

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

**FCC Applicant:** Honeywell International Inc.  
9680 Old Bailes Road, Fort Mill, SC 29707, USA

**IC Applicant:** Honeywell International Inc.  
9680 Old Bailes Road, Fort Mill, SC 29707, USA

**Product Name:** Vehicle Mount Computer

**Brand Name:** Honeywell

**Model No.:** VM1A-L0N

**Model Difference:** N/A

**FCC ID:** HD5-VM1AL0N

**IC:** 1693B-VM1AL0N

**Report Number:** ER/2018/90026

**FCC Rule Part:** §15.407, Cat:NII

**IC Rule:** RSS-247 issue 2 Feb. 2017

**Issue Date:** Nov. 08, 2018

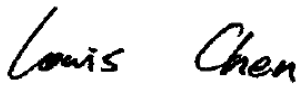
**Date of Test:** Sep. 12, 2018 ~ Oct. 02, 2018

**Date of EUT Received:** Sep. 04, 2018

**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.

**Tested By:**   
 \_\_\_\_\_  
**Louis Chen / Sr. Engineer**

**Approved By:**   
 \_\_\_\_\_  
**CHUN-CHIEH CHEN /  
Asst. Supervisor**



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## Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/90026	Rev.00	Initial creation of document	All	Oct. 05, 2018	Elle Chang
ER/2018/90026	Rev. 01	Section 1.1, 11 & 15 & 16	6, 386~389	Nov. 08, 2018	Allen Tsai

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# 1 GENERAL INFORMATION

## 1.1 Product Description

General:

Product Name:	Vehicle Mount Computer	
Brand Name:	Honeywell	
Model No.:	VM1A-L0N	
Model Difference:	N/A	
Product HW/SW version:	VM1AL0N / 85.00.00-0322	
Radio HW/SW version:	V1.0 / V5.1.1.28U	
Power Supply:	10.8Vdc from Rechargeable Li-ion Battery or 15Vdc from AC/DC Adapter.	
	Battery:	Model No.: 163176-0001 Rev C / OVT310L1R00 C, Supplier: TOTEX
	Adapter:	Model No.: GT-46600-6015-T3, Supplier: GlobTek, Inc.

### FCC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. Power (dBm)	Modulation Technology
11a_20	5150~5250	4	13.95	OFDM
	5250~5350	4	20.93	
	5470~5725	12	20.77	
	5725-5850	5	20.97	
11n_HT / ac_VHT 20M	5150~5250	4	HT: 13.81	OFDM
	5250~5350	4	HT: 20.92	
	5470~5725	12	HT: 20.77	
	5725-5850	5	HT: 21.15	
11n_HT / ac_VHT 40M	5150~5250	2	HT: 13.70	OFDM
	5250~5350	2	HT: 21.16	
	5470~5725	6	HT:21.07	
	5725-5850	2	HT: 21.27	
11ac VHT80M	5150~5250	1	13.21	OFDM
	5250~5350	1	9.25	
	5470~5725	2	20.56	
	5725-5850	1	20.05	

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**IC WLAN 5GHz:**

Wi-Fi	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm) (Worst Case)	Modulation Technology
11a	5150~5250	4	EIRP	21.96	OFDM
	5250~5350	4	Avg.	20.93	
	5470~5725	12	Avg.	20.77	
	5725-5850	5	Avg.	20.97	
11n_HT / ac_VHT 20M	5150~5250	4	EIRP	HT: 21.82	OFDM
	5250~5350	4	Avg.	HT: 20.92	
	5470~5725	12	Avg.	HT: 20.77	
	5725-5850	5	Avg.	HT: 21.15	
11n_HT / ac_VHT 40M	5150~5250	2	EIRP	HT: 21.71	OFDM
	5250~5350	2	Avg.	HT: 21.16	
	5470~5725	6	Avg.	HT: 21.07	
	5725-5850	2	Avg.	HT: 21.27	
11ac VHT80M	5150~5250	1	EIRP	21.22	OFDM
	5250~5350	1	Avg.	9.25	
	5470~5725	2	Avg.	20.56	
	5725-5850	1	Avg.	20.05	
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 –144.4Mbps 802.11 ac_40MHz: 27 – 400 .0Mbps 802.11 ac_80MHz: 58.5 – 866.7Mbps				

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## Antenna designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Transmitter Chain	Peak Antenna Gain (dBi)	MIMO Antenna Gain (dBi)	Worst Antenna Gain
External di-pole antenna	LARSEN	R380500314	5150~5250	Ch 0 & Ch 1	5	8.01	V
			5250~5350	Ch 0 & Ch 1	5	8.01	V
			5470~5725	Ch 0 & Ch 1	5	8.01	V
			5725~5850	Ch 0 & Ch 1	5	8.01	V
	LAIRD	WTS 2450	5150~5250	Ch 0 & Ch 1	2.6	5.61	
			5250~5350	Ch 0 & Ch 1	2.6	5.61	
			5470~5725	Ch 0 & Ch 1	2.6	5.61	
			5725~5850	Ch 0 & Ch 1	3.4	6.41	
Internal Printed Antenna	N/A	N/A	5150~5250	Ch 0	4.7	7.56	
			5250~5350	Ch 0	4.6	7.66	
			5470~5725	Ch 0	4.8	7.86	
			5725~5850	Ch 0	4.7	7.08	
			5150~5250	Ch 1	4.4	7.56	
			5250~5350	Ch 1	4.7	7.66	
			5470~5725	Ch 1	4.9	7.86	
			5725~5850	Ch 1	3.4	7.08	

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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 v02r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

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.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803. (TAF code 0513)

FCC Registration Numbers are: 509634 / TW0001

Canada Registration Number: 4620A-4

## 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

#### 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.

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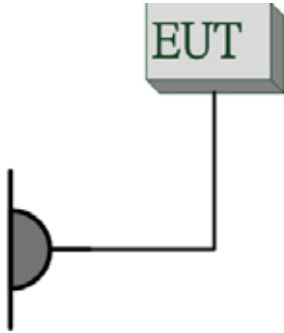
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## 2.5 Configuration of Tested System

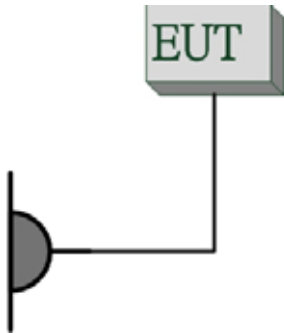
**Fig. 2-1 Radiated Emission Configuration**



**Fig.2-3 Conducted Emission (Antenna Port) Configuration**



**Fig. 2-2 Conducted Emission (AC Power Line) 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

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### 3 SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-247 §6.2.1~ 4 (1) RSS-Gen §6.6	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Power Spectral Density	Compliant
§15.407(b)	RSS-247 §6.2.1~ 4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.7 RSS- Gen §8.3	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 5250 MHz ~5350 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode	
channel	Frequency
52	5260
56	5280
60	5300
64	5320

802.11 n HT40 Mode, 802.11ac VHT40 Mode	
channel	Frequency
54	5270
62	5310

802.11ac VHT80 Mode	
Channel	Frequency
58	5290

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**Operated band in 5470 MHz ~5725 MHz:**

<b>802.11a / n HT20 Mode, 802.11ac VHT20 Mode</b>	
Channel	Frequency
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700

<b>802.11 n HT40 Mode, 802.11ac VHT40 Mode</b>	
channel	Frequency
102	5510
110	5550
118	5590
126	5630
134	5670

<b>802.11ac VHT80 Mode</b>	
channel	Frequency
106	5530
122	5610

**Operated band in 5745 MHz ~5850 MHz:**

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

<b>802.11 n HT40 Mode, 802.11ac VHT40 Mode</b>	
channel	Frequency
151	5755
159	5795

<b>802.11ac VHT80 Mode</b>	
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.
4. The given UE is pre-scanned among 802.11n and ac modes, and 802.11n yields the highest reading that generates the highest emission.

#### RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)						
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	2TX
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	2TX
802.11a	5500~5720	100 to 140	100,116,140	OFDM	6	2TX
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	2TX
RADIATED EMISSION TEST (ABOVE 1 GHz)						
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	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	VHT0	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	2TX
802.11n_HT20				OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	VHT0	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	2TX
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	VHT0	MIMO
802.11a	5260~5320	52 to 64	52,60,64	OFDM	6	2TX
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	VHT0	MIMO
802.11a	5500~5700	100 to 140	100,116,140	OFDM	6	2TX
802.11n_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11n_HT40 802.11ac_VHT40	5510~5670	102 to 134	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	VHT0	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	2TX
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	VHT0	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 : <b>Vertical</b> )	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 : <b>Horizontal</b> )	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	ESCI7	100335	02/02/2018	02/01/2019
LISN	SCHWARZ-BECK	NSLK 8127	8127-649	05/18/2018	05/17/2019

### 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 tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

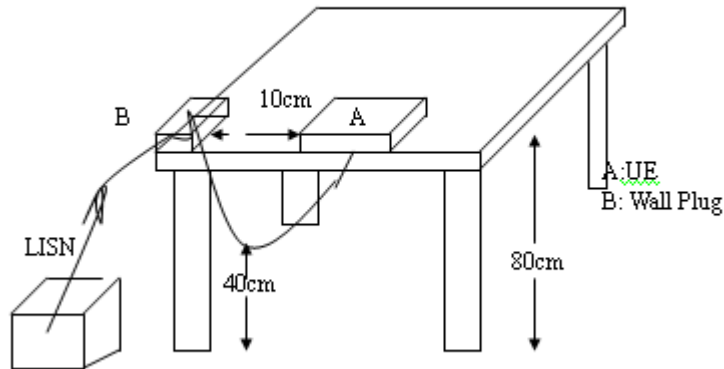
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## 6.4 Test SET-UP



## 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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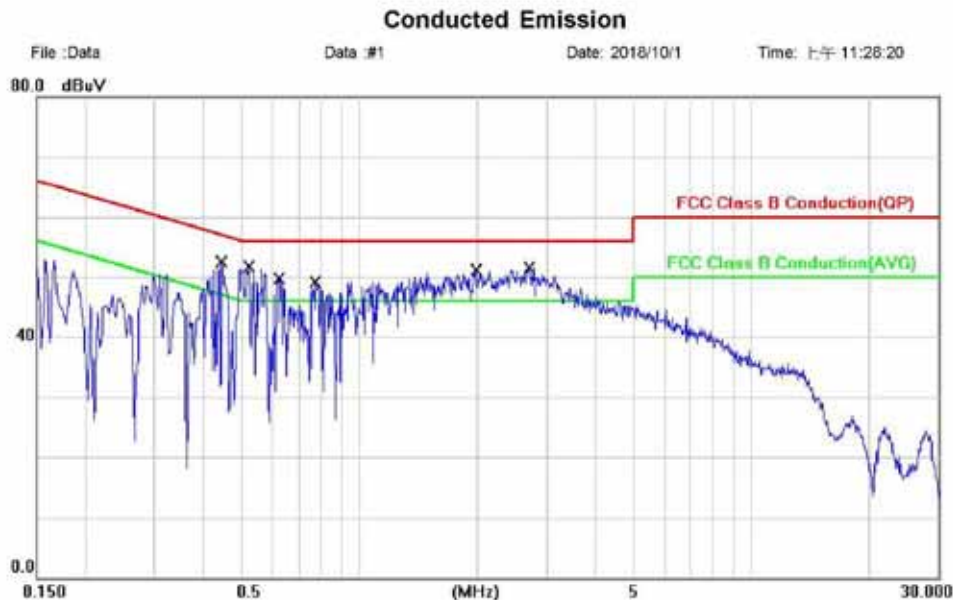
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode	Test By:	Jerry
-----------------	----------------	----------	-------

Site: Conduction Room	Phase: <b>L1</b>	Temperature: 25 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 85 %
Mode: Operation		
Note: Adapter: GT-46600-6015-T3		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.4460	50.90	0.04	50.94	56.95	-6.01	QP	
2		0.4460	39.50	0.04	39.54	46.95	-7.41	AVG	
3		0.5220	49.30	0.04	49.34	56.00	-6.66	QP	
4		0.5220	34.00	0.04	34.04	46.00	-11.96	AVG	
5		0.6220	48.50	0.04	48.54	56.00	-7.46	QP	
6		0.6220	37.10	0.04	37.14	46.00	-8.86	AVG	
7		0.7740	47.50	0.05	47.55	56.00	-8.45	QP	
8		0.7740	36.10	0.05	36.15	46.00	-9.85	AVG	
9		1.9860	46.80	0.06	46.86	56.00	-9.14	QP	
10		1.9860	37.20	0.06	37.26	46.00	-8.74	AVG	
11		2.7140	45.80	0.09	45.89	56.00	-10.11	QP	
12		2.7140	38.00	0.09	38.09	46.00	-7.91	AVG	

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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:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

### Measurement Procedure:

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

Duty Cycle:

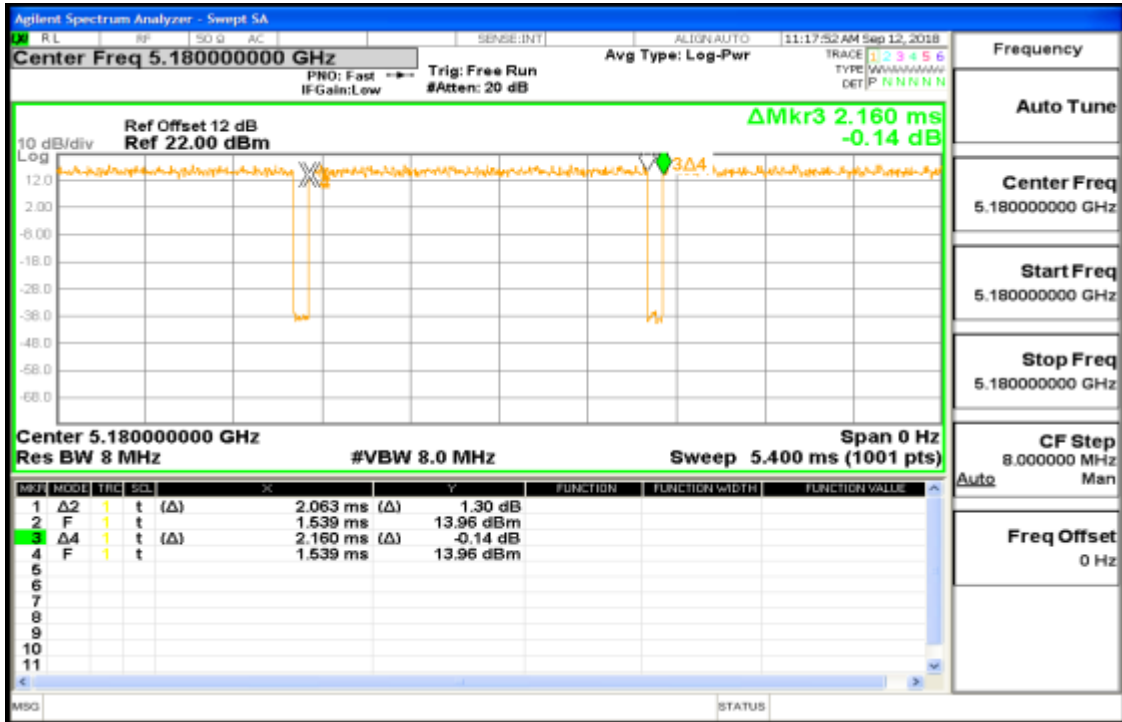
Mode	Duty Cycle (%)	Duty Factor (dB) =10*log ( 1/Duty Cycle )	1/T (kHz)	VBW setting (kHz)
802.11a	95.50	0.20	0.48	1.00
802.11n_20	91.90	0.37	1.02	2.00
802.11ac_20	95.38	0.21	0.52	1.00
802.11n_40	84.08	0.75	2.02	3.00
802.11ac_40	91.96	0.36	1.05	2.00
802.11ac_80	84.96	0.71	2.16	3.00

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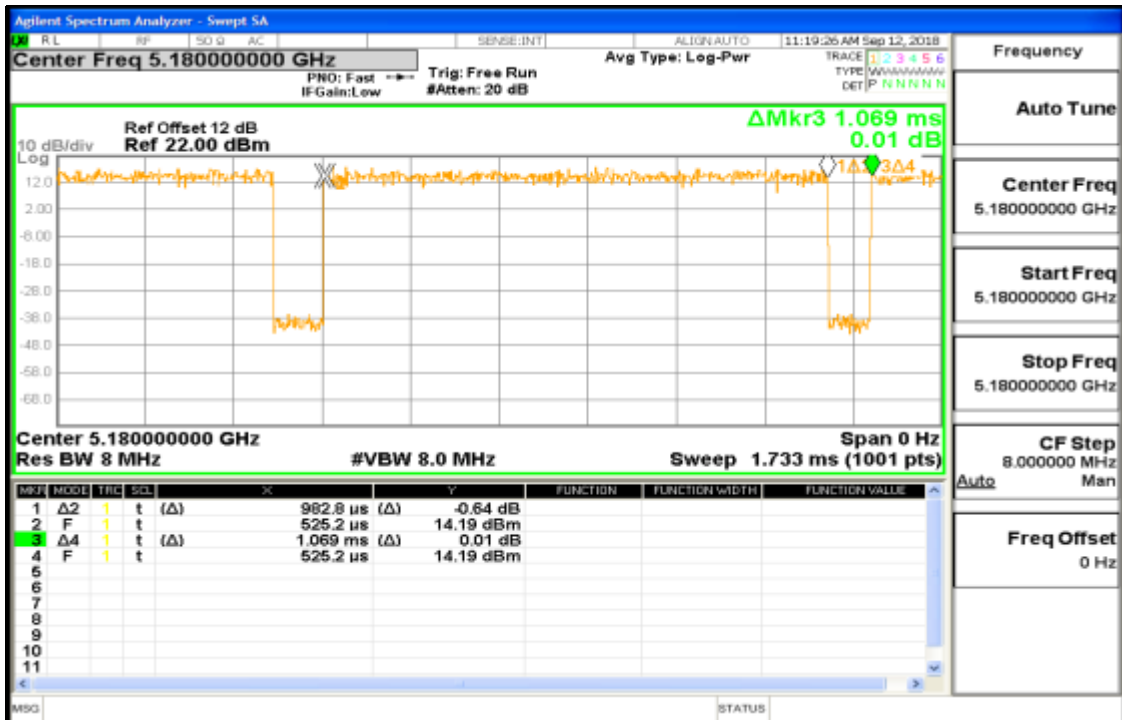
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## DUTY CYCLE TEST SIGNAL Measurement Result 802.11a



## 802.11n HT20

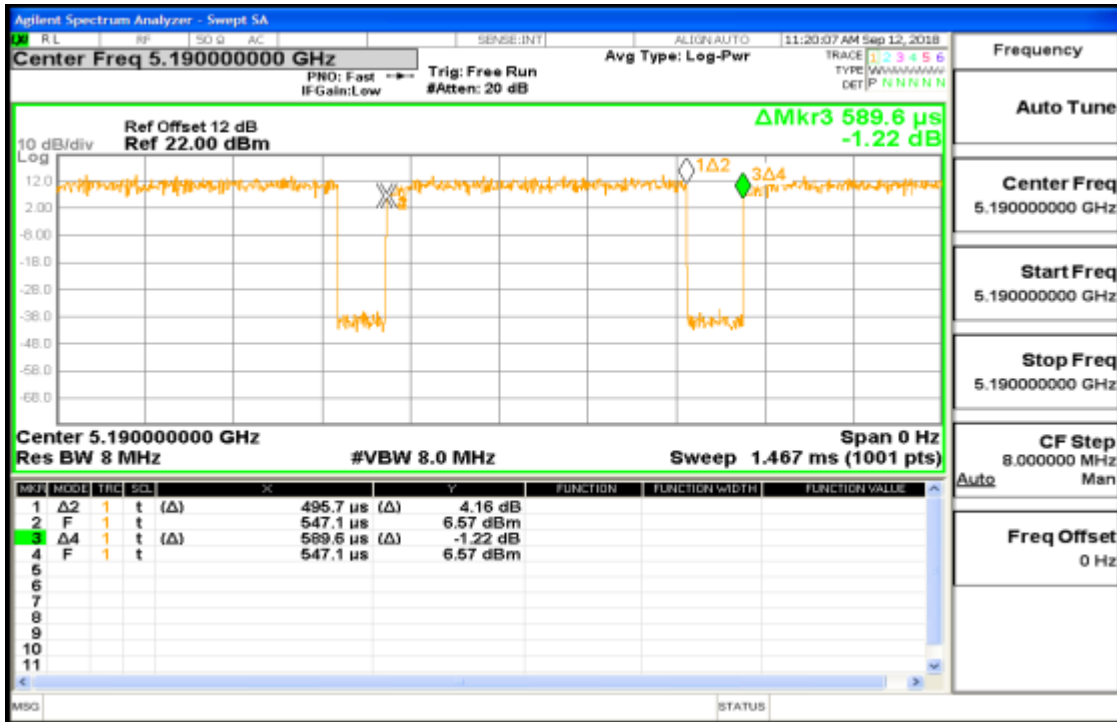


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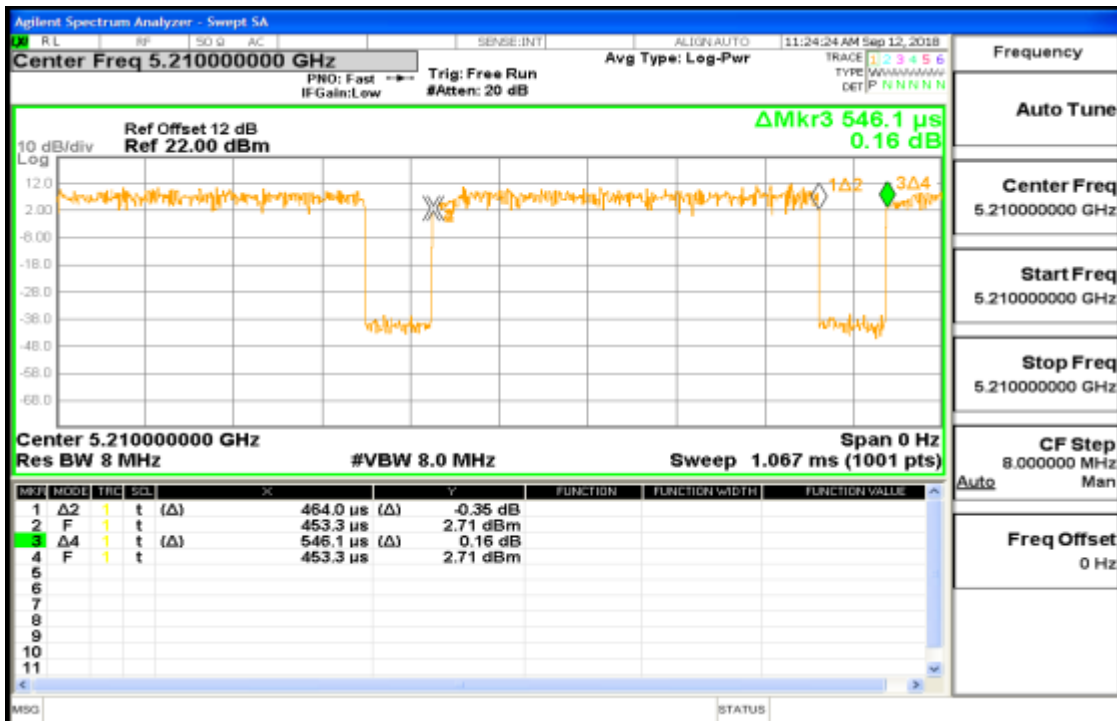
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### 802.11n HT 40



