

FCC Part 15E Measurement and Test Report

For

**ELECTRONICS TECHNOLOGY(DONG GUAN) COMPANY
LIMITED**

No.161, Xin Min Road, Tong Luo Wei Industrial Zone, Dong Guan, China

FCC ID: ZL9-360M

FCC Rule(s): FCC Part 15E

Product Description: Tablet PC

Tested Model: 360M

Report No.: STR15088130I-5

Tested Date: 2015-08-13 to 2015-08-29

Issued Date: 2015-08-29

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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: ELECTRONICS TECHNOLOGY(DONG GUAN) COMPANY LIMITED

Address of applicant: No.161, Xin Min Road, Tong Luo Wei Industrial Zone, Dong Guan, China

Manufacturer: ELECTRONICS TECHNOLOGY(DONG GUAN) COMPANY LIMITED

Address of manufacturer: No.161, Xin Min Road, Tong Luo Wei Industrial Zone, Dong Guan, China

General Description of EUT	
Product Name:	Tablet PC
Trade Name:	/
Model No.:	360M
Adding Model(s):	Flex 360M, 116M
Rated Voltage:	DC 7.4V battery, Adapter DC 12V charging
Power Adapter Model:	SWN024S120200U1 I/P: AC 100-240V; O/P: DC 12V/2A
<i>Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model 360M, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Support Standards:	802.11a, 802.11n(HT20), 802.11ac(HT20)
Frequency Range:	5180-5240MHz, 5745-5805MHz
RF Output Power:	8.53dBm (Conducted)
Type of Modulation:	OFDM, 64-QAM,16-QAM, QPSK, BPSK, 256-QAM
Data Rate:	6-54Mbps, up to 150Mbps
Quantity of Channels:	23
Channel Separation:	20MHz
Type of Antenna:	Integral
Antenna Gain:	Antenna 1:1dBi, Antenna 2:1dBi,
Lowest Internal Frequency	32.768kHz

1.2 Test Standards

The following report is prepared on behalf of the ELECTRONICS TECHNOLOGY(DONG GUAN) COMPANY LIMITED in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.407 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.407 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 789033 D02 v01 for Unlicensed National Information Infrastructure (U-NII) Devices shall be performed also.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	802.11a	5180MHz, 5200MHz, 5240MHz, 5745MHz, 5785MHz, 5805MHz
TM2	802.11n-HT20	5180MHz, 5200MHz, 5240MHz, 5745MHz, 5785MHz, 5805MHz
TM3	802.11ac-HT20	5180MHz, 5200MHz, 5240MHz, 5745MHz, 5785MHz, 5805MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Core
Adapter Cable	1.5	Unshielded	With Core

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2015-06-17	2016-06-16
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-06-17	2016-06-16
Amplifier	Agilent	8447F	3113A06717	2015-06-17	2016-06-16
Amplifier	C&D	PAP-1G18	2002	2015-06-17	2016-06-16
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2015-06-17	2016-06-16
Horn Antenna	ETS	3117	00086197	2015-06-17	2016-06-16
Horn Antenna	ETS	3116B	00088203	2015-06-17	2016-06-16
Loop Antenna	Schwarz beck	FMZB 1516	9773	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2015-06-17	2016-06-16
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2015-06-17	2016-06-16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2015-06-17	2016-06-16

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203; § 15.405	Antenna Requirement	Compliant
§ 15.207; § 15.407(b)(6)	Conducted Emission	Compliant
§ 15.407(a)(1),(2)	Power Spectral Density	Compliant
§ 15.407(e)	Emission Bandwidth and Occupied Bandwidth	Compliant
§ 15.407(a)(1),(2)	Maximum Conducted Output Power	Compliant
§ 15.407(b)(1),(2),(3)	Conducted Spurious Emission	Compliant
§ 15.205; § 15.407(b)(1),(2),(3)	Radiated Emission	Compliant
§ 15.407(g)	Frequency Stability	Compliant
§ 15.407(h)	Dynamic Frequency Selection (DFS)	N/A

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

4. Antenna Requirement

4.1 Standard Applicable

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

4.2 Evaluation Information

This product has two integral antennas, fulfill the requirement of this section.

5. Conducted Emissions

5.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is ± 2.88 dB.

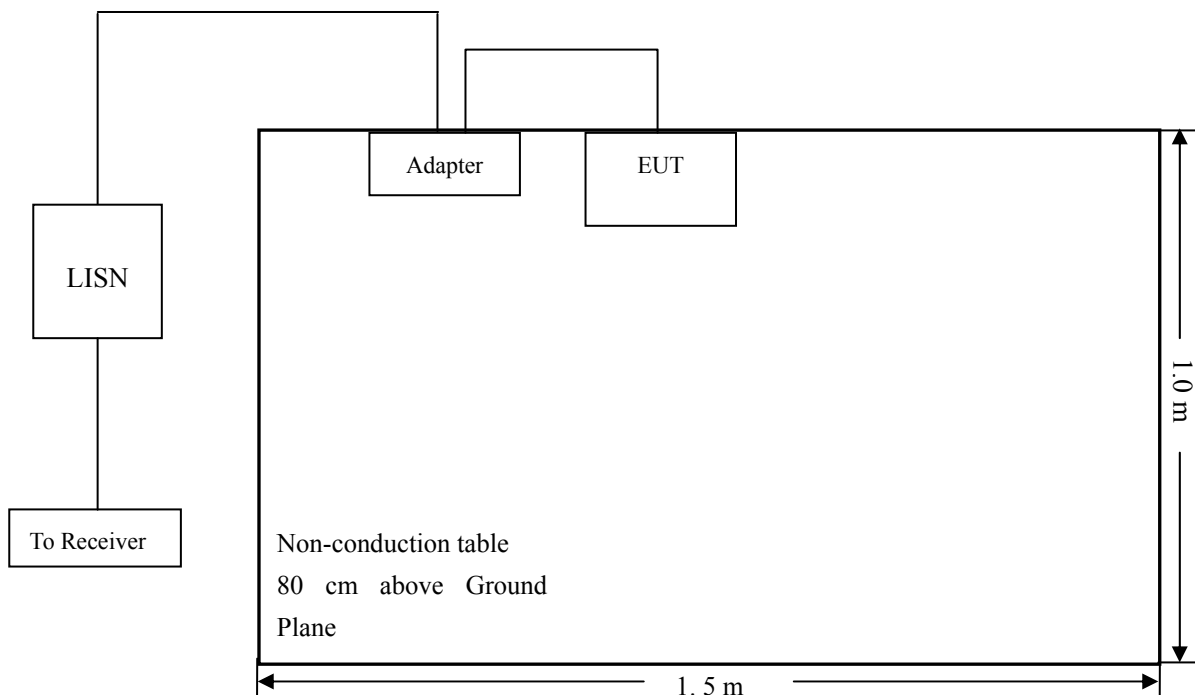
5.2 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

5.3 Basic Test Setup Block Diagram



5.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

5.5 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

5.6 Summary of Test Results/Plots

According to the data in section 3.8, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

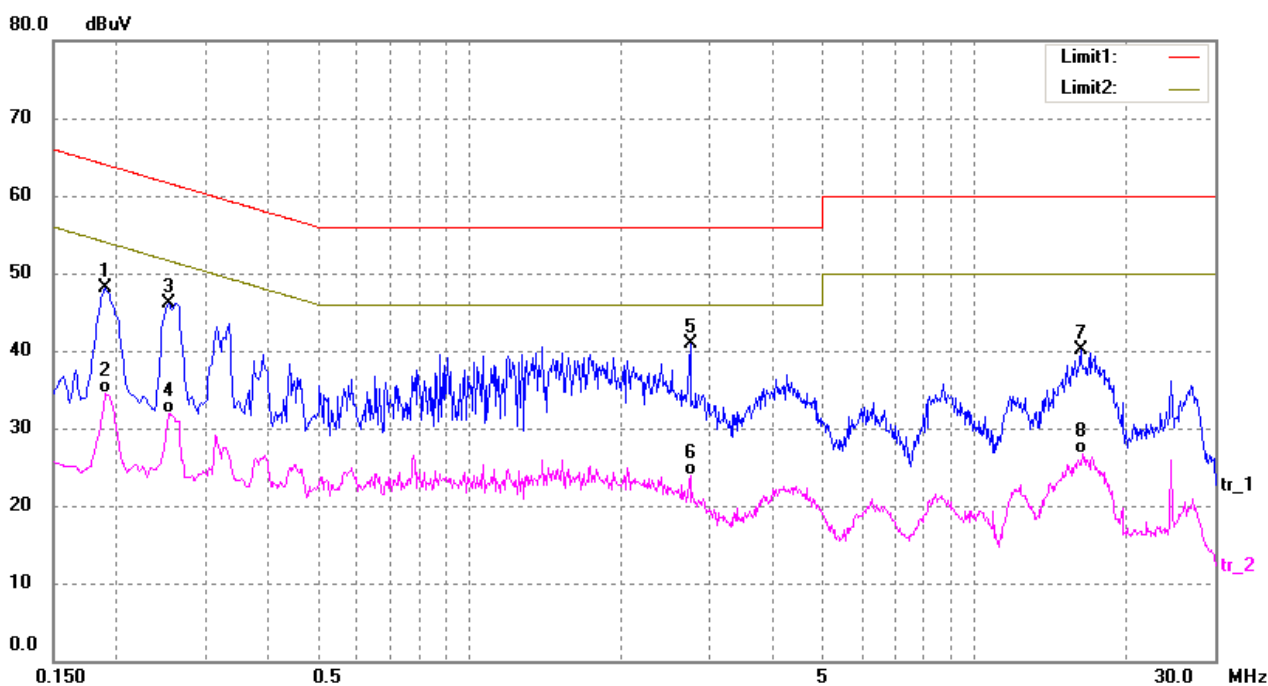
-11.44 dB at 0.1940 MHz in the Line mode, peak detector, 0.15-30MHz

5.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

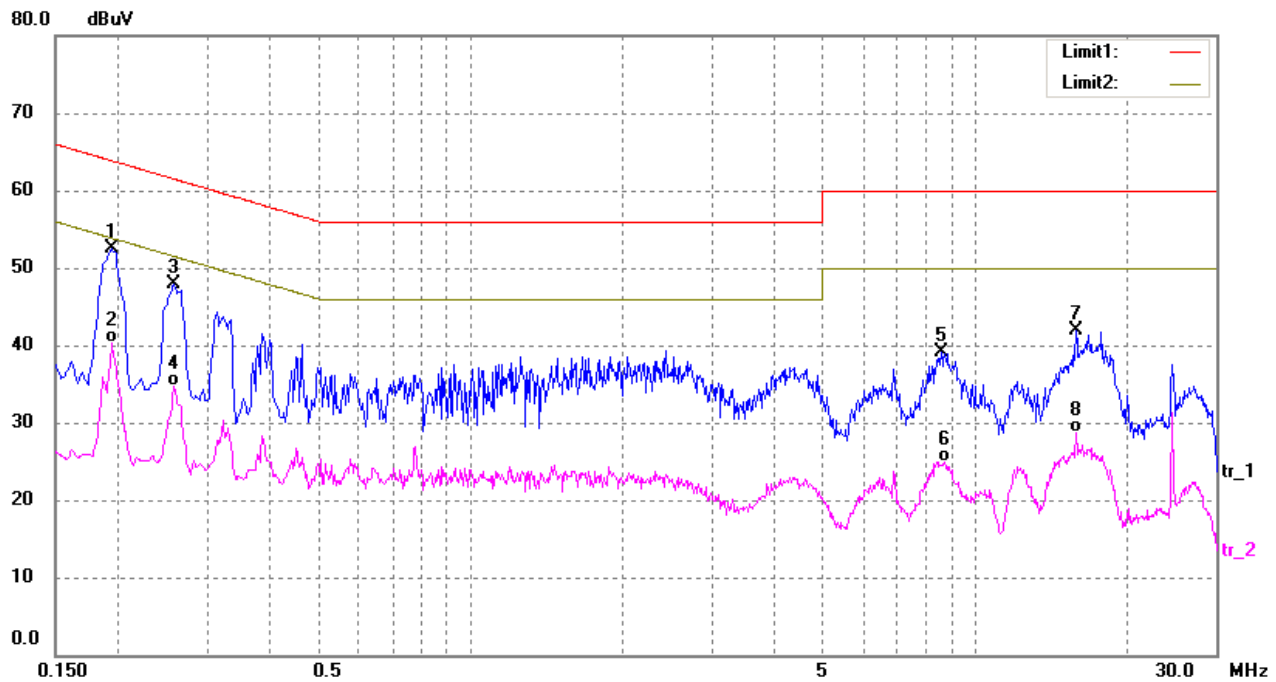
EUT: Tablet PC
Tested Model: 360M
Operating Condition: Transmitting
Comment: AC 120V/60Hz; Adapter DC 12V/2A

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1900	35.59	12.50	48.09	64.04	-15.95	peak
2	0.1900	21.94	12.50	34.44	54.04	-19.60	AVG
3	0.2540	33.67	12.50	46.17	61.63	-15.46	peak
4	0.2540	19.32	12.50	31.82	51.63	-19.81	AVG
5*	2.7380	27.96	13.00	40.96	56.00	-15.04	peak
6	2.7380	10.91	13.00	23.91	46.00	-22.09	AVG
7	16.3020	28.91	11.26	40.17	60.00	-19.83	peak
8	16.4420	15.48	11.29	26.77	50.00	-23.23	AVG

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1940	39.92	12.50	52.42	63.86	-11.44	peak
2	0.1940	27.85	12.50	40.35	53.86	-13.51	AVG
3	0.2580	35.32	12.50	47.82	61.50	-13.68	peak
4	0.2580	22.13	12.50	34.63	51.50	-16.87	AVG
5	8.5700	27.51	11.57	39.08	60.00	-20.92	peak
6	8.6980	13.39	11.52	24.91	50.00	-25.09	AVG
7	15.8220	30.65	11.16	41.81	60.00	-18.19	peak
8	15.8220	17.59	11.16	28.75	50.00	-21.25	AVG

6. Power Spectral Density

6.1 Standard Applicable

Section 15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

6.2 Test Procedure

According to 789033 D02 v01 section F, the following is the measurement procedure.

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ($< 1 \text{ MHz}$, or $< 500 \text{ kHz}$) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ KHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since $RBW=100 \text{ KHz}$ is available on nearly all spectrum analyzers.

6.3 Environmental Conditions

Temperature:	20° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

6.4 Summary of Test Results/Plots

5150-5250MHz

Operating mode	Test Channel	Chain 1 dBm/MHz	Chain 2 dBm/MHz	Total dBm/MHz	Limit (dBm/MHz)
802.11a	5180	1.610	0.154	3.953	11
	5200	0.965	0.964	3.975	11
	5240	0.397	0.445	3.431	11
802.11n-HT20	5180	0.984	0.577	3.796	11
	5200	0.337	1.028	3.707	11
	5240	0.932	0.914	3.933	11
802.11ac-HT20	5180	0.905	0.114	3.538	11
	5200	0.954	0.686	3.804	11
	5240	0.522	0.820	3.684	11

5725-5850MHz

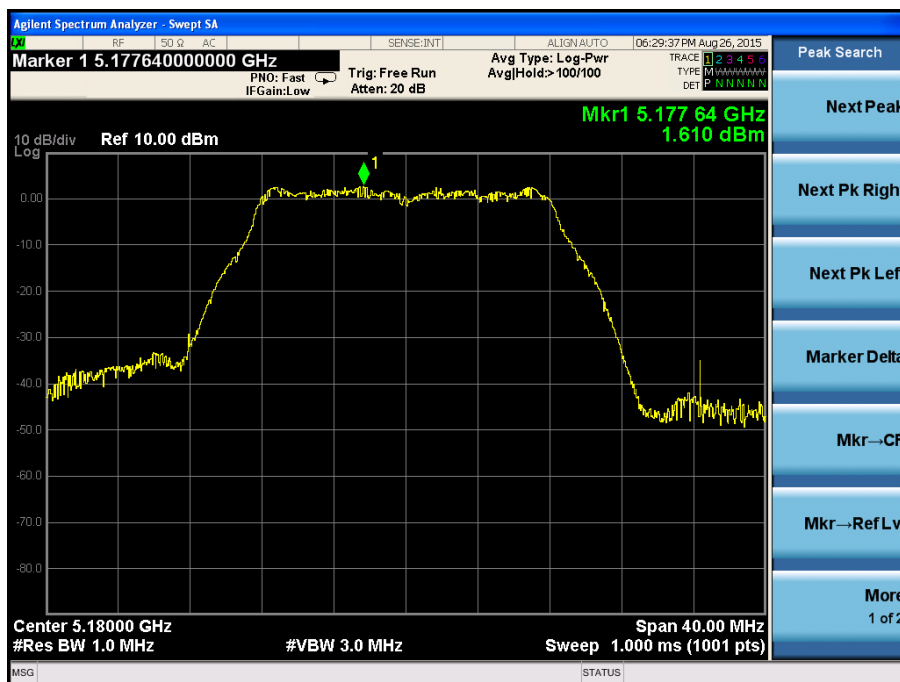
Operating mode	Test Channel	Chain 1 dBm/500kHz	Chain 2 dBm/500kHz	Total dBm/500kHz	Total dBm/500kHz	Limit (dBm/500kHz)
802.11a	5745	-7.099	-7.129	-4.104	-1.886	30
	5785	-6.766	-6.771	-3.758	-1.540	30
	5805	-7.353	-7.329	-4.331	-2.113	30
802.11n-HT20	5745	-6.876	-6.938	-3.897	-1.679	30
	5785	-6.434	-6.746	-3.577	-1.359	30
	5805	-6.165	-6.535	-3.336	-1.118	30
802.11ac-HT20	5745	-8.012	-8.712	-5.338	-3.120	30
	5785	-8.954	-8.824	-5.878	-3.660	30
	5805	-8.600	-9.448	-5.993	-3.775	30

Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/\text{RBW})$ to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

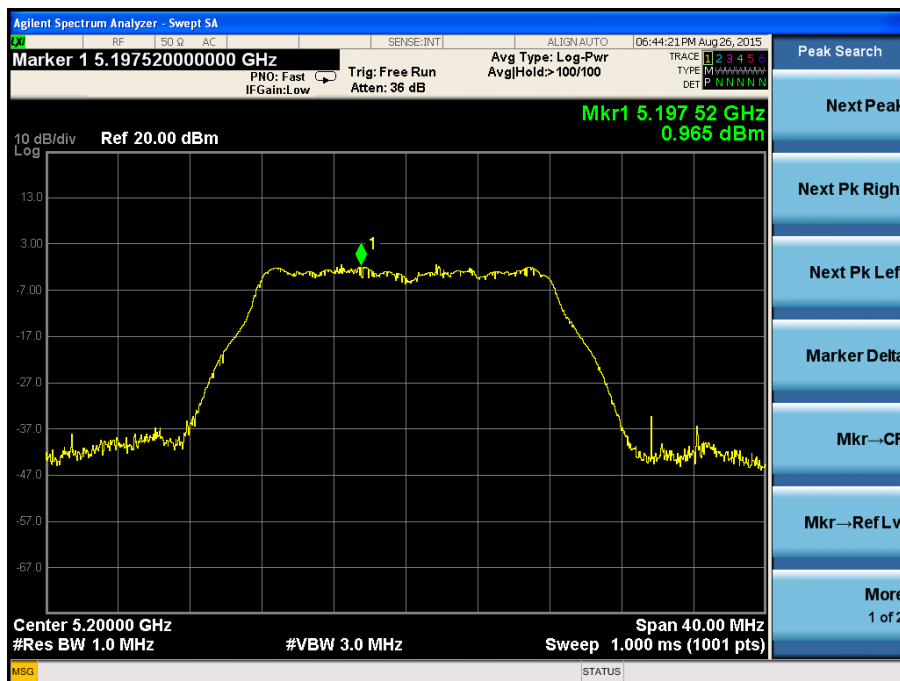
Antenna 1

Test Mode: 802.11a

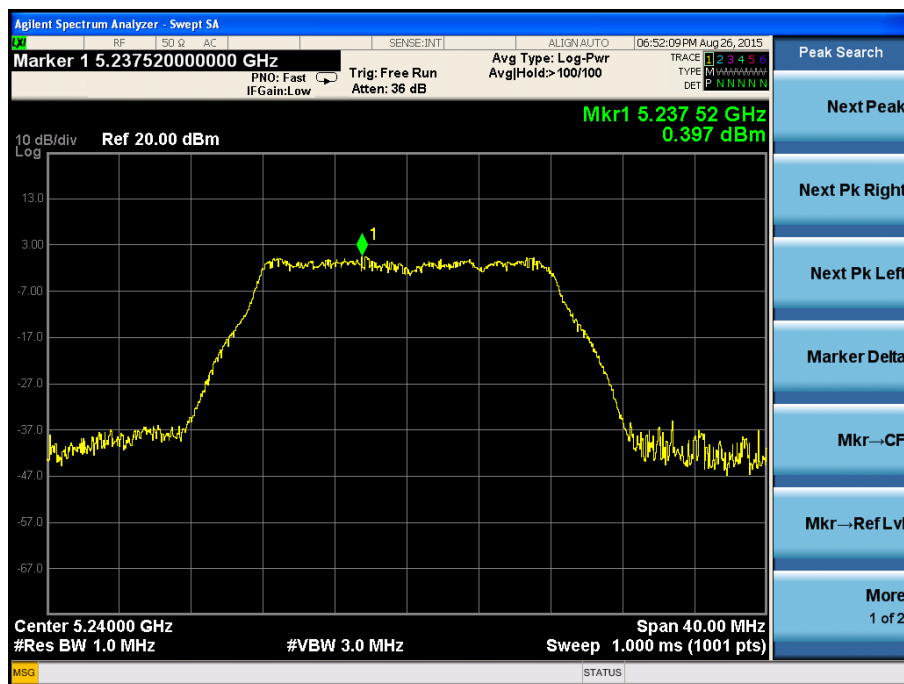
5180MHz



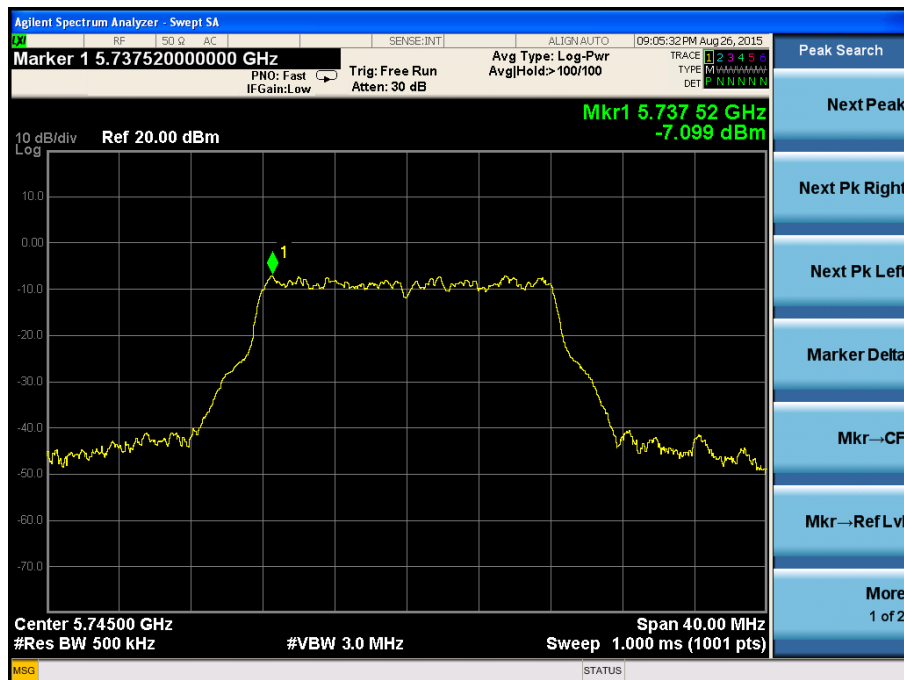
5200MHz



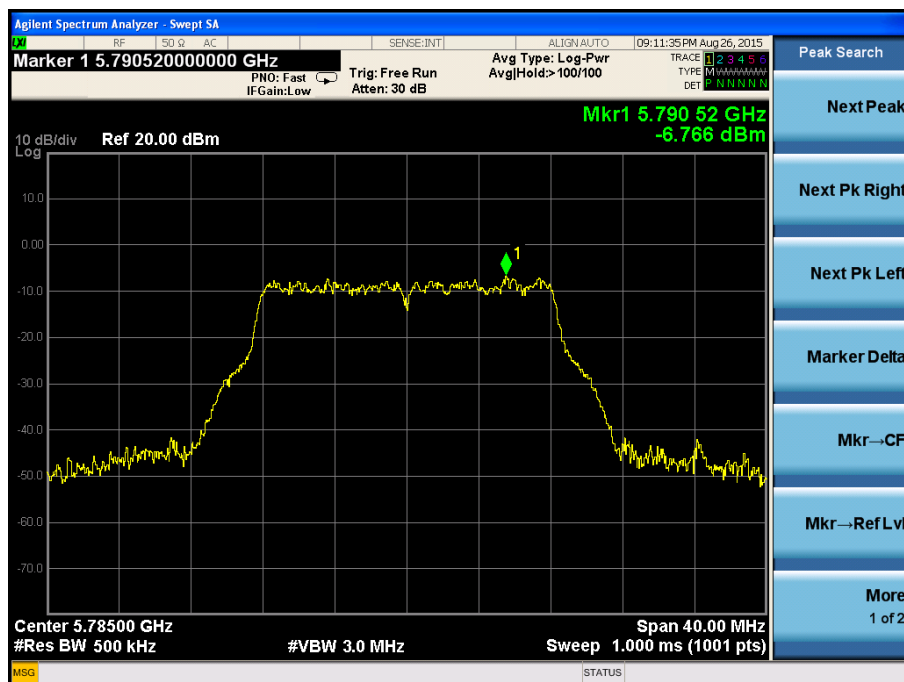
5240MHz



5745MHz



5785MHz

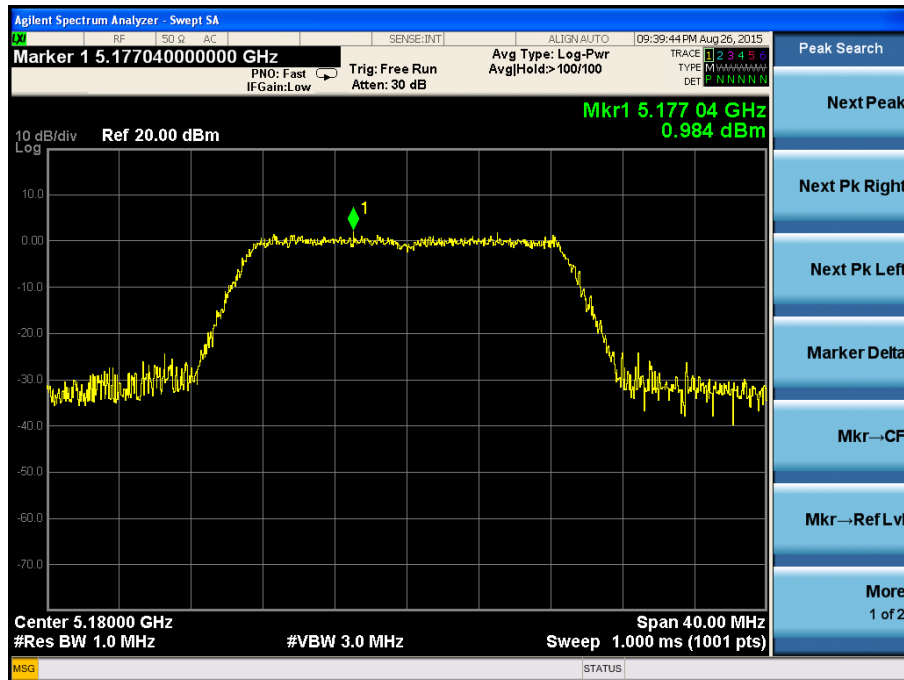


5805MHz

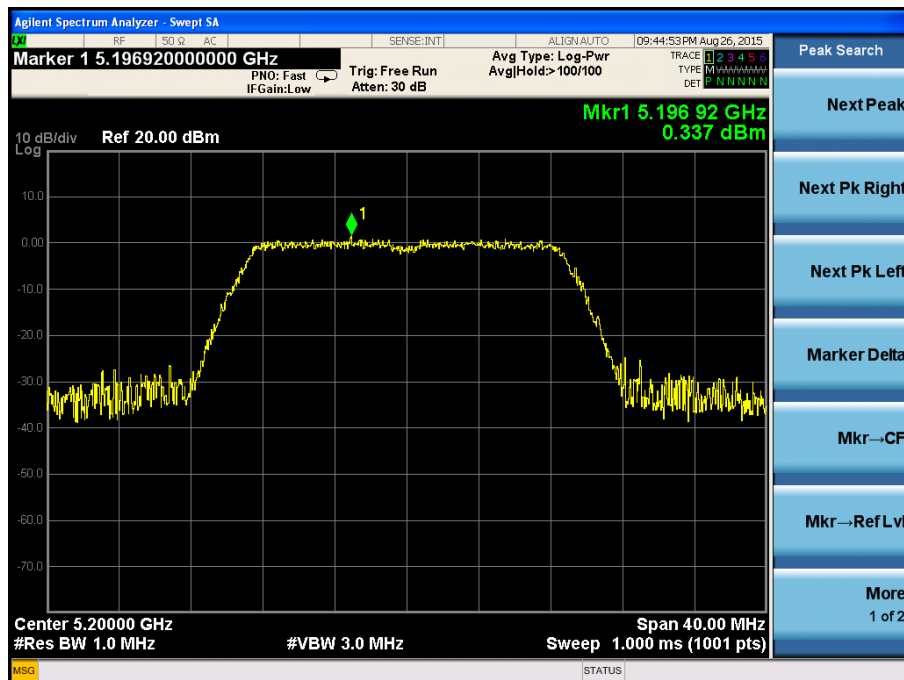


Test Mode: 802.11n-HT20

5180MHz



5200MHz



Agilent Spectrum Analyzer - Swept SA

Marker 1 5.236840000000 GHz

Ref 20.00 dBm

10 dB/div

Log

Center 5.24000 GHz

#Res BW 1.0 MHz

#VBW 3.0 MHz

Span 40.00 MHz

Sweep 1.000 ms (1001 pts)

Trig: Free Run

Atten: 30 dB

Avg Type: Log-Pwr

Avg/Hold: > 100/100

Trace 1 2 3 4 5 6

TYPE M

DET N

Trace/Detector

Select Trace

Clear Write

Trace Average

Max Hold

Min Hold

View Blank

Trace On

More

1 of 3

The screenshot displays a swept spectrum analyzer trace. The horizontal axis represents frequency, with a center frequency of 5.24000 GHz and a span of 40.00 MHz. The vertical axis represents power in dBm, ranging from -70.0 to 10.0 dBm. A yellow trace shows a signal that rises from approximately -35 dBm at the start of the sweep to a plateau around 0 dBm, then falls back to -35 dBm. A green marker labeled '1' is positioned on the plateau at 5.23684 GHz. The reference level is set to 20.00 dBm. The trace is averaged, and the sweep time is 1.000 ms. The interface includes various control buttons on the right side, such as 'Trace/Detector', 'Select Trace', 'Clear Write', 'Trace Average', 'Max Hold', 'Min Hold', 'View Blank', and 'Trace On'.

