ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

Applicant:	Z-Com, Inc. 3390 East Harmony Road Fort Collins, Colorado 80528 United States
Product Name:	IEEE 802.11a/b/g/n/ac Wireless AP
Brand Name:	ZDC
Model No.:	AC-1027-I, AS310
Model Difference:	For Marketing Purpose
FCC ID:	M4Y-AC1027I
Report Number:	E2/2017/90022
FCC Rule Part:	§15.407, Cat: NII
Issue Date:	Oct. 12, 2017
Date of Test:	Sep. 08, 2017~ Oct. 02, 2017
Date of EUT Received:	Sep. 08, 2017

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

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

Prepared By: Stefanie Yu

Stefanie Yu / Clerk

Approved By: Jim Chang

Jim Chang / Asst. Manager

Testing Laboratory
0513

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Revision History

Report Number	Revision	Description	Issue Date
E2/2017/90022	Rev.00	Initial creation of document	Oct. 12, 2017

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Contents

1 GENERAL INFORMATION 4
2 SYSTEM TEST CONFIGURATION 7
3 SUMMARY OF TEST RESULT 9
4 DESCRIPTION OF TEST MODES 10
5 MEASUREMENT UNCERTAINTY 13
6 CONDUCTED EMISSION TEST 14
7 DUTY CYCLE TEST SIGNAL 20
8 26dB & 6dB EMISSION BANDWIDTH MEASUREMENT 23
9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT 47
10 PEAK POWER SPECTRAL DENSITY 50
11 UNDESIRABLE RADIATED EMISSION MEASUREMENT 57
12 TRANSMISSION IN THE ABSENCE OF DATA 136
13 FREQUENCY STABILITY 137
14 ANTENNA REQUIREMENT 145

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	IEEE 802.11a/b/g/n/ac Wireless AP	
Brand Name:	ZDC	
Model No.:	AC-1027-I, AS310	
Model Difference:	For Marketing Purpose	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	12Vdc from Adapter	
	Adapter:	Model No.: DSA-18PFR-12, Supplier: DVE

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WLAN 5GHz:

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (Avg.) (dBm)	Modulation Technology
a	5180~5240	4	24.26	OFDM
	5745-5825	5	22.94	
n_HT ac_VHT 20M	5180~5240	4	HT: 22.37 (Worst case)	OFDM
	5745-5825	5	HT: 21.07 (Worst case)	
n_HT ac_VHT 40M	5190~5230	2	HT: 21.28 (Worst case)	OFDM
	5755~5795	2	HT: 20.45 (Worst case)	
ac_VHT 80M	5210	1	19.74	OFDM
	5775	1	18.59	
Antenna Designation	Operating mode 1: Single Antenna Equipment Equipment with two diversity antenna but only one antenna active at any moment in time 1. PCB Antenna, Model No.: AC-1027-I, Supplier: Z-COM, Inc. 5GHz Gain: 4.78dBi (5150MHz-5250MHz) 5GHz Gain: 4.51dBi (5725MHz-5850MHz) 2. PCB Antenna, Model No.: AC-1027-I, Supplier: Z-COM, Inc. 5GHz Gain: 5.04dBi (5150MHz-5250MHz) 5GHz Gain: 4.75dBi (5725MHz-5850MHz) 3. PCB Antenna, Model No.: AC-1027-I, Supplier: Z-COM, Inc. 5GHz Gain: 4.85dBi (5150MHz-5250MHz) 5GHz Gain: 4.9dBi (5725MHz-5850MHz)			
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps 802.11 ac_20MHz: 6.5 –173.3Mbps 802.11 ac_40MHz: 13.5 –400.0Mbps 802.11 ac_80MHz: 29.3 – 866.7Mbps			

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules

FCC KDB 662911 D01 Multiple Transmitter Output

FCC KDB 644545 D03 Guidance for IEEE 802.11ac

ANSI C63.10:2013

Note:

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

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305 / TW0002

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

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

2.3.2 Radiated Emissions

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

2.4 Measurement Results Explanation Example

For all conducted test items:

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

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

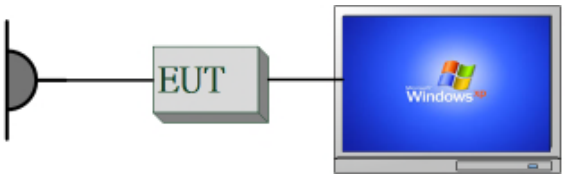

Fig. 2-2 Conducted (Antenna Port) Emission Configuration

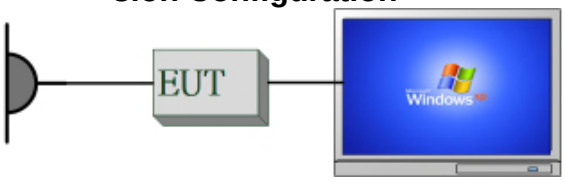

Fig. 2-3 Conducted (AC powerline) Emission Configuration

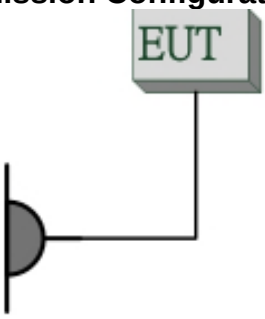

Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-WR6X4	Shielded	Unshielded

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3 SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
36	5180
40	5200
44	5220
48	5240

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
38	5190
46	5230

802.11ac VHT80 Mode	
channel	Frequency
42	5210

Operated band in 5745 MHz ~5850 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
Channel	Frequency
149	5745
153	5765
157	5785
161	5805
165	5825

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
151	5755
159	5795

802.11ac VHT80 Mode	
channel	Frequency
155	5775

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

RADIATED EMISSION TEST:

MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
RADIATED EMISSION TEST (BELOW 1 GHz)						
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Main
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Main
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)						
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Main
802.11n_HT20				OFDM	MCS0	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS0	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Main
802.11n_HT20				OFDM	MCS0	MIMO
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS0	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO

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

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ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Main
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Main
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO

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5 MEASUREMENT UNCERTAINTY

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

Radiated Spurious Emission:

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

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

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

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6 CONDUCTED EMISSION TEST

6.1. Standard Applicable

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

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

6.2. Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2016	12/11/2017
Coaxial Cables	N/A	N30N30-1042-1 50cm	N/A	08/30/2017	08/29/2018
LISN	Schwarzbeck	NSLK 8127	8127-648	06/18/2017	06/17/2018
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

6.3. EUT Setup

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

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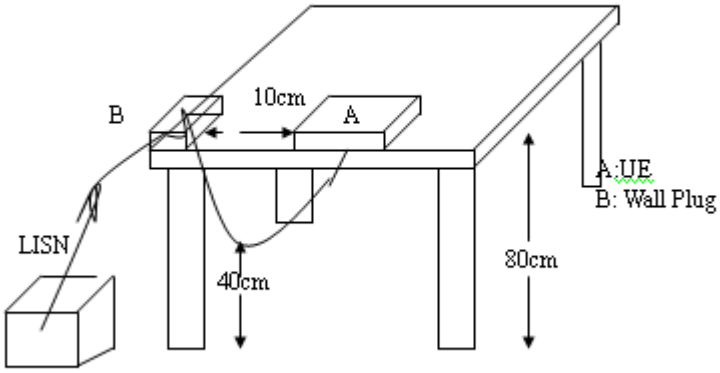
6.4. Test SET-UP



6.5. Measurement Procedure

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

6.6. Measurement Result

Note: Refer to next page for measurement data and plots.
Note2: The * reveals the worst-case results that closet to the limit

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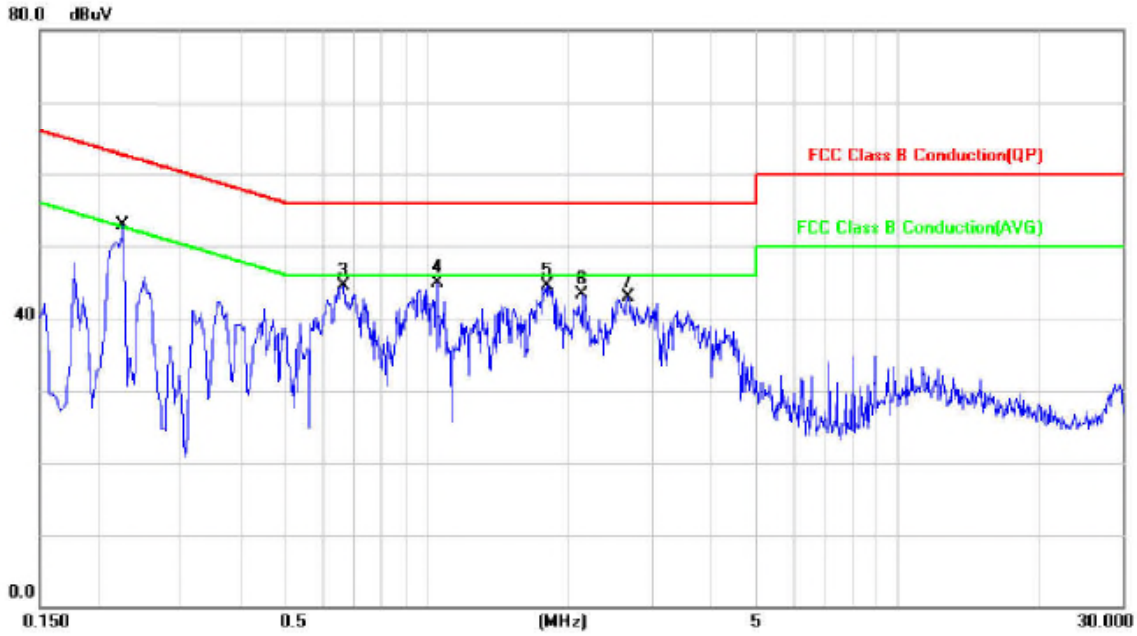
POE CONDUCTED EMISSION TEST DATA

Site :	Conduction Room	Phase:	L1	Temperature:	25 ℃
Limit:	FCC Class B Conduction(QP)	Power:	AC 120V/60Hz	Humidity:	61 %
Mode:					
Note:					

Conducted Emission

File :Condution_tmp Data :#57 Date: 2017/10/2 Time: 上午 09:50:04



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2260	29.83	19.68	49.51	62.60	-13.09	QP	
2		0.2260	18.65	19.68	38.33	52.60	-14.27	AVG	
3		0.6660	24.52	20.04	44.56	56.00	-11.44	peak	
4	*	1.0500	25.10	19.88	44.98	56.00	-11.02	peak	
5		1.7940	24.02	20.42	44.44	56.00	-11.56	peak	
6		2.1380	22.77	20.53	43.30	56.00	-12.70	peak	
7		2.6740	22.39	20.46	42.85	56.00	-13.15	peak	

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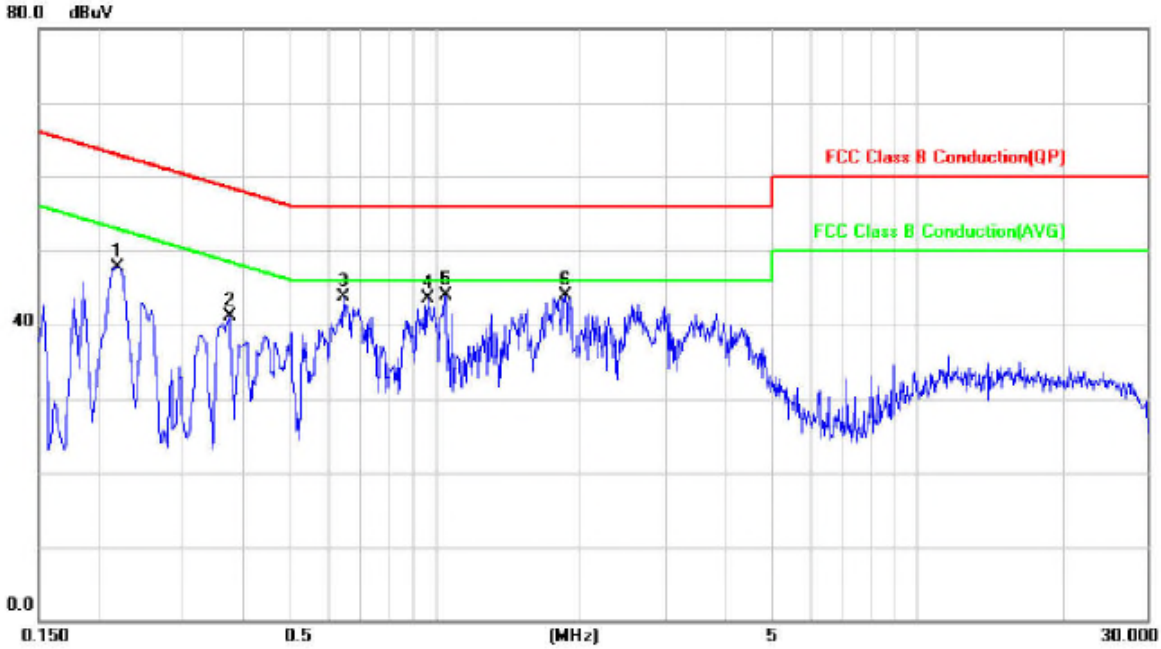
Site :	Conduction Room	Phase:	*N*	Temperature:	25 ℃
Limit:	FCC Class B Conduction(QP)	Power:	AC 120V/60Hz	Humidity:	61 %
Mode:					
Note:					

Conducted Emission

File :Condution_tmp Data :#58 Date: 2017/10/2 Time: 上午 09:51:32



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2180	28.21	19.52	47.73	62.89	-15.16	peak	
2		0.3740	21.37	19.78	41.15	58.41	-17.26	peak	
3		0.6460	23.71	19.91	43.62	56.00	-12.38	peak	
4		0.9660	23.75	19.73	43.48	56.00	-12.52	peak	
5	*	1.0540	24.16	19.75	43.91	56.00	-12.09	peak	
6		1.8620	23.55	20.32	43.87	56.00	-12.13	peak	

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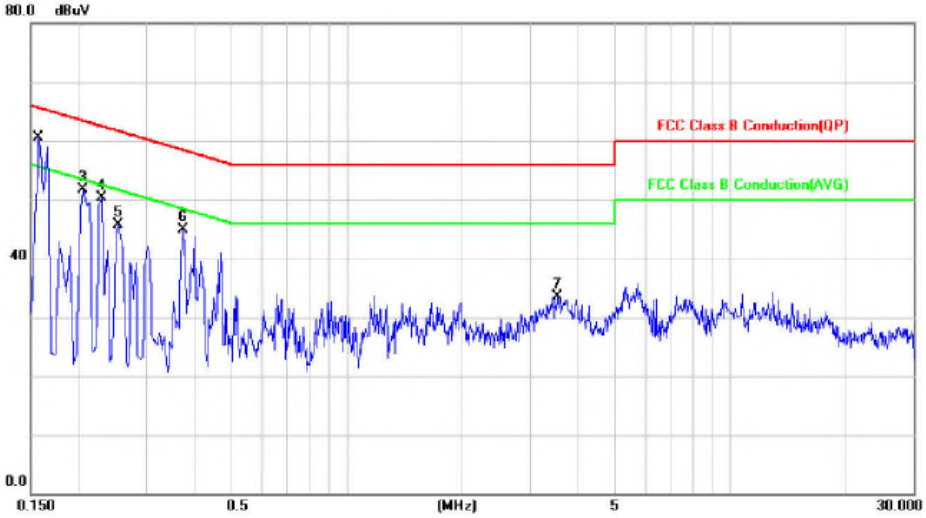
AC POWER LINE CONDUCTED EMISSION TEST DATA

Site : Conduction Room | Phase: L1 | Temperature: 22 ℃
Limit: FCC Class B Conduction(QP) | Power: AC 120V/60Hz | Humidity: 54 %
Mode:
Note:

Conducted Emission

File :Condution Data :#844 Date: 2017/11/30 Time: 上午 08:48:41



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1580	38.74	19.65	58.39	65.57	-7.18	QP	
2		0.1580	21.83	19.65	41.48	55.57	-14.09	AVG	
3		0.2060	32.01	19.65	51.66	63.37	-11.71	peak	
4		0.2300	30.68	19.69	50.37	62.45	-12.08	peak	
5		0.2540	25.92	19.73	45.65	61.63	-15.98	peak	
6		0.3740	25.05	19.92	44.97	58.41	-13.44	peak	
7		3.5580	13.19	20.32	33.51	56.00	-22.49	peak	

*:Maximum data x:Over limit !:over margin

File :Condution\Data :#844 *Page: 1*

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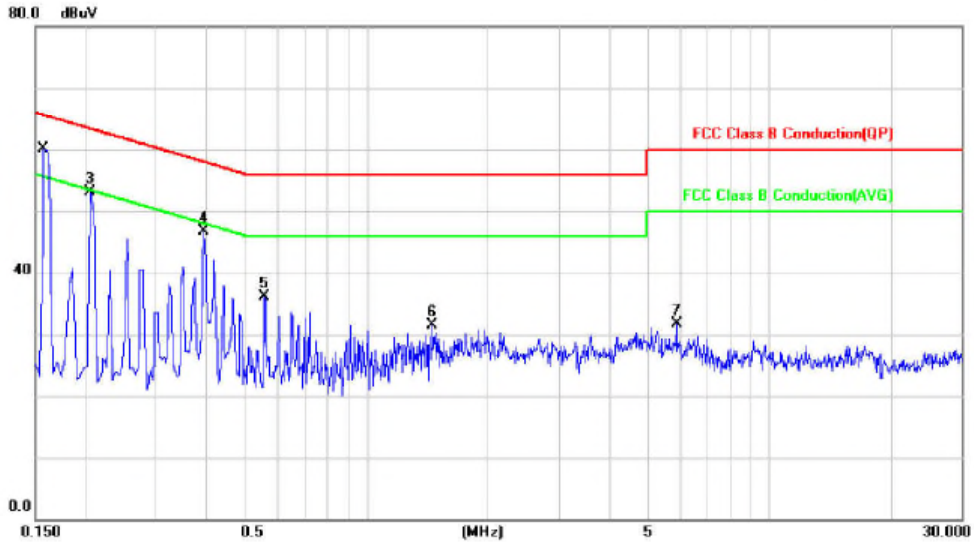
Site :	Conduction Room	Phase:	N	Temperature:	22 ℃
Limit:	FCC Class B Conduction(QP)	Power:	AC 120V/60Hz	Humidity:	54 %
Mode:					
Note:					

Conducted Emission

File :Condution Data :#845 Date: 2017/11/30 Time: 上午 08:50:28



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1580	38.39	19.50	57.89	65.57	-7.68	QP	
2		0.1580	21.53	19.50	41.03	55.57	-14.54	AVG	
3		0.2060	33.55	19.50	53.05	63.37	-10.32	peak	
4		0.3940	26.88	19.81	46.69	57.98	-11.29	peak	
5		0.5580	16.11	19.97	36.08	56.00	-19.92	peak	
6		1.4580	11.47	20.03	31.50	56.00	-24.50	peak	
7		5.8940	11.67	19.95	31.62	60.00	-28.38	peak	

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7 DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.
All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

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

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)
802.11a	99.75	0.01
802.11n_20	99.75	0.01
802.11n_40	99.75	0.01
802.11ac_80	99.75	0.01

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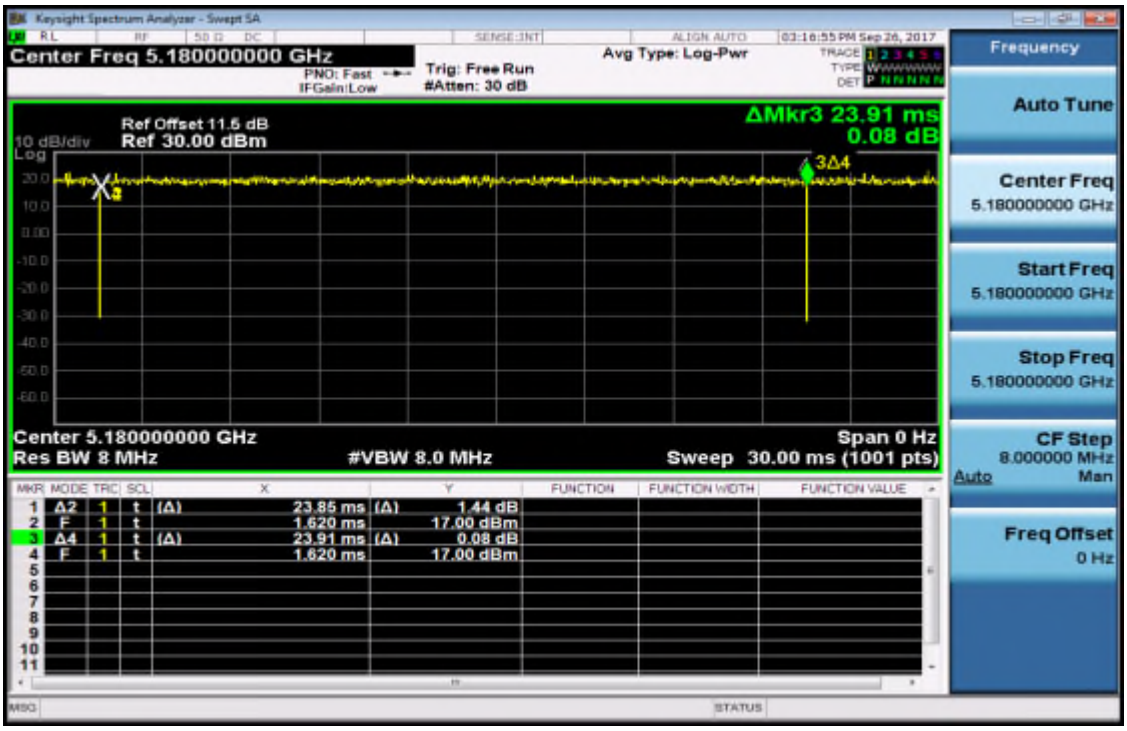
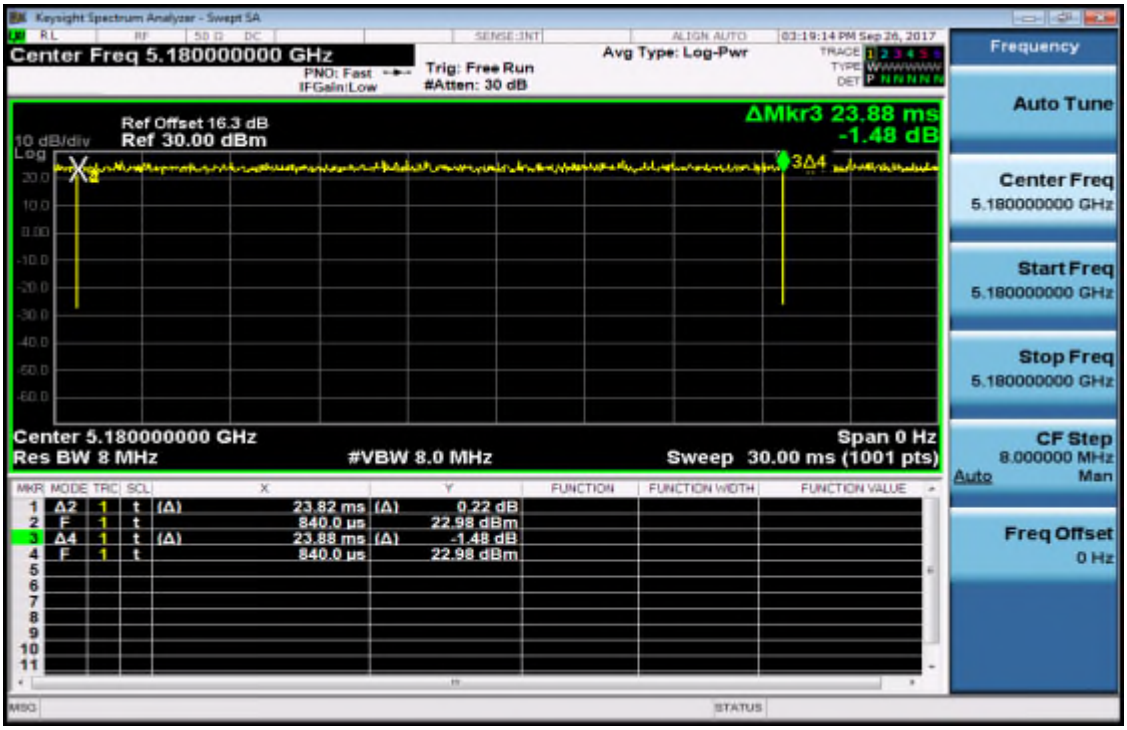
DUTY CYCLE TEST SIGNAL Measurement Result

