RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_SL17031601-RUC-009A1_Rev1.0
Supersede Report No.:

Applicant	:	Ruckus Wireless, Inc.
Product Name	:	T811-CM Access Point
Model No.	:	T811-CM
Test Standard	:	47 CFR 15.407
Test Method	:	ANSI C63.4: 2014 789033 D02 General UNII Test Procedures New Rules v01
FCC ID	:	S9GT811CM
IC ID	:	5912A-T811CM
Dates of test	:	08/11/2017 – 08/25/2017
Issue Date	:	01/10/2018
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification [X] Equipment did not comply with the specification [ ]		

This Test Report is Issued Under the Authority of:	
	
Rachana Khanduri	Chen Ge
Test Engineer	Engineer Reviewer
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only	

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ilac-MRA
A2LA ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & Radio Equipment Directive (RED)
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_SL17031601-RUC-009A1	None	Original	09/20/2017
FCC_SL17031601-RUC-009A1_Rev1.0	Rev1.0	Updated radio description	01/10/2018

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Ruckus Wireless, Inc.
Product: T811-CM Access Point
Model: T811-CM

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	:	Ruckus Wireless, Inc.
Applicant Address	:	350 West Java Drive, Sunnyvale, California 94089 U.S.A
Manufacturer Name	:	Ruckus Wireless, Inc.
Manufacturer Address	:	350 West Java Drive, Sunnyvale, California 94089 U.S.A

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	T811-CM Access Point
Model No.	T811-CM
Trade Name	Ruckus
Serial No.	291706000007
Host Model No.	N/A
Input Power	100-240VAC 50/60Hz
Power Adapter Manu/Model	HK-AD-120A100-US
Power Adapter SN	N/A
Date of EUT received	08/10/2017
Equipment Class/ Category	DTS, UNII
Port/Connectors	-

6.2 Radio Description

Radio Type	802.11a	802.11n-20M	802.11n-40M	802.11ac-80M
Operating Frequency	5260-5320MHz 5500-5720MHz	5260-5320MHz 5500-5720MHz	5270-5310MHz 5510-5710MHz	5290MHz, 5530MHz 5610MHz, 5690MHz
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	20MHz	20MHz	40MHz	80MHz
Number of Channels	16	16	6	4
Antenna Type	Internal Omni PCB Antenna			
Antenna Gain (Peak)	5GHz: 4.5 dBi			
Antenna Connector Type	U.FL			
Note	EUT has 4 antennas, 2 antennas are in horizontal polarity, and 2 antennas in vertical polarity. The 802.11b/g/a is in CDD mode with all 4 antenna transmit simultaneously. Since they're in 90 deg phase shift between the horizontal and vertical antennas, for radiated limit, the result from different polarization antenna will not be combined. So only the result for 2 vertical poparity antennas and 2 horizontal poparity antennas will be combined for MIMO mode separately.For Cross-polarized antenna, the total gain—including array gain—is computed separately for each of polarizations using the procedures presented in this document. The highest of the total gains shall apply. For this case, the highest of the total gain will be the directional gain of 2 antennas. For conducted limit like power and psd, the result from all 4 chains will be summed. For 802.11b/g/a mode under CDD mode, the array gain for power will be 0 and for PSD will be 10 log (Nant/Nss) dB to be calculated separately for horizontal and vertical polarity.Reference to the following KDB for clarification. 662911 D01 Multiple Transmitter Output v02r01 662911 D02 MIMO with Cross-Polarized Antennas v01			

Radio Type	802.11ac-80+80M
Operating Frequency	5210+5530, 5210+5610, 5210+5775, 5290+5530, 5290+5610, 5290+5775, 5530+5775, 5610+5775
Modulation	OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Spacing	80MHz
Number of Channels	8
Antenna Type	Omni Antenna
Antenna Gain (Peak)	5GHz: 4.5dBi
Antenna Connector Type	U.FL
Note	2.4GHz and 5GHz Radio transmit simultaneously

Note: For 80+80MHz channels, chain 0 and chain 1 are transmitting first 80MHz channel, chain 2 and chain 3 are transmitting second 80MHz channel.

The AP supports Beamforming mode and the power setting for Beamforming and Non-Beamforming modes are the same.

EUT Power level setting

Mode	Frequency	Power Setting
802.11-a	5260	27
802.11-a	5280	27
802.11-a	5320	27
802.11-n-20	5260	28
802.11-n-20	5280	28
802.11-n-20	5320	28
802.11-n-40	5270	30
802.11-n-40	5310	30
802.11-ac-80	5290	30
802.11-a	5500	28
802.11-a	5580	28
802.11-a	5700	28
802.11-n-20	5500	29
802.11-n-20	5580	29
802.11-n-20	5700	29
802.11-n-40	5510	30
802.11-n-40	5590	30
802.11-n-40	5670	30
802.11-ac-80	5530	30
802.11-ac-80	5610	30

CROSS Band channels power setting

Mode	Frequency	Power Setting
802.11-a	5720	27
802.11-n-20	5720	28
802.11-n-40	5710	30
802.11-ac-80	5690	30

Note: All data rate has been verified and worst case was used for all test items.

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	PP01L Latitude E5440	F1WPF12	Dell	-
2	Power Supply	DL 7000SSX	61688175	Electroline Equipment Inc.	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	USB	Laptop	USB	2	N/A	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Putty	Set the EUT to transmit continuously in diferent test mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure	Pass / Fail
Restricted Band of Operation	FCC	15.205	ANSI C63.4 – 2014 789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
AC Conducted Emissions Voltage	FCC	15.207(a)	ANSI C63.4 – 2014	☒ Pass ☐ N/A

Test Item	Test standard		Test Method/Procedure	Pass / Fail
26 & 6 dB Emission Bandwidth	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Maximum conducted Output Power	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Power reduction (Antenna Gain > 6 dBi)	FCC	15.407 (a) (2)	-	☐ Pass ☒ N/A
Band Edge and Radiated Spurious Emissions	FCC	15.407(b)(2), 15.407(b)(6)	ANSI C63.4 – 2014 789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Power Spectral Density	FCC	15.407 (a) (2)	789033 D02 General UNII Test Procedures New Rules v01	☒ Pass ☐ N/A
Frequency Stability	FCC	15.407 (g)	-	☐ Pass ☒ N/A
Transmit Power Control (TPC)	FCC	15.407 (h)(1)	-	☐ Pass ☒ N/A
User Manual	FCC	-	-	☒ Pass ☐ N/A
Remark	1. All measurement uncertainties are not taken into consideration for all presented test result. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.			

9 Measurement Uncertainty

9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.
Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
LISN Insertion Loss	0.40	Normal	2	1	0.20
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch LISN - Receiver	0.25	U-Shape	1.414	1	0.1768033
LISN Impedance	2.5	Triangular	2.449	1	1.0208248
Combined Standard Uncertainty					1.928133
Expanded Uncertainty (K=2)					3.856266

The total derived measurement uncertainty is +/- 3.86 dB.

9.2 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.
Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
Expanded Uncertainty (K=2)					6.0118262

The total derived measurement uncertainty is +/- 6.00 dB.

9.3 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
Expanded Uncertainty (K=2)					8.4726

The total derived measurement uncertainty is +/- 8.47 dB.

9.4 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Reference Level	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Attenuator	0.25	Normal	2	1	0.125
Mismatch	0.25	U-Shape	1.414	1	0.1768033
Combined Standard Uncertainty					0.476087
Expanded Uncertainty (K=2)					0.952174

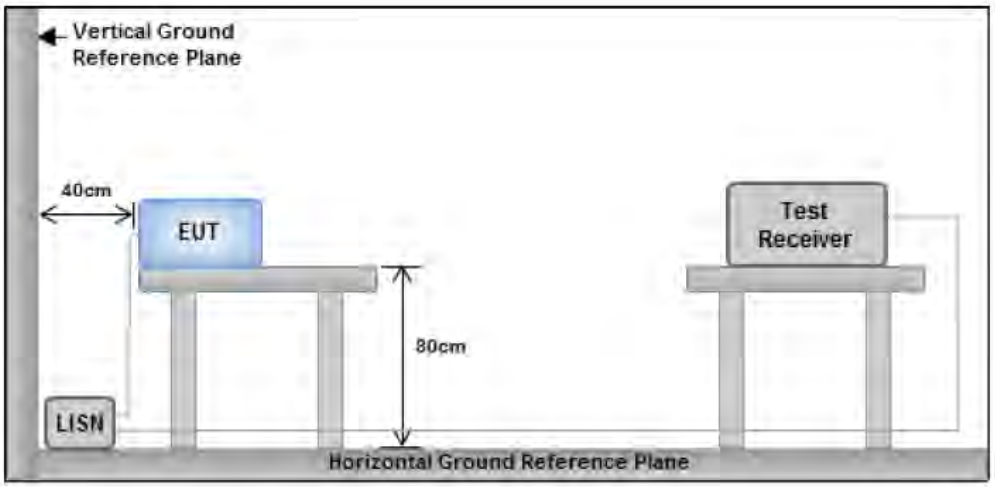
The total derived measurement uncertainty is +/- 0.95 dB.

10 Measurements, Examination and Derived Results

10.1 Conducted Emissions

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Spec	Item	Requirement	Applicable
RSS247(A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup	 Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes		
Procedure	- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment was powered separately from another main supply.		
Remark	EUT was tested at 120VAC, 60Hz		
Result	☒ Pass ☐ Fail		

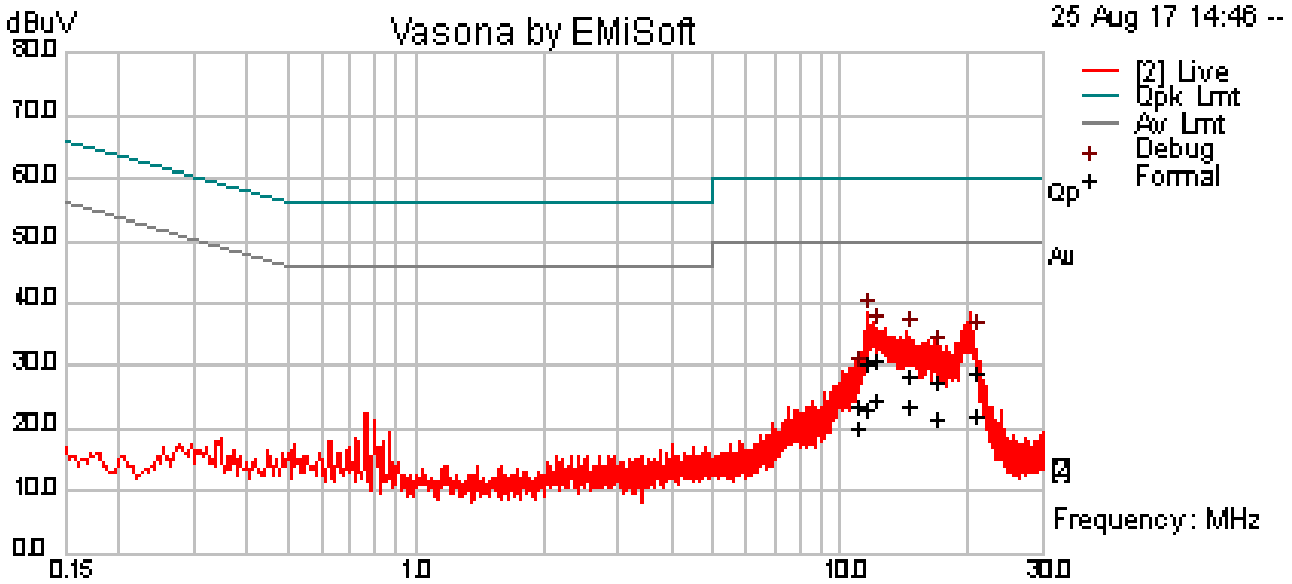
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Rachana Khanduri at Conducted Emission test site.

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(° C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	08/25/2017			
Remarks	Conducted @ Live			

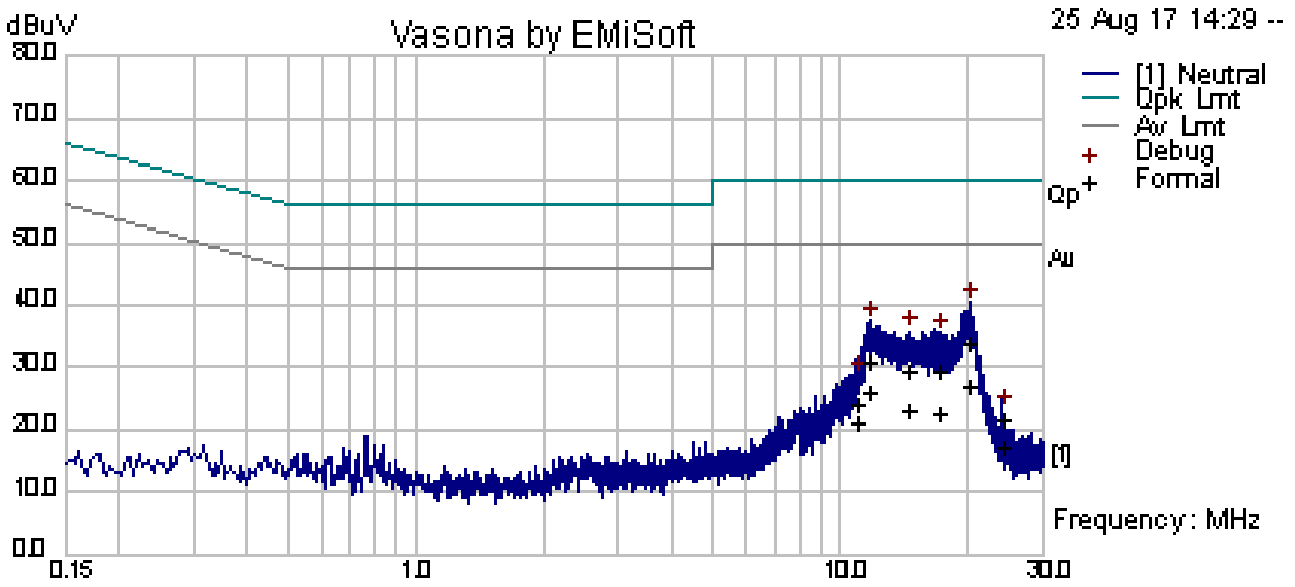


Live Plot at 120VAC, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
11.53	19.61	10.05	0.53	30.19	Quasi Peak	Live	60.00	-29.81	Pass
12.17	20.25	10.05	0.53	30.84	Quasi Peak	Live	60.00	-29.16	Pass
14.39	18.00	10.06	0.55	28.61	Quasi Peak	Live	60.00	-31.39	Pass
20.75	18.16	10.07	0.67	28.90	Quasi Peak	Live	60.00	-31.10	Pass
16.70	16.68	10.06	0.60	27.34	Quasi Peak	Live	60.00	-32.66	Pass
10.87	13.05	10.05	0.52	23.62	Quasi Peak	Live	60.00	-36.38	Pass
11.53	12.41	10.05	0.53	22.99	Average	Live	50.00	-27.01	Pass
12.17	13.72	10.05	0.53	24.31	Average	Live	50.00	-25.69	Pass
14.39	12.91	10.06	0.55	23.52	Average	Live	50.00	-26.48	Pass
20.75	11.31	10.07	0.67	22.05	Average	Live	50.00	-27.95	Pass
16.70	10.80	10.06	0.60	21.46	Average	Live	50.00	-28.54	Pass
10.87	9.43	10.05	0.52	20.00	Average	Live	50.00	-30.00	Pass

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(° C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	08/25/1017			
Remarks	Conducted @ Neutral			



Neutral Plot at 120VAC, 60Hz

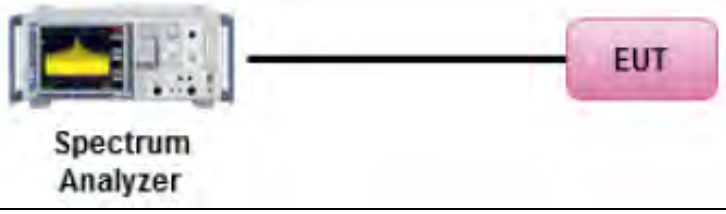
Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line / Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
20.24	23.07	10.07	0.66	33.80	Quasi Peak	Neutral	60.00	-26.20	Pass
11.67	20.43	10.05	0.53	31.01	Quasi Peak	Neutral	60.00	-28.99	Pass
14.49	18.67	10.06	0.56	29.28	Quasi Peak	Neutral	60.00	-30.72	Pass
16.96	18.70	10.06	0.60	29.37	Quasi Peak	Neutral	60.00	-30.63	Pass
10.98	13.45	10.05	0.52	24.02	Quasi Peak	Neutral	60.00	-35.98	Pass
24.00	10.82	10.08	0.72	21.61	Quasi Peak	Neutral	60.00	-38.39	Pass
20.24	16.06	10.07	0.66	26.80	Average	Neutral	50.00	-23.20	Pass
11.67	15.36	10.05	0.53	25.94	Average	Neutral	50.00	-24.06	Pass
14.49	12.59	10.06	0.56	23.20	Average	Neutral	50.00	-26.80	Pass
16.96	11.79	10.06	0.60	22.46	Average	Neutral	50.00	-27.54	Pass
10.98	10.72	10.05	0.52	21.29	Average	Neutral	50.00	-28.71	Pass
24.00	6.47	10.08	0.72	17.27	Average	Neutral	50.00	-32.73	Pass

10.2 6dB & 26 dB Bandwidth

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.407	-	26 dB Emission BW: Report only for reference.	☒
		6 dB Emission BW: Report only for reference(Cross Band)	☒
	a) (2)	26 dB Emission BW: Report only for power limit calculation.	☐

Test Setup



Test Procedure

789033 D02 General UNII Test Procedures New Rules v01

26dB Emission bandwidth measurement procedure (Other than 5.725-5.85 GHz)

- Use the spectrum analyzer built-in measurement function to determine the 26dB BW.
  - Set RBW = around 1% of emission bandwidth
  - Set VBW > RBW
  - Detector = Peak
  - Trace mode = max hold
- Allow the trace to stabilize.
- Capture the plot.
- Repeat above steps for different test channel and other modulation type.
-

6dB Emission bandwidth measurement procedure

- Use the spectrum analyzer built-in measurement function to determine the 26dB BW.
  - Set RBW = 100kHz
  - Set VBW > 3RBW
  - Detector = Peak
  - Trace mode = max hold
- Allow the trace to stabilize.
- Capture the plot.
- Repeat above steps for different test channel and other modulation type.

Test Date	08/11/2017 – 08/12/2017	Environmental condition	Temperature	23°C
			Relative Humidity	42%
			Atmospheric Pressure	1021mbar
Remark	N/A			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

Test was done by Rachana Khanduri at RF test site.

26dB Bandwidth measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5260	Low	19.31
	802.11a	5280	Mid	18.67
	802.11a	5320	High	18.60
	802.11n-20	5260	Low	19.72
	802.11n-20	5280	Mid	20.30
	802.11n-20	5320	High	19.88
	802.11n-40	5270	Low	39.02
	802.11n-40	5310	High	38.80
	802.11ac-80	5290	Mid	81.21

26dB Bandwidth measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5500	Low	18.65
	802.11a	5580	Mid	18.96
	802.11a	5700	High	18.50
	802.11n-20	5500	Low	20.23
	802.11n-20	5580	Mid	20.03
	802.11n-20	5700	High	19.76
	802.11n-40	5510	Low	39.22
	802.11n-40	5590	Mid	38.93
	802.11n-40	5670	High	38.48
	802.11ac-80	5530	Low	80.77
	802.11ac-80	5610	High	81.63

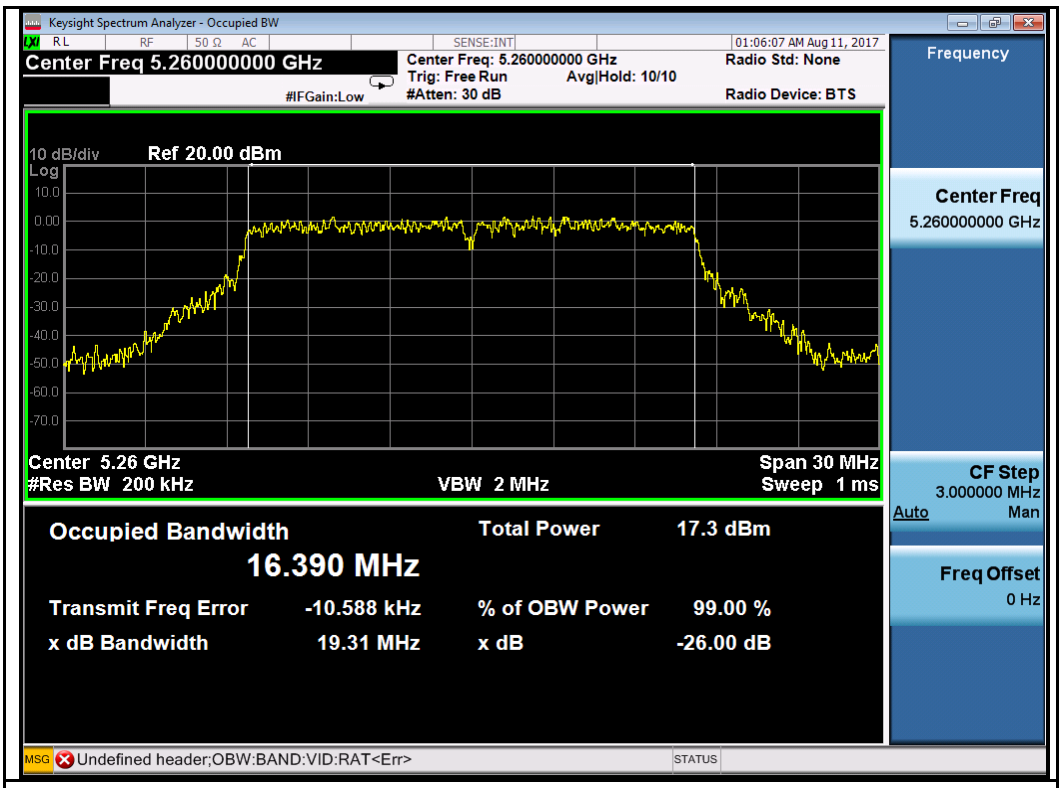
26dB Bandwidth measurement result for cross channels

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5720	CROSS	19.34
	802.11n-20	5720	CROSS	20.01
	802.11n-40	5710	CROSS	38.91
	802.11ac-80	5690	CROSS	79.64

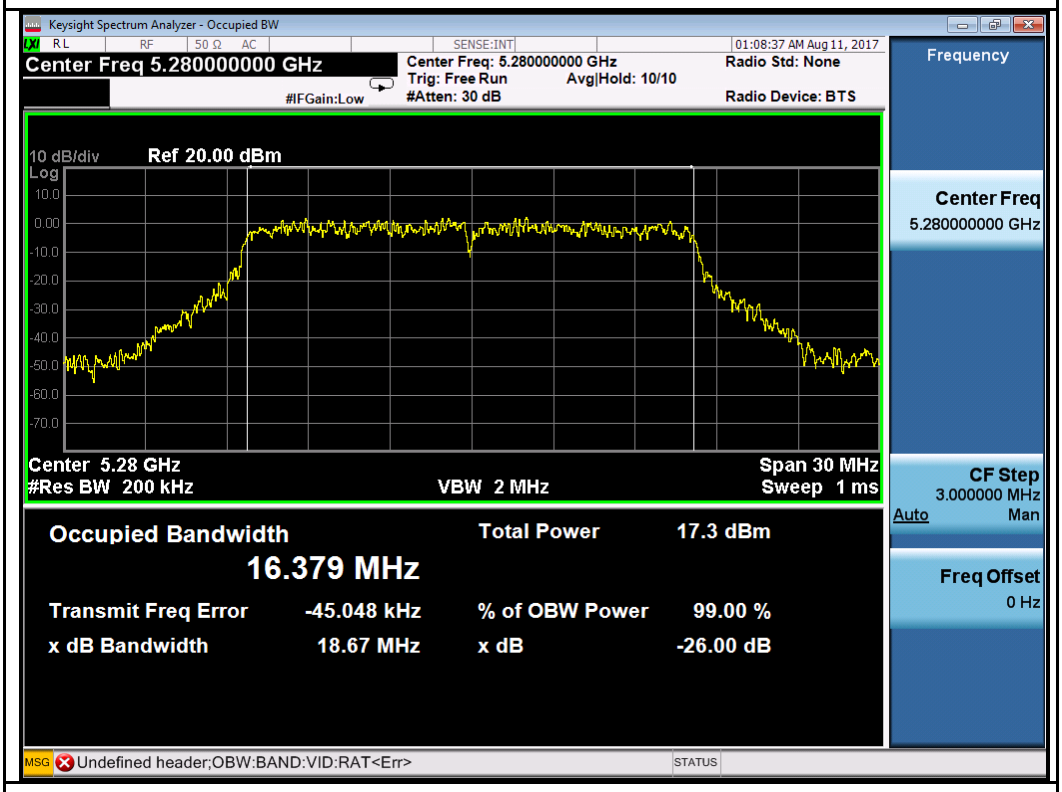
6 Bandwidth measurement result for cross channels

Type	Test mode	Freq (MHz)	CH	Result (MHz)
26dB BW	802.11a	5720	CROSS	16.31
	802.11n-20	5720	CROSS	17.59
	802.11n-40	5710	CROSS	34.49
	802.11ac-80	5690	CROSS	75.78

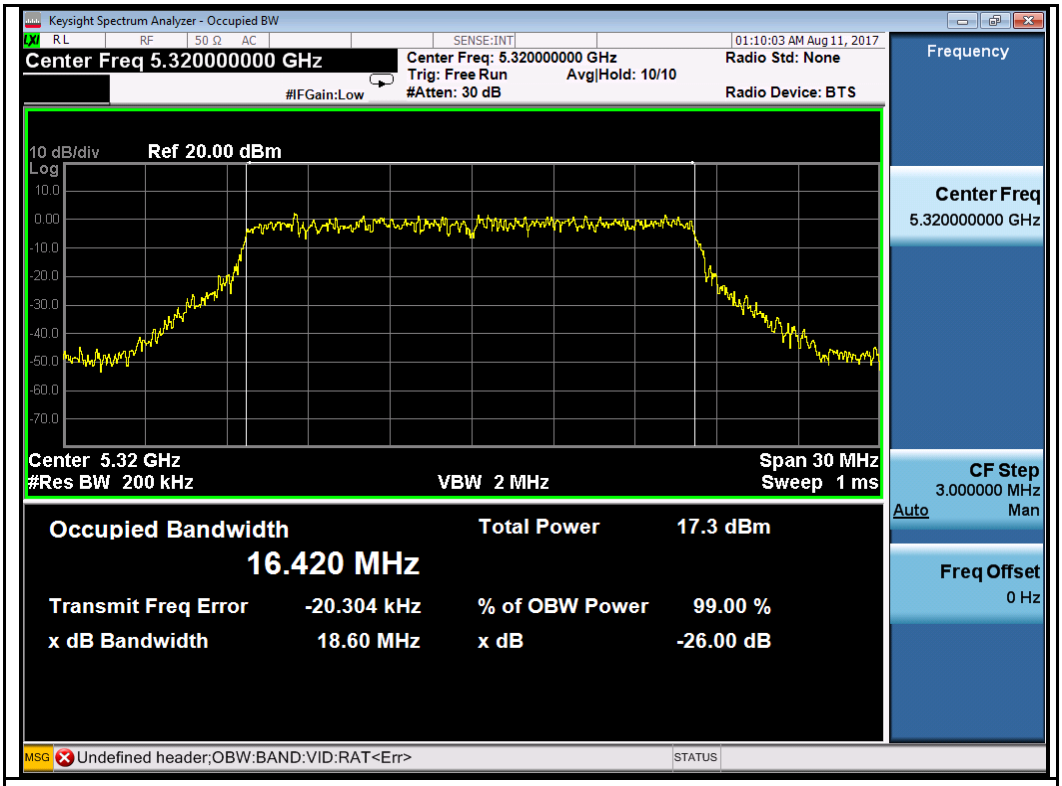
26dB Bandwidth Test Plots
W53:



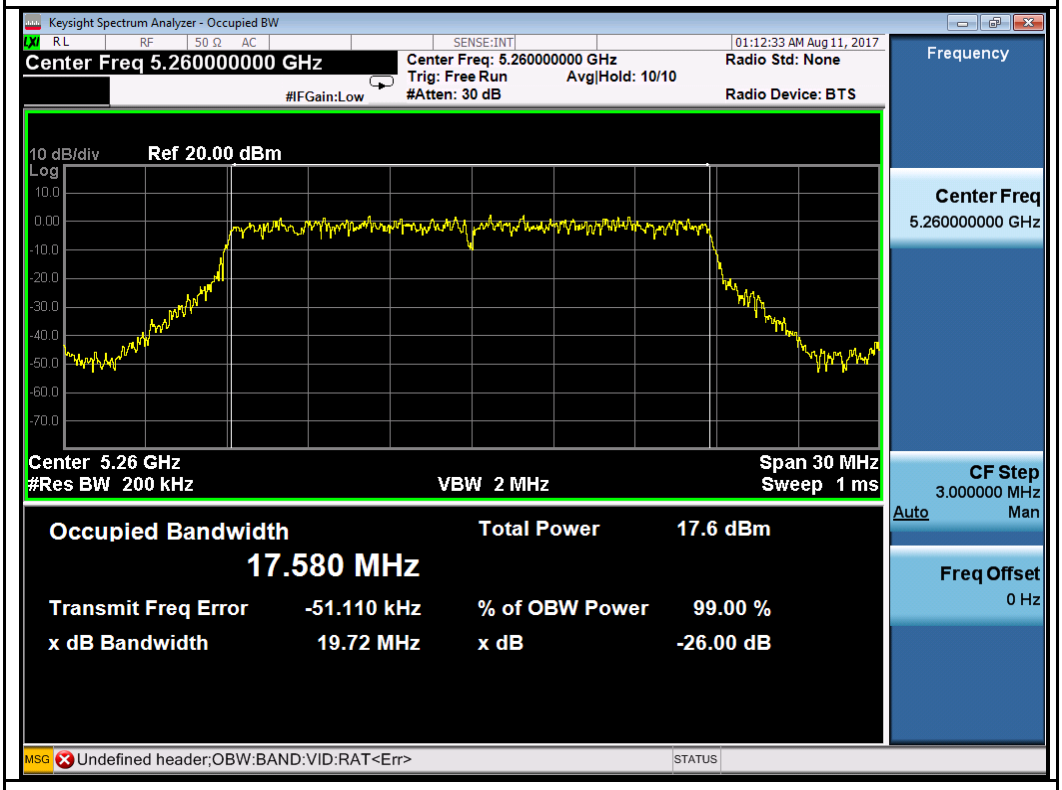
802.11a-5260MHz



802.11a-5280MHz



802.11a-5320MHz



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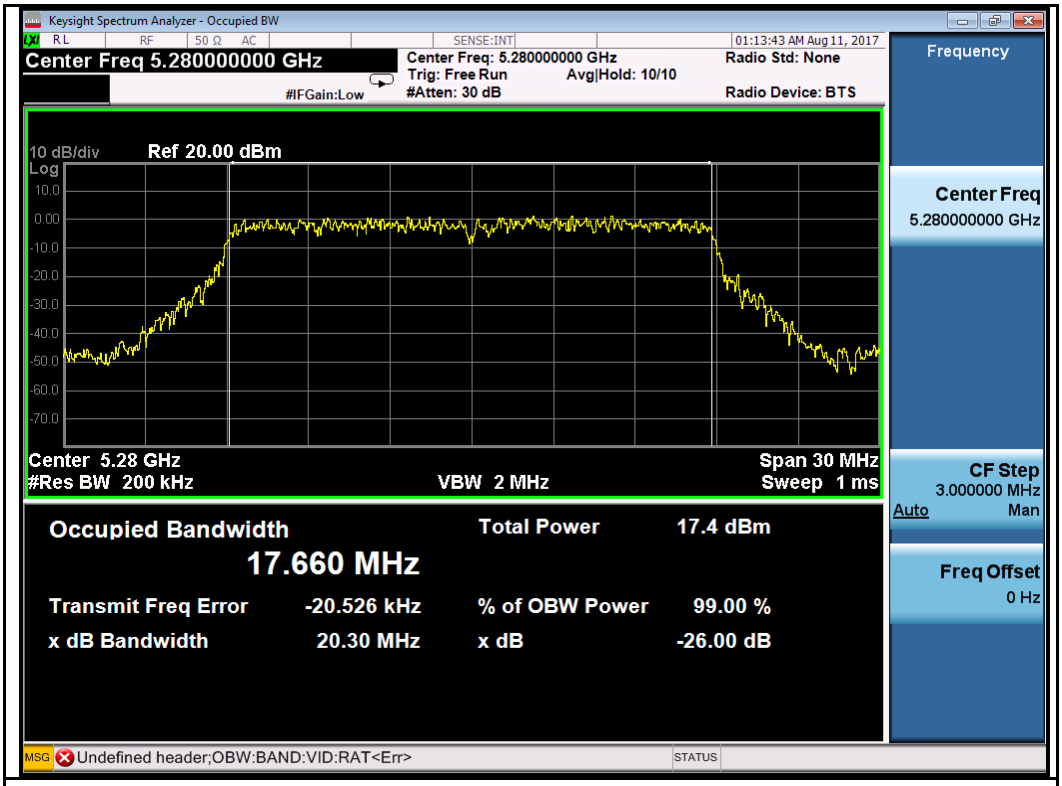

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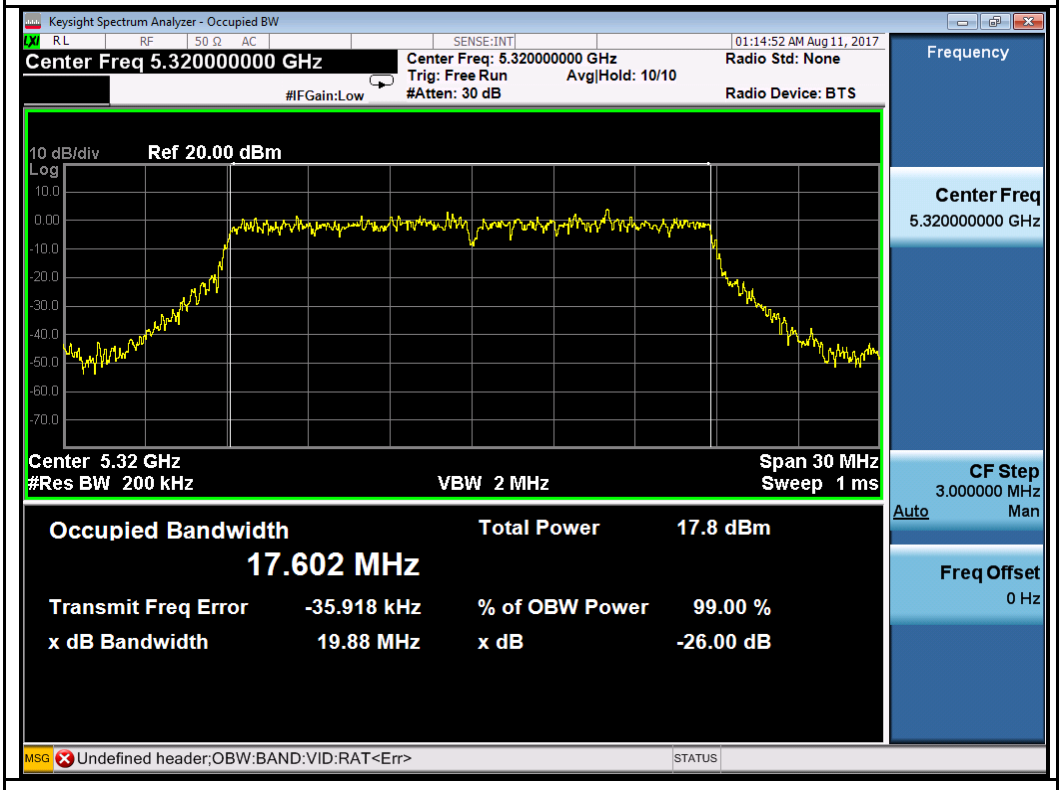

