

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

OF

**Product Name:** Wireless Cable Modem Gateway  
**Brand Name:** Castlenet  
**Model No.:** CBV3843Z4S; CBW3843G4S,CBW383G4S  
**Model Difference:** Without VOIP & For marketing purpose used  
**FCC ID:** RK9-CBV3843Z4S  
**Report No.:** E2/2015/90040  
**Issue Date:** Oct. 08, 2015  
**FCC Rule Part:** §15.407  
  
**Prepared for:** CastleNet Technology Inc.  
No.64, Chung-Shan Rd., Tu-Cheng District,  
New Taipei City, 23680, Taiwan  
  
**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803



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## VERIFICATION OF COMPLIANCE

**Applicant:** CastleNet Technology Inc.  
No.64, Chung-Shan Rd., Tu-Cheng District, New Taipei City,  
23680, Taiwan

**Product Name:** Wireless Cable Modem Gateway

**Brand Name:** Castlenet

**Model No.:** CBV3843Z4S; CBW3843G4S, CBW383G4S

**Model Difference:** Without VOIP & For marketing purpose used

**FCC ID:** RK9-CBV3843Z4S

**File Number:** E2/2015/90040

**Date of test:** Sep. 21, 2015 ~ Oct. 08, 2015

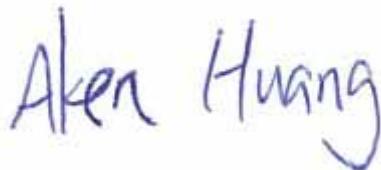
**Date of EUT Received:** Sep. 21, 2015

**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 com-  
pliance with conducted and radiated emission limits.

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

**Test By:**

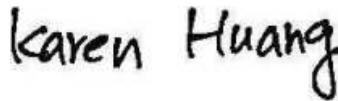


**Date:**

Oct. 08, 2015

**Aken Huang / Engineer**

**Prepared By:**



**Date:**

Oct. 08, 2015

**Karen Huang / Clerk**

**Approved By:**



**Date:**

Oct. 08, 2015

**Jim Chang / Asst. Manager**

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## Revision History

Report Number	Revision	Description	Issue Date
E2/2015/90040	Rev.00	Initial creation of document	Oct. 08, 2015

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## Table of Contents

<b>1. GENERAL INFORMATION .....</b>	<b>6</b>
1.1 Product Description .....	6
1.2 Product Feature of Equipment Under Test .....	9
1.3 Test Methodology of Applied Standards .....	10
1.4 Test Facility .....	10
1.5 Special Accessories .....	10
1.6 Equipment Modifications .....	10
<b>2. SYSTEM TEST CONFIGURATION .....</b>	<b>11</b>
2.1 EUT Configuration .....	11
2.2 EUT Exercise .....	11
2.3 Test Procedure .....	11
2.4 Measurement Results Explanation Example .....	12
2.5 Configuration of Tested System .....	13
<b>3. SUMMARY OF TEST RESULT .....</b>	<b>14</b>
<b>4. DESCRIPTION OF TEST MODES .....</b>	<b>15</b>
4.1 Operated in U-NII Bands .....	15
4.2 The Worst Test Modes and Channel Details .....	16
<b>5. MEASUREMENT UNCERTAINTY .....</b>	<b>18</b>
<b>6. CONDUCTED EMISSION TEST .....</b>	<b>19</b>
6.1 Standard Applicable .....	19
6.2 Measurement Equipment Used .....	19
6.3 EUT Setup .....	19
6.4 Test SET-UP .....	20
6.5 Measurement Procedure .....	20
6.6 Measurement Result .....	20
<b>7. DUTY CYCLE TEST SIGNAL .....</b>	<b>25</b>
<b>8. 26dB &amp; 6dB EMISSION BANDWIDTH MEASUREMENT .....</b>	<b>28</b>
8.1 Standard Applicable .....	28
8.2 Measurement Procedure .....	28
8.3 Measurement Equipment Used .....	29
8.4 Test Set-up .....	29
8.5 Measurement Result .....	30

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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<b>9. MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT .....</b>	<b>62</b>
9.1    Standard Applicable .....	62
9.2    Measurement Procedure.....	63
9.3    Measurement Equipment Used.....	63
9.4    Test Set-up .....	63
9.5    Measurement Result.....	64
<b>10. PEAK POWER SPECTRAL DENSITY .....</b>	<b>66</b>
10.1    Standard Applicable .....	66
10.2    Measurement Procedure.....	67
10.3    Measurement Equipment Used.....	67
10.4    Test Set-up .....	67
10.5    Measurement Result.....	68
<b>11. UNDESIRABLE RADIATED EMISSION MEASUREMENT1 .....</b>	<b>81</b>
11.1    Standard Applicable .....	81
11.2    Measurement Equipment Used.....	83
11.3    Test SET-UP .....	84
11.4    Measurement Procedure.....	85
11.5    Field Strength Calculation .....	85
11.6    Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz .....	86
11.7    Measurement Result.....	86
<b>12. TRANSMISSION IN THE ABSENCE OF DATA.....</b>	<b>125</b>
12.1    Standard Applicable .....	125
12.2    Result .....	125
<b>13. FREQUENCY STABILITY .....</b>	<b>126</b>
13.1    Standard Applicable .....	126
13.2    Measurement Procedure.....	126
13.3    Test SET-UP .....	126
13.4    Measurement Equipment Used.....	127
13.5    Measurement Result.....	128
<b>14. ANTENNA REQUIREMENT .....</b>	<b>132</b>
14.1    Standard Applicable .....	132
14.2    Antenna Connected Construction.....	132

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## 1. GENERAL INFORMATION

### 1.1 Product Description

General:

Product Name:	Wireless Cable Modem Gateway	
Brand Name:	Castlenet	
Model No.:	CBV3843Z4S; CBW3843G4S, CBW383G4S	
Product SW/HW version:	571mp1 / A0	
Radio SW/HW version:	N/A	
RF power setting in TEST SW:	N/A	
Power Supply:	12V from AC/DC adapter	
	Adapter:	1. Model No.: WA-24Q12FU, Supplier: APD 2. Model No.: ADS0306-W 120250, Supplier: AOEM

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## WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology	
11a	5150~5250	4	18.21dBm	OFDM	
	5725-5850	5	18.71dBm		
11n / ac_20M	HT20 / VHT20 5150~5250	4	21.64dBm (Worst Case)	OFDM	
	HT20 / VHT20 5725-5850	5	21.18dBm (Worst Case)		
11n / ac_40M	HT40 / VHT40 5150~5250	2	16.80dBm (Worst Case)	OFDM	
	HT40 / VHT40 5725-5850	2	19.08dBm (Worst Case)		
11ac_80M	VHT80 5150~5250	1	17.00dBm	OFDM	
	VHT80 5725-5850	1	15.46dBm		
Antenna Designation	PIFA Antenna Main: Part No.: AIDP1I-W0001, Supplier: Taiwan Anjie Electronics Co., Ltd. 5GHz Gain: 5.35dBi (5150MHz-5250MHz) 5GHz Gain: 5.11dBi (5725MHz-5850MHz) Aux 1: Part No.: AIDP1I-W0001, Supplier: Taiwan Anjie Electronics Co., Ltd. 5GHz Gain: 5.72dBi (5150MHz-5250MHz) 5GHz Gain: 5.75dBi (5725MHz-5850MHz) Aux 2: Part No.: AP11I-00001, Supplier: Taiwan Anjie Electronics Co., Ltd. 5GHz Gain: 5.65dBi (5150MHz-5250MHz) 5GHz Gain: 5.65dBi (5725MHz-5850MHz)				
Modulation type	64QAM, 16QAM, QPSK, BPSK for OFDM				

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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 – 300Mbps  
802.11 ac\_20MHz: 6.5 – 144.4Mbps  
802.11 ac\_40MHz: 13.5 – 300Mbps  
802.11 ac\_80MHz: 29.3 – 650Mbps

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## 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is Wireless Cable Modem Gateway supporting, Wi-Fi 802.11a/b/g/n/ac feature, and below is details of information.

Product Feature	
Product Name:	Wireless Cable Modem Gateway
Brand Name:	Castlenet
Model No.:	CBV3843Z4S; CBW3843G4S,CBW383G4S
Model Difference:	Without VOIP & For marketing purpose used
FCC ID	RK9-CBV3843Z4S
Wi-Fi Specification	802.11a/b/g/n/ac

**Note:** The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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### 1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules v01

FCC KDB 662311 D01 Multiple Transmitter Output

FCC KDB 644545 D03 Guidance for IEEE 802.11ac v01

ANSI C63.10:2013

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.
3. The EUT was placed 1.5m height for frequency above 1GHz in accordance with ANSI C63.10:2013.

### 1.4 Test Facility

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

FCC Registration Numbers are: 628985

Canada Registration Number: 4620A-5

### 1.5 Special Accessories

There are no special accessories used while test was conducted.

### 1.6 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 placed on a 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 §15.107. 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 placed on a turn table which is 0.8 m above ground plane. 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 hand-held 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.

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## 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. Following shows an offset computation example with cable loss 6.5dB and 10dB attenuator.

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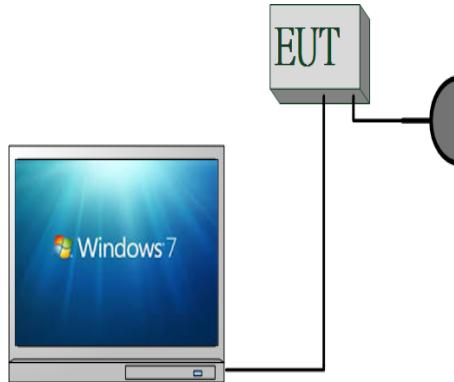
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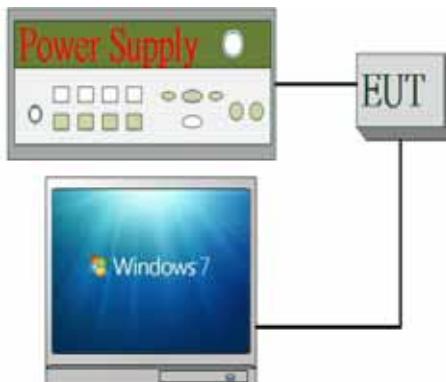
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## 2.5 Configuration of Tested System

**Fig. 2-1 Radiated Emission**



**Fig. 2-2 Conducted (Antenna Port) & & AC Power Line Conducted 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	DRTU	N/A	N/A	N/A	N/A
2.	DC Power Supply	HP	E3640A	KR93300208	Shield	Un-shield
3.	Notebook	Lenovo	L420	LR-7HXZA	Shield	Un-shield

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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 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:

4 channels are provided for 802.11a, 802.11n\_HT20, 802.11ac\_VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n\_HT40, 802.11ac\_VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

1 channel is provided for 802.11ac\_VHT80

CHANNEL	FREQUENCY
42	5210 MHz

Operated band in 5725 MHz ~5850 MHz:

5 channels are provided for 802.11a, 802.11n\_HT20, 802.11ac\_VHT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz		

2 channels are provided for 802.11n\_HT40, 802.11ac\_VHT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
151	5755 MHz	159	5795 MHz

1 channel is provided for 802.11ac\_VHT80

CHANNEL	FREQUENCY
155	5775 MHz

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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 802.11ac yields the highest reading that generates the highest emission. Therefore, 802.11ac as the mode of test configuration is chosen to carry out the relevantly mandatory test items.

### 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	44	OFDM	6	AUX 1
802.11ac_VHT80	5210	42	42	OFDM	MCS8	MIMO
802.11a	5745~5825	149 to 165	157	OFDM	6	AUX 1
802.11ac_VHT80	5775	155	155	OFDM	MCS8	MIMO
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	AUX 1
802.11ac_VHT20				OFDM	MCS8	MIMO
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	AUX 1
802.11ac_VHT20				OFDM	MCS8	MIMO
802.11ac_VHT40	5755~5795	151 to 159	151,159	OFDM	MCS8	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 E1 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	AUX 1
802.11ac_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11ac_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	AUX 1
802.11ac_HT20 802.11ac_VHT20				OFDM	MCS8	MIMO
802.11ac_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 : <b>Vertical</b> )	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> )	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	12/12/2014	12/11/2015
Coaxial Cables	N/A	N30N30-1042-150 cm	N/A	01/06/2015	01/07/2016
LISN	Schwarzbeck	NSLK 8127	8127-648	06/09/2015	06/08/2016
LISN	Rolf-Heine	NNB-2/16Z	99012	03/04/2015	03/03/2016
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 tabletop.
3. The LISN was connected with 120Vac/60Hz power source.

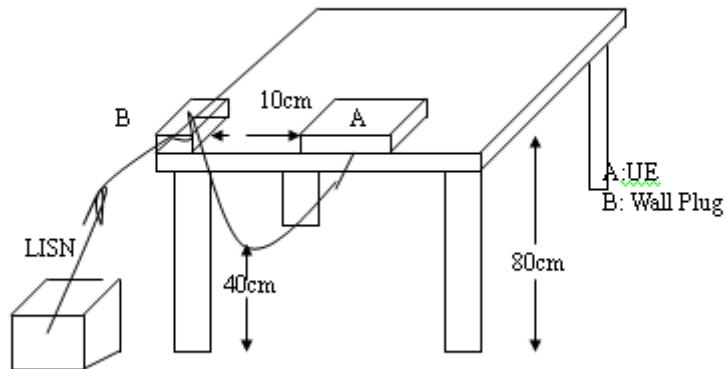
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## 6.4. Test SET-UP



## 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 that closet to the limit

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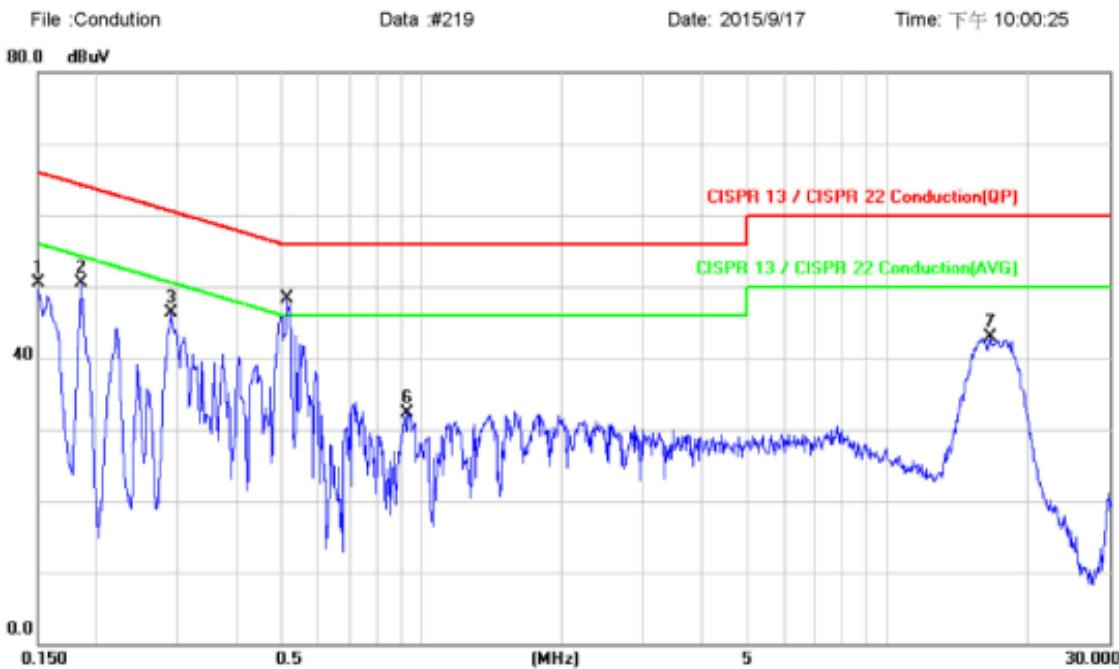
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Sep. 17, 2015
Temperature:	26	Humidity:	54 %	Test By:	Ashton
Model No.:	Adapter: ADS0306-W 120250			Phase:	L1

## Conducted Emission



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1	0.1500	50.39	0.08	50.47	66.00	-15.53	peak		
2	0.1860	50.52	0.07	50.59	64.21	-13.62	peak		
3	0.2900	46.13	0.11	46.24	60.52	-14.28	peak		
4 *	0.5140	46.40	0.24	46.64	56.00	-9.36	QP		
5	0.5140	34.70	0.24	34.94	46.00	-11.06	AVG		
6	0.9380	31.91	0.40	32.31	56.00	-23.69	peak		
7	16.6460	42.24	0.60	42.84	60.00	-17.16	peak		

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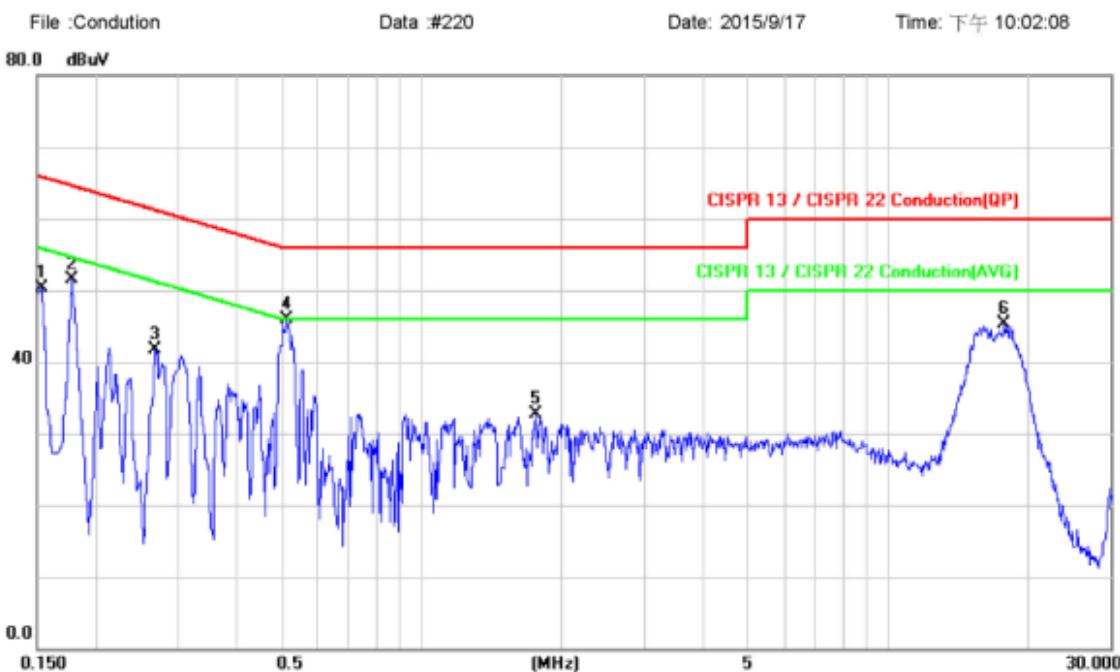
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Operation Mode:	Operation mode			Test Date:	Sep. 17, 2015
Temperature:	26	Humidity:	54 %	Test By:	Ashton
Model No.:	Adapter: ADS0306-W 120250			Phase:	N

**Conducted Emission**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
<hr/>									
1	0.1540	50.19	0.14	50.33	65.78	-15.45	peak		
2	0.1780	51.34	0.14	51.48	64.58	-13.10	peak		
3	0.2700	41.57	0.16	41.73	61.12	-19.39	peak		
4 *	0.5140	45.65	0.29	45.94	56.00	-10.06	peak		
5	1.7700	32.17	0.60	32.77	56.00	-23.23	peak		
6	17.8220	44.77	0.61	45.38	60.00	-14.62	peak		

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Operation Mode:	Operation mode			Test Date:	Oct. 07, 2015
Temperature:	23	Humidity:	69 %	Test By:	Ashton
Model No.:	Adapter: WA-24Q12FU			Phase:	L1

**Conducted Emission**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV	dB	Detector	
1		0.1580	49.71	0.08	49.79	65.57	-15.78	peak
2		0.2060	47.70	0.07	47.77	63.37	-15.60	peak
3 *		0.3620	43.53	0.15	43.68	58.68	-15.00	peak
4		4.4660	34.17	0.61	34.78	56.00	-21.22	peak
5		8.7860	28.91	0.68	29.59	60.00	-30.41	peak
6		20.3140	29.87	0.56	30.43	60.00	-29.57	peak

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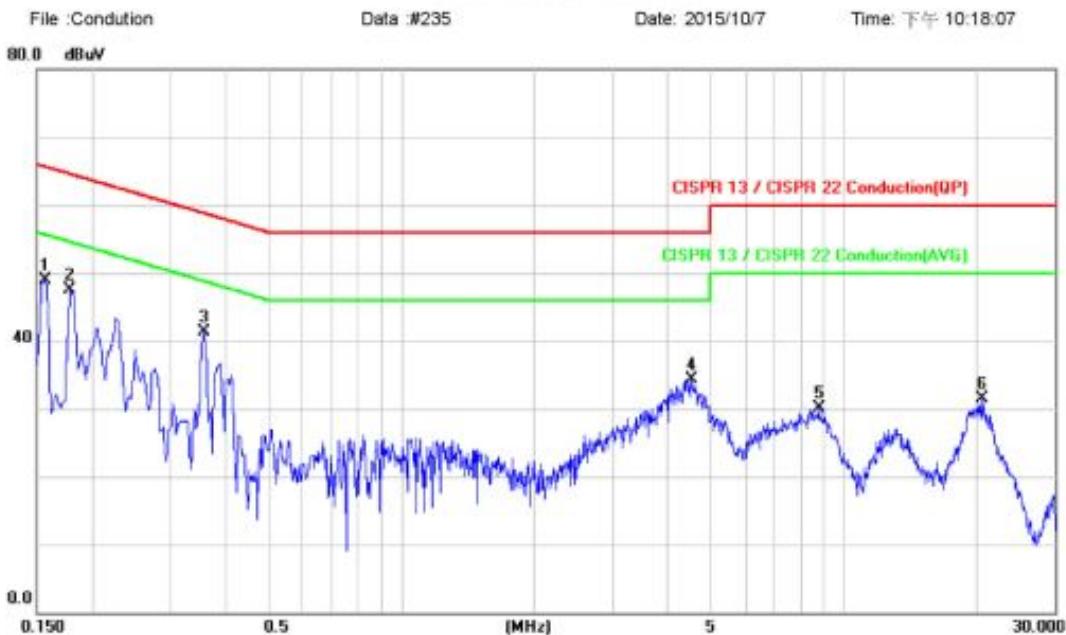
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Operation Mode:	Operation mode			Test Date:	Oct. 07, 2015
Temperature:	23	Humidity:	69 %	Test By:	Ashton
Model No.:	Adapter: WA-24Q12FU			Phase:	N

**Conducted Emission**

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
			Level	Factor	ment				
1 *		0.1580	48.69	0.14	48.83	65.57	-16.74	peak	
2		0.1780	47.33	0.14	47.47	64.58	-17.11	peak	
3		0.3580	41.20	0.20	41.40	58.77	-17.37	peak	
4		4.5420	33.69	0.67	34.36	56.00	-21.64	peak	
5		8.8060	29.47	0.73	30.20	60.00	-29.80	peak	
6		20.4980	30.84	0.60	31.44	60.00	-28.56	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:

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

### Measurement Procedure:

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

### Duty Cycle:

	Duty Cycle	Duty Factor (dB)
802.11a	95.2%	0.21
802.11n_20 (MIMO)	95.2%	0.21
802.11n_40 (MIMO)	78.3%	1.06
802.11 ac80 (MIMO)	87.2%	0.60

$$\text{Duty Cycle Factor: } 10 * \log (1/0.952) = 0.21$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.952) = 0.21$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.783) = 1.06$$

$$\text{Duty Cycle Factor: } 10 * \log (1/0.872) = 0.60$$

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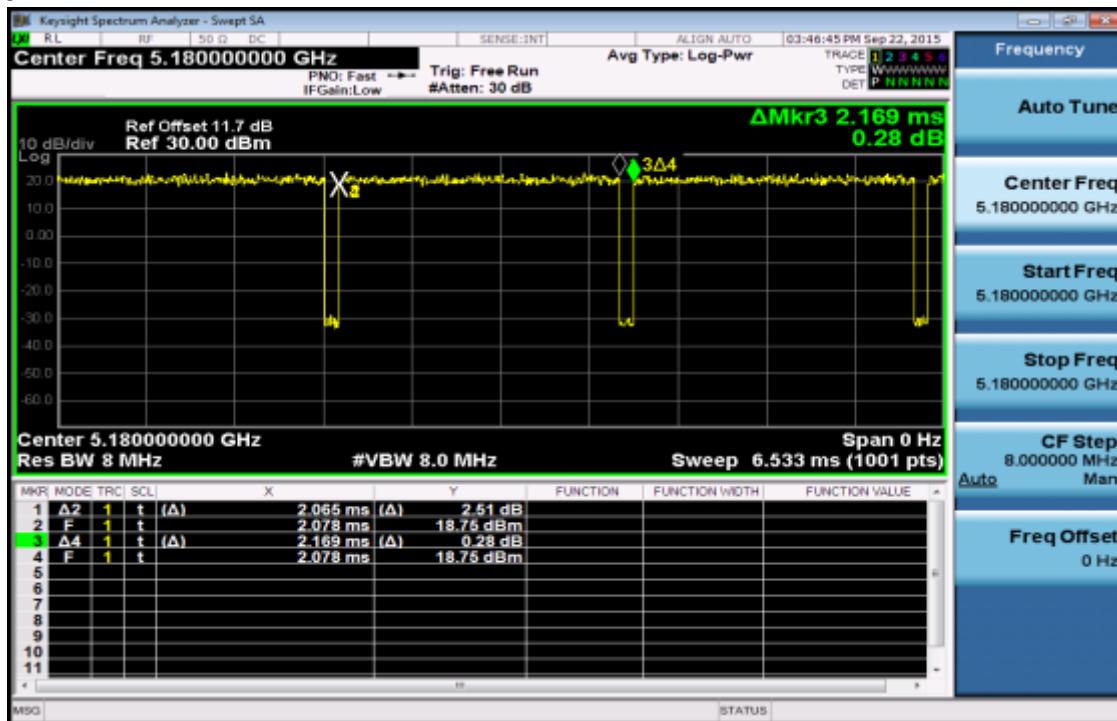
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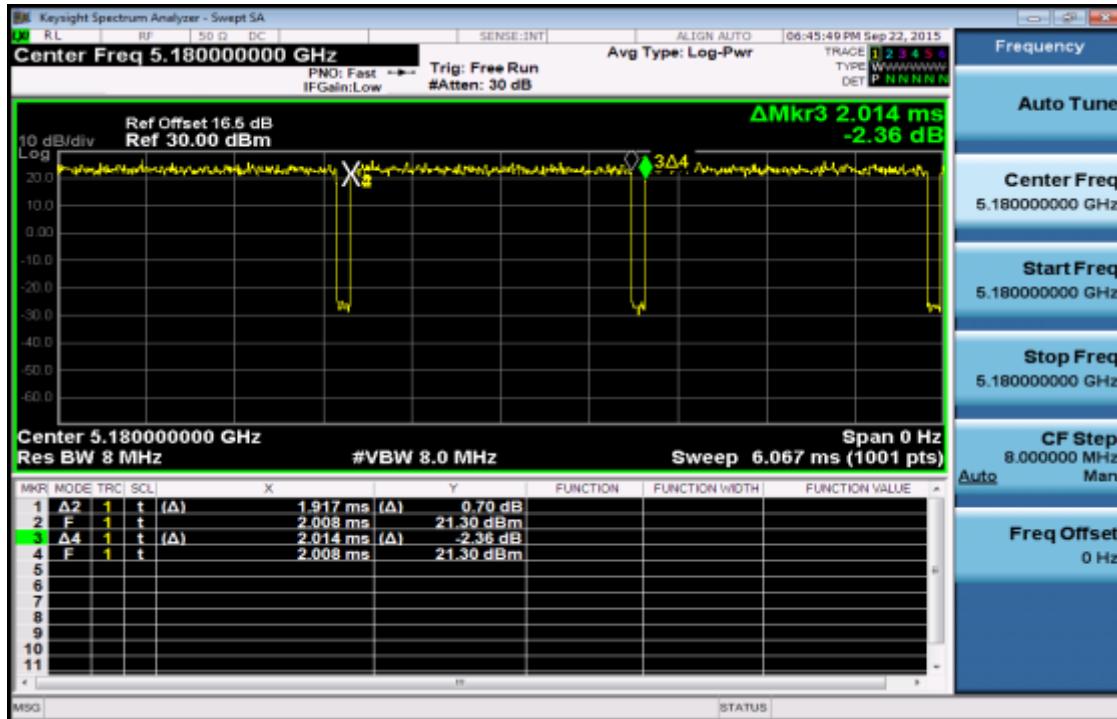
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## DUTY CYCLE TEST SIGNAL Measurement Result

### 802.11a



### 802.11n HT20



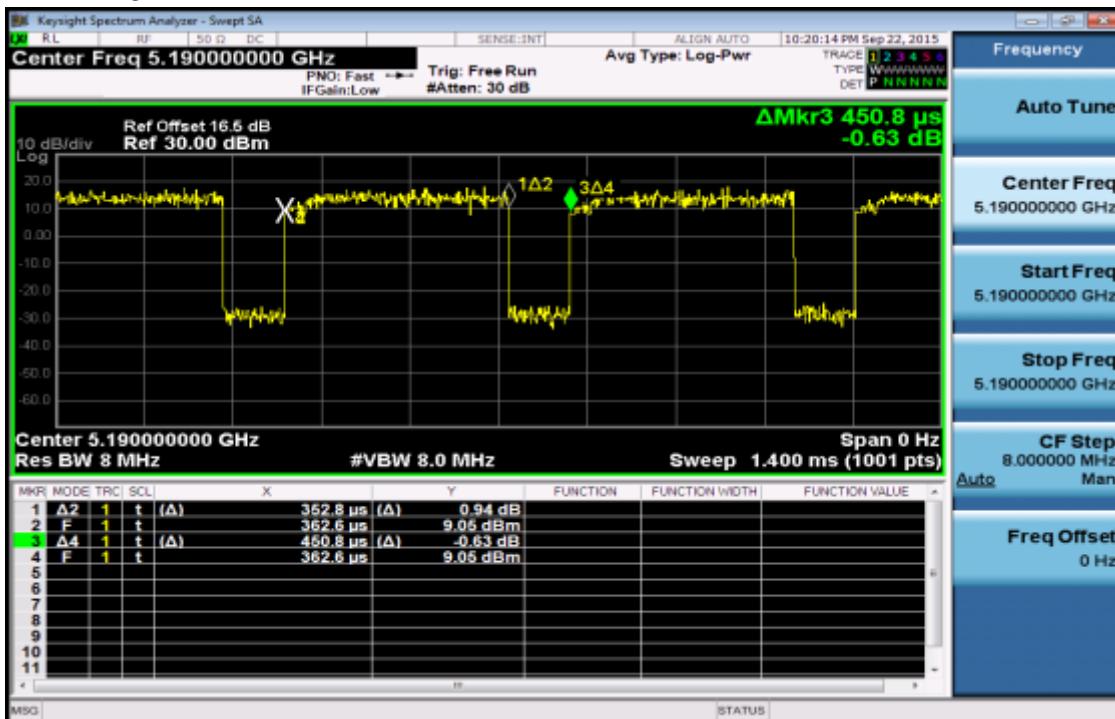
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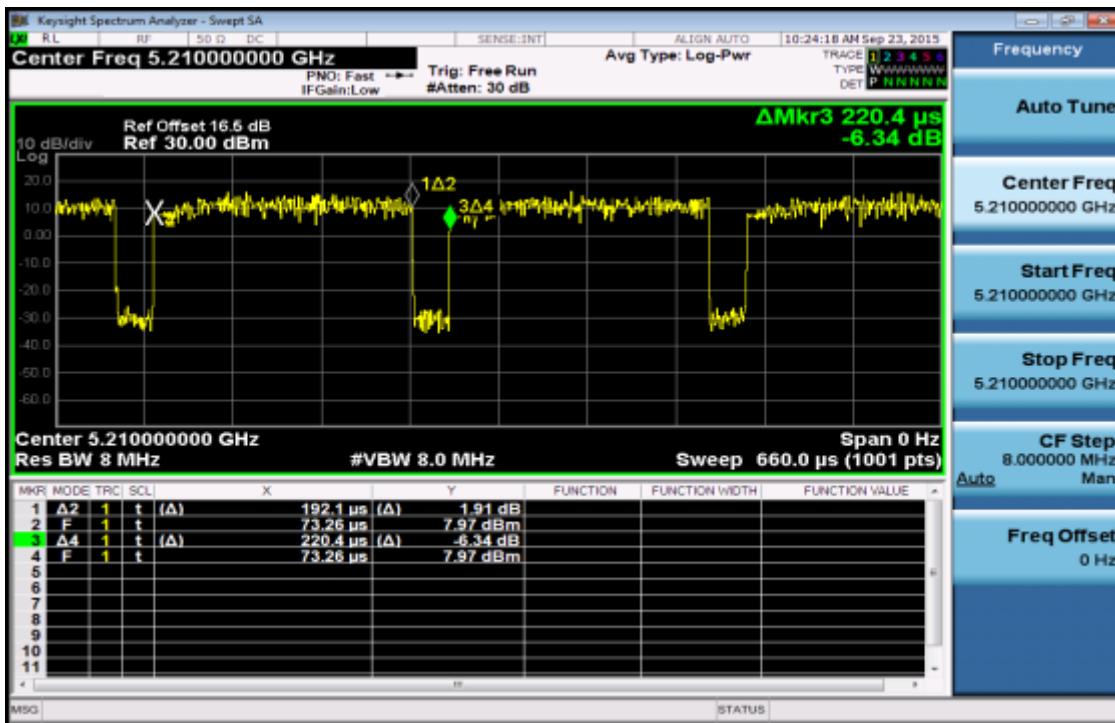
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## 802.11 n HT 40



## 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 v01.
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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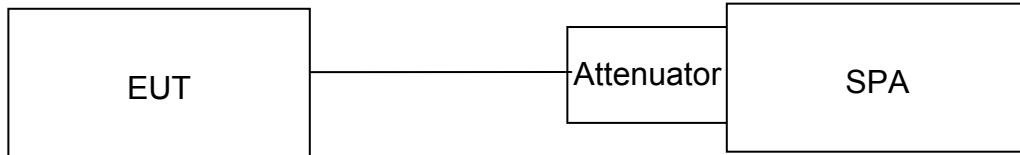
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### 8.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2015	04/13/2016
Power Meter	Anritsu	ML2496A	1326001	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315048	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315049	06/23/2015	06/22/2016
Coaxial Cable 30cm	WOKEN	00100A1F1A 195C	RF01	12/19/2014	12/18/2015
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Splitter	RF-LAMBAD	RFLT2W1G1 8G	RF35	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2015	05/03/2016

### 8.4 Test Set-up



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## 8.5 Measurement Result

### 26dB Bandwidth

802.11a

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	19.81	12.97
5220	20.33	13.08
5240	20.34	13.08

802.11n\_HT20 (Main)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.06	13.02
5220	19.94	13.00
5240	19.89	12.99

802.11n\_HT20 (Aux 1)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	19.98	13.01
5220	20.02	13.01
5240	19.77	12.96

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## 802.11n\_HT20 (Aux2)

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	19.43	12.88
5220	20.10	13.03
5240	19.84	12.98

## 802.11n \_HT40 (Main)

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5190	39.01	15.91
5230	38.97	15.91

## 802.11n \_HT40 (Aux 1)

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5190	38.95	15.91
5230	38.76	15.88

## 802.11n \_HT40 (Aux 2)

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5190	38.66	15.87
5230	38.90	15.90

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## 802.11\_ac 80 (Main)

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5210	81.02	19.09
5775	76.67	18.85

## 802.11\_ac 80 (Aux 1)

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5210	80.47	19.06
5775	75.79	18.80

## 802.11\_ac 80 (Aux 2)

Frequency (MHz)	26dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5210	81.06	19.09
5775	76.43	18.83

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**6dB Bandwidth (5725 MHz~ 5850 MHz)**

## 802.11a

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	16.41	12.15
5785	16.35	12.14
5825	16.38	12.14

## 802.11n\_HT20 (Main)

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.61	12.46
5785	17.62	12.46
5825	17.71	12.48

## 802.11n\_HT20 (Aux 1)

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.63	12.46
5785	17.65	12.47
5825	17.67	12.47

## 802.11n\_HT20 (Aux 2)

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.57	12.45
5785	17.61	12.46
5825	17.70	12.48

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## 802.11n\_HT40 (Main)

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5755	36.42	15.61
5795	36.40	15.61

## 802.11n\_HT40 (Aux 1)

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5755	36.28	15.60
5795	36.45	15.62

## 802.11n\_HT40 (Aux 2)

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5755	36.51	15.62
5795	36.40	15.61

## 802.11n\_ac 80 (Main)

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5775	76.07	18.81

## 802.11n\_ac 80 (AUX 1)

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5775	76.28	18.82

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## 802.11n\_ac 80 (AUX 2)

Frequency (MHz)	6dB Bandwidth (B) (MHz)	10 Log (B) (dB)
5775	76.34	18.83

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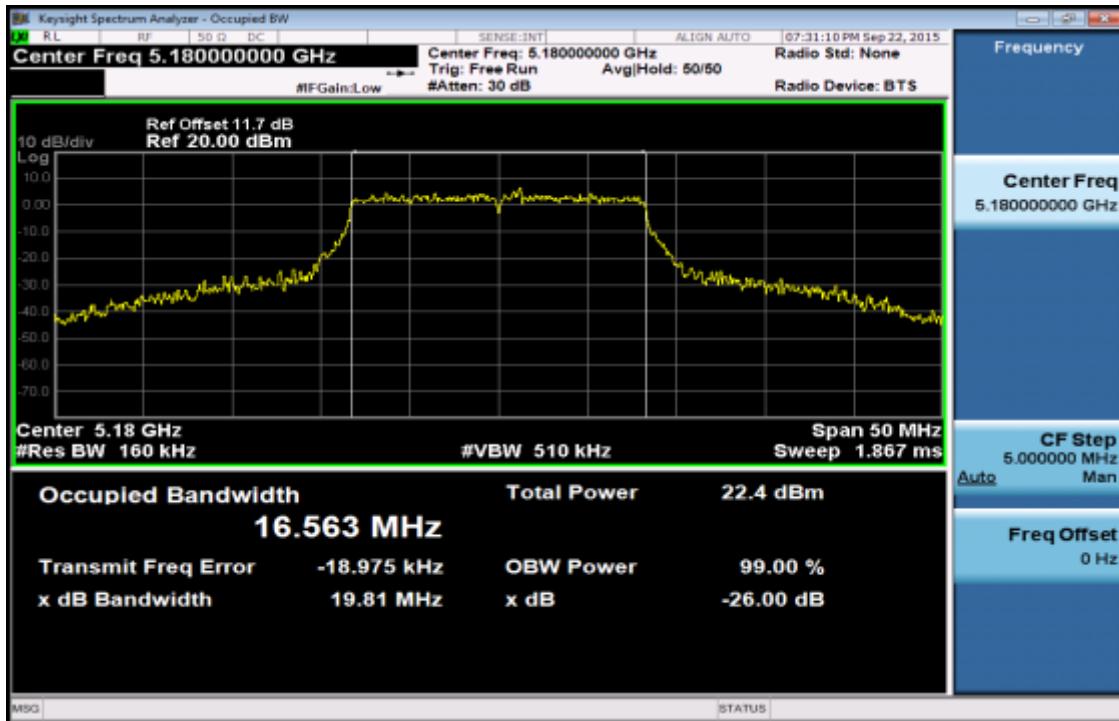
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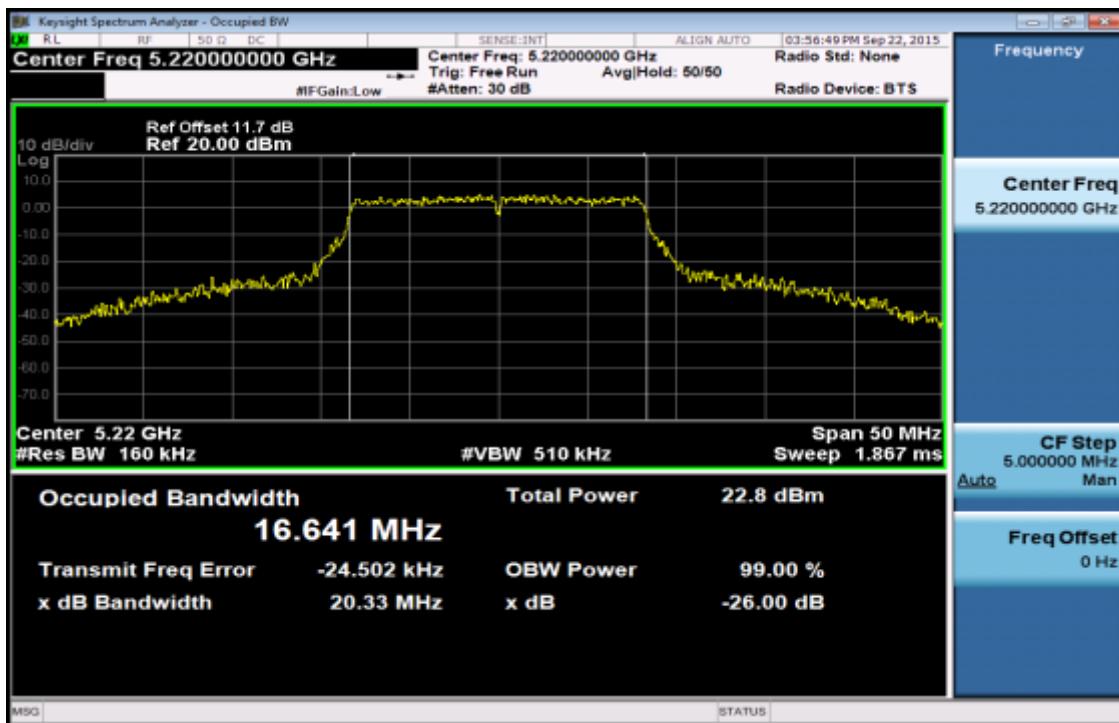
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## 802.11a, 5150~5250 MHz

### 26dB Band Width Test Data CH-Low (5180MHz)



### 26dB Band Width Test Data CH-Mid (5220MHz)

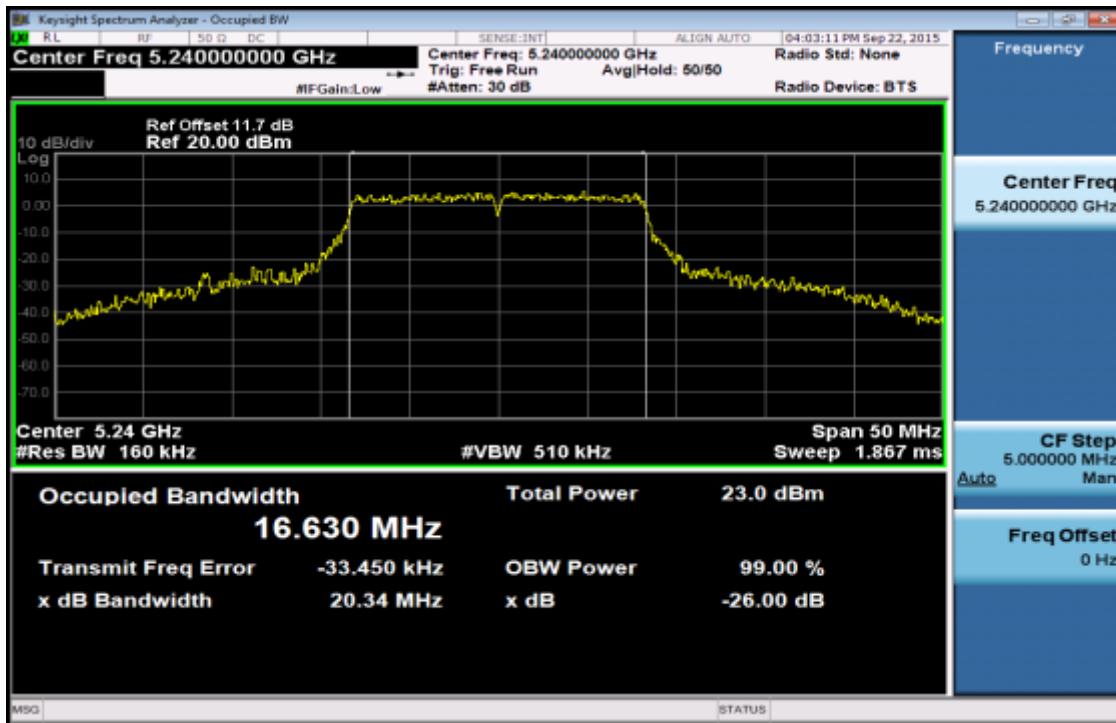


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**26dB Band Width Test Data CH-High (5240MHz)**

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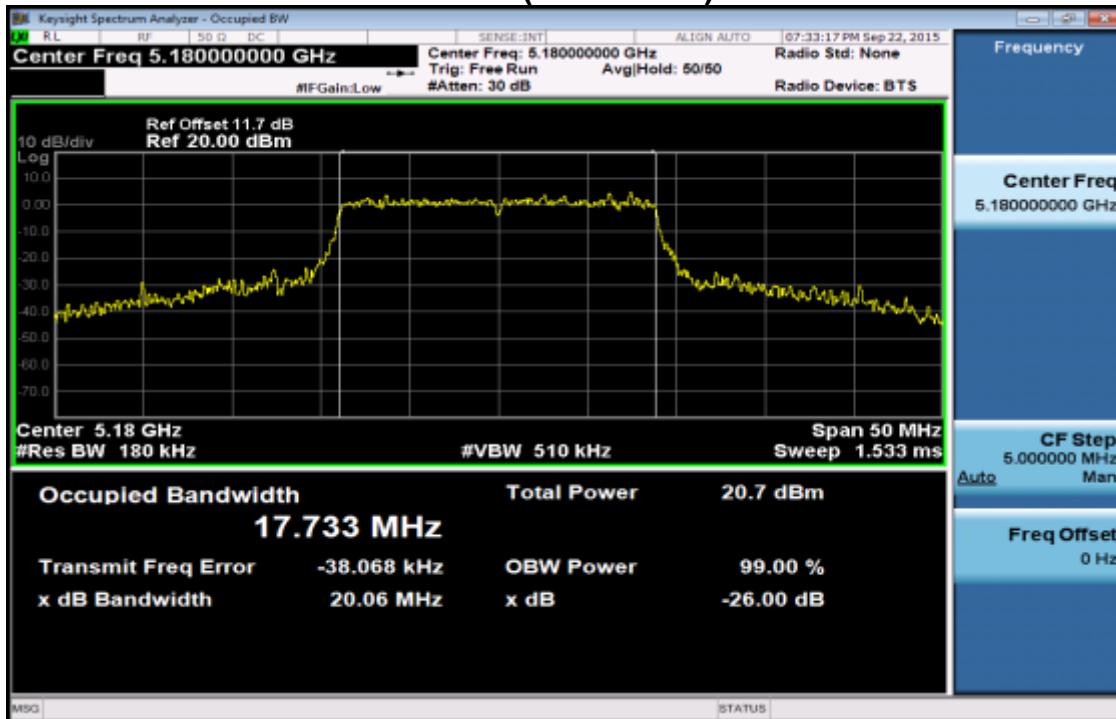
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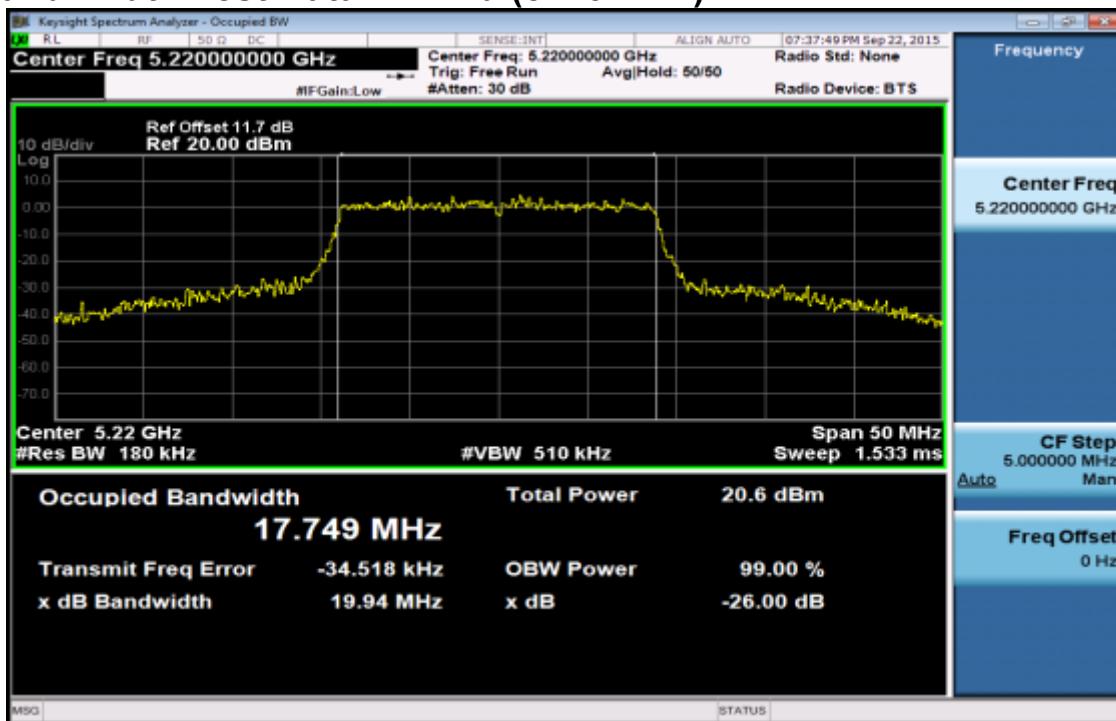
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## 802.11n HT20, 5150~5250 MHz (Main) 26dB Band Width Test Data CH-Low (5180 MHz)