802.11a



802.11n HT20



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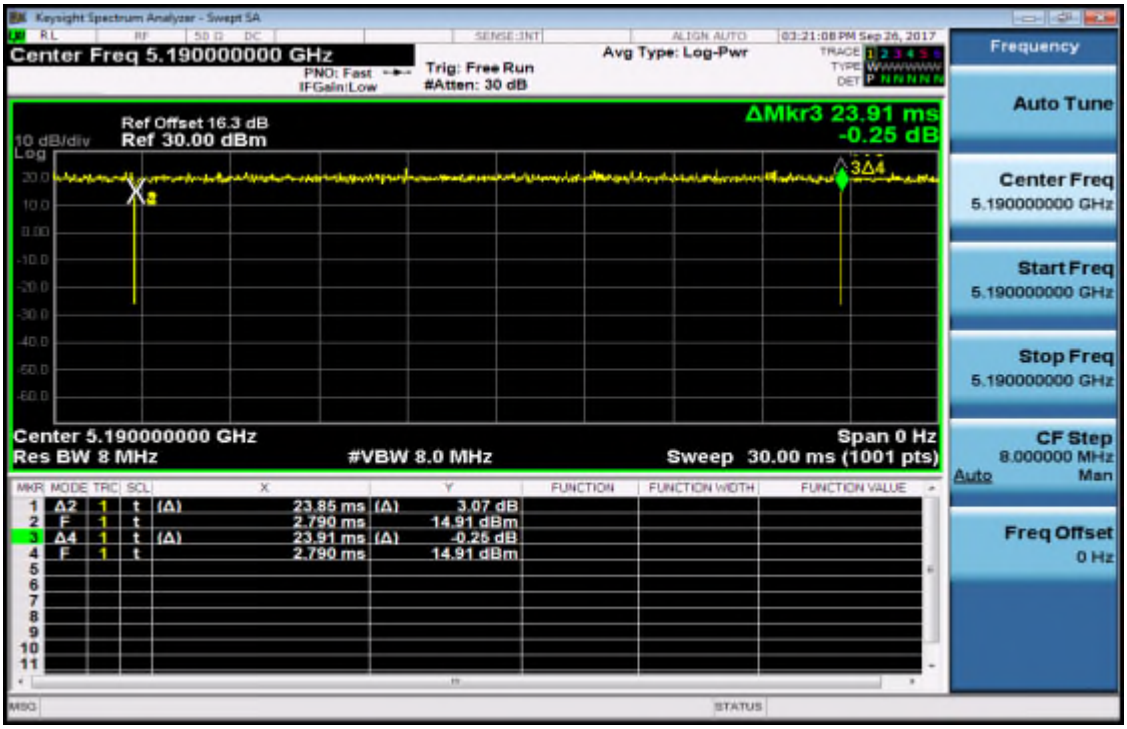
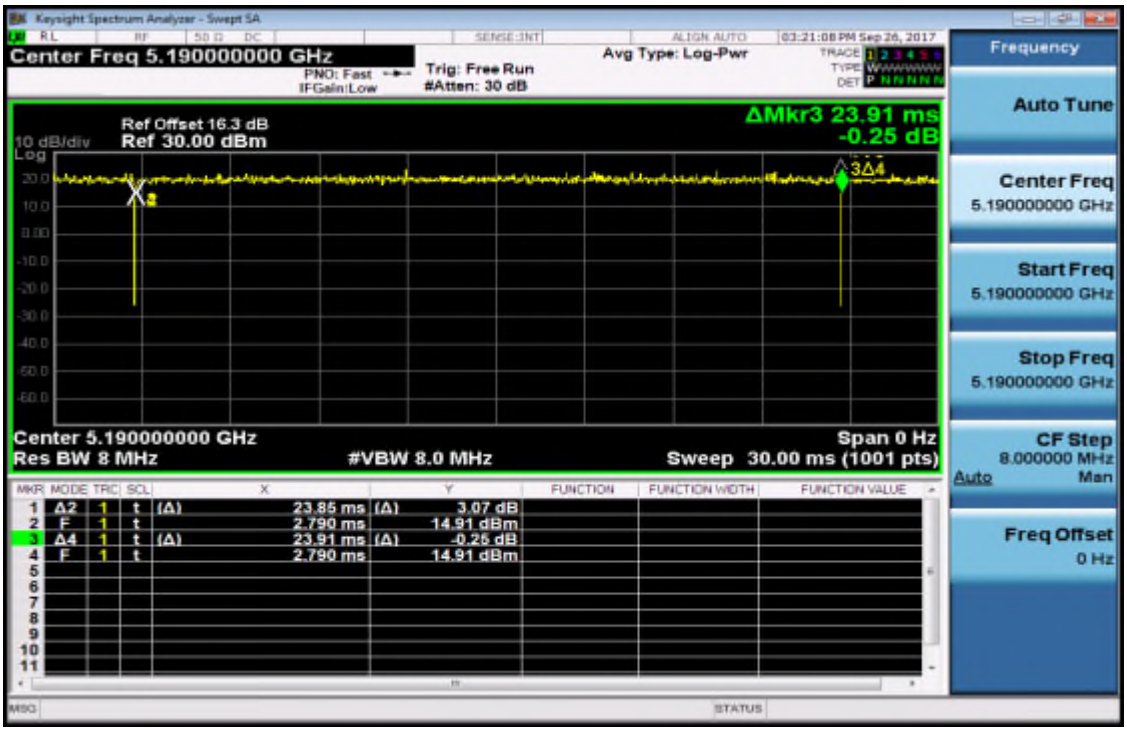
802.11n HT 40



802.11 ac VHT 80



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8 26DB & 6DB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

8.2 Measurement Procedure

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

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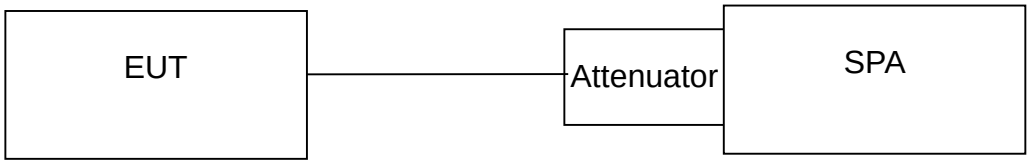
8.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2016	12/11/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

8.4 Test Set-up



8.5 Measurement Result

26dB Bandwidth

802.11a_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	29.60	14.714
5220	29.91	14.758
5240	29.06	14.633

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802.11n_HT20_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	23.13	13.642
5220	22.96	13.609
5240	22.88	13.595

802.11n_HT20_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.14	13.452
5220	22.98	13.614
5240	22.22	13.467

802.11n_HT20_Aux2

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	23.01	13.618
5220	22.28	13.479
5240	22.46	13.513

802.11n _HT40_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	43.74	16.408
5230	50.00	16.990

802.11n _HT40_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	43.62	16.397
5230	50.00	16.990

802.11n _HT40_Aux2

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	44.16	16.450
5230	50.00	16.990

802.11ac _VHT80_Main

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	87.50	19.420

802.11ac _VHT80_Aux1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	86.37	19.364

802.11ac _VHT80_Aux2

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	85.76	19.333

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

802.11a_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.47	12.167
5785	16.57	12.193
5825	16.42	12.153

802.11n_HT20_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.78	12.499
5785	17.80	12.504
5825	17.79	12.502

802.11n_HT20_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.83	12.511
5785	17.56	12.444
5825	17.83	12.512

802.11n_HT20_Aux2

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.77	12.497
5785	17.58	12.449
5825	17.76	12.495

802.11n_HT40_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.09	15.574
5795	36.34	15.604

802.11n_HT40_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.35	15.605
5795	36.34	15.603

802.11n_HT40_Aux2

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	33.43	15.242
5795	36.07	15.572

802.11ac _VHT80_Main

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.20	18.820

802.11ac _VHT80_Aux1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.36	18.829

802.11ac _VHT80_Aux2

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	75.76	18.794

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99% BW to prove that all signals in band I is no over band I

802.11a_Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.31	< 5250
5745	5736.63	> 5725

802.11n_HT20_Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5249.72	< 5250
5745	5736.15	> 5725

802.11n_HT20_Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.88	< 5250
5745	5736.09	> 5725

802.11n_HT20_Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.88	< 5250
5745	5736.15	> 5725

802.11n _HT40_Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.30	< 5250
5755	5736.80	> 5725

802.11n _HT40_Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.20	< 5250
5755	5736.80	> 5725

802.11n _HT40_Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.30	< 5250
5755	5736.80	> 5725

802.11ac _VHT80_Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5248.00	< 5250

802.11n _HT80_Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.90	< 5250

802.11n _HT80_Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5248.00	< 5250

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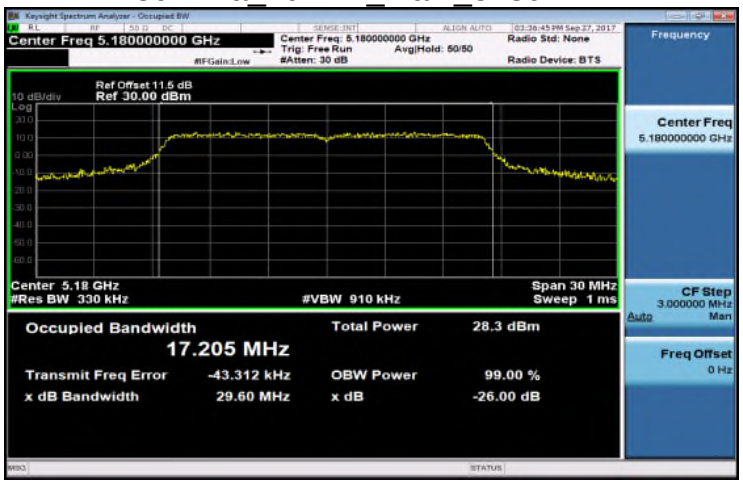
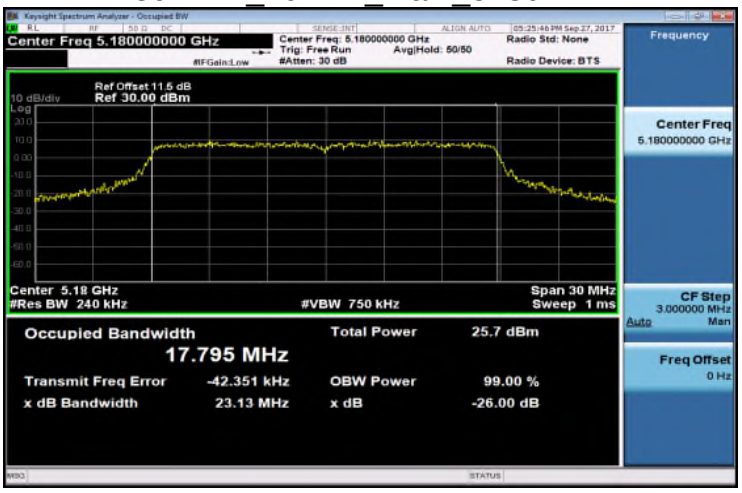
For 26dB,

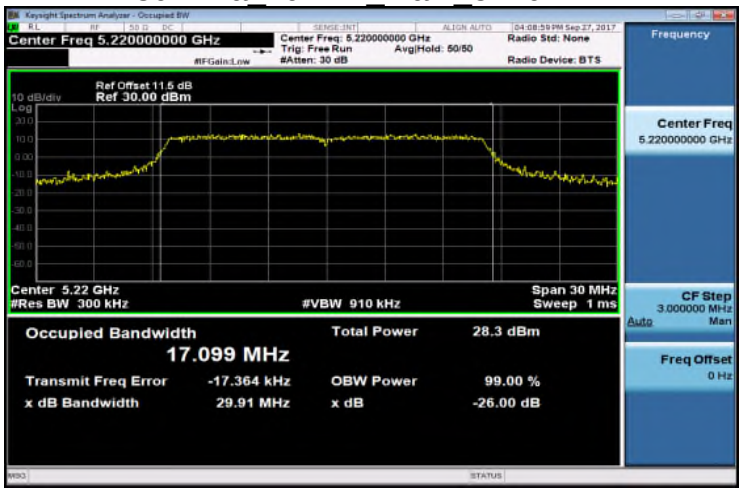
802.11a_20MHz_Main_5180MHz



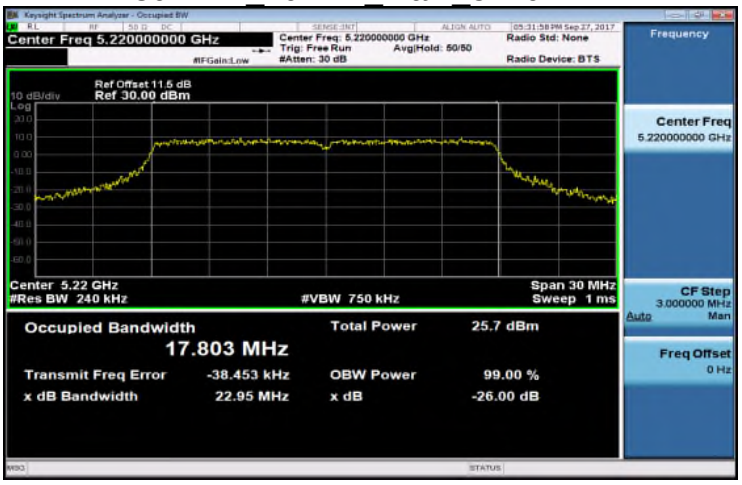
802.11n_20MHz_Main_5180MHz



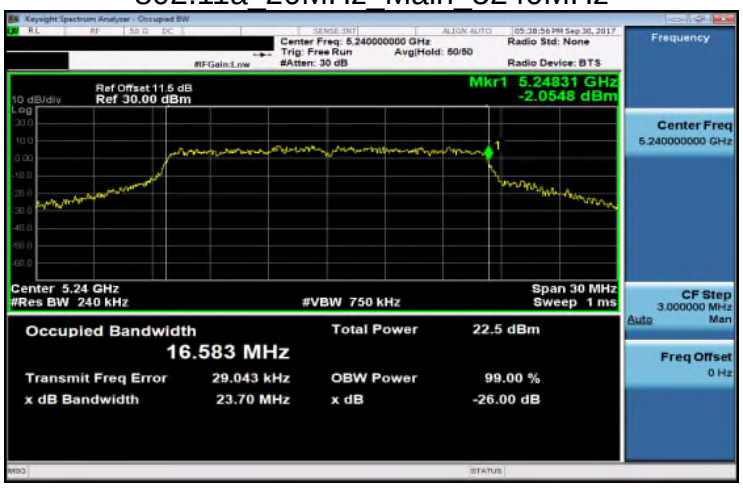
802.11a_20MHz_Main_5220MHz



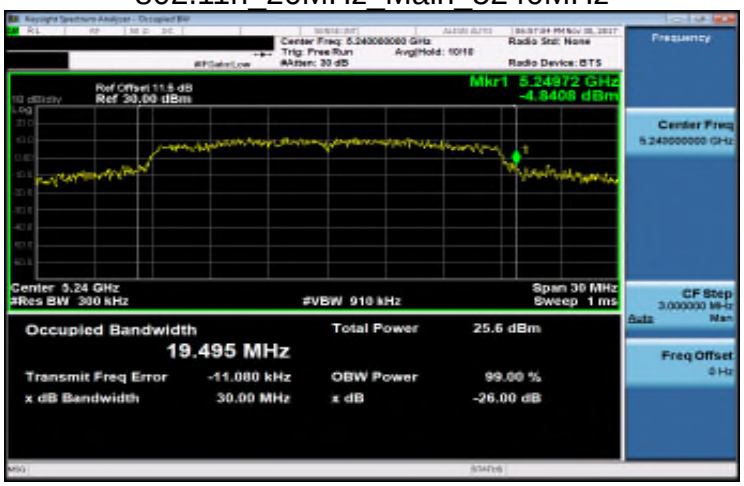
802.11n_20MHz_Main_5220MHz



802.11a_20MHz_Main_5240MHz



802.11n_20MHz_Main_5240MHz



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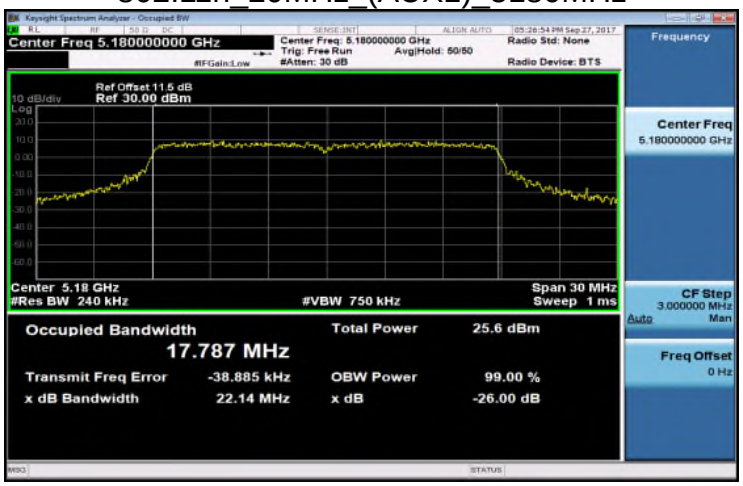
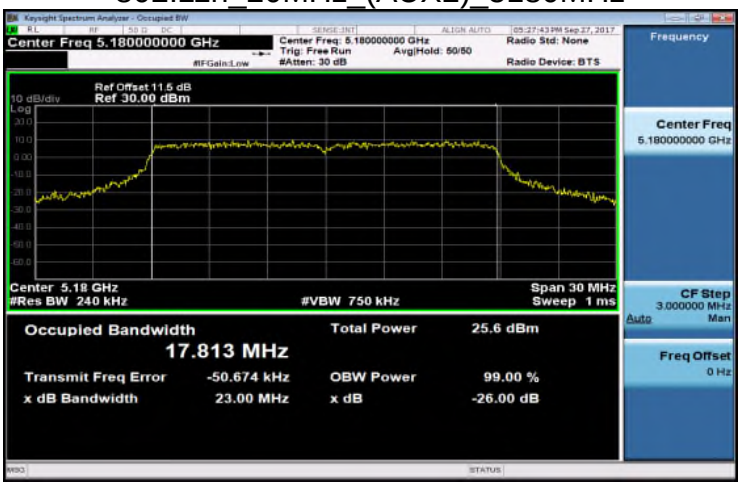
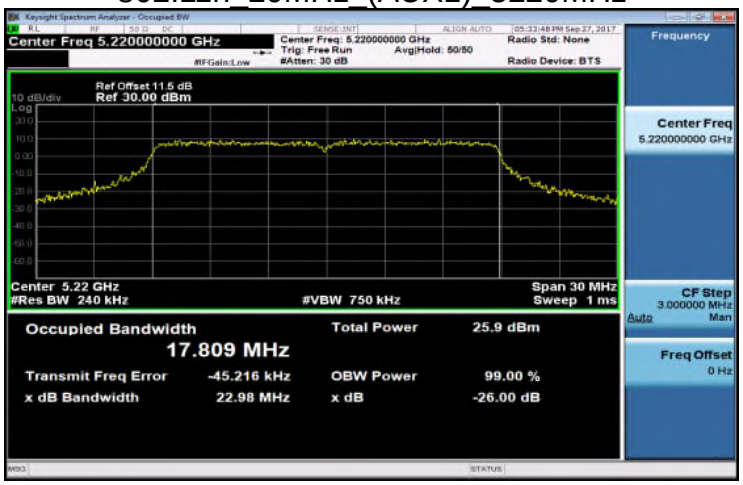
802.11n_20MHz_(AUX1)_5180MHz



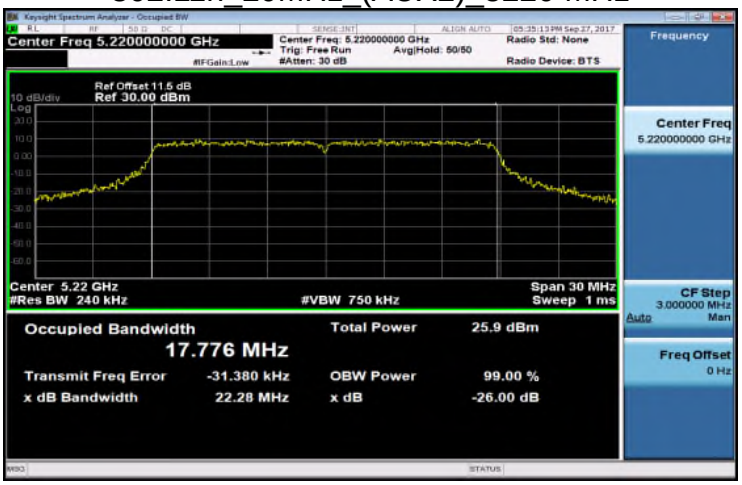
802.11n_20MHz_(AUX2)_5180MHz



802.11n_20MHz_(AUX1)_5220MHz

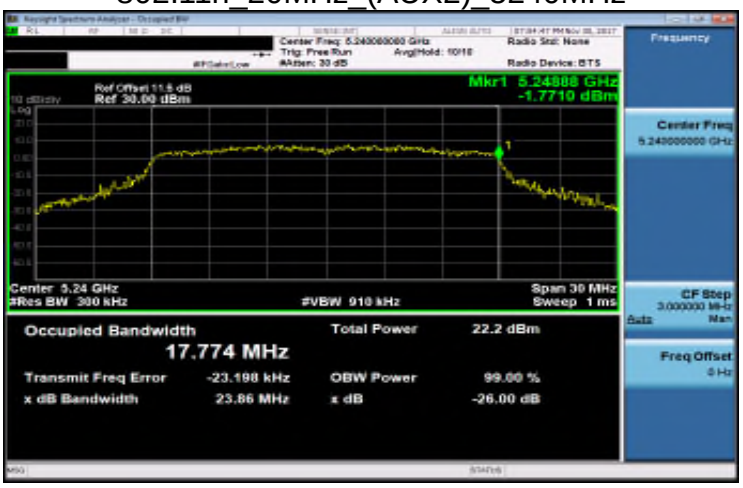


802.11n_20MHz_(AUX2)_5220 MHz



802.11n_20MHz_(AUX1)_5240MHz

802.11n_20MHz_(AUX2)_5240MHz



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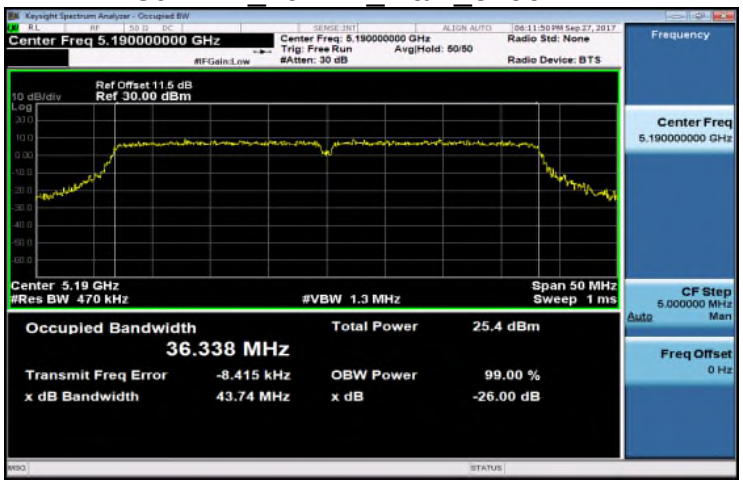
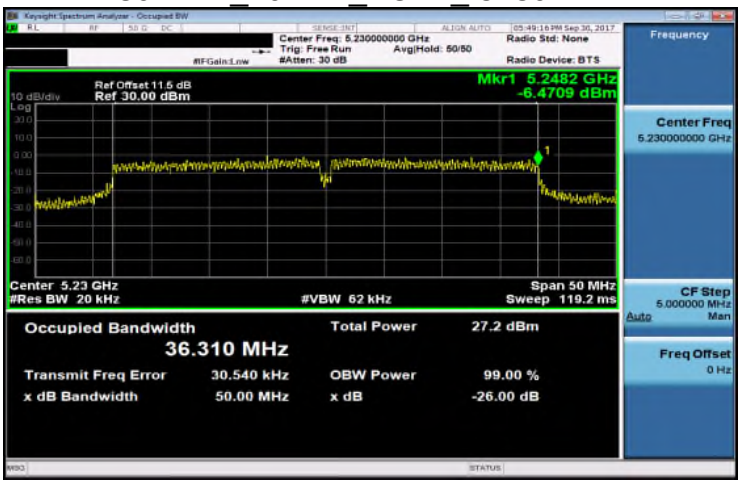
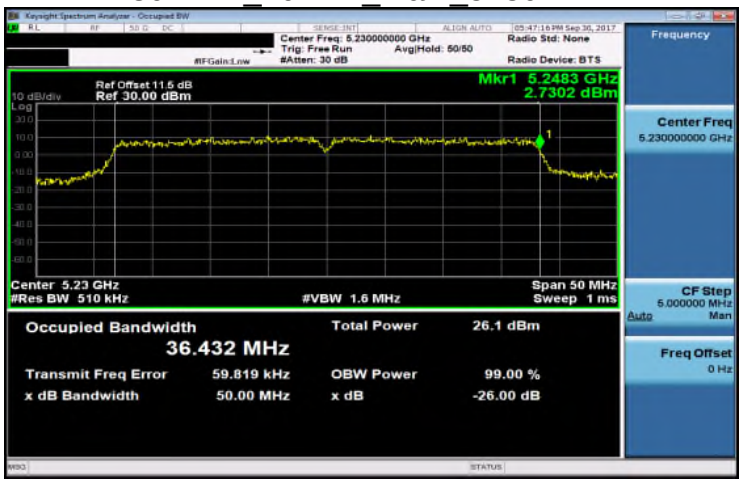
802.11n_40MHz_Main_5190MHz



