

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** Dual-Band 2x2 802.11ac and BT4.1 Combo Module  
**Brand Name:** Foxconn  
**Model No.:** WBUA31  
**Model Difference:** N/A  
**FCC ID:** RX3-WBUA31  
**IC:** 2878F-WBUA31  
**Report No.:** ER/2016/80010-01  
**Issue Date:** Sep. 02, 2019  
**FCC Rule Part:** §15.247, Cat: DTS  
**IC Rule Part:** RSS-247 issue 1 :2015  
**Prepared for:** Hon Hai Precision Industry Co., Ltd.  
No.151, Sec. 1, Nankan Rd., Lujhu Township,  
Taoyuan County, 33859, Taiwan (R.O.C)  
SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
**Prepared by:** No.134, Wu Kung Road, New Taipei Industrial  
Park, Wuku District, New Taipei City, Taiwan  
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## VERIFICATION OF COMPLIANCE

**Applicant:** Hon Hai Precision Industry Co., Ltd.  
No.151, Sec. 1, Nankan Rd., Lujhu Township, Taoyuan County,  
33859, Taiwan (R.O.C)

**Product Name:** Dual-Band 2x2 802.11ac and BT4.1 Combo Module

**Brand Name:** Foxconn

**Model No.:** WBUA31

**Model Difference:** N/A

**FCC ID:** RX3-WBUA31

**IC:** 2878F-WBUA31

**File Number:** ER/2016/80010-01

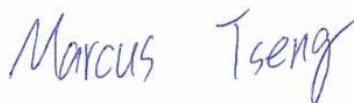
**Date of Test:** Aug. 02, 2016 ~ Aug. 19, 2016

**Date of EUT Received:** Aug. 02, 2016

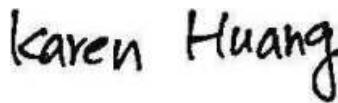
**We hereby certify that:**

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

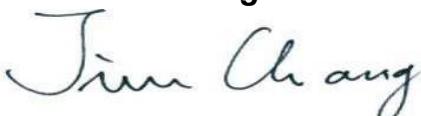
The test results of this report relate only to the tested sample identified in this report.

**Test By:****Date:**

Sep. 02, 2019

*Marcus Tseng / Engineer***Prepared By:****Date:**

Sep. 02, 2019

*Karen Huang / Clerk***Approved By:****Date:**

Sep. 02, 2019

*Jim Chang / Asst. Manager*

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## Revision History

Report Number	Revision	Description	Effectuated Page	Issue Date	Revised By
ER/2016/80010	Rev.00	Initial creation of document	All	Aug. 19, 2016	Karen Huang
ER/2016/80010-01	Rev.01	Add section 1.7 remark and conduction data updated	Page 10, 19~20	Sep. 02, 2019	Karen Huang

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## Contents

<b>1 GENERAL INFORMATION.....</b>	<b>6</b>
1.1 Product description .....	6
1.2 Product Feature of Equipment Under Test .....	8
1.3 Test Methodology of Applied Standards.....	9
1.4 Test Facility .....	9
1.5 Special Accessories .....	9
1.6 Equipment Modifications .....	9
<b>2 SYSTEM TEST CONFIGURATION .....</b>	<b>9</b>
2.1 EUT Configuration .....	10
2.2 EUT Exercise.....	10
2.3 Test Procedure.....	10
2.4 Measurement Results Explanation Example .....	10
2.5 Configuration of Tested System.....	11
<b>3 SUMMARY OF TEST RESULTS .....</b>	<b>12</b>
<b>4 DESCRIPTION OF TEST MODES.....</b>	<b>13</b>
4.1 Operated in 2400 ~ 2483.5MHz Band .....	13
4.2 The Worst Test Modes and Channel Details.....	13
<b>5 MEASUREMENT UNCERTAINTY.....</b>	<b>15</b>
<b>6 CONDUCTED EMISSION TEST.....</b>	<b>16</b>
6.1 Standard Applicable .....	16
6.2 Measurement Equipment Used .....	16
6.3 EUT Setup .....	16
6.4 Test SET-UP (Block Diagram of Configuration) .....	17
6.5 Measurement Procedure .....	17
6.6 Measurement Result .....	17
<b>7 DUTY CYCLE OF TEST SIGNAL.....</b>	<b>20</b>
7.1 DUTY CYCLE TEST SIGNAL Measurement Result.....	21
<b>8 PEAK OUTPUT POWER MEASUREMENT.....</b>	<b>23</b>
8.1 Standard Applicable .....	23
8.2 Measurement Equipment Used .....	24
8.3 Test Set-up.....	24
8.4 Measurement Procedure .....	24
8.5 Measurement Result .....	25

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<b>9 6dB &amp; 99% BANDWIDTH MEASUREMENT .....</b>	<b>28</b>
9.1 Standard Applicable .....	28
9.2 Measurement Equipment Used .....	28
9.3 Test Set-up.....	28
9.4 Measurement Procedure .....	28
9.5 Measurement Result .....	29
<b>10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT .....</b>	<b>55</b>
10.1 Standard Applicable .....	55
10.2 Measurement Equipment Used .....	55
10.3 Test SET-UP .....	55
10.4 Measurement Procedure .....	56
10.5 Measurement Result .....	56
<b>11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT.....</b>	<b>73</b>
11.1 Standard Applicable .....	73
11.2 Measurement Equipment Used: .....	74
11.3 Test SET-UP .....	75
11.4 Measurement Procedure .....	76
11.5 Field Strength Calculation.....	77
11.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz.....	77
11.7 Measurement Result.....	77
<b>12 PEAK POWER SPECTRAL DENSITY .....</b>	<b>116</b>
12.1 Standard Applicable .....	116
12.2 Measurement Equipment Used .....	116
12.3 Test Set-up.....	116
12.4 Measurement Procedure .....	116
12.5 Measurement Result .....	117
<b>13 ANTENNA REQUIREMENT .....</b>	<b>129</b>
13.1 Standard Applicable .....	129
13.2 Antenna Connected Construction .....	129

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## 1 GENERAL INFORMATION

### 1.1 Product description

#### General:

Product Name:	Dual-Band 2x2 802.11ac and BT4.1 Combo Module
Brand Name:	Foxconn
Model No.:	WBUA31
Model Difference:	N/A
Product SW/HW version:	N/A / DVT
Radio SW/HW version:	N/A / N/A
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	3.3Vdc from Test Kit

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WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power / (EIRP)	Type of Emission	Modulation Technology	
11b/g	2412-2462	11	b: 19.41dBm b: 20.21dBm (EIRP) g: 22.78dBm g: 20.10dBm (EIRP)	b: 13M7G1D g:16M4D1D	DSSS, OFDM	
11n	HT 20 2412-2462	11	HT20:22.61dBm (MIMO Chain 0+1) HT20:22.22dBm (MIMO Chain 0+1) (EIRP)	HT20:17M5D1D	OFDM	
11n	HT 40 2422-2452	7	HT40: 22.98dBm (MIMO Chain 0+1) HT40: 22.22dBm (MIMO Chain 0+1) (EIRP)	HT40:36M0D1D	OFDM	
Antenna Designation		PIFA Antenna 1. Main Part No.: W-M-D-B-N-0-0560(65"), Supplier: Foxconn Gain: 2.46dBi Part No.: W-M-D-B-N-0-0560(70"), Supplier: Foxconn Gain: 1.13dBi  2. Aux Part No.: W-M-S-D-N-2-1940(65"), Supplier: Foxconn Gain: 3.22dBi Part No.: W-M-S-D-N-2-2100(70"), Supplier: Foxconn Gain: 1.15dBi				
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transition Rate:		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300Mbps				

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## 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting 802.11a/b/g/n/ac, Bluetooth, features, and below is details of information.

Product Feature	
Product Name:	Dual-Band 2x2 802.11ac and BT4.1 Combo Module
Brand Name:	Foxconn
Model No.:	WBUA31
Model Difference:	N/A
FCC ID:	RX3-WBUA31
IC:	2878F-WBUA31
Bluetooth Version	V4.1 dual mode + HS
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 C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance

FCC KDB 662911 D01 Multiple Transmitter Output

Canada RSS-247 issue 1 May 2015

Canada RSS-Gen issue 4 Nov. 2014

ANSI C63.10:2013

Note:

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

### 1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

(TAF code 0513)

FCC Designation number is: TW0001

ISED#: 4620A

### 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.

### 1.7 Remarks

The original test report ER/2016/80010 will be withdrawn with this test report ER/2016/80010-01 and is no longer valid when the withdrawal occurred.

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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 §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this 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.

### 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 0.5dB and 10dB attenuator.

#### Offset:

= RF cable loss (dB)+ attenuation factor(dB) dB =10.5dB

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## 2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

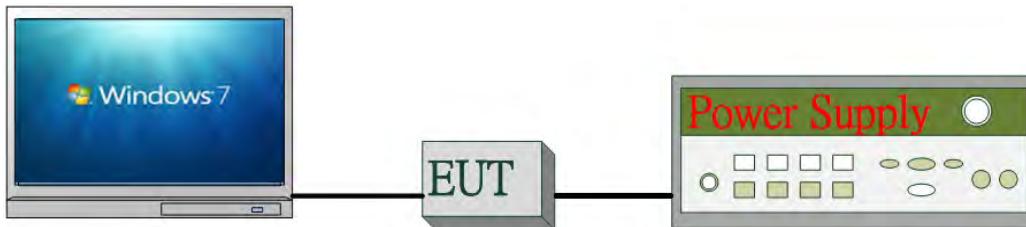


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Unshielded
3.	Notebook	Lenovo	L420	LR-7HXZA	Shielded	Unshielded
4.	Test Kit	N/A	N/A	N/A	N/A	N/A

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### 3 SUMMARY OF TEST RESULTS

FCC Rules / IC Rules	Description Of Test	Result
§15.207(a) RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3) RSS-247 §5.4(4)	Peak Output Power	Compliant
§15.247(a)(2) RSS-247 §5.2 (1) RSS-Gen §6.6	6dB & 99% Emission Bandwidth	Compliant
§15.247(d) RSS-247 §5.5	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d) RSS-247 §5.5	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e) RSS-247 §5.2(2)	Power Spectral Density	Compliant
§15.203 §15.247(b) RSS- Gen §6.7 RSS- Gen §8.3	Antenna Requirement	Compliant

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## 4 DESCRIPTION OF TEST MODES

### 4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n HT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

7 channels are provided for 802.11n HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	7	2442 MHz
4	2427 MHz	8	2447 MHz
5	2432 MHz	9	2452 MHz
6	2437 MHz		

### 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 and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

#### RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	1,6,11	OFDM	54	Main

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RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	11	Main
802.11g	1 to 11	1, 6, 11	OFDM	54	Main
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	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 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

Pre-scanned was done on antenna set W-M-D-B-N-0-0560 & W-M-S-D-N-2-1940 (65"), and antenna set W-M-D-B-N-0-0560 & W-M-S-D-N-2-2100 (70"). The W-M-D-B-N-0-0560 & W-M-S-D-N-2-1940 (65") results higher emission at 2.4GHz. Therefore, the completed set of measurement was done on antenna W-M-D-B-N-0-0560 & W-M-S-D-N-2-1940 (65") to presented on this test report.

**ANTENNA PORT CONDUCTED MEASUREMENT:**

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	11	Main
802.11g	1 to 11	1, 6, 11	OFDM	54	Main
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO

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## 5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

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

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

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

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## 6 CONDUCTED EMISSION TEST

### 6.1 Standard Applicable

Frequency range within 150kHz to 30MHz 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	12/12/2015	12/11/2016
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	02/07/2016	02/06/2017
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

### 6.3 EUT Setup

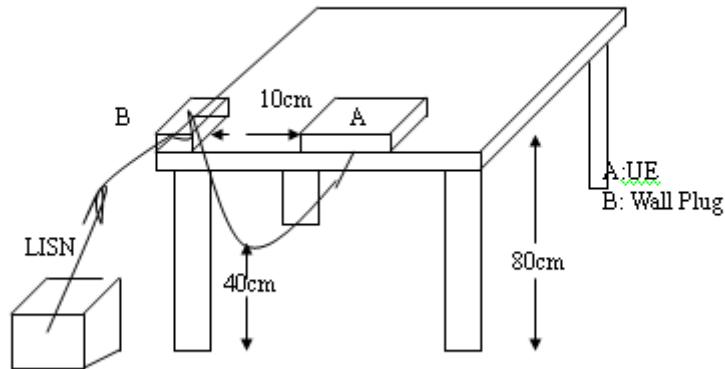
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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## 6.4 Test SET-UP (Block Diagram of Configuration)



## 6.5 Measurement Procedure

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

## 6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The \* reveals the worst-case results that closet to the limit

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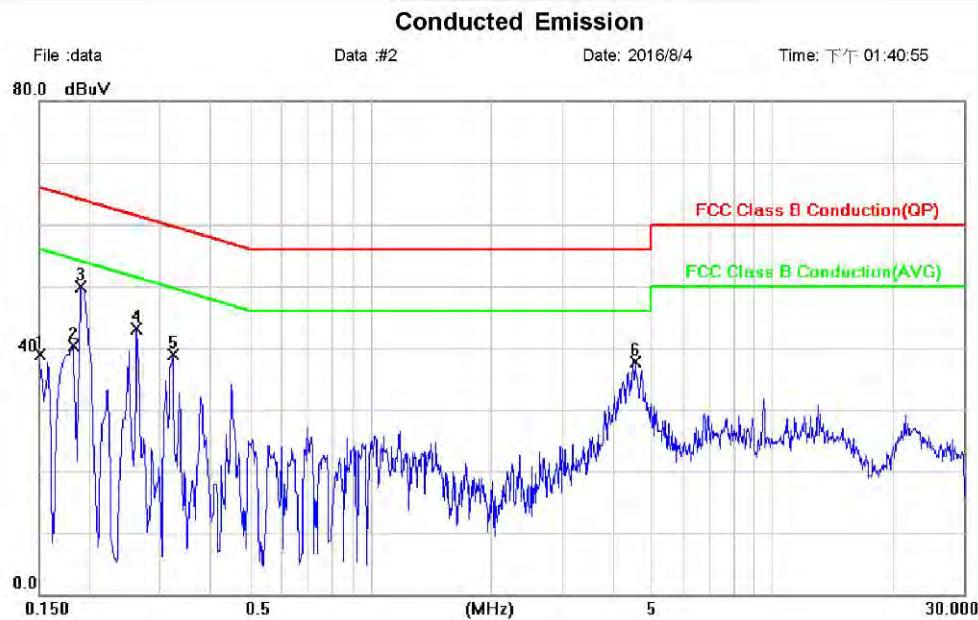
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode: operation mode

Test Date: Marcus Tseng

Site Conduction Room Phase: **L1** Temperature: 25 °C  
Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 85 %  
Mode: Operation mode  
Note:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
							MHz	dBuV	dB	Detector
1		0.1500	38.78	0.07	38.85	66.00	-27.15	peak		
2		0.1820	40.16	0.08	40.24	64.39	-24.15	peak		
3 *		0.1900	49.79	0.08	49.87	64.04	-14.17	peak		
4		0.2620	42.94	0.09	43.03	61.37	-18.34	peak		
5		0.3220	38.74	0.09	38.83	59.66	-20.83	peak		
6		4.5580	37.44	0.27	37.71	56.00	-18.29	peak		

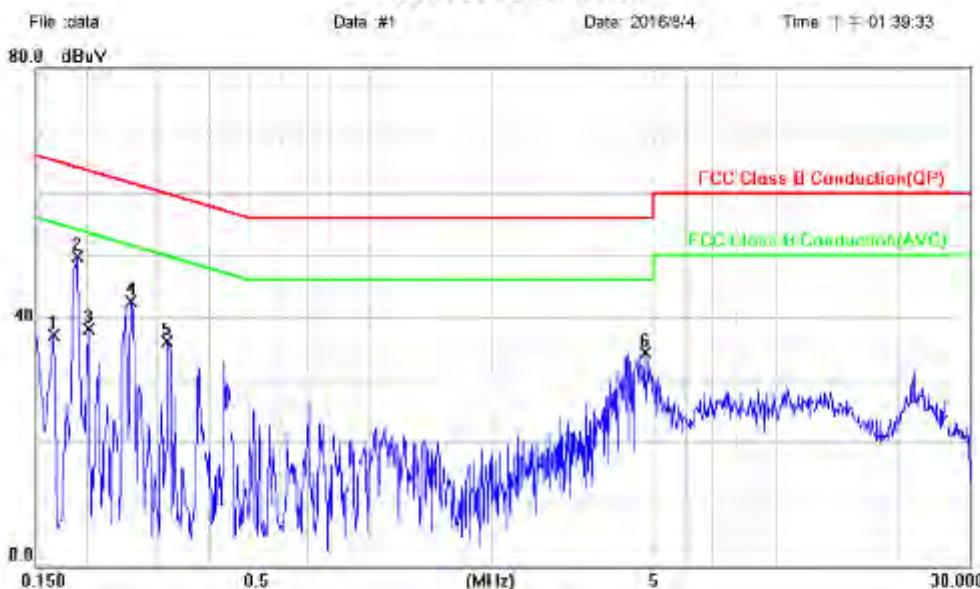
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Site: Conduction Room      Phase: **N**      Temperature: 25 °C  
 Limit: FCC Class B Conduction(QP)      Power: AC 120V/60Hz      Humidity: 85 %  
 Mode: Operation mode  
 Note:

### Conducted Emission



No.	MK.	Freq. MHz	Reading Level	Correct Factor	Measure- ment	Limit	Over	Comment
			dBuV	dB	dBuV	dB	Detector	
1		0.1860	36.96	0.07	37.05	65.16	-28.11	peak
2	*	0.1900	49.57	0.08	49.65	64.04	-14.39	peak
3		0.2020	37.97	0.08	38.05	63.53	-25.48	peak
4		0.2580	42.32	0.09	42.41	61.50	-19.09	peak
5		0.3180	35.93	0.09	36.02	59.76	-23.74	peak
6		4.7580	33.99	0.27	34.26	56.00	-21.74	peak

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## 7 DUTY CYCLE OF 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)
802.11b	98.92	0.05
802.11g	94.63	0.24
802.11n_20	87.59	0.58
802.11n_40	81.86	0.87

$$b = 98.92\%, g = 94.63\%, n\_ht\_20 = 87.59\%, n\_ht40 = 81.86\%$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9892) = 0.05$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9463) = 0.24$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8759) = 0.58$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8186) = 0.87$$

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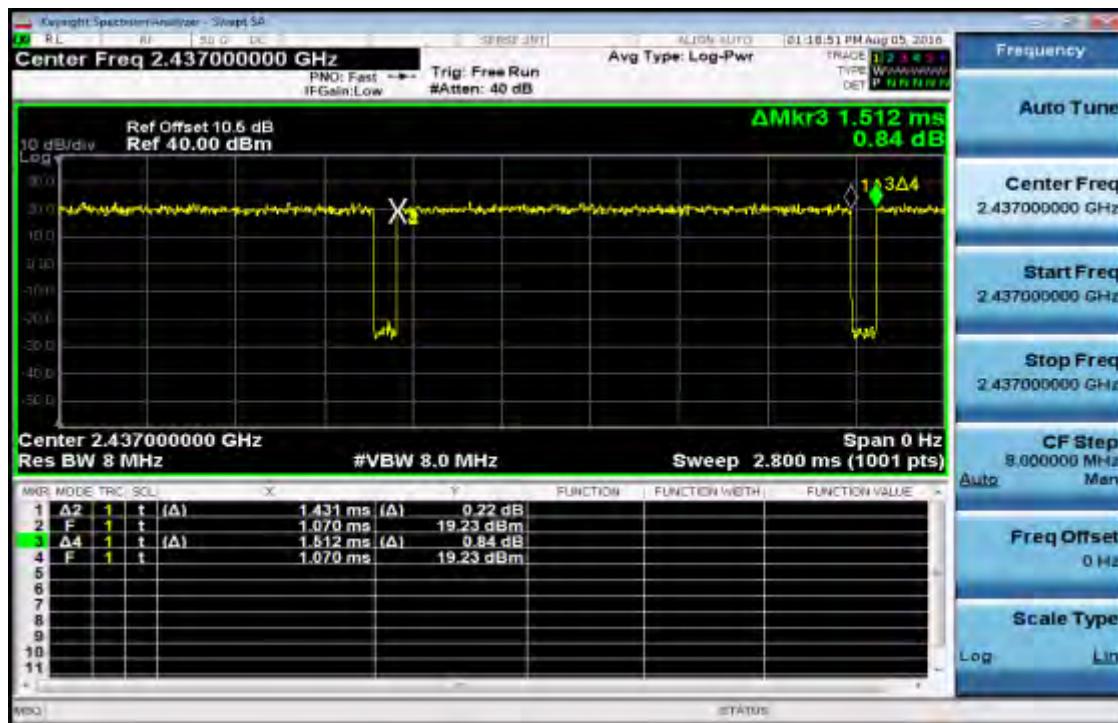
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## 7.1 DUTY CYCLE TEST SIGNAL Measurement Result

## 802.11 b



## 802.11 g

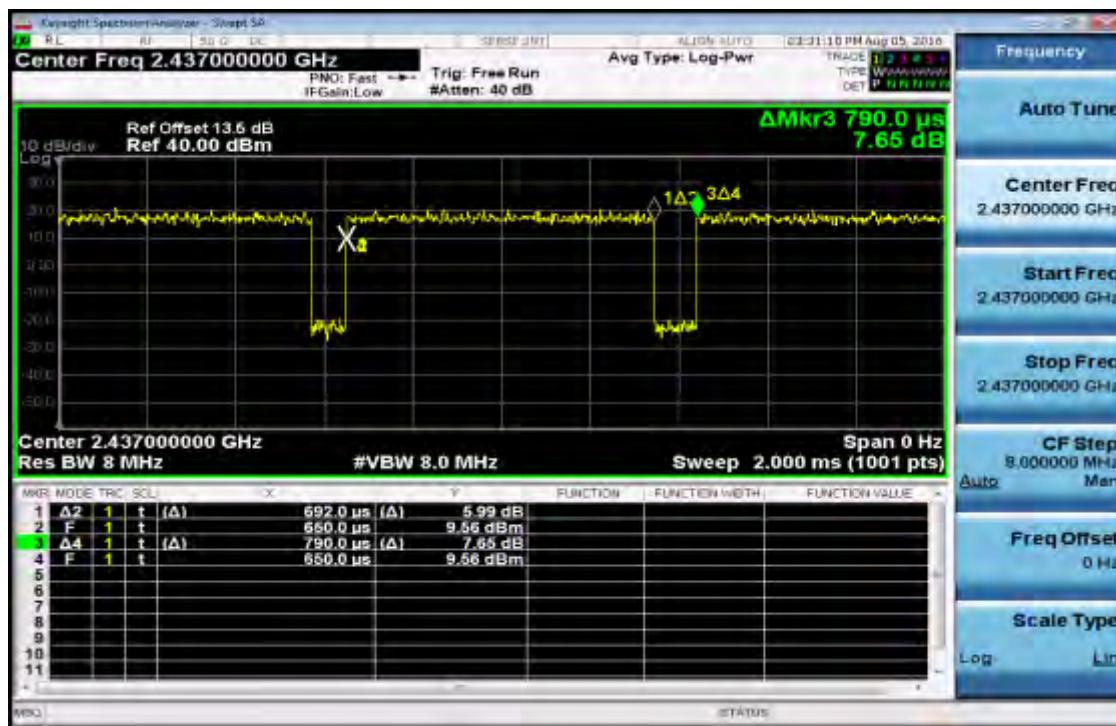


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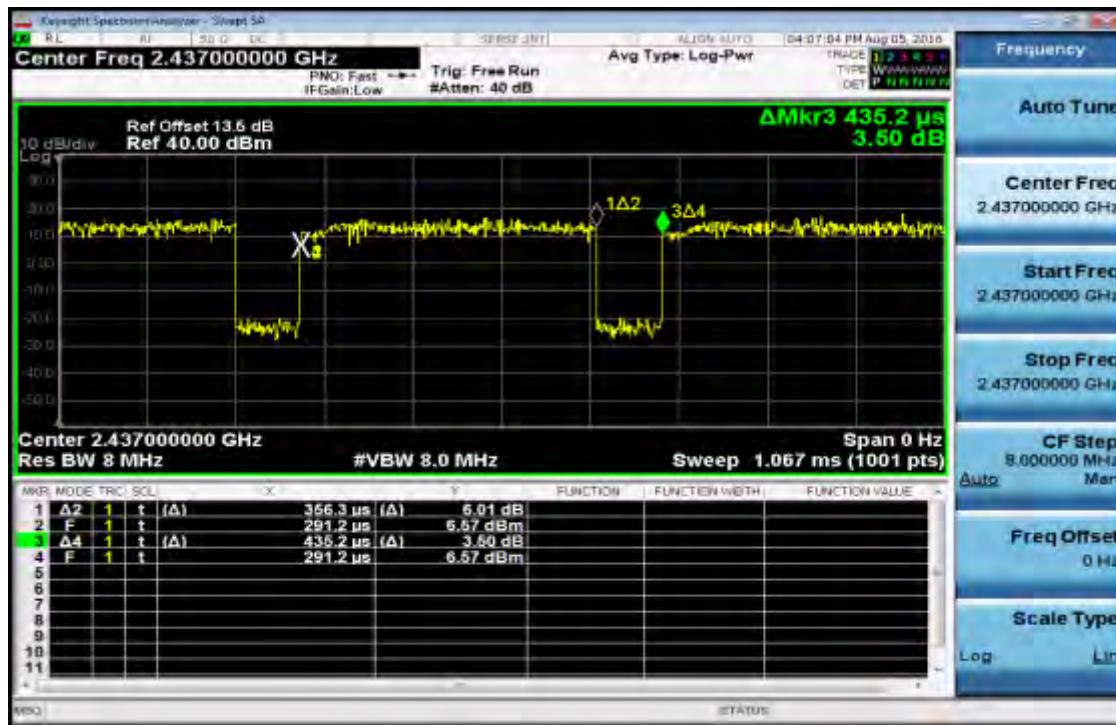
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## 802.11 n\_20 MHz



## 802.11 n\_40 MHz



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## 8 PEAK OUTPUT POWER MEASUREMENT

### 8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

Per RSS-247 §5.4(4)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

Main Antenna Gain: 2.46 dBi  
Aux1 Antenna Gain: 3.22 dBi

Number Antenna: 2 pcs

Limit 30 dBm

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

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

Effective Legacy Gain (dBi) = 3.22+3.01=6.23dBi

Limit: 30dBm - (6.23- 6dBi)=29.77dBm

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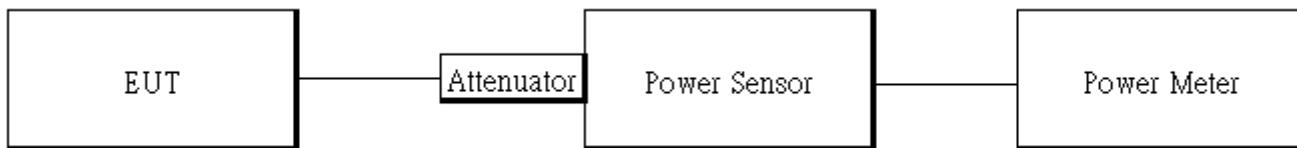
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## 8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/09/2015	12/08/2016
Power Sensor	Anritsu	MA2411B	917032	12/09/2015	12/08/2016
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	23670/2	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017
Splitter	Agilent	11636B	N/A	01/02/2016	01/01/2017
DC Power Supply	Agilent	E3640A	MY52410006	11/05/2015	11/04/2016
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2016	05/16/2017

## 8.3 Test Set-up

Power Meter:



## 8.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

### Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.

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## 8.5 Measurement Result

802.11b Main						
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	1	19.25	84.14	1 Watt = 30.00 dBm	PASS
6	2437	1	19.33	85.70	1 Watt = 30.00 dBm	PASS
11	2462	1	<b>19.41</b>	<b>87.30</b>	1 Watt = 30.00 dBm	PASS
802.11b Main						
CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
1	2412	1	16.82	48.08	1 Watt = 30.00 dBm	PASS
6	2437	1	<b>16.99</b>	<b>50.00</b>	1 Watt = 30.00 dBm	PASS
11	2462	1	16.98	49.89	1 Watt = 30.00 dBm	PASS
802.11g Main						
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	6	<b>22.78</b>	<b>189.67</b>	1 Watt = 30.00 dBm	PASS
6	2437	6	22.69	185.78	1 Watt = 30.00 dBm	PASS
11	2462	6	22.51	178.24	1 Watt = 30.00 dBm	PASS
802.11g Main						
CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
1	2412	6	16.69	46.67	1 Watt = 30.00 dBm	PASS
6	2437	6	<b>16.88</b>	<b>48.75</b>	1 Watt = 30.00 dBm	PASS
11	2462	6	16.86	48.53	1 Watt = 30.00 dBm	PASS

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**802.11n\_HT20M MIMO**

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
1	2412	MCS8	17.10	21.05	22.52	178.64	1 Watt = 29.77 dBm	PASS
6	2437	MCS8	17.22	21.13	22.61	182.44	1 Watt = 29.77 dBm	PASS
11	2462	MCS8	17.06	21.06	22.52	178.46	1 Watt = 29.77 dBm	PASS

**802.11n\_HT20M MIMO**

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)		Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
1	2412	MCS8	11.20	14.18	15.95	39.36	1 Watt = 29.77 dBm	PASS
6	2437	MCS8	11.29	14.20	15.99	39.76	1 Watt = 29.77 dBm	PASS
11	2462	MCS8	11.54	14.05	15.98	39.67	1 Watt = 29.77 dBm	PASS

**802.11n\_HT40M MIMO**

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
3	2422	MCS8	18.18	21.24	22.98	198.81	1 Watt = 29.77 dBm	PASS
6	2437	MCS8	17.93	20.94	22.70	186.25	1 Watt = 29.77 dBm	PASS
9	2452	MCS8	18.06	21.11	22.86	193.10	1 Watt = 29.77 dBm	PASS

**802.11n\_HT40M MIMO**

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)		Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
			CH 0	CH 1				
3	2422	MCS8	10.95	14.19	15.88	38.69	1 Watt = 29.77 dBm	PASS
6	2437	MCS8	11.14	14.27	15.99	39.73	1 Watt = 29.77 dBm	PASS
9	2452	MCS8	11.21	13.96	15.81	38.10	1 Watt = 29.77 dBm	PASS

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

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## EIRP

### 802.11b Main

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit	RESULT
1	2412	1	16.82	3.22	20.04	4W= 36 dBm	PASS
6	2437	1	16.99	3.22	20.21	4W= 36 dBm	PASS
11	2462	1	16.98	3.22	20.20	4W= 36 dBm	PASS

### 802.11g Main

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit	RESULT
1	2412	6	16.69	3.22	19.91	4W= 36 dBm	PASS
6	2437	6	16.88	3.22	20.10	4W= 36 dBm	PASS
11	2462	6	16.86	3.22	20.08	4W= 36 dBm	PASS

### 802.11n\_HT20M MIMO

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)		Avg. Output Power (dBm)	Total Peak Output Power (mW)	Antenna Gain (dBi)	EIRP (dBm)	Limit	RESULT
			CH 0	CH 1						
1	2412	MCS8	11.20	14.18	15.95	39.36	6.23	22.18	4W= 36 dBm	PASS
6	2437	MCS8	11.29	14.20	15.99	39.76	6.23	22.22	4W= 36 dBm	PASS
11	2462	MCS8	11.54	14.05	15.98	39.67	6.23	22.21	4W= 36 dBm	PASS

### 802.11n\_HT40M MIMO

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)		Avg. Output Power (dBm)	Total Peak Output Power (mW)	Antenna Gain (dBi)	EIRP (dBm)	Limit	RESULT
			CH 0	CH 1						
3	2422	MCS8	10.95	14.19	15.88	38.69	6.23	22.11	4W= 36 dBm	PASS
6	2437	MCS8	11.14	14.27	15.99	39.73	6.23	22.22	4W= 36 dBm	PASS
9	2452	MCS8	11.21	13.96	15.81	38.10	6.23	22.04	4W= 36 dBm	PASS

\* Note: EIRP = Average Power + Gain

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## 9 6DB & 99% BANDWIDTH MEASUREMENT

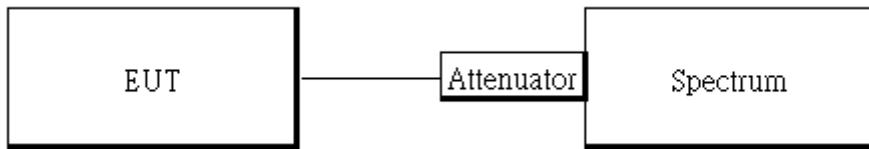
### 9.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

### 9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

### 9.3 Test Set-up



### 9.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. For 6dB Bandwidth:  
Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 30M/50MHz, Detector=peak, Sweep=auto.
5. Mark the peak frequency and -6dB (upper and lower) frequency.
6. For 99% Bandwidth:  
Set the spectrum analyzer as RBW = 1%, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

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## 9.5 Measurement Result

## 6dB Bandwidth

## 802.11b Main

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2412	8085	> 500	PASS
2437	8562	> 500	PASS
2462	<b>8569</b>	> 500	PASS

## 802.11g Main

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2412	<b>16330</b>	> 500	PASS
2437	16320	> 500	PASS
2462	16320	> 500	PASS

## 802.11\_n\_HT20 Main

## 802.11\_n\_HT20 Aux

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2412	17040	> 500	PASS	2412	<b>17290</b>	> 500	PASS
2437	17060	> 500	PASS	2437	17070	> 500	PASS
2462	<b>17290</b>	> 500	PASS	2462	17080	> 500	PASS

## 802.11\_n\_HT40 Main

## 802.11\_n\_HT40 Aux

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2422	35940	> 500	PASS	2422	35910	> 500	PASS
2437	<b>36060</b>	> 500	PASS	2437	35760	> 500	PASS
2452	35750	> 500	PASS	2452	<b>35930</b>	> 500	PASS

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## 99% Bandwidth

802.11b Main	
Frequency (MHz)	99% Bandwidth (MHz)
2412	<b>13.660</b>
2437	13.598
2462	13.402

802.11g Main	
Frequency (MHz)	99% Bandwidth (MHz)
2412	<b>16.480</b>
2437	16.449
2462	16.406

802.11n_HT20M Main		802.11n_HT20M Aux	
Frequency (MHz)	99% Bandwidth (MHz)	Frequency (MHz)	99% Bandwidth (MHz)
2412	17.339	2412	17.674
2437	17.705	2437	<b>17.718</b>
2462	17.613	2462	17.659

802.11n_HT40M Main		802.11n_HT40M Aux	
Frequency (MHz)	99% Bandwidth (MHz)	Frequency (MHz)	99% Bandwidth (MHz)
2422	32.252	2422	35.657
2437	36.315	2437	35.422
2452	33.235	2452	<b>36.391</b>

\*Refer to next page for plots

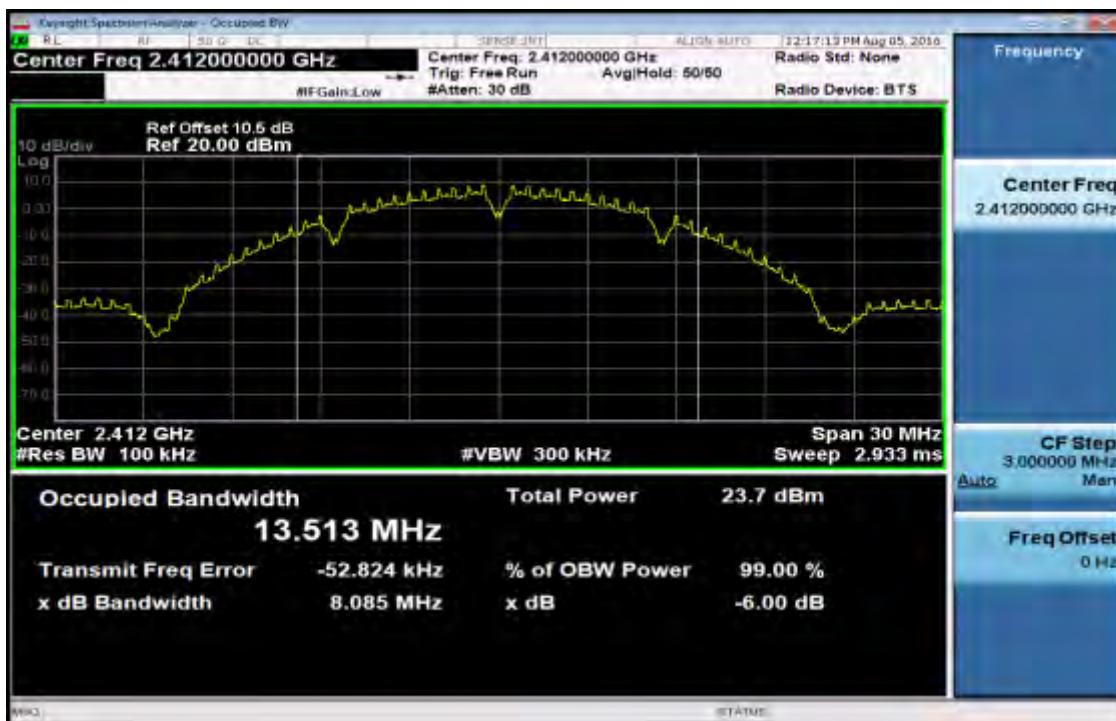
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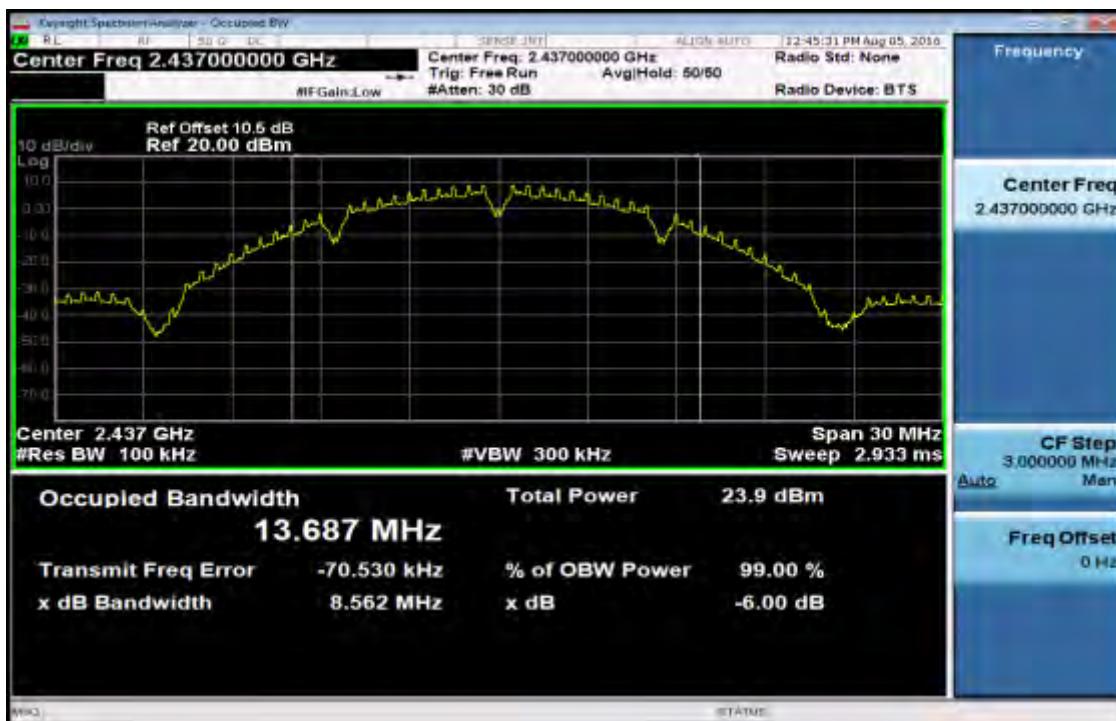
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## 802.11b (Main)

### 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid

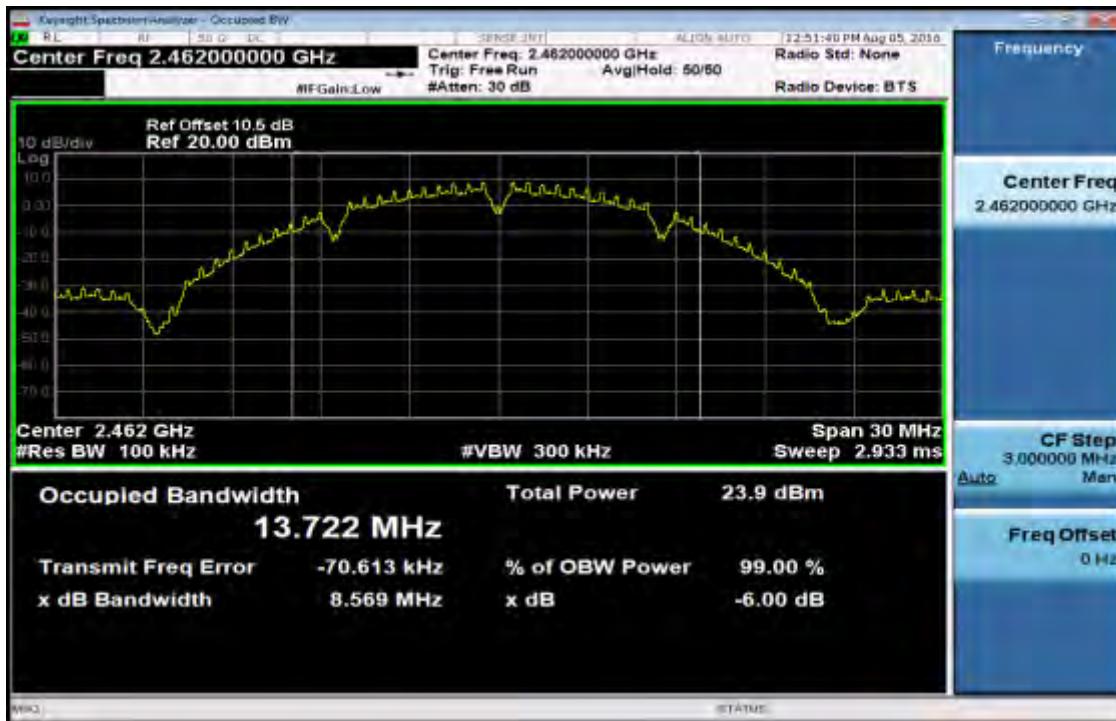


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## 6dB Band Width Test Data CH-High



