REPORT No. : SZ21060072W06

TEST REPORT

APPLICANT	:	Reliance Communications LLC
PRODUCT NAME	:	Orbic Speed 5G
MODEL NAME	:	R500L5
BRAND NAME	:	Orbic
FCC ID	:	2ABGH-R500L5
STANDARD(S)	:	47 CFR Part 15 Subpart E
RECEIPT DATE	:	2021-06-10
TEST DATE	:	2021-07-03 to 2021-07-25
ISSUE DATE	:	2021-10-08

Edited by: Peng Mi

Peng Mi (Rapporteur)

Approved by: Shen Junsheng

Shen Junsheng (Supervisor)

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DIRECTORY

Change History		
Version	Date	Reason for change
1.0	2021-10-08	First edition

1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

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

1.2. Equipment Under Test (EUT) Description

Product Name:	Orbic Speed 5G	
Sample No.:	7#	
Hardware Version:	V1.2	
Software Version:	ORB500L5_v1.0.1.3_BVZRT	
Modulation Technology:	OFDM, OFDMA	
Modulation Mode:	802.11a, 802.11n (HT20), 802.11n (HT40) 802.11ac (VHT20), 802.11ac (VHT40),802.11ac (VHT80) 802.11ax (HEW20), 802.11ax (HEW40),802.11ax (HEW80)	
Operating Frequency Range:	5180MHz-5240MHz; 5745MHz-5825MHz	
Channel Number:	Refer to 1.3	
Antenna Type:	PIFA Antenna	
Antenna Gain:	ANT0: 1.90dBi; ANT1: -0.70dBi	
Directional Gain:	-4.91dBi$_{\text{Note 2}}$	
Accessory Information:	Battery	
	Brand Name:	Orbic
	Model No.:	BTE-4401
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	4400mAh
	Rated Voltage:	3.80V
	Charge Limit:	4.35V
	Manufacturer:	HUIZHOU DXDRAGON INC

Accessory Information:	AC Adapter	
	Brand Name:	Orbic
	Model No.:	TPA-23A050200UU01
	Serial No.:	(N/A, marked #1 by test site)
	Rated Output:	5V⎓2A
	Rated Input:	100-240V~50/60Hz, 0.3A
	Manufacturer:	Dongguan summer electronics Co., LTD

Note 1: The EUT supports a MIMO function. Physically, the EUT provides two completed transmitters and two receivers for 802.11n, 802.11ac and 802.11ax modulation mode.

Modulation Mode:	**TX Function**
802.11n	2TX
802.11ac	2TX
802.11ax	2TX

Note 2: According to KDB 662911 D01, the directional gain = G_{ANT} + 10log(N_{ANT}) dBi, where G_{ANT} is the maximum antenna gain in dBi, N_{ANT} is the number of outputs.

Note 3: For conducted test item Conducted Output Power and Peak Power Spectral Density of each modulation mode, we recorded the test result of two antennas separately, for other conducted test items both of the two antennas were tested separately, we only recorded the worst test result (ANT0) in this report.

Note 4: All radiation test items for 802.11n, 802.11ac and 802.11ax 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 5: WIFI hotspot only support U-NII-1 and U-NII-3 band.

Note 6: We use the dedicated software to control the EUT continuous transmission.

Note 7: 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

Mode	Bandwidth (MHz)	Modulation Technology	Modulation Type	Data Rate	RU Size
802.11a	20	OFDM	**DBPSK**	**1**/2/5.5/11Mbps	N/A
			DQPSK		
			CCK		
802.11n	20/40 (HT20/40)	OFDM	**BPSK**	**MCS0**~MCS7	N/A
			QPSK		
			16QAM		
			64QAM		
802.11ac	20/40/80 (VHT20/40/80)	OFDM	**BPSK**	**MSC0**~MCS9	N/A
			QPSK		
			16QAM		
			64QAM		
			256QAM		
802.11ax	20/40/80 (HEW20/40/80)	OFDMA	**BPSK**	**MSC0**~MCS11	26/52/106/242/484/996
			QPSK		
			16QAM		
			64QAM		
			256QAM		
			1024QAM		

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

(U-NII-1) 5180MHz-5240MHz				
Bandwidth	Channel	Frequency (MHz)	Channel	Frequency (MHz)
20MHz	**36**	**5180**	40	5200
	44	**5220**	**48**	**5240**
40MHz	**38**	**5190**	**46**	**5230**
80MHz	**42**	**5210**		
(U-NII-3) 5745MHz-5825MHz				
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**		

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	Jul 03&23, 2021	Su Xiaoxian	PASS	No deviation
3	15.407(a)	Maximum Conducted Output Power	Jul 06, 2021	Su Xiaoxian	PASS	No deviation
4	15.407(a)(e)	Emission Bandwidth	Jul 03&05, 2021	Su Xiaoxian	PASS	No deviation
5	15.407(a)	Peak Power Spectral Density	Jul 03&05, 2021	Su Xiaoxian	PASS	No deviation
6	15.407(g)	Frequency Stability	Jul 09, 2021	Su Xiaoxian	PASS	No deviation
7	15.207	Conducted Emission	Jul 06, 2021	Wu Runfeng	PASS	No deviation
8	15.407(b)	Restricted Frequency Bands	Jul 16 to 25, 2021	Gao Jianrou	PASS	No deviation
9	15.407(b)	Radiated Emission	Jul 25, 2021	Gao Jianrou	PASS	No deviation

Note 1: The DFS test report was documented in a separate report (Report No.: SZ20120168W05).

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 v02r01 and KDB662911 D01 v02r01.

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 11.5dB contains two parts that cable loss 1.5dB 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% confidence intervals.

1.6. Environmental Conditions

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

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

2. 47 CFR Part 15E Requirements

2.1. Antenna Requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. Test Result: Compliant

Inside of the EUT has a PIFA antenna coupled with the I-PEX connector. Please refer to the EUT internal photos.

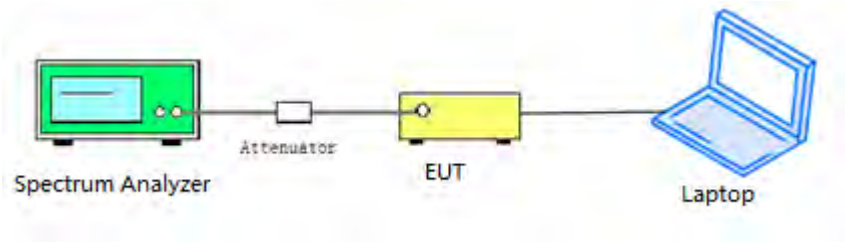
2.2. Duty Cycle of the Test Signal

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 ±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

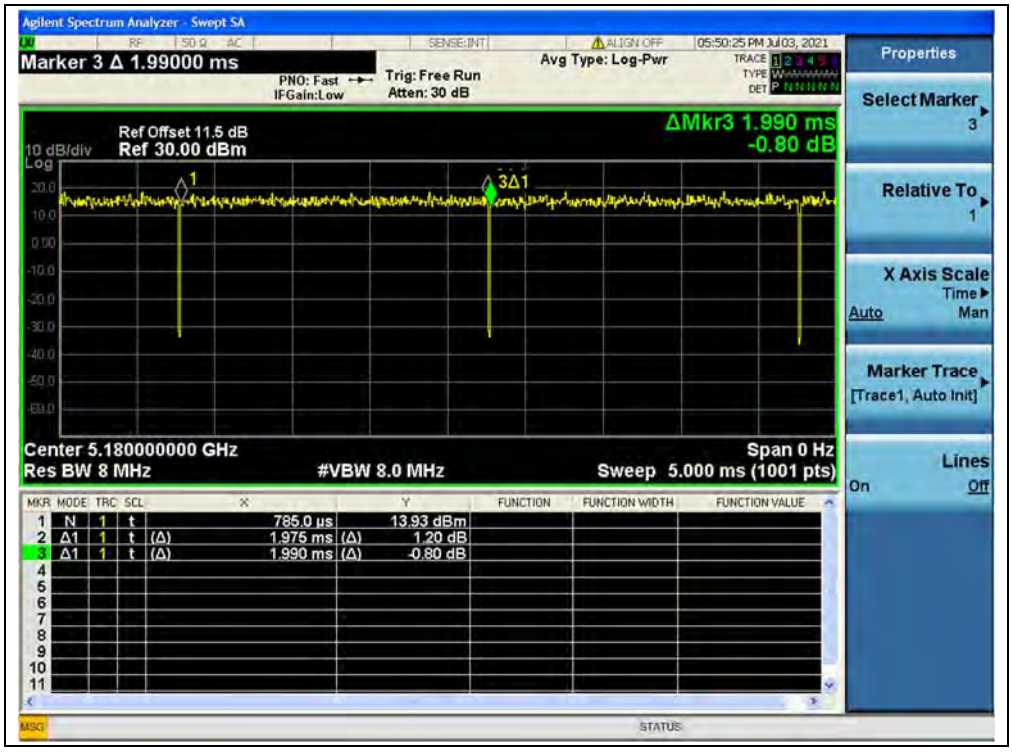
KDB 789033 Section B was used in order to prove compliance.

2.2.4. Test Result

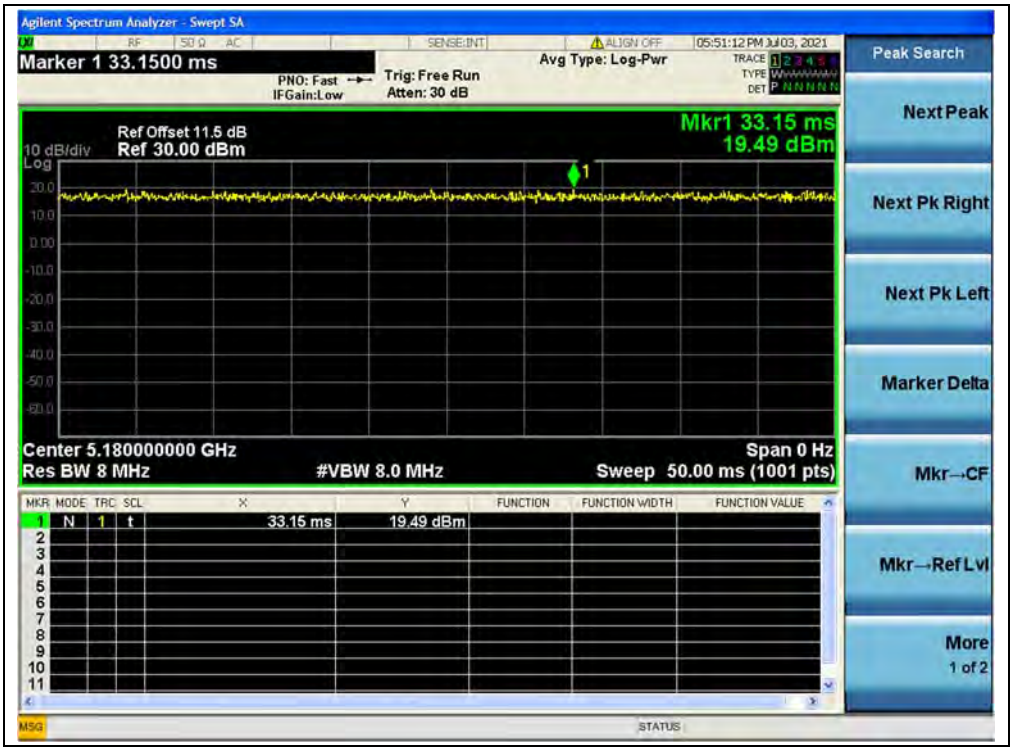
A.Test Verdict:

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*log[1/D])
802.11a	99.25	0.03
802.11n(HT20)	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
802.11ax(HEW20)	100.00	0.00
802.11ax(HEW40)	100.00	0.00
802.11ax(HEW80)	100.00	0.00

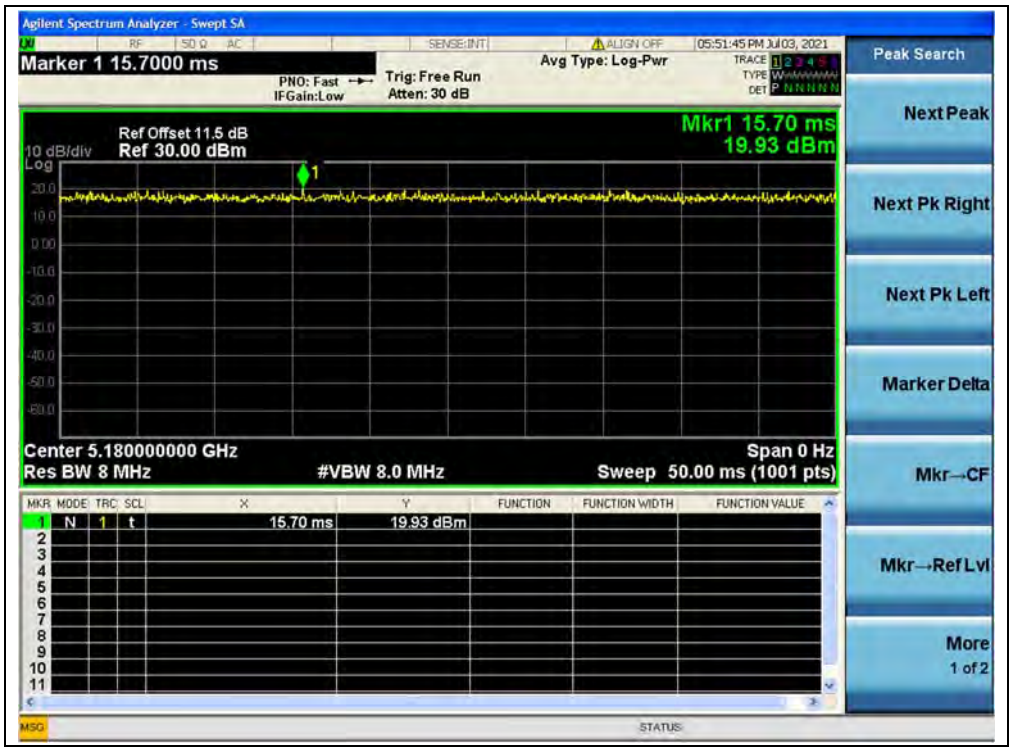
B.Test Plot:



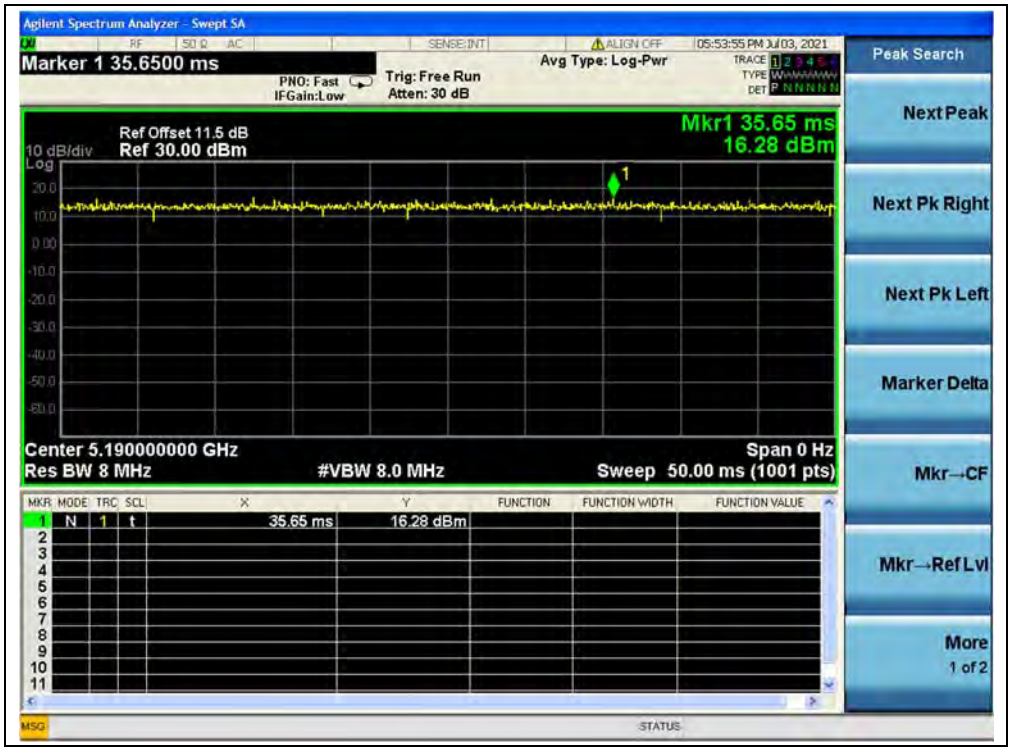
(Channel 36, 5180MHz, 802.11a)



