

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** WLAN 802.11b/g/n 2T2R Module

**Brand Name: Foxconn** 

Model No.: **WFU032** 

**Model Difference:** N/A

FCC ID: **RX3-WFU032** 

IC: 2878F-WFU032

**Report No.:** E2/2017/30026

**Issue Date:** Mar. 27, 2017

FCC Rule Part: §15.247, Cat: DTS

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

Hon Hai Precision Industry Co., Ltd.

Prepared for: No.151, Sec. 1, Nankan Rd., Lujhu Township,

Taoyuan County, 33859, Taiwan (R.O.C)

SGS Taiwan Ltd.

**Electronics & Communication Laboratory** Prepared by:

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Testing Laboratory 0513

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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:** WLAN 802.11b/g/n 2T2R Module

**Brand Name:** Foxconn **WFU032** Model No.:

**Model Difference:** N/A

FCC ID: RX3-WFU032

IC: 2878F-WFU032

E2/2017/30026 **Report Number:** 

Date of test: Mar. 08, 2017 ~ Mar. 27, 2017

Date of EUT Received: Mar. 08, 2017

## We hereby certify that:

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

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

Test By: Date: Mar. 27, 2017

Jerry Lu / Sr. Engineer

Prepared By: Mar. 27, 2017 Date:

Tiffany Kao / Clerk

Approved By: Mar. 27, 2017 Date:

Jim Chang / Asst. Manager

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# **Revision History**

Report Number	Revision	Description	Issue Date
E2/2017/30026	Rev.00	Initial creation of document	Mar. 27, 2017

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## **GENERAL INFORMATION**

### 1.1 Product description

#### General:

Scholar.	
Product Name:	WLAN 802.11b/g/n 2T2R Module
Brand Name:	Foxconn
Model No.:	WFU032
Model Difference:	N/A
Product SW/HW version:	N/A / MP
Radio SW/HW version:	N/A / N/A
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	5.0Vdc from USB port.

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#### WLAN 2.4GHz:

VLAN 2.4GHZ.						
Wi-Fi	Frequency Range	Channels	Rated Power / (EIRP)	Type of Emission	Modulation Technology	
11b/g	2412-2462	11	b: 16.49dBm b: 18.40dBm (EIRP) g: 23.46dBm g: 19.28dBm (EIRP)	b: 14M6G1D g:16M6D1D	DSSS, OFDM	
11n	HT 20 2412-2462	11	HT20:24.45dBm (MIMO Chain 0+1) HT20:22.31dBm (MIMO Chain 0+1) (EIRP)	HT20:17M8D1D	OFDM	
11n	HT 40 2422-2452	7	HT40: 25.31dBm (MIMO Chain 0+1) HT40: 22.44dBm (MIMO Chain 0+1) (EIRP)	HT40:36M2D1D	OFDM	
Antenna	Designation	PIFA Antenna 1. Main Part No.: W-M-D-B-N-0-0100, Supplier: Foxconn Gain: 3.82dBi Part No.: W-M-D-B-N-0-0550, Supplier: Foxconn Gain: 2.695dBi Part No.: W-M-D-B-N-0-0970, Supplier: Foxconn Gain: 1.645dBi  2. Aux Part No.: W-M-D-B-N-0-0100, Supplier: Foxconn Gain: 3.82dBi Part No.: W-M-D-B-N-0-0800, Supplier: Foxconn Gain: 2.07dBi Part No.: W-M-D-B-N-0-1150, Supplier: Foxconn				
Modulati	odulation type: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM					
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 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 2 Feb. 2017

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

### 1.3 Test Facility

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

FCC Registration Numbers are: 735305

Canada Registration Number: 4620A-5.

## 1.4 Special Accessories

There are no special accessories used while test was conducted.

### 1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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#### SYSTEM TEST CONFIGURATION

## 2.1 EUT Configuration

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

#### 2.2 EUT Exercise

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

#### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

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

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground 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 0.9dB, and 10dB attenuator (SISO) and cable loss 3.9dB, and 10dB attenuator (MIMO).

#### Offset:

SISO mode offset = RF cable loss (dB)+ attenuation factor(dB) =10.9(dB) MIMO mode offset = RF cable loss (dB)+ attenuation factor(dB)+ 10 log(Nant) dB =13.9(dB)

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## 2.5 Configuration of Tested System

Fig. 2-1 Conducted & Radiated Emission configuration

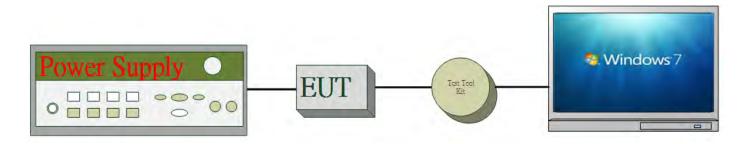
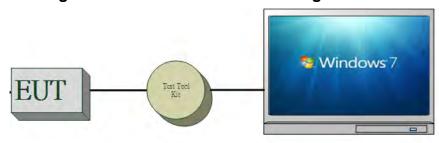


Fig. 2-2 Conduction Emission configuration



**Table 2-1 Equipment Used in Tested System** 

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	DRTU	N/A	N/A	N/A	N/A
2.	DC Power Supply	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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### 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)	Antenna Requirement	Compliant

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#### **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

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

#### 7 channels are provided for 802.11n HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	8	2447 MHz
4	2427 MHz	9	2452 MHz
5	2432 MHz		
6	2437 MHz		
7	2442 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	6	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	1	Main		
802.11g	1 to 11	1, 6, 11	OFDM	6	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 E2 position was reported.

Pre-scanned was done on antenna set W-M-D-B-N-0-0100 & W-M-D-B-N-0-0550 & W-M-D-B-N-0-0970, and antenna set W-M-D-B-N-0-0800 & W-M-D-B-N-0-1150. The W-M-D-B-N-0-0100 results higher emission at 2.4GHz. Therefore, the completed set of measurement was done on antenna W-M-D-B-N-0-0100 to presented on this test repot.

#### 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	1	Main
802.11g	1 to 11	1, 6, 11	OFDM	6	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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#### **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:

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

	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	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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#### CONDUCTED EMISSION TEST

### 6.1 Standard Applicable

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

Frequency range	Limits dB(uV)			
MHz	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	MFR	MFR MODEL		LAST	CAL DUE.						
TYPE		NUMBER	NUMBER	CAL.							
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2016	12/11/2017						
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	08/30/2016	08/29/2017						
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2017	03/10/2018						
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.						

#### 6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 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.

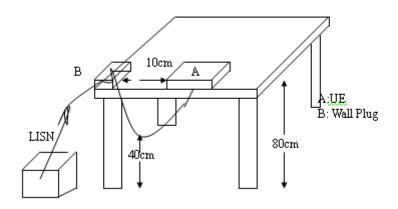
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## 6.4 Test SET-UP (Block Diagram of Configuration)



#### **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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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode		Test Date:	Mar. 21, 2017	
Temperature:	<b>20</b> ℃	Humidity:	Test By:	Aken	
				Phase:	L1

Conduction Room

Phase:

Temperature:

195 C

Limit: FCC Class B Conduction(QP)

AC 120V/60Hz Power:

L1

Humidity: 51 %

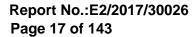
Mode: 鴻海 Note:

# **Conducted Emission** Data :#582 Date: 2017/3/21 File : Condution Time: 下午 07:01:25 80.0 dBuV FCC Class B Conduction(QP) B C 0.0 0.5 (MHz) 5 30.000

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	*	0.1940	33.71	19.79	53.50	63.86	-10.36	QP		
2		0.1940	17,42	19.79	37.21	53.86	-16.65	AVG		
3		0.2500	27.23	19.82	47.05	61.76	-14.71	peak		
4		3.1900	21.03	20.10	41.13	56.00	-14.87	peak		
5		6.2660	14.52	20.26	34.78	60.00	-25.22	peak		
6		12.2500	20.35	20.67	41.02	60.00	-18.98	peak		
7		21.0260	19.81	21.56	41.37	60.00	-18.63	peak		

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Site: Conduction Room

Phase:

Temperature: 19.5 ℃

Limit: FCC Class B Conduction(QP)

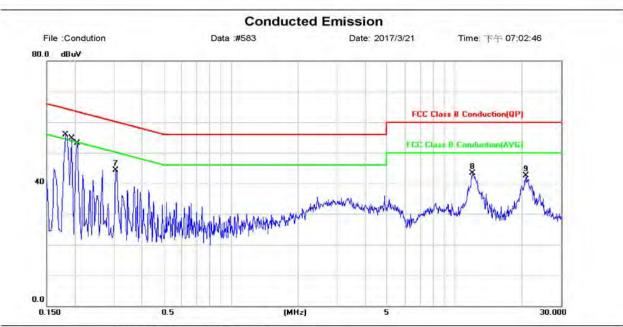
Power:

AC 120V/60Hz

Humidity: 51 %

Mode: 鴻海

Note:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1820	34.30	19.77	54.07	64.39	-10.32	QP	
2		0.1820	14.80	19.77	34.57	54.39	-19.82	AVG	
3		0.1940	32.20	19.77	51.97	63.86	-11.89	QP	
4		0.1940	15.44	19.77	35.21	53.86	-18.65	AVG	
5		0.2060	29.90	19.77	49.67	63.37	-13.70	QP	
6		0.2060	12.30	19.77	32.07	53.37	-21.30	AVG	
7		0.3060	24.40	19.83	44.23	60.08	-15.85	peak	
8		12.0380	23.03	20.31	43.34	60.00	-16.66	peak	
9		20.9180	21.61	20.89	42.50	60.00	-17.50	peak	

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### **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:

Duty Cycle = Ton / (Ton+Toff)

#### **Measurement Procedure:**

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

## **Duty Cycle:**

	Duty Cycle (%)	Duty Factor (dB)
802.11b	98.25	0.08
802.11g	89.64	0.47
802.11n_20	80.87	0.92
802.11n_40	68.49	1.64

b = 98.25%, g = 89.64%,  $n_ht_20 = 80.87\%$ ,  $n_ht_40 = 68.49\%$ 

Duty Cycle Factor:  $10 * \log(1/0.9825) = 0.08$ Duty Cycle Factor:  $10 * \log(1/0.8964) = 0.47$ Duty Cycle Factor:  $10 * \log(1/0.8087) = 0.92$ Duty Cycle Factor:  $10 * \log(1/0.6849) = 1.64$ 

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# 7.1 DUTY CYCLE TEST SIGNAL Measurement Result 802.11 b



