

FCC Part 15E Measurement and Test Report

For

Bak USA Technologies Corp.

425 Michigan Avenue, Buffalo, New York 14203, USA

FCC ID: 2AEY7-S8A001

FCC Rule(s): FCC Part 15E

Product Description: Seal

Tested Model: 8

Report No.: STR16058017-3

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Tested By: Irving Liu / Engineer

Irving Liu

Reviewed By: Suan Su / Engineer

Suan Su

Approved & Authorized By: Jandy So / PSO Manager

Jandy So

Prepared By:

Shenzhen SEM.Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

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: Bak USA Technologies Corp.
Address of applicant: 425 Michigan Avenue, Buffalo, New York 14203, USA

Manufacturer: Shenzhen Wisky Technology Co.,LTD.
Address of manufacturer: 5th Floor,W2-A Building,Hi-tech Park South 1st Road,
Nanshan District,Shenzhen

General Description of EUT:	
Product Name:	Seal
Brand Name:	/
Model No.:	8
Hardware version:	T01-V1.1-0113
Software version:	Windows 10
IMEI:	826259502002440
Adapter Model:	SAP050200CN-C
	INPUT:100-240V,50/60Hz,0.6A; OUTPUT:DC5V,2A
Rated Voltage:	DC 3.7V Li-ion Battery
Device Category:	Portable Device
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT	
Wi-Fi(5G)	
Support Standards:	802.11a, 802.11n (20MHz,40MHz)
Frequency Range:	5150-5250MHz, 5250-5350MHz , 5470-5725MHz, 5725-5850MHz
RF Output Power:	18.11dBm (Conducted)
Type of Modulation:	64QAM, 16QAM, QPSK, BPSK
Data Rate:	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to MCS7
Quantity of Channels:	5180 ~ 5240MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5260 ~ 5320MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5500 ~ 5700MHz: 8 for 802.11a, 802.11n (20MHz) 3 for 802.11n (40MHz)

	5745 ~ 5805MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz)
Channel Separation:	20MHz/40MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	Antenna 1:3.89dBi, Antenna 2:5.06dBi

1.2 Test Standards

The following report is prepared on behalf of the Bak USA Technologies Corp. 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 and KDB 662911 D01 Multiple Transmitter Output v02r01 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,5260MHz,5300MHz,5320MHz,5500MHz,5580 MHz,5700 MHz,5745 MHz,5785 MHz,5825 MHz
TM2	802.11n-HT20	5180MHz,5200MHz,5240MHz,5260MHz,5300MHz,5320MHz,5500MHz,5580 MHz,5700 MHz,5745 MHz,5785 MHz,5825 MHz
TM3	802.11n-HT40	5190MHz,5230MHz,5270MHz,5310MHz,5510MHz,5550MHz,5670MHz,5755 MHz,5795 MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Core
DC Cable	1.0	Unshielded	Without 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 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 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),(3)	Power Spectral Density	Compliant
§ 15.407(e)	Emission Bandwidth and Occupied Bandwidth	Compliant
§ 15.407(a)(1),(2),(3)	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)	Compliant*

Note: DFS report please refers to Report No. 1610RUS00901.

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 SAR 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

Channel	Channel frequency(MHz)	Chain 1 dBm/MHz	Chain 2 dBm/MHz	Total dBm/MHz	Limit (dBm/MHz)
36	5180	5.335	4.863	8.12	11
40	5200	5.615	5.665	8.65	11
48	5240	4.686	4.059	7.40	11
52	5260	4.666	4.221	7.46	11
60	5300	3.683	4.277	7.00	11
64	5320	3.960	3.466	6.73	11
100	5500	3.082	3.246	6.17	11
116	5580	4.061	3.059	6.60	11
140	5700	2.138	2.599	5.39	11

Channel	Channel frequency(MHz)	Chain 1 dBm/500KHz	Chain 2 dBm/500KHz	Total dBm/500KHz	Limit (dBm/500KHz)
149	5745	-3.014	-2.107	0.49	30
157	5785	-2.833	-2.219	0.49	30
165	5825	-2.036	-3.574	0.25	30

802.11n20

Channel	Channel frequency(MHz)	Chain 1 dBm/MHz	Chain 2 dBm/MHz	Total dBm/MHz	Limit (dBm/MHz)
36	5180	5.004	5.824	8.44	11
40	5200	5.051	4.975	8.02	11
48	5240	4.158	4.126	7.15	11
52	5260	4.869	3.971	7.45	11
60	5300	4.410	3.205	6.86	11
64	5320	3.931	2.922	6.30	11
100	5500	3.416	3.216	6.32	11
116	5580	3.625	1.490	5.69	11
140	5700	1.689	1.081	4.41	11

Channel	Channel frequency(MHz)	Chain 1 dBm/500KHz	Chain 2 dBm/500KHz	Total dBm/500KHz	Limit (dBm/500KHz)
149	5745	-2.595	-3.865	-0.18	30
157	5785	-2.037	-3.305	0.37	30
165	5825	-1.761	-1.767	1.24	30

802.11n40

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	7.75	11
54	5270	5.577	4.117	7.92	11
62	5310	4.367	3.121	6.80	11
102	5510	2.110	0.936	4.58	11
110	5550	2.212	0.496	4.46	11
134	5670	0.496	1.472	4.01	11

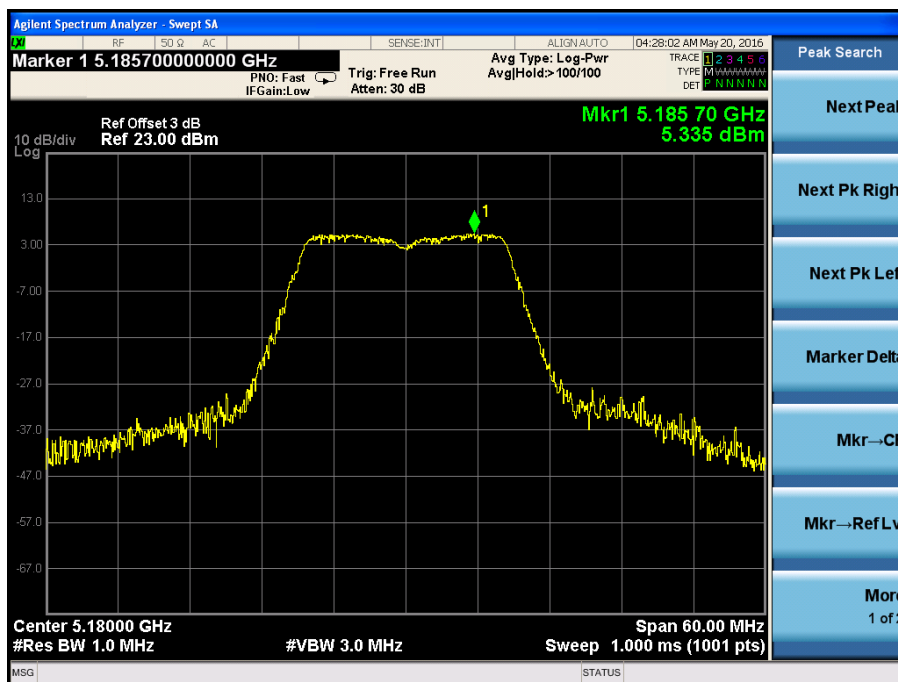
Channel	Channel frequency(MHz)	Chain 1 dBm/500KHz	Chain 2 dBm/500KHz	Total dBm/500KHz	Limit (dBm/500KHz)
151	5755	-7.667	-8.471	-5.09	30
159	5795	-7.895	-8.789	-5.38	30

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.

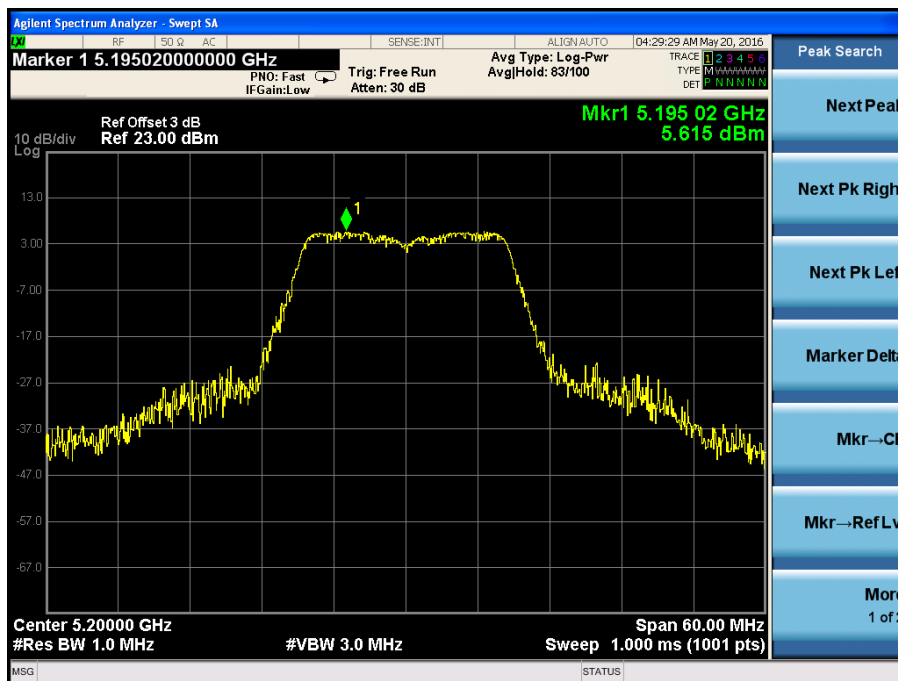
Antenna 1

Test Mode: 802.11a

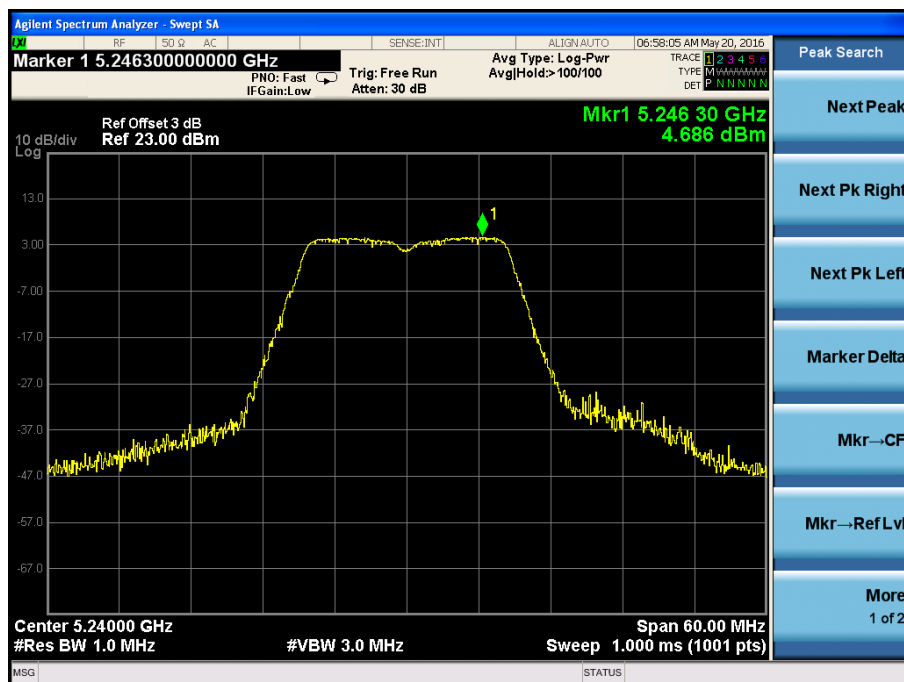
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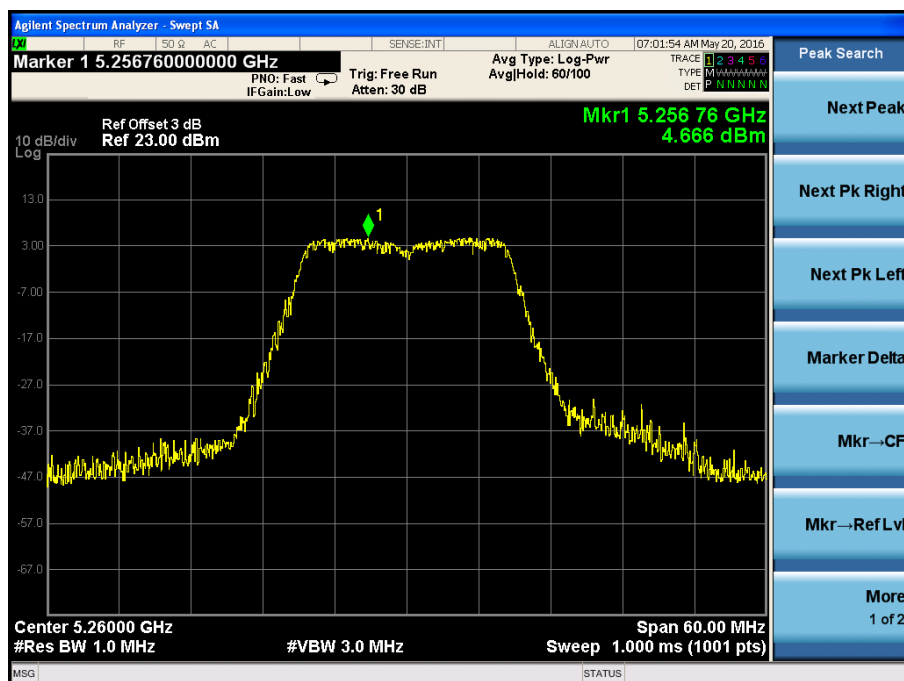
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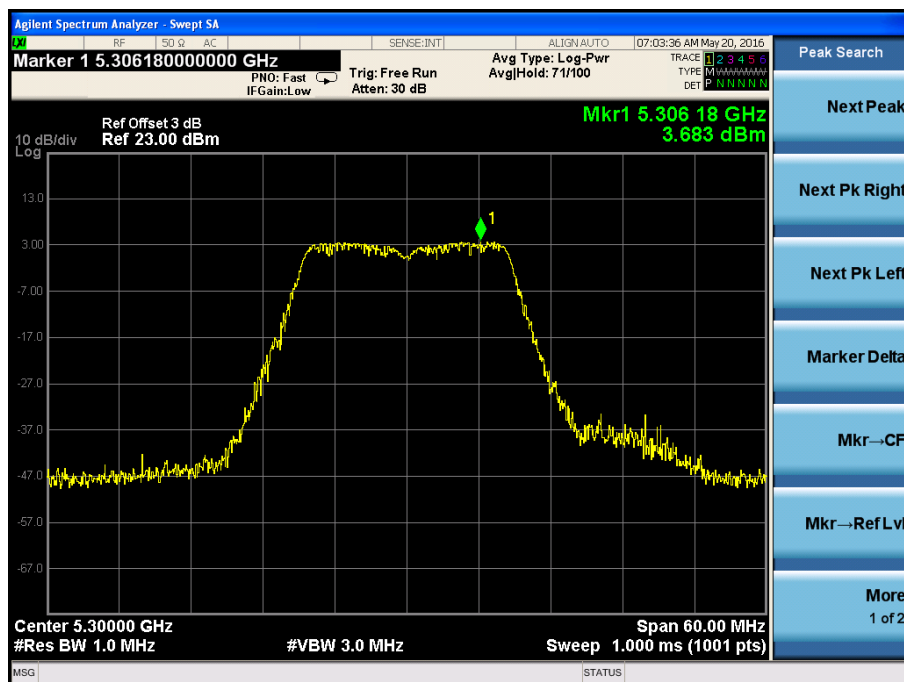
5240MHz



