

FCC Part 15E

Measurement and Test Report

For

Hui Zhou Gaoshengda Technology Co.,LTD

NO.75 Zhongkai Development Area, Huizhou, Guangdong, China

FCC ID:2AC23- WT31M2311A

FCC Rule(s):	<u>FCC Part 15E</u>	
Product Description:	<u>WIFI Module</u>	
Tested Model:	<u>WT31M2311A</u>	
Report No.:	<u>FCC-ATL20161118886-2</u>	
Issued Date:	<u>2016-12-09</u>	
Tested By:	<u>Si feifei / Engineer</u>	<i>Si feifei</i>
Reviewed By:	<u>Xie Lingling / EMC Manager</u>	<i>Xie Lingling</i>
Approved & Authorized By:	<u>Xu Peng / PSQ Manager</u>	<i>Xu Peng</i>
Prepared By:	Shenzhen ATL Testing Technology Co., Ltd. F/4, Building 10, Dayuan Industrial Zone, Xili Town, Nanshan District, Shenzhen, China (518055) Tel.: +86-0755-26909822 Fax.: +86-0755-61605504 Website: www.atllab.org	

Note: This report shall not be reproduced except in full, without the written approval of Shenzhen ATL Testing Technology Co., Ltd.. This document may be altered or revised by Shenzhen ATL Testing Technology Co., Ltd. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 EUT SETUP AND TEST MODE.....	4
1.5 TEST EQUIPMENT LIST AND DETAILS.....	4
2. SUMMARY OF TEST RESULTS	6
3. RF EXPOSURE	7
3.1 STANDARD APPLICABLE.....	7
3.2 TEST RESULT.....	7
4. ANTENNA REQUIREMENT	8
4.1 STANDARD APPLICABLE.....	8
4.2 EVALUATION INFORMATION	8
5. POWER SPECTRAL DENSITY	9
5.1 STANDARD APPLICABLE.....	9
5.2 TEST PROCEDURE.....	9
5.3 ENVIRONMENTAL CONDITIONS	10
5.4 SUMMARY OF TEST RESULTS/PLOTS	10
6. EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH.....	29
6.1 STANDARD APPLICABLE.....	29
6.2 TEST PROCEDURE.....	29
6.3 ENVIRONMENTAL CONDITIONS	31
6.4 SUMMARY OF TEST RESULTS/PLOTS	31
7. MAXIMUM CONDUCTED OUTPUT POWER.....	57
7.1 STANDARD APPLICABLE.....	57
7.2 TEST PROCEDURE.....	57
7.3 TEST SETUP.....	58
7.4 ENVIRONMENTAL CONDITIONS	58
7.4 SUMMARY OF TEST RESULTS/PLOTS	58
8. CONDUCTED SPURIOUS EMISSIONS	60
8.1 STANDARD APPLICABLE.....	60
8.2 TEST PROCEDURE.....	60
8.3 ENVIRONMENTAL CONDITIONS	60
8.4 SUMMARY OF TEST RESULTS/PLOTS	60
9. RADIATED SPURIOUS EMISSIONS.....	87
9.1 MEASUREMENT UNCERTAINTY	87
9.2 STANDARD APPLICABLE.....	87
9.3 TEST PROCEDURE.....	87
9.4 TEST RECEIVER SETUP	88
9.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	88
9.6 ENVIRONMENTAL CONDITIONS	88
9.7 SUMMARY OF TEST RESULTS/PLOTS	88
10. FREQUENCY STABILITY	146
10.1 STANDARD APPLICABLE.....	146
10.2 TEST PROCEDURE.....	146
10.3 ENVIRONMENTAL CONDITIONS	147
10.4 SUMMARY OF TEST RESULTS/PLOTS	147

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Hui Zhou Gaoshengda Technology Co.,LTD
 Address of applicant: NO.75 Zhongkai Development Area, Huizhou, Guangdong, China
 Manufacturer: Hui Zhou Gaoshengda Technology Co.,LTD
 Address of manufacturer: NO.75 Zhongkai Development Area, Huizhou, Guangdong, China

General Description of EUT	
Product Name:	WIFI Module
Trade Name:	GSD
Model No.:	WT31M2311A
Adding Model(s):	/
Rated Voltage:	/
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT	
Wi-Fi(5G/5.8G)	
Support Standards:	802.11a , 802.11n(HT20,HT40)
Frequency Range:	5180-5240MHz, 5745-5825MHz
RF Output Power:	17.45dBm (Conducted)
Type of Modulation:	OFDM, 64-QAM,16-QAM, QPSK, BPSK, 256-QAM
Data Rate:	6-54Mbps, up to 300Mbps
Quantity of Channels:	5180 ~ 5240MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5745 ~ 5825MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
Channel Separation:	20MHz/40MHz
Type of Antenna:	PIFA Antenna
Antenna Gain:	5150-5250 MHz: 5.35 dBi 5725-5850 MHz: 5.18 dBi

1.2 Test Standards

The following report is prepared on behalf of the Hui Zhou Gaoshengda Technology Co.,LTD 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

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation.

1.4 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, 5745 MHz,5785 MHz,5825 MHz
TM2	802.11n-HT20	5180MHz,5200MHz,5240MHz, 5745 MHz,5785 MHz,5825 MHz
TM3	802.11n-HT40	5190MHz,5230MHz,5755 MHz,5795 MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Core
Notebook	Lenovo	T410	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Cable	1.0	Unshielded	Without Core

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

1.5 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
Power Sensor	Anritsu	MA2411B	1126022	2016-11-18	2017-11-17
Power Meter	Anritsu	ML2495A	1135009	2016-11-18	2017-11-17

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. Power Spectral Density

5.1 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.

5.2 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.

5.3 Environmental Conditions

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

5.4 Summary of Test Results/Plots

802.11a

5180-5240:

Channel	Channel frequency(MHz)	Chain 1 dBm/MHz	Chain 2 dBm/MHz	Total dBm/MHz	Limit (dBm/MHz)
36	5180	1.670	2.780	5.634	11
40	5200	0.523	3.292	5.134	11
48	5240	2.821	4.848	6.961	11

5745-5825:

Channel	Channel frequency(MHz)	Chain 1 dBm/500KHz	Chain 2 dBm/500KHz	Total dBm/500KHz	Limit (dBm/500KHz)
149	5745	5.896	8.886	10.653	30
157	5785	3.986	7.119	8.839	30
165	5825	3.755	7.334	8.913	30

802.11n20

5180-5240:

Channel	Channel frequency(MHz)	Chain 1 dBm/MHz	Chain 2 dBm/MHz	Total dBm/MHz	Limit (dBm/MHz)
36	5180	1.677	-0.733	3.65	11
40	5200	0.116	-1.747	2.29	11
48	5240	-0.725	-2.829	1.36	11

5745-5825:

Channel	Channel frequency(MHz)	Chain 1 dBm/500KHz	Chain 2 dBm/500KHz	Total dBm/500KHz	Limit (dBm/500KHz)
149	5745	6.571	5.495	9.076	30
157	5785	5.976	6.076	9.036	30
165	5825	5.201	5.019	8.117	30

802.11n40

5180-5240:

Channel	Channel frequency(MHz)	Chain 1 dBm/MHz	Chain 2 dBm/MHz	Total dBm/MHz	Limit (dBm/MHz)
38	5190	4.998	4.489	7.76	11
46	5230	5.394	3.969	7.74	11

5745-5825:

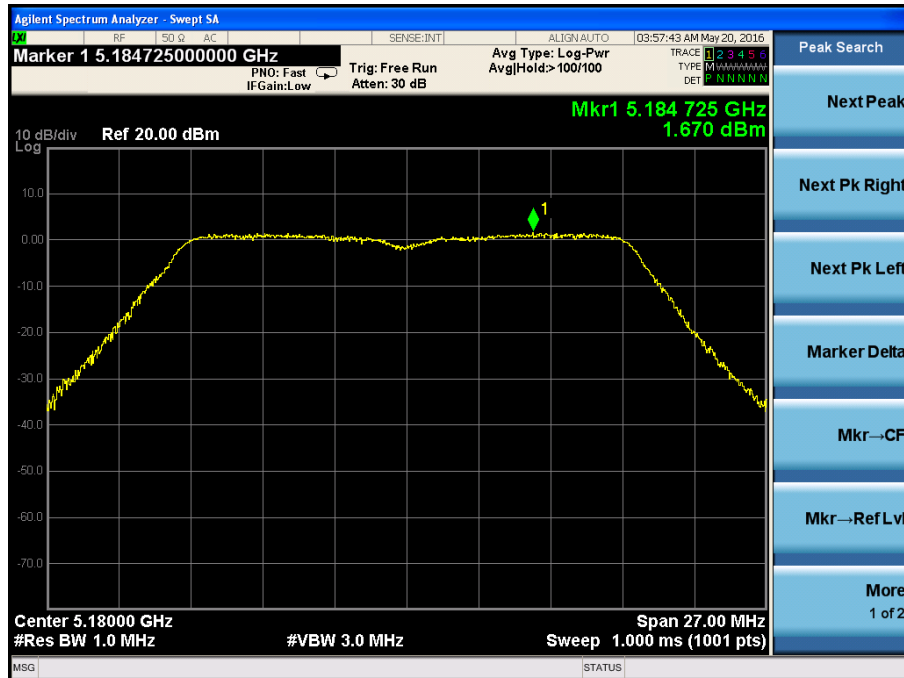
Channel	Channel frequency(MHz)	Chain 1 dBm/500KHz	Chain 2 dBm/500KHz	Total dBm/500KHz	Limit (dBm/500KHz)
151	5755	1.470	4.931	6.547	30
159	5795	0.326	2.630	4.639	30

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 ($< 500 \text{ KHz}$) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

