



# TEST REPORT

**APPLICANT** : Reliance Communications LLC

**PRODUCT NAME** : Orbic Turbo 4G MHS

**MODEL NAME** : RC440L

**BRAND NAME** : Orbic

**FCC ID** : 2ABGH-RC440L

**STANDARD(S)** : 47 CFR Part 15 Subpart E

**RECEIPT DATE** : 2021-11-30

**TEST DATE** : 2021-12-09 to 2022-01-11

**ISSUE DATE** : 2022-01-20

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Shen Junsheng (Supervisor)

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Change History		
Version	Date	Reason for change
1.0	2022-01-20	First edition



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	Reliance Communications LLC
<b>Applicant Address:</b>	91 Colin Drive, Unit 1, HOLBROOK, New York 11741, United States
<b>Manufacturer:</b>	Unimaxcomm
<b>Manufacturer Address:</b>	Room 602, Floor 6th, Building B, Software Park T3,Hi-Tech Park South, Nanshan District, Shenzhen, P.R. China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Orbic Turbo 4G MHS	
<b>Sample No.:</b>	9#	
<b>Hardware Version:</b>	V1.0	
<b>Software Version:</b>	ORB440L_v1.0.1_BVT-NA	
<b>Modulation Type:</b>	OFDM	
<b>Modulation Mode:</b>	802.11a, 802.11n (HT20), 802.11n (HT40) 802.11ac (VHT20), 802.11ac (VHT40), 802.11ac (VHT80)	
<b>Operating Frequency Range:</b>	5180MHz-5240MHz; 5745MHz-5825MHz	
<b>Channel Number:</b>	Refer to 1.3	
<b>Antenna Type:</b>	PIFA Antenna	
<b>Antenna Gain:</b>	ANT0: 2.60dBi; ANT1: 2.60dBi	
<b>Directional Gain:</b>	5.61dBi <sub>Note 3</sub>	
<b>Accessory Information:</b>	Battery	
	<b>Brand Name:</b>	Orbic
	<b>Model No.:</b>	BTE-3401
	<b>Serial No.:</b>	N/A
	<b>Capacity:</b>	3400mAh
	<b>Rated Voltage:</b>	3.8V
	<b>Charge Limit:</b>	4.35V
	<b>Manufacturer:</b>	Phenix New Energy (Huizhou) Co., Ltd



<b>Accessory Information:</b>	AC Adapter	
	Brand Name:	N/A
	Model No.:	TPA-5950100UU
	Serial No.:	N/A
	Rated Output:	5V=1A
	Rated Input:	100-240V~50/60Hz, 0.2A
	Manufacturer:	Shenzhen kingfulin Technology Co.,Ltd

**Note 1:** WIFI hotspot does not support U-NII band.

**Note 2:** The EUT has two antennas and supports a MIMO function. Physically, the EUT provides two completed transmitters and two receivers for 802.11n modulation mode.

<b>Modulation Mode:</b>	<b>TX Function</b>
802.11n	2TX
802.11ac	2TX

**Note 3:** According to KDB 662911 D01, the directional gain =  $G_{ANT} + 10\log(N_{ANT})$  dBi, where  $G_{ANT}$  is the maximum antenna gain in dBi,  $N_{ANT}$  is the number of outputs.

**Note 4:** For conducted test item Maximum conducted output power and Peak Power spectral density of each modulation mode, we recorded the test result of two antennas separately, for other conducted test items both of the two antennas were tested separately, we only recorded the worst test result(ANT0) in this report.

**Note 5:** All radiation test items for 802.11n modulation mode operate at MIMO mode during the test. Other modulation mode operate at SISO mode, both of the two antennas were tested separately, we only recorded the worst test result(ANT0) in this report.

**Note 6:** For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



### 1.3. Modulation Type and Data Rate of EUT

Modulation Technology	Modulation Type	Data Rate (Mbps) <sup>Note1</sup>
OFDM (802.11a)	BPSK	<b>6/9</b>
	QPSK	12/18
	16QAM	24/36
	64QAM	48/54
OFDM (802.11n)	BPSK	<b>6.5</b>
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65
OFDM (802.11ac)	BPSK	<b>6.5</b>
	QPSK	13/19.5
	16QAM	26/39
	64QAM	52/58.5/65
	256QAM	78

**Note1:** The worst-case mode (black bold) in all data rates has been determined during the pre-scan, only the test data of the worst-case were recorded in this report.



## 1.4. The Channel Number and Frequency

Frequency Range: 5150MHz-5250MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	<b>36</b>	<b>5180</b>	40	5200
	<b>44</b>	<b>5220</b>	<b>48</b>	<b>5240</b>
40MHz	<b>38</b>	<b>5190</b>	<b>46</b>	<b>5230</b>
80MHz	<b>42</b>	<b>5210</b>		
Frequency Range: 5725MHz-5825MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	<b>149</b>	<b>5745</b>	153	5765
	<b>157</b>	<b>5785</b>	161	5805
	<b>165</b>	<b>5825</b>		
40MHz	<b>151</b>	<b>5775</b>	<b>159</b>	<b>5795</b>
80MHz	<b>155</b>	<b>5775</b>		

**Note 1:** The black bold channels were selected for test.



## 1.5. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart E (U-NII band) for the EUT FCC ID Certification:

No.	Identity	Document Title
1	47 CFR Part 15(5-1-14 Edition)	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method Determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	ANSI C63.10	Duty Cycle of the Test Signal	Dec 10, 2021	Meng Shurui	PASS	No deviation
3	15.407(a)	Maximum Conducted Output Power	Dec 10, 2020	Meng Shurui	PASS	No deviation
4	15.407(a)(e)	Emission Bandwidth	Dec 30, 2021	Meng Shurui	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	Dec 30, 2021	Meng Shurui	PASS	No deviation
6	15.407(g)	Frequency Stability	Dec 30, 2021	Meng Shurui	PASS	No deviation
7	15.207	Conducted Emission	Dec 15, 2021	Yang Lian	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Dec 28, 2021 Jan 10&11, 2022	Su Zhan	PASS	No deviation
9	15.407(b)	Radiated Emission	Dec 28, 2021 Jan 07&11, 2022	Su Zhan	PASS	No deviation

**Note 1:** The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.

**Note 2:** These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v02r01, KDB662911 D01 v02r01.

**Note 3:** The path loss during the RF test is calibrated to correct the results by the offset setting in



the test equipments. The ref offset 12.0dB contains two parts that cable loss 2.0dB and Attenuator 10dB.

**Note 4:** Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

**Note 5:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.

## 1.6. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106





## 2. 47 CFR Part 15E Requirements

### 2.1. Antenna Requirement

#### 2.1.1. Applicable Standard

According to FCC 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 shall be considered sufficient to comply with the provisions of this section.

#### 2.1.2. Test Result: Compliant

Inside of the EUT has a PIFA antenna coupled with the metal shrapnel. Please refer to the EUT internal photos.

## 2.2. Duty Cycle of the Test Signal

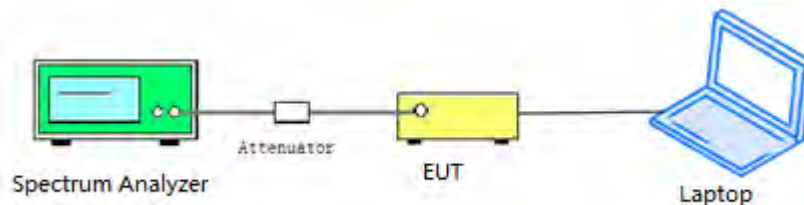
### 2.2.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than  $\pm 2\%$ ; otherwise, the duty cycle is considered to be nonconstant.

### 2.2.2. Test Description

#### Test Setup:



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.

### 2.2.3. Test Procedure

KDB 789033 Section B was used in order to prove compliance.

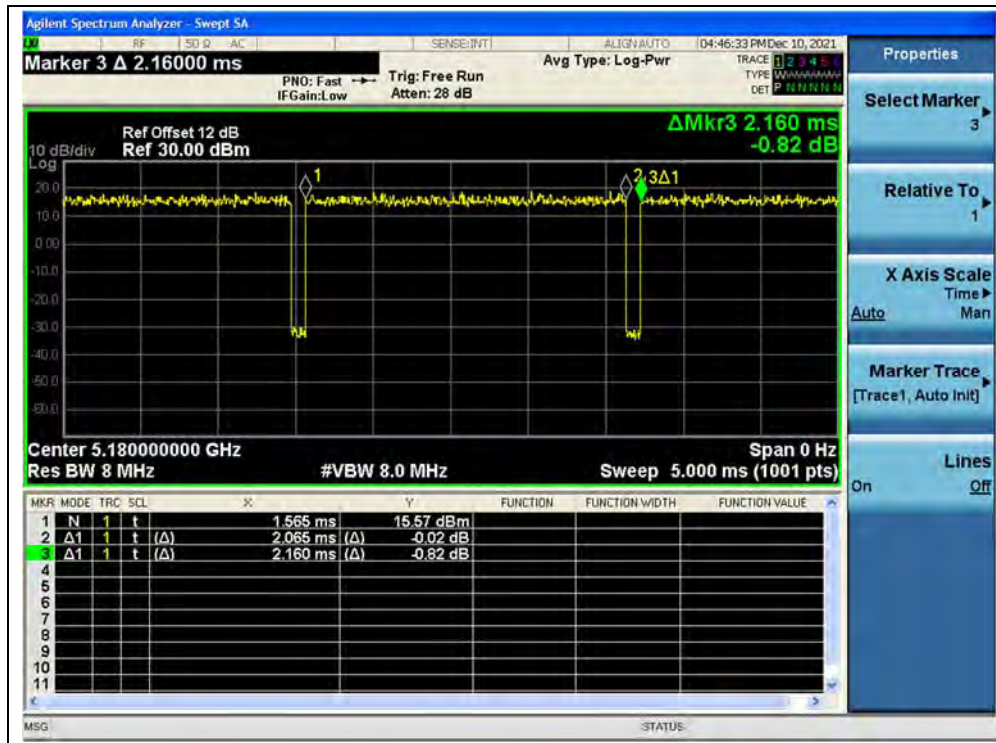


2.2.4. Test Result

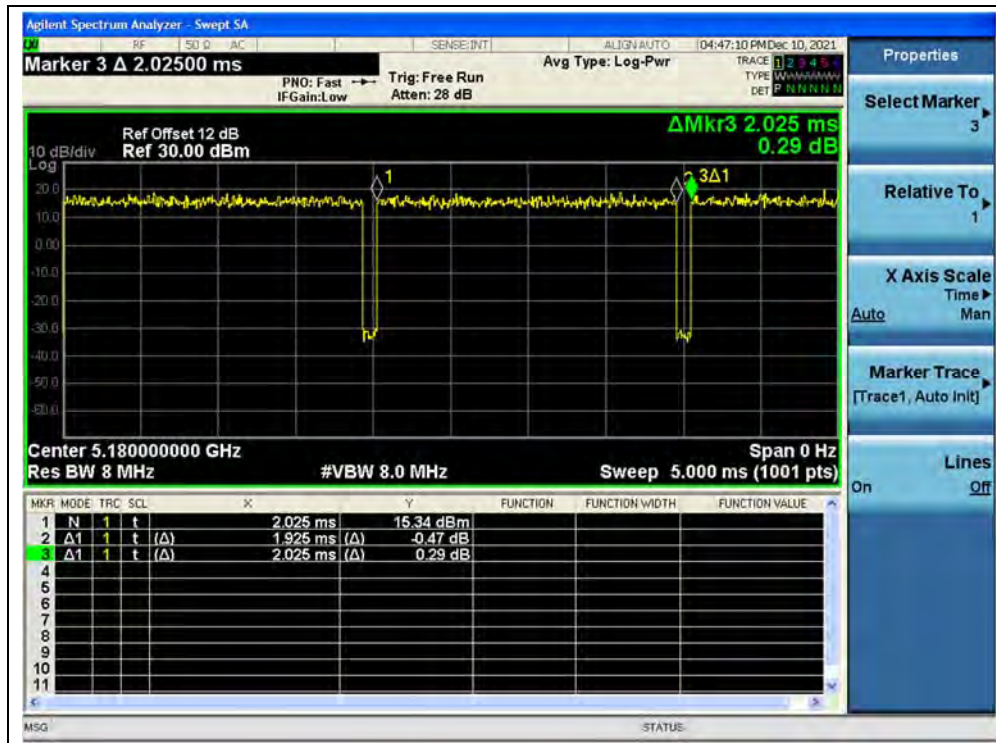
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	95.83	0.18
802.11n (HT20)	95.07	0.22
802.11n (HT40)	92.31	0.35
802.11ac (VHT20)	95.10	0.22
802.11ac (VHT40)	90.48	0.43
802.11ac (VHT80)	82.14	0.85

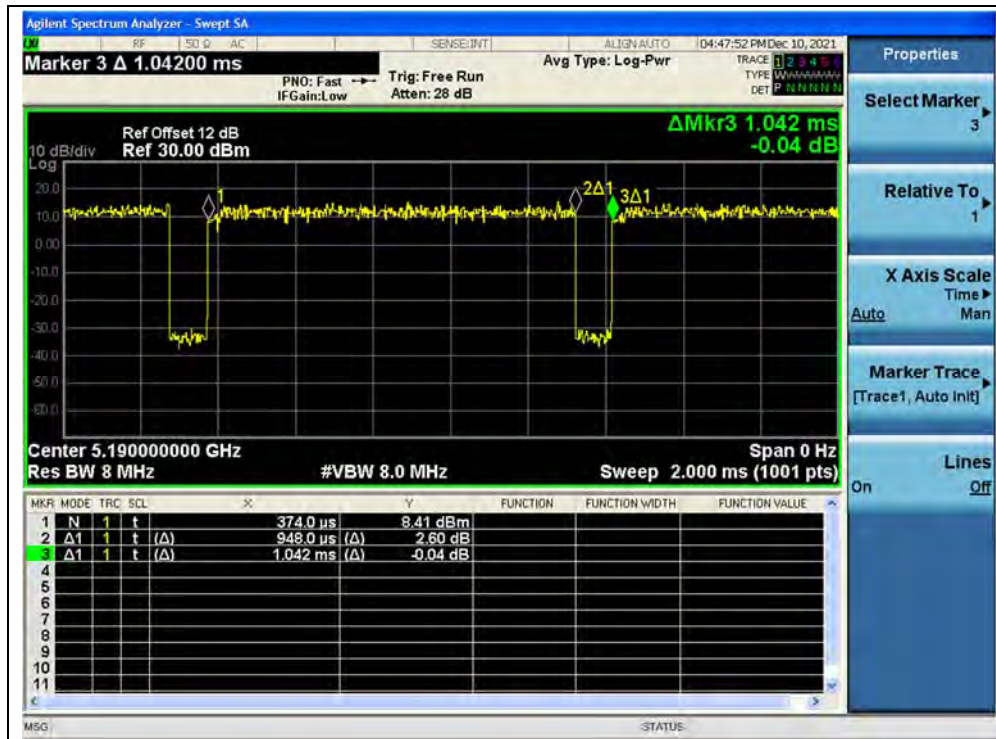
B. Test Plot:



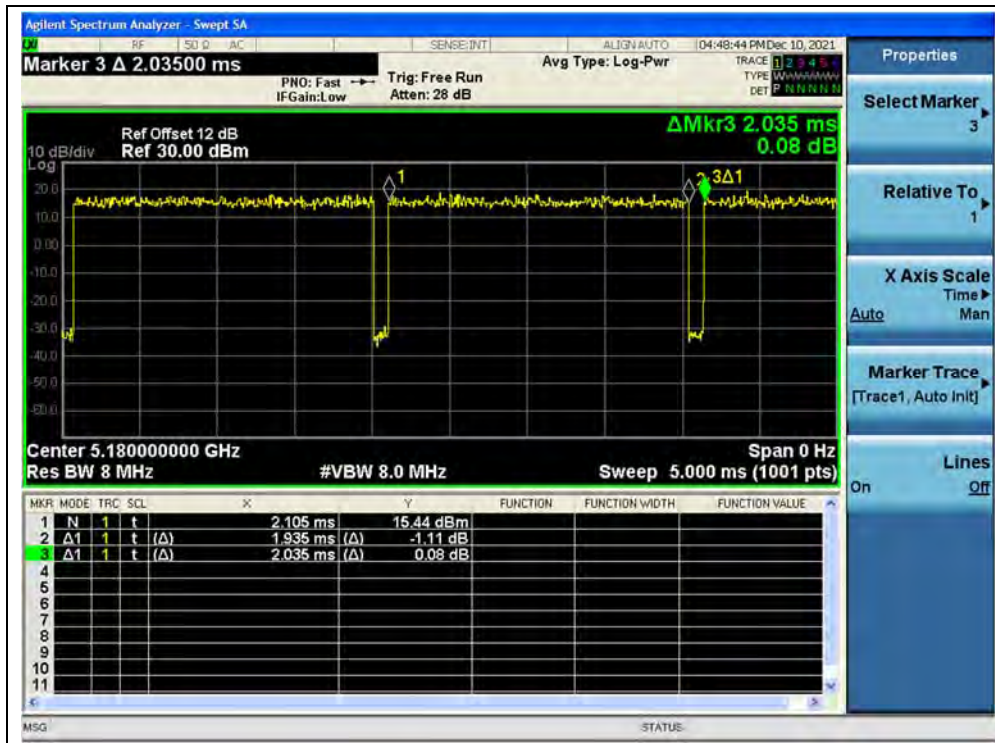
(Channel 36, 5180MHz, 802.11a)



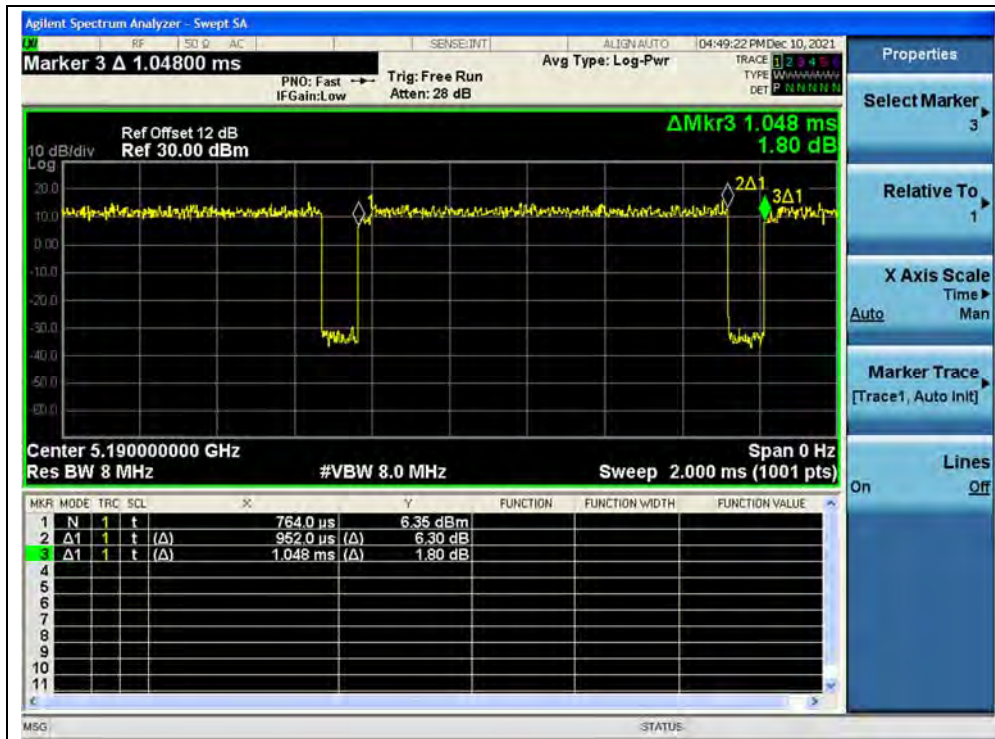
(Channel 36, 5180MHz, 802.11n (HT20))



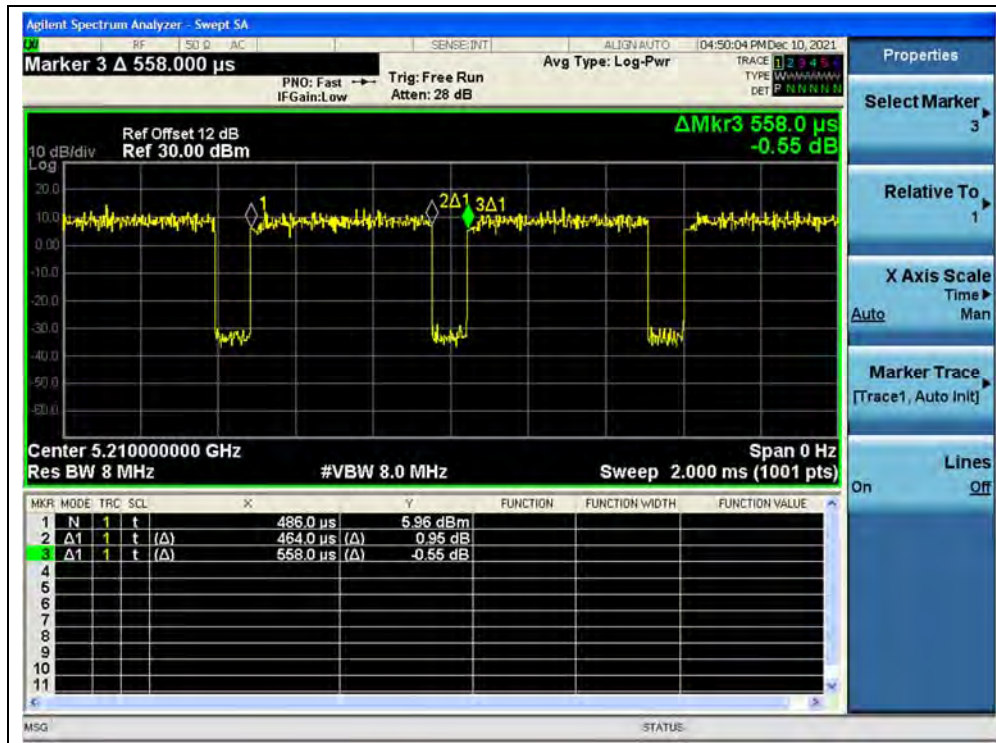
(Channel 38, 5190MHz, 802.11n (HT40))



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



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



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

## 2.3. Maximum Conducted Output Power

### 2.3.1. Requirement

(1) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250mW or  $11\text{dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

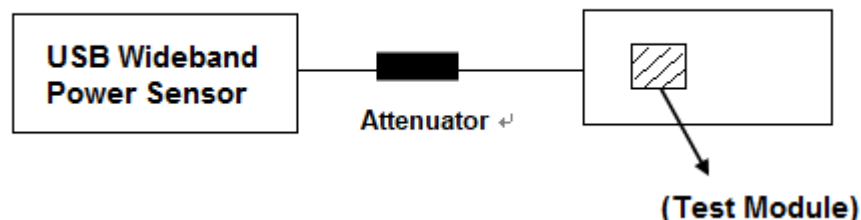
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the device. Summing is performed in units that are directly proportional to power.

(5) According to KDB 662911 D01, the directional gain =  $G_{\text{ANT}} + 10\log(N_{\text{ANT}})\text{dBi}$ , where  $G_{\text{ANT}}$  is the antenna gain in dBi,  $N_{\text{ANT}}$  is the number of outputs.