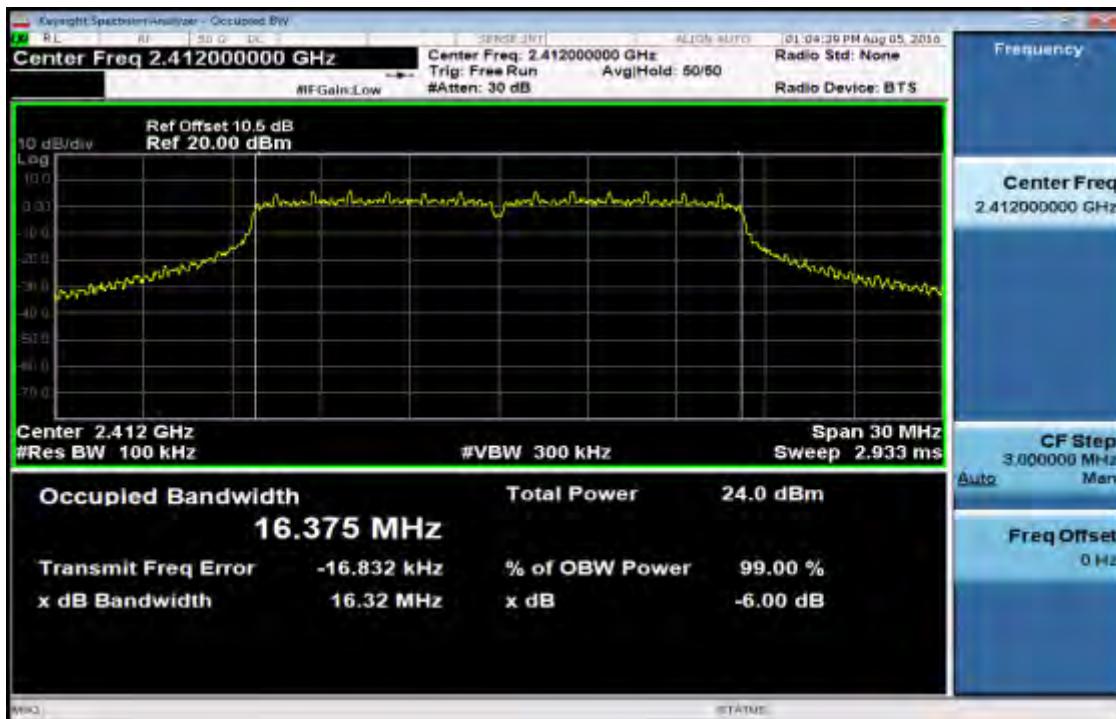
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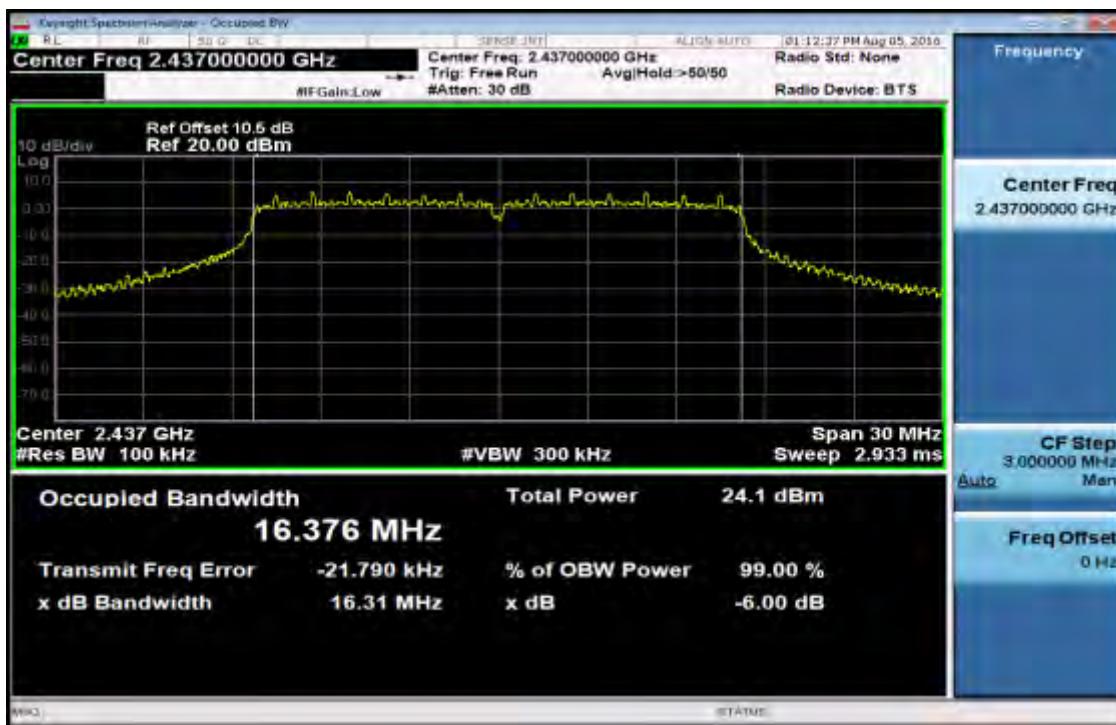
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## 802.11g (Main)

### 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid

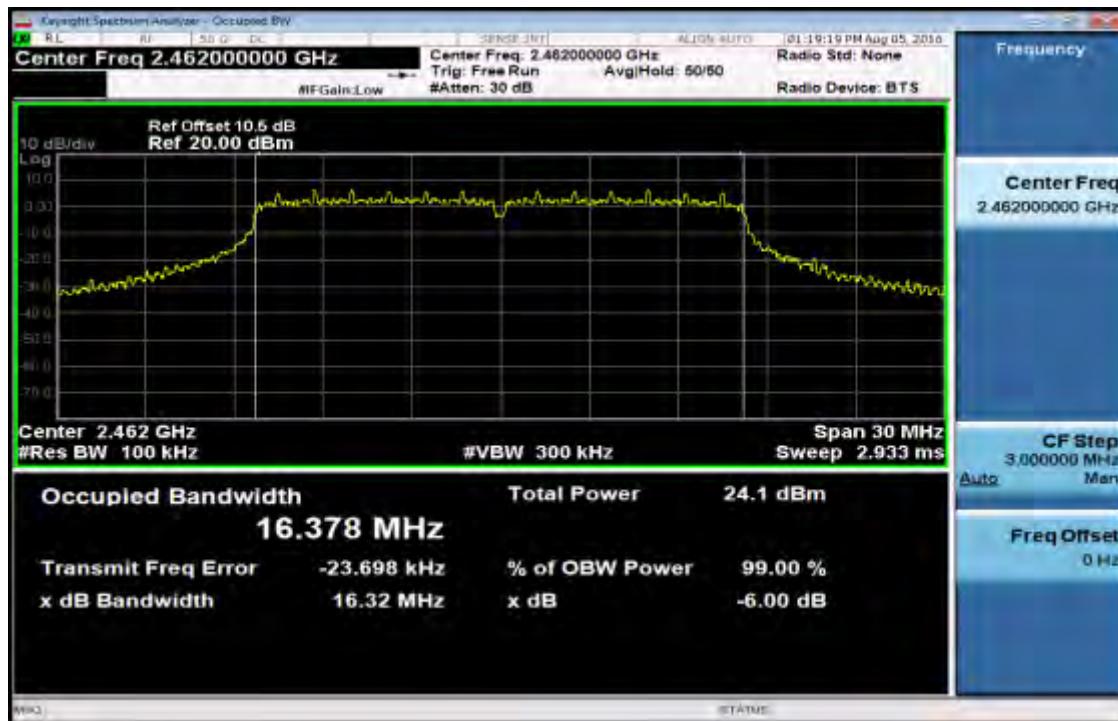


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## 6dB Band Width Test Data CH-High



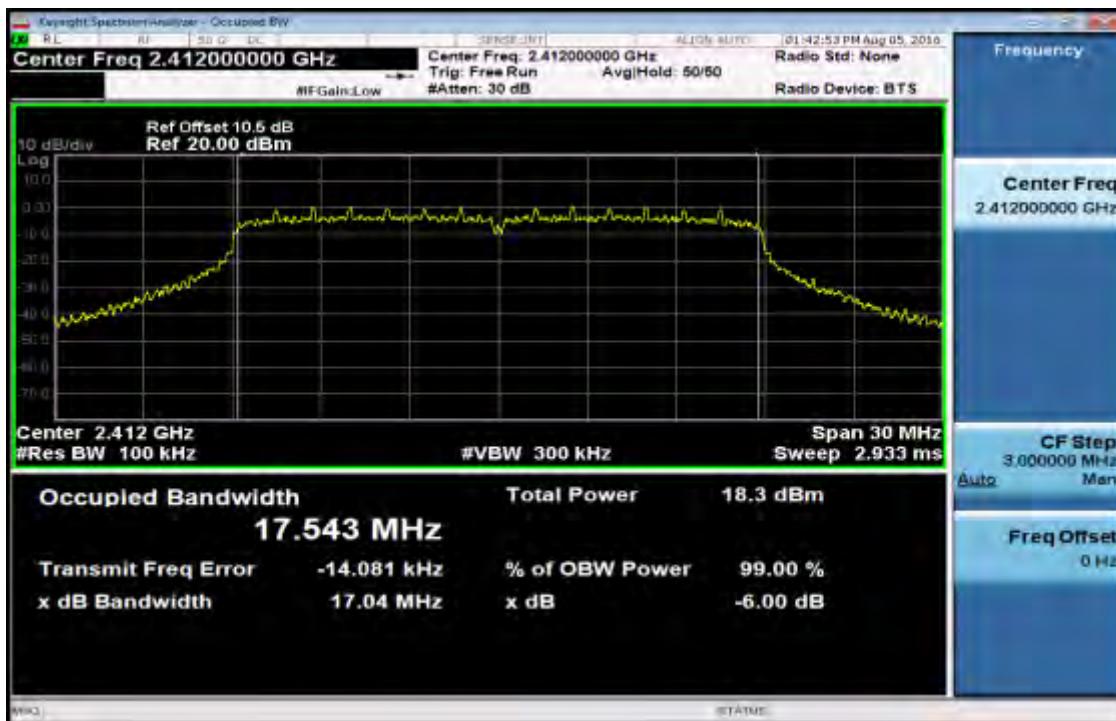
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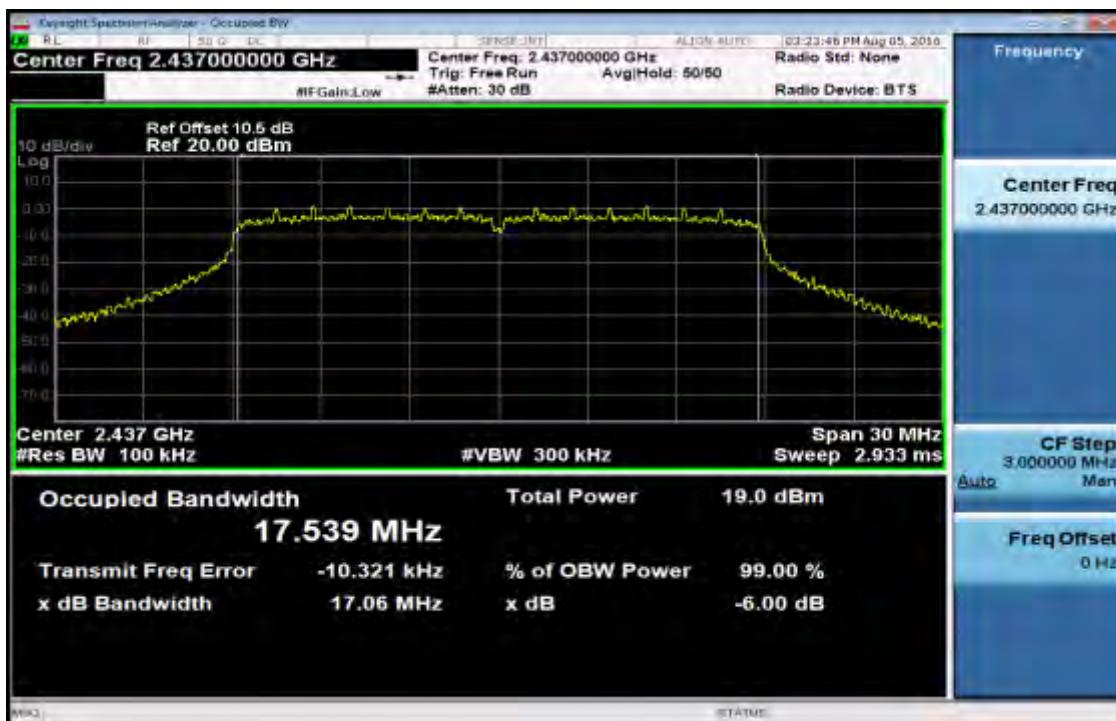
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## 802.11n\_20M (Main)

### 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid

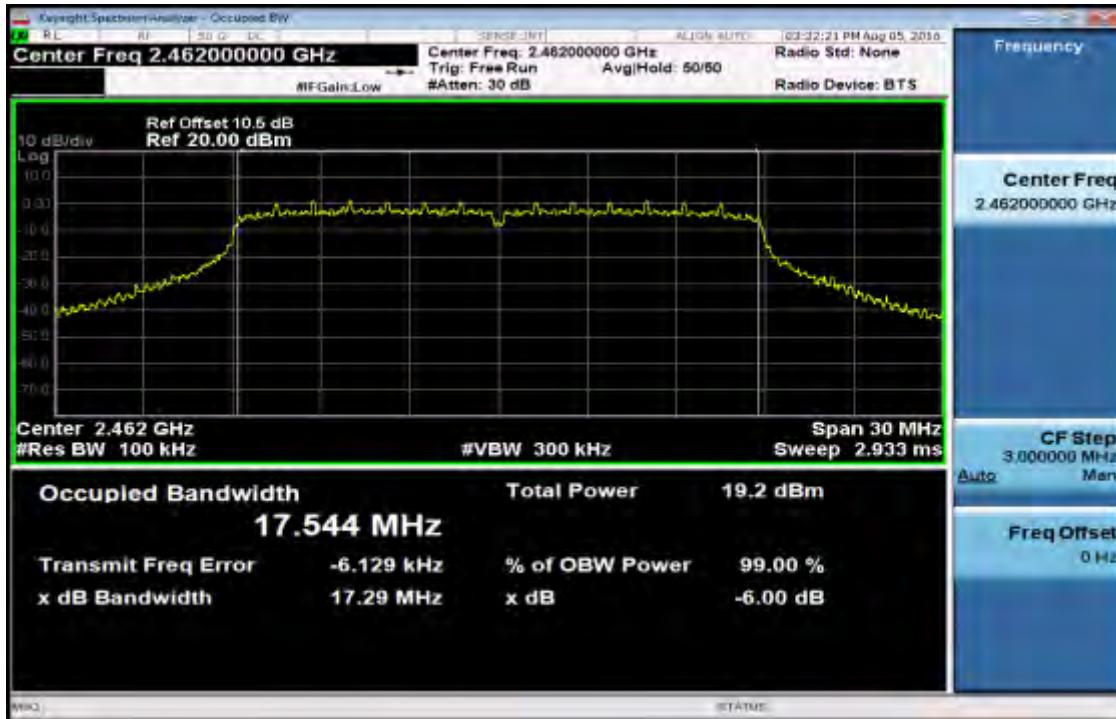


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## 6dB Band Width Test Data CH-High



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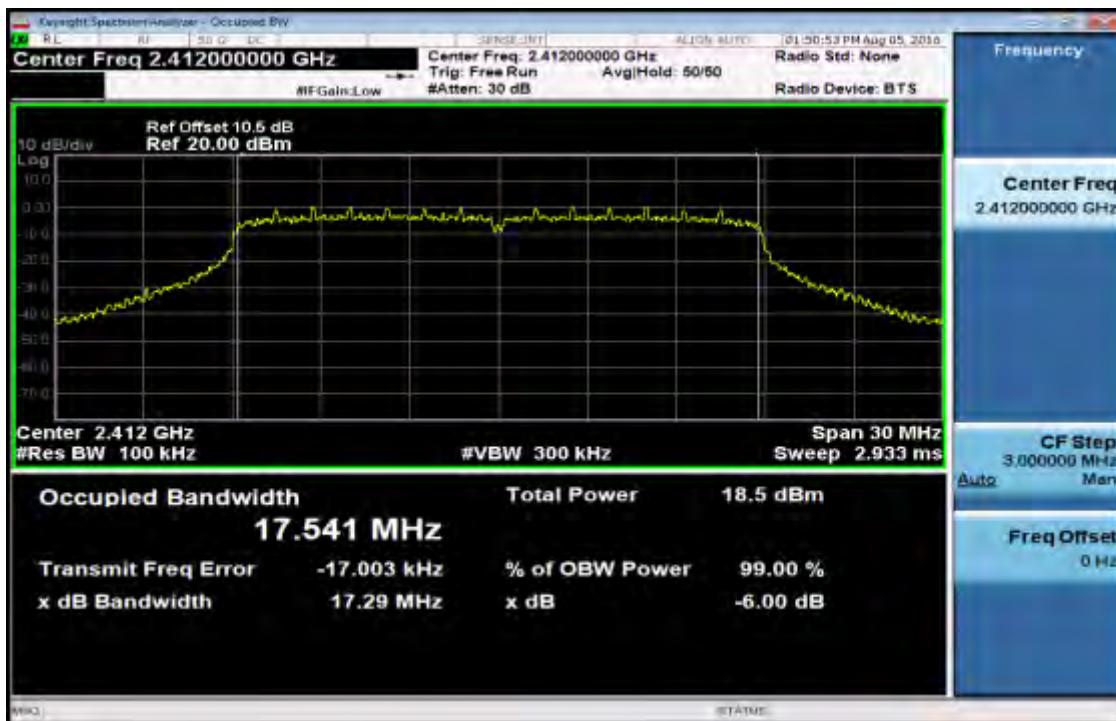
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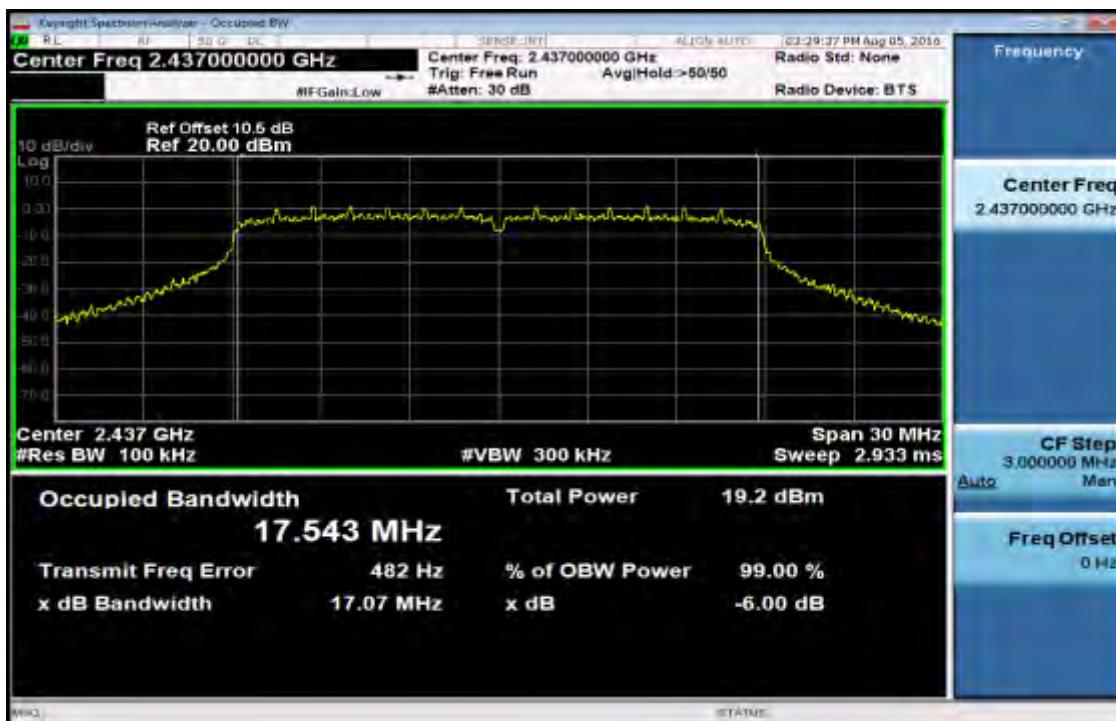
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## 802.11n\_20M (AUX)

## 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



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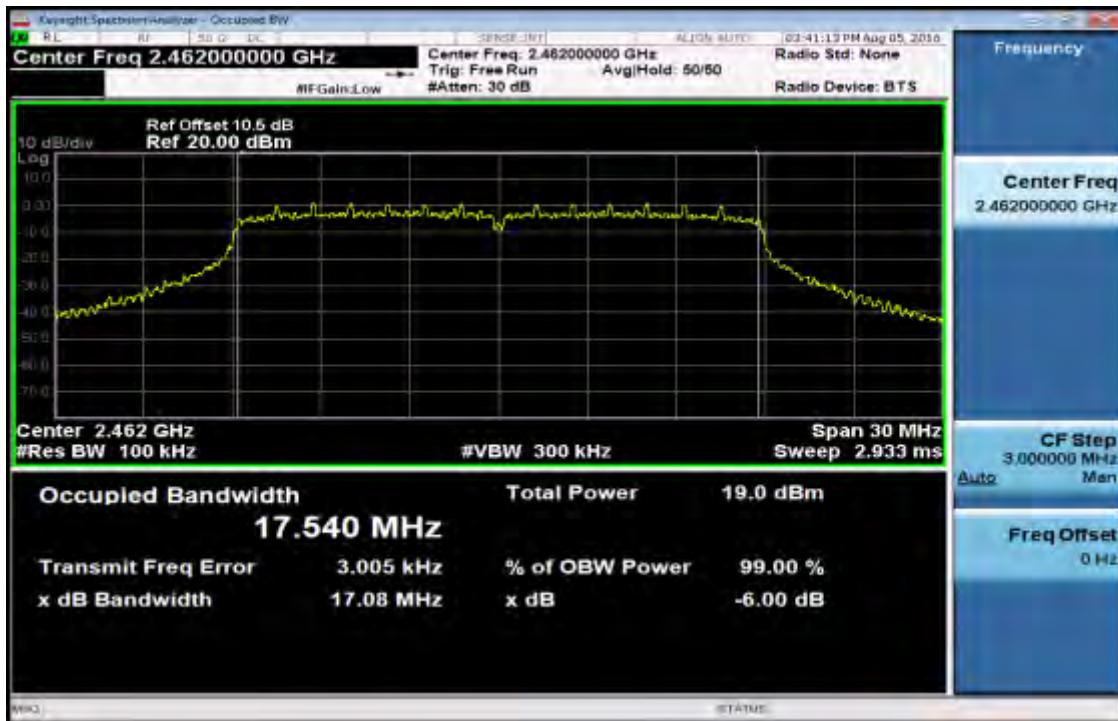
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## 6dB Band Width Test Data CH-High



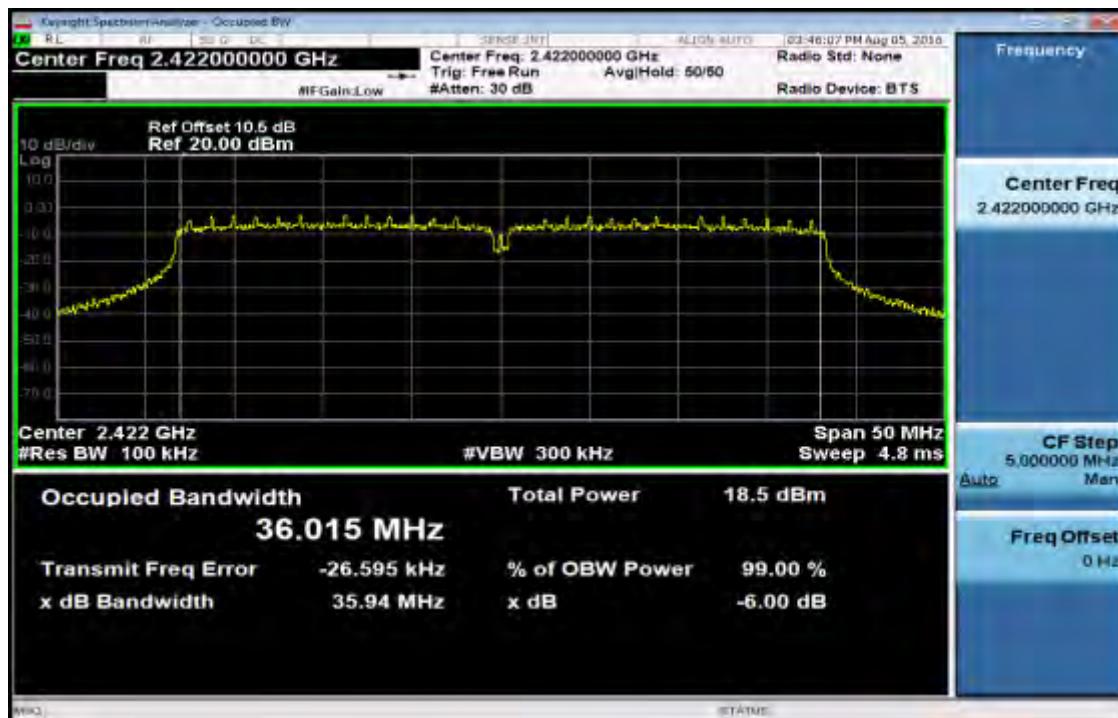
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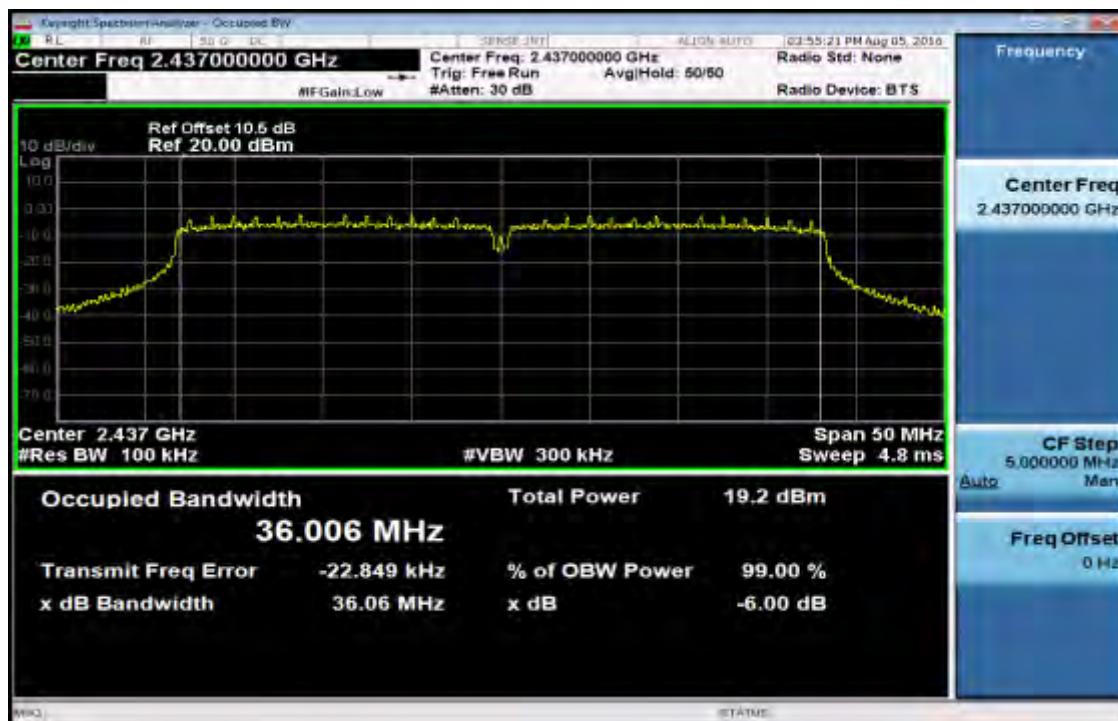
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## 802.11n\_40M (Main)

## 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid

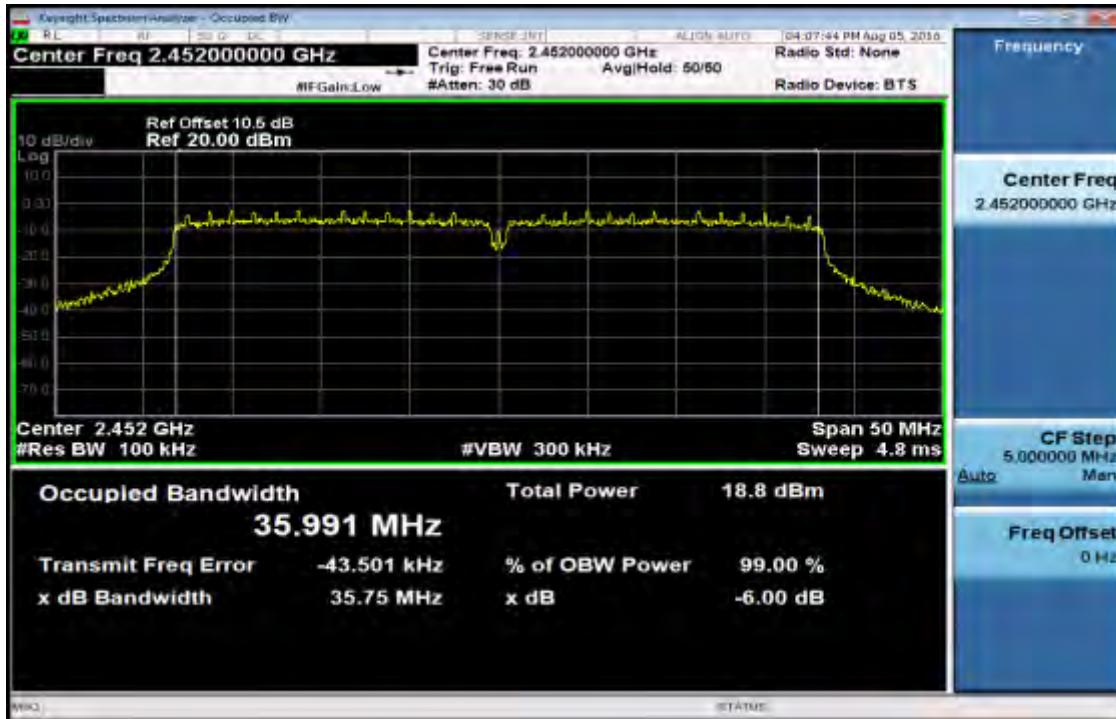


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## 6dB Band Width Test Data CH-High



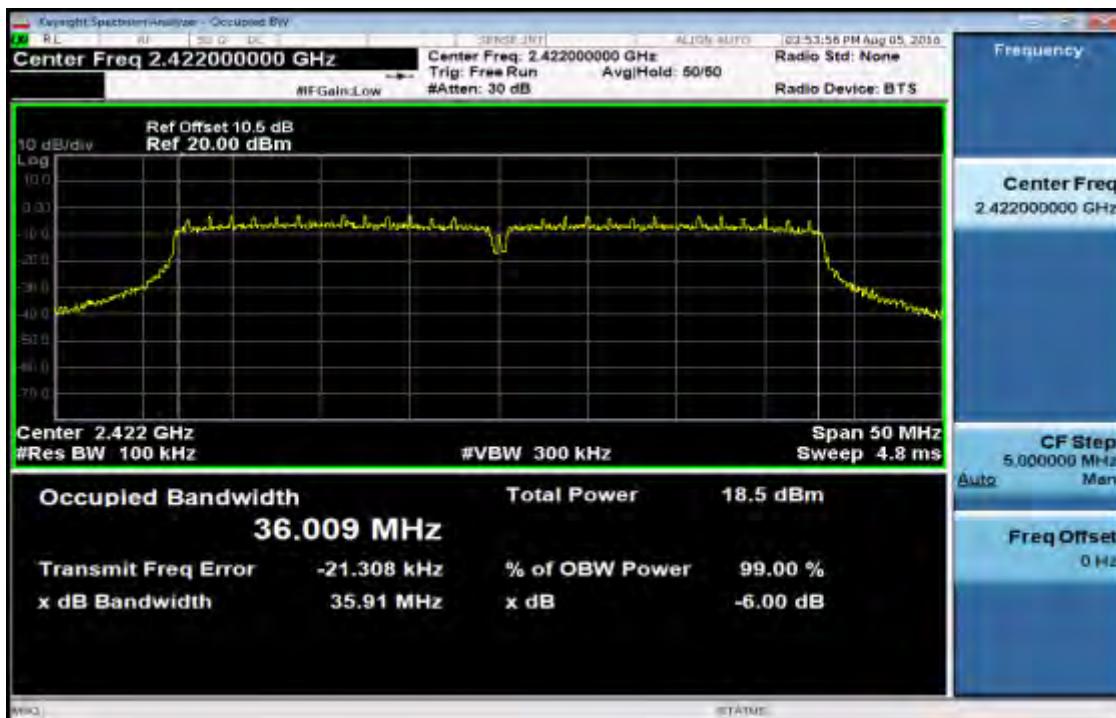
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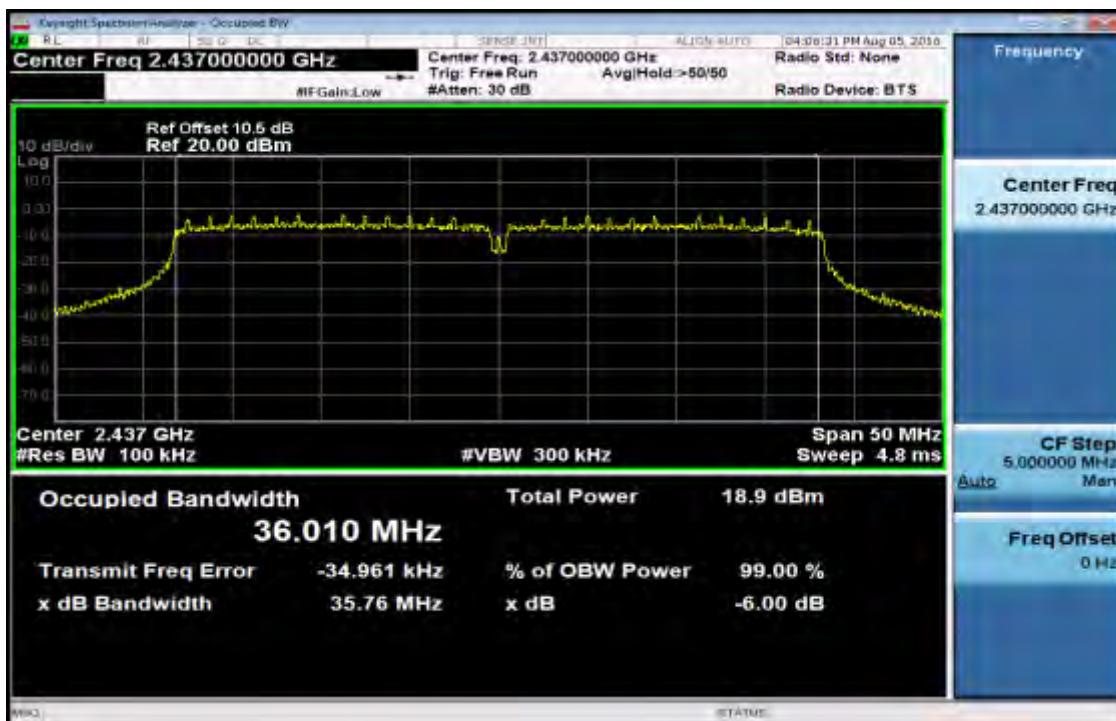
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## 802.11n\_40M (AUX)

## 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid

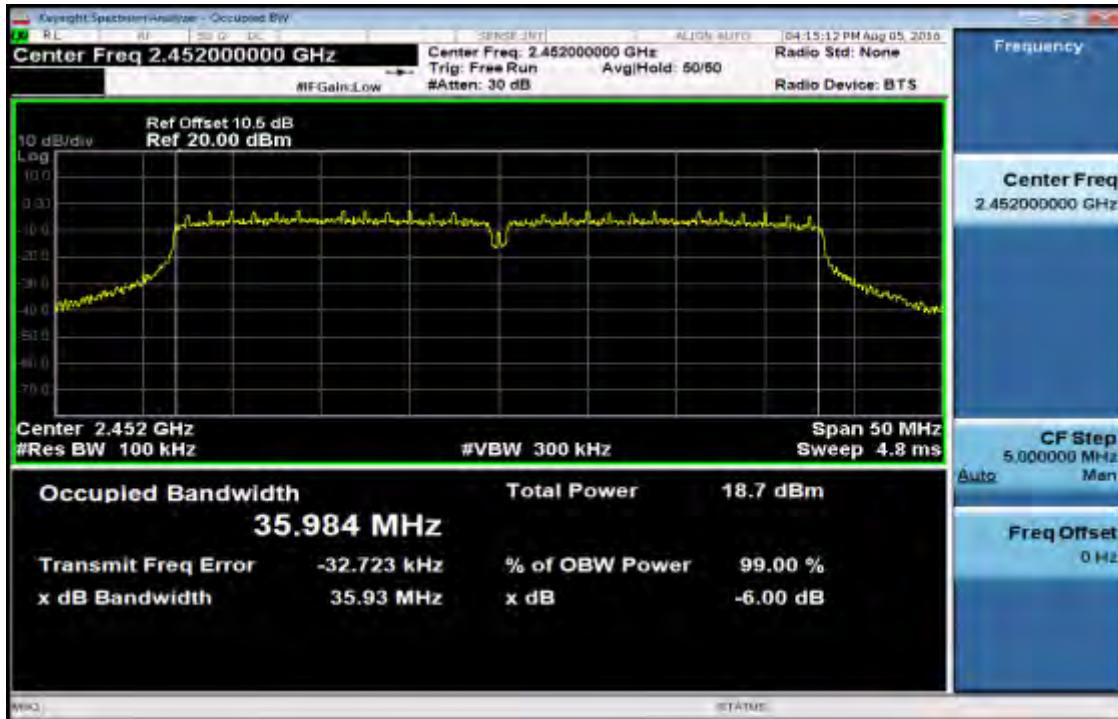


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## 6dB Band Width Test Data CH-High