## 26dB Band Width Test Data CH-Mid (5220 MHz)



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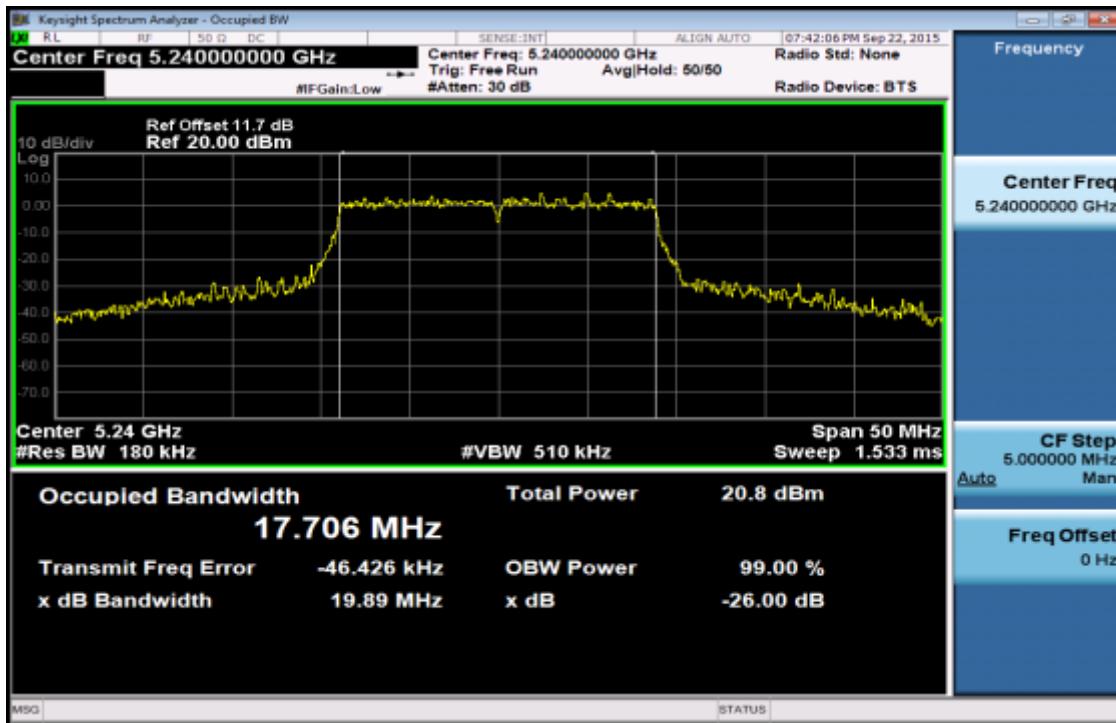
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**26dB Band Width Test Data CH-High (5240 MHz)**

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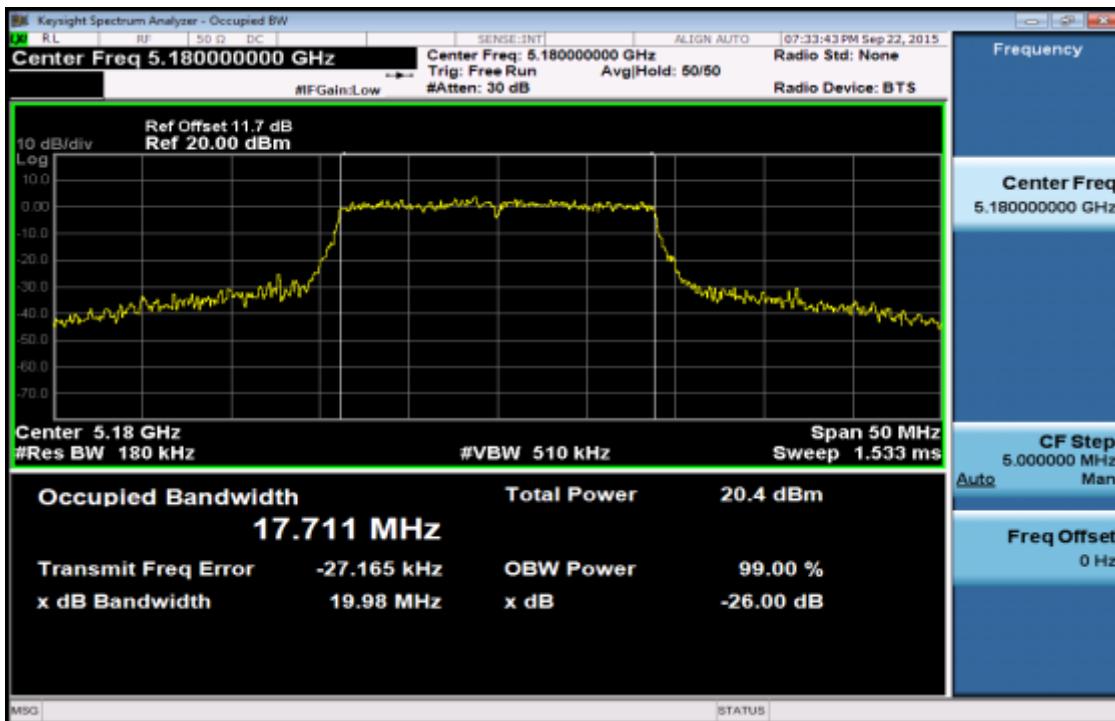
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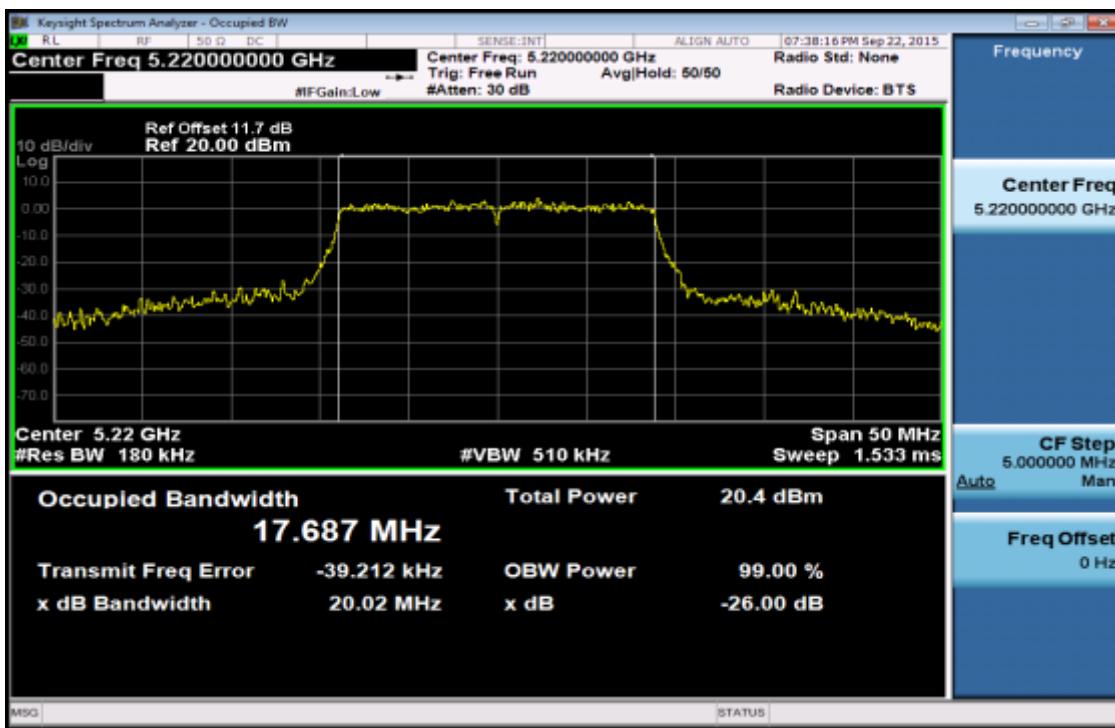
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## 802.11n HT20, 5150~5250 MHz (Aux 1) 26dB Band Width Test Data CH-Low (5180 MHz)



## 26dB Band Width Test Data CH-Mid (5220 MHz)



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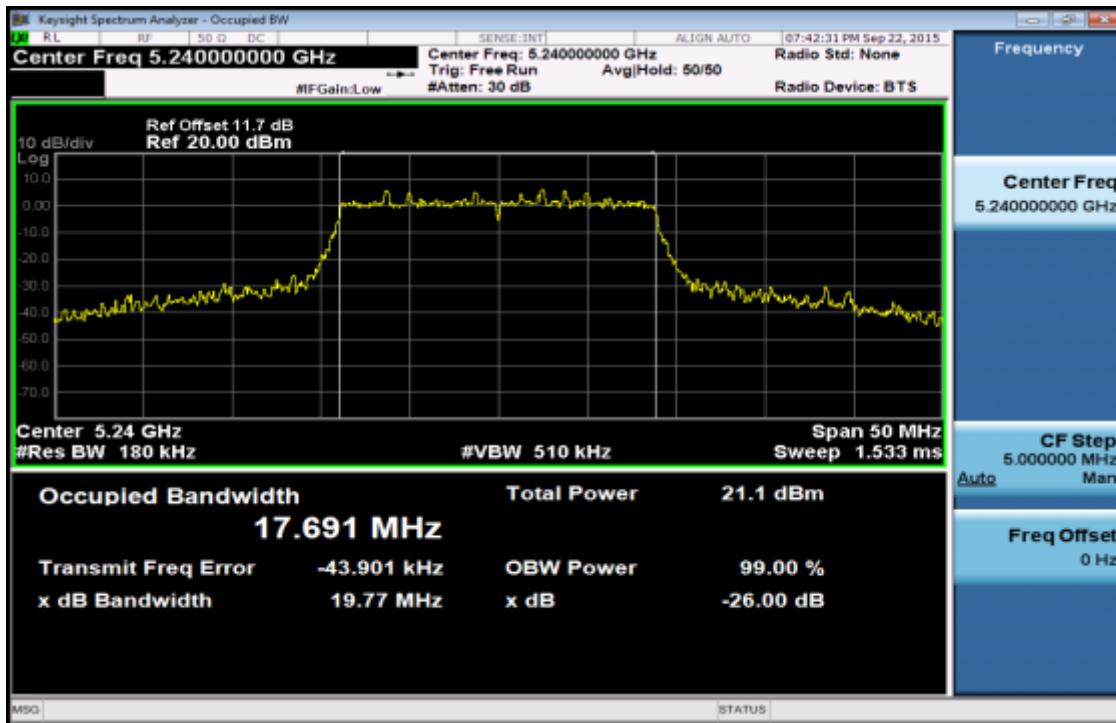
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**26dB Band Width Test Data CH-High (5240 MHz)**

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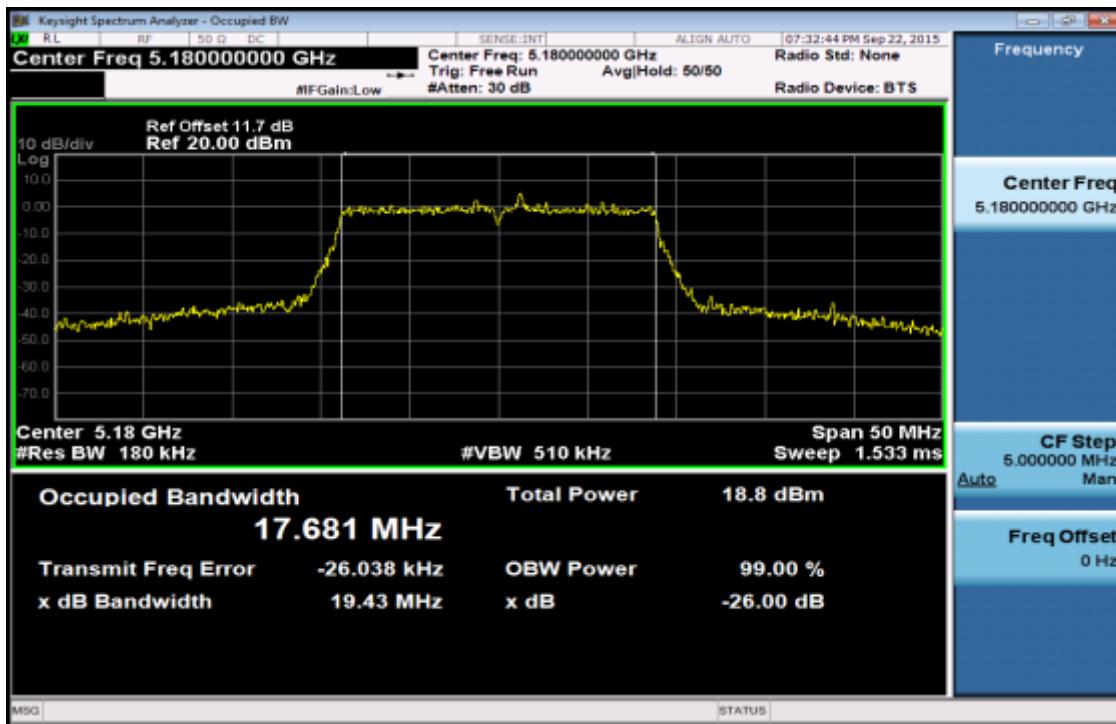
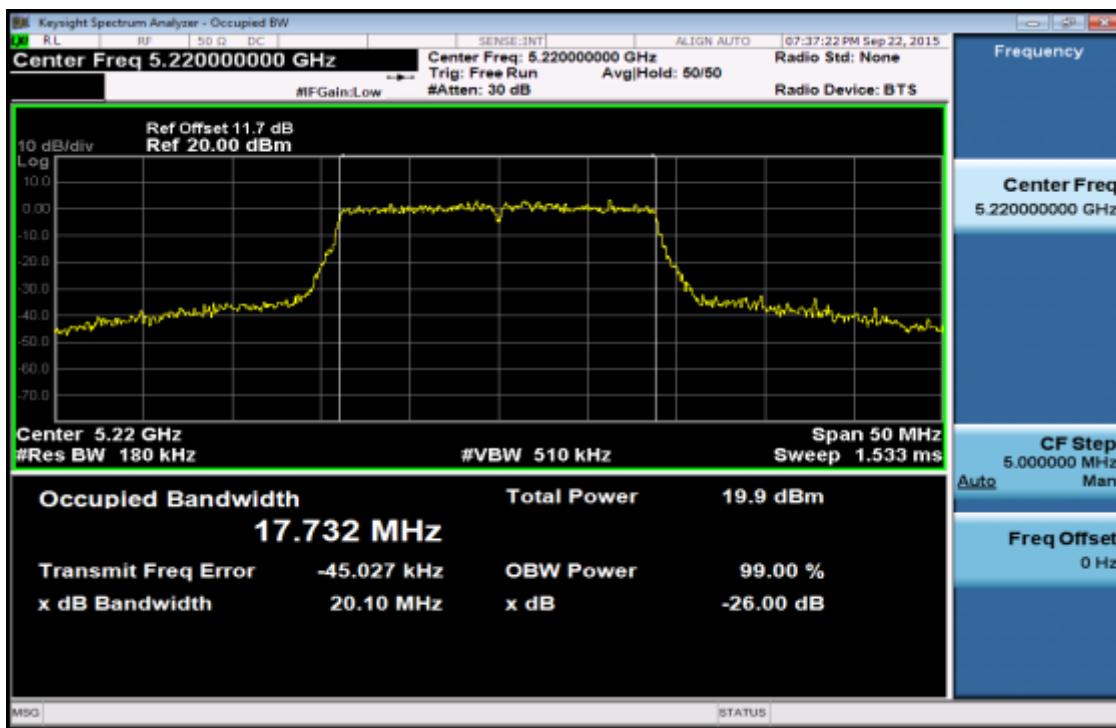
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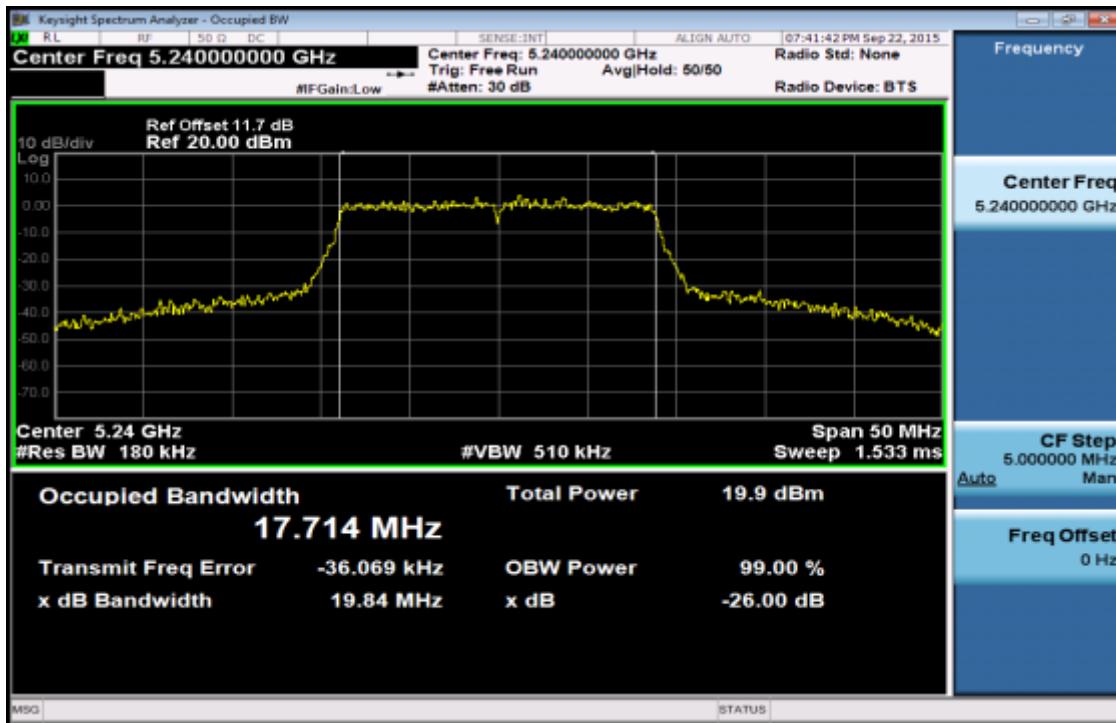
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**802.11n HT20, 5150~5250 MHz (Aux 2)  
26dB Band Width Test Data CH-Low (5180 MHz)****26dB Band Width Test Data CH-Mid (5220 MHz)**

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**26dB Band Width Test Data CH-High (5240 MHz)**

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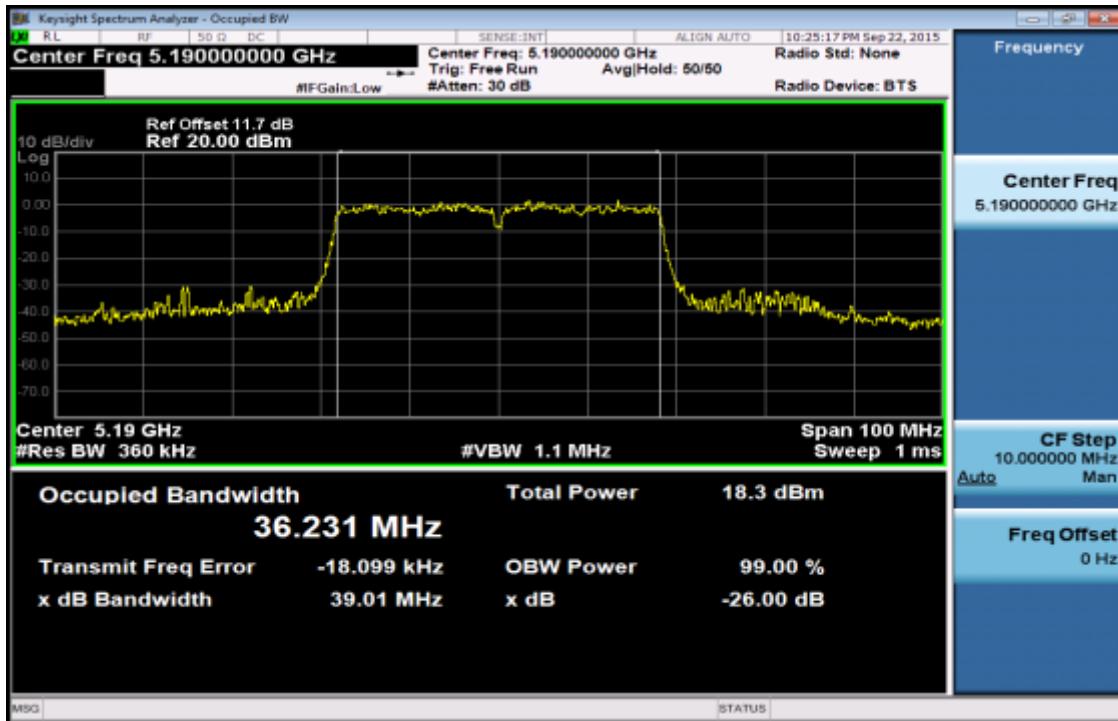
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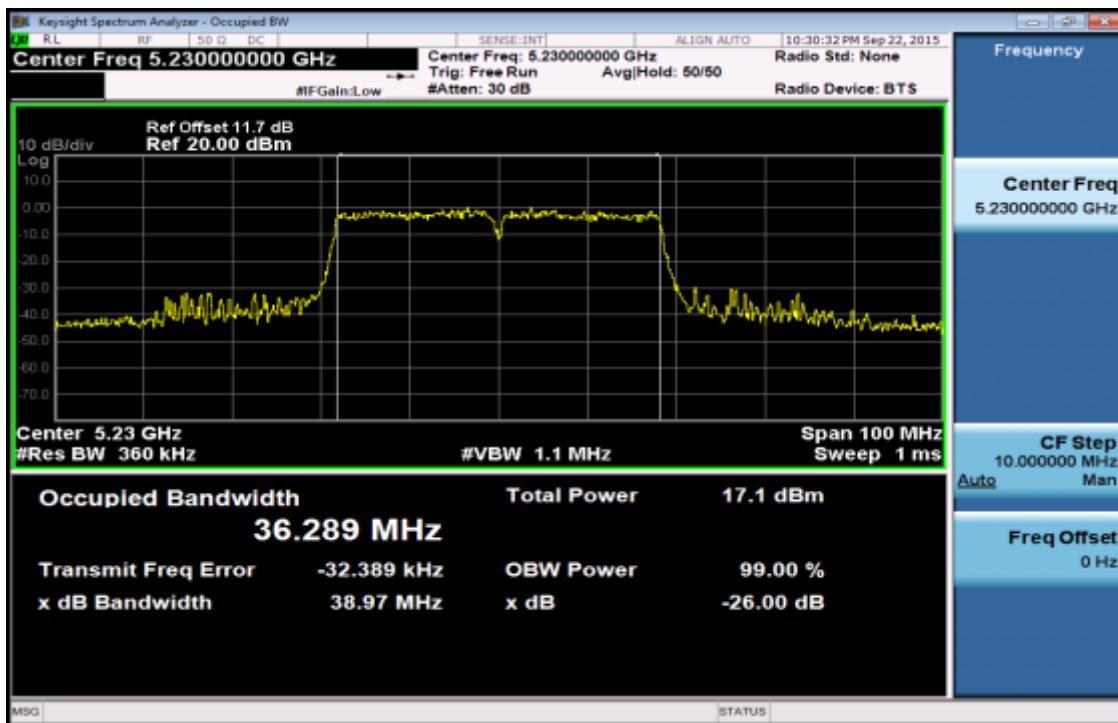
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## 802.11n HT40, 5150~5250 MHz (Main) 26dB Band Width Test Data CH-Low (5190 MHz)



## 26dB Band Width Test Data CH-High (5230 MHz)



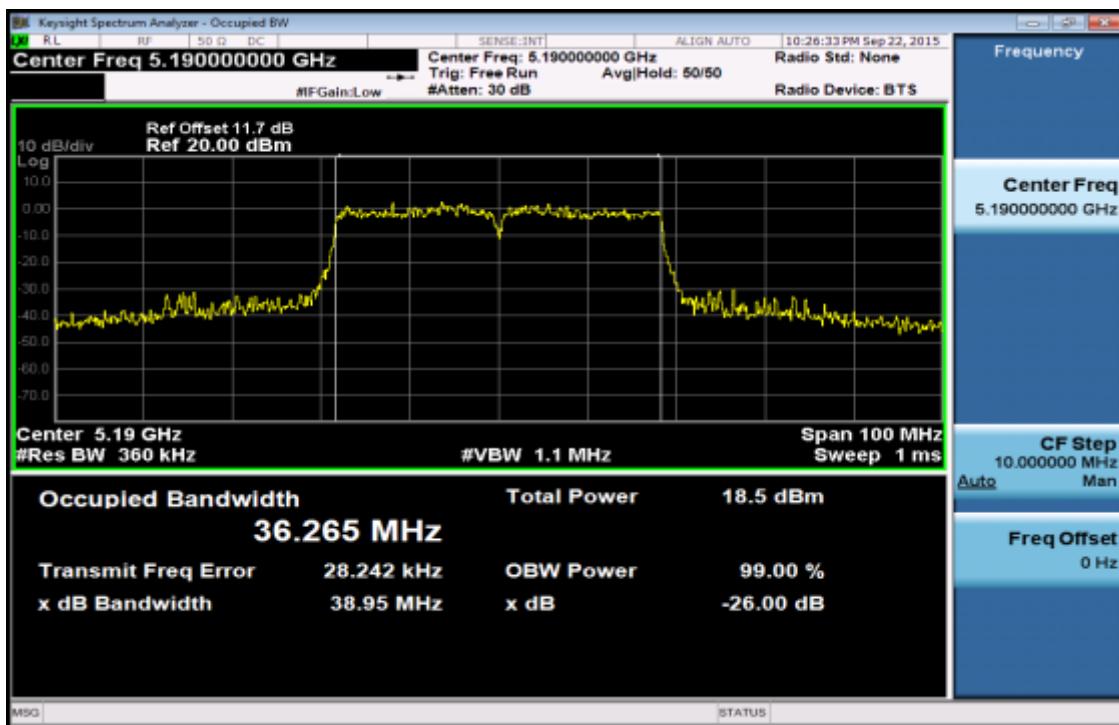
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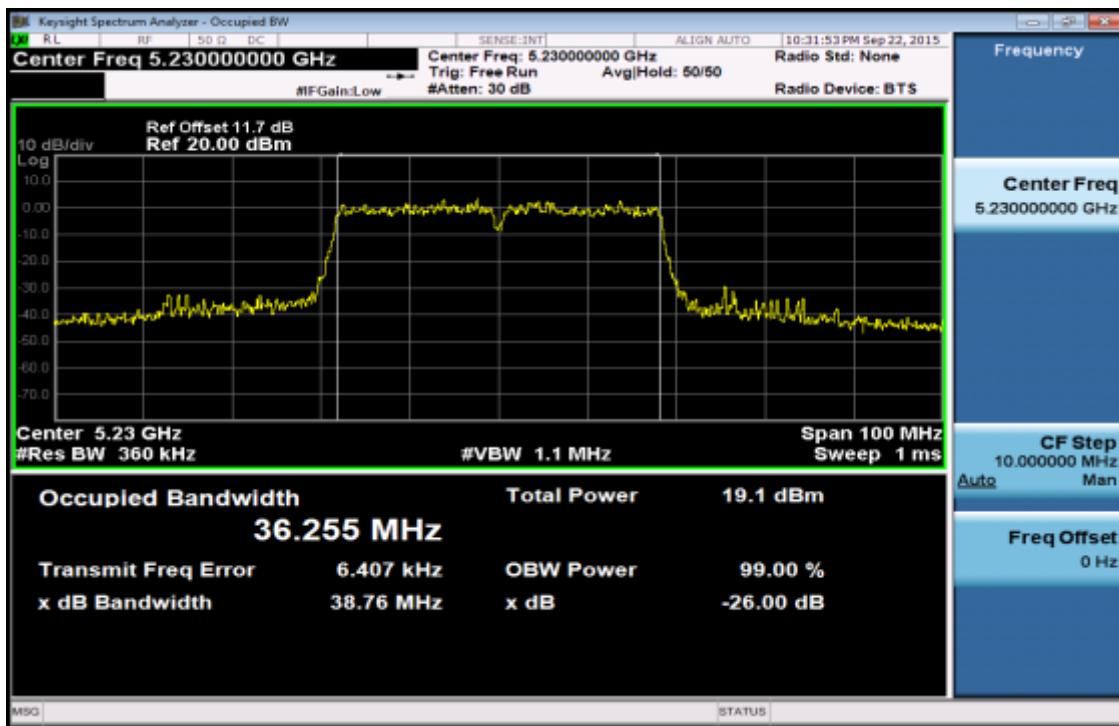
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## 802.11n HT40, 5150~5250 MHz (Aux 1) 26dB Band Width Test Data CH-Low (5190 MHz)



