



TEST REPORT

APPLICANT : Thundercomm Technology Co., Ltd.
PRODUCT NAME : Thundersoft TurboX S820 SOM
MODEL NAME : S820
BRAND NAME : TurboX
FCC ID : 2AOHHTURBOXSOMS820
STANDARD(S) : 47 CFR Part 15 Subpart E
TEST DATE : 2017-12-04 to 2018-01-16
ISSUE DATE : 2018-01-17

Tested by: Tu Ya'nan
Tu Ya'nan (Test Engineer)
Approved by: Andy Yeh
Andy Yeh (Technical Director)

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Change History		
Issue	Date	Reason for change
1.0	2017-12-29	First edition
2.0	2018-01-17	Second edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Thundercomm Technology Co., Ltd.
Applicant Address:	4F, Taixiang Building, 1A Longxiang Rd., Haidian Dist., Beijing, 100191, P.R.China
Manufacturer:	Thundercomm Technology Co., Ltd.
Manufacturer Address:	4F, Taixiang Building, 1A Longxiang Rd., Haidian Dist., Beijing, 100191, P.R.China

1.2. Equipment Under Test (EUT) Description

Product Name:	Thundersoft TurboX S820 SOM
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	Dolphin_V23
Software Version:	N/A
Modulation Type:	OFDM
Modulation Mode:	802.11a, 802.11n(HT20), 802.11n(HT40), 802.11ac(VHT20), 802.11ac(VHT40), 801.11ac(VHT80) ^{Note1}
Operating Frequency Range:	5.150GHz- 5.250GHz; 5.725GHz- 5.850GHz
Channel Number:	Refer to 1.3
Antenna Type:	FPC Antenna ^{Note3}
Antenna Gain:	Ant0: 4 dBi; ANT1: 4 dBi ^{Note3}
Directional Gain:	7.01dBi ^{Note 2}

Note 1: The EUT has two antenna ports and supports a MIMO function. Physically, the EUT provides two completed transmitters and two receivers. All radiation test items for each modulation mode operate at MIMO mode during the test.

Modulation Mode:	TX Function
802.11a	2TX
802.11n	2TX
802.11ac	2TX

Note 2: 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.



Note 3: The product will not sell with antenna. The antennas we use for all radiated test were just for test, the antenna type is FPC antenna and the antenna gain is 4 dBi. For more detailed, please refer to the Internal Photos.

Note 4: During test, the duty cycle of the EUT was setting to 100%.

Note 5: For a more detailed description, please refer to Specification or User’s Manual supplied by the applicant and/or manufacturer.

1.3.The channel number and frequency of EUT

Frequency Range: 5150-5250MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	36	5180	40	5200
	44	5220	48	5240
40MHz	38	5190	46	5230
80MHz	42	5210		
Frequency Range: 5725-5850MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	149	5745	153	5765
	157	5785	161	5805
	165	5825		
40MHz	151	5775	159	5795
80MHz	155	5775		



1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart E (UNII 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
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.407(a) (e)	Emission Bandwidth	Dec 04, 2017	Tu Ya'nan	PASS
3	15.407(a)	Maximum conducted output Power	Dec 04, 2017	Tu Ya'nan	PASS
4	15.407(a)	Peak Power spectral density	Dec 04, 2017	Tu Ya'nan	PASS
5	15.407(b)	Restricted Frequency Bands	Jan 16, 2018	Wang Dalong	PASS
6	15.407(g)	Frequency Stability	Dec 04, 2017	Tu Ya'nan	PASS
7	15.207	Conducted Emission	Dec 12, 2017	Wang Dalong	PASS
8	15.407(b)	Radiated Emission	Dec 15, 2017	Wang Dalong	PASS
9	15.407(c)	Automatically discontinue transmission requirement	N/A	N/A	PASS

Note1: EUT is a Client Device Without Radar Detection, WIFI hotspot does not support U-NII band; A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Note2: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10 2013.

Note3: These RF tests were performed according to the method of measurements prescribed in KDB789033 D02 General UNII Test Procedures New Rules v01r03, KDB662911 D01 Multiple Transmitter Output v02r01.

1.5. 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 15C 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. 2.1.2 Result: Compliant

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

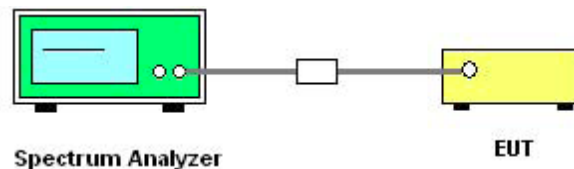
2.2. Emission Bandwidth

2.2.1. 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.

2.2.2. Test Description

A. Test Set:



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.

B. 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 5.725-5.85GHz 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 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.

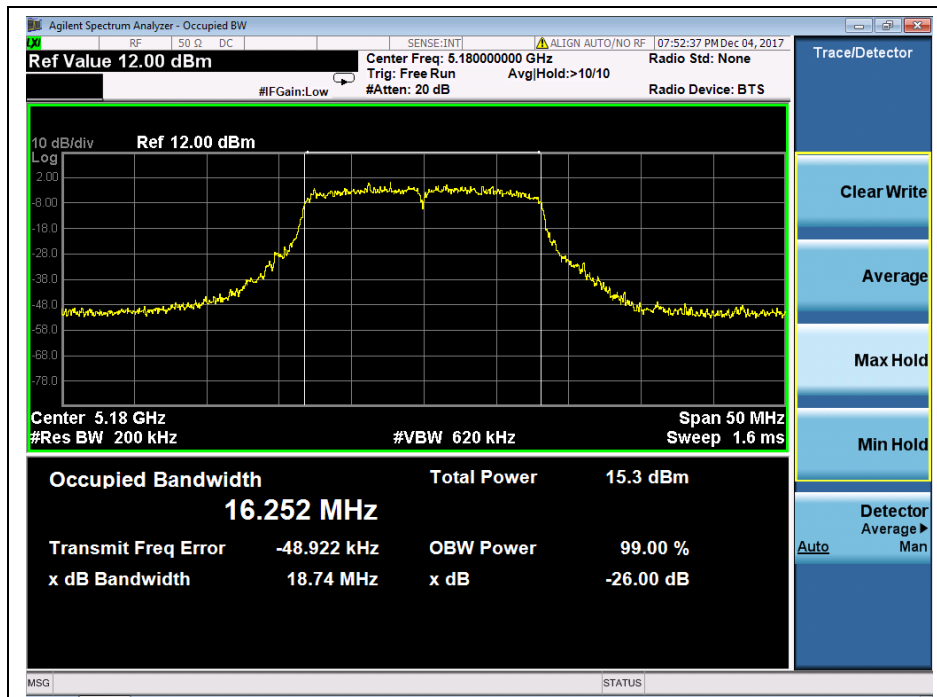
2.2.3. Test Result

802.11a Test mode

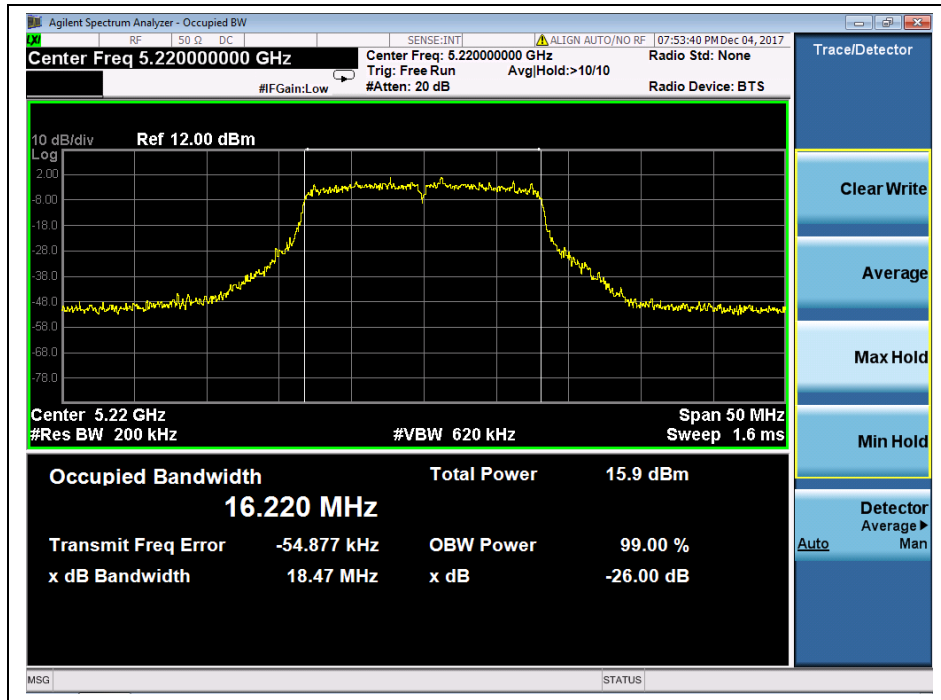
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)	ANT1 26 dB Bandwidth (MHz)
36	5180	18.74	18.74
44	5220	18.47	18.47
48	5240	18.38	18.43
Channel	Frequency (MHz)	ANT0 6dB Bandwidth (MHz)	ANT1 6dB Bandwidth (MHz)
149	5745	15.05	15.05
157	5785	15.36	15.36
165	5825	15.64	15.64

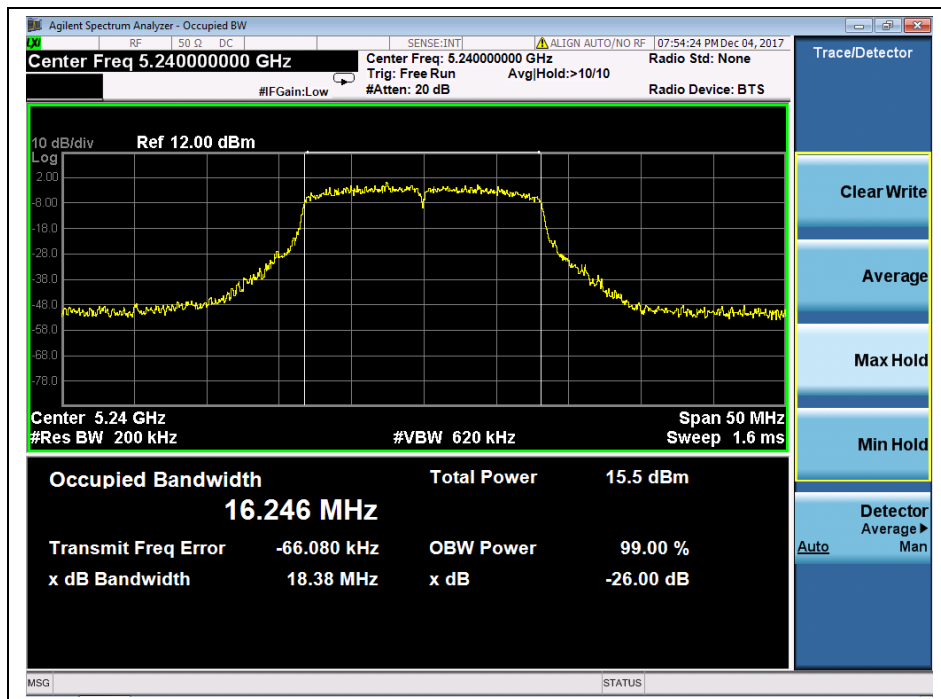
B. Test Plots



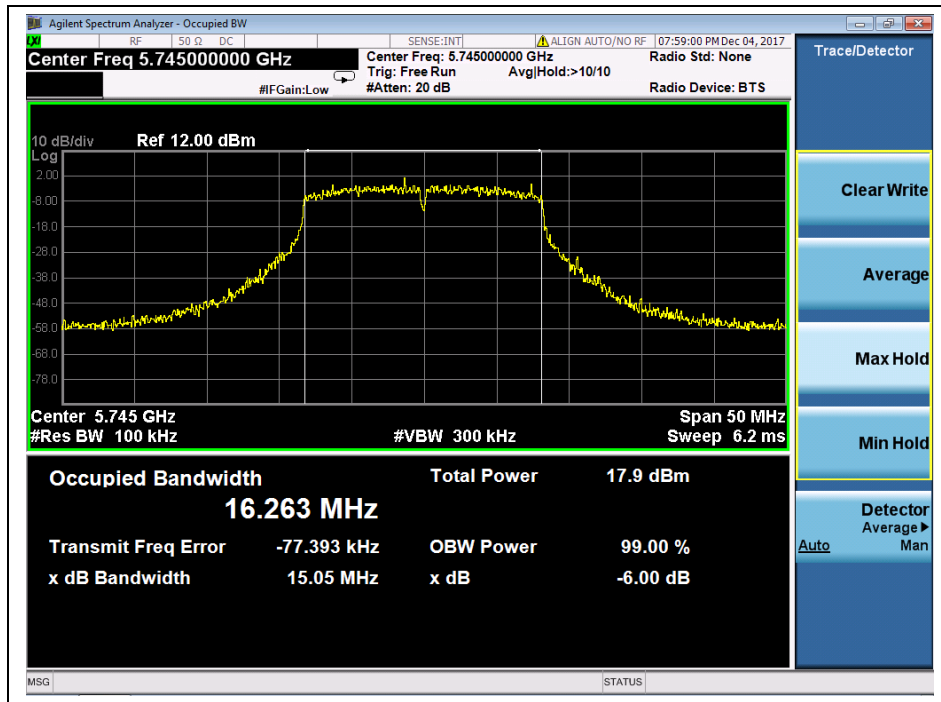
(Channel 36, 5180MHz, 802.11a, ANT0)



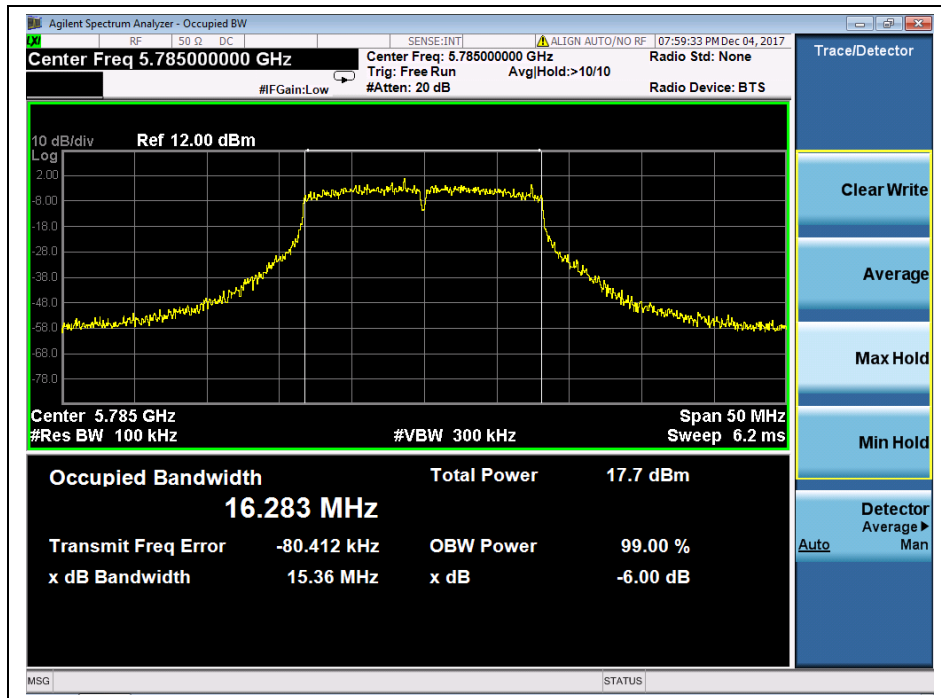
(Channel 44, 5220 MHz, 802.11a, ANT0)



