

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

Product Name: Dual-Band 2x2 802.11ac and BT4.1 Combo Module

Brand Name: Foxconn

Model No.: WBUA31

Model Difference: N/A

FCC ID: RX3-WBUA31

IC: 2878F-WBUA31

Report No.: ER/2016/80013-01

Issue Date: Sep. 02, 2019

FCC Rule Part: §15.407

IC Rule Part: RSS-247 issue 1 May 2015

Prepared for: Hon Hai Precision Industry Co., Ltd.
No.151, Sec. 1, Nankan Rd., Lujhu Township, Taoyuan County, 33859, Taiwan (R.O.C)

Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

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VERIFICATION OF COMPLIANCE

Applicant: Hon Hai Precision Industry Co., Ltd.
No.151, Sec. 1, Nankan Rd., Lujhu Township, Taoyuan County,
33859, Taiwan (R.O.C)

Product Name: Dual-Band 2x2 802.11ac and BT4.1 Combo Module

Brand Name: Foxconn

Model No.: WBUA31

Model Difference: N/A

FCC ID: RX3-WBUA31

IC: 2878F-WBUA31

File Number: ER/2016/80013-01

Date of test: Aug. 02, 2016 ~ Aug. 19, 2016

Date of EUT Received: Aug. 02, 2016

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. 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 conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:

Marcus Tseng

Date:

Sep. 02, 2019

Marcus Tseng / Engineer

Prepared By:

Karen Huang

Date:

Sep. 02, 2019

Karen Huang / Clerk

Approved By:

Jim Chang

Date:

Sep. 02, 2019

Jim Chang / Asst. Manager

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2016/80013	Rev.00	Initial creation of document	All	Aug. 19, 2016	Karen Huang
ER/2016/80013-01	Rev.01	Add section 1.7 remark and conduction data updated	Page 10, 23~24	Sep. 02, 2019	Karen Huang

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1. GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Dual-Band 2x2 802.11ac and BT4.1 Combo Module
Brand Name:	Foxconn
Model No.:	WBUA31
Model Difference:	N/A
Product SW/HW version:	N/A / DVT
Radio SW/HW version:	N/A / N/A
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	3.3Vdc from Test Kit

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WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.) / (EIRP)	Modulation Technology
11a	5150~5250	4	13.98 dBm (Avg.) / 19.33 dBm (EIRP)	OFDM
	5250~5350	4	13.78 dBm	
	5470~5725	12	13.71 dBm	
	5725-5850	5	13.98 dBm	
11n / ac_20M	HT20 / VHT20 5150~5250	4	HT: 12.96 dBm (Avg.) / 21.32 dBm (EIRP) (Worst Case)	OFDM
	HT20 / VHT20 5250~5350	4	HT: 12.97 dBm (Worst Case)	
	HT20 / VHT20 5470~5725	12	HT: 12.97 dBm (Worst Case)	
	HT20 / VHT20 5725-5850	5	HT: 12.79 dBm (Worst Case)	
11n / ac_40M	HT40 / VHT40 5150~5250	2	HT: 11.63 dBm (Avg.) / 19.99 dBm (EIRP) (Worst Case)	OFDM
	HT40 / VHT40 5250~5350	2	HT: 11.92 dBm (Worst Case)	
	HT40 / VHT40 5470~5725	6	HT: 11.98 dBm (Worst Case)	
	HT40 / VHT40 5725-5850	2	HT: 11.81 dBm (Worst Case)	
11ac_80M	VHT80 5150~5250	1	8.80 dBm (Avg.) / 17.16 dBm (EIRP)	OFDM
	VHT80 5250~5350	1	8.80 dBm	
	VHT80 5470~5725	3	8.89 dBm	
	VHT80 5725-5850	1	8.78 dBm	

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Antenna Designation	PIFA Antenna Main: Part No.: W-M-D-B-N-0-0560(65"), Supplier: Foxconn 5GHz Gain: 4.12dBi (5150MHz-5250MHz) 5GHz Gain: 4.12dBi (5250MHz-5350MHz) 5GHz Gain: 4.05dBi (5470MHz-5725MHz) 5GHz Gain: 4.57dBi (5725MHz-5850MHz) Part No.: W-M-D-B-N-0-0560(70"), Supplier: Foxconn 5GHz Gain: 2.03dBi (5150MHz-5250MHz) 5GHz Gain: 2.03dBi (5250MHz-5350MHz) 5GHz Gain: 2.42dBi (5470MHz-5725MHz) 5GHz Gain: 2.93dBi (5725MHz-5850MHz) Aux: Part No.: W-M-S-D-N-2-1940(65"), Supplier: Foxconn 5GHz Gain: 5.35dBi (5150MHz-5250MHz) 5GHz Gain: 5.35dBi (5250MHz-5350MHz) 5GHz Gain: 2.91dBi (5470MHz-5725MHz) 5GHz Gain: 4.41dBi (5725MHz-5850MHz) Part No.: W-M-S-D-N-2-2100(70"), Supplier: Foxconn 5GHz Gain: 2.74dBi (5150MHz-5250MHz) 5GHz Gain: 2.74dBi (5250MHz-5350MHz) 5GHz Gain: 1.83dBi (5470MHz-5725MHz) 5GHz Gain: 2.62dBi (5725MHz-5850MHz)
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300Mbps 802.11 ac_20MHz: 6.5 –144.4Mbps 802.11 ac_40MHz: 13.5 –300Mbps 802.11 ac_80MHz: 29.3 – 650Mbps

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1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting 802.11a/b/g/n/ac, Bluetooth, features, and below is details of information.

Product Feature	
Product Name:	Dual-Band 2x2 802.11ac and BT4.1 Combo Module
Brand Name:	Foxconn
Model No.:	WBUA31
Model Difference:	N/A
FCC ID:	RX3-WBUA31
IC:	2878F-WBUA31
Bluetooth Version	V4.1 dual mode + HS
Wi-Fi Specification	802.11a/b/g/n/ac

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules

FCC KDB 662911 D01 Multiple Transmitter Output

FCC KDB 644545 D03 Guidance for IEEE 802.11ac

RSS-247 issue 1 May 2015

RSS-Gen issue4 Nov. 2014

ANSI C63.10:2013

Note:

All test items have been performed and record as per the above standards.

1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan. (TAF code 0513)

FCC Designation number is: TW0001

ISED#: 4620A

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

1.7 Remarks

The original test report ER/2016/80013 will be withdrawn with this test report ER/2016/80013-01 and is no longer valid when the withdrawal occurred.

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2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss 0.9dB, and 10dB attenuator.

SISO mode offset:

= RF cable loss (dB)+ attenuation factor(dB)=10.9(dB)

MIMO mode offset

= RF cable loss (dB)+ attenuation factor(dB)+ 10 log(NANT) dB =13.9(dB)

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2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Unshielded
3.	Notebook	Lenovo	L420	LR-7HXZA	Shielded	Unshielded
4.	Test Kit	N/A	N/A	N/A	N/A	N/A

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3. SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-247 §6.2.1~ 4 (1) RSS-Gen §6.6	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Power Spectral Density	Compliant
§15.407(b)	RSS-247 §6.2.1~ 4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.7 RSS- Gen §8.3	Antenna Requirement	Compliant

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4. DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

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
42	5210 MHz

Operated band in 5250 MHz ~5350 MHz:

4 channels are provided for 802.11a, 802.11n_HT20, 802.11ac_VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n_HT40, 802.11ac_VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
54	5270 MHz	62	5310 MHz

1 channel is provided for 802.11ac_VHT80

CHANNEL	FREQUENCY
58	5290 MHz

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Operated band in 5470 MHz ~5725 MHz:

11 channels are provided for 802.11a, 802.11n_HT20, 802.11ac_VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
100	5500 MHz	124	5620 MHz
104	5520 MHz	128	5640 MHz
108	5540 MHz	132	5660 MHz
112	5560 MHz	136	5680 MHz
116	5580 MHz	140	5700 MHz
120	5600 MHz	144	5720 MHz

5 channels are provided for 802.11n_HT40, 802.11ac_VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
102	5510 MHz	126	5630 MHz
110	5550 MHz	134	5670 MHz
118	5590 MHz	142	5710 MHz

3 channels are provided for 802.11ac_VHT80

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
106	5530 MHz	138	5690 MHz
122	5610 MHz		

Operated band in 5725 MHz ~5850 MHz:

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
155	5775 MHz

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.
4. The given UE is pre-scanned among 802.11n and ac modes, and 802.11ac yields the highest reading that generates the highest emission. Therefore, 802.11ac as the mode of test configuration is chosen to carry out the relevantly mandatory test items.

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	MAIN
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5720	100 to 140	100,116,140	OFDM	6	MAIN
802.11ac_VHT80	5530~5690	106 to 138	106,122,138	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	MAIN
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO

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MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5500~5720	100 to 144	100,116,140	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5510~5710	102 to 142	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5690	106 to 138	106,122,138	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	MAIN
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

Remark: The device will not operate in 5600~5650MHz band for IC.

Pre-scanned was done on antenna set W-M-D-B-N-0-0560 & W-M-S-D-N-2-1940 (65"), and antenna set W-M-D-B-N-0-0560 & W-M-S-D-N-2-2100 (70"). The W-M-D-B-N-0-0560 & W-M-S-D-N-2-1940 (65") results higher emission at 5GHz. Therefore, the completed set of measurement was done on antenna W-M-D-B-N-0-0560 & W-M-S-D-N-2-1940 (65") to presented on this test report.

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ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	MAIN
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	MAIN
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS8	MIMO
802.11a	5500~5720	100 to 144	100,116,140,144	OFDM	6	MAIN
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5510~5710	102 to 142	102,110,134,142	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5690	106 to 138	106,122,138	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	MAIN
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz
The Maximum Output Power Measurement	+/- 0.96 dB
Peak Power Spectral Density Measurement	+/- 1.67 dB
Frequency Stability	+/- 123.36 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6. CONDUCTED EMISSION TEST

6.1. Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

6.2. Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100760	05/10/2016	05/09/2017
LISN	SCHWARZ BECK	NSLK 8127	8127-649	05/16/2016	05/15/2017
LISN	MESS TEC	FCC-LISN-50/250- 25-2-01	4034	05/16/2016	05/15/2017
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2015	11/25/2016

6.3. EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

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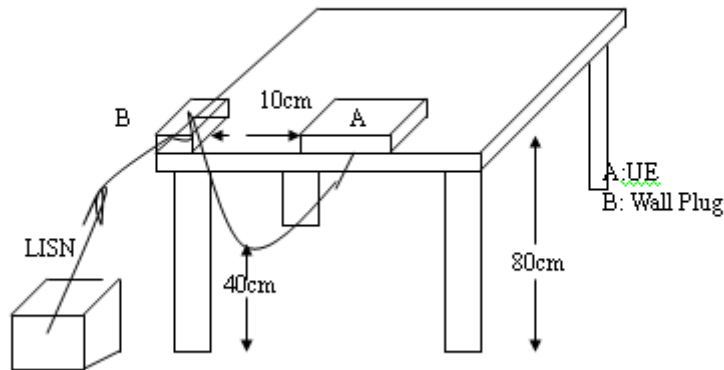
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6.4. Test SET-UP



6.5. Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6. Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

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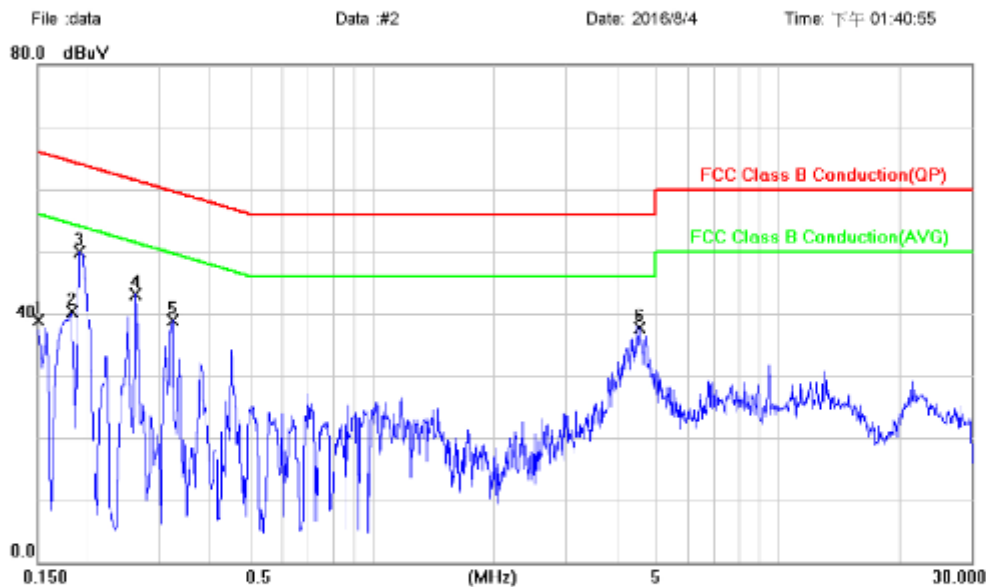
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	operation mode	Test Date:	Marcus Tseng
-----------------	----------------	------------	--------------

Site: Conduction Room	Phase: L1	Temperature: 25 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 85 %
Mode: Operation mode		
Note:		

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	38.78	0.07	38.85	66.00	-27.15	peak	
2		0.1820	40.16	0.08	40.24	64.39	-24.15	peak	
3 *		0.1900	49.79	0.08	49.87	64.04	-14.17	peak	
4		0.2620	42.94	0.09	43.03	61.37	-18.34	peak	
5		0.3220	38.74	0.09	38.83	59.66	-20.83	peak	
6		4.5580	37.44	0.27	37.71	56.00	-18.29	peak	

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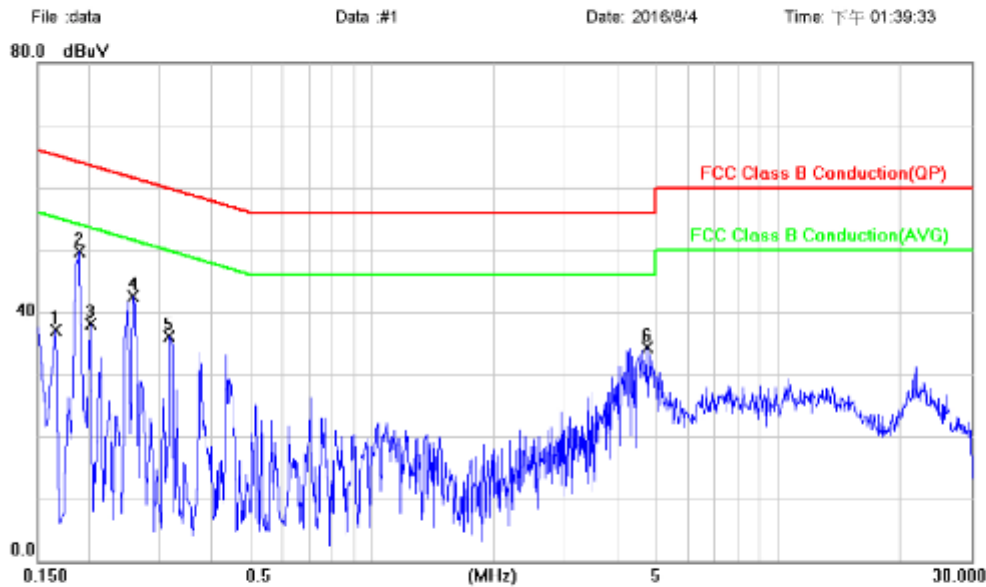
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Site: Conduction Room Phase: **N** Temperature: 25 °C
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 85 %
Mode: Operation mode
Note:

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1660	36.98	0.07	37.05	65.16	-28.11	peak	
2	*	0.1900	49.57	0.08	49.65	64.04	-14.39	peak	
3		0.2020	37.97	0.08	38.05	63.53	-25.48	peak	
4		0.2580	42.32	0.09	42.41	61.50	-19.09	peak	
5		0.3180	35.93	0.09	36.02	59.76	-23.74	peak	
6		4.7580	33.99	0.27	34.26	56.00	-21.74	peak	

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7. DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle
802.11a	95.20	0.21
802.11n_20	94.90	0.23
802.11ac_20	94.87	0.23
802.11n_40	90.44	0.44
802.11ac_40	87.44	0.58
802.11ac_80	82.93	0.81

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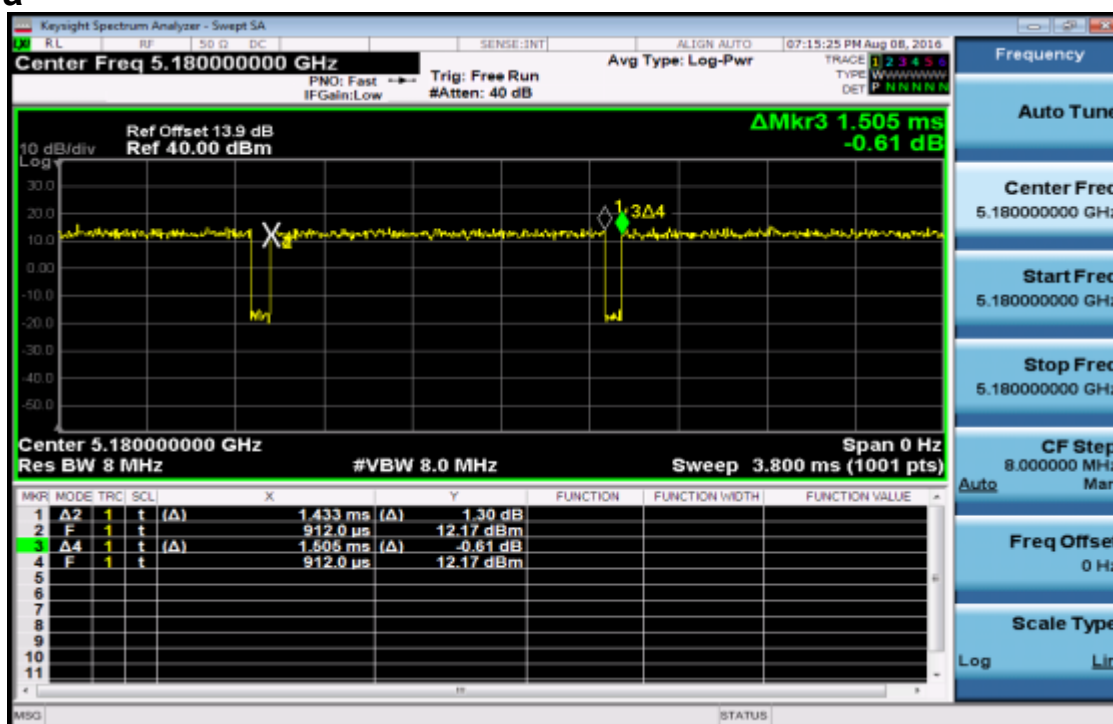
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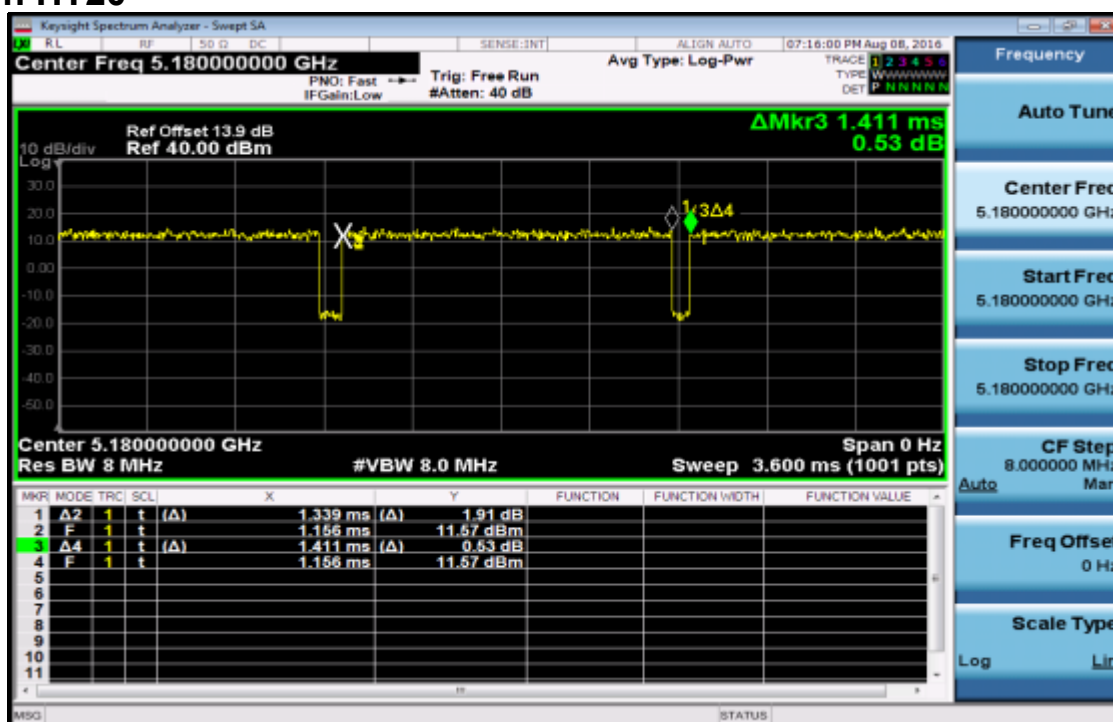
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DUTY CYCLE TEST SIGNAL Measurement Result



802.11n HT20



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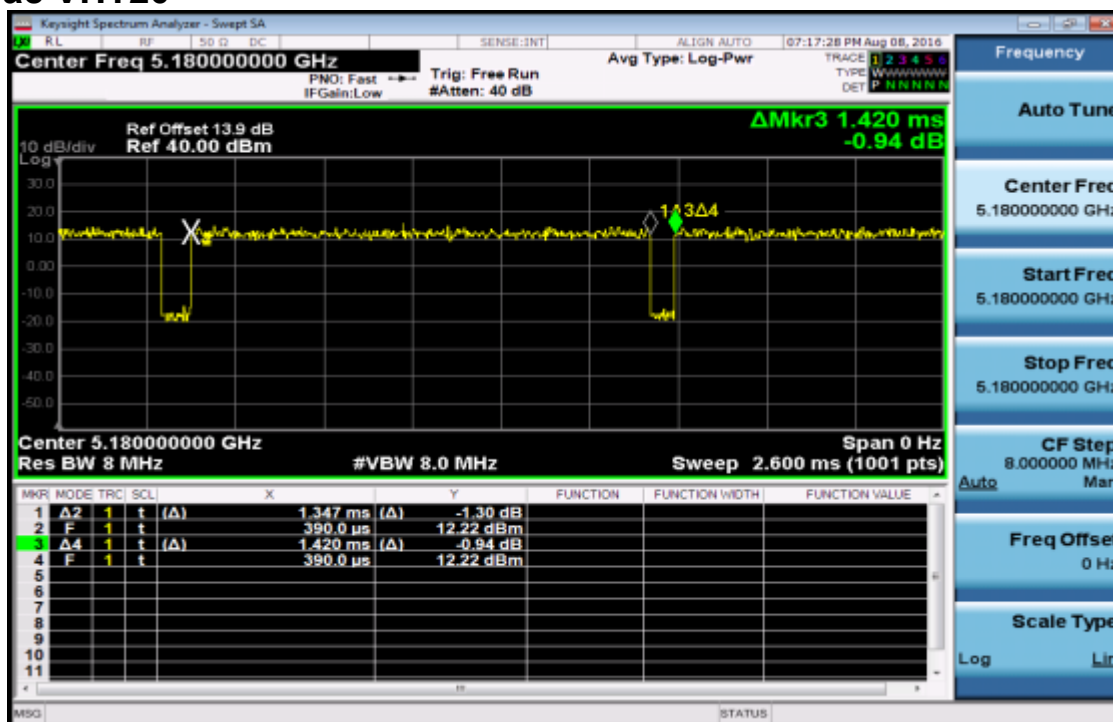
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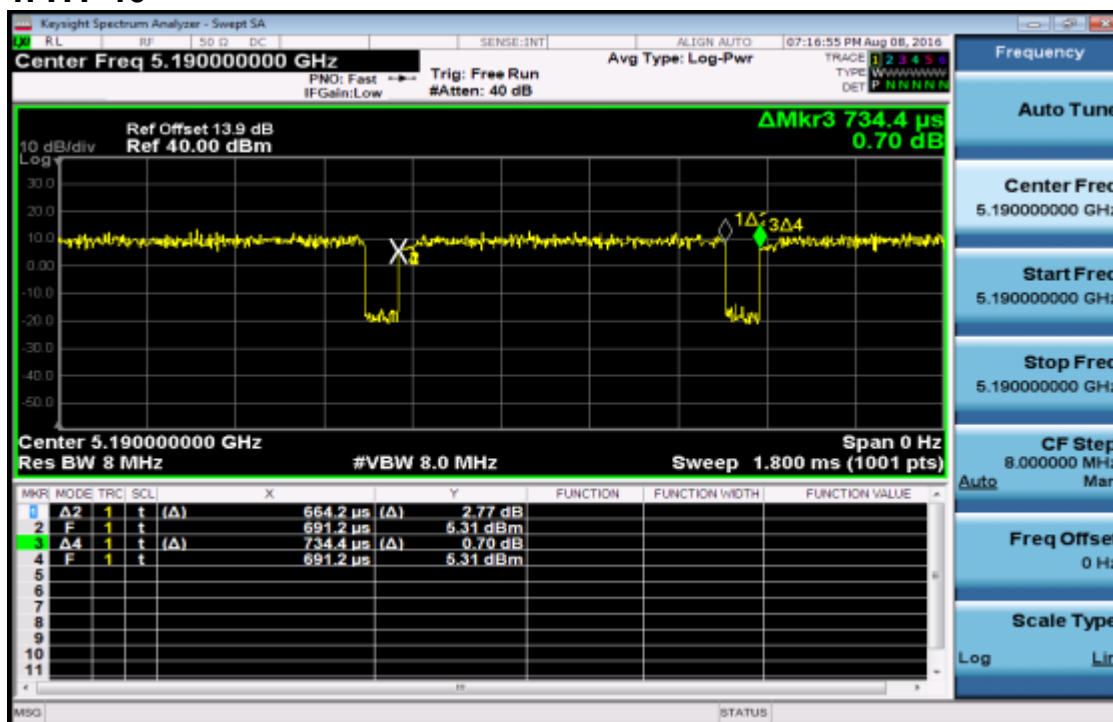
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802.11ac VHT20