## 26dB Band Width Test Data CH-High (5230 MHz)



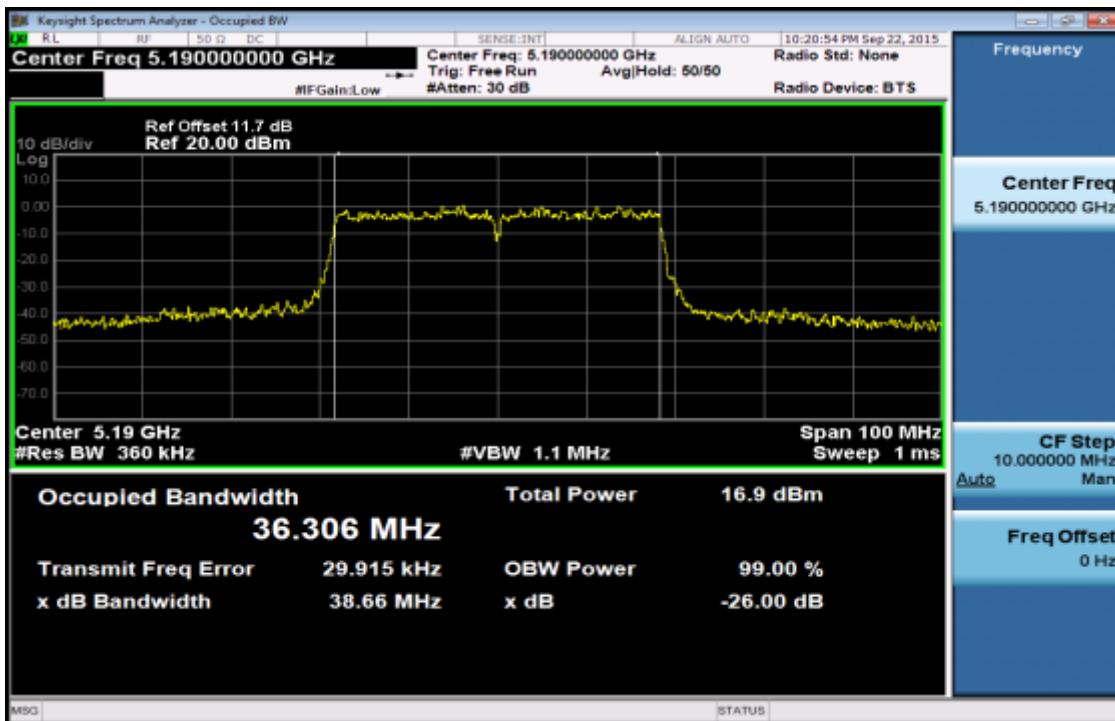
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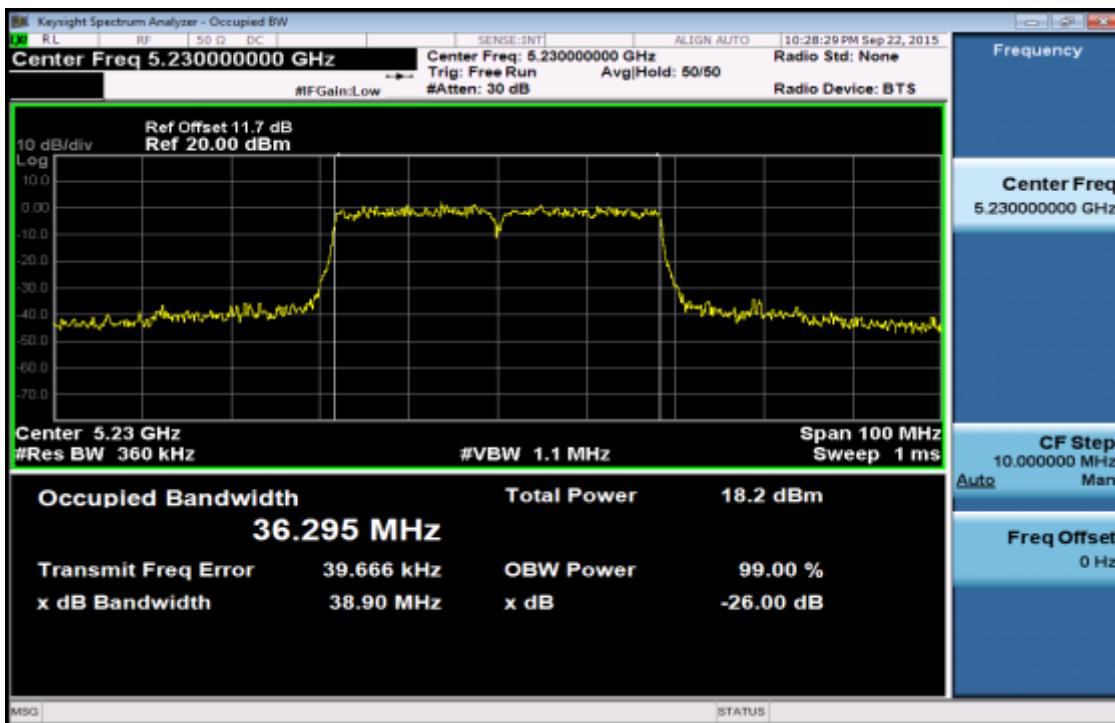
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## 802.11n HT40, 5150~5250 MHz (Aux 2) 26dB Band Width Test Data CH-Low (5190 MHz)



## 26dB Band Width Test Data CH-High (5230 MHz)



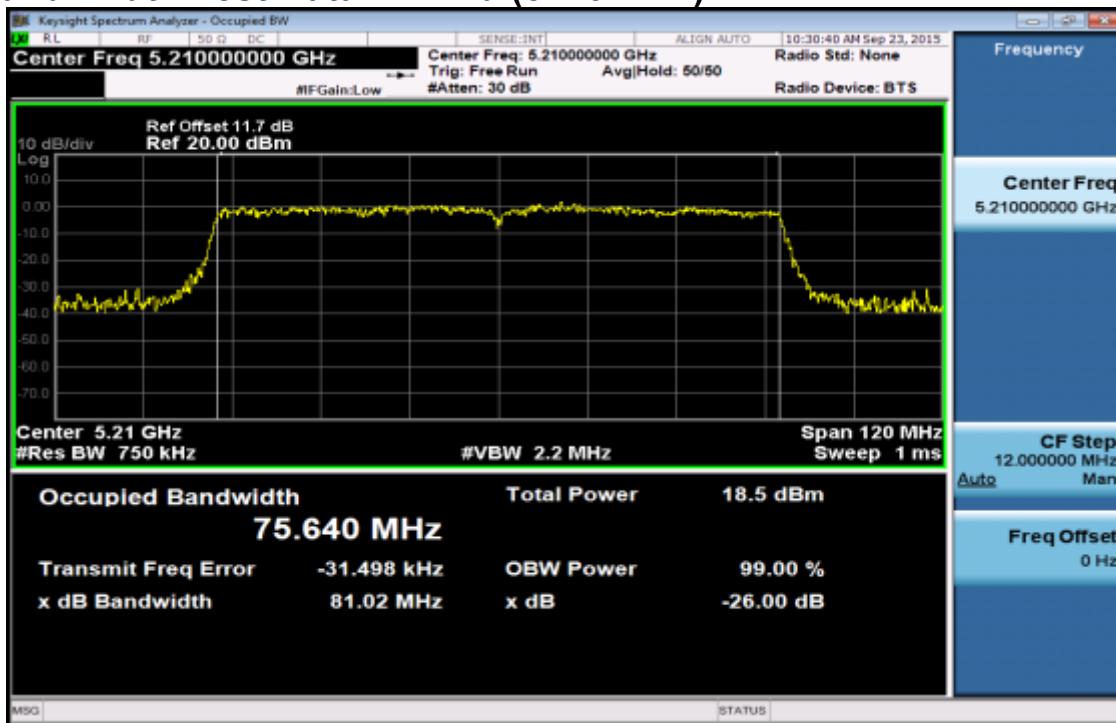
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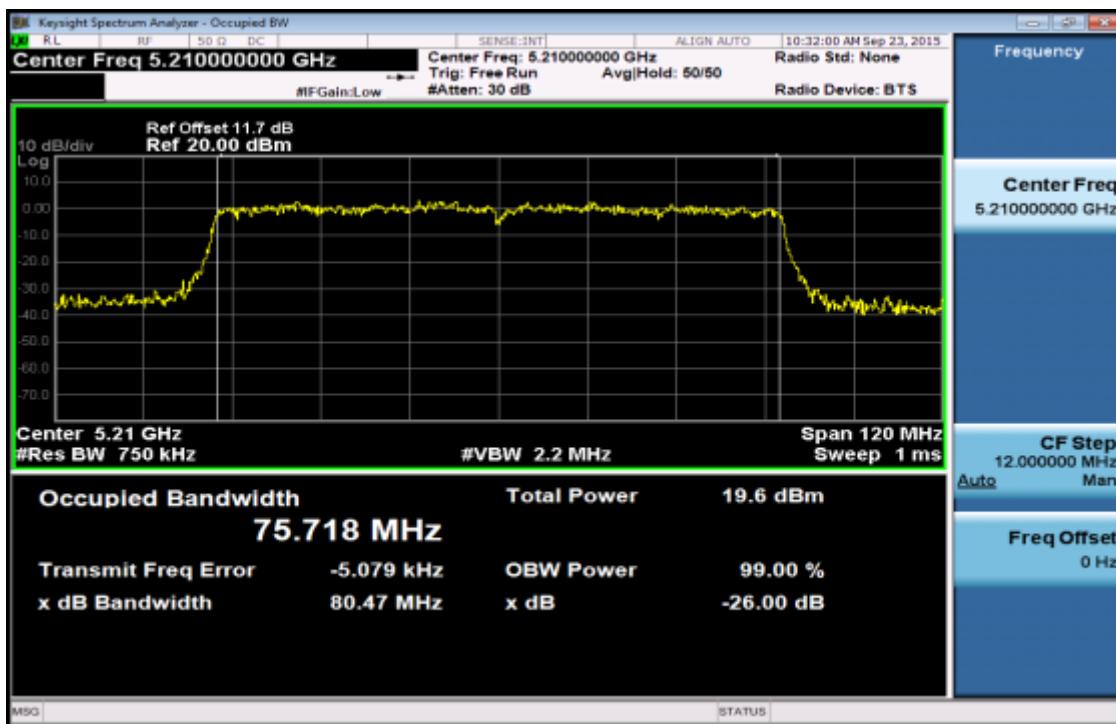
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## 802.11ac VHT80, 5150~5250 MHz (Main) 26dB Band Width Test Data CH-Mid (5210 MHz)



## 802.11ac VHT80, 5150~5250 MHz (Aux 1) 26dB Band Width Test Data CH-Mid (5210 MHz)

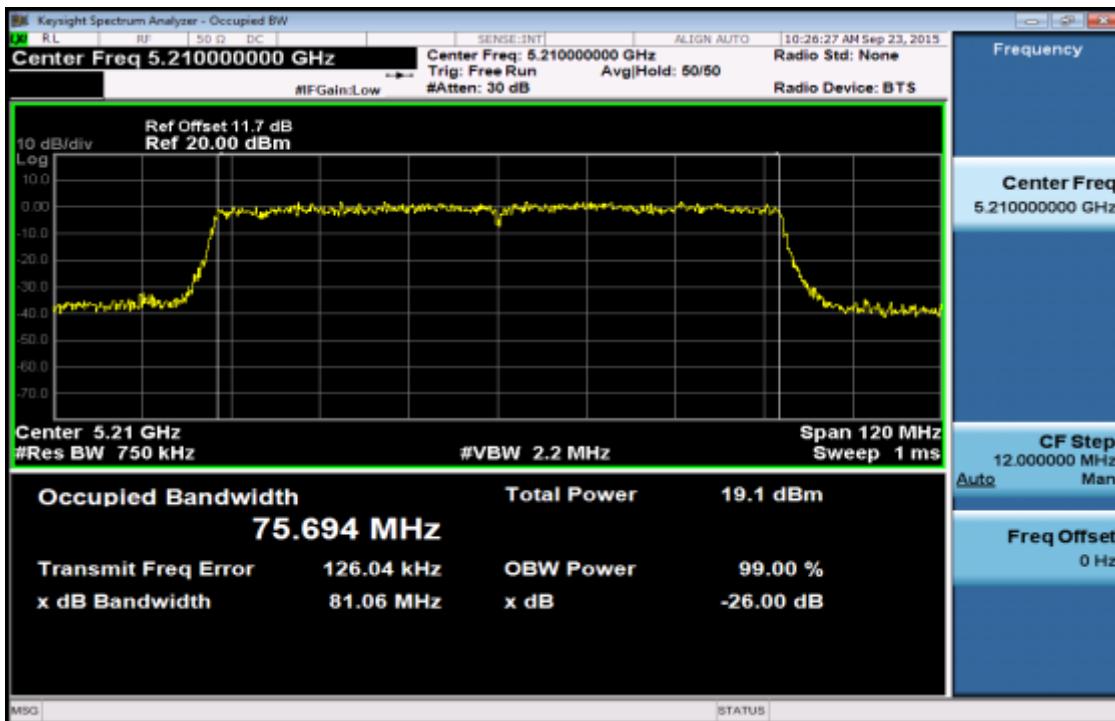


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## 802.11ac VHT80, 5150~5250 MHz (Aux 2) 26dB Band Width Test Data CH-Mid (5210 MHz)



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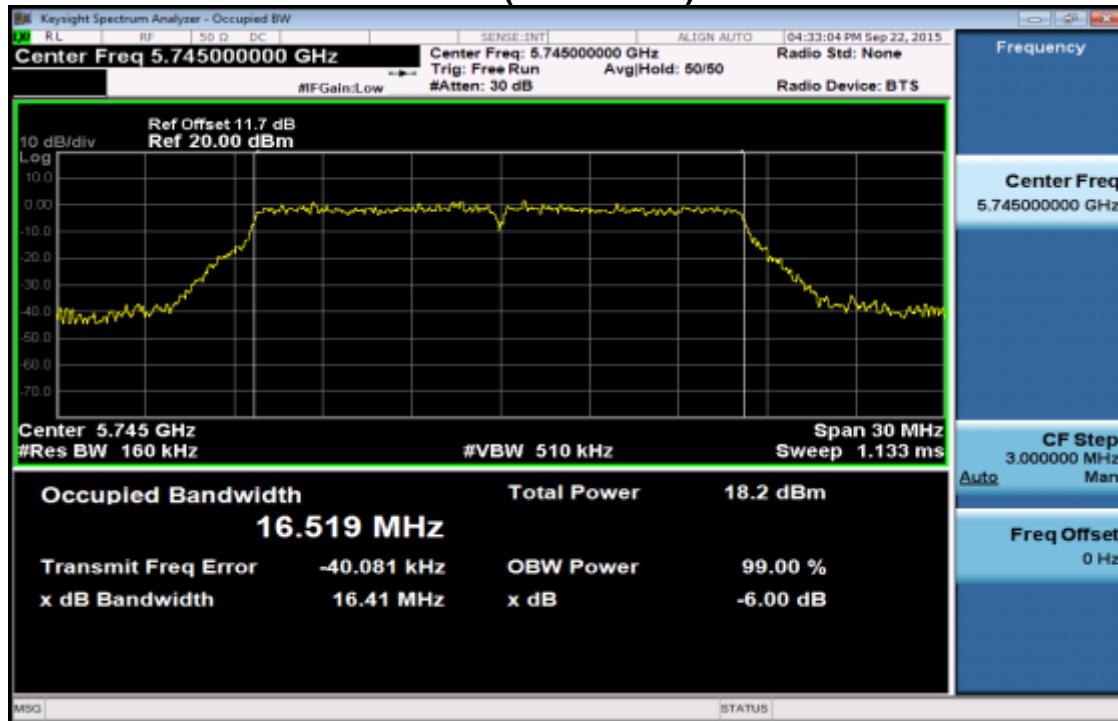
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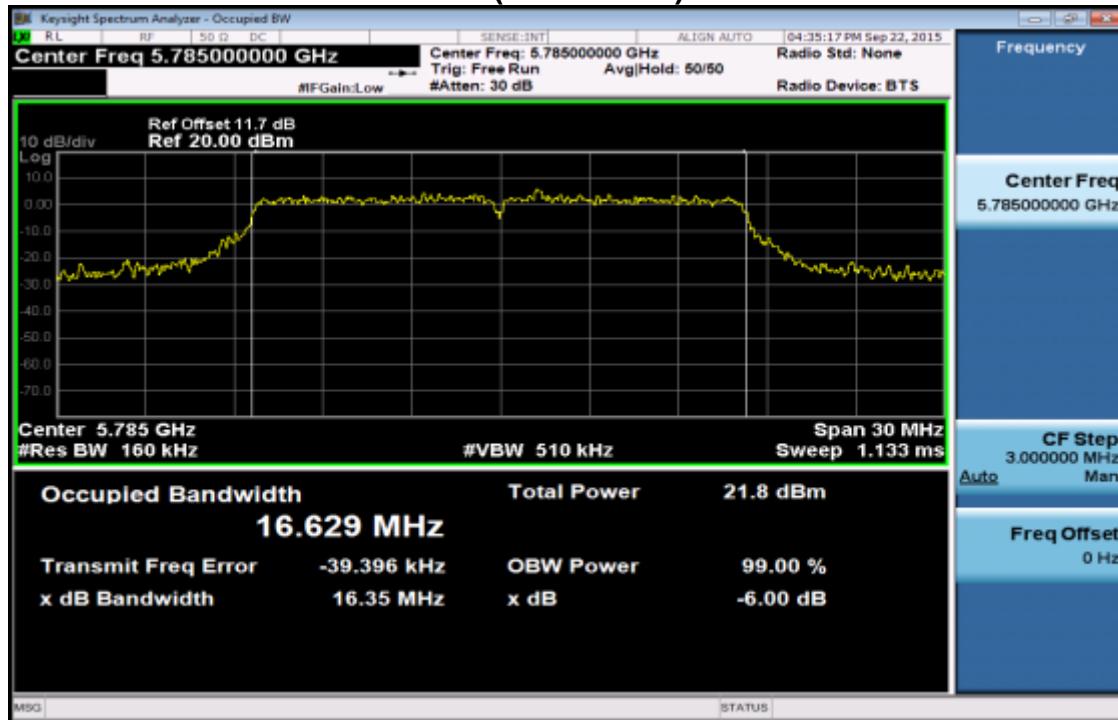
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## 802.11a, 5725~5850 MHz

### 6dB Band Width Test Data CH-Low (5745 MHz)



### 6dB Band Width Test Data CH-Mid (5785 MHz)



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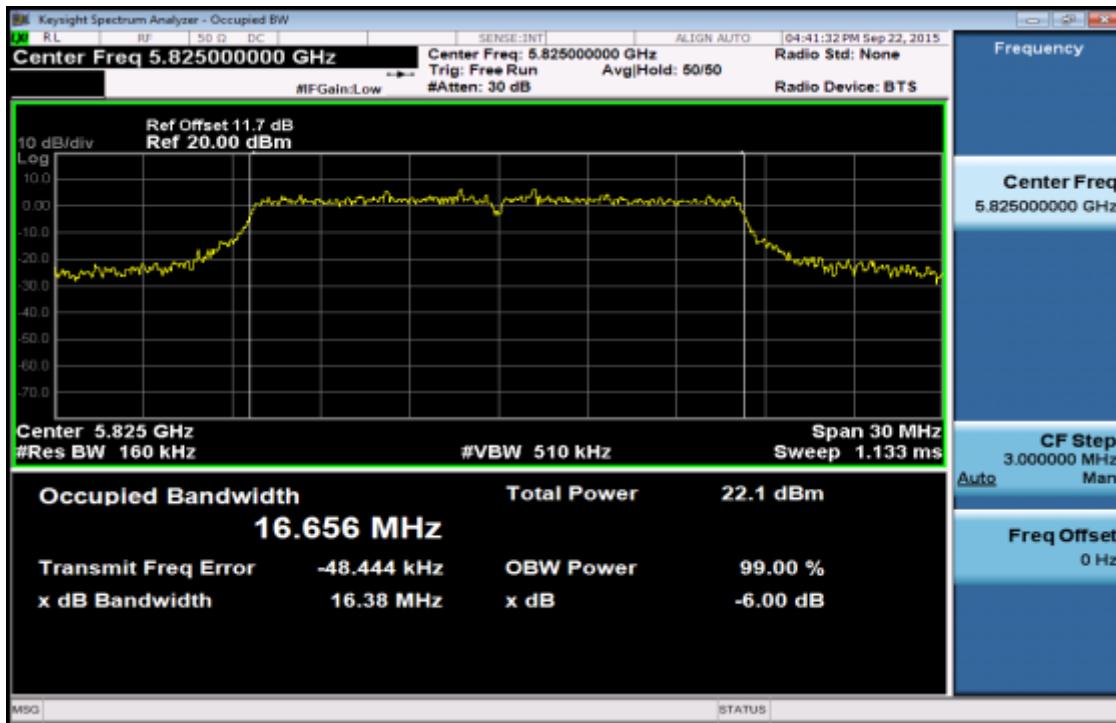
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**6dB Band Width Test Data CH-High (5825 MHz)**