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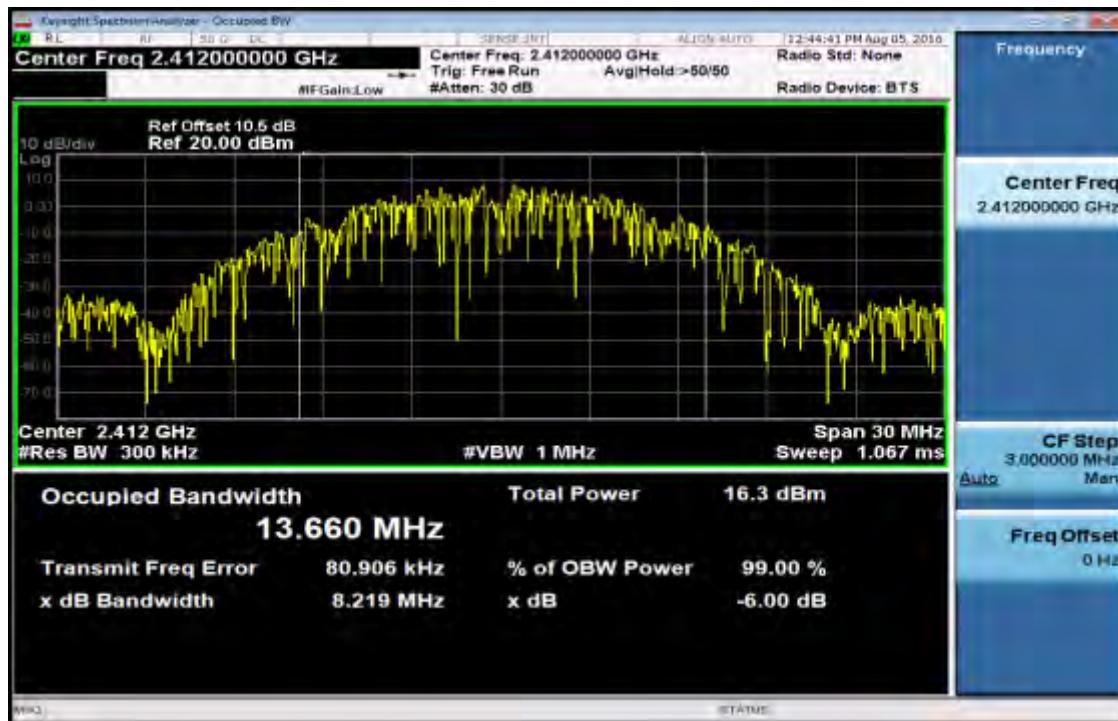
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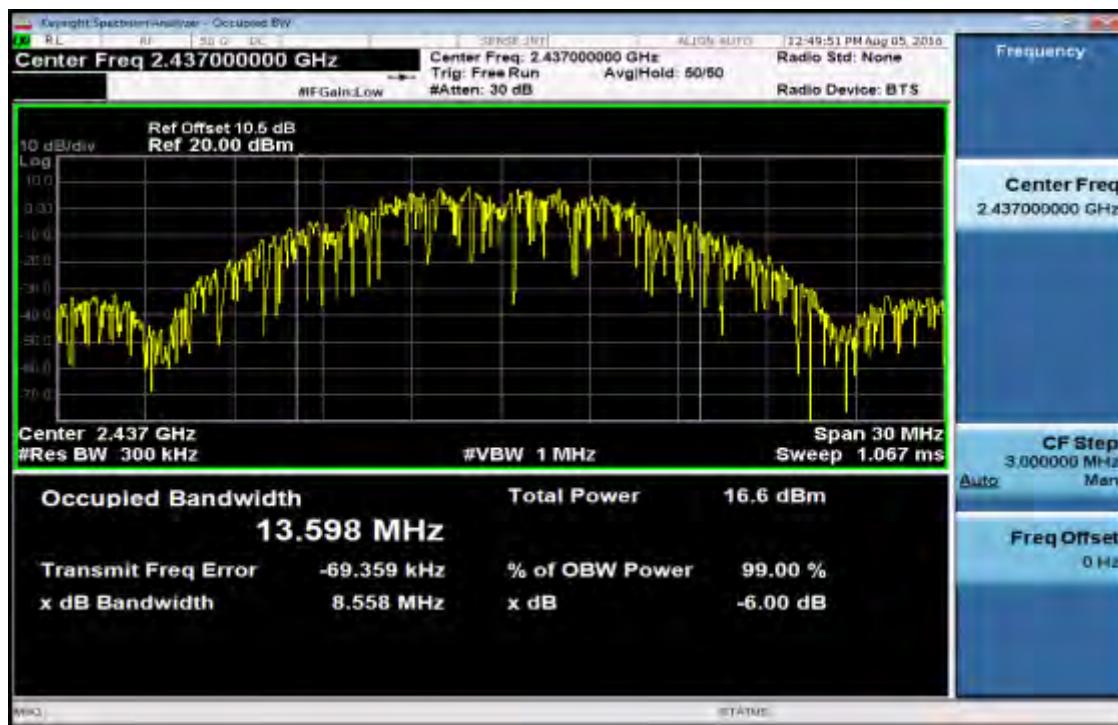
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## 802.11b (Main)

## 99% Band Width Test Data CH-Low



## 99% Band Width Test Data CH-Mid



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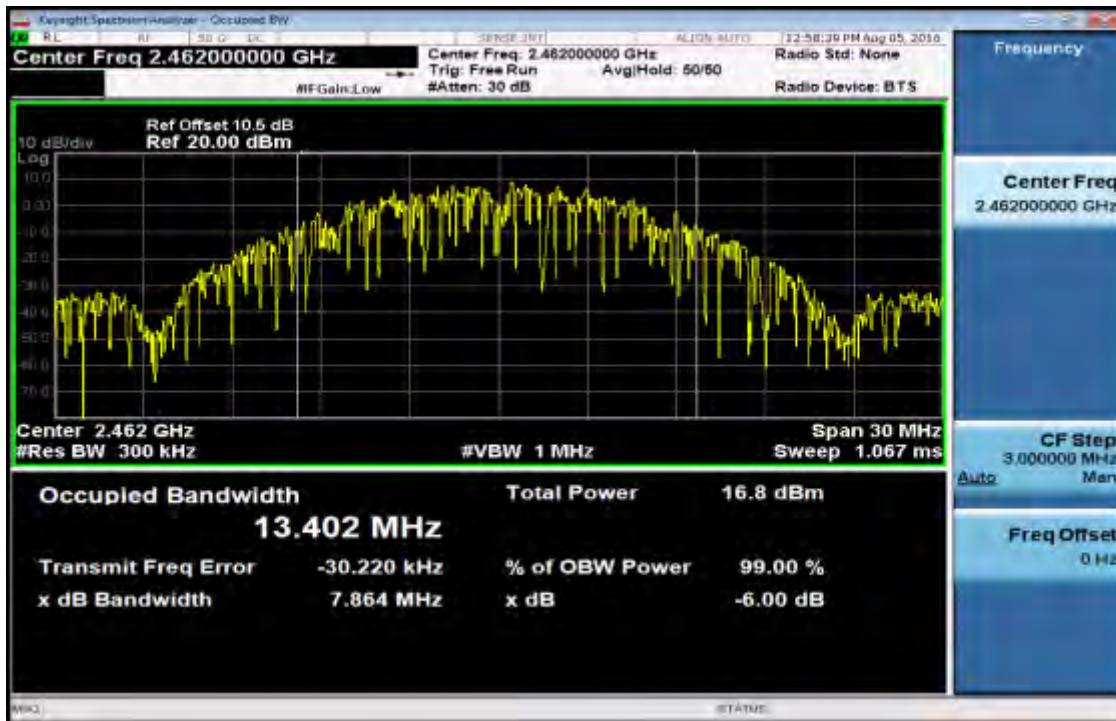
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## 99% Band Width Test Data CH-High



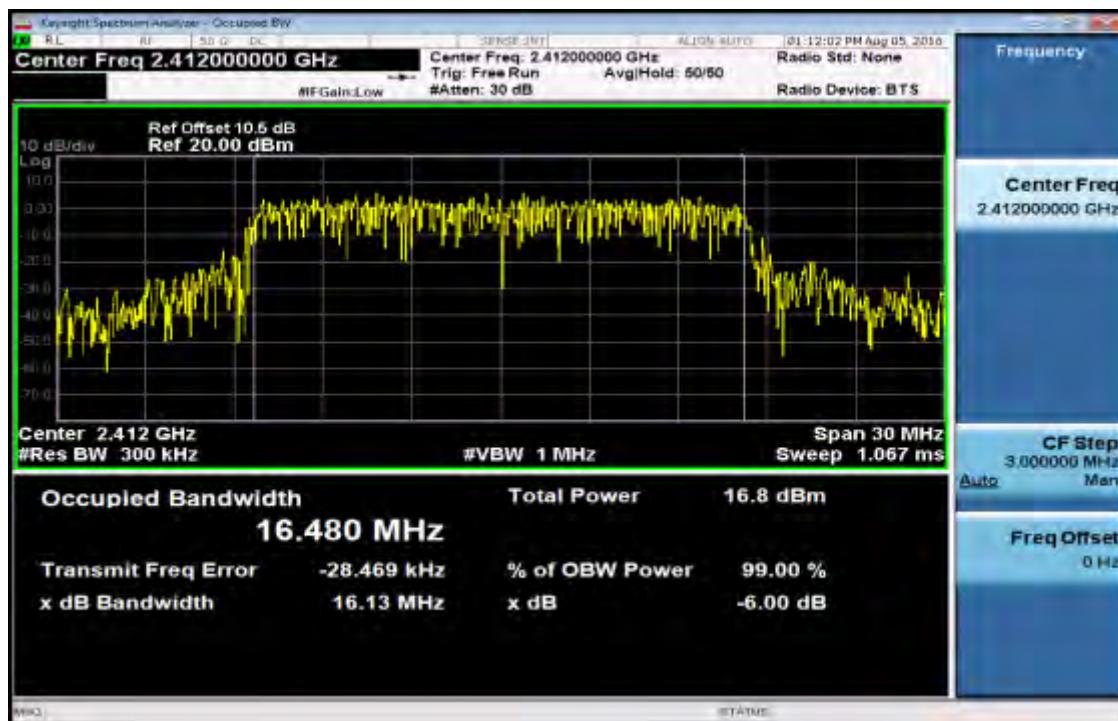
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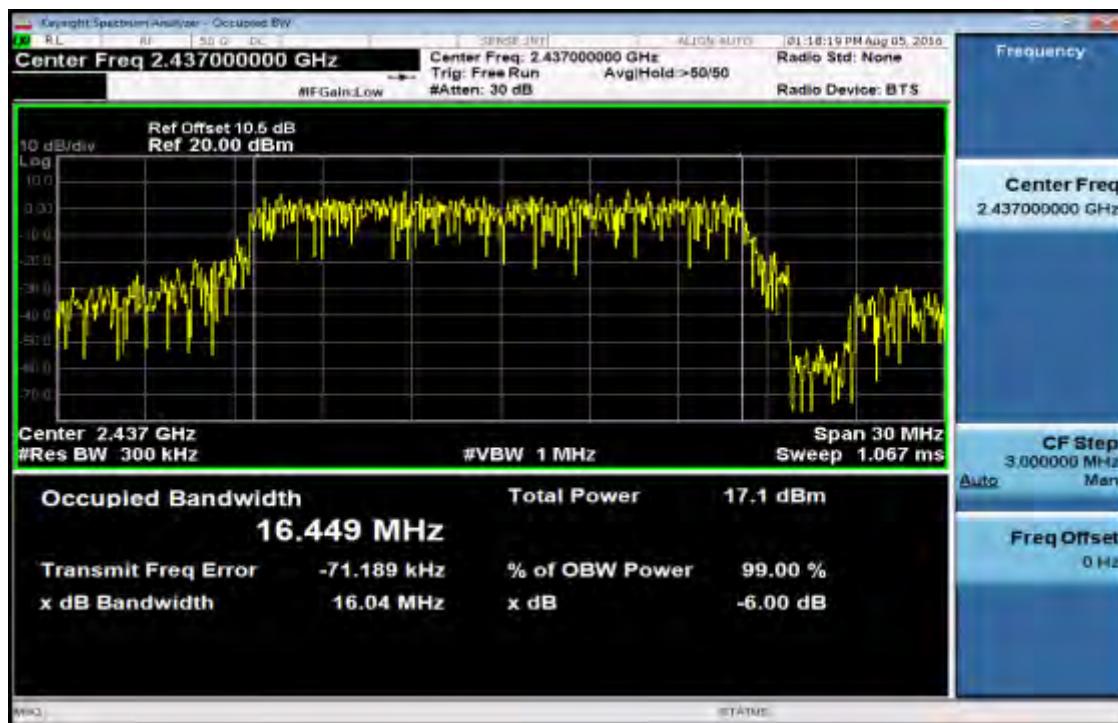
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## 802.11g (Main)

## 99% Band Width Test Data CH-Low



## 99% Band Width Test Data CH-Mid



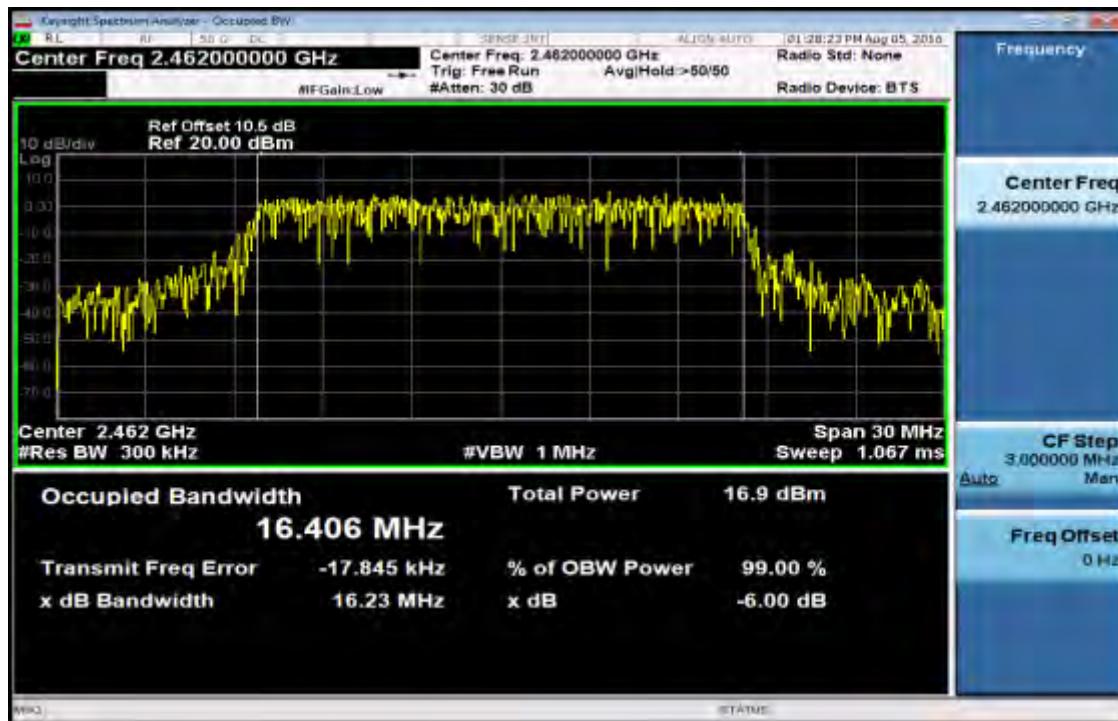
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## 99% Band Width Test Data CH-High



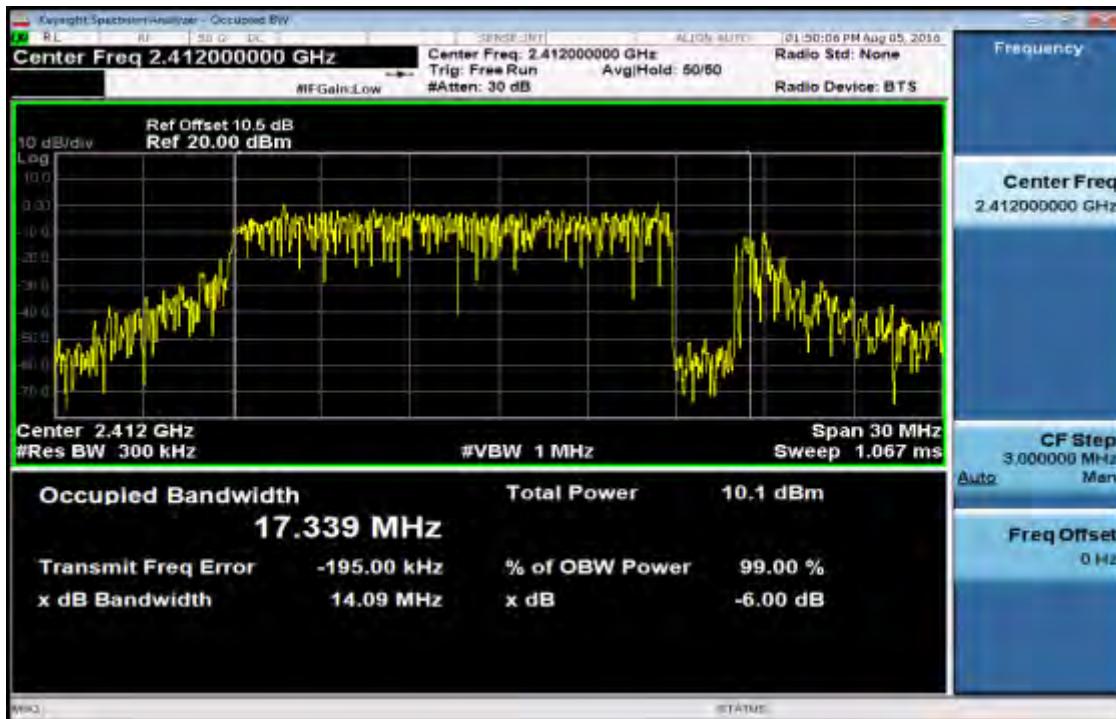
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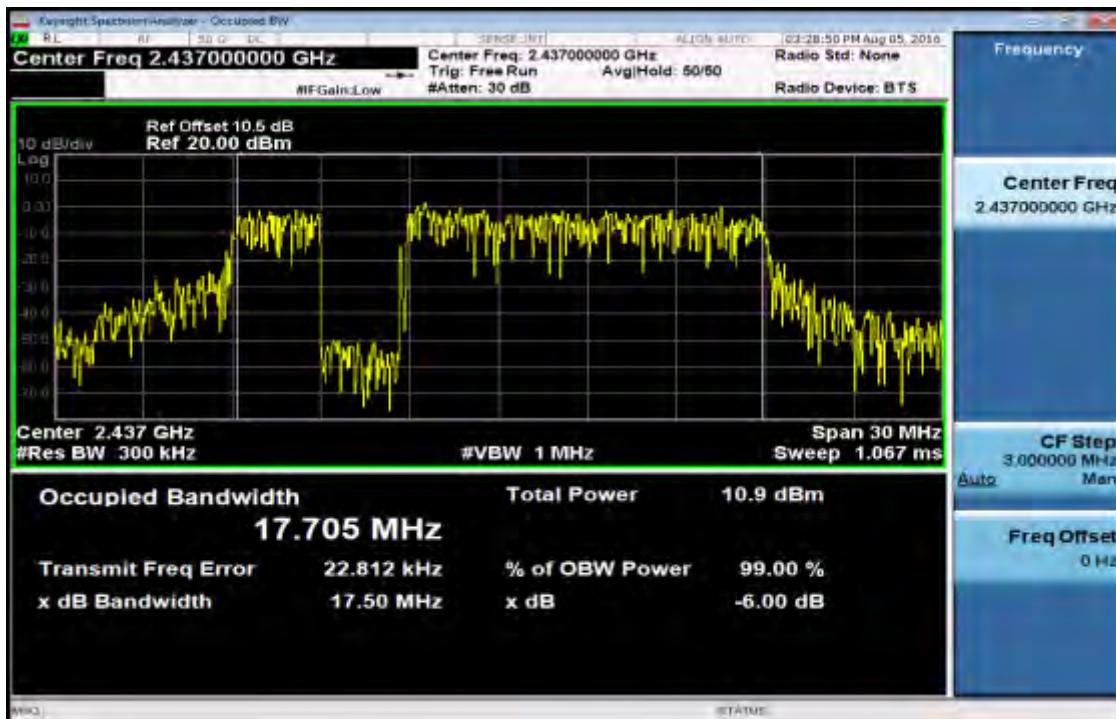
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## 802.11n\_20M (Main)

## 99% Band Width Test Data CH-Low



## 99% Band Width Test Data CH-Mid

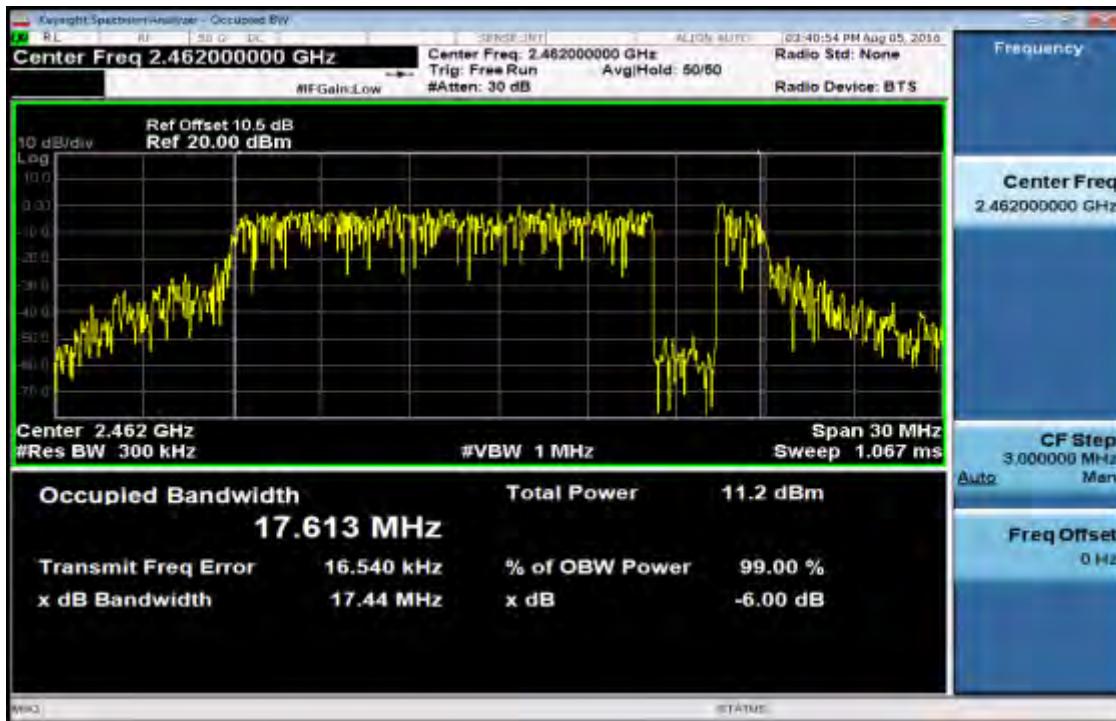


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## 99% Band Width Test Data CH-High



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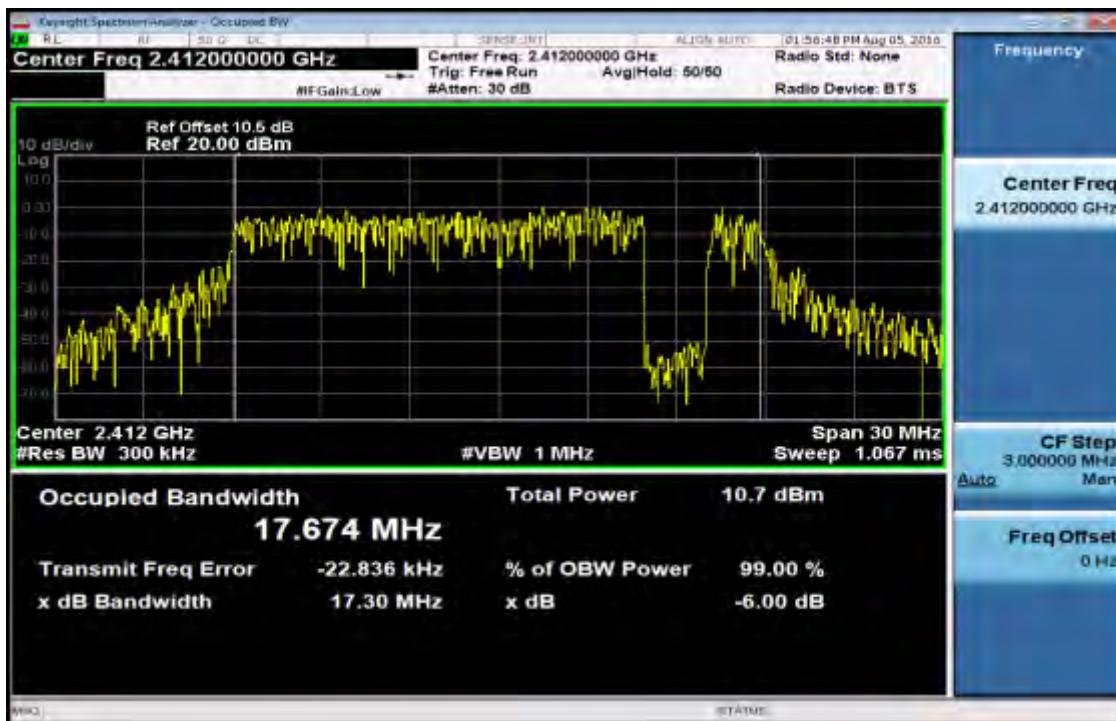
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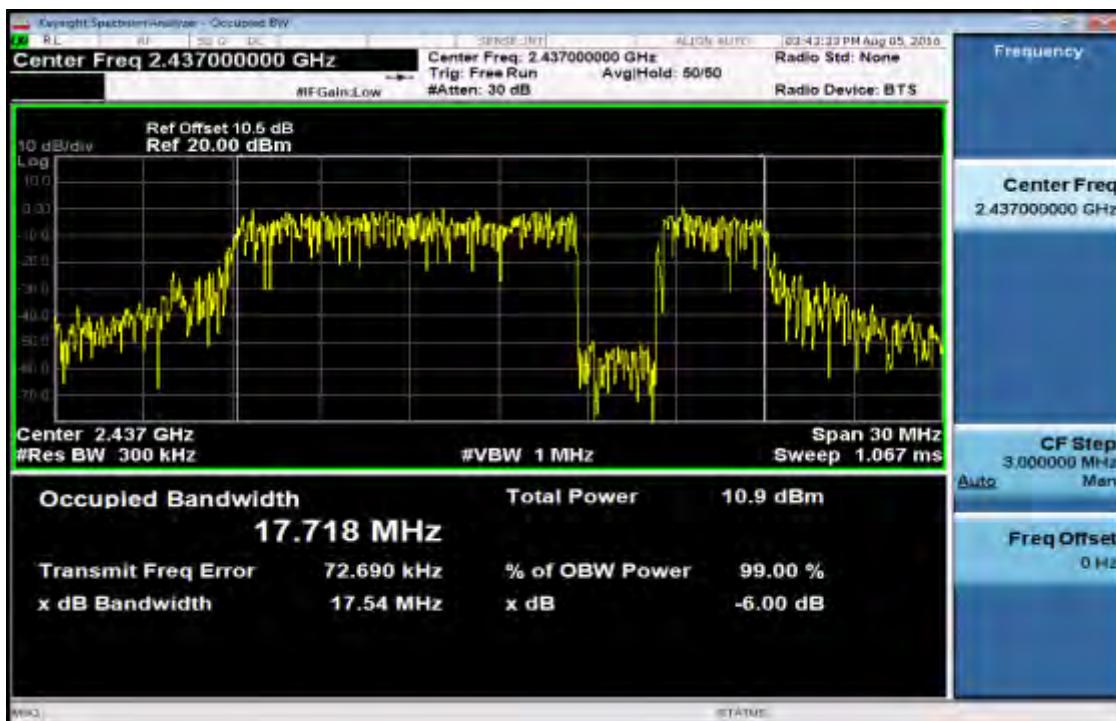
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## 802.11n\_20M (AUX)

## 99% Band Width Test Data CH-Low



## 99% Band Width Test Data CH-Mid

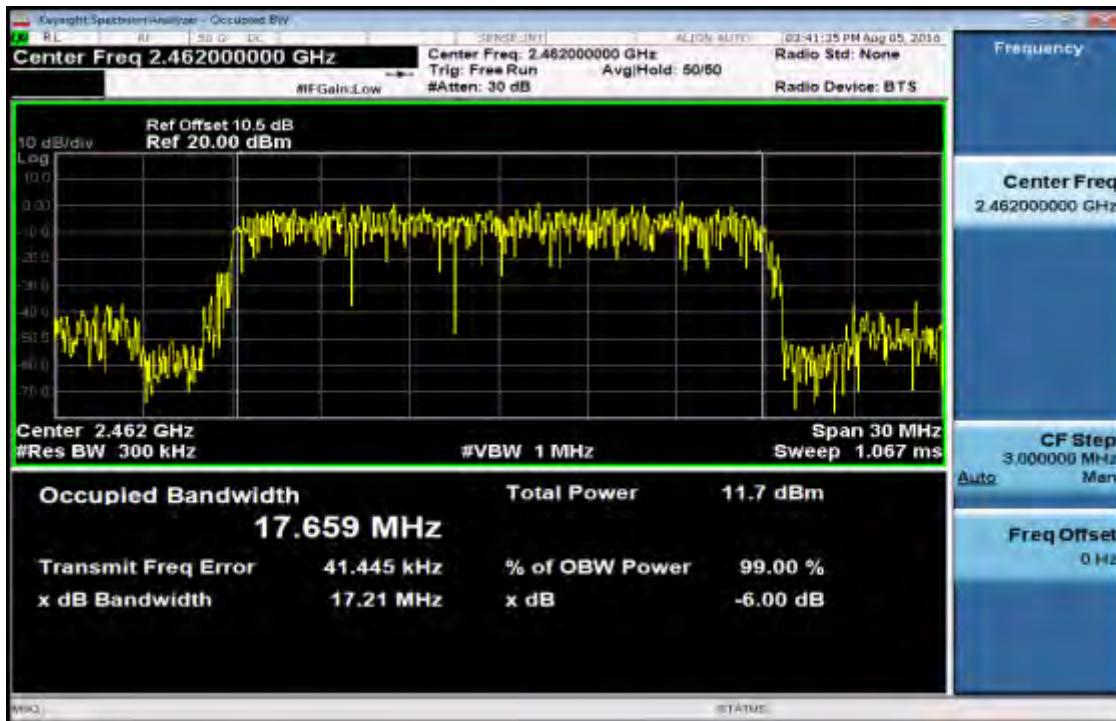


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## 99% Band Width Test Data CH-High



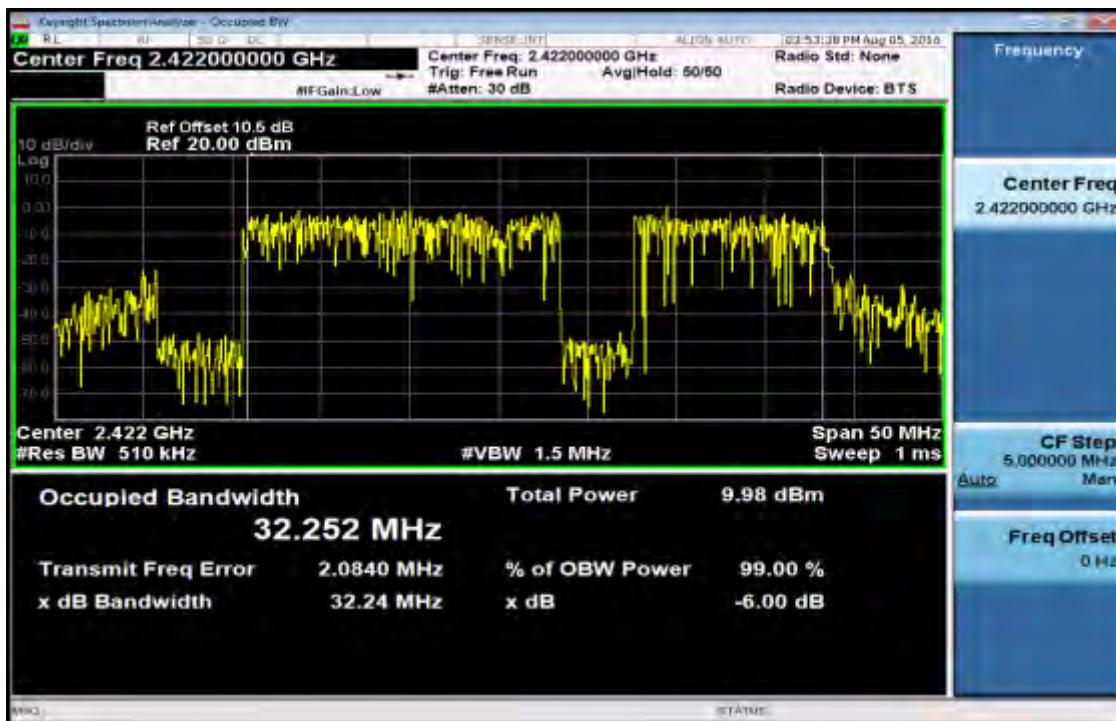
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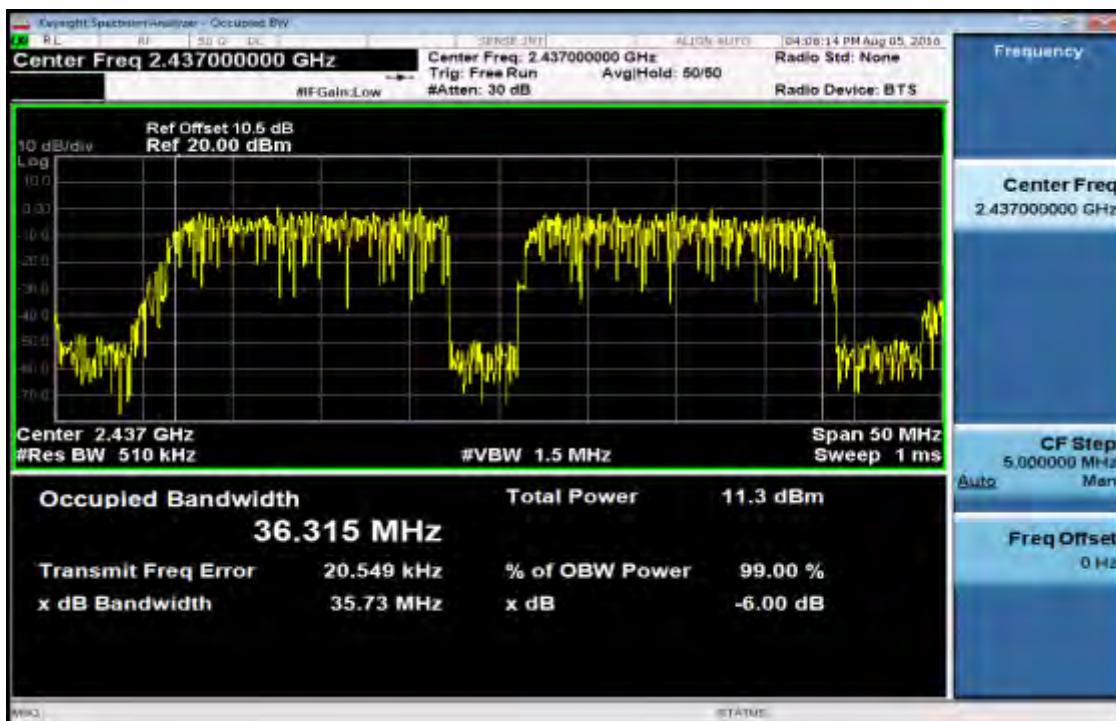
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## 802.11n\_40M (Main)

## 99% Band Width Test Data CH-Low



## 99% Band Width Test Data CH-Mid

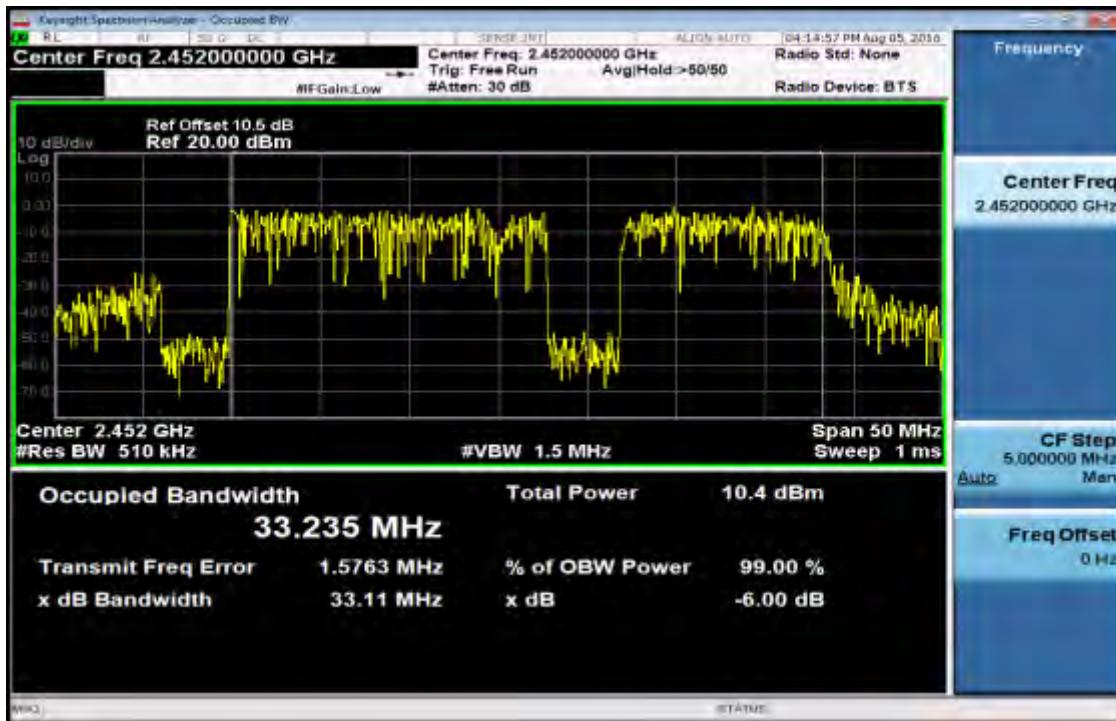


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## 99% Band Width Test Data CH-High



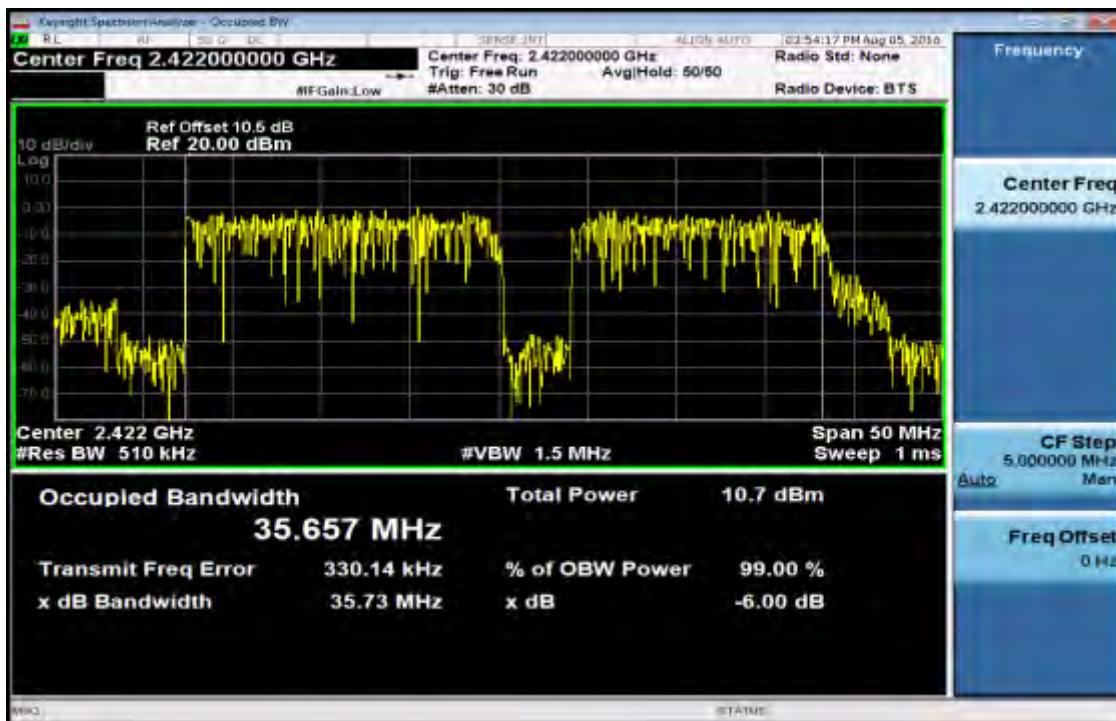
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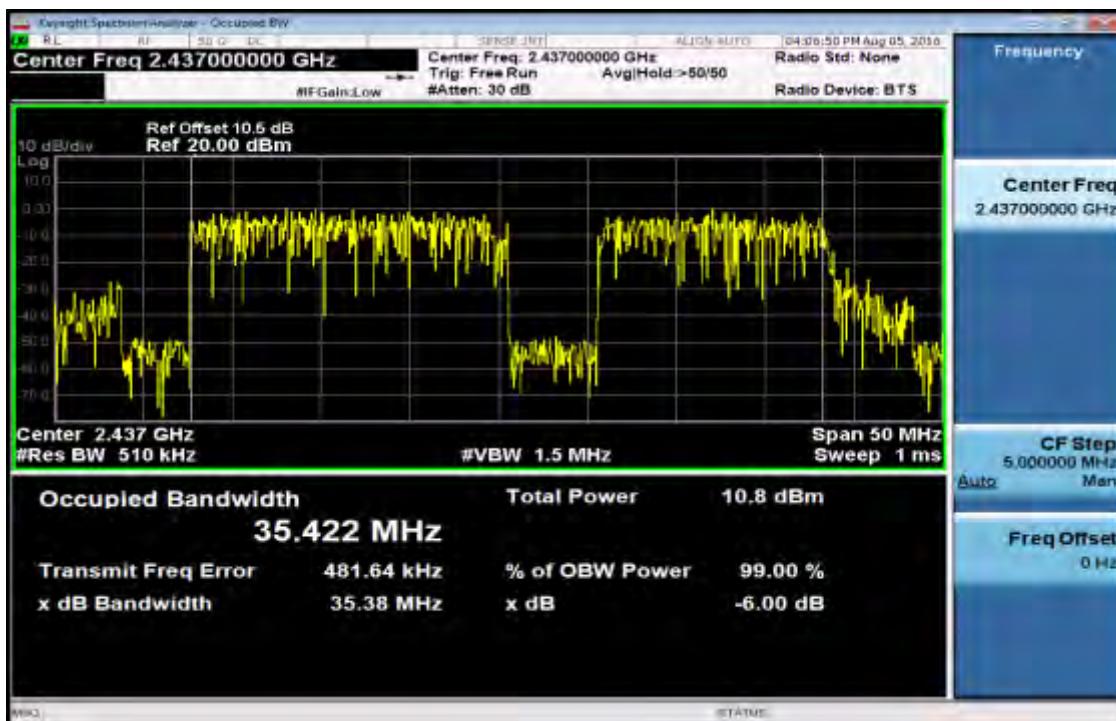
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## 802.11n\_40M (AUX)

## 99% Band Width Test Data CH-Low



## 99% Band Width Test Data CH-Mid

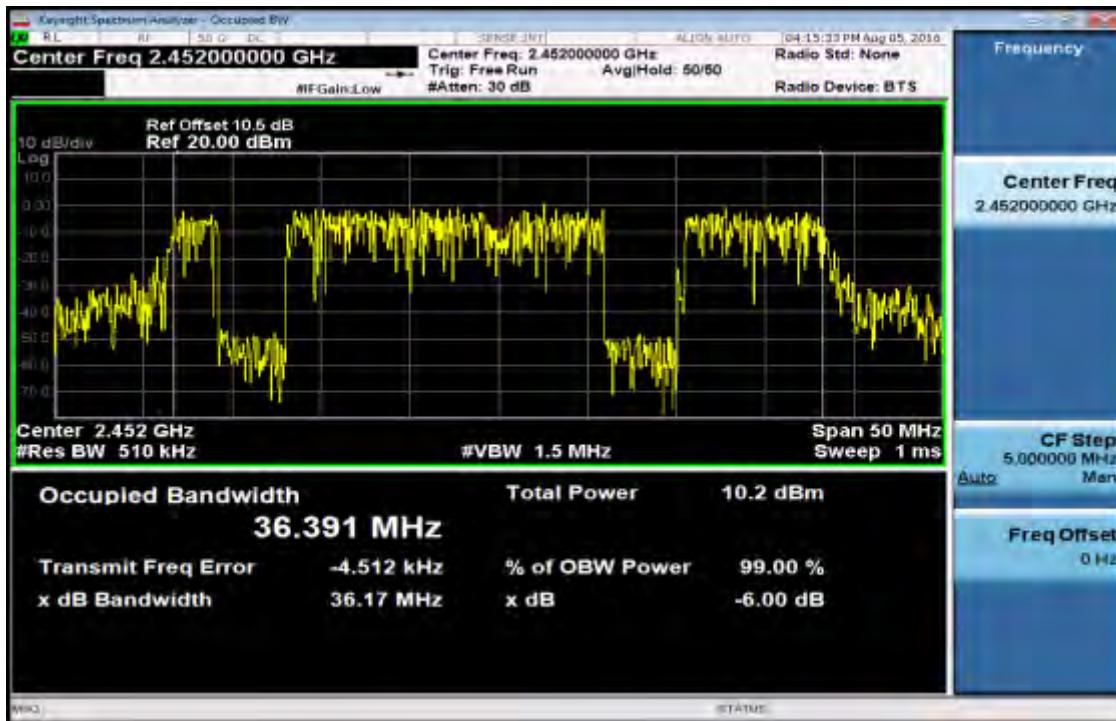


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## 99% Band Width Test Data CH-High



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## 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

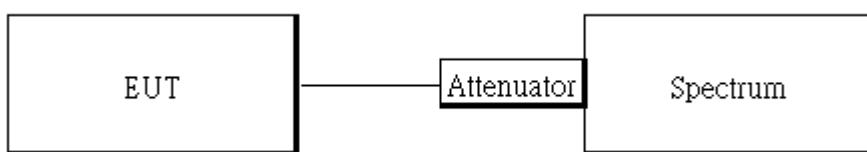
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.8.

