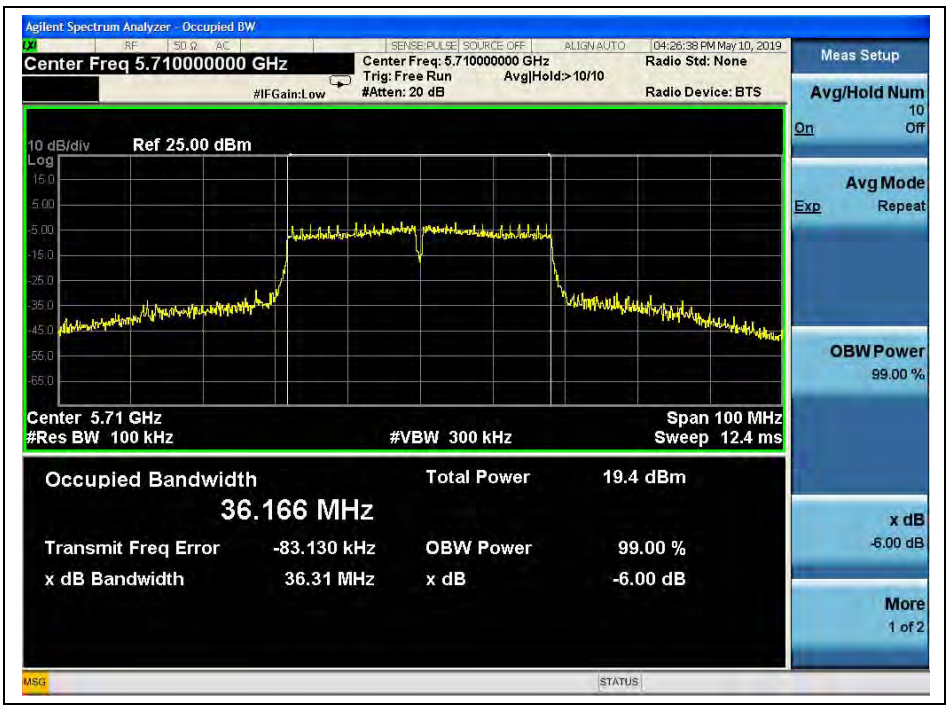
(Channel 142, 5710MHz, 802.11 ac (VHT40))



(Channel 142, 5710MHz, 802.11 ac (VHT40))

(Channel 151, 5755 MHz, 802.11 ac (VHT40))

(Channel 159, 5795MHz, 802.11ac (VHT40))

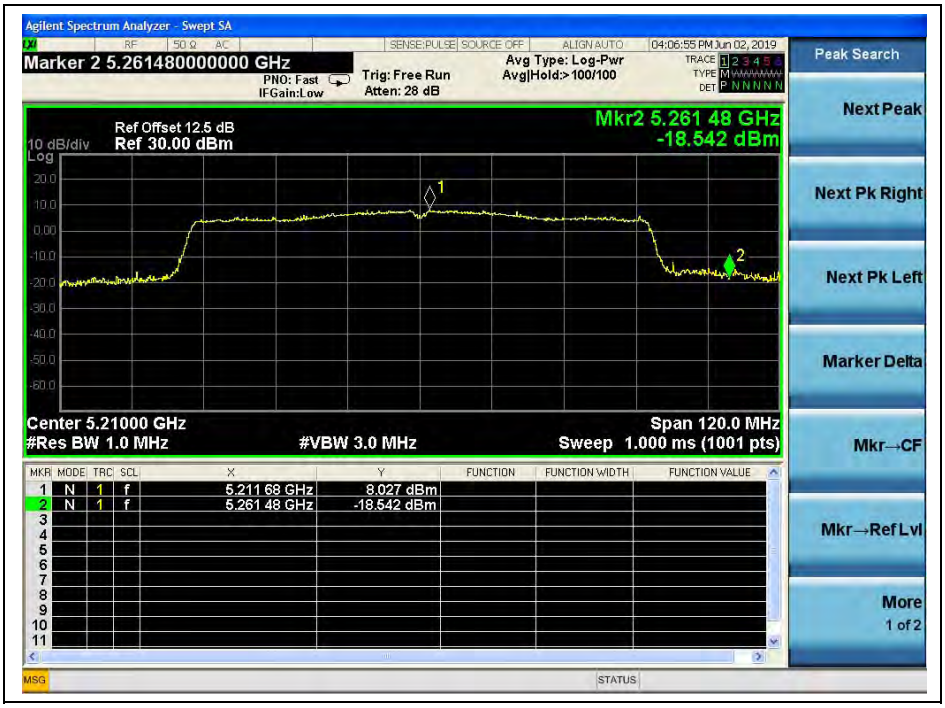
802.11ac (VHT80) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	93.86 Note
58	5290	83.50
106	5530	84.69
122	5610	83.98
138	5690	81.42
Channel	**Frequency (MHz)**	**6dB Bandwidth (MHz)**
138	5690	75.78
155	5775	75.75
Note: The high frequency of the -26dB is 5261.48MHz which is in the DFS frequency range, so DFS testing is required. Please refer to DFS report (Report No.: SZ19040167W05).		