#### 802.11 g



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### 802.11 n\_20 MHz



### 802.11 n\_40 MHz



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#### 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 form 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: 3.82 dBi Aux1 Antenna Gain: 3.82 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) = 3.82+3.01=6.83dBi Limit: 30dBm - (6.83-6dBi)=29.17dBm

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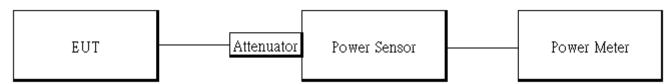


## 8.2 Measurement Equipment Used

	Conducted Emission Test Site											
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.							
TYPE		NUMBER	NUMBER	CAL.								
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017							
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017							
Power Sensor	Anritsu	MA2411B	A2411B 1315048		06/22/2017							
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017							
Coaxial Cable 30cm	WOKEN	00100A1F1A195 C	RF01	12/12/2016	12/11/2017							
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017							
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2016	12/11/2017							
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017							
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017							

#### 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. Guid-
- 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

802.1	l1b Mair	1				
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	1	16.35	43.15	1 Watt = 30.00 dBm	PASS
6	2437	1	16.45	44.16	1 Watt = 30.00 dBm	PASS
11	2462	1	16.49	44.57	1 Watt = 30.00 dBm	PASS
802.1	1b Mair	1				
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (dBm)	Limit	RESULT
1	2412	1	14.35	27.23	1 Watt = 30.00 dBm	PASS
6	2437	1	14.37	27.35	1 Watt = 30.00 dBm	PASS
11	2462	1	14.58	28.71	1 Watt = 30.00 dBm	PASS

802.1	11g Mair	<u> </u>				
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	6	23.06	202.30	1 Watt = 30.00 dBm	PASS
6	2437	6	23.15	206.54	1 Watt = 30.00 dBm	PASS
11	2462	6	23.46	221.82	1 Watt = 30.00 dBm	PASS
802.1	l1g Mair	1				
СН	Freq. (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit	RESULT
1	2412	6	14.92	31.05	1 Watt = 30.00 dBm	PASS
6	2437	6	14.97	31.41	1 Watt = 30.00 dBm	PASS
11	2462	6	15.46	35.16	1 Watt = 30.00 dBm	PASS

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802.1	1n_HT20	OMIM MI							
СН	Freq. (MHz)	Data Rate		Peak Output Total Peak Power Output Power		Total Peak Output Power	Limit		RESULT
	(	rtuto	CH 0	CH 1	(dBm)	(mW)			
1	2412	MCS8	21.64	21.22	24.45	278.32	1 Watt = 29.17	dBm	PASS
6	2437	MCS8	21.35	21.30	24.34	271.35	1 Watt = 29.17	dBm	PASS
11	2462	MCS8	21.12	21.01	24.08	255.60	1 Watt = 29.17	dBm	PASS
802.1	1n_HT20	OMIM MI					•		
СН	Avg. Out Freq. Data Powe (MHz) Rate (dBm		ower	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit		RESULT	
			CH 0	CH 1	(abiii)	(11144)			
1	2412	MCS8	12.62	12.31	15.48	35.30	1 Watt = 29.17	dBm	PASS
6	2437	MCS8	12.22	12.32	15.28	33.73	1 Watt = 29.17	dBm	PASS
11	2462	MCS8	12.52	12.31	15.43	34.89	1 Watt = 29.17	dBm	PASS

802.1	11n_HT40	ом мімо						
СН	Freq. Data		Freq. Data Peak Output Power  (MHz) Rate		Total Peak Output Power	Total Peak Output Power	Limit	RESULT
	(101112)	itato	CH 0	CH 1	(dBm)	(mW)		
3	2422	MCS8	22.19	22.04	25.13	325.53	1 Watt = 29.17 dBm	PASS
6	2437	MCS8	22.17	22.29	25.24	334.25	1 Watt = 29.17 dBm	PASS
9	2452	MCS8	22.35	22.24	25.31	339.29	1 Watt = 29.17 dBm	PASS
802.1	1n_HT40	OMIM M					•	·
СН	Freq. (MHz)	Data Rate	Po	Output ower IBm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
			CH 0	CH 1	(abiii)	(11144)		
3	2422	MCS8	12.87	12.31	15.61	36.39	1 Watt = 29.17 dBm	PASS
6	2437	MCS8	12.61	12.35	15.49	35.42	1 Watt = 29.17 dBm	PASS
9	2452	MCS8	12.66	12.43	15.56	35.95	1 Watt = 29.17 dBm	PASS

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

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#### **EIRP Measurement:**

802.11	lb Main								
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit		RESULT
1	2412	1	14.35	3.82	18.17	4W=	36	dBm	PASS
6	2437	1	14.37	3.82	18.19	4W=	36	dBm	PASS
11	2462	1	14.58	3.82	18.40	4W=	36	dBm	PASS

802.11	Ig Main								
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit		RESULT
1	2412	6	14.92	3.82	18.74	4W=	36	dBm	PASS
6	2437	6	14.97	3.82	18.79	4W=	36	dBm	PASS
11	2462	6	15.46	3.82	19.28	4W=	36	dBm	PASS

802.11	802.11n_HT20M MIMO											
			Avg. C	•	Avg.	Total Peak	tal Peak Antenna		ak Antenna			
СН	Freq.	Data	Pov	wer	Output	Output	Gain	EIRP		Limit		RESULT
CII	(MHz)	Rate	(dE	Bm)	Power	Power	(dBi)	(dBm)		KLJULI		
			CH 0	CH1	(dBm)	(mW)	(ubi)					
1	2412	MCS8	12.62	12.31	15.48	35.30	6.83	22.31	4W=	36	dBm	PASS
6	2437	MCS8	12.22	12.32	15.28	33.73	6.83	22.11	4W=	36	dBm	PASS
11	2462	MCS8	12.52	12.31	15.43	34.89	6.83	22.26	4W=	36	dBm	PASS

802.11	802.11n_HT40M MIMO											
СН	Freq. (MHz)	Data Rate	Avg. C Pov (dE	•	Avg. Output Power	Total Peak Output Power	Antenna Gain (dBi)	EIRP (dBm)		Limit		RESULT
			CH 0	CH 1	(dBm)	(mW)	(4.2.)					
3	2422	MCS8	12.87	12.31	15.61	36.39	6.83	22.44	4W=	36	dBm	PASS
6	2437	MCS8	12.61	12.35	15.49	35.42	6.83	22.32	4W=	36	dBm	PASS
9	2452	MCS8	12.66	12.43	15.56	35.95	6.83	22.39	4W=	36	dBm	PASS

<sup>\*</sup> **Note:** EIRP = Average Power + Gain

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#### 6DB & 99% BANDWIDTH MEASUREMENT

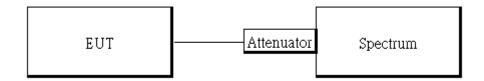
## 9.1 Standard Applicable

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

#### 9.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017			
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017			
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017			

#### 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 11h Main

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result	
2412	10035	> 500	PASS	
2437	10051	> 500	PASS	
2462	10047	> 500	PASS	

802.11g Main

<b>00-</b> 111	ga										
Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result								
2412	15140	> 500	PASS								
2437	15130	> 500	PASS								
2462	15130	> 500	PASS								

### 802.11\_n\_HT20 Main

### 802.11\_n\_HT20 Aux1

Limit

(kHz)

> 500 > 500

> 500

Result

**PASS** 

**PASS** 

**PASS** 

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result	Freq. (MHz)	6dB BW (kHz)
2412	15120	> 500	PASS	2412	15150
2437	15150	> 500	PASS	2437	15140
2462	15140	> 500	PASS	2462	15120

#### 802.11 n HT40 Main

### 802.11 n HT40 Aux1

<u> </u>	<u></u>					10171 1	
Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result		6dB BW (kHz)	Limit (kHz)	Result
2422	30580	> 500	PASS	2422	35110	> 500	PASS
2437	35090	> 500	PASS	2437	35040	> 500	PASS
2452	35150	> 500	PASS	2452	35120	> 500	PASS

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#### 99% Bandwidth

802.11b Main					
Freq.	99% BW				
(MHz)	(MHz)				
2412	14.589				
2437	14.487				
2462	14.497				

802.11g Main						
Freq.	99% BW					
(MHz)	(MHz)					
2412	16.584					
2437	16.539					
2462	16.339					

802.11n_HT20M Main	
Freq. (MHz)	99% BW (MHz)
2412	17.755
2437	17.448
2462	17.651

802.11n_HT20M Aux1		
Freq. (MHz)	99% BW (MHz)	
2412	17.640	
2437	17.833	
2462	17.719	

802.11n_HT40M Main	
Freq. (MHz)	99% BW (MHz)
2422	36.053
2437	36.083
2452	36.097

802.11n_HT40M Aux1	
Freq. (MHz)	99% BW (MHz)
2422	36.100
2437	36.162
2452	35.932

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<sup>\*</sup>Refer to next page for plots



# 802.11b (Main) 6dB Band Width Test Data CH-Low



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

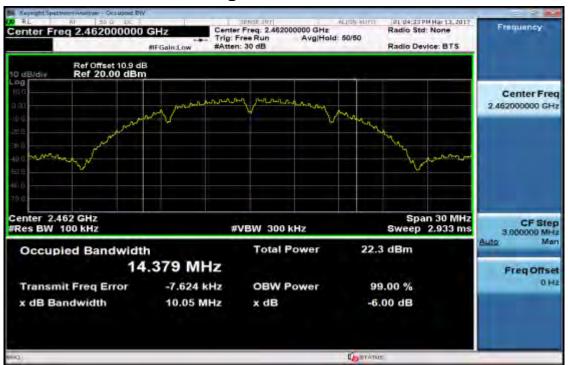


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# 6dB Band Width Test Data CH-High



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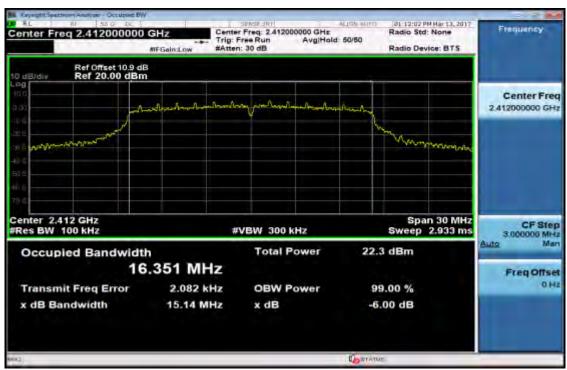
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# 802.11g (Main) 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid

