



# TEST REPORT

**APPLICANT** : DALU Robotech Technology (Beijing)  
Co., Ltd.

**PRODUCT NAME** : ANDI-Security Inspection Robot

**MODEL NAME** : ANDI-III

**BRAND NAME** : ANDI

**FCC ID** : 2AVH4DLZYROBOT15422

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

**RECEIPT DATE** : 2019-12-27

**TEST DATE** : 2020-03-03 to 2020-04-18

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<b>Change History</b>		
<b>Version</b>	<b>Date</b>	<b>Reason for change</b>
1.0	2020-05-28	First edition



# 1. Technical Information

Note: Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	DALU Robotech Technology (Beijing) Co., Ltd.
<b>Applicant Address:</b>	Room 1905-2, Building1, No.32 North Xizhimen Street, Haidian District, Beijing, China
<b>Manufacturer:</b>	Suzhou DALU Robotech Technology Co., Ltd.
<b>Manufacturer Address:</b>	No.80 Lianfeng Road, Changfu Street, Changshu City, Suzhou City, Jiangsu Province, China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	ANDI-Security Inspection Robot	
<b>Serial No:</b>	(N/A, marked #1 by test site)	
<b>Hardware Version:</b>	20191106	
<b>Software Version:</b>	v1.2.0	
<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>	5.180 GHz- 5.240GHz; 5.260 GHz -5.320 GHz ; 5.500 GHz -5.720 GHz ; 5.745GHz- 5.825GHz	
<b>Channel Number:</b>	Refer to 1.3	
<b>Antenna Type:</b>	Whip Antenna	
<b>Antenna Gain:</b>	ANT 0: 4.0dBi; ANT 1: 4.0dBi	
<b>Directional Gain:</b>	7.01dBi <sub>Note 3</sub>	
<b>Accessory Information:</b>	Battery	
	<b>Brand Name:</b>	N/A
	<b>Model No.:</b>	LB13S14P-INR35
	<b>Serial No.:</b>	(N/A, marked #1 by test site)
	<b>Capacity:</b>	35000.00mAh
	<b>Rated Voltage:</b>	46.80V
	<b>Charge Limit:</b>	54.60V



<b>Accessory Information:</b>	AC Adapter	
	Brand Name:	N/A
	Model No.:	HD450W
	Serial No.:	(N/A, marked #1 by test site)
	Rated Output:	28.50V $\pm$ 15.00A
	Rated Input:	200-260V $\sim$ 50 $\sim$ 60Hz

**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, 802.11ac modulation mode.

Modulation Mode:	TX Function
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(ANT 0) in this report.

**Note 5:** All radiation test items for 802.11n and 802.11ac 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: 5180MHz-5240MHz				
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: 5260MHz-5320MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	<b>52</b>	<b>5260</b>	56	5280
	<b>60</b>	<b>5300</b>	<b>64</b>	<b>5320</b>
40MHz	<b>54</b>	<b>5270</b>	<b>62</b>	<b>5310</b>
80MHz	<b>58</b>	<b>5290</b>		
Frequency Range: 5500MHz-5720MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	<b>100</b>	<b>5500</b>	105	5520
		5540	112	5560
		5580	<b>120</b>	<b>5600</b>
		5620	128	5640
		5660	136	5680
		5700	<b>144</b>	<b>5720</b>
40MHz	<b>102</b>	<b>5510</b>	110	5550
		5590	<b>126</b>	<b>5630</b>
		5670	<b>142</b>	<b>5710</b>
80MHz	<b>106</b>	<b>5530</b>	<b>122</b>	<b>5610</b>
	<b>138</b>	<b>5690</b>		
Frequency Range: 5745-5825MHz				
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	Mar 03, 2020	Ouyang Feng	PASS	No deviation
3	15.407(a)	Maximum conducted output Power	Mar 03, 2020	Ouyang Feng	PASS	No deviation
4	15.407(a) (e)	Emission Bandwidth	Mar 04, 2020	Ouyang Feng	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	Mar 04, 2020	Ouyang Feng	PASS	No deviation
6	15.407(g)	Frequency Stability	Mar 03, 2020	Ouyang Feng	PASS	No deviation
7	15.207	Conducted Emission	May 14, 2020	Huang Zhiye	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Apr 11&17, 2020	Gao Jianrou	PASS	No deviation
9	15.407(b)	Radiated Emission	Apr 16&17, 2020	Gao Jianrou	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 v01r03.

**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 12.5dB contains two parts that cable loss 2.5dB 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.

## 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. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

## 2.2. Duty Cycle of the Test Signal

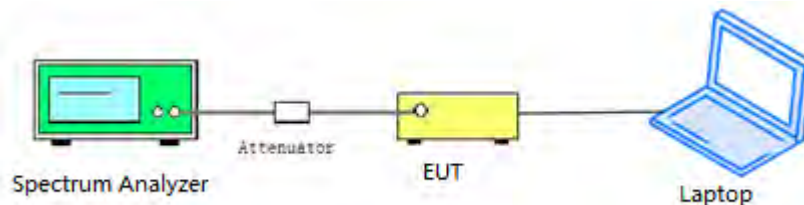
### 2.2.1. Requirement

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.

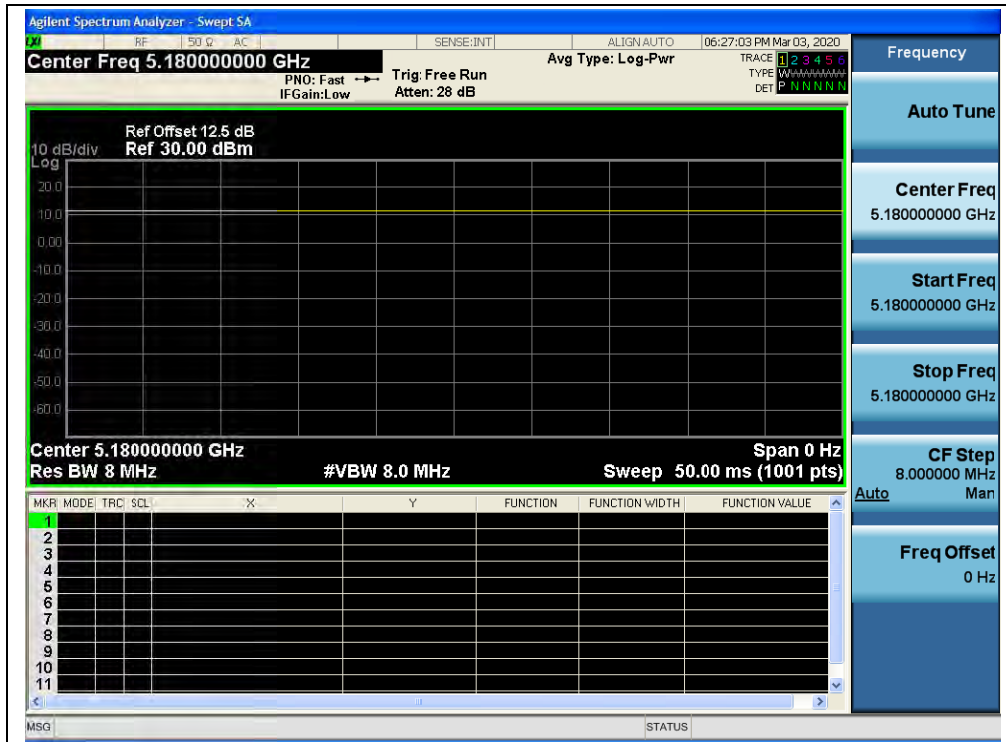


2.2.4. Test Result

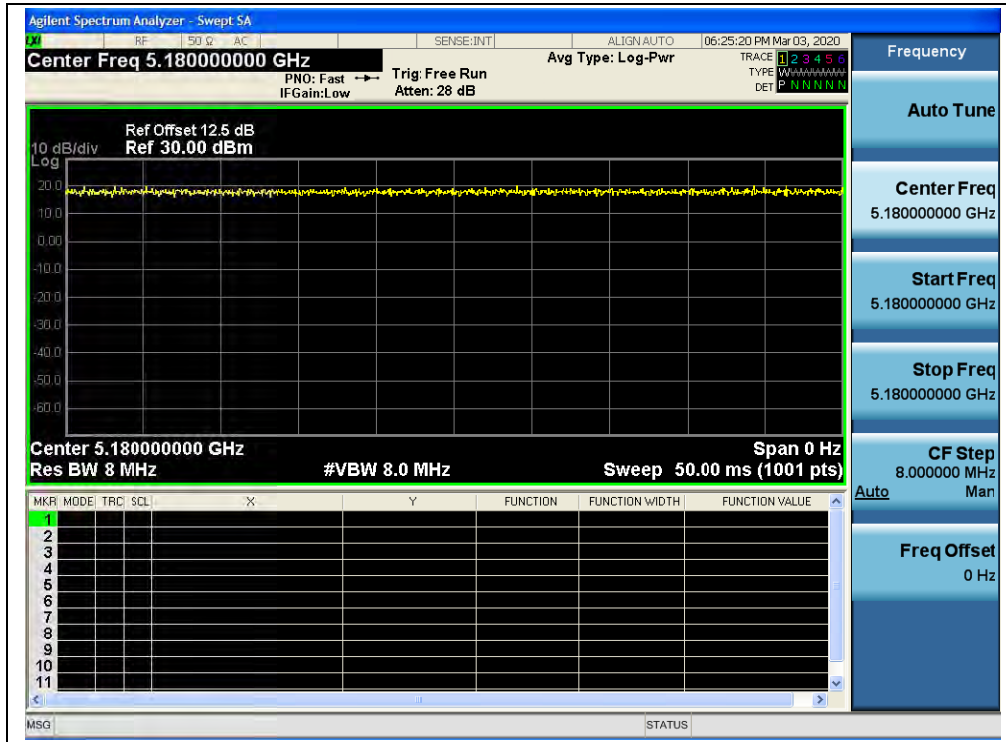
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	100.00	0.00
802.11n(HT20)	100.00	0.00
802.11n(HT40)	100.00	0.00
802.11ac(VHT20)	100.00	0.00
802.11ac(VHT40)	100.00	0.00
802.11ac(VHT80)	100.00	0.00

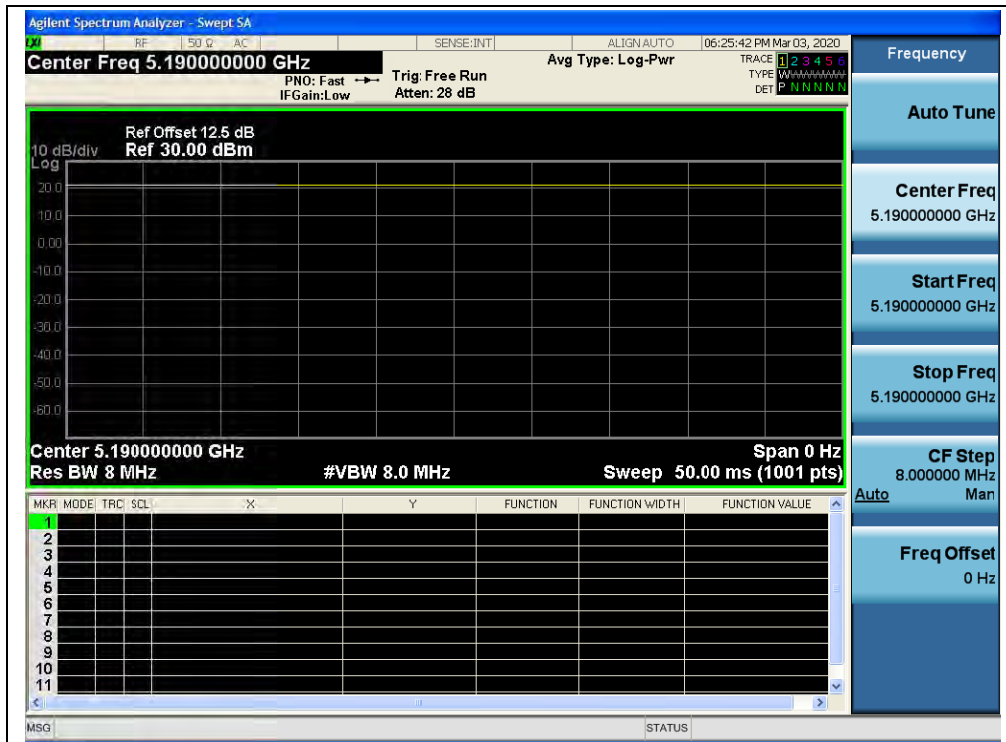
B. Test Plots



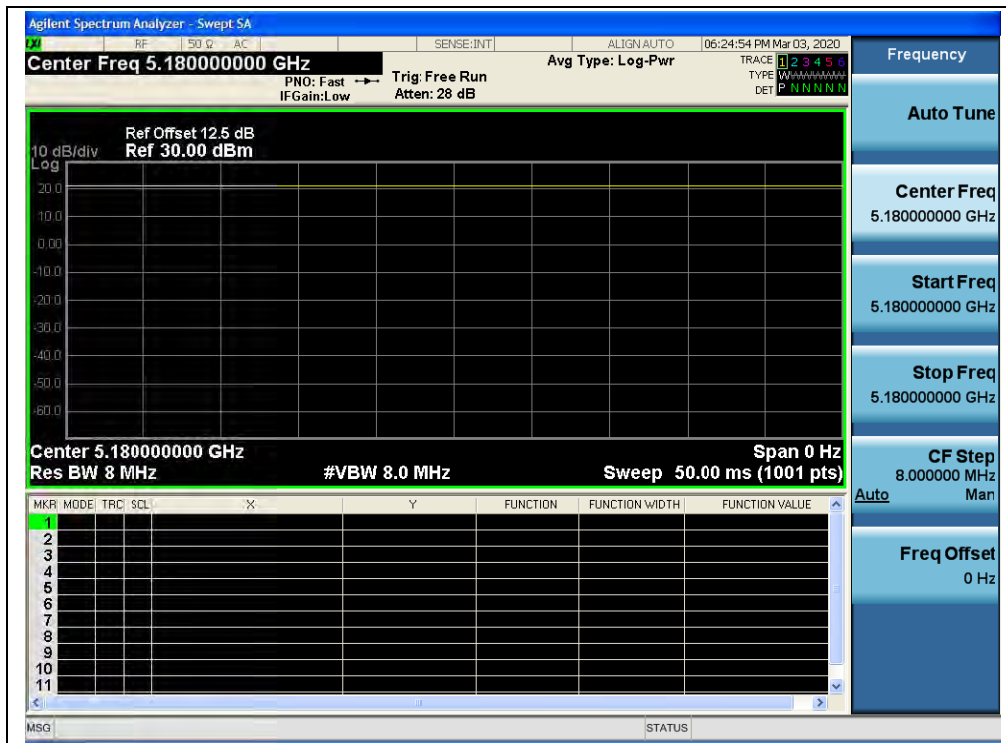
(CH36\_5180MHz\_802.11a)



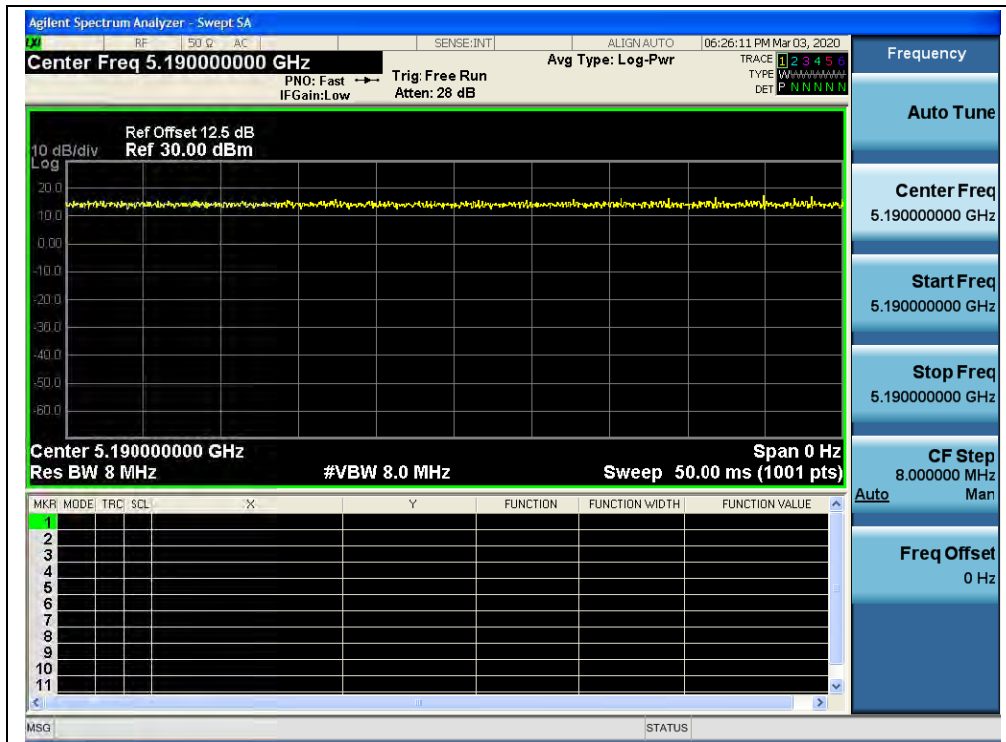
(CH36\_5180MHz\_802.11n(HT20))



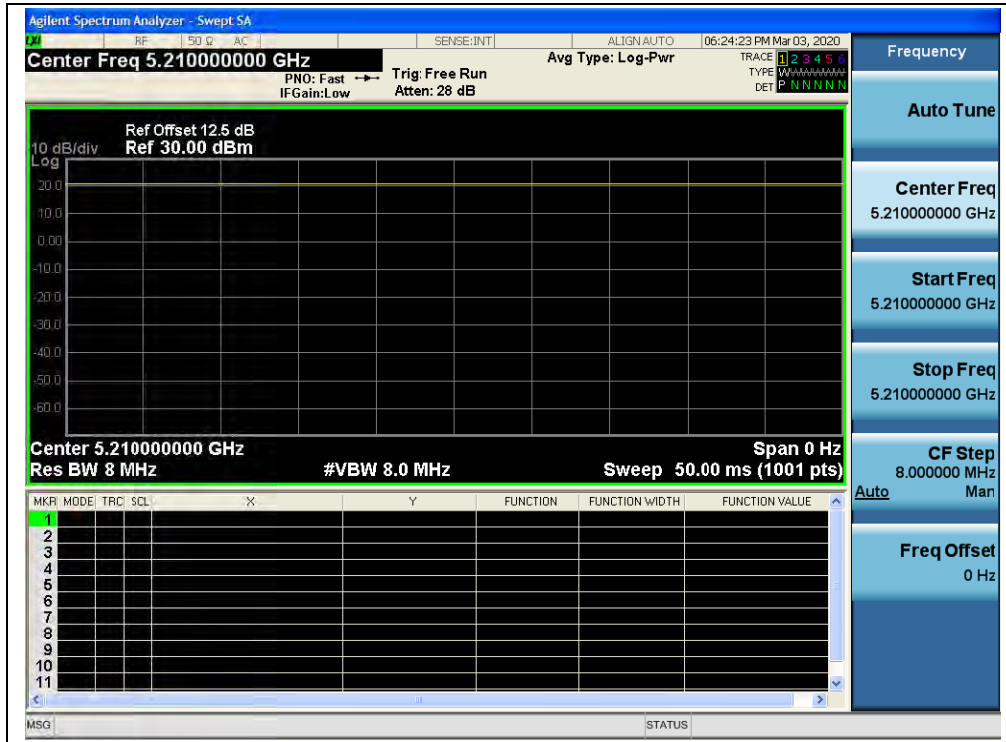
(CH38\_5190MHz\_802.11n(HT40))



(CH36\_5180MHz\_802.11ac(VHT20))



(CH38\_5190MHz\_802.11ac(VHT40))



(CH42\_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 250 mW provided the maximum antenna gain does not exceed 6 dBi.

(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 250 mW 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 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

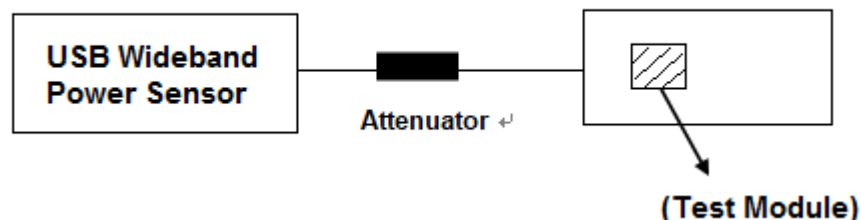
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the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

(5) According to KDB 662911 D01, the directional gain =  $G_{\text{ANT}} + 10 \log(N_{\text{ANT}})$  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.

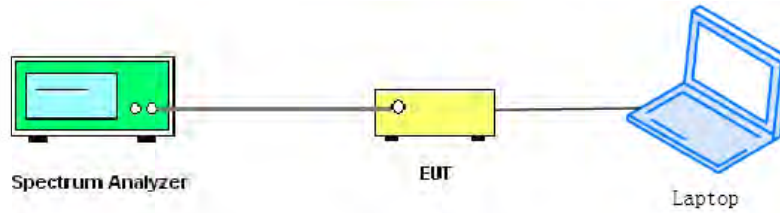
#### Test Setup:



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 50 Ohm; 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. Limits**

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 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

Mode	Band	Channel (MHz)	26dB BW (MHz)	11+10log(26dB BW)	Limits (dBm)
a	UNII-2a	5260	21.67	24.36	24.00
		5300	21.83	24.39	24.00
		5320	21.36	24.30	24.00
	UNII-2c	5500	21.72	24.37	24.00
		5600	22.06	24.44	24.00
		5720	21.5	24.32	24.00
n20	UNII-2a	5260	21.83	24.39	24.00
		5300	21.73	24.37	24.00
		5320	22.25	24.47	24.00
	UNII-2c	5500	22.02	24.43	24.00
		5600	22.09	24.44	24.00
		5720	22.3	24.48	24.00
ac20	UNII-2a	5260	22.04	24.43	24.00
		5300	21.88	24.40	24.00
		5320	22.3	24.48	24.00
	UNII-2c	5500	21.89	24.40	24.00
		5600	21.97	24.42	24.00
		5720	22.14	24.45	24.00



2.3.4. Test Result

Maximum Average Conducted Output Power

802.11a Test mode

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty factor Calculated						
	ANT0	ANT1		ANT0		ANT1				
	dBm	dBm		dBm	W	dBm	W	dBm	W	
5180	12.94	14.60	0.00	12.94	0.020	14.60	0.029	24	0.25	PASS
5220	12.87	14.56		12.87	0.019	14.56	0.029			
5240	12.96	14.52		12.96	0.020	14.52	0.028			
5260	11.52	15.26		11.52	0.014	15.26	0.034			
5300	11.43	15.33		11.43	0.014	15.33	0.034			
5320	11.36	15.28		11.36	0.014	15.28	0.034			
5500	11.14	15.18		11.14	0.013	15.18	0.033			
5600	11.43	15.24		11.43	0.014	15.24	0.033			
5720	11.36	15.31		11.36	0.014	15.31	0.034			
5745	15.29	17.78		15.29	0.034	17.78	0.060			
5785	15.12	17.69		15.12	0.033	17.69	0.059			
5825	15.30	17.95		<b>15.30</b>	<b>0.034</b>	<b>17.95</b>	<b>0.062</b>			



**802.11n (HT20) Test mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1		W	dBm	dBm		W
	dBm	dBm						
5180	13.24	16.33	0.00	0.064	18.06	22.99	0.20	PASS
5220	13.16	16.43		0.065	18.13			
5240	13.40	16.51		0.067	18.26			
5260	12.10	16.78		0.064	18.06	28.99	0.79	PASS
5300	12.12	16.67		0.063	17.99			
5320	12.17	16.53		0.061	17.85			
5500	11.45	14.76		0.044	16.43			
5600	11.57	14.43		0.042	16.23			
5720	11.62	14.65		0.044	16.43			
5745	15.83	17.70		0.097	19.87			
5785	15.76	17.67		0.096	19.82			
5825	<b>15.86</b>	<b>17.87</b>		<b>0.100</b>	<b>20.00</b>			

**Note:** Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be 22.99dBm for 5.18-5.24 GHz, and 28.99dBm for 5.260-5.320 GHz, 5.500-5.720 GHz, 5.745-5.825 GHz band.

**802.11n (HT40) Test mode**





Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0 dBm	ANT1 dBm		W	dBm	dBm		W
5190	12.96	16.02	0.00	0.060	17.78	22.99	0.20	PASS
5230	12.87	16.21		0.061	17.85			
5270	11.62	15.87		0.053	17.24			
5310	11.76	15.74		0.052	17.16	28.99	0.79	
5510	11.27	14.50		0.042	16.23			
5630	11.32	14.33		0.041	16.13			
5710	11.26	14.43		0.041	16.13			
5755	15.57	17.54		<b>0.093</b>	<b>19.68</b>			
5795	15.63	17.31		0.090	19.54			

**Note:** Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be 22.99dBm for 5.18-5.24 GHz, and 28.99dBm for 5.260-5.320 GHz, 5.500-5.720 GHz, 5.745-5.825 GHz band.

**802.11ac (VHT20) Test mode**

Frequency (MHz)	Average Power				Limit		Verdict	
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0 dBm	ANT1 dBm		W	dBm	dBm		W
5180	12.34	15.96	0.00	0.057	17.56	22.99	0.20	PASS
5220	12.43	15.76		0.055	17.40			
5240	12.46	15.54		0.053	17.24			
5260	11.85	16.59		0.061	17.85	28.99	0.79	PASS
5300	11.97	16.42		0.060	17.78			
5320	11.76	16.23		0.057	17.56			
5500	11.28	14.66		0.043	16.33			
5600	11.34	14.63		0.043	16.33			
5720	11.12	14.52		0.041	16.13			
5745	15.46	17.58		<b>0.092</b>	<b>19.64</b>			
5785	15.32	17.25		0.087	19.40			
5825	15.40	17.37		0.089	19.49			

**Note:** Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be 22.99dBm for 5.18-5.24 GHz, and 28.99dBm for 5.260-5.320 GHz, 5.500-5.720 GHz, 5.745-5.825 GHz band.

**802.11ac (VHT40) Test mode**



Frequency (MHz)	Average Power				Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor			
	ANT0 dBm	ANT1 dBm		W	dBm	dBm	
5190	13.06	15.50	0.00	0.056	17.48	22.99	0.20
5230	13.09	15.32		0.054	17.32		
5270	12.14	15.87		0.055	17.40		
5310	12.21	15.65		0.053	17.24	28.99	0.79
5510	11.55	14.16		0.040	16.02		
5630	11.46	14.02		0.039	15.91		
5710	11.62	14.24		0.041	16.13		
5755	15.79	17.36		<b>0.092</b>	<b>19.64</b>		
5795	15.70	17.21		0.090	19.54		

**Note:** Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be 22.99dBm for 5.18-5.24 GHz, and 28.99dBm for 5.260-5.320 GHz, 5.500-5.720 GHz, 5.745-5.825 GHz band.

**802.11ac (VHT80) Test mode**

Frequency (MHz)	Average Power (dBm)				Limit (dBm)		Verdict
	Measured		Duty Factor	Total Power with Duty Factor			
	ANT0 dBm	ANT1 dBm		W	dBm	dBm	
5210	12.97	15.68	0.00	0.057	17.56	22.99	0.20
5290	11.84	15.73		0.053	17.24		
5530	11.42	14.55		0.042	16.23		
5610	11.54	14.33		0.041	16.13	28.99	0.79
5690	11.48	14.42		0.042	16.23		
5775	<b>15.32</b>	<b>17.82</b>		<b>0.095</b>	<b>19.78</b>		

**Note:** Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be 22.99dBm for 5.18-5.24 GHz, and 28.99dBm for 5.260-5.320 GHz, 5.500-5.720 GHz, 5.745-5.825 GHz band.

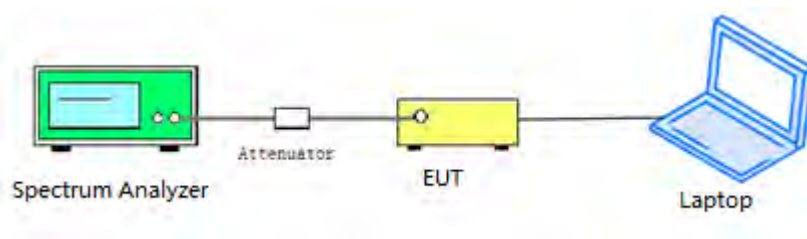
## 2.4. Emission Bandwidth

### 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 emission 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 the 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 5.725-5.85 GHz 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 the 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

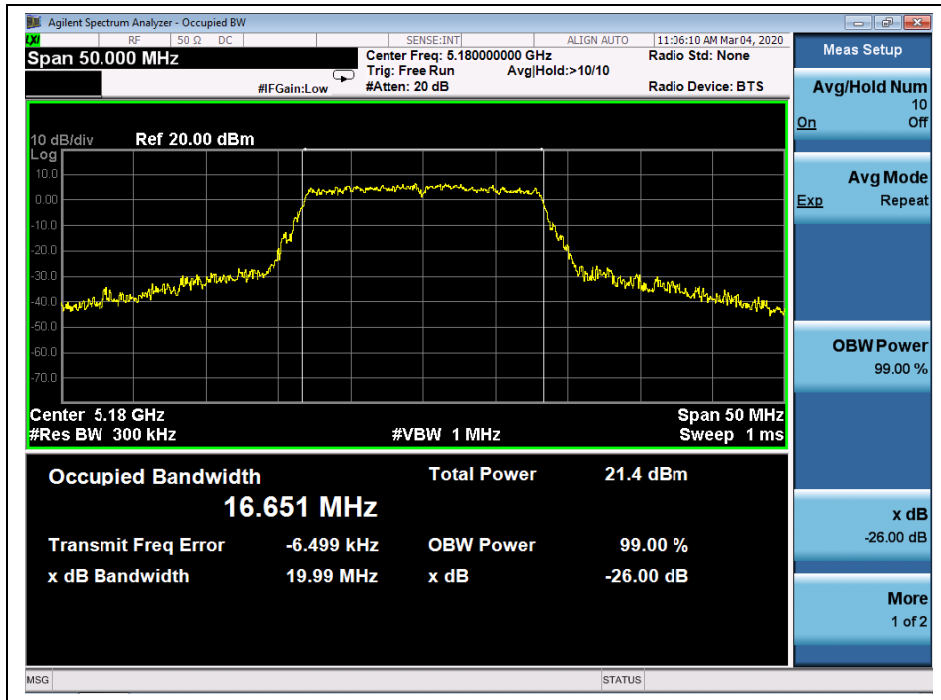
##### 802.11a Test mode

###### A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	19.99
44	5220	19.60
48	5240	20.14
52	5260	20.08
60	5300	20.33
64	5320	19.66
100	5500	19.98
120	5600	20.21
144	5720	20.07
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
144	5720	17.71
149	5745	16.49
157	5785	17.73
165	5825	17.65



B. Test Plots

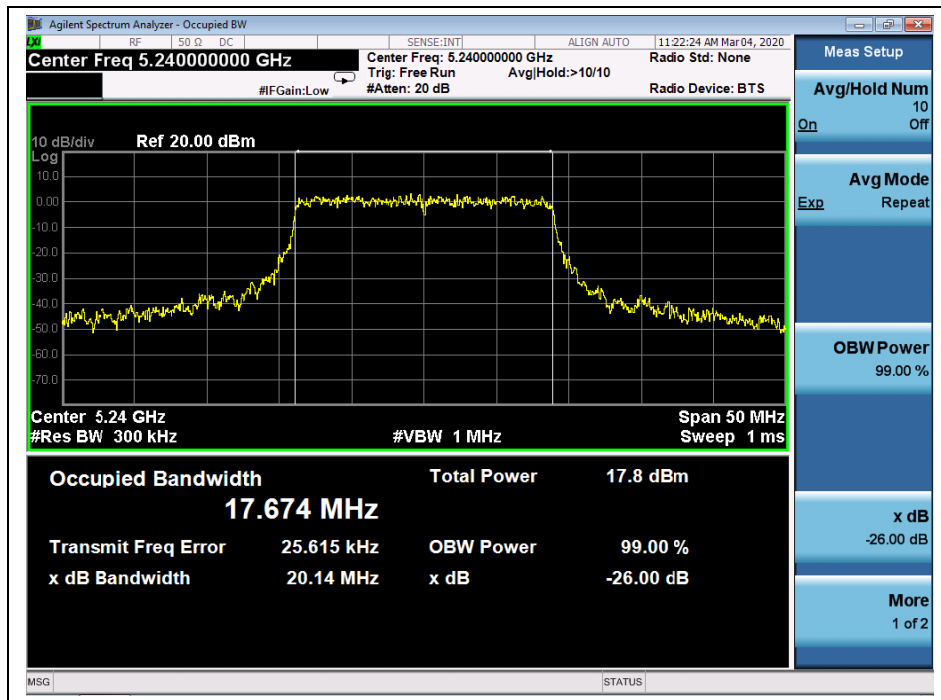


(Channel 36,5180MHz, 802.11a,)

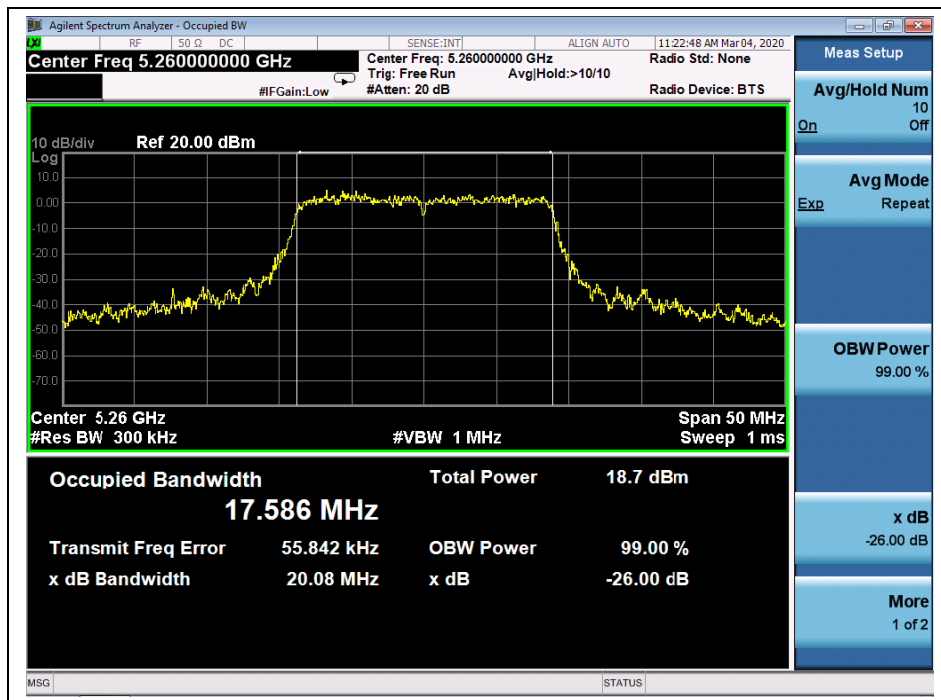


(Channel 44, 5220 MHz, 802.11a,)

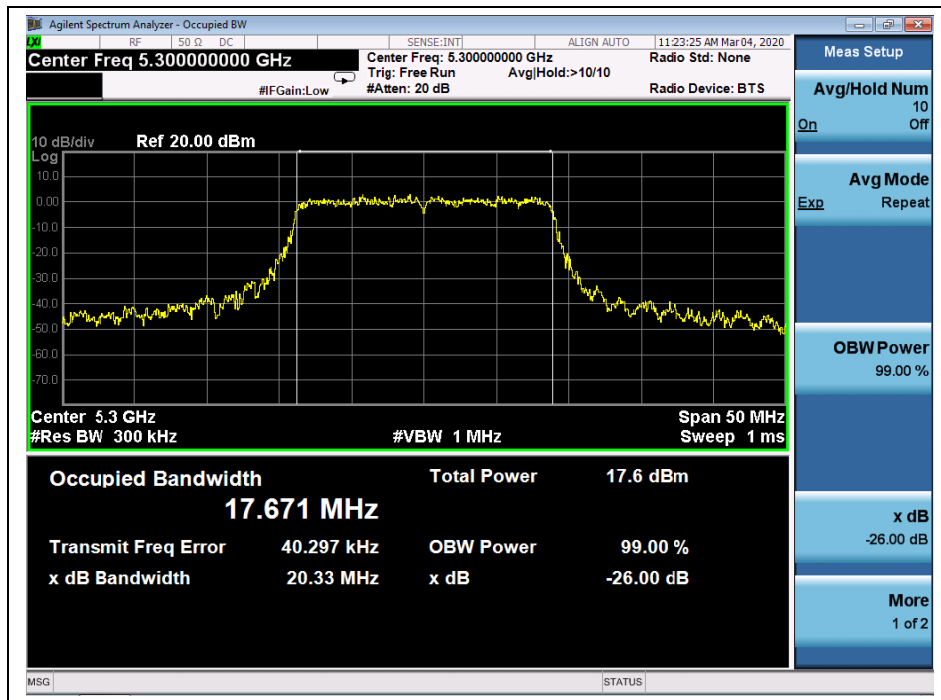




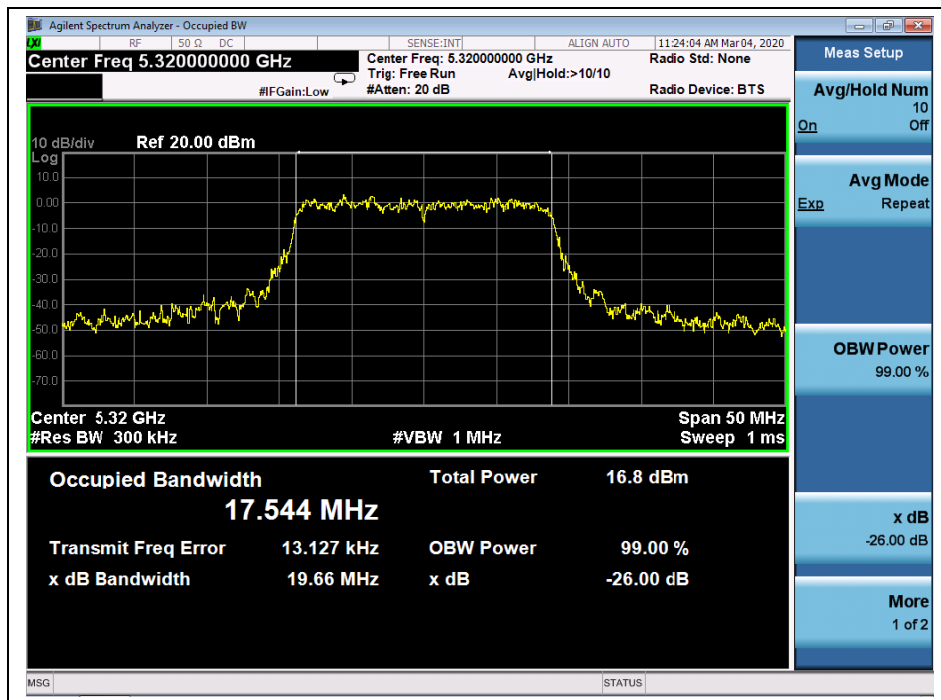
(Channel 48, 5240MHz, 802.11a,)



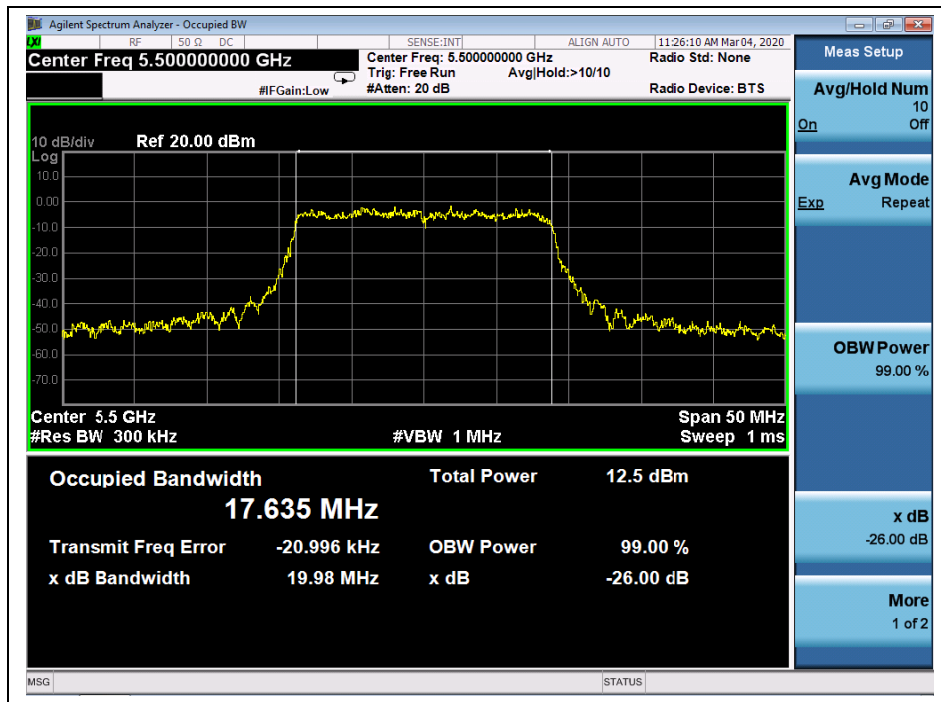
(Channel 52, 5260MHz, 802.11a,)