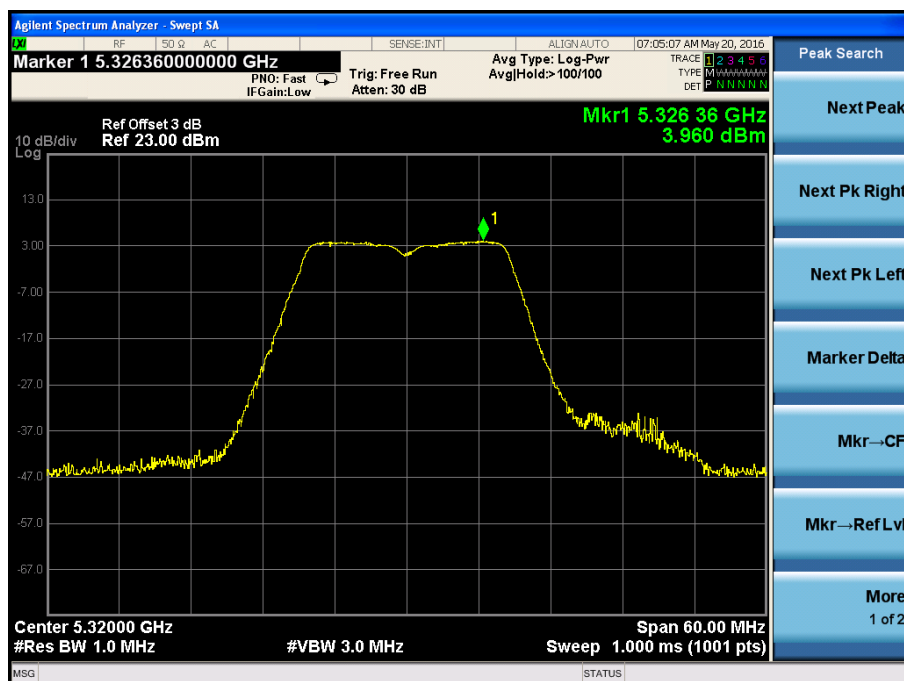
5260MHz



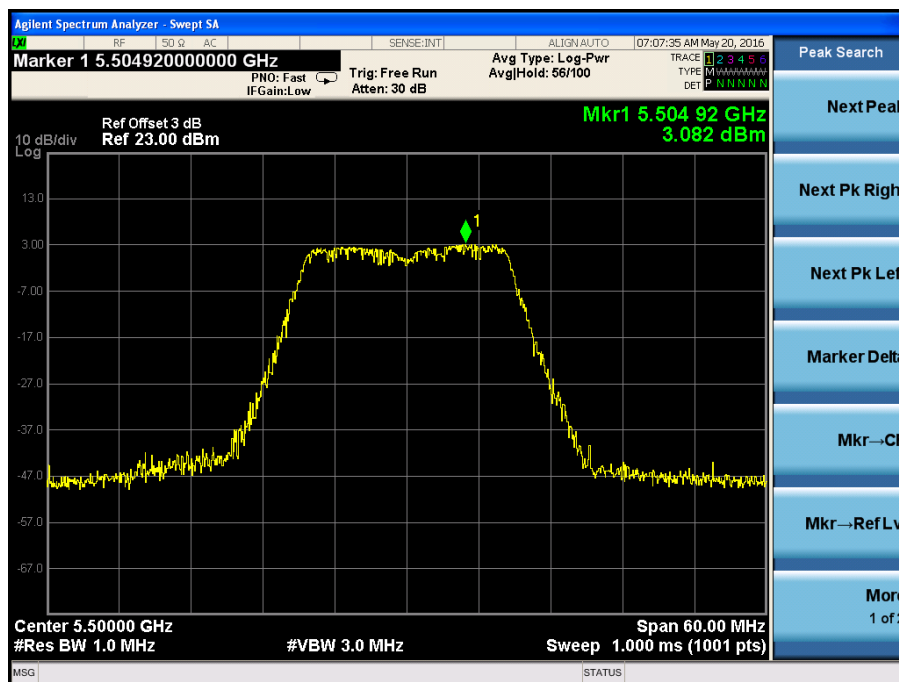
5300MHz



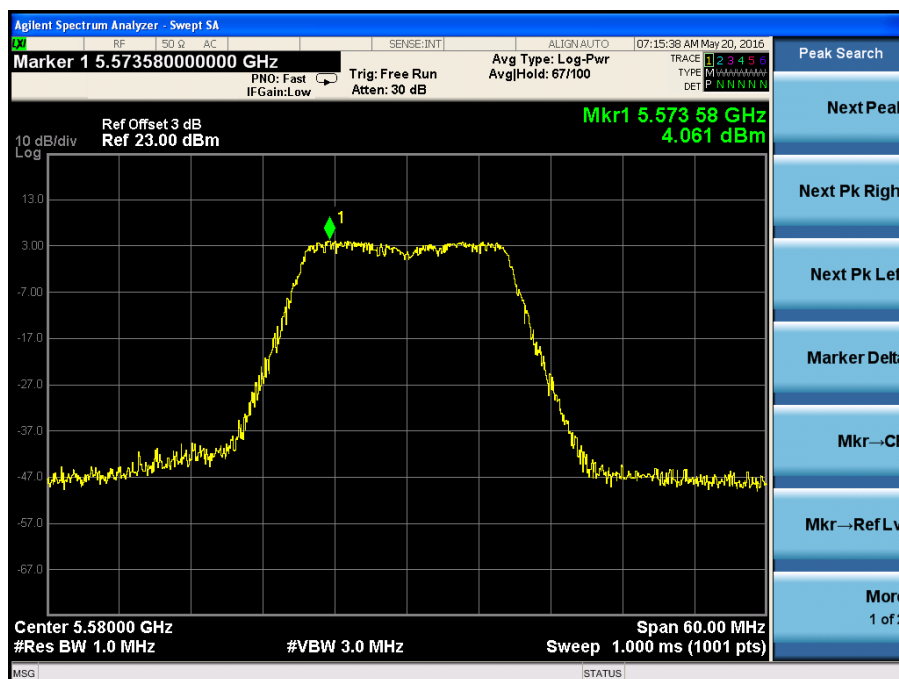
5320MHz



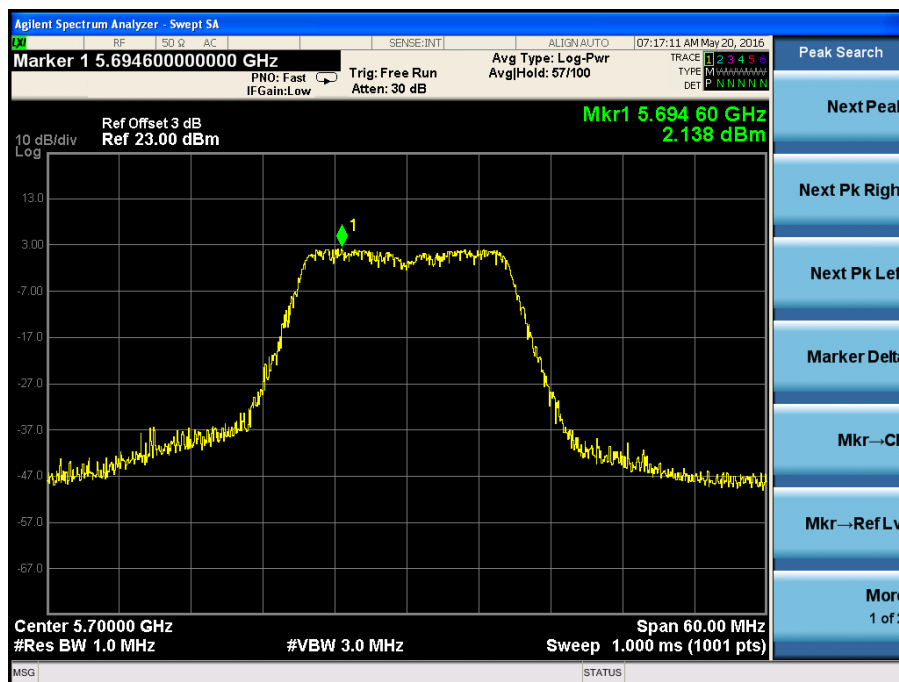
5500MHz



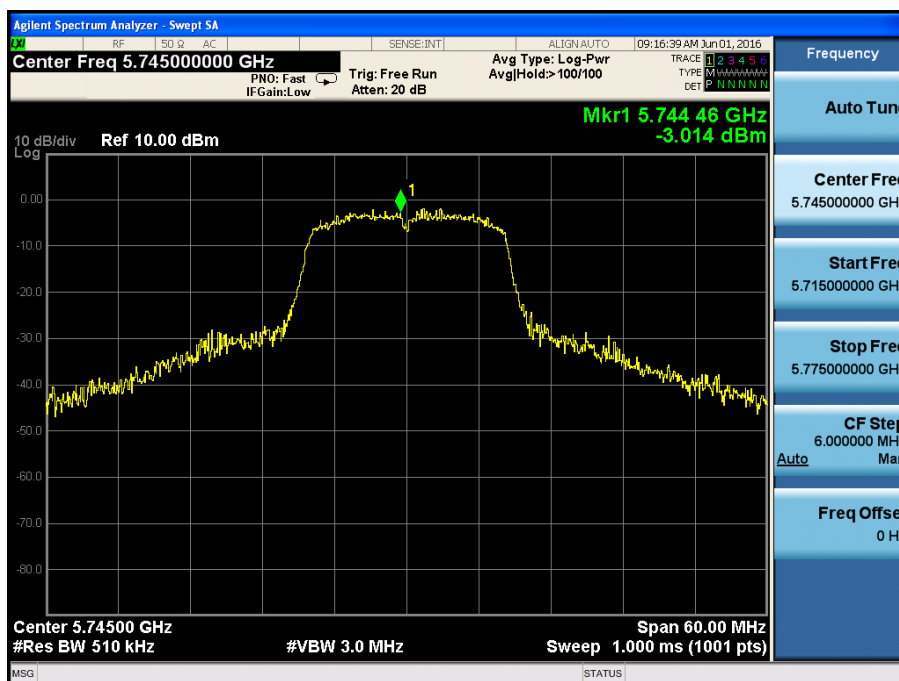
5580MHz



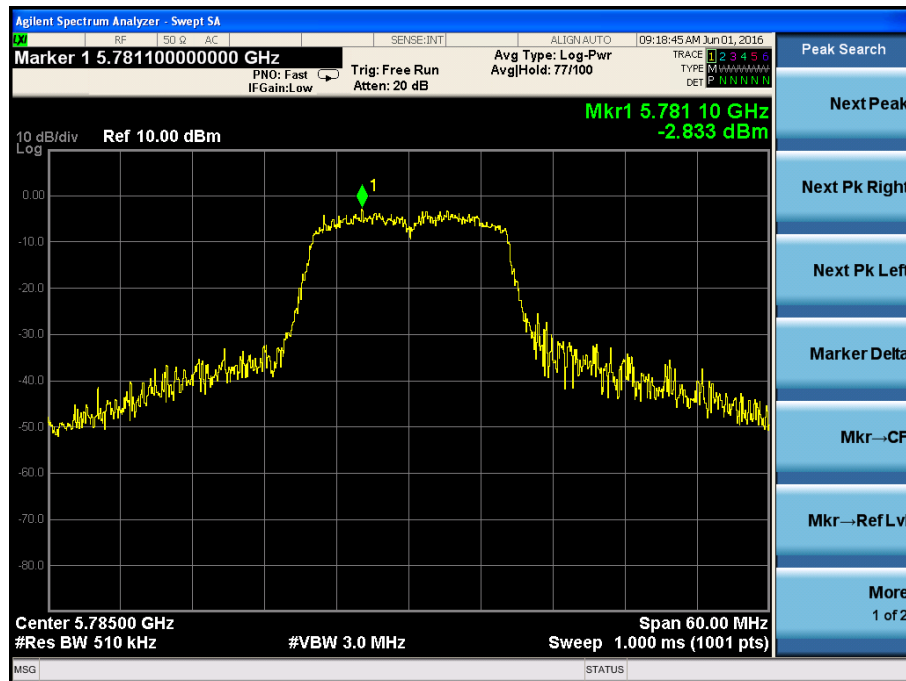
5700MHz



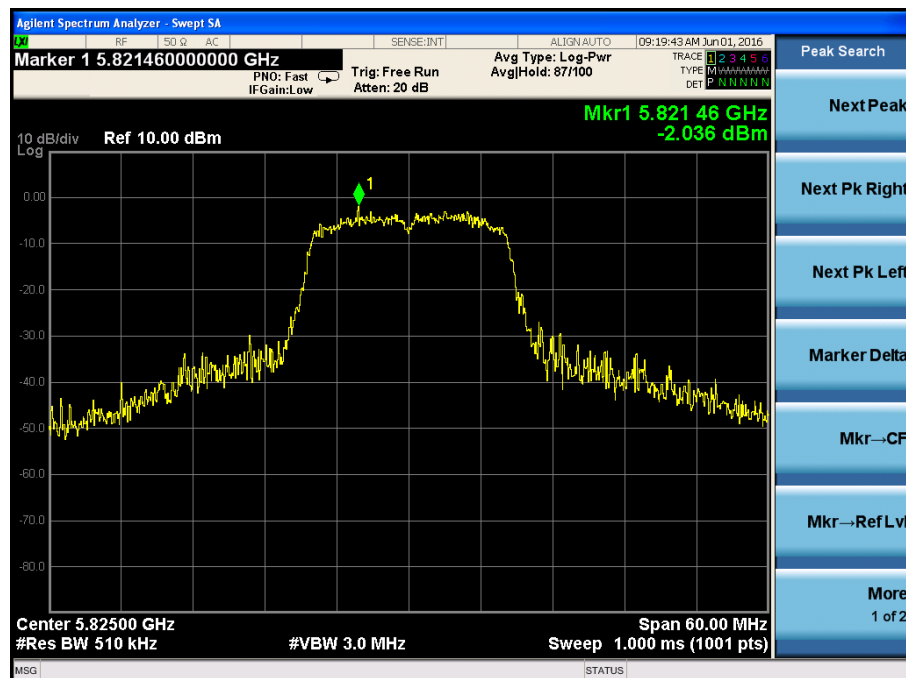
5745MHz



5785MHz

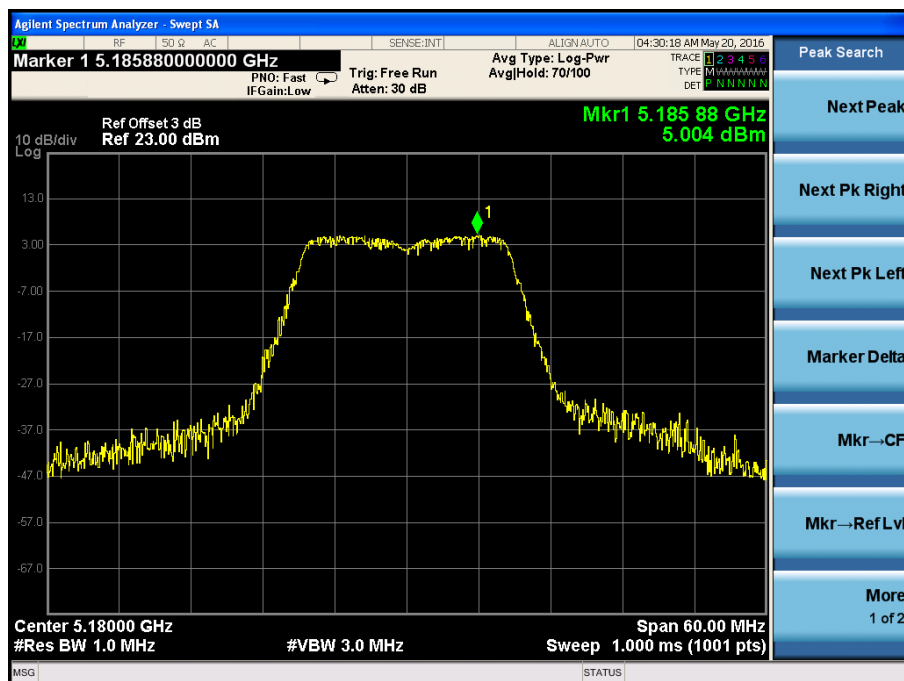


5825MHz

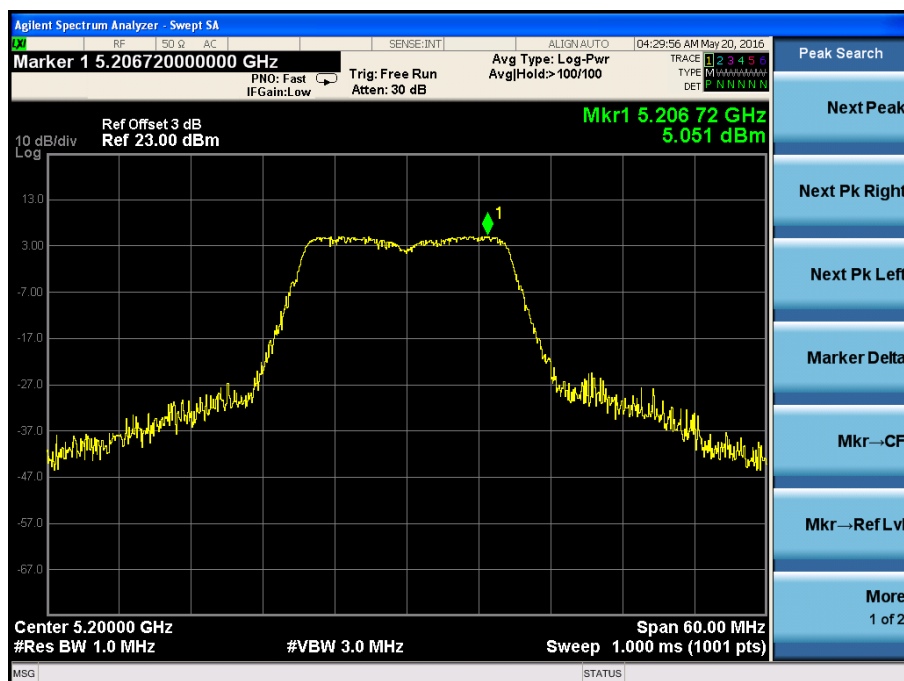


Test Mode: 802.11n20

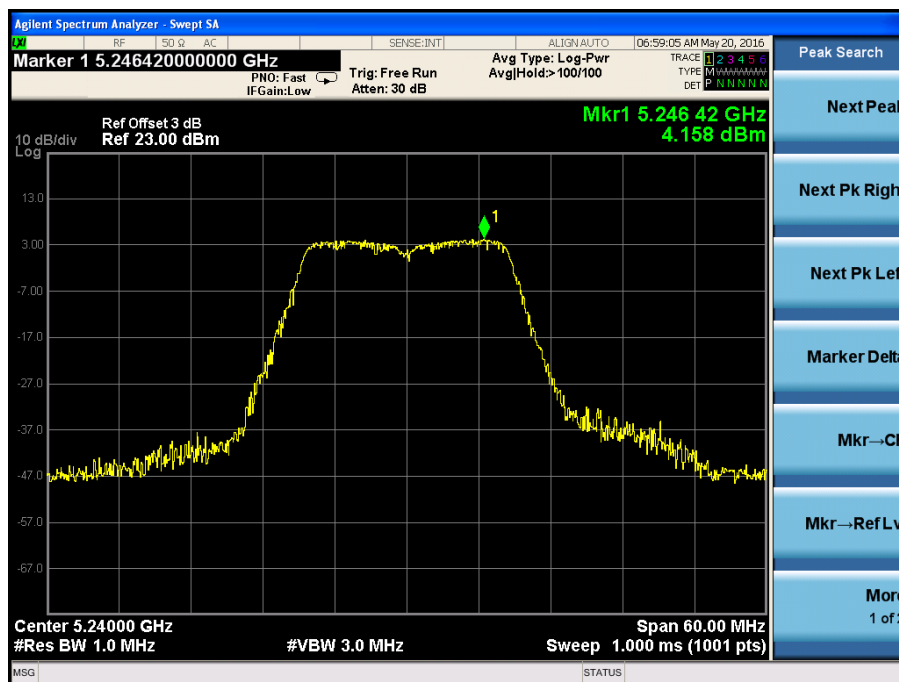
5180MHz



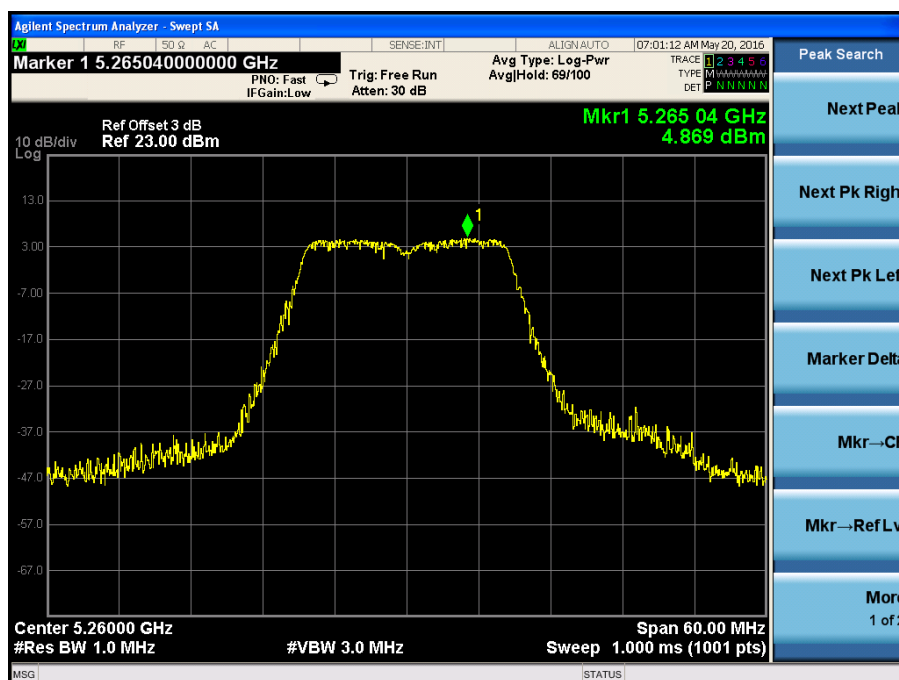
5200MHz



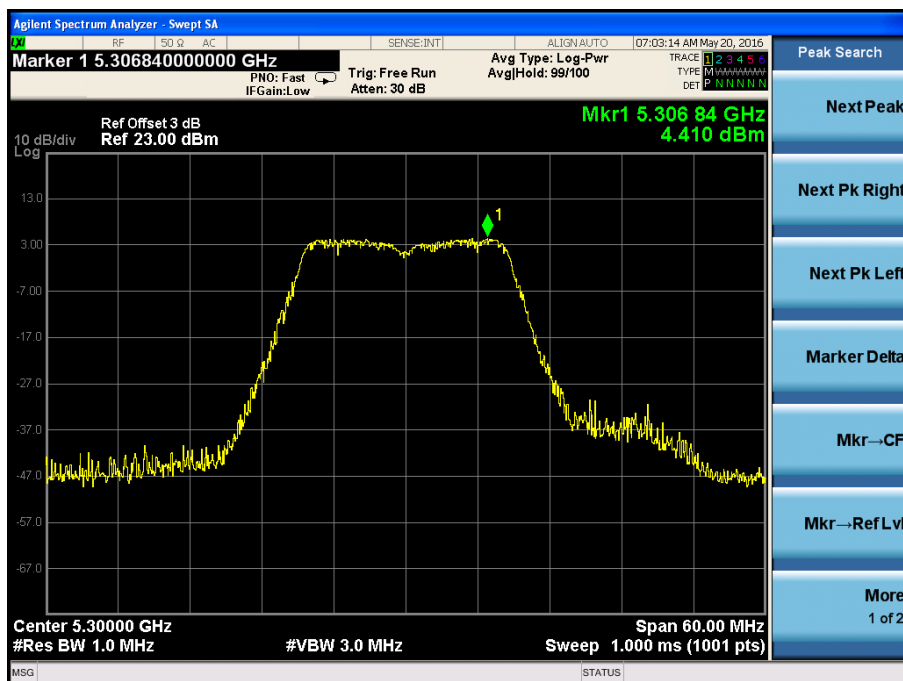
5240MHz



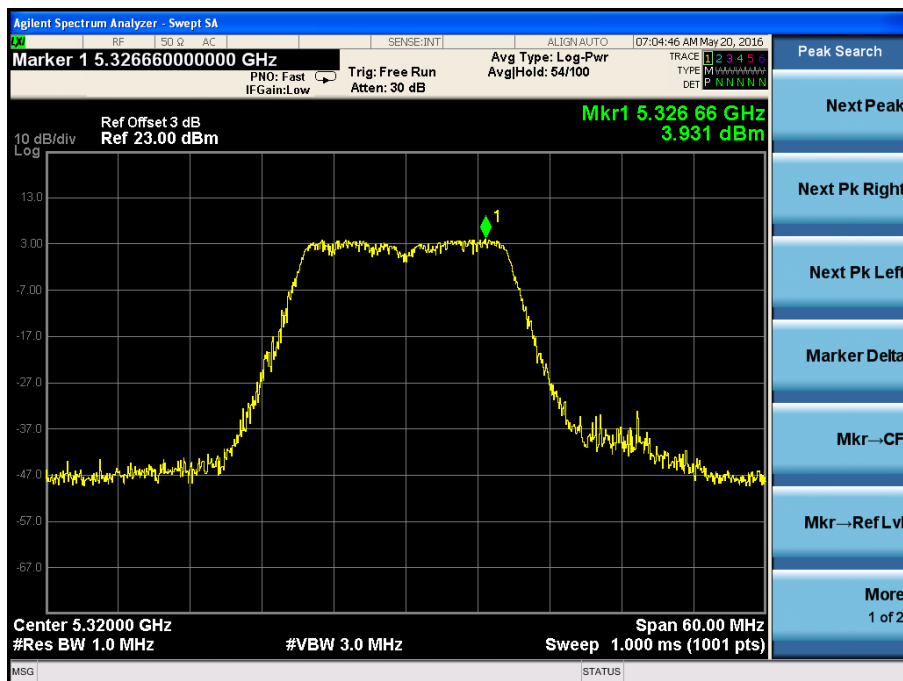
5260MHz



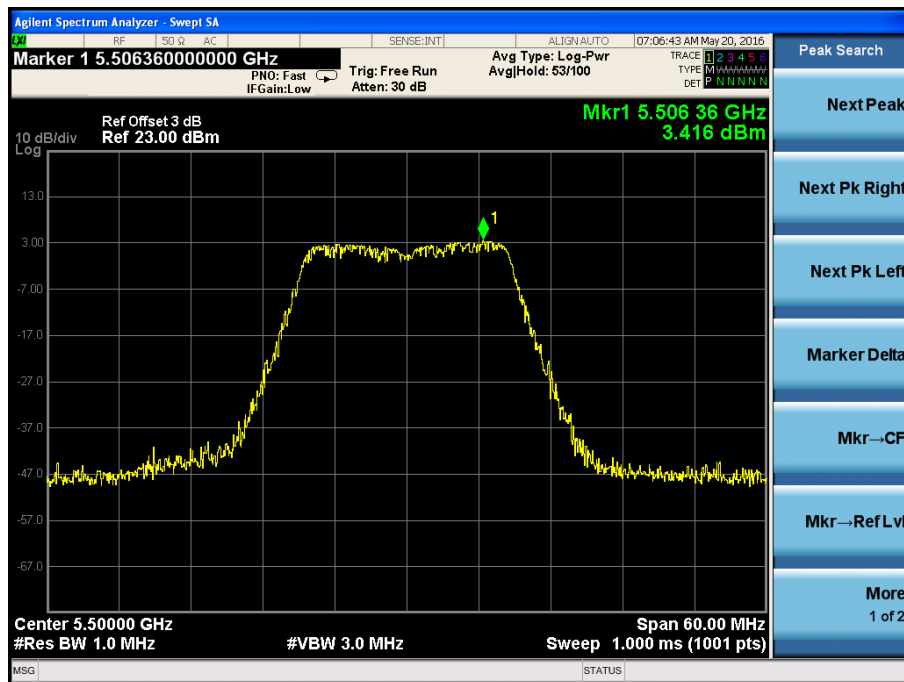
5300MHz



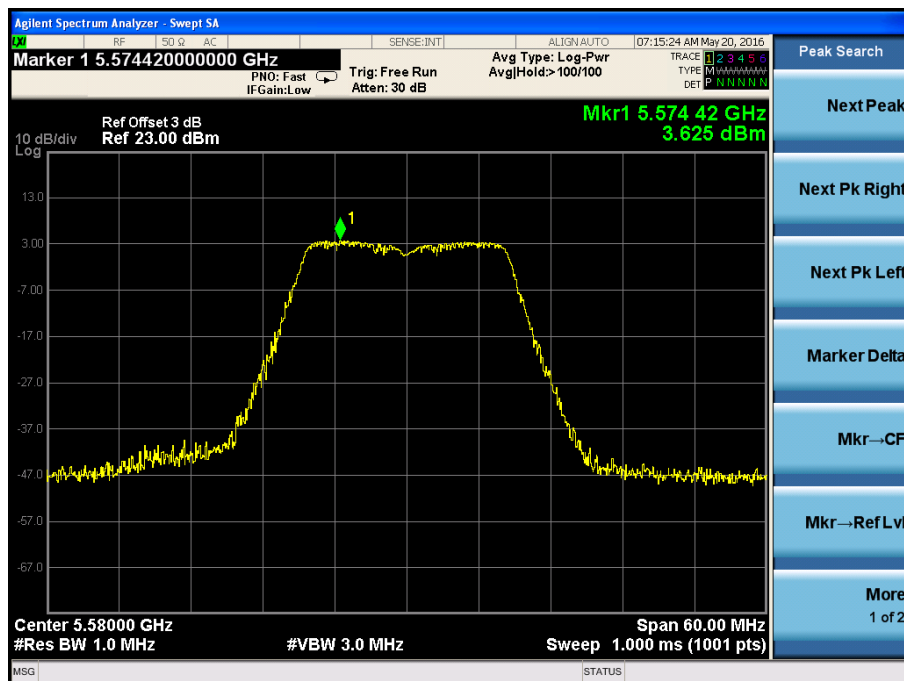
5320MHz



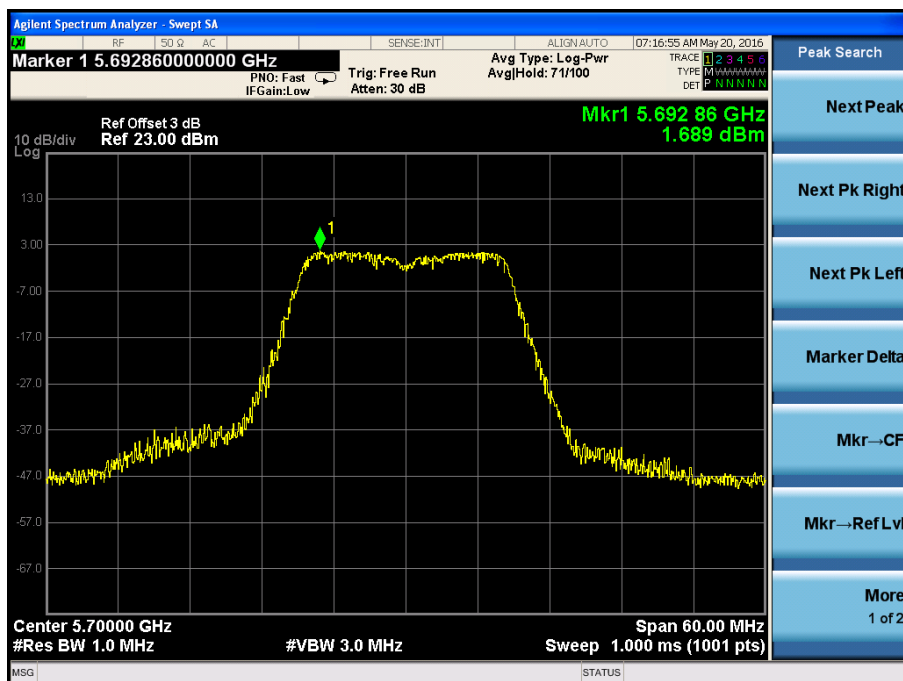
5500MHz



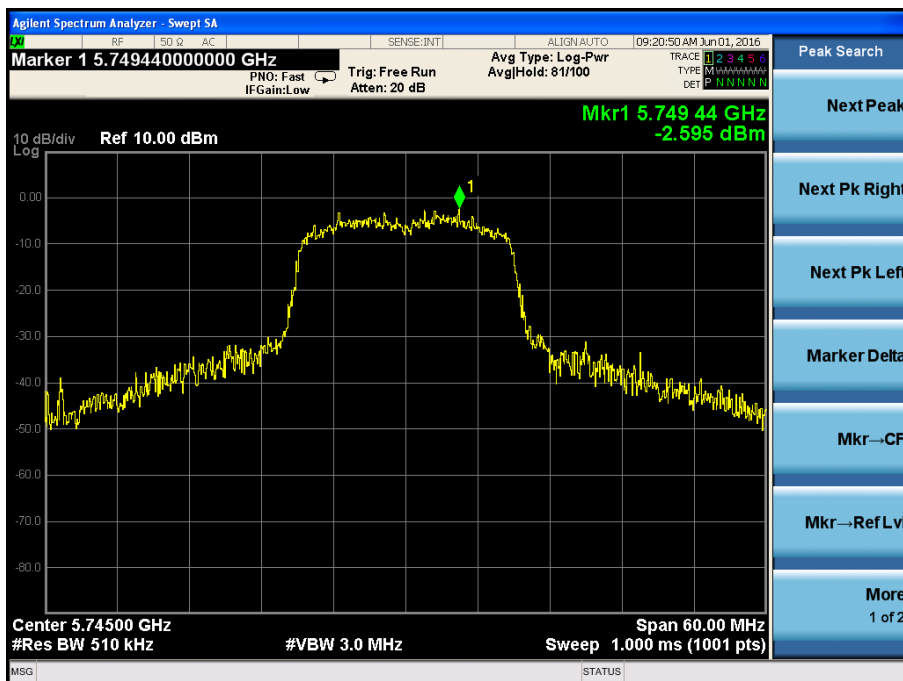
5580MHz



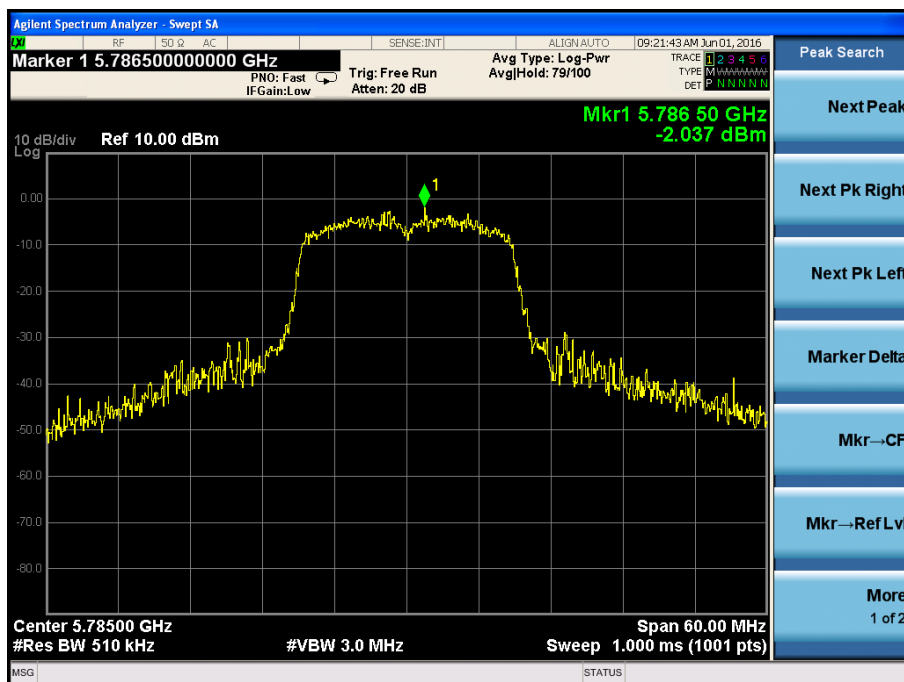
5700MHz



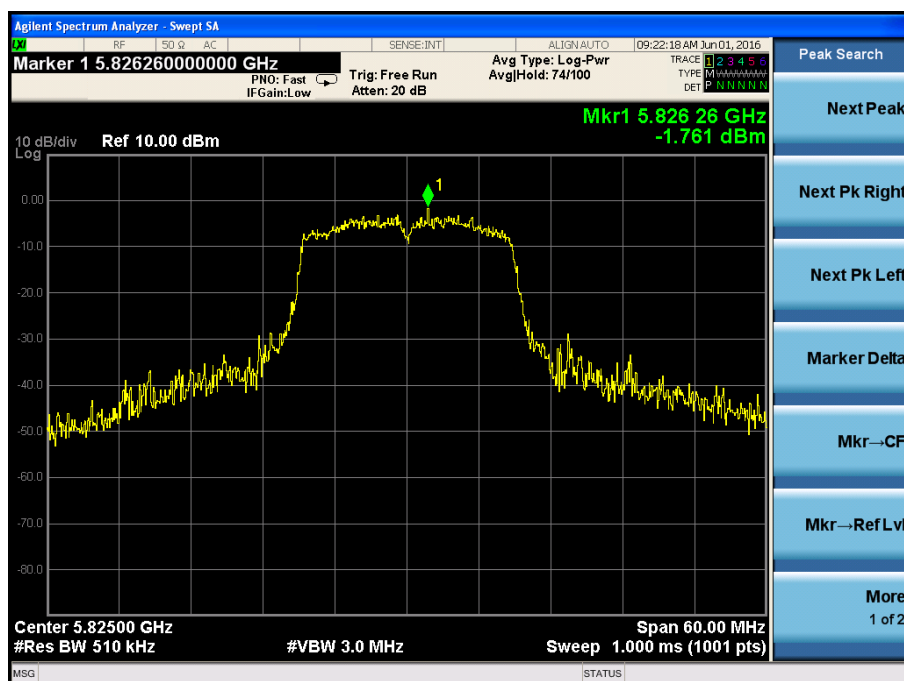
5745MHz



5785MHz

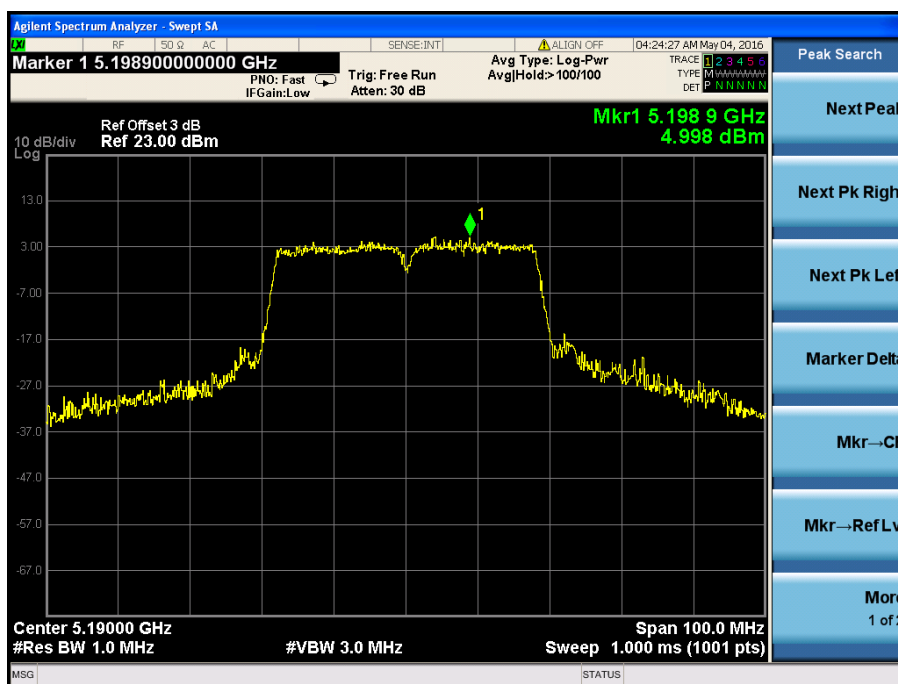


5825MHz

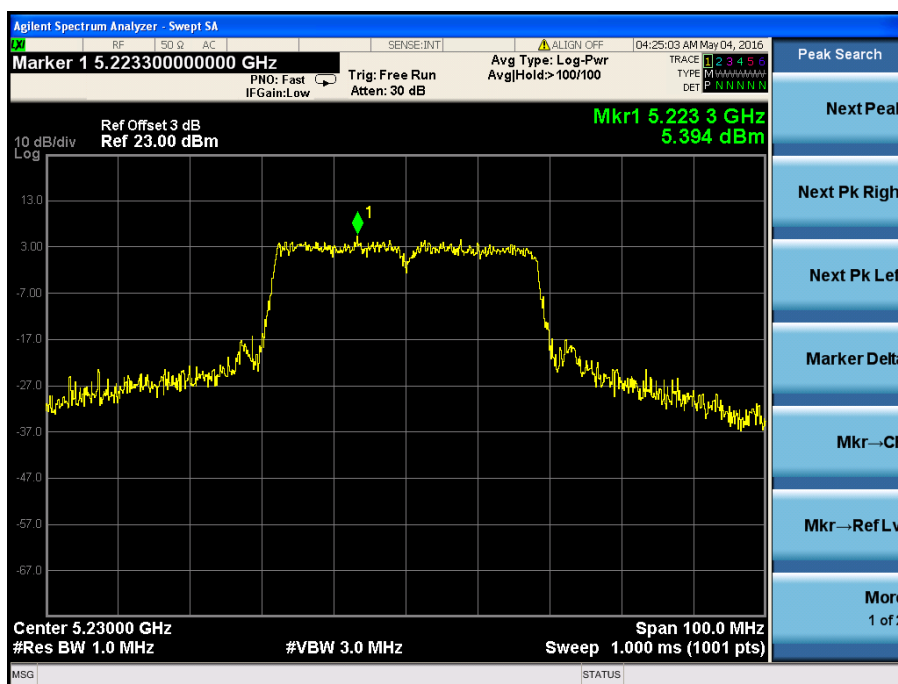


Test Mode: 802.11n-HT40

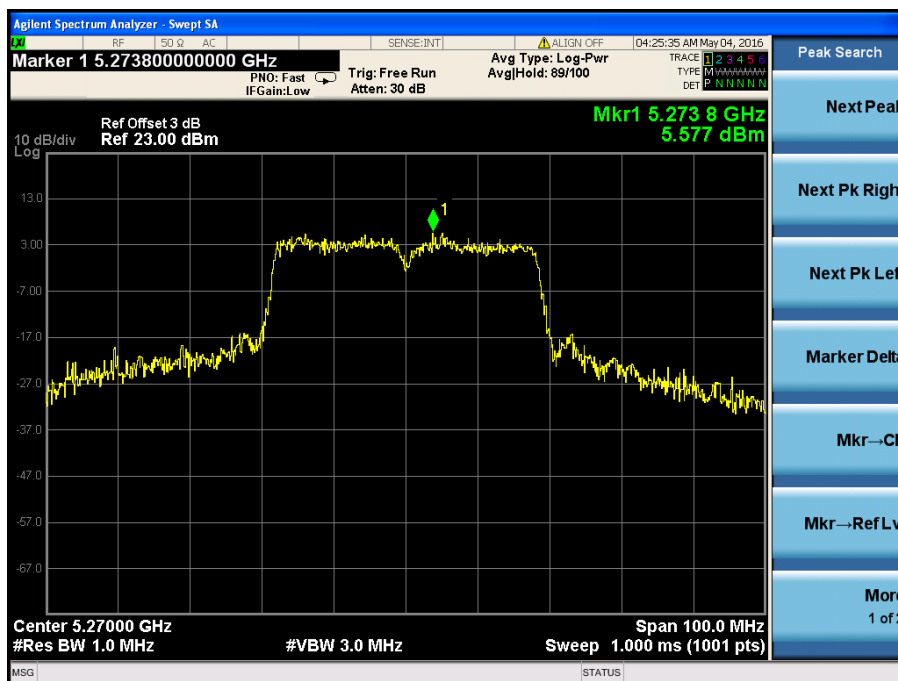
5190MHz



5230MHz



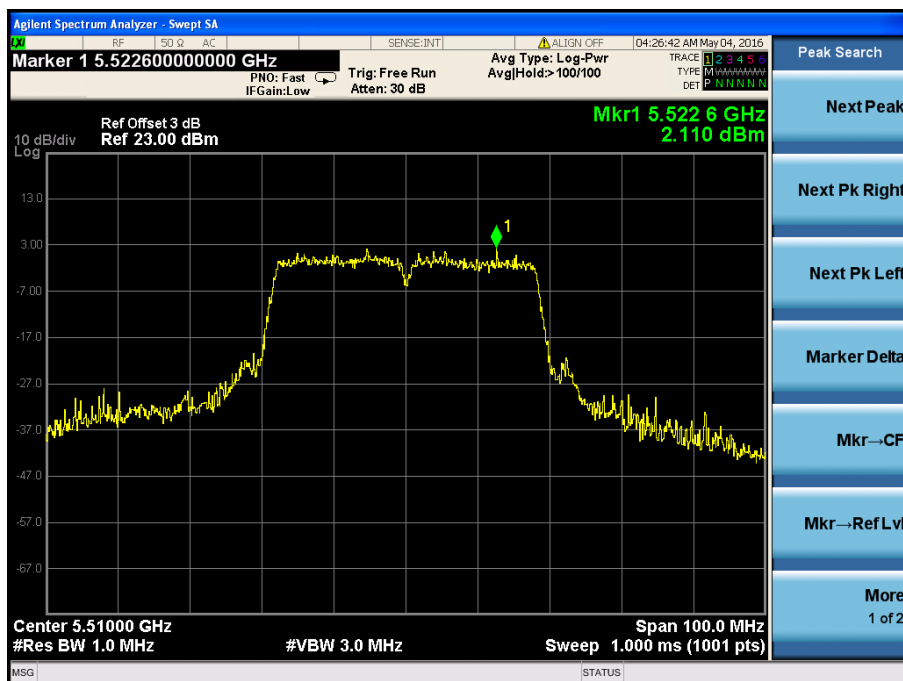
5270MHz



5310MHz



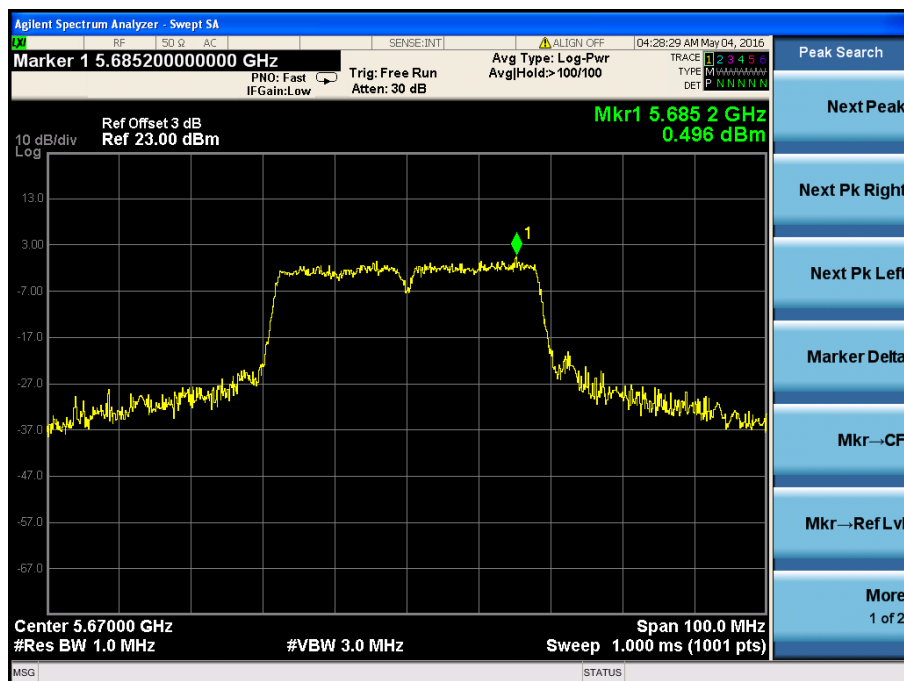
5510MHz



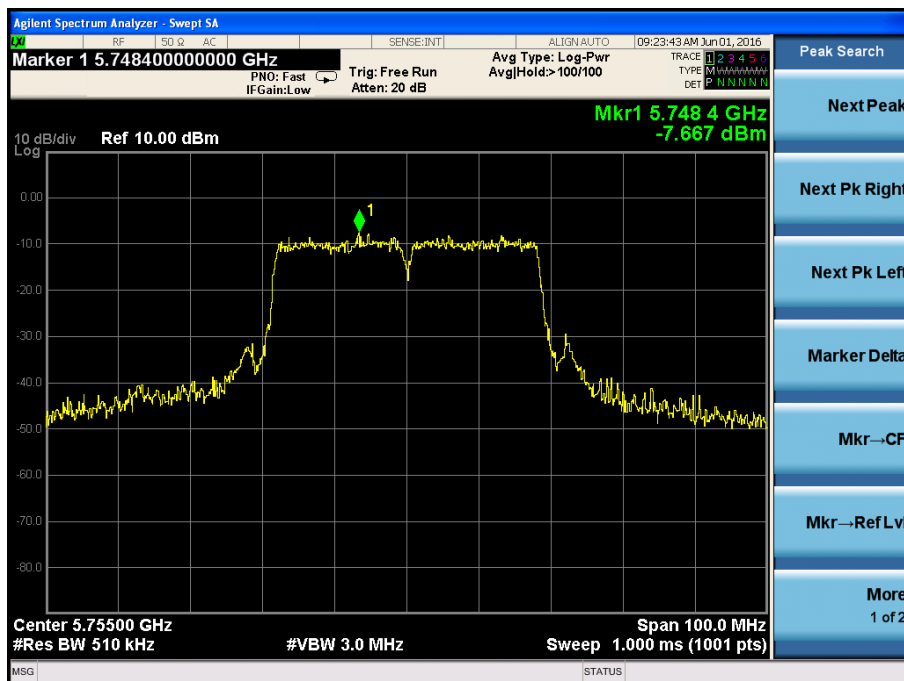
5550MHz



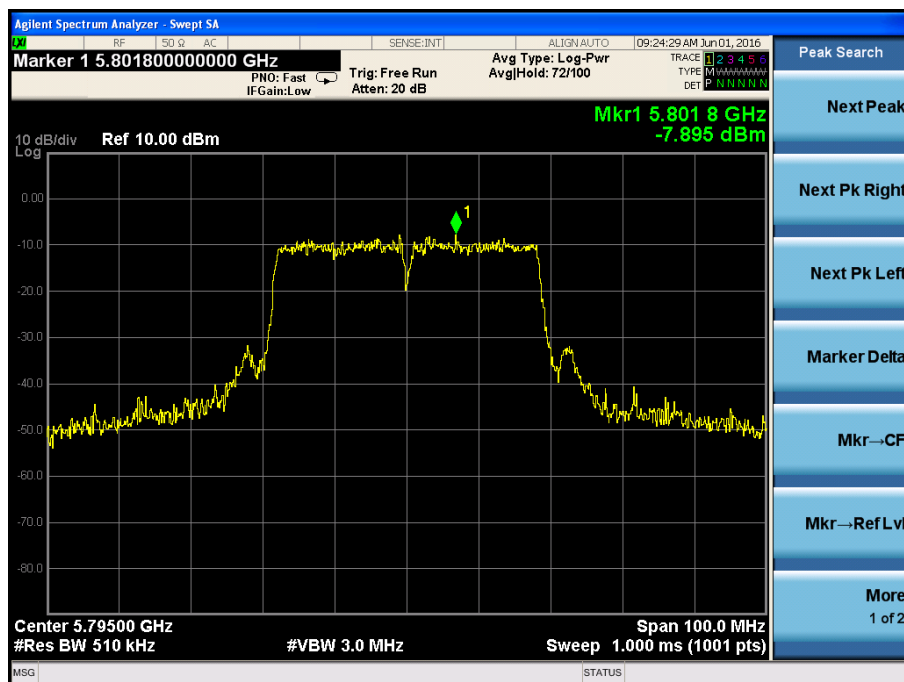
5670MHz



5755MHz



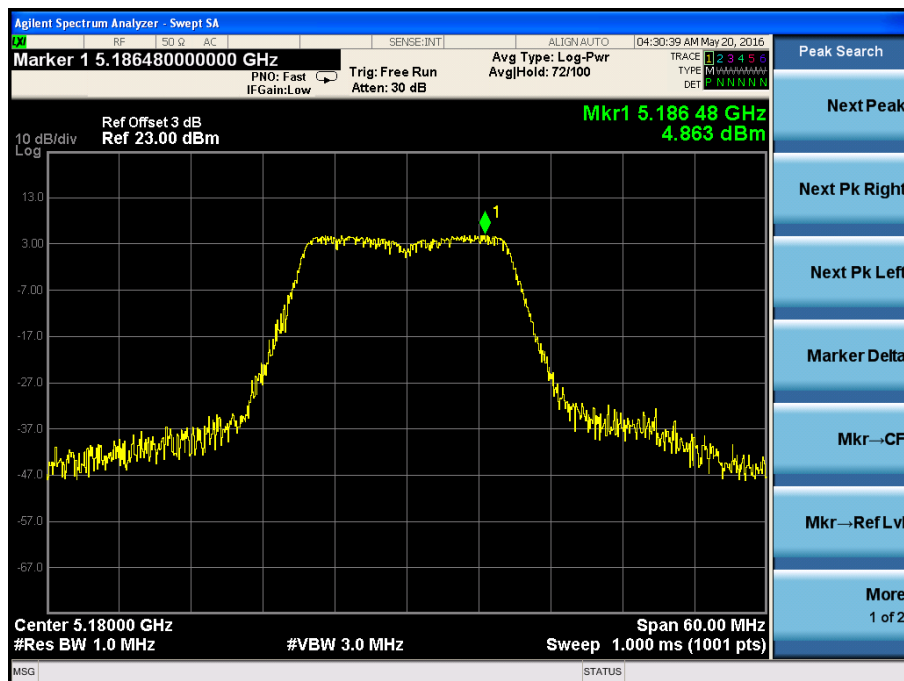
5795MHz



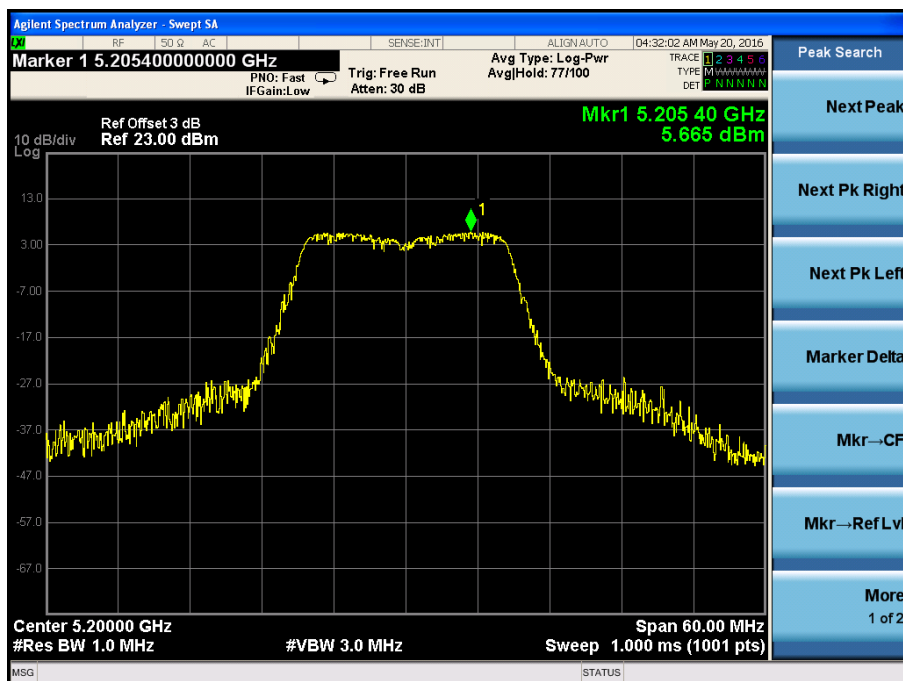
Antenna 2

Test Mode: 802.11a

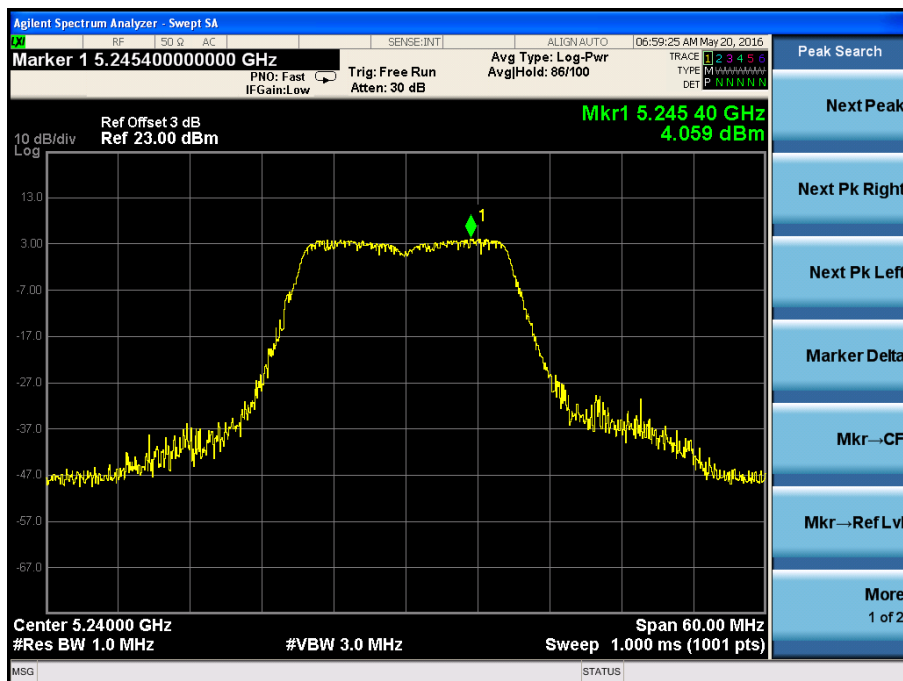
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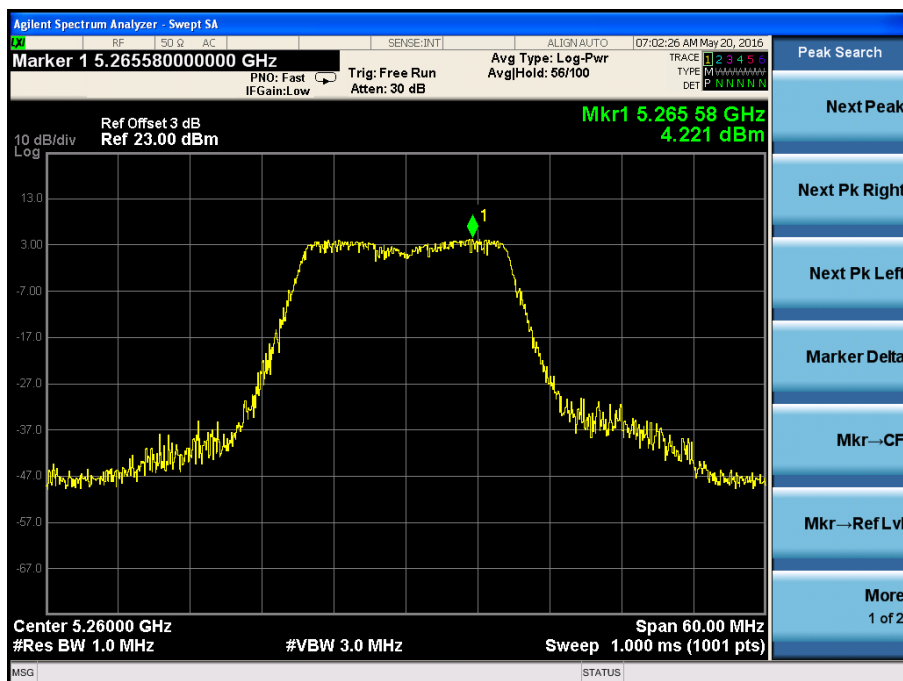
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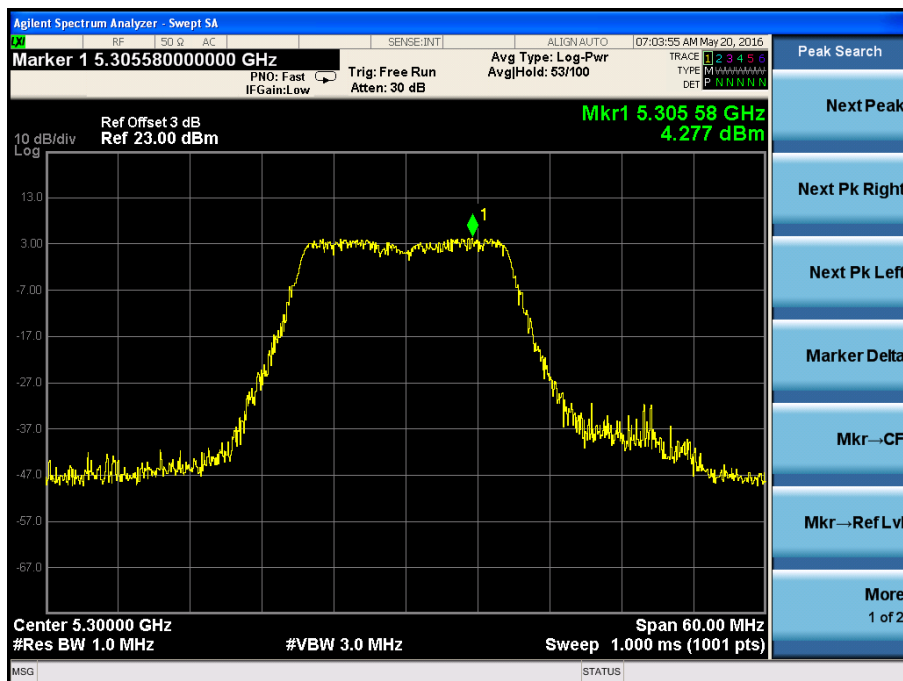
5240MHz