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



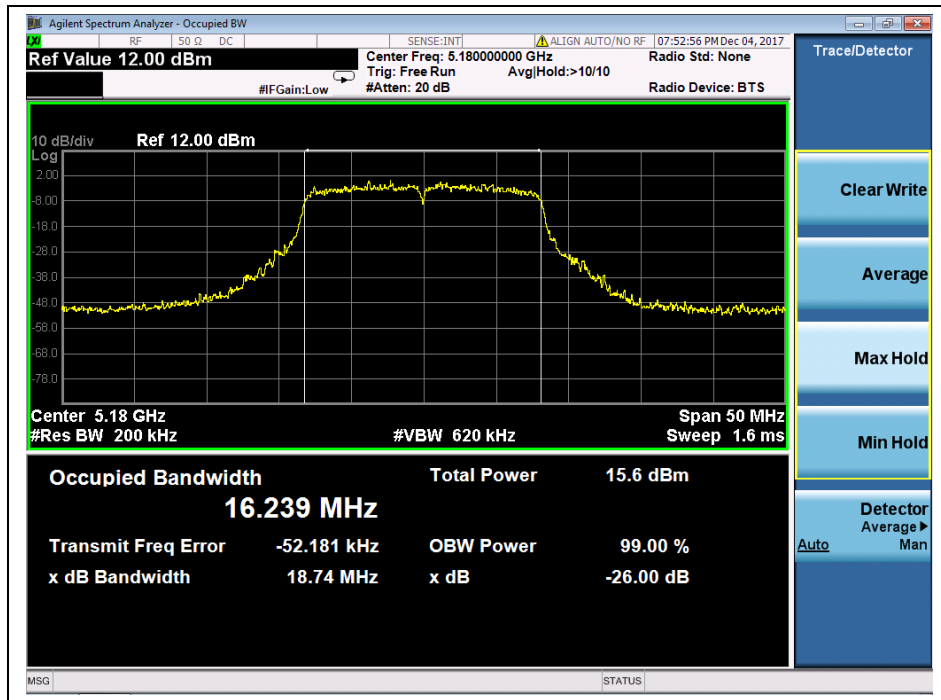
(Channel 149, 5745MHz, 802.11a, ANT0)



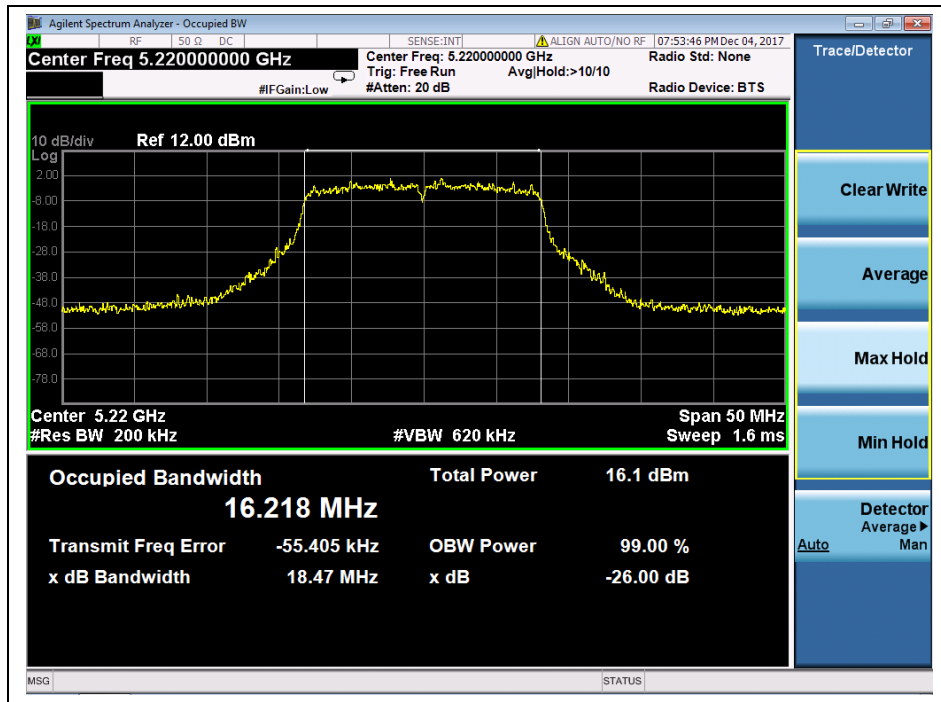
(Channel 157, 5785MHz, 802.11a, ANT0)



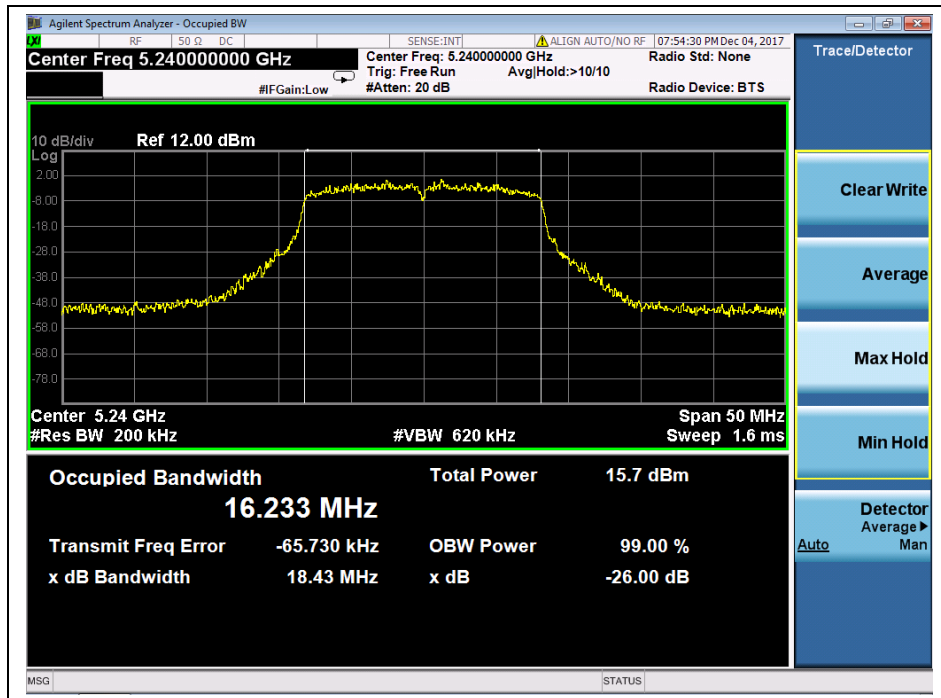
(Channel 165, 5825MHz, 802.11a, ANT0)



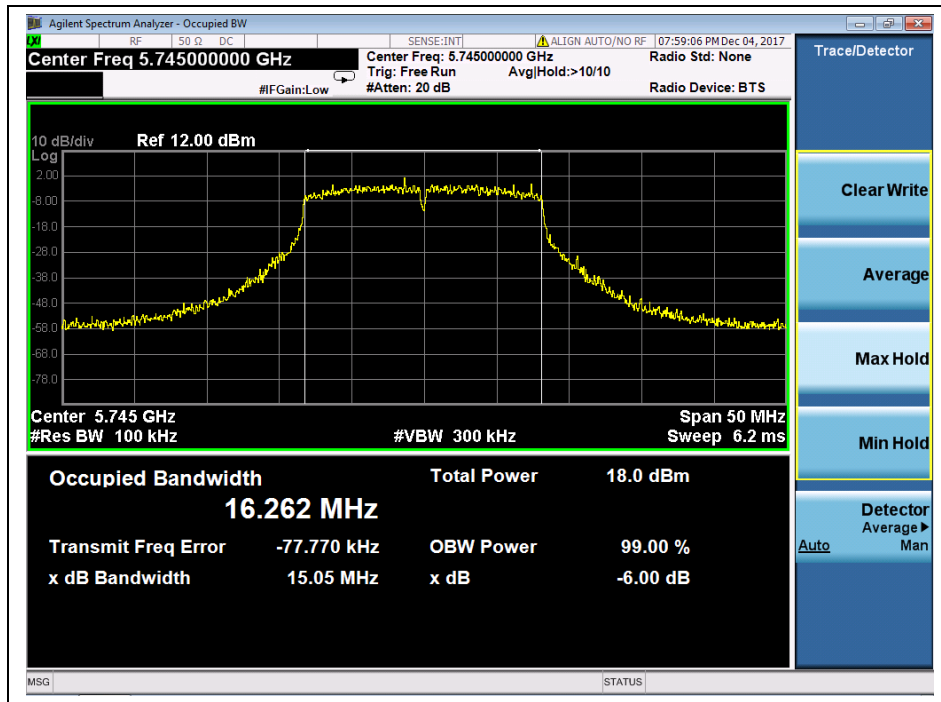
(Channel 36, 5180MHz, 802.11a, ANT1)



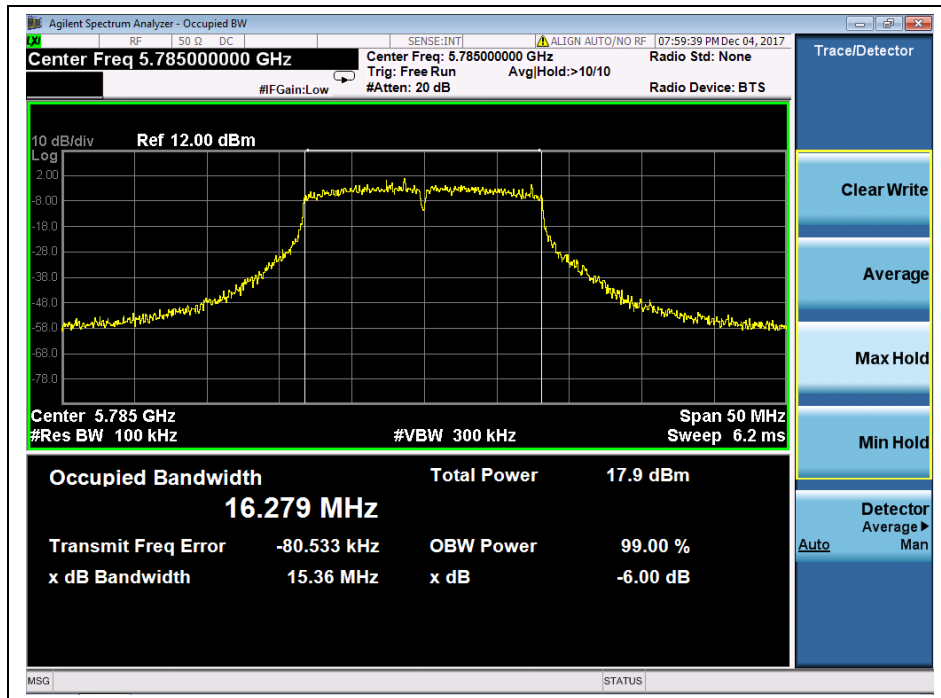
(Channel 44, 5220 MHz, 802.11a, ANT1)



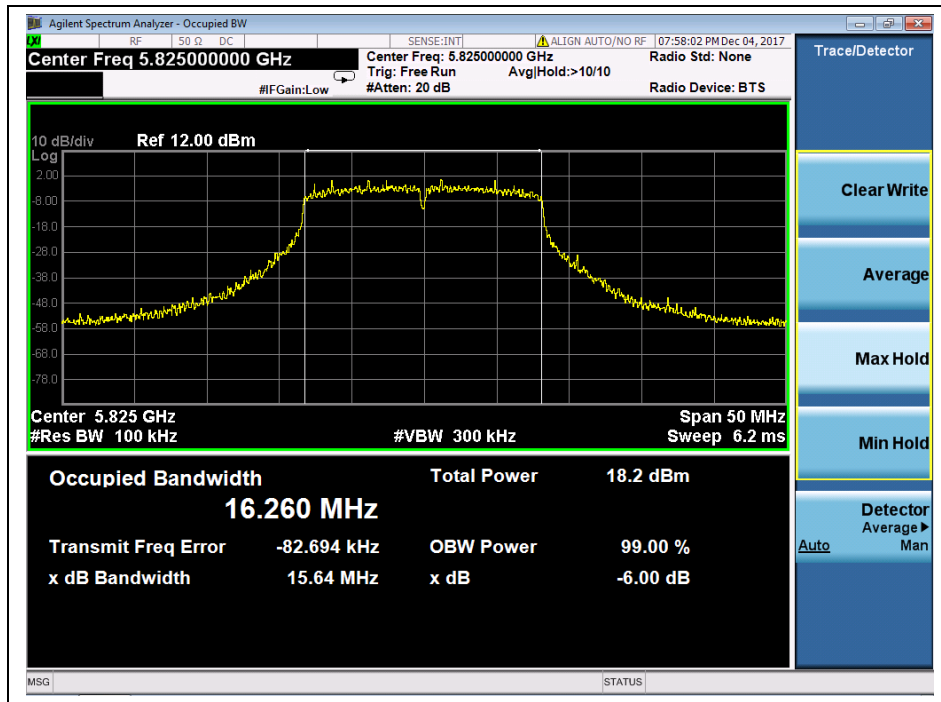
(Channel 48, 5240MHz, 802.11a, ANT1)



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



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



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

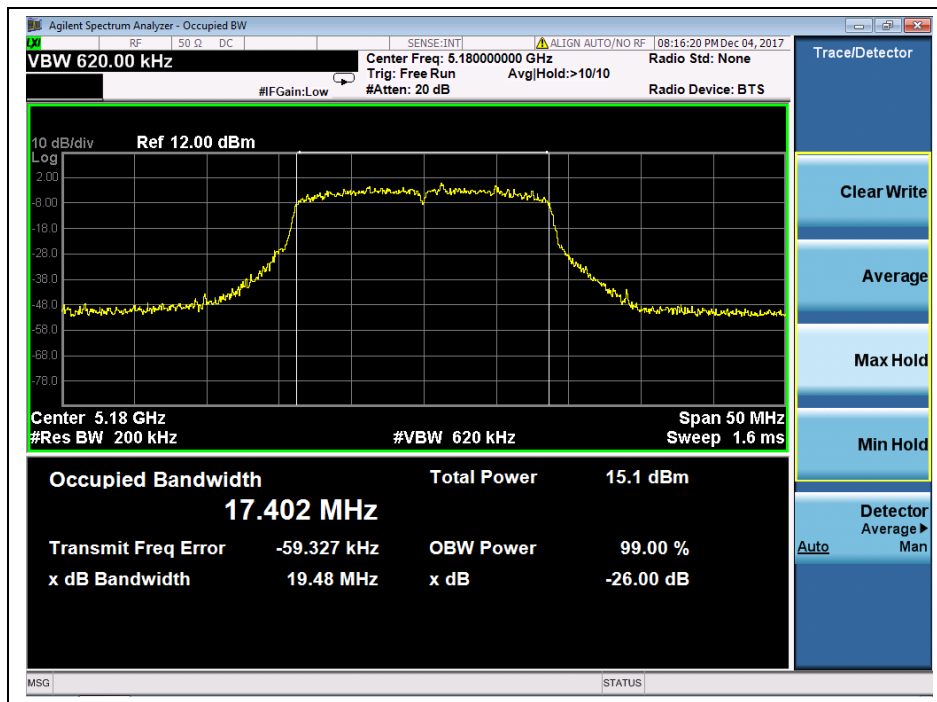


802.11n (HT20) Test mode

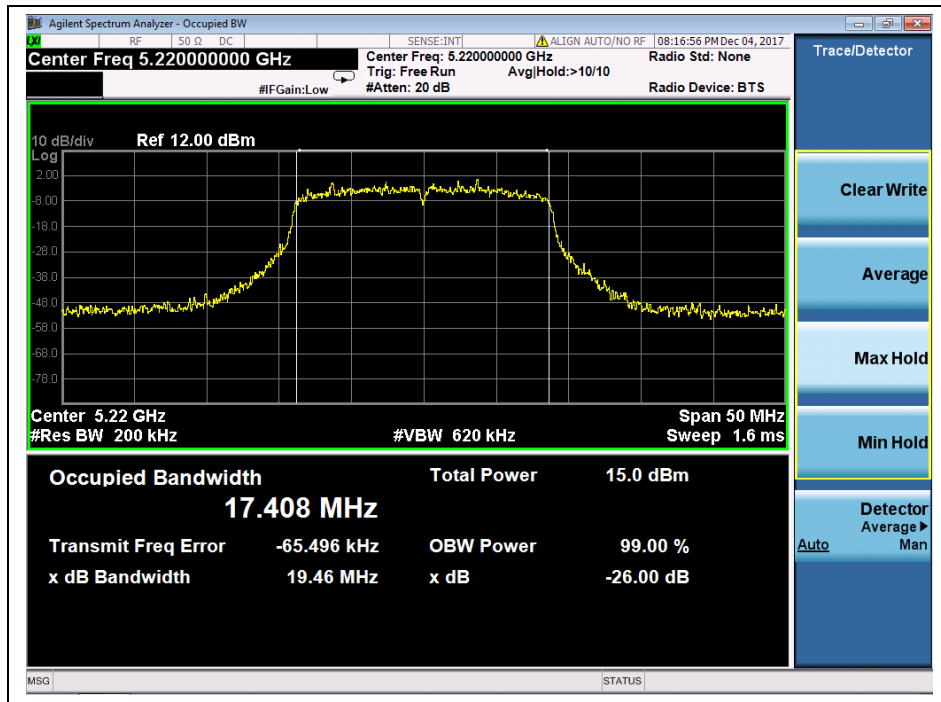
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)	ANT1 26 dB Bandwidth (MHz)
36	5180	19.48	19.48
44	5220	19.46	19.46
48	5240	19.63	19.98
Channel	Frequency (MHz)	ANT0 6dB Bandwidth (MHz)	ANT1 6dB Bandwidth (MHz)
149	5745	15.06	15.11
157	5785	17.19	17.19
165	5825	15.11	15.11