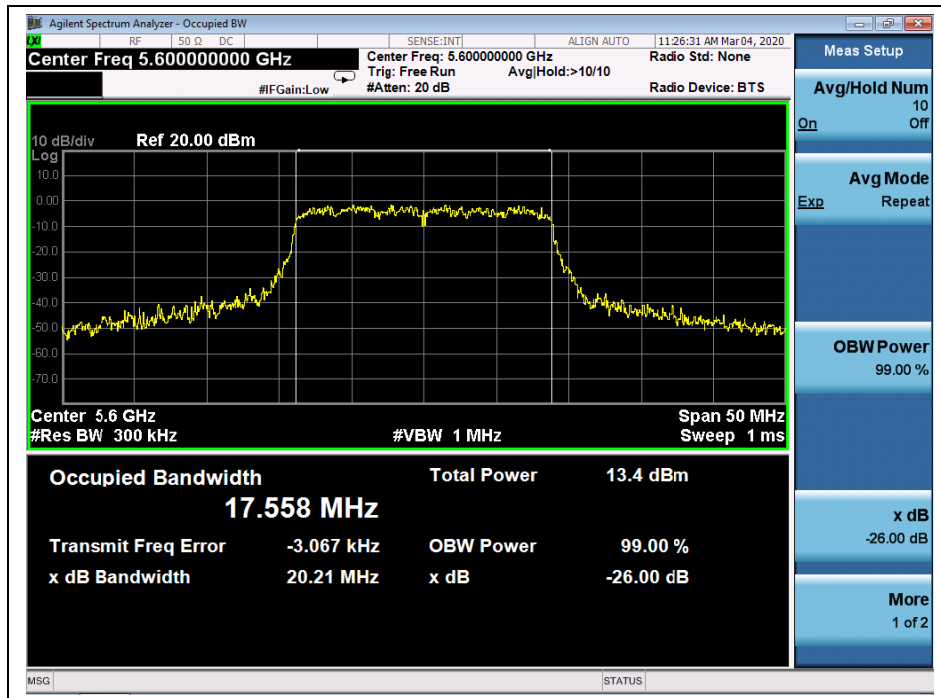
(Channel 60, 5300 MHz, 802.11a,)



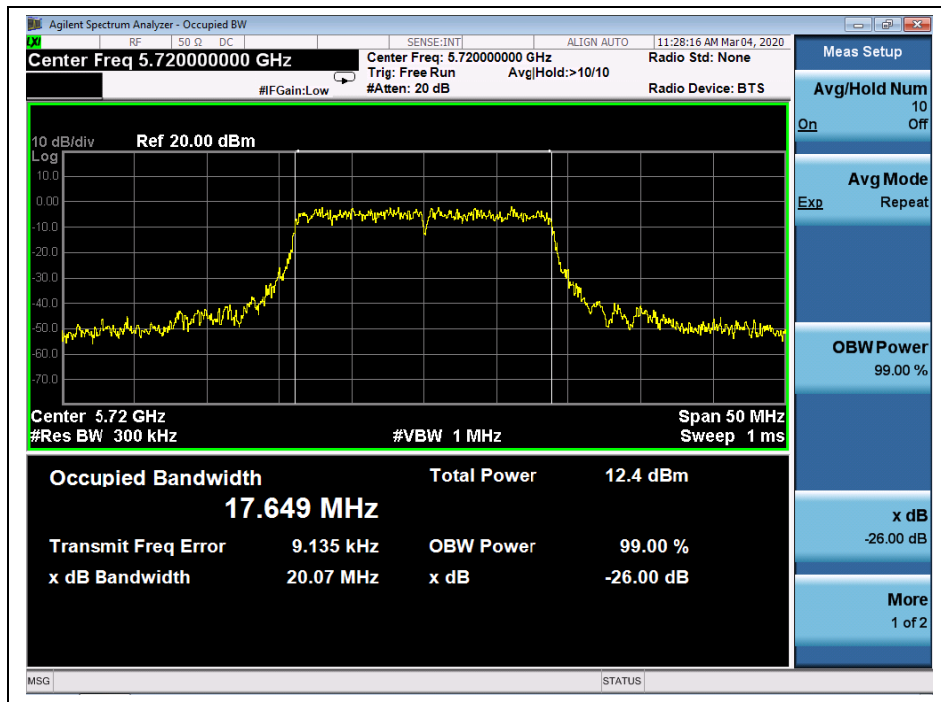
(Channel 64, 5320MHz, 802.11a,)



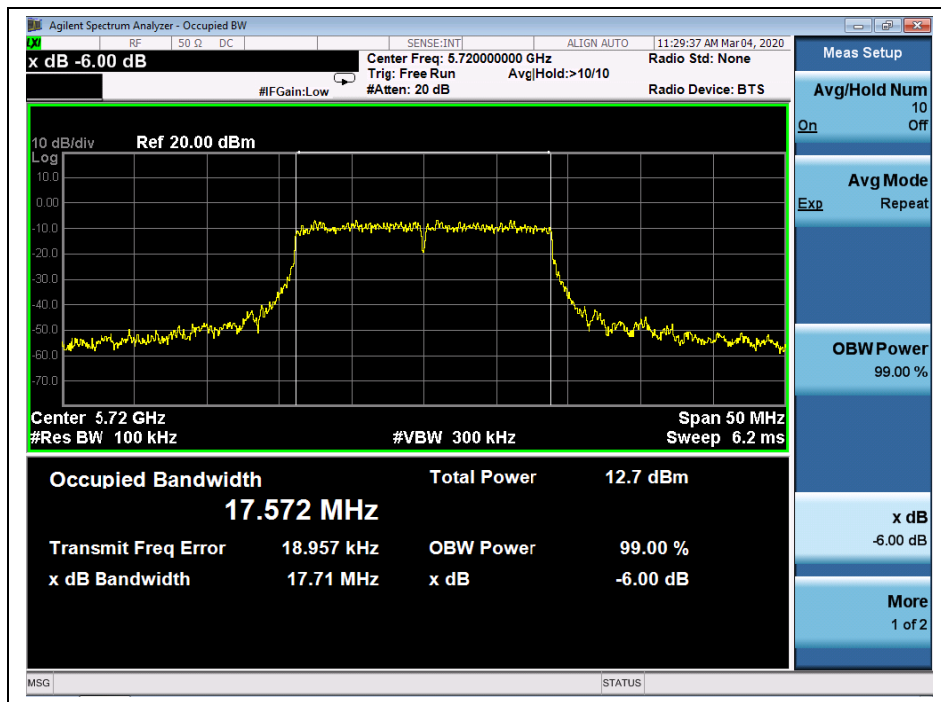
(Channel 100,5500MHz, 802.11a,)



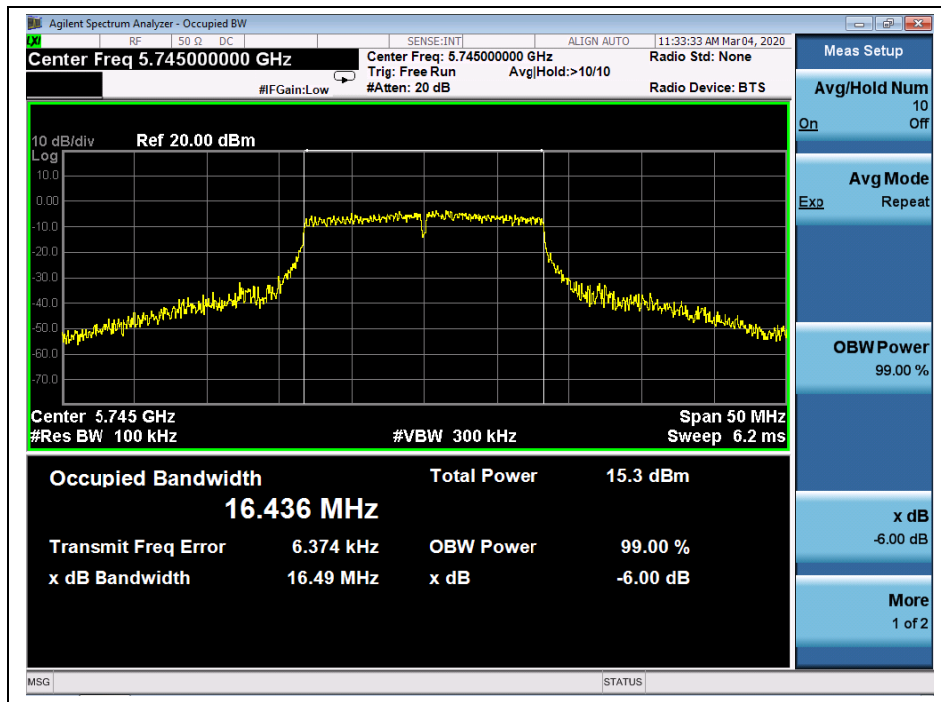
(Channel 120, 5600 MHz, 802.11a,)



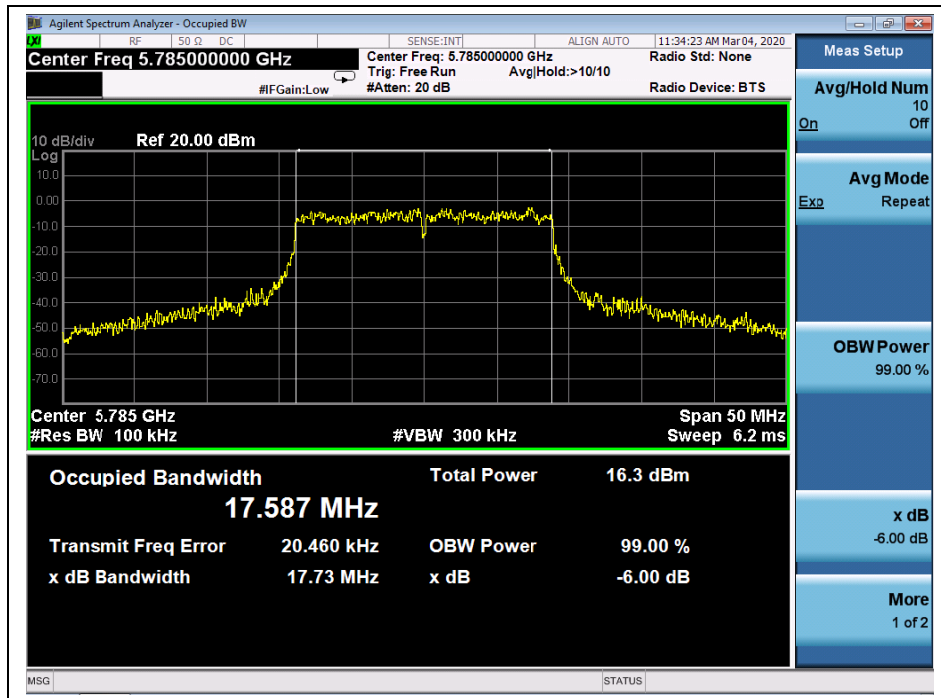
(Channel 144, 5720MHz, 802.11a,)



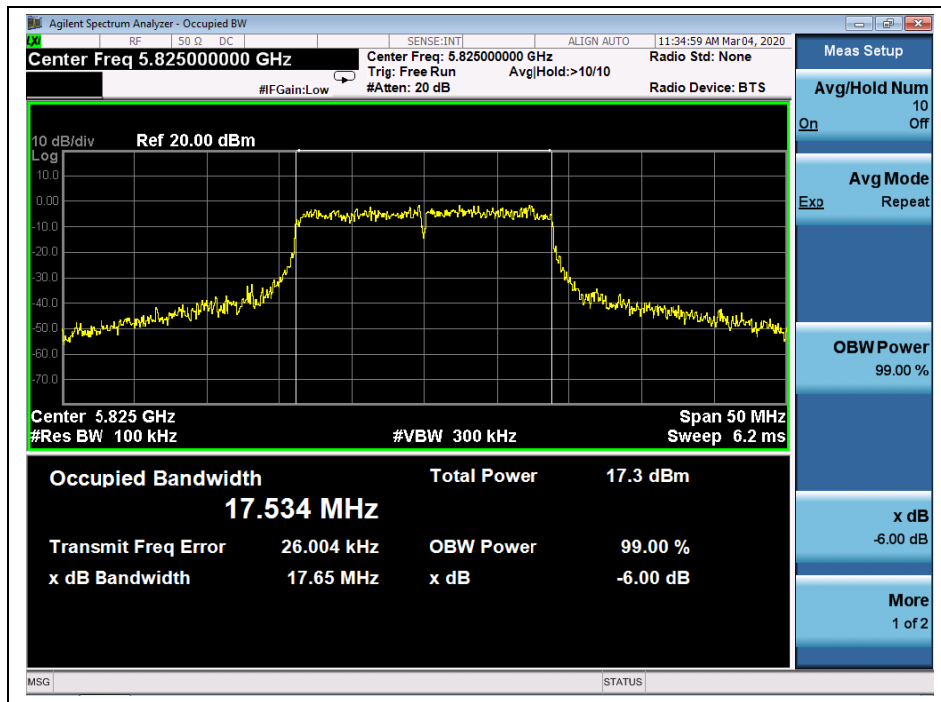
(Channel 144, 5720MHz, 802.11a,)



(Channel 149,5745MHz, 802.11a)



(Channel 157,5785MHz, 802.11a)



(Channel 165,5825MHz, 802.11a)

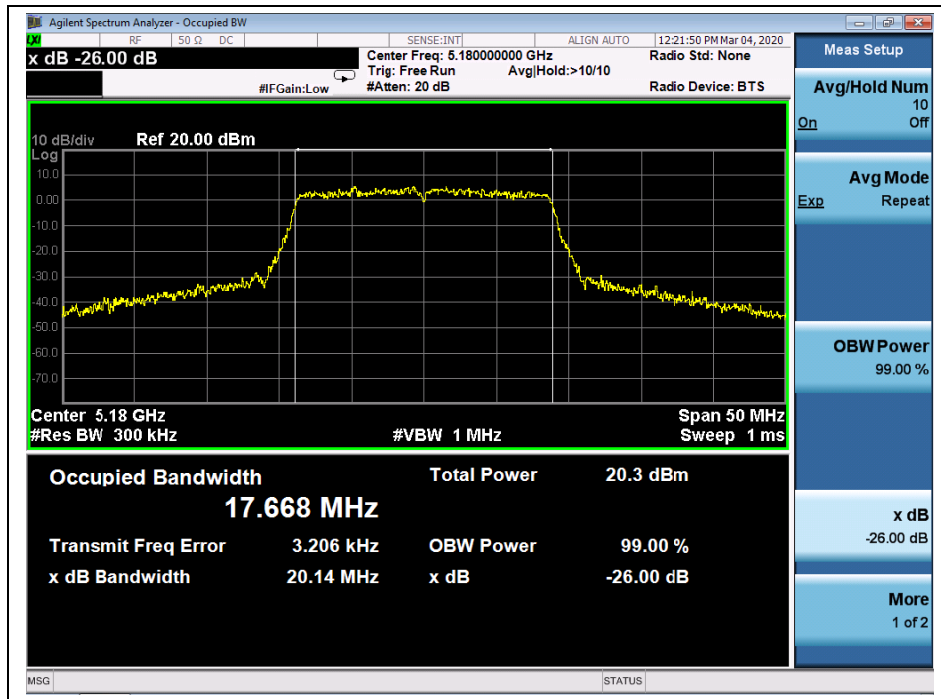


802.11n (HT20) Test mode

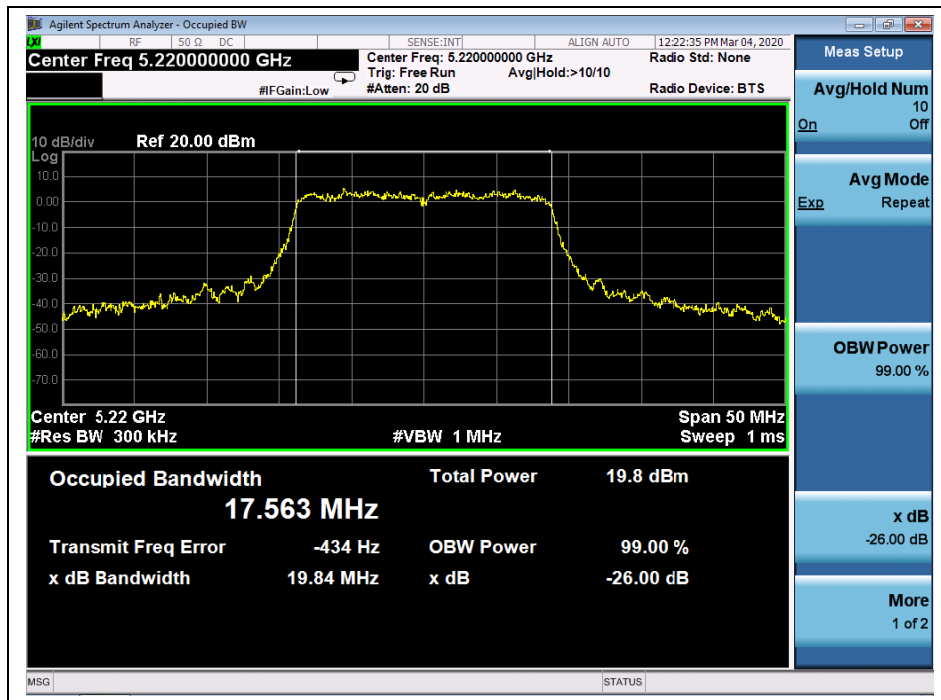
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.14
44	5220	19.84
48	5240	20.01
52	5260	20.22
60	5300	19.88
64	5320	20.64
100	5500	19.59
120	5600	20.20
144	5720	20.08
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
144	5720	17.64
149	5745	17.75
157	5785	17.71
165	5825	17.73

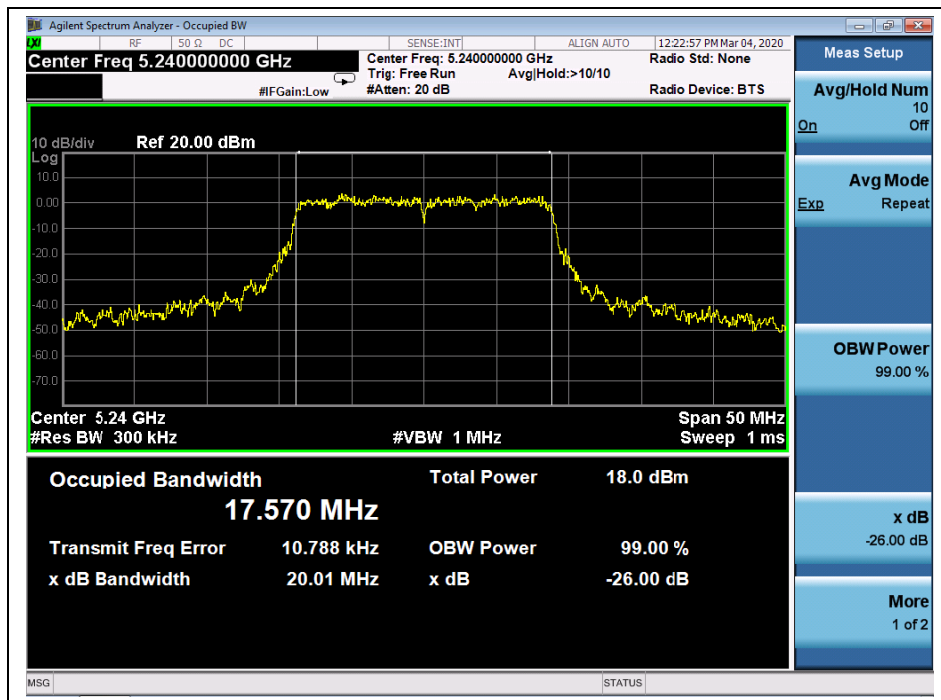
B. Test Plots



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

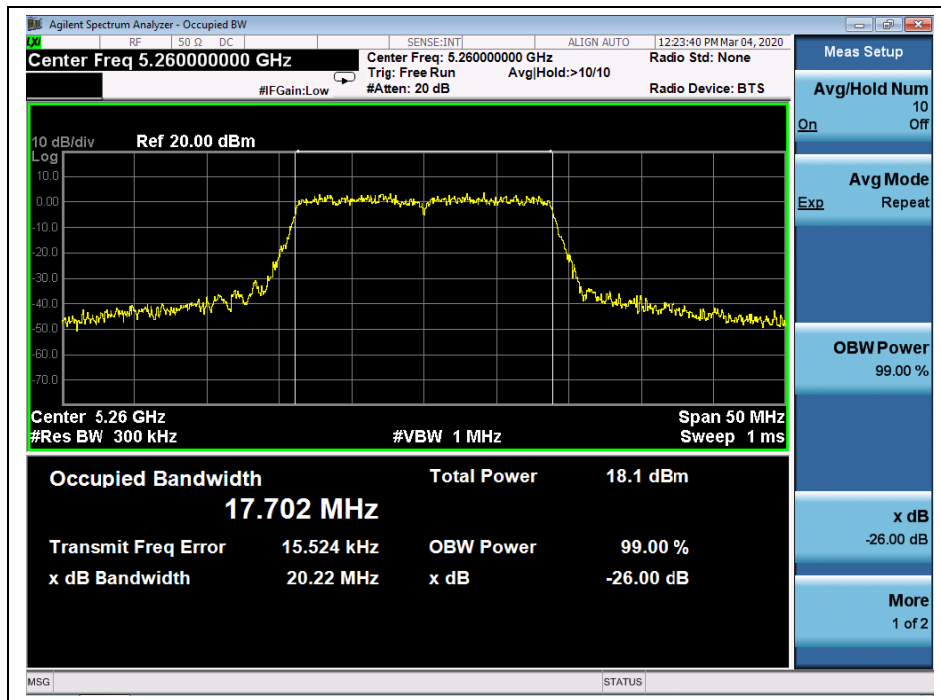


(Channel 44, 5220 MHz, 802.11n (HT20))

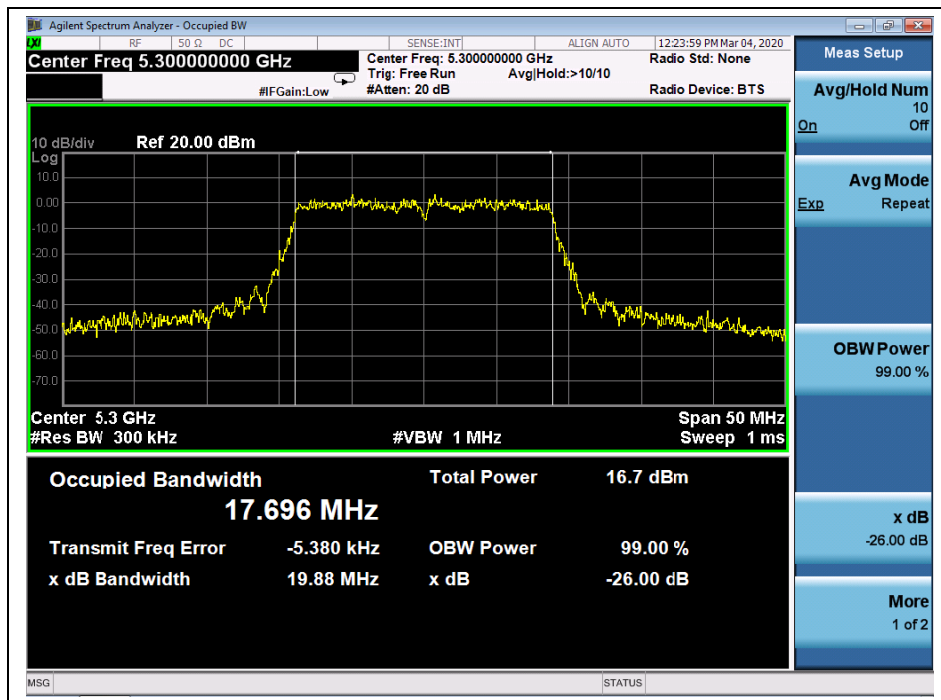


(Channel 48, 5240MHz, 802.11n (HT20))

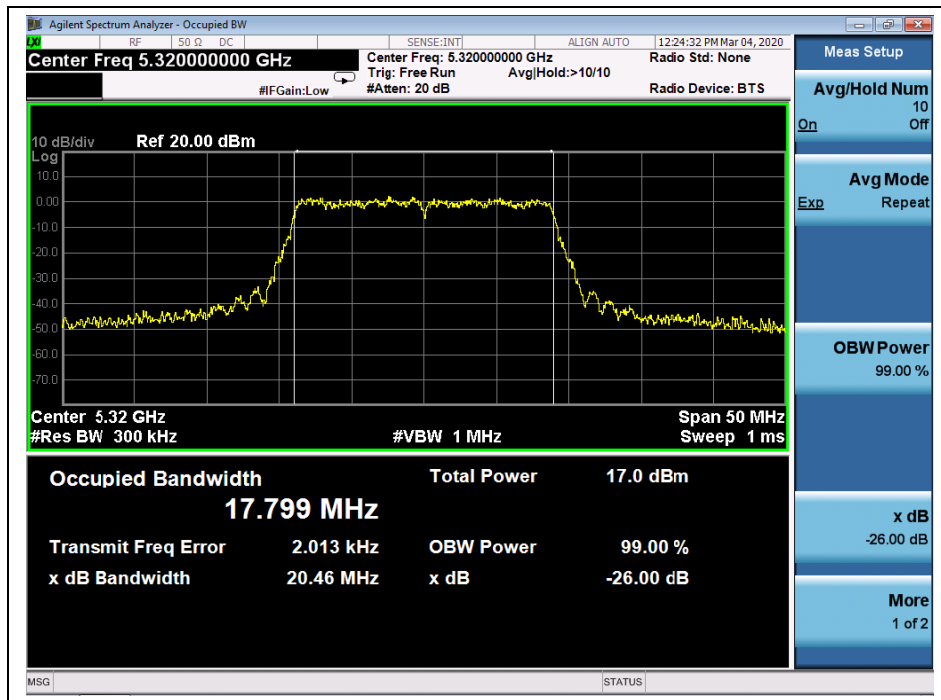




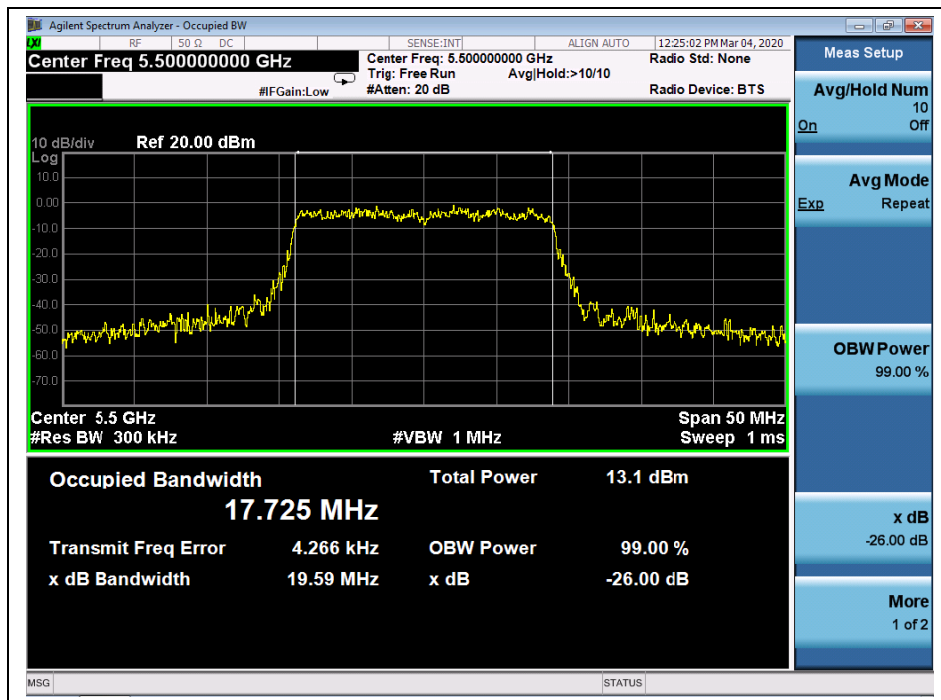
(Channel 52,5260MHz, 802.11n (HT20))



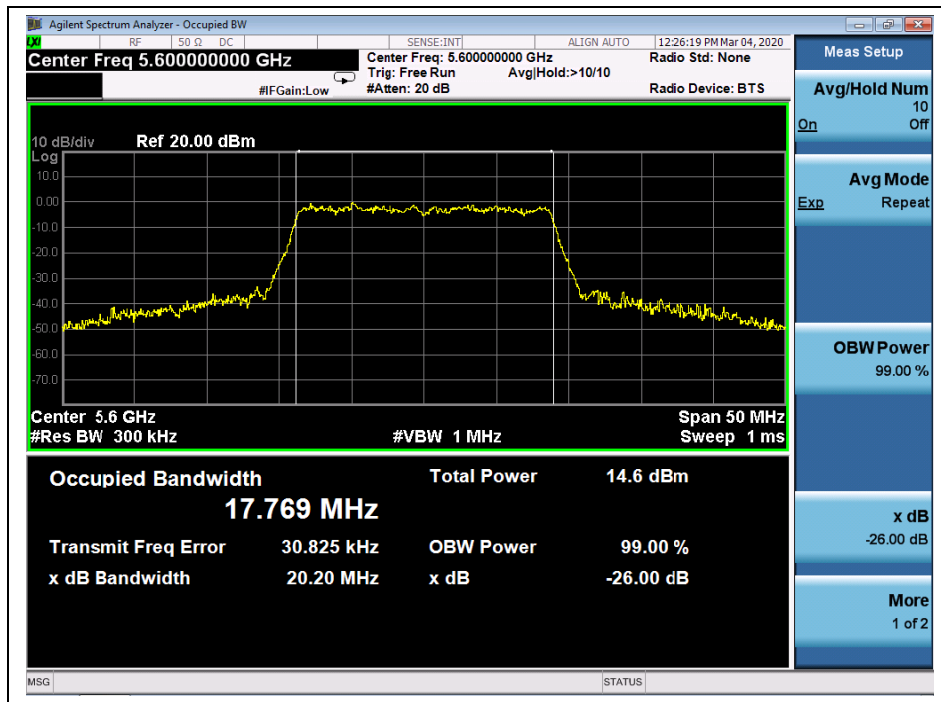
(Channel 60, 5300 MHz, 802.11n (HT20))



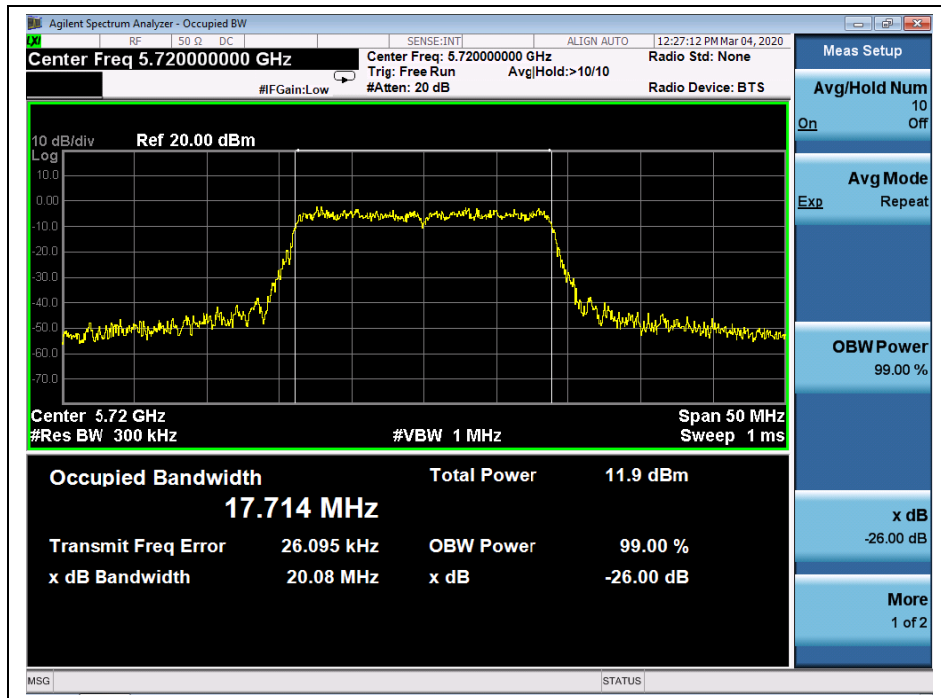
(Channel 64, 5320MHz, 802.11n (HT20))



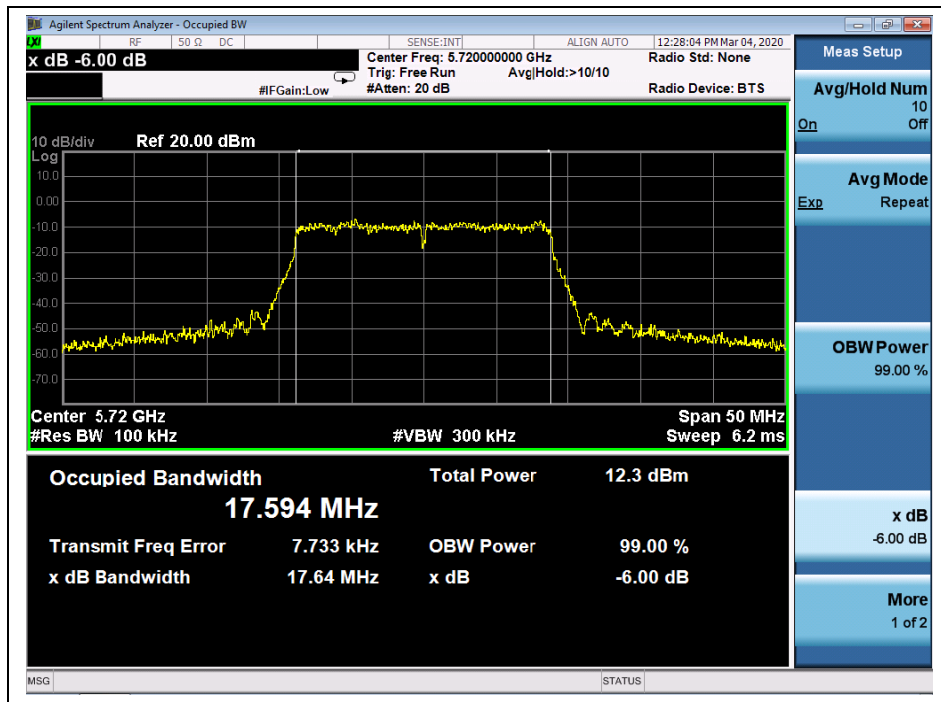
(Channel 100,5500MHz, 802.11n (HT20))



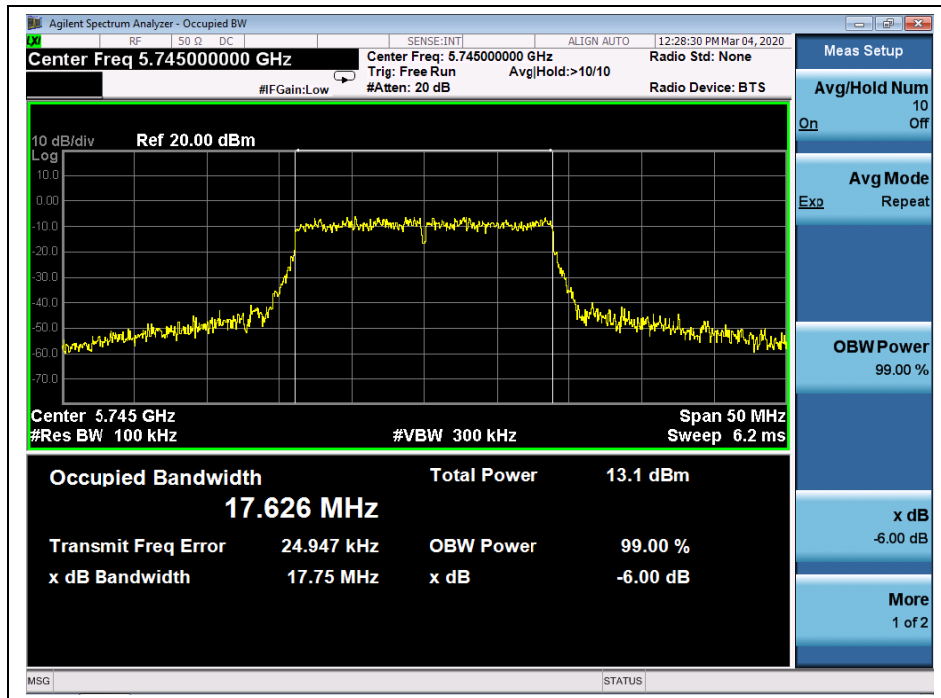
(Channel 120, 5600 MHz, 802.11n (HT20))



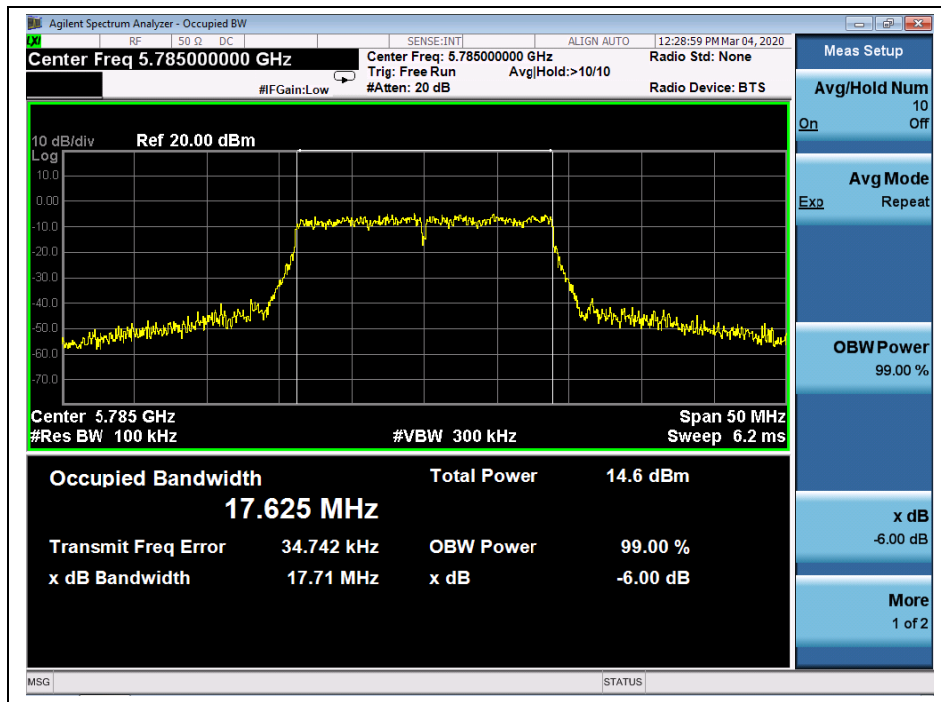
(Channel 144, 5720MHz, 802.11n (HT20))



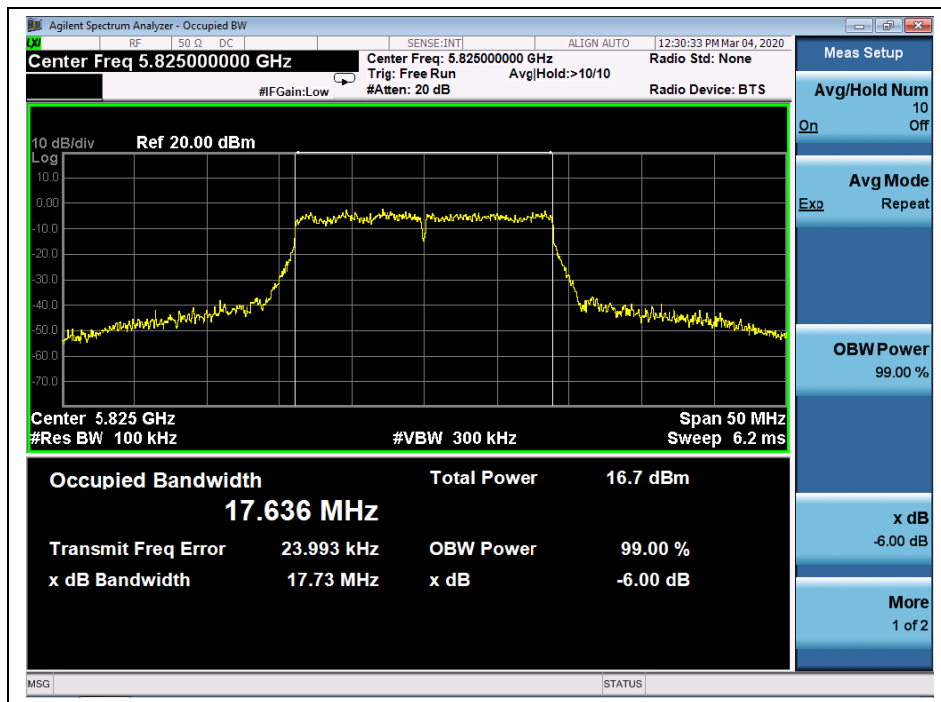
(Channel 144, 5720MHz, 802.11 n (HT20))



