



# TEST REPORT

**APPLICANT** : Linkplay Technology Inc.

**PRODUCT NAME** : Wireless Smart Audio Module

**MODEL NAME** : A98M, A98M-12, A98M-22, A98MG

**BRAND NAME** : Linkplay

**FCC ID** : 2ANOG-A98M

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

**RECEIPT DATE** : 2021-02-22

**TEST DATE** : 2021-03-06

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Change History		
Version	Date	Reason for change
1.0	2021-03-25	First edition



# 1. Technical Information

**Note:** Provide by applicant.

## 1.1. Applicant and Manufacturer Information

<b>Applicant:</b>	Linkplay Technology Inc.
<b>Applicant Address:</b>	8F-8036, Qianren Building, No.7, Yingcui Road, Jiangning District, Nanjing, China
<b>Manufacturer:</b>	Linkplay Technology Inc.
<b>Manufacturer Address:</b>	8F-8036, Qianren Building, No.7, Yingcui Road, Jiangning District, Nanjing, China

## 1.2. Equipment Under Test (EUT) Description

<b>Product Name:</b>	Wireless Smart Audio Module	
<b>Serial No.:</b>	(N/A, marked #1 by test site)	
<b>Hardware Version:</b>	V02	
<b>Software Version:</b>	Linkplay.3.6.7430	
<b>Modulation Technology:</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; 5260MHz-5320MHz; 5500MHz-5720MHz; 5745MHz-5825MHz	
<b>Channel Number:</b>	Refer to 1.3	
<b>Antenna Type:</b>	PIFA Antenna	
<b>Antenna Gain:</b>	2.41dBi	
<b>Test Fixture:</b>	By PCBA	
	<b>Brand Name:</b>	Linkplay
	<b>Model Name:</b>	A98x_PCM5121_EVB_V04

**Note 1:** This test report is variant from the original report (Report No.: SZ20110203W04, FCC ID: 2ANOG-A98M), based on the similarity between before, changed the antenna from External Rod Antenna to PIFA Antenna, BT&WiFi gain is smaller than the original, no other changes. The changes only affect the results of Antenna Requirement, Restricted Frequency Bands and Radiated Emission in this report.



**Note 2:** According to the certificate holder, they declared that the models A98M, A98M-12, A98M-22 and A98MG have different ROM and RAM density, different brands or different vendors. The differences do not affect BT/Wi-Fi RF performance. The detailed information of differences is listed below. The main measuring model is A98M, only the results for A98M were recorded in this report.

A98M: 128MB RAM, 128MB FLASH

A98M-12: 128MB RAM, 256MB FLASH

A98M-22: 256MB RAM, 256MB FLASH

A98MG: 512MB RAM, 512MB FLASH

**Note 3:** WIFI hotspot does not support U-NII band.

**Note 4:** 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: 5250MHz-5350MHz				
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: 5470MHz-5725MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	<b>100</b>	<b>5500</b>	105	5520
			108	5540
			116	5580
			124	5620
			132	5660
			140	<b>144</b>
40MHz	<b>102</b>	<b>5510</b>	110	5550
			118	5590
			134	<b>142</b>
80MHz	<b>106</b>	<b>5530</b>	<b>122</b>	<b>5610</b>
	<b>138</b>	<b>5690</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	Nov 27, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation
3	15.407(a)	Maximum Conducted Output Power	Dec 06, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation
4	15.407(a)(e)	Emission Bandwidth	Nov 27, 2020 Dec 05, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation
5	15.407(a)	Peak Power Spectral Density	Nov 24&27, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation
6	15.407(g)	Frequency Stability	Dec 06, 2020	Ouyang Feng	PASS <sub>Note1</sub>	No deviation
7	15.207	Conducted Emission	Nov 21, 2020	Huang Zhiye	PASS <sub>Note1</sub>	No deviation
8	15.407(b)	Restricted Frequency Bands	Nov 24, 2020	Peng Xuewei	PASS	No deviation
9	15.407(b)	Radiated Emission	Nov 24, 2020	Peng Xuewei	PASS	No deviation

**Note 1:** The test results of these test items in this report refer to the test report (Report No.: SZ20110203W04).

**Note 1:** The DFS test report was documented in a separate report (Report No.: SZ21020081W05).

**Note 2:** The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.102013.



**Note 3:** These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 v01r03.

**Note 4:** 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 5:** 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 6:** When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

## 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

The EUT has a PIFA antenna coupled with the I-PEX connector. 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.

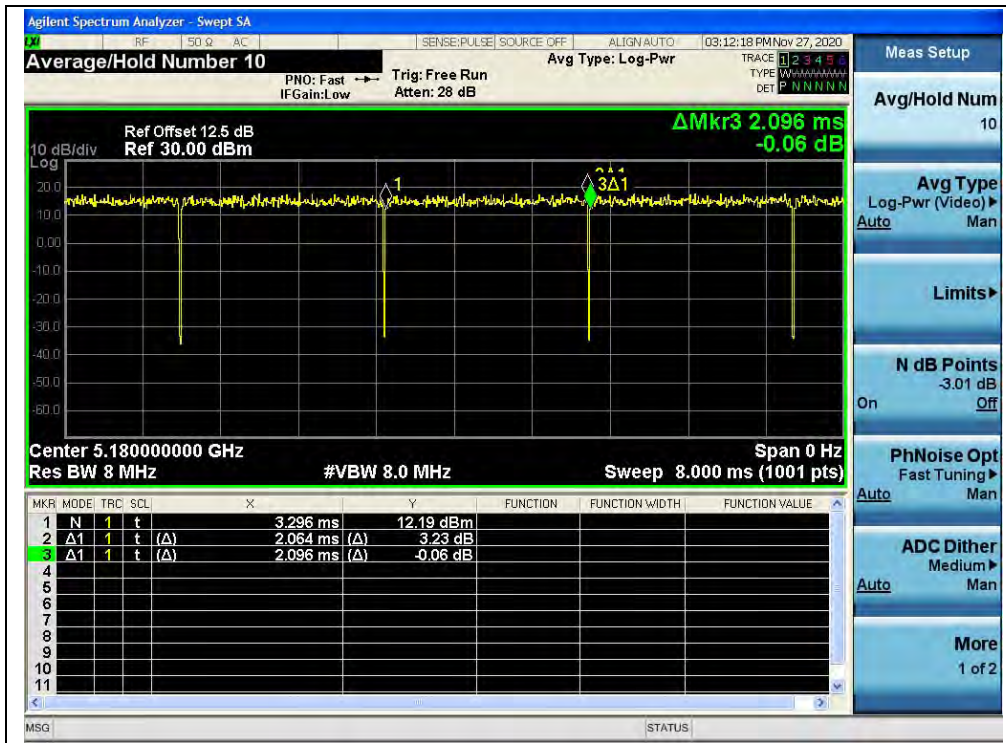


2.2.4. Test Result

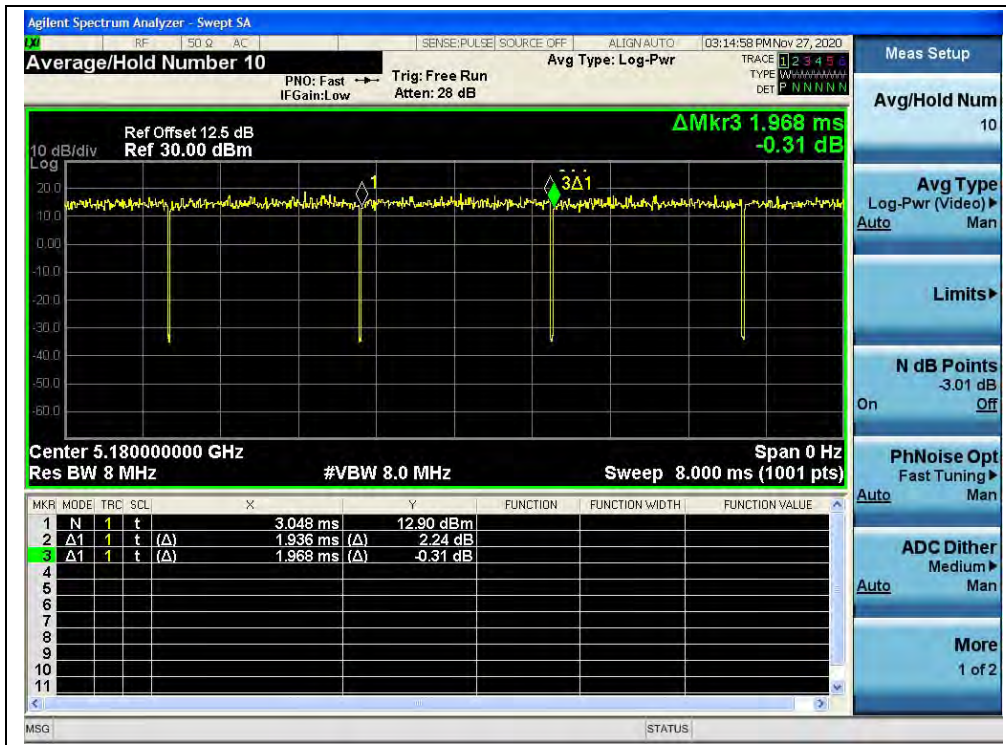
A. Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	98.47	0.07
802.11n (HT20)	98.37	0.07
802.11n (HT40)	97.93	0.09
802.11ac (VHT20)	98.36	0.07
802.11ac (VHT40)	98.43	0.07
802.11ac (VHT80)	97.02	0.13

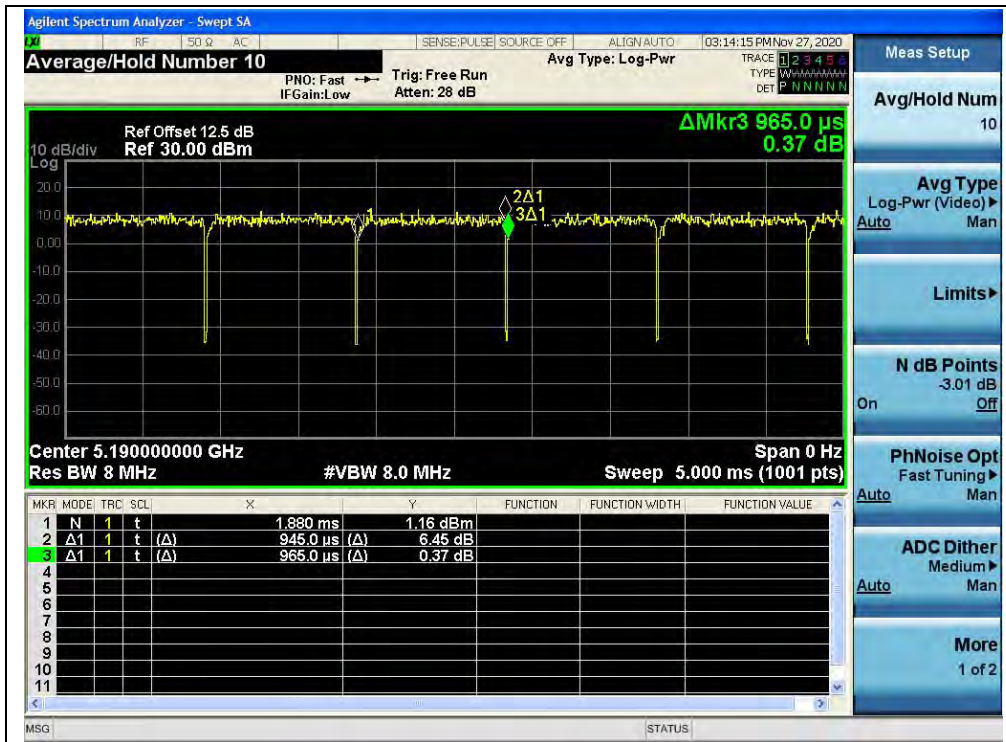
B. Test Plot:



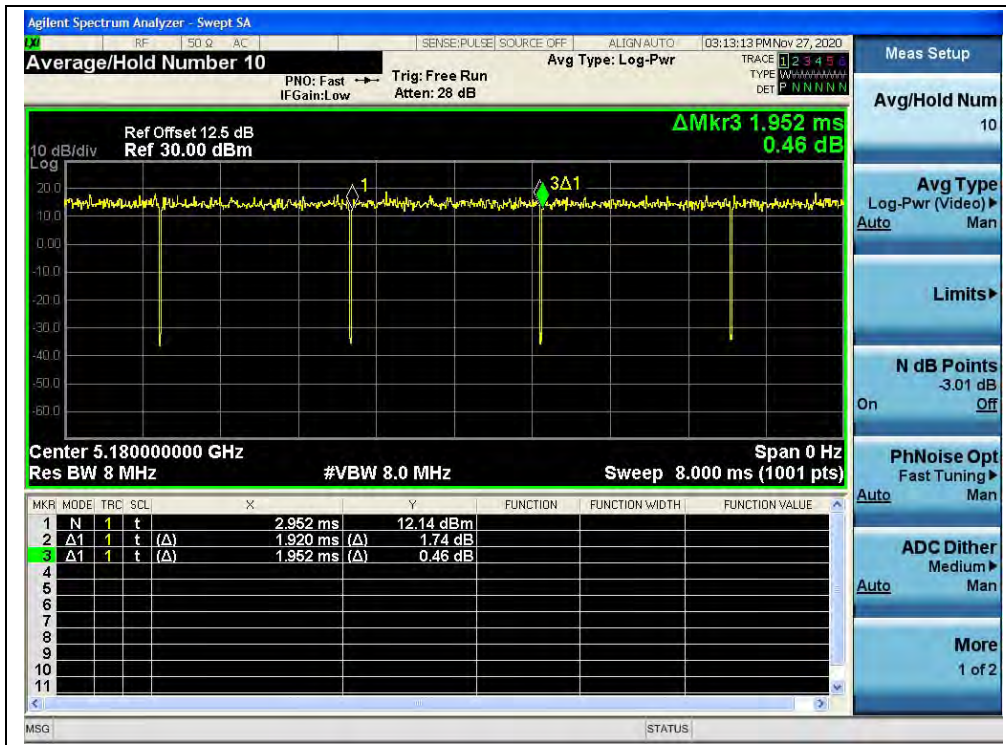
(Channel 36, 5180MHz, 802.11a)