B. Test Plots

(Channel 42, 5210MHz, 802.11 ac (VHT80))



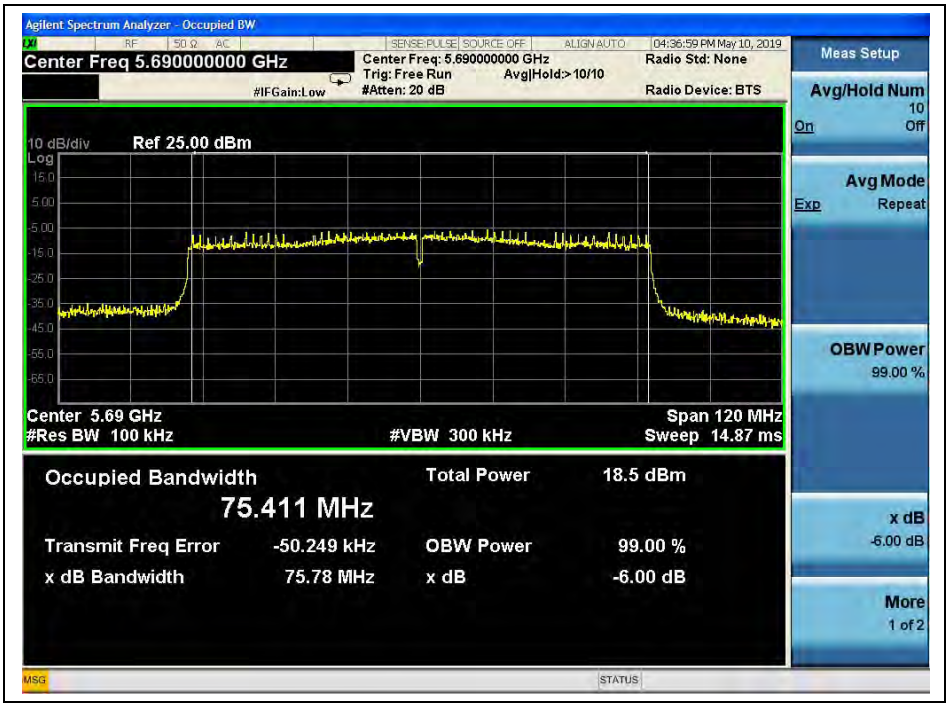
(Channel 42, 5210 MHz, fh of -26dB, 802. ac (VHT80))

(Channel 58, 5290 MHz, 802.11 ac (VHT80))

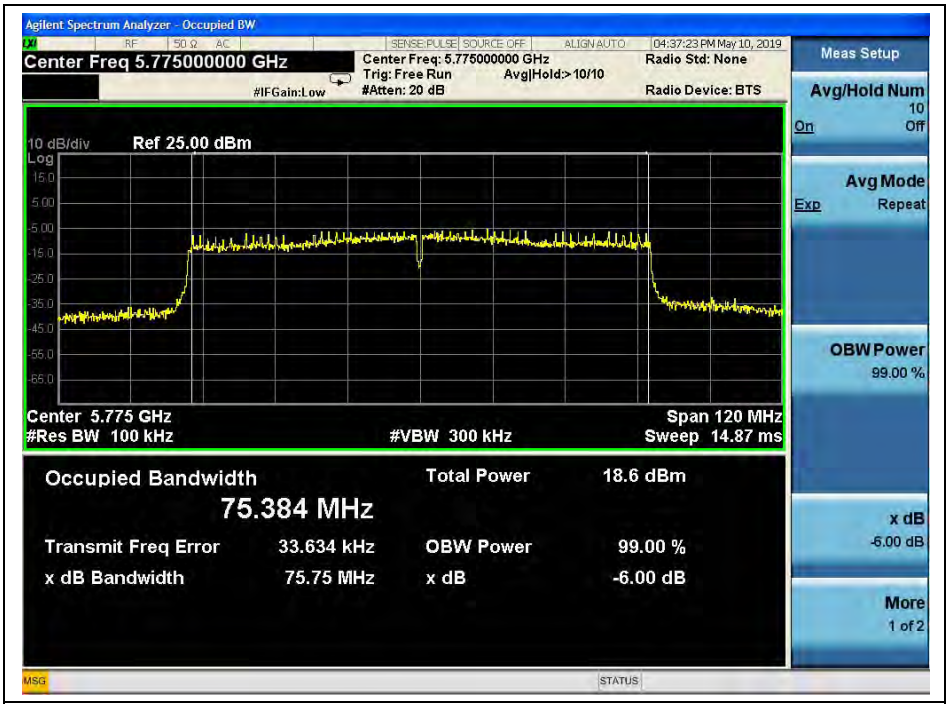
(Channel 106, 5530MHz, 802.11 ac (VHT80))

(Channel 122, 5610 MHz, 802.11 ac (VHT80))

(Channel 138, 5690MHz, 802.11 ac (VHT80))



(Channel 138, 5690MHz, 802.11 ac (VHT80))



(Channel 155, 5775 MHz, 802.11 ac (VHT80))

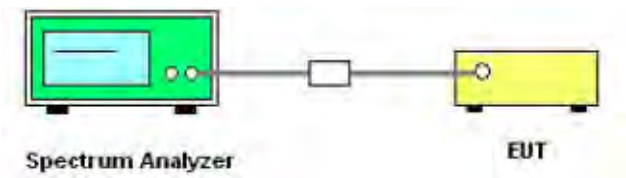
2.5. Peak Power spectral density

2.5.1. Requirement

(1) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.
(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500KHz band.
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(4) According to KDB662911D01Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.
(5) According to KDB 662911 D01, the directional gain = G_{ANT} +10log(N_{ANT}) dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