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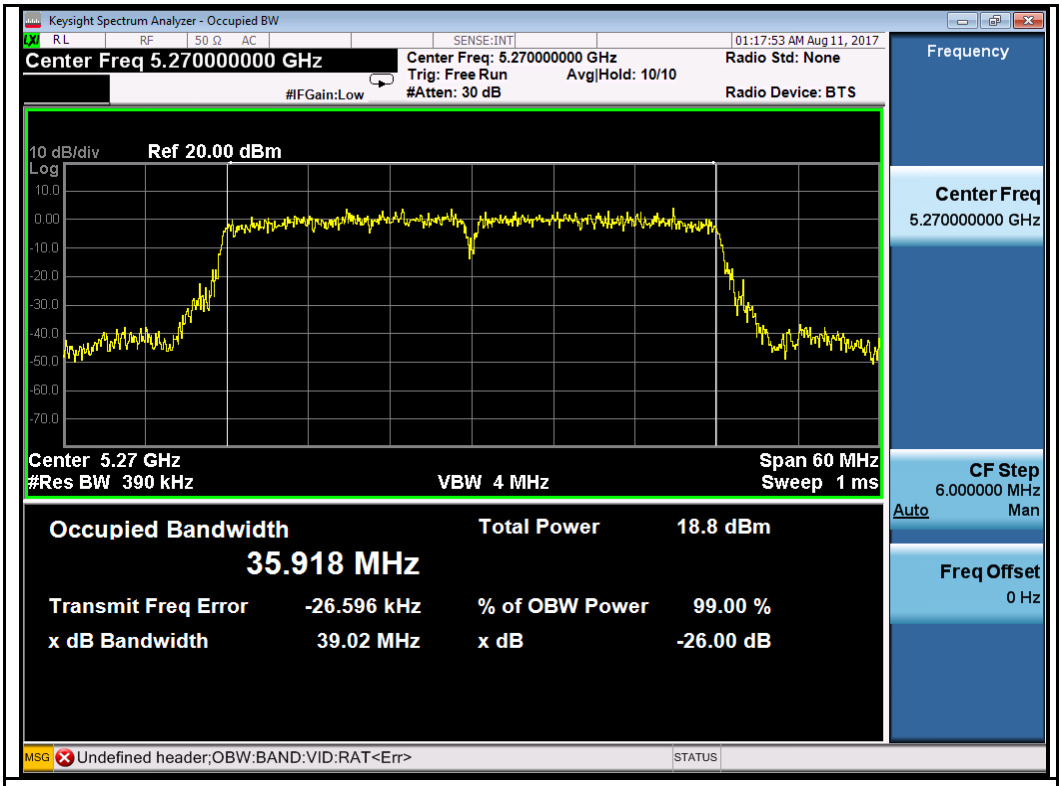

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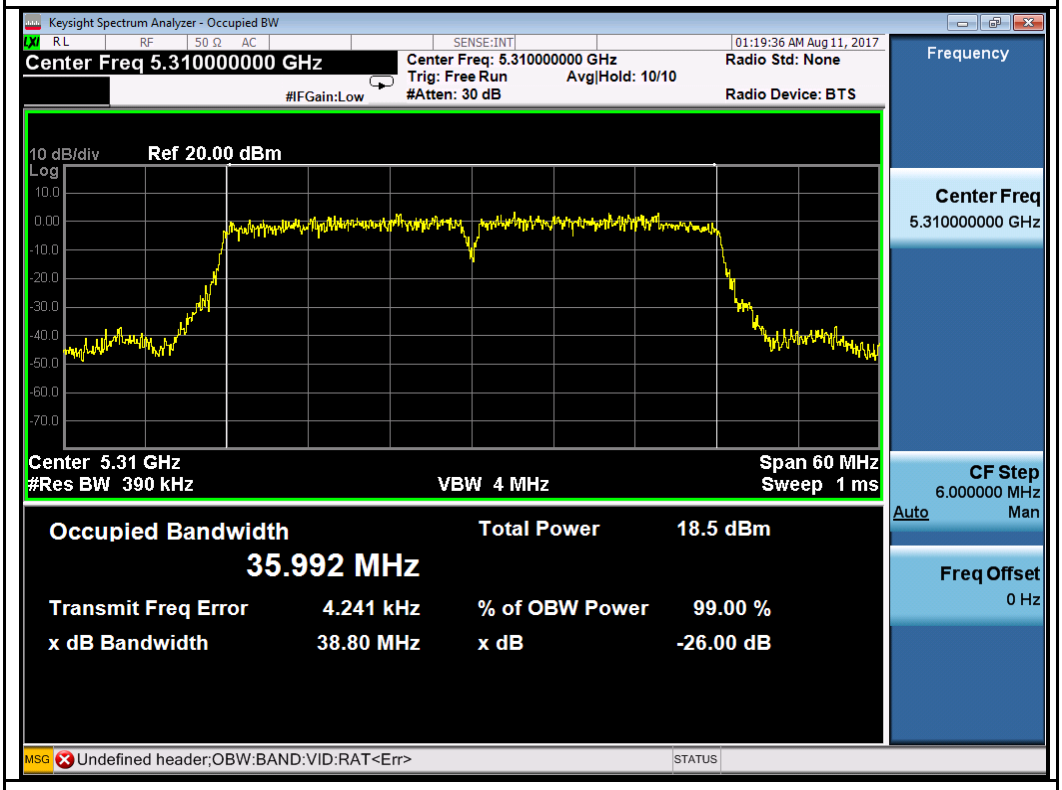

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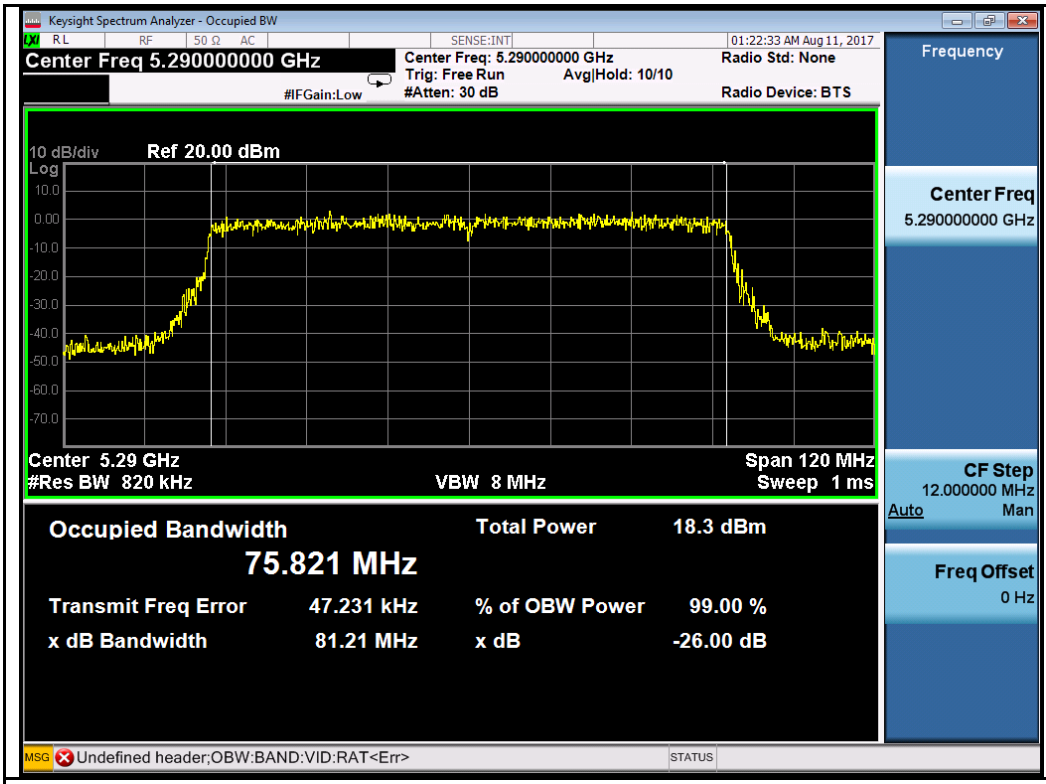
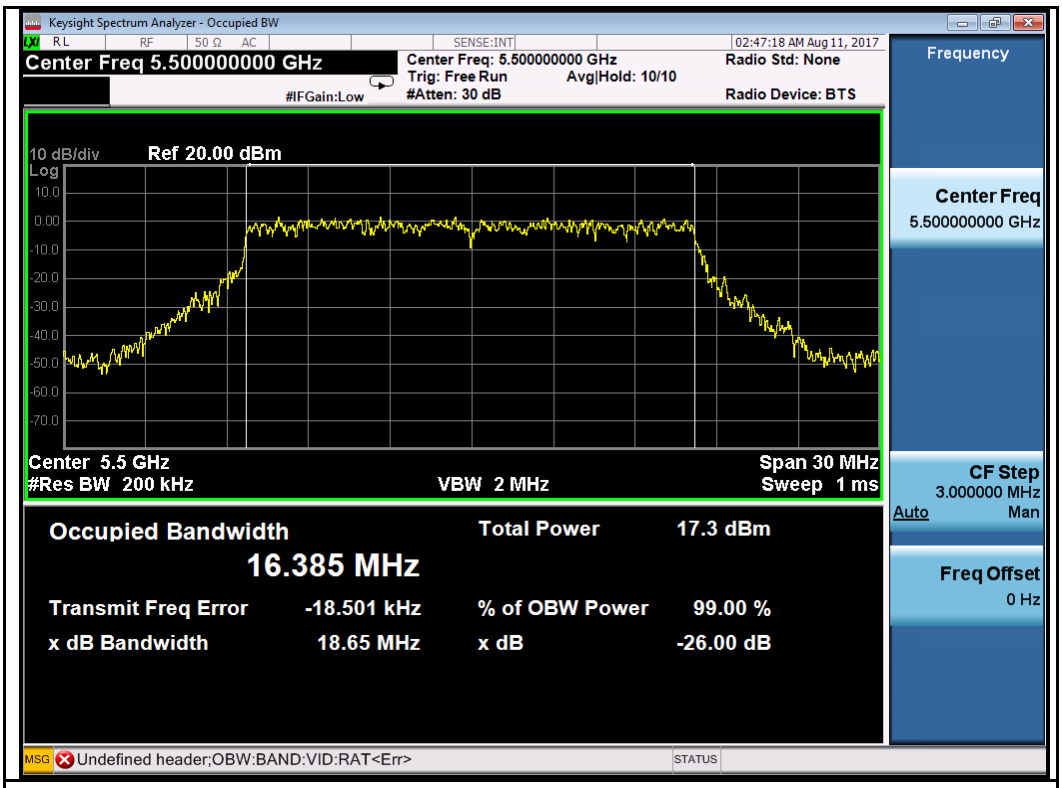


802.11ac-VHT80-5290MHz

W56:



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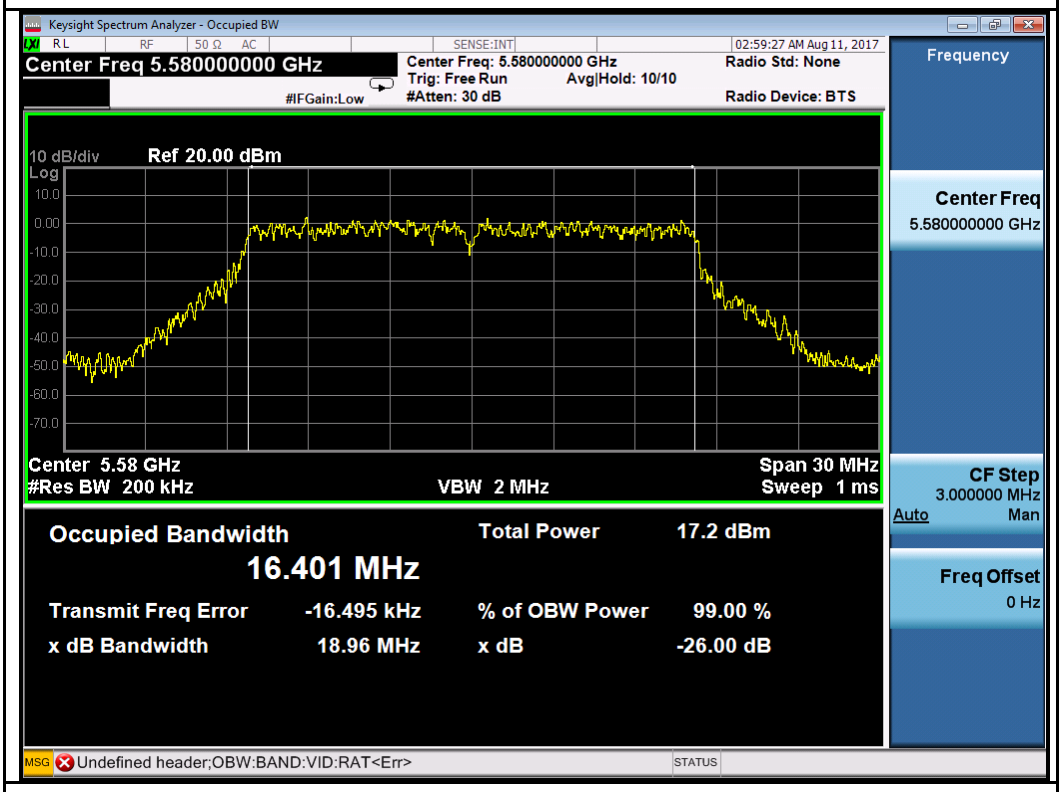

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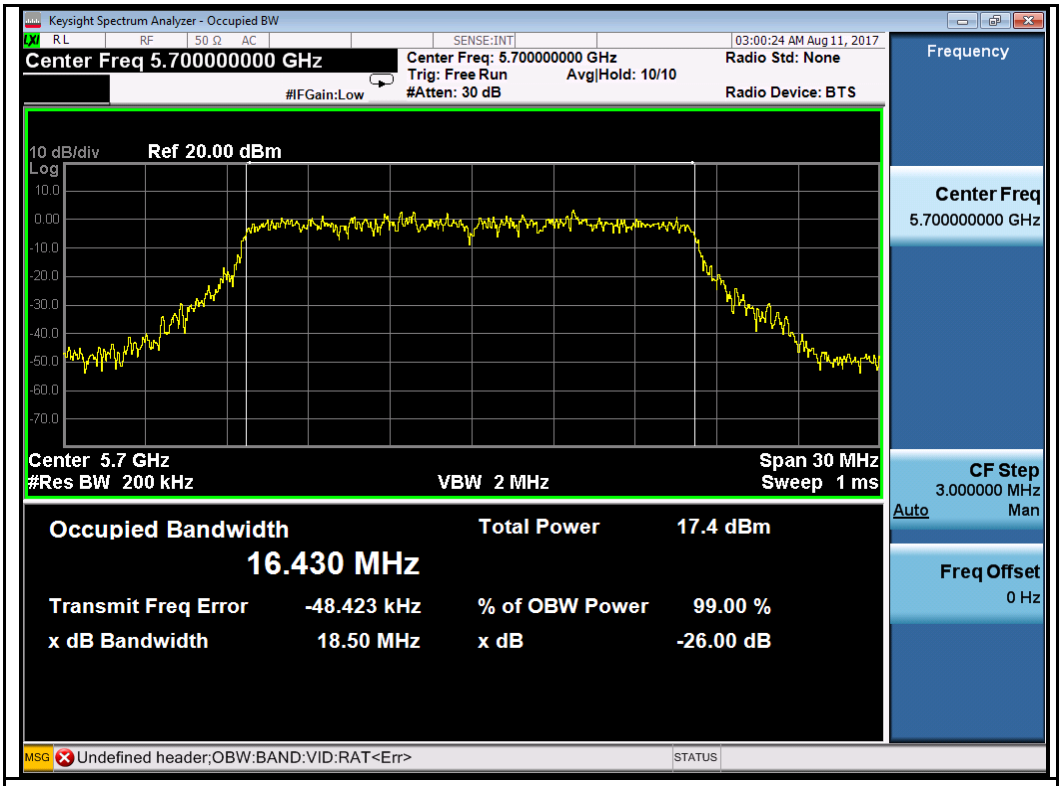
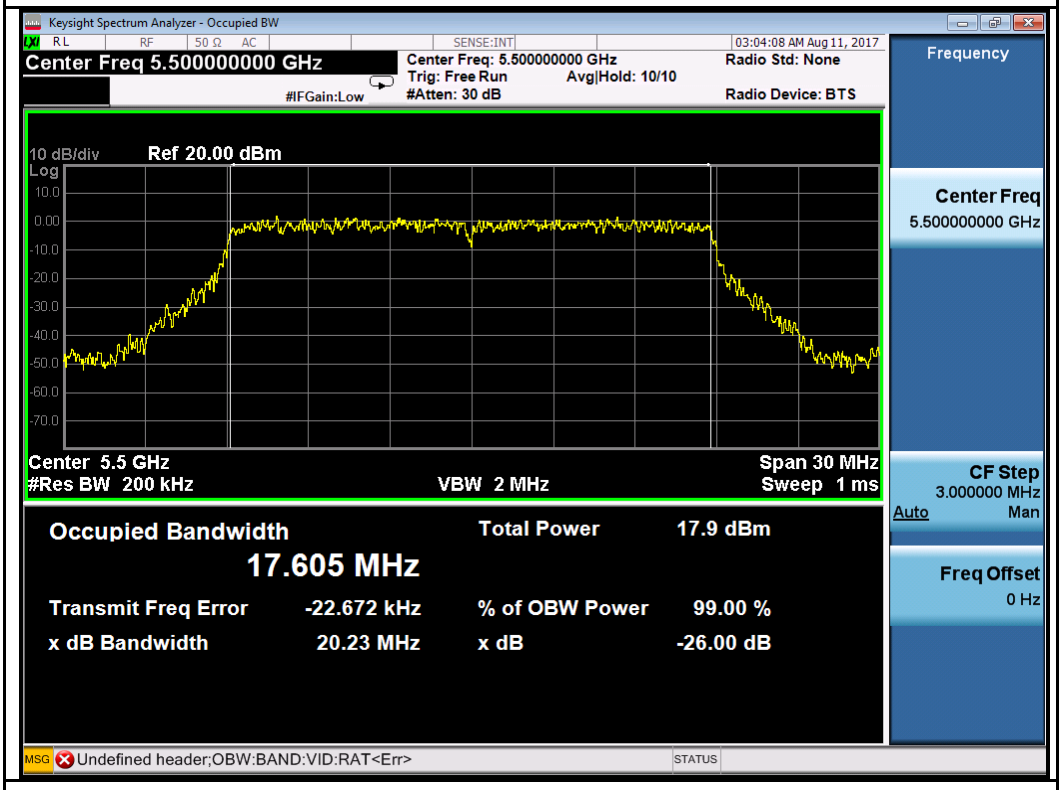


802.11a-5700MHz



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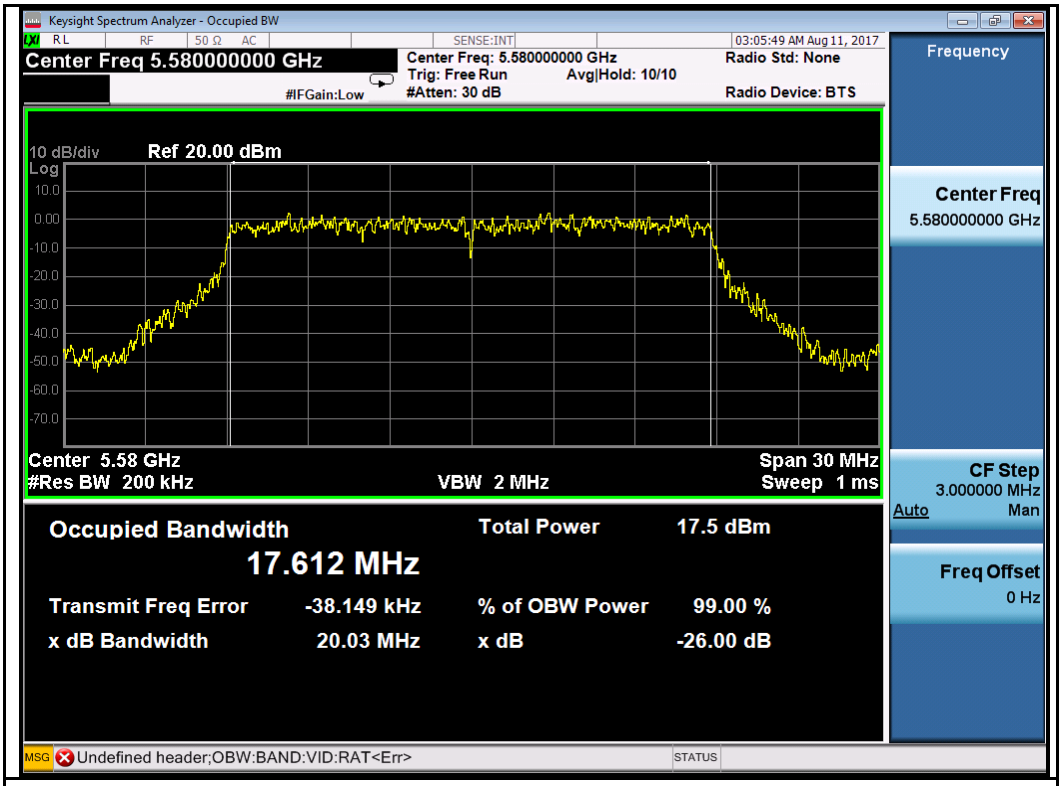
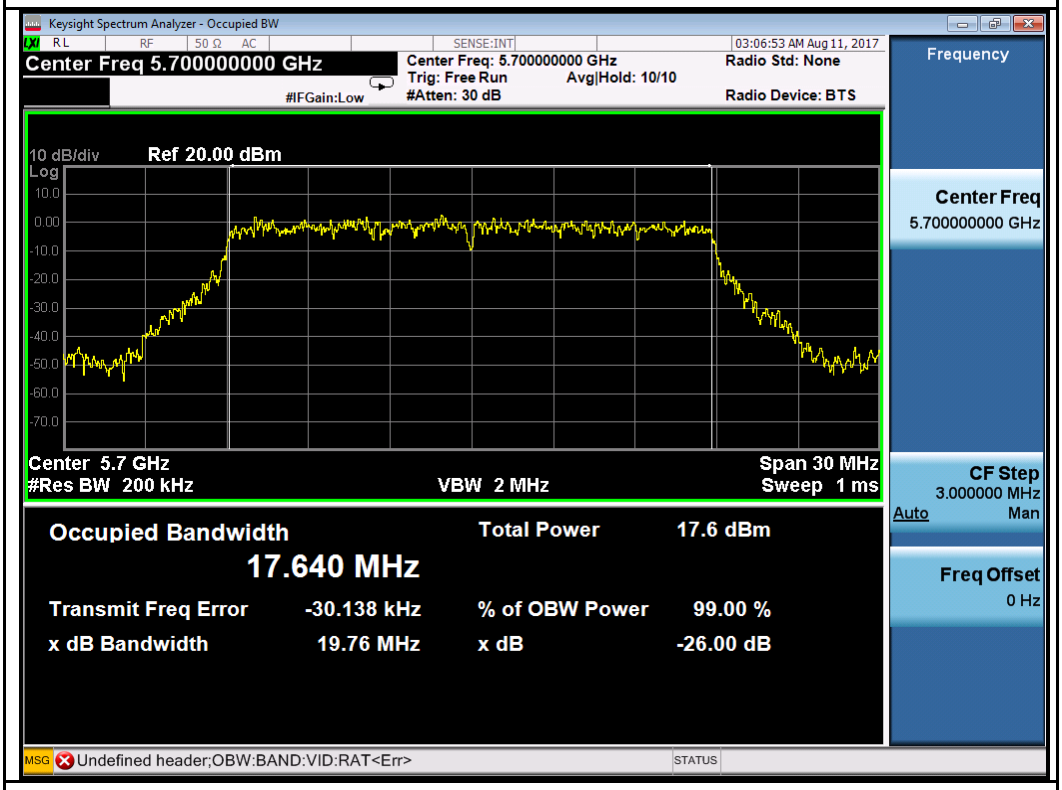
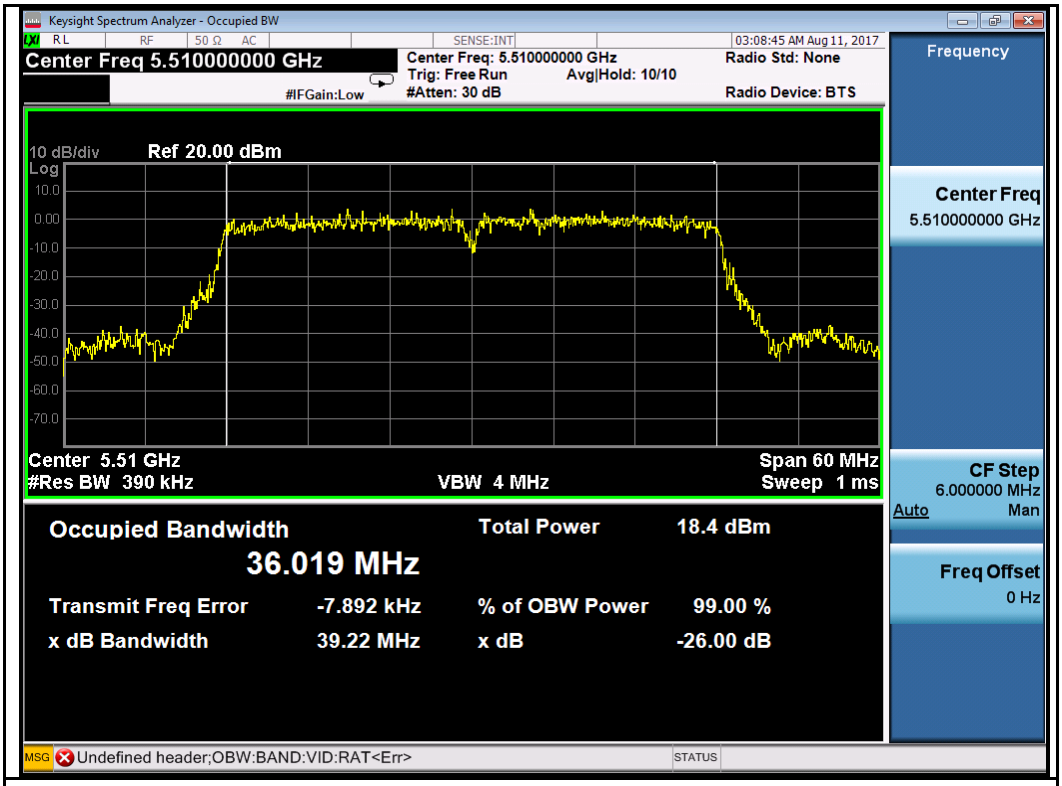