802.11 n HT 40



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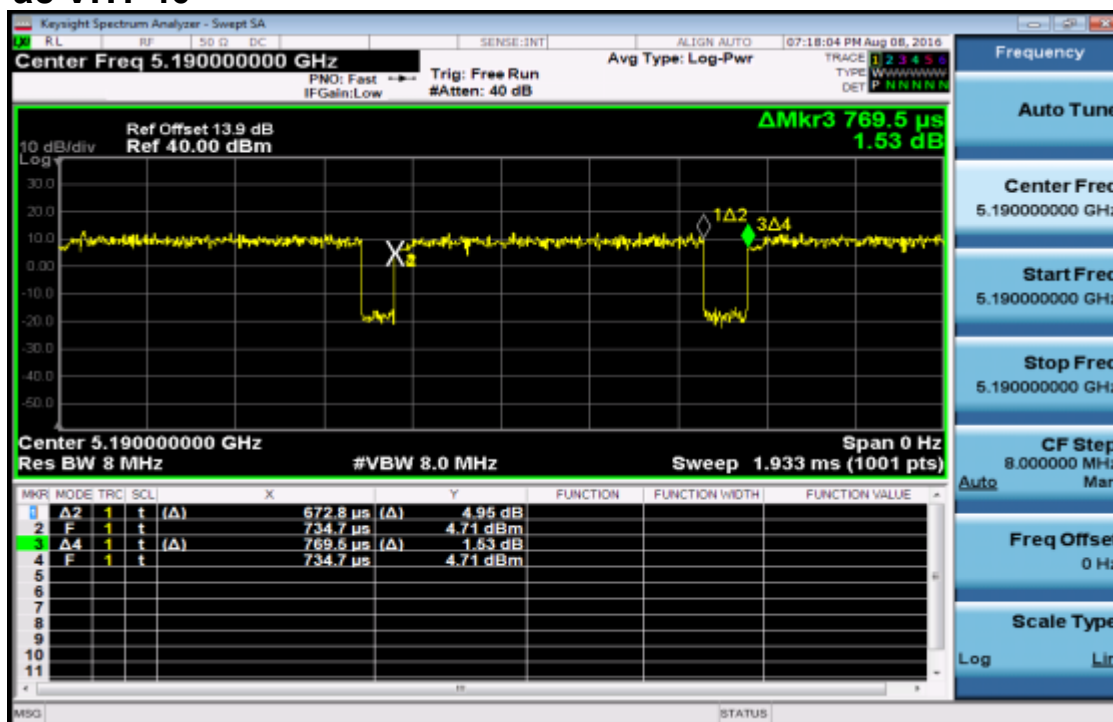
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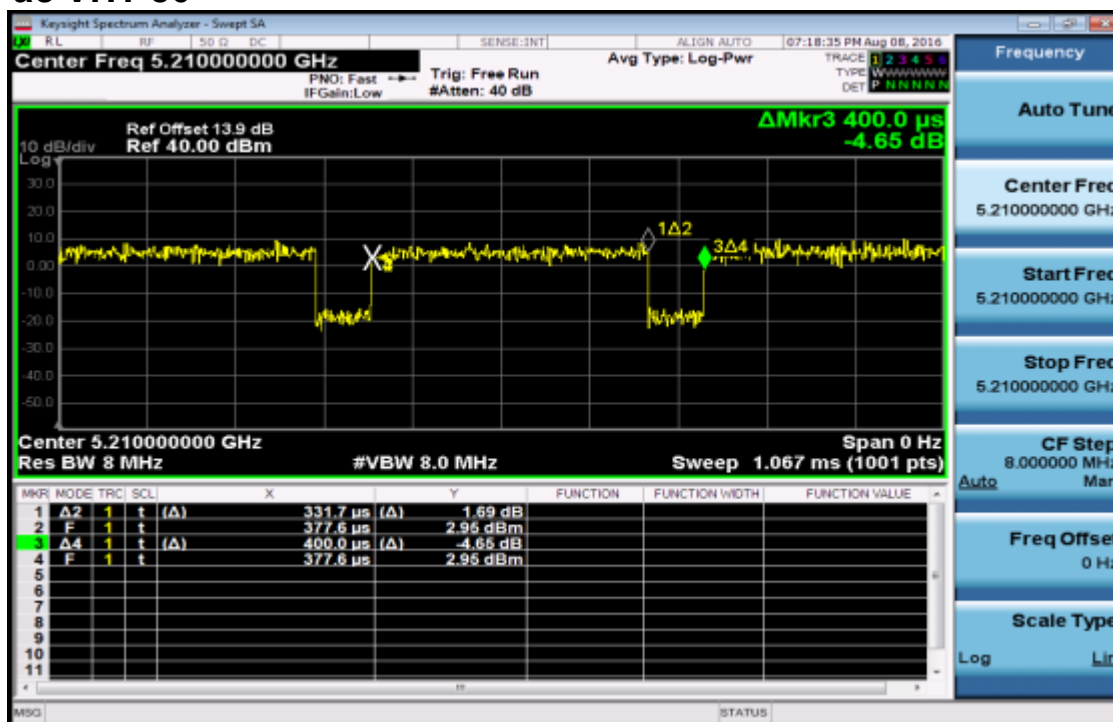
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802.11 ac VHT 40



802.11 ac VHT 80



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8. 26dB & 6dB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
 - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
 - b. Mark the peak frequency and -26dB (upper and lower) frequency.
4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
 - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto
 - b. Mark the peak frequency and -6dB (upper and lower) frequency.
6. Repeat above procedures until all test default channel measured were complete.

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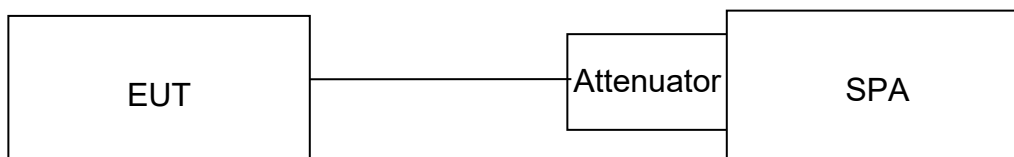
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8.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/09/2015	12/08/2016
Power Sensor	Anritsu	MA2411B	917032	12/09/2015	12/08/2016
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2016	05/16/2017

8.4 Test Set-up



8.5 Measurement Result 26dB Bandwidth

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802.11a_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	26.73	14.271
5220	22.83	13.585
5240	23.24	13.662
5260	22.62	13.545
5300	19.58	12.917
5320	20.01	13.012
5500	19.25	12.845
5580	19.44	12.887
5700	19.00	12.787

802.11n_HT20_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	19.88	12.985
5220	19.93	12.994
5240	19.73	12.950
5260	19.67	12.939
5300	19.80	12.966
5320	19.89	12.986
5500	21.08	13.239
5580	20.26	13.067
5700	20.17	13.047

802.11n_HT20_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	20.15	13.043
5220	19.93	12.994
5240	20.70	13.159
5260	20.26	13.066
5300	19.63	12.930
5320	19.70	12.946
5500	19.89	12.986
5580	19.73	12.952
5700	19.73	12.951

802.11n_HT40_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	40.82	16.109
5230	43.03	16.338
5270	40.39	16.062
5310	44.72	16.505
5510	41.33	16.163
5550	40.48	16.073
5670	41.72	16.204

802.11n_HT40_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	41.00	16.127
5230	40.72	16.098
5270	39.96	16.016
5310	41.41	16.171
5510	41.27	16.156
5550	40.04	16.025
5670	42.22	16.256

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802.11ac _VHT80_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	82.88	19.184
5290	80.97	19.083
5530	83.14	19.198
5610	81.68	19.121

802.11ac _VHT80_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	83.19	19.201
5290	85.39	19.314
5530	80.80	19.074
5610	83.04	19.193

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99% Bandwidth

802.11a_Main

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.443	12.160
5220	16.408	12.151
5240	16.385	12.144
5260	16.410	12.151
5300	16.365	12.139
5320	16.351	12.135
5500	16.289	12.119
5580	16.311	12.125
5700	16.304	12.123

802.11n_HT20_Main

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.434	12.414
5220	17.434	12.414
5240	17.432	12.413
5260	17.428	12.412
5300	17.463	12.421
5320	17.405	12.407
5500	17.398	12.405
5580	17.391	12.403
5700	17.363	12.396

802.11n_HT20_Aux1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.432	12.413
5220	17.430	12.413
5240	17.448	12.417
5260	17.414	12.409
5300	17.400	12.405
5320	17.404	12.406
5500	17.395	12.404
5580	17.394	12.404
5700	17.430	12.413

802.11n_HT40_Main

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	35.855	15.545
5230	35.845	15.544
5270	35.873	15.548
5310	35.849	15.545
5510	35.308	15.479
5550	35.871	15.547
5670	35.877	15.548

802.11n_HT40_Aux1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	35.853	15.545
5230	35.851	15.545
5270	35.816	15.541
5310	35.895	15.550
5510	35.833	15.543
5550	35.858	15.546
5670	35.796	15.538

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802.11ac_VHT80_Main

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	74.941	18.747
5290	74.990	18.750
5530	75.017	18.752
5610	74.939	18.747

802.11ac_VHT80_Aux1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.033	18.753
5290	75.021	18.752
5530	74.934	18.747
5610	74.930	18.747

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6dB Bandwidth (5725 MHz~ 5850 MHz) measure with Peak detector for FCC

802.11a_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.06	11.779
5785	14.41	11.586
5825	15.31	11.849

802.11n_HT20_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.10	11.791
5785	15.14	11.800
5825	15.15	11.803

802.11n_HT20_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.15	11.804
5785	15.17	11.810
5825	15.12	11.796

802.11n_HT40_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.10	15.453
5795	35.10	15.453

802.11n_HT40_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.10	15.453
5795	35.11	15.455

802.11ac_VHT80_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.04	18.753

802.11ac_VHT80_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.13	18.758

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6dB Bandwidth (5725 MHz~ 5850 MHz) measure with Average detector for IC

802.11a_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.22	11.824
5785	15.25	11.833
5825	14.55	11.629

802.11n_HT20_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.17	12.087
5785	16.68	12.222
5825	17.13	12.338

802.11n_HT20_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	15.82	11.992
5785	15.34	11.858
5825	14.92	11.738

802.11n_HT40_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	33.70	15.276
5795	33.38	15.235

802.11n_HT40_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	34.68	15.401
5795	33.02	15.188

802.11ac_VHT80_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	70.54	18.484

802.11ac_VHT80_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	73.11	18.640

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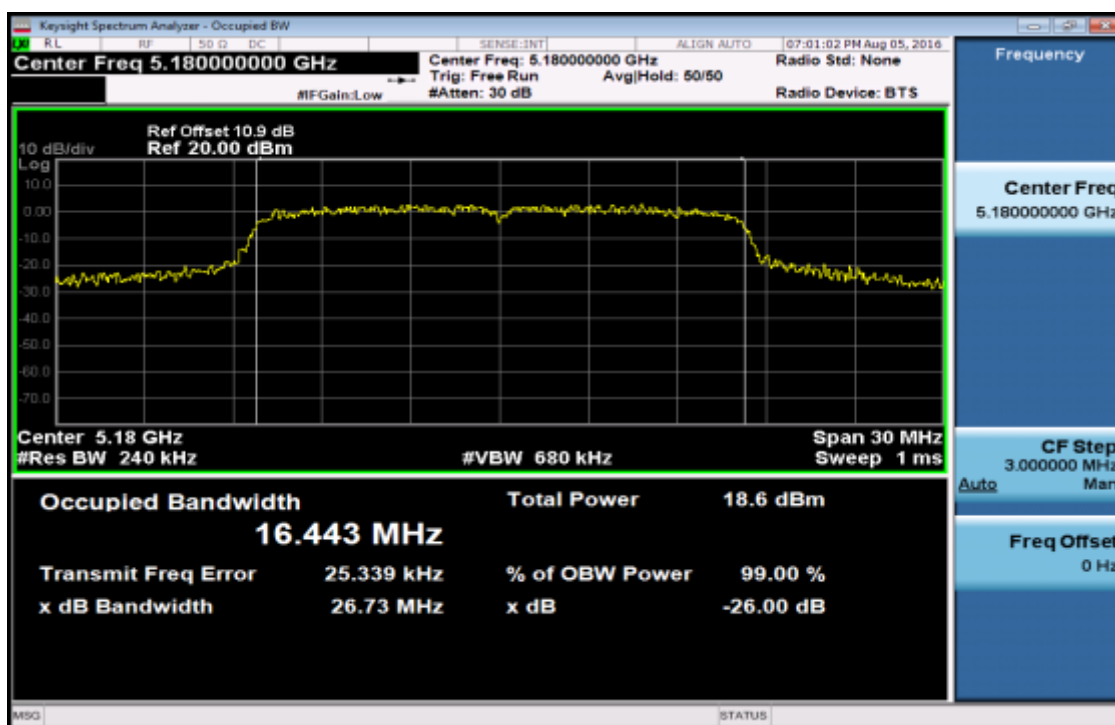
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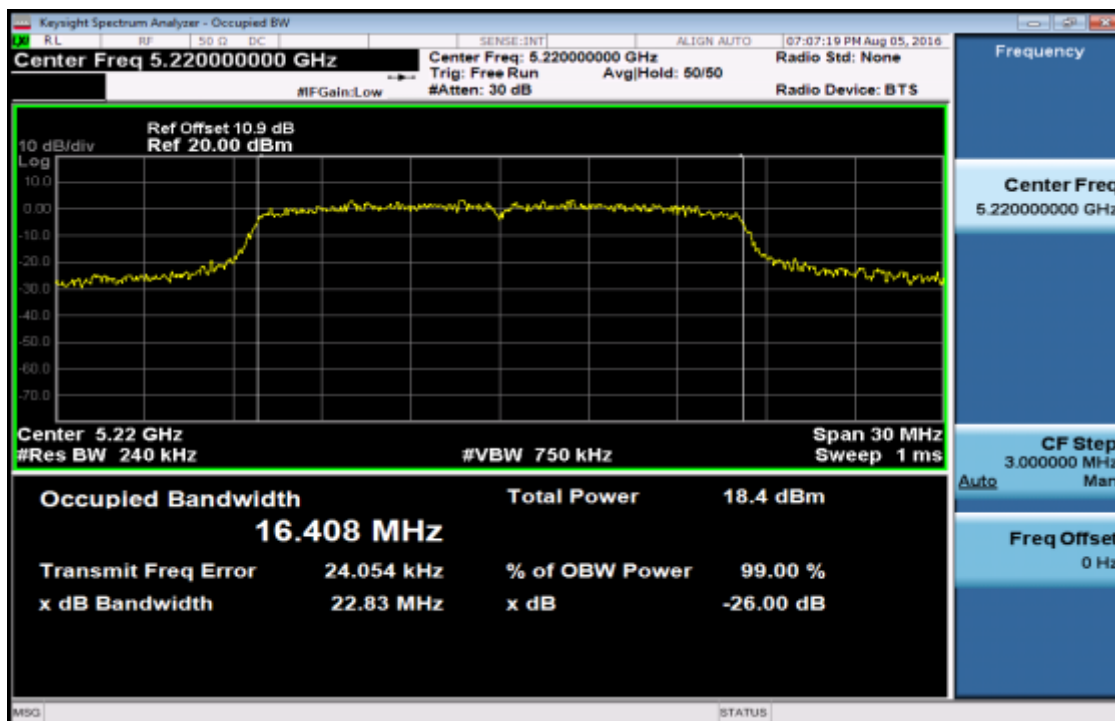
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26dB & 99% Band Width Test Data CH-Low (5180MHz)



26dB & 99% Band Width Test Data CH-Mid (5220MHz)



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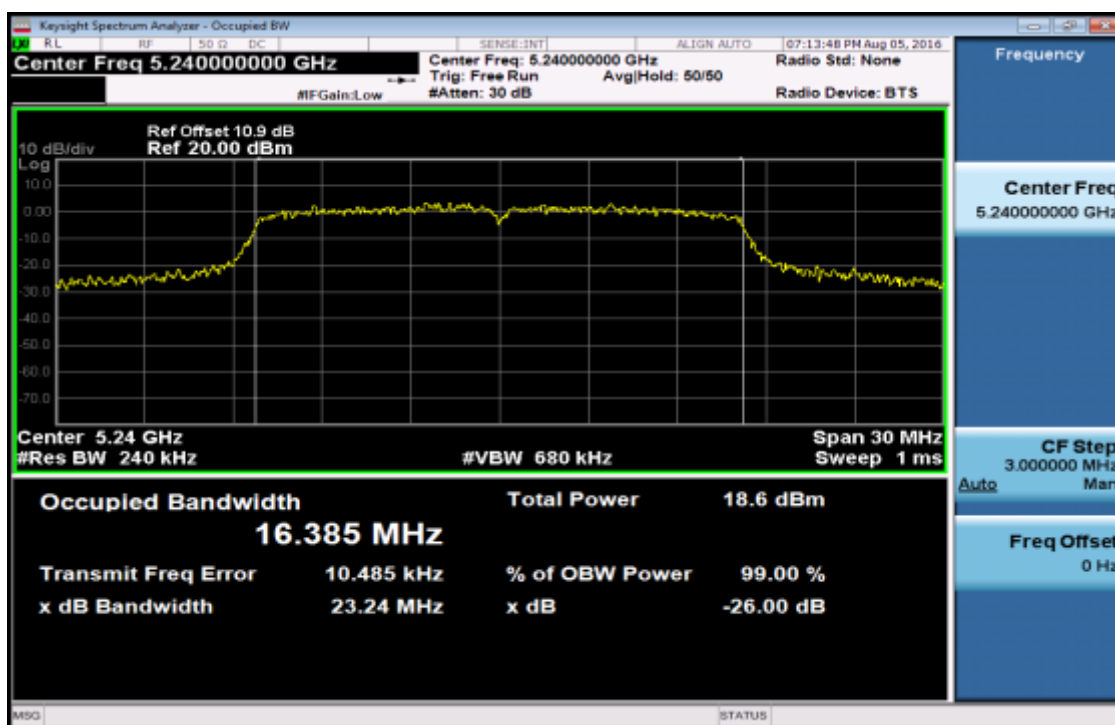
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26dB & 99% Band Width Test Data CH-High (5240MHz)



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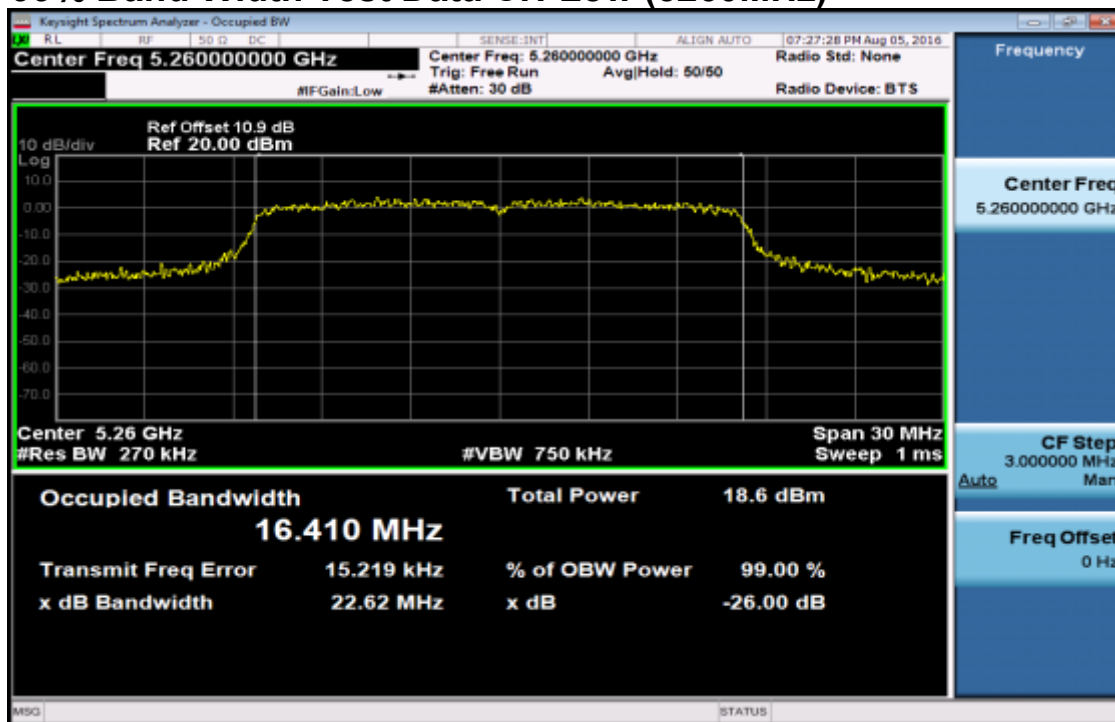
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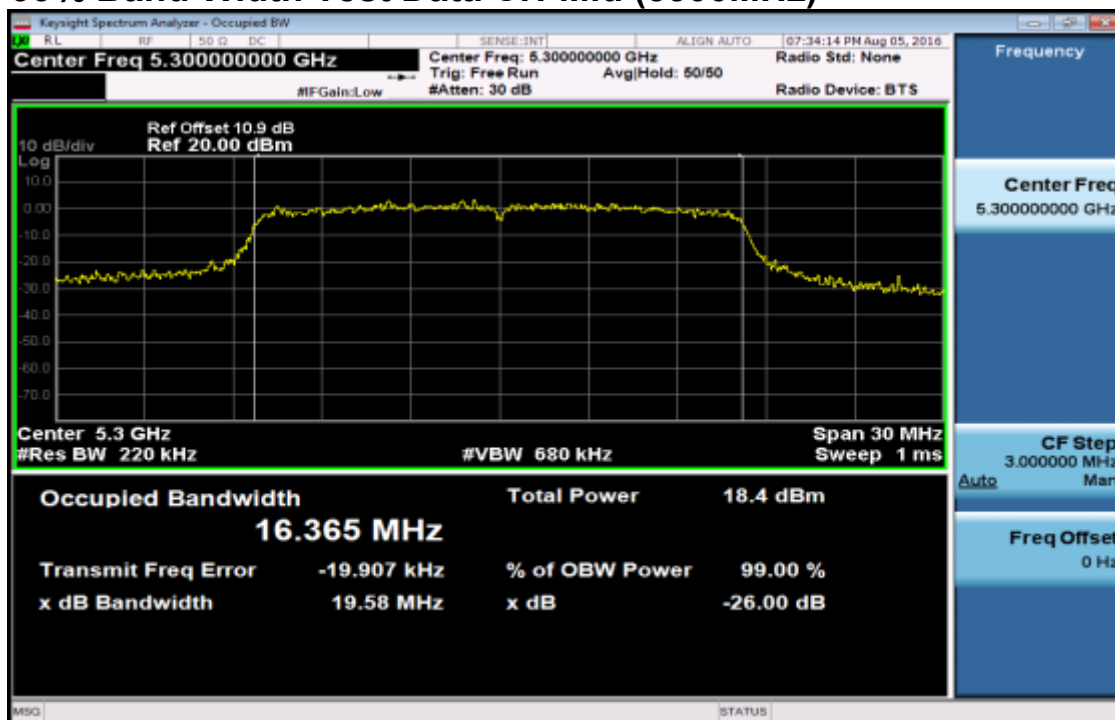
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802.11a, 5250~5350 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5260MHz)



26dB & 99% Band Width Test Data CH-Mid (5300MHz)



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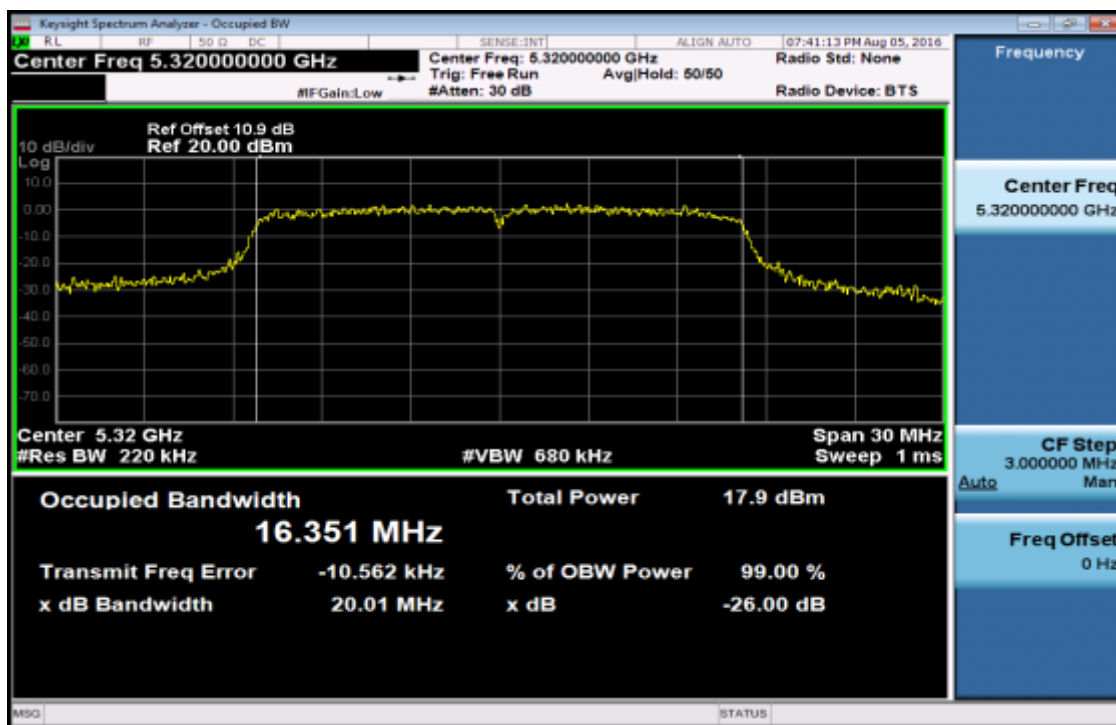
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26dB & 99% Band Width Test Data CH-High (5320MHz)