### 2.3.2. Test Description

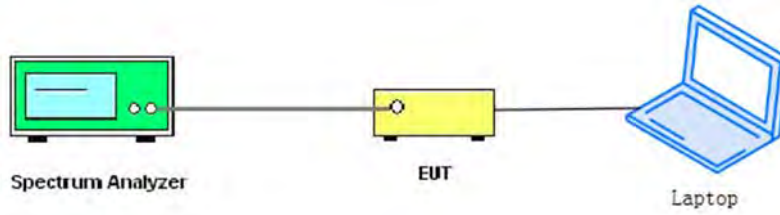
Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.

#### Test Setup:



The EUT (Equipment under the test) which is coupled to the USB Wideband Power Sensor; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading, all test result in USB Wideband Power Sensor.

**For ac (VHT80) mode power**



The EUT (Equipment under the test) 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, all test result in Spectrum analyzer.

**2.3.3. Test Result**

**Maximum Average Conducted Output Power**

**802.11a Mode**

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty Factor Calculated						
	ANT0	ANT1		ANT0		ANT1				
	dBm	dBm		dBm	W	dBm	W			
5180	12.11	12.00	0.18	12.29	0.017	12.18	0.017	24	0.25	PASS
5220	12.25	12.06		12.43	0.017	12.24	0.017			
5240	12.27	12.04		12.45	0.018	12.22	0.017			
5745	15.31	13.01		15.49	0.035	13.19	0.021	30	1	PASS
5785	12.59	12.68		12.77	0.019	12.86	0.019			
5825	12.17	12.56		12.35	0.017	12.74	0.019			





**802.11n (HT20) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0 dBm	ANT1 dBm		W	dBm	dBm		W
5180	11.77	11.73	0.22	0.031	14.91	24	0.25	PASS
5220	12.07	11.80		0.033	15.19			
5240	11.99	11.79		0.033	15.19			
5745	15.07	12.74		0.054	17.32	30	1	PASS
5785	12.35	12.39		0.036	15.56			
5825	11.91	12.27		0.034	15.31			

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.

**802.11n (HT40) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0 dBm	ANT1 dBm		W	dBm	dBm		W
5190	12.29	12.13	0.35	0.036	15.56	24	0.25	PASS
5230	12.45	12.12		0.037	15.68			
5755	15.47	13.11		0.060	17.78	30	1	
5795	12.59	12.70		0.040	16.02			

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.



**802.11ac (VHT20) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1		W	dBm	dBm		W
5180	11.91	11.66	0.22	0.032	15.05	24	0.25	PASS
5220	11.97	11.73		0.032	15.05			
5240	11.98	11.72		0.032	15.05			
5745	15.13	12.67		0.054	17.32	30	1	PASS
5785	12.46	12.33		0.037	15.68			
5825	11.99	12.23		0.034	15.31			

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.

**802.11ac (VHT40) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1		W	dBm	dBm		W
5190	12.37	12.10	0.43	0.037	15.68	24	0.25	PASS
5230	12.44	12.21		0.038	15.80			
5755	15.57	13.17		<b>0.063</b>	<b>17.99</b>	30	1	
5795	12.80	12.80		0.042	16.23			

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.

**802.11ac (VHT80) Mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1		W	dBm	dBm		W
5210	11.83	10.94	0.85	0.034	15.31	24	0.25	PASS
5775	14.73	12.49		0.058	17.63	30	1	

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.

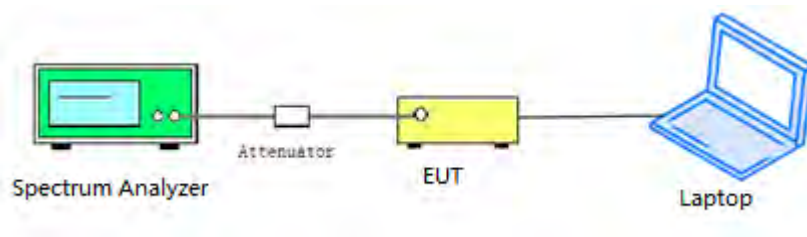
## 2.4. Emission Bandwidth

### 2.4.1. Requirement

For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement. Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

### 2.4.2. Test Description

#### Test Setup:



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

### 2.4.3. Test Procedure

1. KDB 789033 Section C) 1) Emission Bandwidth was used in order to prove compliance
  - a) Set RBW = approximately 1% of the emission bandwidth.
  - b) Set VBW > RBW.
  - c) Detector = Peak.
  - d) Trace mode = max hold.
  - e) 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%.
2. KDB 789033 Section C) 2) minimum emission bandwidth for the band 5.725-5.85GHz was used in order to prove compliance.  
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:



- a) Set RBW = 100 kHz.
- b) Set video bandwidth (VBW)  $\geq 3 \times$  RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 2.4.4. Test Result

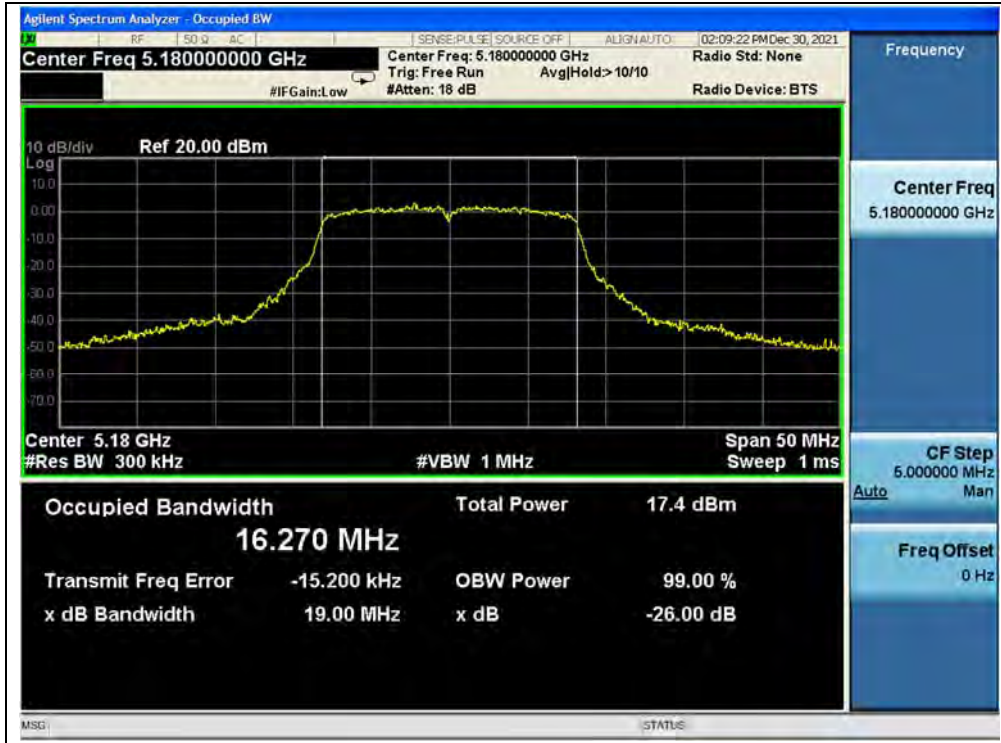
##### 802.11a Mode

##### A. Test Verdict:

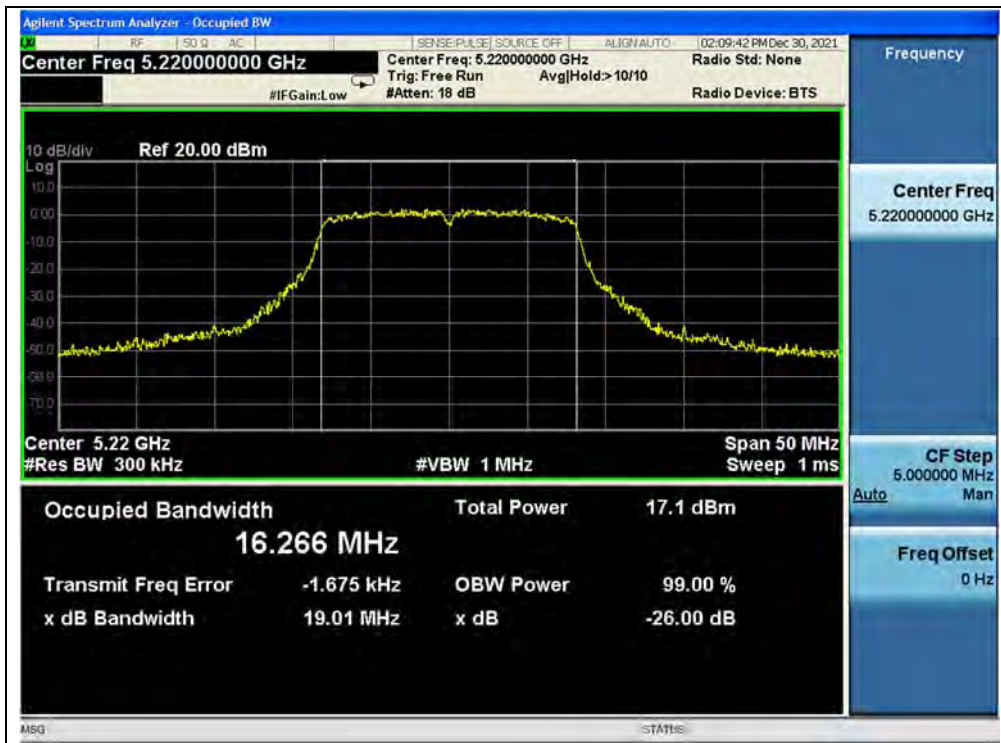
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	19.00
44	5220	19.01
48	5240	18.84
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	15.27
157	5785	15.12
165	5825	15.75



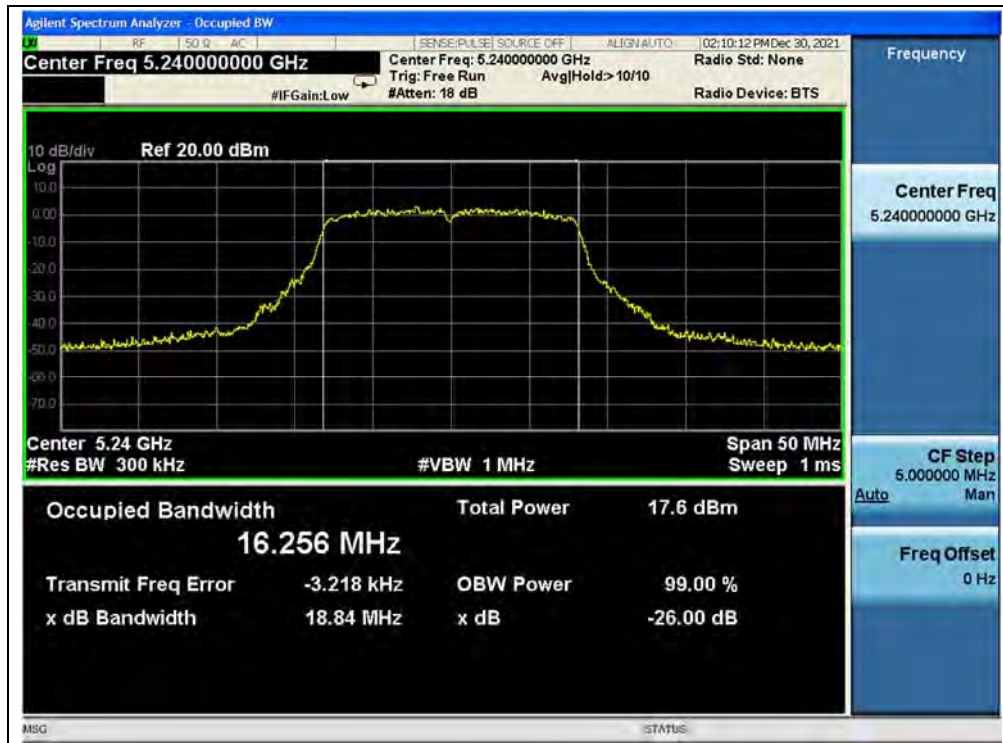
B.Test Plot:



(Channel 36, 5180MHz, 802.11a)



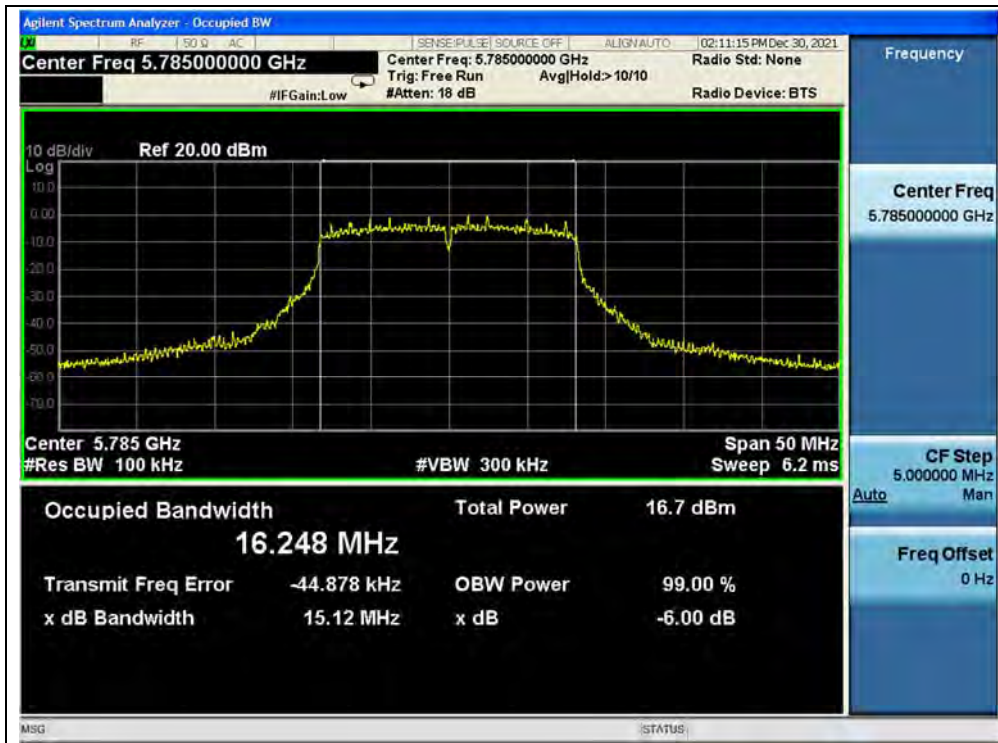
(Channel 44, 5220 MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)

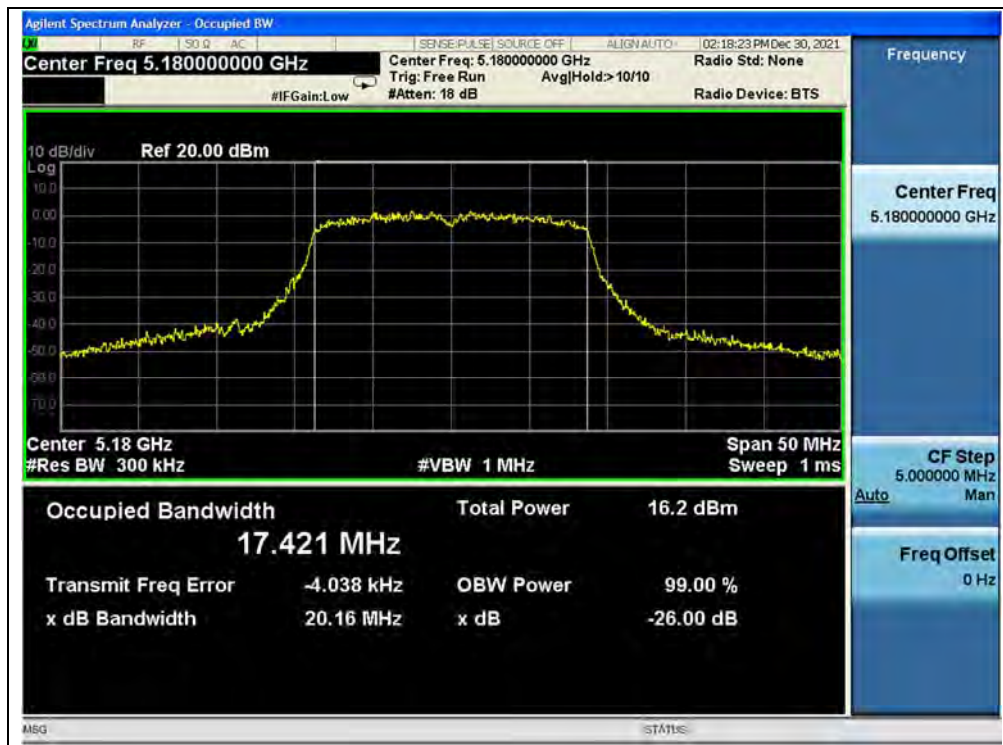


802.11n (HT20) Mode

A. Test Verdict:

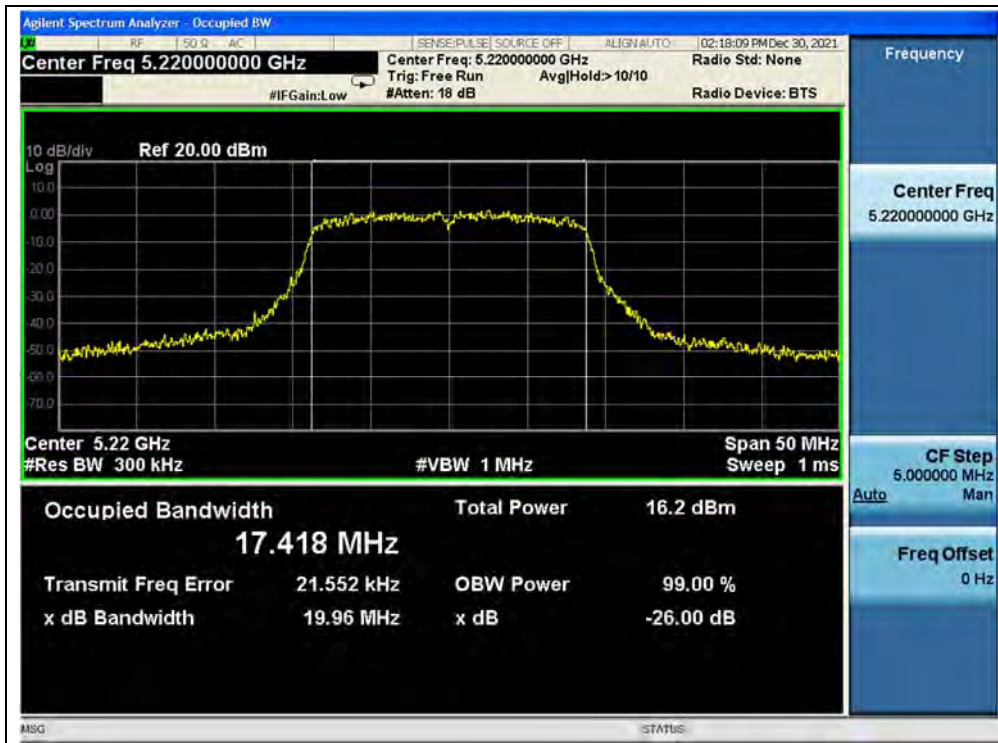
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.16
44	5220	19.96
48	5240	20.18
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
149	5745	15.42
157	5785	15.40
165	5825	15.15

B. Test Plot:

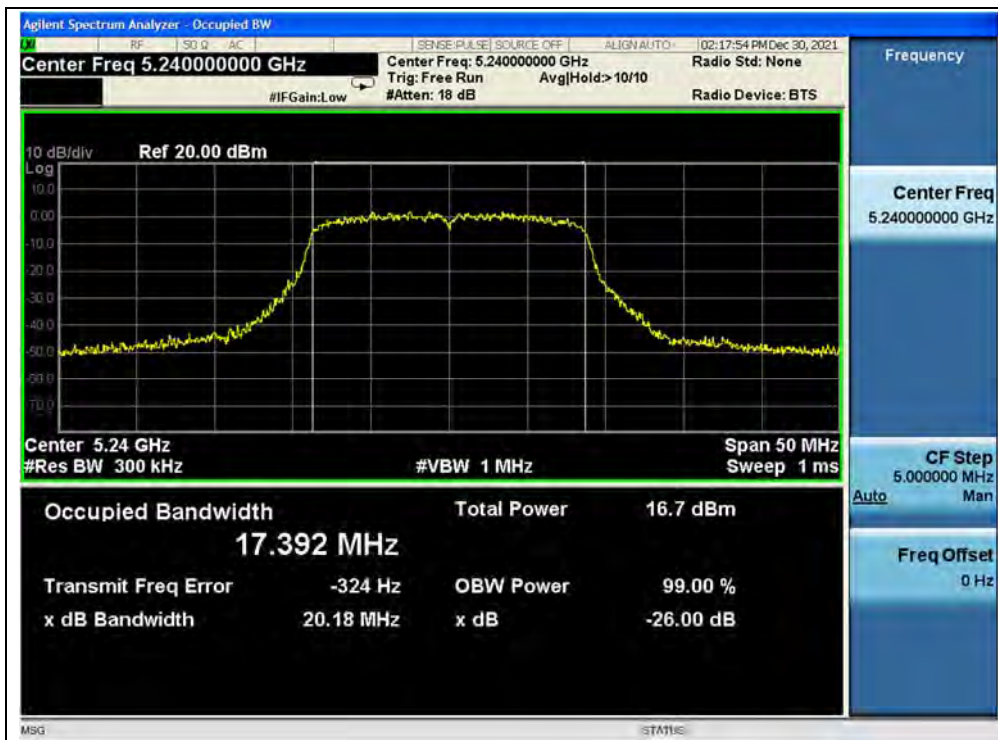


(Channel 36, 5180MHz, 802.11n (HT20))