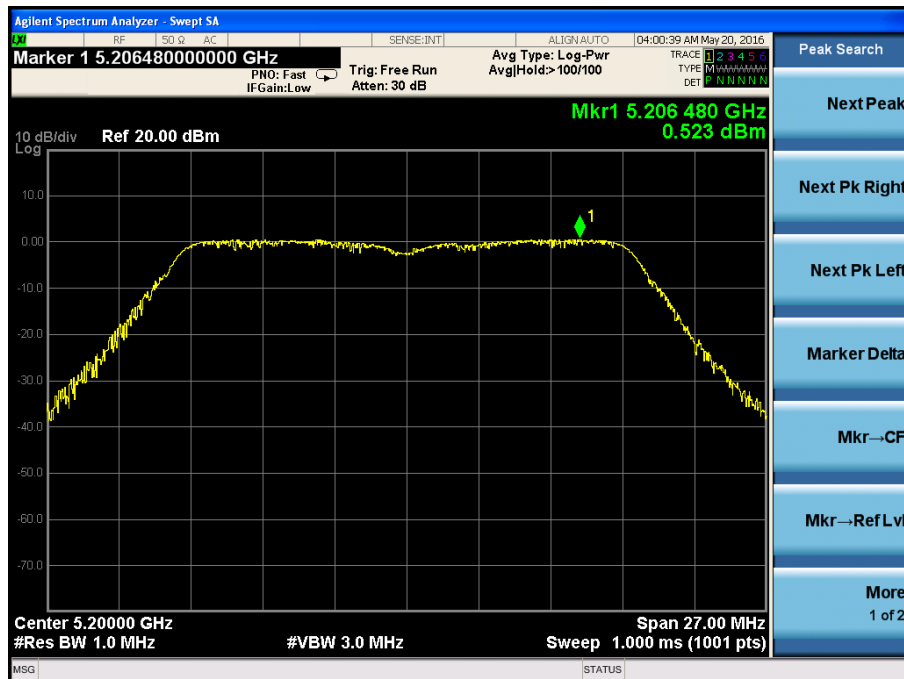
Antenna 1

Test Mode: 802.11a

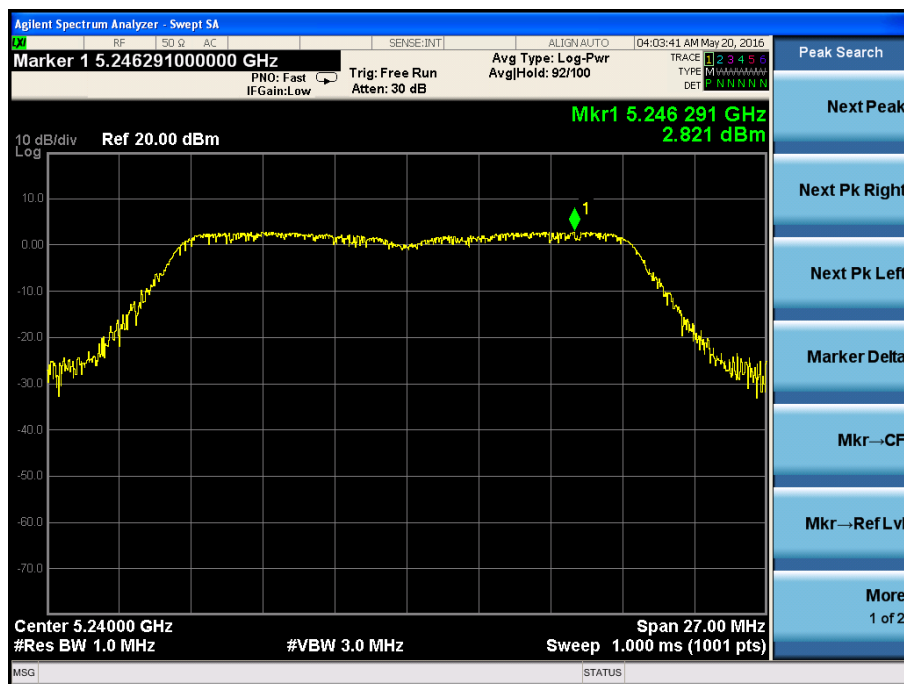
5180MHz



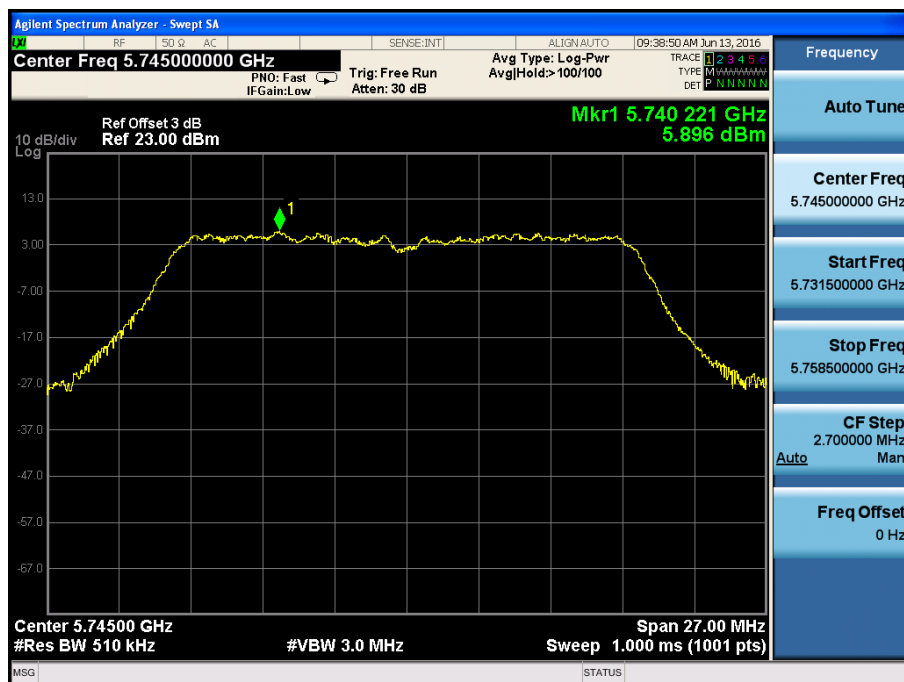
5200MHz



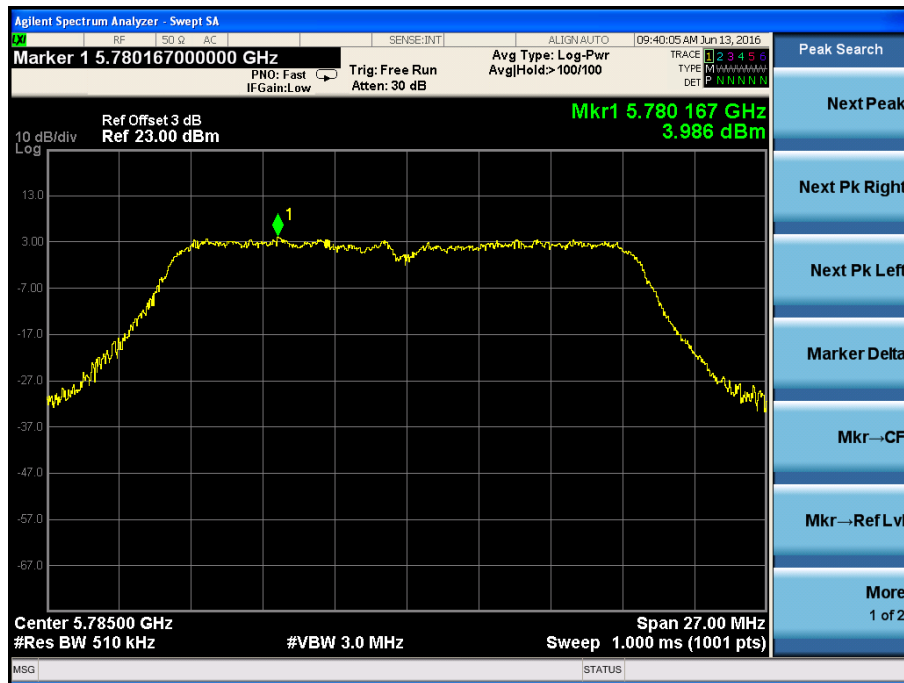
5240MHz



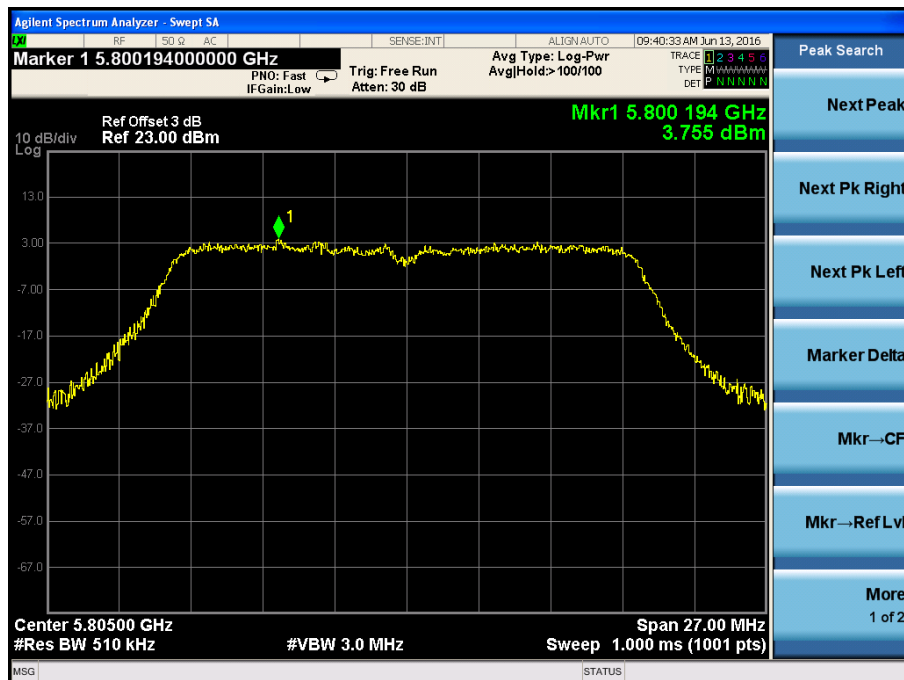
5745MHz



5785MHz

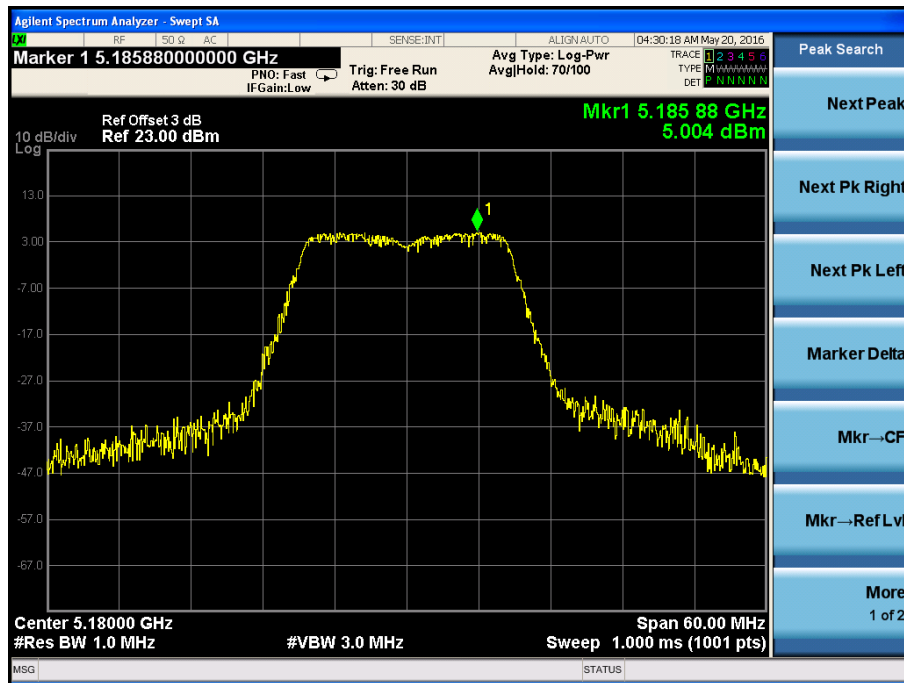


5825MHz

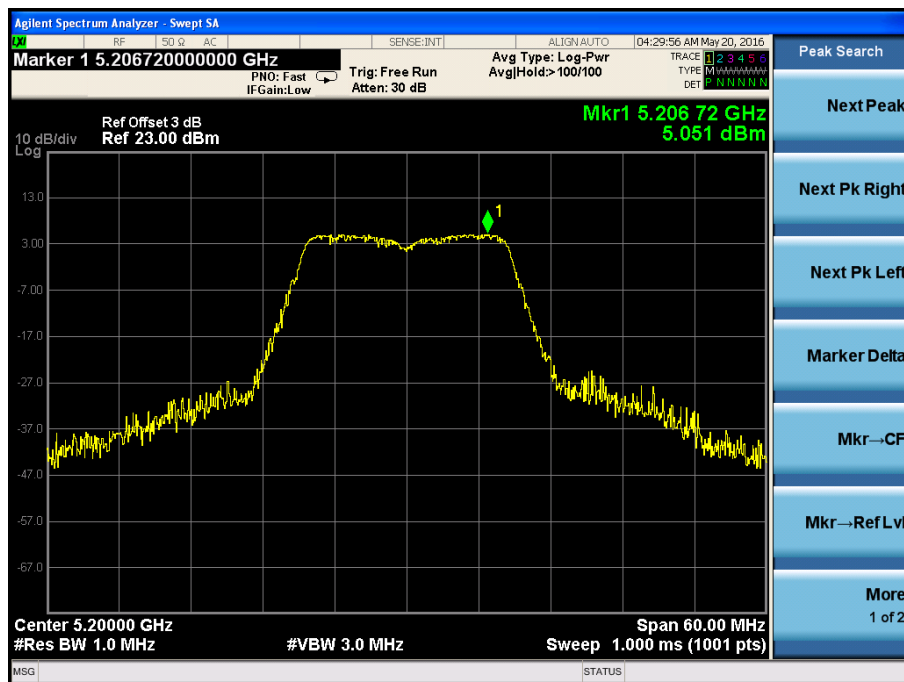


Test Mode: 802.11n20

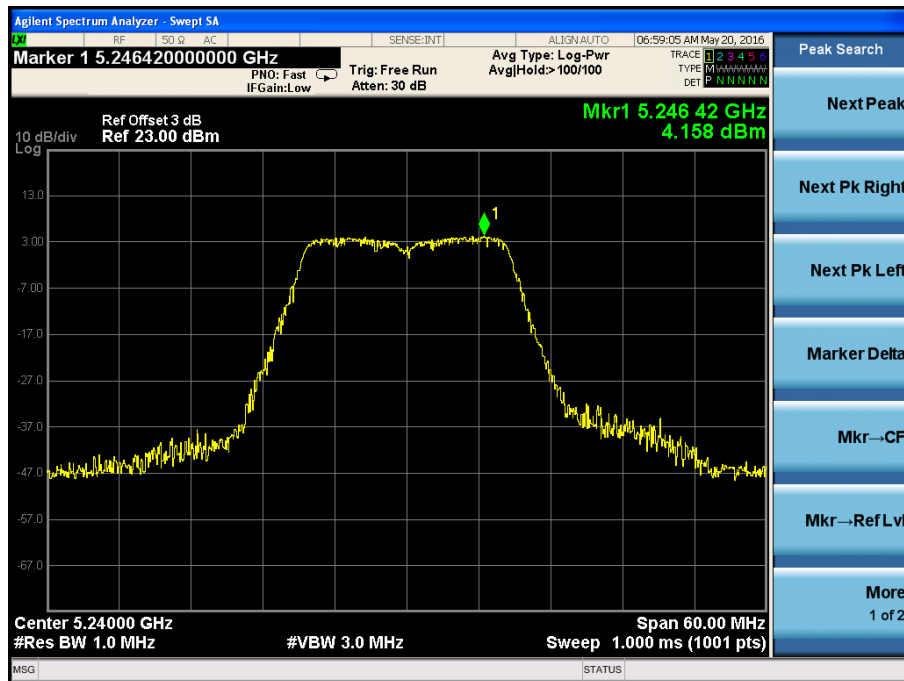
5180MHz



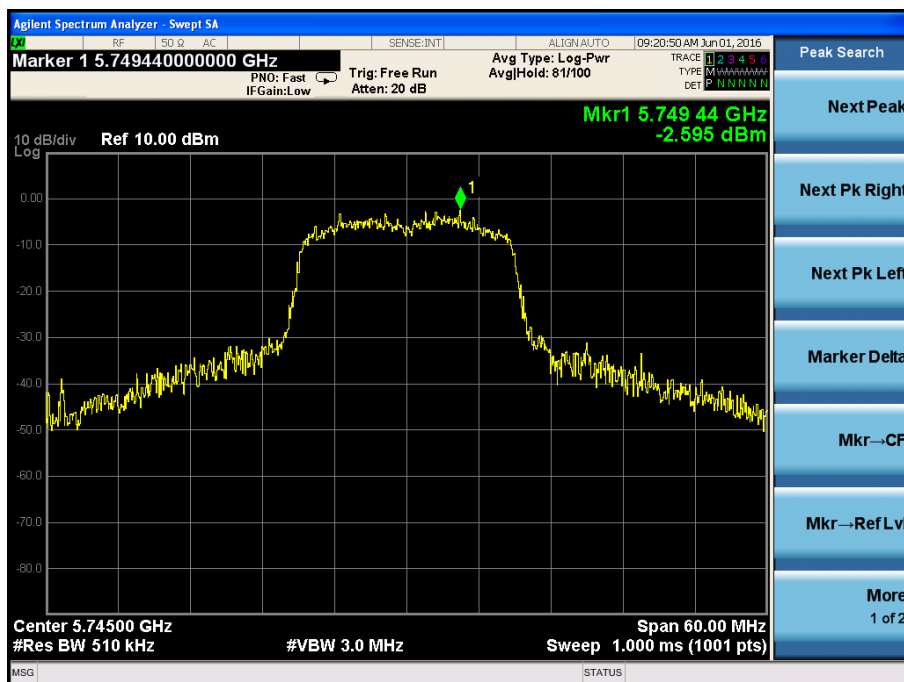
5200MHz



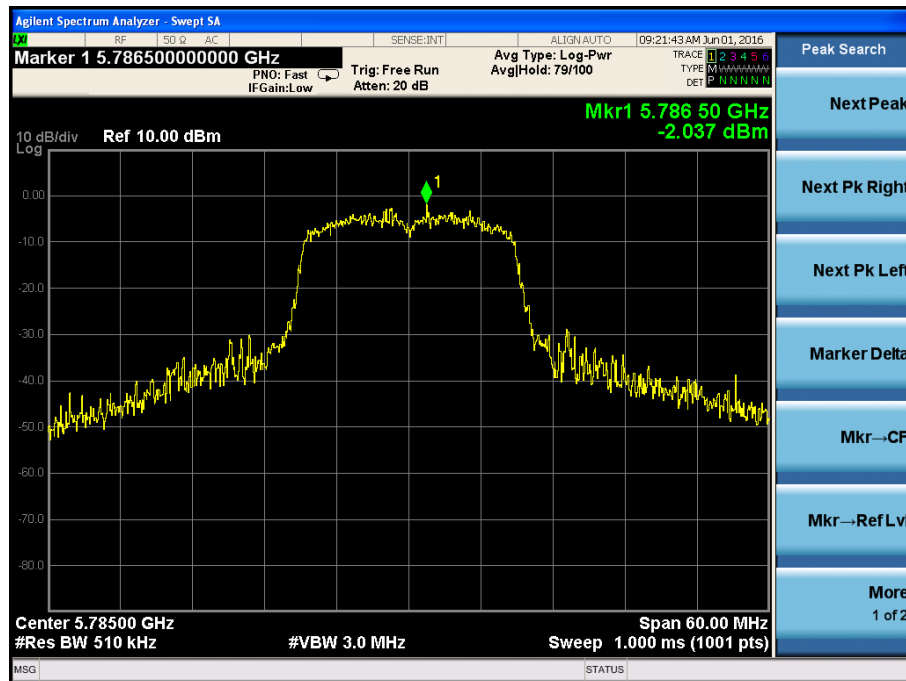
5240MHz



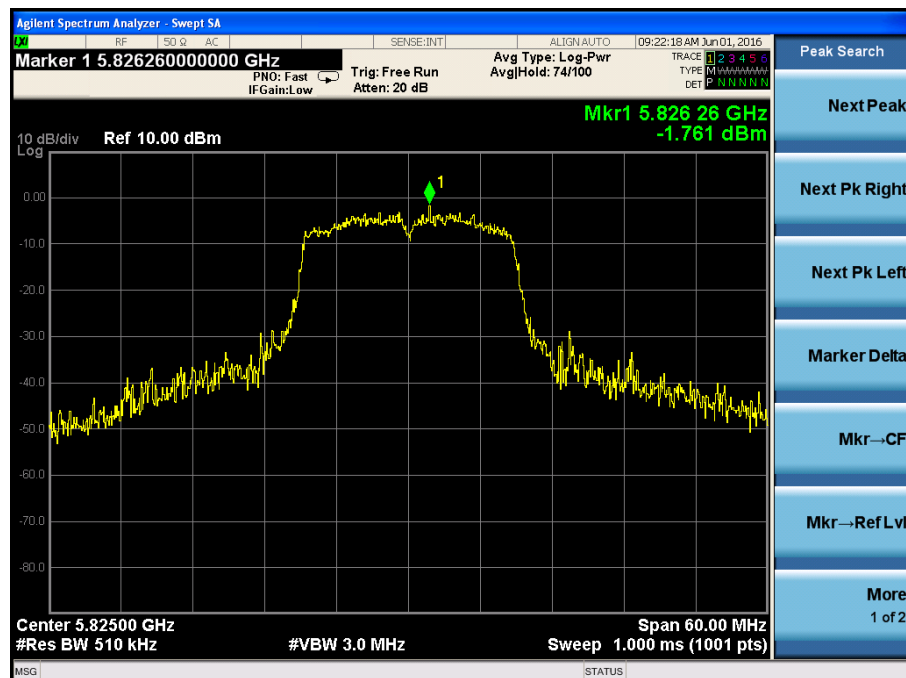
5745MHz



5785MHz

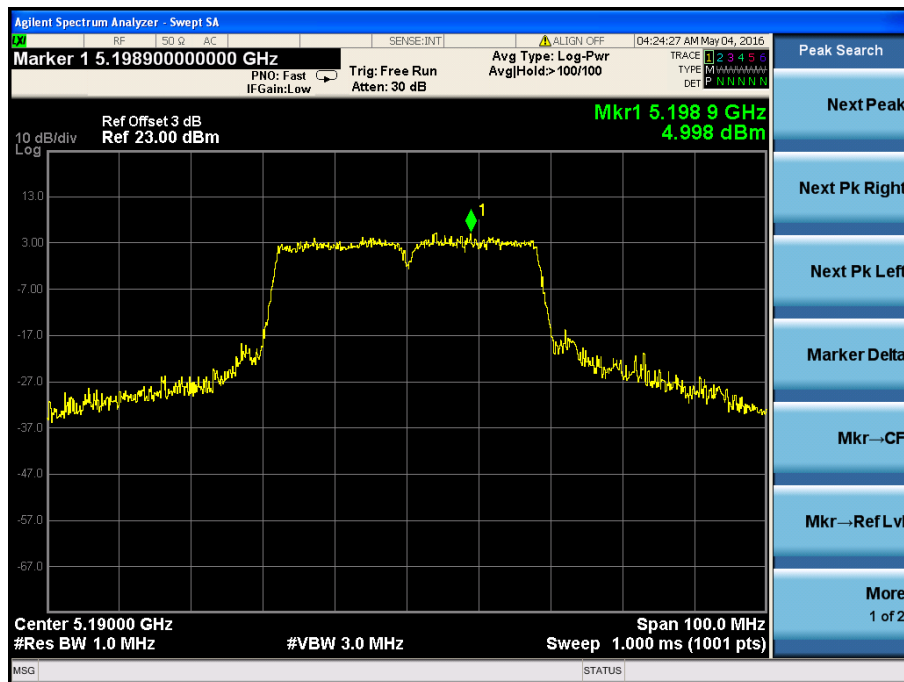


5825MHz

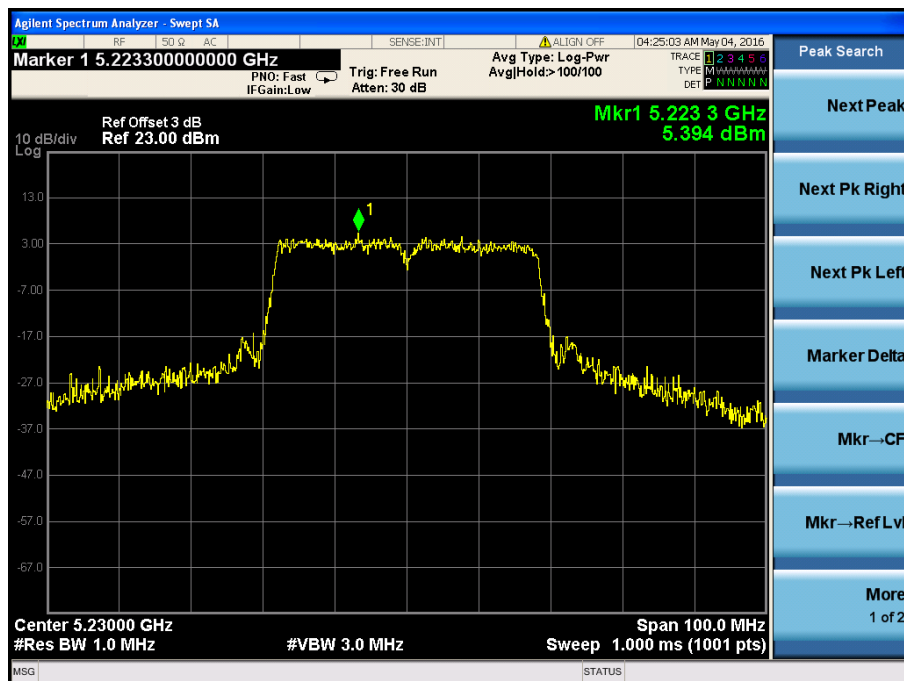


Test Mode: 802.11n-HT40

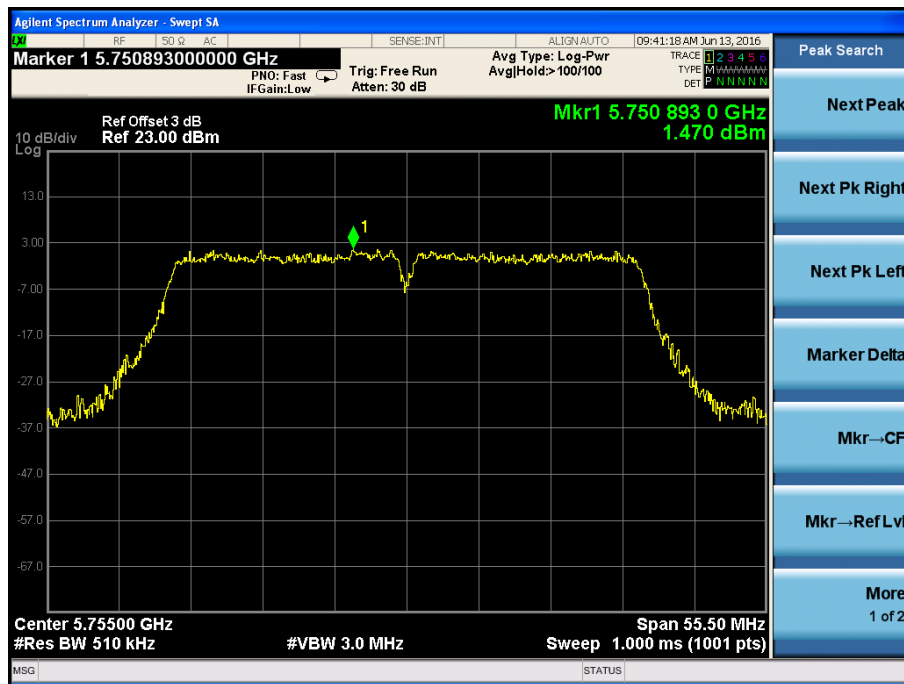
5190MHz



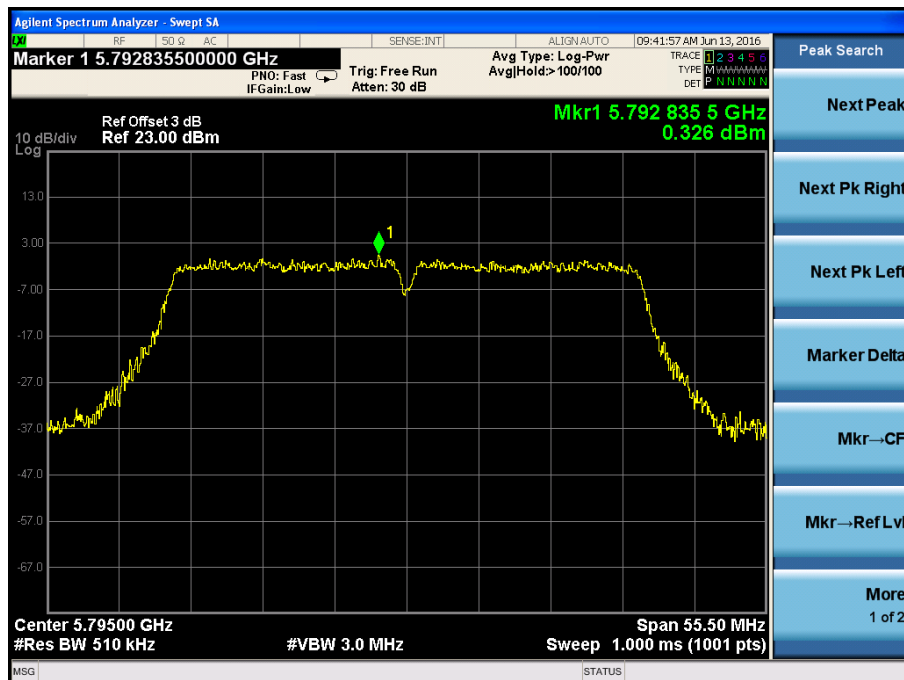
5230MHz



5755MHz



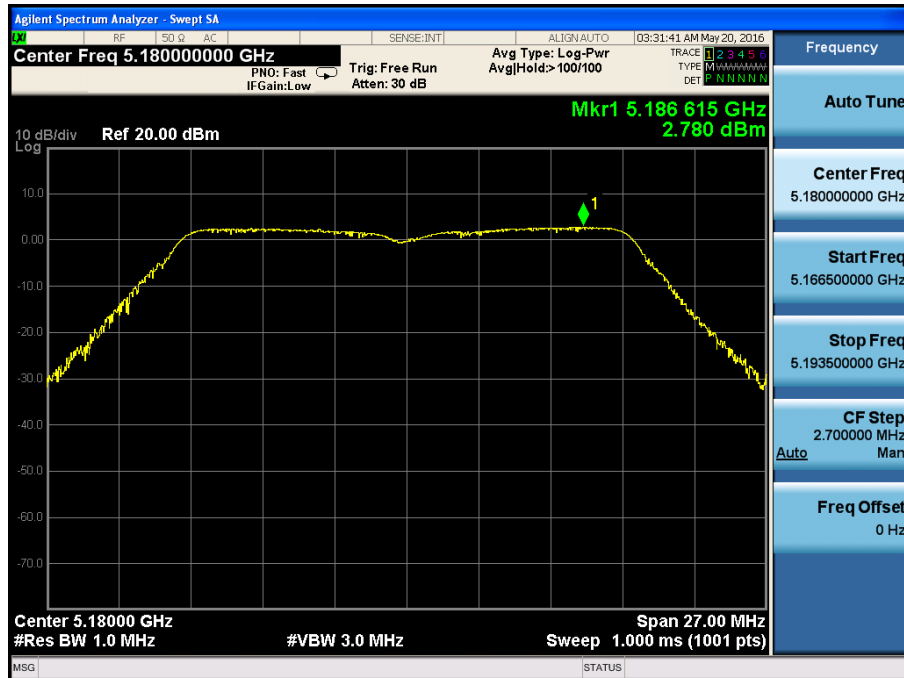
5795MHz



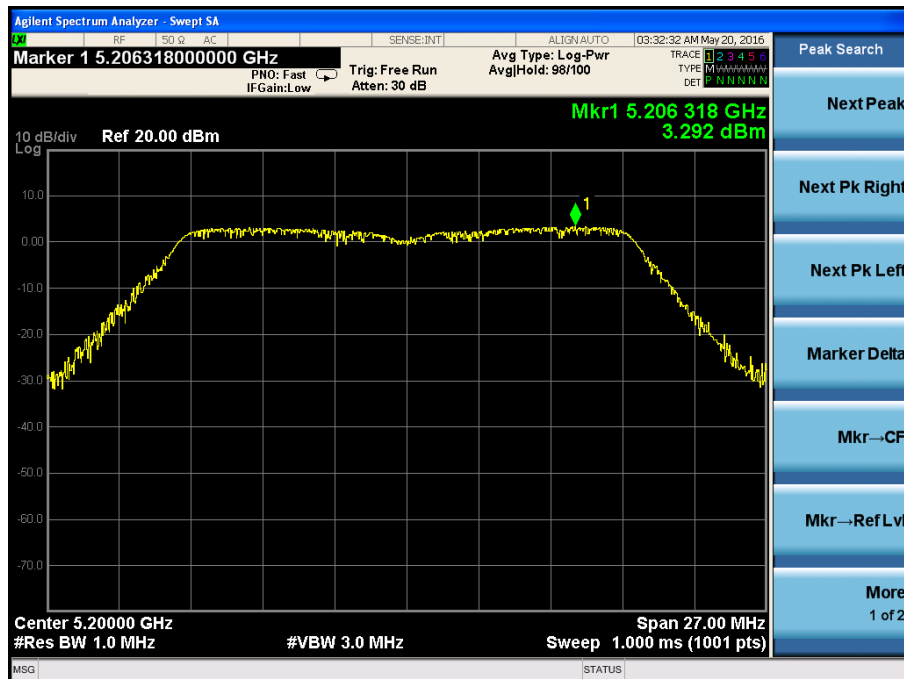
Antenna 2

Test Mode: 802.11a

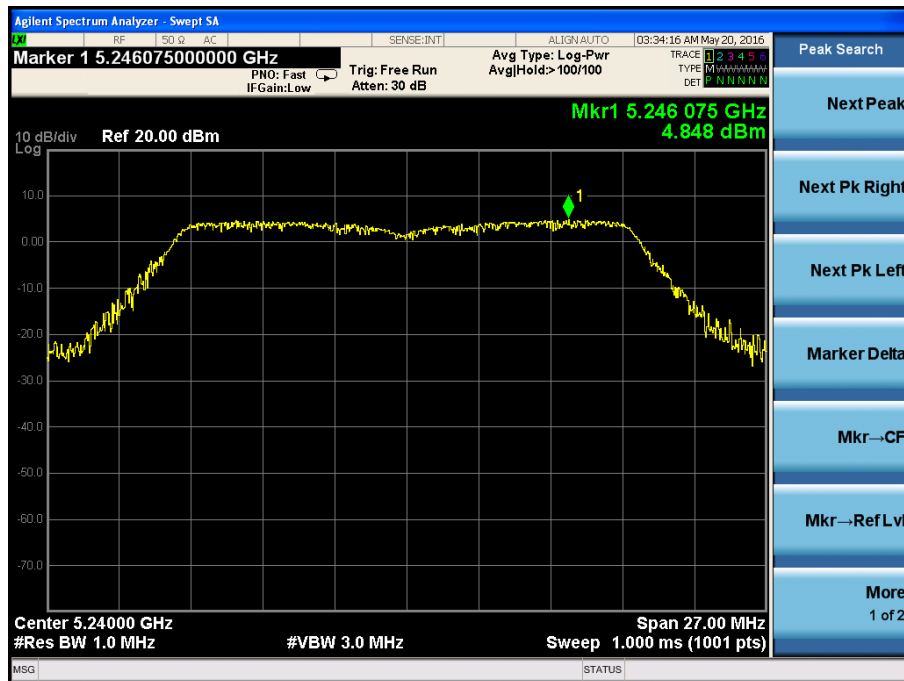
5180MHz



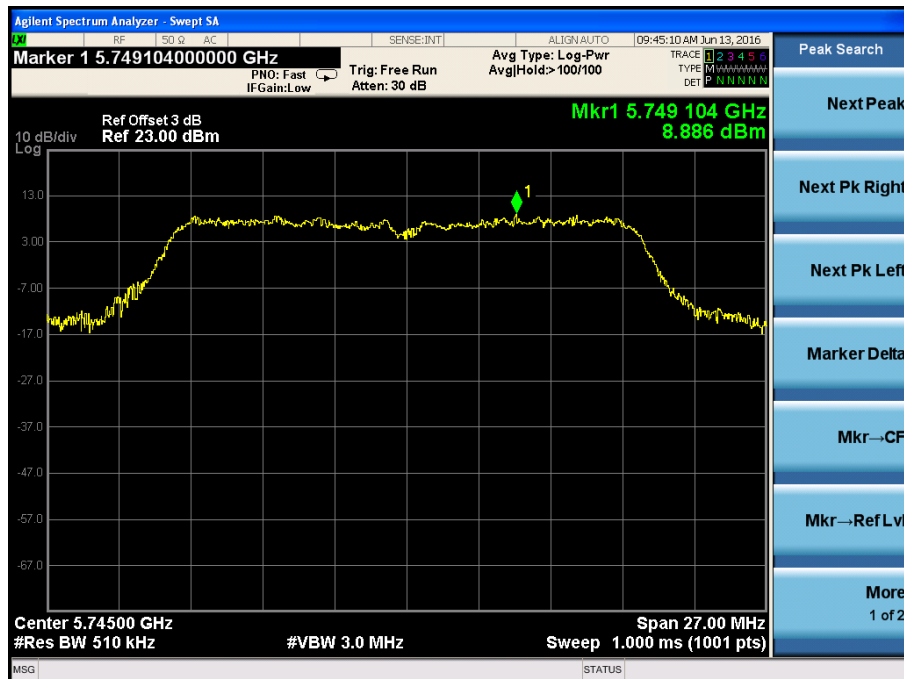
5200MHz