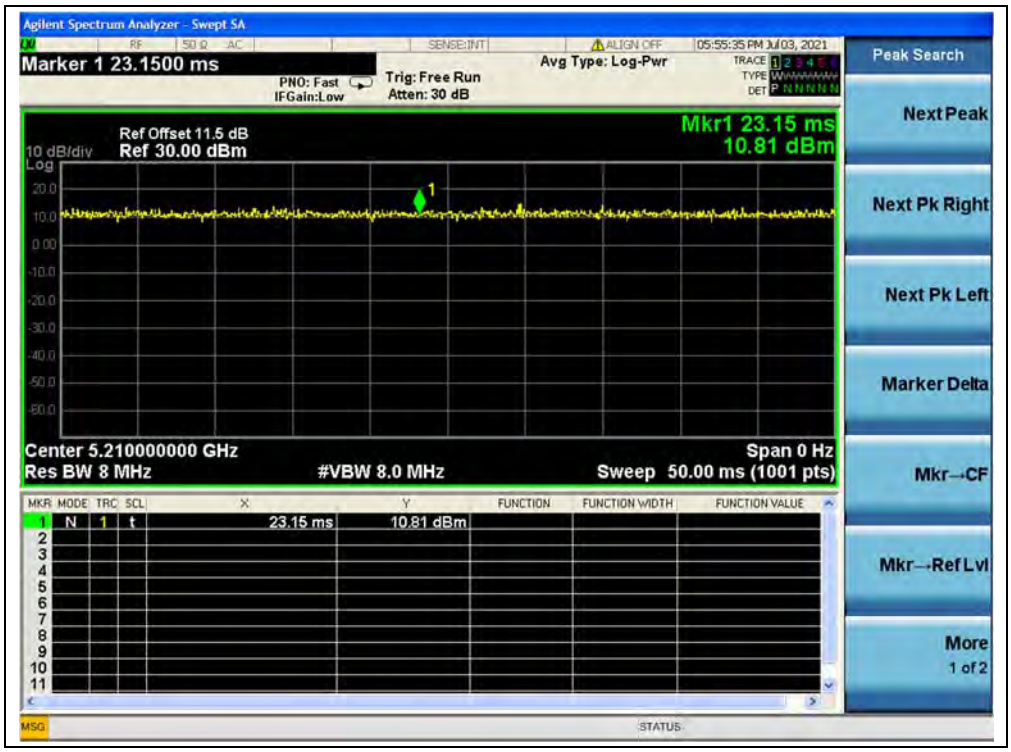
(Channel 36, 5180MHz, 802.11n (HT20))



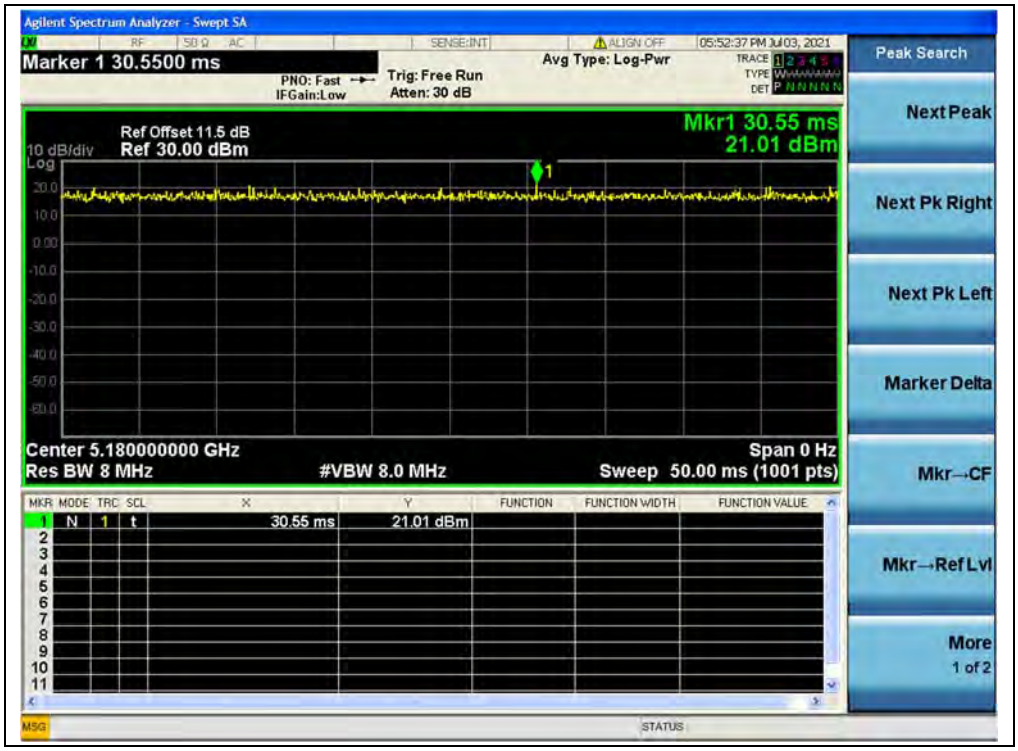
(Channel 36, 5180MHz, 802.11ac (VHT20))



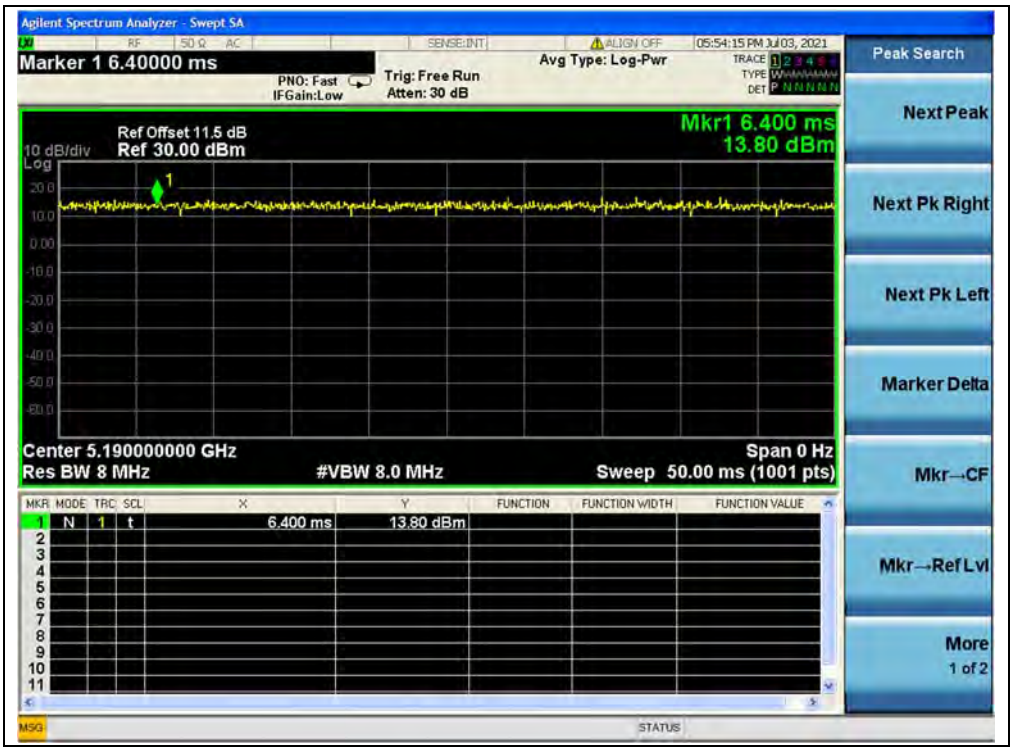
(Channel 38, 5190MHz, 802.11ac (VHT40))



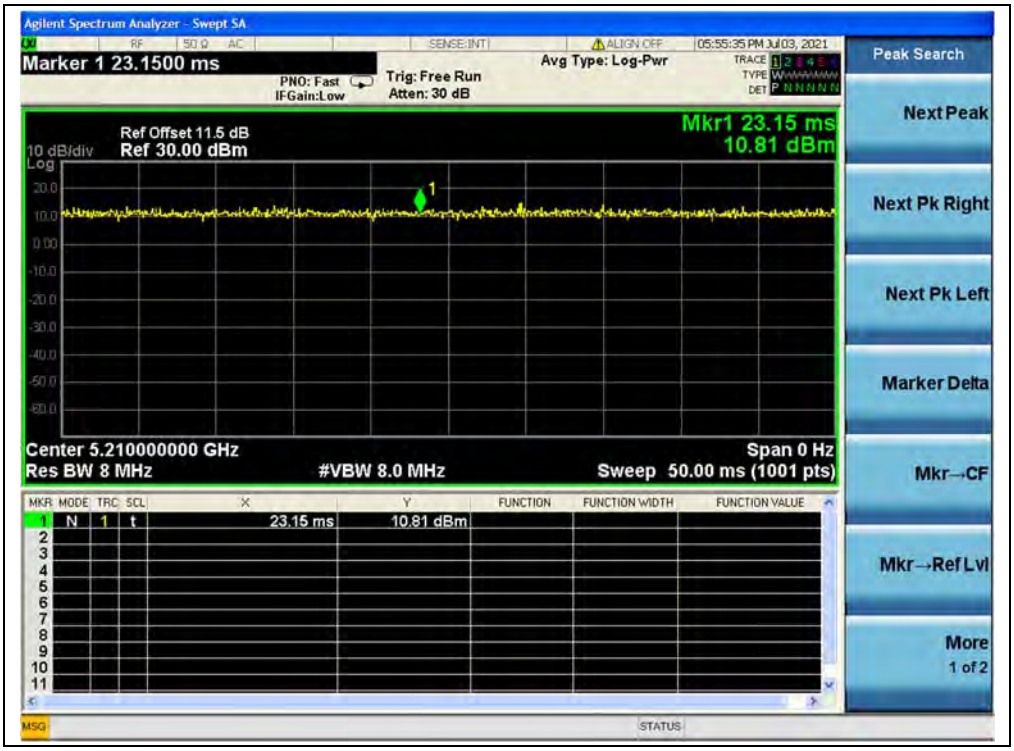
(Channel 42, 5210MHz, 802.11ac (VHT80))



(CH36, 5180MHz, 802.11ax (HEW20))



(CH38, 5190MHz, 802.11ax (HEW40))



(CH42, 5210MHz, 802.11ax (HEW80))

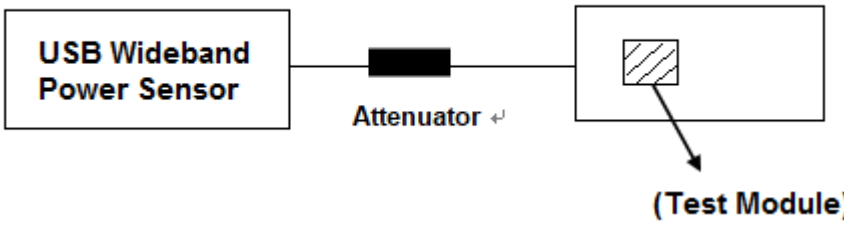
2.3. Maximum Conducted Output Power

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 11dBm + 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 KDB662911D01Measure-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} +10log(N_{ANT})dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

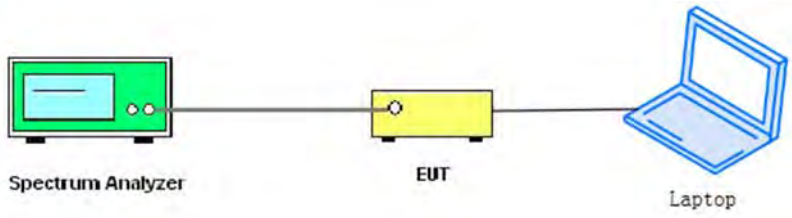
2.3.2. Test Description

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



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

For ac (VHT80) mode power



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

2.3.3. Test Result

Maximum Average Conducted Output Power

802.11a Mode

Frequency (MHz)	Average Power							Limit		Verdict
	Measured		Duty Factor	Duty Factor Calculated						
	ANT0	ANT1		ANT0		ANT1				
	dBm	dBm		dBm	W	dBm	W	dBm	W	
5180	12.02	11.44	0.03	12.02	0.016	11.44	0.014	24	0.25	PASS
5220	12.31	11.63		12.31	0.017	11.63	0.015			PASS
5240	12.40	11.82		12.40	0.017	11.82	0.015			
5745	12.09	12.25		12.09	0.016	12.25	0.017	30	1	
5785	12.15	12.08		12.15	0.016	12.08	0.016			
5825	11.77	12.27		11.77	0.015	12.27	0.017			

802.11n (HT20) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5180	11.91	11.26	0.00	14.62	0.029	24	0.25	PASS
5220	12.21	11.47		14.91	0.031			
5240	12.22	11.65		14.91	0.031			
5745	11.95	12.14		15.05	0.032	30	1	
5785	12.02	12.06		15.05	0.032			
5825	11.64	12.25		14.91	0.031			

Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.

802.11ac (VHT20) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5180	11.88	11.25	0.00	14.62	0.029	24	0.25	PASS
5220	12.16	11.48		14.91	0.031			
5240	12.27	11.64		14.91	0.031			
5745	11.94	12.11		15.05	0.032	30	1	
5785	12.02	12.02		15.05	0.032			
5825	11.65	12.08		14.91	0.031			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ac (VHT40) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5190	12.10	11.40	0.00	14.77	0.030	24	0.25	PASS
5230	12.27	11.64		14.91	0.031			
5755	12.06	12.23		15.19	0.033	30	1	
5795	12.12	12.16		15.19	0.033			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ac (VHT80) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		W	dBm	dBm	W	
5210	12.23	11.36	0.00	14.77	0.030	24	0.25	PASS
5775	12.09	12.15		15.19	0.033	30	1	
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ax (HEW20) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5180	12.00	11.37	0.00	14.77	0.030	24	0.25	PASS
5220	12.31	11.56		14.91	0.031			
5240	12.41	11.73		15.05	0.032			
5745	12.37	12.22		15.31	0.034	30	1	
5785	12.18	12.03		15.05	0.032			
5825	11.77	12.17		15.05	0.032			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ax (HEW20) RU26 Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5180	11.76	10.79	0.00	14.31	0.027	24	0.25	PASS
5220	12.00	10.88		14.47	0.028			
5240	12.49	10.87		14.77	0.030			
5745	11.80	10.78		14.31	0.027	30	1	
5785	11.78	10.21		14.15	0.026			
5825	11.57	10.85		14.31	0.027			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ax (HEW20) RU52 Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5180	11.78	10.97	0.00	14.47	0.028	24	0.25	PASS
5220	12.39	10.97		14.77	0.030			
5240	12.62	11.15		**14.91**	**0.031**			
5745	11.78	10.88		14.31	0.027	30	1	
5785	11.93	10.37		14.15	0.026			
5825	11.59	10.69		14.15	0.026			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ax (HEW20) RU106 Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5180	11.77	10.89	0.00	14.31	0.027	24	0.25	PASS
5220	12.21	11.35		14.77	0.030			
5240	12.48	11.09		14.91	0.031			
5745	12.13	10.41		14.31	0.027	30	1	
5785	12.28	10.26		14.47	0.028			
5825	11.56	10.95		14.31	0.027			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ax (HEW40) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		dBm	W	dBm	W	
5190	11.98	11.26	0.00	14.62	0.029	24	0.25	PASS
5230	12.15	11.52		14.91	0.031			
5755	11.90	12.11		15.05	0.032	30	1	
5795	11.85	12.06		14.91	0.031			
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

802.11ax (HEW80) Mode

Frequency (MHz)	Average Power					Limit		Verdict
	Measured		Duty Factor	Total Power with Duty Factor				
	ANT0	ANT1						
	dBm	dBm		W	dBm	dBm	W	
5210	12.18	11.35	0.00	14.77	0.030	24	0.25	PASS
5775	12.02	12.15		15.05	0.032	30	1	
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the power limit shall be 24dBm for 5.18-5.24 GHz band and 30dBm for 5.745-5.825 GHz band.								