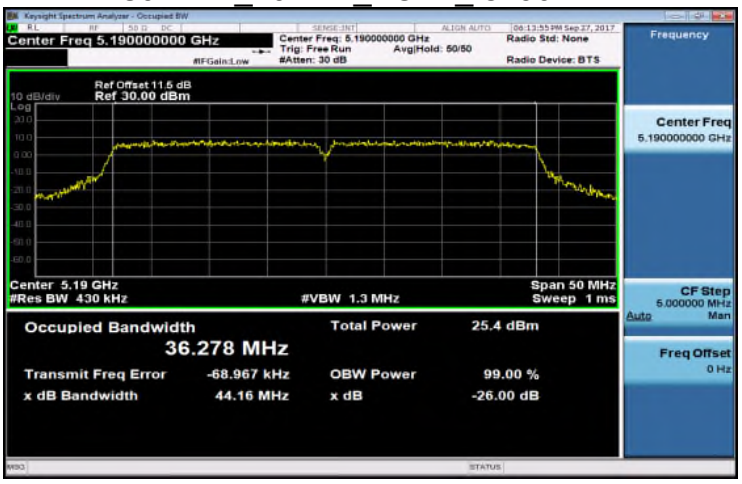
802.11n_40MHz_AUX1_ 5230 MHz



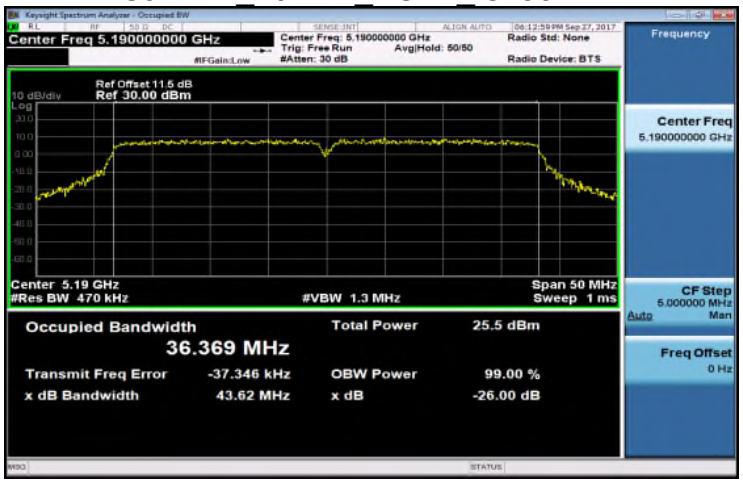
802.11n_40MHz_Main_5230 MHz



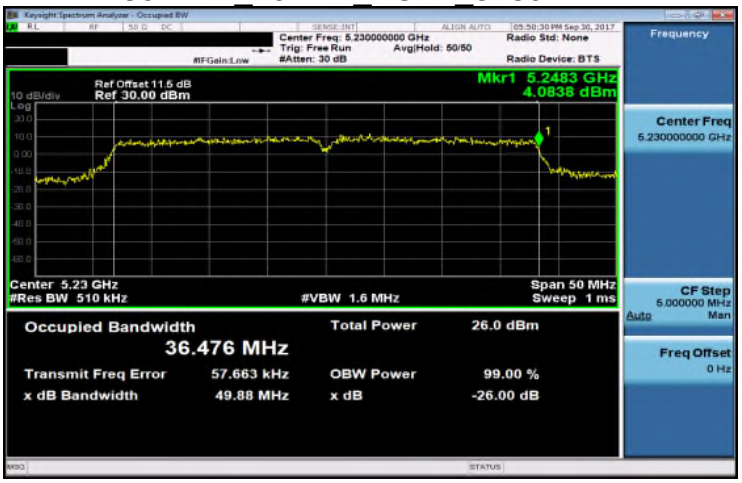
802.11n_40MHz_AUX2_ 5190MHz



802.11n_40MHz_AUX1_ 5190MHz



802.11n_40MHz_AUX2_5230 MHz



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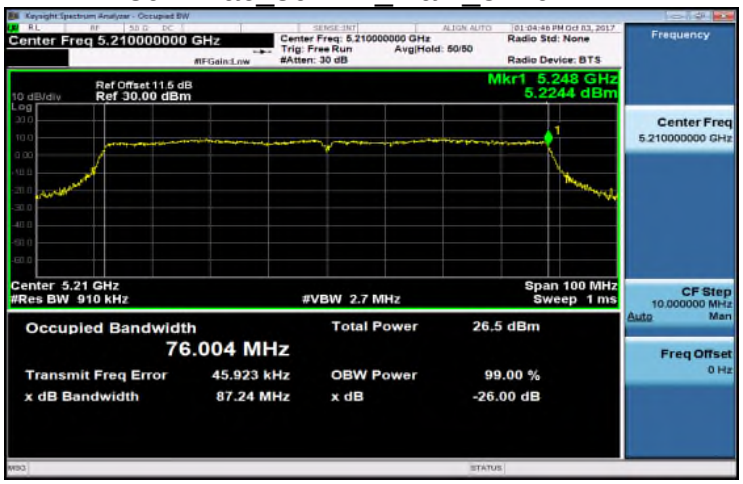
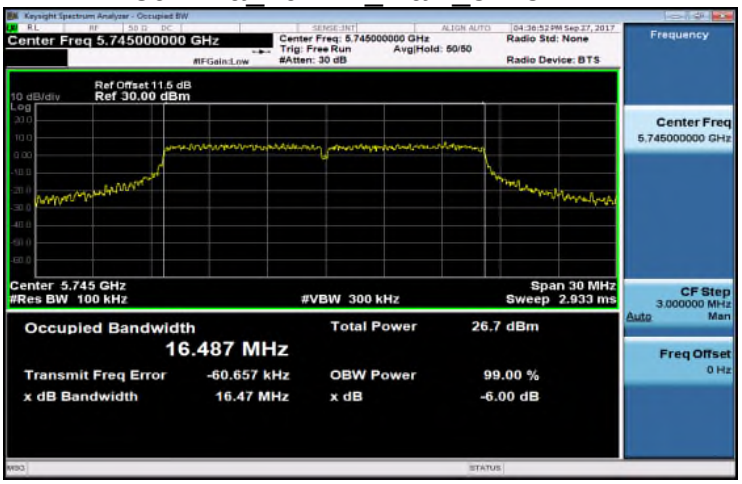
6dB Band Width measure with Peak detector for FCC

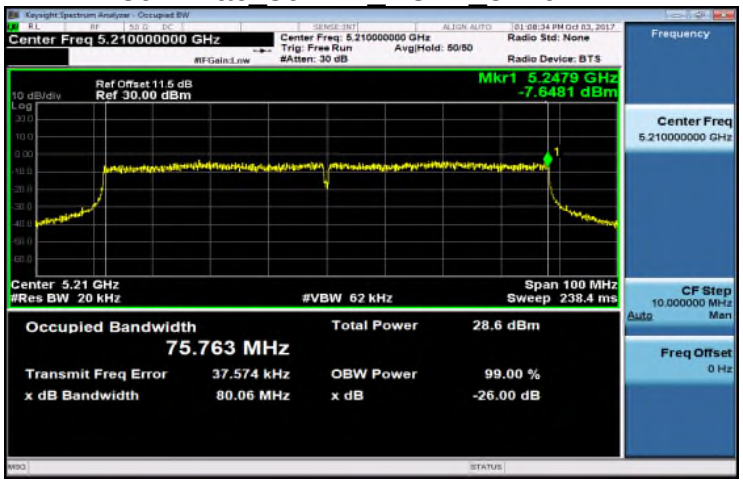
802.11ac_80MHz_Main_5210MHz



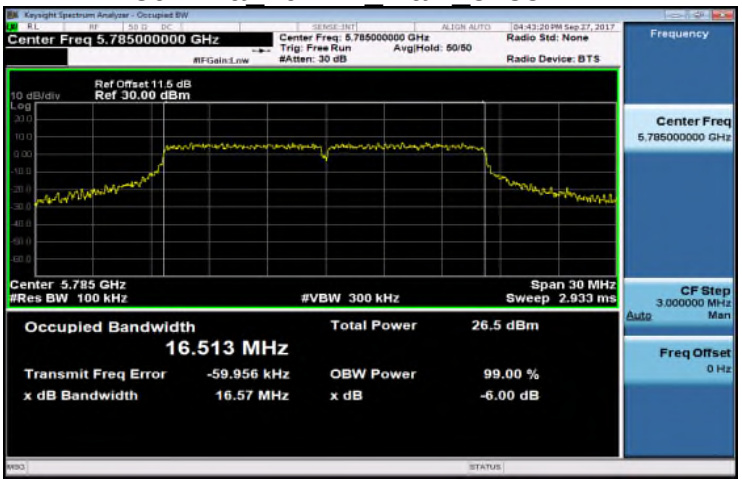
802.11a_20MHz_Main_5745MHz



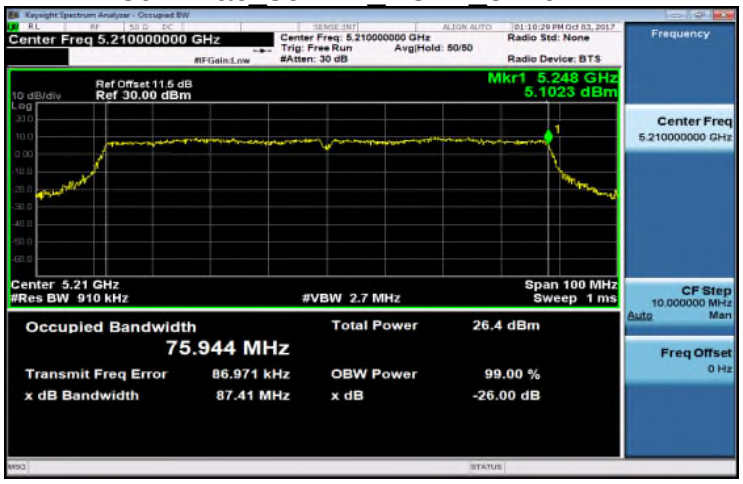
802.11ac_80MHz_AUX1_5210MHz



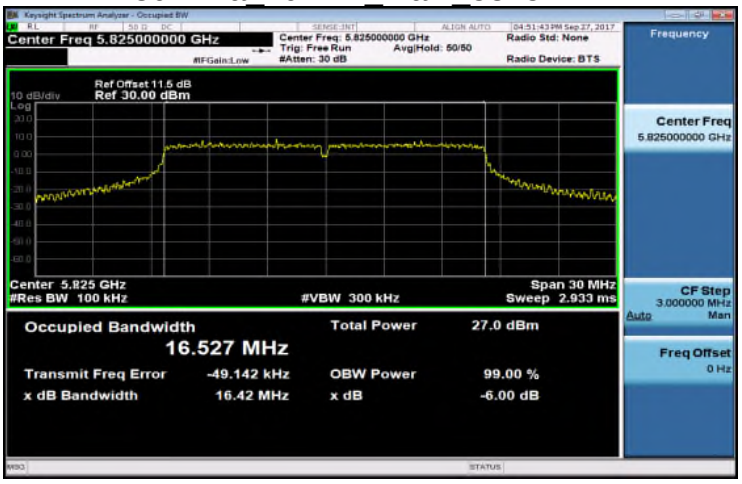
802.11a_20MHz_Main_5785MHz



802.11ac_80MHz_AUX2_5210MHz



802.11a_20MHz_Main_5825MHz



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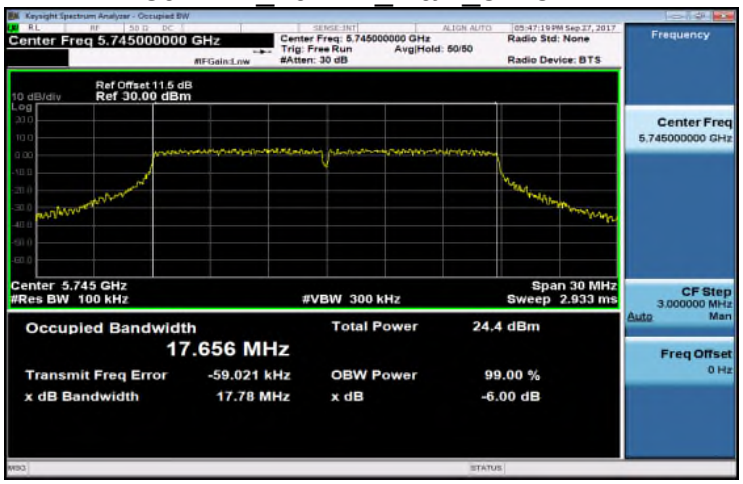
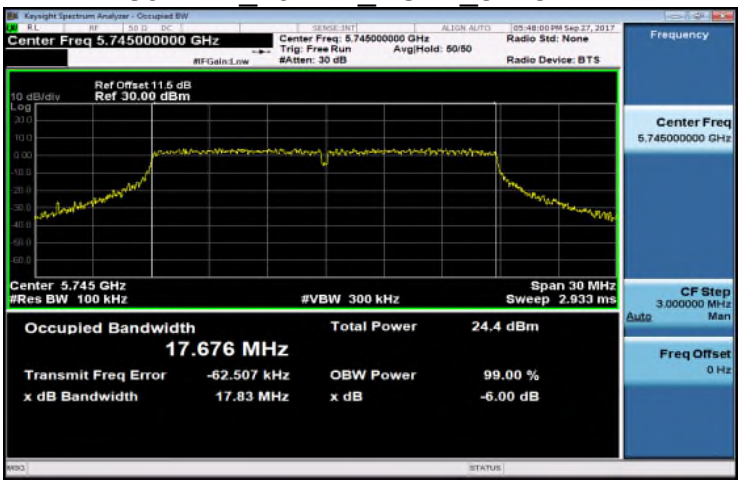
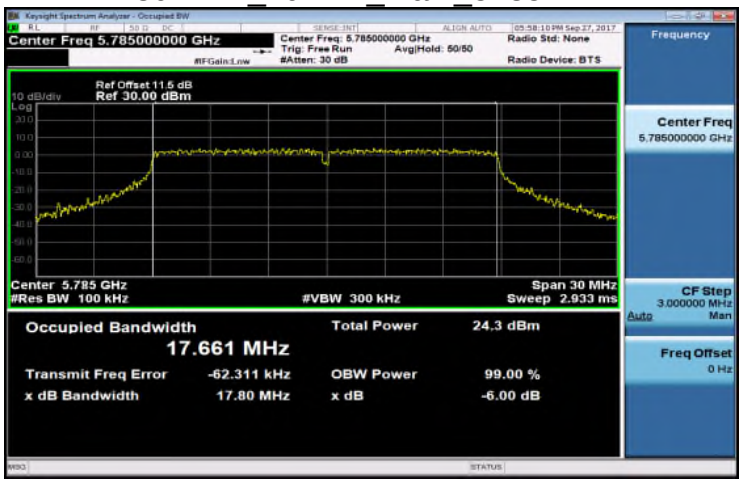
802.11n_20MHz_Main_5745MHz



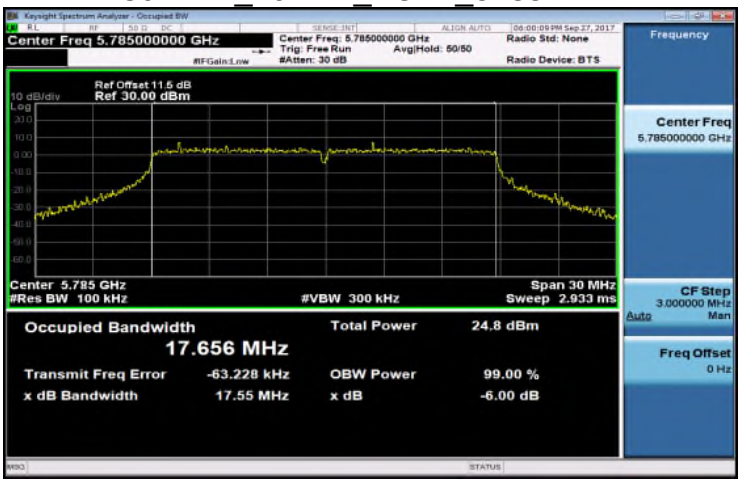
802.11n_20MHz_AUX1_5745MHz



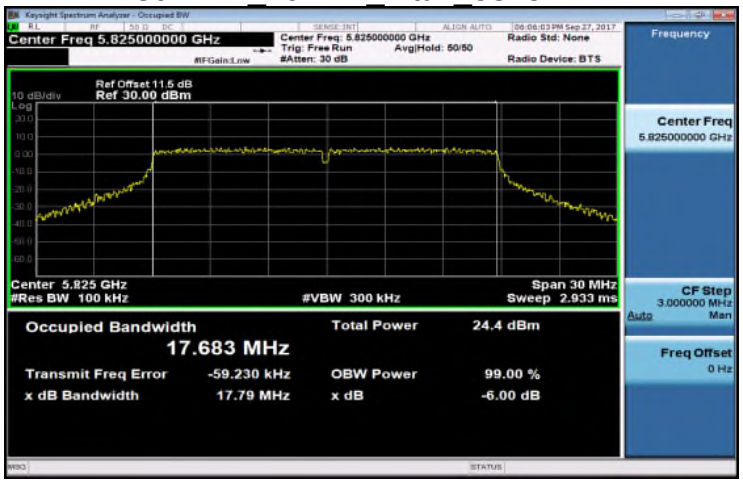
802.11n_20MHz_Main_5785MHz



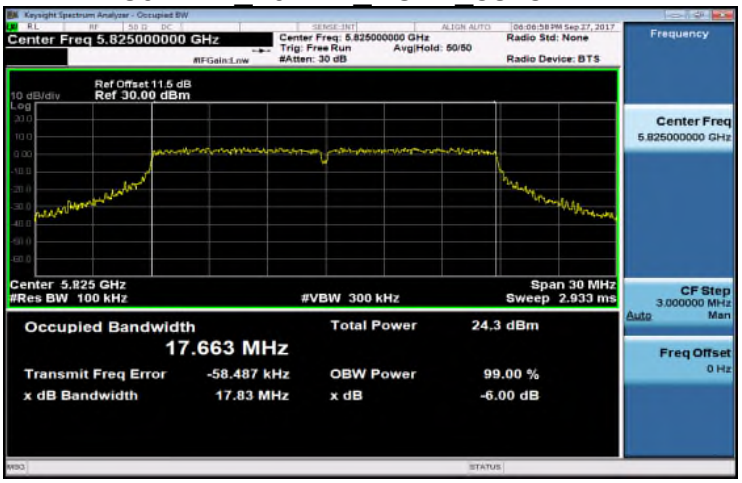
802.11n_20MHz_AUX1_5785 MHz



802.11n_20MHz_Main_5825MHz



802.11n_20MHz_AUX1_5825 MHz



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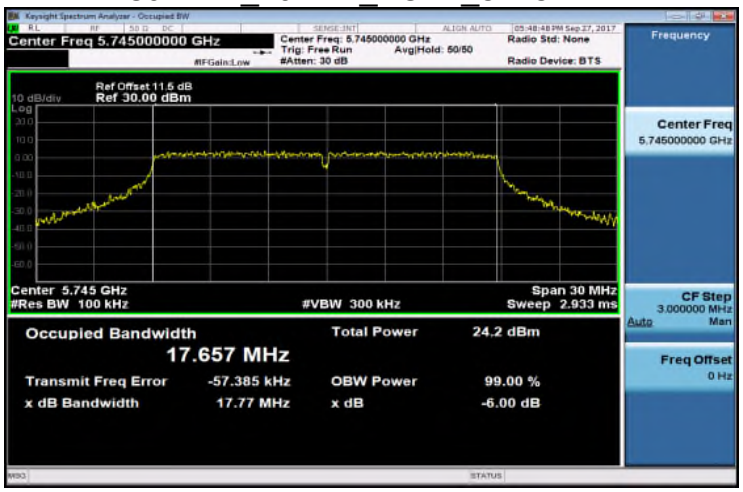
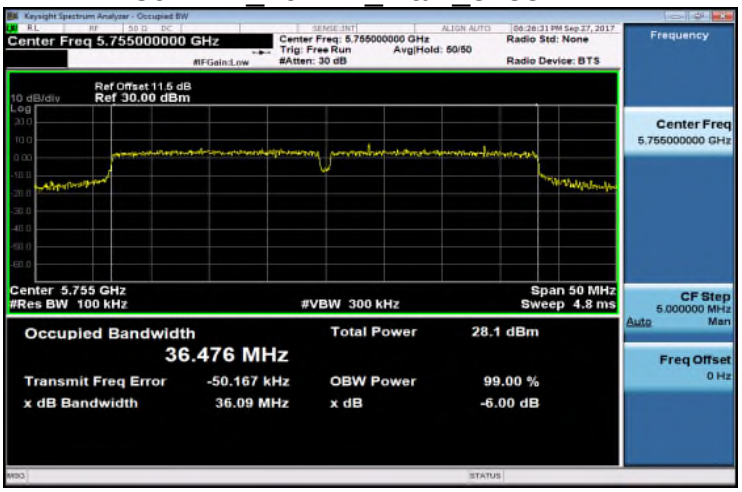
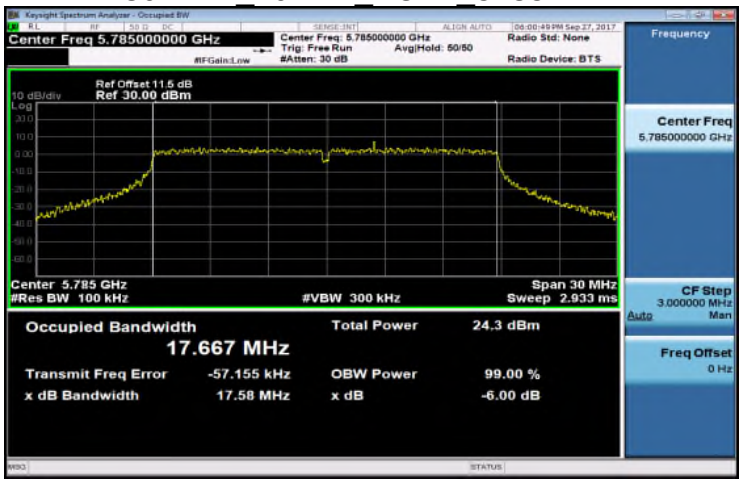
802.11n_20MHz_AUX2_5745MHz