If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

### 10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

### 10.3 Test SET-UP



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## 10.4 Measurement Procedure

### Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker 1 – 20dBm
8. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

### Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

## 10.5 Measurement Result

### Note:

1. **Refer to next page spectrum analyzer data chart and tabular data sheets.**
2. **For Restricted Band Edge Limit, please refer to section 12.5 of this report for measurement result.**

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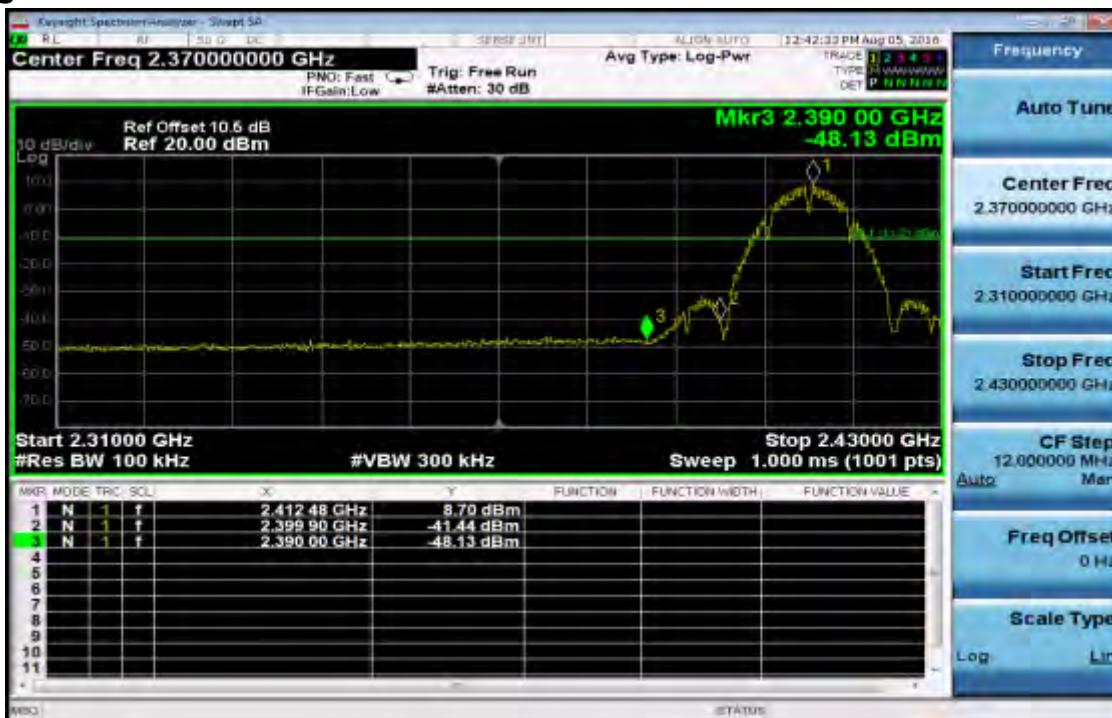
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## 802.11b

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



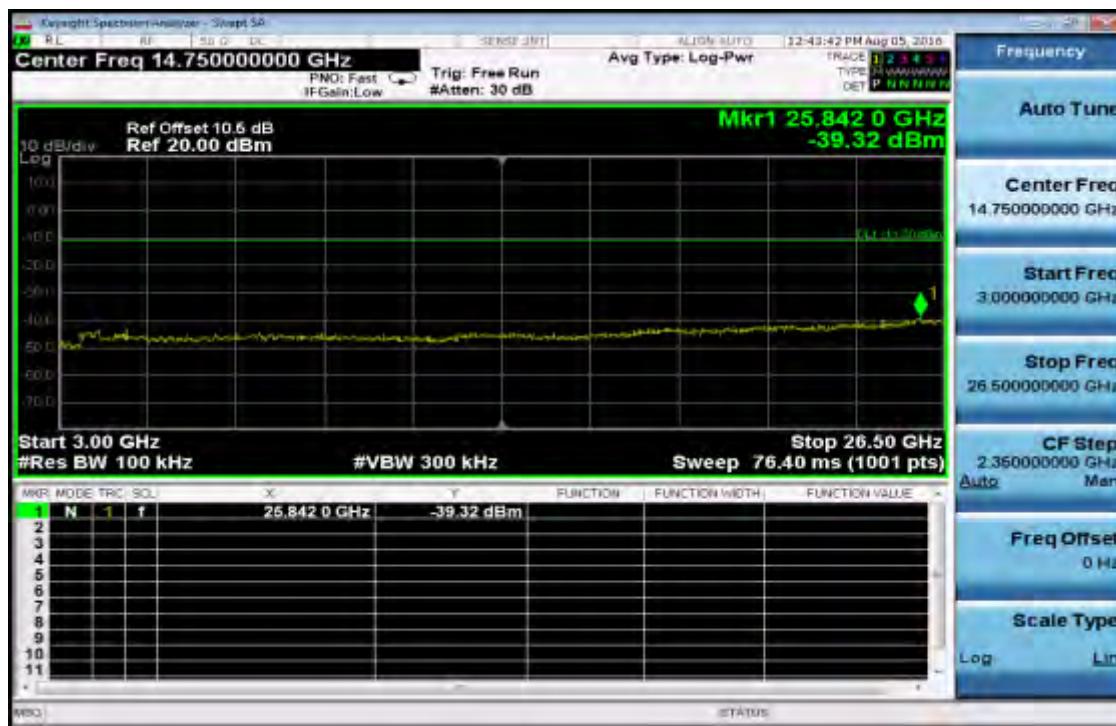
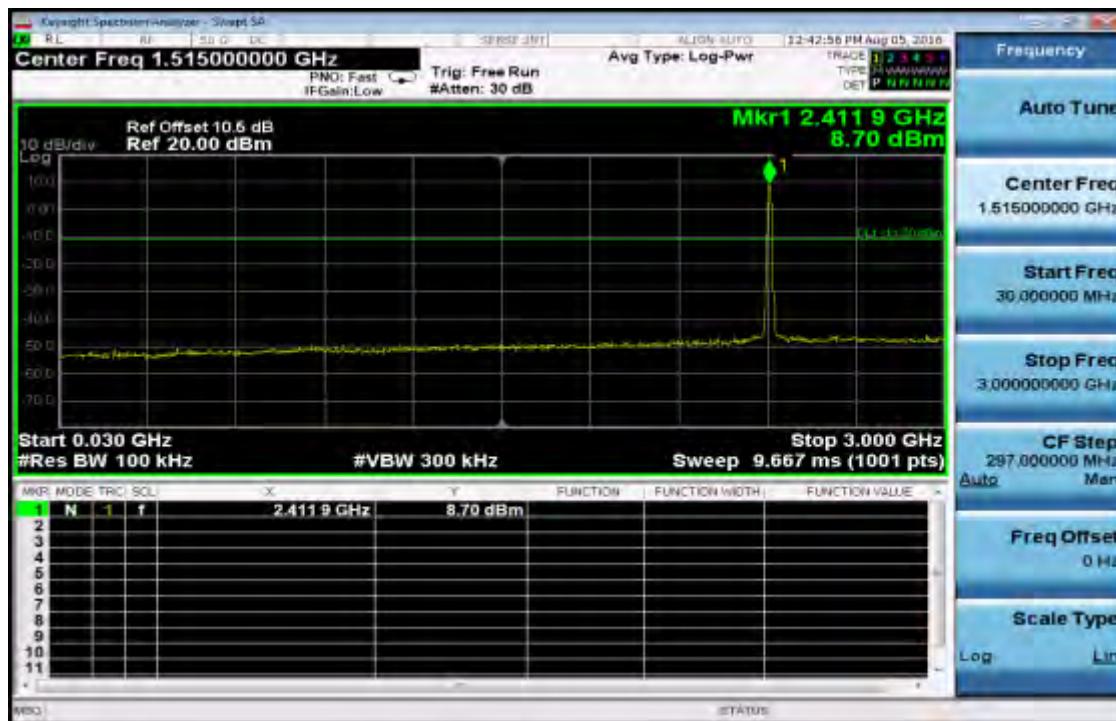
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## 802.11b

## Spurious Emission Test Data CH-Low



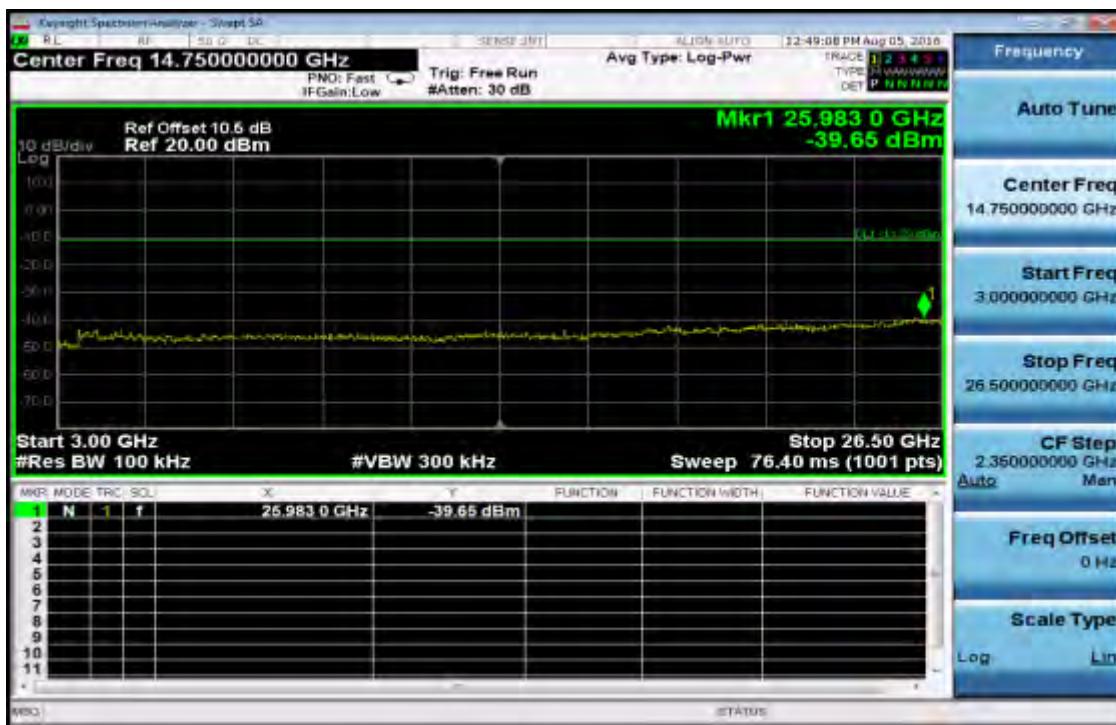
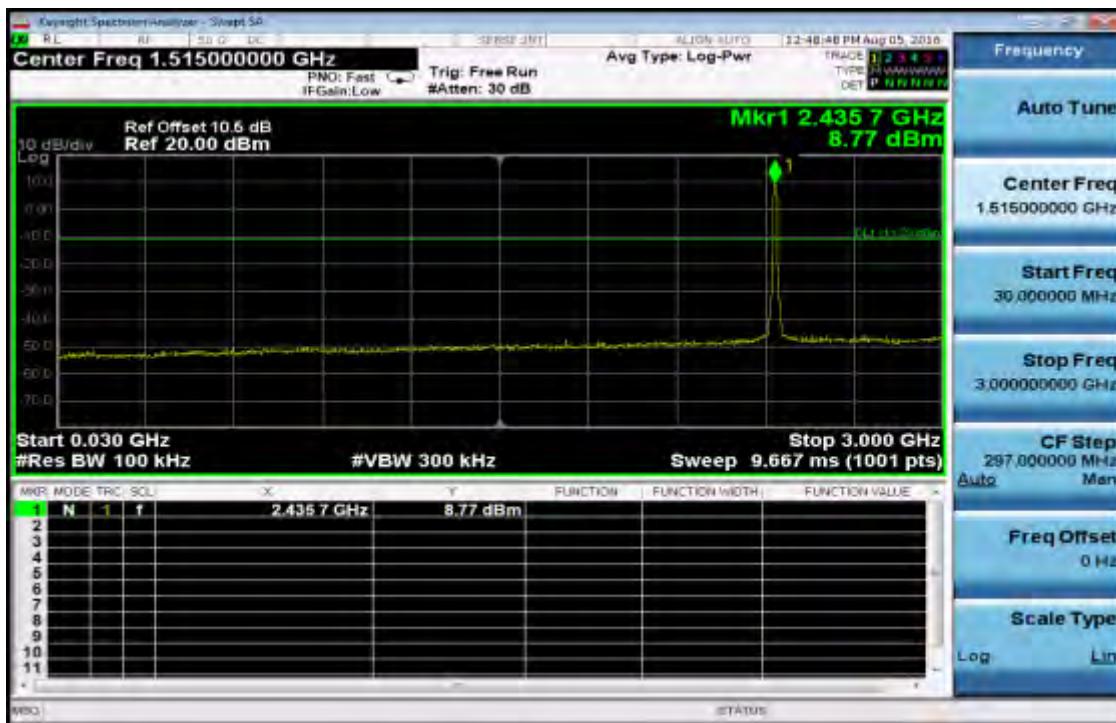
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## Spurious Emission Test Data CH-Mid

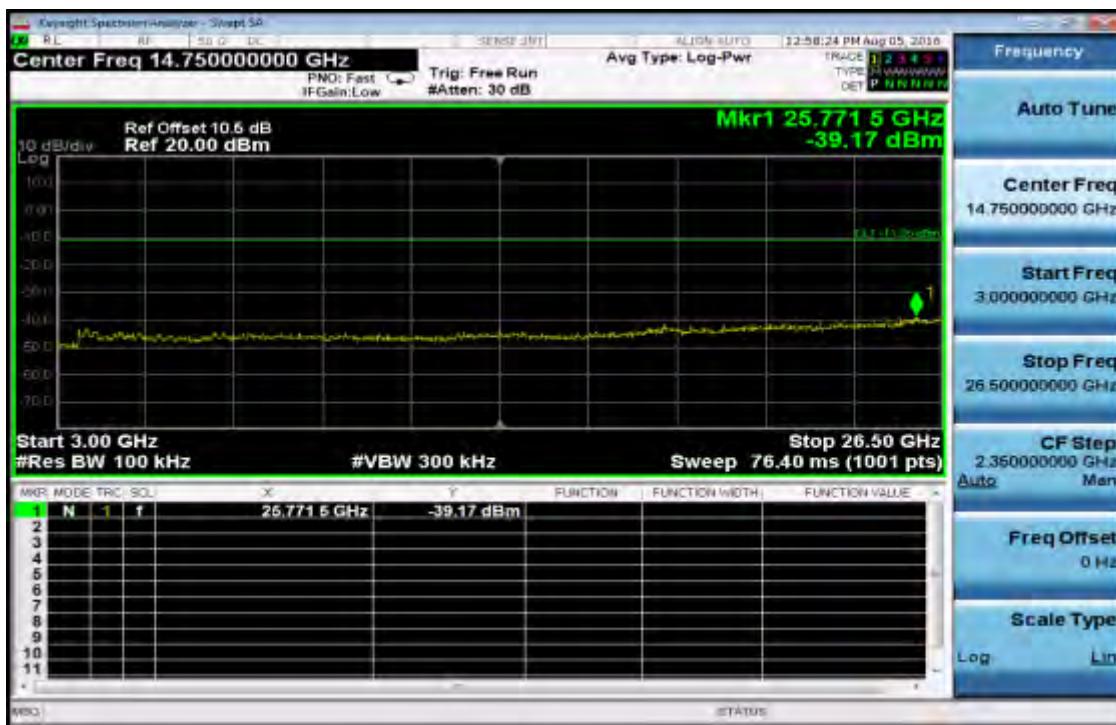
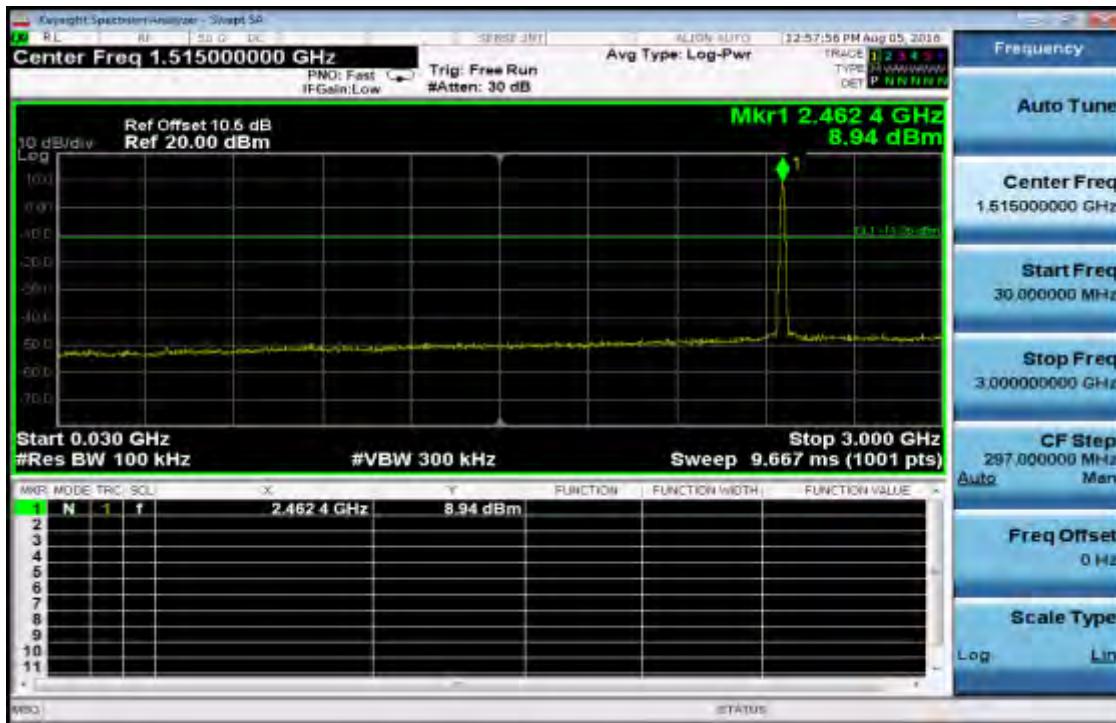


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## Spurious Emission Test Data CH-High



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## 802.11g

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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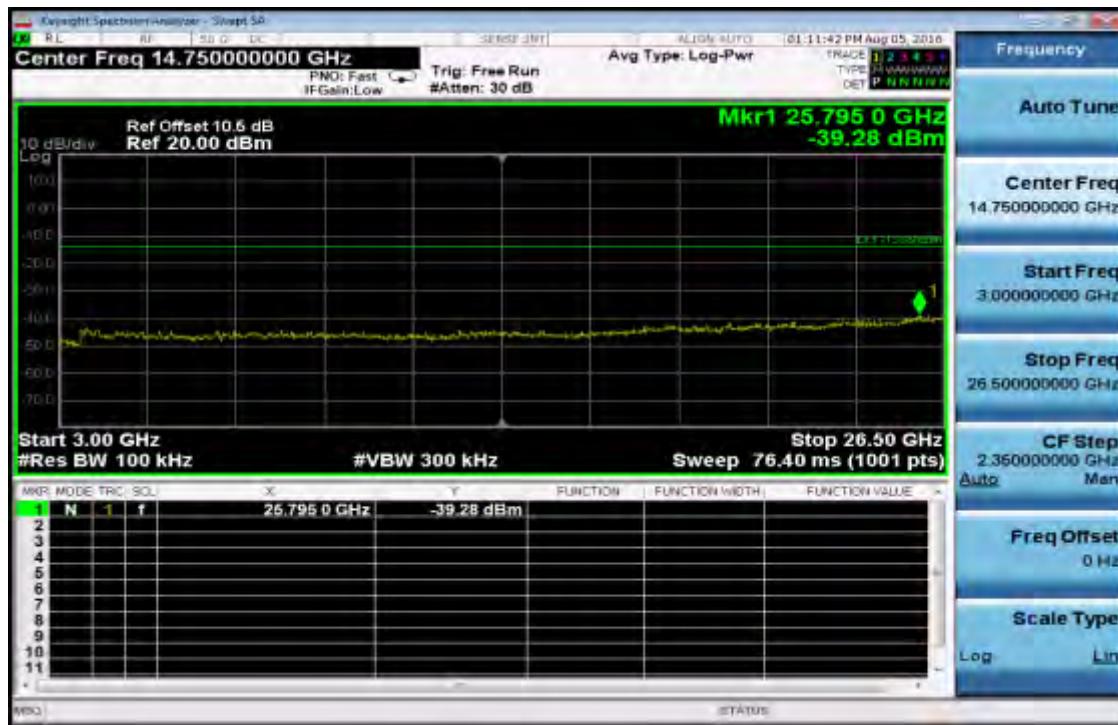
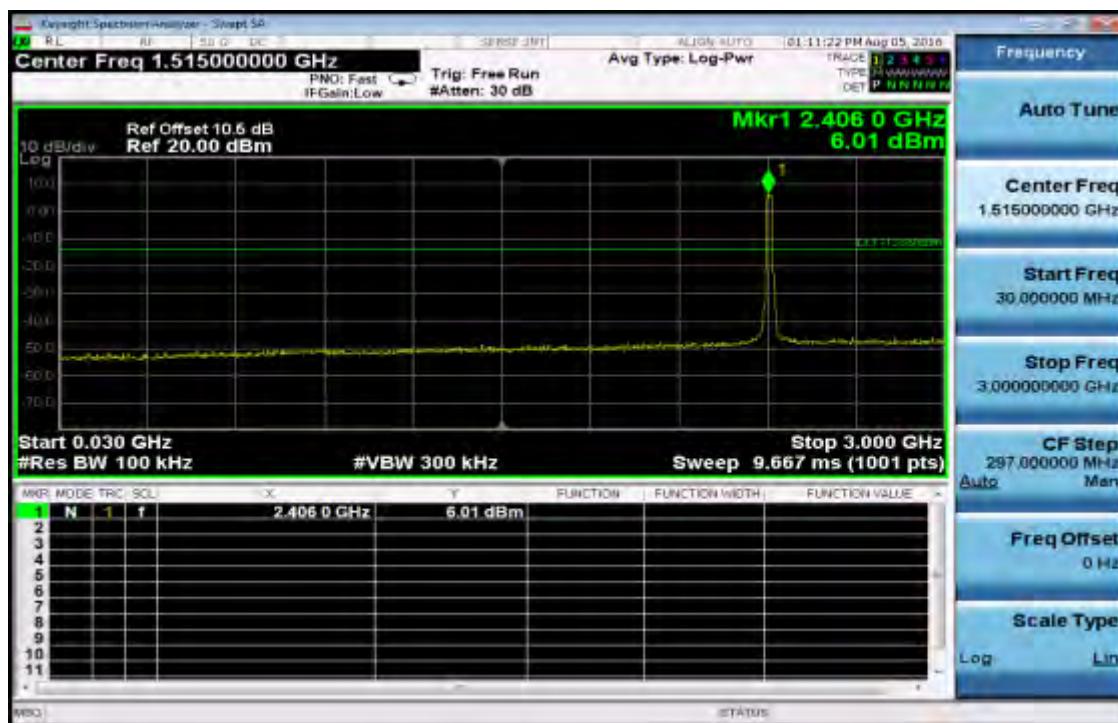
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## 802.11g

## Spurious Emission Test Data CH-Low



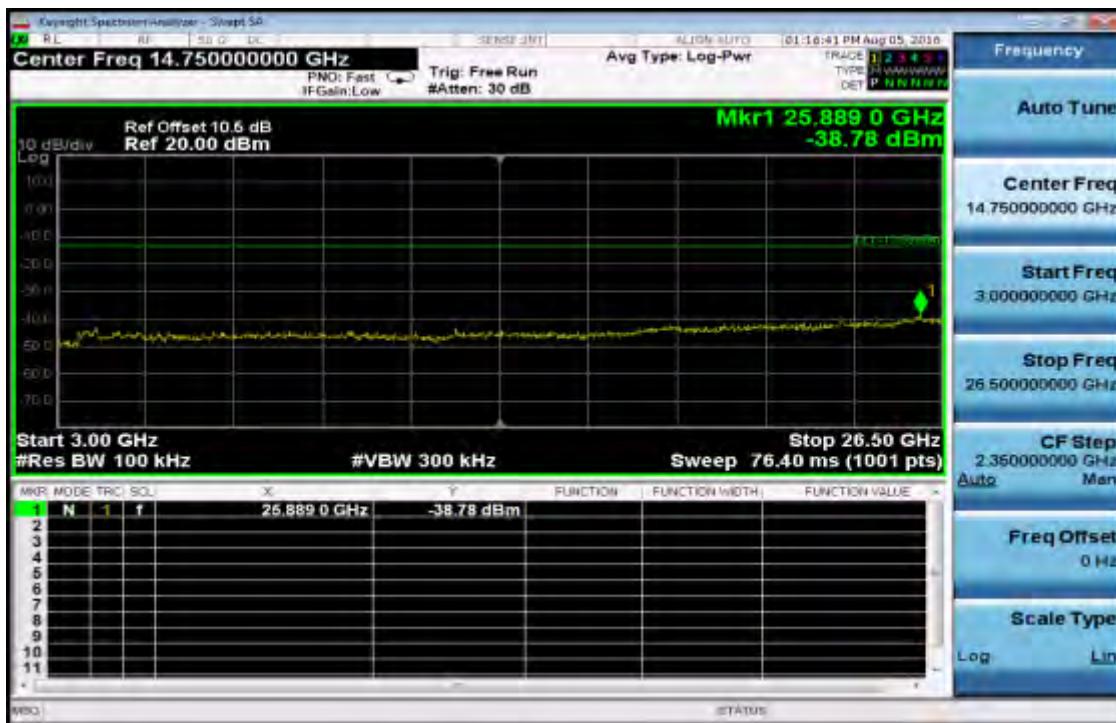
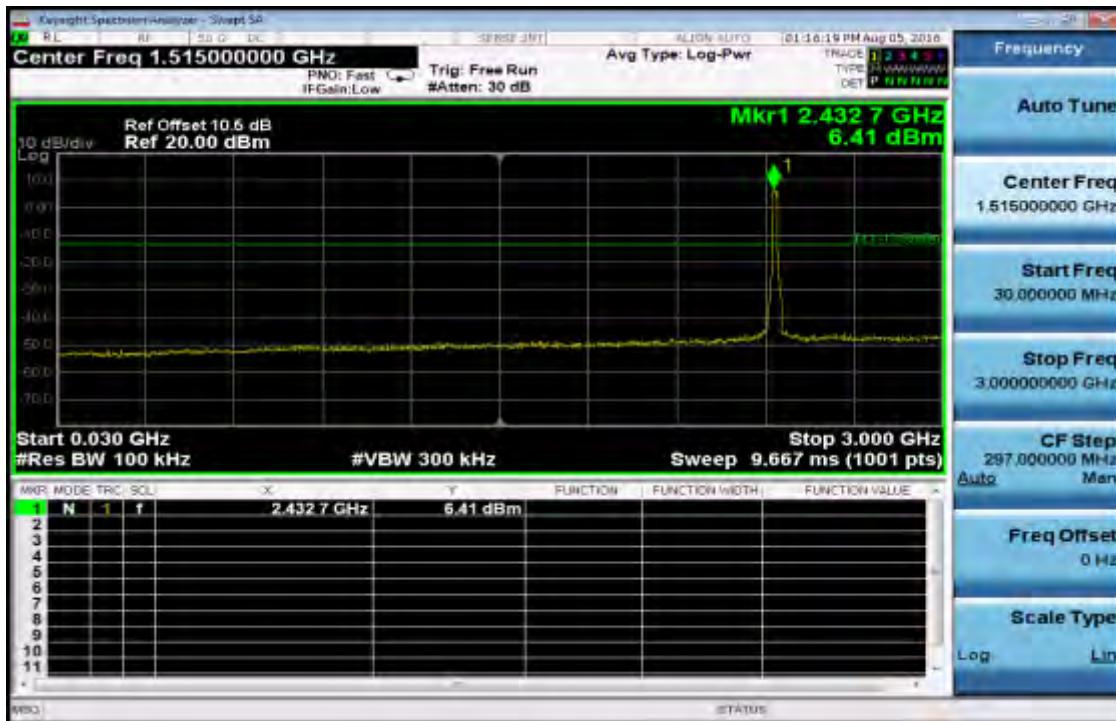
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## Spurious Emission Test Data CH-Mid



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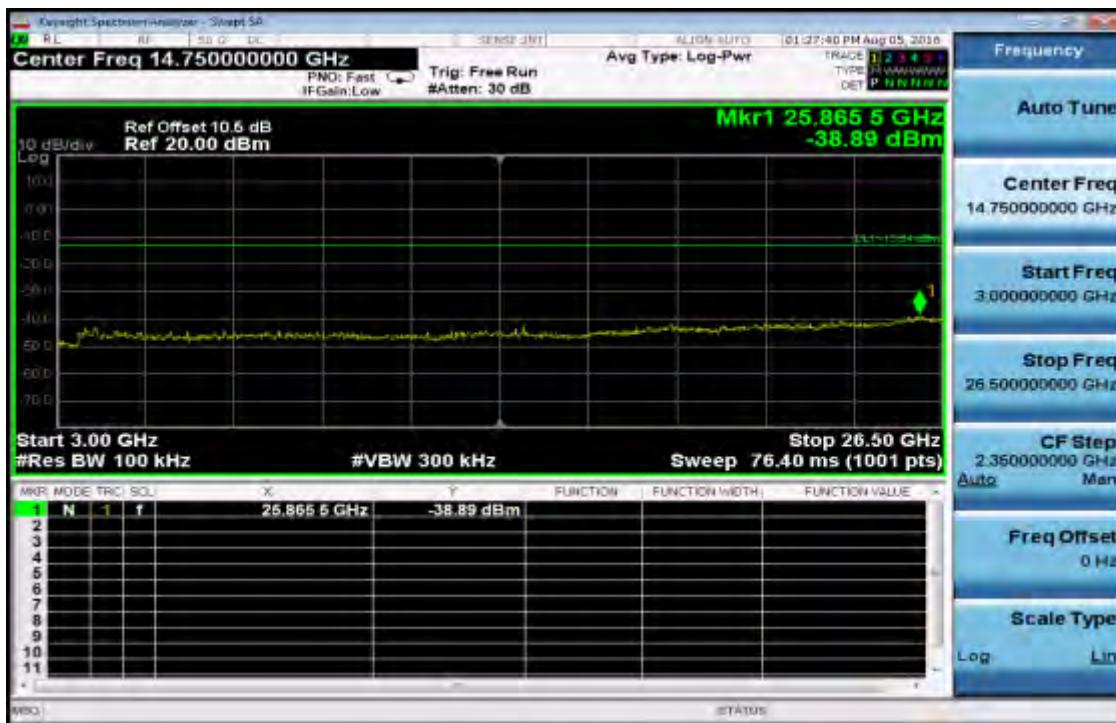
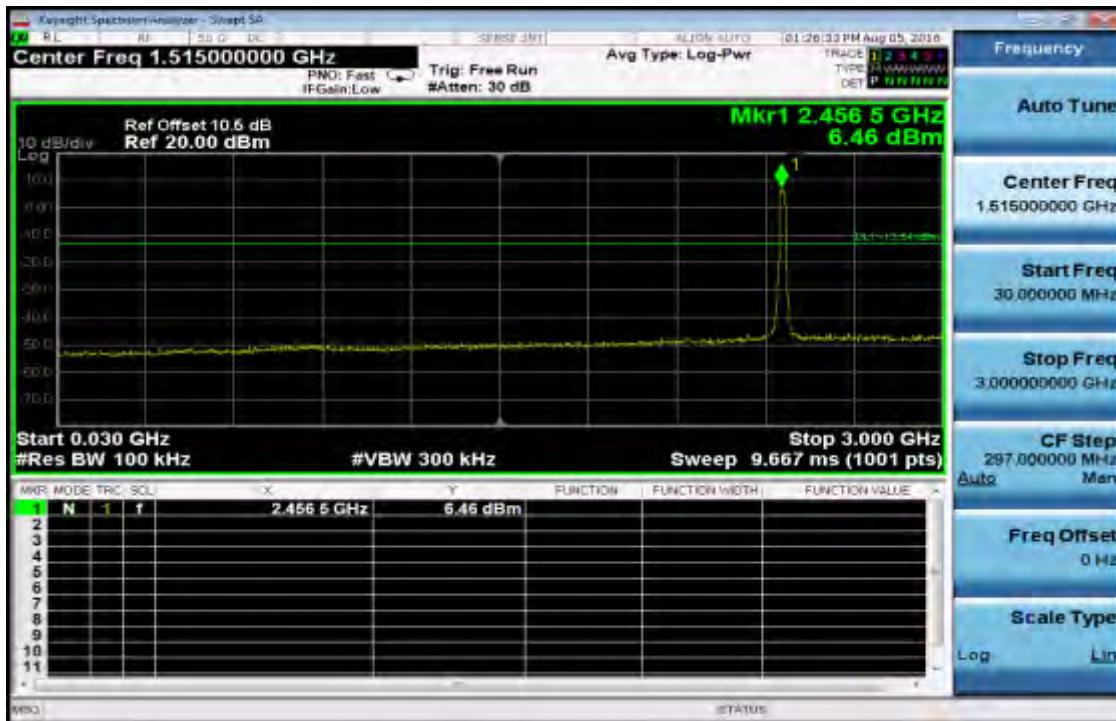
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## Spurious Emission Test Data CH-High



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## 802.11n\_HT20

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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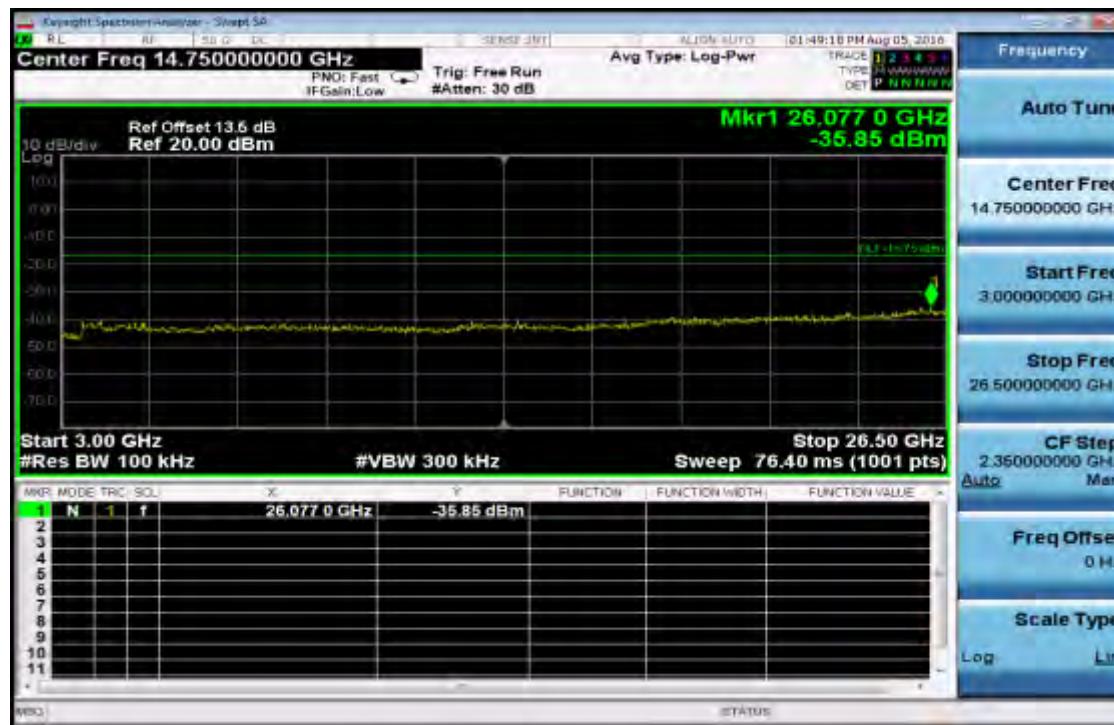
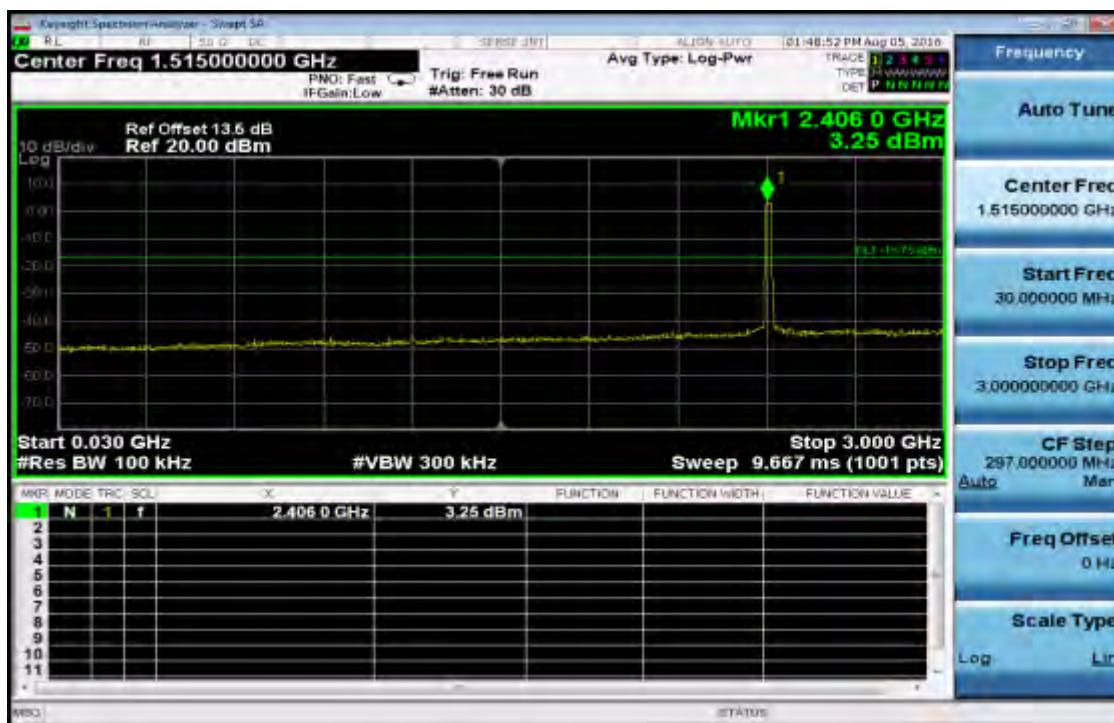
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## 802.11n\_HT20