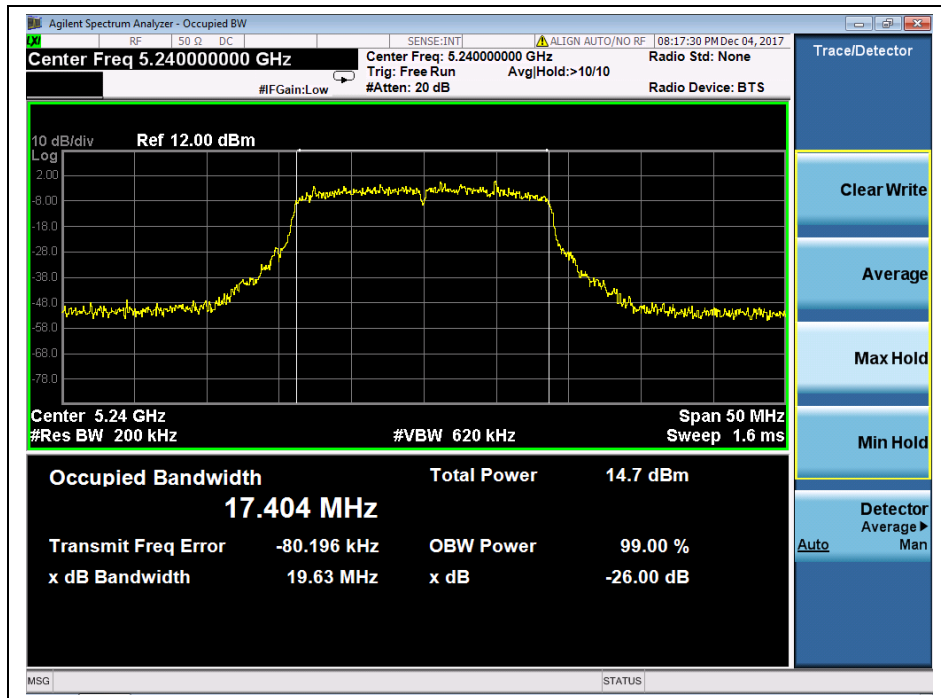
B. Test Plots



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



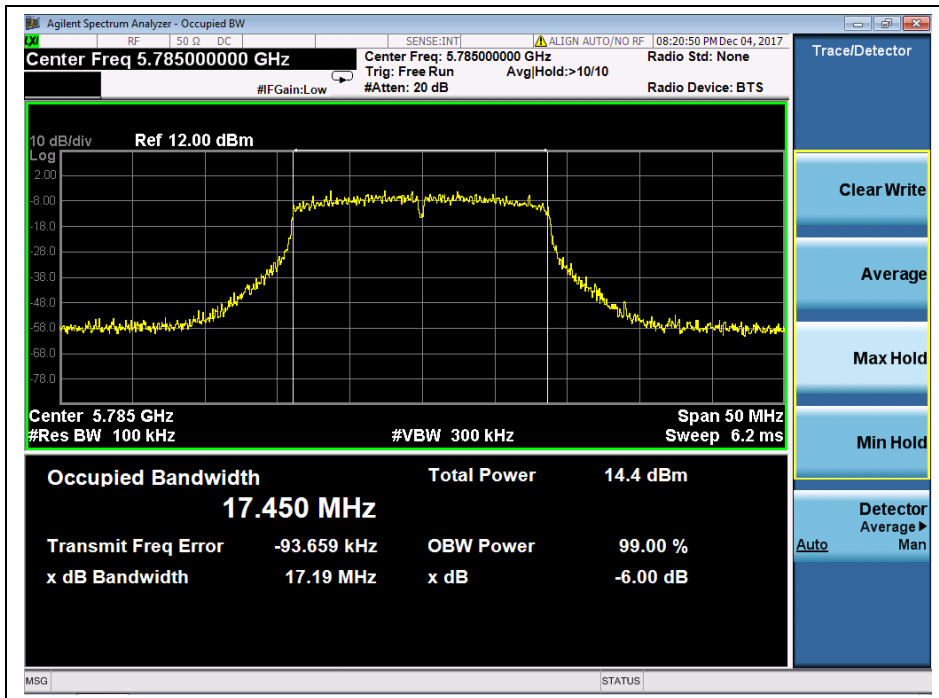
(Channel 44, 5220 MHz, 802.11n (HT20), ANT0)



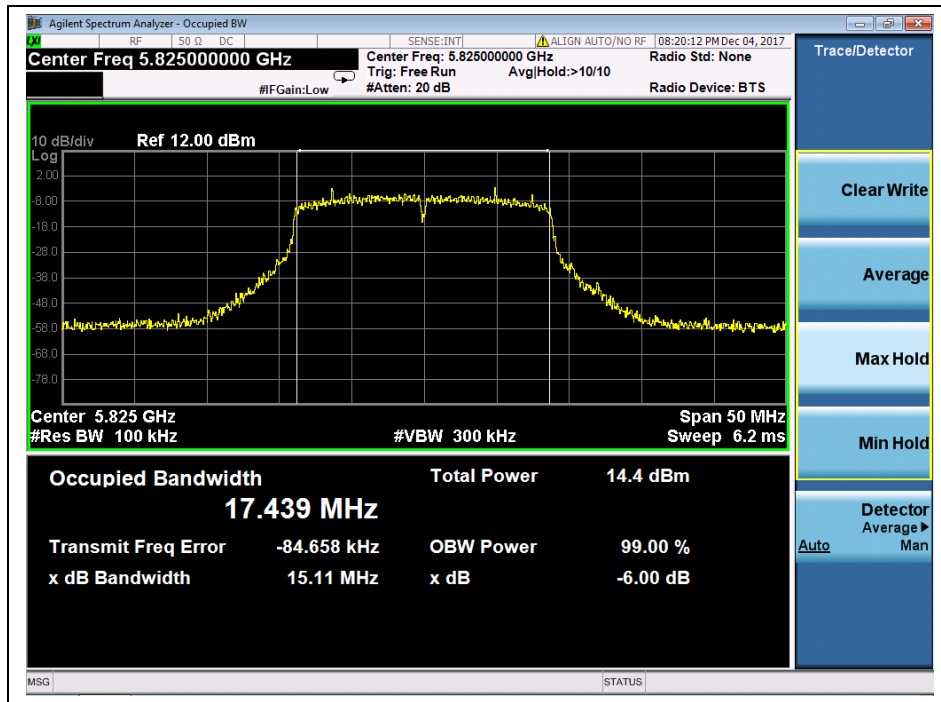
(Channel 48, 5240MHz, 802.11 n (HT20), ANT0)



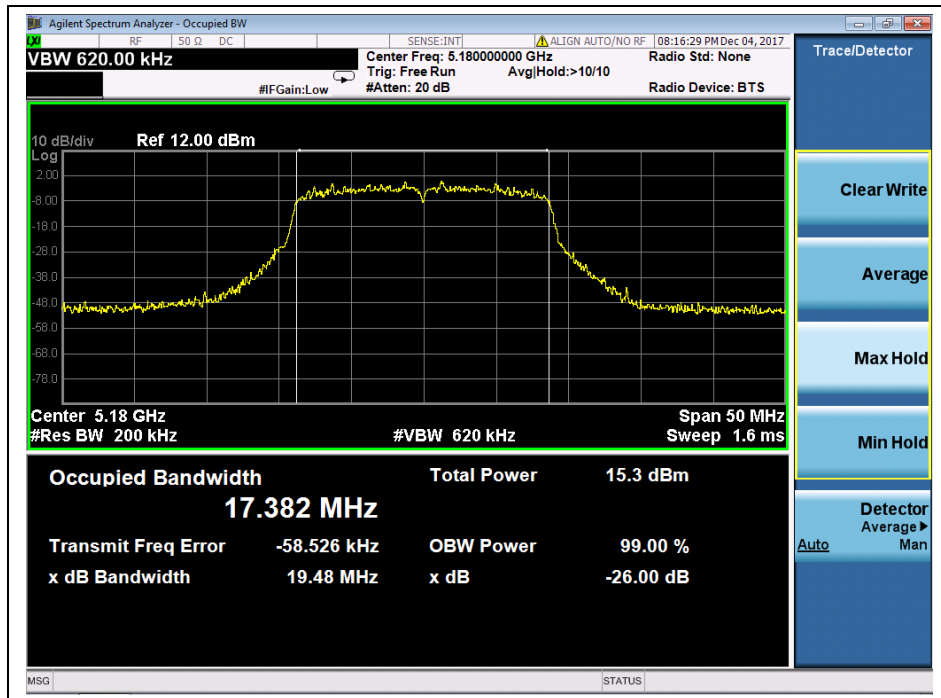
(Channel 149, 5745MHz, 802.11 n (HT20), ANT0)



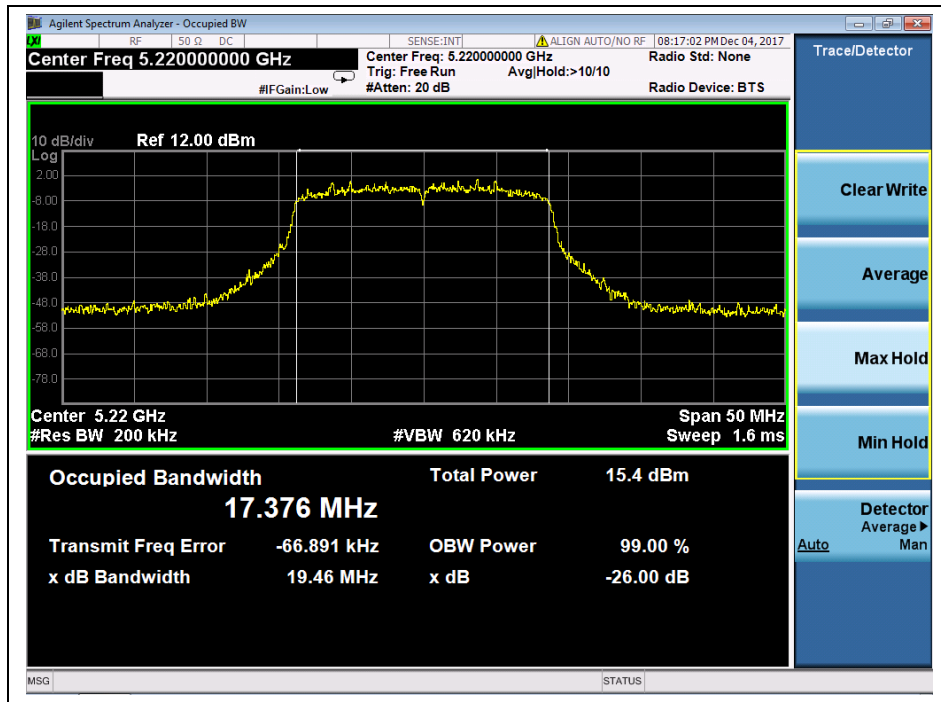
(Channel 157, 5785MHz, 802.11 n (HT20), ANT0)



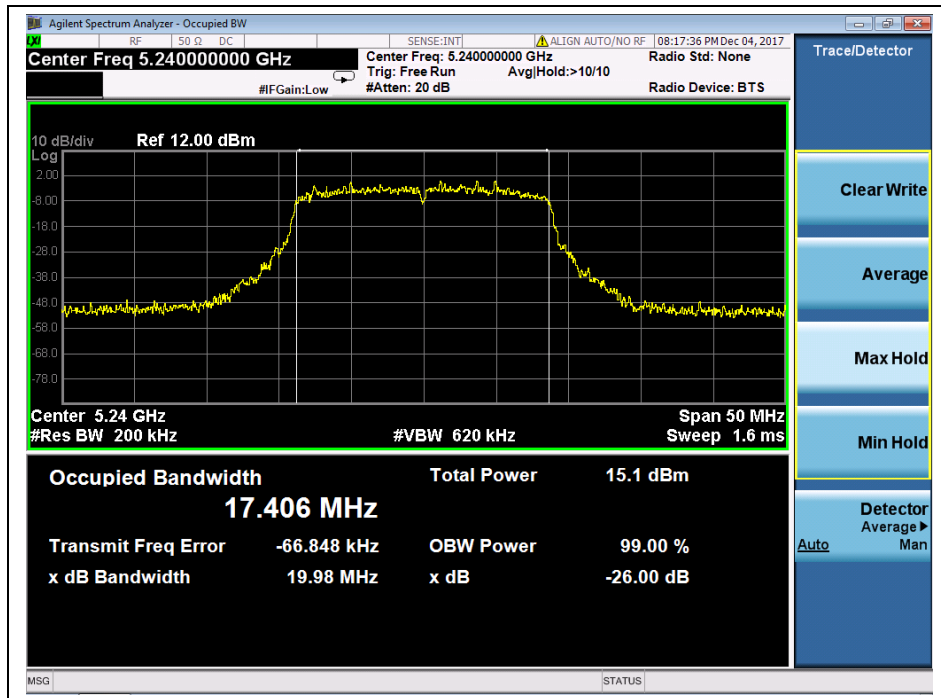
(Channel 165, 5825MHz, 802.11 n (HT20), ANT0)



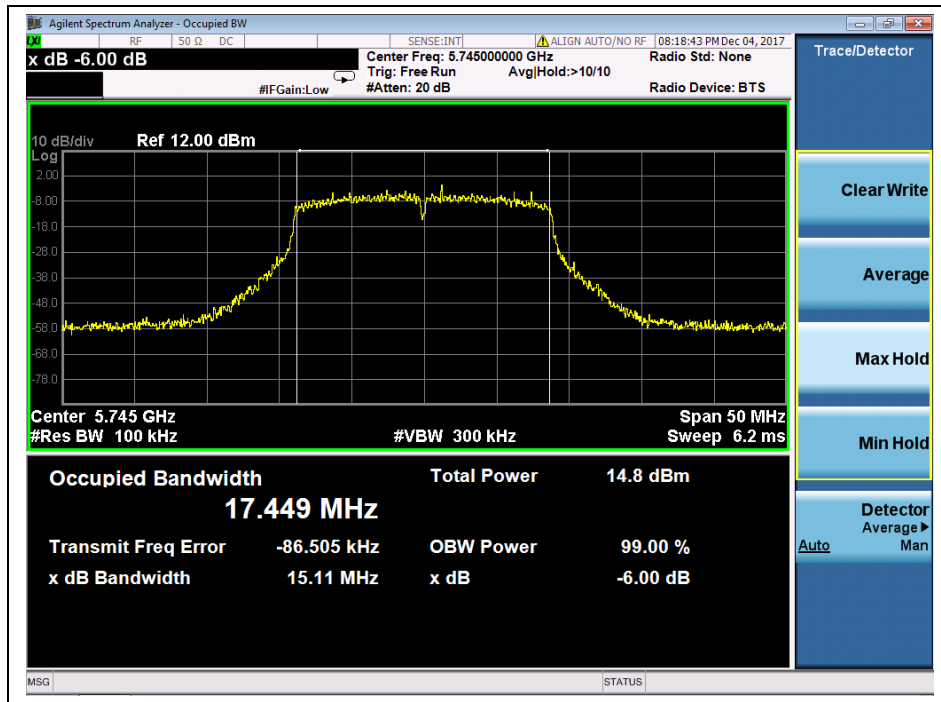
(Channel 36, 5180MHz, 802.11 n (HT20), ANT1)



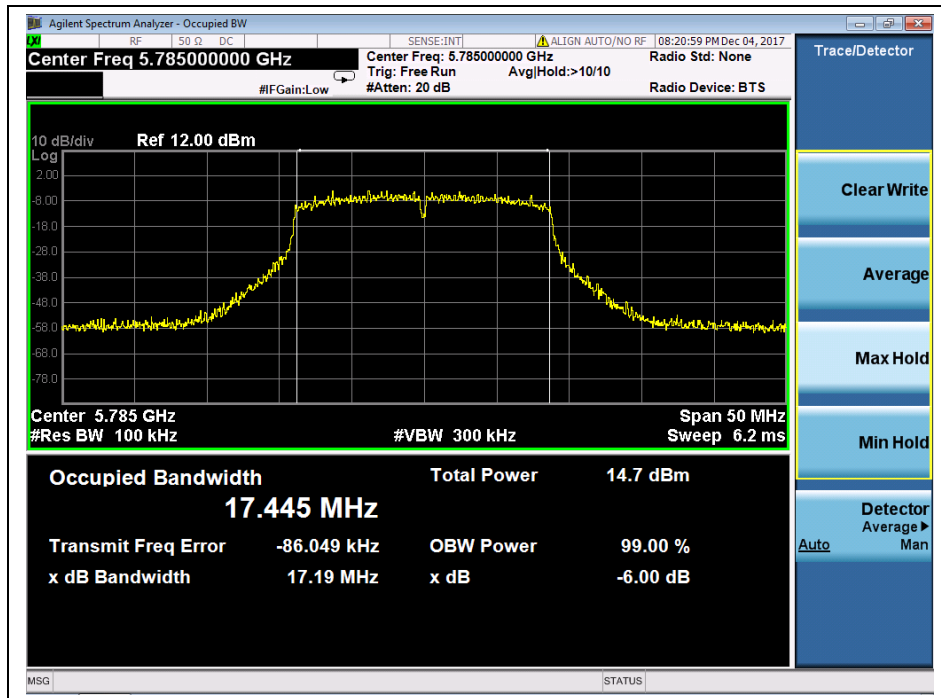
(Channel 44, 5220 MHz, 802.11 n (HT20), ANT1)