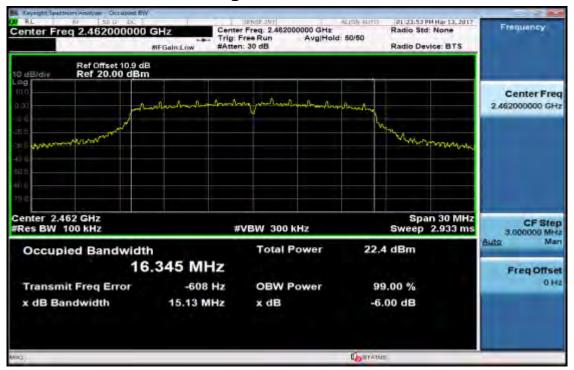


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# 6dB Band Width Test Data CH-High



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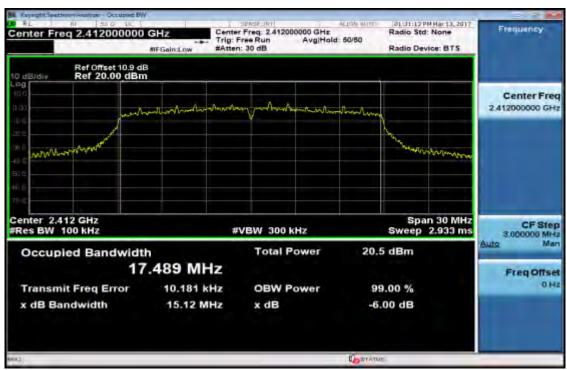
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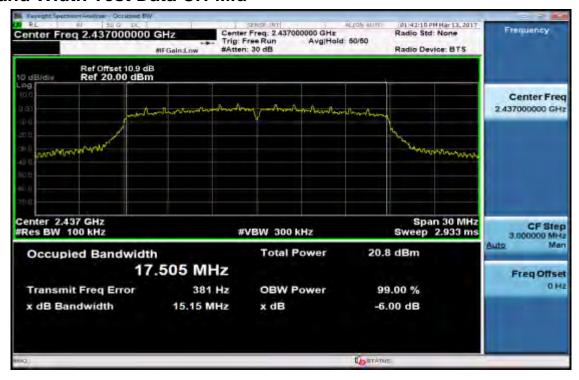
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# 802.11n\_20M (Main) 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid

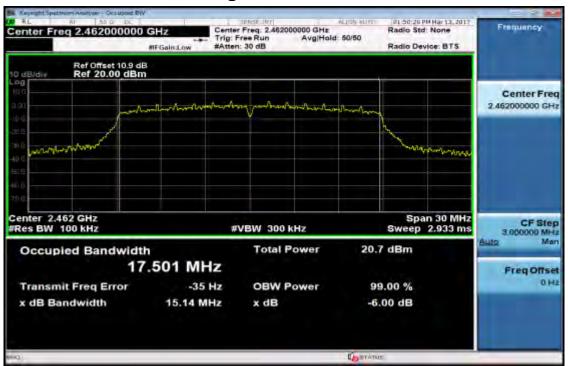


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# 6dB Band Width Test Data CH-High



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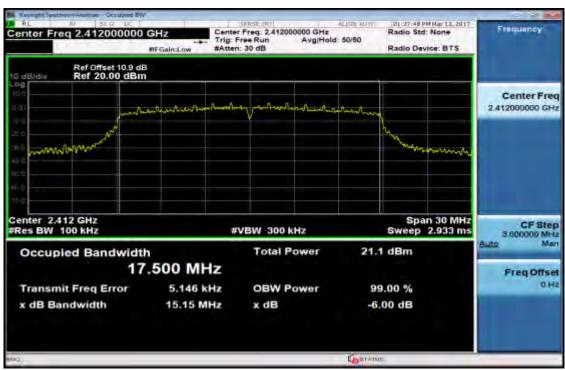
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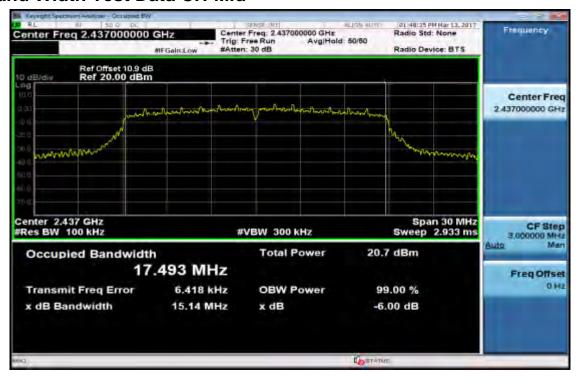
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# 802.11n\_20M (Aux) 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



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# 6dB Band Width Test Data CH-High



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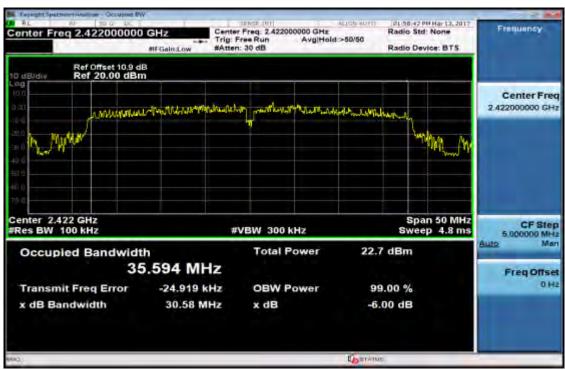
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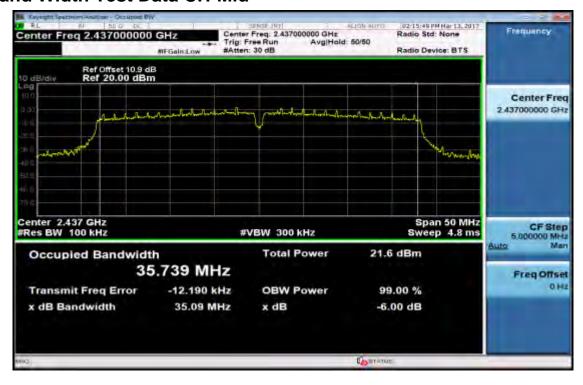
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# 802.11n 40M (Main) 6dB Band Width Test Data CH-Low



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

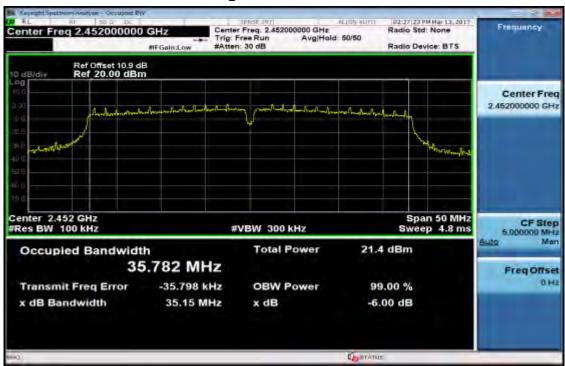


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# 6dB Band Width Test Data CH-High



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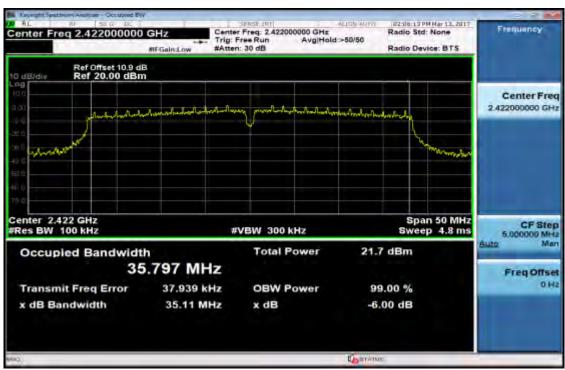
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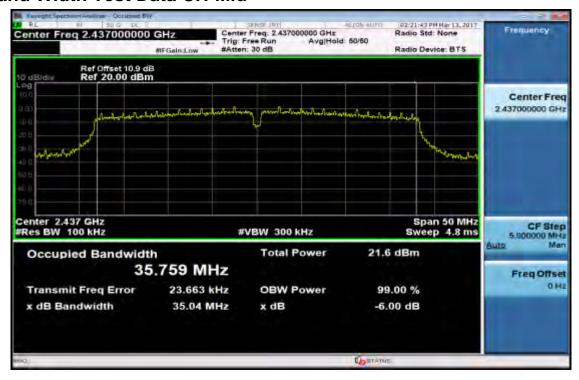
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# 802.11n\_40M (Aux) 6dB Band Width Test Data CH-Low



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

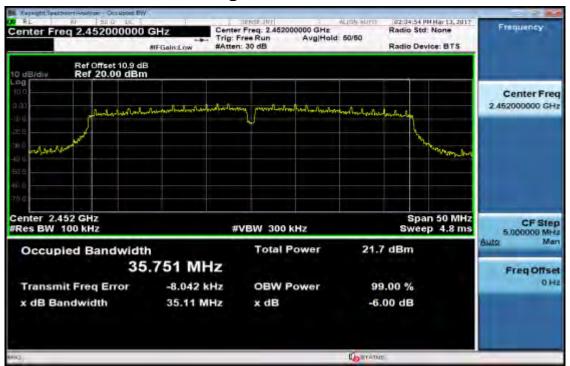


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# 6dB Band Width Test Data CH-High



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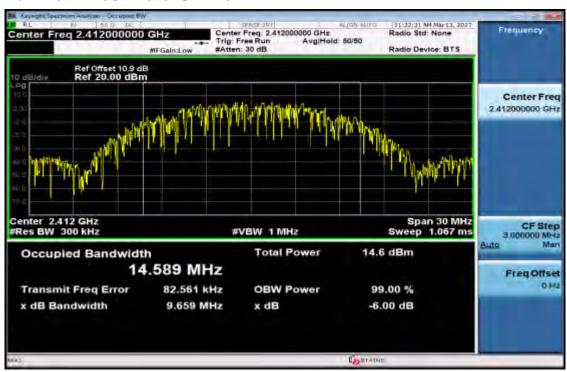
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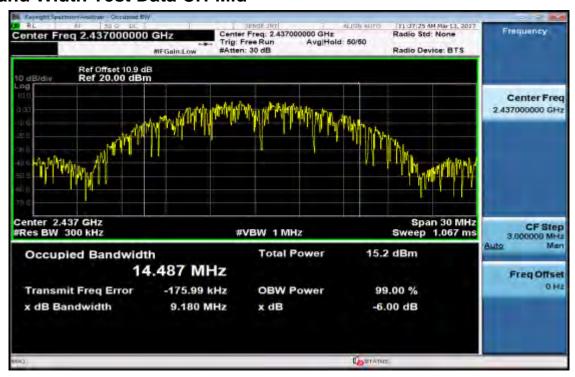
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# 802.11b (Main) 99% Band Width Test Data CH-Low