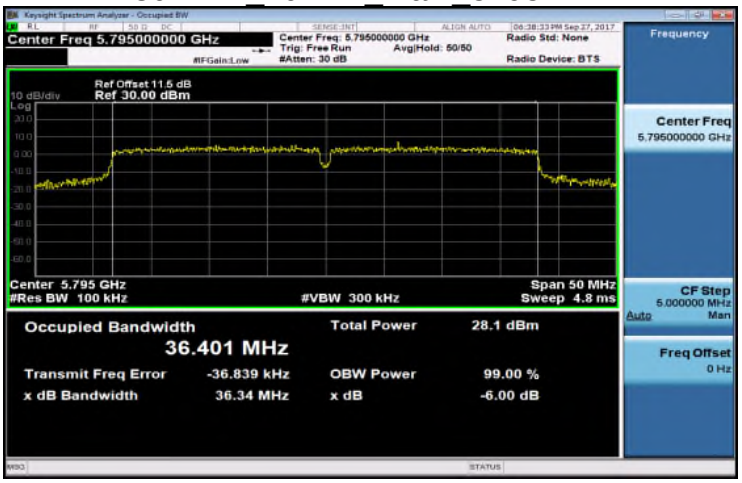
802.11n_40MHz_Main_5755MHz



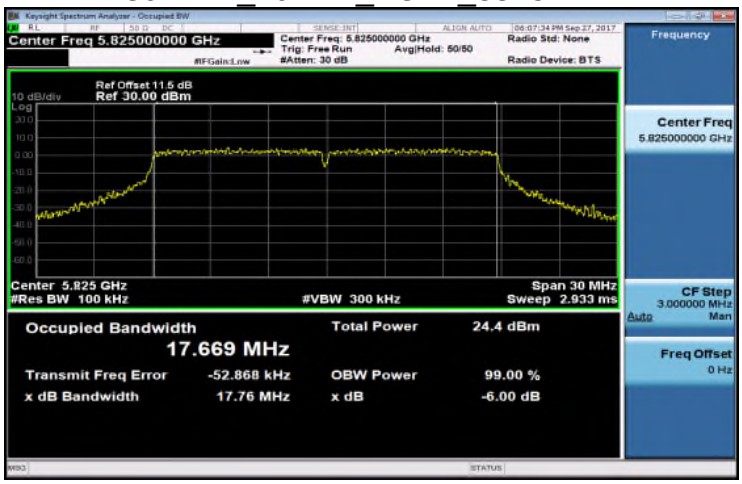
802.11n_20MHz_AUX2_5785 MHz



802.11n_40MHz_Main_5795MHz



802.11n_20MHz_AUX2_5825 MHz



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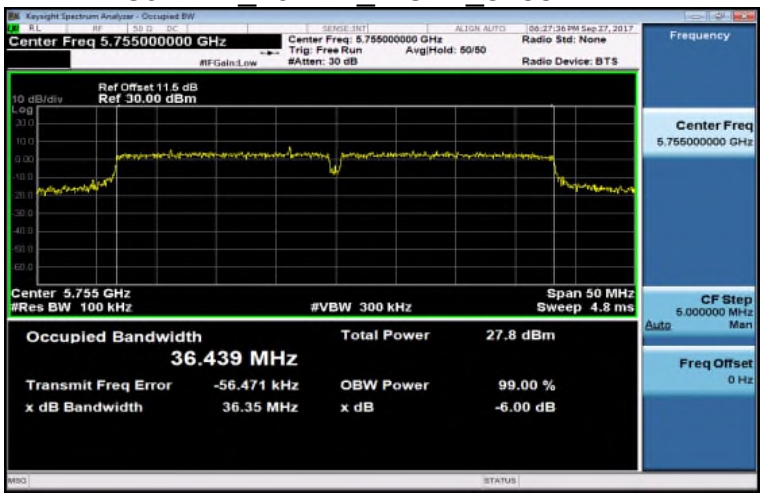
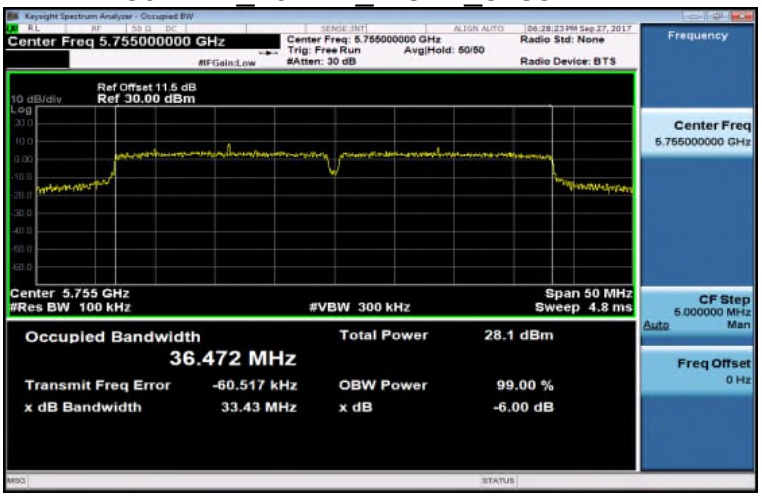
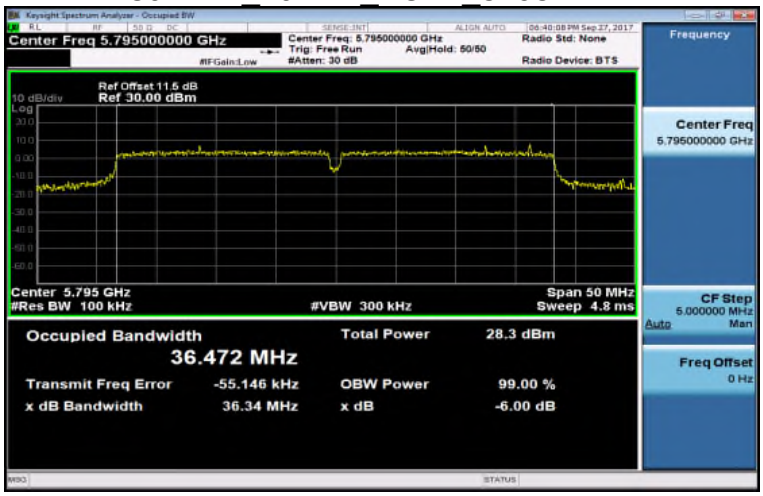
802.11n_40MHz_AUX1_5755MHz



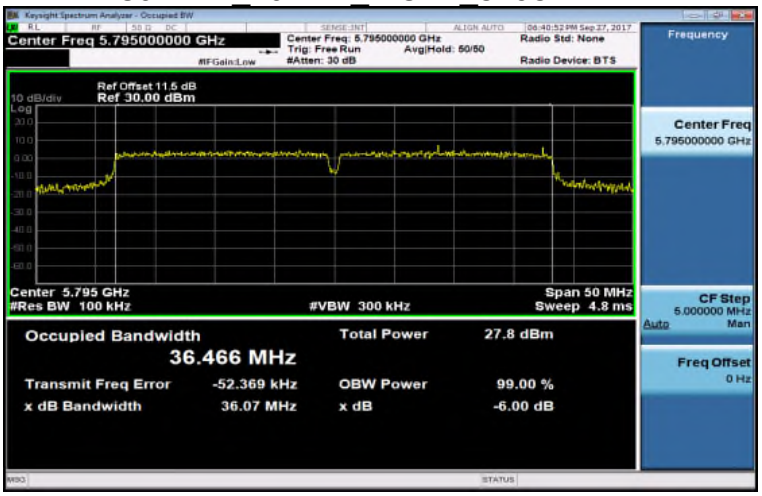
802.11n_40MHz_AUX2_5755MHz



802.11n_40MHz_AUX1_5795MHz



802.11n_40MHz_AUX2_5795 MHz



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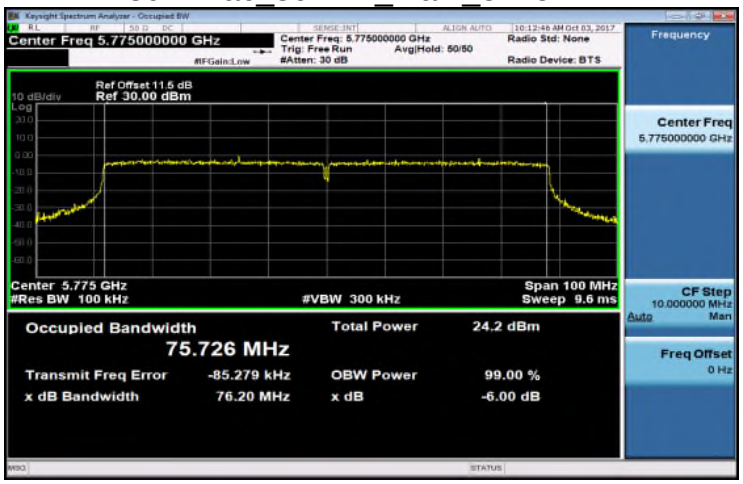
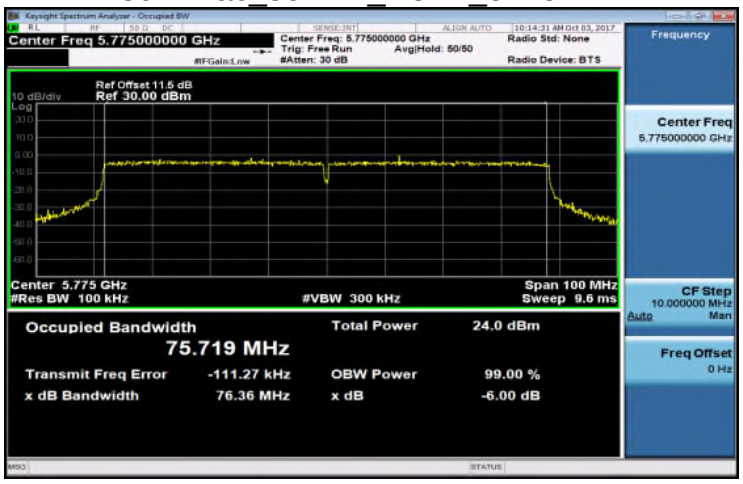
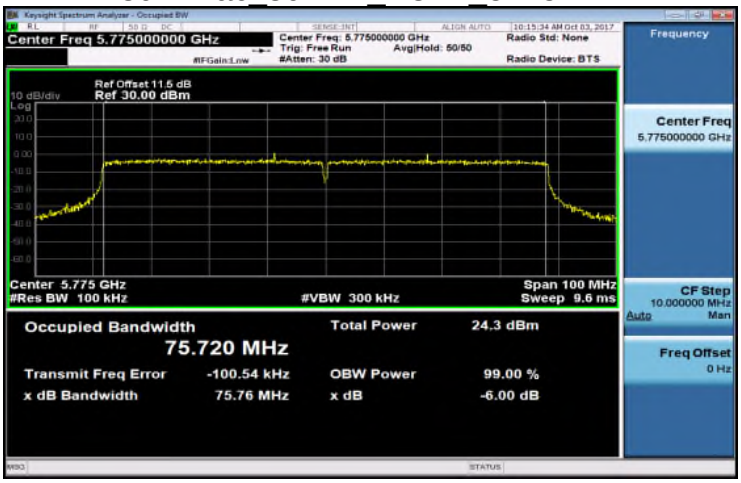
802.11ac_80MHz_Main_5775MHz



802.11ac_80MHz_AUX1_5775MHz



802.11ac_80MHz_AUX2_5775MHz



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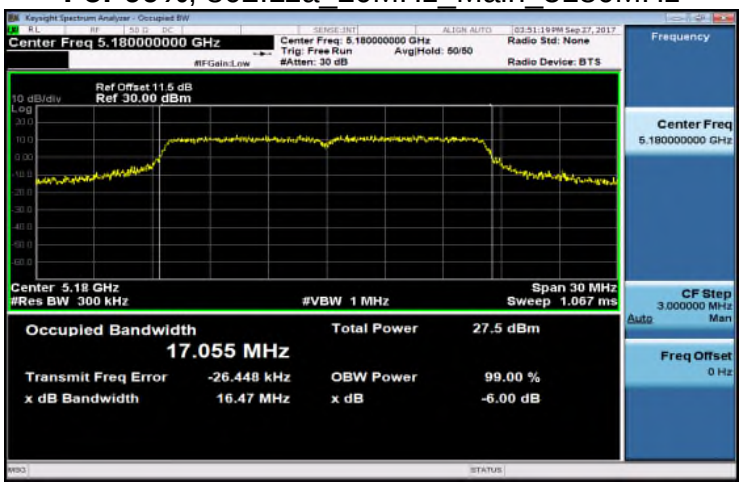
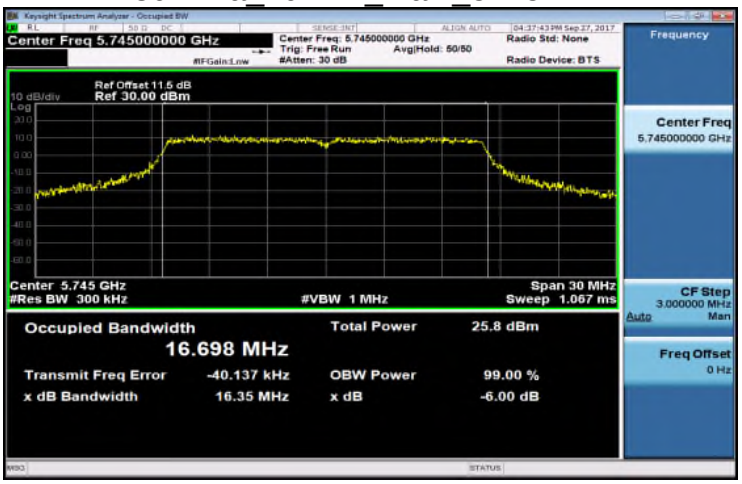
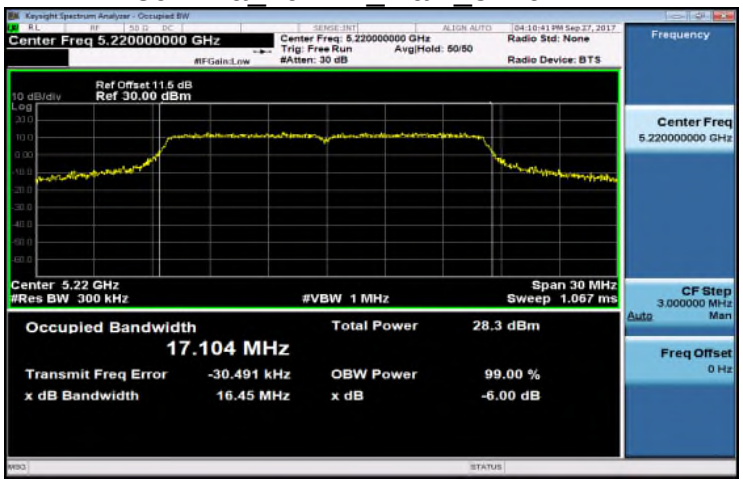
For 99%, 802.11a_20MHz_Main_5180MHz



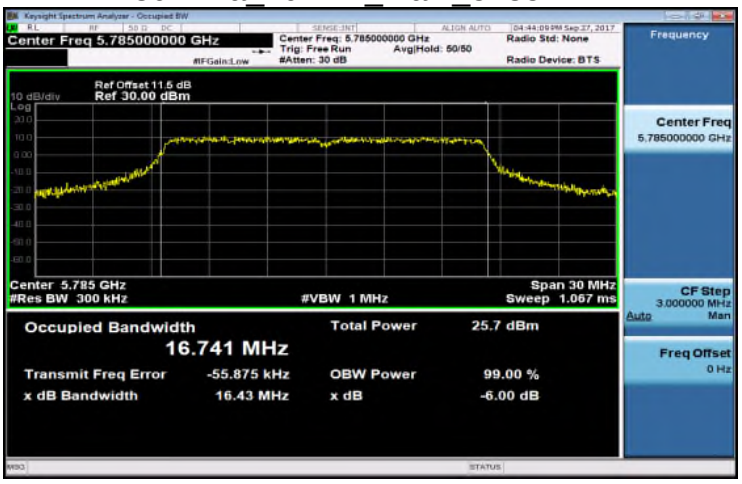
802.11a_20MHz_Main_5745MHz



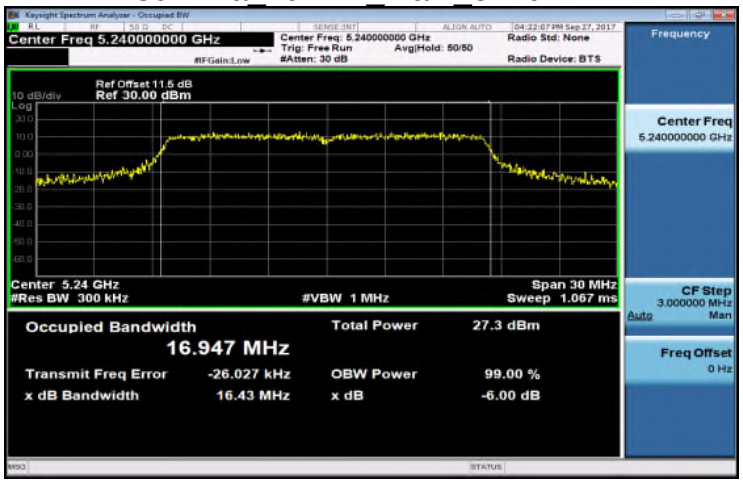
802.11a_20MHz_Main_5220MHz



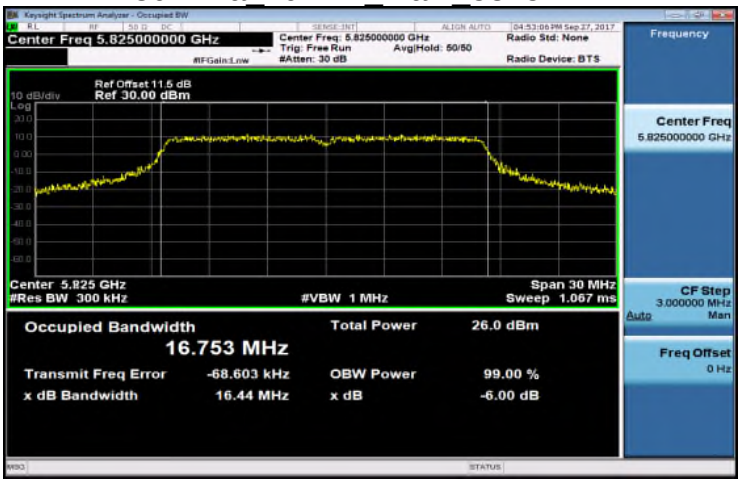
802.11a_20MHz_Main_5785MHz



802.11a_20MHz_Main_5240MHz



802.11a_20MHz_Main_5825MHz



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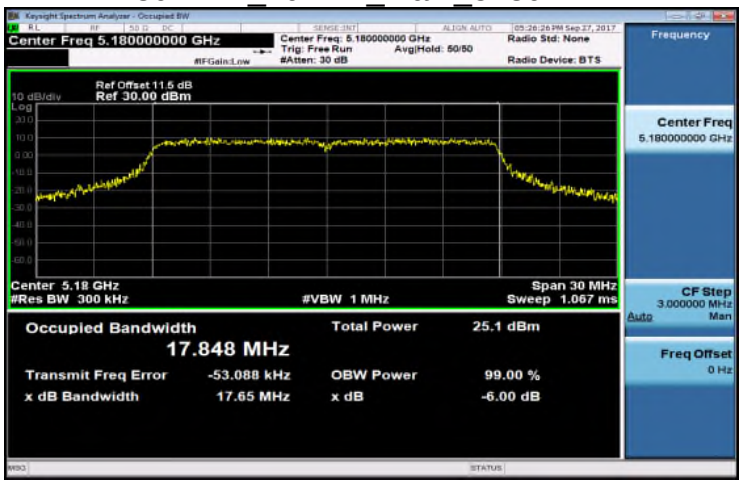
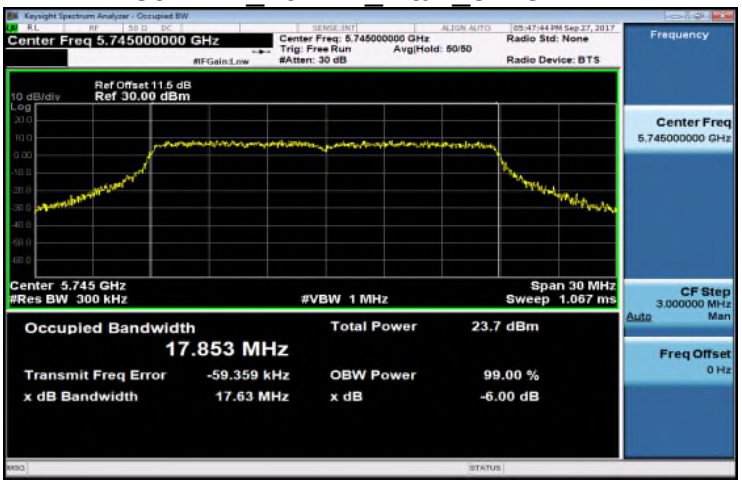
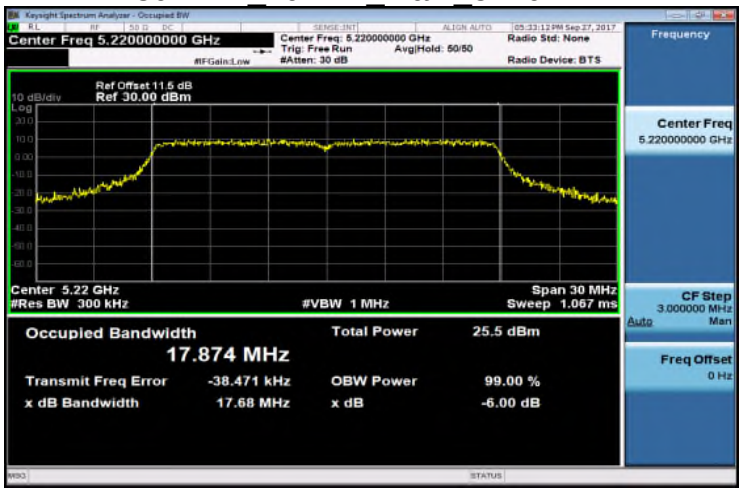
802.11n_20MHz_Main_5180MHz



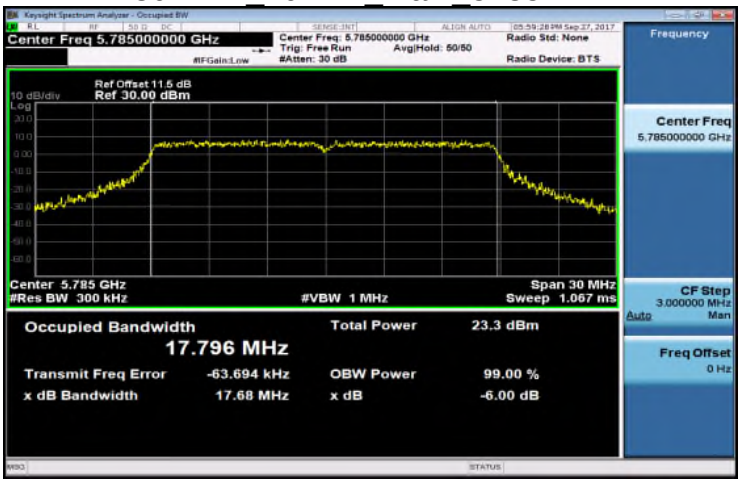
802.11n_20MHz_Main_5745MHz



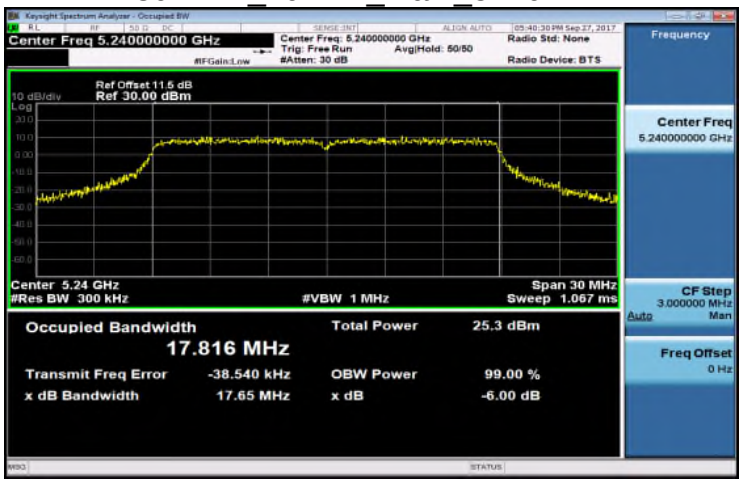
802.11n_20MHz_Main_5220MHz



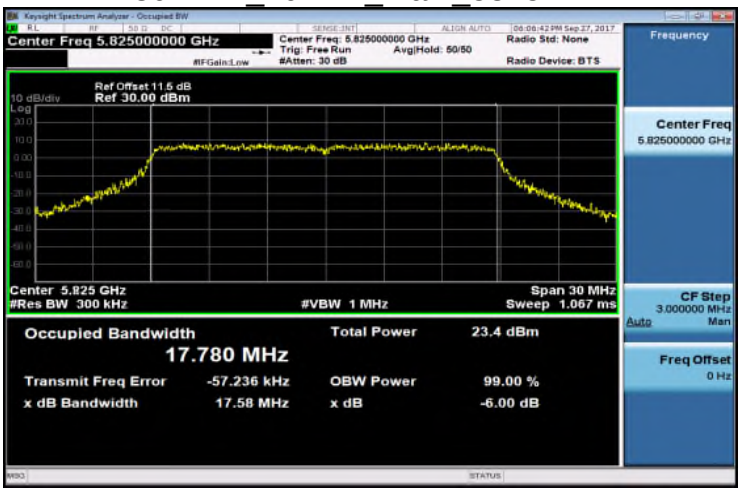
802.11n_20MHz_Main_5785MHz



802.11n_20MHz_Main_5240MHz



802.11n_20MHz_Main_5825MHz



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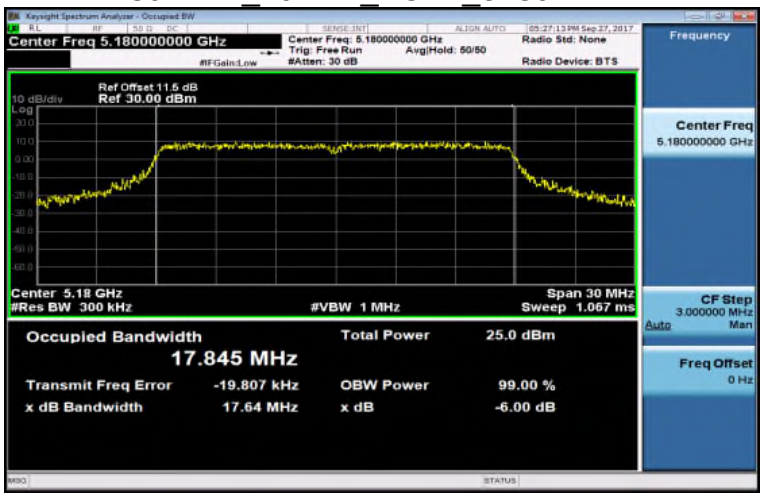
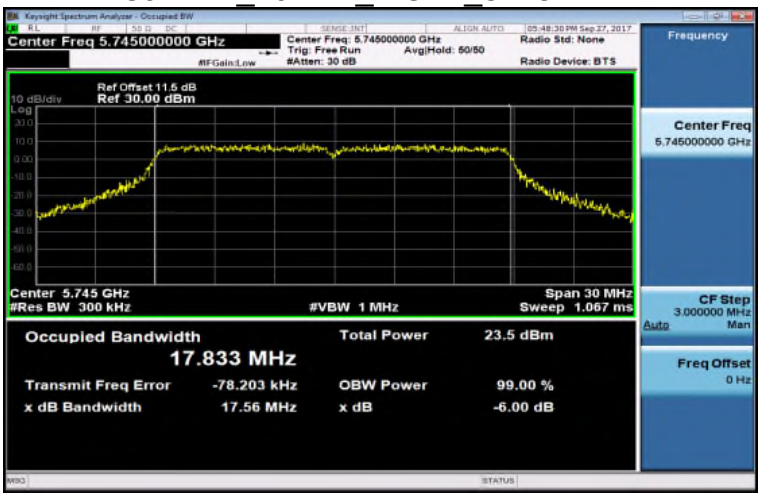
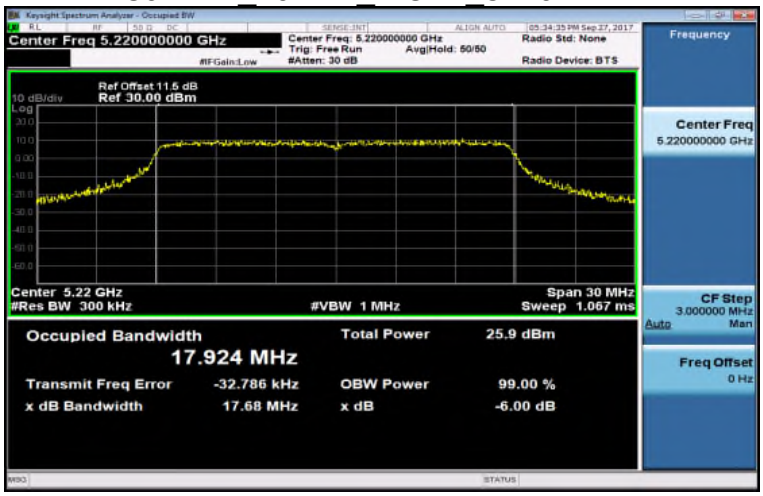
802.11n_20MHz_AUX1_5180MHz