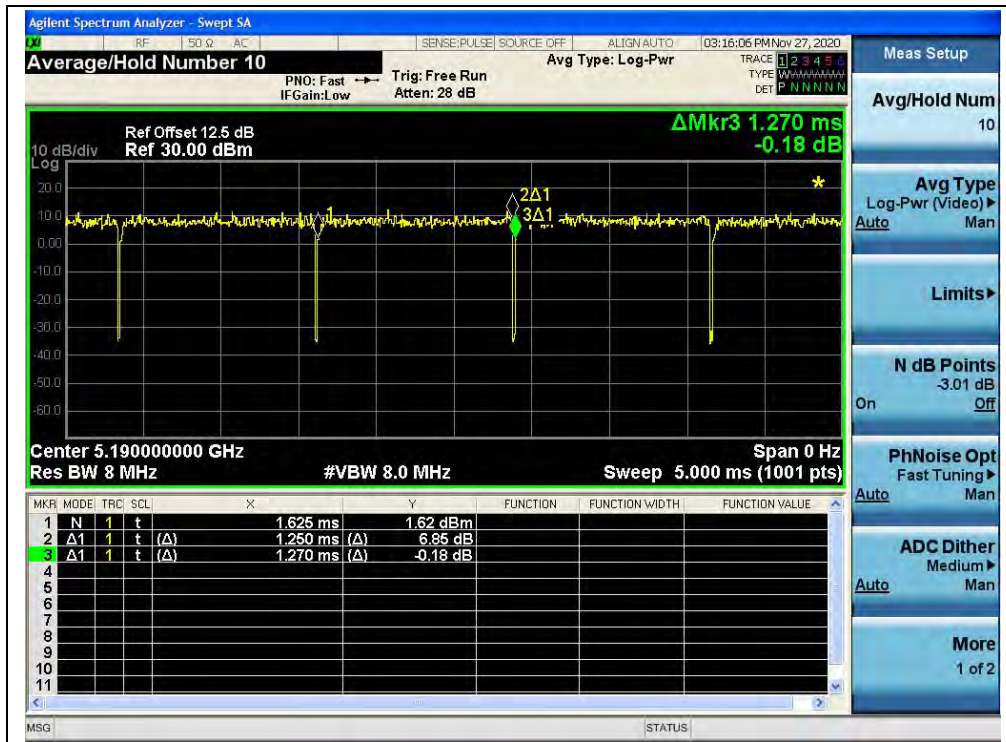
(Channel 36, 5180MHz, 802.11n (HT20))



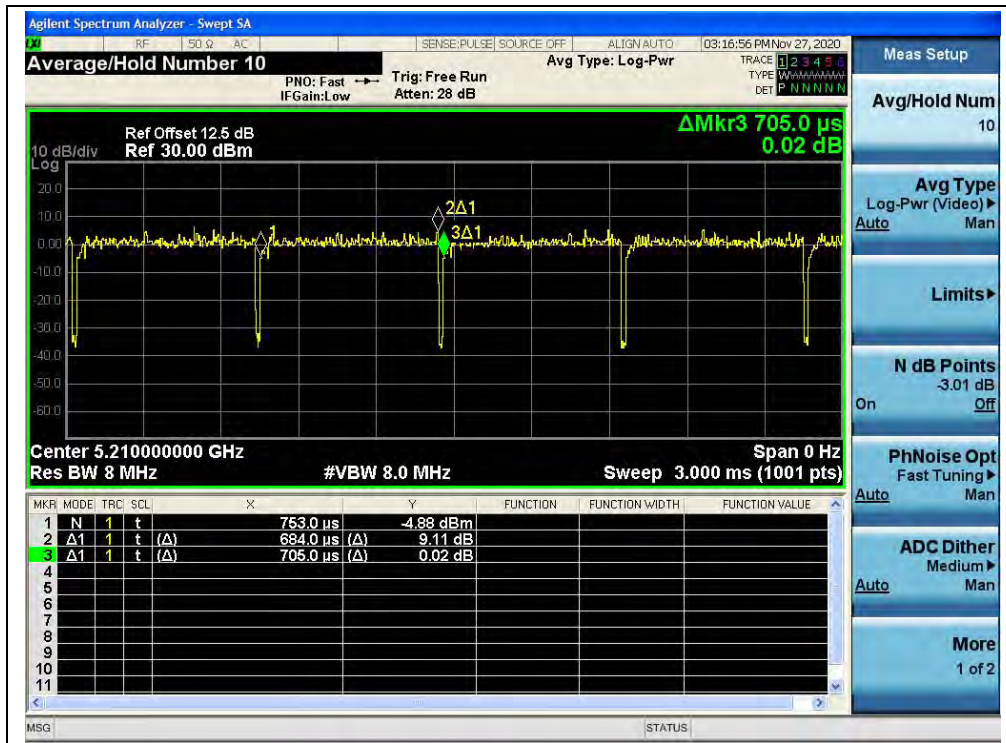
(Channel 38, 5190MHz, 802.11n (HT40))



(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.

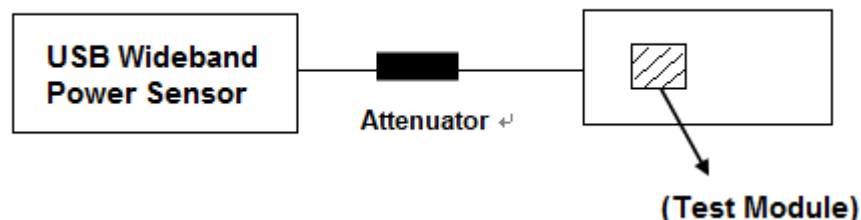
(4) According to KDB662911D01 Measure-and-sum technique, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically to determine the total emission level from the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

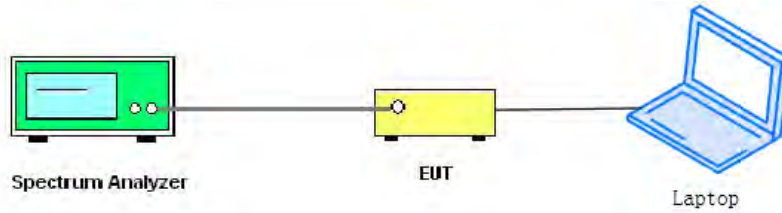
Section E) 3) of KDB 789033 defines a methodology using a USB Wideband Power Sensor.

#### 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.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	21.11	24.24	24.00
		5300	20.83	24.19	24.00
		5320	21.02	24.23	24.00
	UNII-2c	5500	21.30	24.28	24.00
		5600	21.27	24.28	24.00
		5720	21.41	24.31	24.00
n20	UNII-2a	5260	21.19	24.26	24.00
		5300	21.30	24.28	24.00
		5320	21.63	24.35	24.00
	UNII-2c	5500	21.45	24.31	24.00
		5600	21.59	24.34	24.00
		5720	21.56	24.34	24.00
ac20	UNII-2a	5260	21.30	24.28	24.00
		5300	21.53	24.33	24.00
		5320	21.37	24.30	24.00
	UNII-2c	5500	21.34	24.29	24.00
		5600	21.57	24.34	24.00
		5720	21.21	24.27	24.00



2.3.4. Test Result

Maximum Average Conducted Output Power

802.11a Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5180	11.26	0.07	11.33	0.014	24	0.25	PASS
5220	13.08		13.15	0.021			
5240	13.85		<b>13.92</b>	<b>0.025</b>			
5260	13.60		13.67	0.023			
5300	13.65		13.72	0.024			
5320	12.95		13.02	0.020			
5500	12.35		12.42	0.017			
5600	12.36		12.43	0.017			
5720	12.74		12.81	0.019			
5745	11.02		11.09	0.013	30	1	
5785	11.25		11.32	0.014			
5825	11.63		11.70	0.015			

802.11n (HT20) Mode

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5180	10.54	0.07	10.61	0.012	24	0.25	PASS
5220	11.62		11.69	0.015			
5240	11.38		11.45	0.014			
5260	11.47		11.54	0.014			
5300	13.58		13.65	0.023			
5320	14.69		<b>14.76</b>	<b>0.030</b>			
5500	12.54		12.61	0.018			
5600	12.31		12.38	0.017			
5720	10.58		10.65	0.012			
5745	10.74		10.81	0.012	30	1	
5785	10.68		10.75	0.012			
5825	10.58		10.65	0.012			





**802.11n (HT40) Mode**

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5190	7.41	0.09	7.50	0.006	24	0.25	PASS
5230	10.58		10.67	0.012			
5270	12.09		12.18	0.017			
5310	<b>12.57</b>		<b>12.66</b>	<b>0.018</b>			
5510	11.00		11.09	0.013			
5630	11.85		11.94	0.016			
5710	11.46		11.55	0.014			
5755	10.45		10.54	0.011	30	1	
5795	10.03		10.12	0.010			

**802.11ac (VHT20) Mode**

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5180	10.42	0.07	10.49	0.011	24	0.25	PASS
5220	12.38		12.45	0.018			
5240	12.21		12.28	0.017			
5260	12.36		12.43	0.017			
5300	11.56		11.63	0.015			
5320	13.54		13.61	0.023			
5500	13.47		13.54	0.023			
5600	14.05		<b>14.12</b>	<b>0.026</b>			
5720	10.22		10.29	0.011			
5745	10.34		10.41	0.011	30	1	
5785	10.58		10.65	0.012			
5825	10.94		11.01	0.013			



**802.11ac (VHT40) Mode**

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5190	7.86	0.07	7.93	0.006	24	0.25	PASS
5230	10.85		10.92	0.012			
5270	10.74		10.81	0.012			
5310	10.68		10.75	0.012			
5510	11.86		11.93	0.016			
5630	12.08		<b>12.15</b>	<b>0.016</b>			
5710	10.56		10.63	0.012			
5755	10.26		10.33	0.011	30	1	
5795	10.37		10.44	0.011			

**802.11ac (VHT80) Mode**

Frequency (MHz)	Average Power				Limit		Verdict
	Measured	Duty Factor	Duty factor Calculated		dBm	W	
	dBm		dBm	W			
5210	3.53	0.13	3.66	0.002	24	0.25	PASS
5290	7.63		7.76	0.006			
5530	10.82		10.95	0.012			
5610	11.58		<b>11.71</b>	<b>0.015</b>			
5690	11.56		11.69	0.015			
5775	11.00		11.13	0.013	30	1	

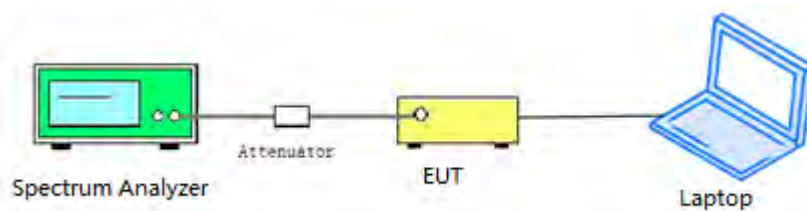
## 2.4. Emission Bandwidth

### 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

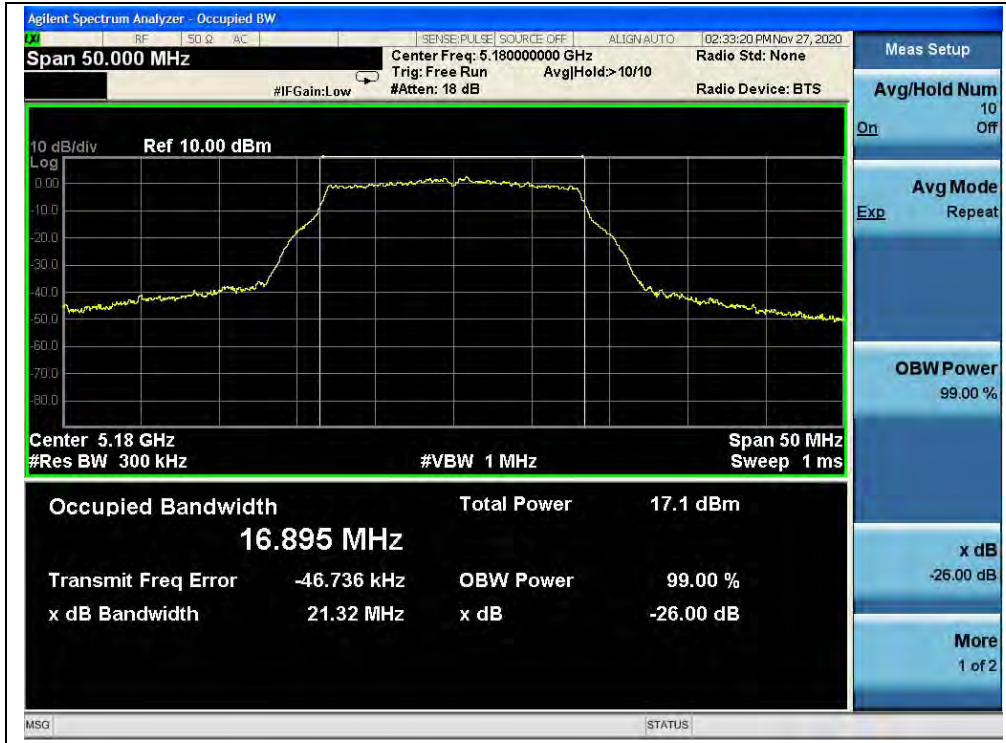
##### 802.11a Mode

##### A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.32
44	5220	21.38
48	5240	21.27
52	5260	21.11
60	5300	20.83
64	5320	21.02
100	5500	21.30
120	5600	21.27
144	5720	21.41
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
144	5720	17.59
149	5745	17.57
157	5785	17.63
165	5825	17.58



