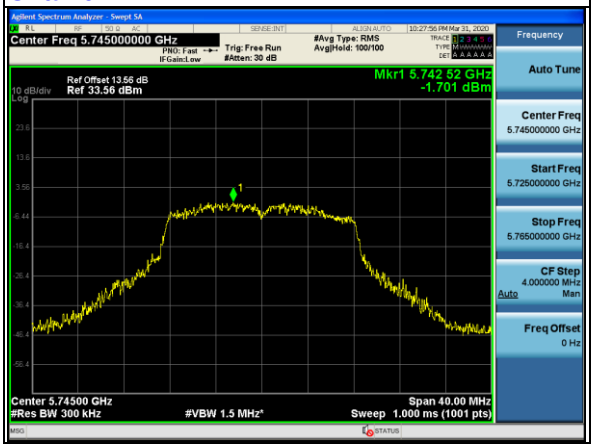
Chain1

Channel Number	Frequency (MHz)	RF Power Level in 300kHz BW (dBm)		RF Power Level in 500kHz BW (dBm)		Total PSD (dBm/500kHz)	Total power add dutycycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1			
149	5745	**-1.701**	**-1.768**	0.517	0.450	2.236	2.346	26.44
157	5785	-2.075	-2.022	0.143	0.196	2.080	2.190	26.44
165	5825	-1.904	-1.868	0.314	0.350	2.159	2.269	26.44

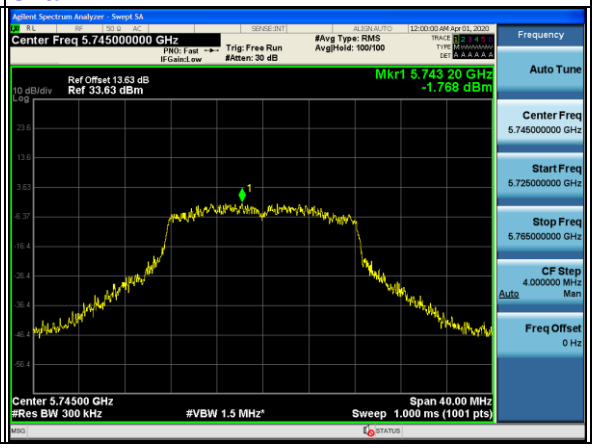
Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

Spectrum plot of worst value

Chain0



Chain1



802.11n (20MHz)

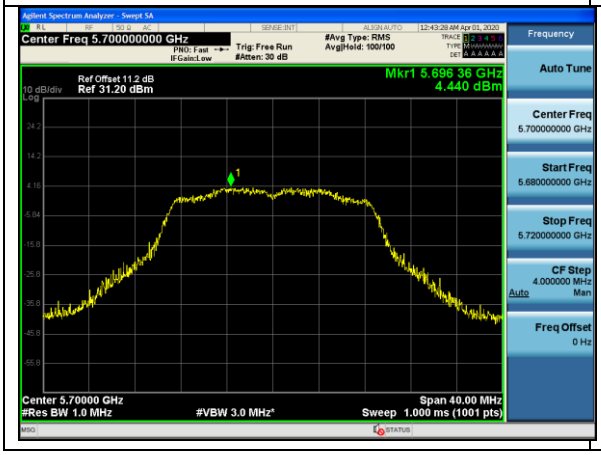
Channel Number	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)		Total power density (mW)		Total power density		Total power add dutycycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
36	5180	-3.755	-3.944	0.421	0.403	0.824	-0.84	-0.72	7.44
40	5200	-4.206	-4.472	0.380	0.357	0.737	-1.33	-1.21	7.44
48	5240	-3.842	-3.931	0.413	0.404	0.817	-0.88	-0.76	7.44
52	5260	4.085	3.801	2.562	2.399	4.961	6.96	7.08	7.44
56	5280	3.987	4.142	2.5044	2.595	5.100	7.08	7.20	7.44
64	5320	3.597	4.398	2.289	2.753	5.042	7.03	7.15	7.44
100	5500	4.203	3.841	2.632	2.422	5.054	7.04	7.16	7.44
116	5580	3.982	4.173	2.501	2.614	5.115	7.09	7.21	7.44
140	5700	**4.44**	**4.087**	2.780	2.563	5.342	7.28	7.40	7.44

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

Spectrum plot of worst value

Chain0



Chain1

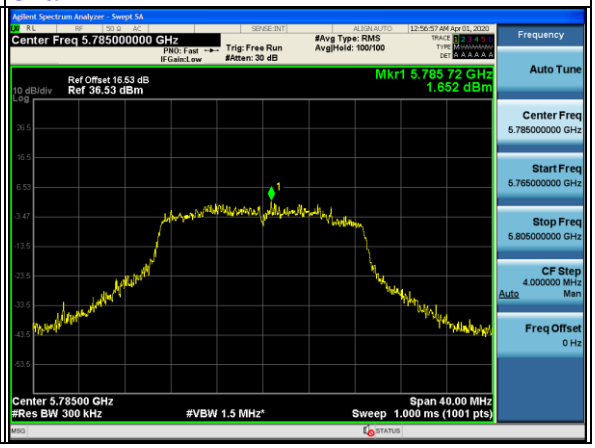
Channel Number	Frequency (MHz)	RF Power Level in 300kHz BW (dBm)		RF Power Level in 500kHz BW (dBm)		Total PSD (dBm/500k Hz)	Total power add dutycycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1			
149	5745	0.922	1.122	3.140	3.340	4.219	4.339	26.44
157	5785	**1.489**	**1.652**	3.707	3.870	4.786	4.906	26.44
165	5825	1.206	0.962	3.424	3.180	4.280	4.400	26.44

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

Spectrum plot of worst value

Chain0

Chain1



802.11n (40MHz)