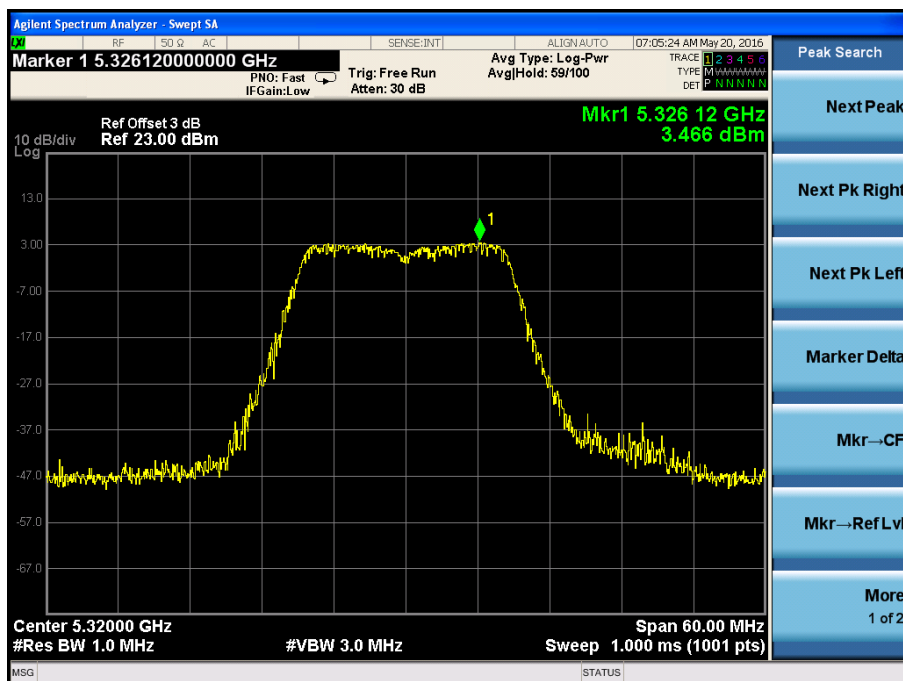
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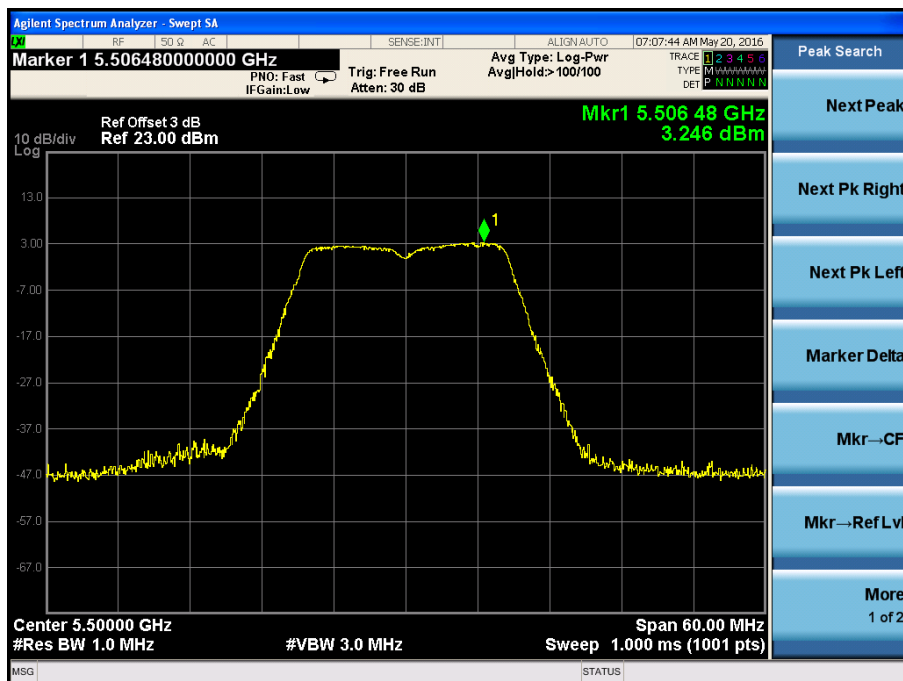
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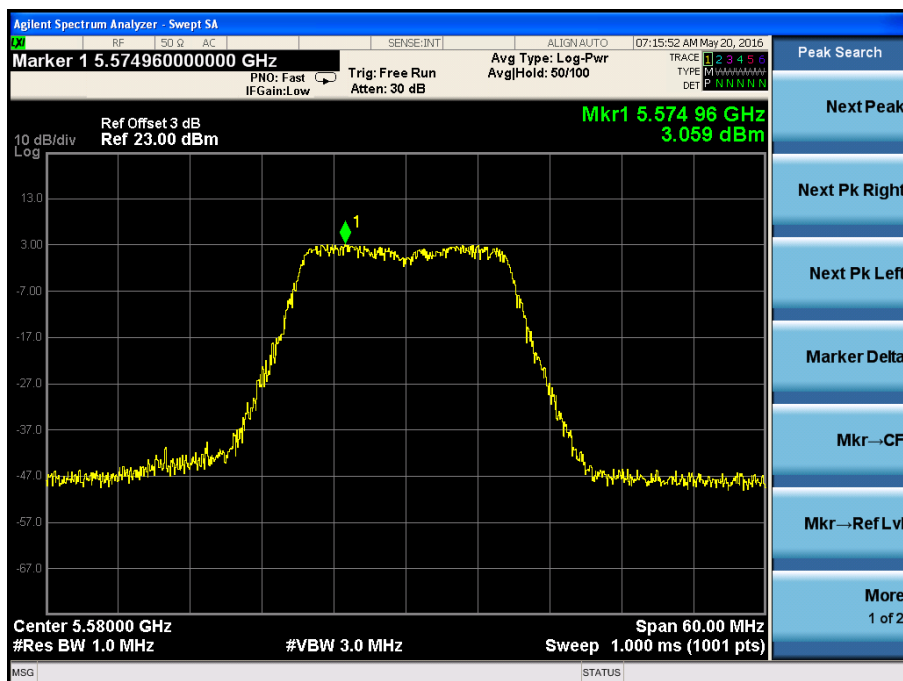
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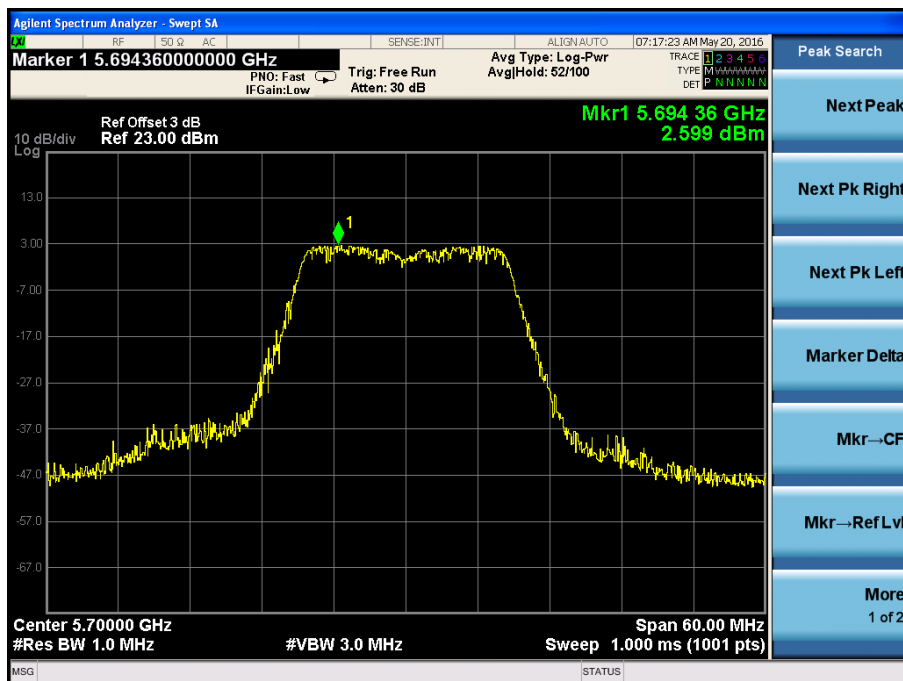
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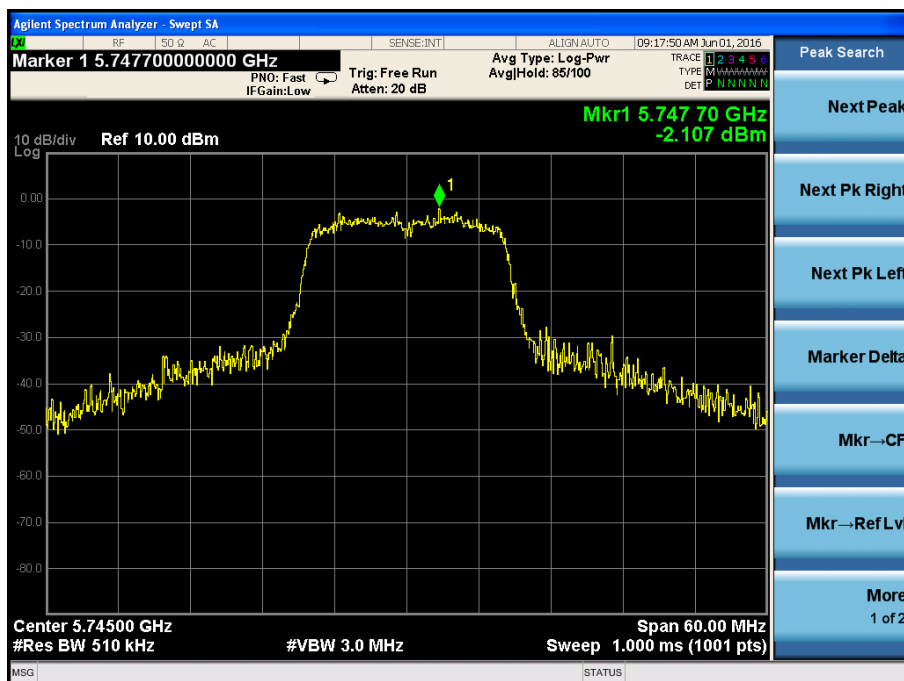
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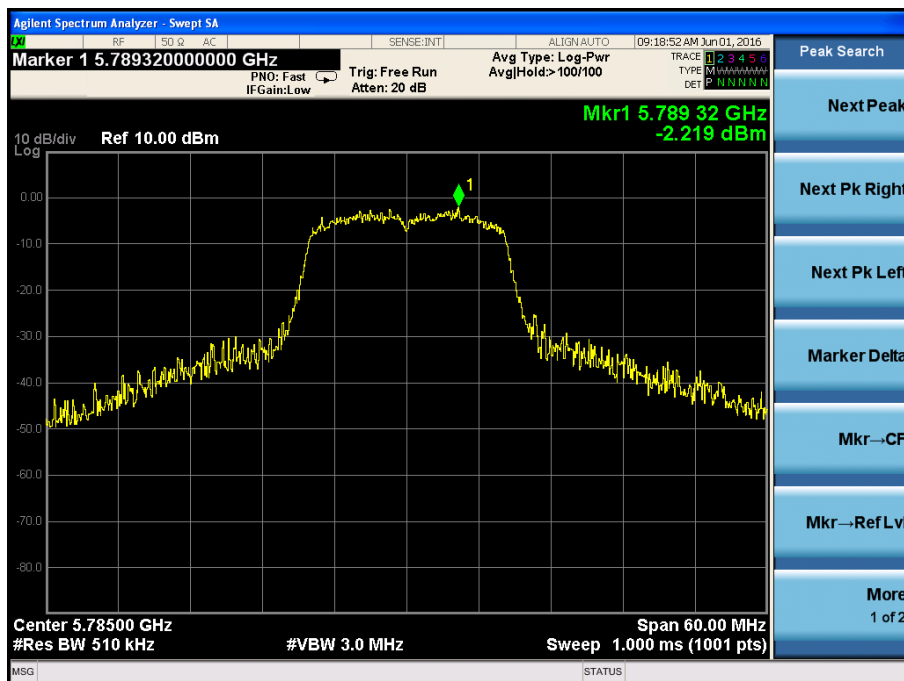
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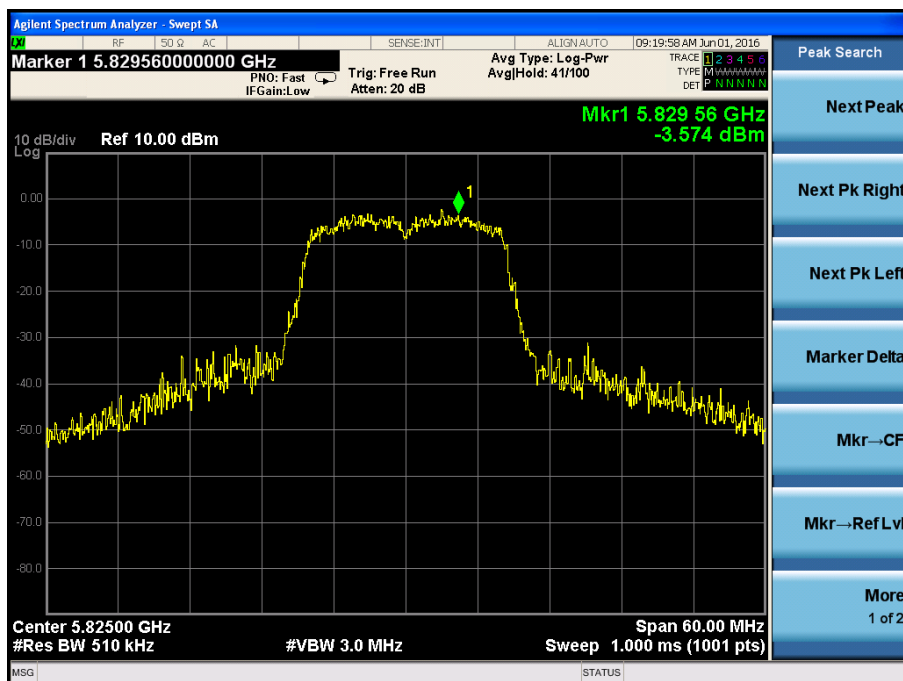
5745MHz



5785MHz

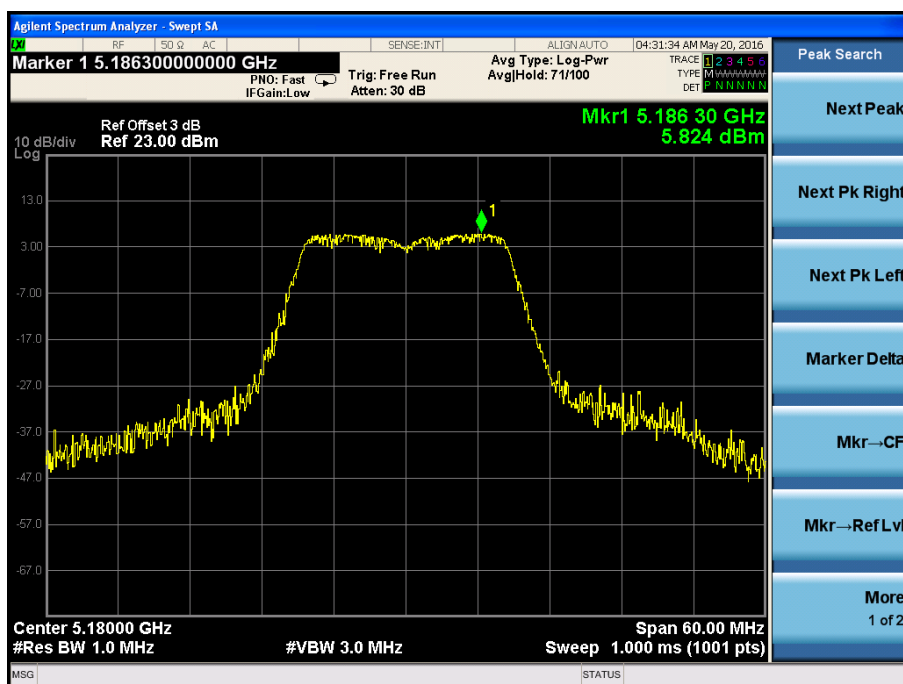


5825MHz

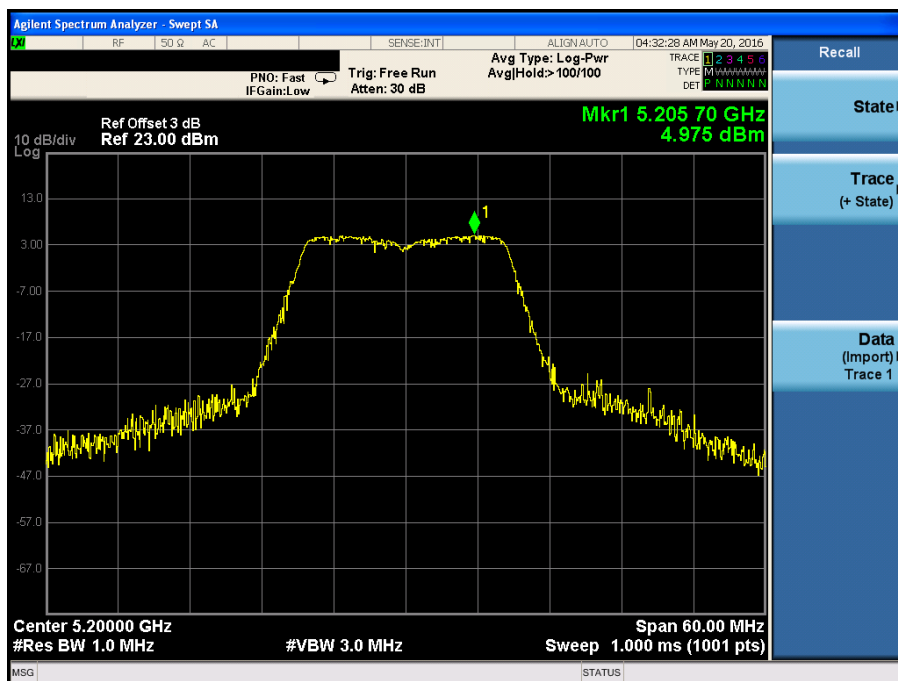


Test Mode: 802.11n20

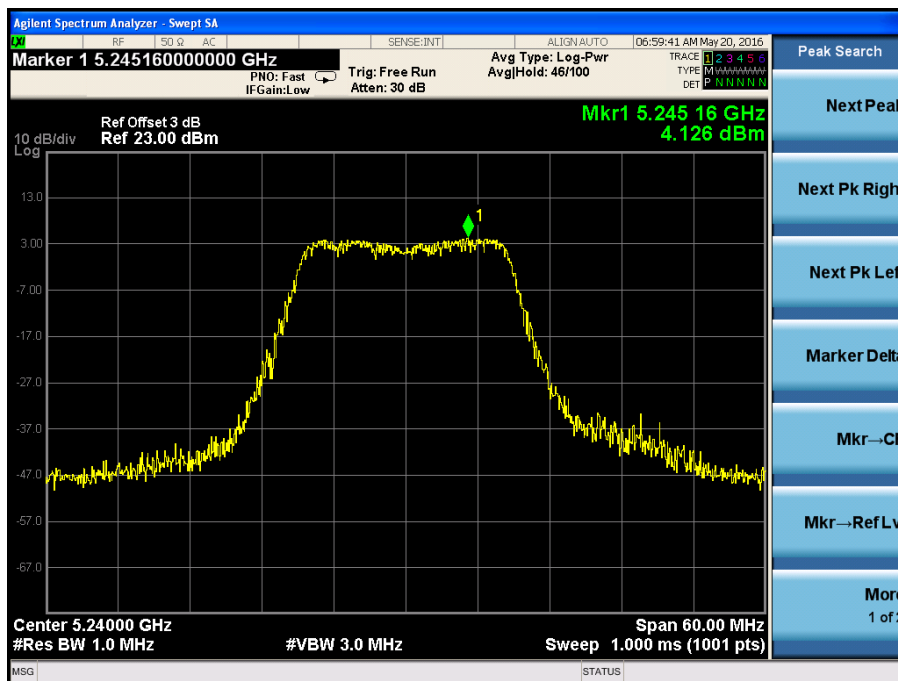
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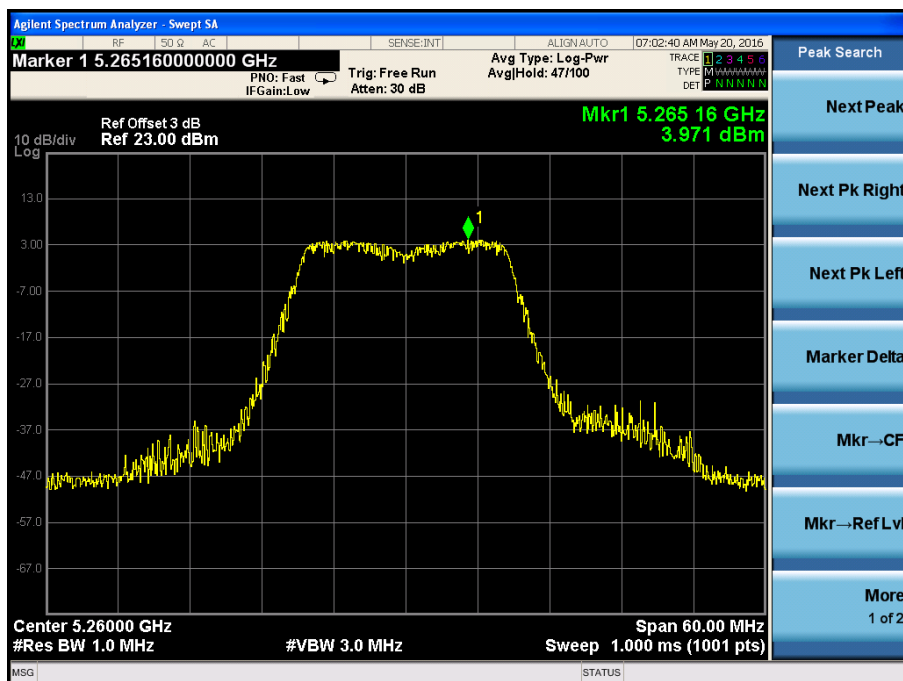
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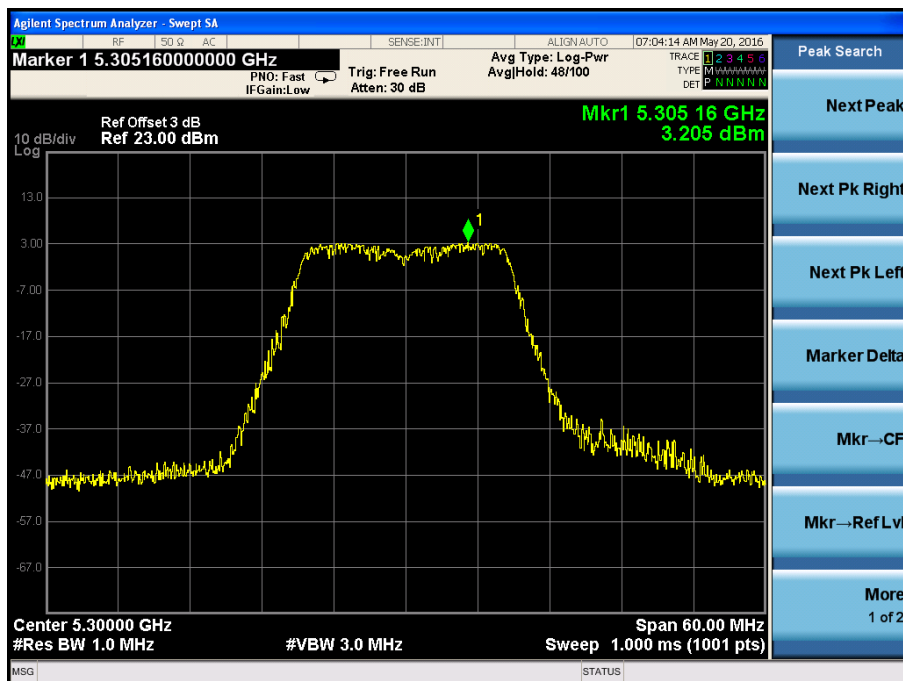
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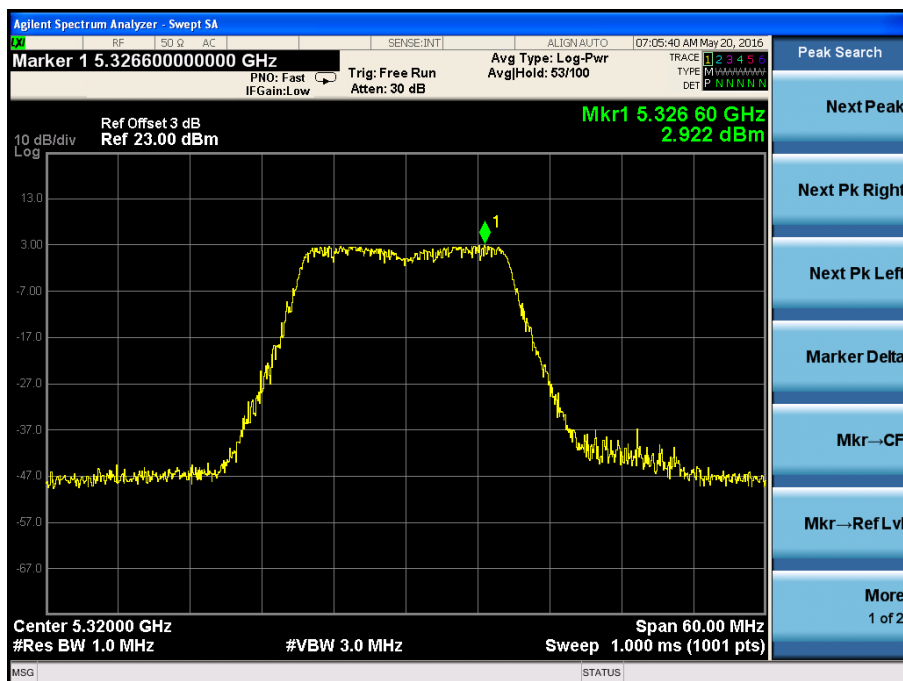
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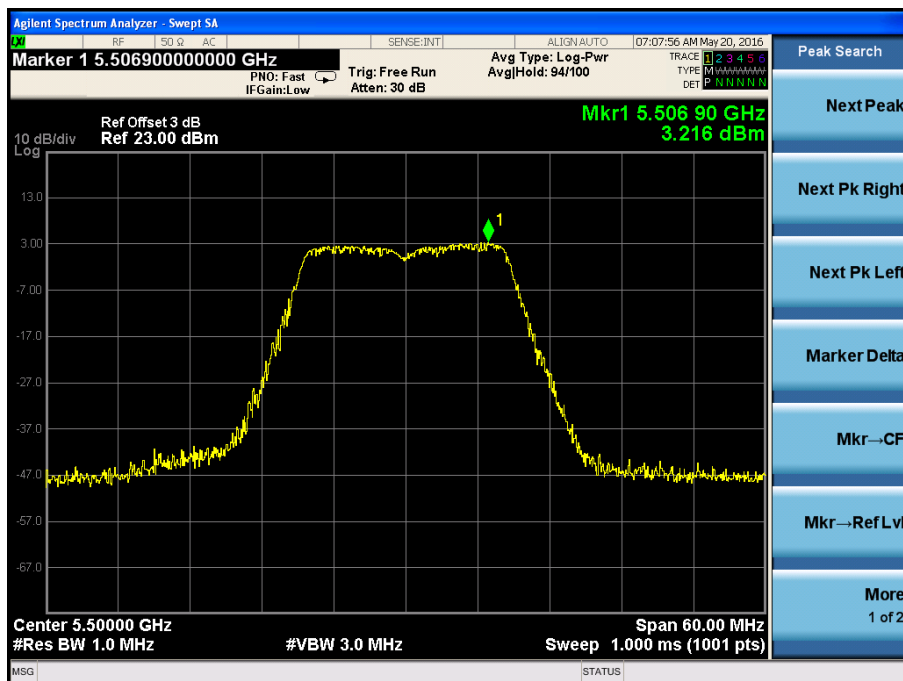
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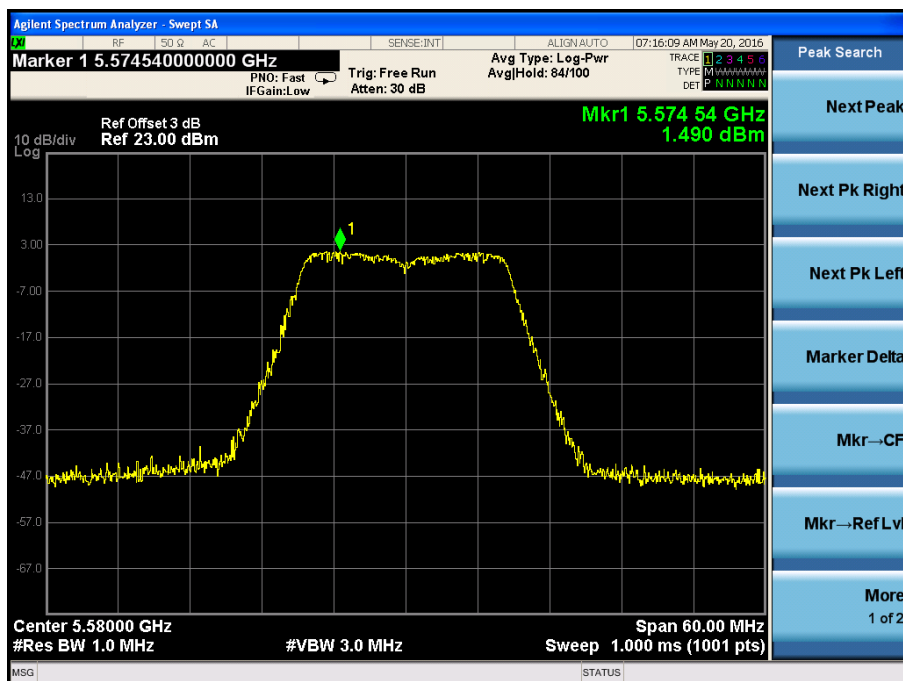
5320MHz