B.Test Plot:



(Channel 36, 5180MHz, 802.11a)



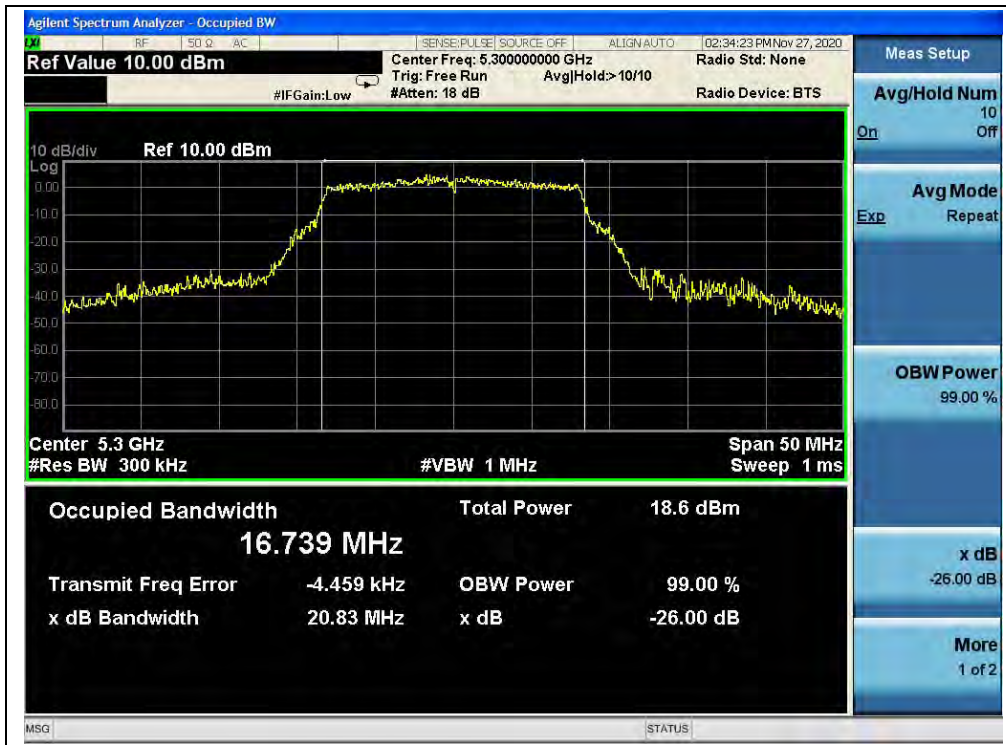
(Channel 44, 5220 MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 52, 5260MHz, 802.11a)



(Channel 60, 5300 MHz, 802.11a)



(Channel 64, 5320MHz, 802.11a)

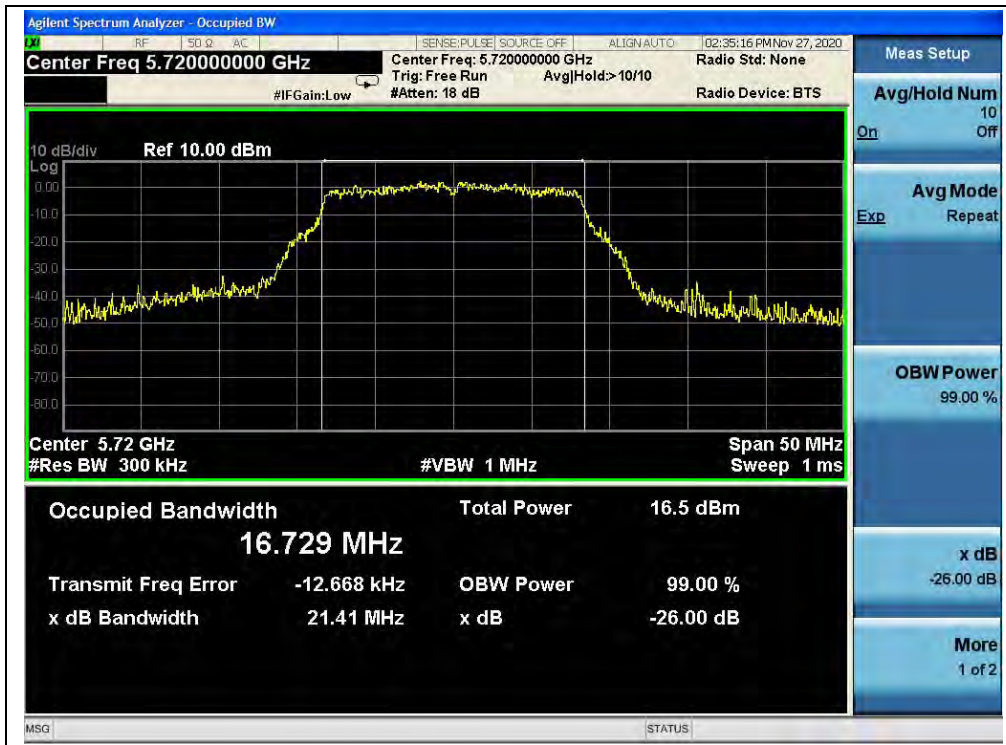


(Channel 100,5500MHz, 802.11a)



(Channel 120,5600 MHz, 802.11a)





(Channel 144, 5720MHz, 802.11a)



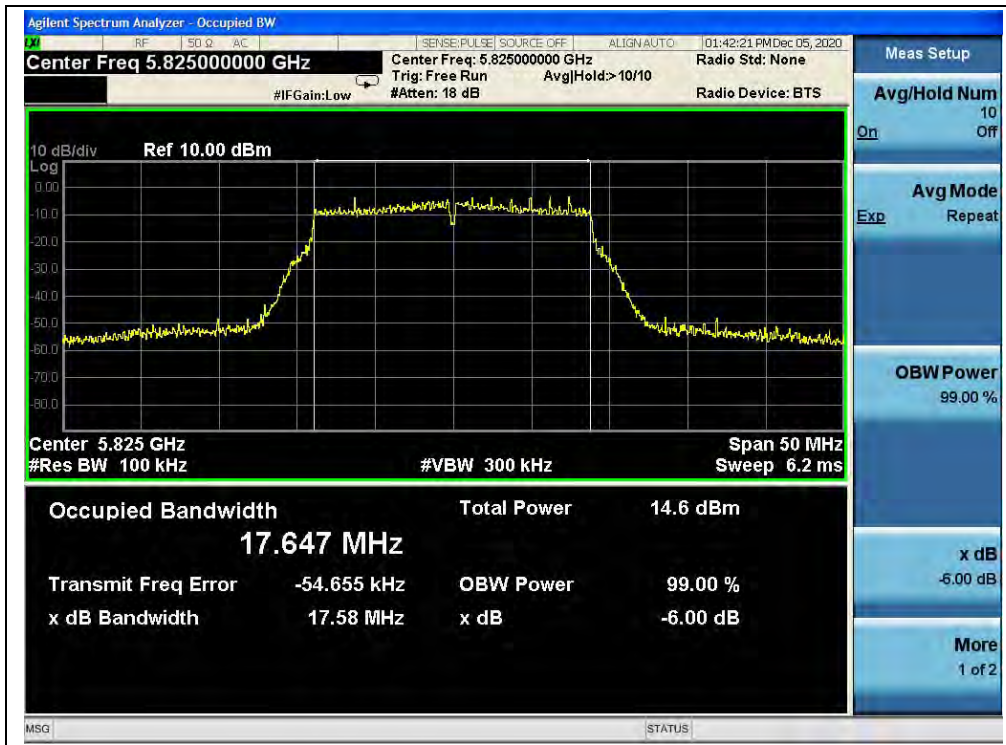
(Channel 144, 5720MHz, 802.11a)



(Channel 149,5745MHz, 802.11a)



(Channel 157,5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)

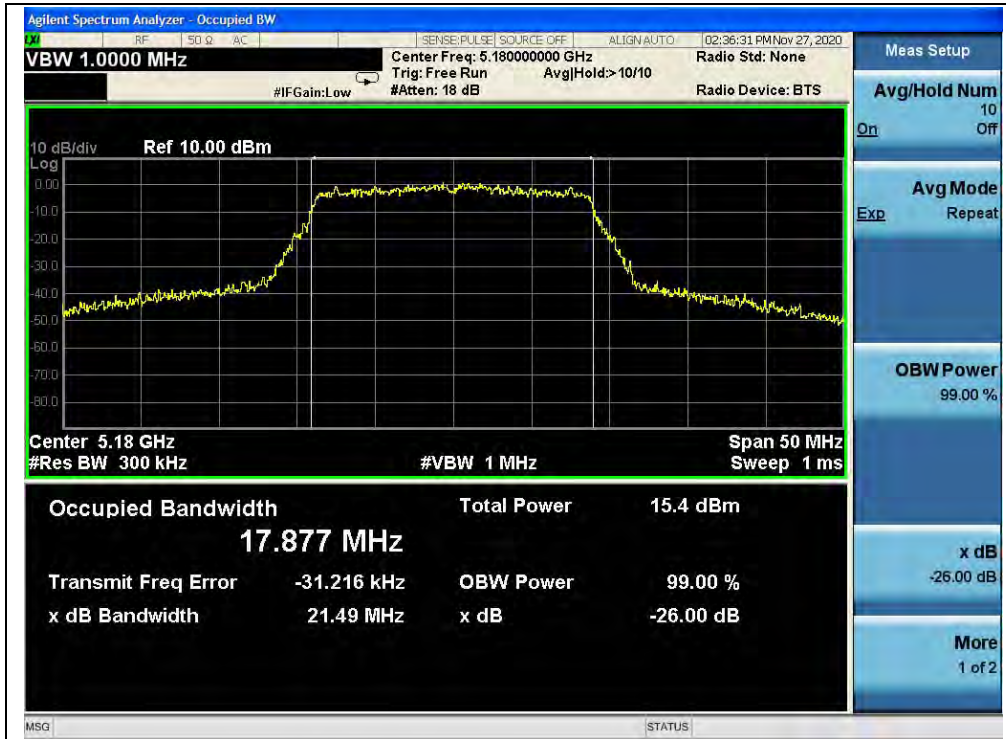


802.11n (HT20) Mode

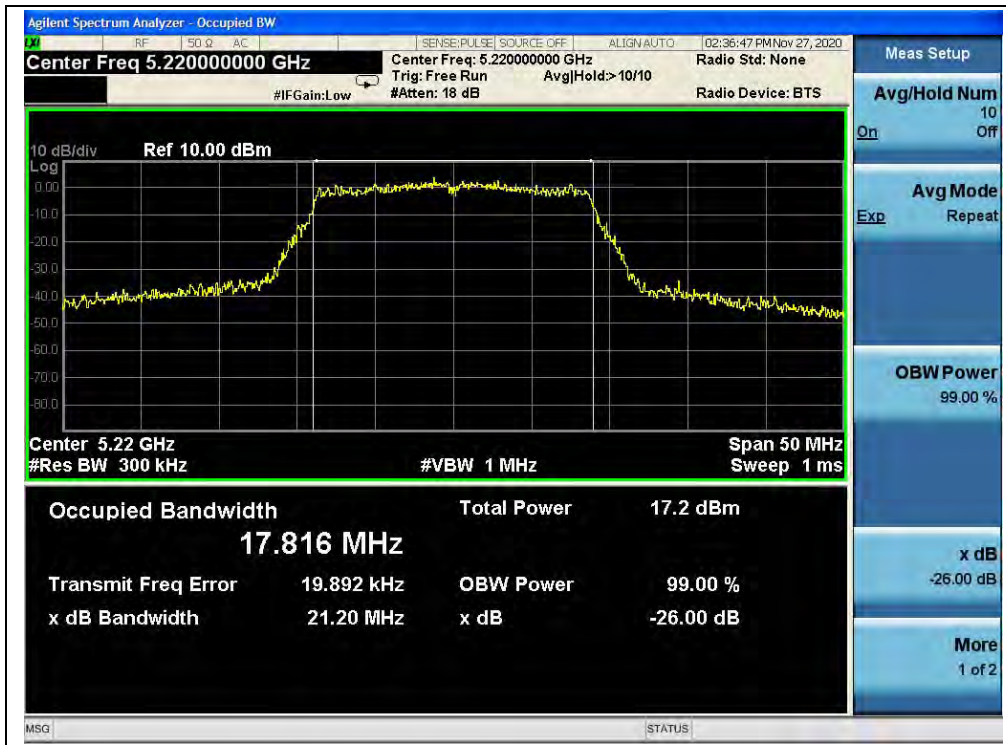
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.49
44	5220	21.20
48	5240	21.07
52	5260	21.19
60	5300	21.30
64	5320	21.63
100	5500	21.45
120	5600	21.59
144	5720	21.56
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
144	5720	17.57
149	5745	17.60
157	5785	17.59
165	5825	17.60