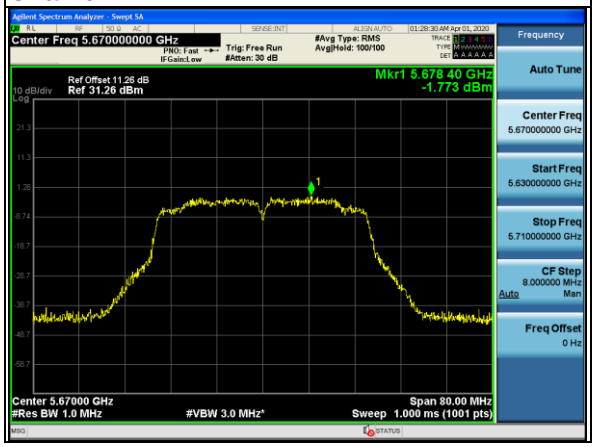
Channel Number	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)		Total power density (mW)		Total power density		Total power add dutycycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
38	5190	-6.786	-6.269	0.210	0.236	0.446	-3.51	-3.34	7.44
46	5230	-6.398	-6.45	0.229	0.226	0.456	-3.41	-3.24	7.44
54	5270	-2.695	-1.879	0.538	0.649	1.186	0.74	0.91	7.44
62	5310	-3.080	-3.050	0.492	0.495	0.987	-0.05	0.12	7.44
102	5510	-2.865	-2.530	0.517	0.558	1.075	0.32	0.49	7.44
112	5550	-2.055	-1.738	0.623	0.670	1.293	1.12	1.29	7.44
134	5670	**-1.773**	**-1.398**	0.665	0.725	1.390	1.43	1.60	7.44

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB..

Spectrum plot of worst value

Chain0



Chain1

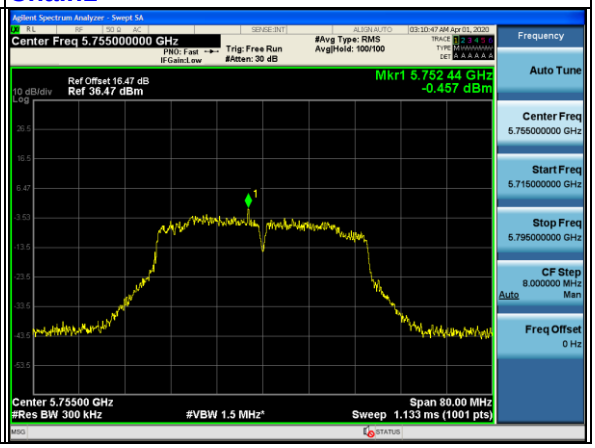
Channel Number	Frequency (MHz)	RF Power Level in 300kHz BW (dBm)		RF Power Level in 500kHz BW (dBm)		Total PSD (dBm /500kHz)	Total power add duty cycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1			
151	5755	**-0.905**	**-0.457**	1.313	1.761	2.853	3.023	26.44
159	5795	-1.113	-0.977	1.105	1.241	2.621	2.791	26.44

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB..

Spectrum plot of worst value

Chain0

Chain1



802.11ac (80MHz)

Channel Number	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)		Total power density (mW)		Total power density		Total power add dutycycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1	mW	dBm		
42	5210	-9.055	-8.834	0.124	0.131	0.255	-5.93	-5.32	7.44
58	5290	**-1.956**	**-1.598**	0.637	0.692	1.330	1.24	2.047	7.44
106	5530	-4.154	-3.391	0.384	0.458	0.842	-0.75	0.065	7.44
122	5610	-3.528	-2.361	0.444	0.581	1.024	0.10	0.915	7.44

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

Spectrum plot of worst value

Chain0

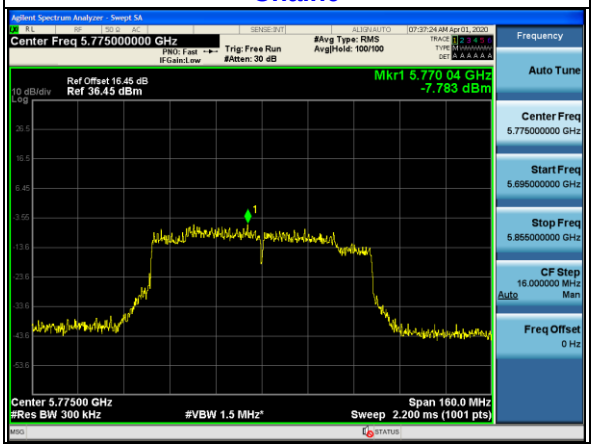
Chain1

Channel Number	Frequency (MHz)	RF Power Level in 300kHz BW (dBm)		RF Power Level in 500kHz BW (dBm)		Total PSD (dBm /500kHz)	Total power add duty cycle factor(dBm)	Limit (dBm)
		Chain 0	Chain 1	Chain 0	Chain 1			
155	5775	**-7.789**	**-7.302**	-5.571	-5.084	0.588	1.398	26.44

Note:
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across ponding frequency bins on the various outputs by computer
2. Directional gain =6.55dBi + 10l0q (2) = 9.56dBi > 6dBi, so the power density limit need to reduce 3.56dB.