### 99% Band Width Test Data CH-Mid

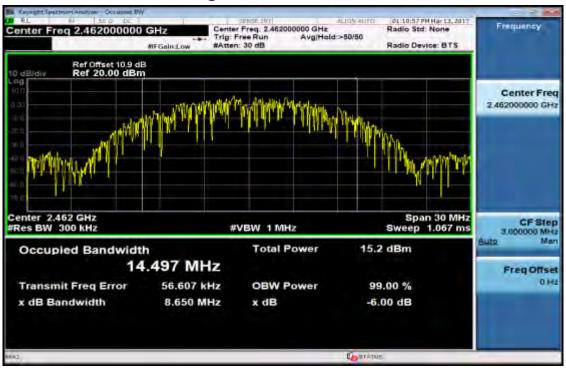


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## 99% Band Width Test Data CH-High



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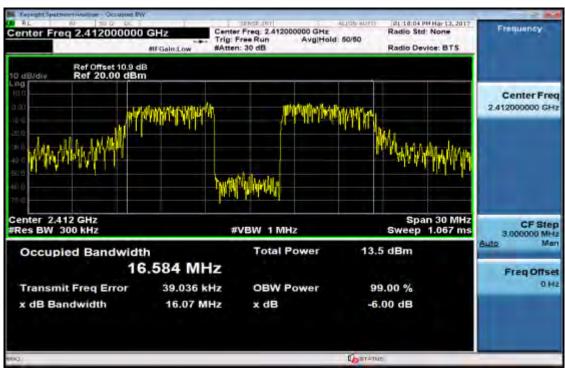
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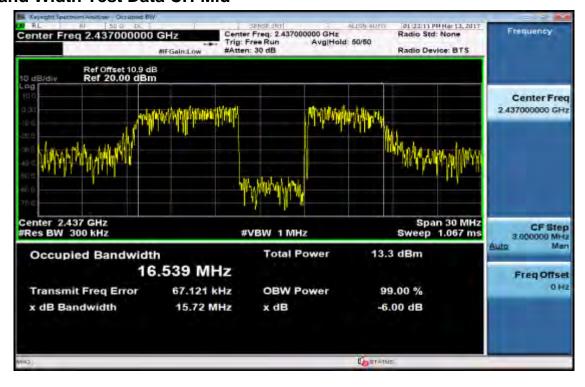


## 802.11g (Main)

### 99% Band Width Test Data CH-Low



### 99% Band Width Test Data CH-Mid

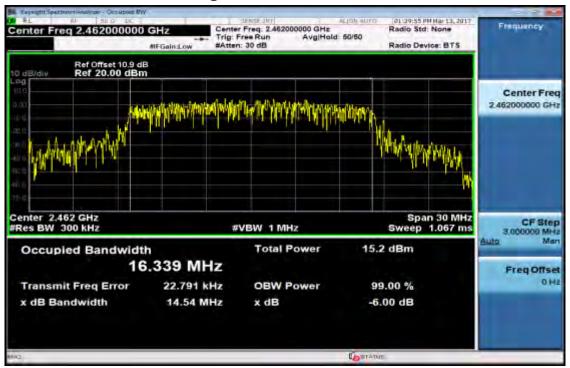


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### 99% Band Width Test Data CH-High



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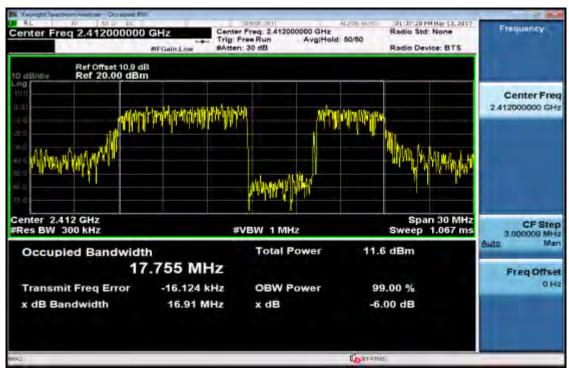
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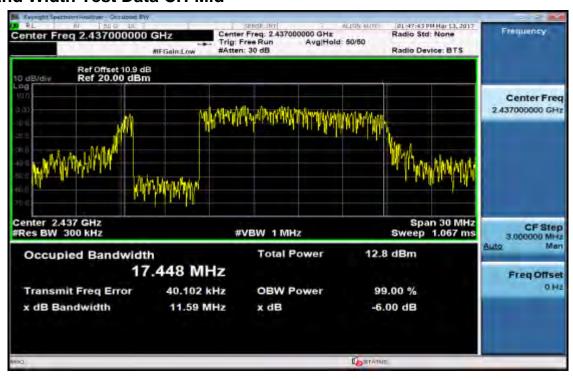
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# 802.11n\_20M (Main) 99% Band Width Test Data CH-Low



### 99% Band Width Test Data CH-Mid



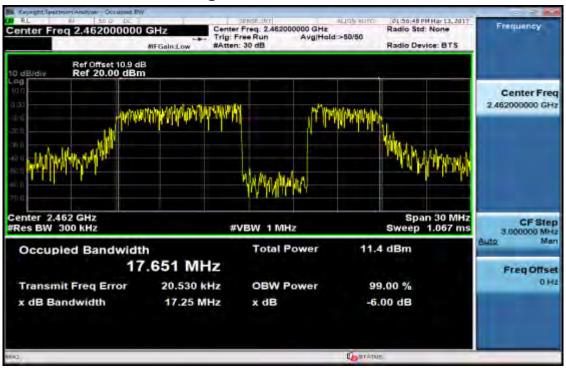
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## 99% Band Width Test Data CH-High



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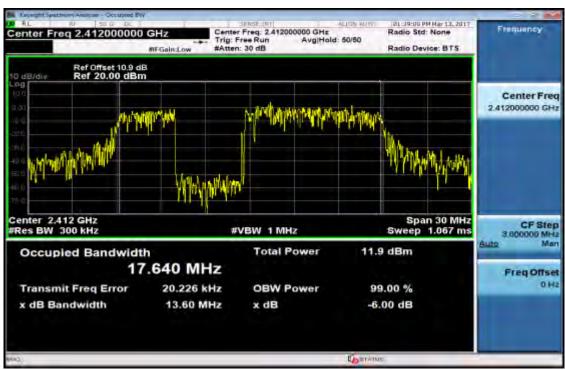
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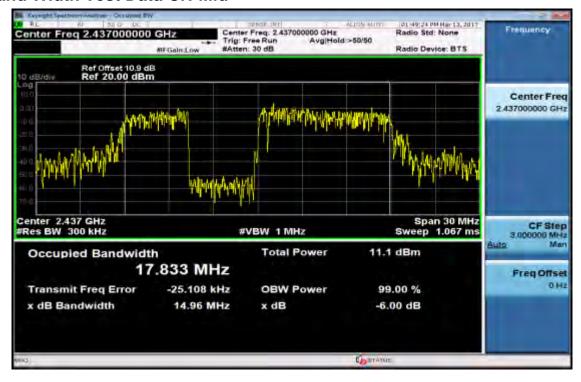
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# 802.11n\_20M (Aux) 99% Band Width Test Data CH-Low



### 99% Band Width Test Data CH-Mid

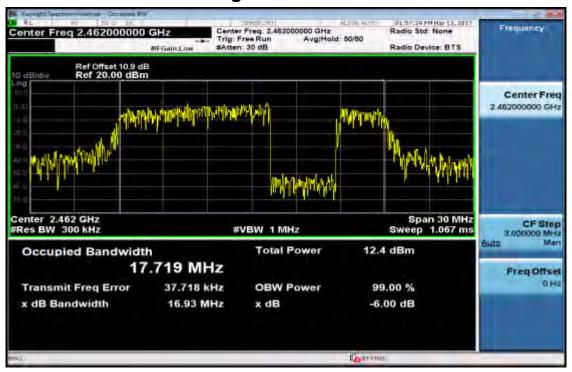


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## 99% Band Width Test Data CH-High



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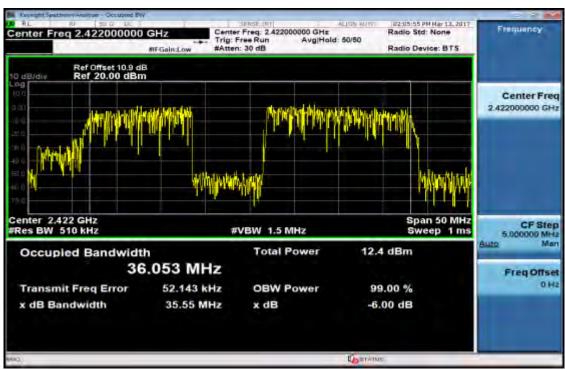
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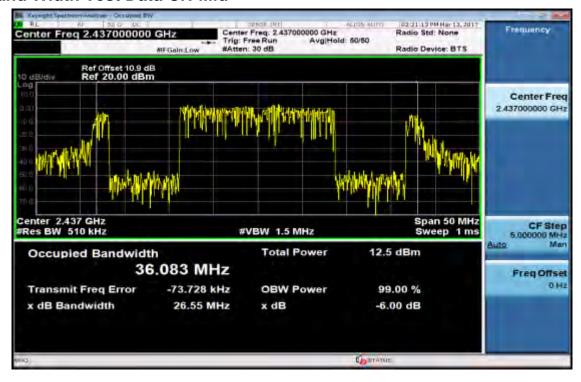
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# 802.11n\_40M (Main) 99% Band Width Test Data CH-Low



### 99% Band Width Test Data CH-Mid



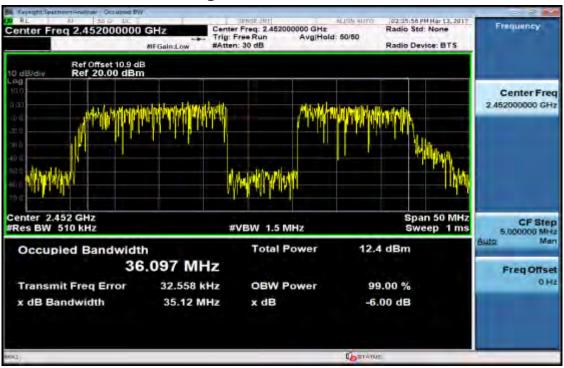
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## 99% Band Width Test Data CH-High