B. Test Plot:



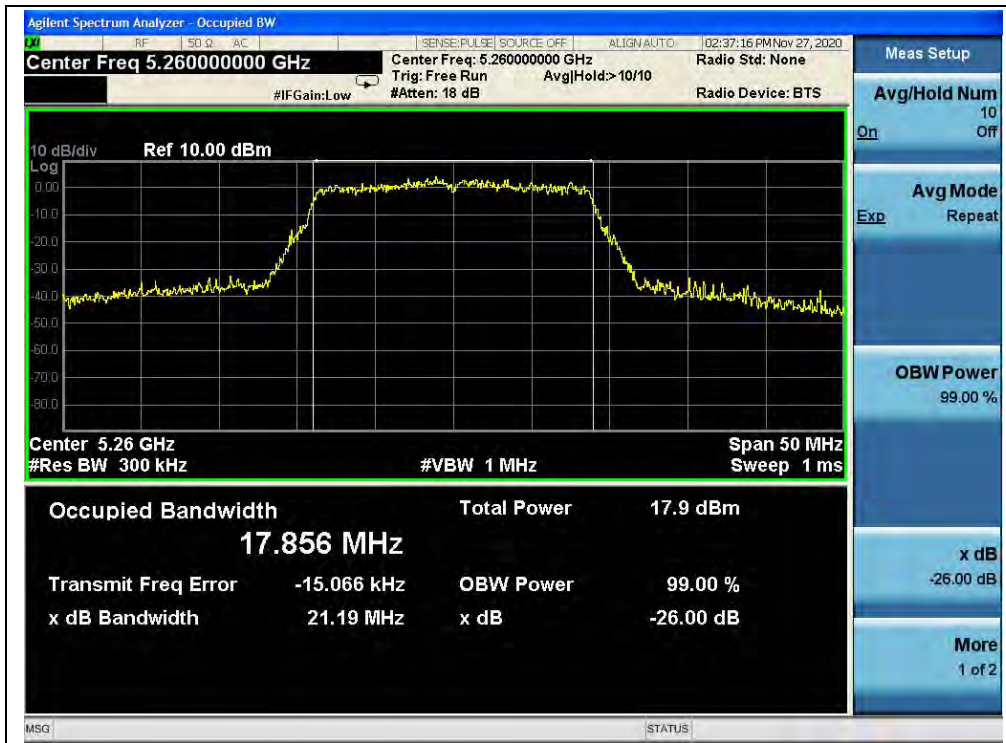
(Channel 36, 5180MHz, 802.11n (HT20))



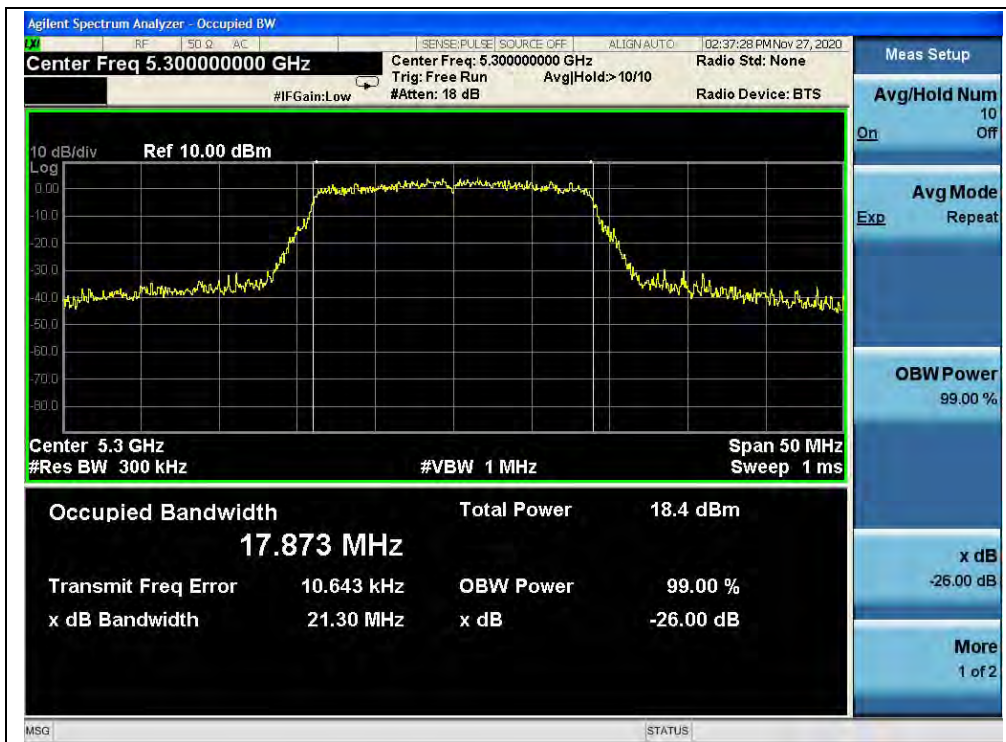
(Channel 44, 5220MHz, 802.11n (HT20))



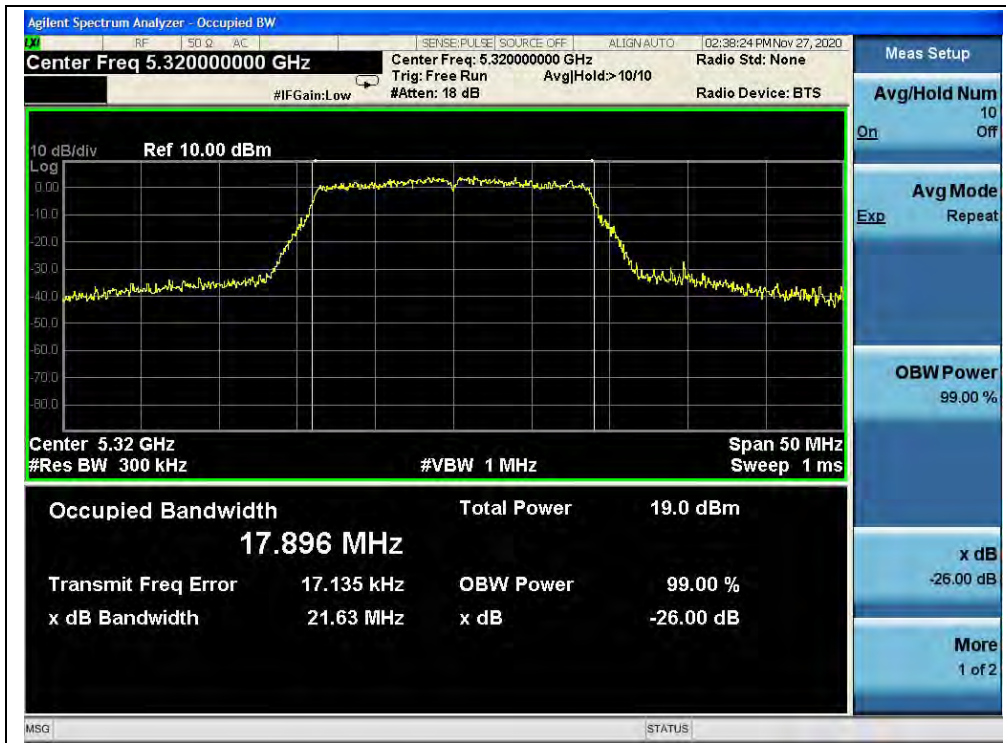
(Channel 48, 5240MHz, 802.11n (HT20))



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



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



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



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

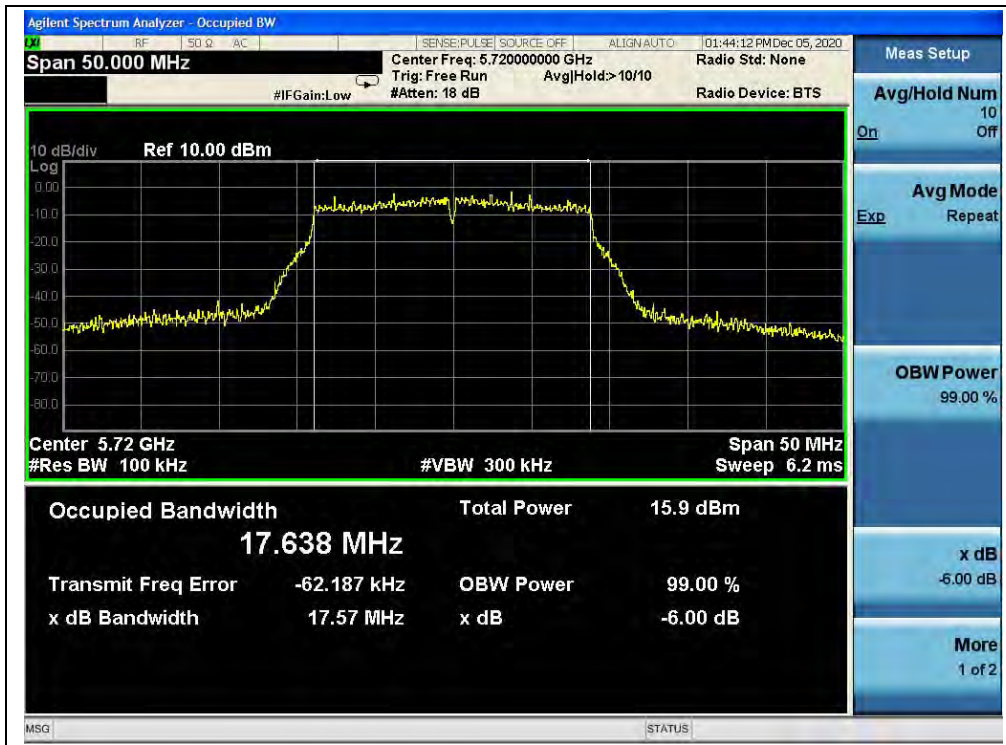


(Channel 120, 5600MHz, 802.11n (HT20))

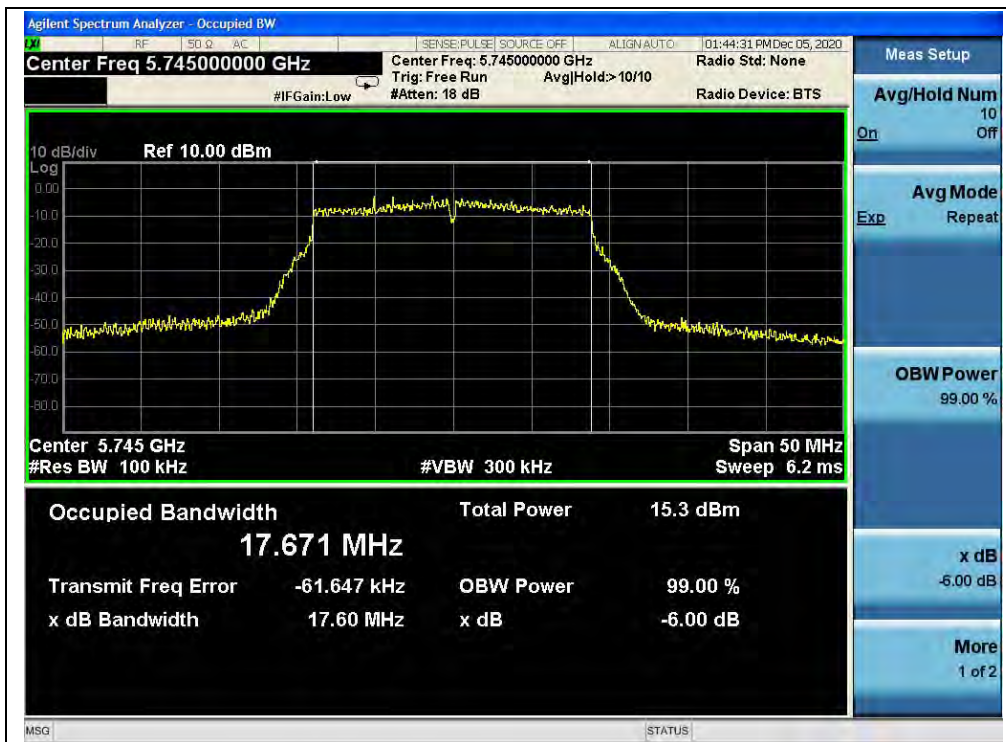


(Channel 144, 5720MHz, 802.11n (HT20))