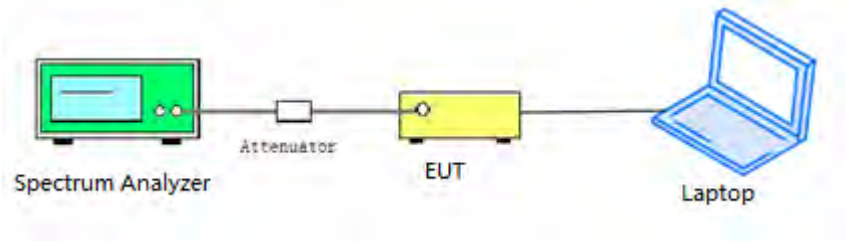
2.4. Emission Bandwidth

2.4.1. Requirement

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

2.4.2. Test Description

Test Setup:



The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; 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 theband5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

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

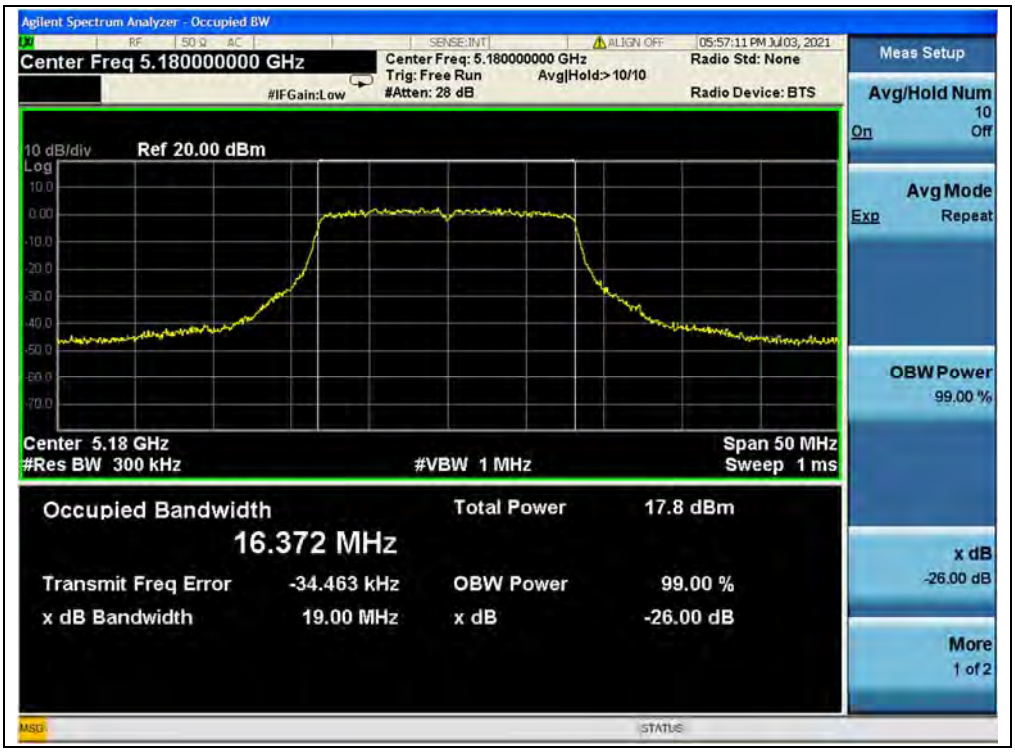
2.4.4. Test Result

802.11a Mode

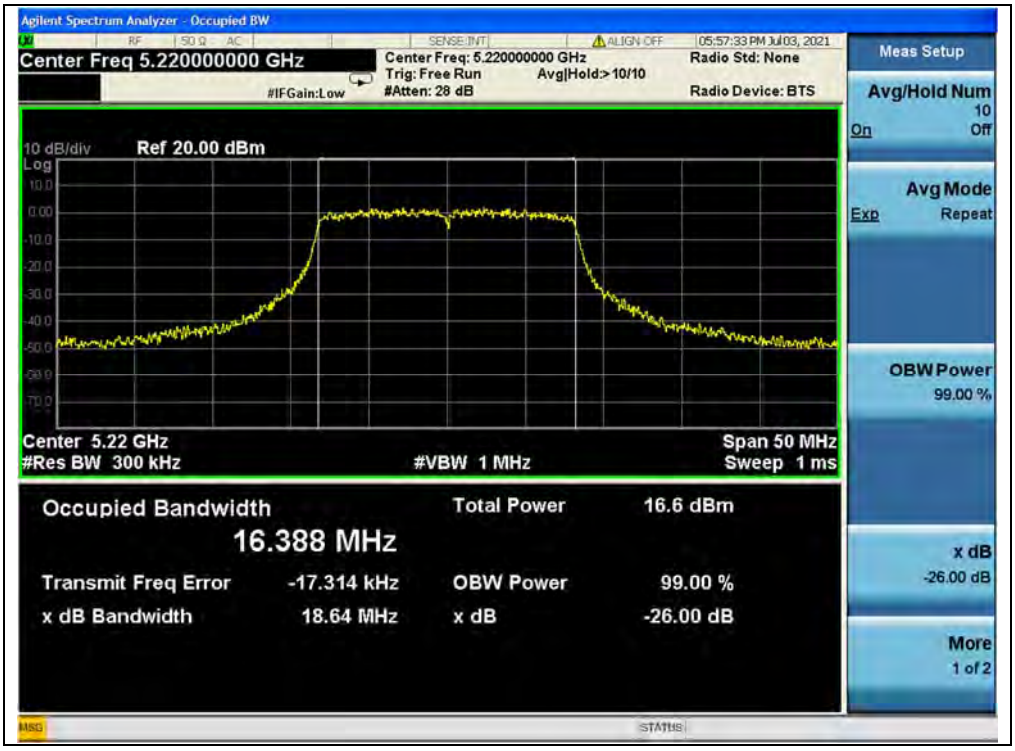
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	19.00
44	5220	18.64
48	5240	18.86
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	15.69
157	5785	16.31
165	5825	16.36

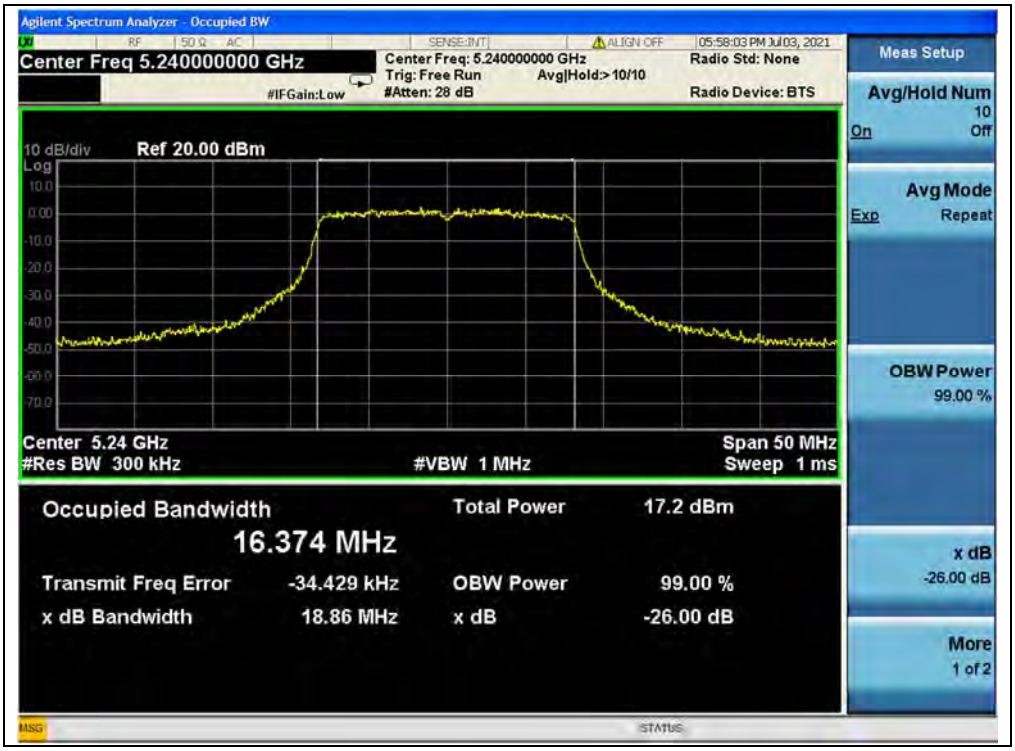
B.Test Plot:



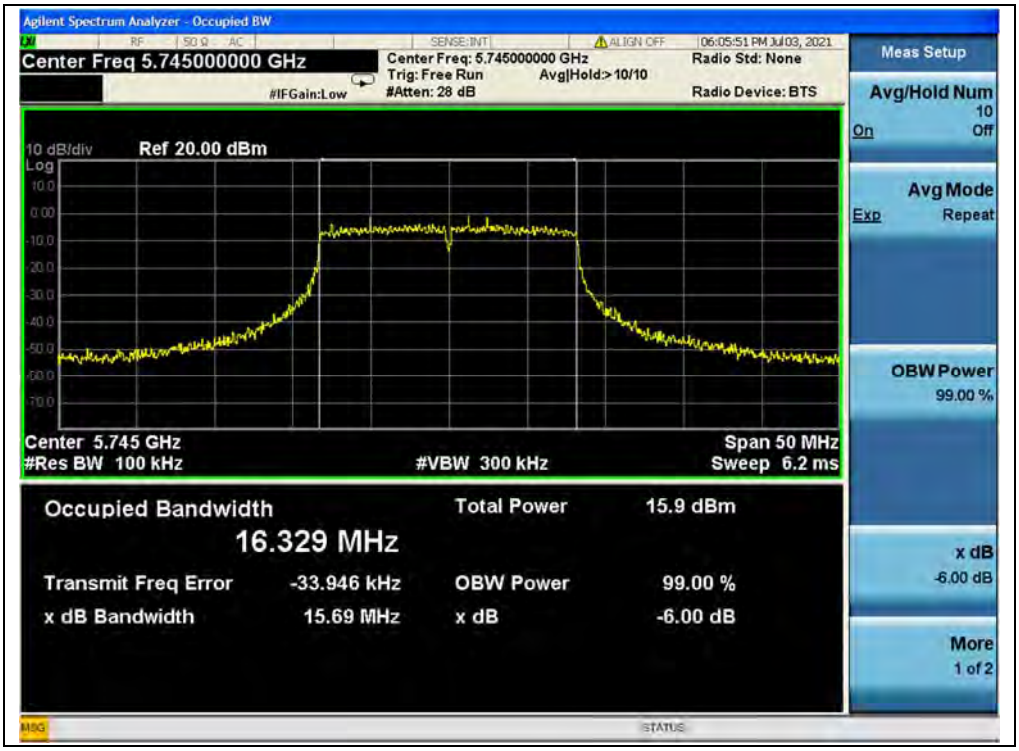
(Channel 36, 5180MHz, 802.11a)



(Channel 44, 5220 MHz, 802.11a)

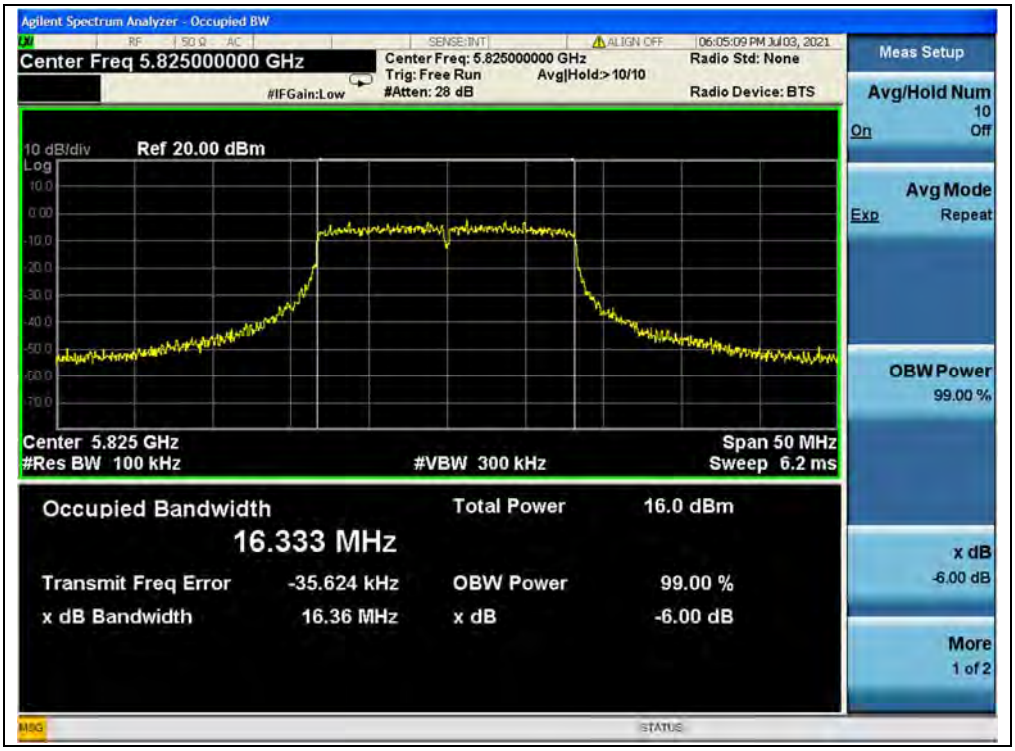


(Channel 48, 5240MHz, 802.11a)



(Channel 149,5745MHz, 802.11a)

(Channel 157,5785MHz, 802.11a)



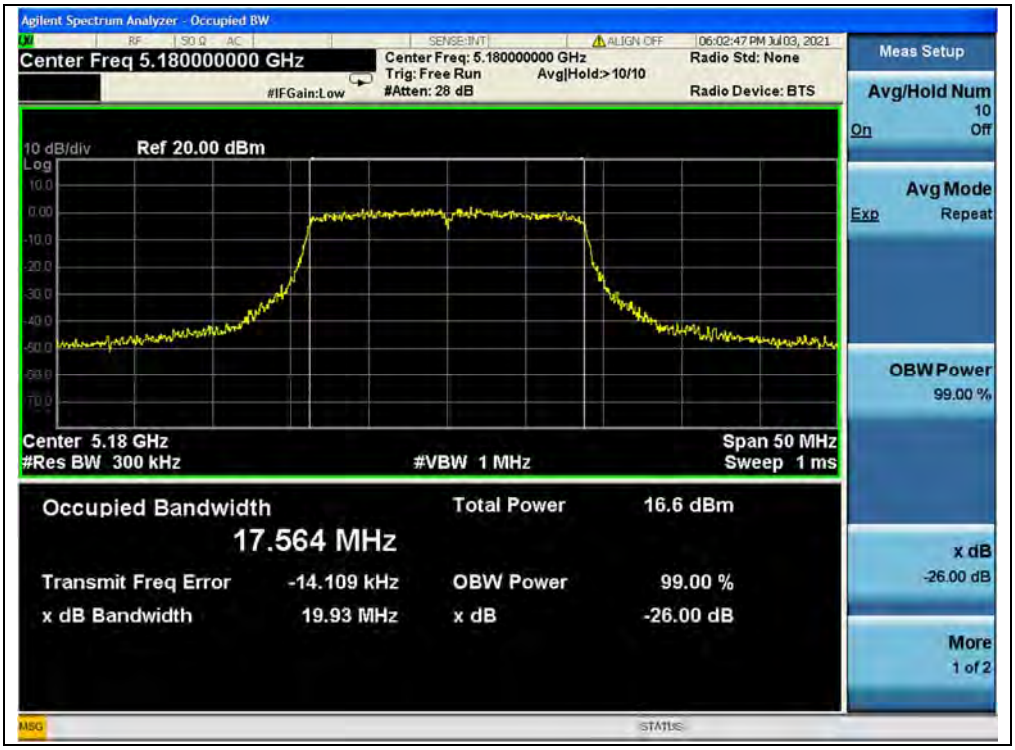
(Channel 165, 5825MHz, 802.11a)