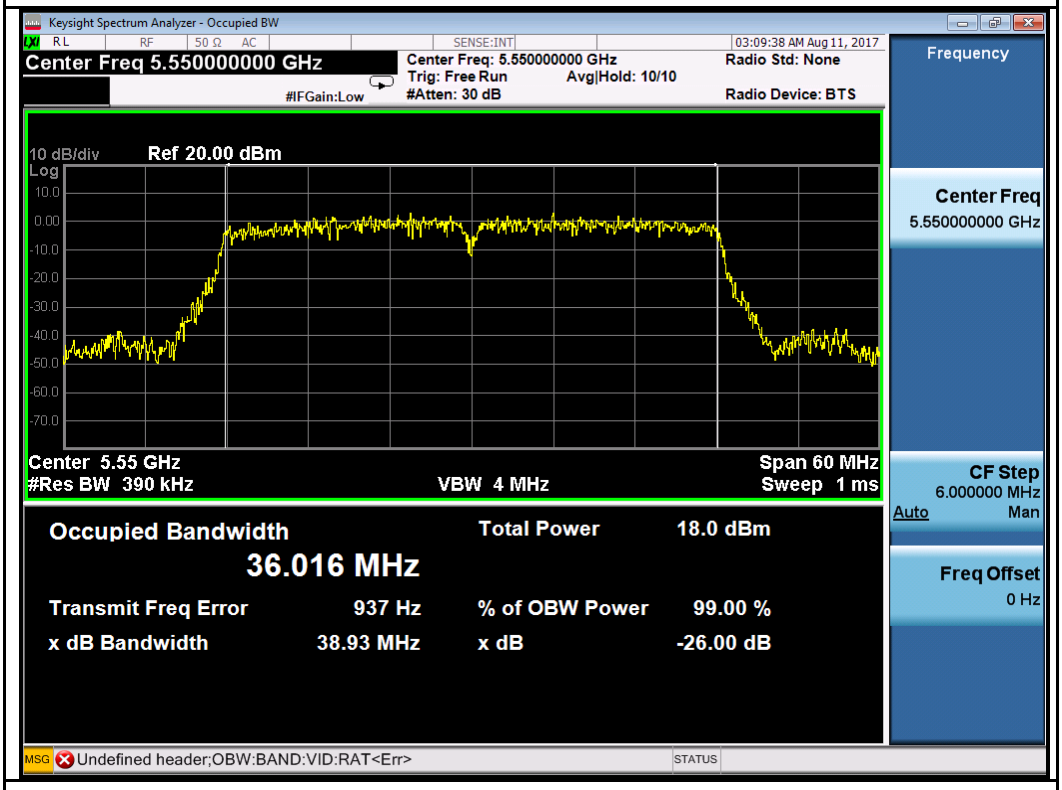
802.11n-HT20-5580MHz



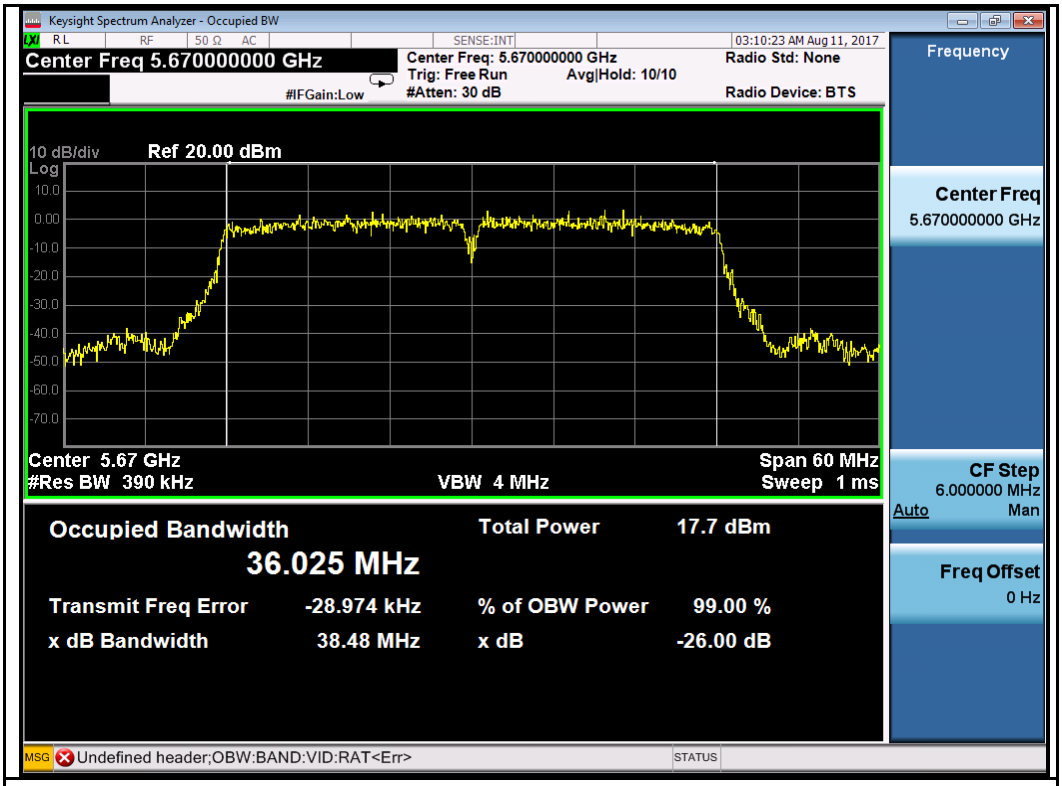
802.11n-HT20-5700MHz



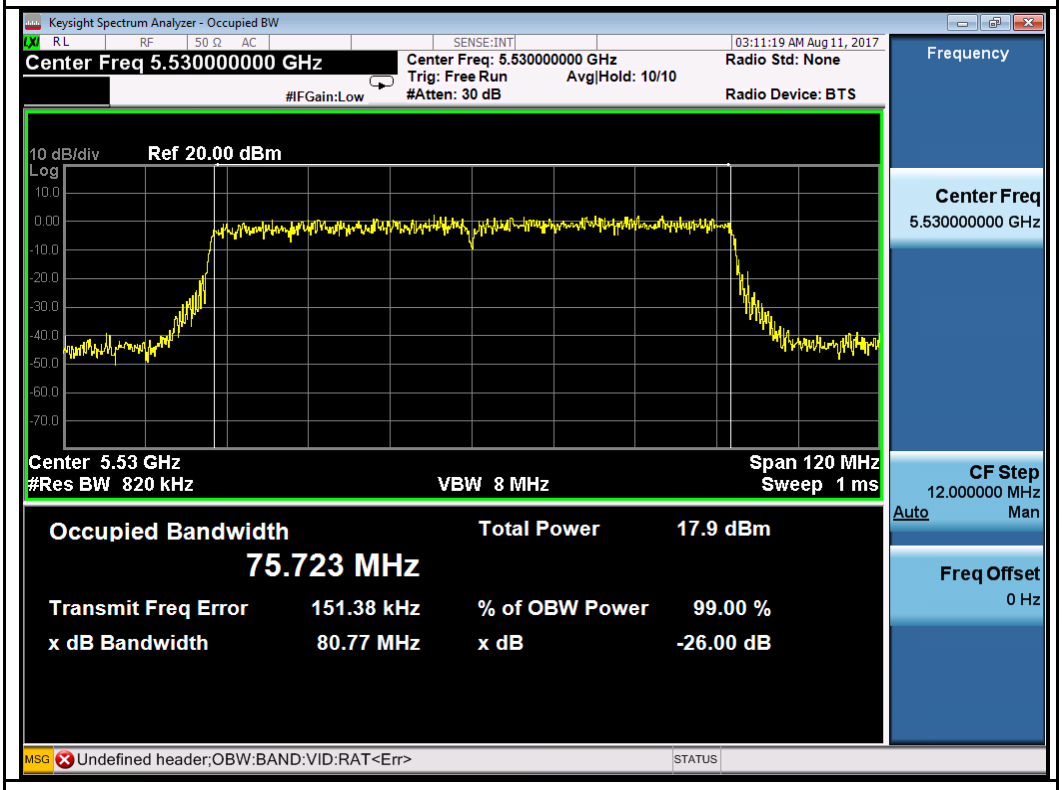
802.11n-HT40-5510MHz



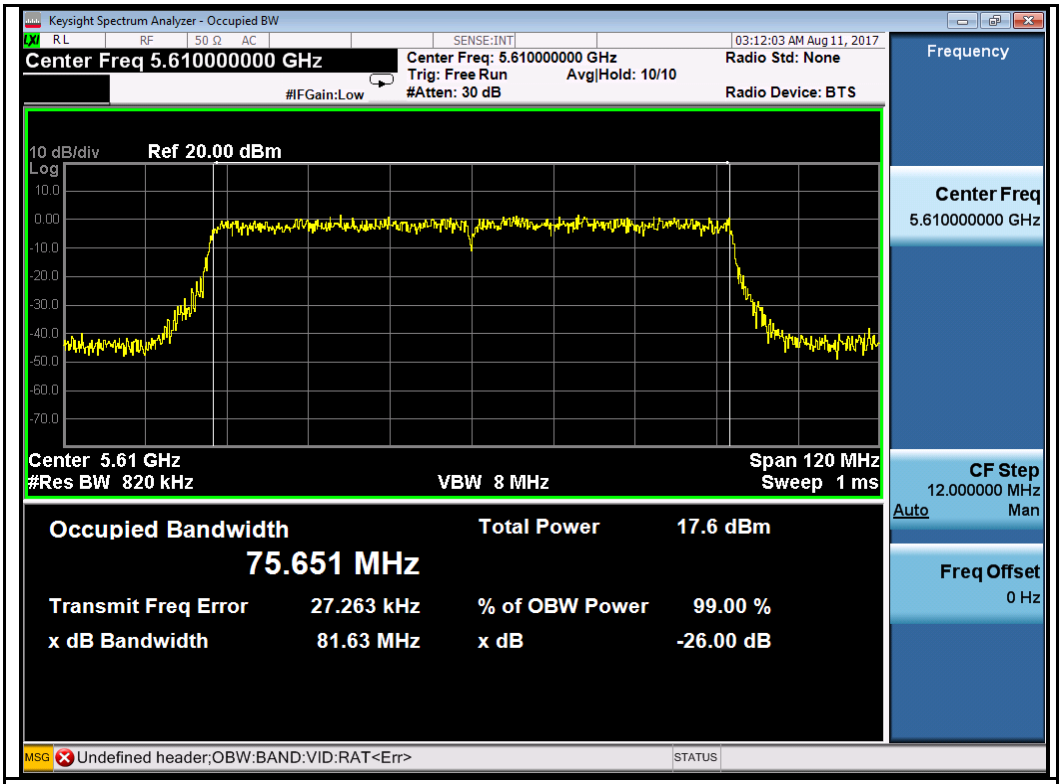
802.11n-HT40-5550MHz



802.11n-HT40-5670MHz

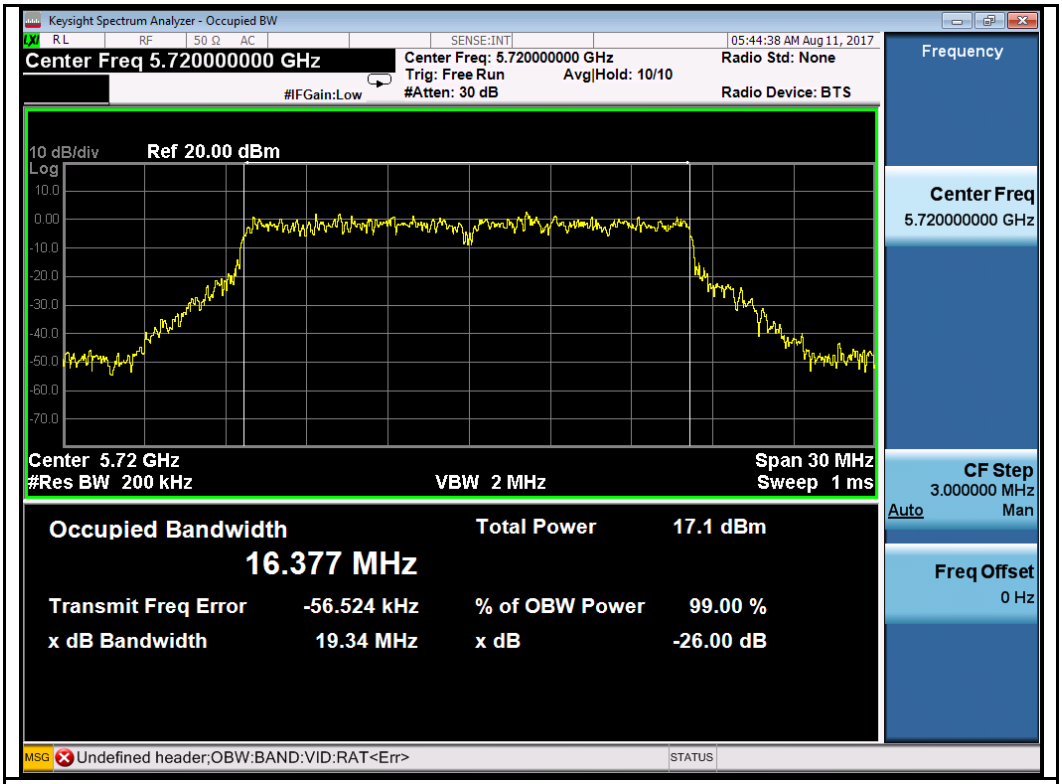


802.11ac-VHT80-5530MHz

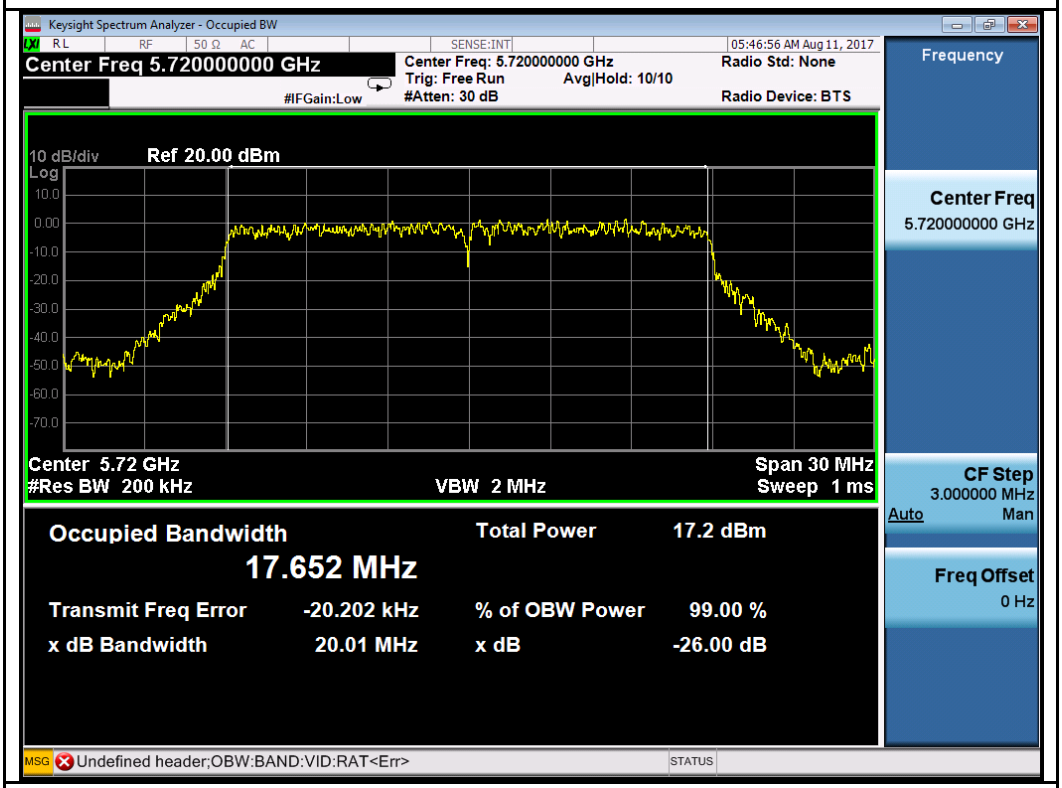


802.11ac-VHT80-5610MHz

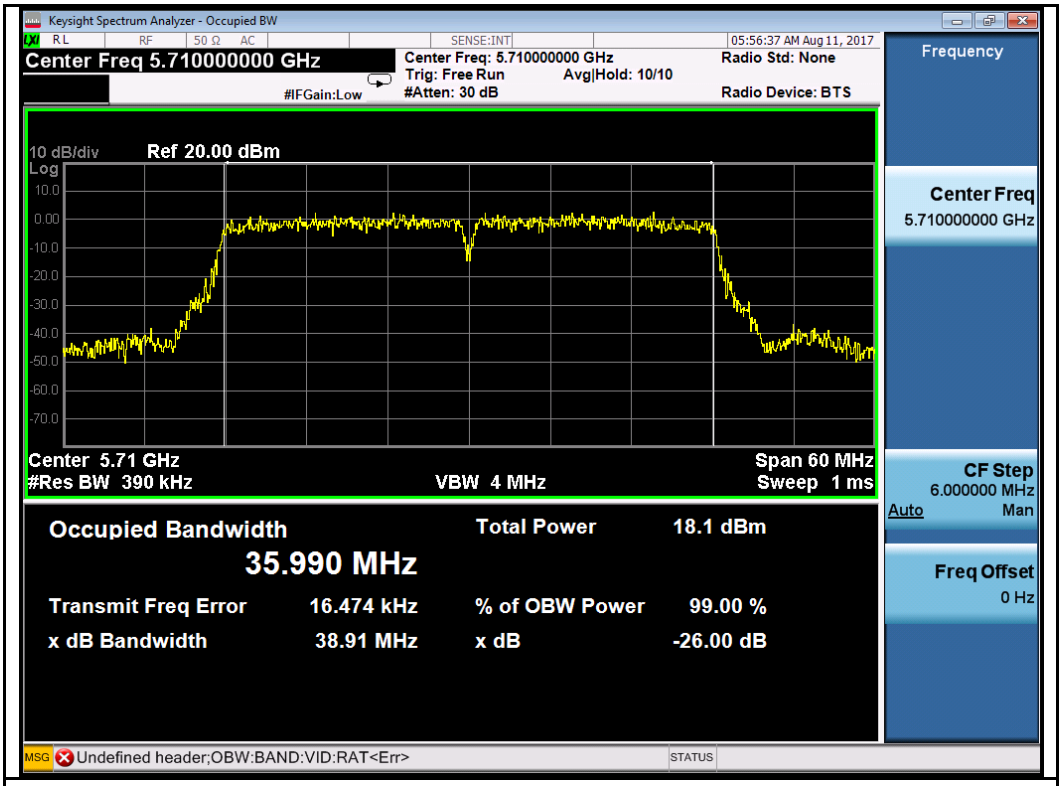
26dB BW Cross Band:



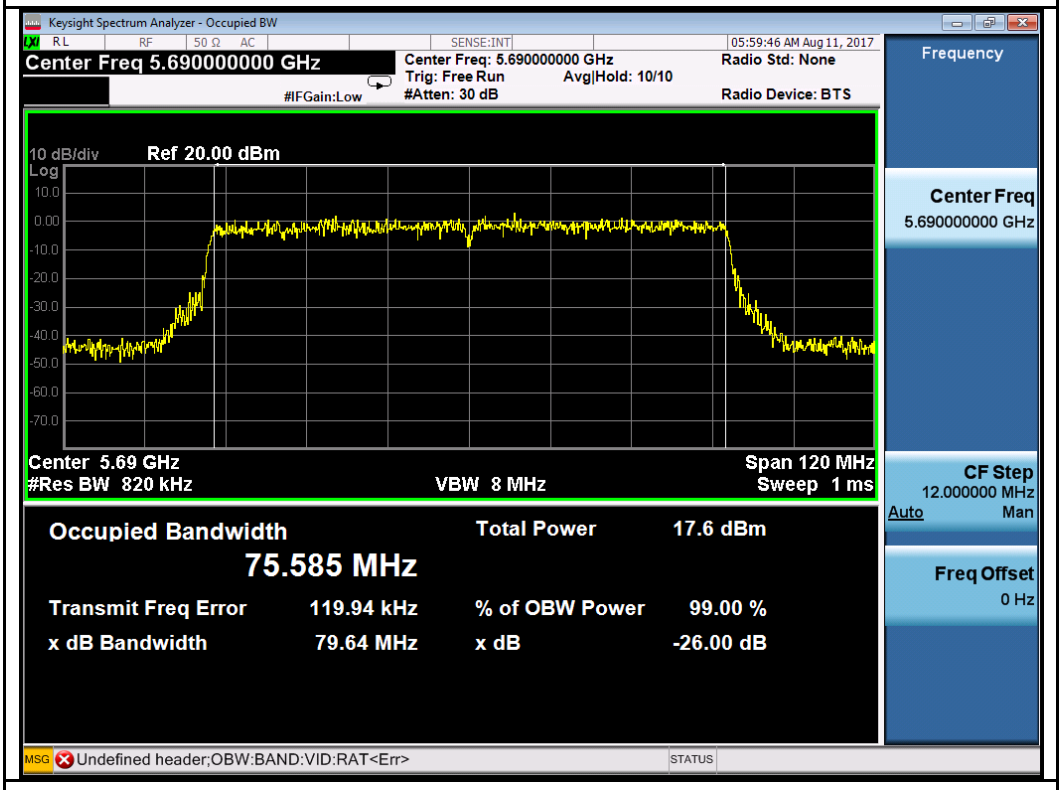
802.11a-5720MHz



802.11n-HT20 5720MHz

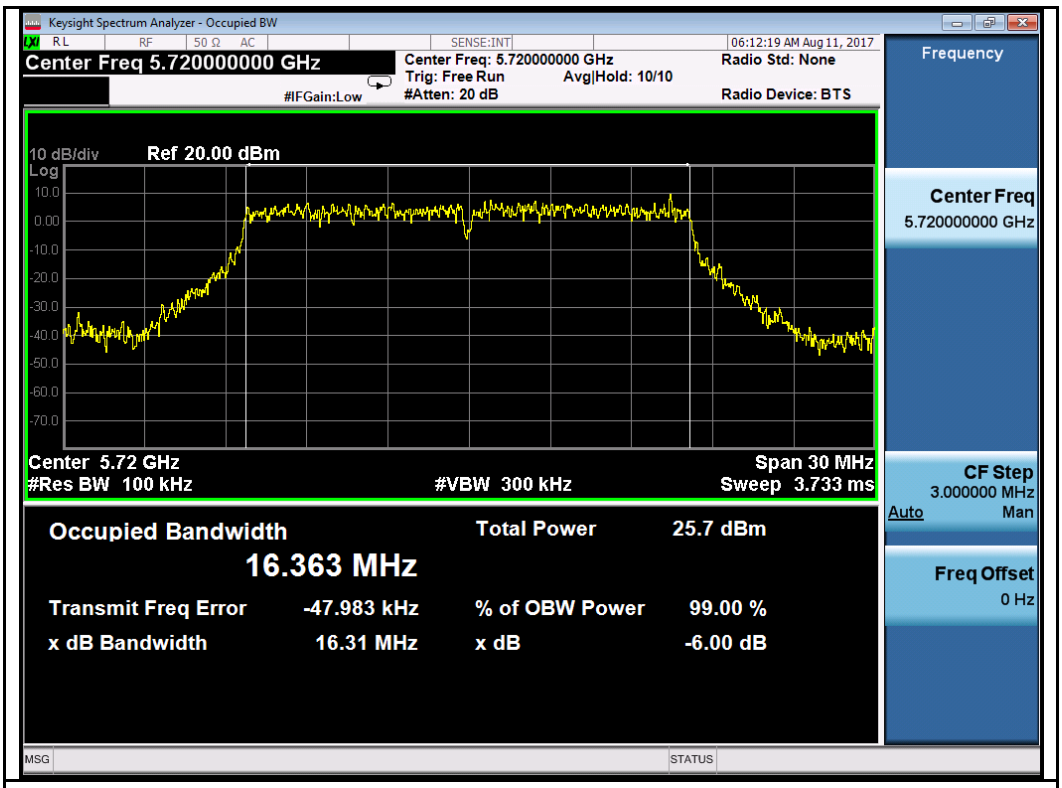


802.11n-HT40 5710MHz

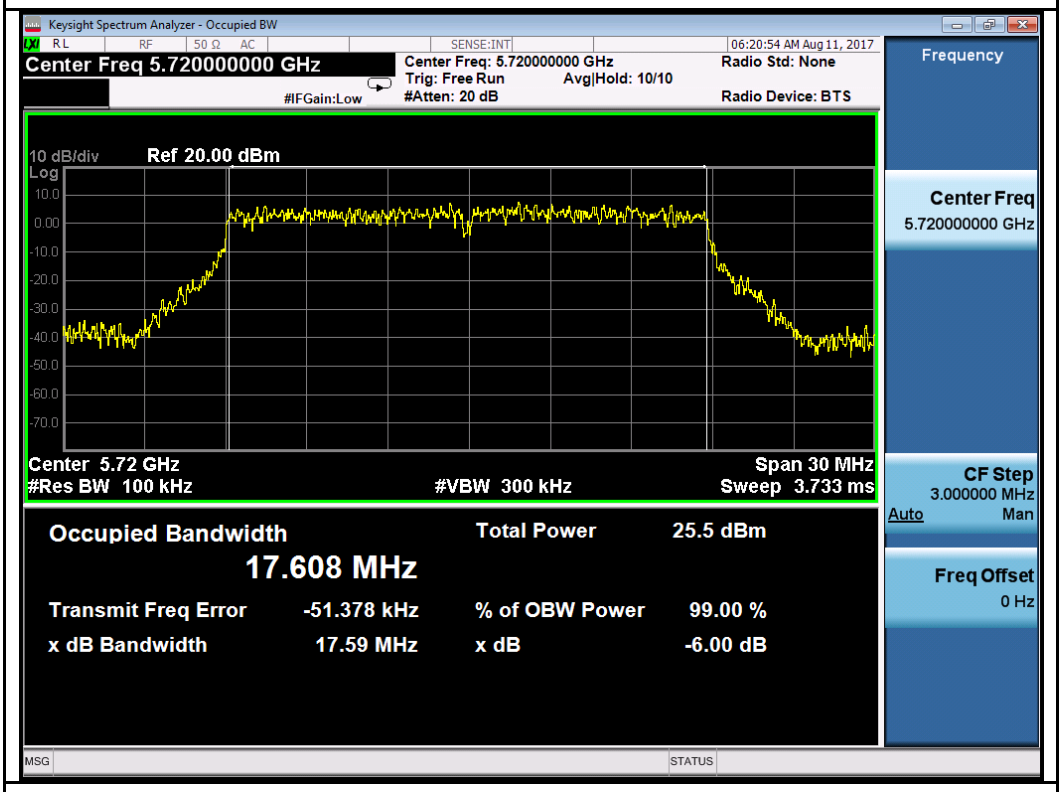


802.11AC-VHT80-5690MHz

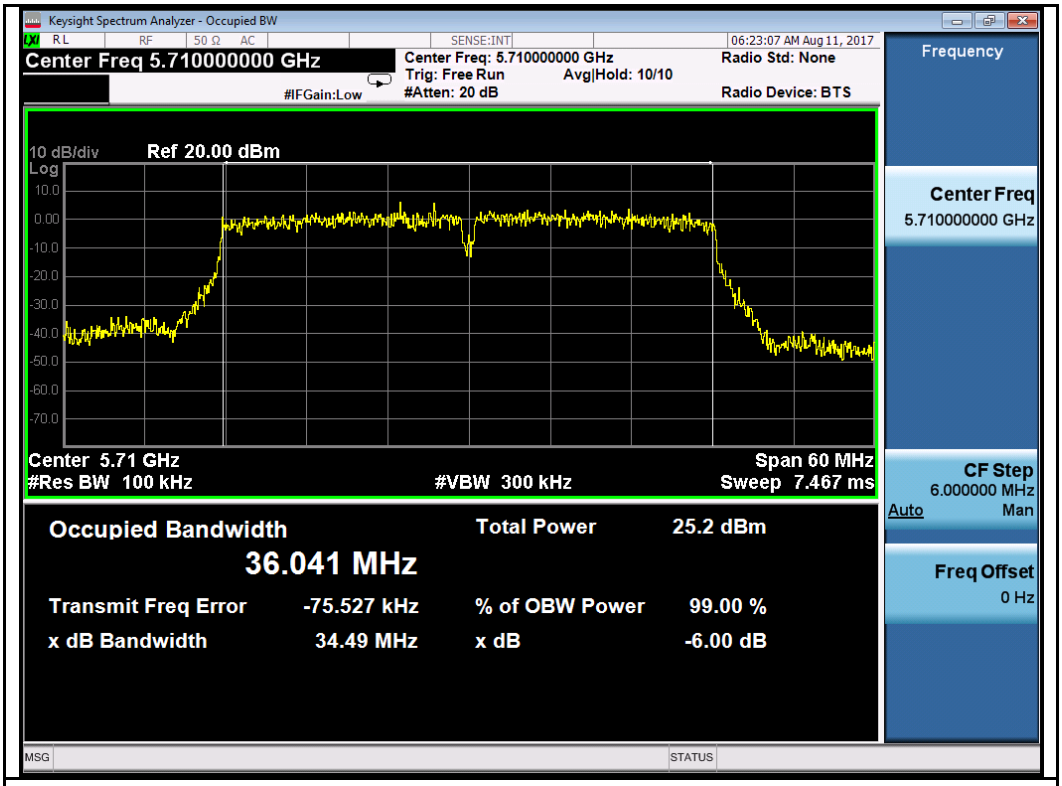
6dB BW Cross Band:



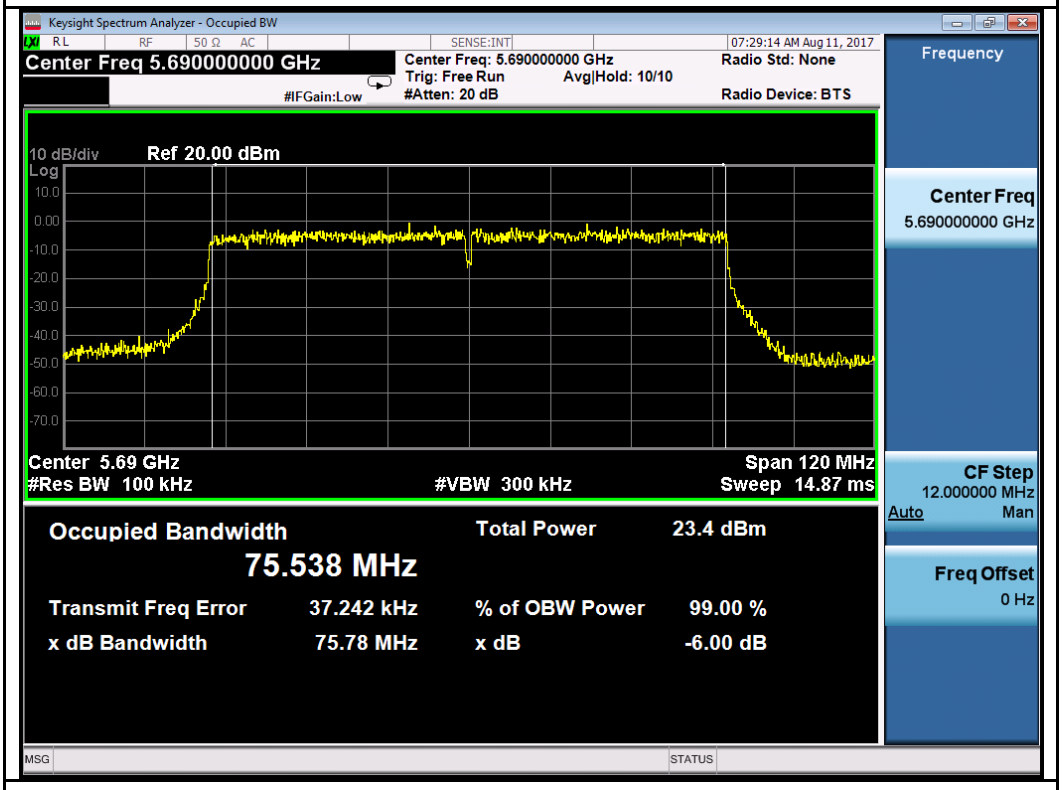
802.11a-5720MHz



802.11n-HT20 5720MHz



802.11n-HT40 5710MHz

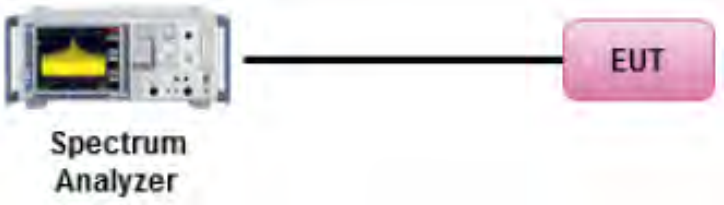


802.11ac-VHT80-5690MHz

10.3 Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.407	a)(2)	For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.	☒
	a)(3)	For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.	☒

Test Setup				
Test Procedure	789033 D02 General UNII Test Procedures New Rules v01r02 Measurement using a Spectrum Analyzer or EMI Receiver (SA) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep): - Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal. - Set RBW = 1 MHz - Set VBW = 3 MHz - Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.) - Sweep time = auto. - Detector = power averaging (rms), if available. Otherwise, use sample detector mode. - If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98%, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run." - Trace average at least 100 traces in power averaging (rms) mode. - Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument's band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.			
Test Date	08/11/2017 – 08/12/2017	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 44% 1021mbar
Remark	Per KDB 662911 D01 Multiple Transmitter Output v02r01, the direction gain for horizontal polarization and vertical polarization is calculated separately. For 5Ghz band, peak antenna gain = 4.5 dBi, directional gain = 3 dB, total gain = 7.5 dBi Highest of totoal directional gain is 7.5 dBi. The power limit and PSD limit will be reduced by amount of 1.5 dB. For the Cross band channels, the output power of full bandwidth is compared to the power limit in 5.5G and 5.8G as the worst case.			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Rachana Khanduri at RF test site.

Output Power measurement result for 5.3GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain 0	Chain 1	Chain 2	Chain 3	Combined Power		
Output Power	802.11a	5260	Low	13.98	14.01	13.92	13.93	19.98	22.5	Pass
	802.11a	5280	Mid	14.13	14.16	13.96	13.95	20.07	22.5	Pass
	802.11a	5320	High	13.97	13.83	13.84	13.94	19.92	22.5	Pass
	802.11n-20M	5260	Low	14.13	14.11	13.94	14.12	20.10	22.5	Pass
	802.11n-20M	5280	Mid	14.28	14.39	14.32	14.04	20.28	22.5	Pass
	802.11n-20M	5320	High	14.34	14.17	14.03	14.18	20.20	22.5	Pass
	802.11n-40M	5270	Low	15.48	15.29	15.35	14.99	21.30	22.5	Pass
	802.11n-40M	5310	Mid	15.08	15.63	14.97	15.23	21.26	22.5	Pass
	802.11ac-80M	5290	High	15.16	15.58	15.10	14.90	21.21	22.5	Pass

Output Power measurement result for 5.5GHz

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain 0	Chain 1	Chain 2	Chain 3	Combined Power		
Output Power	802.11a	5500	Low	14.04	13.97	14.39	13.86	20.09	22.5	Pass
	802.11a	5580	Mid	14.15	14.27	14.46	14.16	20.28	22.5	Pass
	802.11a	5700	High	14.20	14.62	14.38	13.79	20.28	22.5	Pass
	802.11n-20M	5500	Low	14.11	14.35	14.52	14.07	20.29	22.5	Pass
	802.11n-20M	5580	Mid	14.15	14.66	14.58	14.20	20.42	22.5	Pass
	802.11n-20M	5700	High	14.39	14.95	14.76	14.00	20.56	22.5	Pass
	802.11n-40M	5510	Low	14.89	15.13	15.12	14.62	20.97	22.5	Pass
	802.11n-40M	5550	Mid	14.98	14.86	14.73	14.36	20.76	22.5	Pass
	802.11n-40M	5670	High	14.50	15.04	14.47	14.60	20.68	22.5	Pass
	802.11ac-80M	5530	Low	14.79	15.05	14.63	14.44	20.75	22.5	Pass
	802.11ac-80M	5610	High	14.36	14.73	14.57	14.53	20.57	22.5	Pass

Output Power measurement result for CROSS channels (in band 5470-5725MHz)

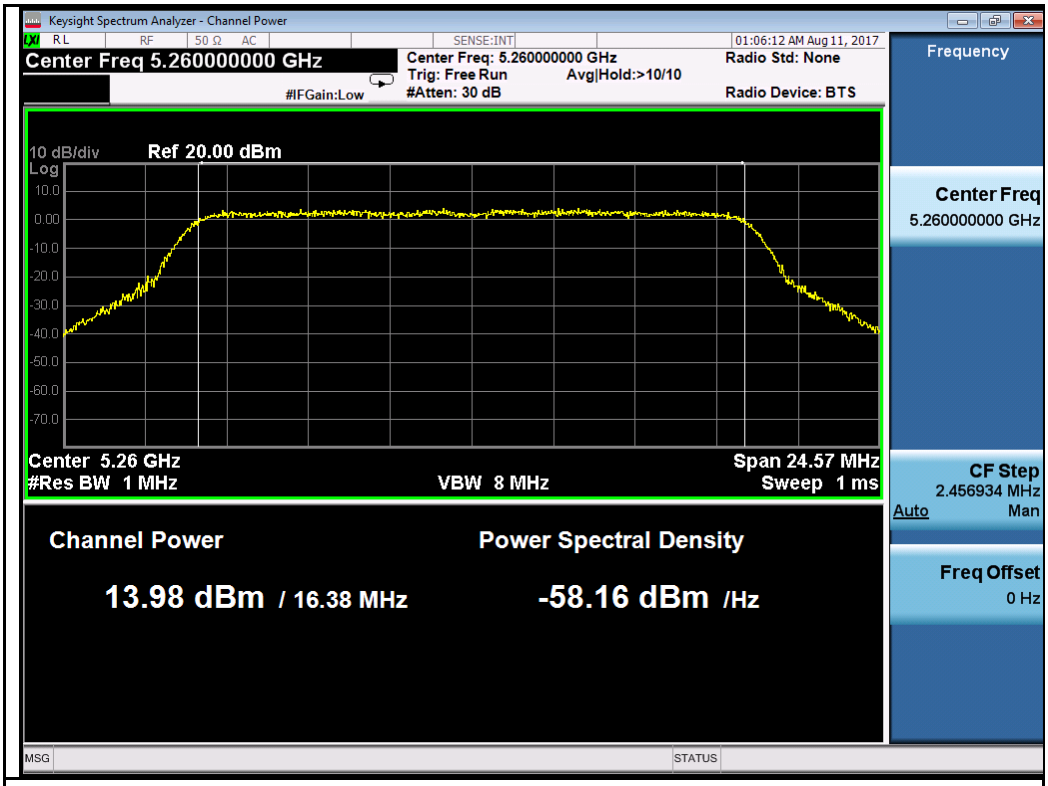
Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain 0	Chain 1	Chain 2	Chain 3	Combined Power		
Output Power	802.11a	5720	CROSS	13.94	14.38	14.08	13.59	20.03	22.5	Pass
	802.11n-20M	5720	CROSS	14.10	14.49	14.49	13.61	20.21	22.5	Pass
	802.11n-40M	5710	CROSS	14.58	15.37	15.28	14.57	20.99	22.5	Pass
	802.11ac-80M	5690	CROSS	14.35	15.05	14.94	14.59	20.76	22.5	Pass

Output Power measurement result for CROSS channels (in band 5725-5850MHz)

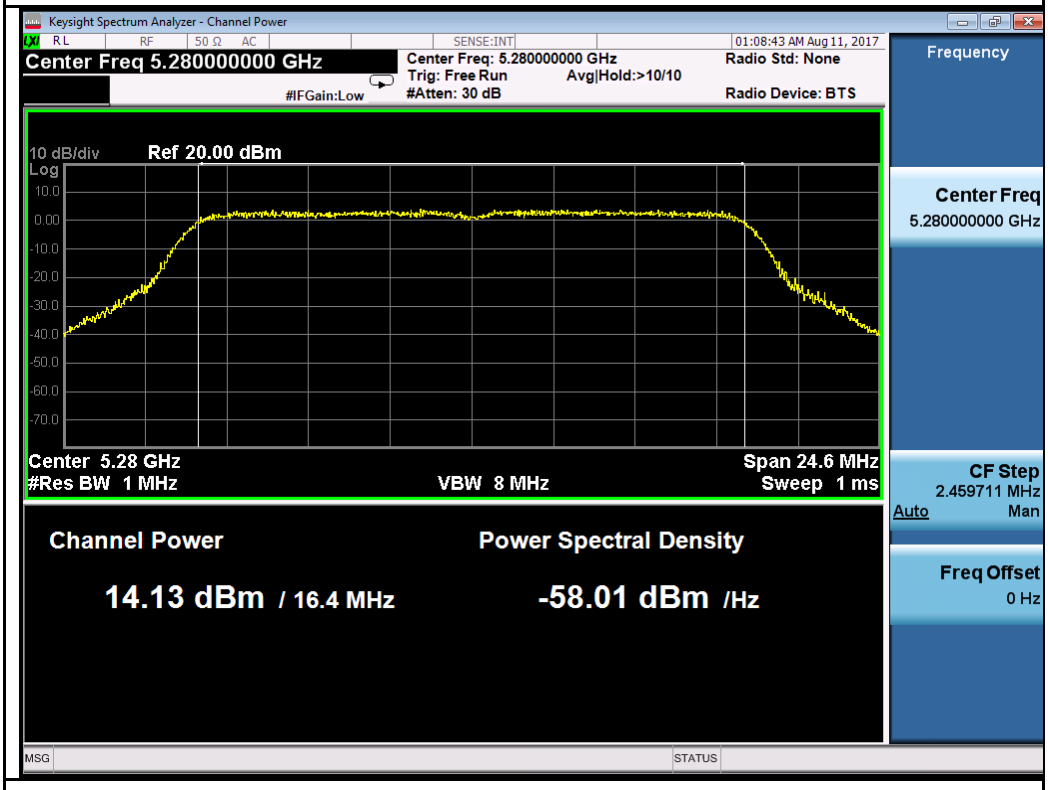
Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)					Limit (dBm)	Result
				Chain 0	Chain 1	Chain 2	Chain 3	Combined Power		
Output Power	802.11a	5720	CROSS	21.70	22.01	22.01	21.51	27.83	28.5	Pass
	802.11n-20M	5720	CROSS	21.72	22.33	22.32	21.81	28.07	28.5	Pass
	802.11n-40M	5710	CROSS	21.18	21.55	21.40	21.40	27.41	28.5	Pass
	802.11ac-80M	5690	CROSS	20.38	20.88	21.05	20.73	26.79	28.5	Pass