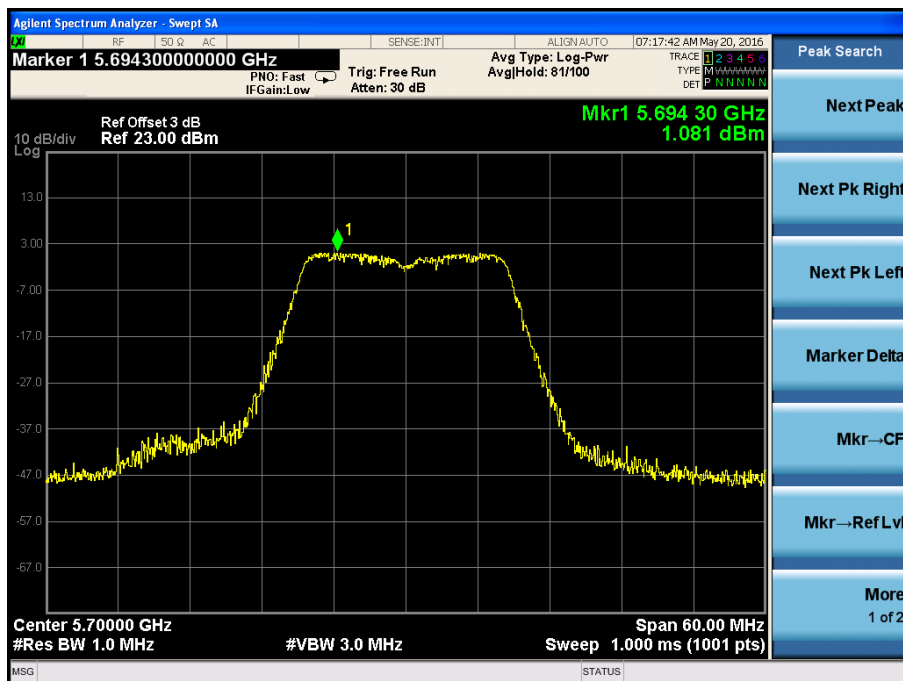
5500MHz



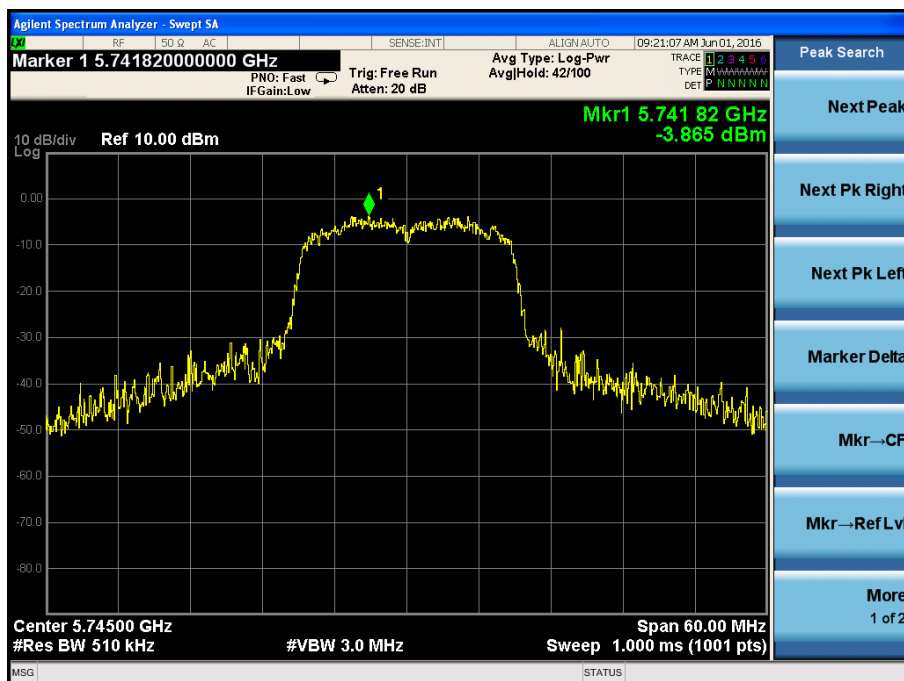
5580MHz



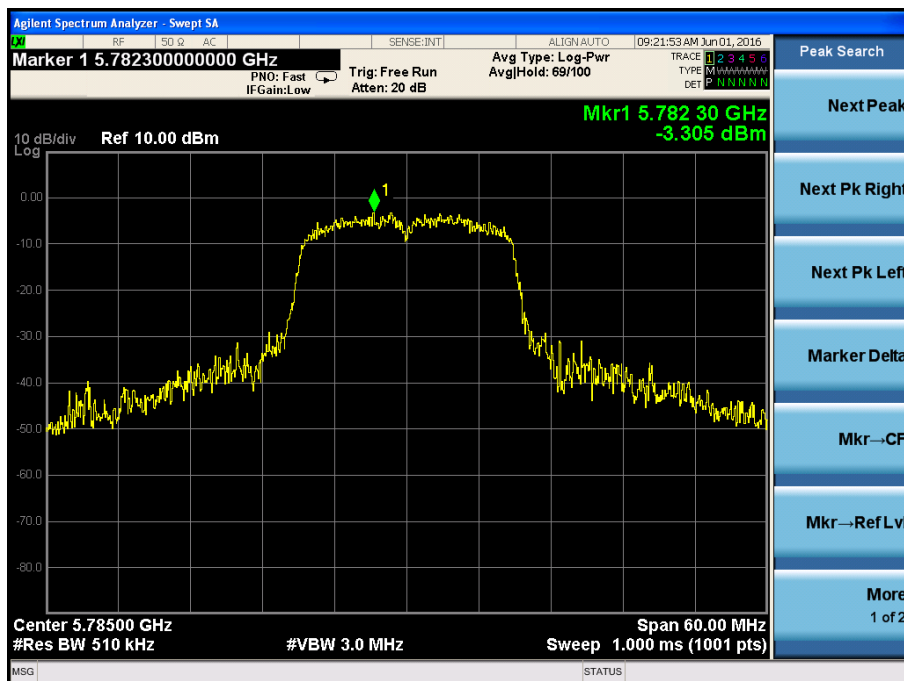
5700MHz



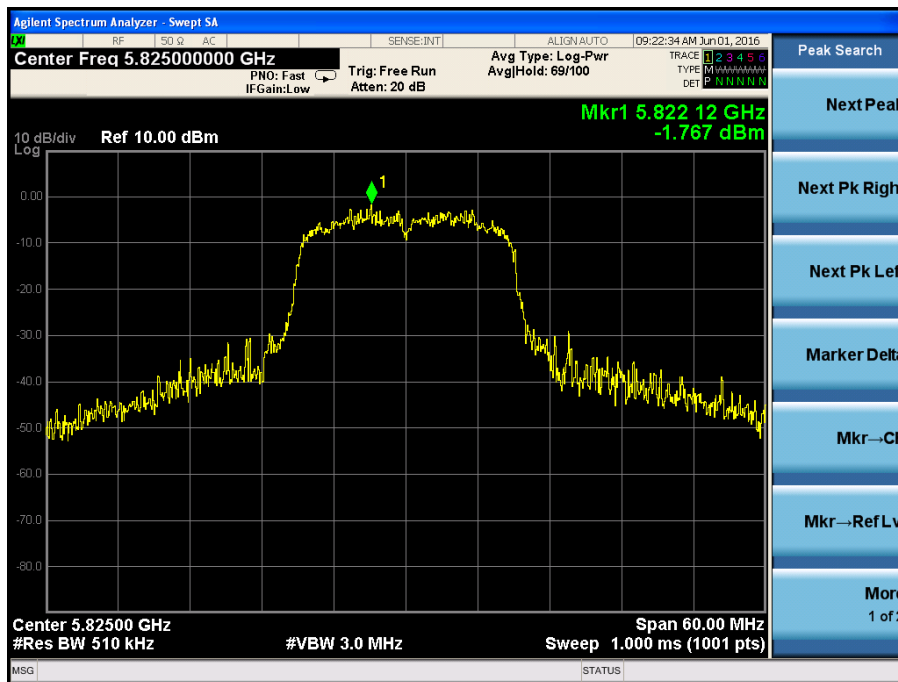
5745MHz



5785MHz

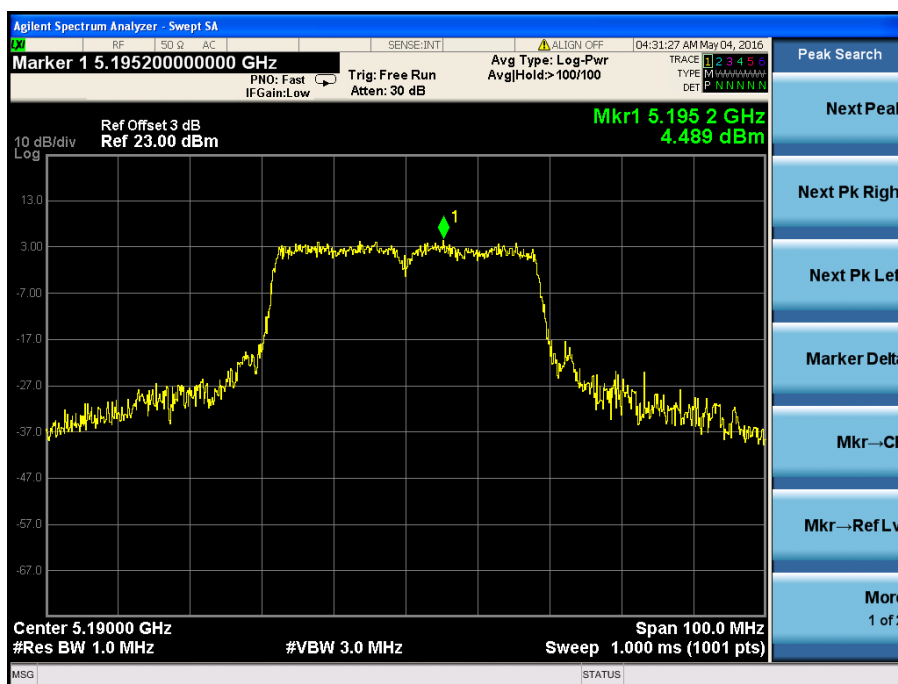


5825MHz

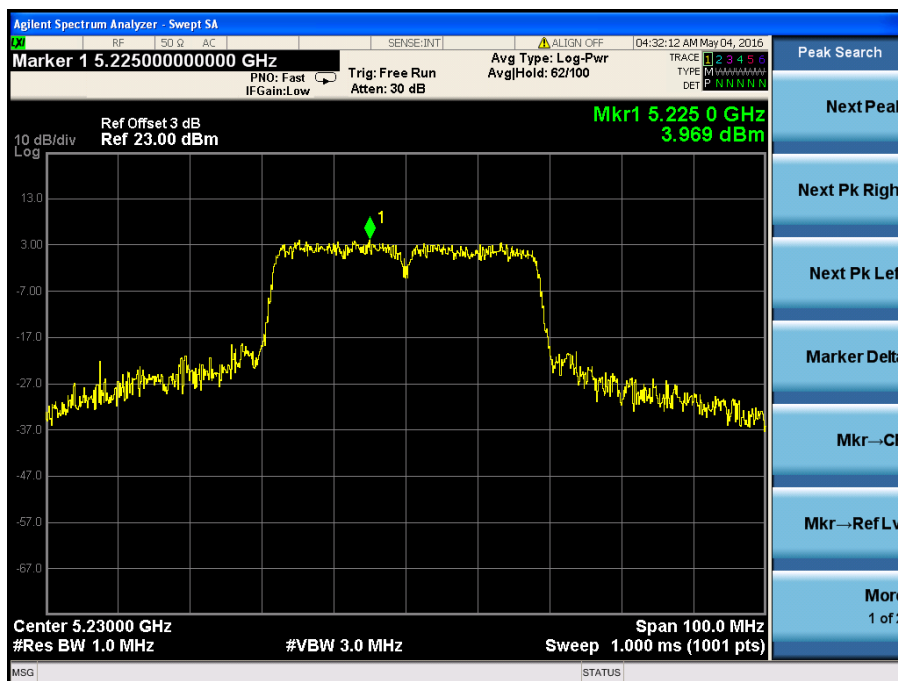


Test Mode: 802.11n-HT40

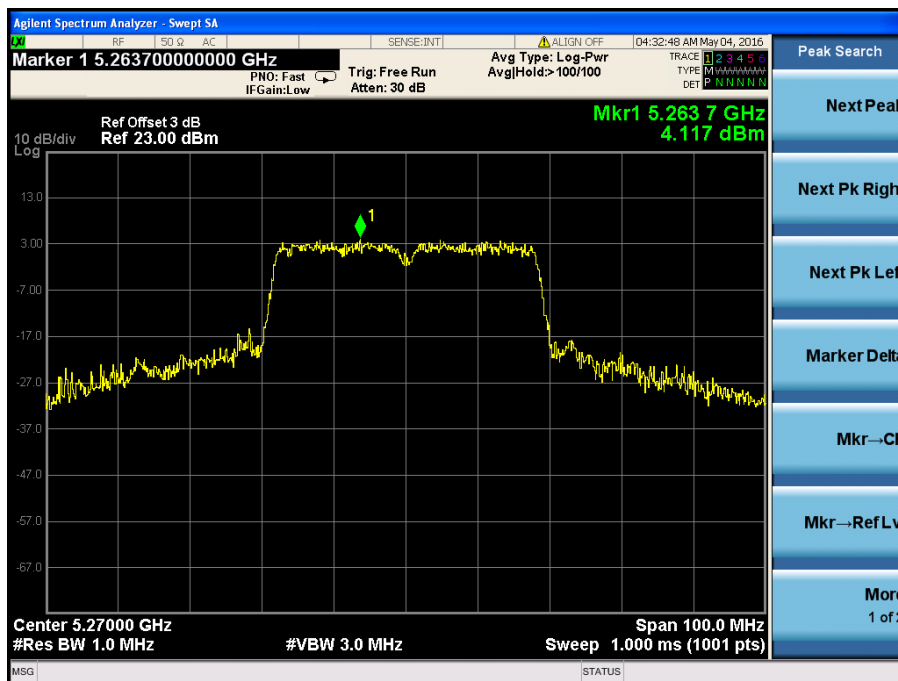
5190MHz



5230MHz



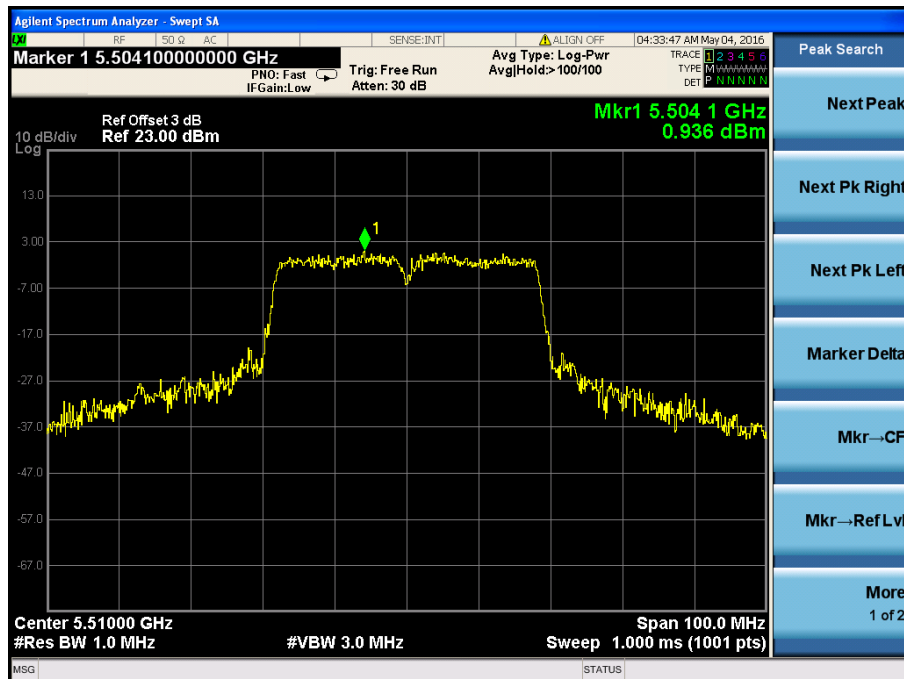
5270MHz



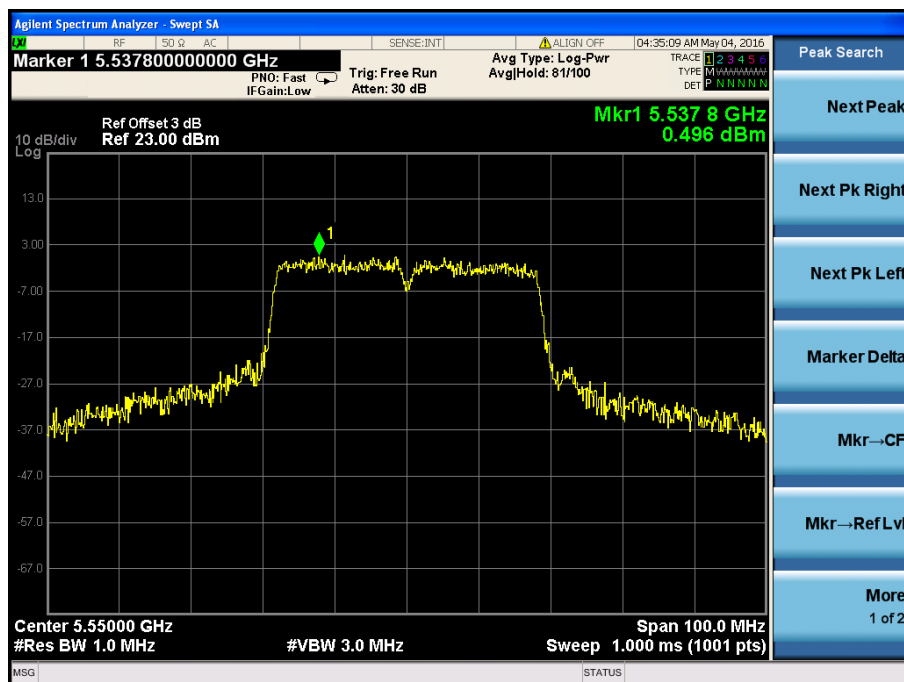
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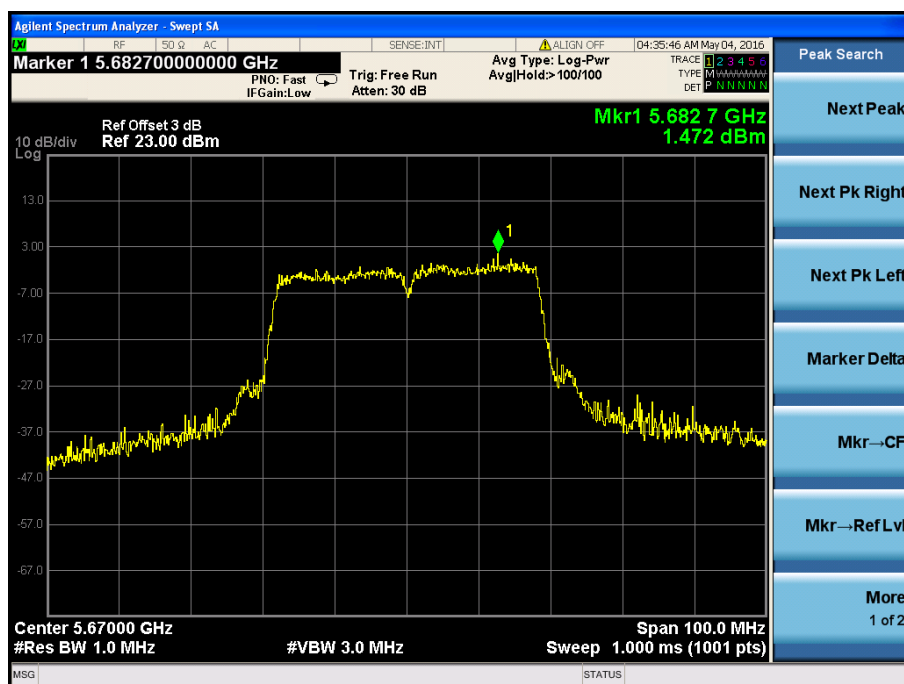
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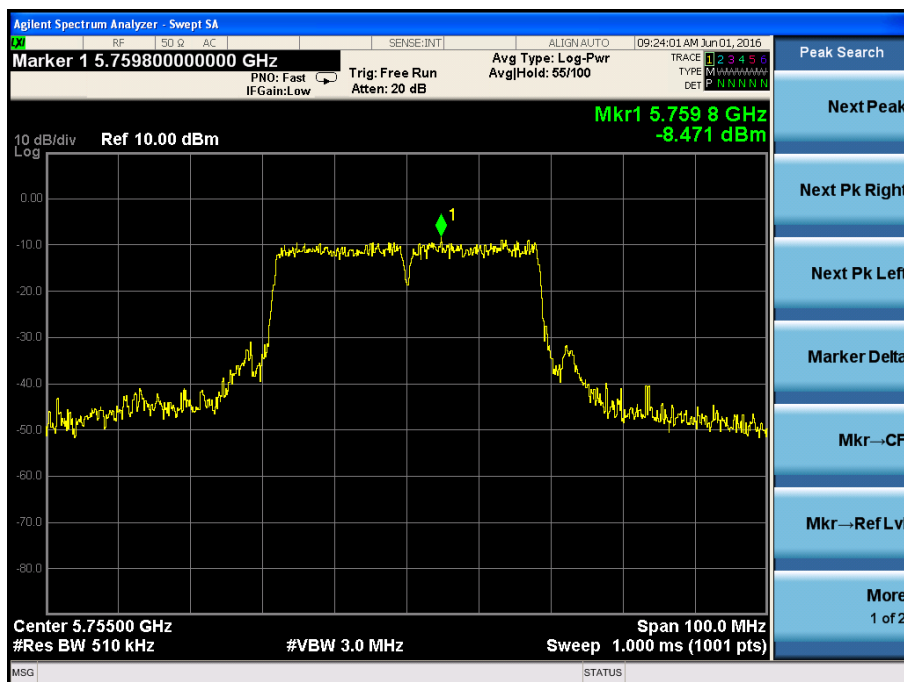
5550MHz



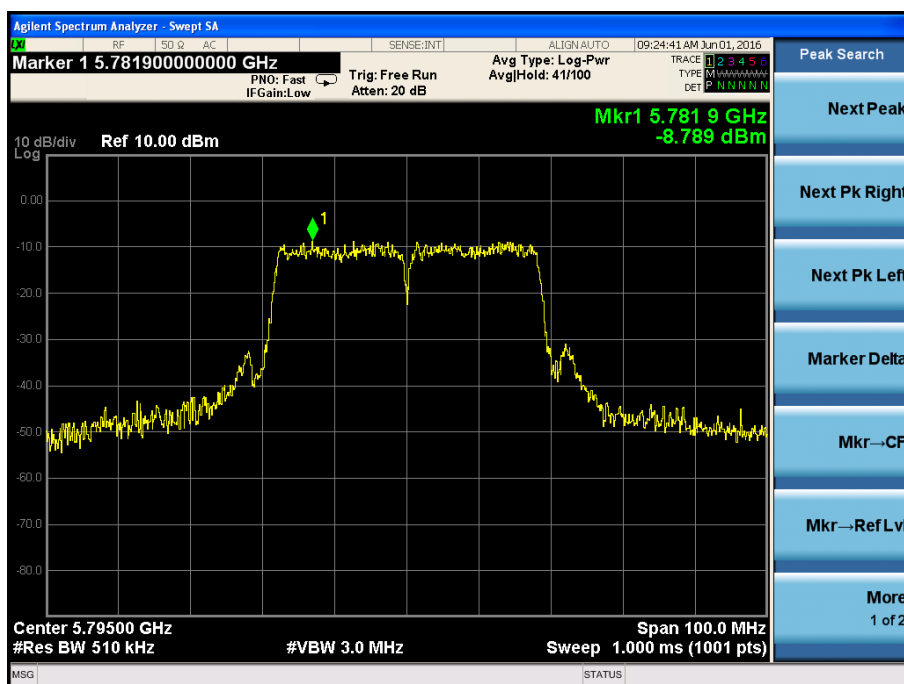
5670MHz



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

802.11a

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit (dBm/MHz)
36	5180	24.60	16.603	--
40	5200	22.57	16.527	--
48	5240	22.24	16.595	--
52	5260	20.01	16.520	--
60	5300	19.64	16.428	--
64	5320	19.23	16.480	--
100	5500	19.54	16.423	--
116	5580	19.14	16.407	--
140	5700	19.28	16.472	--

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
149	5745	19.12	15.22	16.438	≥500
157	5785	19.46	15.98	16.461	≥500
161	5825	21.10	16.03	16.457	≥500

802.11n20

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit (dBm/MHz)
36	5180	27.67	17.594	--
40	5200	25.37	17.545	--
48	5240	23.32	17.562	--
52	5260	21.60	17.530	--
60	5300	20.95	17.496	--
64	5320	21.22	17.531	--
100	5500	19.74	17.434	--
116	5580	19.90	17.478	--
140	5700	19.78	17.505	--

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
149	5745	23.18	17.16	17.519	≥500
157	5785	19.84	16.66	17.470	≥500
161	5825	20.96	16.50	17.508	≥500

802.11n40

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit (dBm/MHz)
38	5190	47.26	36.540	--
46	5230	48.65	36.555	--
54	5270	47.34	36.518	--
62	5310	46.98	36.495	--
102	5510	42.83	36.337	--
110	5550	45.94	36.454	--
134	5670	46.30	36.440	--

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
151	5755	45.83	36.61	36.409	≥500
159	5795	46.06	36.58	36.451	≥500

Antenna 2

802.11a

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit (dBm/MHz)
36	5180	18.81	16.337	--
40	5200	18.69	16.352	--
48	5240	19.10	16.345	--
52	5260	19.13	16.370	--
60	5300	18.93	16.365	--
64	5320	18.85	16.339	--
100	5500	18.70	16.340	--
116	5580	18.75	16.318	--
140	5700	18.59	16.307	--

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
149	5745	18.78	15.22	16.438	≥500
157	5785	18.79	15.98	16.461	≥500
161	5825	18.91	16.03	16.457	≥500

802.11n20

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit (dBm/MHz)
36	5180	19.36	17.411	--
40	5200	19.37	17.378	--
48	5240	21.39	17.500	--
52	5260	22.67	17.459	--
60	5300	19.26	17.416	--
64	5320	19.23	17.399	--
100	5500	19.21	17.426	--
116	5580	19.29	17.434	--
140	5700	19.07	17.403	--

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
149	5745	19.30	17.24	17.441	≥500
157	5785	19.09	17.08	17.412	≥500
161	5825	19.22	16.56	17.418	≥500

802.11n40

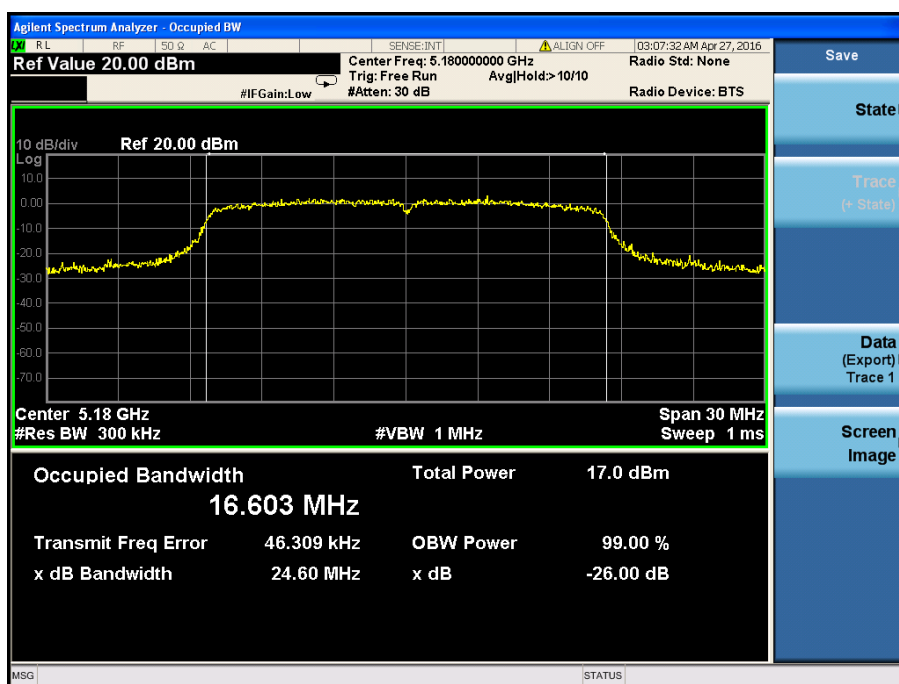
Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	99% Bandwidth MHz	Limit (dBm/MHz)
38	5190	45.78	36.445	--
46	5230	46.38	36.543	--
54	5270	47.92	36.534	--
62	5310	45.94	36.529	--
102	5510	45.63	36.455	--
110	5550	45.81	36.520	--
134	5670	45.73	36.463	--

Channel	Channel frequency(MHz)	26 dB Bandwidth MHz	6 dB Bandwidth MHz	99% Bandwidth MHz	Limit kHz
151	5755	45.53	36.72	36.461	≥500
159	5795	45.28	36.64	36.433	≥500

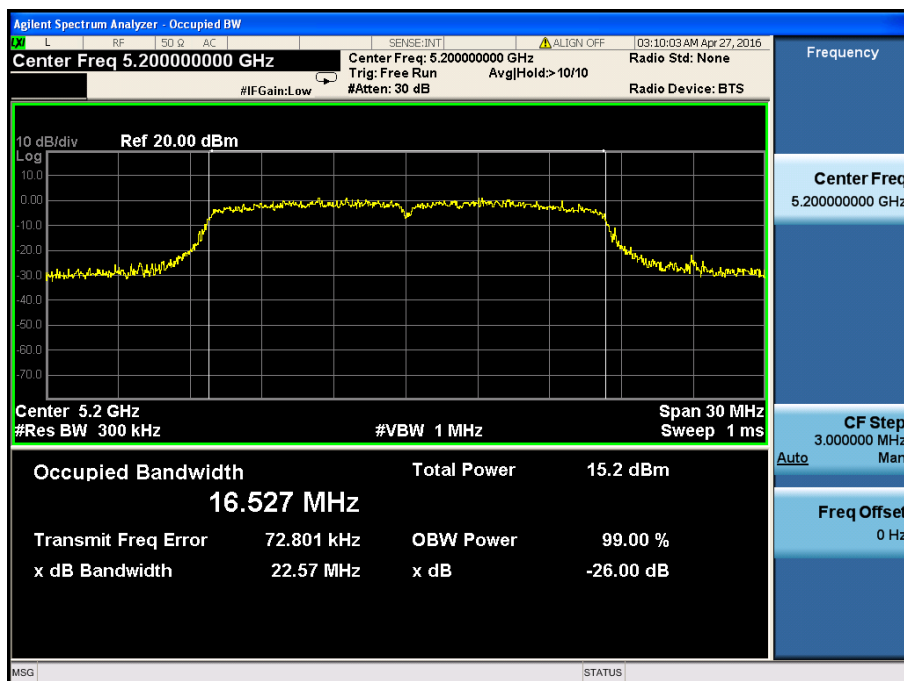
Antenna 1

Test Mode: 802.11a

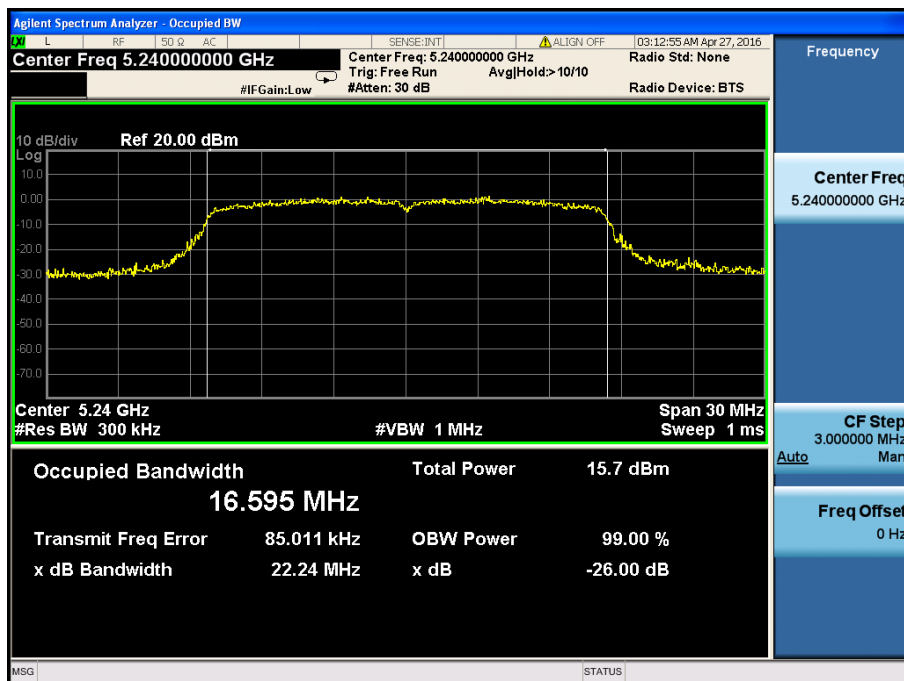
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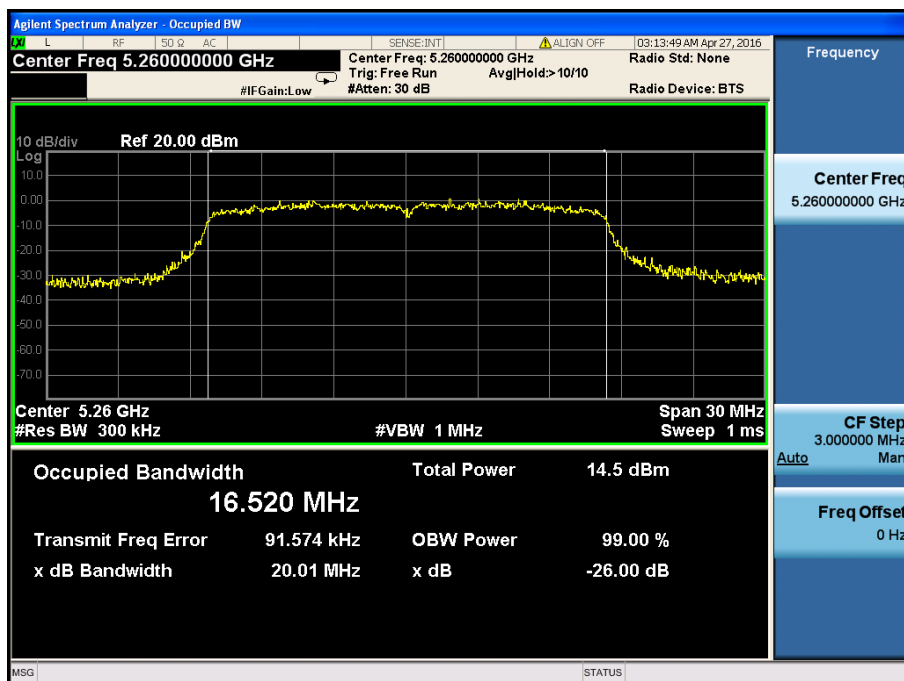
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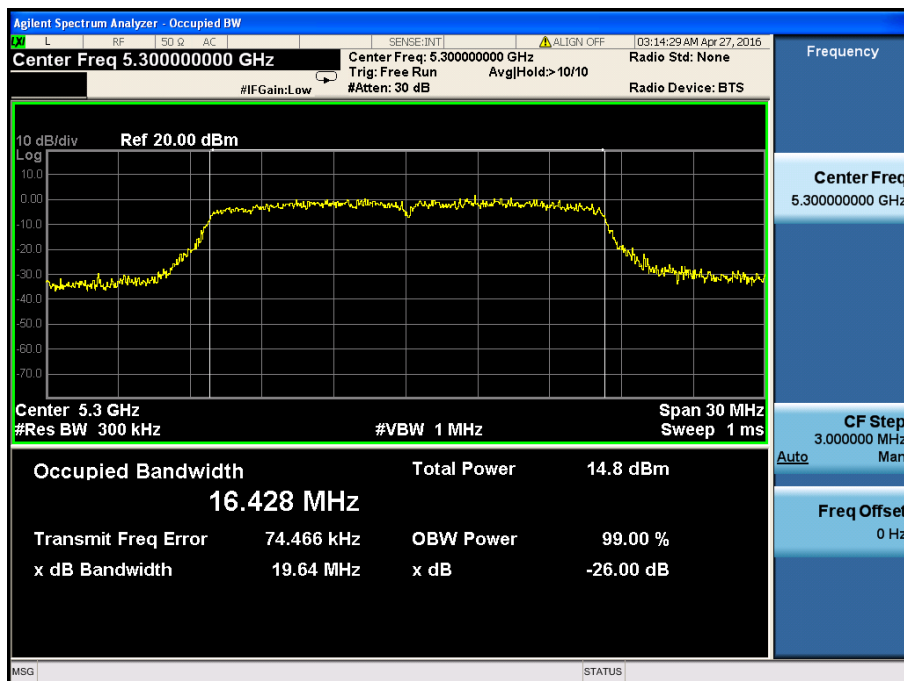
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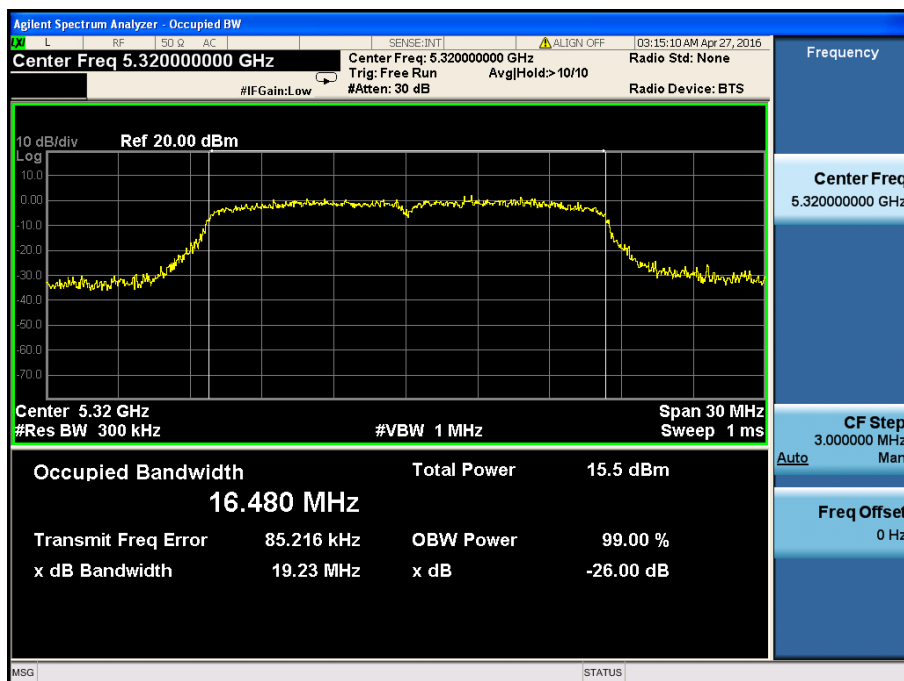
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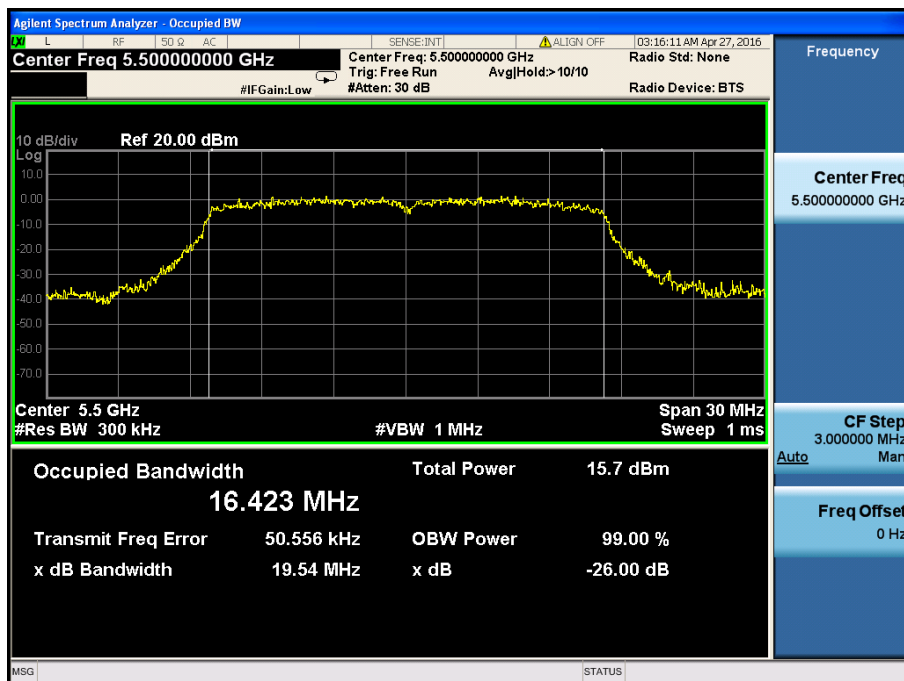
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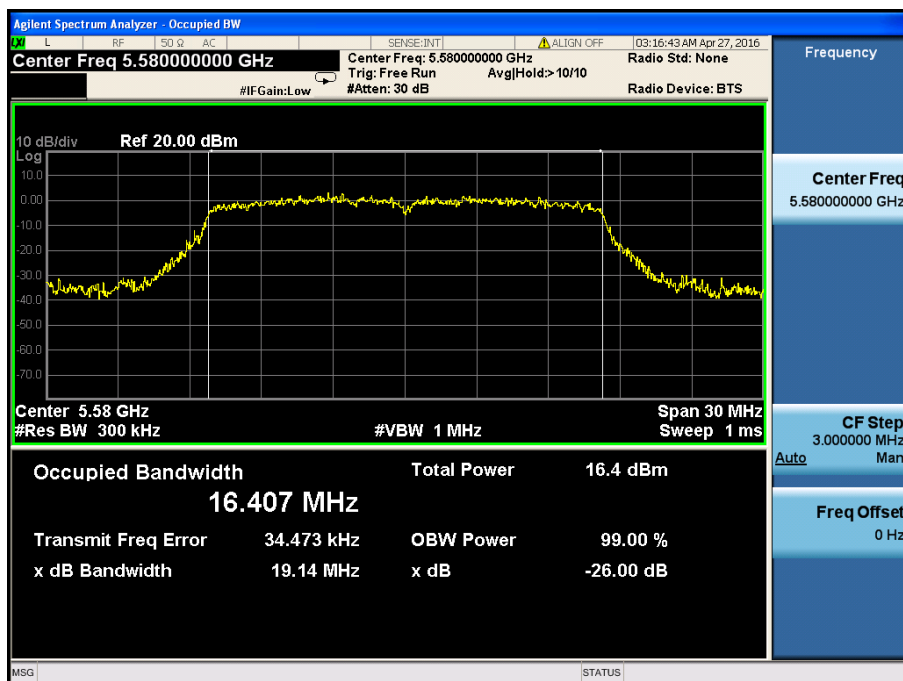
5320MHz