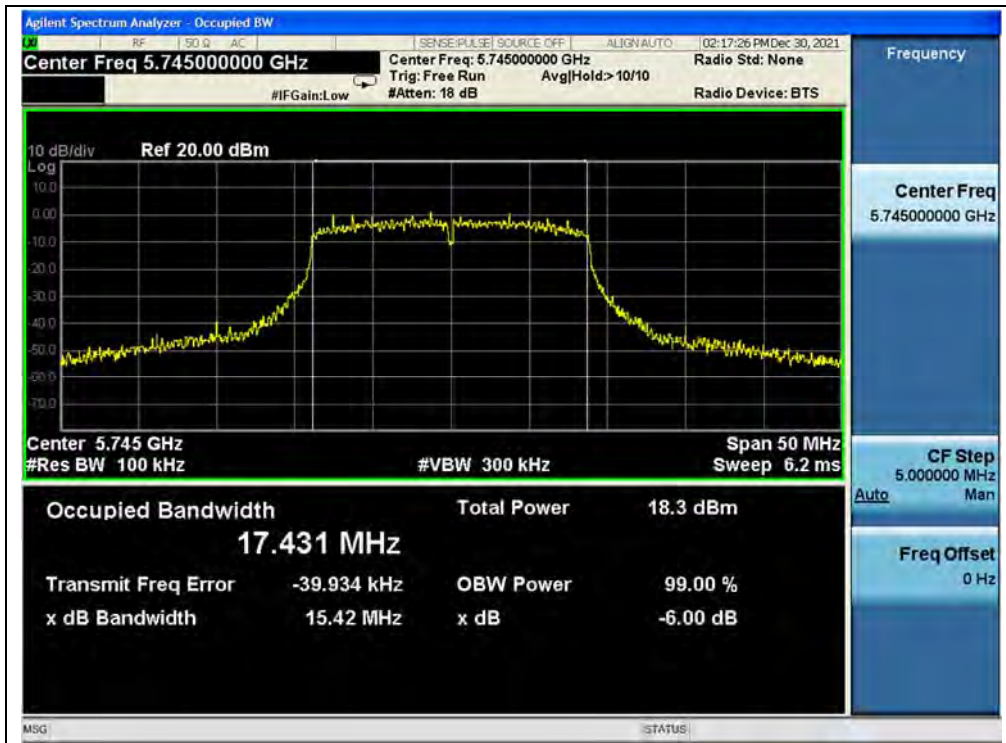




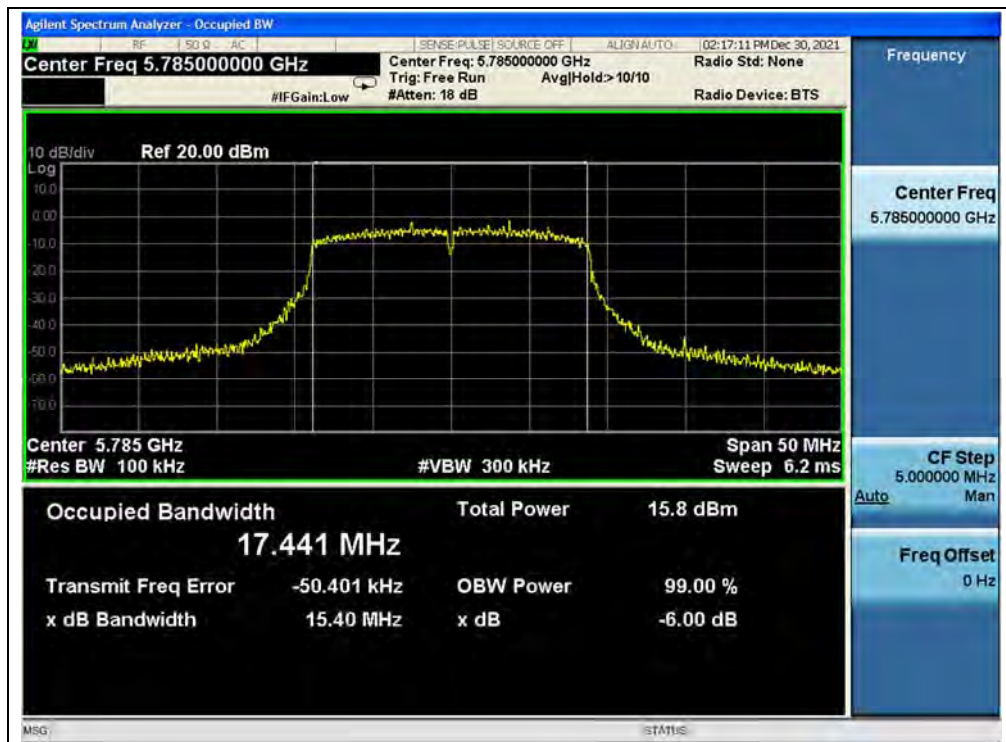
(Channel 44, 5220MHz, 802.11n (HT20))



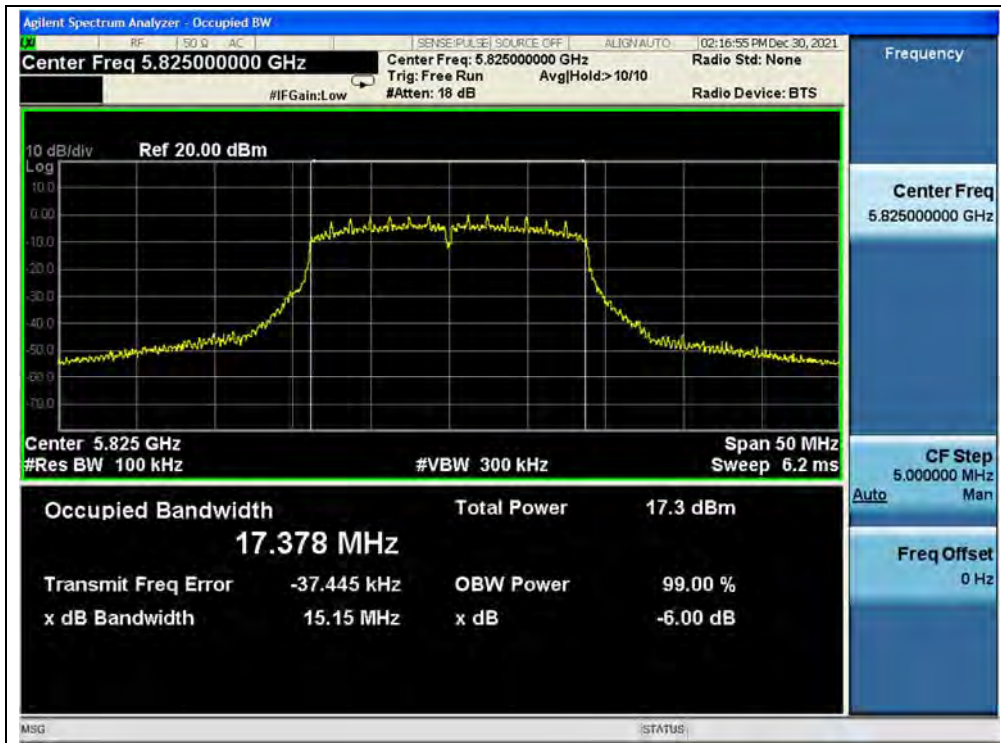
(Channel 48, 5240MHz, 802.11n (HT20))



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



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



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

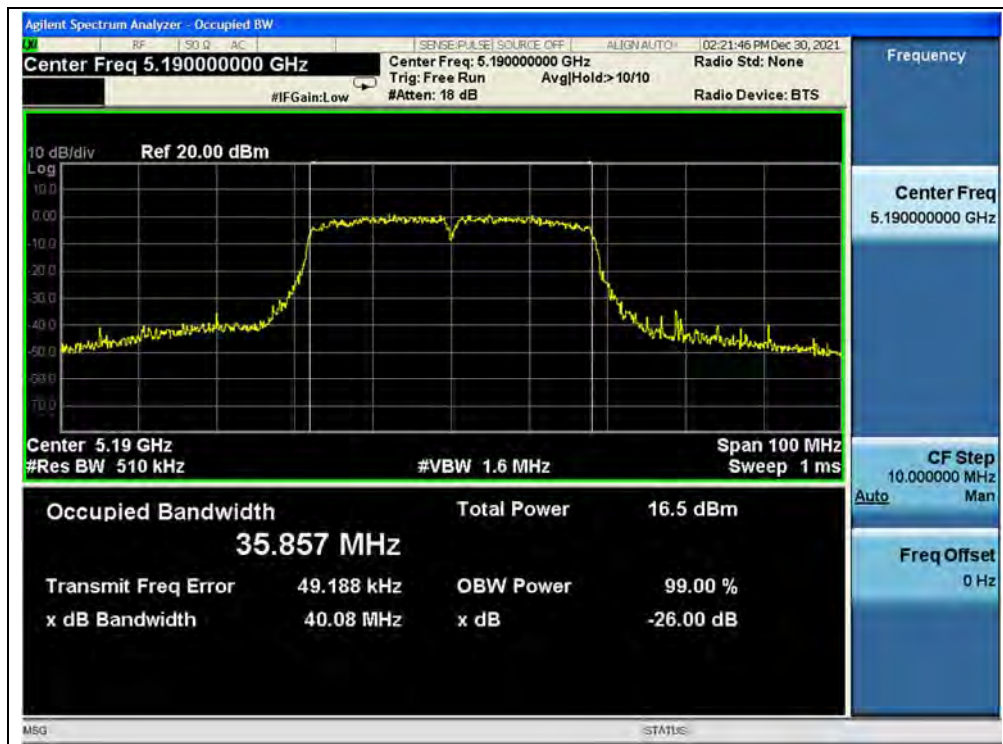


802.11n (HT40) Test mode

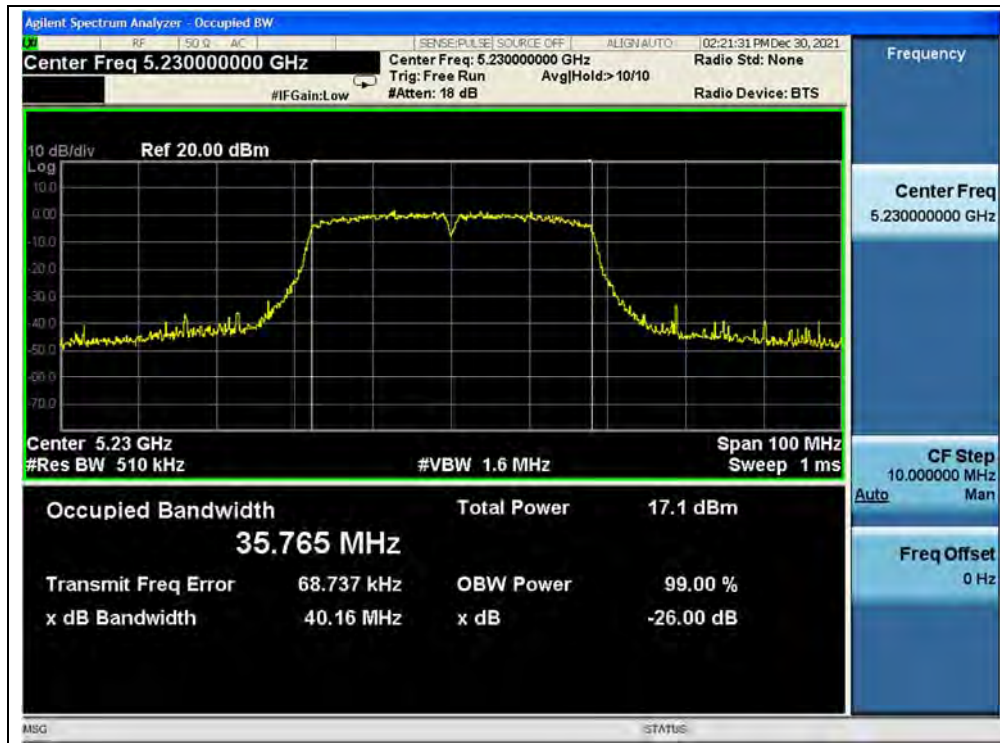
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.08
46	5230	40.16
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
151	5755	35.09
159	5795	35.09

B. Test Plot:



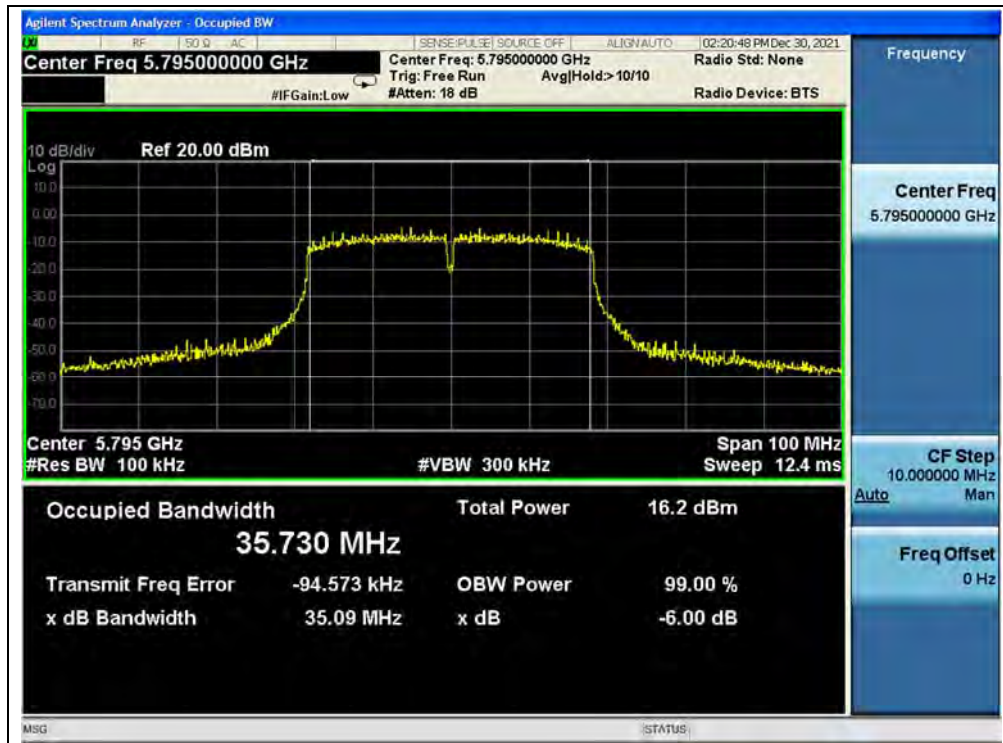
(Channel 38, 5190MHz, 802.11n (HT40))



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



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



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

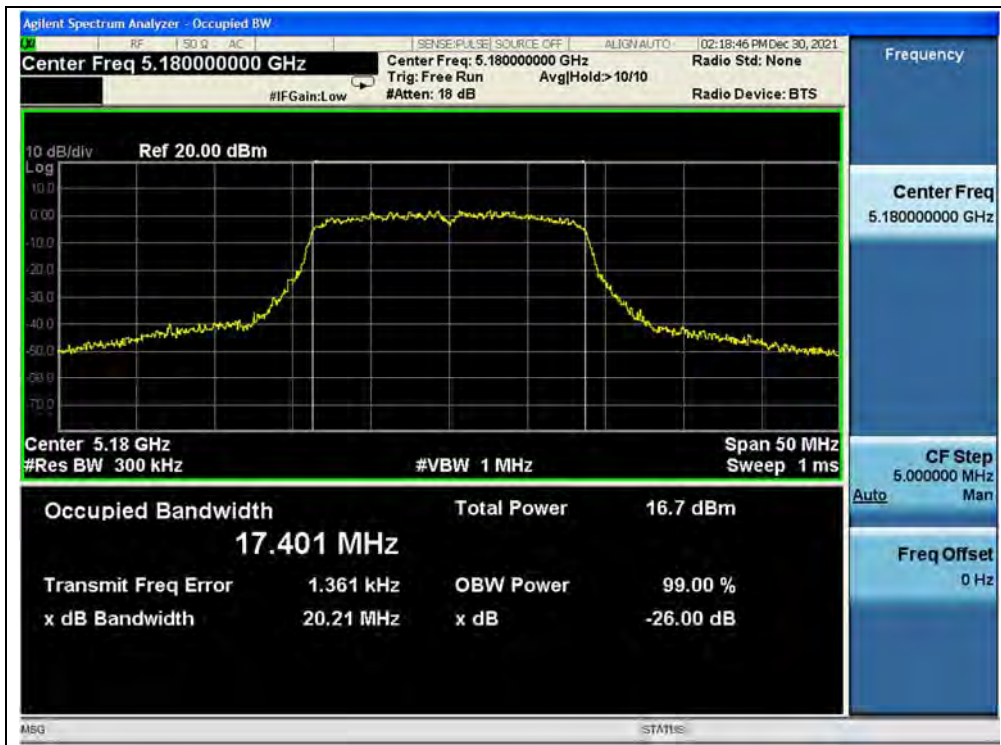


802.11ac (VHT20) Test mode

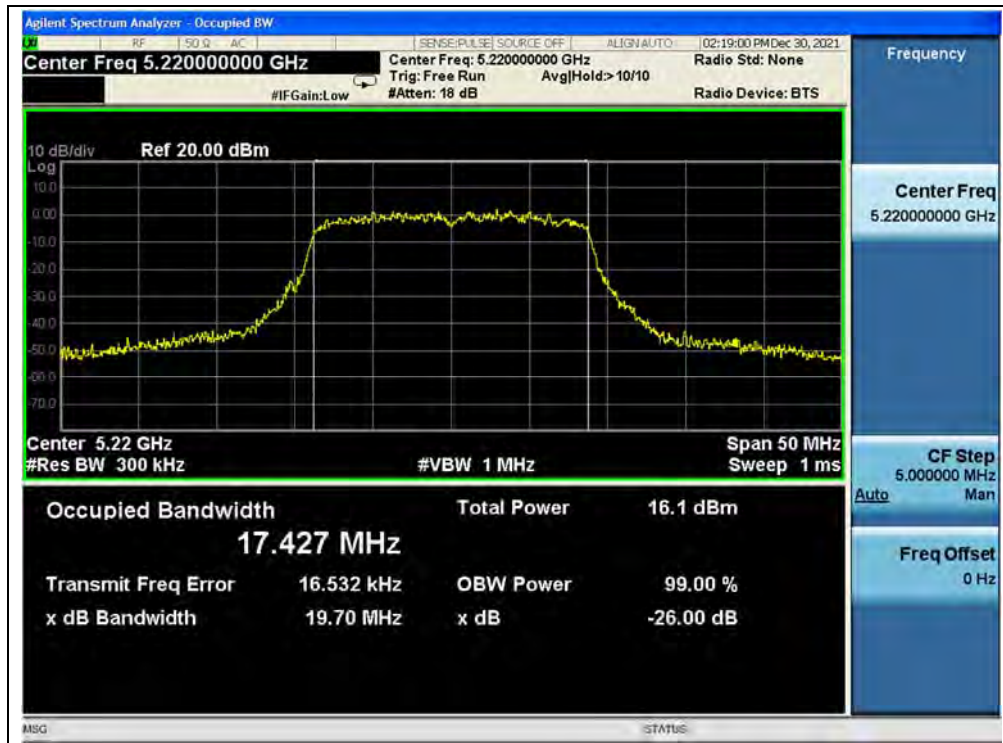
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.21
44	5220	19.70
48	5240	19.99
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
149	5745	15.07
157	5785	16.95
165	5825	15.08

B. Test Plot:



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

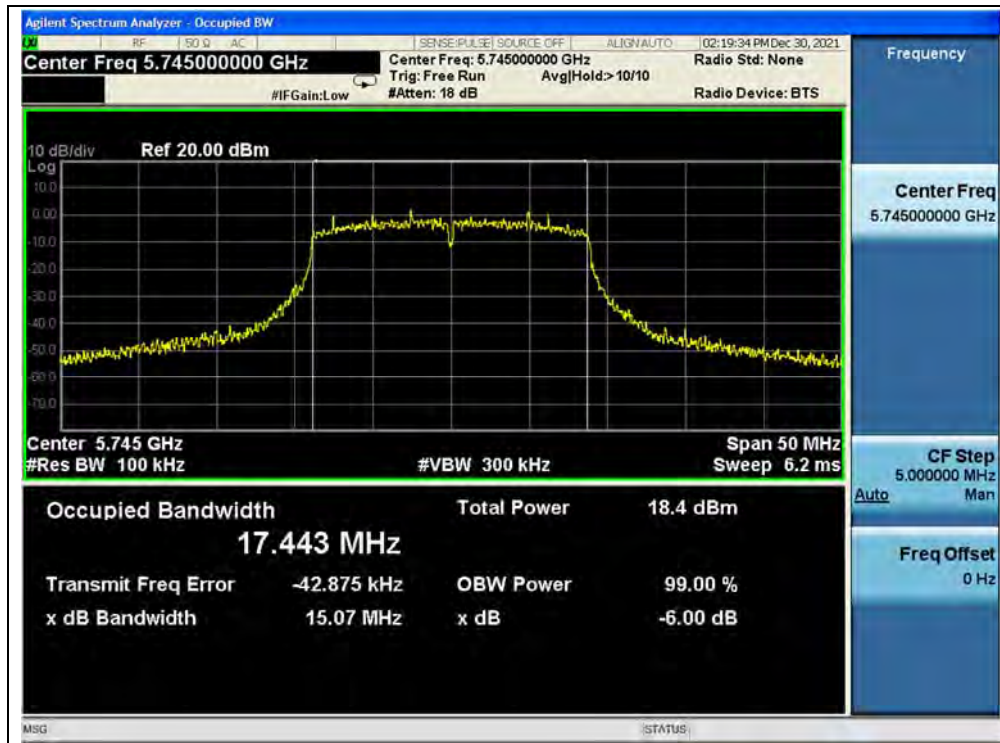


(Channel 44, 5220 MHz, 802.11ac (VHT20))



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

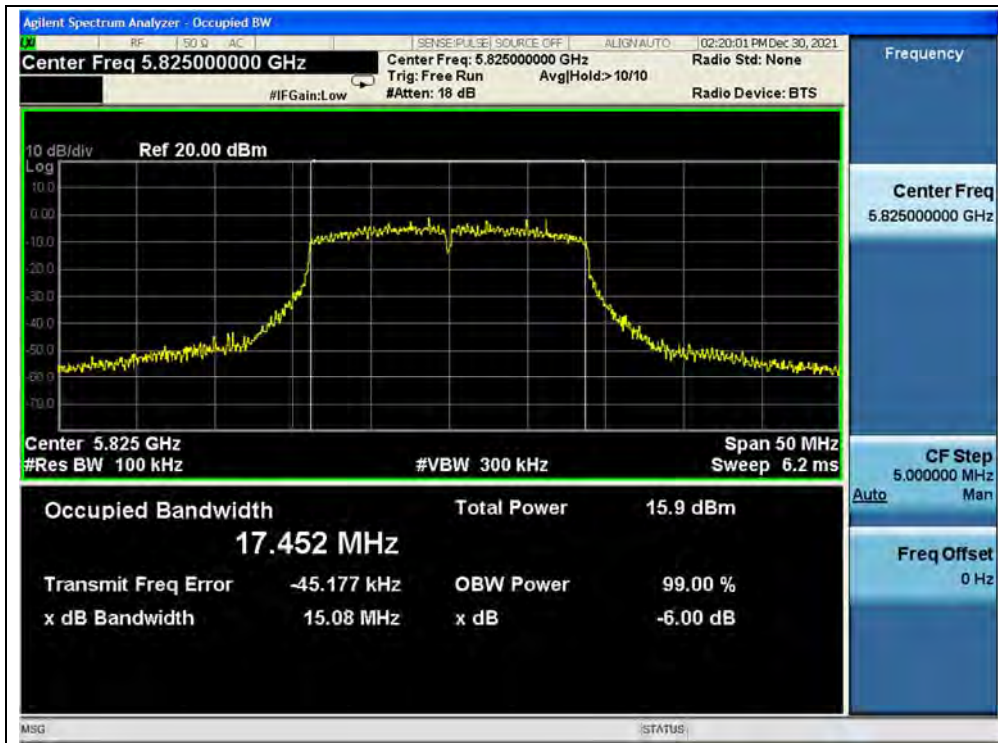




(Channel 149, 5745MHz, 802.11ac (VHT20))