Spectrum plot of worst value

Chain0



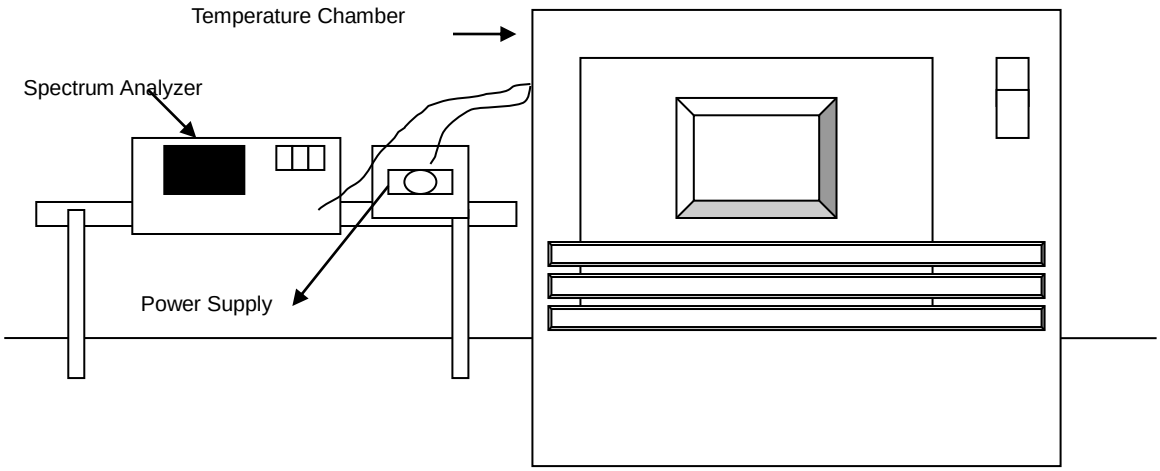
Chain1

3.5 Frequency stability

3.5.1 Limits of frequency stability measurement

The frequency of the carrier signal shall be maintained within band of operation.

3.5.2 Test setup



3.5.3 Test instruments

Refer to section 3.3.3 to get information of above instrument.

3.5.4 Test procedure

a. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.

b. Turn the EUT on and couple its output to a spectrum analyzer.

c. Turn the EUT off and set the chamber to the highest temperature specified.

d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.

e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.

f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

3.5.5 Deviation from test standard

No deviation.

3.5.6 EUT operating condition

Set the EUT transmit at un-modulation mode to test frequency stability.

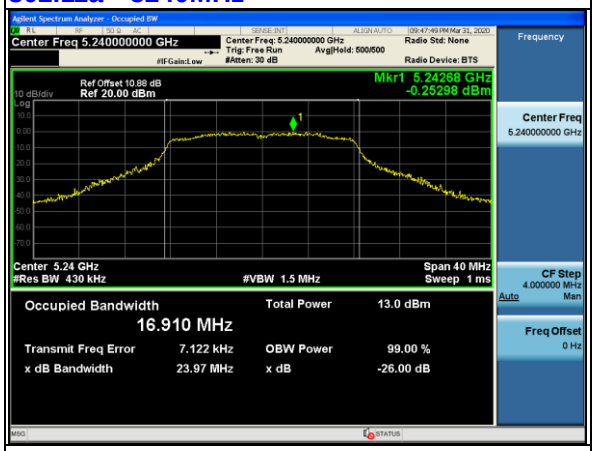
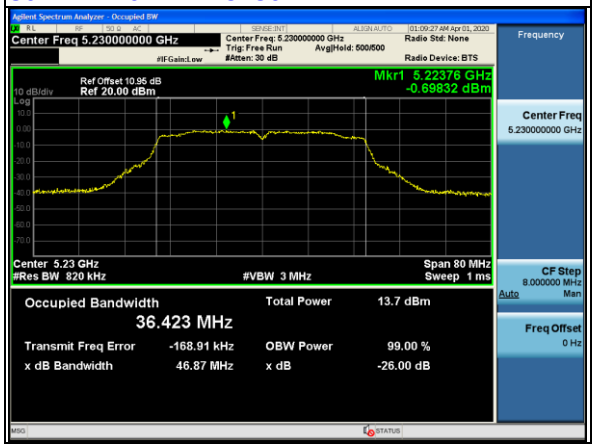
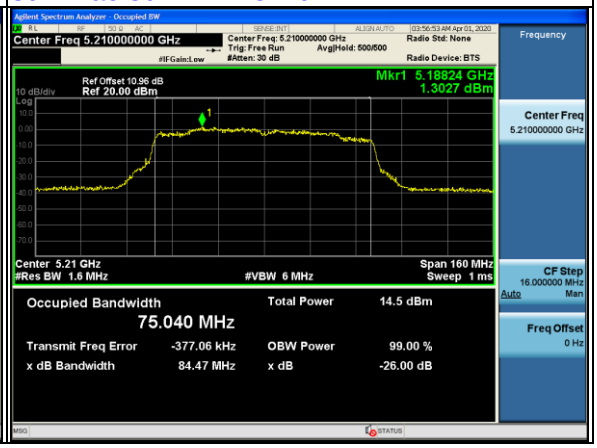
3.5.7 Test results

Operating frequency: 5180MHz									
Temp. (℃)	Power supply (Vdc)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift
50	5	5179.9789	-0.00041	5179.9818	-0.00035	5179.9786	-0.00041	5179.9815	-0.00036
40	5	5179.9856	-0.00028	5179.9886	-0.00022	5179.9873	-0.00025	5179.9901	-0.00019
30	5	5180.0048	0.00009	5180.0028	0.00005	5180.0044	0.00008	5180.0047	0.00009
20	5	5179.9898	-0.00020	5179.9947	-0.00010	5179.9925	-0.00014	5179.9915	-0.00016
10	5	5179.9898	-0.00020	5179.9899	-0.00019	5179.9873	-0.00025	5179.9916	-0.00016
0	5	5180.0095	0.00018	5180.0129	0.00025	5180.0114	0.00022	5180.0111	0.00021
-10	5	5179.9775	-0.00043	5179.9766	-0.00045	5179.9762	-0.00046	5179.9791	-0.00040
-20	5	5180.0206	0.00040	5180.0216	0.00042	5180.0221	0.00043	5180.0189	0.00036
-30	5	5180.0186	0.00036	5180.0207	0.00040	5180.0222	0.00043	5180.0202	0.00039