Test Plot for W53:

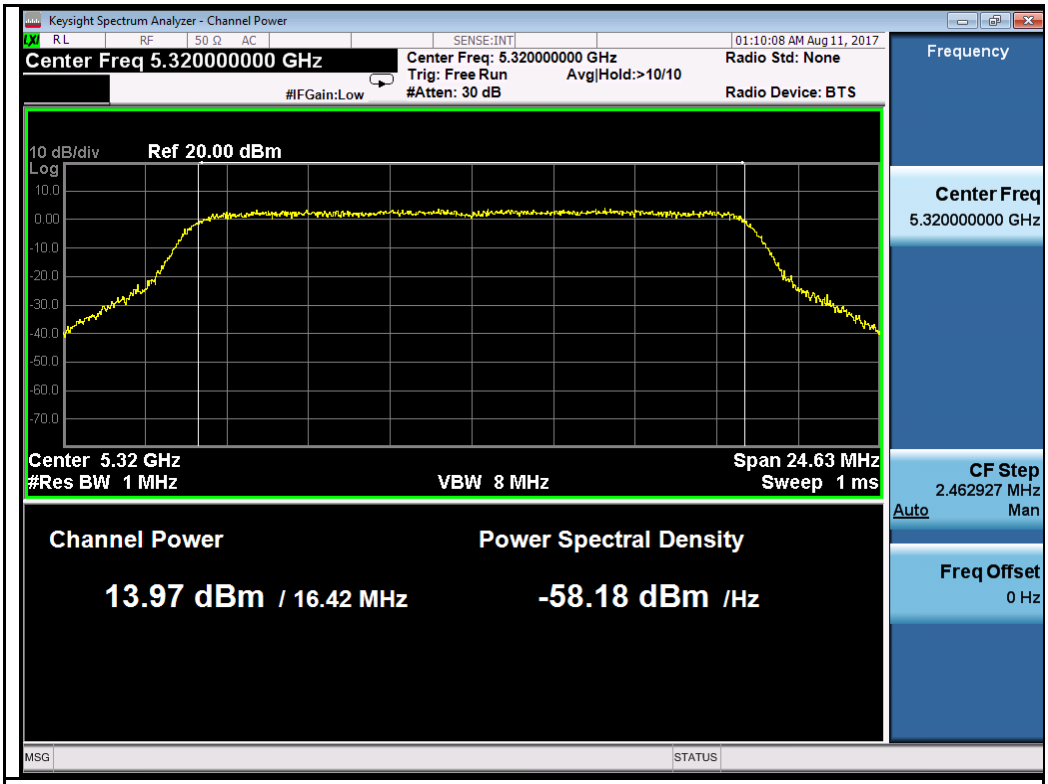
Chain 0:



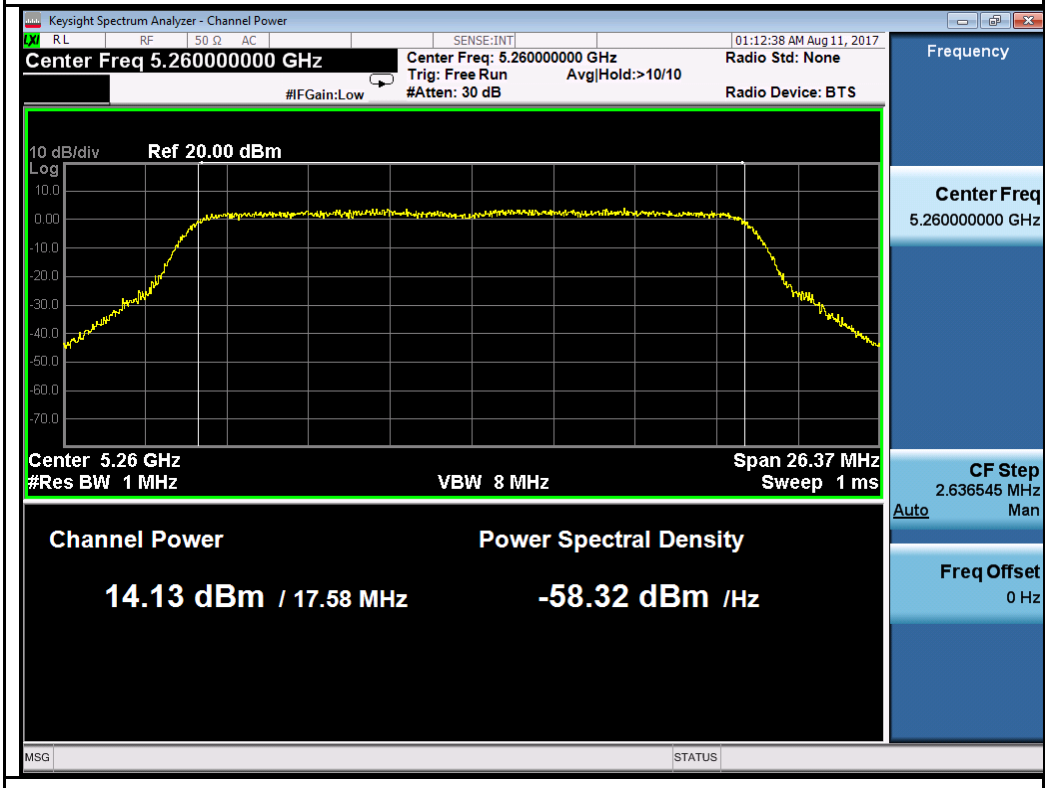
802.11a-5260M



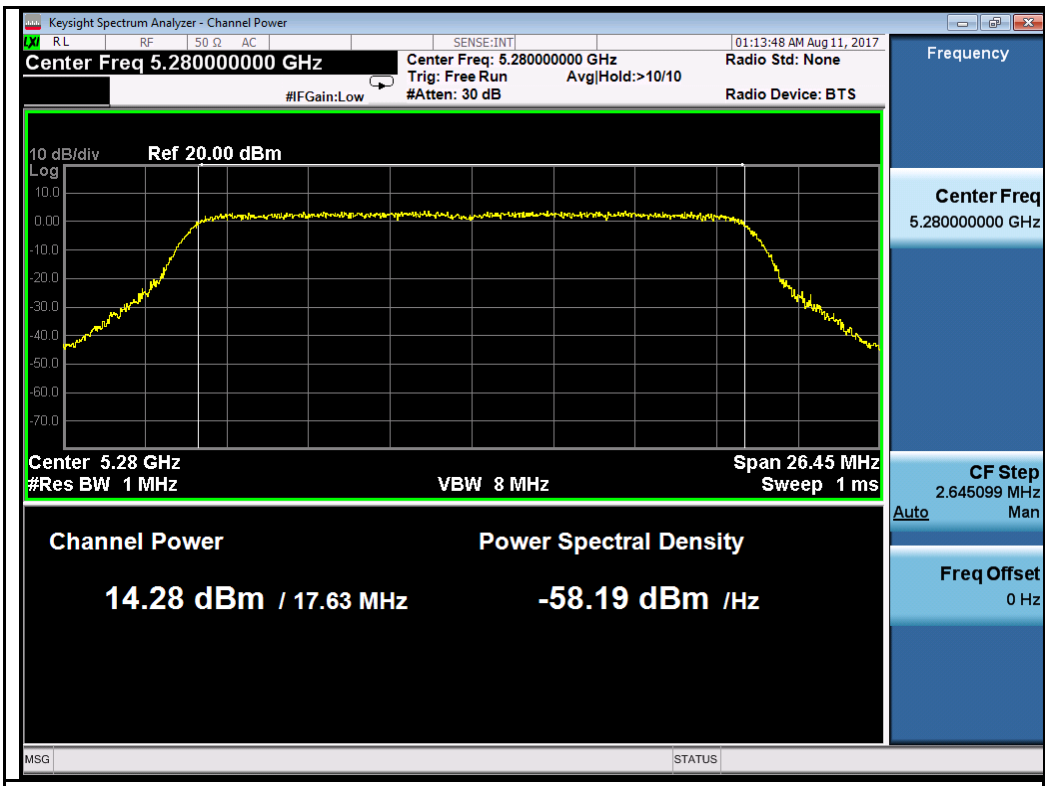
802.11a-5280M



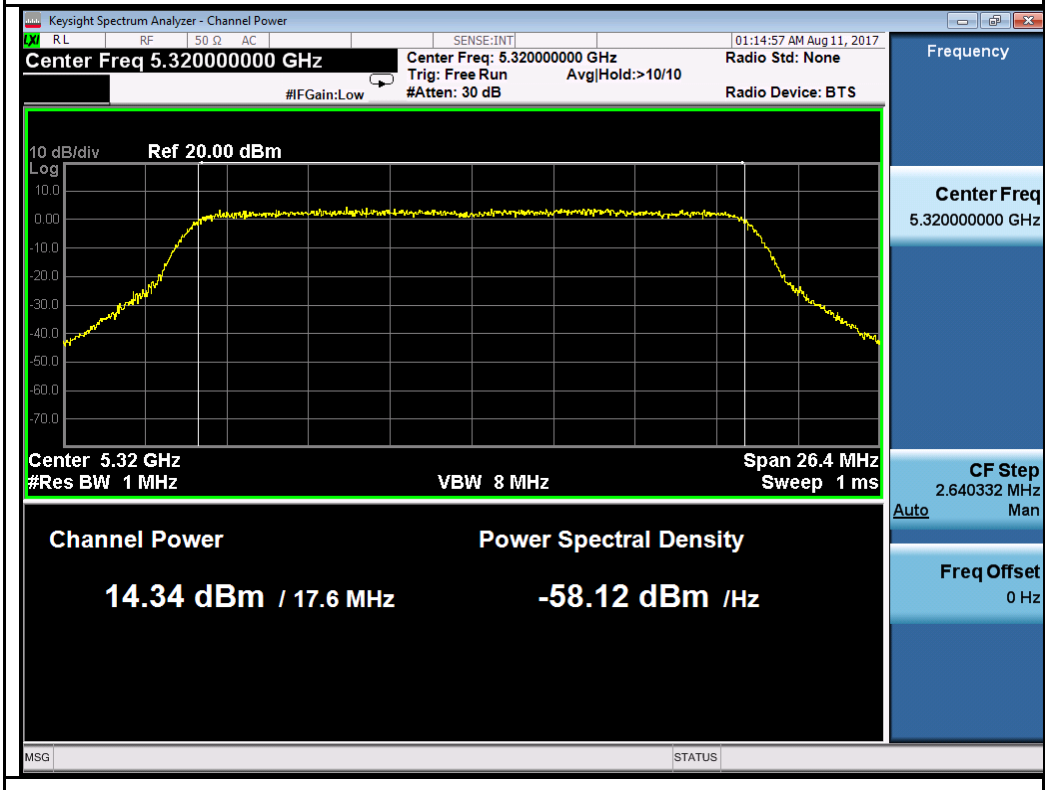
802.11a-5320M



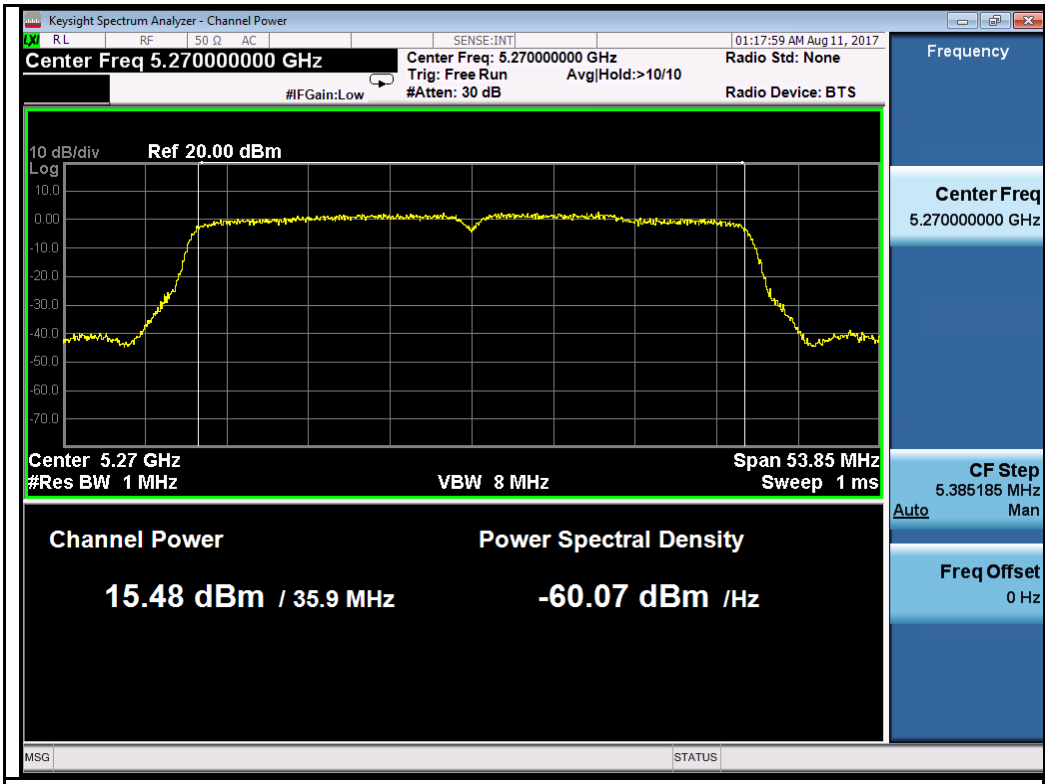
802.11n-HT20 5260M



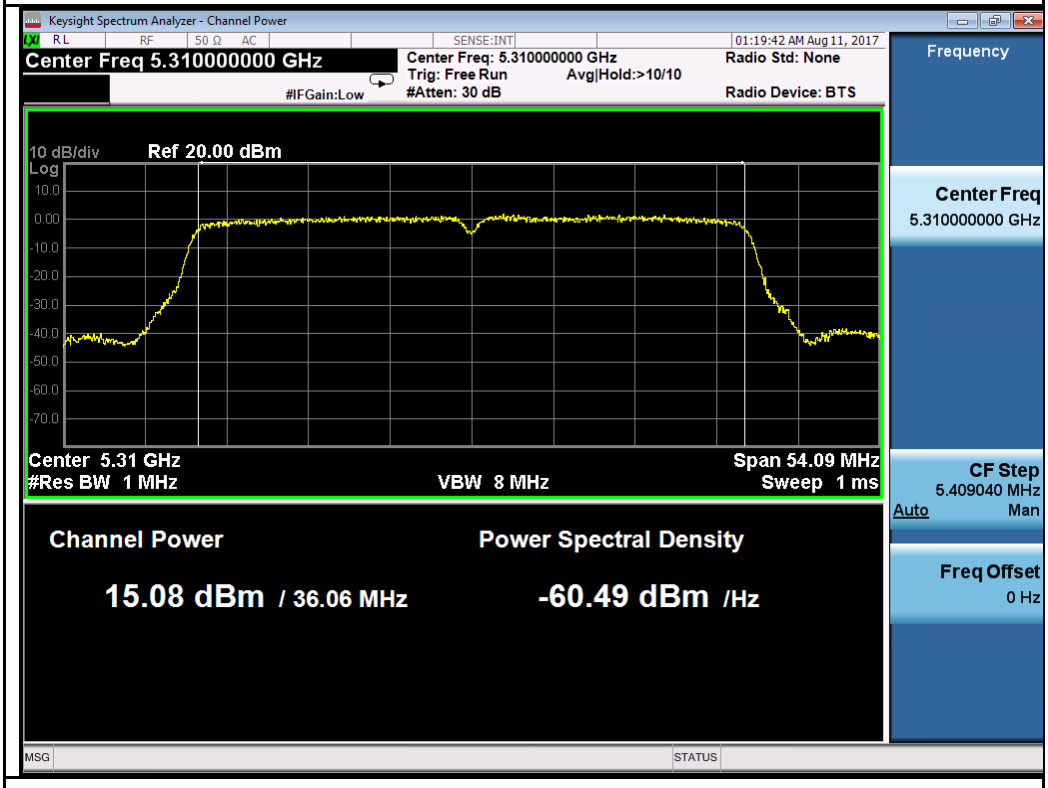
802.11n-HT20 5280M



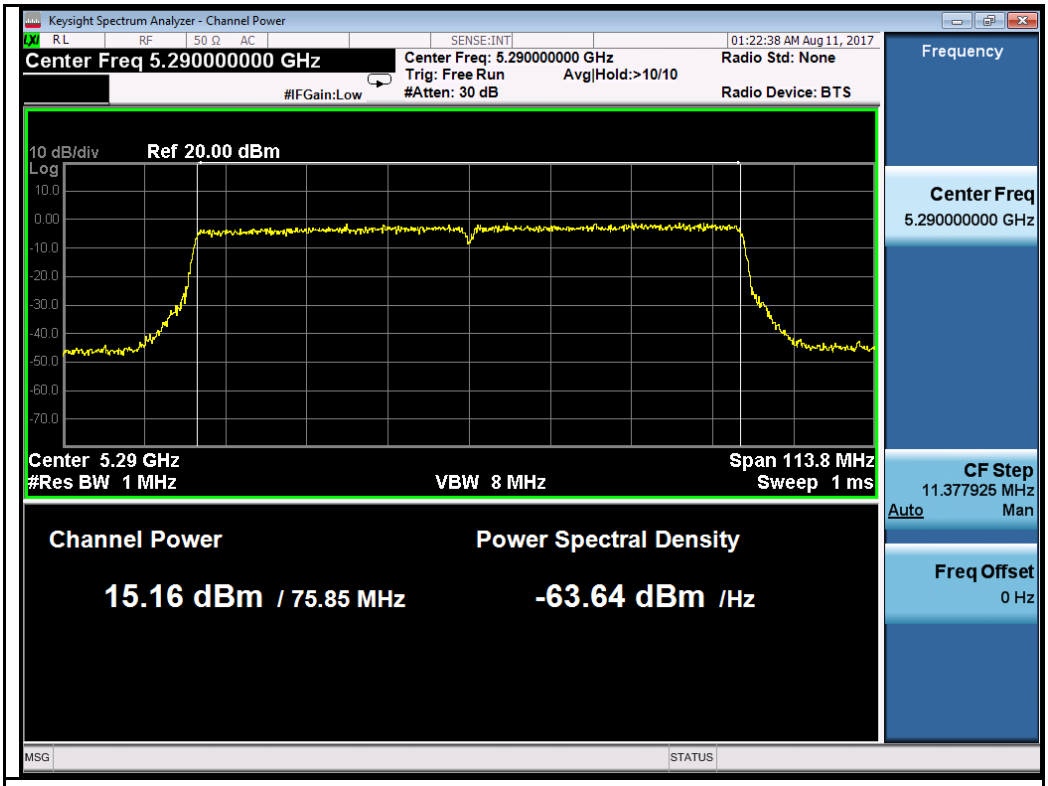
802.11n-HT20 5320M



802.11n-HT40 5270M

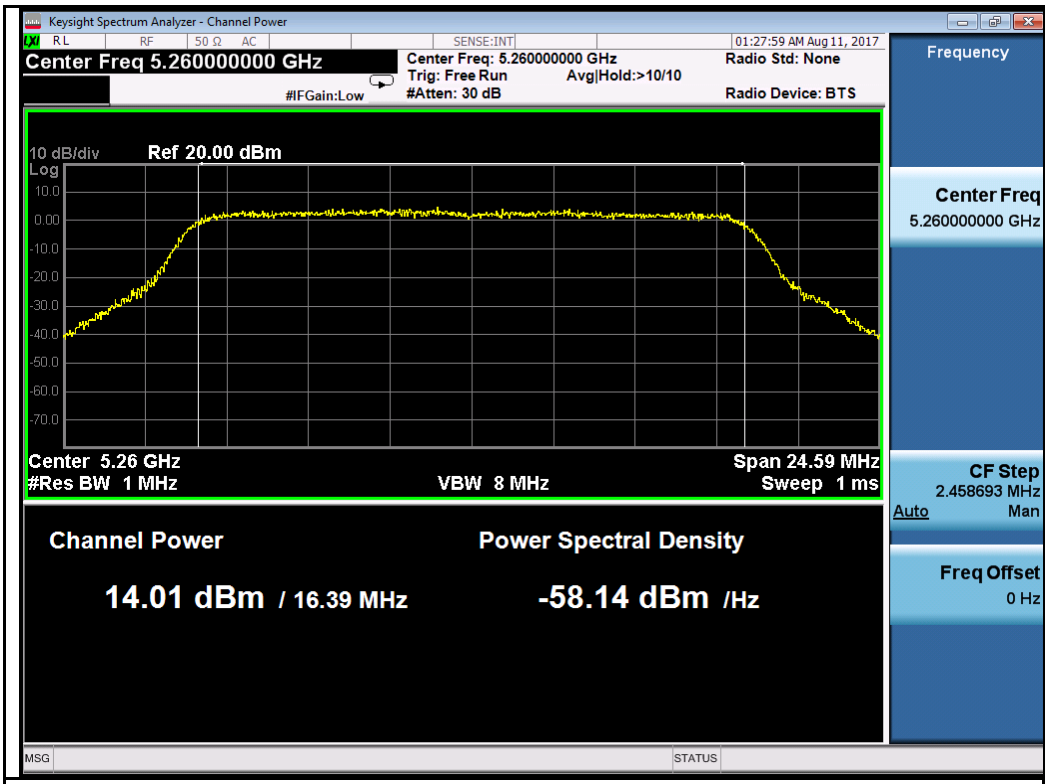


802.11n-HT40 5310M

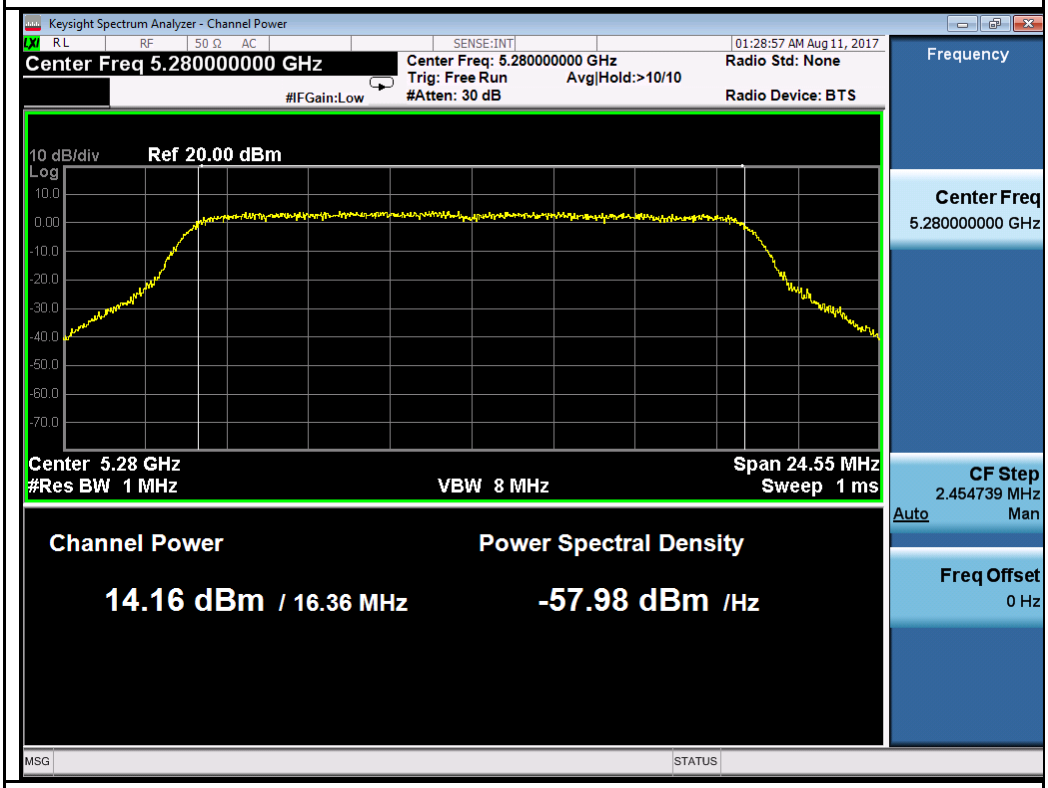


802.11ac-VHT80 5290M

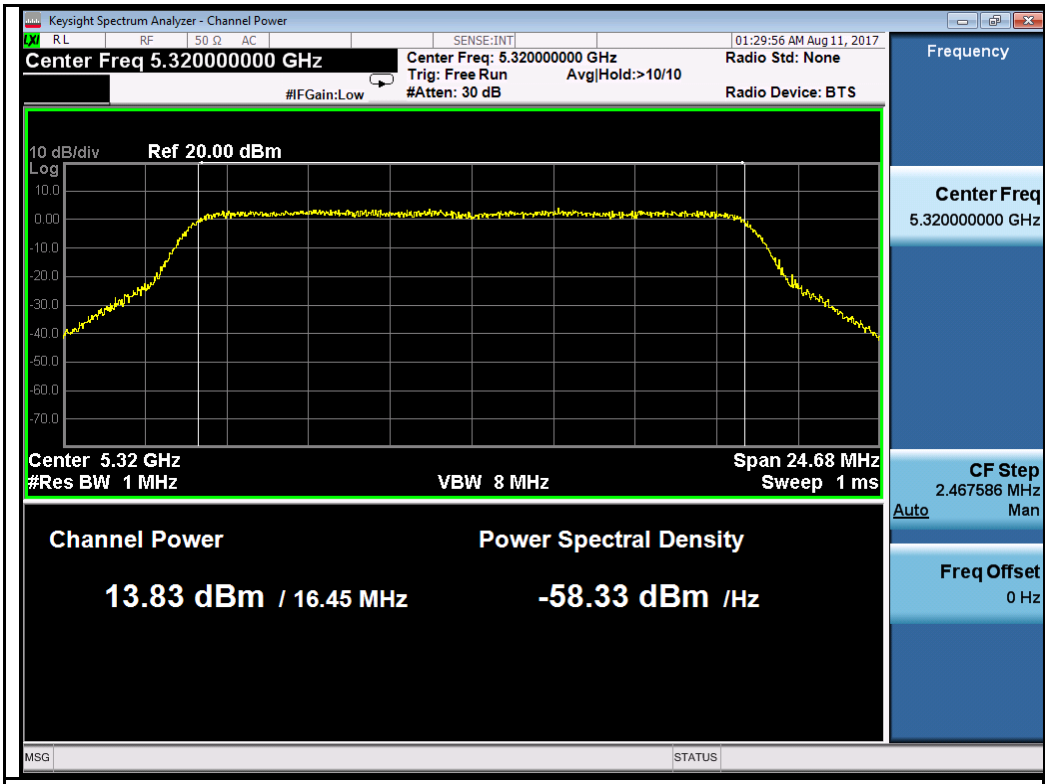
Chain 1:



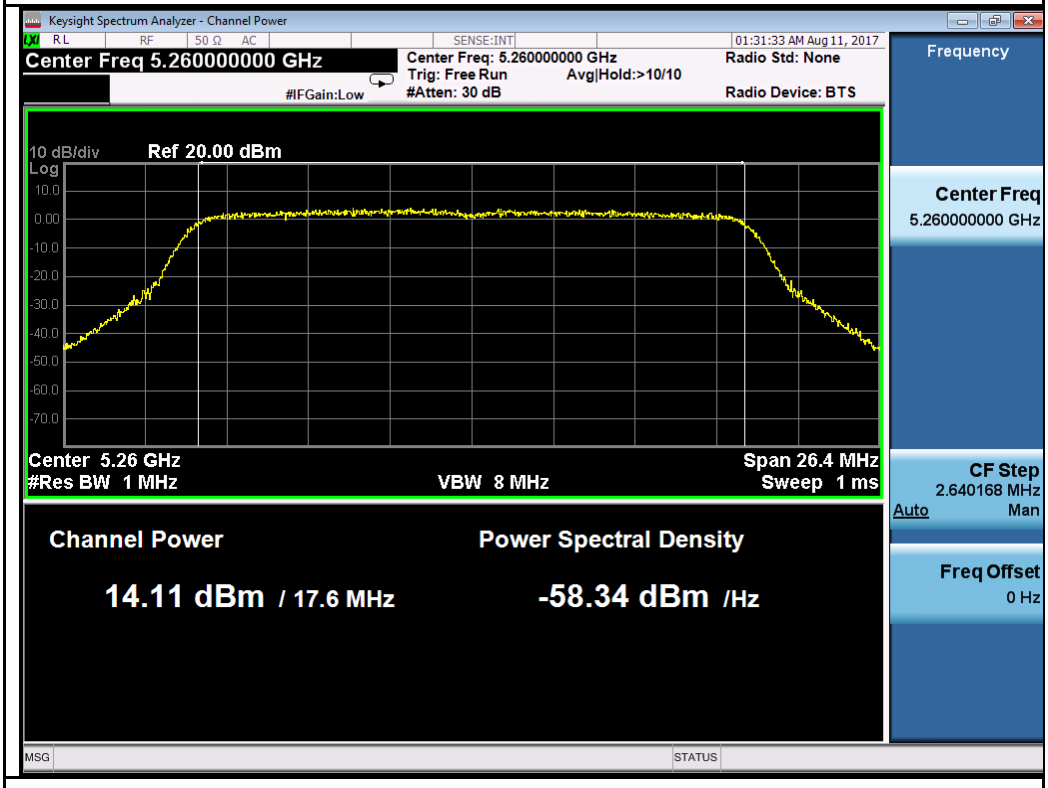
802.11a-5260M



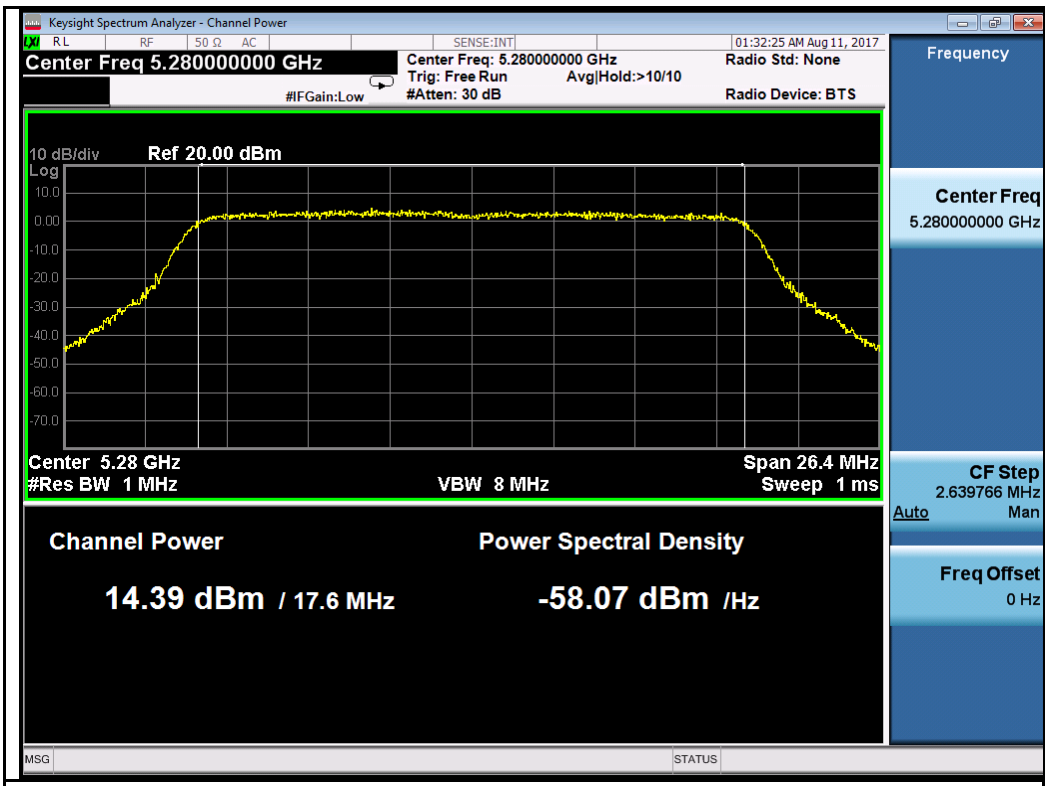
802.11a-5280M



802.11a-5320M



802.11n-HT20 5260M



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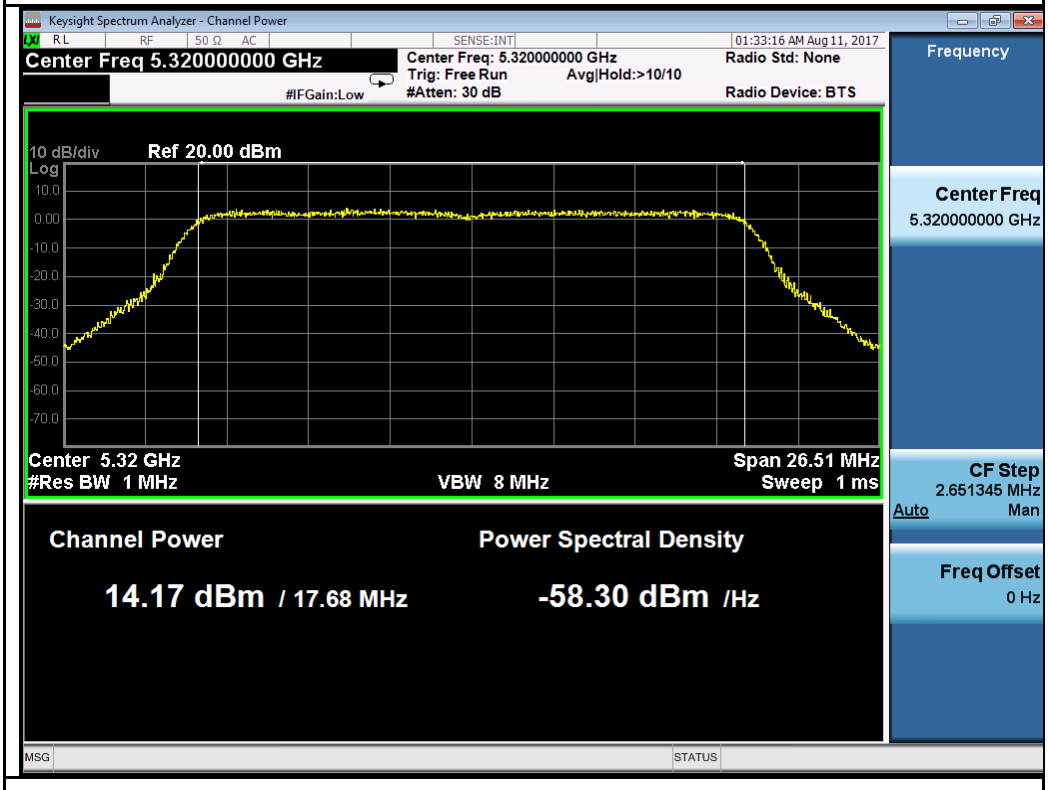