2.5.2. Test Description

A. Test Set:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

B. Test Procedure

KDB 789033 Section F) Maximum Power Spectral Density (PSD) Method SA-1 was used in order to prove compliance

1) Set span to encompass the entire 26-dB emission bandwidth
2) Set RBW = 1 MHz. Set VBW ≥ 3 MHz.
3) Number of points in sweep ≥ 2 Span / RBW. Sweep time = auto.
4) Detector = Peak
5) Trace mode=Max hold
6) Record the max value

2.5.3. Test Result

802.11a Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	9.41	11	PASS
44	5220	9.72		
48	5240	9.56		
52	5260	9.87		
60	5300	9.98		
64	5320	9.97		
100	5500	9.74		
120	5600	9.48		
144	5720	9.40		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	6.41	30	PASS
149	5745	9.28		
157	5785	9.23		
165	5825	9.05		

B. Test Plots

(Channel 36, 5180MHz, 802.11a,)

(Channel 44, 5220 MHz, 802.11a,)

(Channel 48, 5240MHz, 802.11a,)

(Channel 52, 5260MHz, 802.11a,)

(Channel 60, 5300 MHz, 802.11a,)

(Channel 64, 5320MHz, 802.11a,)

(Channel 100, 5500MHz, 802.11a,)

(Channel 120, 5600 MHz, 802.11a,)

(Channel 144, 5720MHz, 802.11a,)

(Channel 144, 5720MHz, 802.11a,)

(Channel 149, 5745MHz, 802.11a)

(Channel 157, 5785MHz, 802.11a)

(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	9.91	11	PASS
44	5220	9.75		
48	5240	10.07		
52	5260	9.61		
60	5300	10.01		
64	5320	10.01		
100	5500	9.73		
116	5600	9.48		
144	5720	9.99		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	5.95	30	PASS
149	5745	9.23		
157	5785	9.10		
165	5825	8.88		

B. Test Plots

(Channel 36, 5180MHz, 802.11 n (HT20))

(Channel 44, 5220 MHz, 802.11 n (HT20))

(Channel 48, 5240MHz, 802.11 n (HT20))

(Channel 52, 5260MHz, 802.11 n (HT20))

(Channel 60, 5300 MHz, 802.11 n (HT20))

(Channel 64, 5320MHz, 802.11 n (HT20))

(Channel 100, 5500MHz, 802.11 n (HT20))

(Channel 120, 5600 MHz, 802.11 n (HT20))

(Channel 144, 5720MHz, 802.11 n (HT20))

(Channel 144, 5720MHz, 802.11 n (HT20))

(Channel 149, 5745MHz, 802.11 n (HT20))

(Channel 157, 5785MHz, 802.11 n (HT20))

(Channel 165, 5825MHz, 802.11 n (HT20))

802.11n (HT40) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	9.46	11	PASS
46	5230	9.22		
54	5270	7.98		
62	5310	8.07		
102	5510	8.00		
126	5630	7.47		
142	5710	7.52		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
142	5710	3.99	30	PASS
151	5755	6.63		
159	5795	6.71		

B. Test Plots

(Channel 38, 5190MHz, 802.11n (HT40))

(Channel 46, 5230 MHz, 802.11n (HT40))

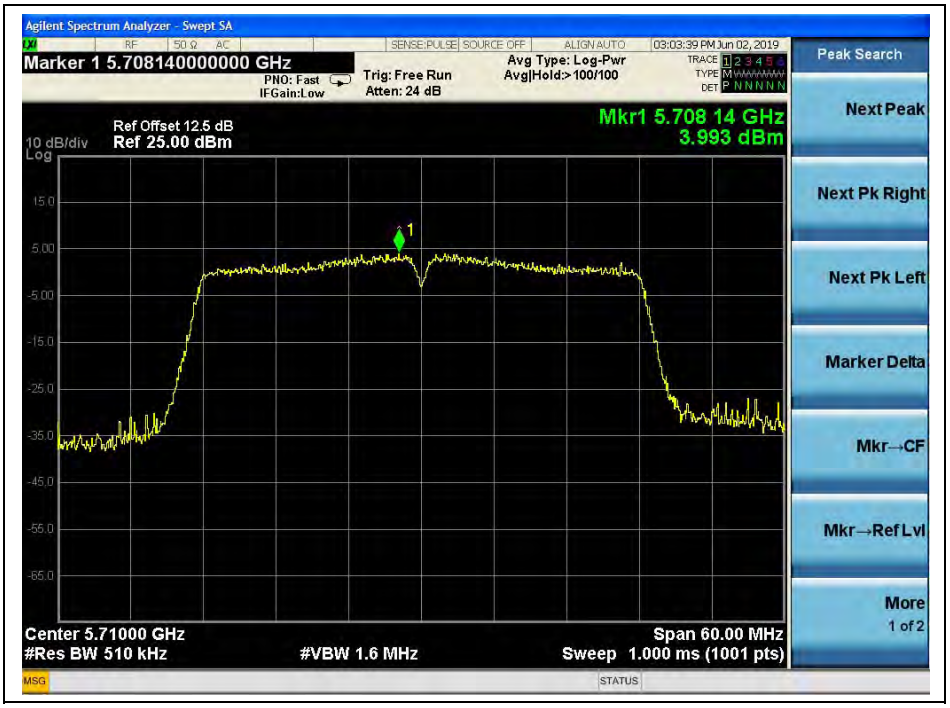
(Channel 54, 5270MHz, 802.11n (HT40))