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



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



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

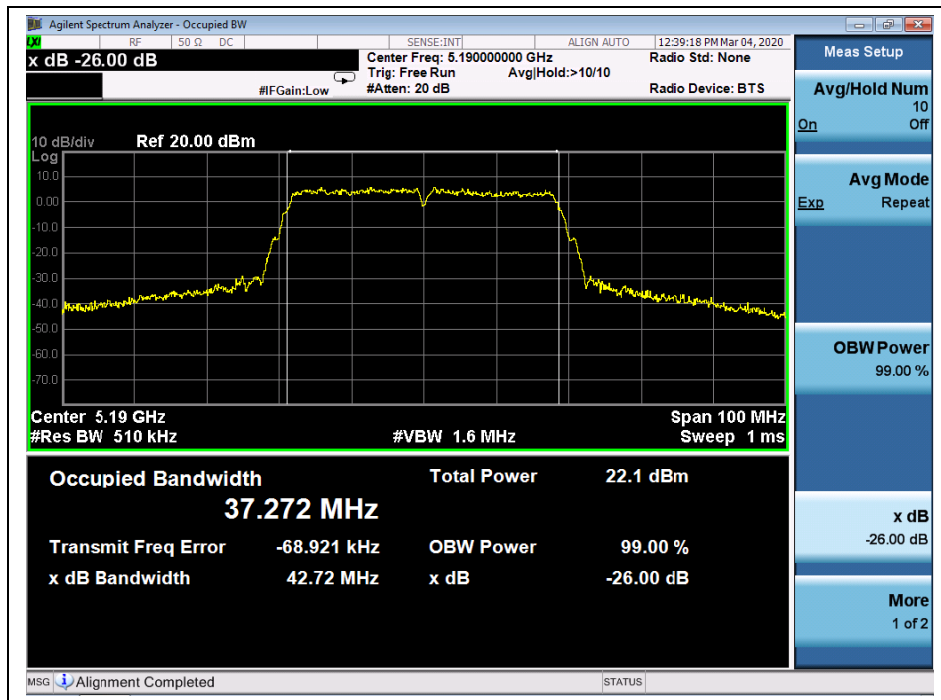


802.11n (HT40) Test mode

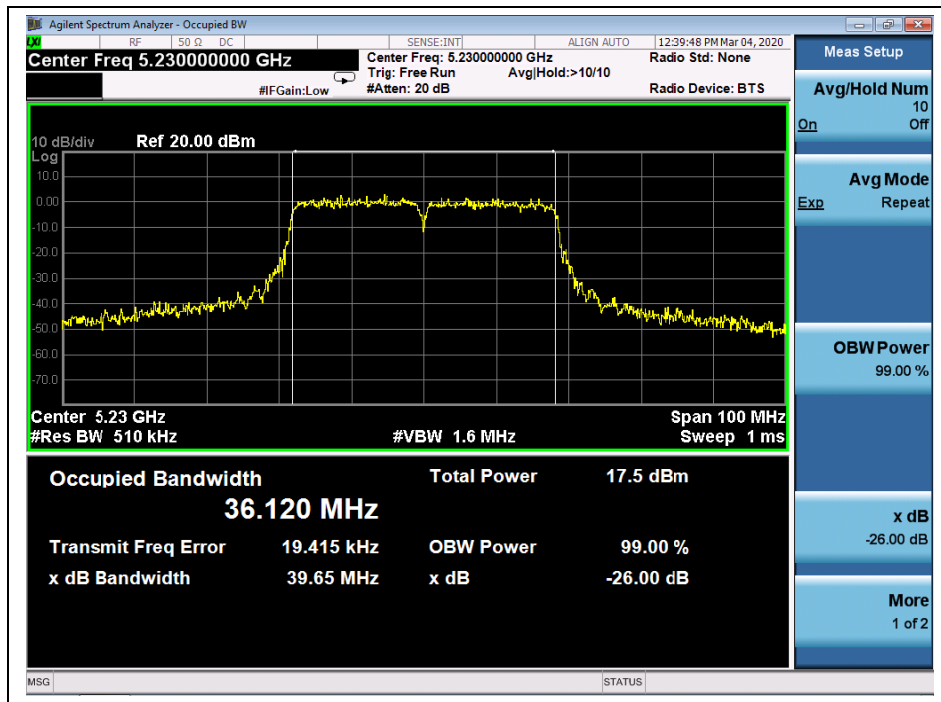
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	42.72
46	5230	39.65
54	5270	40.47
62	5310	39.74
102	5510	39.93
126	5630	39.82
142	5710	39.90
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
142	5710	36.44
151	5755	36.46
159	5795	36.13

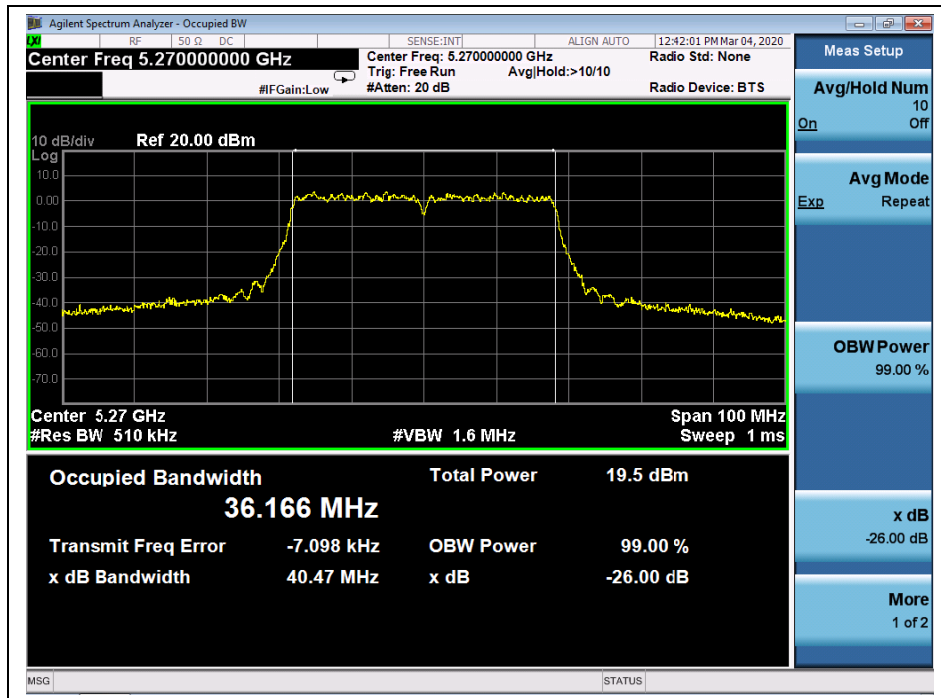
B. Test Plots



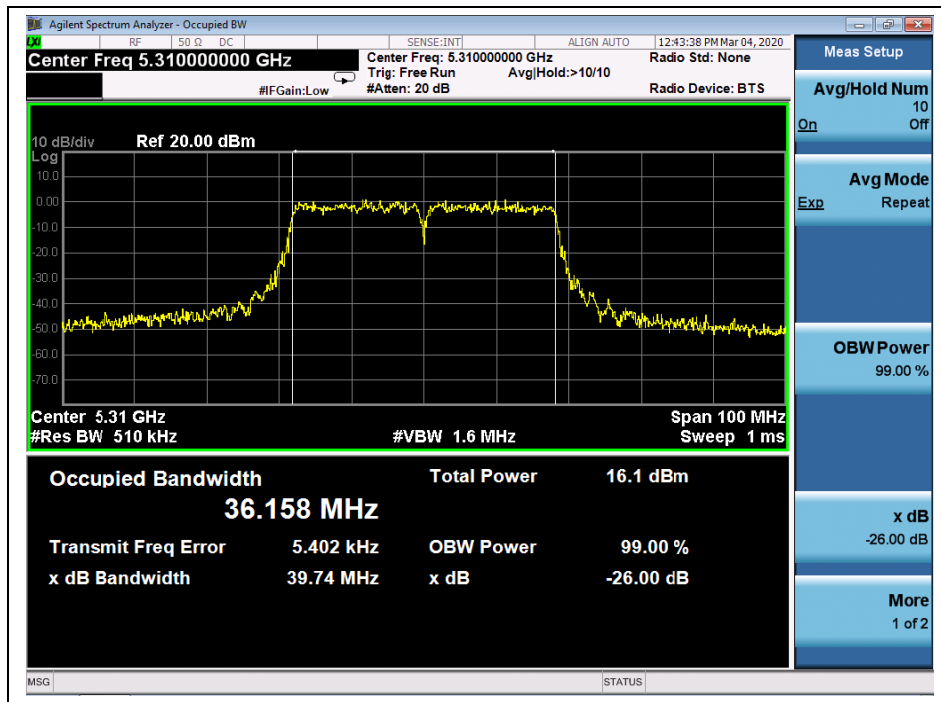
(Channel 38,5190MHz, 802.11n(HT40))



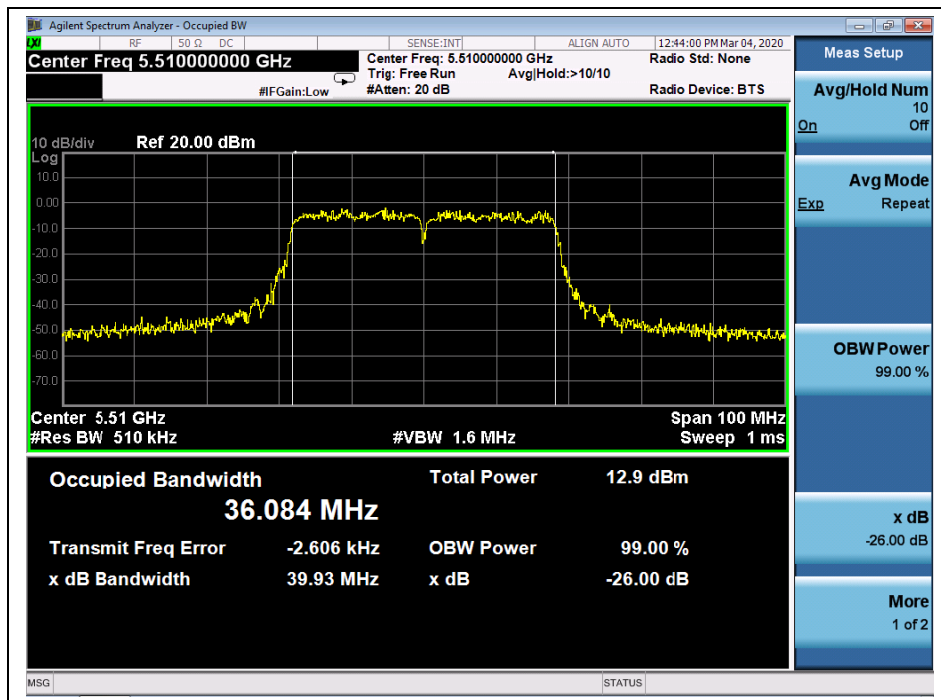
(Channel 46, 5230 MHz, 802.11n(HT40))



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

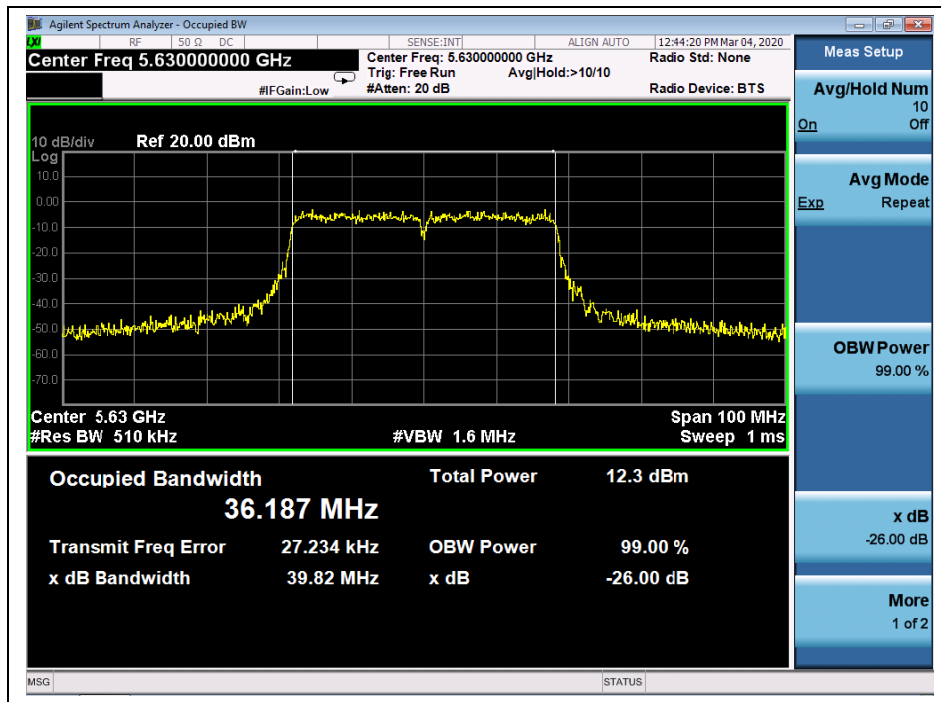


(Channel 62, 5310 MHz, 802.11n(HT40))

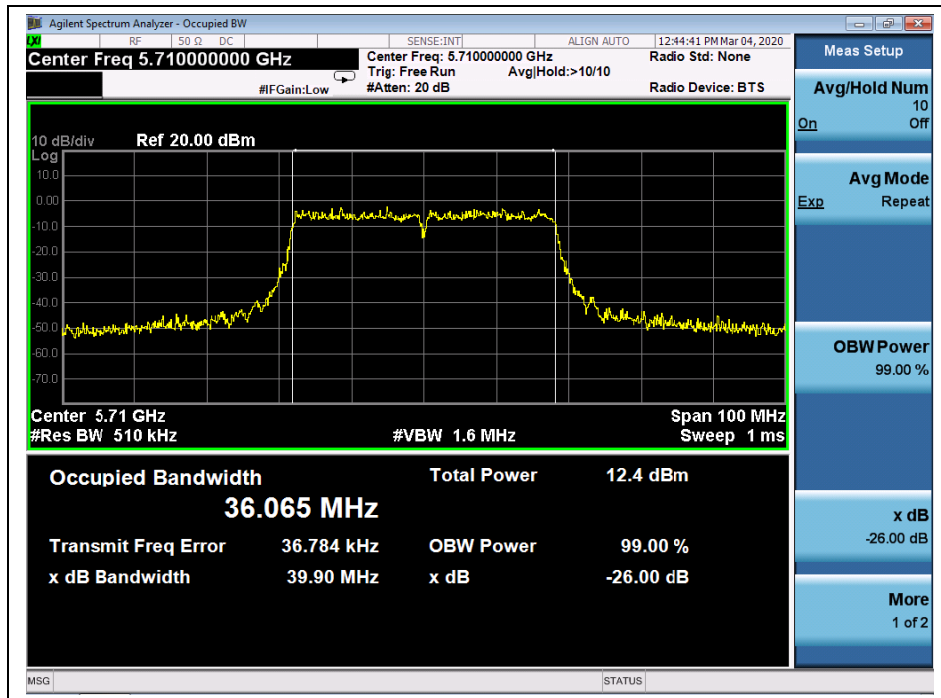


(Channel 102,5510MHz, 802.11n(HT40))

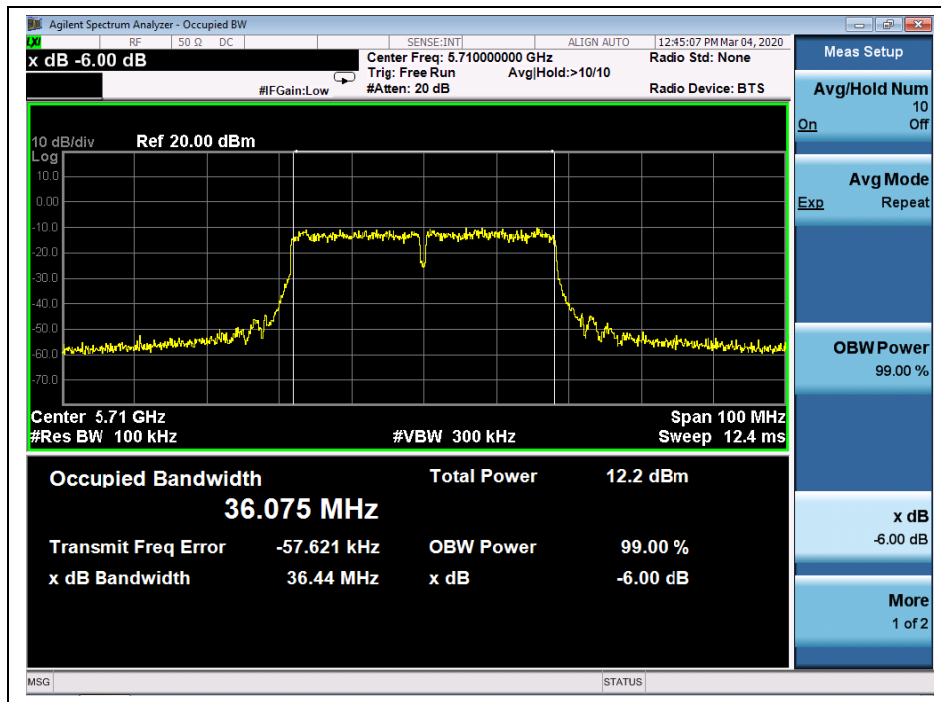




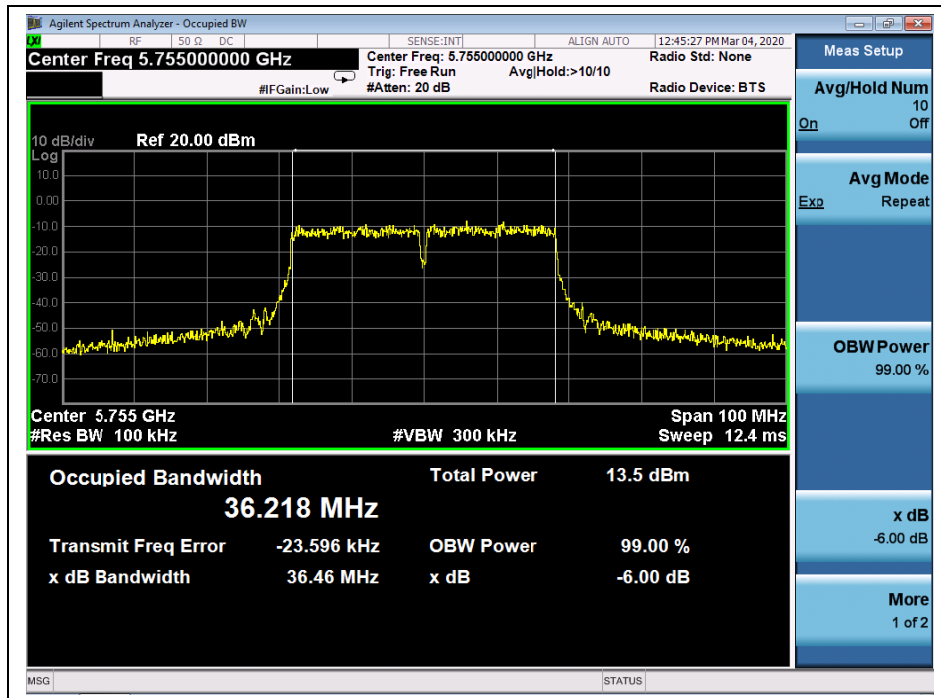
(Channel 126, 5630 MHz, 802.11n(HT40))



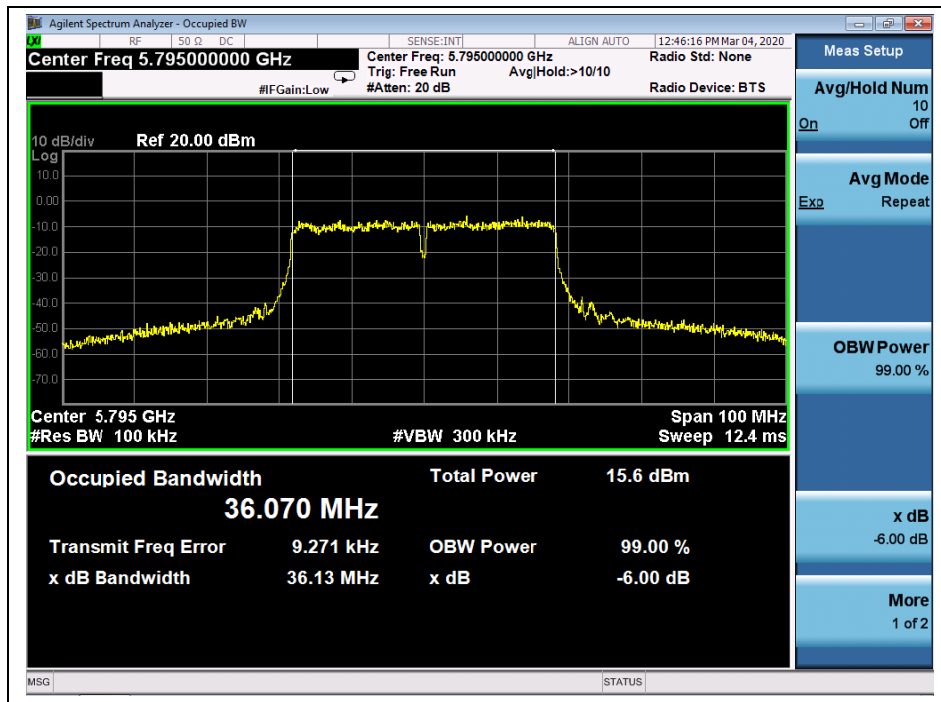
(Channel 142, 5710 MHz, 802.11n(HT40))



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



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



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

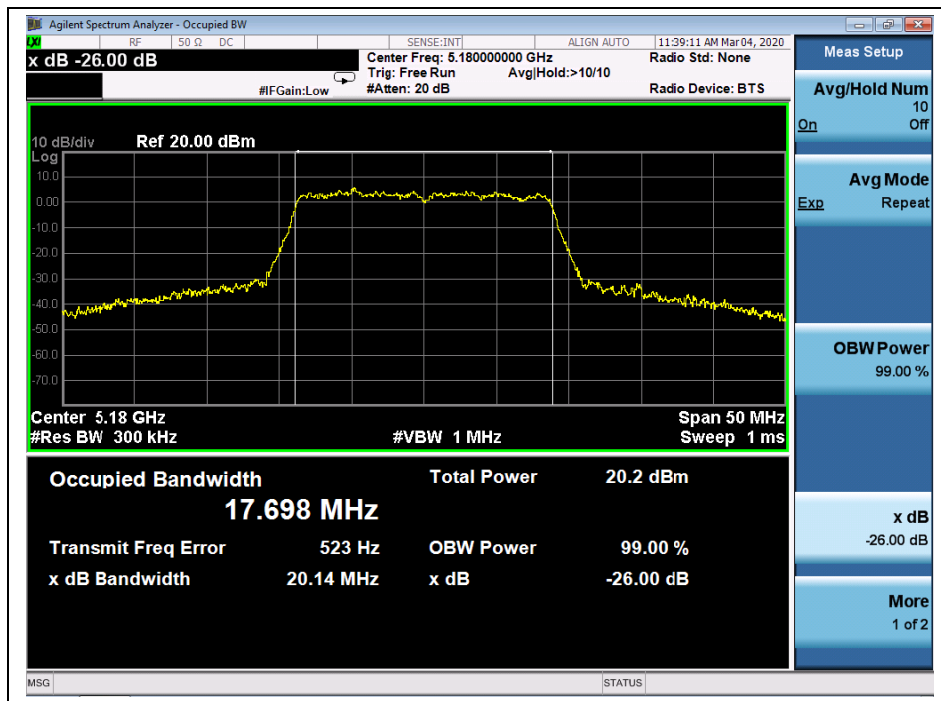


802.11ac (VHT20) Test mode

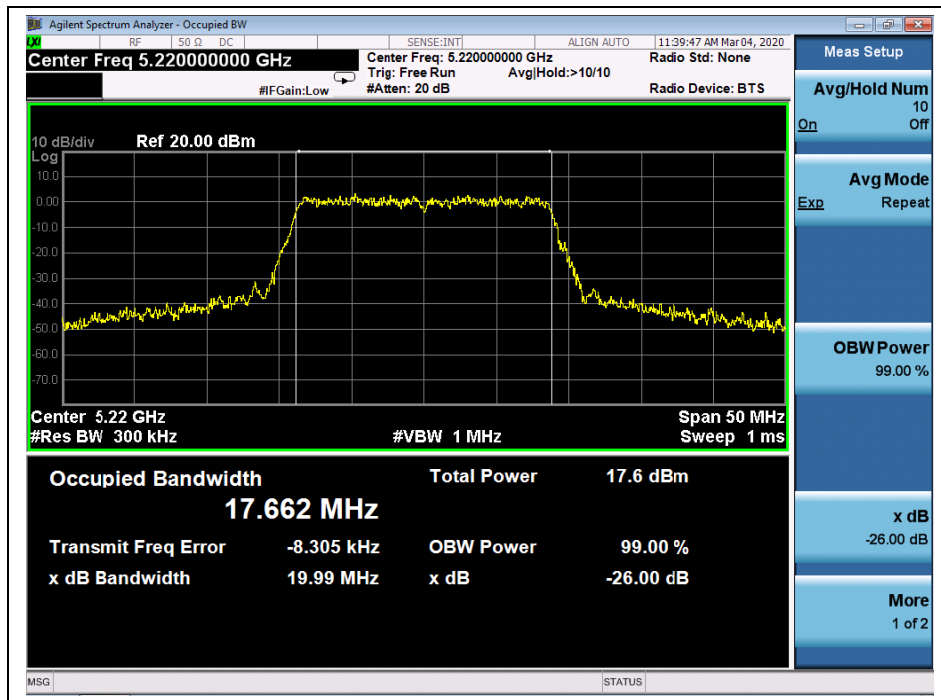
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.14
44	5220	19.99
48	5240	20.02
52	5260	19.90
60	5300	19.70
64	5320	20.03
100	5500	20.22
120	5600	20.09
144	5720	20.12
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
144	5720	17.73
149	5745	17.77
157	5785	17.78
165	5825	17.62

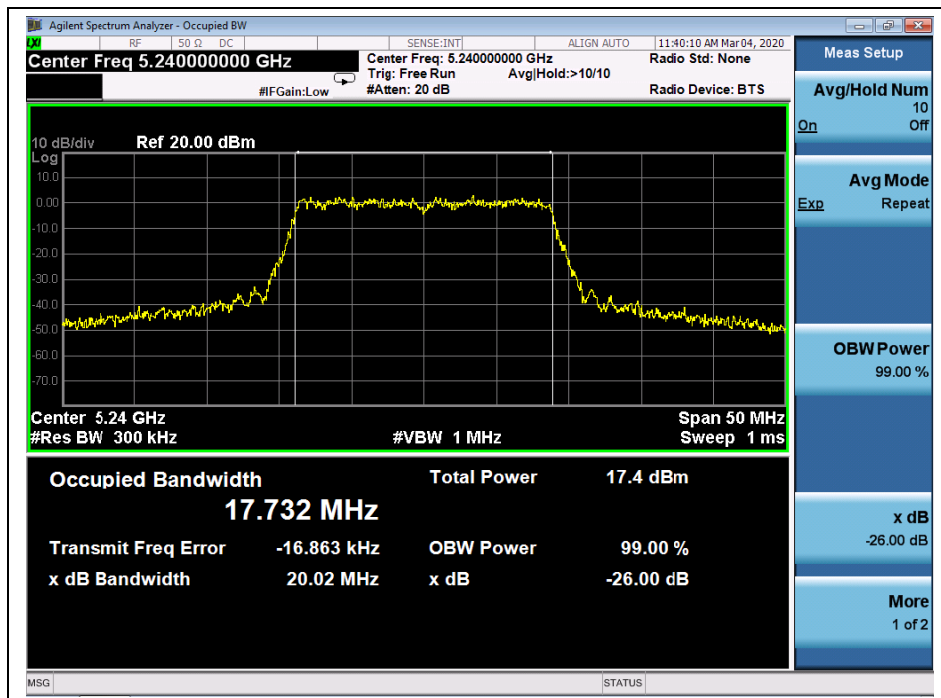
B. Test Plots



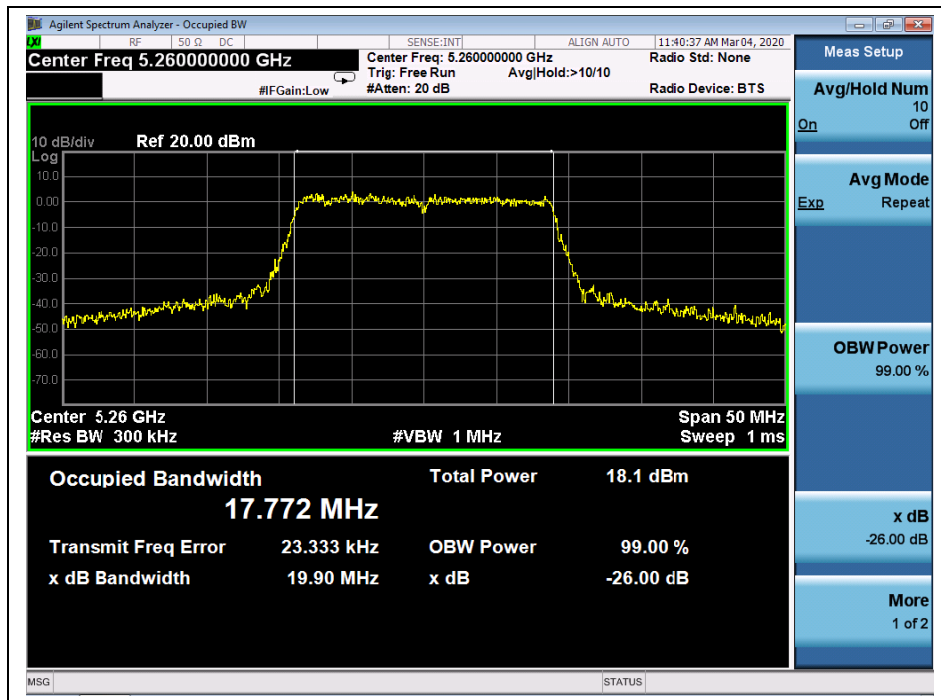
(Channel 36,5180MHz, 802.11ac (VHT20))



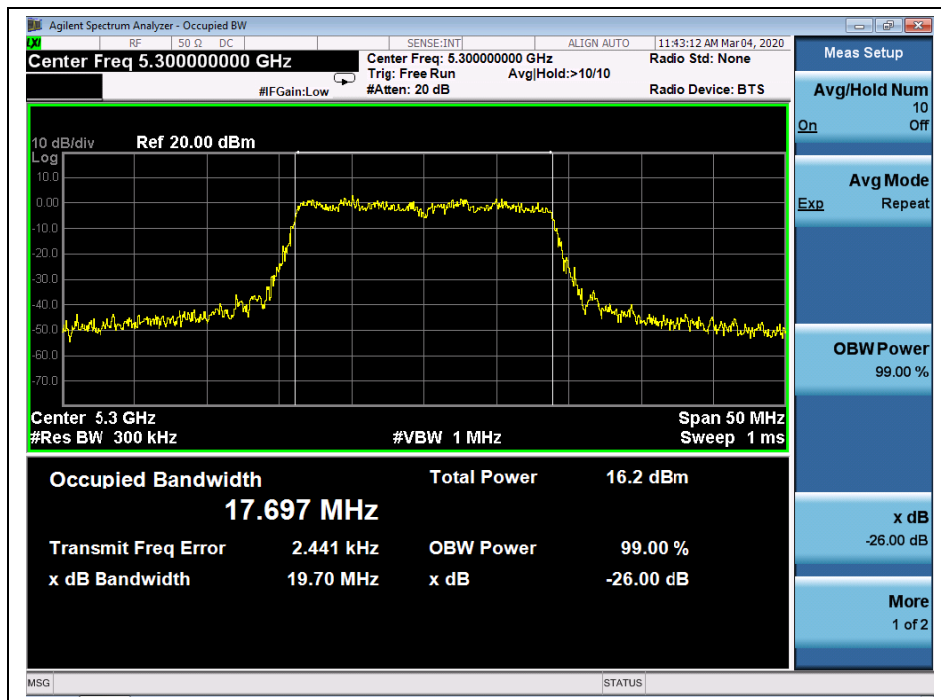
(Channel 44, 5220 MHz, 802.11ac (VHT20))



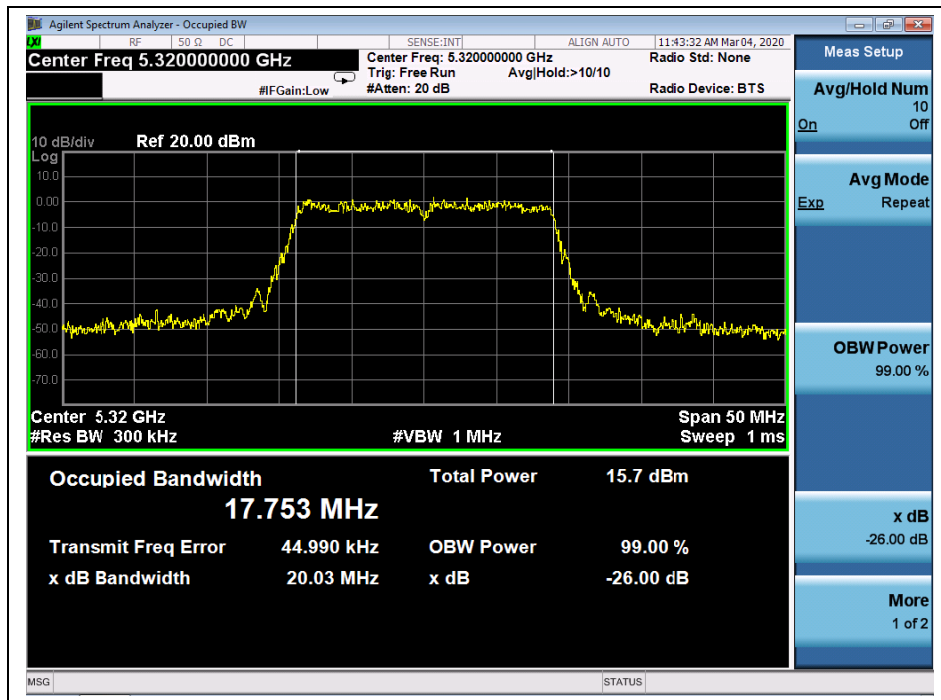
(Channel 48, 5240MHz, 802.11ac (VHT20))



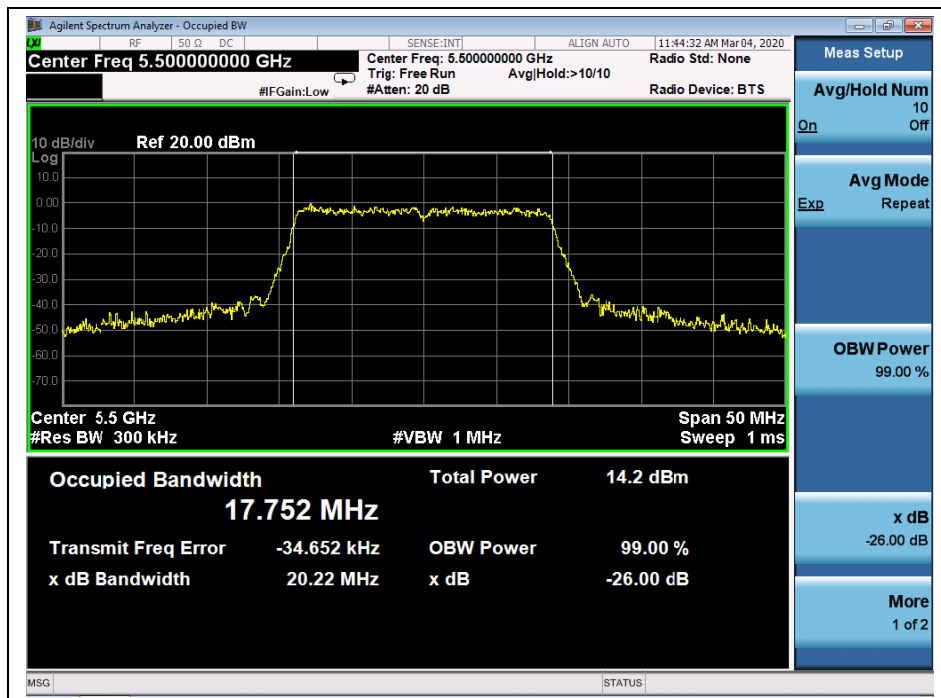
(Channel 52, 5260MHz, 802.11ac (VHT20))



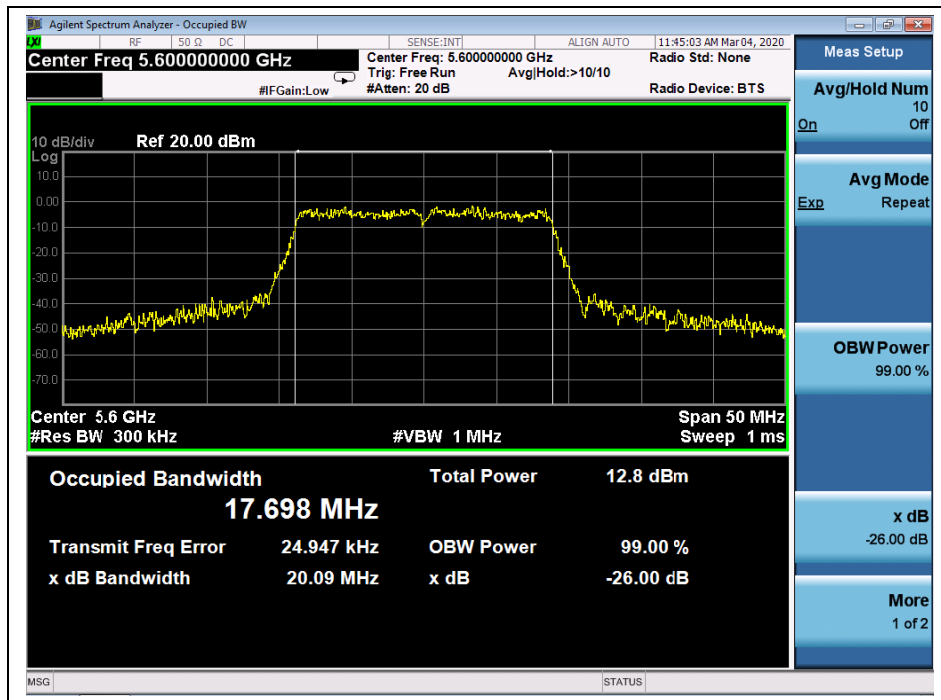
(Channel 60, 5300 MHz, 802.11ac (VHT20))



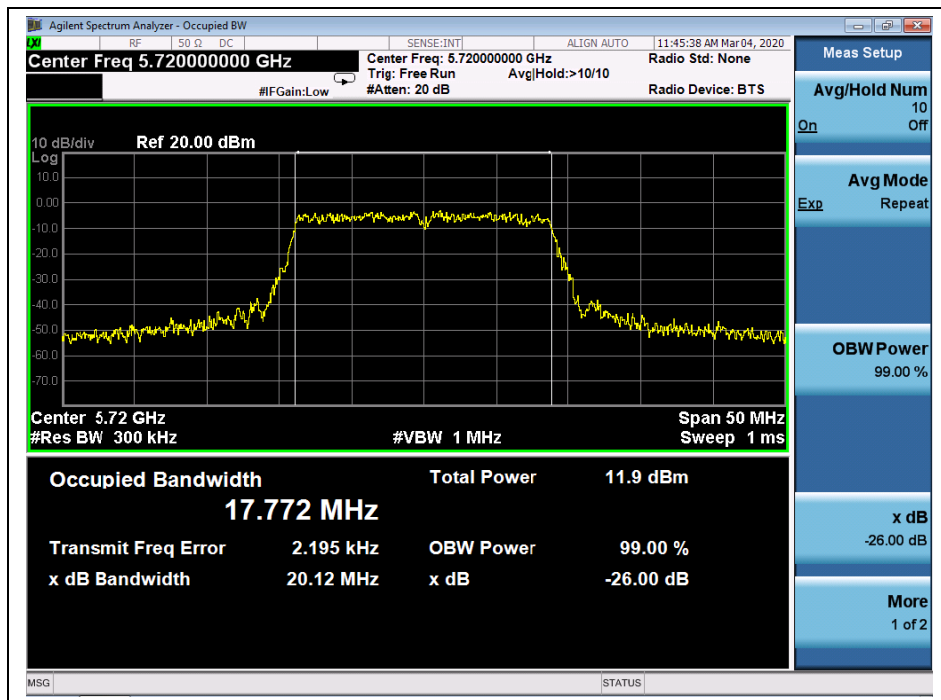
(Channel 64, 5320MHz, 802.11ac (VHT20))



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

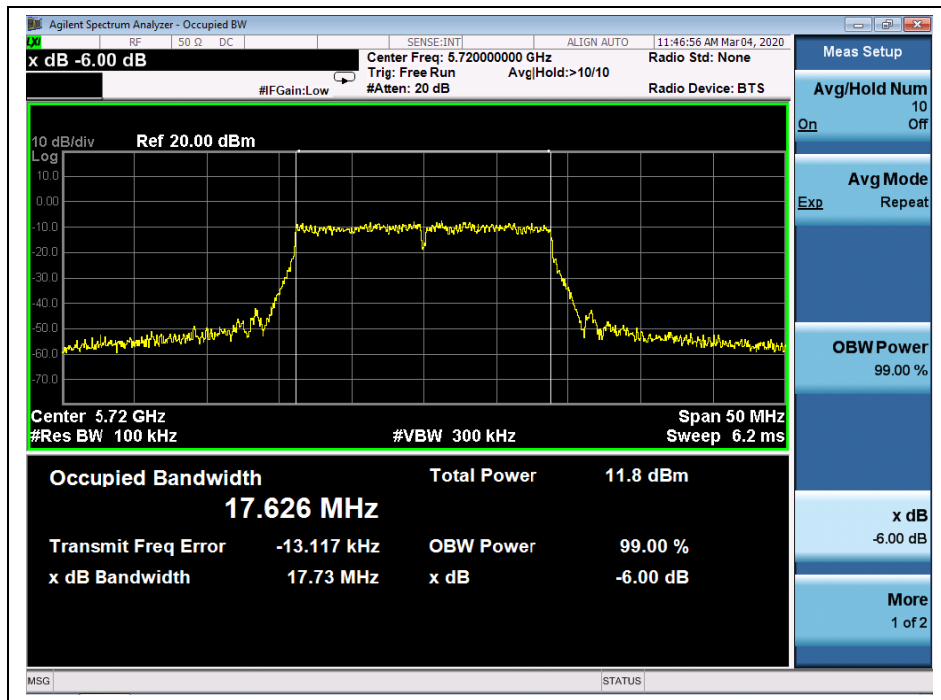


(Channel 120, 5600 MHz, 802.11ac (VHT20))