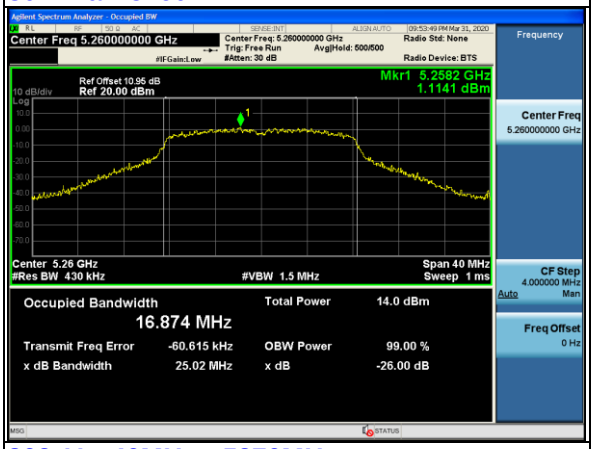
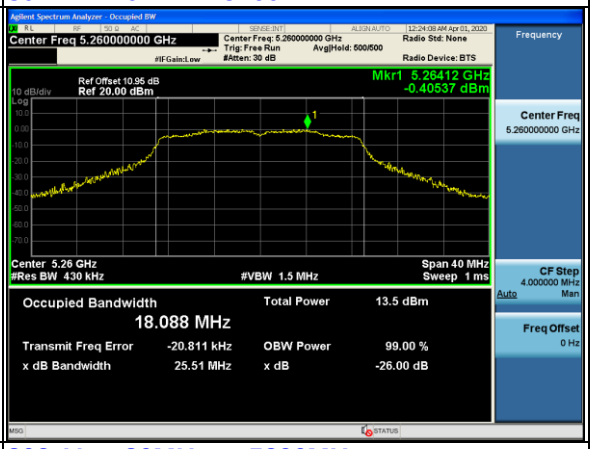
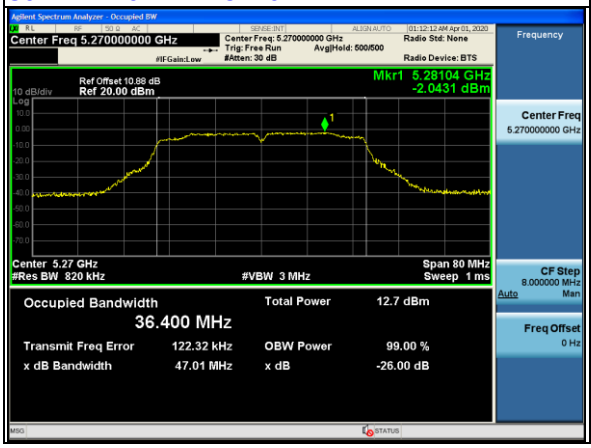
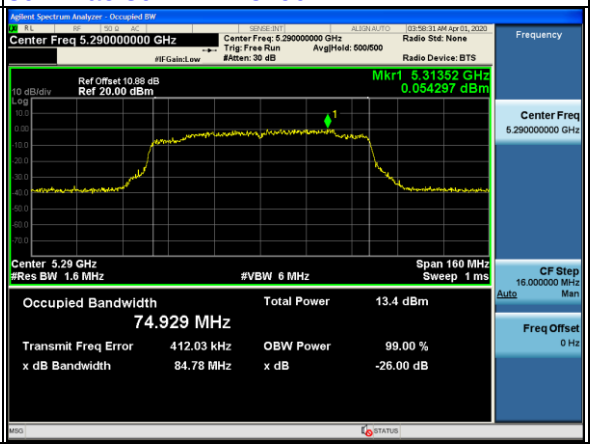
Operating frequency: 5180MHz									
Temp. (℃)	Power supply (Vdc)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift	Measured Frequency (MHz)	Frequency Drift
20	5.5	5179.9895	-0.00020	5179.9941	-0.00011	5179.9923	-0.00015	5179.9909	-0.00018
	5	5179.9898	-0.00020	5179.9947	-0.00010	5179.9925	-0.00014	5179.9915	-0.00016
	4.5	5179.9905	-0.00018	5179.9944	-0.00011	5179.9921	-0.00015	5179.9915	-0.00016