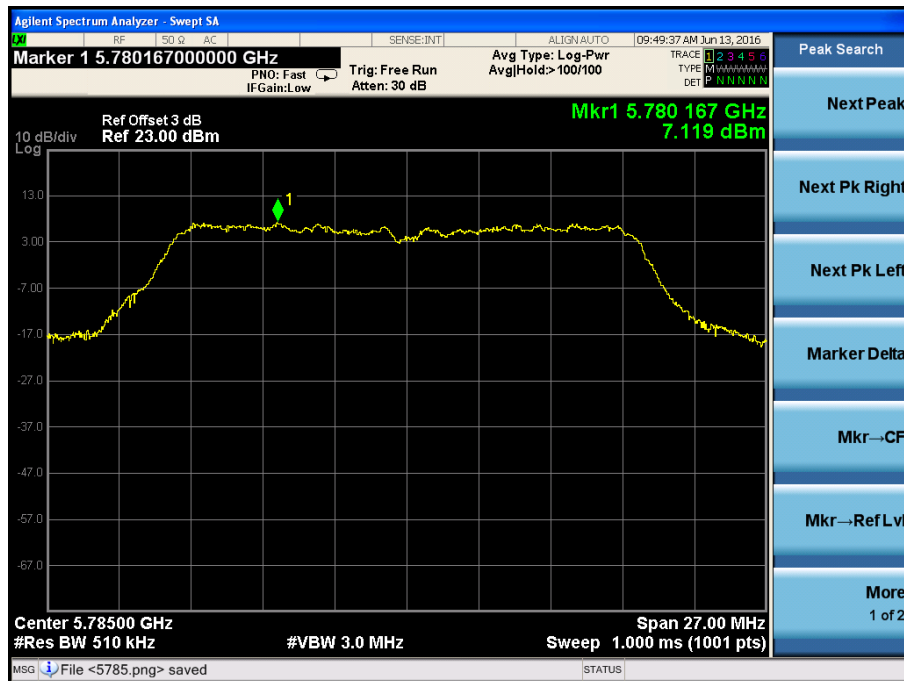
5240MHz



5745MHz



5785MHz

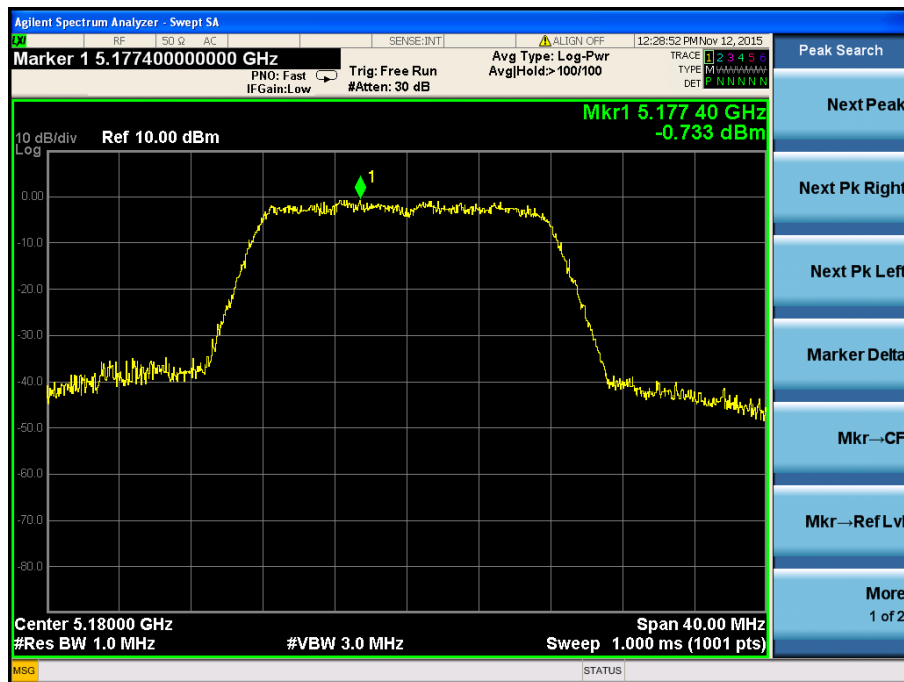


5825MHz

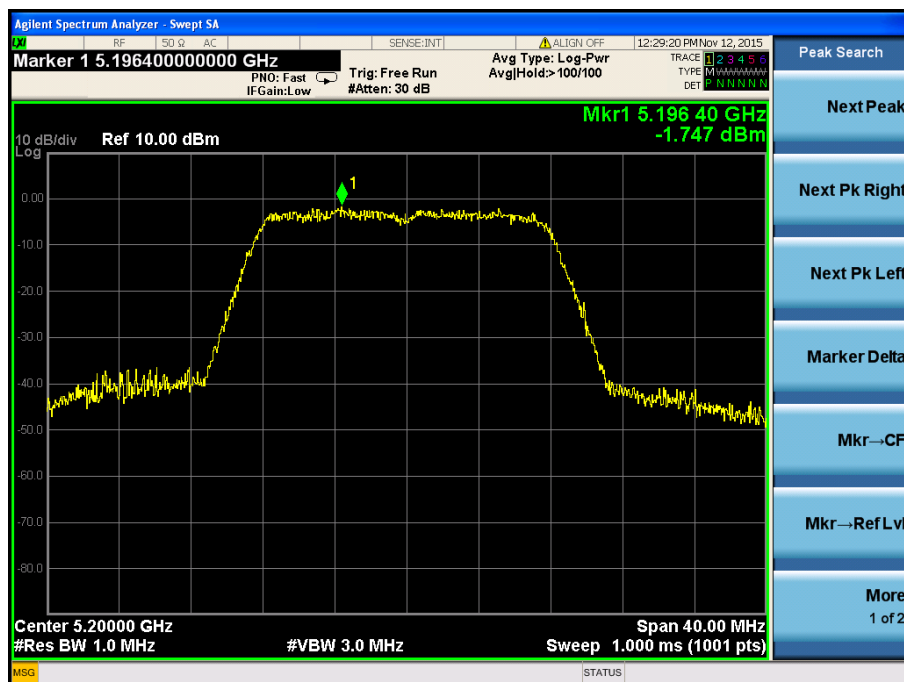


Test Mode: 802.11n-HT20

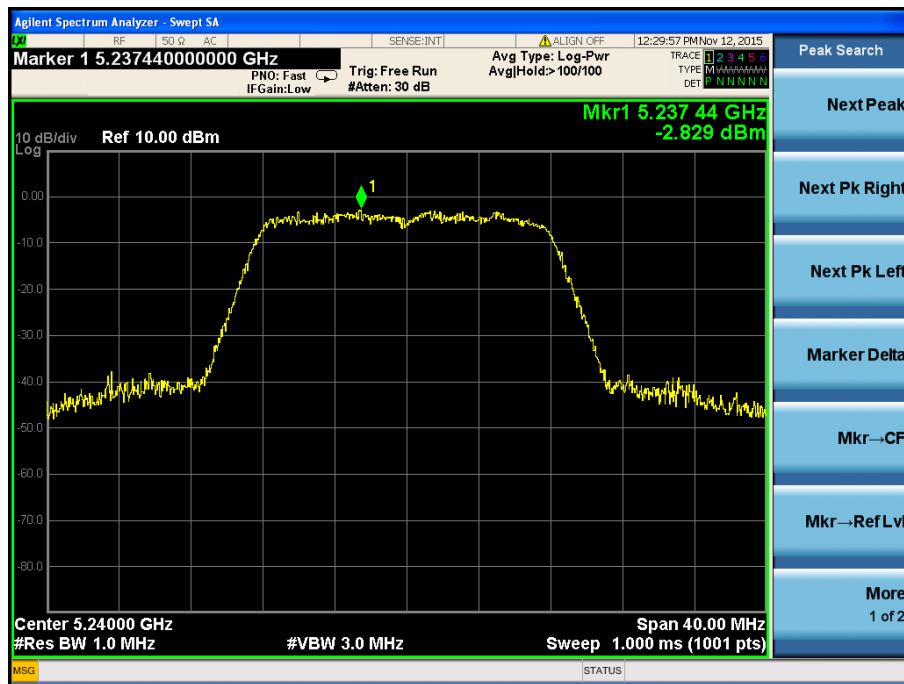
5180MHz



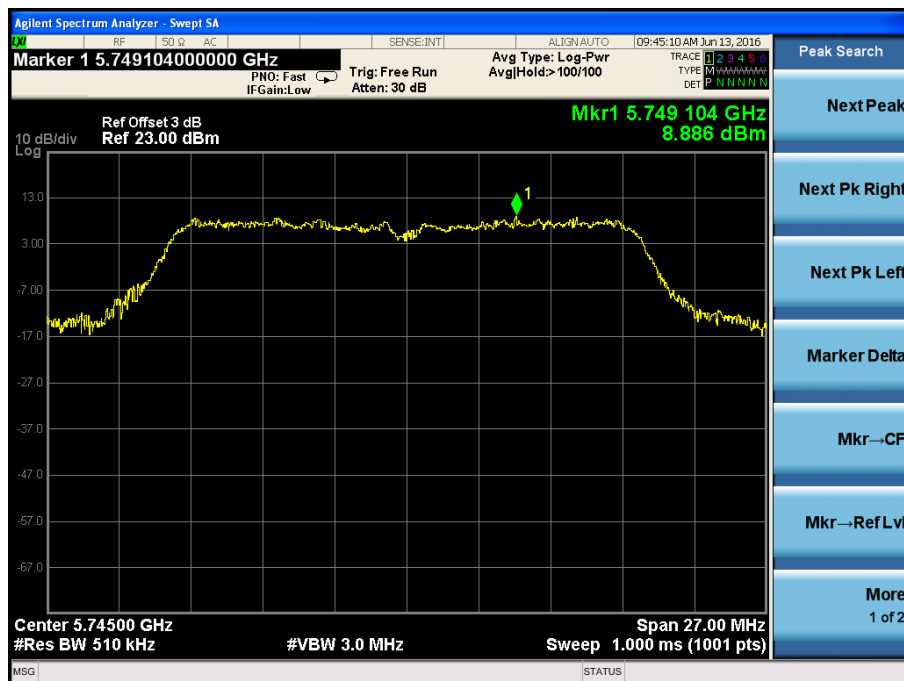
5200MHz



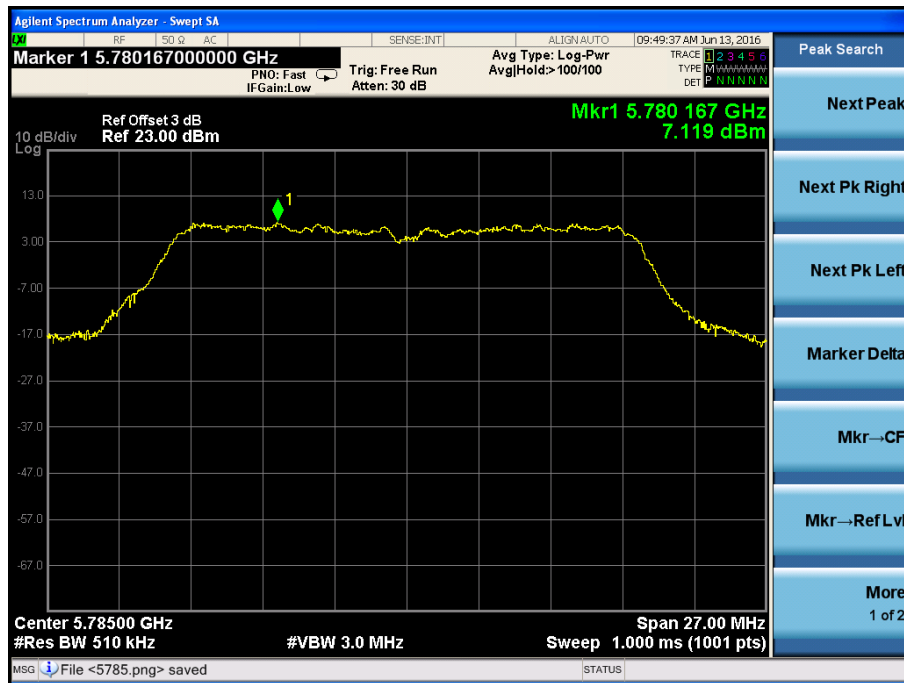
5240MHz



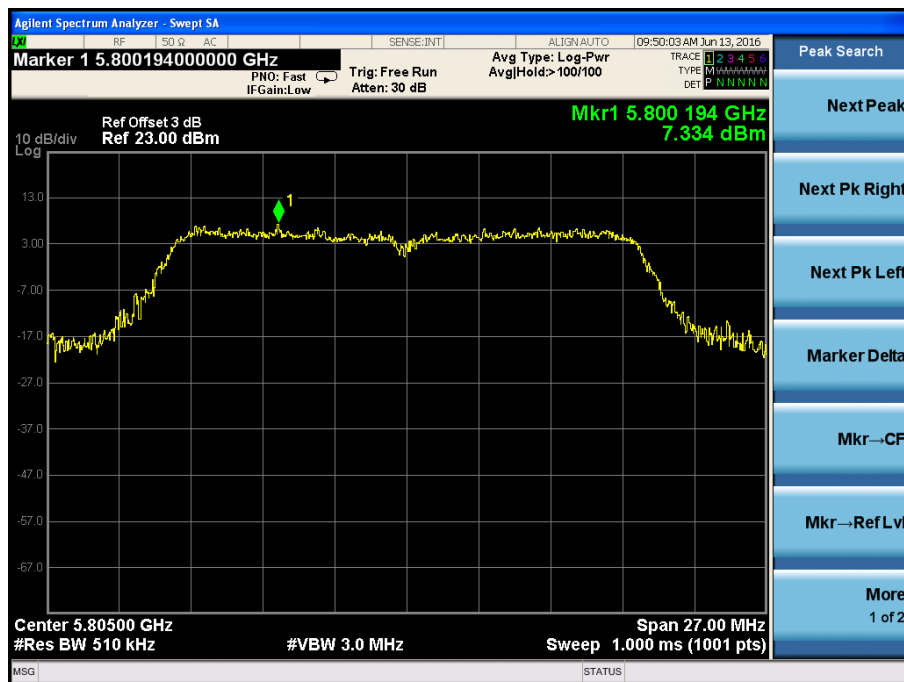
5745MHz



5785MHz

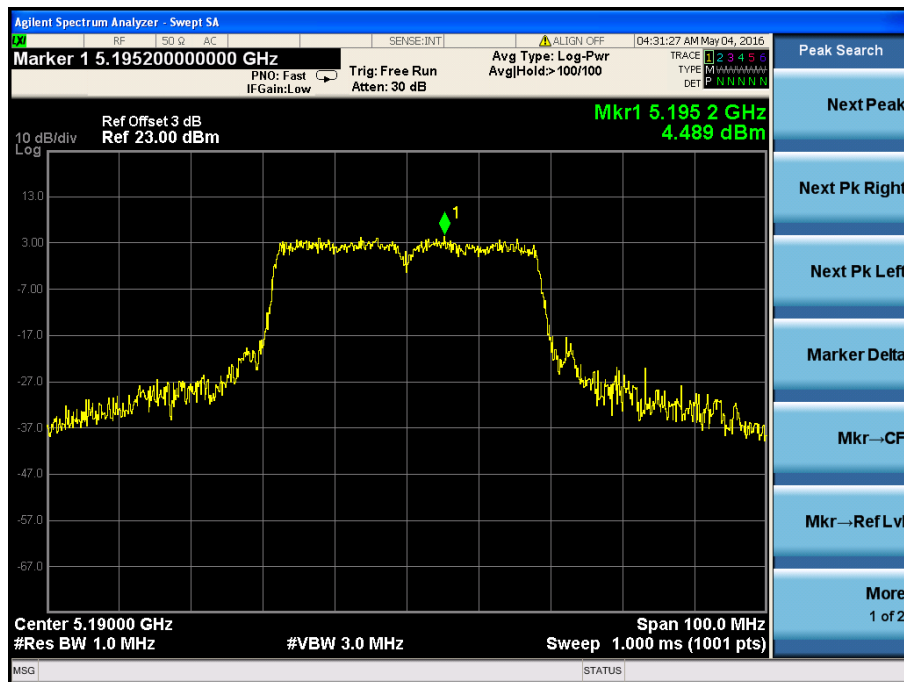


5825MHz

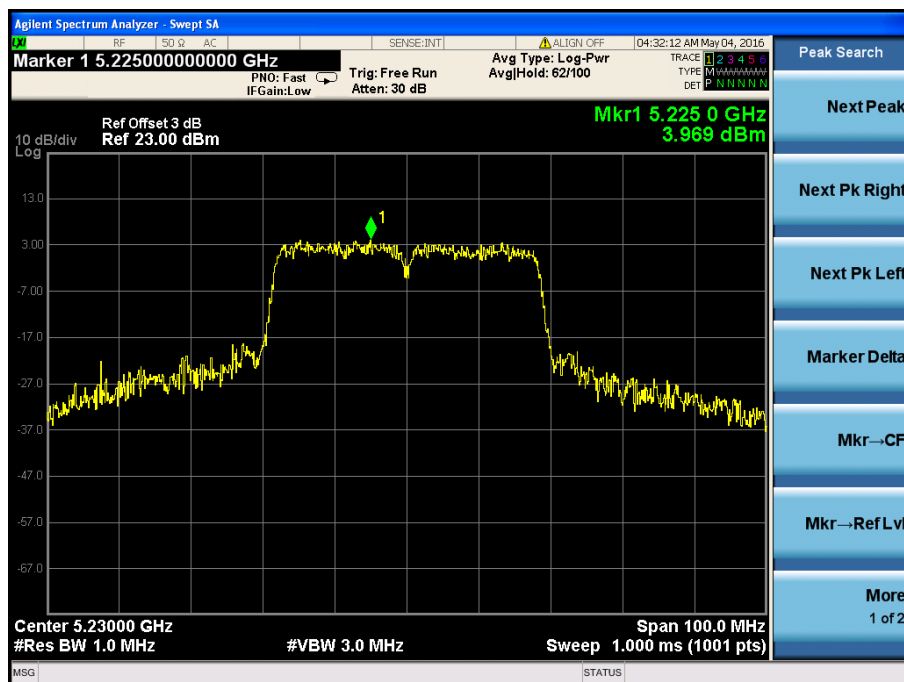


Test Mode: 802.11n-HT40

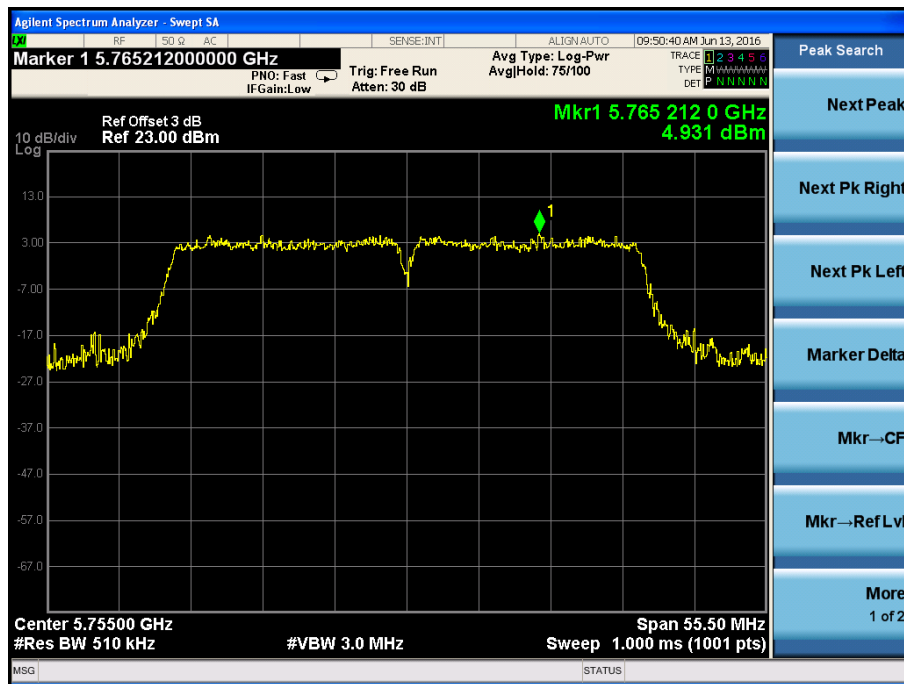
5190MHz



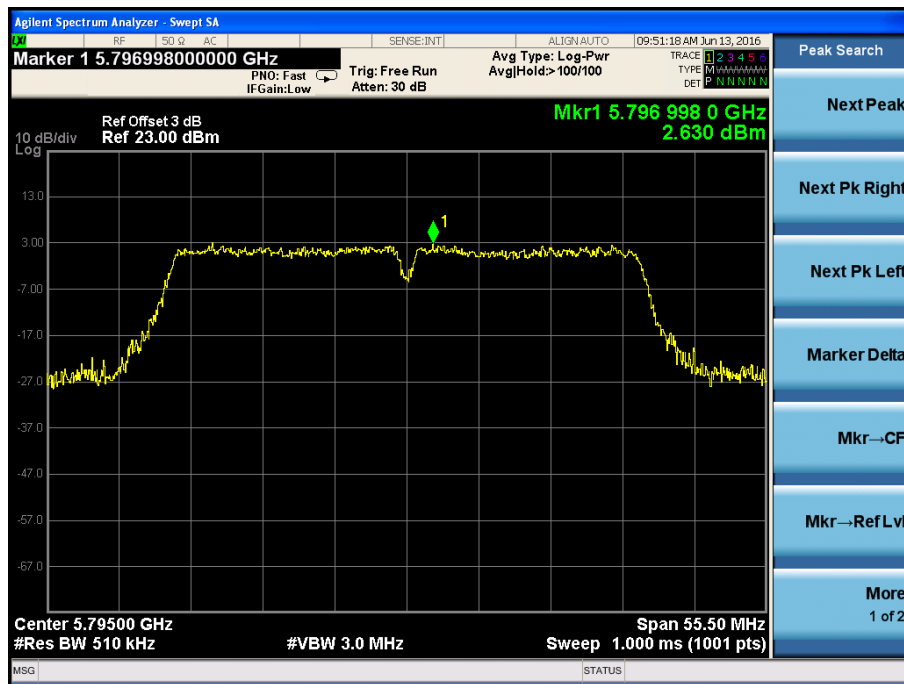
5230MHz



5755MHz



5795MHz



6. Emission Bandwidth and Occupied Bandwidth

6.1 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.

6.2 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.

6.3 Environmental Conditions

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

6.4 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	20.54	17.668	--
	5200	20.48	17.671	--
	5240	20.70	17.670	--
802.11n-HT20	5180	18.78	16.405	--
	5200	18.80	16.392	--
	5240	18.84	16.407	--
