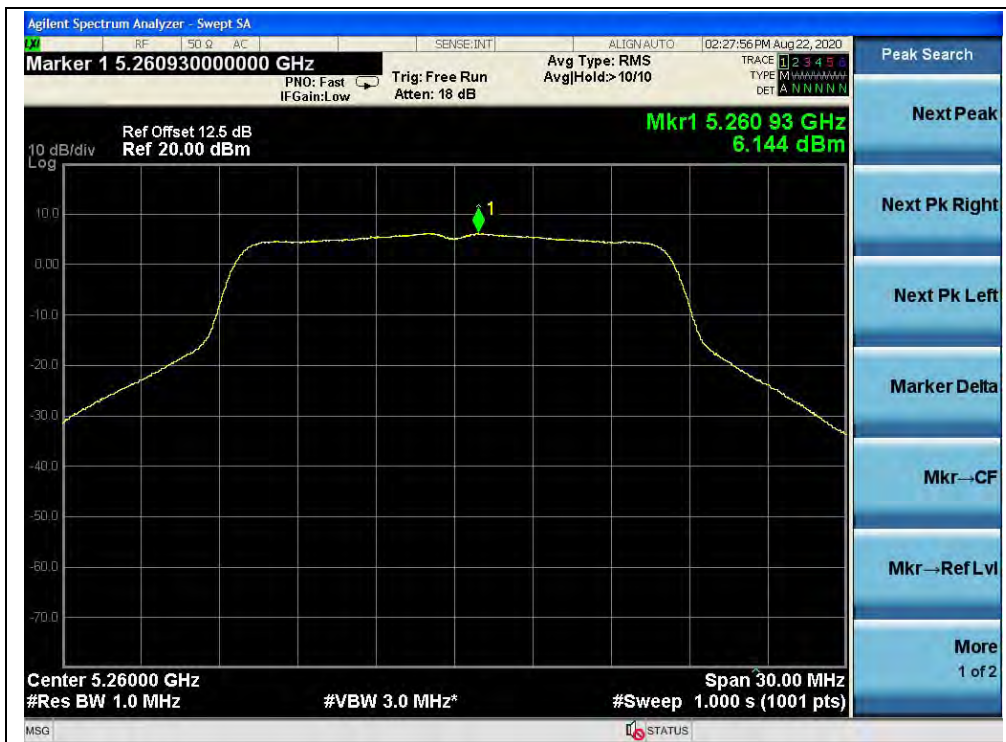
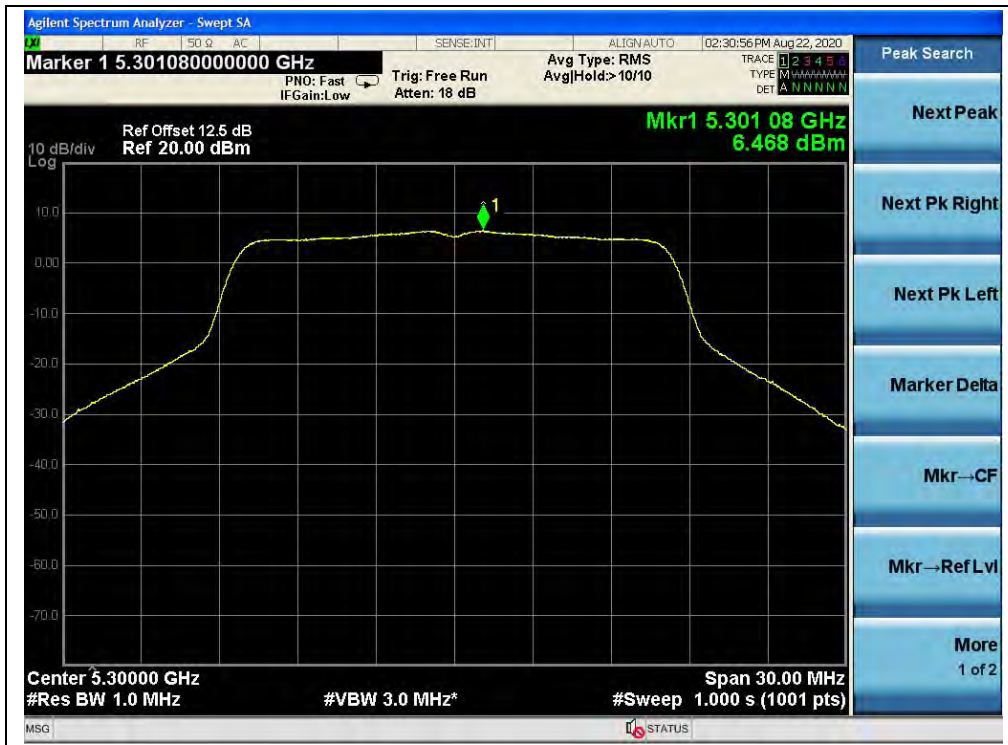




(Channel 48, 5240MHz, 802.11a)



(Channel 52, 5260MHz, 802.11a)



(Channel 60, 5300MHz, 802.11a)



(Channel 64, 5320MHz, 802.11a)

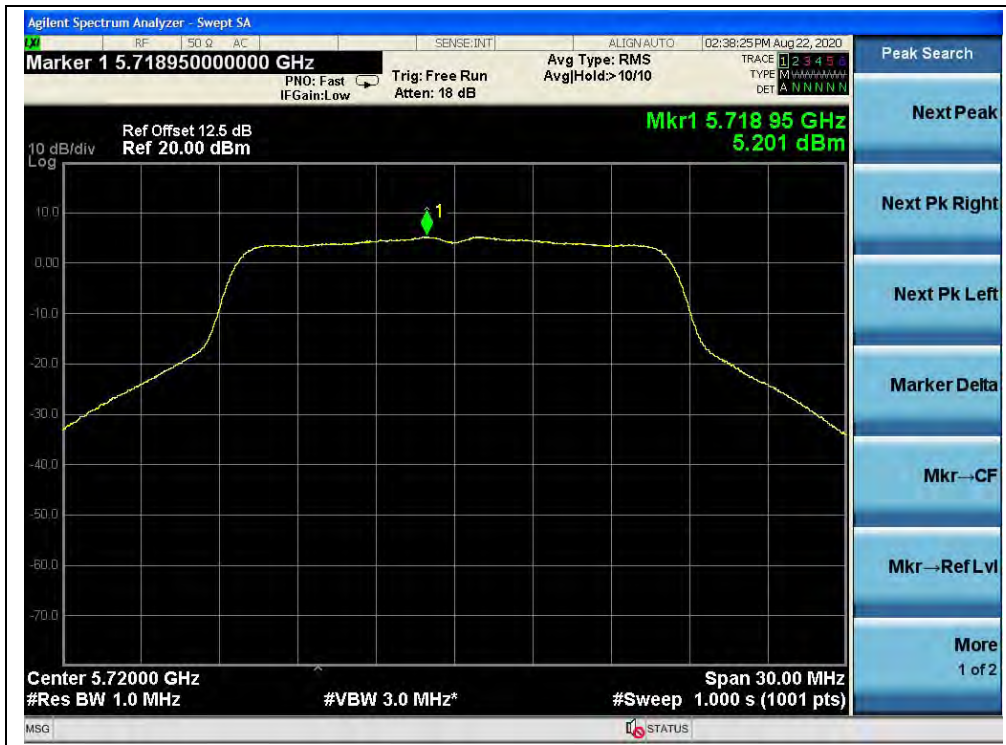


(Channel 100, 5500MHz, 802.11a)



(Channel 120, 5600MHz, 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) Mode**

**A.Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	5.77	0.09	5.84	11	PASS
44	5220	5.99		6.06		
48	5240	5.68		5.75		
52	5260	5.66		5.73		
60	5300	5.79		5.86		
64	5320	6.22		6.29		
100	5500	5.75		5.82		
120	5600	5.35		5.42		
144	5720	4.83		4.90		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	2.19	0.09	2.26	30	PASS
149	5745	-2.32		-2.25		
157	5785	-2.07		-2.00		
165	5825	-1.95		-1.88		





B.Test Plot:



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



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





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



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



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



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



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



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





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



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





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



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



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



802.11n (HT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	3.01	0.13	3.19	11	PASS
46	5230	3.31		3.49		
54	5270	2.85		3.03		
62	5310	3.14		3.32		
102	5510	2.97		3.15		
126	5630	2.24		2.42		
142	5710	2.03		2.21		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
142	5710	-0.82	0.13	-0.64	30	PASS
151	5755	-5.26		-5.08		
159	5795	-4.90		-4.72		

B. Test Plot:



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



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



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





(Channel 62, 5310MHz, 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, 5755MHz, 802.11n (HT40))





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





**802.11ac (VHT20) Mode**

**A.Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	5.73	0.07	5.80	11	PASS
44	5220	5.89		5.96		
48	5240	5.61		5.68		
52	5260	5.82		5.89		
60	5300	5.80		5.87		
64	5320	6.14		6.21		
100	5500	5.71		5.78		
120	5600	5.30		5.37		
144	5720	4.64		4.71		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	2.10	0.07	2.17	30	PASS
149	5745	-2.27		-2.20		
157	5785	-2.18		-2.11		
165	5825	-1.89		-1.82		



B.Test Plot:



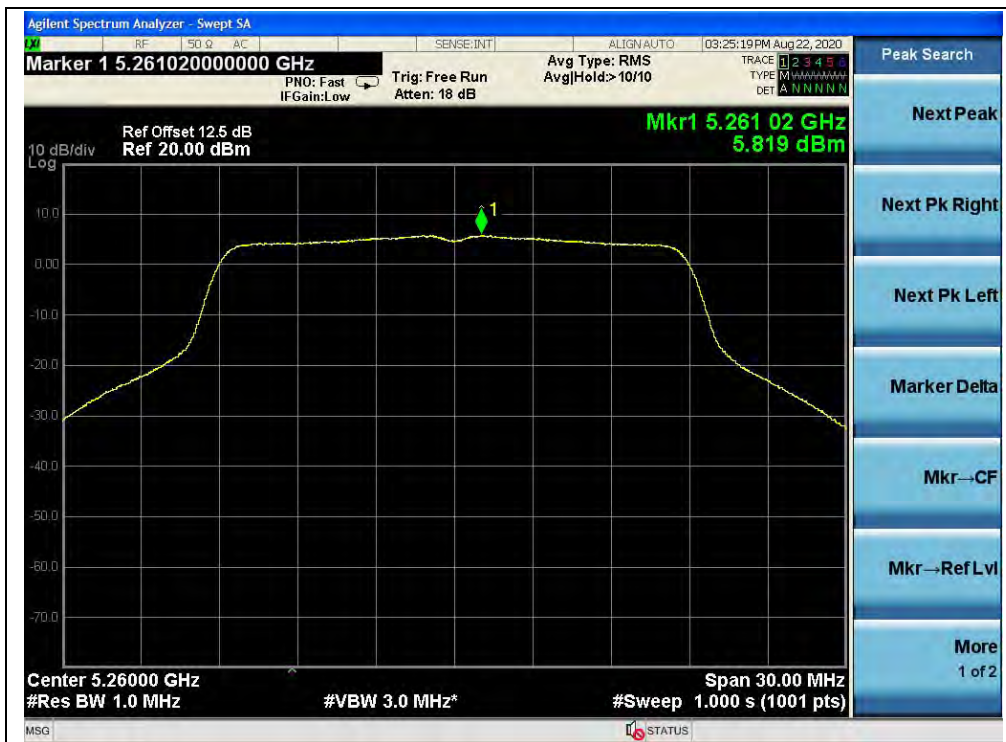
(Channel 36, 5180MHz, 802.11ac (VHT20))