## Spurious Emission Test Data CH-Low



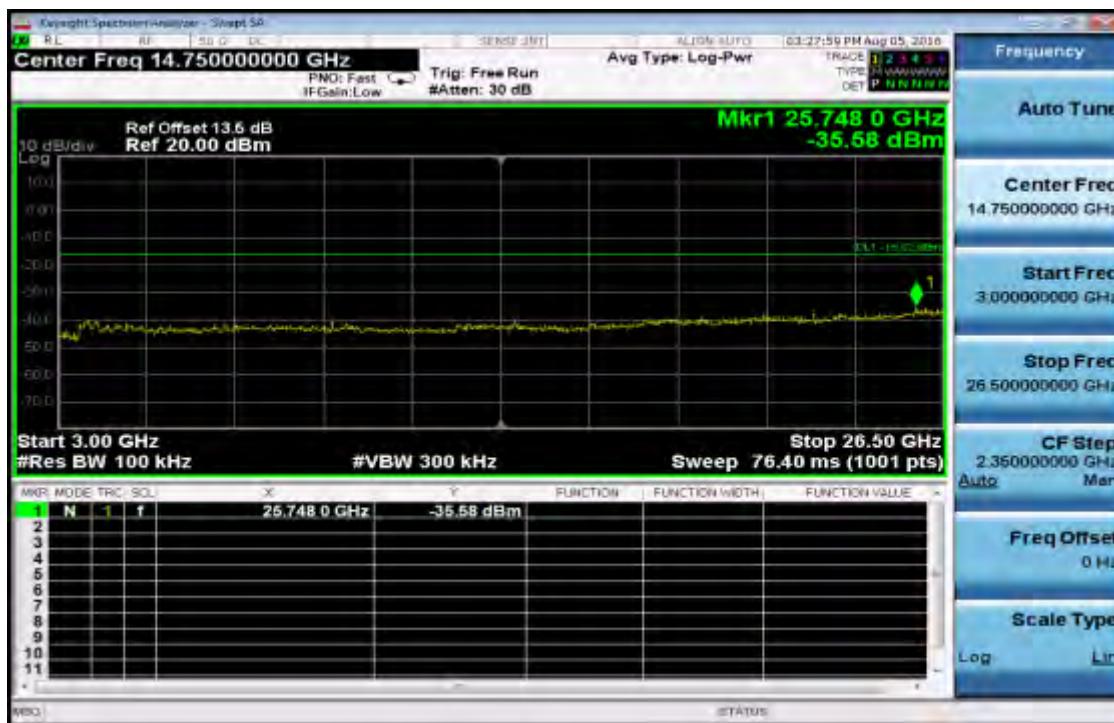
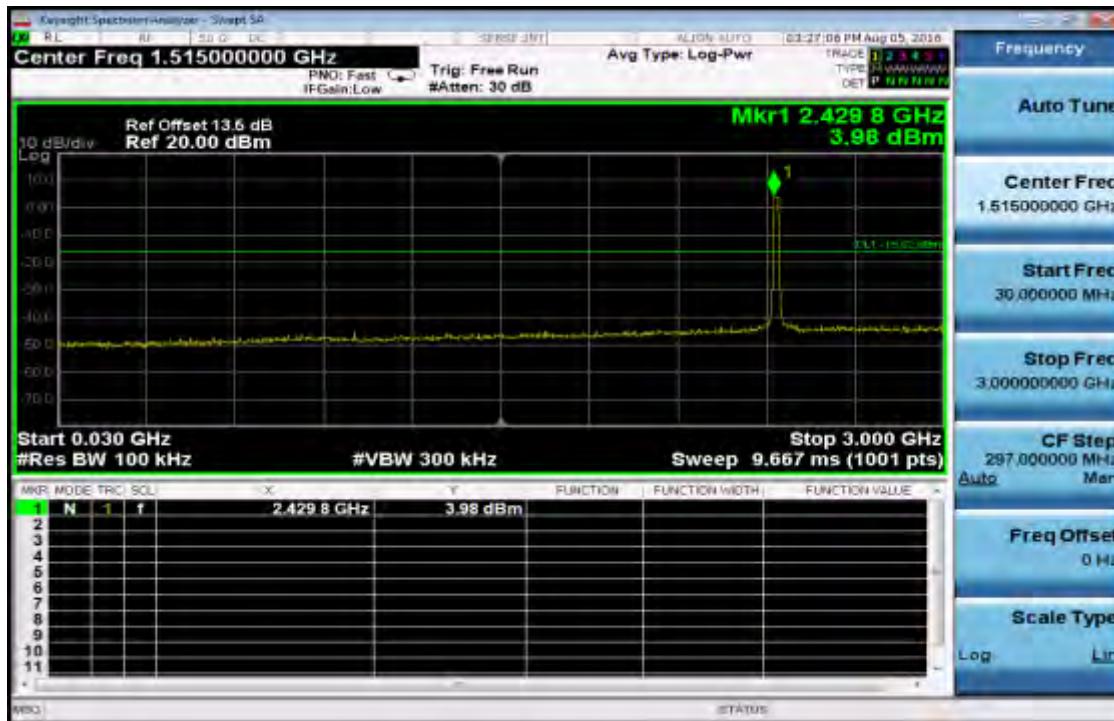
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## Spurious Emission Test Data CH-Mid



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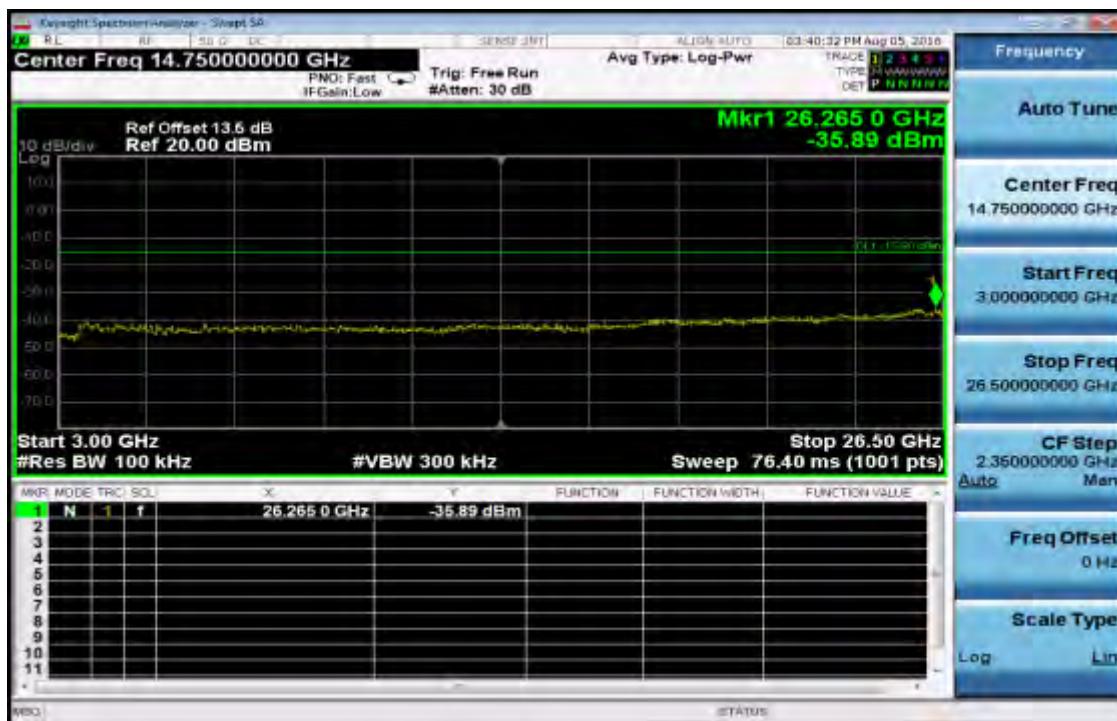
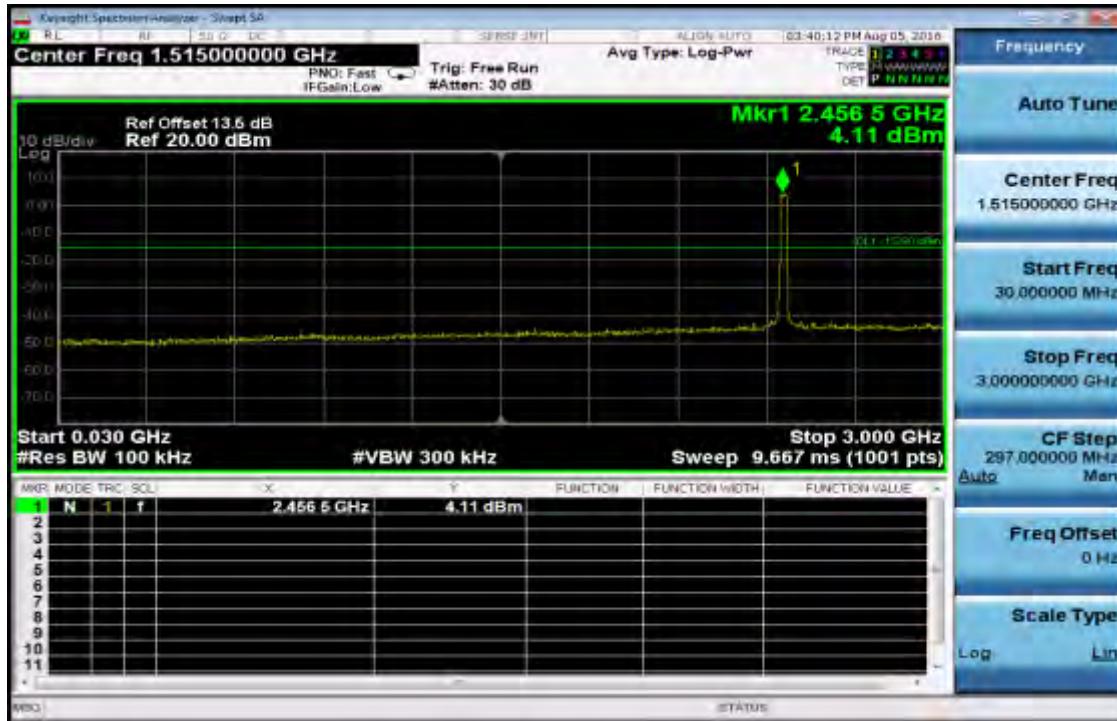
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## Spurious Emission Test Data CH-High



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## 802.11n\_HT40

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



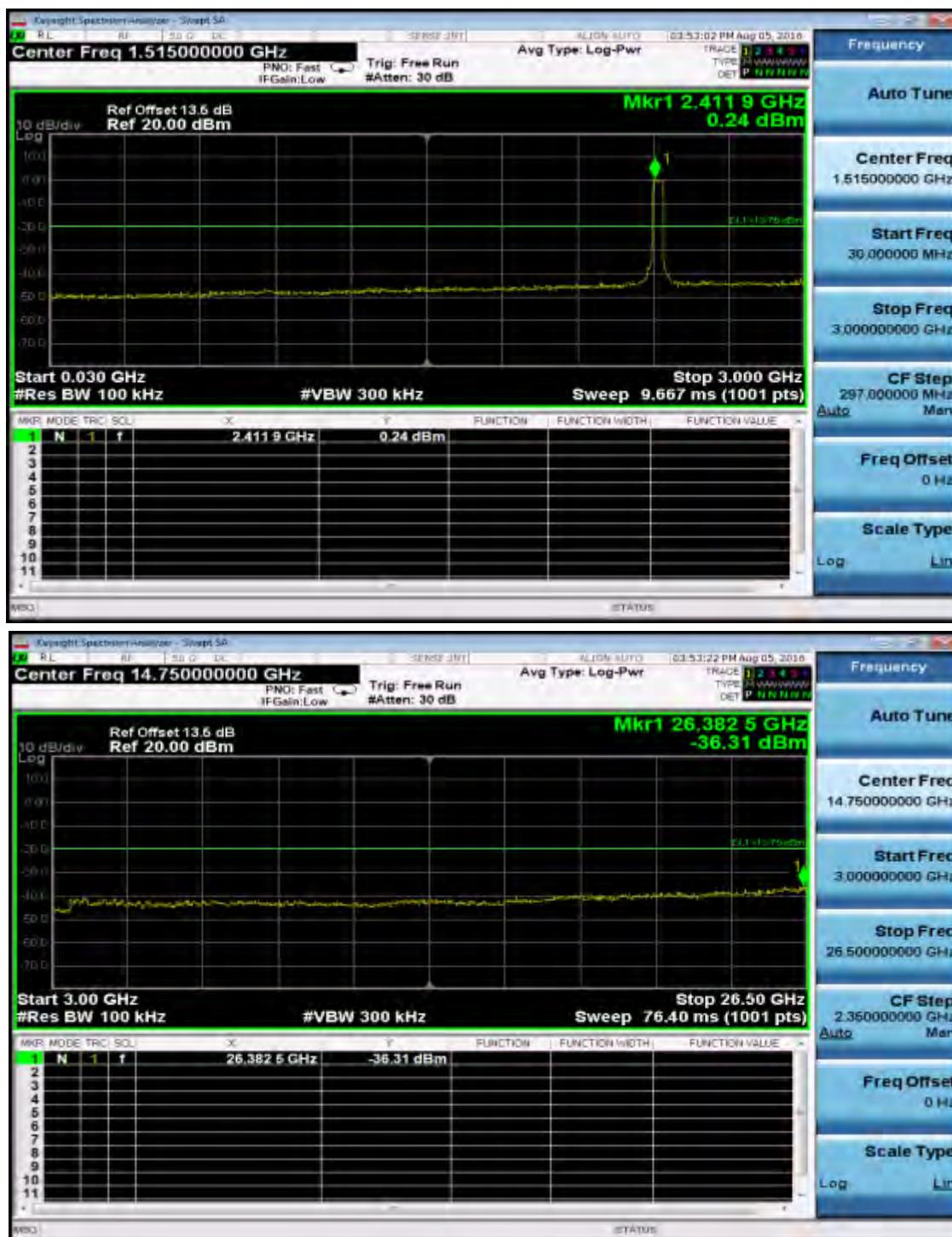
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## 802.11n\_HT40

## Spurious Emission Test Data CH-Low

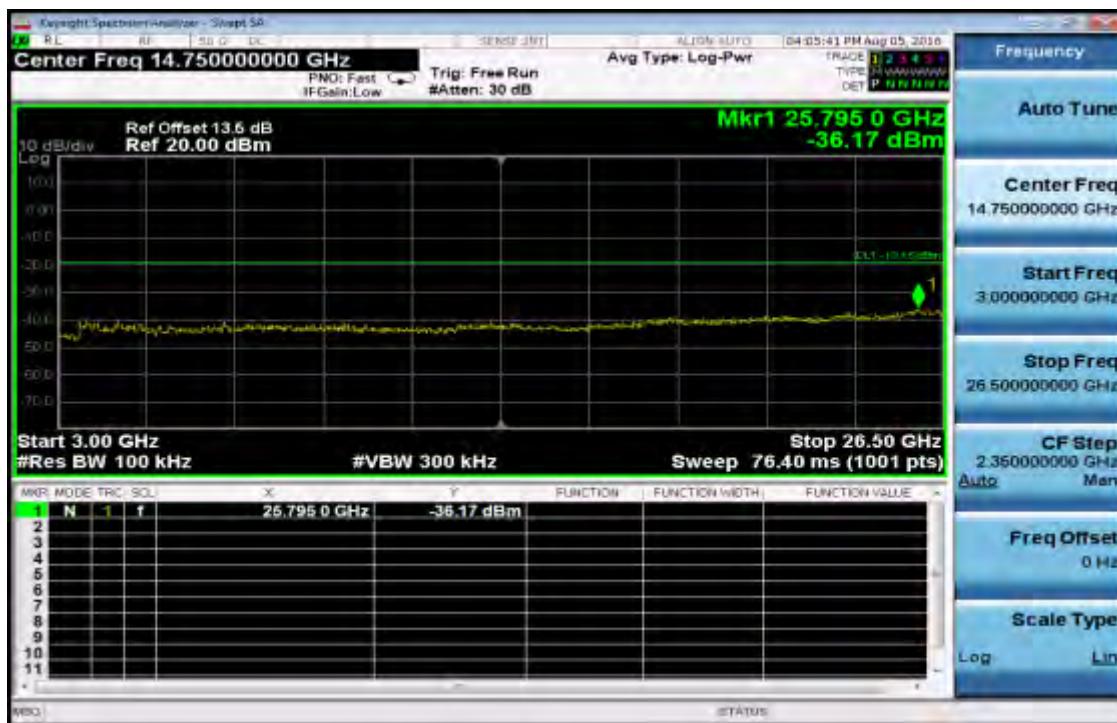
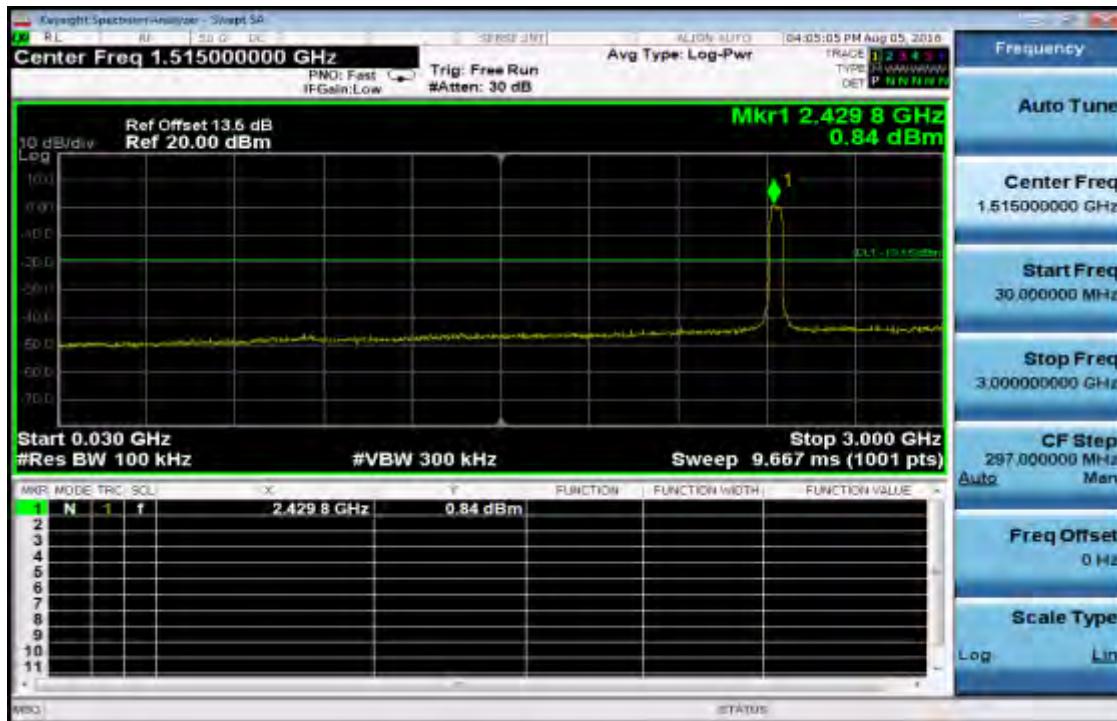


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## Spurious Emission Test Data CH-Mid

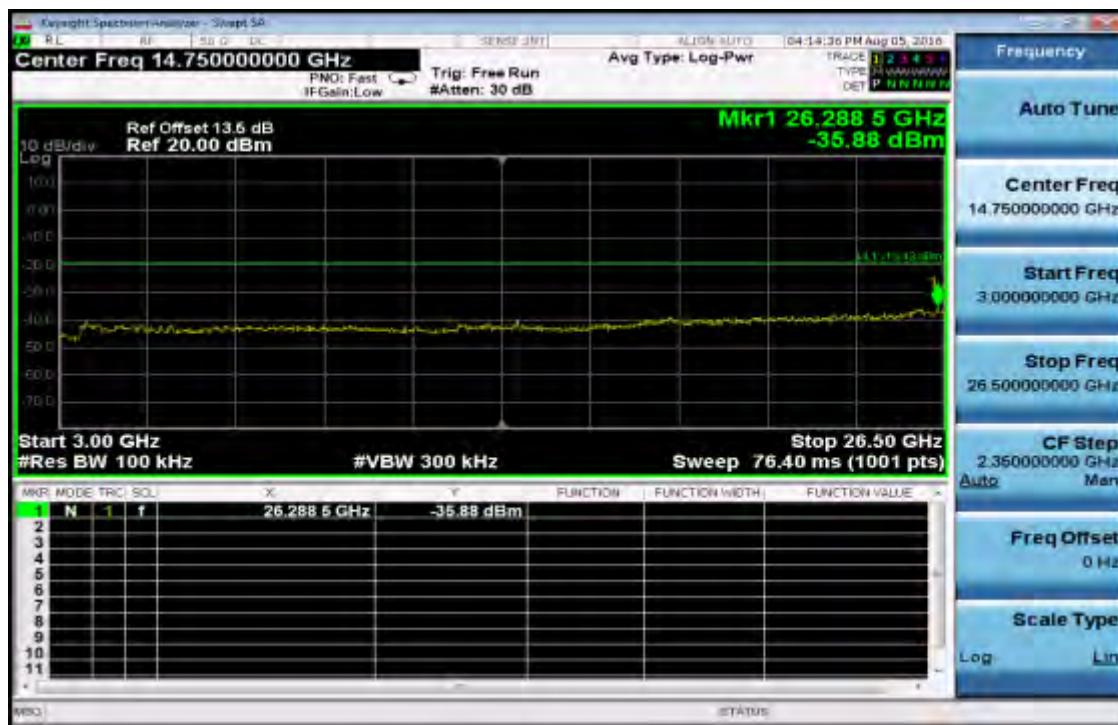
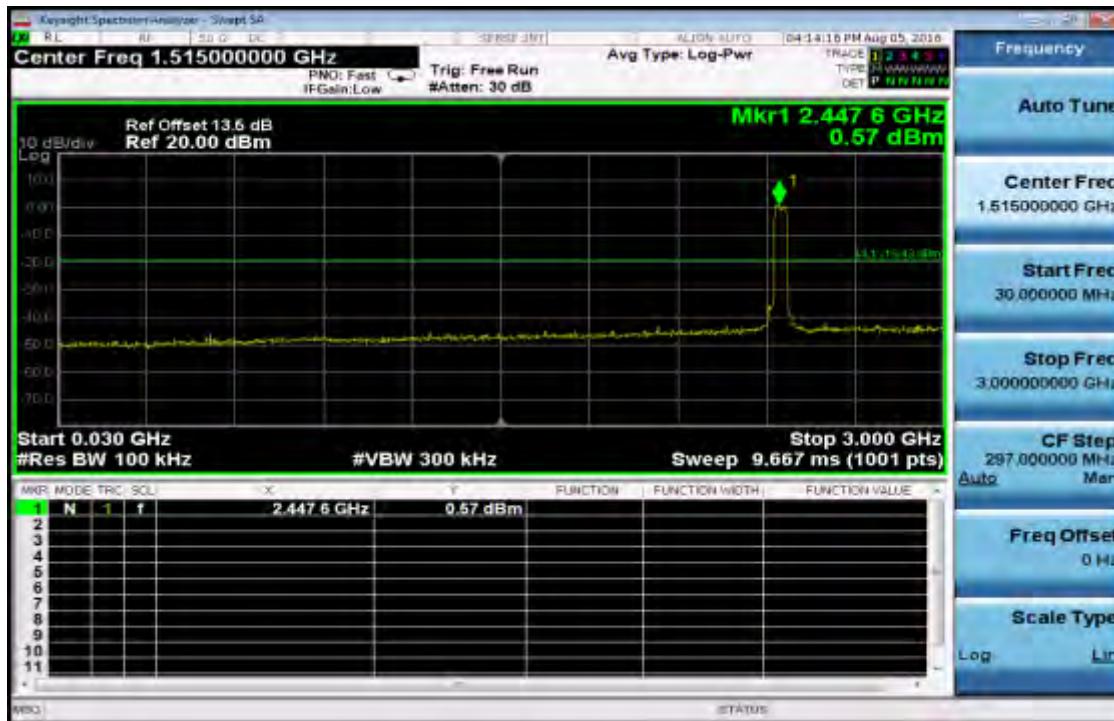


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## Spurious Emission Test Data CH-High



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## 11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

### 11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 & RSS-Gen §8.8, 8.9 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13(a), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/10/2016	05/09/2017
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/29/2016	01/28/2017
Loop Antenna	ETS.LINDGREN	6502	148045	09/07/2015	09/06/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/01/2016	07/31/2017
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/01/2016	06/30/2017
Low Loss Cable	Huber Suhner	966 TX	1	01/02/2016	01/01/2017
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2015	12/11/2016
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/02/2016	01/01/2017

NOTE: N.C.R refers to Not Calibrated Required.

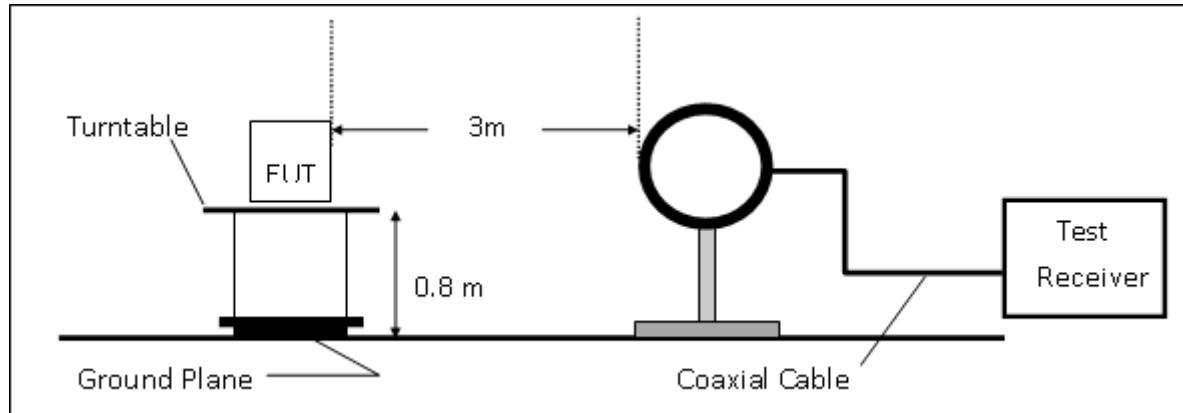
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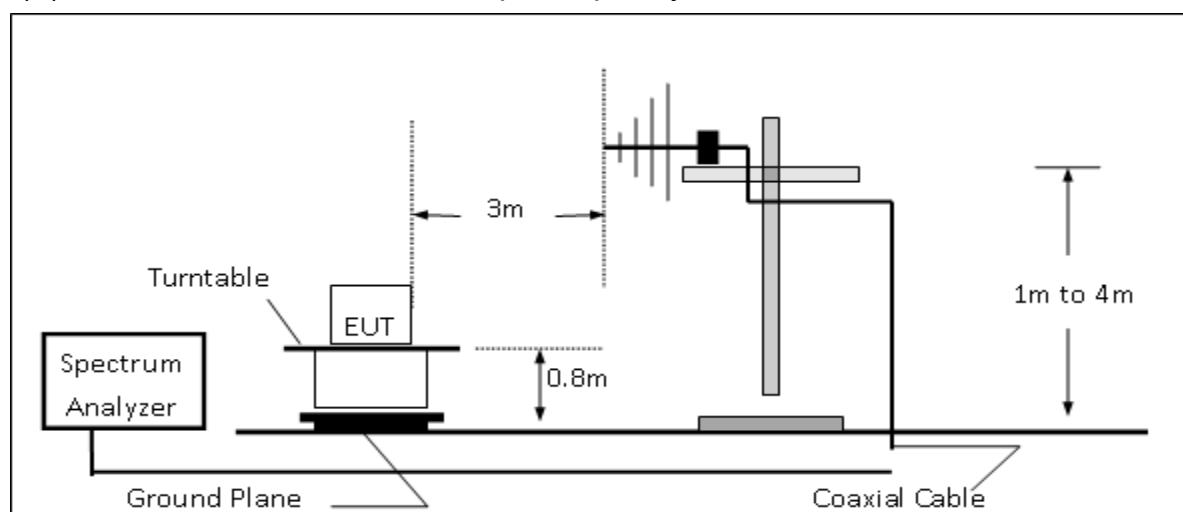
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### 11.3 Test SET-UP

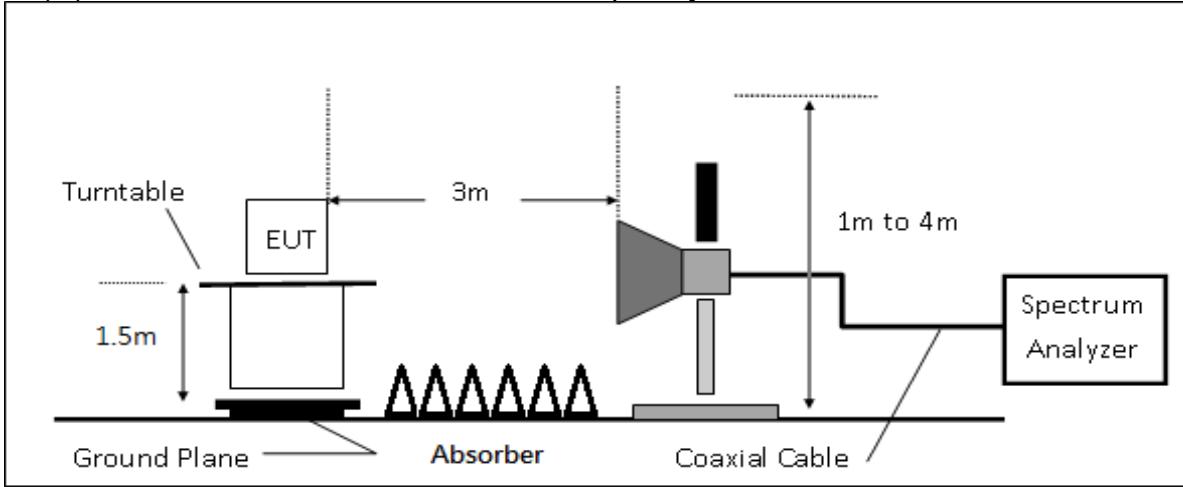
#### (A) Radiated Emission Test Set-UP Frequency Below 30MHz.



#### (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 testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When 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.
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. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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## 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)

### 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

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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## Radiated Band Edge Measurement Result (802.11b)

Operation Mode : 802.11b Test Date : 08/04/2016  
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Bandedge CH LOW Test Engineer : Kane  
 EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	38.04	39.78	-1.74	54.00	-15.96
2390.00	E	Peak	51.45	53.19	-1.74	74.00	-22.55

Operation Mode : 802.11b Test Date : 08/04/2016  
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Bandedge CH LOW Test Engineer : Kane  
 EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	37.50	39.24	-1.74	54.00	-16.50
2390.00	E	Peak	51.53	53.27	-1.74	74.00	-22.47

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Operation Mode : 802.11b Test Date : 08/04/2016  
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						dB	dB
2483.50	E	Average	38.05	39.67	-1.62	54.00	-15.95
2483.50	E	Peak	54.00	55.62	-1.62	74.00	-20.00

Operation Mode : 802.11b Test Date : 08/04/2016  
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						dB	dB
2483.50	E	Average	39.03	40.65	-1.62	54.00	-14.97
2483.50	E	Peak	53.05	54.66	-1.62	74.00	-20.95

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## Radiated Band Edge Measurement Result (802.11g)

Operation Mode : 802.11g Test Date : 08/04/2016  
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Bandedge CH LOW Test Engineer : Kane  
 EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	47.11	48.85	-1.74	54.00	-6.89
2390.00	E	Peak	62.57	64.31	-1.74	74.00	-11.43

Operation Mode : 802.11g Test Date : 08/04/2016  
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Bandedge CH LOW Test Engineer : Kane  
 EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	46.99	48.73	-1.74	54.00	-7.01
2390.00	E	Peak	63.98	65.72	-1.74	74.00	-10.02

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Operation Mode : 802.11g Test Date : 08/04/2016  
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual	Spectrum	Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	FS dB $\mu$ V/m			
2483.50	E	Average	49.85	51.47	-1.62	54.00	-4.15
2483.50	E	Peak	68.17	69.79	-1.62	74.00	-5.83

Operation Mode : 802.11g Test Date : 08/04/2016  
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual	Spectrum	Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	FS dB $\mu$ V/m			
2483.50	E	Average	50.01	51.63	-1.62	54.00	-3.99
2483.50	E	Peak	67.63	69.25	-1.62	74.00	-6.37

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## Radiated Band Edge Measurement Result (802.11\_HT20)

Operation Mode : 802.11n20 Test Date : 08/04/2016  
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Bandedge CH LOW Test Engineer : Kane  
 EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	44.81	46.55	-1.74	54.00	-9.19
2390.00	E	Peak	61.42	63.16	-1.74	74.00	-12.58

Operation Mode : 802.11n20 Test Date : 08/04/2016  
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Bandedge CH LOW Test Engineer : Kane  
 EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	45.43	47.17	-1.74	54.00	-8.57
2390.00	E	Peak	61.49	63.24	-1.74	74.00	-12.51

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Operation Mode : 802.11n20 Test Date : 08/04/2016  
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual	Spectrum	Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	FS dB $\mu$ V/m			
2483.50	E	Average	45.63	47.25	-1.62	54.00	-8.37
2483.50	E	Peak	61.81	63.43	-1.62	74.00	-12.19

Operation Mode : 802.11n20 Test Date : 08/04/2016  
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual	Spectrum	Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	FS dB $\mu$ V/m			
2483.50	E	Average	47.17	48.79	-1.62	54.00	-6.83
2483.50	E	Peak	64.61	66.22	-1.62	74.00	-9.39

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**Radiated Band Edge Measurement Result (802.11\_HT40)**

Operation Mode : 802.11n40 Test Date : 08/04/2016  
Fundamental Frequency : 2422 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH LOW Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	49.76	51.50	-1.74	54.00	-4.24
2390.00	E	Peak	67.88	69.62	-1.74	74.00	-6.12

Operation Mode : 802.11n40 Test Date : 08/04/2016  
Fundamental Frequency : 2422 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH LOW Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
						Test Date : 08/04/2016	Temp. / Humi. : 21 deg_C / 62 RH
2390.00	E	Average	50.68	52.42	-1.74	54.00	-3.32
2390.00	E	Peak	66.53	68.28	-1.74	74.00	-7.47

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Operation Mode : 802.11n40 Test Date : 08/04/2016  
Fundamental Frequency : 2452 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual	Spectrum	Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	FS dB $\mu$ V/m			
2483.50	E	Average	48.29	49.91	-1.62	54.00	-5.71
2483.50	E	Peak	63.65	65.26	-1.62	74.00	-10.35

Operation Mode : 802.11n40 Test Date : 08/04/2016  
Fundamental Frequency : 2452 MHz Temp. / Humi. : 21 deg\_C / 62 RH  
Operation Band : Bandedge CH HIGH Test Engineer : Kane  
EUT Pol. : H Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual	Spectrum	Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	FS dB $\mu$ V/m			
2483.50	E	Average	49.72	51.34	-1.62	54.00	-4.28
2483.50	E	Peak	65.06	66.67	-1.62	74.00	-8.94

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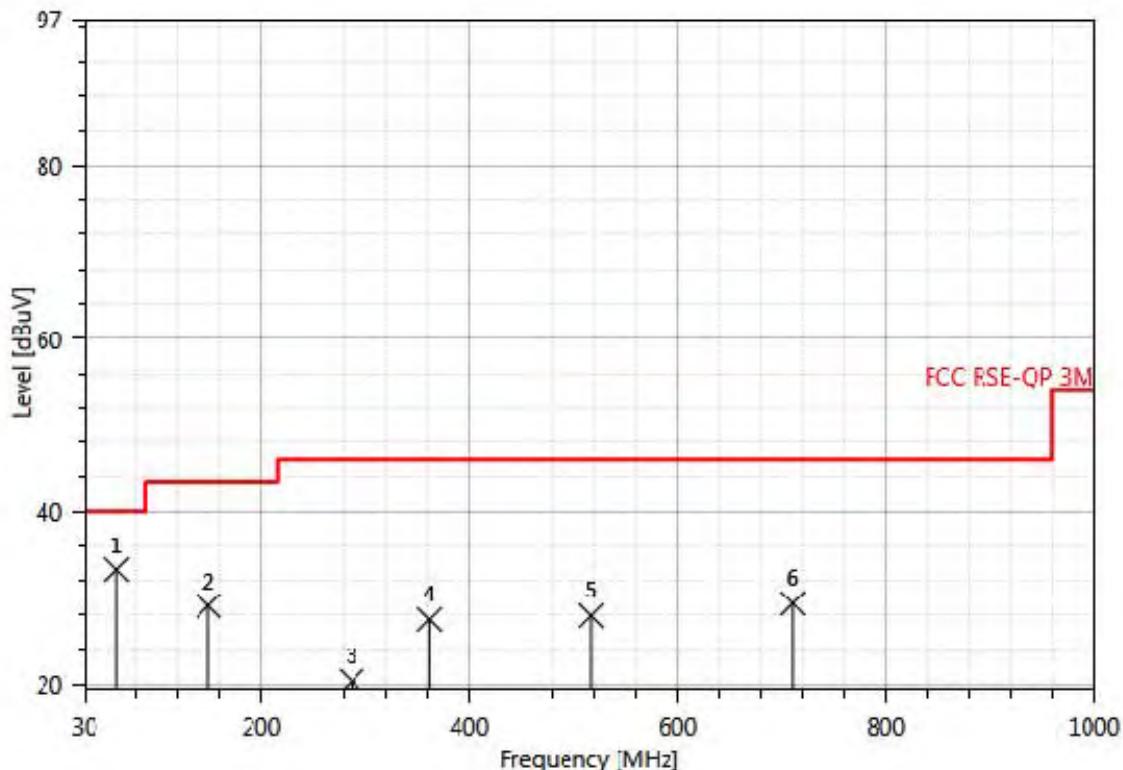
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**Below 1GHz Worst-Case Data:****Radiated Spurious Emission Measurement Result (802.11 g)**

Operation Mode :	802.11g	Test Date :	08/03/2016
Fundamental Frequency :	2412 MHz	Temp. / Humi. :	23 deg_C / 62 RH
Operation Band :	Tx CH LOW	Test Engineer :	Kane
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



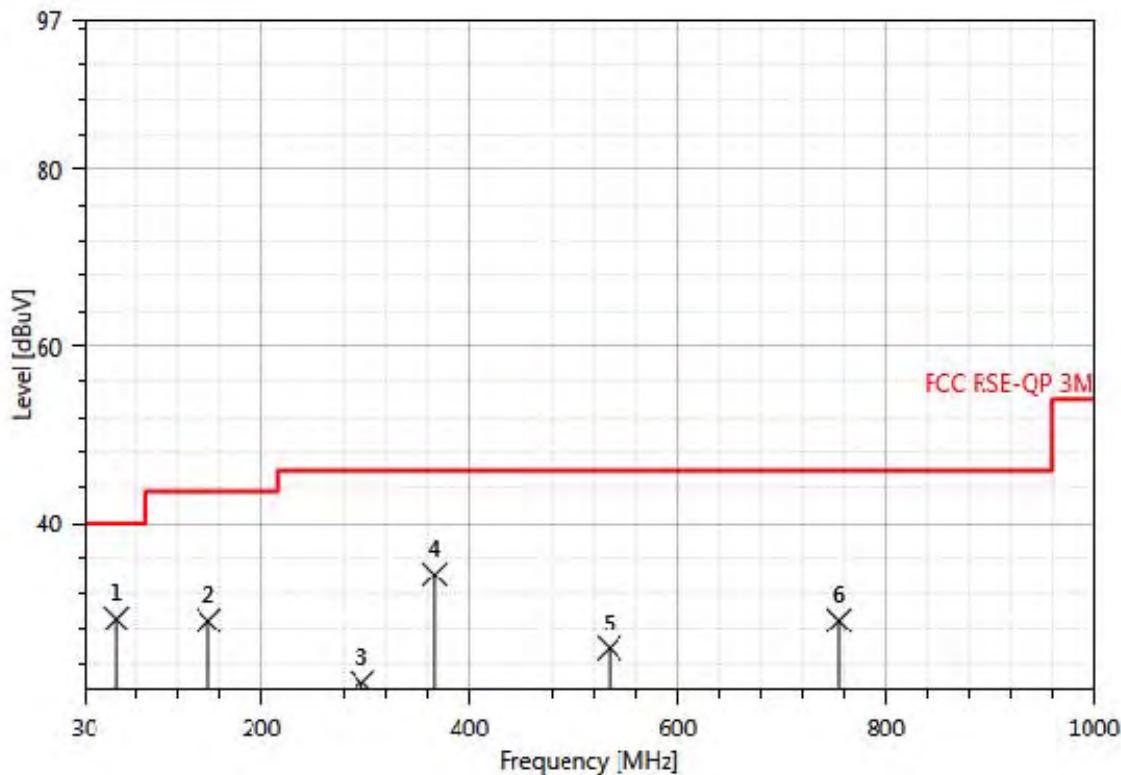
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading	Spectrum	Factor	Limit @3m	Margin
			Level dB $\mu$ V/m	FS dB $\mu$ V/m			
61.04	S	Peak	33.29	41.54	-8.25	40.00	-6.71
149.31	S	Peak	29.14	36.95	-7.82	43.50	-14.36
287.05	S	Peak	20.42	26.61	-6.19	46.00	-25.58
361.74	S	Peak	27.55	32.34	-4.80	46.00	-18.45
516.94	S	Peak	27.99	29.93	-1.94	46.00	-18.01
710.94	S	Peak	29.40	28.08	1.33	46.00	-16.60