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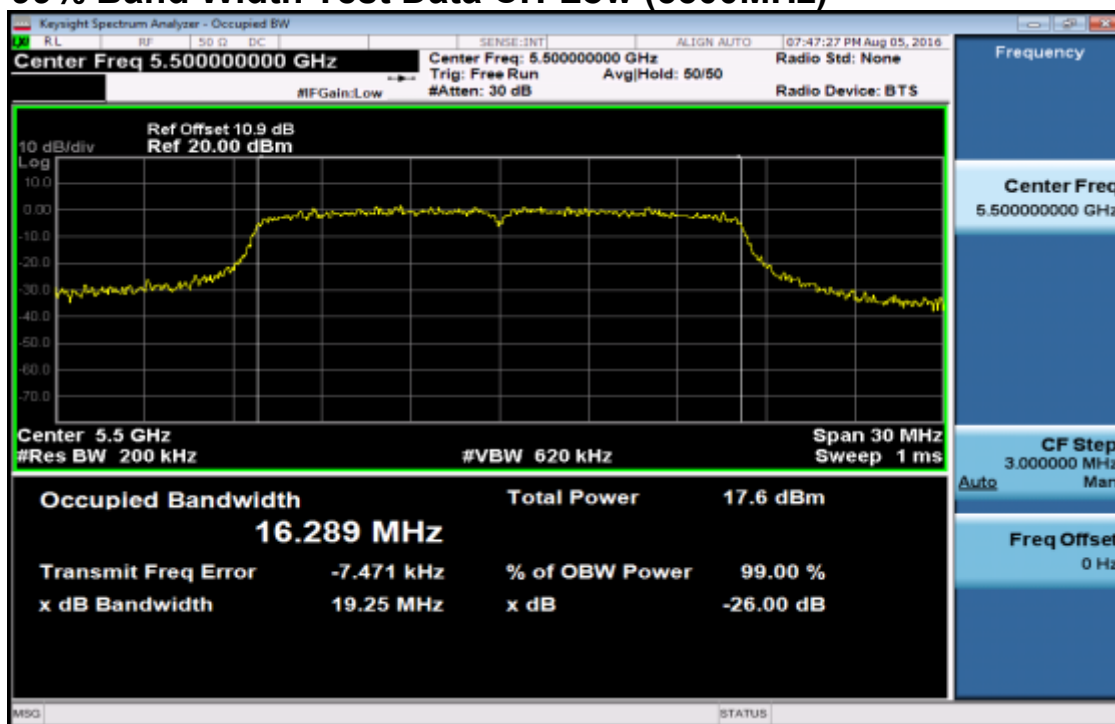
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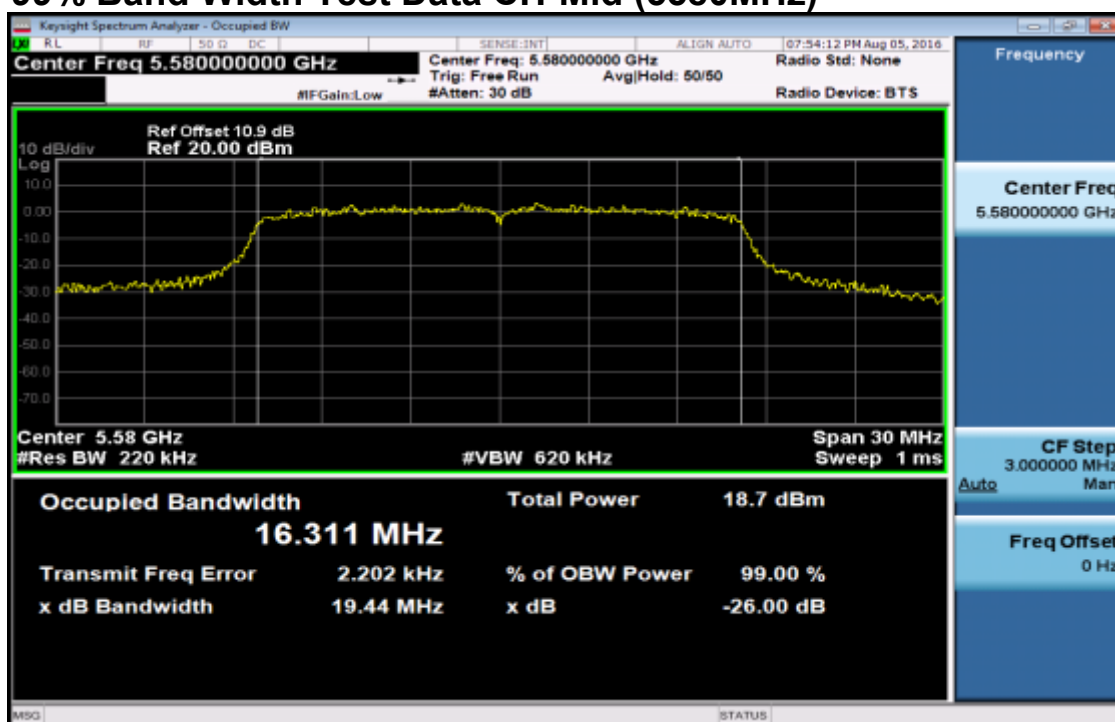
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802.11a, 5470~5725 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5500MHz)



26dB & 99% Band Width Test Data CH-Mid (5580MHz)



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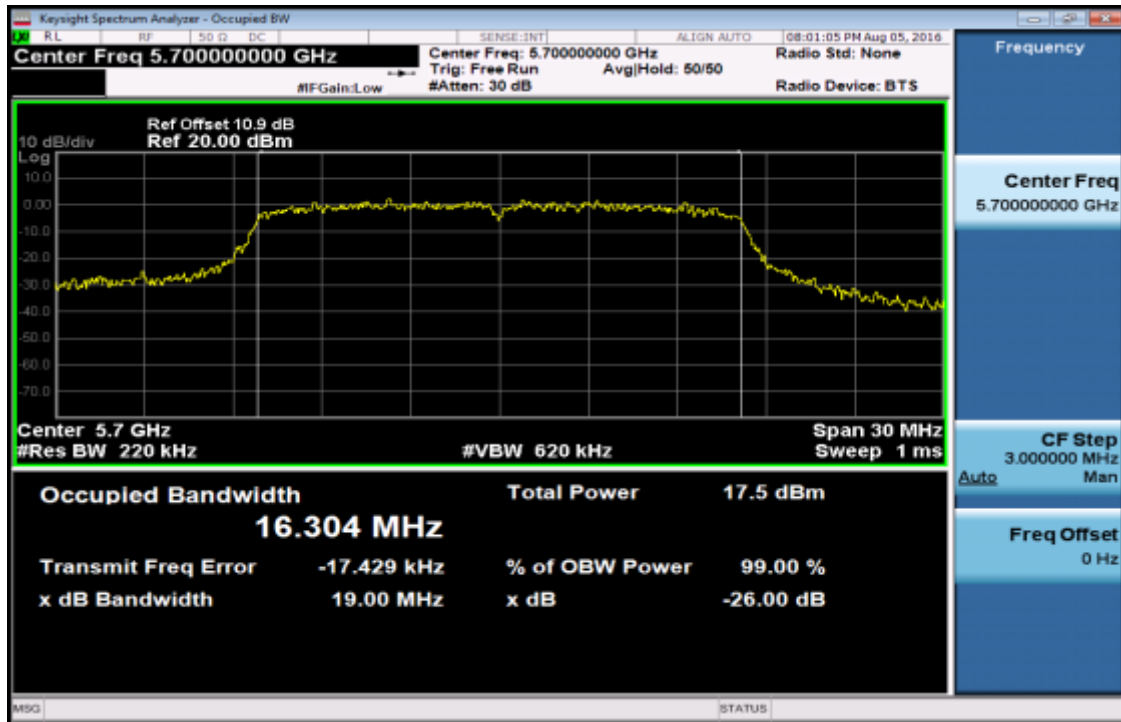
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26dB & 99% Band Width Test Data CH-High (5700MHz)



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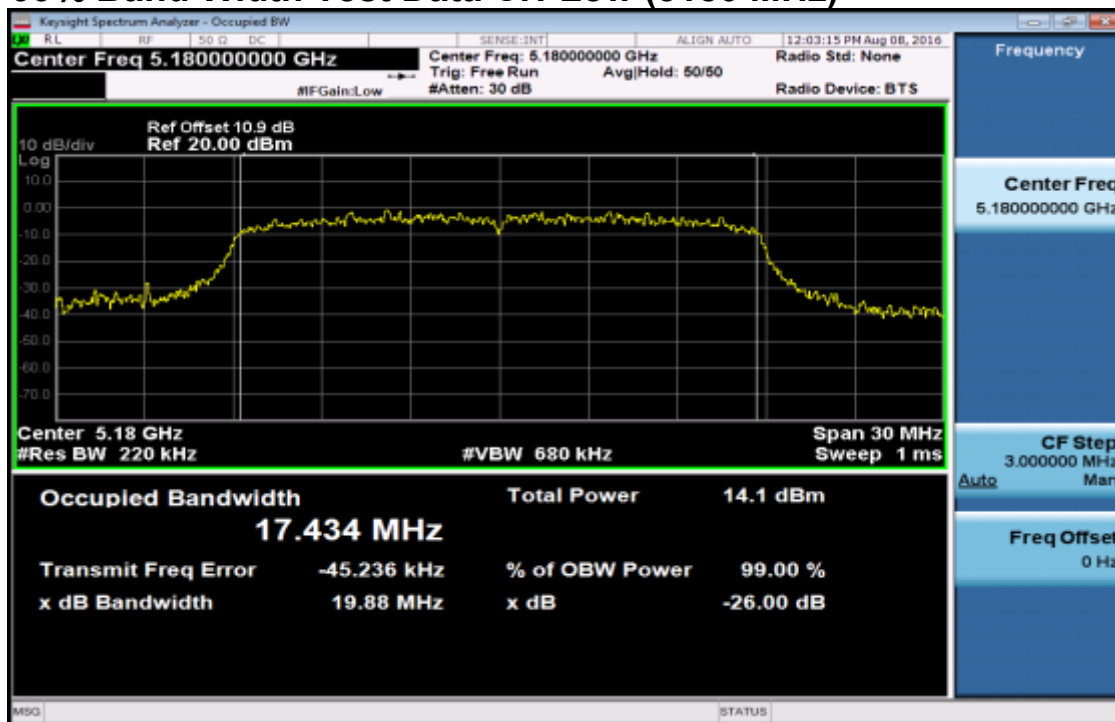
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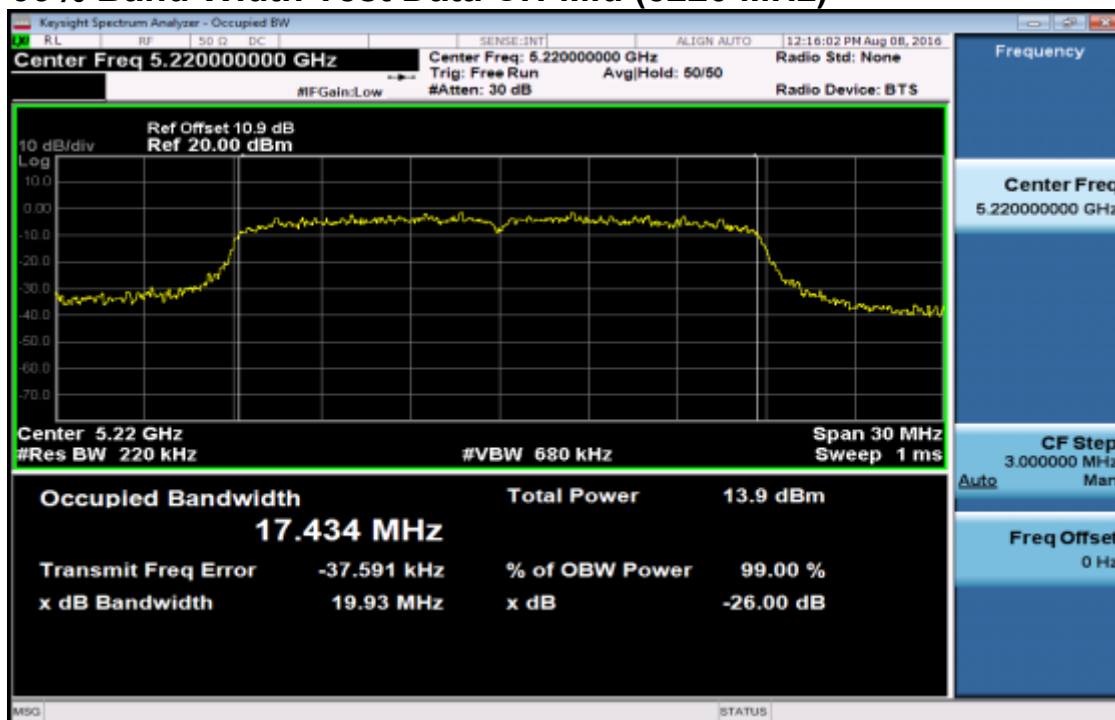
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802.11n HT20, 5150~5250 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5180 MHz)



26dB & 99% Band Width Test Data CH-Mid (5220 MHz)



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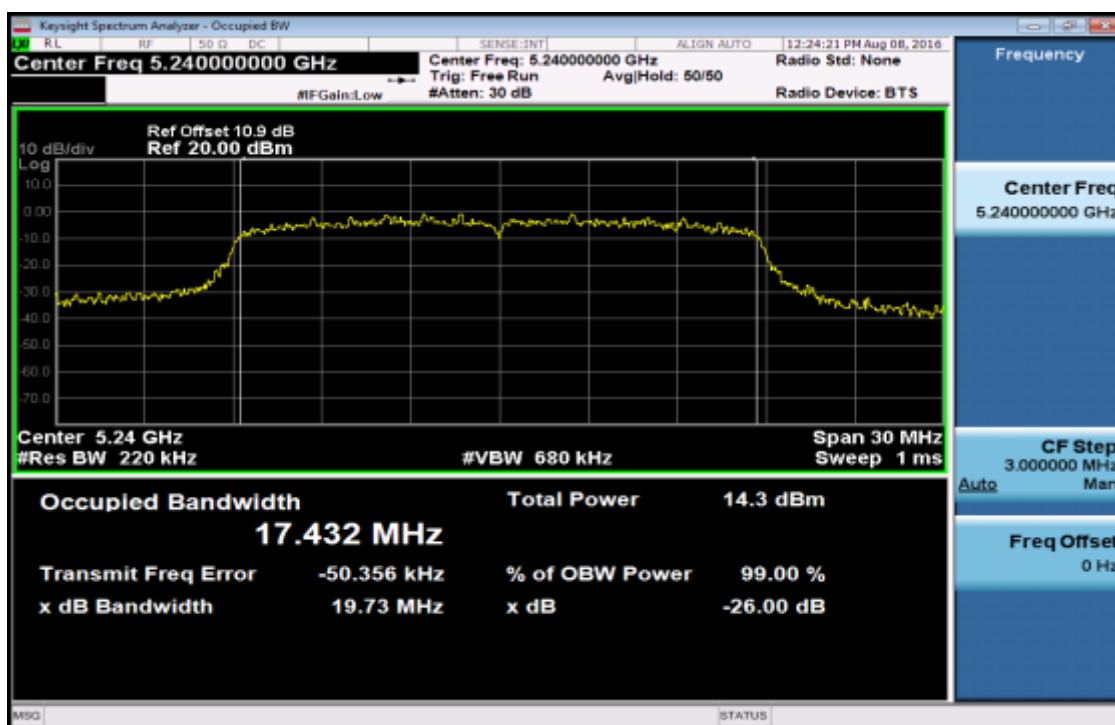
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26dB & 99% Band Width Test Data CH-High (5240 MHz)



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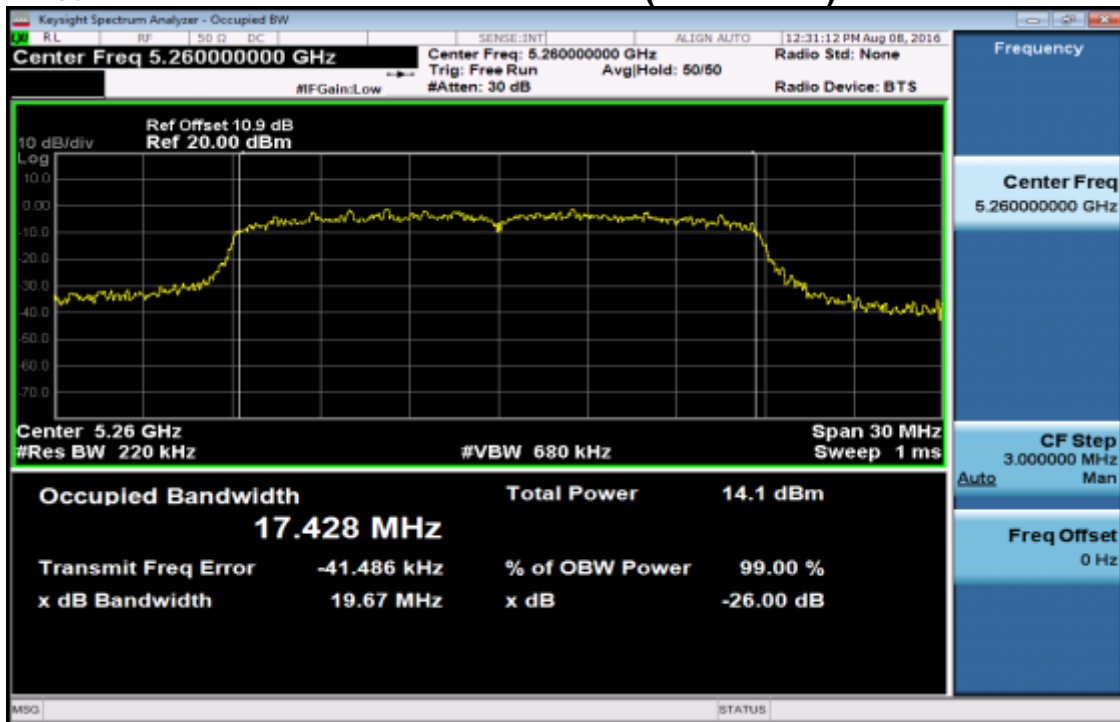
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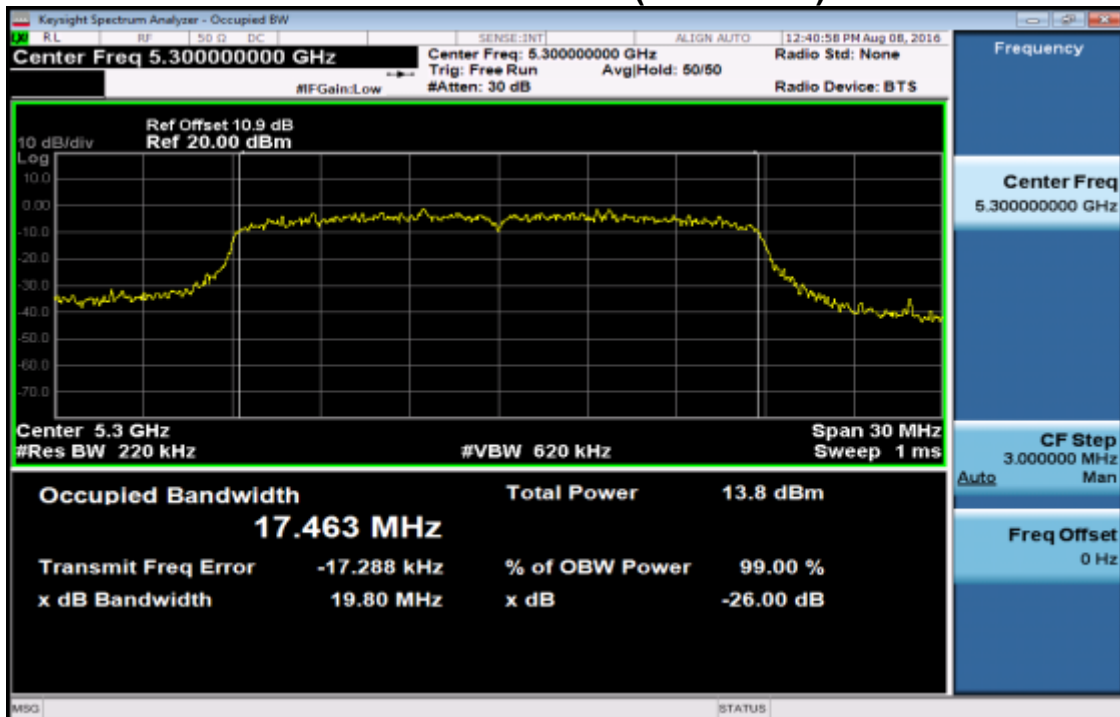
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802.11n HT20, 5250~5350 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5260 MHz)



26dB & 99% Band Width Test Data CH-Mid (5300 MHz)



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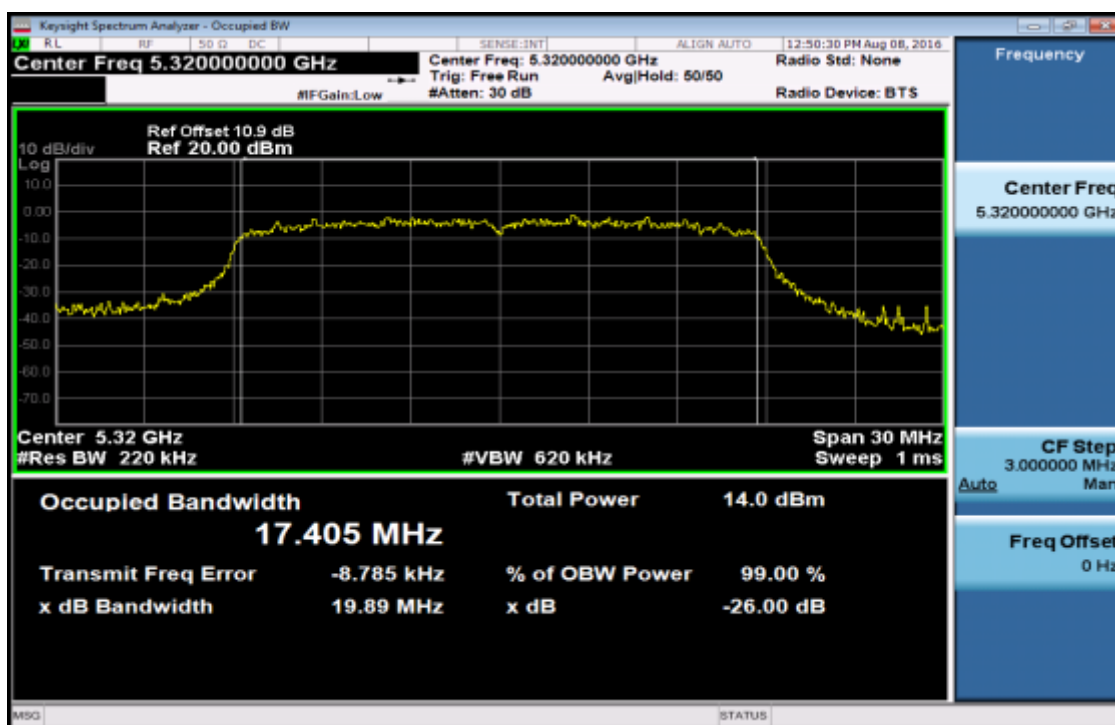
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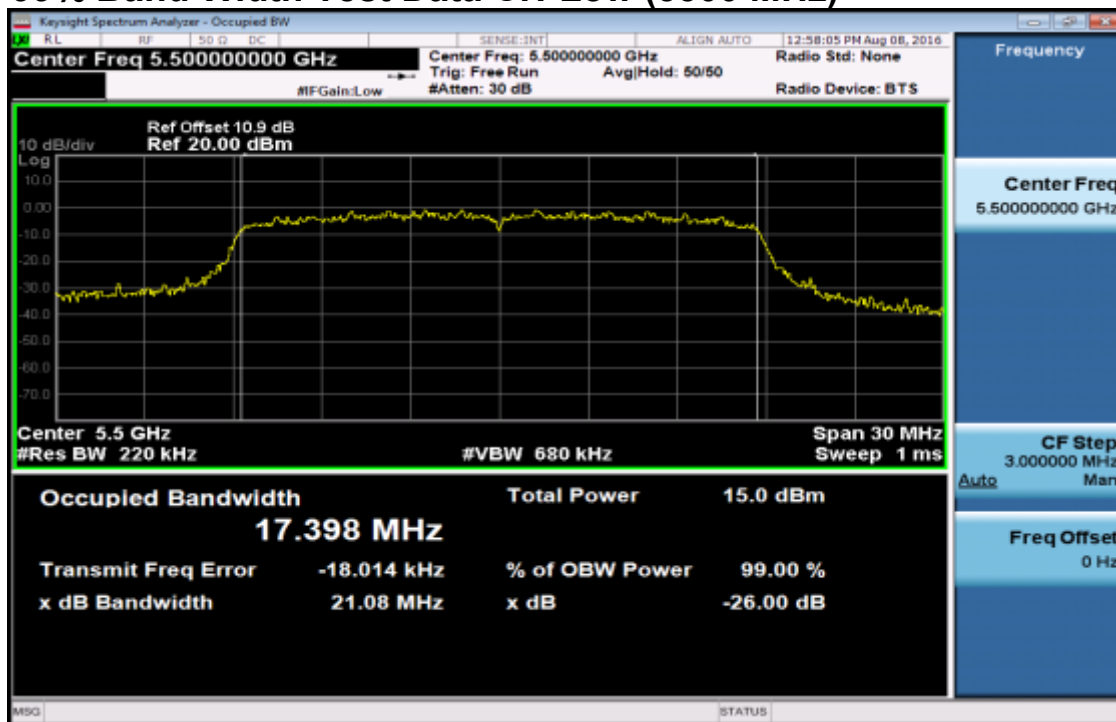
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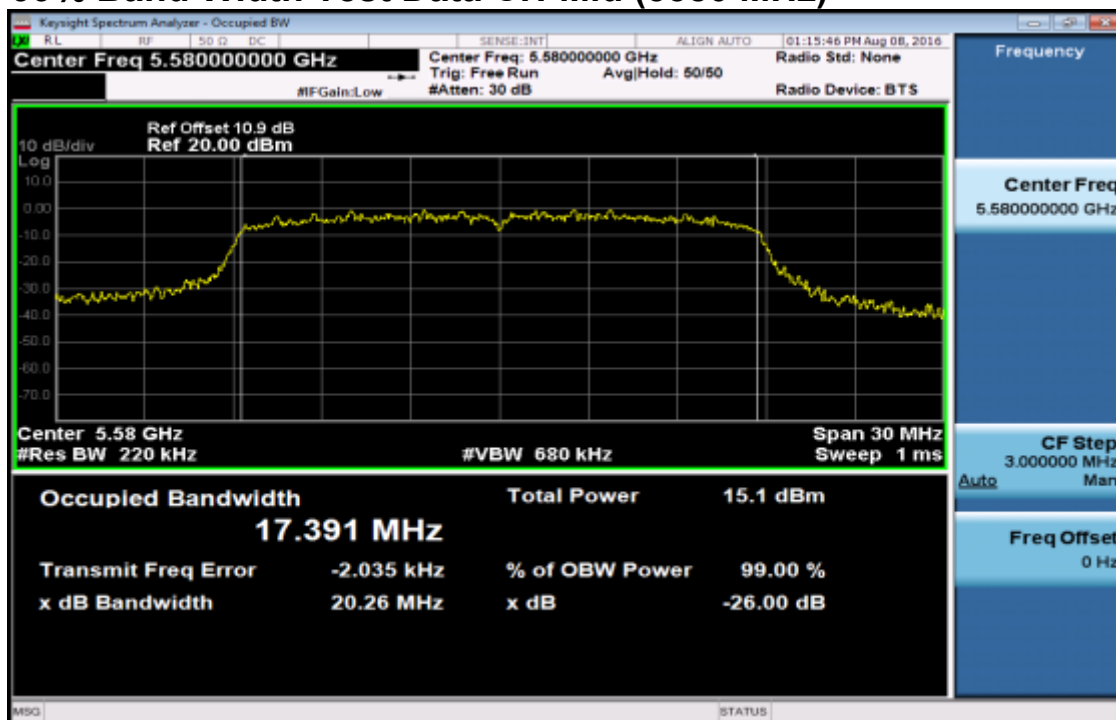
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802.11n HT20, 5470~5725 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5500 MHz)



