

FCC Test Report

Report No.: AGC10849211001FE06

FCC ID : VTJ-M2
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : Brama S-A1
BRAND NAME : SoloProtect
MODEL NAME : M2
APPLICANT : SoloProtect Limited
DATE OF ISSUE : Nov. 11, 2021
STANDARD(S) : FCC Part 15.407
TEST PROCEDURE(S) : KDB 789033 D02 v02r01
REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Nov. 11, 2021	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	SoloProtect Limited
Address	Suzy Lamplugh House, Vantage Drive, Sheffield, United Kingdom, S9 1RG
Manufacturer	Shenzhen Unicair Communication Technology Co., Ltd.
Address	8-9/F, Block1, Wutong Island, Shunchang Rd., Xixiang, Bao'an District, Shenzhen China.
Factory	Dongguan Unicair Communication Technology Co., Ltd.
Address	49 Yinhu Road, Qiaotou Town, Dongguan City, Guangdong Province, China
Product Designation	Brama S-A1
Brand Name	SoloProtect
Test Model	M2
Date of test	Oct. 14, 2021~Nov. 11, 2021
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BGN/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with requirement of FCC Part 15 Rules requirement.

Prepared By



Eder Zhan
(Project Engineer)

Nov. 11, 2021

Reviewed By



Calvin Liu
(Reviewer)

Nov. 11, 2021

Approved By



Max Zhang
Authorized Officer

Nov. 11, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as “Brama S-A1”. It is designed by way of utilizing the OFDM technology to achieve the system operation.

A major technical description of EUT is described as following

Equipment Type	☐ Outdoor access points ☐ Fixed P2P access points	☐ Indoor access points ☒ Client devices
Operation Frequency	☒ U-NII 1:5150MHz~5250MHz ☐ U-NII 2C:5470MHz~5725MHz	☐ U-NII 2A: 5250MHz~5350MHz ☒ U-NII 3: 5725MHz~5850MHz
DFS Design Type	☐ Master ☐ Slave with radar detection	☒ Slave without radar detection
TPC Function	☐ Yes ☒ No	
Test Frequency Range:	For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5775MHz	
Output Power	IEEE 802.11a:16.42dBm; IEEE 802.11n-HT20:15.28dBm; IEEE 802.11n-HT40:15.27dBm; IEEE 802.11ac-VHT20:14.47dBm; IEEE 802.11ac-VHT40:12.46dBm; IEEE 802.11ac-VHT80:11.99dBm	
Modulation	BPSK, QPSK, 16QAM, 64QAM, 128QAM, 256QAM, OFDM	
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.6Mbps	
Number of channels	7 channels of U-NII-1 Band 8 channels of U-NII-3 Band	
Hardware Version	GBE Brama S v2_main_RevA	
Software Version	S-A1.D02.20211008	
Antenna Designation	PIFA Antenna (Comply with requirements of the FCC part 15.203)	
Antenna Gain	2.0dBi	
Power Supply	DC 3.85V by battery	

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2.2. TABLE OF CARRIER FREQUENCIES

For 5180~5240MHz:

4 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
42	5210 MHz	--	--

For 5745~5825MHz:

5 channels are provided for 802.11a, 802.11n (HT20), 802.11ac (VHT20):

Channel	Frequency	Channel	Frequency
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz	--	--

2 channels are provided for 802.11n (HT40), 802.11ac (VHT40):

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac (VHT80):

Channel	Frequency	Channel	Frequency
155	5775 MHz	--	--

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2.3. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: VTJ-M2** filing to comply with the FCC Part 15 requirements.

2.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013).

Radiated testing was performed at an antenna to EUT distance 3 meters.

Others testing (listed at item 5.3) was performed according to the procedures in FCC Part 15.407 rules KDB 789033 D02

2.5. SPECIAL ACCESSORIES

Refer to section 5.2.

2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 3.1 \text{ dB}$
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 4.0 \text{ dB}$
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.8 \text{ dB}$
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$
Uncertainty of spurious emissions, conducted	$U_c = \pm 2 \%$
Uncertainty of Occupied Channel Bandwidth	$U_c = \pm 2 \%$

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4. DESCRIPTION OF TEST MODES

Mode	Available channel	Tested channel	Modulation	Date rate (Mbps)
802.11a/n/ac20	36,40,44,48, 149,153,157,161,165	36,40,48, 149,157,165	OFDM	6Mbps/MCS0
802.11n/ac40	38,46,151,159	38,46, 151,159	OFDM	MCS0
802.11ac80	42, 155	42, 155	OFDM	MCS0

Note:

1. The EUT has been set to operate continuously on tested channel individually, and the EUT is operating at its maximum duty cycle>or equal 98%.
2. All modes under which configure applicable have been tested and the worst mode test data recording in the test report, if no other mode data.
3. The test software is through engineering commands, EUT can be set to a separate test mode.

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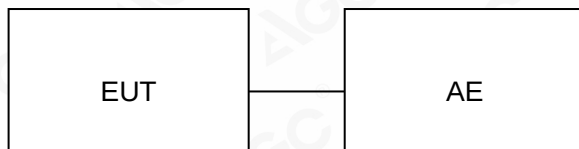
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5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Configure 1:



5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Brama S-A1	M2	VTJ-M2	EUT
2	Battery	Brama S v2	DC 3.85V 1070mAh	AE

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.407	6dB Bandwidth	Compliant
§15.407	Emission Bandwidth	Compliant
§15.407	Maximum conducted output power	Compliant
§15.407	Conducted Spurious Emission	Compliant
§15.407	Maximum Conducted Output Power Density	Compliant
§15.209	Radiated Emission	Compliant
§15.407	Band Edges	Compliant
§15.207	Line Conduction Emission	Compliant

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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 11, 2021	May 10, 2022
LISN	R&S	ESH2-Z5	100086	Jun. 09, 2021	Jun. 08, 2022
Test software	R&S	ES-K1 (Ver V1.71)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Apr. 14, 2021	Apr. 13, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec. 06, 2021
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 19, 2021	Sep. 18, 2023
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	Apr. 23, 2021	Apr. 22, 2023
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 08, 2021	Jan. 07, 2023
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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7. MAXIMUM CONDUCTED OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

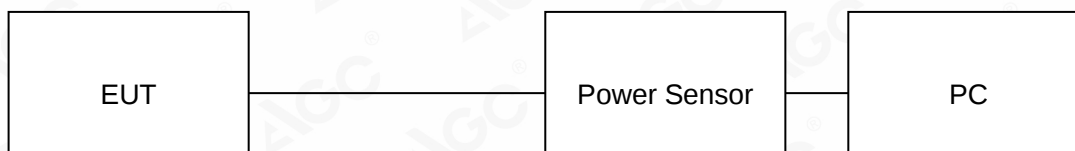
For average power test:

1. Connect EUT RF output port to power sensor through an RF attenuator.
2. Connect the power sensor to the PC.
3. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
4. Record the maximum power from the software.

Note : The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

7.2. TEST SET-UP

AVERAGE POWER SETUP



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7.3. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power for band 5.15-5.25 GHz				
Test Mode	Test Channel (MHz)	Average Power (dBm)	Limits (dBm)	Pass or Fail
802.11a	5180	14.82	23.98	Pass
	5200	14.60	23.98	Pass
	5240	13.02	23.98	Pass
802.11n20	5180	14.49	23.98	Pass
	5200	13.63	23.98	Pass
	5240	13.09	23.98	Pass
802.11n40	5190	13.15	23.98	Pass
	5230	12.77	23.98	Pass
802.11ac20	5180	12.72	23.98	Pass
	5200	11.98	23.98	Pass
	5240	11.45	23.98	Pass
802.11ac40	5190	11.48	23.98	Pass
	5230	11.09	23.98	Pass
802.11ac80	5210	11.76	23.98	Pass

Test Data of Conducted Output Power for band 5.725-5.85 GHz				
Test Mode	Test Channel (MHz)	Average Power (dBm)	Limits (dBm)	Pass or Fail
802.11a	5745	16.42	23.98	Pass
	5785	15.28	23.98	Pass
	5825	14.41	23.98	Pass
802.11n20	5745	15.28	23.98	Pass
	5785	14.43	23.98	Pass
	5825	13.50	23.98	Pass
802.11n40	5755	15.27	23.98	Pass
	5795	14.93	23.98	Pass
802.11ac20	5745	14.47	23.98	Pass
	5785	13.54	23.98	Pass
	5825	12.76	23.98	Pass
802.11ac40	5755	12.46	23.98	Pass
	5795	12.31	23.98	Pass
802.11ac80	5775	11.99	23.98	Pass

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8. BANDWIDTH

8.1. MEASUREMENT PROCEDURE

-6dB bandwidth (DTS bandwidth):

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on operation frequency individually.
3. Set RBW = 100kHz.
4. Set the VBW $\geq 3 \times$ RBW. Detector = Peak. Trace mode = max hold.
5. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.

99% occupied bandwidth:

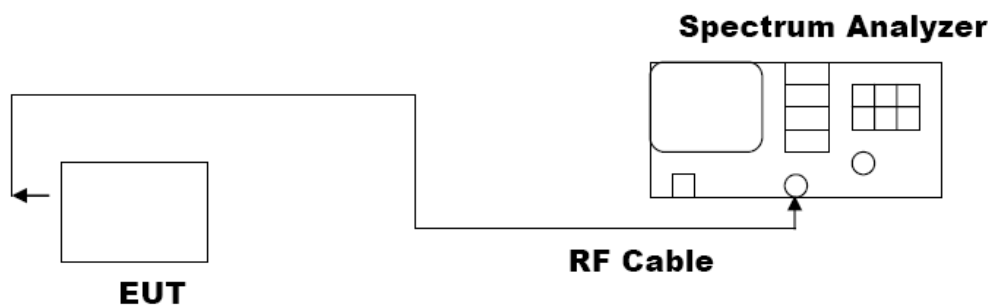
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 1.5 to 5 times the OBW, centered on a nominal channel
The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

-26dB Bandwidth:

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW $>$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the maximum 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%.

Note: The EUT was tested according to KDB 789033 for compliance to FCC 47CFR 15.407 requirements.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



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8.3. LIMITS AND MEASUREMENT RESULTS

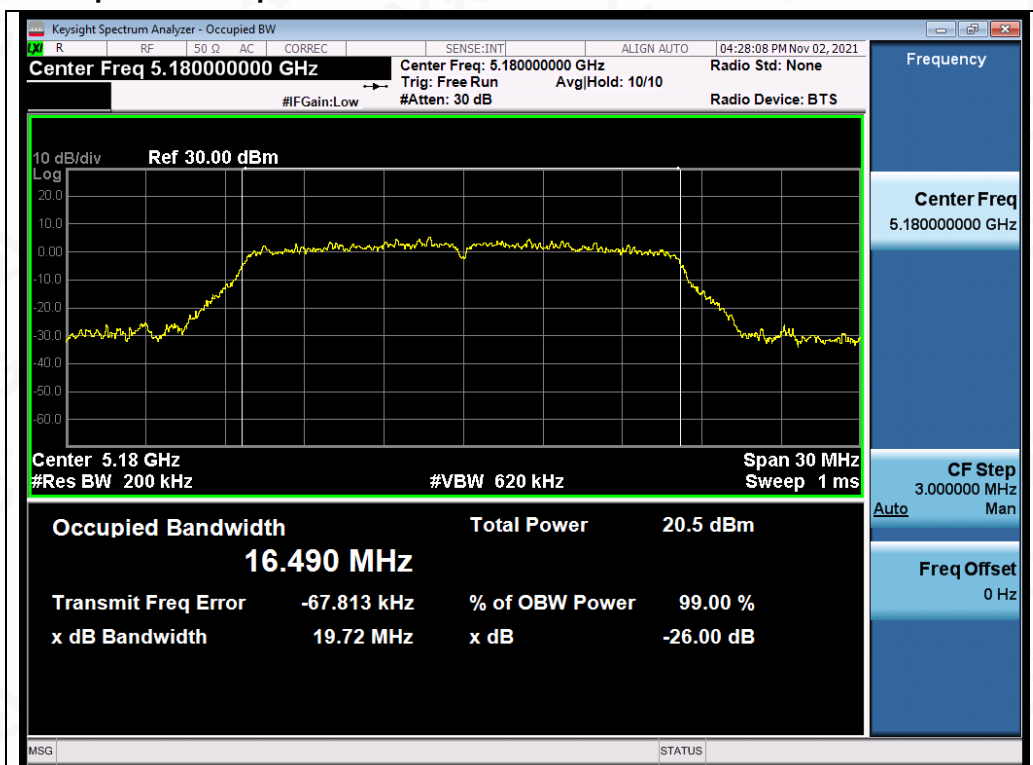
Test Data of Occupied Bandwidth and -26dB Bandwidth for band 5.15-5.25 GHz					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-26dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11a	5180	16.490	19.722	N/A	Pass
	5200	16.752	25.914	N/A	Pass
	5240	16.534	20.297	N/A	Pass
802.11n20	5180	17.537	19.793	N/A	Pass
	5200	17.539	19.806	N/A	Pass
	5240	17.560	20.047	N/A	Pass
802.11n40	5190	35.977	39.625	N/A	Pass
	5230	36.035	39.419	N/A	Pass
802.11ac20	5180	17.525	19.881	N/A	Pass
	5200	17.523	19.717	N/A	Pass
	5240	17.544	19.739	N/A	Pass
802.11ac40	5190	36.115	40.275	N/A	Pass
	5230	36.142	40.163	N/A	Pass
802.11ac80	5210	75.703	80.391	N/A	Pass