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2412 MHz      Temp. / Humi. : 23 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



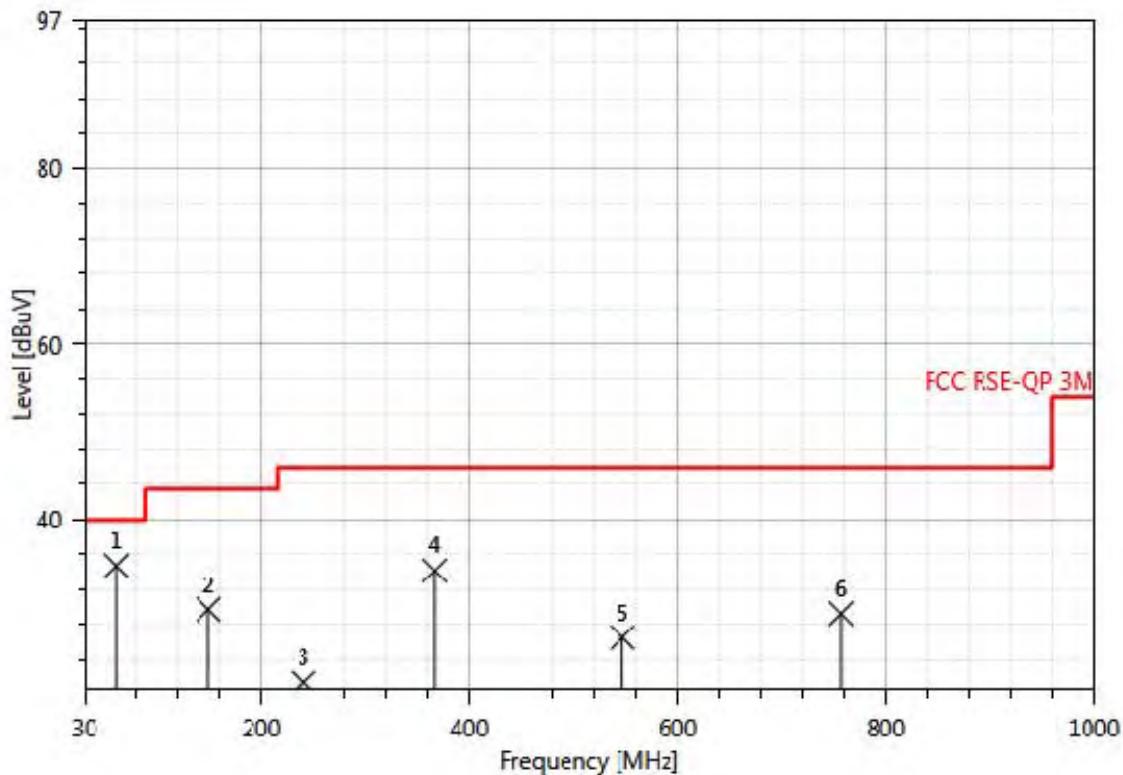
Freq. MHz	Note F/H/E/S	Decetor Mode	Actual	Spectrum	Factor	Limit @3m	Margin
			Reading	FS			
61.04	S	Peak	29.12	37.37	-8.25	40.00	-10.88
149.31	S	Peak	28.92	36.73	-7.82	43.50	-14.58
296.75	S	Peak	21.92	27.90	-5.98	46.00	-24.08
366.59	S	Peak	34.14	38.86	-4.72	46.00	-11.86
534.40	S	Peak	25.78	27.45	-1.67	46.00	-20.22
755.56	S	Peak	28.94	26.14	2.81	46.00	-17.06

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 23 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



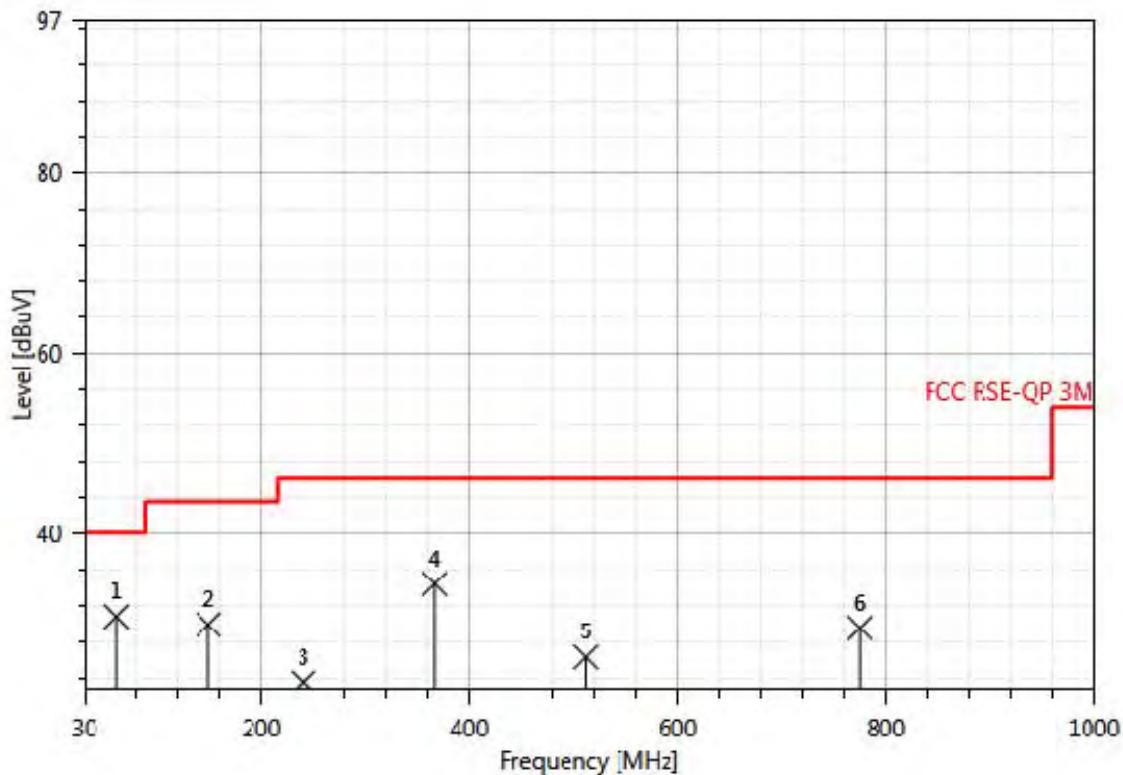
Freq. MHz	Note F/H/E/S	Decetor Mode	Actual	Spectrum	Factor	Limit @3m	Margin
			Reading	FS			
61.04	S	Peak	34.74	42.99	-8.25	40.00	-5.26
149.31	S	Peak	29.77	37.59	-7.82	43.50	-13.73
240.49	S	Peak	21.44	29.48	-8.03	46.00	-24.56
366.59	S	Peak	34.19	38.91	-4.72	46.00	-11.81
547.01	S	Peak	26.56	28.23	-1.67	46.00	-19.44
757.50	S	Peak	29.30	26.28	3.01	46.00	-16.70

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 23 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode	Actual	Spectrum	Factor	Limit @3m	Margin
			Reading	FS			
61.04	S	Peak	30.72	38.97	-8.25	40.00	-9.28
149.31	S	Peak	29.83	37.65	-7.82	43.50	-13.67
240.49	S	Peak	23.42	31.45	-8.03	46.00	-22.58
366.59	S	Peak	34.36	39.08	-4.72	46.00	-11.64
512.09	S	Peak	26.26	28.24	-1.98	46.00	-19.74
774.96	S	Peak	29.46	26.70	2.76	46.00	-16.54

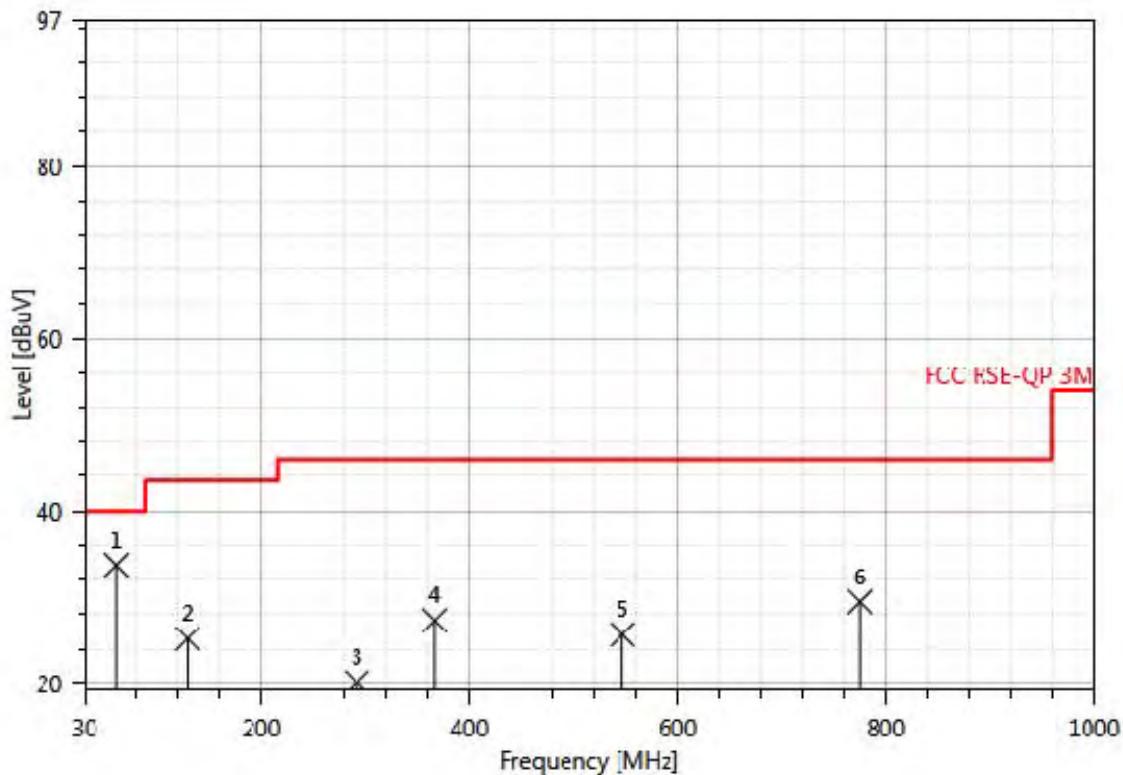
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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 23 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



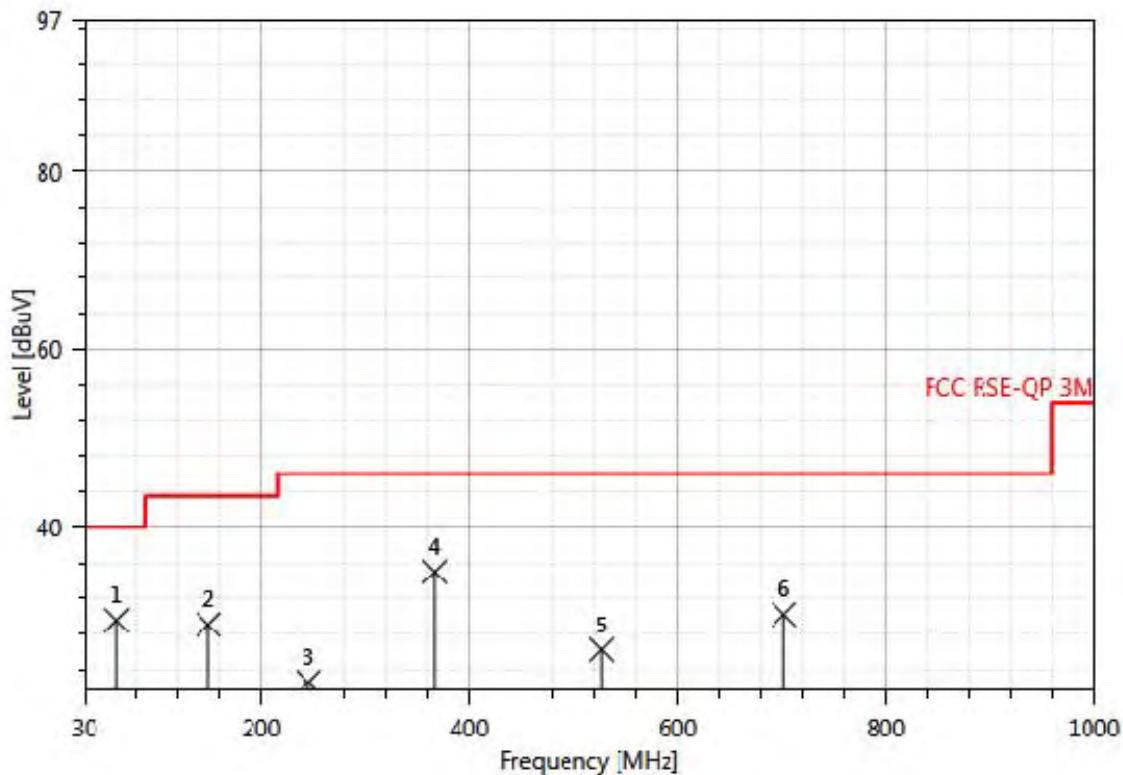
Freq. MHz	Note F/H/E/S	Decetor Mode	Actual	Spectrum	Factor	Limit @3m	Margin
			Reading	FS			
61.04	S	Peak	33.74	41.99	-8.25	40.00	-6.26
128.94	S	Peak	25.19	34.76	-9.57	43.50	-18.31
291.90	S	Peak	20.12	26.20	-6.08	46.00	-25.88
366.59	S	Peak	27.33	32.05	-4.72	46.00	-18.67
547.01	S	Peak	25.67	27.35	-1.67	46.00	-20.33
774.96	S	Peak	29.46	26.70	2.76	46.00	-16.54

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 23 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode	Actual	Spectrum	Factor	Limit @3m	Margin
			Reading	FS			
61.04	S	Peak	29.55	37.80	-8.25	40.00	-10.45
149.31	S	Peak	29.07	36.88	-7.82	43.50	-14.43
245.34	S	Peak	22.57	30.61	-8.03	46.00	-23.43
366.59	S	Peak	34.99	39.72	-4.72	46.00	-11.01
526.64	S	Peak	26.25	27.68	-1.44	46.00	-19.75
702.21	S	Peak	30.20	28.84	1.36	46.00	-15.80

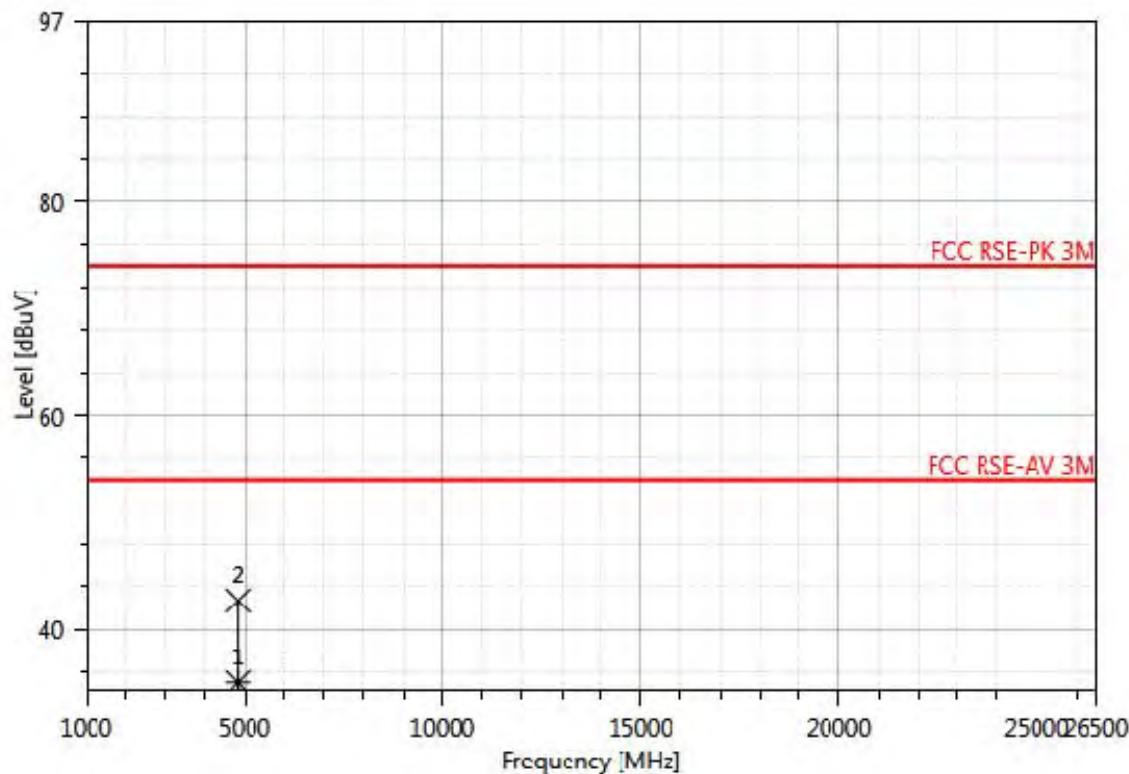
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**Above 1GHz Data:****Radiated Spurious Emission Measurement Result (802.11 b)**

Operation Mode :	802.11b	Test Date :	08/03/2016
Fundamental Frequency :	2412 MHz	Temp. / Humi. :	21 deg_C / 62 RH
Operation Band :	Tx CH LOW	Test Engineer :	Kane
EUT Pol. :	H Plane	Measurement Antenna Pol. :	VERTICAL



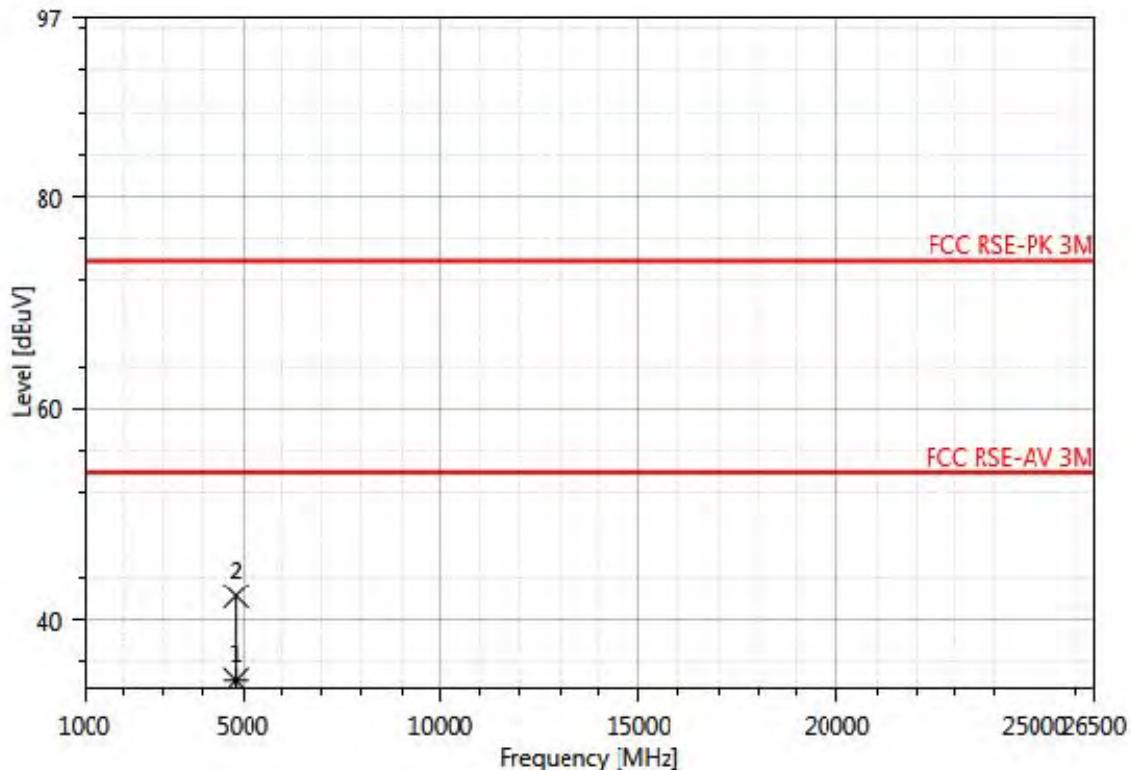
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
MHz	F/H/E/S	Mode	Reading	FS	dB	@3m	dB
4824.00	H	Average	35.06	30.12	4.94	54.00	-18.94
4824.00	H	Peak	42.71	37.77	4.94	74.00	-31.29

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Operation Mode : 802.11b      Test Date : 08/03/2016  
 Fundamental Frequency : 2412 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



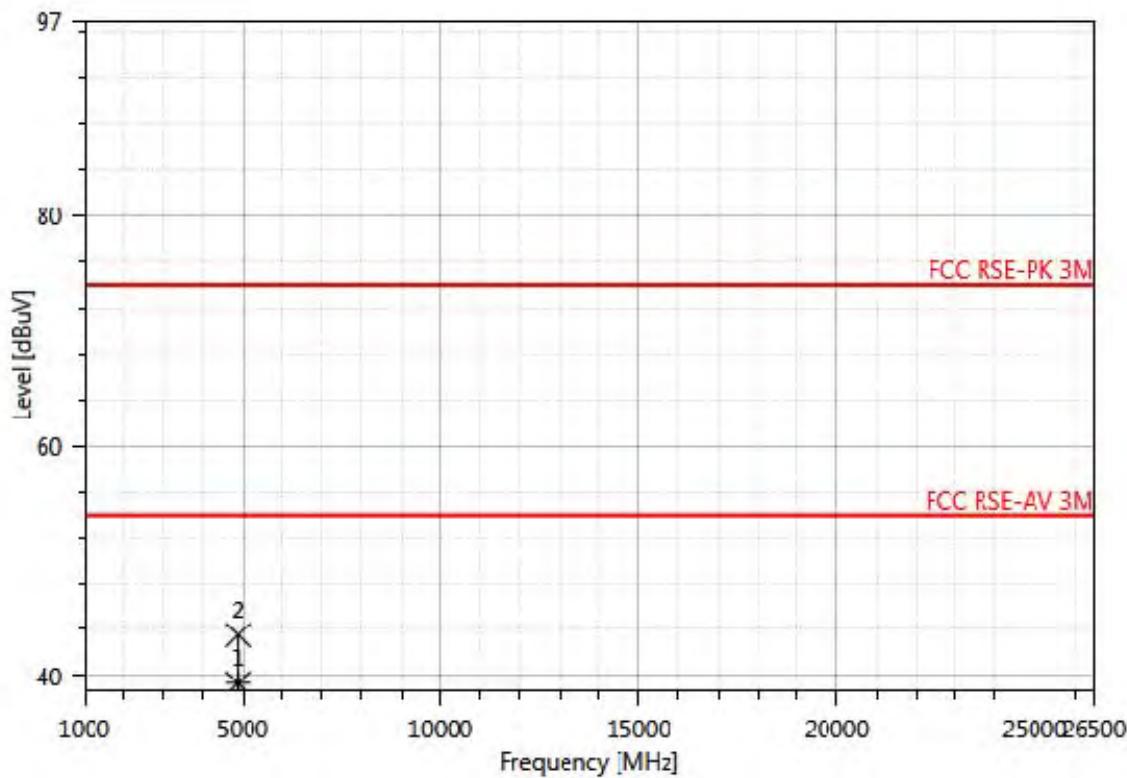
Freq. MHz	Note F/H/E/S	Detector Mode	Actual Reading	Spectrum FS	Factor	Limit	Margin
						@3m dBuV/m	dB
4824.00	H	Average	34.32	29.38	4.94	54.00	-19.68
4824.00	H	Peak	42.24	37.30	4.94	74.00	-31.76

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Operation Mode : 802.11b      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



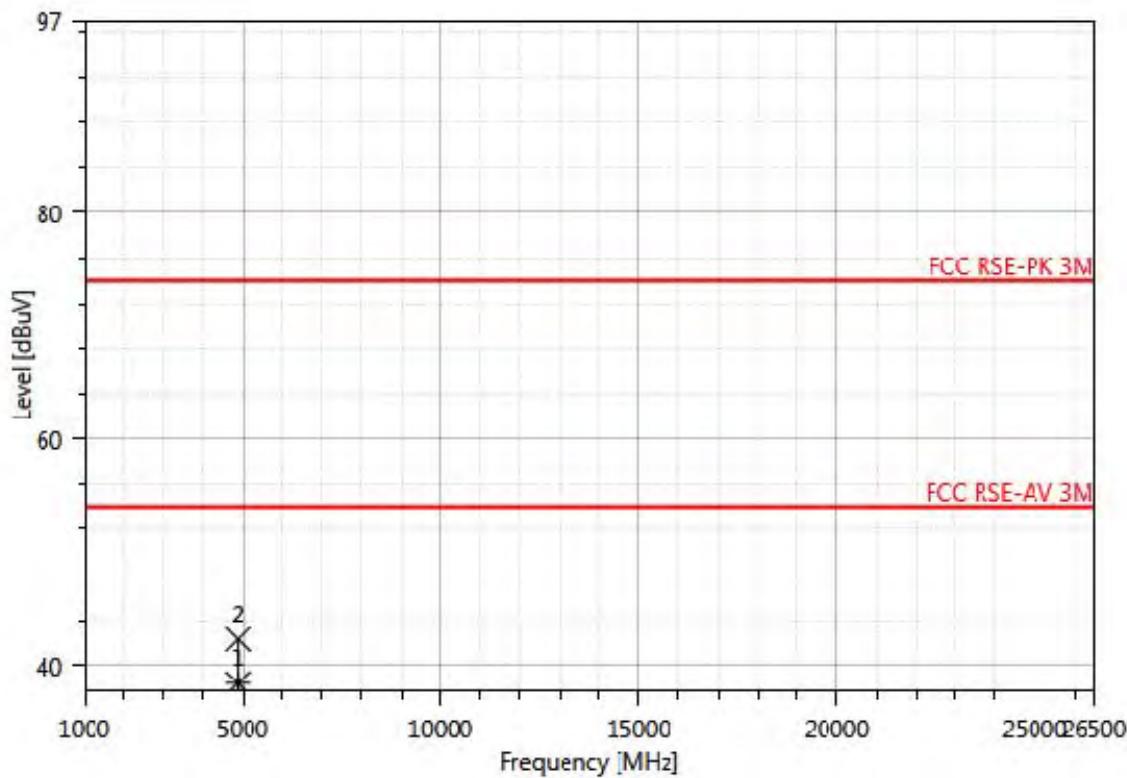
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
MHz	F/H/E/S	Mode	Reading	FS		@3m	
4874.00	H	Average	39.34	34.21	5.13	54.00	-14.66
4874.00	H	Peak	43.55	38.41	5.13	74.00	-30.45

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Operation Mode : 802.11b      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



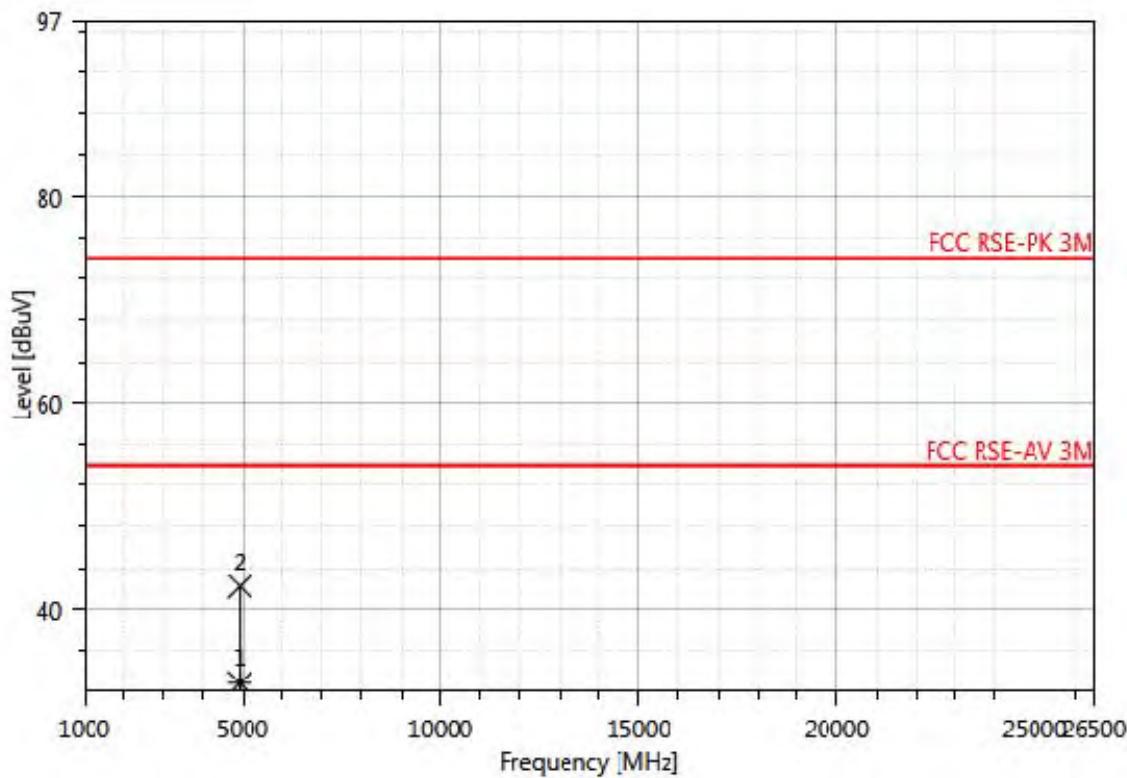
Freq.	Note	Decetor	Actual	Spectrum	Factor	Limit	Margin
MHz	F/H/E/S	Mode	Reading	FS		@3m	
4874.00	H	Average	38.39	33.26	5.13	54.00	-15.61
4874.00	H	Peak	42.26	37.13	5.13	74.00	-31.74

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Operation Mode : 802.11b      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



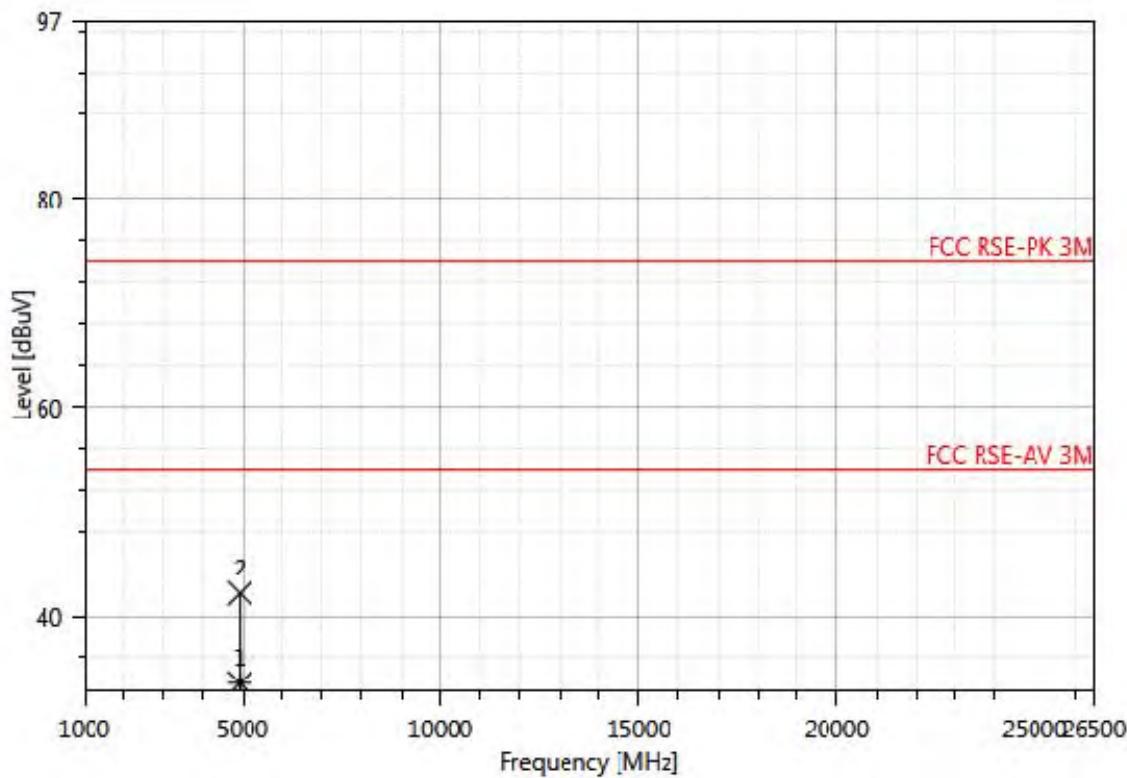
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4924.00	H	Average	32.81	27.56	5.25	54.00	-21.19
4924.00	H	Peak	42.18	36.93	5.25	74.00	-31.82

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Operation Mode : 802.11b      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4924.00	H	Average	33.56	28.31	5.25	54.00	-20.44
4924.00	H	Peak	42.18	36.93	5.25	74.00	-31.82

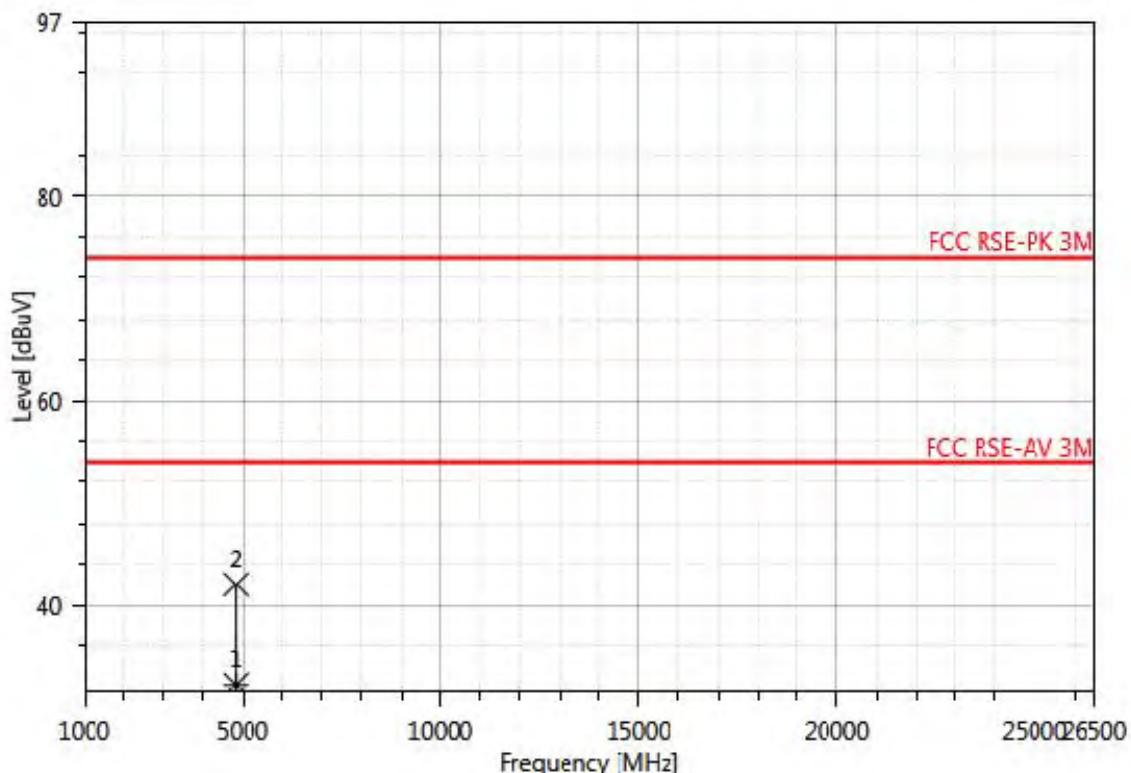
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## Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2412 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



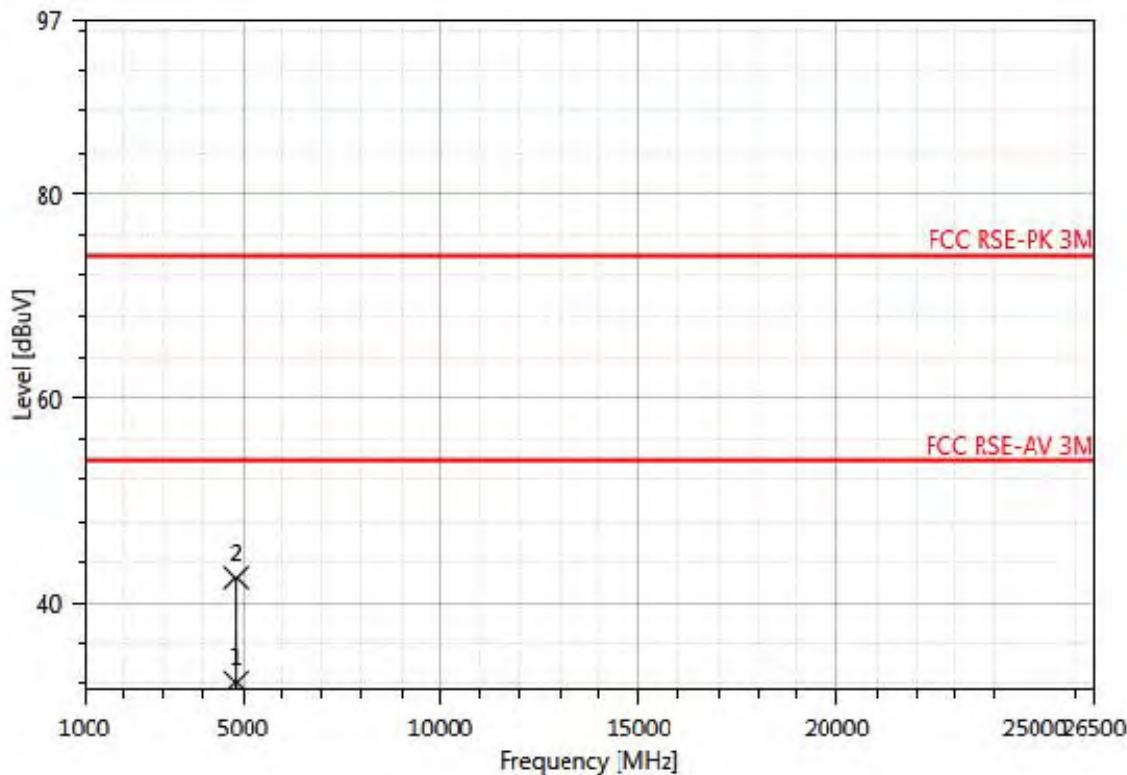
Freq. MHz	Note F/H/E/S	Detector Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4824.00	H	Average	32.26	27.32	4.94	54.00	-21.74
4824.00	H	Peak	42.05	37.11	4.94	74.00	-31.95

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2412 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