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



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

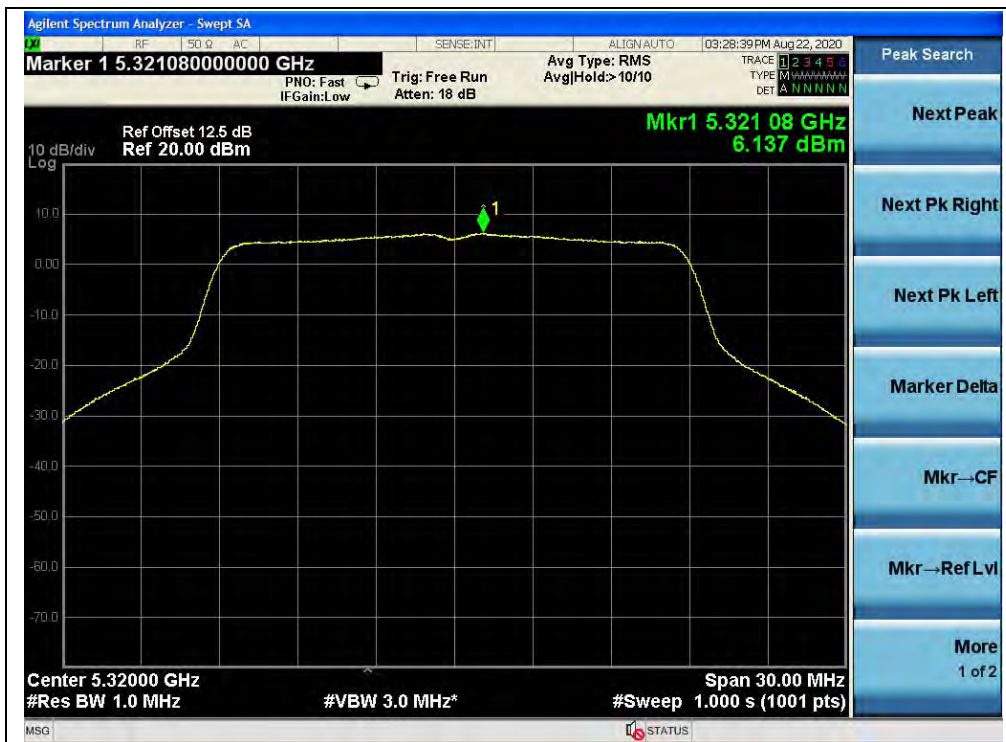


(Channel 52, 5260MHz, 802.11ac (VHT20))





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



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



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



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



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



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





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



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



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



802.11ac (VHT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	3.06	0.18	3.24	11	PASS
46	5230	3.07		3.25		
54	5270	3.05		3.23		
62	5310	3.01		3.19		
102	5510	2.93		3.11		
126	5630	2.15		2.33		
142	5710	2.07		2.25		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
142	5710	-0.80	0.18	-0.62	30	PASS
151	5755	-5.21		-5.03		
155	5795	-4.99		-4.81		

B. Test Plot:



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





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



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



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



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



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



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





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



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



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



802.11ac (VHT80) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Corrected PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
42	5210	-0.33	0.36	0.03	11	PASS
58	5290	-0.46		-0.10		
106	5530	-0.62		-0.26		
122	5610	-1.10		-0.74		
138	5690	-1.42		-1.06		
Channel	Frequency (MHz)	Measured PSD (dBm/500KHz)	Duty Factor	Corrected PSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
138	5690	-3.19	0.36	-2.83	30	PASS
155	5775	-8.51		-8.15		

B. Test Plot:



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



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



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





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



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



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



(Channel 155, 5775MHz, 802.11ac (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)	Fre. Dev. (kHz)	Deviation (ppm)
100%	7.74	+20(Ref)	23	4.440
100%		-30	30	5.792
100%		-20	28	5.405
100%		-10	26	5.019
100%		0	24	4.633
100%		+10	26	5.019
100%		+20	24	4.633
100%		+30	23	4.440
100%		+40	28	5.405
100%		+50	23	4.440
85%		6.58	+20	30
115%	8.90	+20	28	5.405





<b>U-NII-2A (Ch. 52)</b>				
<b>5260MHz</b>				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	7.74	+20(Ref)	20	3.802
100%		-30	22	4.183
100%		-20	24	4.563
100%		-10	24	4.563
100%		0	23	4.373
100%		+10	18	3.422
100%		+20	20	3.802
100%		+30	27	5.133
100%		+40	29	5.513
100%		+50	25	4.753
85%	6.58	+20	21	3.992
115%	8.90	+20	19	3.612

<b>U-NII-2C (Ch. 100)</b>				
<b>5500MHz</b>				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	7.74	+20(Ref)	21	3.818
100%		-30	25	4.545
100%		-20	30	5.455
100%		-10	28	5.091
100%		0	22	4.000
100%		+10	24	4.364
100%		+20	23	4.182
100%		+30	30	5.455
100%		+40	35	6.364
100%		+50	25	4.545
85%	6.58	+20	30	5.455
115%	8.90	+20	27	4.909



<b>U-NII-3 (Ch. 149)</b>				
<b>5745MHz</b>				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	7.74	+20(Ref)	22	3.829
100%		-30	26	4.526
100%		-20	28	4.874
100%		-10	24	4.178
100%		0	30	5.222
100%		+10	26	4.526
100%		+20	27	4.700
100%		+30	27	4.700
100%		+40	29	5.048
100%		+50	30	5.222
85%	6.58	+20	29	5.048
115%	8.90	+20	31	5.396

## 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 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN).

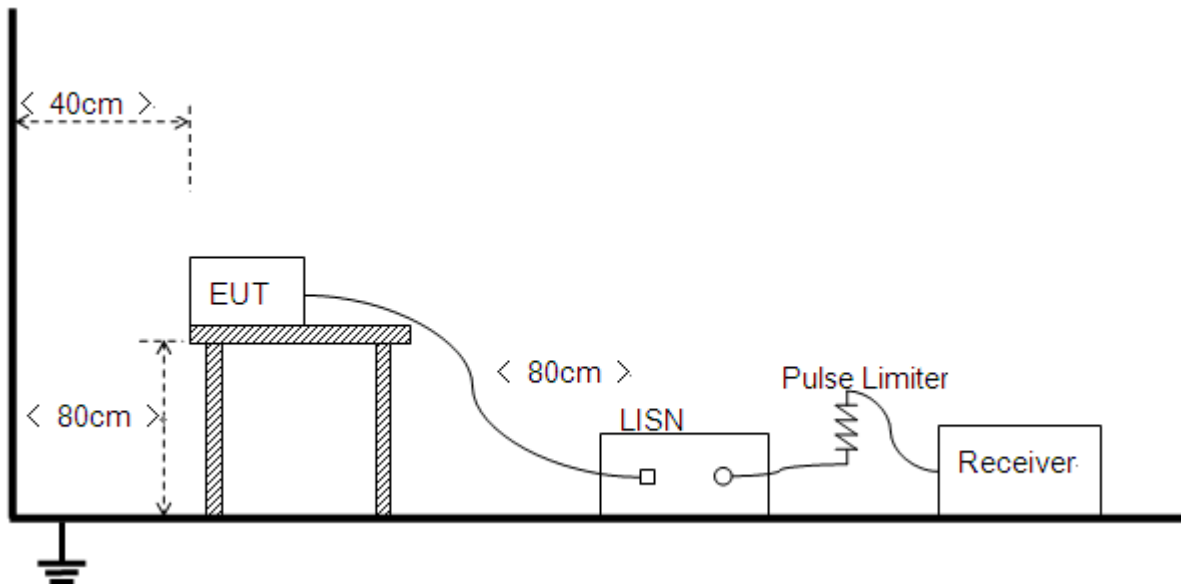
Frequency range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**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

**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 Plot 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+adapter+earphone+ WIFI TX

Test Voltage: AC 120V/60Hz

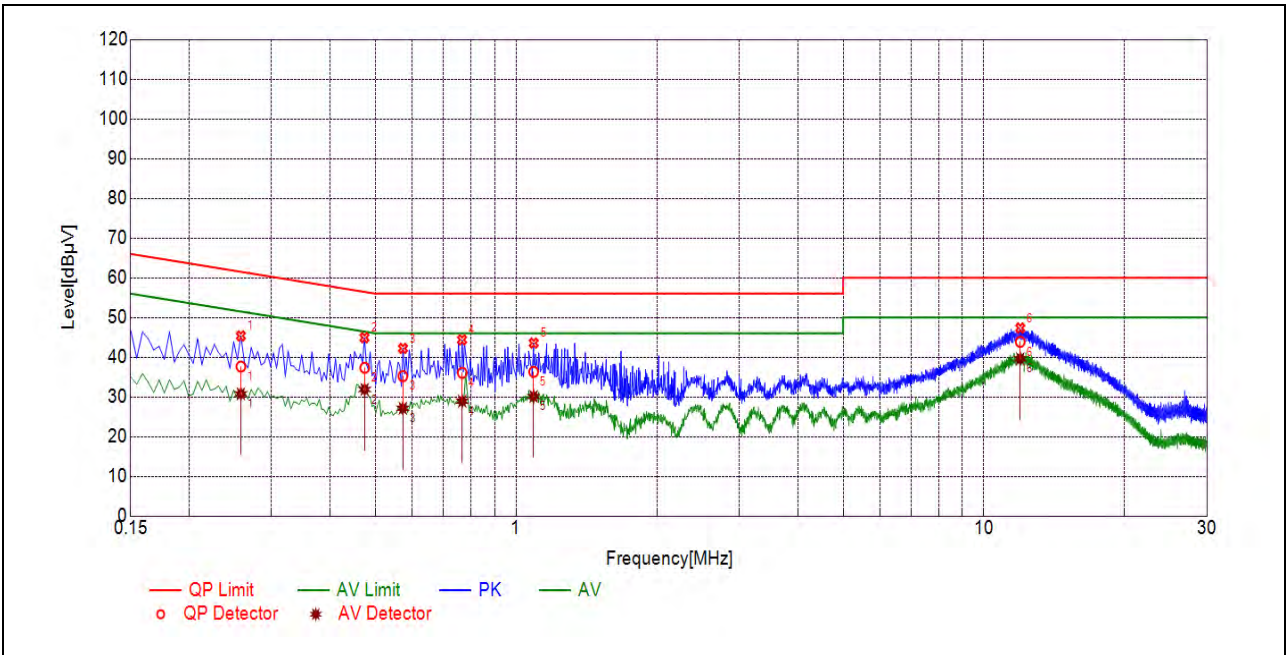
The measurement results are obtained as below:

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

$U_R$ : Receiver Reading

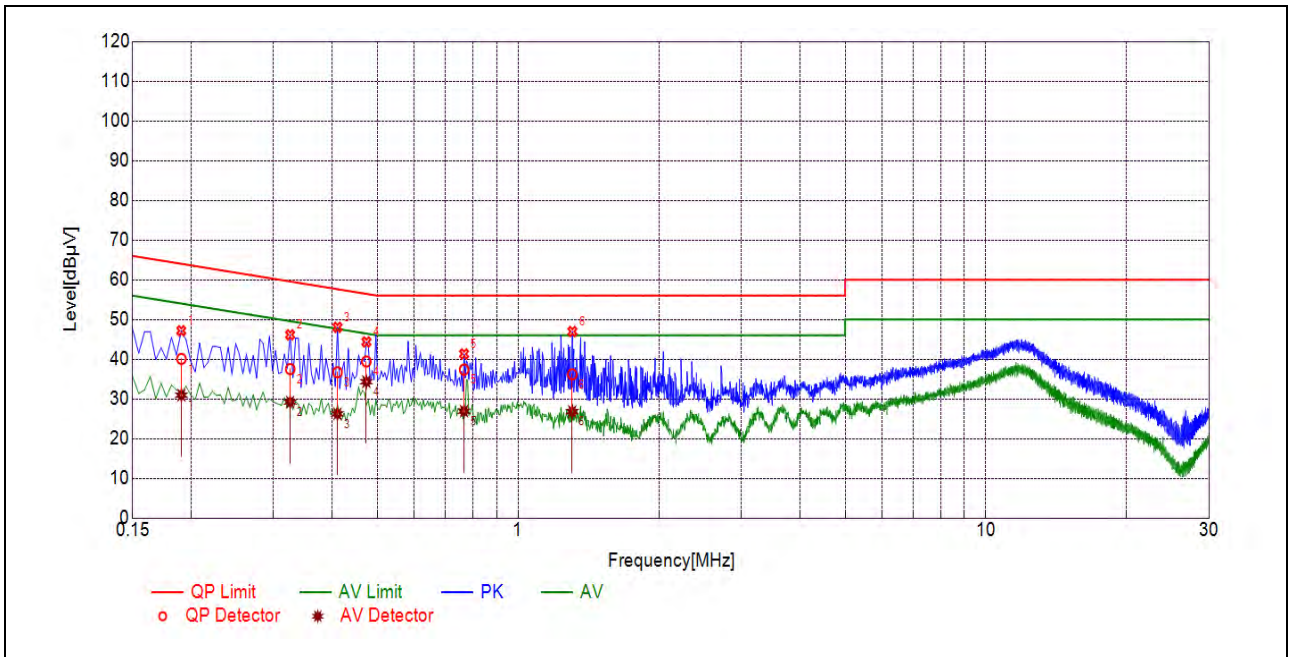
$A_{\text{Factor}}$ : Voltage division factor of LISN

**B.Test Plot:**



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2580	37.63	30.78	61.50	51.50	Line	PASS
2	0.4745	37.32	31.88	56.44	46.44		PASS
3	0.5725	35.23	27.14	56.00	46.00		PASS
4	0.7669	36.06	28.94	56.00	46.00		PASS
5	1.0900	36.32	30.12	56.00	46.00		PASS
6	11.9561	43.88	39.60	60.00	50.00		PASS



(N Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1906	40.09	30.95	64.01	54.01	Neutral	PASS
2	0.3256	37.52	29.22	59.56	49.56		PASS
3	0.4109	36.70	26.24	57.63	47.63		PASS
4	0.4738	39.43	34.33	56.45	46.45		PASS
5	0.7663	37.37	26.91	56.00	46.00		PASS
6	1.3054	36.18	26.82	56.00	46.00		PASS



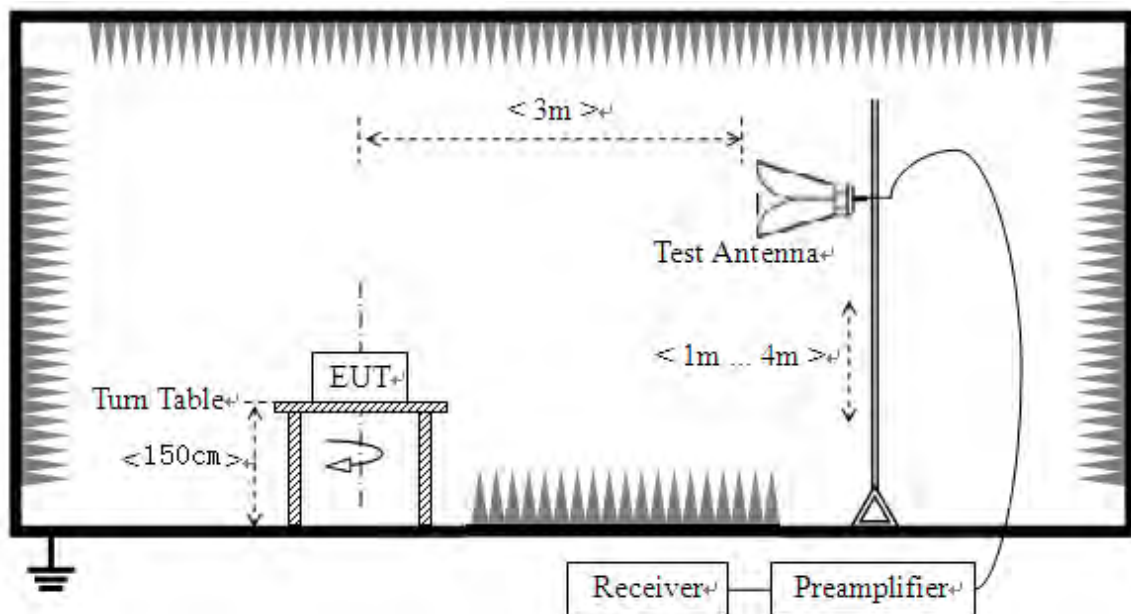
## 2.8. Restricted Frequency Bands

### 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

#### 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:

$$E \text{ [dB}\mu\text{V/m]} = U_R + A_T + A_{\text{Factor}} \text{ [dB]}; A_T = L_{\text{Cable loss}} \text{ [dB]} - G_{\text{preamp}} \text{ [dB]}$$

$A_T$ : Total correction Factor except Antenna;  $U_R$ : Receiver Reading

$G_{\text{preamp}}$ : Preamplifier Gain;  $A_{\text{Factor}}$ : Antenna Factor at 3m