Test Data of Occupied Bandwidth and DTS Bandwidth for band 5.725-5.85 GHz					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	DTS Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11a	5745	16.464	15.097	0.5	Pass
	5785	16.628	15.067	0.5	Pass
	5825	16.578	15.065	0.5	Pass
802.11n20	5745	17.521	16.103	0.5	Pass
	5785	17.530	16.574	0.5	Pass
	5825	17.524	16.030	0.5	Pass
802.11n40	5755	35.989	35.366	0.5	Pass
	5795	36.049	35.142	0.5	Pass
802.11ac20	5745	17.522	17.401	0.5	Pass
	5785	17.504	17.170	0.5	Pass
	5825	17.543	17.412	0.5	Pass
802.11ac40	5755	36.097	35.327	0.5	Pass
	5795	36.093	35.139	0.5	Pass
802.11ac80	5775	75.797	76.122	0.5	Pass

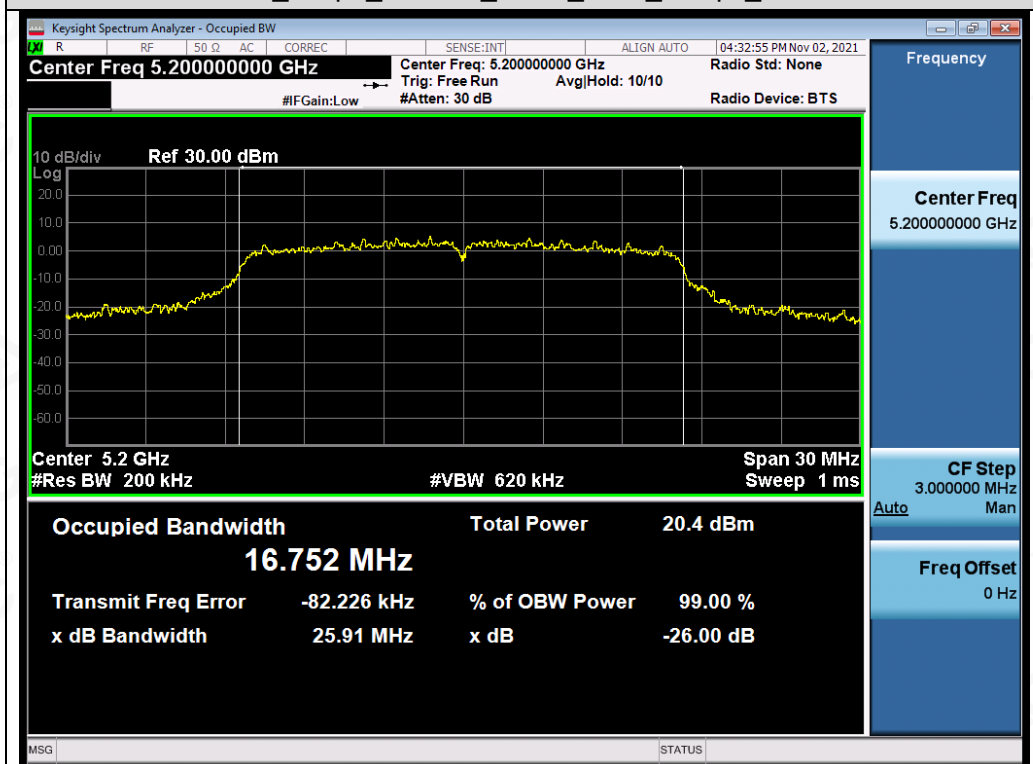
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Test Graphs of Occupied Bandwidth and -26dB Bandwidth for band 5.15-5.25 GHz



Test_Graph_802.11a_ANT1_5180_6Mbps_OBW

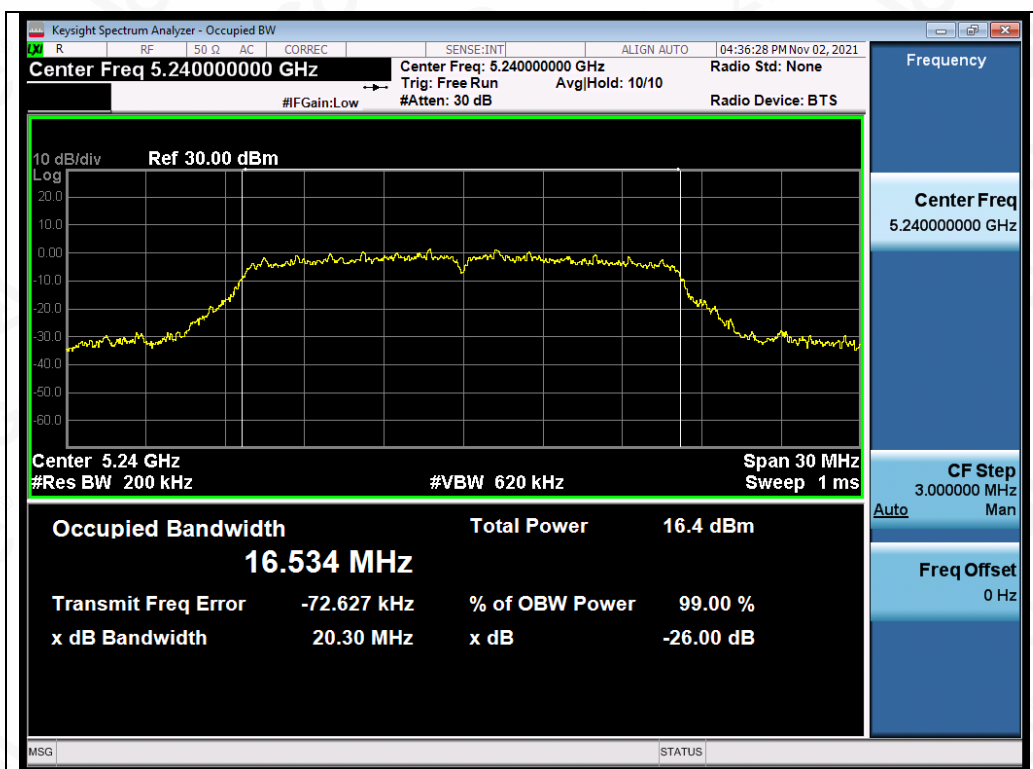


Test_Graph_802.11a_ANT1_5200_6Mbps_OBW

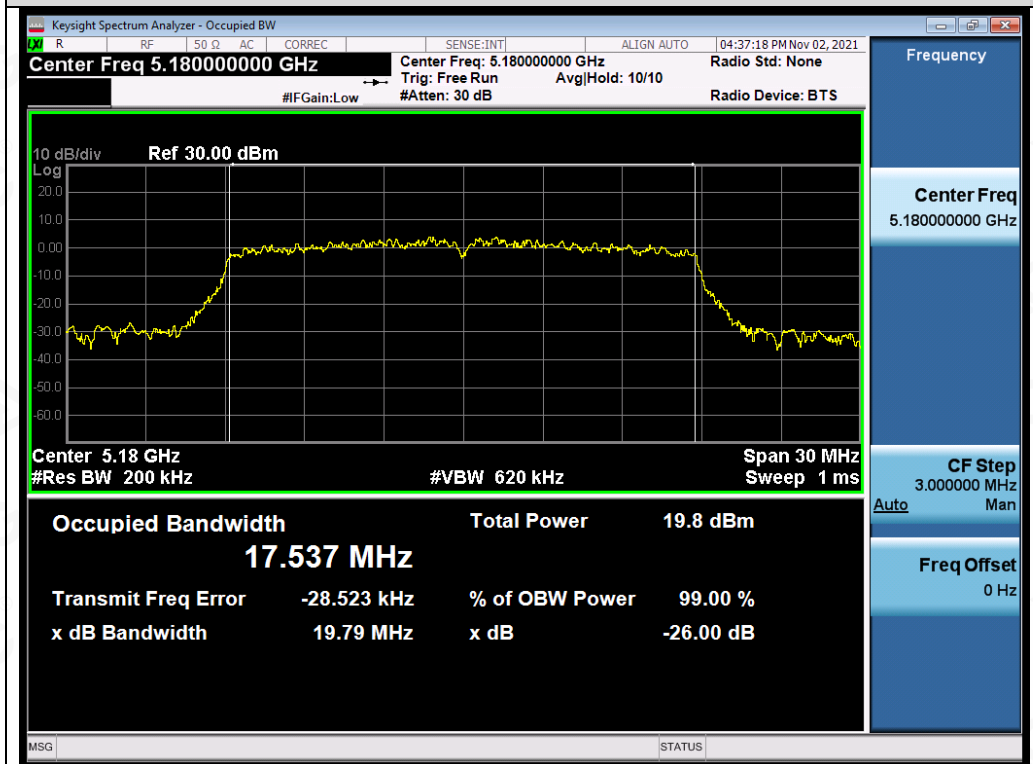
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Test_Graph_802.11a_ANT1_5240_6Mbps_OBW

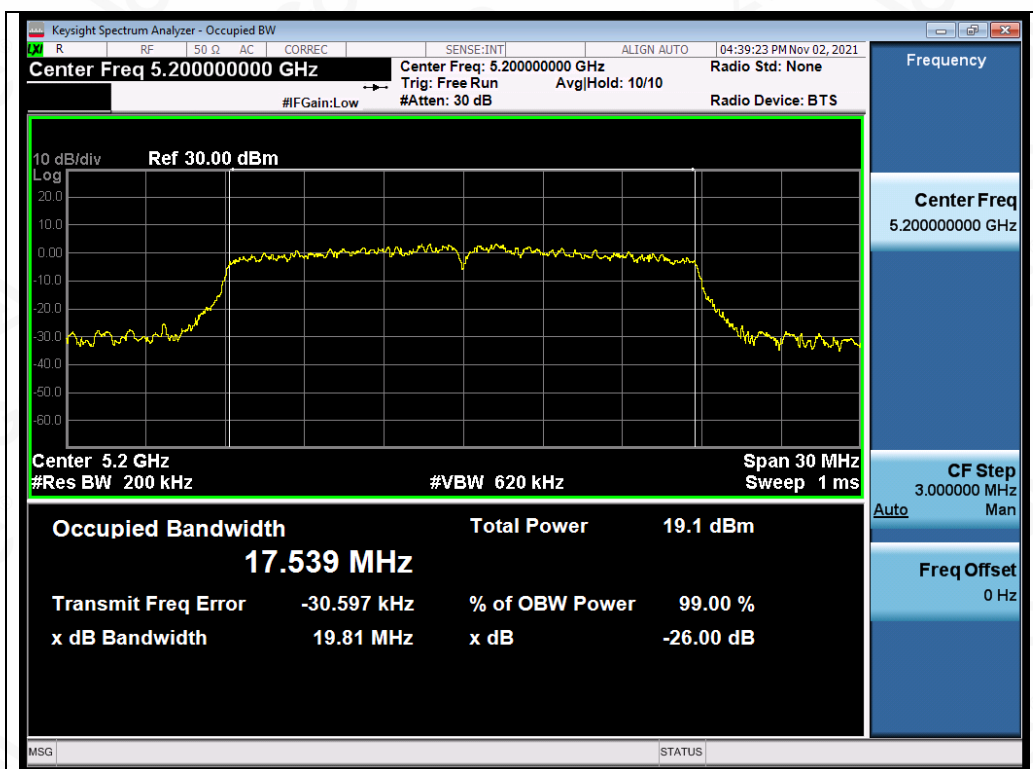


Test_Graph_802.11n20_ANT1_5180_MCS0_OBW

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Test_Graph_802.11n20_ANT1_5200_MCS0_OBW