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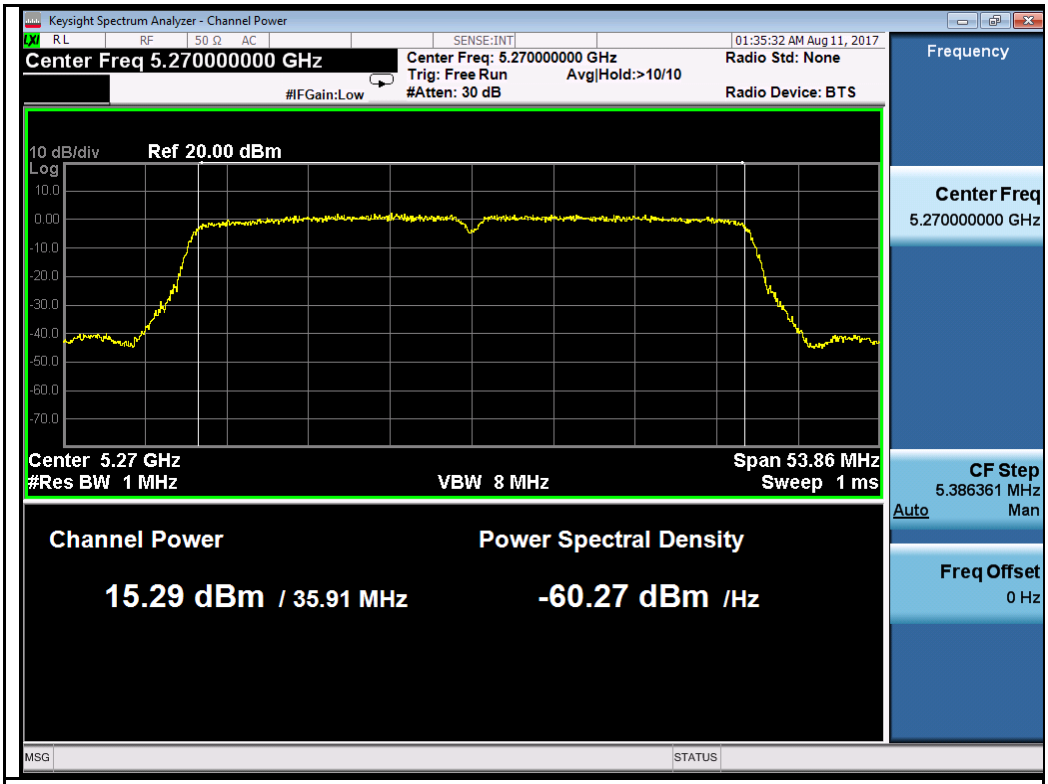
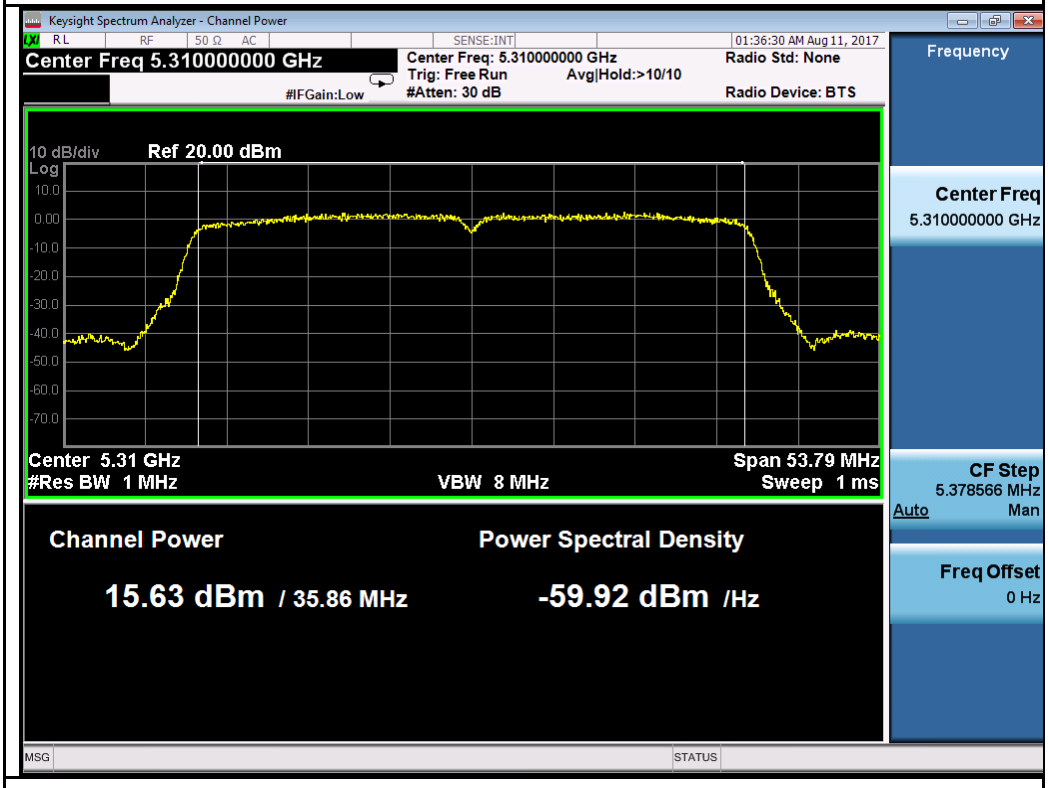


802.11n-HT40 5270M



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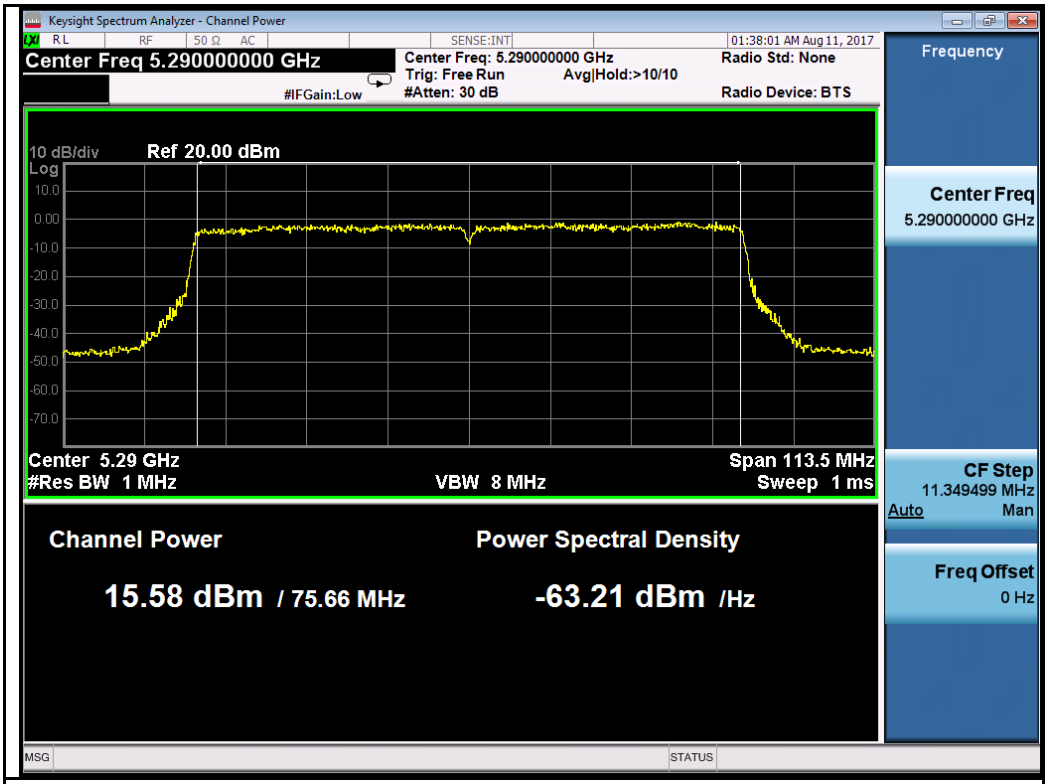

802.11ac-VHT80 5290M

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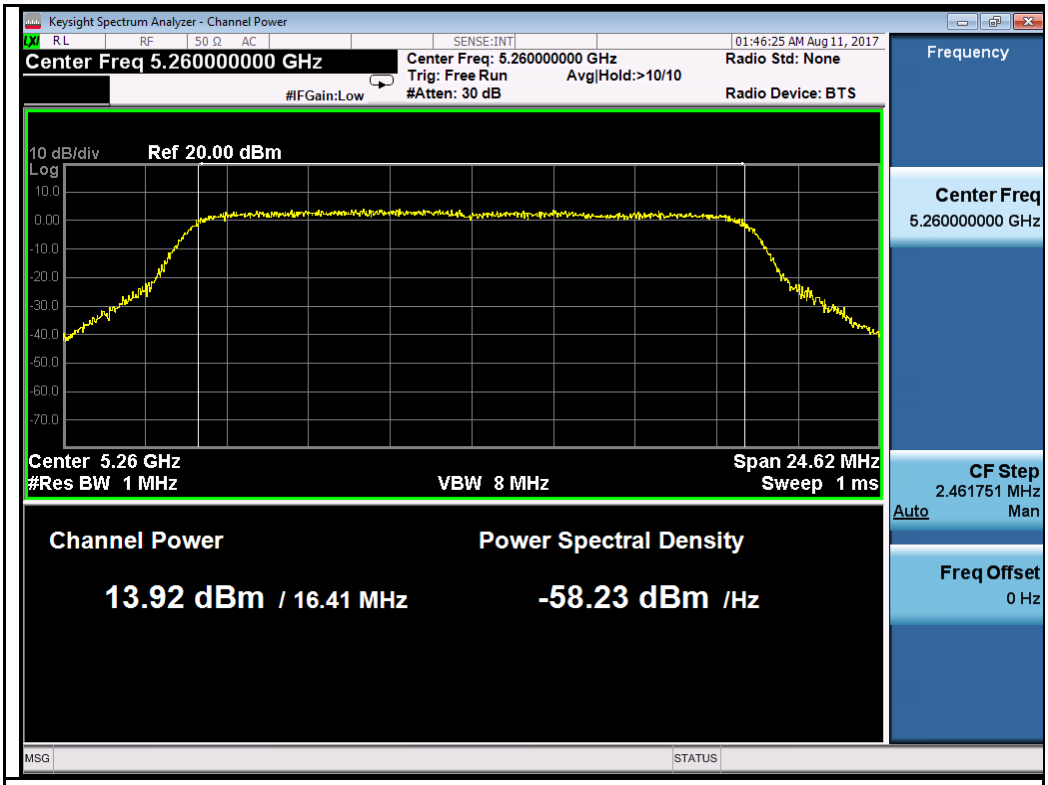

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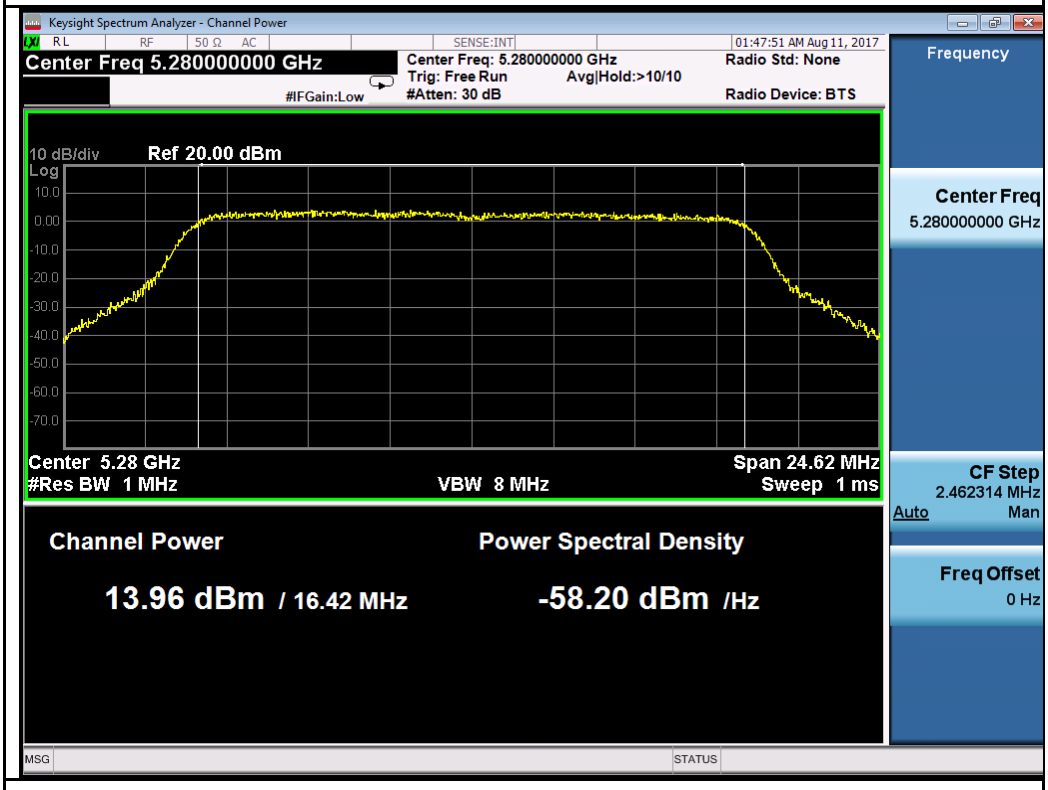

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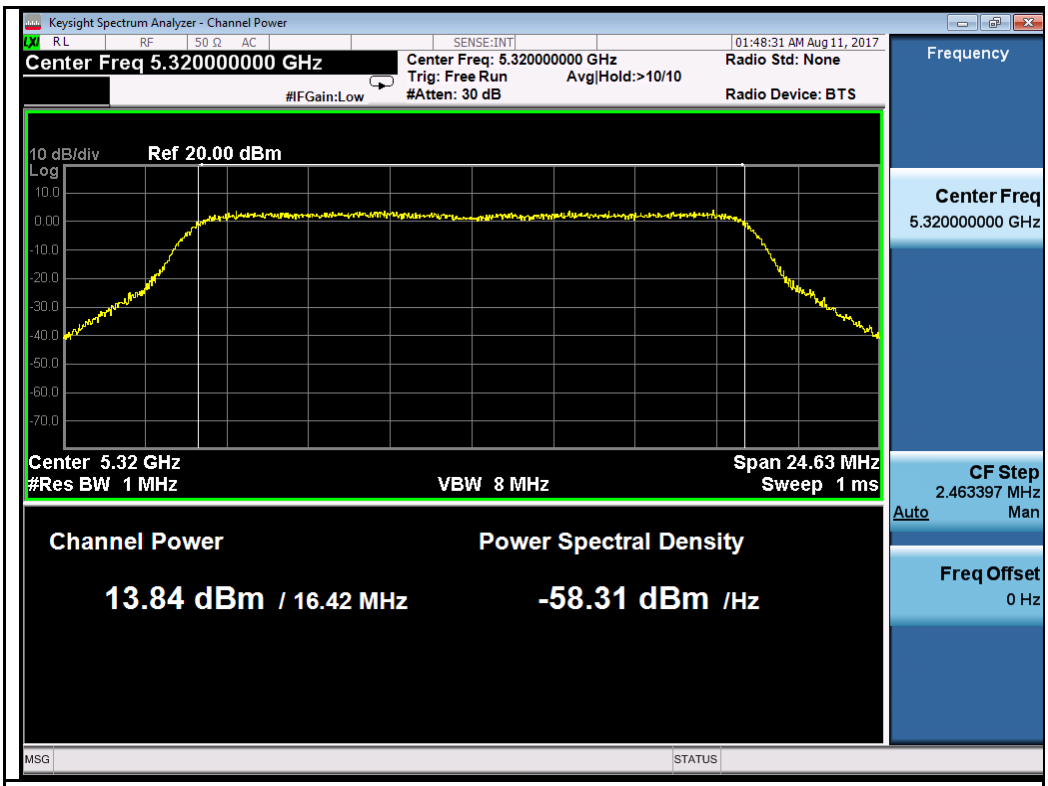

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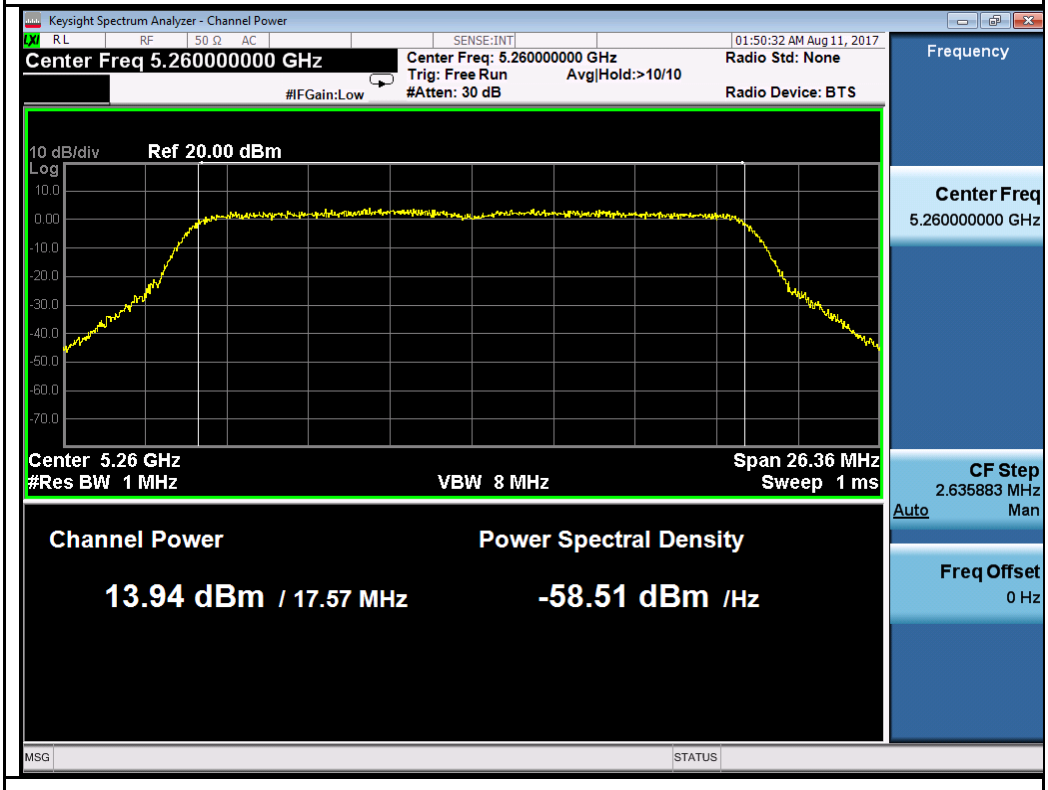

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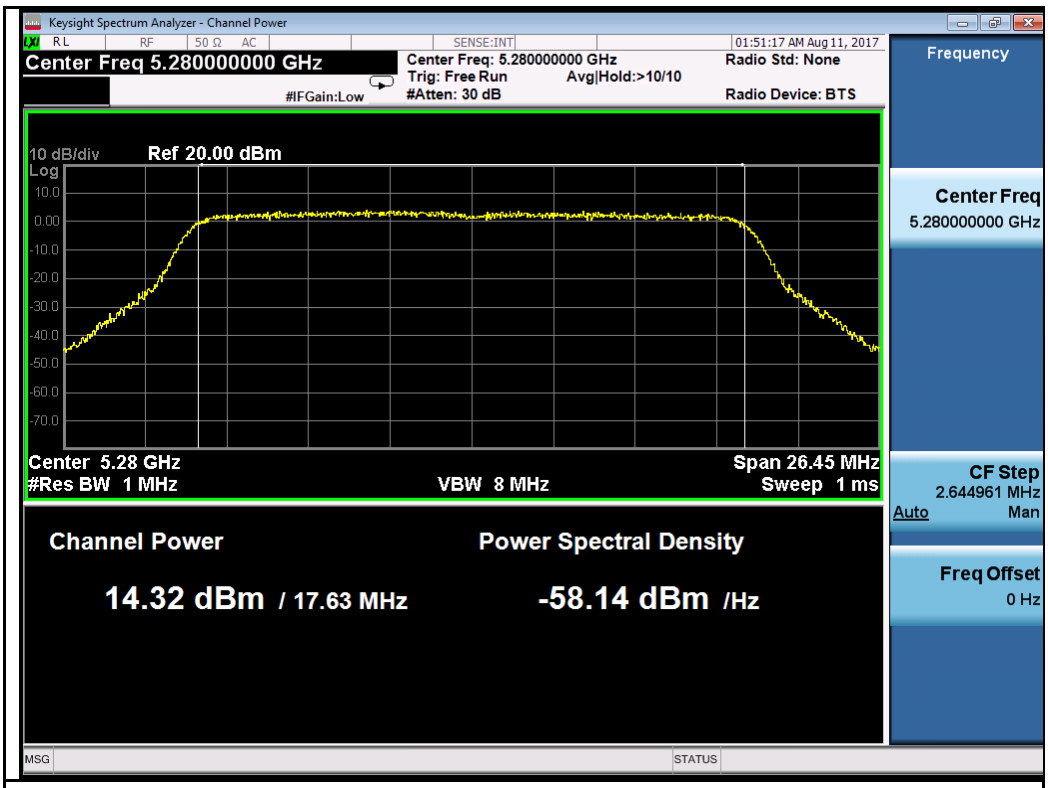

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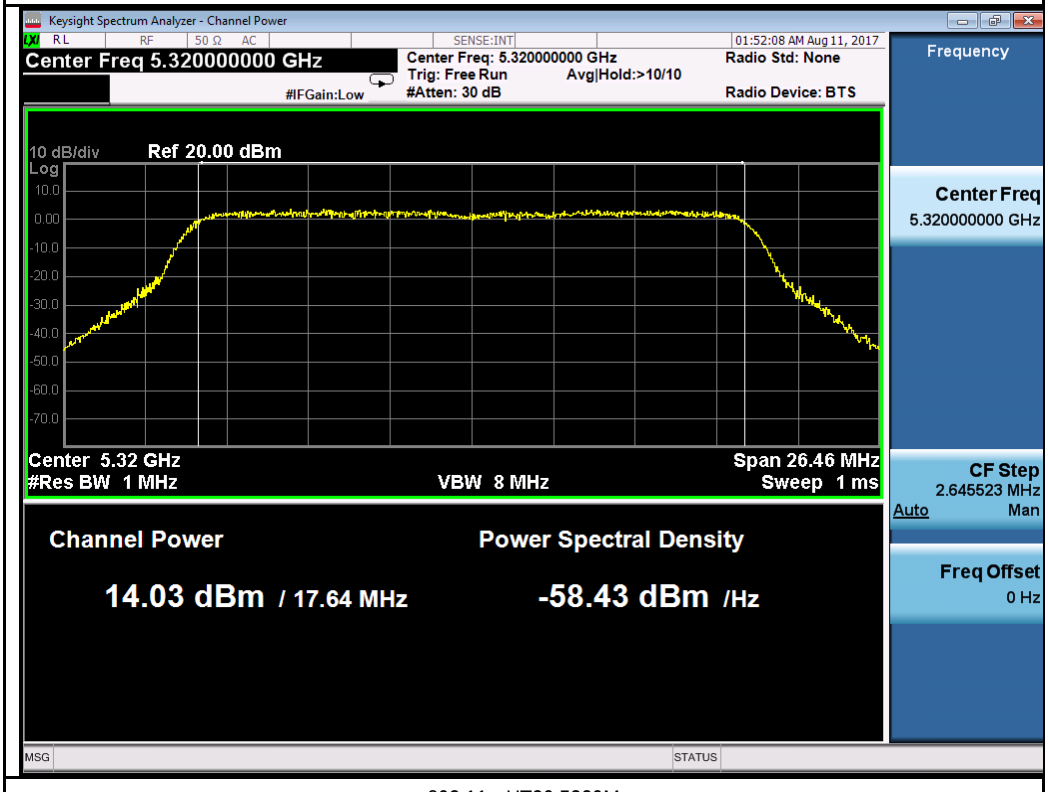

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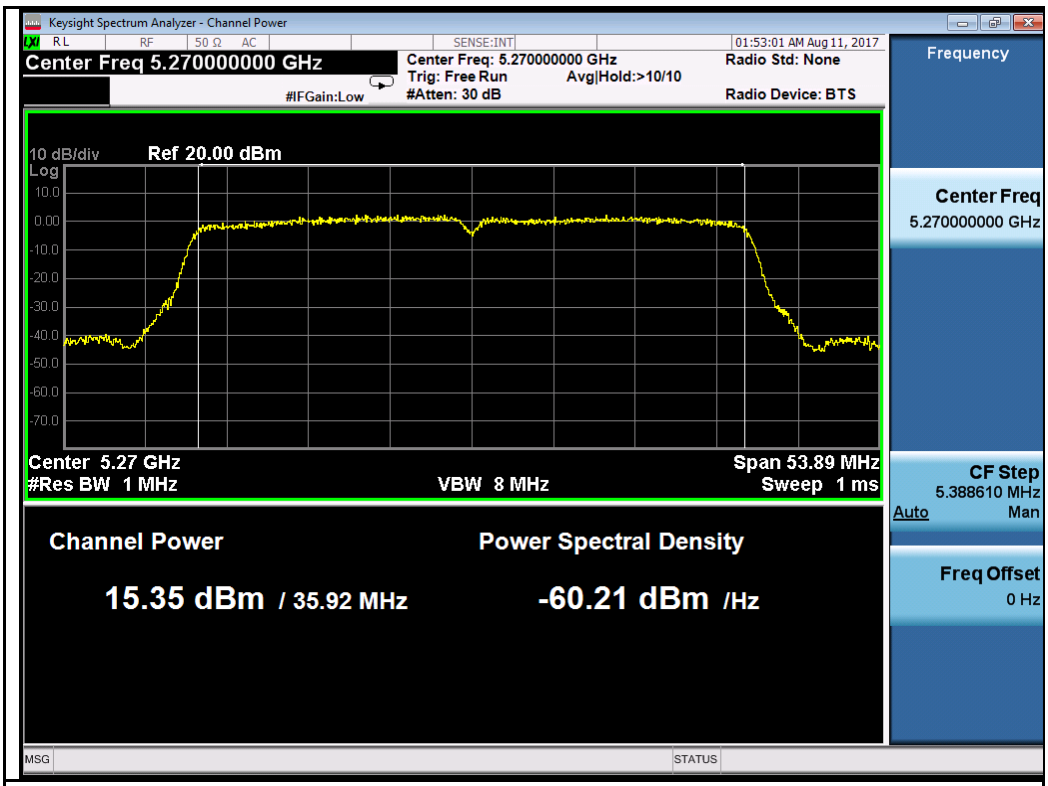

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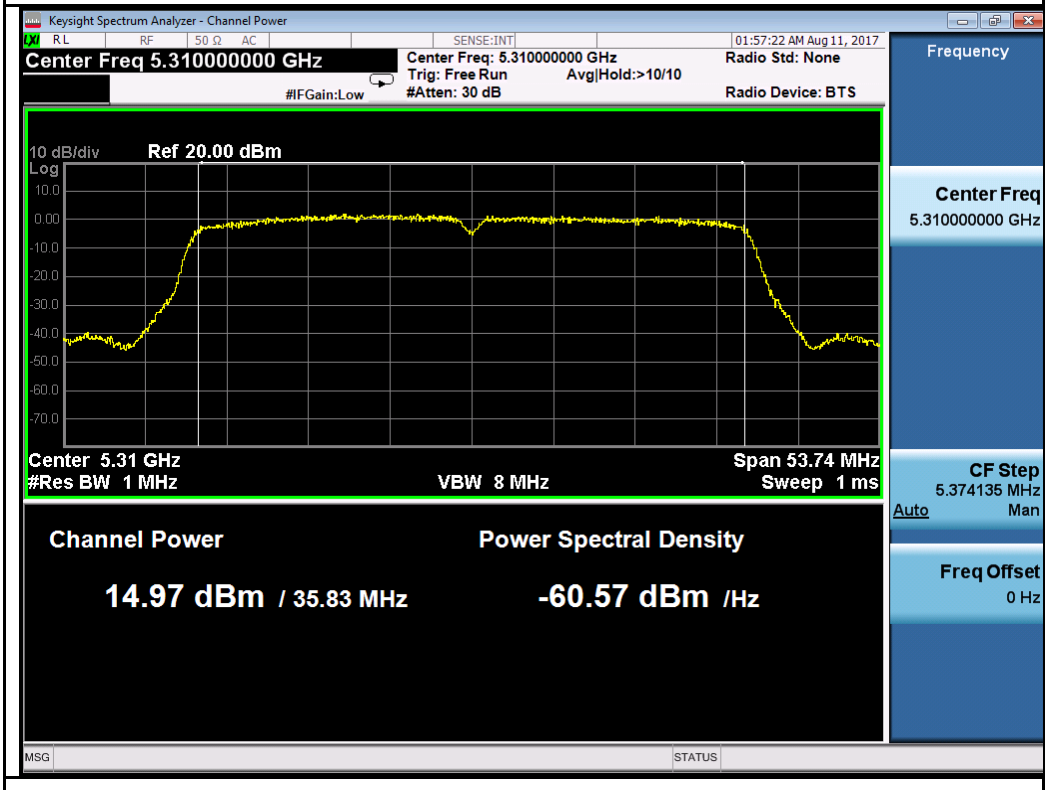

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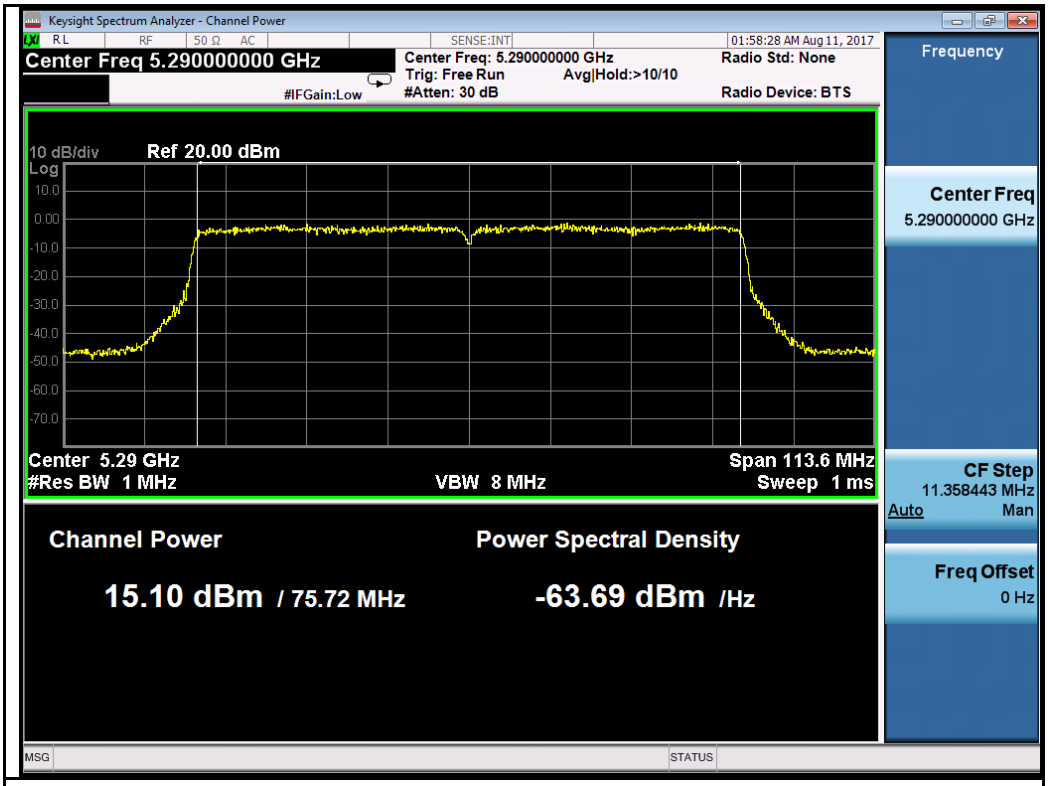

802.11ac-VHT80 5290M

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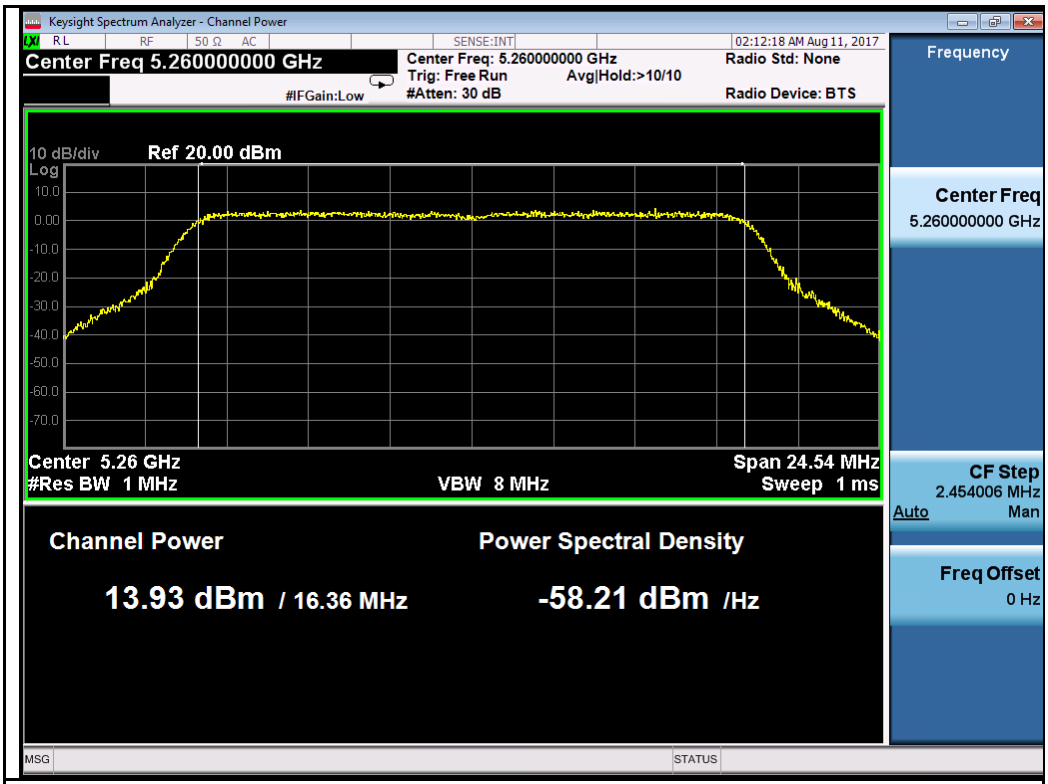