**Note 1:** 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.

**Note 2** All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

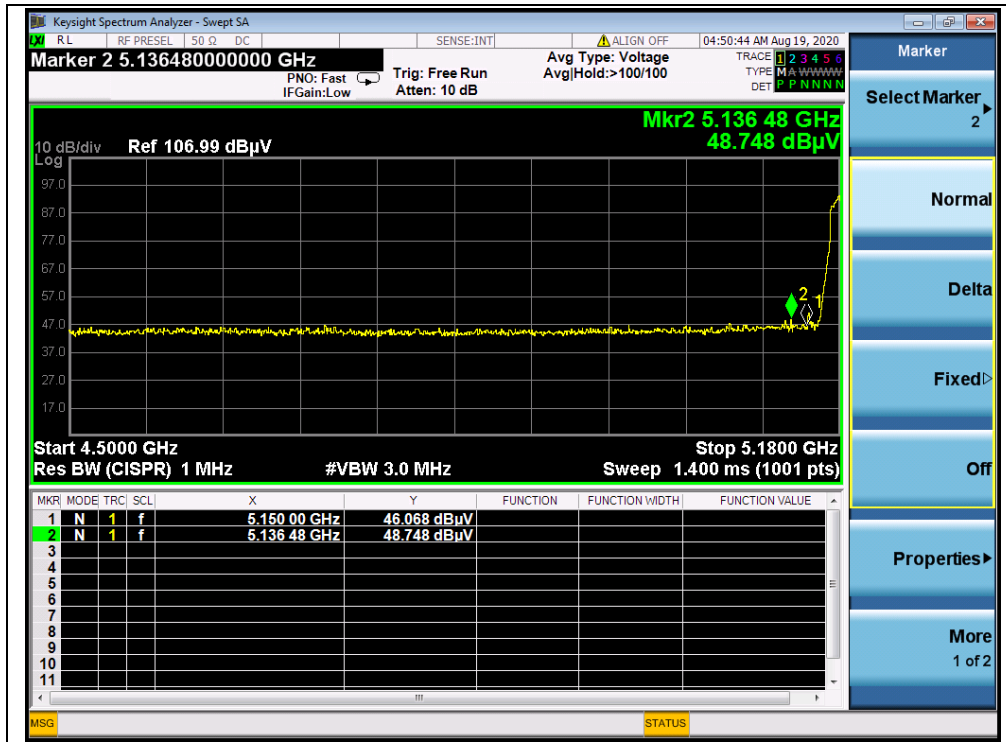
### 802.11a Mode

#### A. Test Verdict:

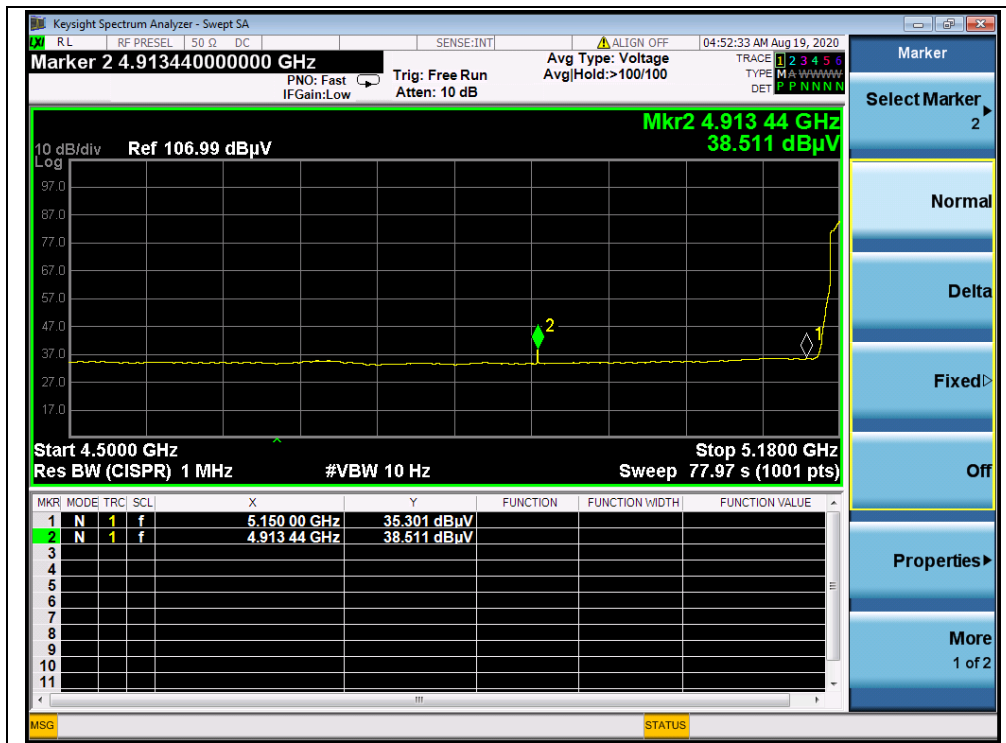
Channel	Frequency (MHz)	Detector	Receiver Reading	$A_T$ (dB)	$A_{\text{Factor}}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV	$U_R$ (dB $\mu$ V)					
36	5136.48	PK	48.75	-26.92	32.20	54.03	74	PASS
36	4913.44	AV	38.51	-26.92	32.20	43.79	54	PASS
64	5367.52	PK	43.94	-26.80	32.20	49.34	74	PASS
64	5350.00	AV	33.81	-26.80	32.20	39.21	54	PASS
100	5439.62	PK	45.38	-26.64	32.20	50.94	74	PASS
100	5470.00	AV	34.06	-26.64	32.20	39.62	54	PASS
144	5737.20	PK	45.54	-26.64	32.20	51.10	68.23	PASS
144	5725.00	AV	34.71	-26.64	32.20	40.27	54	PASS
149	5725.00	PK	46.04	-26.23	32.20	52.01	122.23	PASS
165	5855.00	PK	43.87	-26.23	32.20	49.84	110.83	PASS



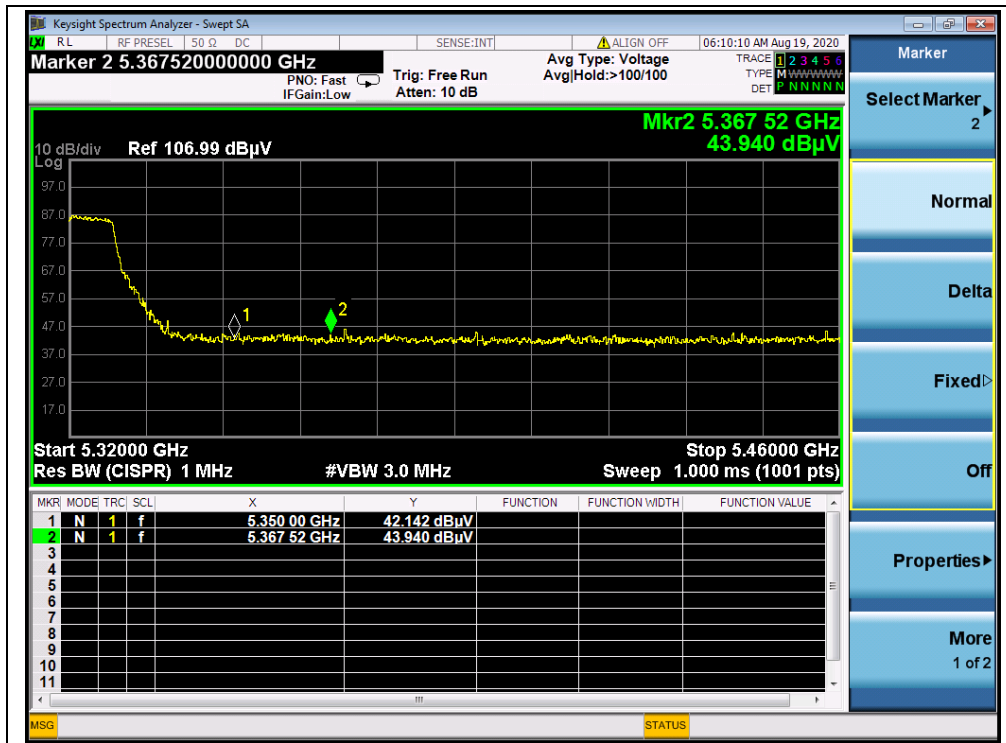
B.Test Plot:



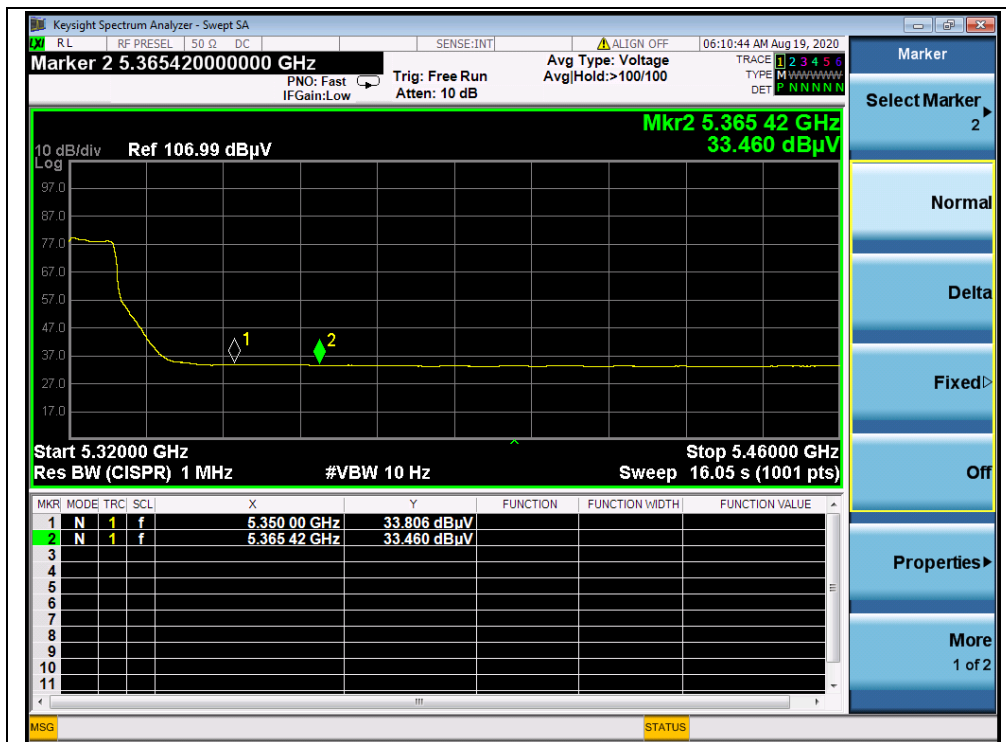
(PEAK, Channel 36, 802.11a)



(AVERAGE, Channel 36, 802.11a)

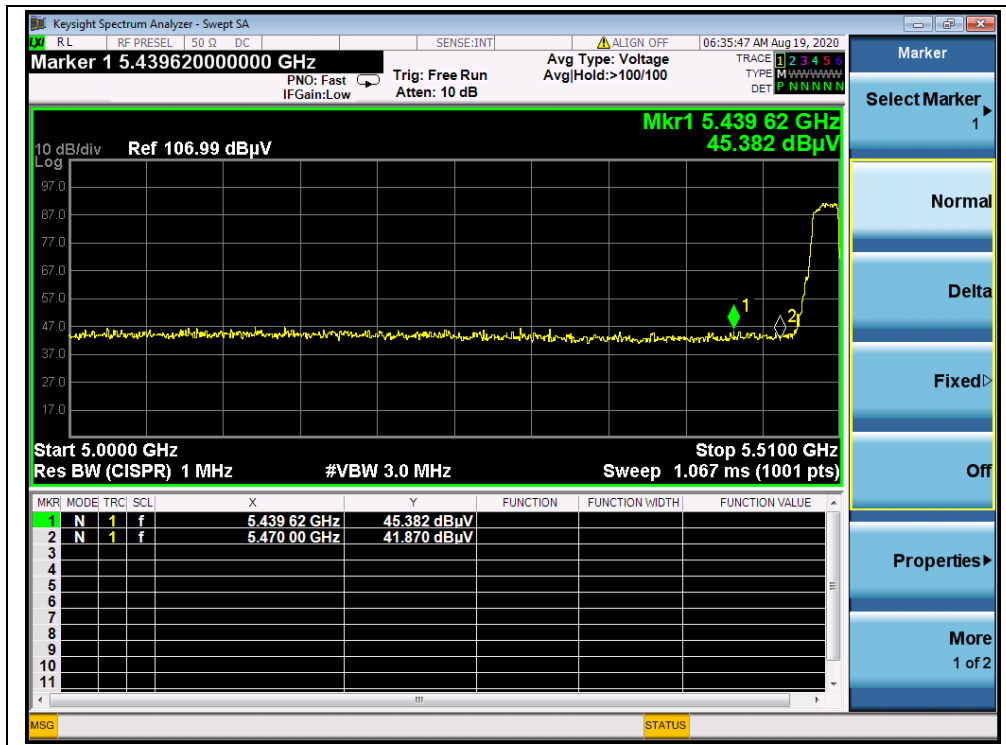


(PEAK, Channel 64, 802.11a)