Agilent Spectrum Analyzer - Swept SA

Marker 1 5.750080000000 GHz

PNO: Fast IFGain: Low Trig: Free Run Atten: 30 dB Avg Type: Log-Pwr Avg|Hold:> 100/100

TRACE 1 2 3 4 5 6 TYPE M N N N N N DET N N N N N N

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

Mkr→CF

Mkr→Ref Lvl

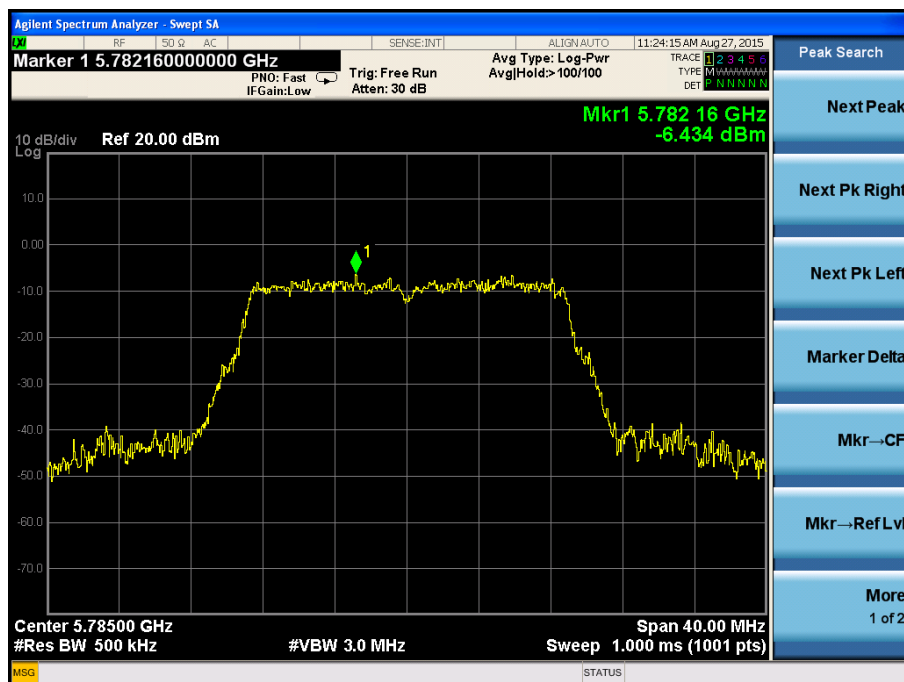
More

1 of 2

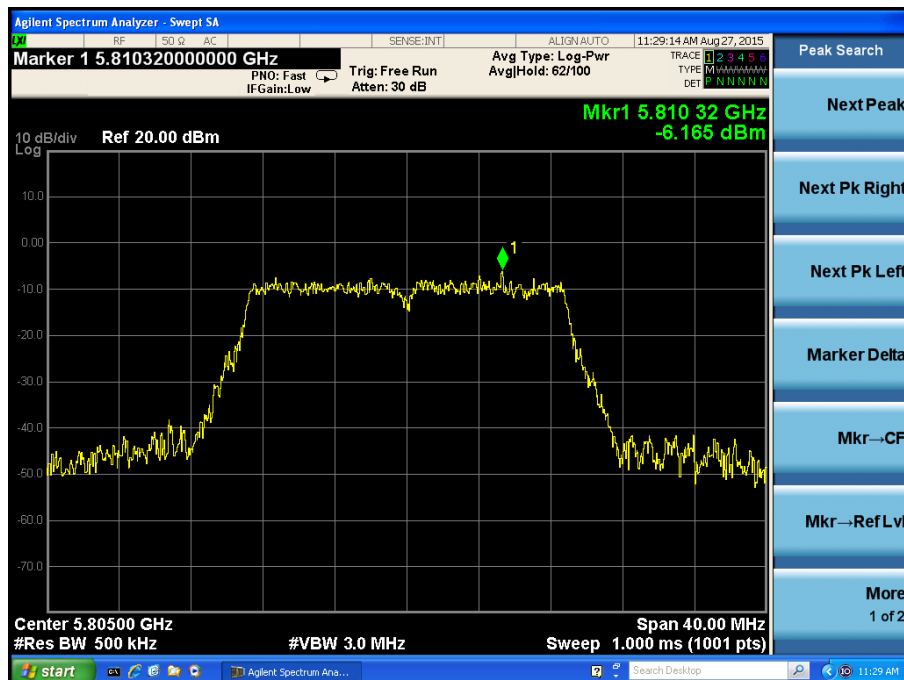
10 dB/div Ref 20.00 dBm

Center 5.74500 MHz #Res BW 500 kHz #VBW 3.0 MHz Span 40.00 MHz Sweep 1.000 ms (1001 pts)

5785MHz

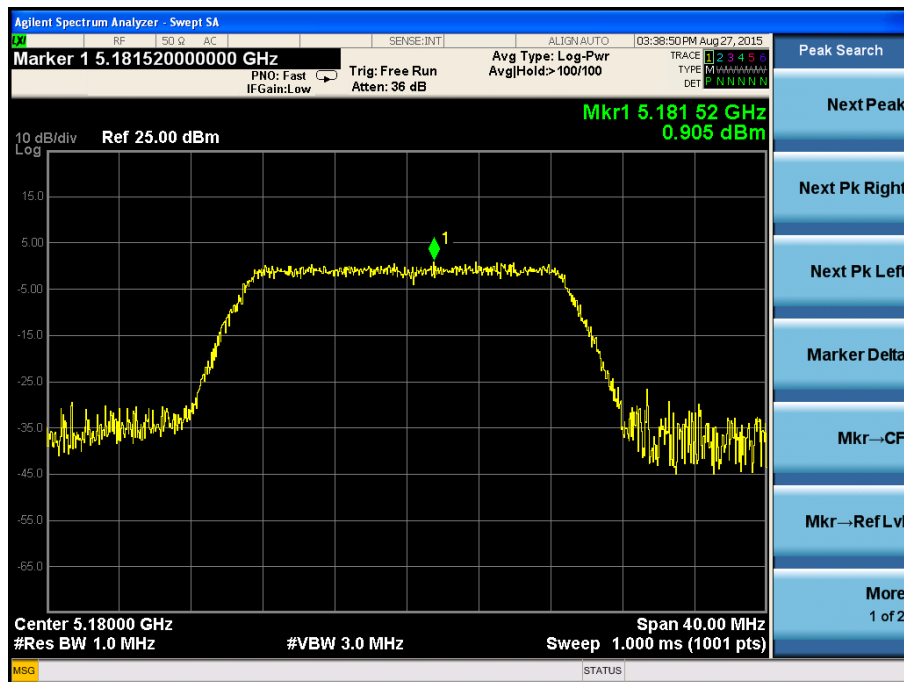


5805MHz

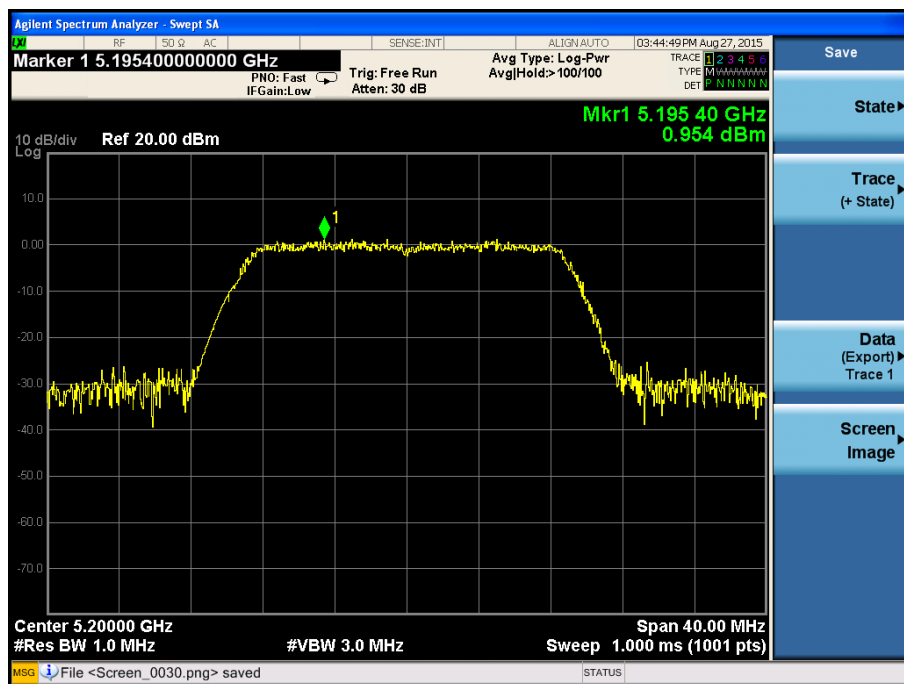


Test Mode: 802.11ac-HT20

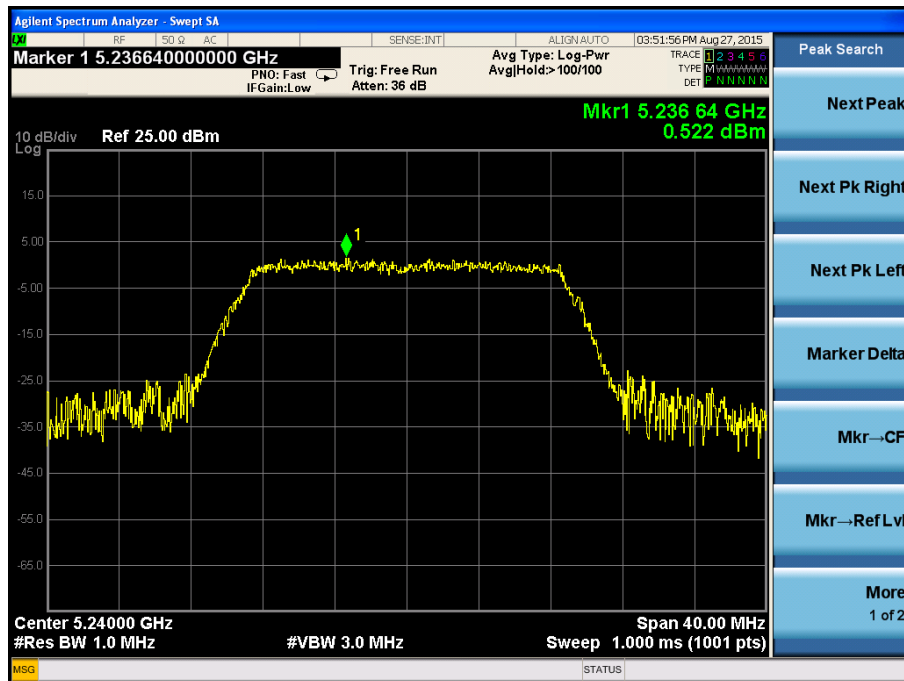
5180MHz



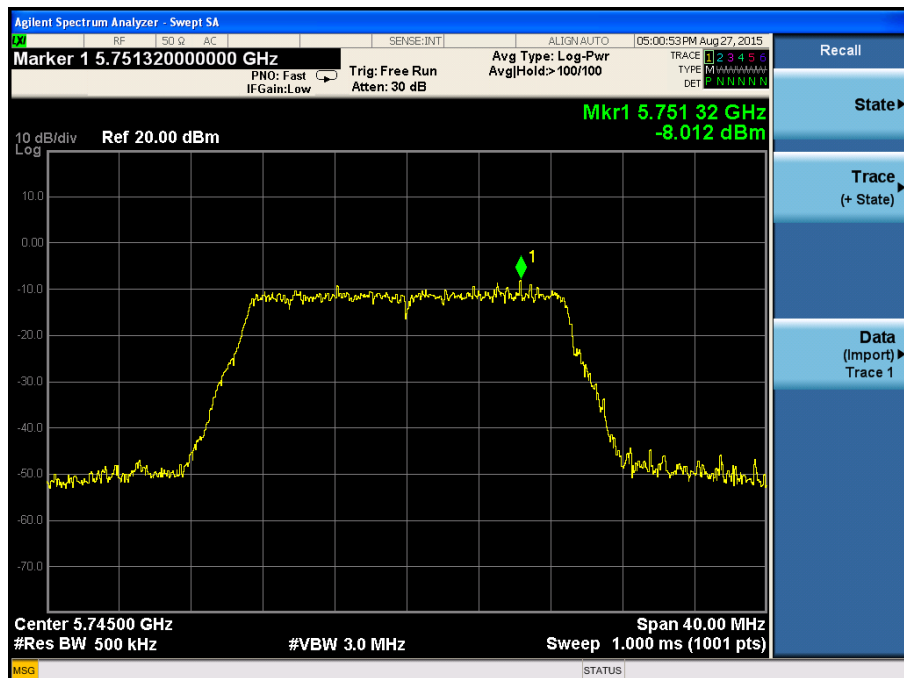
5200MHz



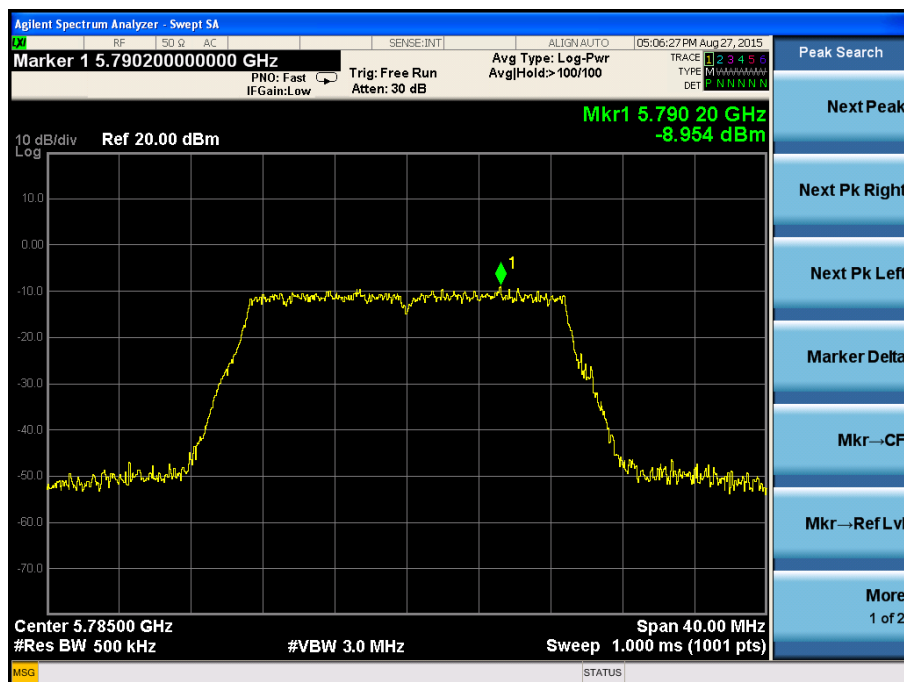
5240MHz



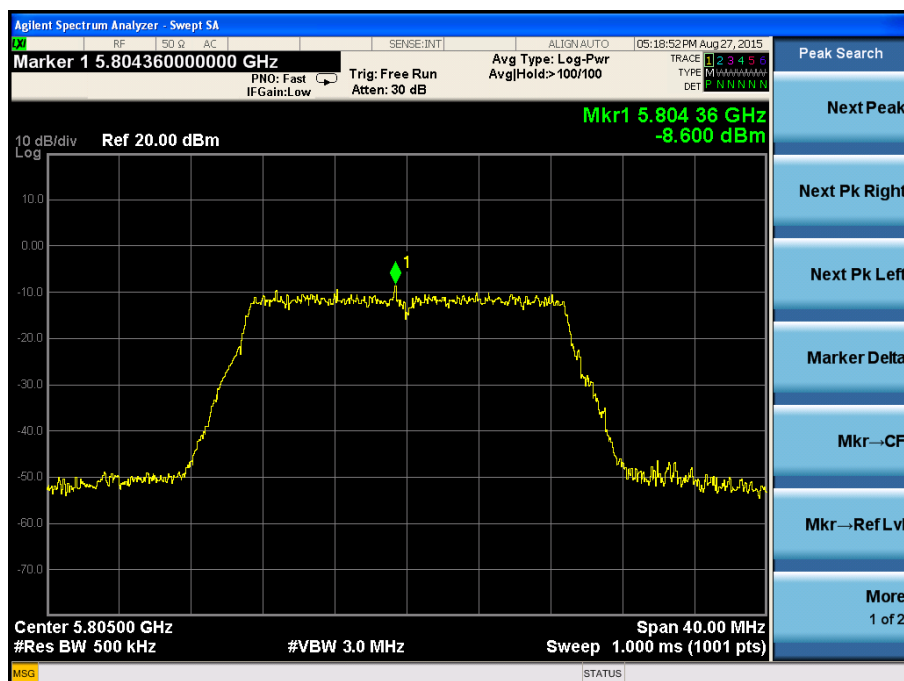
5745MHz

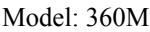


5785MHz

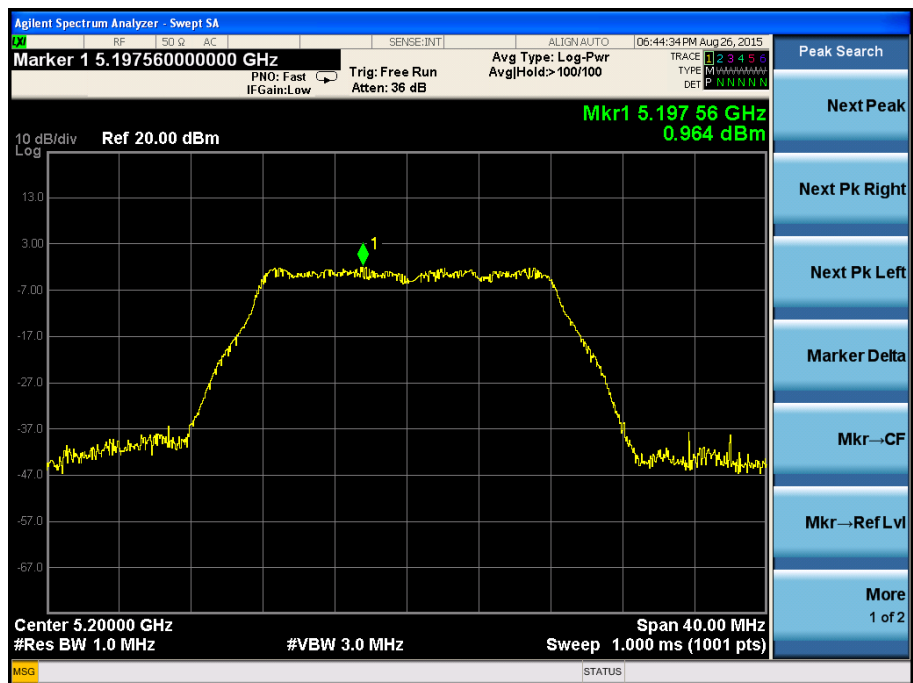


5805MHz

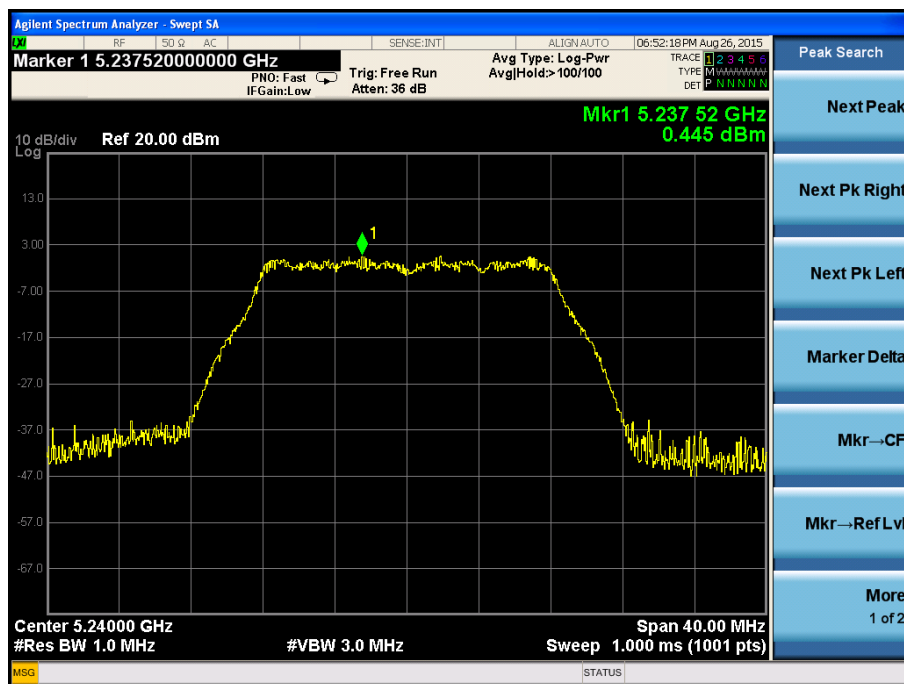




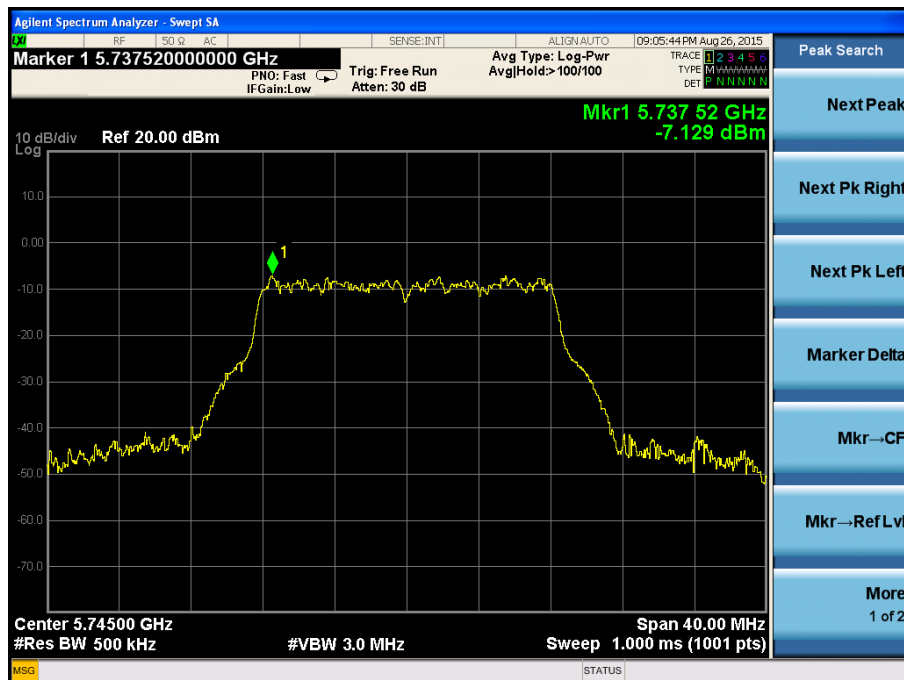
5180MHz



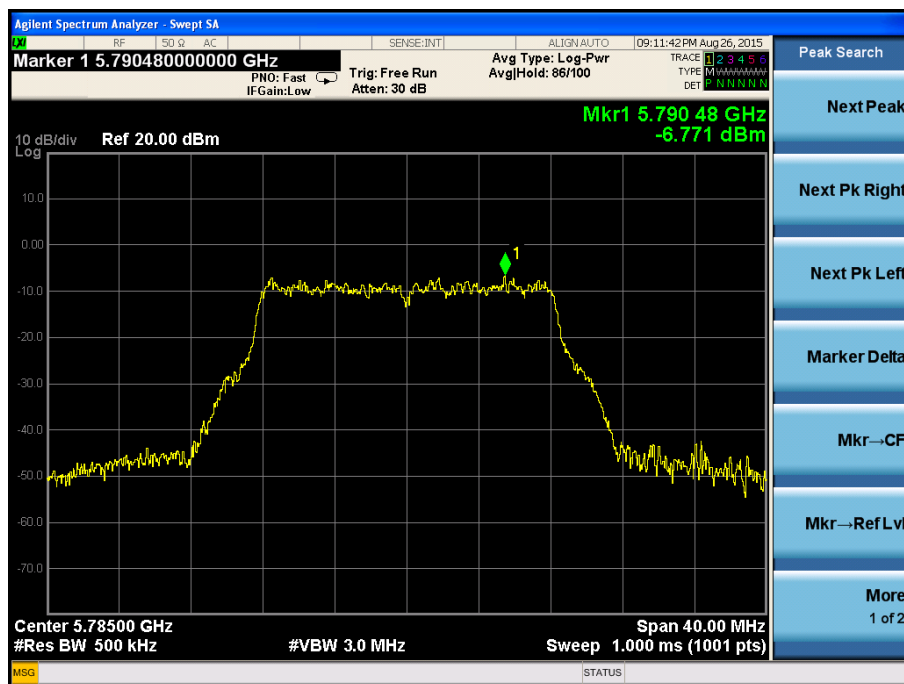
5240MHz



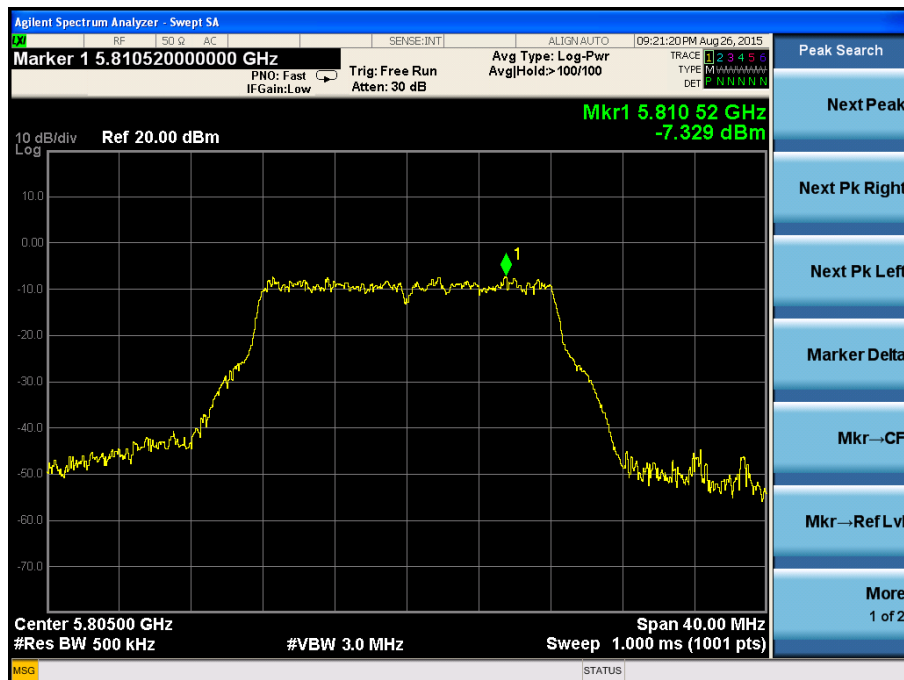
5745MHz



5785MHz

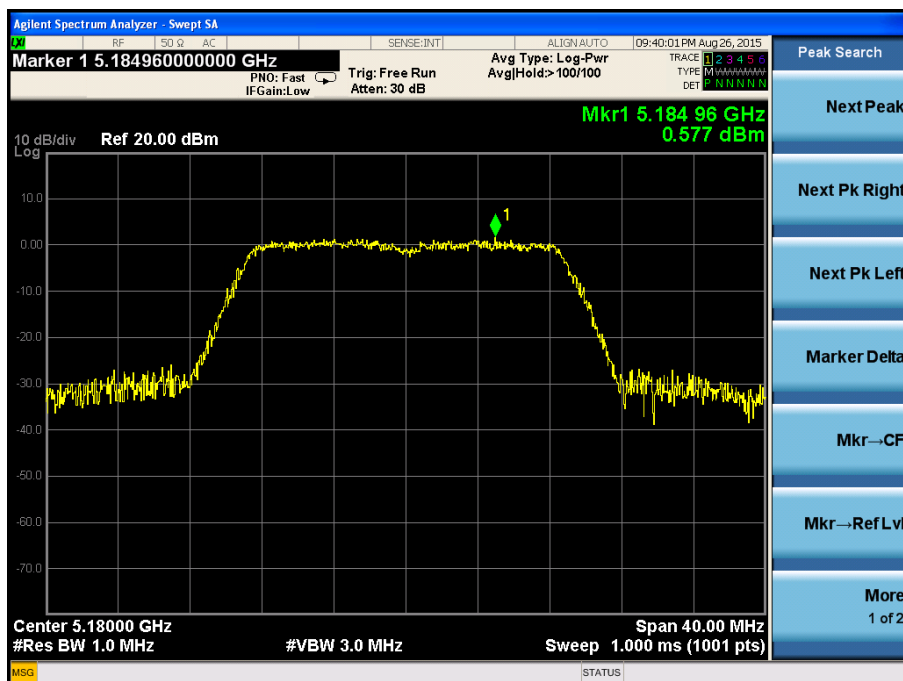


5805MHz

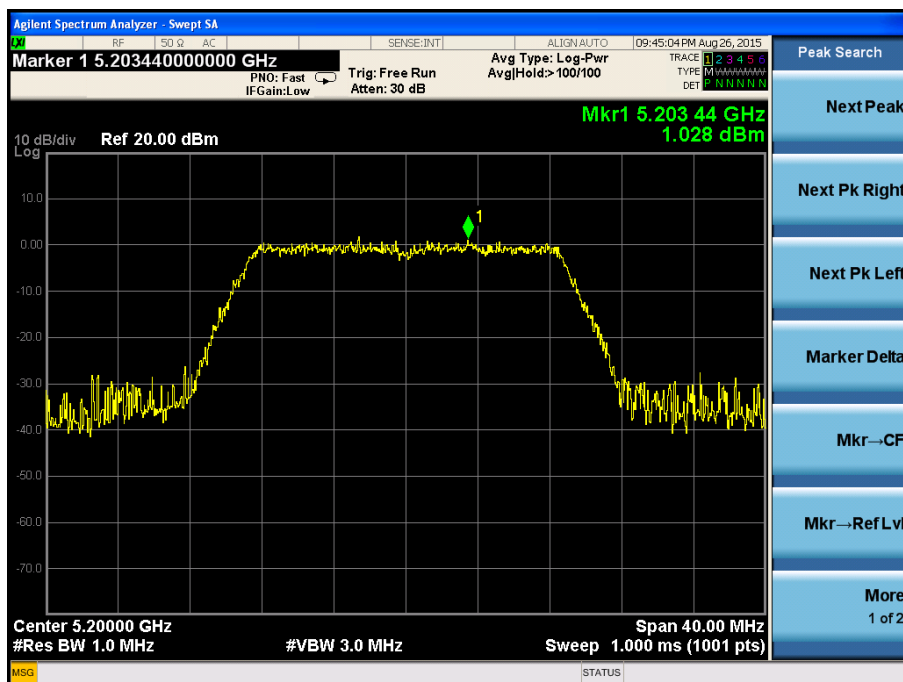


Test Mode: 802.11n-HT20

5180MHz



5200MHz



Agilent Spectrum Analyzer - Swept SA

RF 50 Q AC SENSE:INT ALIGN AUTO 10:26:58 AM Aug 27, 2015

Marker 1 5.236840000000 GHz PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB Avg Type: Log-Pwr AvgHold: > 100/100 TRACE 1 TYPE M DET N