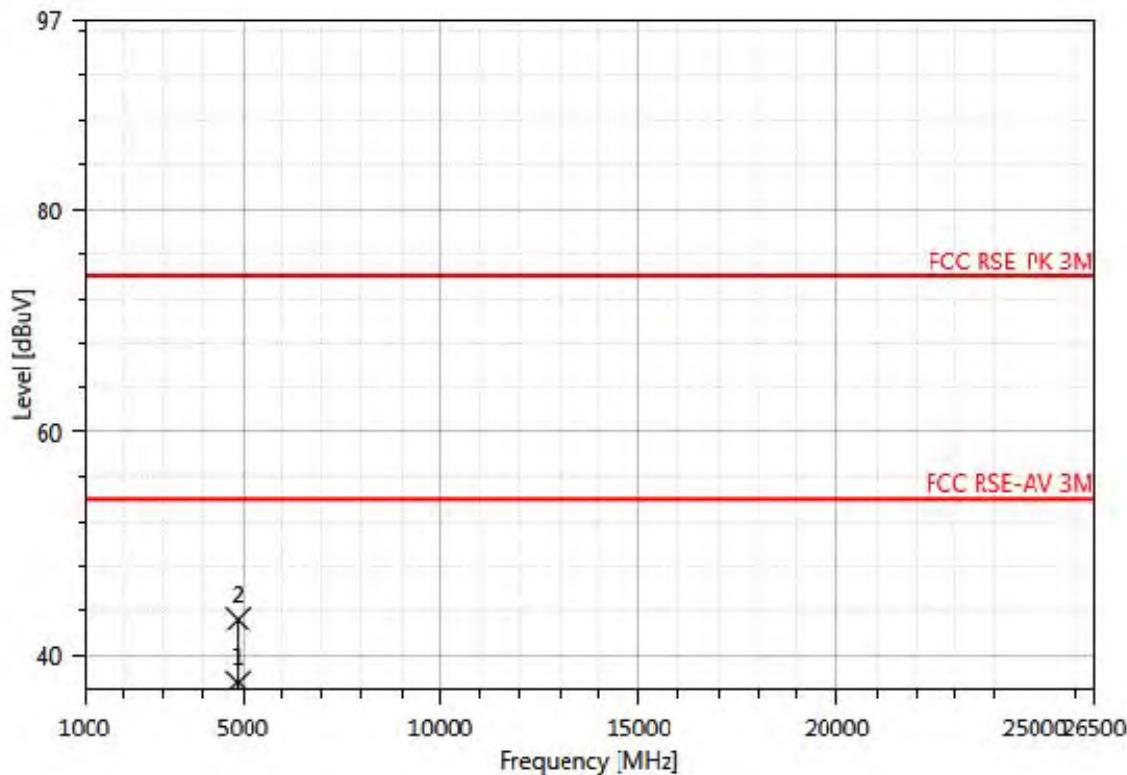
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4824.00	H	Peak	42.46	37.51	4.94	74.00	-31.54
4824.00	H	Peak	32.23	27.29	4.94	74.00	-41.77

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



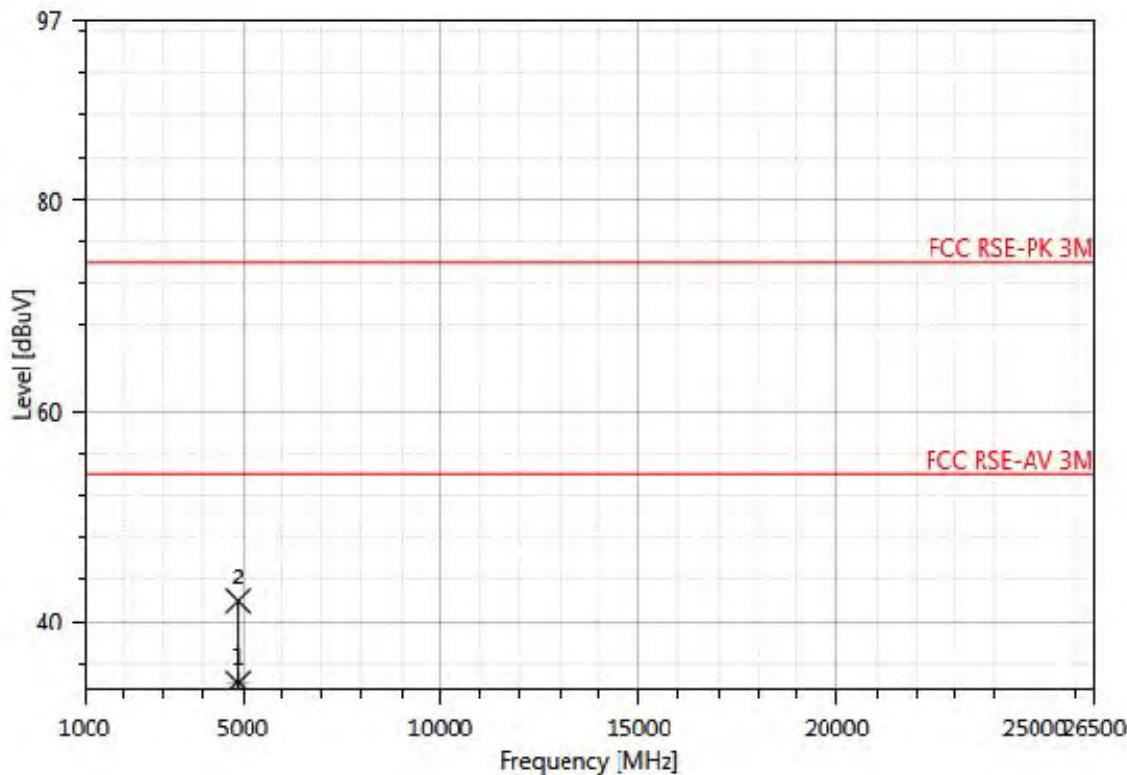
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	Peak	43.26	38.12	5.13	74.00	-30.74
4874.00	H	Peak	37.58	32.45	5.13	74.00	-36.42

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



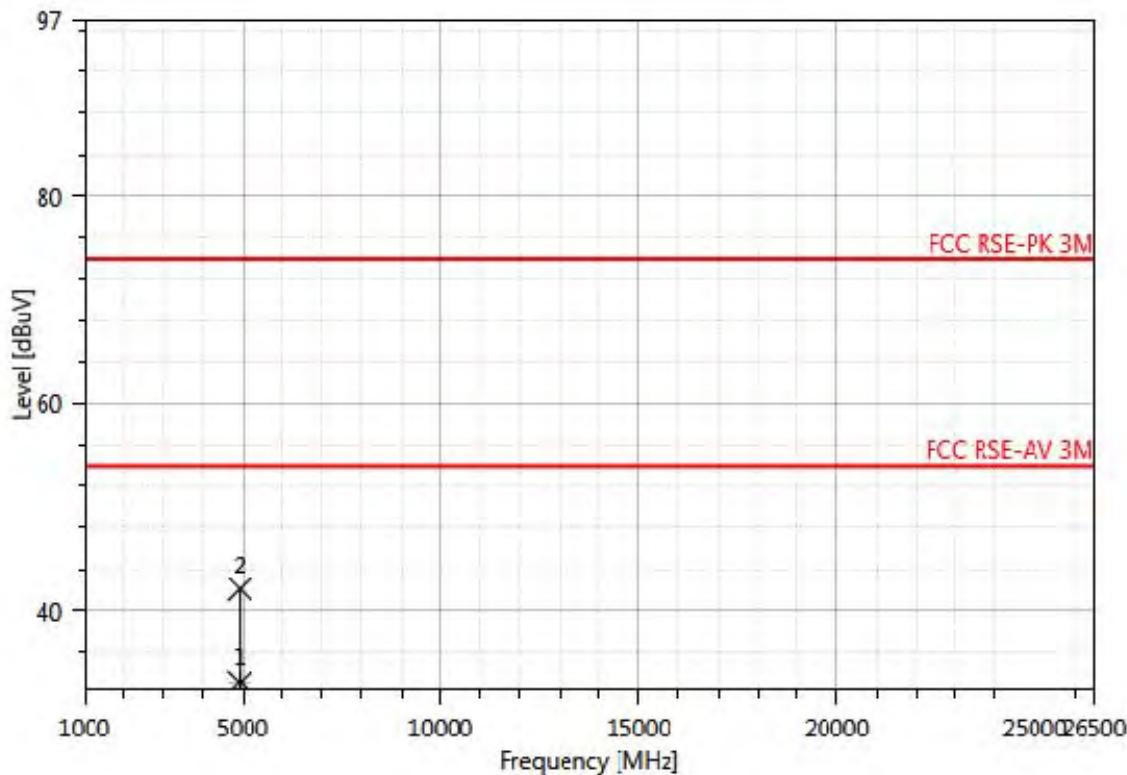
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	Average	34.27	29.14	5.13	54.00	-19.73
4874.00	H	Peak	41.97	36.84	5.13	74.00	-32.03

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



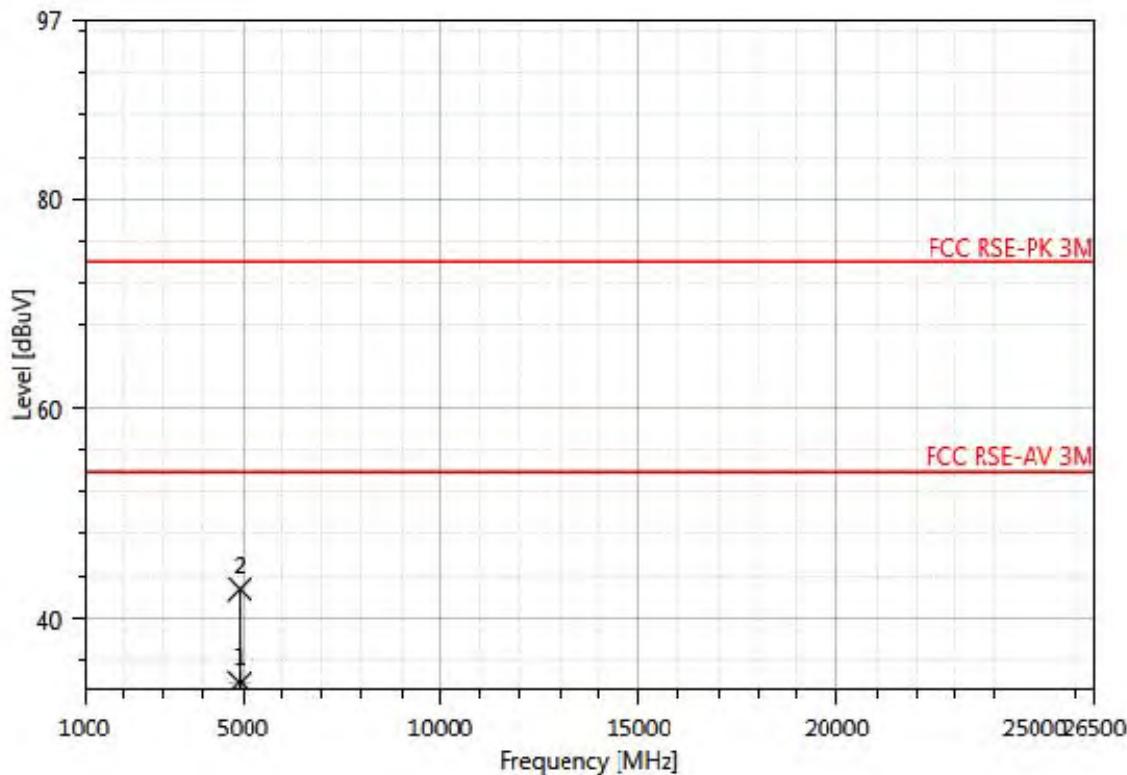
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dB $\mu$ V/m	Margin dB
4924.00	H	Average	33.08	27.83	5.25	54.00	-20.92
4924.00	H	Peak	42.08	36.83	5.25	74.00	-31.92

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Operation Mode : 802.11g      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4924.00	H	Average	33.92	28.67	5.25	54.00	-20.08
4924.00	H	Peak	42.74	37.49	5.25	74.00	-31.26

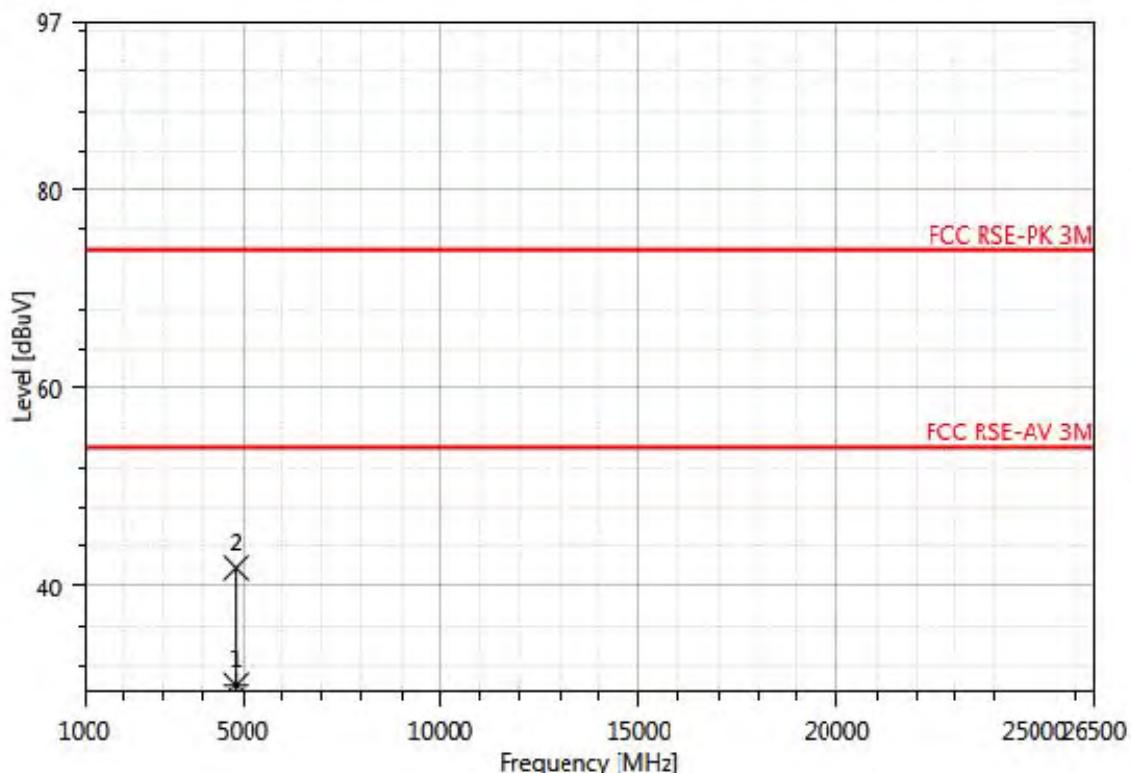
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## Radiated Spurious Emission Measurement Result (802.11\_HT20)

Operation Mode : 802.11n20      Test Date : 08/03/2016  
 Fundamental Frequency : 2412 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



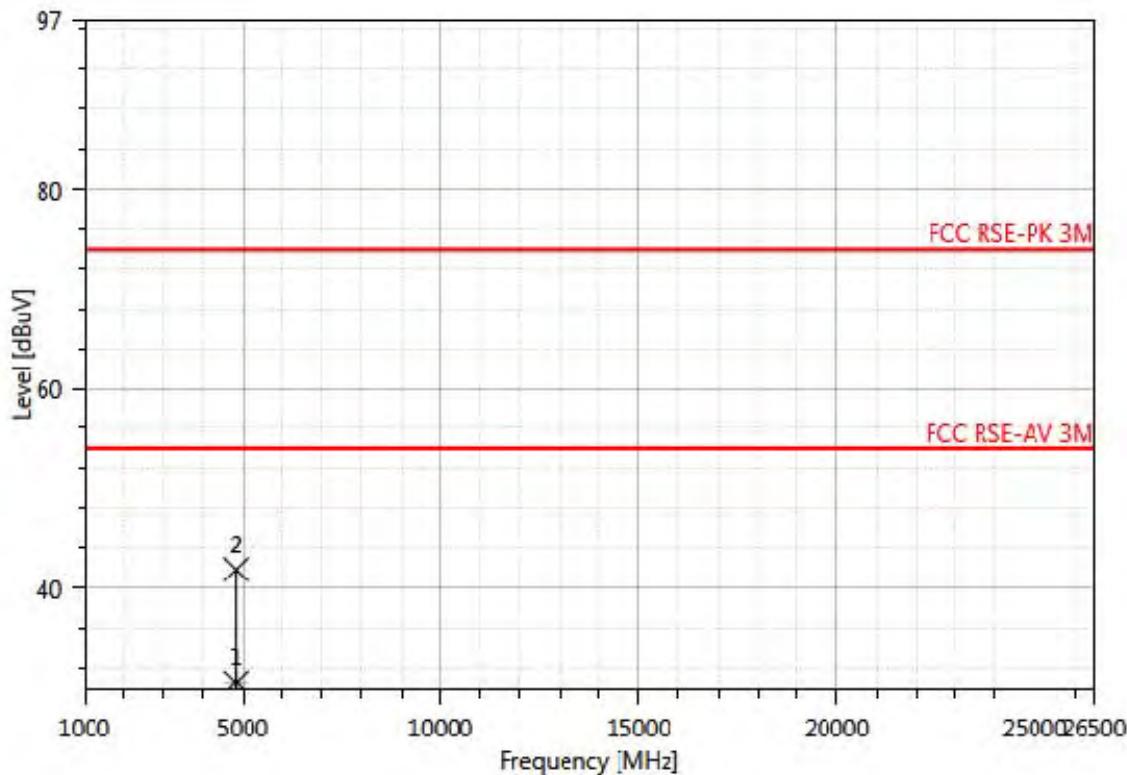
Freq. MHz	Note F/H/E/S	Detector Mode	Actual Reading Level dB $\mu$ V/m	Spectrum		Factor	Limit @3m dBuV/m	Margin dB
				QP/Avg/PK	FS dB $\mu$ V/m			
4824.00	H	Average	30.06	25.12	4.94	54.00	-23.94	
4824.00	H	Peak	41.87	36.93	4.94	74.00	-32.13	

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Operation Mode : 802.11n20      Test Date : 08/03/2016  
 Fundamental Frequency : 2412 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



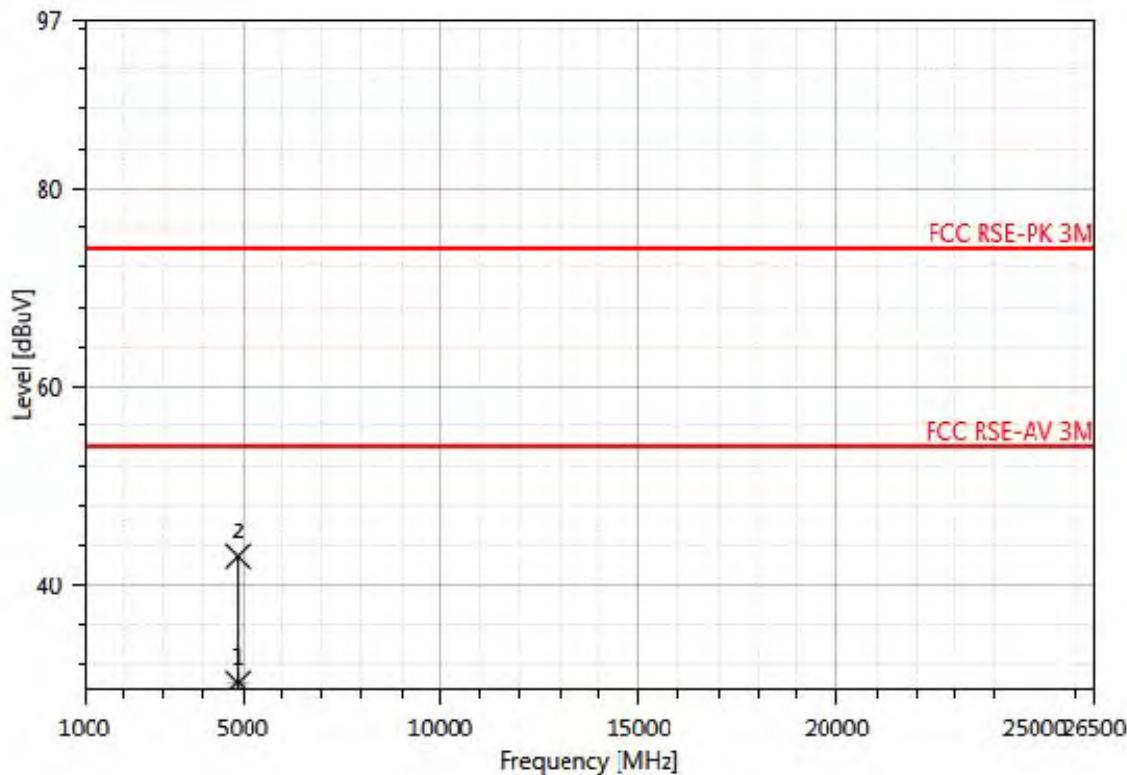
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4824.00	H	Average	30.52	25.58	4.94	54.00	-23.48
4824.00	H	Peak	41.86	36.92	4.94	74.00	-32.14

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Operation Mode : 802.11n20      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



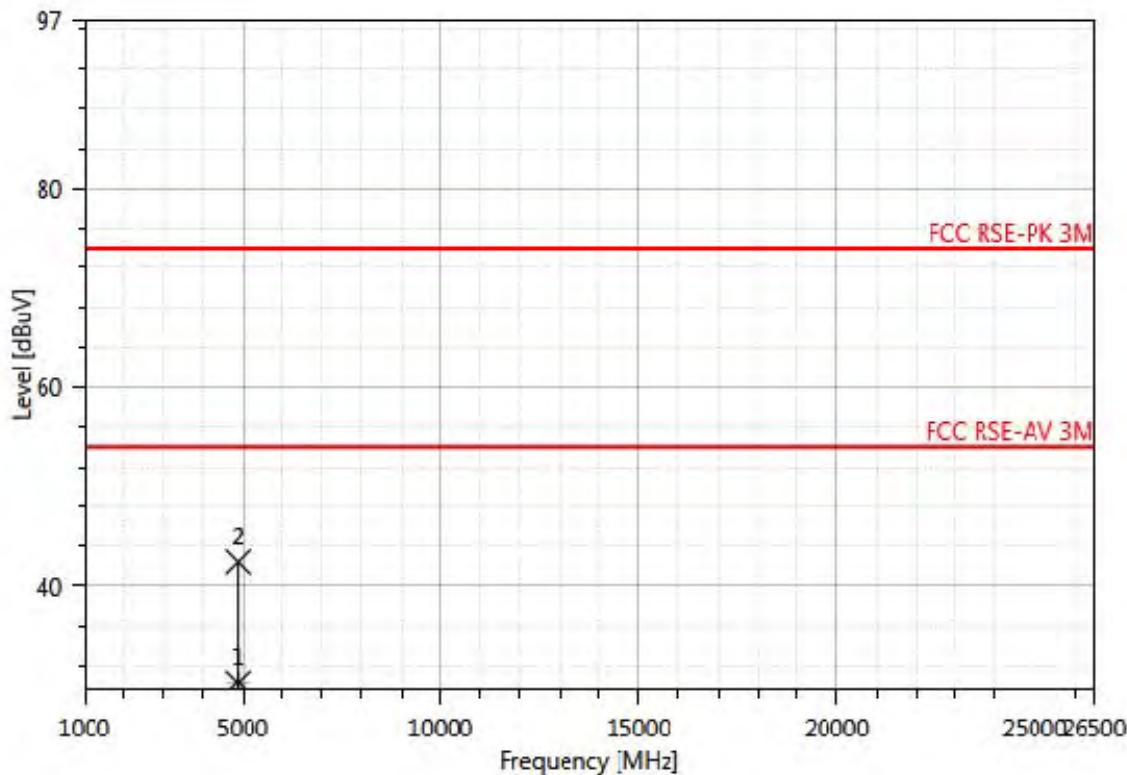
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	Average	30.19	25.06	5.13	54.00	-23.81
4874.00	H	Peak	42.92	37.79	5.13	74.00	-31.08

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Operation Mode : 802.11n20      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



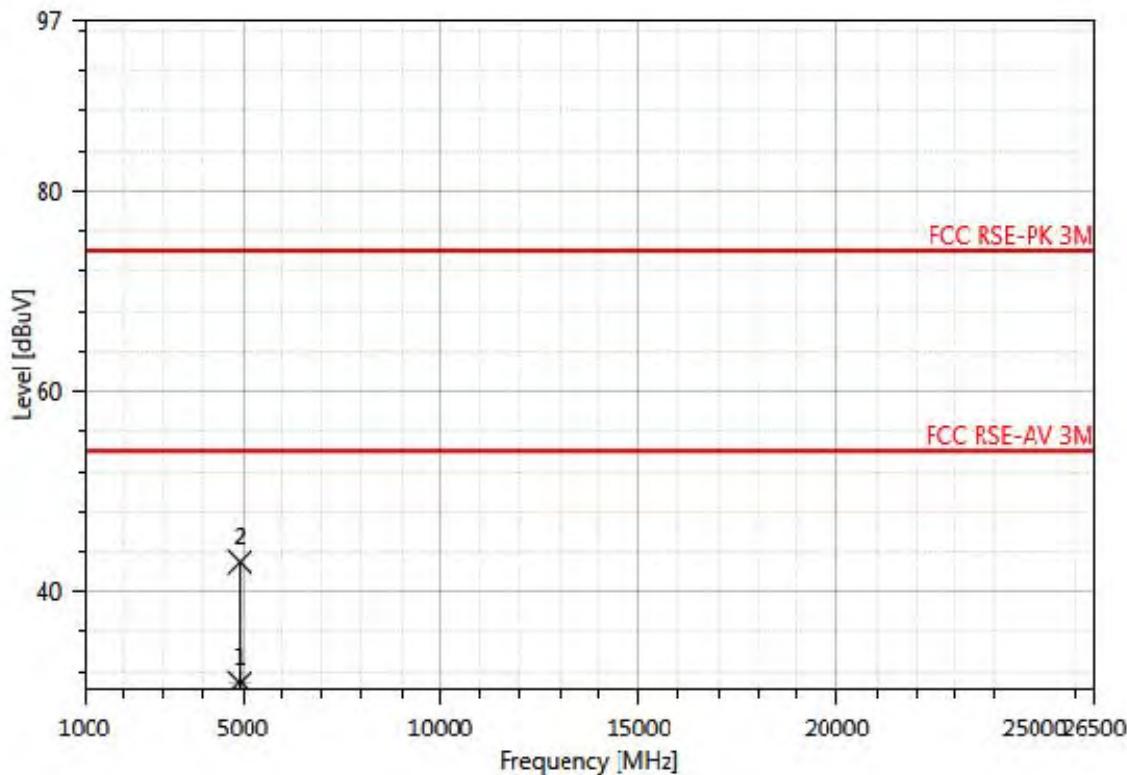
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	Average	30.29	25.16	5.13	54.00	-23.71
4874.00	H	Peak	42.46	37.33	5.13	74.00	-31.54

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Operation Mode : 802.11n20      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



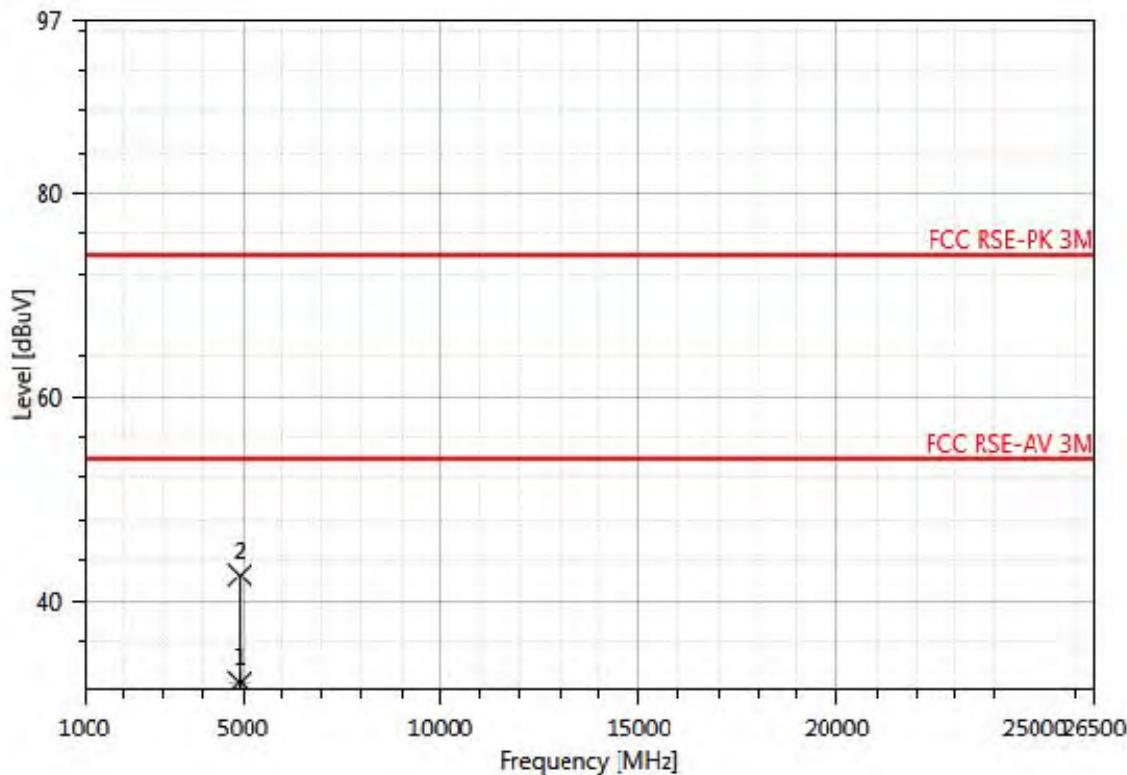
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4924.00	H	Average	30.87	25.62	5.25	54.00	-23.13
4924.00	H	Peak	42.91	37.66	5.25	74.00	-31.09

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Operation Mode : 802.11n20      Test Date : 08/03/2016  
 Fundamental Frequency : 2462 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4924.00	H	Average	32.01	26.76	5.25	54.00	-21.99
4924.00	H	Peak	42.52	37.26	5.25	74.00	-31.48

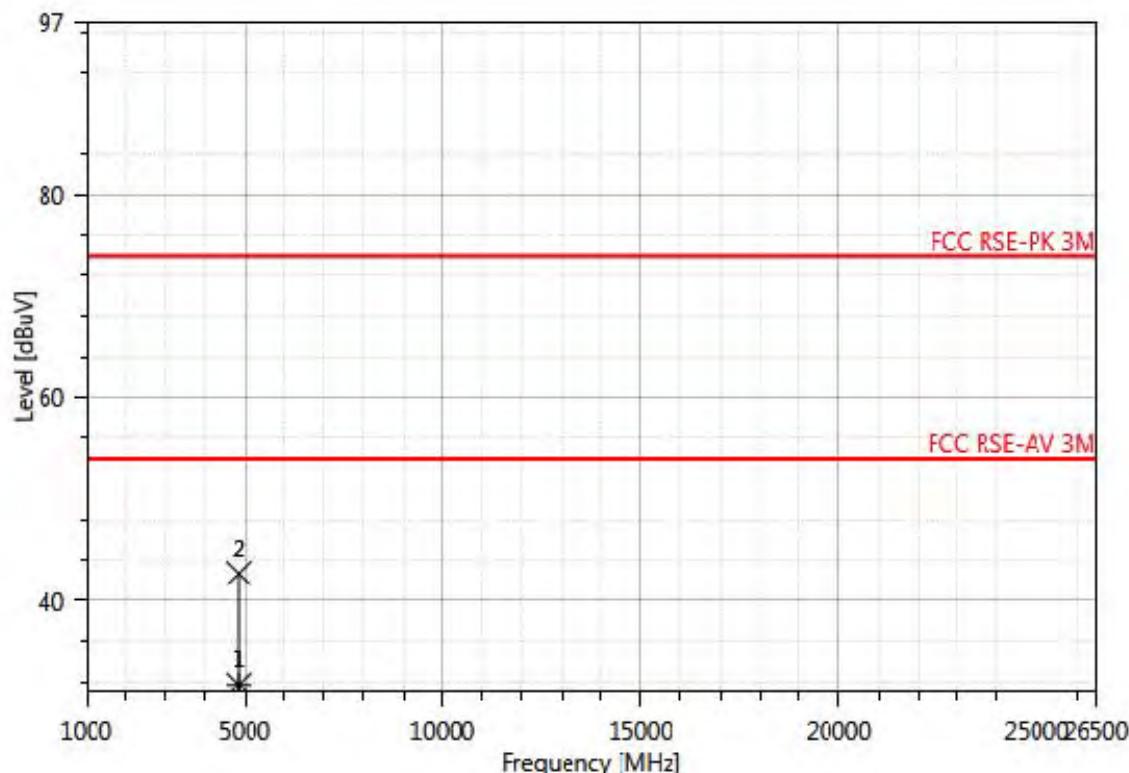
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## Radiated Spurious Emission Measurement Result (802.11\_HT40)

Operation Mode : 802.11n40      Test Date : 08/03/2016  
 Fundamental Frequency : 2422 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



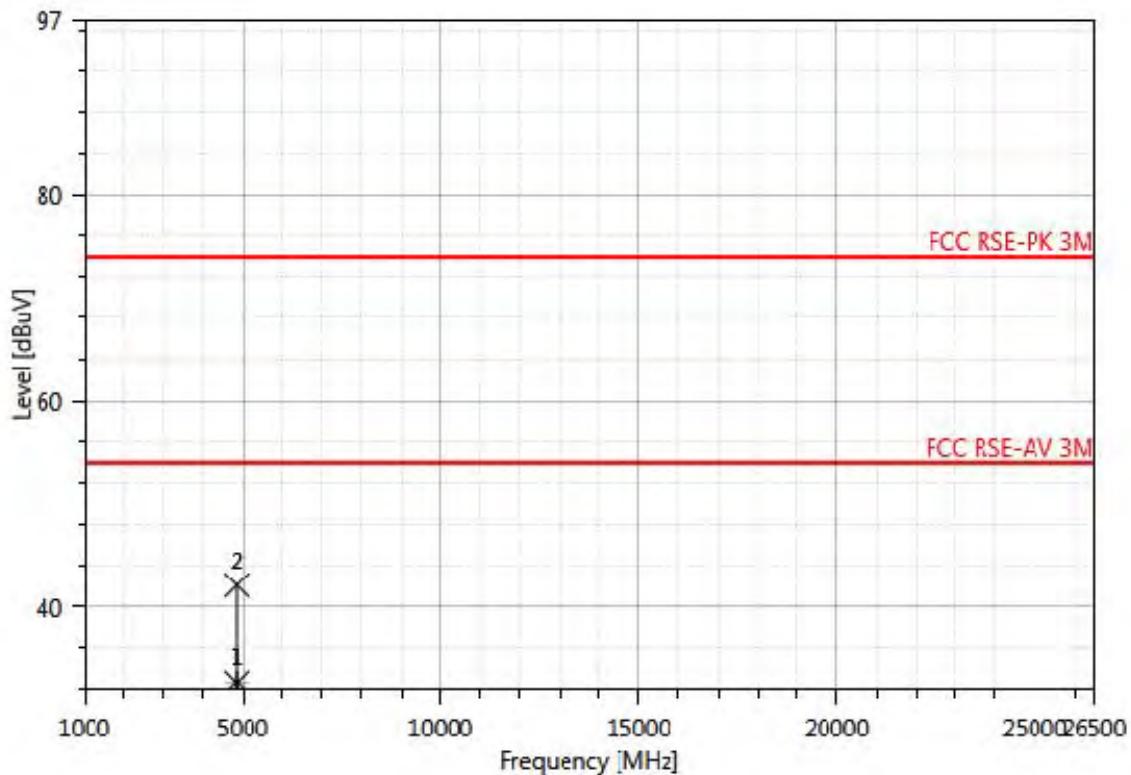
Freq. MHz	Note F/H/E/S	Decotor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum		Factor dB	Limit @3m dBuV/m	Margin dB
				FS dB $\mu$ V/m	Factor dB			
4844.00	H	Average	31.75	26.78	4.97	54.00	-22.25	
4844.00	H	Peak	42.71	37.74	4.97	74.00	-31.29	

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Operation Mode : 802.11n40      Test Date : 08/03/2016  
 Fundamental Frequency : 2422 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH LOW      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



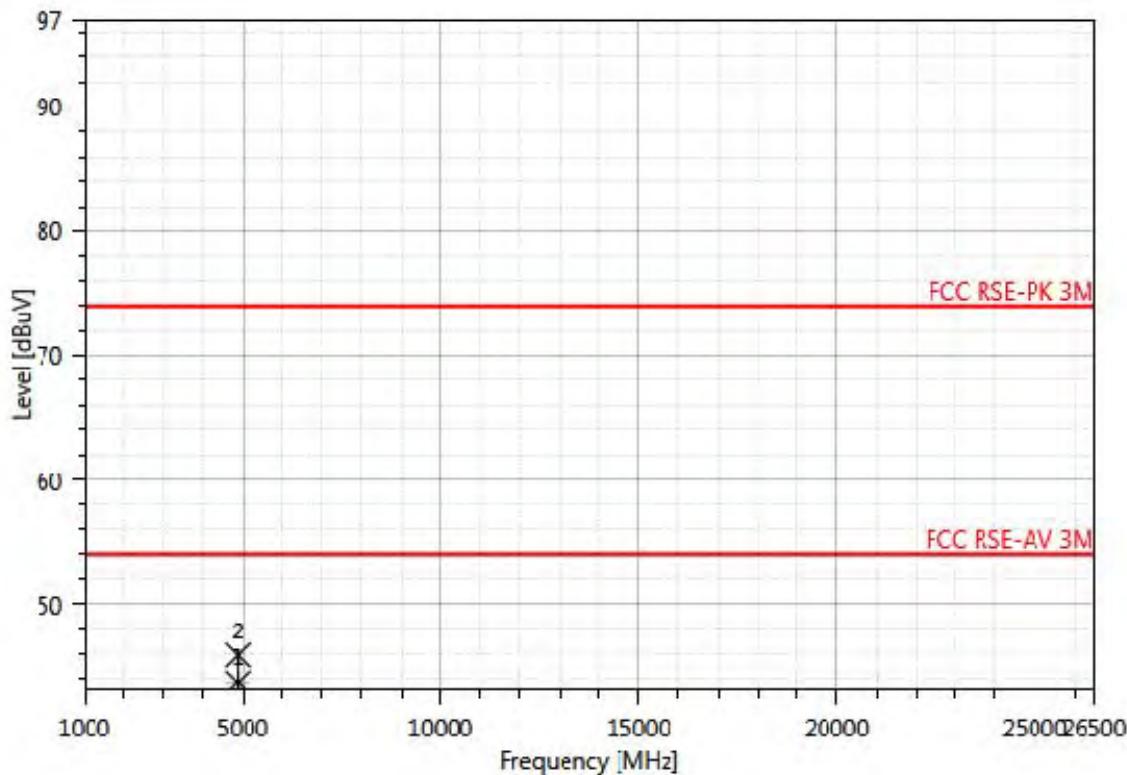
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4844.00	H	Average	32.61	27.64	4.97	54.00	-21.39
4844.00	H	Peak	42.06	37.09	4.97	74.00	-31.94

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Operation Mode : 802.11n40      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



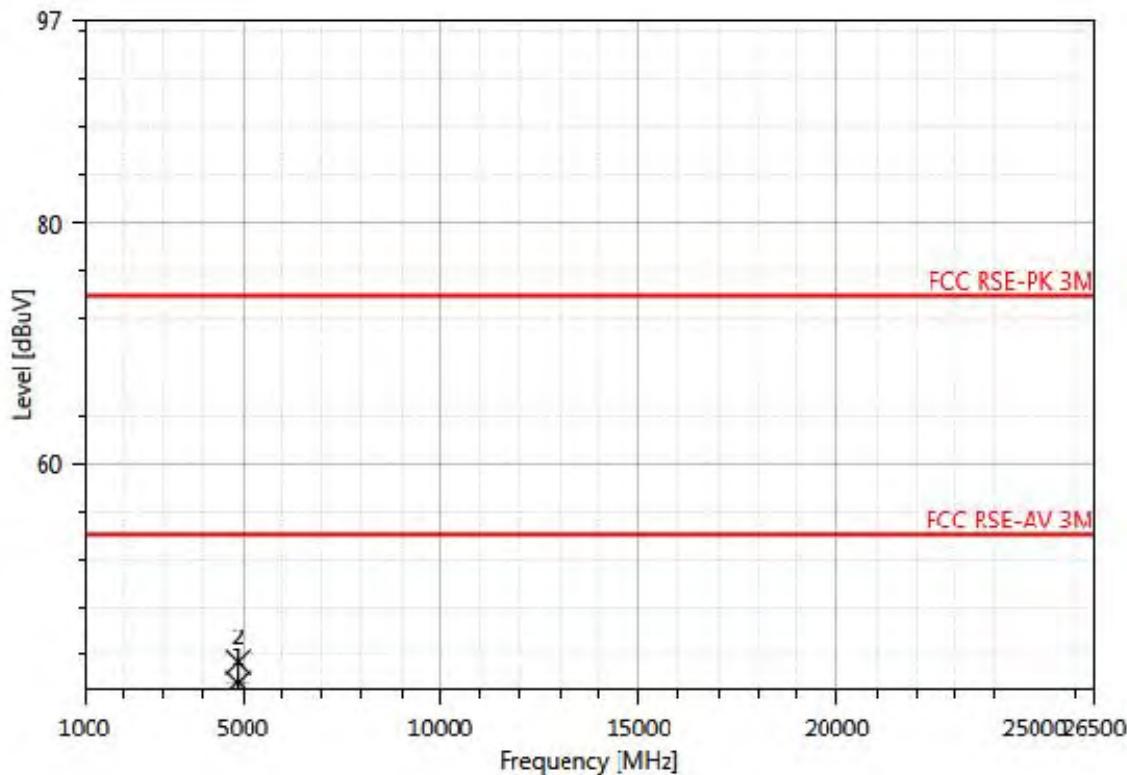
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	Average	43.69	38.56	5.13	54.00	-10.31
4874.00	H	Peak	45.89	40.76	5.13	74.00	-28.11