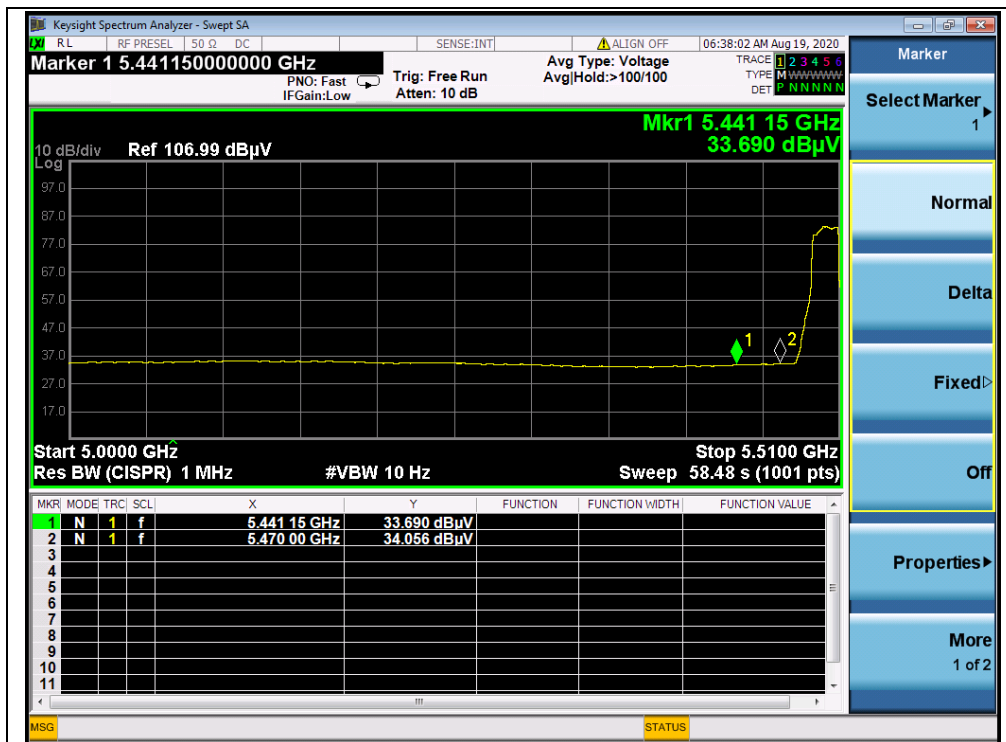


(AVERAGE, Channel 64, 802.11a)

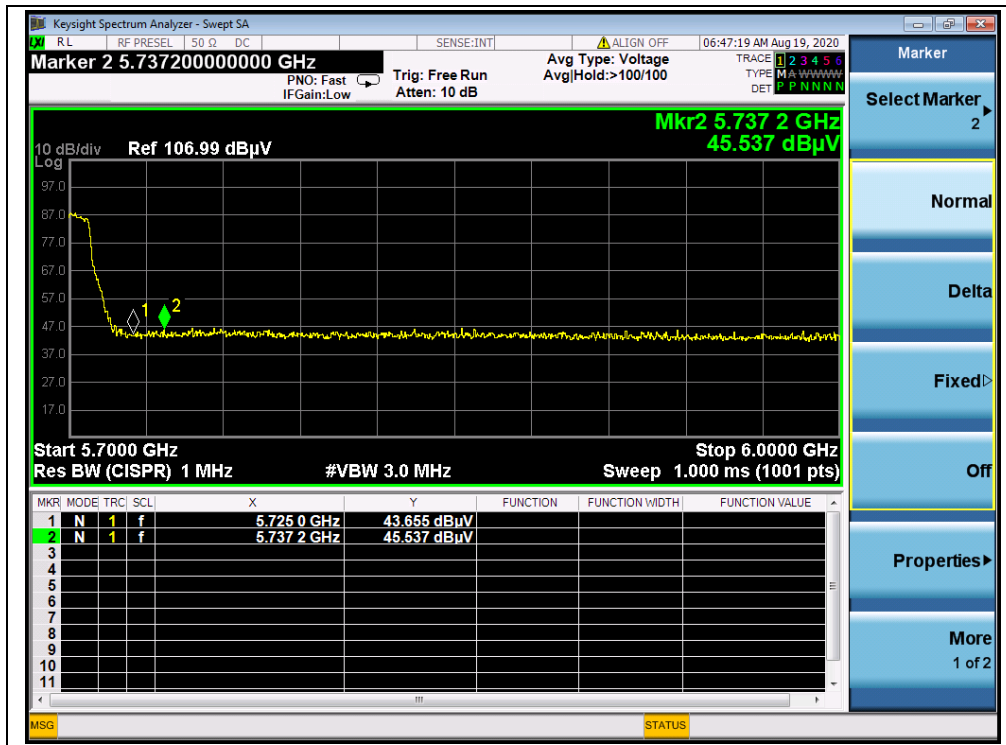




(PEAK, Channel100, 802.11a)



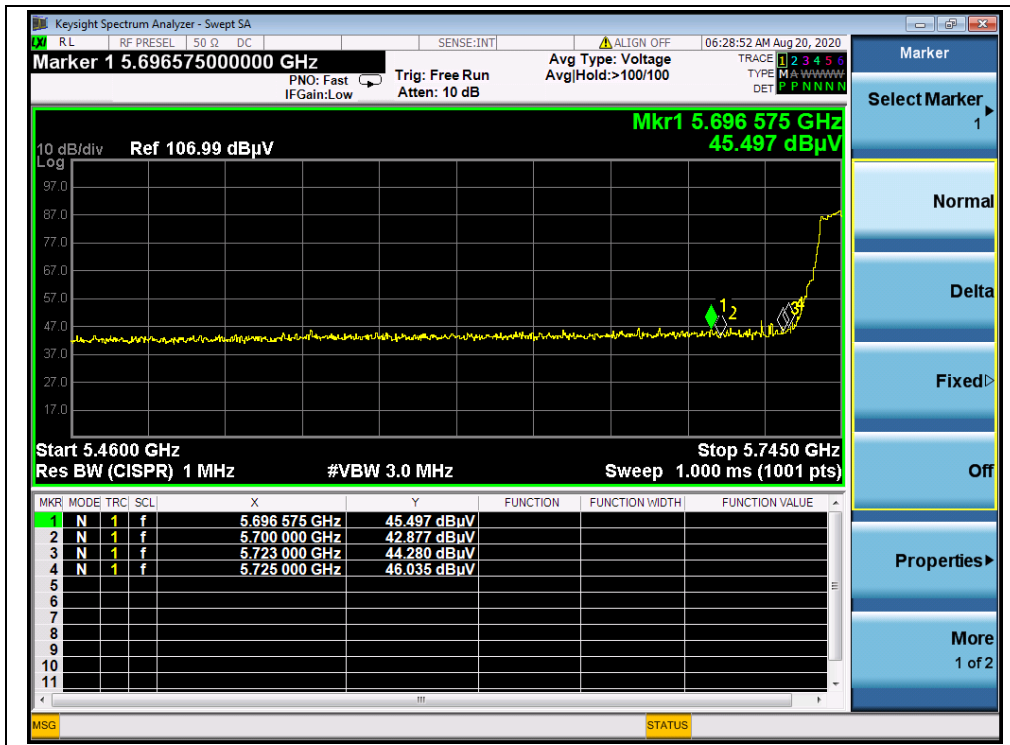
(AVERAGE, Channel 100, 802.11a)



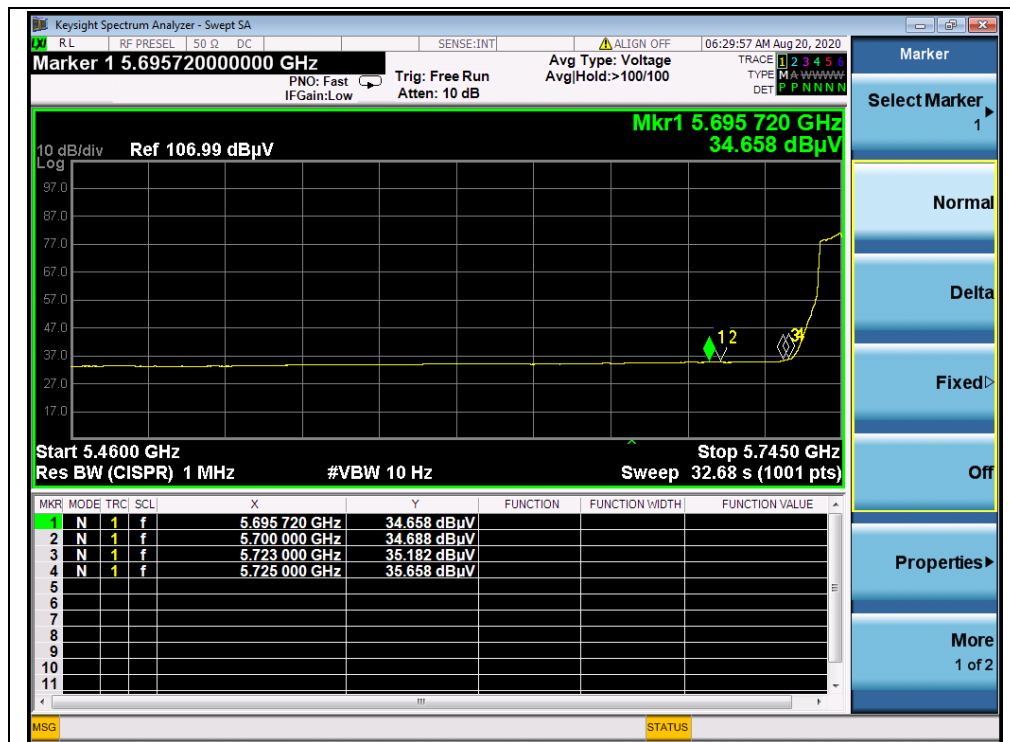
(PEAK, Channel 144, 802.11a)



(AVERAGE, Channel 144, 802.11a)



(PEAK, Channel 149, 802.11a)



(PEAK, Channel 165, 802.11a)