10 dB/div Log Ref 20.00 dBm

Mkr1 5.236 84 GHz 0.914 dBm

Center 5.24000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Span 40.00 MHz Sweep 1.000 ms (1001 pts)

Trace/Detector Select Trace Clear Write Trace Average Max Hold Min Hold View Blank Trace On More

start Agilent Spectrum Ana... Search Desktop 10:26 AM

Agilent Spectrum Analyzer - Swept SA

Marker 1 5.745640000000 GHz

PNO: Fast Trig: Free Run Atten: 30 dB

Avg Type: Log-Pwr Avg Hold: > 100/100

TRACE 1 2 3 4 5 6

TYPE M

DET N

10 dB/div Log

Ref 20.00 dBm

Center 5.74500 GHz

#Res BW 500 kHz

#VBW 3.0 MHz

Span 40.00 MHz

Sweep 1.000 ms (1001 pts)

Marker 1 5.74564 GHz

-6.938 dBm

Peak Search

Next Peak

Next Pk Right

Next Pk Left

Marker Delta

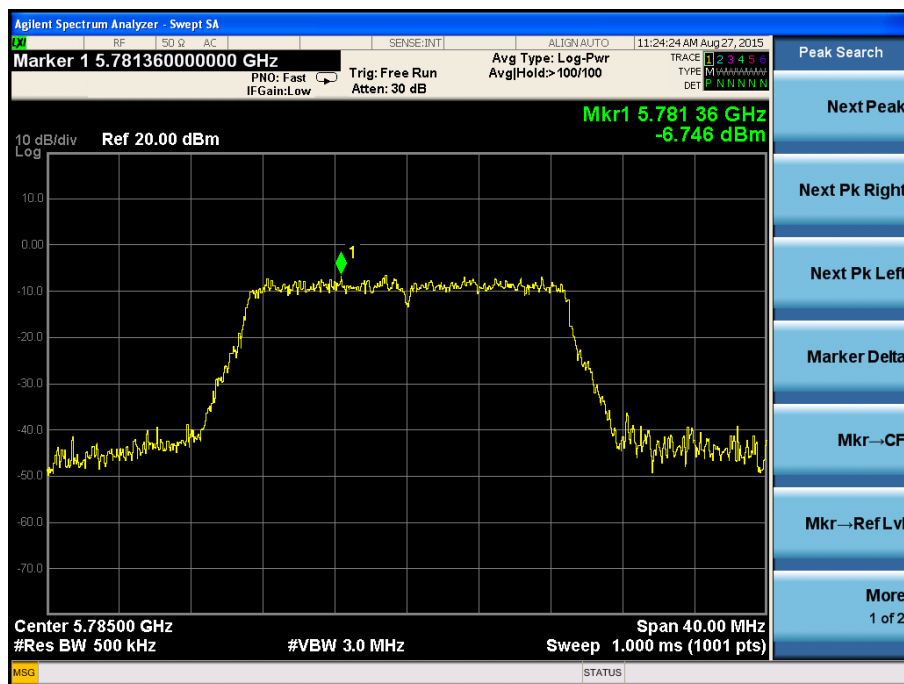
Mkr → CF

Mkr → Ref Lvl

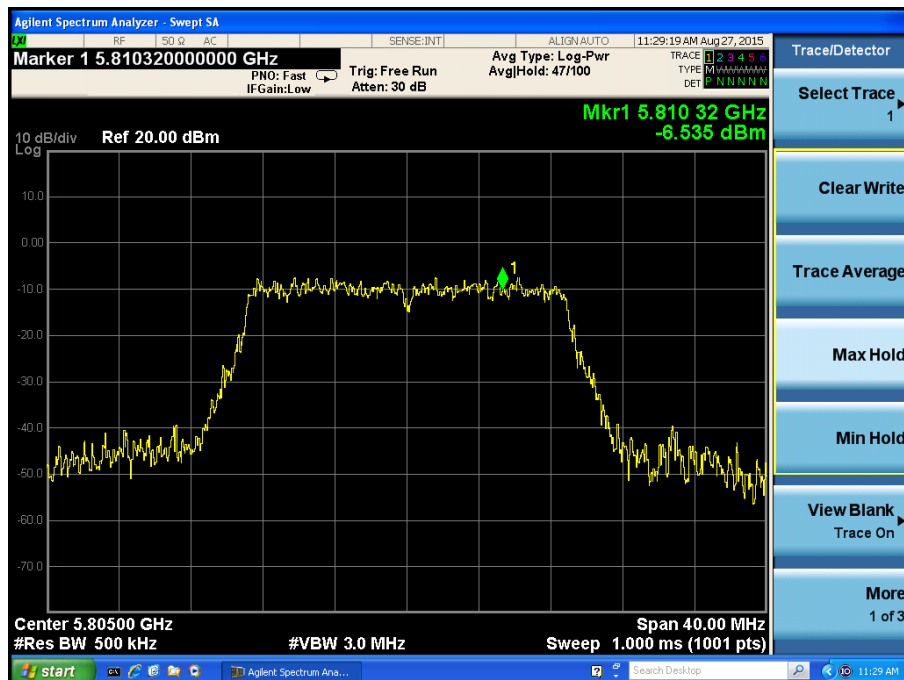
More

1 of 2

5785MHz

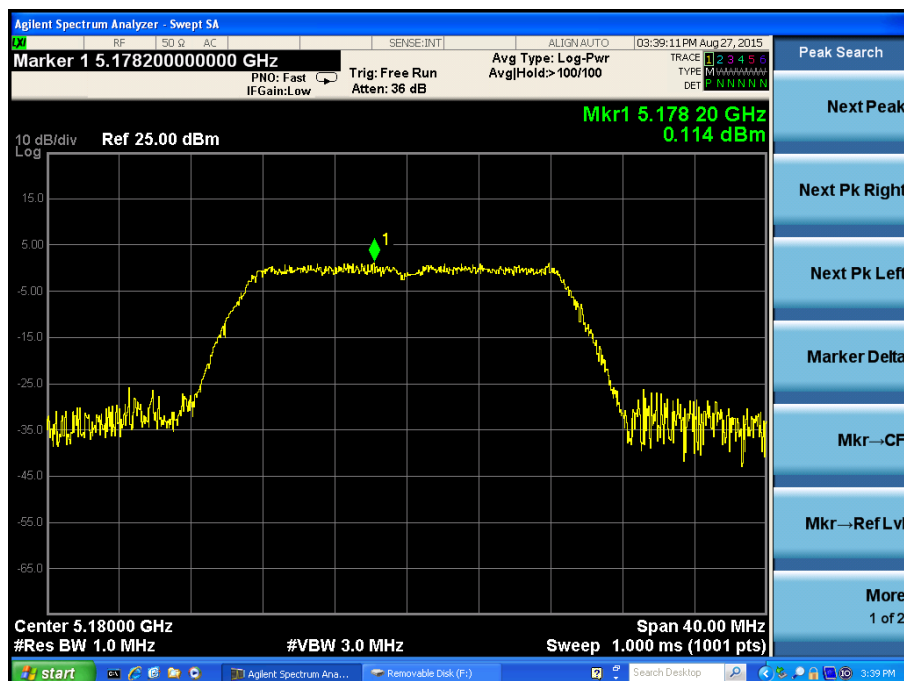


5805MHz

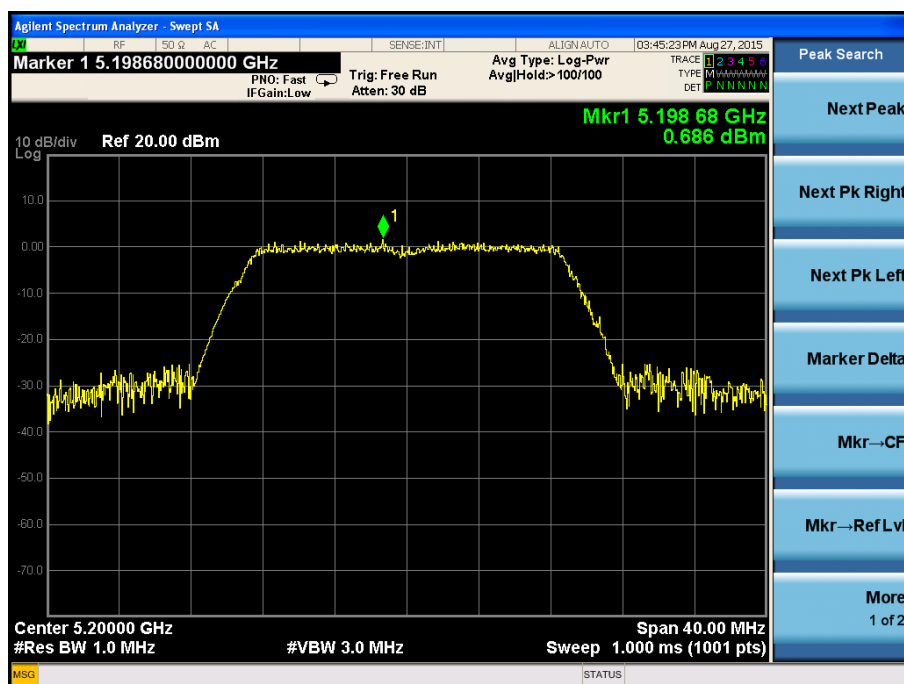


Test Mode: 802.11ac-HT20

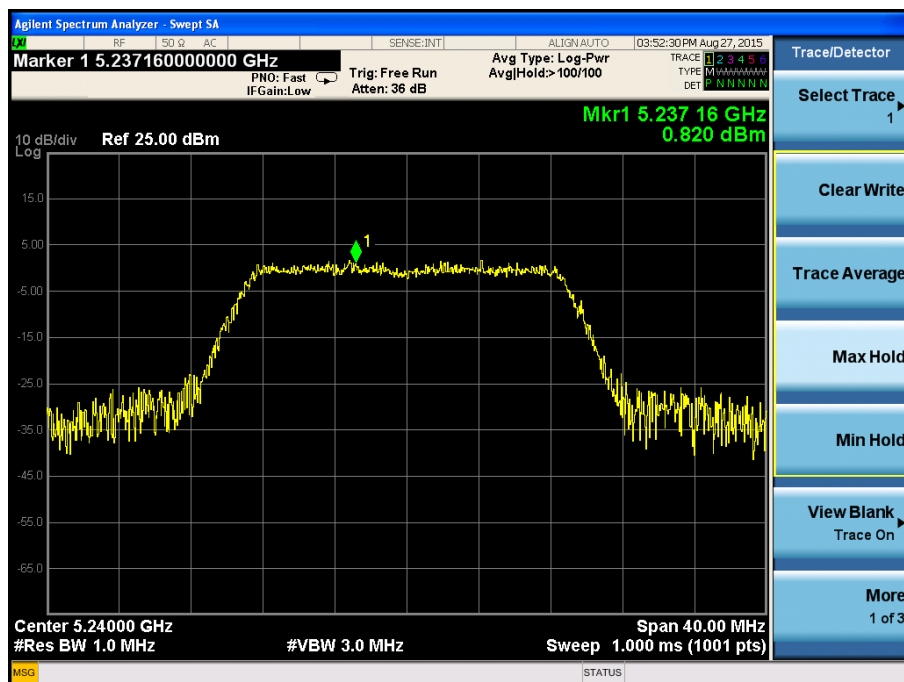
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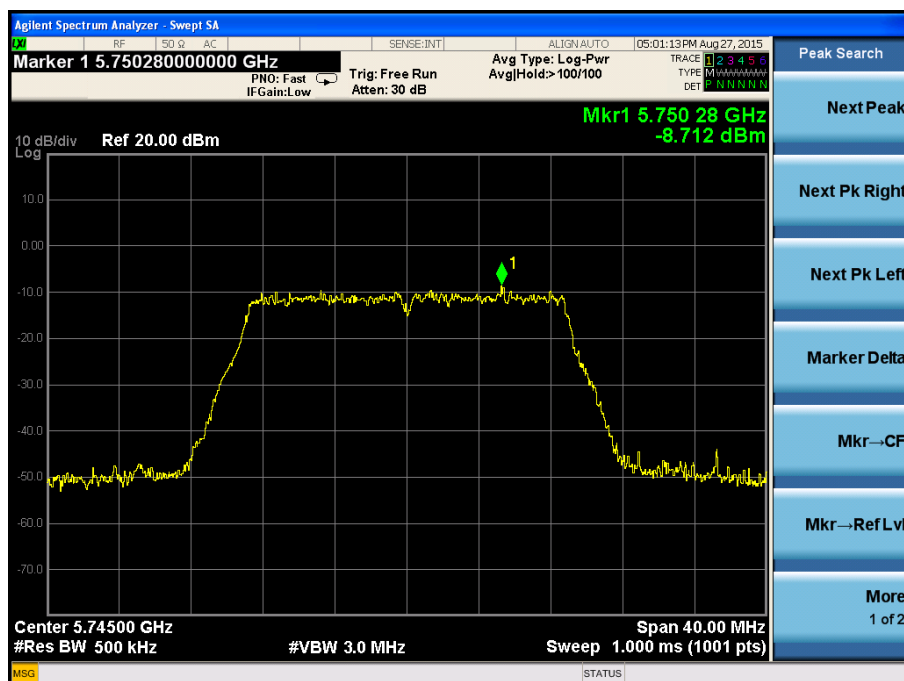
5200MHz



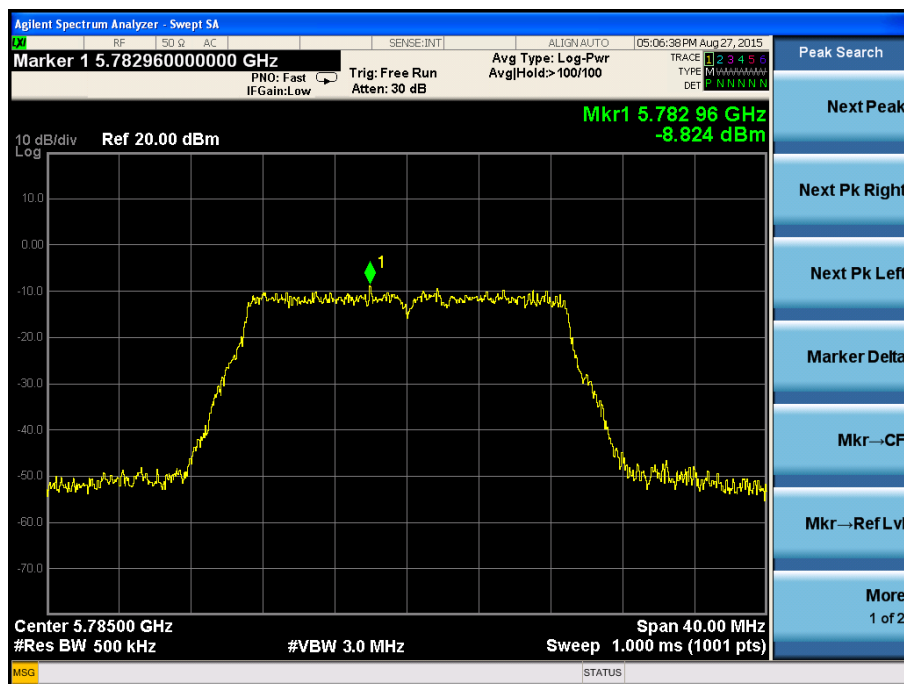
5240MHz



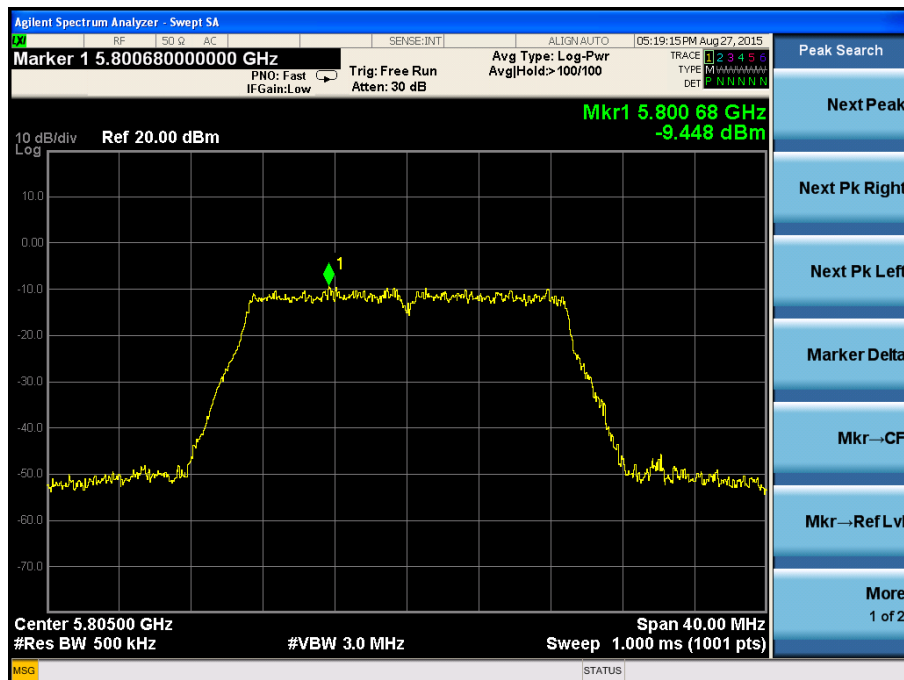
5745MHz



5785MHz



5805MHz



7. Emission Bandwidth and Occupied Bandwidth

7.1 Standard Applicable

According to 15.407 (a) and (e)

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

7.2 Test Procedure

According to 789033 D02 v01 section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)

a) Set RBW = approximately 1% of the emission bandwidth.

b) Set the VBW > RBW.

c) Detector = Peak.

d) Trace mode = max hold.

e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare

this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

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

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth

The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 \cdot \text{RBW}$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

7.3 Environmental Conditions

Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

7.4 Summary of Test Results/Plots

Antenna 1

5150-5250MHz

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz
802.11a	5180	20.95	16.562	--
	5200	20.89	16.562	--
	5240	20.95	16.549	--
802.11n-HT20	5180	21.47	17.787	--
	5200	21.23	17.809	--
	5240	21.32	17.772	--
802.11n-HT20	5180	21.11	17.828	--
	5200	21.35	17.810	--
	5240	21.45	17.833	--

5725-5850MHz

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11a	5745	20.91	16.47	16.525	≥500
	5785	20.77	16.48	16.505	≥500
	5805	20.91	16.45	16.527	≥500
802.11n-HT20	5745	21.73	17.68	17.816	≥500
	5785	21.27	17.69	17.805	≥500
	5805	21.29	17.67	17.750	≥500
802.11ac-HT20	5745	21.33	17.30	17.847	≥500
	5785	21.43	17.94	17.864	≥500
	5805	21.11	17.40	17.853	≥500

Antenna 2

5150-5250MHz

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz
802.11a	5180	20.94	16.531	--
	5200	20.96	16.556	--
	5240	20.87	16.563	--
802.11n-HT20	5180	21.18	17.686	--
	5200	20.94	17.754	--
	5240	21.32	17.772	--
802.11n-HT20	5180	21.36	17.828	--
	5200	21.37	17.827	--
	5240	21.48	17.821	--

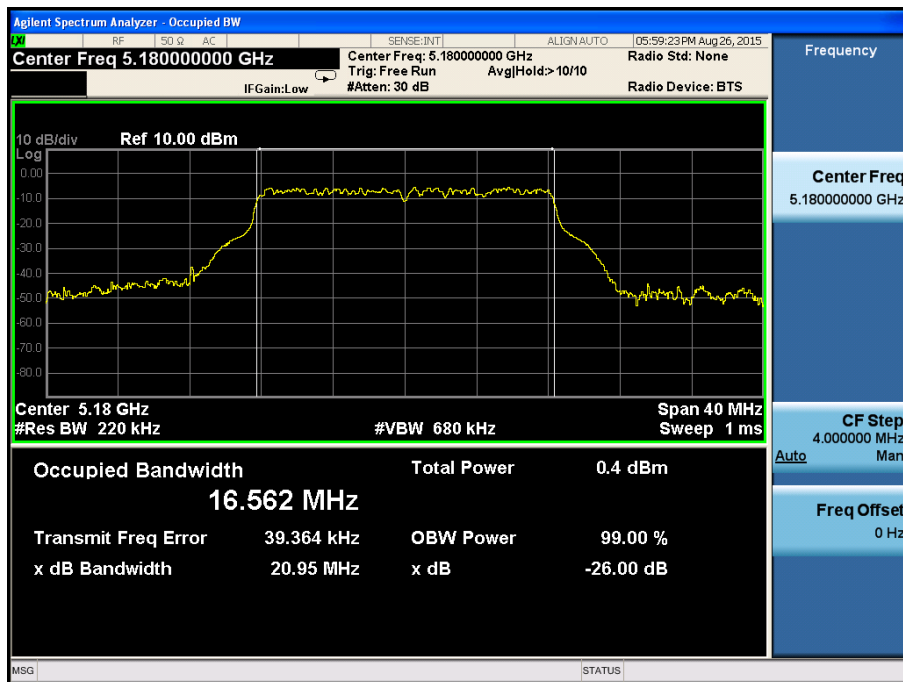
5725-5850MHz

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz
802.11a	5745	20.79	16.48	16.532	≥500
	5785	20.64	16.43	16.554	≥500
	5805	20.62	16.44	16.498	≥500
802.11n-HT20	5745	21.01	17.76	17.797	≥500
	5785	21.37	17.63	17.814	≥500
	5805	21.34	17.65	17.755	≥500
802.11ac-HT20	5745	21.17	17.66	17.858	≥500
	5785	21.11	17.71	17.802	≥500
	5805	21.49	17.65	17.854	≥500

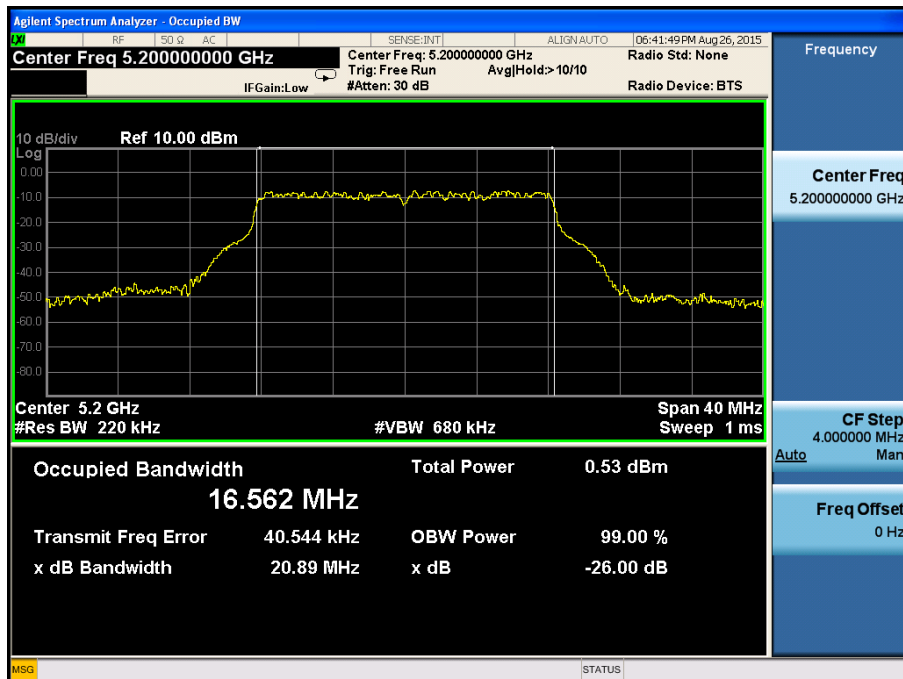
Antenna 1

Test mode: 802.11a

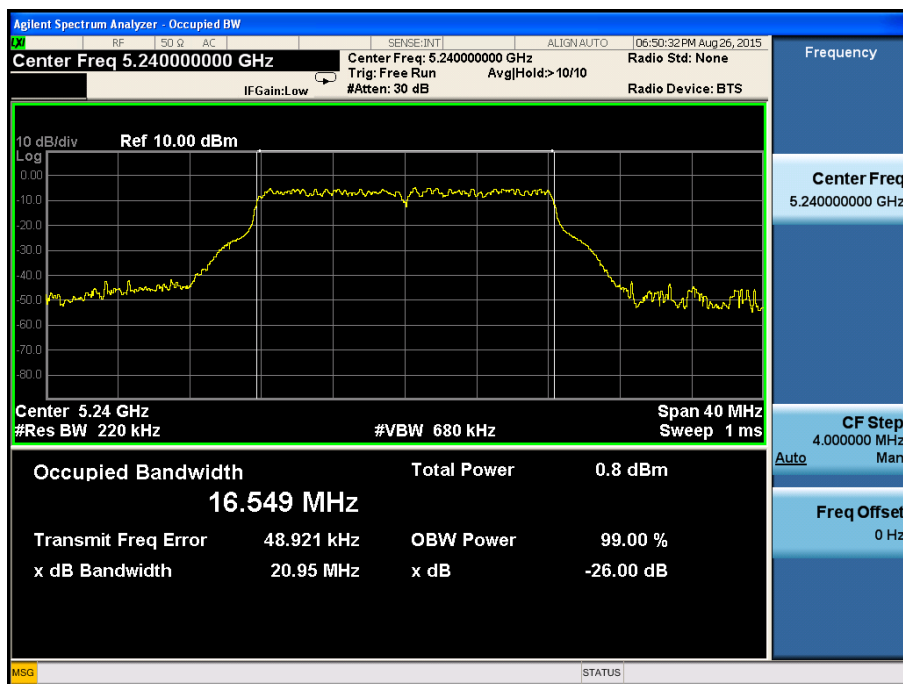
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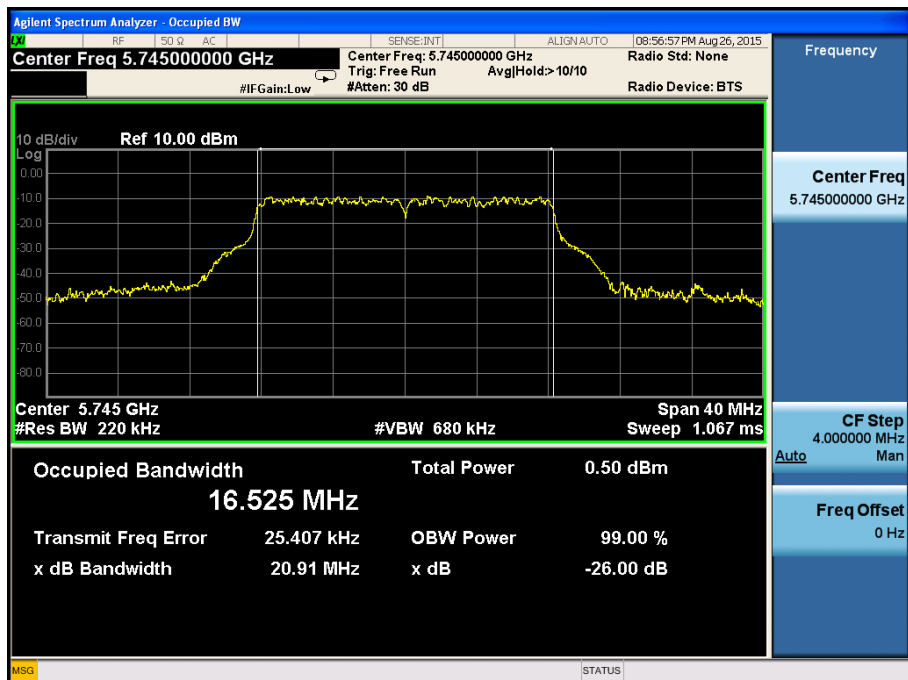
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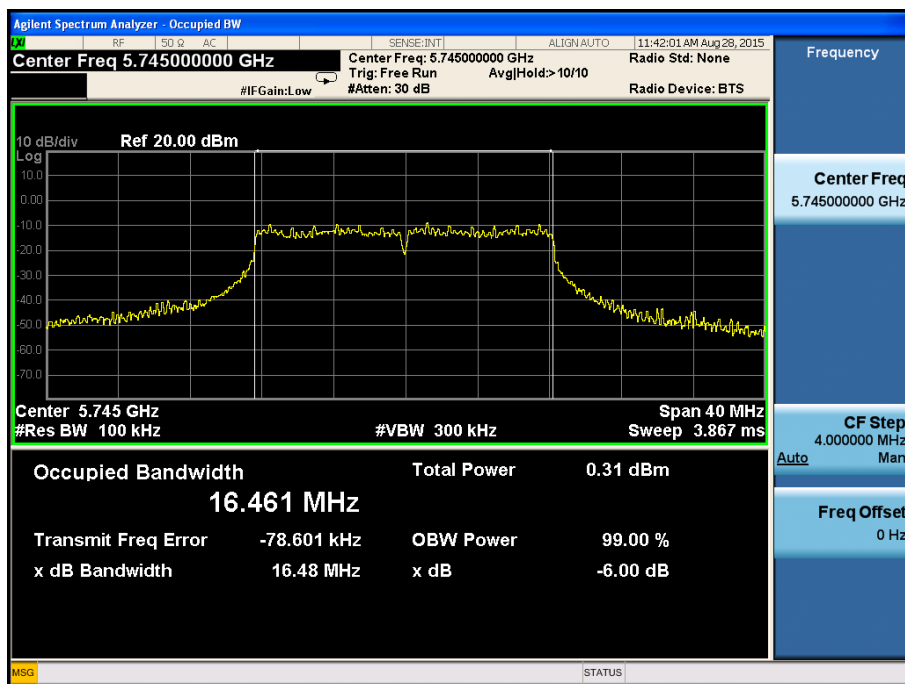