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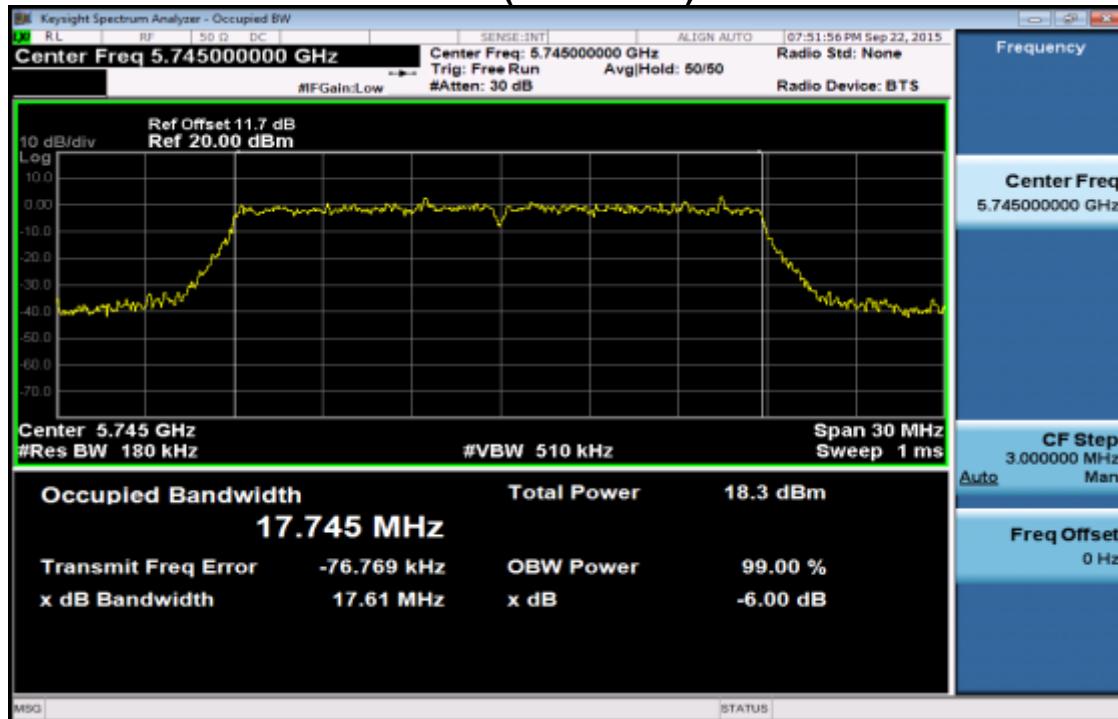
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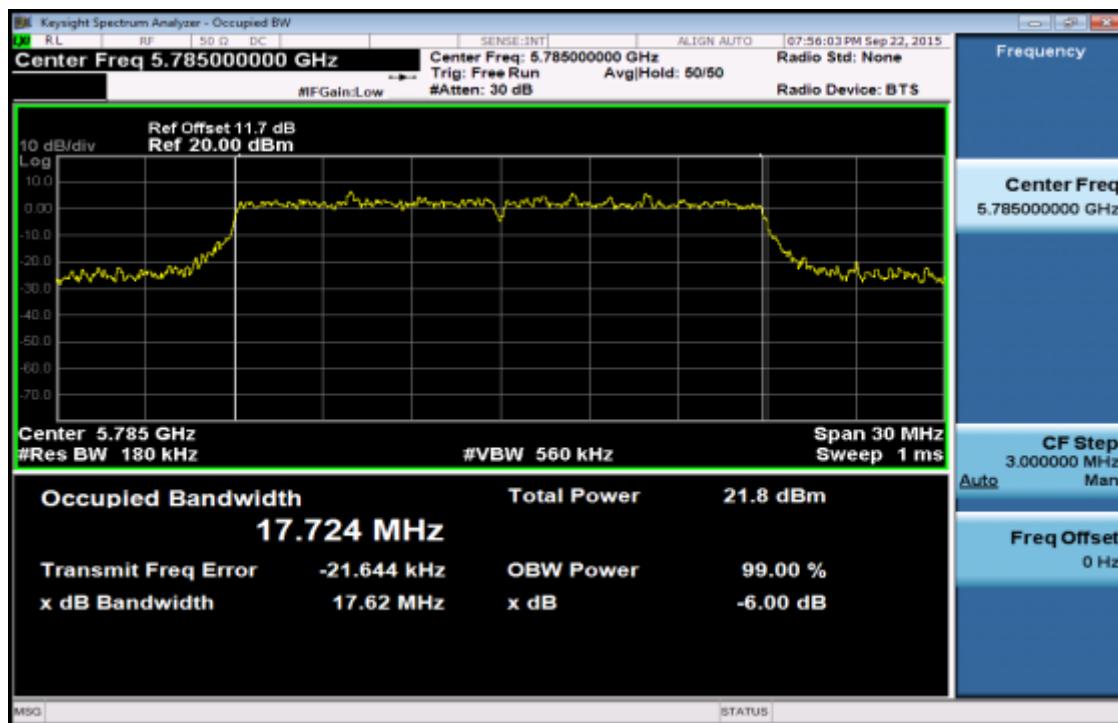
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## 802.11ac VHT20, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5745 MHz)



## 6dB Band Width Test Data CH-Mid (5785 MHz)



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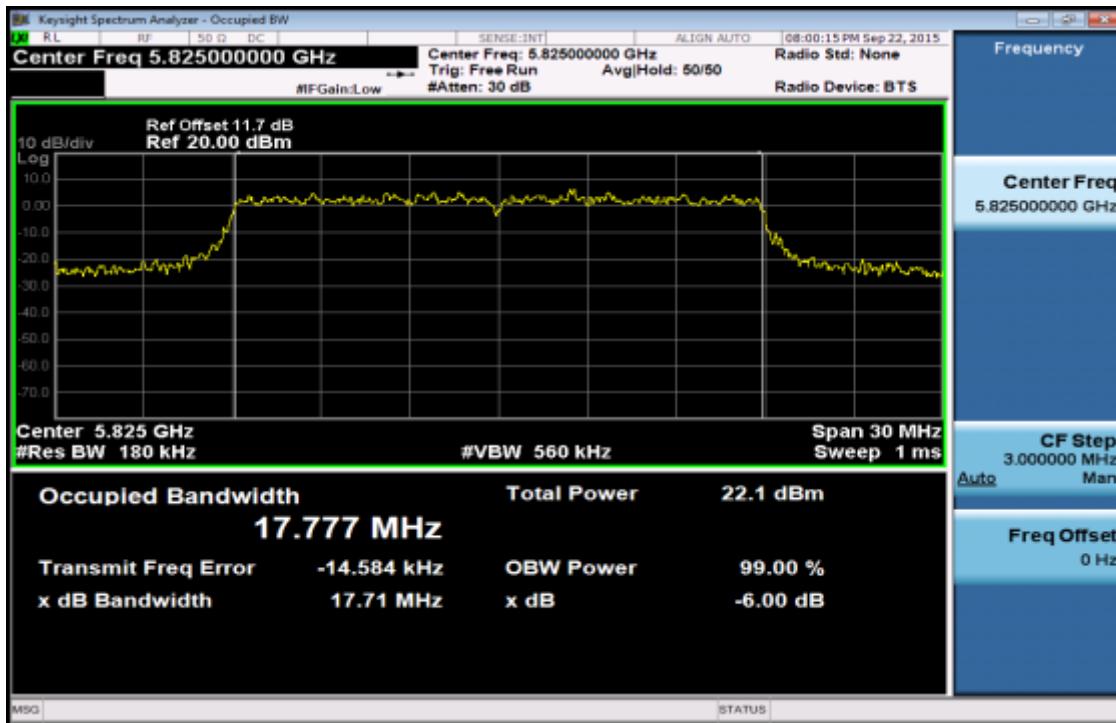
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**6dB Band Width Test Data CH-High (5825 MHz)**

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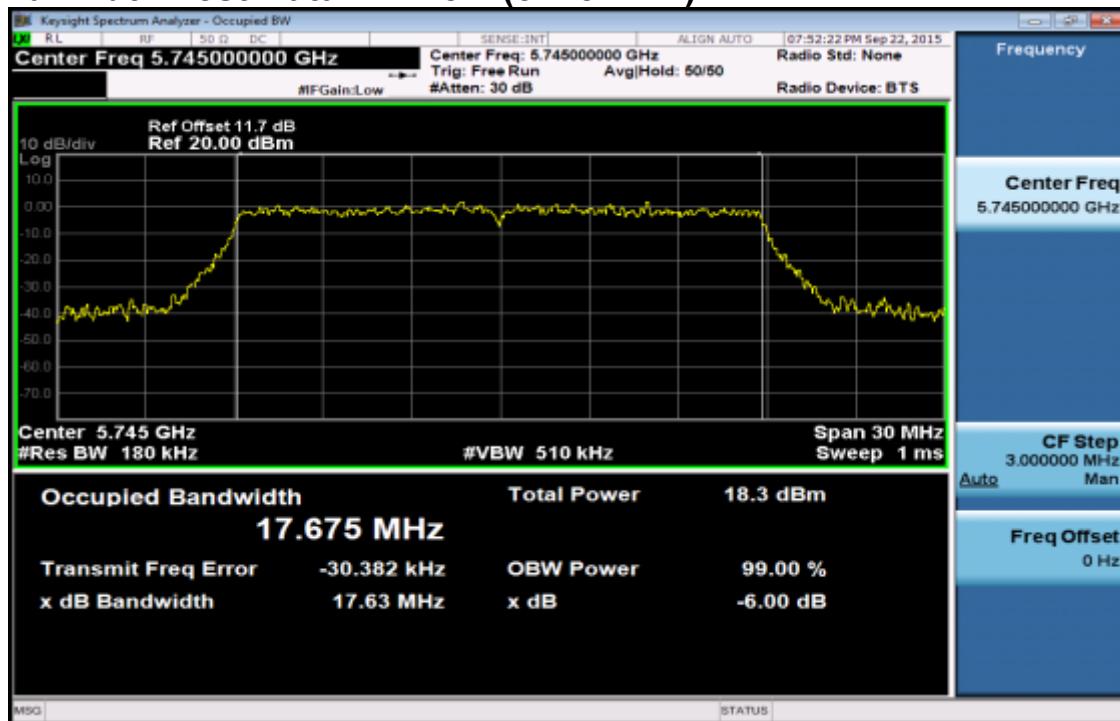
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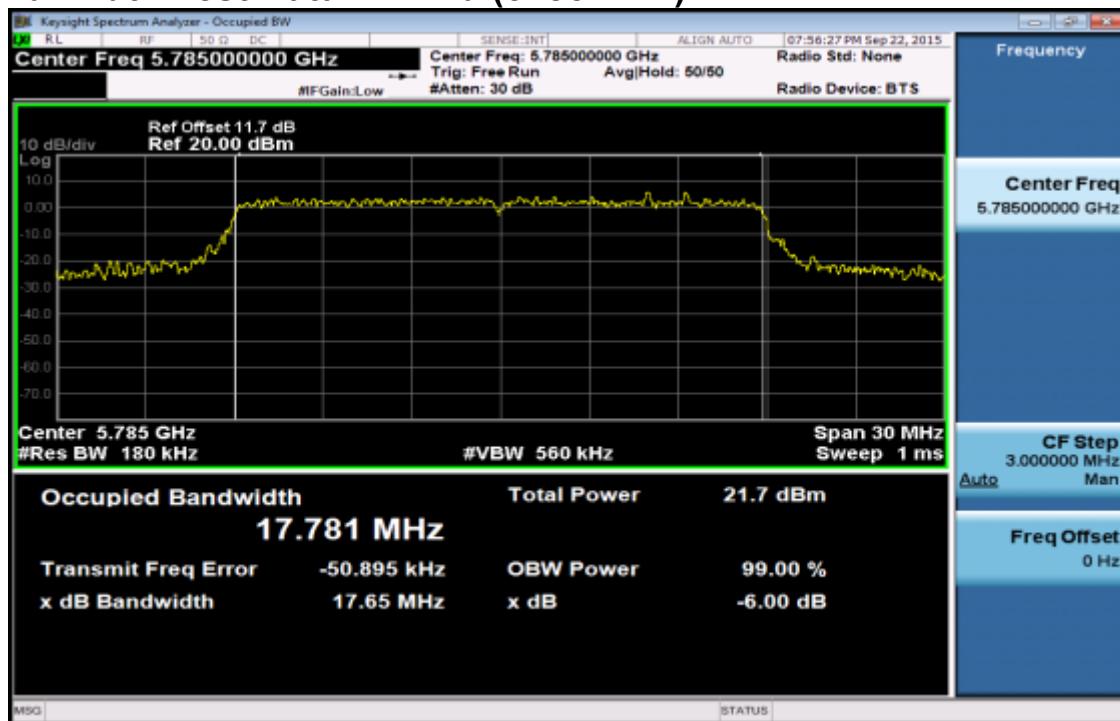
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## 802.11ac VHT20, 5725~5850 MHz (AUX 1) 6dB Band Width Test Data CH-Low (5745 MHz)



## 6dB Band Width Test Data CH-Mid (5785 MHz)



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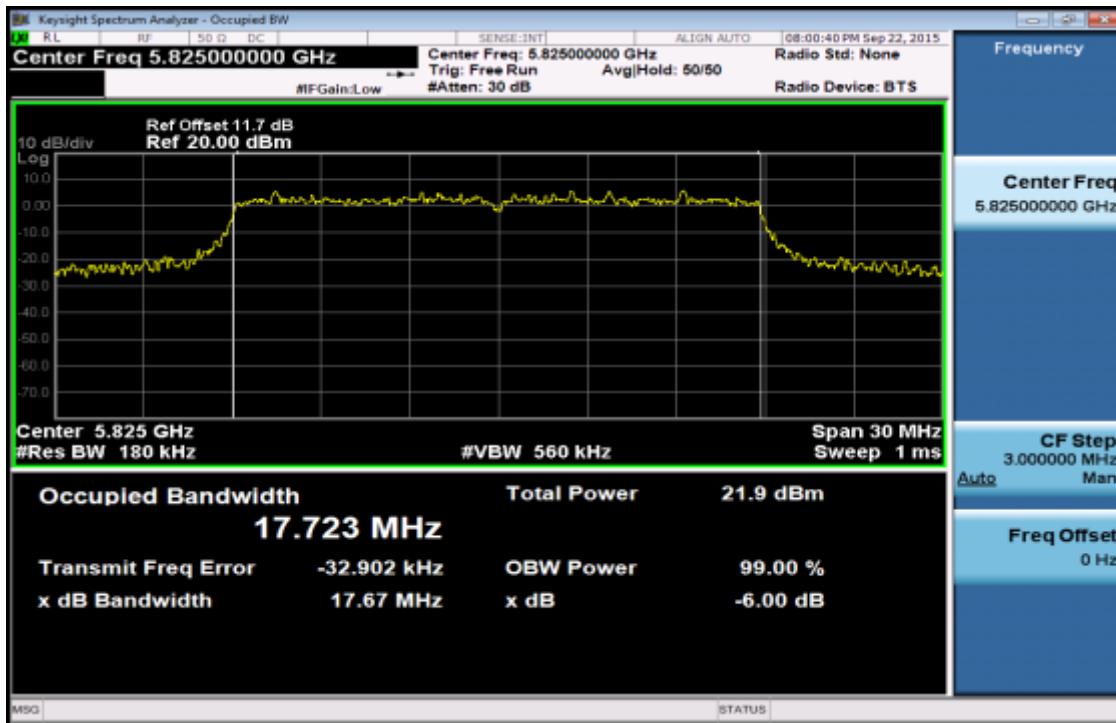
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**6dB Band Width Test Data CH-High (5825 MHz)**

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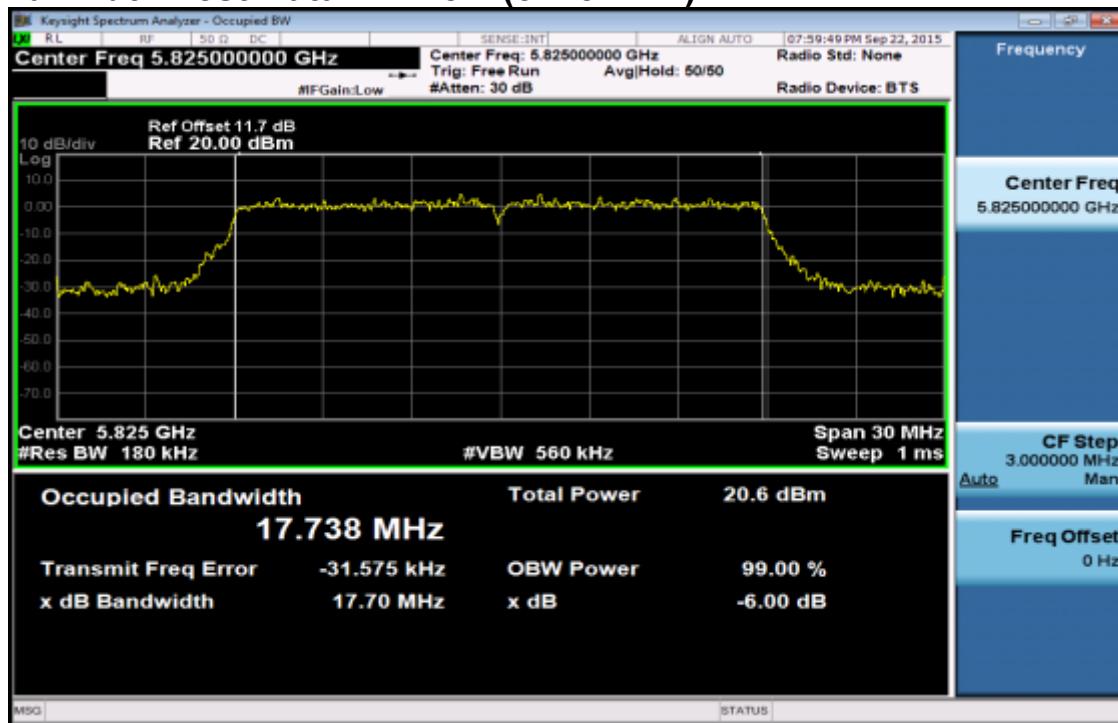
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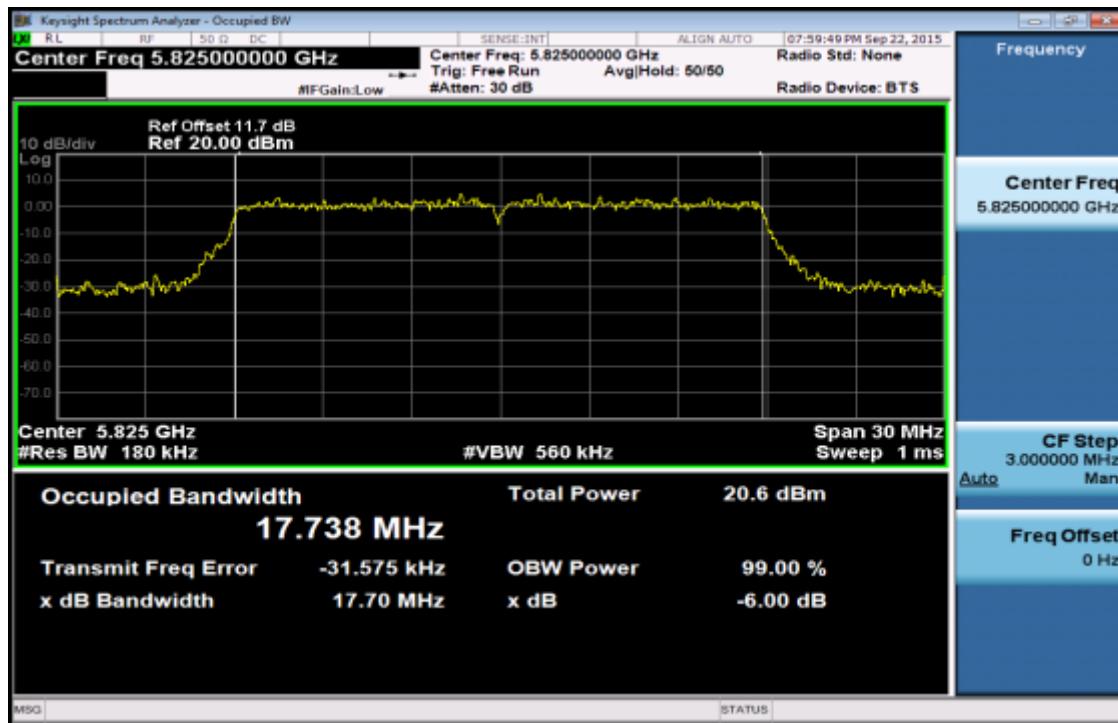
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## 802.11ac VHT20, 5725~5850 MHz (Aux 2) 6dB Band Width Test Data CH-Low (5745 MHz)



## 6dB Band Width Test Data CH-Mid (5785 MHz)



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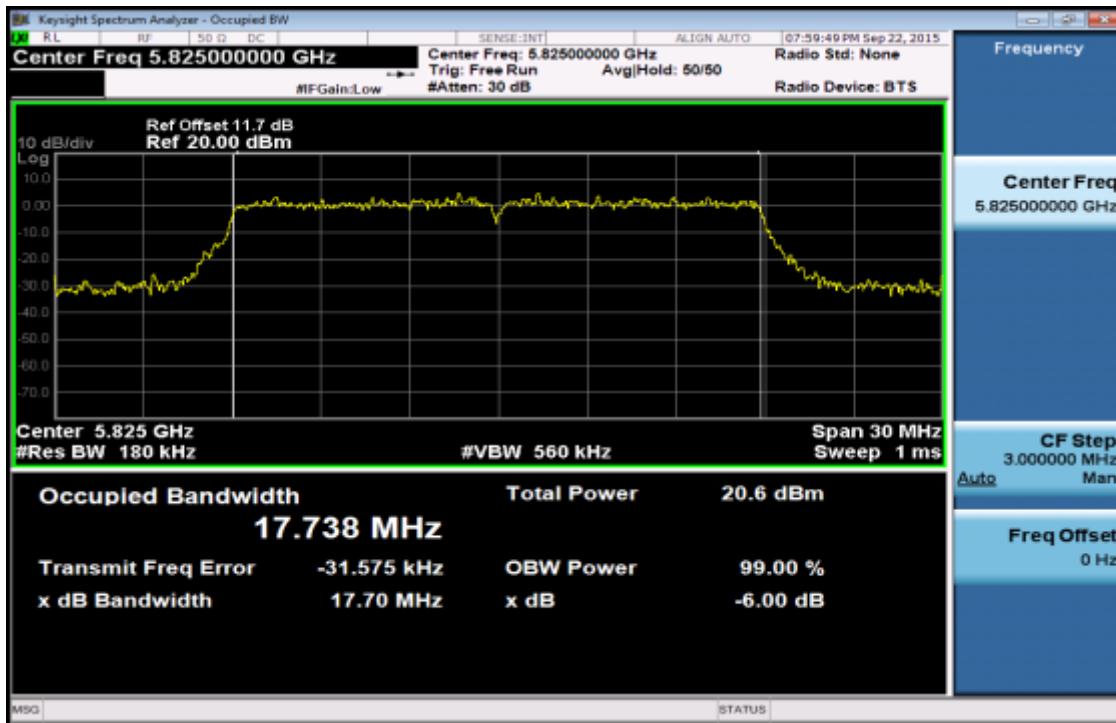
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**6dB Band Width Test Data CH-High (5825 MHz)**

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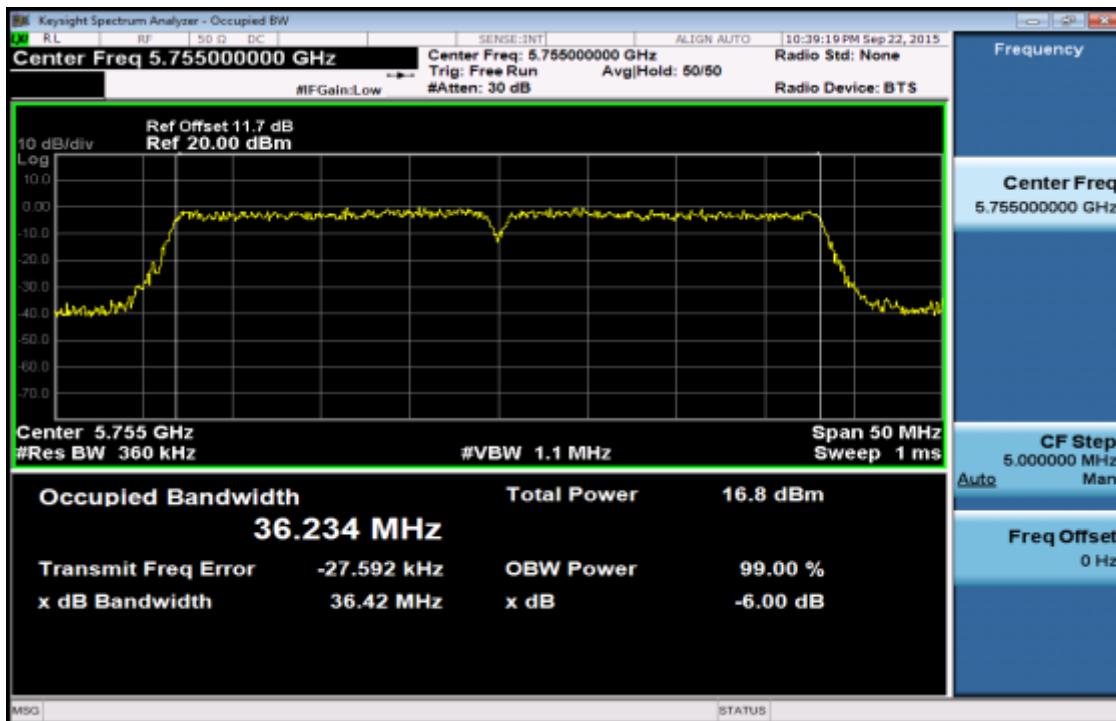
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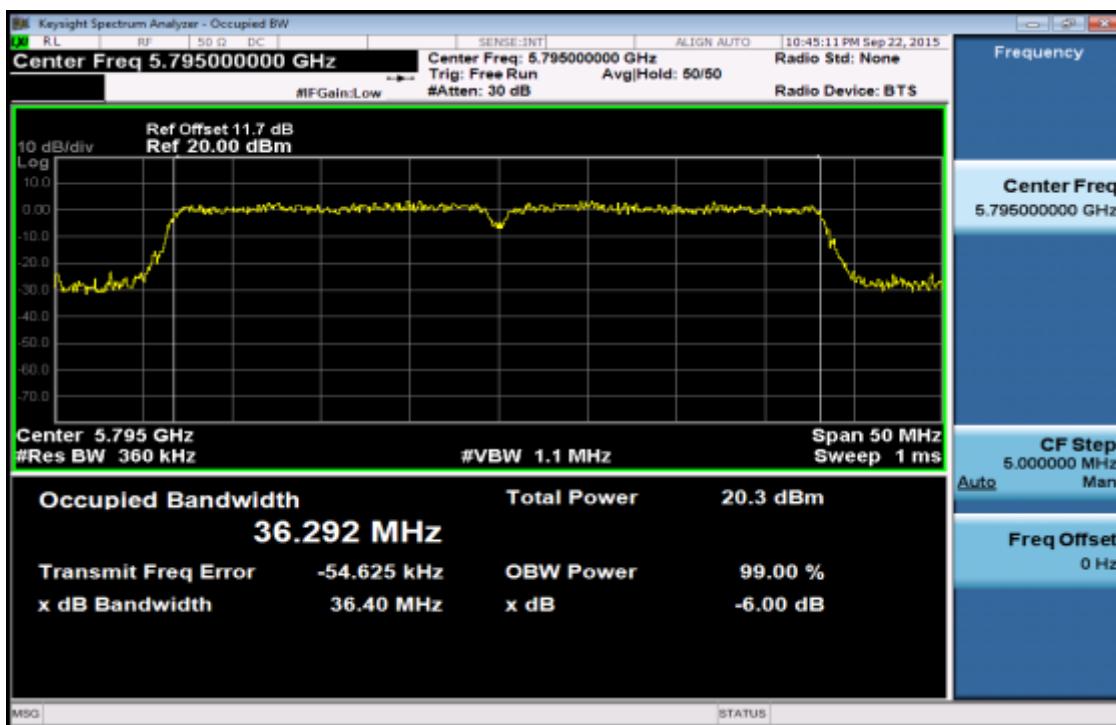
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## 802.11ac VHT40, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5755 MHz)