26dB & 99% Band Width Test Data CH-Mid (5580 MHz)



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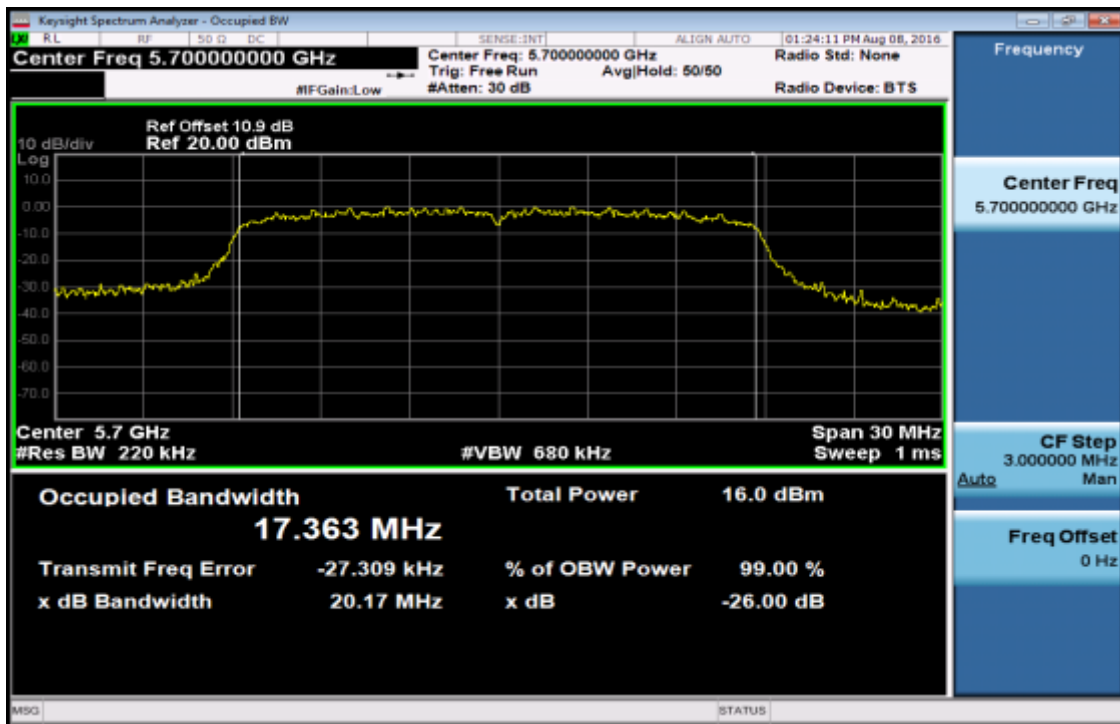
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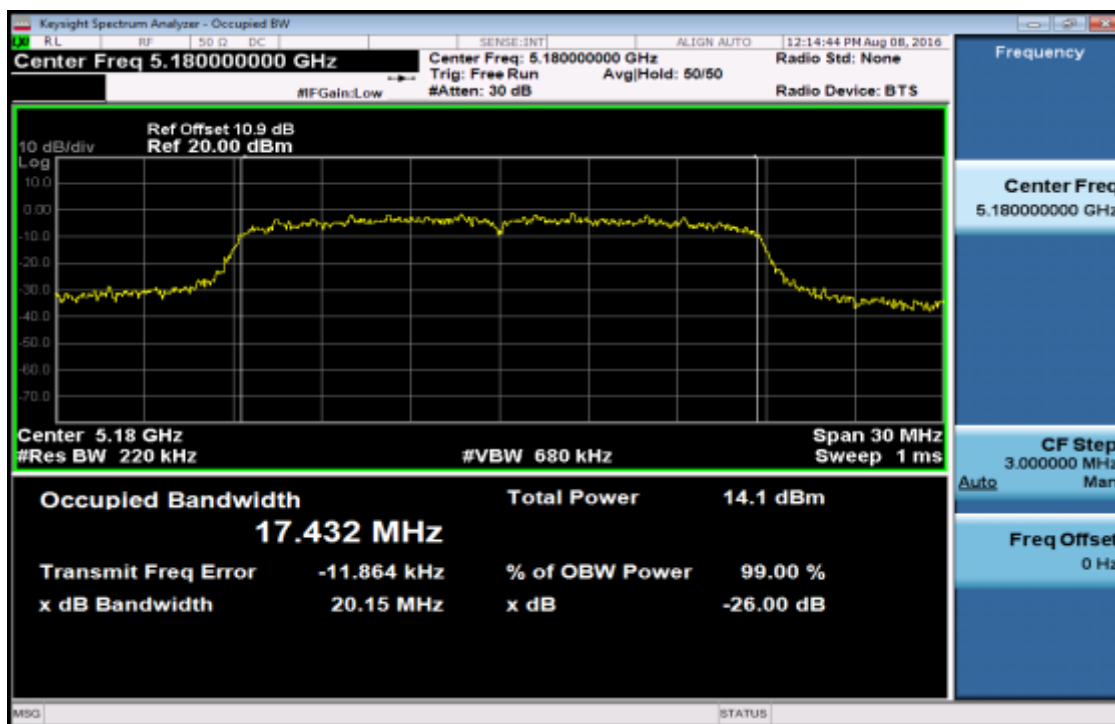
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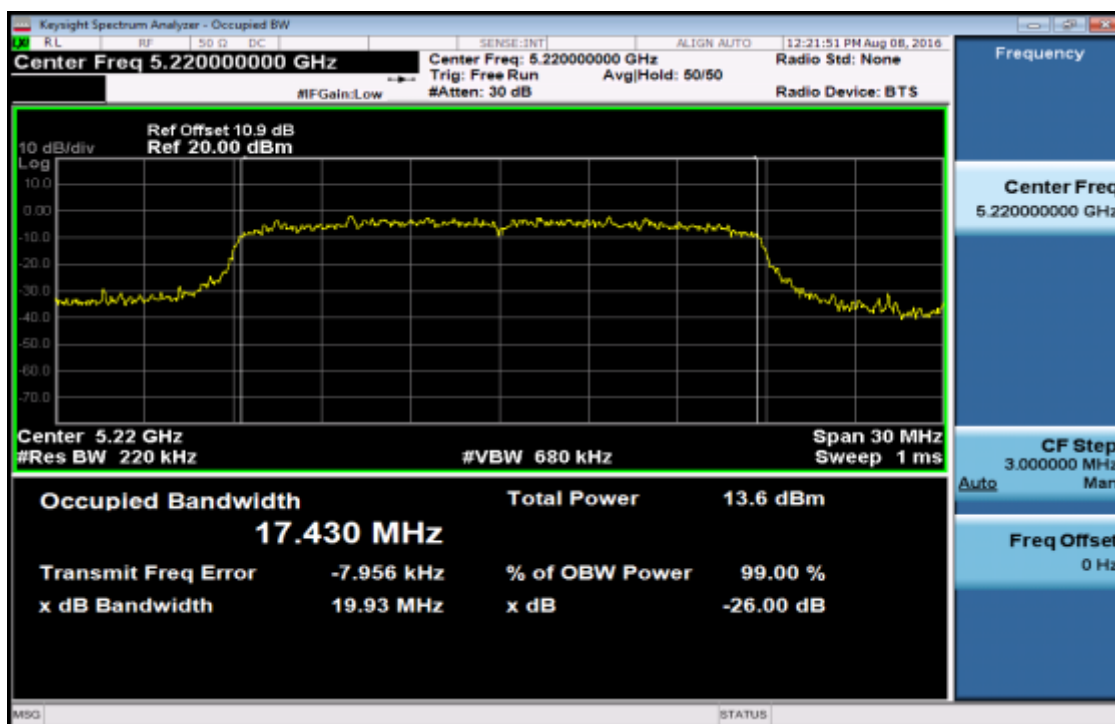
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802.11n HT20, 5150~5250 MHz (Aux) 26dB & 99% Band Width Test Data CH-Low (5180 MHz)



26dB & 99% Band Width Test Data CH-Mid (5220 MHz)



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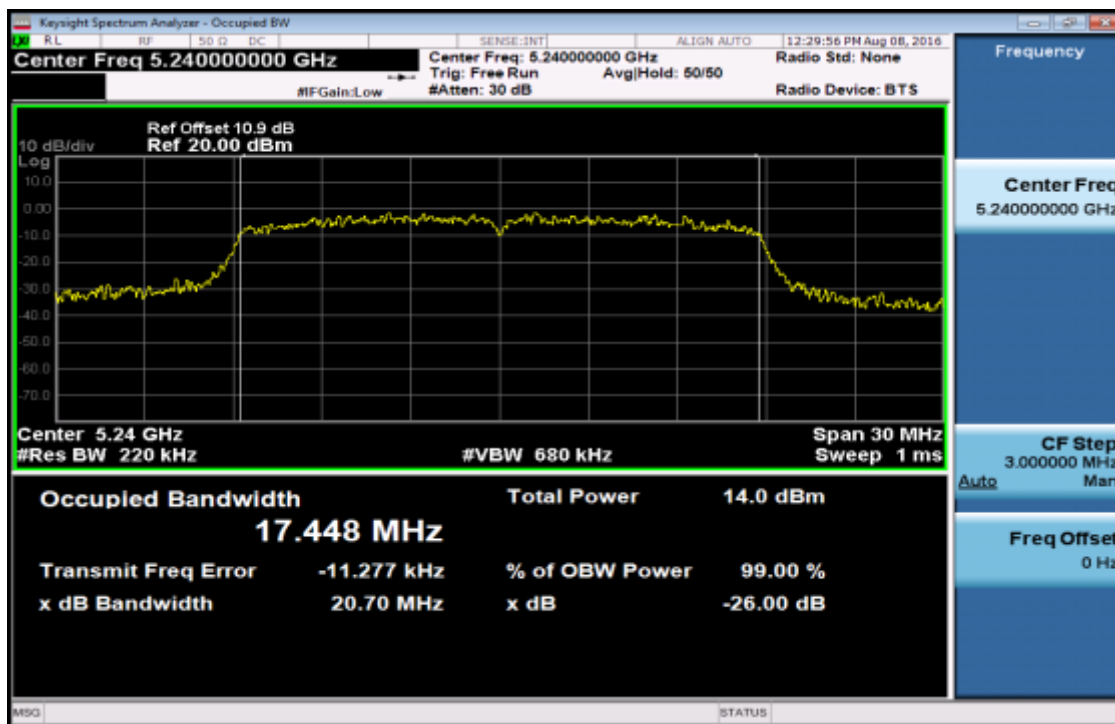
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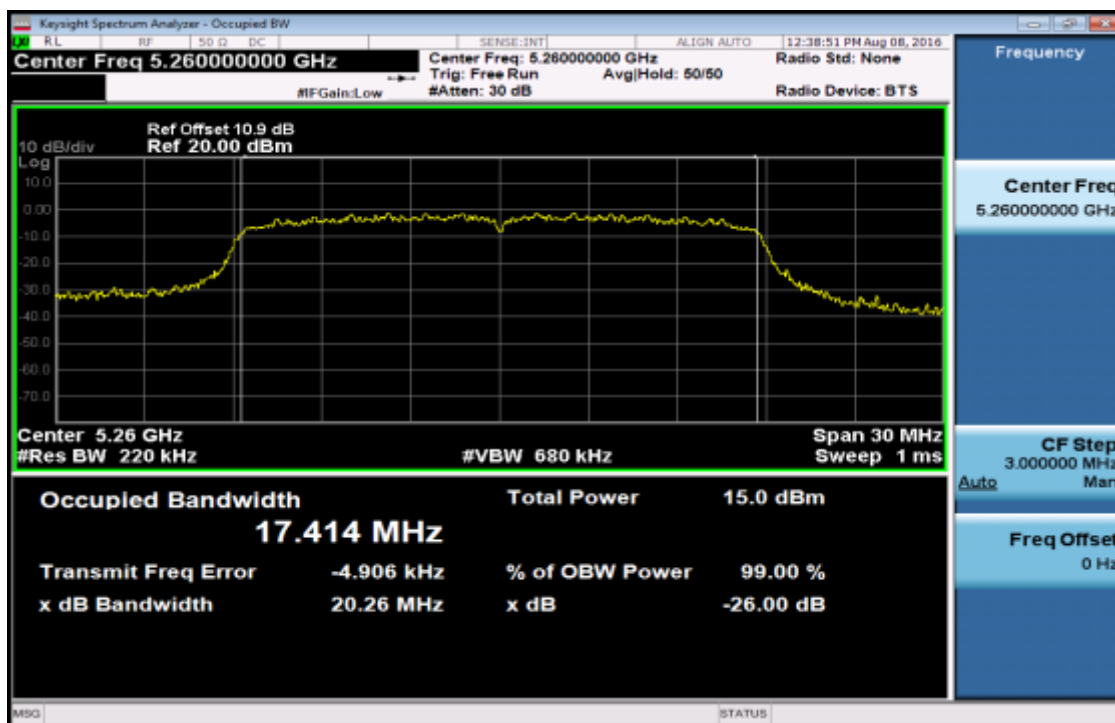
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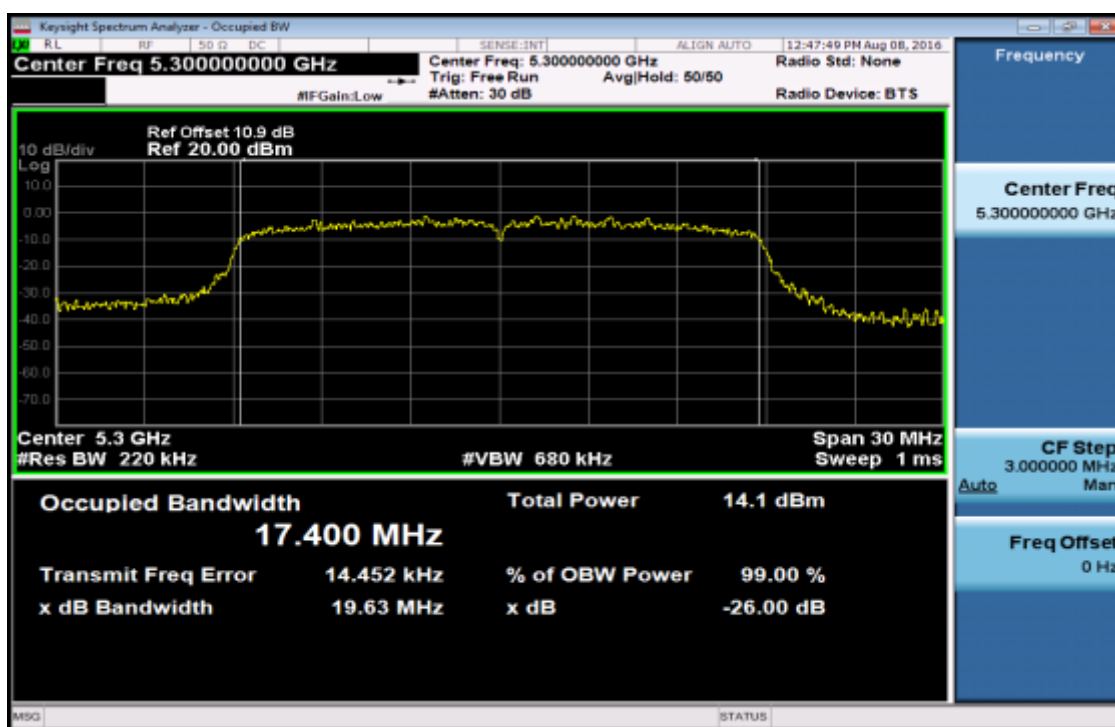
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26dB & 99% Band Width Test Data CH-Mid (5300 MHz)



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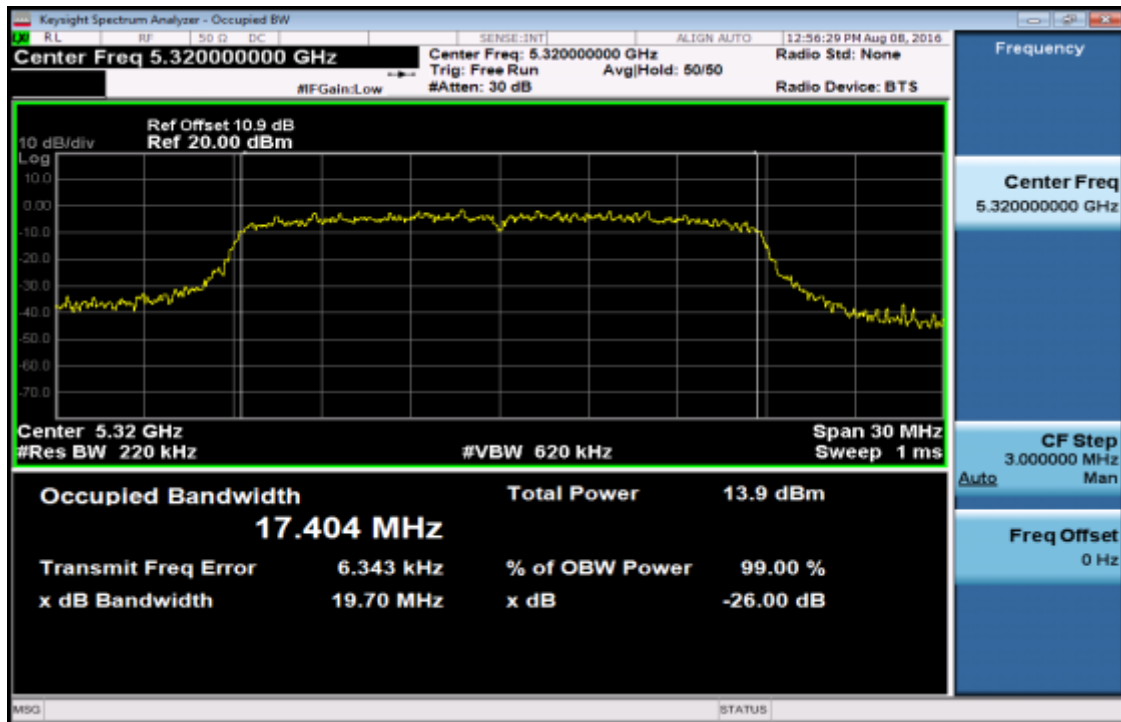
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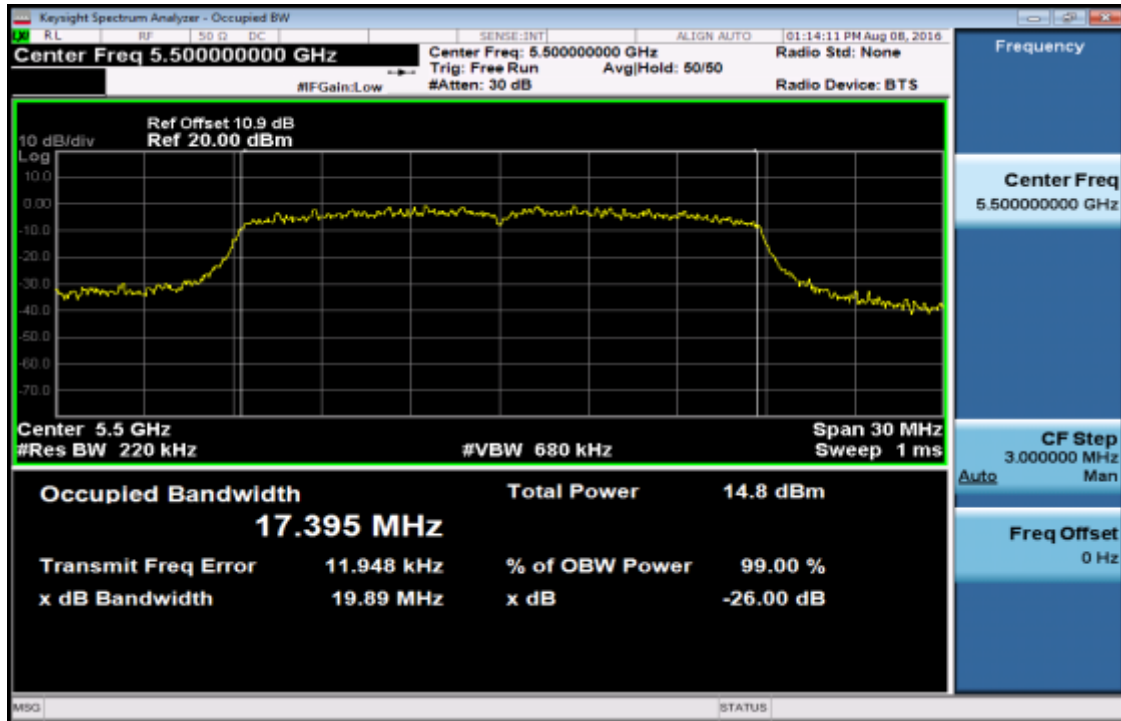
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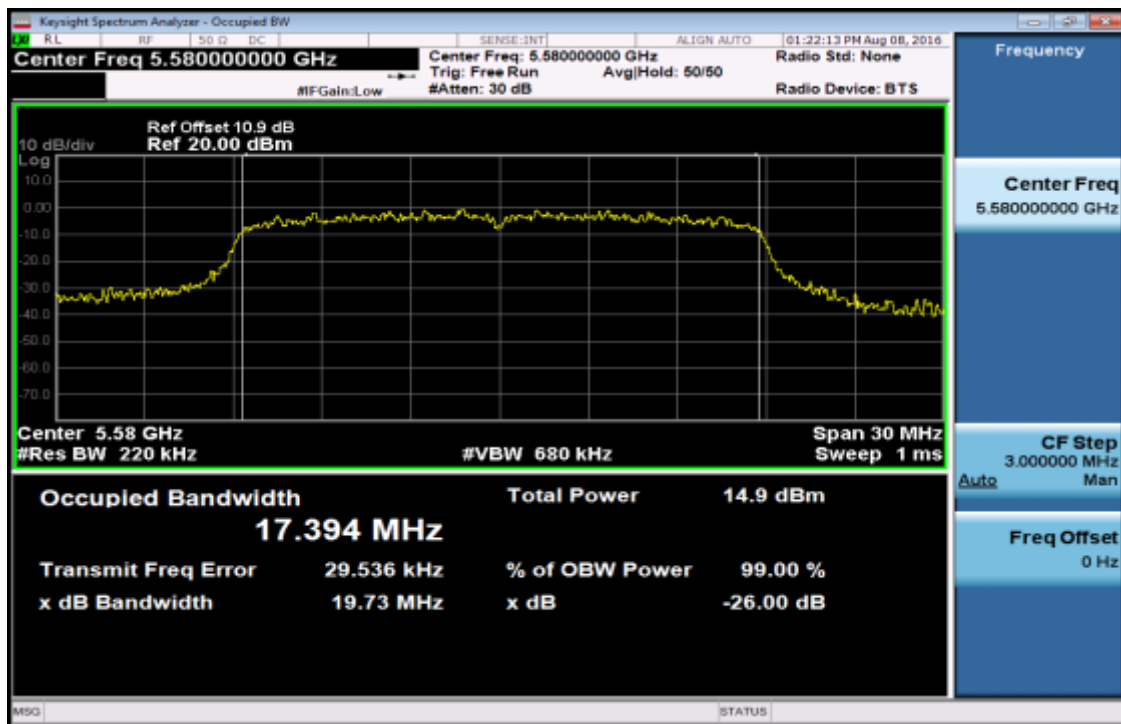
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26dB & 99% Band Width Test Data CH-Mid (5580 MHz)



