

FCC Test Report

Report No.: AGC10849211104FE06

FCC ID : VTJ-BRAMALV2
APPLICATION PURPOSE : Original Equipment
PRODUCT DESIGNATION : Brama L V2
BRAND NAME : SoloProtect
MODEL NAME : SoloProtect ID touch
APPLICANT : SoloProtect Limited
DATE OF ISSUE : Dec. 23, 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	/	Dec. 23, 2021	Valid	Initial Release

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TABLE OF CONTENTS

1. VERIFICATION OF CONFORMITY	5
2. GENERAL INFORMATION	6
2.1. PRODUCT DESCRIPTION	6
2.2. TABLE OF CARRIER FREQUENCIES	7
2.3. RELATED SUBMITTAL(S) / GRANT (S)	8
2.4. TEST METHODOLOGY	8
2.5. SPECIAL ACCESSORIES	8
2.6. EQUIPMENT MODIFICATIONS	8
2.7. ANTENNA REQUIREMENT	8
3. MEASUREMENT UNCERTAINTY	9
4. DESCRIPTION OF TEST MODES	10
5. SYSTEM TEST CONFIGURATION	11
5.1. CONFIGURATION OF EUT SYSTEM	11
5.2. EQUIPMENT USED IN EUT SYSTEM	11
5.3. SUMMARY OF TEST RESULTS	11
6. TEST FACILITY	12
7. MAXIMUM CONDUCTED OUTPUT POWER	13
7.1. MEASUREMENT PROCEDURE	13
7.2. TEST SET-UP	13
7.3. LIMITS AND MEASUREMENT RESULT	14
8. BANDWIDTH	15
8.1. MEASUREMENT PROCEDURE	15
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	15
8.3. LIMITS AND MEASUREMENT RESULTS	16
9. MAXIMUM CONDUCTED OUTPUT AVERAGE POWER SPECTRAL DENSITY	38
9.1. MEASUREMENT PROCEDURE	38
9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	38
9.3. MEASUREMENT EQUIPMENT USED	38
9.4. LIMITS AND MEASUREMENT RESULT	38
10. CONDUCTED SPURIOUS EMISSION	54
10.1. MEASUREMENT PROCEDURE	54
10.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	54
10.3. MEASUREMENT EQUIPMENT USED	54

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10.4. LIMITS AND MEASUREMENT RESULT	54
11. RADIATED EMISSION	75
11.1. MEASUREMENT PROCEDURE.....	75
11.2. TEST SETUP.....	76
11.3. LIMITS AND MEASUREMENT RESULT	77
11.4. TEST RESULT	77
12. LINE CONDUCTED EMISSION TEST	95
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST	95
12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST	95
12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST	96
12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST	96
12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST	97
APPENDIX I: PHOTOGRAPHS OF TEST SETUP	99I
APPENDIX II: PHOTOGRAPHS OF EUT	99

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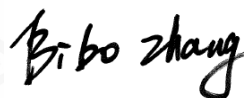
1. VERIFICATION OF CONFORMITY

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 L V2
Brand Name	SoloProtect
Test Model	SoloProtect ID touch
Date of test	Dec. 03, 2021~Dec. 20, 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



Bibo Zhang
(Project Engineer)

Dec. 20, 2021

Reviewed By



Calvin Liu
(Reviewer)

Dec. 23, 2021

Approved By



Max Zhang
Authorized Officer

Dec. 23, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as “Brama L V2”. 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 ☐ Indoor access points ☐ Fixed P2P access points ☒ Client devices
Operation Frequency	☒ U-NII 1:5150MHz~5250MHz ☐ U-NII 2A: 5250MHz~5350MHz ☐ U-NII 2C:5470MHz~5725MHz ☒ 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
Max Average Power	IEEE 802.11a:15.70dBm; IEEE 802.11n-HT20:14.85dBm; IEEE 802.11n-HT40:15.64dBm; IEEE 802.11ac-VHT20:13.41dBm; IEEE 802.11ac-VHT40:14.14dBm; IEEE 802.11ac-VHT80:13.36dBm
Modulation	802.11a/n:(64-QAM, 16-QAM, QPSK, BPSK) OFDM 802.11ac :(256-QAM, 64-QAM, 16-QAM, QPSK, BPSK) OFDM
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 433Mbps
Number of channels	7 channels of U-NII-1 Band 8 channels of U-NII-3 Band
Hardware Version	Brama-L _main_ RevA
Software Version	Brama_L.D01.20211104
Antenna Designation	PIFA Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	0.2dBi
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-BRAMALV2** 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 II: 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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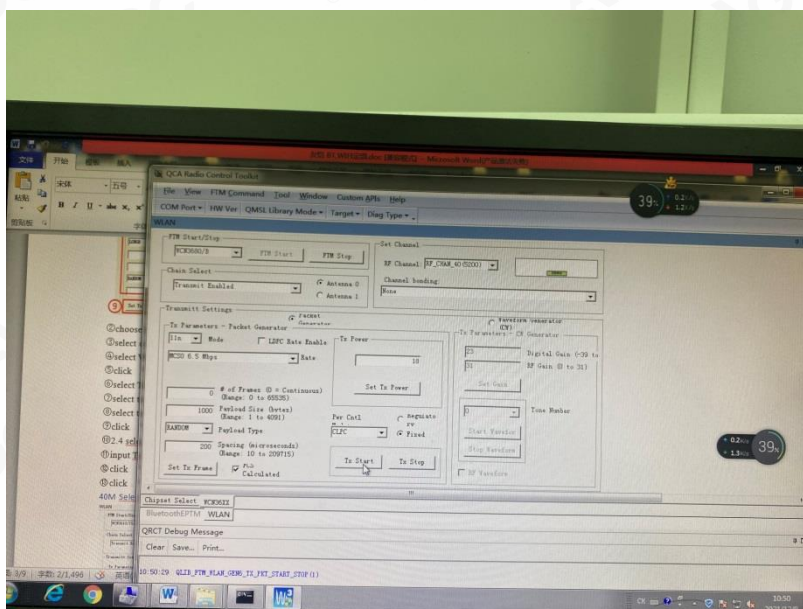
4. DESCRIPTION OF TEST MODES

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.

Software Setting



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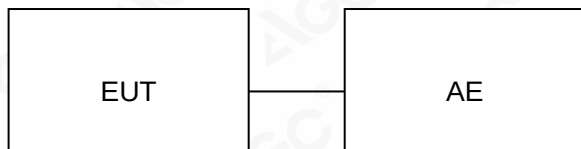
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5. SYSTEM TEST CONFIGURATION

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 L V2	SoloProtect ID touch	VTJ-BRAMALV2	EUT
2	Battery	DC383072	DC 3.85V 1150mAh	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	Nov. 17, 2021	Nov. 16, 2022
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	Oct. 31, 2021	Oct. 30, 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

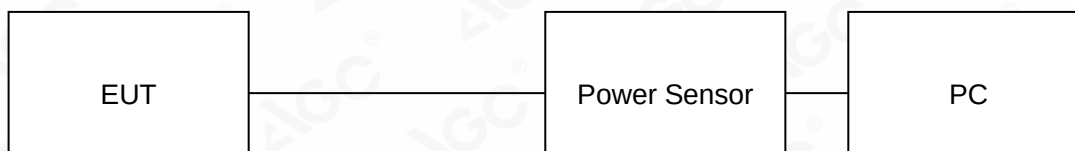
For average power test:

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	14.62	23.98	Pass
	5200	14.99	23.98	Pass
	5240	14.51	23.98	Pass
802.11n20	5180	14.85	23.98	Pass
	5200	14.12	23.98	Pass
	5240	13.69	23.98	Pass
802.11n40	5190	13.70	23.98	Pass
	5230	13.73	23.98	Pass
802.11ac20	5180	11.70	23.98	Pass
	5200	11.93	23.98	Pass
	5240	11.63	23.98	Pass
802.11ac40	5190	14.09	23.98	Pass
	5230	14.14	23.98	Pass
802.11ac80	5210	12.35	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	14.81	30	Pass
	5785	15.70	30	Pass
	5825	14.24	30	Pass
802.11n20	5745	13.91	30	Pass
	5785	14.72	30	Pass
	5825	13.12	30	Pass
802.11n40	5755	15.37	30	Pass
	5795	15.64	30	Pass
802.11ac20	5745	12.65	30	Pass
	5785	13.41	30	Pass
	5825	12.17	30	Pass
802.11ac40	5755	11.66	30	Pass
	5795	11.91	30	Pass
802.11ac80	5775	13.36	30	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:

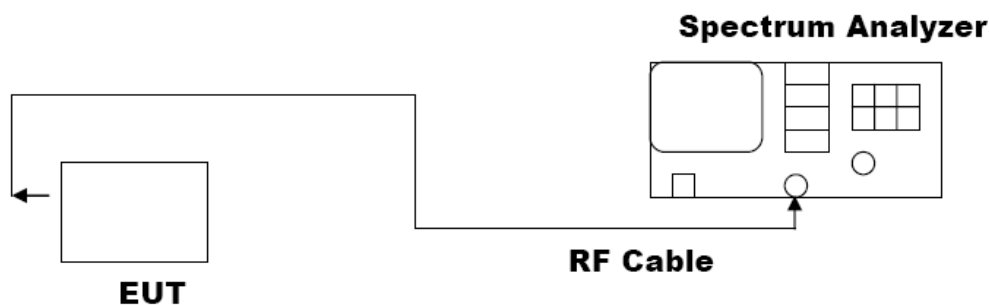
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 1.5 to 5 times the OBW, centered on a nominal channel
The nominal IF filter bandwidth (3 dB RBW) shall 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

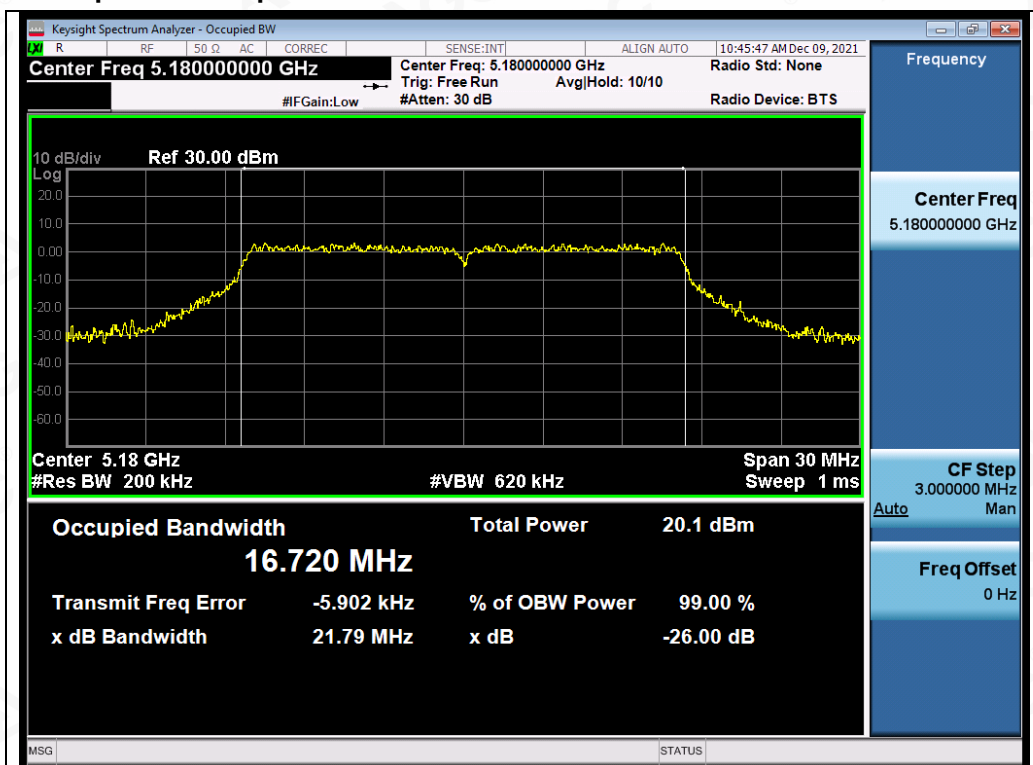
Test Data of Occupied Bandwidth and -26dB Bandwidth for band 5.15-5.25 GHz					
Test Mode	Test Channel (MHz)	99% Occupied Bandwidth (MHz)	-26dB Bandwidth (MHz)	Limits (MHz)	Pass or Fail
802.11a	5180	16.720	21.787	N/A	Pass
	5200	16.744	21.861	N/A	Pass
	5240	16.790	22.967	N/A	Pass
802.11n20	5180	17.825	22.261	N/A	Pass
	5200	17.795	22.331	N/A	Pass
	5240	17.854	22.241	N/A	Pass
802.11n40	5190	36.116	41.438	N/A	Pass
	5230	36.043	41.167	N/A	Pass
802.11ac20	5180	17.790	21.626	N/A	Pass
	5200	17.783	21.510	N/A	Pass
	5240	17.812	21.592	N/A	Pass
802.11ac40	5190	36.196	42.401	N/A	Pass
	5230	36.223	42.147	N/A	Pass
802.11ac80	5210	74.503	81.857	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	16.728	16.384	0.5	Pass
	5785	16.700	16.377	0.5	Pass
	5825	16.747	16.372	0.5	Pass
802.11n20	5745	17.810	17.592	0.5	Pass
	5785	17.819	17.606	0.5	Pass
	5825	17.797	17.580	0.5	Pass
802.11n40	5755	36.231	35.374	0.5	Pass
	5795	36.183	35.382	0.5	Pass
802.11ac20	5745	17.789	17.617	0.5	Pass
	5785	17.810	17.615	0.5	Pass
	5825	17.812	17.616	0.5	Pass
802.11ac40	5755	36.063	35.147	0.5	Pass
	5795	36.044	35.361	0.5	Pass
802.11ac80	5775	74.480	73.733	0.5	Pass