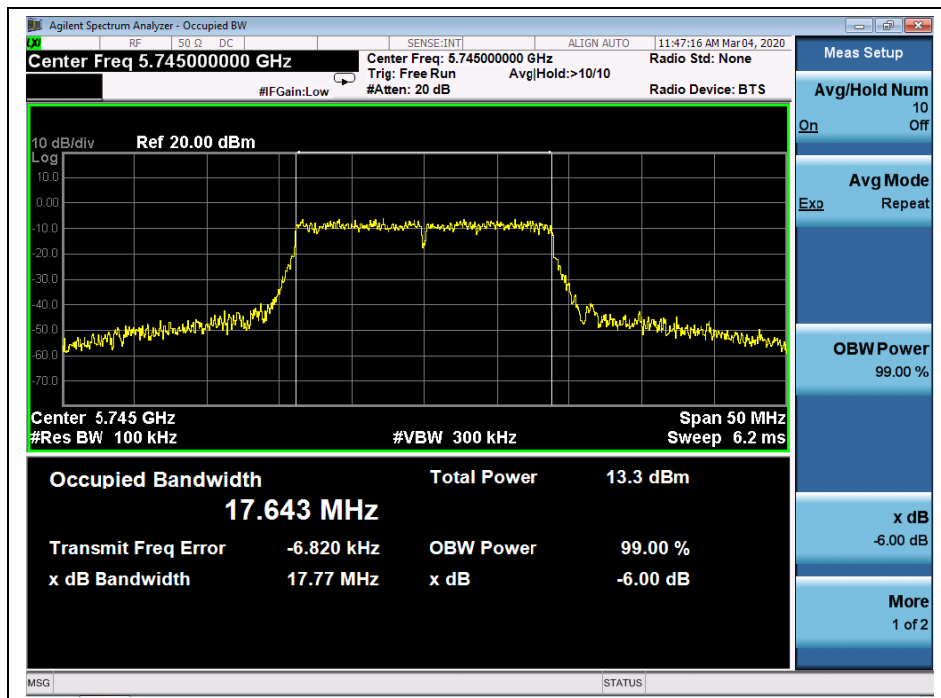


(Channel 144, 5720MHz, 802.11ac (VHT20))

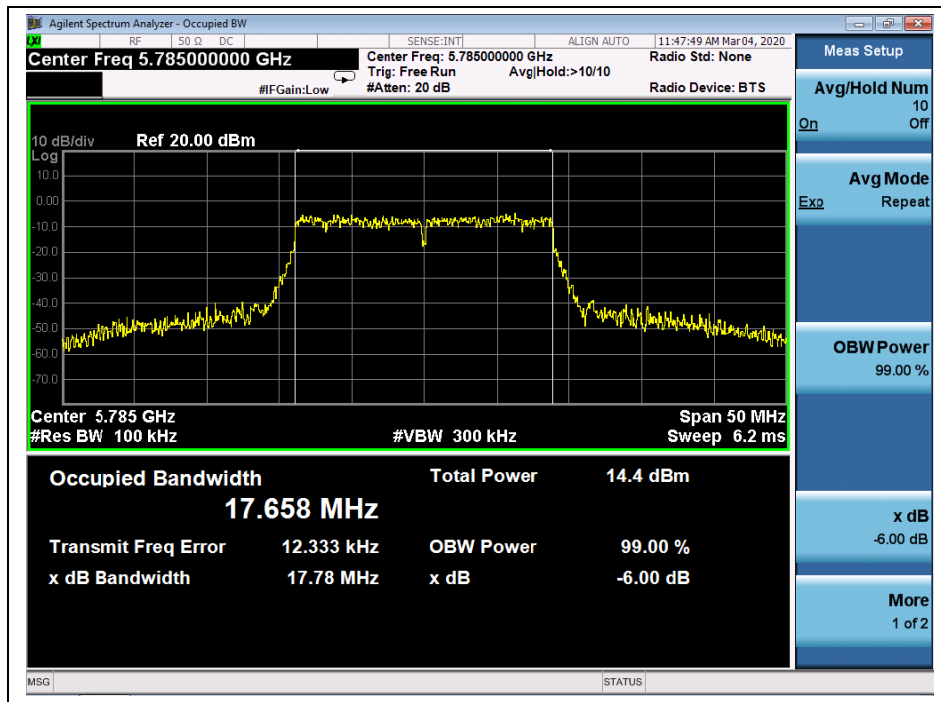




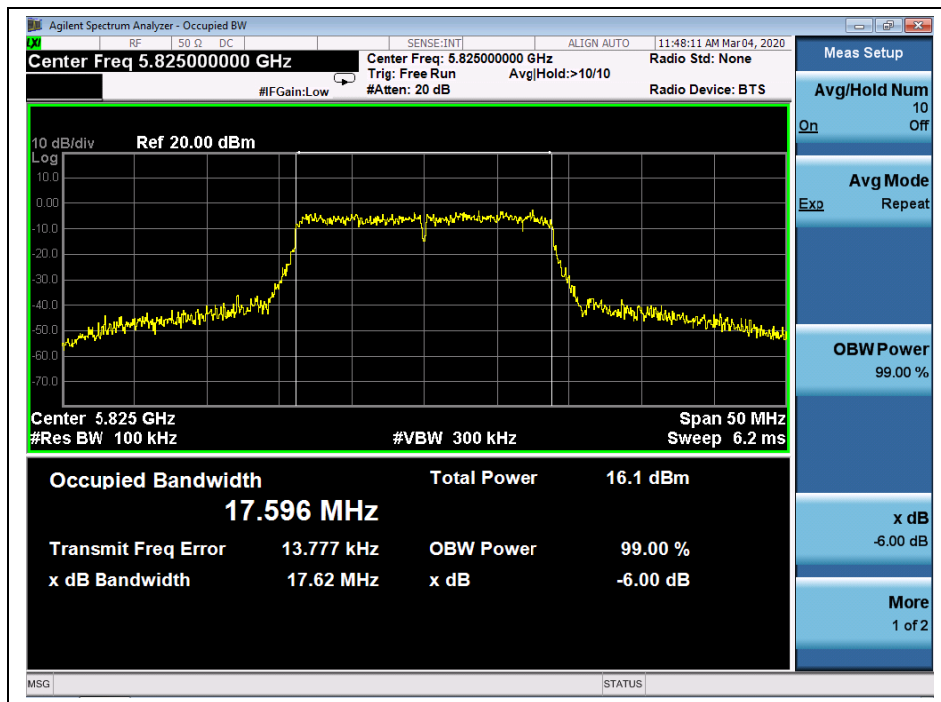
(Channel 144, 5720MHz, 802.11ac (VHT20))



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



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



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

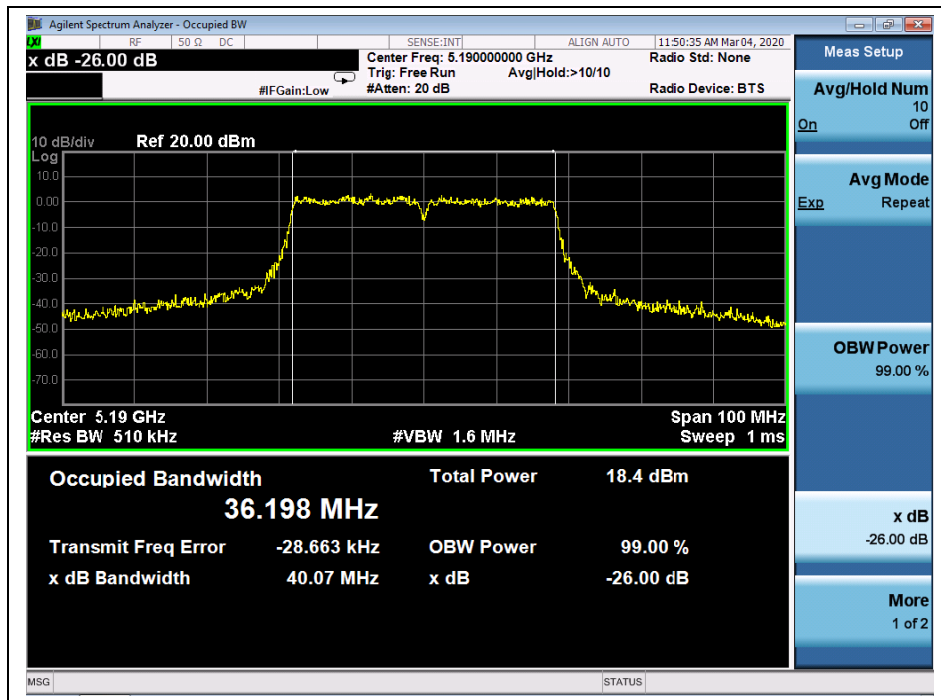


**802.11ac (VHT40) Test mode**

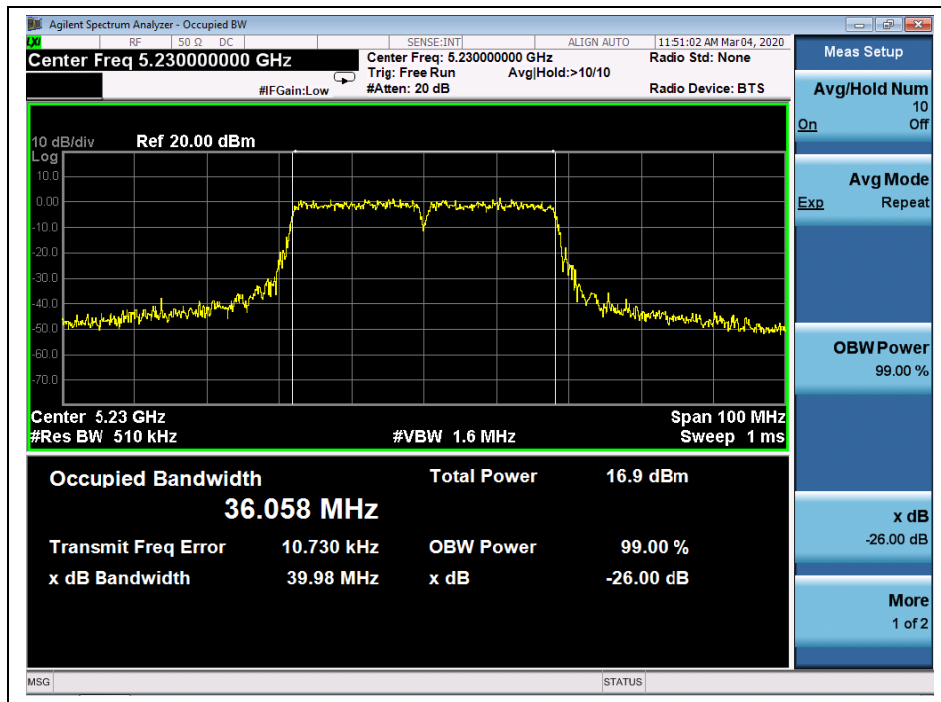
**A. Test Verdict:**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	40.07
46	5230	39.98
54	5270	39.70
62	5310	40.33
102	5510	39.91
126	5630	40.64
142	5710	41.35
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
142	5710	36.51
151	5755	36.39
159	5795	36.47

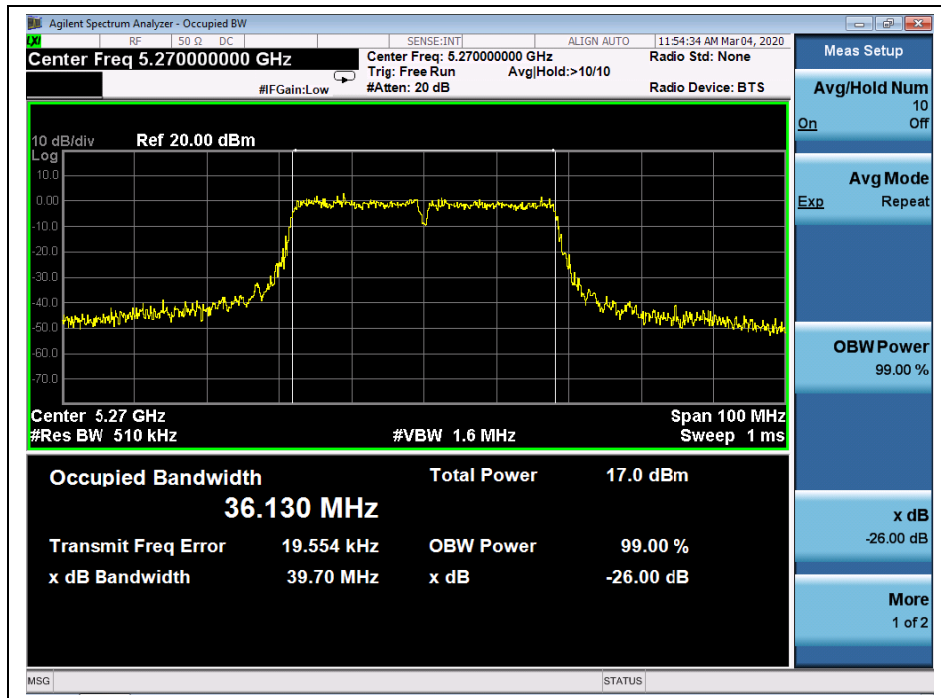
**B. Test Plots**



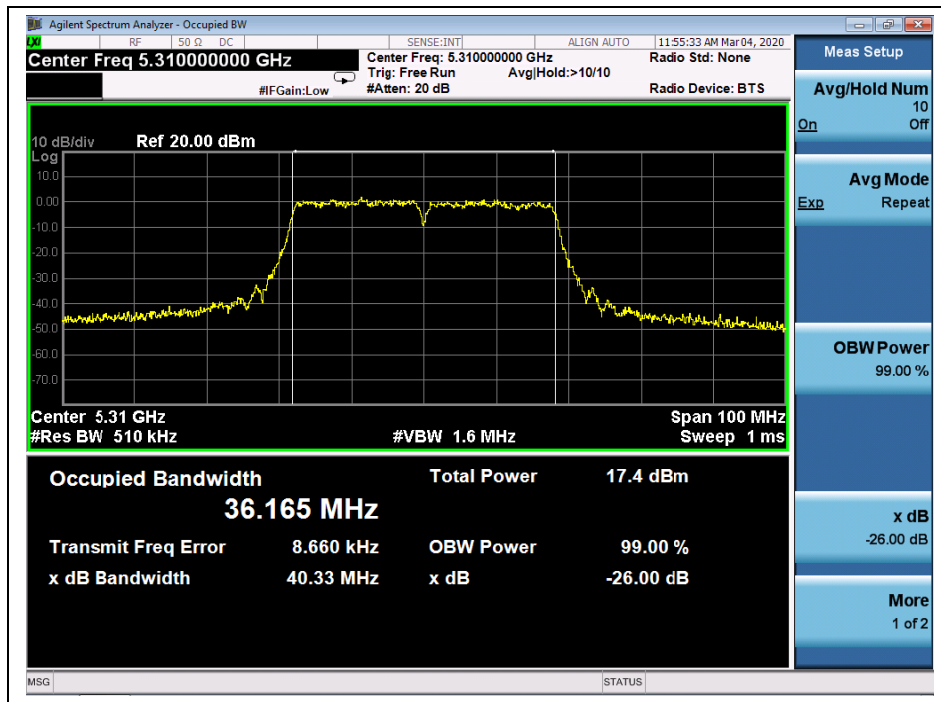
(Channel 38,5190MHz, 802.11ac(VHT40))



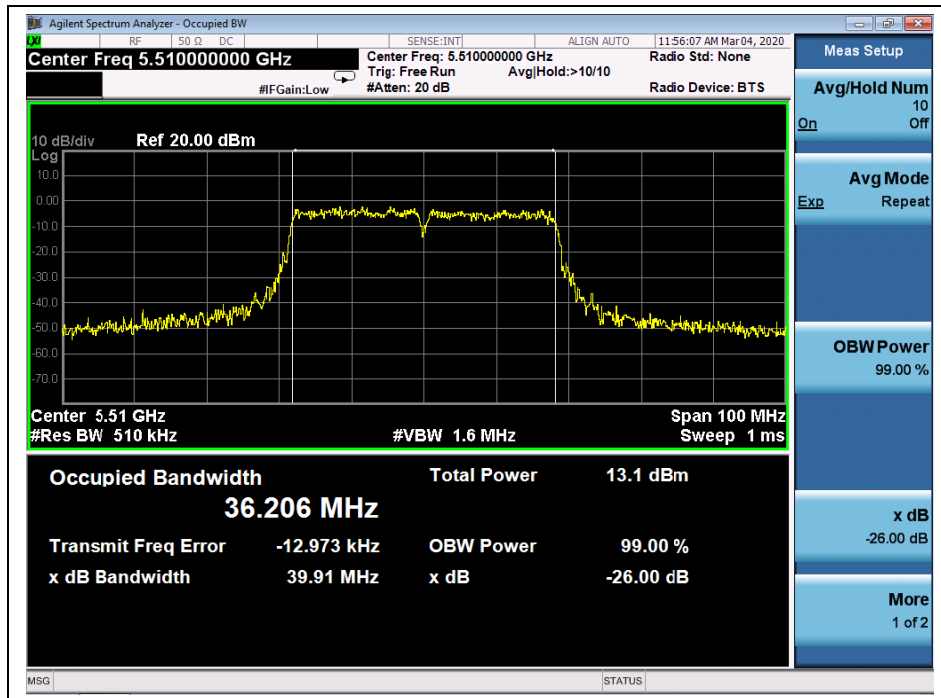
(Channel 46, 5230 MHz, 802.11ac(VHT40))



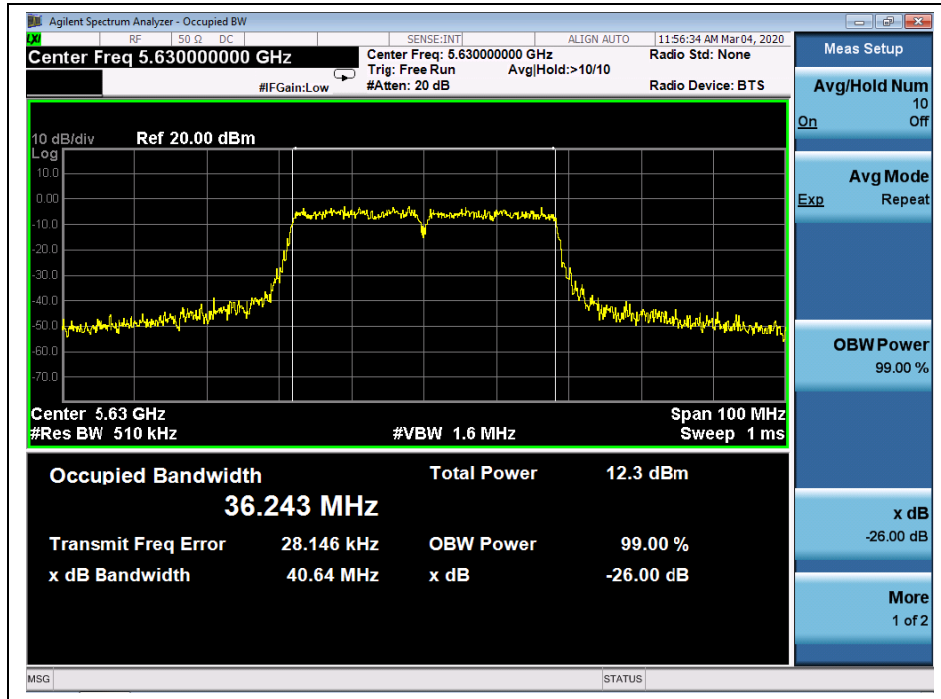
(Channel 54, 5270 MHz, 802.11ac(VHT40))



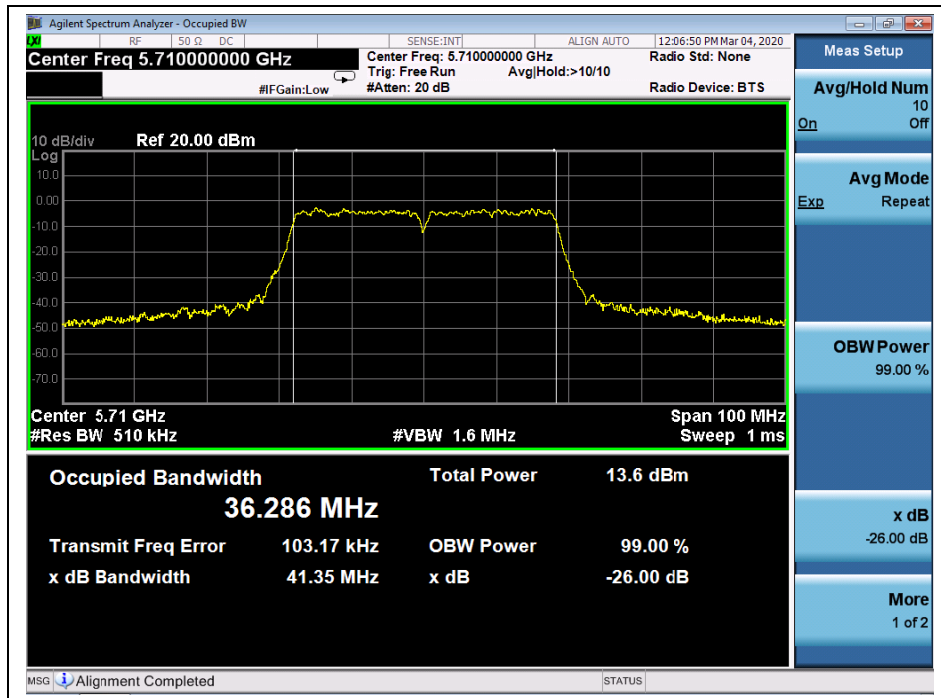
(Channel 62, 5310 MHz, 802.11ac(VHT40))



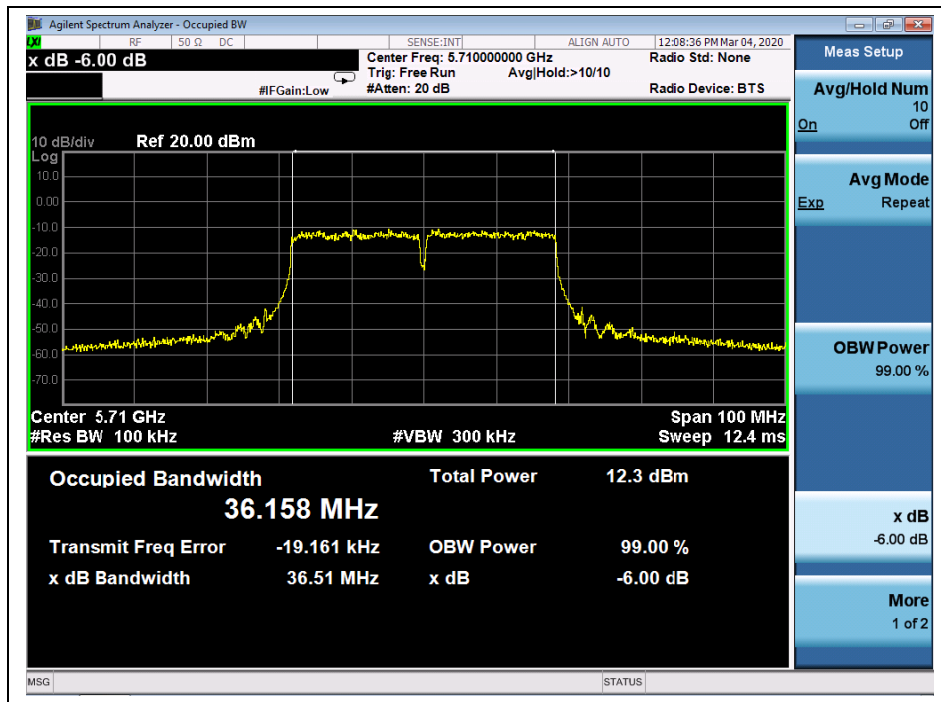
(Channel 102,5510MHz, 802.11ac(VHT40))



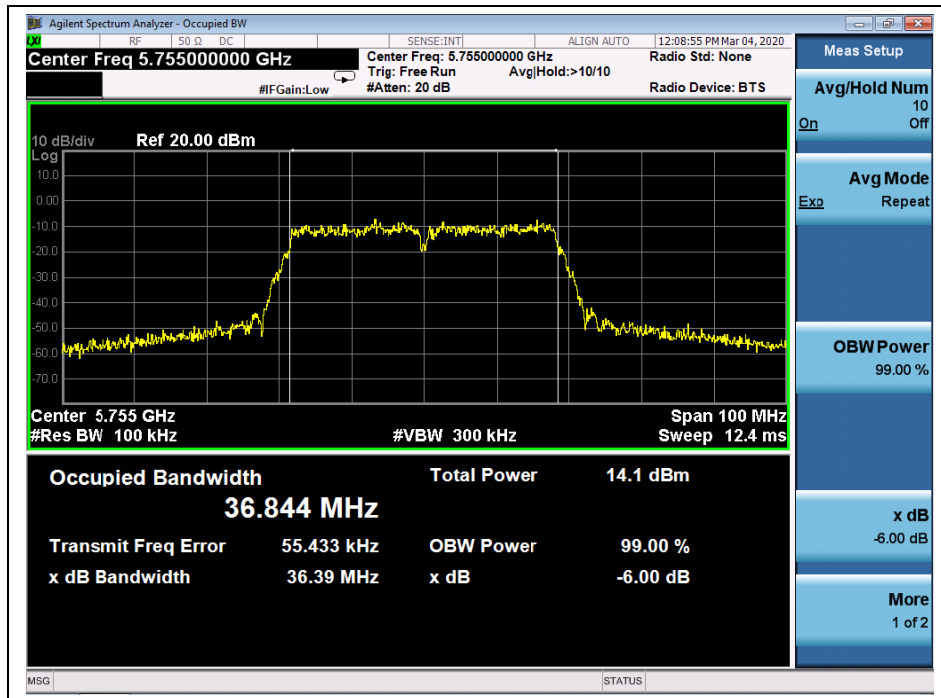
(Channel 126, 5630 MHz, 802.11ac(VHT40))



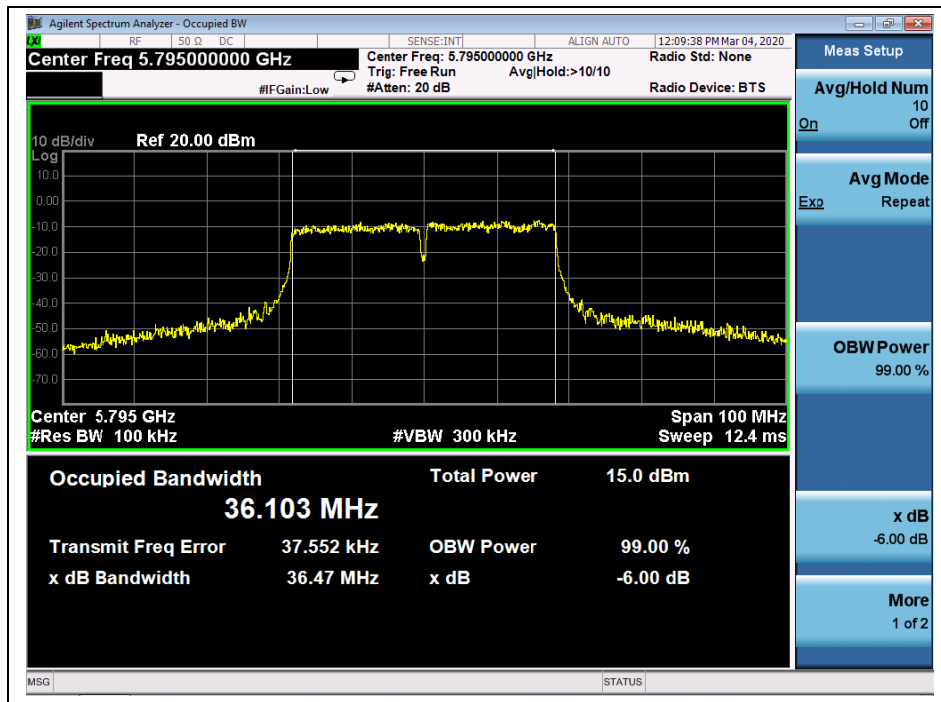
(Channel 142, 5710 MHz, 802.11ac(VHT40))



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



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



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



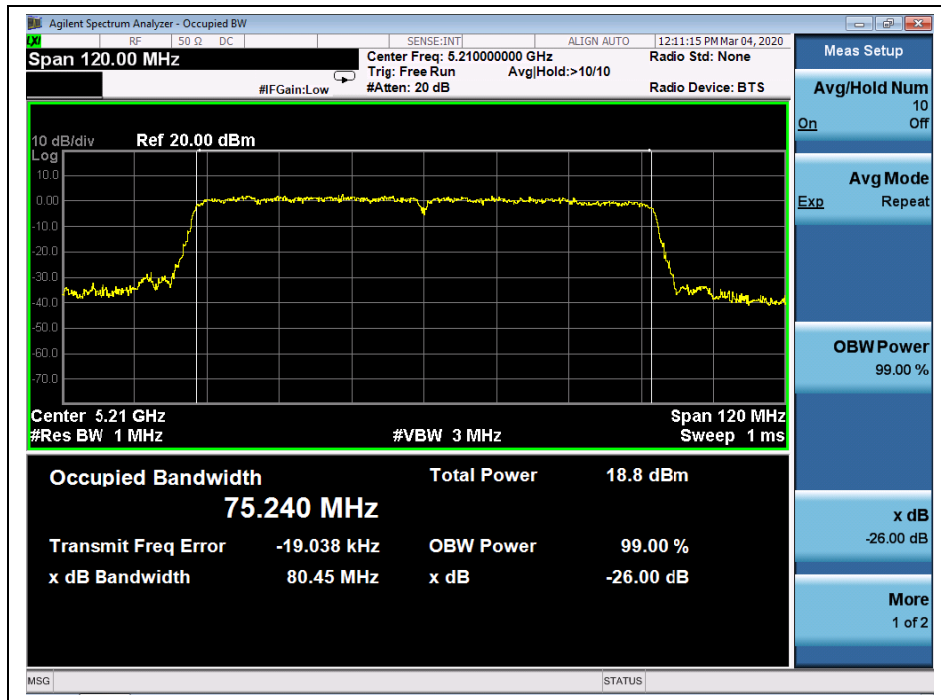


**802.11ac (VHT80) Test mode**

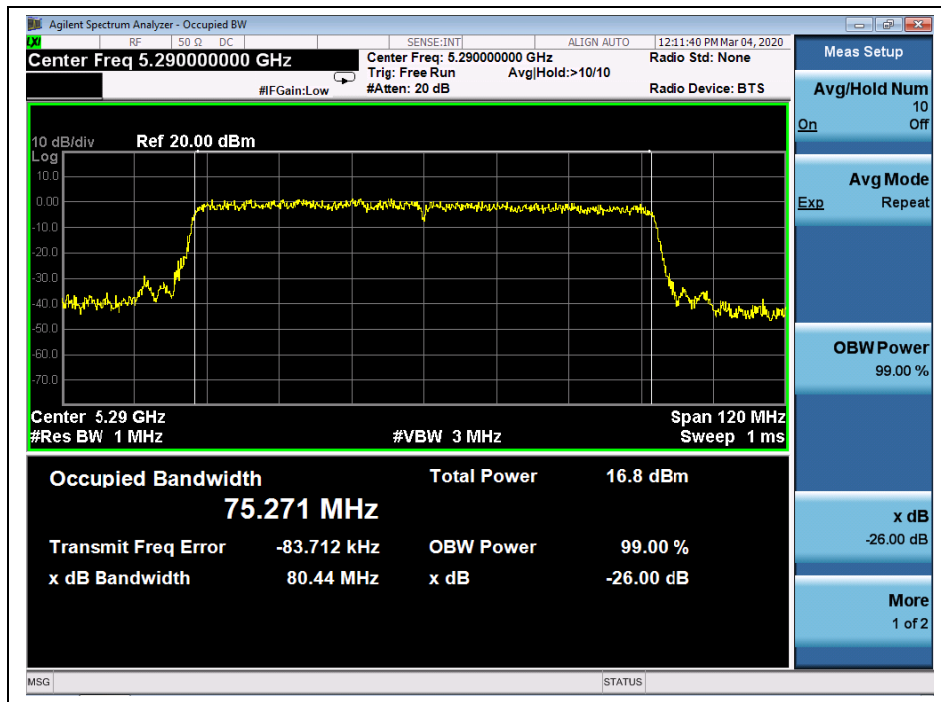
**A. Test Verdict:**

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	80.45
58	5290	80.44
106	5530	80.38
122	5610	79.84
138	5690	80.28
Channel	Frequency (MHz)	6dB Bandwidth (MHz)
138	5690	76.42
155	5775	75.99

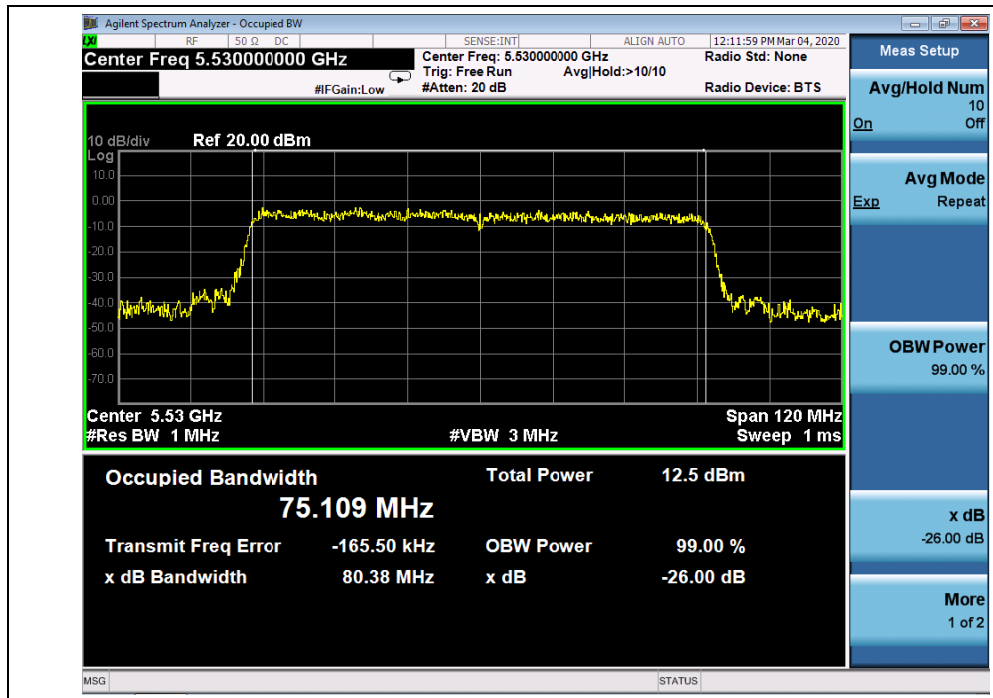
**B. Test Plots**



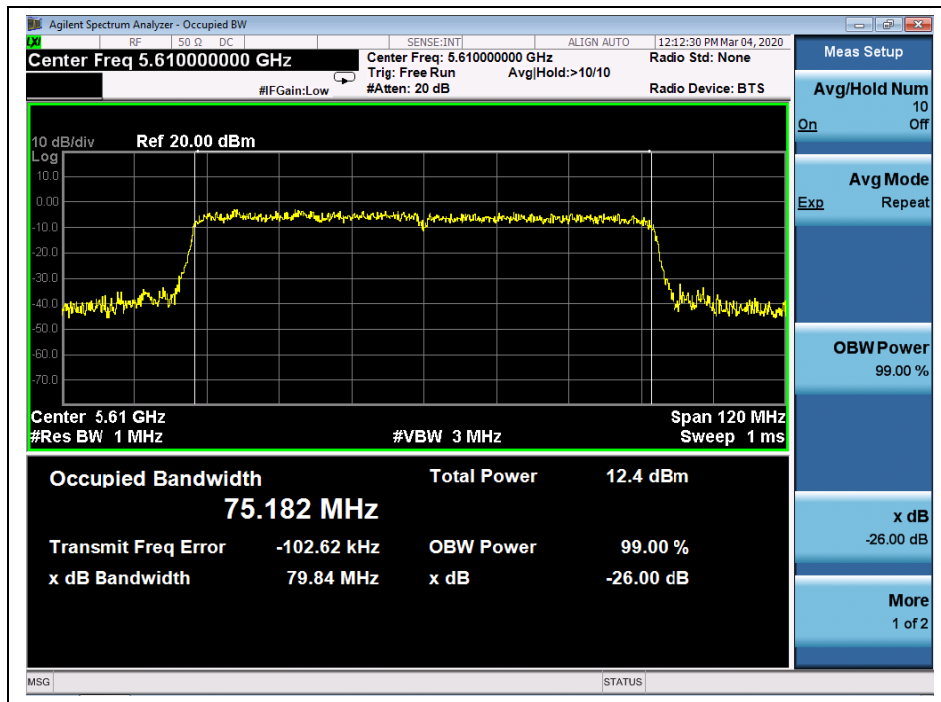
(Channel 42,5210MHz, 802.11ac(VHT80))



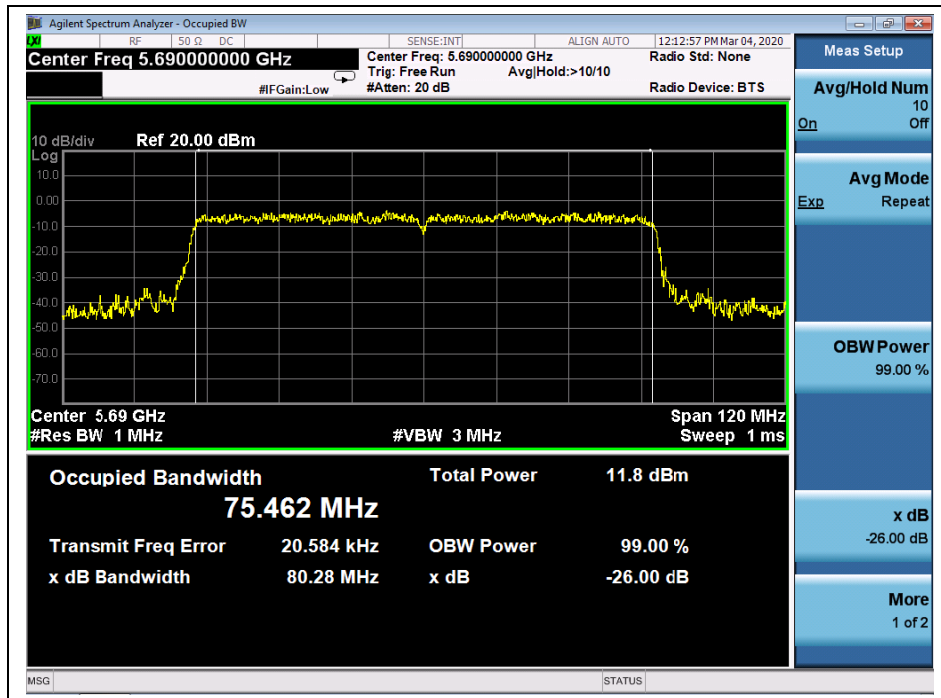
(Channel 58, 5290 MHz, 802.11ac(VHT80))



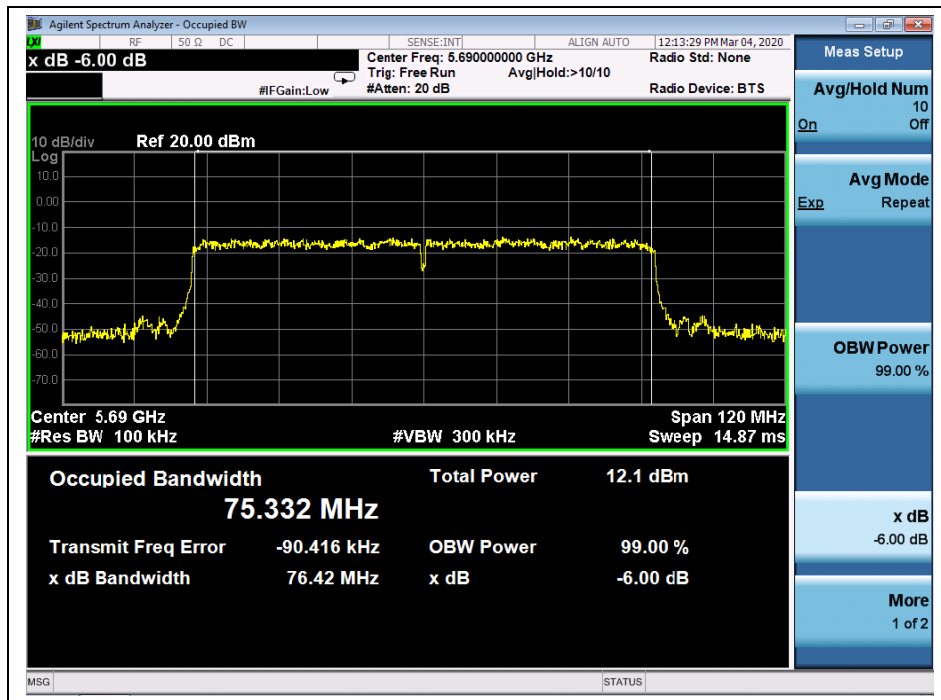
(Channel 106,5530MHz, 802.11ac(VHT80))



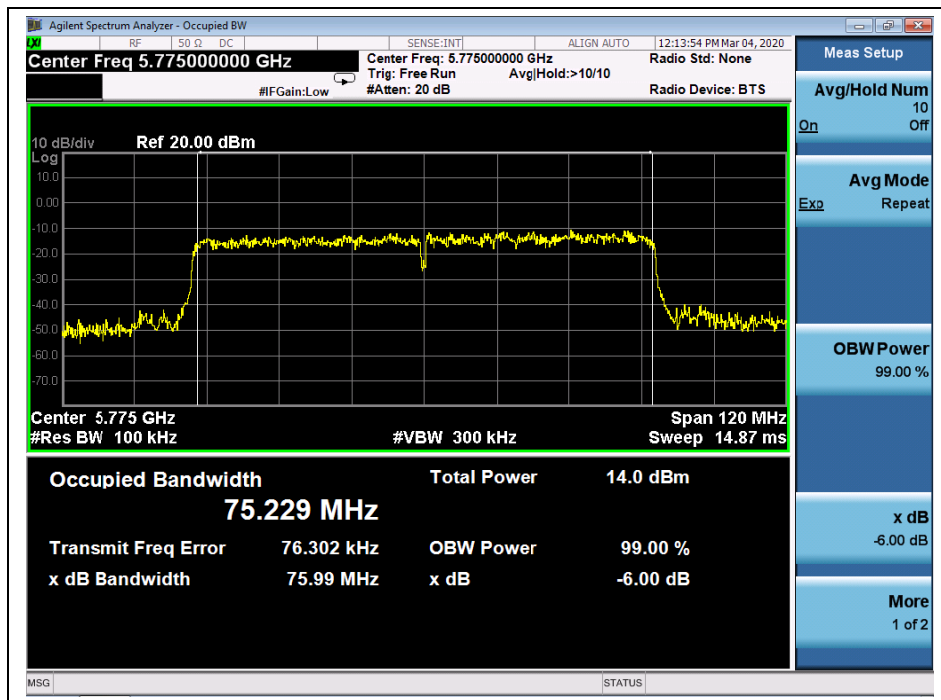
(Channel 122, 5610 MHz, 802.11ac(VHT80))



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



(Channel 138,5690MHz, 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 11 dBm in any 1 megahertz band.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

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

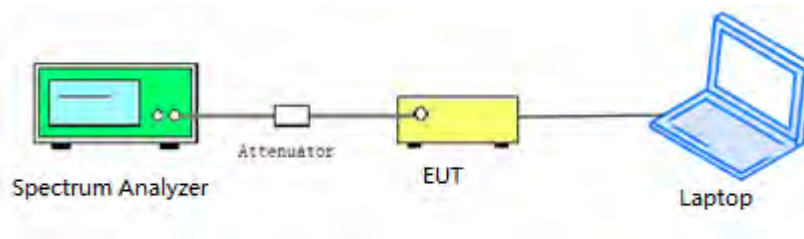
If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(4) According to 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 50 Ohm; 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-1 was used in order to prove compliance

- 1) Set span to encompass the entire 26-dB emission bandwidth
- 2) Set RBW = 1 MHz. Set VBW  $\geq$  3 MHz.