802.11n-HT40	5190	47.26	36.54	--
	5230	48.65	36.56	--

5725-5850MHz

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11a	5745	20.63	17.71	17.649	≥500
	5785	20.84	17.69	17.649	≥500
	5825	20.76	17.73	17.656	≥500
802.11n-HT20	5745	18.73	16.39	16.361	≥500
	5785	19.14	16.38	16.387	≥500
	5825	18.70	16.40	16.383	≥500
802.11n-HT40	5755	40.22	36.54	36.141	≥500
	5795	40.22	36.54	36.136	≥500

Antenna 2**5150-5250MHz**

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit MHz
802.11a	5180	20.57	17.694	--
	5200	20.44	17.632	--
	5240	20.55	17.655	--
802.11n-HT20	5180	19.02	16.387	--
	5200	18.80	16.366	--
	5240	18.96	16.385	--
802.11n-HT40	5190	45.78	36.45	--
	5230	46.38	36.54	--

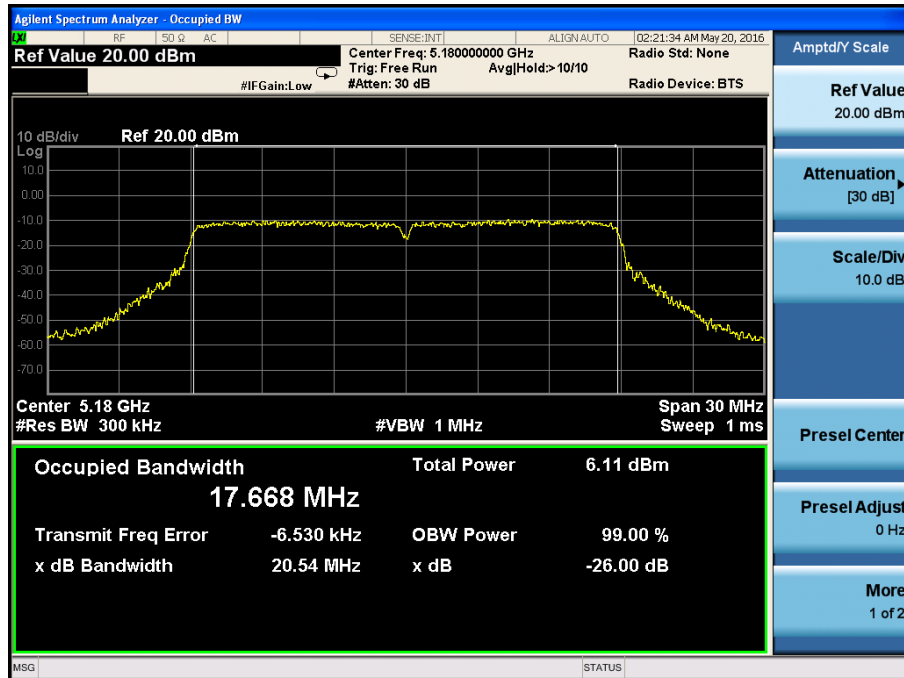
5725-5850MHz

Test Mode	Test Channel MHz	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
802.11a	5745	20.53	17.82	17.804	≥500
	5785	20.59	17.76	17.714	≥500
	5805	20.47	17.81	17.758	≥500
802.11n-HT20	5745	19.06	16.48	16.381	≥500
	5785	18.78	16.43	16.378	≥500
	5825	18.86	16.38	16.381	≥500
802.11n-HT40	5755	40.55	36.51	36.205	≥500
	5795	39.01	35.28	35.864	≥500