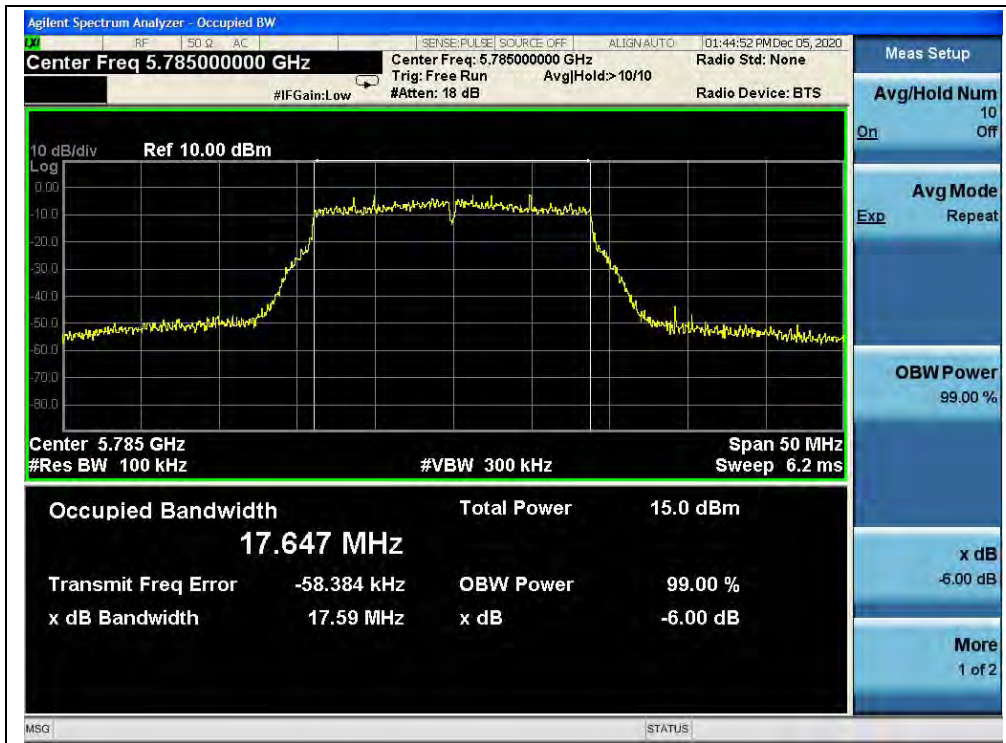




(Channel 144, 5720MHz, 802.11 n (HT20))



(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

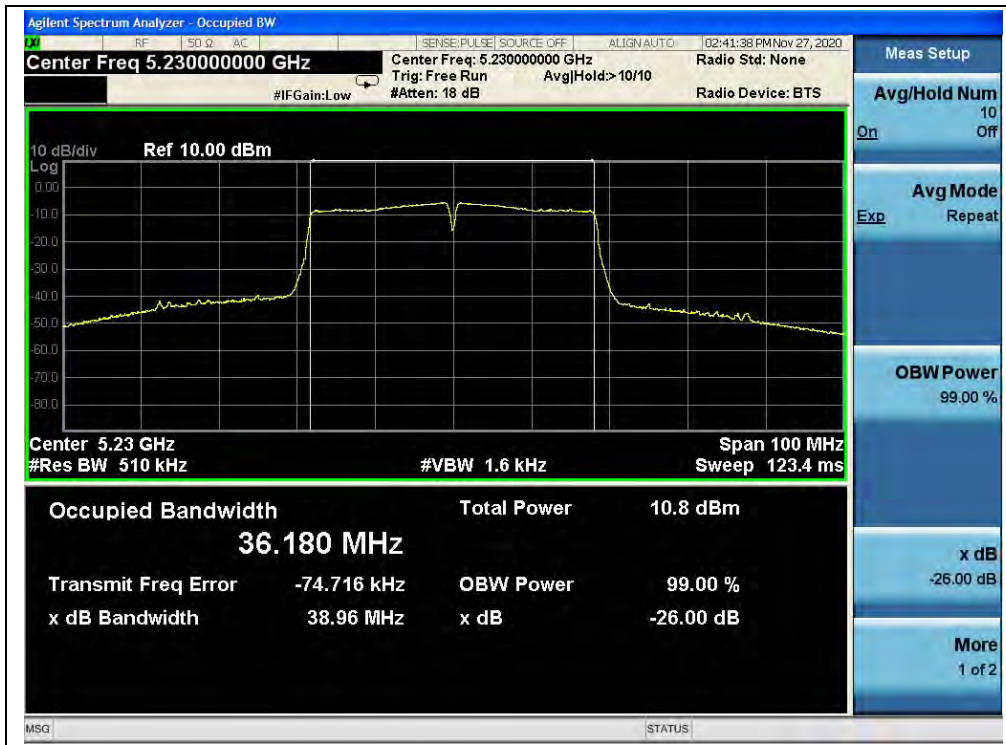
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	39.03
46	5230	38.96
54	5270	38.94
62	5310	38.91
102	5510	38.85
126	5630	38.85
142	5710	38.84
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
142	5710	36.30
151	5755	36.25
159	5795	36.29

B. Test Plot:



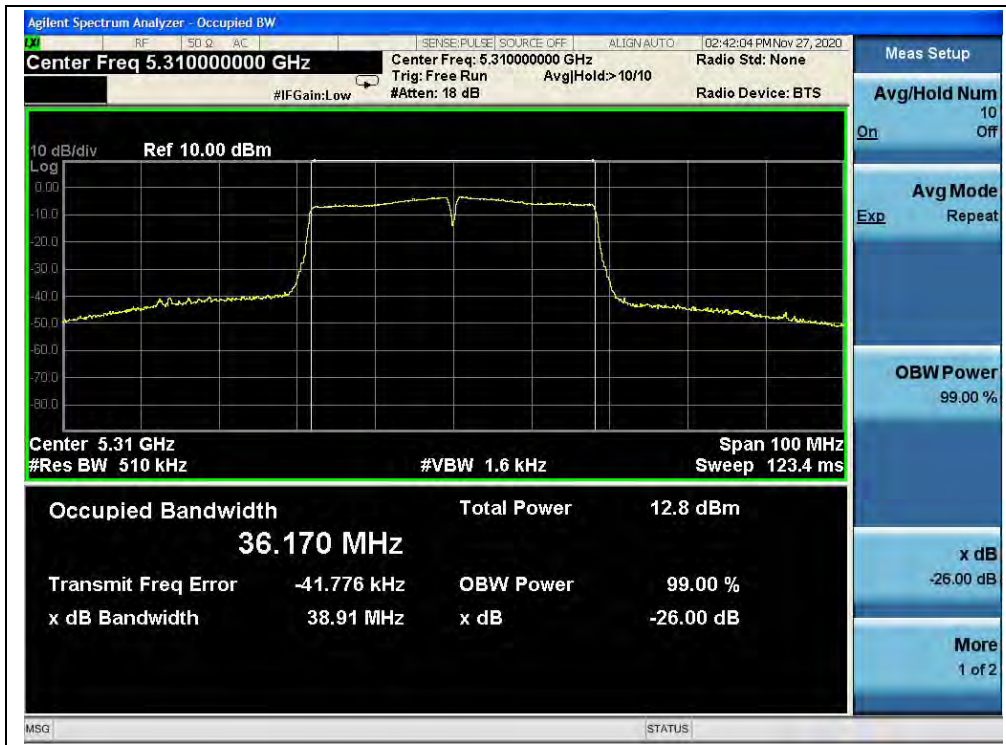
(Channel 38, 5190MHz, 802.11n (HT40))



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



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



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



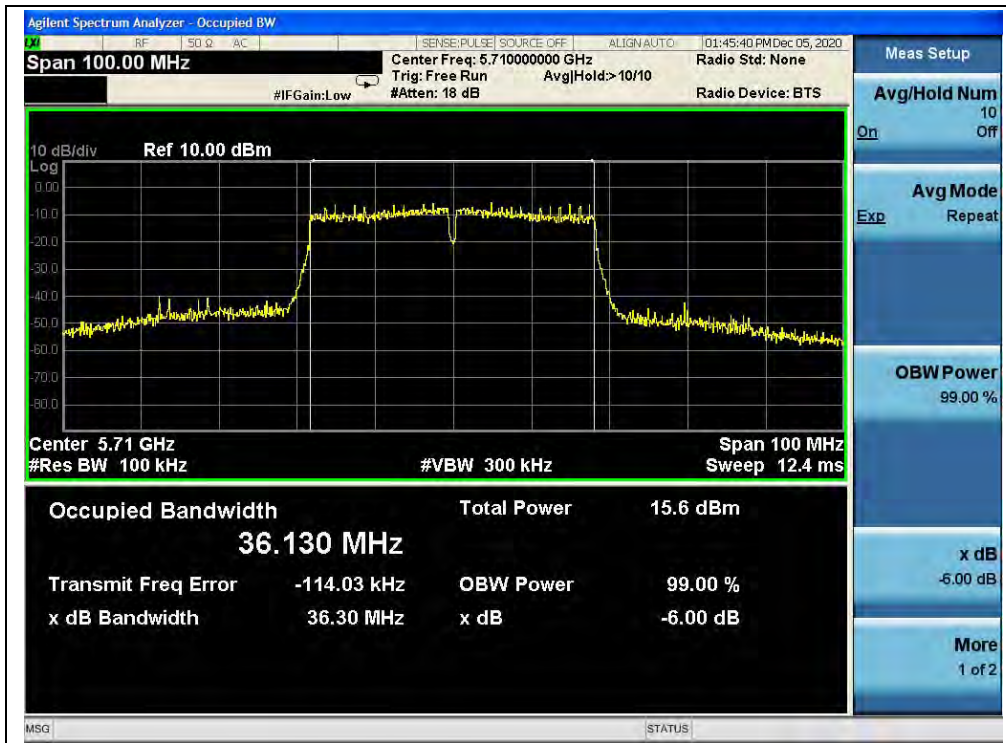
(Channel 102, 5510MHz, 802.11n (HT40))



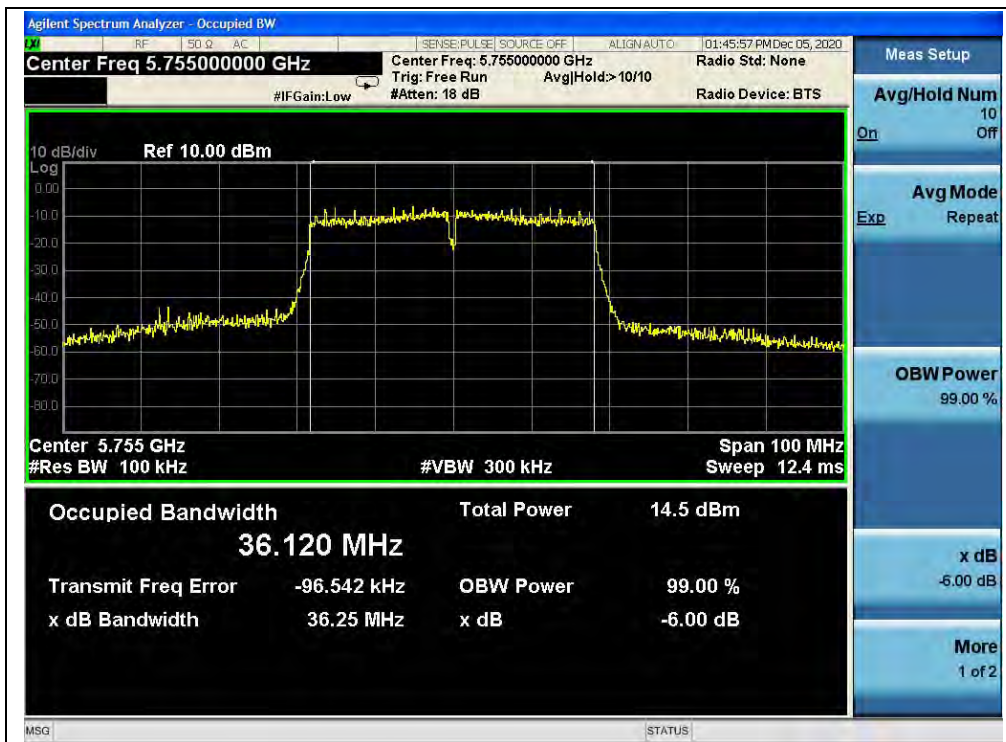
(Channel 126, 5630MHz, 802.11n (HT40))



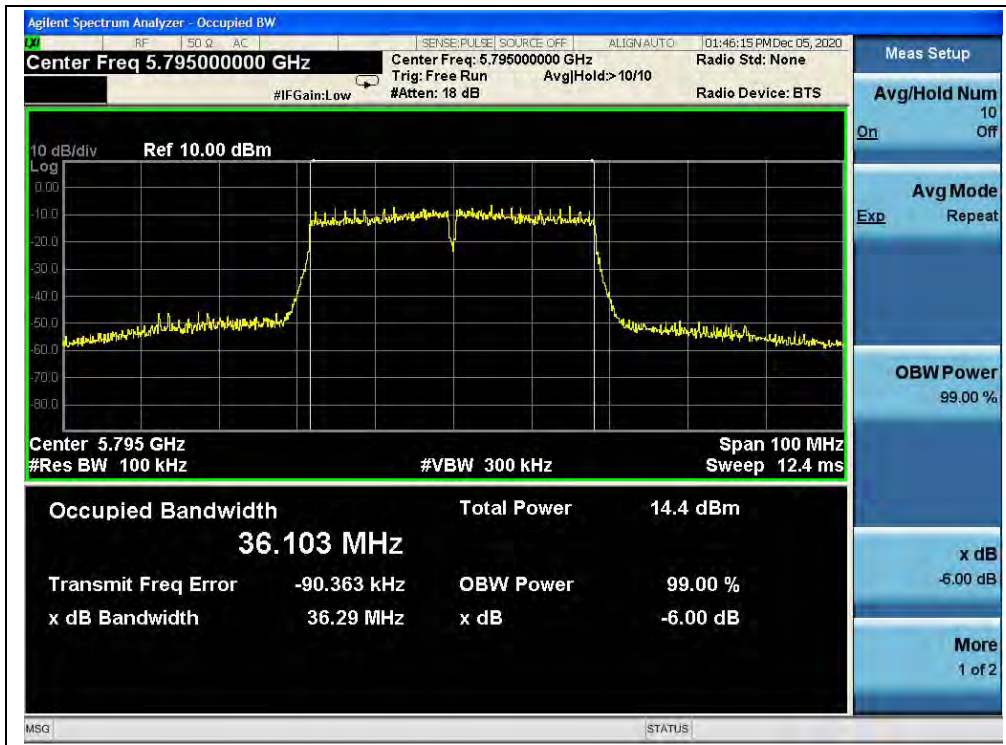
(Channel 142, 5710MHz, 802.11n (HT40))