- 3) Number of points in sweep  $\geq 2$  Span / RBW. Sweep time = auto.
- 4) Detector = Peak
- 5) Trace mode=Max hold
- 6) Record the max value

**2.5.4. Test Result**

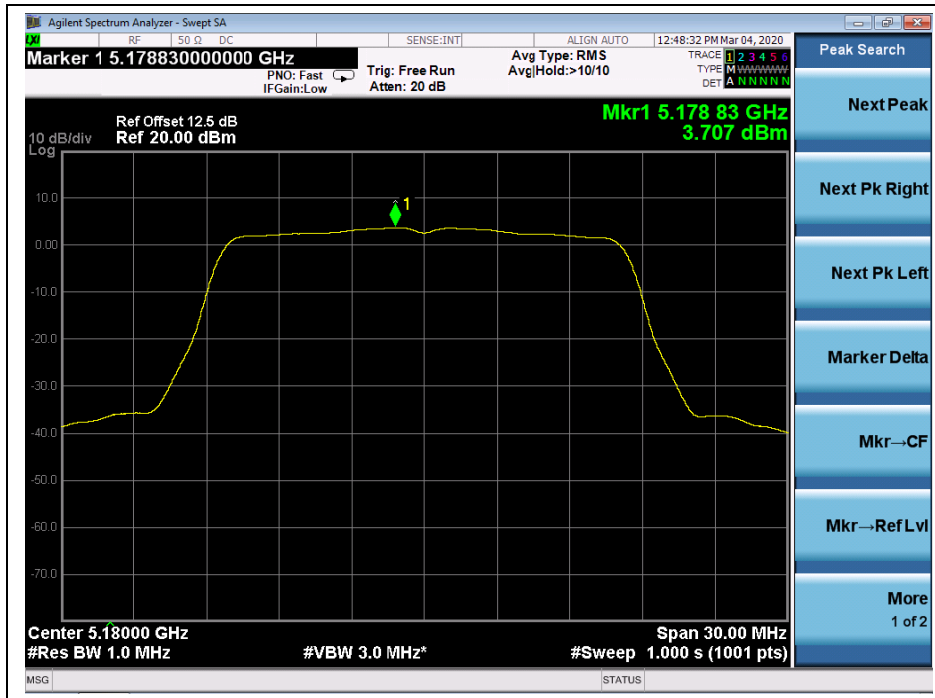
**802.11a Test mode**

**A. Test Verdict:**

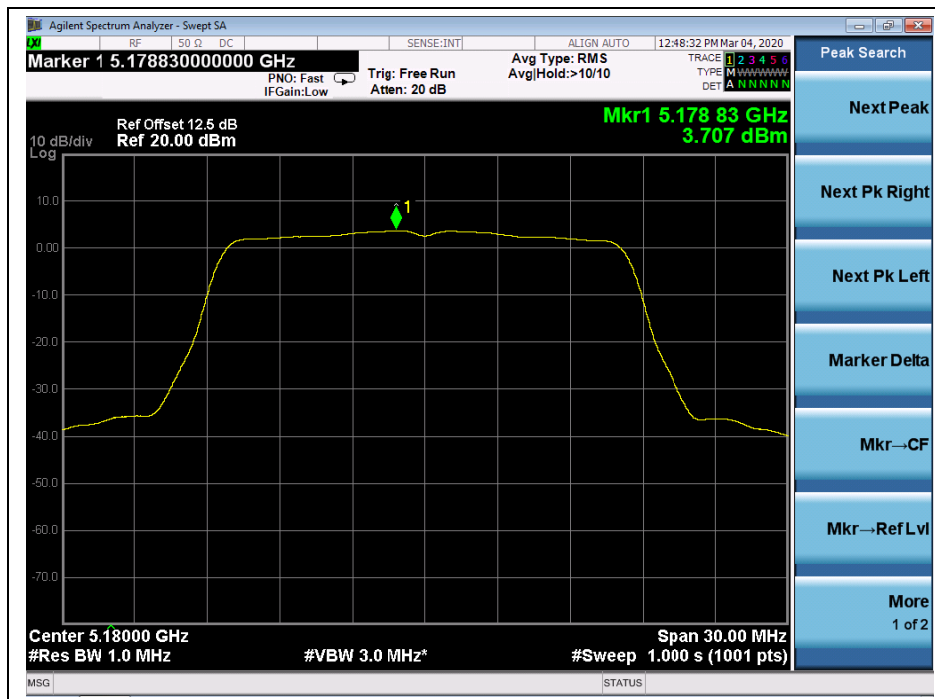
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Corrected PPSD (dBm/MHz)		Limit (dBm/MHz)	Verdict
		ANT 0	ANT 1		ANT 0	ANT 1		
36	5180	5.19	3.71	0.00	5.19	3.71	11	PASS
44	5220	2.85	3.71		2.85	3.71		
48	5240	3.69	1.88		3.69	1.88		
52	5260	1.85	3.00		1.85	3.00		
60	5300	0.66	1.87		0.66	1.87		
64	5320	0.64	1.49		0.64	1.49		
100	5500	-0.46	2.55		-0.46	2.55		
120	5600	0.13	-0.54		0.13	-0.54		
144	5720	-2.23	-0.54		-2.23	-0.54		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)		Limit (dBm/500KHz)	Verdict
		ANT 0	ANT 1		ANT 0	ANT 1		
144	5720	-5.25	-3.42	0.00	-5.25	-3.42	30	PASS
149	5745	-2.49	4.26		-2.49	4.26		
157	5785	-2.35	3.19		-2.35	3.19		
165	5825	-2.46	3.39		-2.46	3.39		



B. Test Plots



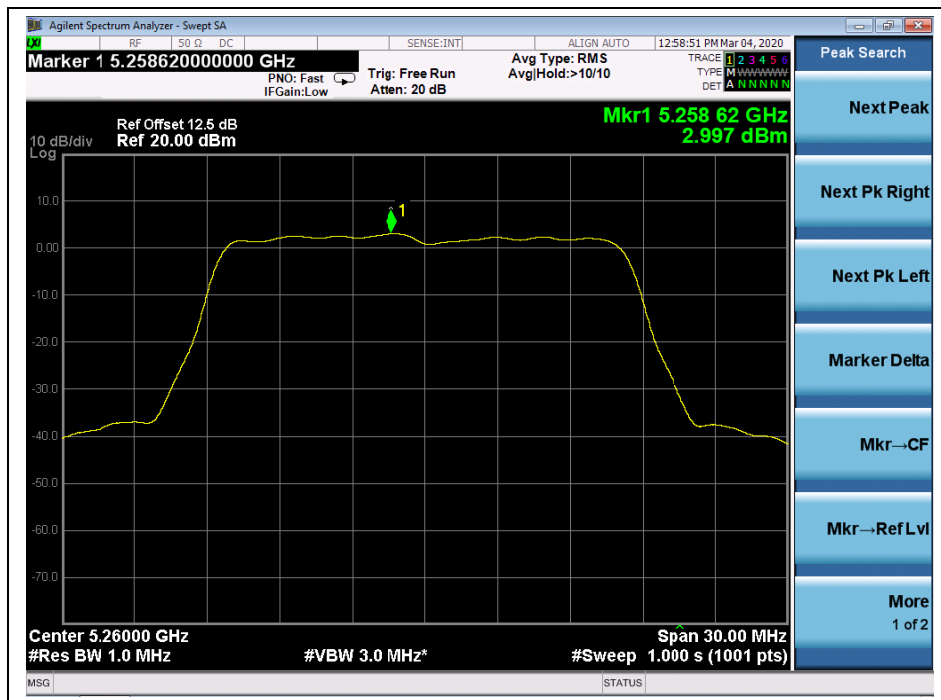
(Channel 36,5180MHz, 802.11a,ANT 1)



(Channel 44, 5220 MHz, 802.11a,ANT 1))

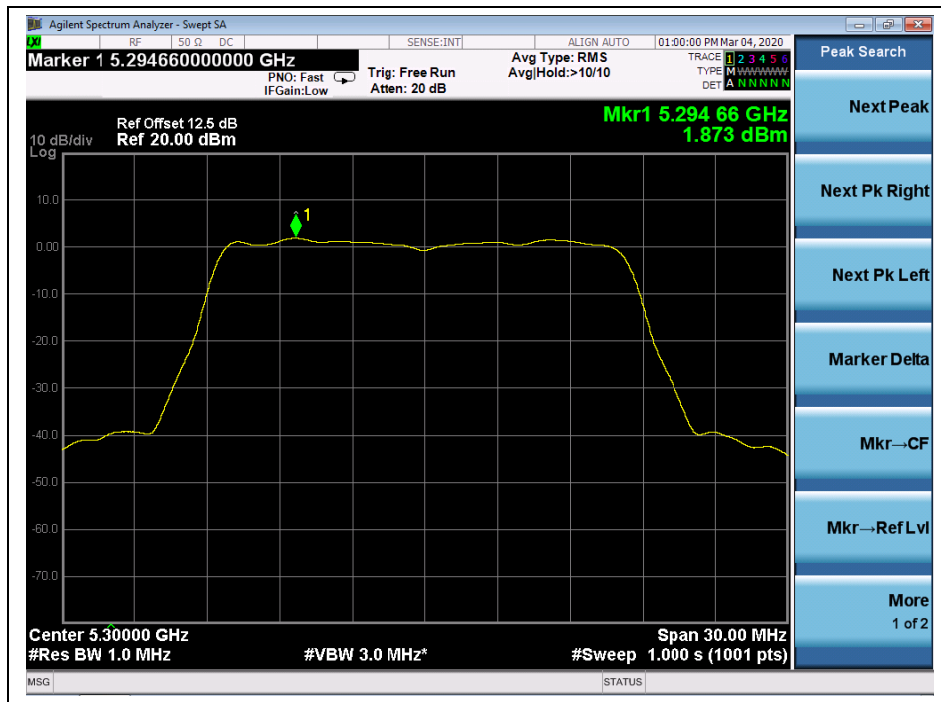


(Channel 48, 5240MHz, 802.11a,ANT 1))

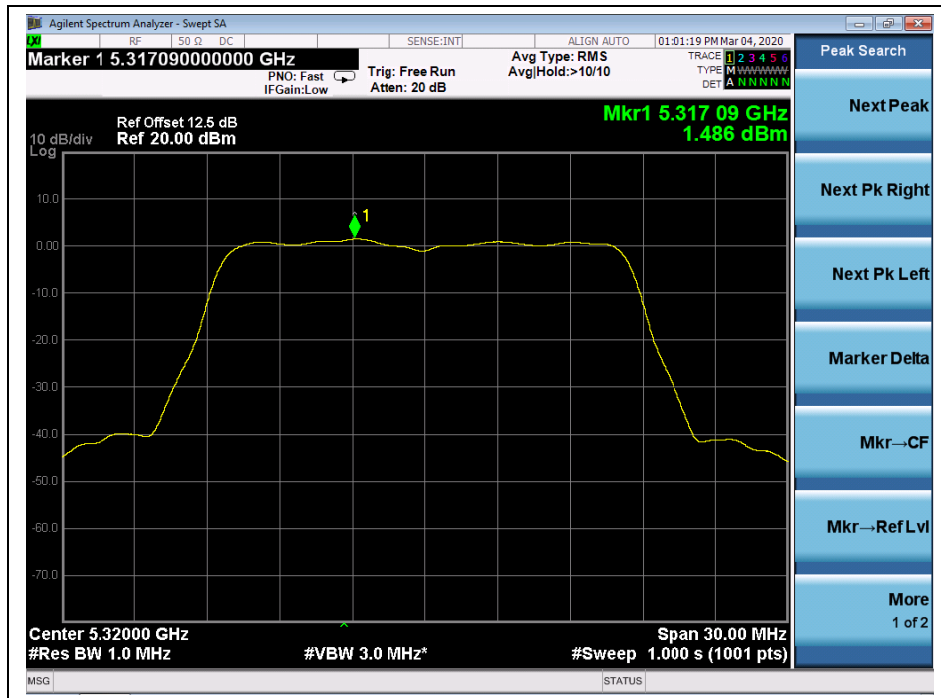


(Channel 52,5260MHz, 802.11a,ANT 1))

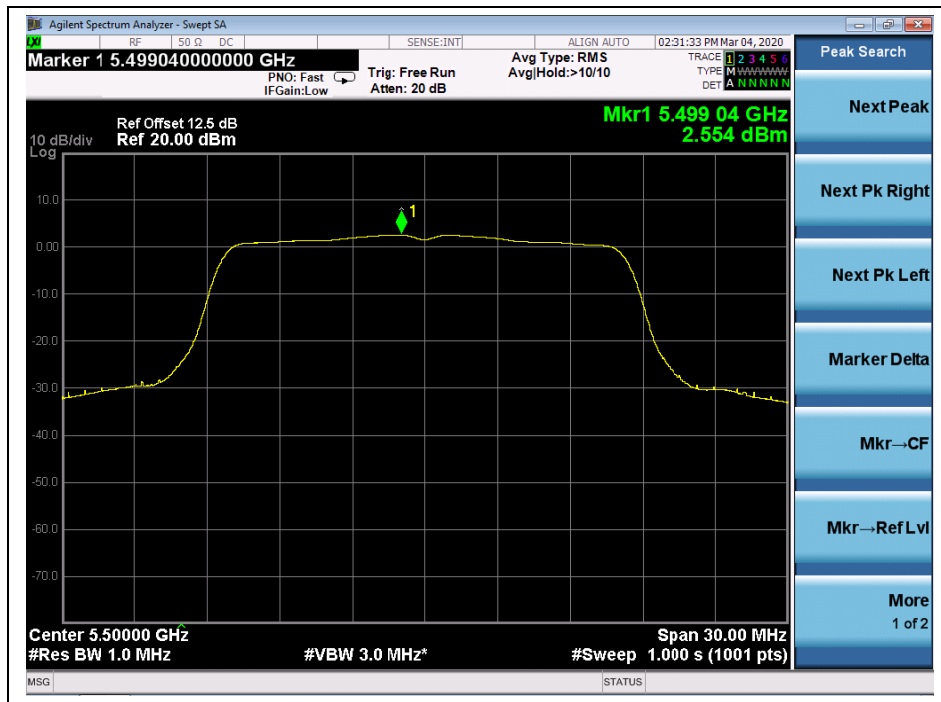




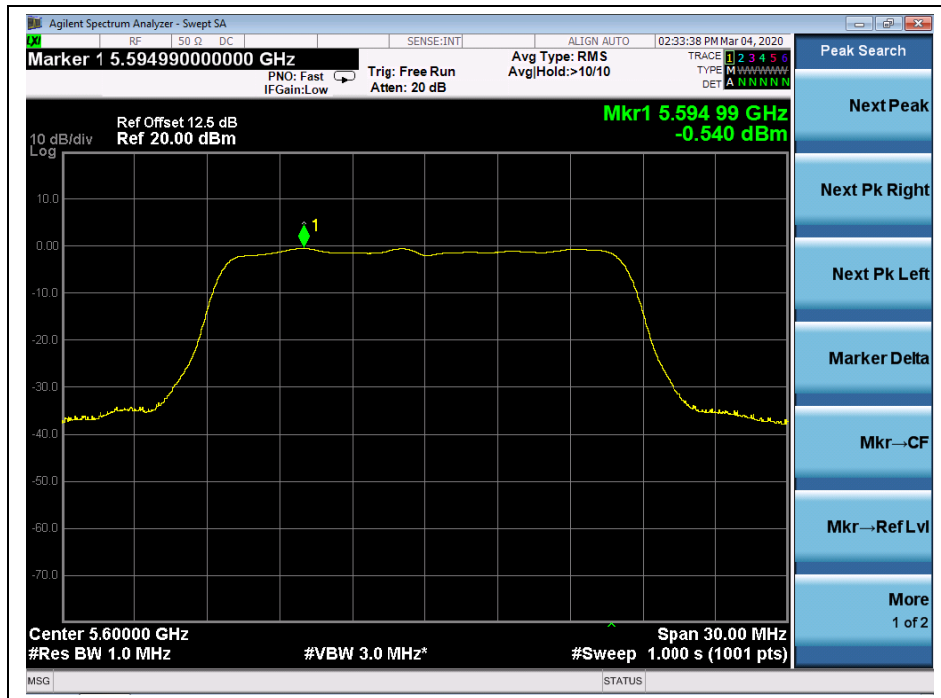
(Channel 60, 5300 MHz, 802.11a,ANT 1))



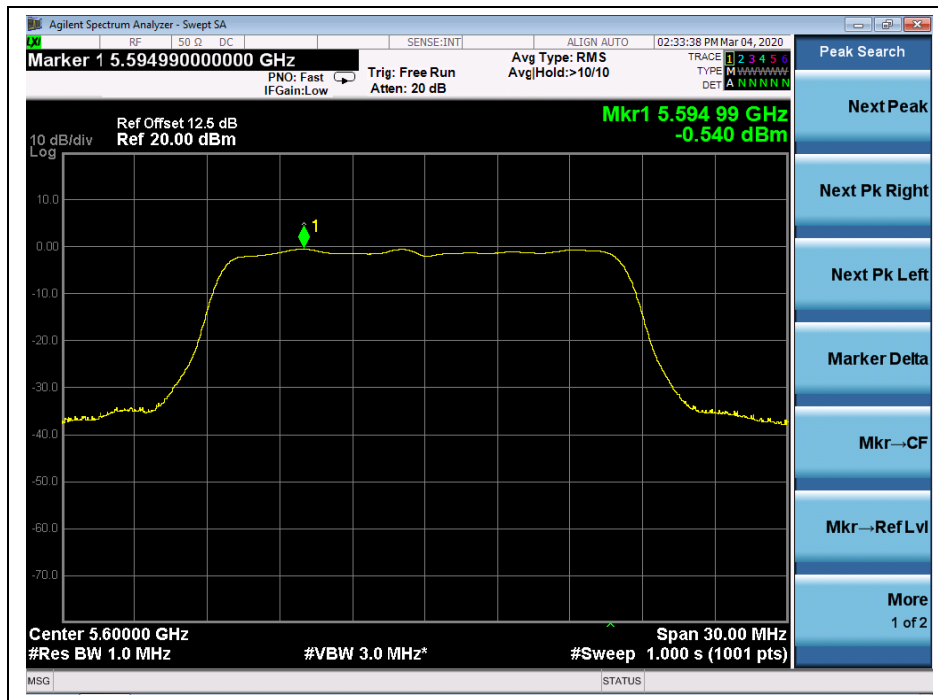
(Channel 64, 5320MHz, 802.11a,ANT 1))



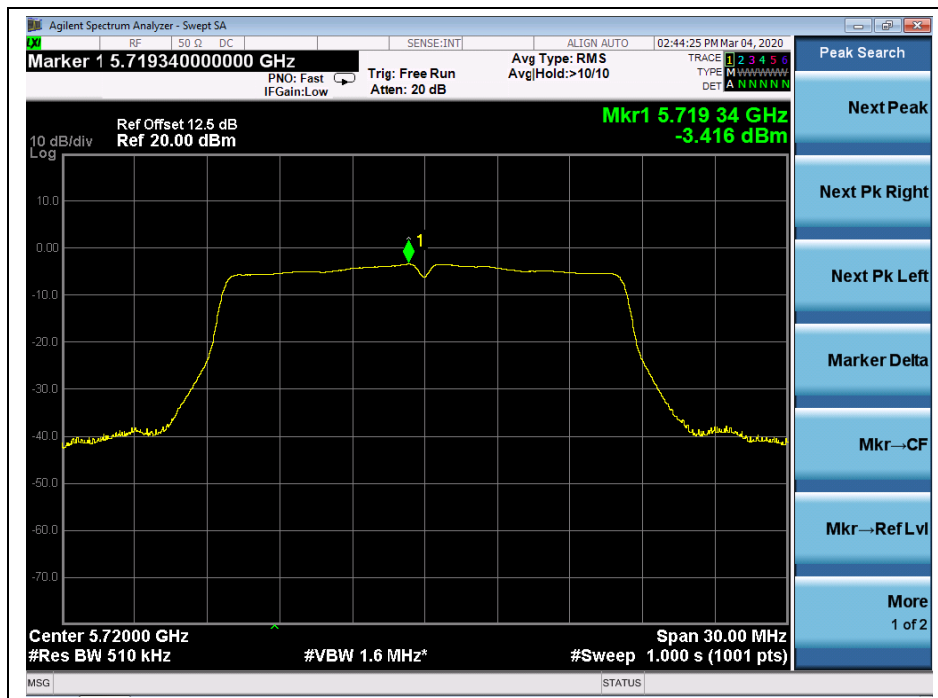
(Channel 100,5500MHz, 802.11a,ANT 1))



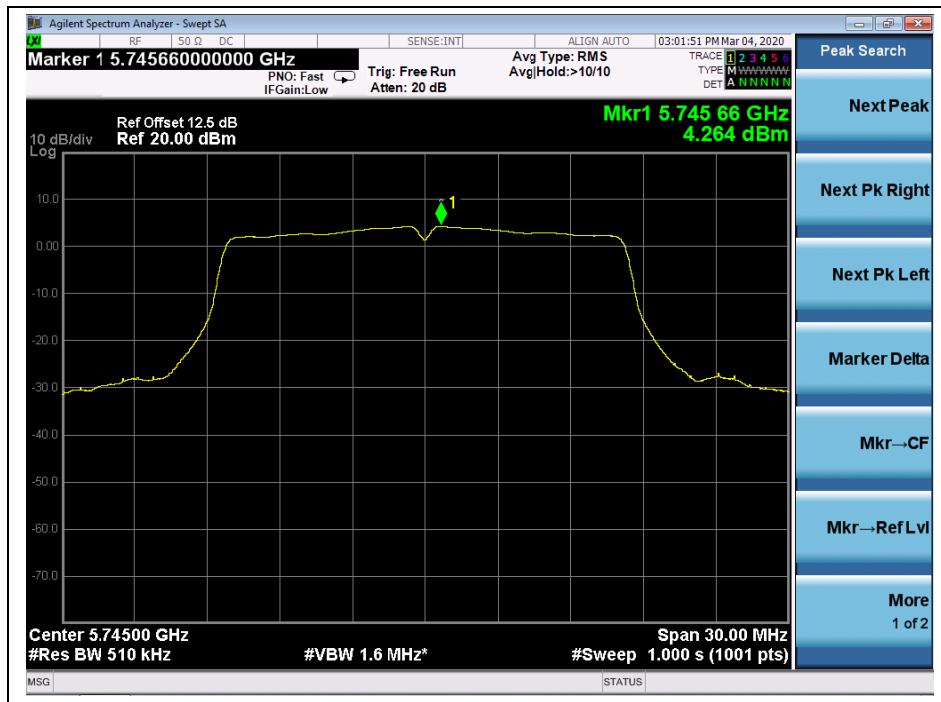
(Channel 120, 5600 MHz, 802.11a,ANT 1))



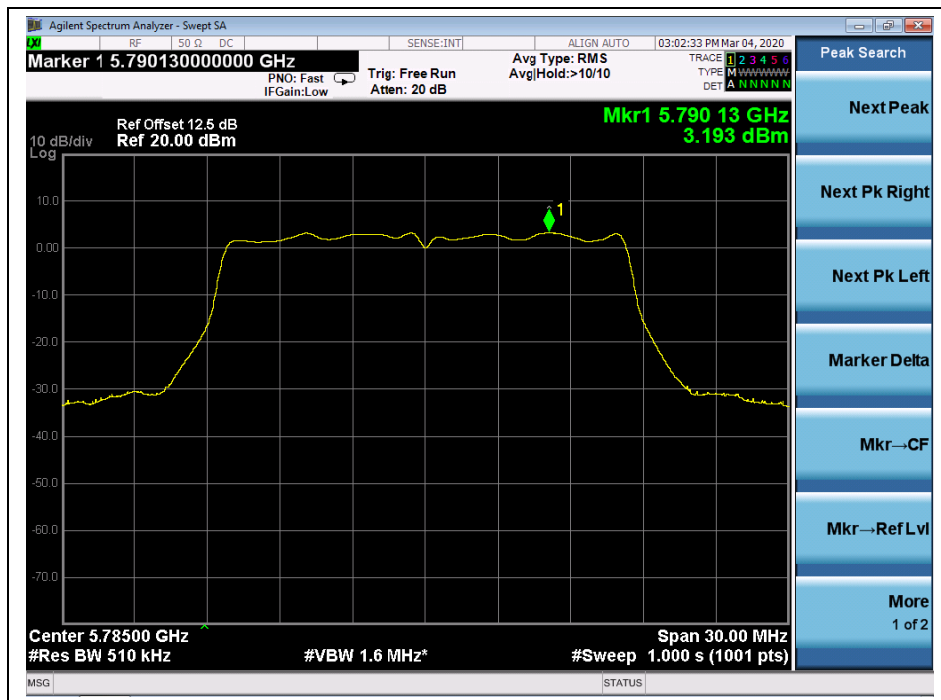
(Channel 144, 5720MHz, 802.11a,ANT 1))



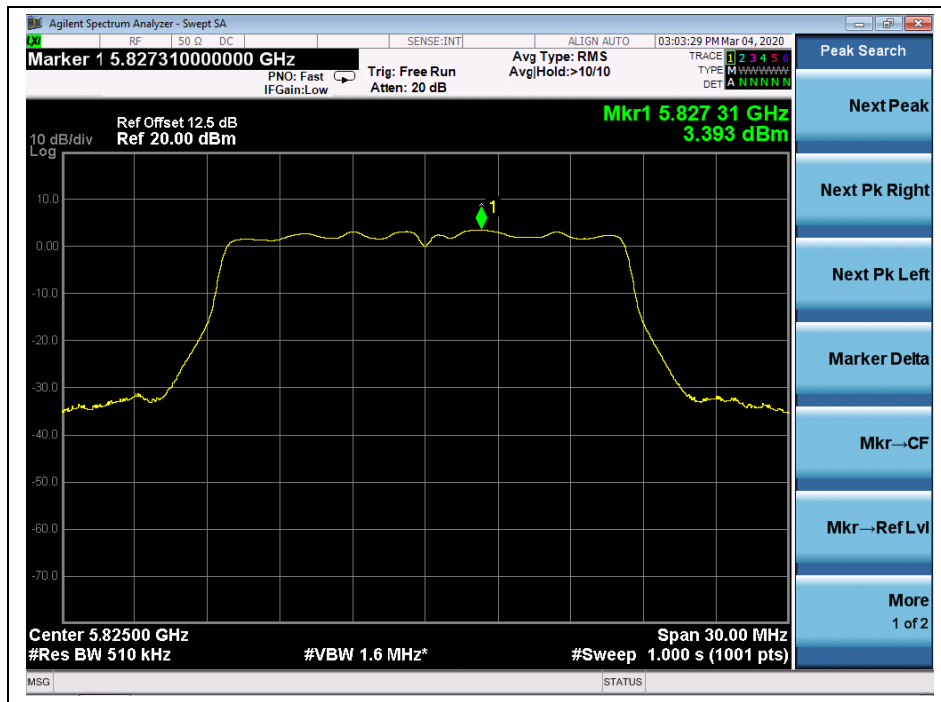
(Channel 144, 5720MHz, 802.11a,ANT 1))



(Channel 149,5745MHz, 802.11a,ANT 1))



(Channel 157,5785MHz, 802.11a,ANT 1))



(Channel 165,5825MHz, 802.11a,ANT 1))



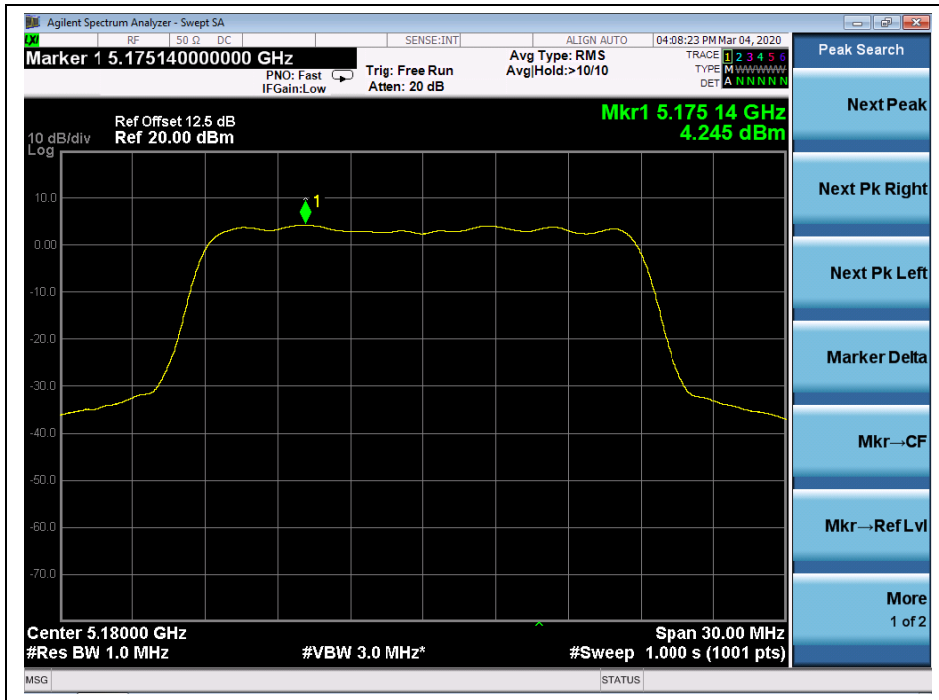
**802.11n (HT20) Test mode**

**A. Test Verdict:**

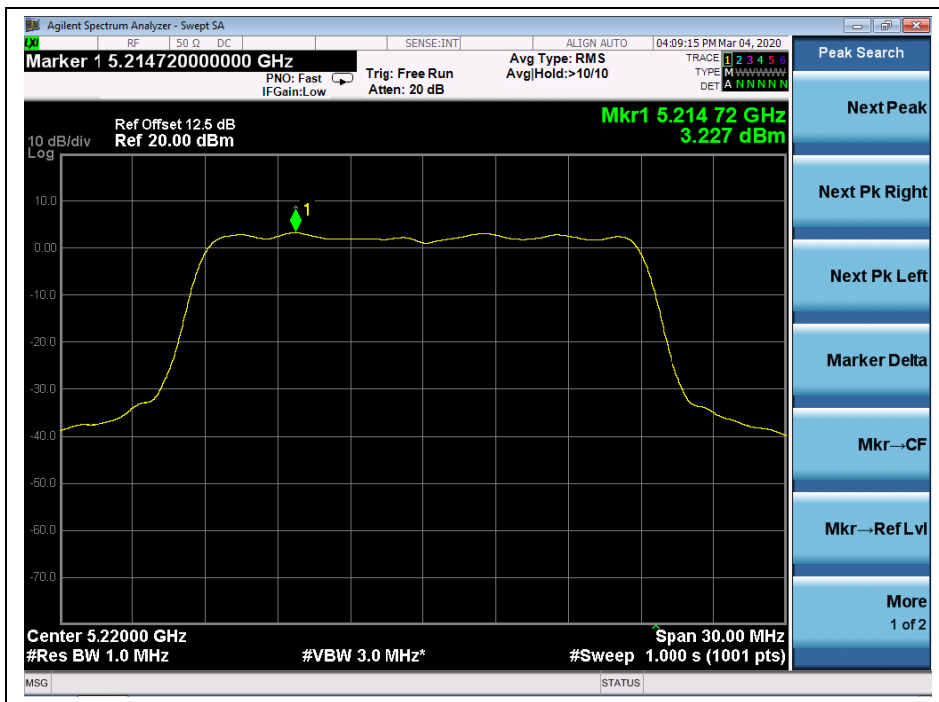
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT 0	ANT 1				
36	5180	3.42	4.25	0.00	6.87	9.99	PASS
44	5220	2.64	3.23		5.96		
48	5240	1.67	2.41		5.07		
52	5260	1.70	3.69		5.82		
60	5300	0.86	3.10		5.13		
64	5320	0.92	2.12		4.57		
100	5500	-0.12	1.23		3.62		
120	5600	-0.14	2.12		4.15		
144	5720	-0.48	2.57		4.32		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)			Duty Factor		
		ANT 0	ANT 1				
144	5720	-3.37	-0.11	0.00	1.57	28.99	PASS
149	5745	-2.16	1.85		3.30		
157	5785	-1.82	2.64		3.97		
165	5825	-1.63	3.16		4.40		

**Note:** Directional gain =  $4.0\text{dBi} + 10\log(2) = 7.01\text{dBi} > 6\text{dBi}$ , so the limit shall be 9.99dBm/MHz for 5.18-5.24 GHz, 5.260-5.320 GHz, 5.500-5.720 GHz band and 28.99dBm/500KHz for 5.745-5.825 GHz band.

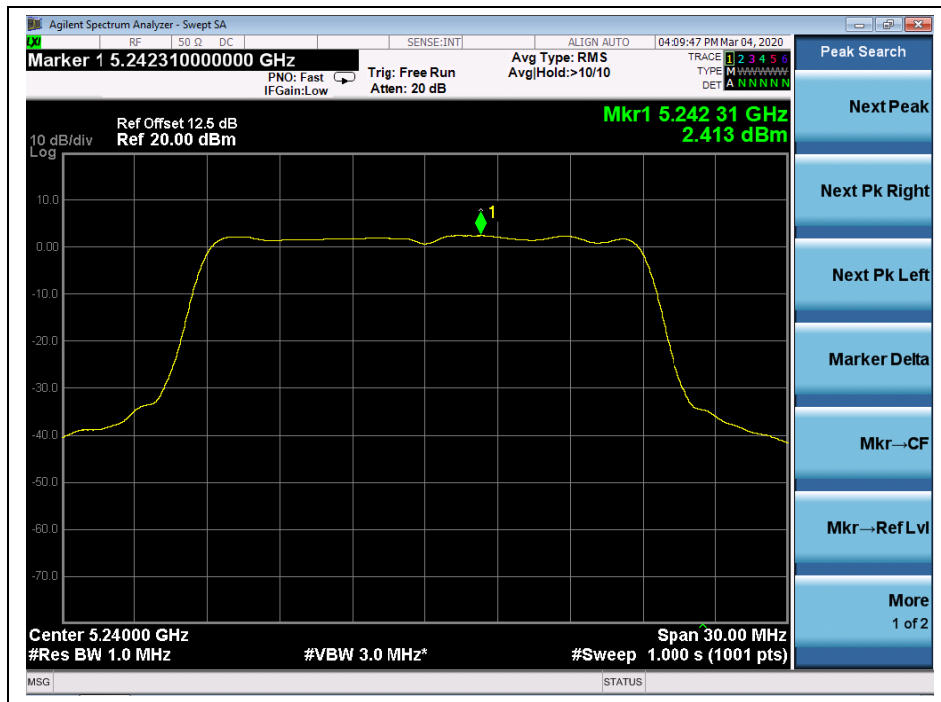
**B. Test Plots**



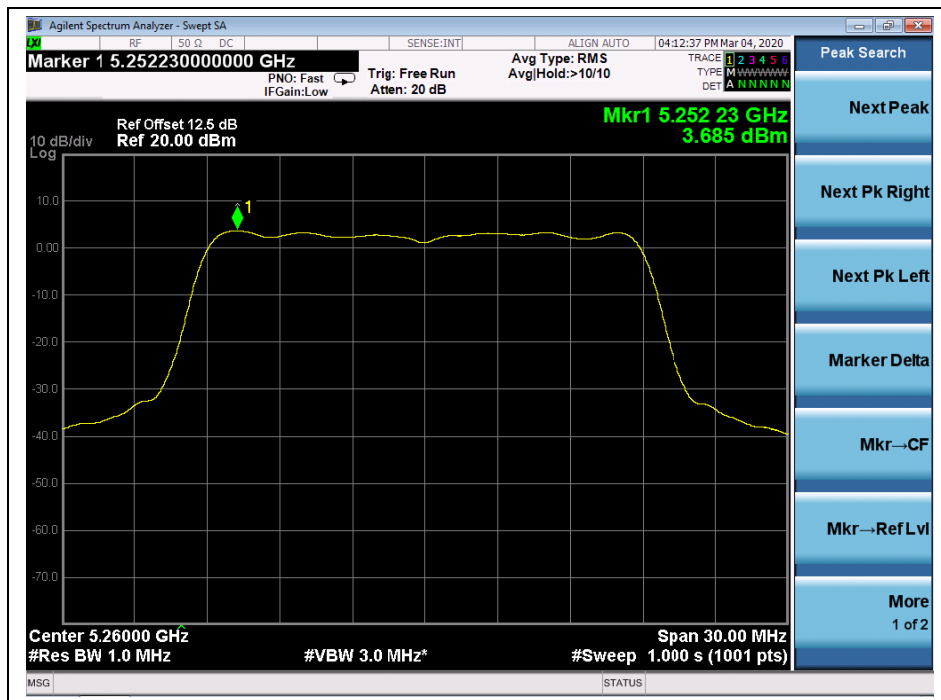
(Channel 36, 5180MHz, 802.11n (HT20), ANT1)



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



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

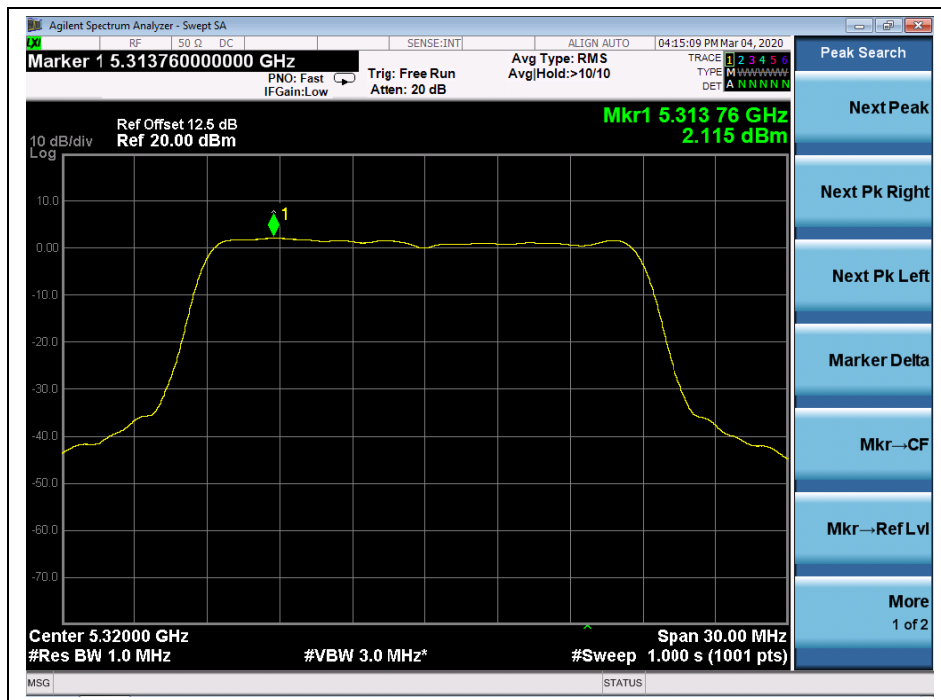


(Channel 52, 5260MHz, 802.11n (HT20), ANT1)