802.11n (HT20) Mode

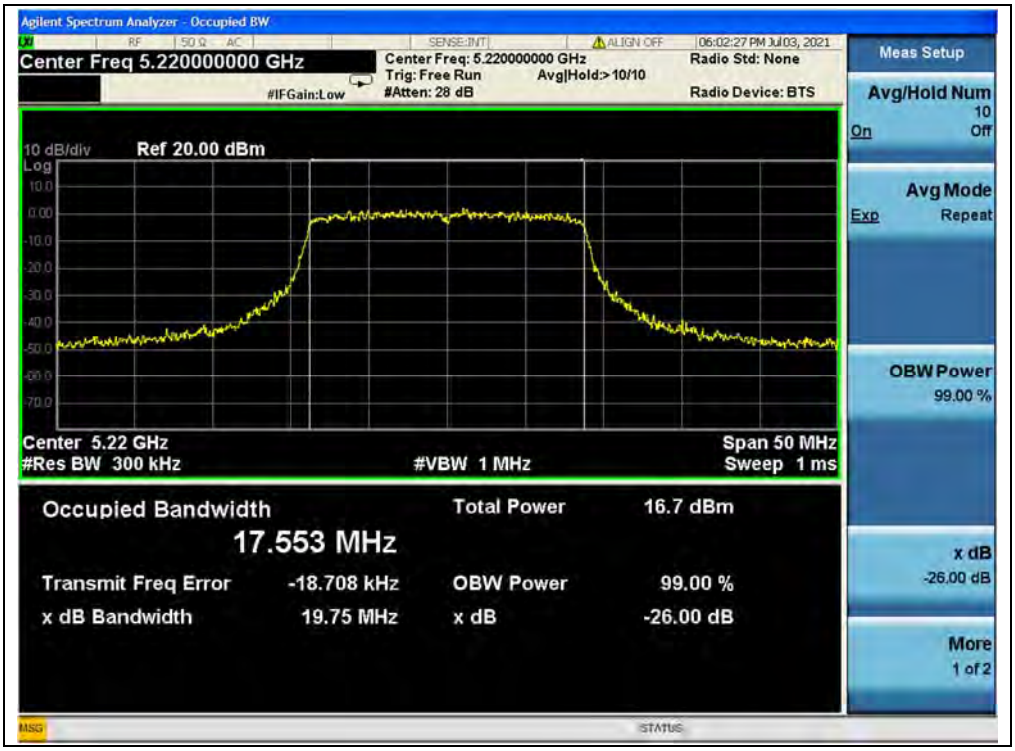
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	19.93
44	5220	19.75
48	5240	19.90
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	17.54
157	5785	17.55
165	5825	17.20

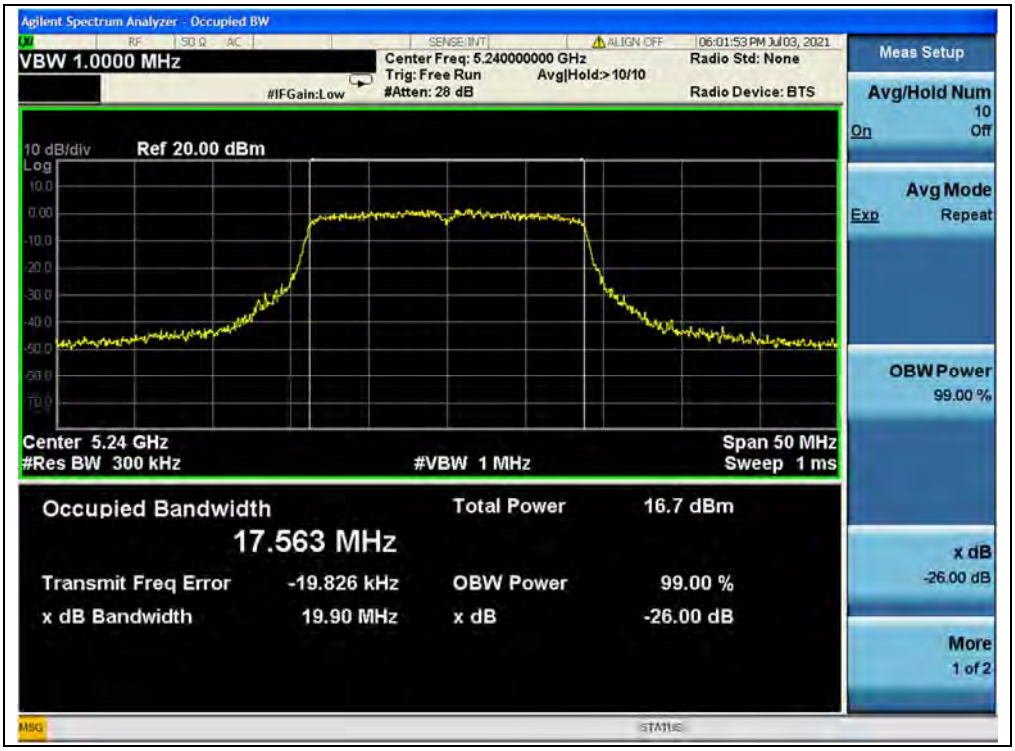
B.Test Plot:



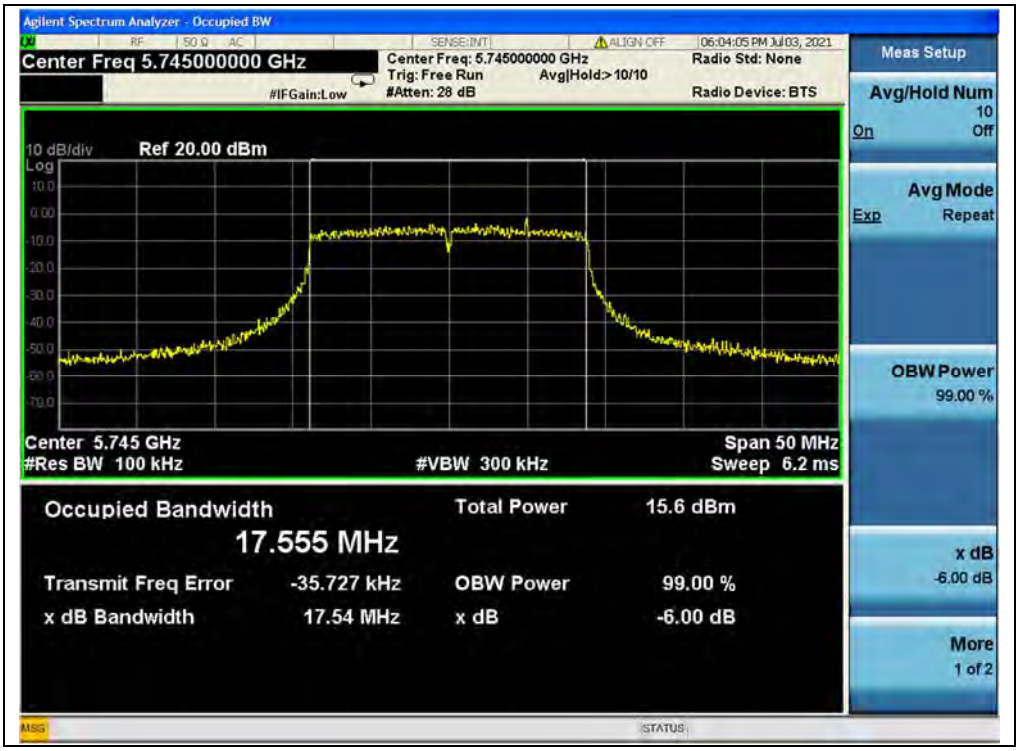
(Channel 36, 5180MHz, 802.11n (HT20))



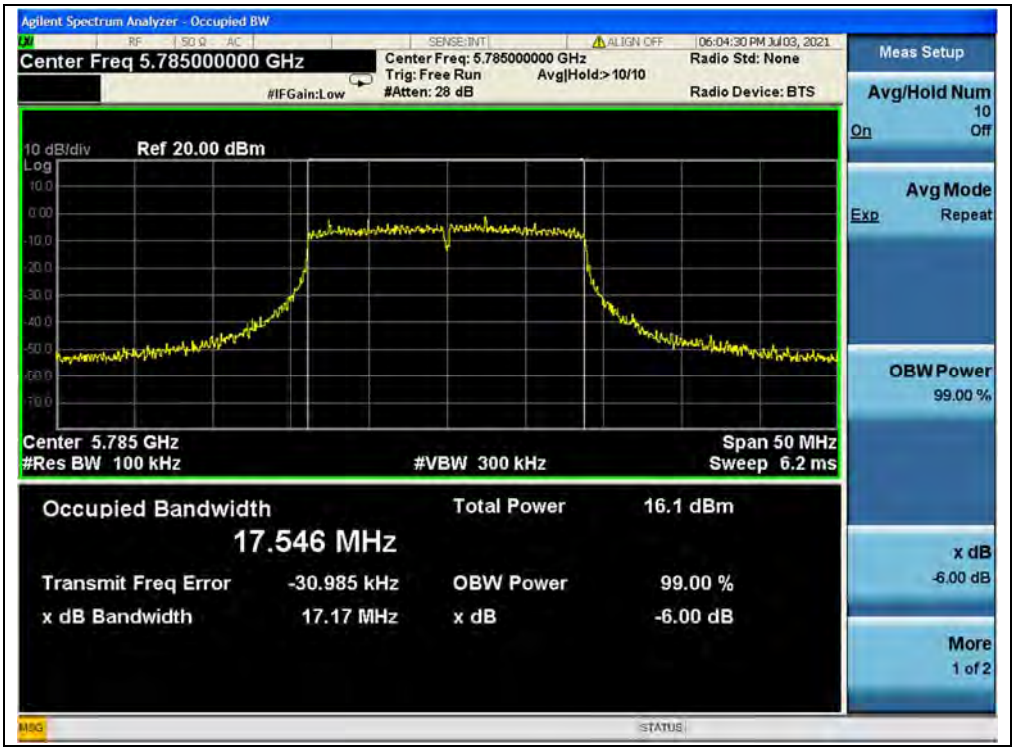
(Channel 44, 5220MHz, 802.11n (HT20))



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



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



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

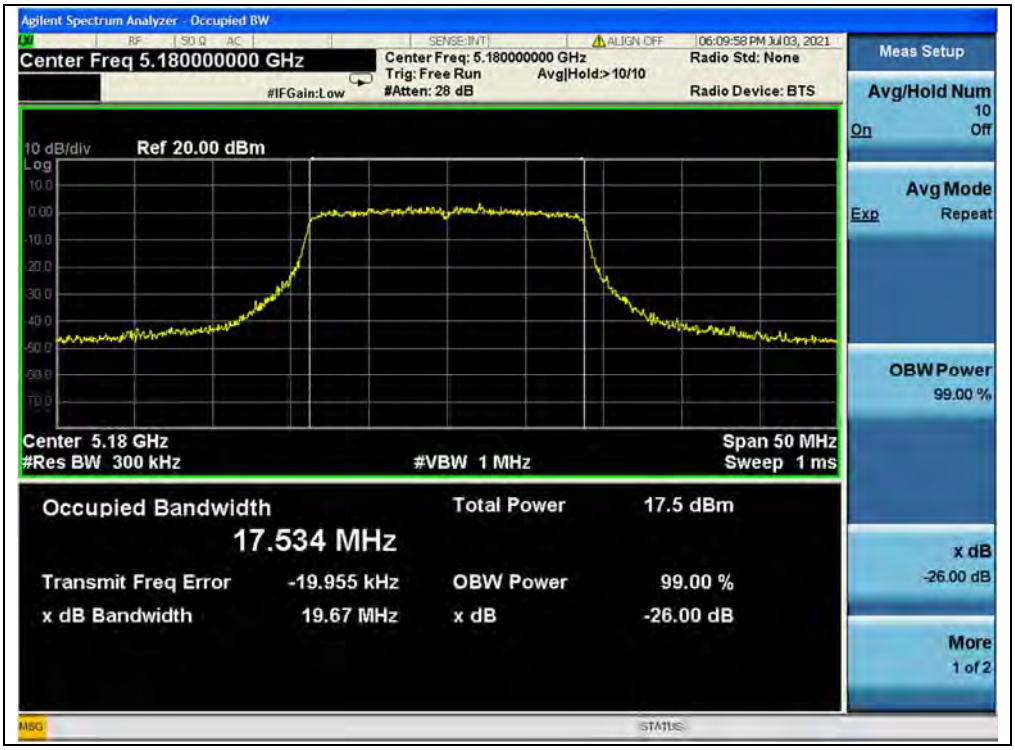
(Channel 165, 5825MHz, 802.11 n (HT20))

802.11ac (VHT20) Mode

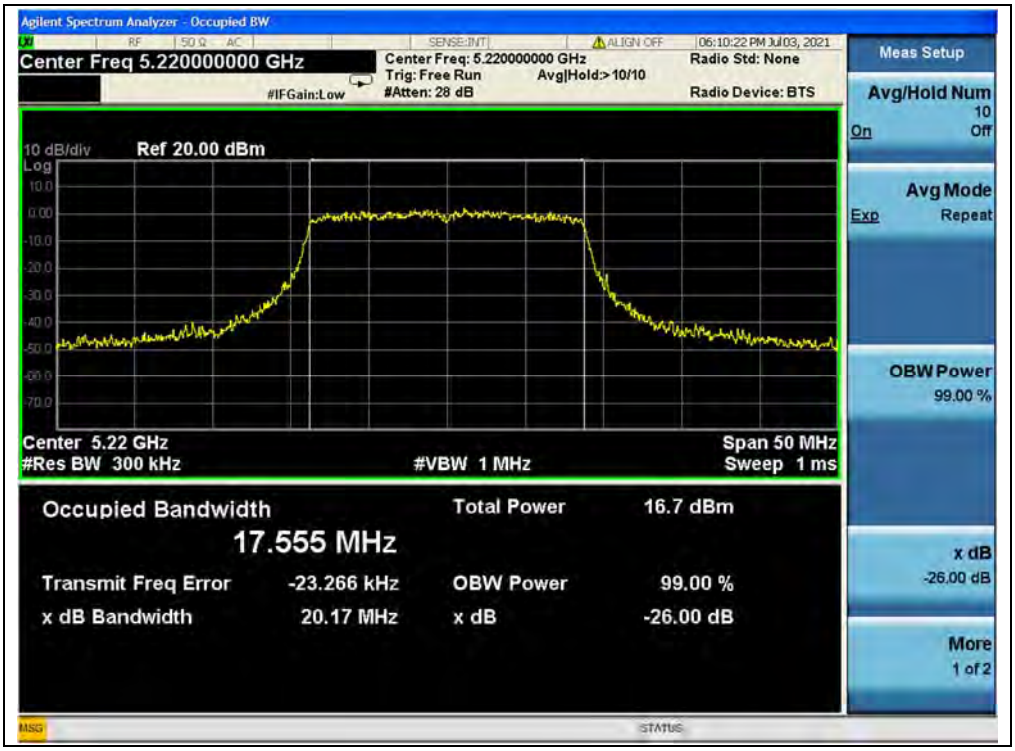
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	19.67
44	5220	20.17
48	5240	19.76
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	17.51
157	5785	17.58
165	5825	17.59