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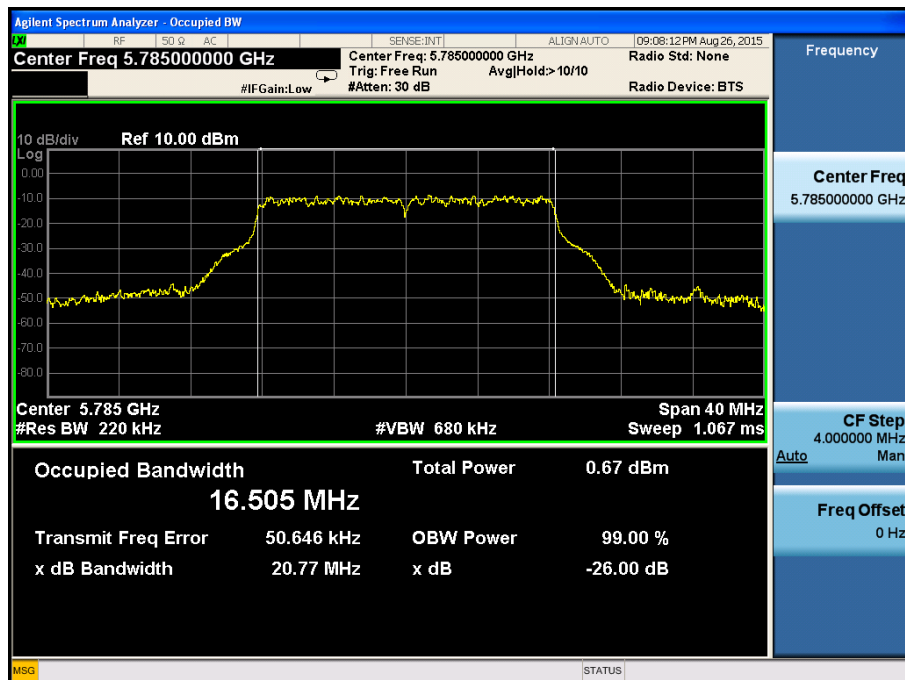


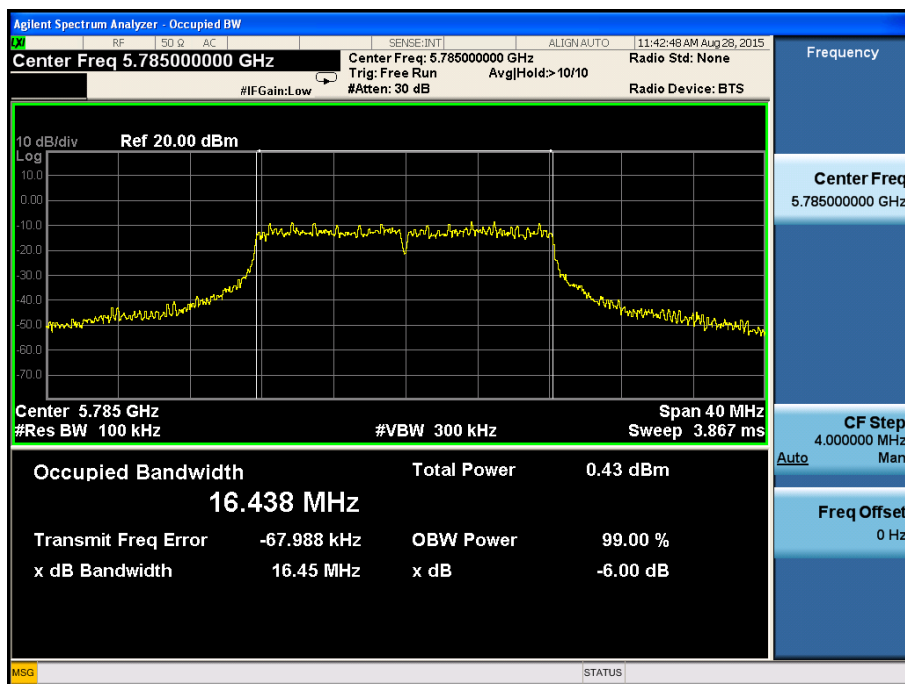
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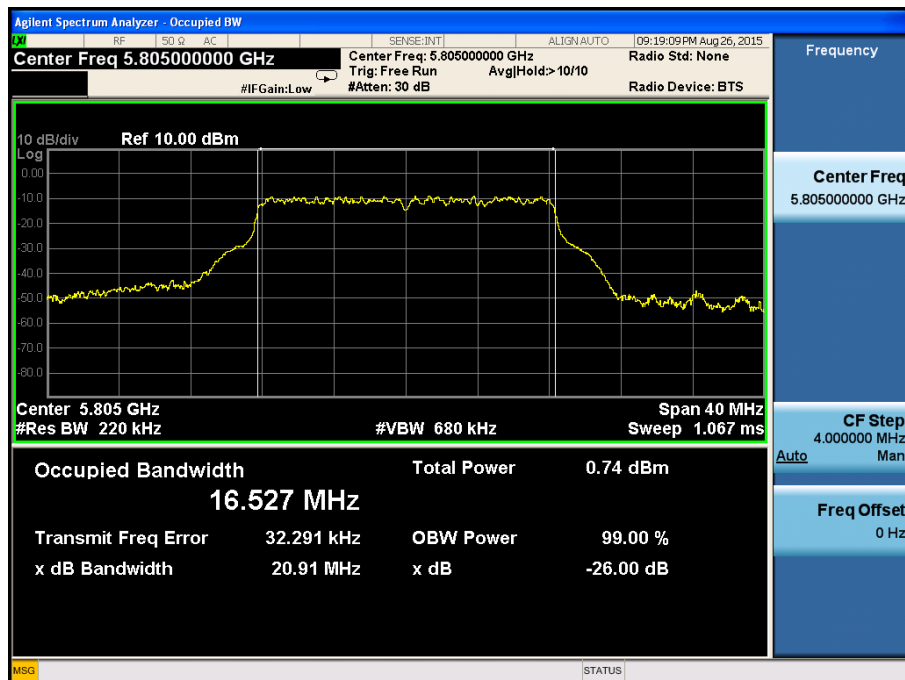


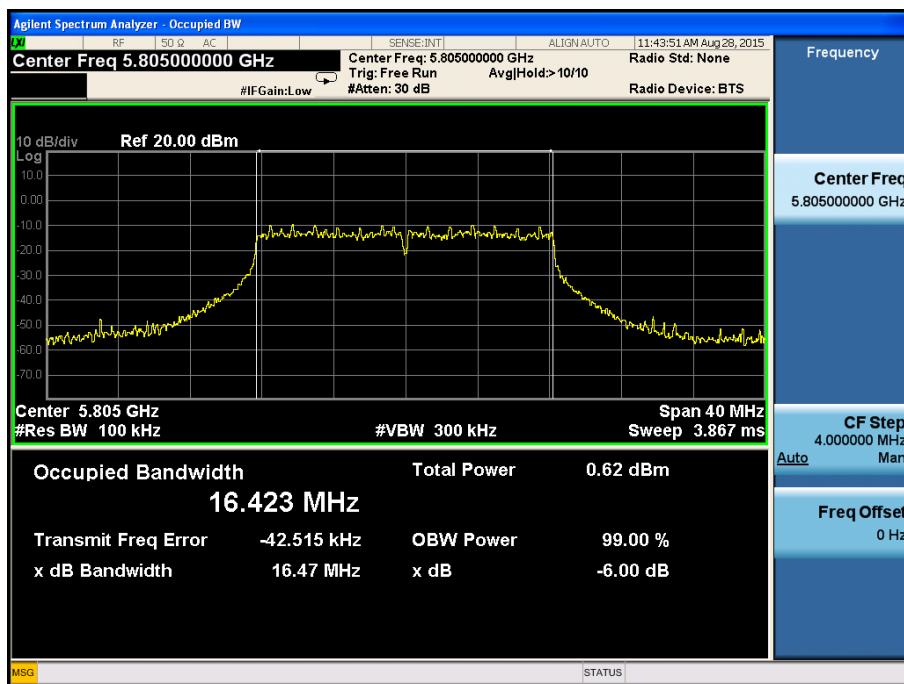
5785MHz





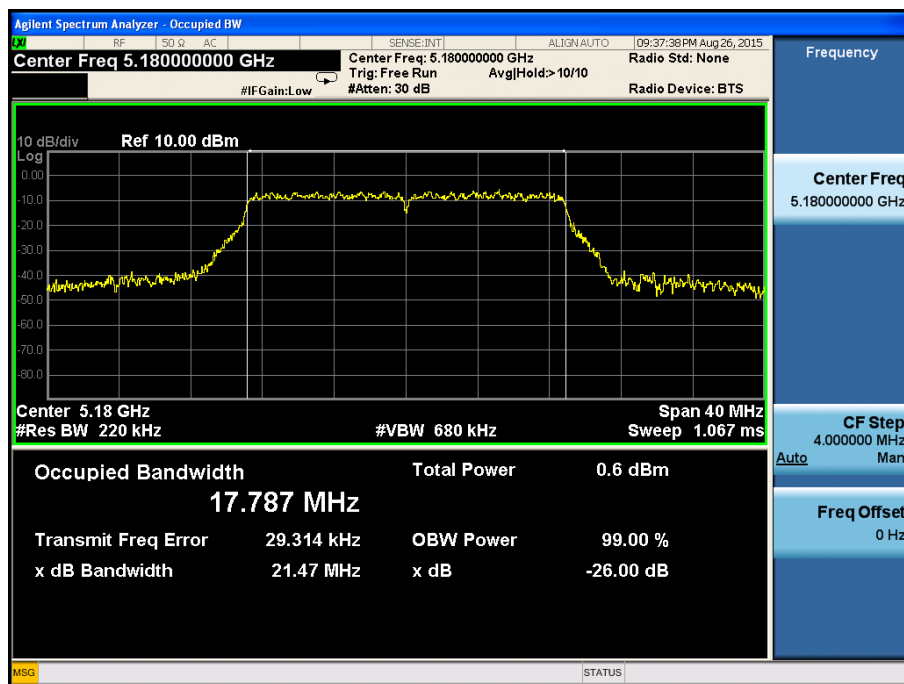
5805MHz



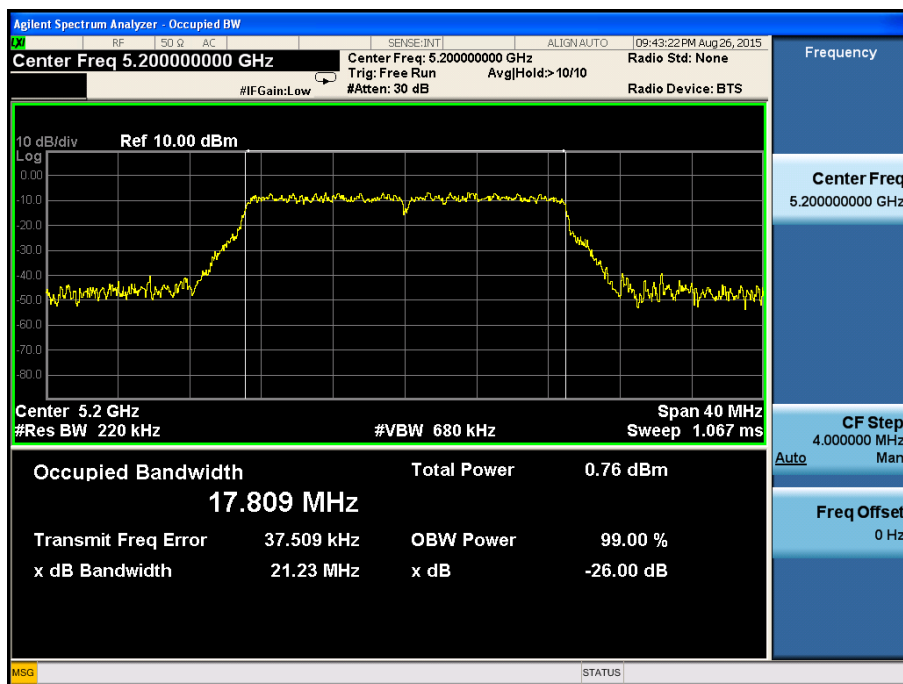


Test mode: 802.11n-HT20

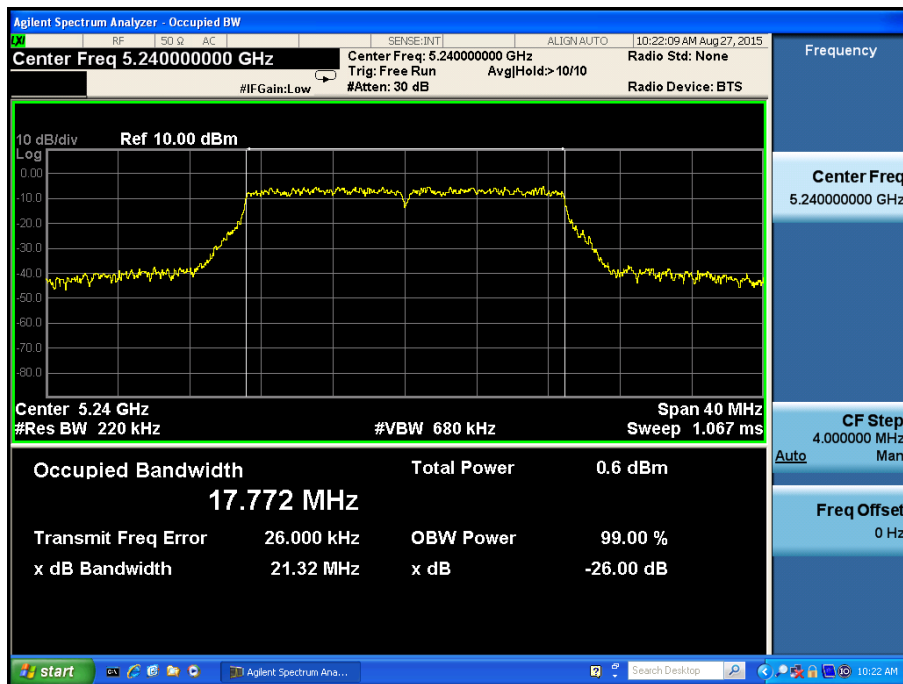
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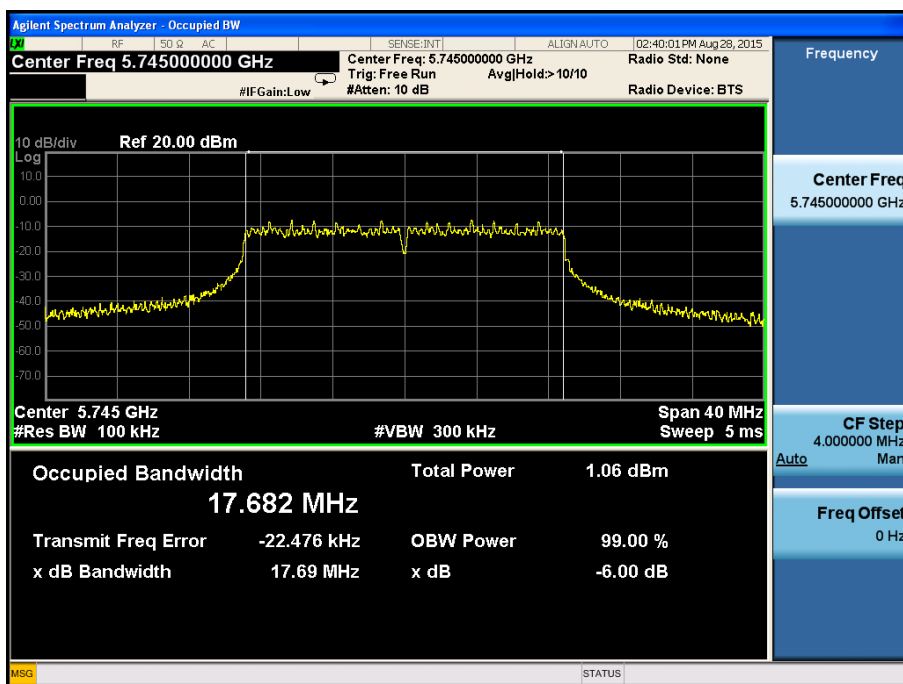
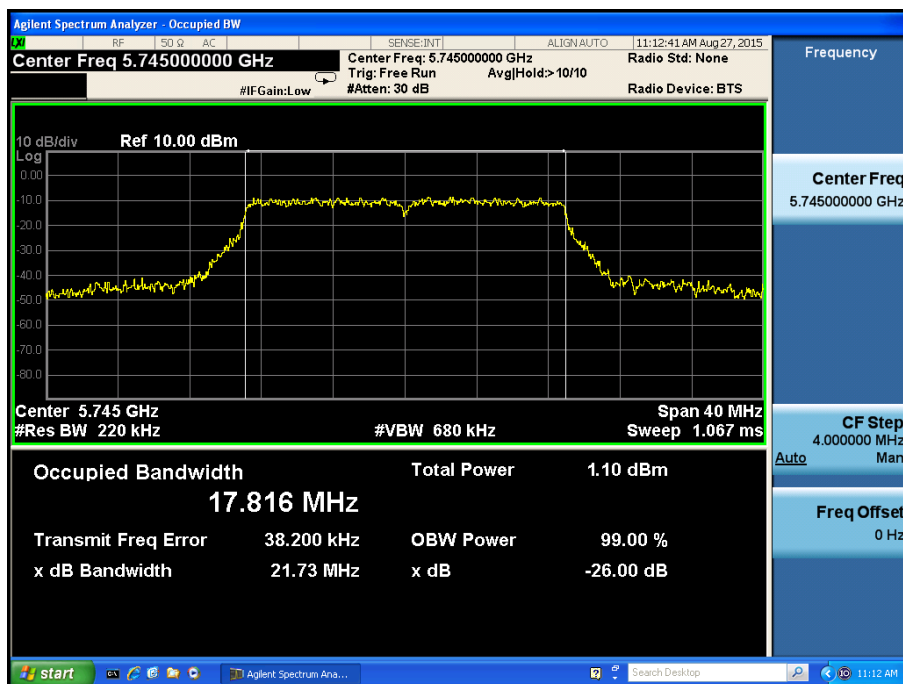
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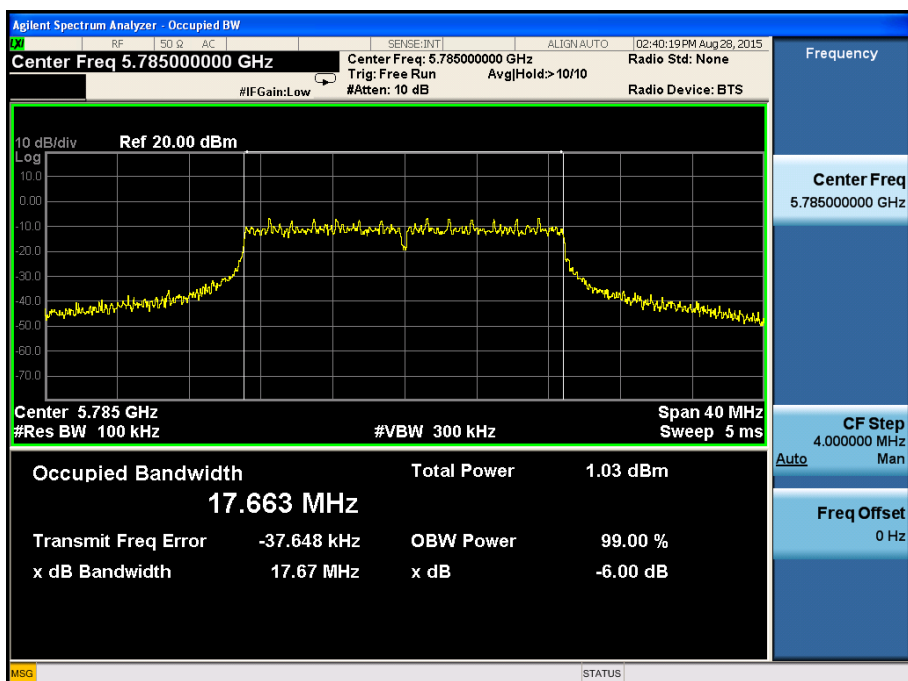
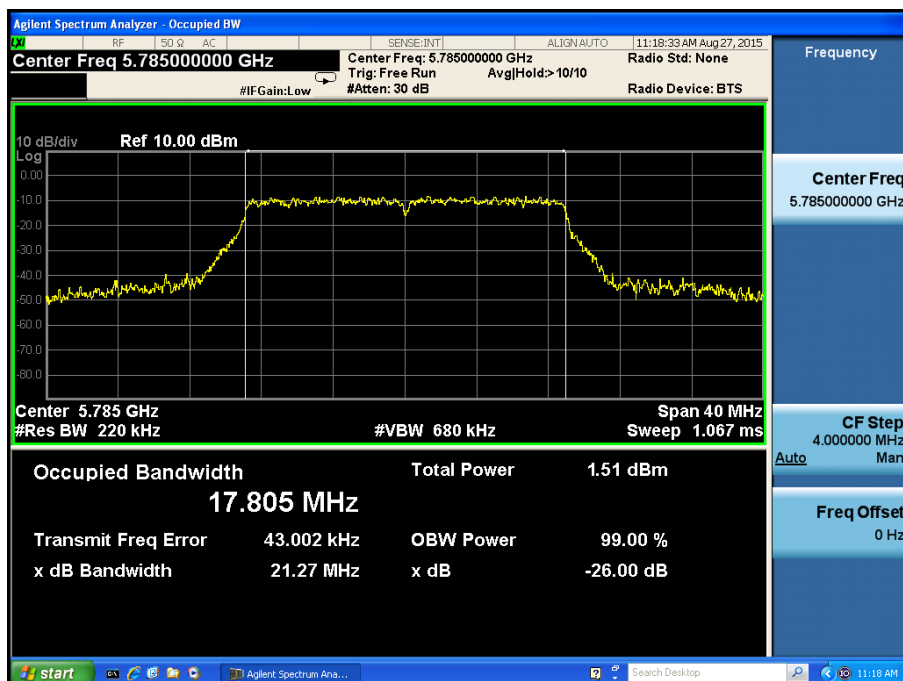
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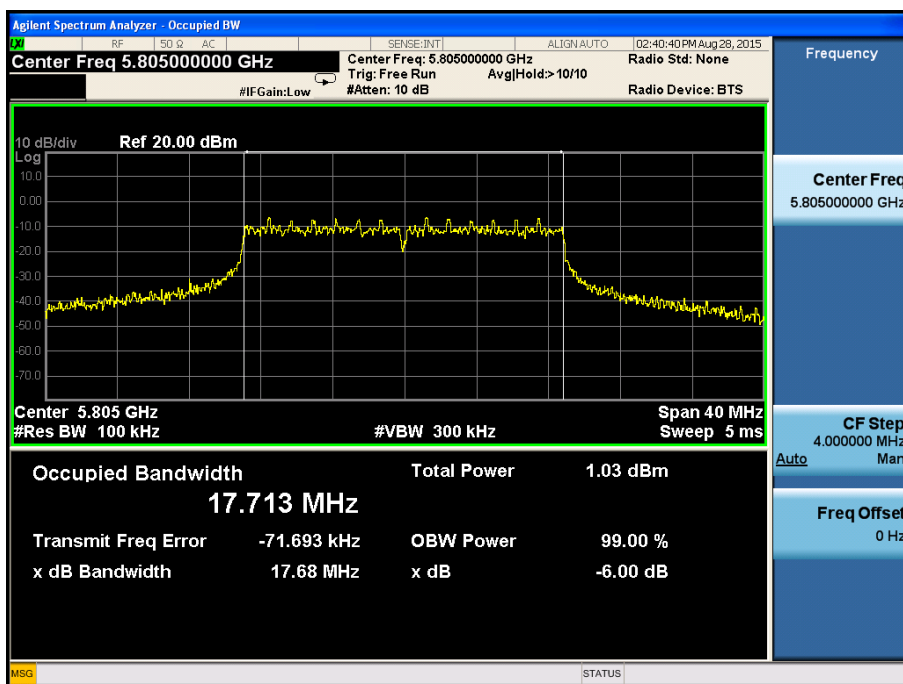
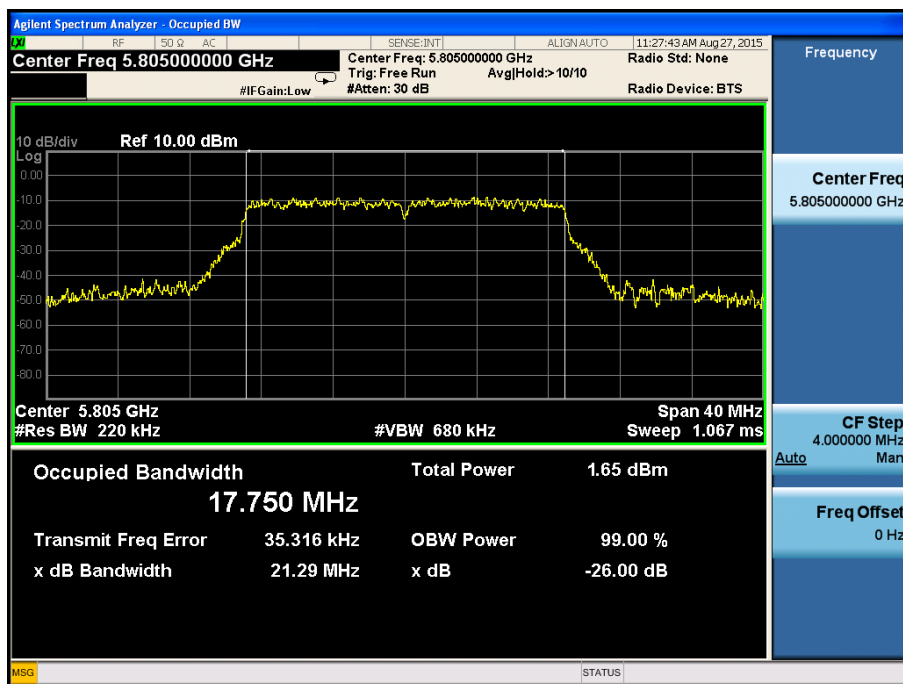
5745MHz