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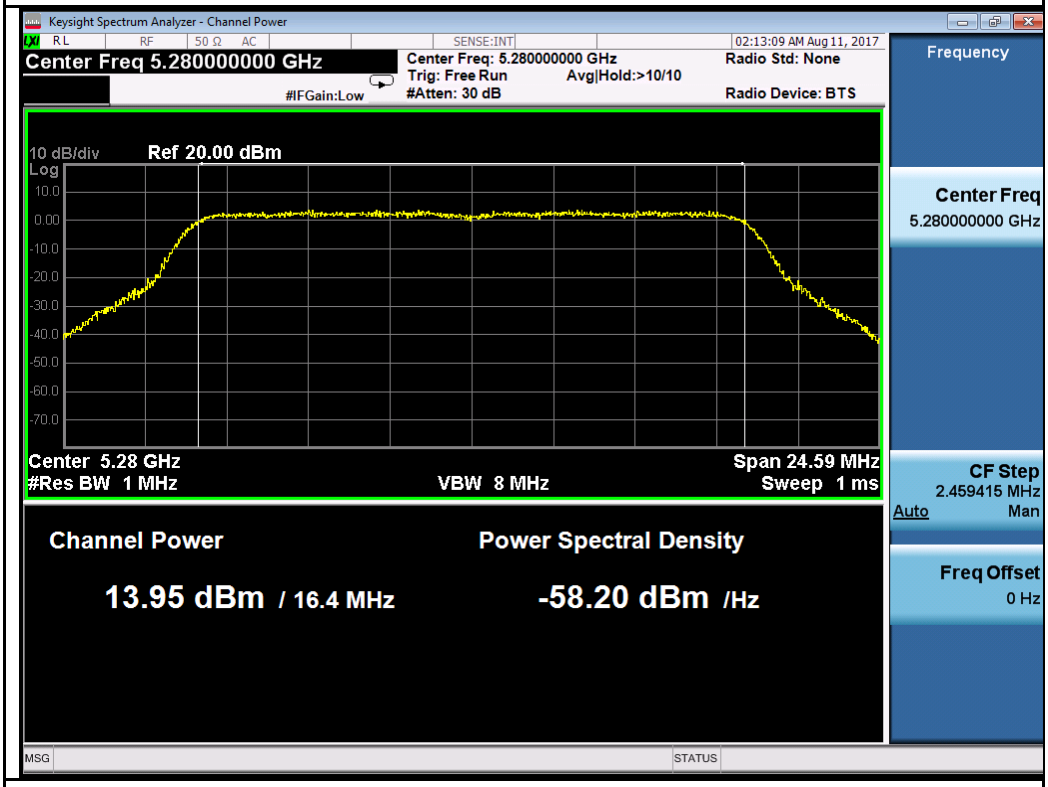

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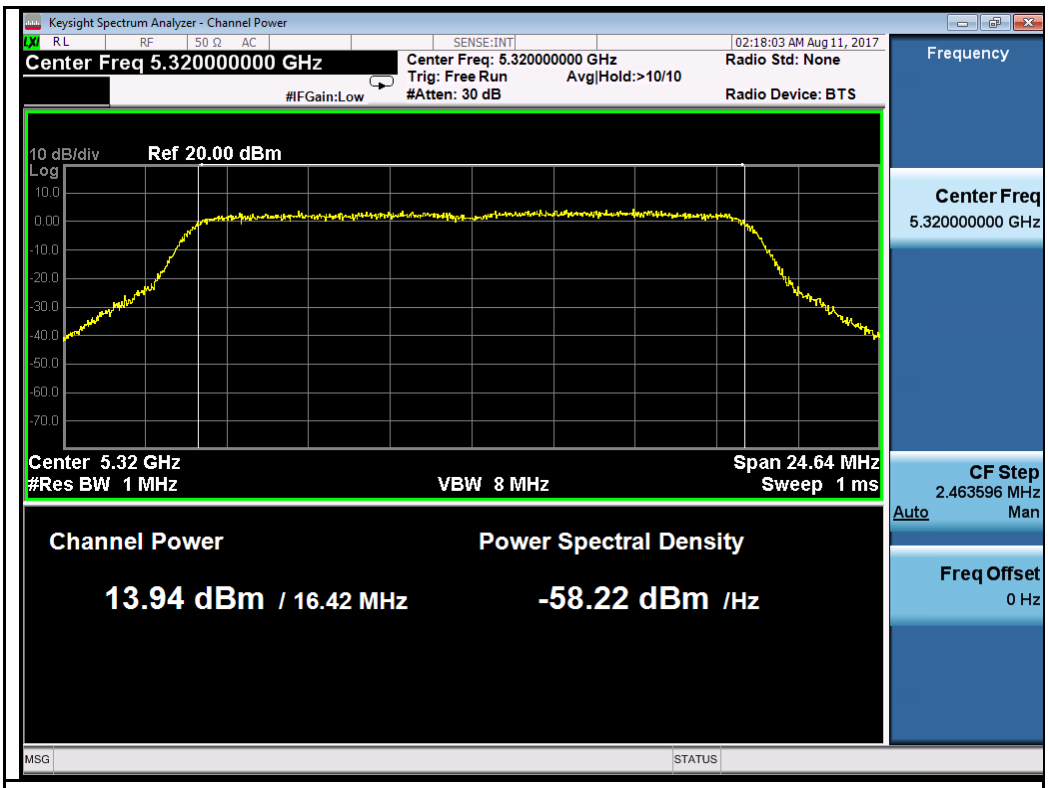

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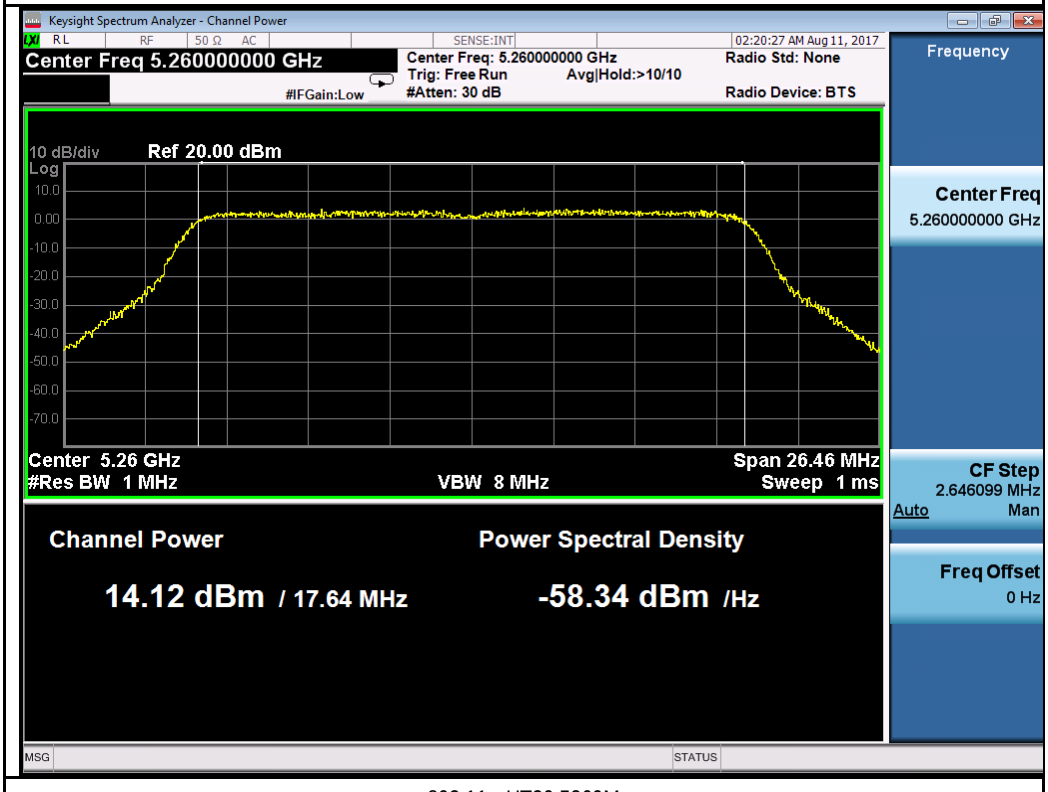

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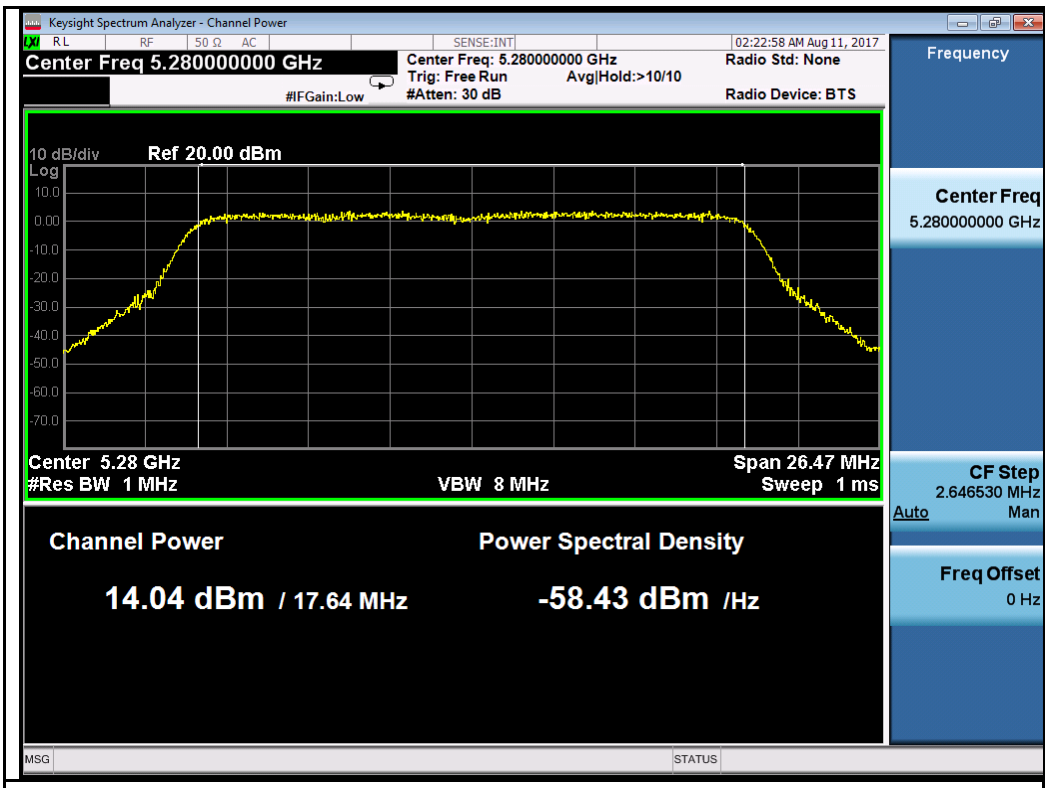

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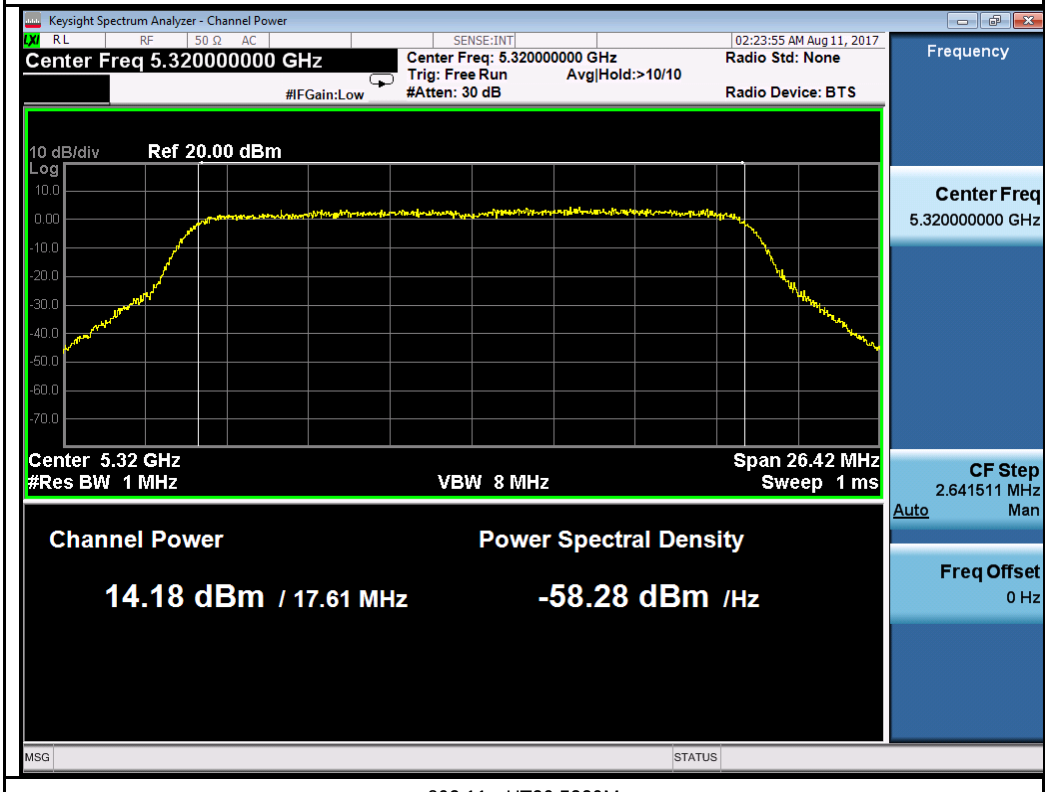

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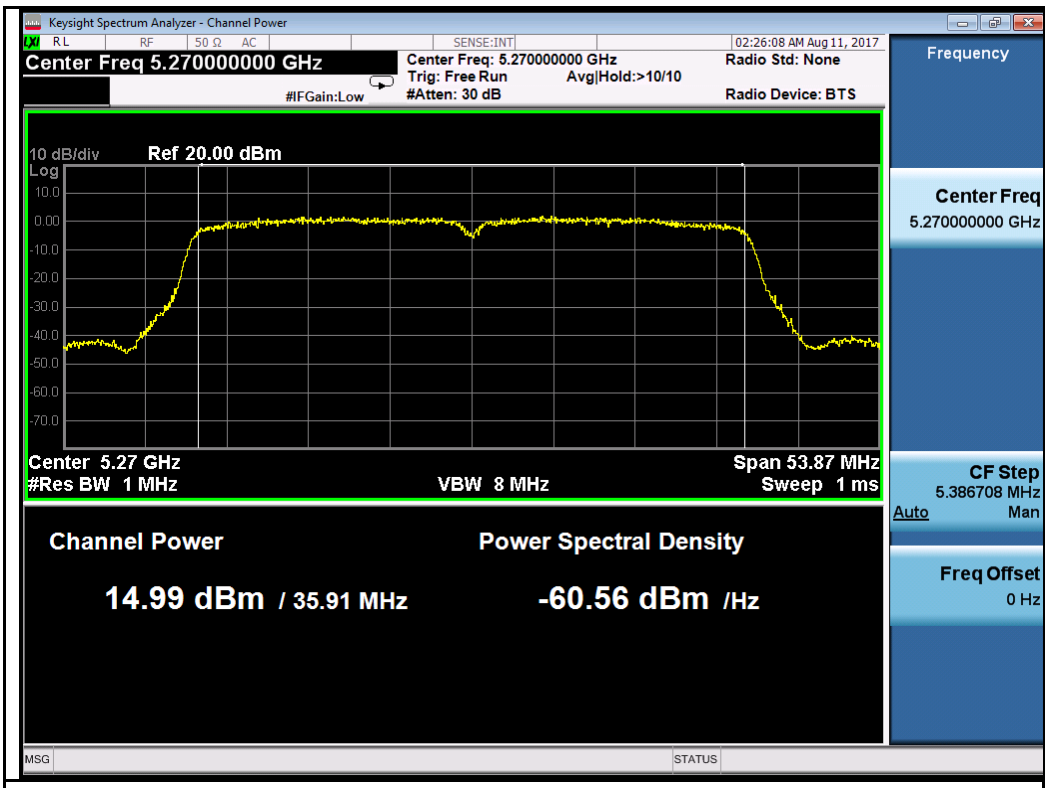

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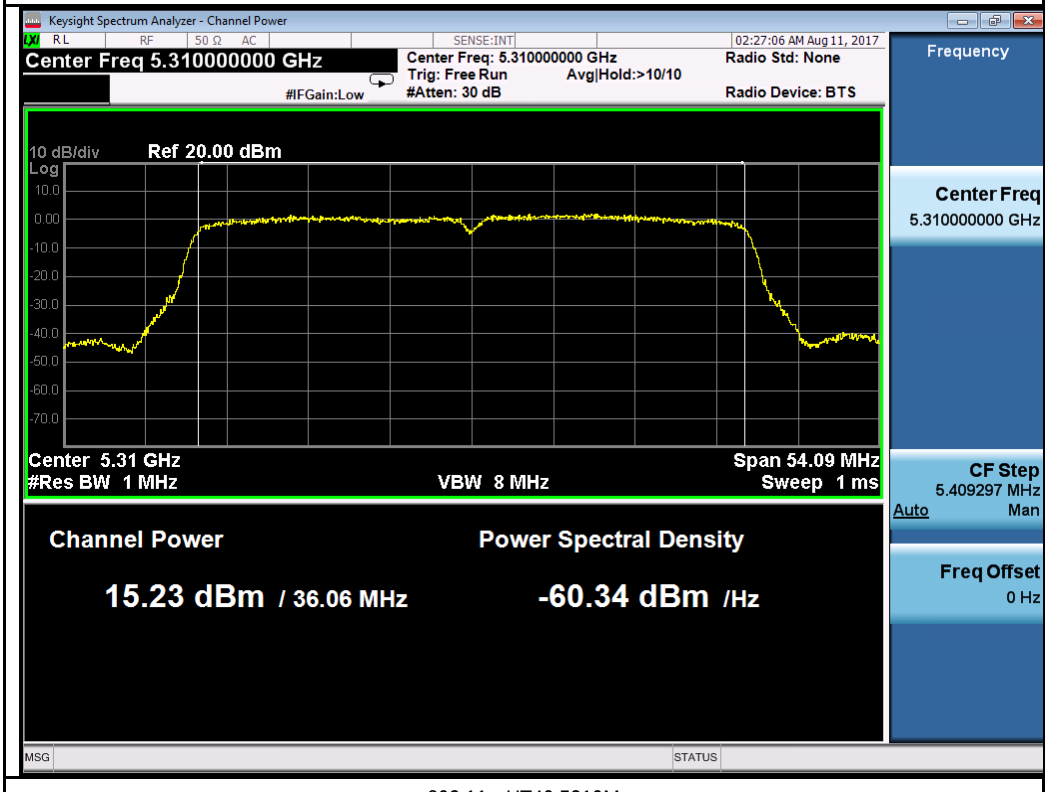

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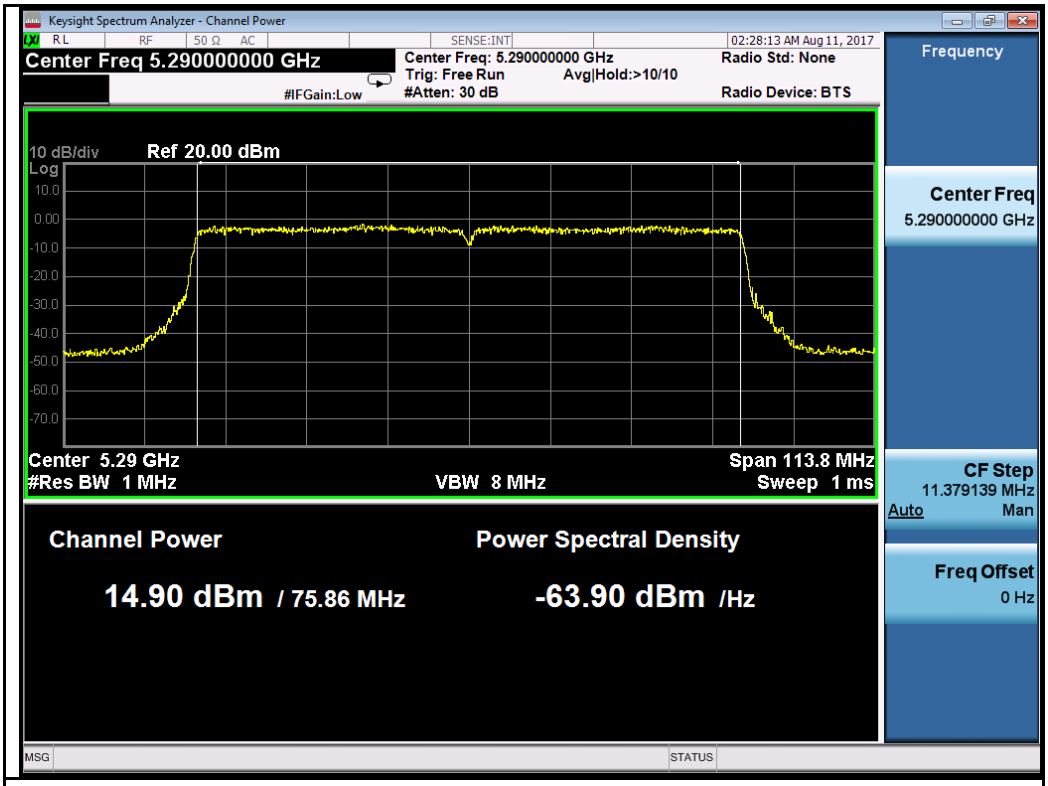

802.11ac-VHT80 5290M

Test Plot for W56:

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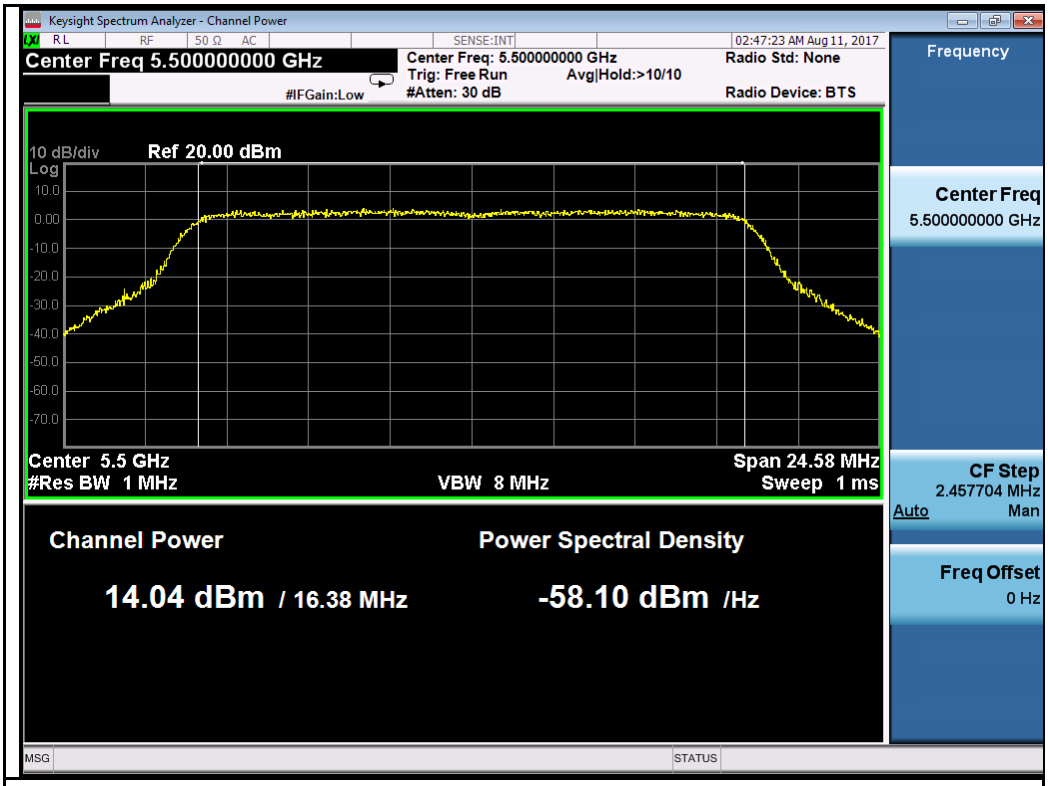
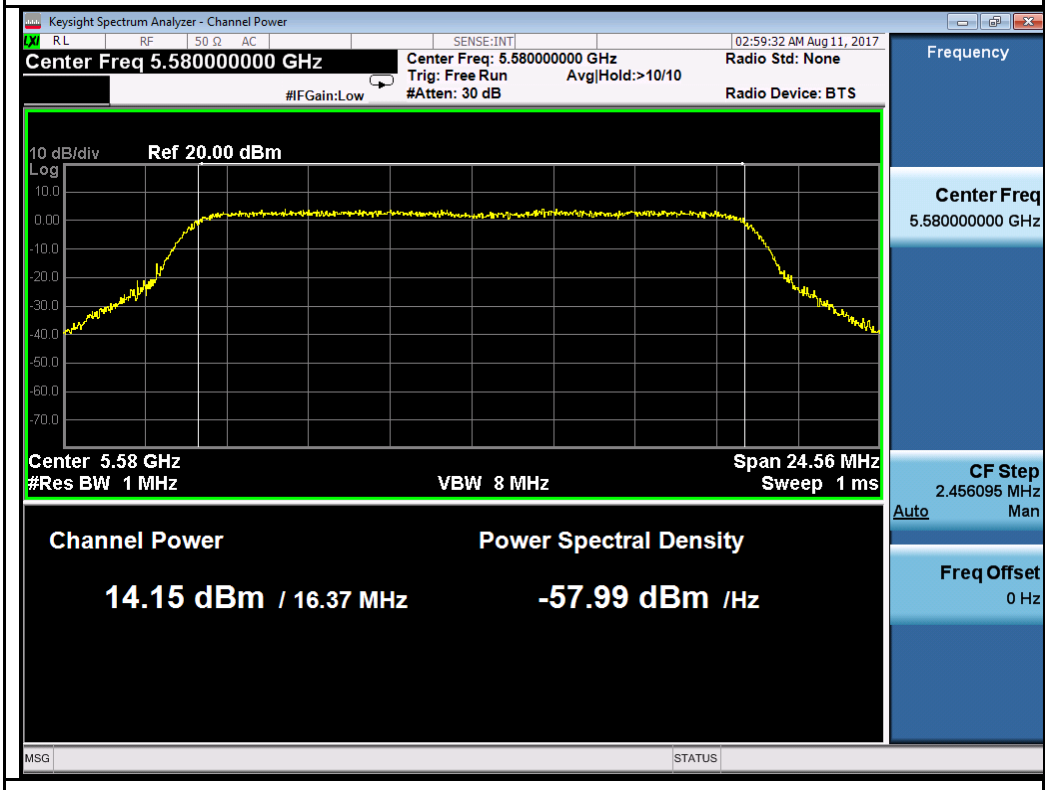


802.11a-5500M



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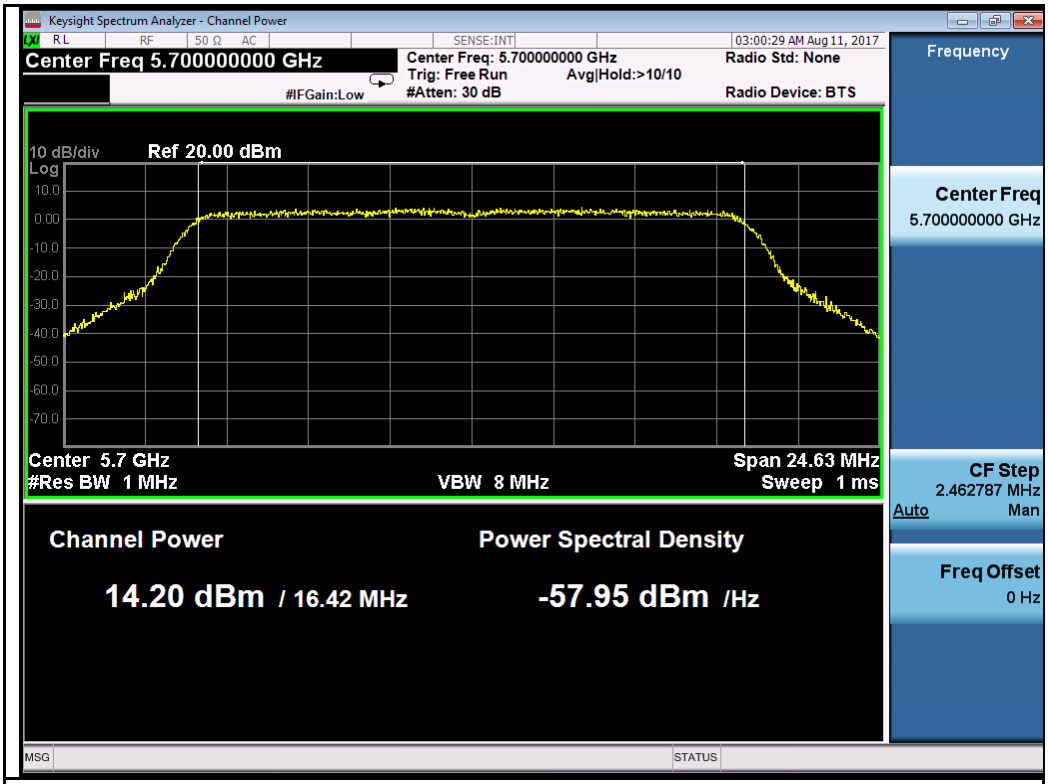

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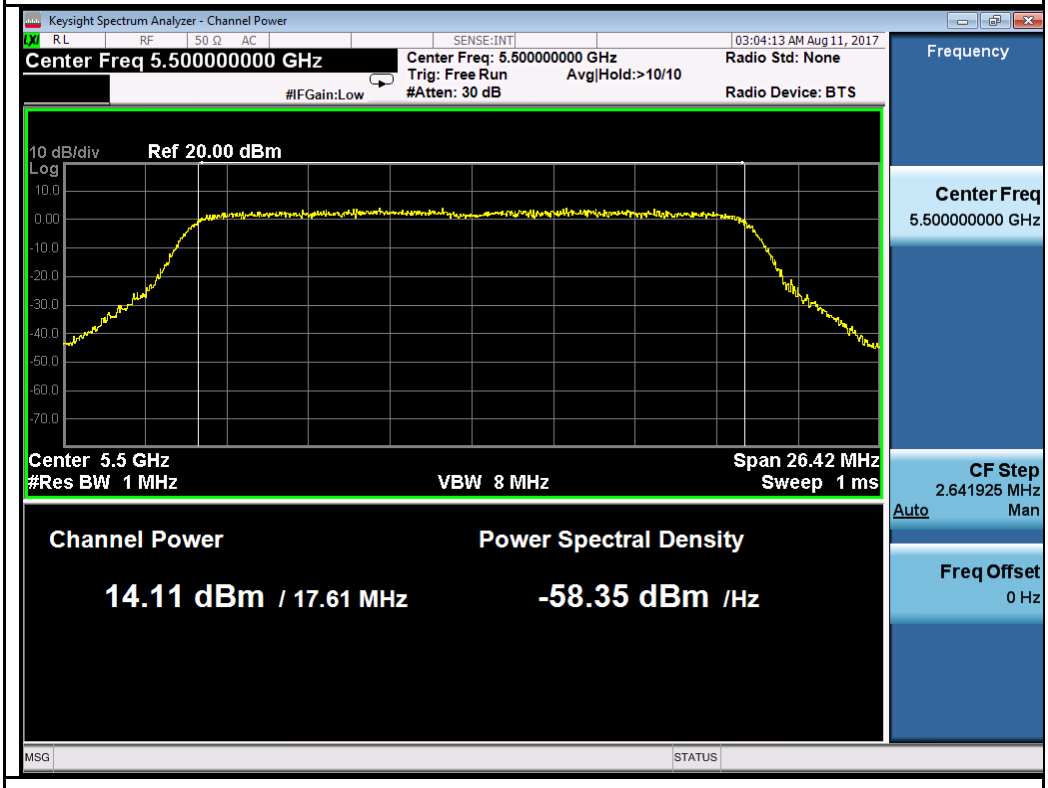
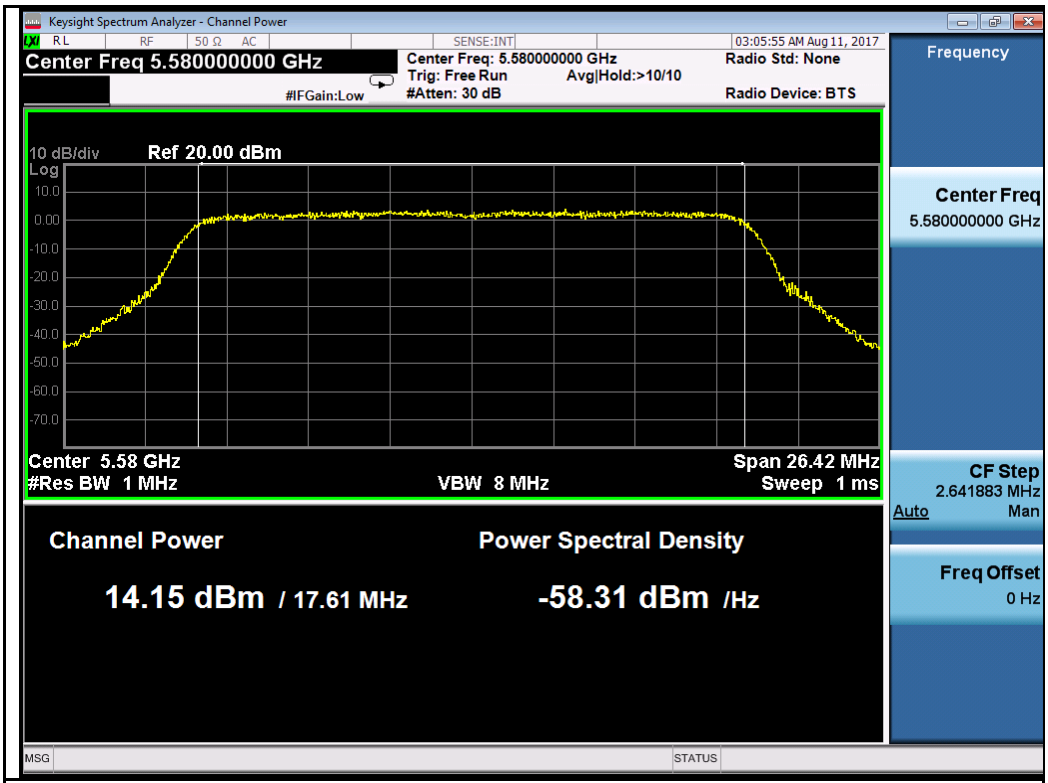