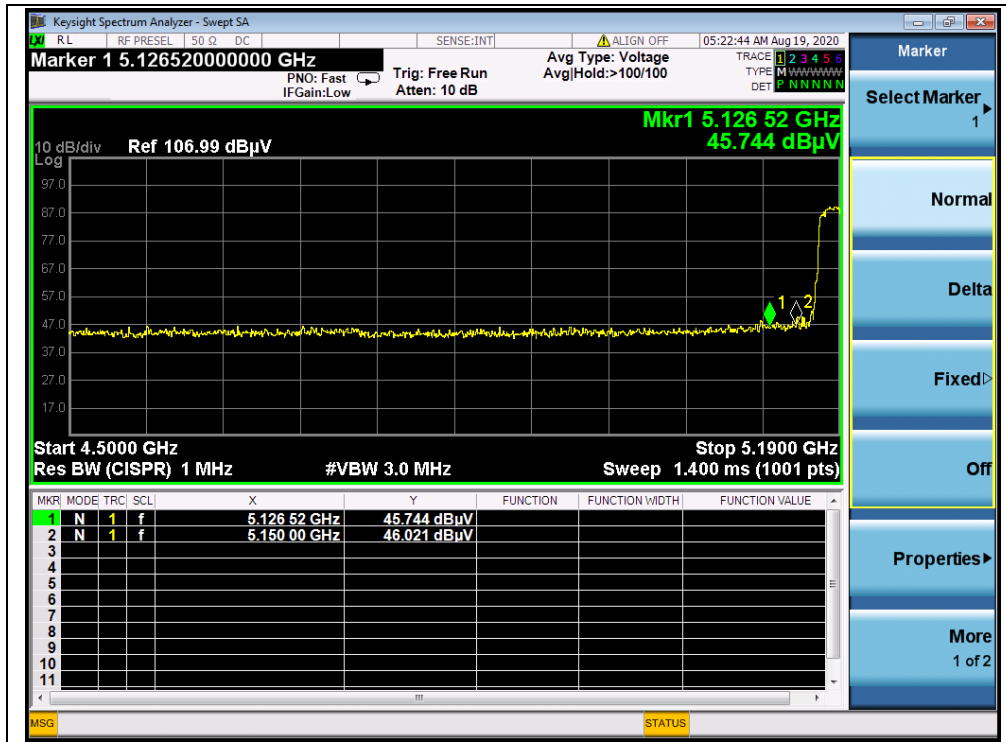
**802.11ac (VHT40) Mode****A.Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading $U_R$ (dB $\mu$ V)	$A_T$ (dB)	$A_{Factor}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV						
38	5150.00	PK	46.02	-26.92	32.20	51.30	74	PASS
38	5150.00	AV	36.25	-26.92	32.20	41.53	54	PASS
62	5358.90	PK	47.20	-26.80	32.20	52.60	74	PASS
62	5357.70	AV	35.19	-26.80	32.20	40.59	54	PASS
102	5432.83	PK	49.15	-26.64	32.20	54.71	74	PASS
102	5470.00	AV	37.06	-26.64	32.20	42.62	54	PASS
142	5747.55	PK	47.54	-26.64	32.20	53.10	68.23	PASS
142	5743.92	AV	35.02	-26.64	32.20	40.58	54	PASS
151	5725.00	PK	48.99	-26.23	32.20	54.96	122.83	PASS
159	5855.00	PK	45.60	-26.23	32.20	51.57	110.83	PASS

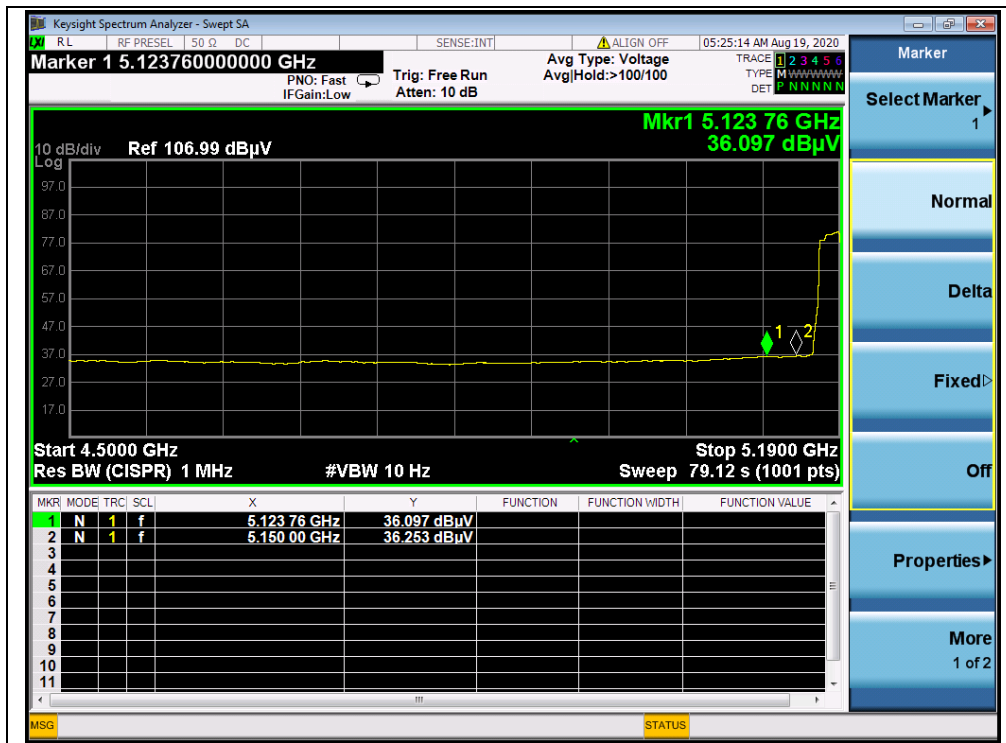




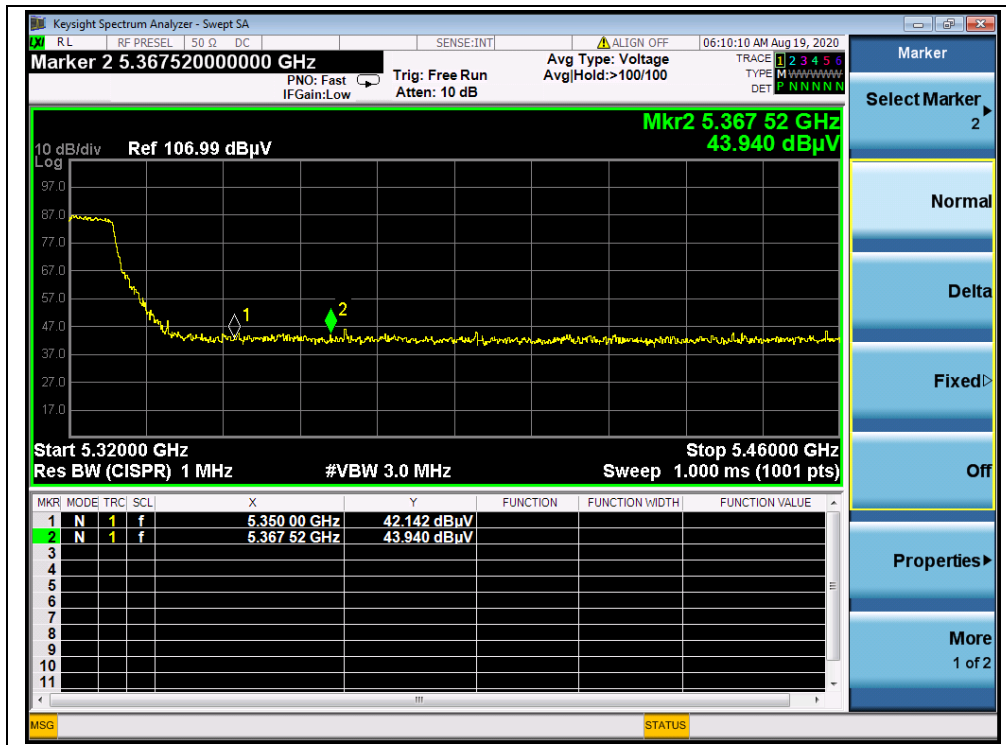
B.Test Plot:



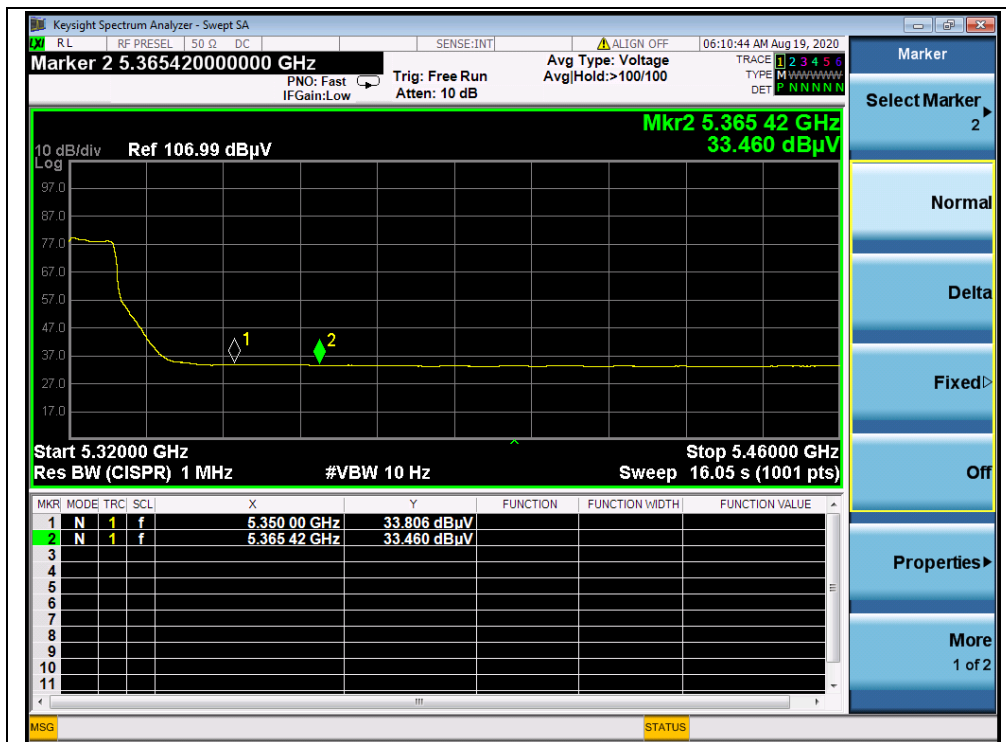
(PEAK, Channel 38, 802.11ac (VHT40))