5785MHz

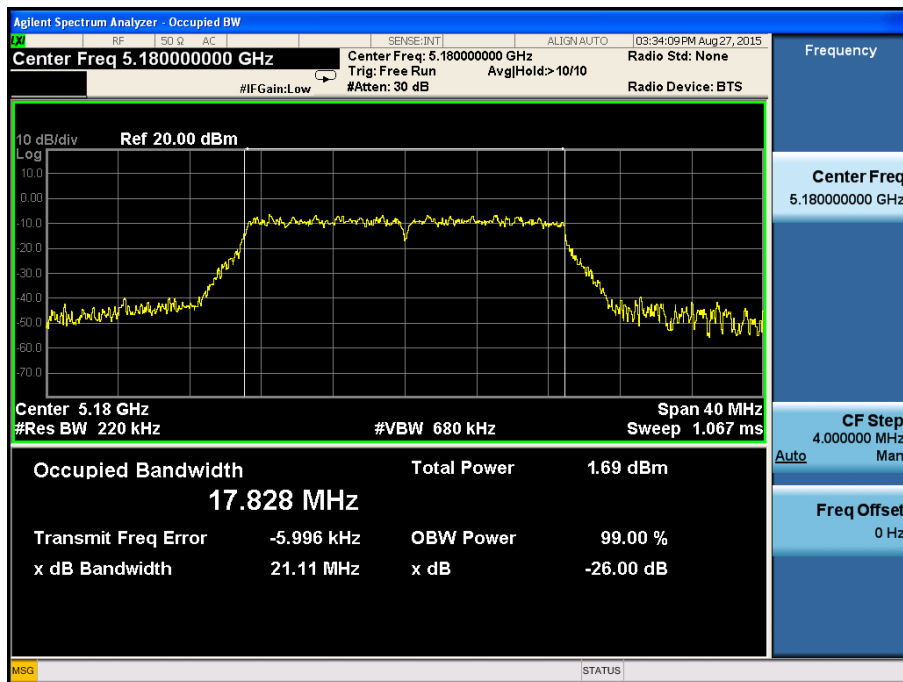


5805MHz

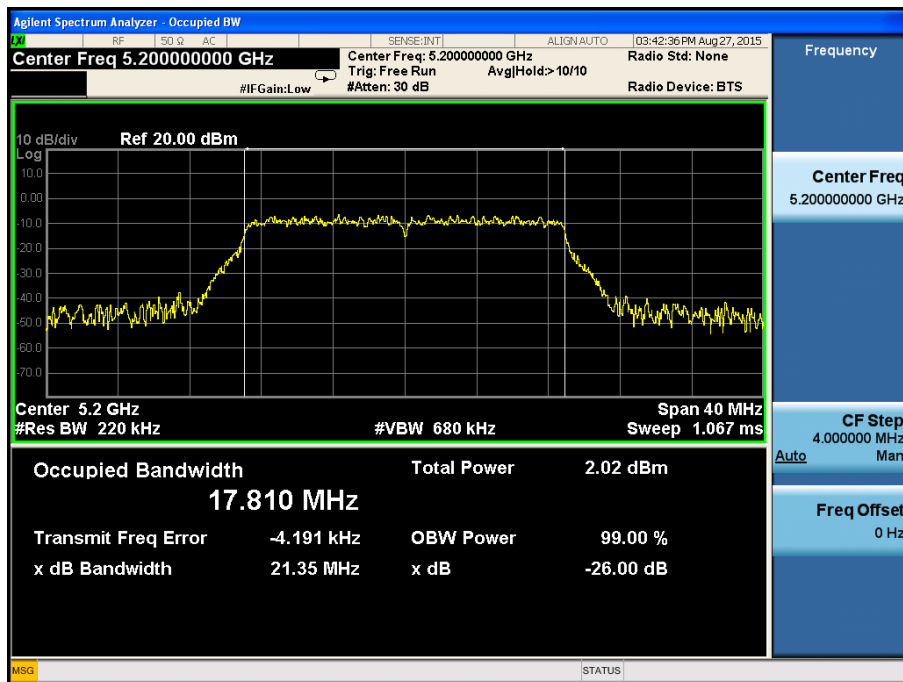


Test mode: 802.11ac-HT20

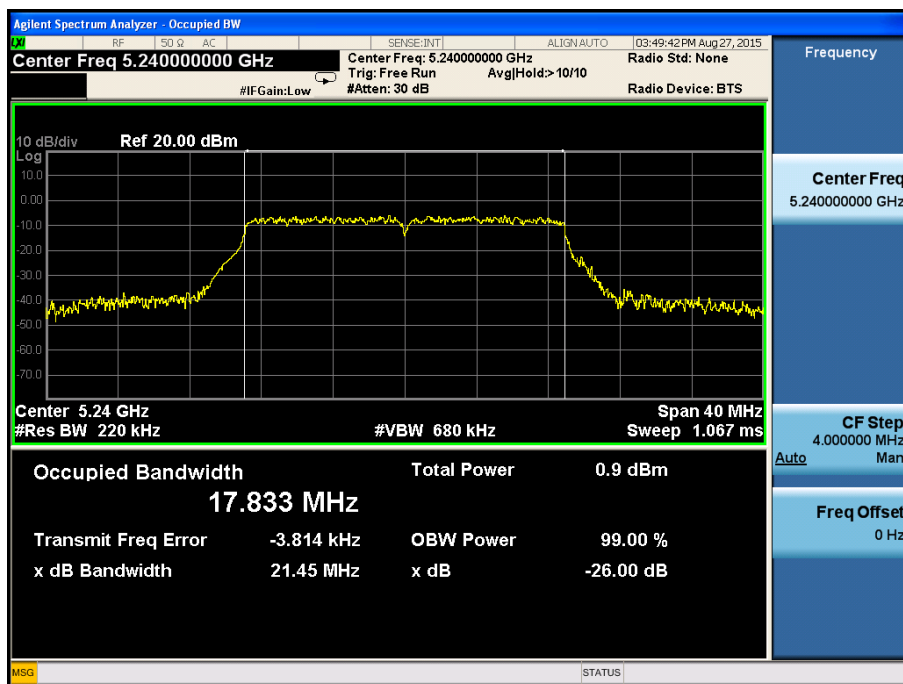
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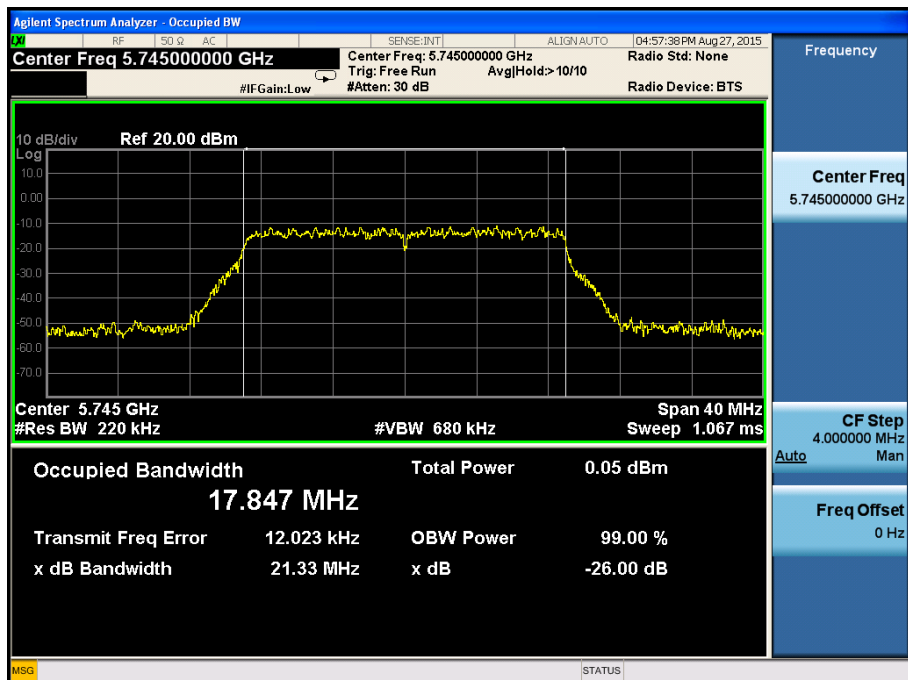
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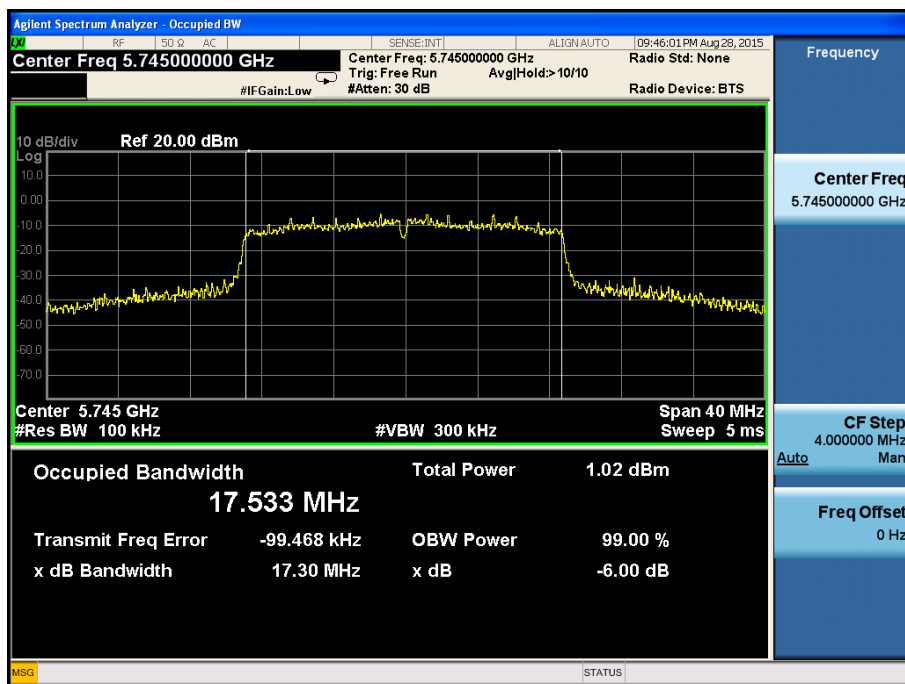


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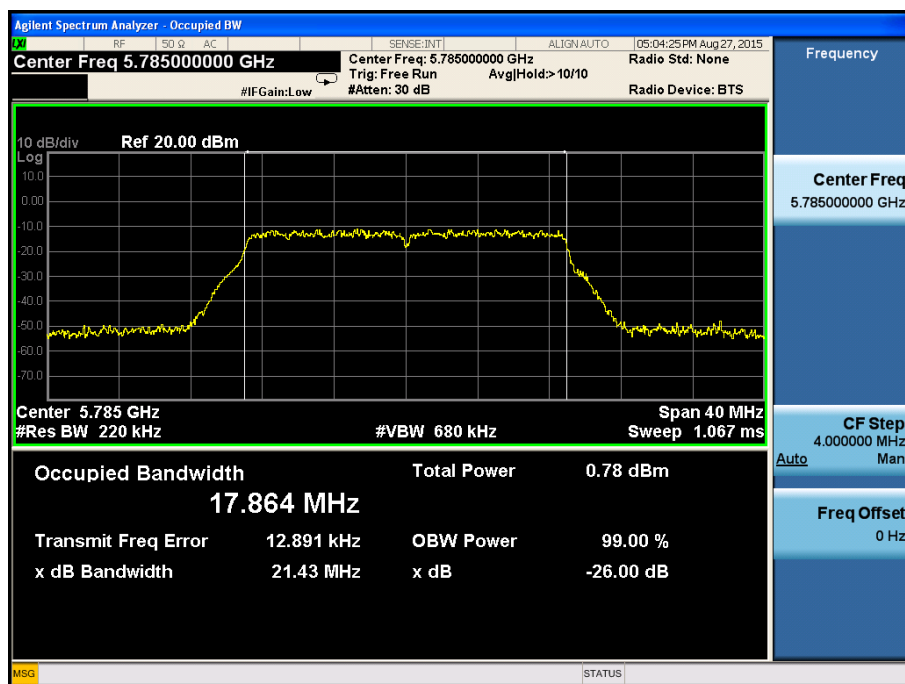


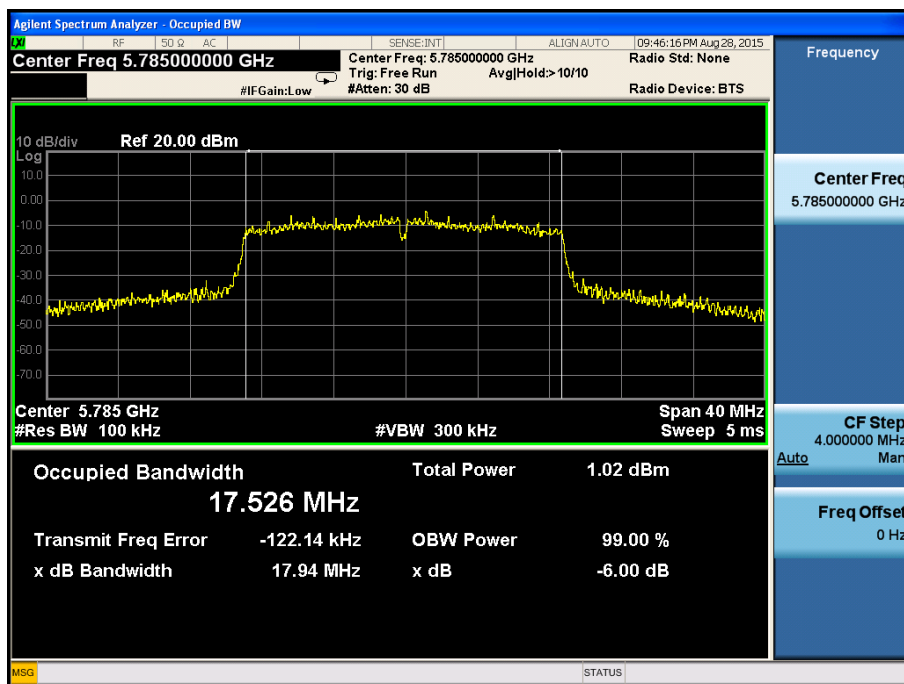
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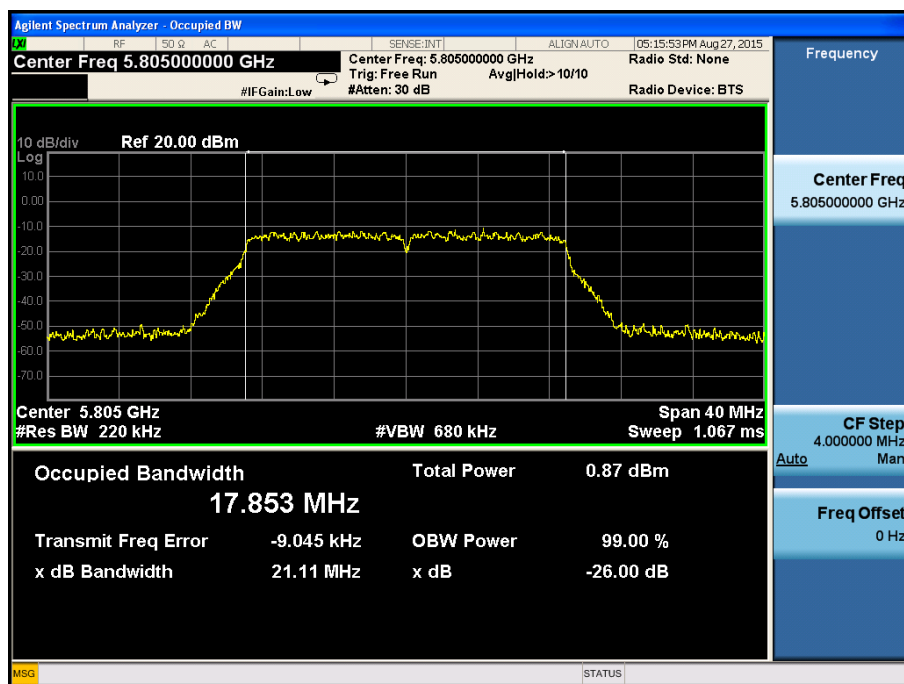


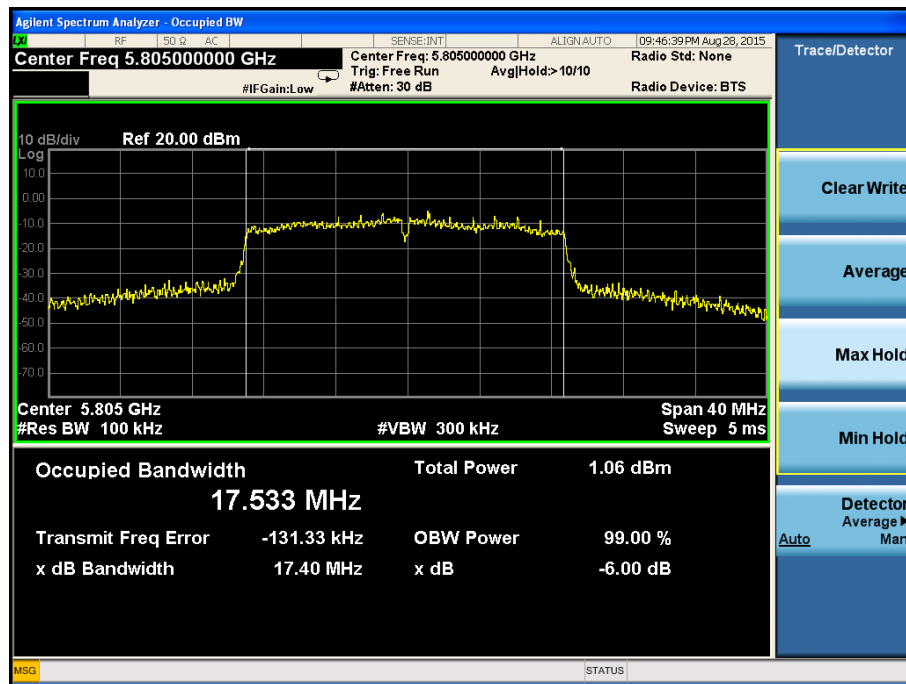
5785MHz





5805MHz

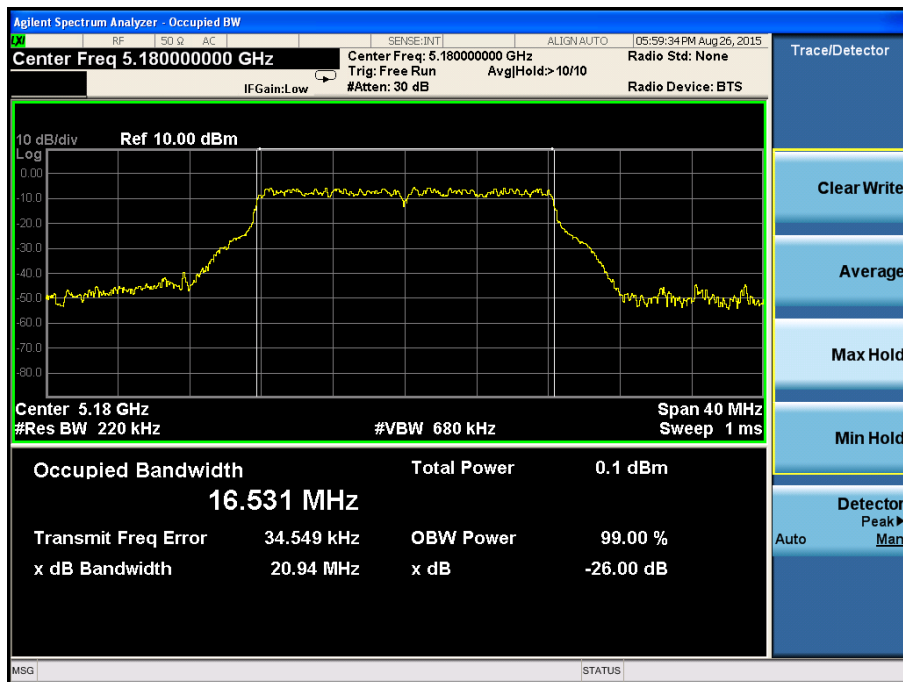




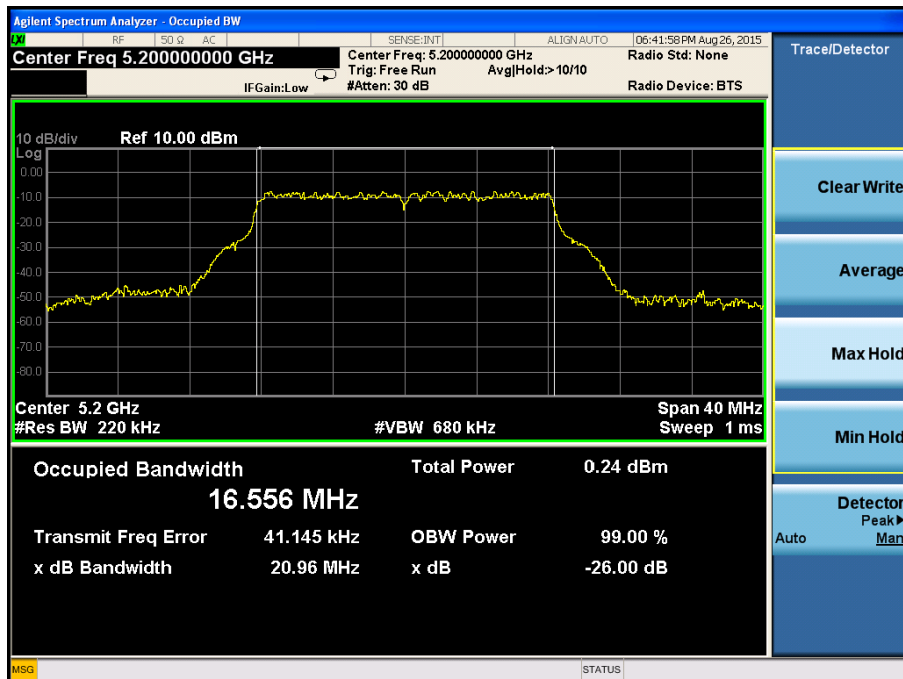
Antenna 2

Test mode: 802.11a

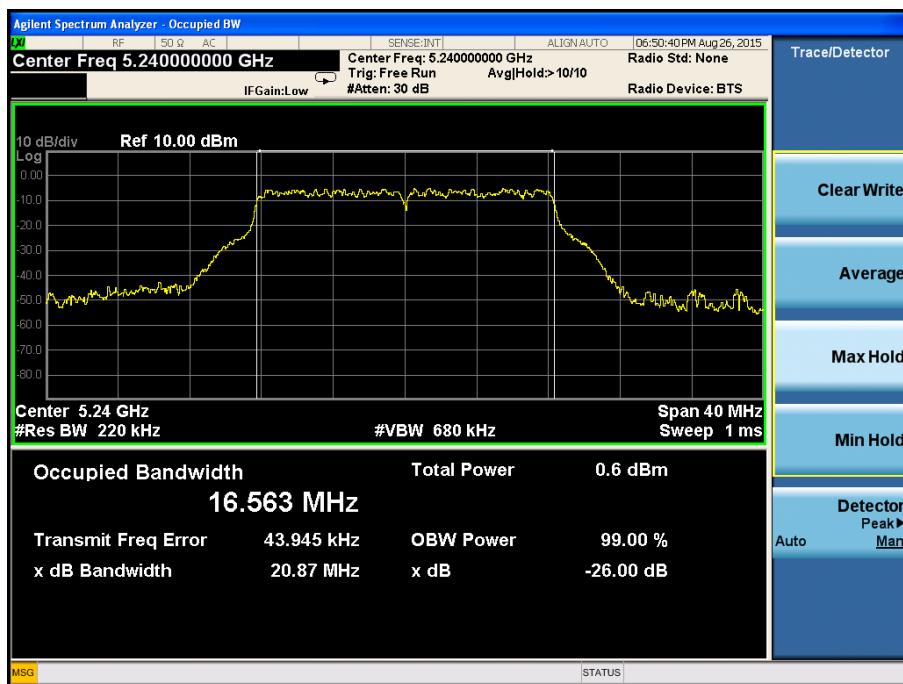
5180MHz



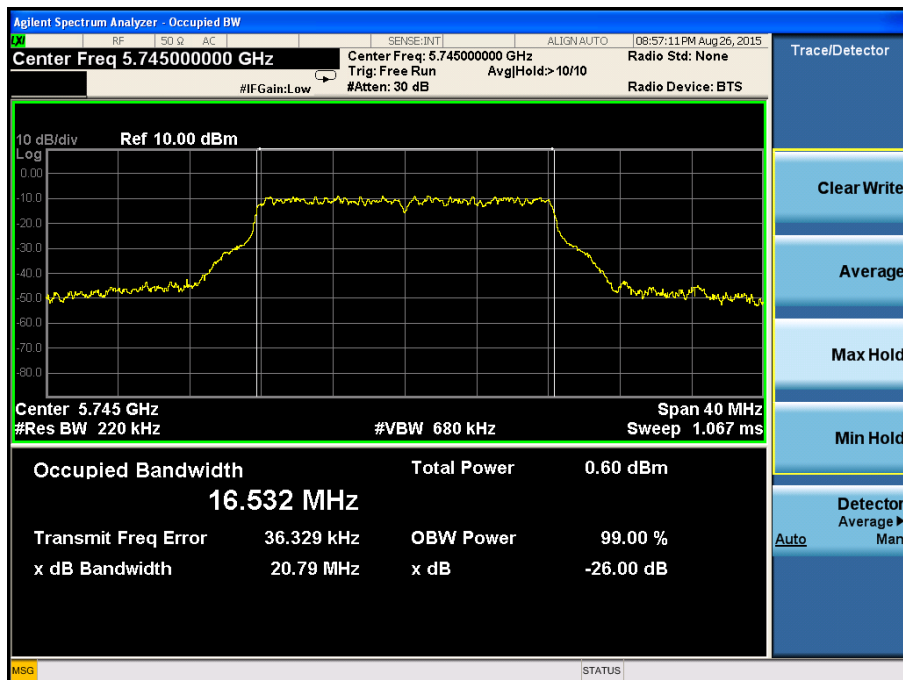
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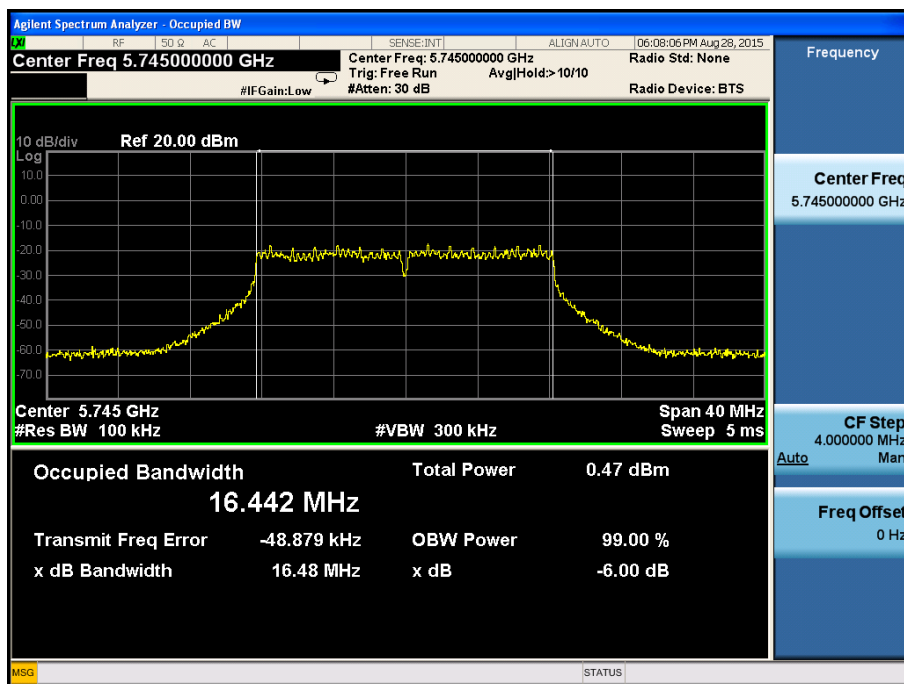