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



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

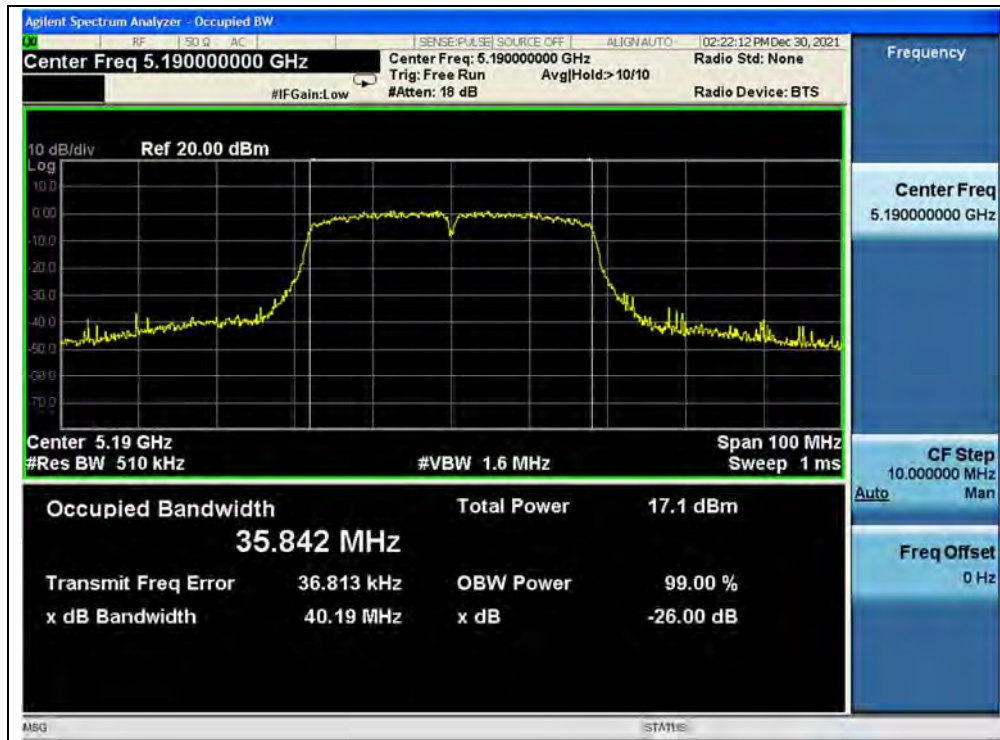


802.11ac (VHT40) Test mode

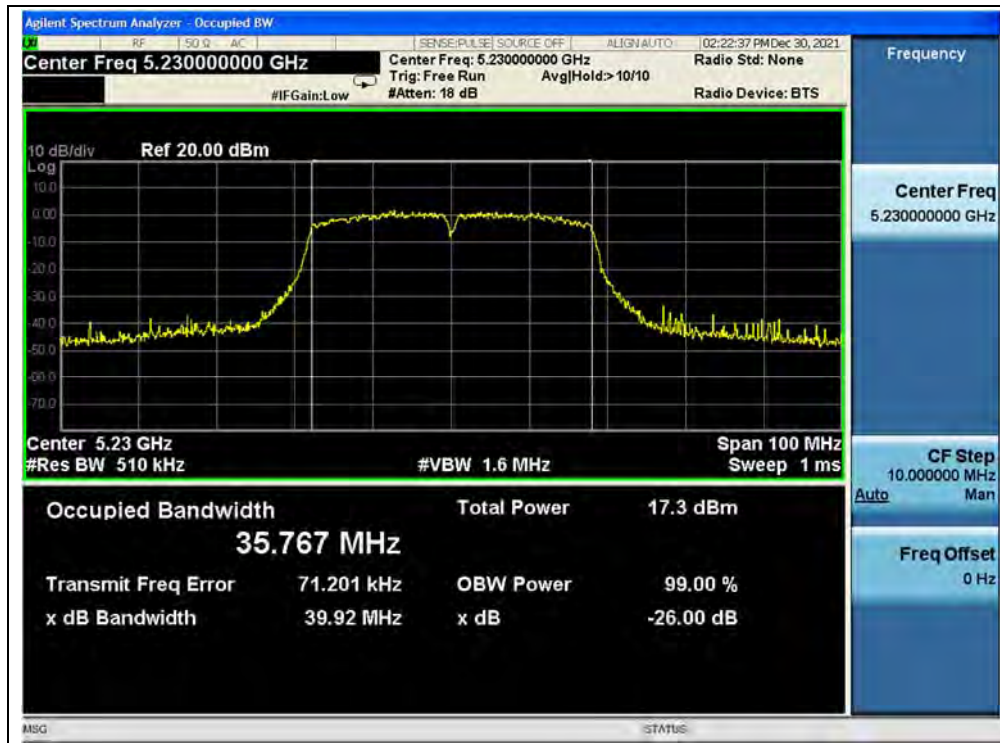
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.19
46	5230	39.92
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
151	5755	35.09
159	5795	35.12

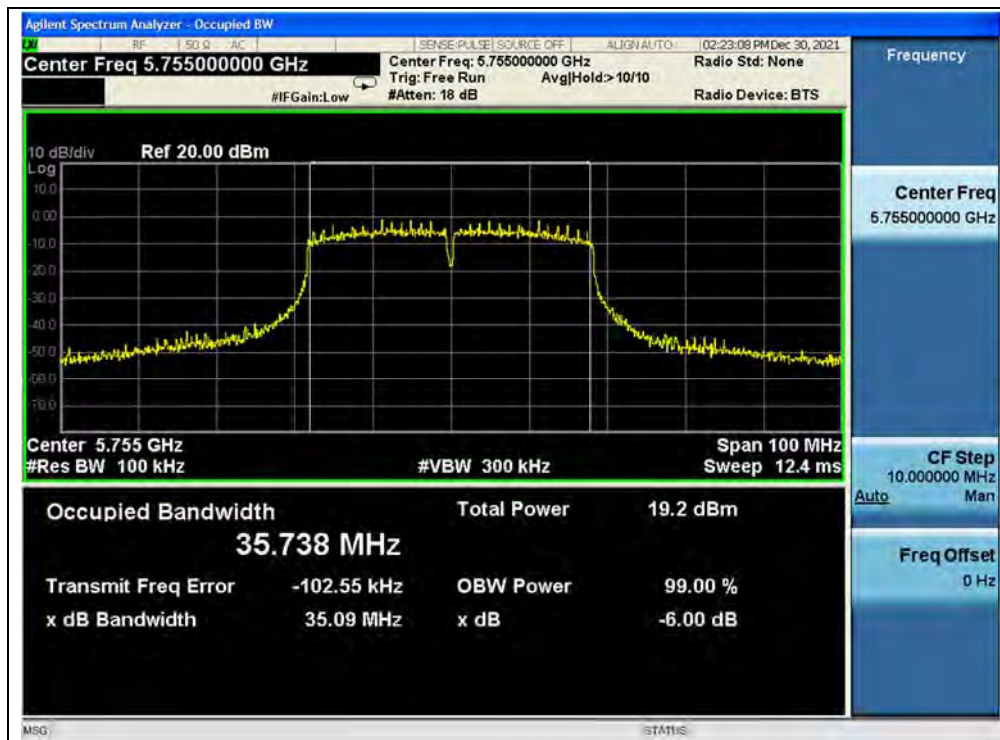
B. Test Plot:



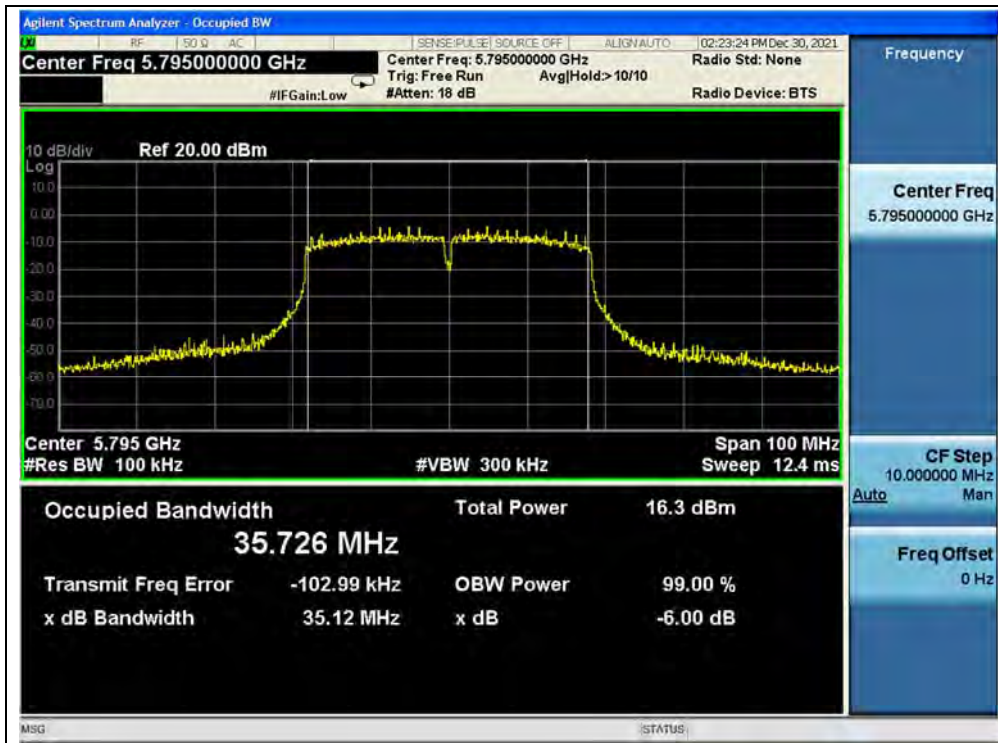
(Channel 38, 5190MHz, 802.11ac (VHT40))



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



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



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

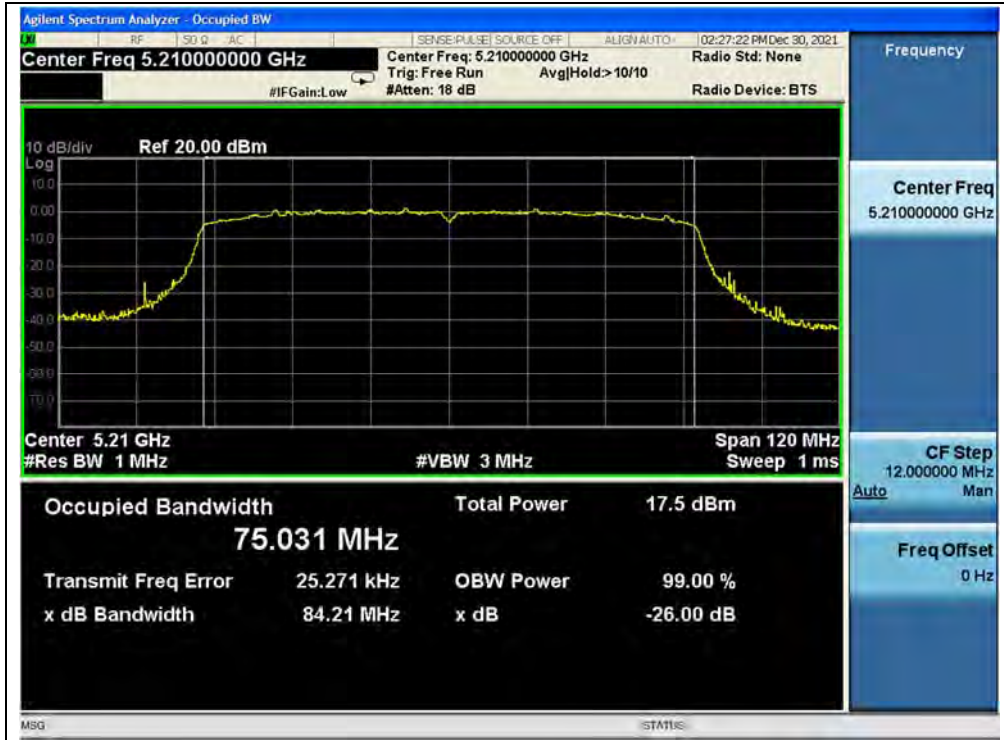


802.11 ac (VHT80) Test mode

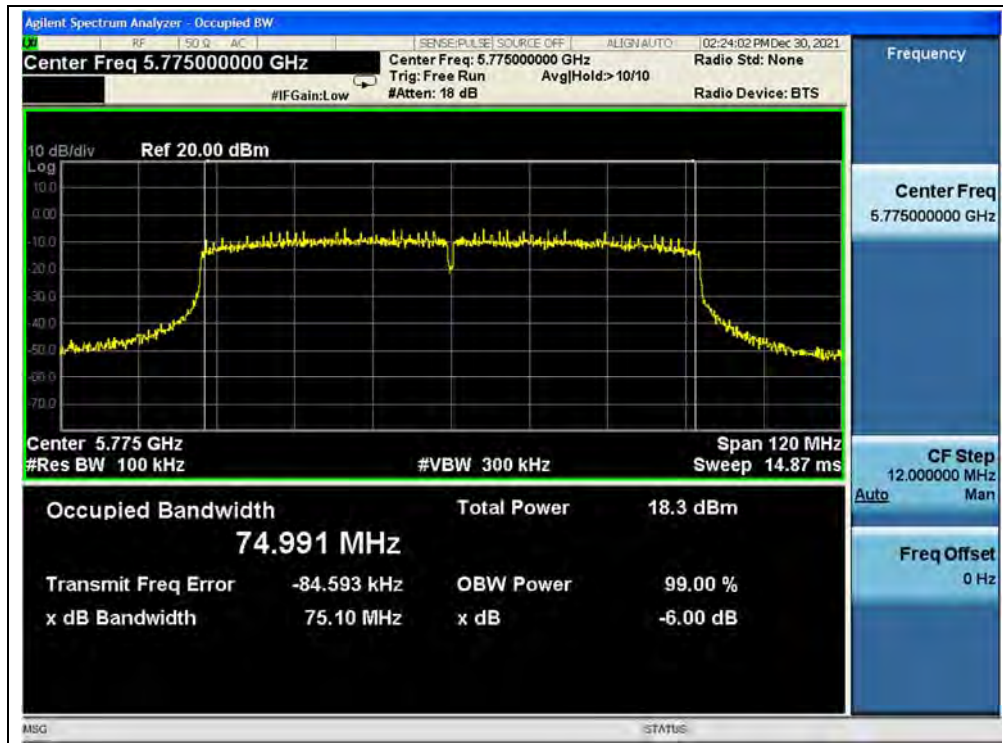
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	84.21
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
155	5775	75.10

B. Test Plot:



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



(Channel 155, 5775 MHz, 802.11ac (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 11dBm 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 11dBm in any 1 megahertz band.

(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30dBm in any 500kHz band.

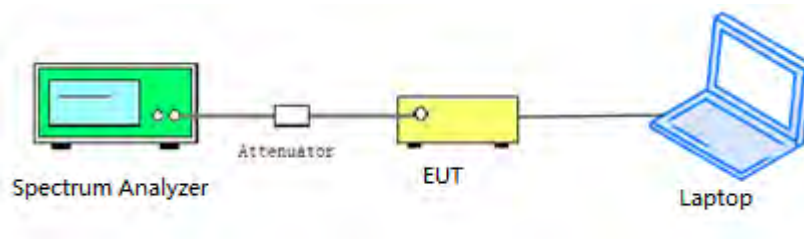
If transmitting antennas of directional gain greater than 6dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(4) According to KDB662911D01 Measure-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 =  $G_{ANT} + 10\log(N_{ANT})$  dBi, where  $G_{ANT}$  is the antenna gain in dBi,  $N_{ANT}$  is the number of outputs.

### 2.5.2. Test Description

#### Test Setup:



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.





**2.5.3. Test Procedure**

KDB 789033 Section F) Maximum Power Spectral Density (PSD) Method SA-3 was used in order to prove compliance

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

**2.5.4. Test Result**

**802.11a Mode**

**A.Test Verdict:**

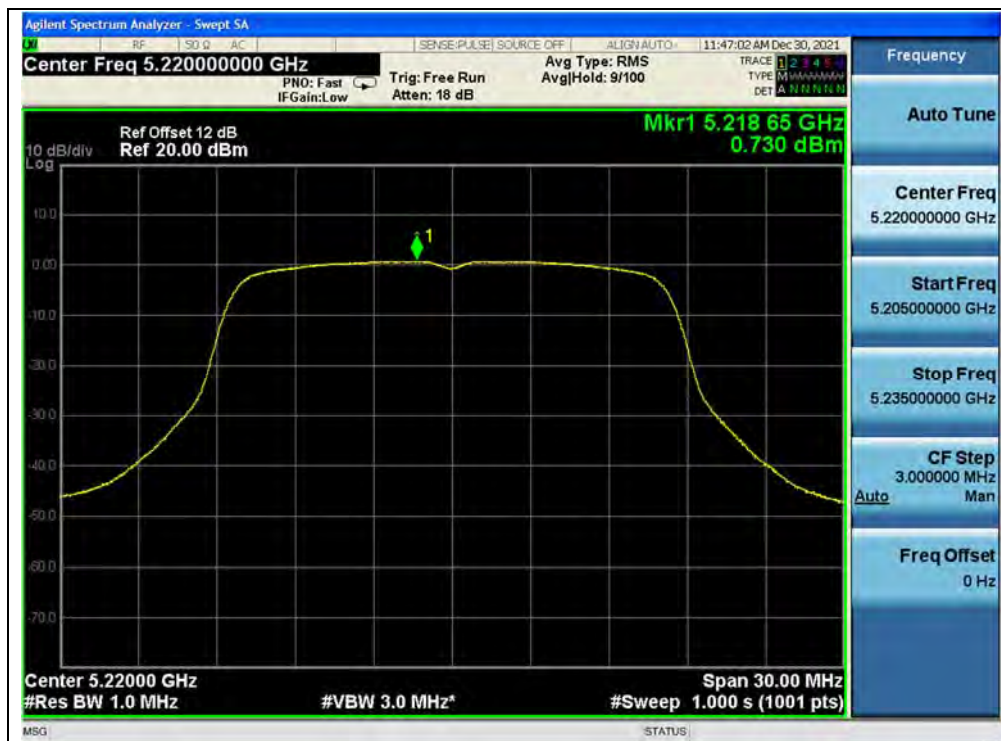
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Corrected PPSD (dBm/MHz)		Limit (dBm/MHz)	Verdict
		ANT0	ANT1		ANT0	ANT1		
36	5180	0.43	0.18	0.18	0.61	0.36	11	PASS
44	5220	0.73	0.44		0.91	0.62		
48	5240	0.80	<b>0.58</b>		0.98	0.76		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)		Limit (dBm/500KHz)	Verdict
		ANT0	ANT1		ANT0	ANT1		
149	5745	<b>0.92</b>	-1.57	0.18	1.10	-1.39	30	PASS
157	5785	-1.70	-1.73		-1.52	-1.55		
165	5825	-1.90	-1.57		-1.72	-1.39		



B.Test Plot:



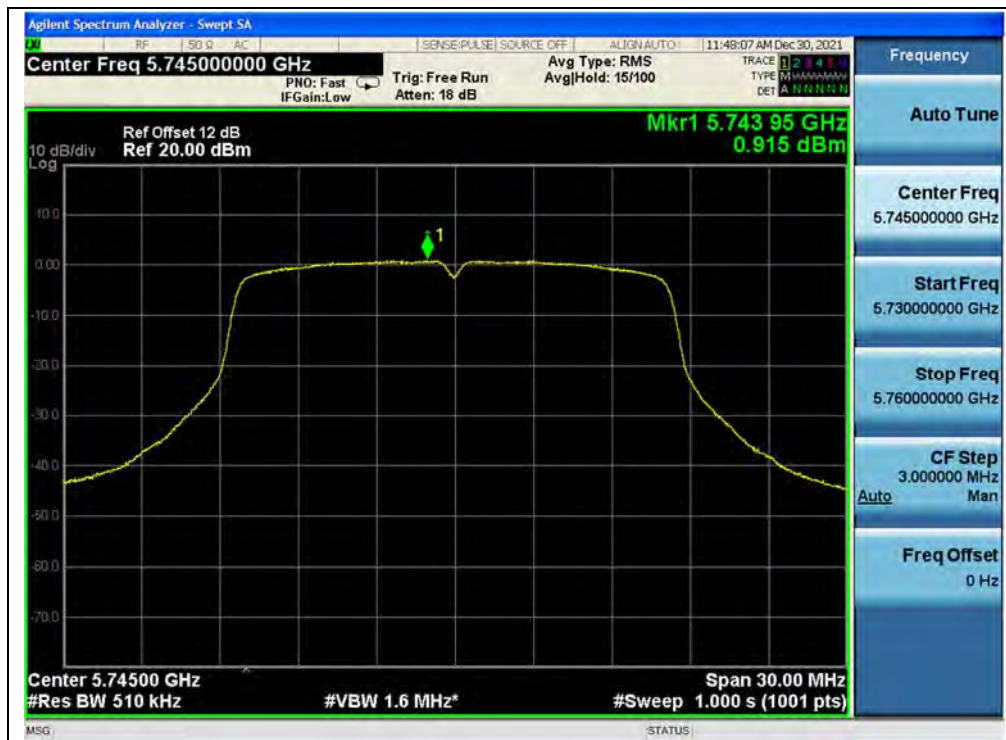
(Channel 36, 5180MHz, 802.11a, ANT0)



(Channel 44, 5220MHz, 802.11a, ANT0)



(Channel 48, 5240MHz, 802.11a, ANT0)



(Channel 149, 5745MHz, 802.11a, ANT0)



(Channel 157, 5785MHz, 802.11a, ANT0)



(Channel 165, 5825MHz, 802.11a, ANT0)



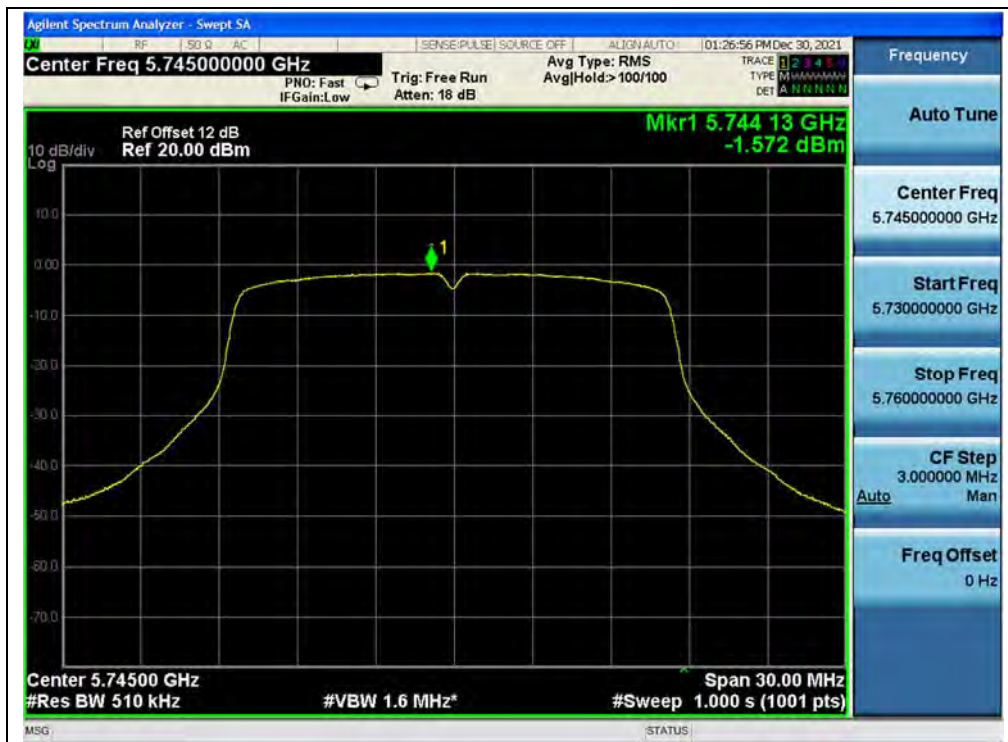
(Channel 36, 5180MHz, 802.11a, ANT1)



(Channel 44, 5220MHz, 802.11a, ANT1)



(Channel 48, 5240MHz, 802.11a, ANT1)



(Channel 149, 5745MHz, 802.11a, ANT1)



(Channel 157, 5785MHz, 802.11a, ANT1)



(Channel 165, 5825MHz, 802.11a, ANT1)



**802.11n (HT20) Mode**

**A.Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT0	ANT1				
36	5180	-0.07	-0.24	0.22	3.08	11	PASS
44	5220	0.24	0.06		3.38		
48	5240	0.32	0.00		3.39		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT0	ANT1				
149	5745	0.60	-2.15	0.22	2.67	30	PASS
157	5785	-2.12	-2.20		1.07		
165	5825	-2.23	-2.00		1.12		

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.