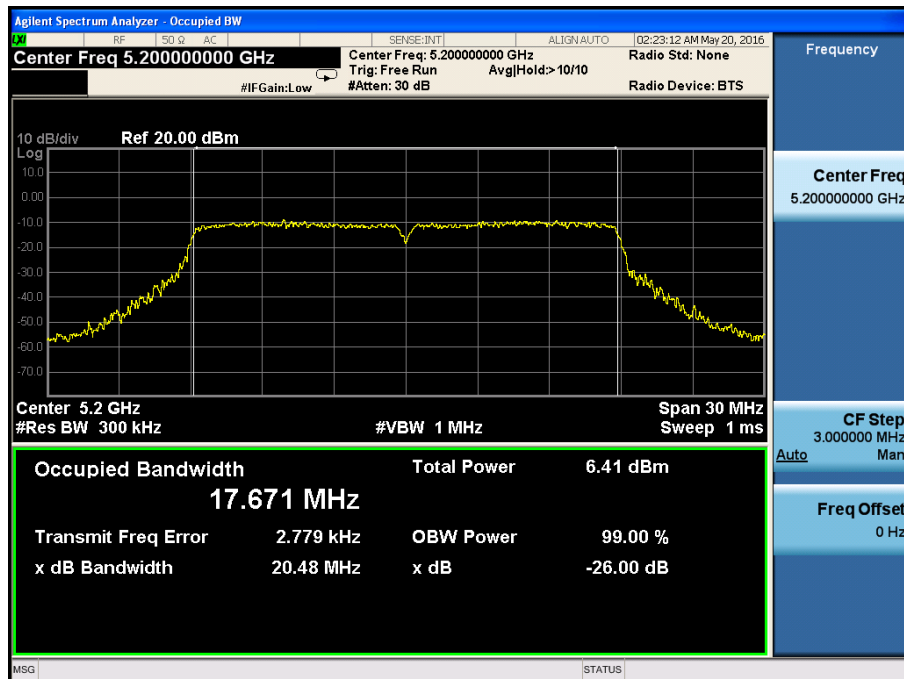
Antenna 1

Test Mode: 802.11a

5180MHz



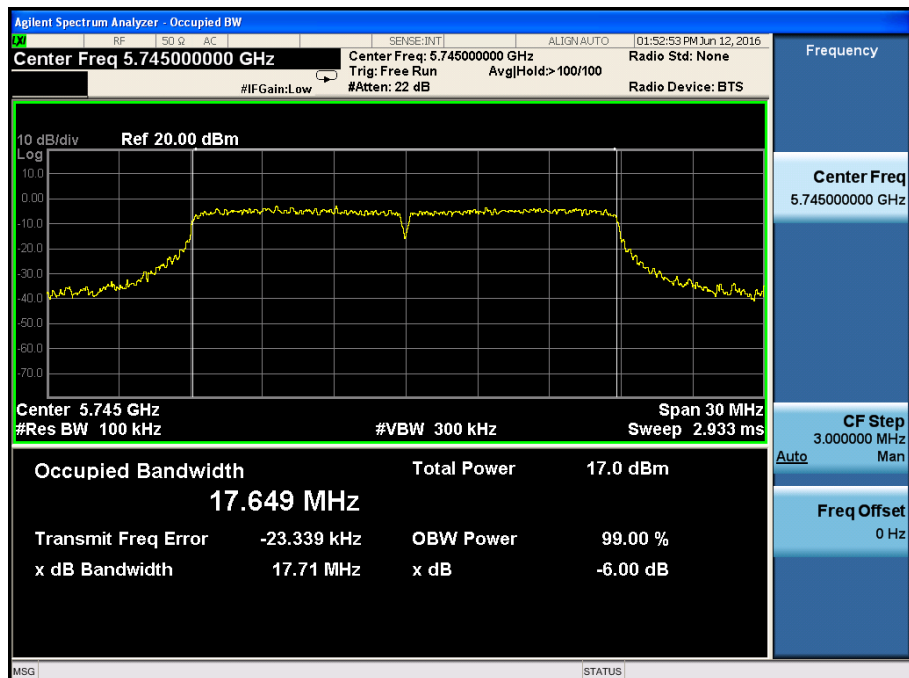
5200MHz

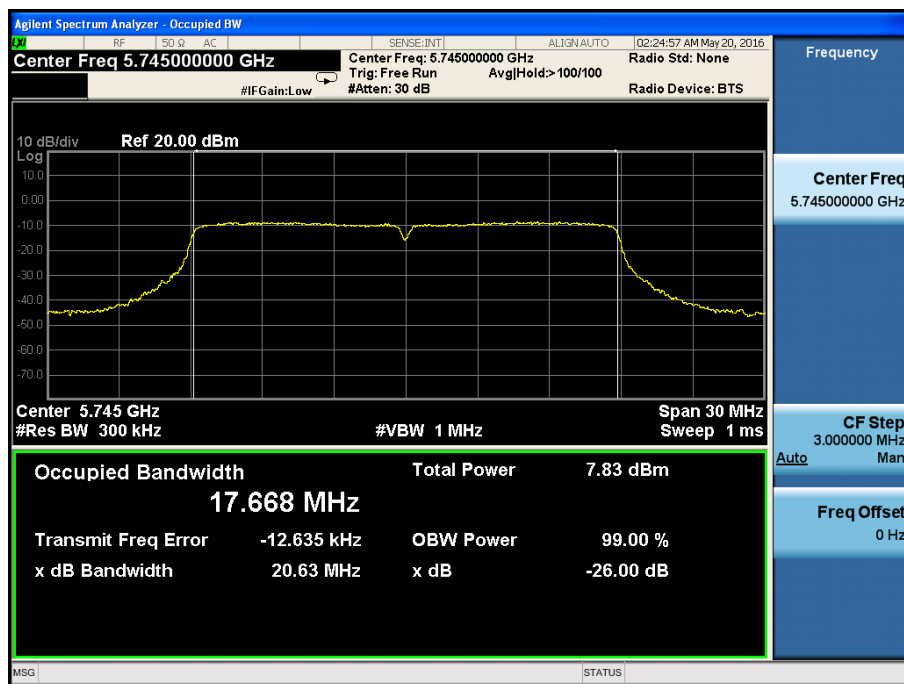


5240MHz

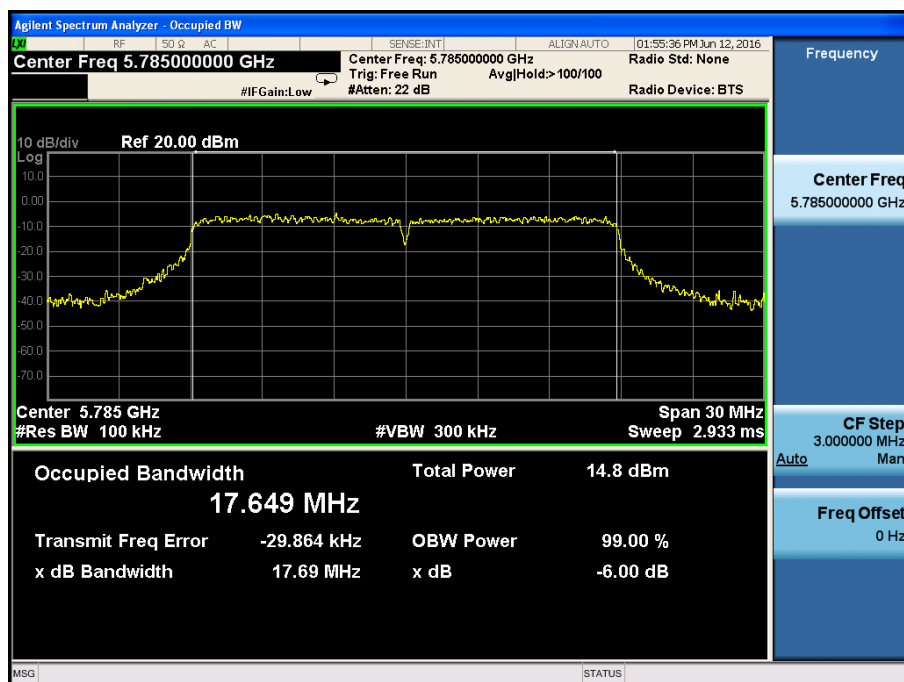


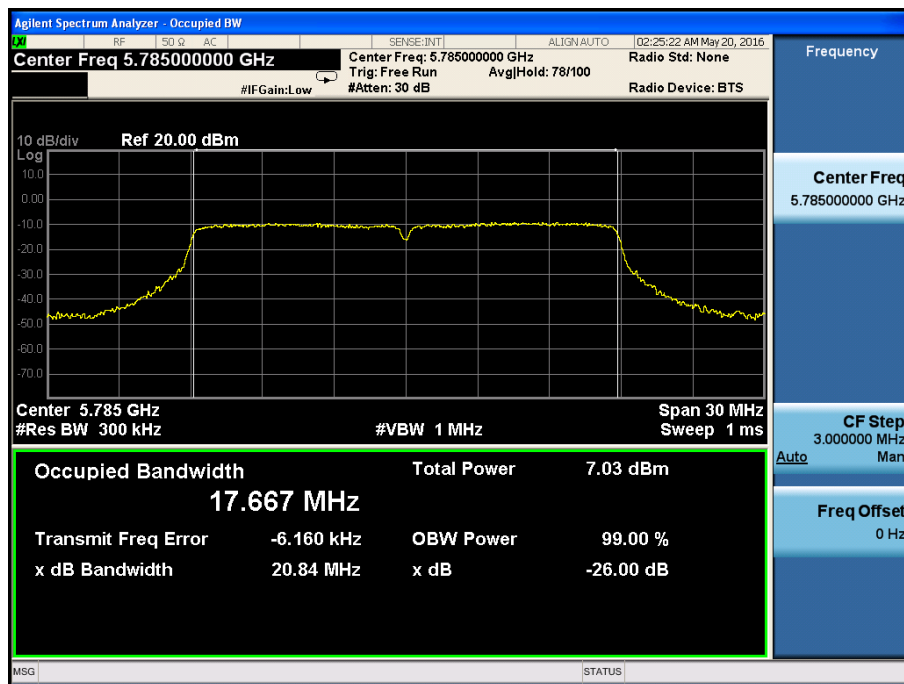
5745MHz



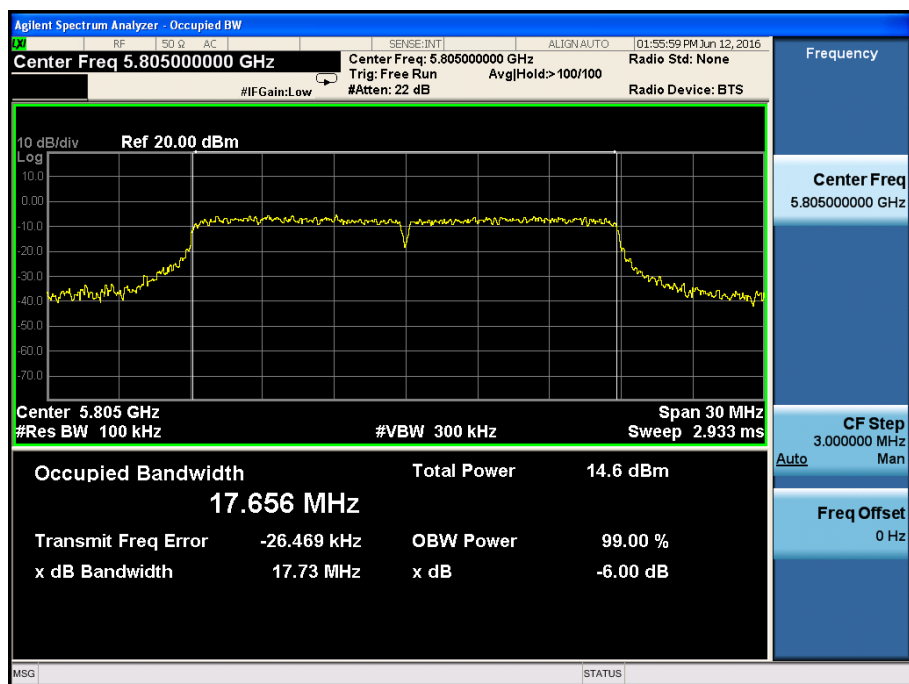


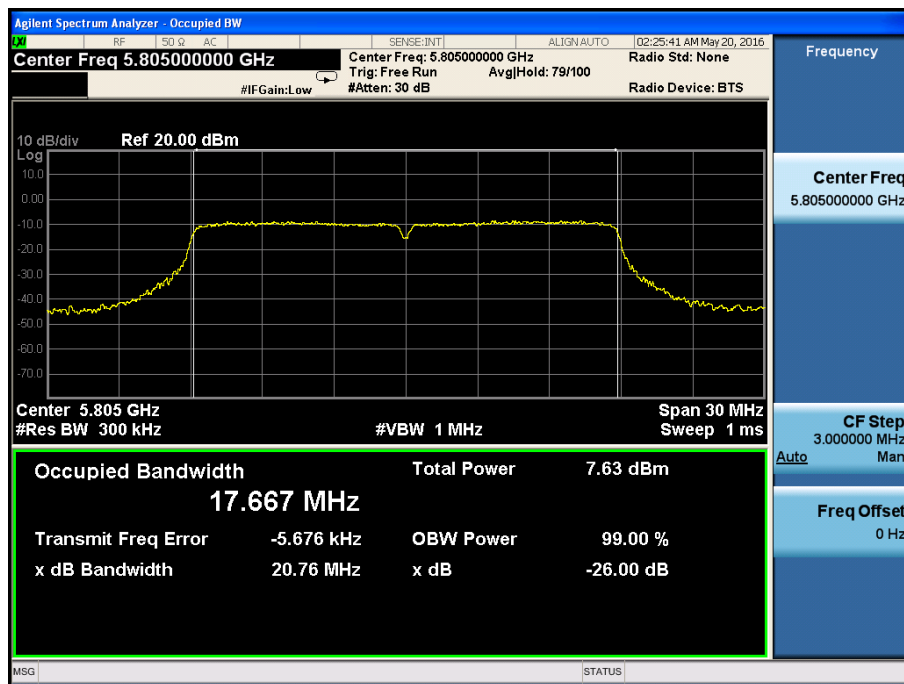
5785MHz





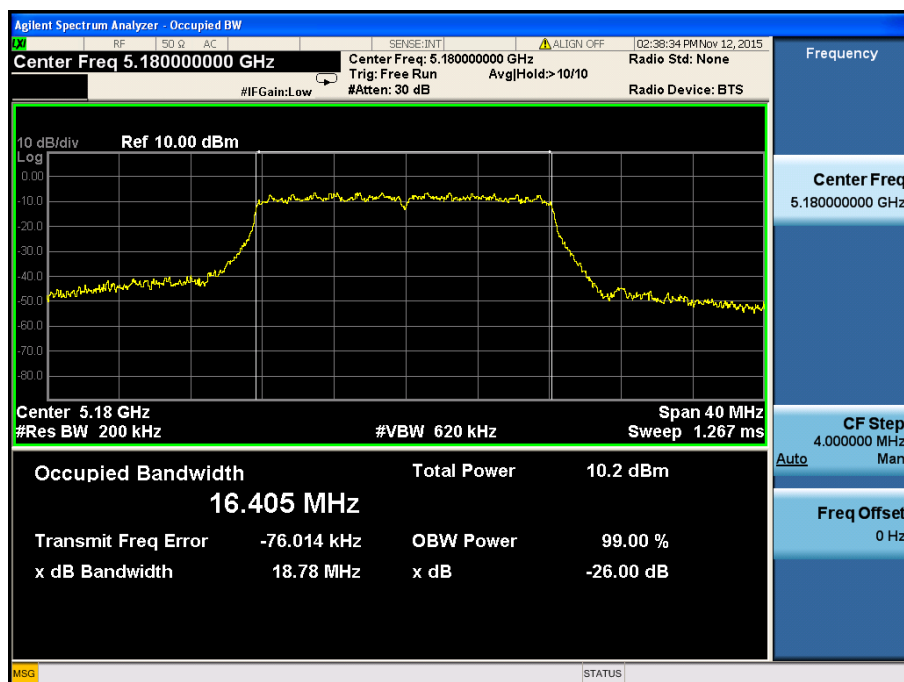
5825MHz



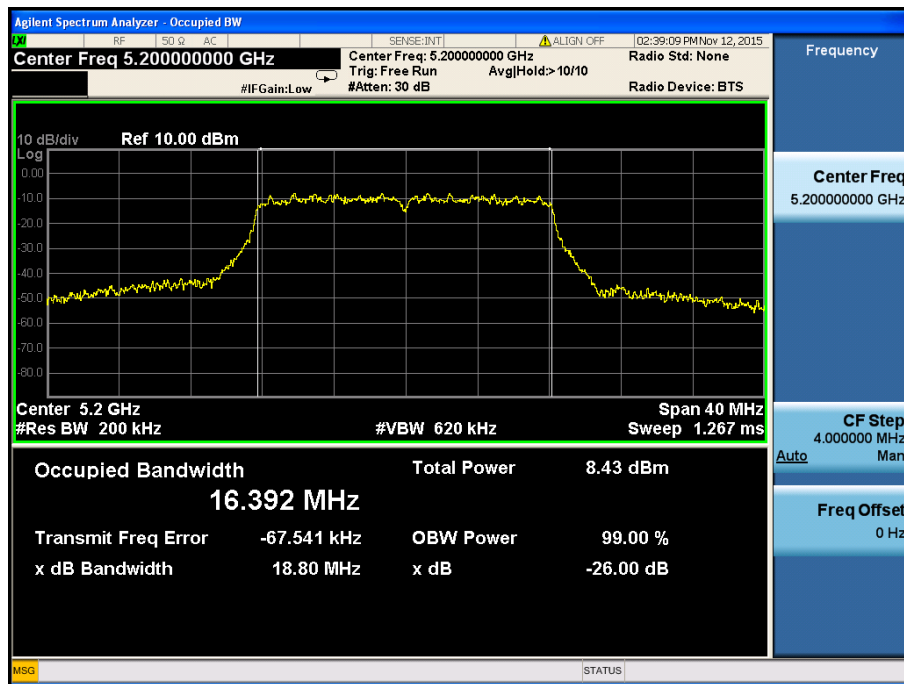


Test mode: 802.11n-HT20

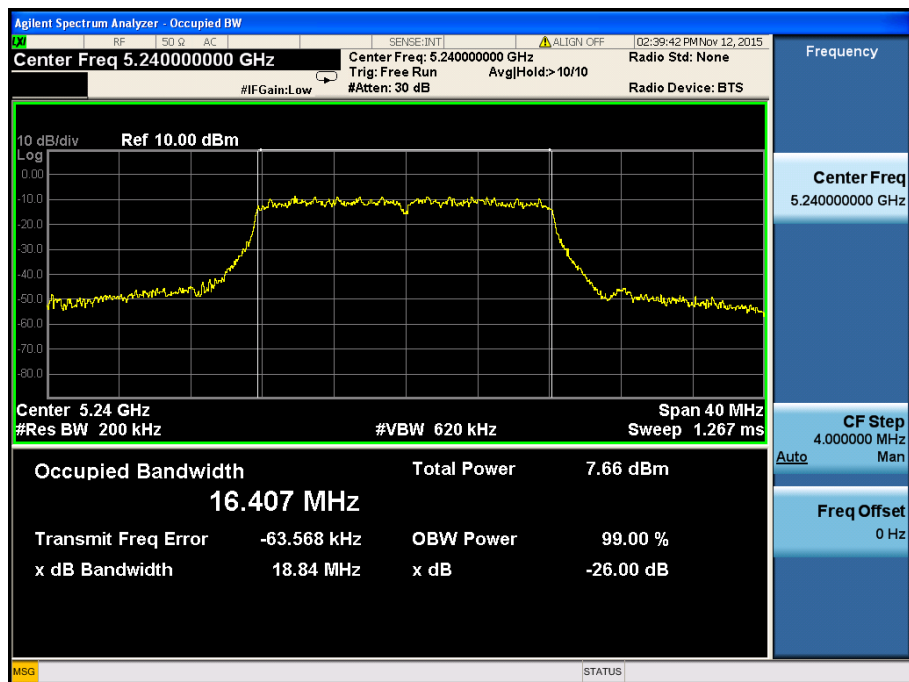
5180MHz



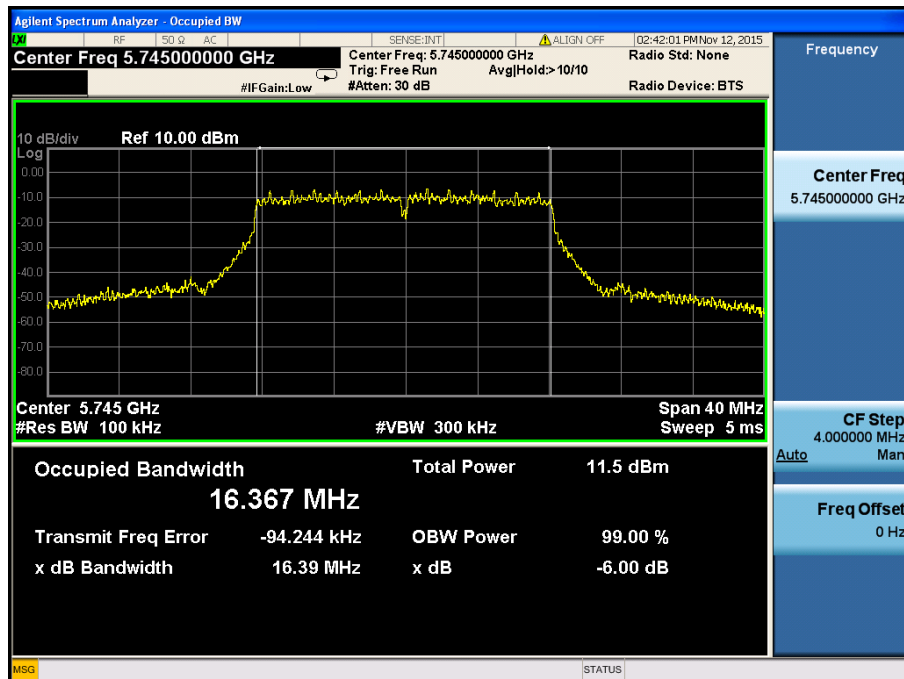
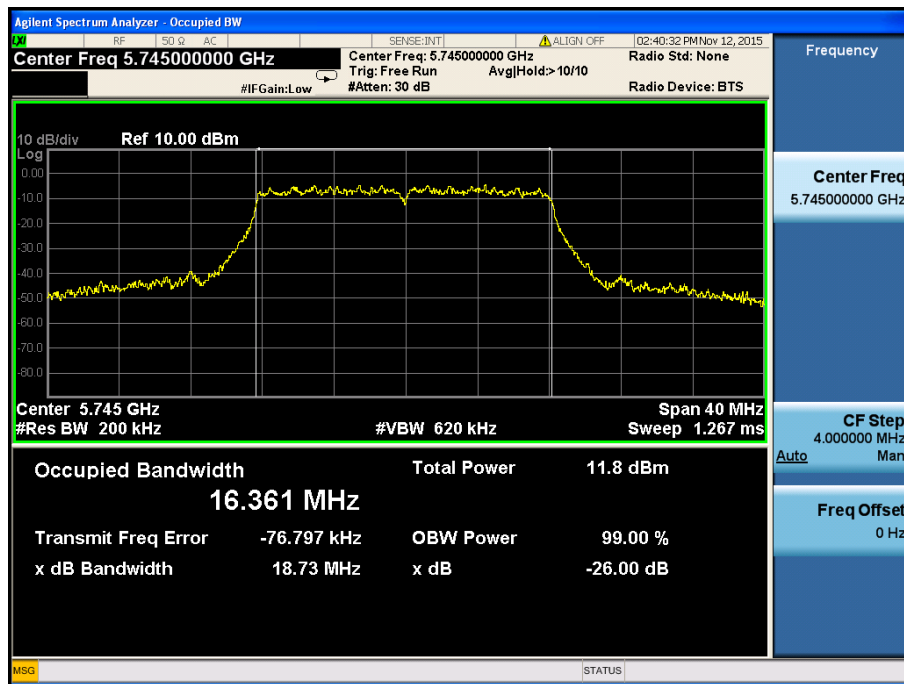
5200MHz



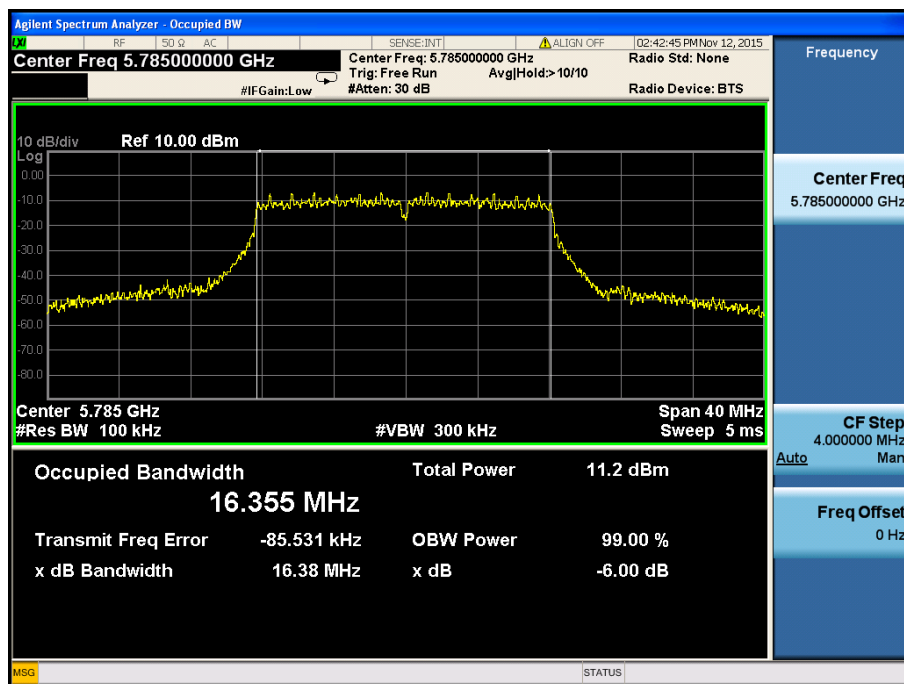
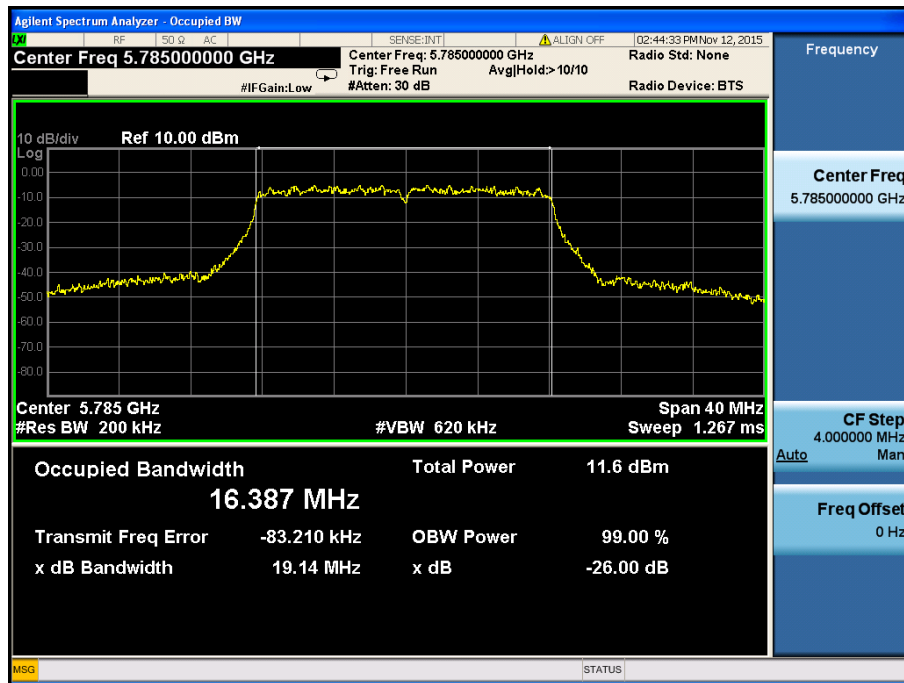
5240MHz



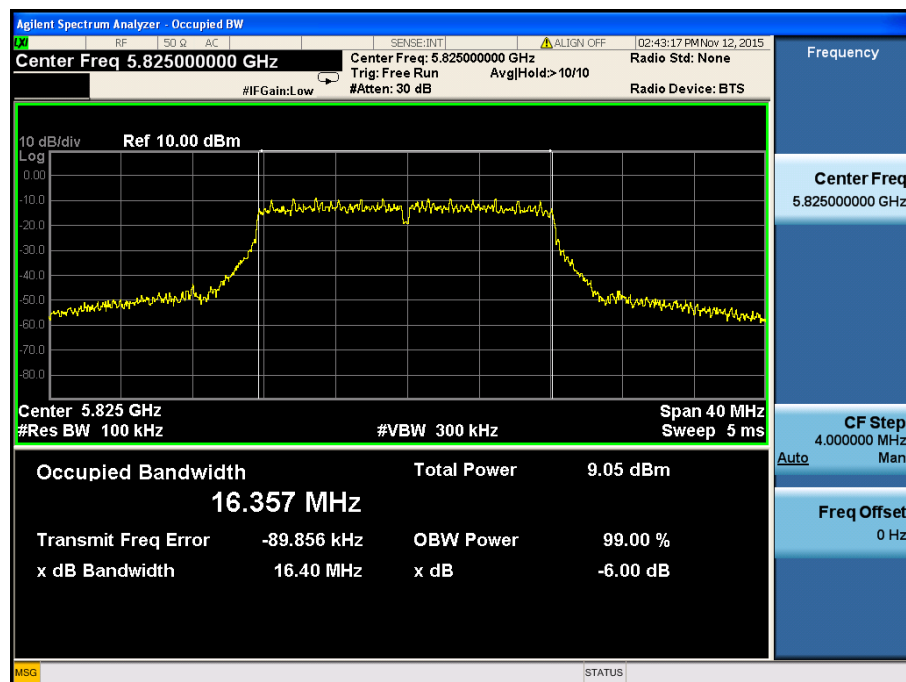
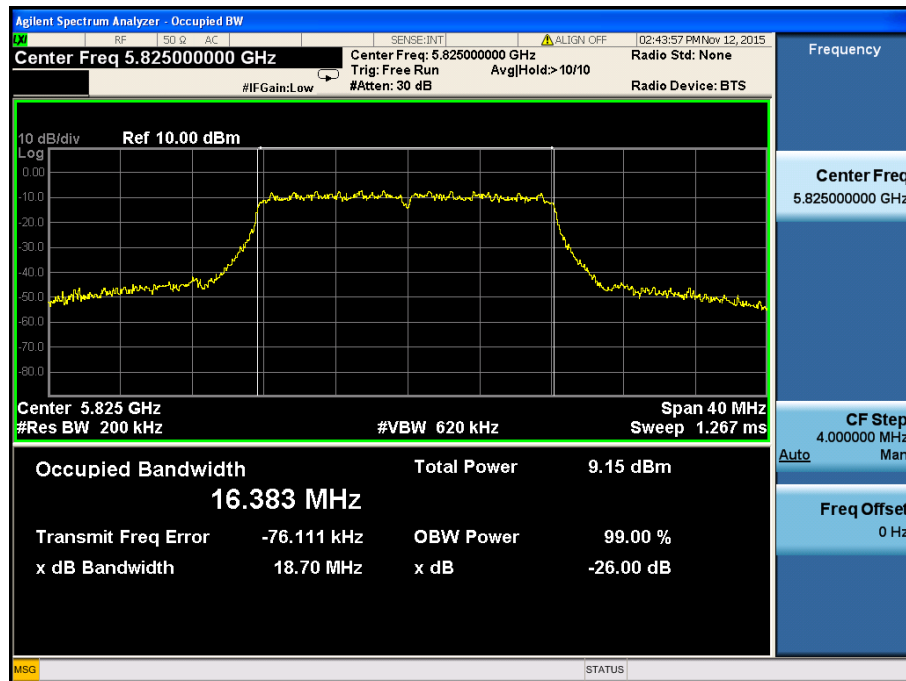
5745MHz