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



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



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





802.11ac (VHT20) Mode

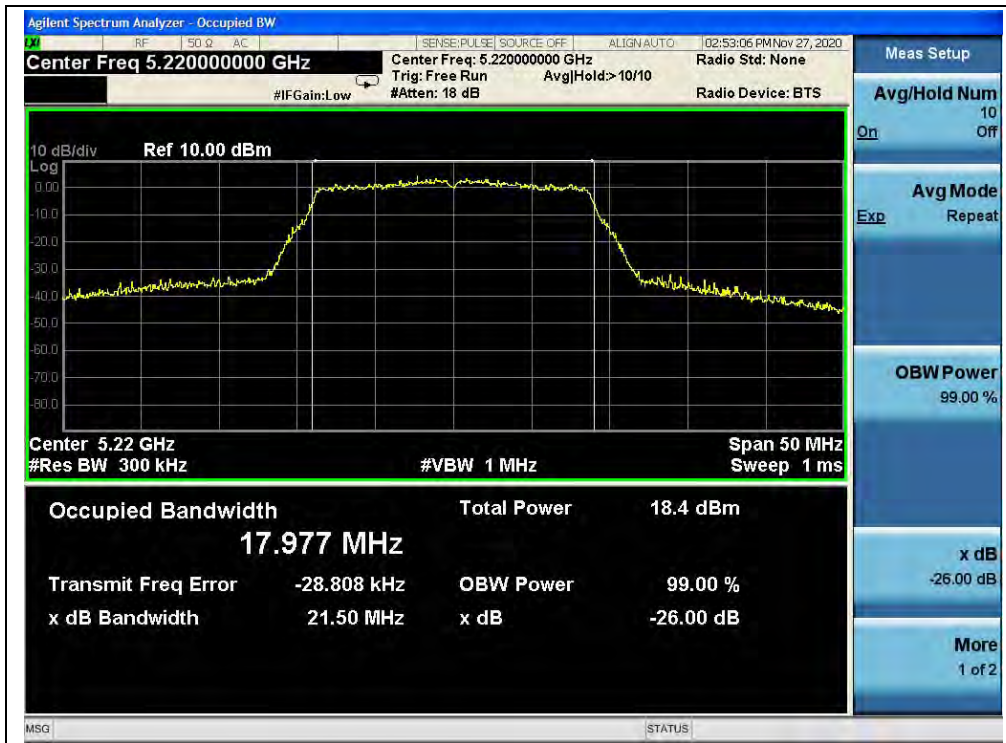
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	21.81
44	5220	21.50
48	5240	21.69
52	5260	21.30
60	5300	21.53
64	5320	21.37
100	5500	21.34
120	5600	21.57
144	5720	21.21
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
144	5720	17.51
149	5745	17.59
157	5785	17.04
165	5825	17.58

B. Test Plot:



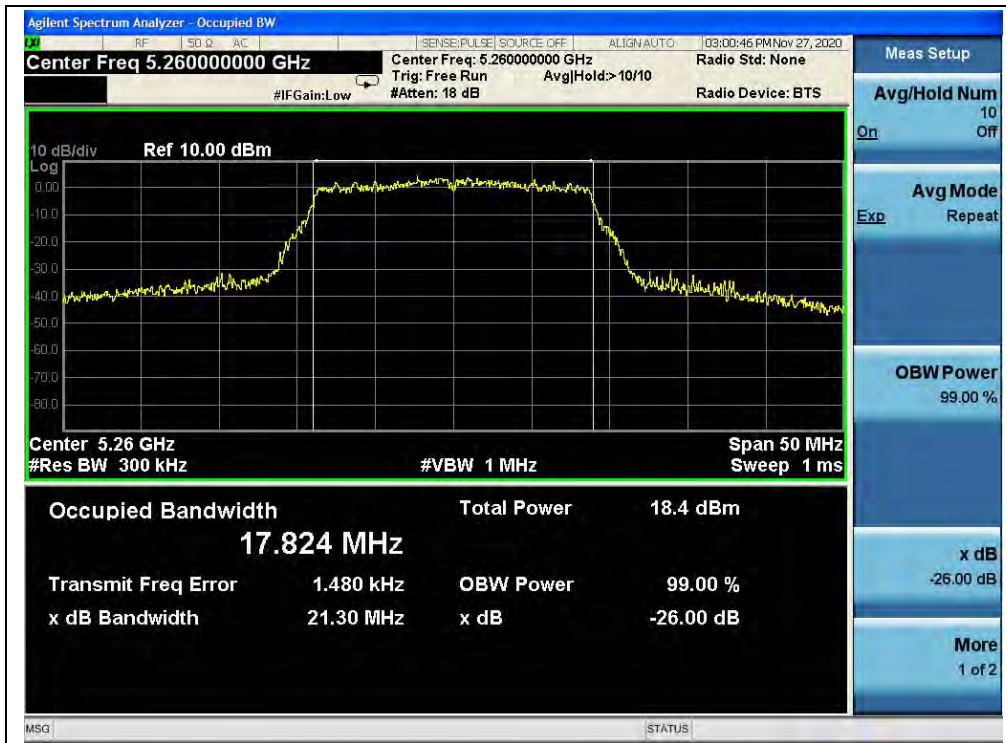
(Channel 36, 5180MHz, 802.11ac (VHT20))



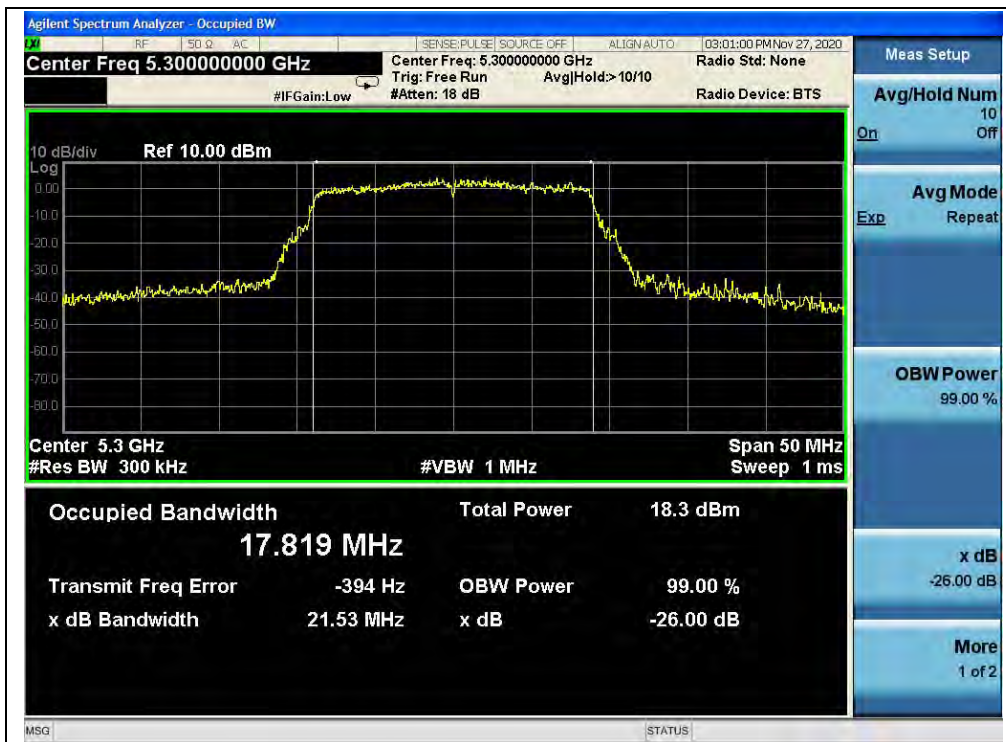
(Channel 44, 5220MHz, 802.11ac (VHT20))



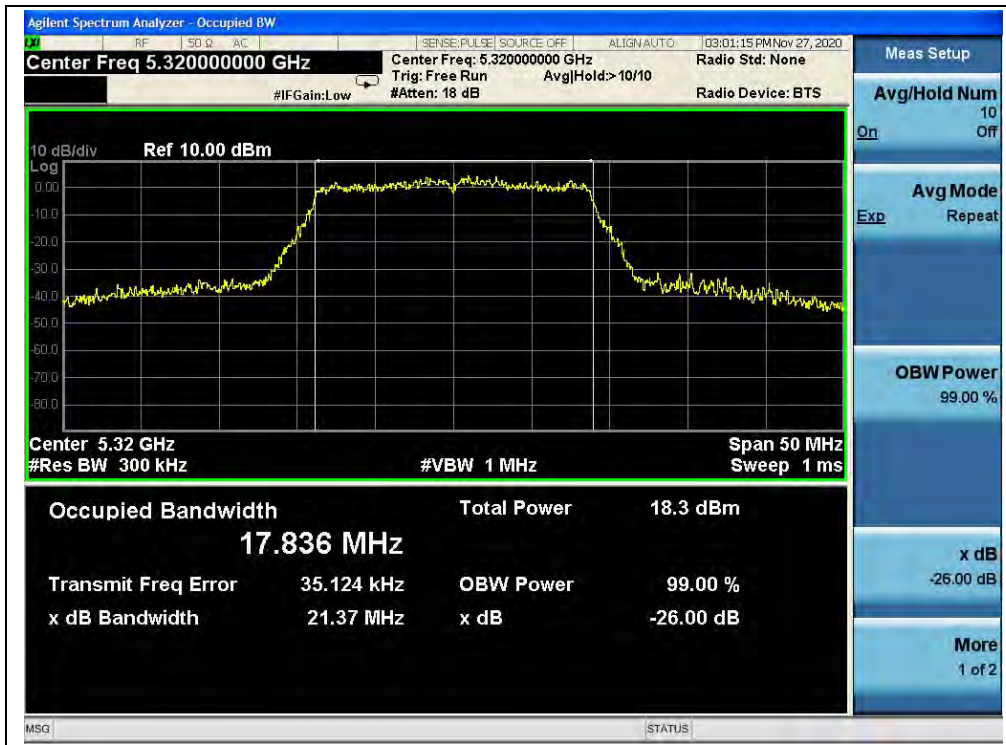
(Channel 48, 5240MHz, 802.11ac (VHT20))



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



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



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



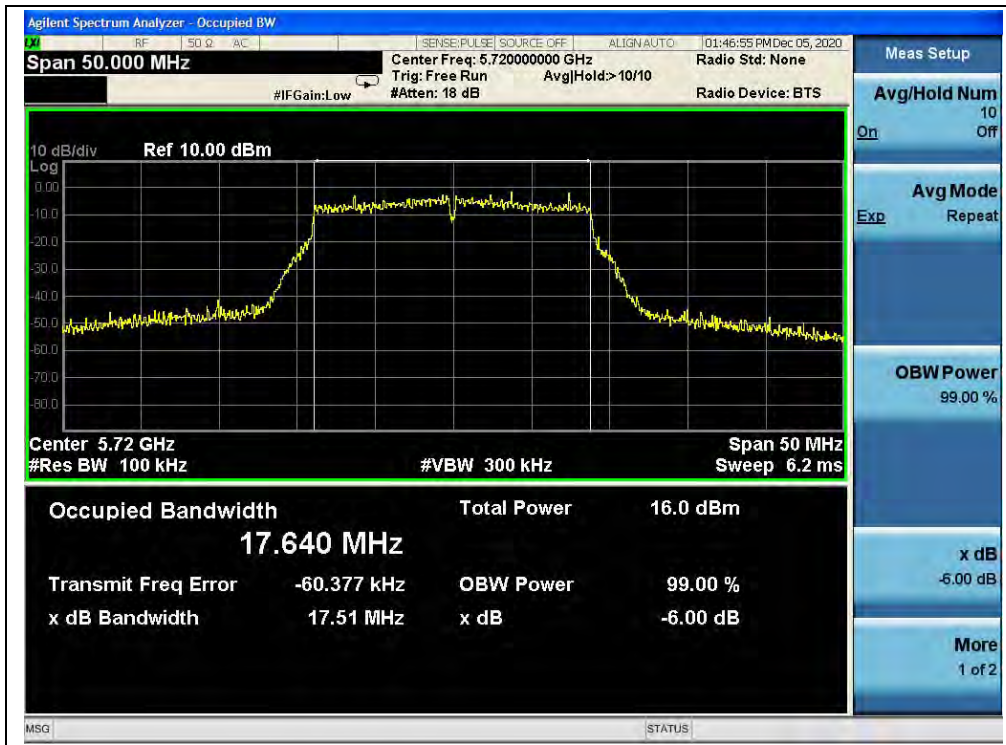
(Channel 100, 5500MHz, 802.11ac (VHT20))