**B.Test Plot:**



(Channel 36, 5180MHz, 802.11n (HT20), ANT0)





(Channel 44, 5220MHz, 802.11n (HT20), ANT0)



(Channel 48, 5240MHz, 802.11n (HT20), ANT0)



(Channel 149, 5745MHz, 802.11n (HT20), ANT0)



(Channel 157, 5785MHz, 802.11n (HT20), ANT0)



(Channel 165, 5825MHz, 802.11n (HT20), ANT0)



(Channel 36, 5180MHz, 802.11n (HT20), ANT1)



(Channel 44, 5220MHz, 802.11n (HT20), ANT1)



(Channel 48, 5240MHz, 802.11n (HT20), ANT1)



(Channel 149, 5745MHz, 802.11n (HT20), ANT1)



(Channel 157, 5785MHz, 802.11n (HT20), ANT1)



(Channel 165, 5825MHz, 802.11n (HT20), ANT1)



802.11n (HT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT0	ANT1				
38	5190	-2.69	-2.76	0.35	0.64	11	PASS
46	5230	-2.55	-2.58		0.80		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT0	ANT1				
151	5755	-2.71	-4.64	0.35	-0.21	30	PASS
159	5795	-5.09	-4.71		-1.54		

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.

B. Test Plot:



(Channel 38, 5190MHz, 802.11n (HT40), ANT0)



(Channel 46, 5230MHz, 802.11n (HT40), ANT0)



(Channel 151, 5755MHz, 802.11n (HT40), ANT0)





(Channel 159, 5795MHz, 802.11n (HT40), ANT0)



(Channel 38, 5190MHz, 802.11n (HT40), ANT1)



(Channel 46, 5230MHz, 802.11n (HT40), ANT1)



(Channel 151, 5755MHz, 802.11n (HT40), ANT1)



(Channel 159, 5795MHz, 802.11n (HT40), ANT1)



802.11ac (VHT20) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSS (dBm/MHz)		Duty Factor	Total PPSS (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT0	ANT1				
36	5180	-0.06	-0.20	0.22	3.10	11	PASS
44	5220	0.18	0.06				
48	5240	0.27	0.15				
Channel	Frequency (MHz)	Measured PPSS (dBm/500KHz)		Duty Factor	Total PPSS (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT0	ANT1				
149	5745	0.25	-2.00	0.22	2.50	30	PASS
157	5785	-2.35	-2.07				
165	5825	-2.52	-1.90				

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.

B. Test Plot:



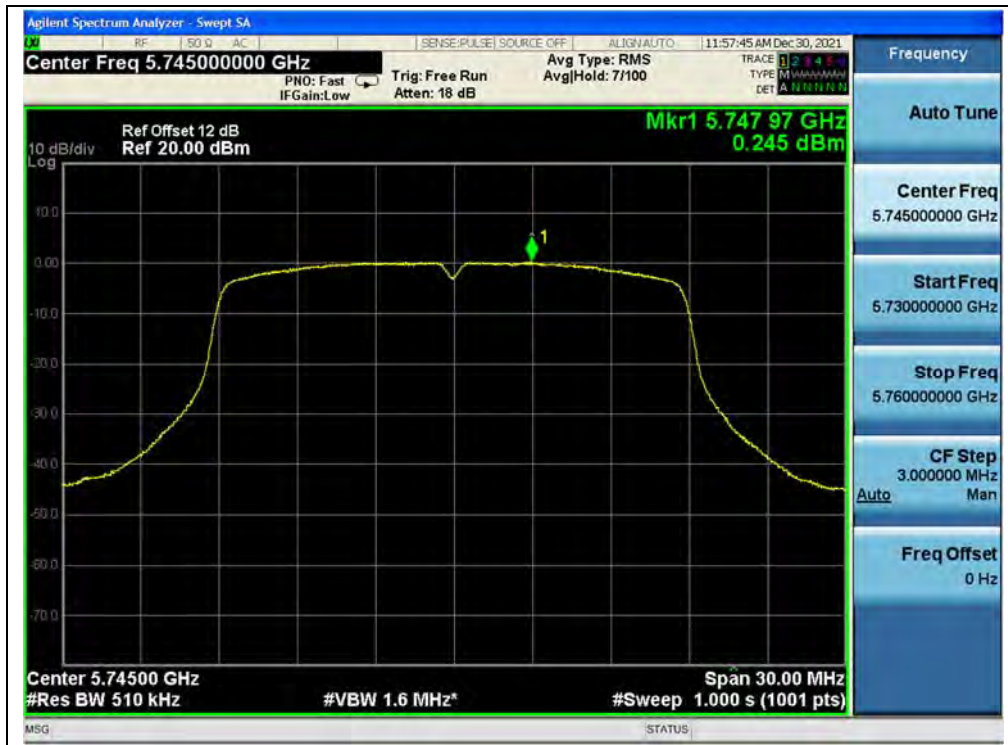
(Channel 36, 5180MHz, 802.11ac (VHT20), ANT0)



(Channel 44, 5220MHz, 802.11ac (VHT20), ANT0)



(Channel 48, 5240MHz, 802.11ac (VHT20), ANT0)



(Channel 149, 5745MHz, 802.11ac (VHT20), ANT0)



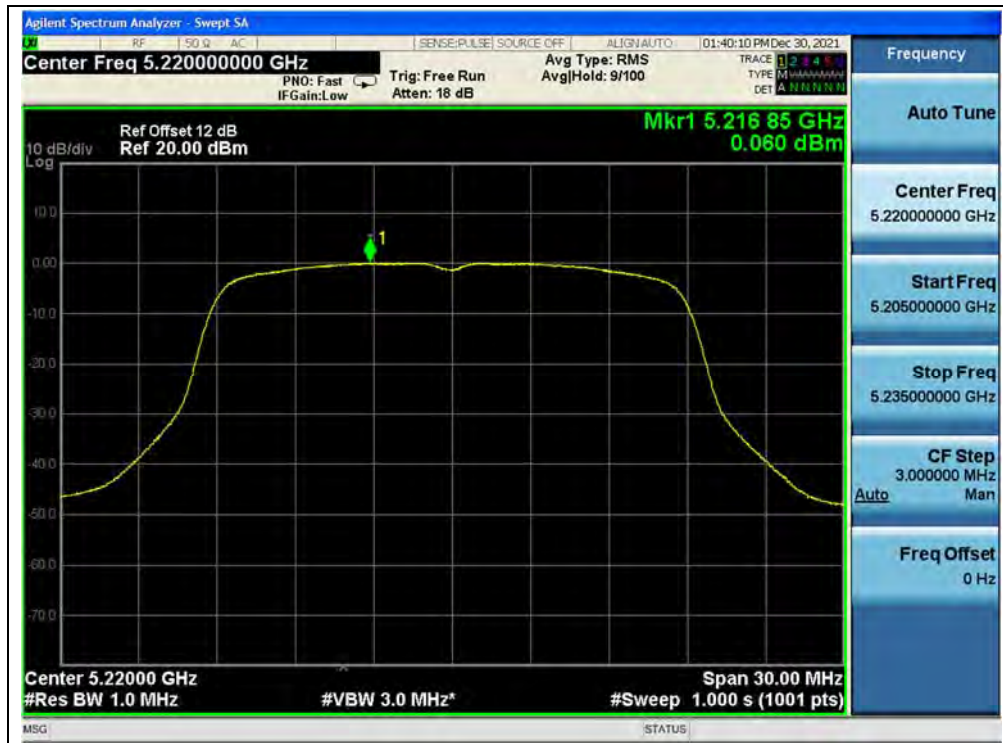
(Channel 157, 5785MHz, 802.11ac (VHT20), ANT0)



(Channel 165, 5825MHz, 802.11ac (VHT20), ANT0)



(Channel 36, 5180MHz, 802.11ac (VHT20), ANT1)



(Channel 44, 5220MHz, 802.11ac (VHT20), ANT1)



(Channel 48, 5240MHz, 802.11ac (VHT20), ANT1)





(Channel 149, 5745MHz, 802.11ac (VHT20), ANT1)



(Channel 157, 5785MHz, 802.11ac (VHT20), ANT1)





802.11ac (VHT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT0	ANT1				
38	5190	-2.82	-2.74	0.43	0.66	11	PASS
46	5230	-2.55	-2.59		0.87		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT0	ANT1				
151	5755	-2.57	-4.60	0.43	-0.03	30	PASS
159	5795	-5.25	-4.83		-1.59		

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.

B. Test Plot:



(Channel 38, 5190MHz, 802.11ac (VHT40), ANT0)



(Channel 46, 5230MHz, 802.11ac (VHT40), ANT0)



(Channel 151, 5755MHz, 802.11ac (VHT40), ANT0)



(Channel 159, 5795MHz, 802.11ac (VHT40), ANT0)



(Channel 38, 5190MHz, 802.11ac (VHT40), ANT1)



(Channel 46, 5230MHz, 802.11ac (VHT40), ANT1)



(Channel 151, 5755MHz, 802.11ac (VHT40), ANT1)



(Channel 159, 5795MHz, 802.11ac (VHT40), ANT1)



**802.11ac (VHT80) Mode**

**A.Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT0	ANT1				
42	5210	-6.32	-6.37	0.85	-2.48	11	PASS
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT0	ANT1				
155	5775	-6.46	-8.36	0.85	-3.45	30	PASS

**Note:** Directional gain = 2.60dBi + 10log(2) = 5.61dBi < 6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.

**B.Test Plot:**



(Channel 42, 5210MHz, 802.11ac (VHT80), ANT0)





(Channel 155, 5775MHz, 802.11ac (VHT80), ANT0)



(Channel 42, 5210MHz, 802.11ac (VHT80), ANT1)



(Channel 155, 5775MHz, 802.11ac (VHT80), ANT1)

## 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%	5.00	+20(Ref)	21	4.054
100%		-30	29	5.598
100%		-20	28	5.405
100%		-10	25	4.826
100%		0	24	4.633
100%		+10	21	4.054
100%		+20	20	3.861
100%		+30	24	4.633
100%		+40	26	5.019
100%		+50	23	4.440
85%		4.25	+20	27
115%	5.75	+20	29	5.598



<b>U-NII-3 (Ch. 149)</b>				
<b>5745MHz</b>				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Fre. Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	21	3.655
100%		-30	25	4.352
100%		-20	26	4.526
100%		-10	22	3.829
100%		0	29	5.048
100%		+10	24	4.178
100%		+20	26	4.526
100%		+30	23	4.003
100%		+40	27	4.700
100%		+50	28	4.874
85%		4.25	+20	20
115%	5.75	+20	29	5.048

## 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).

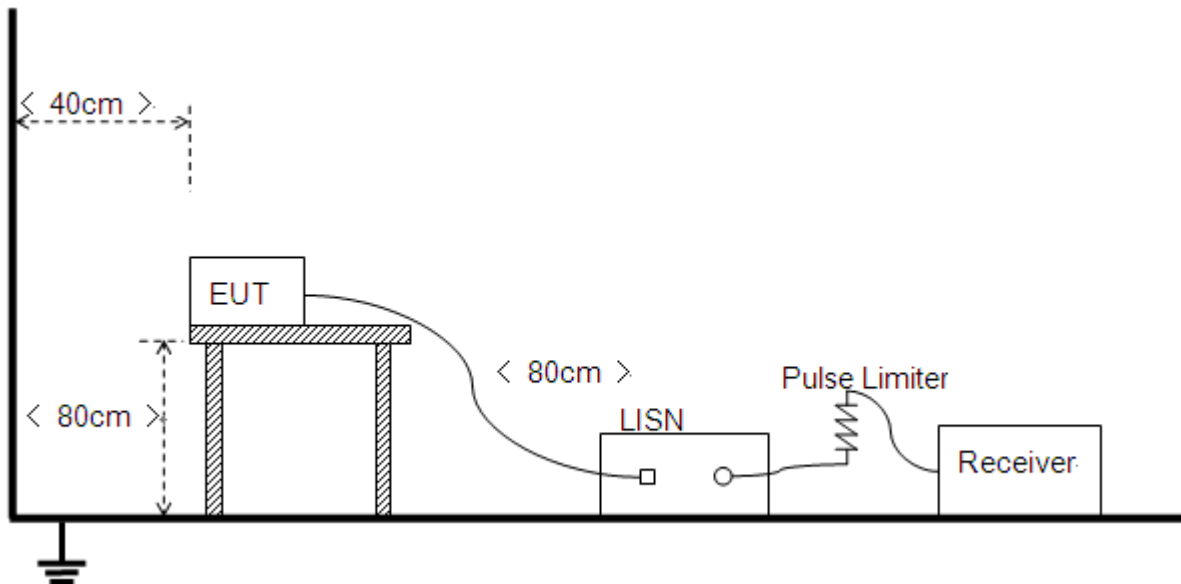
Frequency Range (MHz)	Conducted Limit (dB $\mu$ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**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. Set RBW=9kHz, VBW=30kHz. 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+charging+WIFI TX

Test Voltage: AC 120V/60Hz

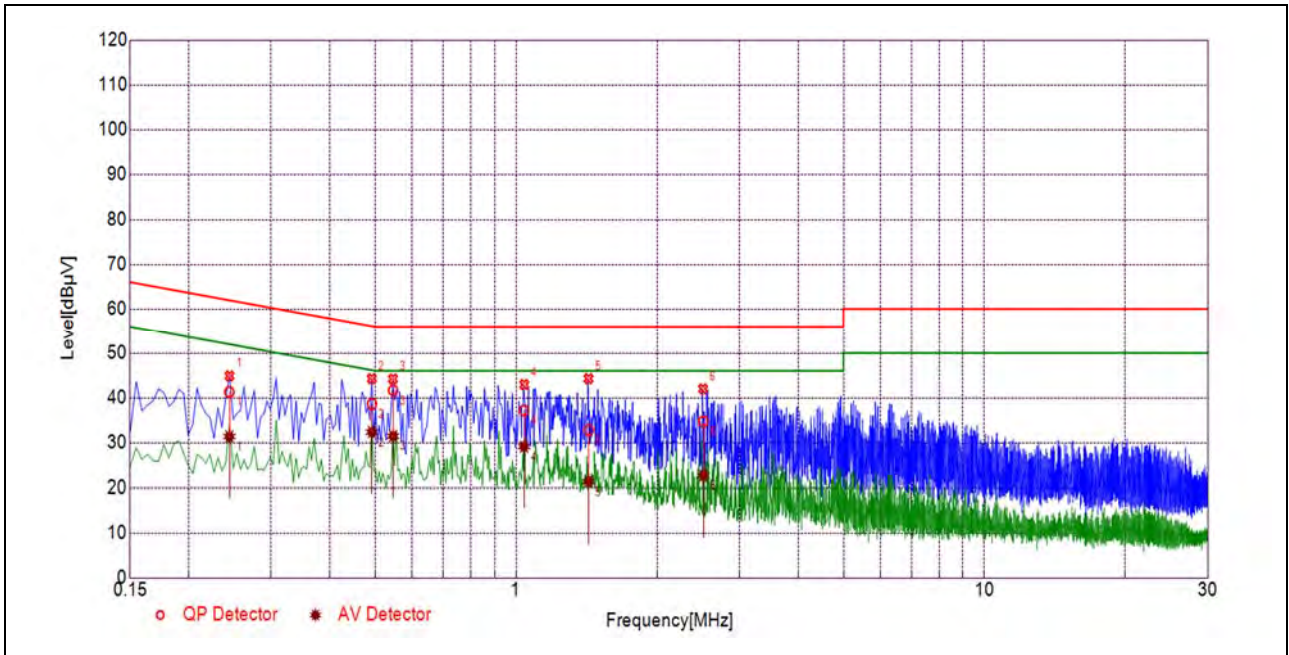
The measurement results are obtained as below:

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

$U_R$ : Receiver Reading

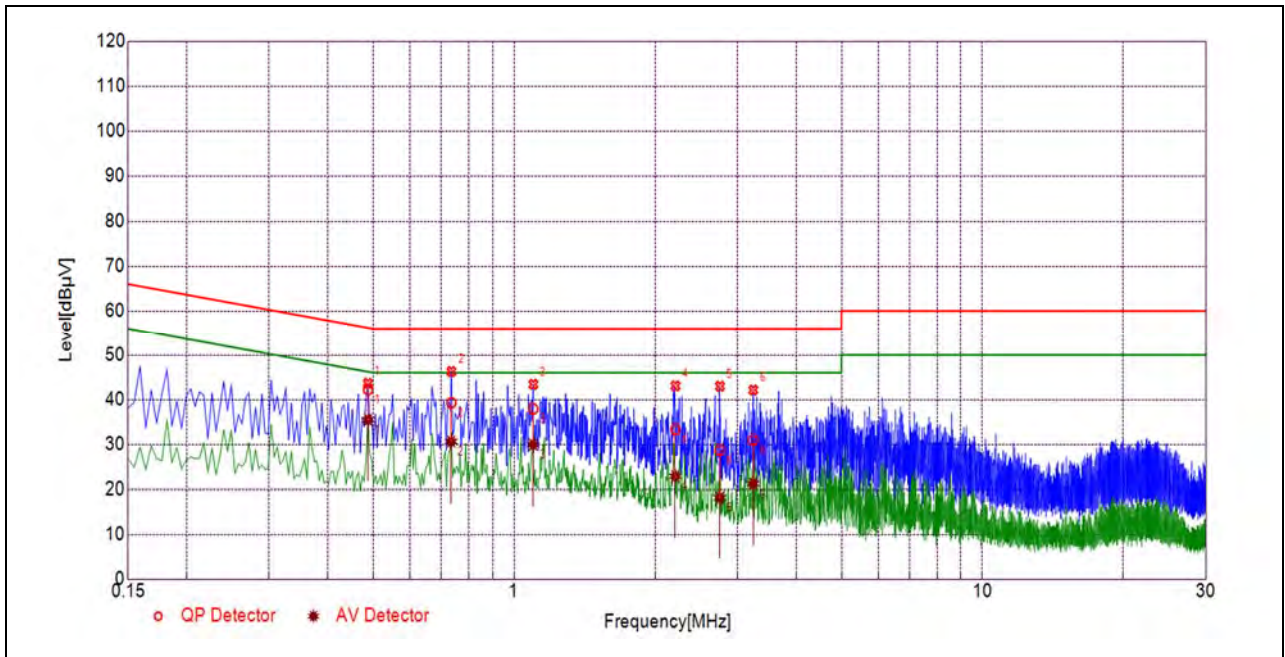
$A_{\text{Factor}}$ : Voltage division factor of LISN

**B.Test Plot:**



(L Phase)

No.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2443	41.29	31.36	61.95	51.95	Line	PASS
2	0.4923	38.64	32.34	56.13	46.13		PASS
3	0.5462	41.65	31.44	56.00	46.00		PASS
4	1.0402	37.14	29.11	56.00	46.00		PASS
5	1.4290	32.74	21.31	56.00	46.00		PASS
6	2.5105	34.75	22.61	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	0.4879	42.22	35.46	56.20	46.20	Neutral	PASS
2	0.7343	39.27	30.63	56.00	46.00		PASS
3	1.0986	37.91	29.92	56.00	46.00		PASS
4	2.2101	33.31	22.87	56.00	46.00		PASS
5	2.7497	28.67	18.18	56.00	46.00		PASS
6	3.2386	30.94	21.19	56.00	46.00		PASS



## 2.8. Restricted Frequency Bands

### 2.8.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) 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 EIRP of -27dBm/MHz.
- (2) 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 EIRP of -27dBm/MHz.
- (3) 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 EIRP of -27dBm/MHz.
- (4) 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.

The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \mu\text{V/m}$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

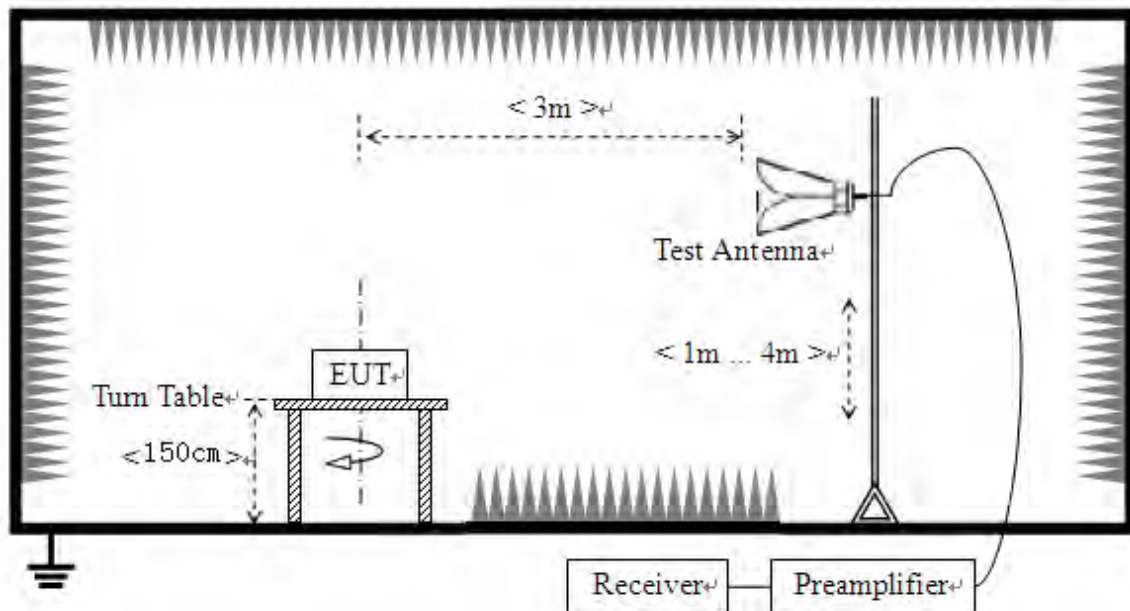
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Measurement Distance (m)
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

For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

### 2.8.2. Test Description

#### Test Setup





The EUT 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.