(Channel 62, 5310 MHz, 802.11n (HT40))

(Channel 102, 5510MHz, 802.11n (HT40))

(Channel 126, 5630 MHz, 802.11n (HT40))

(Channel 142, 5710MHz, 802.11n (HT40))



(Channel 142, 5710MHz, 802.11n (HT40))

(Channel 151, 5755 MHz, 802.11n (HT40))

(Channel 159, 5795MHz, 802.11n (HT40))

802.11ac (VHT20) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	9.77	11	PASS
44	5220	9.88		
48	5240	9.62		
52	5260	9.73		
60	5300	10.04		
64	5320	9.93		
100	5500	9.78		
120	5600	9.42		
144	5720	9.44		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	5.79	30	PASS
149	5745	8.75		
157	5785	8.84		
165	5825	8.52		

B. Test Plots

(Channel 36, 5180MHz, 802.11ac (VHT20))

(Channel 44, 5220 MHz, 802.11 ac (VHT20))

(Channel 48, 5240MHz, 802.11 ac (VHT20))

(Channel 52, 5260MHz, 802.11 ac (VHT20))

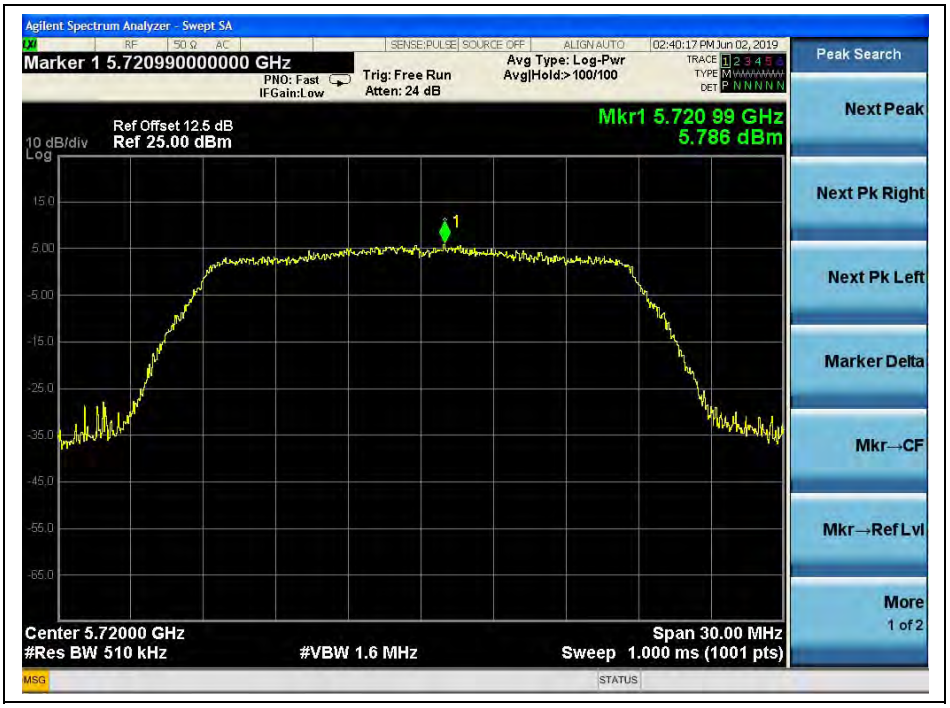
(Channel 60, 5300 MHz, 802.11 ac (VHT20))

(Channel 64, 5320MHz, 802.11 ac (VHT20))

(Channel 100, 5500MHz, 802.11 ac (VHT20))

(Channel 120, 5600 MHz, 802.11 ac (VHT20))

(Channel 144, 5720MHz, 802.11 ac (VHT20))



(Channel 144, 5720MHz, 802.11 ac (VHT20))

(Channel 149, 5745MHz, 802.11 ac (VHT20))

(Channel 157, 5785MHz, 802.11 ac (VHT20))

(Channel 165, 5825MHz, 802.11 ac (VHT20))

802.11ac (VHT40) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	9.55	11	PASS
46	5230	9.62		
54	5270	8.08		
62	5310	8.15		
102	5510	7.81		
126	5630	7.54		
142	5710	7.15		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
142	5710	3.68	30	PASS
151	5755	6.84		
155	5795	6.57		

B. Test Plots

(Channel 38, 5190MHz, 802.11 ac (VHT40))

(Channel 46, 5230 MHz, 802.11 ac (VHT40))

(Channel 54, 5270MHz, 802.11 ac (VHT40))

(Channel 62, 5310MHz, 802.11 ac (VHT40))

(Channel 102, 5510 MHz, 802.11 ac (VHT40))

(Channel 126, 5630MHz, 802.11 ac (VHT40))

(Channel 142, 5710MHz, 802.11 ac (VHT40))

(Channel 142, 5710 MHz, 802.11 ac (VHT40))

(Channel 151, 5755MHz, 802.11 ac (VHT40))