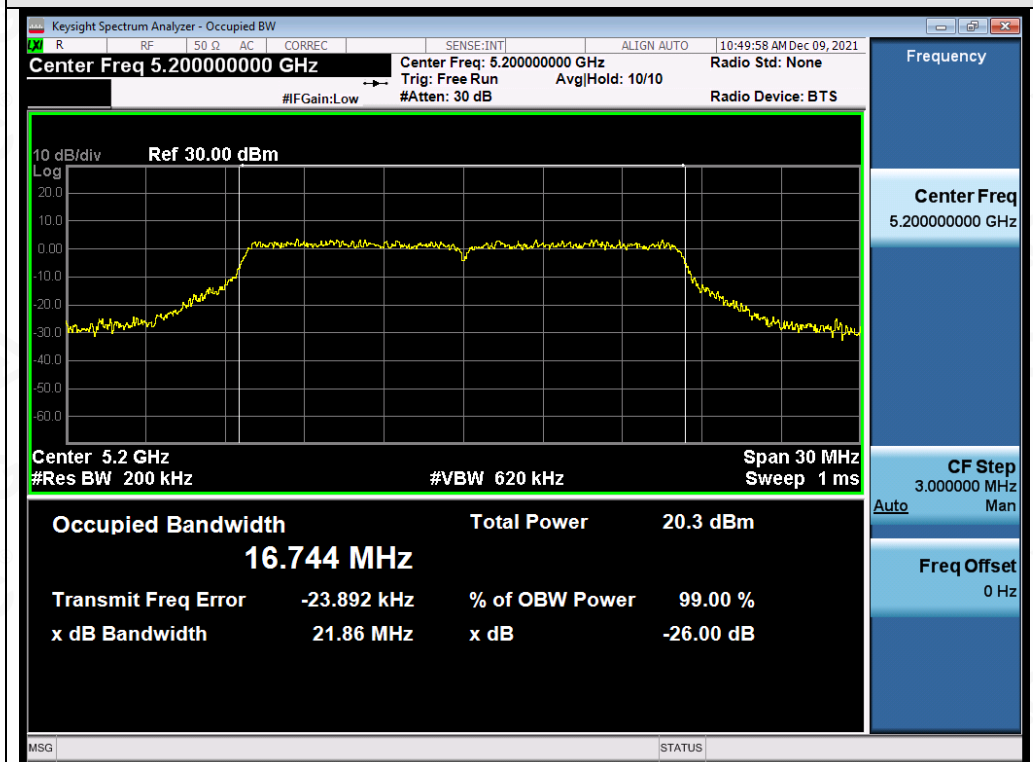
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Test Graphs of Occupied Bandwidth and -26dB Bandwidth for band 5.15-5.25 GHz



Test_Graph_802.11a_ANT1_5180_6Mbps_OBW

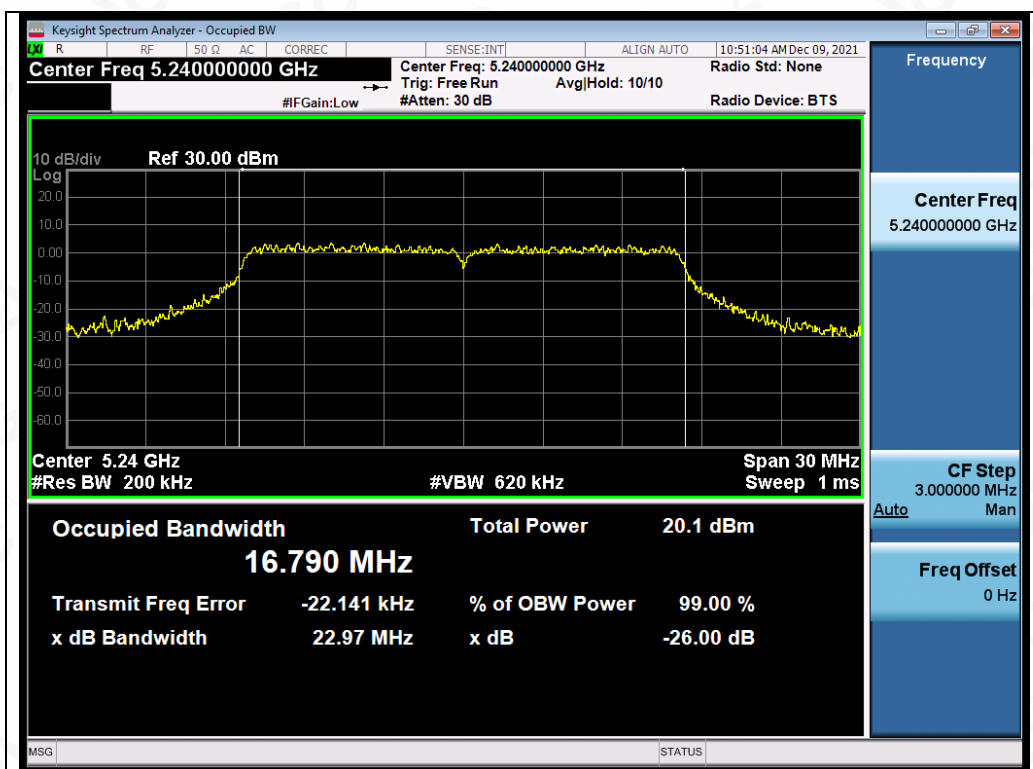


Test_Graph_802.11a_ANT1_5200_6Mbps_OBW

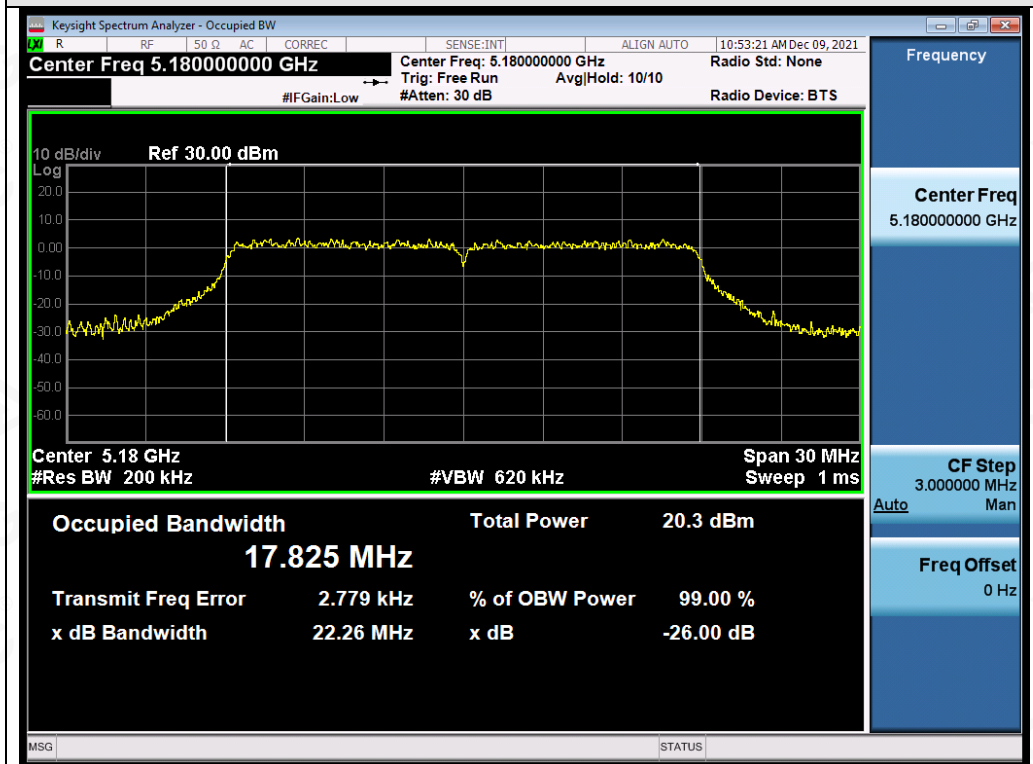
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Test_Graph_802.11a_ANT1_5240_6Mbps_OBW



Test_Graph_802.11n20_ANT1_5180_MCS0_OBW

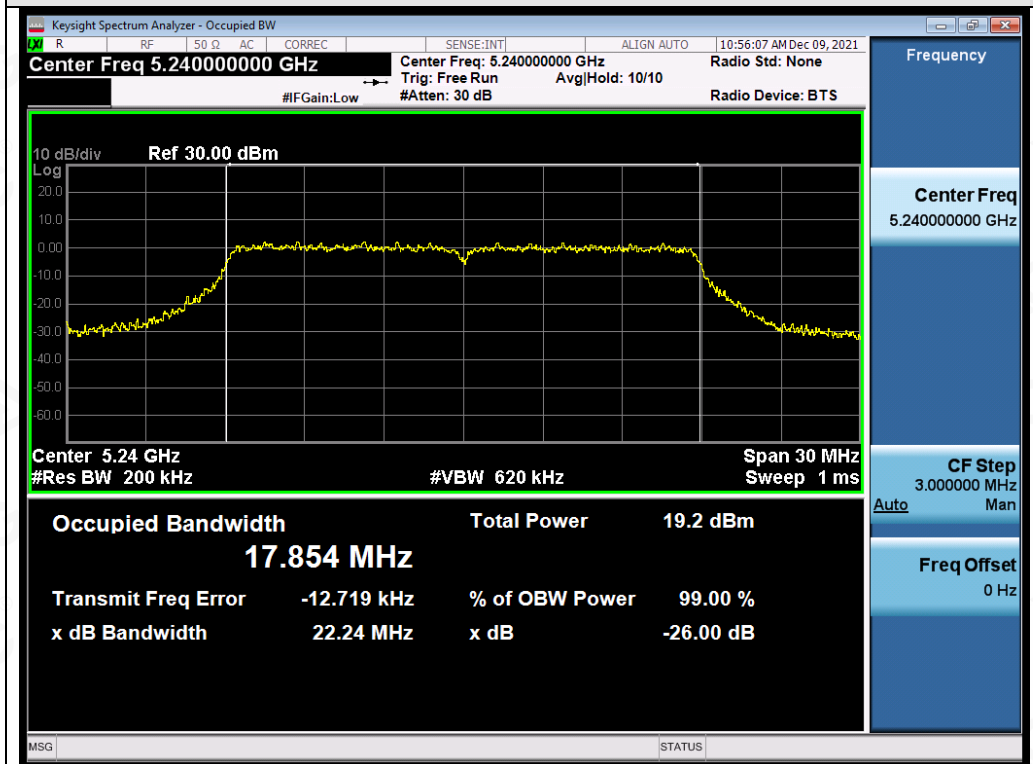
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Test_Graph_802.11n20_ANT1_5200_MCS0_OBW



Test_Graph_802.11n20_ANT1_5240_MCS0_OBW

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Test_Graph_802.11n40_ANT1_5190_MCS0_OBW

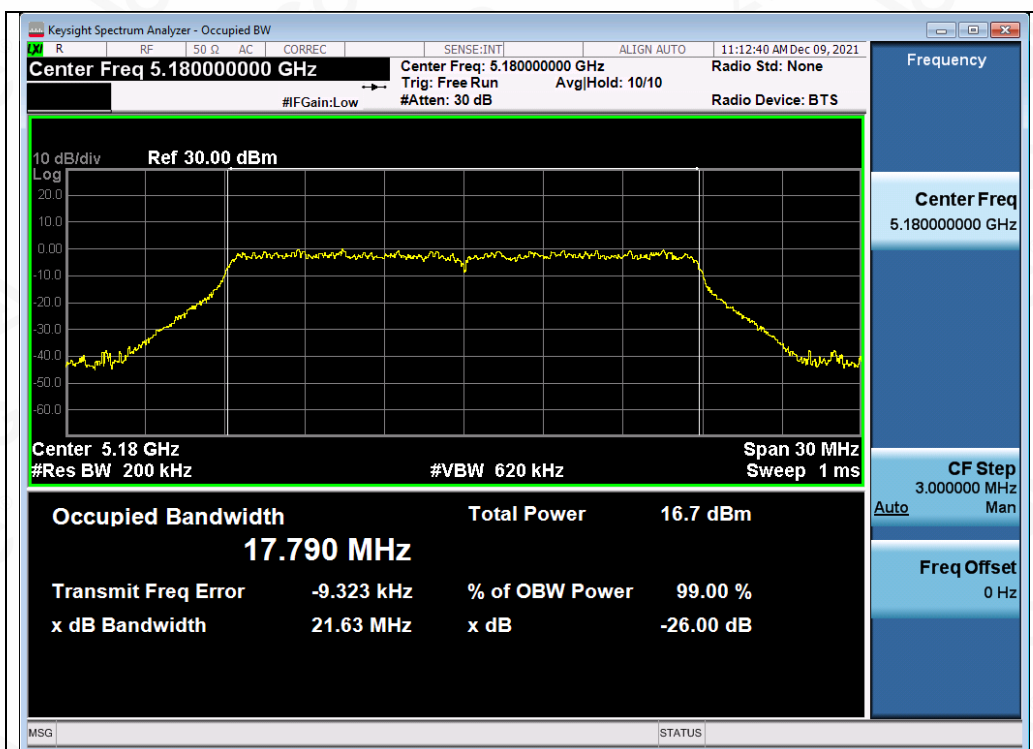


Test_Graph_802.11n40_ANT1_5230_MCS0_OBW

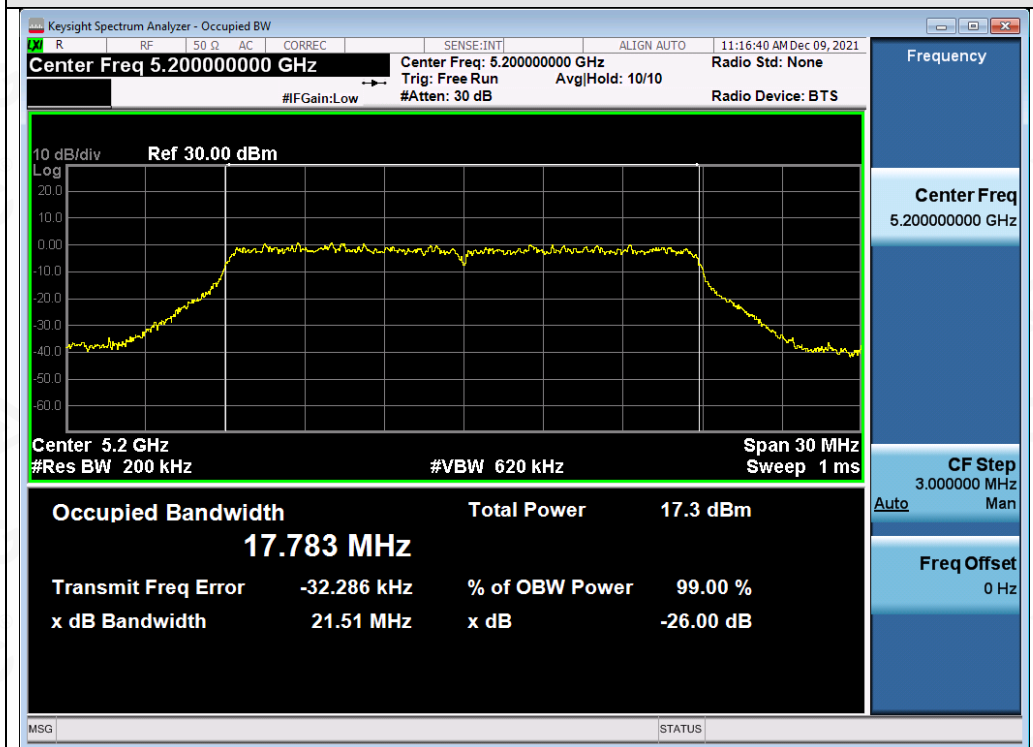
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Test_Graph_802.11ac20_ANT1_5180_MCS0_OBW