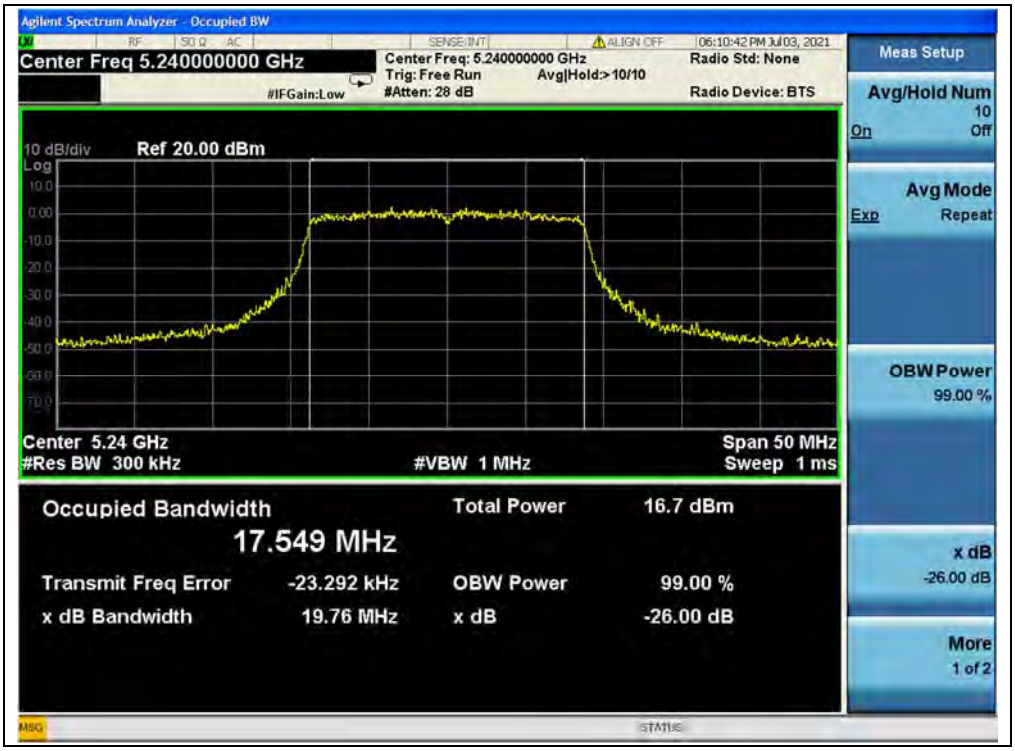
B.Test Plot:



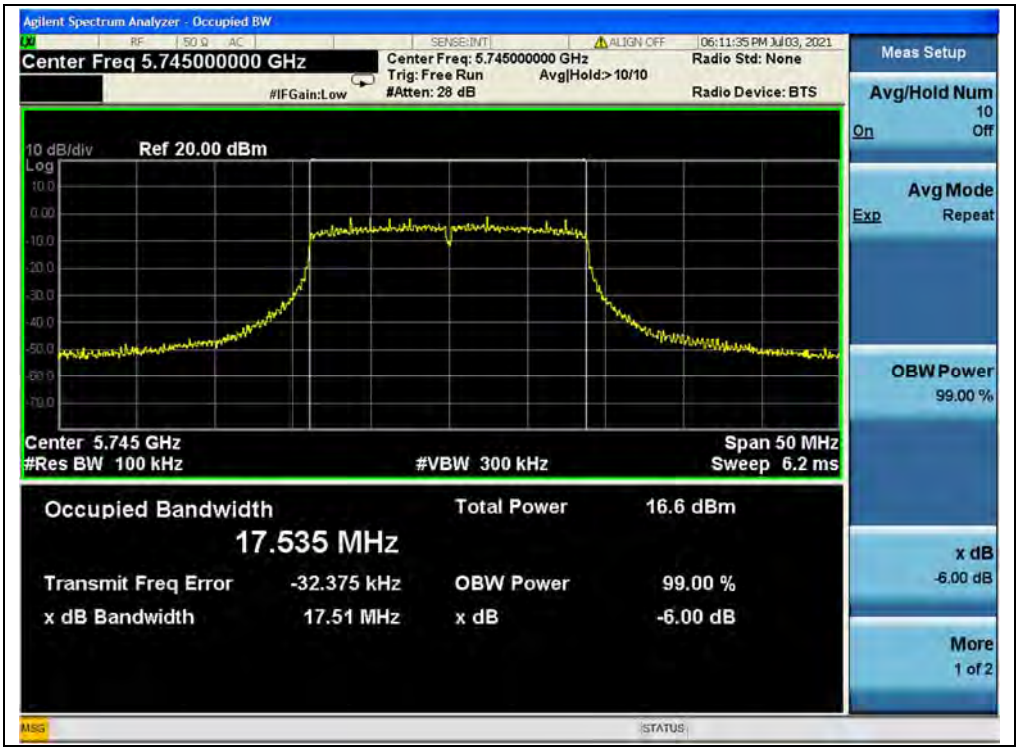
(Channel 36, 5180MHz, 802.11ac (VHT20))



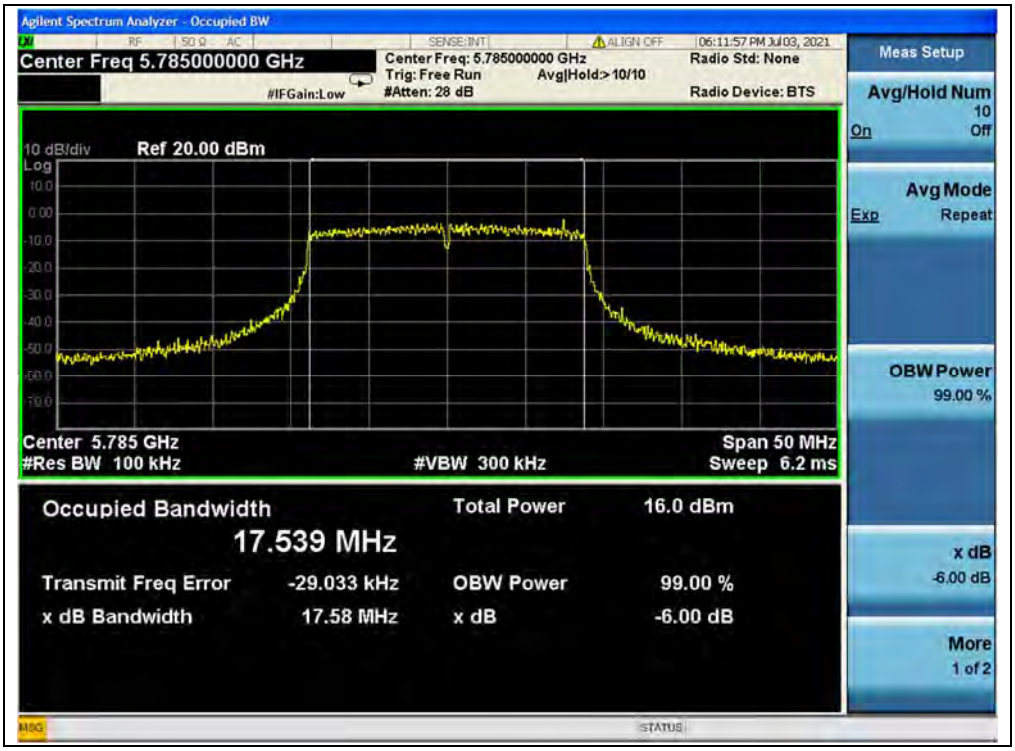
(Channel 44, 5220MHz, 802.11ac (VHT20))



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



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



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

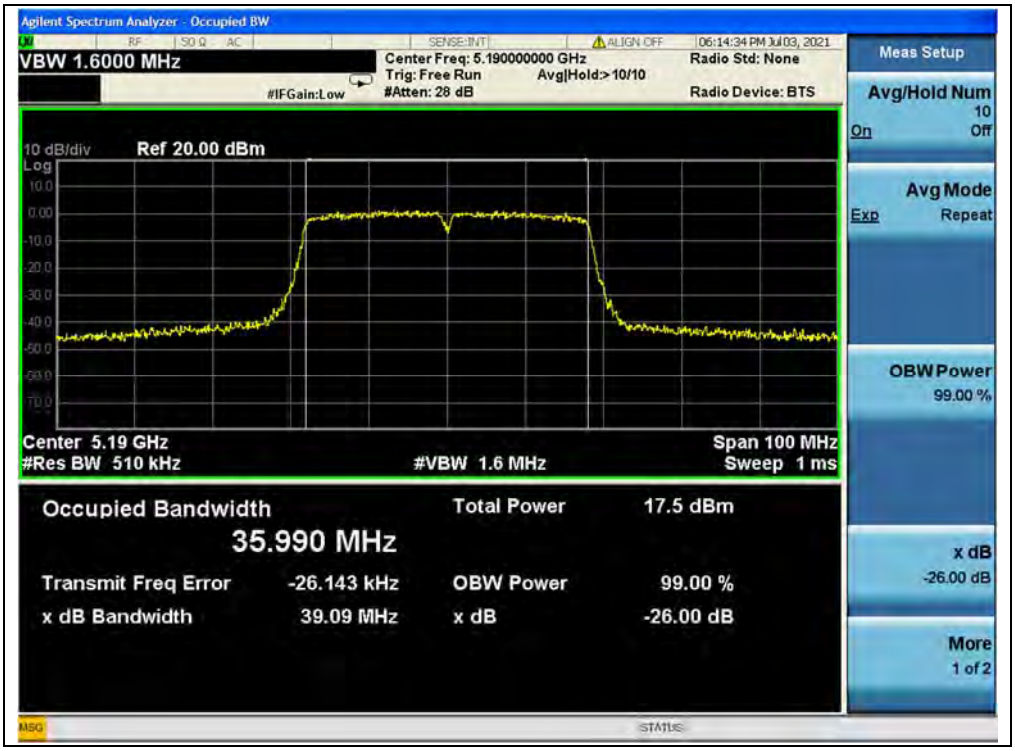
(Channel 165, 5825MHz, 802.11 ac (VHT20))

802.11ac (VHT40) Mode

A.Test Verdict:

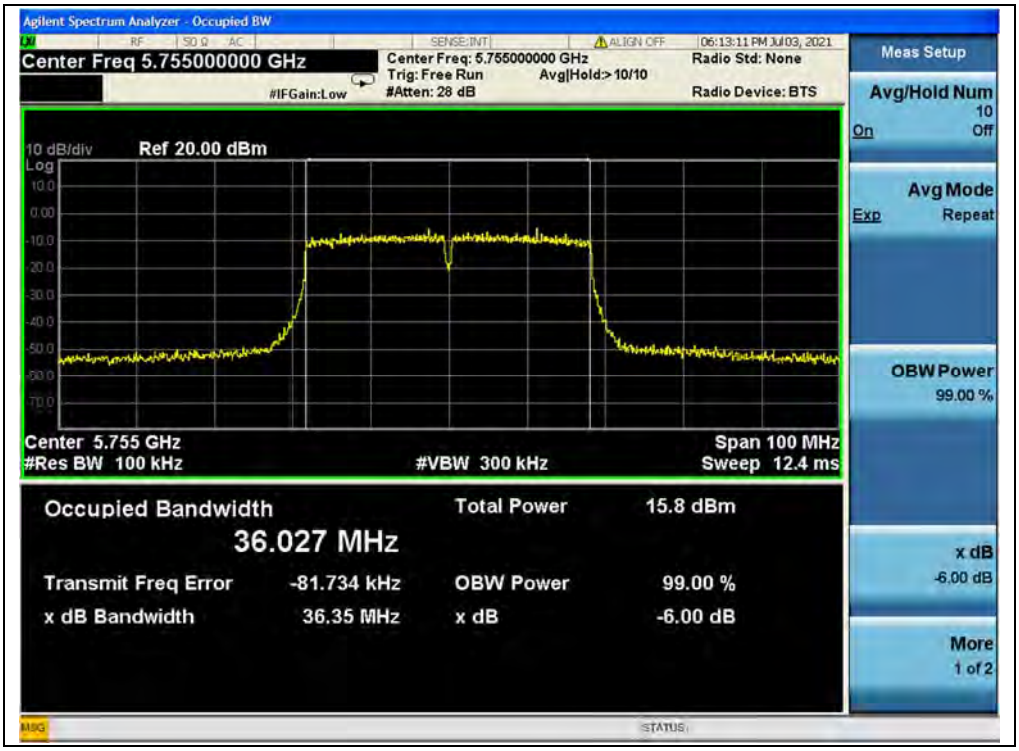
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	39.09
46	5230	39.31
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
151	5755	36.35
159	5795	36.38

B.Test Plot:



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

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



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

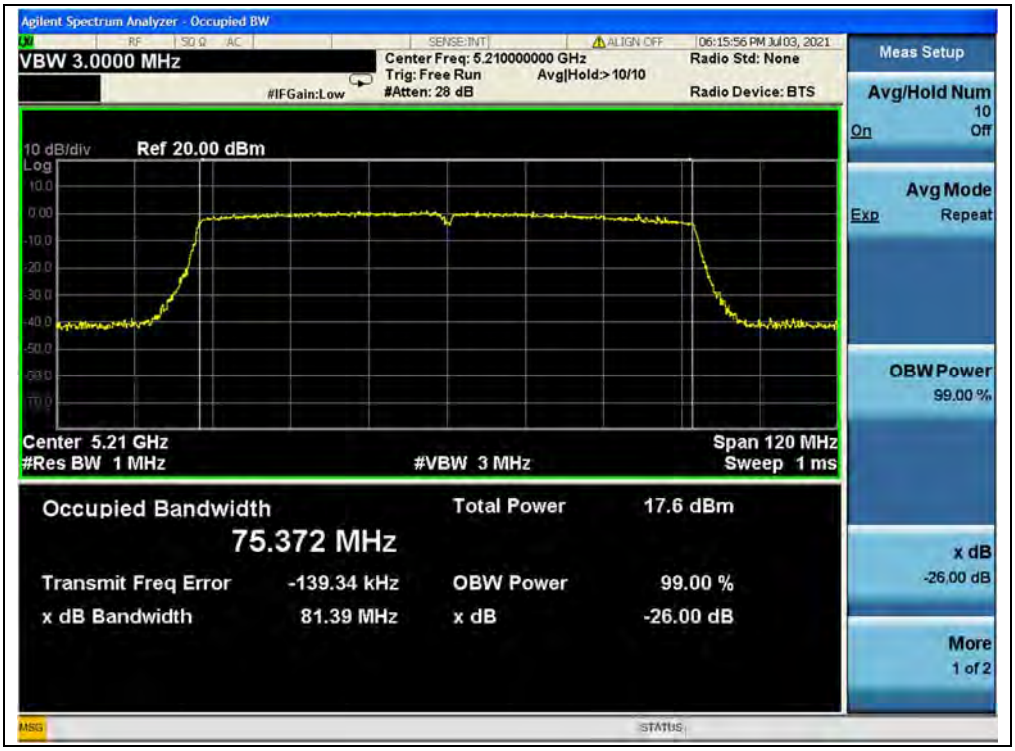
(Channel 159, 5795MHz, 802.11ac (VHT40))