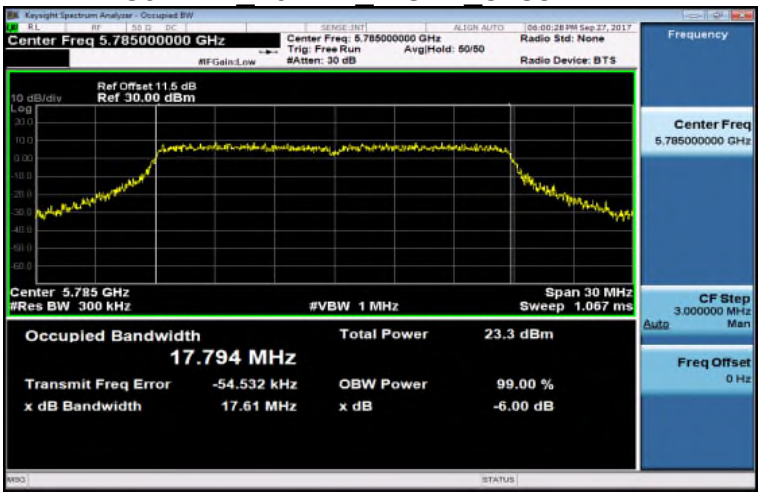
802.11n_20MHz_AUX1_5745MHz



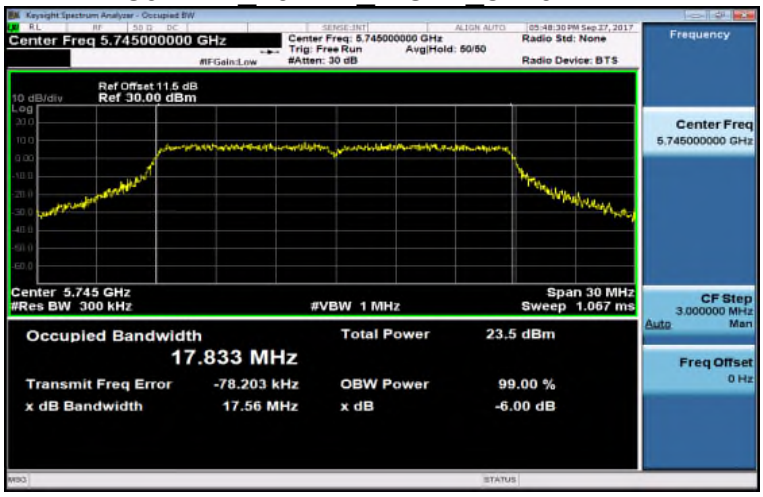
802.11n_20MHz_AUX1_5220MHz



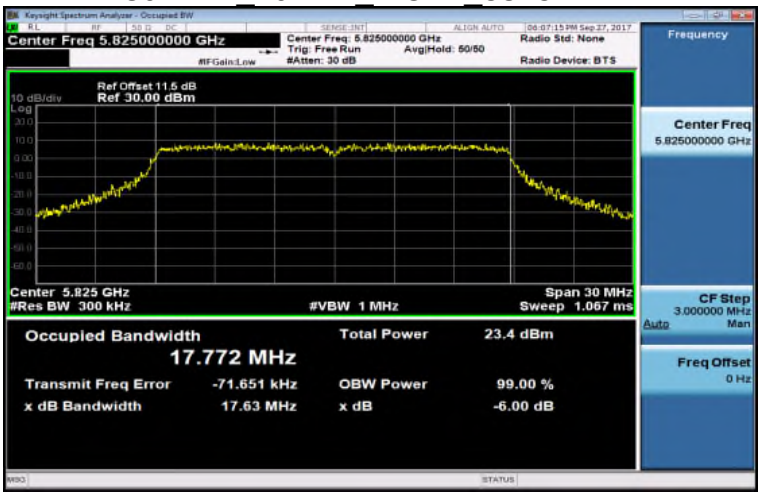
802.11n_20MHz_AUX1_5785MHz



802.11n_20MHz_AUX1_5240MHz



802.11n_20MHz_AUX1_5825MHz



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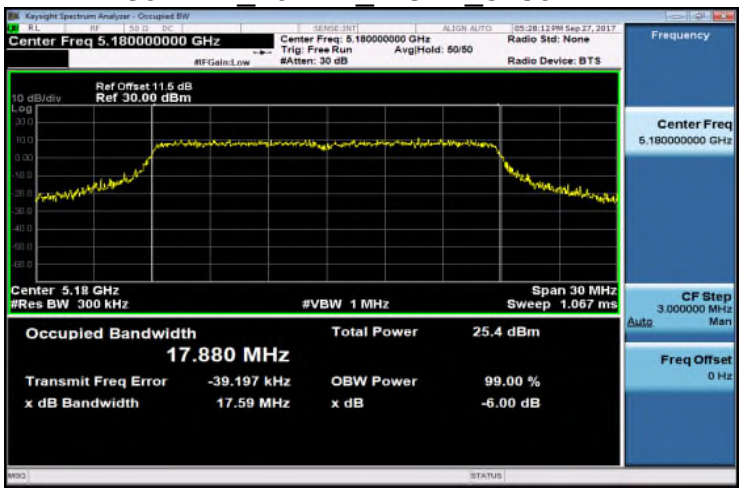
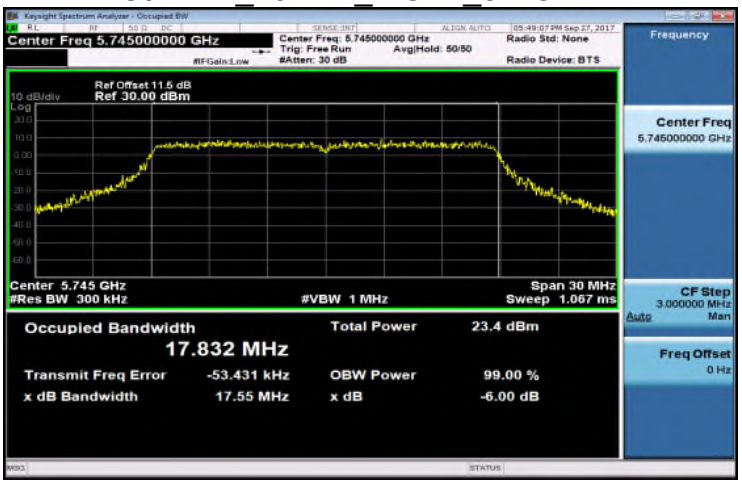
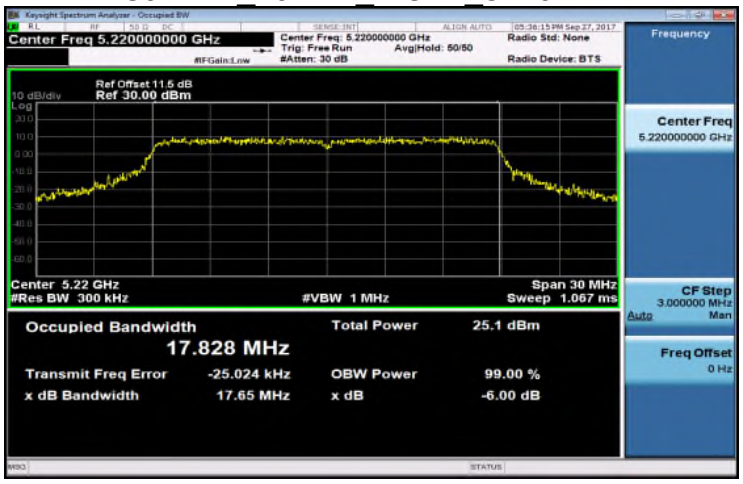
802.11n_20MHz_AUX2_5180MHz



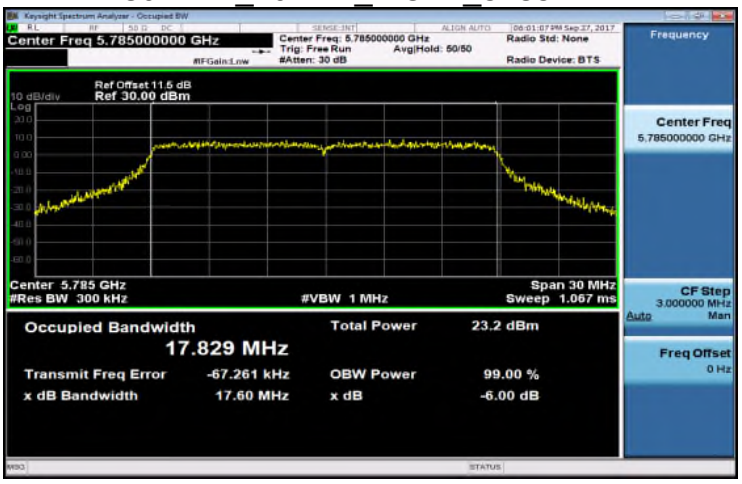
802.11n_20MHz_AUX2_5745MHz



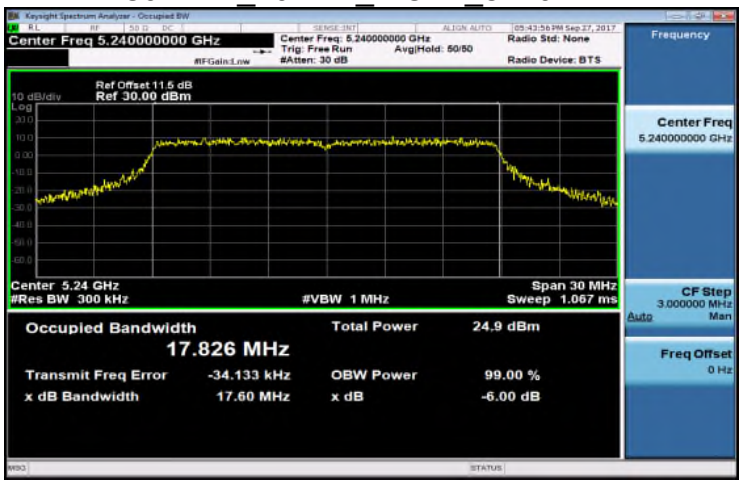
802.11n_20MHz_AUX2_5220MHz



802.11n_20MHz_AUX2_5785MHz



802.11n_20MHz_AUX2_5240MHz



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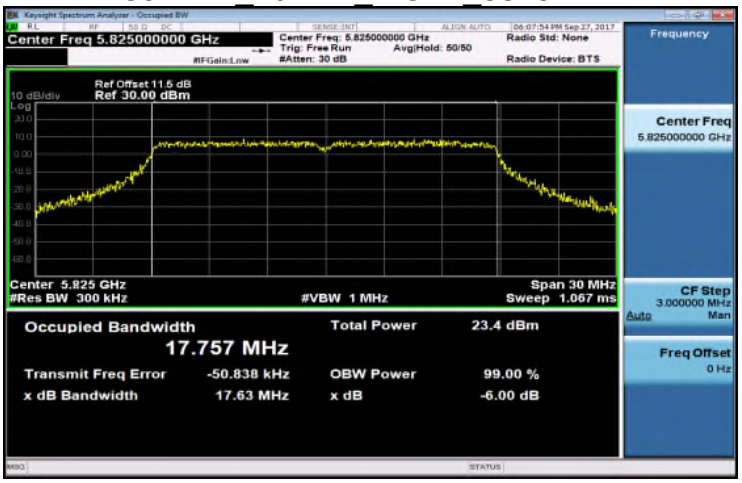

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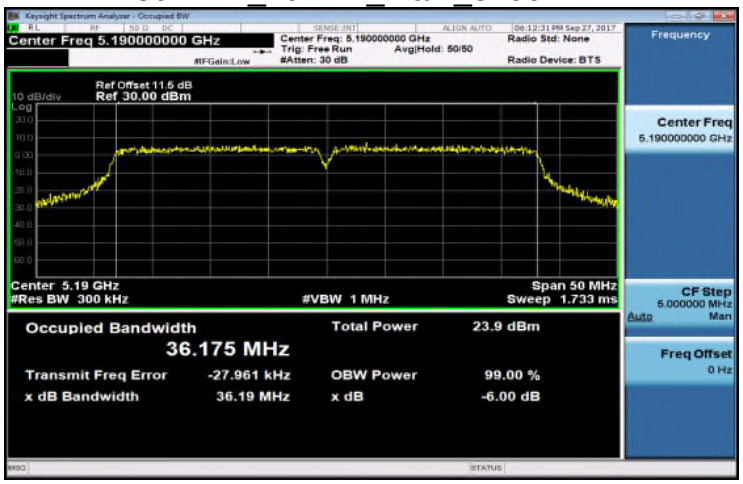
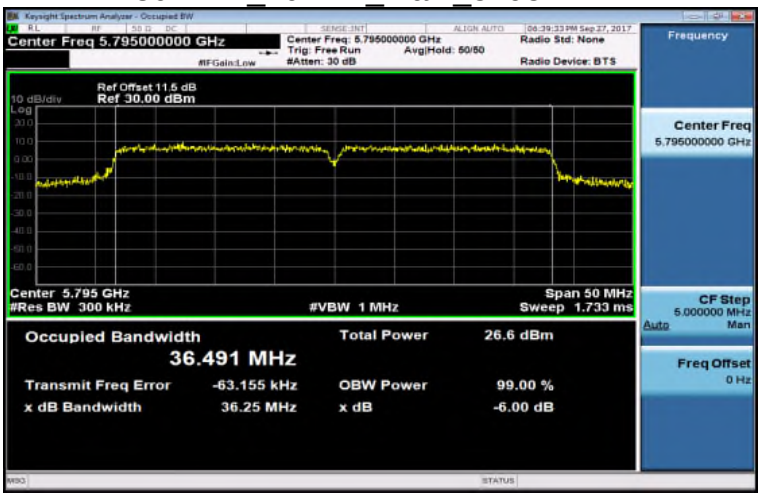
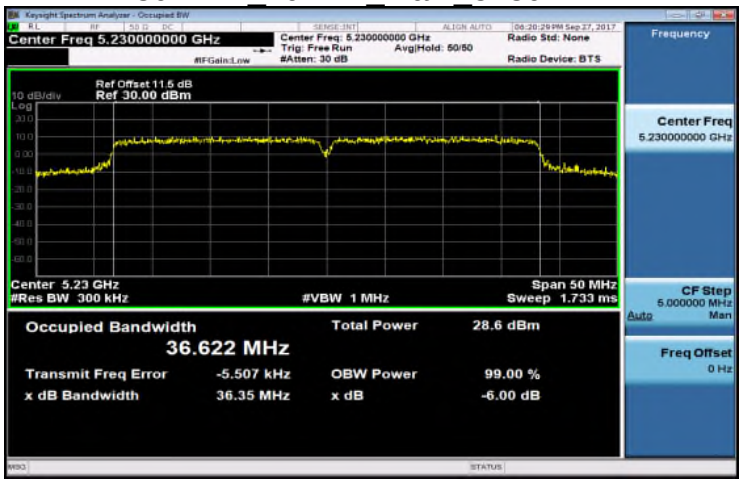
802.11n_40MHz_Main_5190MHz



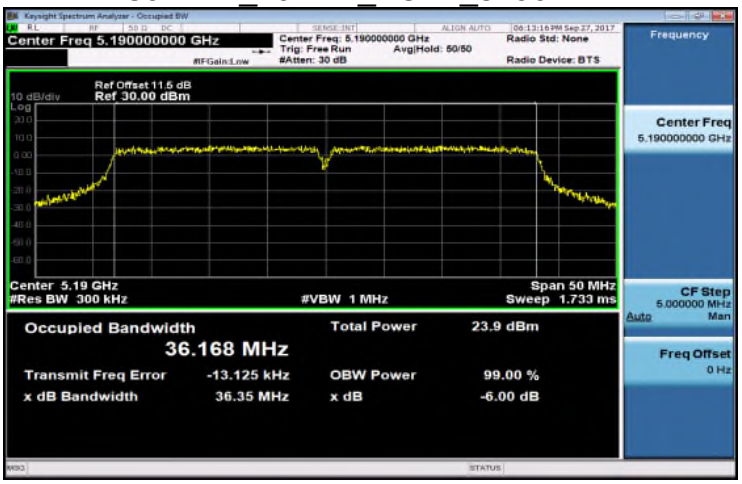
802.11n_40MHz_Main_5795MHz



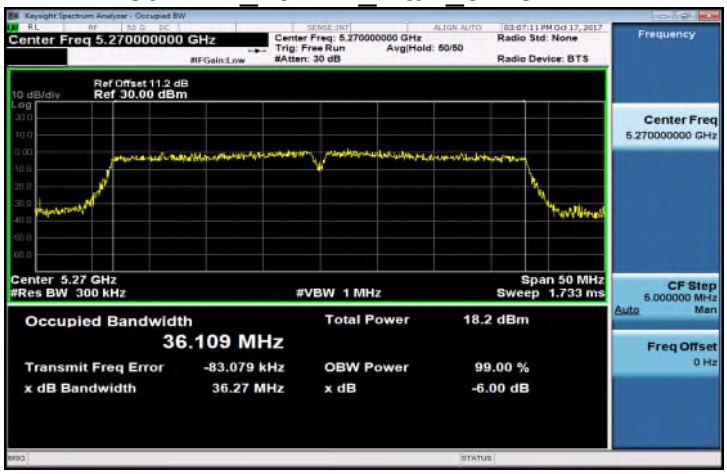
802.11n_40MHz_Main_5230MHz



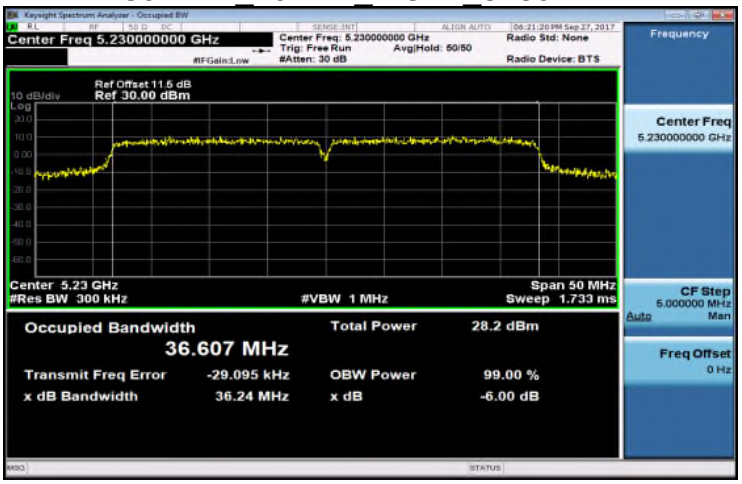
802.11n_40MHz_AUX1_5190MHz



802.11n_40MHz_Main_5775MHz



802.11n_40MHz_AUX1_5230MHz



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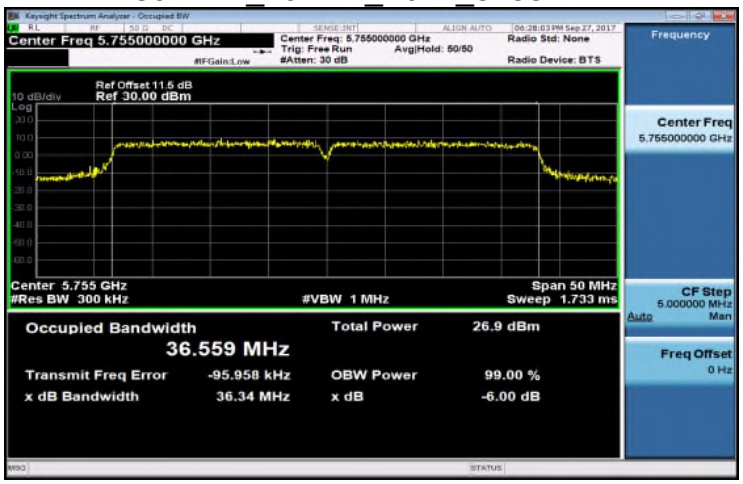
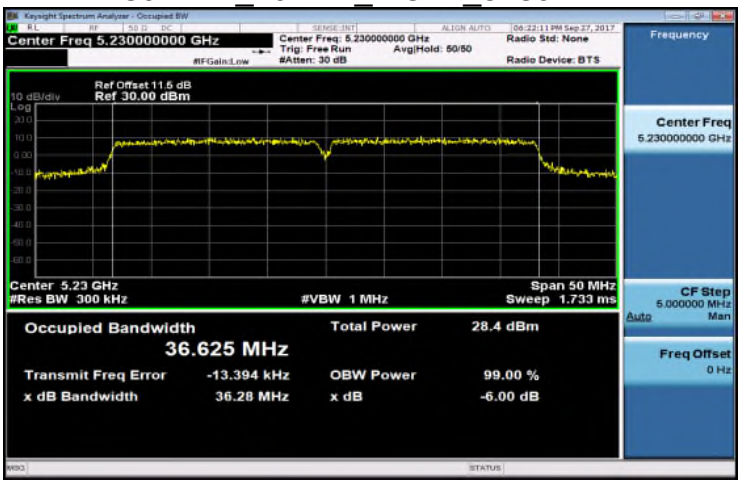
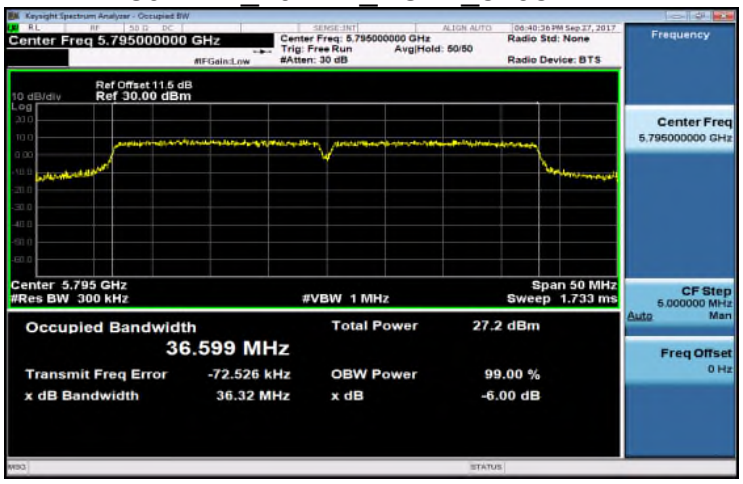
802.11n_40MHz_Aux1_5755MHz