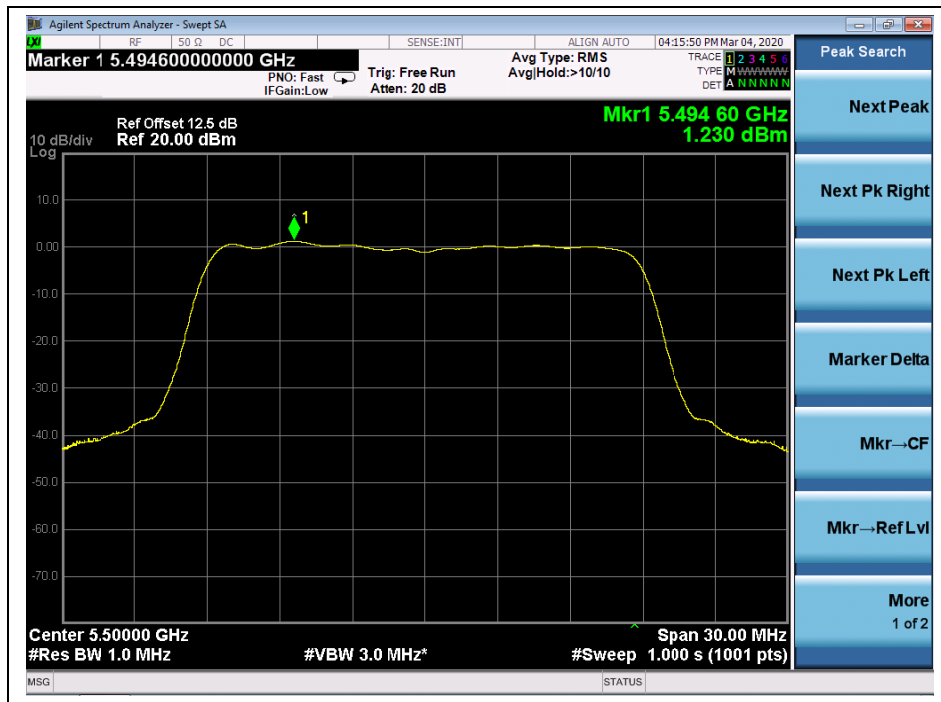




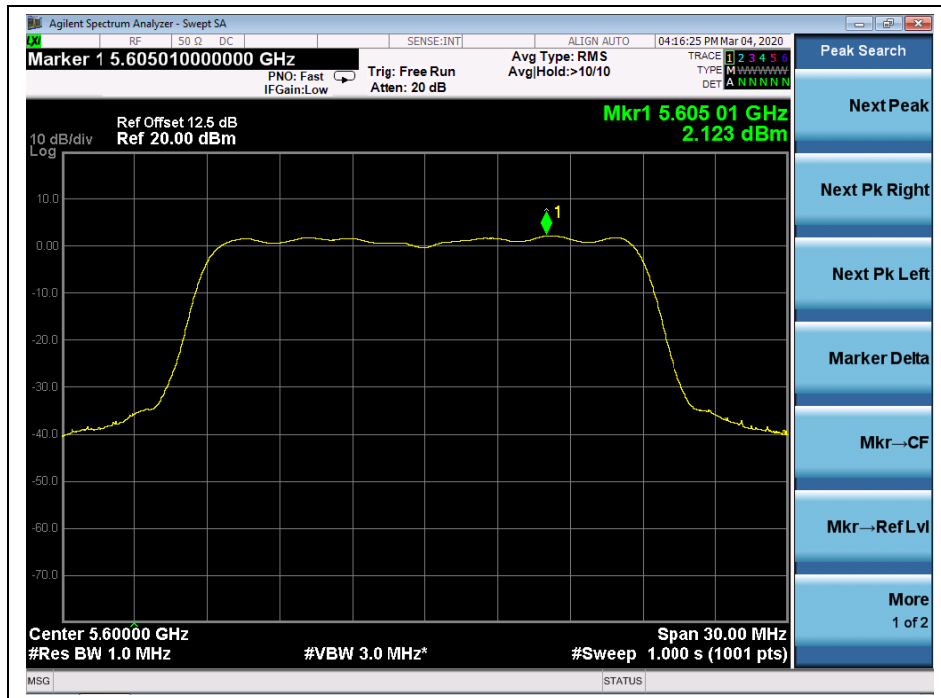
(Channel 60, 5300 MHz, 802.11n (HT20), ANT1)



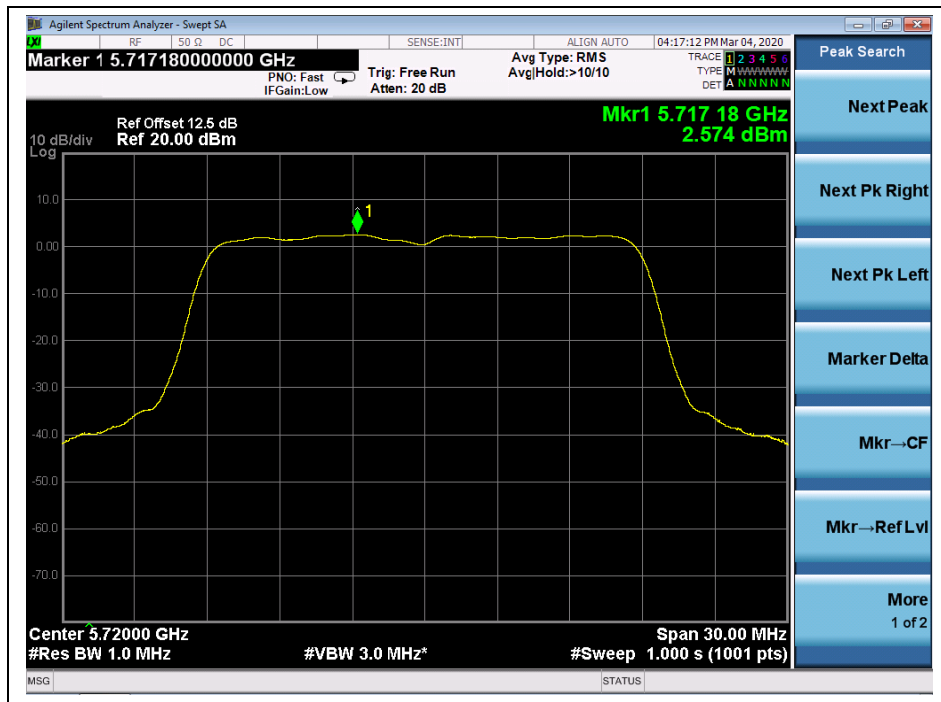
(Channel 64, 5320MHz, 802.11n (HT20), ANT1)



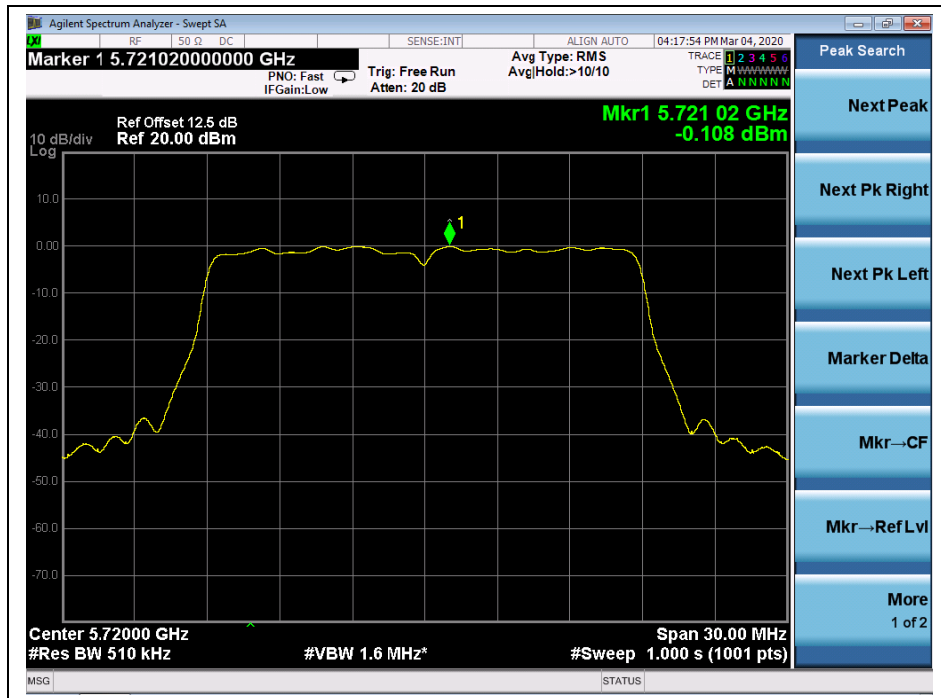
(Channel 100,5500MHz, 802.11n (HT20), ANT1)



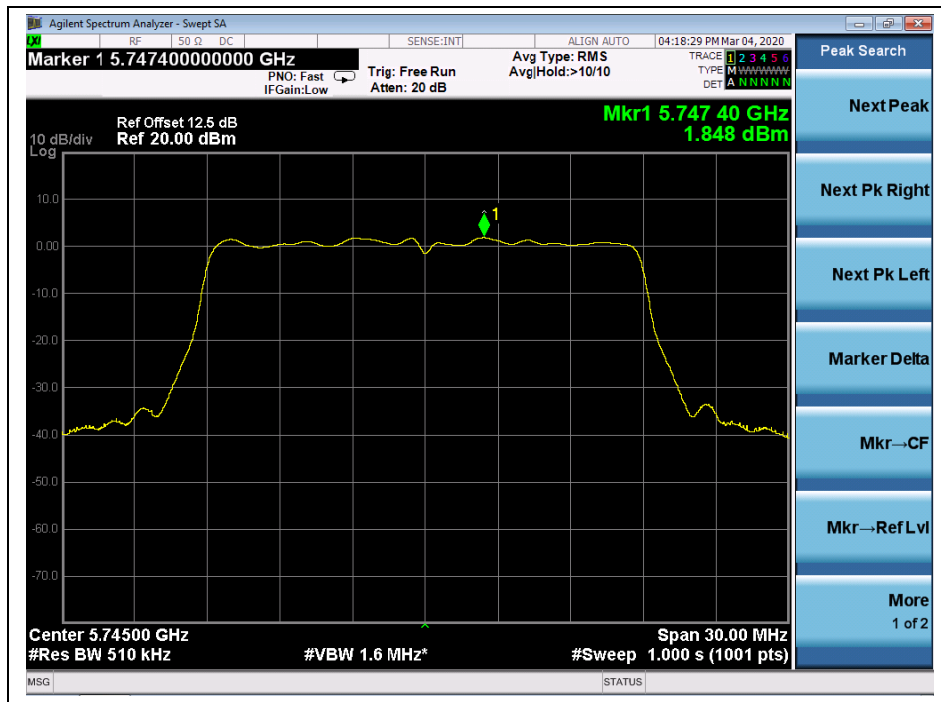
(Channel 120, 5600 MHz, 802.11n (HT20), ANT1)



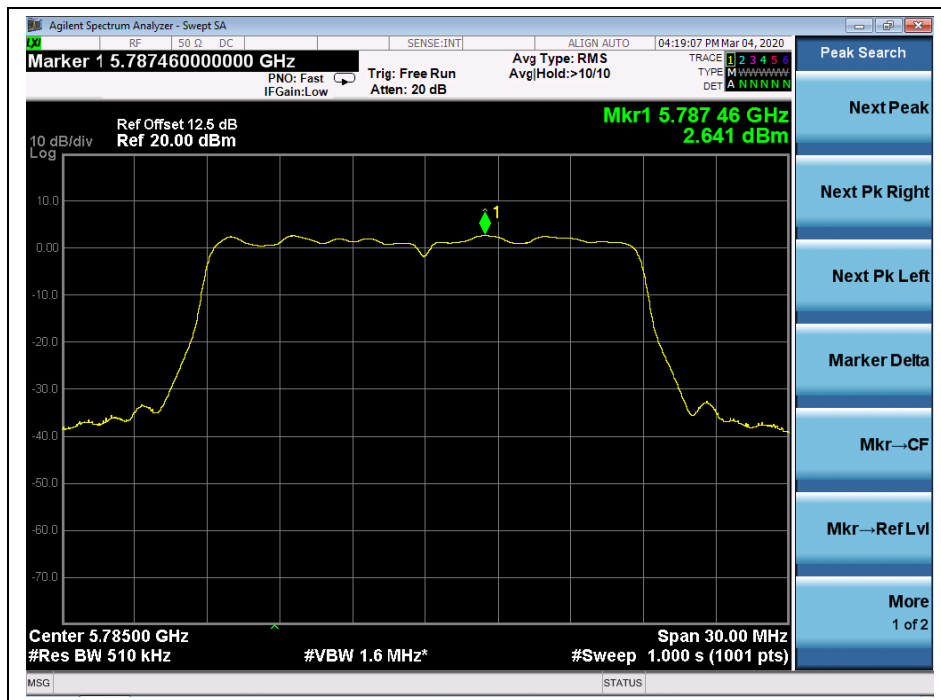
(Channel 144, 5720MHz, 802.11n (HT20), ANT1)



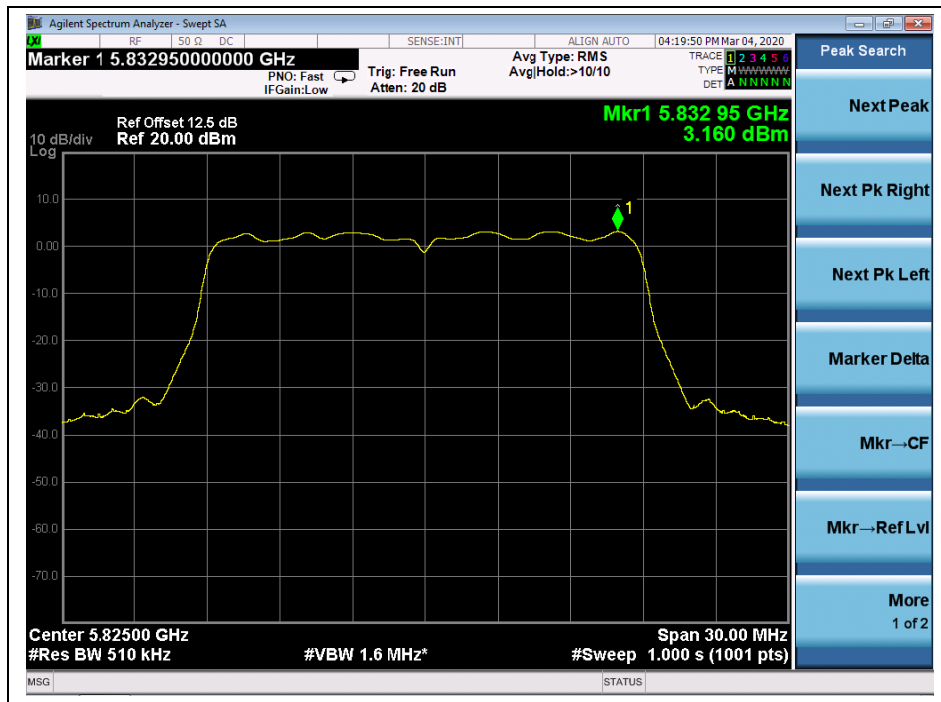
(Channel 144, 5720MHz, 802.11 n (HT20), ANT1)



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



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



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

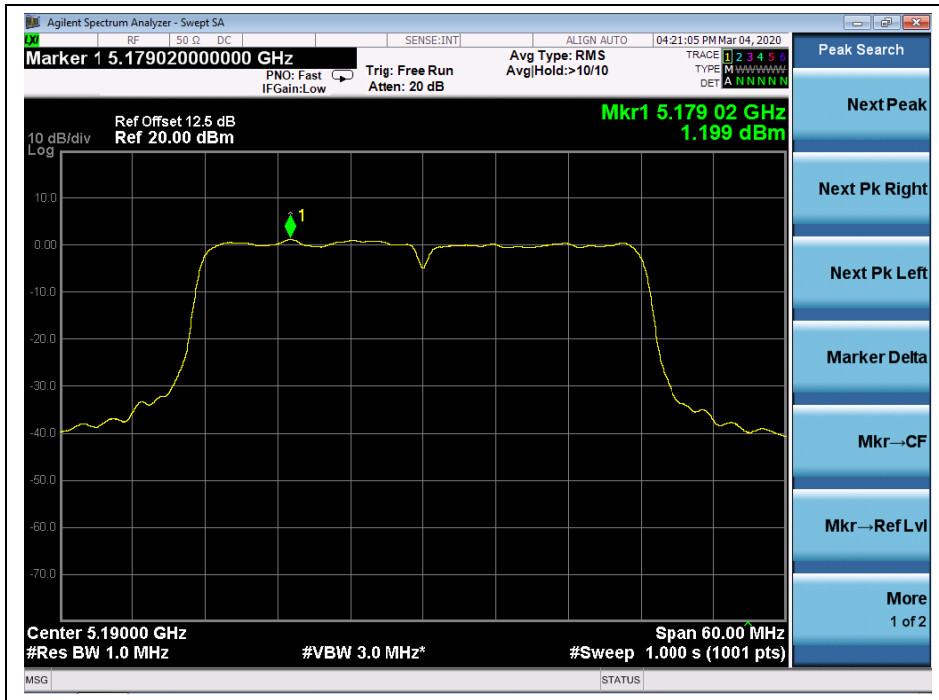


**802.11n (HT40) Test mode**

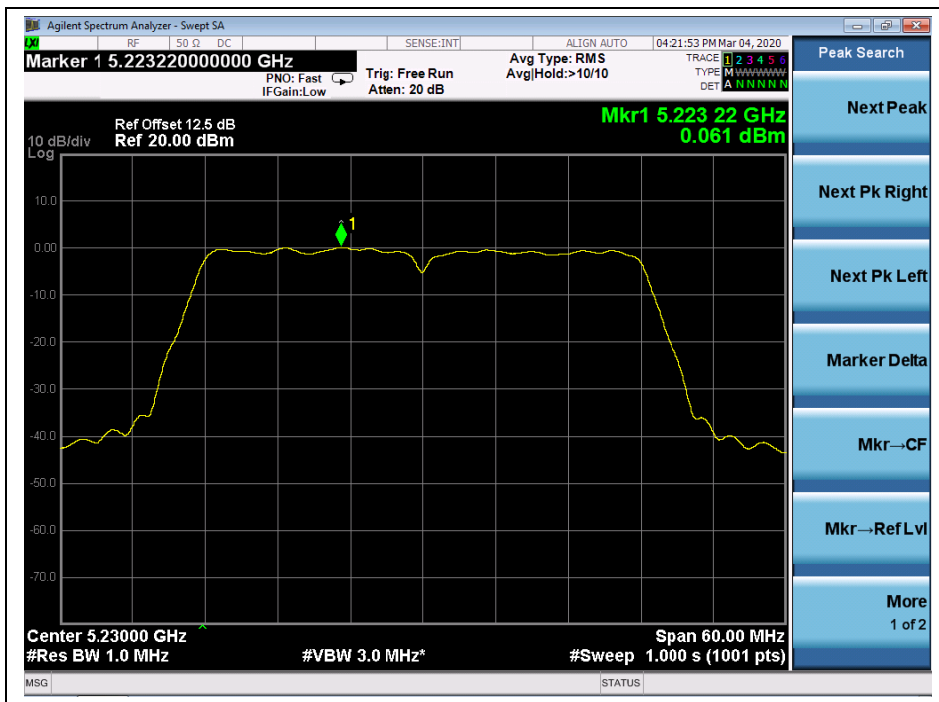
**A. Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT 0	ANT 1				
38	5190	-2.52	1.20	0.00	2.74	9.99	PASS
46	5230	-0.33	0.06		2.88		
54	5270	-0.91	0.66		2.96		
62	5310	-2.45	-0.07		1.91		
102	5510	-3.15	-2.02		0.46		
126	5630	-3.49	-0.46		1.29		
142	5710	-4.23	-0.08		1.33		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT 0	ANT 1				
142	5710	-6.93	-2.64	0.00	-1.27	28.99	PASS
151	5755	-5.81	-0.75		0.43		
159	5795	-6.03	-0.37		0.67		
<p><b>Note:</b> Directional gain = <math>4.0\text{dBi} + 10\log(2) = 7.01\text{dBi} &gt; 6\text{dBi}</math>, so the limit shall be 10.49dBm/MHz for 5.18-5.24 GHz, 5.260-5.320 GHz, 5.500-5.720 GHz band and 28.49dBm/500KHz for 5.745-5.825 GHz band.</p>							

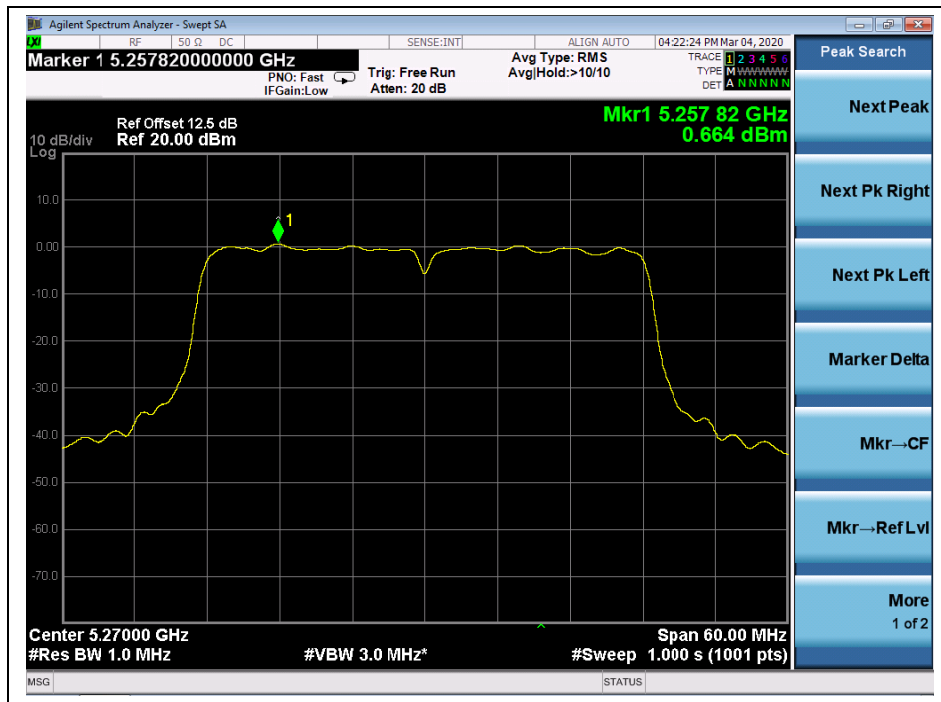
B. Test Plots



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



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

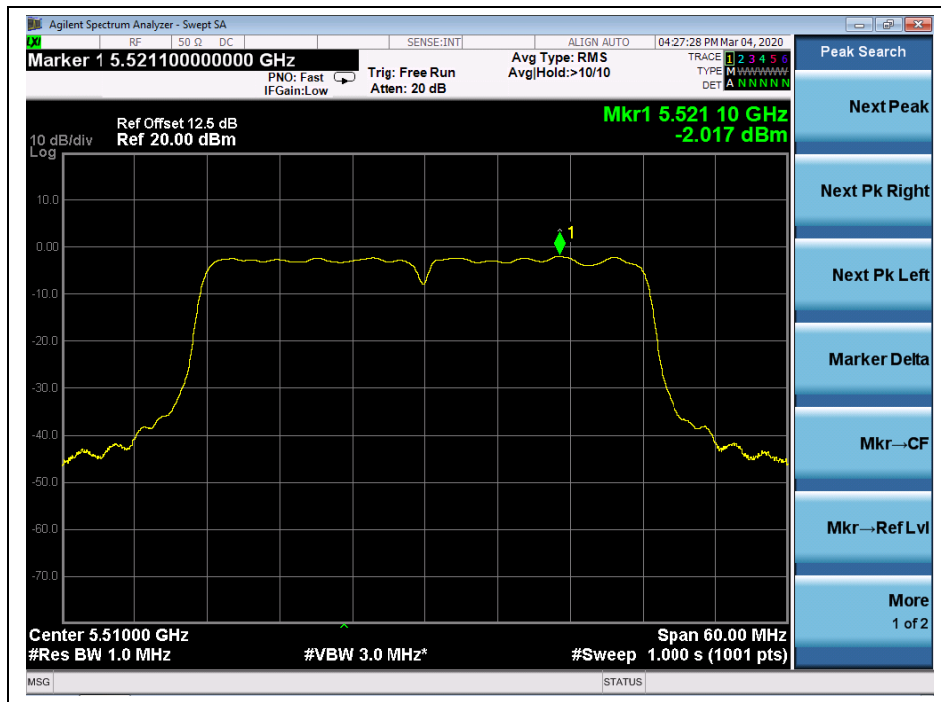


(Channel 54, 5270MHz, 802.11n(HT40), ANT1)

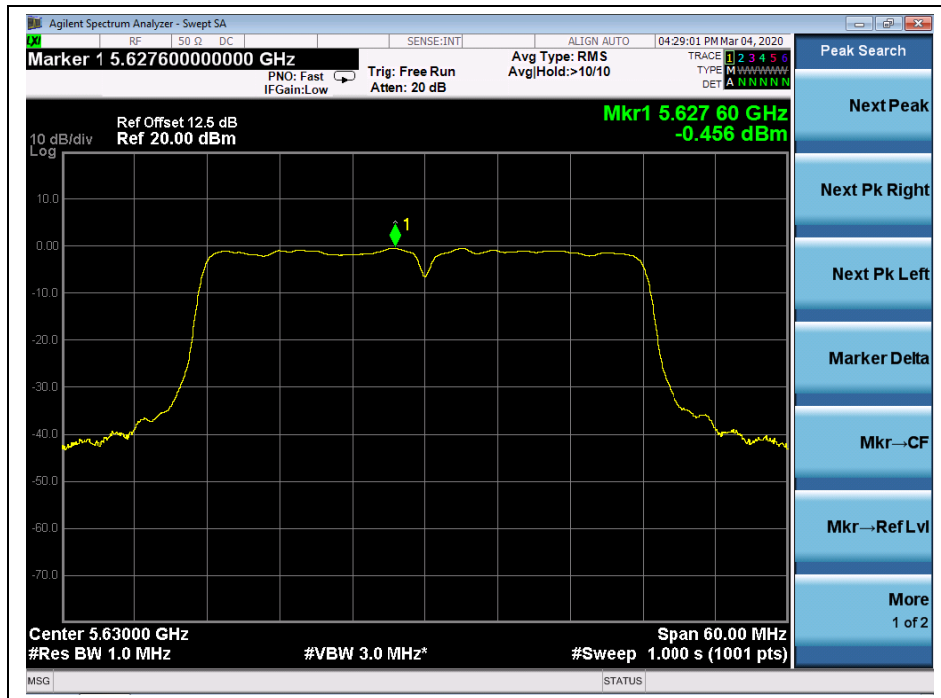


(Channel 62, 5310 MHz, 802.11n(HT40), ANT1)





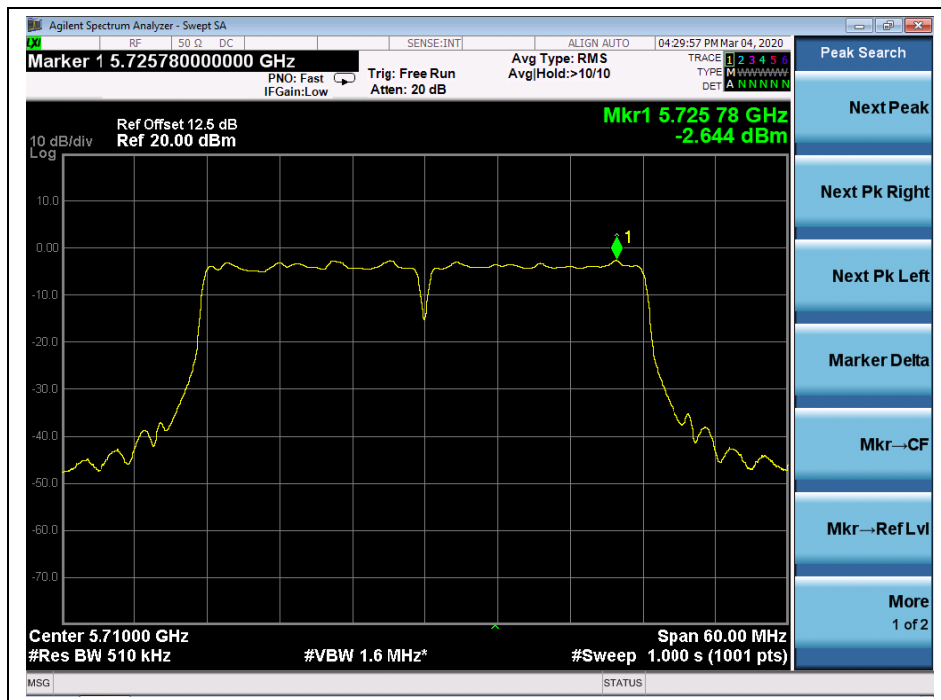
(Channel 102,5510MHz, 802.11n(HT40), ANT1)



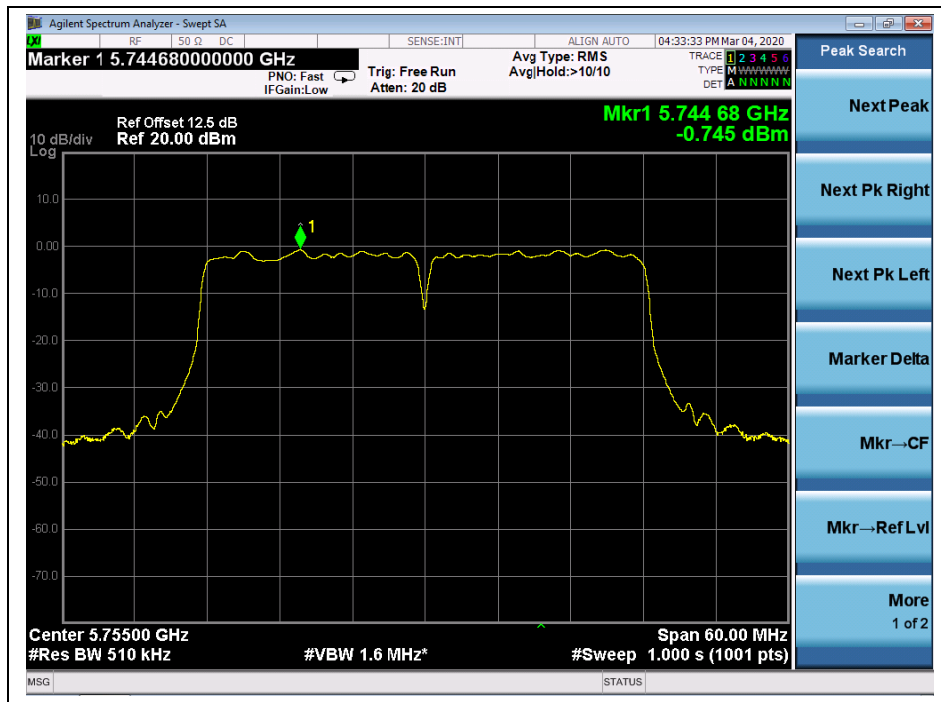
(Channel 126, 5630 MHz, 802.11n(HT40), ANT1)



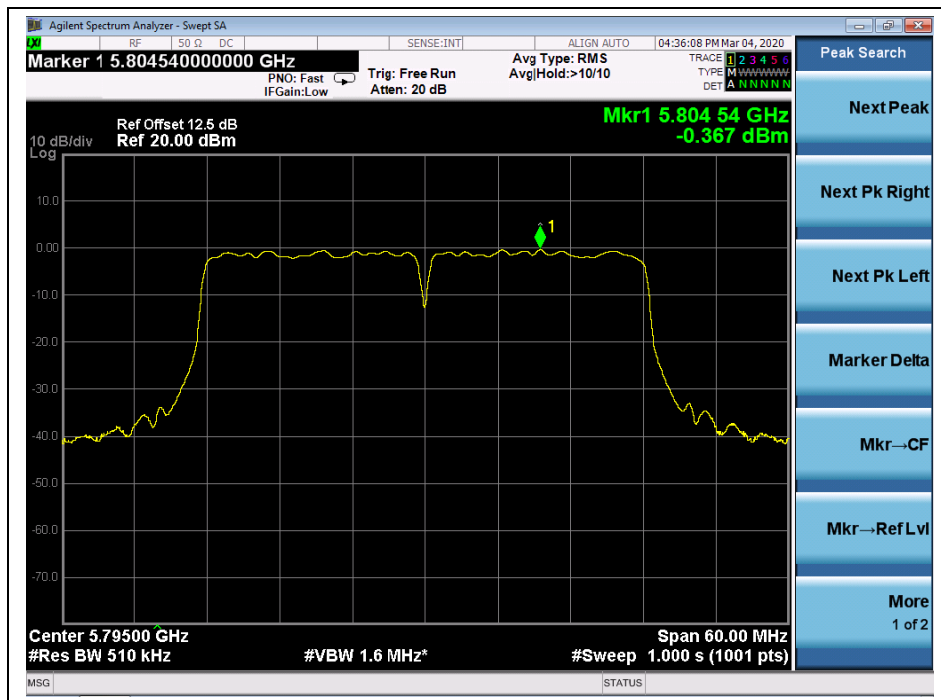
(Channel 142,5710MHz, 802.11n(HT40), ANT1)



(Channel 142,5710MHz, 802.11n(HT40), ANT1)



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



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



**802.11ac(VHT20) Test mode**

**A. Test Verdict:**

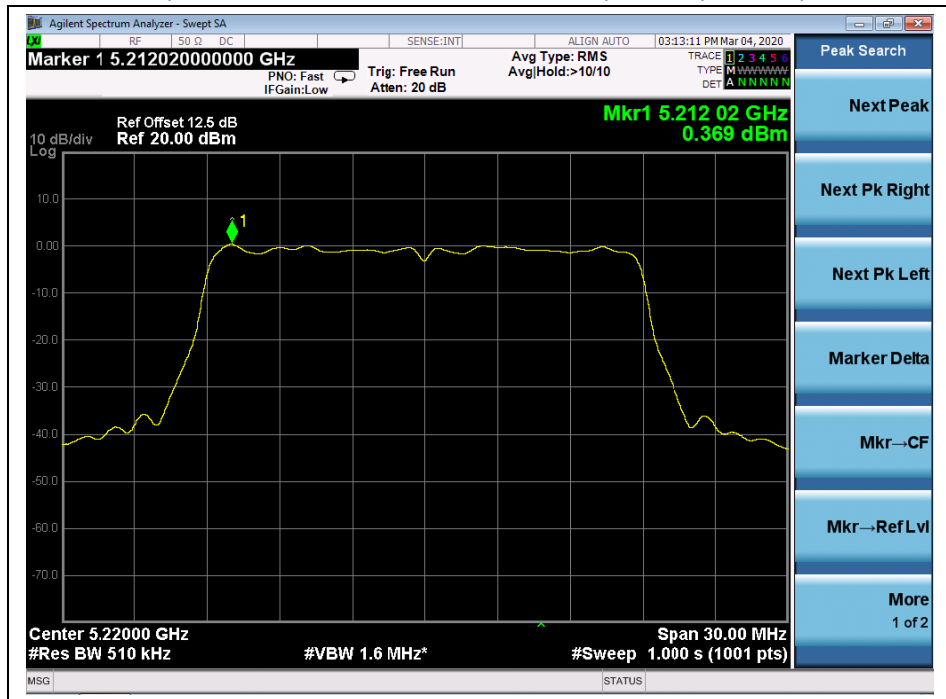
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT 0	ANT 1				
36	5180	3.94	3.58	0.00	6.77	9.99	PASS
44	5220	2.92	0.37		4.84		
48	5240	2.90	2.49		5.71		
52	5260	2.30	3.34		5.86		
60	5300	1.74	2.72		5.27		
64	5320	0.60	1.94		4.33		
100	5500	-0.28	0.58		3.18		
120	5600	0.00	2.02		4.14		
144	5720	-2.42	2.75		3.90		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)			Duty Factor		
		ANT 0	ANT 1				
144	5720	-5.47	0.04	0.00	1.12	28.99	PASS
149	5745	-2.52	1.84		3.20		
157	5785	-3.92	2.27		3.21		
165	5825	-2.89	2.53		3.63		
<p><b>Note:</b> Directional gain = <math>4.0\text{dBi} + 10\log(2) = 7.01\text{dBi} &gt; 6\text{dBi}</math>, so the limit shall be <math>10.49\text{dBm/MHz}</math> for 5.18-5.24 GHz, 5.260-5.320 GHz, 5.500-5.720 GHz band and <math>28.49\text{dBm/500KHz}</math> for 5.745-5.825 GHz band.</p>							



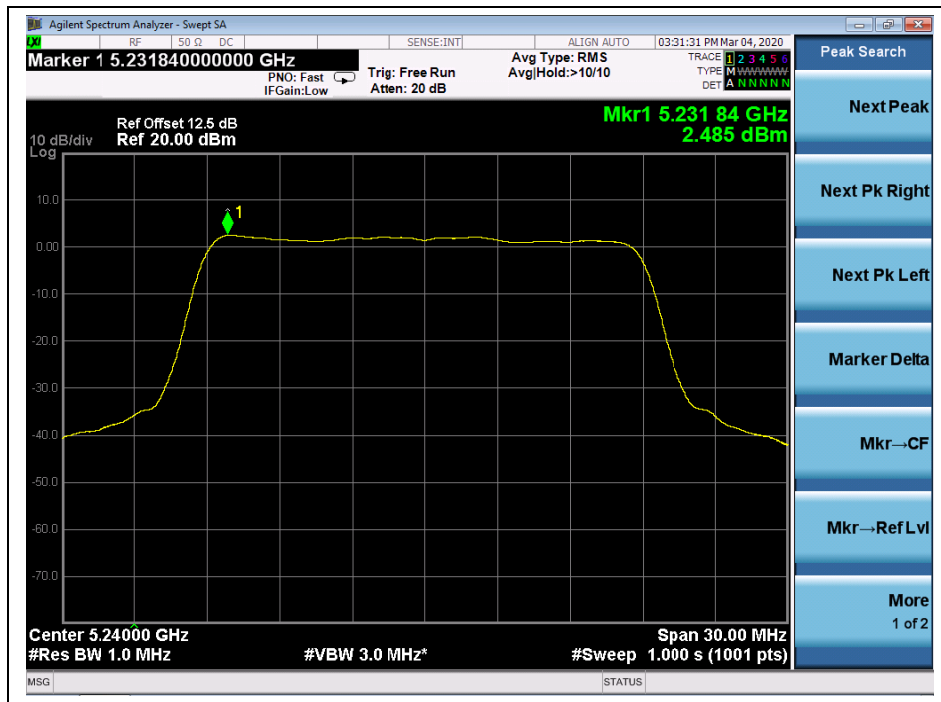
B. Test Plots



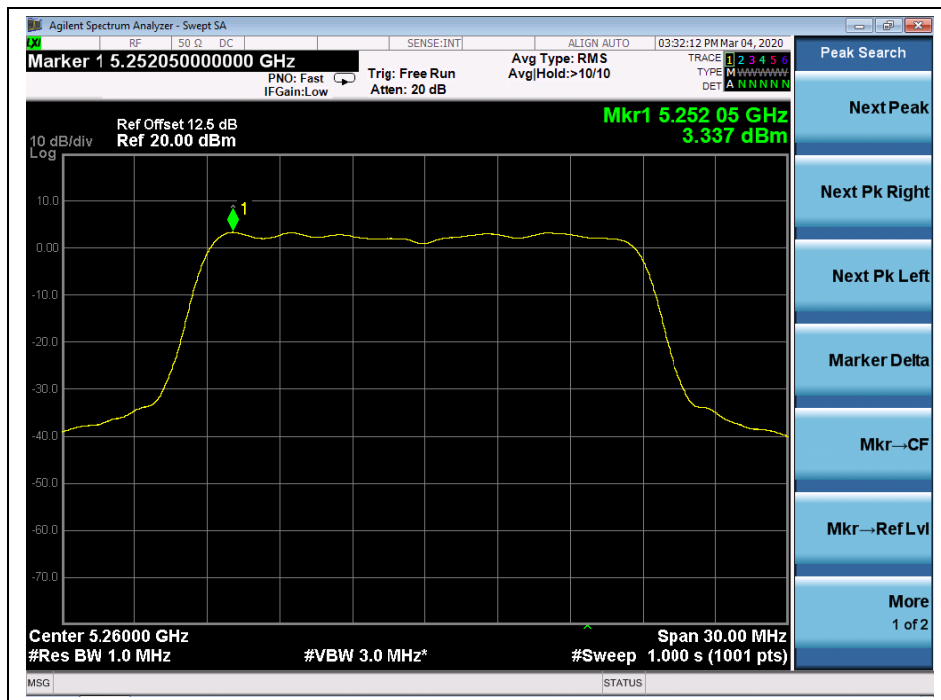
(Channel 36, 5180MHz, 802.11ac (VHT20), ANT1)



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



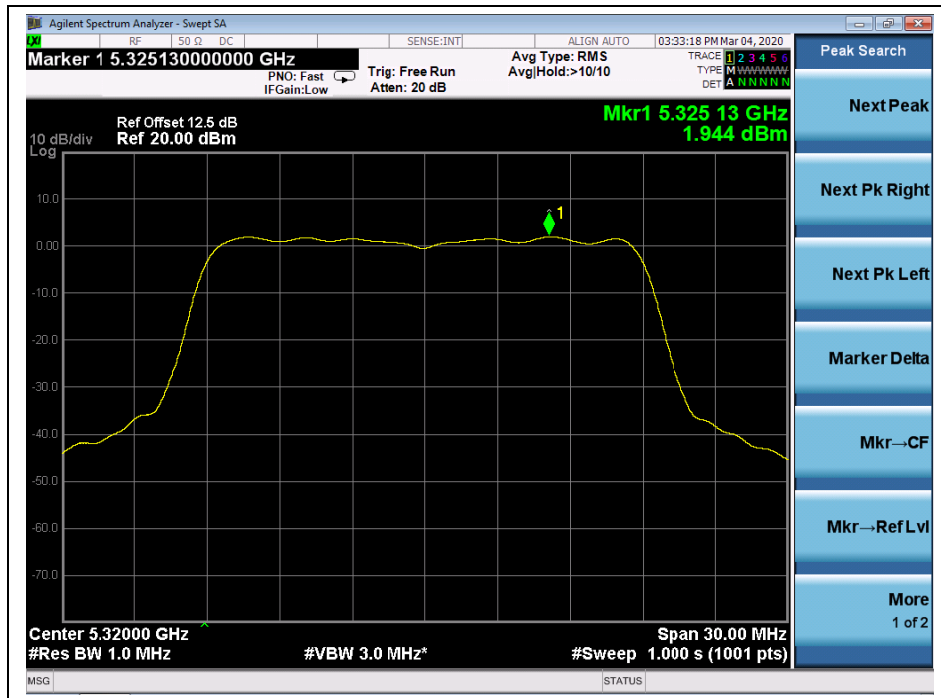
(Channel 48, 5240MHz, 802.11ac(VHT20), ANT1)