802.11ac (VHT80) Mode

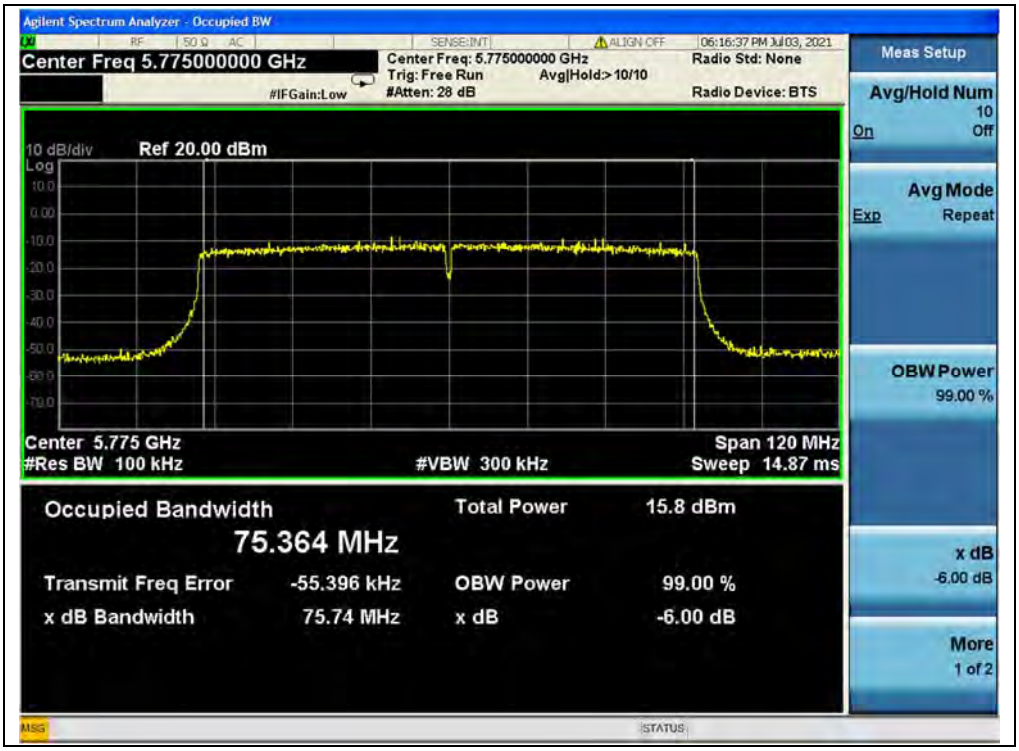
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	81.39
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
155	5775	75.74

B.Test Plot:



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



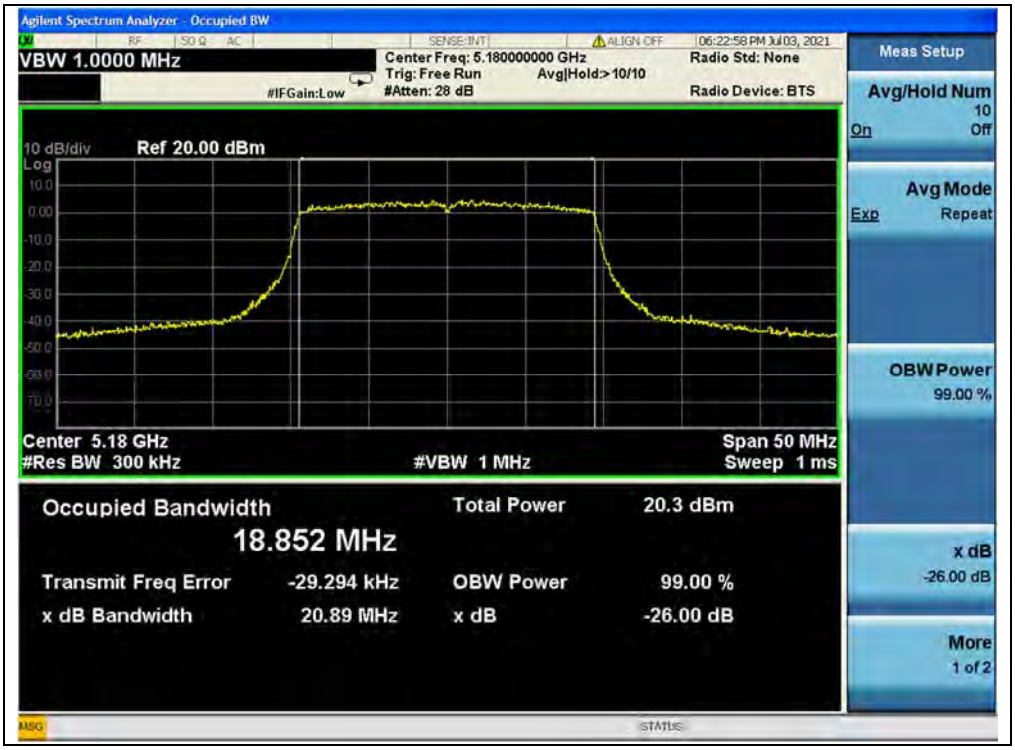
(Channel 155, 5775MHz, 802.11ac (VHT80))

802.11ax (HEW20) Mode

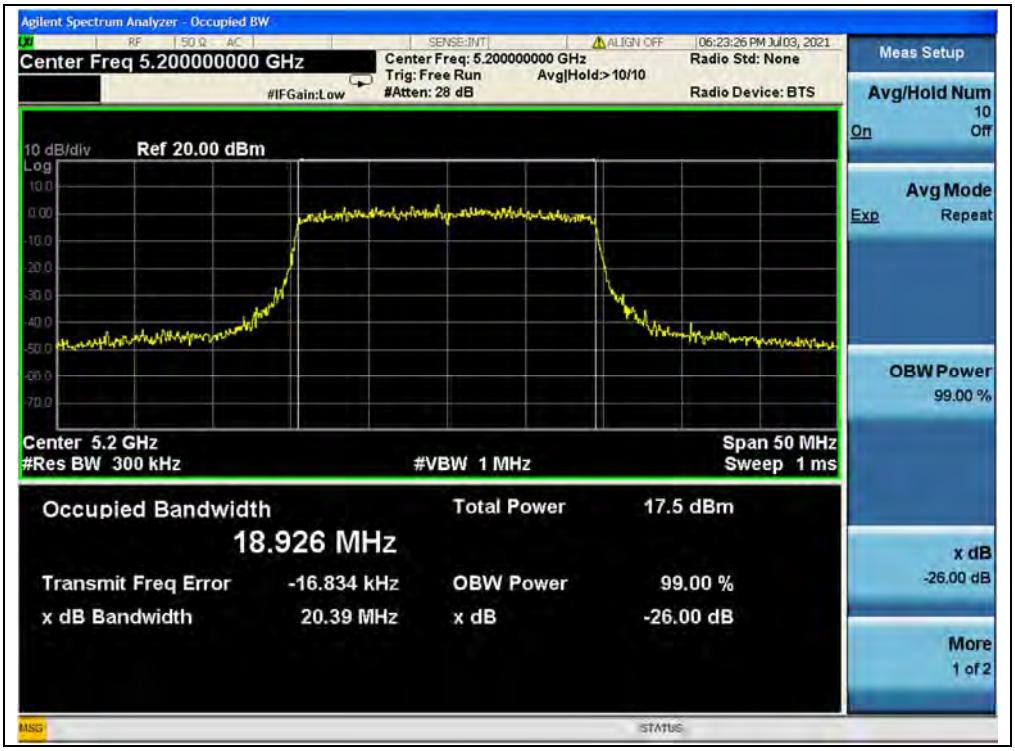
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.89
44	5220	20.39
48	5240	20.57
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	18.94
157	5785	18.89
165	5825	18.59

B.Test Plot:



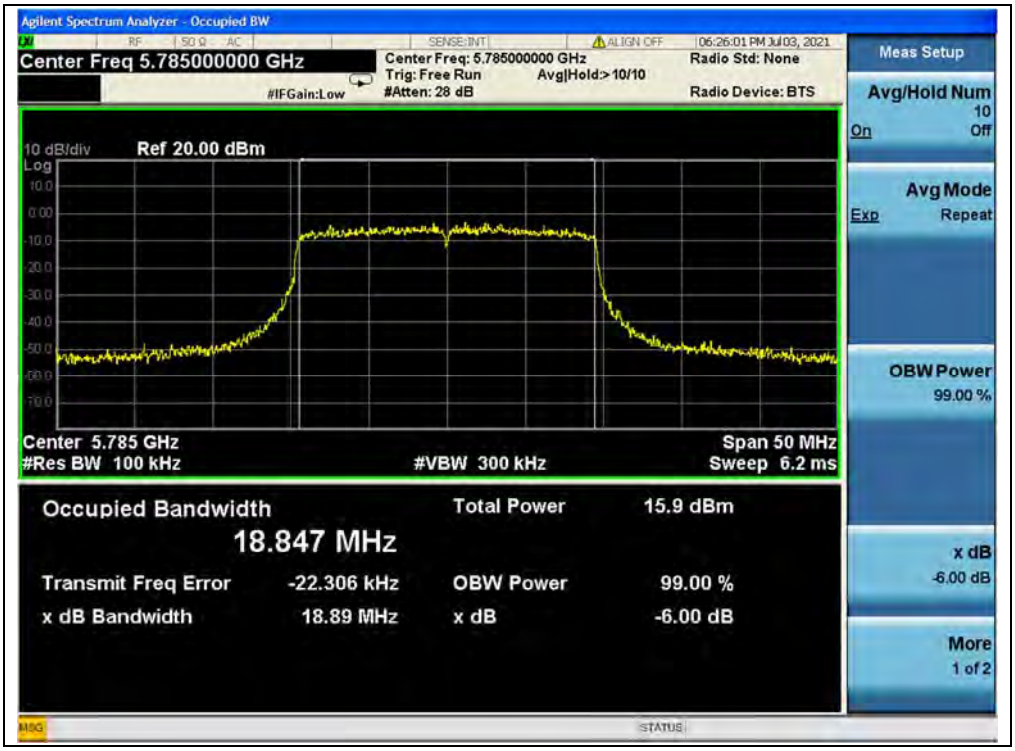
(Channel 36, 5180MHz, 802.11ax (HEW20))



(Channel 44, 5220MHz, 802.11ax (HEW20))

(Channel 48, 5240MHz, 802.11ax (HEW20))

(Channel 149, 5745MHz, 802.11ax (HEW20))



(Channel 157, 5785MHz, 802.11ax (HEW20))

(Channel 165, 5825MHz, 802.11ax (HEW20))

802.11ax (HEW20) RU26 Mode

A.Test Verdict:

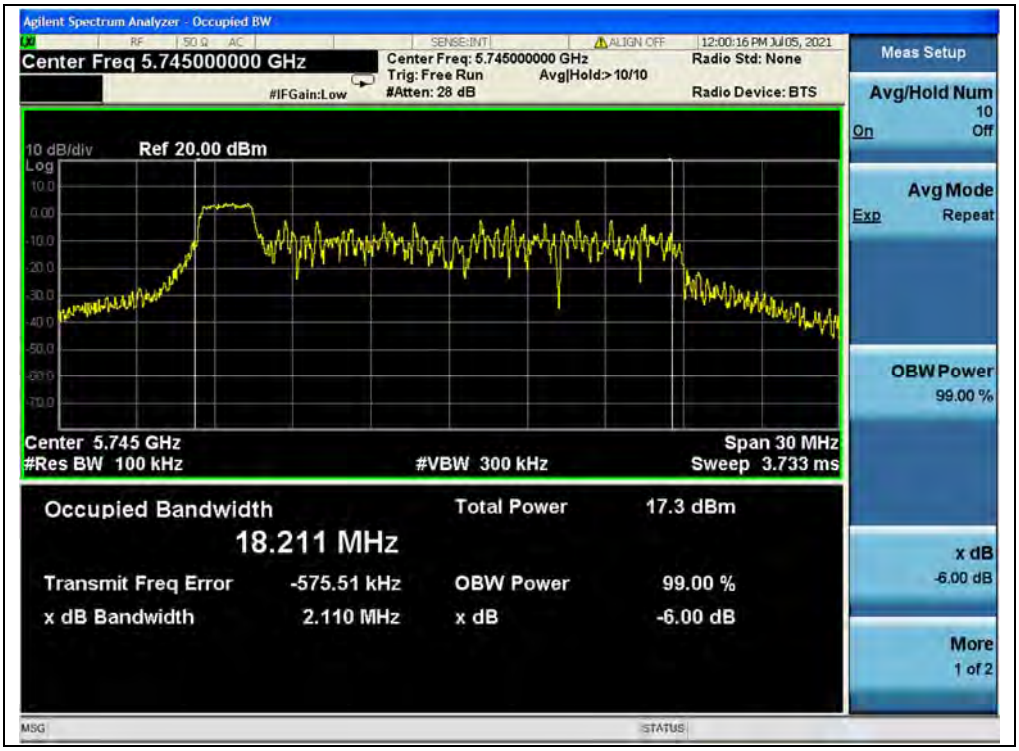
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.42
44	5220	20.36
48	5240	20.31
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	2.11
157	5785	2.06
165	5825	12.05

B.Test Plot:

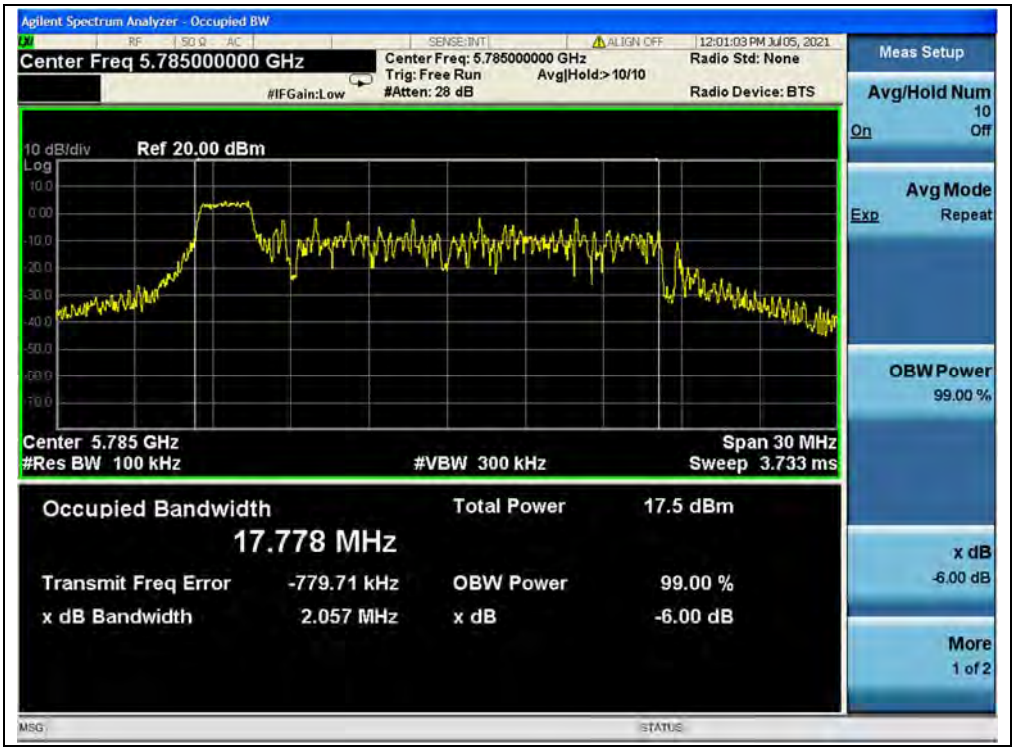
(Channel 36, 5180MHz, 802.11ax (HEW20) RU26)

(Channel 44, 5220MHz, 802.11ax (HEW20) RU26)