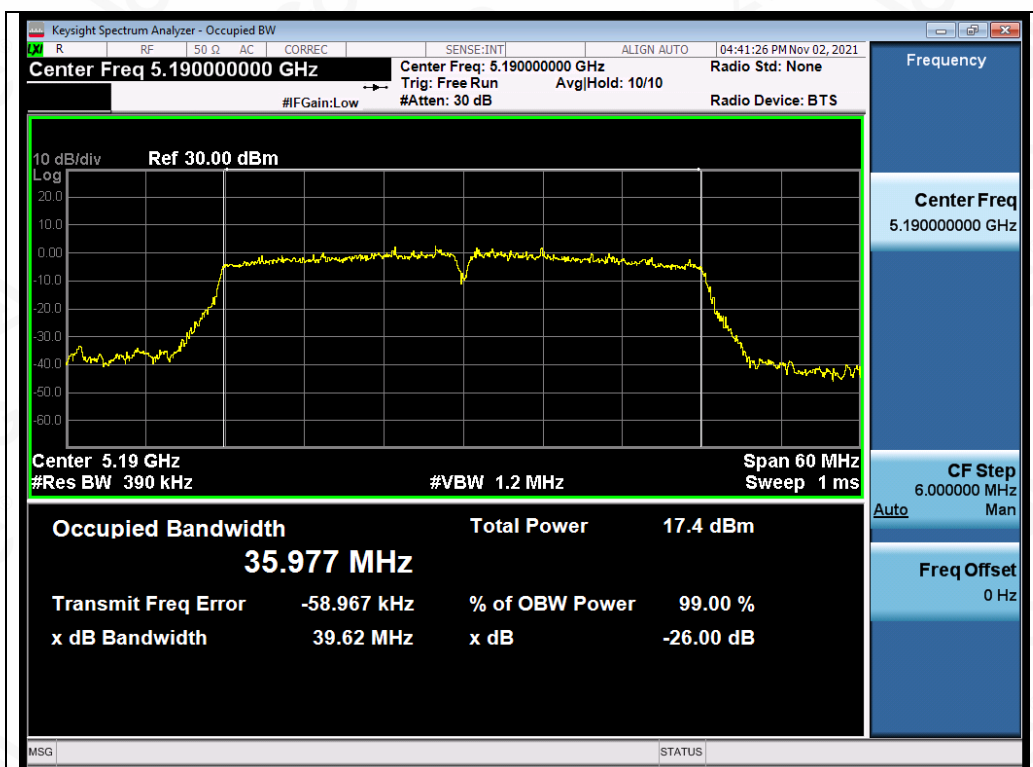


Test_Graph_802.11n20_ANT1_5240_MCS0_OBW

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Test_Graph_802.11n40_ANT1_5190_MCS0_OBW

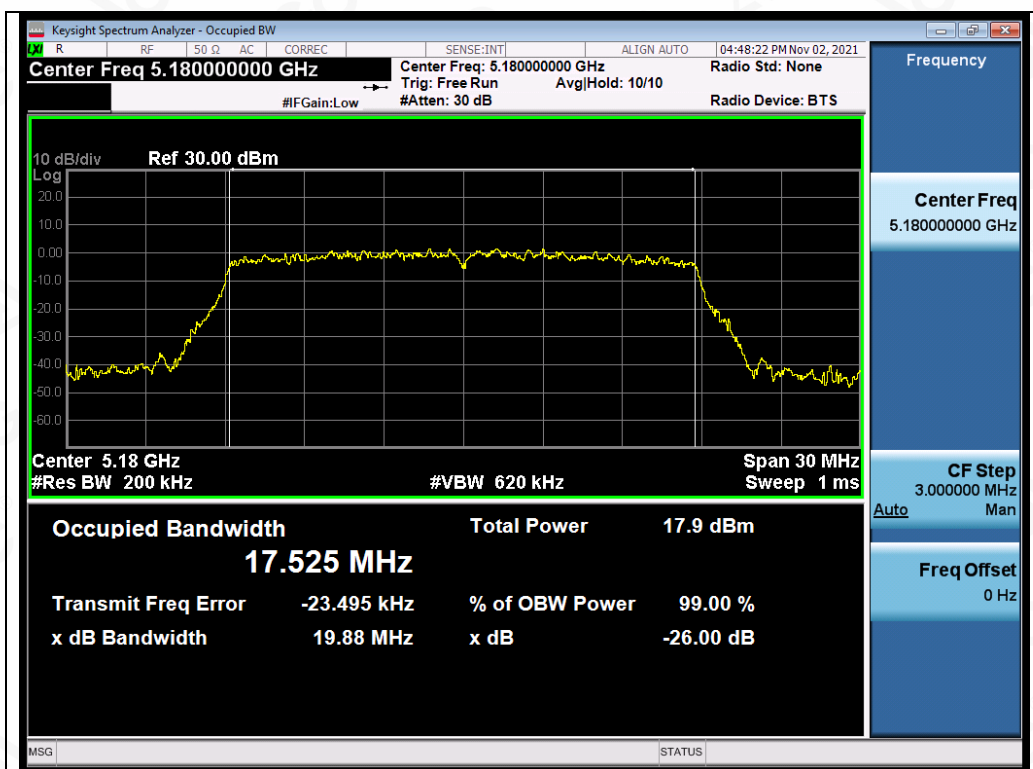


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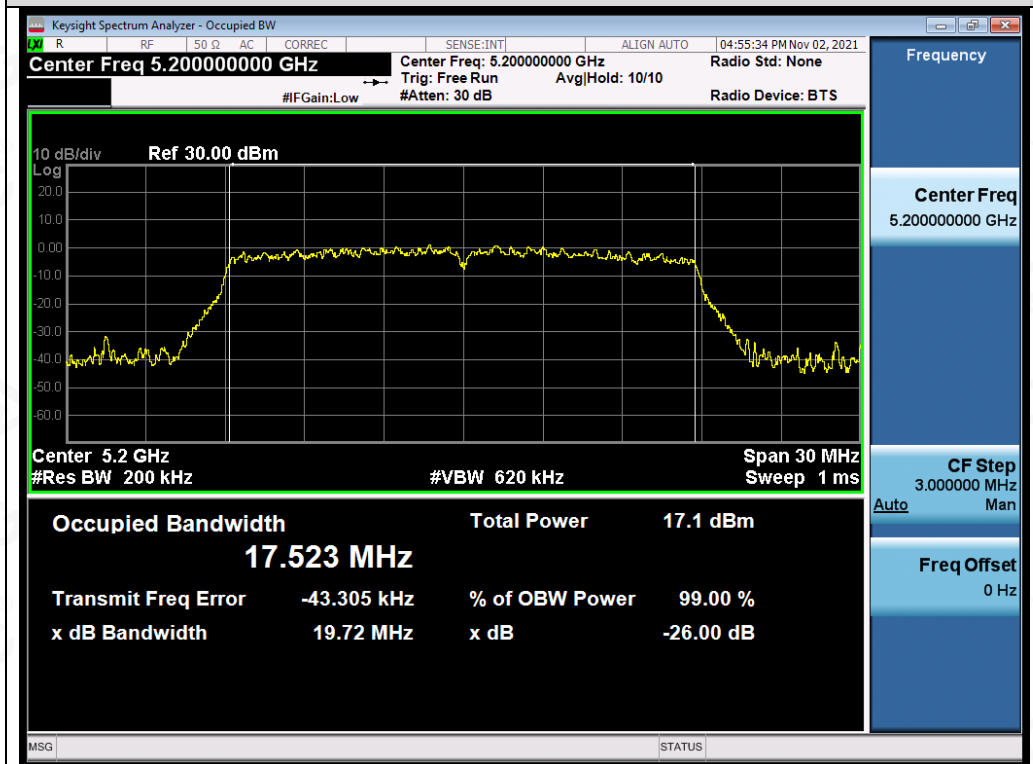
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Test_Graph_802.11ac20_ANT1_5180_MCS0_OBW

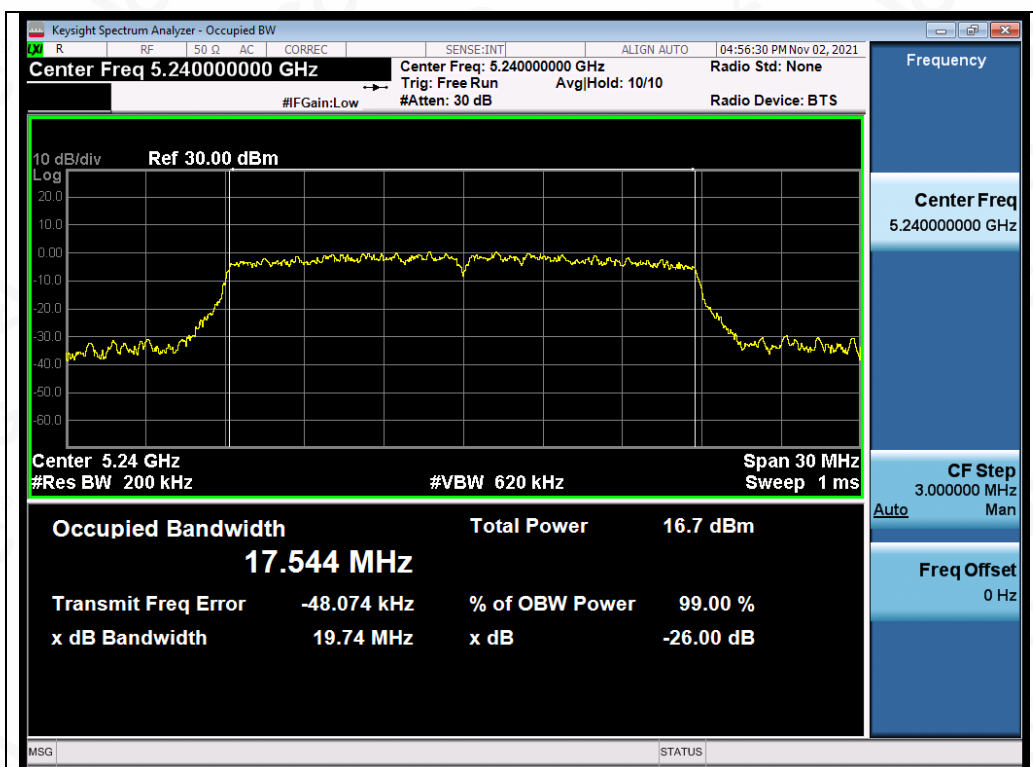


Test_Graph_802.11ac20_ANT1_5200_MCS0_OBW

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Test_Graph_802.11ac20_ANT1_5240_MCS9_OBW