### 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. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

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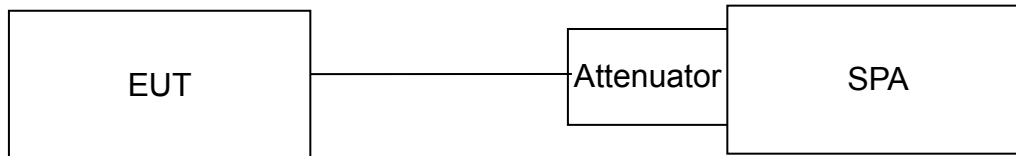
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### 8.3 Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/03/2018	05/02/2019
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2018	01/01/2019
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2018	01/01/2019
Coaxial Cables	N/A	WK CE Cable	N/A	01/02/2018	01/01/2019
Power Meter	Anritsu	ML2496A	1804001	02/01/2018	01/31/2019
Power Sensor	Anritsu	MA2411B	1726104	02/01/2018	01/31/2019
Power Sensor	Anritsu	MA2411B	1726107	02/01/2018	01/31/2019

### 8.4 Test Set-up



### 8.5 Measurement Result

#### 26dB and 6dB Bandwidth

##### 802.11a\_Ch0

##### 802.11a\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	21.23	13.269	5180	21.36	13.295
5220	21.11	13.244	5220	21.19	13.262
5240	21.17	13.257	5240	21.29	13.282
5260	30.00	14.771	5260	30.00	14.771
5300	30.00	14.771	5300	30.00	14.771
5320	27.69	14.422	5320	27.49	14.392
5500	24.29	13.854	5500	22.96	13.610
5580	30.00	14.771	5580	30.00	14.771
5700	21.37	13.297	5700	21.50	13.324

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802.11a\_Ch0

802.11a\_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.36	12.137	5745	16.36	12.139
5785	16.13	12.075	5785	16.36	12.138
5825	16.35	12.135	5825	16.33	12.130

802.11n\_HT20\_Ch0

802.11n\_HT20\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	22.94	13.606	5180	23.51	13.712
5220	22.90	13.599	5220	23.36	13.685
5240	22.90	13.597	5240	22.86	13.590
5260	30.00	14.771	5260	30.00	14.771
5300	30.00	14.771	5300	30.00	14.771
5320	26.77	14.276	5320	26.47	14.228
5500	23.17	13.649	5500	22.79	13.578
5580	30.00	14.771	5580	30.00	14.771
5700	23.14	13.643	5700	23.30	13.674

802.11n\_HT20\_Ch0

802.11n\_HT20\_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.35	12.392	5745	17.58	12.450
5785	17.57	12.448	5785	17.57	12.448
5825	17.54	12.441	5825	17.60	12.454

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802.11n\_HT40\_Ch0

802.11n\_HT40\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	42.18	16.251	5190	41.96	16.228
5230	42.22	16.255	5230	42.13	16.245
5270	50.00	16.990	5270	50.00	16.990
5310	42.06	16.239	5310	41.78	16.209
5510	42.19	16.252	5510	41.71	16.202
5550	<b>50.00</b>	16.990	5550	<b>50.00</b>	16.990
5670	49.44	16.941	5670	49.98	16.988

802.11n\_HT40\_Ch0

802.11n\_HT40\_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.37	15.607	5755	36.36	15.606
5795	36.35	15.605	5795	36.37	15.607

802.11ac\_VHT80\_Ch0

802.11ac\_VHT80\_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	84.75	19.281	5210	84.30	19.258
5290	84.31	19.259	5290	84.20	19.253
5530	84.40	19.263	5530	84.56	19.271
5610	100.00	20.000	5610	100.00	20.000

802.11ac\_VHT80\_Ch0

802.11ac\_VHT80\_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.38	18.830	5775	75.91	18.803

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**99% Bandwidth**
**802.11a\_Ch0**
**802.11a\_Ch1**

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.765	12.244	5180	16.631	12.209
5220	16.814	12.257	5220	16.617	12.206
5240	16.803	12.254	5240	16.653	12.215
5260	19.460	12.891	5260	19.195	12.832
5300	18.901	12.765	5300	19.135	12.818
5320	16.946	12.291	5320	16.977	12.299
5500	16.840	12.263	5500	16.845	12.265
5580	18.822	12.747	5580	18.797	12.741
5700	16.791	12.251	5700	16.775	12.247

**802.11a\_Ch0**
**802.11a\_Ch1**

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.38	12.143	5745	16.49	12.171
5785	16.45	12.161	5785	16.37	12.139
5825	16.41	12.152	5825	16.47	12.167

**802.11n\_HT20\_Ch0**
**802.11n\_HT20\_Ch1**

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	17.956	12.542	5180	18.030	12.560
5220	18.020	12.558	5220	17.998	12.552
5240	17.933	12.537	5240	17.986	12.549
5260	19.675	12.939	5260	19.625	12.928
5300	19.153	12.822	5300	19.293	12.854
5320	18.037	12.562	5320	18.068	12.569
5500	18.018	12.557	5500	18.015	12.556
5580	19.116	12.814	5580	19.196	12.832
5700	17.997	12.552	5700	17.998	12.552

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## 802.11n\_HT20\_Ch0

## 802.11n\_HT20\_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.73	12.488	5745	17.74	12.490
5785	17.73	12.488	5785	17.76	12.495
5825	17.76	12.493	5825	17.74	12.491

## 802.11n\_HT40\_Ch0

## 802.11n\_HT40\_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.300	15.599	5190	36.324	15.602
5230	36.294	15.598	5230	36.292	15.598
5270	37.776	15.772	5270	37.736	15.768
5310	36.287	15.598	5310	36.281	15.597
5510	36.286	15.597	5510	36.266	15.595
5550	36.925	15.673	5550	36.875	15.667
5670	36.304	15.600	5670	36.342	15.604

## 802.11n\_HT40\_Ch0

## 802.11n\_HT40\_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.53	15.627	5755	36.48	15.620
5795	36.44	15.616	5795	36.44	15.615

## 802.11ac\_VHT80\_Ch0

## 802.11ac\_VHT80\_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.644	18.788	5210	75.684	18.790
5290	75.688	18.790	5290	75.716	18.792
5530	75.693	18.791	5530	75.675	18.790
5610	76.373	18.829	5610	76.361	18.829

## 802.11ac\_VHT80\_Ch0

## 802.11ac\_VHT80\_Ch1

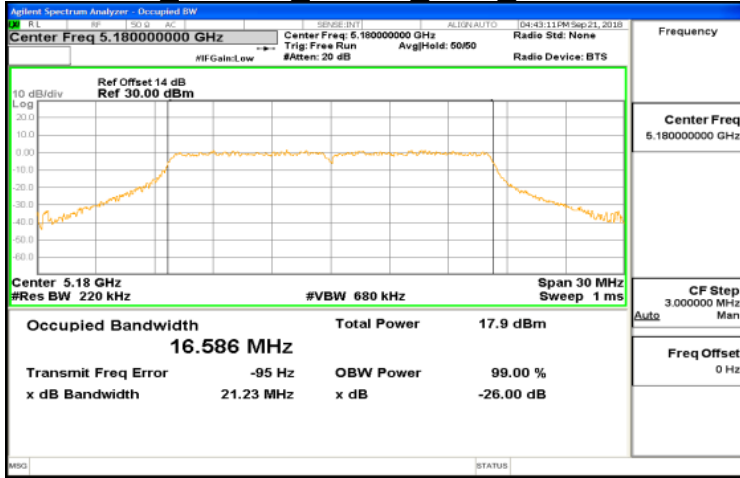
Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.46	18.834	5775	76.51	18.837

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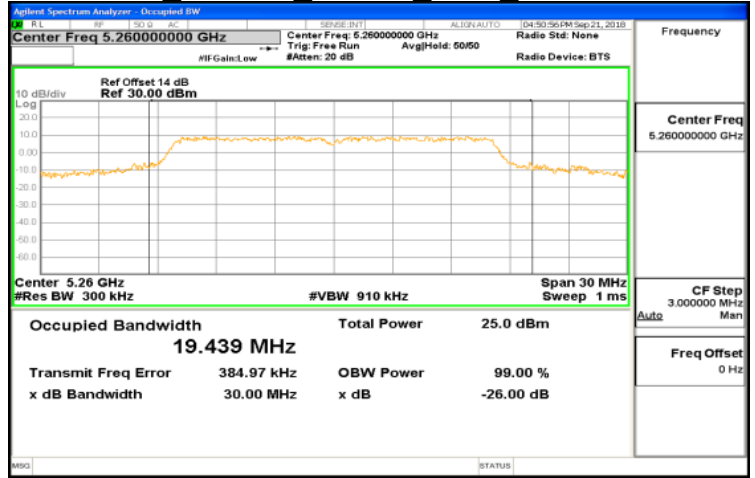
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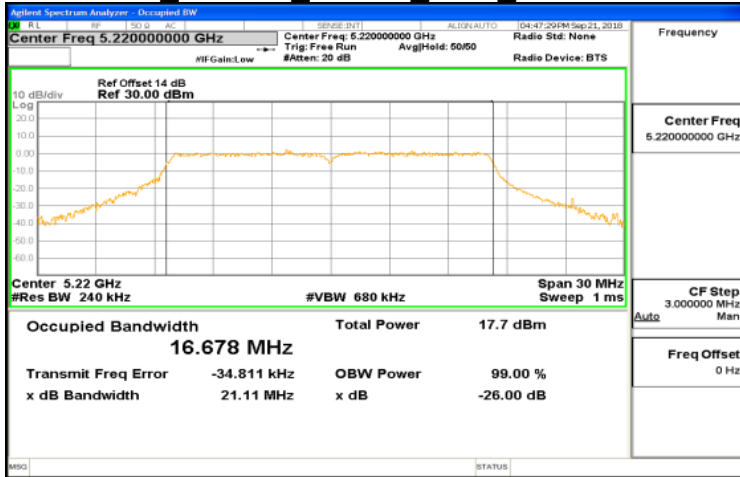
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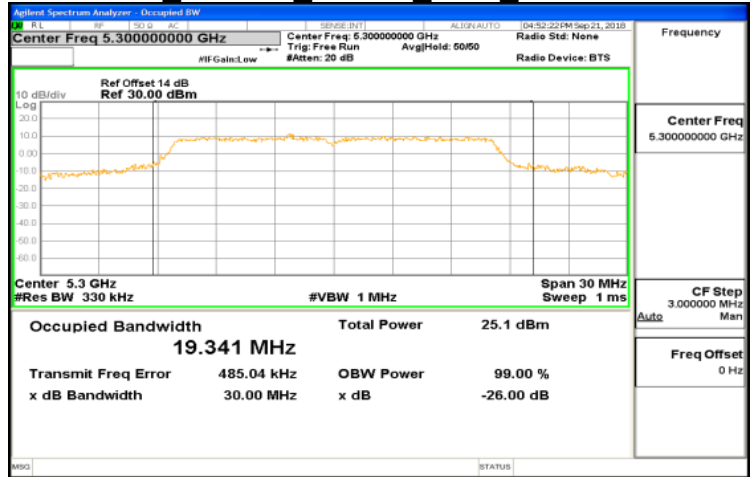
FCC 802.11a 20MHz Main 5260MHz



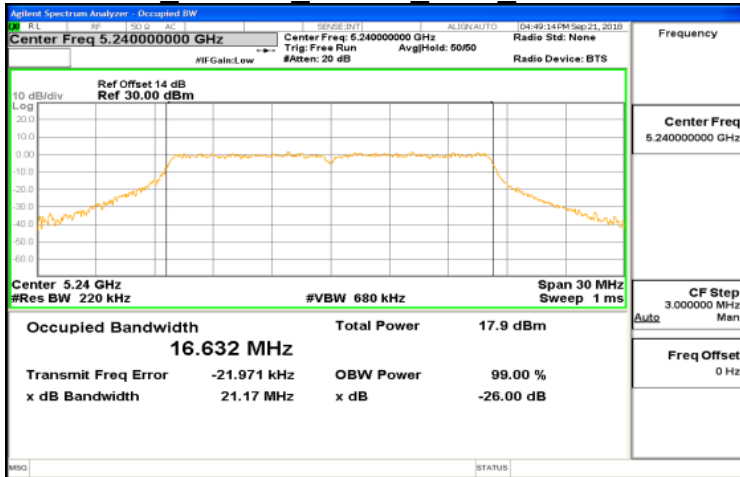
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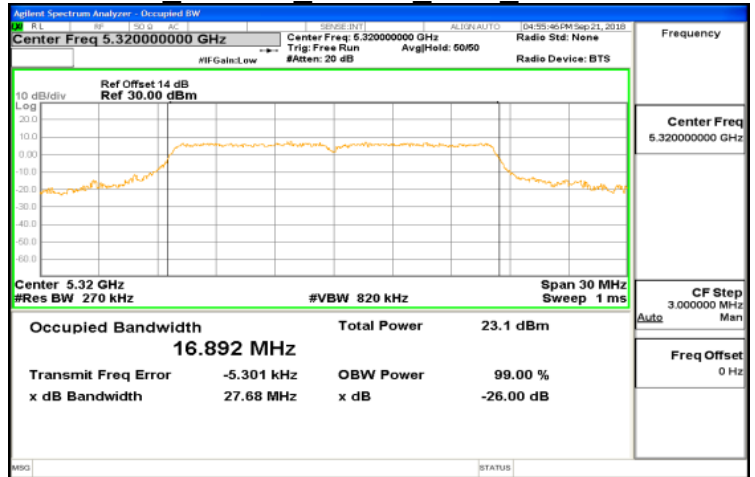
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FCC 802.11a 20MHz Main 5240MHz



FCC 802.11a 20MHz Main 5320MHz

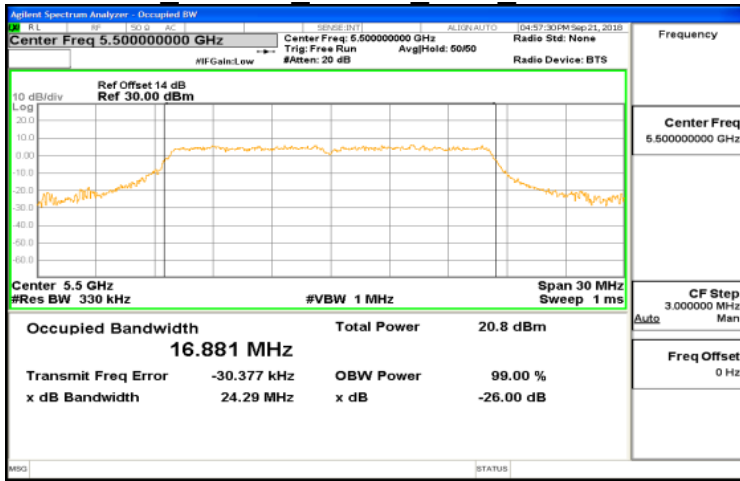


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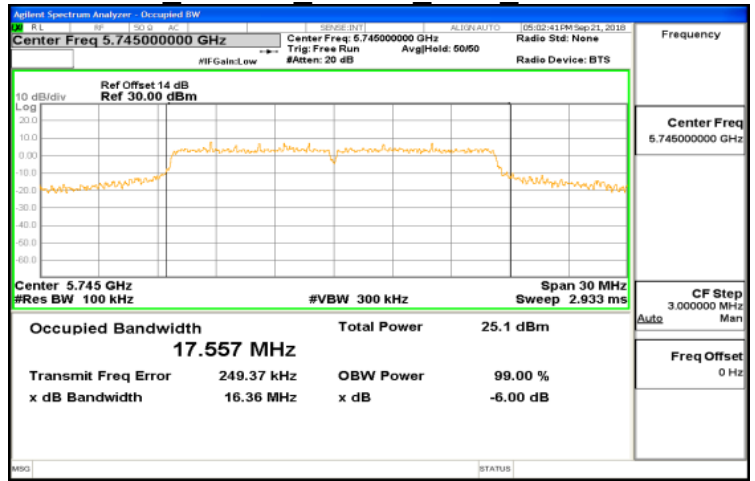
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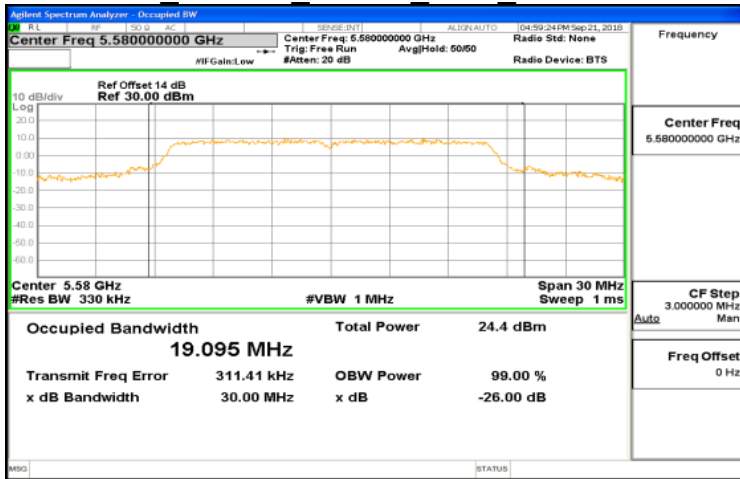
FCC 802.11a 20MHz Main 5500MHz