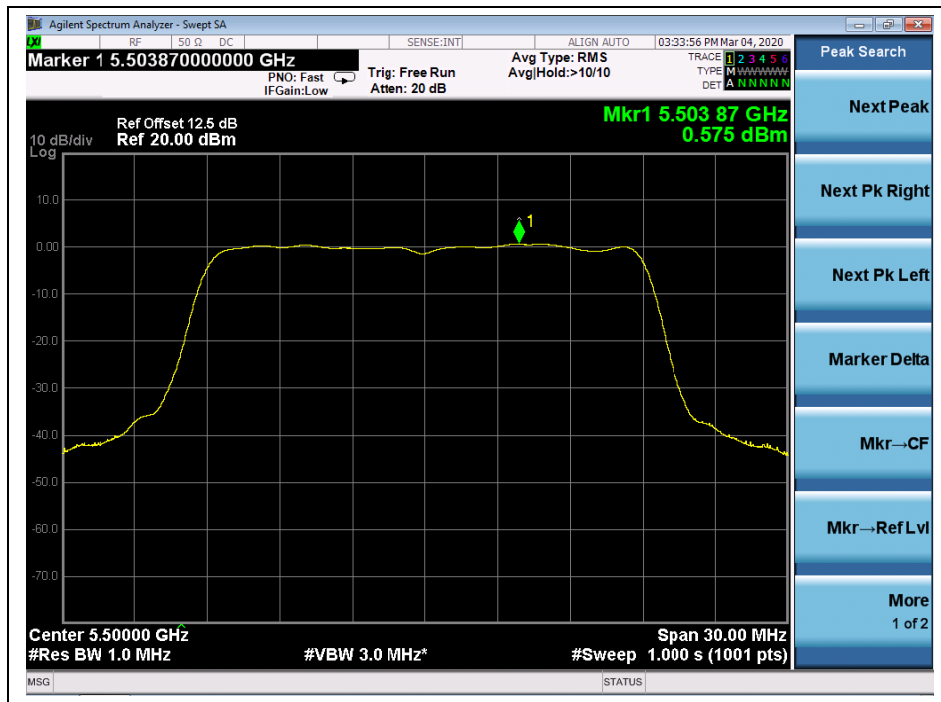
(Channel 52, 5260MHz, 802.11ac(VHT20), ANT1)



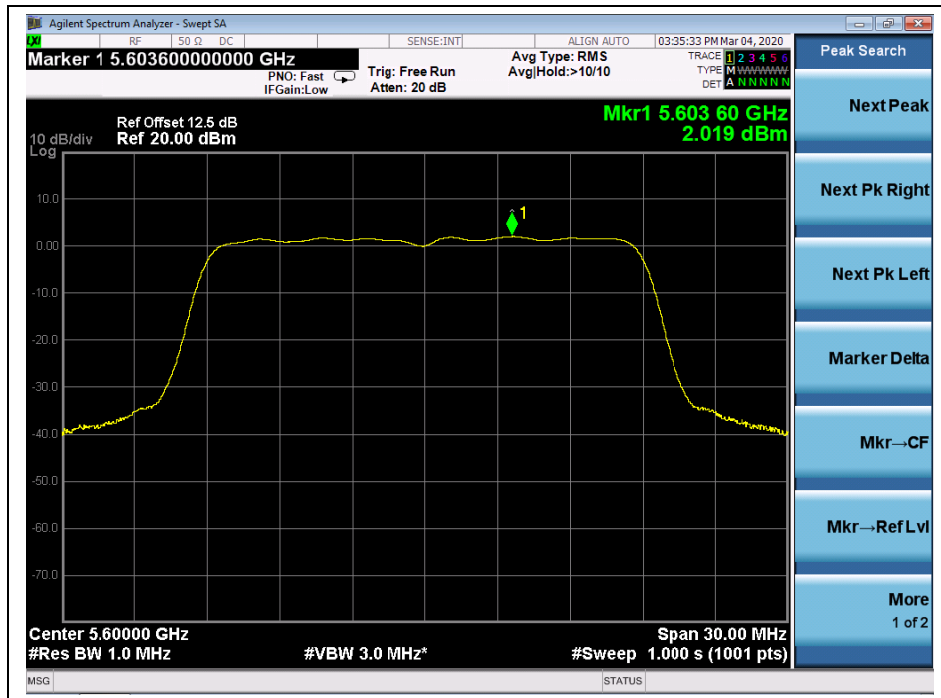
(Channel 60, 5300 MHz, 802.11ac(VHT20), ANT1)



(Channel 64, 5320MHz, 802.11ac (VHT20), ANT1)

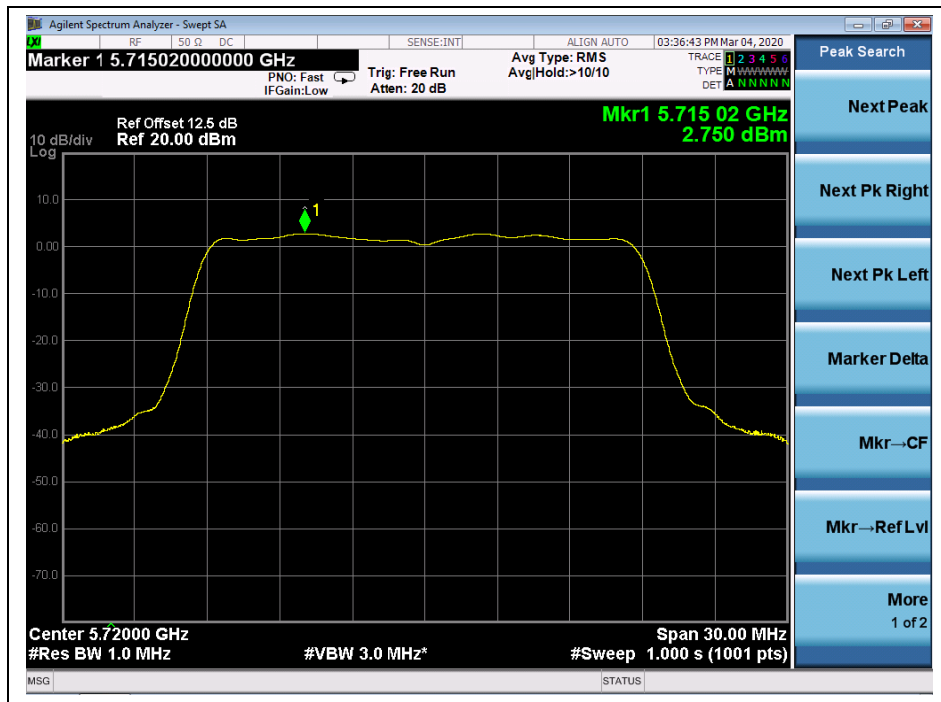


(Channel 100, 5500MHz, 802.11ac (VHT20), ANT1)

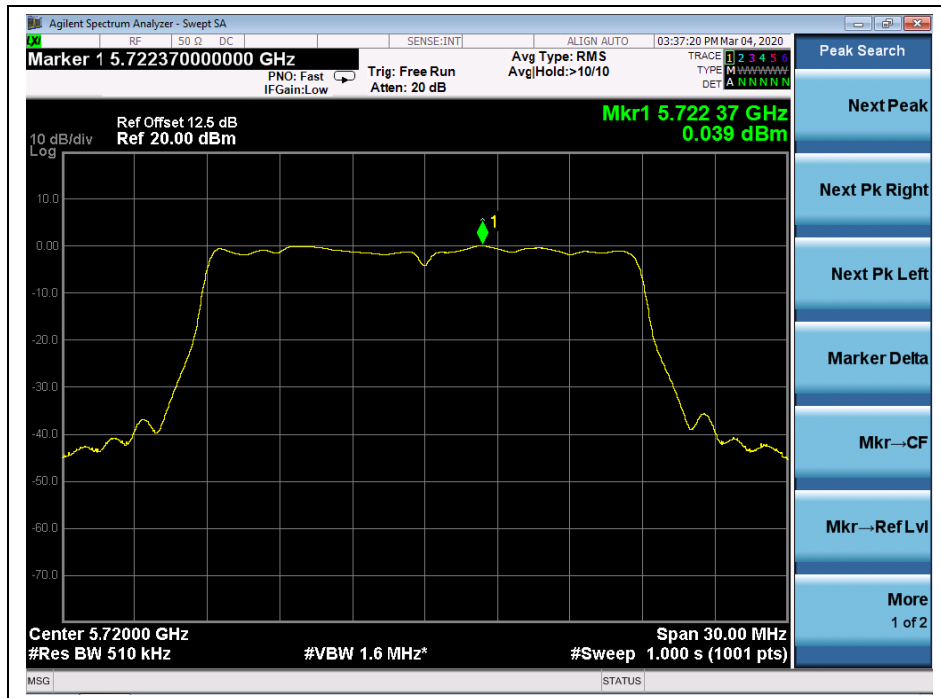


(Channel 120, 5600 MHz, 802.11ac (VHT20), ANT1)





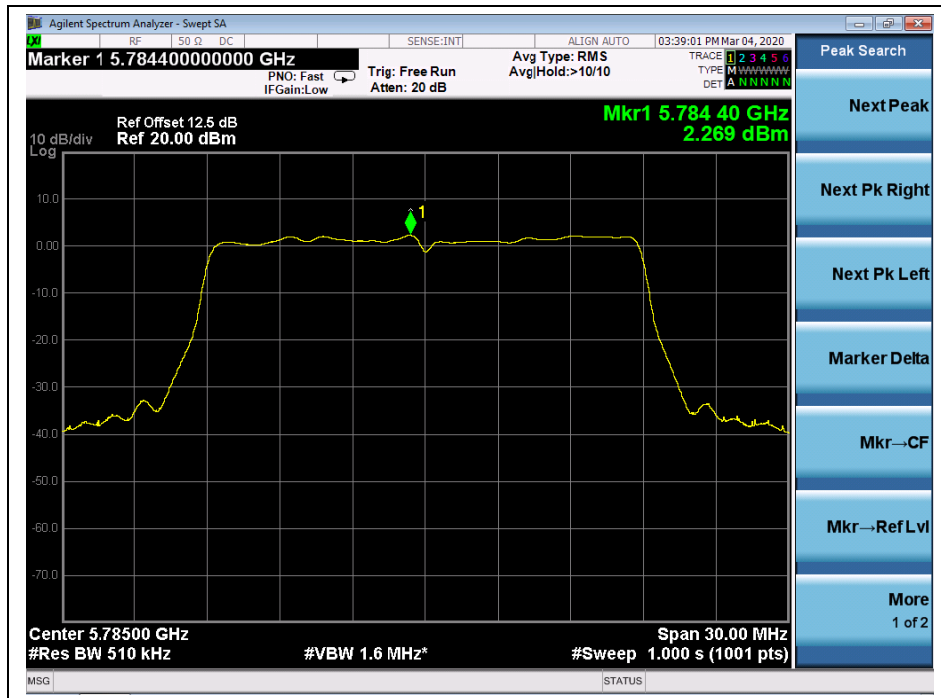
(Channel 144, 5720MHz, 802.11ac (VHT20), ANT1)



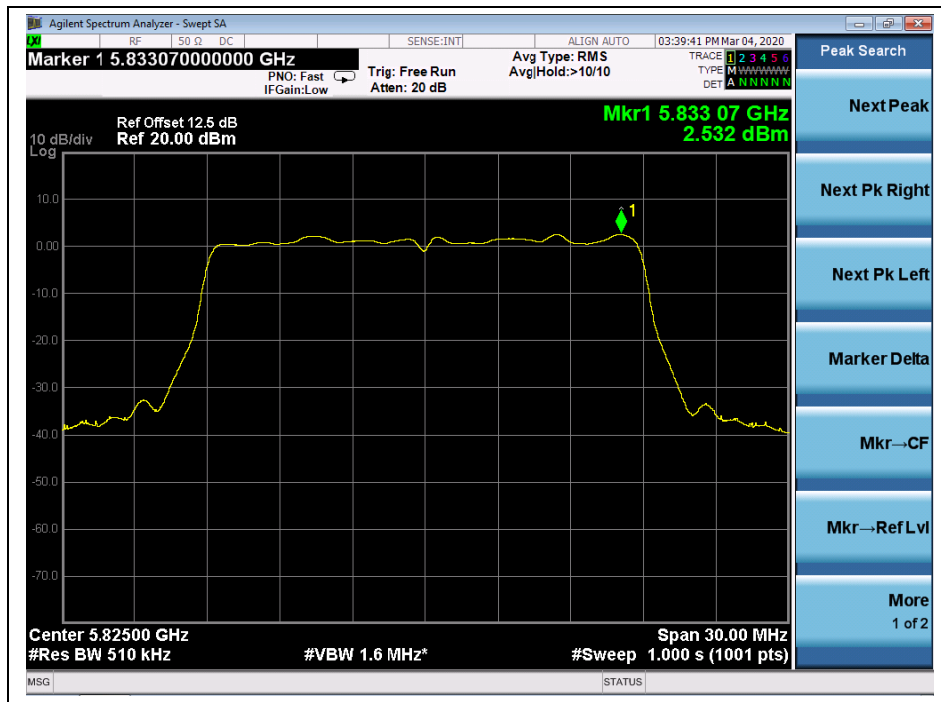
(Channel 144, 5720MHz, 802.11ac(VHT20), ANT1)



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



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



(Channel 165,5825MHz, 802.11ac(VHT20), ANT1)



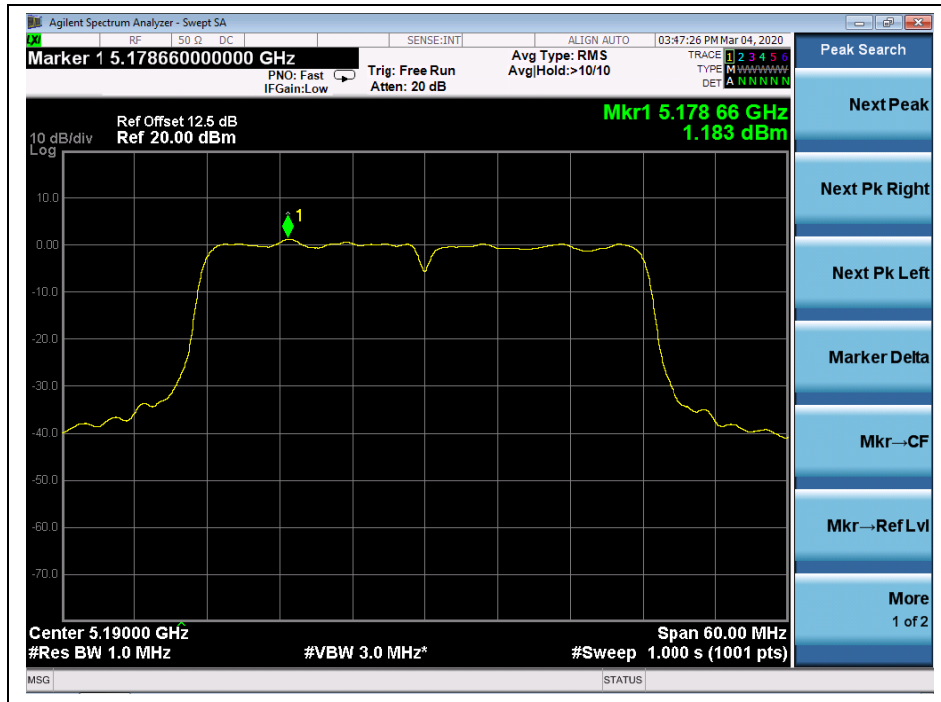
**802.11ac (VHT40) Test mode**

**A. Test Verdict:**

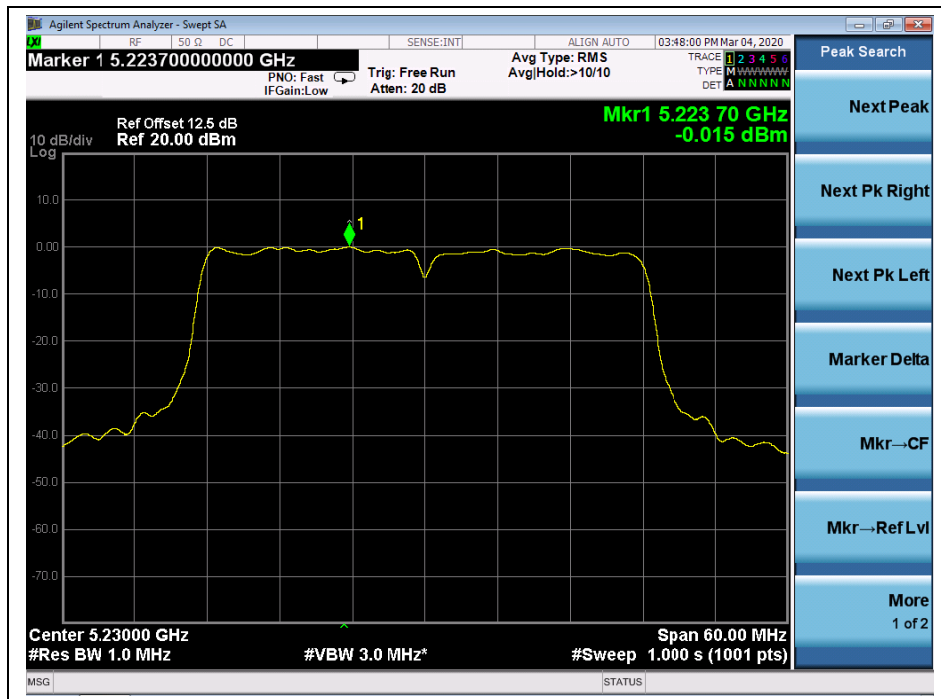
Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT 0	ANT 1				
38	5190	0.49	1.18	0.00	3.86	9.99	PASS
46	5230	-0.01	-0.02		3.00		
54	5270	-0.69	0.45		2.93		
62	5310	-1.79	-0.39		1.98		
102	5510	-3.64	-1.77		0.41		
126	5630	-4.71	-0.63		0.80		
142	5710	-5.28	-0.06		1.08		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT 0	ANT 1				
142	5710	-7.37	-3.00	0.00	-1.65	28.99	PASS
151	5755	-5.99	-1.01		0.19		
159	5795	-5.69	-0.50		0.65		
<p><b>Note:</b> Directional gain = 4.0dBi + 10log(2) = 7.01dBi &gt; 6dBi, so the limit shall be 10.49dBm/MHz for 5.18-5.24 GHz, 5.260-5.320 GHz, 5.500-5.720 GHz band and 28.49dBm/500KHz for 5.745-5.825 GHz band.</p>							



B. Test Plots



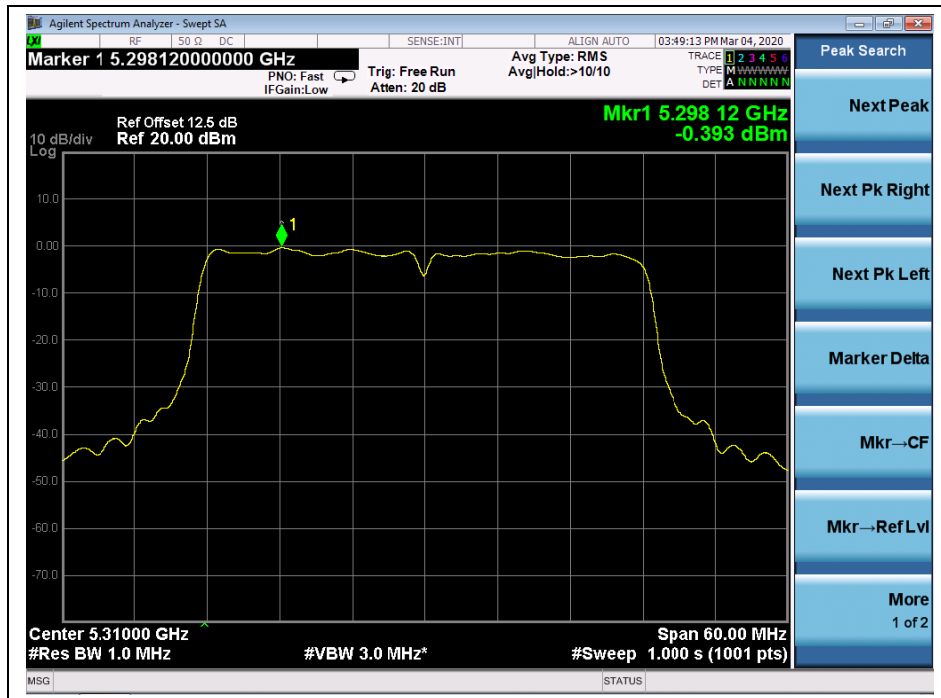
(Channel 38,5190MHz, 802.11ac (VHT40), ANT1)



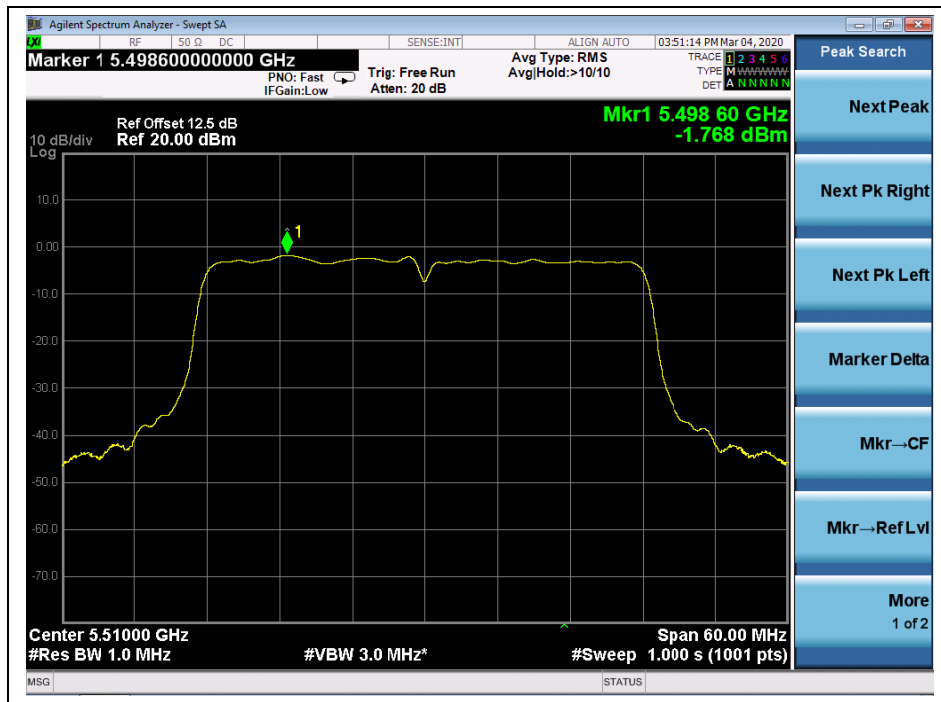
(Channel 46, 5230 MHz, 802.11ac (VHT40), ANT1)



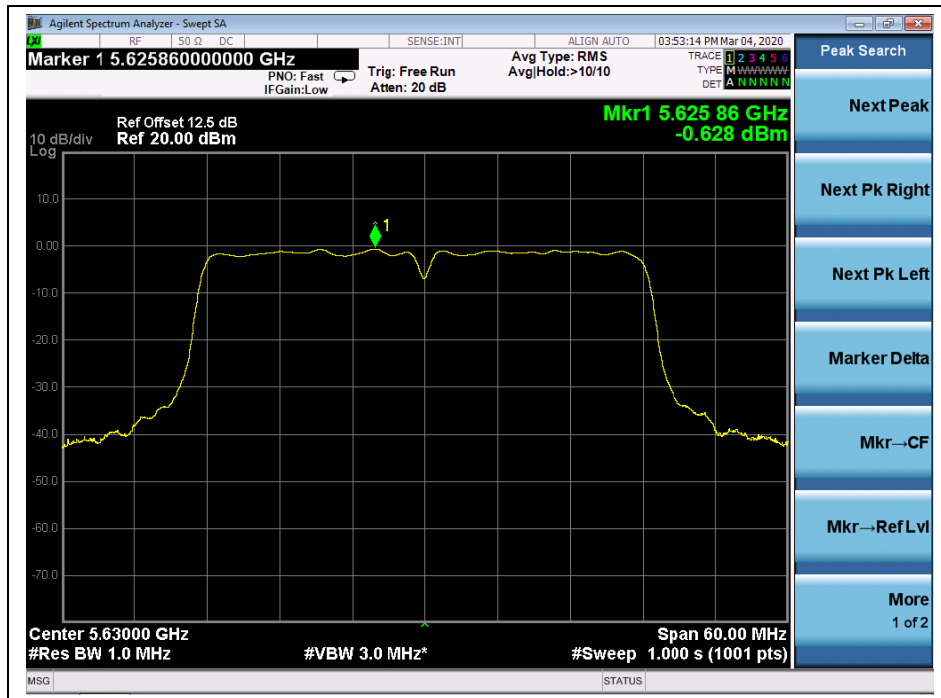
(Channel 54, 5270MHz, 802.11ac (VHT40), ANT1)



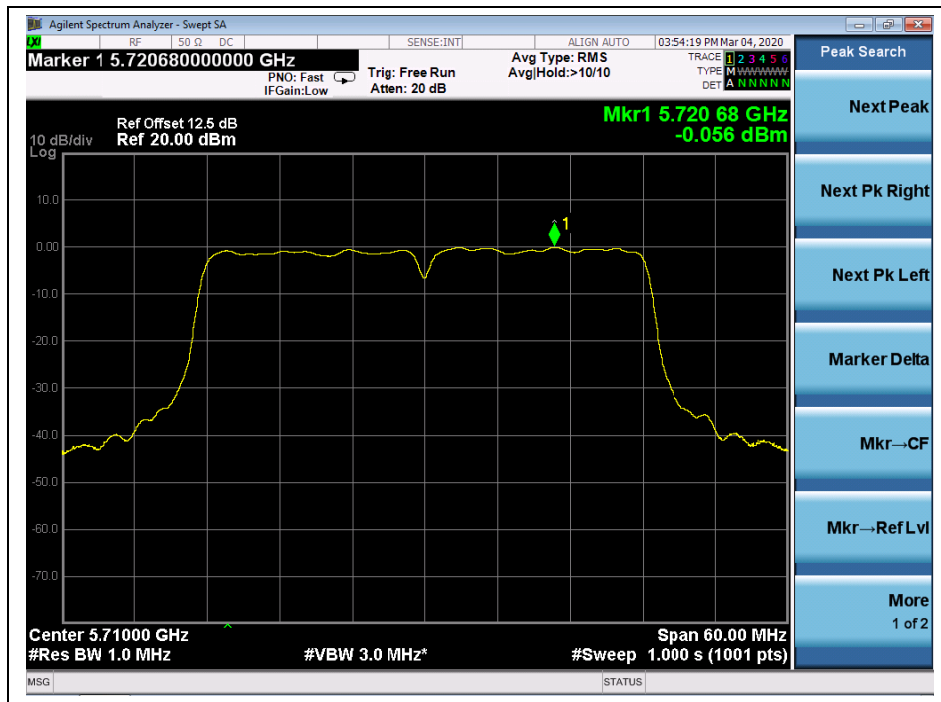
(Channel 62, 5310MHz, 802.11ac (VHT40), ANT1)



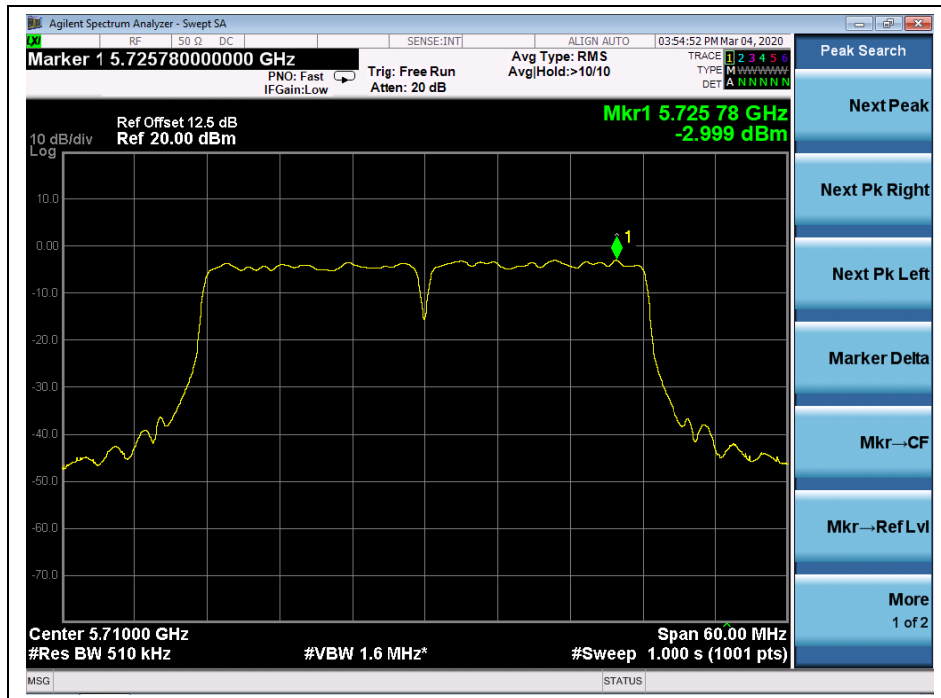
(Channel 102, 5510 MHz, 802.11ac (VHT40), ANT1)



(Channel 126, 5630MHz, 802.11ac (VHT40), ANT1)

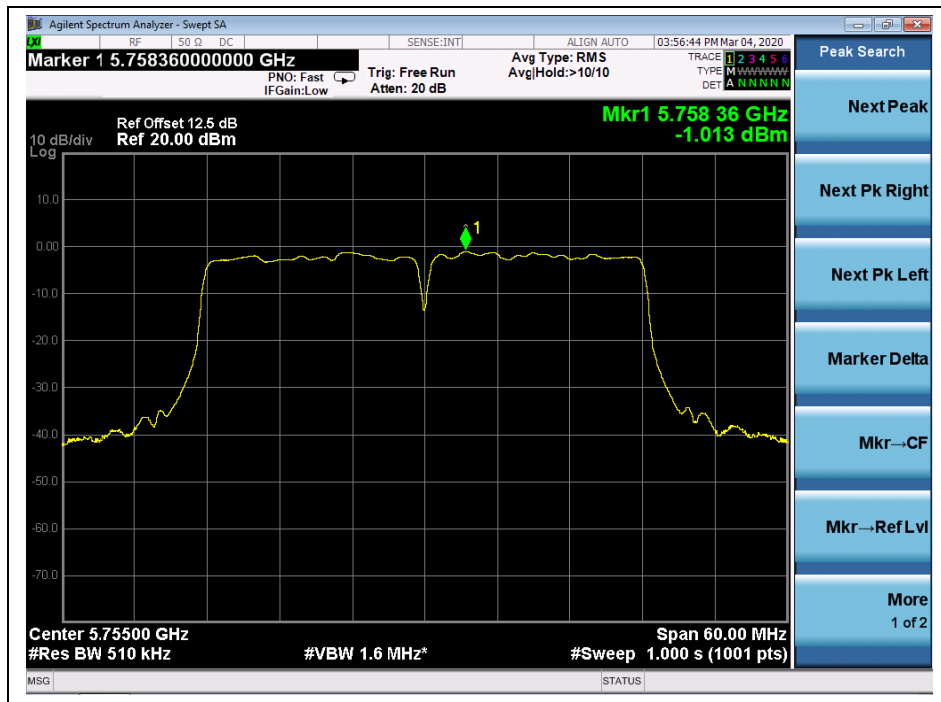


(Channel 142, 5710MHz, 802.11ac (VHT40), ANT1)

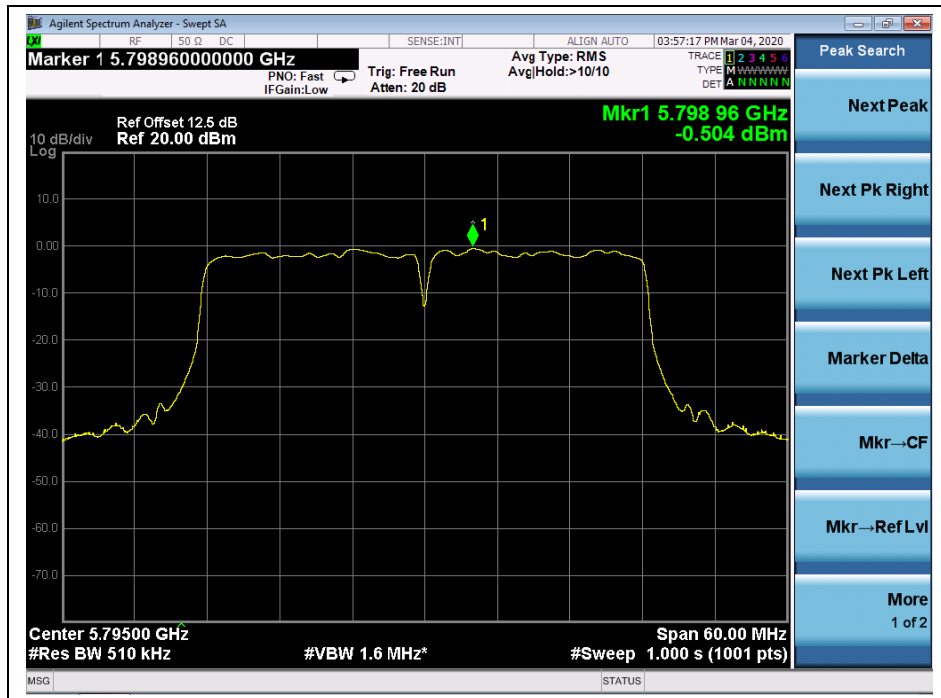


(Channel 142, 5710 MHz, 802.11ac (VHT40), ANT1)





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



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



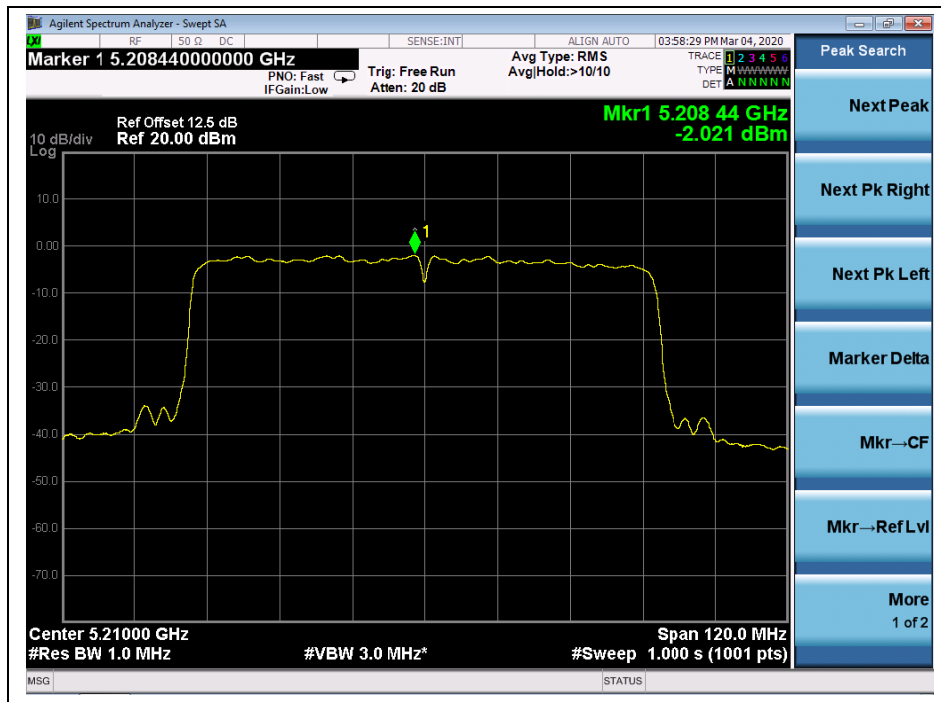
**802.11ac (VHT80) Test mode**

**A. Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
		ANT 0	ANT 1				
42	5210	-2.79	-2.02	0.00	0.62	9.99	PASS
58	5290	-4.22	-2.20				
106	5530	-7.18	-4.86				
122	5610	-7.49	-3.26				
138	5690	-7.67	-3.21				
Channel	Frequency (MHz)	Measured PPSD(dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
		ANT 0	ANT 1				
138	5690	-10.45	-5.85	0.00	-4.56	28.99	PASS
155	5775	-8.03	-3.57				

**Note:** Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the limit shall be 10.49dBm/MHz for 5.18-5.24 GHz, 5.260-5.320 GHz, 5.500-5.720 GHz band and 28.49dBm/500KHz for 5.745-5.825 GHz band.