5240MHz

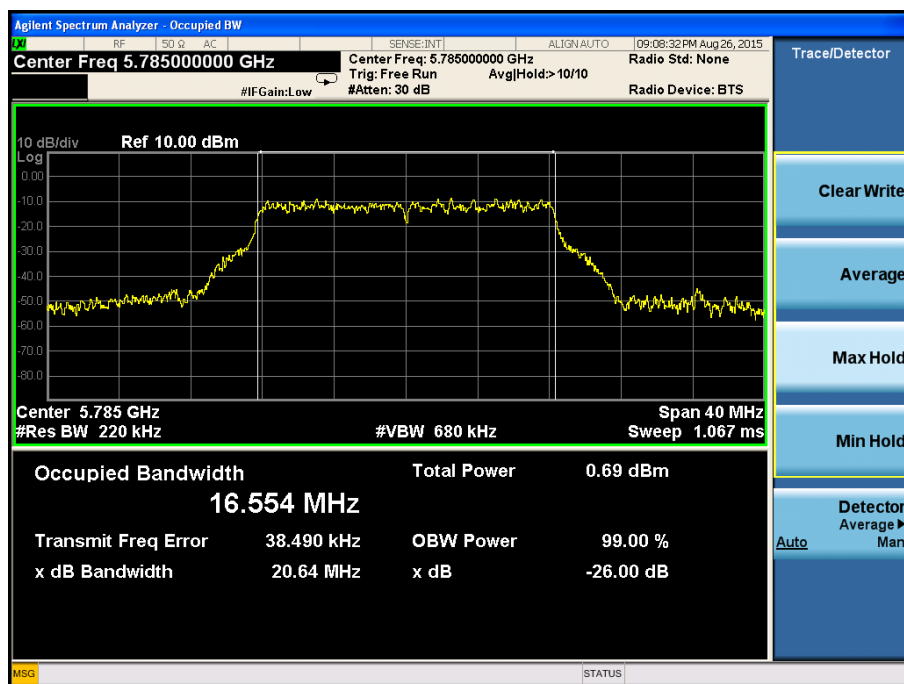


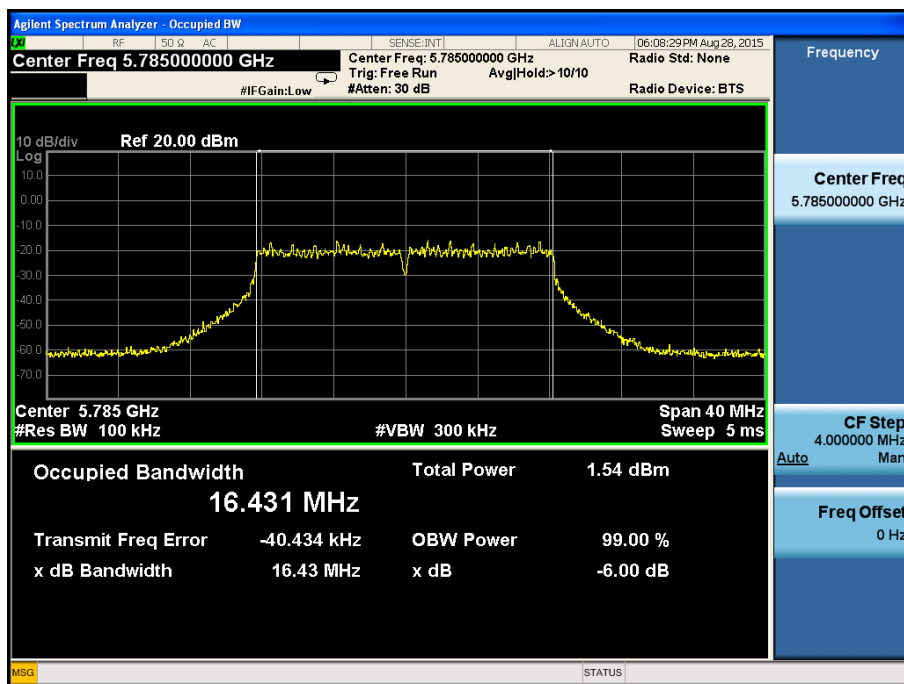
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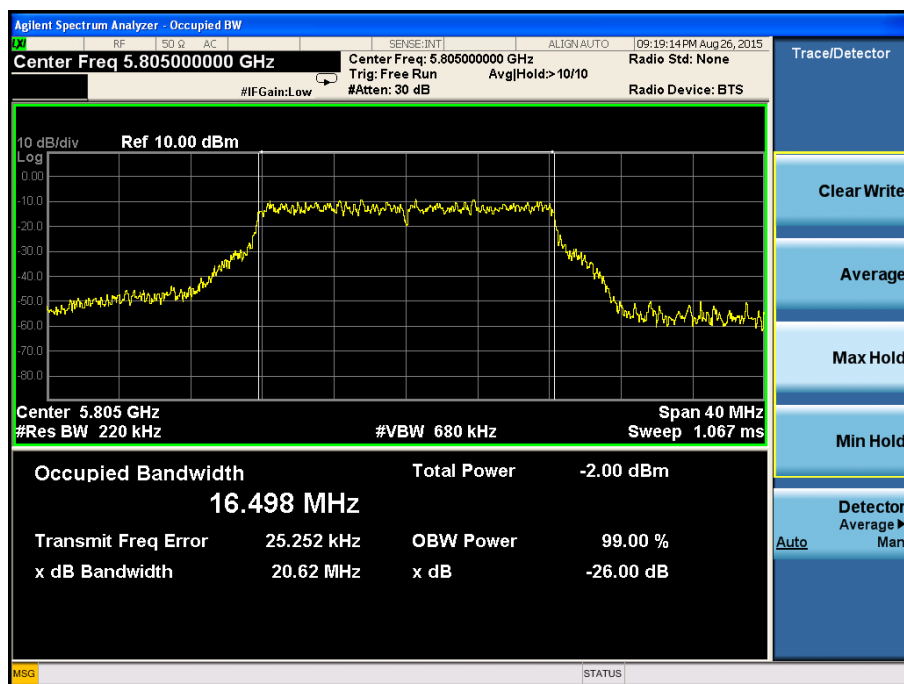


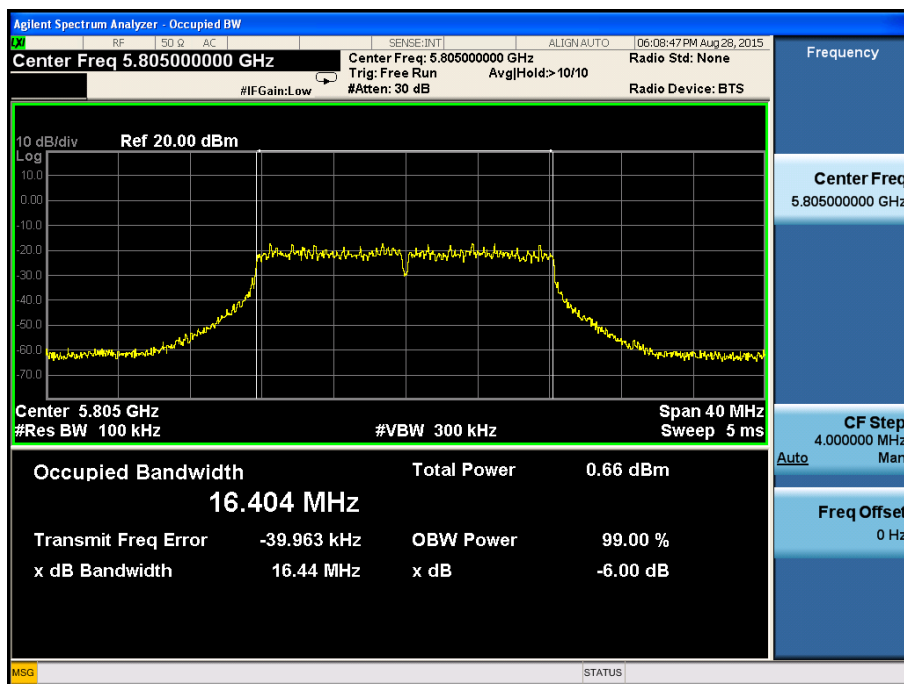
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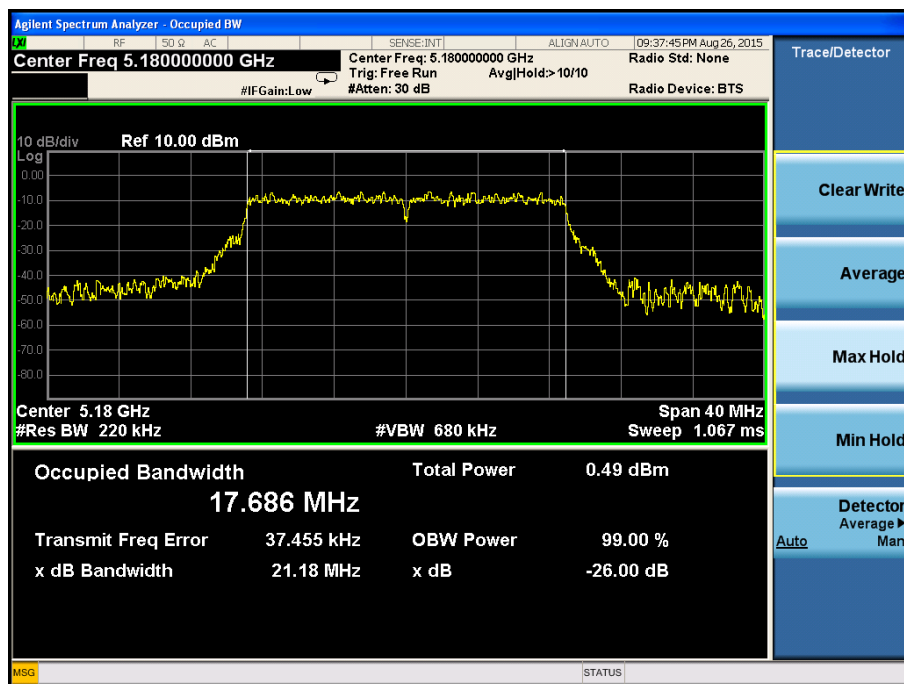
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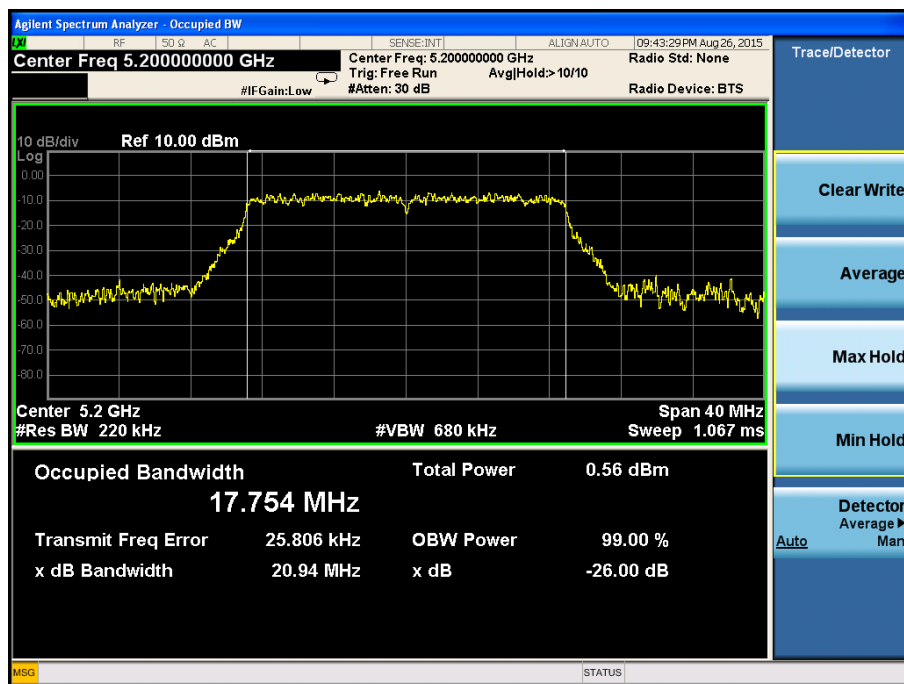


Test mode: 802.11n-HT20

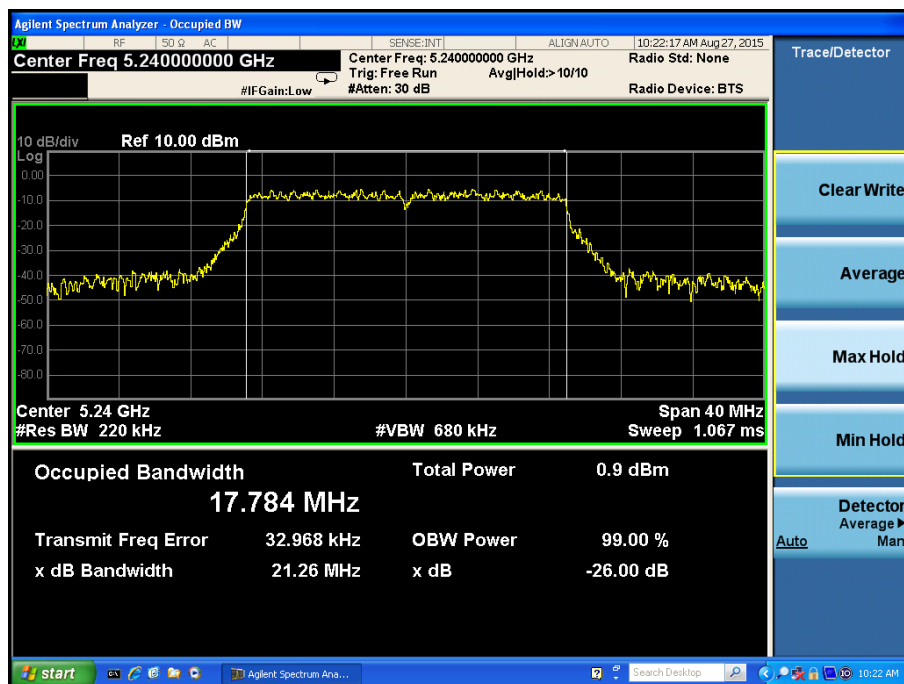
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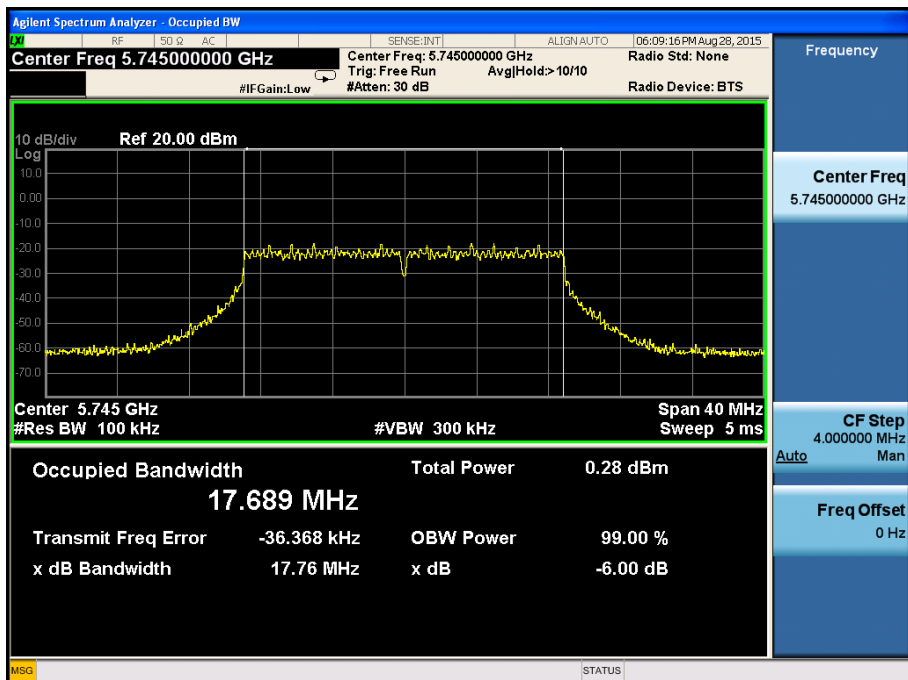
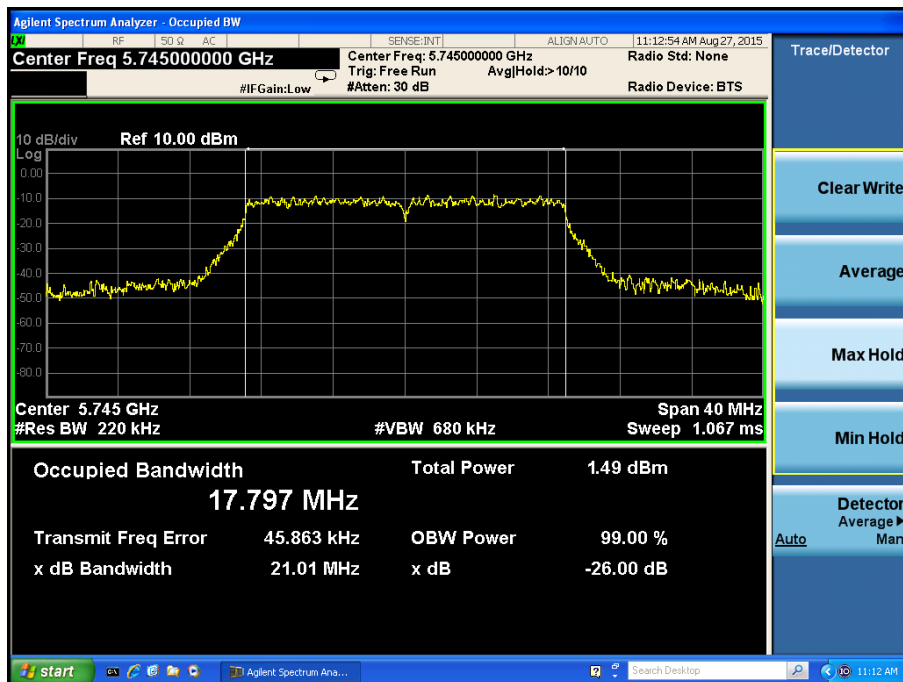
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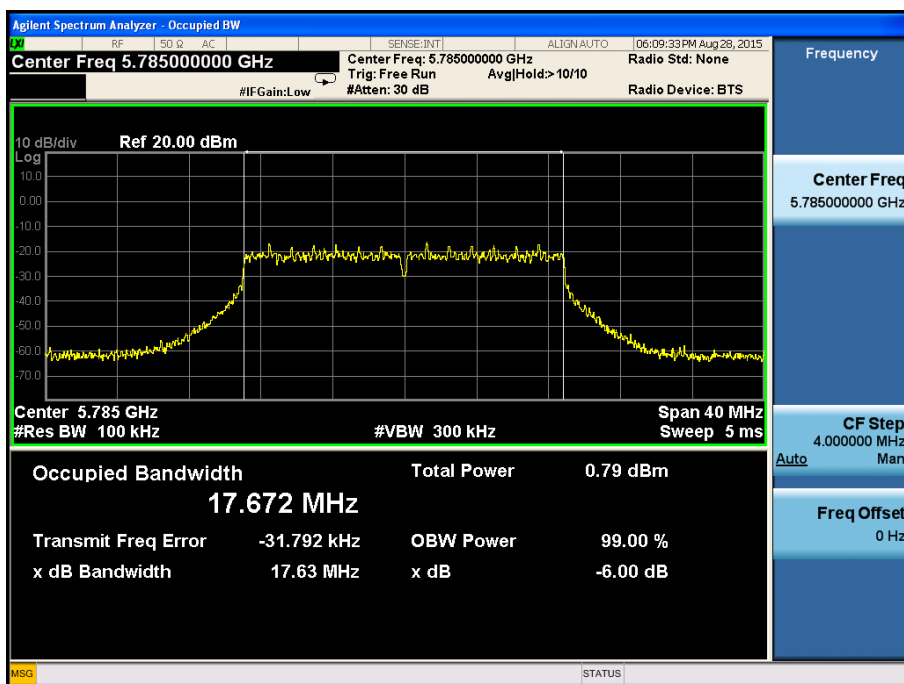
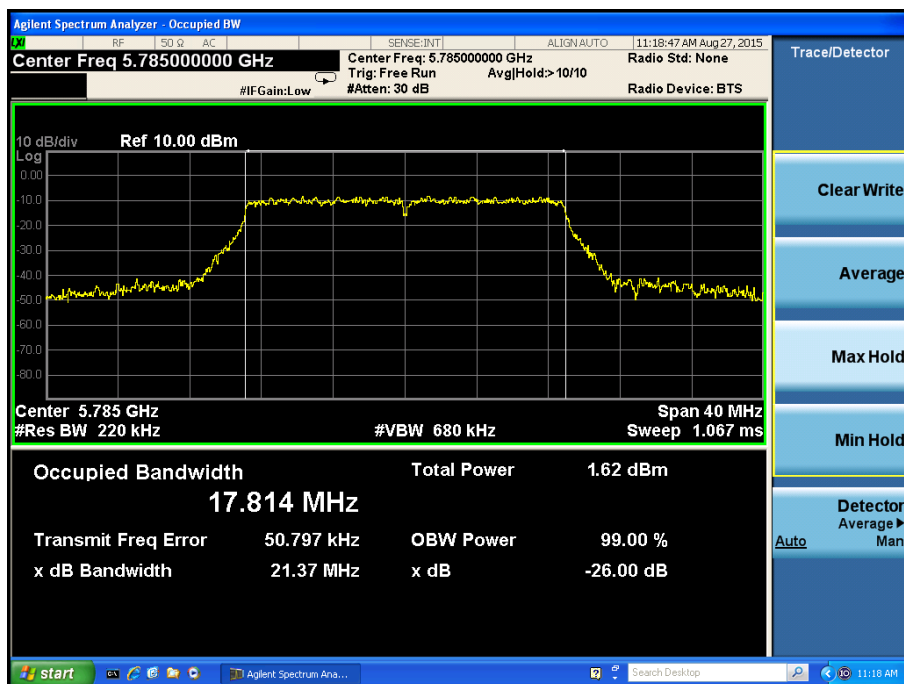
5240MHz



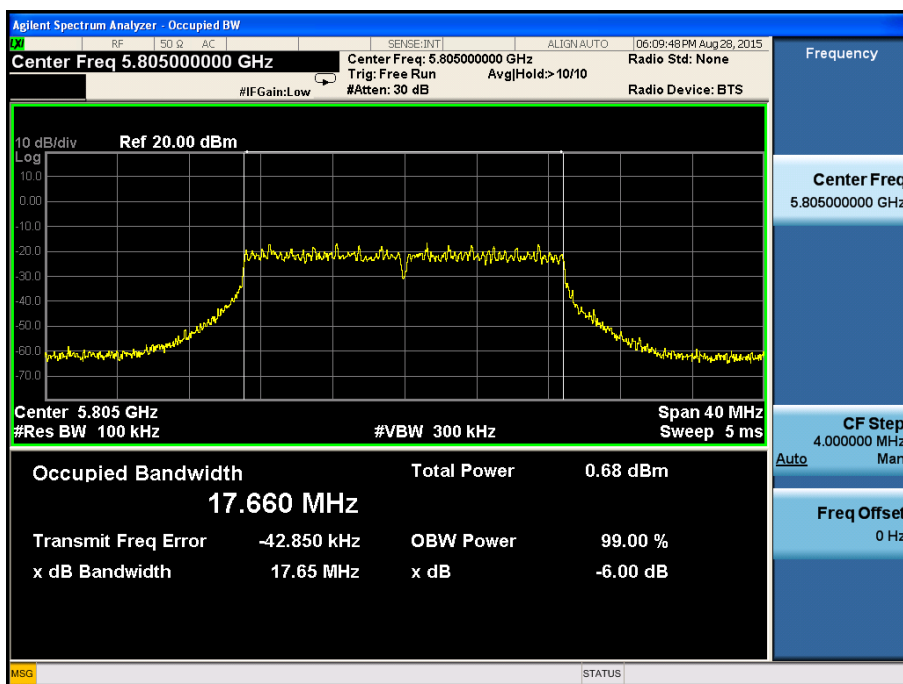
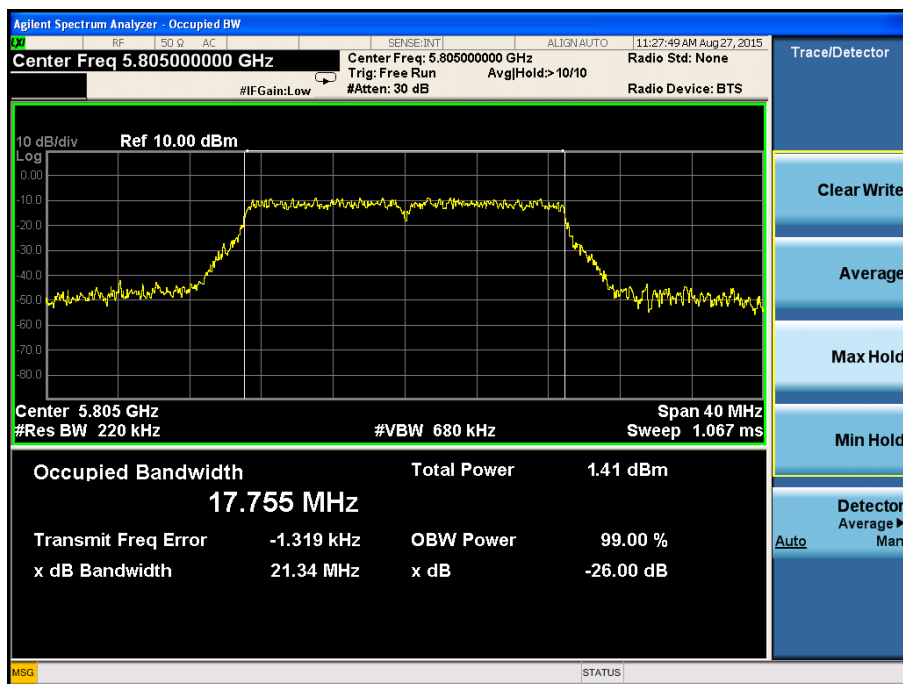
5745MHz