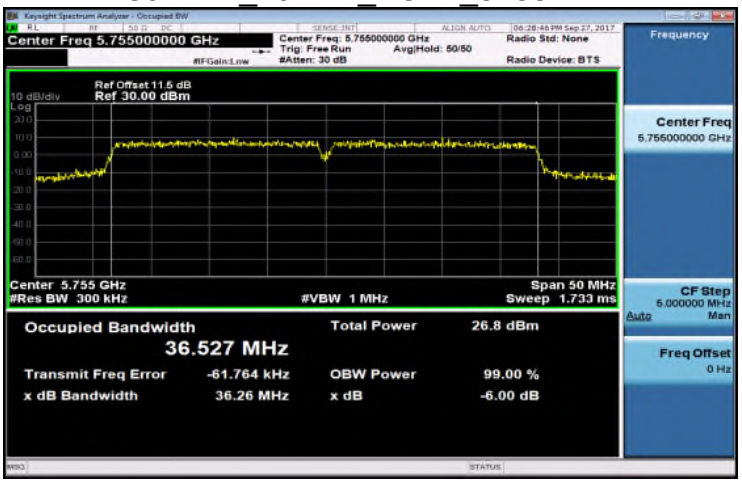
802.11n_40MHz_AUX2_5230MHz



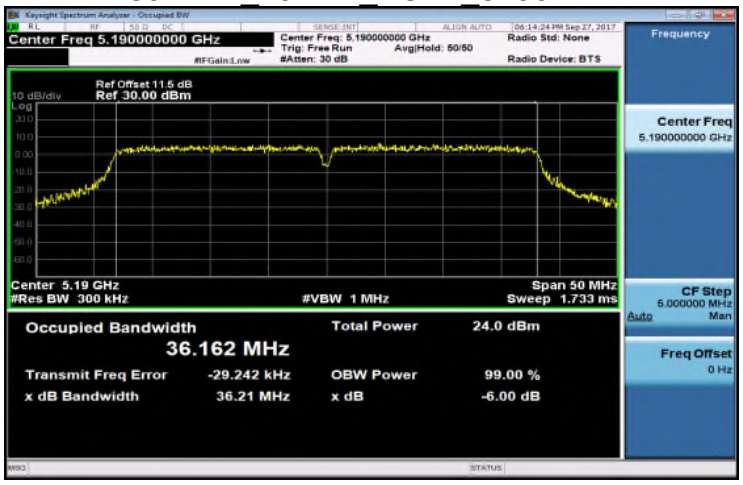
802.11n_40MHz_AUX1_5795MHz



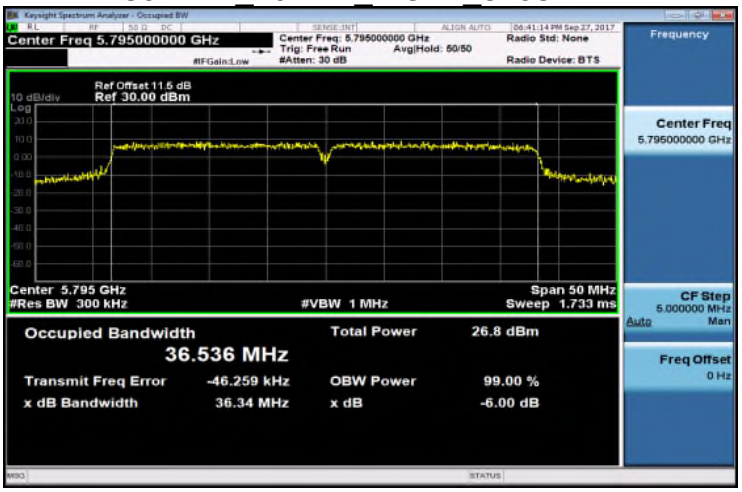
802.11n_40MHz_AUX2_5755MHz



802.11n_40MHz_AUX2_5190MHz



802.11n_40MHz_AUX2_5795MHz



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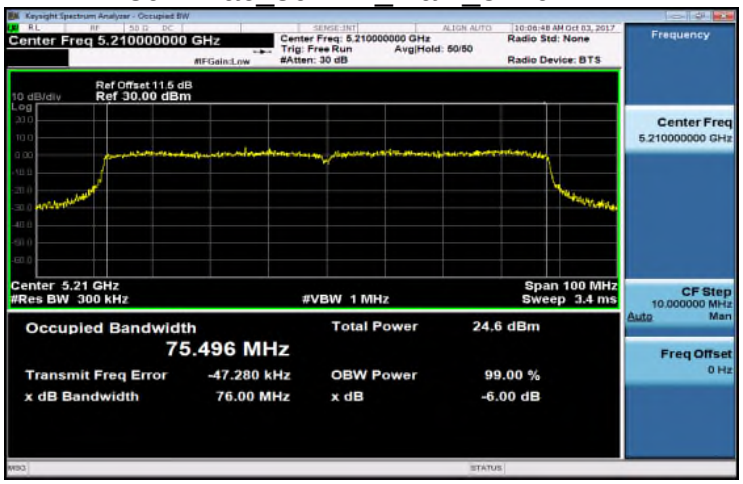
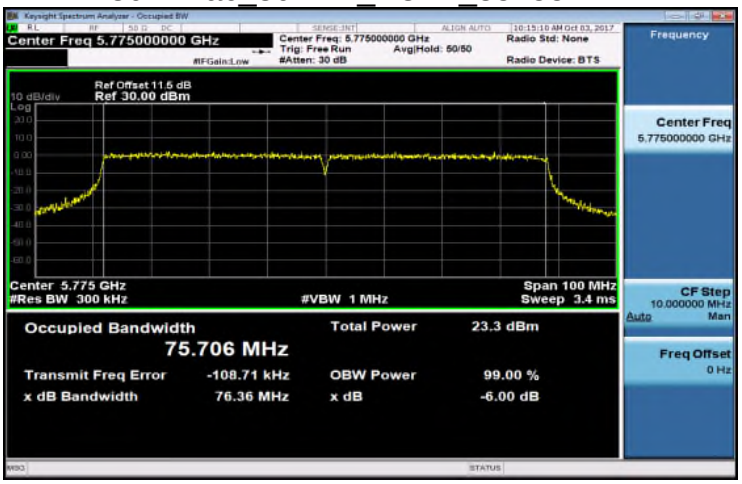
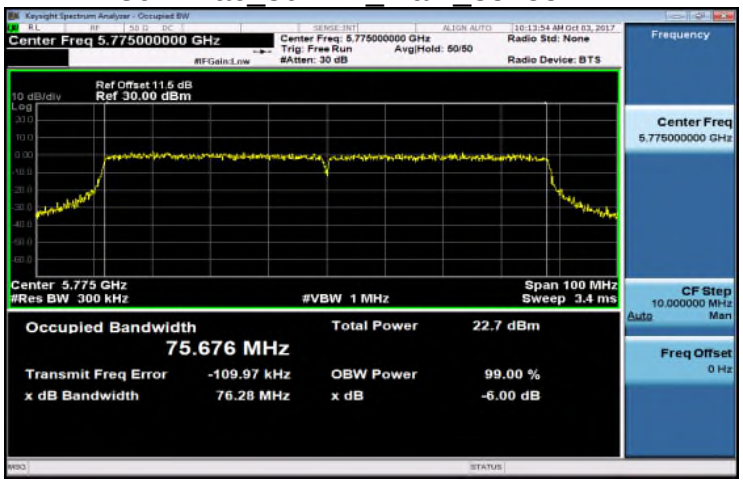
802.11ac_80MHz_Main_5210MHz



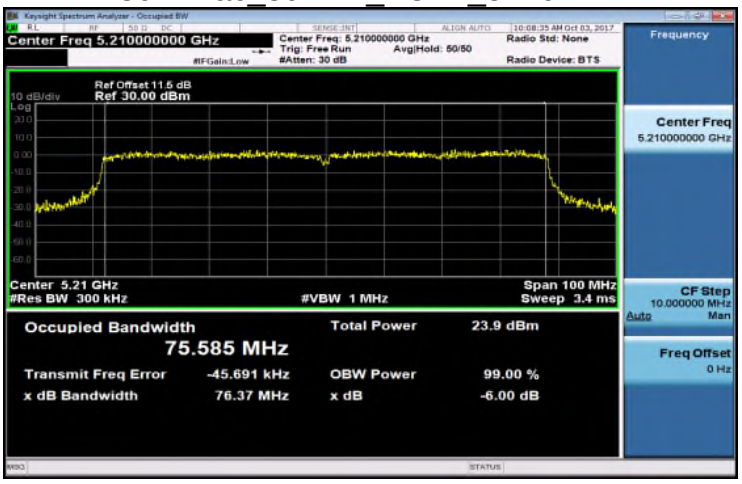
802.11ac_80MHz_AUX1_85755MHz



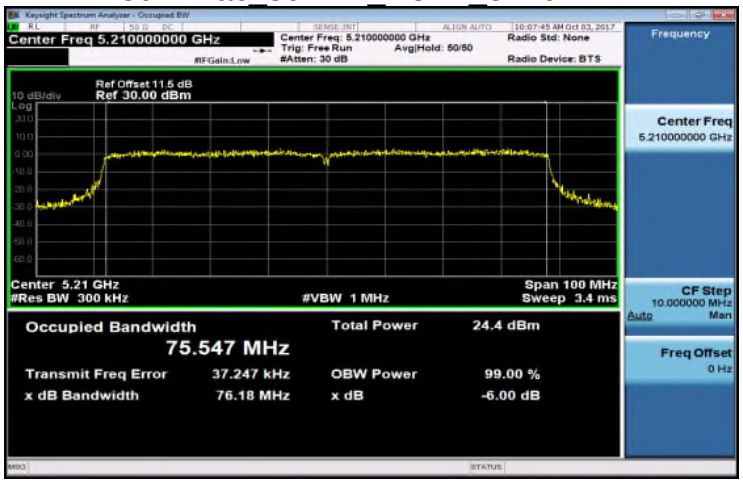
802.11ac_80MHz_Main_85755MHz



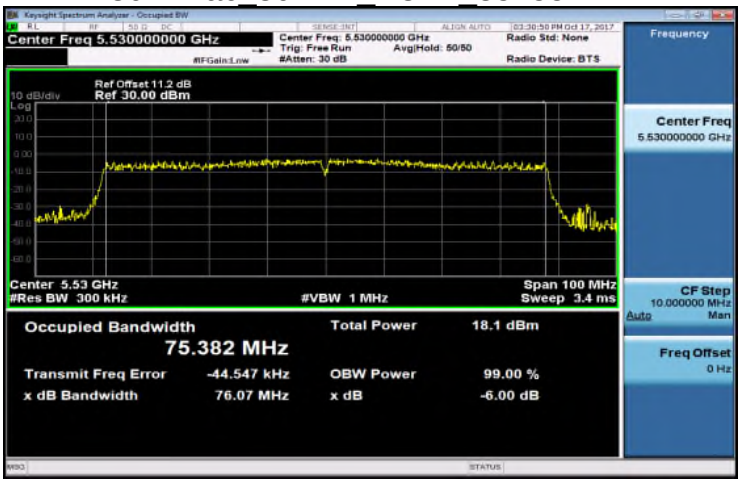
802.11ac_80MHz_AUX2_5210MHz



802.11ac_80MHz_AUX1_5210MHz



802.11ac_80MHz_AUX2_85755MHz



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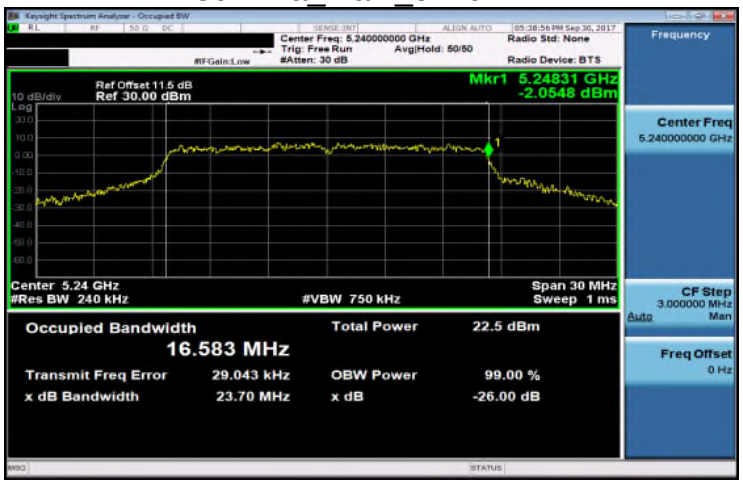
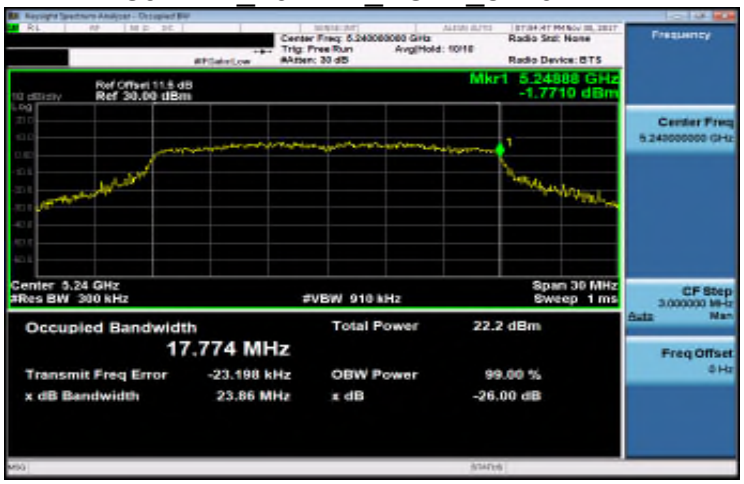
99% BW to prove that all signals in band I is no over band I

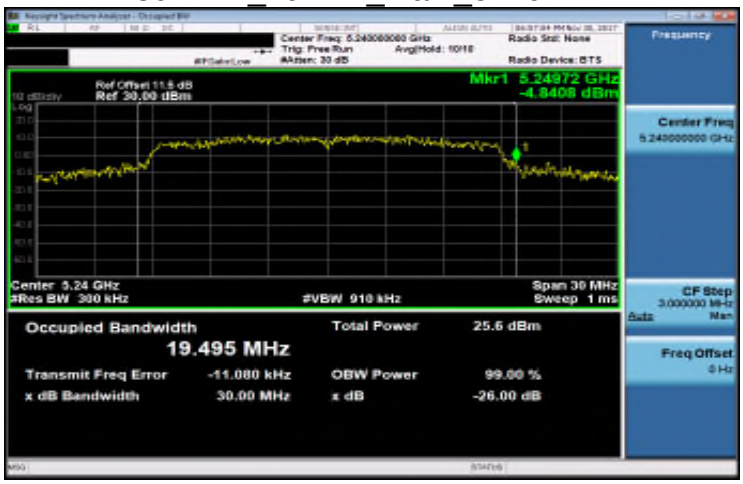
802.11a_Main_5240MHz



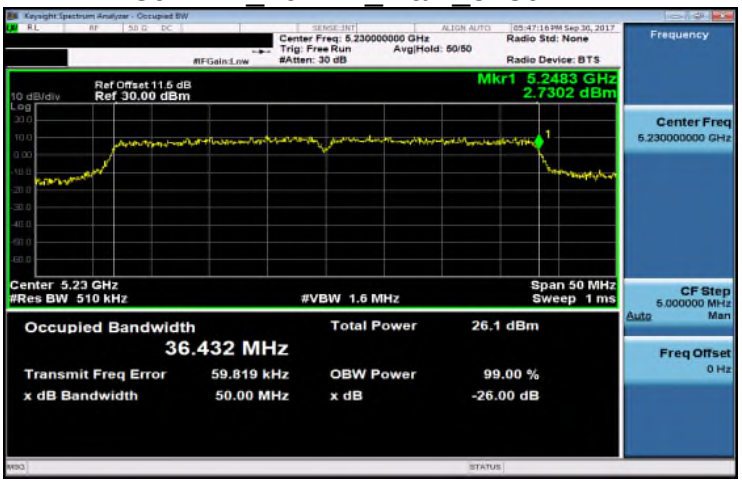
802.11n_20MHz _AUX2_5240MHz



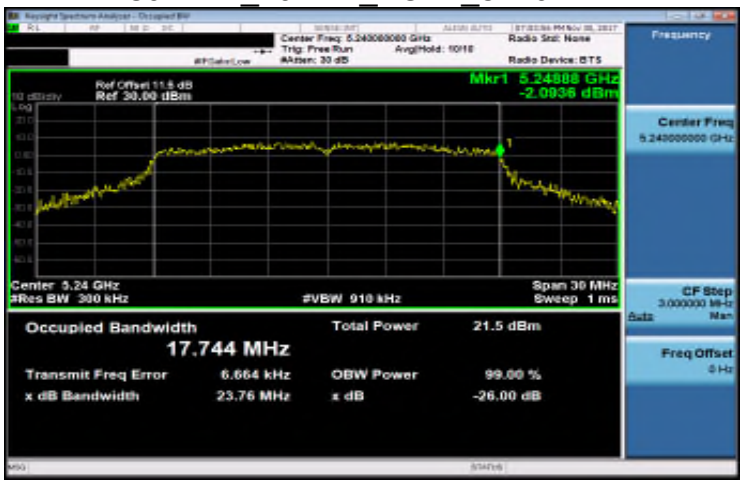
802.11n_20MHz_Main_5240MHz



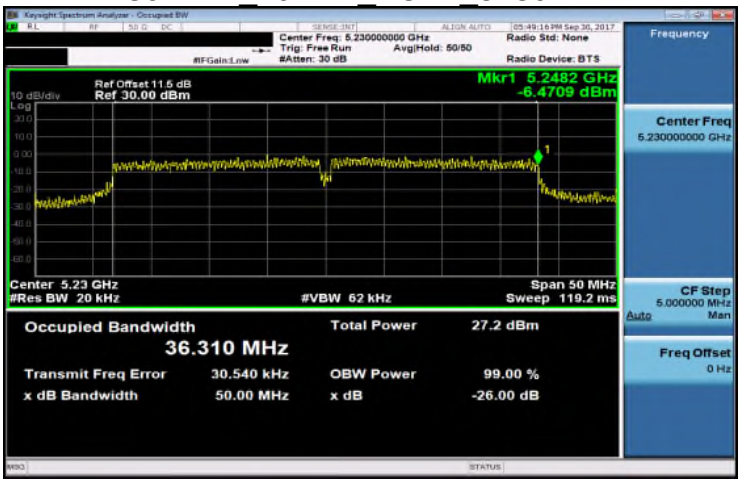
802.11n_40MHz_Main_5230MHz



802.11n_20MHz_AUX1_5240MHz



802.11n_40MHz_AUX1_5230MHz



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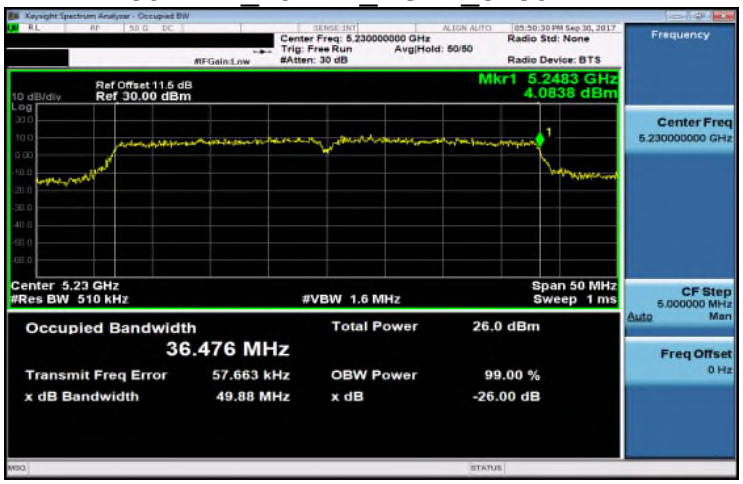
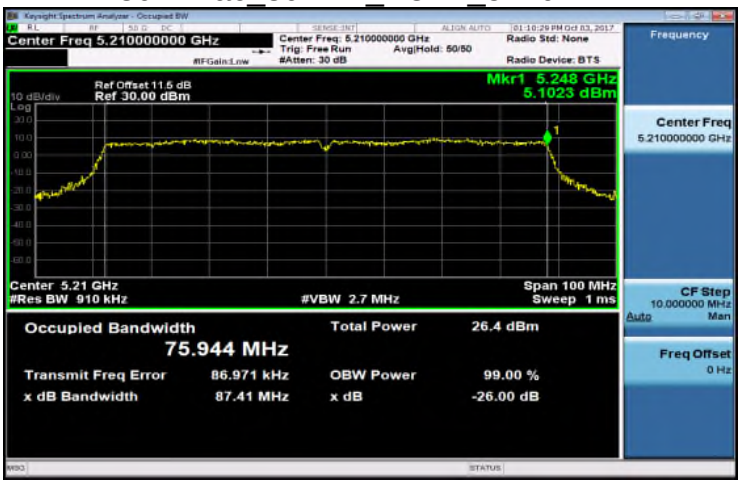
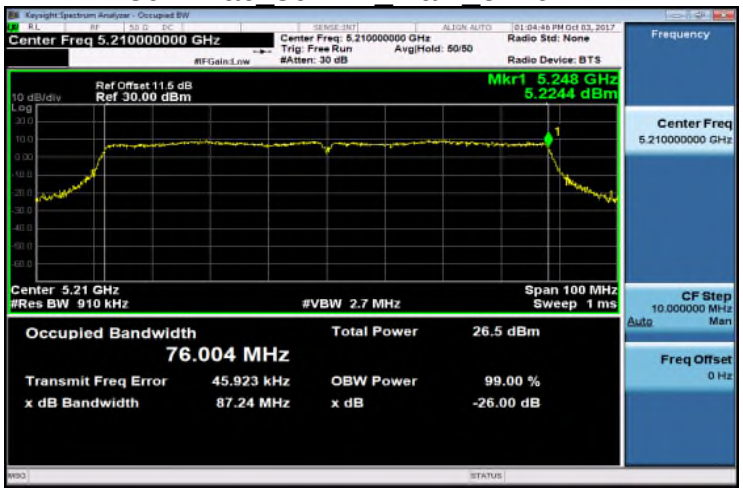
802.11n_40MHz_AUX2_5230MHz