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



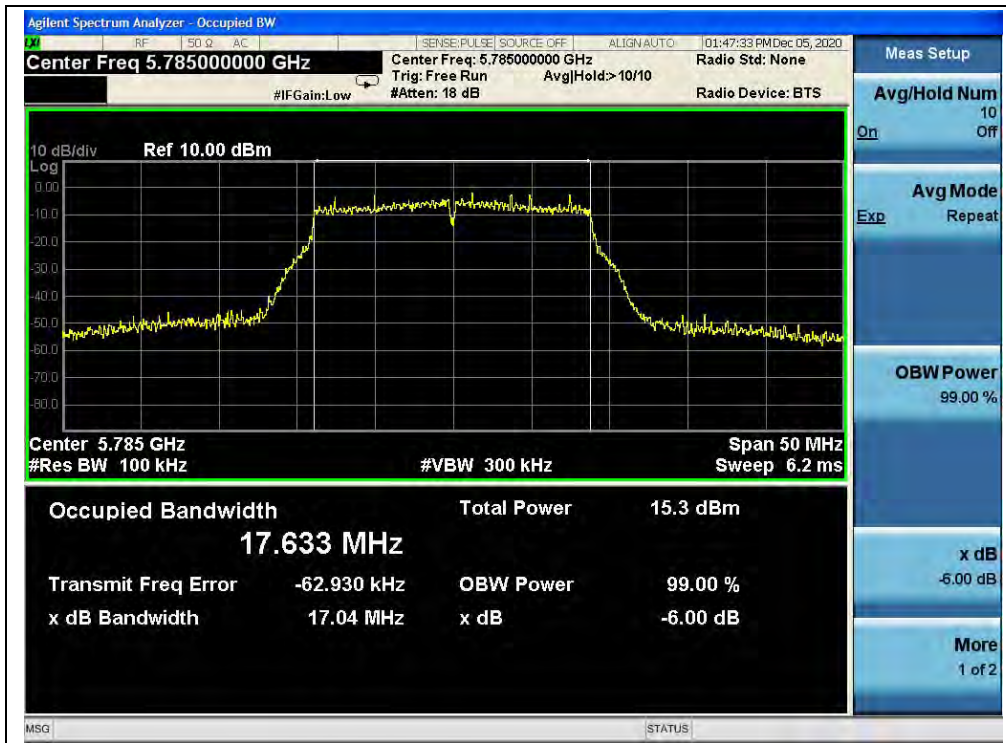
(Channel 144, 5720MHz, 802.11ac (VHT20))



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



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



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



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



802.11ac (VHT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	39.81
46	5230	39.80
54	5270	39.65
62	5310	39.46
102	5510	39.63
126	5630	39.76
142	5710	39.74
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
142	5710	36.33
151	5755	36.30
159	5795	36.31

B. Test Plot:



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

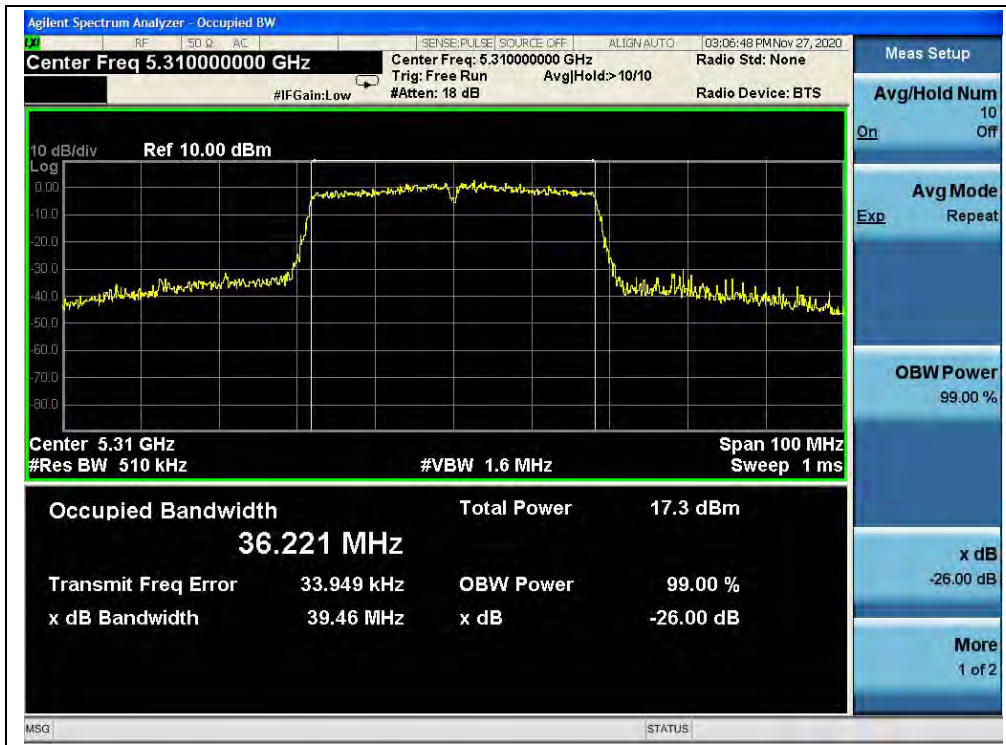




(Channel 46, 5230MHz, 802.11ac (VHT40))



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



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



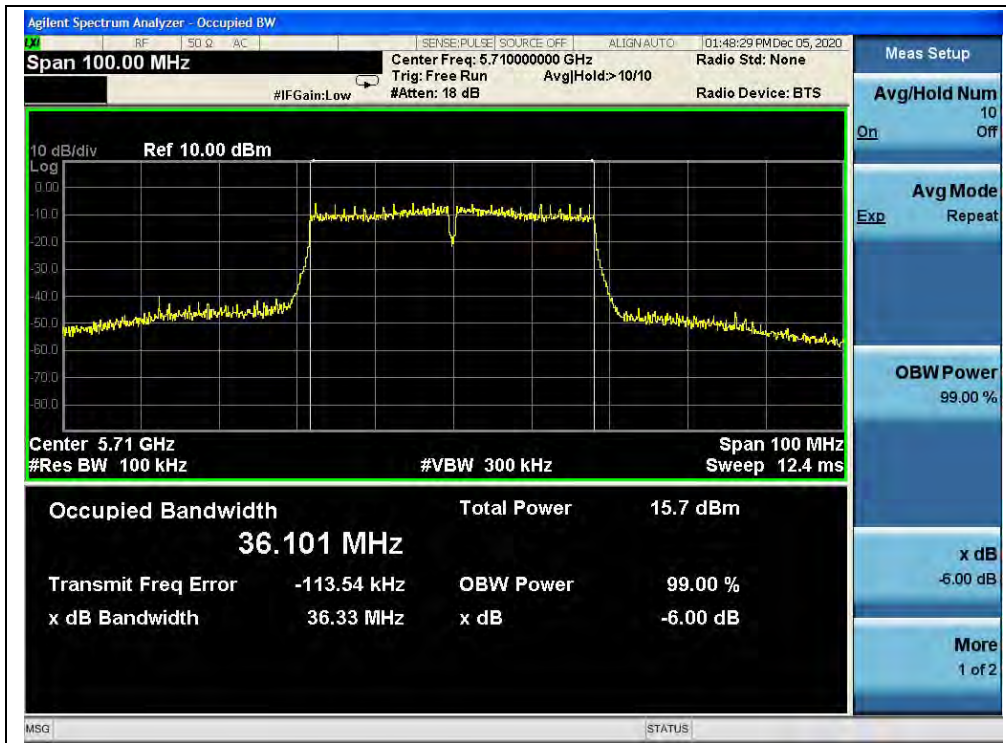
(Channel 102, 5510MHz, 802.11ac (VHT40))



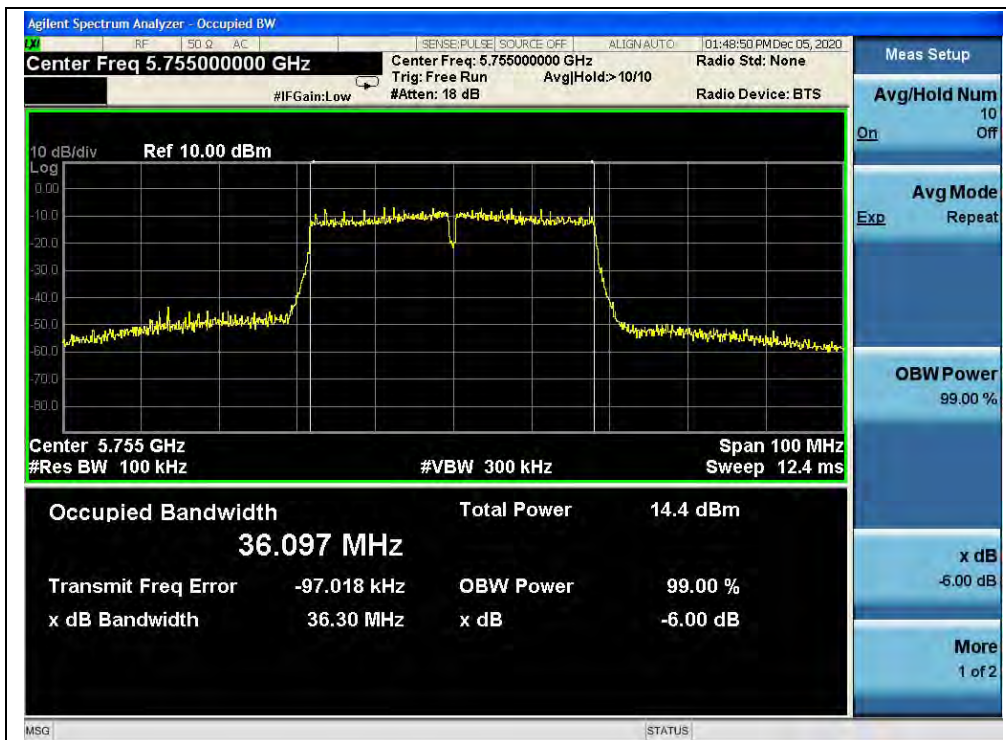
(Channel 126, 5630MHz, 802.11ac (VHT40))



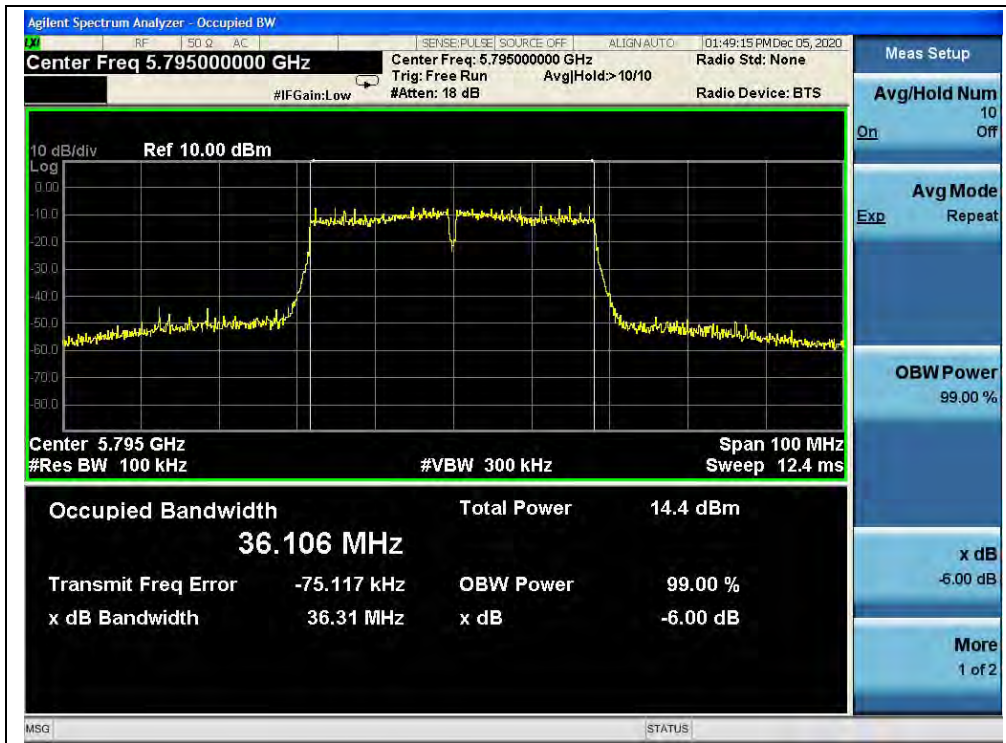
(Channel 142, 5710MHz, 802.11ac (VHT40))