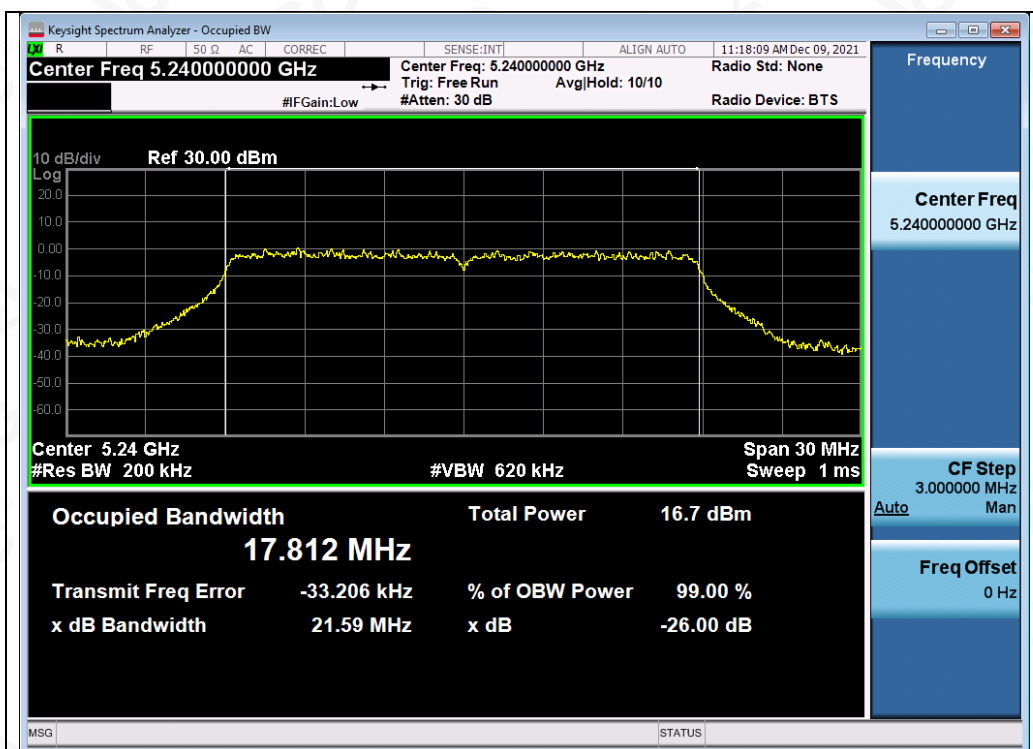


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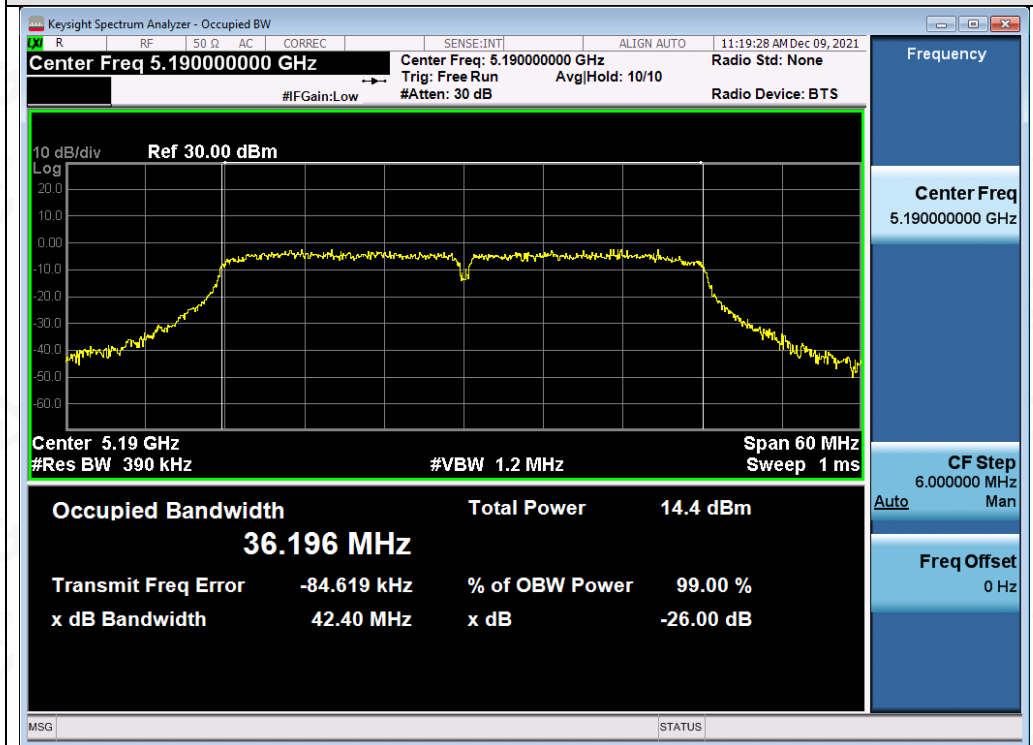
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Test_Graph_802.11ac20_ANT1_5240_MCS9_OBW

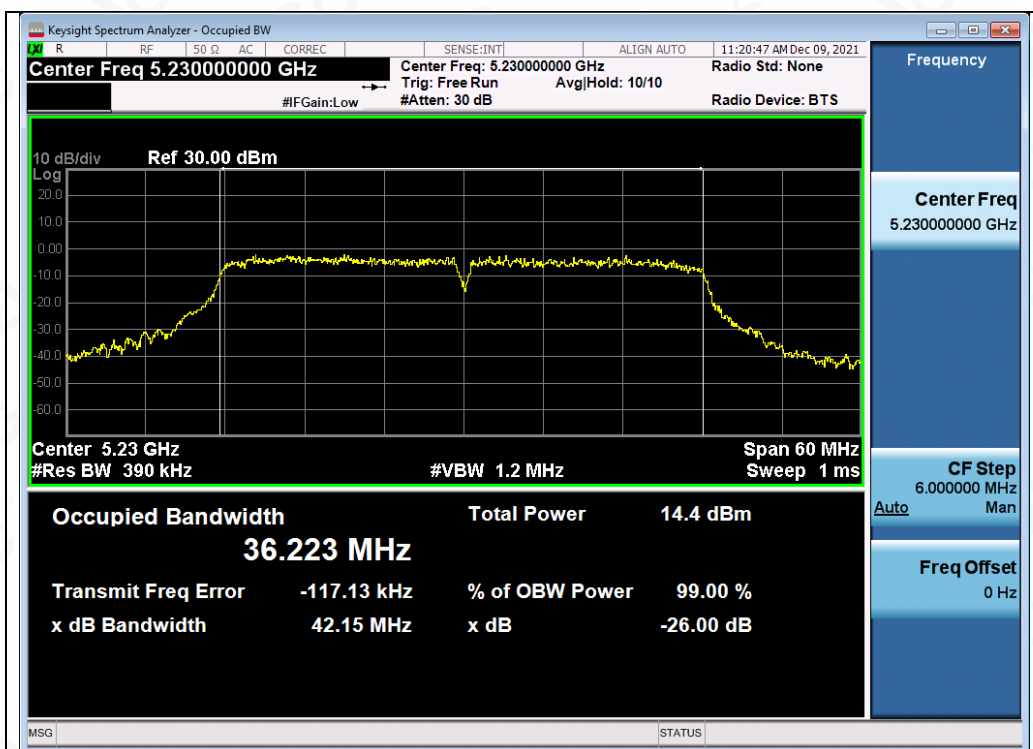


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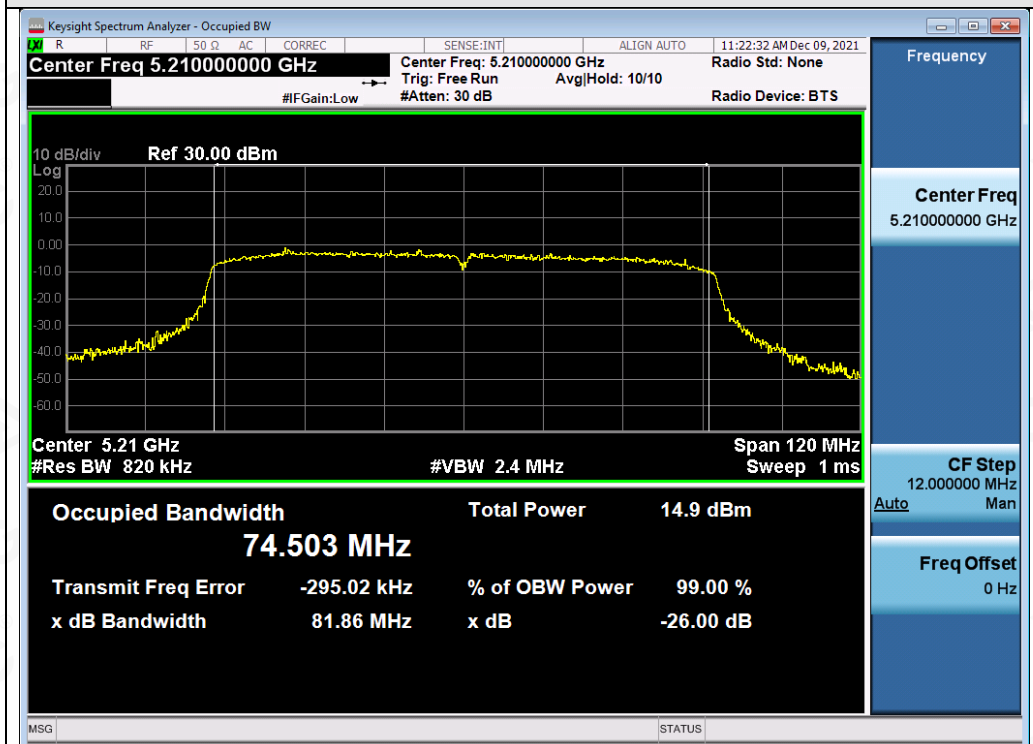
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Test_Graph_802.11ac40_ANT1_5230_MCS9_OBW



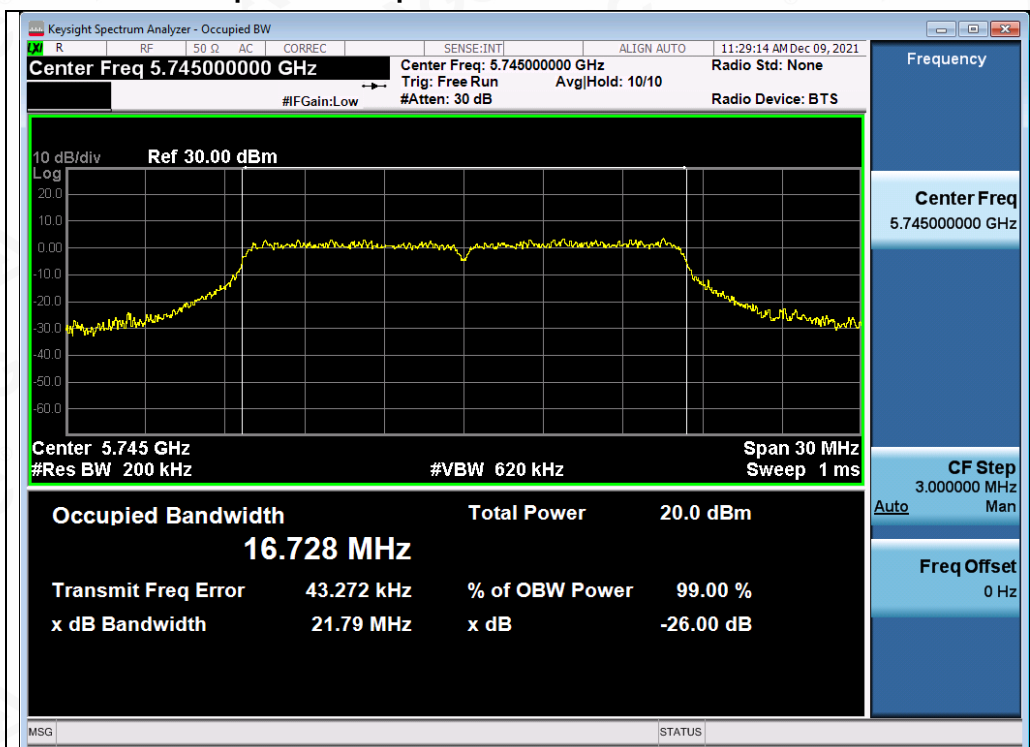
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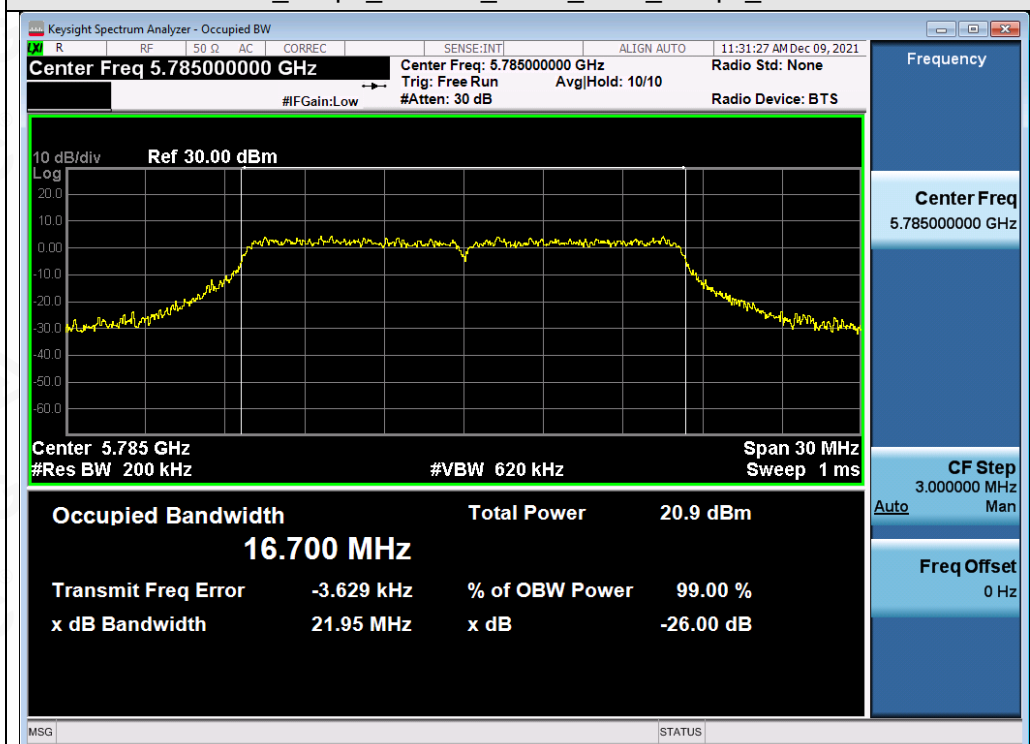
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Test Graphs of Occupied Bandwidth for band 5.725-5.85 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_OBW