## 6dB Band Width Test Data CH-High (5795 MHz)



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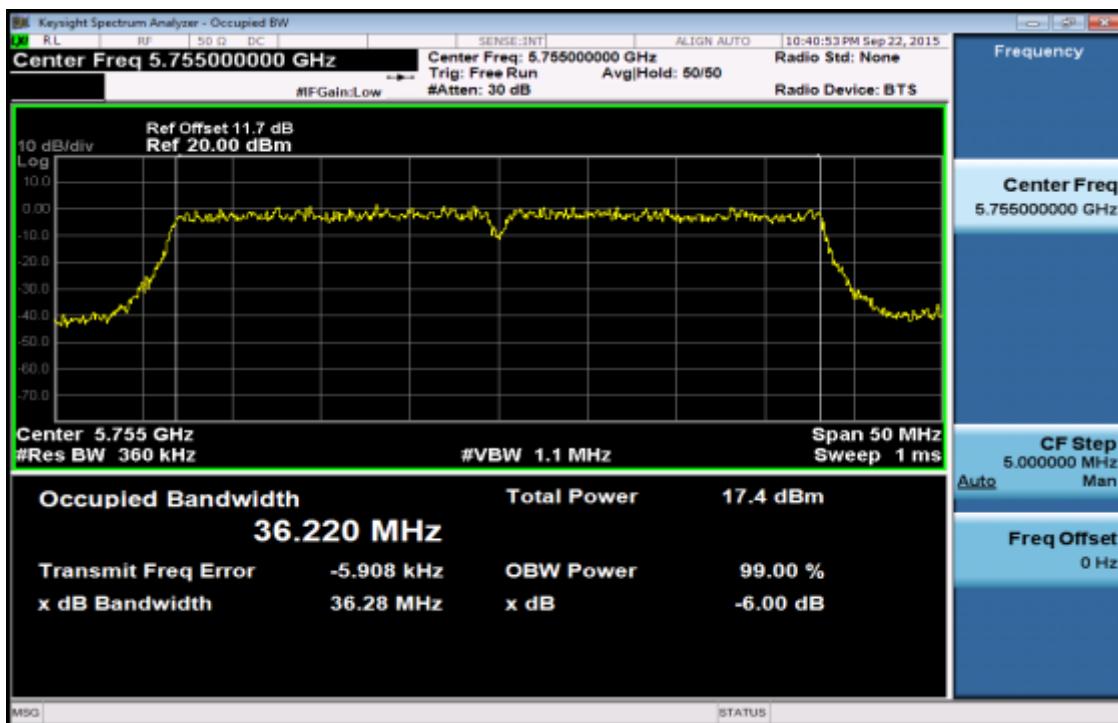
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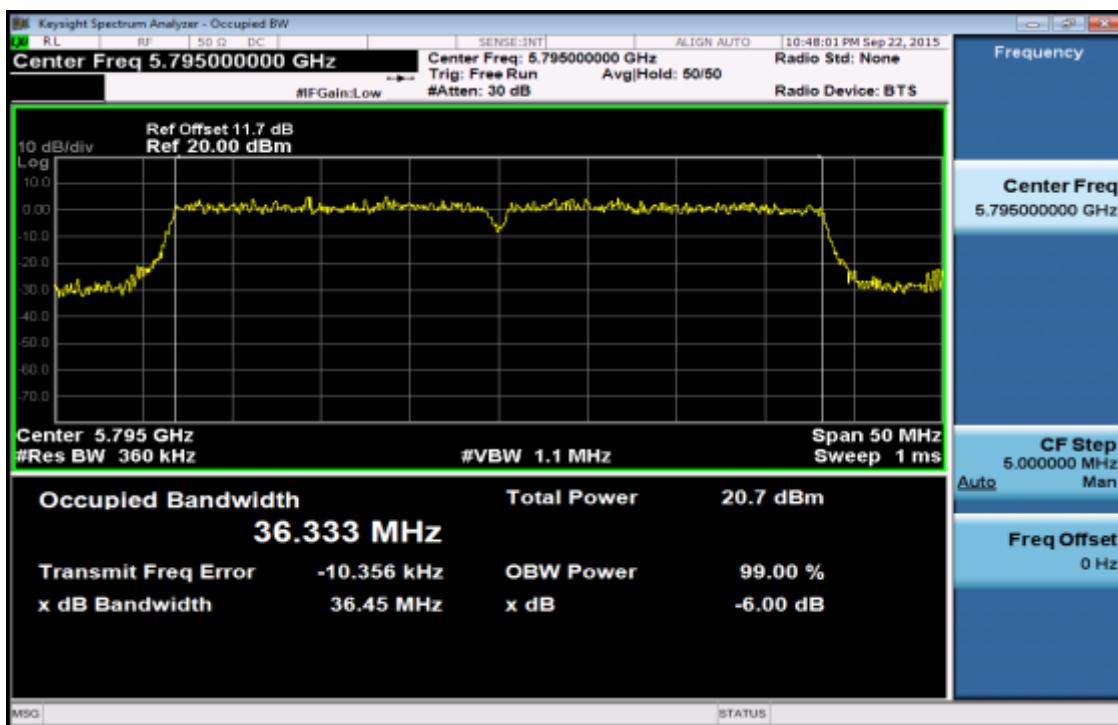
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## 802.11ac VHT40, 5725~5850 MHz (AUX 1) 6dB Band Width Test Data CH-Low (5755 MHz)



## 6dB Band Width Test Data CH-High (5795 MHz)



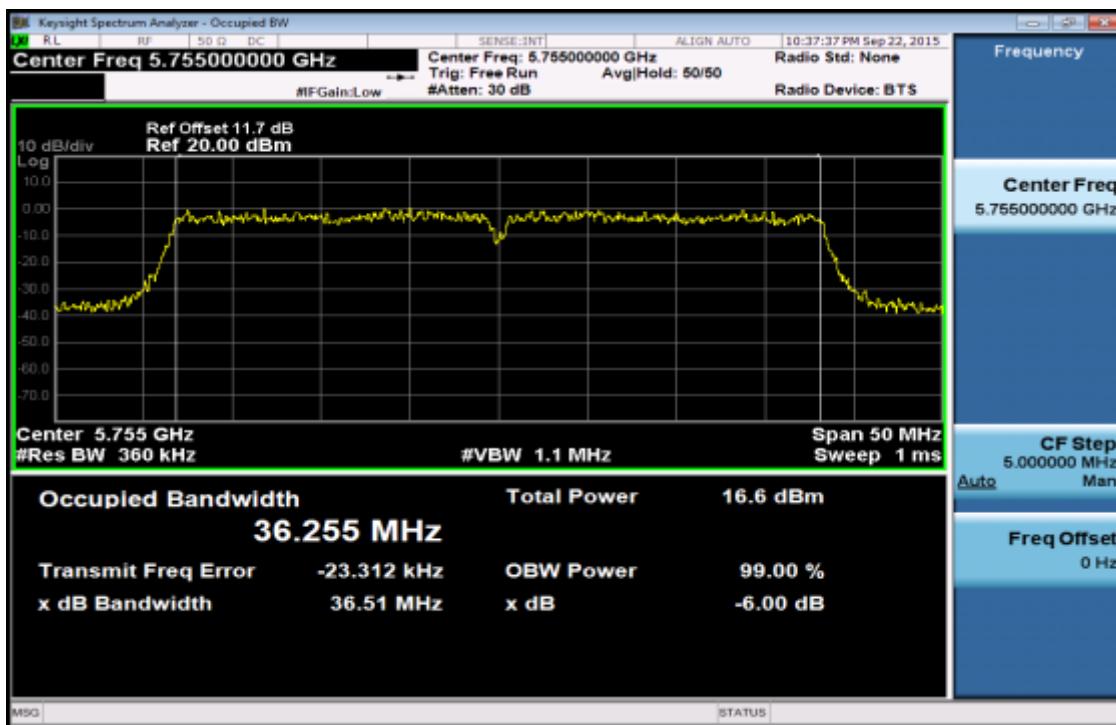
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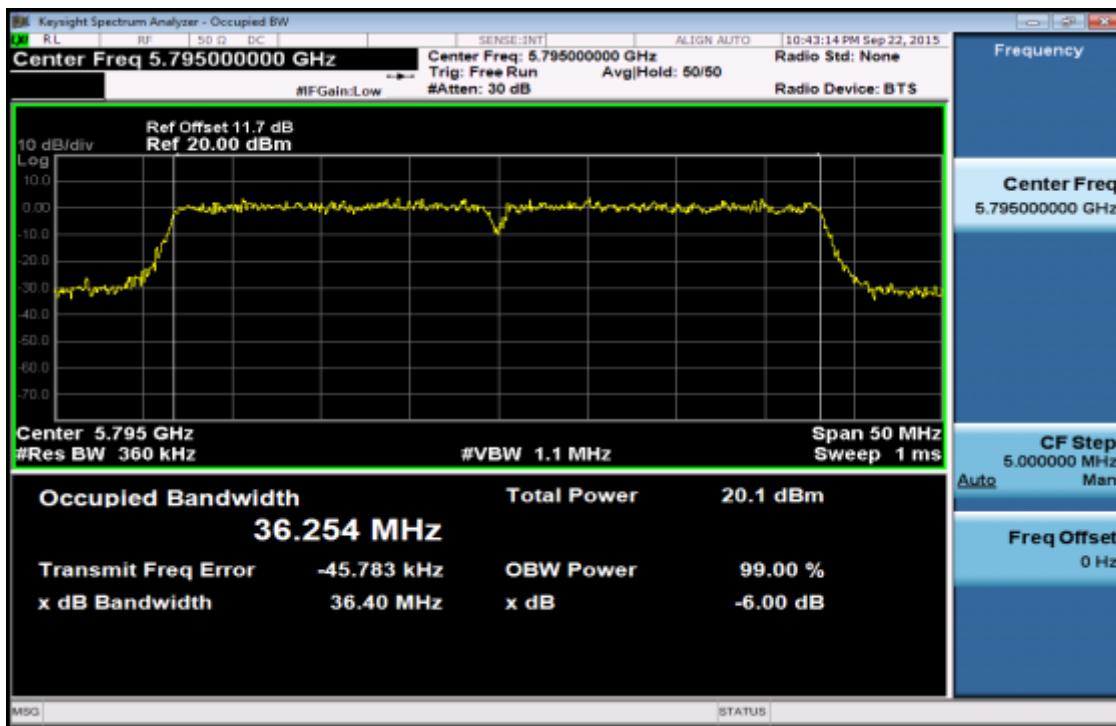
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## 802.11ac VHT40, 5725~5850 MHz (AUX 2) 6dB Band Width Test Data CH-Low (5755 MHz)



## 6dB Band Width Test Data CH-High (5795 MHz)



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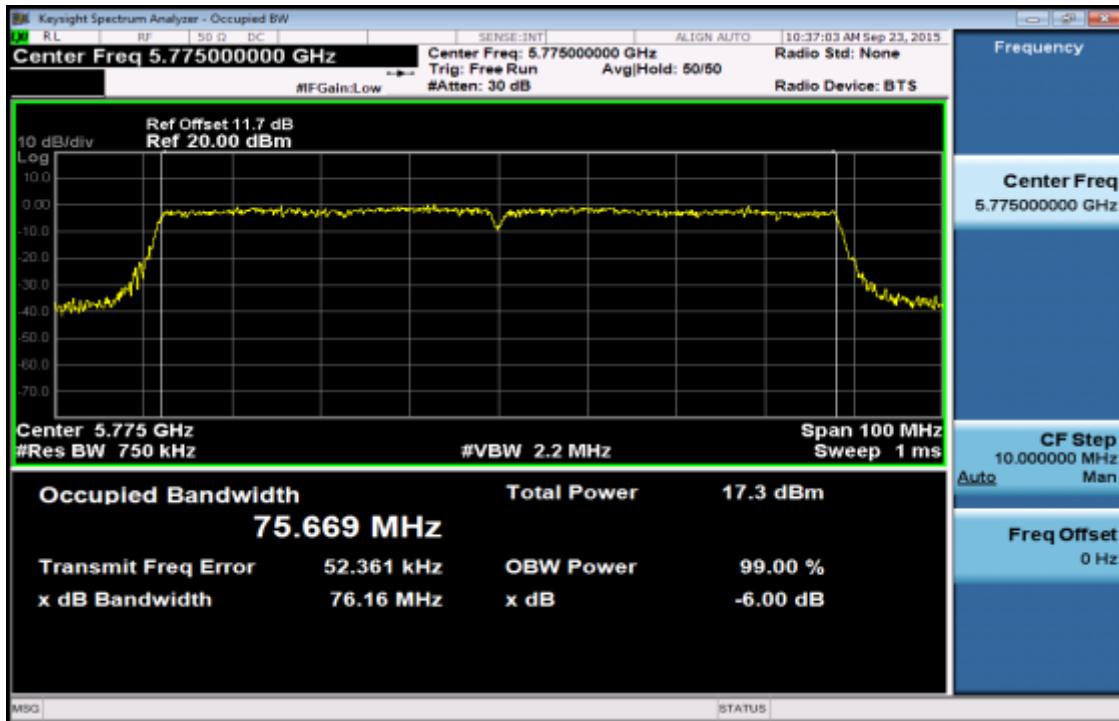
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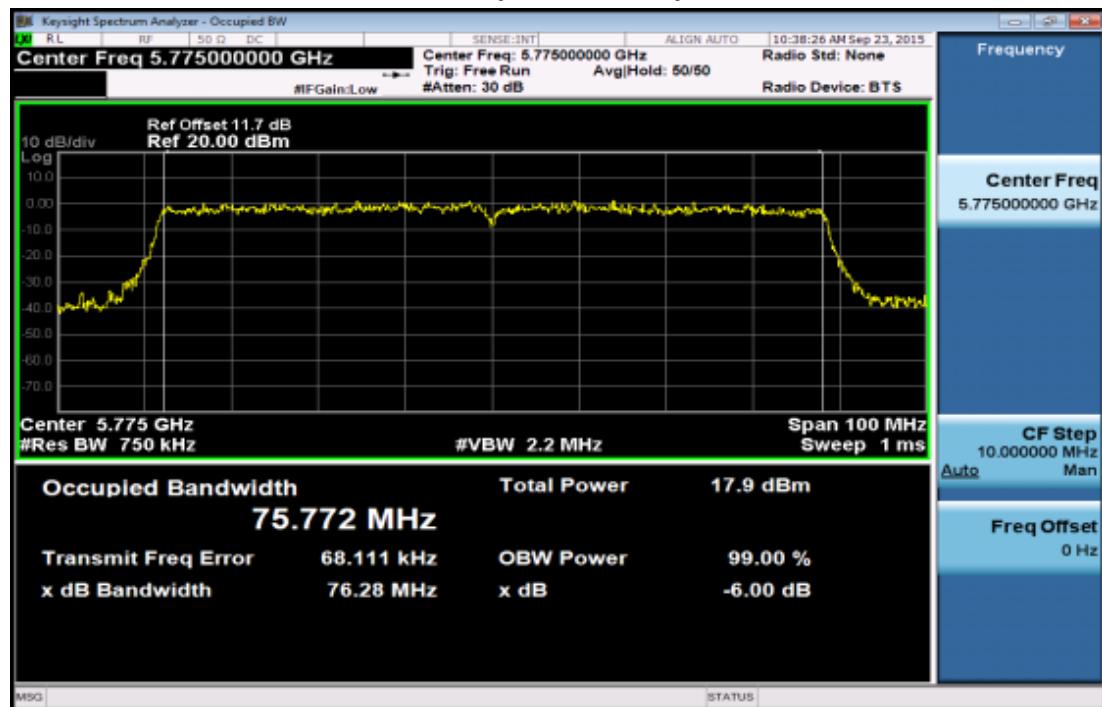
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## 802.11ac VHT80, 5725~5850 MHz (Main) 6dB Band Width Test Data CH-Low (5775 MHz)



## 802.11ac VHT80, 5725~5850 MHz (Aux 1) 6dB Band Width Test Data CH-Low (5775 MHz)



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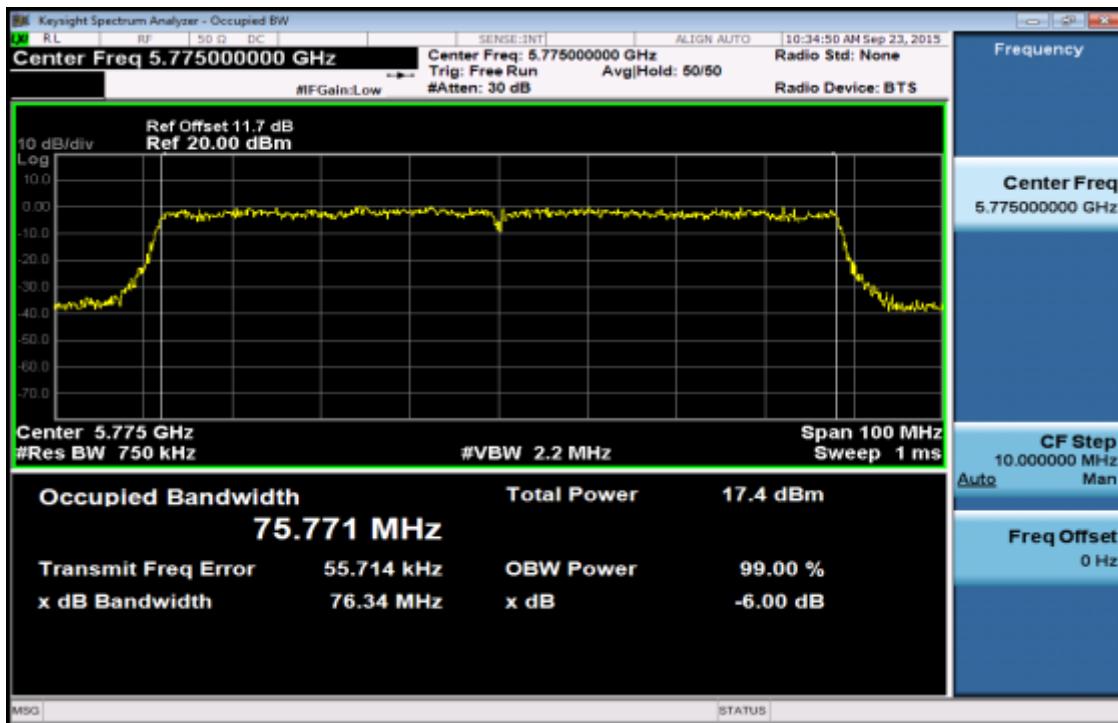
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**802.11ac VHT80, 5725~5850 MHz (Aux 2)  
6dB Band Width Test Data CH-Low (5775 MHz)**

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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-2A	✓		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C	✓		250mW(23.98dBm) or 11dBm+10 log B
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 directional gain of the antenna exceeds 6 dBi.

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

Effective Legacy Gain (dBi) = 5.72+3.01=8.73dBi for the U-NII-1.

Limit: 30dBm - (8.73 - 6dBi) = 27.27dBm

Effective Legacy Gain (dBi) = 5.75+3.01=8.76dBi for the U-NII-3 Band.

Limit: 30dBm – (8.76 – 6dBi) = 27.24dBm

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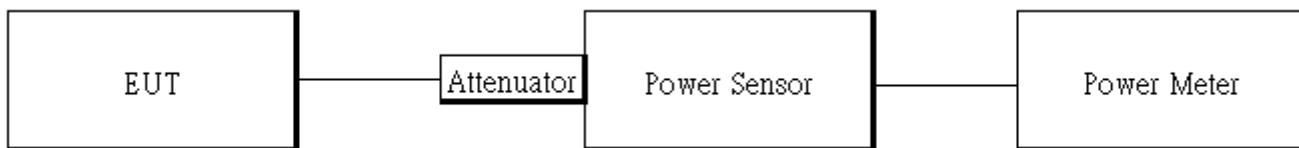
## 9.2 Measurement Procedure

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 v01.
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  $10 \log(1/\text{duty cycle})$ .
6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

## 9.3 Measurement Equipment Used

Refer to section 8.3 for details.

## 9.4 Test Set-up



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## 9.5 Measurement Result

802.11a

CH	Frequency (MHz)	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	<b>18.21</b>	<b>66.222</b>	30	PASS
44	5220	18.15	65.313	30	PASS
48	5240	18.12	64.863	30	PASS
149	5745	15.38	34.514	30	PASS
157	5785	<b>18.71</b>	<b>74.302</b>	30	PASS
165	5825	18.66	73.451	30	PASS

802.11n HT20 (MIMO)

CH	Frequency (MHz)	AVERAGE POWER (dBm)			TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)
		CHAIN 0	CHAIN 1	CHAIN 2			
36	5180	16.15	17.77	16.38	21.60	144.502	27.27
44	5220	16.33	17.69	16.46	<b>21.64</b>	<b>145.961</b>	27.27
48	5240	16.35	17.42	16.49	21.55	142.925	27.27
149	5745	13.07	13.34	12.38	17.72	59.152	27.24
157	5785	16.32	16.77	15.98	21.14	130.016	27.24
165	5825	16.41	16.86	15.91	<b>21.18</b>	<b>131.275</b>	27.24

*\* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.*

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## 802.11n HT40 (MIMO)

CH	Frequency (MHz)	AVERAGE POWER (dBm)			TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)
		CHAIN 0	CHAIN 1	CHAIN 2			
38	5190	11.92	12.49	11.61	16.79	47.789	27.27
46	5230	12.06	12.24	11.76	<b>16.80</b>	<b>47.816</b>	27.27
151	5755	10.96	11.25	10.52	15.69	37.081	27.24
159	5795	14.29	14.72	13.87	<b>19.08</b>	<b>80.880</b>	27.24

## 802.11\_ac80 (MIMO)

CH	Frequency (MHz)	AVERAGE POWER (dBm)			TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)
		CHAIN 0	CHAIN 1	CHAIN 2			
42	5210	12.16	12.65	11.84	17.00	50.127	27.27
155	5775	10.64	10.97	10.44	15.46	35.157	27.27

\* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average

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## 10. PEAK POWER SPECTRAL DENSITY

### 10.1 Standard Applicable

OPERATION 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-2A	√		11dBm/ MHz
U-NII-2C	√		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: Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain (dBi) = 5.72+3.01=8.73dBi for the U-NII-1.

Limit: 30dBm - (8.73 - 6dBi) = 27.27dBm

Effective Legacy Gain (dBi) = 5.75+3.01=8.76dBi for the U-NII-3 Band.