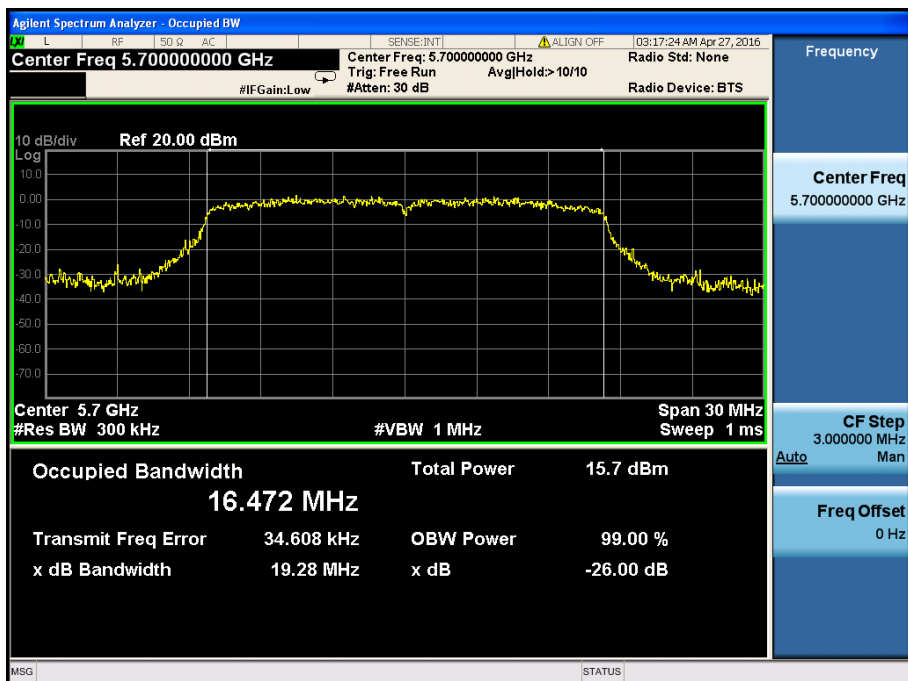
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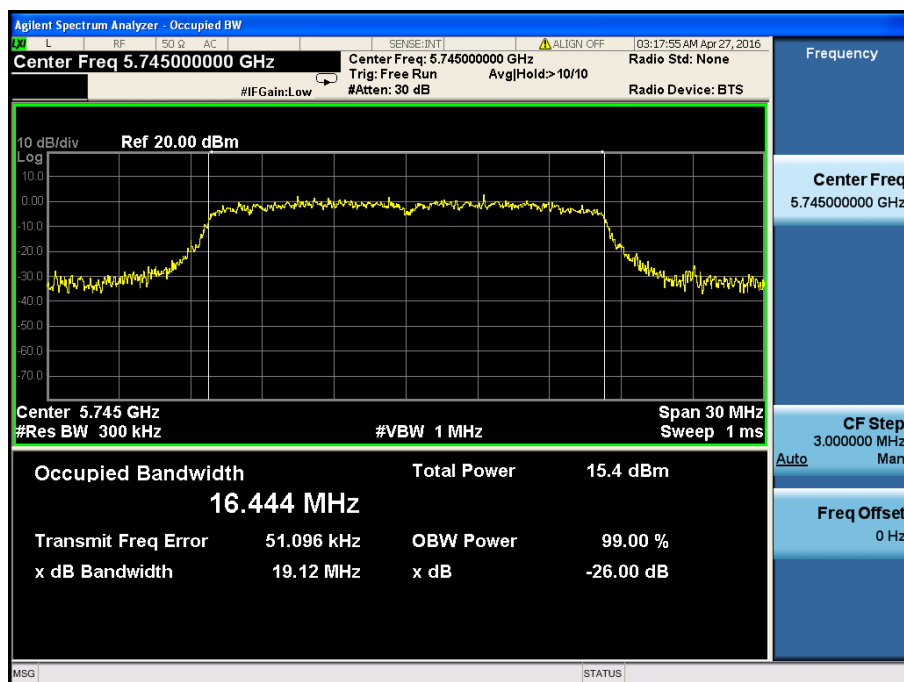
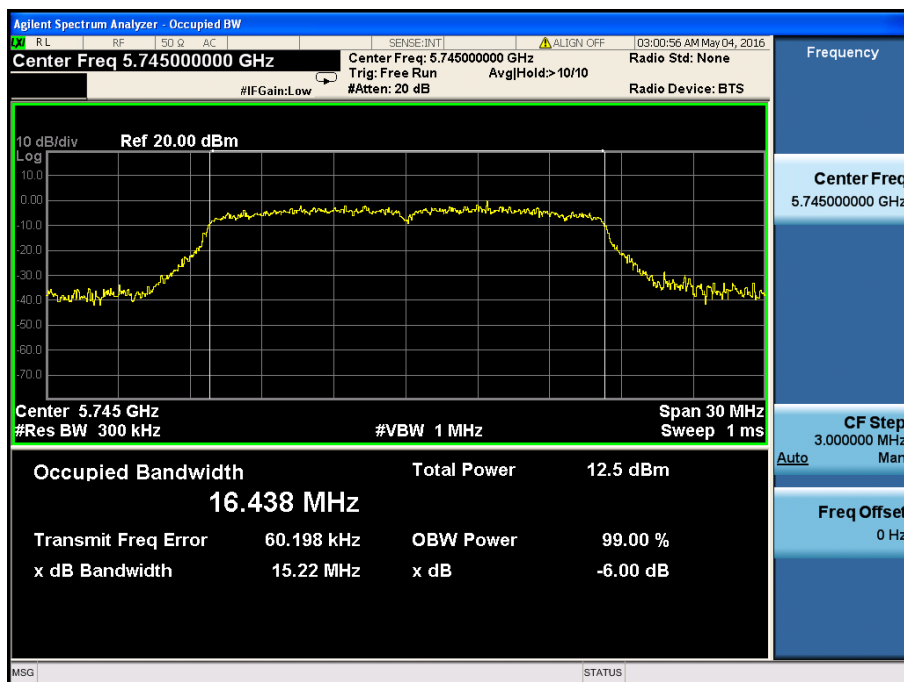
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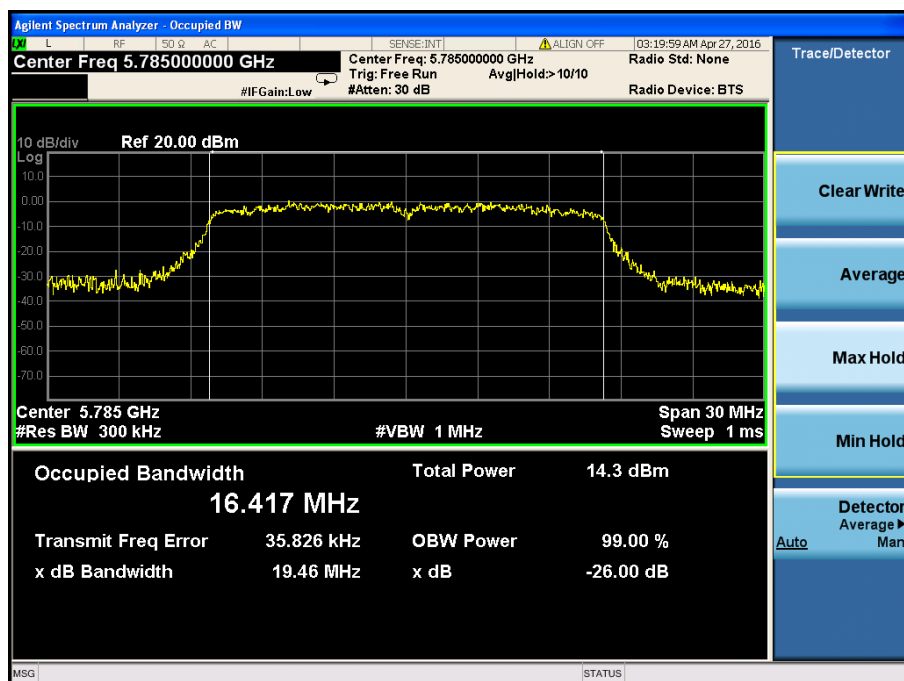
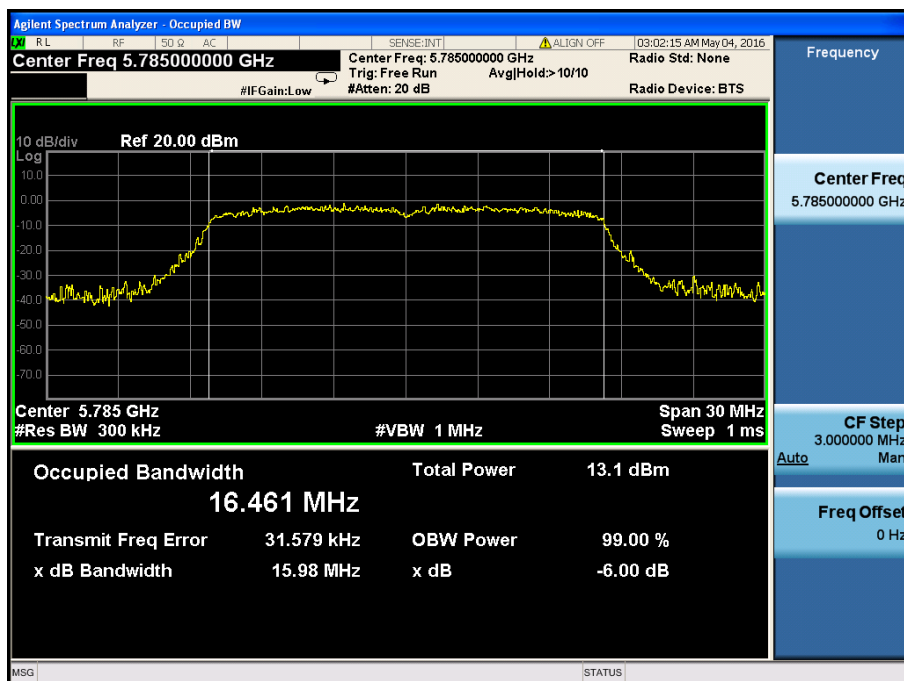
5700MHz



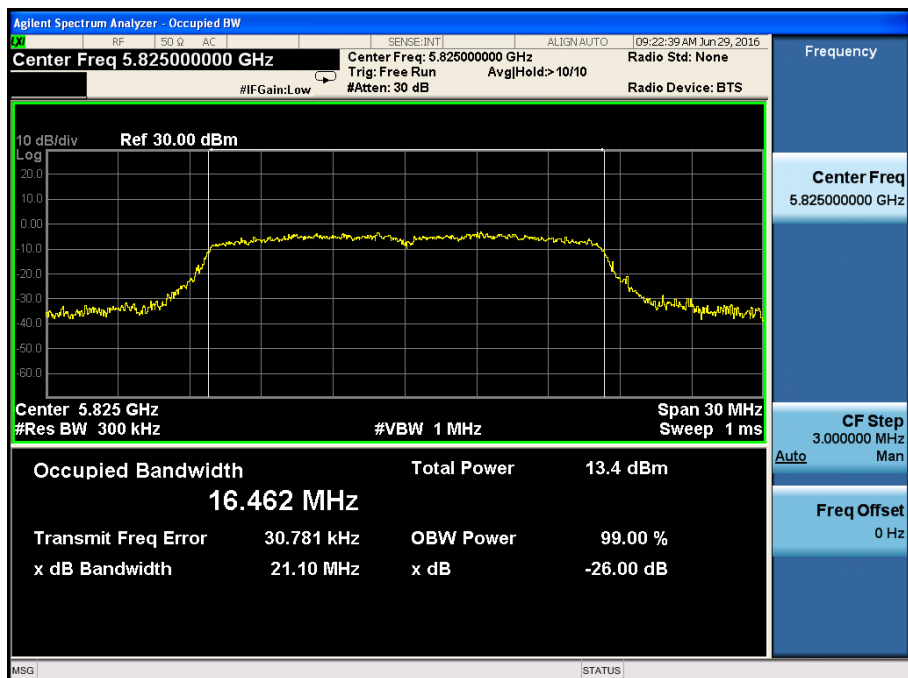
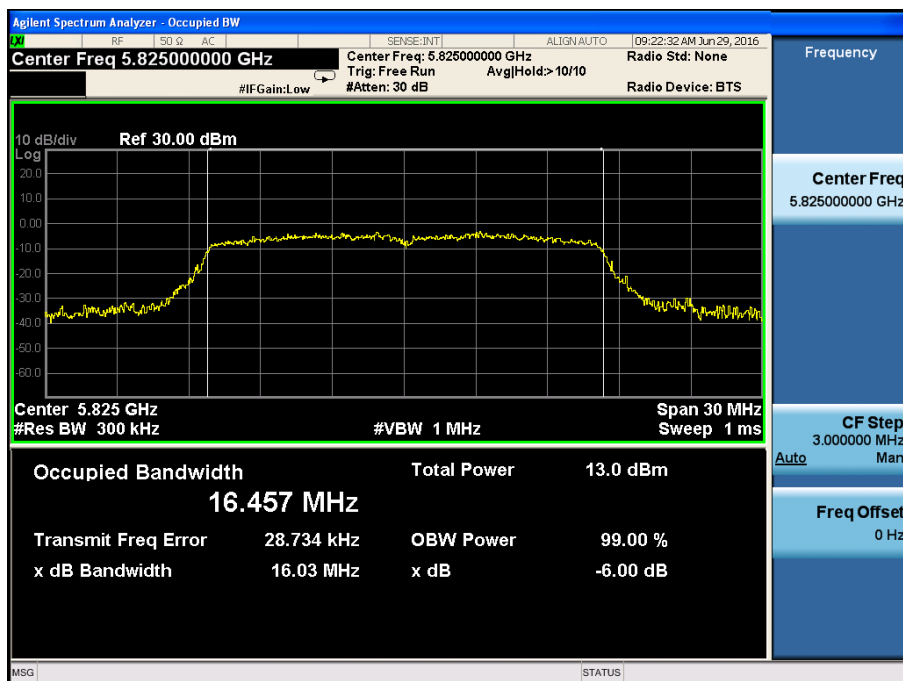
5745MHz



5785MHz

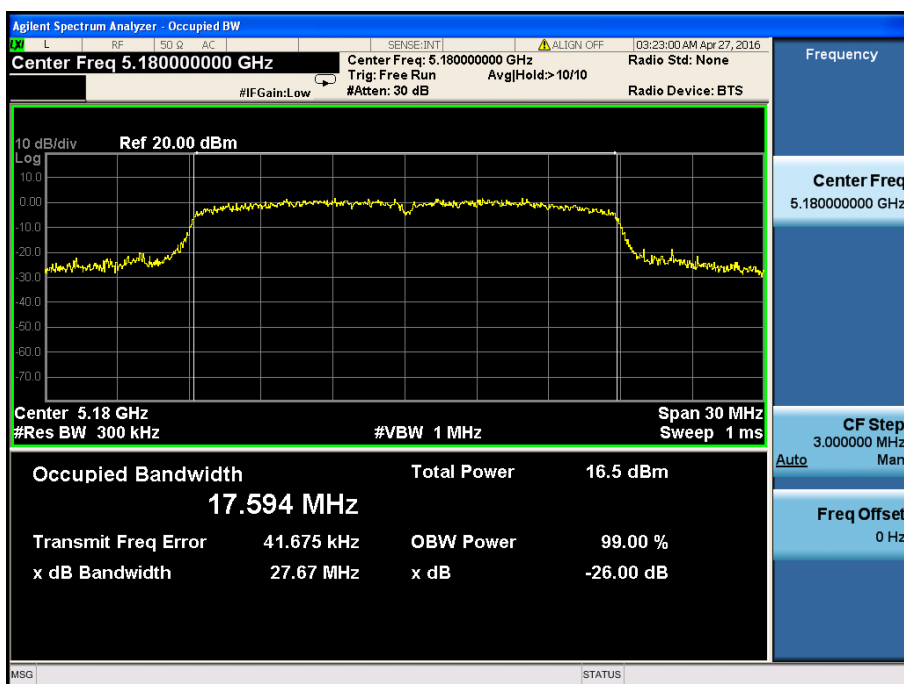


5825MHz

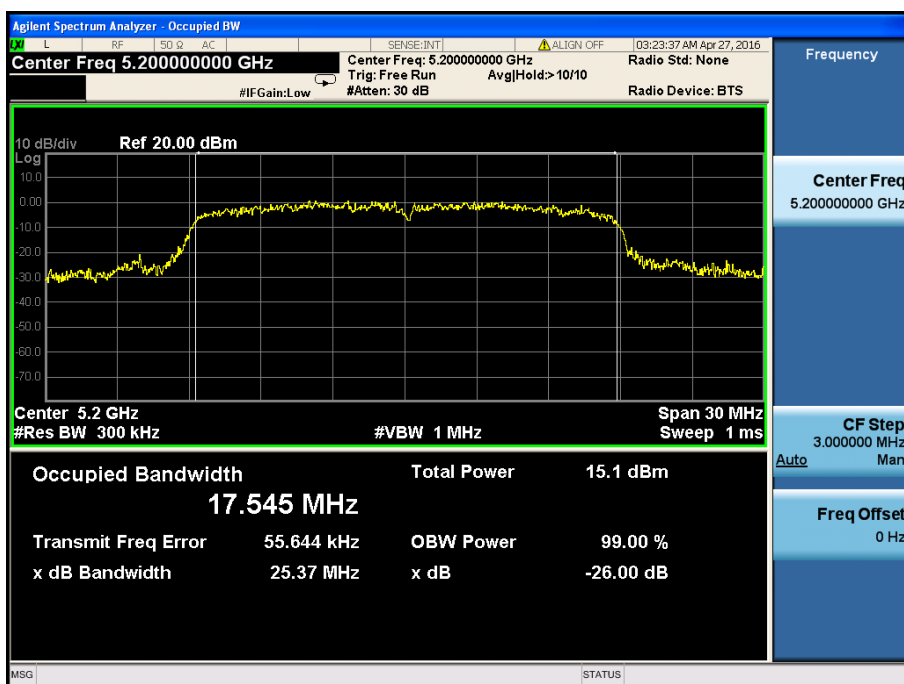


Test Mode: 802.11n20

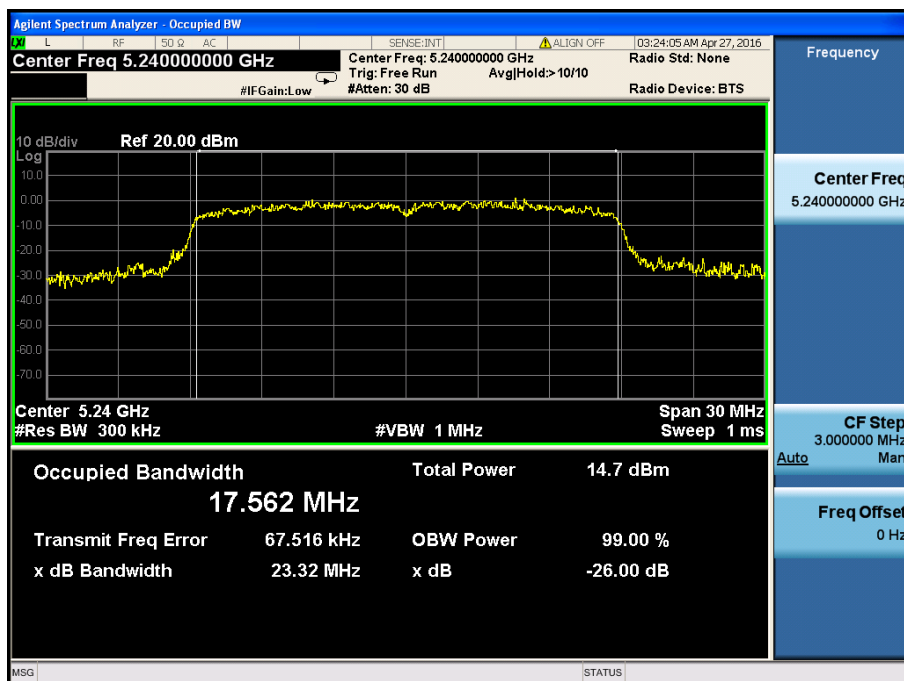
5180MHz



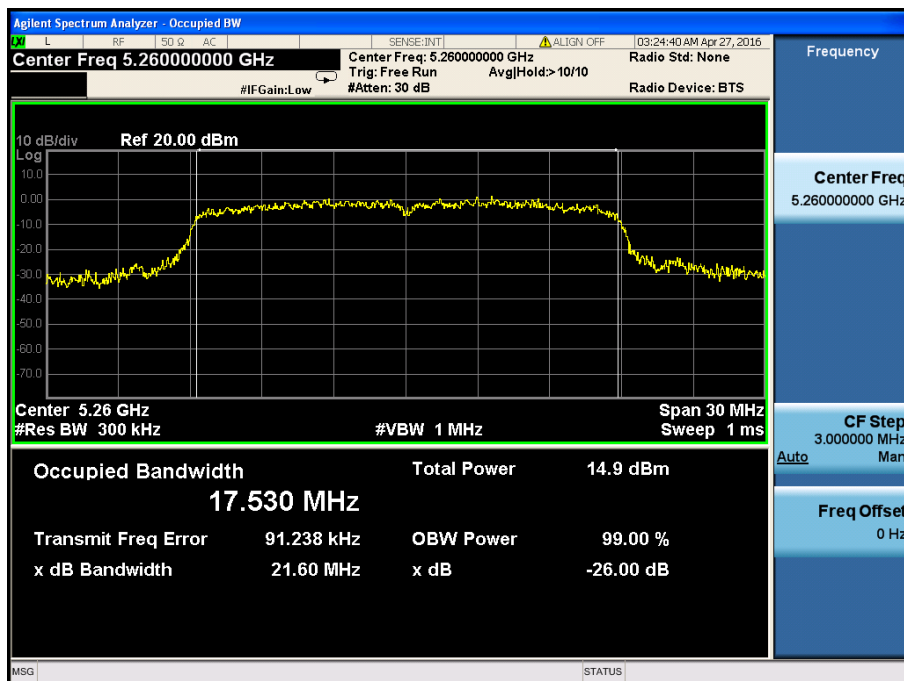
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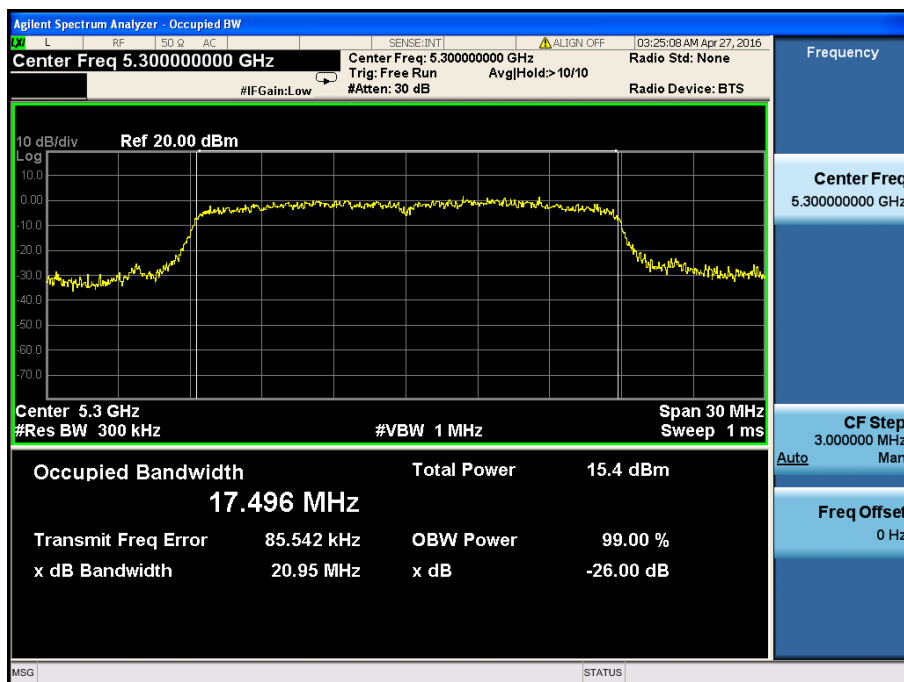
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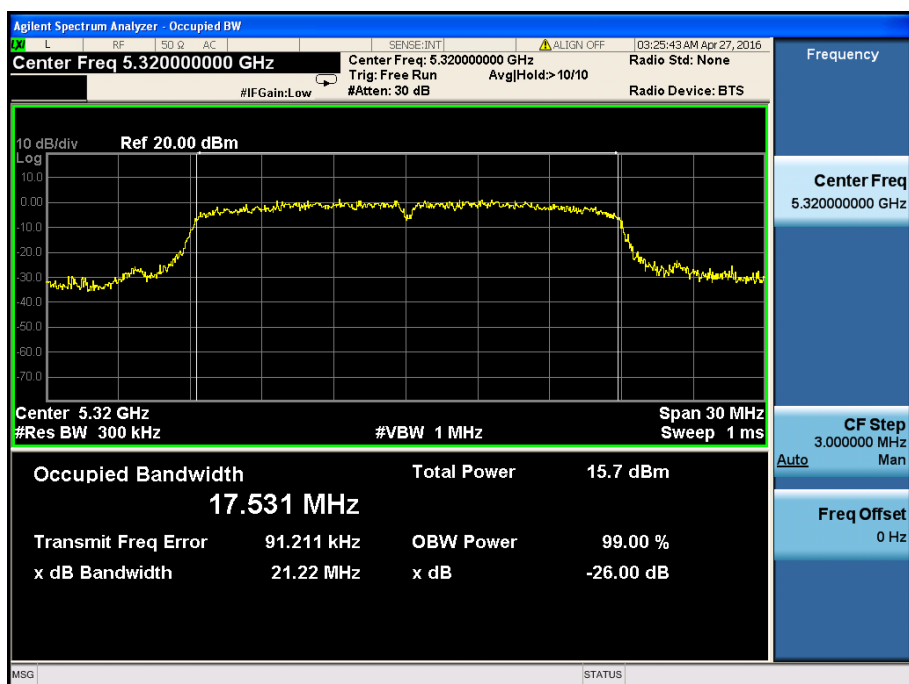
5260MHz



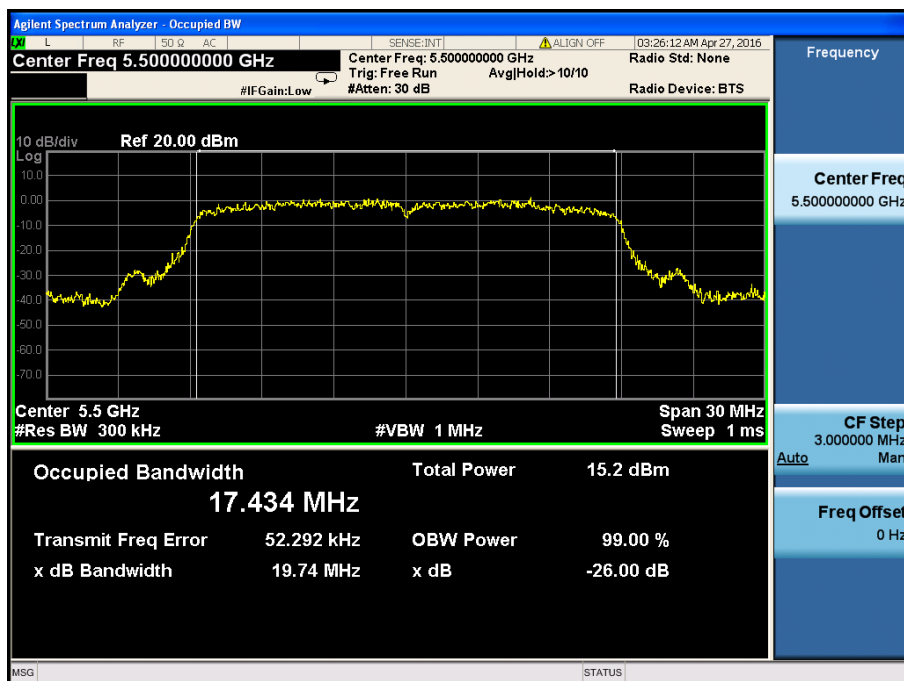
5300MHz



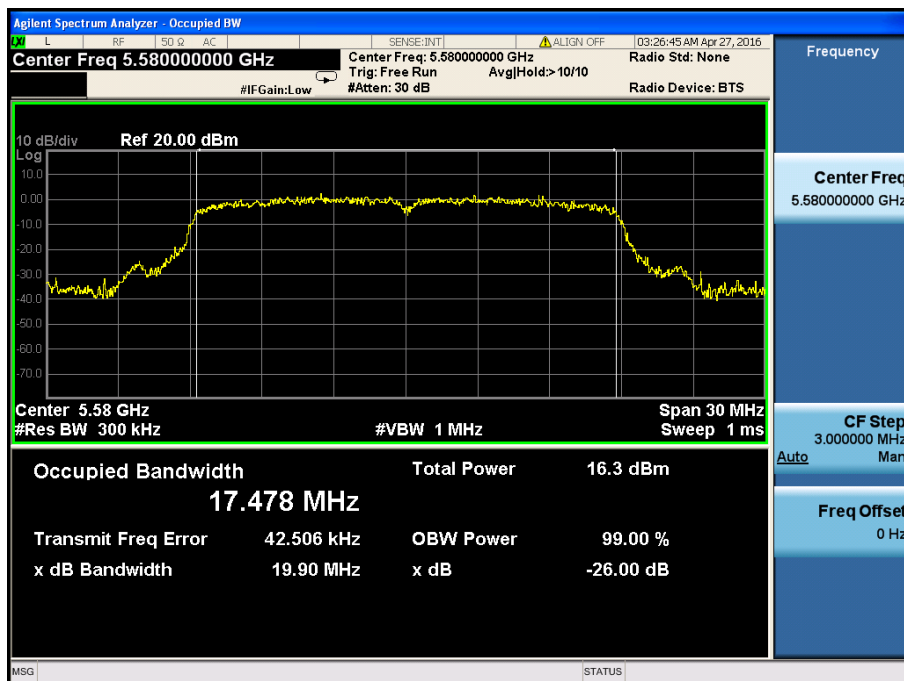
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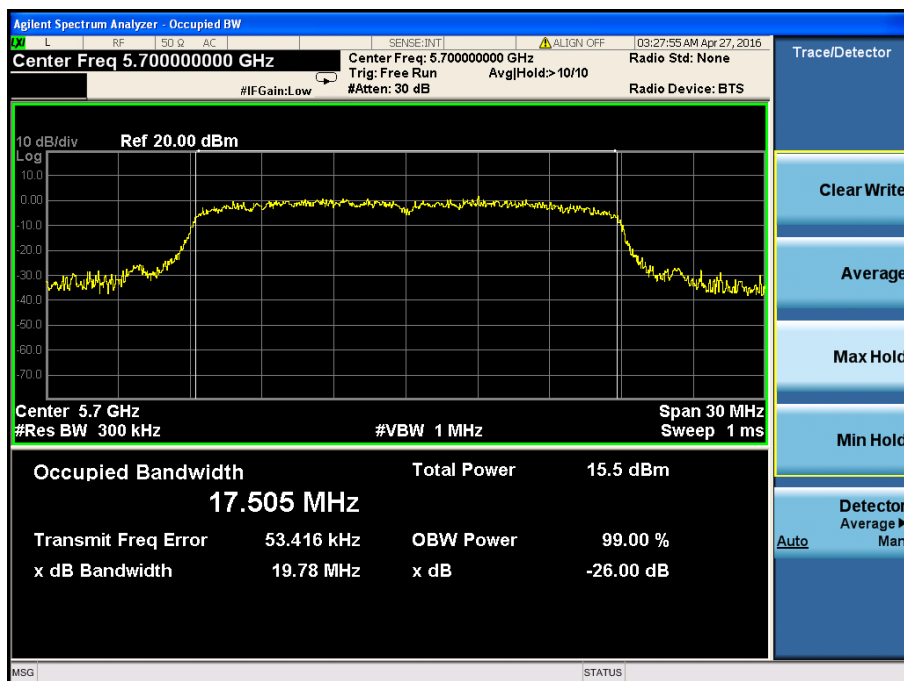
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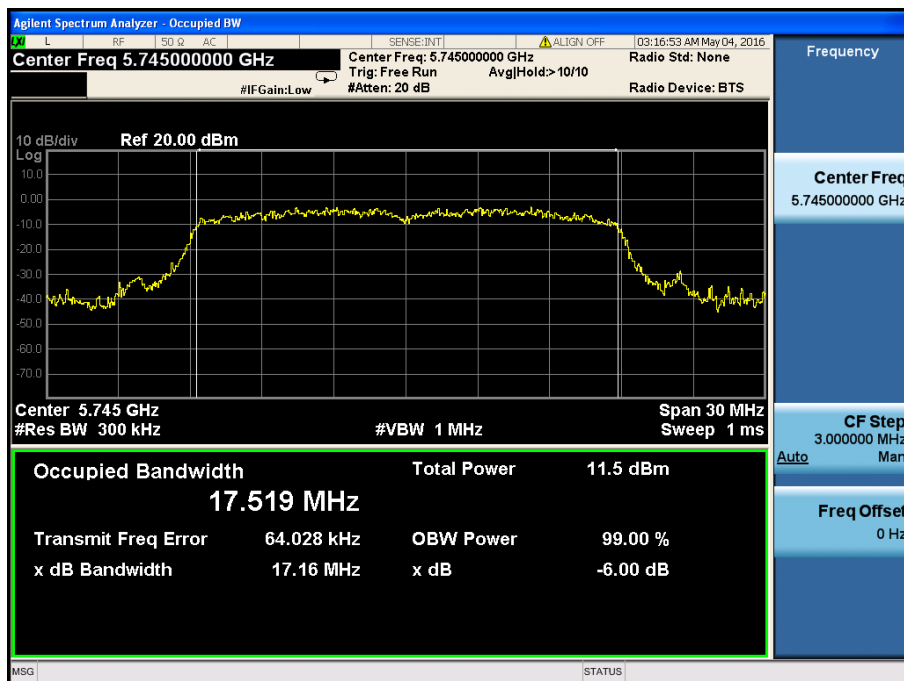
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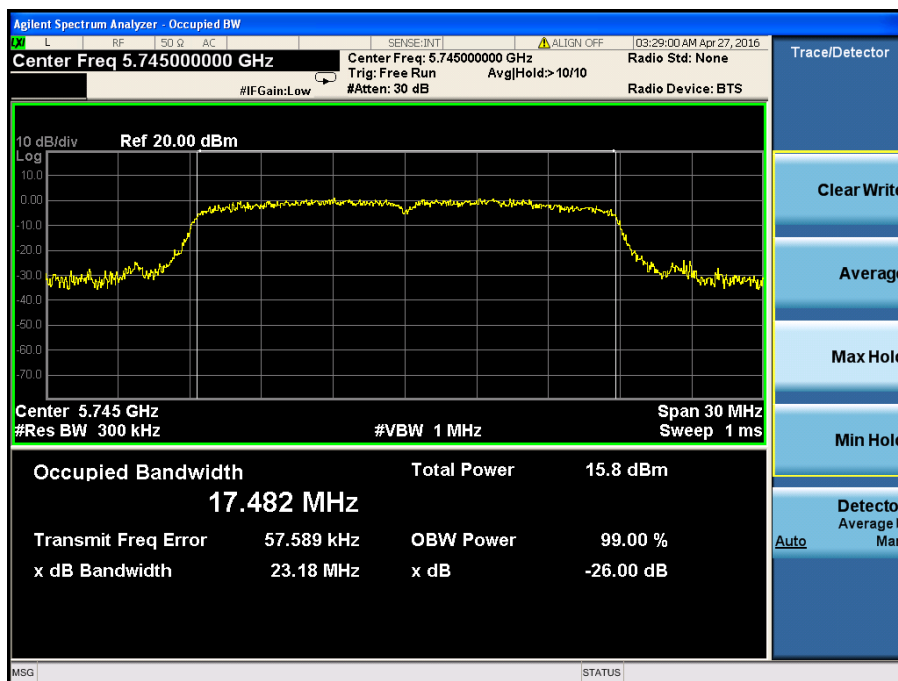