5785MHz

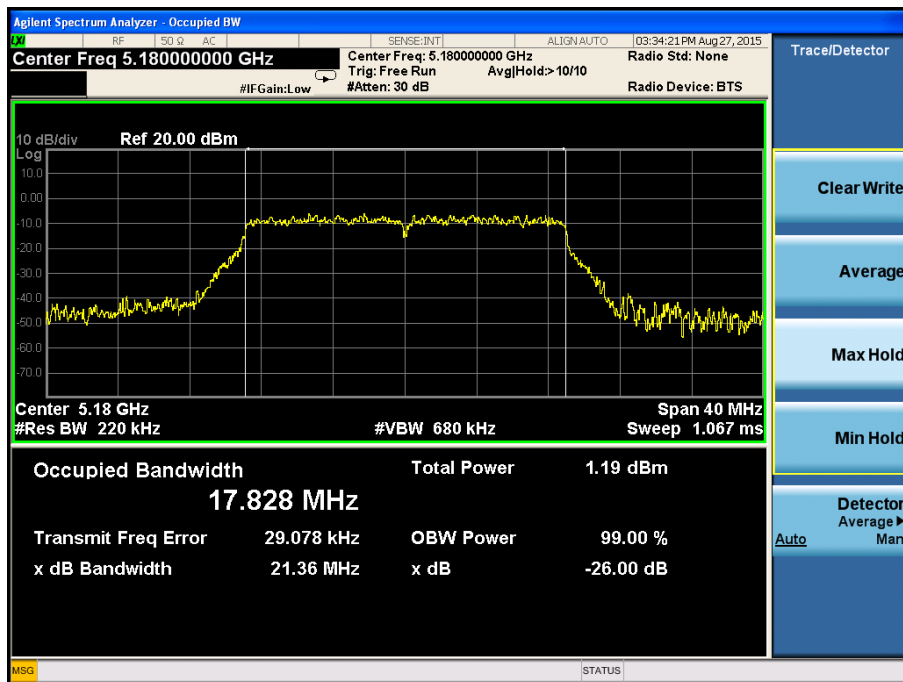


5805MHz

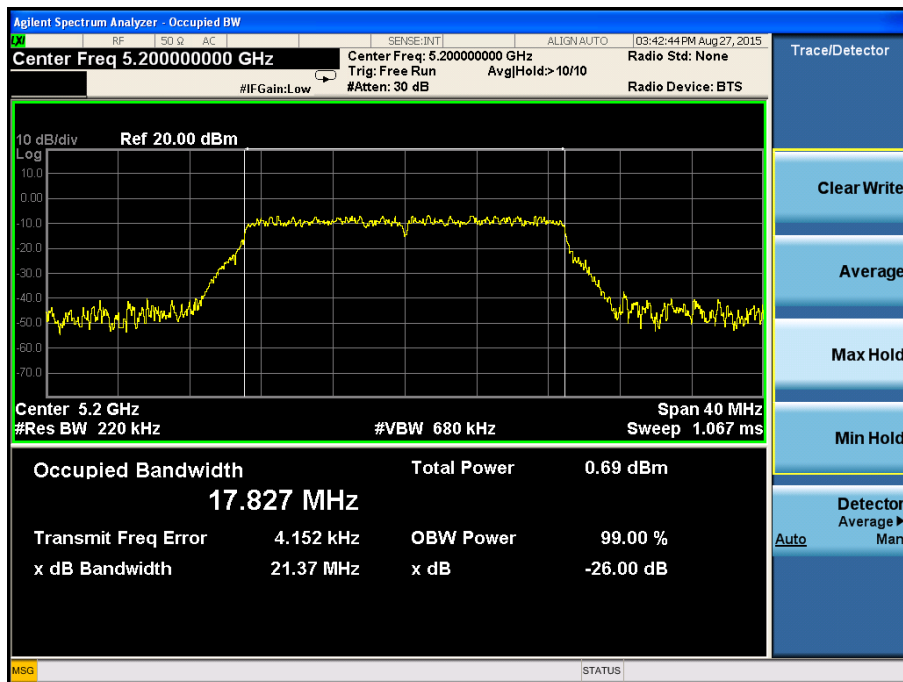


Test mode: 802.11ac-HT20

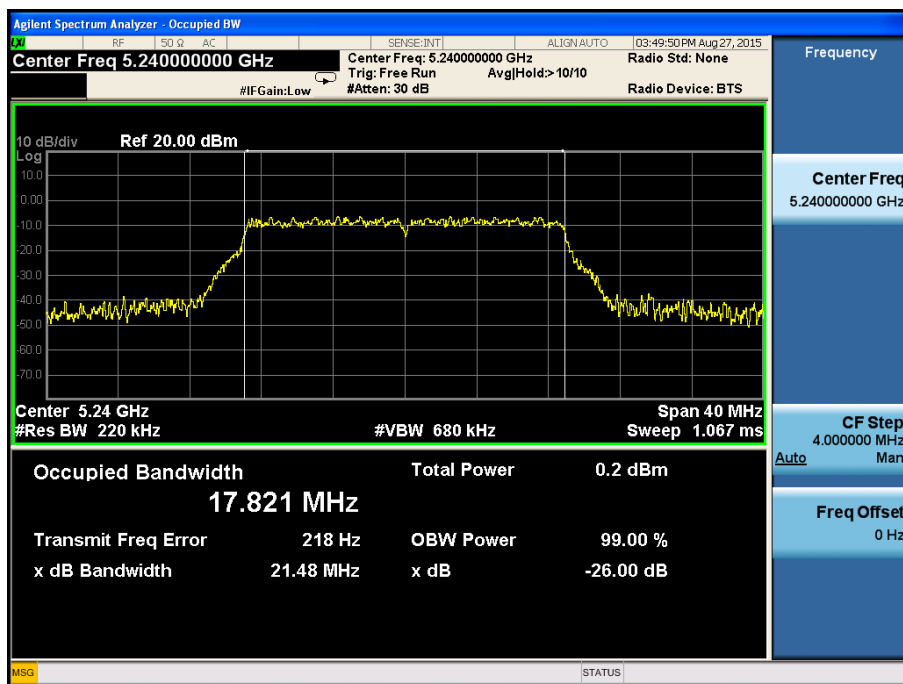
5180MHz



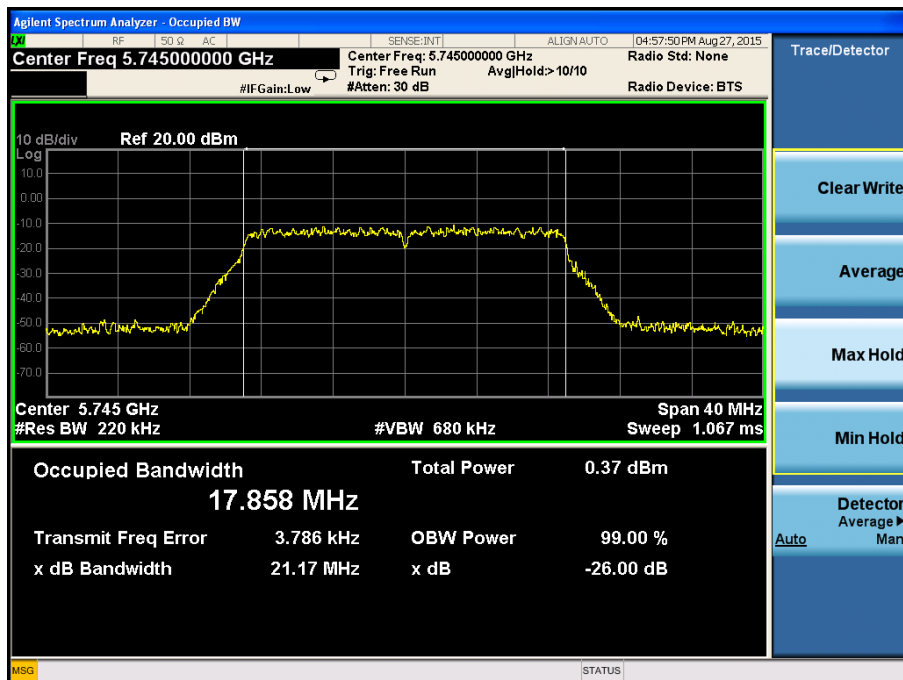
5200MHz

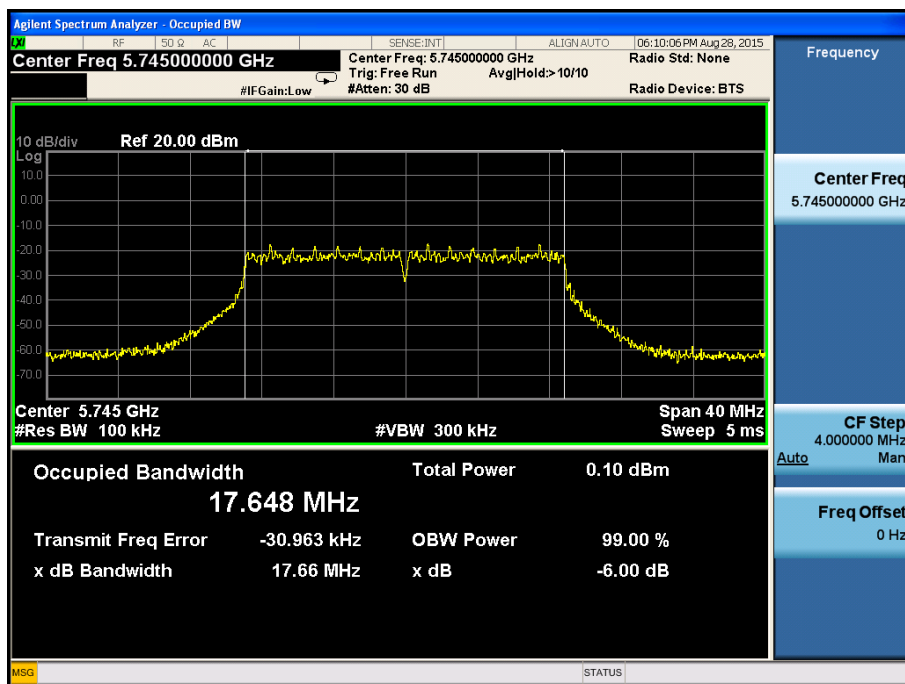


5240MHz

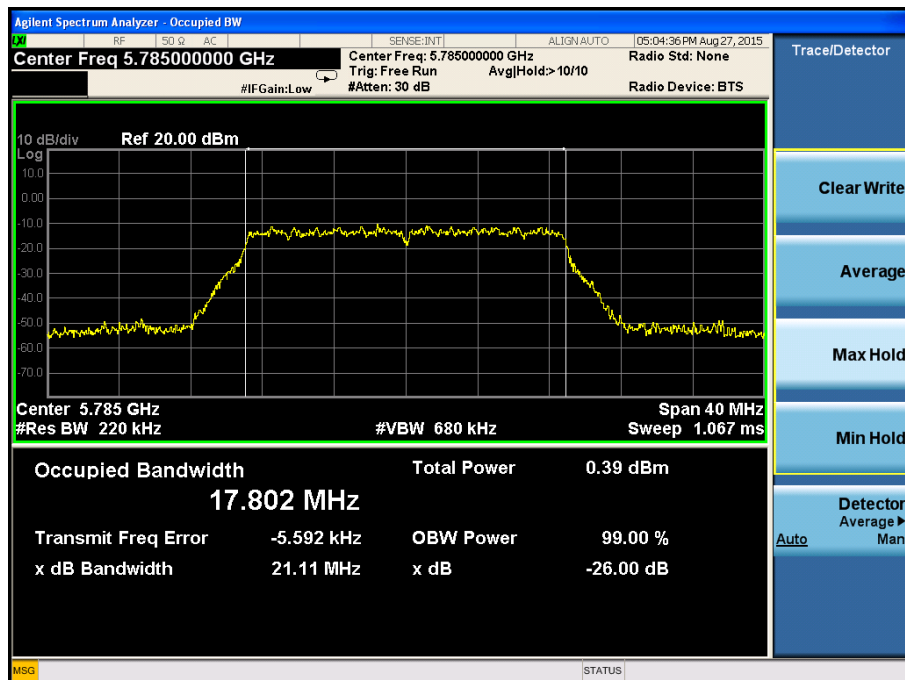


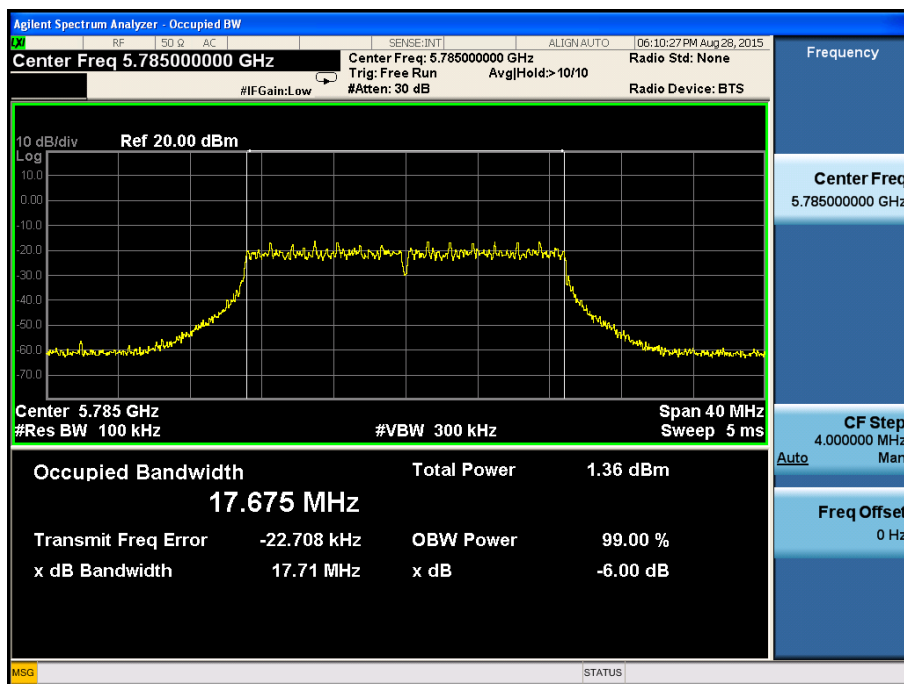
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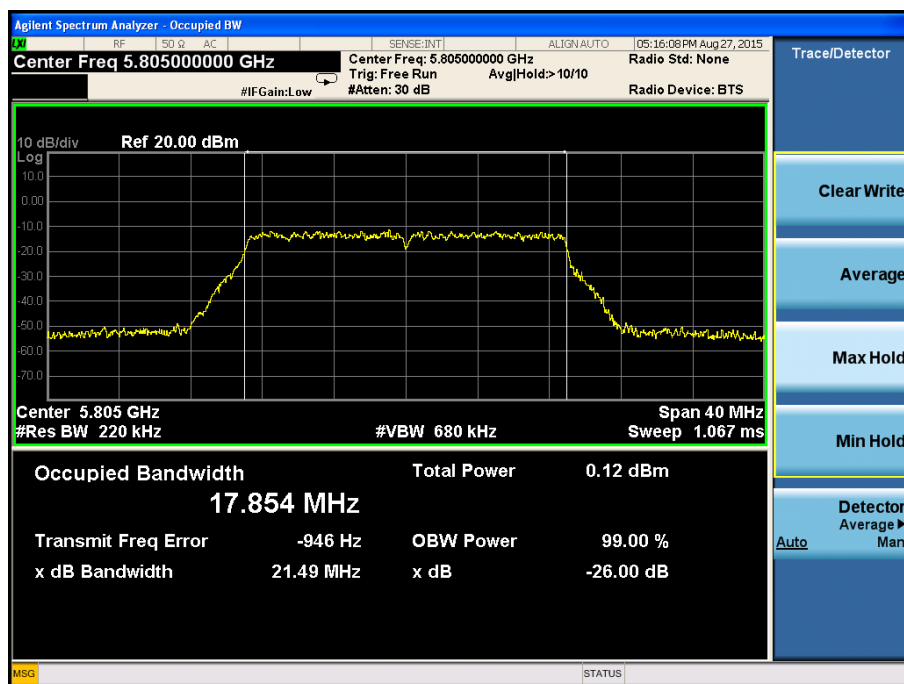


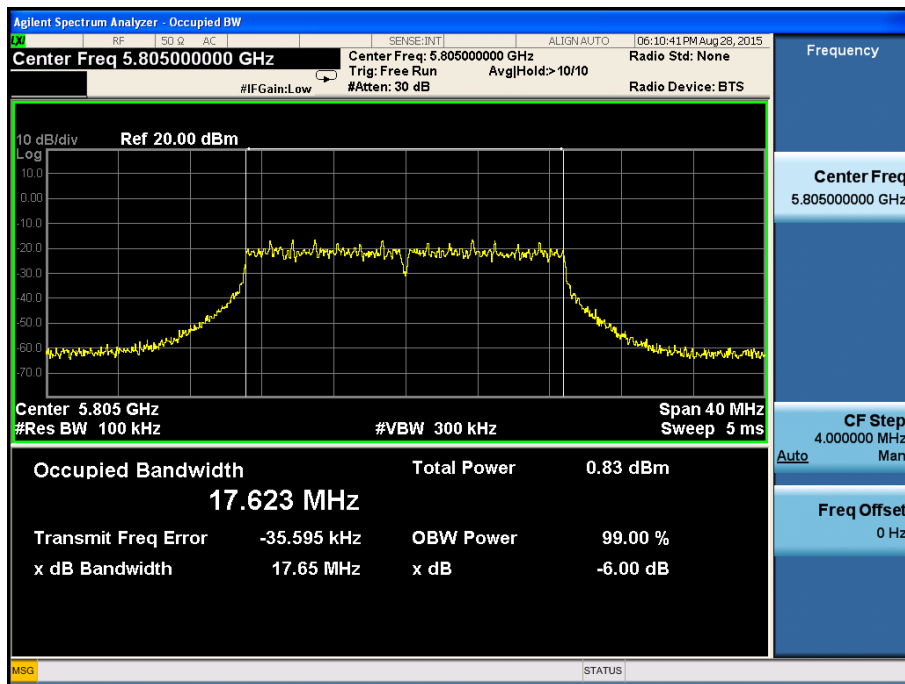
5785MHz





5805MHz





8. Maximum Conducted Output Power

8.1 Standard Applicable

According to 15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

8.2 Test Procedure

According to KDB789033 D02 v01 section E, the following is the measurement procedure.

- (i) Set span to encompass the entire emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
- (ii) Set RBW = 1 MHz.
- (iii) Set VBW ≥ 3 MHz.
- (iv) Number of points in sweep $\geq 2 \text{ Span} / \text{RBW}$. (This ensures that bin-to-bin spacing is $\leq \text{RBW}/2$, so that narrowband signals are not lost between frequency bins.)
- (v) Sweep time = auto.

- (vi) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
- (vii) If transmit duty cycle < 98 percent, 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 $\geq$ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
- (viii) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- (ix) 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.

8.3 Environmental Conditions

Temperature:	26° C
Relative Humidity:	65%
ATM Pressure:	1011 mbar

8.4 Summary of Test Results/Plots

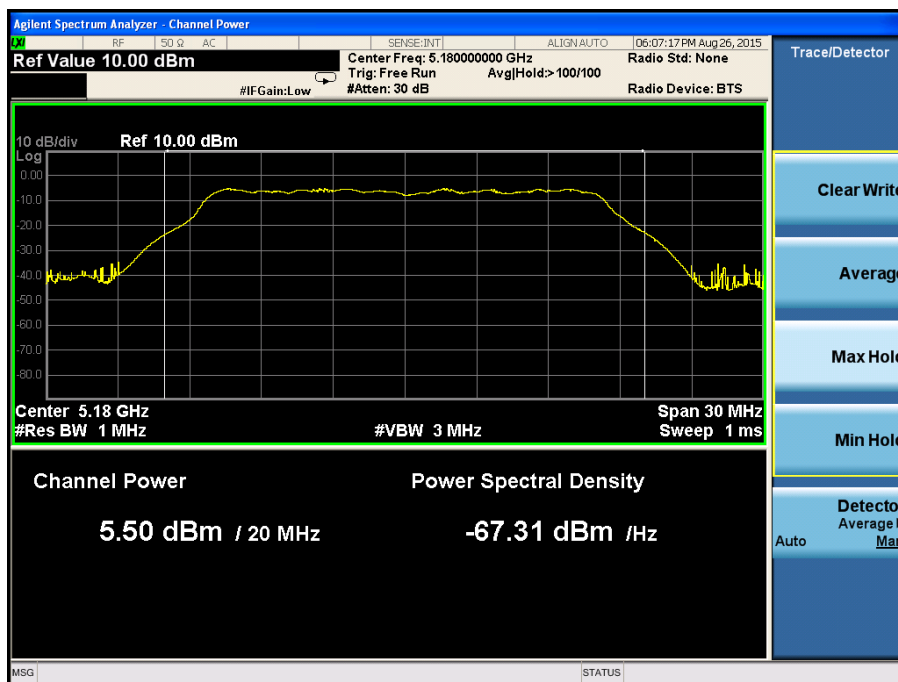
For the frequency band 5.15-5.25GHz, 5.275-5.850GHz

Test mode	Frequency MHz	Power 1 dBm	Power 2 dBm	Total Power dBm	Total Power mW	Limit mW
802.11a	5180	5.50	5.34	8.43	6.97	250
	5200	3.70	3.66	6.69	4.67	250
	5240	5.34	5.37	8.37	6.86	250
	5745	2.59	2.34	5.48	3.53	1000
	5785	2.48	2.65	5.58	3.61	1000
	5805	2.32	2.26	5.30	3.39	1000
802.11n-HT20	5180	5.13	4.95	8.05	6.38	250
	5200	4.44	4.43	7.45	5.55	250
	5240	5.17	5.37	8.28	6.73	250
	5745	3.02	2.47	5.76	3.77	1000
	5785	3.33	3.66	6.51	4.48	1000
	5805	2.45	2.49	5.48	3.53	1000
802.11ac-HT20	5180	4.83	5.32	8.09	6.44	250
	5200	4.20	4.30	7.26	5.32	250
	5240	4.68	4.46	7.58	5.73	250
	5745	0.11	0.22	2.08	3.18	1000
	5785	0.66	0.72	2.34	3.70	1000
	5805	0.38	0.62	2.24	3.51	1000