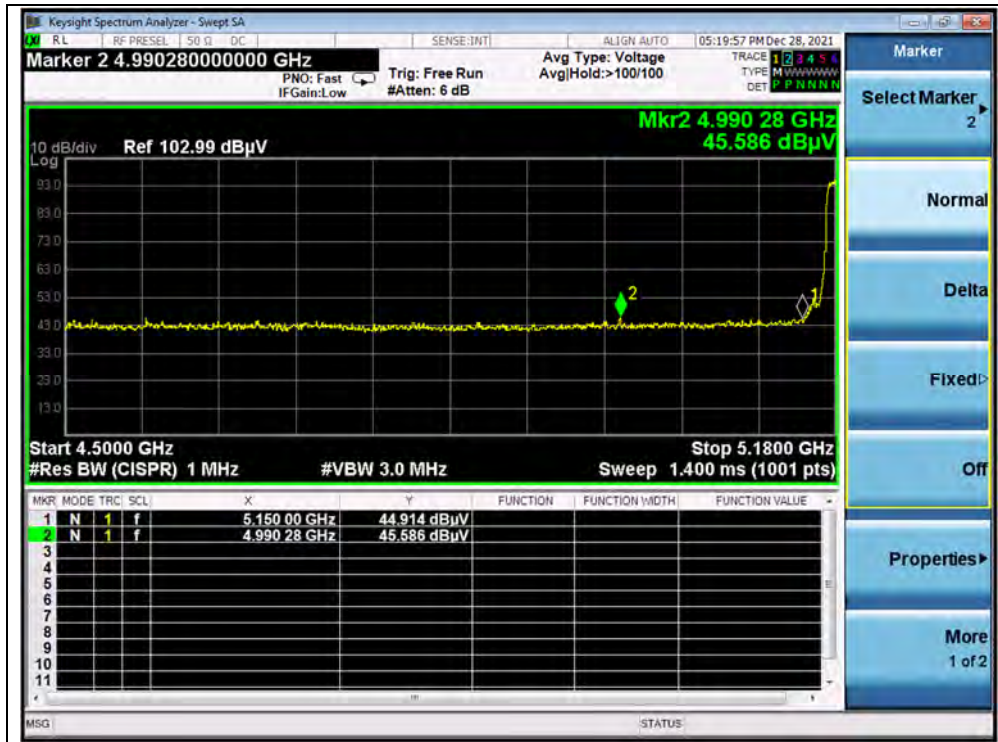
**Note 2** All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.

### 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	4990.28	PK	45.59	-19.54	32.20	58.25	74	PASS
36	5084.12	AV	34.01	-19.54	32.20	46.67	54	PASS
48	5372.44	PK	42.59	-19.54	32.20	55.25	74	PASS
48	5357.70	AV	31.55	-19.54	32.20	44.21	54	PASS
149	5725.00	PK	45.19	-19.01	32.20	58.38	122.23	PASS
165	5850.00	PK	41.05	-19.01	32.20	54.24	122.23	PASS

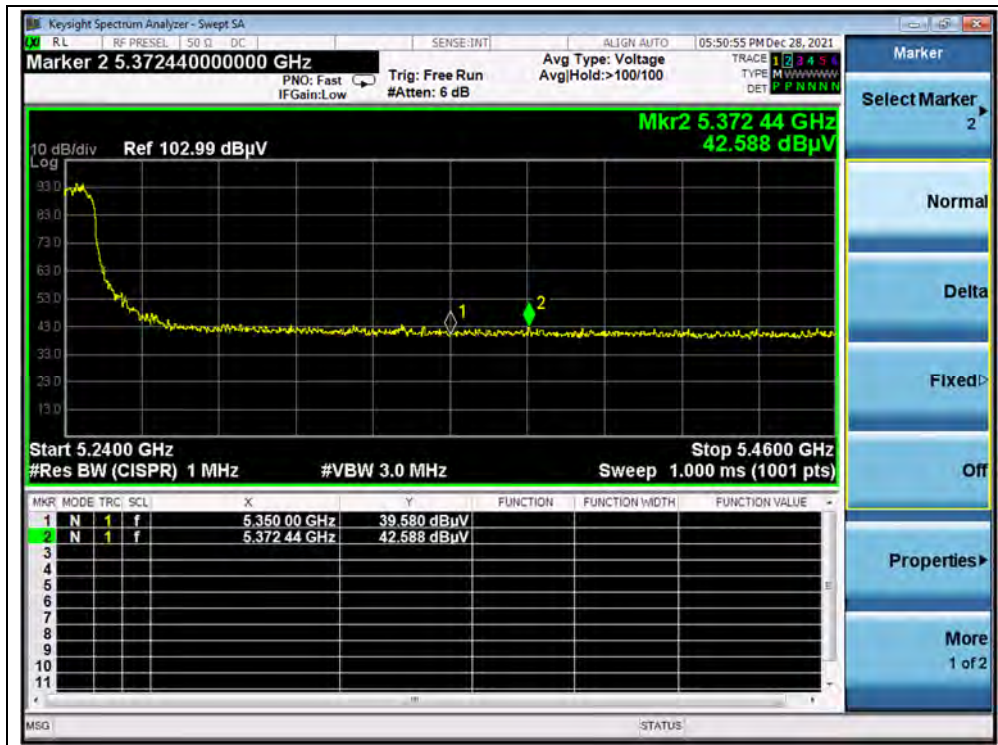
B.Test Plot:



(PEAK, Channel 36, 802.11a)



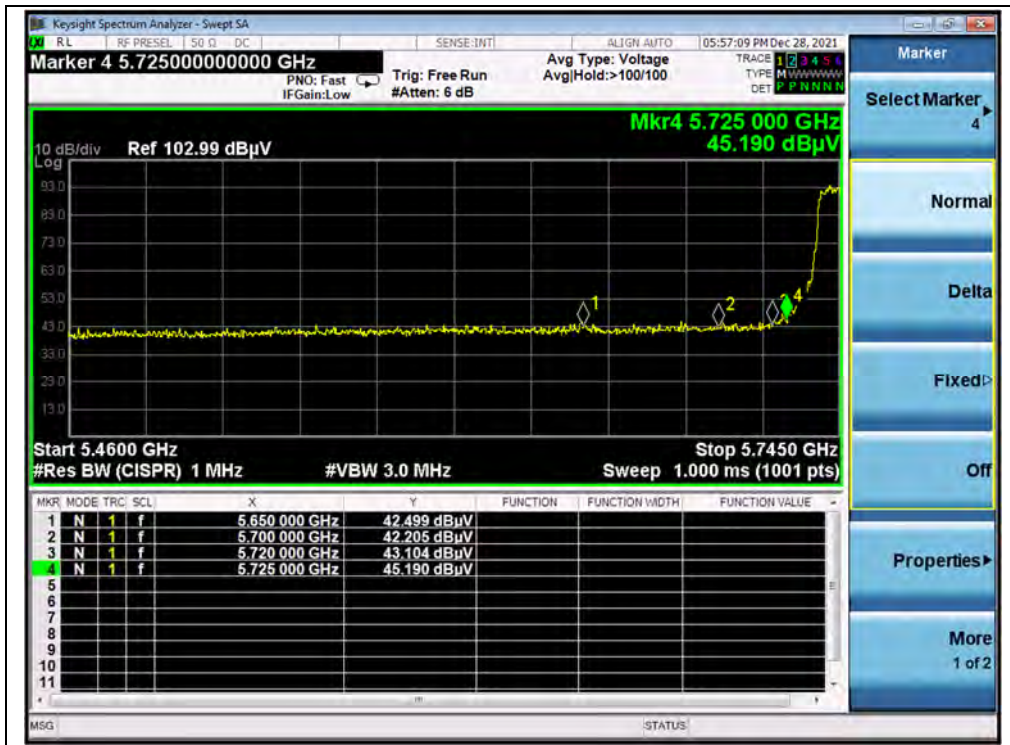
(AVERAGE, Channel 36, 802.11a)



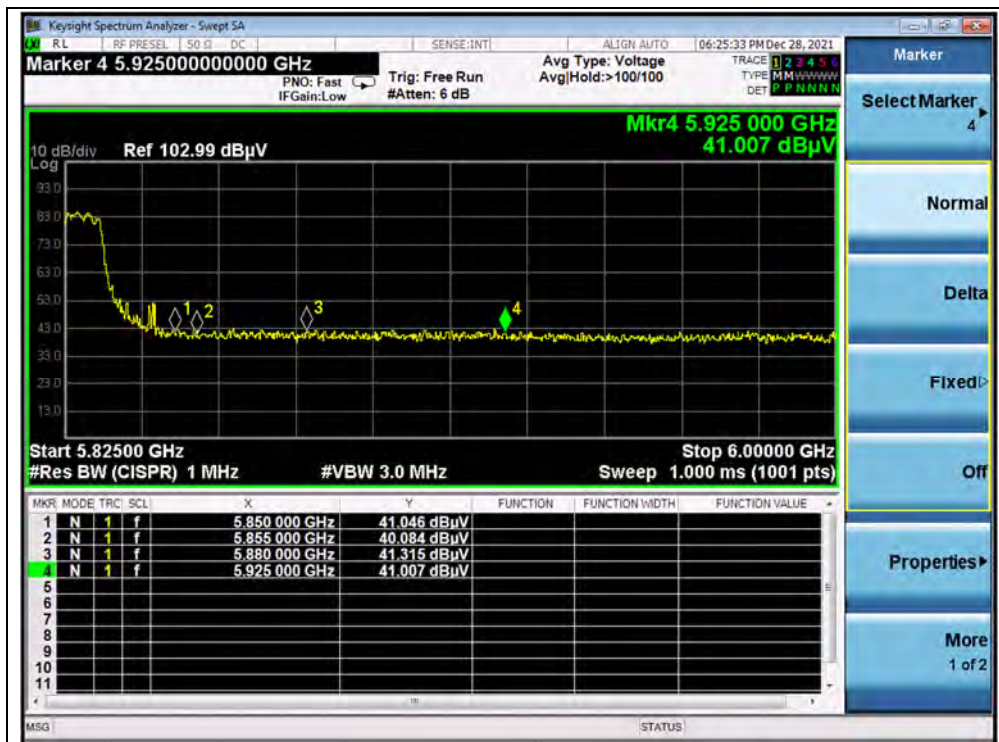
(PEAK, Channel 48, 802.11a)



(AVERAGE, Channel 48, 802.11a)



(PEAK, Channel 149, 802.11a)



(PEAK, Channel 165, 802.11a)

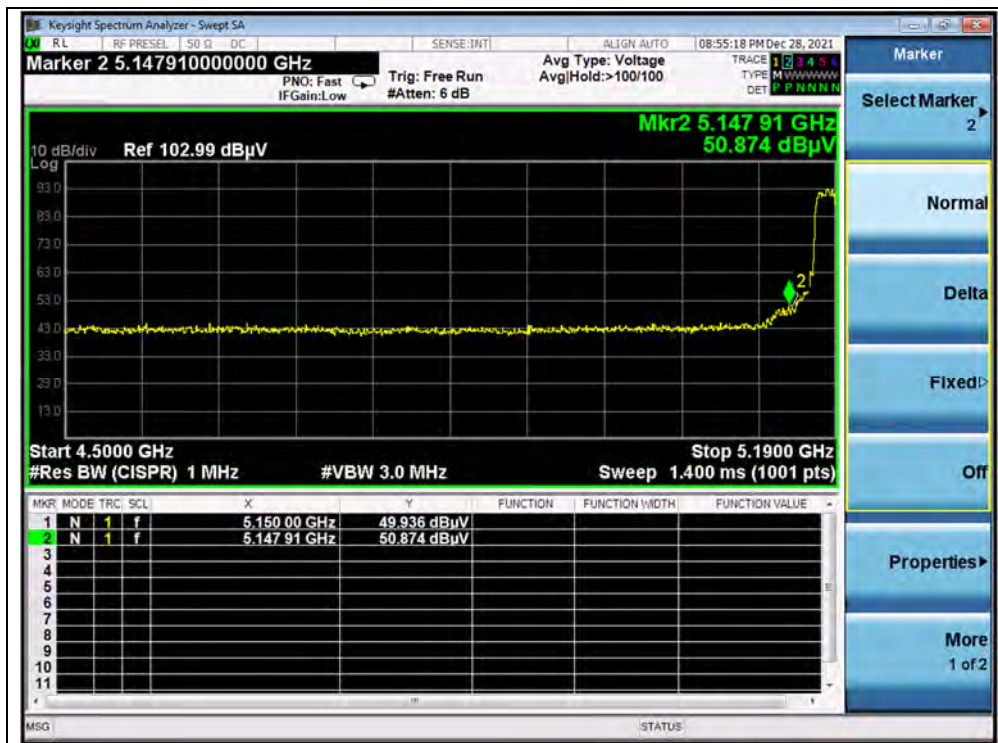


802.11n (HT40) Mode

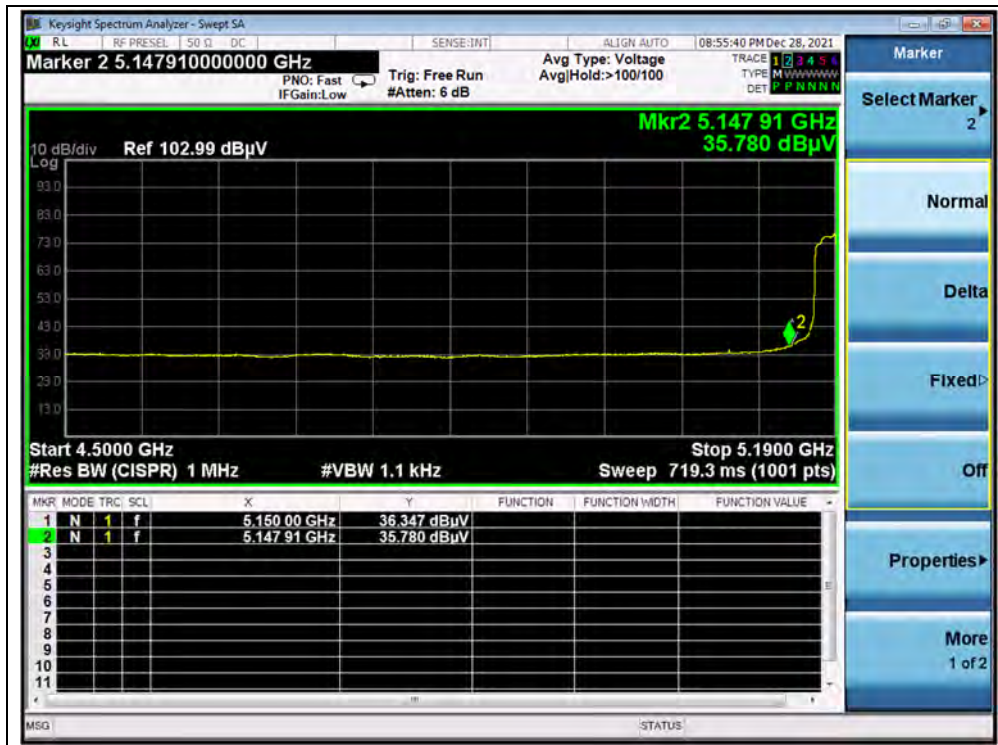
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading	$A_T$	$A_{Factor}$	Max. Emission	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV	$U_R$ (dB $\mu$ V)	(dB)	(dB@3m)	E (dB $\mu$ V/m)		
38	5147.91	PK	50.87	-19.54	32.20	63.53	74	PASS
38	5150.00	AV	36.35	-19.54	32.20	49.01	54	PASS
46	5357.42	PK	42.59	-19.54	32.20	55.25	74	PASS
46	5350.00	AV	31.43	-19.54	32.20	44.09	54	PASS
151	5725.00	PK	50.75	-19.01	32.20	63.94	122.23	PASS
159	5880.00	PK	39.66	-19.01	32.20	52.85	101.53	PASS

B. Test Plot:



(PEAK, Channel 38, 802.11n (HT40))

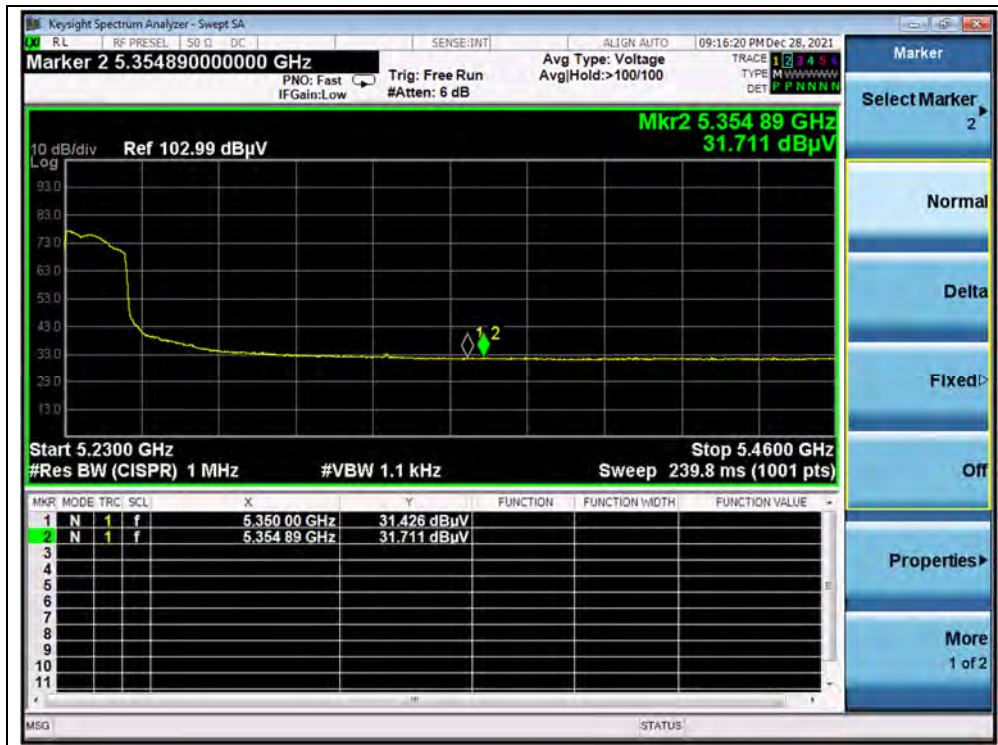


(AVERAGE, Channel 38, 802.11n (HT40))



(PEAK, Channel 48, 802.11n (HT40))

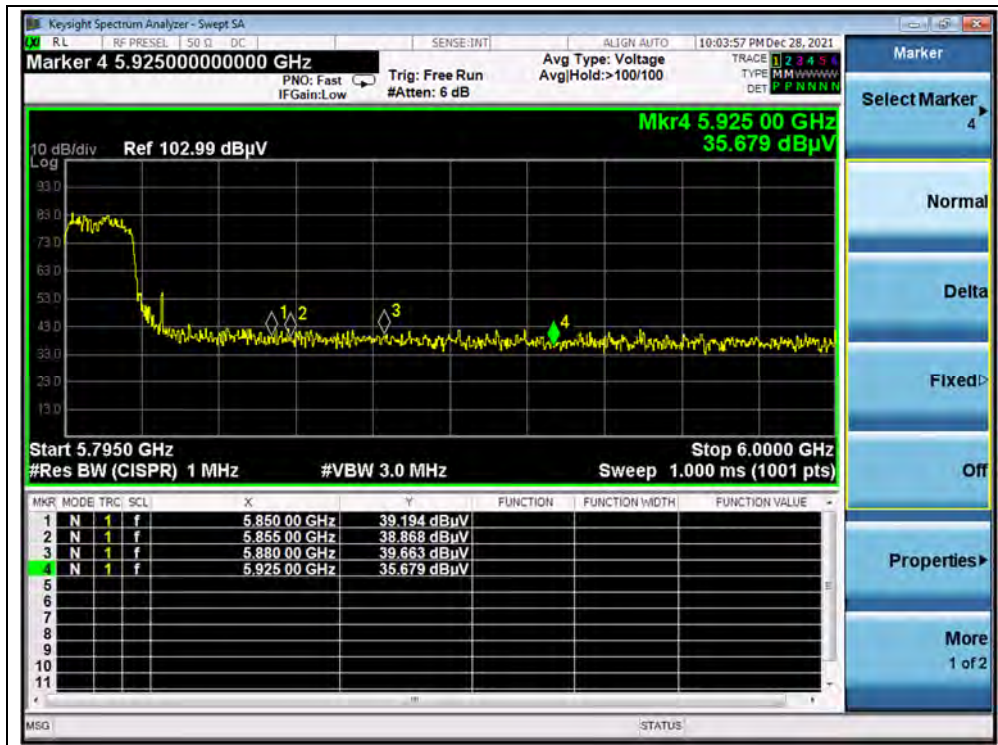




(AVERAGE, Channel 48, 802.11n (HT40))



(PEAK, Channel 151, 802.11n (HT40))



(PEAK, Channel 159, 802.11n (HT40))

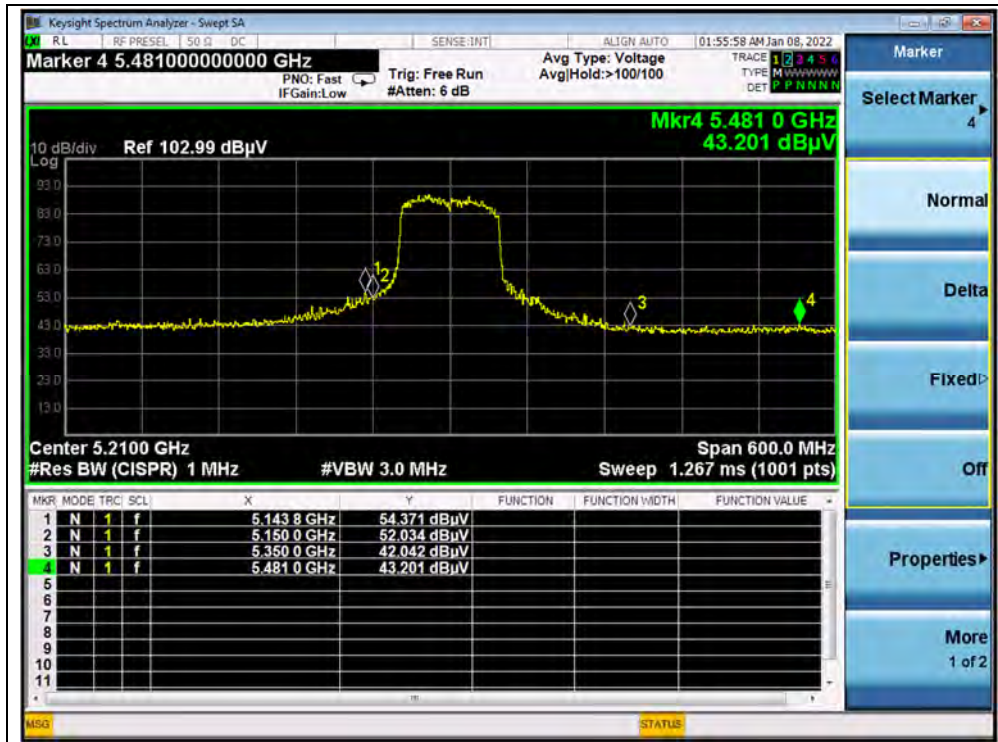


**802.11 ac (VHT80) Mode**

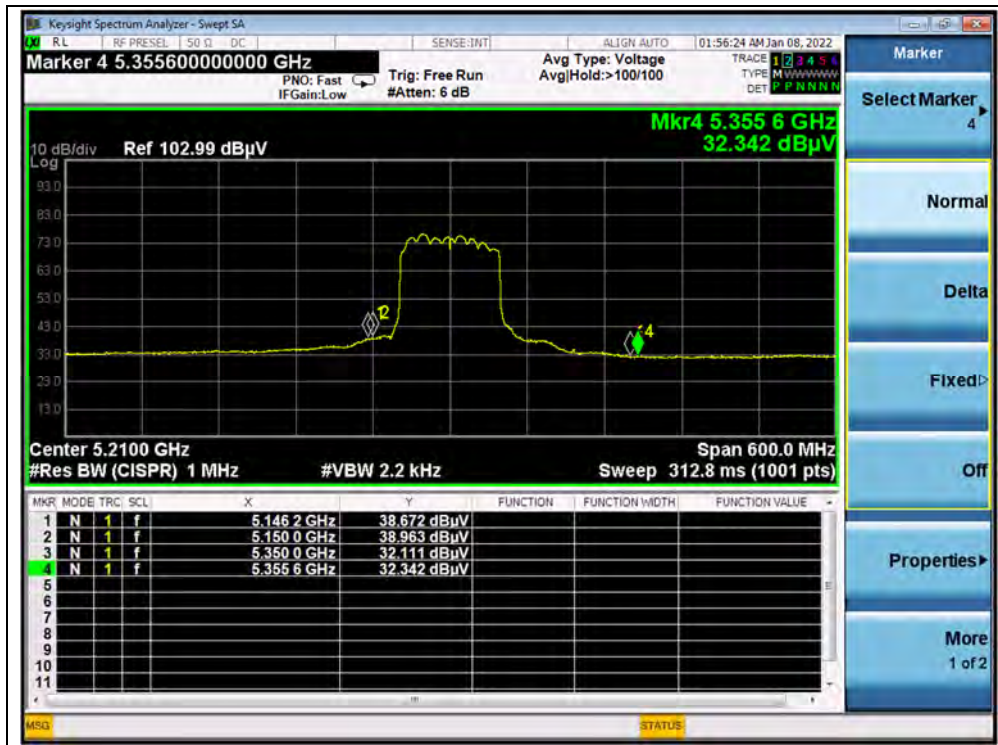
**A. Test Verdict:**

Channel	Frequency (MHz)	Detector	Receiver Reading	A <sub>T</sub> (dB)	A <sub>Factor</sub> (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV	U <sub>R</sub> (dBuV)					
42	5143.80	PK	54.37	-19.54	32.20	67.03	74	PASS
42	5150.00	AV	38.96	-19.54	32.20	51.62	54	PASS
42	5481.00	PK	43.20	-19.54	32.20	55.86	74	PASS
42	5355.60	AV	32.34	-19.54	32.20	45.00	54	PASS
155	5725.00	PK	53.28	-19.01	32.20	66.47	122.23	PASS
155	5855.00	PK	46.03	-19.01	32.20	59.22	110.83	PASS