5700MHz

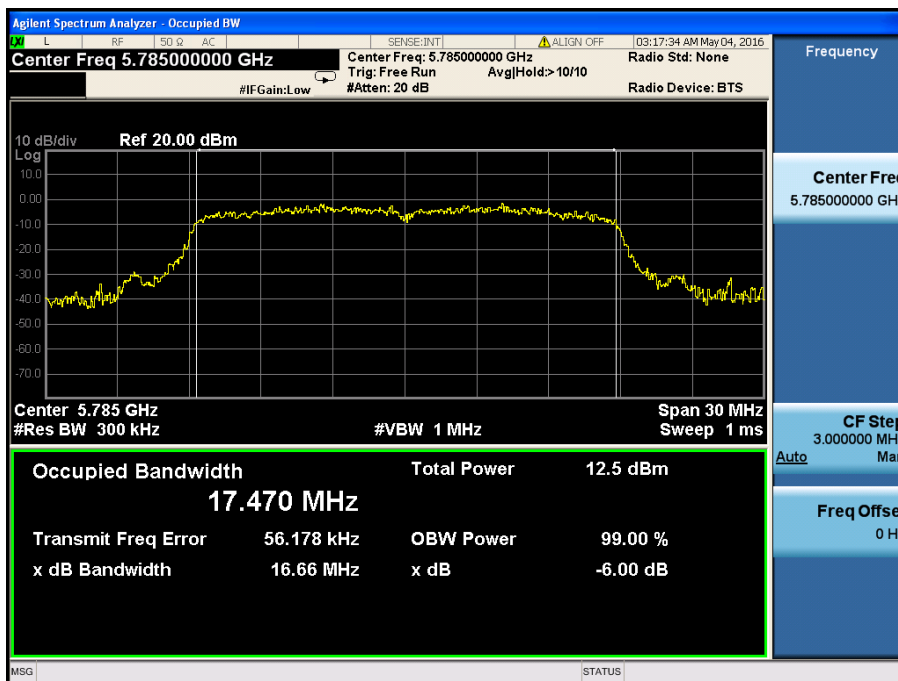


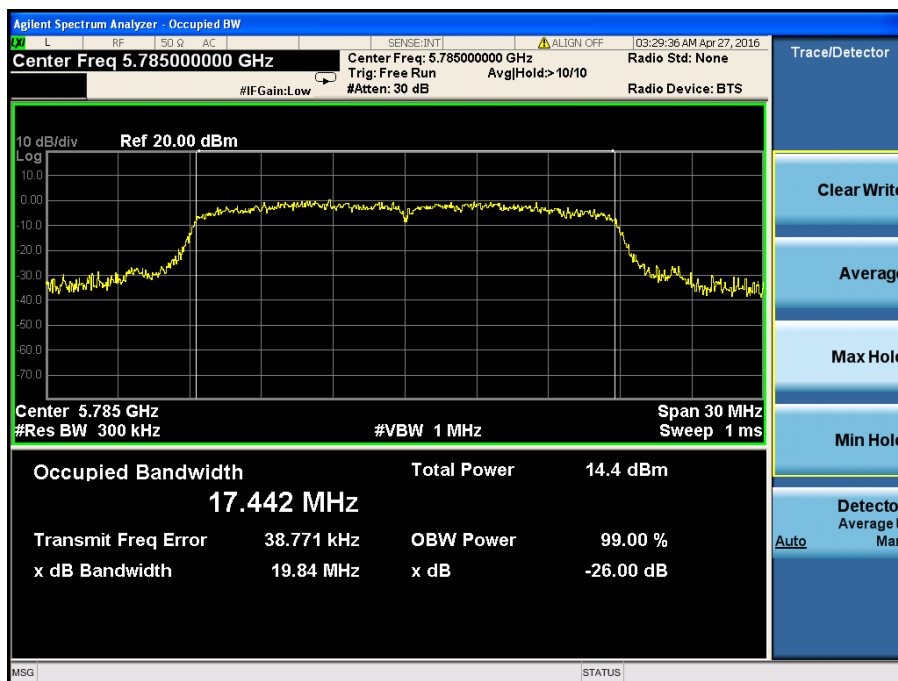
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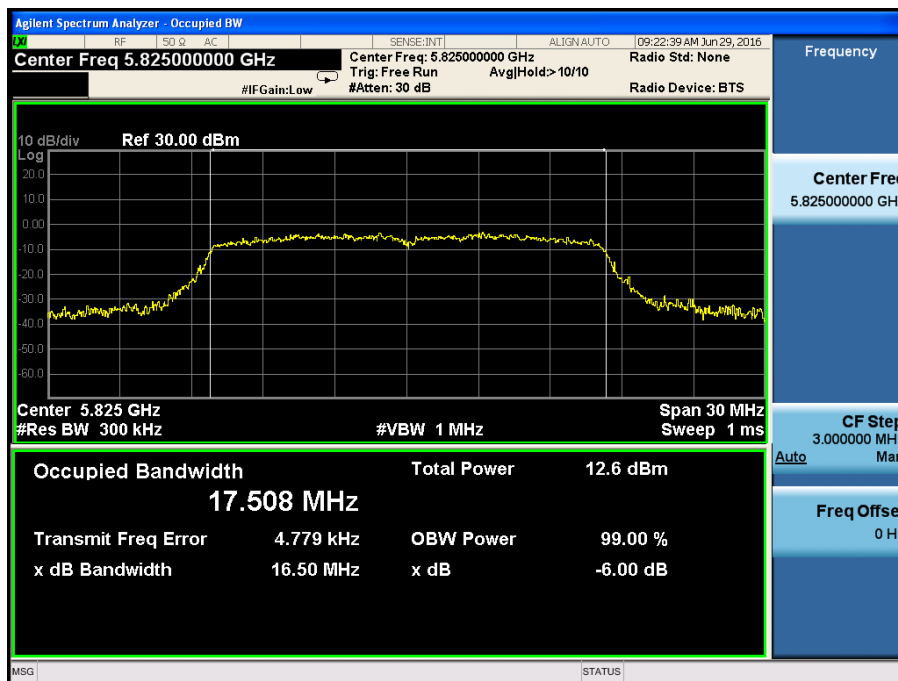


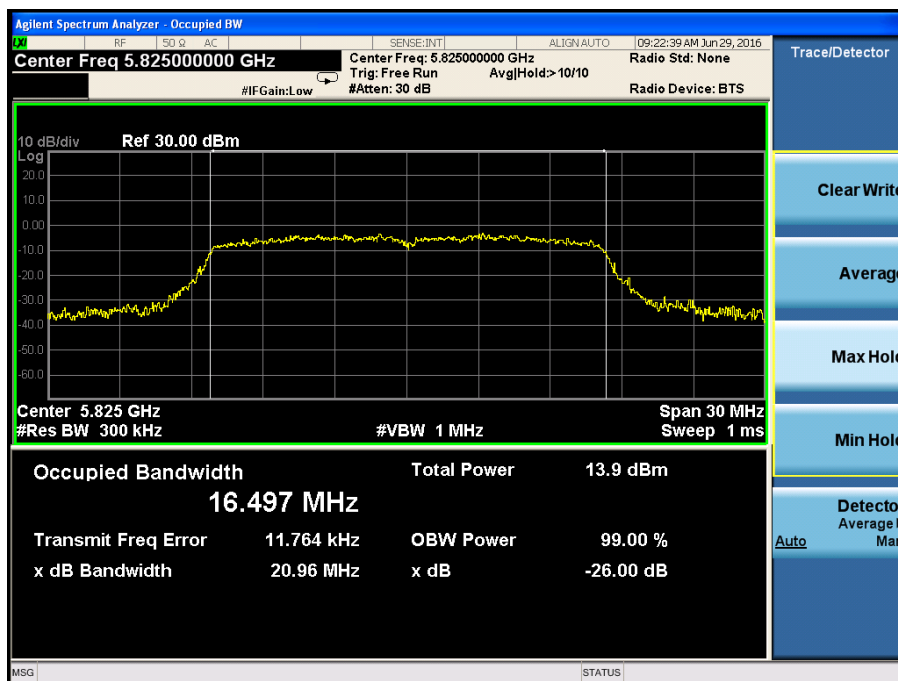
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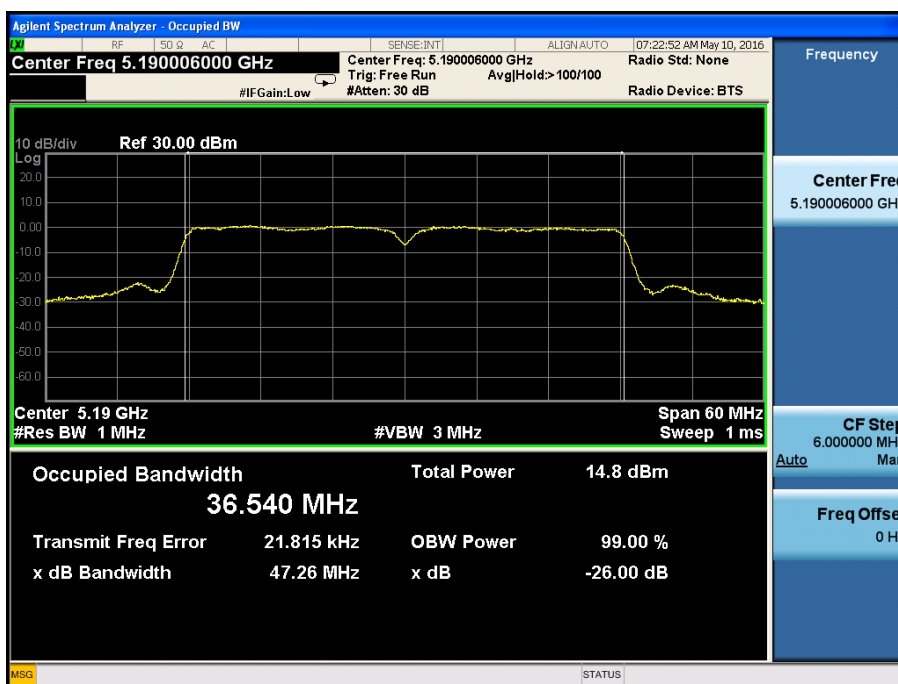
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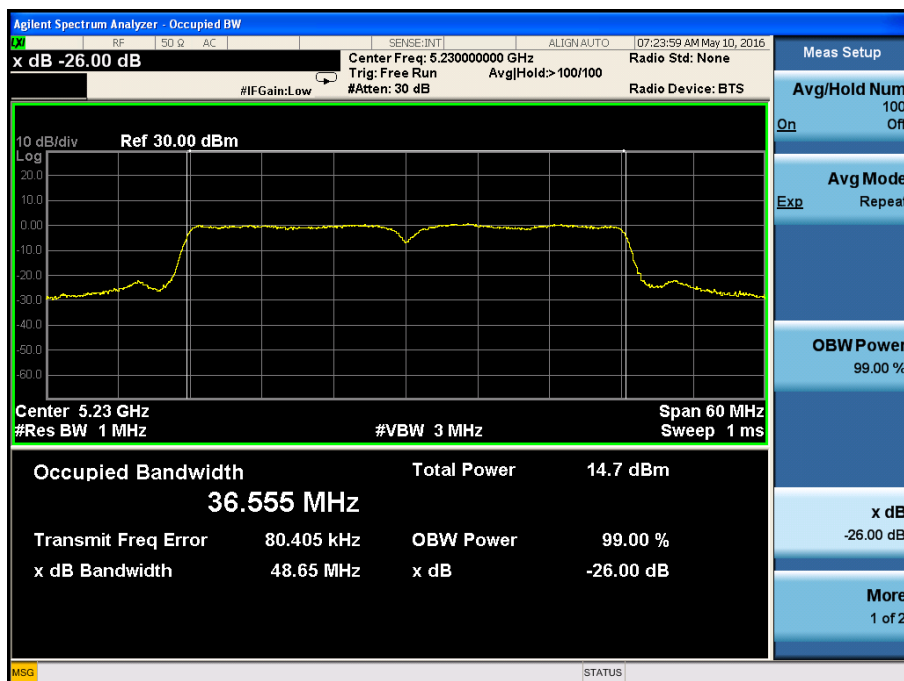


Test Mode: 802.11n-HT40

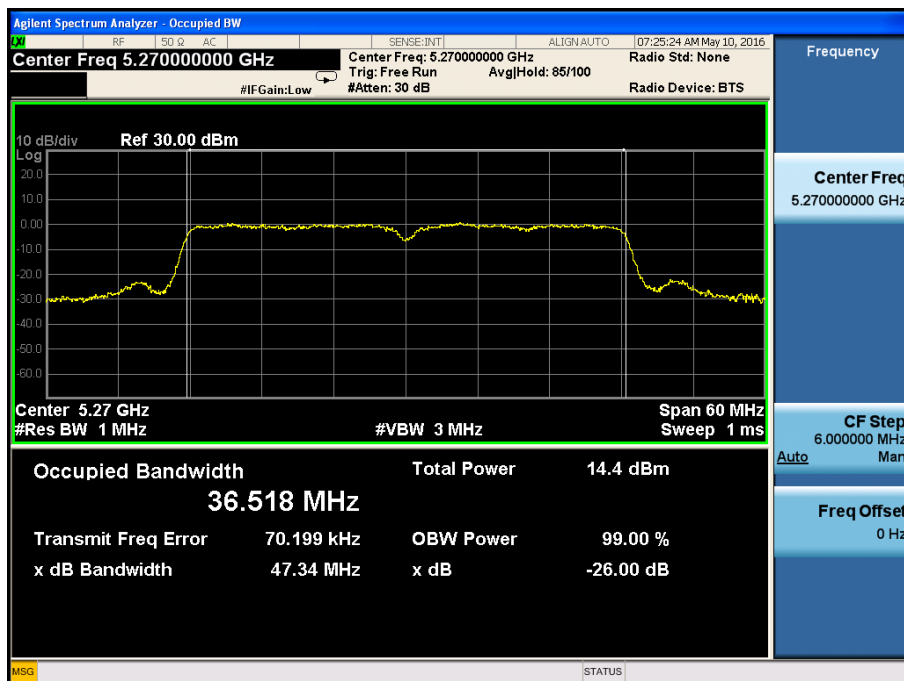
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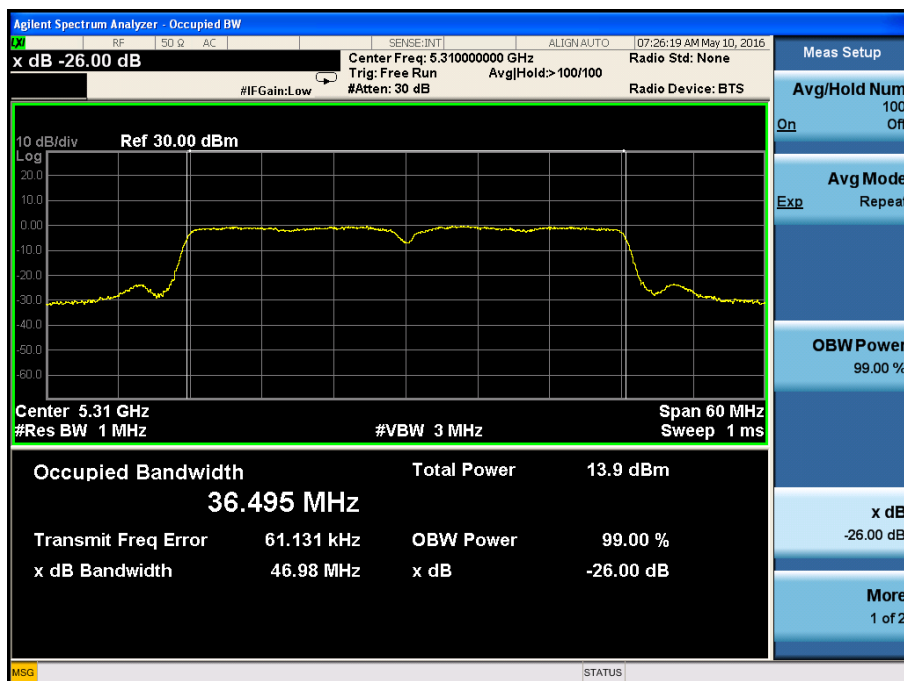
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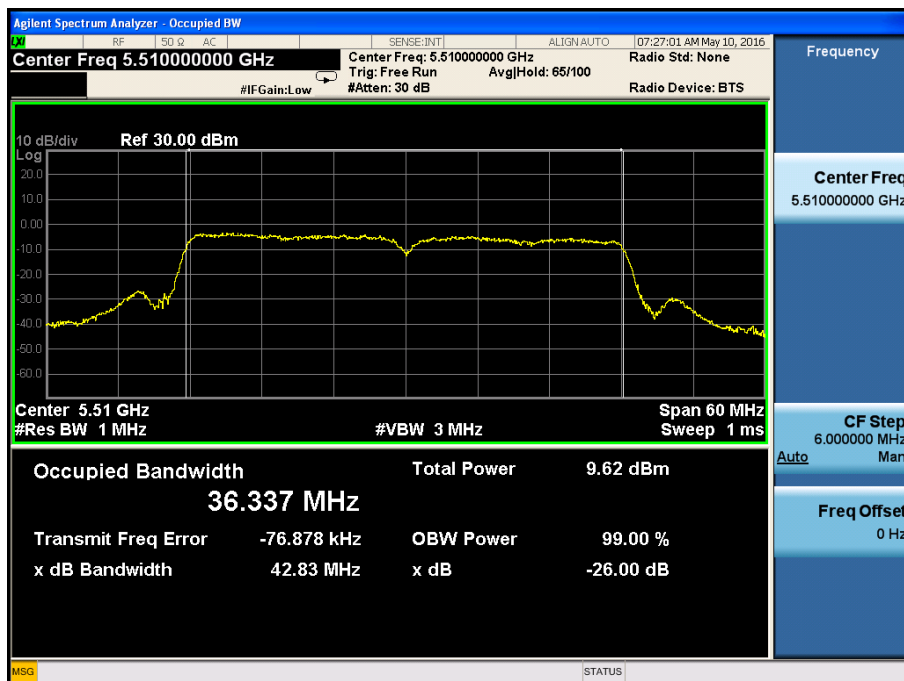
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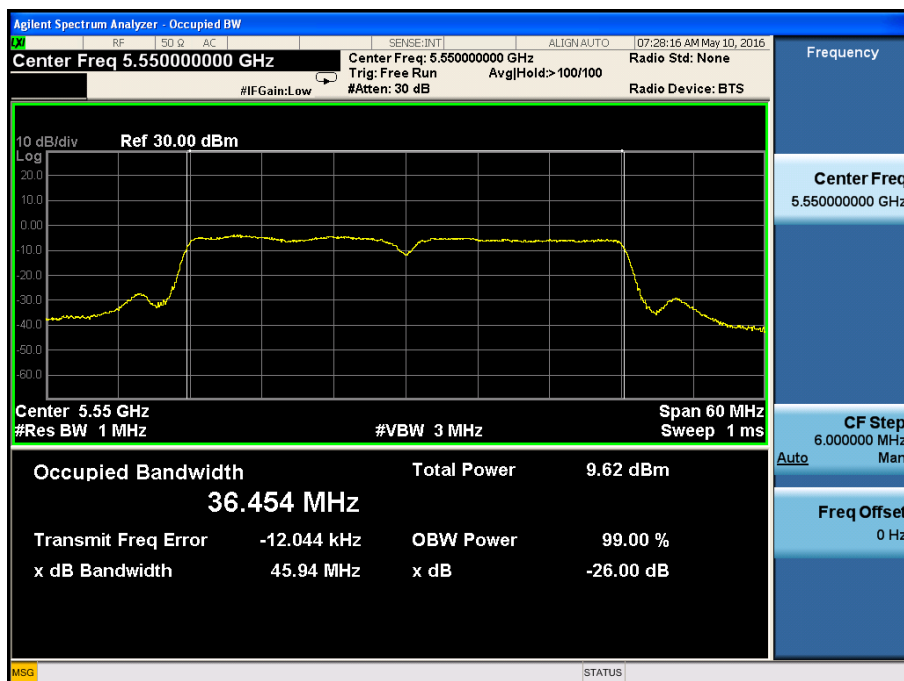
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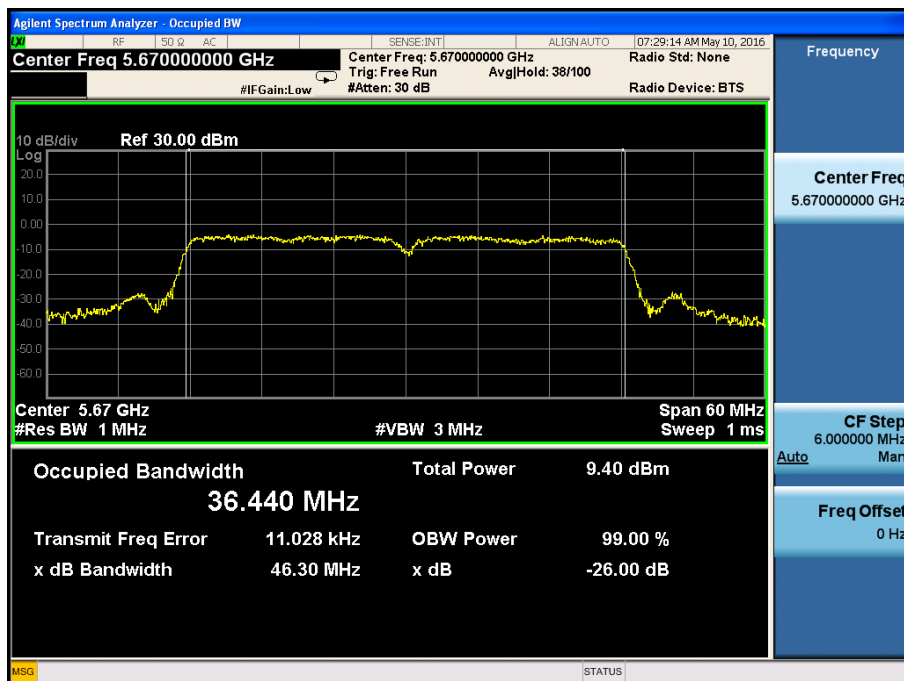
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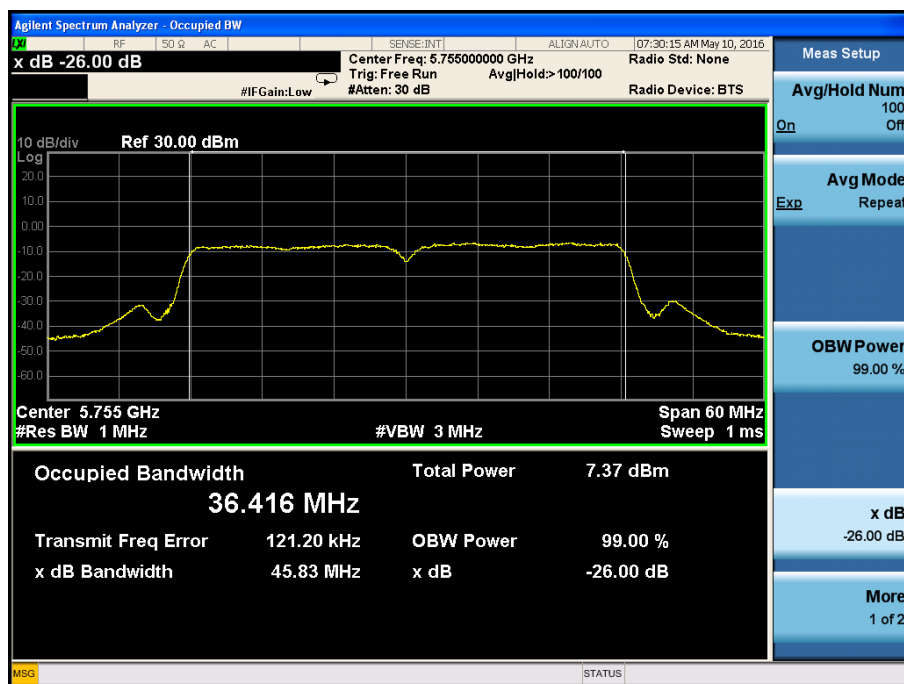
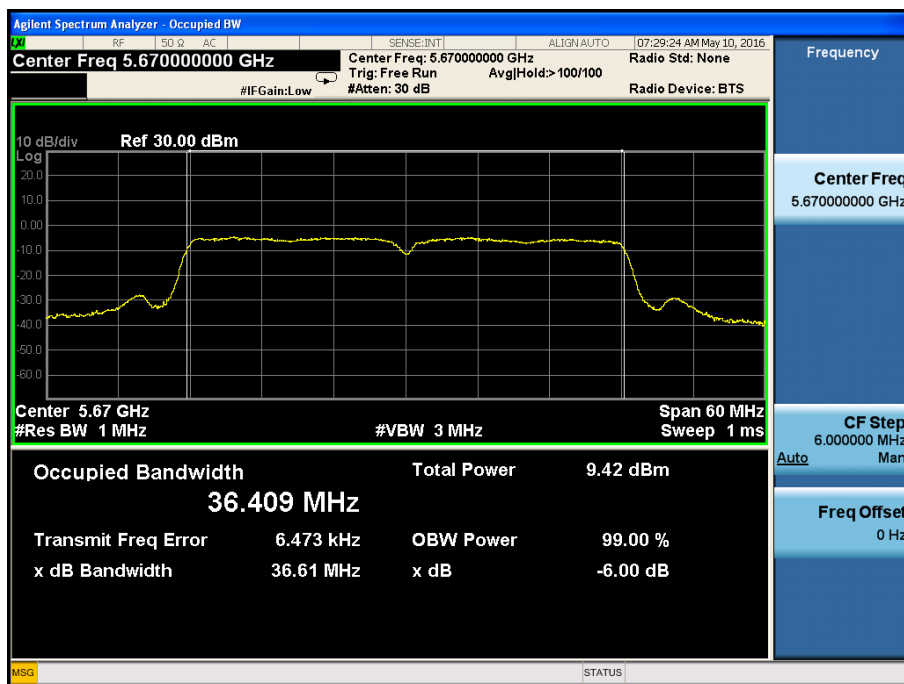
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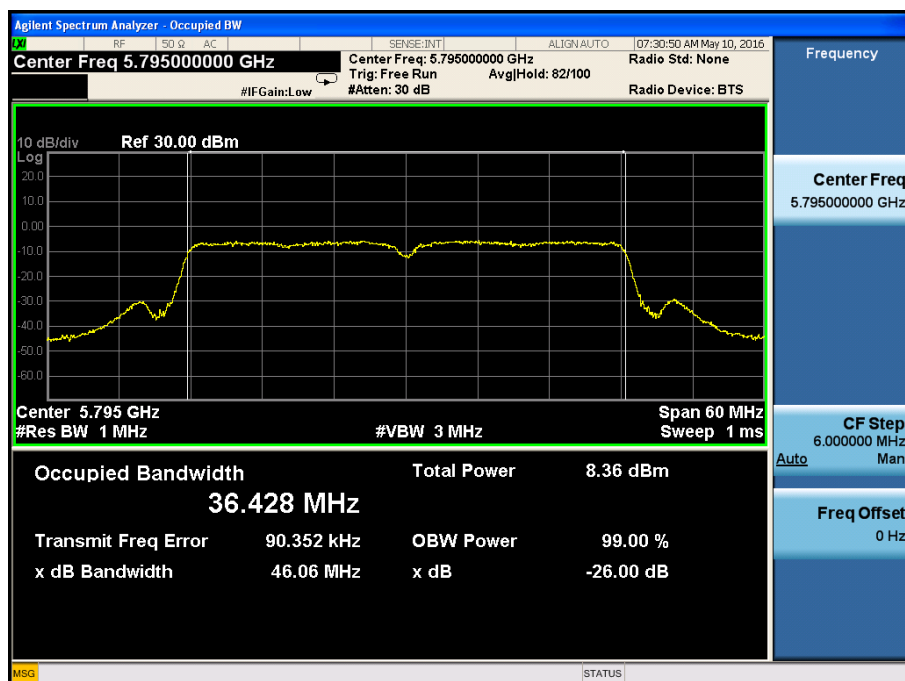
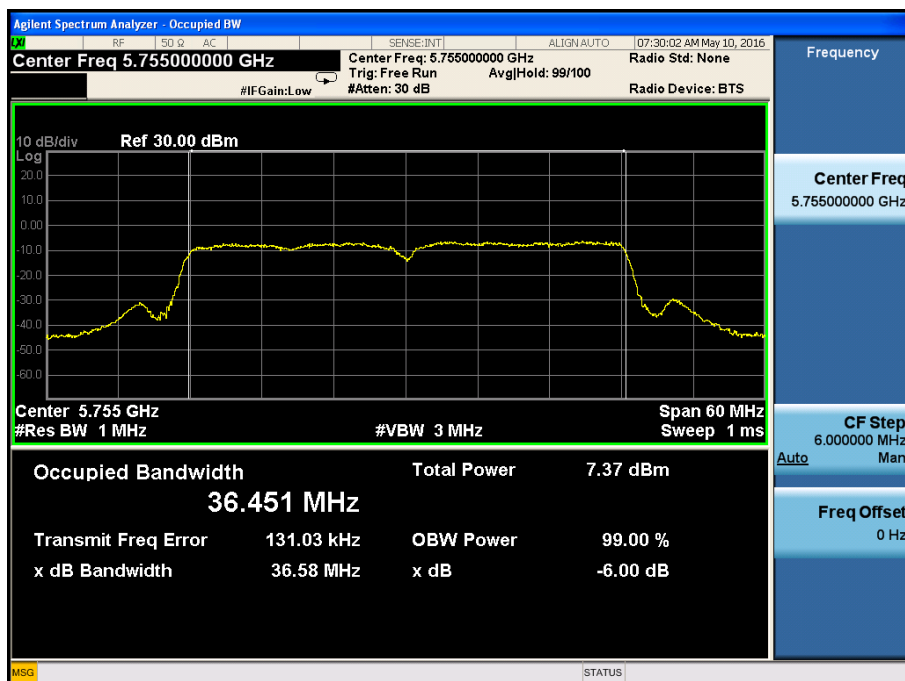
5670MHz