(Channel 159, 5795MHz, 802.11 ac (VHT40))

802.11ac (VHT80) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
42	5210	8.05	11	PASS
58	5290	8.26		
106	5530	6.90		
122	5610	6.89		
138	5690	6.75		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
138	5690	3.25	30	PASS
155	5775	5.14		

B. Test Plots

(Channel 42, 5210MHz, 802.11ac (VHT80))

(Channel 58, 5290 MHz, 802.11 ac (VHT80))

(Channel 106, 5530MHz, 802.11 ac (VHT80))

(Channel 122, 5610 MHz, 802.11 ac (VHT80))

(Channel 138, 5690MHz, 802.11 ac (VHT80))

(Channel 138, 5690 MHz, 802.11 ac (VHT80))

(Channel 155, 5775MHz, 802.11 ac (VHT80))

2.6. Frequency Stability

2.6.1. Requirement

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

2.6.2. Test Procedure

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between 5°C to 40°C. The temperature was incremented by 10° intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

2.6.3. Test Result

U-NII-1 (Ch. 36) 5180MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (Hz)	Deviation (ppm)
100%	5.00	+20(Ref)	20	0.004
100%		-30	50	0.010
100%		-20	45	0.009
100%		-10	37	0.007
100%		0	29	0.006
100%		+10	23	0.004
100%		+20	27	0.005
100%		+30	32	0.006
100%		+40	44	0.008
100%		+50	49	0.009
85%	4.25	+20	53	0.010
115%	5.57	+20	44	0.008

U-NII-2A (Ch. 52) 5260MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (Hz)	Deviation (ppm)
100%	5.00	+20(Ref)	25	0.005
100%		-30	50	0.010
100%		-20	49	0.009
100%		-10	40	0.008
100%		0	31	0.006
100%		+10	33	0.006
100%		+20	39	0.007
100%		+30	45	0.009
100%		+40	49	0.009
100%		+50	55	0.010
85%	4.25	+20	29	0.006
115%	5.57	+20	33	0.006

U-NII-2C (Ch. 100) 5500MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (Hz)	Deviation (ppm)
100%	5.00	+20(Ref)	22	0.004
100%		-30	49	0.009
100%		-20	37	0.007
100%		-10	28	0.005
100%		0	21	0.004
100%		+10	18	0.003
100%		+20	24	0.004
100%		+30	27	0.005
100%		+40	35	0.006
100%		+50	46	0.008
85%	4.25	+20	24	0.004
115%	5.57	+20	31	0.006

U-NII-3 (Ch. 149) 5745MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (Hz)	Deviation (ppm)
100%	5.00	+20(Ref)	25	0.004
100%		-30	53	0.009
100%		-20	45	0.008
100%		-10	37	0.006
100%		0	31	0.005
100%		+10	25	0.004
100%		+20	29	0.005
100%		+30	22	0.004
100%		+40	37	0.006
100%		+50	44	0.008
85%	4.25	+20	49	0.009
115%	5.57	+20	35	0.006

2.7. Conducted Emission

2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that 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 within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

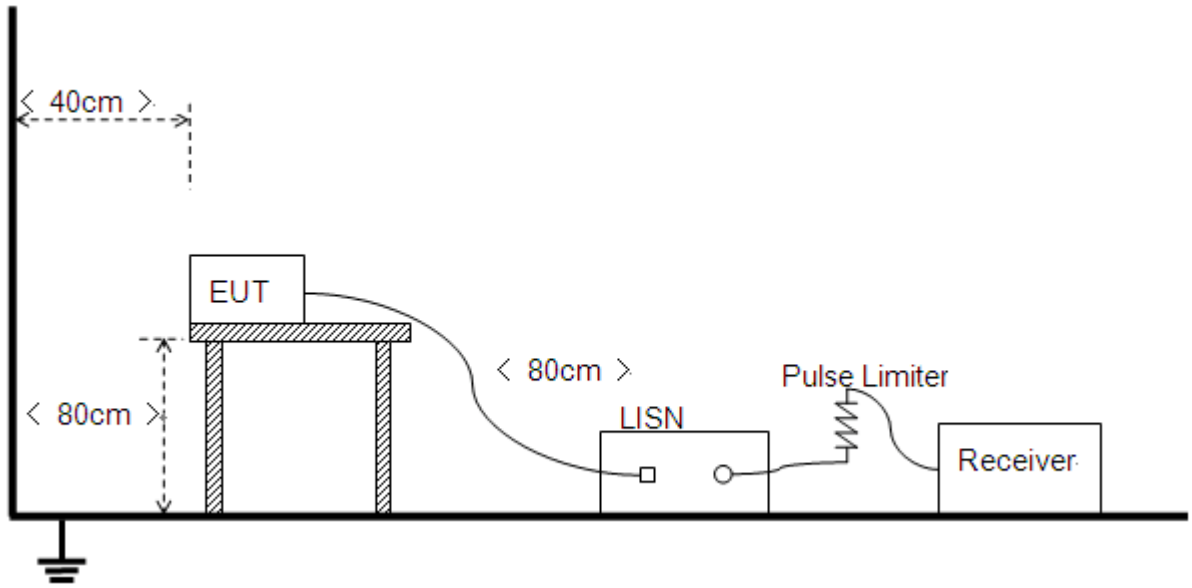
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.7.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