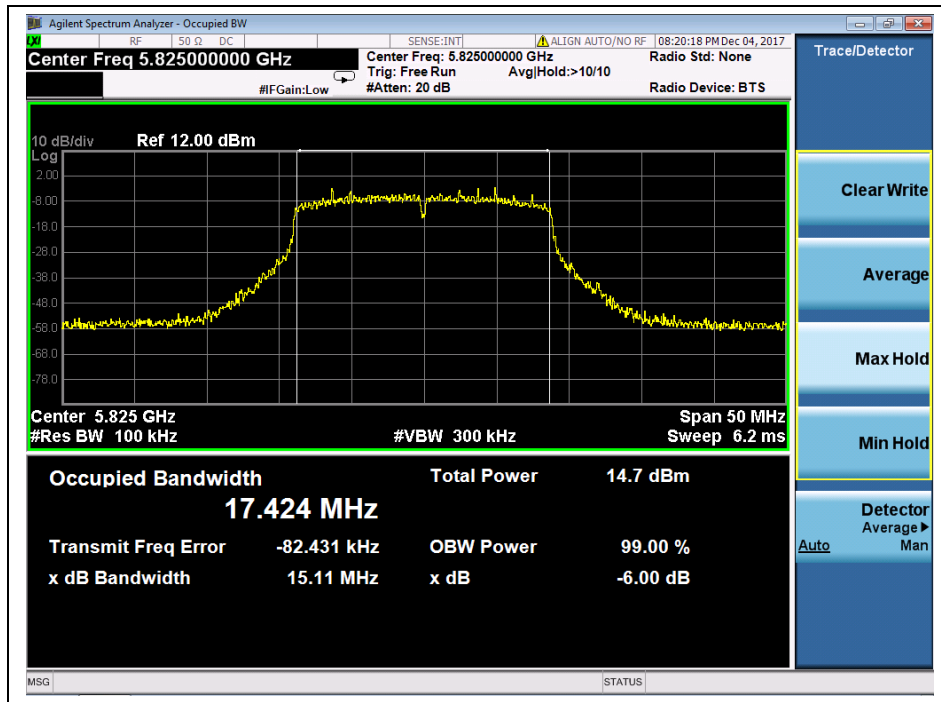
(Channel 48, 5240MHz, 802.11 n (HT20), ANT1)



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



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



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

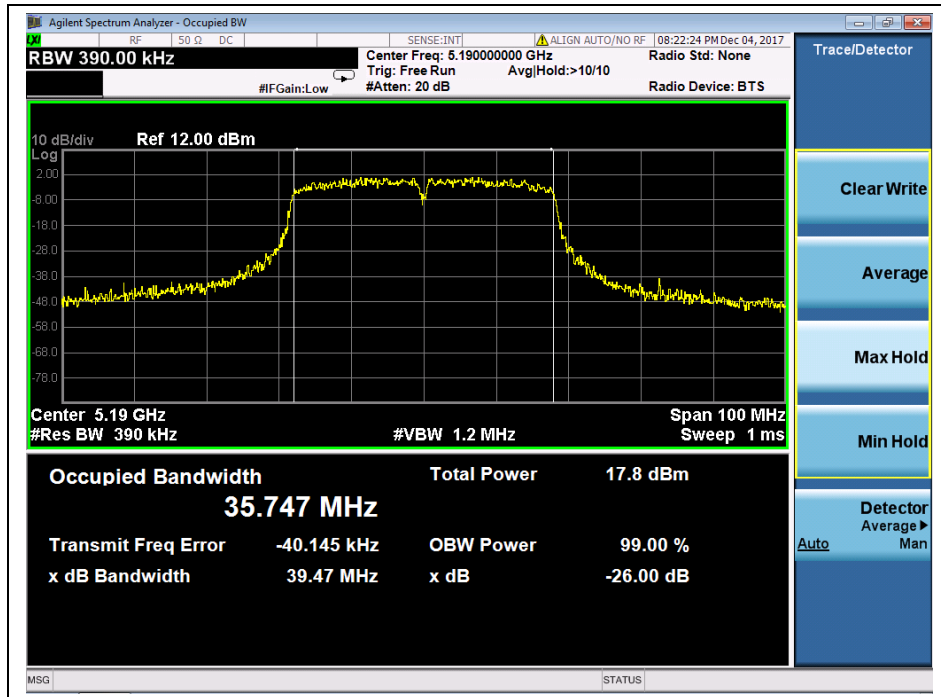


802.11n (HT40) Test mode

A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)	ANT1 26 dB Bandwidth (MHz)
38	5190	39.47	39.32
46	5230	39.67	39.81
Channel	Frequency (MHz)	ANT0 6dB Bandwidth (MHz)	ANT1 6dB Bandwidth (MHz)
151	5755	34.17	34.18
159	5795	34.49	35.13

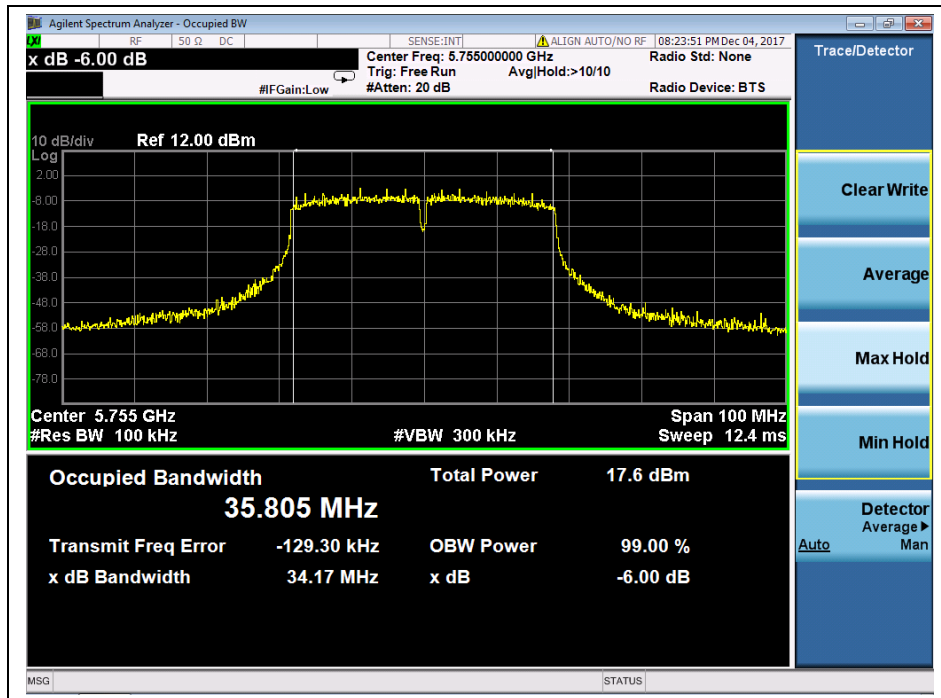
B. Test Plots



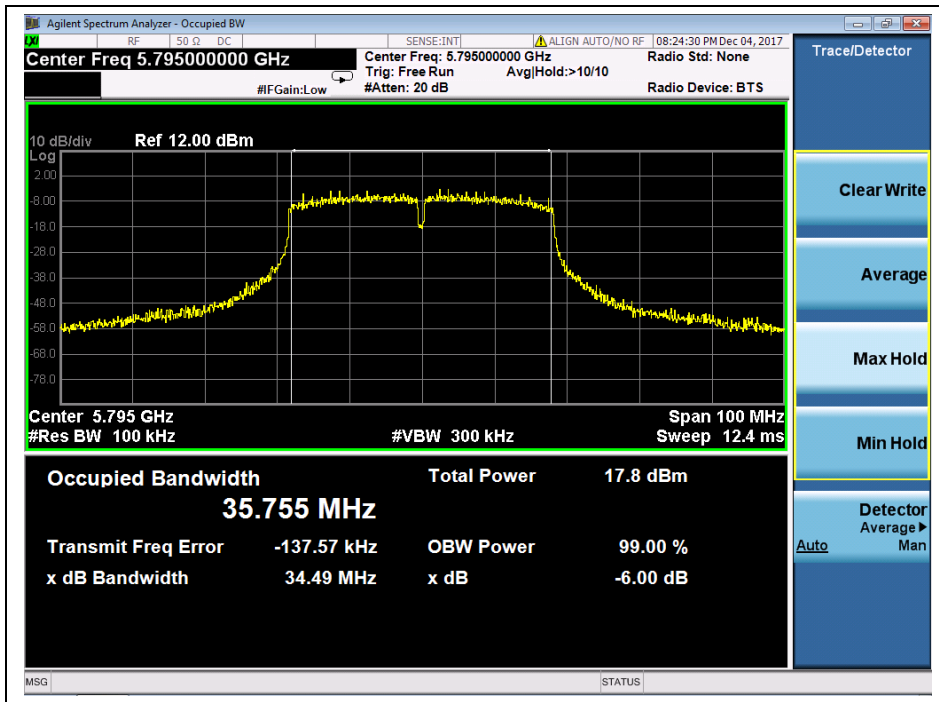
(Channel 38, 5190MHz, 802.11n (HT40), ANT0)



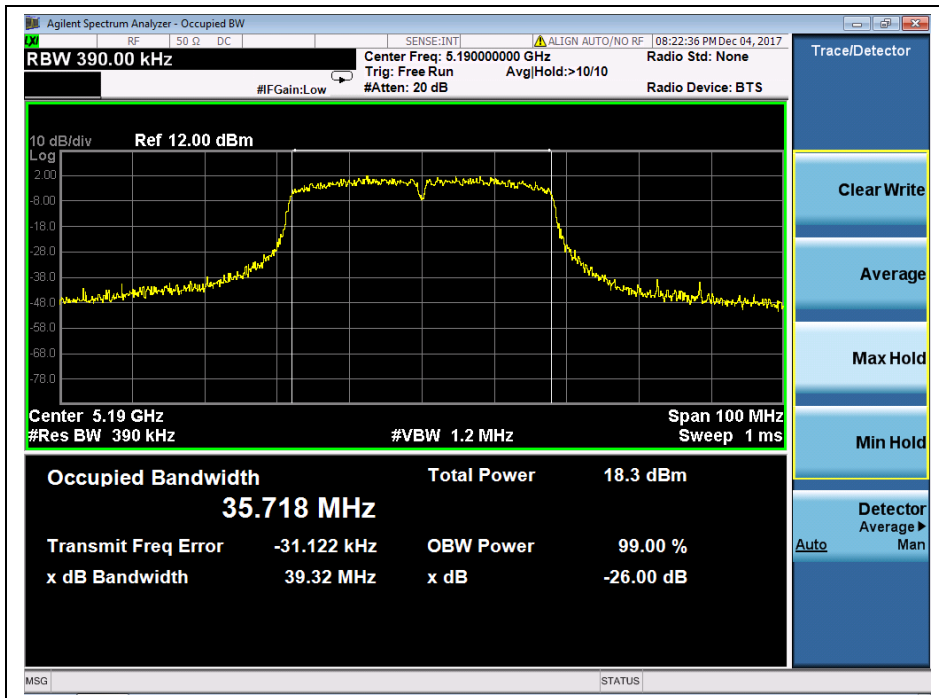
(Channel 46, 5230 MHz, 802.11n (HT40), ANT0)



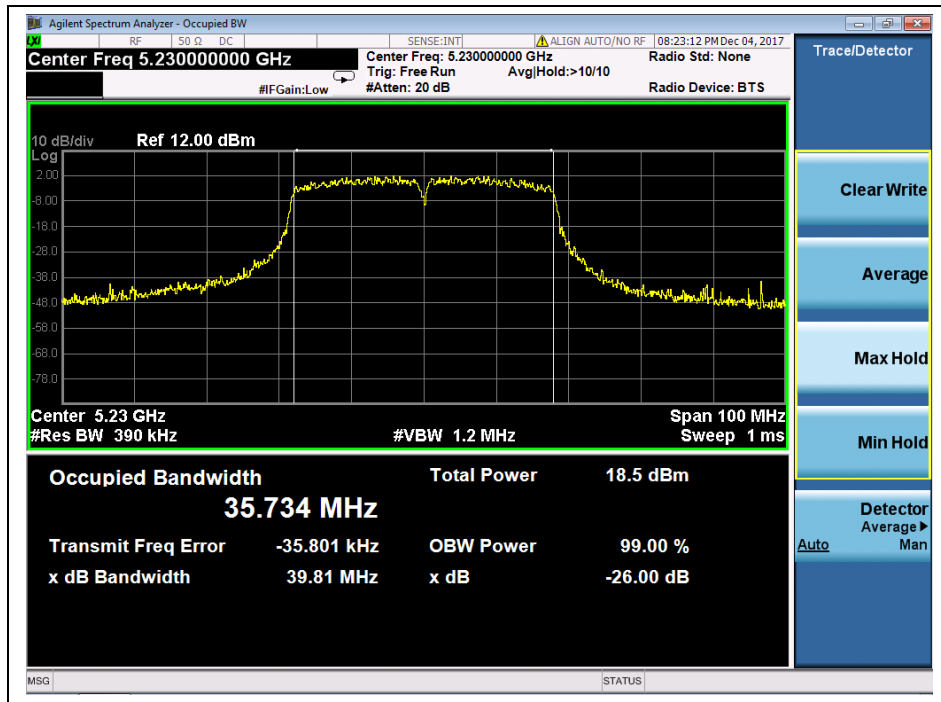
(Channel 151, 5755 MHz, 802.11n (HT40), ANT0)



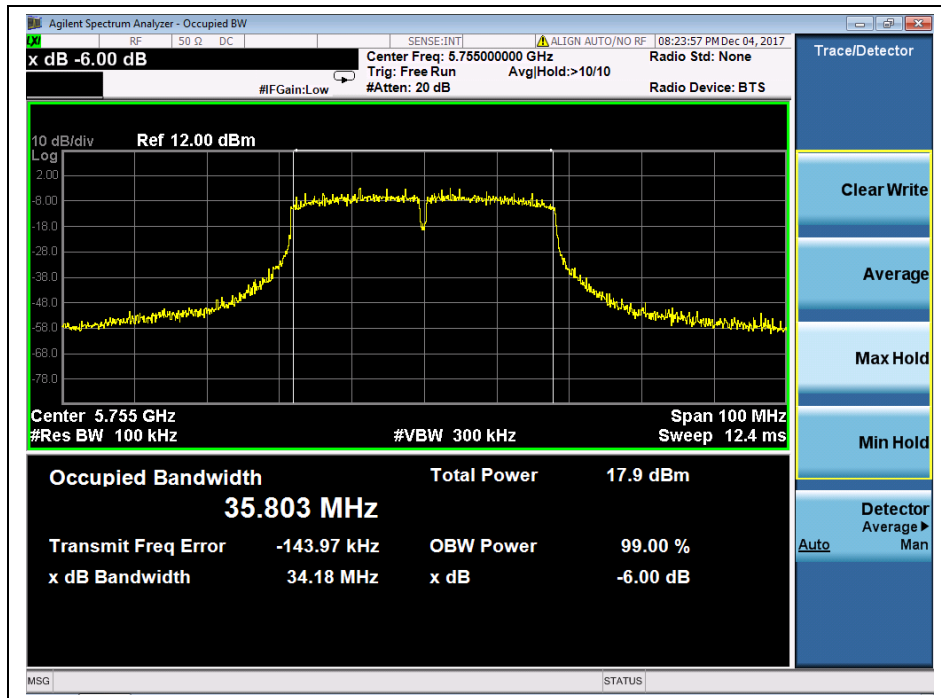
(Channel 159, 5795MHz, 802.11n (HT40), ANT0)