5755MHz



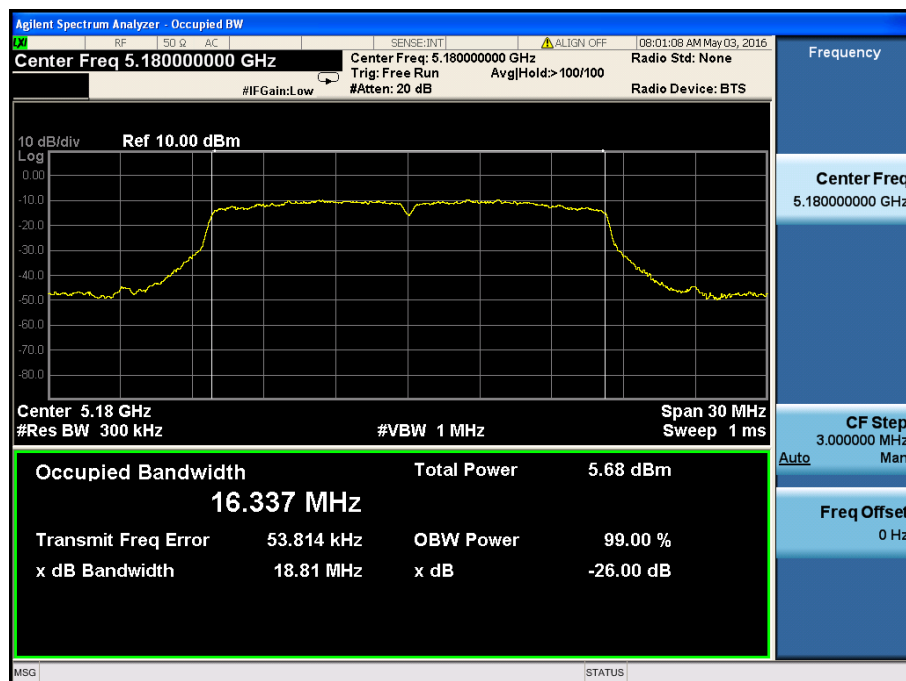
5795MHz



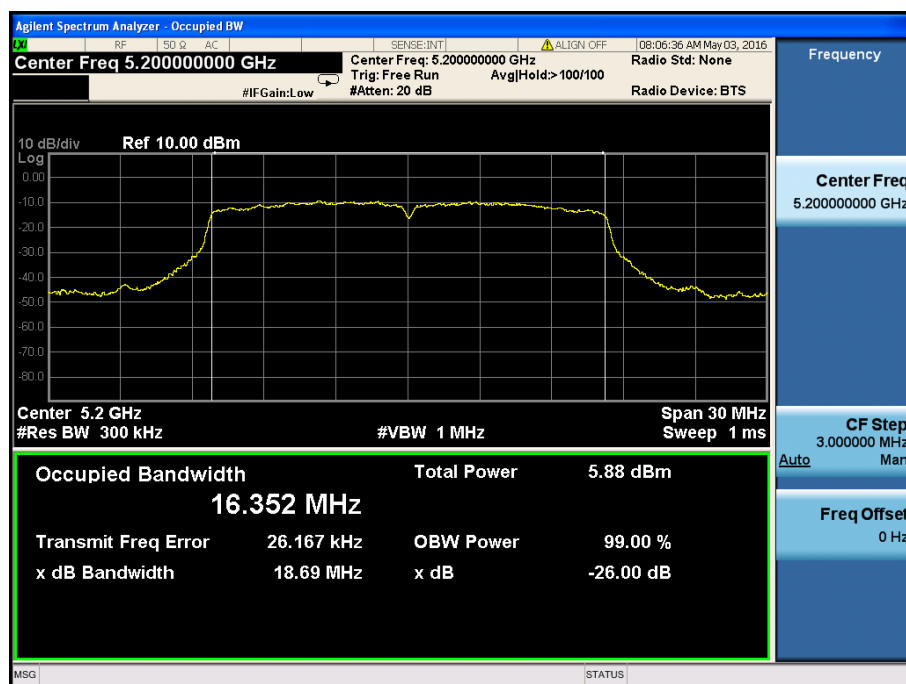
Antenna 2

Test Mode: 802.11a

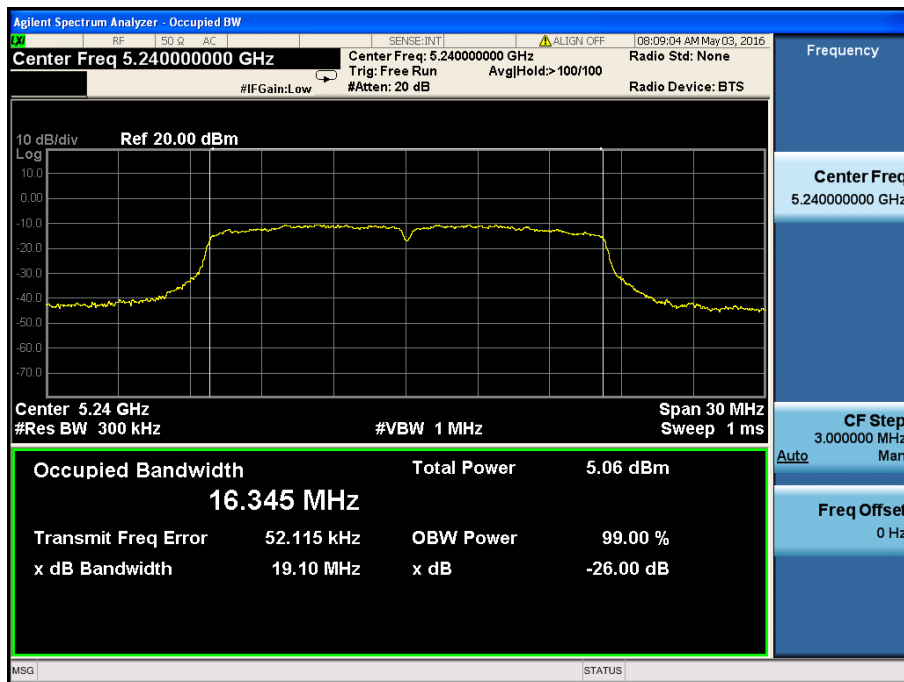
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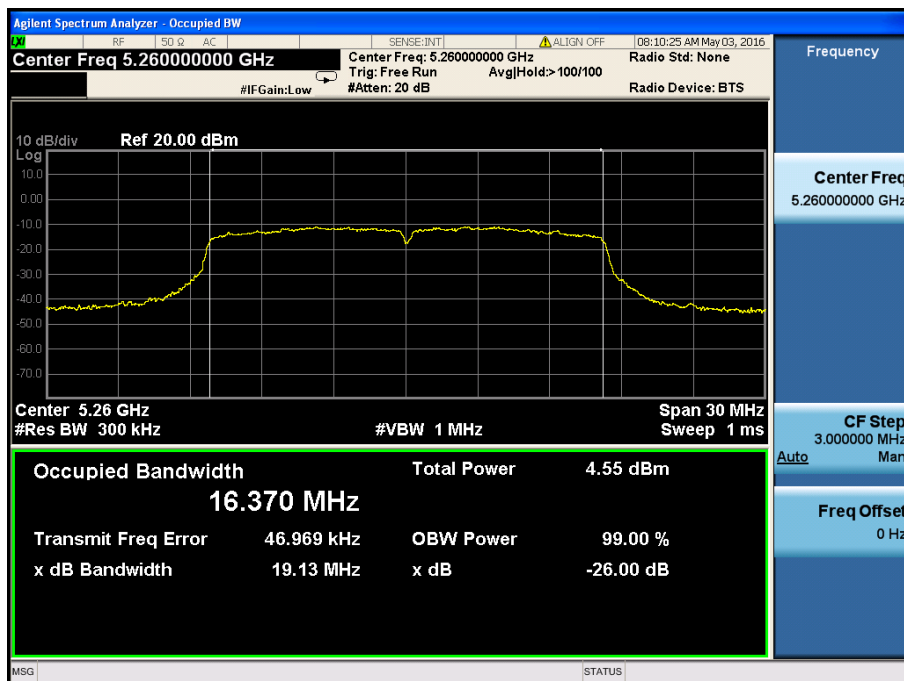
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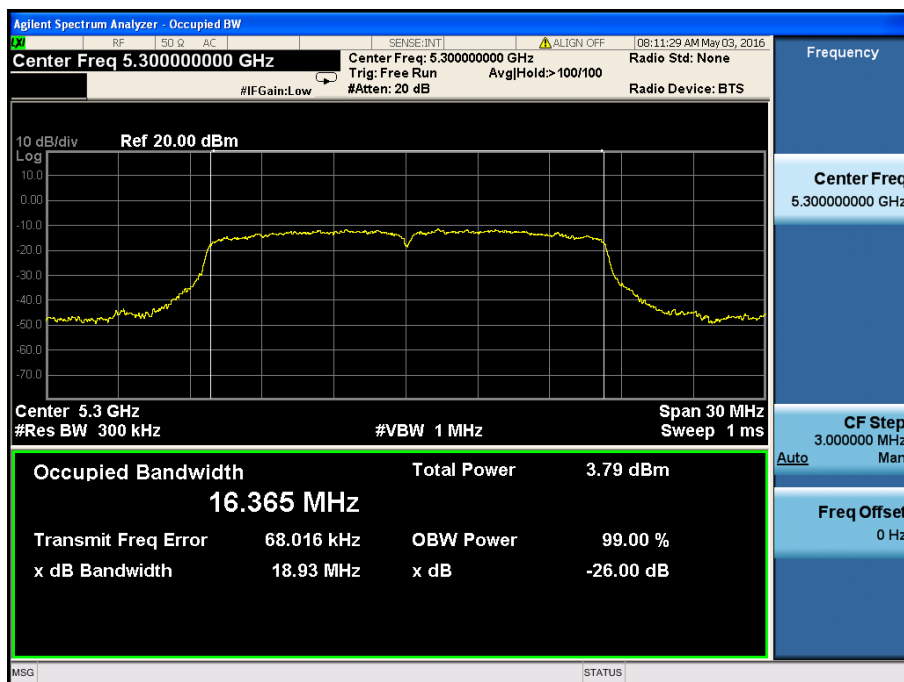
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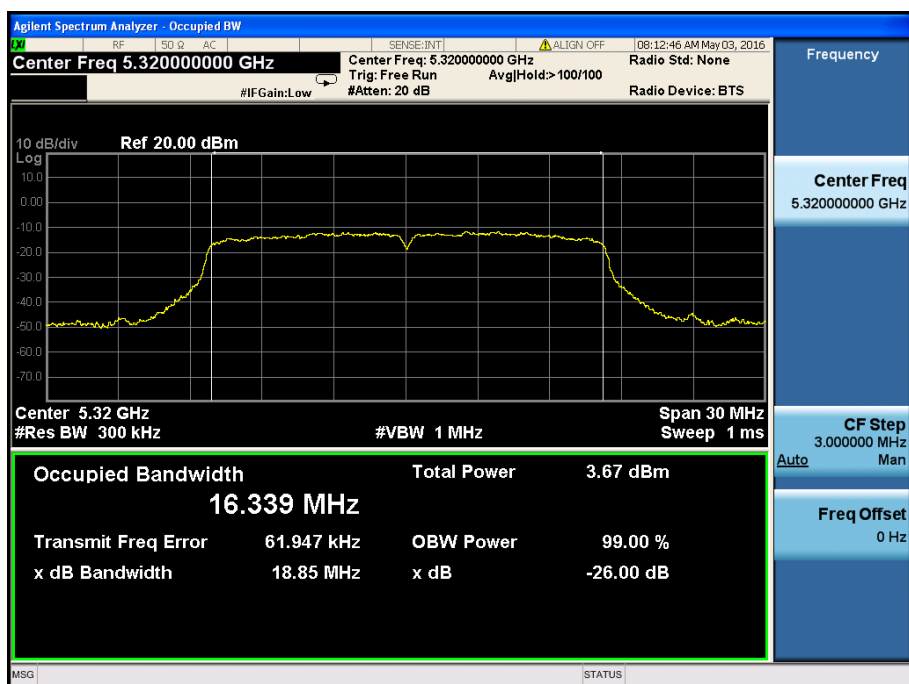
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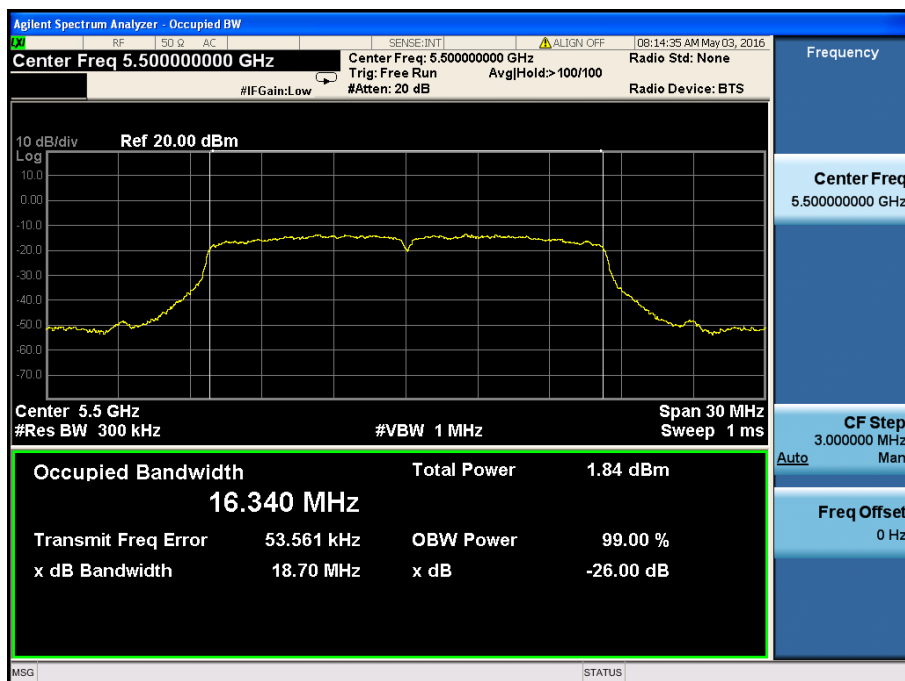
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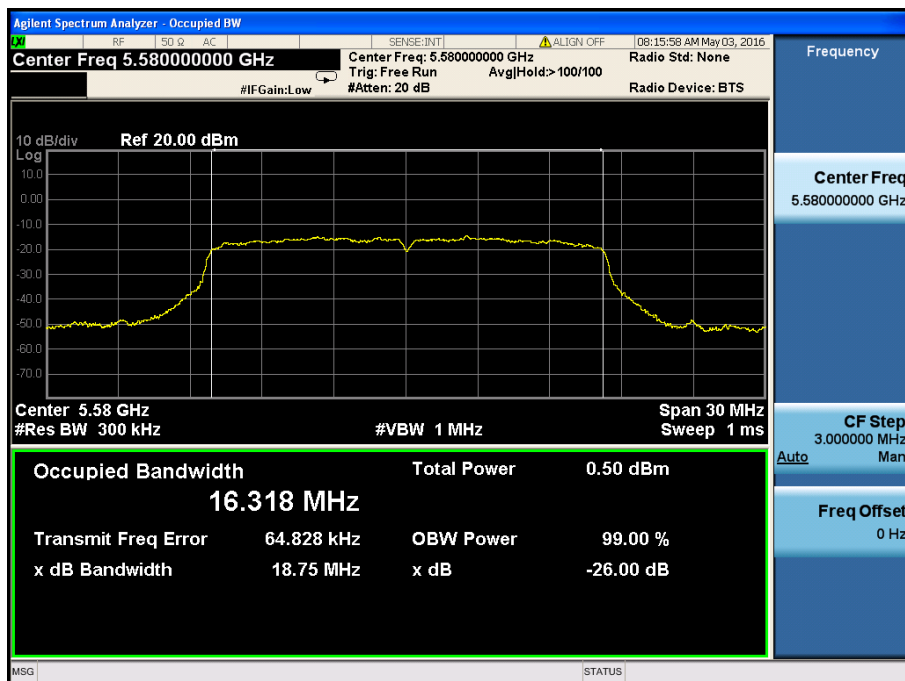
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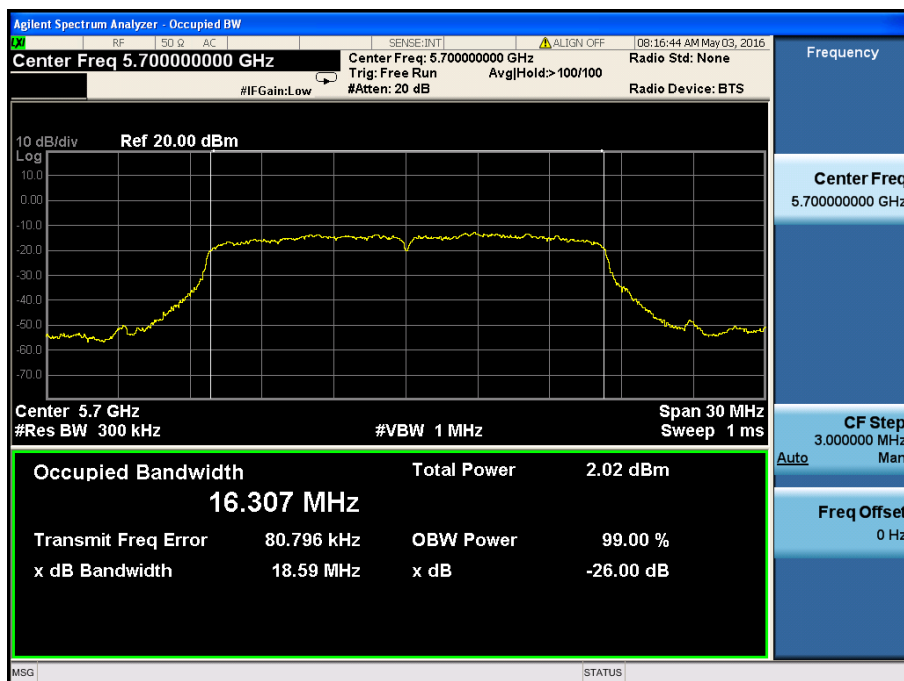
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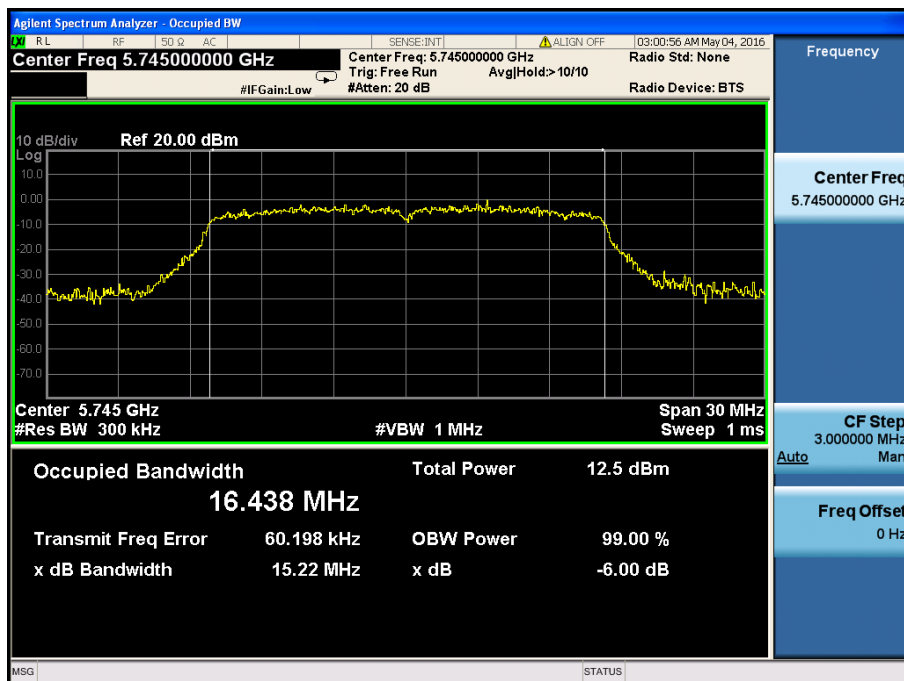
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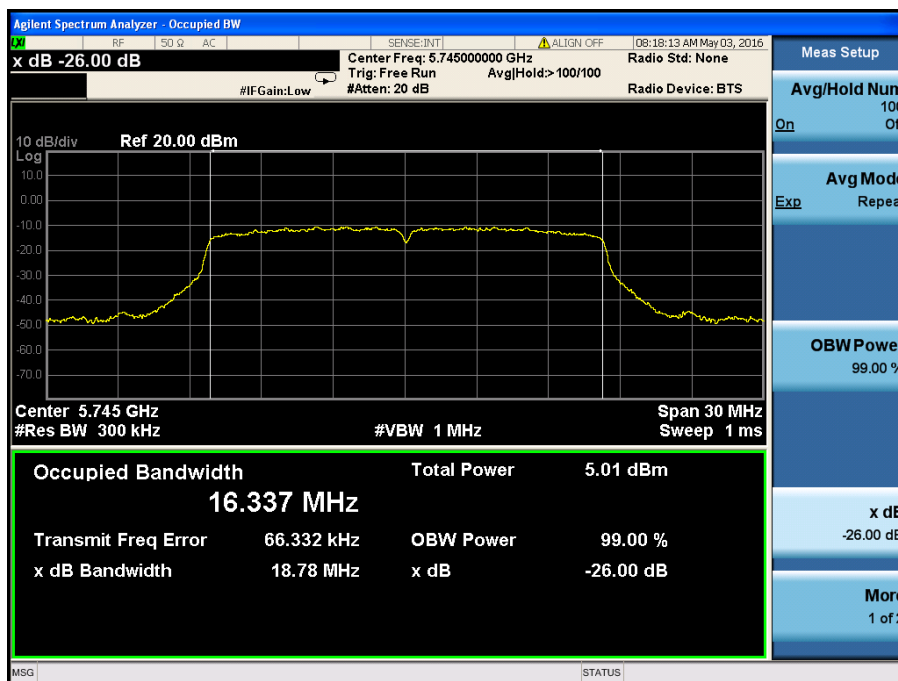


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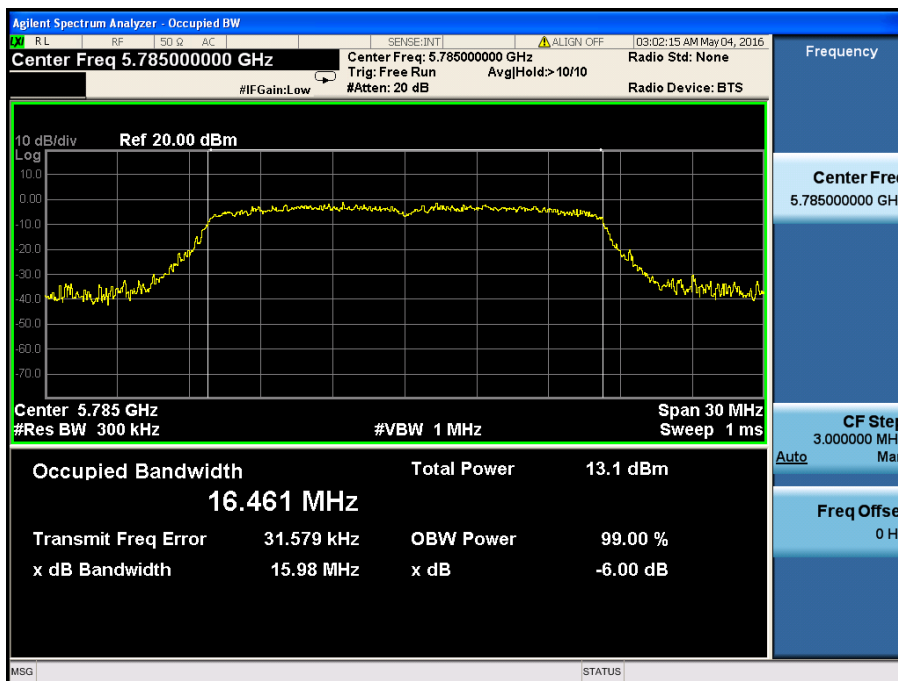


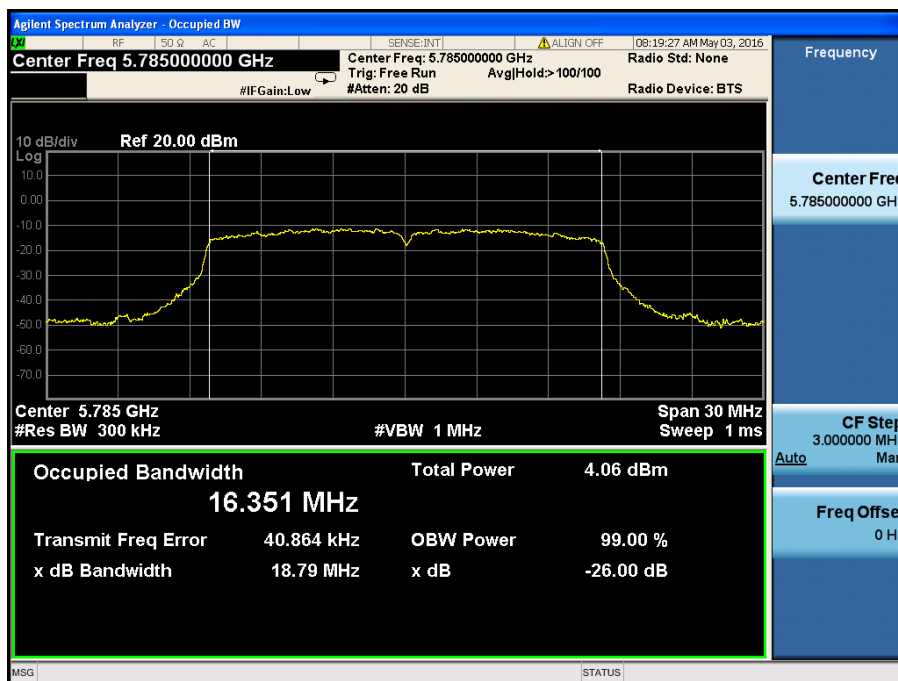
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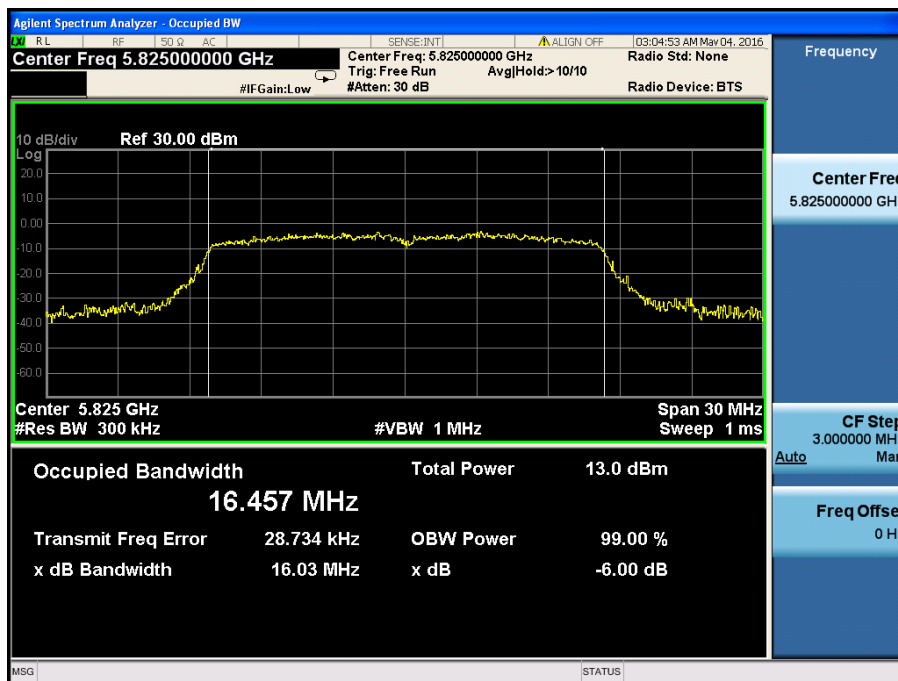


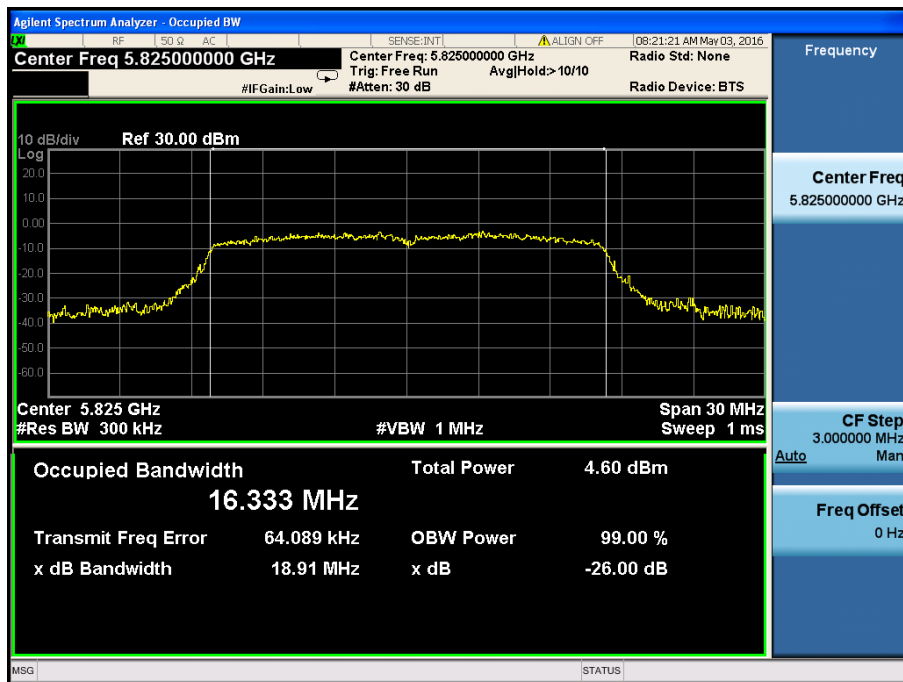
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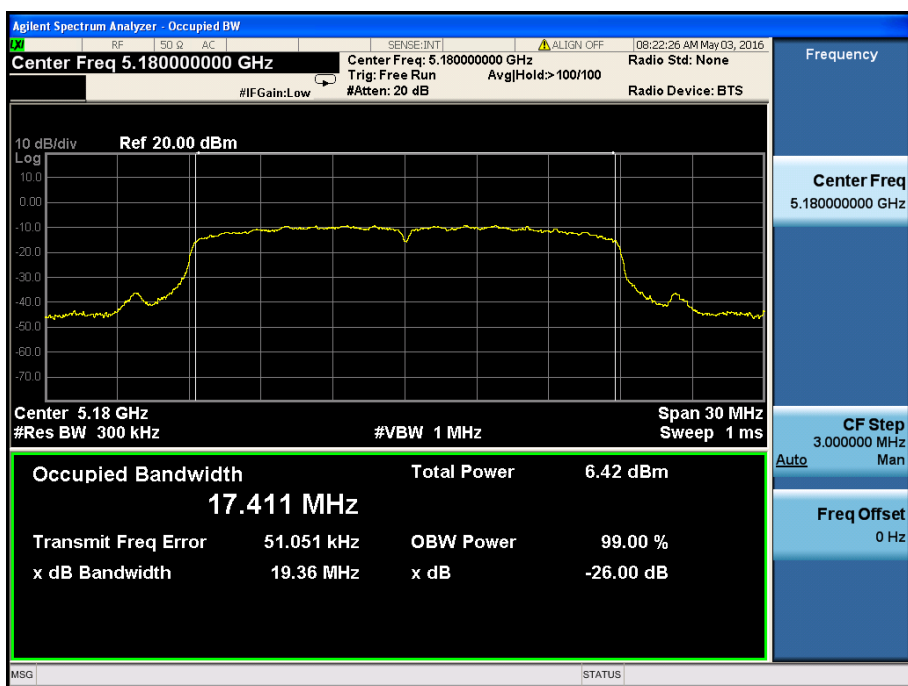
5825MHz



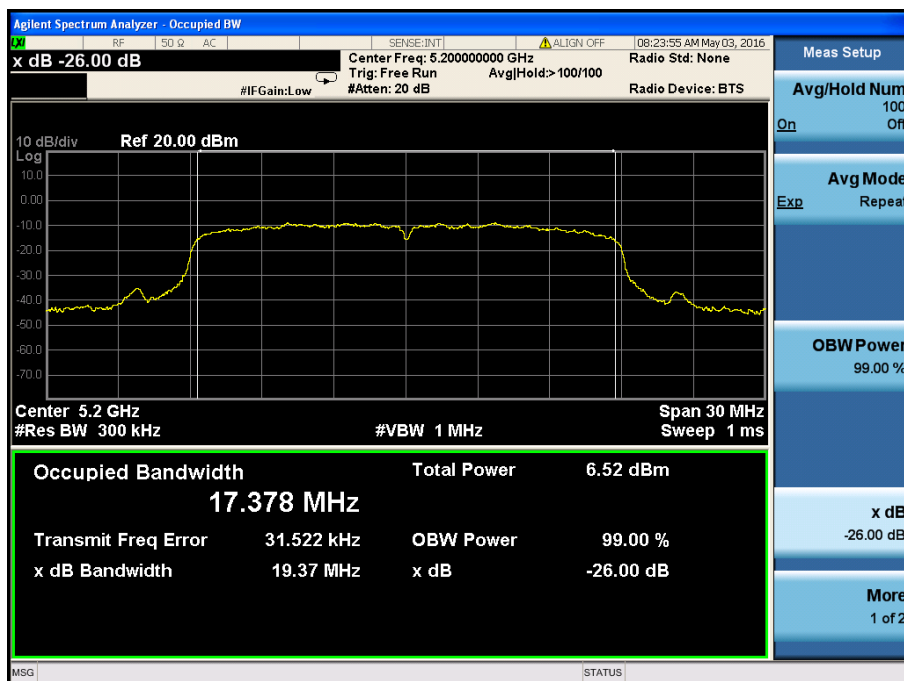


Test Mode: 802.11n20

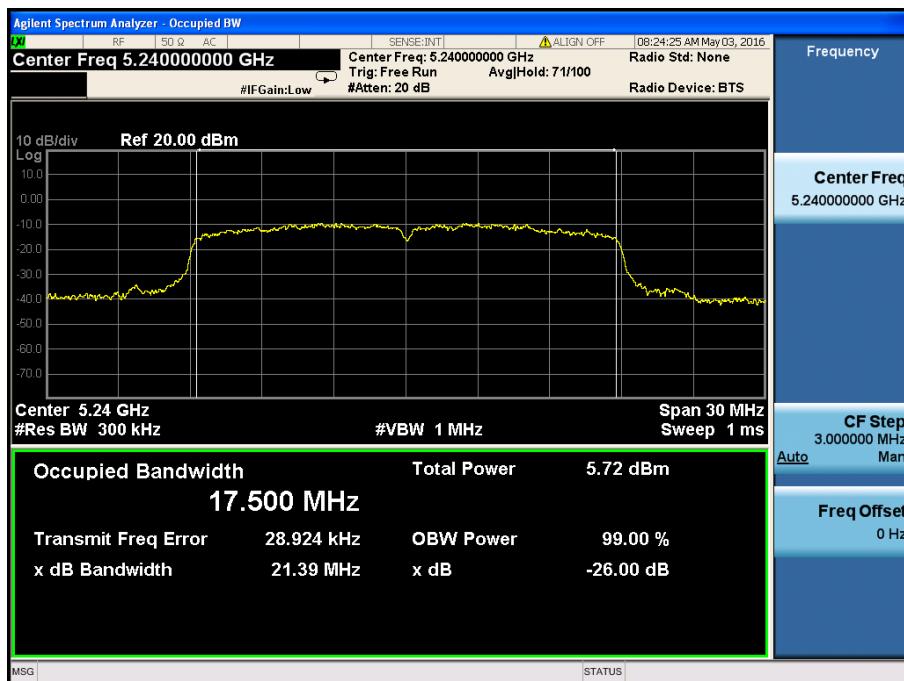
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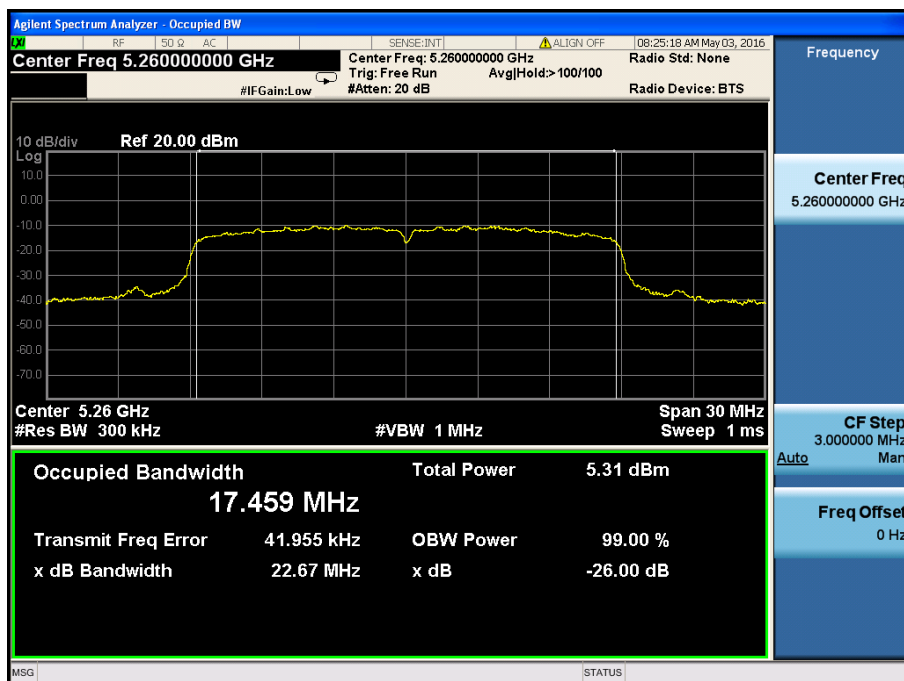
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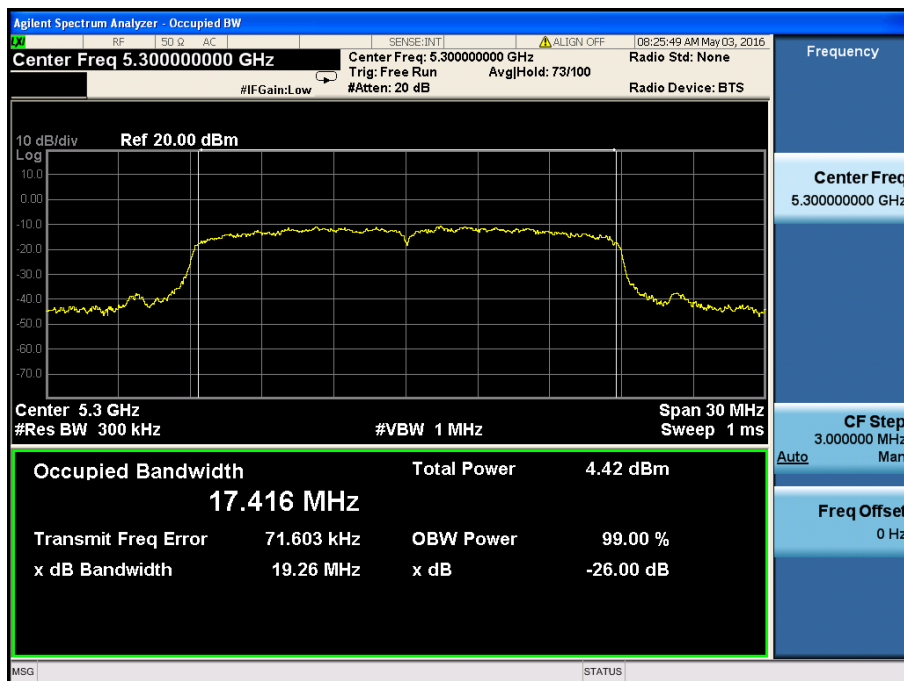
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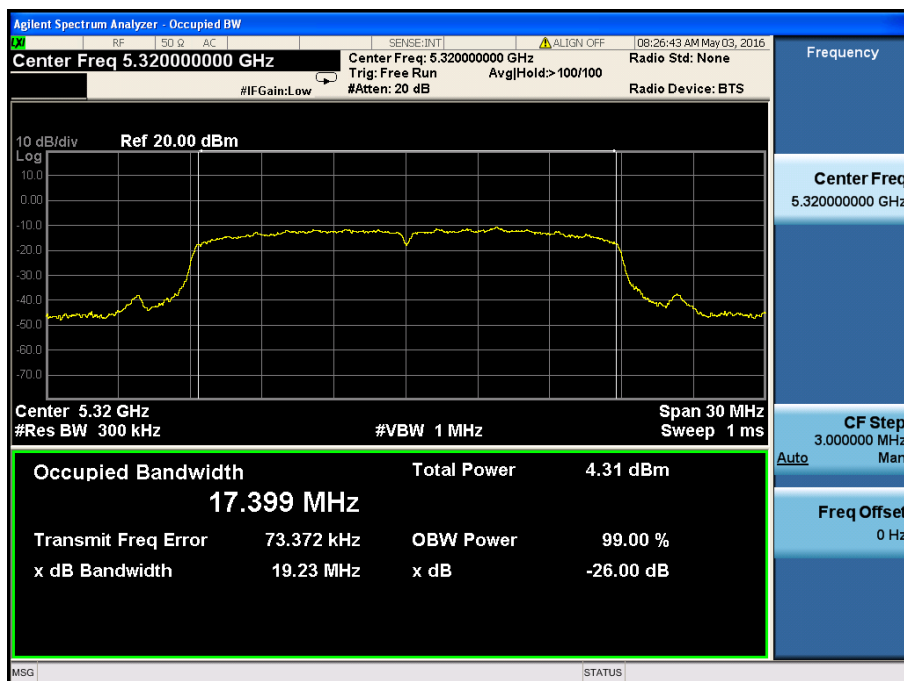
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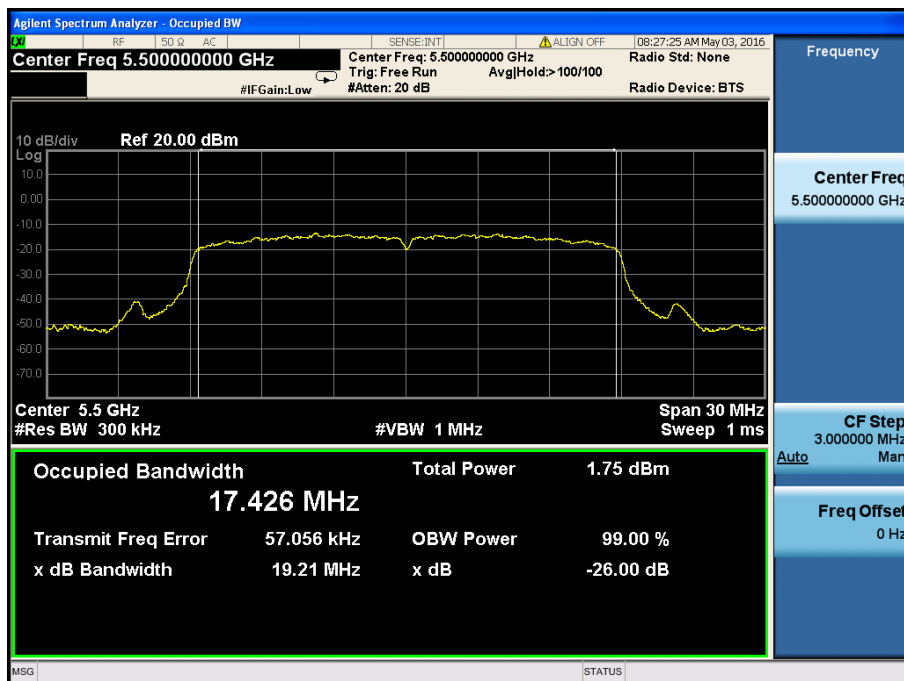
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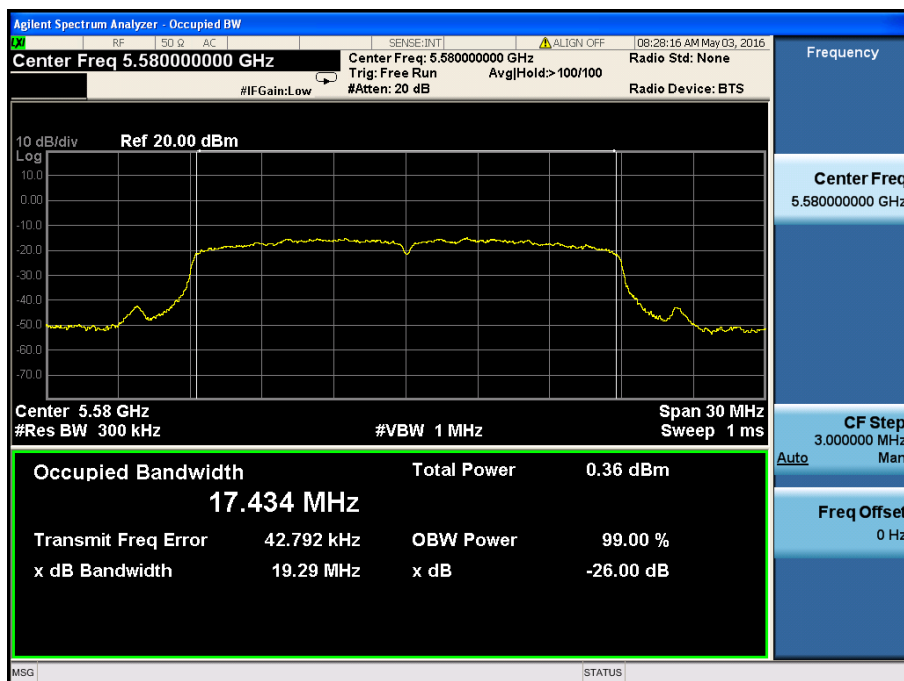
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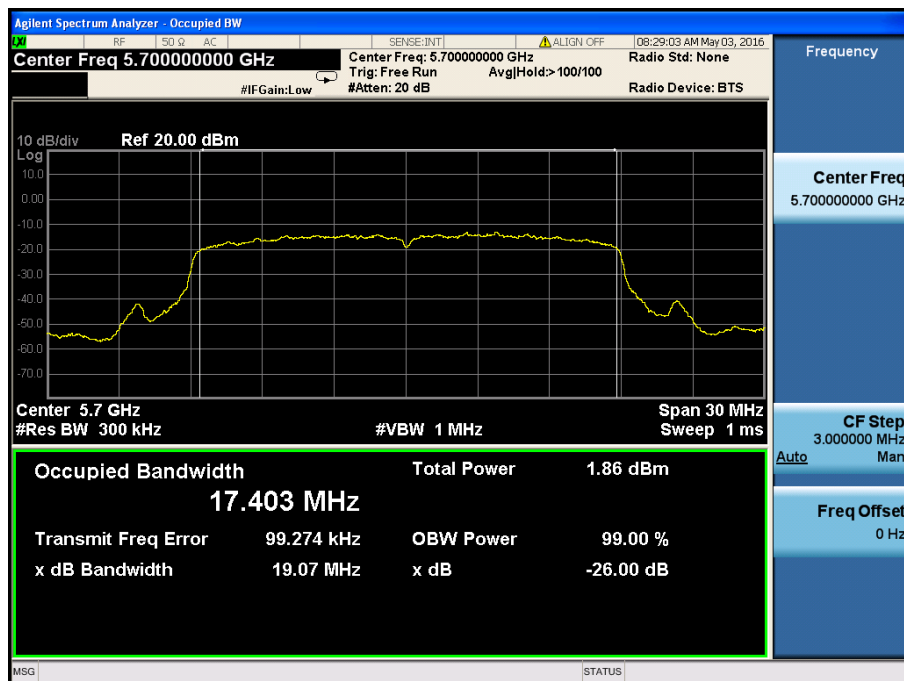
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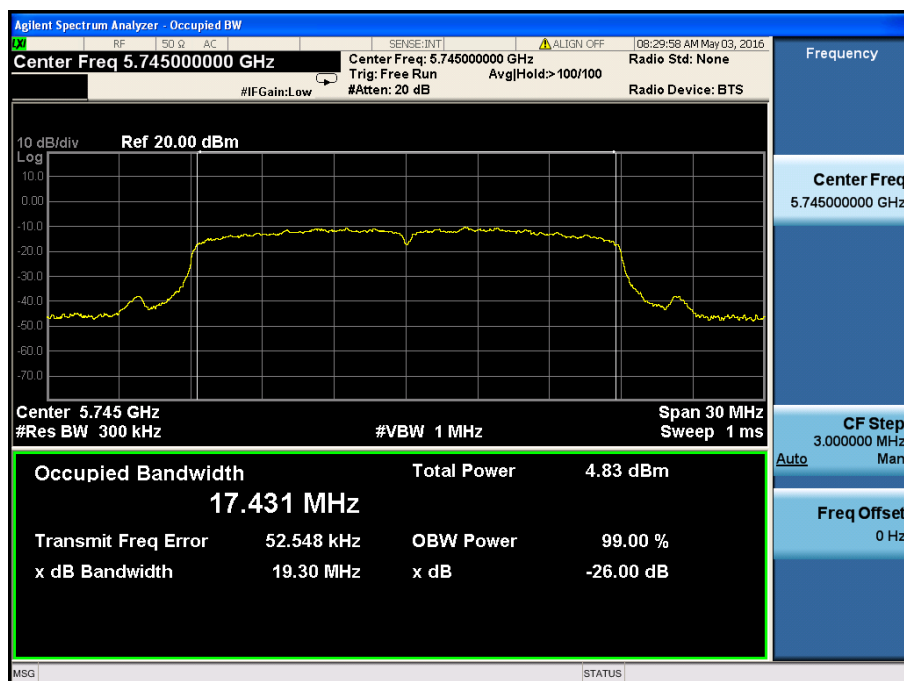
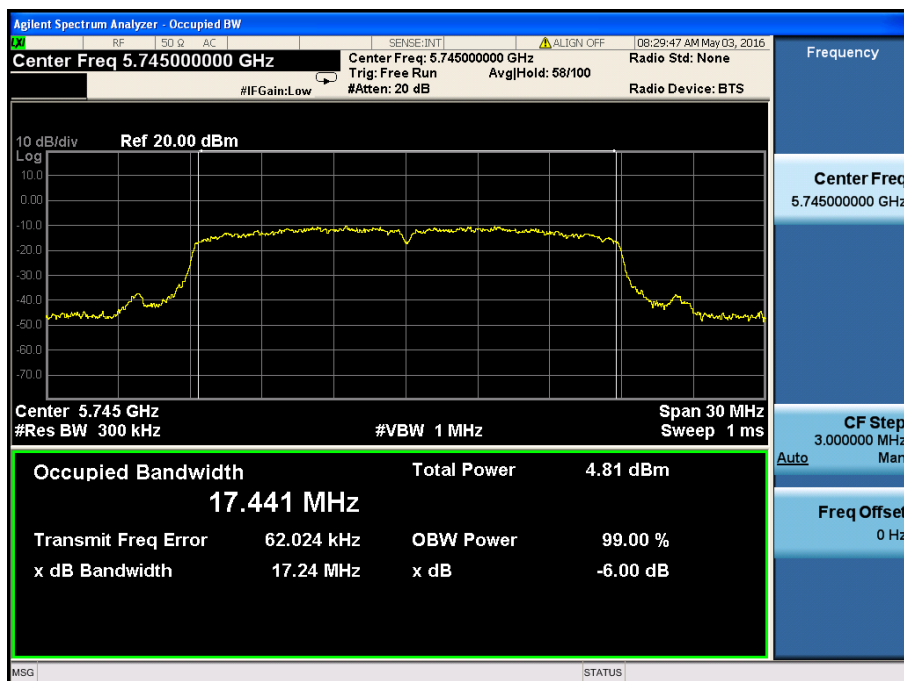
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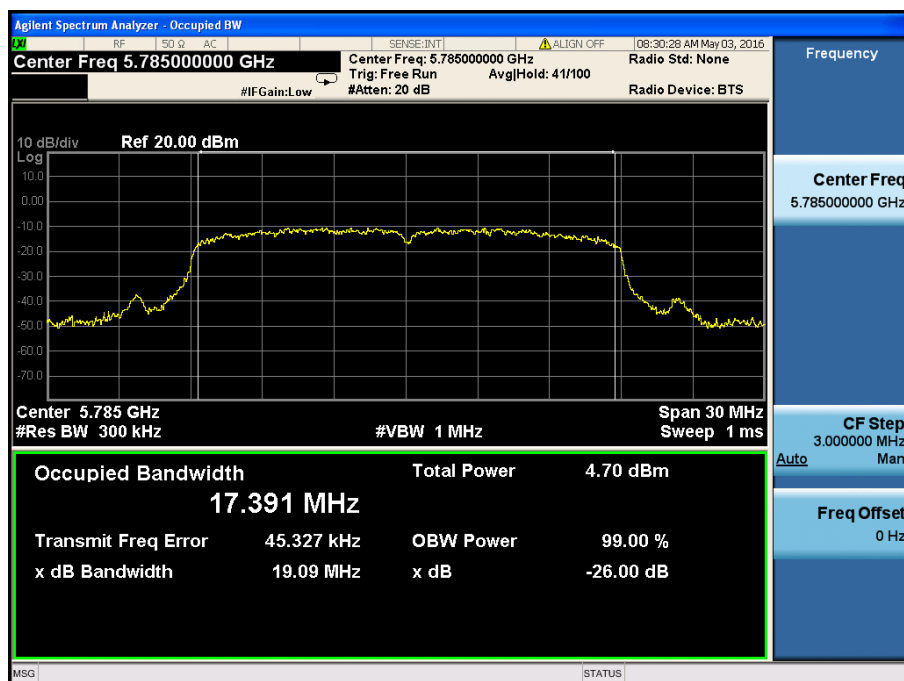
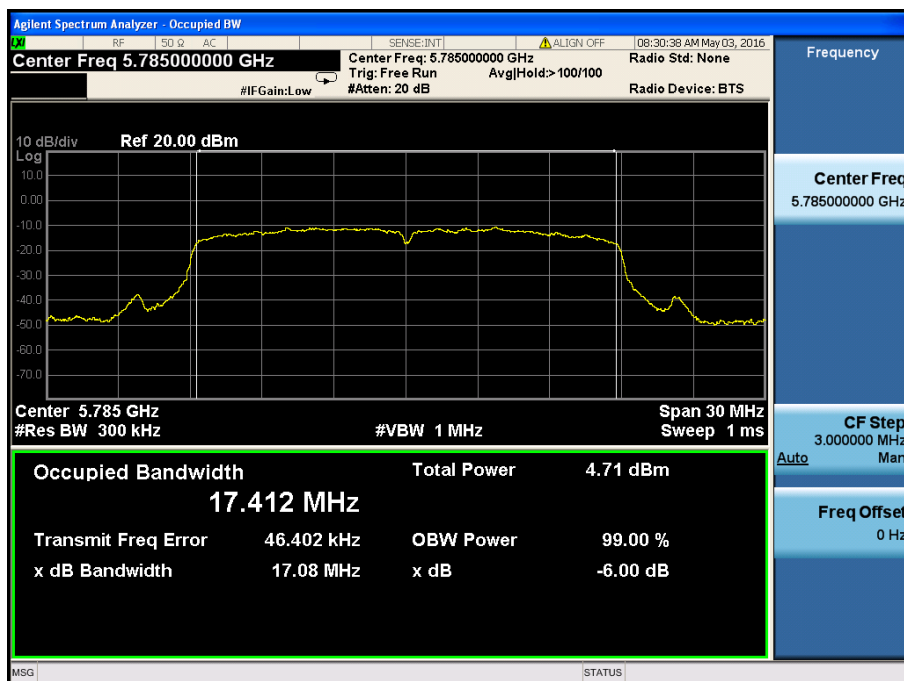
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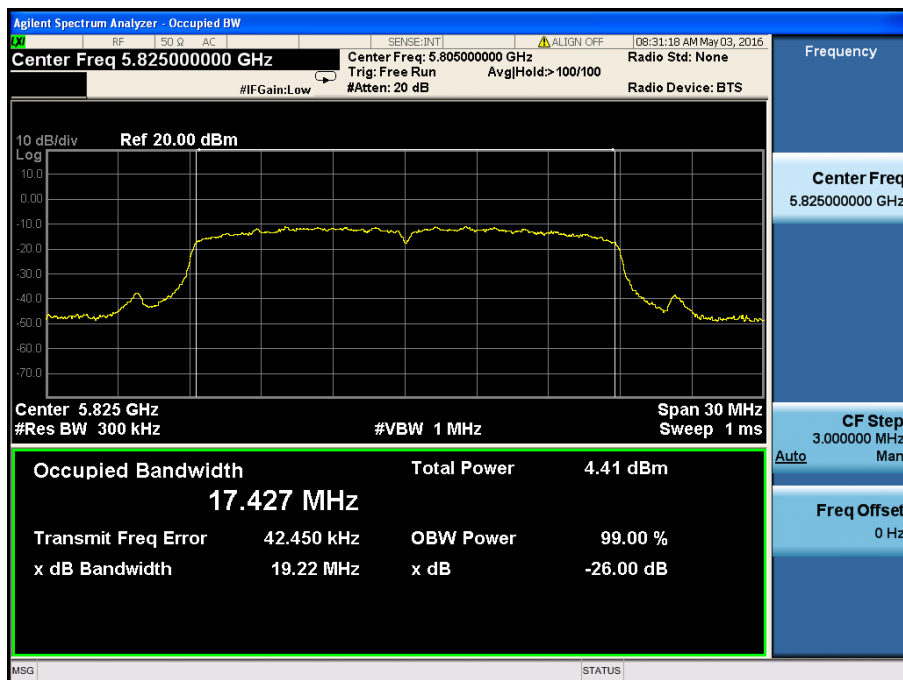
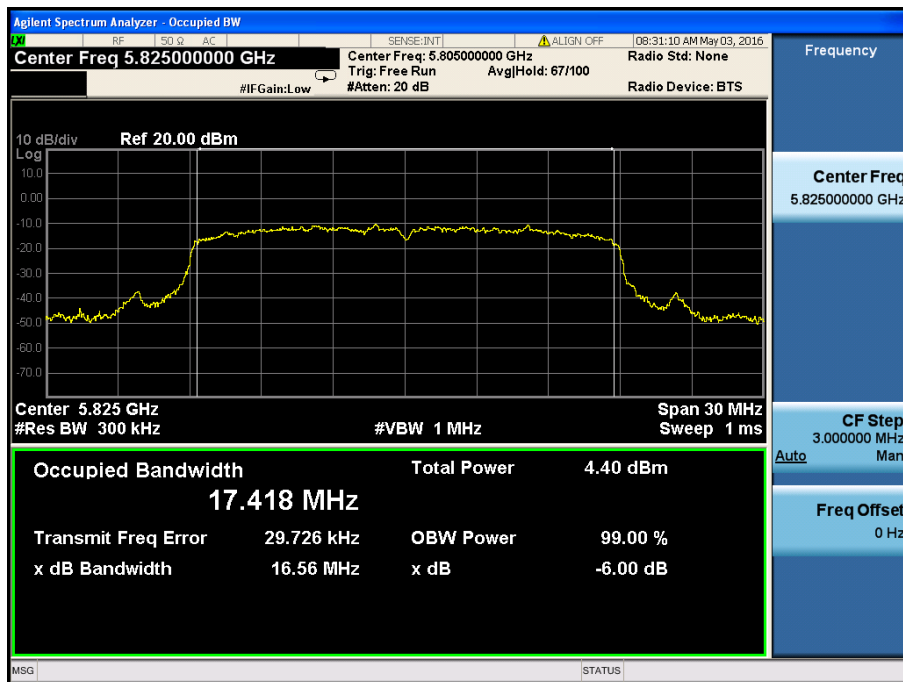
5745MHz