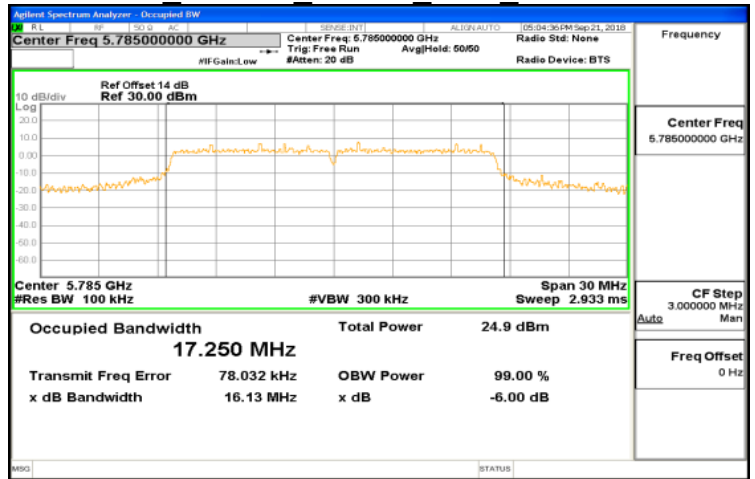
FCC 802.11a 20MHz Main 5745MHz



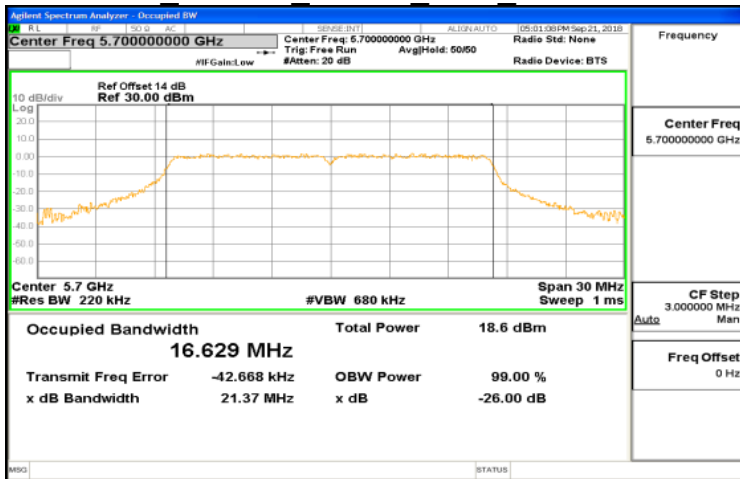
FCC 802.11a 20MHz Main 5580MHz



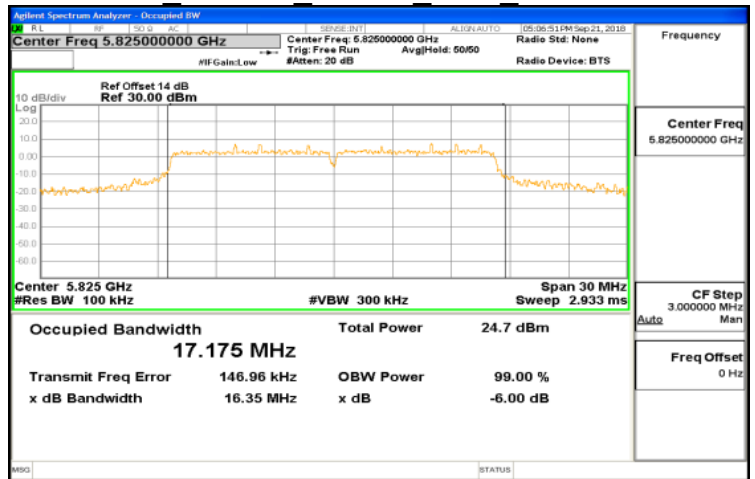
FCC 802.11a 20MHz Main 5785MHz



FCC 802.11a 20MHz Main 5700MHz



FCC 802.11a 20MHz Main 5825MHz

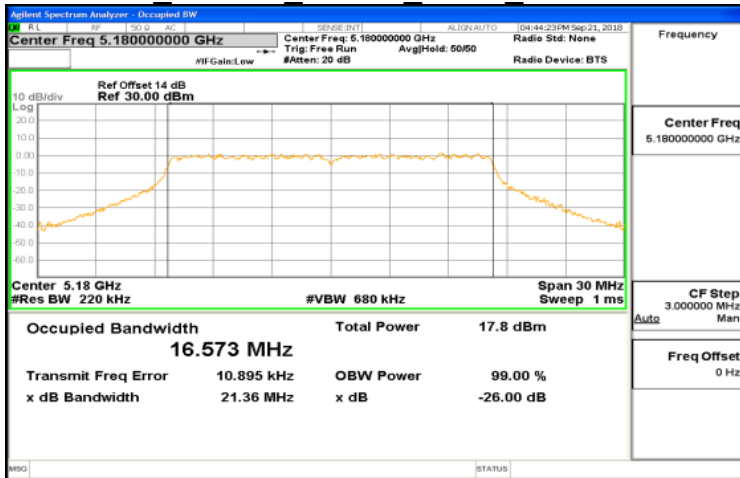


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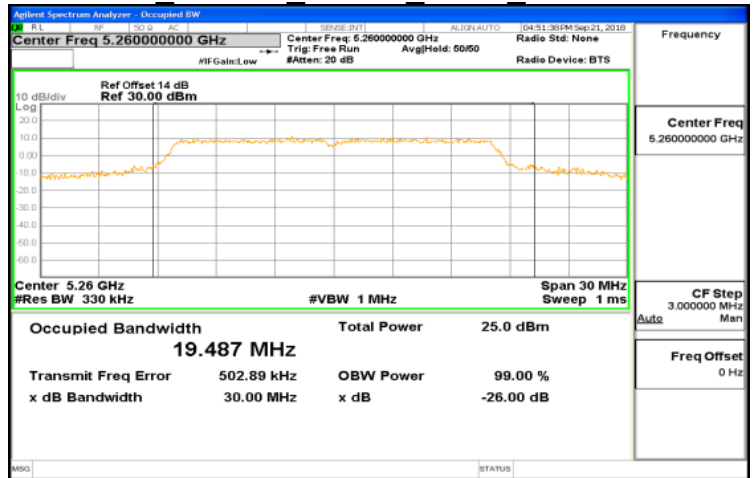
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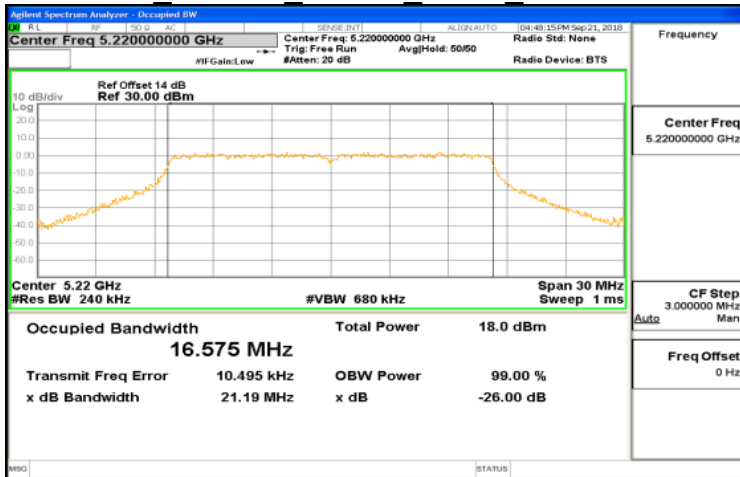
FCC 802.11a 20MHz AUX1 5180MHz



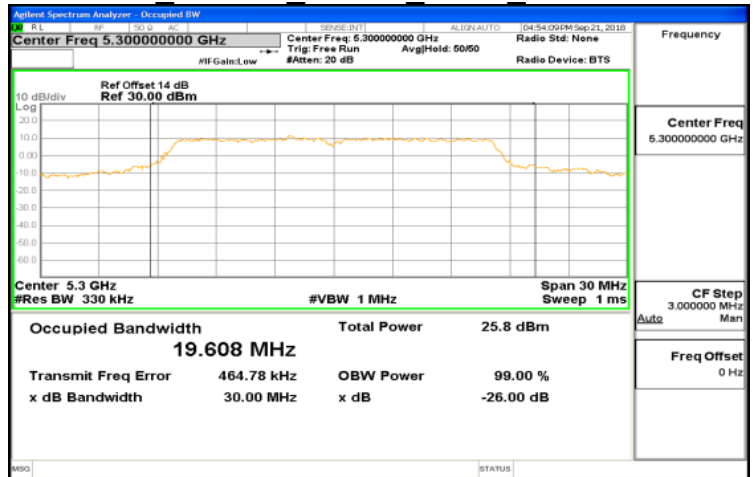
FCC 802.11a 20MHz AUX1 5260MHz



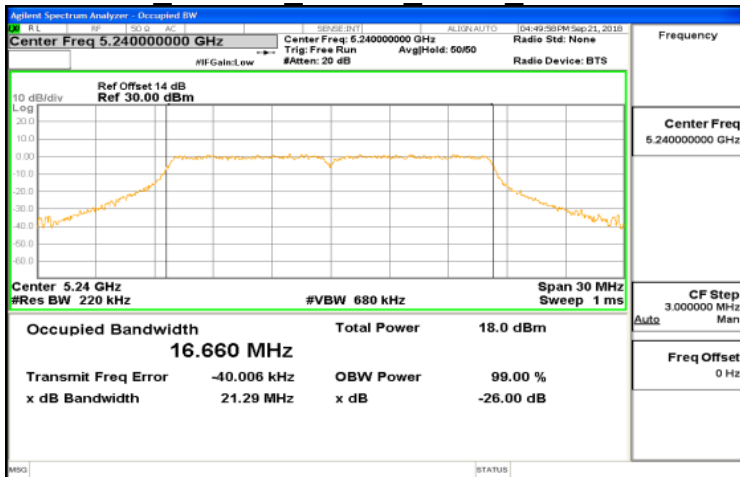
FCC 802.11a 20MHz AUX1 5220MHz



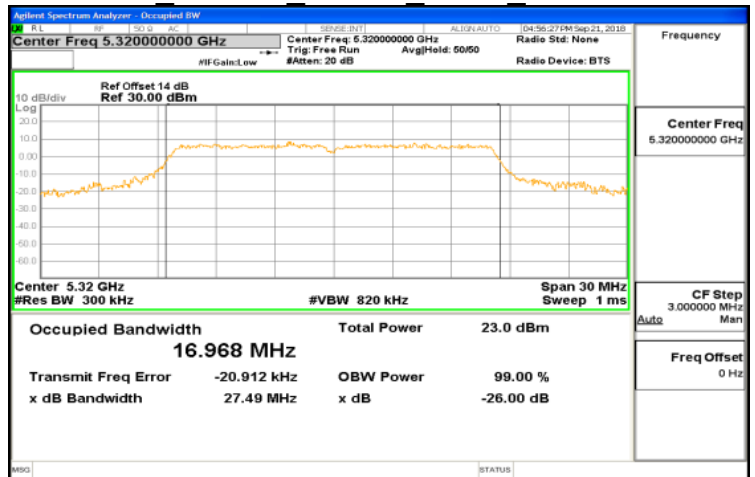
FCC 802.11a 20MHz AUX1 5300MHz



FCC 802.11a 20MHz AUX1 5240MHz



FCC 802.11a 20MHz AUX1 5320MHz

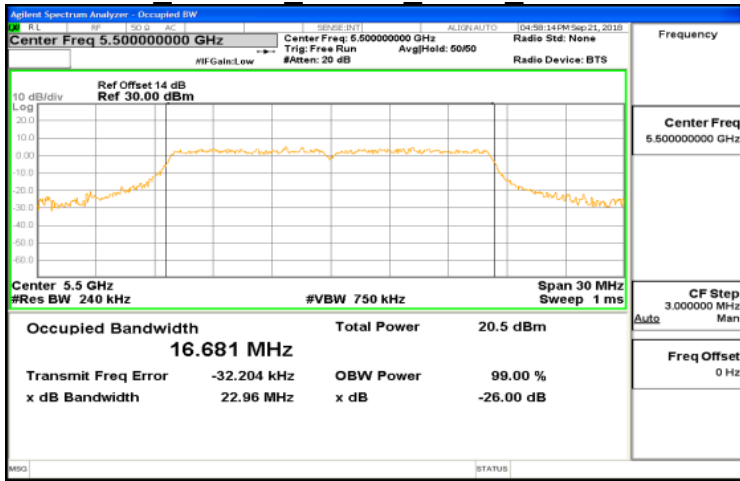


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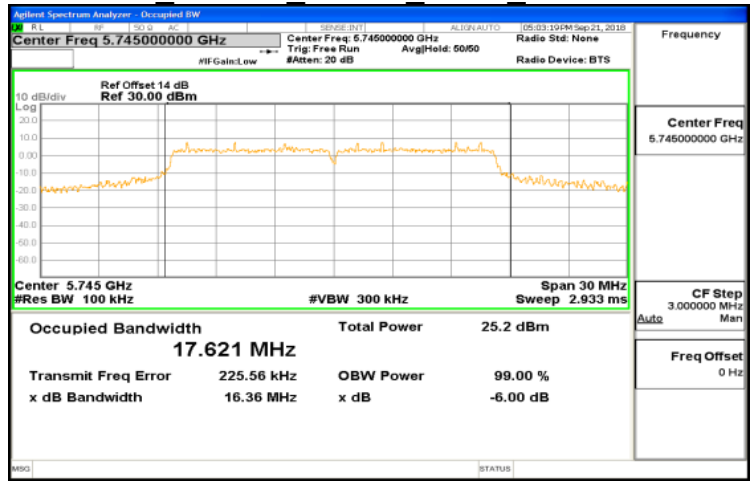
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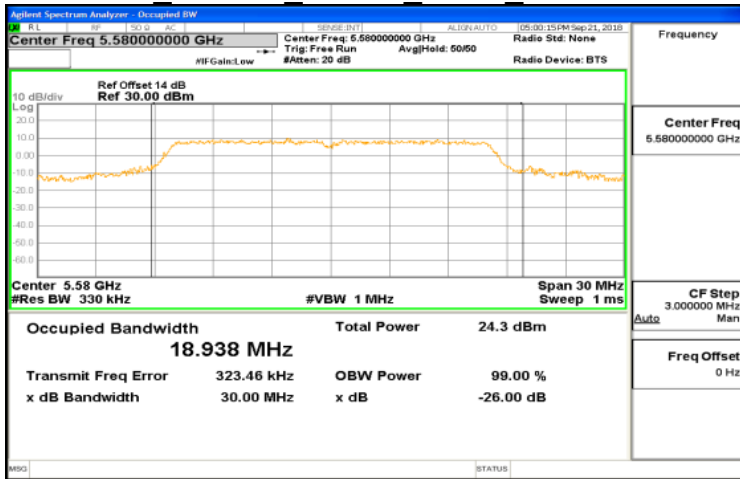
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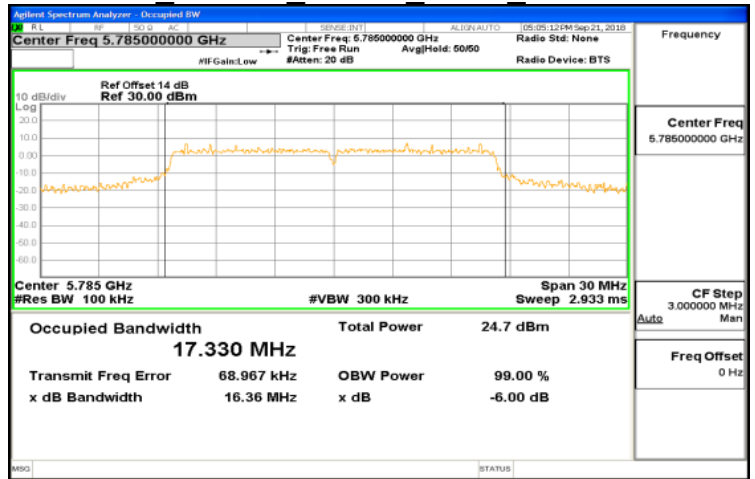
FCC 802.11a 20MHz AUX1 5745MHz



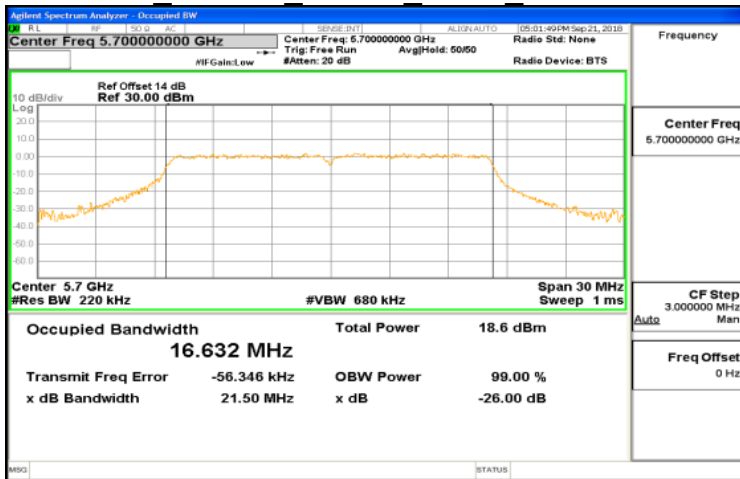
FCC 802.11a 20MHz AUX1 5580MHz



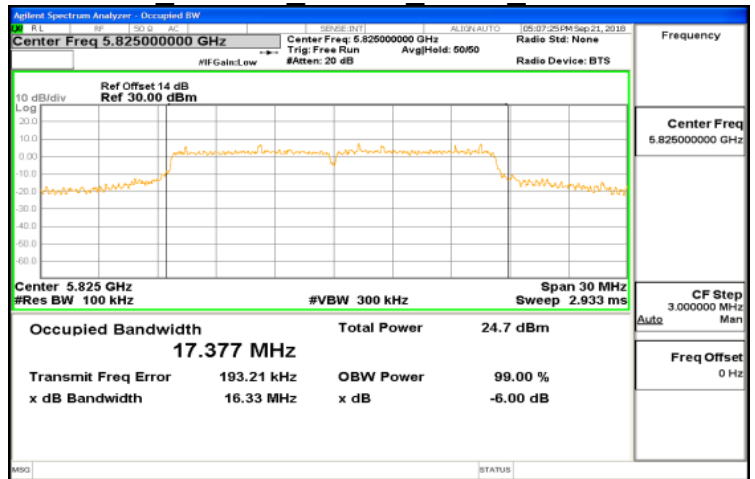
FCC 802.11a 20MHz AUX1 5785MHz



FCC 802.11a 20MHz AUX1 5700MHz



FCC 802.11a 20MHz AUX1 5825MHz



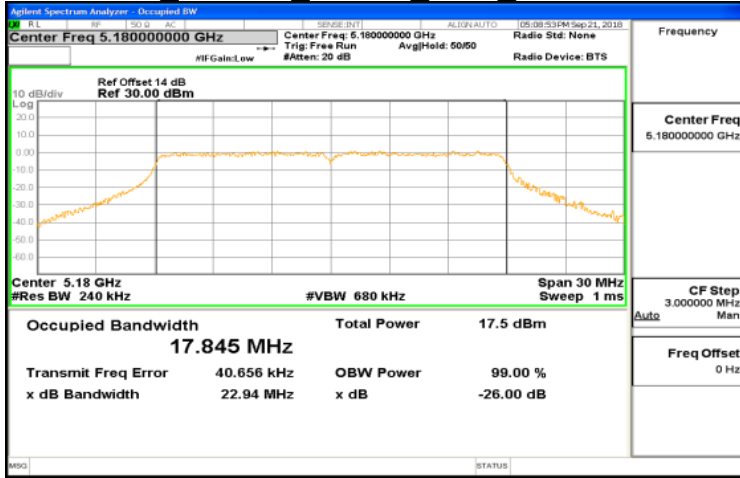
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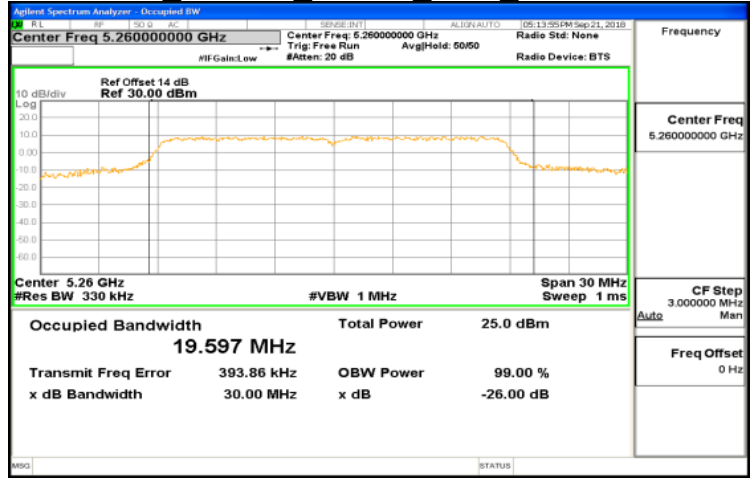
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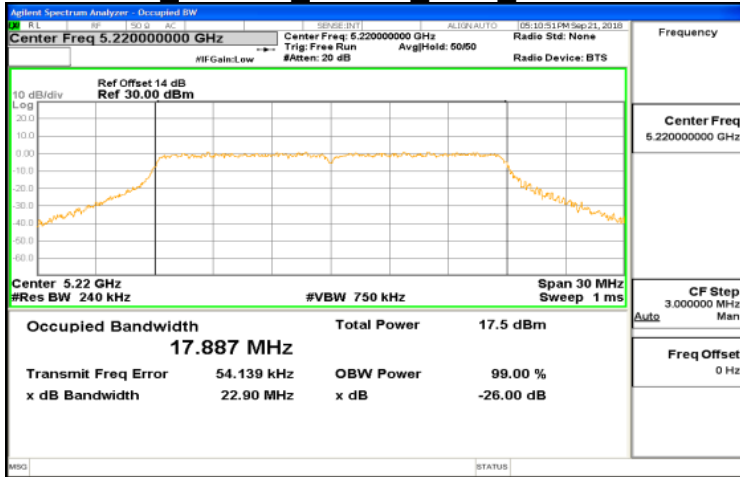
FCC 802.11n 20MHz Main 5180MHz