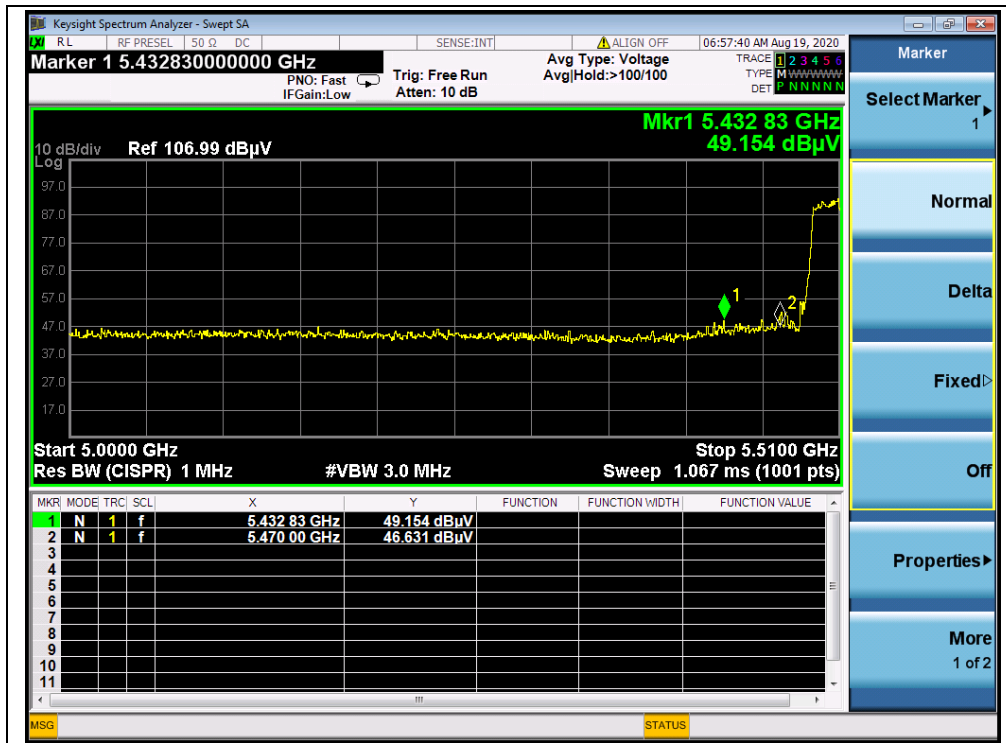
(AVERAGE, Channel 38, 802.11ac (VHT40))



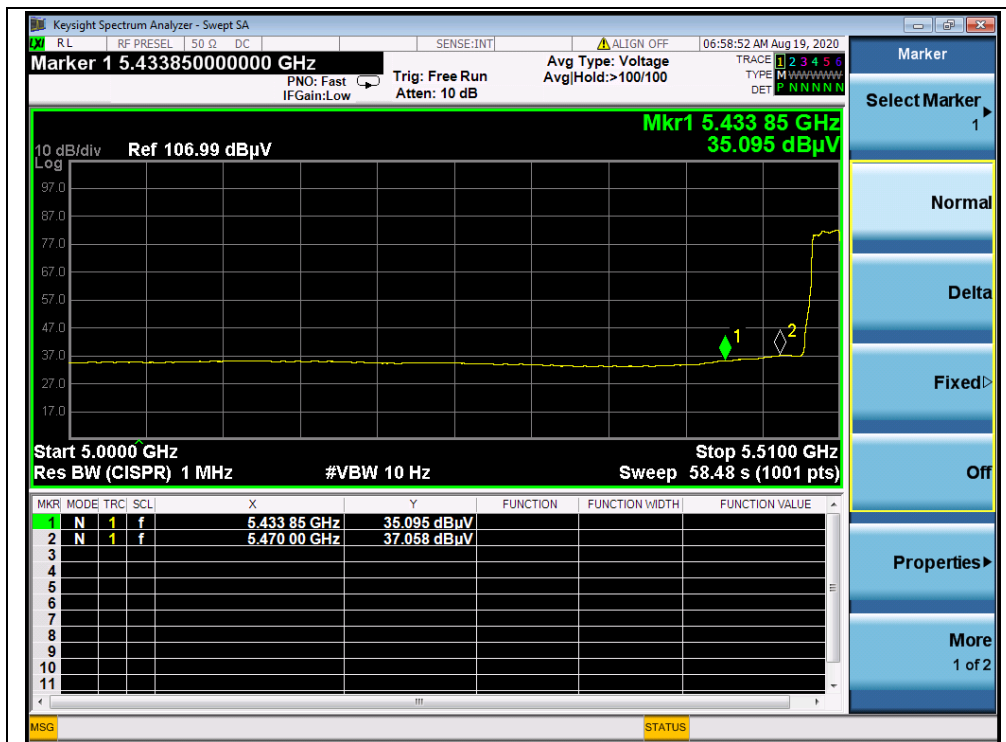
(PEAK, Channel 62, 802.11ac (VHT40))



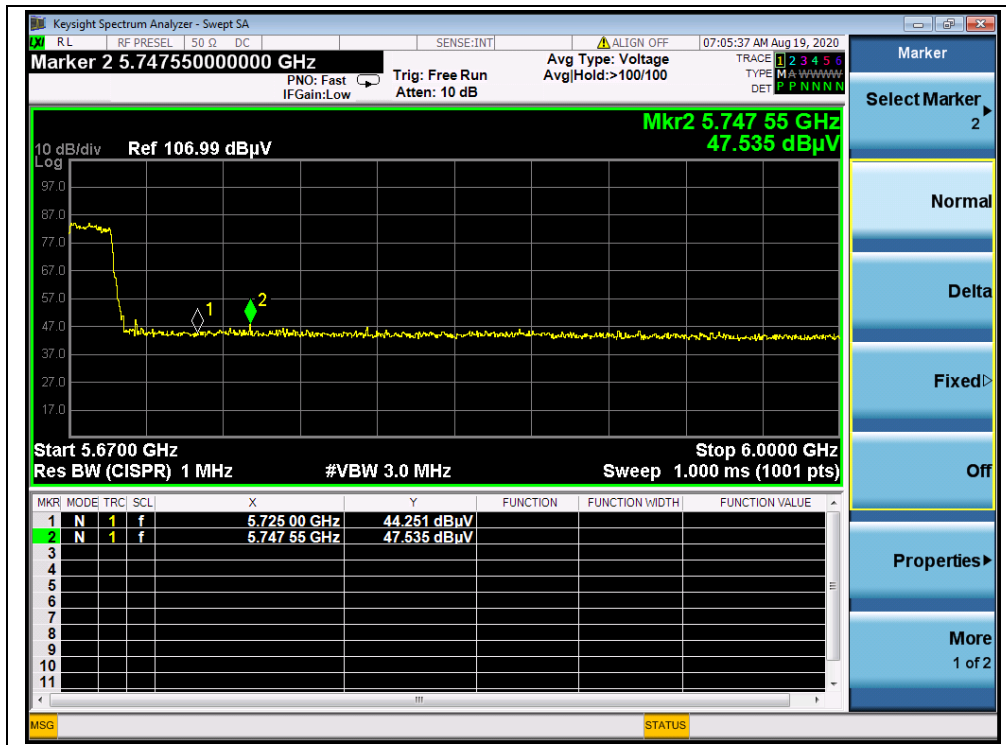
(AVERAGE, Channel 62, 802.11ac (VHT40))



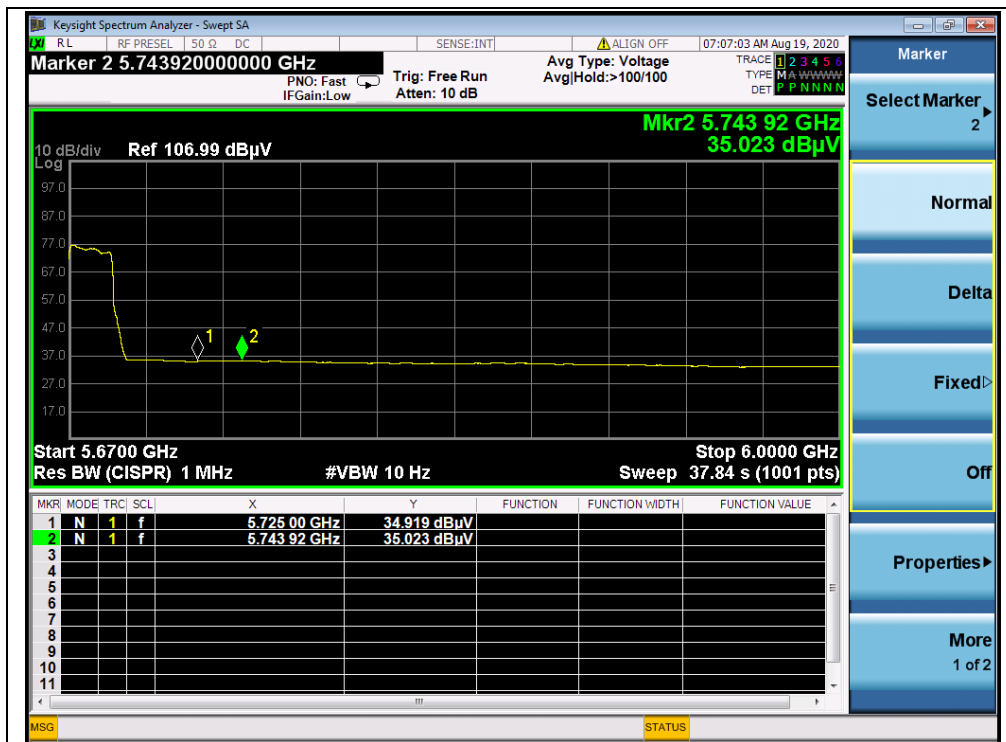
(PEAK, Channel 102, 802.11ac (VHT40))



(AVERAGE, Channel 102, 802.11ac (VHT40))