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Operation Mode : 802.11n40      Test Date : 08/03/2016  
 Fundamental Frequency : 2437 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH MID      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



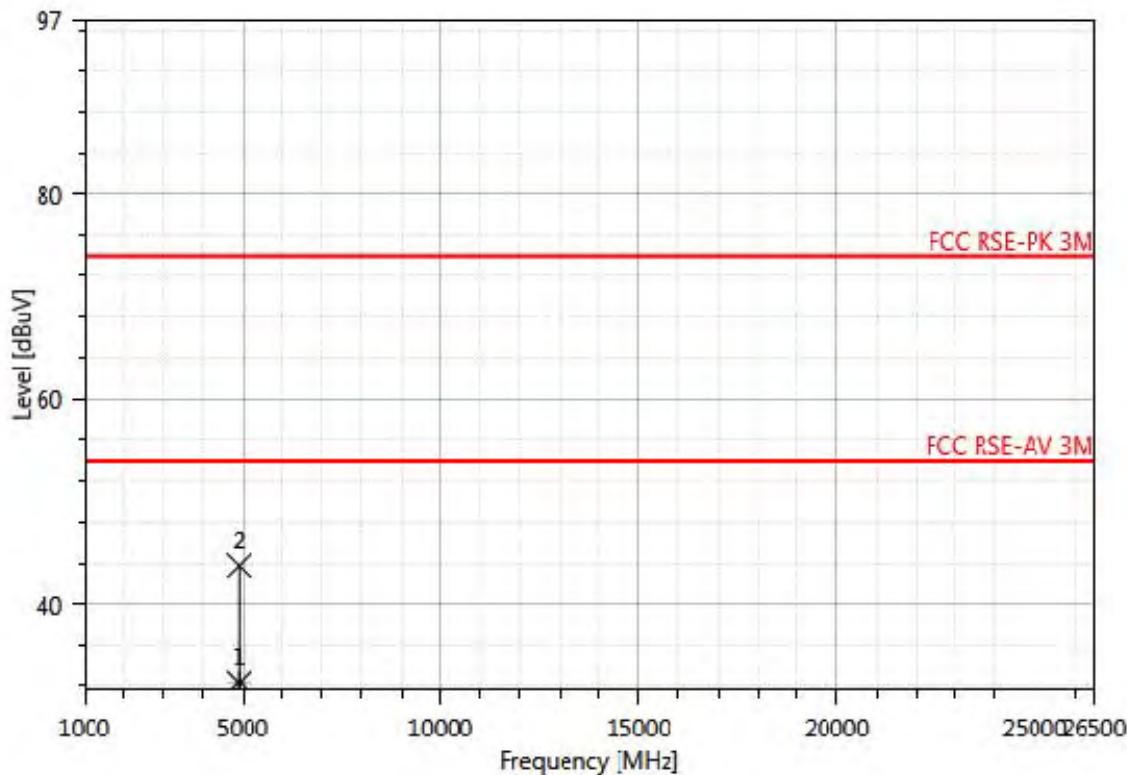
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	Average	41.70	36.57	5.13	54.00	-12.30
4874.00	H	Peak	43.41	38.28	5.13	74.00	-30.59

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Operation Mode : 802.11n40      Test Date : 08/03/2016  
 Fundamental Frequency : 2452 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : VERTICAL



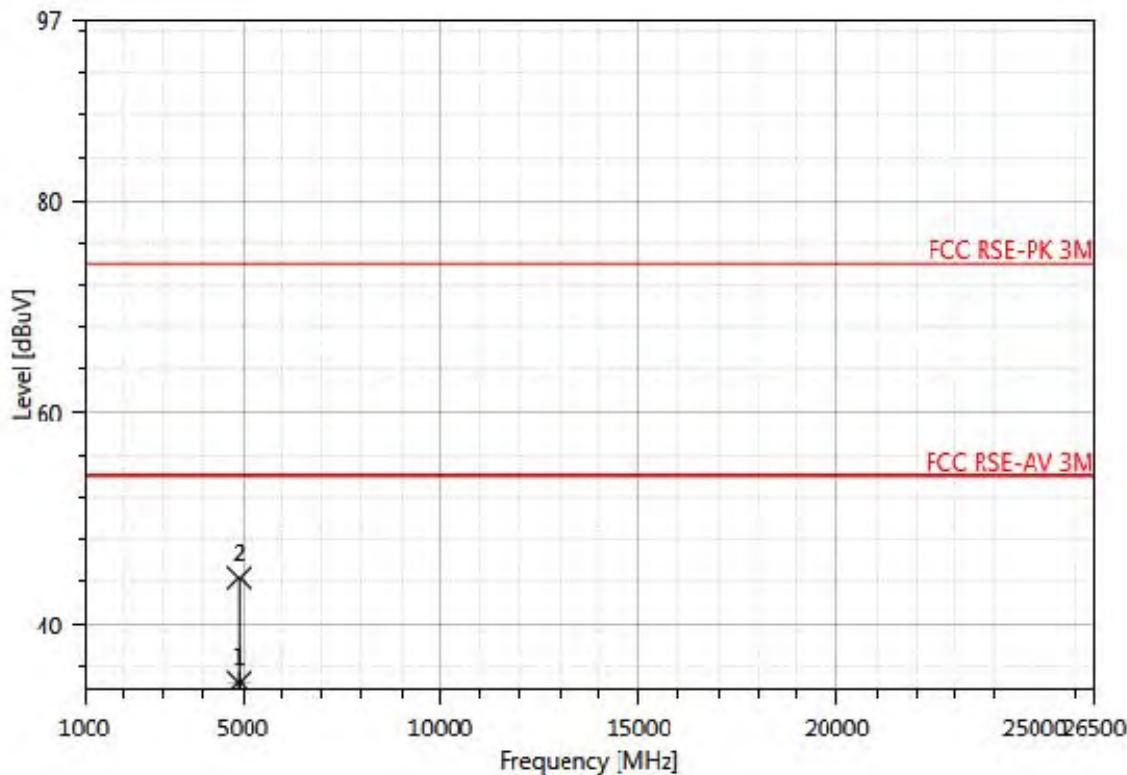
Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4904.00	H	Average	32.35	27.12	5.23	54.00	-21.65
4904.00	H	Peak	43.78	38.55	5.23	74.00	-30.22

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Operation Mode : 802.11n40      Test Date : 08/03/2016  
 Fundamental Frequency : 2452 MHz      Temp. / Humi. : 21 deg\_C / 62 RH  
 Operation Band : Tx CH HIGH      Test Engineer : Kane  
 EUT Pol. : H Plane      Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Decetor Mode QP/AV/PK	Actual Reading Level dB $\mu$ V/m	Spectrum FS dB $\mu$ V/m	Factor dB	Limit @3m dBuV/m	Margin dB
4904.00	H	Average	34.54	29.31	5.23	54.00	-19.46
4904.00	H	Peak	44.39	39.16	5.23	74.00	-29.61

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## 12 PEAK POWER SPECTRAL DENSITY

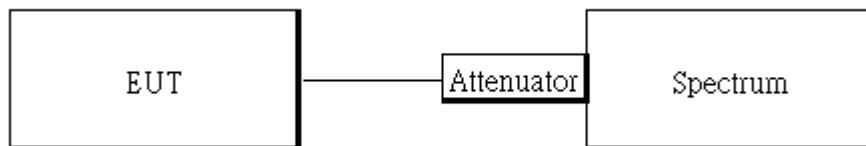
### 12.1 Standard Applicable

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

### 12.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	02/26/2016	02/25/2017
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

### 12.3 Test Set-up



### 12.4 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz. & the VBW = 10 kHz
5. For defining Restricted Band Edge Limit:  
Set the RBW = 100kHz & VBW = 300 kHz.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. 802.11n MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

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**Note:**

Antenna Gain: 3.22 dBi  
Aux1 Antenna Gain: 3.22 dBi

Number Antenna: 2 pcs  
Limit: 8 dBm

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

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

Effective Legacy Gain (dBi) =  $3.22 + 3.01 = 6.23 \text{ dBi}$

Limit:  $8 \text{ dBm} - (6.23 - 6 \text{ dBi}) = 7.77 \text{ dBm}$

## 12.5 Measurement Result

POWER DENSITY 802.11b MODE				POWER DENSITY 802.11g MODE			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result	Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2412	-4.87	8.00	PASS	2412	-7.52	8.00	PASS
2437	-3.96	8.00	PASS	2437	-7.33	8.00	PASS
2462	-4.20	8.00	PASS	2462	-7.49	8.00	PASS

POWER DENSITY 802.11n HT20 MODE				POWER DENSITY 802.11n HT40 MODE			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result	Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2412	-9.83	7.77	PASS	2422	-11.67	7.77	PASS
2437	-9.62	7.77	PASS	2437	-11.99	7.77	PASS
2462	-8.97	7.77	PASS	2452	-11.73	7.77	PASS

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## Bandedge Limit

Bandedge Limit 802.11b MODE		
Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit (dBm)
2412	8.79	-11.21
2462	8.58	-11.42

Bandedge Limit 802.11g MODE		
Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit (dBm)
2412	5.99	-14.01
2462	6.25	-13.75

Bandedge Limit 802.11n20 MODE		
Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit (dBm)
2412	3.20	-16.80
2462	3.87	-16.13

Bandedge Limit 802.11n40 MODE		
Frequency (MHz)	RF Power Density (dBm)	Bandedge Limit (dBm)
2422	0.11	-19.89
2452	0.44	-19.56

\*Refer to next page for plots

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## 802.11b

## Power Spectral Density Test Plot (CH-Low)



## Power Spectral Density Test Plot (CH-Mid)



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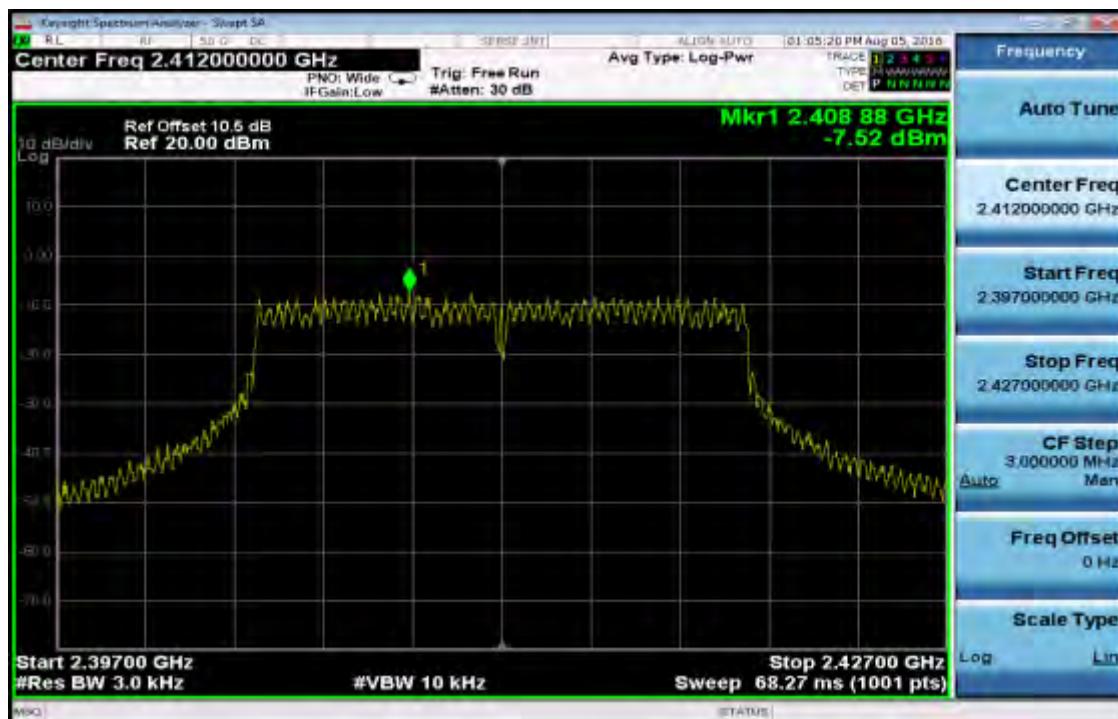
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## Power Spectral Density Test Plot (CH-High)



## 802.11g

## Power Spectral Density Test Plot (CH-Low)



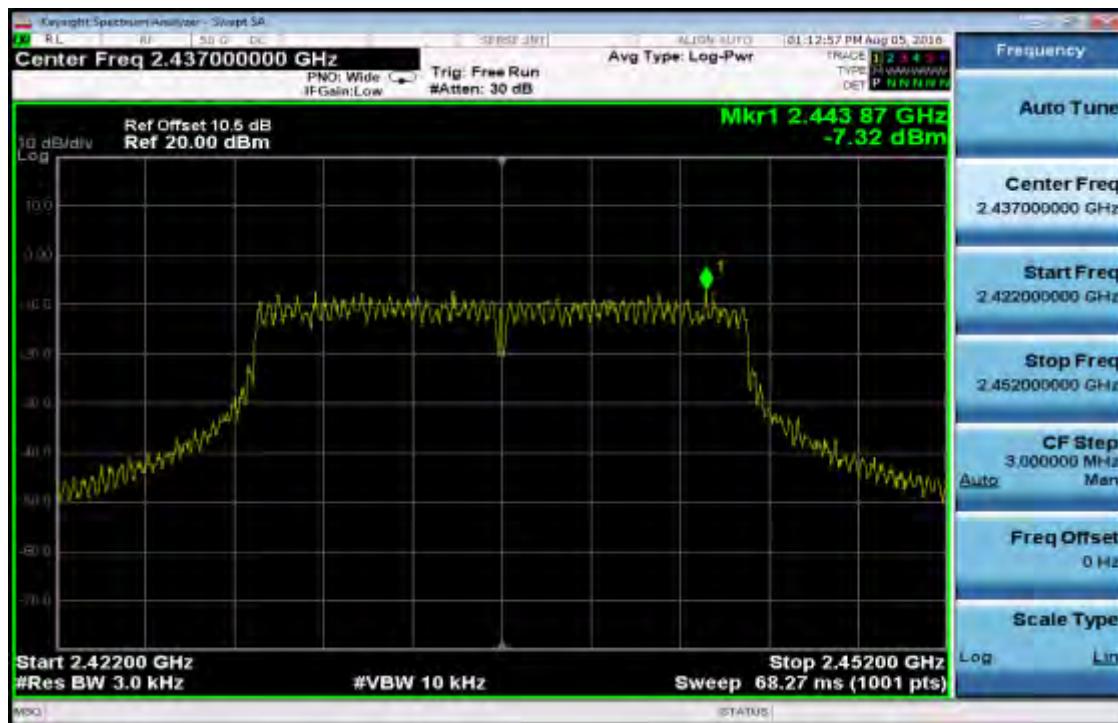
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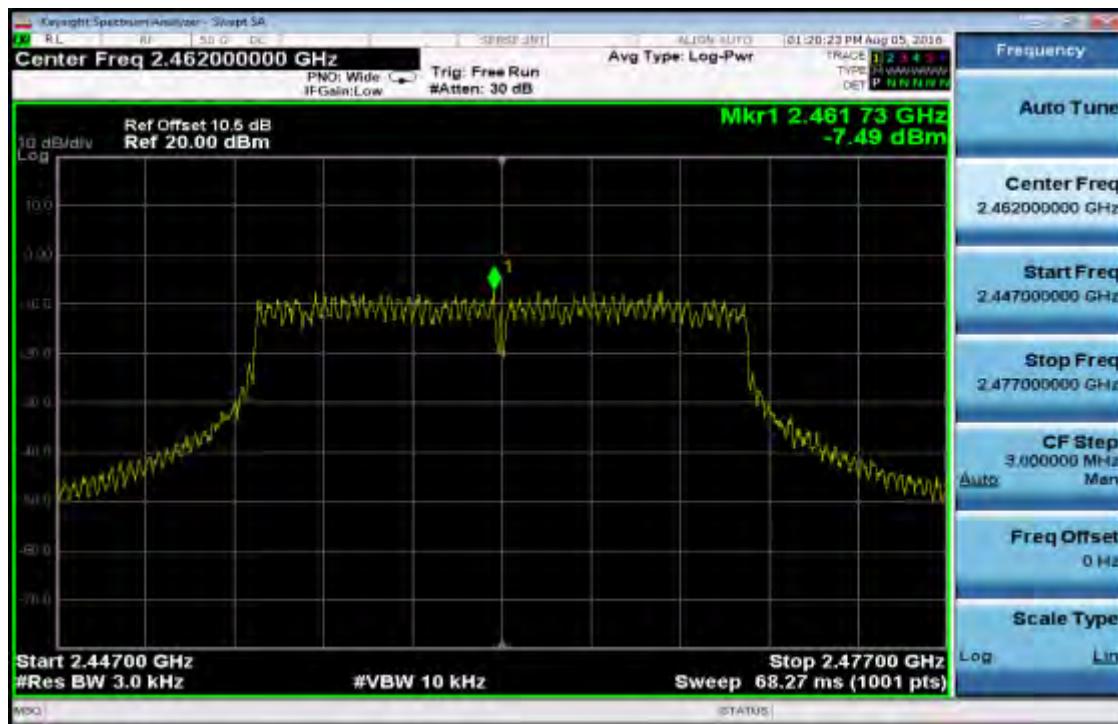
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## Power Spectral Density Test Plot (CH-Mid)



## Power Spectral Density Test Plot (CH-High)



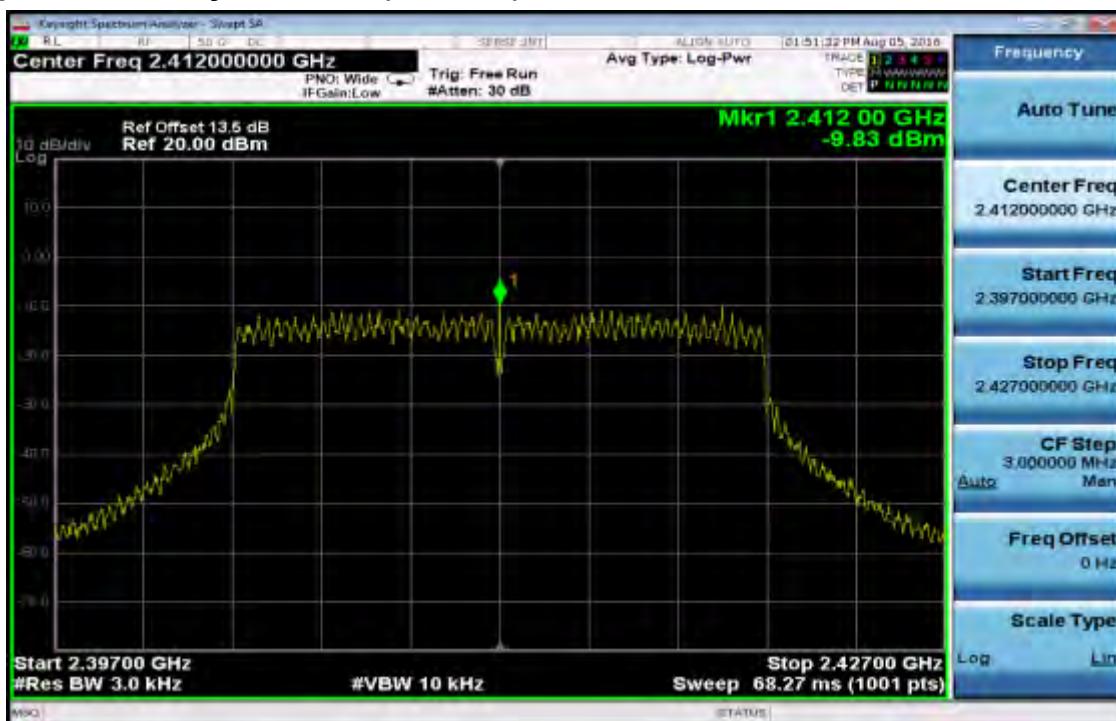
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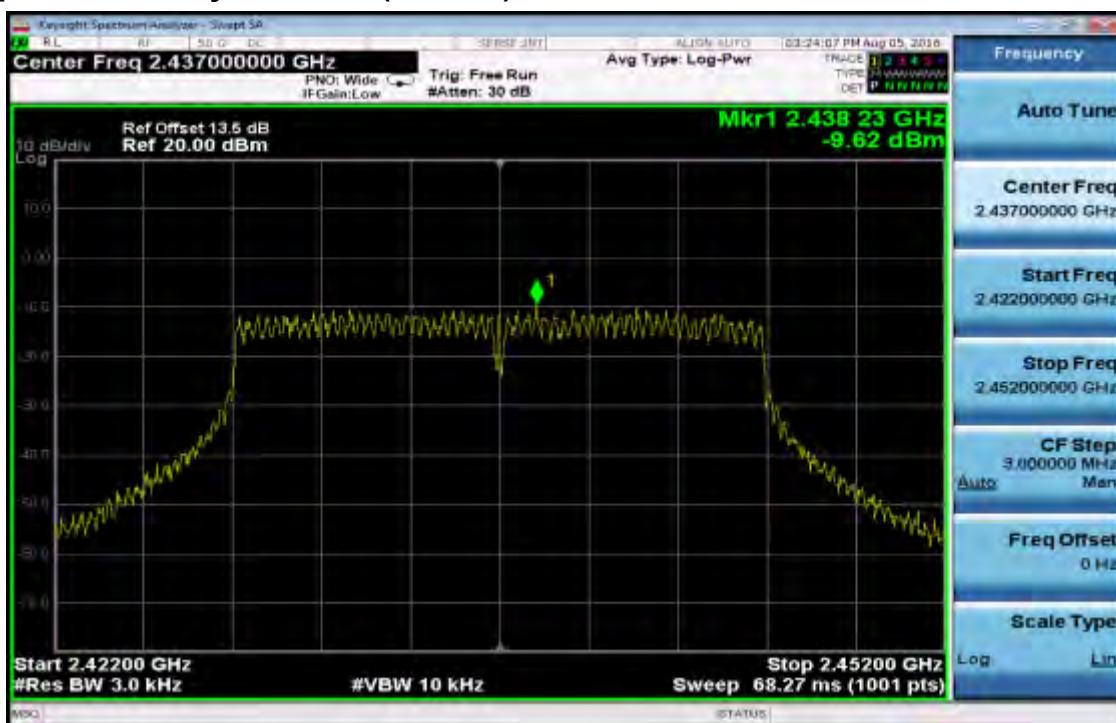
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## 802.11n\_HT20 (MIMO)

## Power Spectral Density Test Plot (CH-Low)



## Power Spectral Density Test Plot (CH-Mid)



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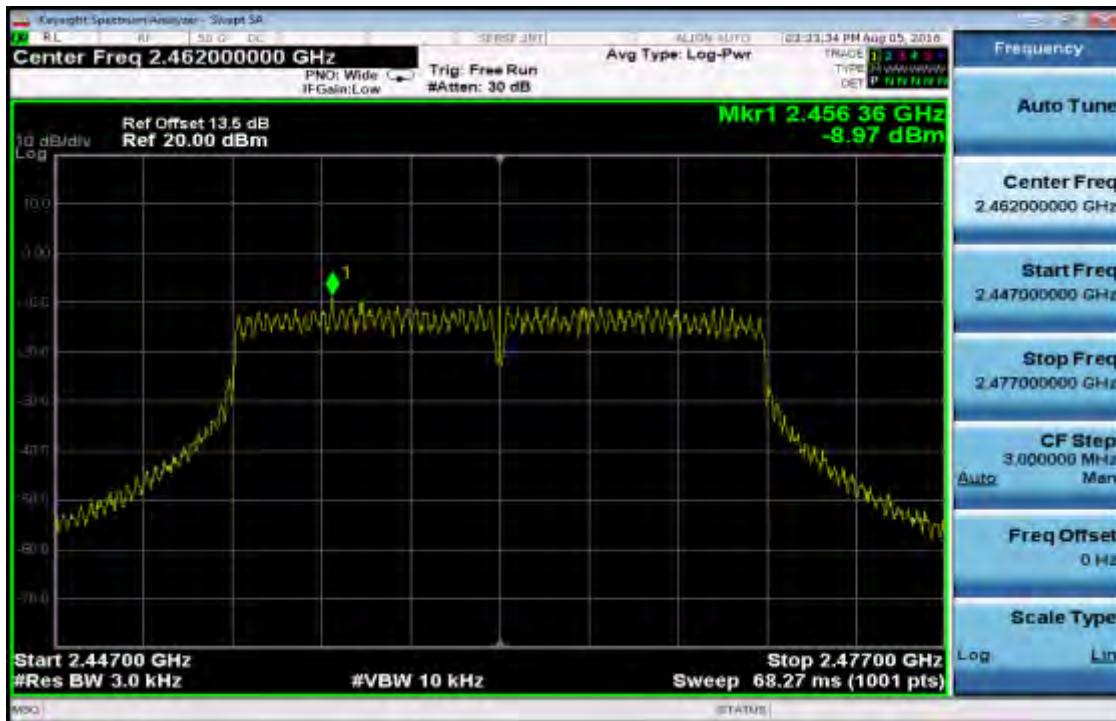
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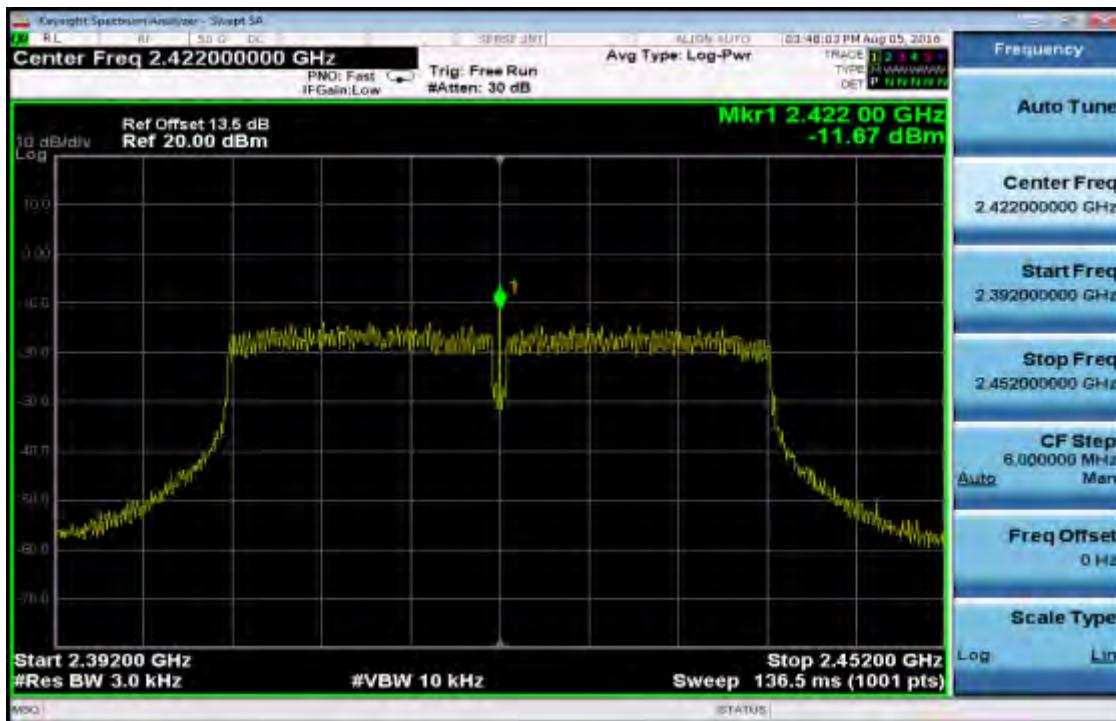
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## Power Spectral Density Test Plot (CH-High)



## 802.11n\_HT40 (MIMO)

## Power Spectral Density Test Plot (CH-Low)



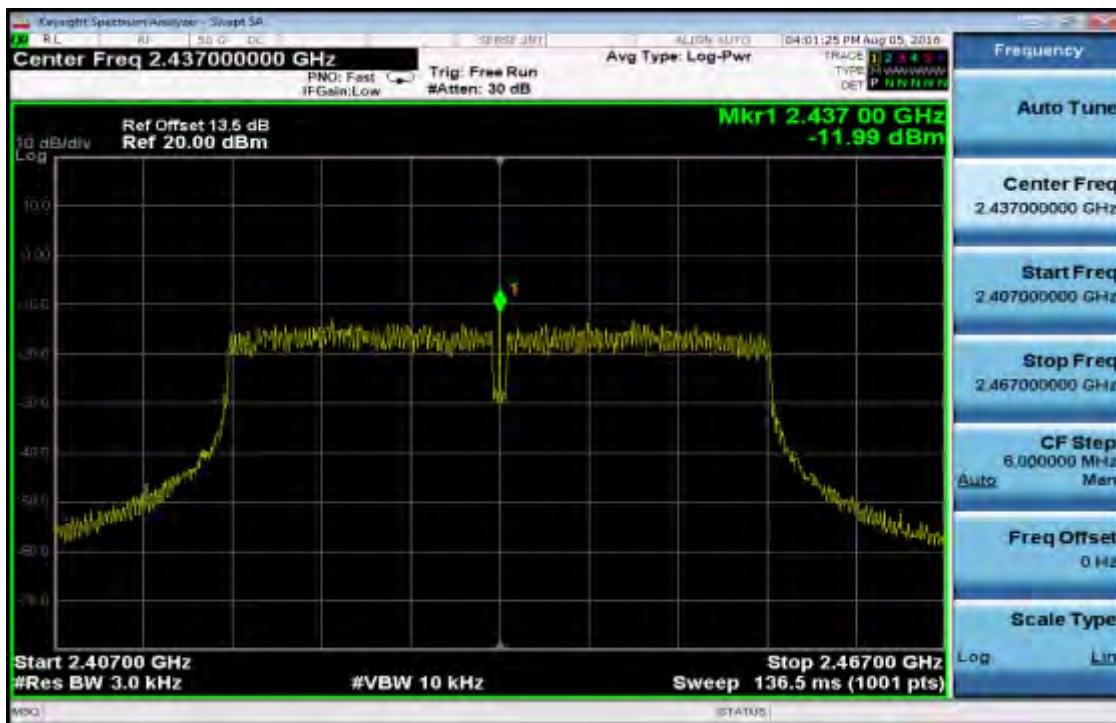
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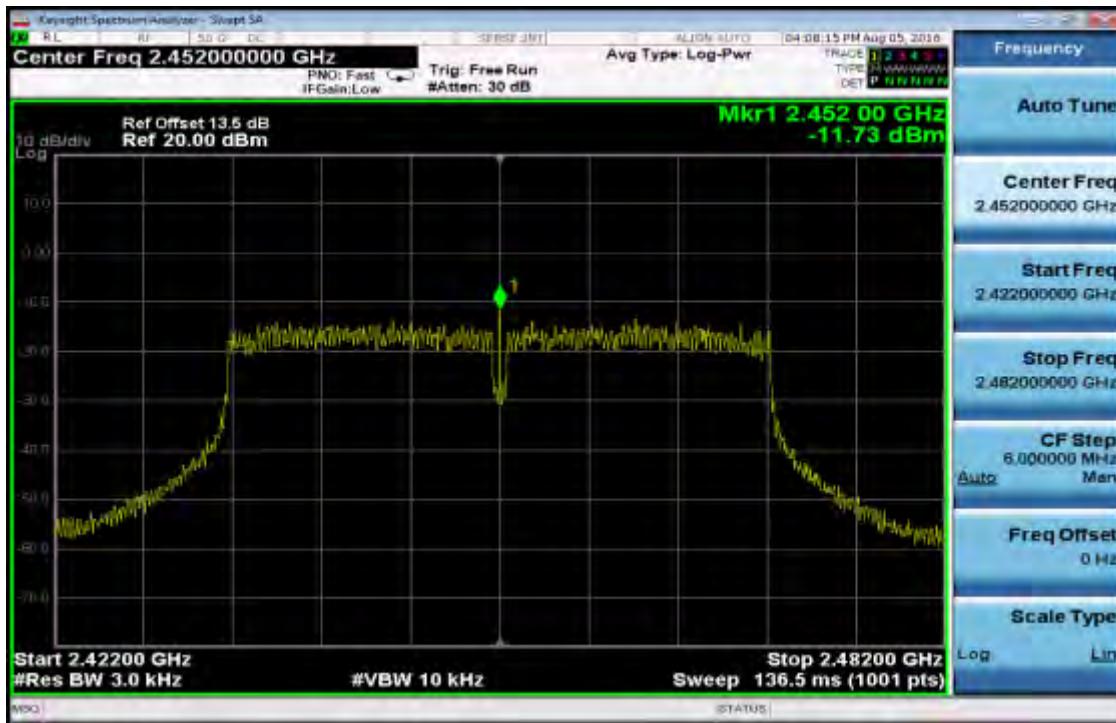
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## Power Spectral Density Test Plot (CH-Mid)



## Power Spectral Density Test Plot (CH-High)



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## 802.11b

## Power Spectral Density for Bandedge Limit (CH-Low)



## Power Spectral Density for Bandedge Limit (CH-High)



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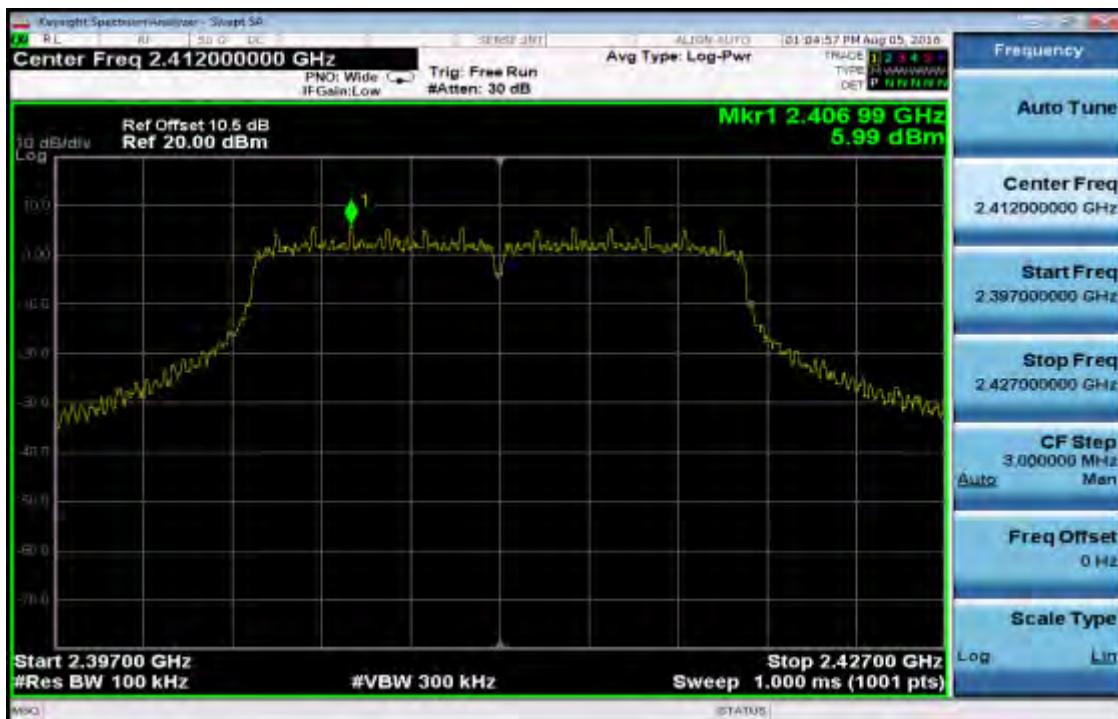
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## 802.11g

## Power Spectral Density for Bandedge Limit (CH-Low)



## Power Spectral Density for Bandedge Limit (CH-High)



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## 802.11n\_HT20

## Power Spectral Density for Bandedge Limit (CH-Low)



## Power Spectral Density for Bandedge Limit (CH-High)



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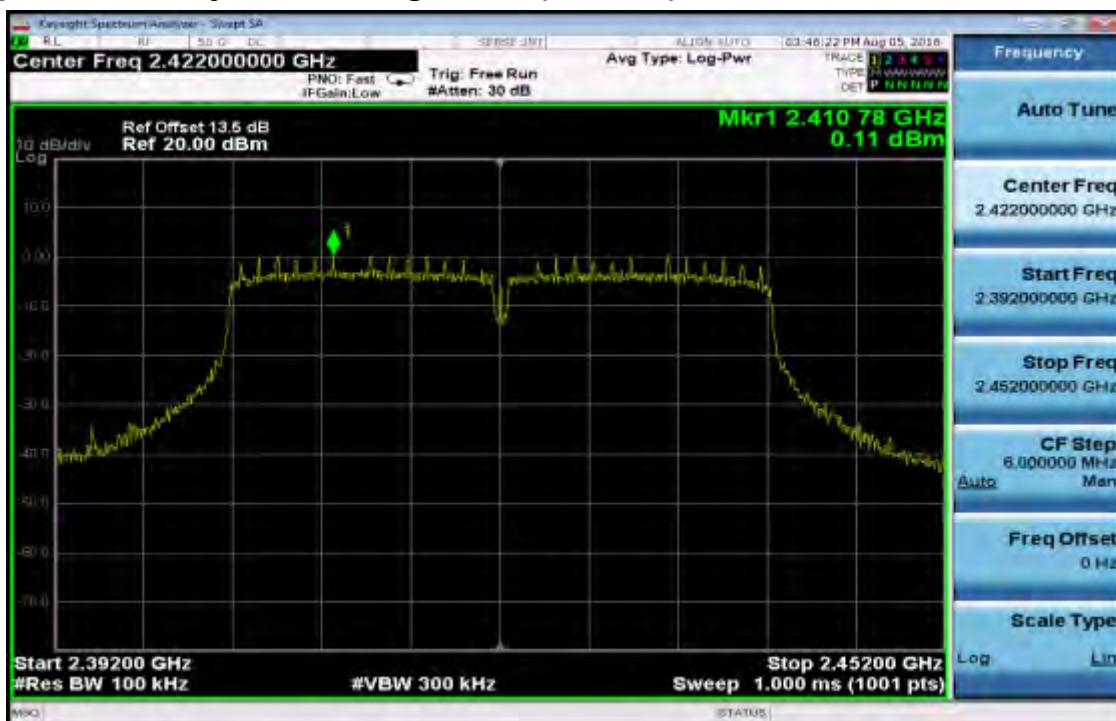
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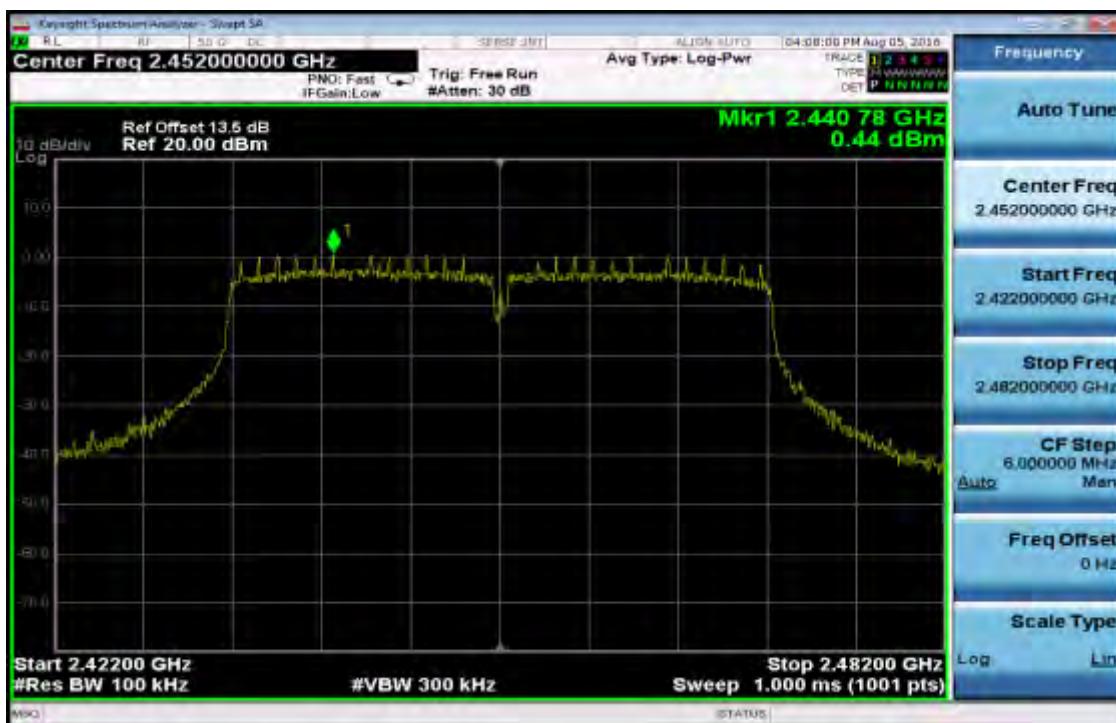
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## 802.11n\_HT40

## Power Spectral Density for Bandedge Limit (CH-Low)



## Power Spectral Density for Bandedge Limit (CH-High)



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## 13 ANTENNA REQUIREMENT

### 13.1 Standard Applicable

For intentional device, 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.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

According to RSS-GEN 8.3

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.<sup>9</sup> When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

### 13.2 Antenna Connected Construction

An embedded-in antenna design is used.

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

*~ End of Report ~*

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