5785MHz

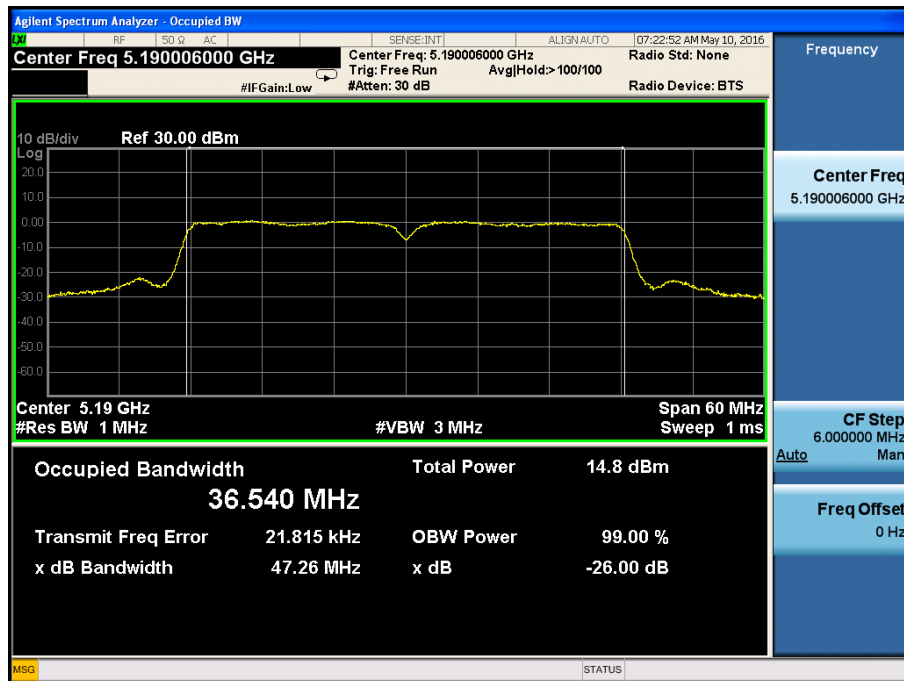


5825MHz

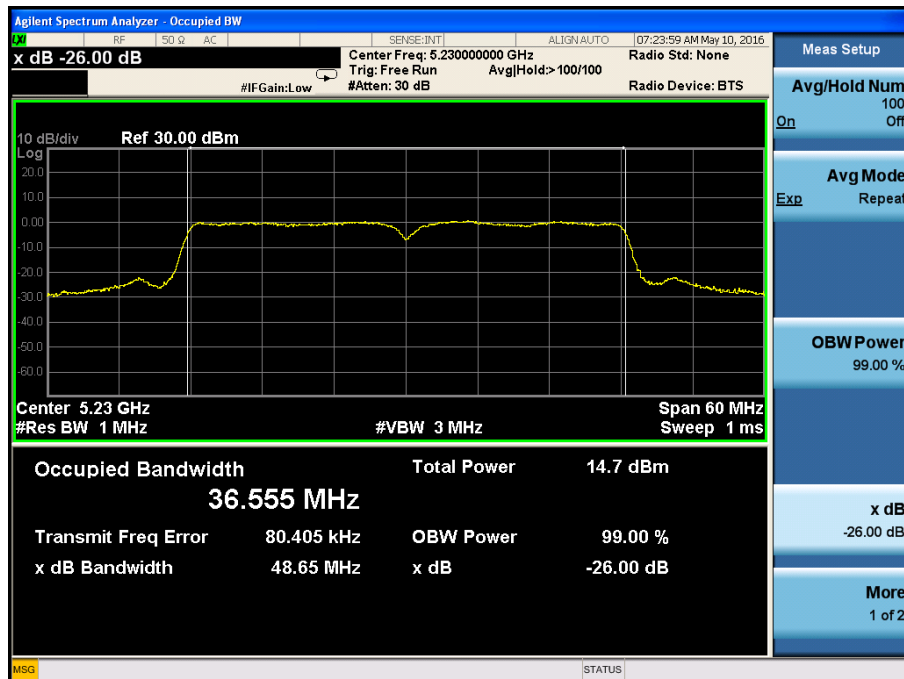


Test mode : 802.11n-HT40

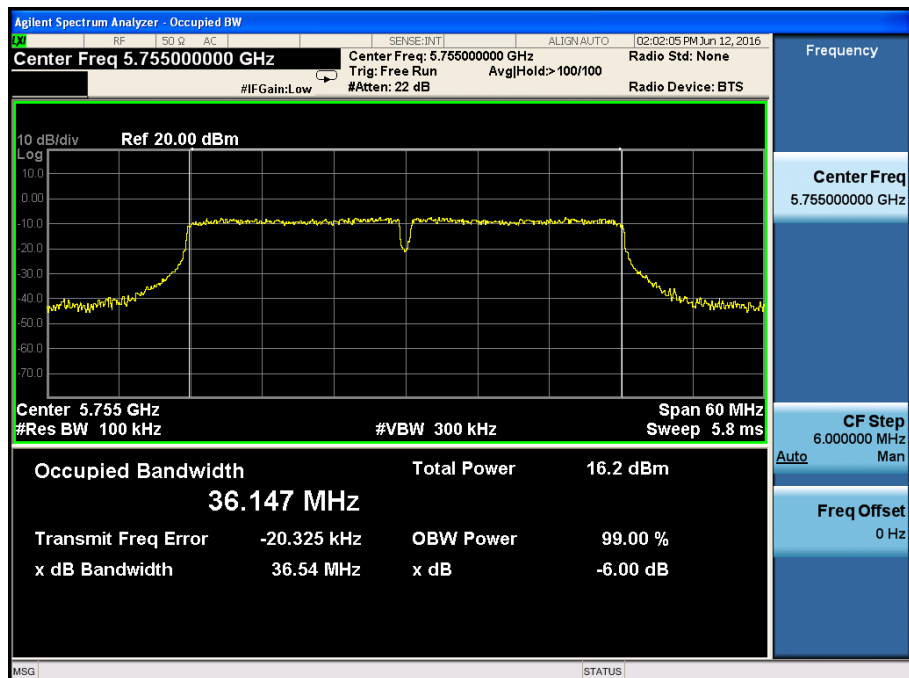
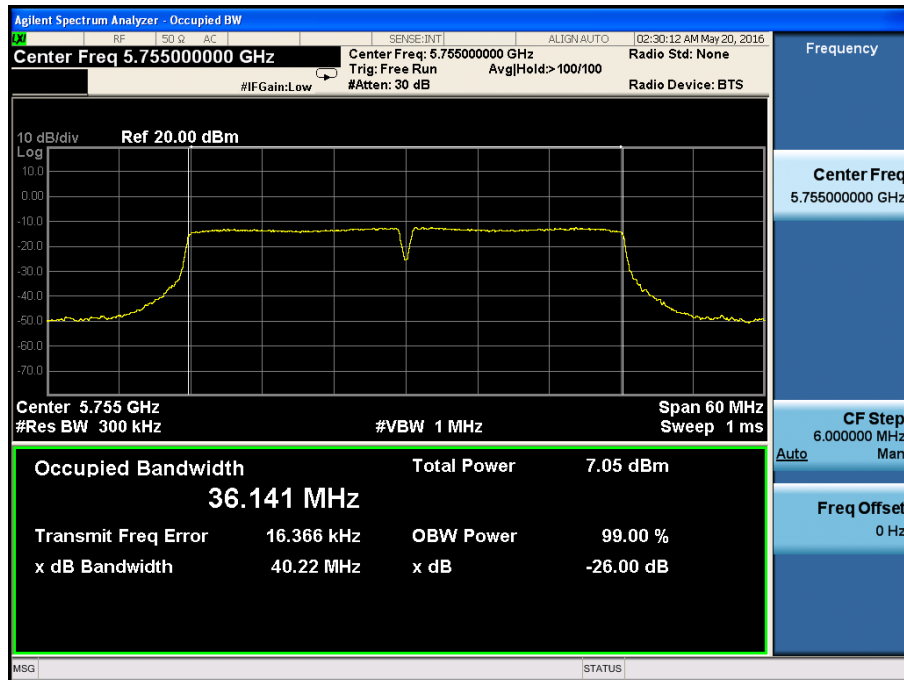
5190MHz



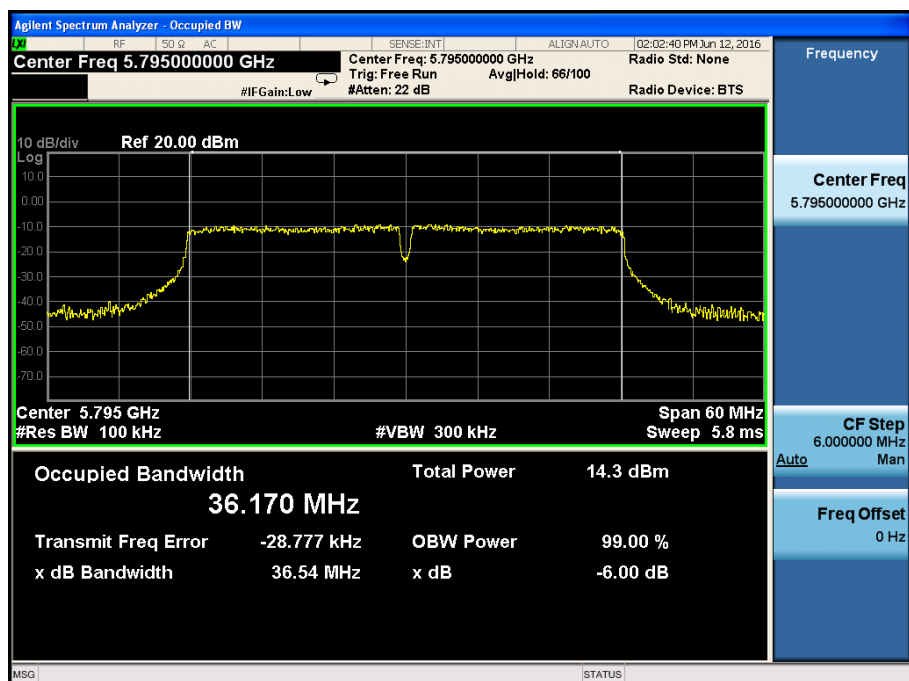
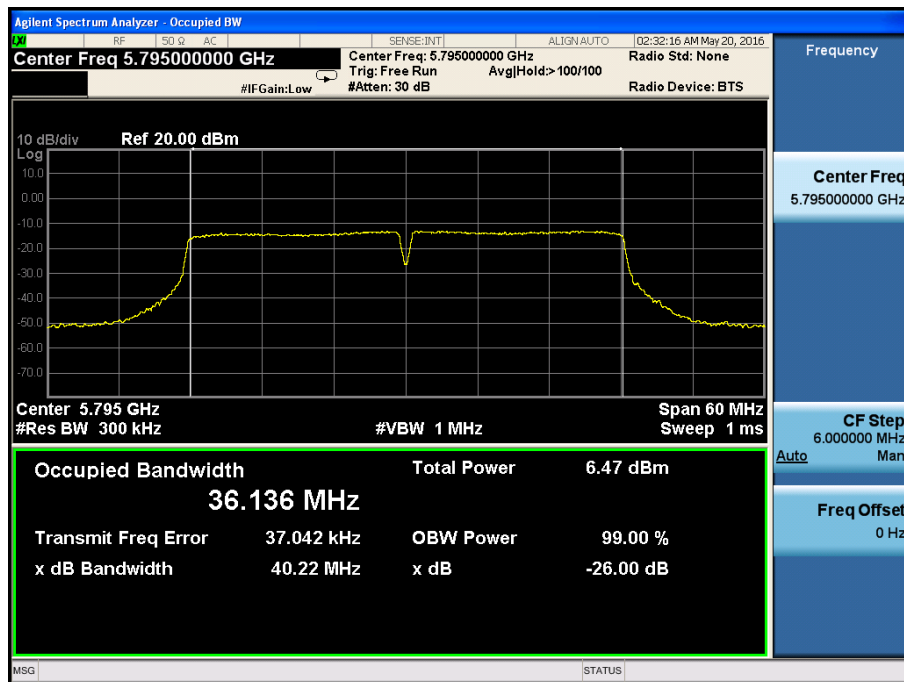
5230MHz