2.7.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

Test Mode: EUT+ ADAPTOR + WIFI TX

Test Voltage: AC 120V/60Hz

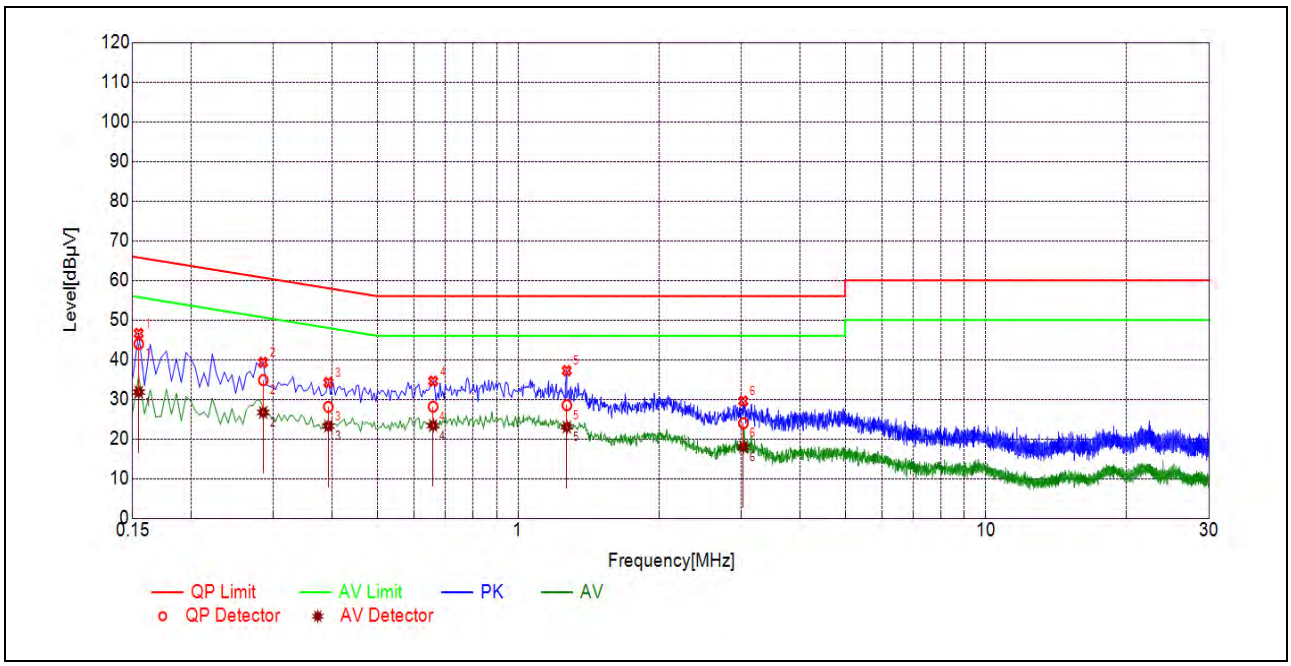
The measurement results are obtained as below:

E [dBμV] $=U_R + L_{Cable\ loss}$ [dB] + A_{Factor}

U_R: Receiver Reading

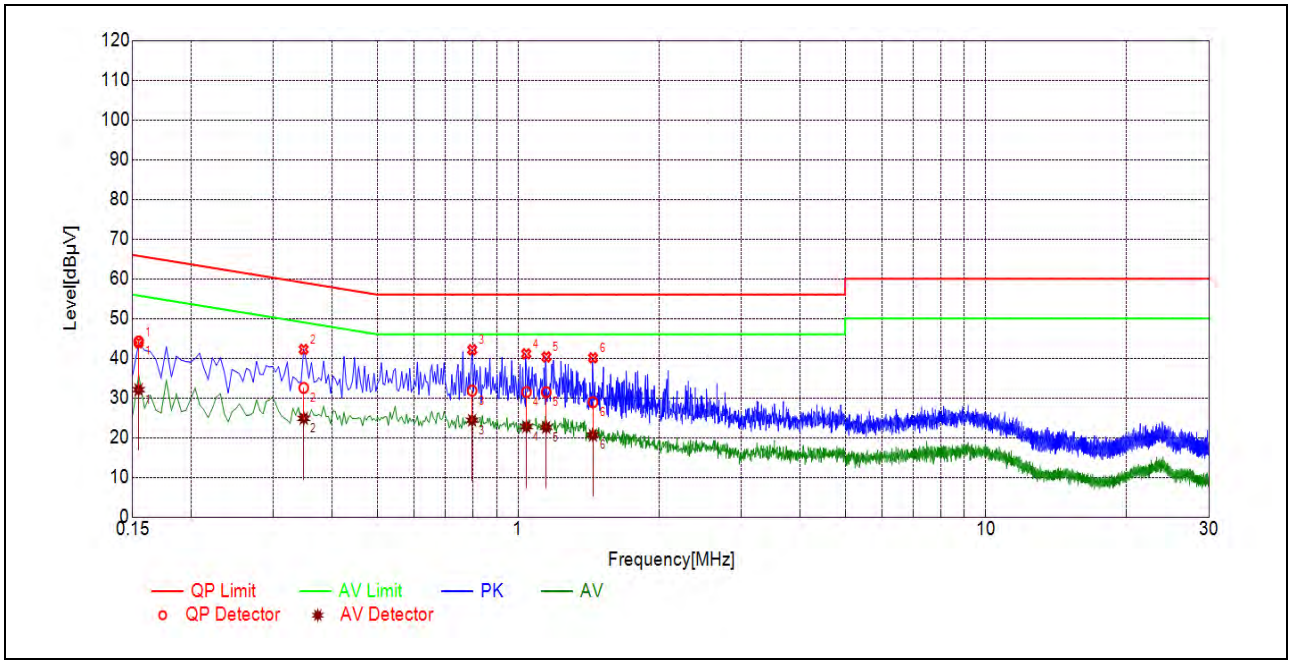
A_{Factor}: Voltage division factor of LISN