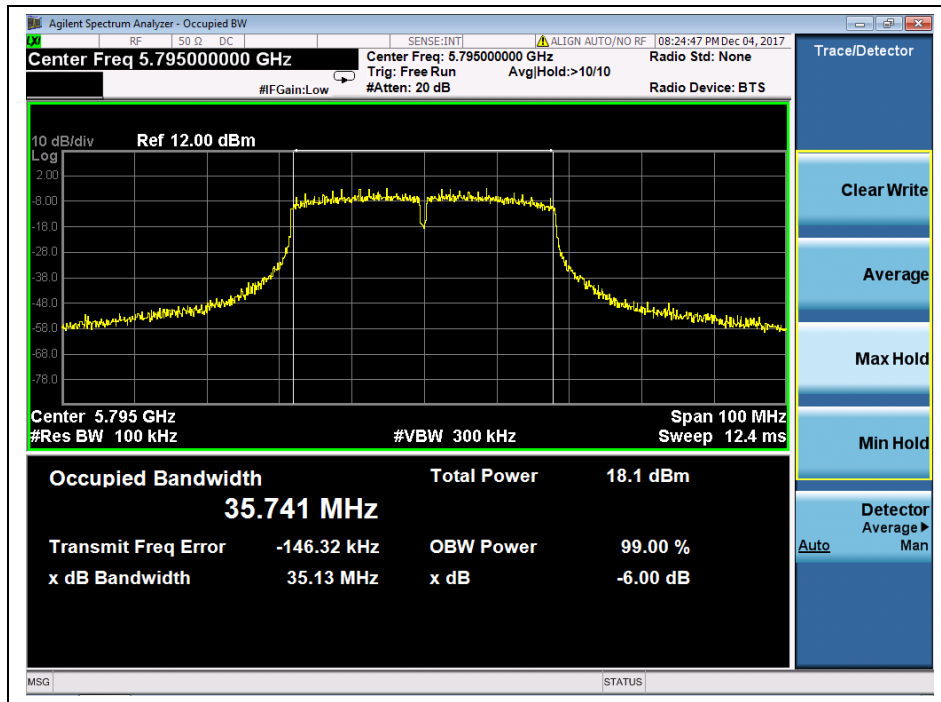
(Channel 38, 5190MHz, 802.11n (HT40), ANT1)



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



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



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

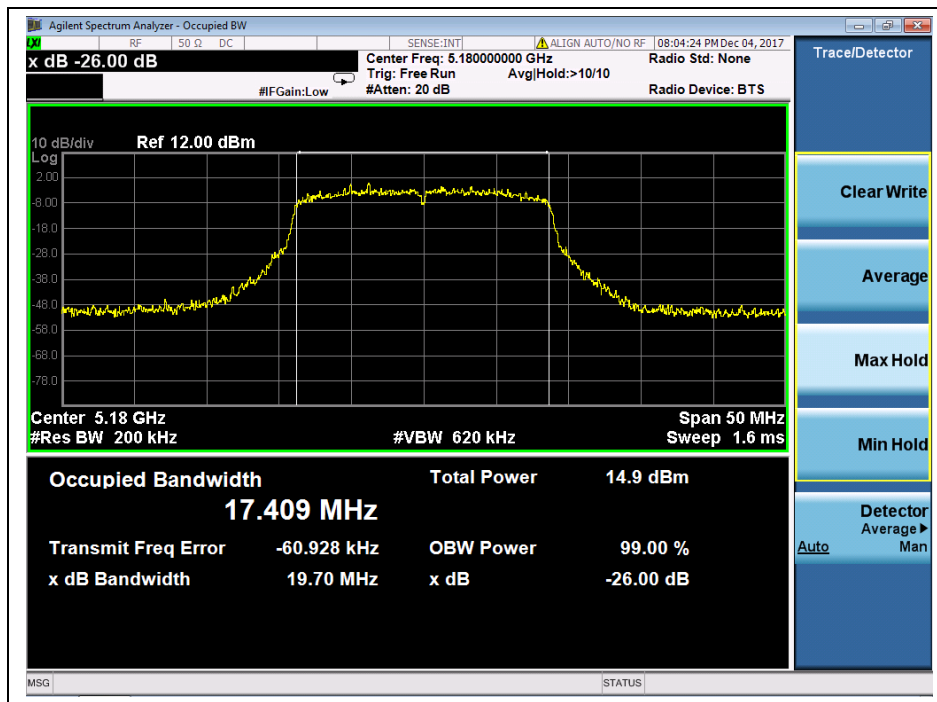


802.11ac (VHT20) Test mode

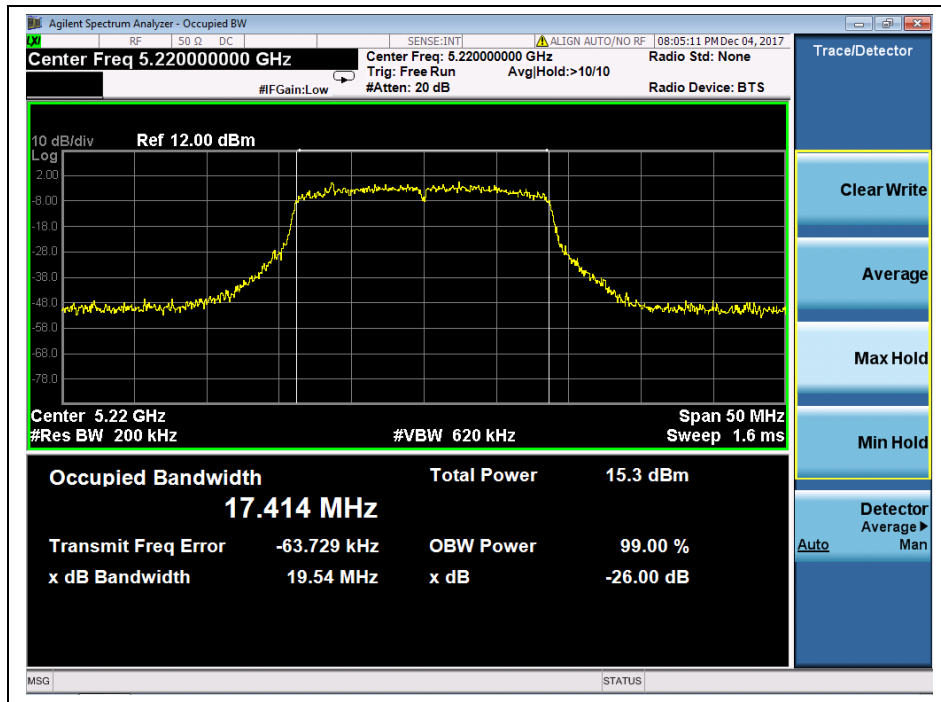
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)	ANT1 26 dB Bandwidth (MHz)
36	5180	19.70	19.70
44	5220	19.54	19.45
48	5240	19.92	19.48
Channel	Frequency (MHz)	ANT0 6dB Bandwidth (MHz)	ANT1 6dB Bandwidth (MHz)
149	5745	16.21	16.21
157	5785	15.42	15.46
165	5825	15.07	15.07

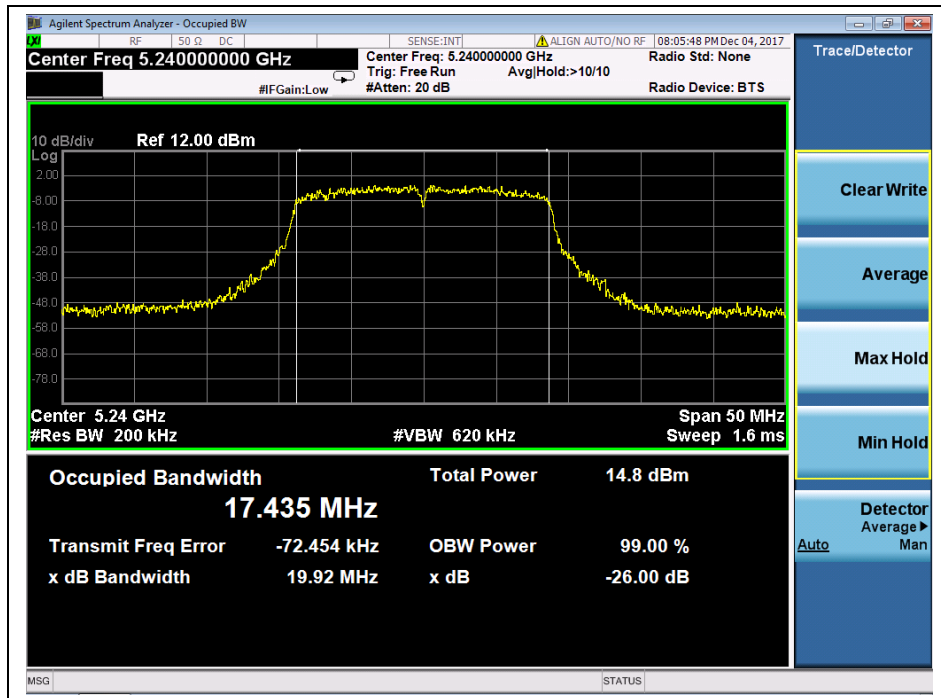
B. Test Plots



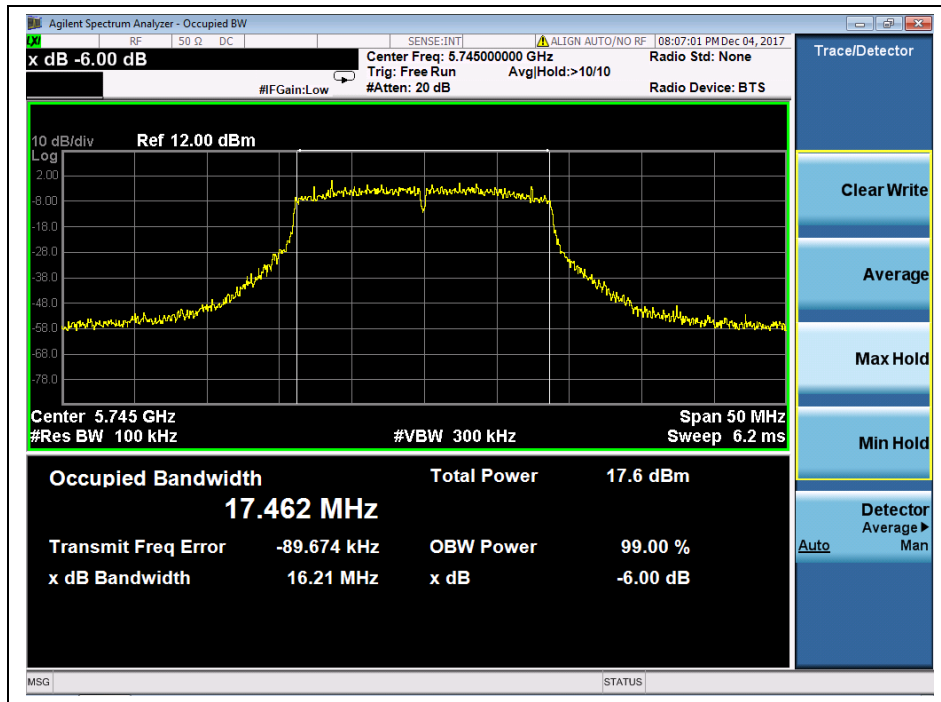
(Channel 36, 5180MHz, 802.11ac (VHT20), ANT0)



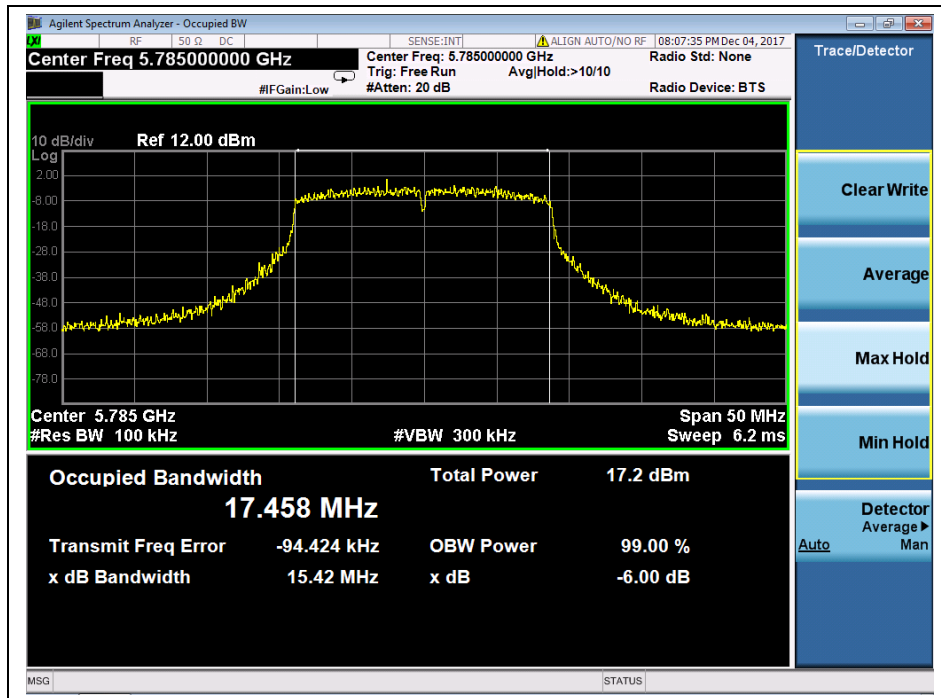
(Channel 44, 5220 MHz, 802.11ac (VHT20), ANT0)



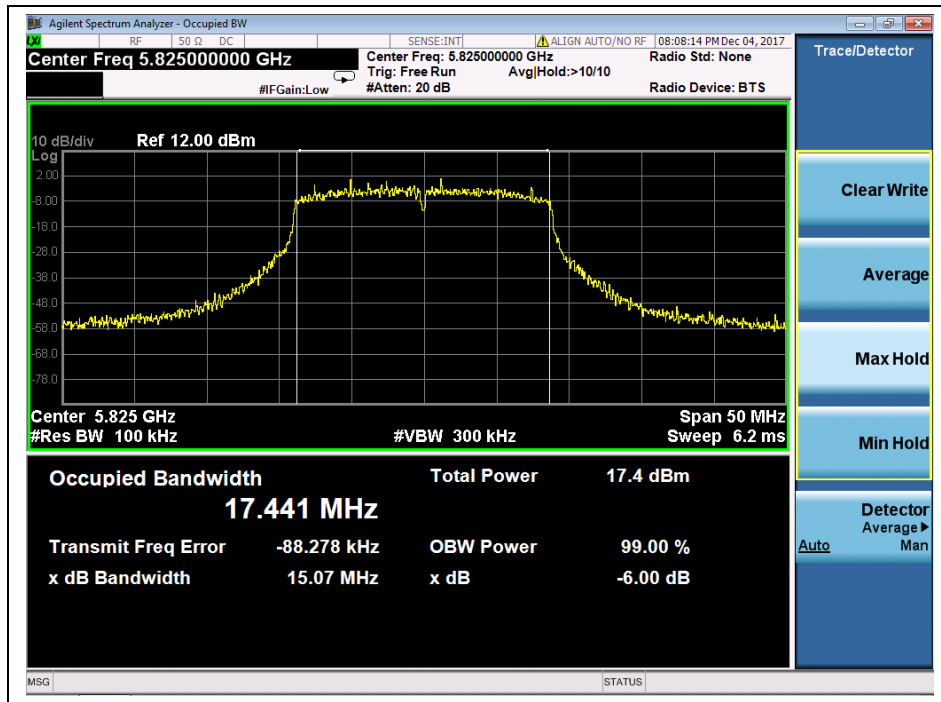
(Channel 48, 5240MHz, 802.11 ac (VHT20), ANT0)



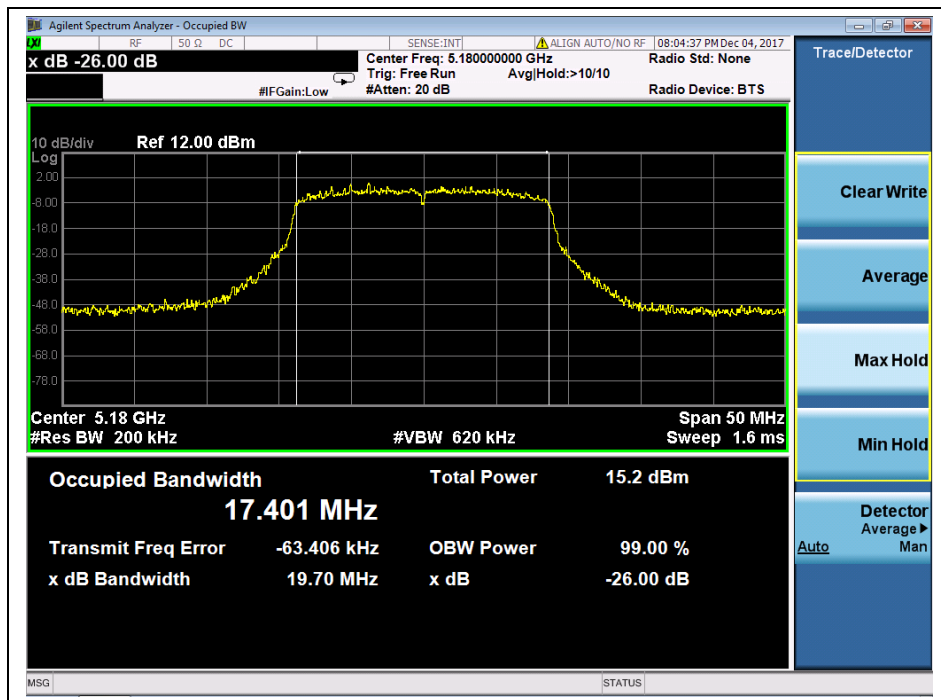
(Channel 149, 5745MHz, 802.11 ac (VHT20), ANT0)