3.6 The appendix A (DFS band-edge check for U-NII-1)

Band 1:5150-5250MHz
99% Occupied Bandwidth Without over DFS Band

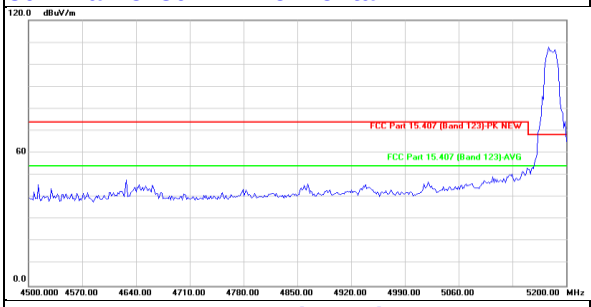
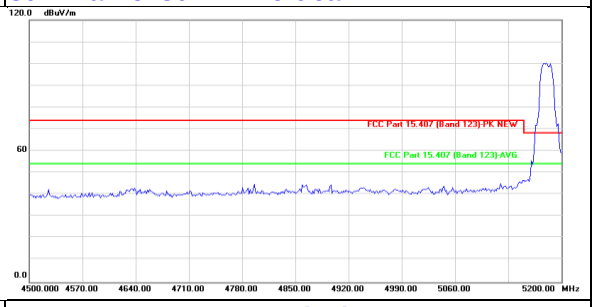
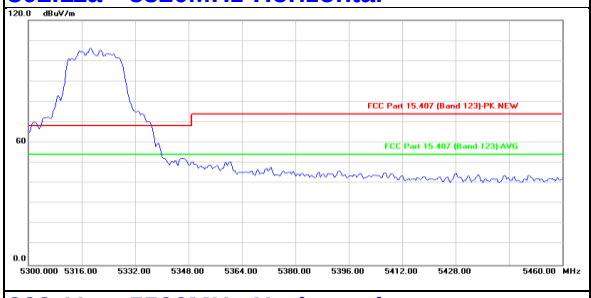
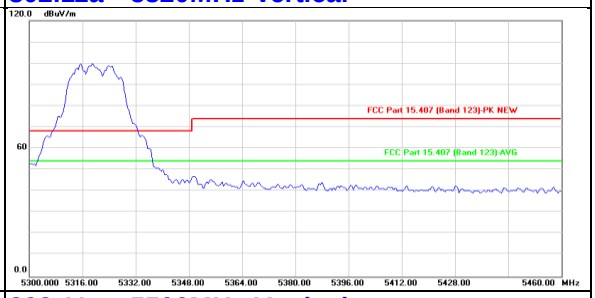
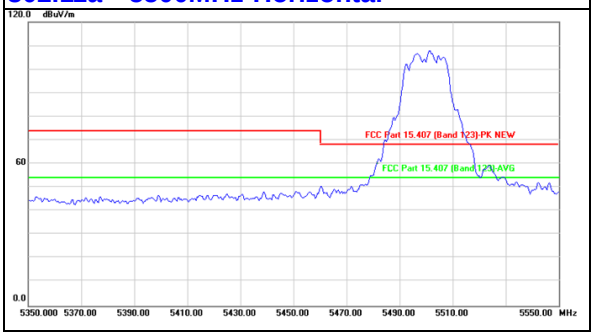
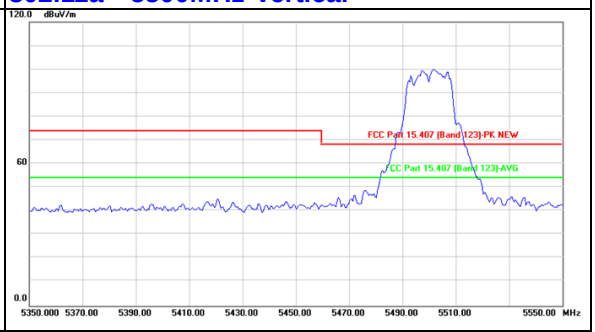
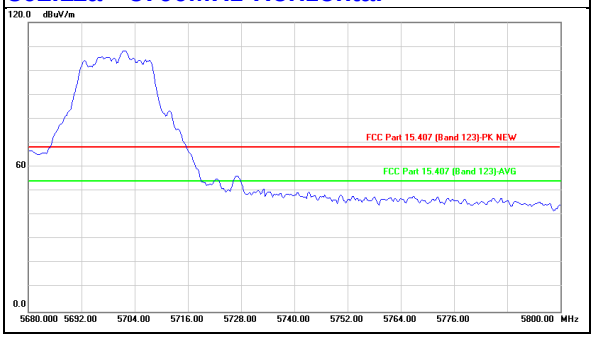
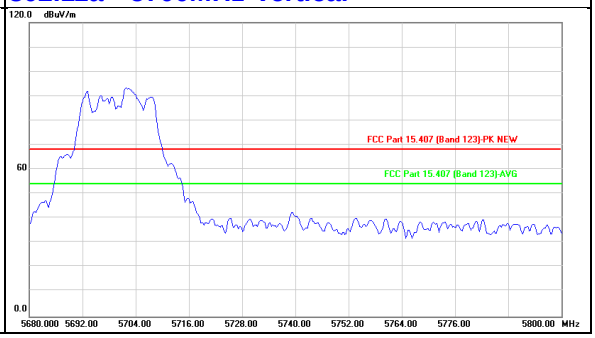
Spectrum plot of worst value	
802.11a 5240MHz	802.11n 20MHz 5240MHz
	