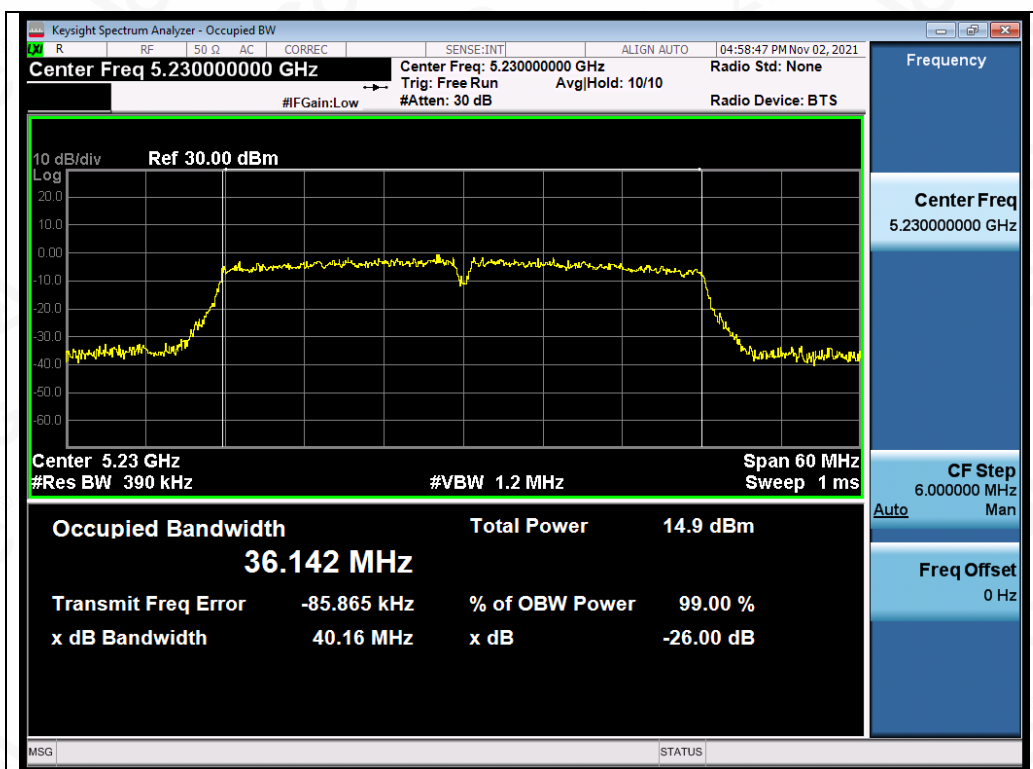


Test_Graph_802.11ac40_ANT1_5190_MCS9_OBW

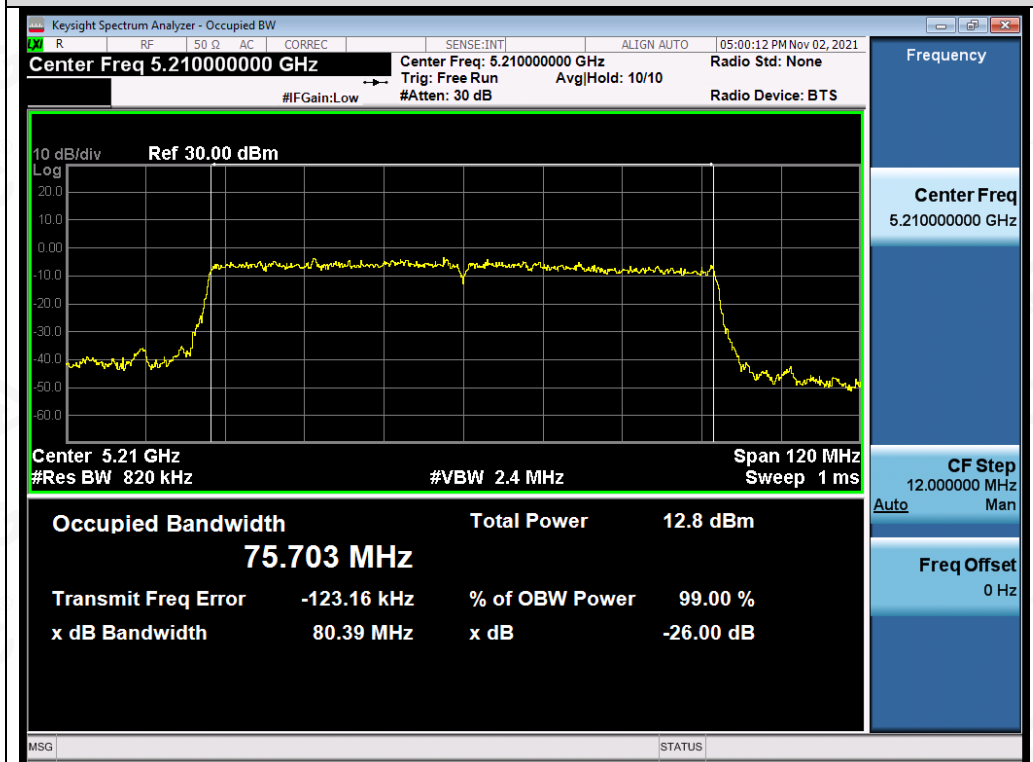
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Test_Graph_802.11ac40_ANT1_5230_MCS9_OBW



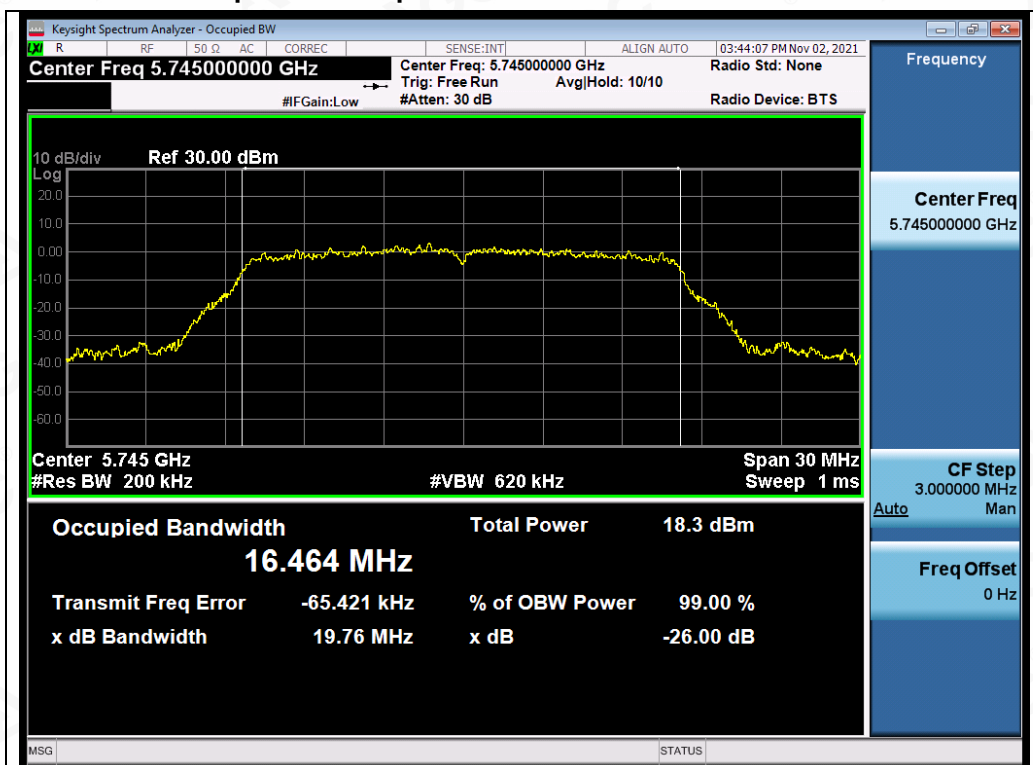
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Test Graphs of Occupied Bandwidth for band 5.725-5.85 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_OBW



Test_Graph_802.11a_ANT1_5785_6Mbps_OBW

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Test_Graph_802.11a_ANT1_5825_6Mbps_OBW



Test_Graph_802.11n20_ANT1_5745_MCS0_OBW

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Test_Graph_802.11n20_ANT1_5785_MCS0_OBW

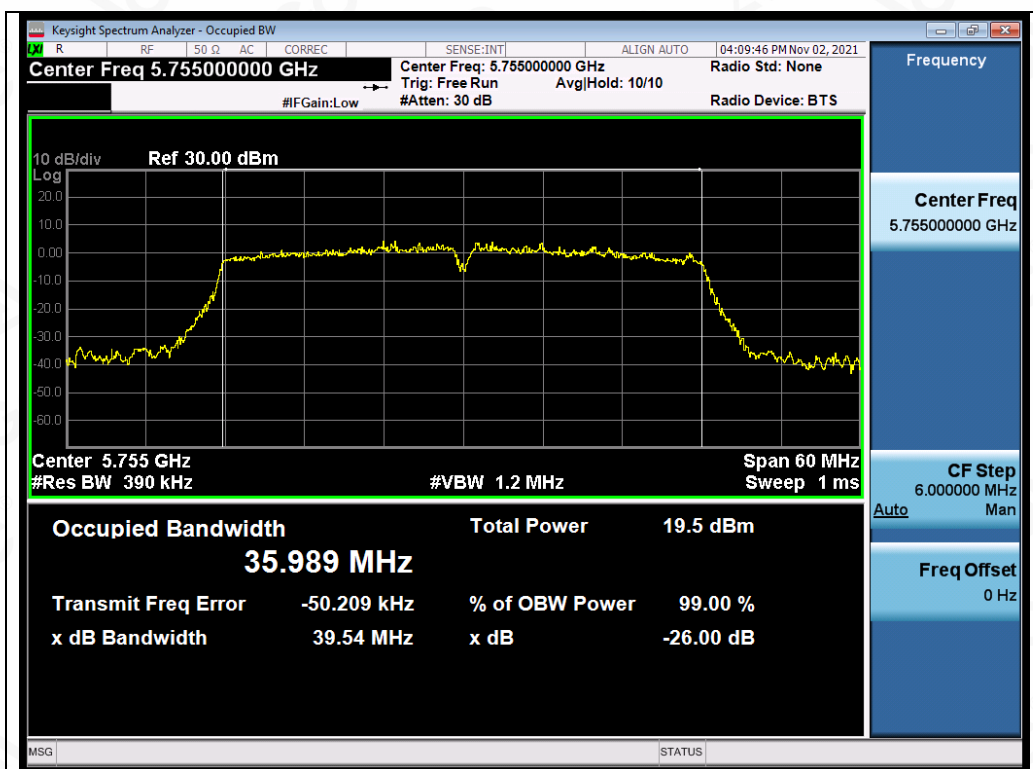


Test_Graph_802.11n20_ANT1_5825_MCS0_OBW

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Test_Graph_802.11n40_ANT1_5755_MCS0_OBW