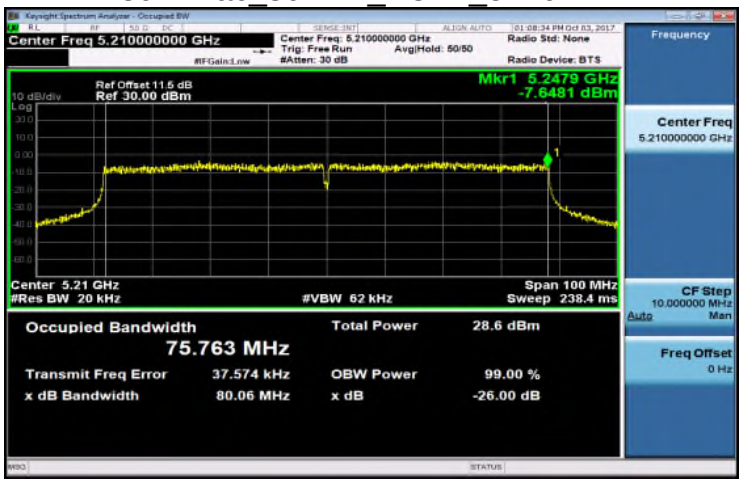
802.11ac_80MHz_AUX2_5210MHz



802.11ac_80MHz_Main_5210MHz



802.11ac_80MHz_AUX1_5210MHz



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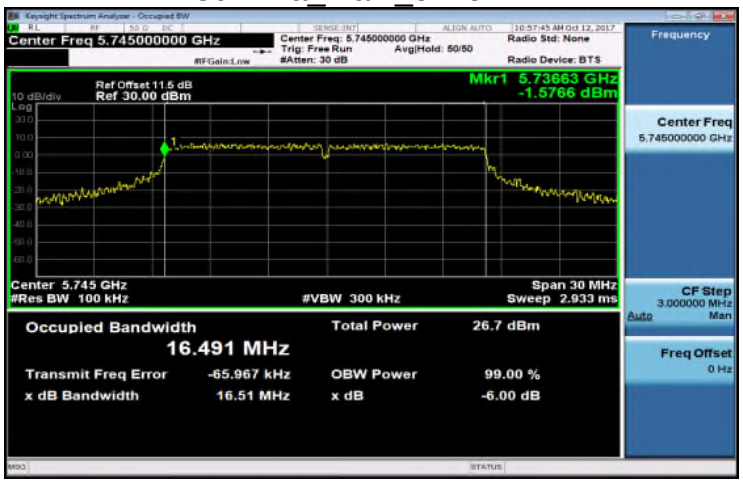
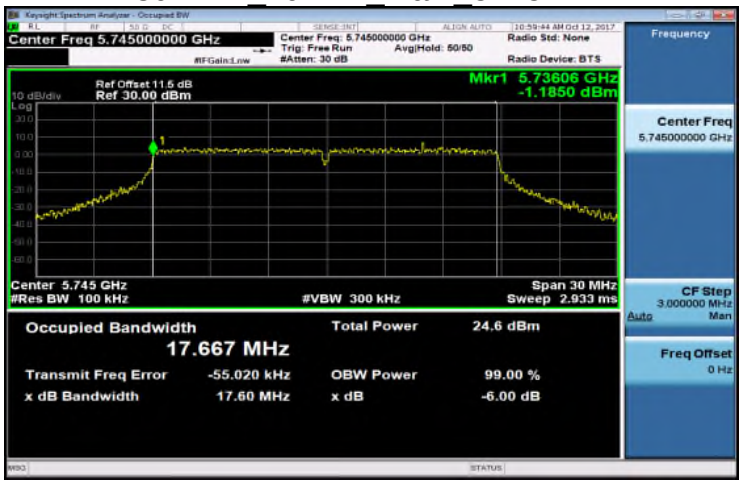
99% BW to prove that all signals in band IV is no over band IV

802.11a_Main_5775MHz

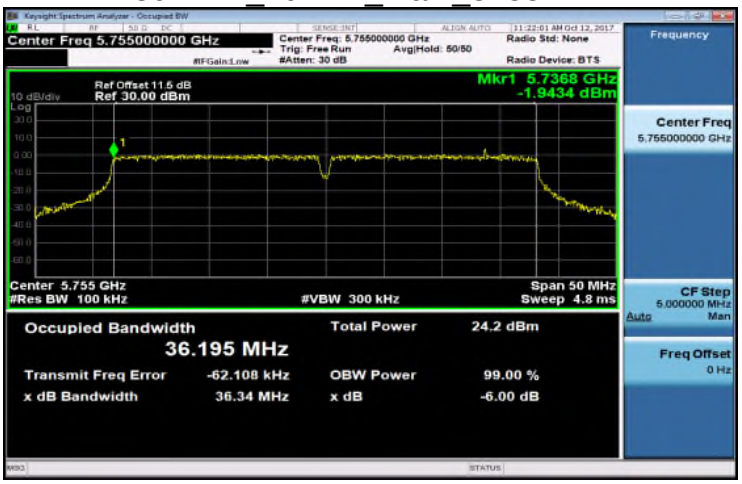


802.11n_20MHz_AUX2_5745MHz

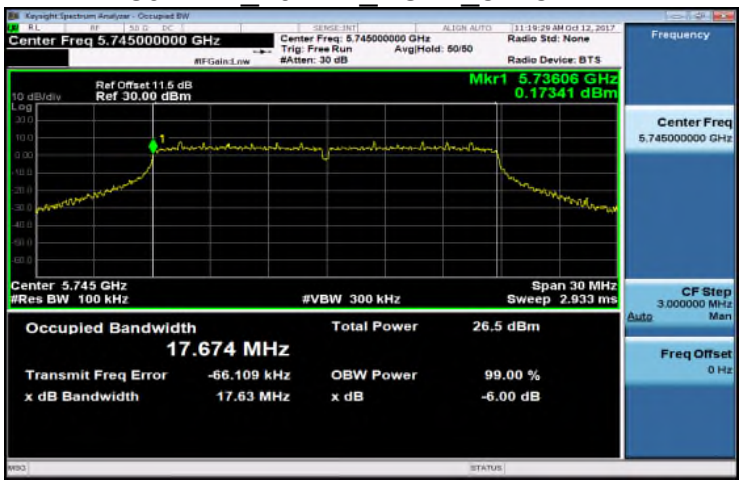
802.11n_20MHz_Main_5745MHz



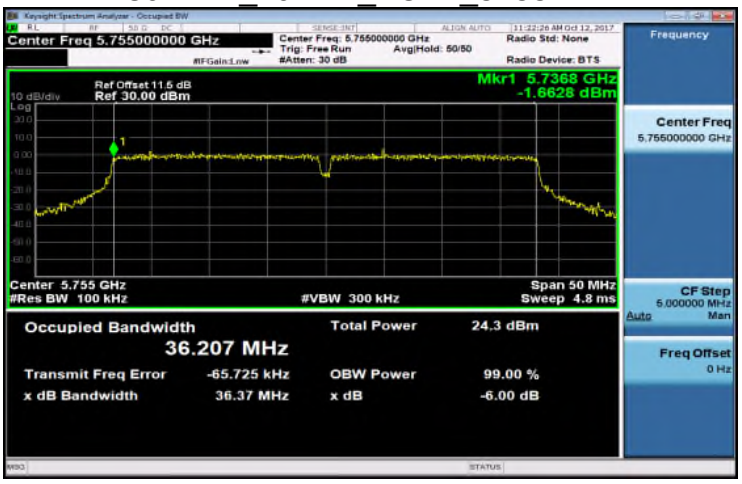
802.11n_40MHz_Main_5755MHz



802.11n_20MHz_AUX1_5745MHz



802.11n_40MHz_AUX1_5755MHz



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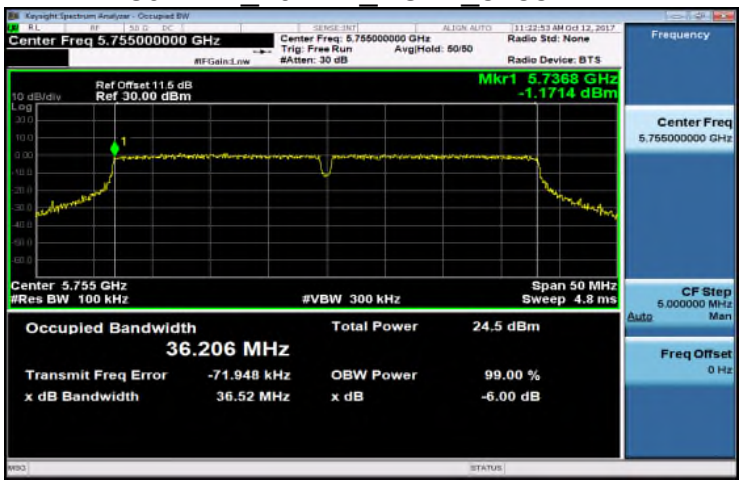
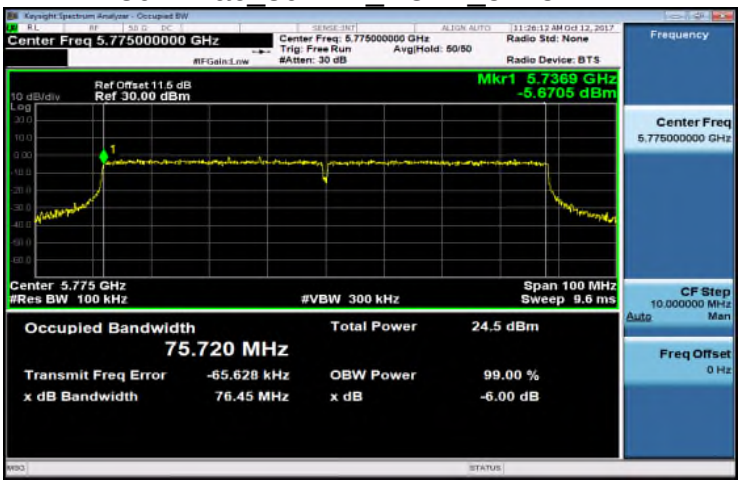
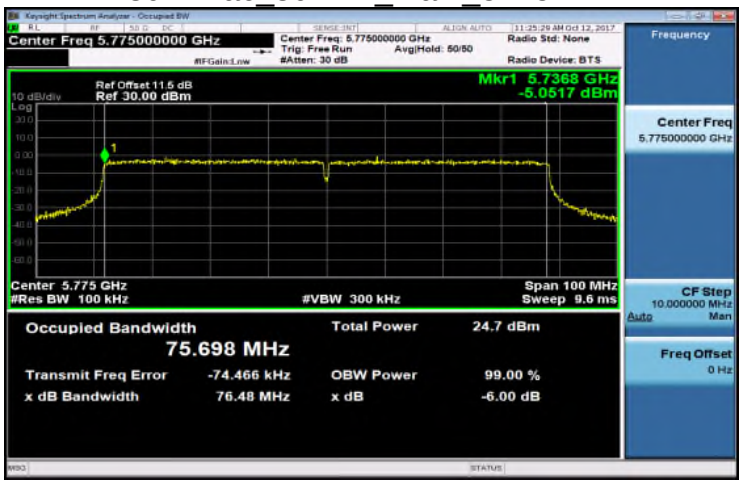
802.11n_40MHz_AUX2_5755MHz



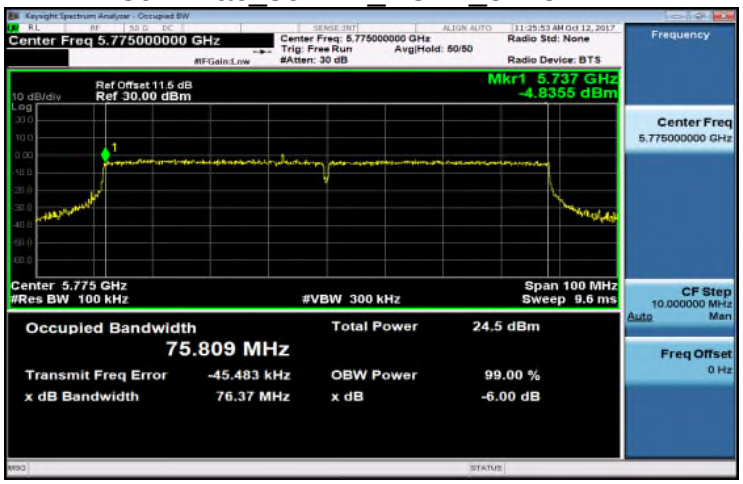
802.11ac_80MHz_AUX2_5775MHz



802.11ac_80MHz_Main_5775MHz



802.11ac_80MHz_AUX1_5775MHz



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9 MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT

9.1 Standard Applicable

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1	√	Access Point (Mater device)	1 Watt(30dBm)
		Fixed point-to-point Acess Ponit	1 Watt(30dBm)
		Mobile and portable clinet device	250mW(23.98dBm)
U-NII-3	√		1 Watt(30dBm)

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.

Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
UNII-1	5.04dBi	17dBm
U-NII-3	4.9dBi	30dBm

Therefore the limit no needs to reduce for the UNII-1, U-NII-2A, U-NII-2C and U-NII-3 band.

For the band UNII-1

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain (dBi) = 9.81

The effective legacy gain is 9.81 dBi, therefore the limit needs to reduce.

Limit = 30dBm – (9.81-6) = 26.19dBm

For the band U-NII-3

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain (dBi) = 9.67

The effective legacy gain is 9.67 dBi, therefore the limit needs to reduce.

Limit = 30dBm – (9.67-6) = 26.33dBm

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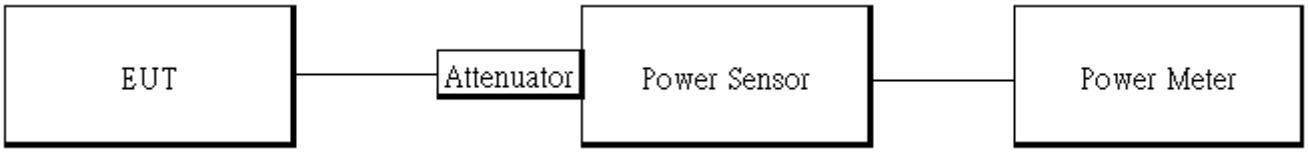
9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
5. Record the max. reading and add 10 log(1/duty cycle).
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

9.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2016	12/11/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

9.4 Test Set-up



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9.5 Measurement Result

Conducted output power (FCC)

802.11a_Main

CH	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	6	**24.26**	266.742	30	PASS
44	5220	6	24.19	262.477	30	PASS
48	5240	6	24.16	260.670	30	PASS
149	5745	6	**22.94**	196.830	30	PASS
157	5785	6	22.53	179.098	30	PASS
165	5825	6	22.35	171.827	30	PASS

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)				TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1	CH 2	CH3			
36	5180	MCS16	22.13	20.81	20.29		**25.93**	30	PASS
44	5220	MCS16	22.03	20.74	20.23		25.85	30	PASS
48	5240	MCS16	21.93	20.58	20.08		**25.72**	30	PASS
149	5745	MCS16	20.78	20.66	20.09		**25.30**	30	PASS
157	5785	MCS16	20.31	20.26	19.57		24.84	30	PASS
165	5825	MCS16	20.16	20.01	19.46		24.67	30	PASS

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)			TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1	CH 2			
38	5190	MCS16	21.13	19.91	19.65	25.06	26.19	PASS
46	5230	MCS16	21.23	20.34	19.96	**25.33**	26.19	PASS
151	5755	MCS16	20.31	20.12	19.47	**24.76**	26.33	PASS
159	5795	MCS16	19.91	19.64	18.92	24.29	26.33	PASS

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)			TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1	CH 2			
42	5210	MCS8	19.49	18.41	18.11	**23.49**	26.19	PASS
155	5775	MCS8	18.24	18.5	18.08	**23.06**	26.33	PASS

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10 PEAK POWER SPECTRAL DENSITY

10.1 Standard Applicable

OPERZTION Band	EUT CATEGORY		LIMIT
U-NII-1	√	Access Point (Mater device)	17dBm/ MHz
		Fixed point-to-point Acess Ponit	
		Mobile and portable clinet device	11dBm/ MHz
U-NII-3	√		30dBm/ 500kHz

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
UNII-1	5.04dBi	17dBm
U-NII-3	4.9dBi	30dBm

Therefore the limit needs to reduce for the UNII-1, U-NII-2A, U-NII-2C and U-NII-3 band.

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10.2 Measurement Procedure

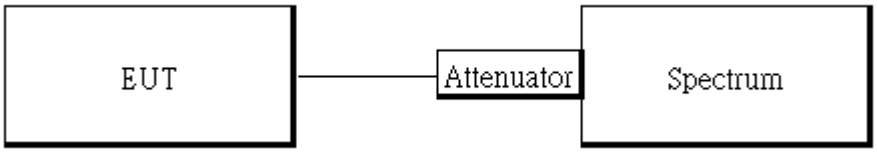
1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
4. **For U-NII1, U-NII-2A, U-NII-2C Band**:
   Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
   For U-NII-3 Band:
   Set RBW=500 kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)
5. User the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add 10 log(1/duty cycle).
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

10.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2016	12/11/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

10.4 Test Set-up



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10.5 Measurement Result

POWER DENSITY 802.11a MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	10.07	0.01	10.08	17	-6.92
5220	10.85	0.01	10.86	17	-6.14
5240	10.44	0.01	10.45	17	-6.55
5260		0.01	0.01	11	-10.99
5300		0.01	0.01	11	-10.99
5320		0.01	0.01	11	-10.99
5500		0.01	0.01	11	-10.99
5580		0.01	0.01	11	-10.99
5700		0.01	0.01	11	-10.99
5745	13.92	0.01	13.92	30	-16.08
5785	14.16	0.01	14.16	30	-15.84
5825	14.24	0.01	14.24	30	-15.76
POWER DENSITY 802.11n HT20 MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5180	12.95	0.01	12.96	13.19	-0.23
5220	12.64	0.01	12.65	13.19	-0.54
5240	13.05	0.01	13.06	13.19	-0.13
5260		0.01	0.01	11	-10.99
5300		0.01	0.01	11	-10.99
5320		0.01	0.01	11	-10.99
5500		0.01	0.01	11	-10.99
5580		0.01	0.01	11	-10.99
5700		0.01	0.01	11	-10.99
5745	16.47	0.01	16.47	26.33	-9.86
5785	16.22	0.01	16.22	26.33	-10.11
5825	16.15	0.01	16.15	26.33	-10.18
POWER DENSITY 802.11n HT40 MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5190	8.3	0.01	8.31	13.19	-4.88
5230	12.41	0.01	12.42	13.19	-0.77
5270		0.01	0.01	13.19	-13.18
5310		0.01	0.01	11	-10.99
5510		0.01	0.01	11	-10.99
5550		0.01	0.01	11	-10.99
5670		0.01	0.01	11	-10.99
5755	17.64	0.01	17.64	26.33	-8.69
5795	17.11	0.01	17.11	26.33	-9.22
POWER DENSITY 802.11ac VHT80 MODE					
Frequency (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Margin (dB)
5210	5.84	0.01	5.85	13.19	-7.34
5775	9.47	0.01	9.47	26.33	-16.86

Note:

SISO offset= 11.5 dB

MIMO offset= 16.3 dB

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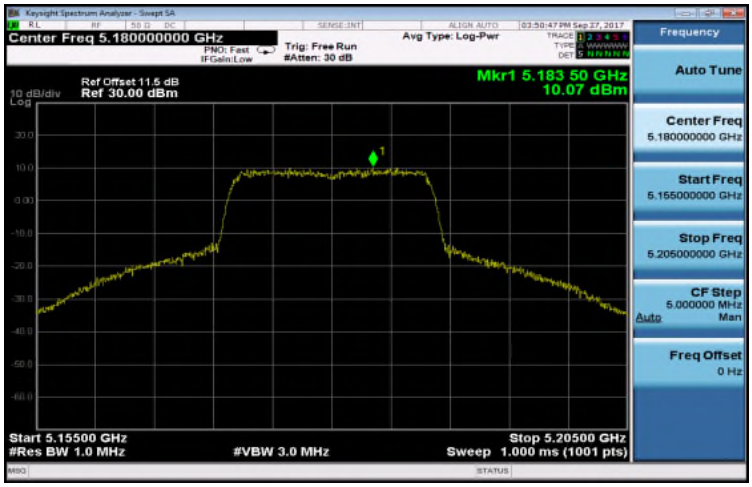
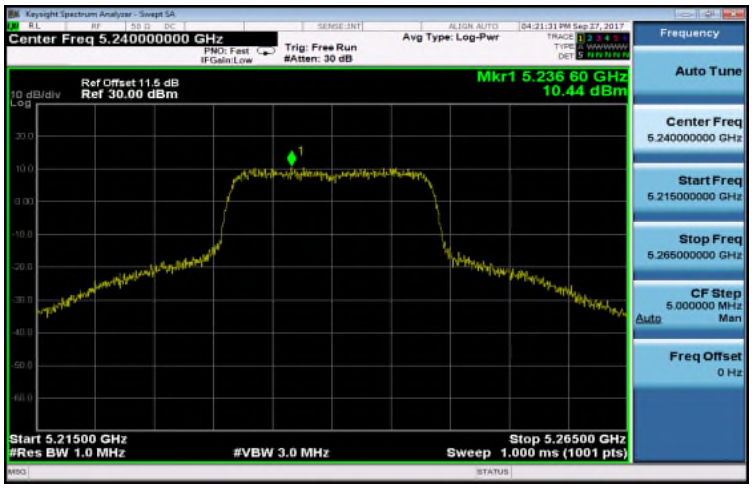
802.11a 5150~5250 MHz

Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

Peak Power Spectral Density Data Plot (CH High 5240 MHz)



802.11a 5725~5850 MHz

Peak Power Spectral Density Data Plot (CH Low 5745 MHz)

Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)

Peak Power Spectral Density Data Plot (CH High 5825 MHz)

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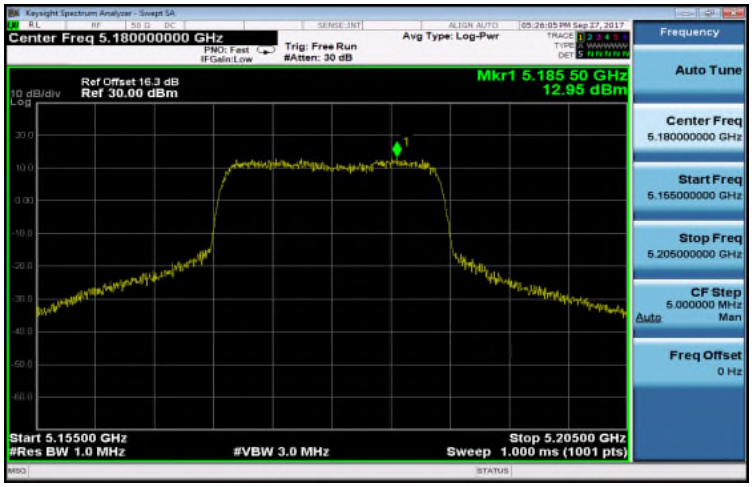
802.11n HT20, 5150~5250 MHz

Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



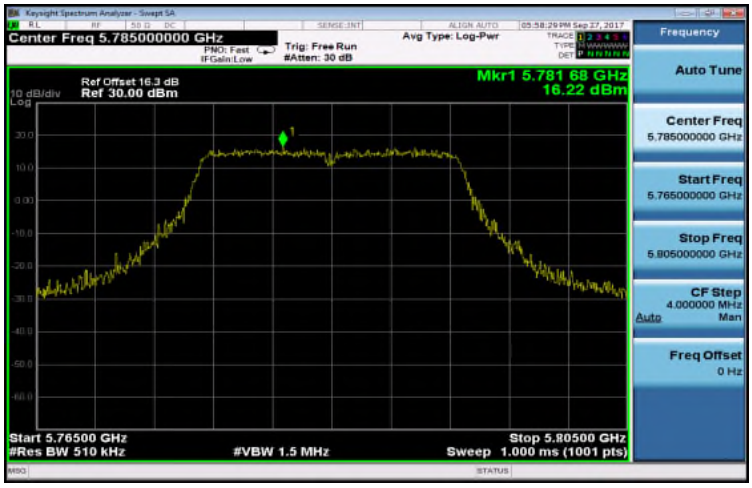
Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

Peak Power Spectral Density Data Plot (CH High 5240 MHz)

802.11n HT20, 5725~5850 MHz

Peak Power Spectral Density Data Plot (CH Low 5745 MHz)

Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)



Peak Power Spectral Density Data Plot (CH High 5825 MHz)

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802.11n HT40, 5150~5250 MHz

Peak Power Spectral Density Data Plot (CH Low 5190 MHz)

Peak Power Spectral Density Data Plot (CH High 5230 MHz)

802.11n HT40, 5725~5850 MHz

Peak Power Spectral Density Data Plot (CH Low 5755 MHz)

Peak Power Spectral Density Data Plot (CH High 5795 MHz)

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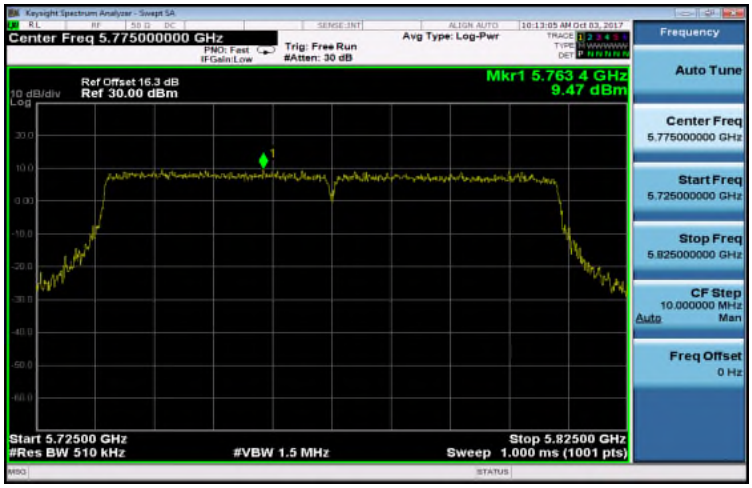
802.11ac VHT80, 5150~5250 MHz
Peak Power Spectral Density Data Plot (CH Mid 5210 MHz)

802.11ac VHT80, 5470~5725 MHz

Peak Power Spectral Density Data Plot (CH High 5725 MHz)



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11 UNDESIRABLE RADIATED EMISSION MEASUREMENT

11.1 Standard Applicable

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 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRENGTH AT 3m	
	PK: 74 (dBµV/m)	AV 54 (dBµV/m)
APPLICABLE TO	**EIRP LIMIT**	**FIELD STRENGTH AT 3m**
15.407(b)(1)	PK: -27 (dBm/MHz)	PK: 68.3 (dBµV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4
*1 beyond 75 MHz or more above of the bandedge. *2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above. *3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above. *4 from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.		