B. Test Plots:



(L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1545	0.1545	31.83	65.75	55.75	Line	PASS
2	0.2852	0.2852	26.69	60.66	50.66		PASS
3	0.3928	0.3928	23.26	58.00	48.00		PASS
4	0.6580	0.6580	23.39	56.00	46.00		PASS
5	1.2711	1.2711	23.02	56.00	46.00		PASS
6	3.0300	3.0300	17.99	56.00	46.00		PASS



(N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1544	44.22	32.08	65.76	55.76	Neutral	PASS
2	0.3481	32.53	24.84	59.01	49.01		PASS
3	0.7973	31.83	24.37	56.00	46.00		PASS
4	1.0418	31.49	22.78	56.00	46.00		PASS
5	1.1481	31.45	22.58	56.00	46.00		PASS
6	1.4453	28.92	20.61	56.00	46.00		PASS

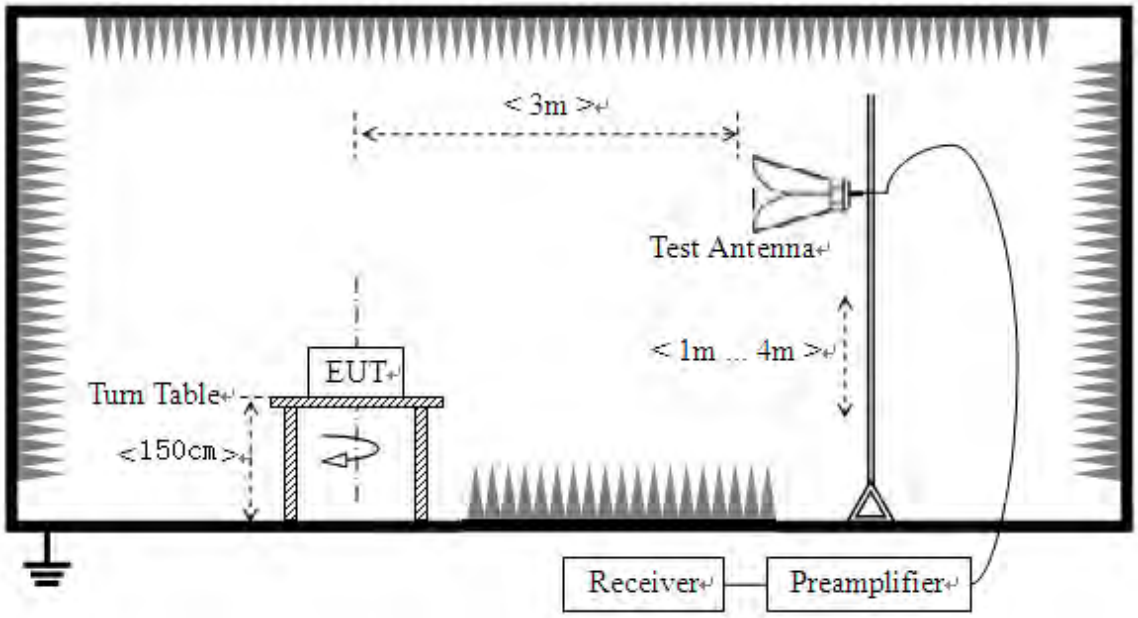
2.8. Restricted Frequency Bands

2.8.1. Requirement

According to FCC section 15.407(b)(7), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.8.2. Test Description

A. Test Setup



The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.
KDB 789033 Section H) 3)5)6(d)) was used in order to prove compliance
For the Test Antenna:
Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