Limit: 30dBm – (8.76 – 6dBi) = 27.24dBm

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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 v01.
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:

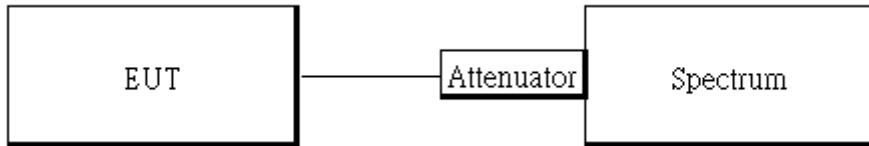
Set RBW=500 kHz, VBW $\geq$  3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

5. Use the cursor on spectrum to peak search the highest level of trace
6. Record the max. reading and add  $10 \log(1/\text{duty cycle})$ .
7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

## 10.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY5451056 8	04/14/2015	04/13/2016
DC Block	PASTERNACK	PE8210	RF29	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF23	12/19/2014	12/18/2015
Attenuator	WOKEN	6SR1211	RF41	12/19/2014	12/18/2015

## 10.4 Test Set-up



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## 10.5 Measurement Result

802.11a

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	8.140	17.00	-8.86
5220	8.760	17.00	-8.24
5240	7.560	17.00	-9.44
5745	5.870	30.00	-24.13
5785	9.350	30.00	-20.65
5825	9.560	30.00	-20.44

802.11n HT20 (MIMO)

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5180	4.260	17.00	-12.74
5220	5.020	17.00	-11.98
5240	4.440	17.00	-12.56
5745	12.570	30.00	-17.43
5785	15.860	30.00	-14.14
5825	15.370	30.00	-14.63

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## 802.11n HT40 (MIMO)

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5190	-3.310	11.00	-14.31
5230	-3.040	11.00	-14.04
5755	7.240	30.00	-22.76
5795	12.280	30.00	-17.72

## 802.11\_ac80 (MIMO)

Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
5210	-3.200	11.00	-14.20
5775	6.140	30.00	-23.86

**Note: As cable loss+ Duty cycle factor that offsets on the Spectrum.**

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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)



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



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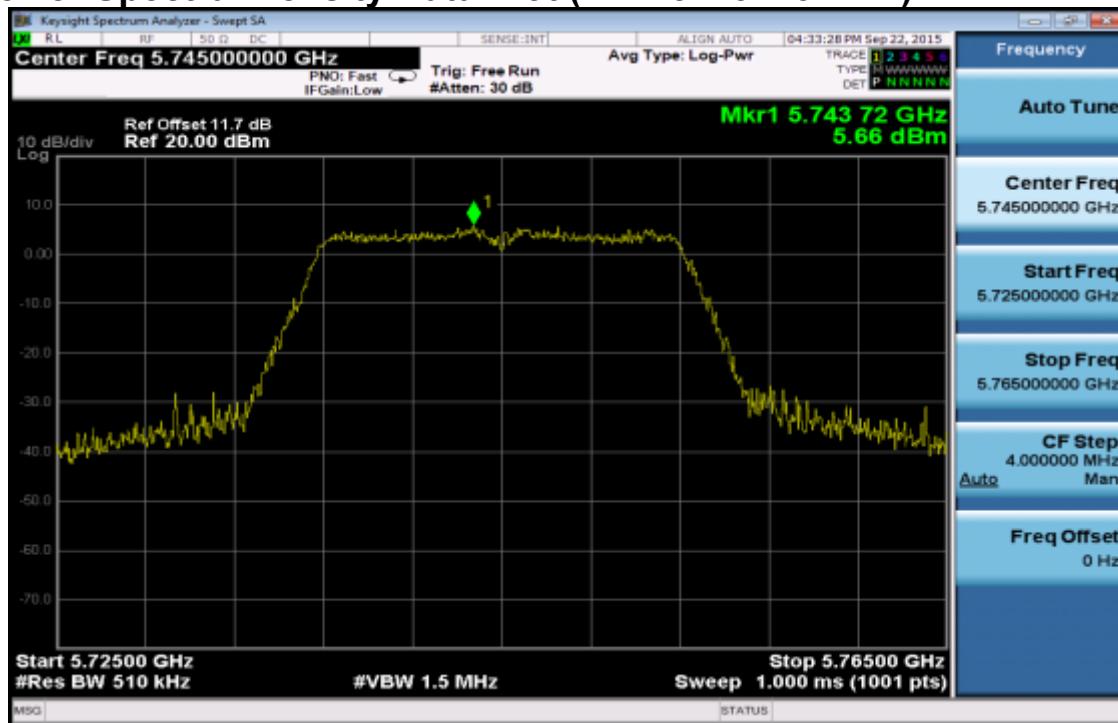
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## 802.11a 5725~5850 MHz

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



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



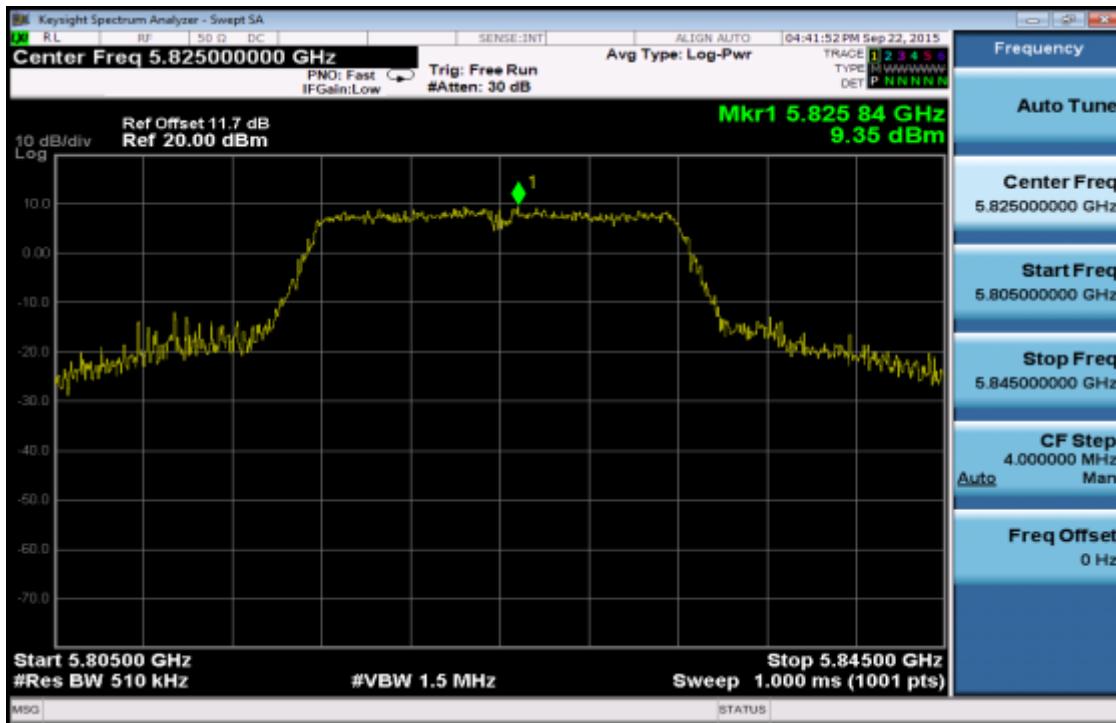
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## Peak Power Spectral Density Data Plot (CH High 5825 MHz)



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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)



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



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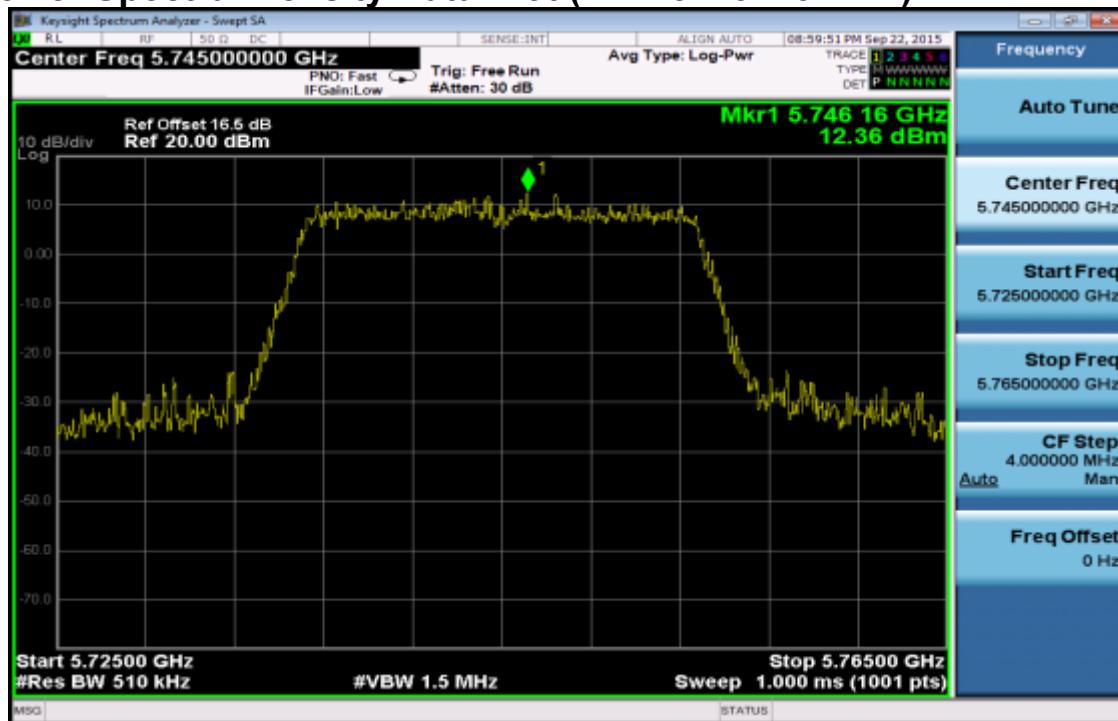
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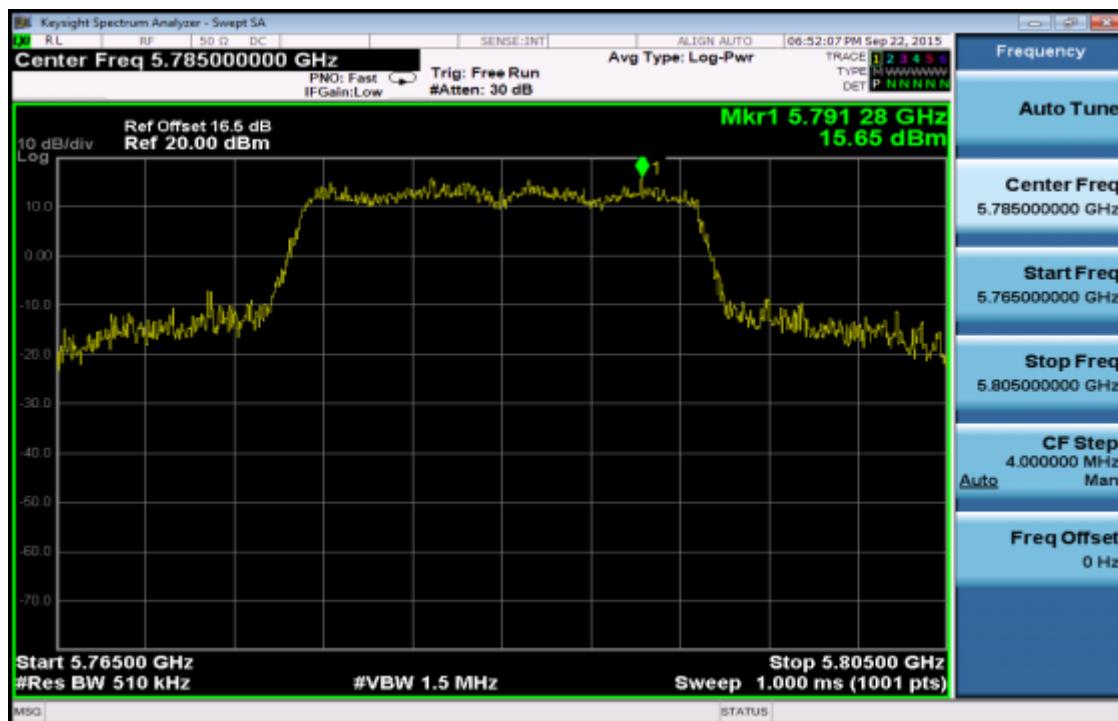
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## 802.11n HT20, 5725~5850 MHz

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



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



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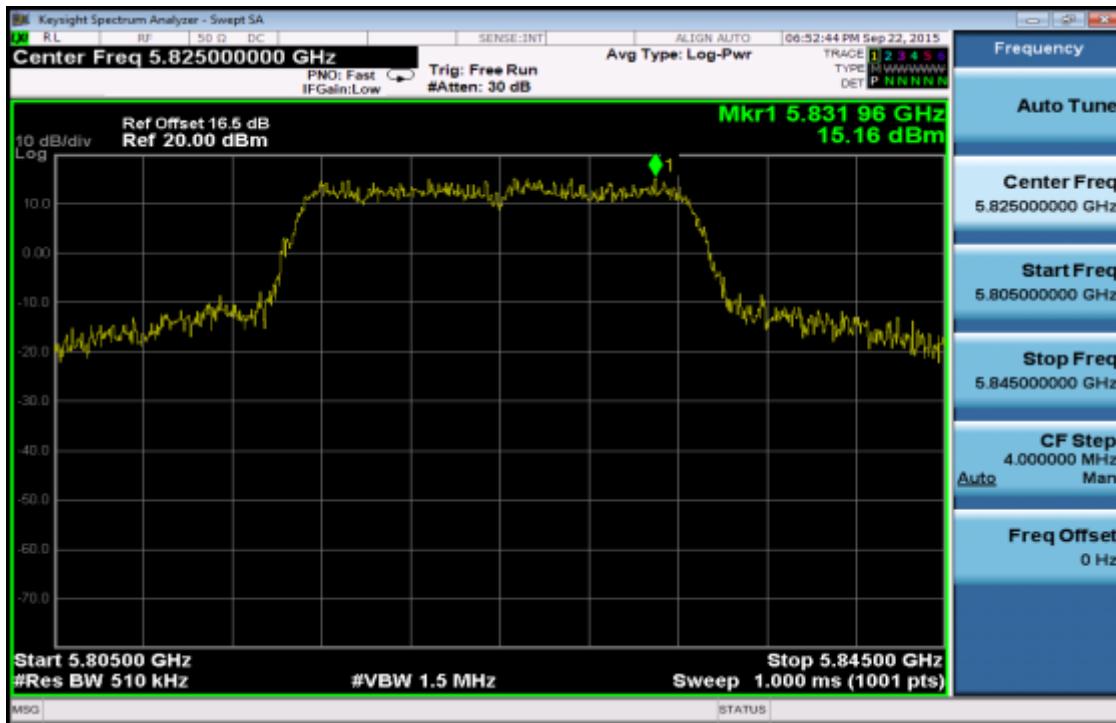
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## Peak Power Spectral Density Data Plot (CH High 5825 MHz)



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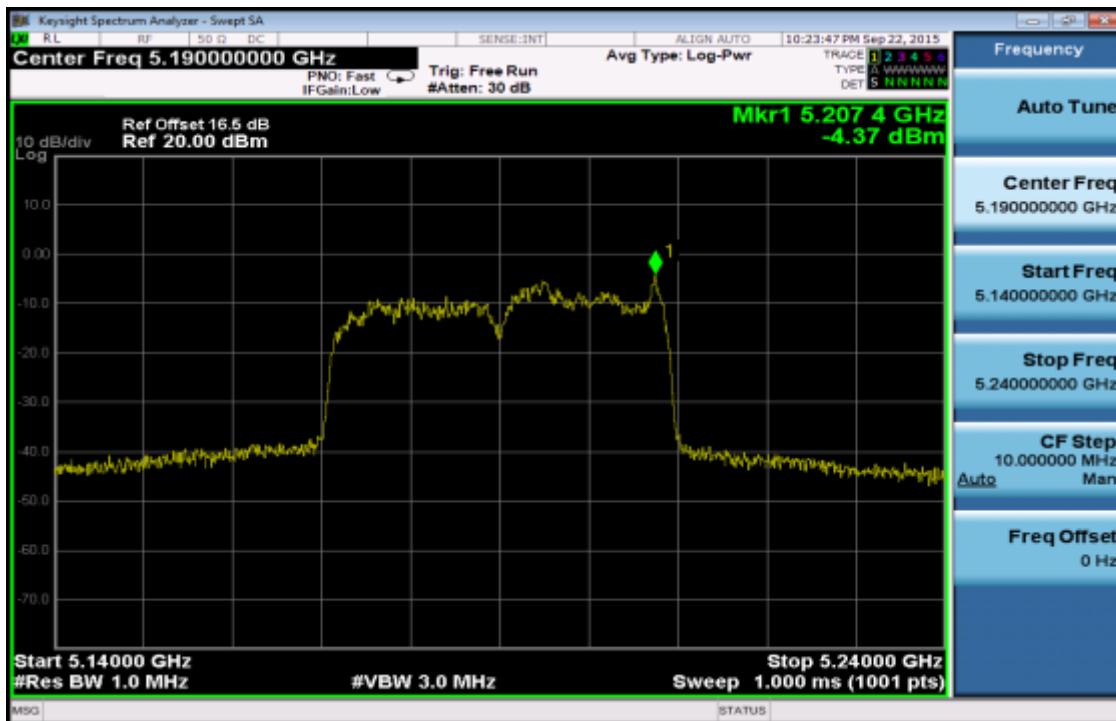
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## 802.11n HT40, 5150~5250 MHz

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



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



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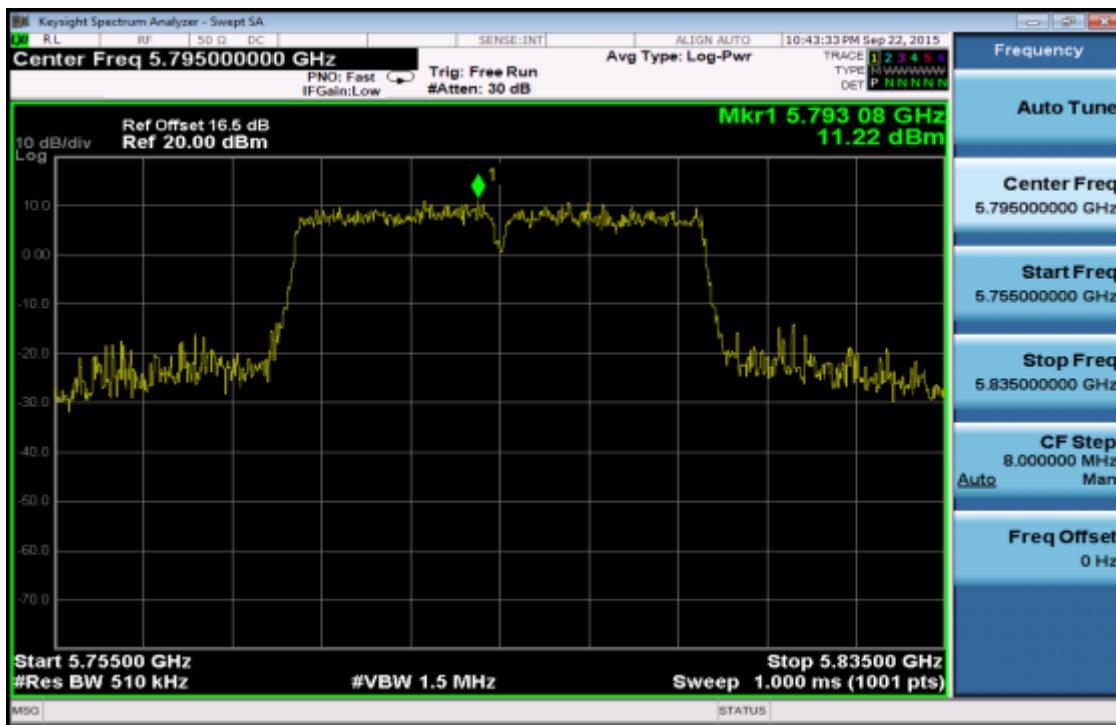
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## 802.11n HT40, 5725~5850 MHz Peak Power Spectral Density Data Plot (CH Low 5755 MHz)



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



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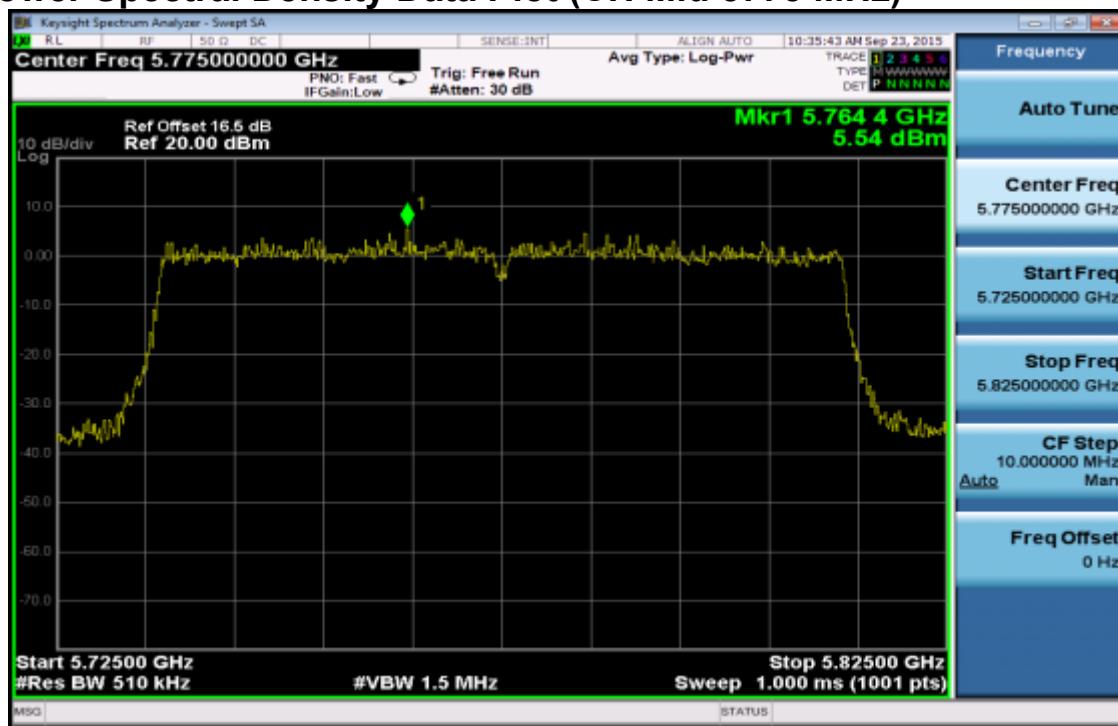
## 802.11ac VHT80, 5150~5250 MHz

### Peak Power Spectral Density Data Plot (CH ,Mid 5210 MHz)



## 802.11ac VHT80, 5725~5850 MHz

### Peak Power Spectral Density Data Plot (CH Mid 5775 MHz)



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## 11. UNDESIRABLE RADIATED EMISSION MEASUREMENT1

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

APPLICABLE TO	LIMIT	
FCC KDB 789033 D02 General UNII Test Procedures New Rules v01	FIELD STRENGTH AT 3m	
	PK: 74 (dB $\mu$ V/m)	AV 54 (dB $\mu$ V/m)
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m
15.407(b)(1)		
15.407(b)(2)	PK: -27 (dBm/MHz)	PK: 68.3 (dB $\mu$ V/m)
15.407(b)(3)		
15.407(b)(4)	PK: -27 (dBm/MHz) PK: -17 (dBm/MHz)	PK: 68.3 (dB $\mu$ V/m) PK: 78.2 (dB $\mu$ V/m)

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 (dB $\mu$ V/m) = 20 log Emission level (dB $\mu$ V/m)

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## 11.2 Measurement Equipment Used

SGS 966 Chamber No.C					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/09/2015	04/08/2016
Loop Antenna	ETS-Lindgren	6502	00143303	12/09/2014	12/08/2015
Broadband Antenna	TESEQ	CBL 6112D	35240	12/05/2014	12/04/2015
Horn Antenna	ETS-Lindgren	3117	00143272	12/08/2014	12/07/2015
Horn Antenna	ETS-Lindgren	3160-09	00117911	11/13/2014	11/12/2015
Horn Antenna	ETS-Lindgren	3160-10	00117783	11/13/2014	11/12/2015
Pre Amplifier	EMC Instruments	EMC330	980096	12/19/2014	12/18/2015
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-18	10204	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-26	100780	12/19/2014	12/18/2015
Pre Amplifier	R&S	SCU-40	100356	12/19/2014	12/18/2015
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/19/2014	12/18/2015
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/19/2014	12/18/2015
Attenuator	WOKEN	218FS-10	RF27	12/19/2014	12/18/2015
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2015	03/03/2016
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2015	05/03/2016
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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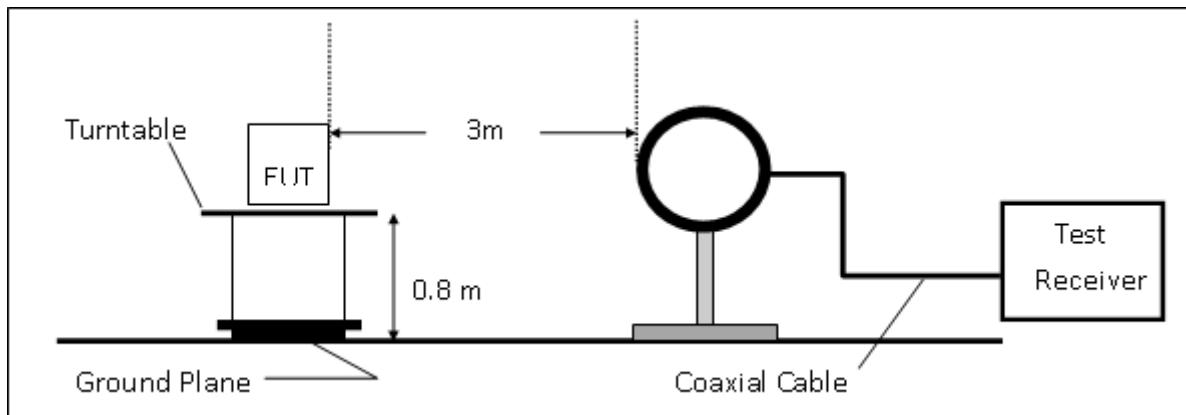
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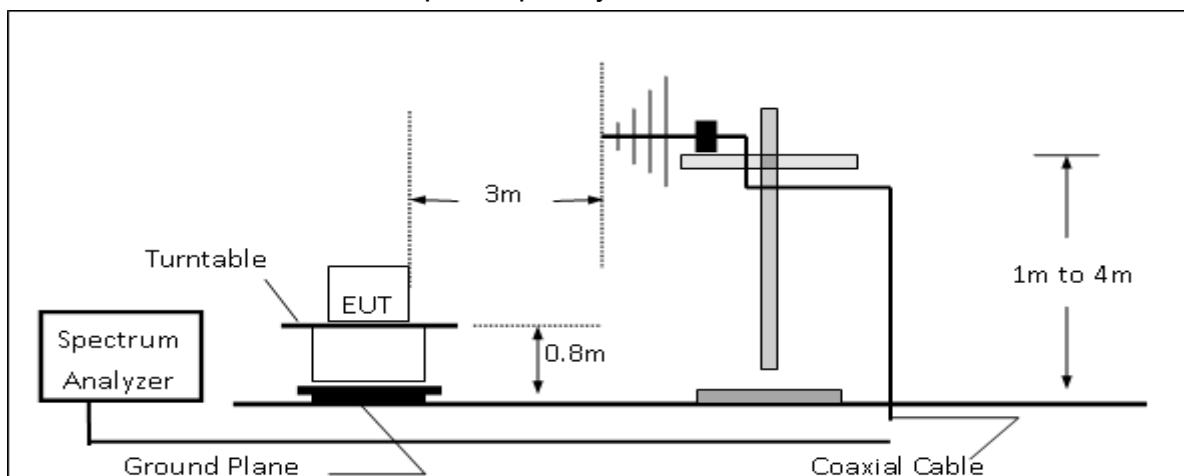
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### 11.3 Test SET-UP

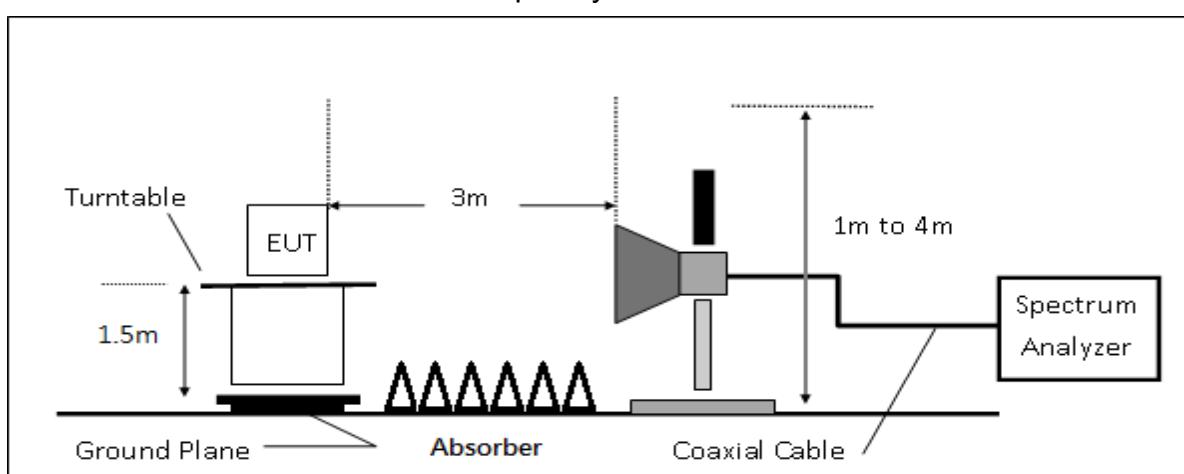
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (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 v01.
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  $\geq$  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(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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**Note :**

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.  
“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

## 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

Refer to attach tabular data sheets.