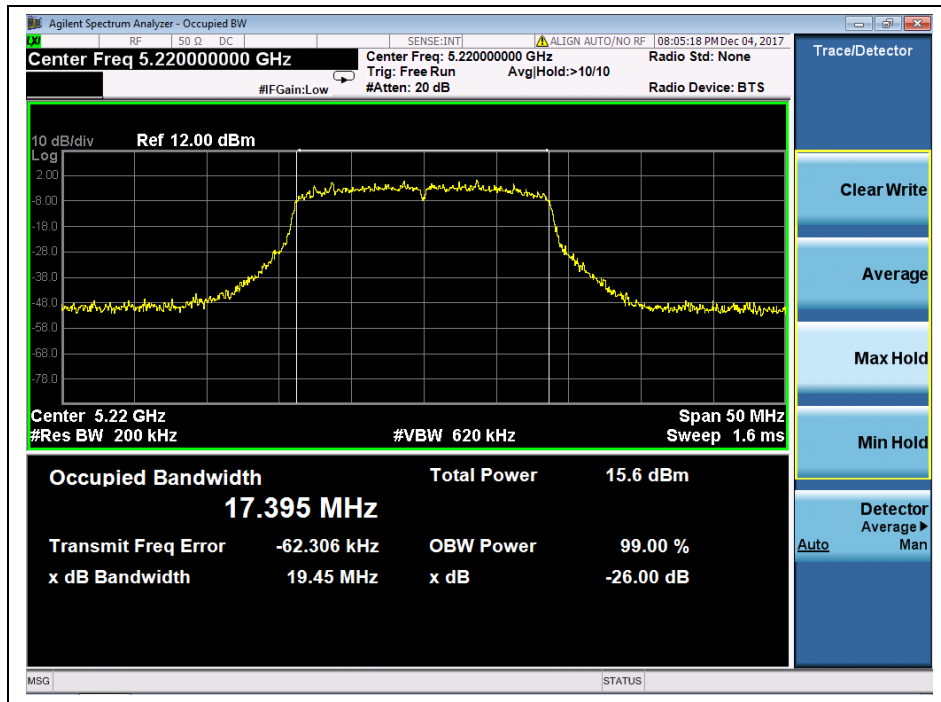
(Channel 157, 5785MHz, 802.11 ac (VHT20), ANT0)



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



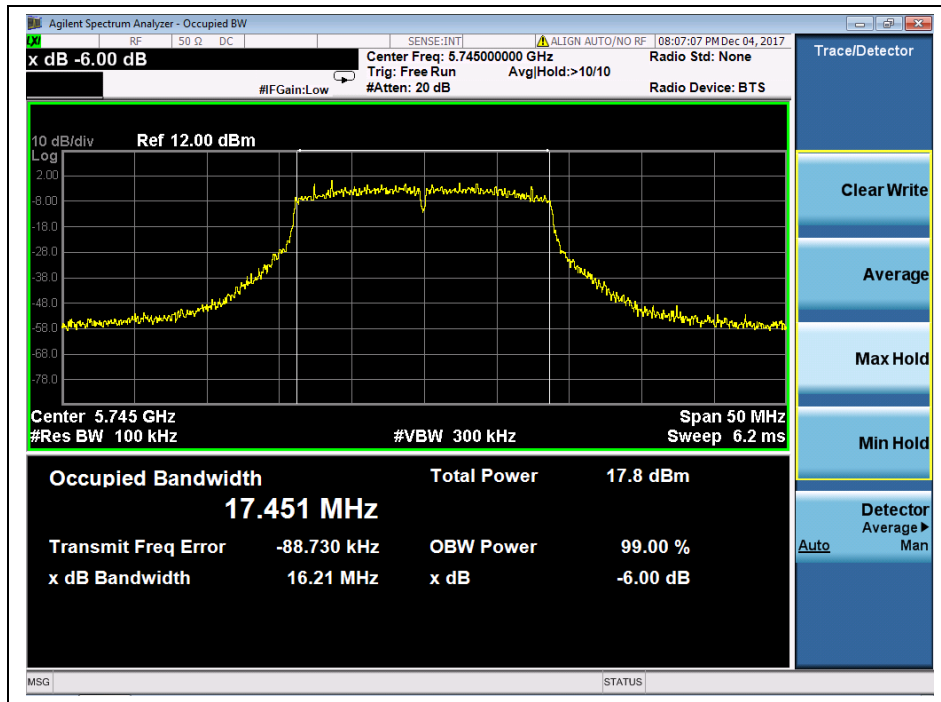
(Channel 36, 5180MHz, 802.11 ac (VHT20), ANT1)



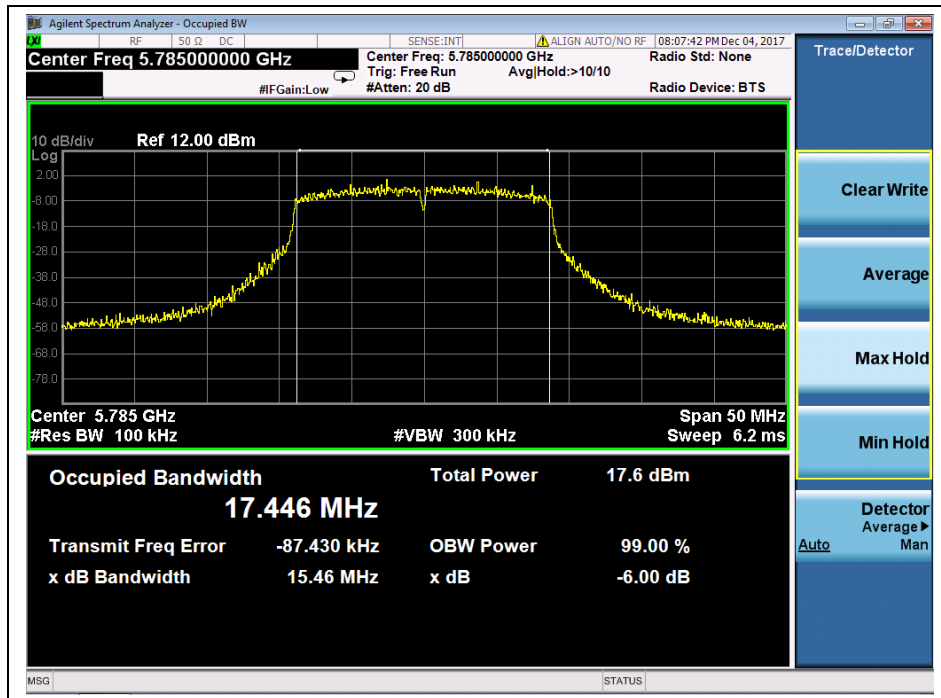
(Channel 44, 5220 MHz, 802.11 ac (VHT20), ANT1)



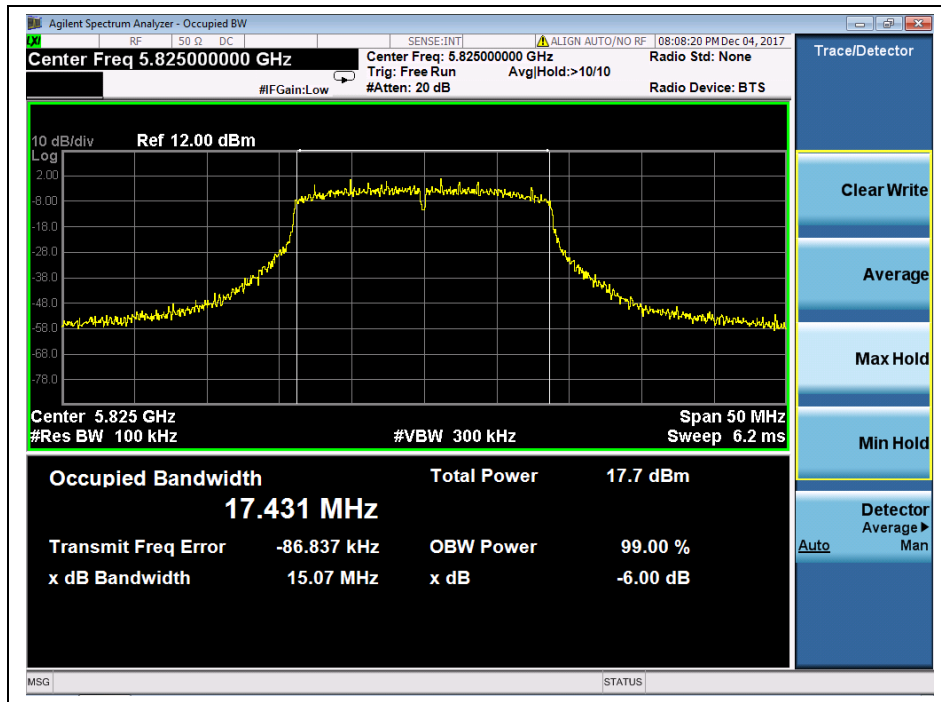
(Channel 48, 5240MHz, 802.11 ac (VHT20), ANT1)



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



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



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

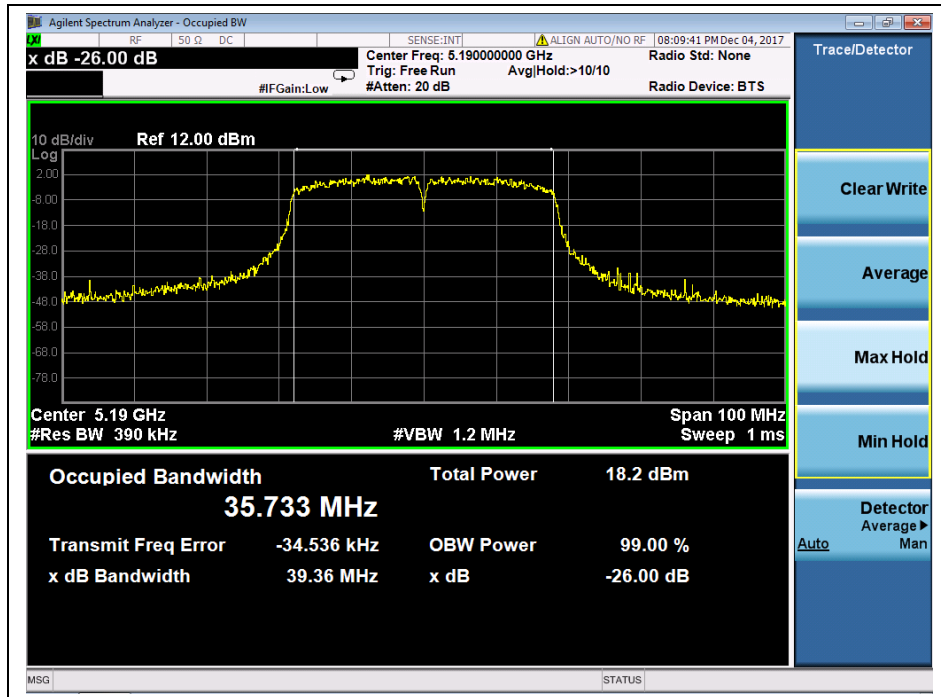


802.11ac (VHT40) Test mode

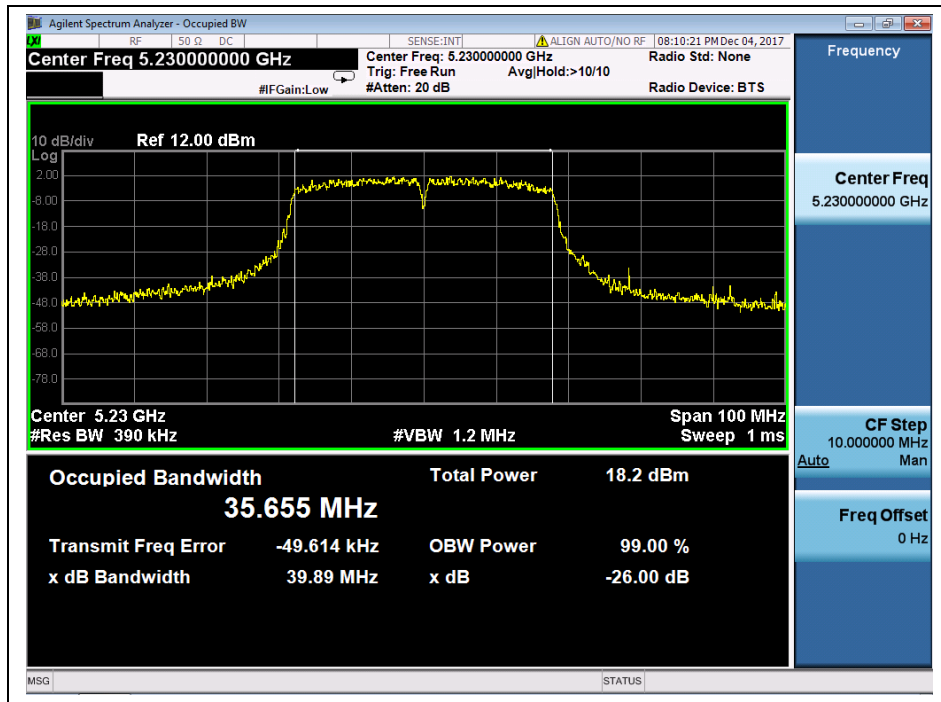
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)	ANT1 26 dB Bandwidth (MHz)
38	5190	39.36	39.69
46	5230	39.89	39.85
Channel	Frequency (MHz)	ANT0 6dB Bandwidth (MHz)	ANT1 6dB Bandwidth (MHz)
151	5755	35.08	33.92
159	5795	34.51	35.14

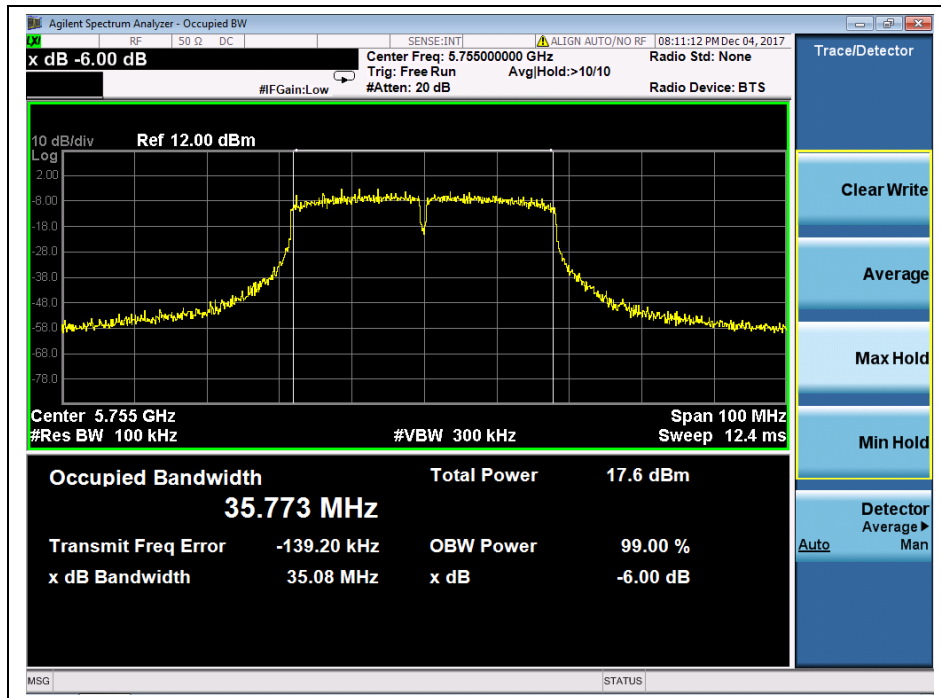
B. Test Plots



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



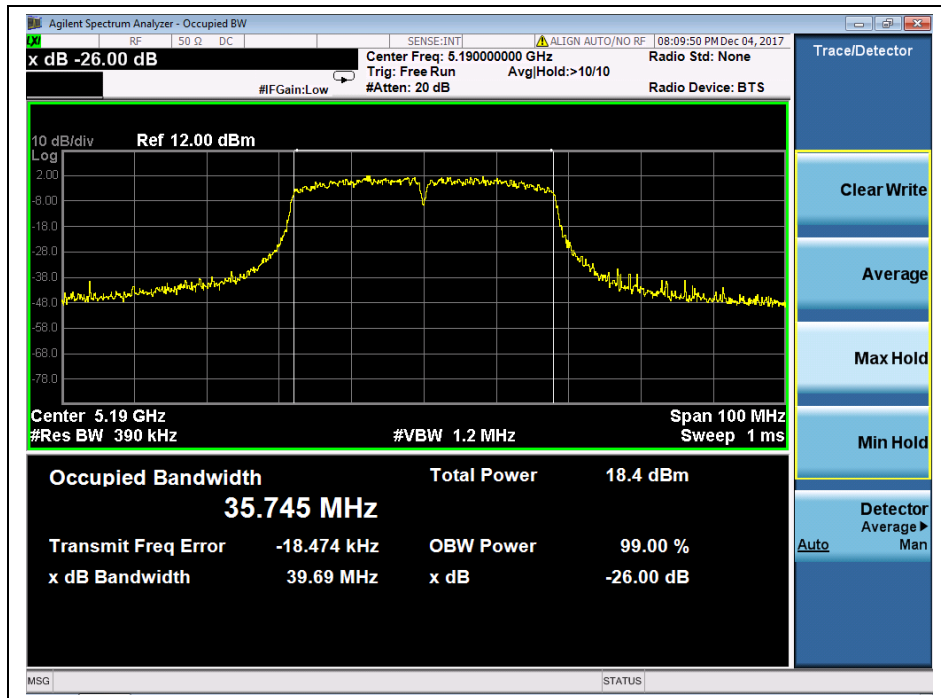
(Channel 46, 5230 MHz, 802.11ac (VHT40), ANT0)