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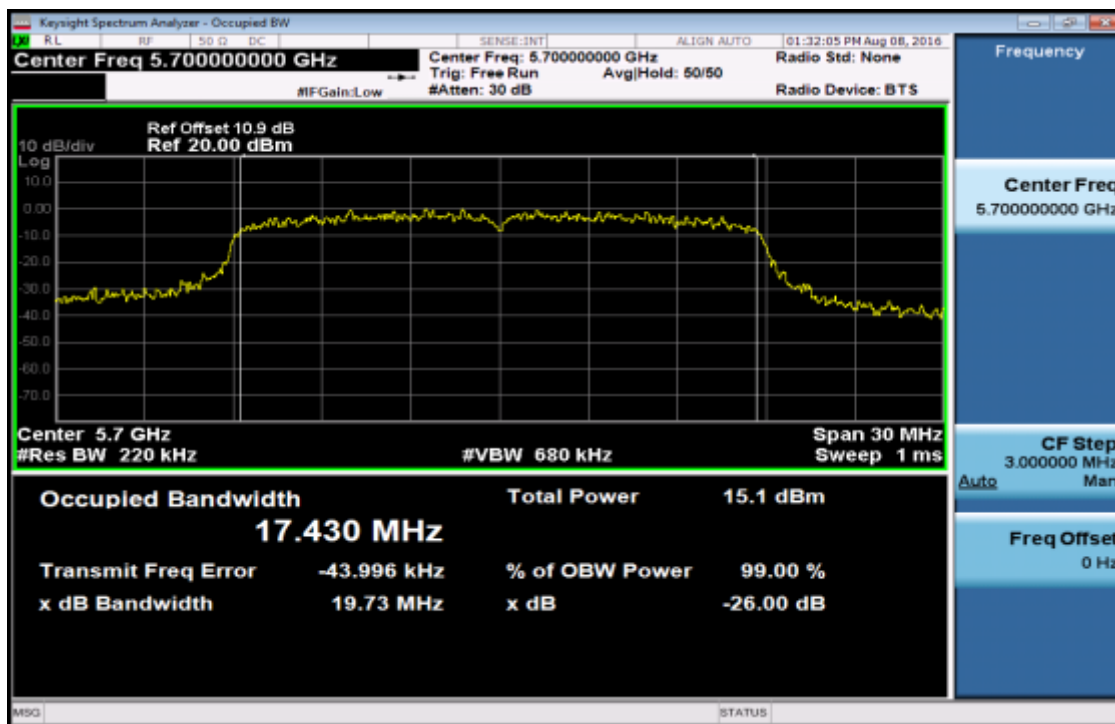
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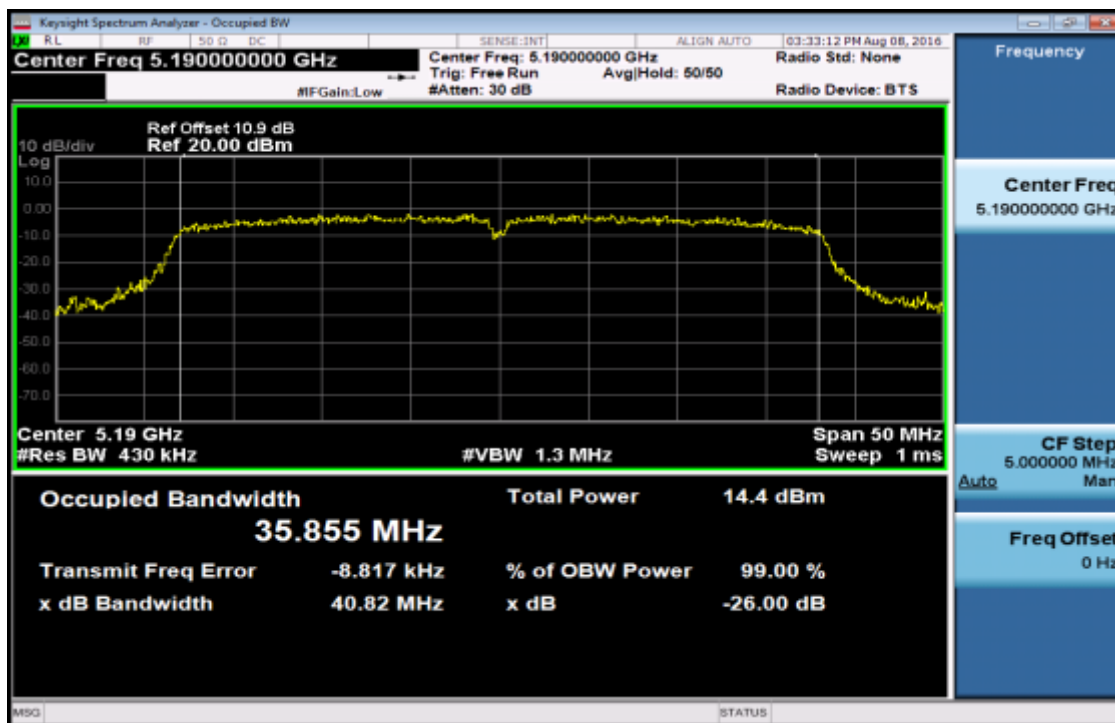
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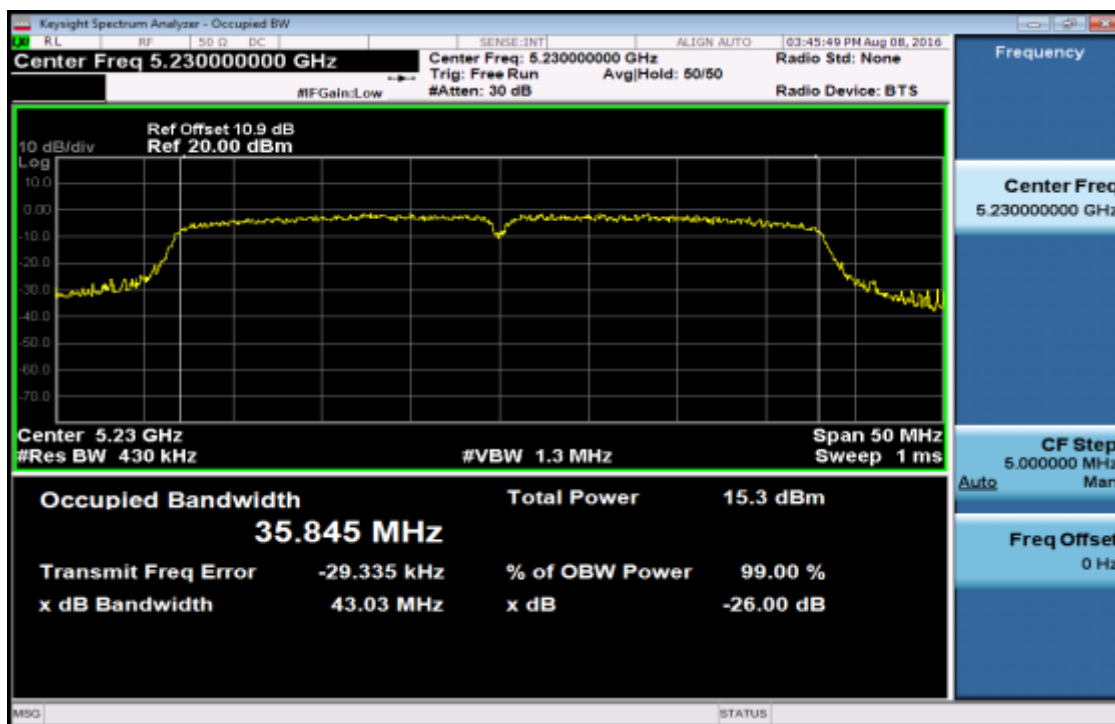
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802.11n HT40, 5150~5250 MHz (Main)

26dB & 99% Band Width Test Data CH-Low (5190 MHz)



26dB & 99% Band Width Test Data CH-High (5230 MHz)



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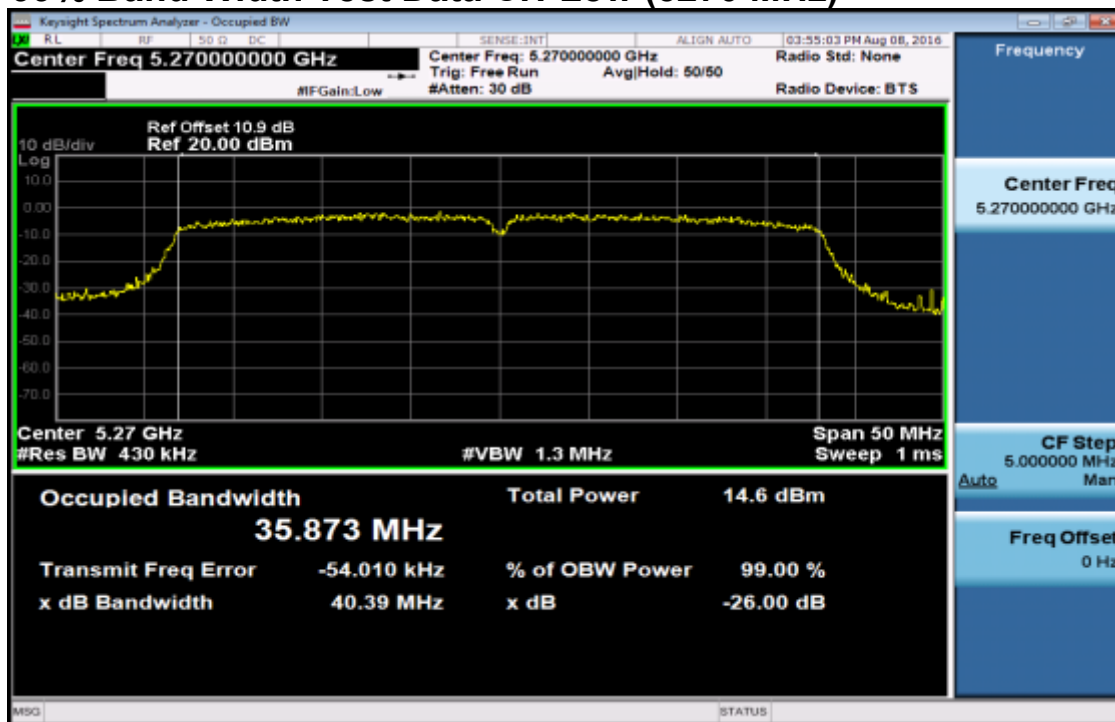
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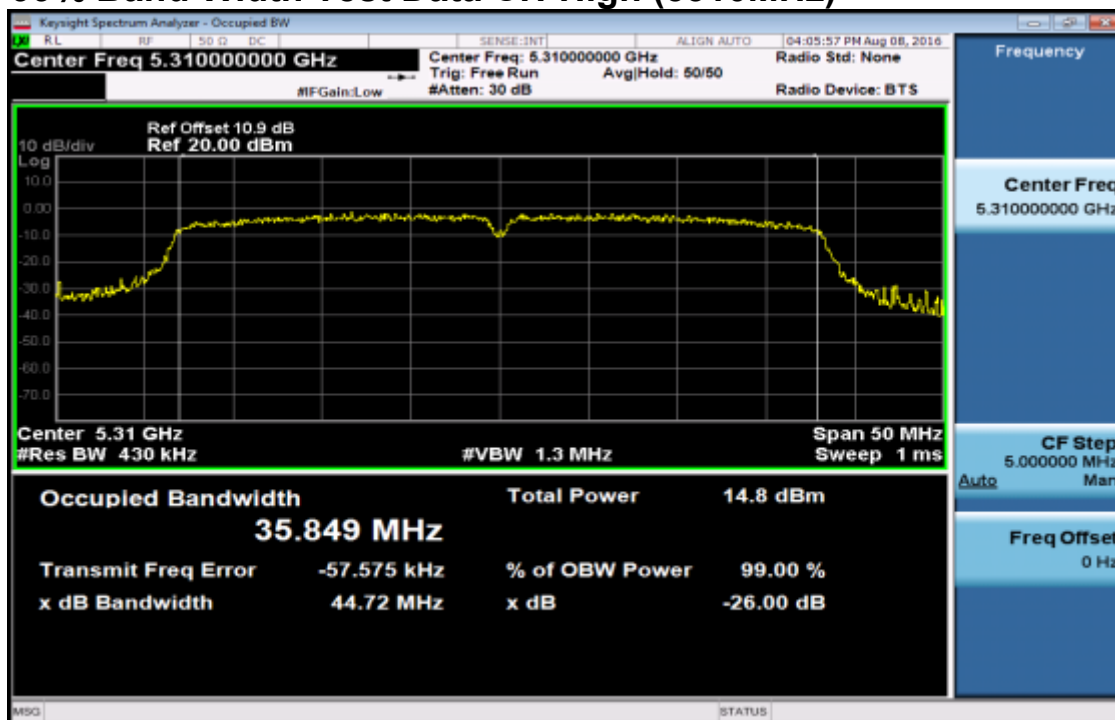
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802.11n HT40, 5250~5350 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5270 MHz)



26dB & 99% Band Width Test Data CH-High (5310MHz)



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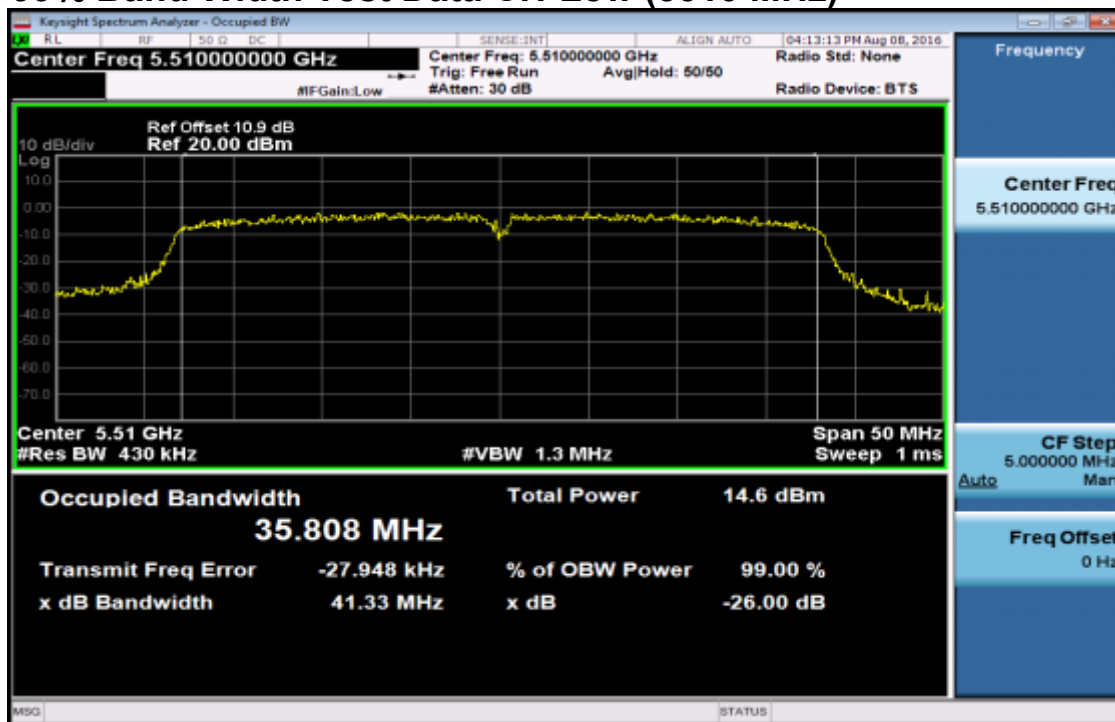
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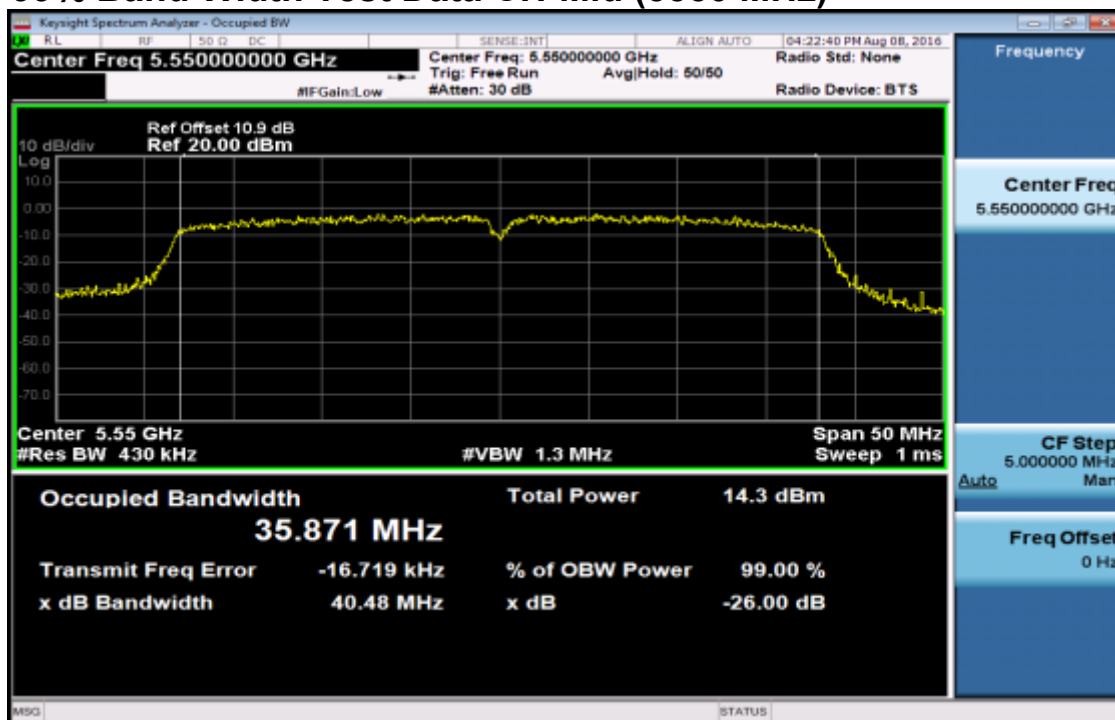
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802.11n HT40, 5470~5725 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5510 MHz)



26dB & 99% Band Width Test Data CH-Mid (5550 MHz)



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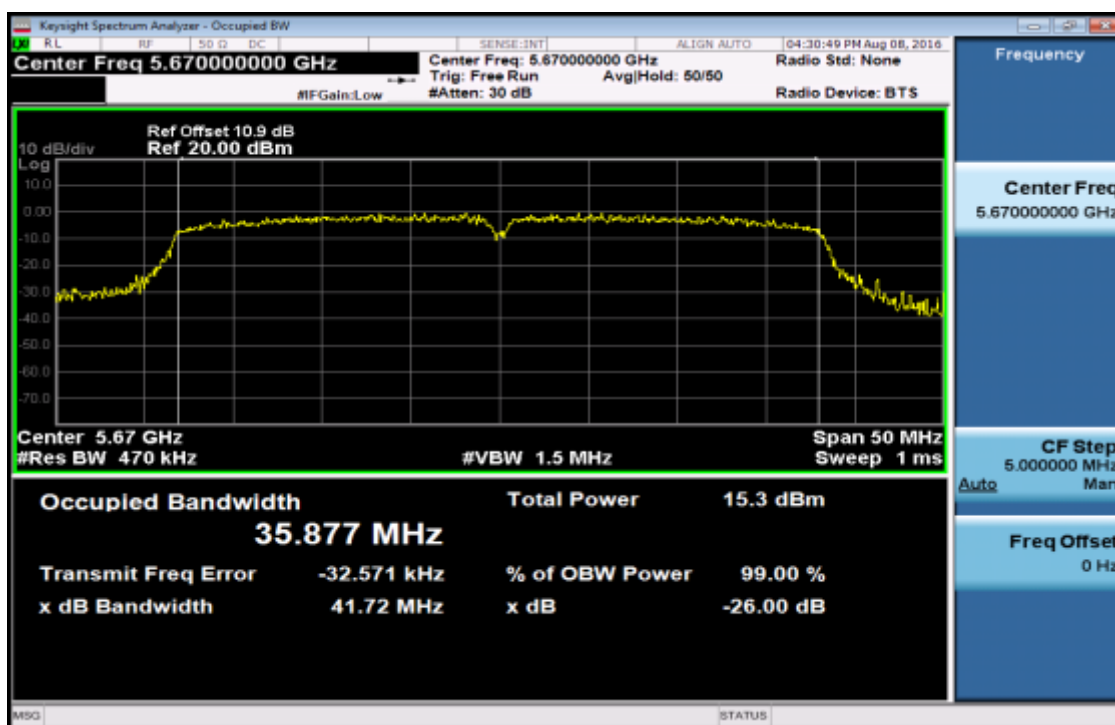
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26dB & 99% Band Width Test Data CH-High (5670 MHz)



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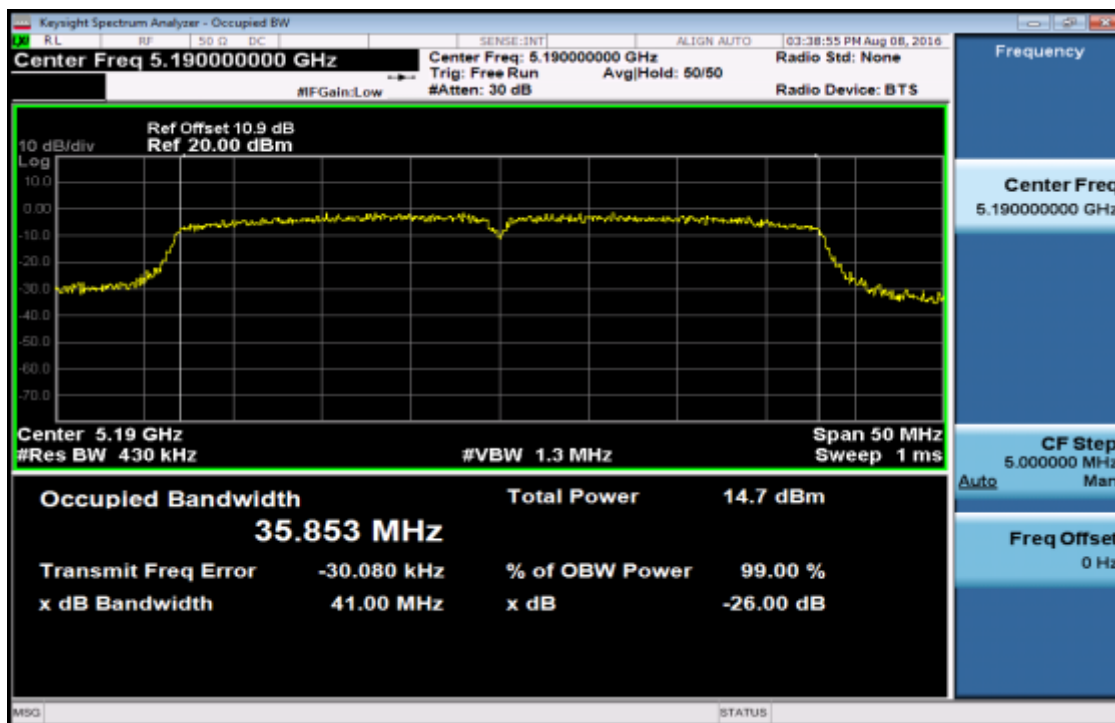
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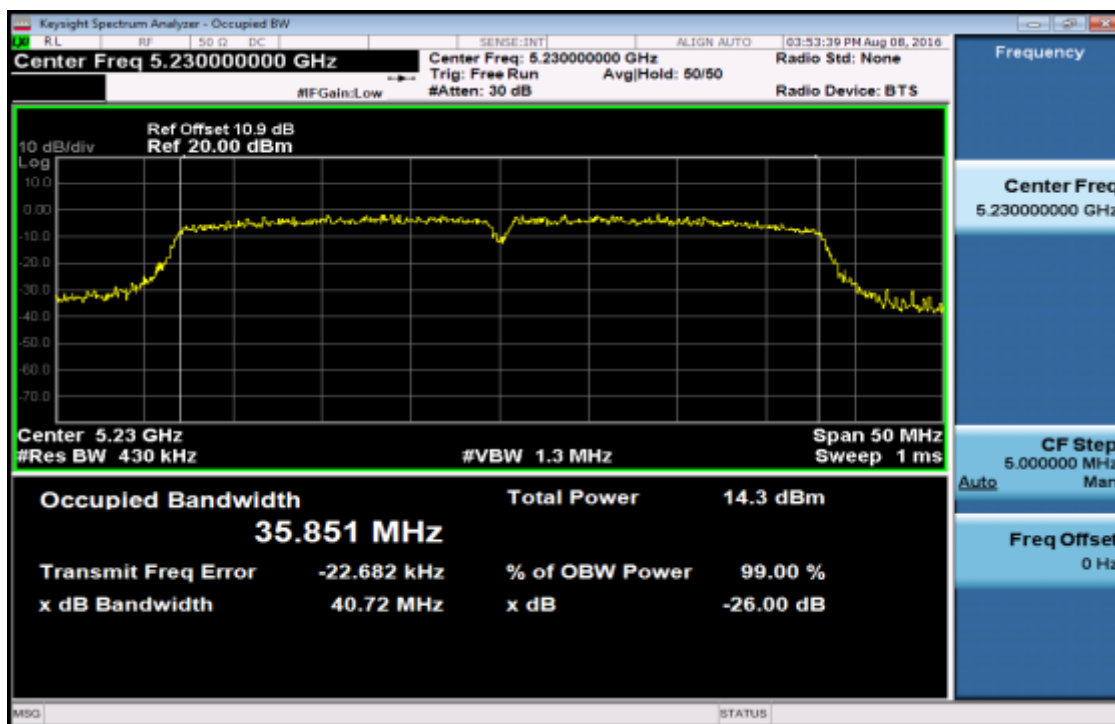
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802.11n HT40, 5150~5250 MHz (Aux)

26dB & 99% Band Width Test Data CH-Low (5190 MHz)



26dB & 99% Band Width Test Data CH-High (5230 MHz)