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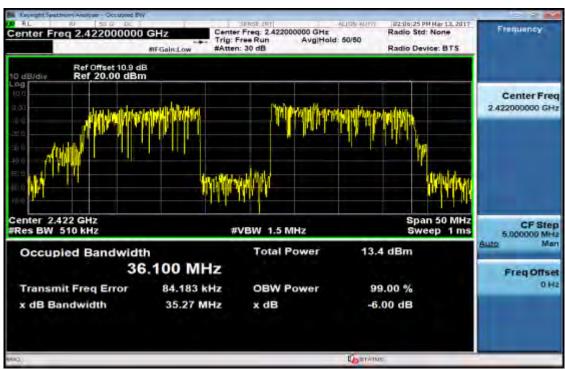
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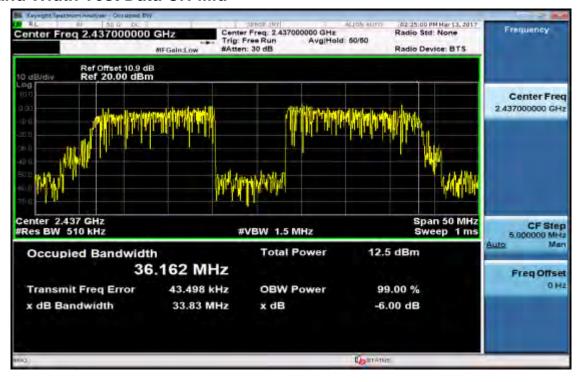
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# 802.11n\_40M (Aux) 99% Band Width Test Data CH-Low



### 99% Band Width Test Data CH-Mid

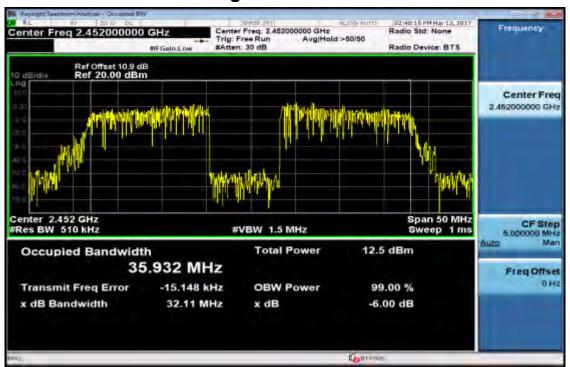


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## 99% Band Width Test Data CH-High



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#### 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.

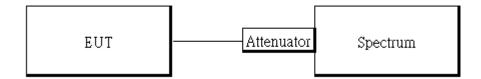
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.8.

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	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017			
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017			
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017			

#### 10.3 Test SET-UP



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#### 10.4 Measurement Procedure

#### **Conducted Band Edge:**

- 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:**

- 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

- 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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# 802.11b **Band Edges Test Data CH-Low**



### **Band Edges Test Data CH-High**



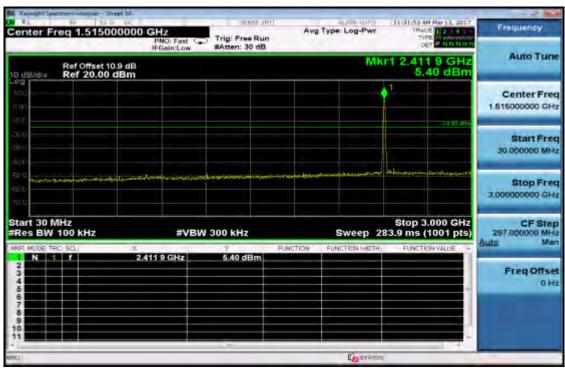
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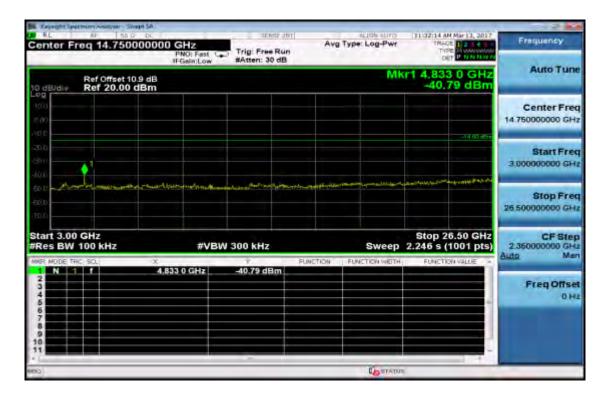
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### 802.11b

### **Spurious Emission Test Data CH-Low**





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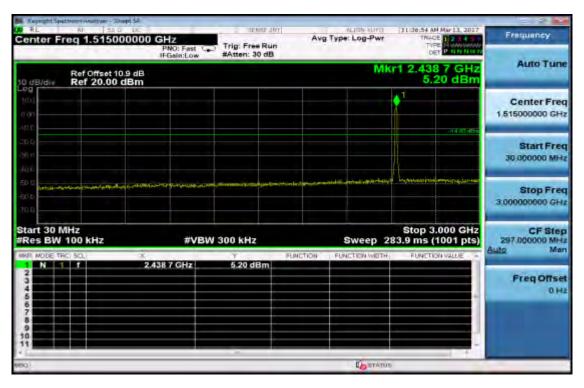
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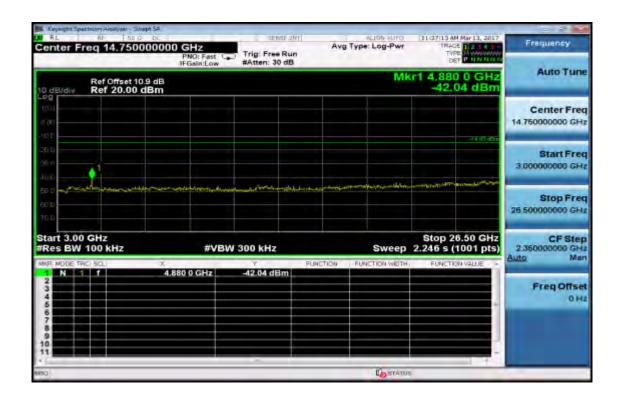
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# **Spurious Emission Test Data CH-Mid**





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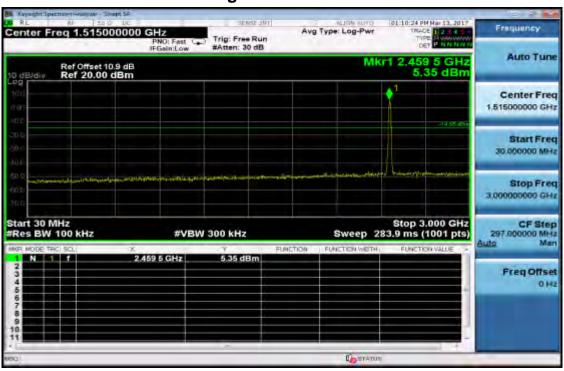
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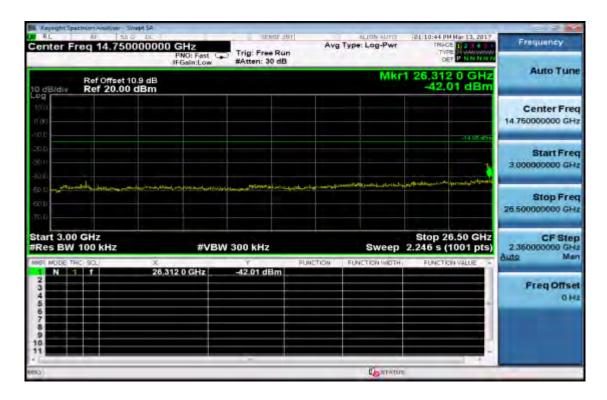
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### **Spurious Emission Test Data CH-High**





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# 802.11g **Band Edges Test Data CH-Low**



## **Band Edges Test Data CH-High**



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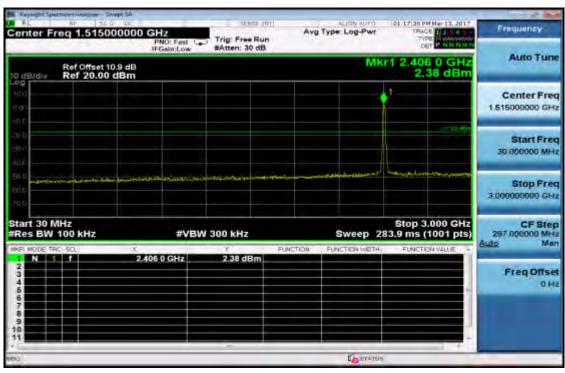
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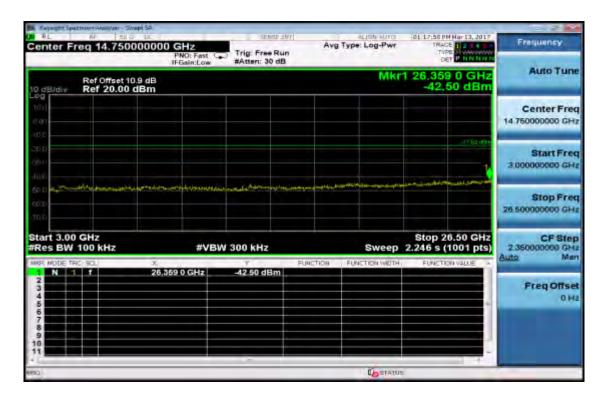
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### 802.11g

### **Spurious Emission Test Data CH-Low**





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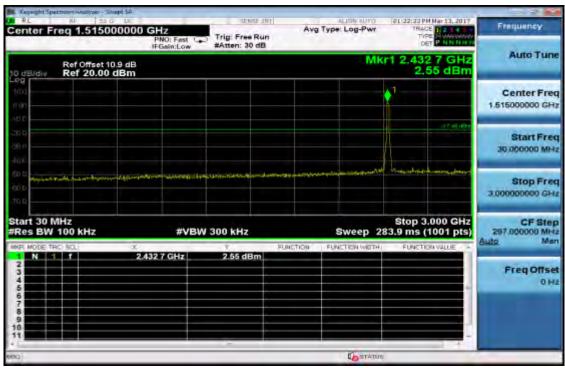
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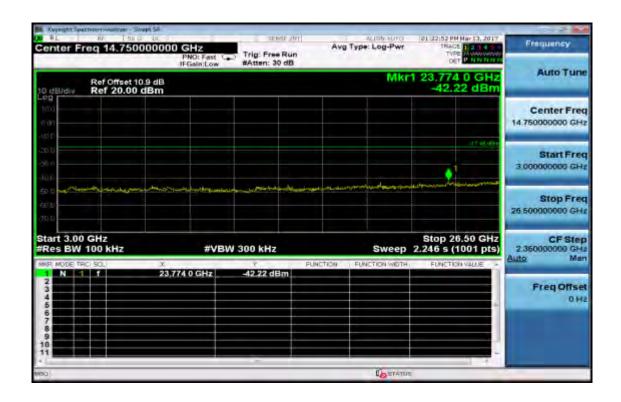
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### **Spurious Emission Test Data CH-Mid**