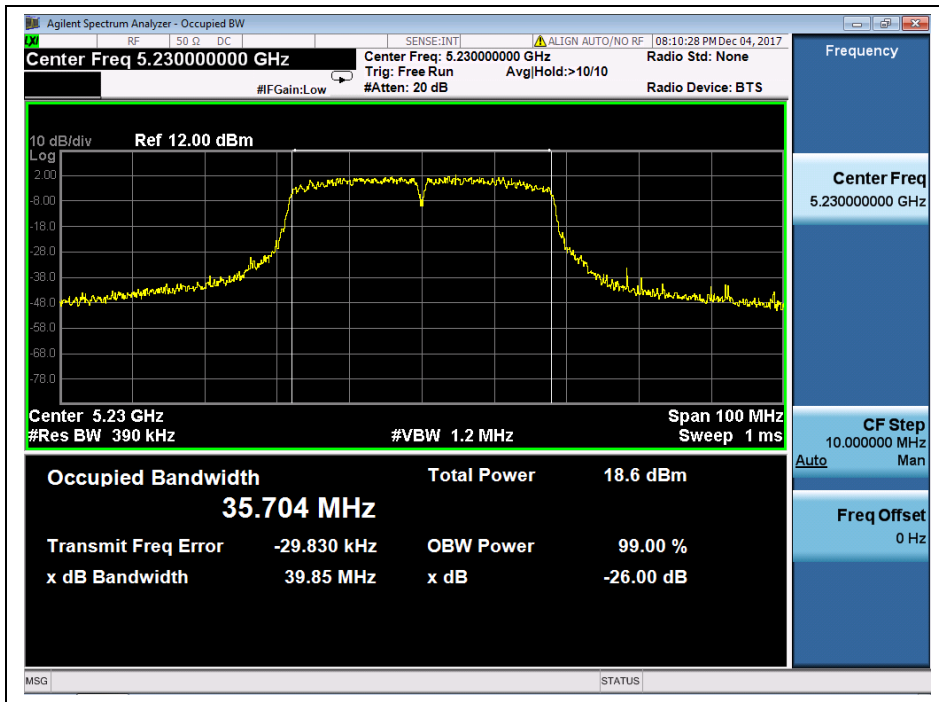
(Channel 151, 5755 MHz, 802.11ac (VHT40), ANT0)



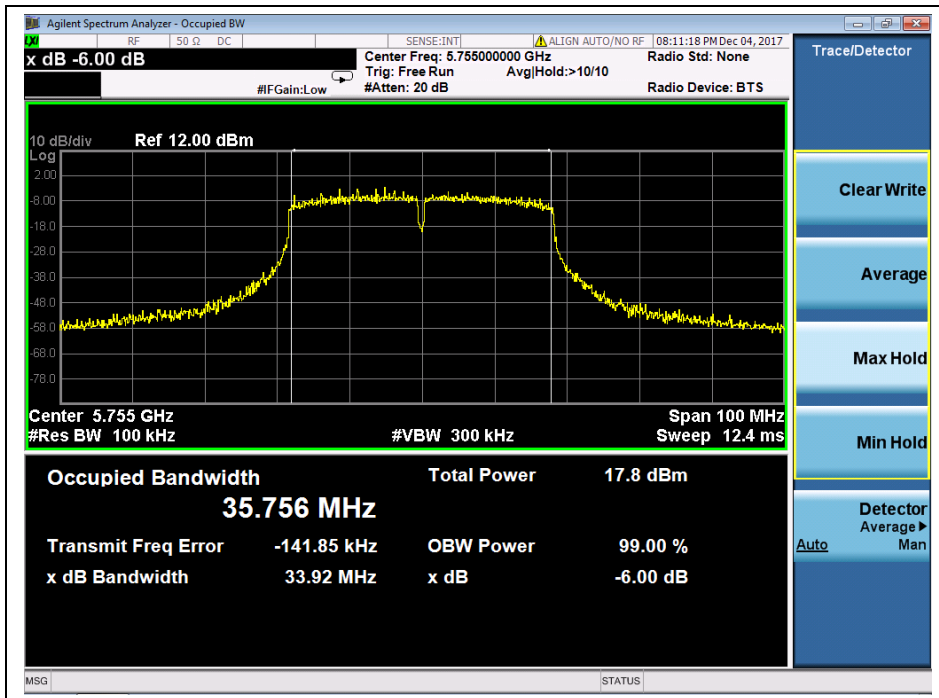
(Channel 159, 5795MHz, 802.11ac (VHT40), ANT0)



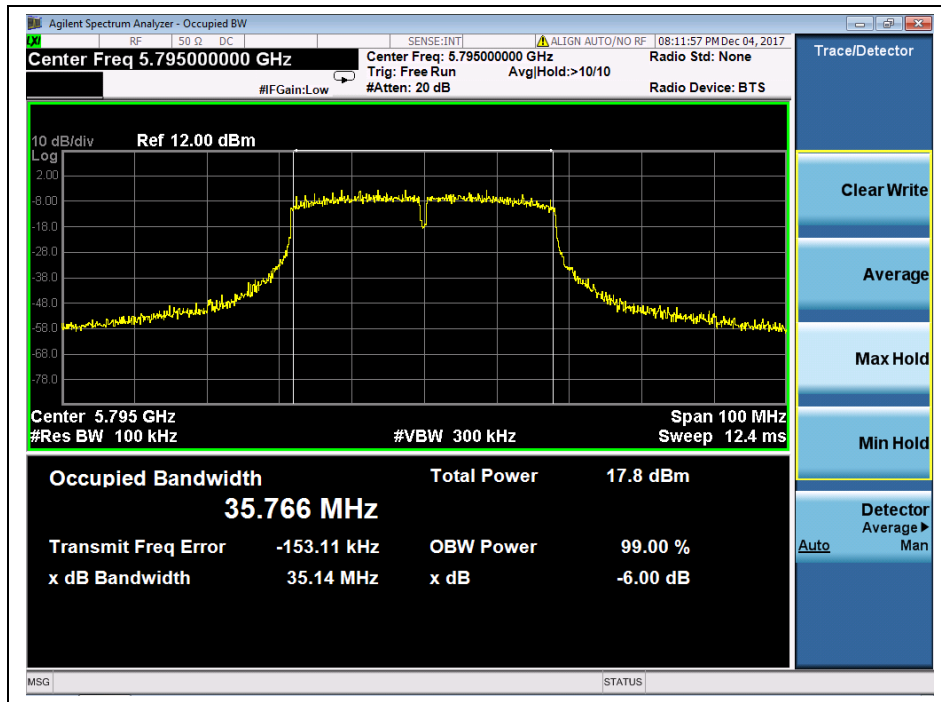
(Channel 38, 5190MHz, 802.11ac (VHT40), ANT1)



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



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



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

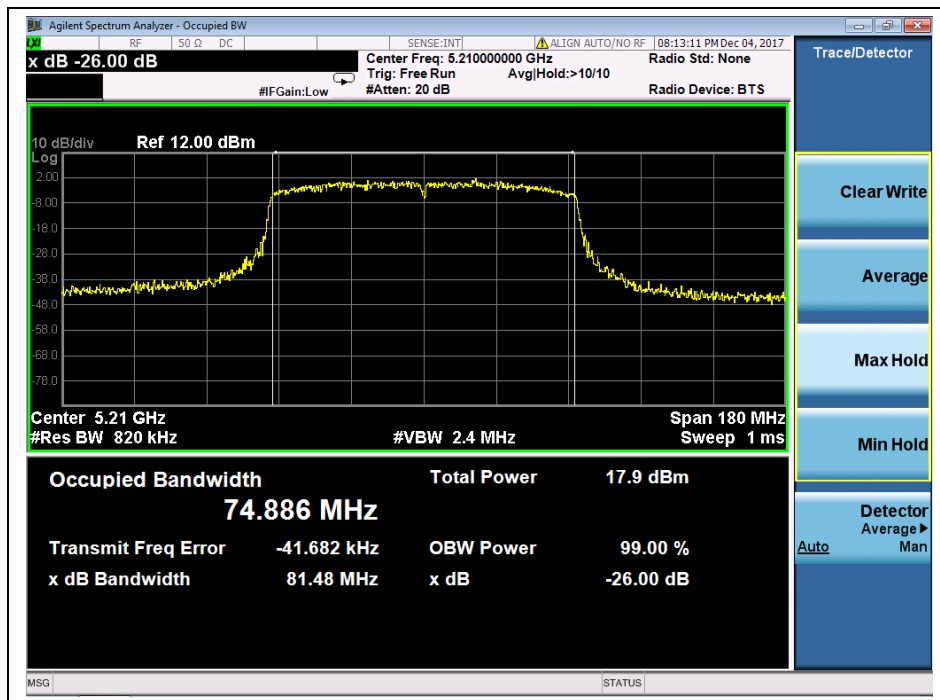


802.11ac (VHT80) Test mode

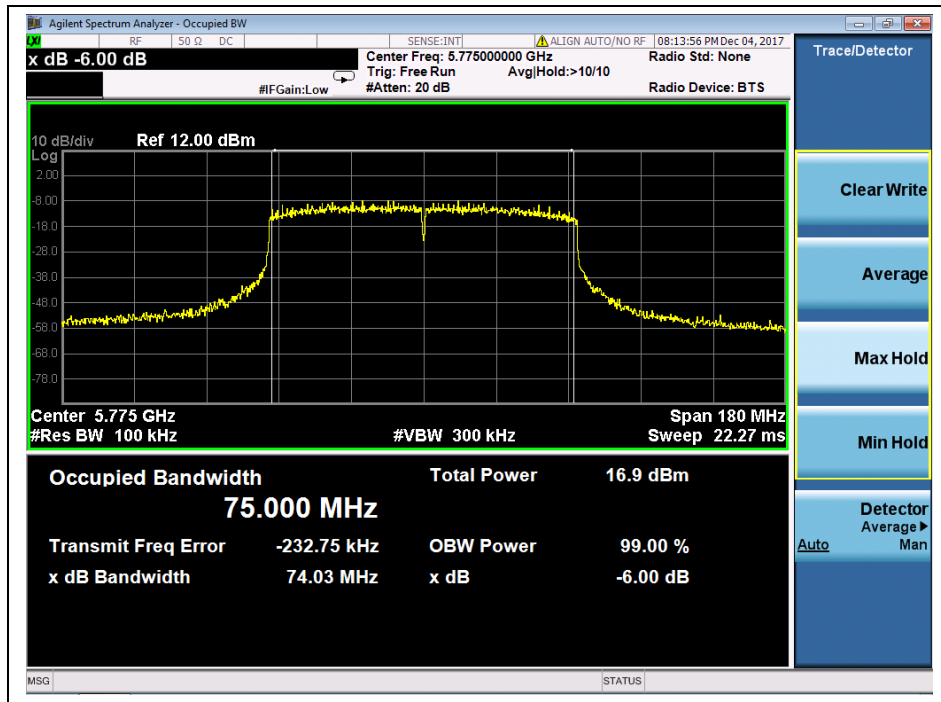
A. Test Verdict:

Channel	Frequency (MHz)	ANT0 26 dB Bandwidth (MHz)	ANT1 26 dB Bandwidth (MHz)
42	5210	81.48	81.23
Channel	Frequency (MHz)	ANT0 6dB Bandwidth (MHz)	ANT1 6dB Bandwidth (MHz)
155	5775	74.03	74.03

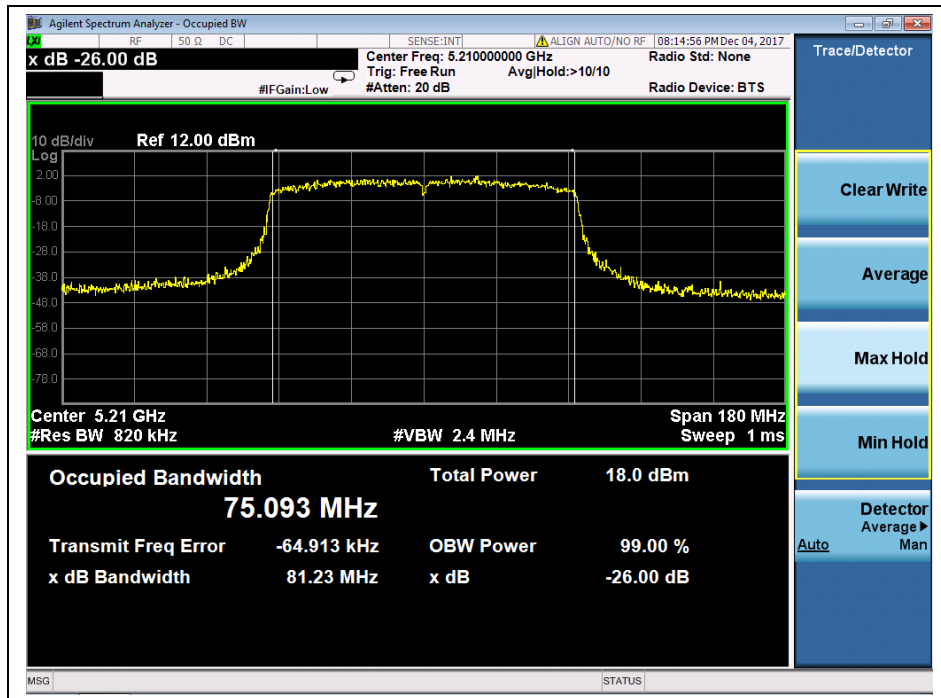
B. Test Plots



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



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



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



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

2.3. 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. 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.

(2) 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.

(3) 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.

(4) 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.

2.3.2. Test Description

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

A. 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.

2.3.3. Test Result

802.11a Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power (dBm)	ANT1 Measured Peak Power (dBm)	Limit (dBm)	Verdict
36	5180	16.05	16.14	24	PASS
44	5220	15.83	15.78		
48	5240	15.80	15.63		
149	5745	18.77	18.78	30	
157	5785	18.35	18.27		
165	5825	18.63	18.56		

Channel	Frequency (MHz)	ANT0 Measured Average Power (dBm)	ANT1 Measured Average Power (dBm)	Limit (dBm)	Verdict
36	5180	9.02	9.06	24	PASS
44	5220	9.46	9.39		
48	5240	9.44	9.35		
149	5745	12.13	12.09	30	
157	5785	11.97	11.87		
165	5825	12.08	12.13		

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (W)	Total Peak Power (dBm)	Limit ^{Note} (dBm)	Verdict
36	5180	0.0814	19.11	22.99	PASS
44	5220	0.0761	18.82		
48	5240	0.0746	18.73		
149	5745	0.1508	21.79	28.99	
157	5785	0.1355	21.32		
165	5825	0.1447	21.61		

Note: Directional gain = $4.0\text{dBi} + 10\log(2) = 7.01\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $24 - (7.01 - 6) = 22.99\text{dBm}$ for 5.15-5.25 GHz band and be reduced $30 - (7.01 - 6) = 28.99\text{dBm}$ for 5.725-5.85 GHz band.