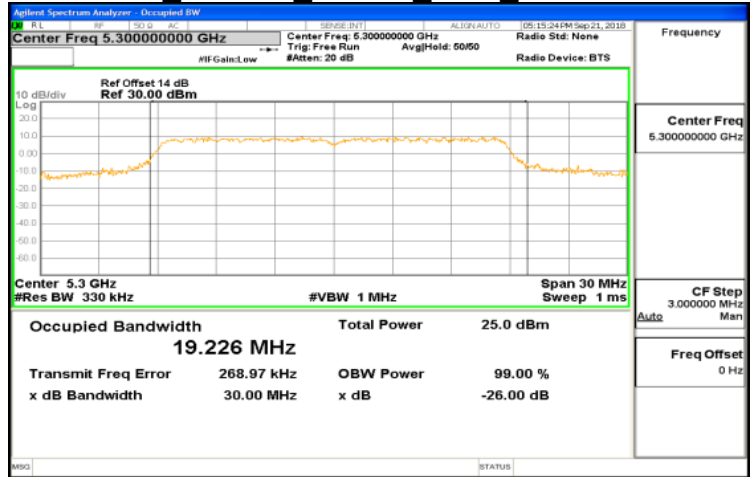
FCC 802.11n 20MHz Main 5260MHz



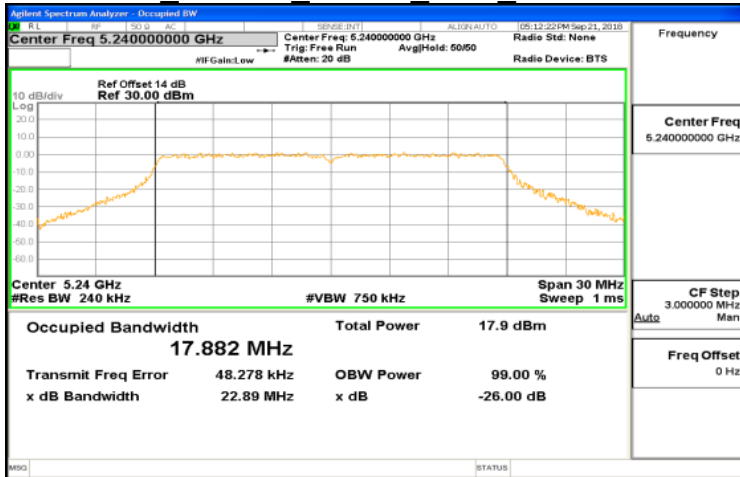
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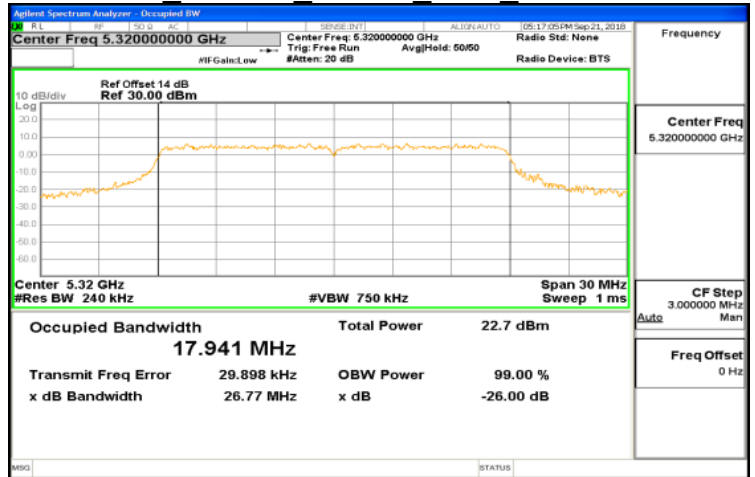
FCC 802.11n 20MHz Main 5300MHz



FCC 802.11n 20MHz Main 5240MHz



FCC 802.11n 20MHz Main 5320MHz

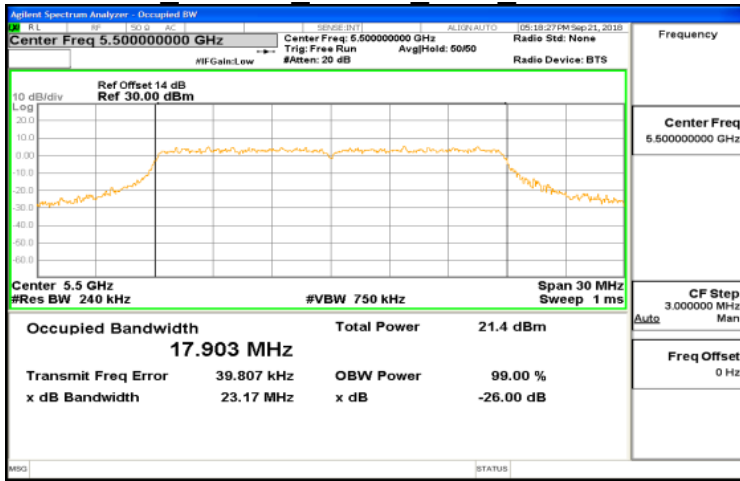


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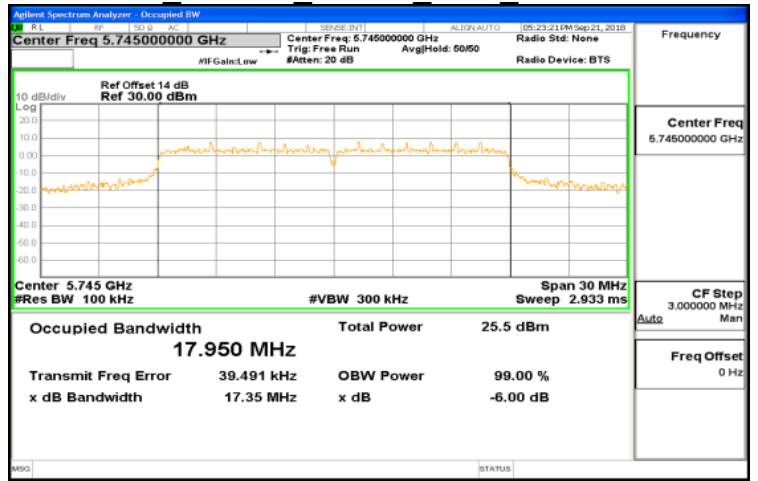
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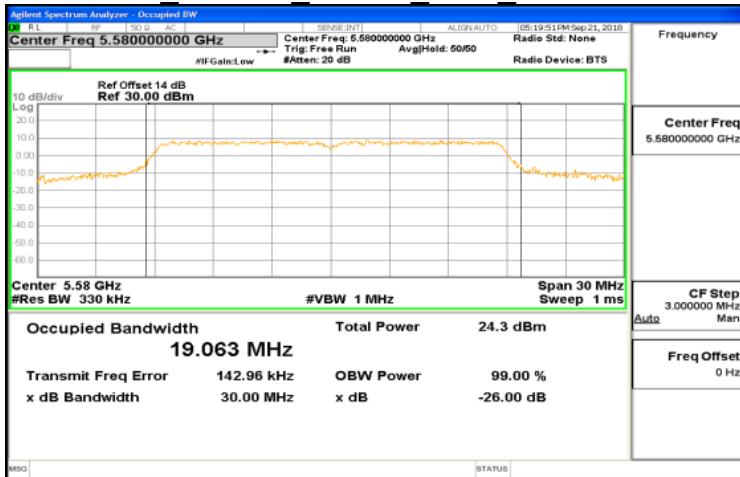
FCC 802.11n 20MHz Main 5500MHz



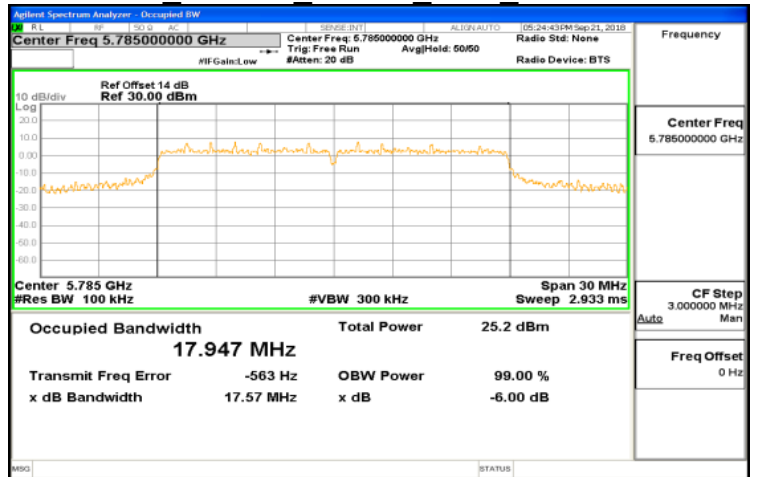
FCC 802.11n 20MHz Main 5745MHz



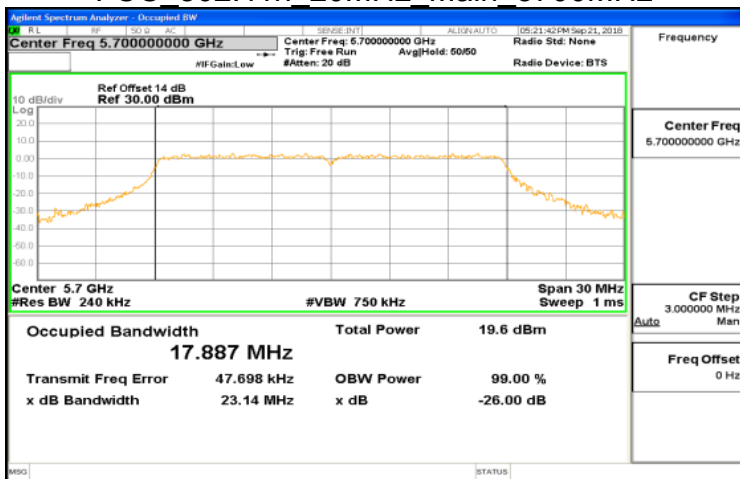
FCC 802.11n 20MHz Main 5580MHz



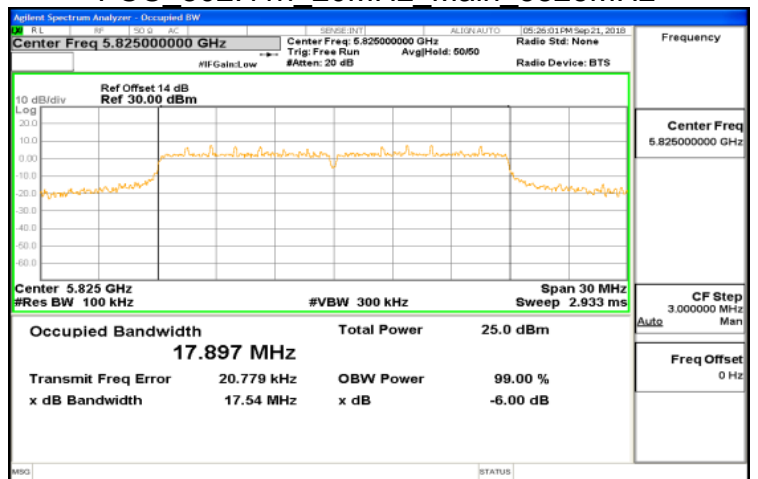
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FCC 802.11n 20MHz Main 5700MHz



FCC 802.11n 20MHz Main 5825MHz

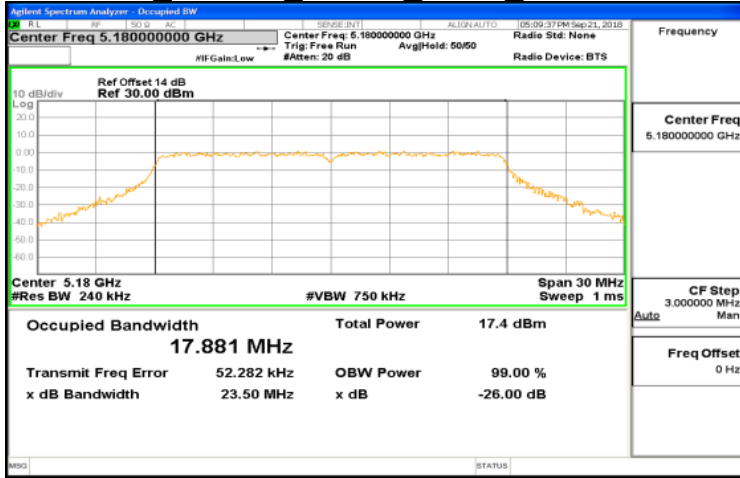


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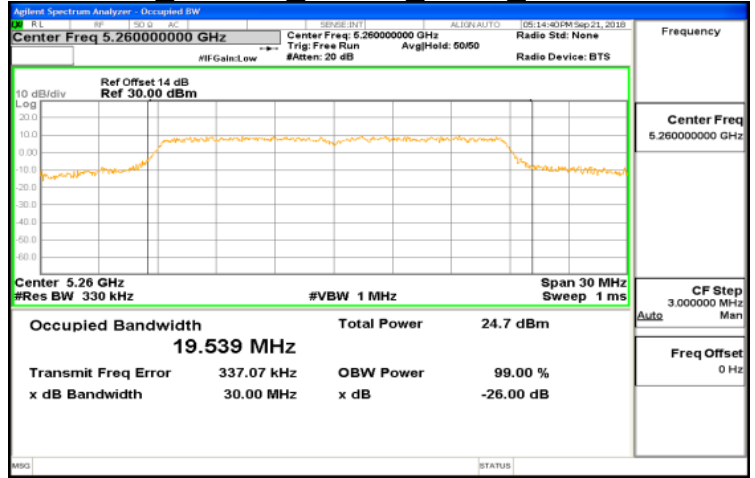
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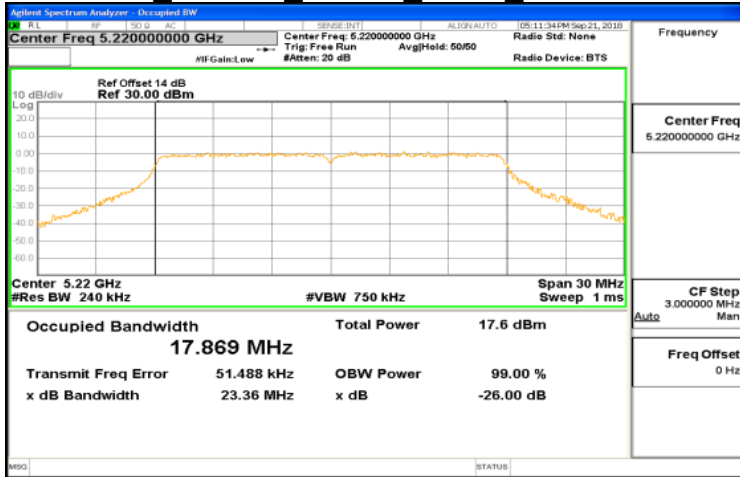
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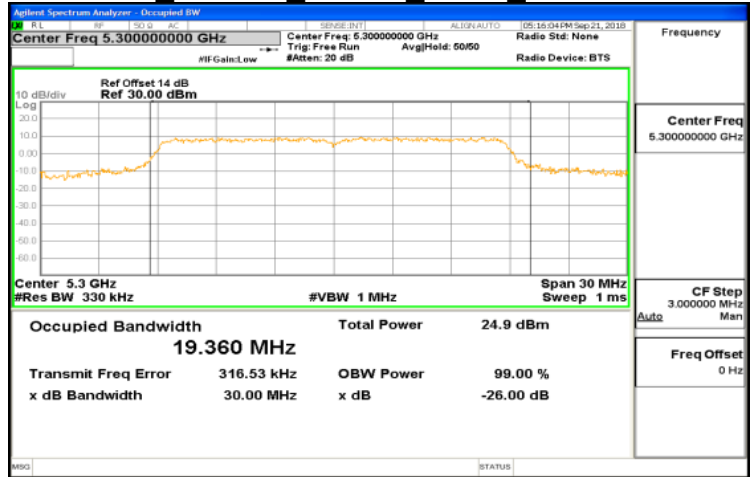
FCC 802.11n 20MHz AUX1 5260MHz



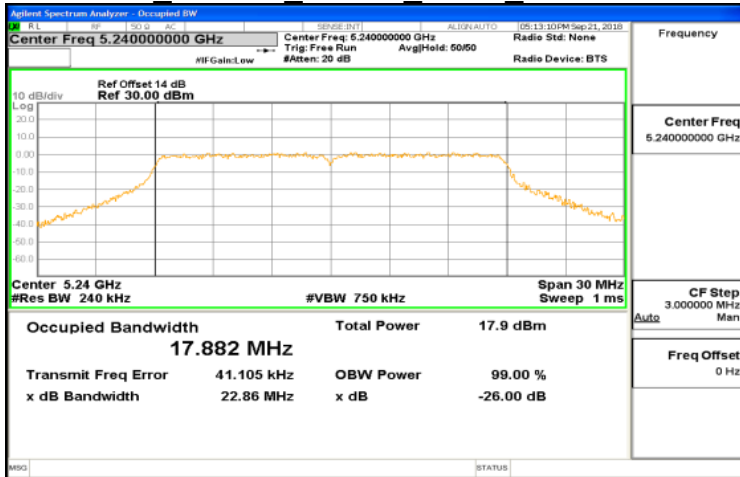
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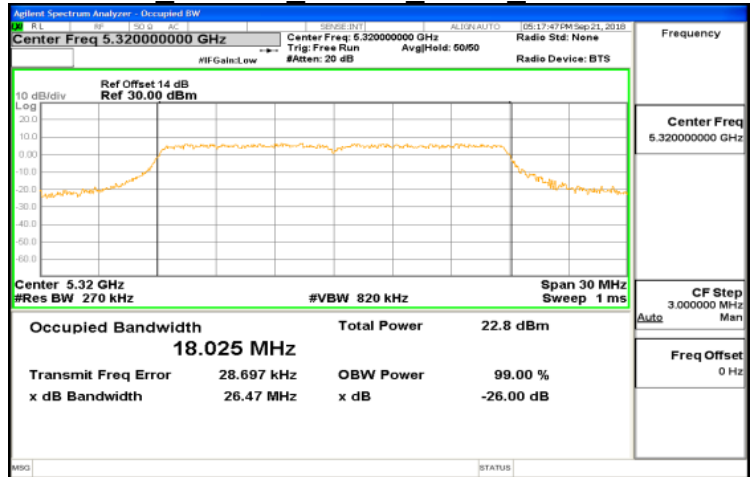
FCC 802.11n 20MHz AUX1 5300MHz



FCC 802.11n 20MHz AUX1 5240MHz



FCC 802.11n 20MHz AUX1 5320MHz

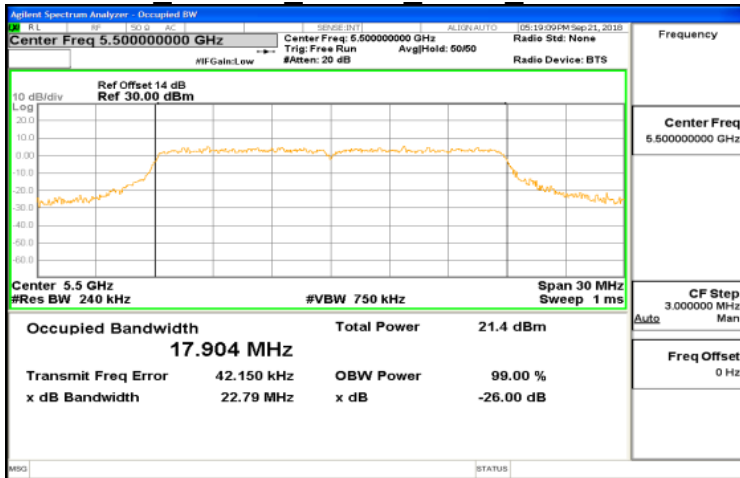


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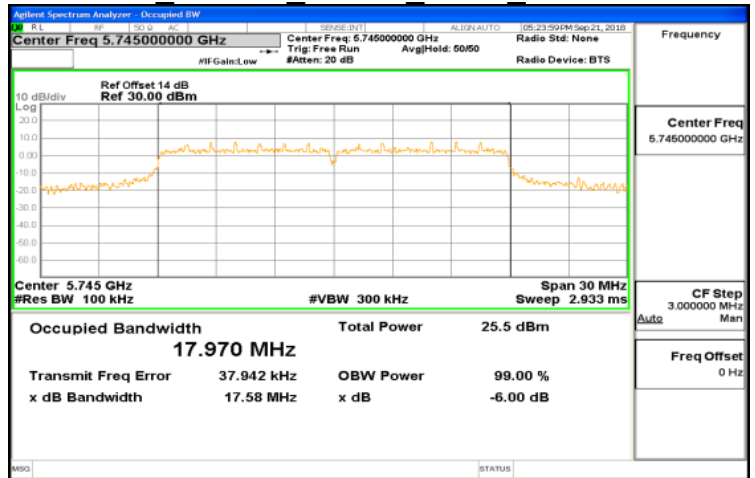
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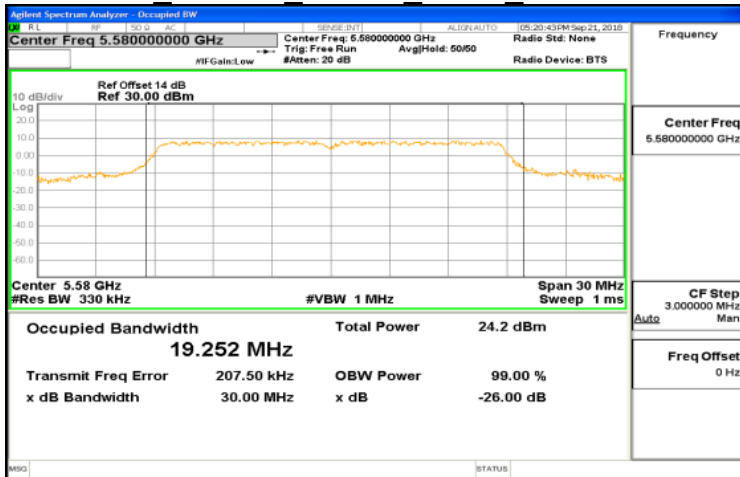
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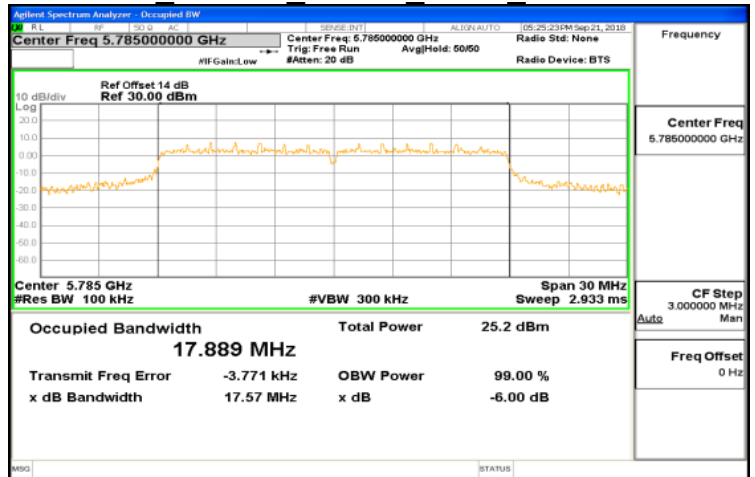
FCC 802.11n 20MHz AUX1 5745MHz