802.11n-HT20 5500M



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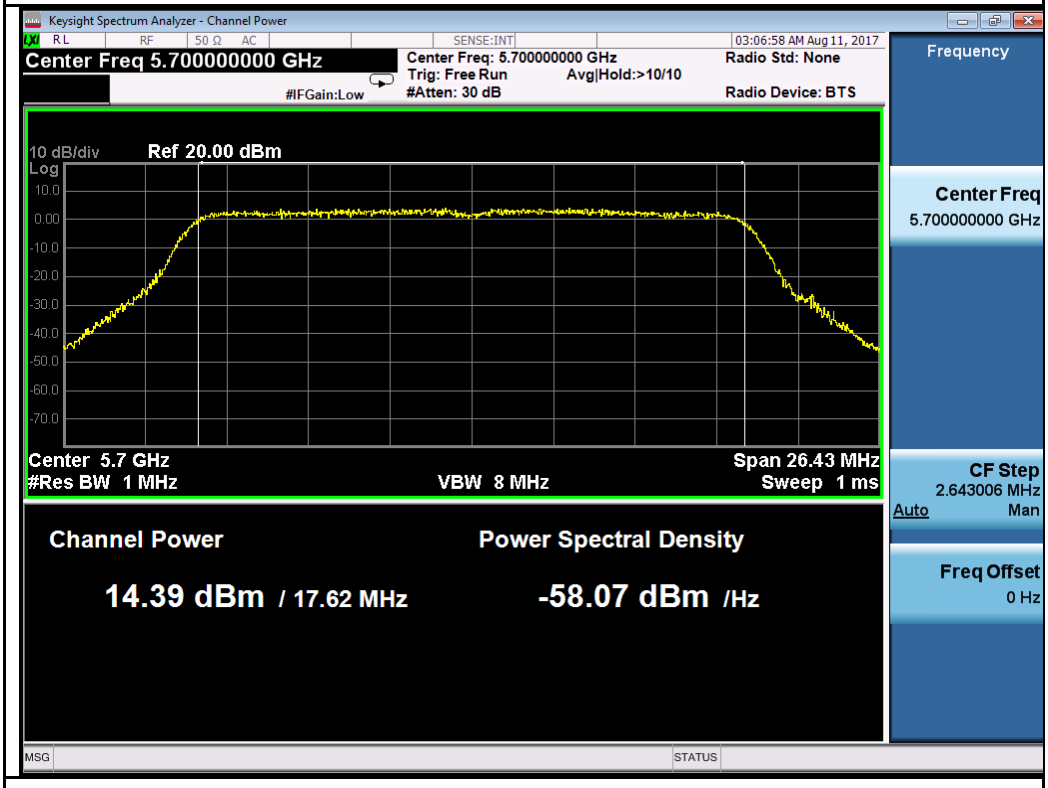

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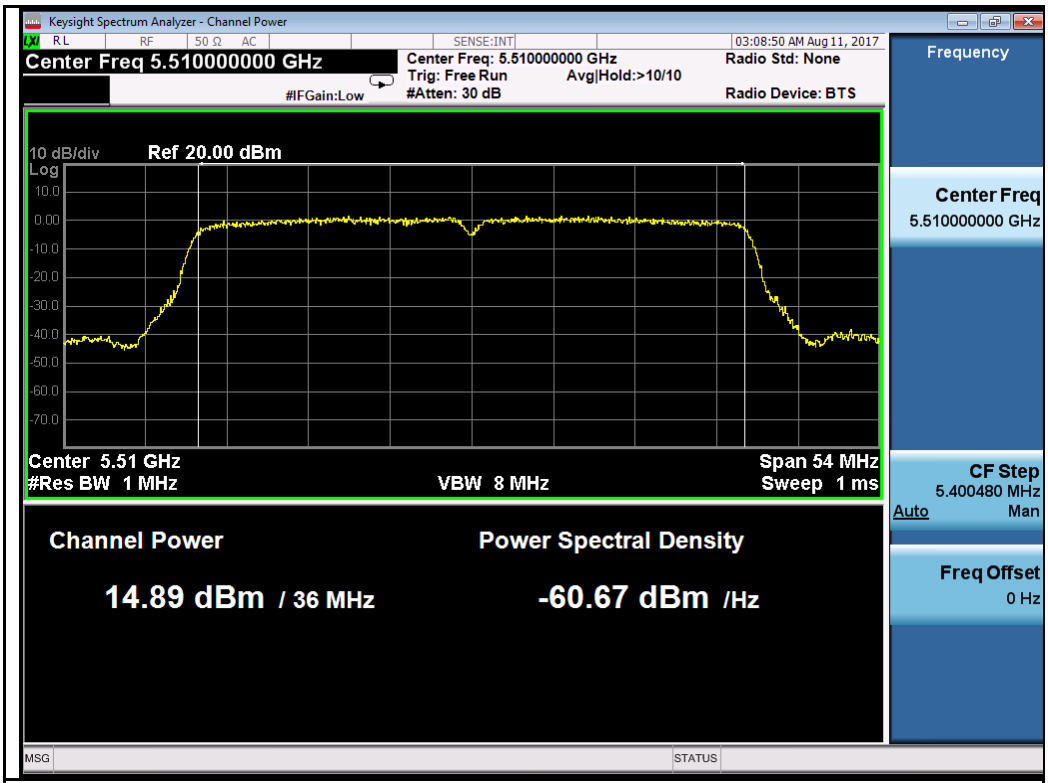
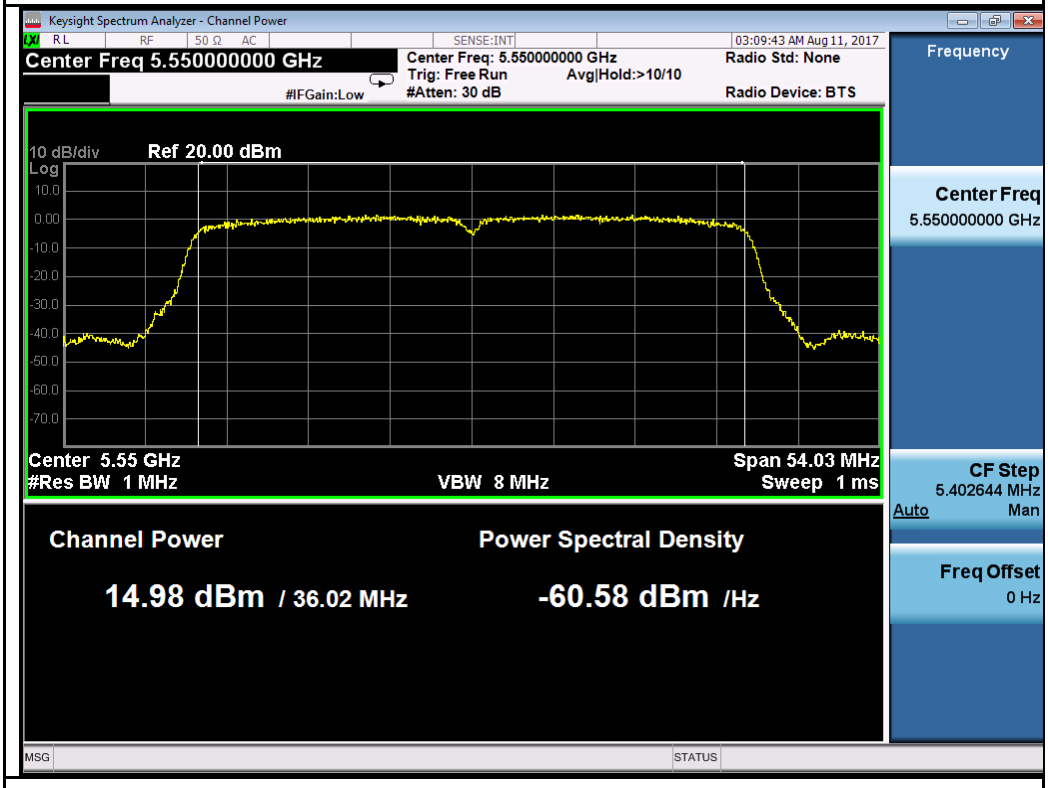


802.11n-HT40 5510M



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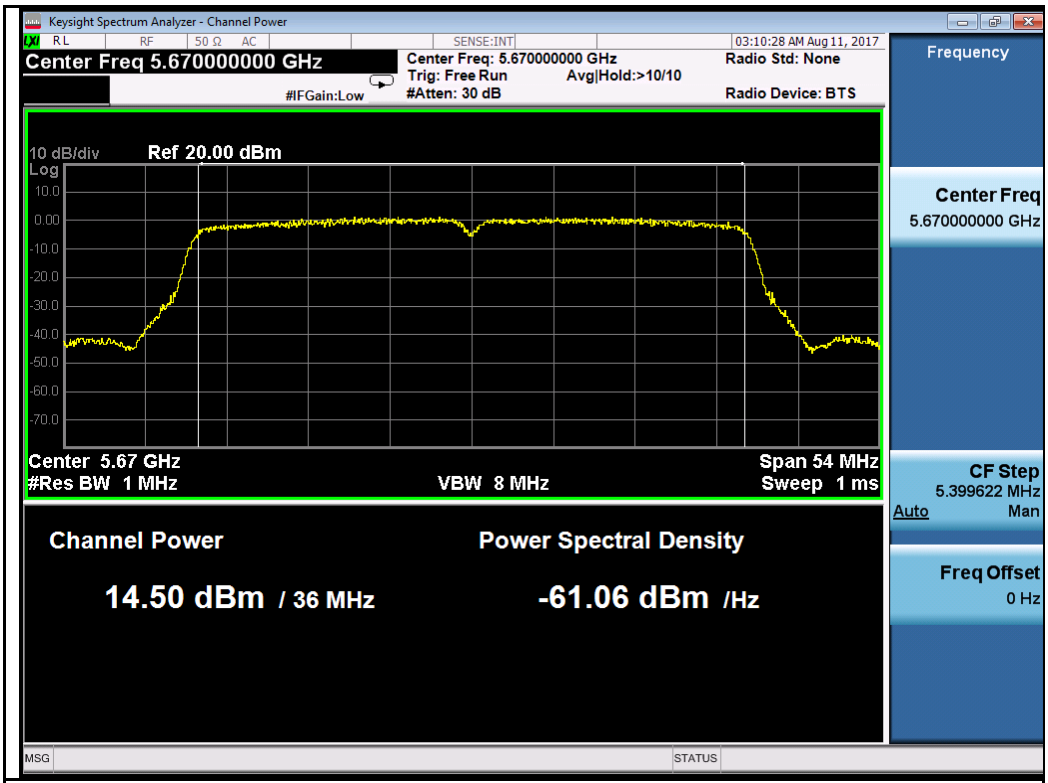
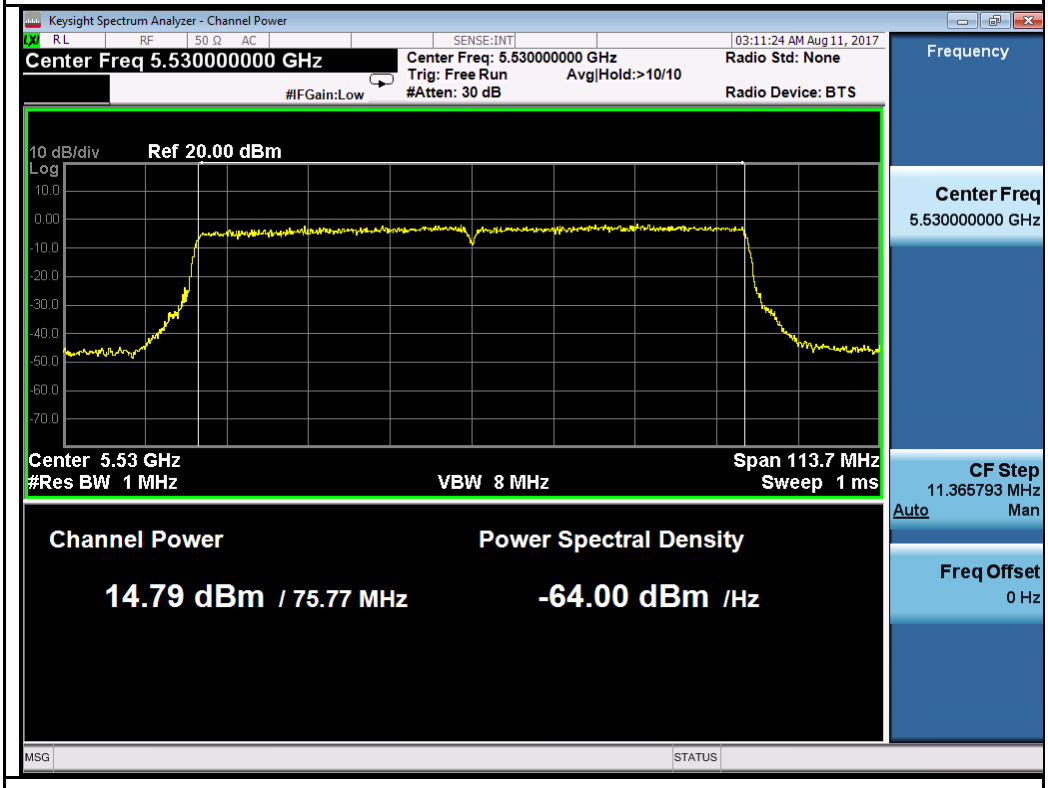
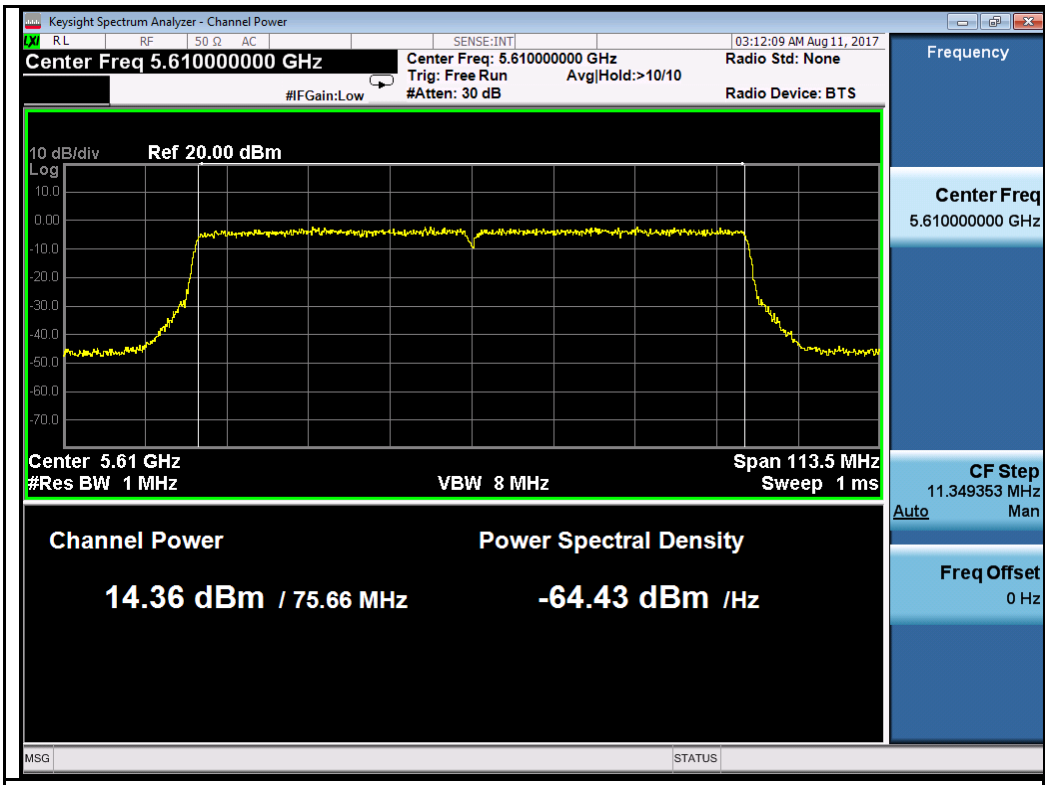


802.11n-HT40 5670M



802.11ac-VHT80 5530M



802.11ac-VHT80 5610M

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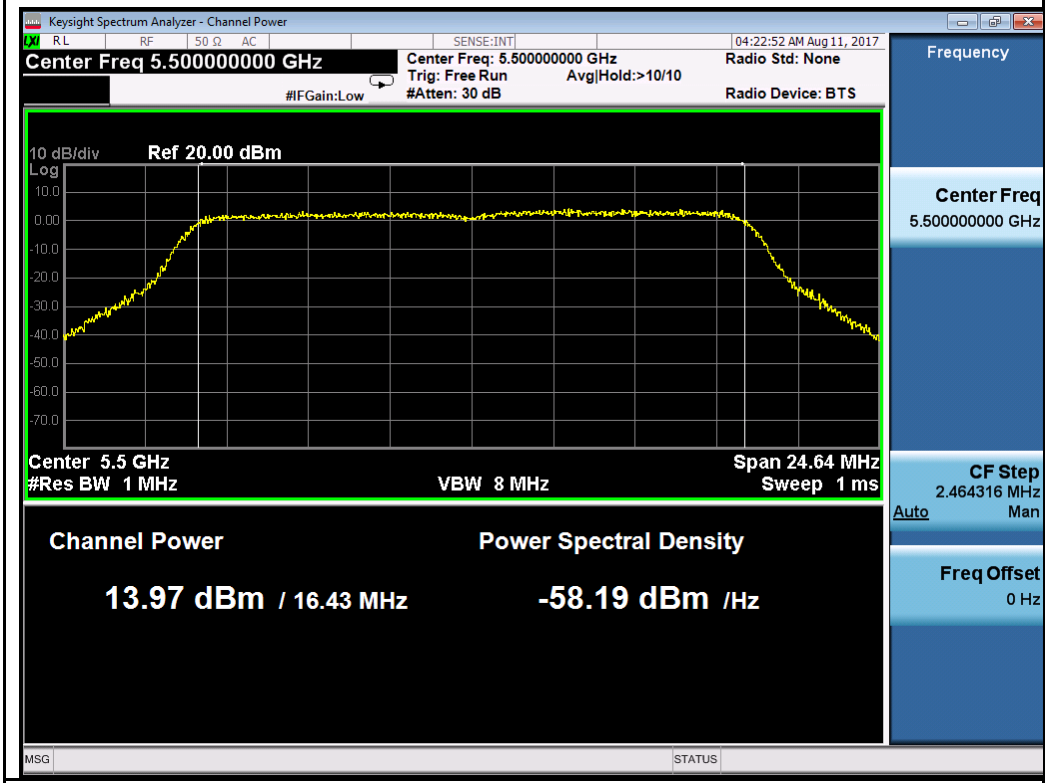
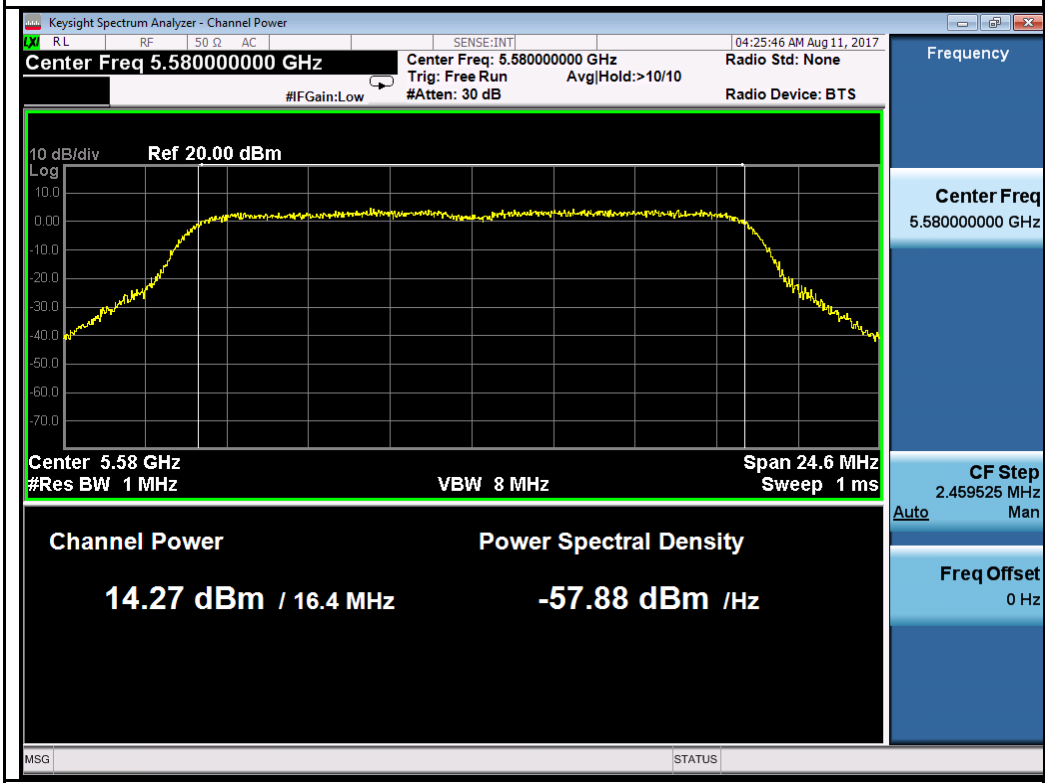


802.11a-5500M



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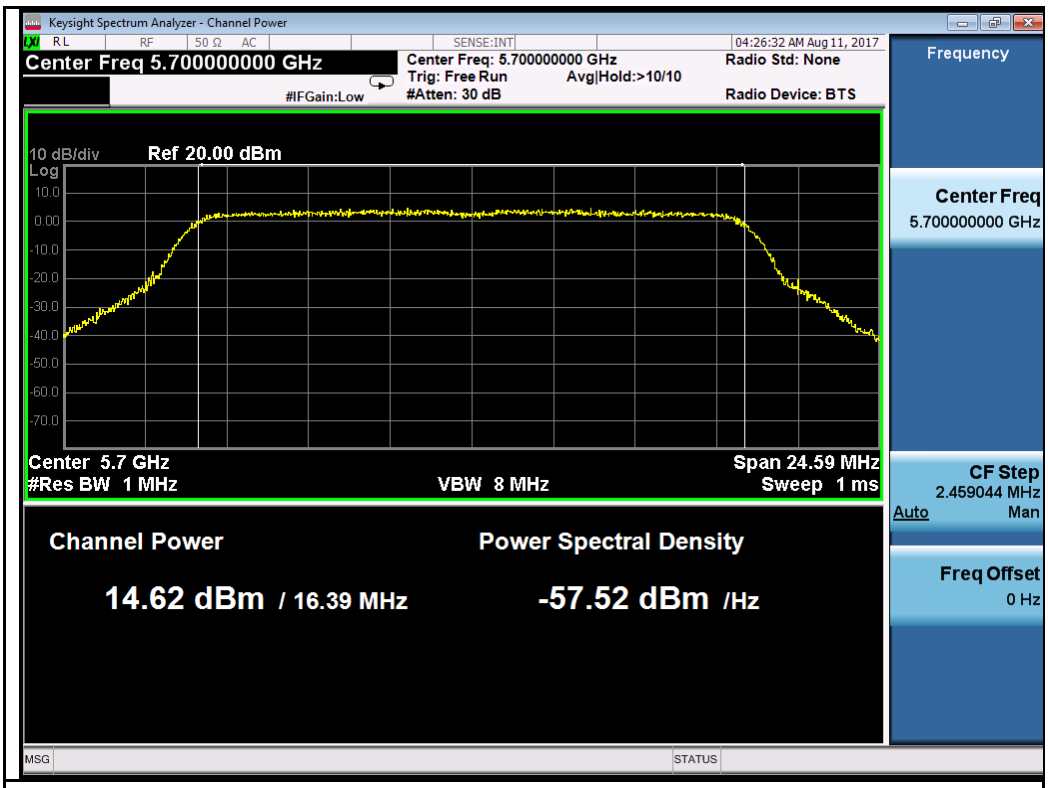
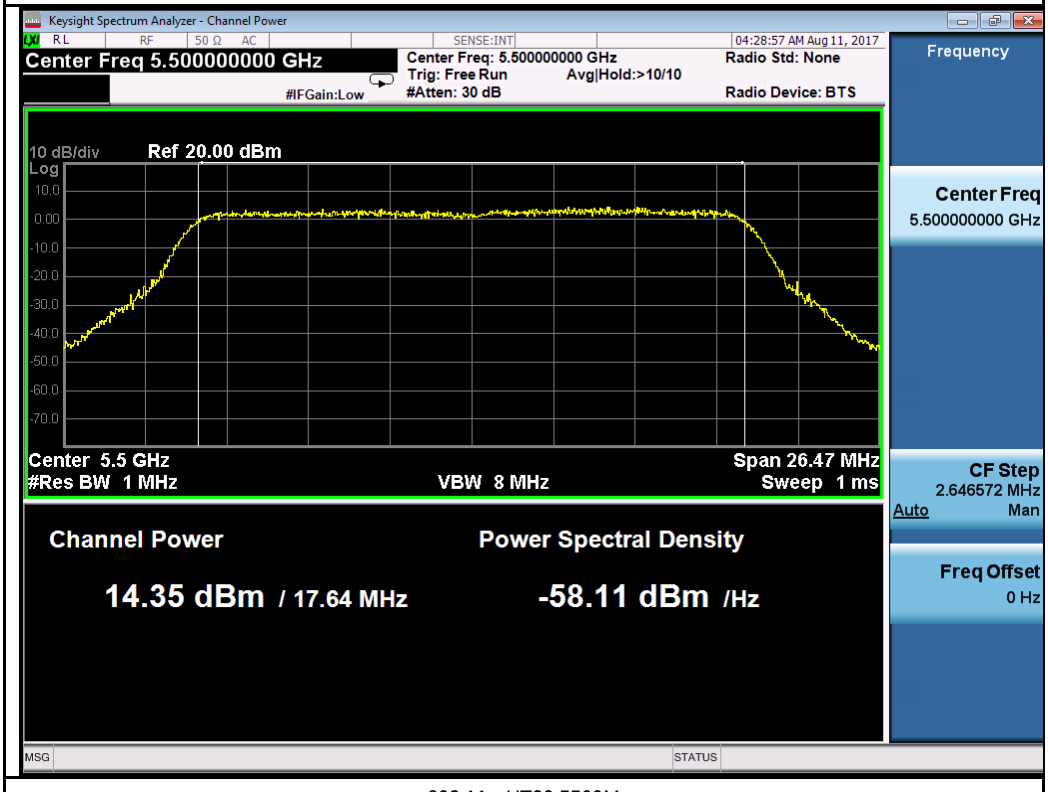
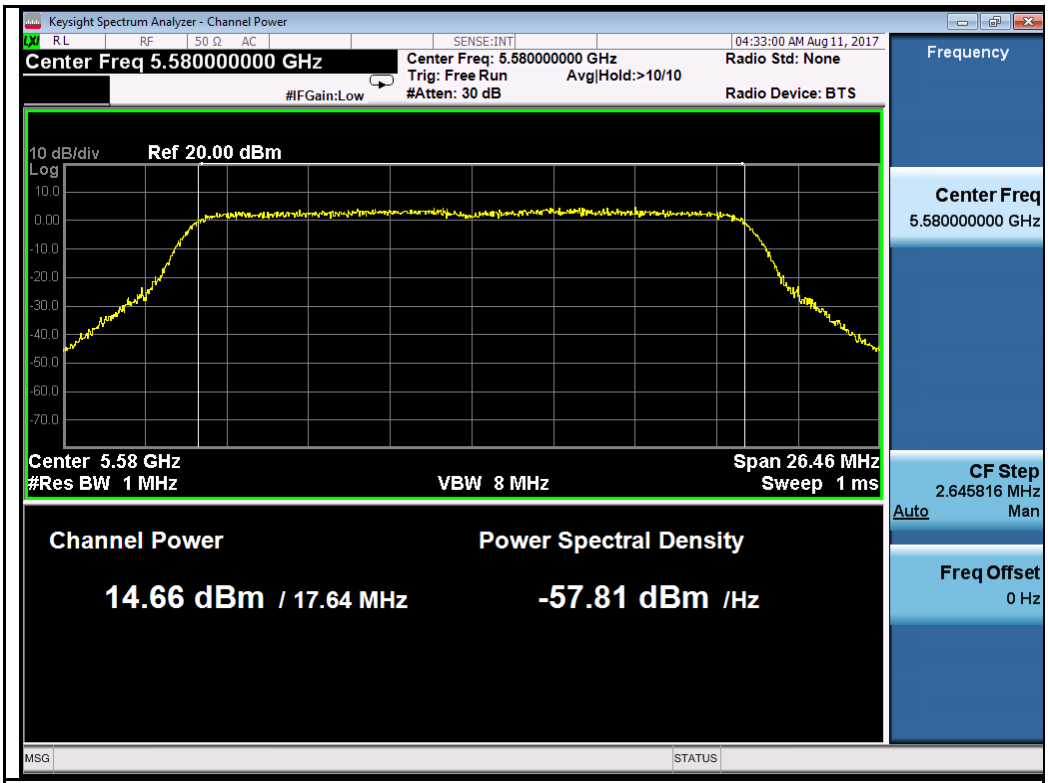


802.11a-5700M



802.11n-HT20 5500M



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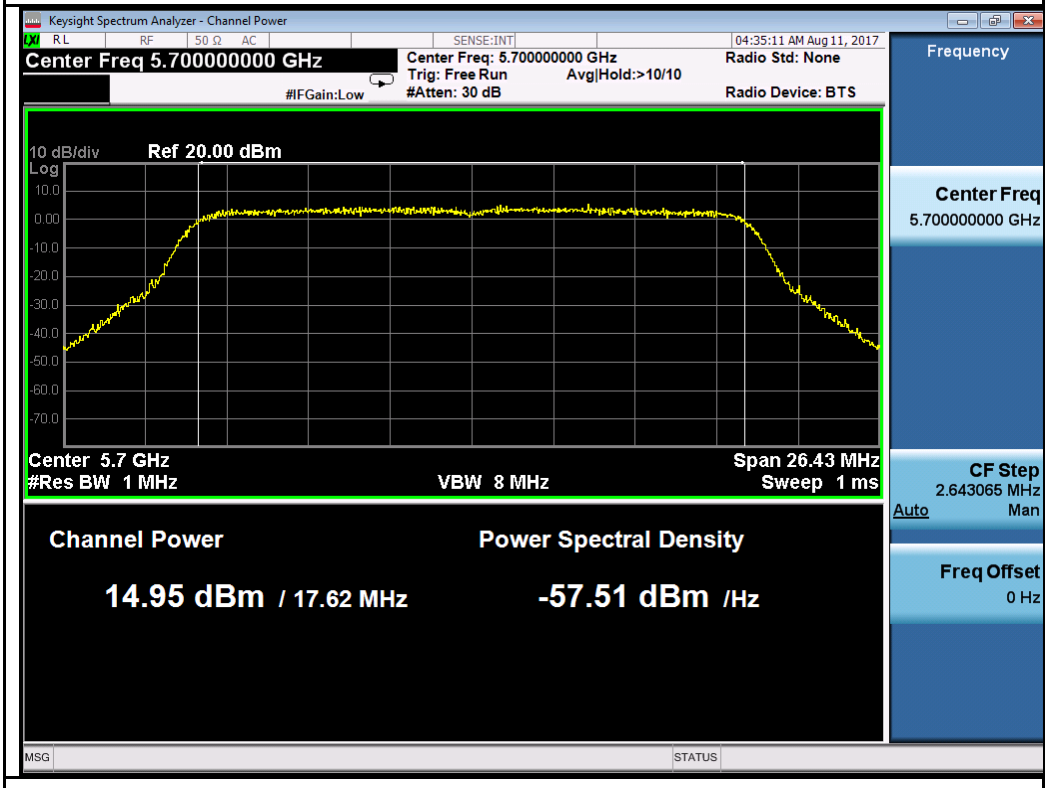

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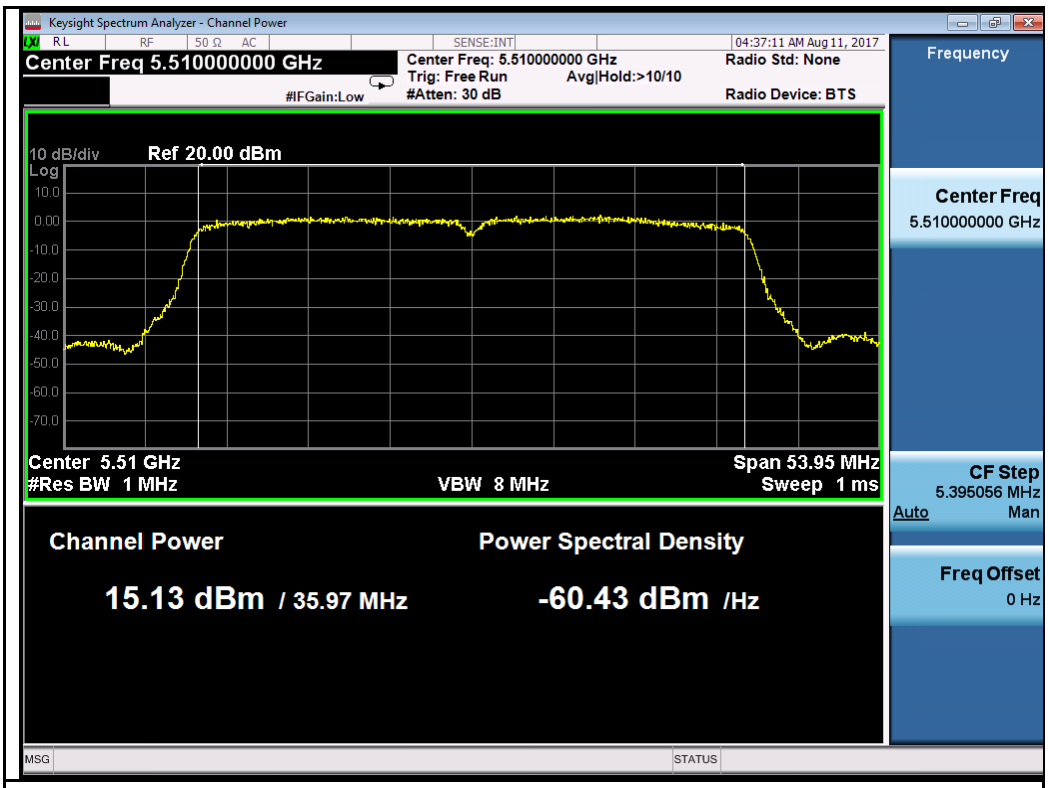

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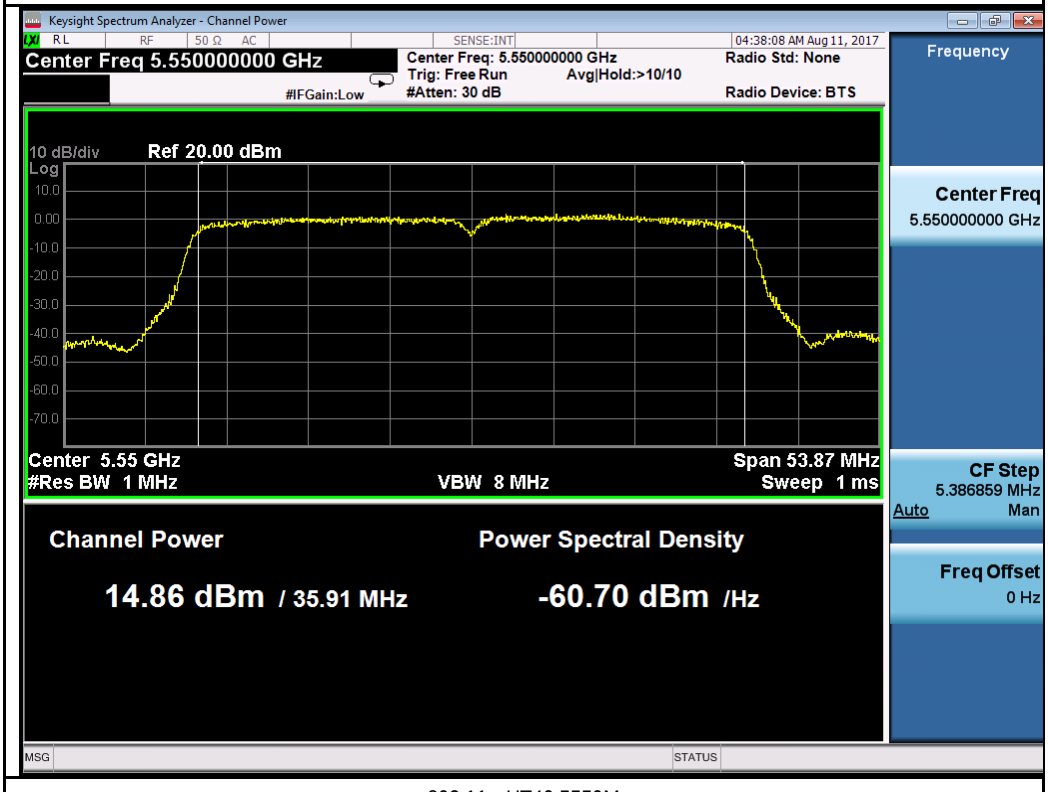