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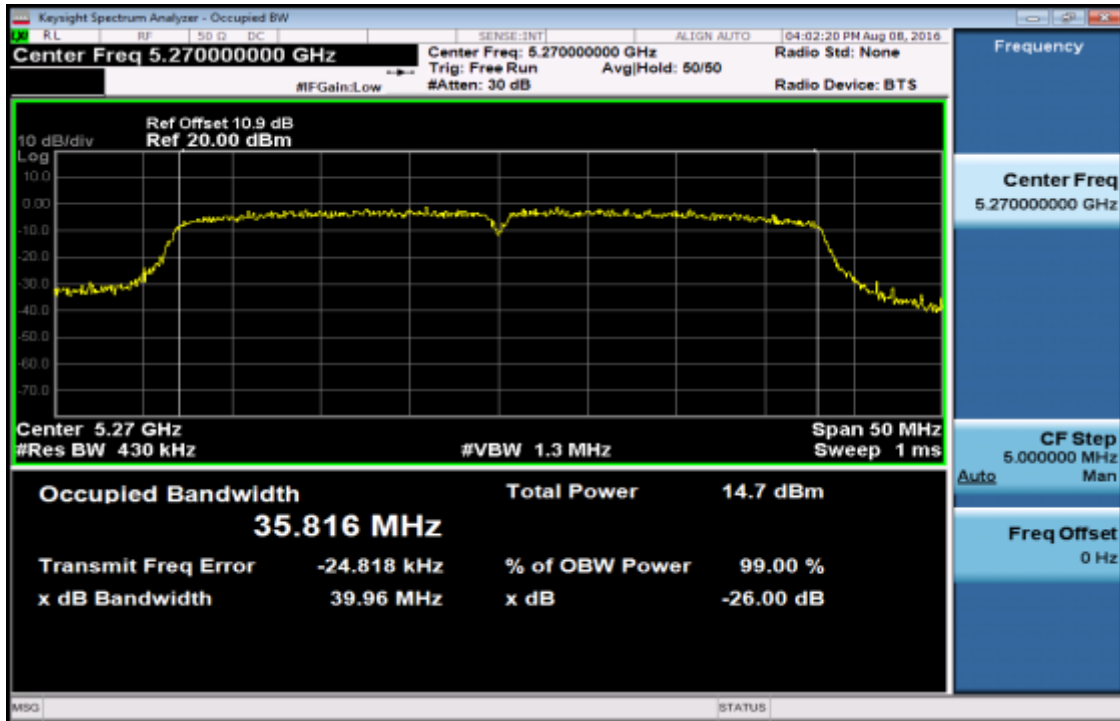
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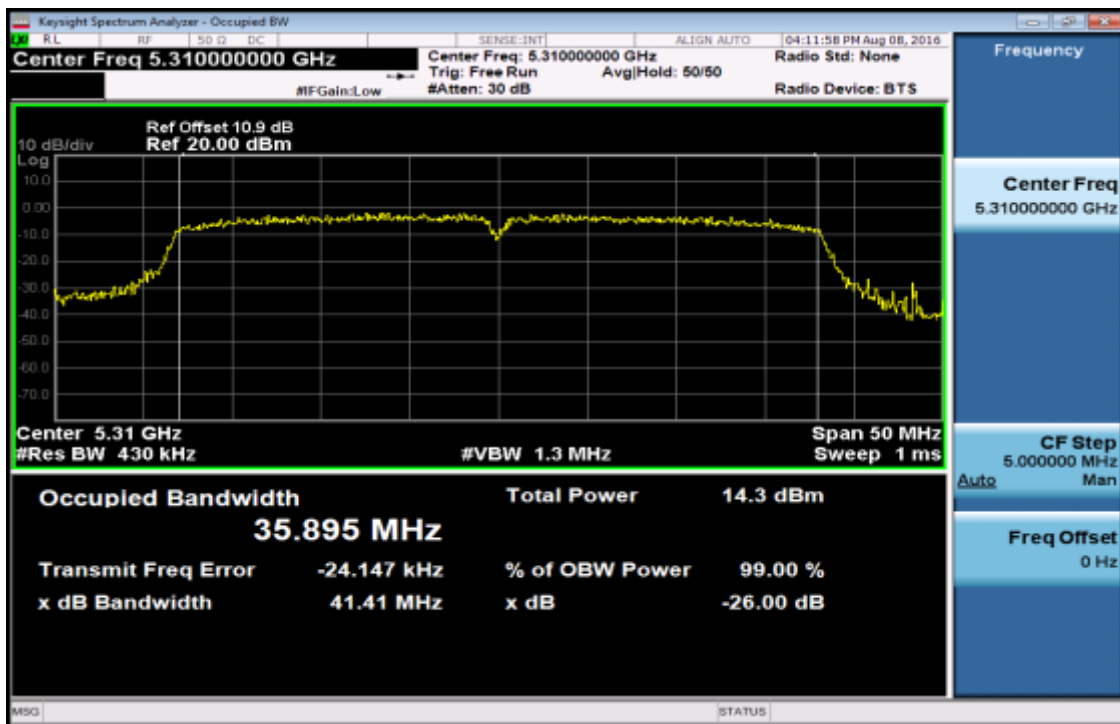
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802.11n HT40, 5250~5350 MHz (Aux) 26dB & 99% Band Width Test Data CH-Low (5270 MHz)



26dB & 99% Band Width Test Data CH-High (5310MHz)



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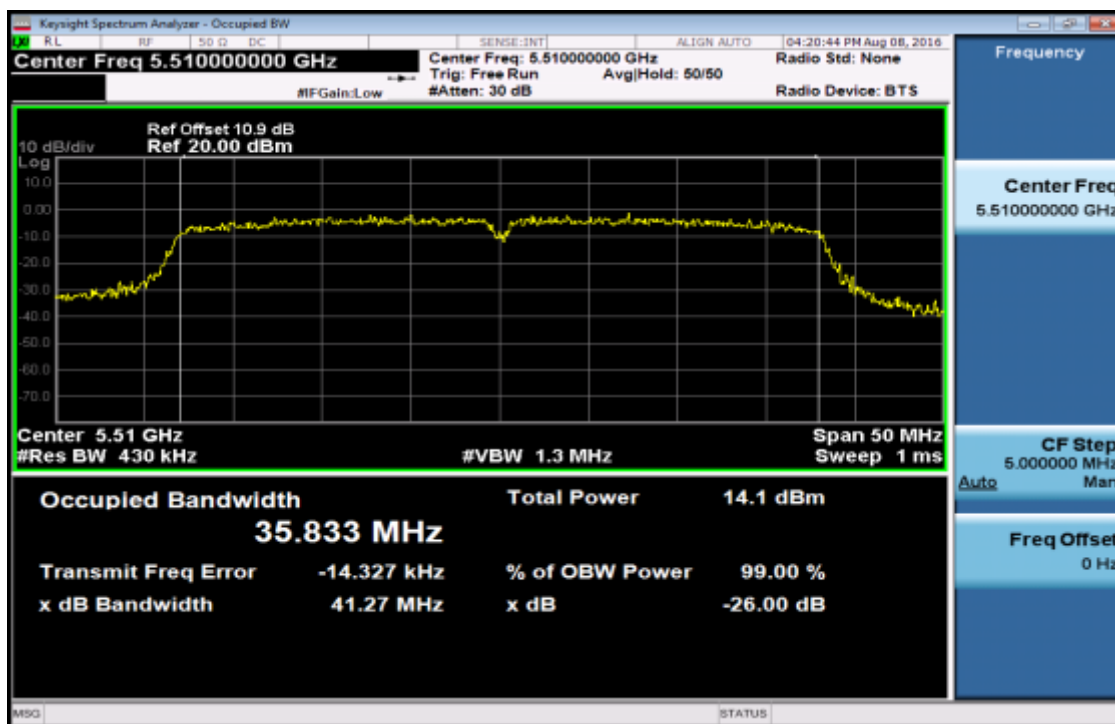
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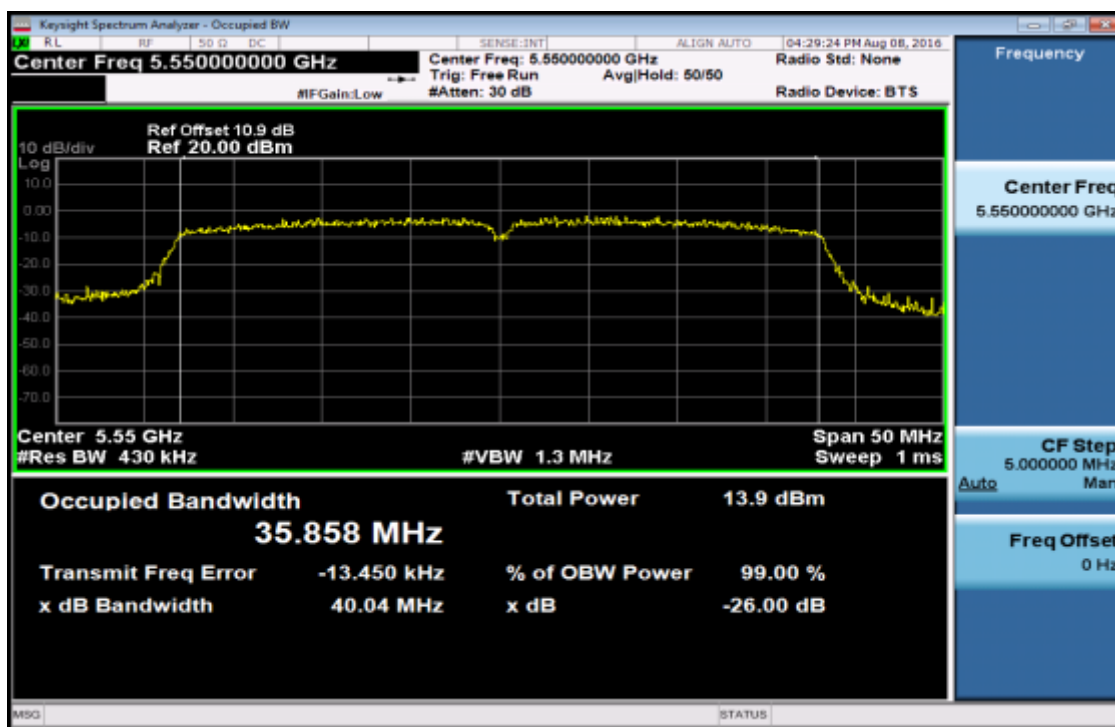
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802.11n HT40, 5470~5725 MHz (Aux) 26dB & 99% Band Width Test Data CH-Low (5510 MHz)



26dB & 99% Band Width Test Data CH-Mid (5550 MHz)



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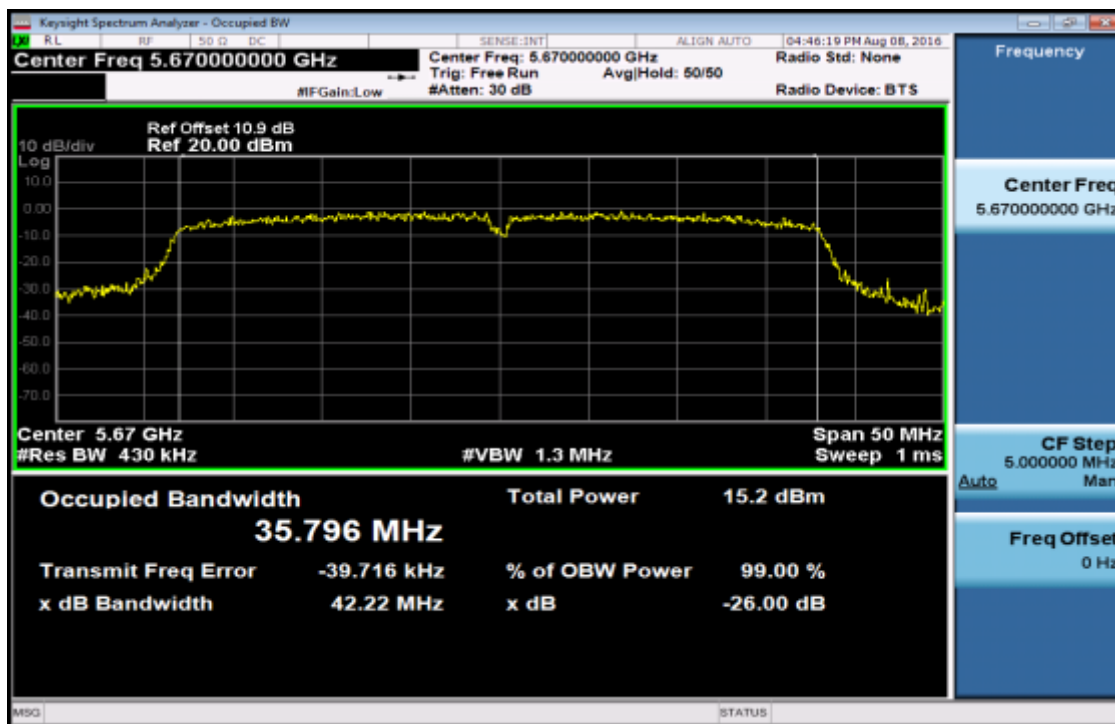
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26dB & 99% Band Width Test Data CH-High (5670 MHz)



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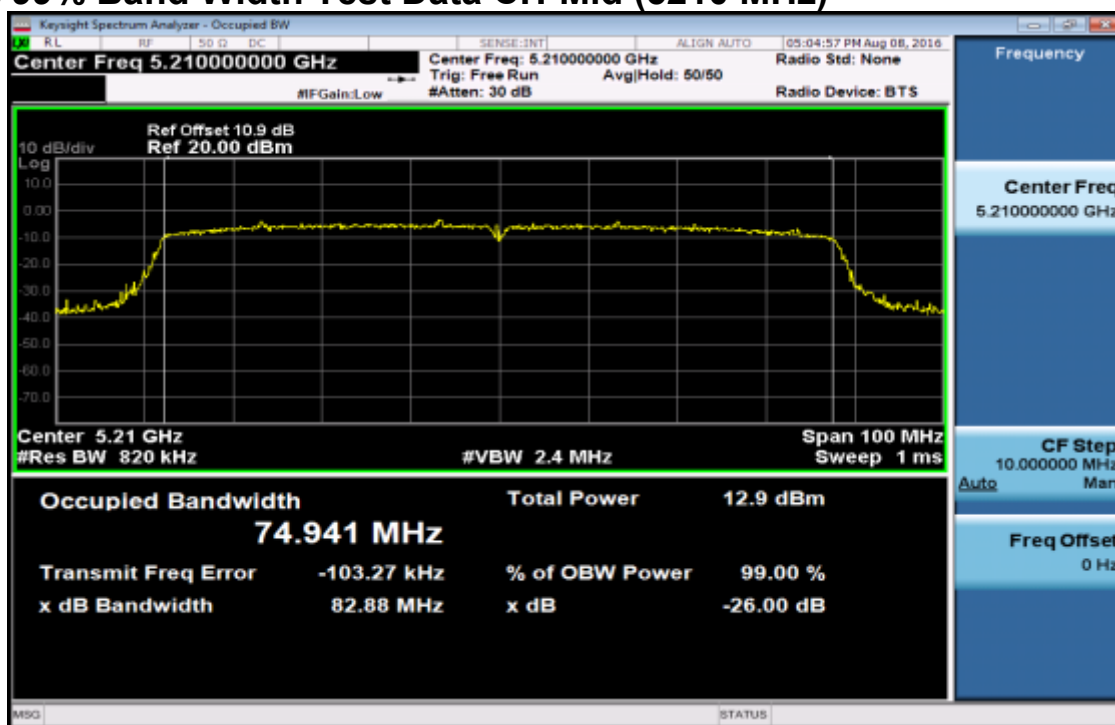
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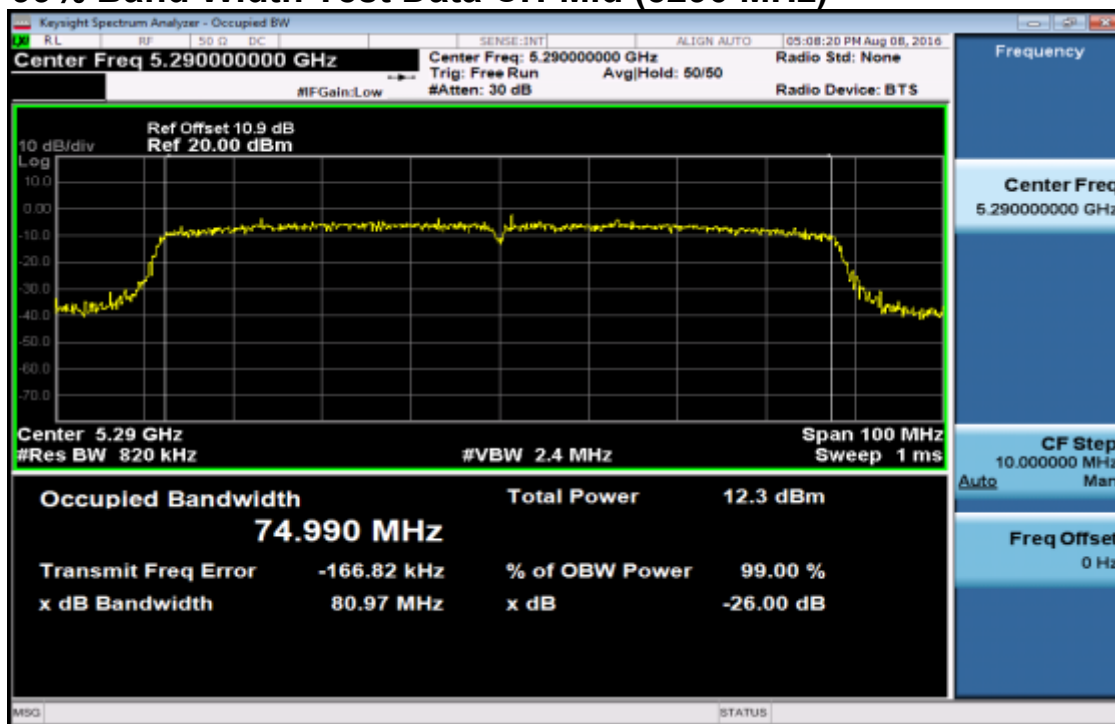
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802.11ac VHT80, 5150~5250 MHz (Main) 26dB & 99% Band Width Test Data CH-Mid (5210 MHz)



802.11ac VHT80, 5250~5350 MHz 26dB & 99% Band Width Test Data CH-Mid (5290 MHz)



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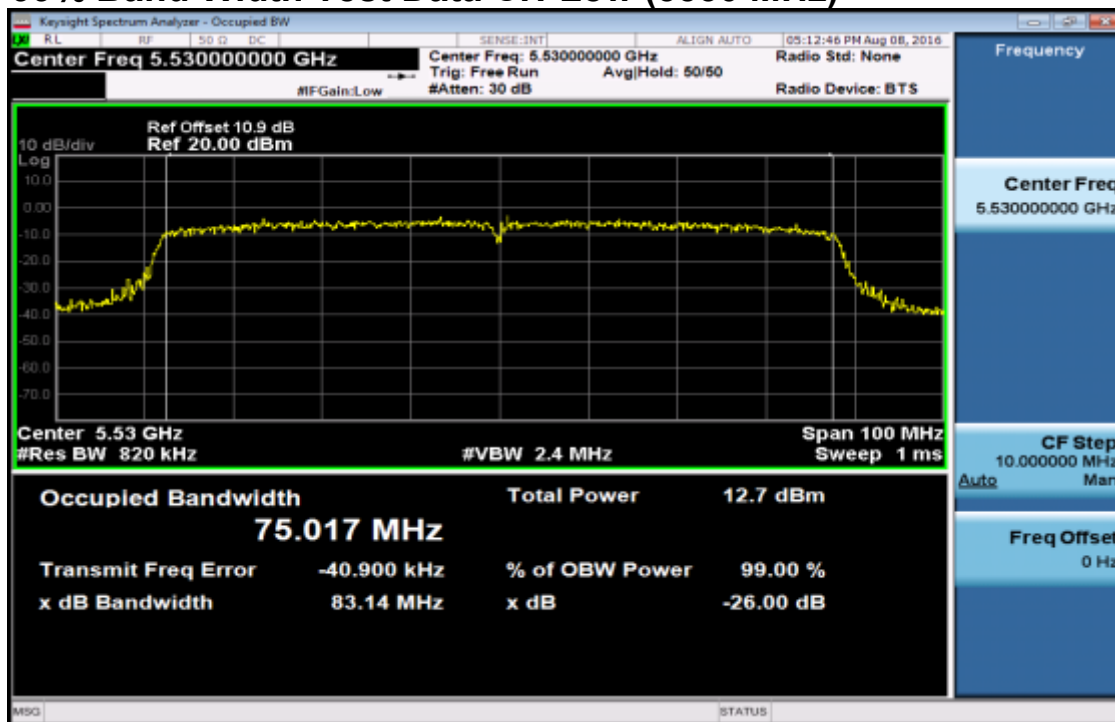
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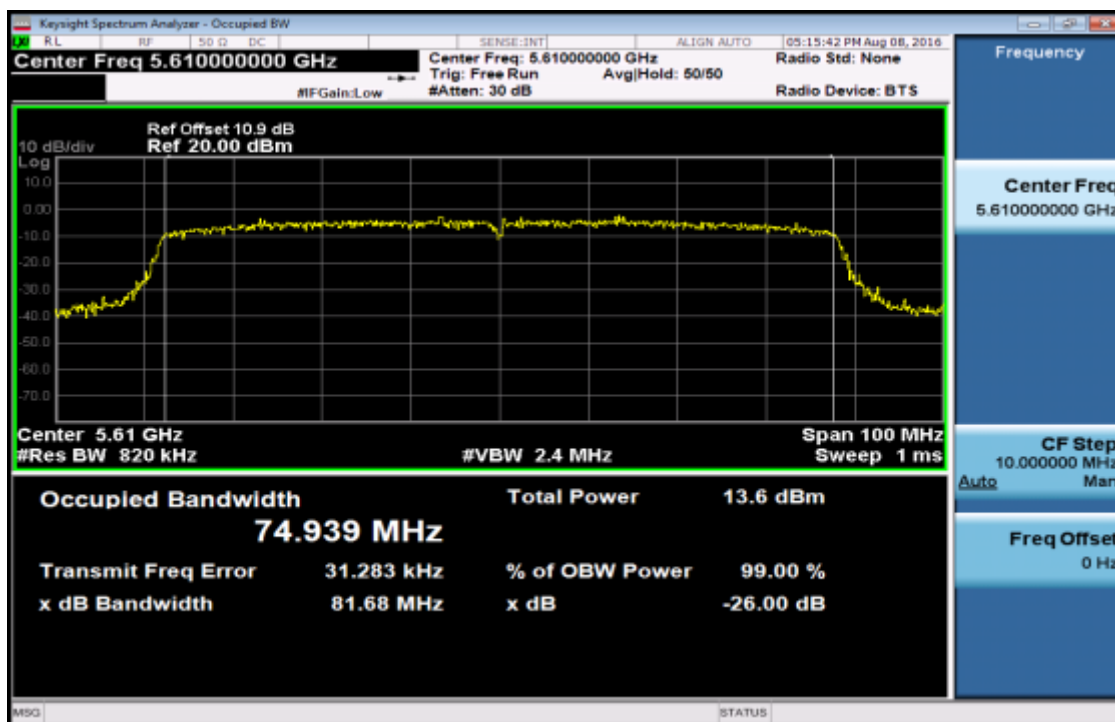
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802.11ac VHT80, 5470~5725 MHz (Main) 26dB & 99% Band Width Test Data CH-Low (5530 MHz)



26dB & 99% Band Width Test Data CH-High (5610 MHz)



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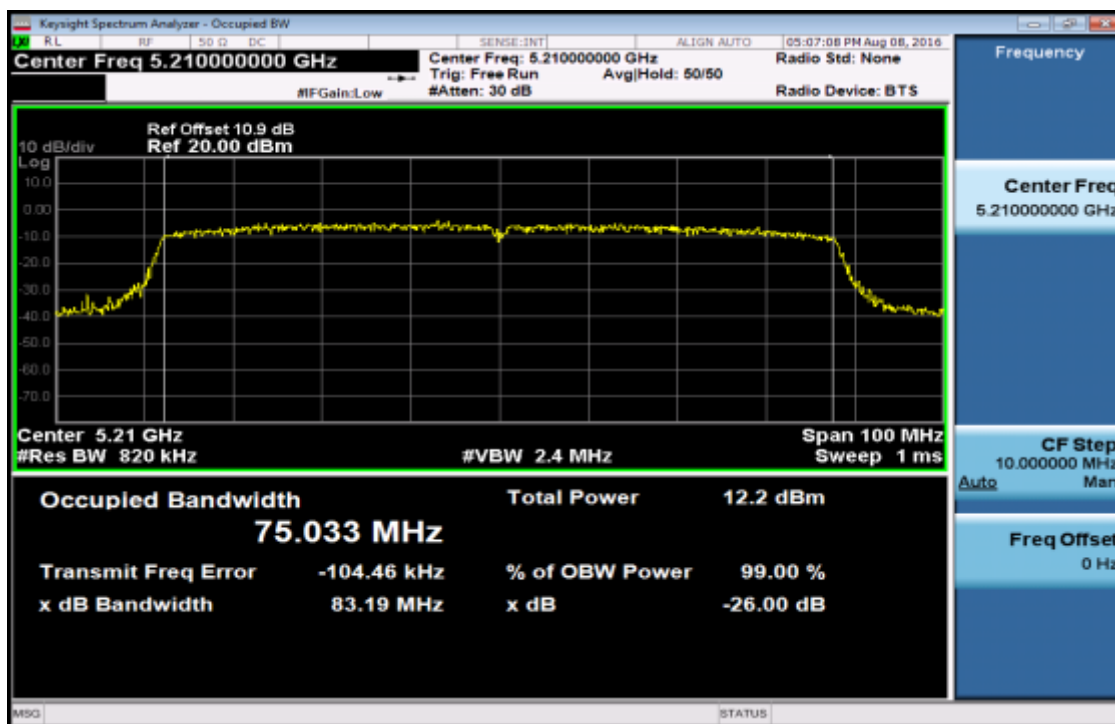
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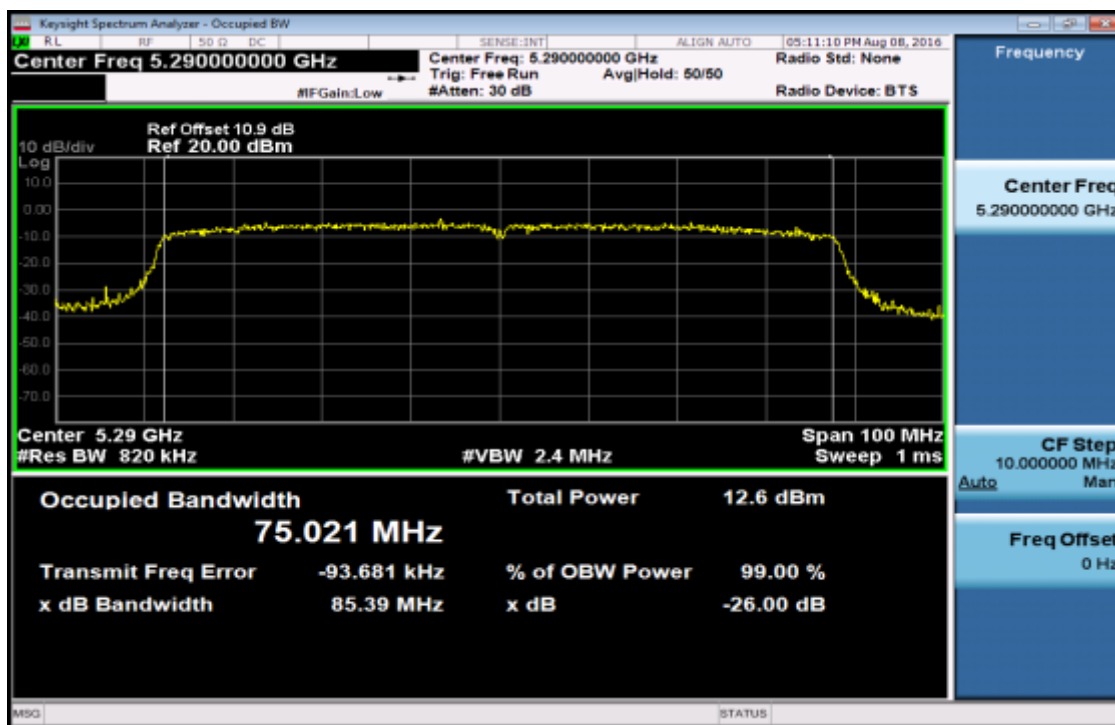
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802.11ac VHT80, 5150~5250 MHz (Aux) 26dB & 99% Band Width Test Data CH-Mid (5210 MHz)