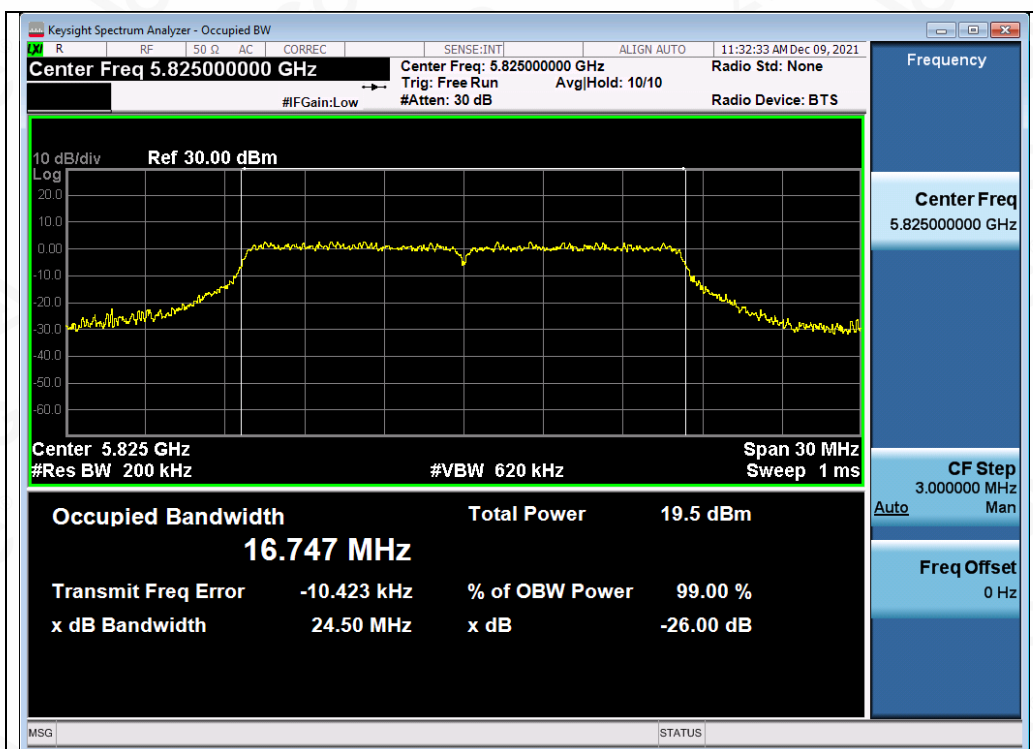


Test_Graph_802.11a_ANT1_5785_6Mbps_OBW

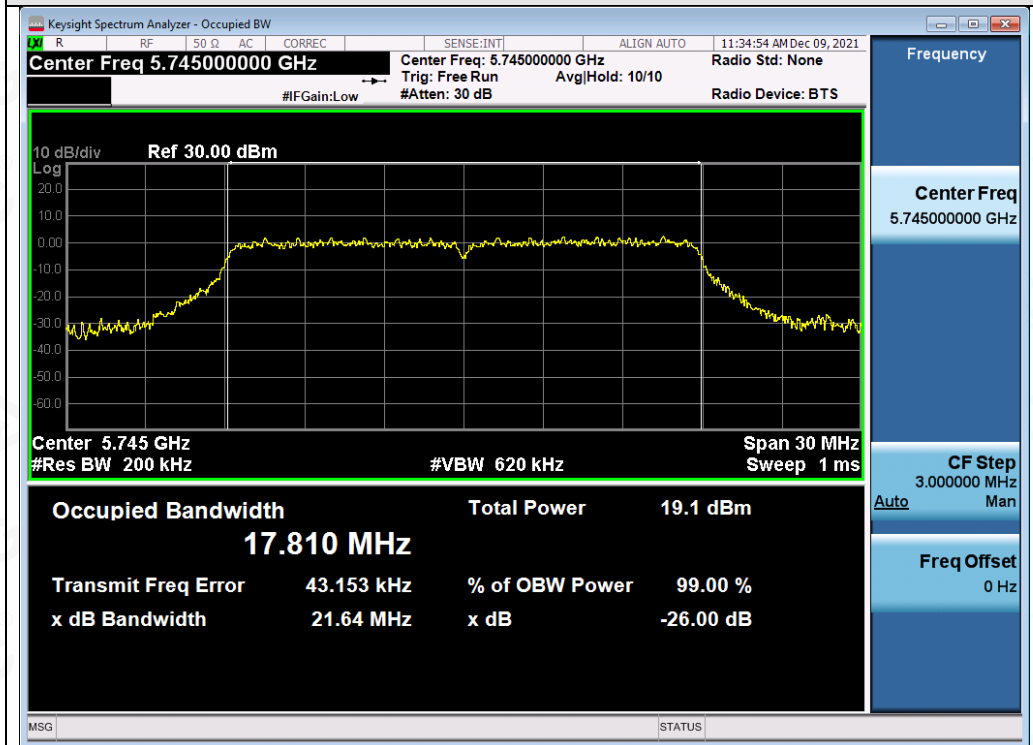
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Test_Graph_802.11a_ANT1_5825_6Mbps_OBW

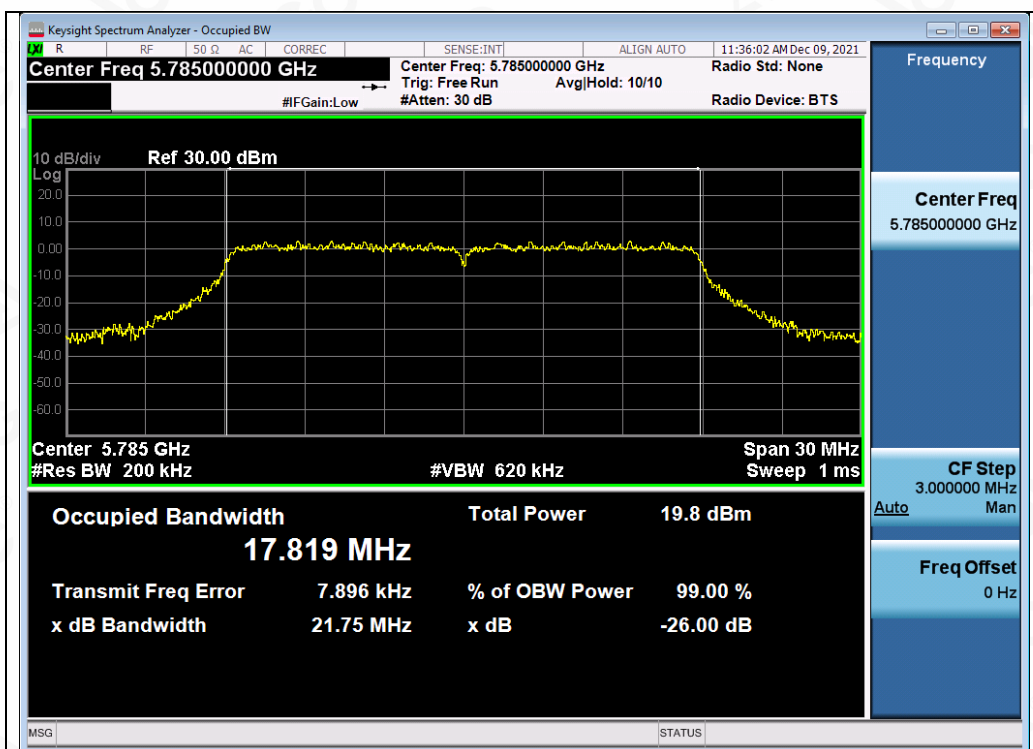


Test_Graph_802.11n20_ANT1_5745_MCS0_OBW

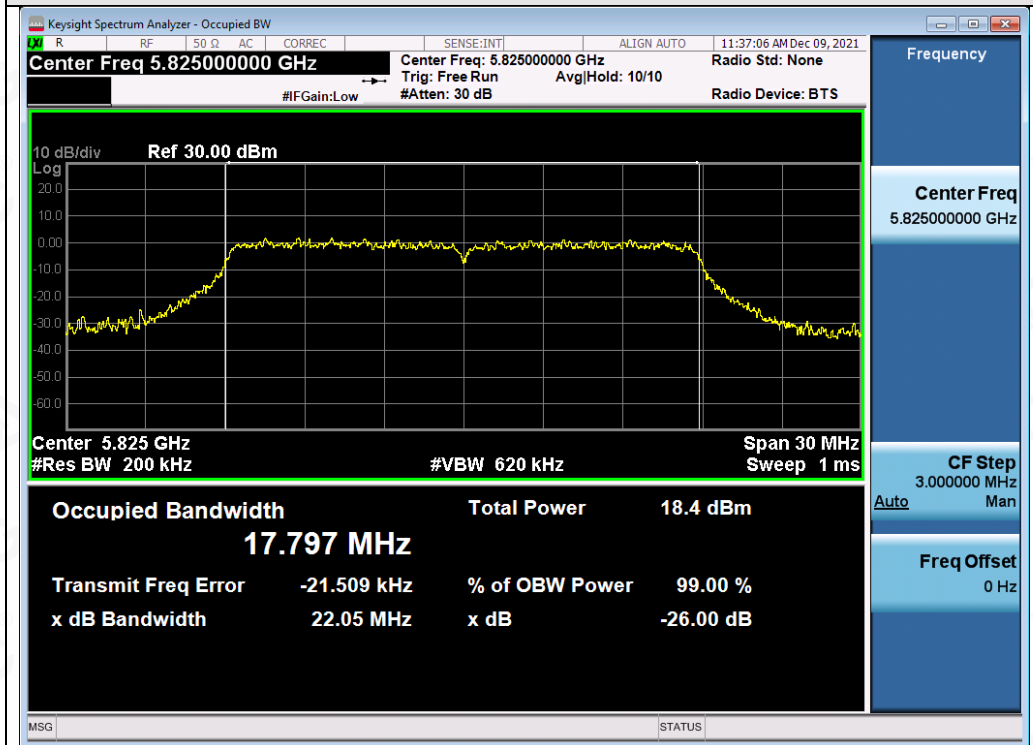
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Test_Graph_802.11n20_ANT1_5785_MCS0_OBW

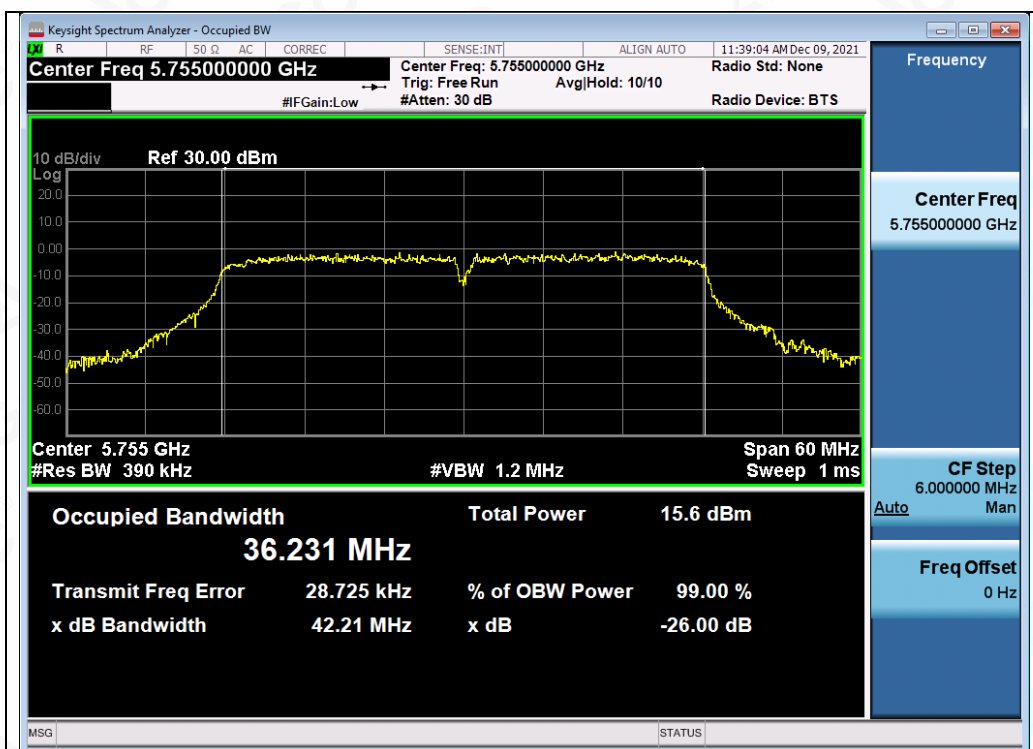


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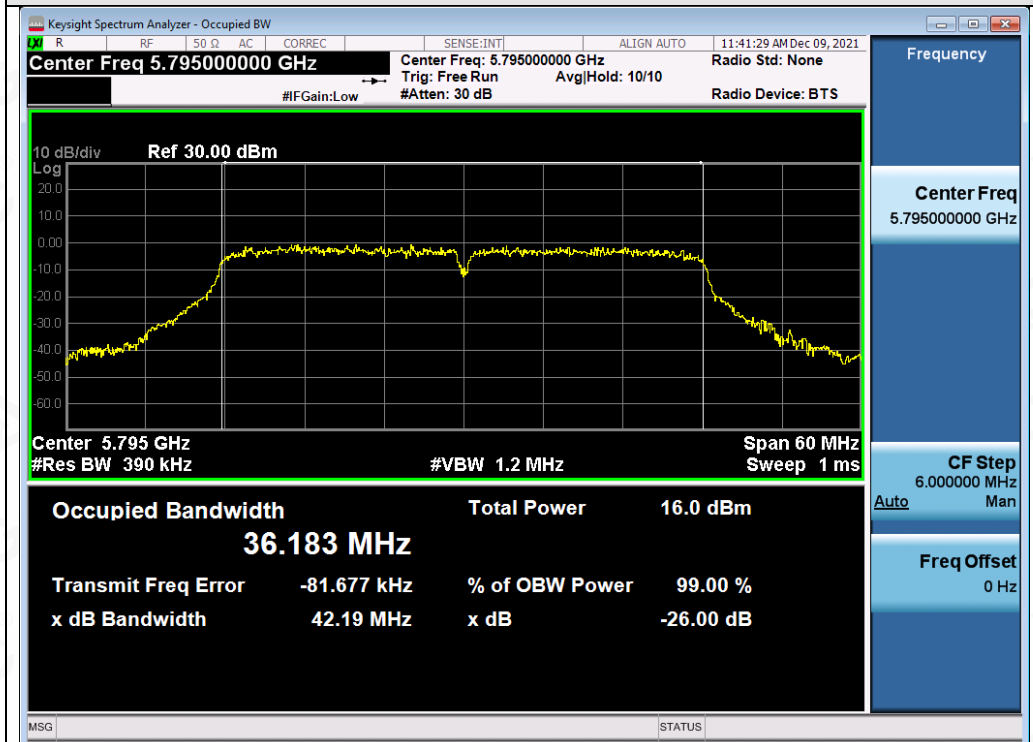
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Test_Graph_802.11n40_ANT1_5755_MCS0_OBW