802.11n 40MHz 5230MHz	802.11ac 80MHz 5210MHz
	

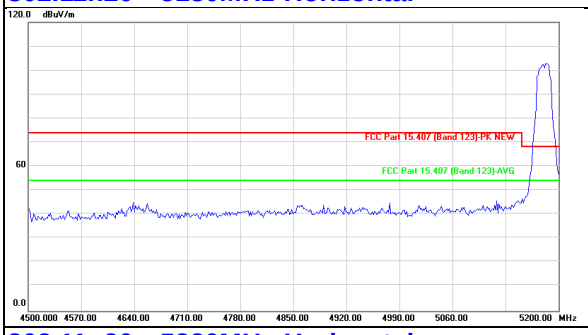
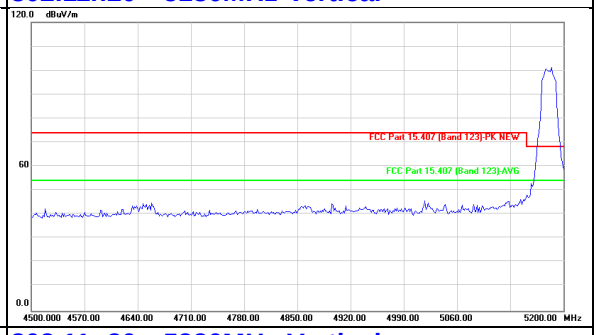
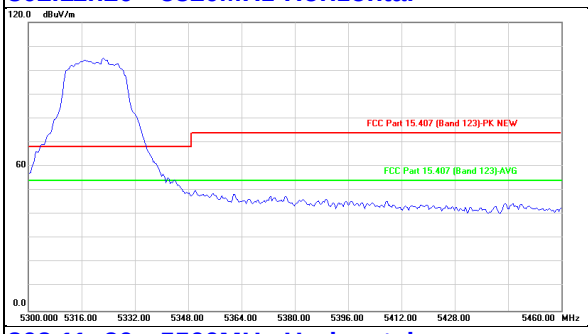
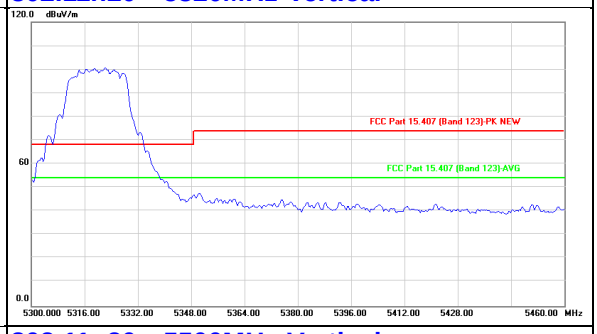
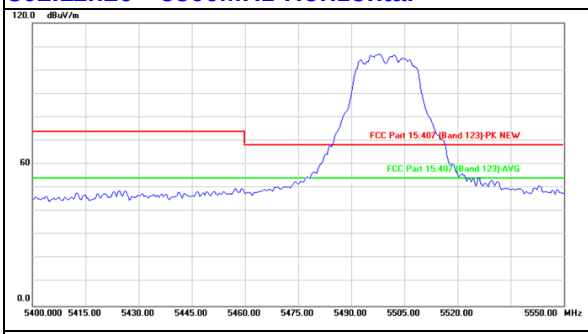
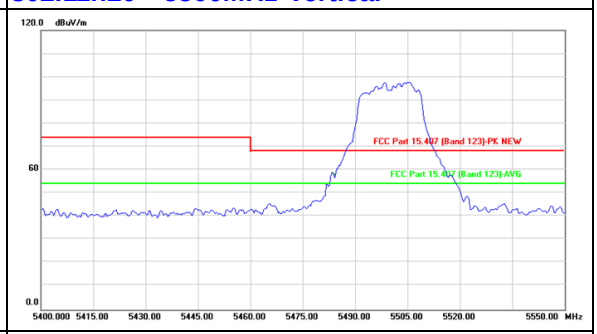
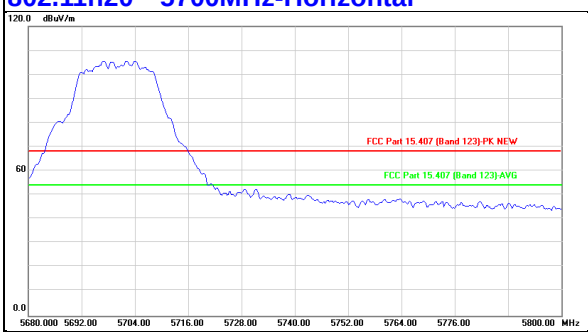
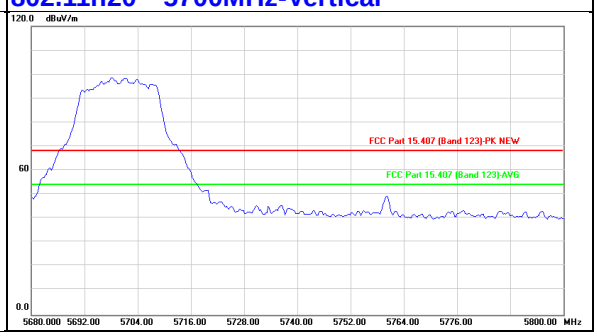
Band 2:5250-5350MHz
99% Occupied Bandwidth Without over Band 1