802.11ac VHT80, 5250~5350 MHz 26dB & 99% Band Width Test Data CH-Mid (5290 MHz)



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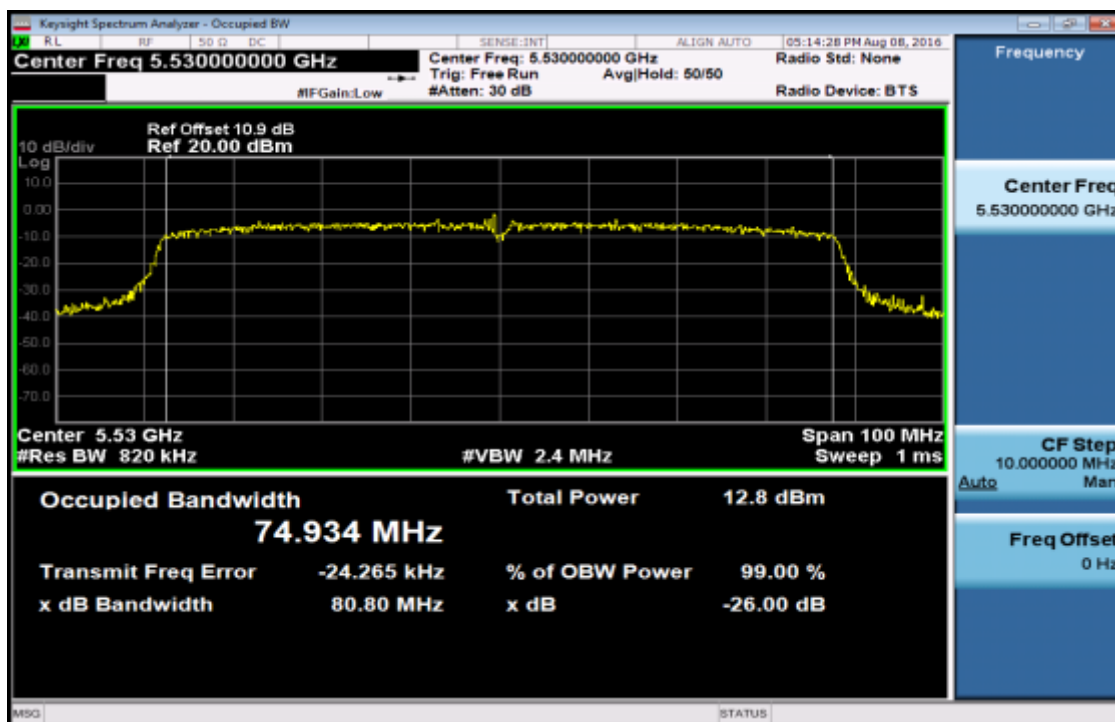
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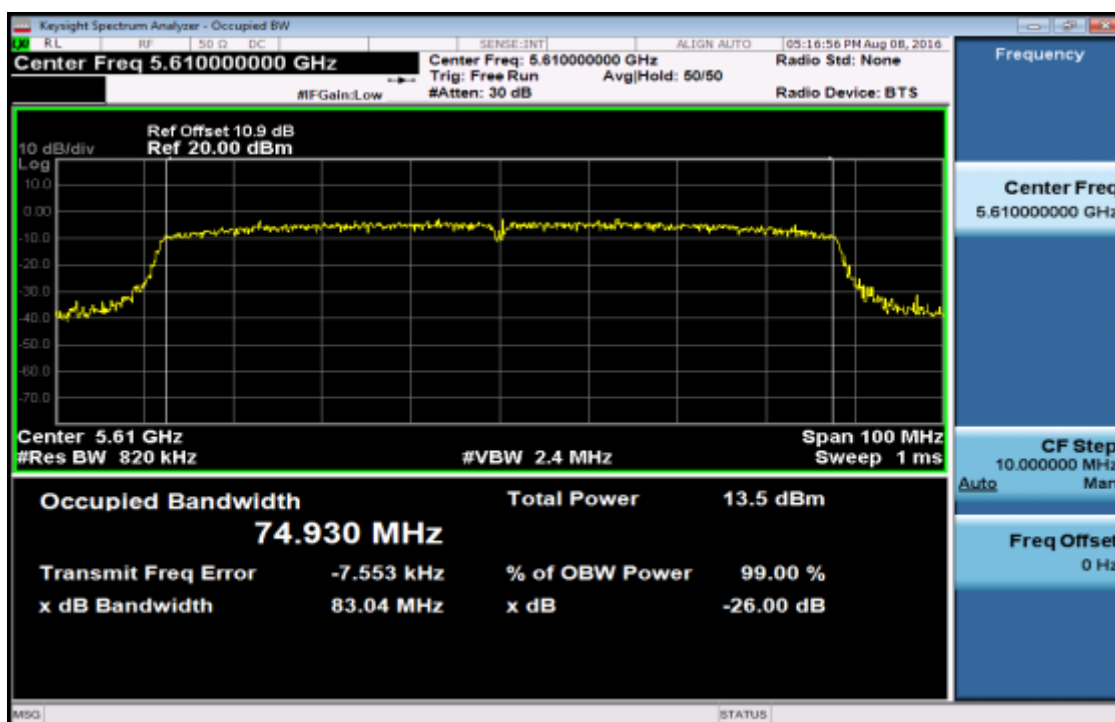
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802.11ac VHT80, 5470~5725 MHz (Aux) 26dB & 99% Band Width Test Data CH-Low (5530 MHz)



26dB & 99% Band Width Test Data CH-High (5610 MHz)



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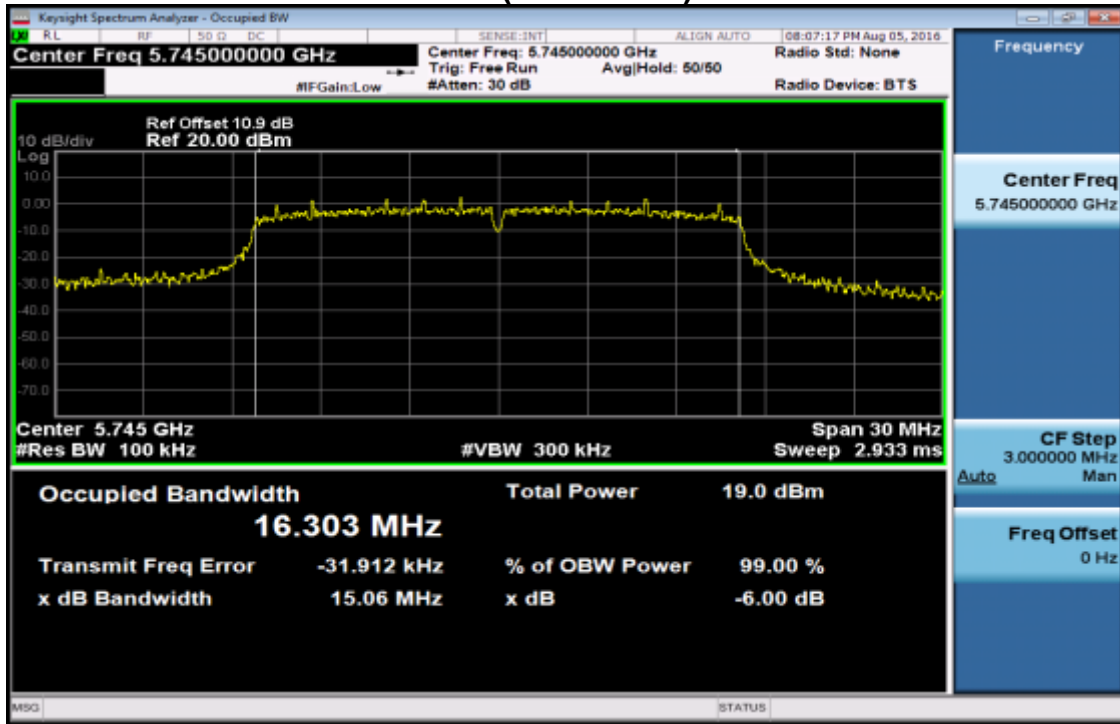
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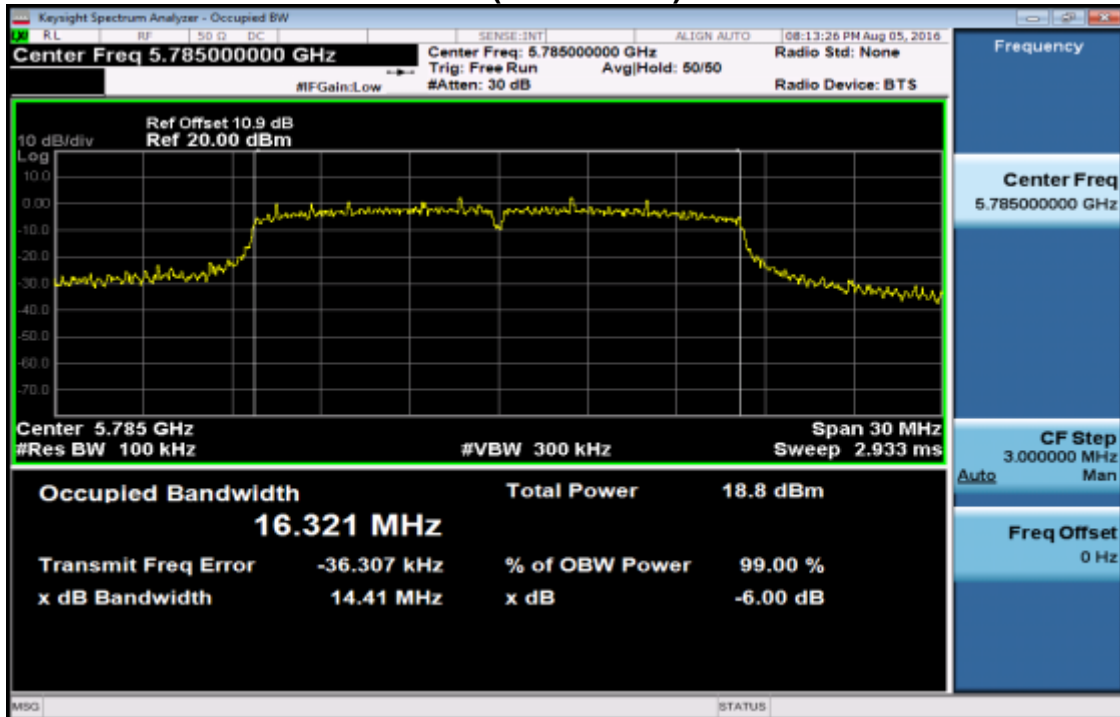
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6dB Band Width measure with Peak detector for FCC 802.11a, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5745 MHz)



6dB Band Width Test Data CH-Mid (5785 MHz)



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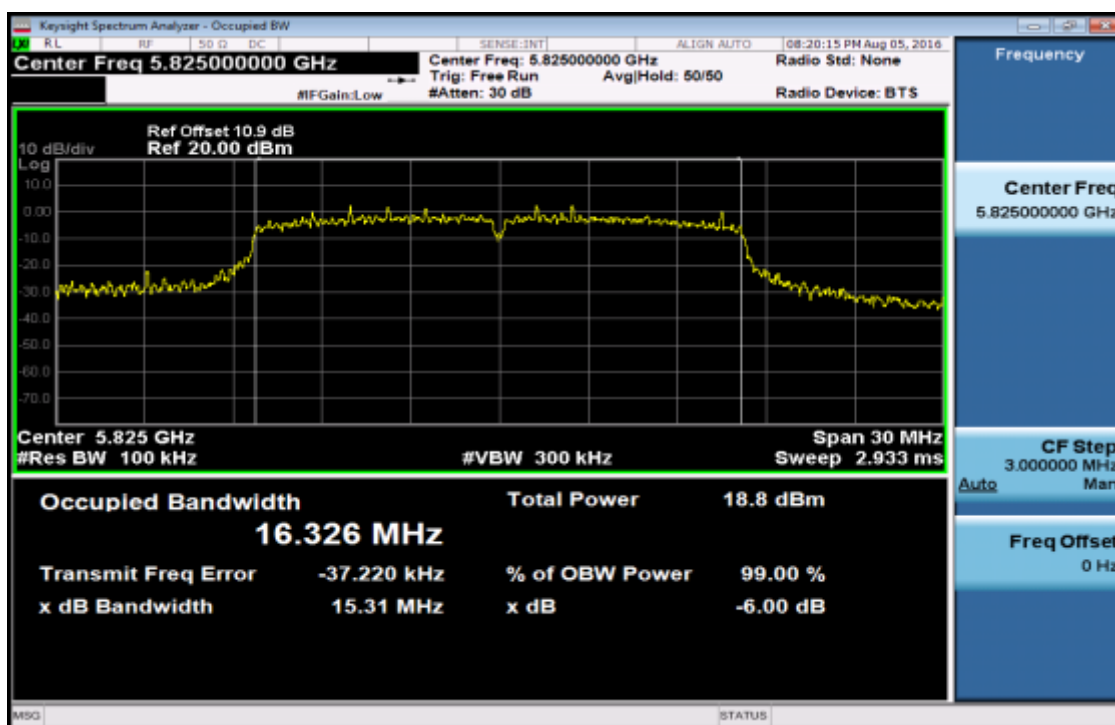
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6dB Band Width Test Data CH-High (5825 MHz)



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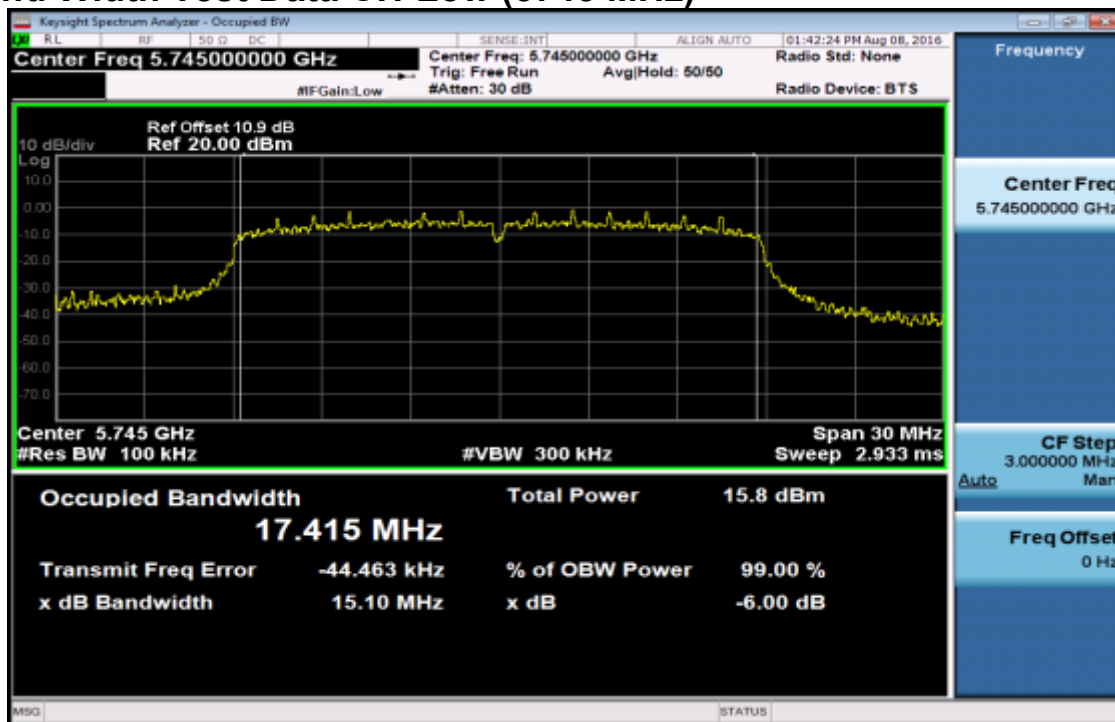
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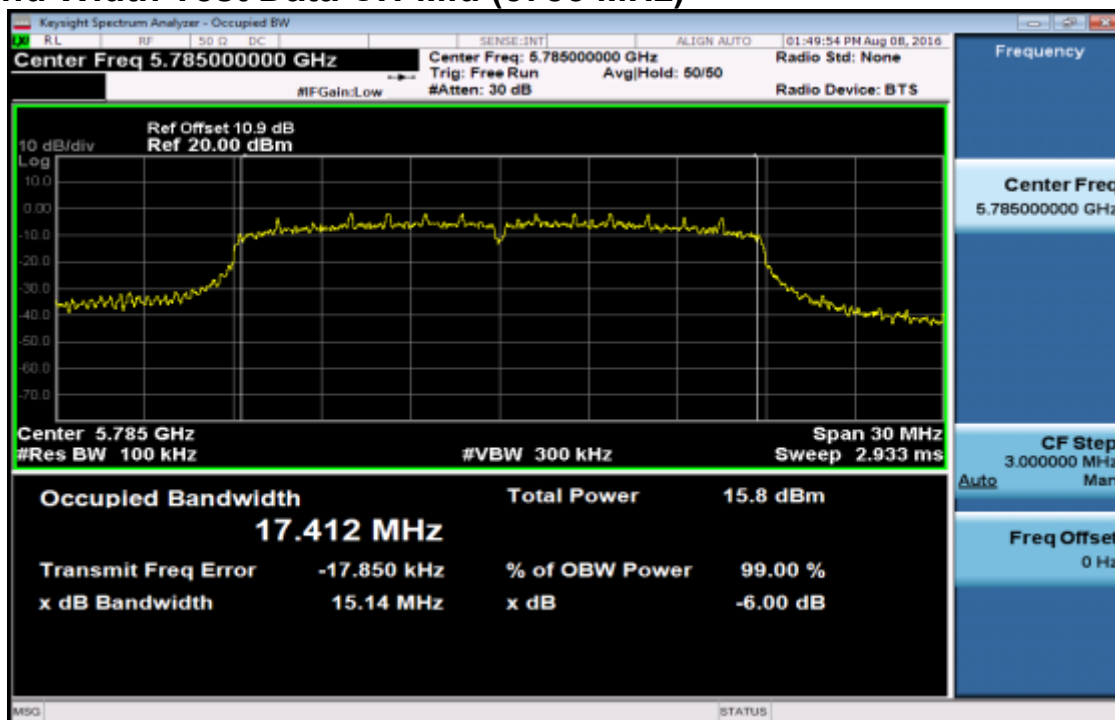
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802.11n_HT20, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5745 MHz)



6dB Band Width Test Data CH-Mid (5785 MHz)



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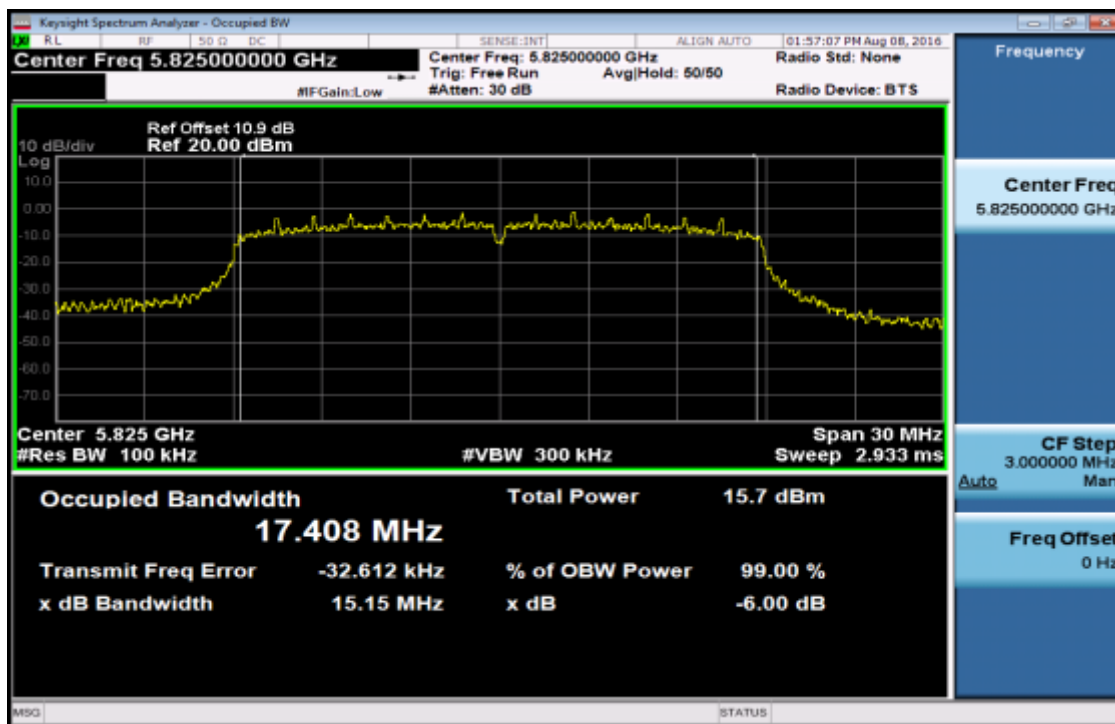
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6dB Band Width Test Data CH-High (5825 MHz)



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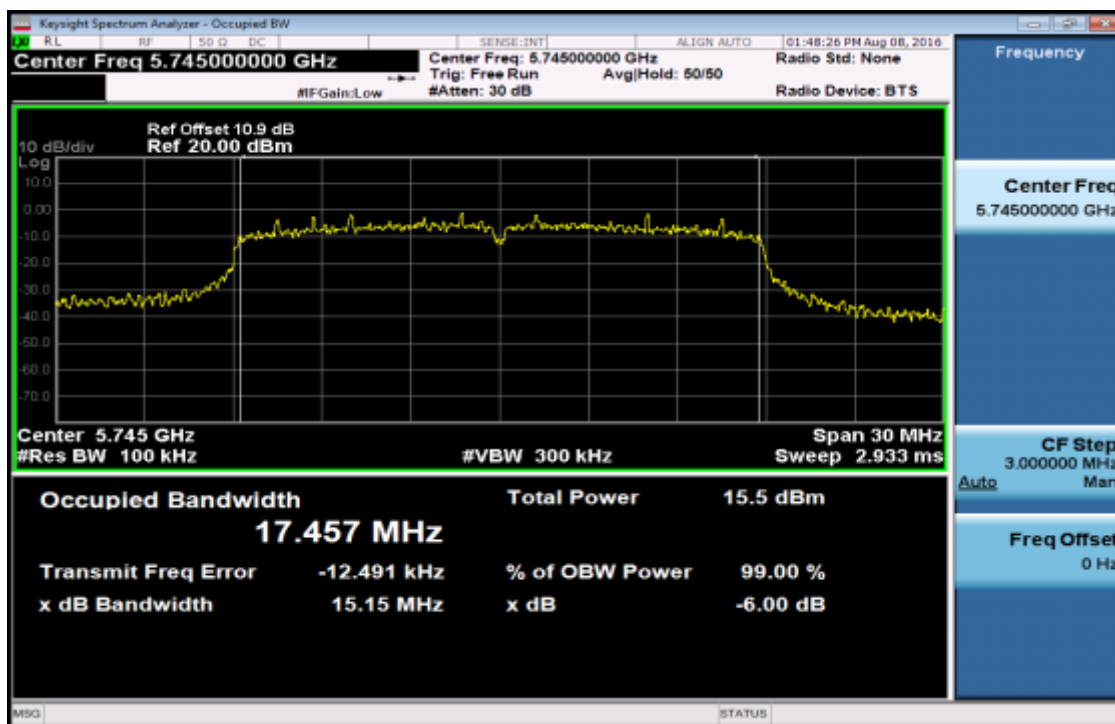
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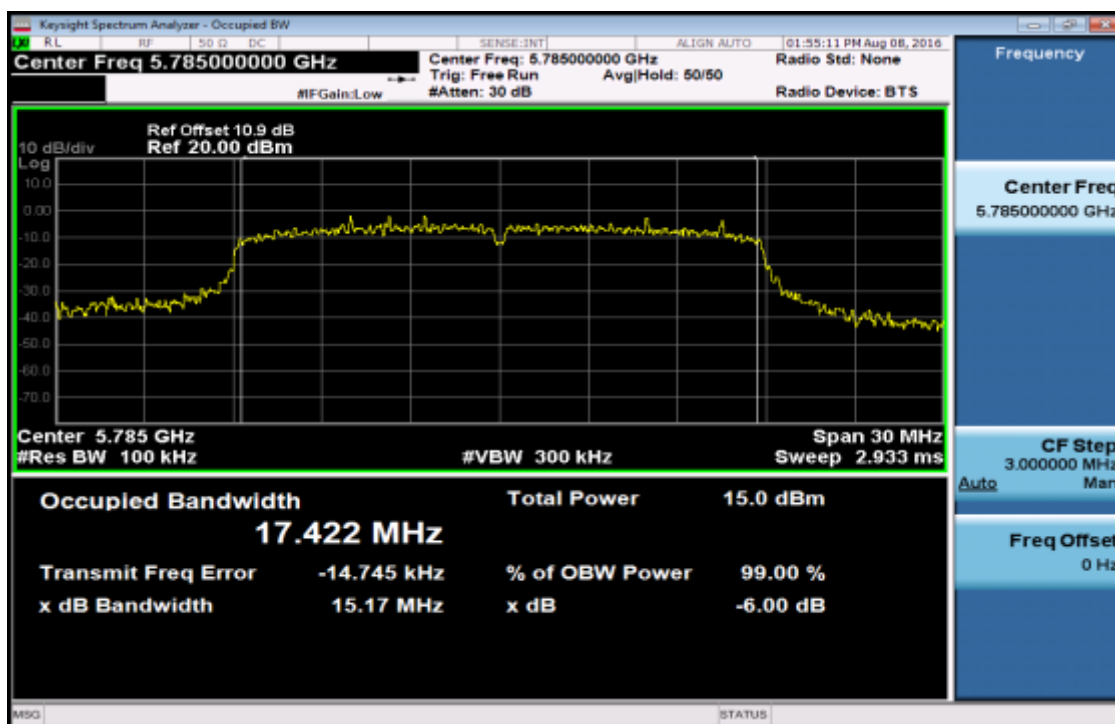
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802.11n_HT20, 5725~5850 MHz (Aux) 6dB Band Width Test Data CH-Low (5745 MHz)