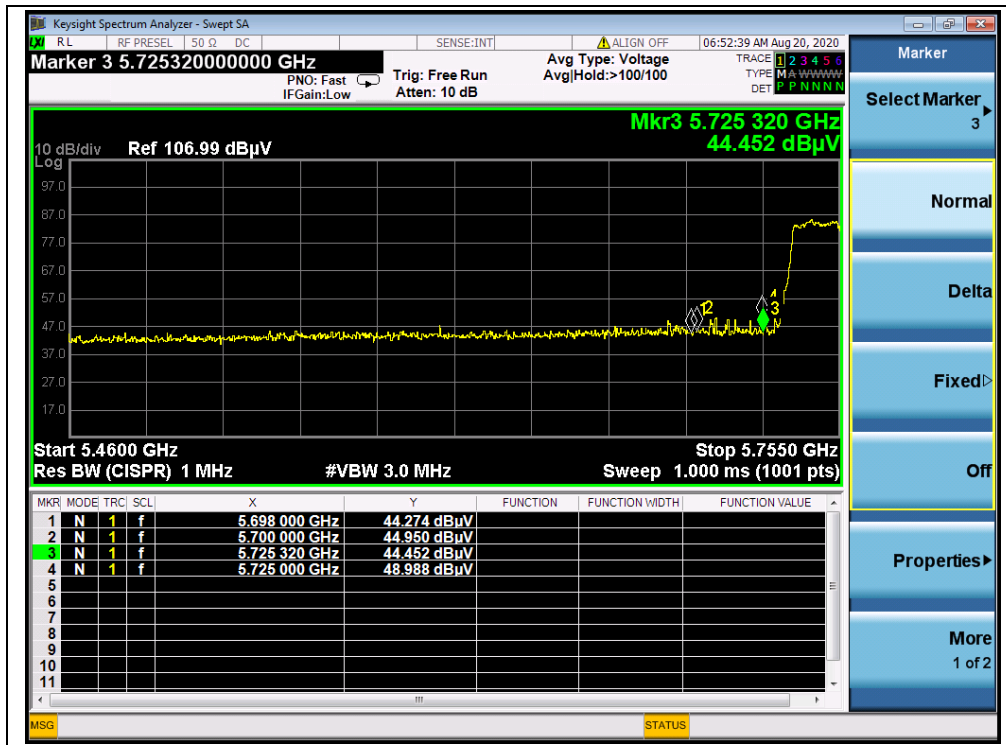


(PEAK, Channel 142, 802.11ac (VHT40))

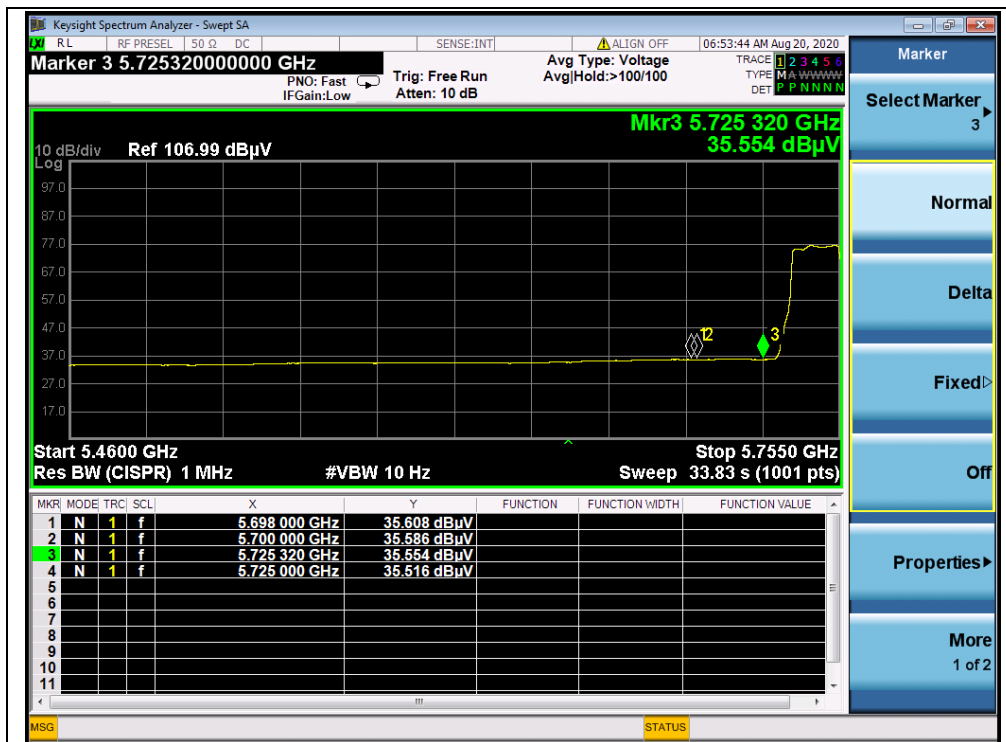


(AVERAGE, Channel 142, 802.11ac (VHT40))





(PEAK, Channel 151, 802.11ac (VHT40))



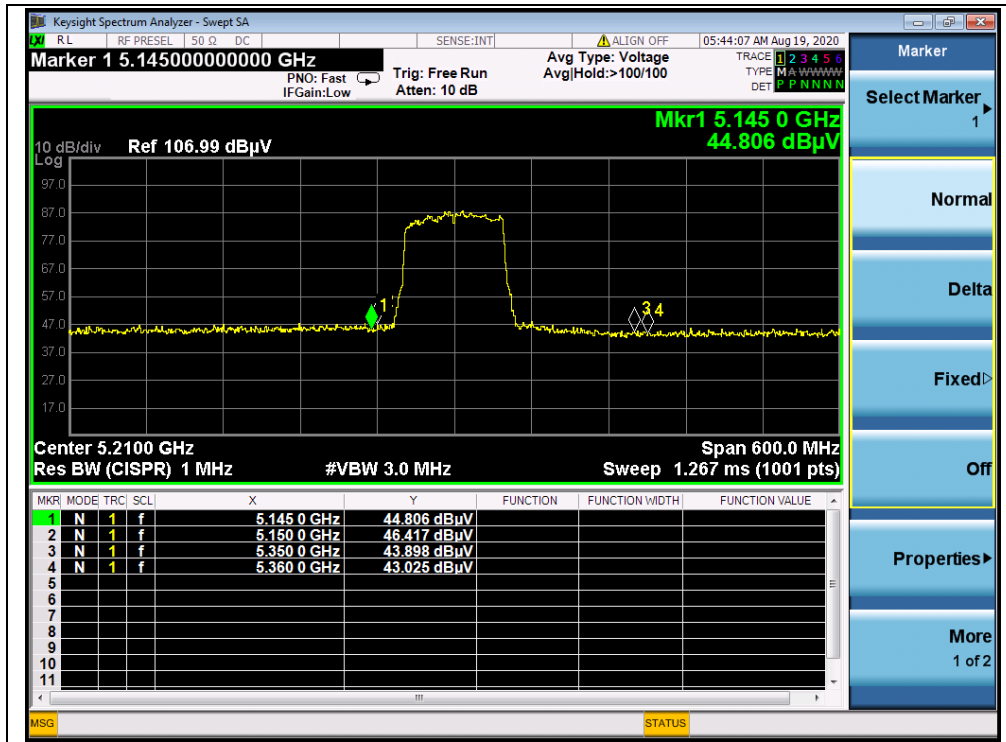
(PEAK, Channel 159, 802.11ac (VHT40))

**802.11ac (VHT80) Mode****A.Test Verdict:**

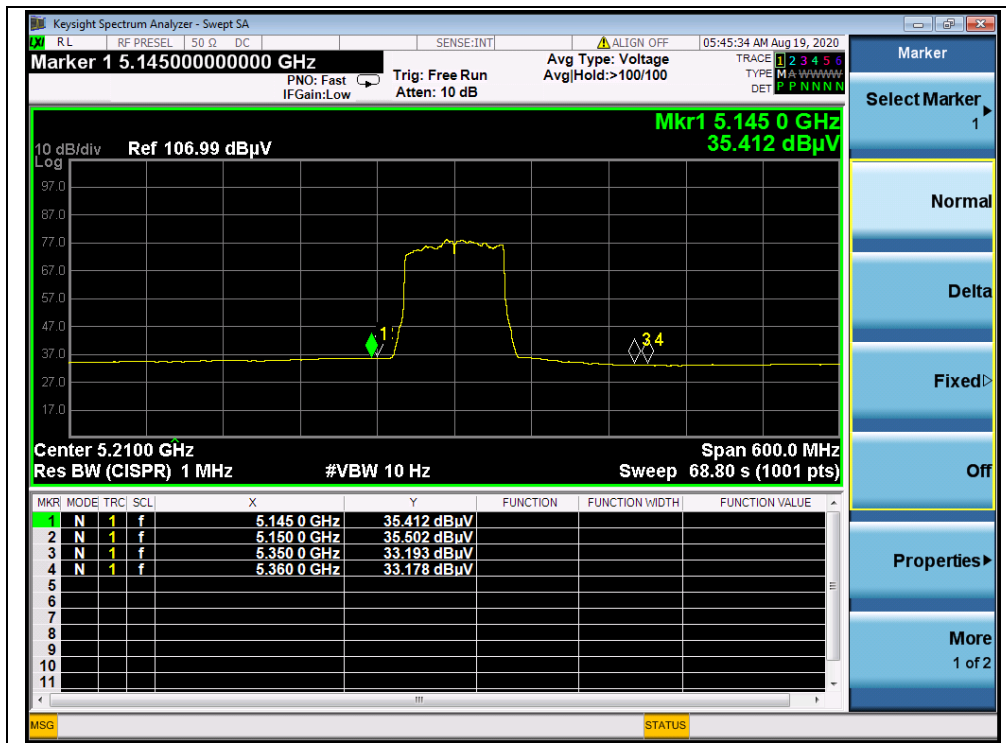
Channel	Frequency (MHz)	Detector	Receiver Reading $U_R$ (dB $\mu$ V)	$A_T$ (dB)	$A_{Factor}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV						
42	5150.00	PK	46.42	-26.92	32.20	51.70	74	PASS
42	5150.00	AV	35.50	-26.92	32.20	40.78	54	PASS
58	5352.80	PK	45.64	-26.80	32.20	51.04	74	PASS
58	5352.80	AV	34.15	-26.80	32.20	39.55	54	PASS
106	5461.63	PK	48.38	-26.64	32.20	53.94	68.23	PASS
106	5470.00	AV	37.21	-26.64	32.20	42.77	54	PASS
138	5738.70	PK	45.19	-26.64	32.20	50.75	68.23	PASS
138	5737.53	AV	34.79	-26.64	32.20	40.35	54	PASS
155	5686.50	PK	46.50	-26.23	32.20	52.47	95.24	PASS
155	5858.70	PK	44.96	-26.23	32.20	50.93	100.47	PASS



B.Test Plot:



(PEAK, Channel 42, 802.11ac (VHT80))



(AVERAGE, Channel 42, 802.11ac (VHT80))