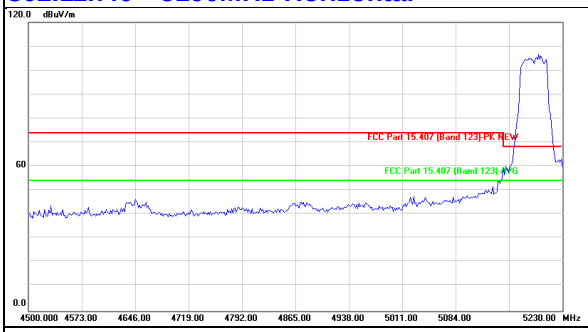
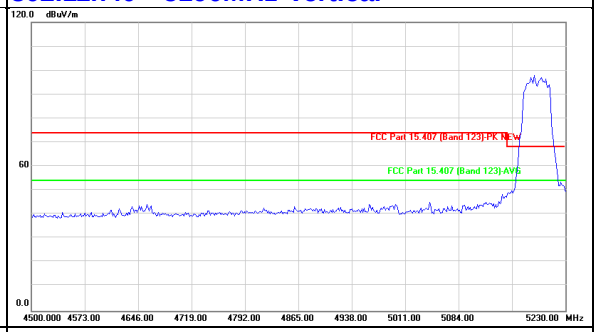
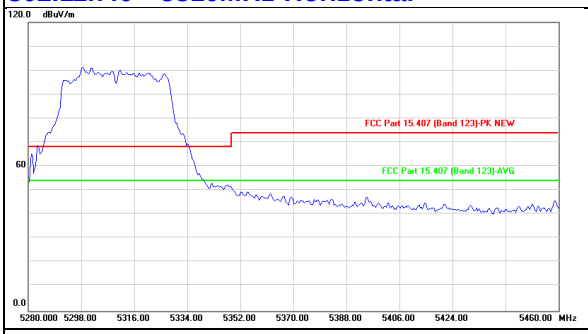
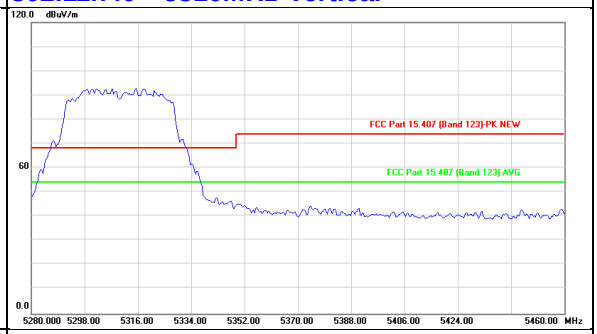
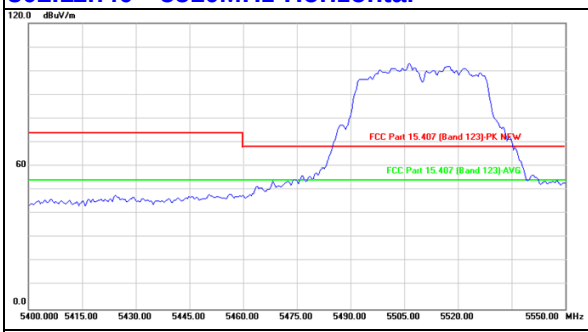
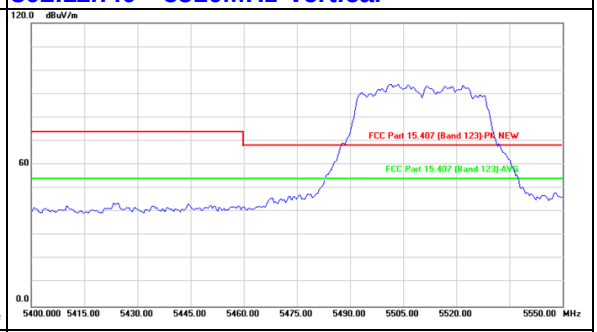
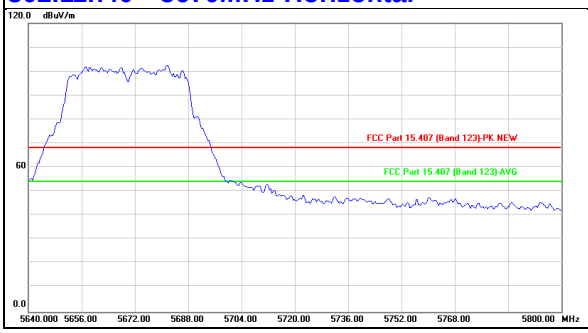
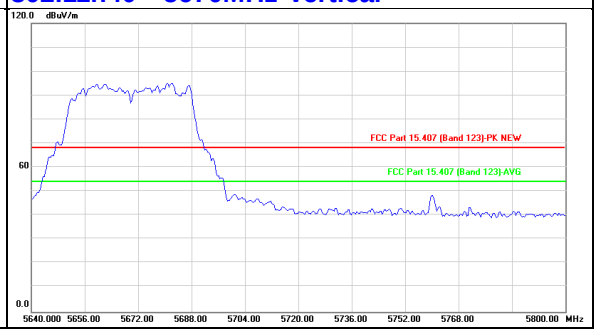
Spectrum plot of worst value	
802.11a 5260MHz	**802.11n 20MHz 5260MHz**
	