EIRP = ((E*d)^2) / 30, where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBµV/m) = 20 log Emission level (dBµV/m)

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Member of SGS Group

11.2 Measurement Equipment Used

SGS SAC-III					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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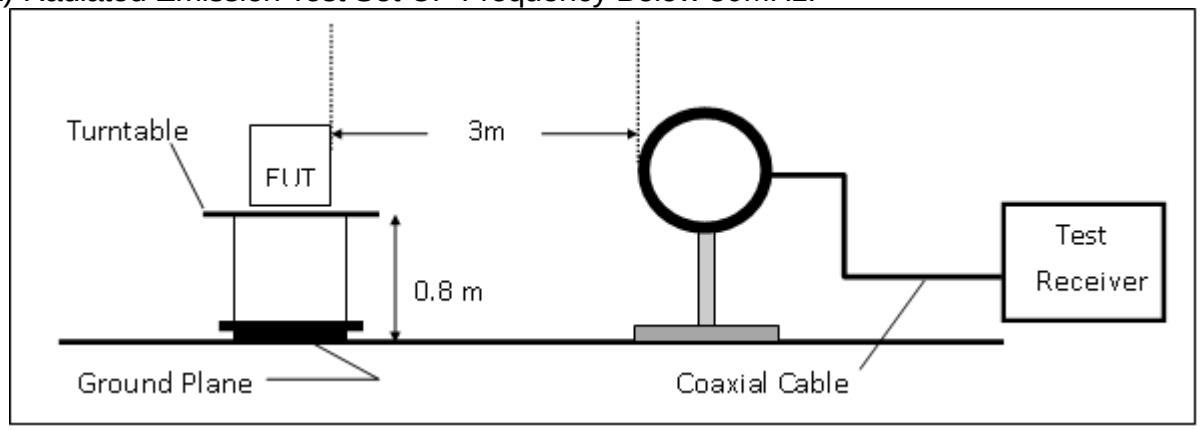
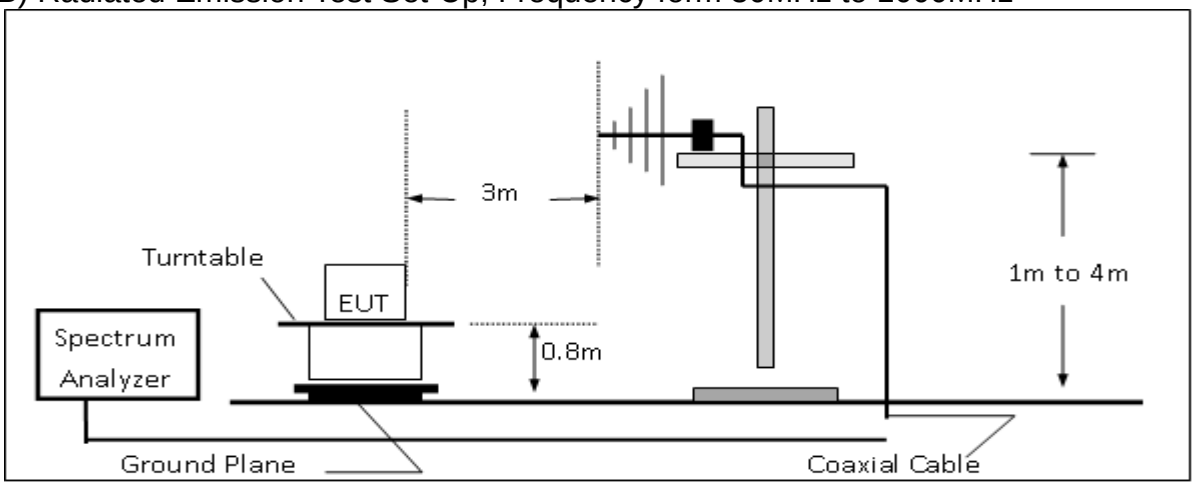
11.3 Test SET-UP

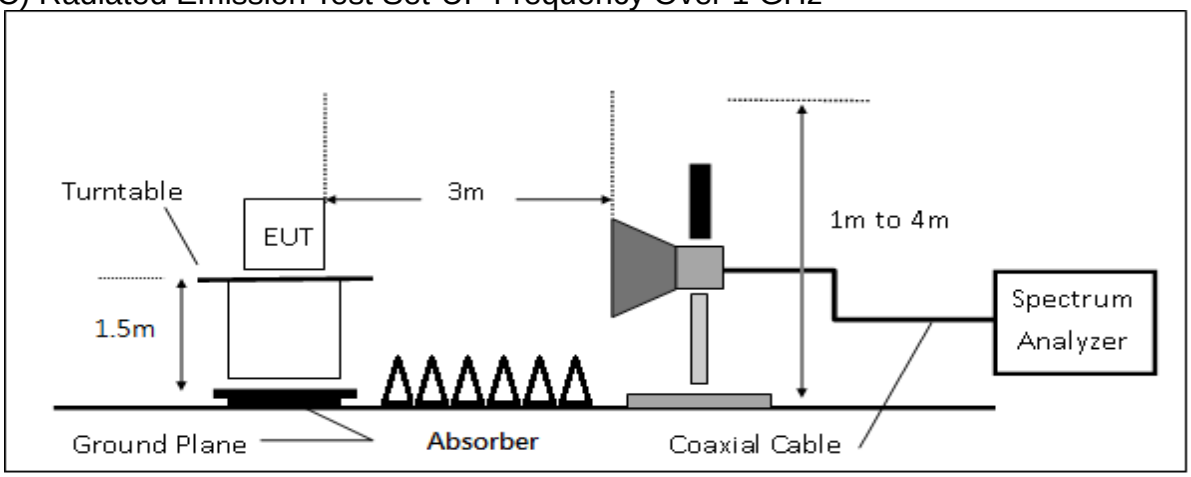
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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11.4 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
3. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
4. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
5. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all frequency measured were complete.

11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)
Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :
"**F**" : denotes Fundamental Frequency. ; "**H**" : denotes Harmonic Frequency.
"**E**" : denotes Band Edge Frequency. ; "**S**" : denotes Spurious Frequency.

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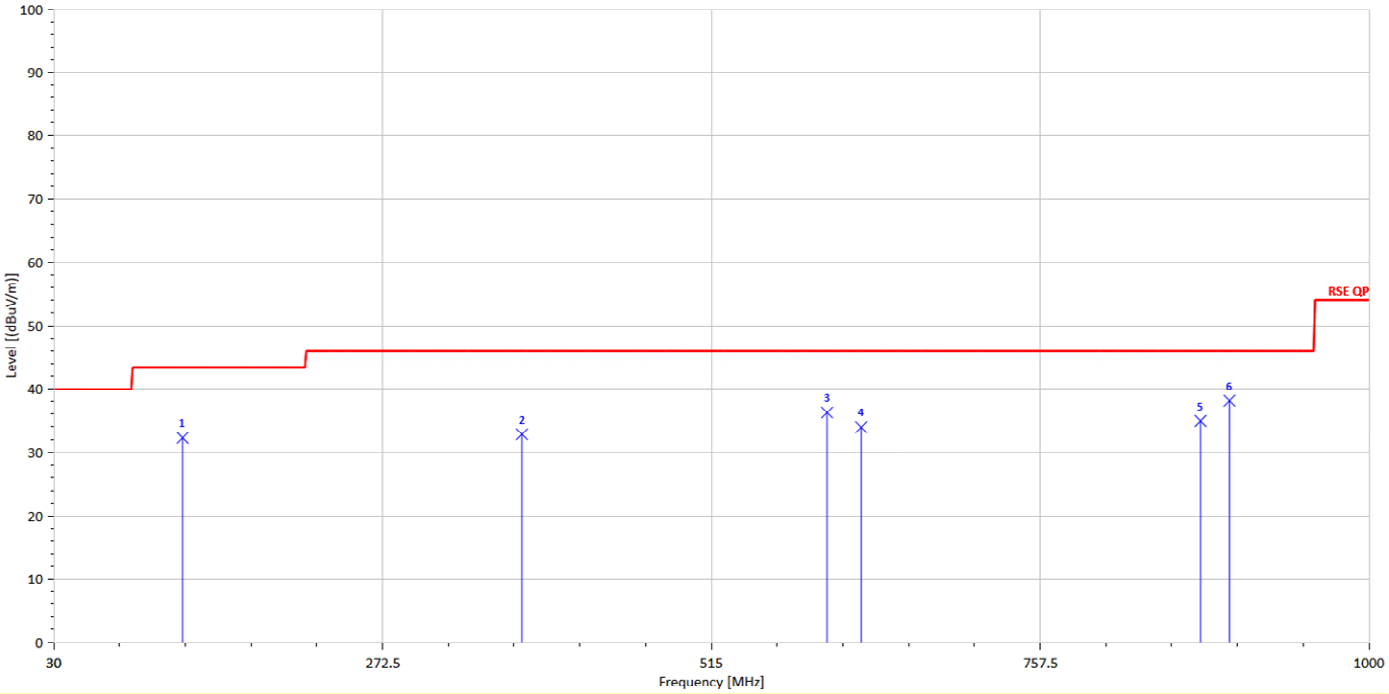
11.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

11.7 Measurement Result

Radiated Spurious Emission Measurement Result
Below 1GHz Worst-Case Data:
802.11a 5150~5250 MHz

Operation Mode :	802.11aB1	Test Date :	2017/9/26
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
125.06	S	Peak	47.94	-15.68	32.26	43.5	-11.24
375.32	S	Peak	43.36	-10.53	32.83	46	-13.17
600.36	S	Peak	42.84	-6.56	36.28	46	-9.72
625.58	S	Peak	40.05	-6.10	33.95	46	-12.05
875.84	S	Peak	37.75	-2.80	34.94	46	-11.06
897.18	S	Peak	40.53	-2.37	38.16	46	-7.84

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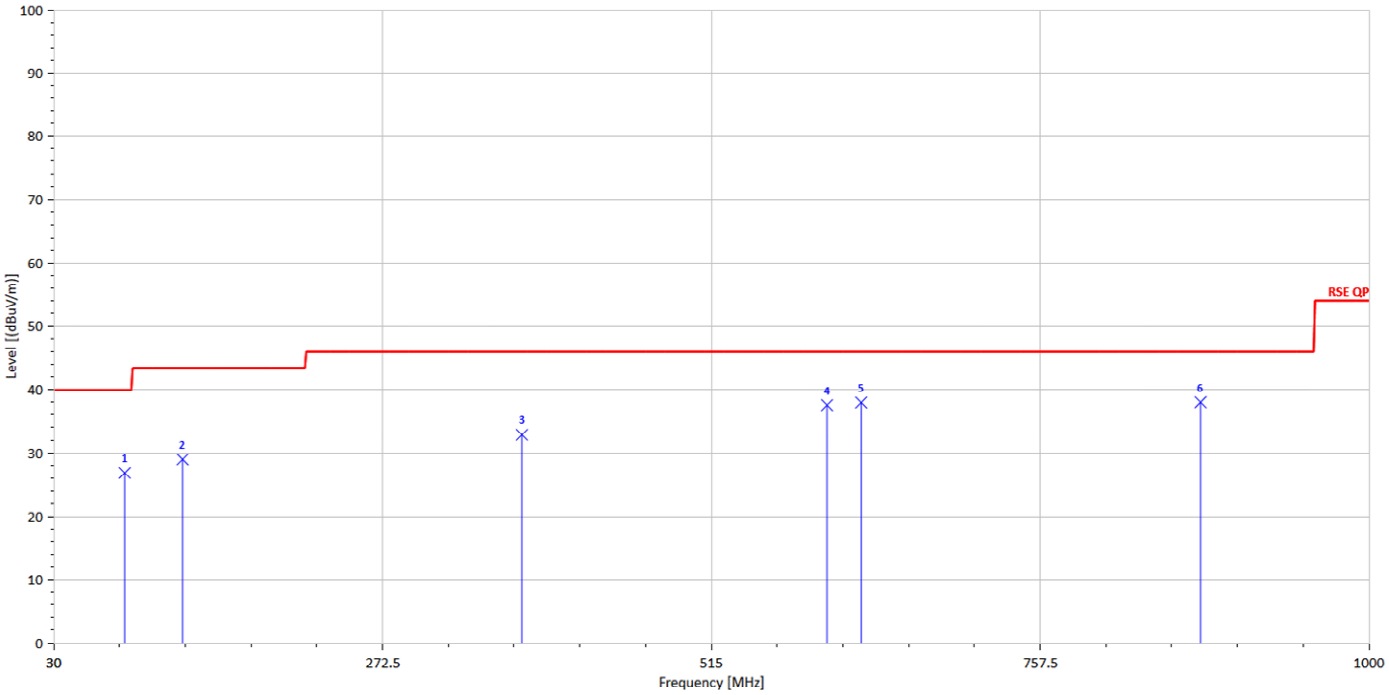
Operation Mode :	802.11aB1	Test Date :	2017/9/26
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
82.38	S	Peak	47.41	-20.61	26.80	40	-13.20
125.06	S	Peak	44.61	-15.68	28.93	43.5	-14.57
375.32	S	Peak	43.38	-10.53	32.85	46	-13.15
600.36	S	Peak	44.13	-6.56	37.57	46	-8.43
625.58	S	Peak	44.08	-6.10	37.98	46	-8.02
875.84	S	Peak	40.84	-2.80	38.03	46	-7.97

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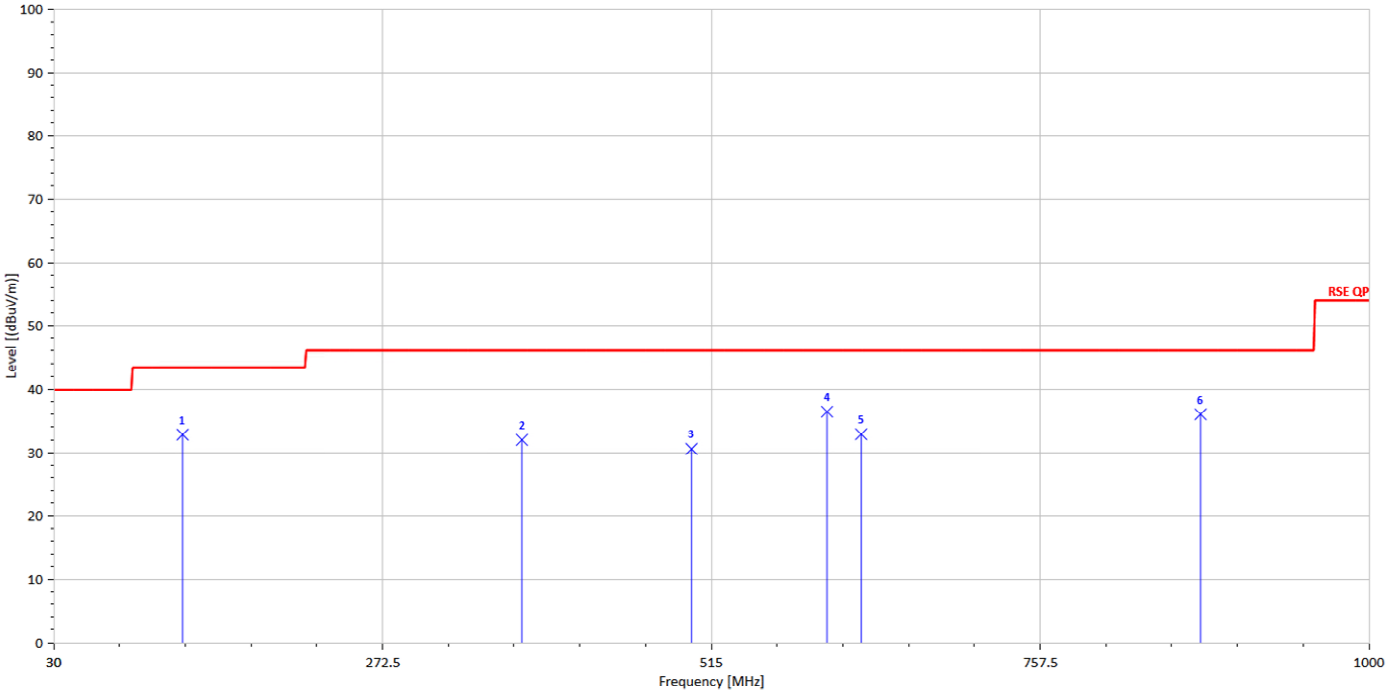
802.11a 5725~5850 MHz

Operation Mode :	802.11aB4	Test Date :	2017/9/26
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
125.06	S	Peak	48.51	-15.68	32.83	43.5	-10.67
375.32	S	Peak	42.52	-10.53	31.99	46	-14.01
500.45	S	Peak	38.09	-7.53	30.56	46	-15.44
600.36	S	Peak	43.02	-6.56	36.46	46	-9.54
625.58	S	Peak	38.99	-6.10	32.89	46	-13.11
875.84	S	Peak	38.86	-2.80	36.06	46	-9.94

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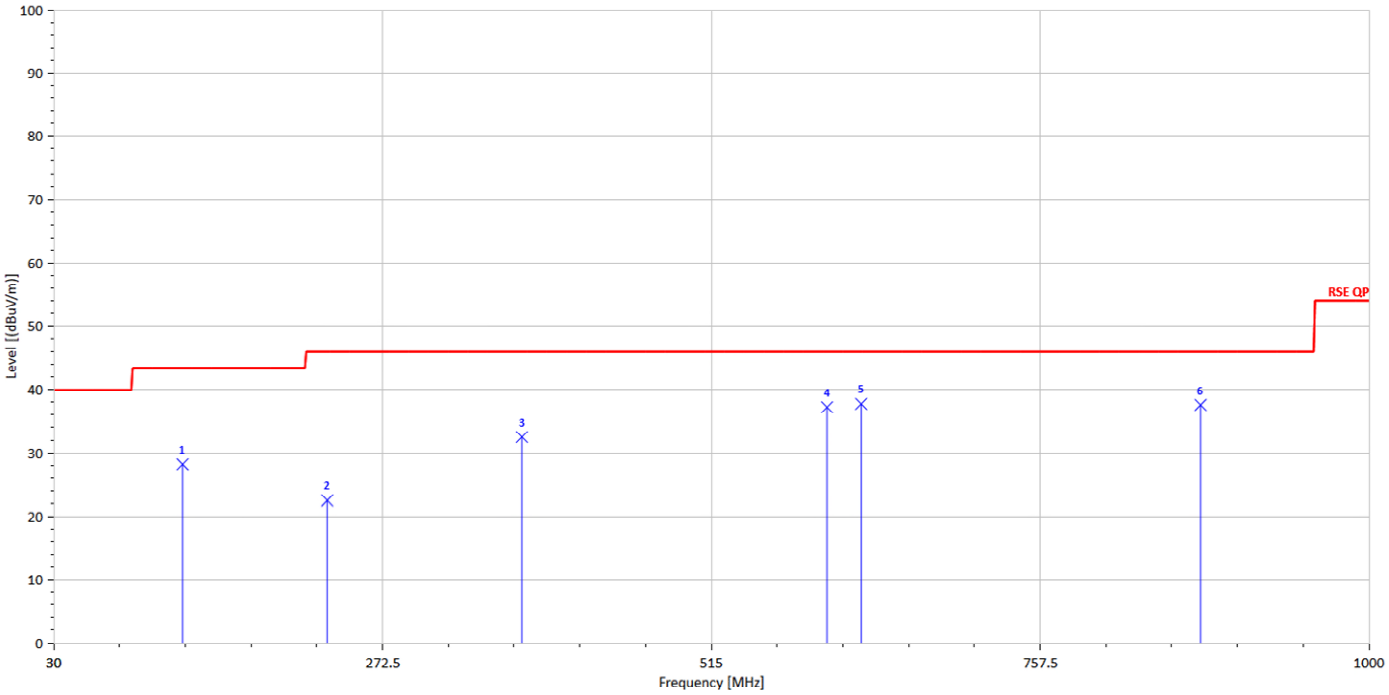
Operation Mode :	802.11aB4	Test Date :	2017/9/26
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Enzo
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
125.06	S	Peak	43.84	-15.68	28.16	43.5	-15.34
231.76	S	Peak	38.55	-16.09	22.46	46	-23.54
375.32	S	Peak	43.03	-10.53	32.50	46	-13.50
600.36	S	Peak	43.79	-6.56	37.23	46	-8.77
625.58	S	Peak	43.85	-6.10	37.75	46	-8.25
875.84	S	Peak	40.39	-2.80	37.59	46	-8.41

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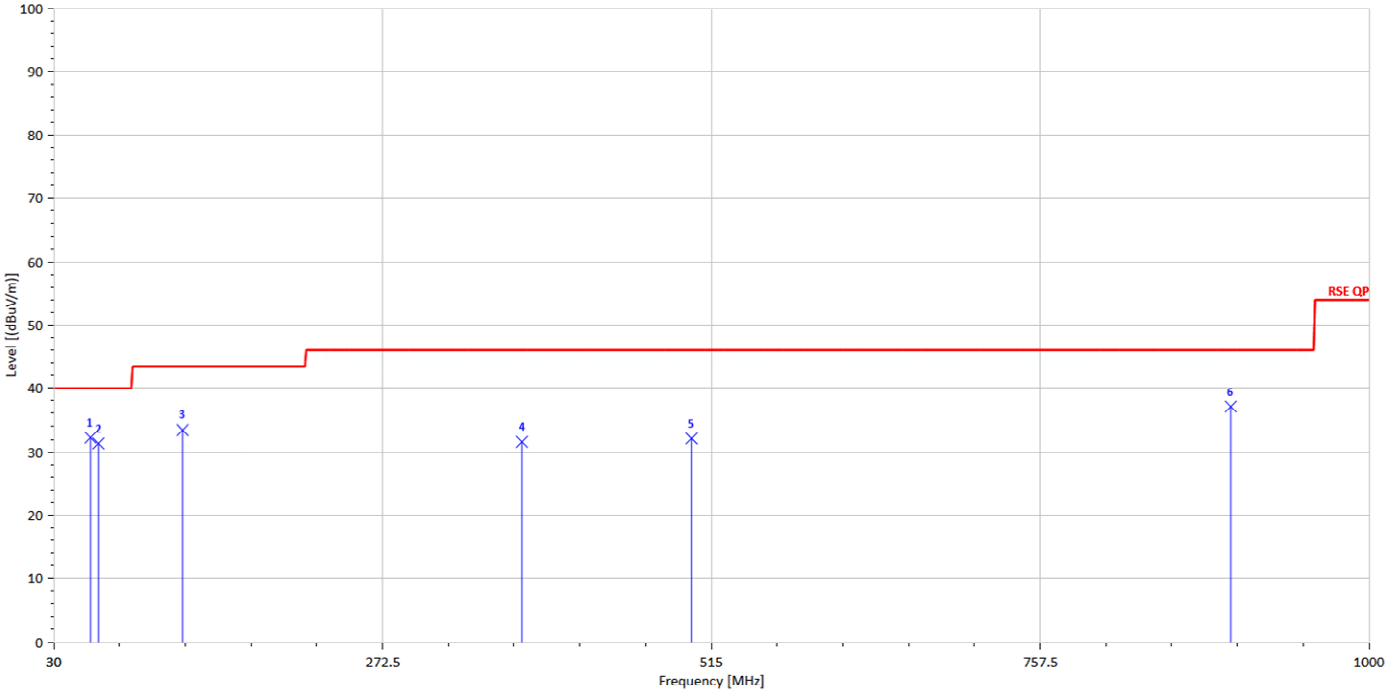
802.11ac VHT80, 5150~5250 MHz

Operation Mode :	802.11ac80B1	Test Date :	2017/10/2
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
57.16	S	Peak	54.27	-21.98	32.29	40	-7.71
62.98	S	Peak	53.93	-22.56	31.37	40	-8.63
125.06	S	Peak	49.15	-15.68	33.47	43.5	-10.03
375.32	S	Peak	42.15	-10.53	31.63	46	-14.37
500.45	S	Peak	39.69	-7.53	32.16	46	-13.84
898.15	S	Peak	39.44	-2.36	37.08	46	-8.92

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