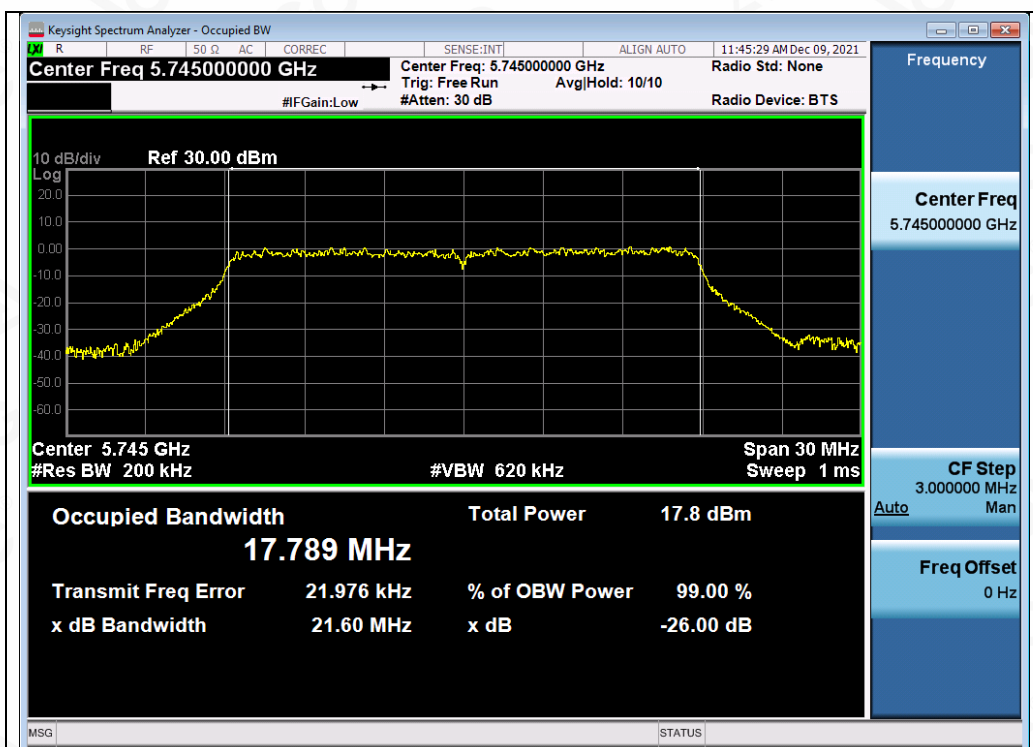


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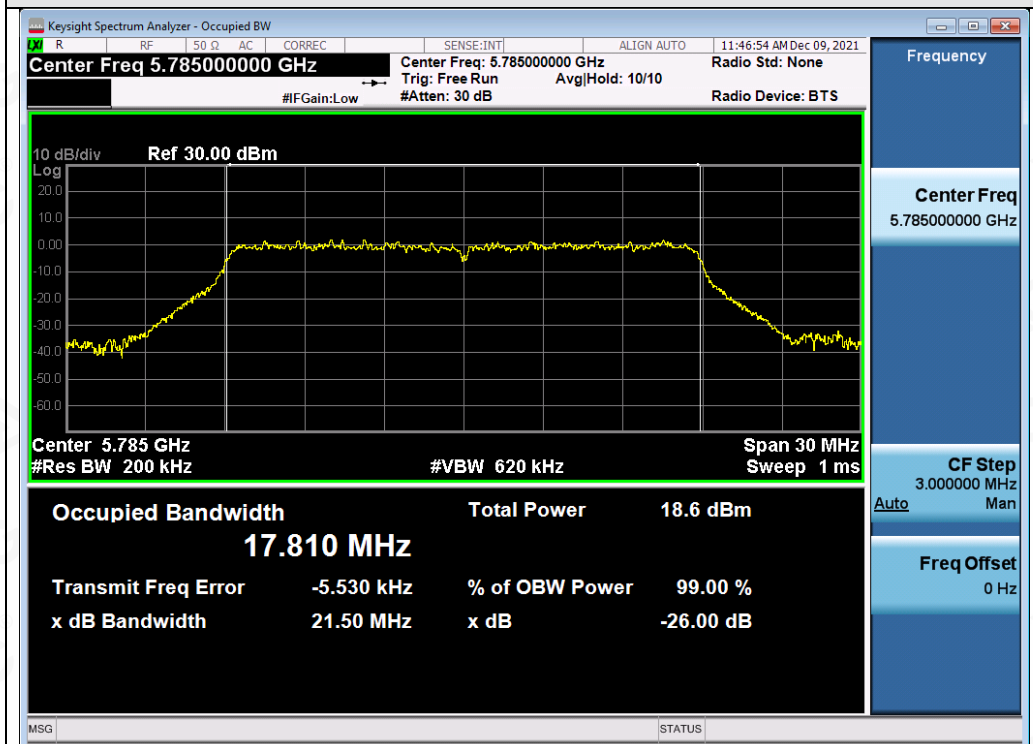
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Test_Graph_802.11ac20_ANT1_5745_MCS0_OBW

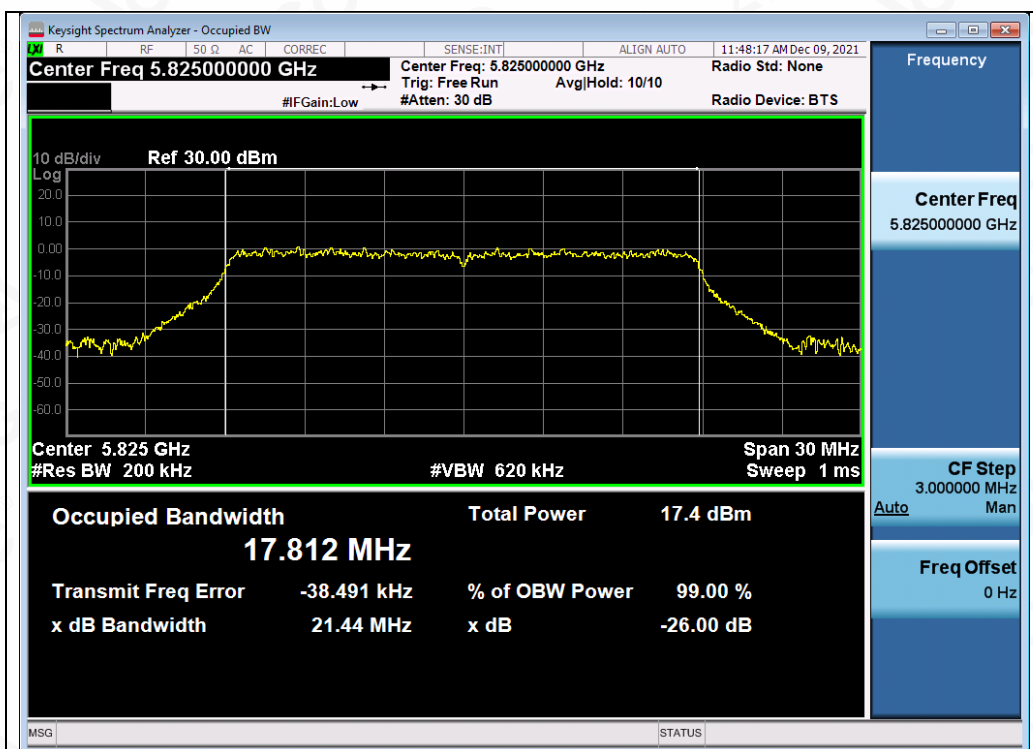


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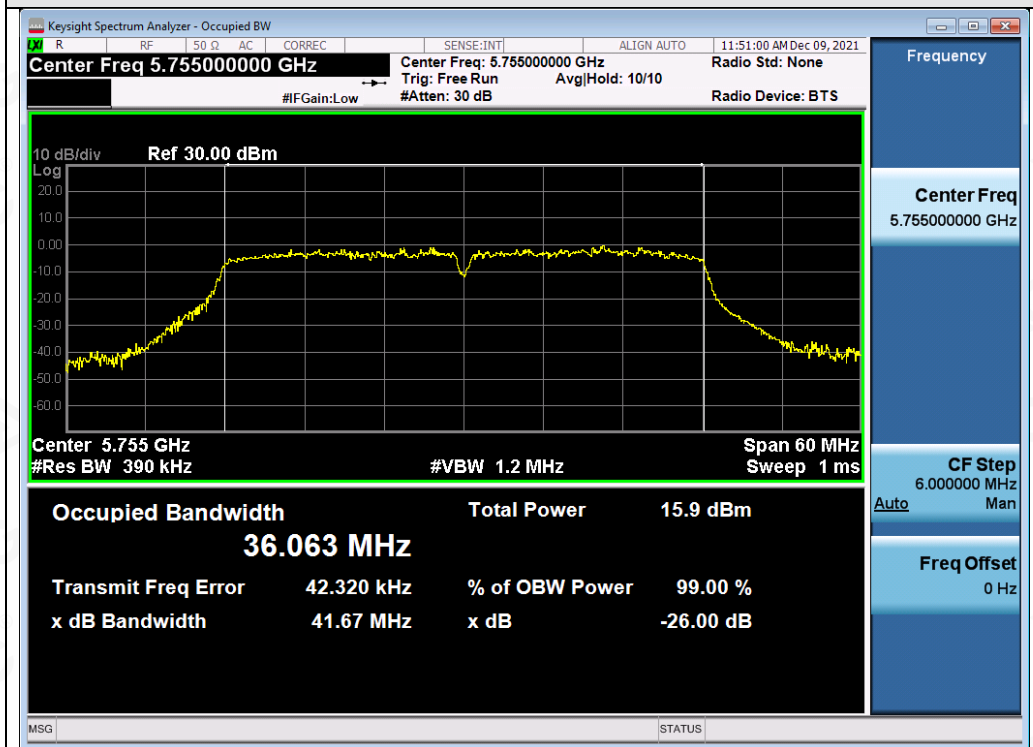
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Test_Graph_802.11ac20_ANT1_5825_MCS9_OBW

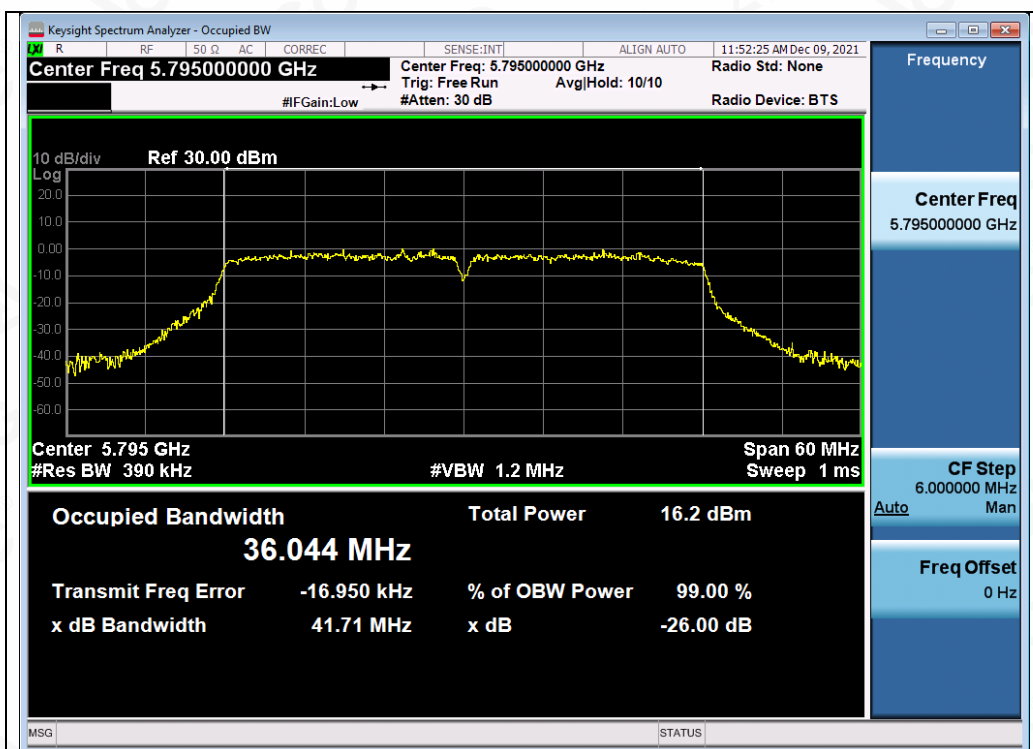


Test_Graph_802.11ac40_ANT1_5755_MCS9_OBW

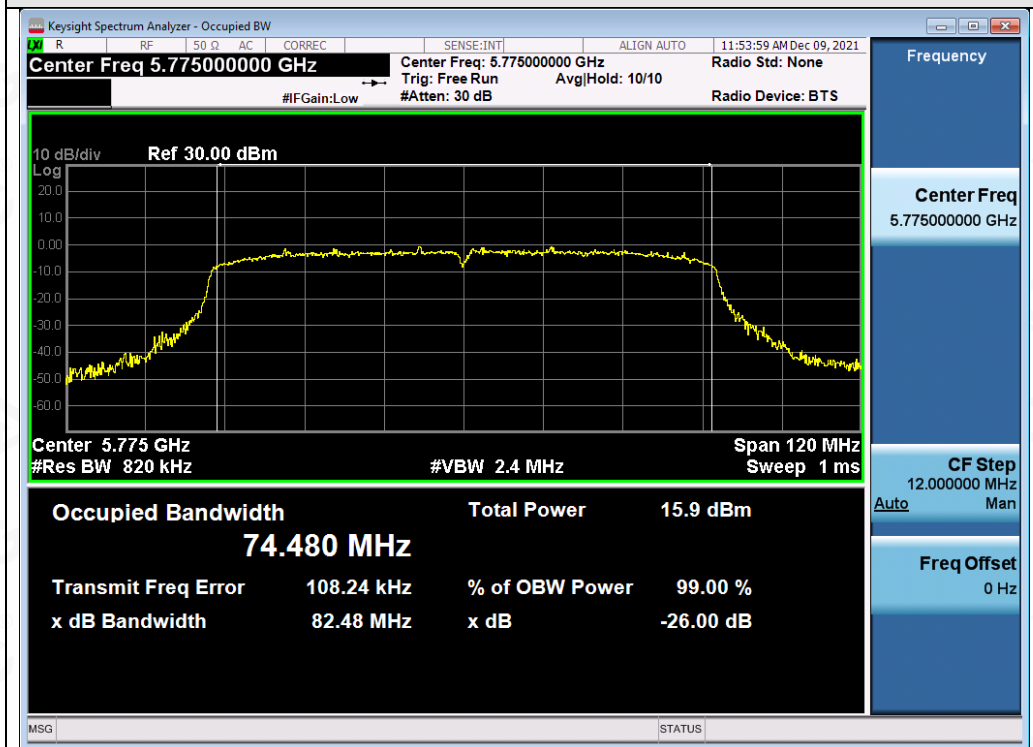
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Test_Graph_802.11ac40_ANT1_5795_MCS9_OBW