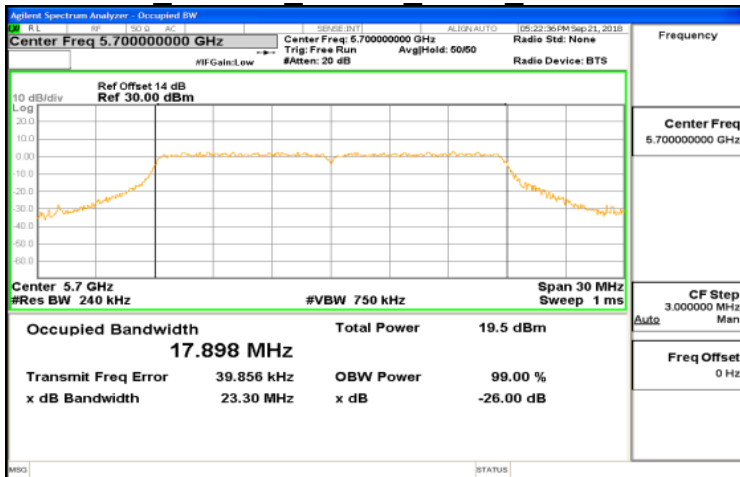
FCC 802.11n 20MHz AUX1 5580MHz



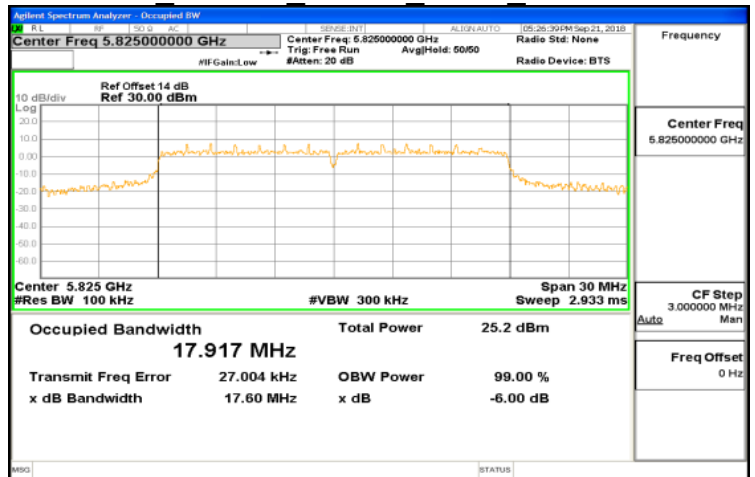
FCC 802.11n 20MHz AUX1 5785MHz



FCC 802.11n 20MHz AUX1 5700MHz



FCC 802.11n 20MHz AUX1 5825MHz

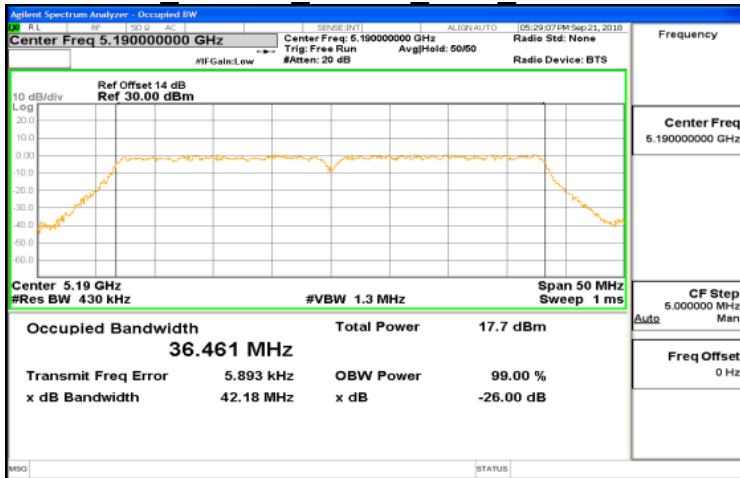


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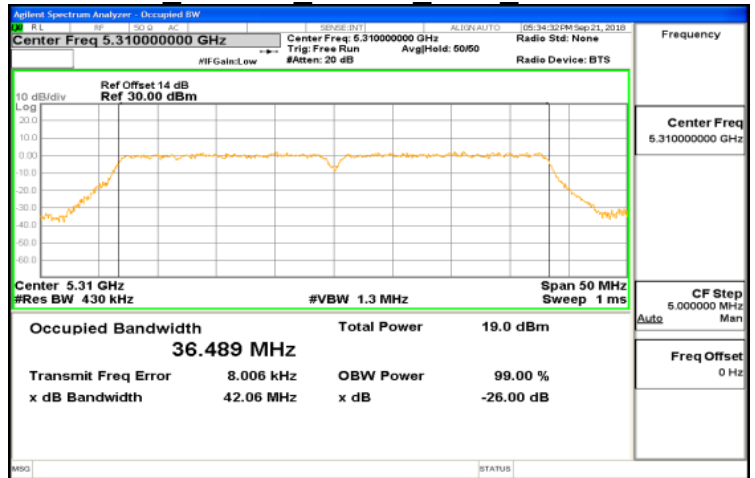
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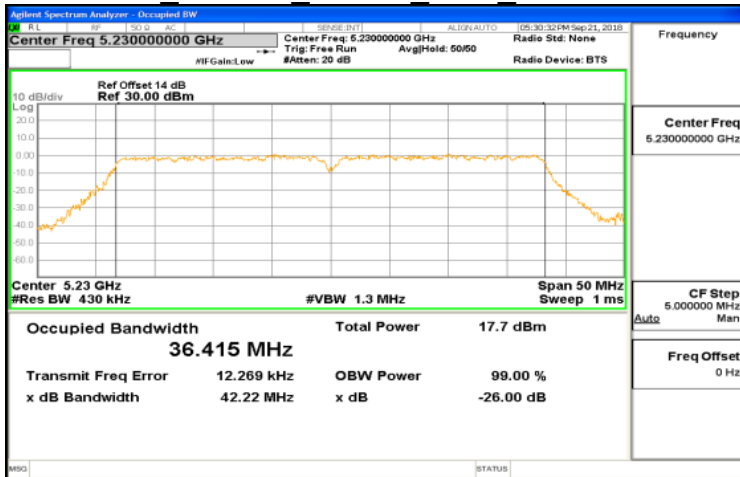
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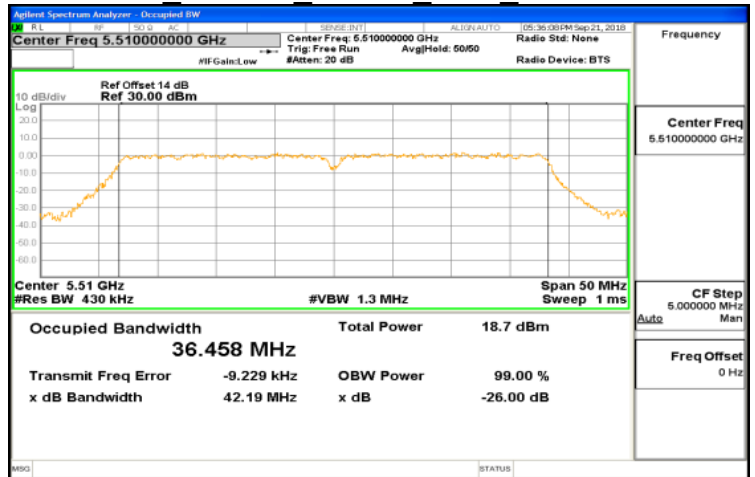
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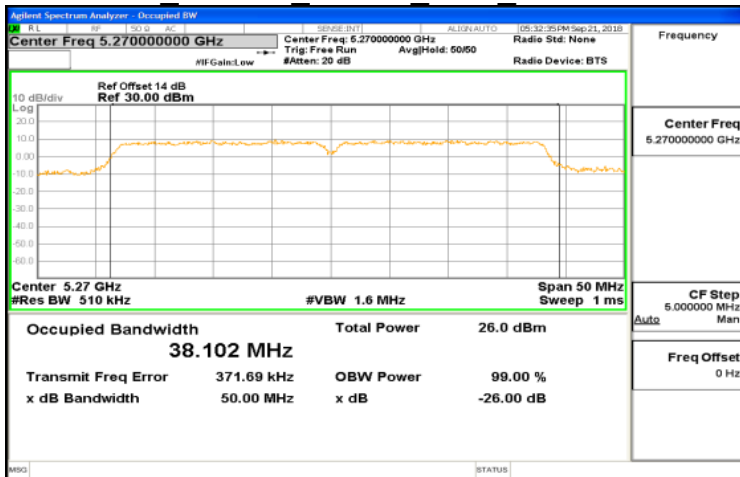
FCC 802.11n 40MHz Main 5230MHz



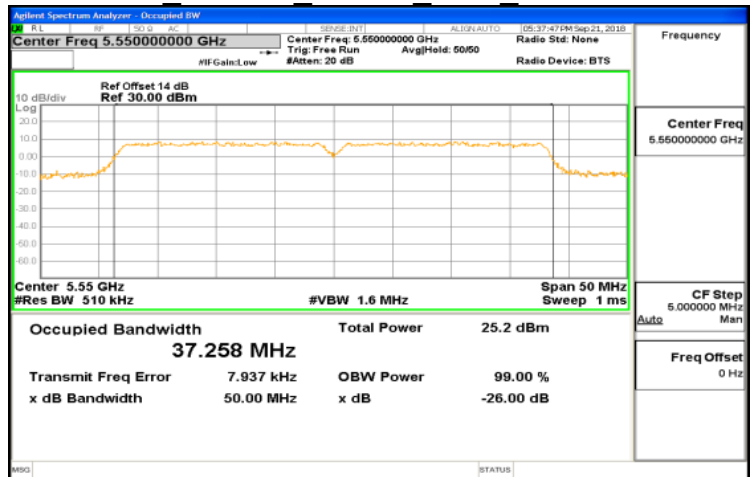
FCC 802.11n 40MHz Main 5510MHz



FCC 802.11n 40MHz Main 5270MHz



FCC 802.11n 40MHz Main 5550MHz

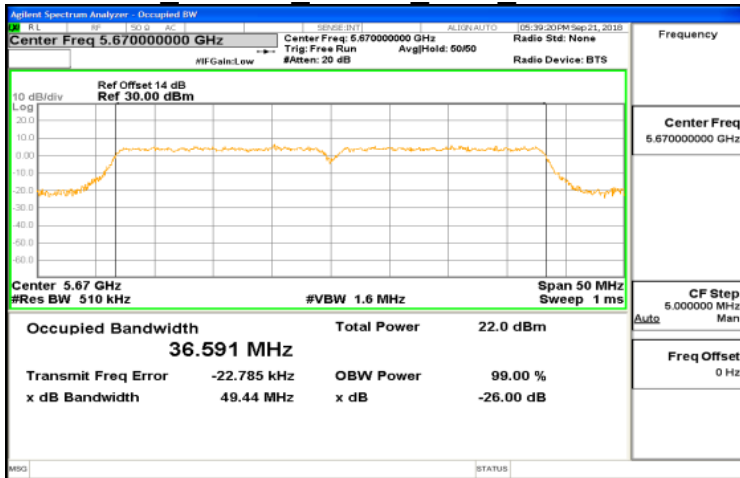


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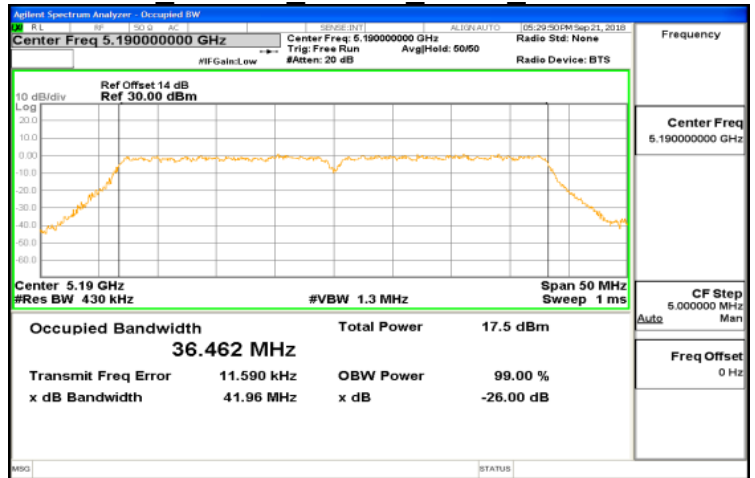
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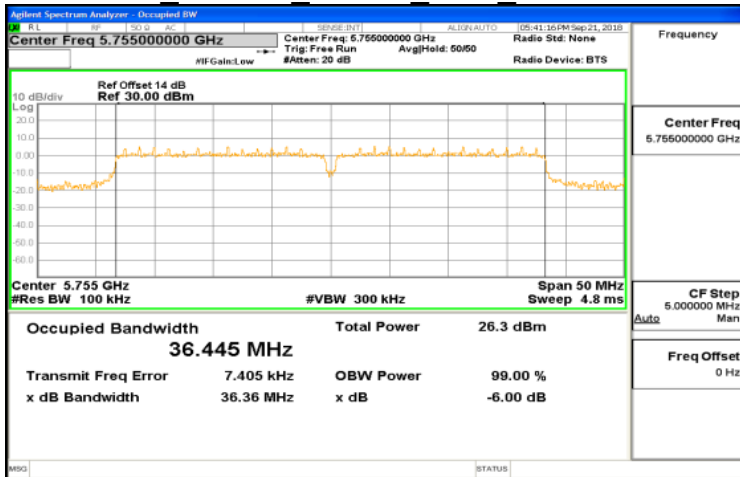
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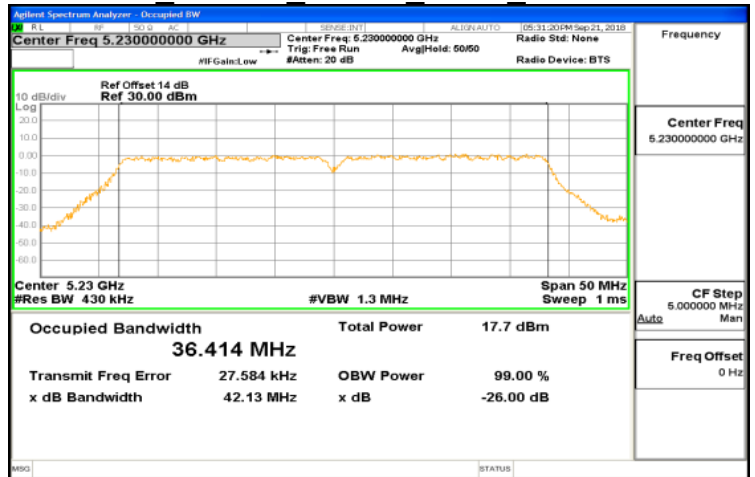
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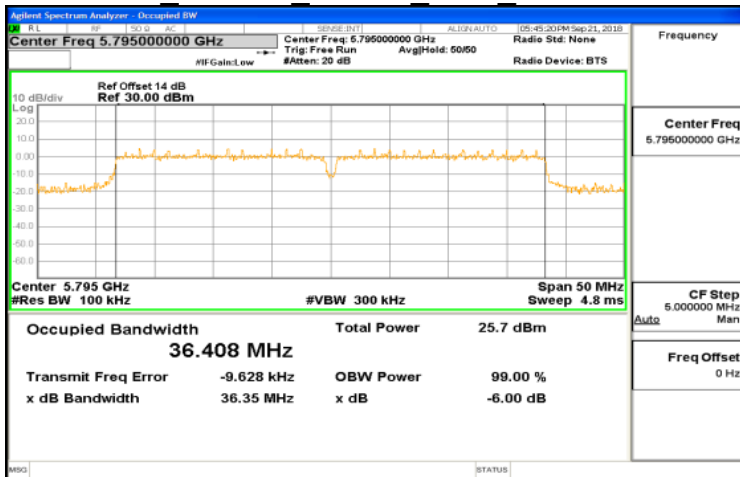
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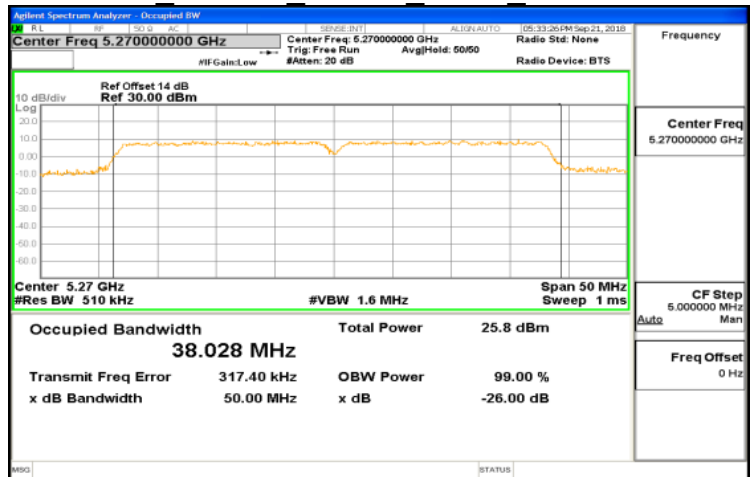
FCC 802.11n 40MHz AUX1 5230MHz