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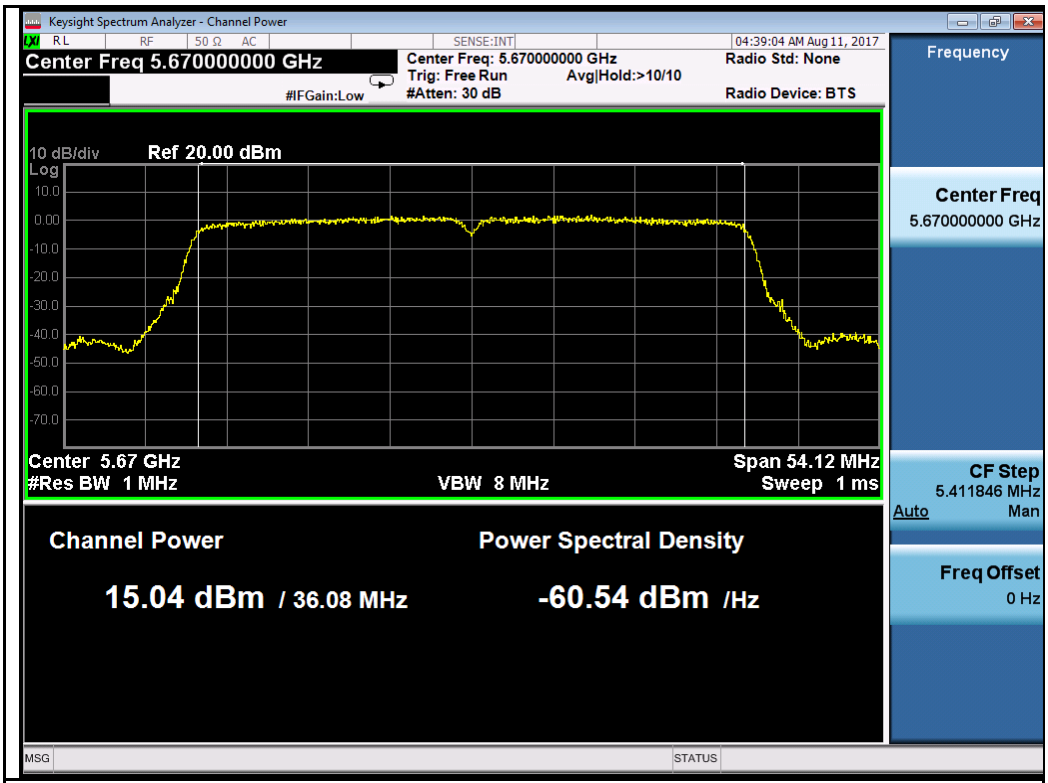

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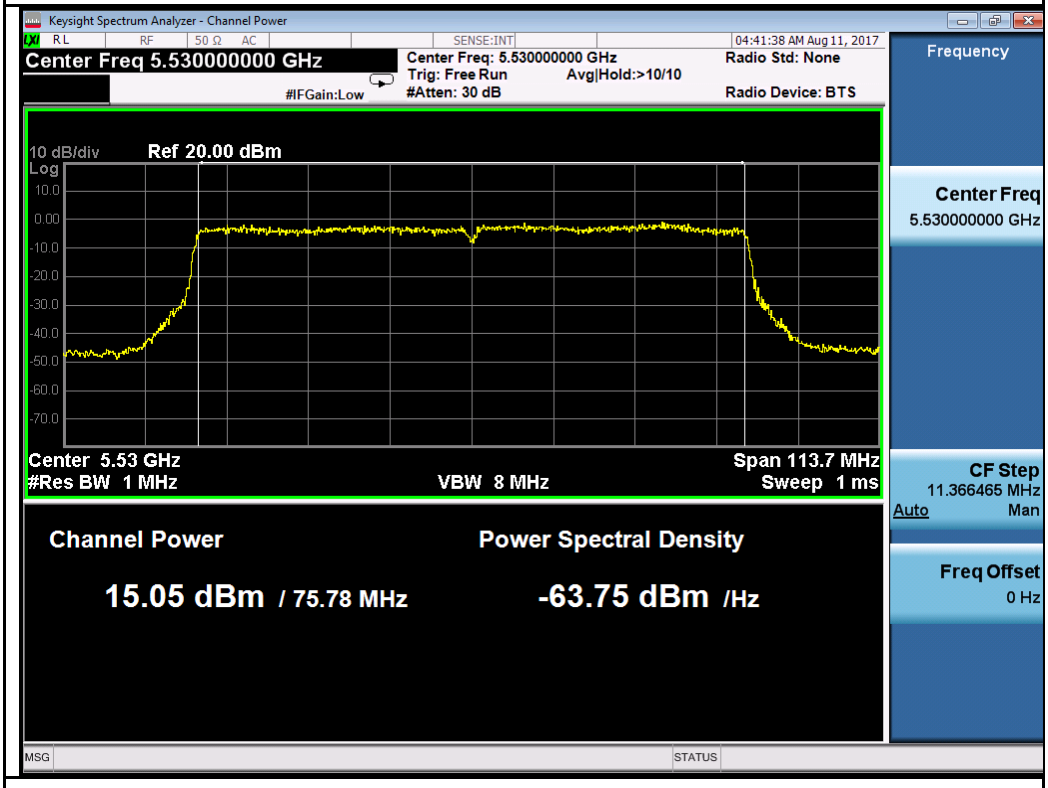
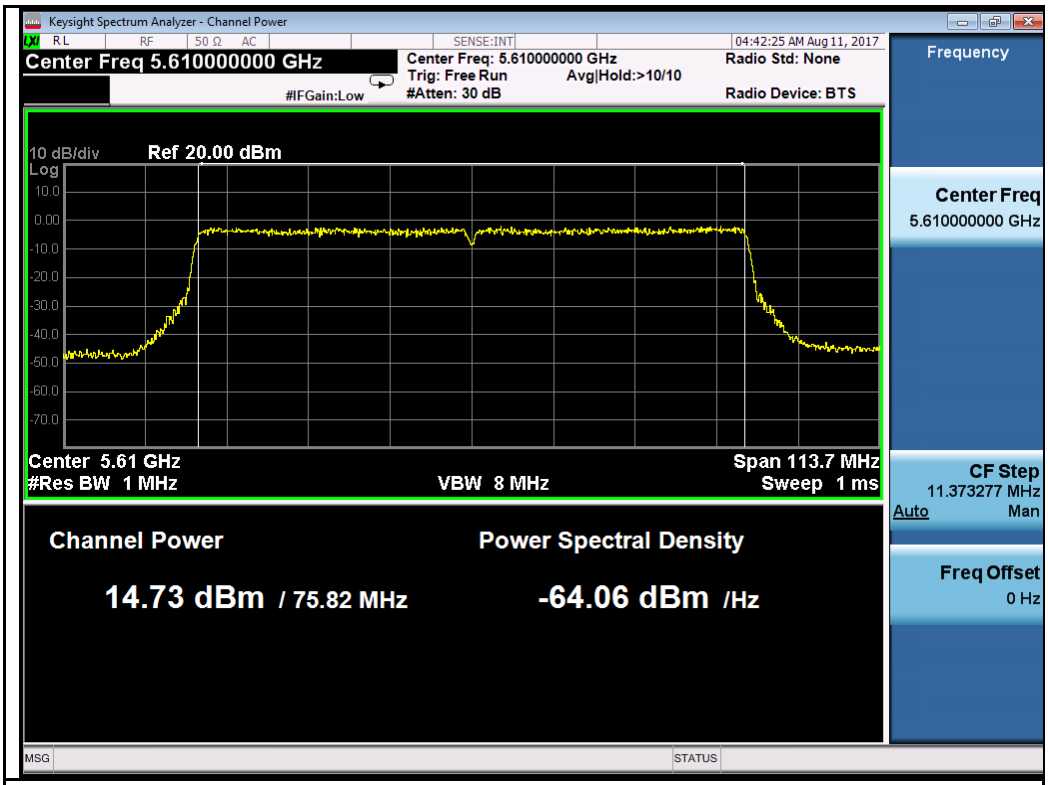


802.11ac-VHT80 5530M



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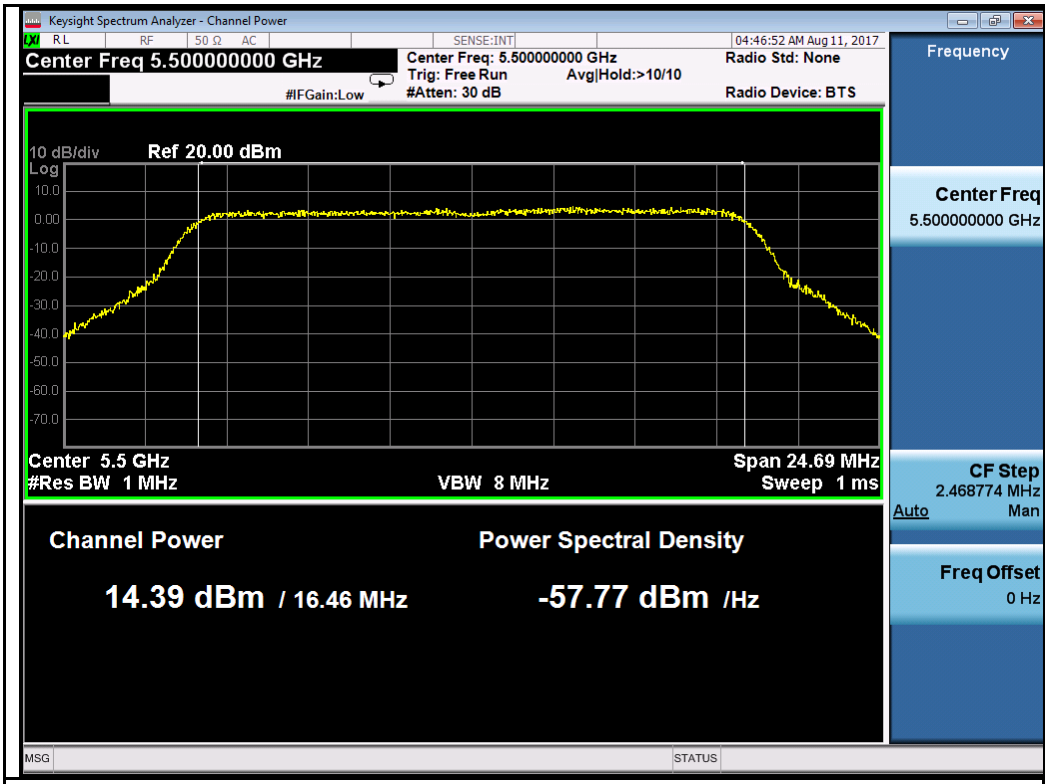
Chain 2:



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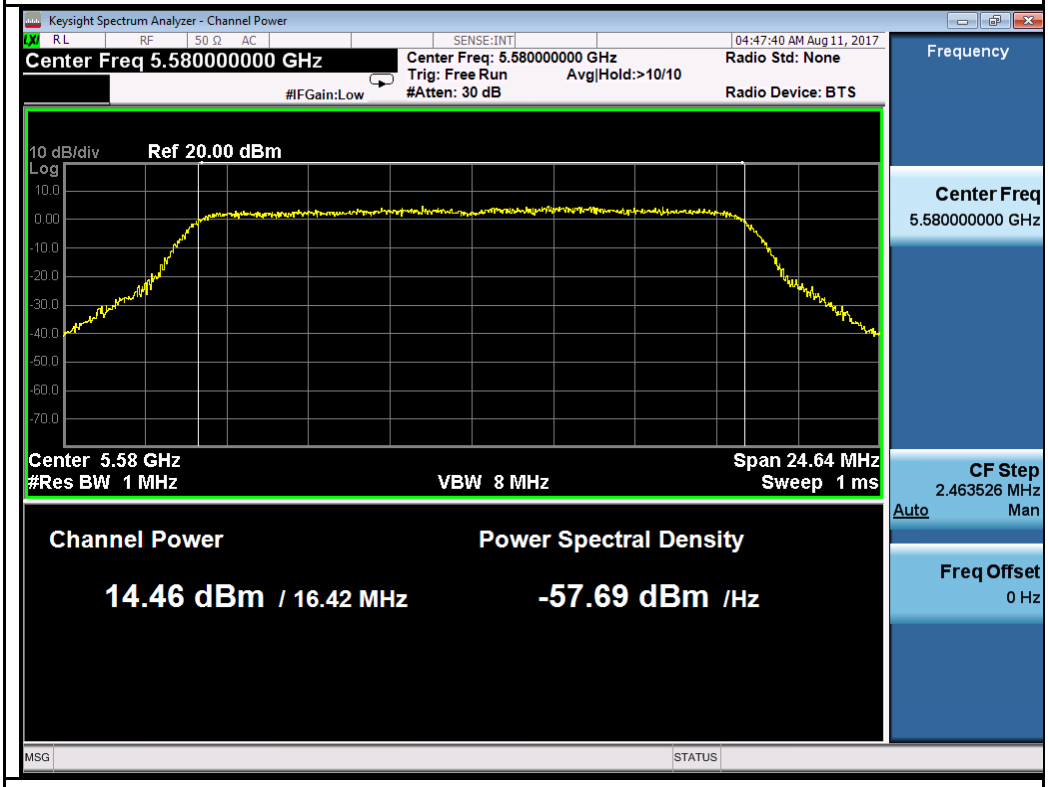

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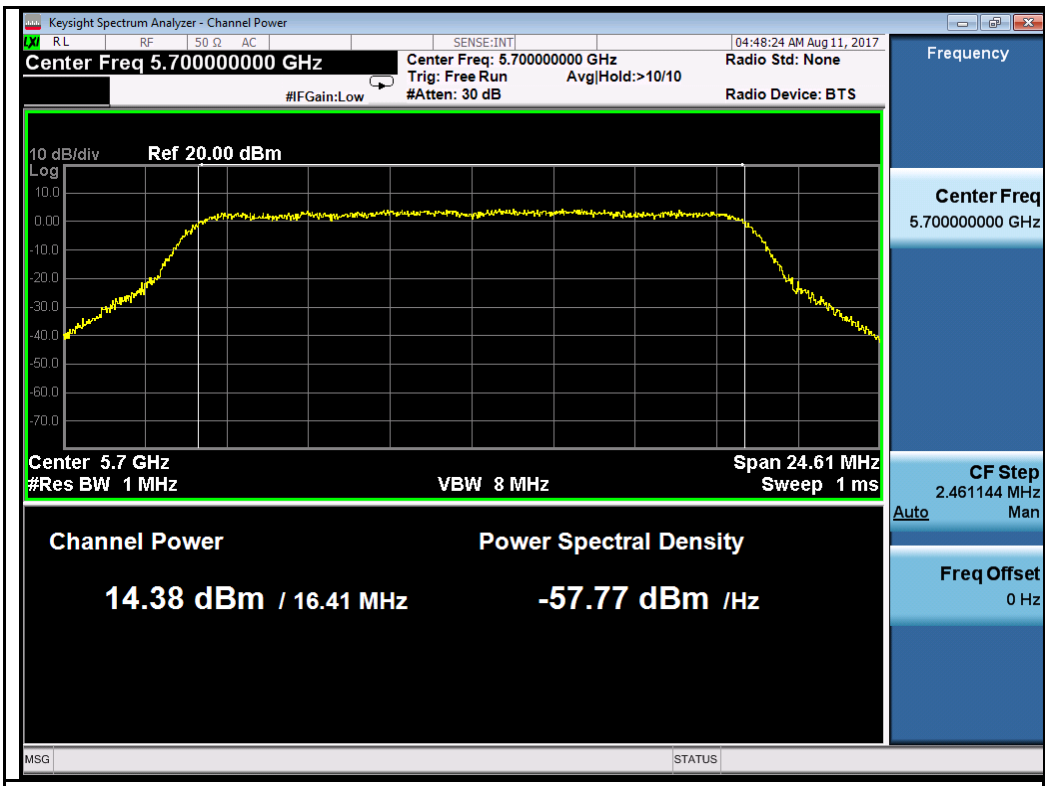

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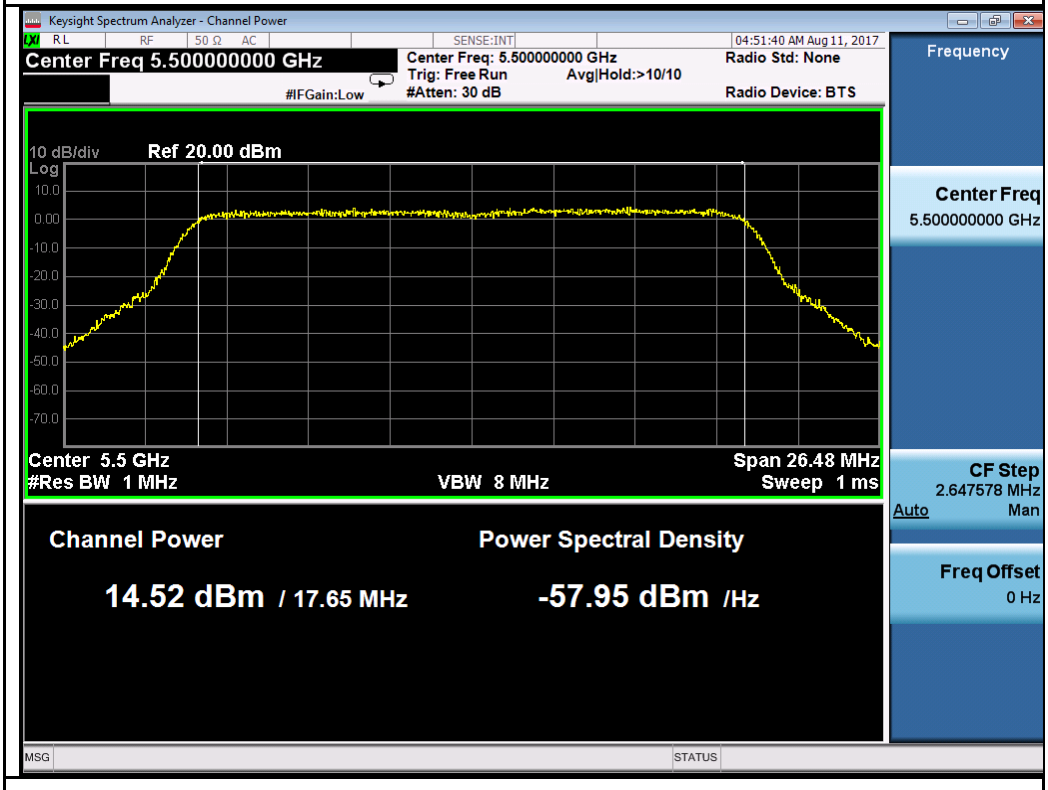

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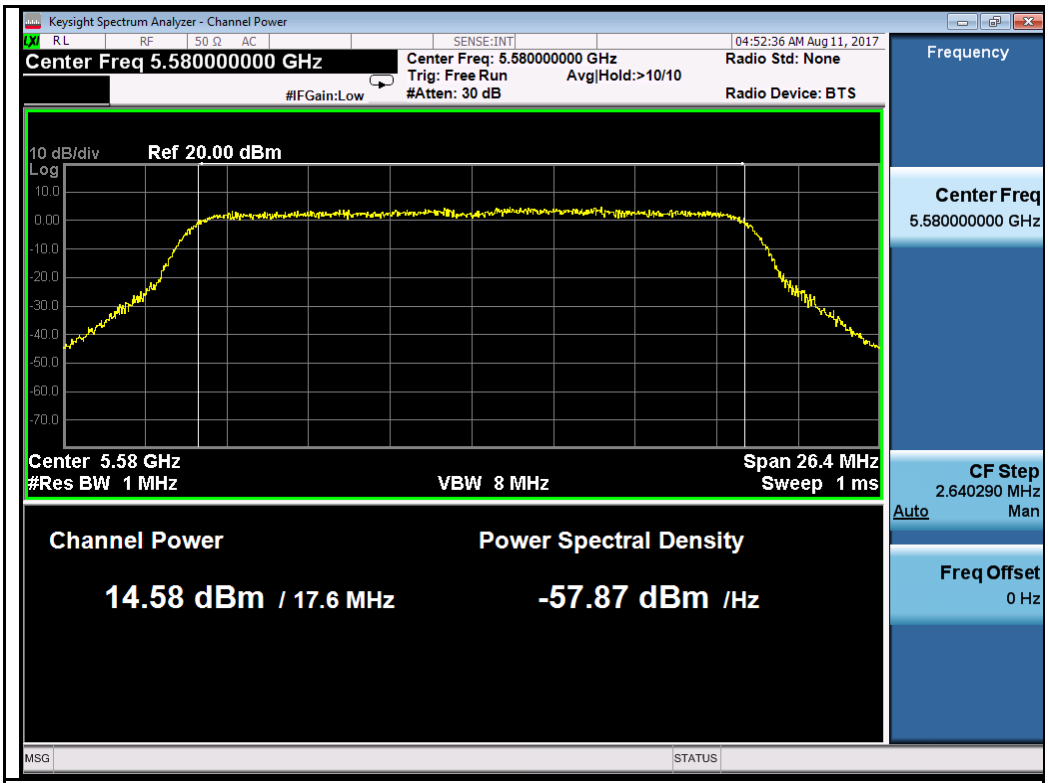

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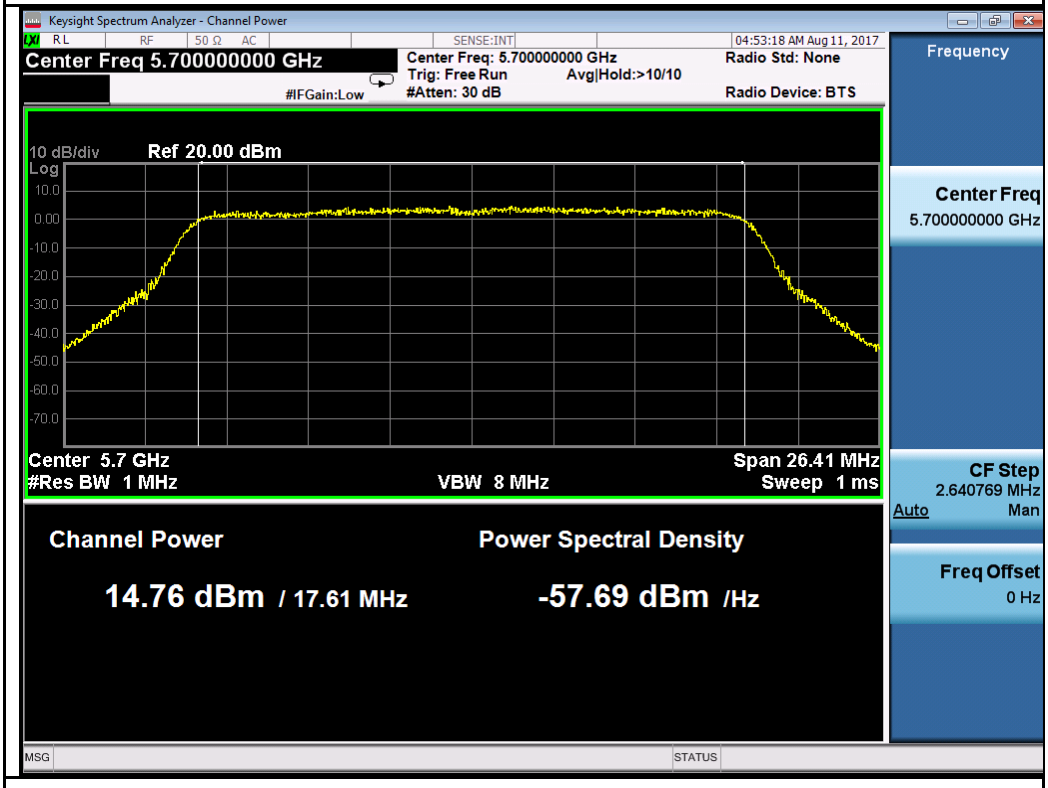
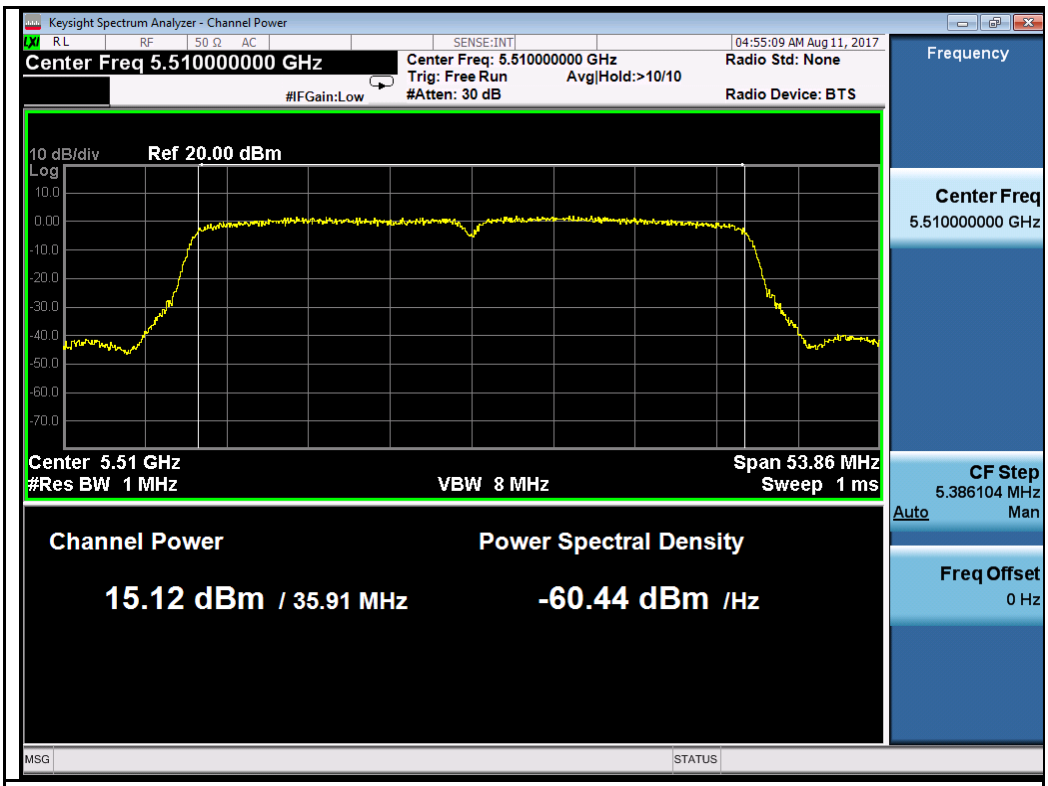


802.11n-HT20 5700M



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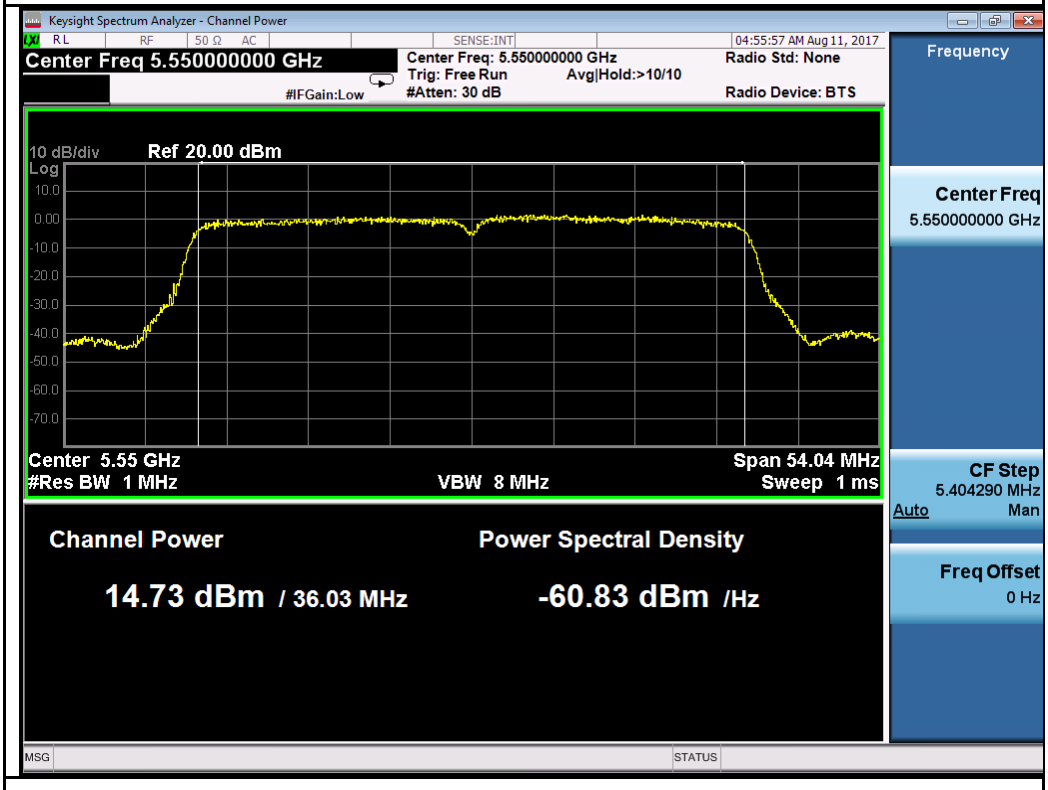

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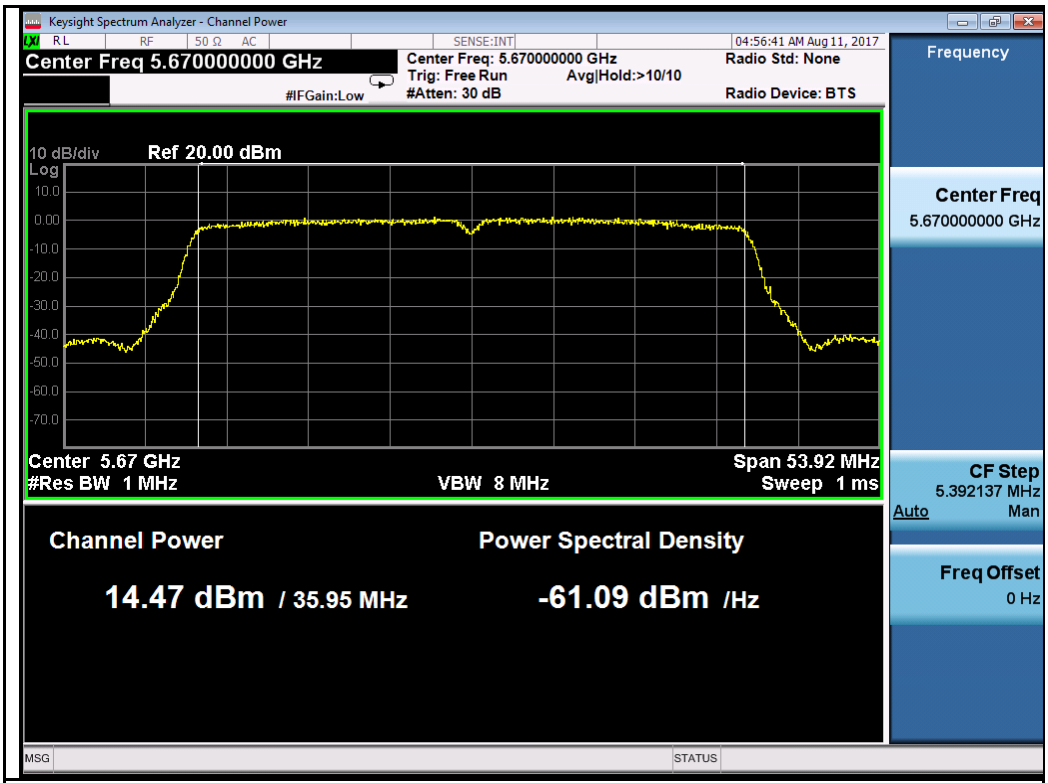

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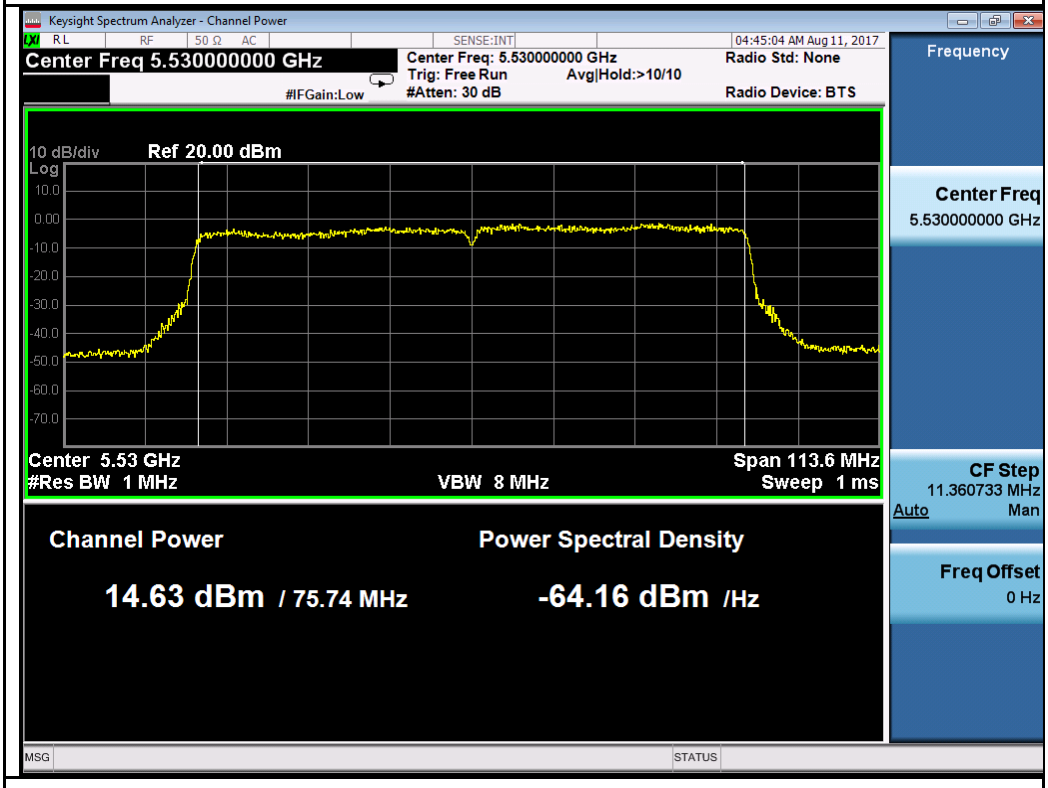

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