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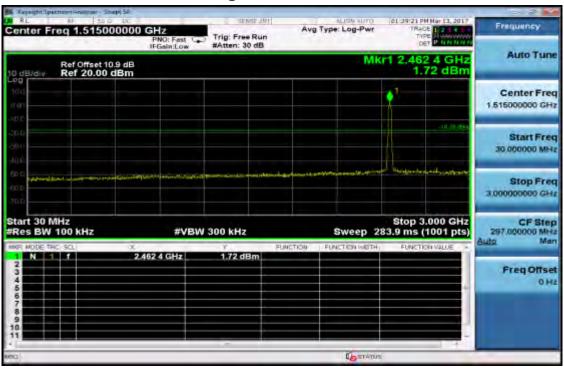
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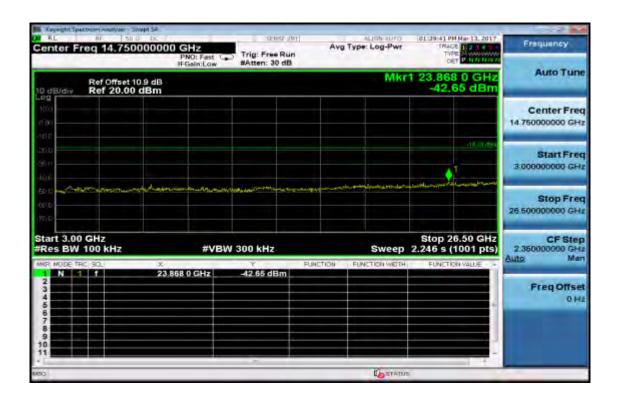
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# **Spurious Emission Test Data CH-High**





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# 802.11n HT20 **Band Edges Test Data CH-Low**



### **Band Edges Test Data CH-High**



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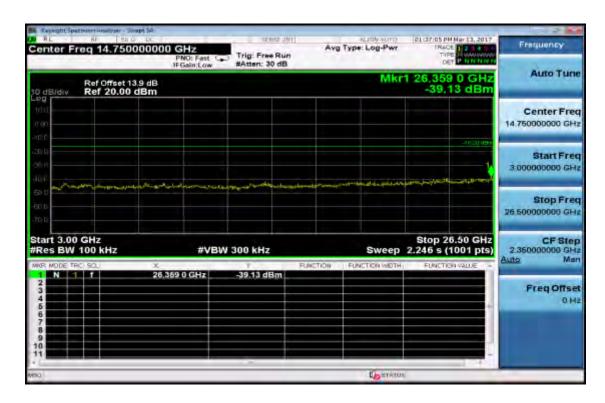
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### 802.11n HT20

### **Spurious Emission Test Data CH-Low**



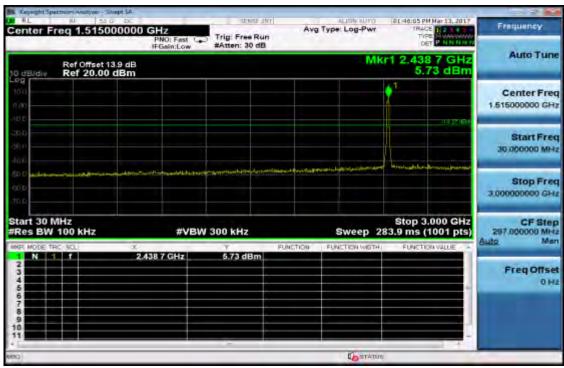


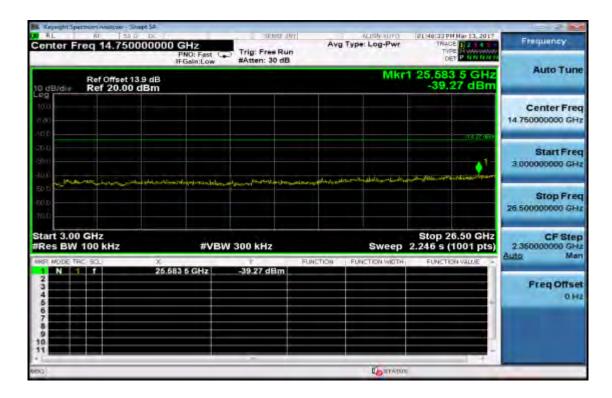
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### **Spurious Emission Test Data CH-Mid**





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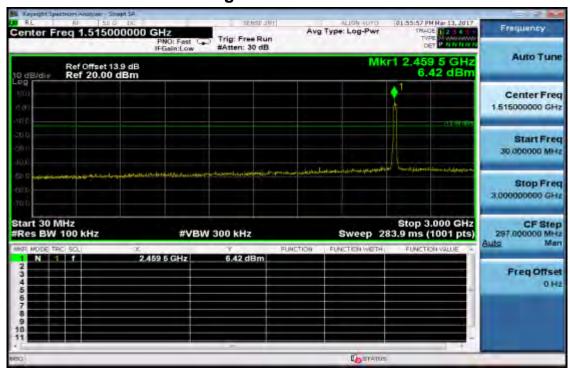
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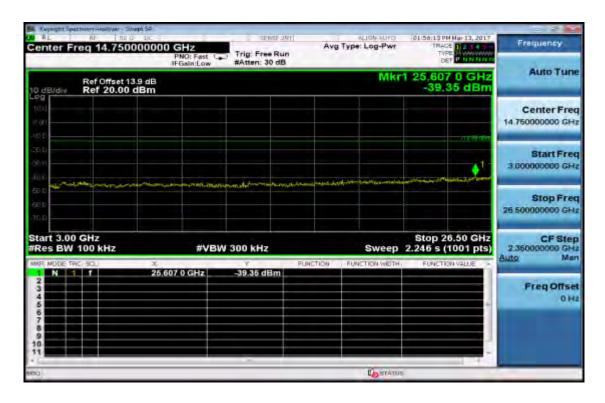
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### **Spurious Emission Test Data CH-High**





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# 802.11n HT40 **Band Edges Test Data CH-Low**



# **Band Edges Test Data CH-High**



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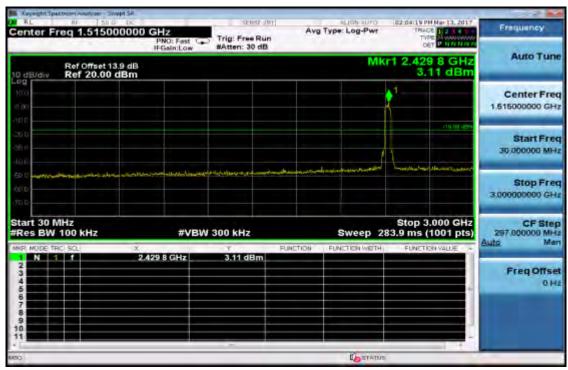
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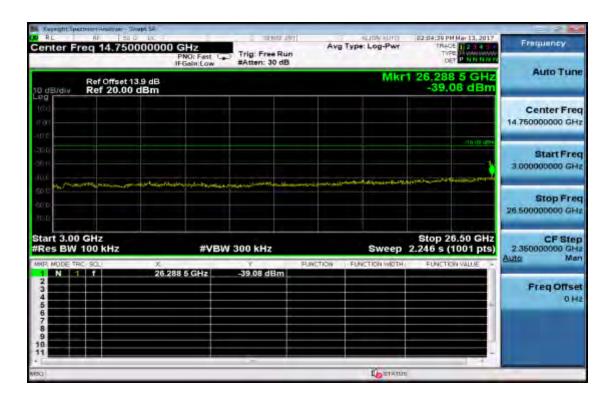
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### 802.11n HT40

### **Spurious Emission Test Data CH-Low**



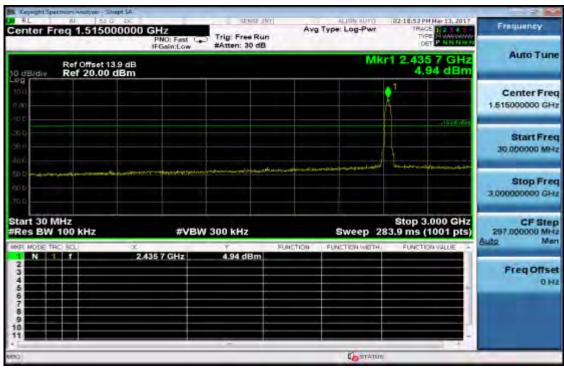


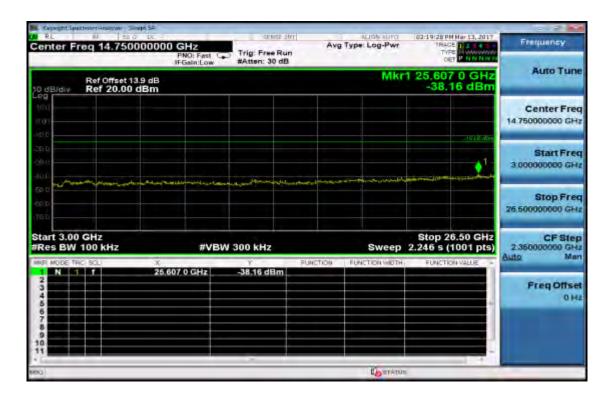
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### **Spurious Emission Test Data CH-Mid**





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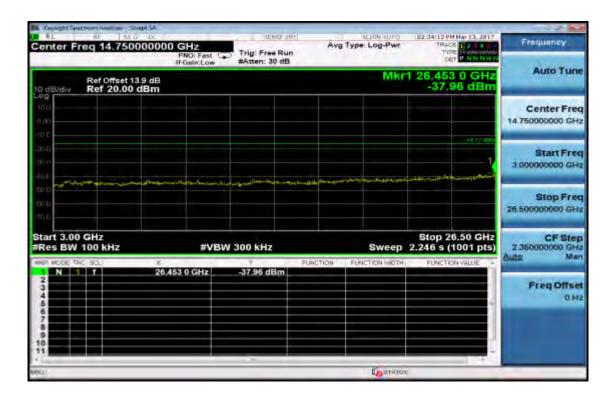
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## **Spurious Emission Test Data CH-High**





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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.
- Emission level (dBµV/m) = 20 log Emission level (dBµV/m)

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### 11.2 Measurement Equipment Used:

966 Chamber								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017			
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017			
Broadband Antenna	TESEQ	CBL 6112D	35240	11/03/2016	11/02/2017			
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017			
Horn Antenna	Schwarzbeck	BBHA9170	185	07/24/2016	07/23/2017			
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017			
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017			
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017			
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017			
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017			
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017			
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017			
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017			
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017			
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017			
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017			
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018			
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018			
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017			
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.			
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.			
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.			
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.			