5755MHz



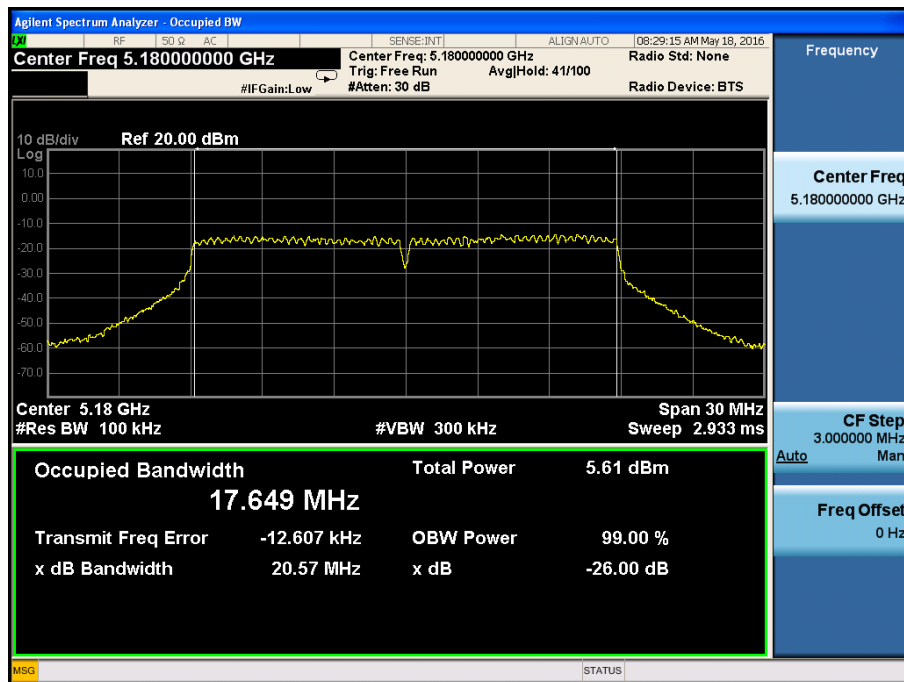
5795MHz



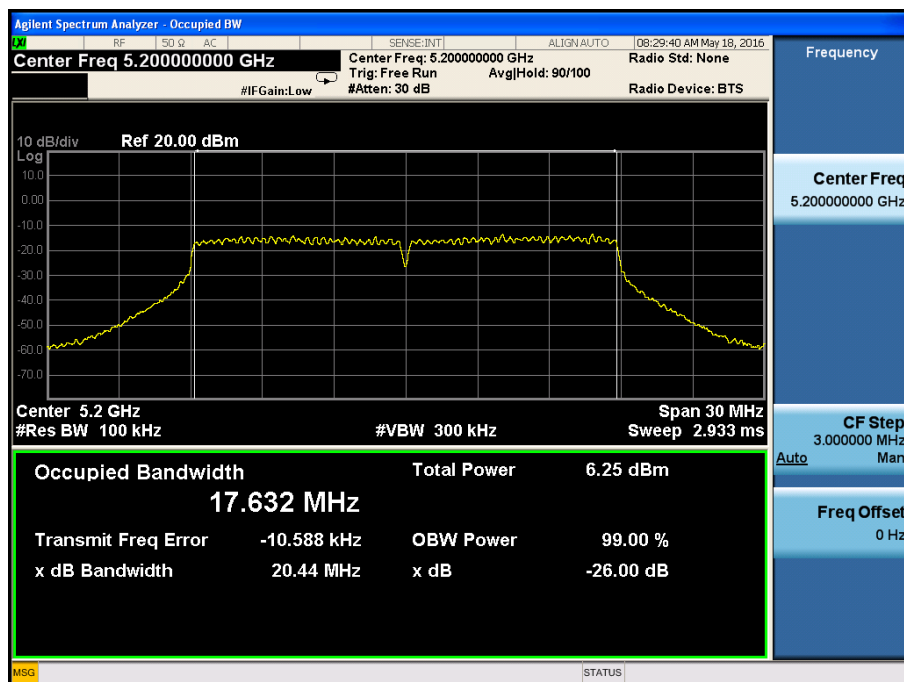
Antenna 2

Test Mode: 802.11a

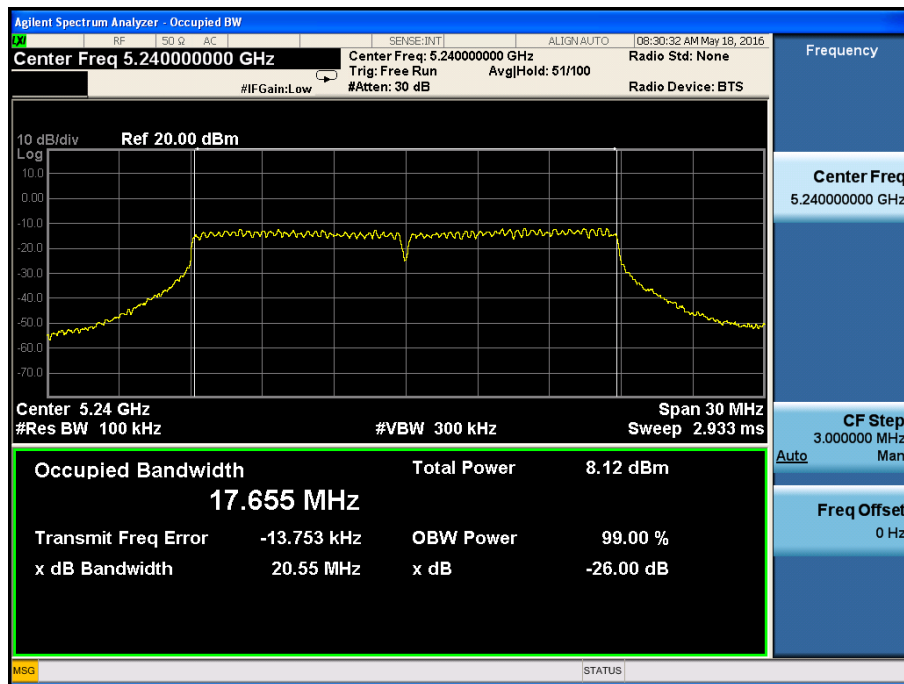
5180MHz



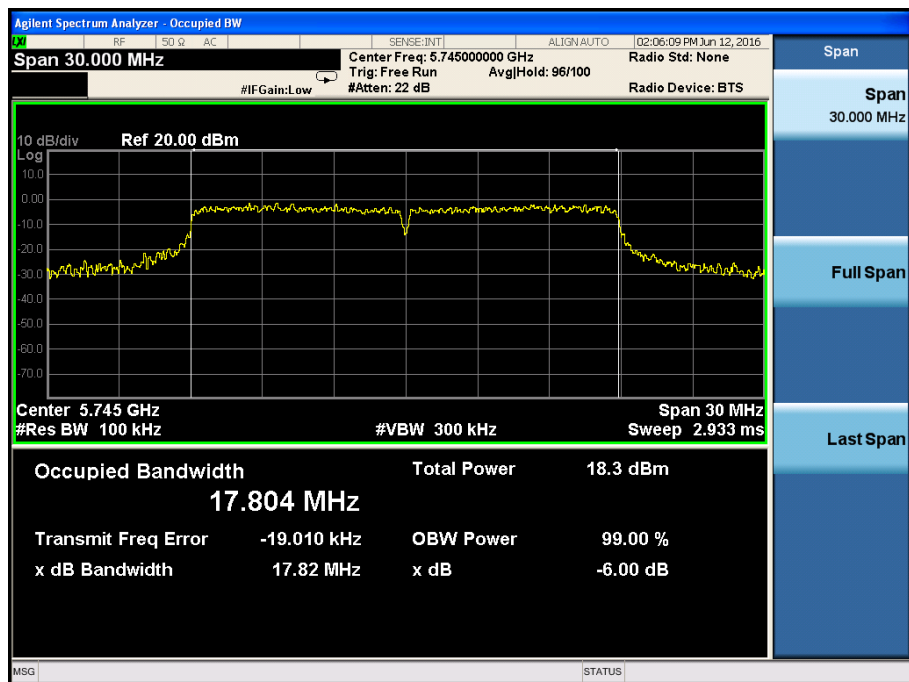
5200MHz

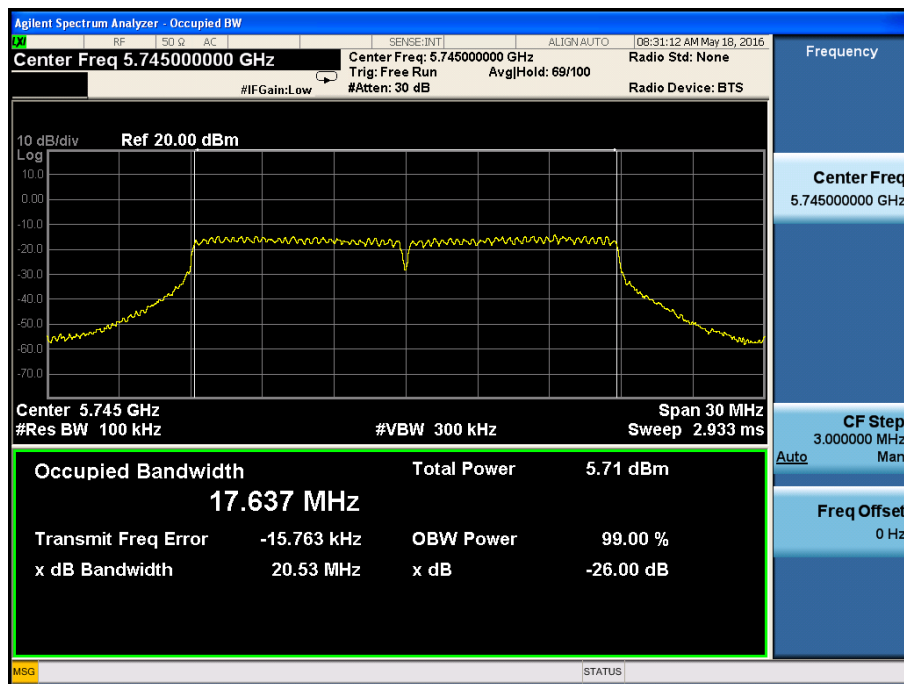


5240MHz

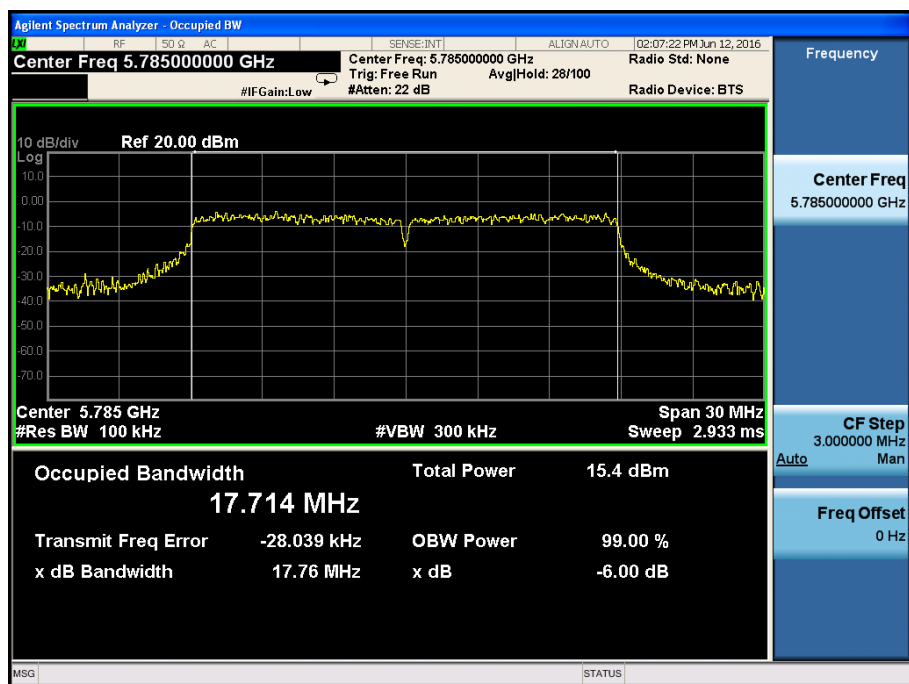


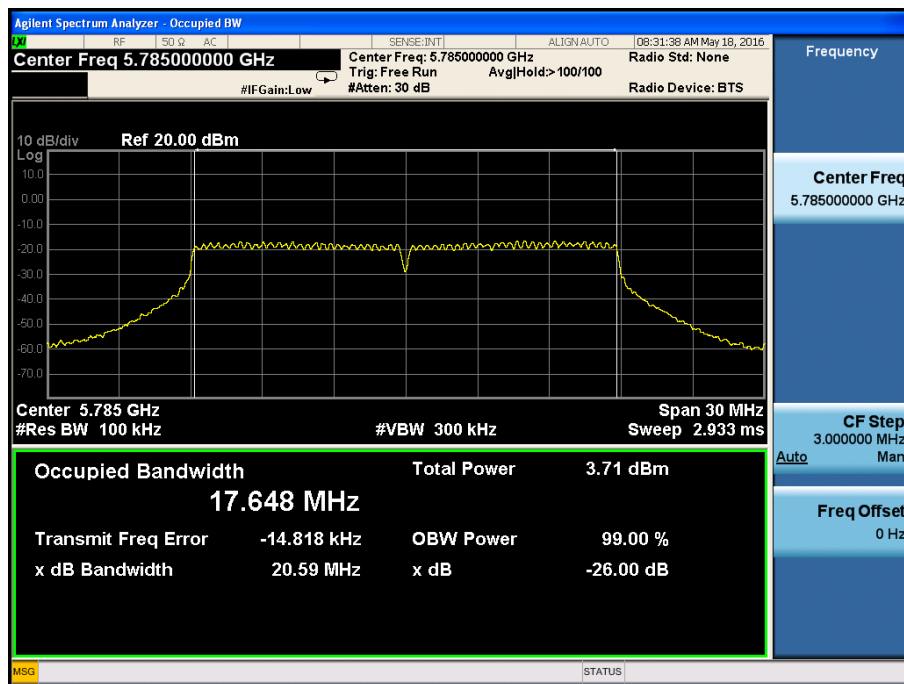
5745MHz



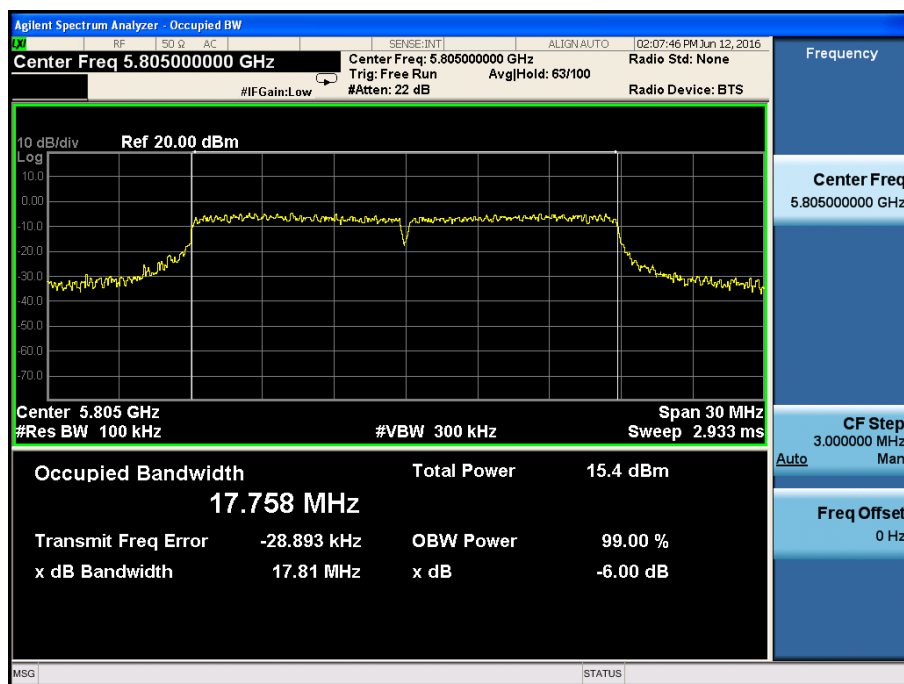


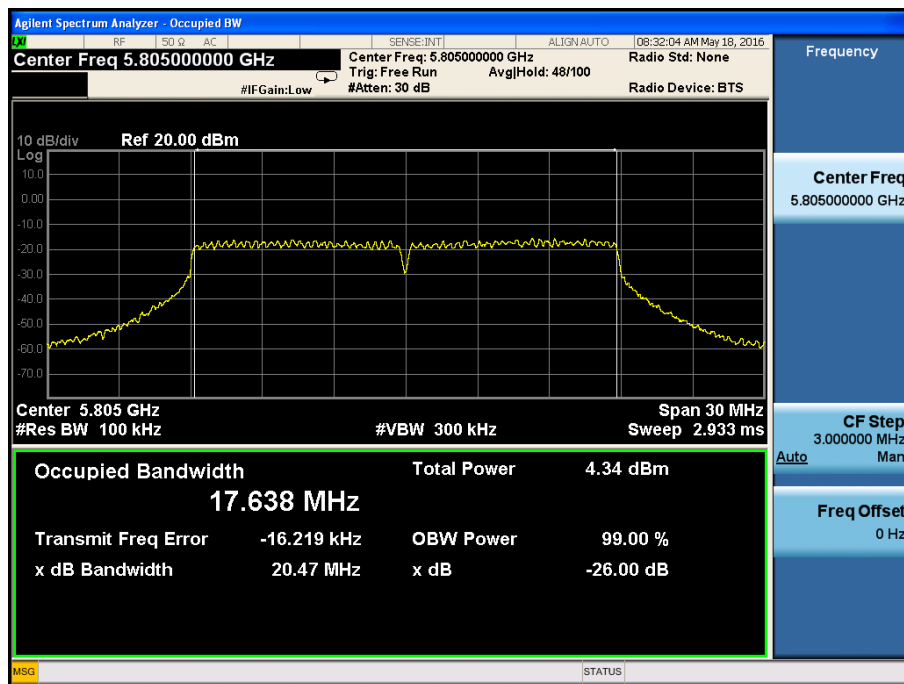
5785MHz





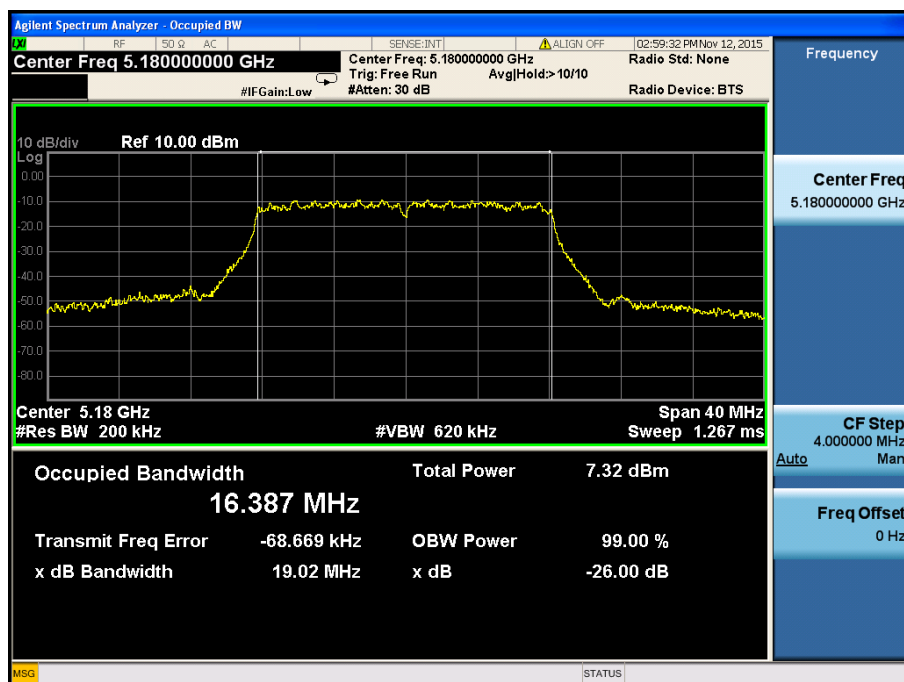
5805MHz



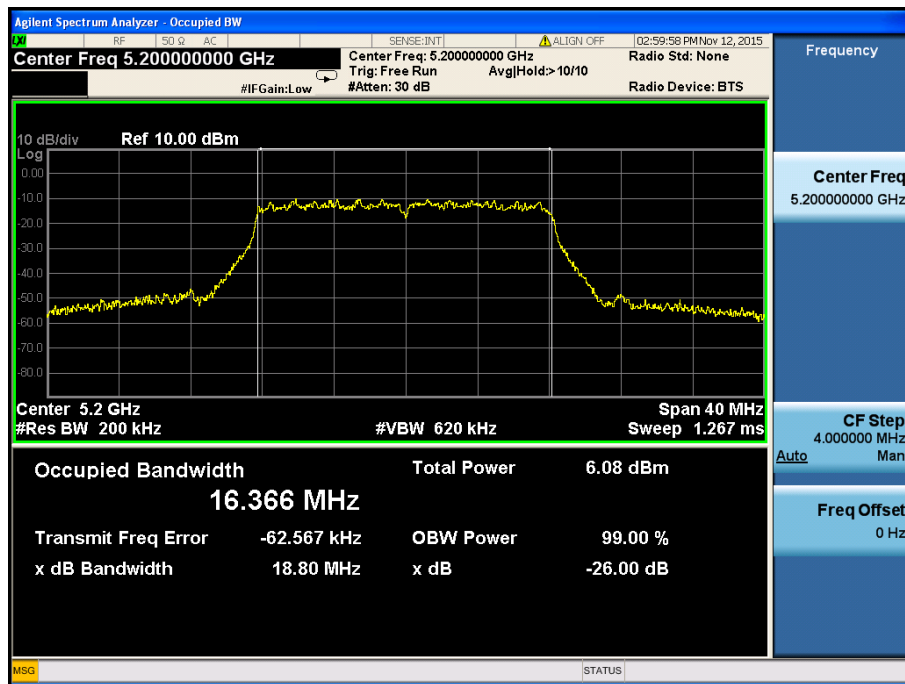


Test mode: 802.11n-HT20

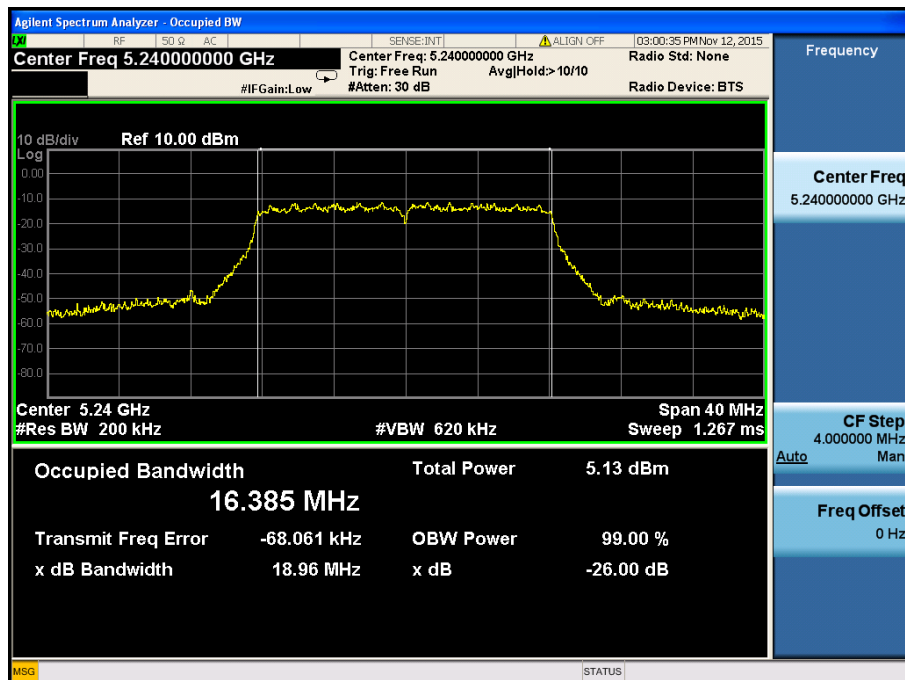
5180MHz



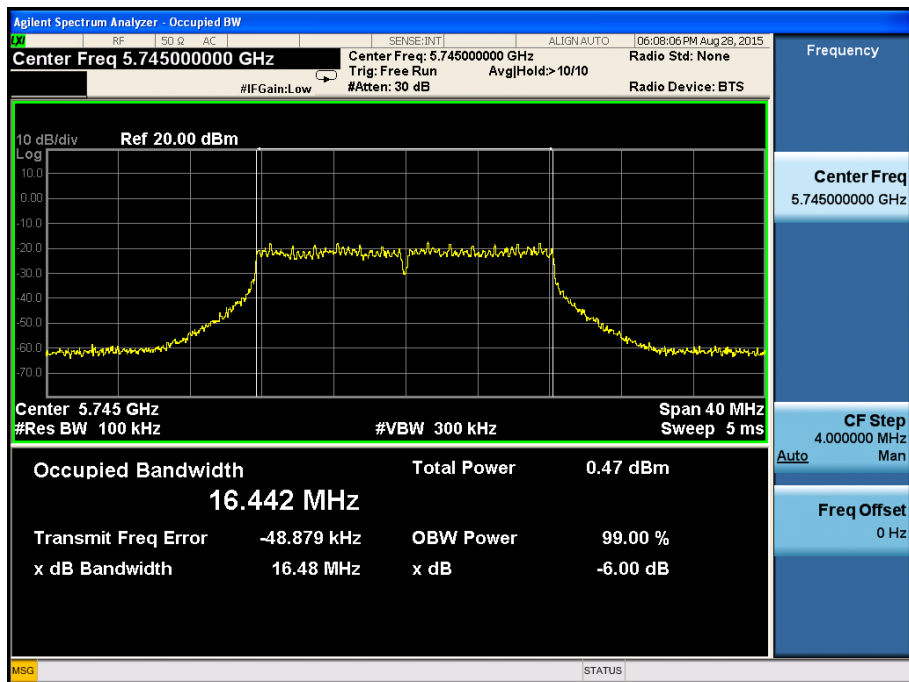
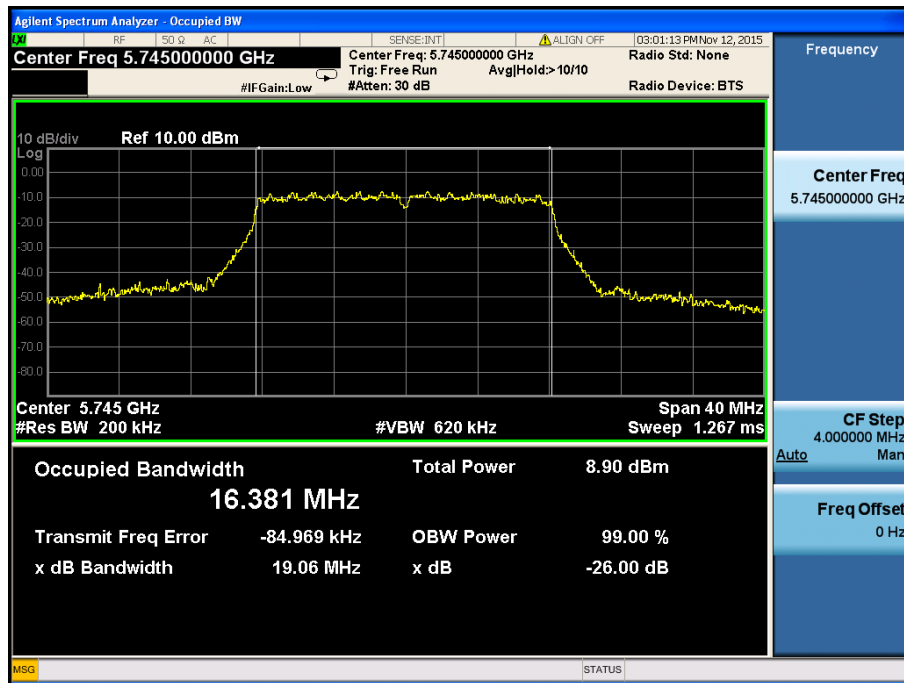
5200MHz