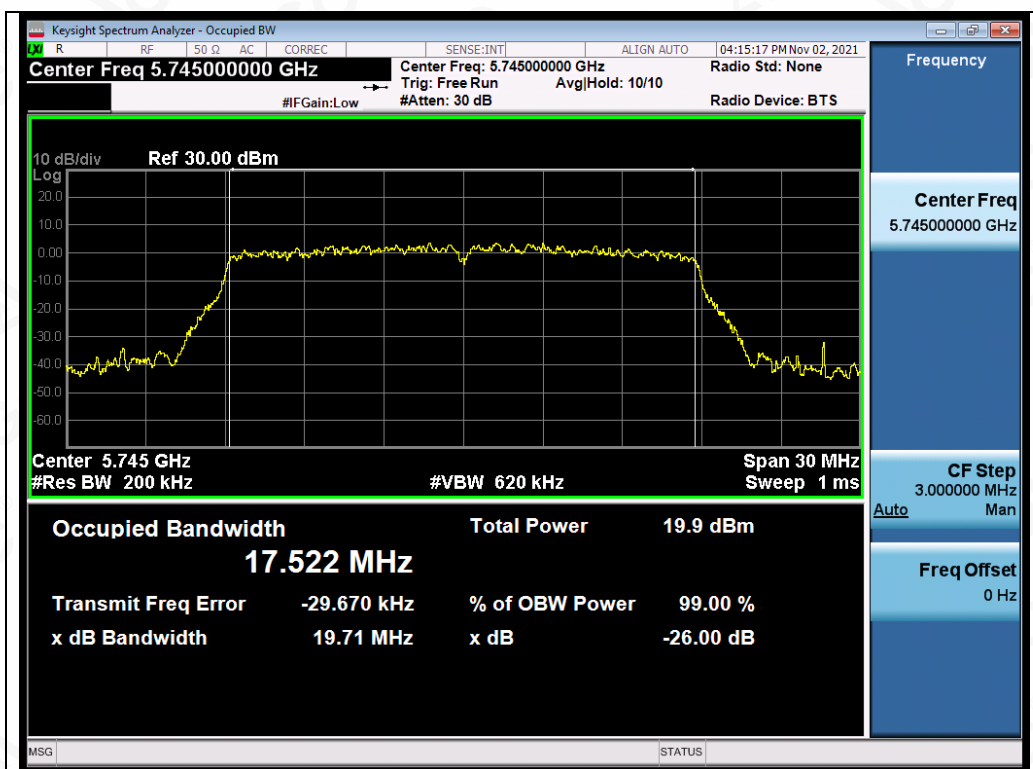


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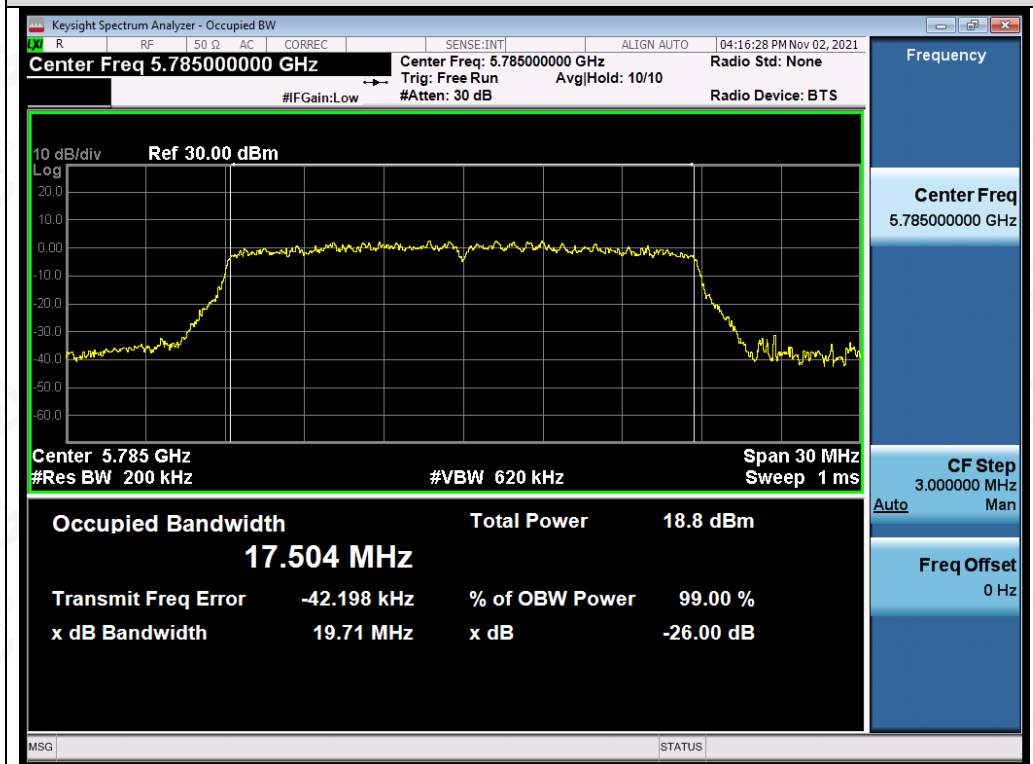
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Test_Graph_802.11ac20_ANT1_5745_MCS0_OBW

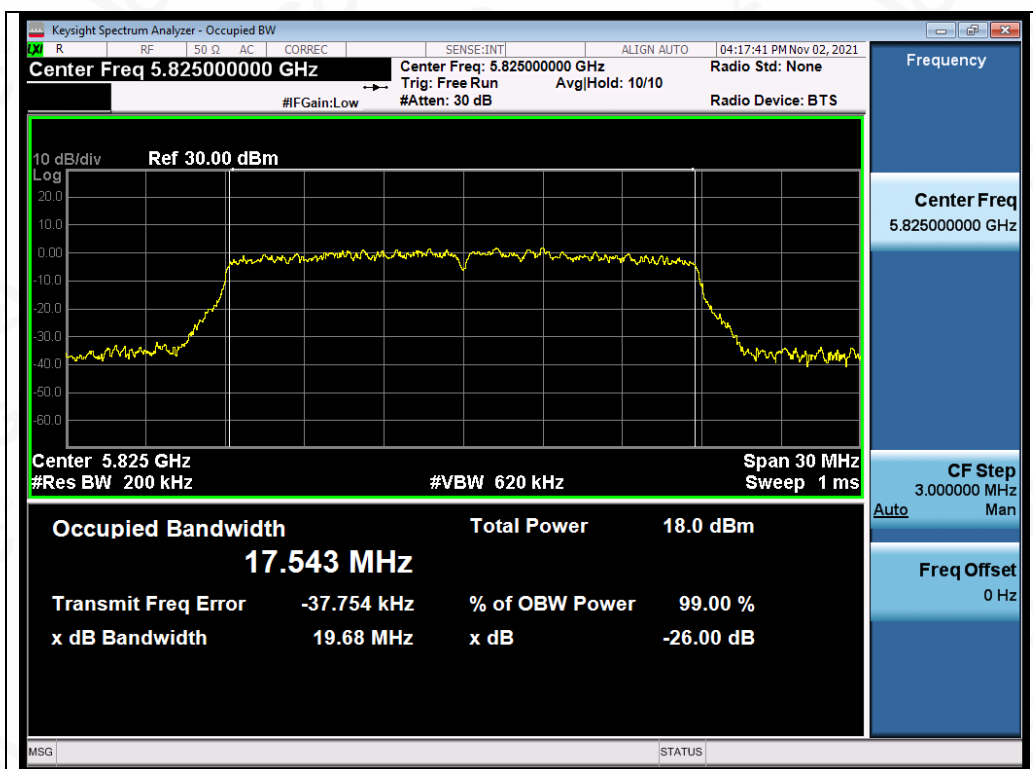


Test_Graph_802.11ac20_ANT1_5785_MCS0_OBW

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Test_Graph_802.11ac20_ANT1_5825_MCS9_OBW



Test_Graph_802.11ac40_ANT1_5755_MCS9_OBW

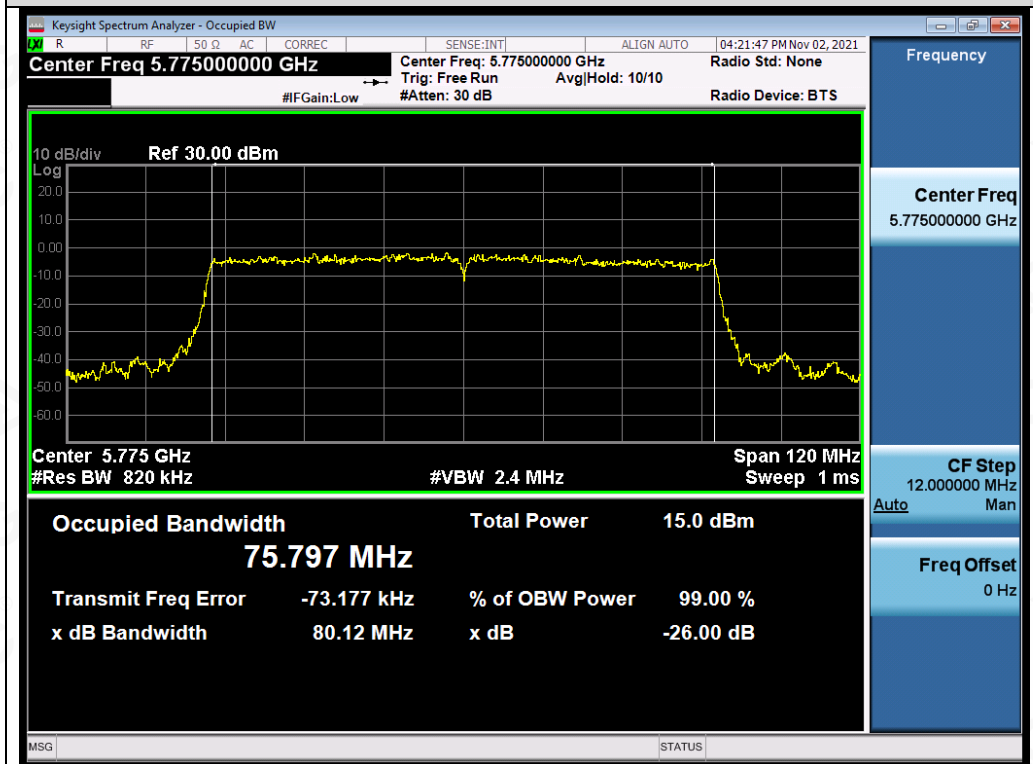
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Test_Graph_802.11ac40_ANT1_5795_MCS9_OBW



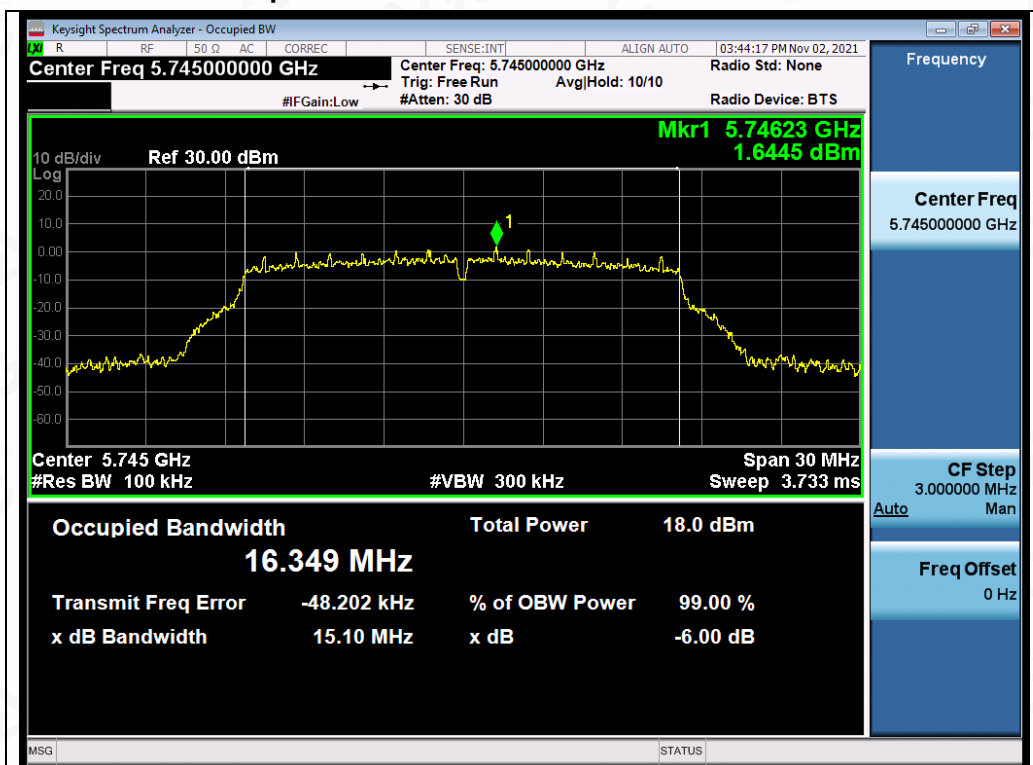
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Test Graphs of DTS Bandwidth for band 5.725-5.85 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_DTSBW



Test_Graph_802.11a_ANT1_5785_6Mbps_DTSBW

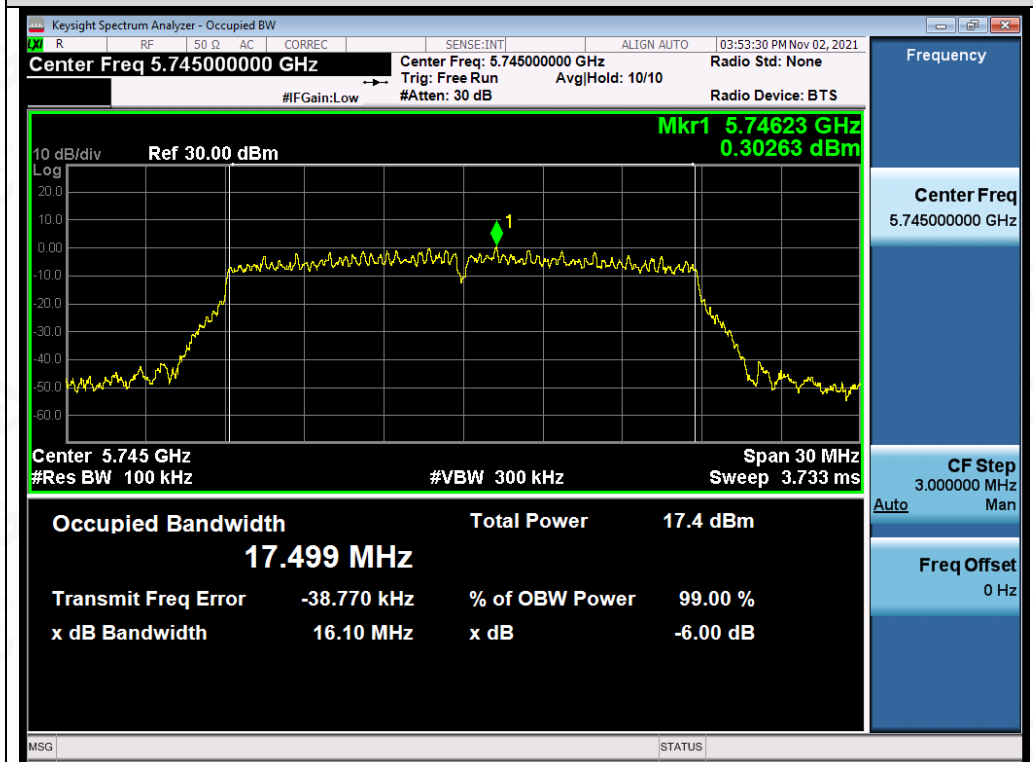
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Test_Graph_802.11a_ANT1_5825_6Mbps_DTSBW