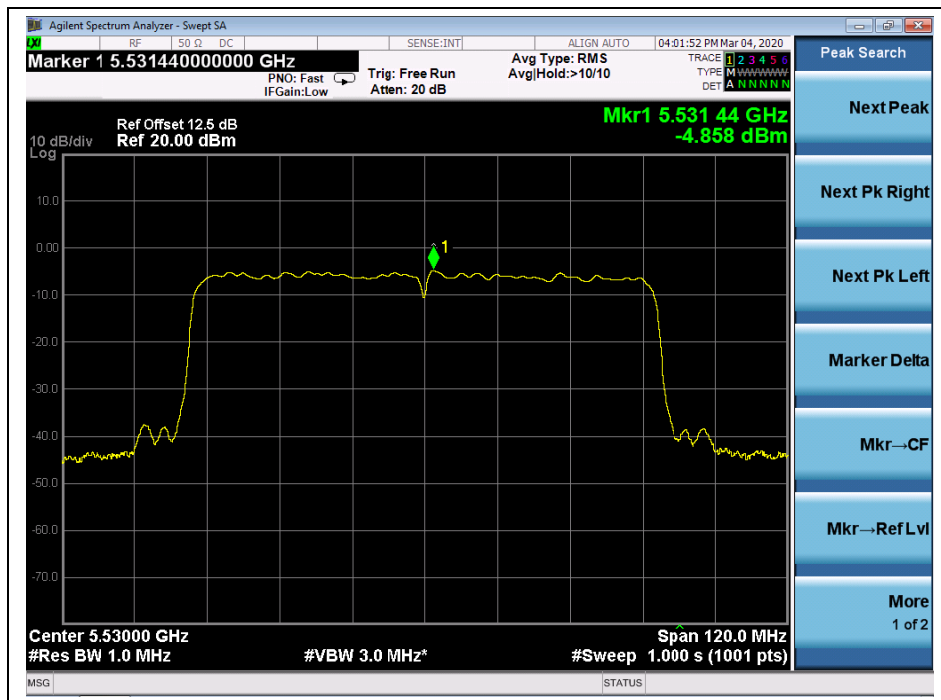
**B. Test Plots**



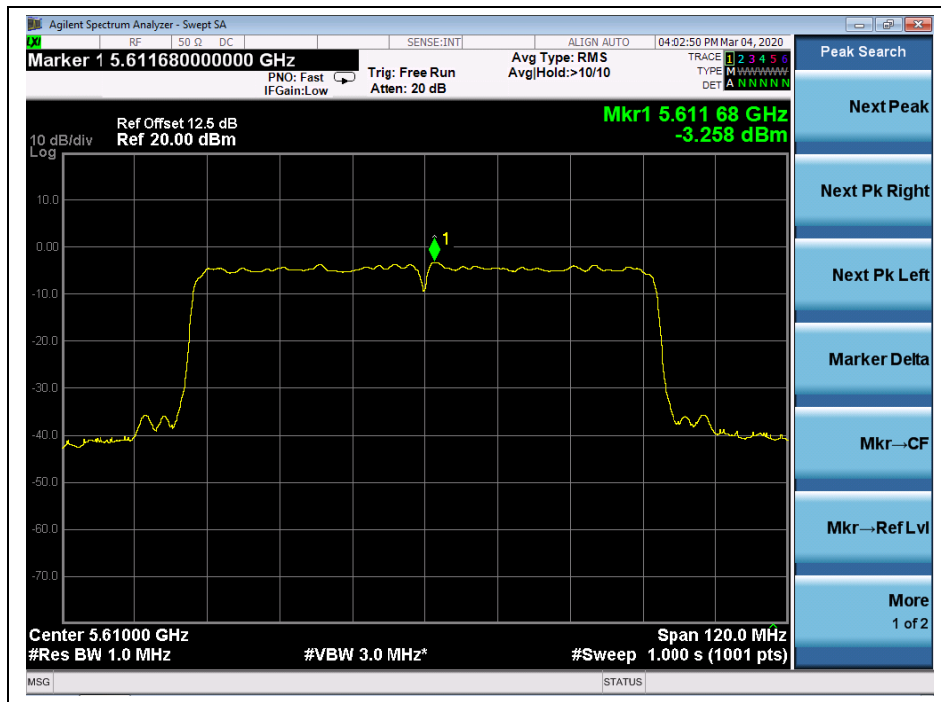
(Channel 42, 5210MHz, 802.11ac(VHT80), ANT1)



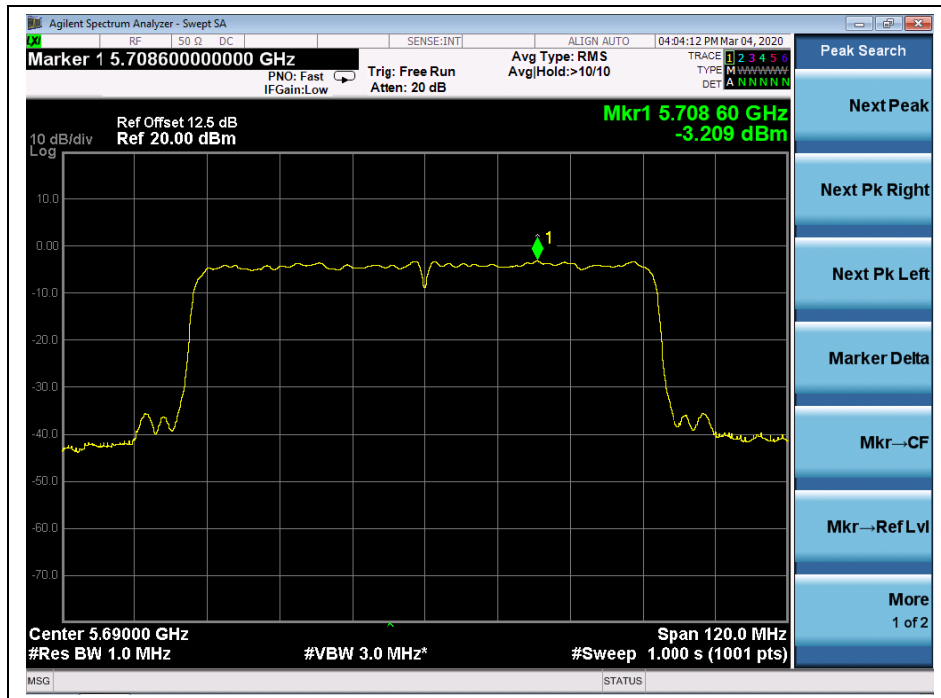
(Channel 58, 5290 MHz, 802.11ac(VHT80), ANT1)



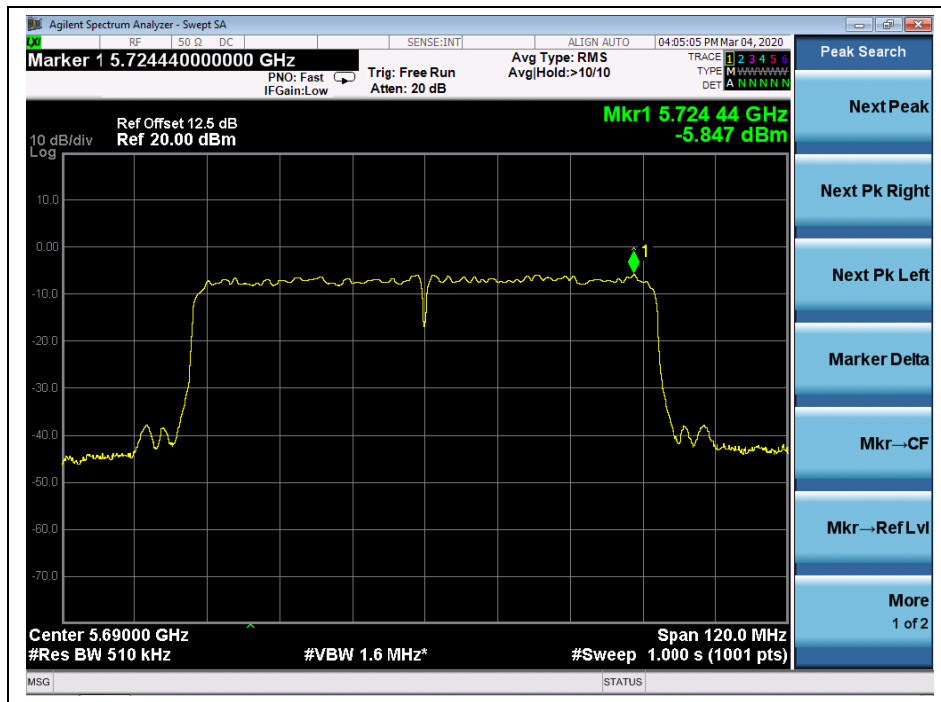
(Channel 106, 5530MHz, 802.11ac(VHT80), ANT1)



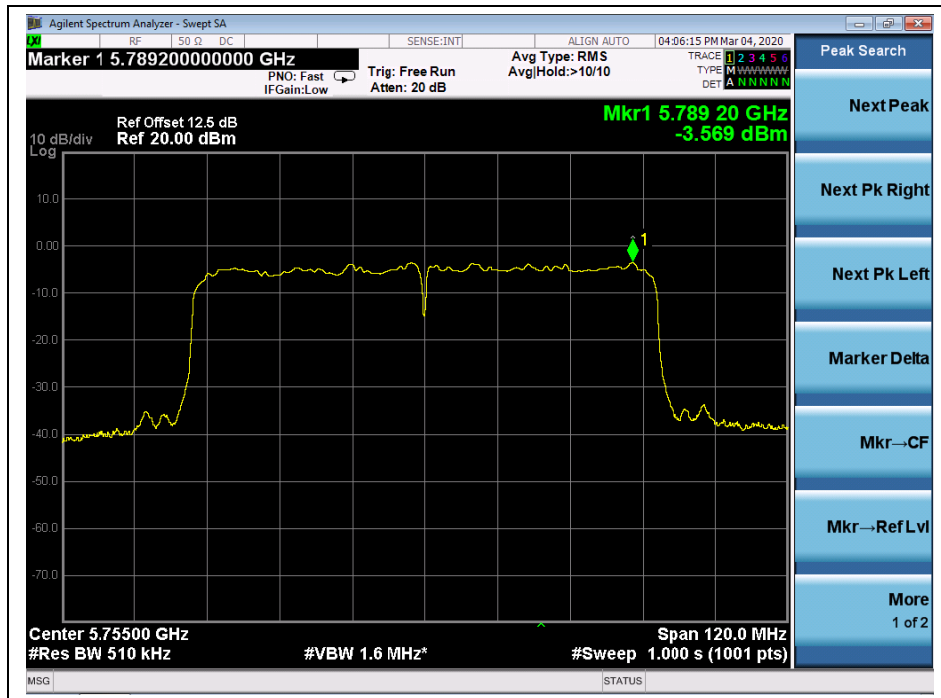
(Channel 122, 5610 MHz, 802.11ac(VHT80), ANT1)



(Channel 138, 5690MHz, 802.11ac(VHT80), ANT1)



(Channel 138, 5690 MHz, 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)	Freq Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	31	5.985
100%		-30	55	10.618
100%		-20	34	6.564
100%		-10	32	6.178
100%		0	34	6.564
100%		+10	32	6.178
100%		+20	37	7.143
100%		+30	44	8.494
100%		+40	49	9.459
100%		+50	51	9.846
85%		4.25	+20	25
115%	5.75	+20	28	5.405



U-NII-2A (Ch. 52)				
5260MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	32	6.084
100%		-30	23	4.373
100%		-20	18	3.422
100%		-10	33	6.274
100%		0	42	7.985
100%		+10	22	4.183
100%		+20	49	9.316
100%		+30	51	9.696
100%		+40	25	4.753
100%		+50	41	7.795
85%	4.25	+20	36	6.844
115%	5.75	+20	28	5.323

U-NII-2C (Ch. 100)				
5500MHz				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	25	4.545
100%		-30	23	4.182
100%		-20	18	3.273
100%		-10	21	3.818
100%		0	25	4.545
100%		+10	18	3.273
100%		+20	42	7.636
100%		+30	22	4.000
100%		+40	49	8.909
100%		+50	51	9.273
85%	4.25	+20	22	4.000
115%	5.75	+20	32	5.818



<b>U-NII-3 (Ch. 149)</b>				
<b>5745MHz</b>				
VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Freq Dev. (kHz)	Deviation (ppm)
100%	5.00	+20(Ref)	19	3.307
100%		-30	49	8.529
100%		-20	36	6.266
100%		-10	25	4.352
100%		0	23	4.003
100%		+10	18	3.133
100%		+20	21	3.655
100%		+30	25	4.352
100%		+40	33	5.744
100%		+50	42	7.311
85%		4.25	+20	22
115%	5.75	+20	32	5.570



## 2.7. Conducted Emission

### 2.7.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

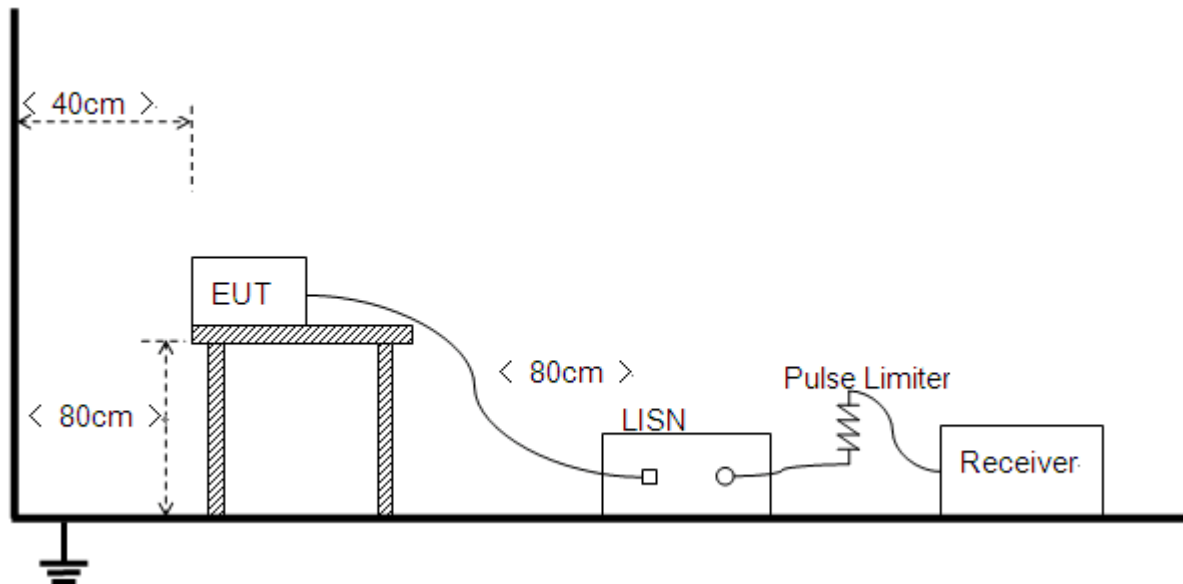
Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

**NOTE:**

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

### 2.7.2. Test Description

**TestSetup:**



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



### 2.7.3. Test Result

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

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

#### A. Test setup:

Test Mode: EUT+ADAPTER+WiFiTX

Test Voltage: AC 120V/60Hz

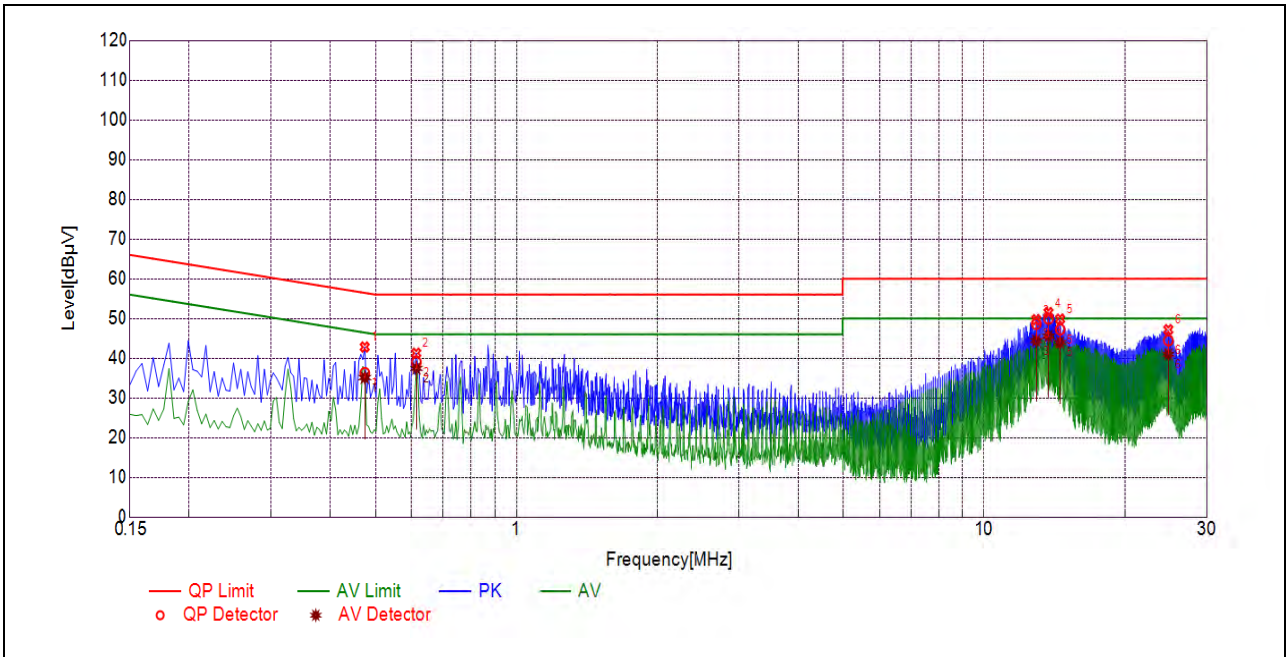
The measurement results are obtained as below:

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

$U_R$ : Receiver Reading

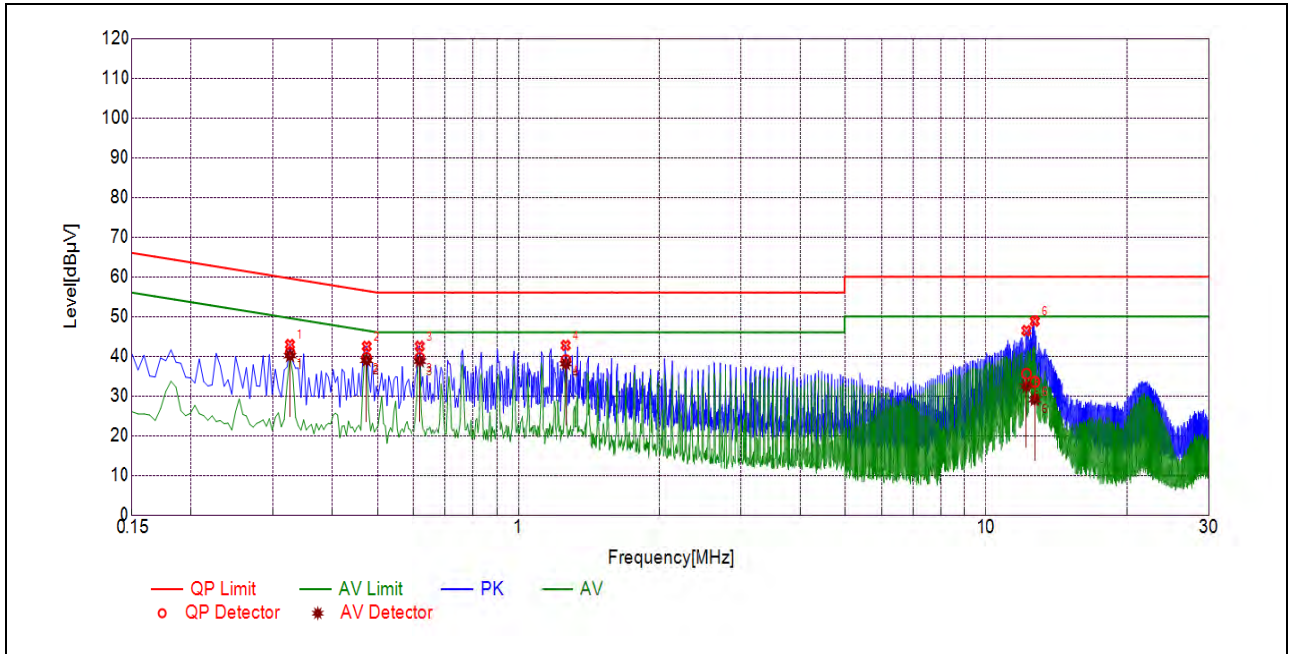
$A_{\text{Factor}}$ : Voltage division factor of LISN

**B. Test Plots:**



(L Phase)

NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.4741	36.29	35.12	56.44	46.44	Line	PASS
2	0.6140	39.01	37.44	56.00	46.00		PASS
3	12.9584	48.62	44.43	60.00	50.00		PASS
4	13.7546	49.93	45.55	60.00	50.00		PASS
5	14.5522	47.23	43.97	60.00	50.00		PASS
6	24.8308	44.49	41.03	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	0.3256	40.81	40.12	59.56	49.56	Neutral	PASS
2	0.4736	39.55	38.95	56.45	46.45		PASS
3	0.6182	39.55	38.74	56.00	46.00		PASS
4	1.2669	39.01	38.08	56.00	46.00		PASS
5	12.2364	35.58	32.45	60.00	50.00		PASS
6	12.7419	33.56	29.08	60.00	50.00		PASS

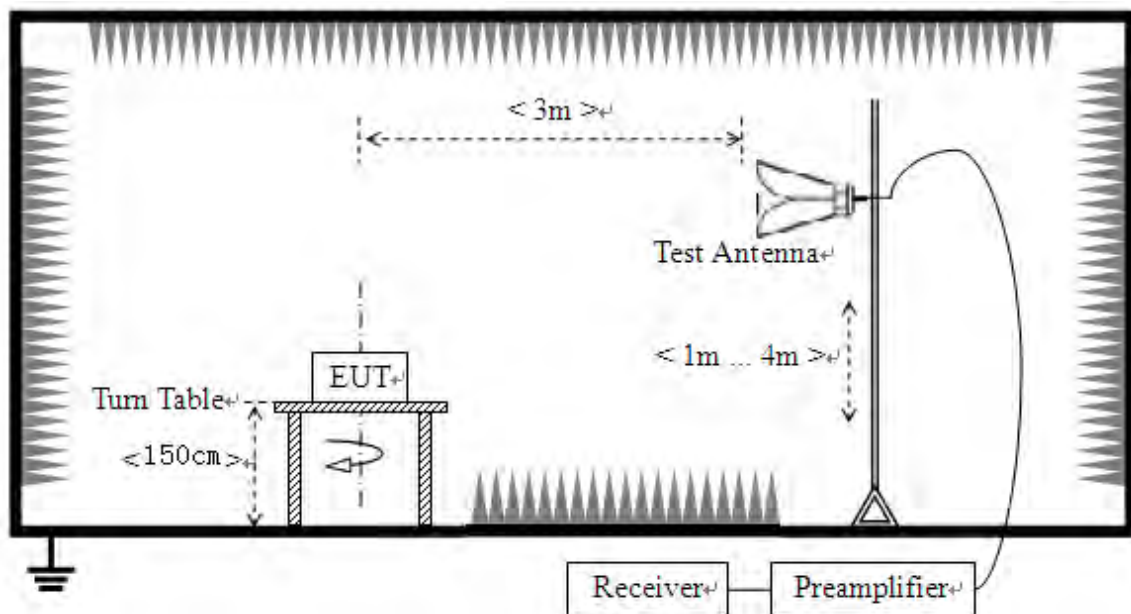
## 2.8. Restricted Frequency Bands

### 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:** Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

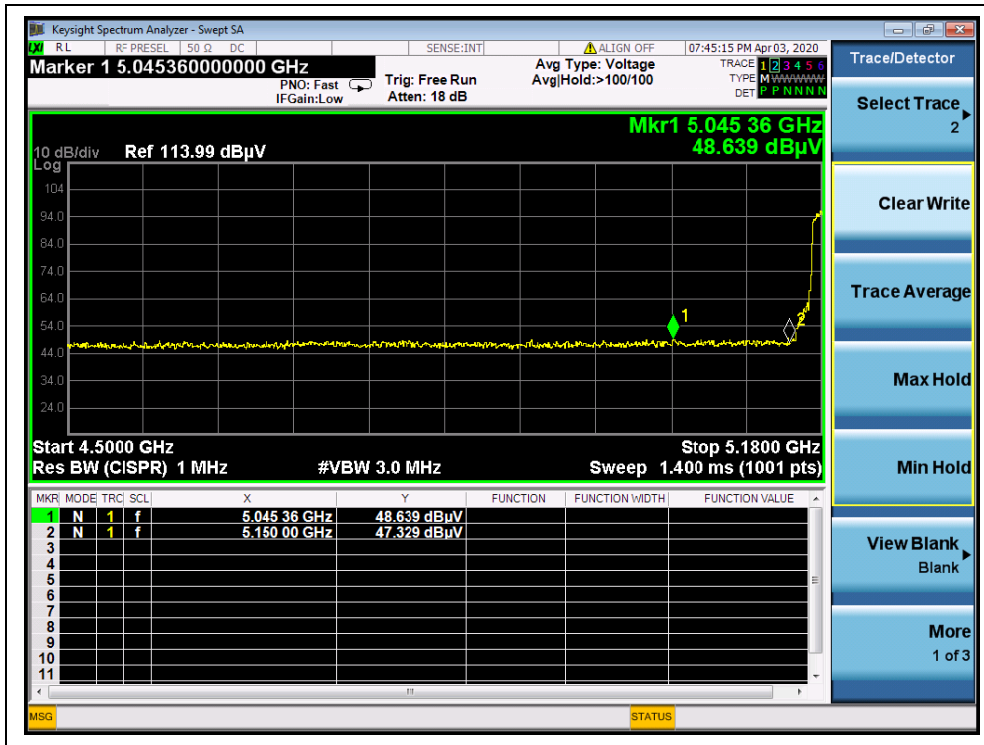
### 802.11a Test mode

#### A. Test Verdict:

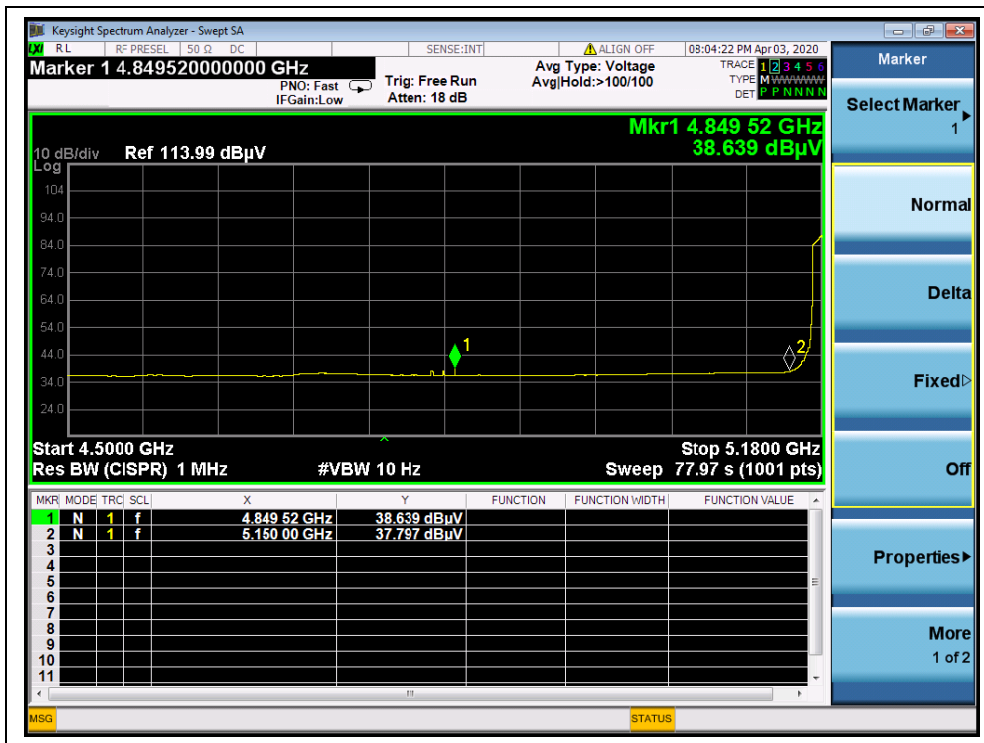
Channel	Frequency (MHz)	Detector	Receiver Reading	$A_T$ (dB)	$A_{\text{Factor}}$ (dB@3m)	Max. Emission E (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Verdict
		PK/ AV	$U_R$ (dB $\mu$ V)					
36	5045.36	PK	48.64	-26.92	32.20	53.92	74	PASS
36	4849.52	AV	38.64	-26.92	32.20	43.92	54	PASS
64	5359.90	PK	44.77	-26.80	32.20	50.17	74	PASS
64	5350.00	AV	34.31	-26.80	32.20	39.71	54	PASS
100	5470.00	PK	45.56	-26.64	32.20	51.12	74	PASS
100	5470.00	AV	34.56	-26.64	32.20	40.12	54	PASS
144	5738.10	PK	46.72	-26.64	32.20	52.28	68.23	PASS
144	5725.00	AV	34.71	-26.64	32.20	40.27	54	PASS
149	5723.00	PK	52.09	-26.23	32.20	58.06	117.67	PASS
149	5725.00	AV	36.84	-26.23	32.20	42.81	54	PASS
165	5850.00	PK	47.07	-26.23	32.20	53.04	122.23	PASS
165	5850.00	AV	35.35	-26.23	32.20	41.32	54	PASS



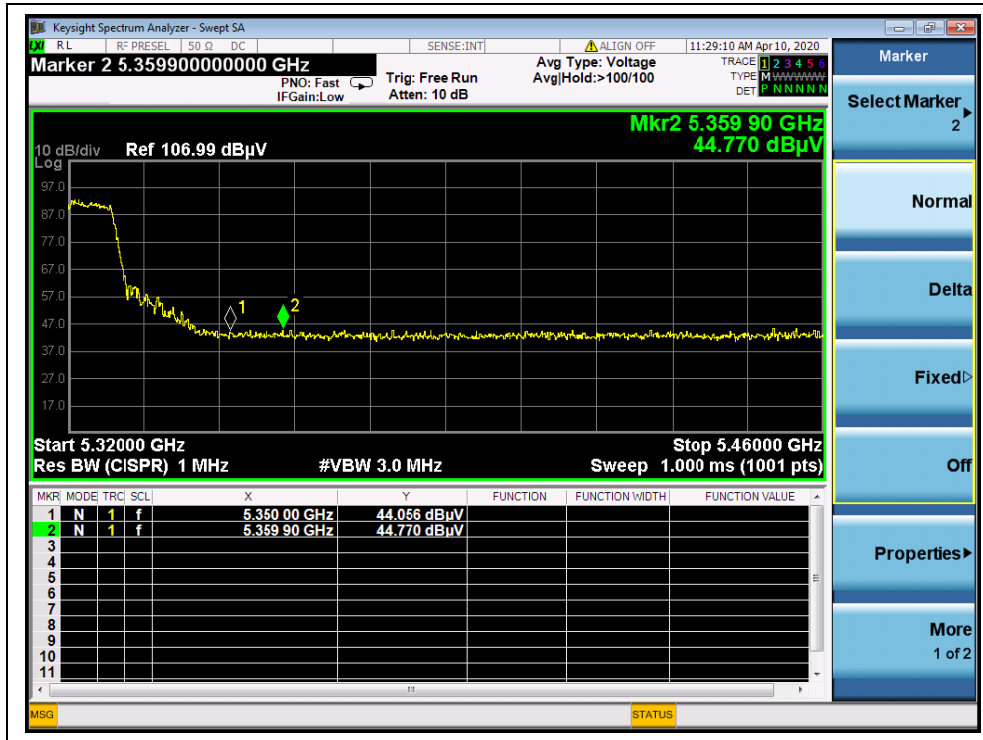
B. Test Plots:



(PEAK,Channel 36,802.11a)



(AVG,Channel 36,802.11a)

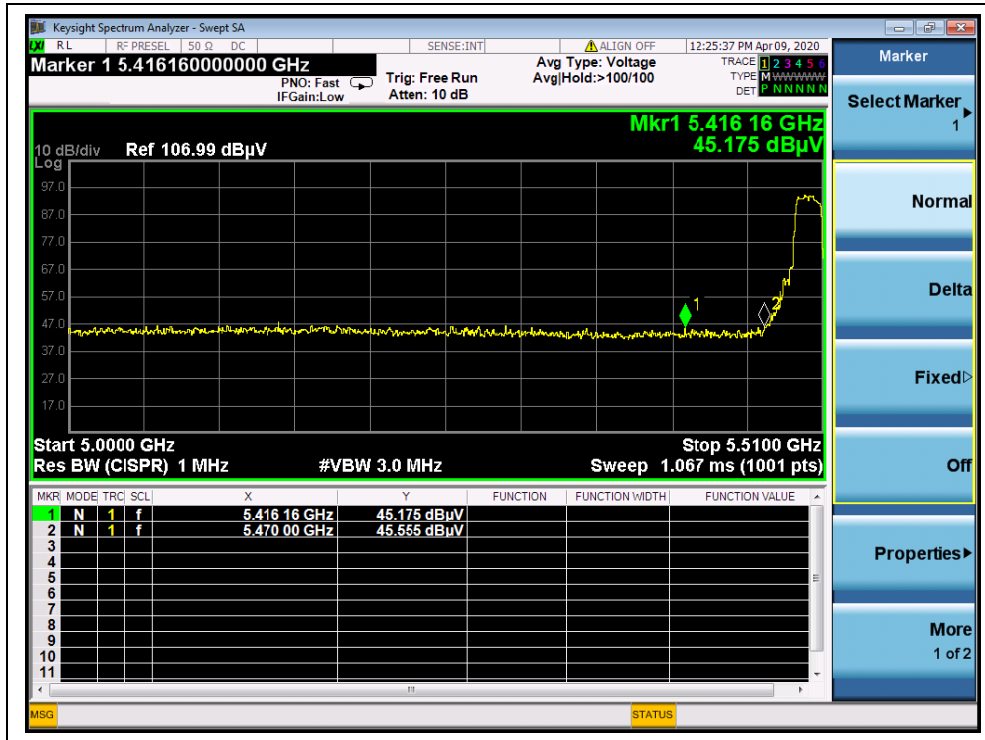


(PEAK,Channel64, 802.11a)

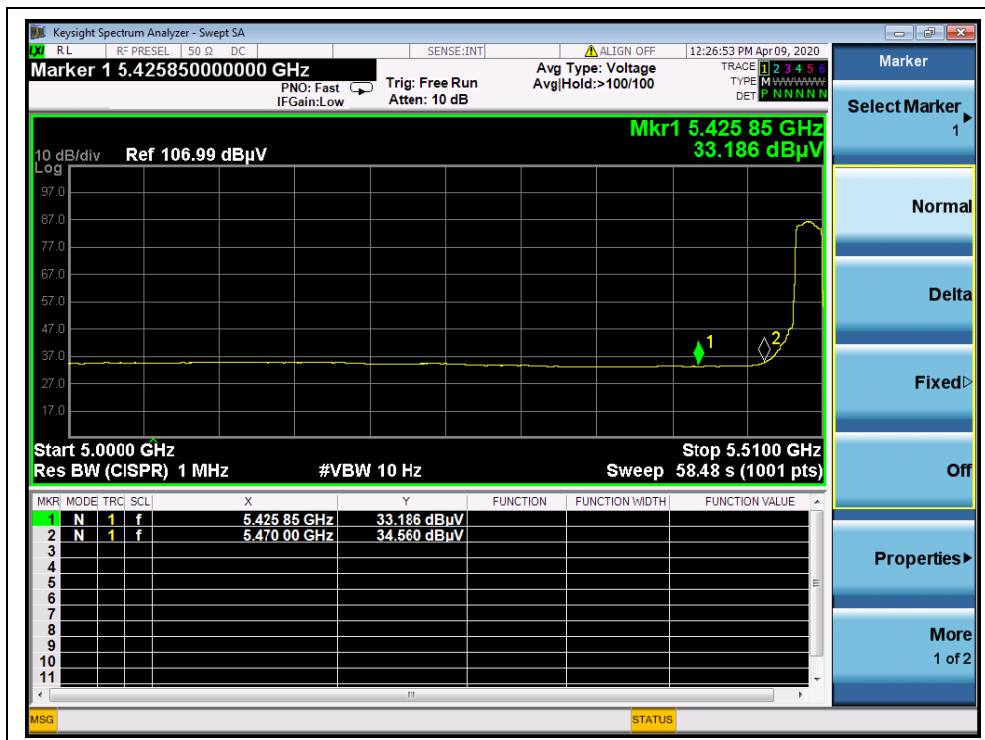


(AVG,Channel 64,802.11a)

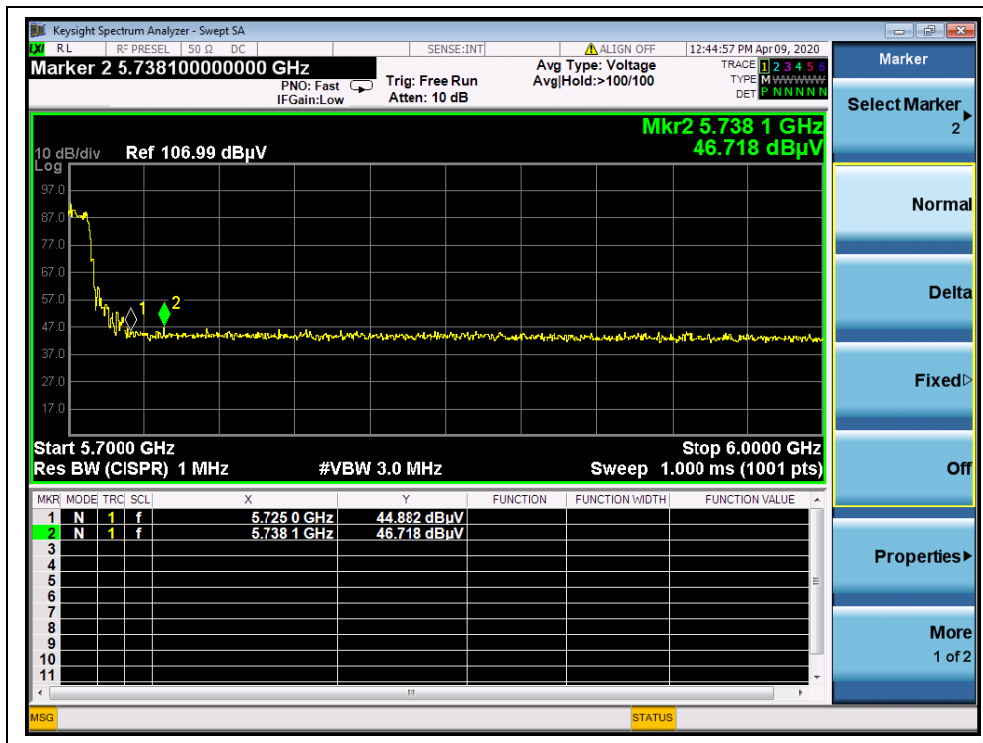




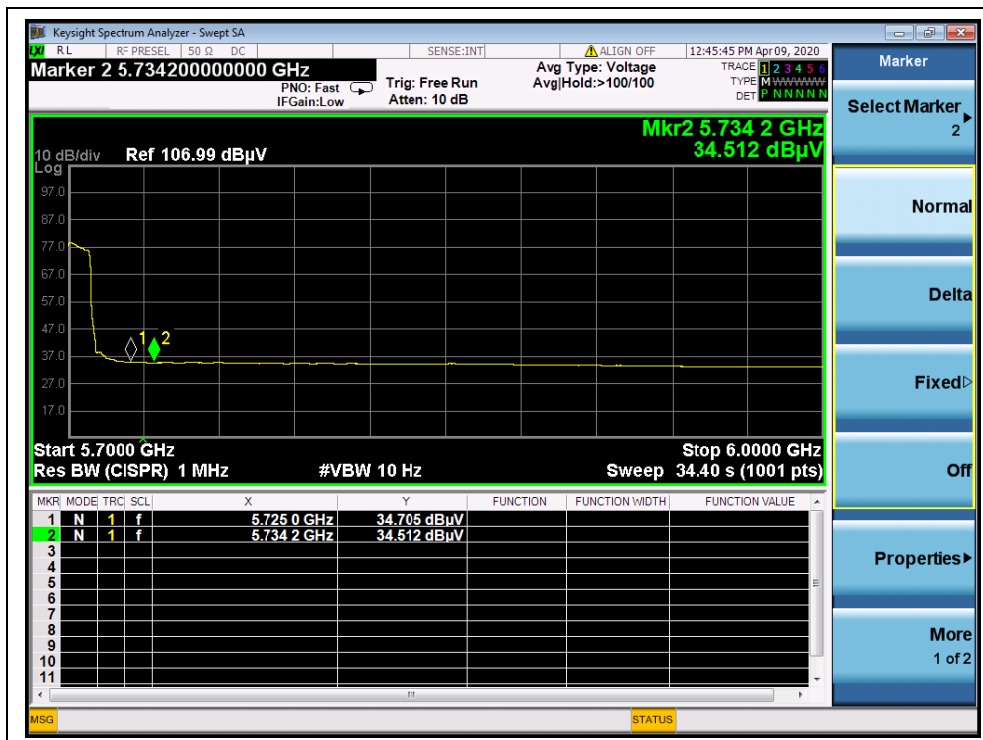
(PEAK,Channel100, 802.11a)



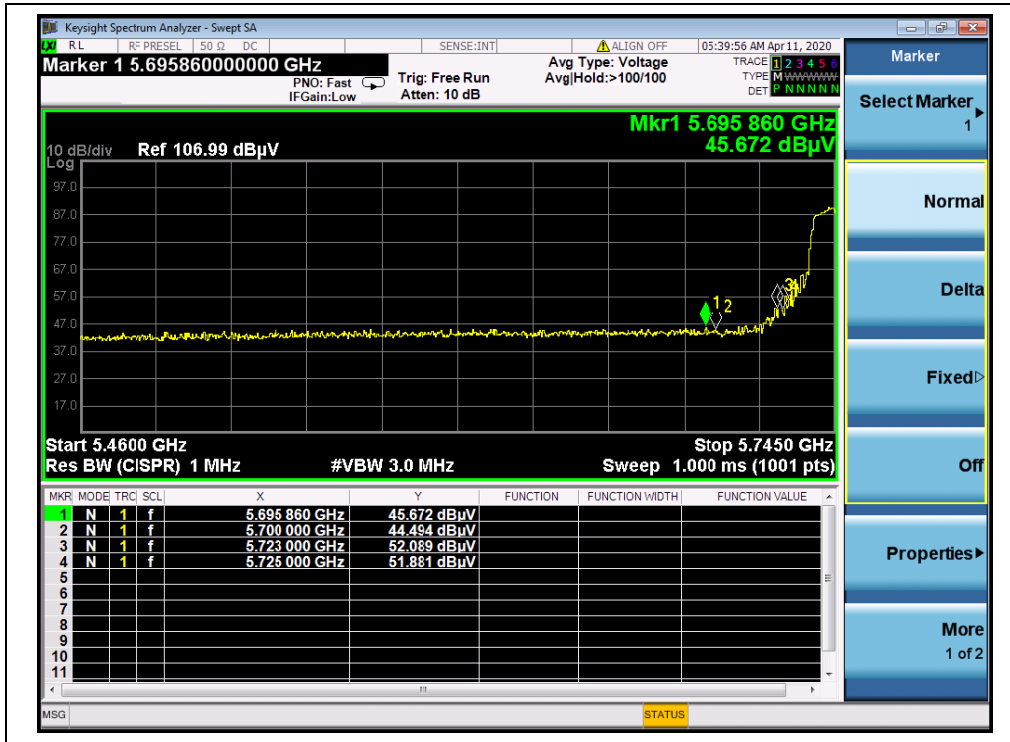
(AVG,Channel 100, 802.11a)



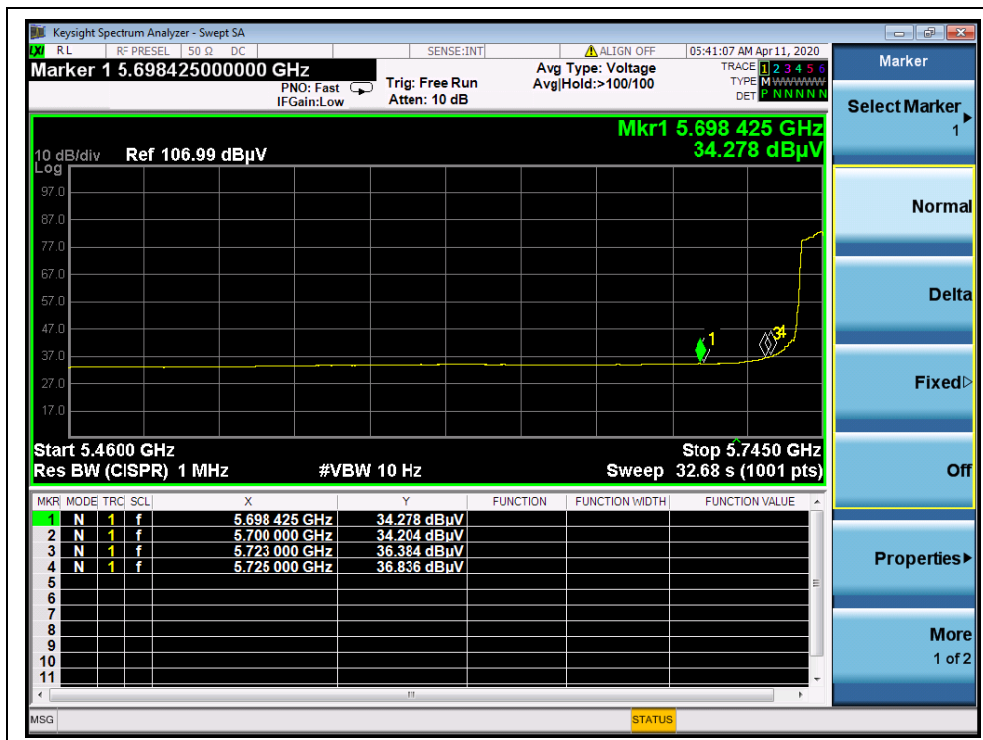
(PEAK,Channel144, 802.11a)



(AVG,Channel 144, 802.11a)



(PEAK,Channel149, 802.11a)



(AVG,Channel 149,802.11a)