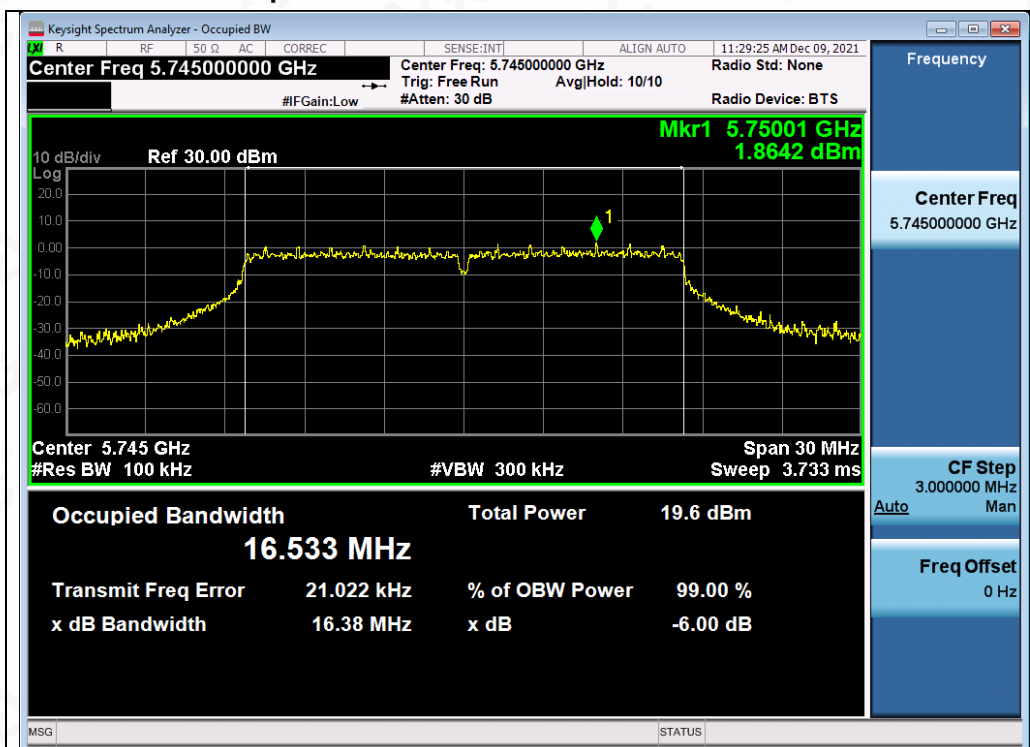
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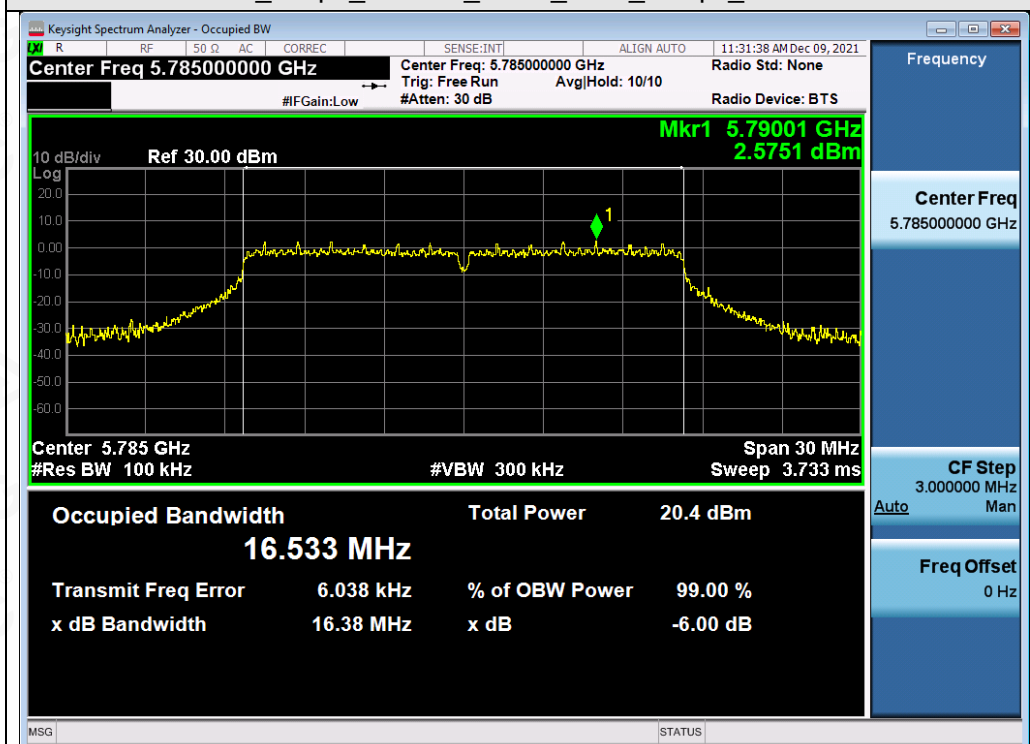
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Test Graphs of DTS Bandwidth for band 5.725-5.85 GHz



Test_Graph_802.11a_ANT1_5745_6Mbps_DTSBW

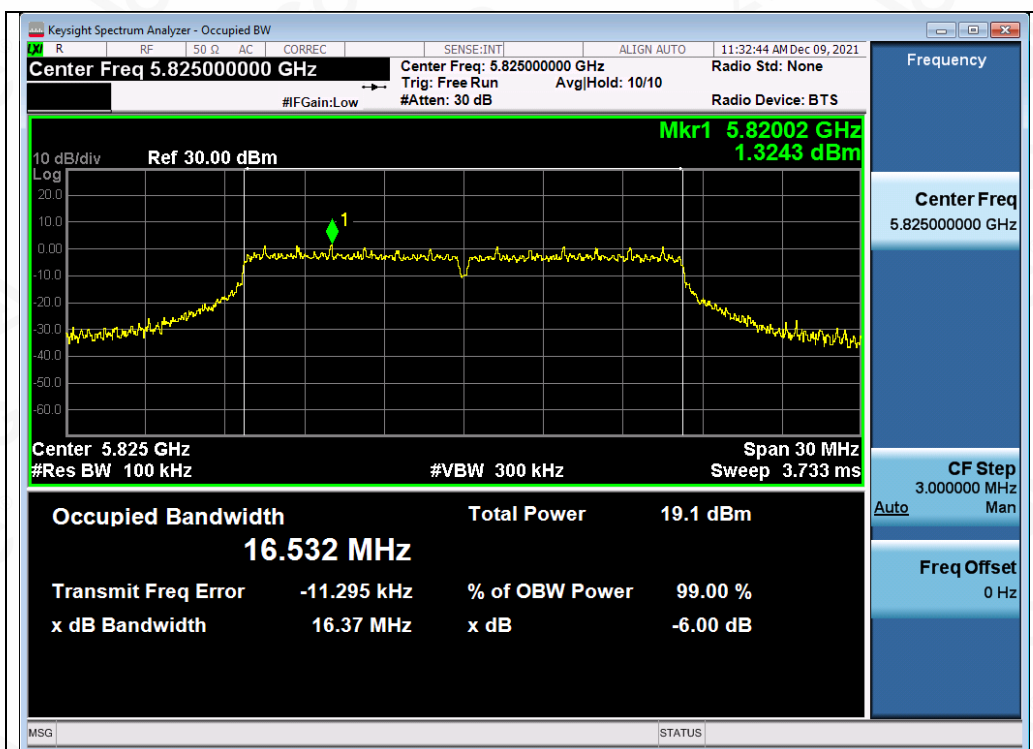


Test_Graph_802.11a_ANT1_5785_6Mbps_DTSBW

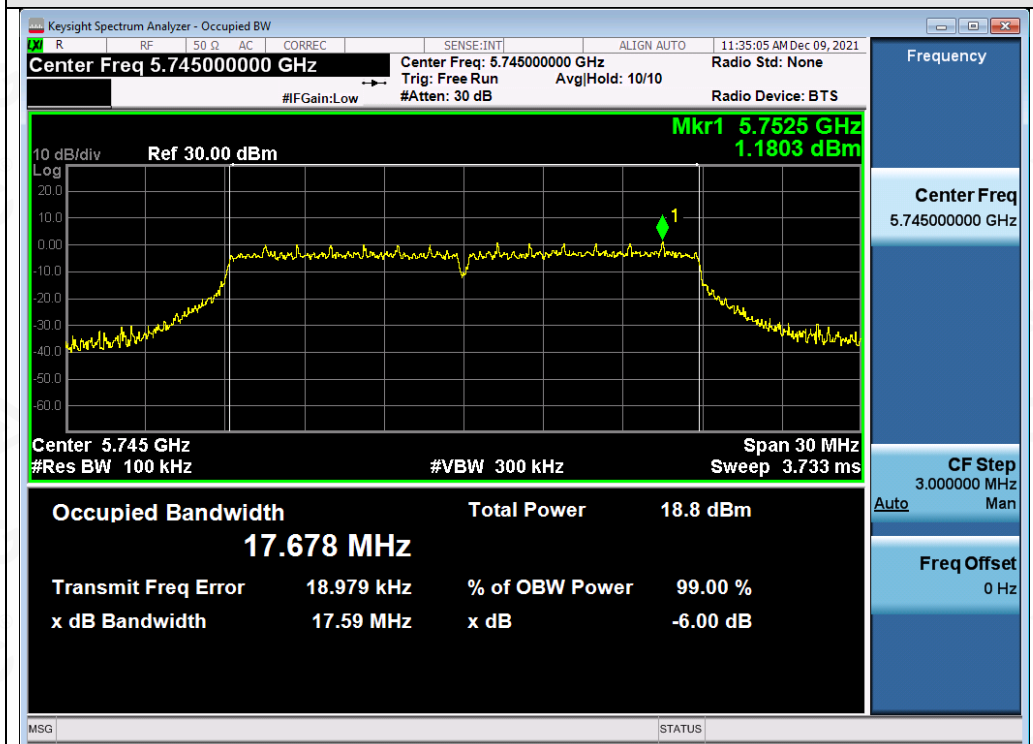
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Test_Graph_802.11a_ANT1_5825_6Mbps_DTSBW