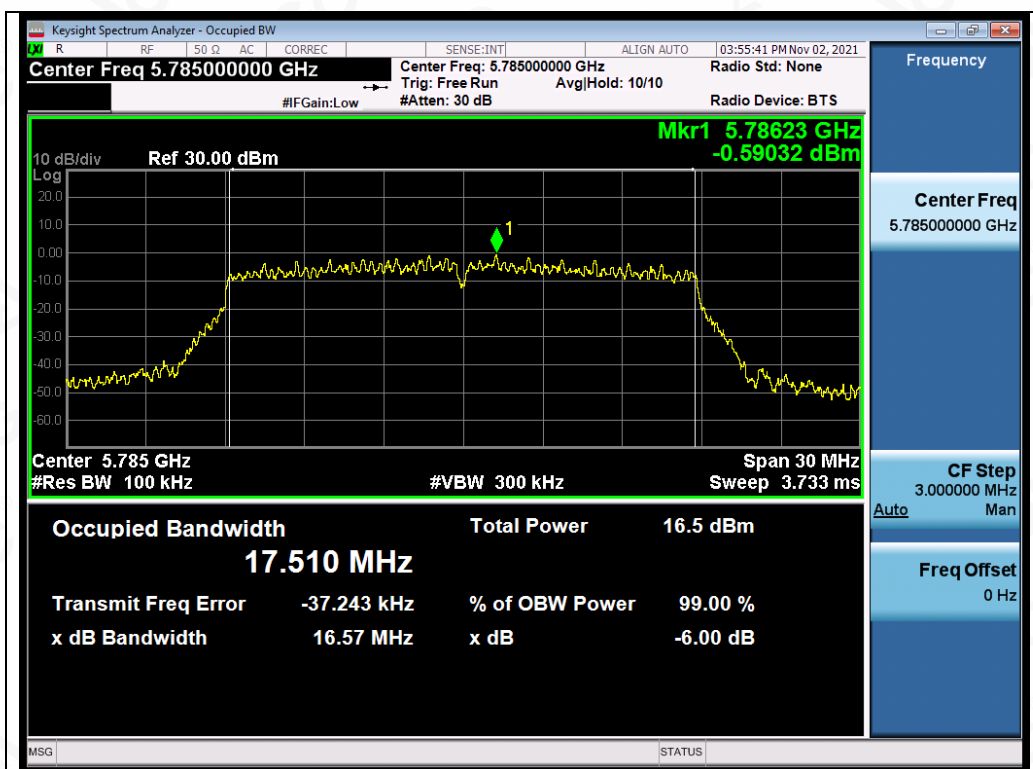


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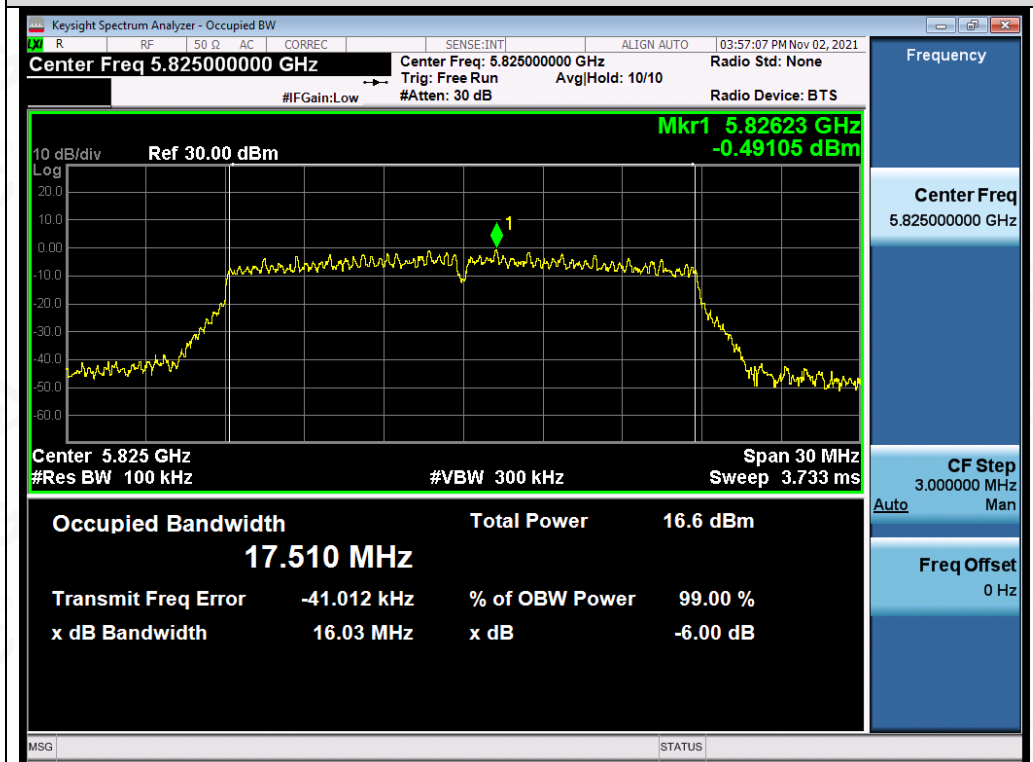
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Test_Graph_802.11n20_ANT1_5785_MCS0_DTSBW

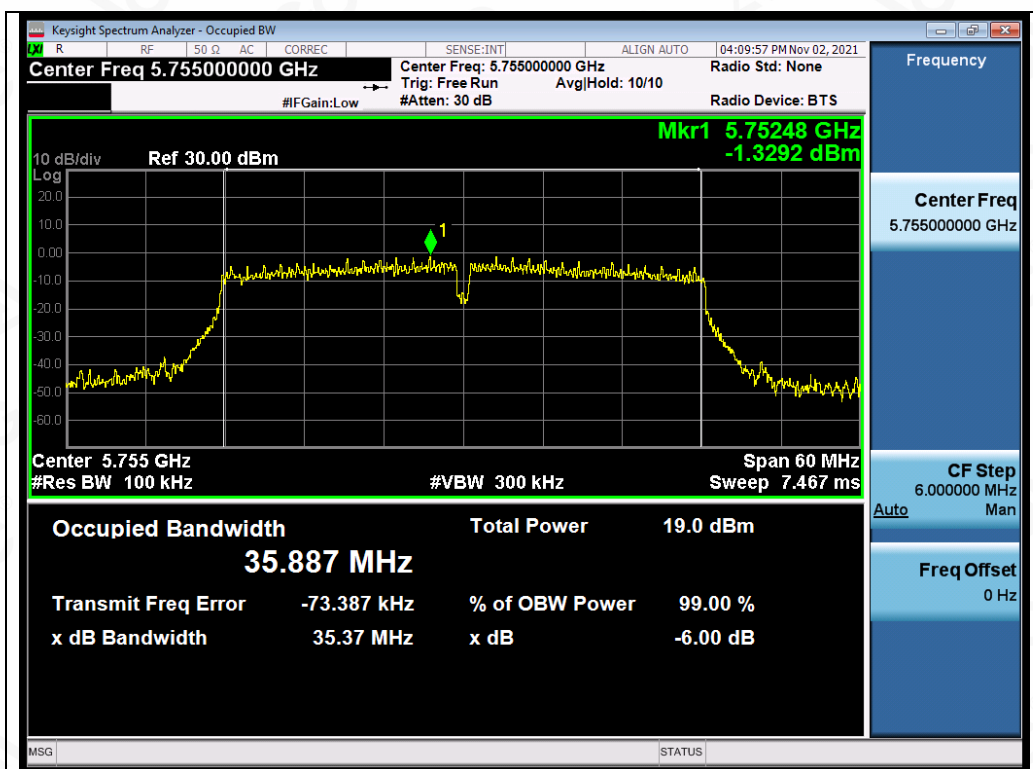


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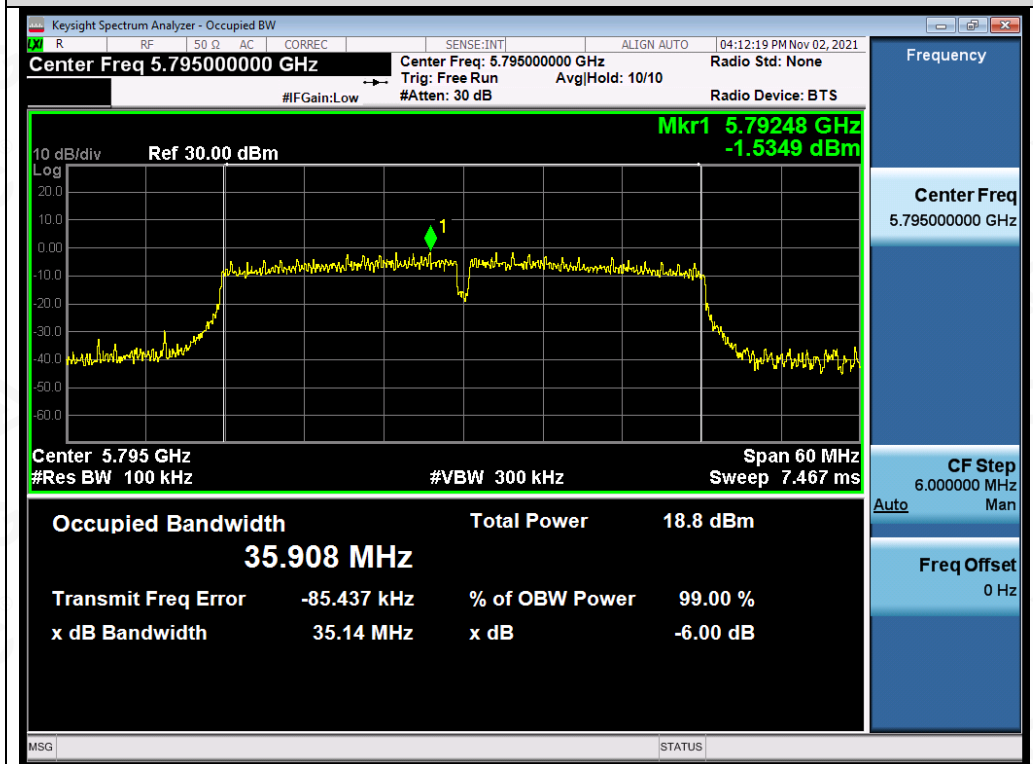
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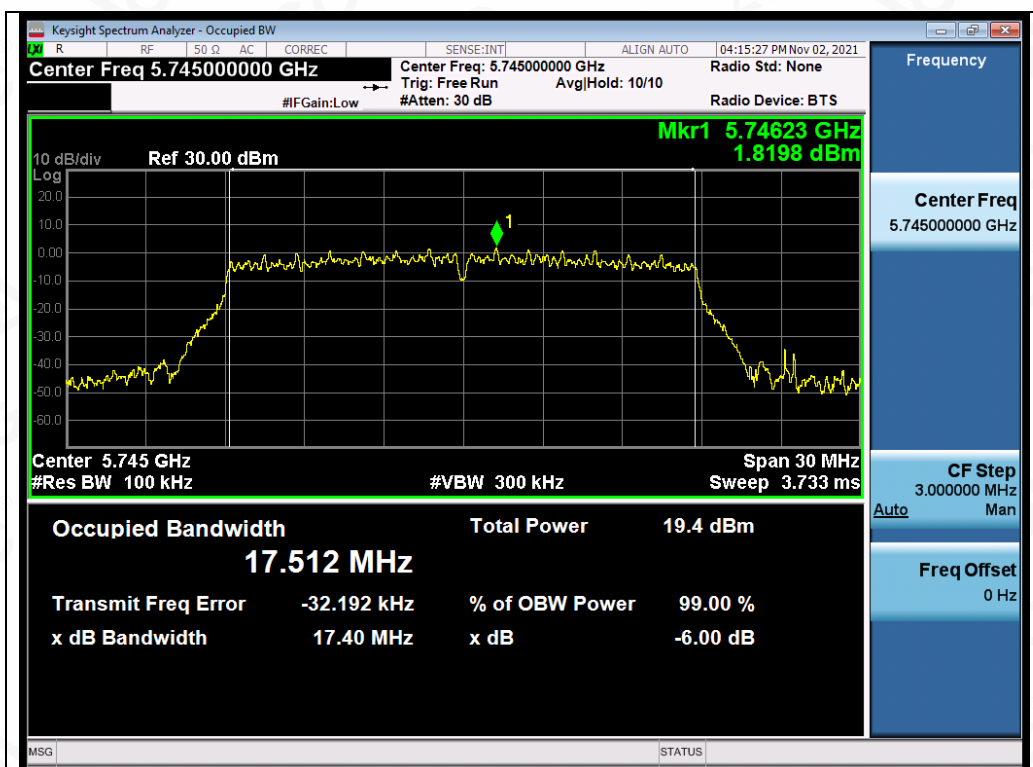