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

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH MID	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
65.89	S	QP	63.80	-28.09	35.71	40	-4.29
125.06	S	Peak	60.93	-21.38	39.55	43.5	-3.95
500.45	S	Peak	52.66	-14.29	38.37	46	-7.63
625.58	S	Peak	53.61	-12.06	41.55	46	-4.45
729.37	S	Peak	52.70	-10.66	42.04	46	-3.96
875.84	S	Peak	49.29	-8.49	40.80	46	-5.20

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH MID	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
66.16	S	QP	63.10	-28.07	35.03	40	-4.97
125.06	S	Peak	56.32	-21.38	34.94	43.5	-8.56
247.28	S	Peak	49.97	-20.64	29.33	46	-16.67
375.32	S	Peak	48.61	-16.68	31.93	46	-14.07
625.58	S	Peak	47.10	-12.06	35.04	46	-10.96
875.84	S	Peak	43.08	-8.49	34.59	46	-11.41

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**802.11ac VHT80, 5150~5250 MHz**

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
65.89	S	QP	66.10	-28.09	38.01	40	-1.99
125.06	S	Peak	60.99	-21.38	39.61	43.5	-3.89
500.45	S	Peak	52.68	-14.29	38.40	46	-7.60
625.58	S	Peak	53.11	-12.06	41.05	46	-4.95
738.10	S	Peak	47.99	-10.30	37.69	46	-8.31
875.84	S	Peak	48.69	-8.49	40.20	46	-5.80

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
65.89	S	QP	63.12	-28.09	35.03	40	-4.97
137.67	S	Peak	57.21	-21.58	35.63	43.5	-7.87
243.40	S	Peak	50.64	-20.91	29.73	46	-16.27
625.58	S	Peak	47.23	-12.06	35.17	46	-10.83
729.37	S	Peak	49.72	-10.66	39.06	46	-6.94
875.84	S	Peak	43.26	-8.49	34.77	46	-11.23

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**802.11a, 5725~5850 MHz**

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH MID	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
65.89	S	QP	63.82	-28.09	35.73	40	-4.27
125.06	S	Peak	60.96	-21.38	39.58	43.5	-3.92
500.45	S	Peak	52.78	-14.29	38.49	46	-7.51
625.58	S	Peak	53.41	-12.06	41.35	46	-4.65
875.84	S	Peak	48.69	-8.49	40.20	46	-5.80

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH MID	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
66.14	S	QP	63.21	-28.08	35.13	40	-4.87
139.61	S	Peak	56.31	-21.63	34.68	43.5	-8.82
375.32	S	Peak	48.31	-16.68	31.63	46	-14.37
500.45	S	Peak	46.33	-14.29	32.04	46	-13.96
625.58	S	Peak	47.41	-12.06	35.36	46	-10.64
875.84	S	Peak	42.53	-8.49	34.04	46	-11.96

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**802.11ac VHT80, 5725~5850 MHz**

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
33.88	S	Peak	50.03	-15.22	34.81	40	-5.19
65.89	S	QP	66.33	-28.09	38.24	40	-1.76
125.06	S	Peak	61.22	-21.38	39.84	43.5	-3.66
500.45	S	Peak	52.50	-14.29	38.21	46	-7.79
625.58	S	Peak	53.41	-12.06	41.35	46	-4.65
875.84	S	Peak	48.90	-8.49	40.42	46	-5.58

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
65.89	S	QP	63.23	-28.09	35.14	40	-4.86
139.61	S	Peak	56.54	-21.63	34.91	43.5	-8.59
375.32	S	Peak	48.06	-16.68	31.38	46	-14.62
500.45	S	Peak	46.26	-14.29	31.97	46	-14.03
625.58	S	Peak	46.80	-12.06	34.74	46	-11.26
875.84	S	Peak	42.32	-8.49	33.84	46	-12.16

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**Above 1GHz Worst-Case Data:****802.11a, 5150~5250 MHz**

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10360.00	H	Peak	32.90	18.94	51.84	68.3	-16.46
15540.00	H	Peak	33.42	25.80	59.21	74	-14.79
15540.00	H	Average	21.72	25.80	47.52	54	-6.48

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10360.00	H	Peak	35.30	18.94	54.24	68.3	-14.06
15540.00	H	Peak	34.74	25.80	60.54	74	-13.46
15540.00	H	Average	21.74	25.80	47.54	54	-6.46

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Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5220 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10440.00	H	Peak	34.18	19.03	53.21	68.3	-15.09
10440.00	H	Average	21.46	19.03	40.49	68.3	-27.81

Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5220 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10440.00	H	Peak	34.66	19.03	53.69	68.3	-14.61
15660.00	H	Peak	34.69	26.06	60.75	74	-13.25
15660.00	H	Average	21.67	26.06	47.73	54	-6.27

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Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10480.00	H	Peak	33.55	19.13	52.67	68.3	-15.63

Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10480.00	H	Peak	34.28	19.13	53.41	68.3	-14.89
15720.00	H	Peak	33.44	26.13	59.57	74	-14.43
15720.00	H	Average	21.25	26.13	47.38	54	-6.62

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**Band edge falling to restricted band**

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5146.72	S	Peak	53.30	11.16	64.46	74	-9.54
5146.72	S	Average	34.36	11.16	45.52	54	-8.48
5150.00	E	Peak	50.20	11.14	61.34	74	-12.66
5150.00	E	Average	35.75	11.14	46.89	54	-7.11

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5146.72	S	Peak	61.83	11.16	72.99	74	-1.01
5146.72	S	Average	32.29	11.16	43.45	54	-10.55
5150.00	E	Peak	58.17	11.14	69.31	74	-4.69
5150.00	E	Average	41.29	11.14	52.43	54	-1.57

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Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	44.35	11.30	55.65	74	-18.35
5350.00	E	Average	32.29	11.30	43.59	54	-10.41

Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	44.88	11.30	56.18	74	-17.82
5350.00	E	Average	34.15	11.30	45.45	54	-8.55
5353.35	S	Peak	47.81	11.32	59.13	74	-14.87
5353.35	S	Average	34.86	11.32	46.18	54	-7.82

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**802.11n\_20M, 5150~5250 MHz**

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5180 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH LOW Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10360.00	H	Peak	34.74	18.94	53.68	68.3	-14.62

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5180 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH LOW Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10360.00	H	Peak	32.90	18.94	51.84	68.3	-16.46
15540.00	H	Peak	33.49	25.80	59.29	74	-14.71
15540.00	H	Average	21.26	25.80	47.06	54	-6.94

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Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5220 MHz Temp. / Humi. : 22.7 deg\_C/57 RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10440.00	H	Peak	32.33	19.03	51.35	68.3	-16.95

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5220 MHz Temp. / Humi. : 22.7 deg\_C/57 RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10440.00	H	Peak	32.97	19.03	52.00	68.3	-16.30
15660.00	H	Peak	33.16	26.06	59.22	74	-14.78
15660.00	H	Average	21.80	26.06	47.86	54	-6.14

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Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10480.00	H	Peak	32.35	19.13	51.47	68.3	-16.83

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10480.00	H	Peak	32.45	19.13	51.58	68.3	-16.72

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**Band edge falling to restricted band**

Operation Mode :	802.11n20	Test Date :	2015/9/17
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5149.60	S	Peak	61.67	11.14	72.82	74	-1.18
5149.60	S	Average	41.82	11.14	52.96	54	-1.04
5150.00	E	Peak	60.46	11.14	71.60	74	-2.40
5150.00	E	Average	41.81	11.14	52.95	54	-1.05

Operation Mode :	802.11n20	Test Date :	2015/9/17
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5149.12	S	Peak	61.54	11.15	72.69	74	-1.31
5149.12	S	Average	40.11	11.15	51.26	54	-2.74
5150.00	E	Peak	60.90	11.14	72.04	74	-1.96
5150.00	E	Average	40.54	11.14	51.68	54	-2.32

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Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	45.81	11.30	57.11	74	-16.89
5350.00	E	Average	32.91	11.30	44.21	54	-9.79

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5240 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	46.78	11.30	58.08	74	-15.92
5350.00	E	Average	33.93	11.30	45.23	54	-8.77

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**802.11n\_40M, 5150~5250 MHz**

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10360.00	H	Peak	31.01	18.94	49.95	68.3	-18.36

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10360.00	H	Peak	31.96	18.94	50.90	68.3	-17.40

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Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5230 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10460.00	H	Peak	34.42	19.11	53.54	68.3	-14.76

Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5230 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
10460.00	H	Peak	37.82	19.11	56.93	68.3	-11.37

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**Band edge falling to restricted band**

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5143.60	S	Peak	60.88	11.17	72.05	74	-1.95
5143.60	S	Average	36.40	11.17	47.57	54	-6.43
5150.00	E	Average	37.97	11.14	49.11	54	-4.89
5150.00	E	Peak	57.91	11.14	69.05	74	-4.95

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5149.48	S	Peak	55.74	11.14	66.88	74	-7.12
5149.48	S	Average	37.04	11.14	48.18	54	-5.82
5150.00	E	Peak	54.48	11.14	65.62	74	-8.38
5150.00	E	Average	37.17	11.14	48.31	54	-5.69

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Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5230 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	43.16	11.30	54.46	74	-19.54
5350.00	E	Average	32.55	11.30	43.85	54	-10.15

Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5230 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	43.34	11.30	54.64	74	-19.36
5350.00	E	Average	32.75	11.30	44.05	54	-9.95

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**802.11ac VHT80, 5150~5250 MHz**

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
10420.00	F/H/E/S H	PK/QP/AV Peak	dB $\mu$ V 32.97	dB 18.96	dB $\mu$ V/m 51.93	dB $\mu$ V/m 68.3	dB -16.37

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
10420.00	F/H/E/S H	PK/QP/AV Peak	dB $\mu$ V 36.97	dB 18.96	dB $\mu$ V/m 55.93	dB $\mu$ V/m 68.3	dB -12.37

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**Band edge falling to restricted band**

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5134.10	S	Peak	61.10	11.22	72.32	74	-1.68
5134.10	S	Average	39.34	11.22	50.56	54	-3.44
5150.00	E	Peak	58.91	11.14	70.06	74	-3.94
5150.00	E	Average	40.03	11.14	51.17	54	-2.83

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5149.80	S	Peak	59.57	11.14	70.71	74	-3.29
5149.80	S	Average	39.53	11.14	50.67	54	-3.33
5150.00	E	Peak	55.13	11.14	66.27	74	-7.73
5150.00	E	Average	39.54	11.14	50.68	54	-3.32

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Operation Mode : 802.11ac80 Test Date : 2015/9/17  
Fundamental Frequency : 5210 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	43.63	11.30	54.93	74	-19.07
5350.00	E	Average	33.10	11.30	44.40	54	-9.60

Operation Mode : 802.11ac80 Test Date : 2015/9/17  
Fundamental Frequency : 5210 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5350.00	E	Peak	44.52	11.30	55.82	74	-18.18
5350.00	E	Average	33.25	11.30	44.55	54	-9.45

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**802.11a, 5725~5850 MHz**

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11490.00	H	Peak	35.17	21.08	56.26	74	-17.74

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11490.00	H	Peak	36.78	21.08	57.86	74	-16.14

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Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5785 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11570.00	H	Peak	36.25	21.14	57.39	74	-16.61
11570.00	H	Average	21.92	21.14	43.06	54	-10.94

Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5785 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11570.00	H	Peak	37.80	21.14	58.94	74	-15.06
11570.00	H	Average	23.70	21.14	44.84	54	-9.16

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Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11650.00	H	Peak	36.92	21.27	58.19	74	-15.81
11650.00	H	Average	22.37	21.27	43.64	54	-10.36

Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11650.00	H	Peak	38.31	21.27	59.58	74	-14.42
11650.00	H	Average	23.47	21.27	44.74	54	-9.26

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**Band edge falling to restricted band**

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5724.80	S	Peak	60.97	12.27	73.25	78.2	-4.95
5725.00	E	Peak	56.50	12.27	68.77	78.2	-9.43

Operation Mode :	802.11a	Test Date :	2015/9/17
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5725.00	E	Peak	64.73	12.27	77.00	78.2	-1.20

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Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5850.00	E	Peak	55.14	12.61	67.75	78.2	-10.45

Operation Mode : 802.11a Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5850.00	E	Peak	63.16	12.61	75.77	78.2	-2.43

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**802.11n\_20M, 5725~5850 MHz**

Operation Mode :	802.11n20	Test Date :	2015/9/17
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11490.00	H	Peak	33.04	21.08	54.12	74	-19.88
11490.00	H	Average	22.10	21.08	43.18	54	-10.82

Operation Mode :	802.11n20	Test Date :	2015/9/17
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11490.00	H	Peak	35.83	21.08	56.92	74	-17.08
11490.00	H	Average	22.50	21.08	43.58	54	-10.42

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Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5785 MHz Temp. / Humi. : 22.7 deg\_C/57 RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11570.00	H	Peak	34.71	21.14	55.84	74	-18.16
11570.00	H	Average	22.21	21.14	43.35	54	-10.65

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5785 MHz Temp. / Humi. : 22.7 deg\_C/57 RH  
Operation Band : TX CH MID Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11570.00	H	Peak	36.66	21.14	57.80	74	-16.20
11570.00	H	Average	22.73	21.14	43.87	54	-10.13

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Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11650.00	H	Peak	36.25	21.27	57.53	74	-16.47
11650.00	H	Average	22.21	21.27	43.48	54	-10.52

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11650.00	H	Peak	36.51	21.27	57.78	74	-16.22
11650.00	H	Average	22.67	21.27	43.94	54	-10.06

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**Band edge falling to restricted band**

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5745 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH LOW Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
5658.10	S	Peak	52.17	12.13	64.30	68.3	-4.00
5725.00	E	Peak	64.70	12.27	76.97	78.2	-1.23

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5745 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH LOW Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
5663.20	S	Peak	51.88	12.16	64.04	68.3	-4.26
5713.30	S	Peak	49.34	12.31	61.65	68.3	-6.65
5724.60	S	Peak	59.58	12.27	71.85	78.2	-6.35
5725.00	E	Peak	59.54	12.27	71.81	78.2	-6.39

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Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
5850.00	E	Peak	63.99	12.61	76.60	78.2	-1.60
5898.20	S	Peak	53.78	12.91	66.68	68.3	-1.62

Operation Mode : 802.11n20 Test Date : 2015/9/17  
Fundamental Frequency : 5825 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
5850.00	E	Peak	61.83	12.61	74.45	78.2	-3.75
5903.10	S	Peak	53.52	12.95	66.47	68.3	-1.83

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**802.11n\_40M, 5725~5850 MHz**

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11510.00	H	Peak	32.47	21.17	53.64	74	-20.36
11510.00	H	Average	22.19	21.17	43.36	54	-10.64

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11510.00	H	Peak	33.87	21.17	55.04	74	-18.96
11510.00	H	Average	21.83	21.17	43.00	54	-11.00

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Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5795 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11590.00	H	Peak	32.38	21.28	53.66	74	-20.34
11590.00	H	Average	22.16	21.28	43.44	54	-10.56

Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5795 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : TX CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11590.00	H	Peak	36.80	21.28	58.08	74	-15.92
11590.00	H	Average	22.14	21.28	43.42	54	-10.58

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**Band edge falling to restricted band**

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5708.00	S	Peak	54.50	12.32	66.82	68.3	-1.48
5721.40	S	Peak	64.68	12.28	76.96	78.2	-1.24
5725.00	E	Peak	58.40	12.27	70.67	78.2	-7.53

Operation Mode :	802.11n40	Test Date :	2015/9/17
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5714.00	S	Peak	53.20	12.31	65.50	68.3	-2.80
5719.20	S	Peak	59.03	12.29	71.32	78.2	-6.88
5725.00	E	Peak	57.67	12.27	69.94	78.2	-8.26

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Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5795 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5850.00	E	Peak	55.76	12.61	68.37	78.2	-9.83
5861.70	S	Peak	54.64	12.72	67.36	68.3	-0.94

Operation Mode : 802.11n40 Test Date : 2015/9/17  
Fundamental Frequency : 5795 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5850.00	E	Peak	49.68	12.61	62.29	78.2	-15.91
5865.90	S	Peak	50.98	12.74	63.72	68.3	-4.58

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**802.11ac VHT80, 5725~5850 MHz**

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11550.00	H	Peak	32.44	20.97	53.41	74	-20.59
11550.00	H	Average	21.61	20.97	42.58	54	-11.42

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
11550.00	H	Peak	32.07	20.97	53.04	74	-20.96
11550.00	H	Average	22.21	20.97	43.18	54	-10.82

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**Band edge falling to restricted band**

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Vertical

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5714.80	S	Peak	54.86	12.30	67.17	68.3	-1.13
5725.00	E	Peak	54.23	12.27	66.50	78.2	-11.70

Operation Mode :	802.11ac80	Test Date :	2015/9/17
Fundamental Frequency :	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE CH LOW	Test Engineer :	Ashton
EUT Pol. :	E1	Measurement Antenna Pol. :	Horizontal

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dB $\mu$ V	dB	dB $\mu$ V/m	dB $\mu$ V/m	dB
5706.10	S	Peak	55.01	12.31	67.32	68.3	-0.98
5712.60	S	Peak	54.98	12.31	67.29	68.3	-1.01
5725.00	E	Peak	56.64	12.27	68.91	78.2	-9.29

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Operation Mode : 802.11ac80 Test Date : 2015/9/17  
Fundamental Frequency : 5775 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Vertical

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Reading	Level dB $\mu$ V				
5850.00	E	Peak	53.97		12.61	66.58	78.2	-11.62
5860.32	S	Peak	50.83		12.71	63.54	68.3	-4.76

Operation Mode : 802.11ac80 Test Date : 2015/9/17  
Fundamental Frequency : 5775 MHz Temp. / Humi. : 22.7deg\_C/57RH  
Operation Band : BE CH HIGH Test Engineer : Ashton  
EUT Pol. : E1 Measurement Antenna Pol. : Horizontal

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB
			Reading	Level dB $\mu$ V				
5850.00	E	Peak	49.96		12.61	62.57	78.2	-15.63
5864.52	S	Peak	51.75		12.74	64.49	68.3	-3.81

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## 12. TRANSMISSION IN THE ABSENCE OF DATA

### 12.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

### 12.2 Result

No non-compliance noted:

Refer to the theory of operation.

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## 13. FREQUENCY STABILITY

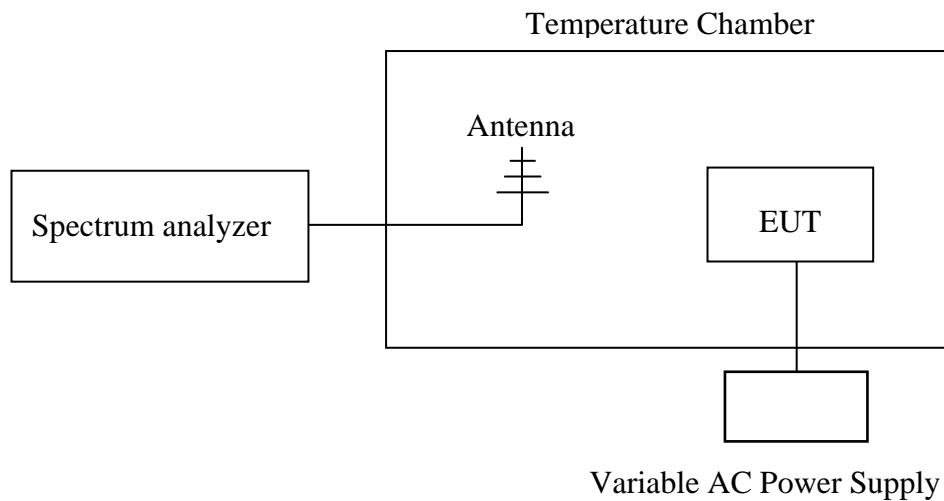
### 13.1 Standard Applicable

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### 13.2 Measurement Procedure

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.

### 13.3 Test SET-UP



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### 13.4 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2015	04/13/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/18/2015	06/17/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2015	05/03/2016

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## 13.5 Measurement Result

Operation Mode	TX	Test Date	2015.09.23
Temperature	26	Test By	Wayne
Humidity	64 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	13.8V	36	5180.0000	5,179.854470	0.1455
		44	5220.0000	5,219.840110	0.1599
		48	5240.0000	5,239.855130	0.1449
		149	5745.0000	5,744.848870	0.1511
		157	5785.0000	5,784.853960	0.1460
		165	5825.0000	5,824.856180	0.1438
	10.8V	36	5180.0000	5,179.859800	0.1402
		44	5220.0000	5,219.852740	0.1473
		48	5240.0000	5,239.848800	0.1512
		149	5745.0000	5,744.859190	0.1408
		157	5785.0000	5,784.848480	0.1515
		165	5825.0000	5,824.844980	0.1550
25	12V	36	5180.0000	5,179.854200	0.1458
		44	5220.0000	5,219.858410	0.1416
		48	5240.0000	5,239.853190	0.1468
		149	5745.0000	5,744.858390	0.1416
		157	5785.0000	5,784.848250	0.1517
		165	5825.0000	5,824.853040	0.1470

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40	13.8V	36	5180.0000	5,179.859650	0.1403
		44	5220.0000	5,219.857450	0.1425
		48	5240.0000	5,239.847680	0.1523
		149	5745.0000	5,744.842790	0.1572
		157	5785.0000	5,784.841960	0.1580
		165	5825.0000	5,824.851830	0.1482
	10.8V	36	5180.0000	5,179.854580	0.1454
		44	5220.0000	5,219.851730	0.1483
		48	5240.0000	5,239.855860	0.1441
		149	5745.0000	5,744.850300	0.1497
		157	5785.0000	5,784.844040	0.1560
		165	5825.0000	5,824.844880	0.1551

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Operation Mode	TX	Test Date	2015.09.23
Temperature	26	Test By	Wayne
Humidity	64 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	13.8V	38	5190.0000	5,189.827940	0.1721
		46	5230.0000	5,229.836070	0.1639
		151	5755.0000	5,754.831040	0.1690
		159	5795.0000	5,794.832840	0.1672
	10.8V	38	5190.0000	5,189.827910	0.1721
		46	5230.0000	5,229.838950	0.1610
		151	5755.0000	5,754.825900	0.1741
		159	5795.0000	5,794.830390	0.1696
25	12V	38	5190.0000	5,189.828310	0.1717
		46	5230.0000	5,229.822850	0.1771
		151	5755.0000	5,754.827190	0.1728
		159	5795.0000	5,794.835100	0.1649
40	13.8V	38	5190.0000	5,189.823110	0.1769
		46	5230.0000	5,229.827790	0.1722
		151	5755.0000	5,754.833560	0.1664
		159	5795.0000	5,794.820090	0.1799
	10.8V	38	5190.0000	5,189.832800	0.1672
		46	5230.0000	5,229.832720	0.1673
		151	5755.0000	5,754.838260	0.1617
		159	5795.0000	5,794.833500	0.1665

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Operation Mode	TX	Test Date	2015.09.23
Temperature	26	Test By	Wayne
Humidity	64 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
0	13.8V	42	5210.0000	5,209.825070	0.1749
		155	5775.0000	5,774.828890	0.1711
	10.8V	42	5210.0000	5,209.827820	0.1722
		155	5775.0000	5,774.820330	0.1797
25	12V	42	5210.0000	5,209.839530	0.1605
		155	5775.0000	5,774.824420	0.1756
40	13.8V	42	5210.0000	5,209.825070	0.1749
		155	5775.0000	5,774.838630	0.1614
	10.8V	42	5210.0000	5,209.824980	0.1750
		155	5775.0000	5,774.836640	0.1634

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## 14. ANTENNA REQUIREMENT

### 14.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

According to §15.407, If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 14.2 Antenna Connected Construction

A PIFA antenna design is used.

The antenna is designed with permanent attached and no consideration of replacement.

Please see EUT photo and antenna spec. for details.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

*~ End of Report ~*

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