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

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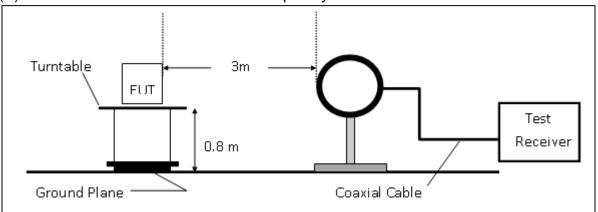
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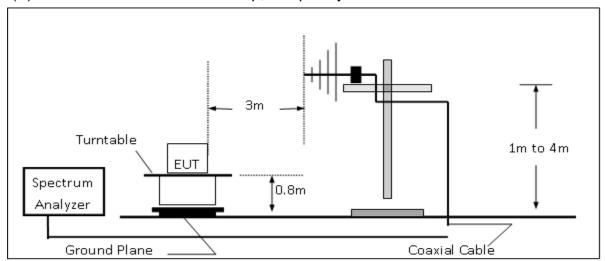


#### 11.3 Test SET-UP

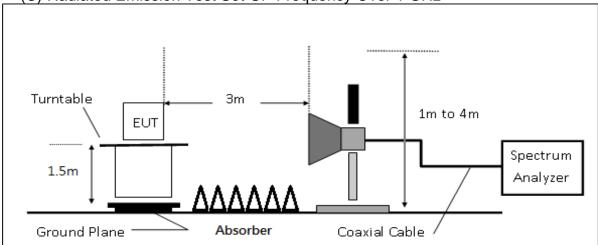
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



### (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

- The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guid-
- 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 ≥ 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	S .	CL = Cable Attenuation Factor (Cable Loss)
		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.

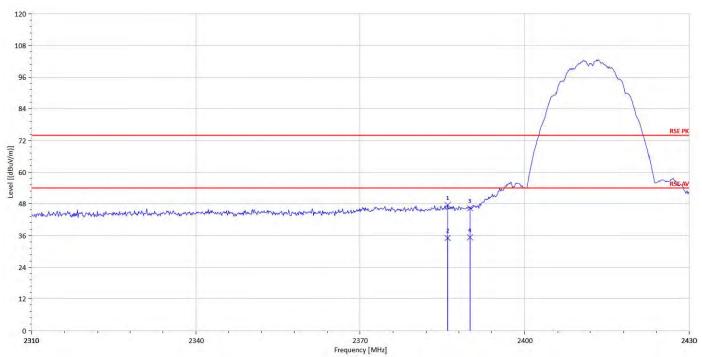
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# Radiated Band Edge Measurement Result (802.11b)

Operation Mode:	802.11b	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



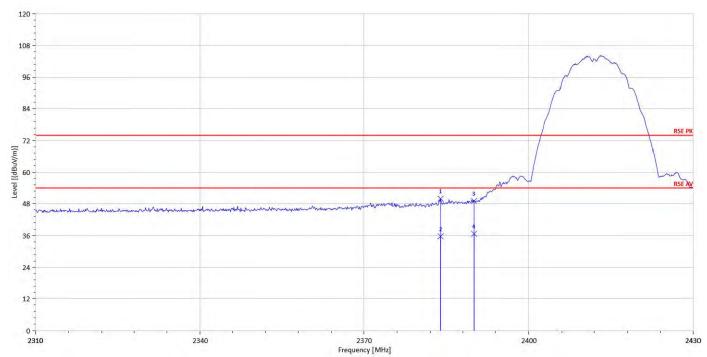
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2385.96	S	Peak	46.63	0.86	47.49	74	-26.51
2385.96	S	Average	34.19	0.86	35.05	54	-18.95
2390.00	Е	Peak	45.32	0.92	46.25	74	-27.75
2390.00	Е	Average	34.40	0.92	35.32	54	-18.68

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Operation Mode:	802.11b	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2383.92	S	Peak	49.07	0.83	49.90	74	-24.10
2383.92	S	Average	34.88	0.83	35.71	54	-18.29
2390.00	Е	Peak	48.10	0.92	49.03	74	-24.97
2390.00	Е	Average	35.79	0.92	36.71	54	-17.29

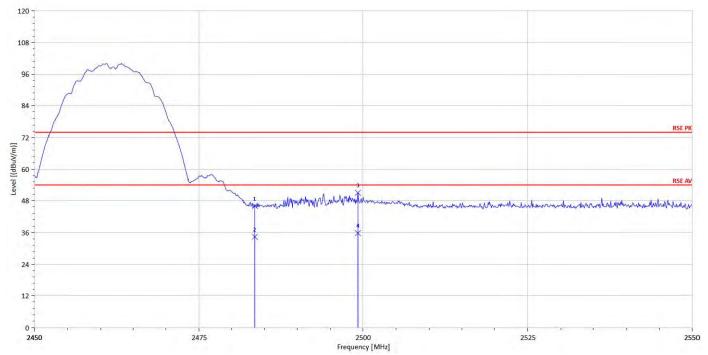
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Operation Mode:	802.11b	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	44.84	1.16	46.00	74	-28.00
2483.50	Е	Average	33.21	1.16	34.37	54	-19.63
2499.20	S	Peak	49.88	1.15	51.03	74	-22.97
2499.20	S	Average	34.63	1.15	35.78	54	-18.22

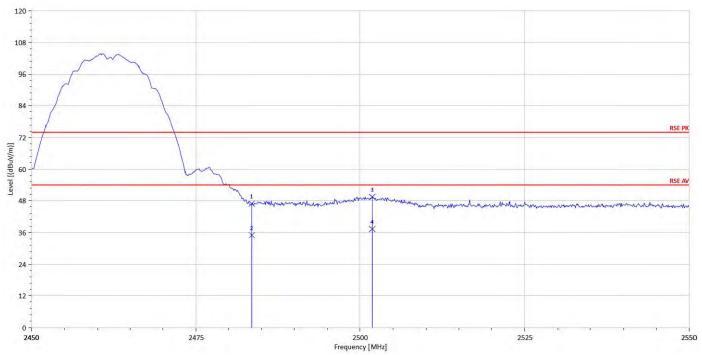
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Operation Mode:	802.11b	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	45.71	1.16	46.87	74	-27.13
2483.50	Е	Average	33.84	1.16	35.00	54	-19.00
2501.80	S	Peak	48.32	1.17	49.49	74	-24.51
2501.80	S	Average	36.17	1.17	37.34	54	-16.66

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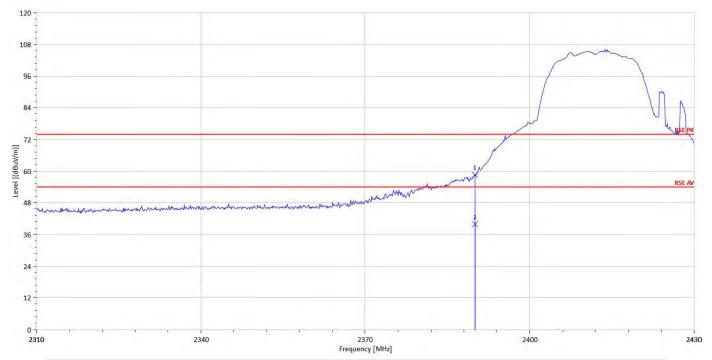
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# Radiated Band Edge Measurement Result (802.11g)

Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



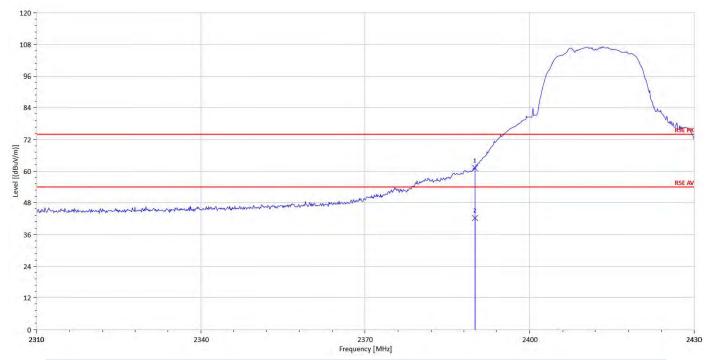
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	57.73	0.92	58.65	74	-15.35
2390.00	Е	Peak	39.03	0.92	39.95	74	-34.05

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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	60.22	0.92	61.14	74	-12.86
2390.00	Е	Peak	41.40	0.92	42.32	74	-31.68

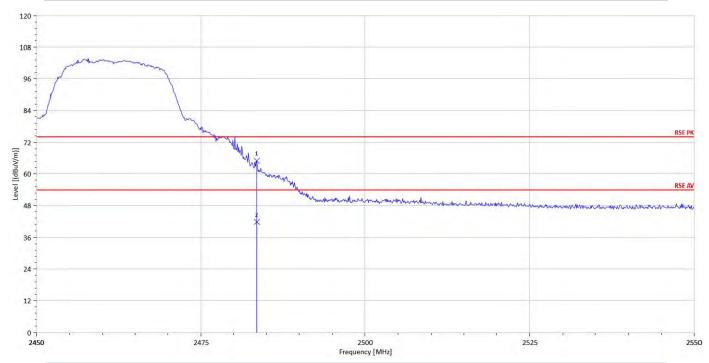
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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	63.84	1.16	65.00	74	-9.00
2483.50	E	Average	40.61	1.16	41.77	54	-12.23

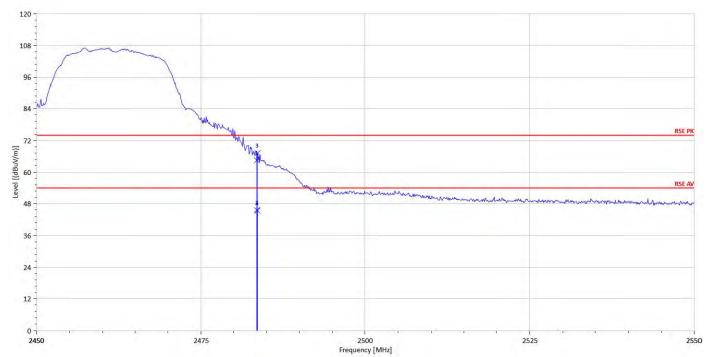
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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	63.28	1.16	64.44	74	-9.56
2483.50	Е	Average	44.44	1.16	45.60	54	-8.40
2483.60	S	Peak	66.02	1.16	67.18	74	-6.82
2483.60	S	Average	44.20	1.16	45.36	54	-8.64