6dB Band Width Test Data CH-Mid (5785 MHz)



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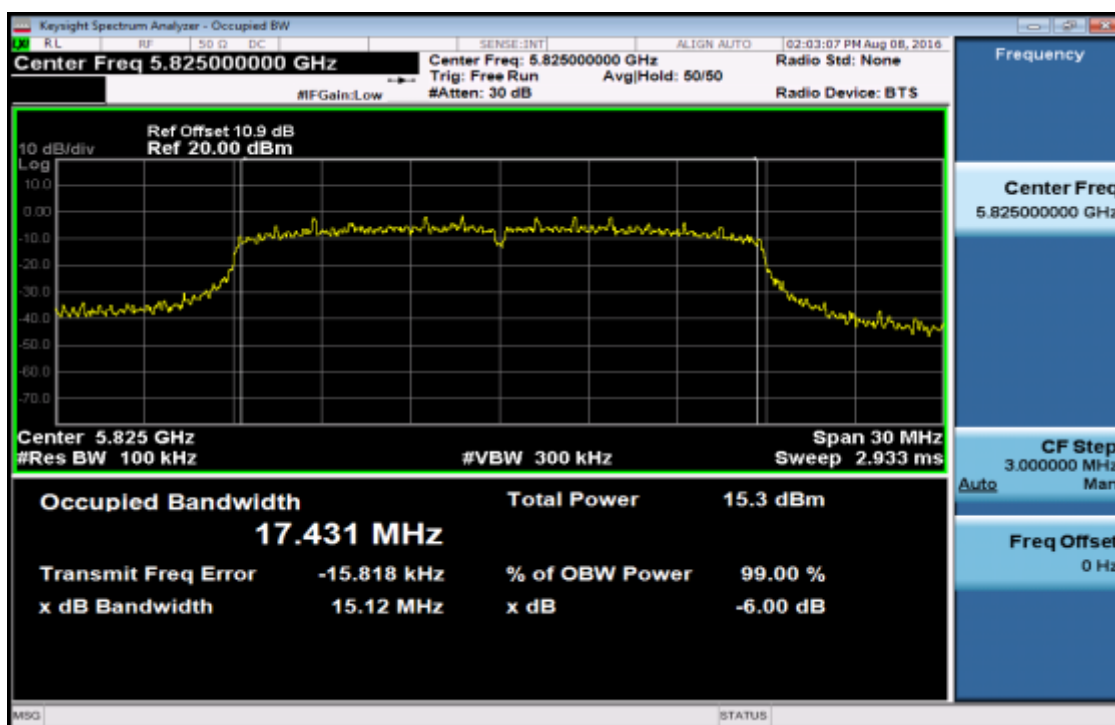
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6dB Band Width Test Data CH-High (5825 MHz)



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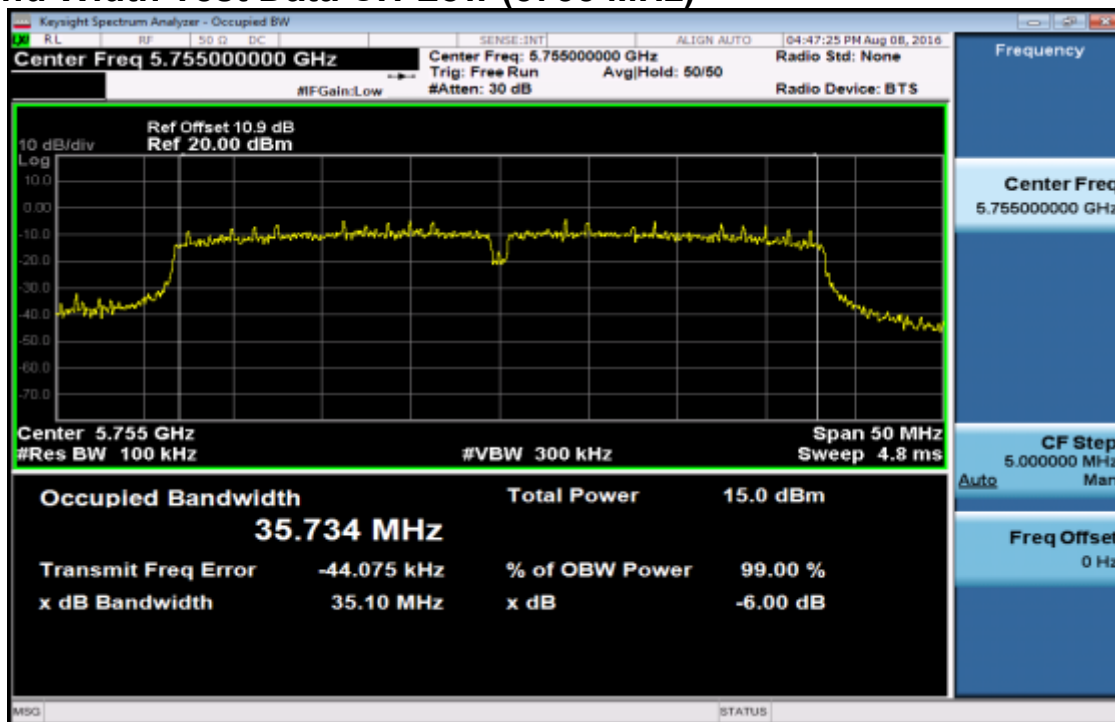
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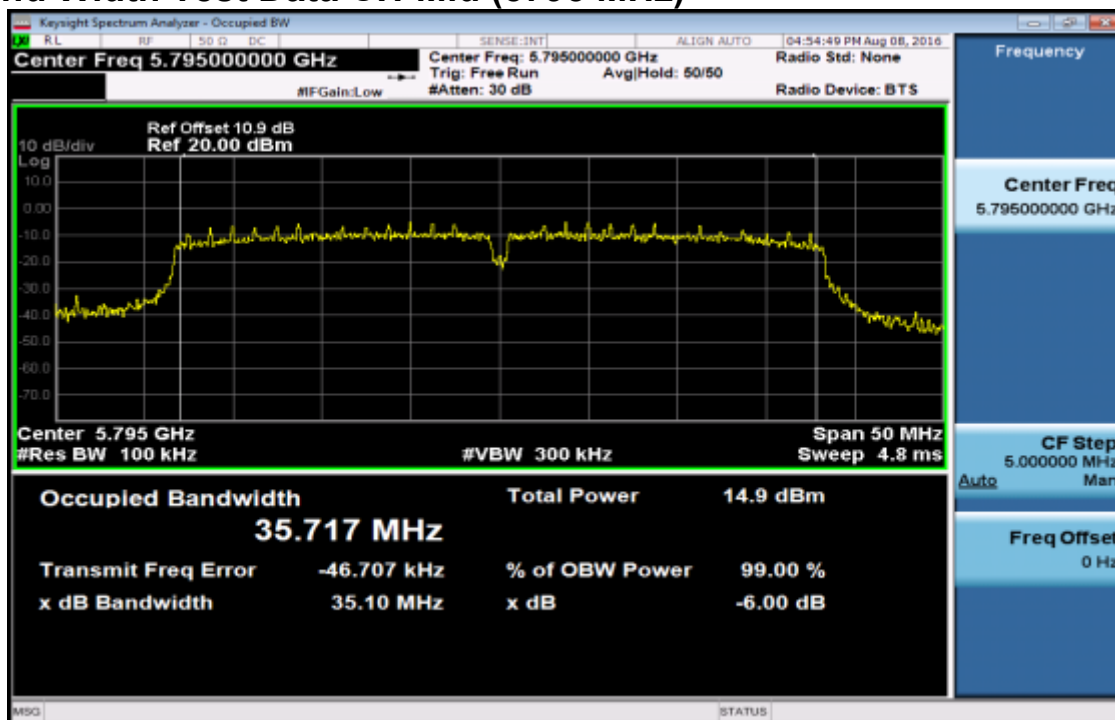
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802.11n_HT40, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5755 MHz)



6dB Band Width Test Data CH-Mid (5795 MHz)



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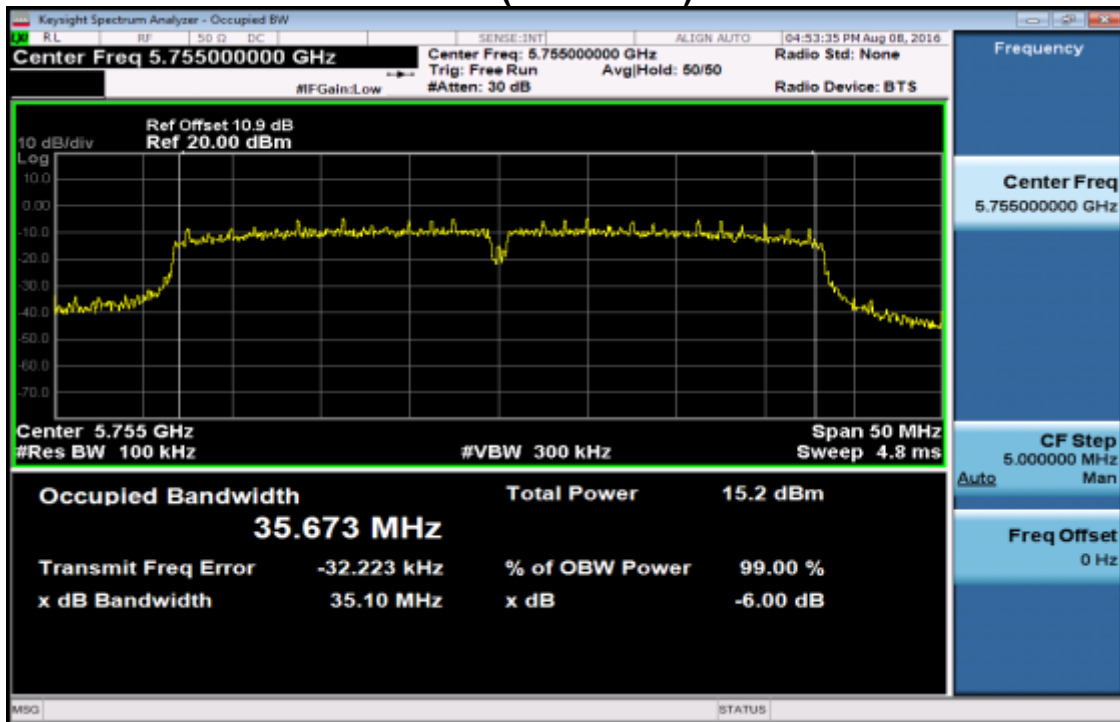
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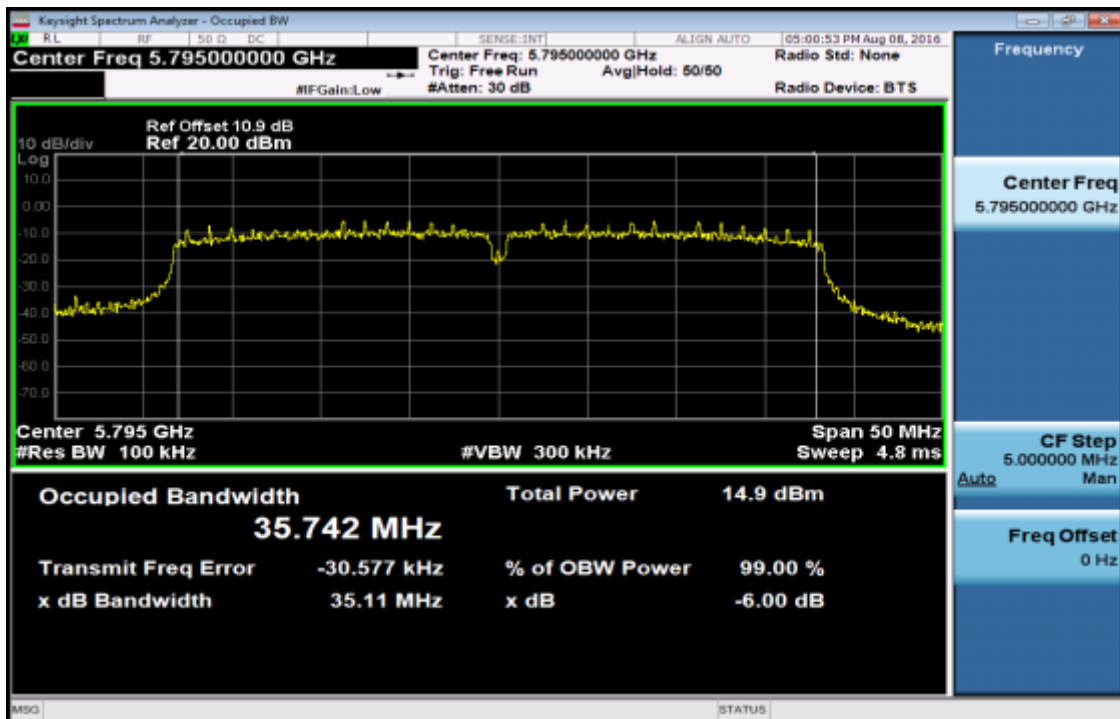
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802.11n_HT40, 5725~5850 MHz (Aux) 6dB Band Width Test Data CH-Low (5755 MHz)



6dB Band Width Test Data CH-Mid (5795 MHz)



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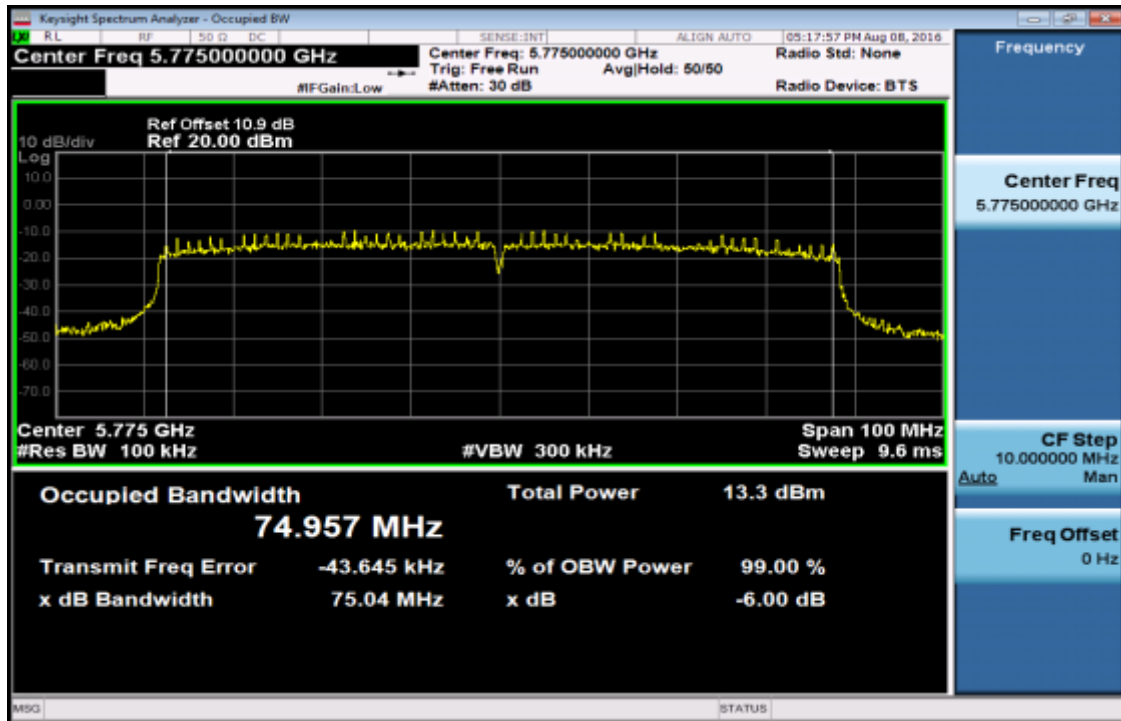
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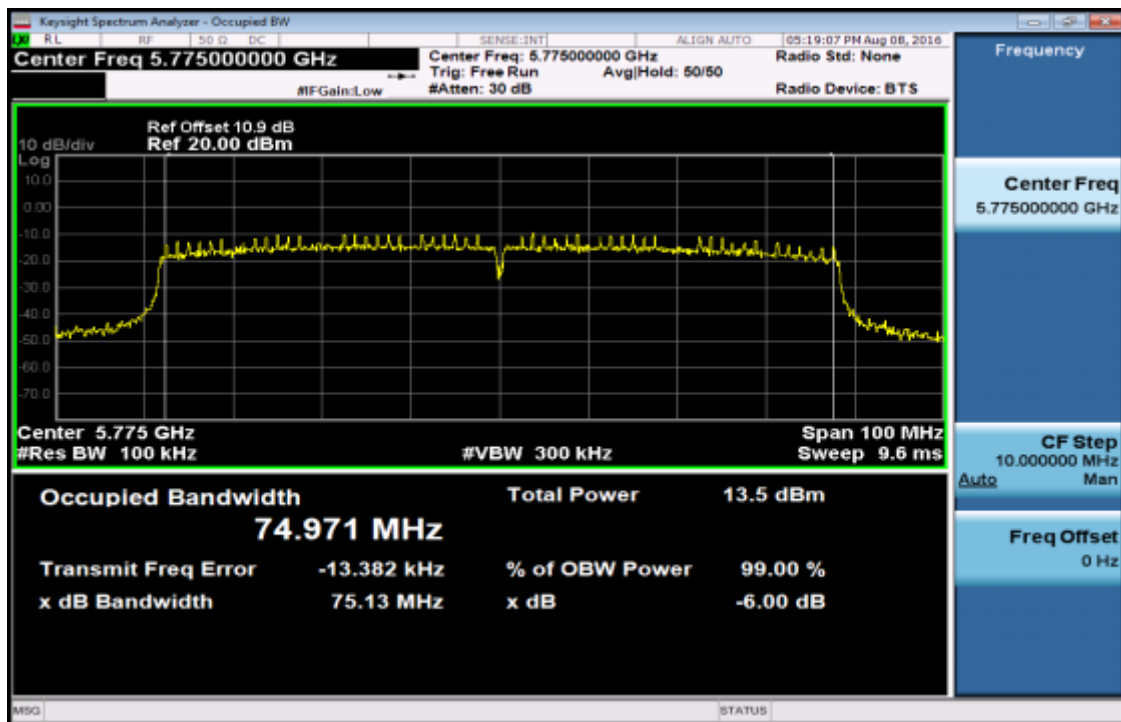
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802.11ac VHT80, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5775 MHz)



802.11ac VHT80, 5725~5850 MHz (Aux) 6dB Band Width Test Data CH-Low (5775 MHz)

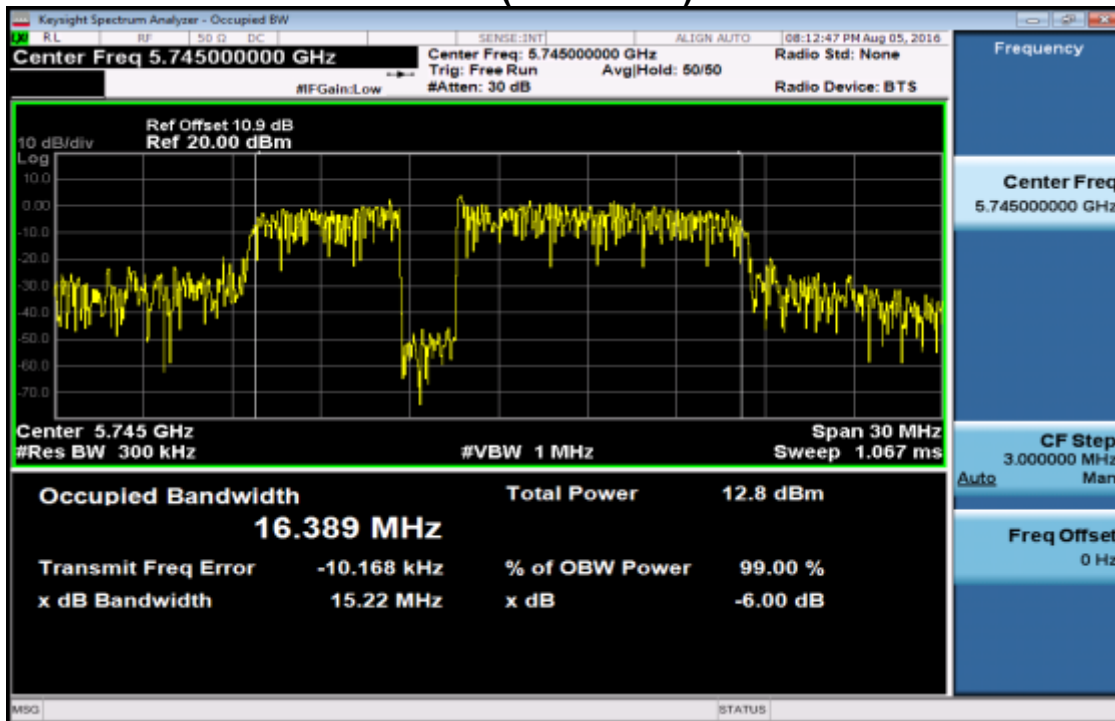


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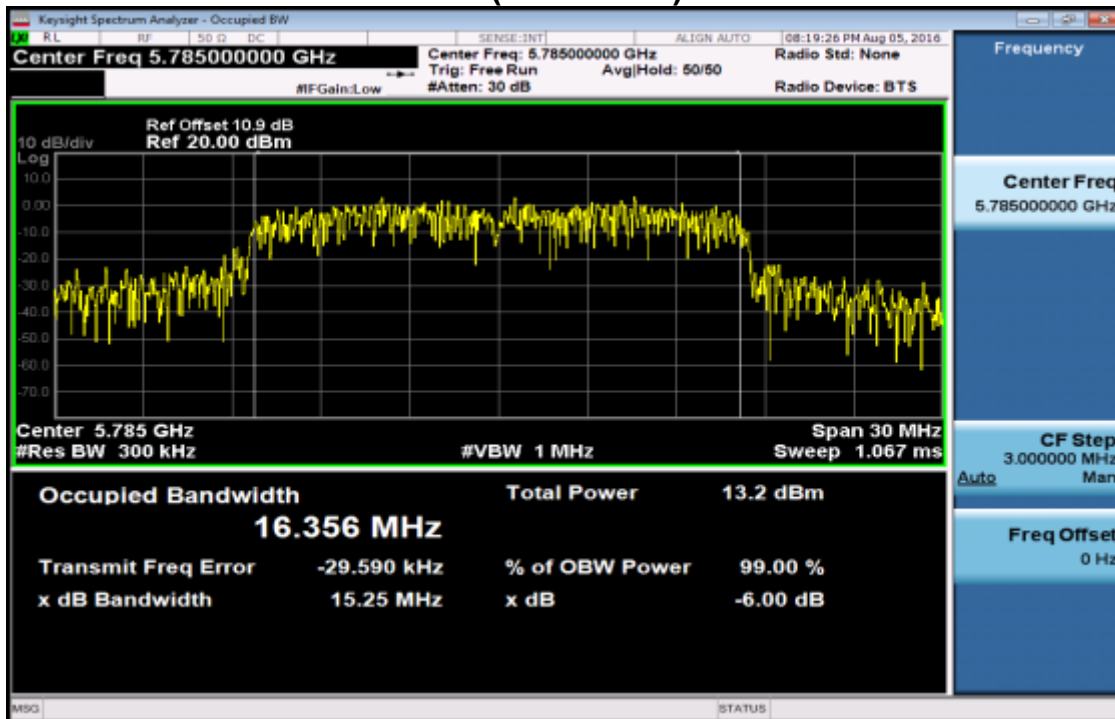
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6dB Band Width measure with Average detector for IC 802.11a, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5745 MHz)



6dB Band Width Test Data CH-Mid (5785 MHz)



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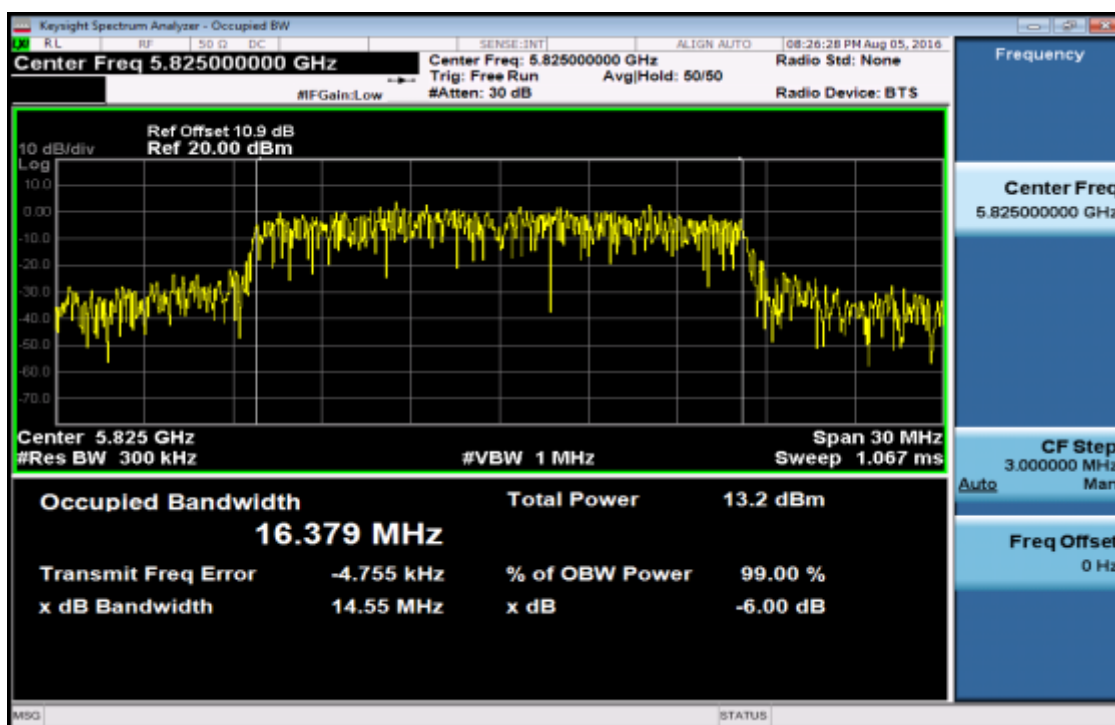
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6dB Band Width Test Data CH-High (5825 MHz)



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