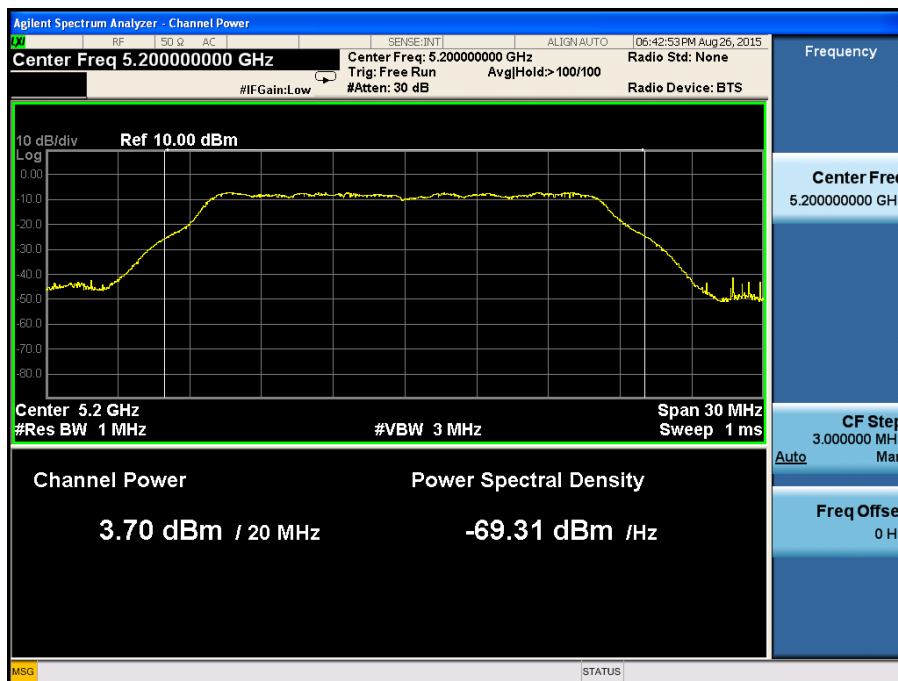
Antenna 1

Test Mode: 802.11a

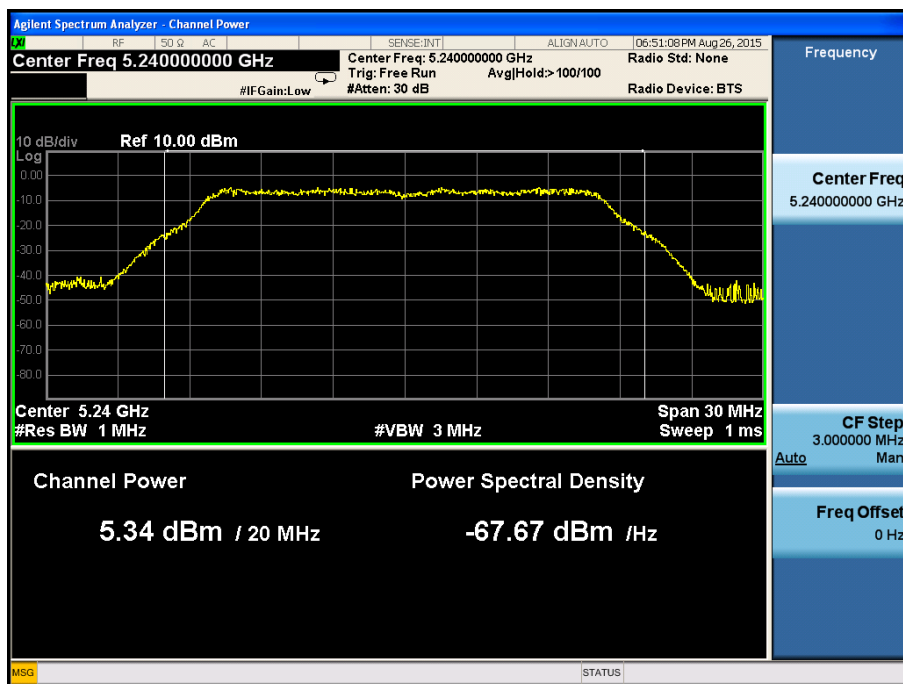
5180MHz



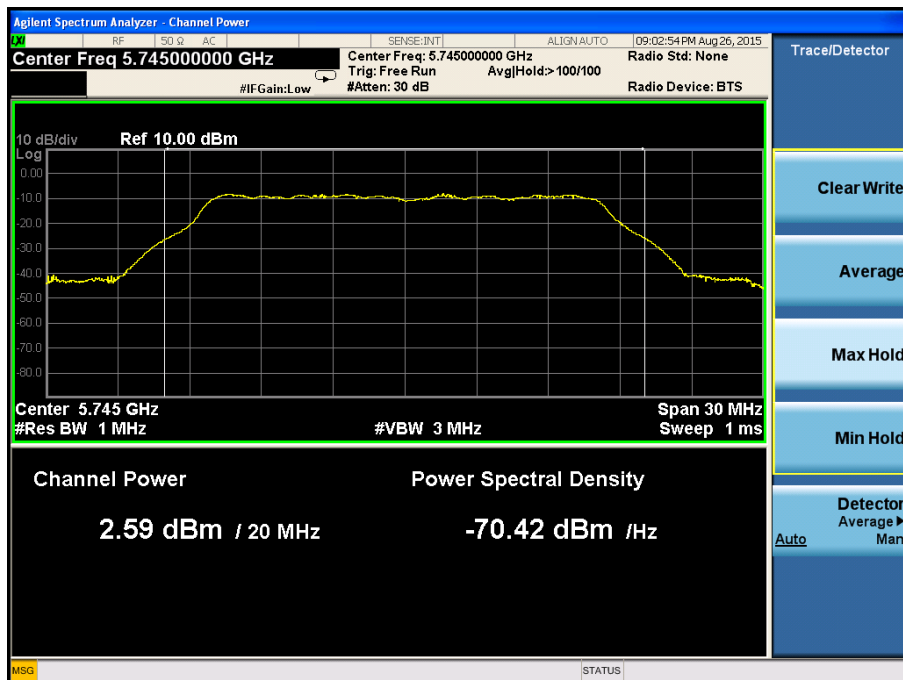
5200MHz



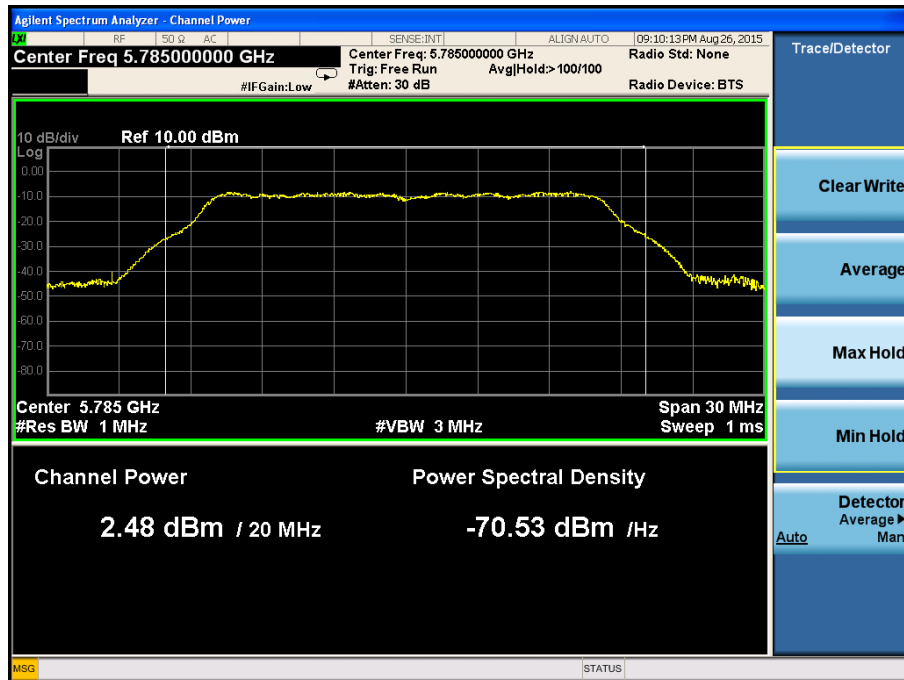
5240MHz



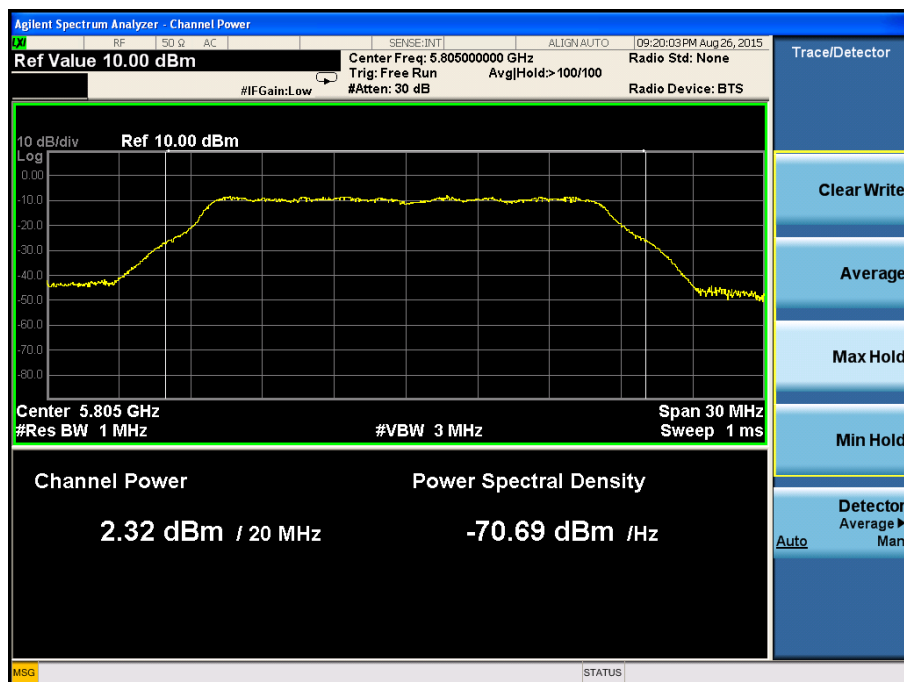
5745MHz



5785MHz

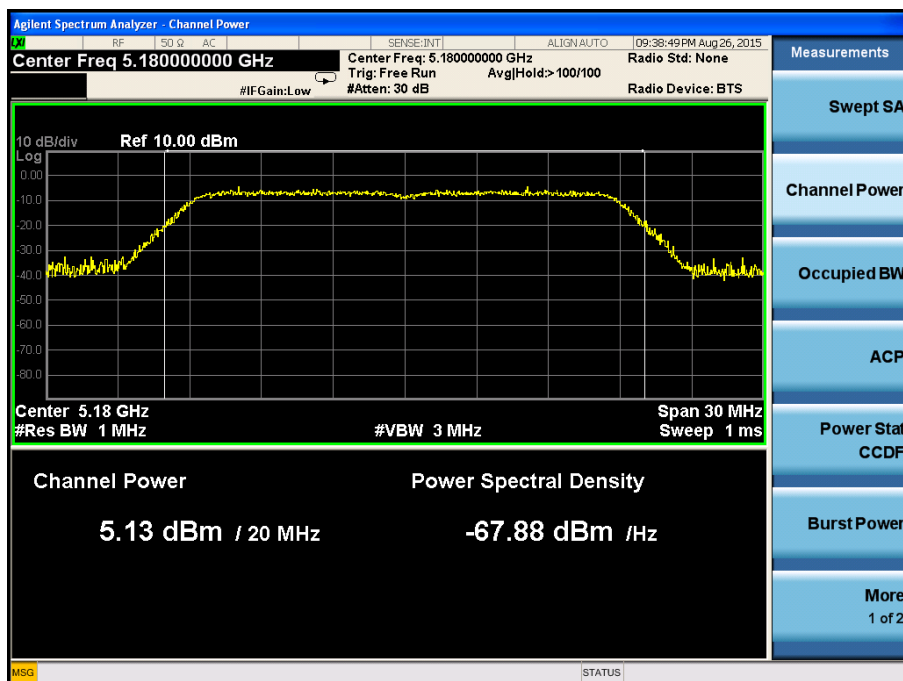


5805MHz

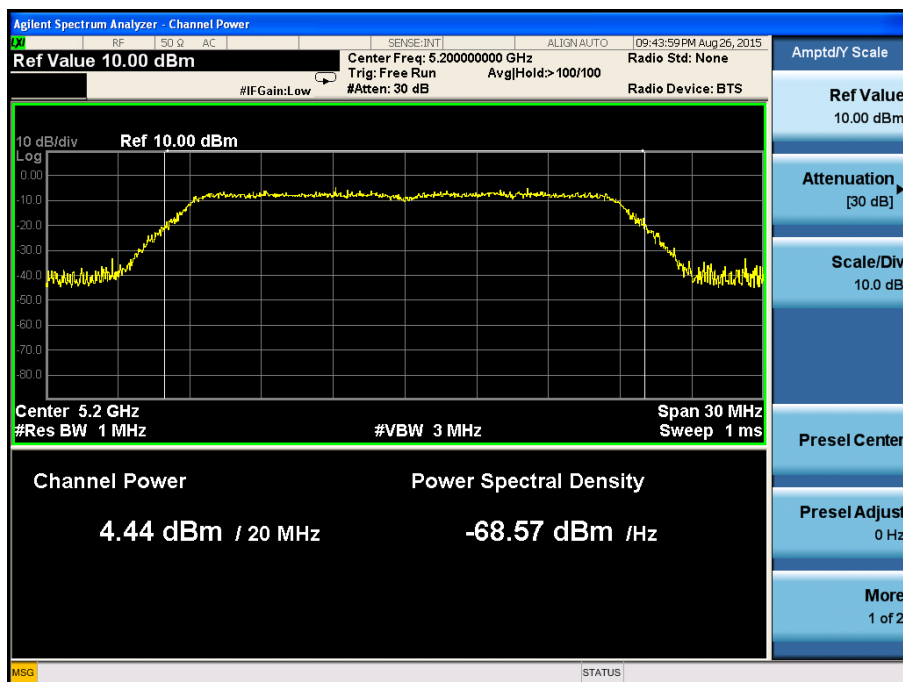


Test Mode: 802.11n-HT20

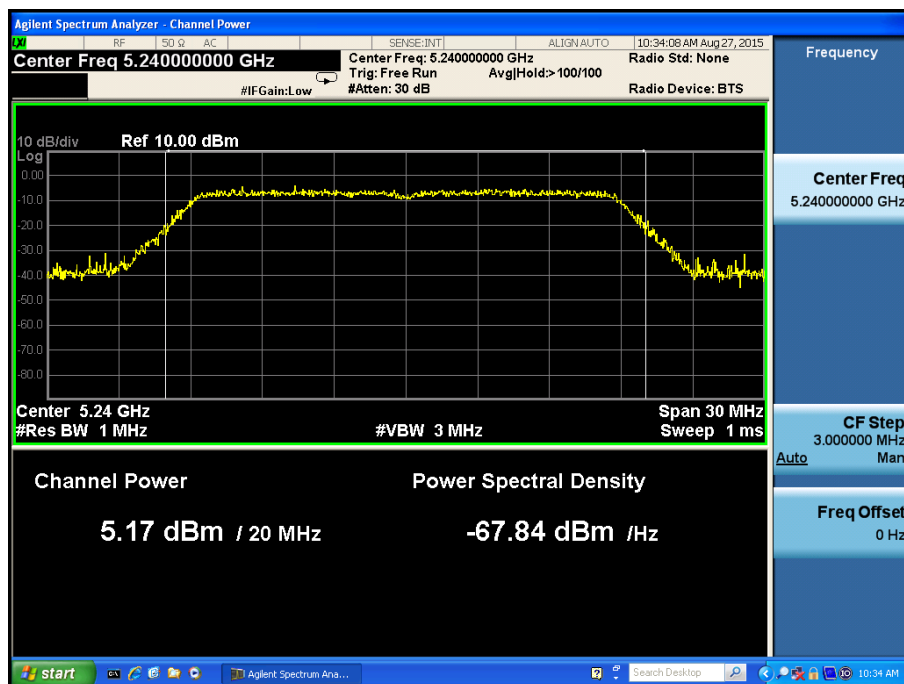
5180MHz



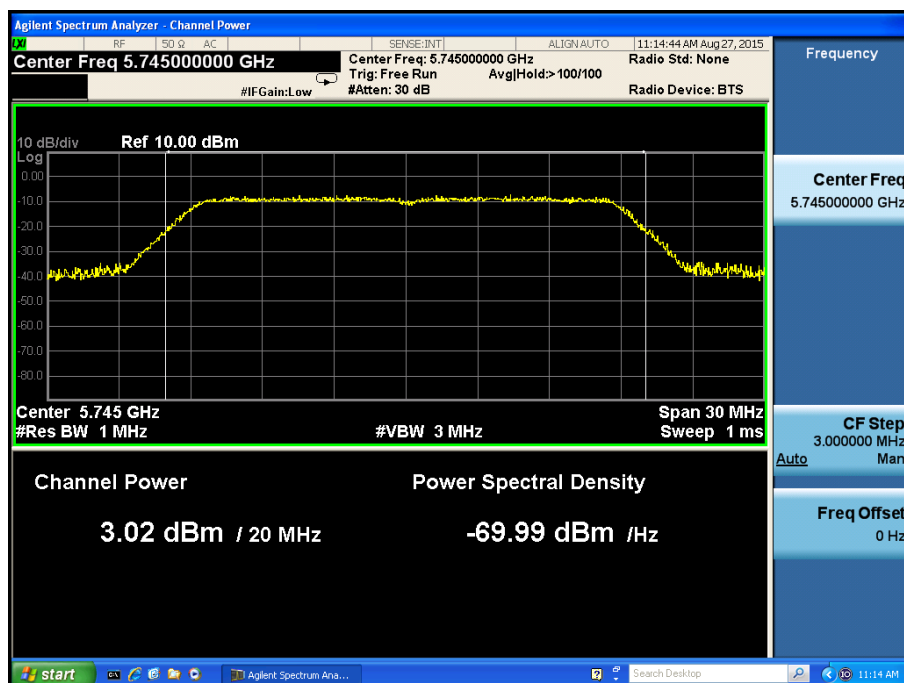
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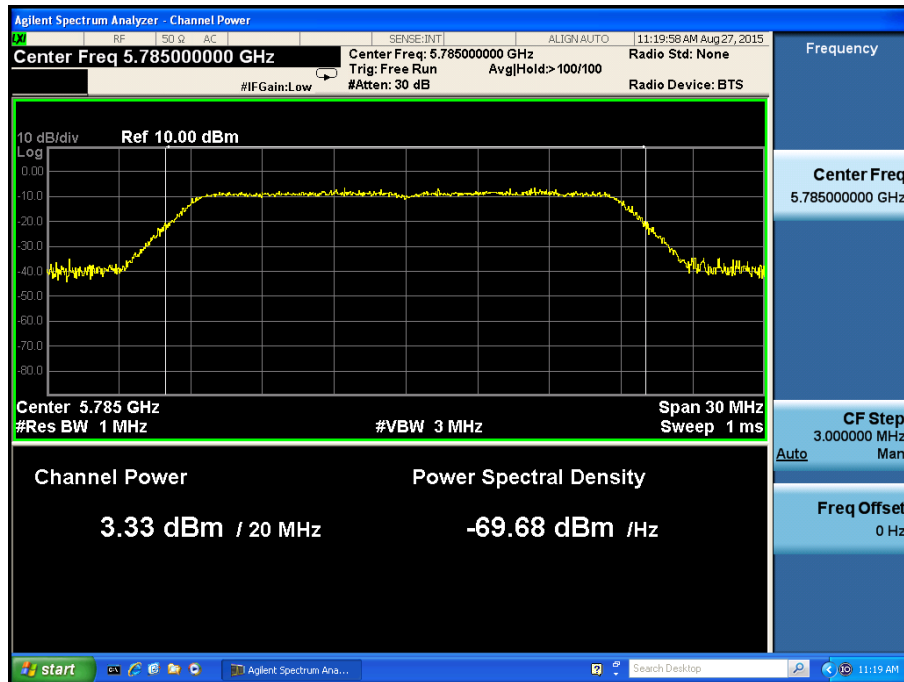
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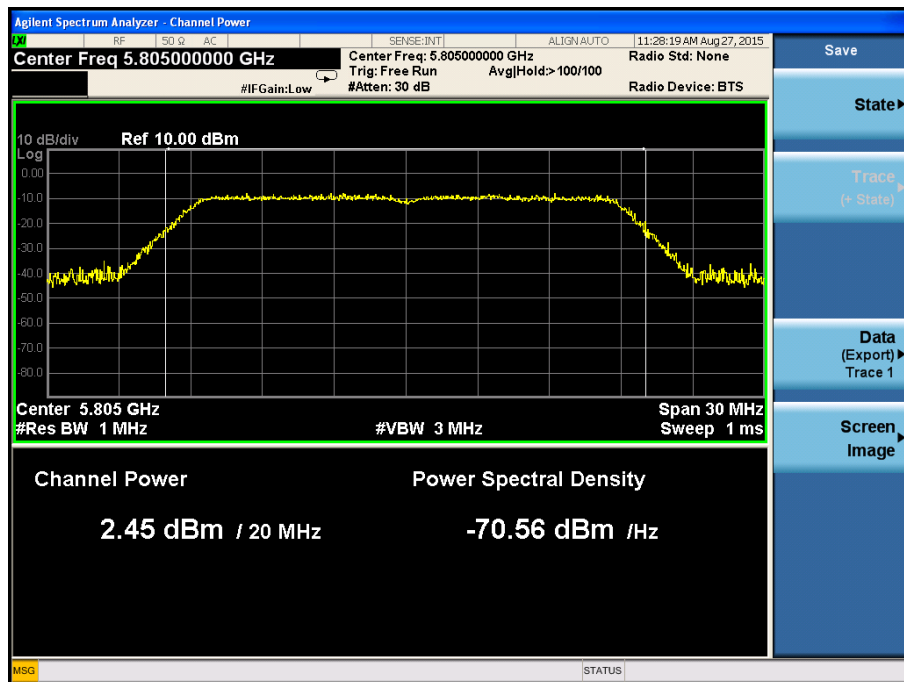
5745MHz



5785MHz

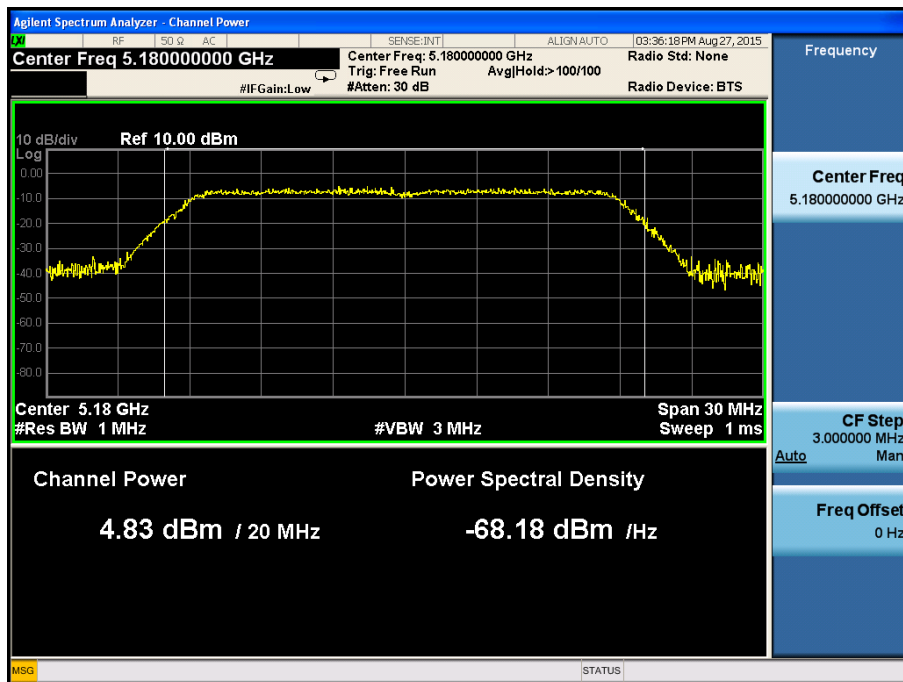


5805MHz

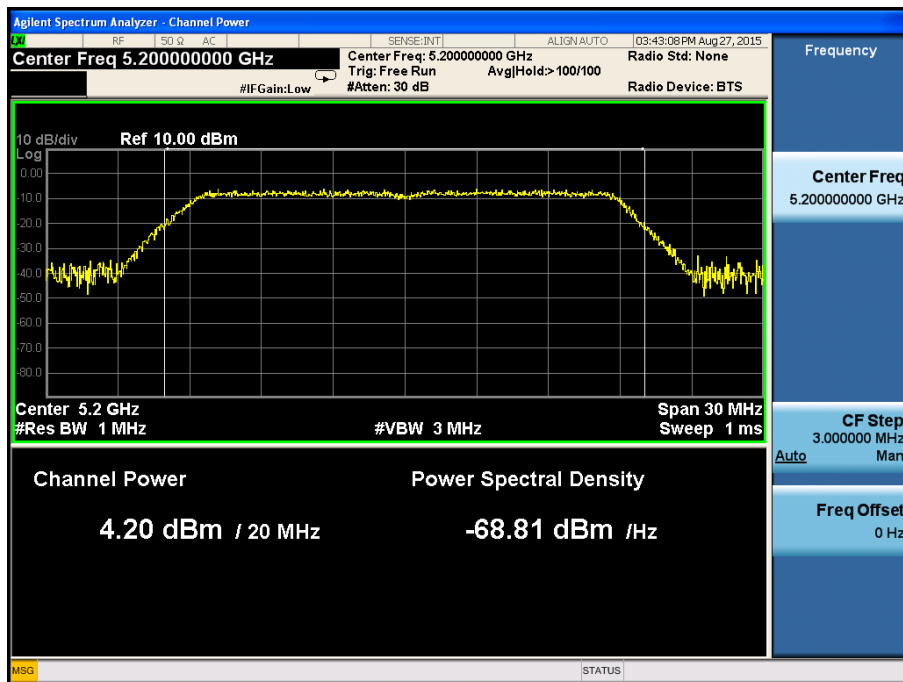


Test Mode: 802.11ac-HT20

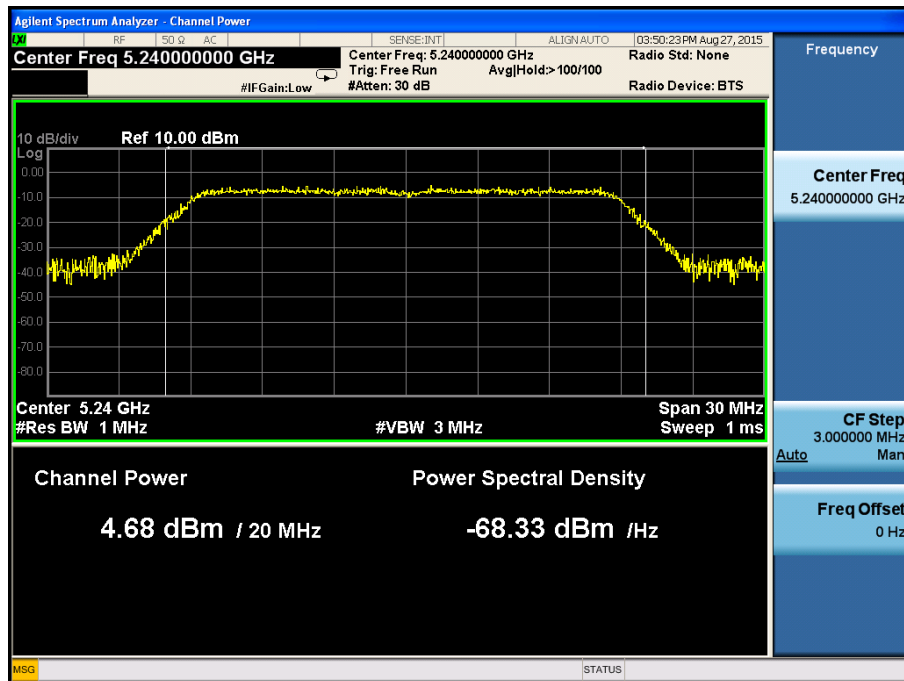
5180MHz



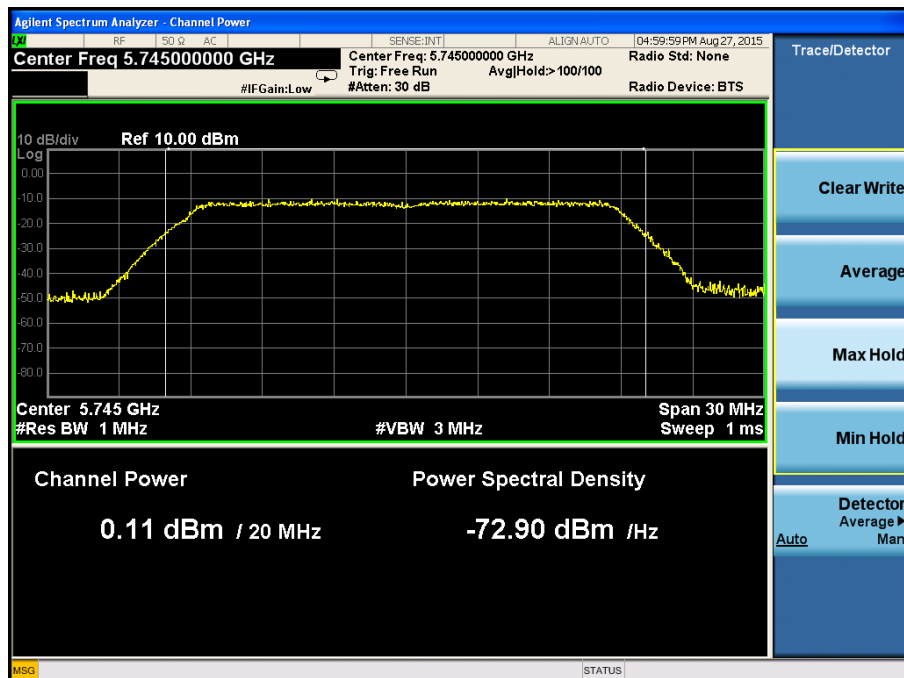
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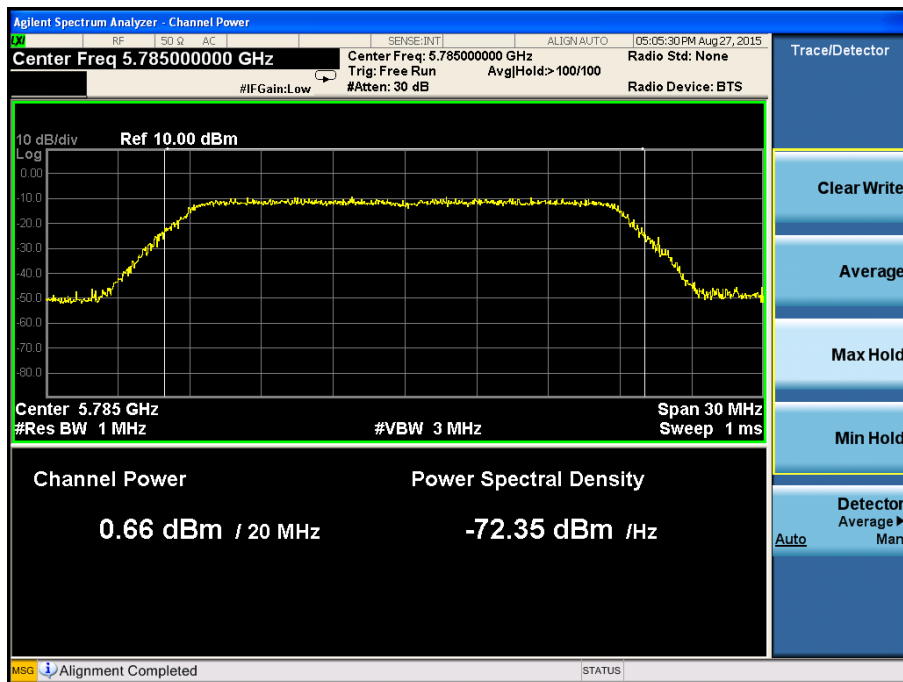
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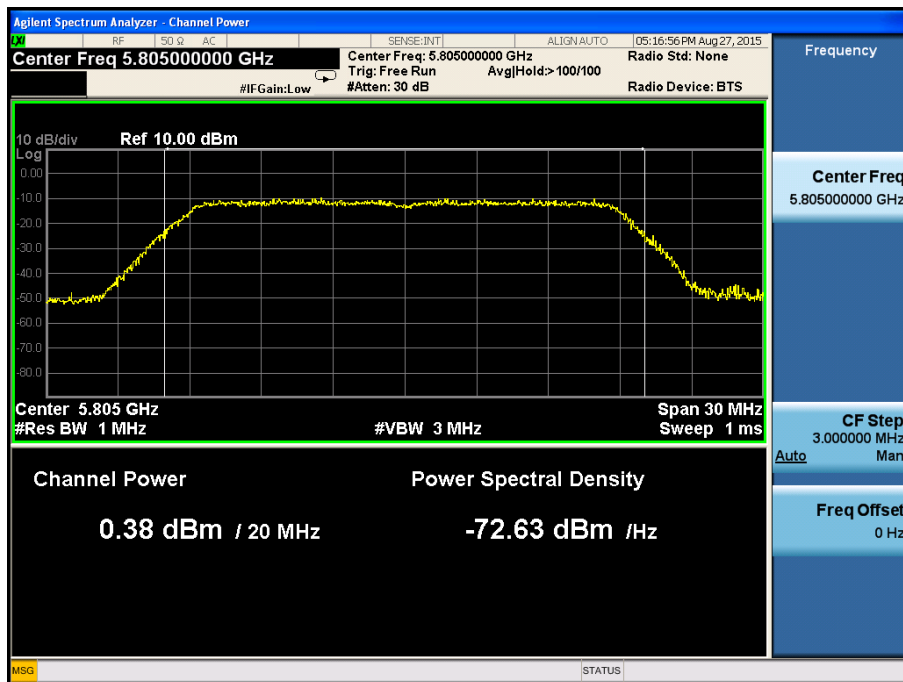
5745MHz



5785MHz



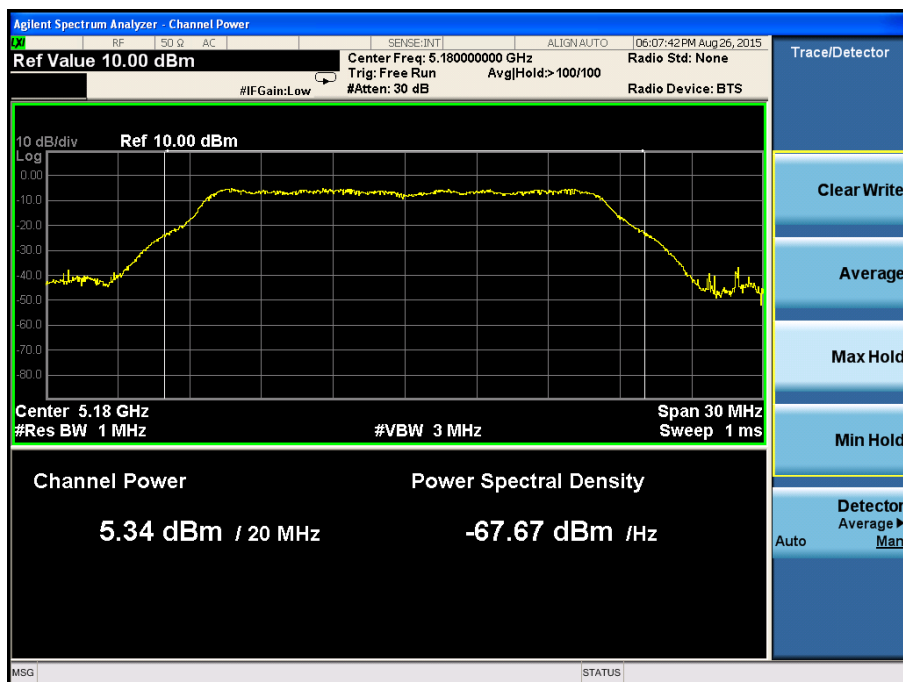
5805MHz



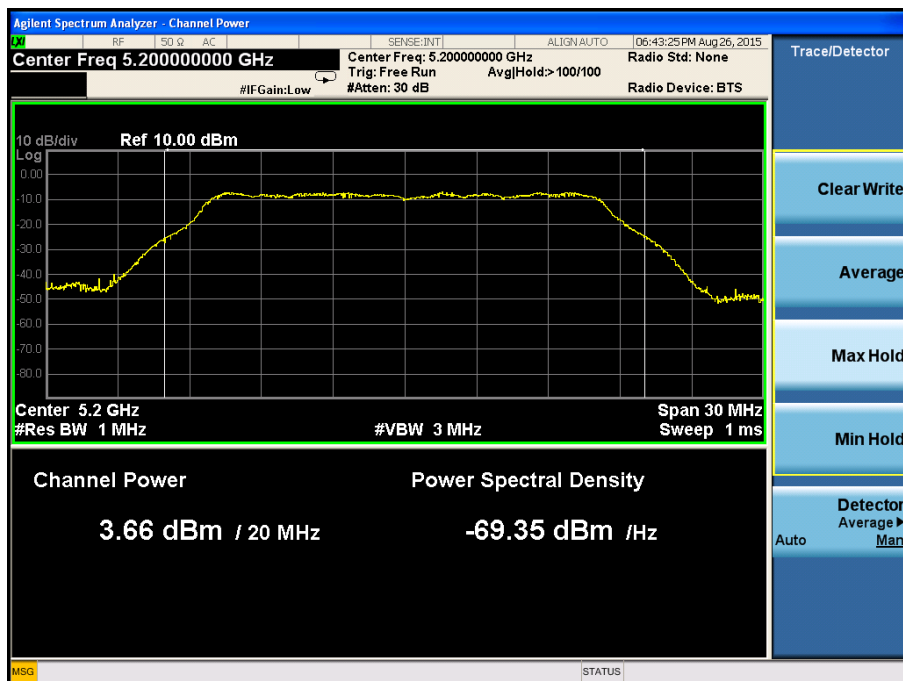
Antenna 2

Test Mode: 802.11a

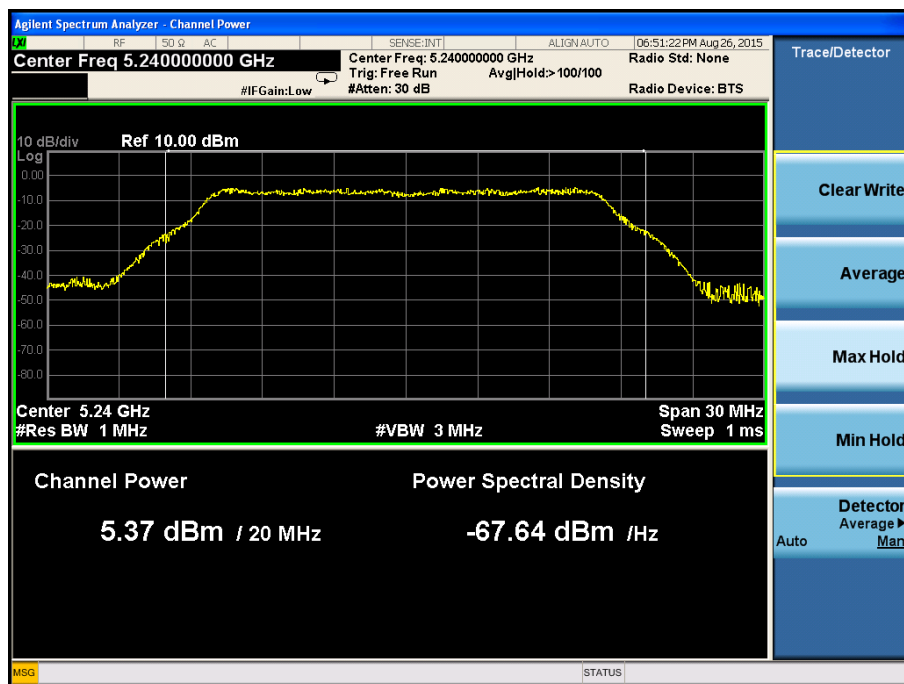
5180MHz



5200MHz



5320MHz



5745MHz