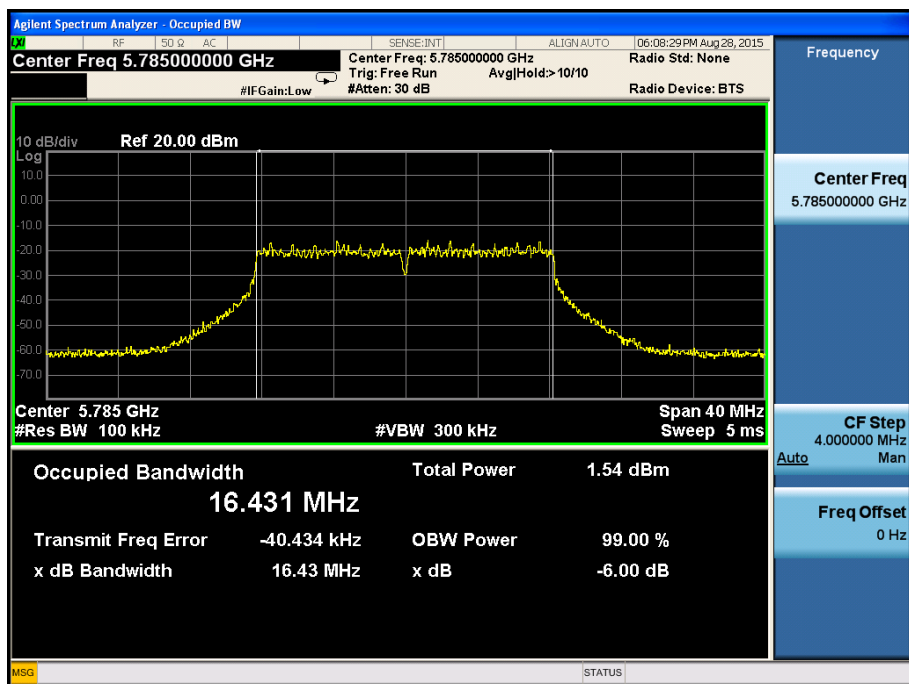
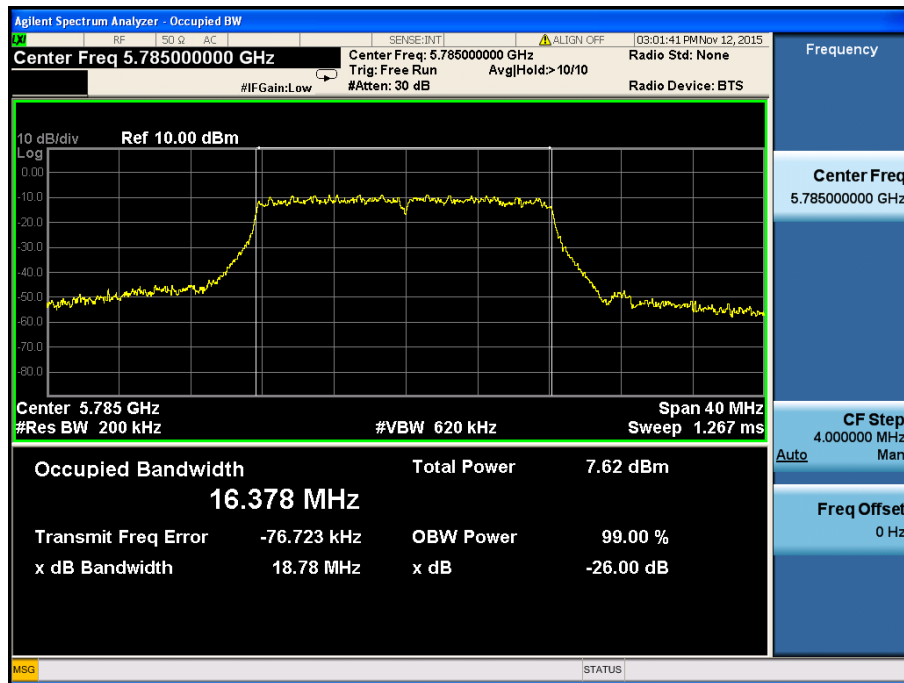
5240MHz



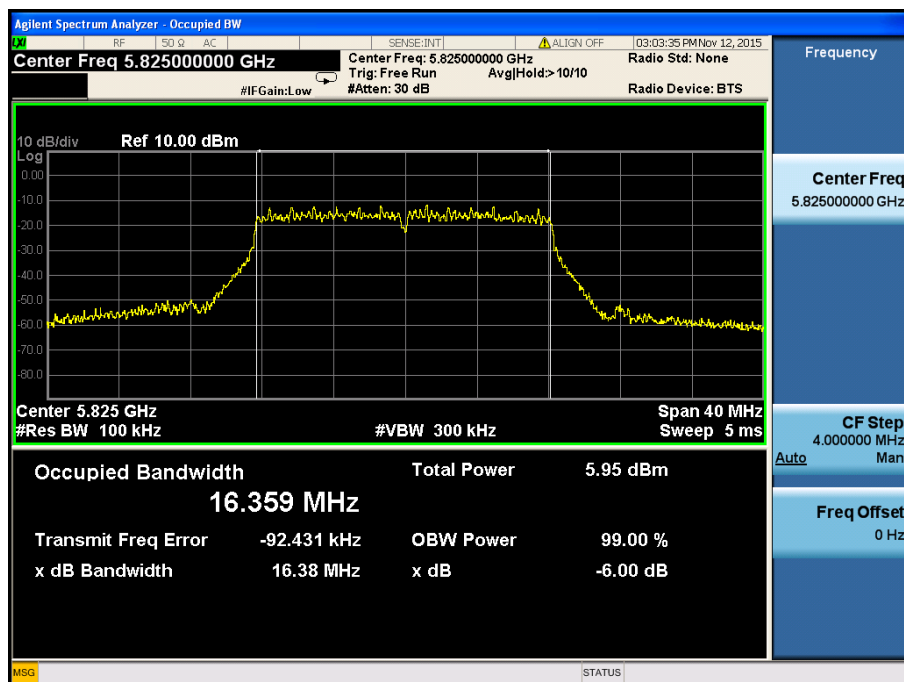
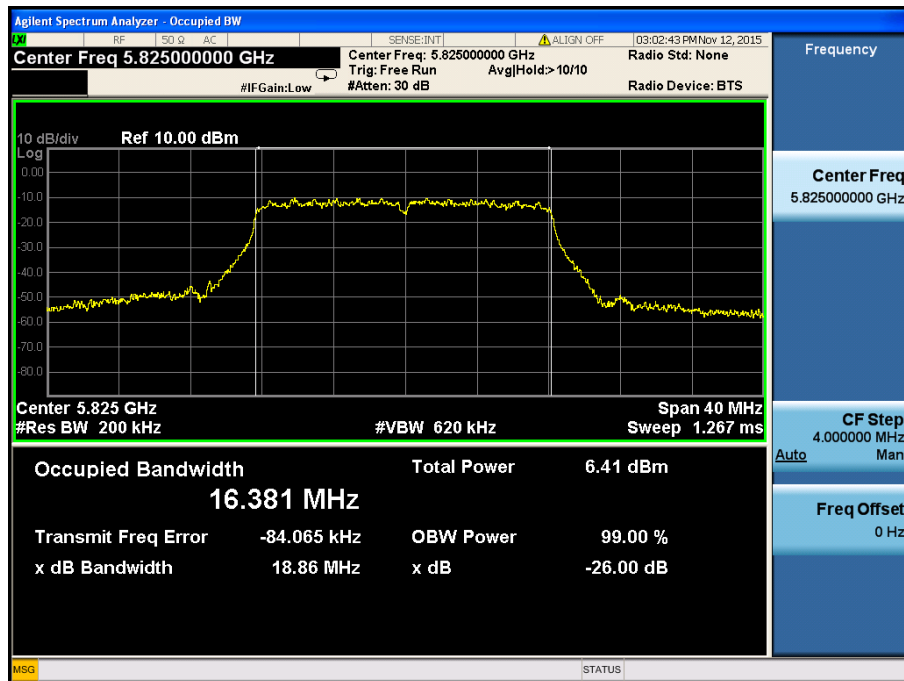
5745MHz



5785MHz

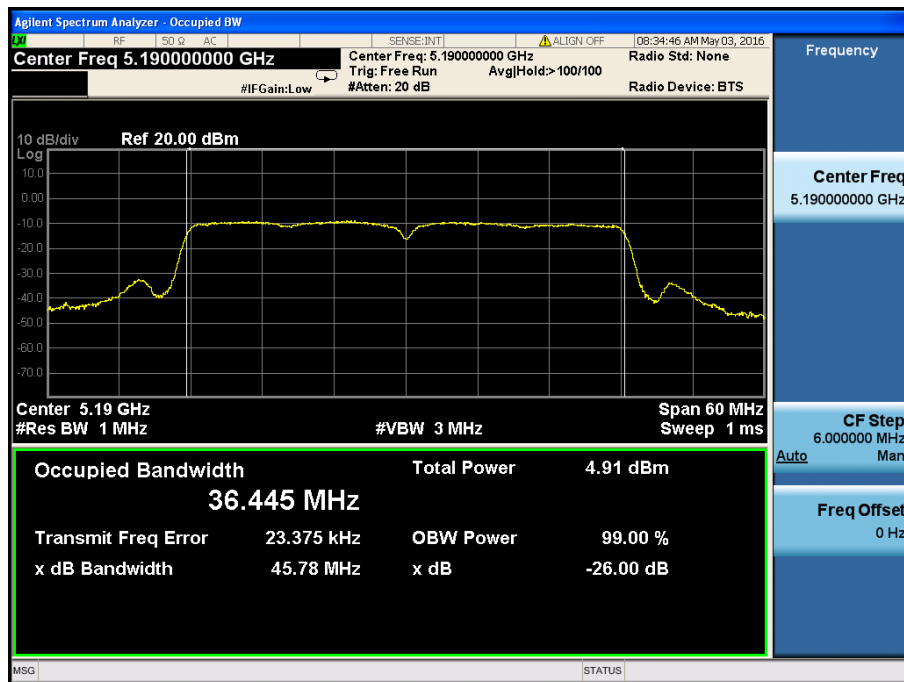


5825MHz

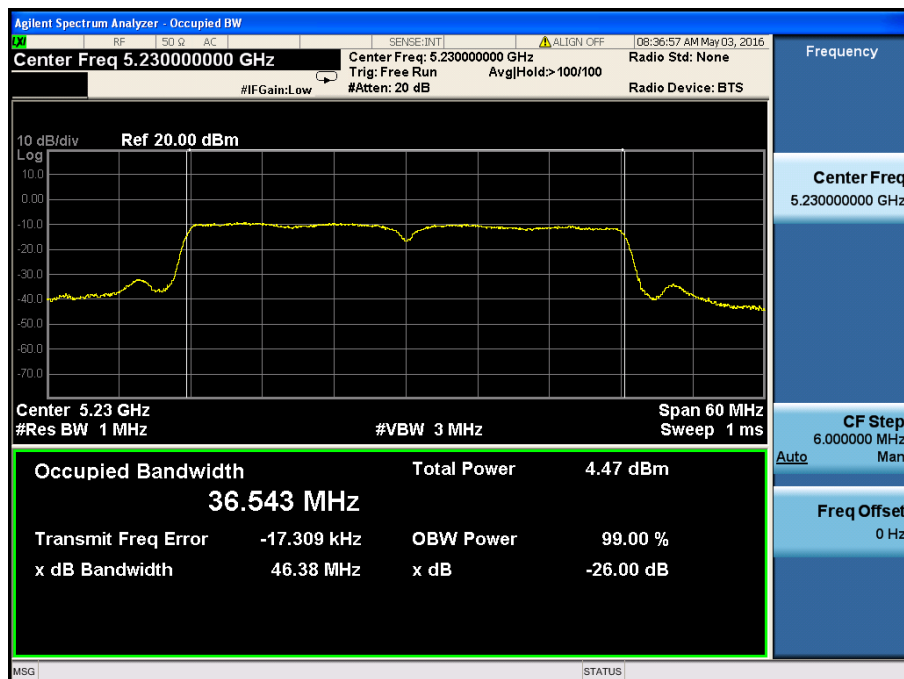


Test mode : 802.11n-HT40

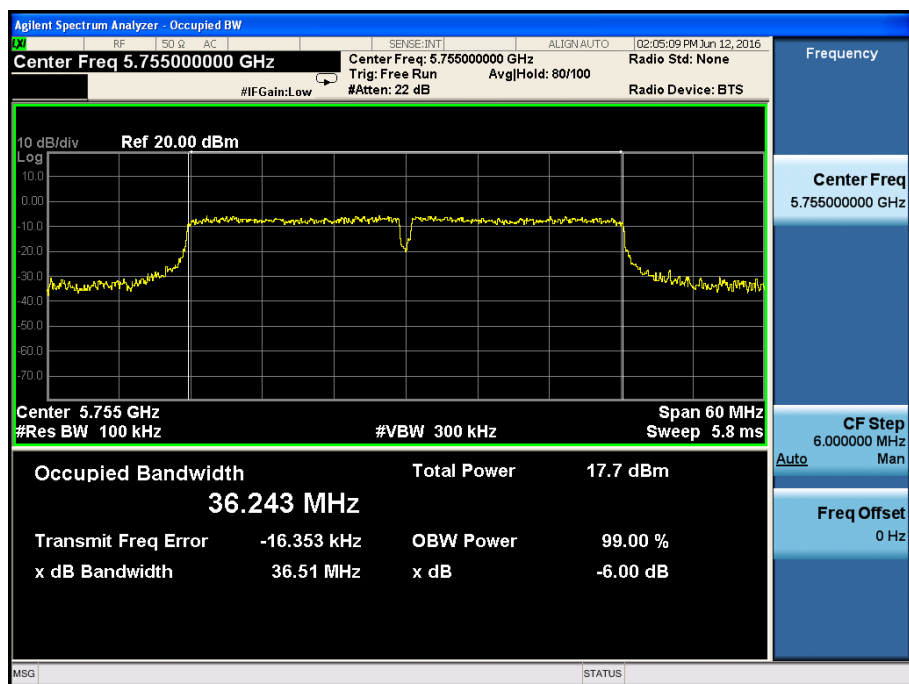
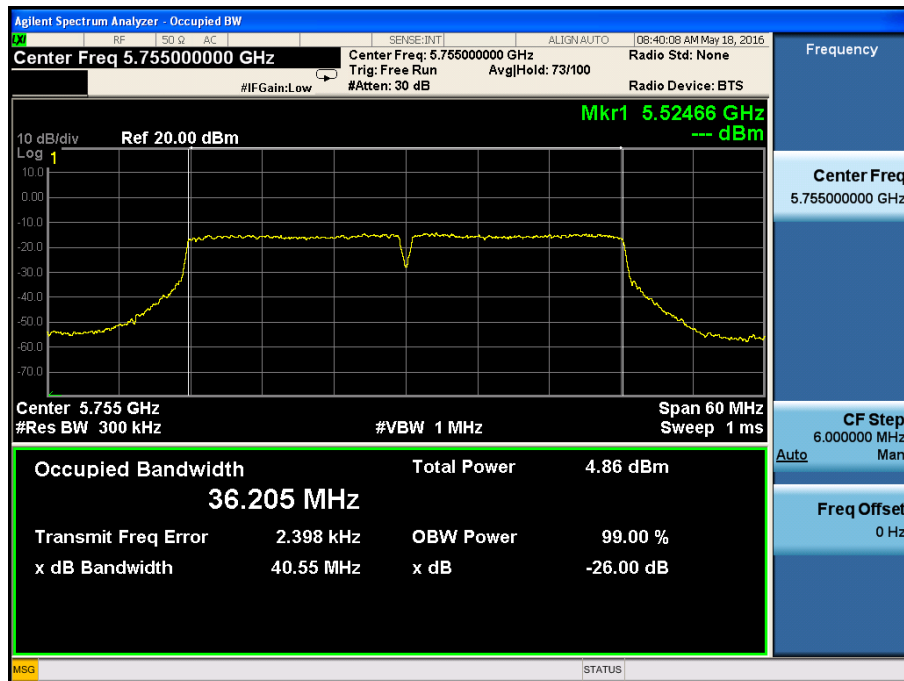
5190MHz



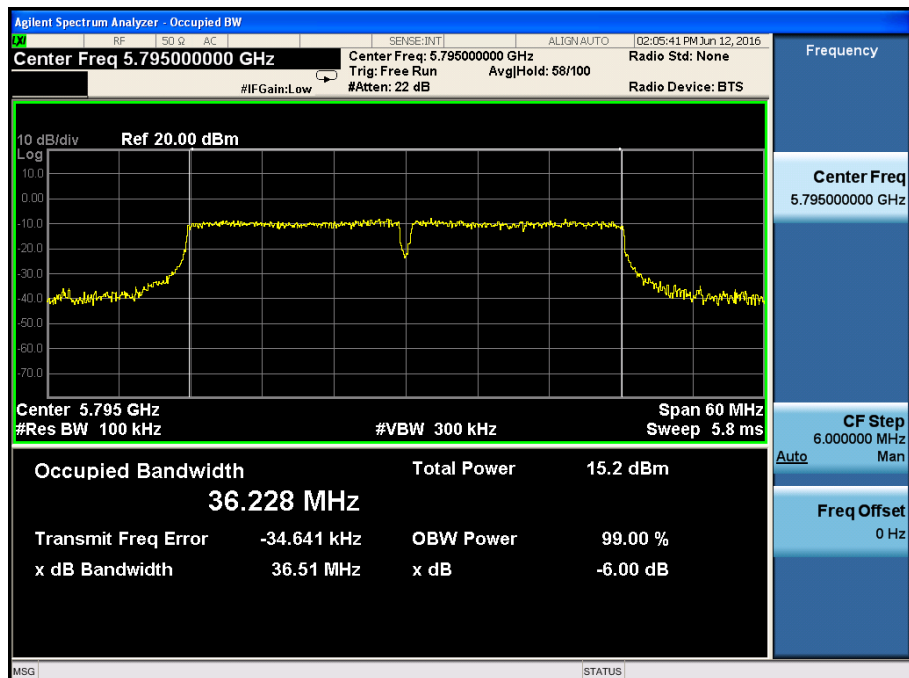
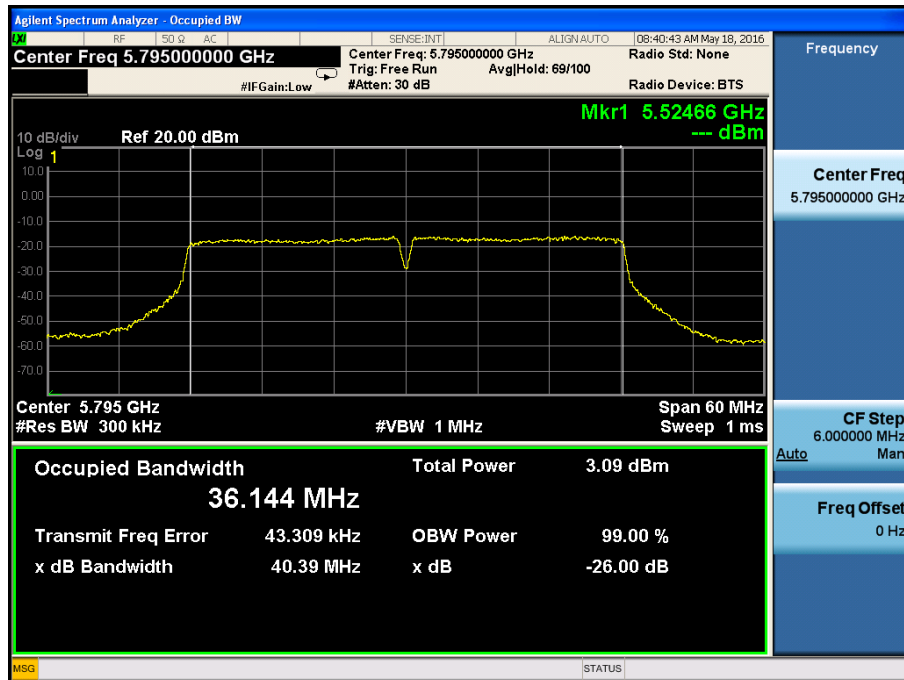
5230MHz



5755MHz



5795MHz



7. Maximum Conducted Output Power

7.1 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.

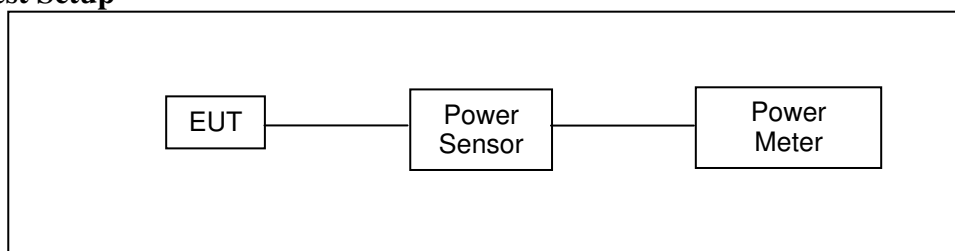
7.2 Test Procedure

The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01r02, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices
Section (E) Maximum Conducted Output Power

3. Measurement using a Power Meter (PM)

b) Method PM-G (Measurement using a gated RF average power meter)

7.3 Test Setup



7.4 Environmental Conditions

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

7.4 Summary of Test Results/Plots

For the frequency band 5.15-5.25GHz

Test mode	Frequency MHz	Power 1 dBm	Power 2 dBm	Total Power dBm	Total Power mW	Limit mW
802.11a	5180	14.34	14.21	17.29	53.52	250
	5200	13.23	12.81	16.36	40.14	250
	5240	12.16	12.10	15.14	32.66	250
	5745	13.31	12.35	15.87	38.61	1000
	5785	13.42	13.12	16.28	42.5	1000
	5825	14.32	14.33	17.34	54.14	1000
802.11n-HT20	5180	14.35	14.53	17.45	55.6	250
	5200	13.75	12.86	16.21	41.76	250
	5240	12.79	12.56	15.69	37.04	250
	5745	13.22	12.88	16.06	40.39	1000
	5785	13.56	13.08	16.34	43.02	1000
	5825	13.67	13.18	16.44	44.08	1000
802.11n-HT40	5190	11.32	11.05	14.20	26.29	250
	5230	11.09	11.12	14.11	25.79	250
	5755	11.98	11.19	14.61	28.93	1000
	5795	11.67	12.01	14.85	30.58	1000

8. Conducted Spurious Emissions

8.1 Standard Applicable

According to §15.407 (b) (b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

8.2 Test Procedure

1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer via a RF combiner.
2. Set the spectrum analyzer as RBW = 100kHz/1MHz, VBW=300kHz/3MHz, Sweep = auto
3. Set the Lowest, Middle and Highest Transmitting Channel, observed the outside band of 30MHz to 40GHz, then mark the higher-level emission for comparing with the FCC rules.

8.3 Environmental Conditions

Temperature:	21° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

8.4 Summary of Test Results/Plots