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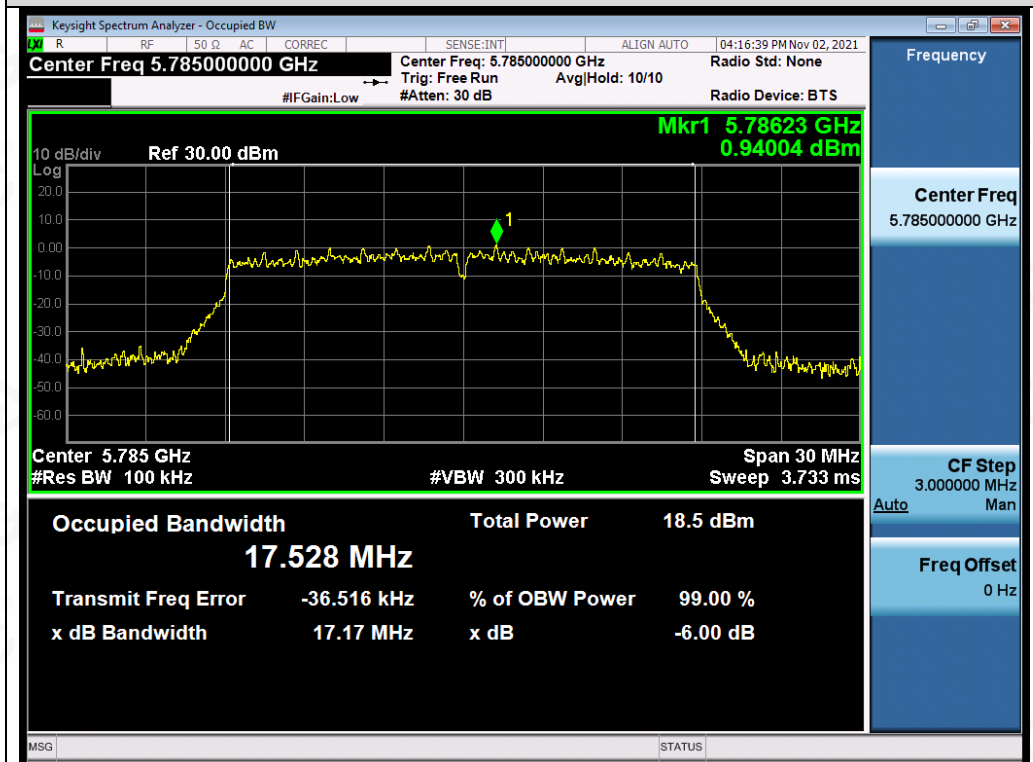
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Test_Graph_802.11ac20_ANT1_5745_MCS0_DTSBW

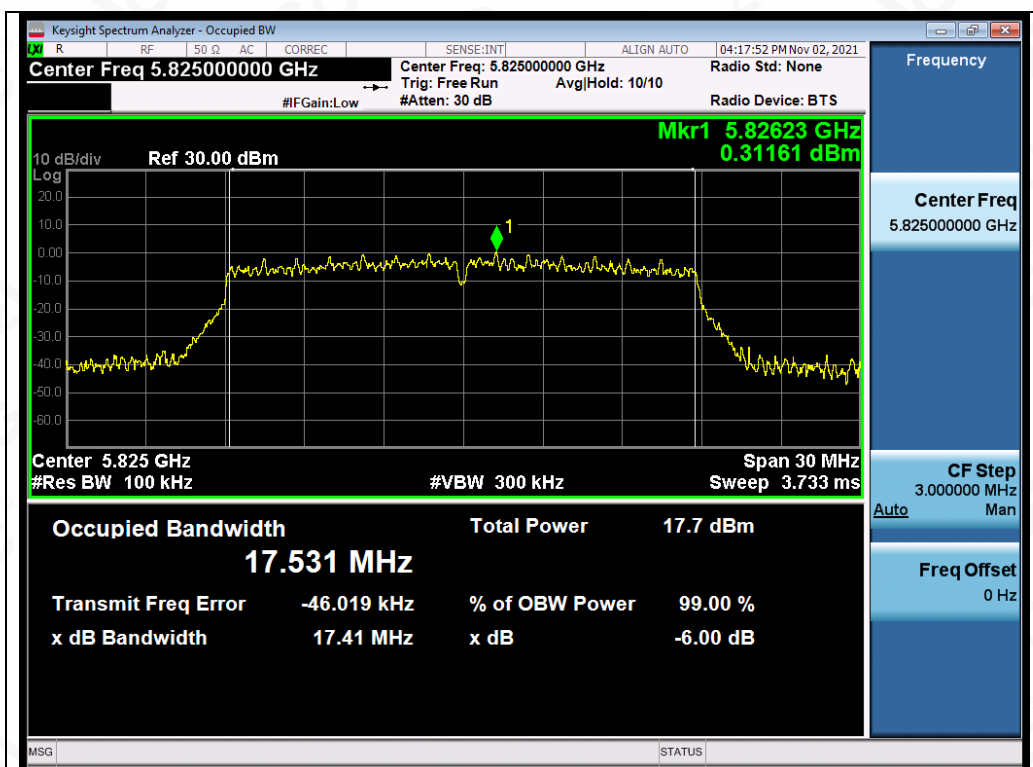


Test_Graph_802.11ac20_ANT1_5785_MCS0_DTSBW

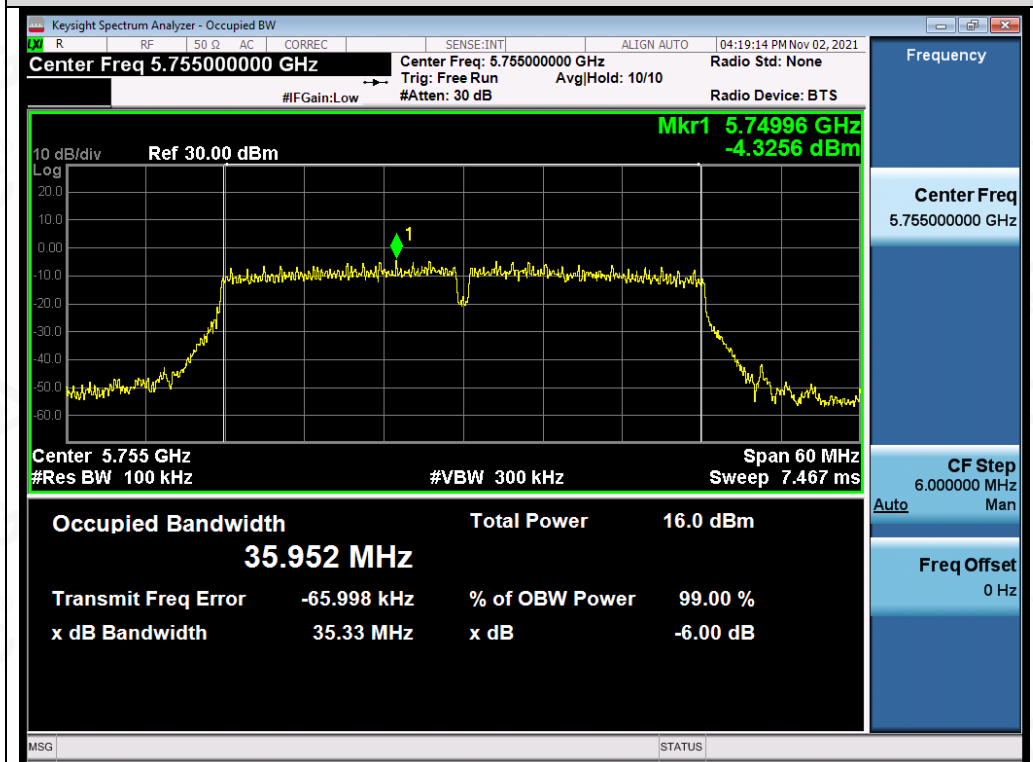
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Test_Graph_802.11ac20_ANT1_5825_MCS9_DTSBW

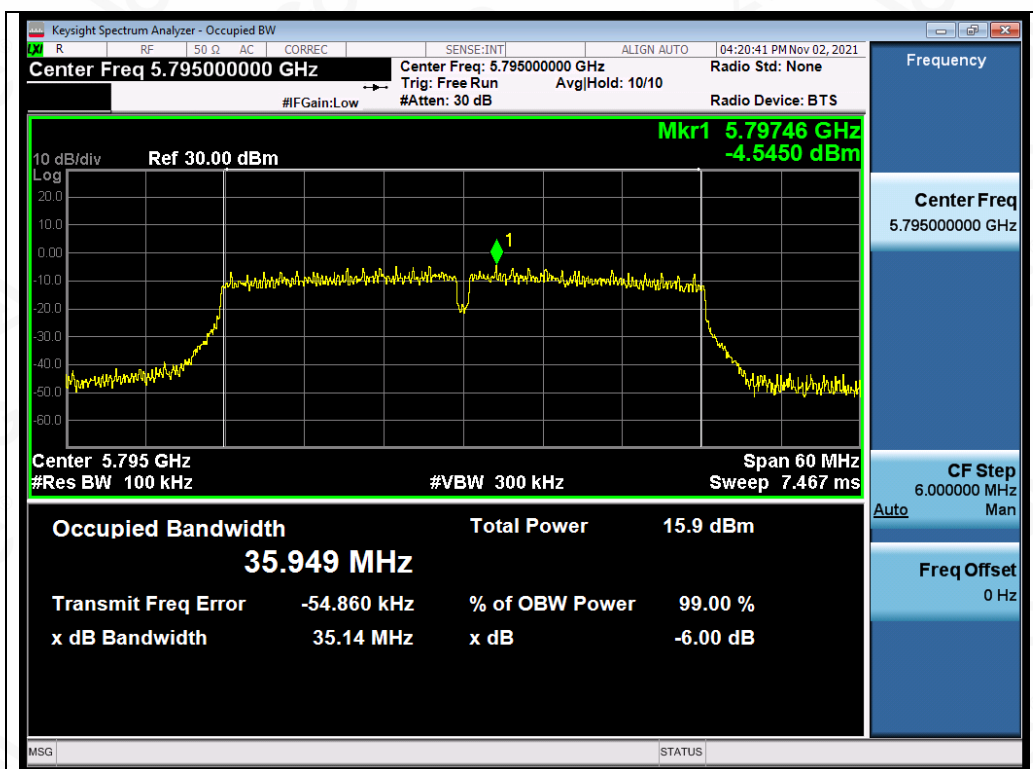


Test_Graph_802.11ac40_ANT1_5755_MCS9_DTSBW

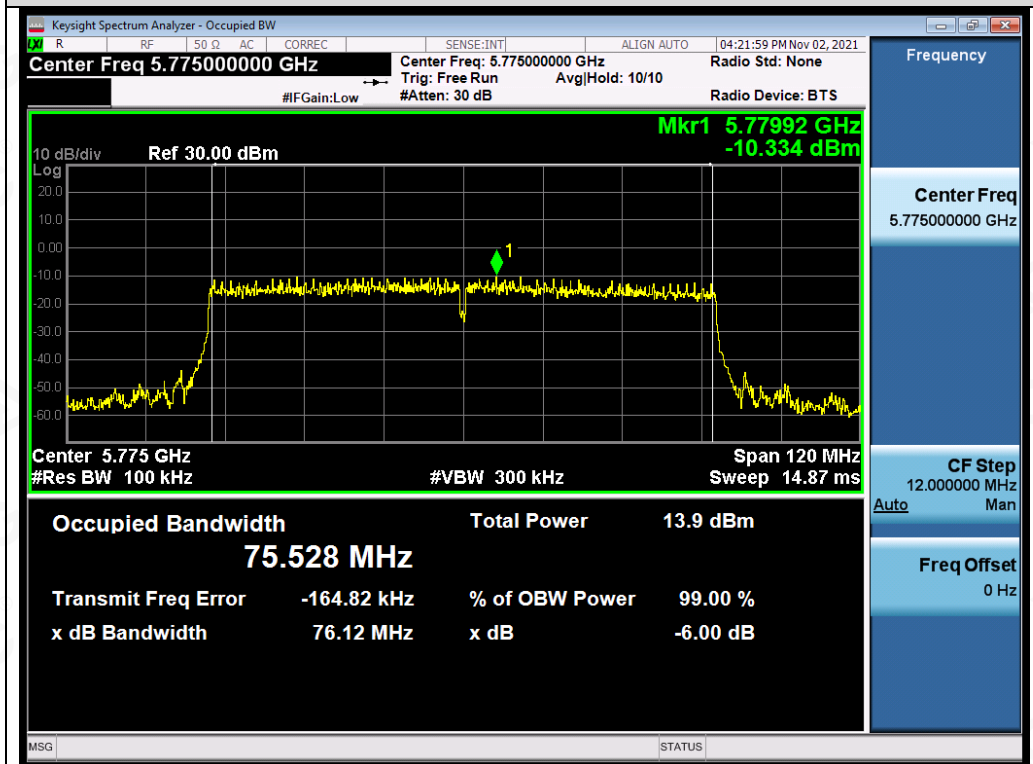
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Test_Graph_802.11ac40_ANT1_5795_MCS9_DTSBW



Test_Graph_802.11ac80_ANT1_5775_MCS9_DTSBW

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9. MAXIMUM CONDUCTED OUTPUT AVERAGE POWER SPECTRAL DENSITY

9.1. MEASUREMENT PROCEDURE

Refer to KDB 789033 section F

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer to Section 8.2.