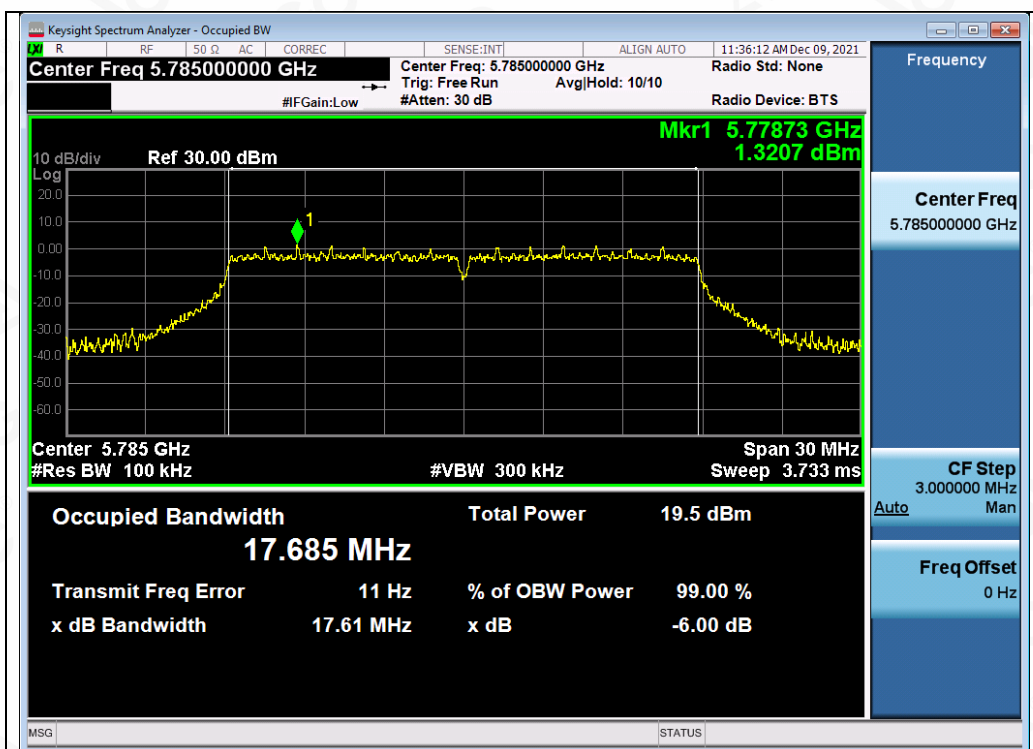


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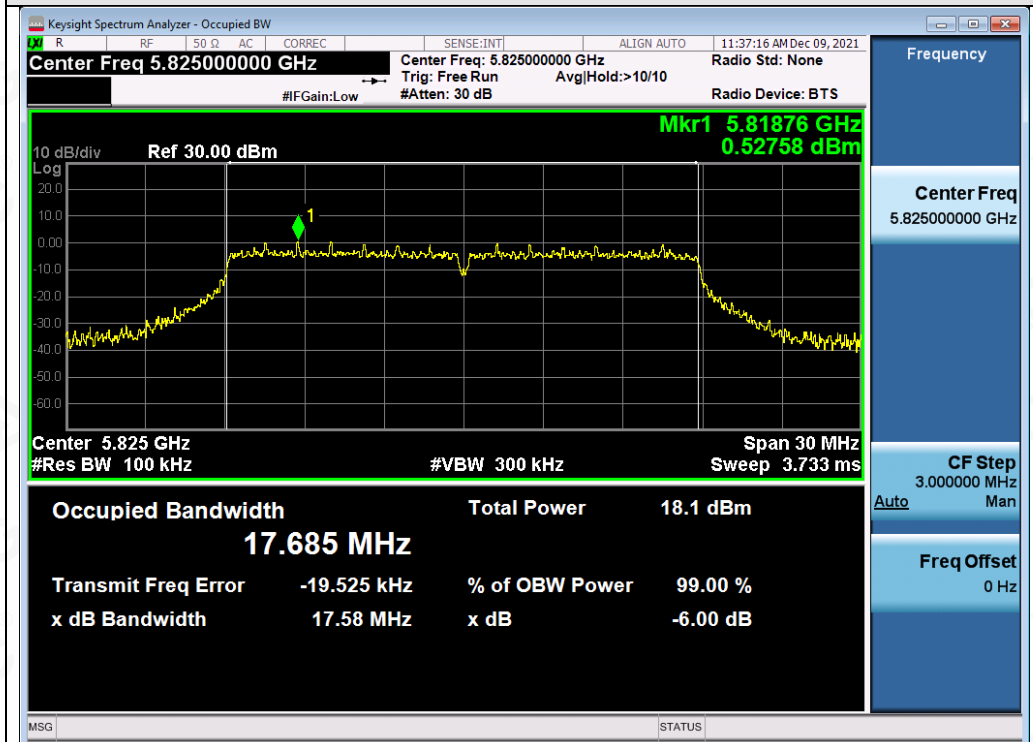
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Test_Graph_802.11n20_ANT1_5785_MCS0_DTSBW

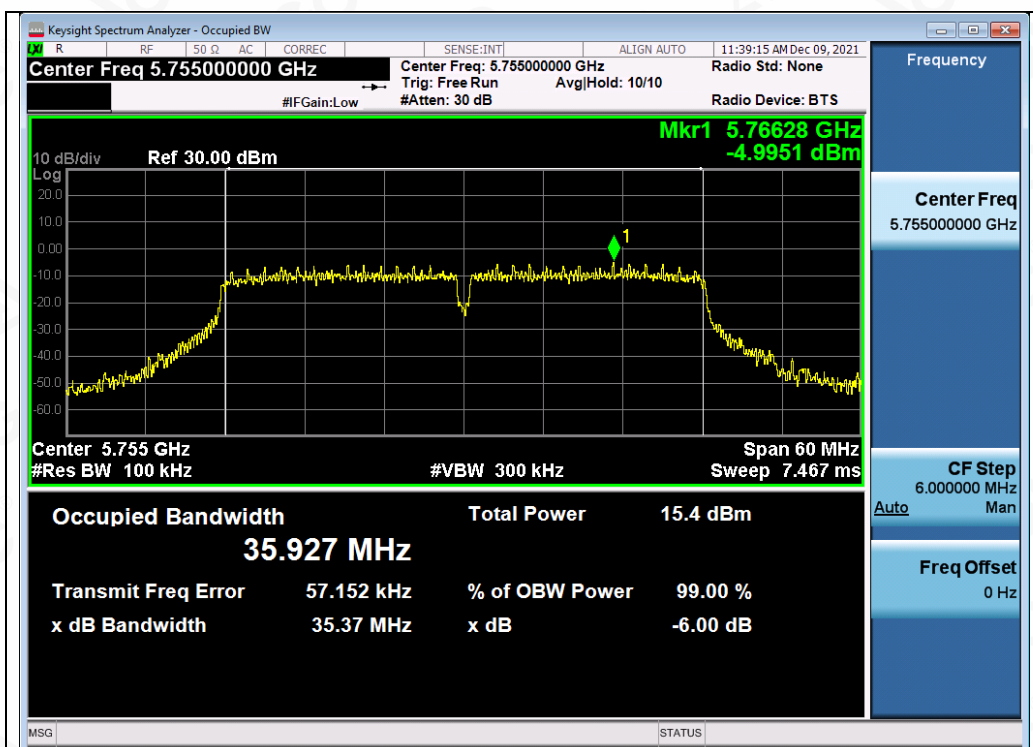


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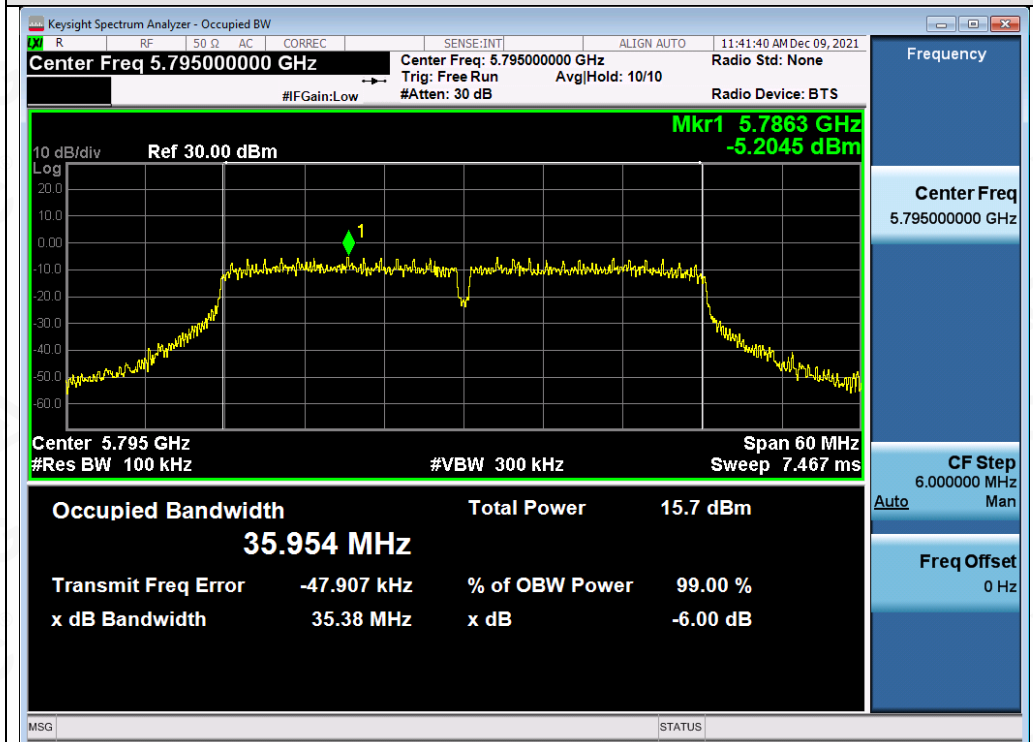
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Test_Graph_802.11n40_ANT1_5755_MCS0_DTSBW

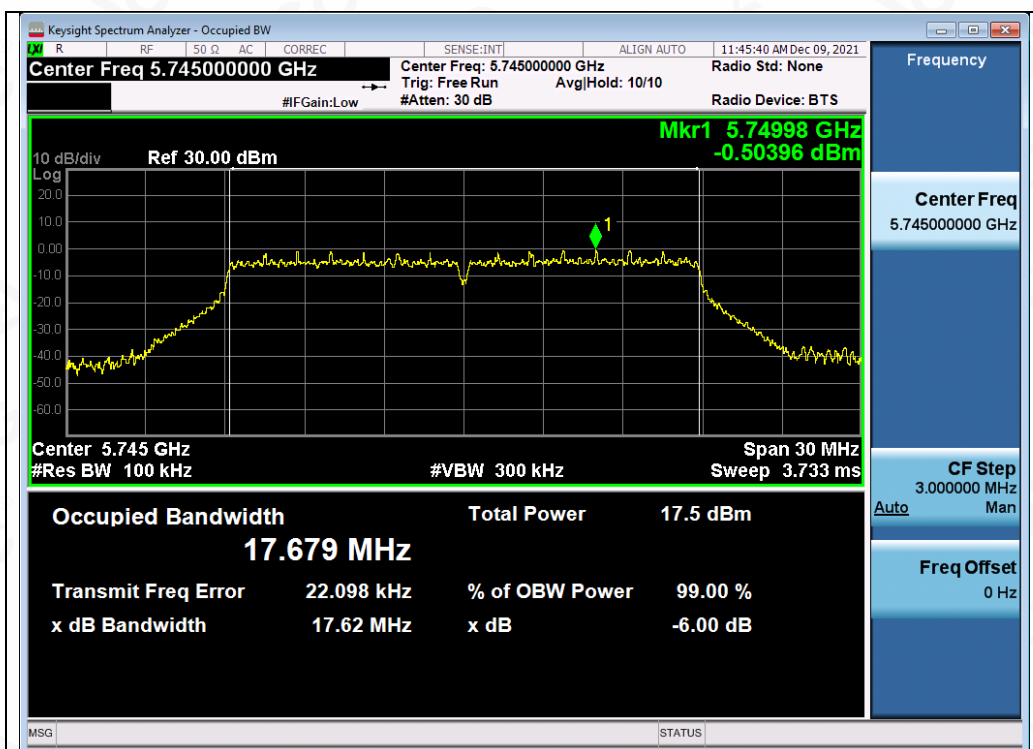


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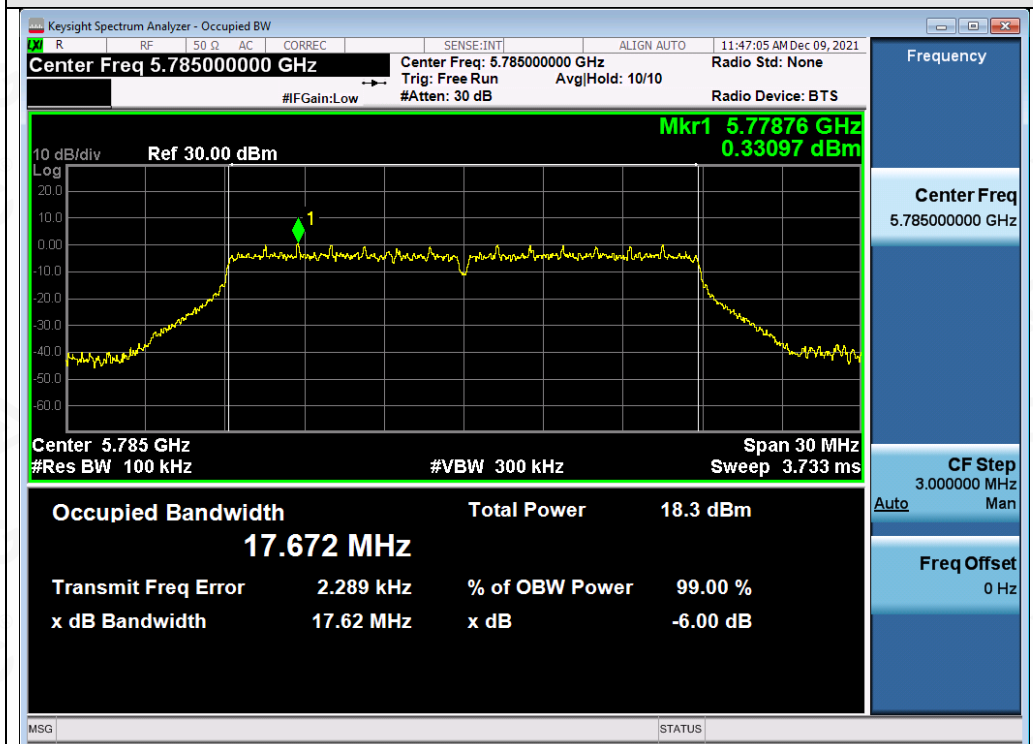
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Test_Graph_802.11ac20_ANT1_5745_MCS0_DTSBW