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



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



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

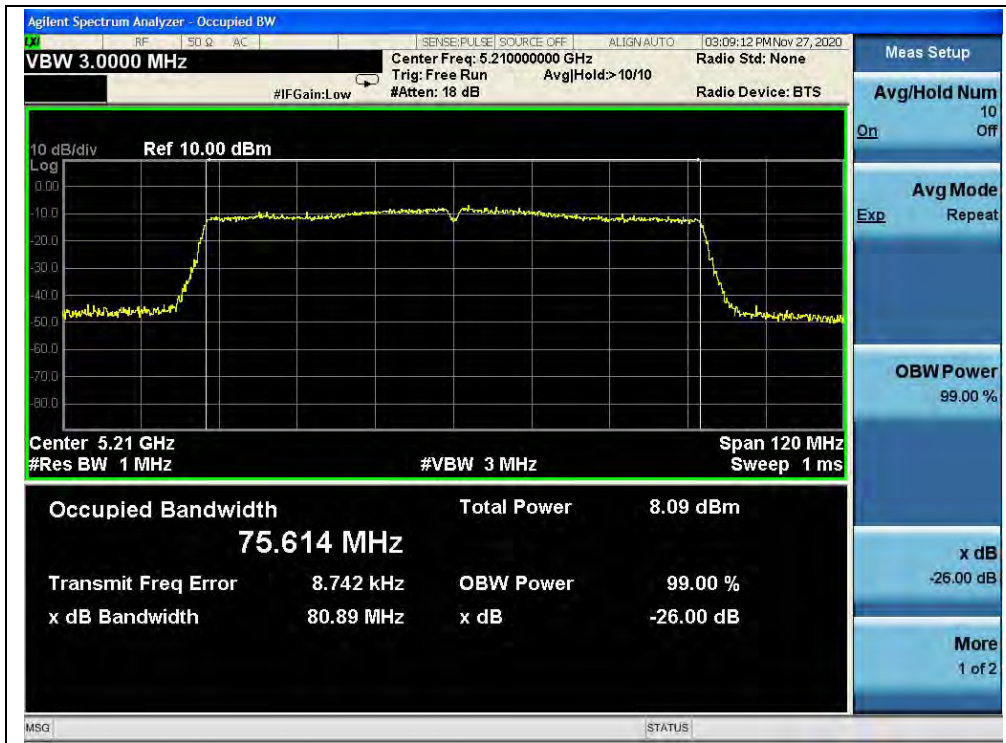


802.11ac (VHT80) Mode

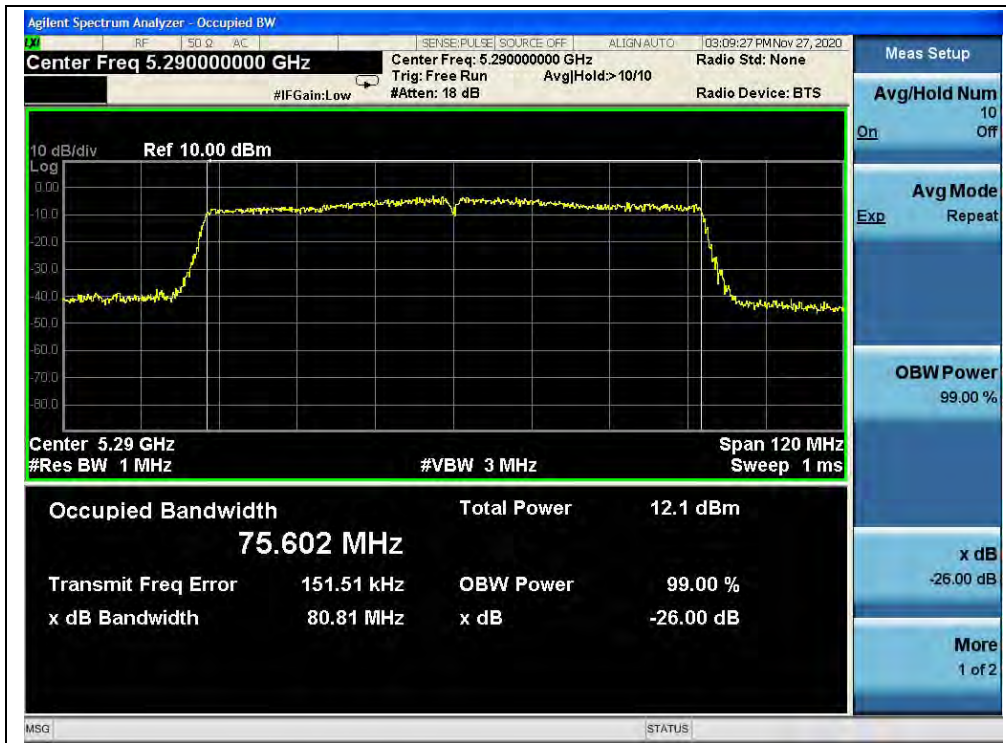
A. Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	80.89
58	5290	80.81
106	5530	80.85
122	5610	81.12
138	5690	81.19
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)
138	5690	75.32
155	5775	75.73

B. Test Plot:



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



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



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

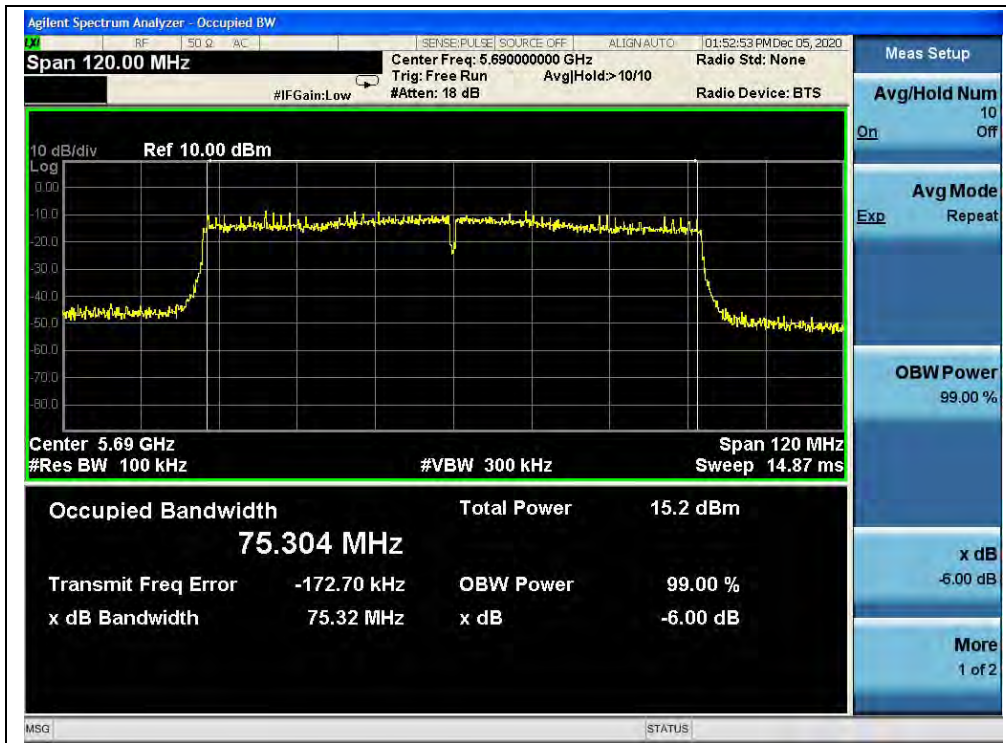


(Channel 122, 5610MHz, 802.11ac (VHT80))



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





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



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

## 2.5. 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.

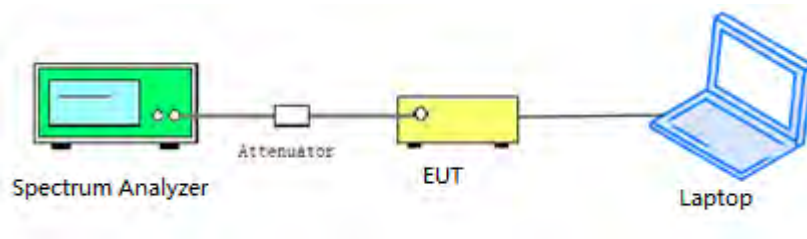
If transmitting antennas of directional gain greater than 6dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

(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 = Peak
- 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
36	5180	0.36	0.07	0.43	11	PASS
44	5220	2.30		2.37		
48	5240	2.09		2.16		
52	5260	2.80		2.87		
60	5300	3.14		3.21		
64	5320	3.23		3.30		
100	5500	1.26		1.33		
120	5600	1.55		1.62		
144	5720	1.35		1.42		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	-1.33	0.07	-1.26	30	PASS
149	5745	-1.95		-1.88		
157	5785	-2.48		-2.41		
165	5825	-2.60		-2.53		



B.Test Plot:



(Channel 36, 5180MHz, 802.11a)



(Channel 44, 5220MHz, 802.11a)



(Channel 48, 5240MHz, 802.11a)



(Channel 52, 5260MHz, 802.11a)



(Channel 60, 5300MHz, 802.11a)



(Channel 64, 5320MHz, 802.11a)



(Channel 100, 5500MHz, 802.11a)



(Channel 120, 5600MHz, 802.11a)



(Channel 144, 5720MHz, 802.11a)



(Channel 144, 5720MHz, 802.11a)





(Channel 149, 5745MHz, 802.11a)



(Channel 157, 5785MHz, 802.11a)



(Channel 165, 5825MHz, 802.11a)

**802.11n (HT20) Mode****A.Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	-0.26	0.07	-0.19	11	PASS
44	5220	1.69		1.76		
48	5240	1.73		1.80		
52	5260	2.65		2.72		
60	5300	2.82		2.89		
64	5320	2.93		3.00		
100	5500	0.70		0.77		
120	5600	1.36		1.43		
144	5720	1.59		1.66		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	-0.95	0.07	-0.88	30	PASS
149	5745	-2.31		-2.24		
157	5785	-2.60		-2.53		
165	5825	-3.48		-3.41		



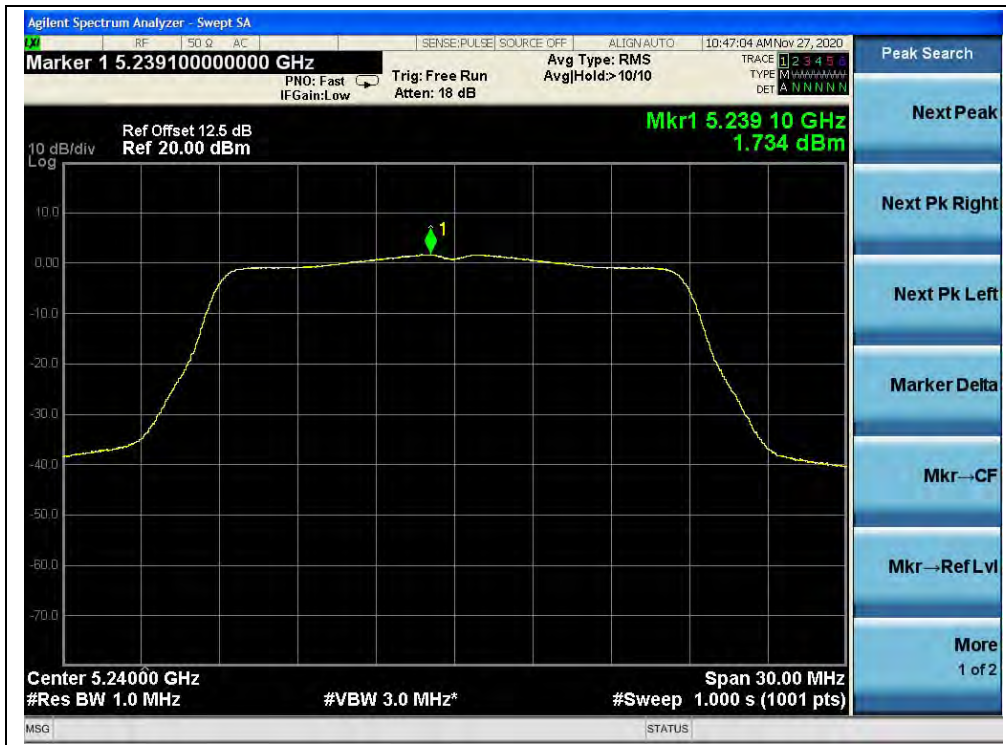
B.Test Plot:



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



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



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



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



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



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



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



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



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



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





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



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



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



802.11n (HT40) Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
38	5190	-6.16	0.09	-6.07	11	PASS
46	5230	-3.18		-3.09		
54	5270	-1.21		-1.12		
62	5310	-1.15		-1.06		
102	5510	-2.75		-2.66		
126	5630	-1.55		-1.46		
142	5710	-1.92		-1.83		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
142	5710	-4.84	0.09	-4.75	30	PASS
151	5755	-5.83		-5.74		
159	5795	-6.22		-6.13		

B. Test Plot:



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



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



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



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



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



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



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



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



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



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





**802.11ac (VHT20) Mode**

**A.Test Verdict:**

Channel	Frequency (MHz)	Measured PPSD (dBm/MHz)	Duty Factor	Corrected PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	-0.26	0.07	-0.19	11	PASS
44	5220	1.62		1.69		
48	5240	1.56		1.63		
52	5260	2.46		2.53		
60	5300	2.44		2.51		
64	5320	2.56		2.63		
100	5500	0.46		0.53		
120	5600	0.89		0.96		
144	5720	1.14		1.21		
Channel	Frequency (MHz)	Measured PPSD (dBm/500KHz)	Duty Factor	Corrected (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
144	5720	-1.58	0.07	-1.51	30	PASS
149	5745	-2.61		-2.54		
157	5785	-3.12		-3.05		
165	5825	-3.68		-3.61		