9.3. MEASUREMENT EQUIPMENT USED

Refer to Section 6.

9.4. LIMITS AND MEASUREMENT RESULT

Test Data of Conducted Output Power Density for band 5.15-5.25 GHz				
Test Mode	Test Channel (MHz)	Average Power Density (dBm/MHz)	Limits (dBm/MHz)	Pass or Fail
802.11a	5180	4.587	11	Pass
	5200	4.372	11	Pass
	5240	2.868	11	Pass
802.11n20	5180	4.295	11	Pass
	5200	3.484	11	Pass
	5240	2.983	11	Pass
802.11n40	5190	-0.190	11	Pass
	5230	-0.224	11	Pass
802.11ac20	5180	2.039	11	Pass
	5200	1.691	11	Pass
	5240	1.212	11	Pass
802.11ac40	5190	-1.921	11	Pass
	5230	-2.345	11	Pass
802.11ac80	5210	-4.391	11	Pass

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Test Data of Conducted Output Power Density for band 5.725-5.85 GHz				
Test Mode	Test Channel (MHz)	Average Power Density (dBm/500kHz)	Limits (dBm/500kHz)	Pass or Fail
802.11a	5745	4.256	30	Pass
	5785	3.001	30	Pass
	5825	2.342	30	Pass
802.11n20	5745	4.508	30	Pass
	5785	3.609	30	Pass
	5825	2.545	30	Pass
802.11n40	5755	2.203	30	Pass
	5795	2.121	30	Pass
802.11ac20	5745	3.253	30	Pass
	5785	2.503	30	Pass
	5825	2.058	30	Pass
802.11ac40	5755	-0.670	30	Pass
	5795	-0.853	30	Pass
802.11ac80	5775	-3.677	30	Pass

Test Data of Conducted Output Power Density for band 5.725-5.85 GHz					
Test Mode	Test Channel (MHz)	Average Power Density (dBm/100kHz)	Average Power Density (dBm/500kHz)	Limits (dBm/500kHz)	Pass or Fail
802.11a	5745	-2.734	4.256	30	Pass
	5785	-3.989	3.001	30	Pass
	5825	-4.648	2.342	30	Pass
802.11n20	5745	-2.482	4.508	30	Pass
	5785	-3.381	3.609	30	Pass
	5825	-4.445	2.545	30	Pass
802.11n40	5755	-4.787	2.203	30	Pass
	5795	-4.869	2.121	30	Pass
802.11ac20	5745	-3.737	3.253	30	Pass
	5785	-4.487	2.503	30	Pass
	5825	-4.932	2.058	30	Pass
802.11ac40	5755	-7.66	-0.670	30	Pass
	5795	-7.843	-0.853	30	Pass
802.11ac80	5775	-10.667	-3.677	30	Pass

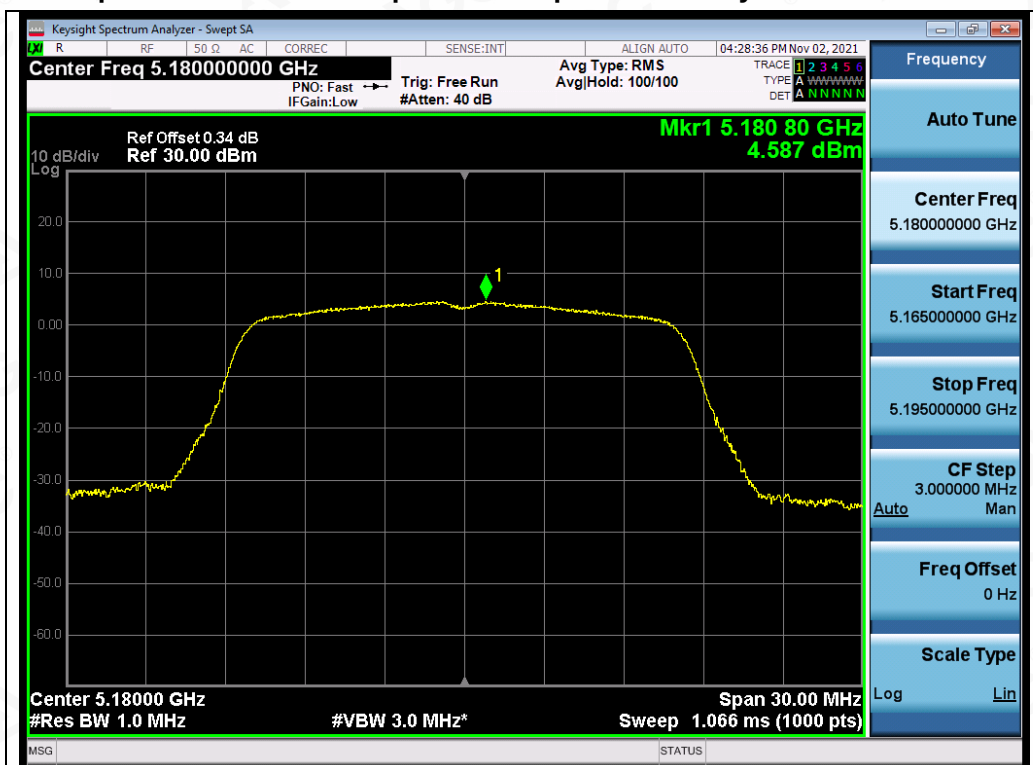
Note:1. Power density(dBm/500kHz) = Power density(dBm/100kHz) +10*log(500/100).

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Test Graphs of Conducted Output Power Spectral Density for band 5.15-5.25 GHz



Test_Graph_802.11a_ANT1_5180_6Mbps_PSD

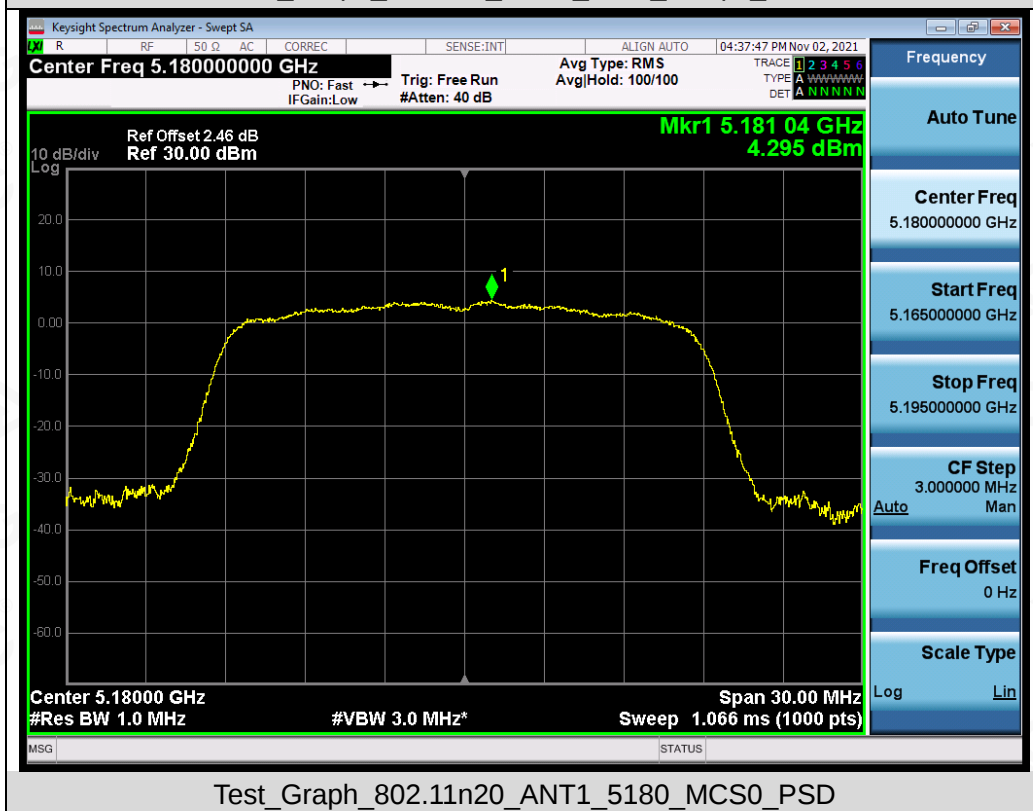
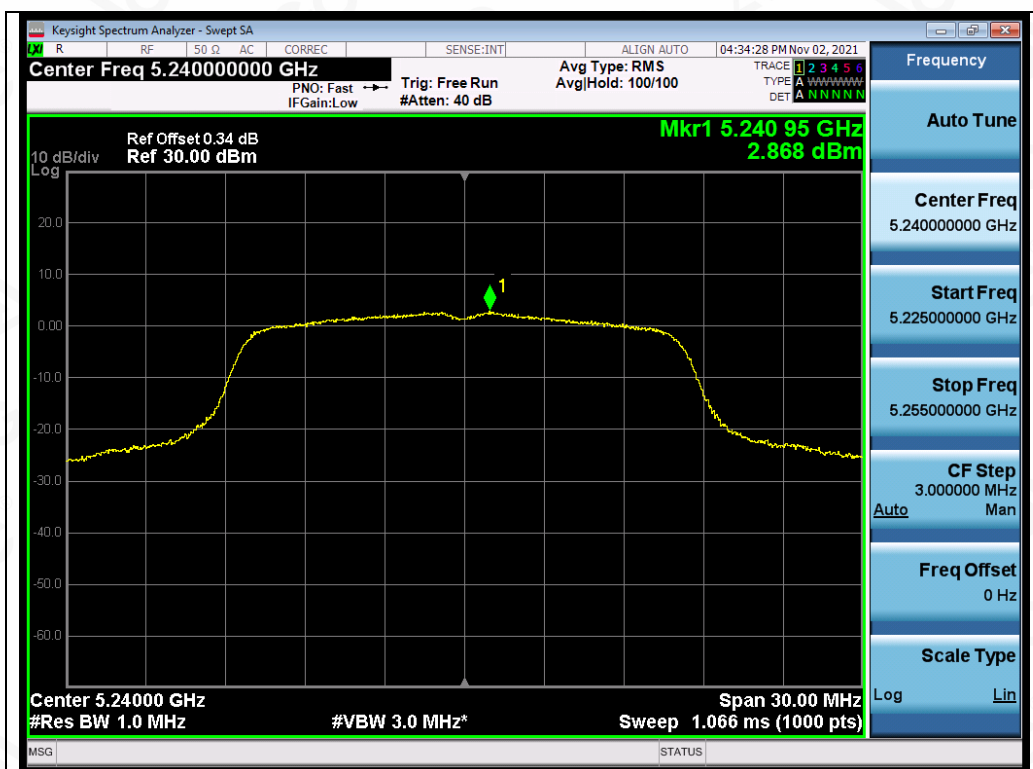


Test_Graph_802.11a_ANT1_5200_6Mbps_PSD

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Test_Graph_802.11n20_ANT1_5200_MCS0_PSD



Test_Graph_802.11n20_ANT1_5240_MCS0_PSD

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