FCC 802.11n 40MHz Main 5795MHz



FCC 802.11n 40MHz AUX1 5270MHz

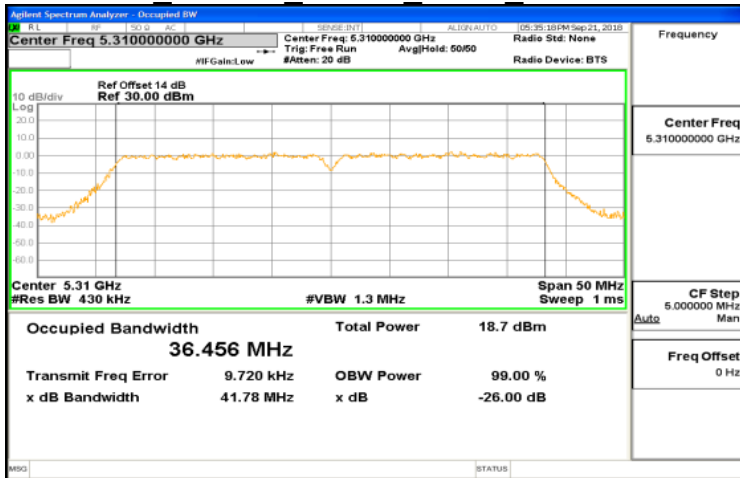


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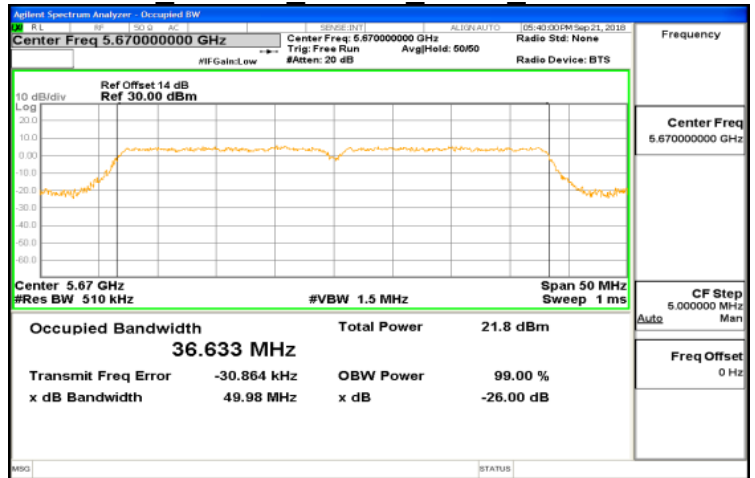
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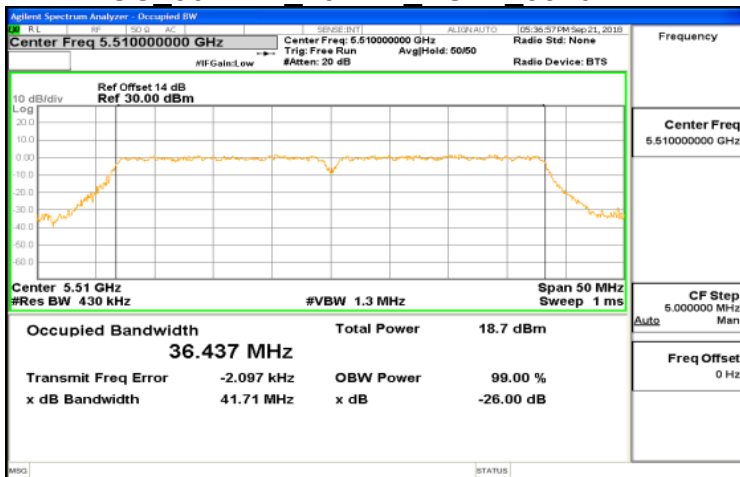
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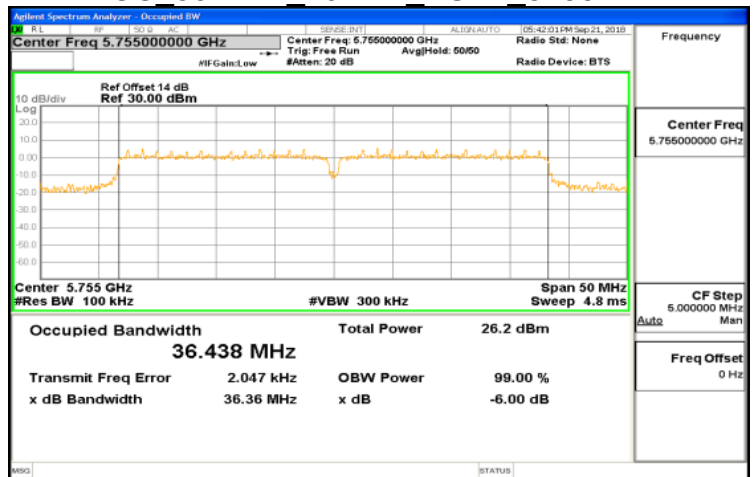
FCC 802.11n 40MHz AUX1 5670MHz



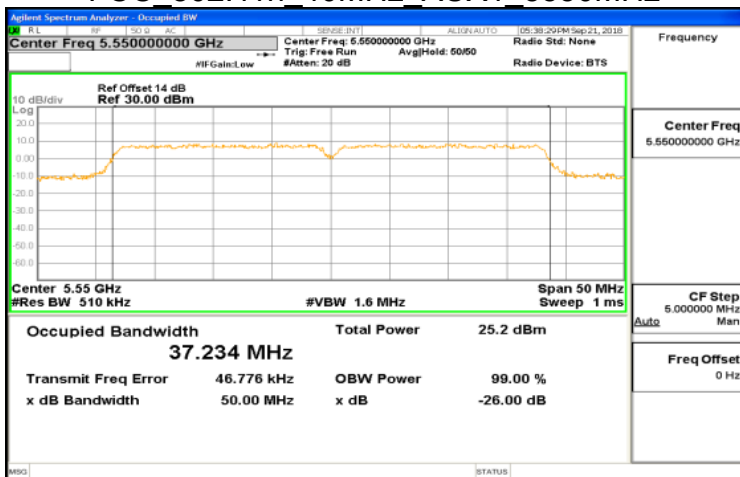
FCC 802.11n 40MHz AUX1 5510MHz



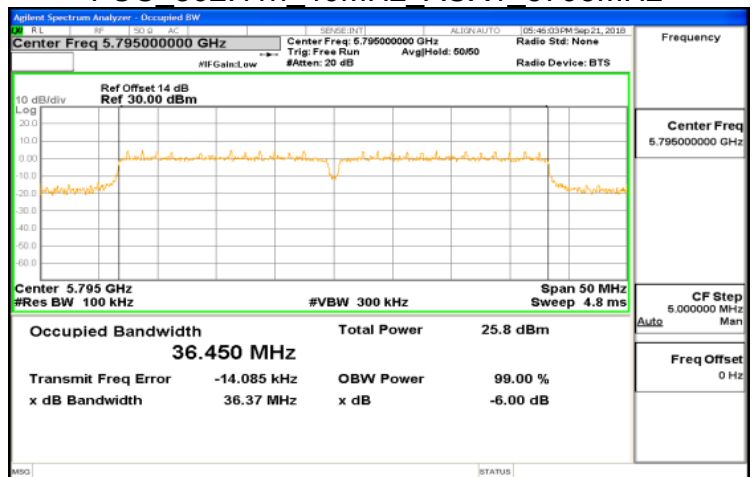
FCC 802.11n 40MHz AUX1 5755MHz



FCC 802.11n 40MHz AUX1 5550MHz



FCC 802.11n 40MHz AUX1 5795MHz

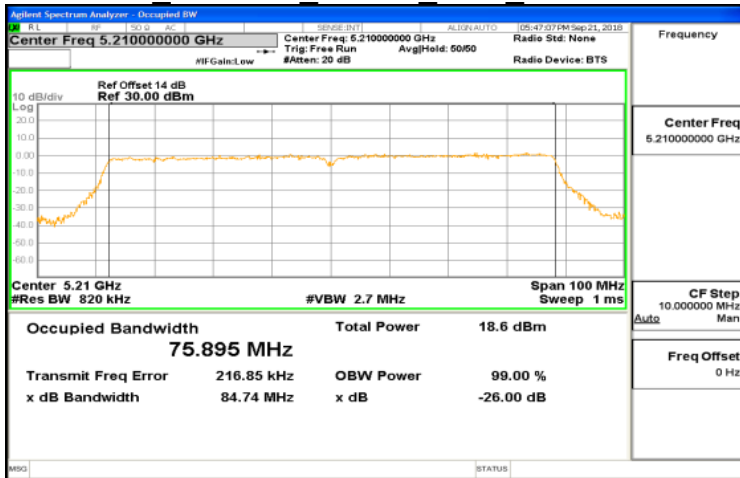


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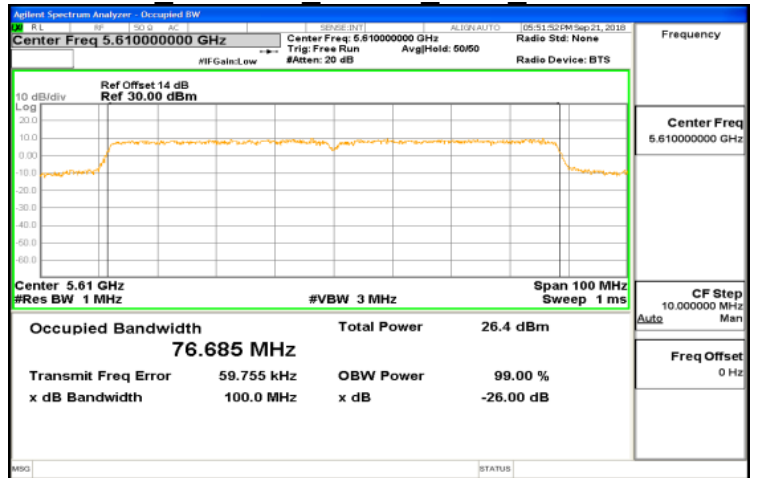
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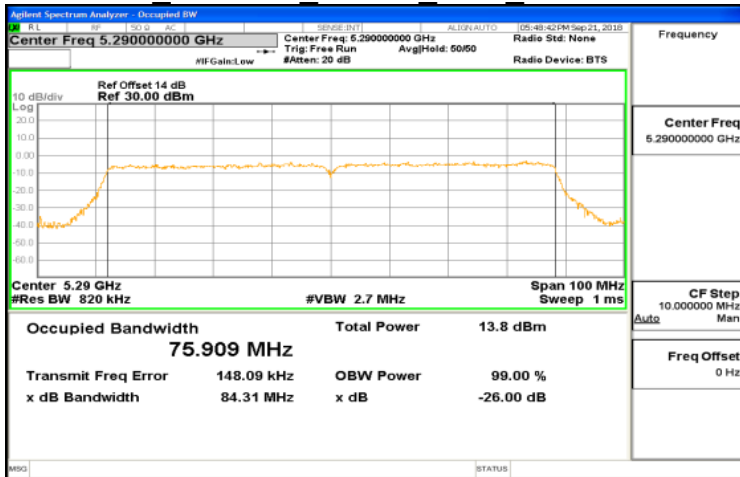
FCC 802.11ac 80MHz Main 5210MHz



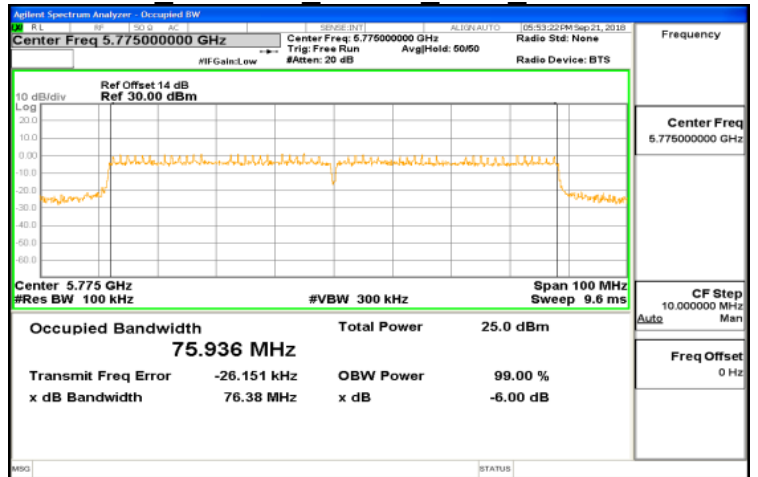
FCC 802.11ac 80MHz Main 5610MHz



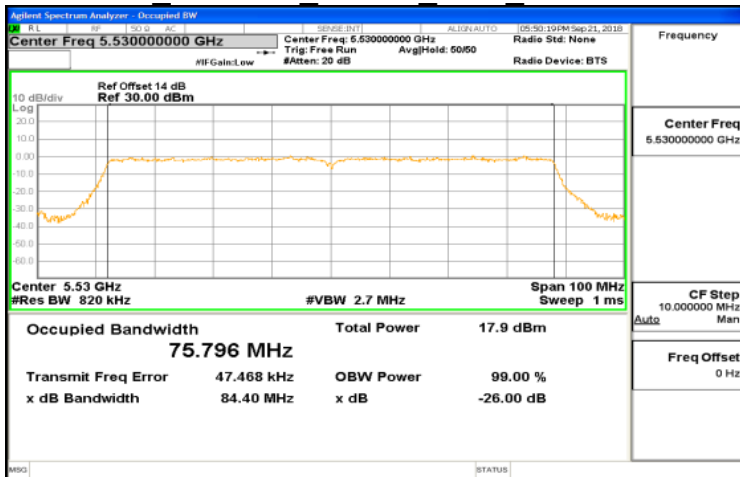
FCC 802.11ac 80MHz Main 5290MHz



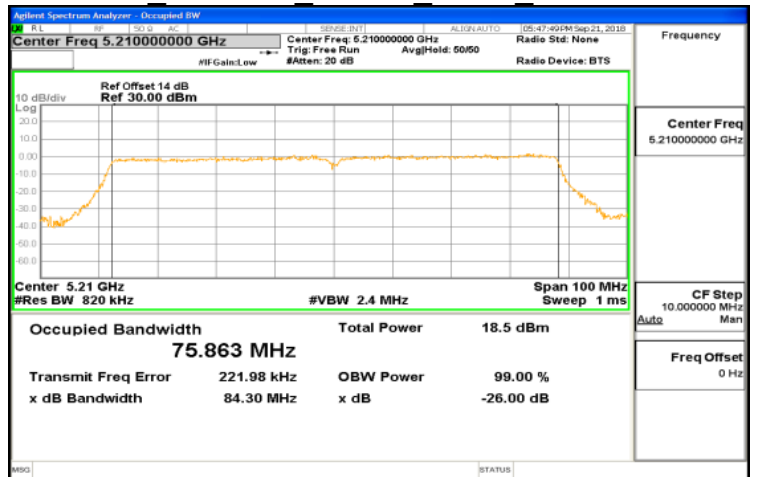
FCC 802.11ac 80MHz Main 5775MHz



FCC 802.11ac 80MHz Main 5530MHz



FCC 802.11ac 80MHz AUX1 5210MHz



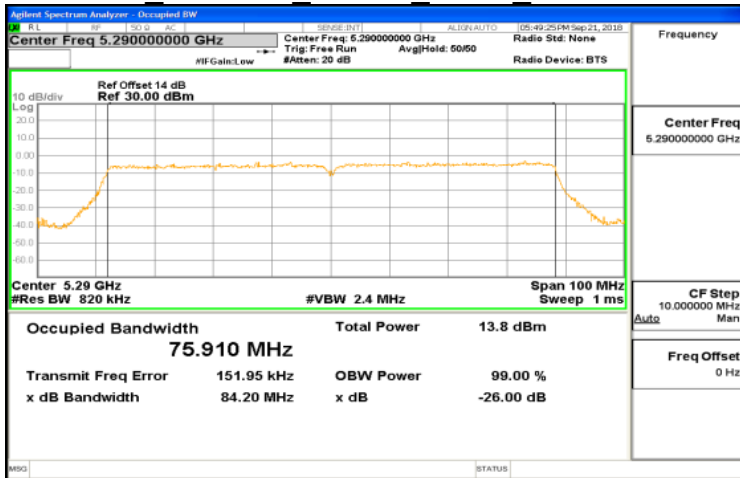
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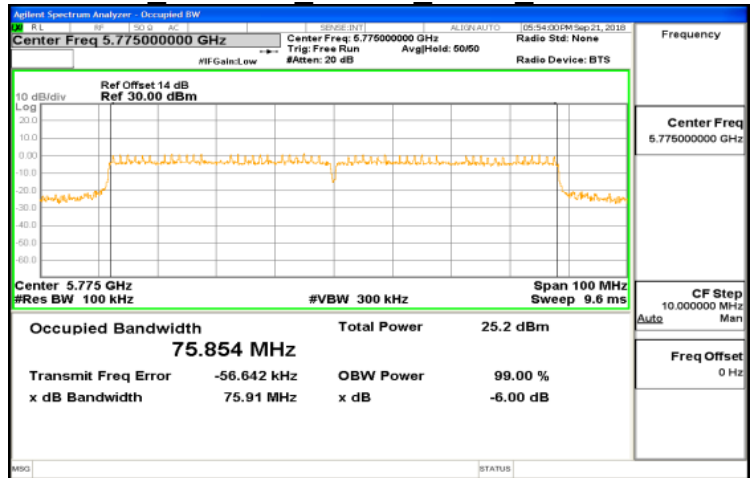
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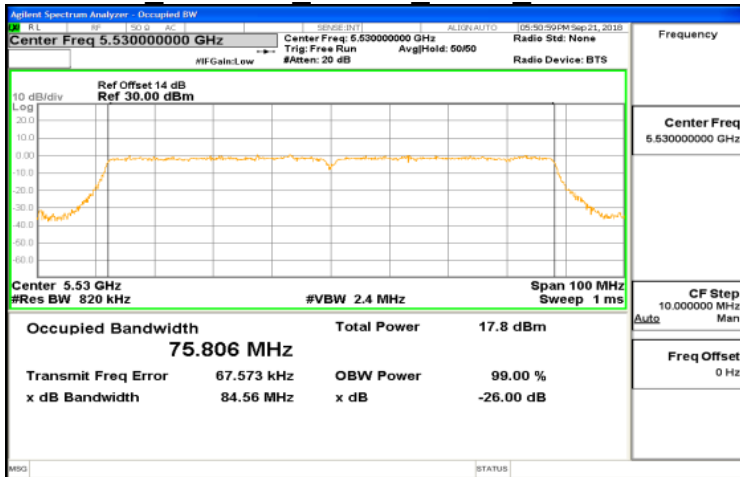
FCC 802.11ac 80MHz AUX1 5290MHz



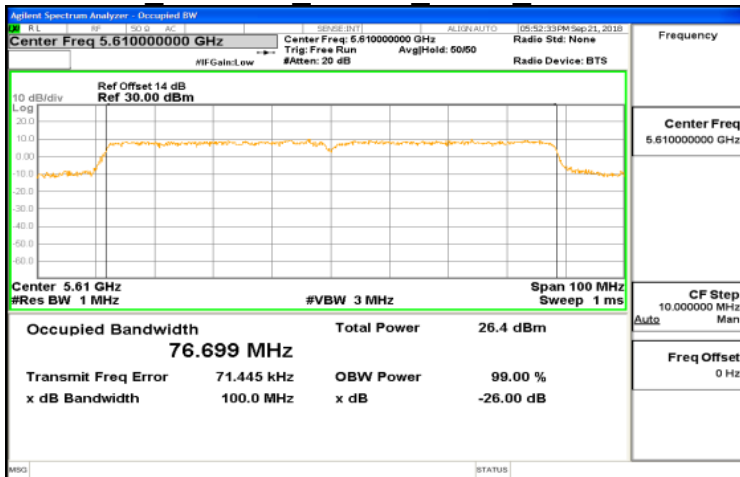
FCC 802.11ac 80MHz AUX1 5775MHz



FCC 802.11ac 80MHz AUX1 5530MHz



FCC 802.11ac 80MHz AUX1 5610MHz

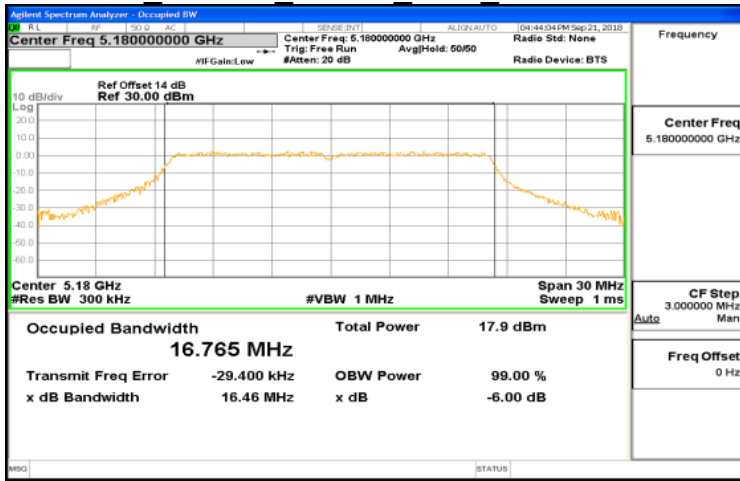


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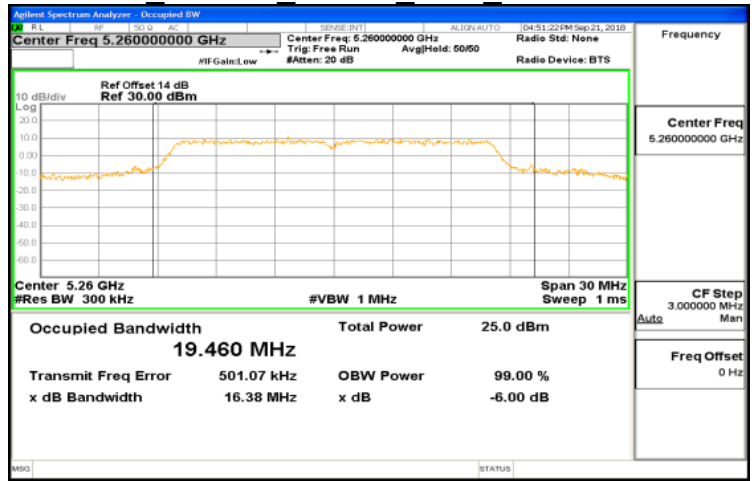
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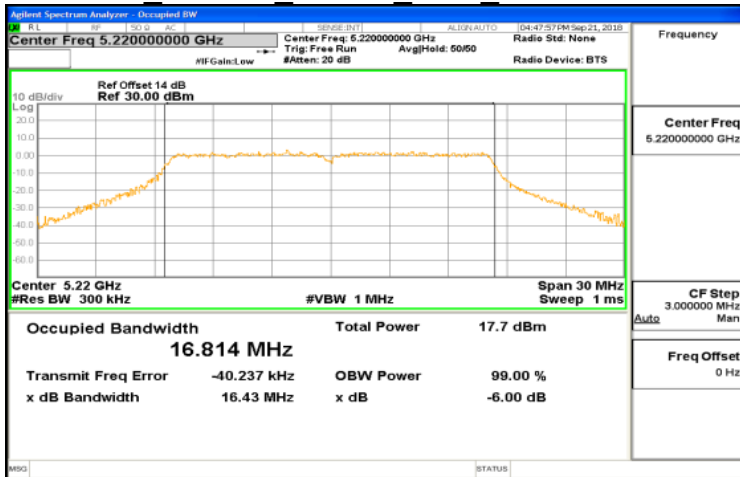
IC 802.11a 20MHz Main 5180MHz