802.11n (HT20) Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power (dBm)	ANT1 Measured Peak Power (dBm)	Limit (dBm)	Verdict
36	5180	15.88	15.78	24	PASS
44	5220	16.26	16.23		
48	5240	16.26	16.24		
149	5745	18.96	18.78	30	
157	5785	18.72	18.65		
165	5825	18.77	18.75		

Channel	Frequency (MHz)	ANT0 Measured Average Power (dBm)	ANT1 Measured Average Power (dBm)	Limit (dBm)	Verdict
36	5180	8.80	8.75	24	PASS
44	5220	9.25	9.19		
48	5240	9.19	9.23		
149	5745	11.89	11.76	30	
157	5785	11.75	11.63		
165	5825	11.82	11.39		

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (W)	Total Peak Power (dBm)	Limit ^{Note} (dBm)	Verdict
36	5180	0.0775	18.89	22.99	PASS
44	5220	0.0845	19.27		
48	5240	0.0845	19.27		
149	5745	0.1542	21.88	28.99	
157	5785	0.1478	21.70		
165	5825	0.1503	21.77		

Note: Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be reduced to 24-(7.01-6) = 22.99dBm for 5.15-5.25 GHz band and be reduced 30-(7.01-6) = 28.99dBm for 5.725-5.85 GHz band.



802.11n (HT40) Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power (dBm)	ANT1 Measured Peak Power (dBm)	Limit (dBm)	Verdict
38	5190	19.39	19.47	24	PASS
46	5230	19.81	19.68		
151	5755	19.53	19.45	30	
159	5795	19.38	19.31		

Channel	Frequency (MHz)	ANT0 Measured Average Power (dBm)	ANT1 Measured Average Power (dBm)	Limit (dBm)	Verdict
38	5190	11.97	11.69	24	PASS
46	5230	12.35	12.36		
151	5755	12.19	12.07	30	
159	5795	12.03	12.04		

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (W)	Total Peak Power (dBm)	Limit _{Note} (dBm)	Verdict
38	5190	0.1738	22.40	22.99	PASS
46	5230	0.1914	22.82		
151	5755	0.1795	22.54	28.99	
159	5795	0.1734	22.39		

Note: Directional gain = $4.0\text{dBi} + 10\log(2) = 7.01\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $24 - (7.01 - 6) = 22.99\text{dBm}$ for 5.15-5.25 GHz band and be reduced $30 - (7.01 - 6) = 28.99\text{dBm}$ for 5.725-5.85 GHz band.



802.11ac (VHT20) Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power (dBm)	ANT1 Measured Peak Power (dBm)	Limit (dBm)	Verdict
36	5180	15.76	15.81	24	PASS
44	5220	16.02	16.08		
48	5240	16.25	16.17		
149	5745	18.87	18.76	30	
157	5785	18.78	18.8		
165	5825	18.87	18.63		

Channel	Frequency (MHz)	ANT0 Measured Average Power (dBm)	ANT1 Measured Average Power (dBm)	Limit (dBm)	Verdict
36	5180	8.82	8.93	24	PASS
44	5220	9.23	9.18		
48	5240	9.22	9.36		
149	5745	11.88	11.78	30	
157	5785	11.74	11.64		
165	5825	11.81	11.67		

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (W)	Total Peak Power (dBm)	Limit ^{Note} (dBm)	Verdict
36	5180	0.0758	18.80	22.99	PASS
44	5220	0.0805	19.06		
48	5240	0.0836	19.22		
149	5745	0.1523	21.83	28.99	
157	5785	0.1514	21.80		
165	5825	0.1500	21.76		

Note: Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be reduced to 24-(7.01-6) = 22.99dBm for 5.15-5.25 GHz band and be reduced 30-(7.01-6) = 28.99dBm for 5.725-5.85 GHz band.



802.11ac (VHT40) Test mode

Channel	Frequency (MHz)	ANT0 Measured Peak Power (dBm)	ANT1 Measured Peak Power (dBm)	Limit (dBm)	Verdict
38	5190	19.46	19.43	24	PASS
46	5230	19.71	19.74		
151	5755	19.36	19.25	30	
159	5795	19.27	19.23		

Channel	Frequency (MHz)	ANT0 Measured Average Power (dBm)	ANT1 Measured Average Power (dBm)	Limit (dBm)	Verdict
38	5190	11.95	11.79	24	PASS
46	5230	12.37	12.31		
151	5755	12.16	12.19	30	
159	5795	12.04	13.06		

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (W)	Total Peak Power (dBm)	Limit _{Note} (dBm)	Verdict
38	5190	0.1760	22.46	22.99	PASS
46	5230	0.1877	22.74		
151	5755	0.1704	22.32	28.99	
159	5795	0.1683	22.26		

Note: Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be reduced to 24-(7.01-6) = 22.99dBm for 5.15-5.25 GHz band and be reduced 30-(7.01-6) = 28.99dBm for 5.725-5.85 GHz band.

**802.11ac (VHT80) Test mode**

Channel	Frequency (MHz)	ANT0 Measured Peak Power (dBm)	ANT1 Measured Peak Power (dBm)	Limit (dBm)	Verdict
42	5210	18.92	19.76	24	PASS
155	5775	18.59	18.63	30	

Channel	Frequency (MHz)	ANT0 Measured Average Power (dBm)	ANT1 Measured Average Power (dBm)	Limit (dBm)	Verdict
42	5210	11.70	11.64	24	PASS
155	5775	11.33	11.42	30	

Total Peak Power (ANT0+ANT1)

Channel	Frequency (MHz)	Total Peak Power (W)	Total Peak Power (dBm)	Limit ^{Note} (dBm)	Verdict
42	5210	0.1560	21.93	22.99	PASS
155	5775	0.1446	21.60	28.99	

Note: Directional gain = $4.0\text{dBi} + 10\log(2) = 7.01\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $24 - (7.01 - 6) = 22.99\text{dBm}$ for 5.15-5.25 GHz band and be reduced $30 - (7.01 - 6) = 28.99\text{dBm}$ for 5.725-5.85 GHz band.

2.4. Peak Power spectral density

2.4.1. 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. 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.

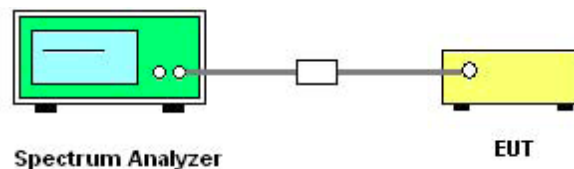
(2) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500KHz band. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) 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.

(4) 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.

2.4.2. Test Description

A. Test Set:



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

B. Test Procedure

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

- 1) Set span to encompass the entire 26-dB emission bandwidth
- 2) Set RBW = 1 MHz. Set VBW \geq 3 MHz.
- 3) Number of points in sweep \geq 2 Span / RBW. Sweep time = auto.
- 4) Detector = RMS (i.e., power averaging)
- 5) Trace average at least 100 traces in power averaging (i.e., RMS) mode
- 6) Record the max value



2.4.3. Test Result

802.11a Test mode

A. Test Verdict:

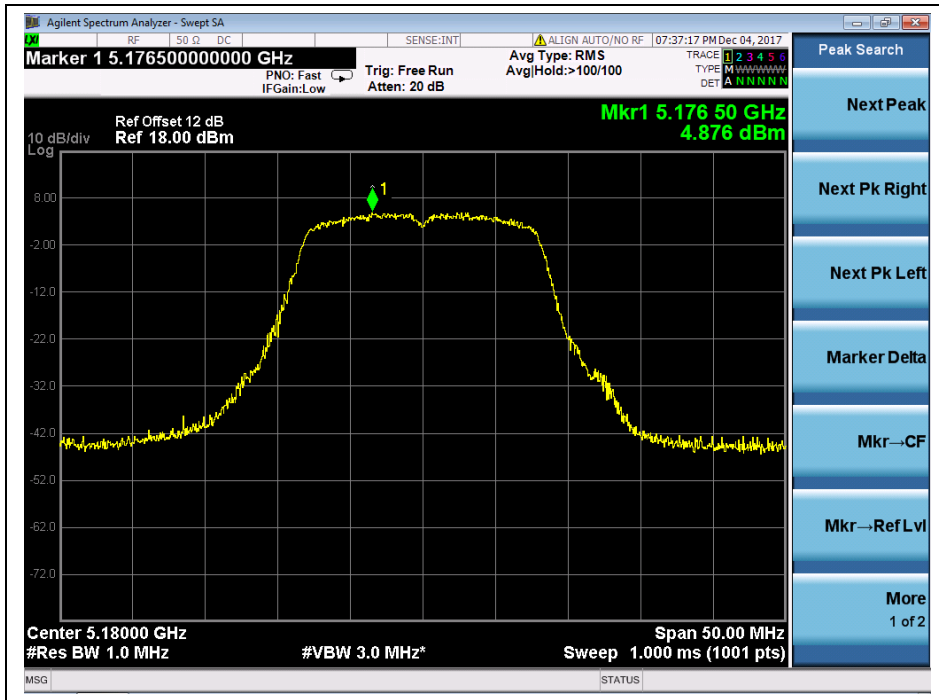
Channel	Frequency (MHz)	ANT0 Measured PPSD (dBm/MHz)	ANT1 Measured PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	4.88	4.76	11	PASS
44	5220	4.93	5.04		
48	5240	4.85	4.85		
Channel	Frequency (MHz)	ANT0 Measured PPSD (dBm/500KHz)	ANT1 Measured PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	6.70	6.67	30	PASS
157	5785	6.11	6.38		
165	5825	6.64	6.82		

Total Peak Power spectral density (ANT0+ANT1)

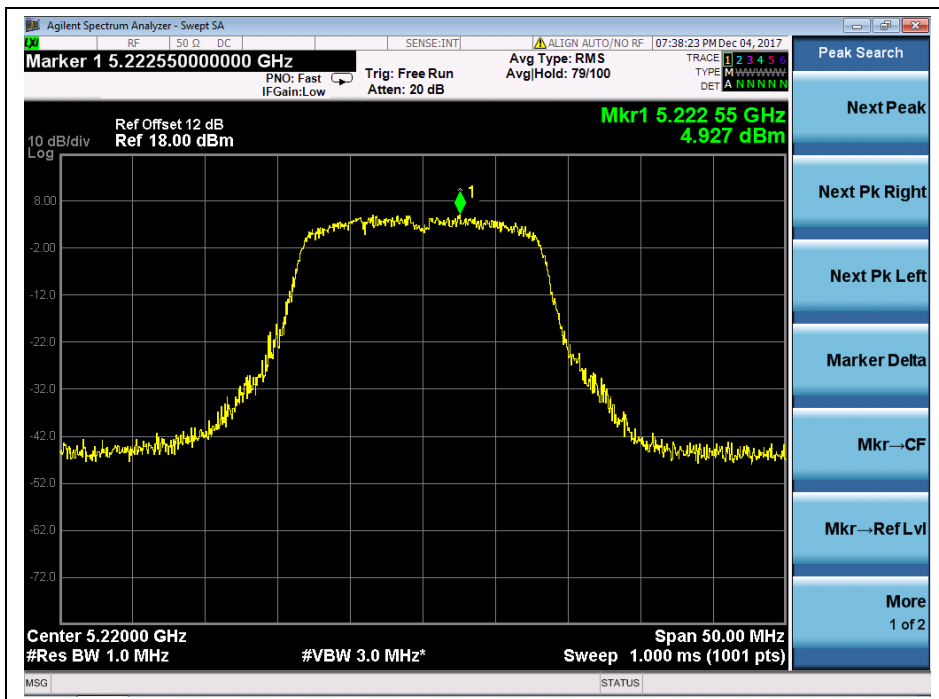
Channel	Frequency (MHz)	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
36	5180	7.83	9.99	PASS
44	5220	8.00		
48	5240	7.86		
Channel	Frequency (MHz)	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
149	5745	9.70	28.99	PASS
157	5785	9.26		
165	5825	9.74		

Note: Directional gain = 4.0dBi + 10log(2) = 7.01dBi > 6dBi, so the power limit shall be reduced to 11-(7.01-6) = 9.99dBm for 5.15-5.25 GHz band and be reduced 30-(7.01-6) = 28.99dBm for 5.725-5.85 GHz band.

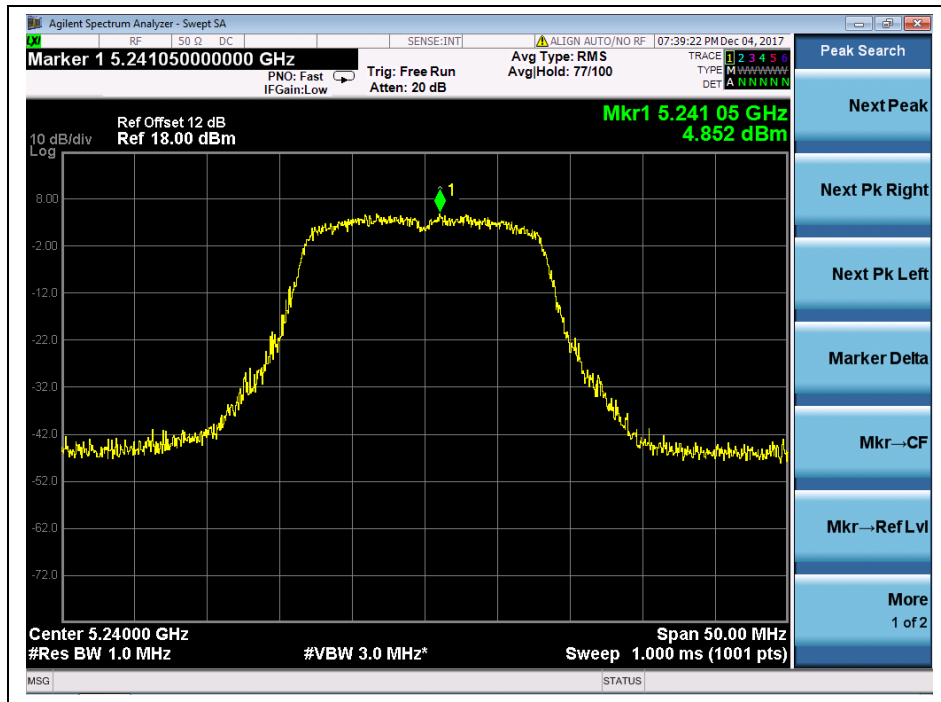
B. Test Plots



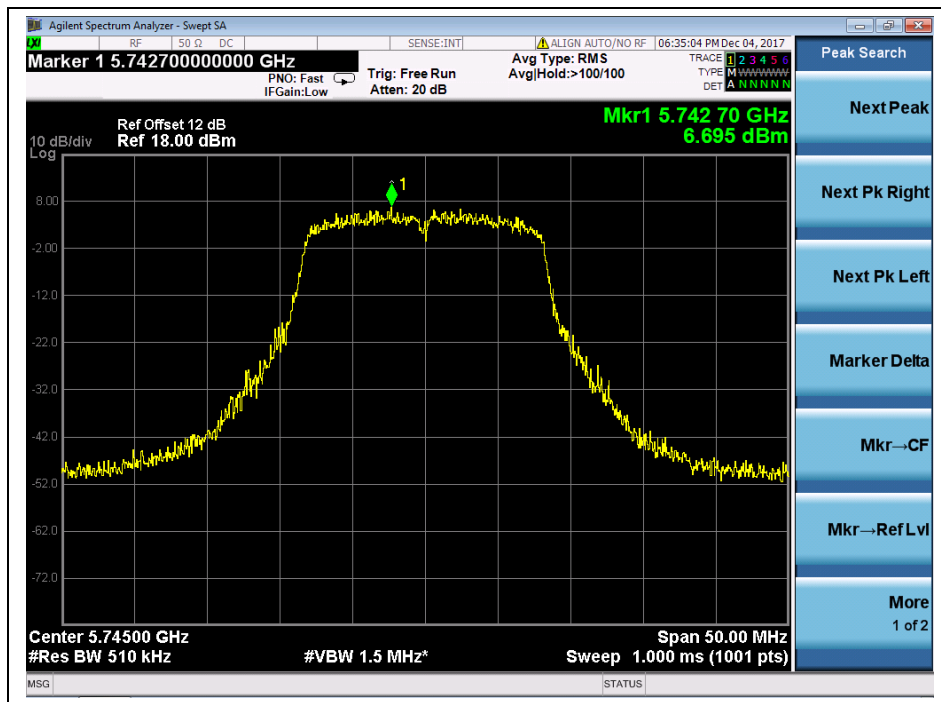
(Channel 36, 5180MHz, 802.11a, ANT0)



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



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



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