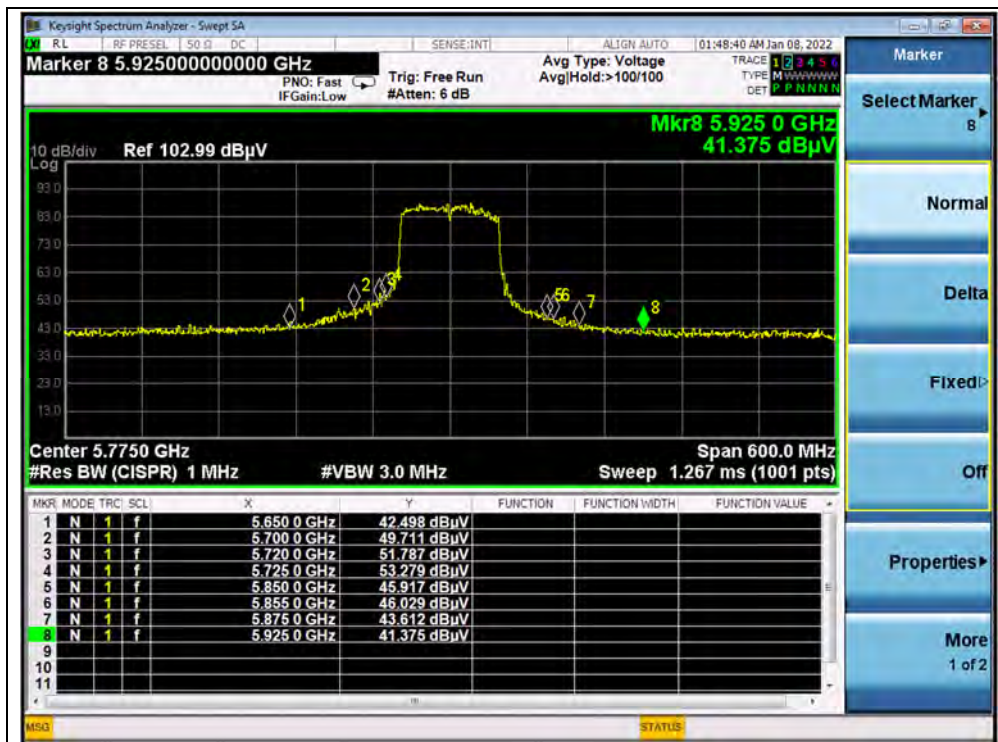
**B. Test Plot:**



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



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



(Channel 155, PEAK, 802.11ac (VHT80))

## 2.9. Radiated Emission

### 2.9.1. Requirement

The peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) 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 EIRP of -27dBm/MHz.
- (2) 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 EIRP of -27dBm/MHz.
- (3) 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 EIRP of -27dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

The following formula is used to convert the equipment isotropic radiated power(e.i.r.p.) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \mu\text{V/m}$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

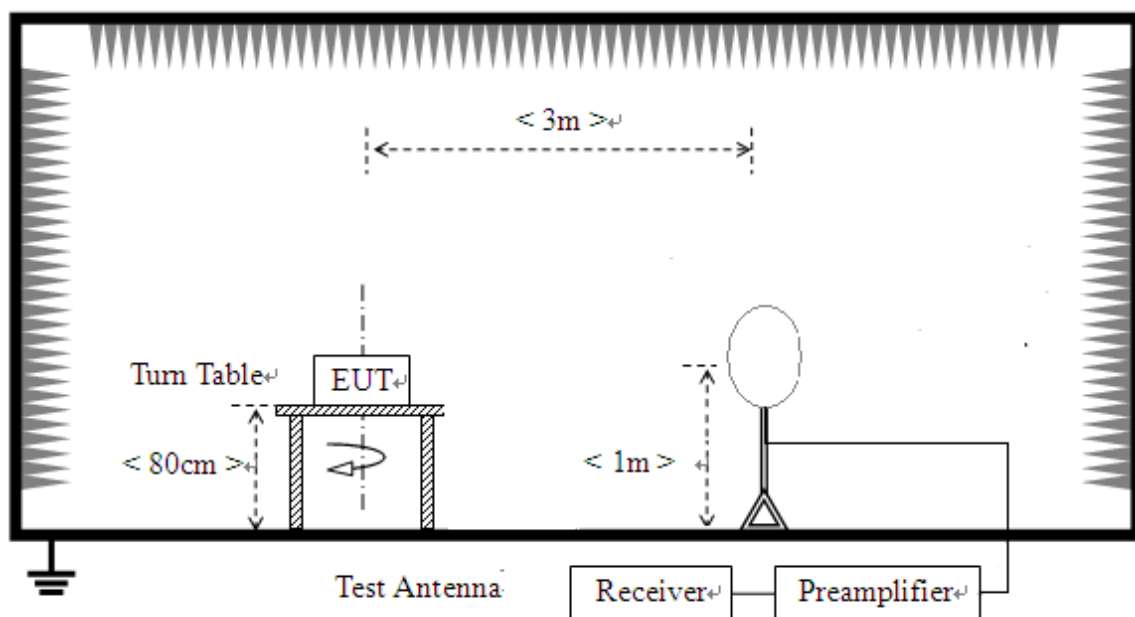
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table).

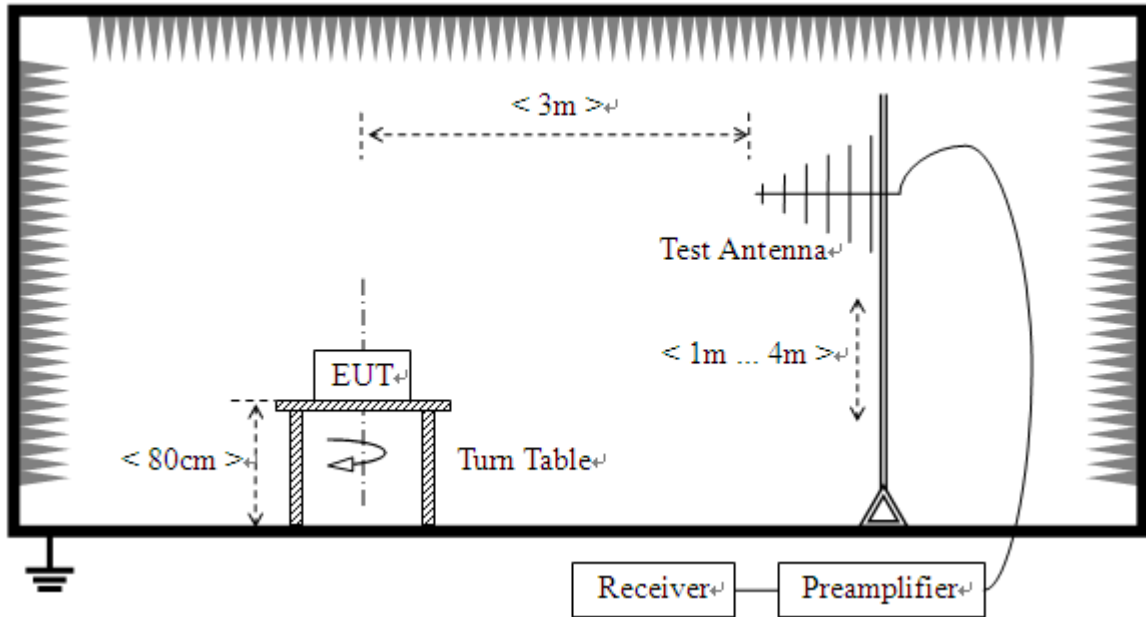
## 2.9.2. Test Description

### Test Setup:

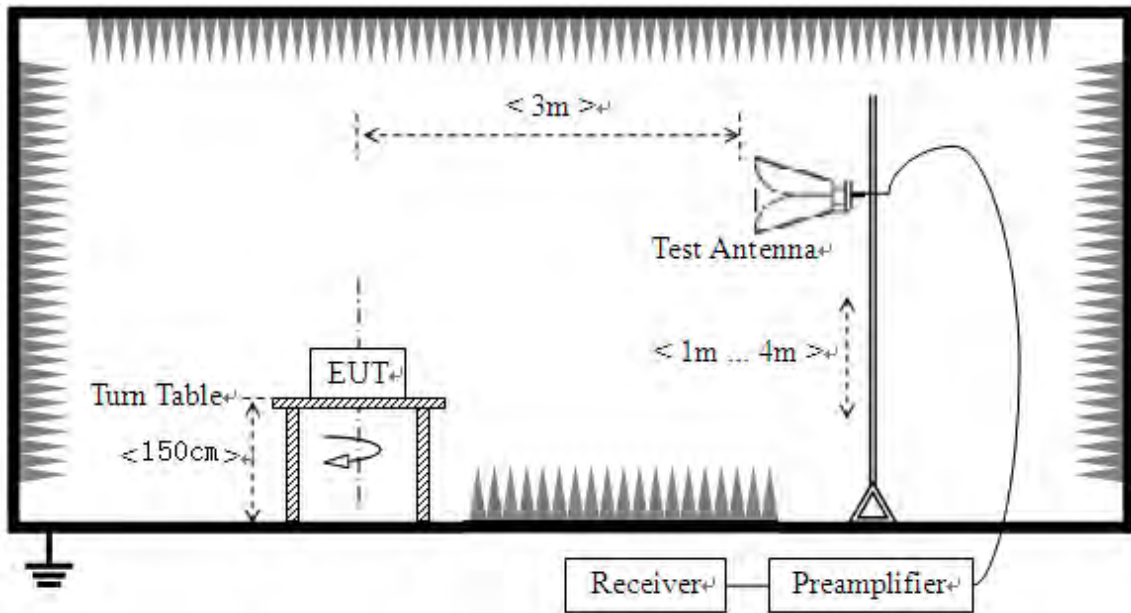
- 1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.



For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

### 2.9.3. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak (or average) limit, it is unnecessary to perform a quasi-peak measurement (or average).

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

During the test, the total correction Factor  $A_T$  and  $A_{\text{Factor}}$  were built in test software.

**Note 1:** All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

**Note 2:** For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

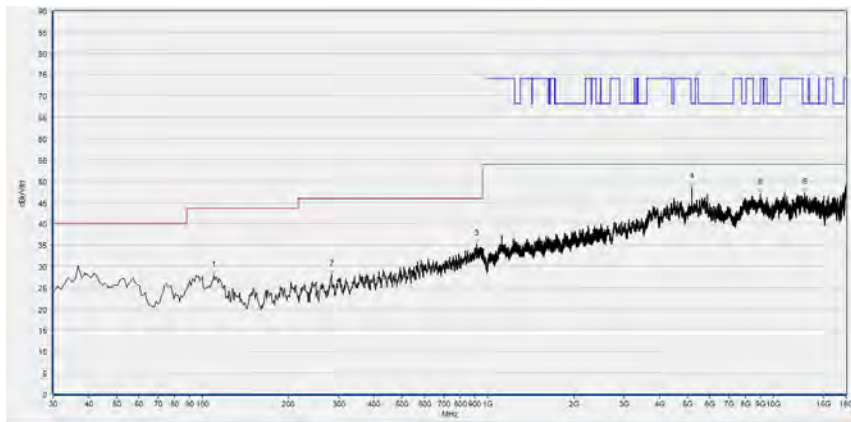
**Note 3:** For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

**Note 4:** All test modes and bandwidth were considered and evaluated respectively by performing full test, only the worst data were recorded for each bandwidth.



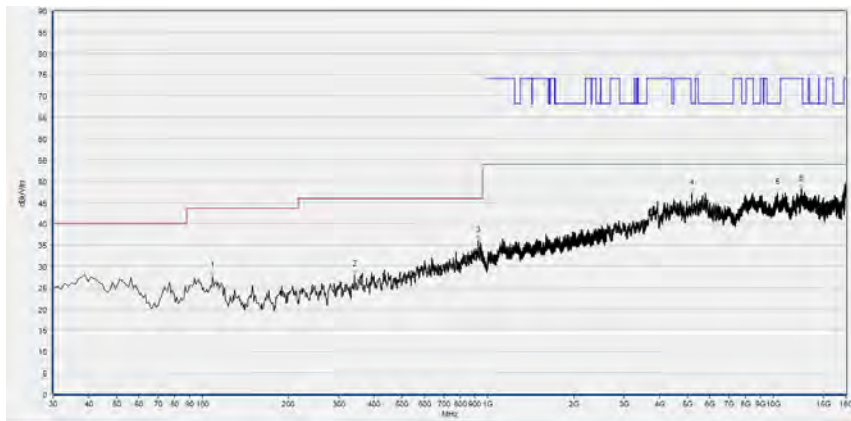
**802.11a Mode**

**Plot for Channel 36**



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
109.620	27.83	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
283.423	28.21	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
915.526	35.11	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5184.637	48.69	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8992.278	47.13	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12864.613	47.24	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

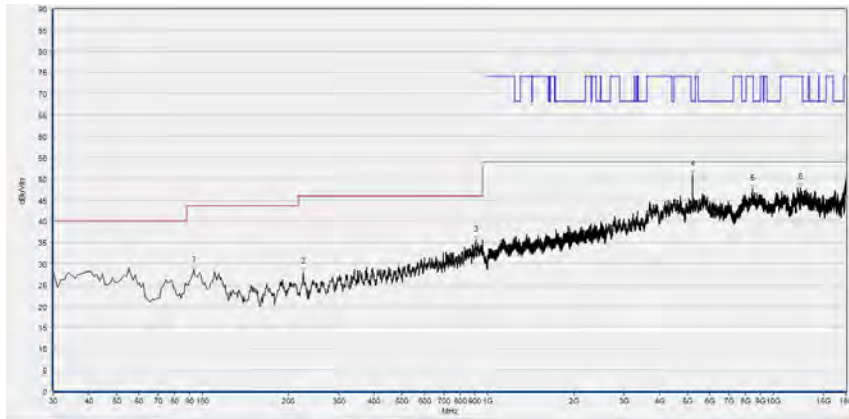
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
108.649	27.69	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
340.711	27.98	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
924.264	35.96	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5181.556	47.11	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
10323.105	47.26	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12541.148	48.13	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

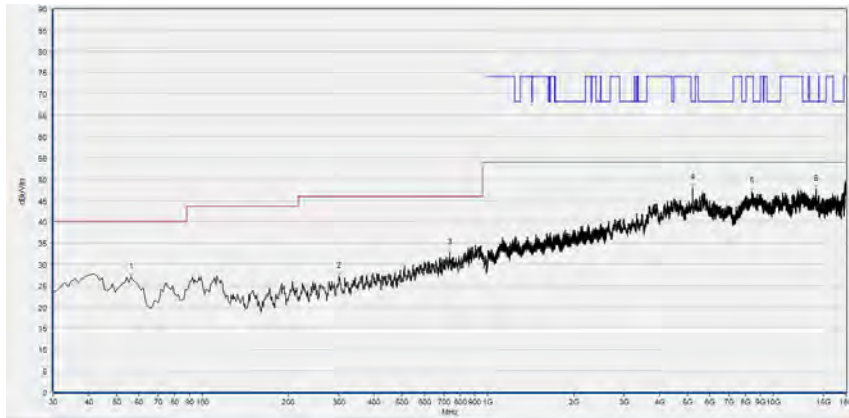
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 44



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
93.113	28.48	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
225.165	27.92	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
907.758	35.59	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5218.524	50.93	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8447.009	47.60	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12479.536	47.92	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

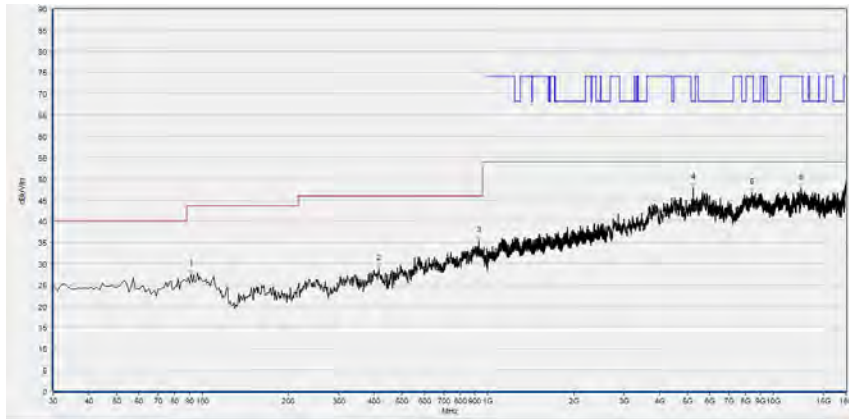
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
56.216	27.02	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
300.901	27.09	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
734.925	32.66	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5218.524	48.01	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8422.364	47.02	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
14090.698	47.63	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

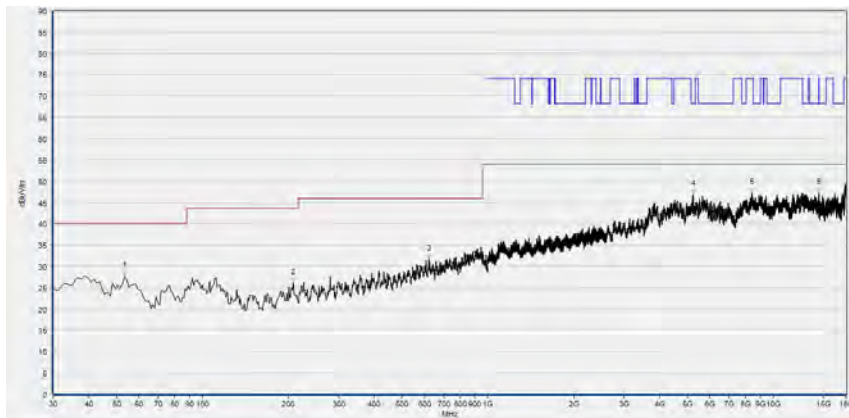
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 48



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
91.171	27.56	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
415.475	28.75	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
932.032	35.39	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5237.007	48.00	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8431.606	46.74	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12501.100	47.82	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

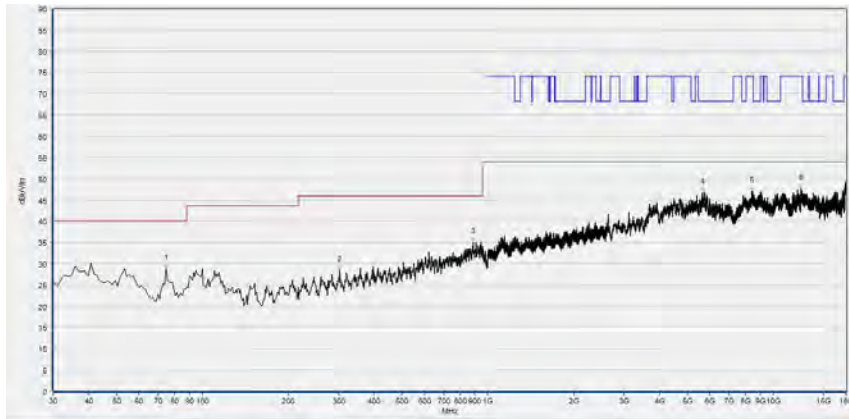
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
53.303	27.65	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
207.688	26.21	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
622.292	31.75	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5233.927	46.85	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8410.042	47.19	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
14438.808	47.28	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

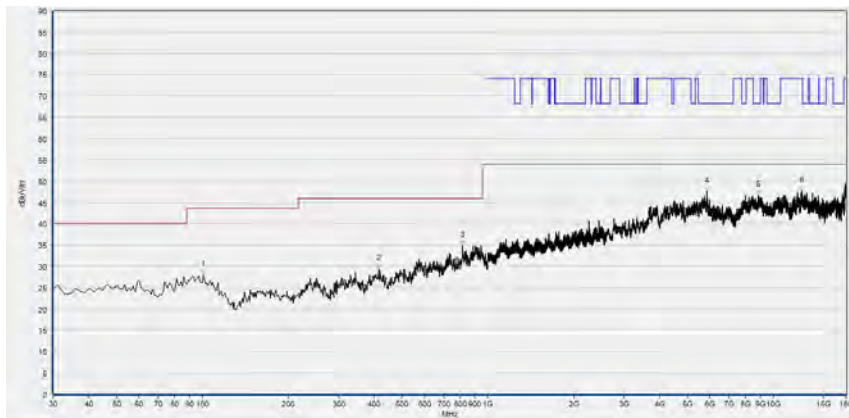
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 149



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
74.665	28.76	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
302.843	28.45	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
889.309	35.04	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5655.971	46.77	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8410.042	47.12	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12522.665	47.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

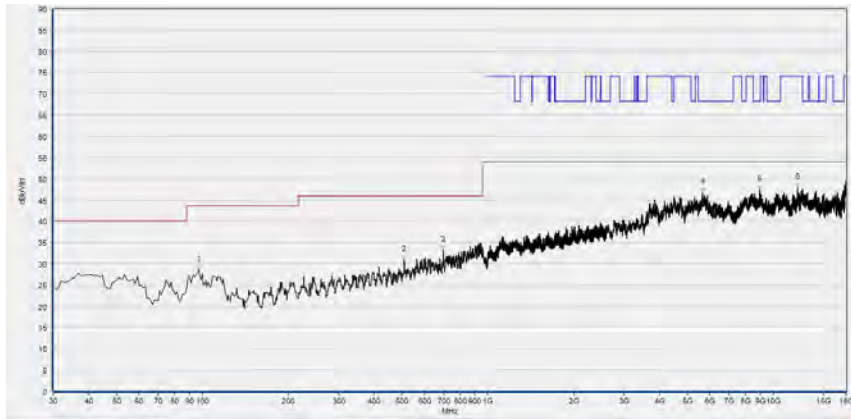
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
100.881	27.95	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
414.505	29.27	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
815.516	34.92	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5865.453	47.59	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8875.215	46.77	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12615.083	47.81	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