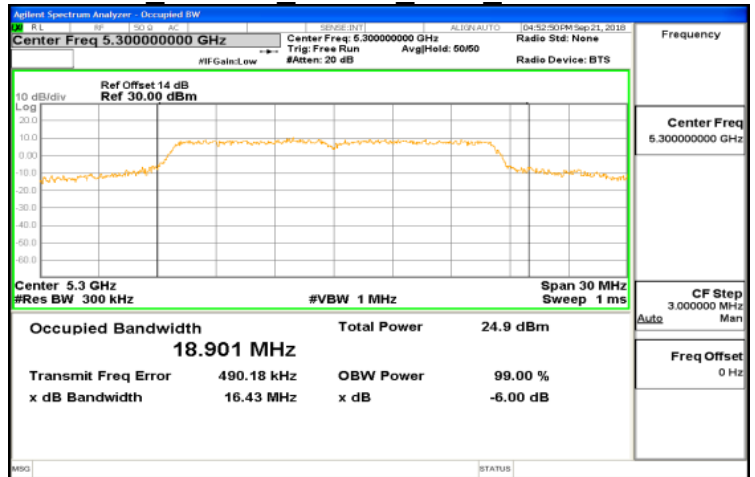
IC 802.11a 20MHz Main 5260MHz



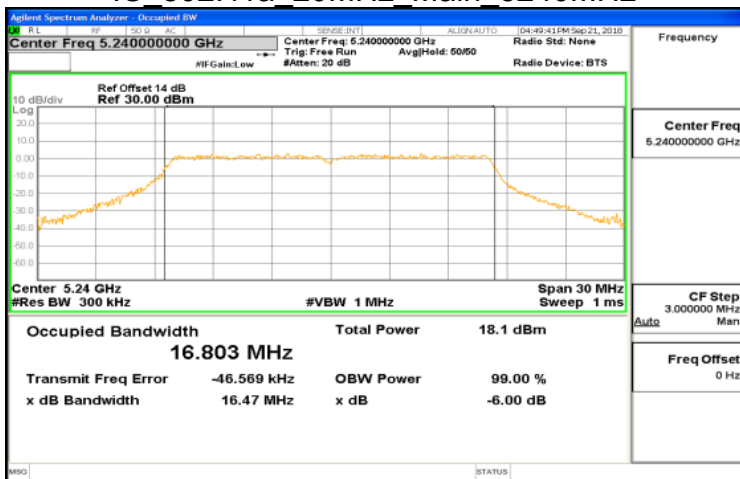
IC 802.11a 20MHz Main 5220MHz



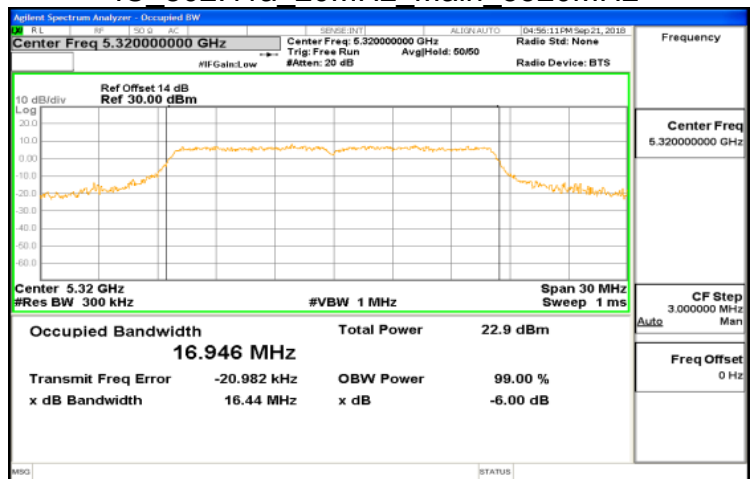
IC 802.11a 20MHz Main 5300MHz



IC 802.11a 20MHz Main 5240MHz



IC 802.11a 20MHz Main 5320MHz

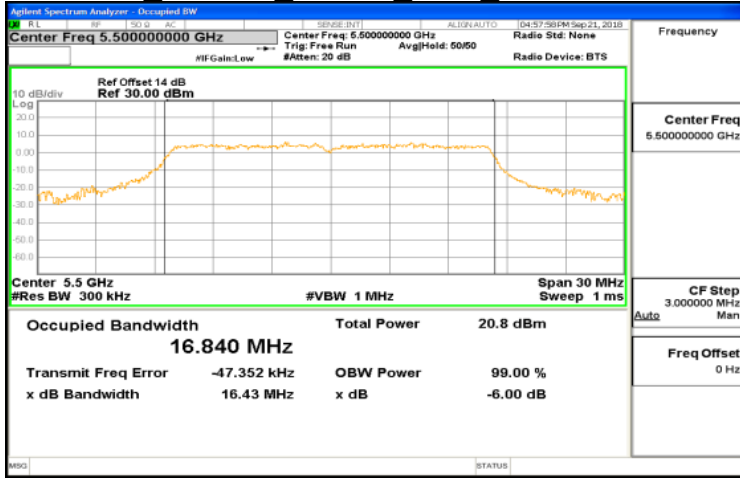


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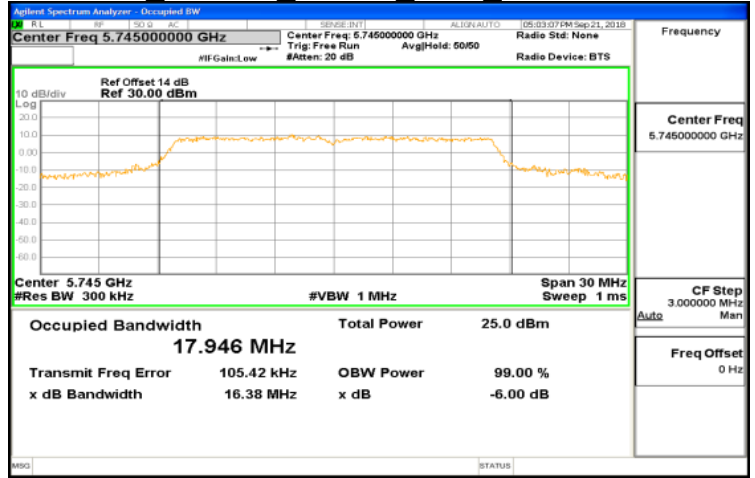
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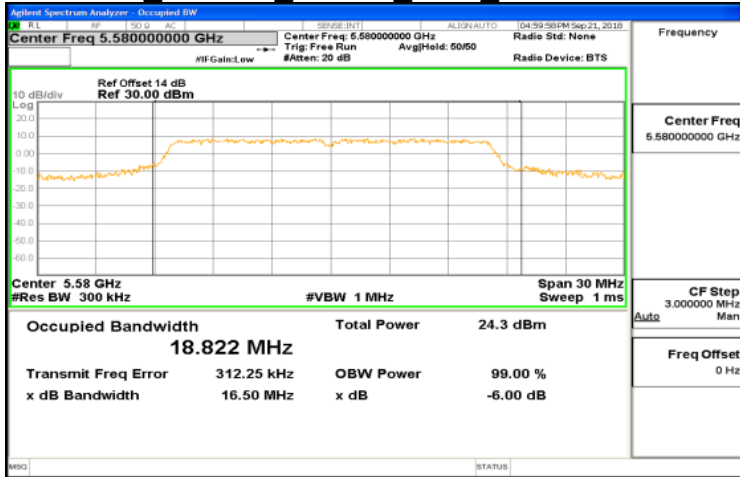
IC 802.11a 20MHz Main 5500MHz



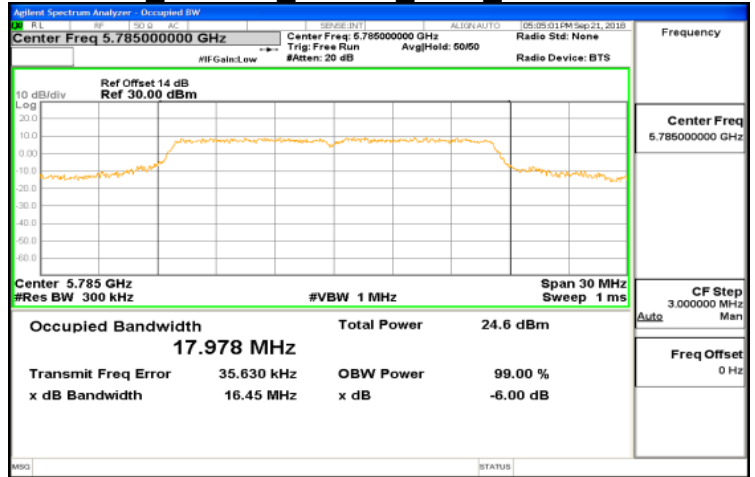
IC 802.11a 20MHz Main 5745MHz



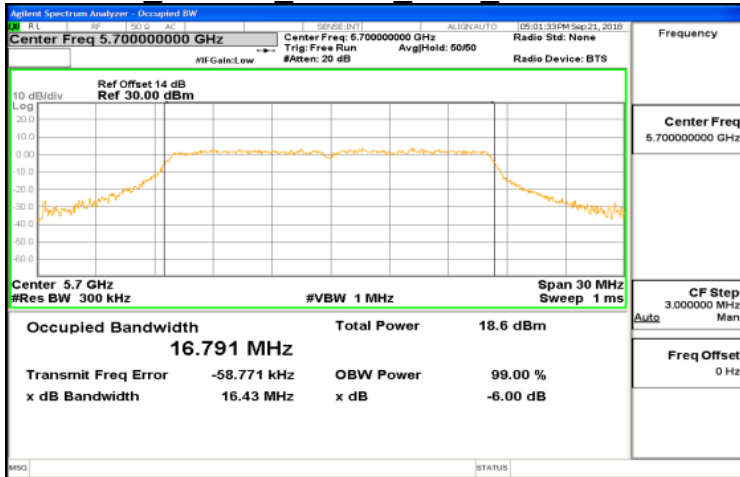
IC 802.11a 20MHz Main 5580MHz



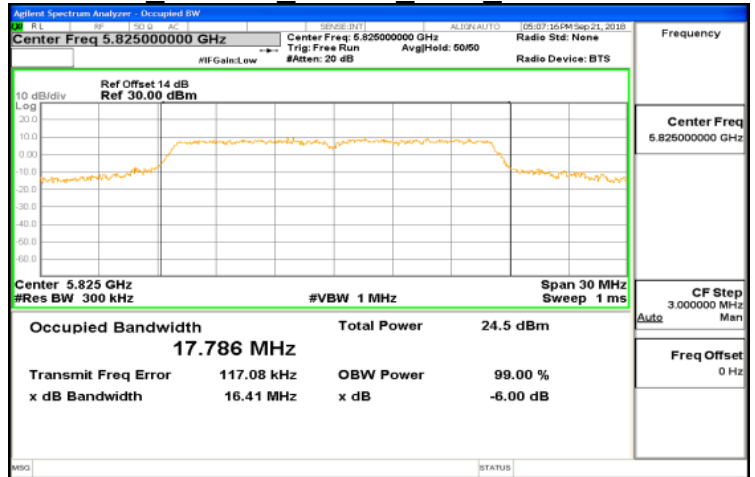
IC 802.11a 20MHz Main 5785MHz



IC 802.11a 20MHz Main 5700MHz



IC 802.11a 20MHz Main 5825MHz

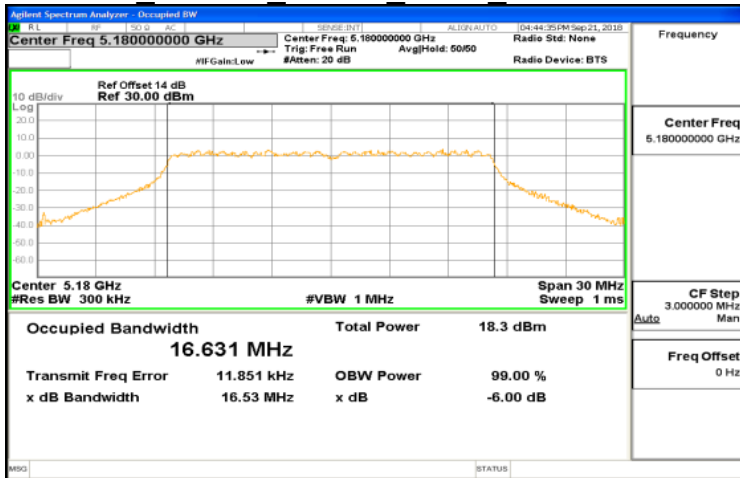


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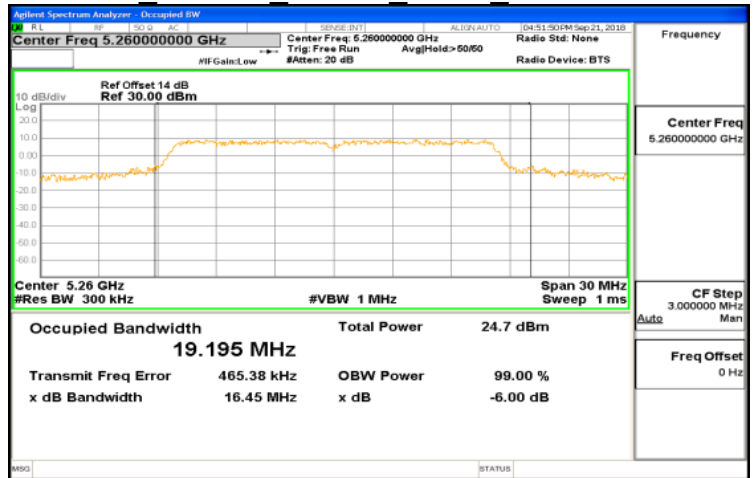
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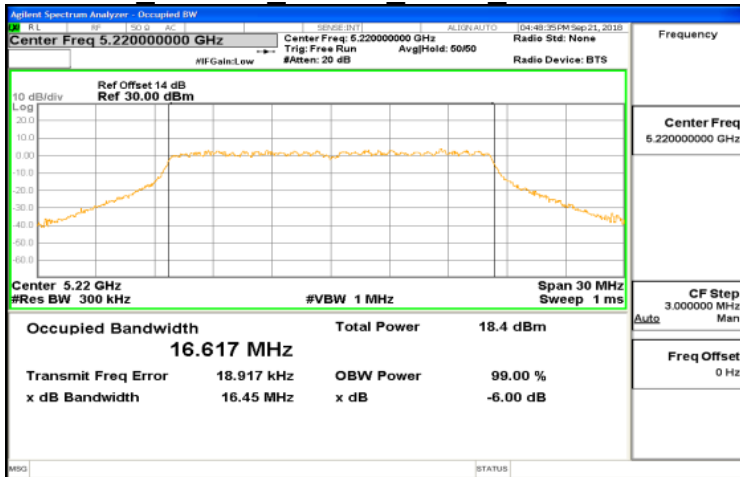
IC 802.11a 20MHz AUX1 5180MHz



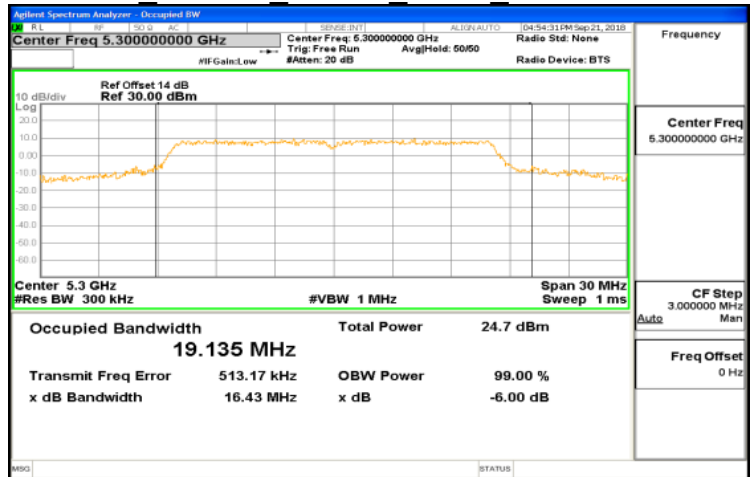
IC 802.11a 20MHz AUX1 5260MHz



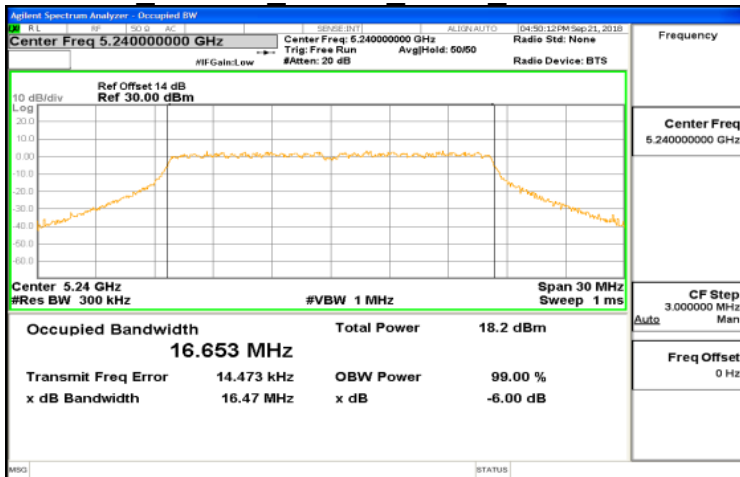
IC 802.11a 20MHz AUX1 5220MHz



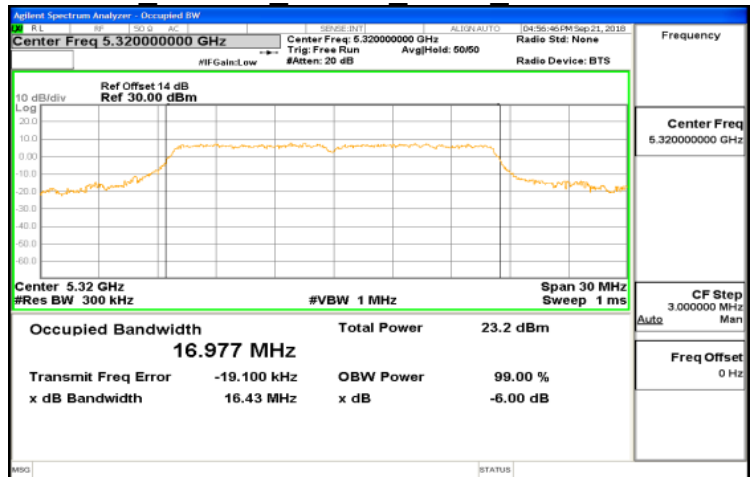
IC 802.11a 20MHz AUX1 5300MHz



IC 802.11a 20MHz AUX1 5240MHz



IC 802.11a 20MHz AUX1 5320MHz

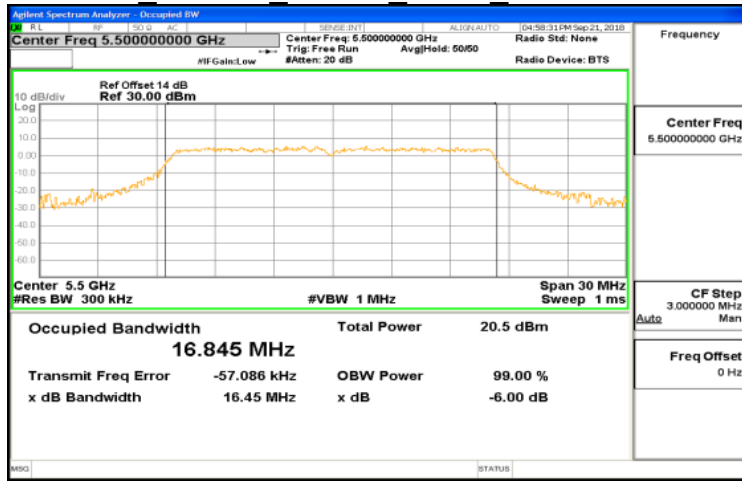


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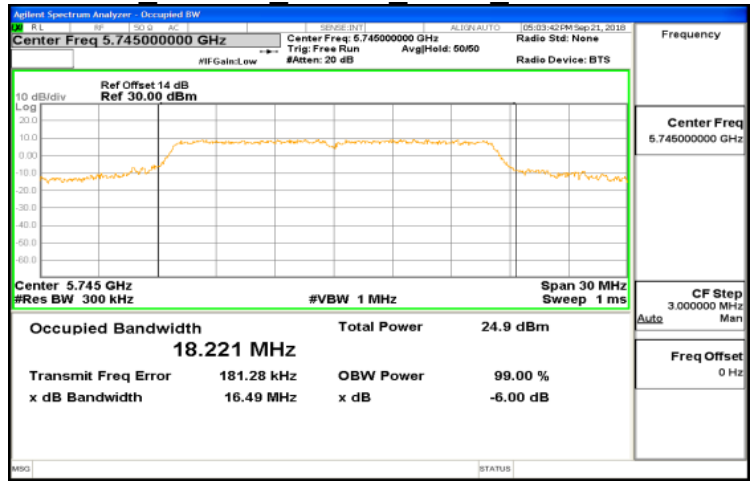
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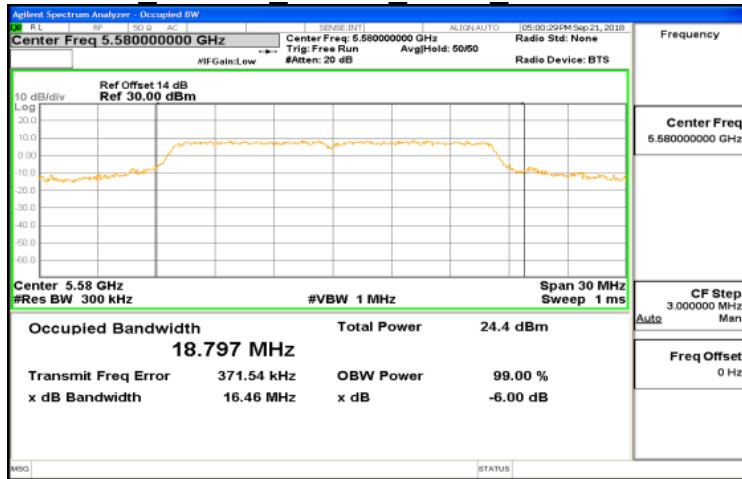
IC 802.11a 20MHz AUX1 5500MHz