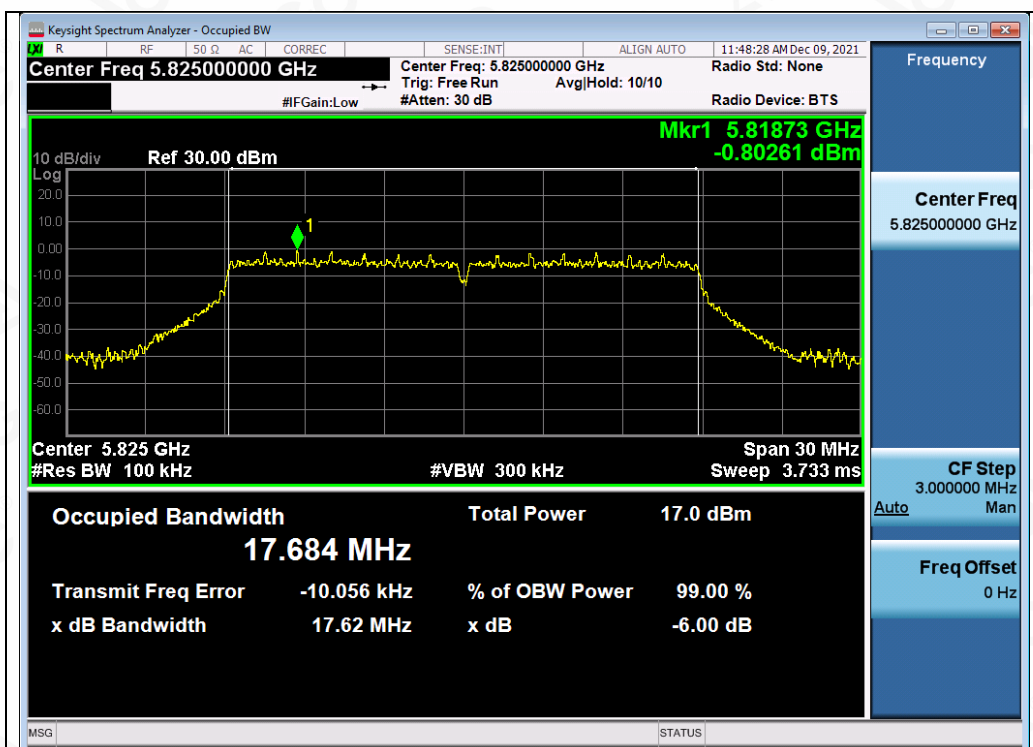


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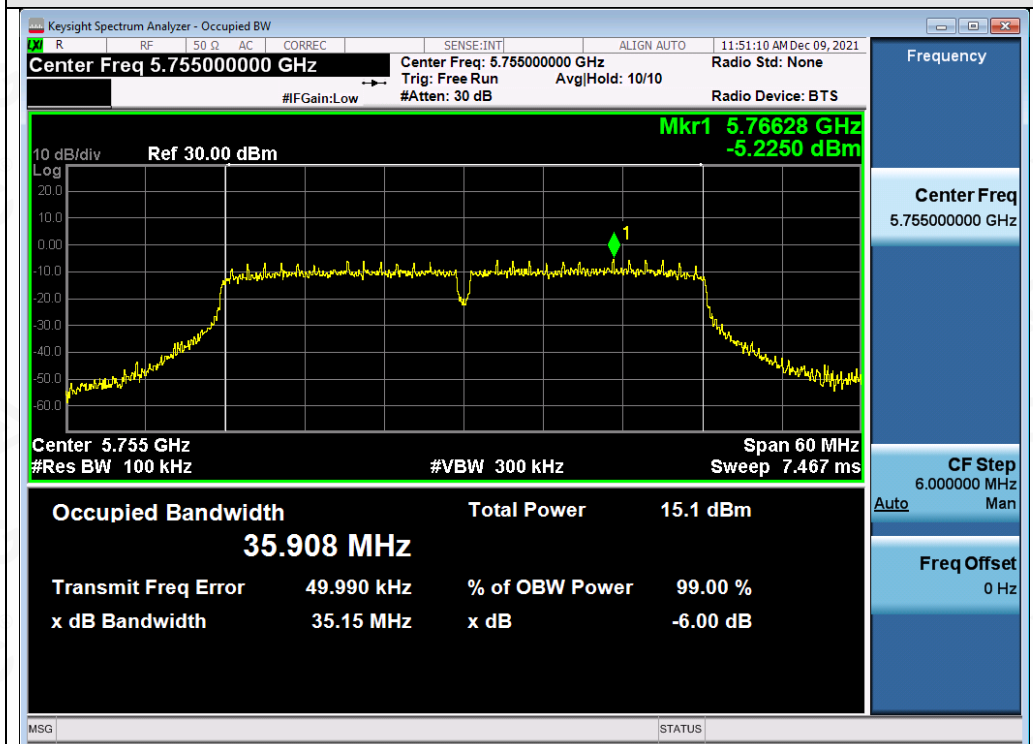
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Test_Graph_802.11ac20_ANT1_5825_MCS9_DTSBW

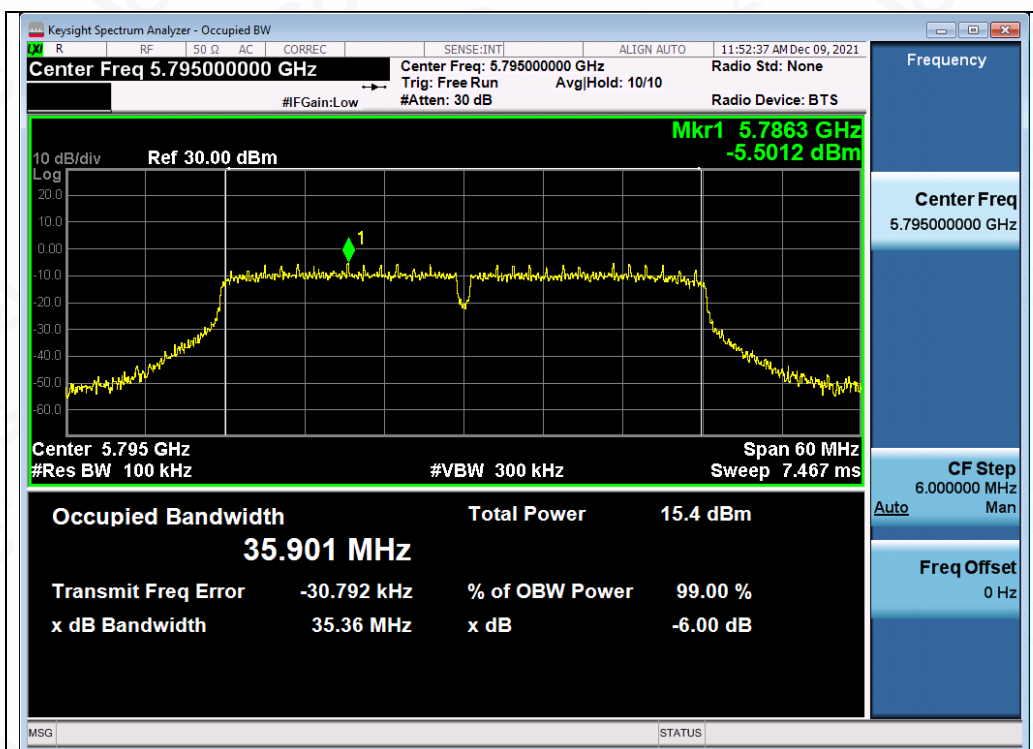


Test_Graph_802.11ac40_ANT1_5755_MCS9_DTSBW

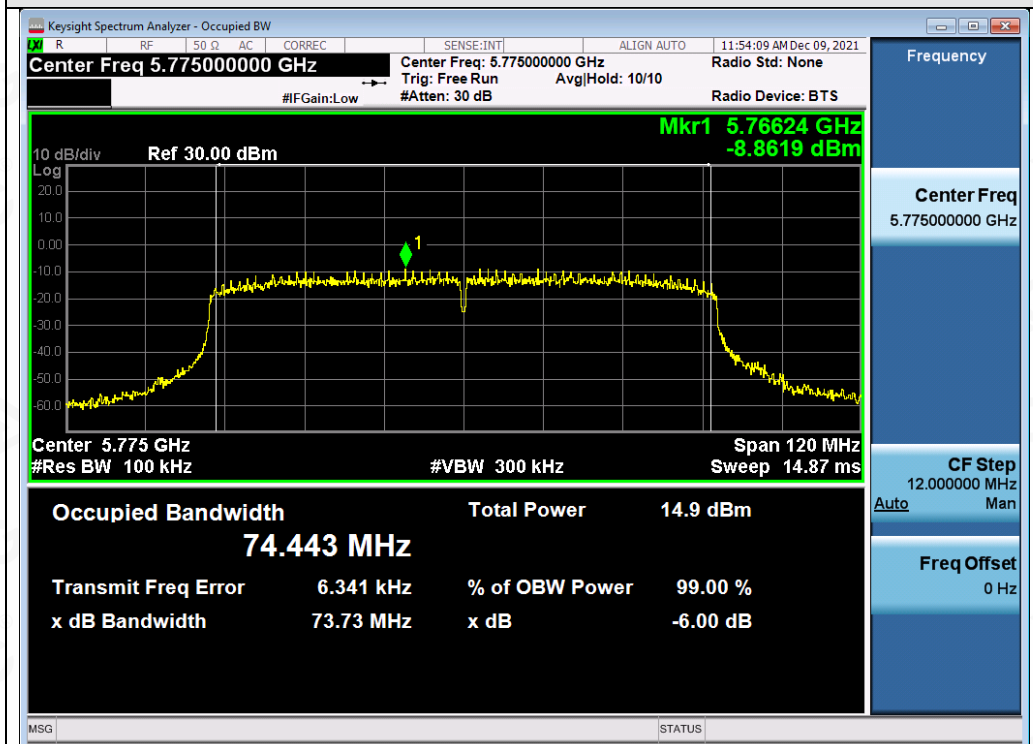
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Test_Graph_802.11ac40_ANT1_5795_MCS9_DTSBW



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	3.583	11	Pass
	5200	3.964	11	Pass
	5240	3.485	11	Pass
802.11n20	5180	3.381	11	Pass
	5200	2.816	11	Pass
	5240	2.427	11	Pass
802.11n40	5190	0.617	11	Pass
	5230	0.531	11	Pass
802.11ac20	5180	0.396	11	Pass
	5200	0.698	11	Pass
	5240	0.586	11	Pass
802.11ac40	5190	0.607	11	Pass
	5230	1.353	11	Pass
802.11ac80	5210	-4.158	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/100kHz)	Average Power Density (dBm/500kHz)	Limits (dBm/500kHz)	Pass or Fail
802.11a	5745	-5.349	1.641	30	Pass
	5785	-4.343	2.647	30	Pass
	5825	-5.970	1.020	30	Pass
802.11n20	5745	-6.086	0.904	30	Pass
	5785	-5.818	1.172	30	Pass
	5825	-6.700	0.290	30	Pass
802.11n40	5755	-5.046	1.944	30	Pass
	5795	-4.586	2.404	30	Pass
802.11ac20	5745	-7.362	-0.372	30	Pass
	5785	-6.488	0.502	30	Pass
	5825	-7.607	-0.617	30	Pass
802.11ac40	5755	-11.227	-4.237	30	Pass
	5795	-10.633	-3.643	30	Pass
802.11ac80	5775	-11.206	-4.216	30	Pass

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

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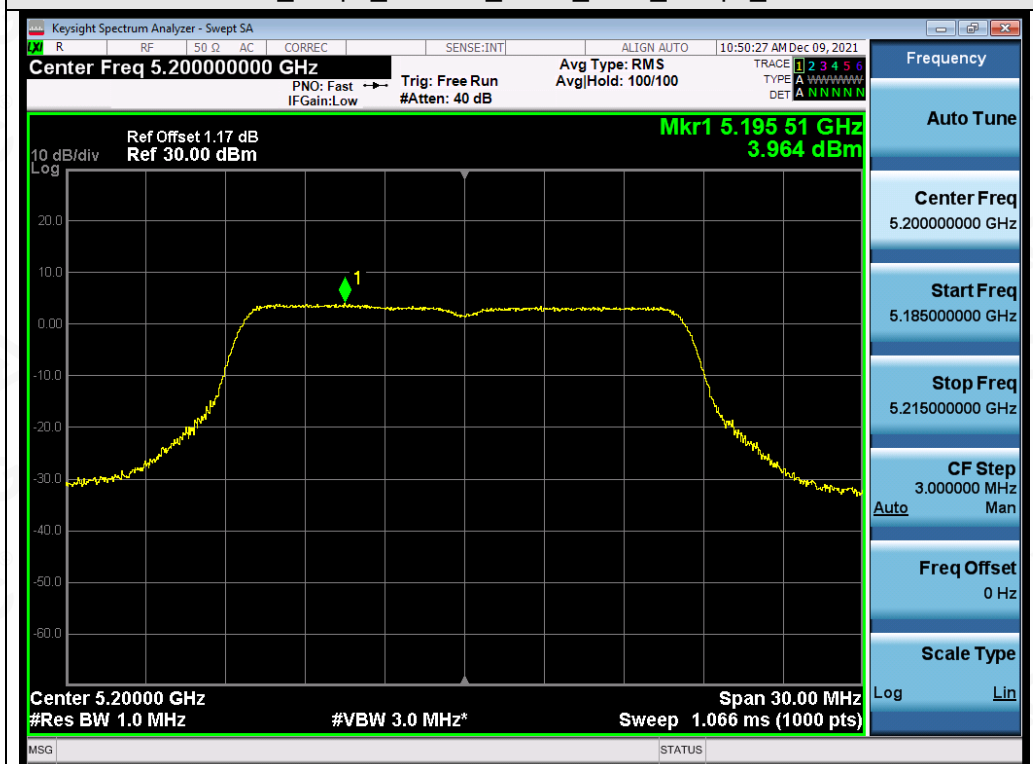
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Test Graphs of Conducted Output Power Spectral Density for band 5.15-5.25 GHz



Test_Graph_802.11a_ANT1_5180_6Mbps_PSD



Test_Graph_802.11a_ANT1_5200_6Mbps_PSD

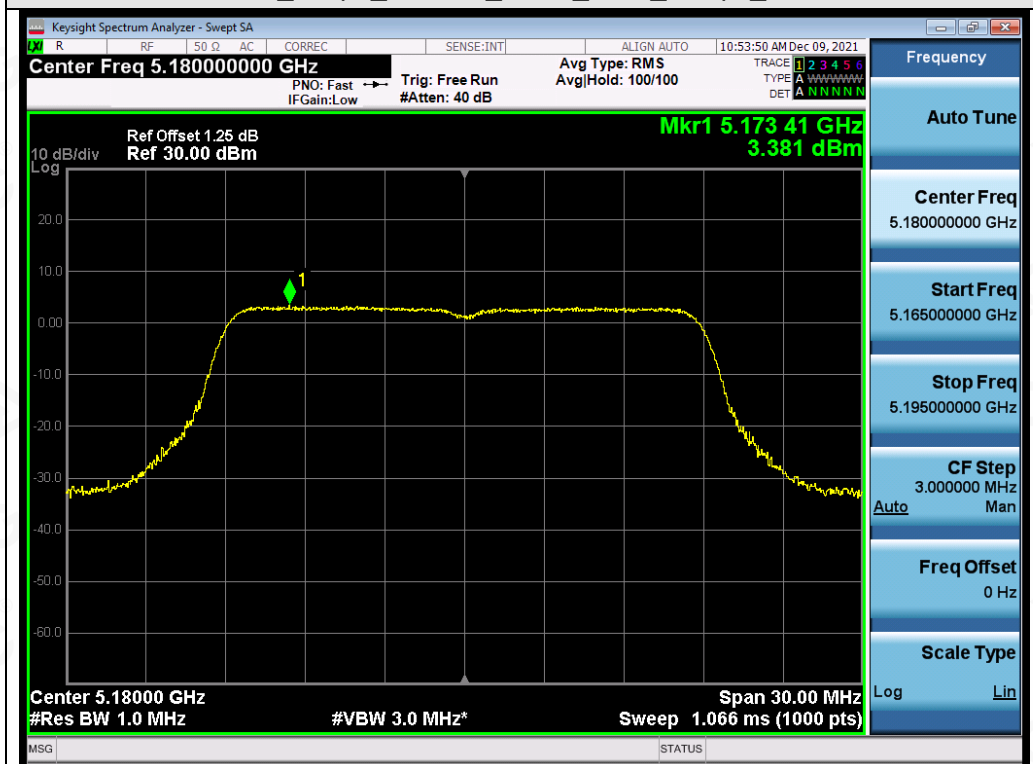
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Test_Graph_802.11a_ANT1_5240_6Mbps_PSD



Test_Graph_802.11n20_ANT1_5180_MCS0_PSD

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