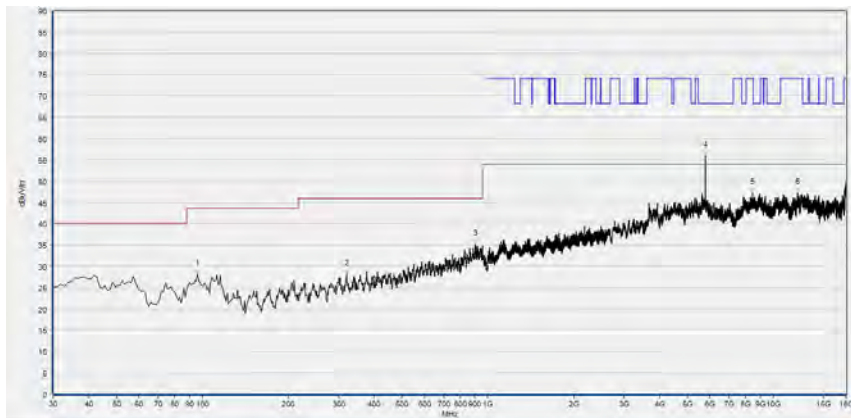
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 157



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.997	28.45	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
508.689	30.76	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
698.999	33.11	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5640.568	46.76	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8942.989	47.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12143.749	47.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

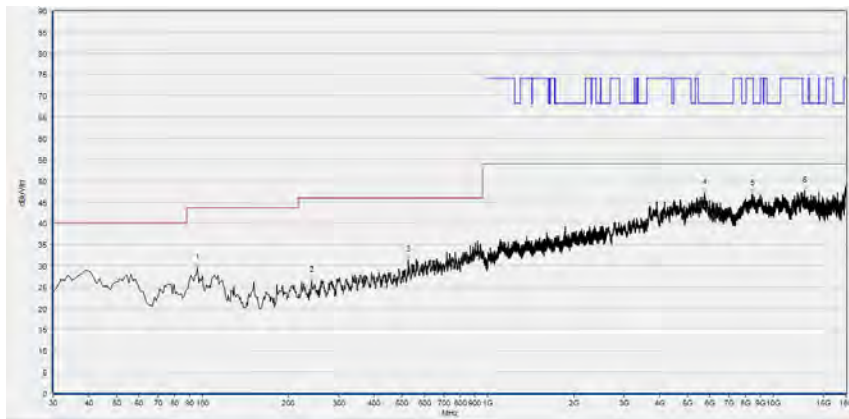
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.026	28.12	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
320.320	28.22	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
901.932	35.27	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5782.276	56.03	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8443.929	47.33	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12162.232	47.20	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

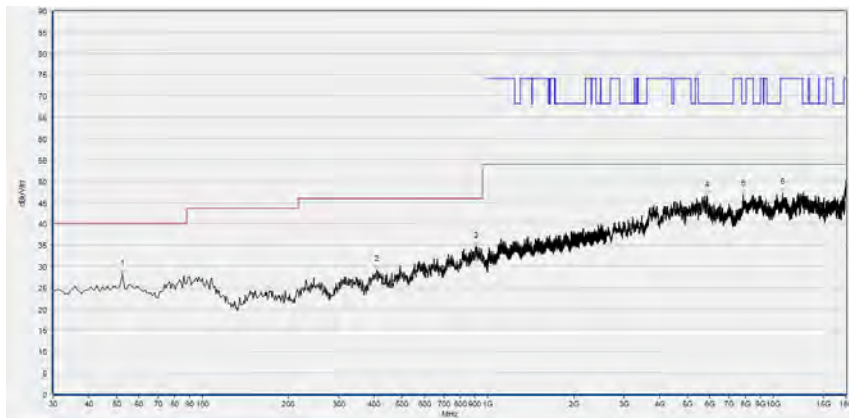
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 165



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
96.026	29.56	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
241.672	26.43	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
526.166	31.36	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5763.793	47.12	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8483.977	46.96	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12880.016	47.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

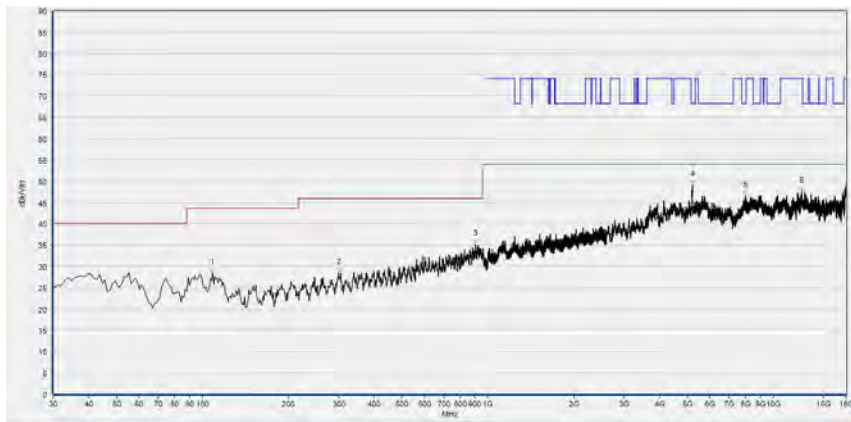


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
52.332	28.12	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
408.679	29.18	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
911.642	34.64	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5865.453	46.62	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7861.692	46.93	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10794.439	47.19	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

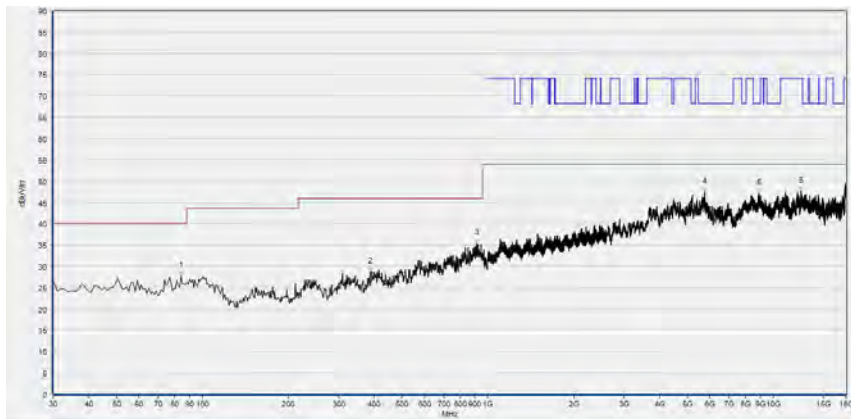
**802.11n (HT40) mode**

**Plot for Channel 38**



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
108.649	28.53	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
299.930	28.47	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
906.787	35.17	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5203.121	49.16	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
7981.836	46.68	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12605.841	47.59	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

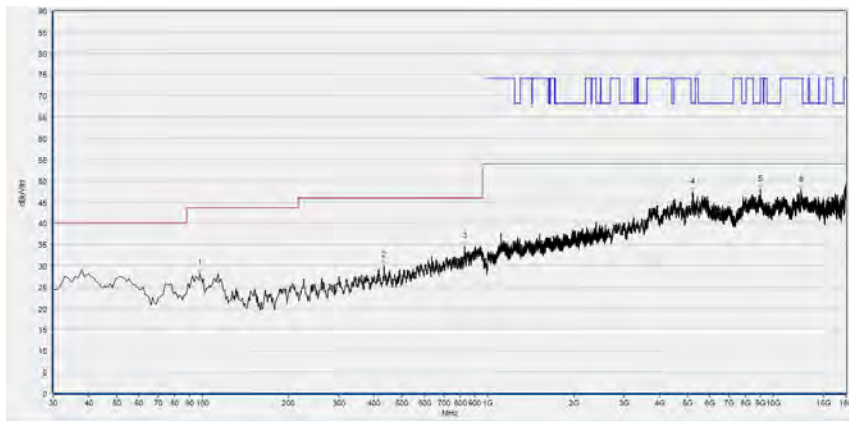
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBµV/m)	QP (dBµV/m)	AV (dBµV/m)	Limit-PK (dBµV/m)	Limit-QP (dBµV/m)	Limit-AV (dBµV/m)	Antenna	Verdict
84.374	27.64	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
387.317	28.66	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
913.584	35.41	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5760.712	47.35	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8896.779	47.02	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
12531.906	47.58	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

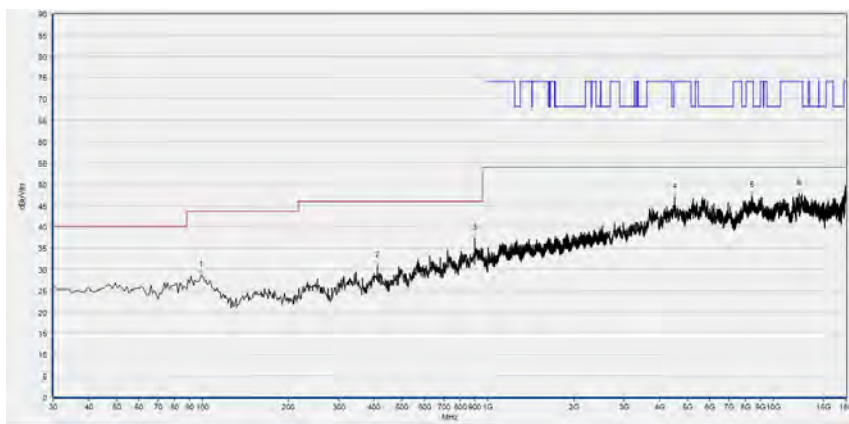
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 46



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
97.968	28.22	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
432.953	30.07	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
829.109	34.49	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5221.604	47.19	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8998.440	47.88	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12522.665	47.82	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)

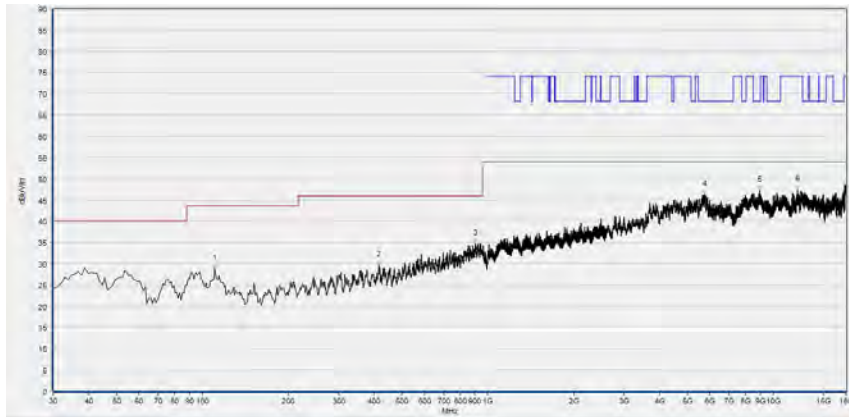


Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
98.939	28.73	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
409.650	30.92	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
900.961	37.25	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
4506.901	46.94	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8388.478	47.18	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12294.699	47.84	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)

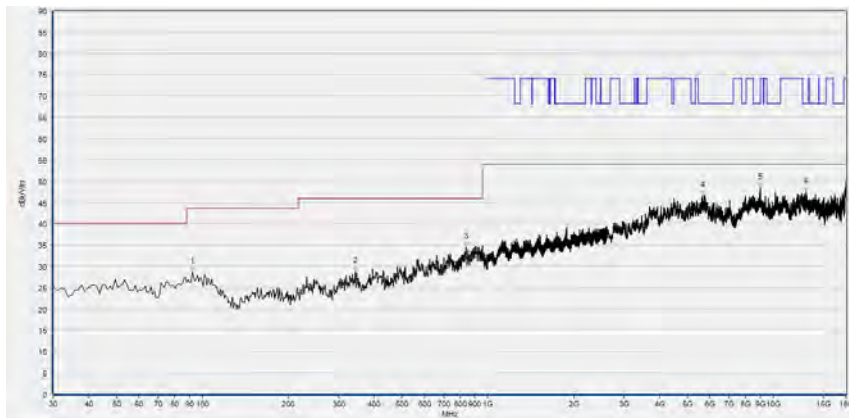


Plot for Channel 151



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
110.591	28.87	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
415.475	29.71	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
903.874	34.73	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5739.148	46.29	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8983.037	47.24	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12152.991	47.38	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

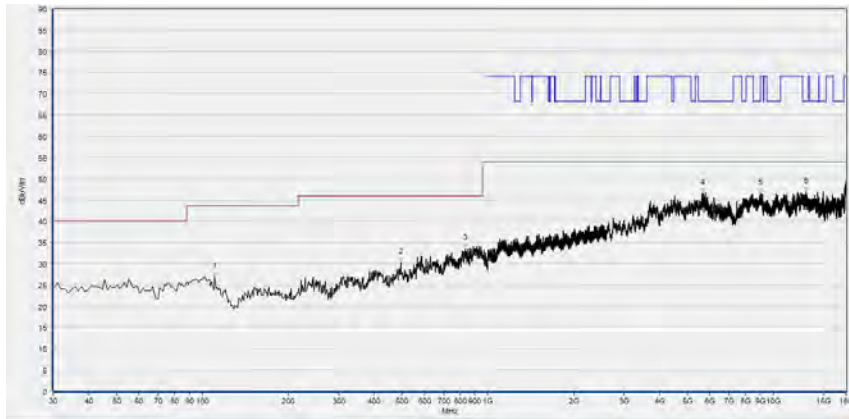
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
92.142	28.62	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
342.653	28.89	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
838.819	34.60	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5652.891	46.66	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8998.440	48.49	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
13058.692	47.41	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

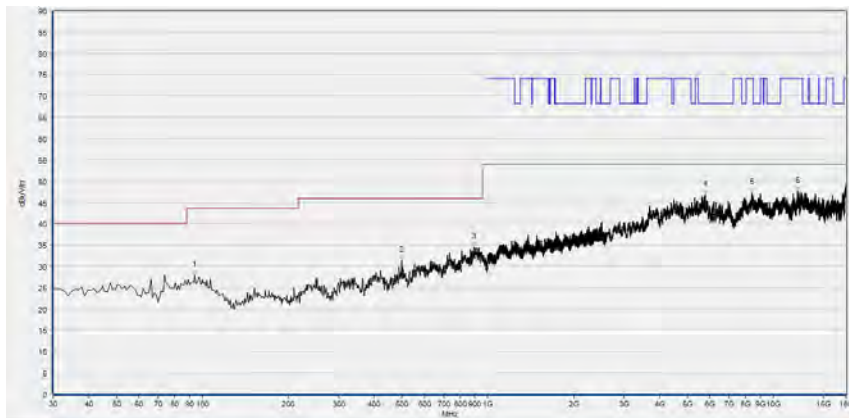
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 159



Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
110.591	27.04	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
496.066	30.32	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
834.935	33.49	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5646.729	46.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
9020.004	46.63	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
13052.531	46.91	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



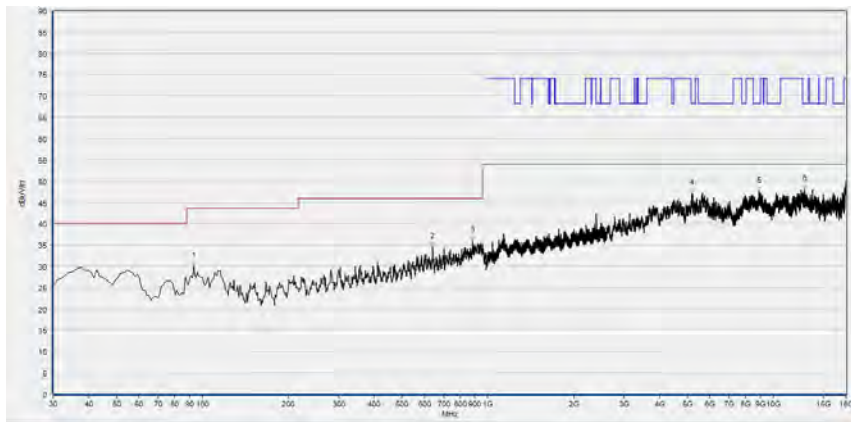
Fre. (MHz)	PK (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.084	27.80	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
498.979	31.30	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
894.164	34.49	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5776.115	46.68	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8416.203	47.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12196.119	47.61	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



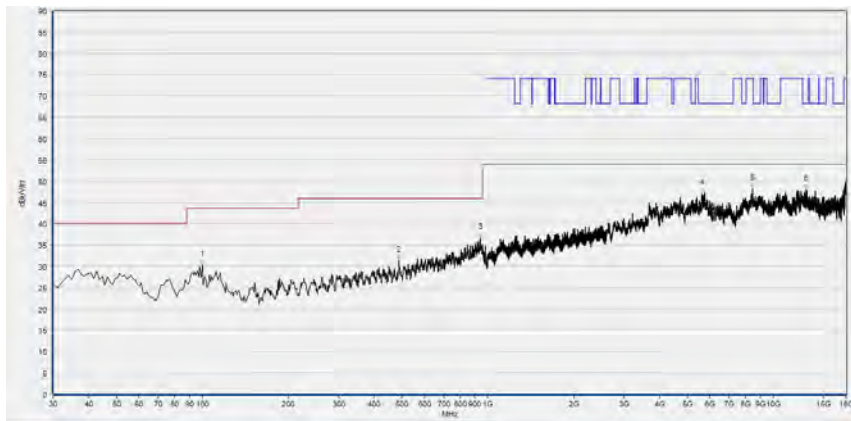
**802.11ac (VHT80) Mode**

Plot for Channel 42



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
93.113	29.97	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
641.712	34.51	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
884.454	36.09	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5196.959	47.11	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
8912.182	47.57	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS
12880.016	48.13	N/A	N/A	68.23	N/A	N/A	Horizontal	PASS

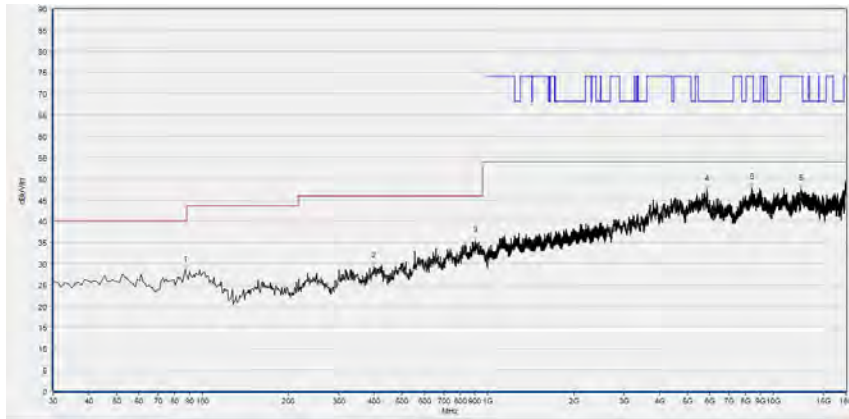
(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
99.910	30.37	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
489.269	31.37	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
938.829	36.72	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5619.004	47.15	N/A	N/A	68.23	N/A	N/A	Vertical	PASS
8453.171	48.31	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
13071.014	48.09	N/A	N/A	68.23	N/A	N/A	Vertical	PASS

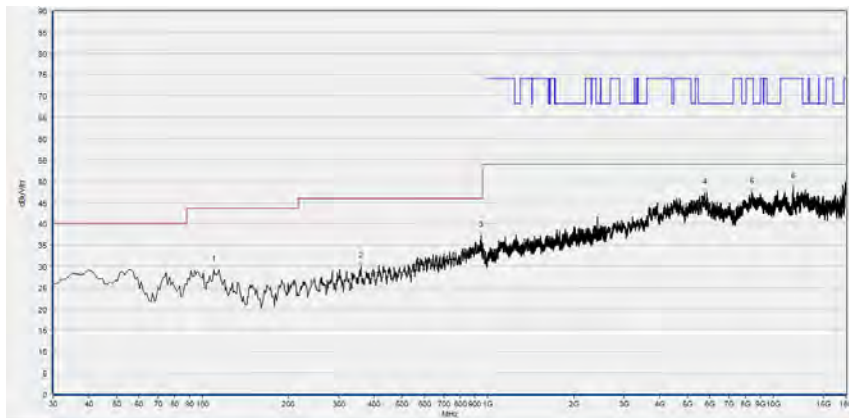
(Antenna Vertical, 30MHz to 18GHz)

Plot for Channel 155



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
87.287	28.44	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
397.998	29.38	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
901.932	35.29	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
5865.453	47.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8425.445	47.90	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12553.471	47.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(Antenna Horizontal, 30MHz to 18GHz)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
109.620	29.20	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
359.159	29.96	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
945.626	37.19	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
5742.228	47.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8419.284	47.42	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
11737.107	48.63	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(Antenna Vertical, 30MHz to 18GHz)



## Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test Items	Uncertainty
Peak Output Power	$\pm 2.22\text{dB}$
Power Spectral Density	$\pm 2.22\text{dB}$
Bandwidth	$\pm 5\%$
Restricted Frequency Bands	$\pm 5\%$
Radiated Emission	$\pm 2.95\text{dB}$
Conducted Emission	$\pm 2.44\text{dB}$

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .



## Annex B Testing Laboratory Information

### 1. Identification of the Responsible Testing Laboratory

<b>Laboratory Name:</b>	Shenzhen Morlab Communications Technology Co., Ltd.
<b>Laboratory Address:</b>	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
<b>Telephone:</b>	+86 755 36698555
<b>Facsimile:</b>	+86 755 36698525

### 2. Identification of the Responsible Testing Location

<b>Name:</b>	Shenzhen Morlab Communications Technology Co., Ltd.
<b>Address:</b>	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

### 3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



#### 4. Test Equipments Utilized

##### 4.1 Conducted Test Equipments

Equipment	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Attenuator 1	N/A	10dB	Resnet	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2021.03.25	2022.03.24
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2021.03.25	2022.03.24
RF Cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial Cable	CB02	RF02	Morlab	N/A	N/A
SMA Connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Temperature Chamber	12108015	DTL-003S101	YOMA	2020.10.26	2021.10.25

##### 4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2021.03.09	2022.03.08
LISN	812744	NSLK 8127	Schwarzbeck	2021.03.09	2022.03.08
Pulse Limiter (10dB)	VTSD 9561 F-B #206	VTSD 9561-F	Schwarzbeck	2021.07.21	2022.07.20
Coaxial Cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

##### 4.3 List of Software Used

Description	Manufacturer	Software Version
Test System	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0
TS+ -[JS32-CE]	Tonscend	V2.5.0.0

**4.4 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2021.07.16	2022.07.15
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Horn	BBHA9170 #774	BBHA 9170	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Coaxial Cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
Coaxial Cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L32 03	Tonscend	2021.07.16	2022.07.15
26-40GHz pre-Amplifier	56774	S40M400L4 002	Tonscend	2021.07.16	2022.07.15
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5150-5350	Wainwright	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5470-5725	Wainwright	2021.07.16	2022.07.15
Notch Filter	N/A	WRCG-5725-5850	Wainwright	2021.07.16	2022.07.15





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Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Due Date
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

————— END OF REPORT —————