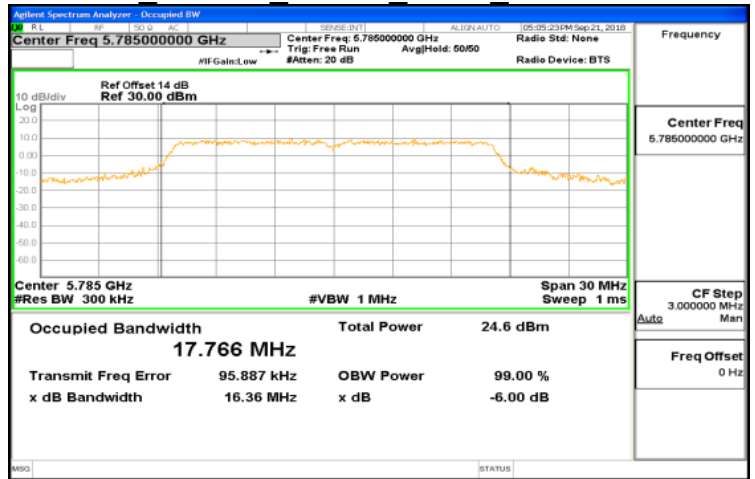
IC 802.11a 20MHz AUX1 5745MHz



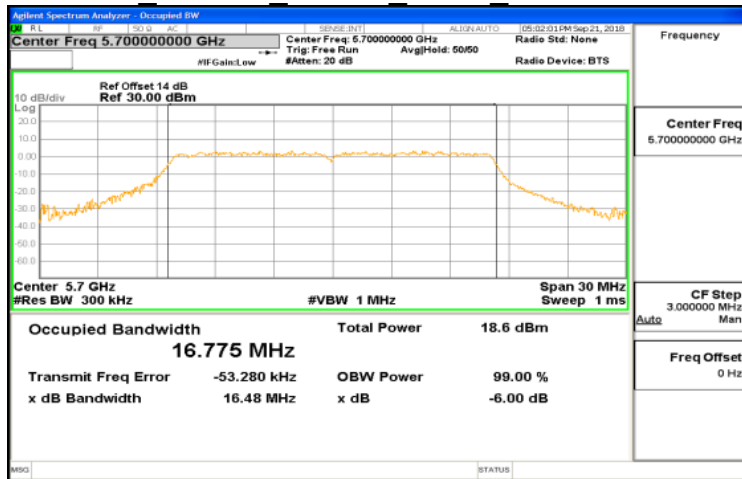
IC 802.11a 20MHz AUX1 5580MHz



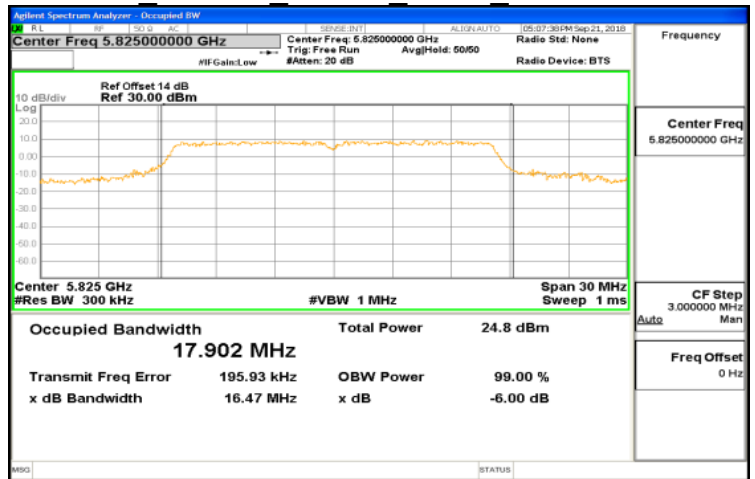
IC 802.11a 20MHz AUX1 5785MHz



IC 802.11a 20MHz AUX1 5700MHz



IC 802.11a 20MHz AUX1 5825MHz

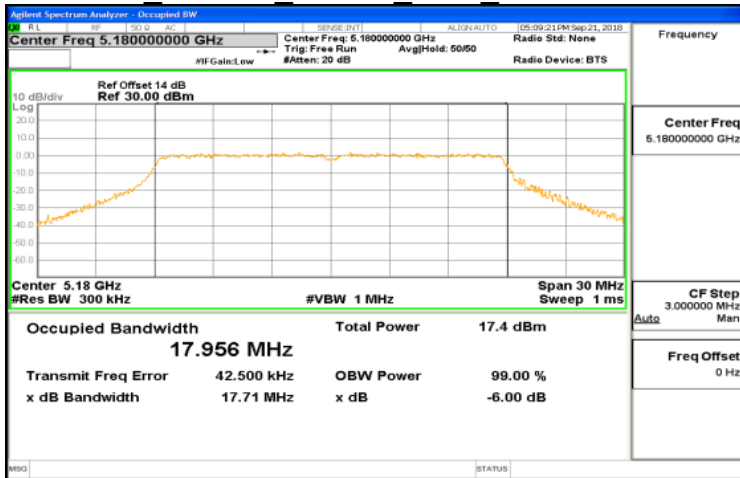


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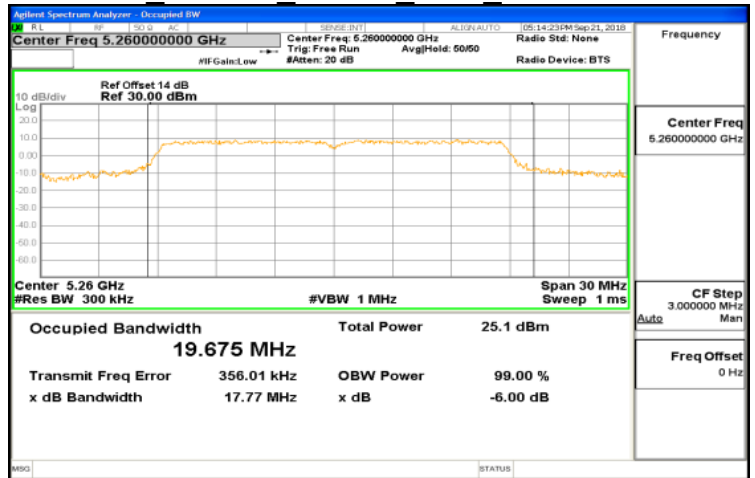
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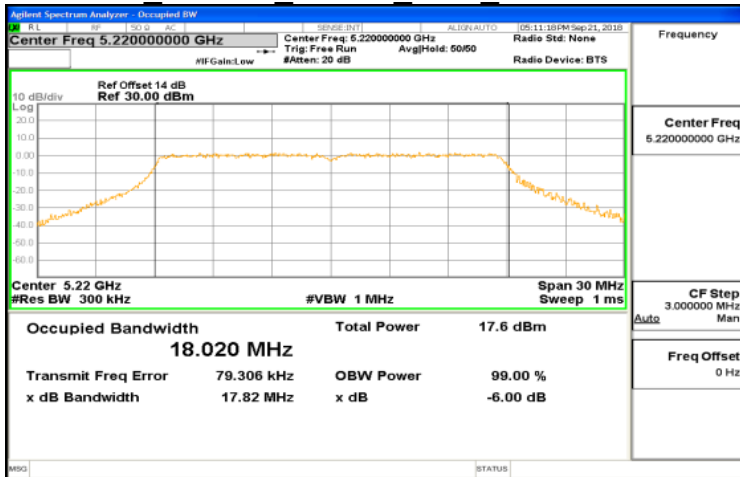
IC 802.11n 20MHz Main 5180MHz



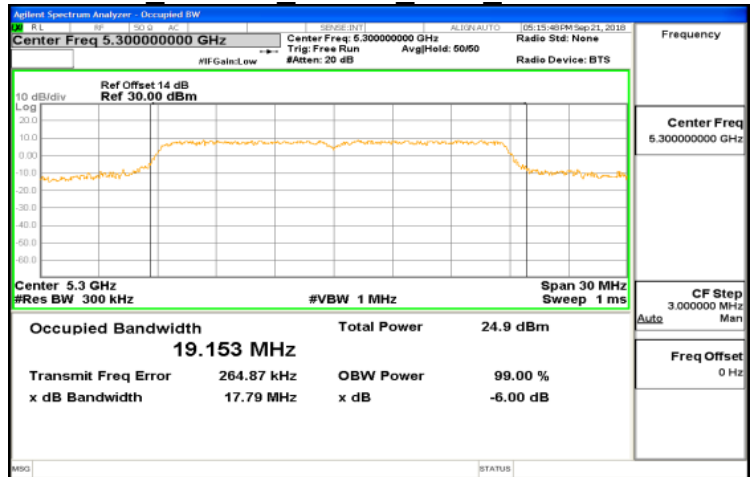
IC 802.11n 20MHz Main 5260MHz



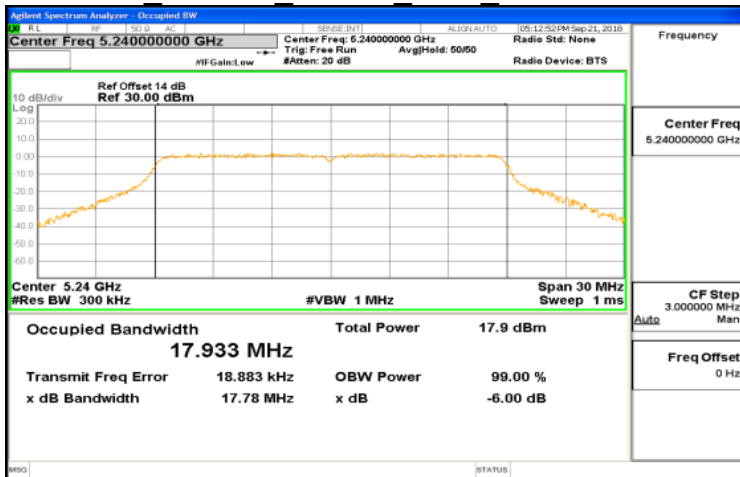
IC 802.11n 20MHz Main 5220MHz



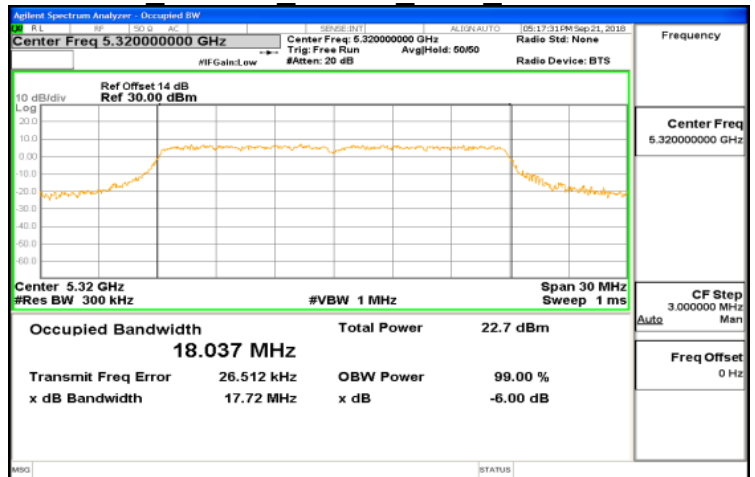
IC 802.11n 20MHz Main 5300MHz



IC 802.11n 20MHz Main 5240MHz



IC 802.11n 20MHz Main 5320MHz

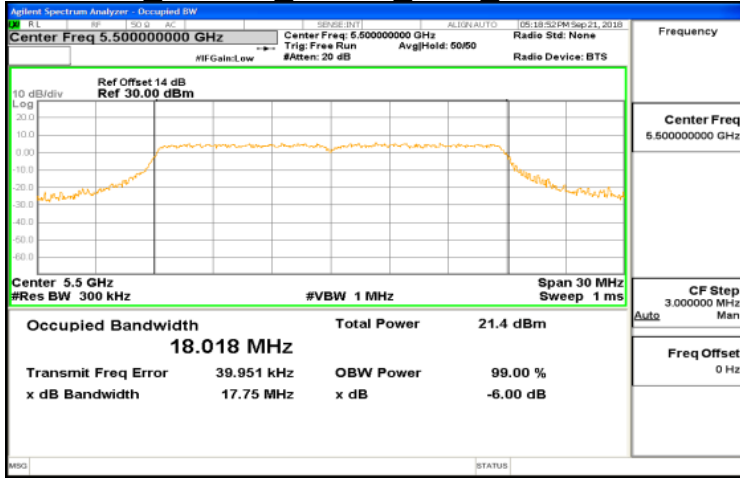


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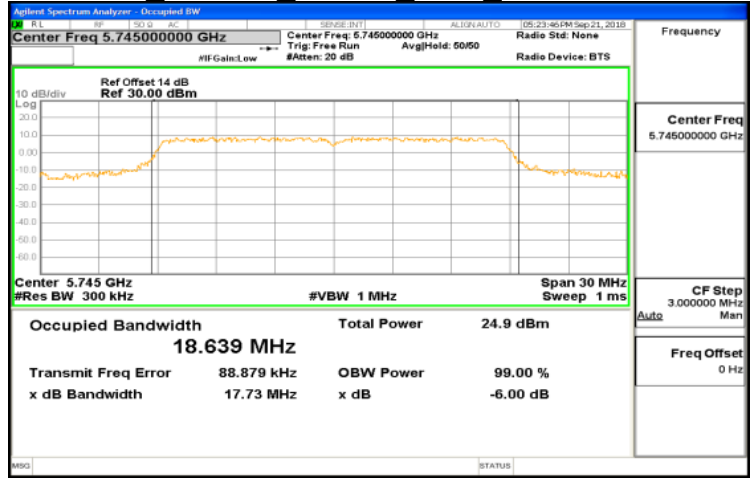
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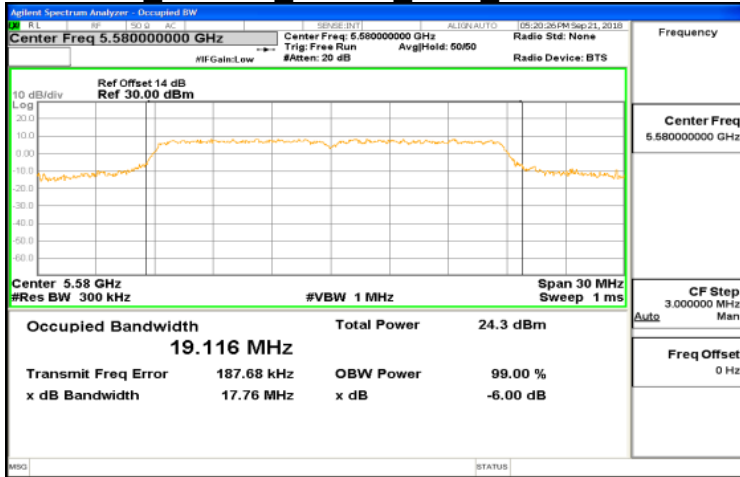
IC 802.11n 20MHz Main 5500MHz



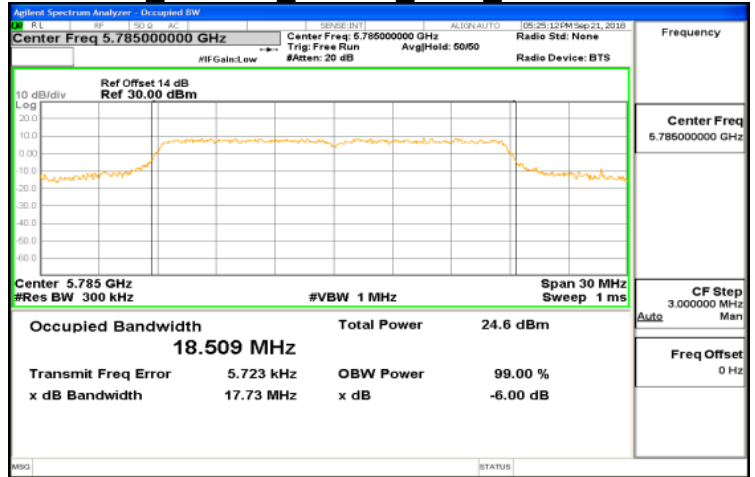
IC 802.11n 20MHz Main 5745MHz



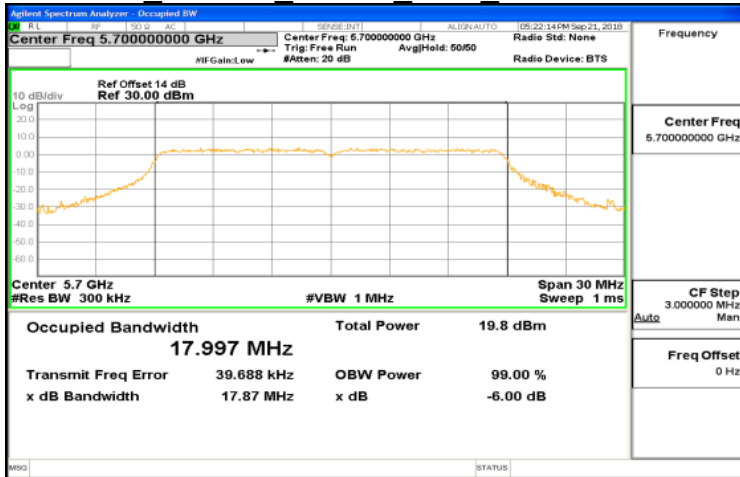
IC 802.11n 20MHz Main 5580MHz



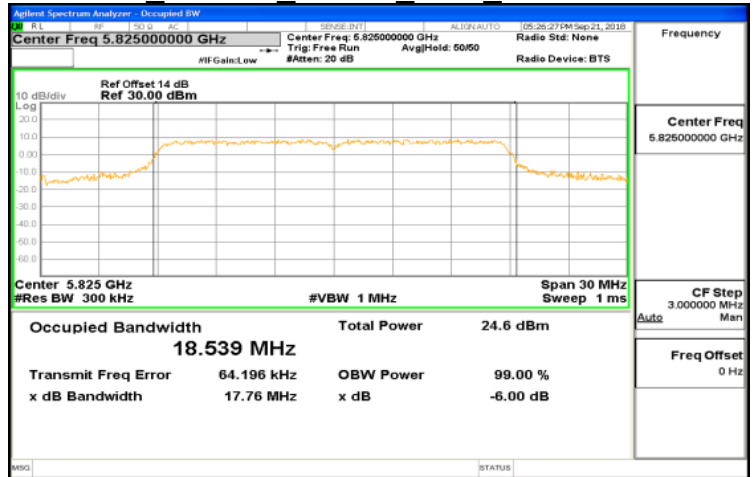
IC 802.11n 20MHz Main 5785MHz



IC 802.11n 20MHz Main 5700MHz



IC 802.11n 20MHz Main 5825MHz



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