802.11n 40MHz 5270MHz	**802.11ac 80MHz 5290MHz**
	

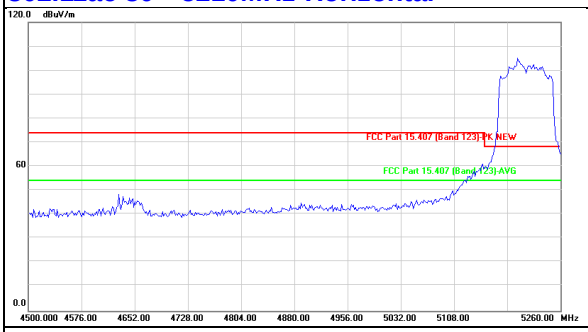
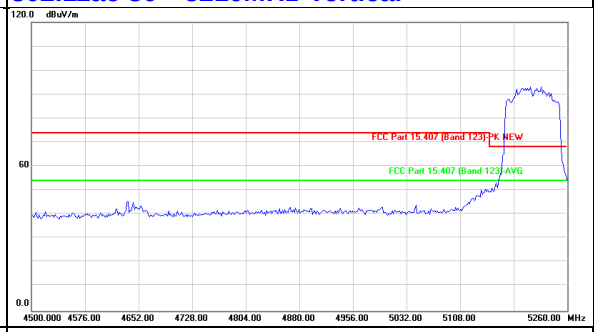
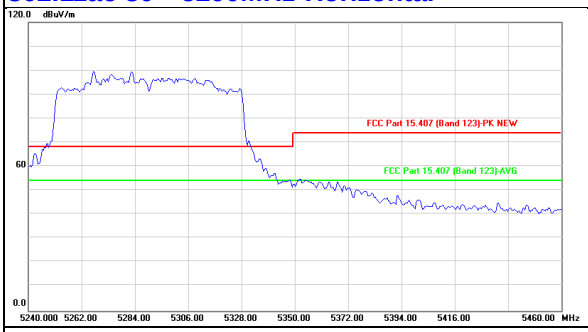
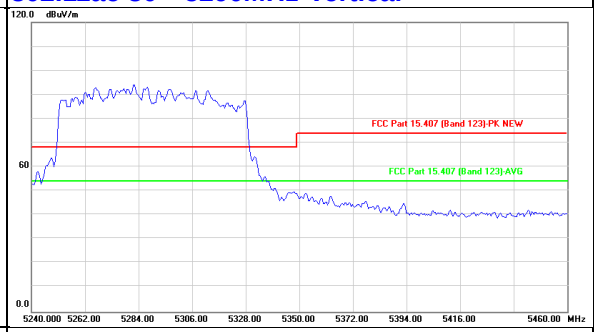
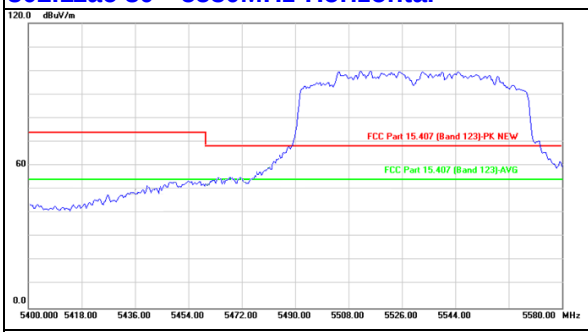
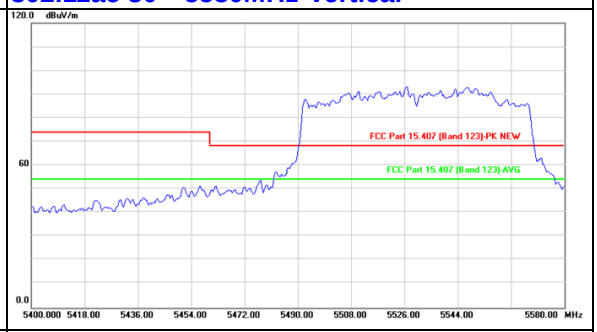
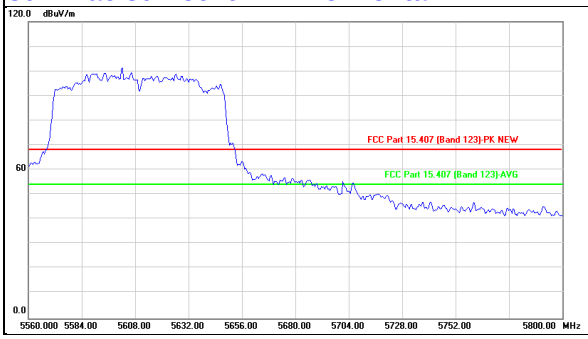
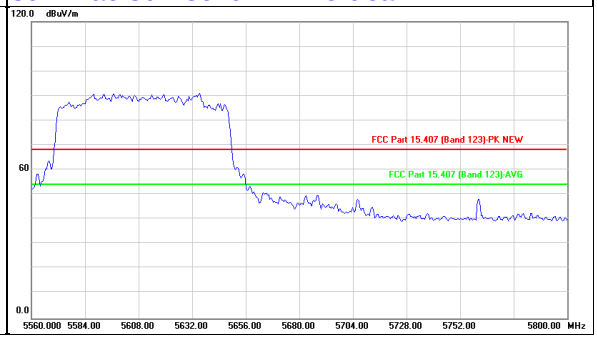
3.7 The appendix B (Radiated band-edge for U-NII Band)

The test values please see the 3.1.7 section.

Spectrum plot of worst value	
802.11a 5180MHz-Horizontal	802.11a 5180MHz-Vertical
	
802.11a 5320MHz-Horizontal	802.11a 5320MHz-Vertical
	
802.11a 5500MHz-Horizontal	802.11a 5500MHz-Vertical
	
802.11a 5700MHz-Horizontal	802.11a 5700MHz-Vertical
	

Spectrum plot of worst value	
802.11n20 5180MHz-Horizontal	802.11n20 5180MHz-Vertical
	
802.11n20 5320MHz-Horizontal	802.11n20 5320MHz-Vertical
	
802.11n20 5500MHz-Horizontal	802.11n20 5500MHz-Vertical
	
802.11n20 5700MHz-Horizontal	802.11n20 5700MHz-Vertical
	

Spectrum plot of worst value	
802.11n40 5190MHz-Horizontal	802.11n40 5190MHz-Vertical
	
802.11n40 5310MHz-Horizontal	802.11n40 5310MHz-Vertical
	
802.11n40 5510MHz-Horizontal	802.11n40 5510MHz-Vertical
	
802.11n40 5670MHz-Horizontal	802.11n40 5670MHz-Vertical
	

Spectrum plot of worst value	
802.11ac 80 5210MHz-Horizontal	802.11ac 80 5210MHz-Vertical
	
802.11ac 80 5290MHz-Horizontal	802.11ac 80 5290MHz-Vertical
	
802.11ac 80 5530MHz-Horizontal	802.11ac 80 5530MHz-Vertical
	
802.11ac 80 5610MHz-Horizontal	802.11ac 80 5610MHz-Vertical
	

4 Photographs of the test configuration

Please refer to the attached file (Test Setup Photo).

Appendix A – modifications recorders for engineering changes

No modifications were made to the EUT by the lab during the test.

Appendix B Information on the testing laboratories

We, Hwa-Hsing (Dongguan) Co., Ltd.,A global provider of TESTING and CERTIFICATION services for consumer products, electronic products and wireless information technology products. Adhering to the core values “HONEST and TRUSTWORTHY, OBJECTIVE and IMPARTIALITY, RIGOROUS and AFFICIENT”, commitment to provide professional, perfect and efficient comprehensive ONE-STOP solution of TESTING and CERTIFICATION services for Manufacturers, Buyers, Traders, Brands, Retailers. Assist client to better manage risk, protect their brands, reduce costs and cut time to over 150 markets in global. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Contact Tel: 0769-83078199
Email: customerservice.dg@hwa-hsing.com
Web Site: www.hwa-hsing.com

The address and road map of all our labs can be found in our web site also.

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