5785MHz

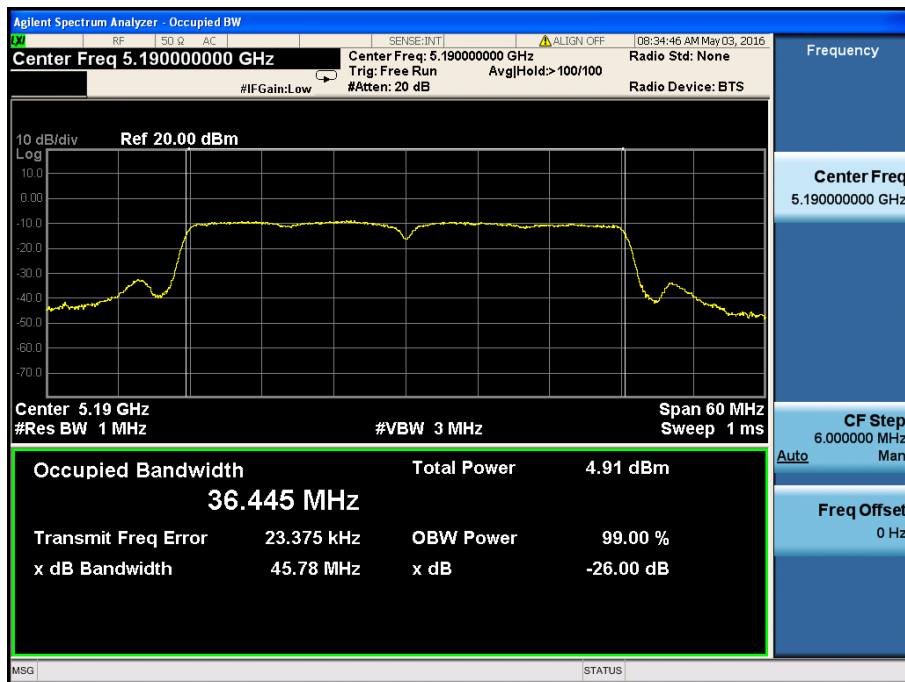


5825MHz

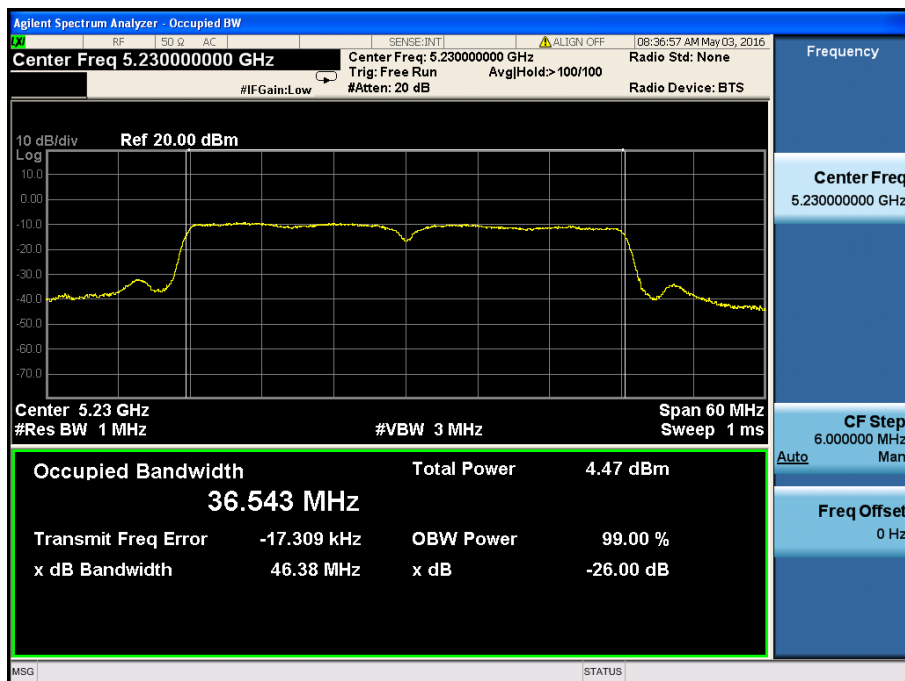


Test Mode: 802.11n-HT40

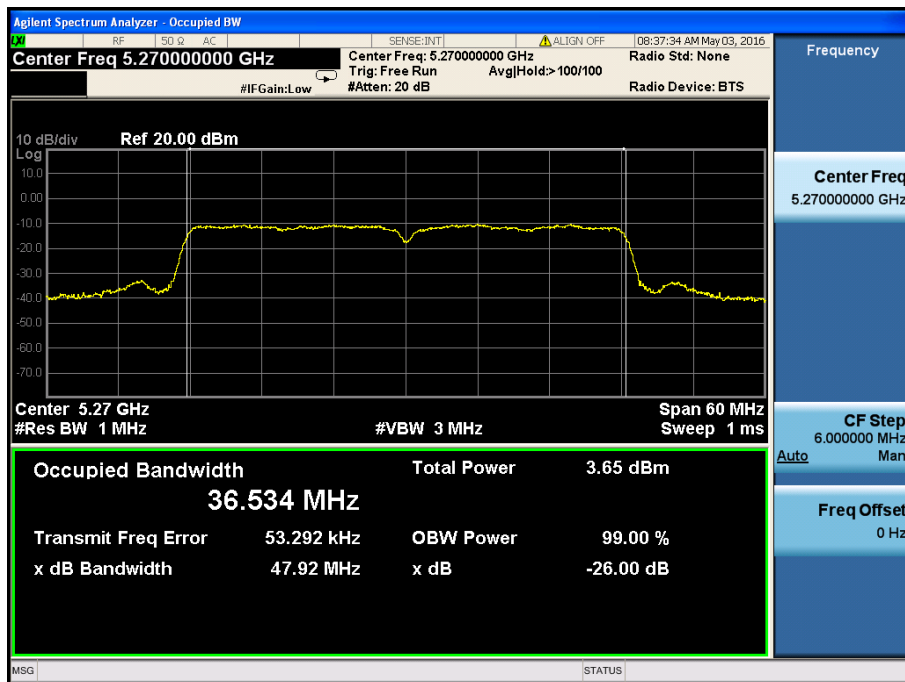
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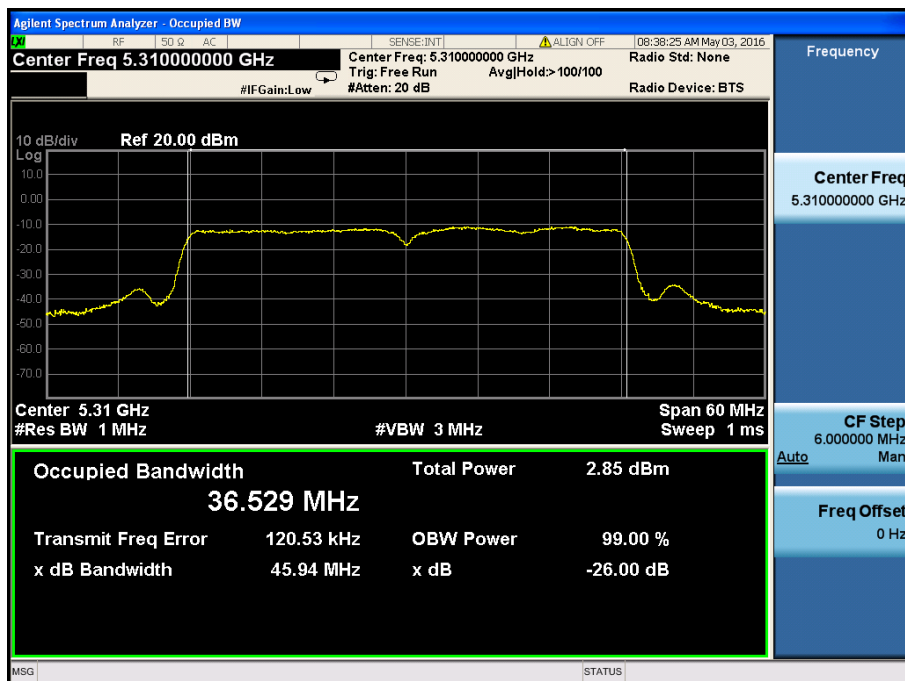
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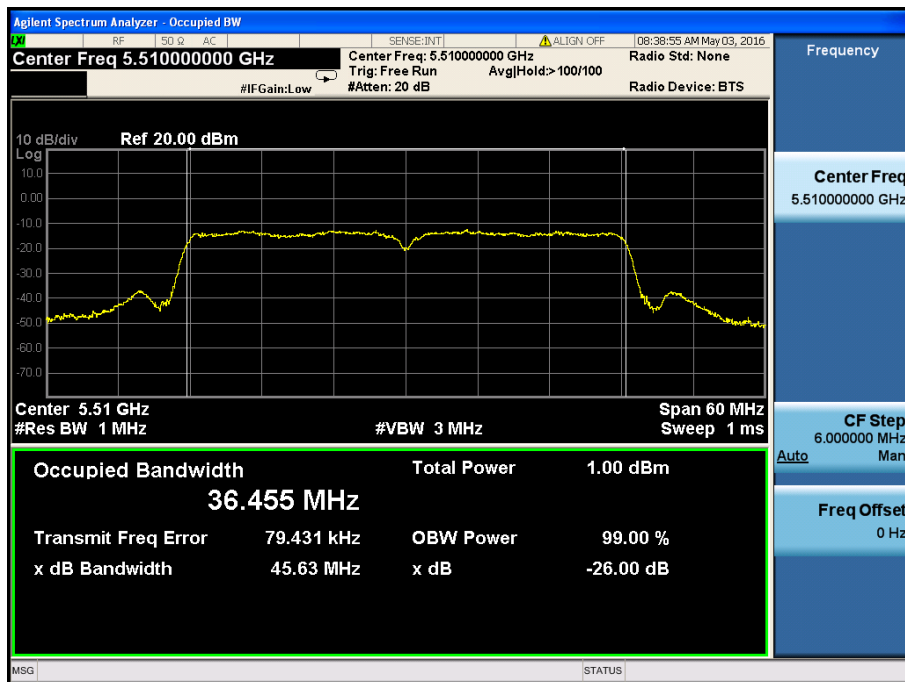
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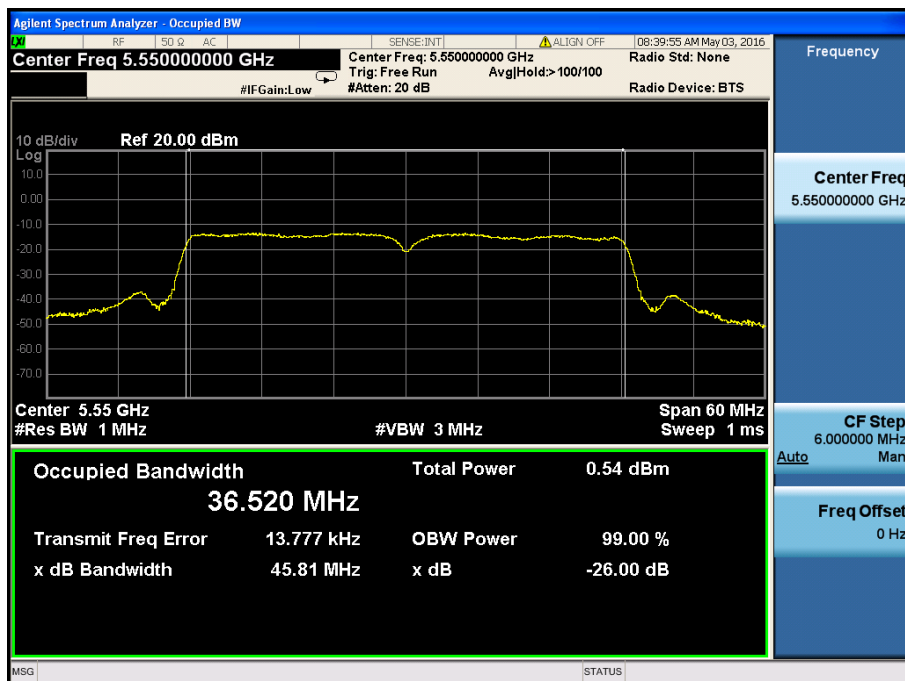
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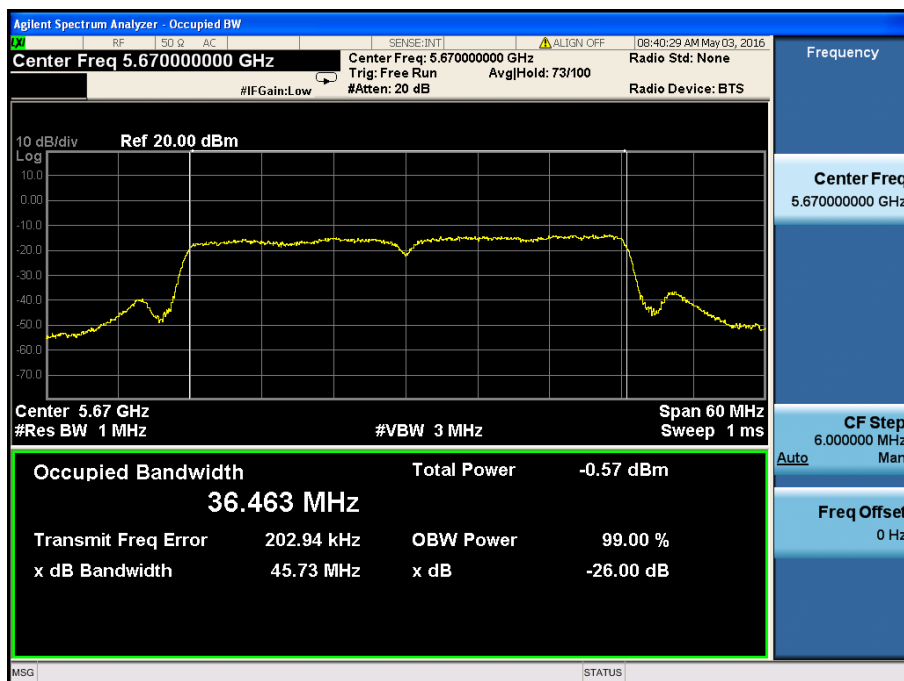
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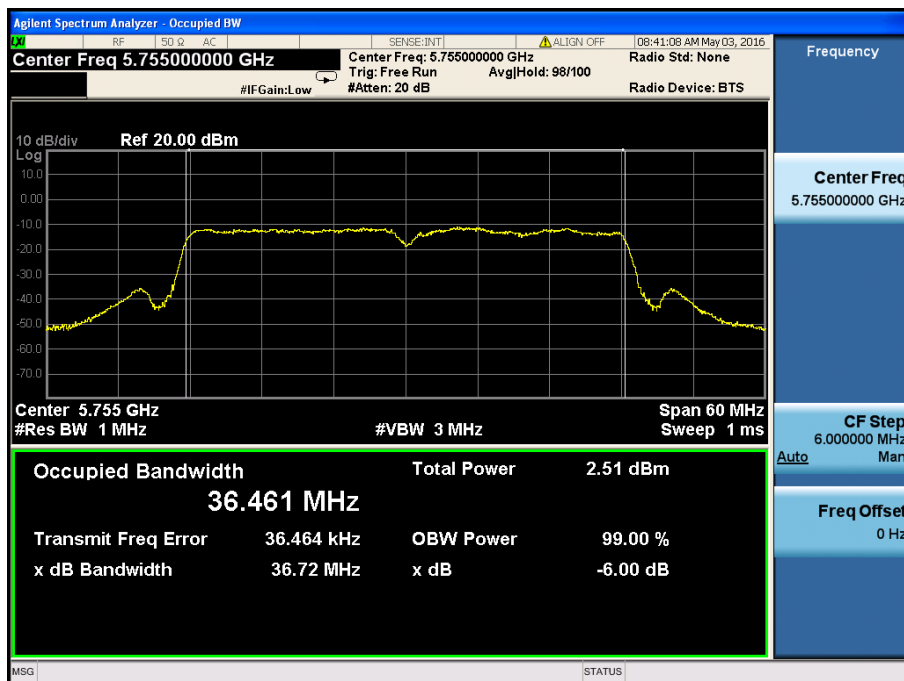
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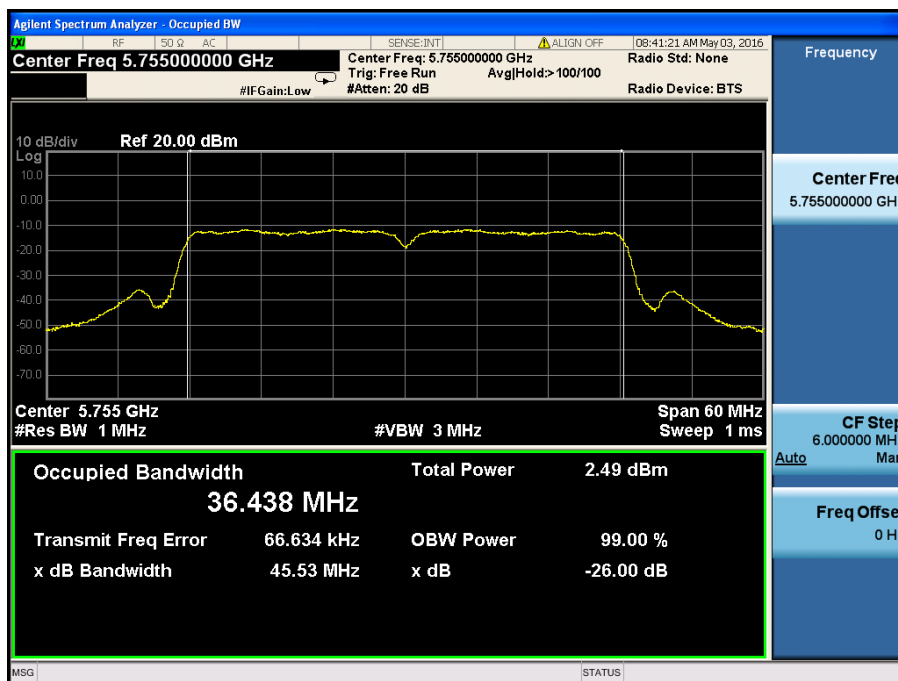


5670MHz

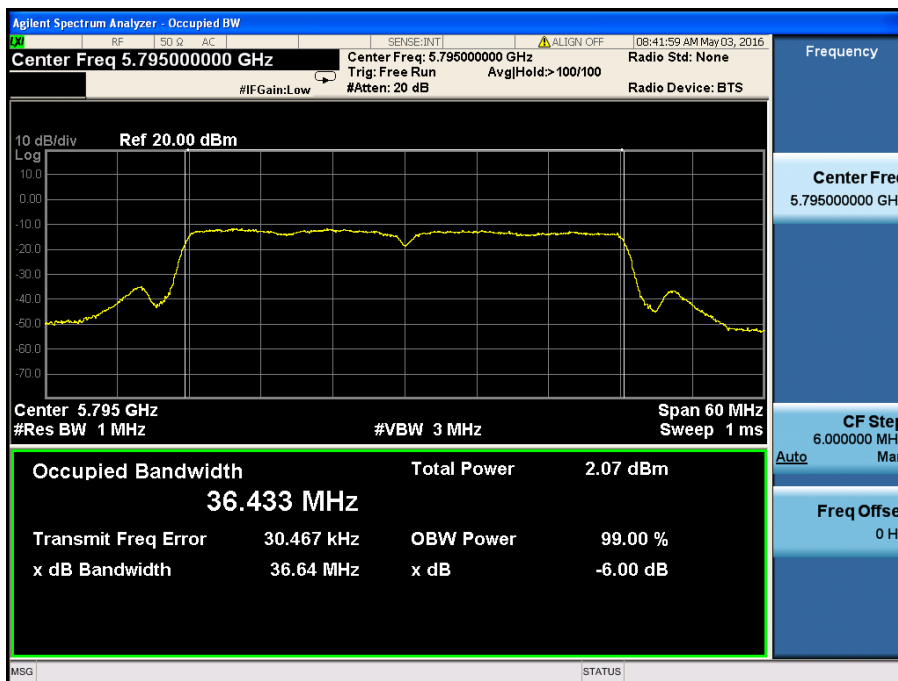


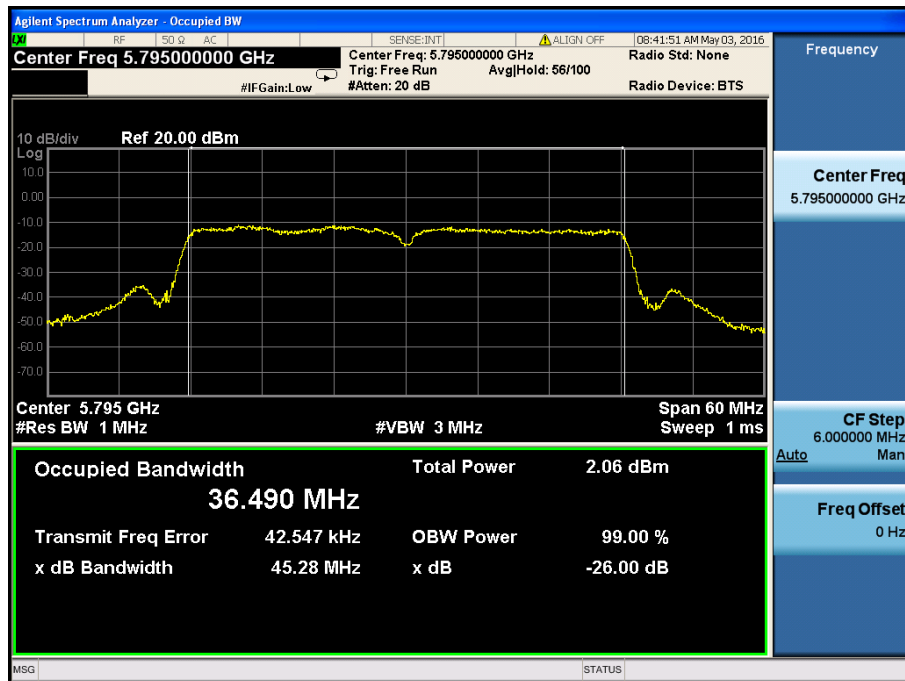
5755MHz





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

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.

7.3 Environmental Conditions

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

7.4 Summary of Test Results/Plots

Power output:

802.11a

channel	Frequency MHz	Power 1 dBm	Power 2 dBm	Total Power dBm	Total Power mW	Limit mW
36	5180	15.08	14.42	17.77	59.88	250
40	5200	14.29	13.17	16.78	47.6	250
48	5240	13.87	13.20	16.56	45.27	250
52	5260	13.51	13.05	16.30	42.62	250
60	5300	13.79	13.39	16.60	45.76	250
64	5320	14.70	13.60	17.19	52.42	250
100	5500	14.76	14.31	17.55	56.9	250
116	5580	15.76	14.22	18.11	64.65	250
140	5700	14.75	13.00	16.97	49.8	250
149	5745	14.83	12.54	16.84	48.36	1000
157	5785	14.06	13.55	16.82	48.12	1000
165	5825	14.14	13.02	16.63	45.98	1000

802.11n20

channel	Frequency MHz	Power 1 dBm	Power 2 dBm	Total Power dBm	Total Power mW	Limit mW
36	5180	14.95	14.69	17.83	60.7	250
40	5200	14.55	13.36	17.01	50.19	250
48	5240	14.43	14.16	17.31	53.79	250
52	5260	14.44	14.22	17.34	54.22	250
60	5300	14.82	14.42	17.64	58.01	250
64	5320	14.82	14.80	17.82	60.54	250
100	5500	14.39	14.74	17.58	57.27	250
116	5580	15.52	14.64	18.11	64.76	250
140	5700	14.94	13.06	17.11	51.42	250
149	5745	14.75	13.96	17.38	54.74	1000
157	5785	14.02	13.09	16.59	45.6	1000
165	5825	13.63	13.05	16.36	43.25	1000

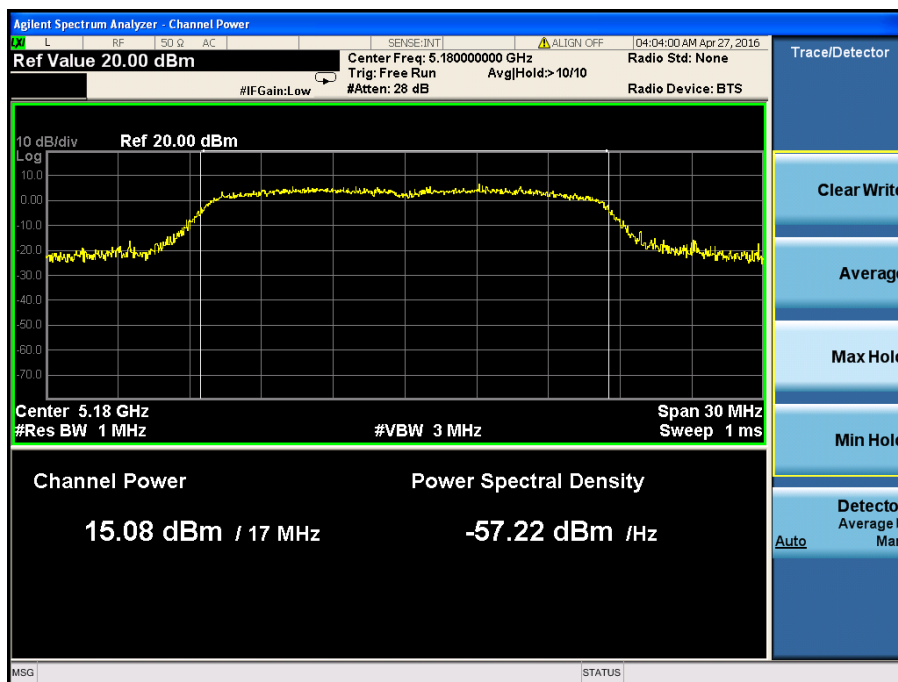
802.11n40

channel	Frequency MHz	Power 1 dBm	Power 2 dBm	Total Power dBm	Total Power mW	Limit mW
38	5190	13.65	12.37	16.07	40.43	250
46	5230	14.03	13.68	16.87	48.62	250
54	5270	14.89	13.50	17.26	53.22	250
62	5310	14.06	13.19	16.66	46.31	250
102	5510	10.80	10.55	13.69	23.37	250
110	5550	11.10	9.37	13.33	21.53	250
134	5670	10.49	8.92	12.79	18.99	250
151	5755	13.18	11.68	15.50	35.52	1000
159	5795	12.83	12.32	15.30	33.91	1000

Antenna 1

Test Mode: 802.11a

5180MHz



5200MHz