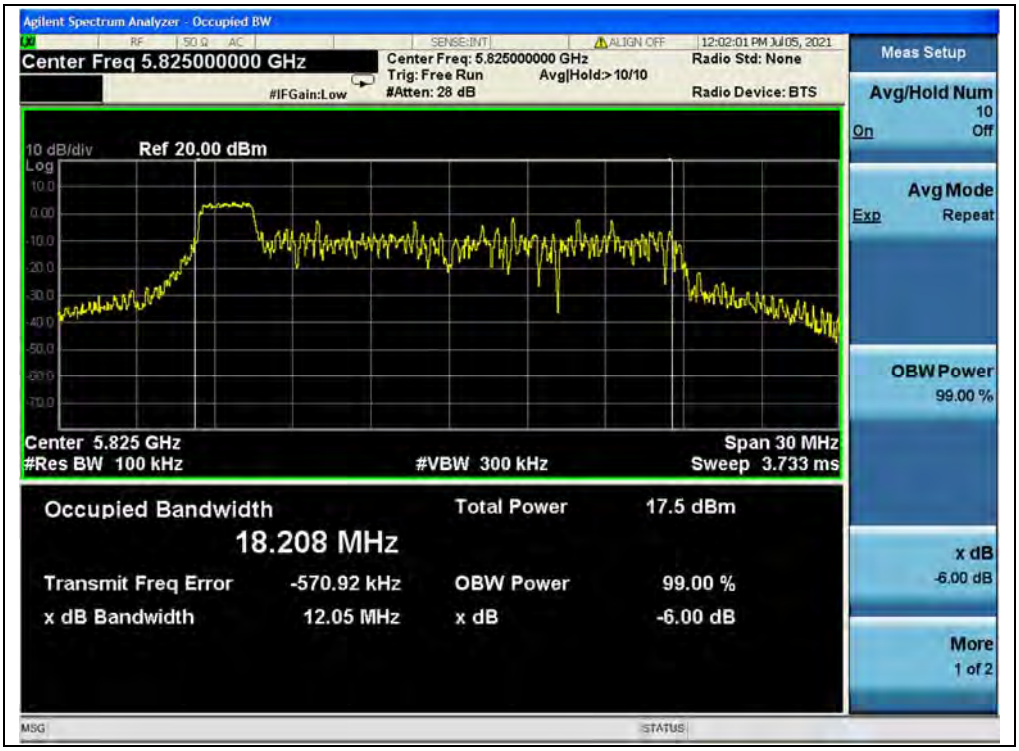
(Channel 48, 5240MHz, 802.11ax (HEW20) RU26)



(Channel 149, 5745MHz, 802.11ax (HEW20) RU26)



(Channel 157, 5785MHz, 802.11ax (HEW20) RU26)



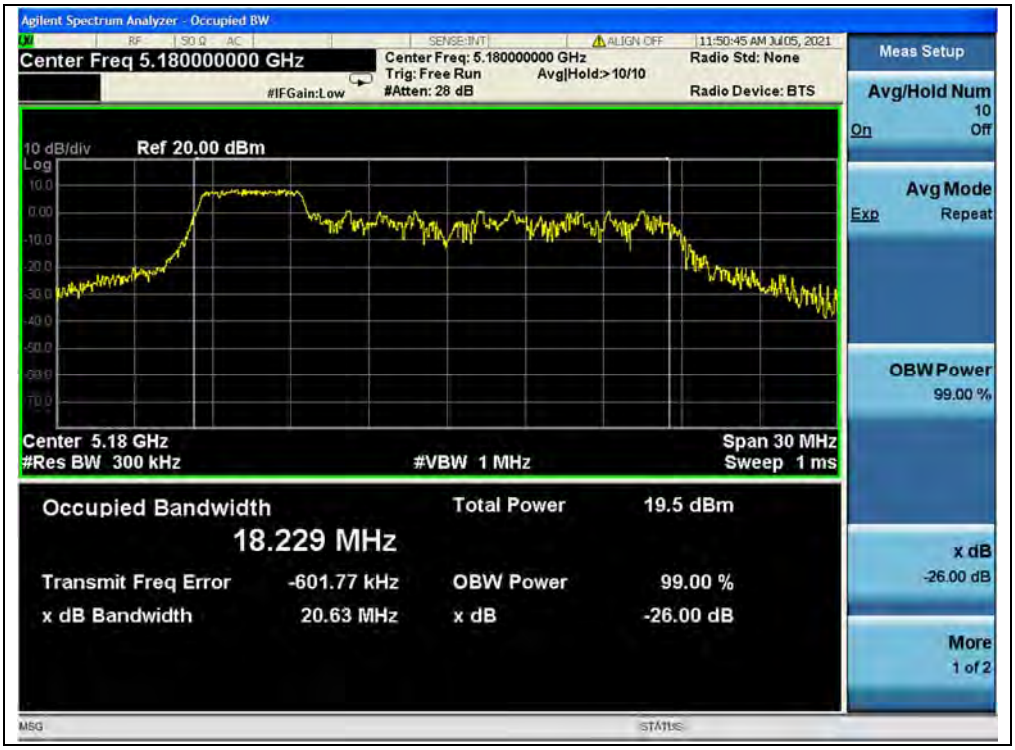
(Channel 165, 5825MHz, 802.11ax (HEW20) RU26)

802.11ax (HEW20) RU52 Mode

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	20.63
44	5220	20.67
48	5240	20.67
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	14.55
157	5785	13.34
165	5825	17.05

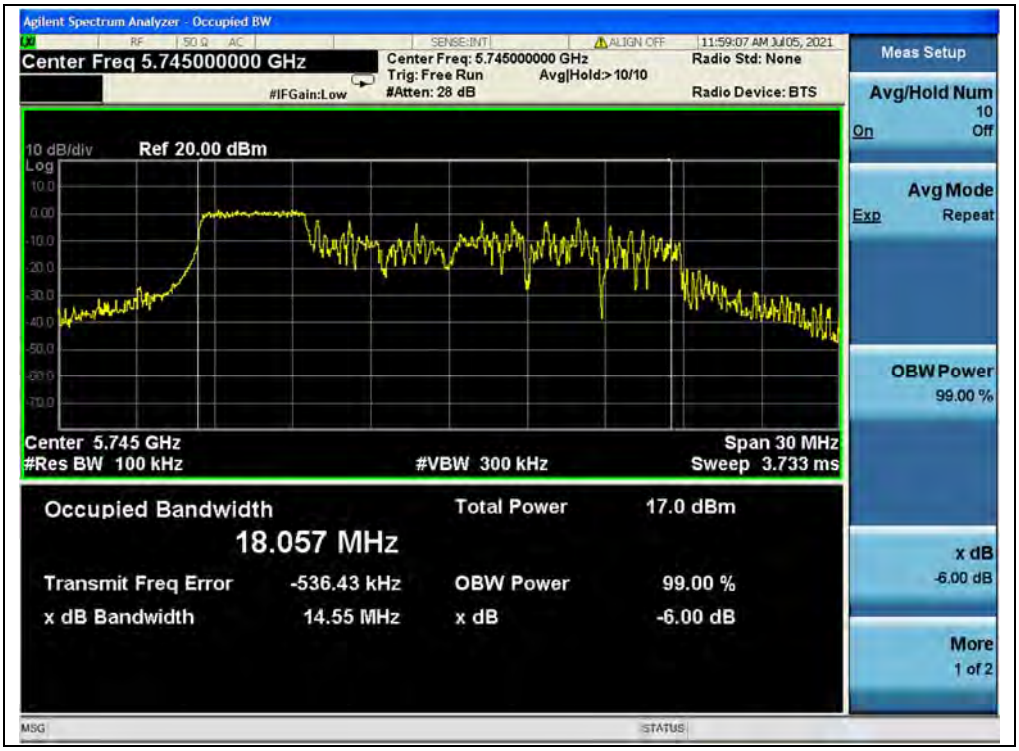
B.Test Plot:



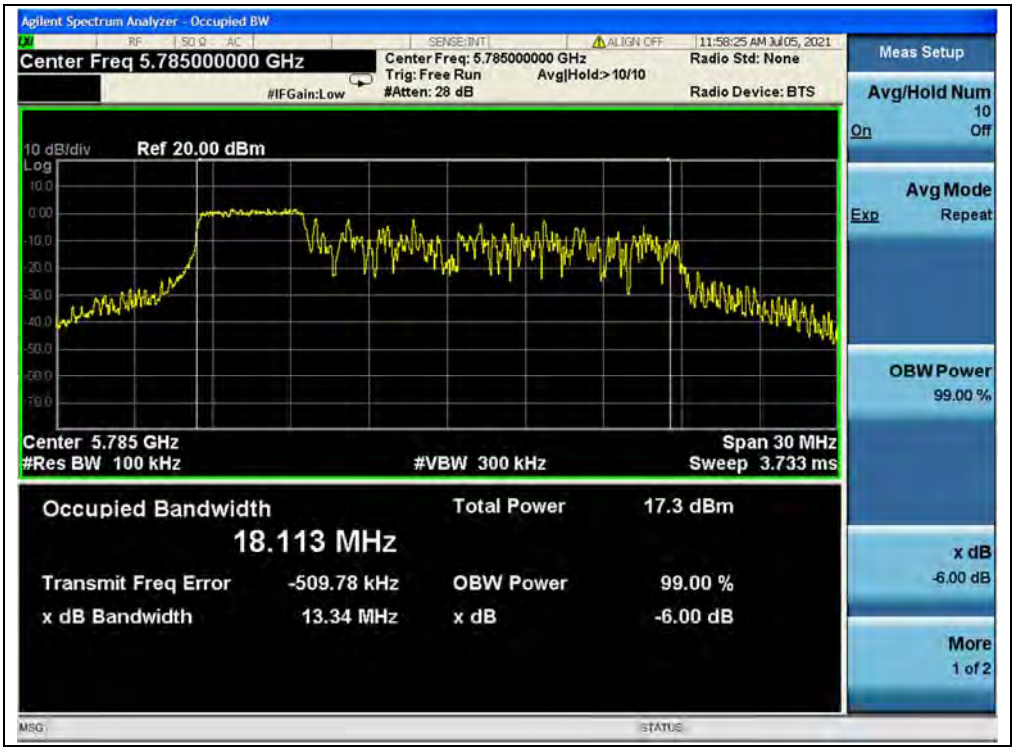
(Channel 36, 5180MHz, 802.11ax (HEW20) RU52)

(Channel 44, 5220MHz, 802.11ax (HEW20) RU52)

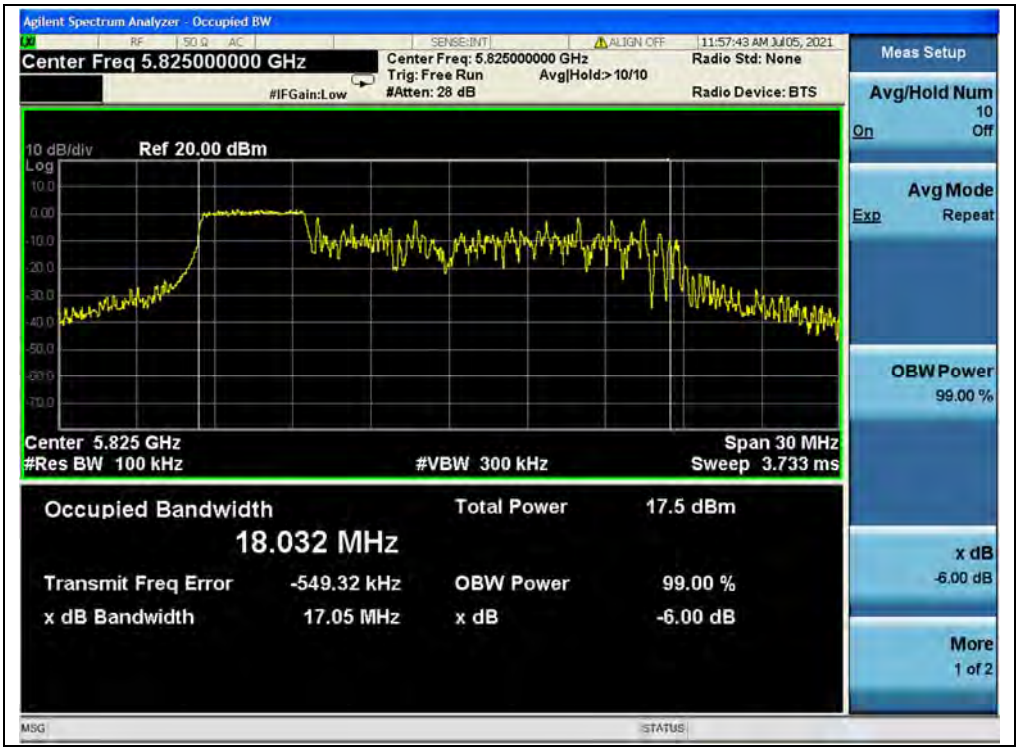
(Channel 48, 5240MHz, 802.11ax (HEW20) RU52)



(Channel 149, 5745MHz, 802.11ax (HEW20) RU52)



(Channel 157, 5785MHz, 802.11ax (HEW20) RU52)



(Channel 165, 5825MHz, 802.11ax (HEW20) RU52)

802.11ax (HEW20) RU106 Mode

A.Test Verdict:

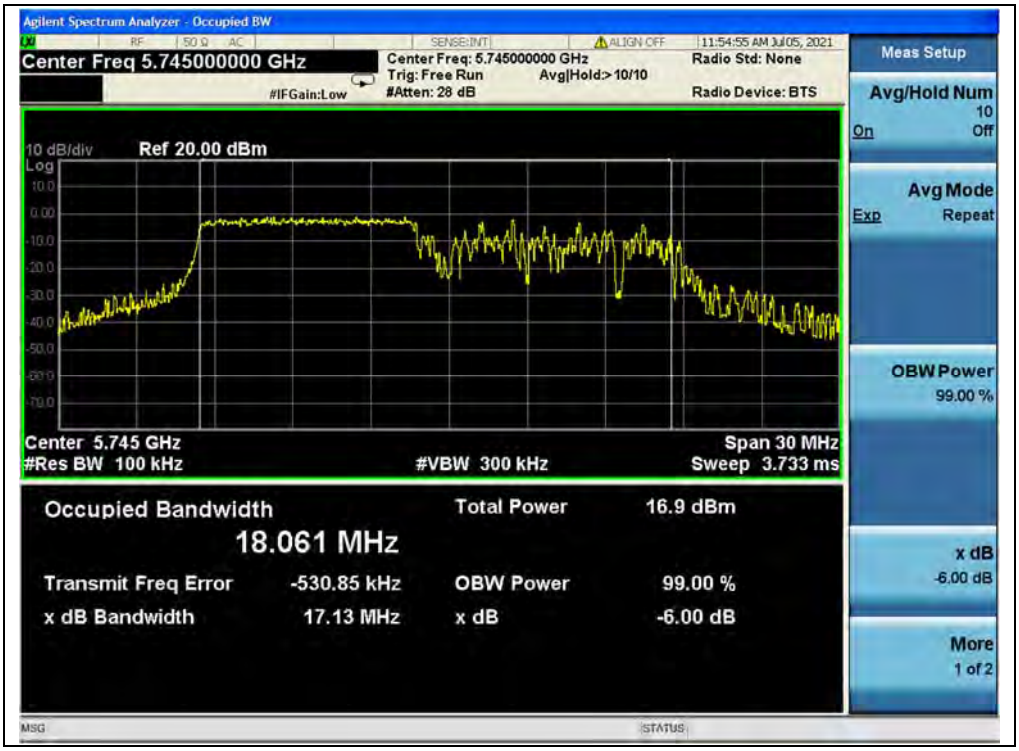
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	22.45
44	5220	22.67
48	5240	22.53
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
149	5745	17.13
157	5785	17.12
165	5825	17.14

B.Test Plot:

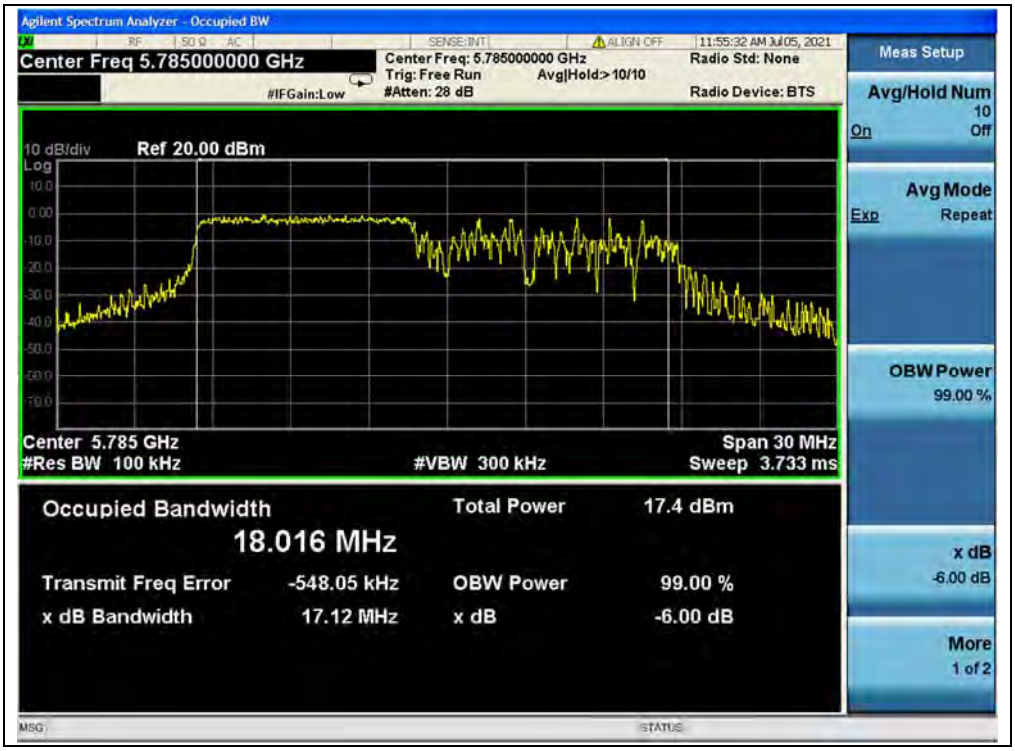
(Channel 36, 5180MHz, 802.11ax (HEW20) RU106)

(Channel 44, 5220MHz, 802.11ax (HEW20) RU106)

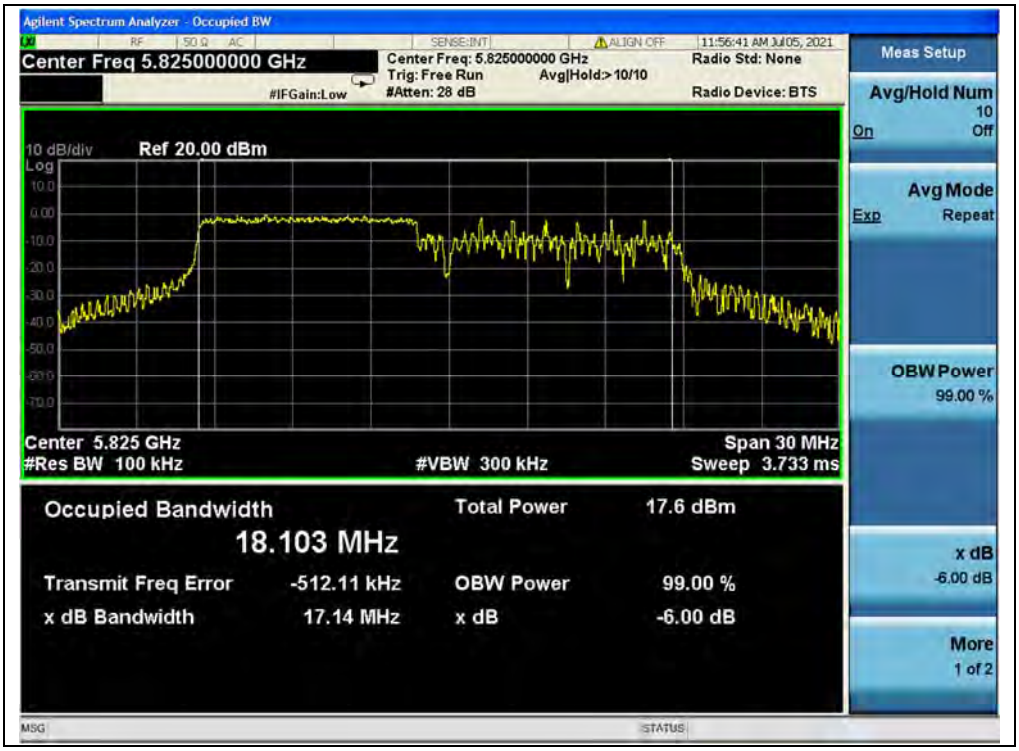
(Channel 48, 5240MHz, 802.11ax (HEW20) RU106)



(Channel 149, 5745MHz, 802.11ax (HEW20) RU106)



(Channel 157, 5785MHz, 802.11ax (HEW20) RU106)



(Channel 165, 5825MHz, 802.11ax (HEW20) RU106)

802.11ax (HEW40) Mode

A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
38	5190	39.64
46	5230	39.88
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
151	5755	37.95
159	5795	36.84

B.Test Plot:

(Channel 38, 5190MHz, 802.11ax (HEW40))

(Channel 46, 5230MHz, 802.11ax (HEW40))

(Channel 151, 5755MHz, 802.11ax (HEW40))

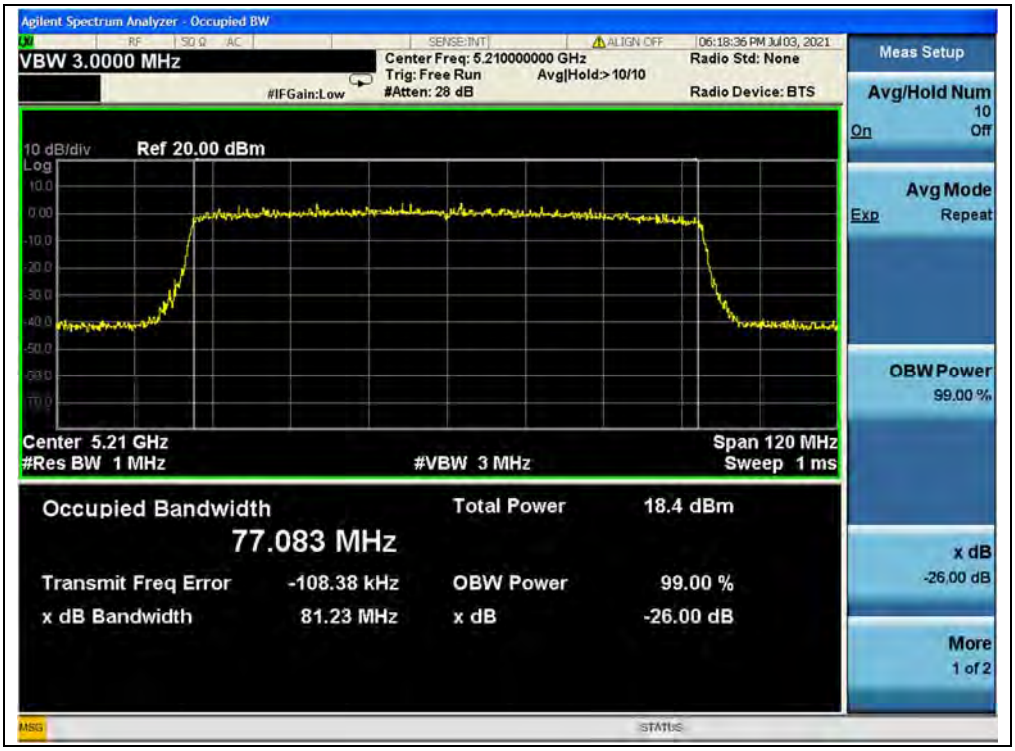
(Channel 159, 5795MHz, 802.11ax (HEW40))

802.11ax (HEW80) Mode

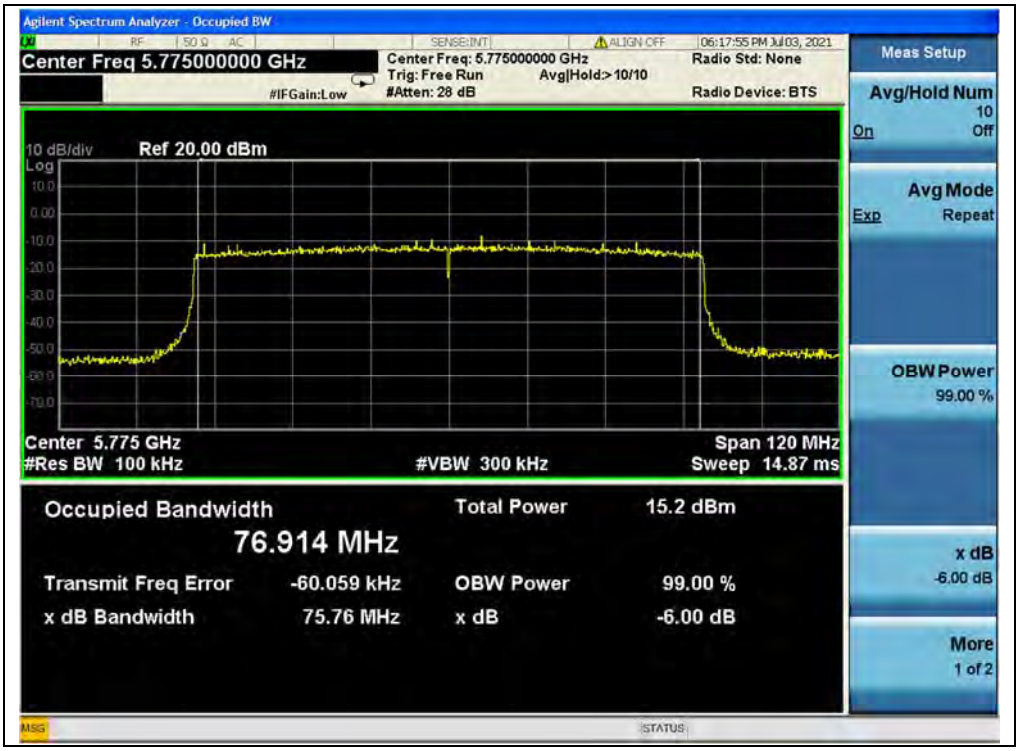
A.Test Verdict:

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
42	5210	81.23
Channel	**Frequency (MHz)**	**6 dB Bandwidth (MHz)**
155	5775	75.76

B.Test Plot:



(Channel 42, 5210MHz, 802.11ax (HEW80))



(Channel 155, 5775MHz, 802.11ax (HEW80))

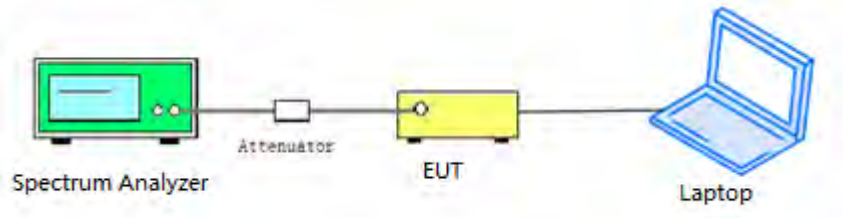
2.5. Peak Power Spectral Density

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 KDB662911D01Measure-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} +10log(N_{ANT}) dBi, where G_{ANT} is the antenna gain in dBi, N_{ANT} is the number of outputs.

2.5.2. Test Description

Test Setup:



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

2.5.3. Test Procedure

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

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

2.5.4. Test Result

802.11a Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Corrected PPSD (dBm/MHz)		Limit (dBm/MHz)	Verdict
	ANT0	ANT1		ANT0	ANT1		
5180	0.94	0.38	0.03	0.97	0.41	11	PASS
5220	1.09	0.28		1.12	0.31		
5240	0.81	0.15		0.84	0.18		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)		Limit (dBm/500KHz)	Verdict
	ANT0	ANT1		ANT0	ANT1		
5745	-2.14	-1.89	0.03	-2.11	-1.86	30	PASS
5785	-1.93	-1.87		-1.9	-1.84		
5825	-1.93	-1.88		-1.9	-1.85		

B.Test Plot:

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

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

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

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

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

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

802.11n (HT20) Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5180	0.73	0.12	0.00	3.45	11	PASS
5220	0.78	0.03		3.43		
5240	0.53	-0.25		3.17		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5745	-2.59	-2.29	0.00	0.57	30	PASS
5785	-2.21	-1.82		1.00		
5825	-2.54	-1.78		0.87		
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

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

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

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

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

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

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

802.11ac (VHT20) Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5180	0.76	0.12	0.00	3.46	11	PASS
5220	0.93	-0.04		3.48		
5240	0.70	-0.25		3.26		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5745	-2.37	-2.12	0.00	0.77	30	PASS
5785	-2.18	-2.35		0.75		
5825	-2.13	-2.15		0.87		
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

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

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

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

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

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

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

802.11ac (VHT40) Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5190	-2.00	-2.45	0.00	0.79	11	PASS
5230	-2.15	-2.71		0.59		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5755	-5.38	-5.06	0.00	-2.21	30	PASS
5795	-5.07	-4.93		-1.99		
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

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

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

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

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

802.11ac (VHT80) Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5210	-5.20	-5.76	0.00	-2.46	11	PASS
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5775	-8.39	-8.48	0.00	-5.42	30	PASS
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

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

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

802.11ax (HEW20) Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5180	0.57	0.09	0.00	3.35	11	PASS
5220	0.73	-0.03		3.38		
5240	0.49	-0.16		3.19		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5745	-2.70	-2.59	0.00	0.37	30	PASS
5785	-2.09	-2.45		0.74		
5825	-2.59	-2.20		0.62		
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

(Channel 36, 5180MHz, 802.11ax (HEW20), ANT0)

(Channel 44, 5220MHz, 802.11ax (HEW20), ANT0)

(Channel 48, 5240MHz, 802.11ax (HEW20), ANT0)

(Channel 149, 5745MHz, 802.11ax (HEW20), ANT0)

(Channel 157, 5785MHz, 802.11ax (HEW20), ANT0)

(Channel 165, 5825MHz, 802.11ax (HEW20), ANT0)

802.11ax (HEW20) RU26 Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5180	7.72	7.00	0.00	10.39	11	PASS
5220	7.74	7.18		10.48		
5240	7.76	7.34		10.57		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5745	3.98	4.33	0.00	7.17	30	PASS
5785	3.82	3.77		6.81		
5825	3.80	3.90		6.86		
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

(Channel 36, 5180MHz, 802.11ax (HEW20) RU26, ANT0)

(Channel 44, 5220MHz, 802.11ax (HEW20) RU26, ANT0)

(Channel 48, 5240MHz, 802.11ax (HEW20) RU26, ANT0)

(Channel 149, 5745MHz, 802.11ax (HEW20) RU26, ANT0)

(Channel 157, 5785MHz, 802.11ax (HEW20) RU26, ANT0)

(Channel 165, 5825MHz, 802.11ax (HEW20) RU26, ANT0)

802.11ax (HEW20) RU52 Mode

A.Test Verdict:

Frequency (MHz)	Measured PPSD (dBm/MHz)		Duty Factor	Total PPSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
	ANT0	ANT1				
5180	6.50	6.87	0.00	9.70	11	PASS
5220	6.82	6.56		9.70		
5240	6.74	6.51		9.64		
Frequency (MHz)	Measured PPSD (dBm/500KHz)		Duty Factor	Total PPSD (dBm/500KHz)	Limit (dBm/500KHz)	Verdict
	ANT0	ANT1				
5745	2.38	4.21	0.00	6.40	30	PASS
5785	2.90	4.28		6.65		
5825	2.95	4.24		6.65		
Note: Directional gain = 1.90dBi +10log(2) = 4.91dBi＜6dBi, so the limit shall be 11 dBm/MHz for 5.18-5.24 GHz band and 30 dBm/500KHz for 5.745-5.825 GHz band.						

B.Test Plot:

(Channel 36, 5180MHz, 802.11ax (HEW20) RU52, ANT0)

(Channel 44, 5220MHz, 802.11ax (HEW20) RU52, ANT0)

(Channel 48, 5240MHz, 802.11ax (HEW20) RU52, ANT0)

(Channel 149, 5745MHz, 802.11ax (HEW20) RU52, ANT0)

(Channel 157, 5785MHz, 802.11ax (HEW20) RU52, ANT0)