2.8.3. Test Result

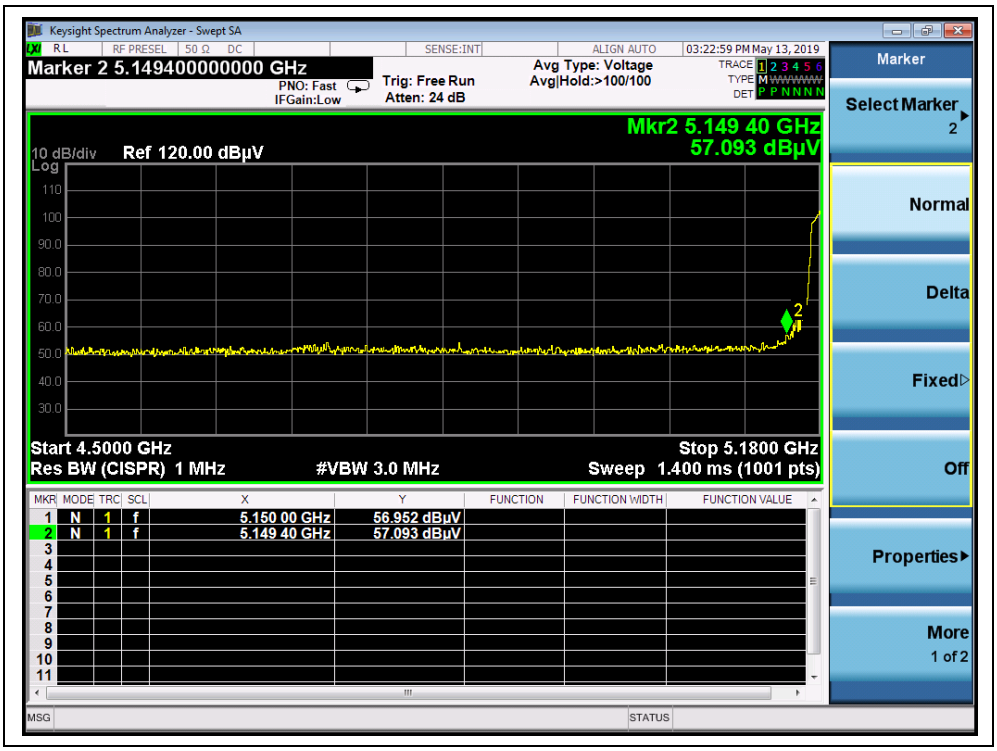
The lowest and highest channels are tested to verify Restricted Frequency Bands.
The measurement results are obtained as below:
E [dBμV/m] $=U_R + A_T + A_{Factor}$ [dB]; $A_T = L_{Cable\ loss}$ [dB]-G_{preamp} [dB]
A_T: Total correction Factor except Antenna; U_R: Receiver Reading
G_{preamp}: Preamplifier Gain; A_{Factor}: Antenna Factor at 3m
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

802.11a Test mode

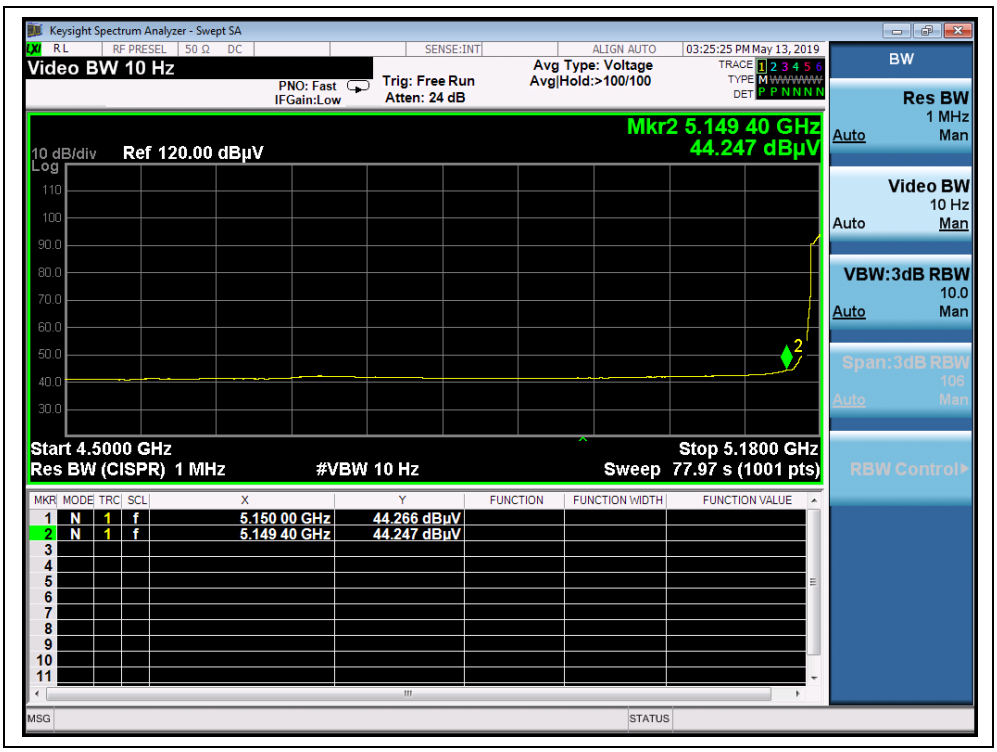
A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
36	5149.40	PK	57.09	-26.92	32.20	62.37	74	PASS
36	5150.00	AV	44.27	-26.92	32.20	49.55	54	PASS
64	5352.94	PK	55.55	-26.80	32.20	60.95	74	PASS
64	5350.00	AV	42.52	-26.80	32.20	47.92	54	PASS
100	5467.50	PK	56.13	-26.64	32.20	61.69	68.23	PASS
100	5170.00	AV	42.39	-26.64	32.20	47.95	54	PASS
144	5726.80	PK	55.94	-26.64	32.20	61.50	68.23	PASS
144	5725.00	AV	42.52	-26.64	32.20	48.08	54	PASS
149	5723.34	PK	61.43	-26.23	32.20	67.40	118.44	PASS
149	5725.00	AV	45.90	-26.23	32.20	51.87	54	PASS
165	5850.00	PK	57.95	-26.23	32.20	63.92	122.23	PASS
165	5850.00	AV	44.25	-26.23	32.20	50.22	54	PASS

B. Test Plots:



(Channel 36, PEAK, 802.11a)



(Channel 36, AVG, 802.11a)