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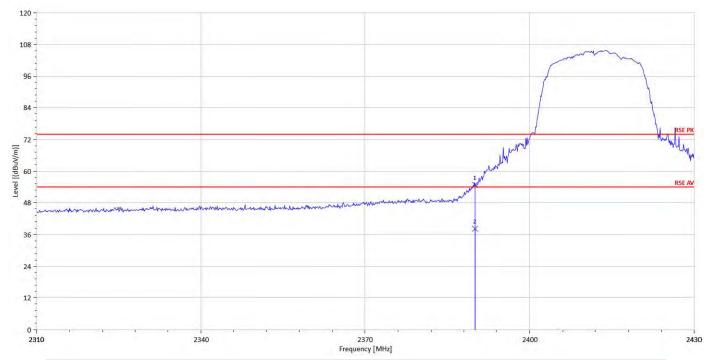
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# Radiated Band Edge Measurement Result (802.11\_HT20)

Operation Mode:	802.11n20	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



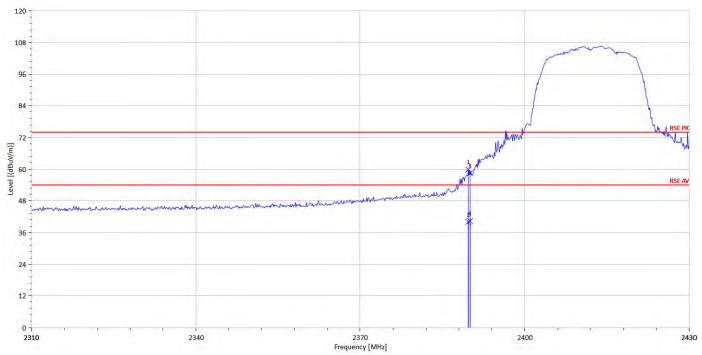
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	53.89	0.92	54.81	74	-19.19
2390.00	Е	Average	37.32	0.92	38.24	54	-15.76

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Operation Mode:	802.11n20	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2389.68	S	Peak	59.00	0.92	59.92	74	-14.08
2389.68	S	Average	39.17	0.92	40.09	54	-13.91
2390.00	Е	Peak	57.60	0.92	58.53	74	-15.47
2390.00	Е	Average	39.51	0.92	40.43	54	-13.57

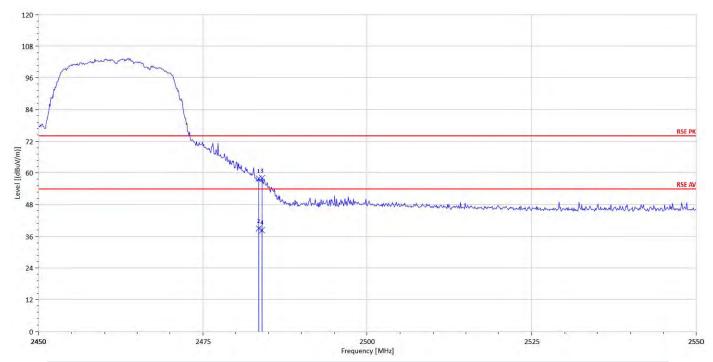
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Operation Mode:	802.11n20	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical

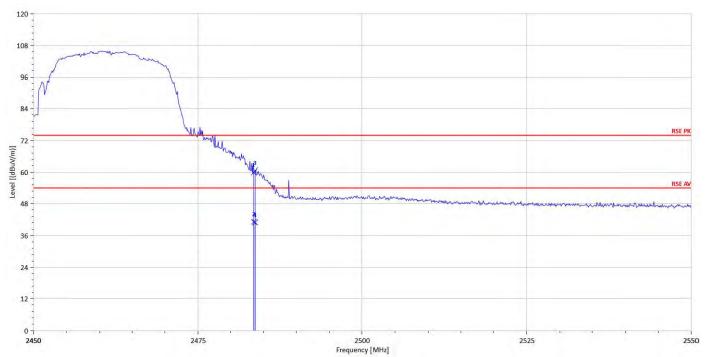


Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	56.72	1.16	57.88	74	-16.12
2483.50	Е	Average	37.81	1.16	38.97	54	-15.03
2484.00	S	Peak	56.88	1.16	58.04	74	-15.96
2484.00	S	Average	37.17	1.16	38.33	54	-15.67

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Operation Mode:	802.11n20	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	58.76	1.16	59.92	74	-14.08
2483.50	Е	Average	40.13	1.16	41.29	54	-12.71
2483.70	S	Peak	59.50	1.16	60.66	74	-13.34
2483.70	S	Average	39.88	1.16	41.04	54	-12.96

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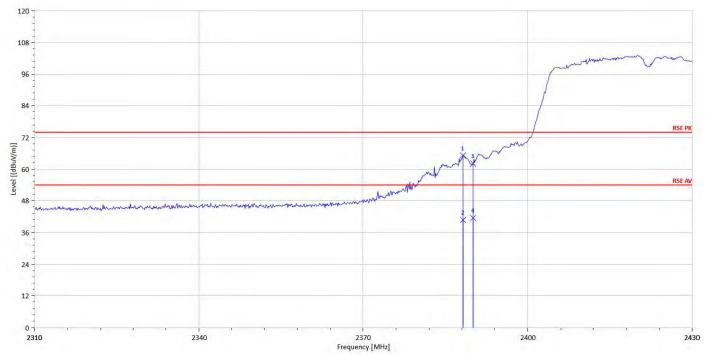
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# Radiated Band Edge Measurement Result (802.11\_HT40)

Operation Mode:	802.11n40	Test Date :	2017/3/16
Fundamental Frequency:	2422 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2388.24	S	Peak	64.24	0.90	65.13	74	-8.87
2388.24	S	Average	39.94	0.90	40.84	54	-13.16
2390.00	Е	Peak	61.15	0.92	62.07	74	-11.93
2390.00	Е	Average	40.63	0.92	41.55	54	-12.45

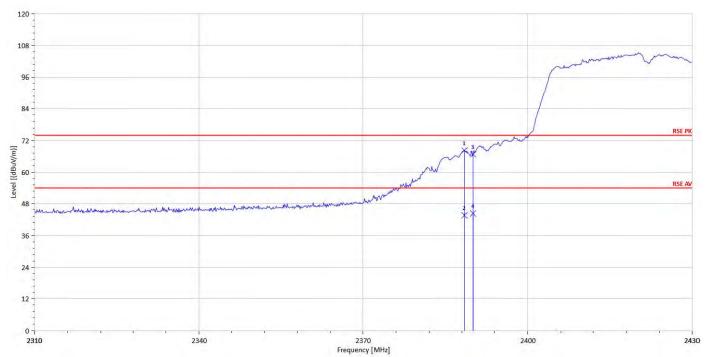
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Operation Mode:	802.11n40	Test Date :	2017/3/16
Fundamental Frequency:	2422 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2388.48	S	Peak	67.32	0.90	68.22	74	-5.78
2388.48	S	Average	42.74	0.90	43.64	54	-10.36
2390.00	Е	Peak	65.79	0.92	66.71	74	-7.29
2390.00	Е	Average	43.43	0.92	44.35	54	-9.65

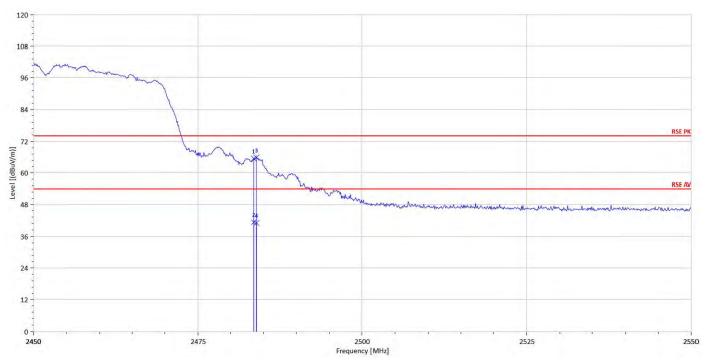
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Operation Mode :	802.11n40	Test Date :	2017/3/16
Fundamental Frequency:	2452 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	64.33	1.16	65.49	74	-8.51
2483.50	Е	Average	40.10	1.16	41.26	54	-12.74
2483.90	S	Peak	64.68	1.16	65.84	74	-8.16
2483.90	S	Average	39.86	1.16	41.02	54	-12.98

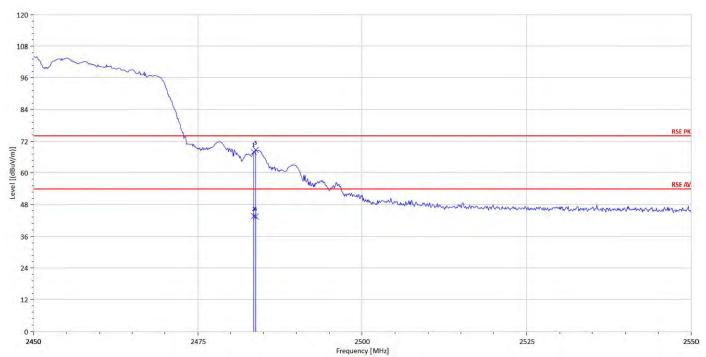
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Operation Mode:	802.11n40	Test Date :	2017/3/16
Fundamental Frequency:	2452 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	BE CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2483.50	Е	Peak	66.84	1.16	68.00	74	-6.00
2483.50	Е	Average	42.47	1.16	43.63	54	-10.37
2483.80	S	Peak	67.62	1.16	68.78	74	-5.22
2483.80	S	Average	42.31	1.16	43.47	54	-10.53

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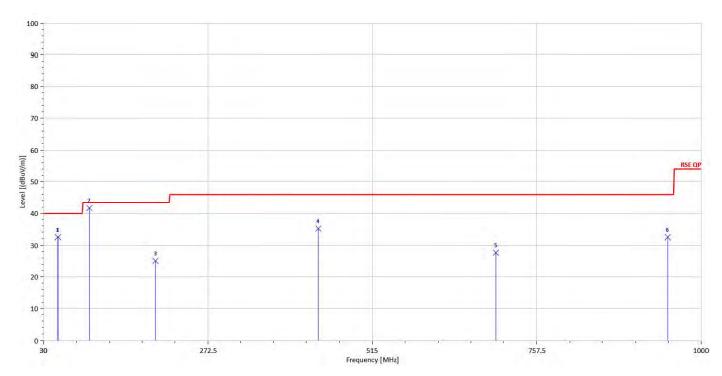
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#### **Below 1GHz Worst-Case Data:**

# Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



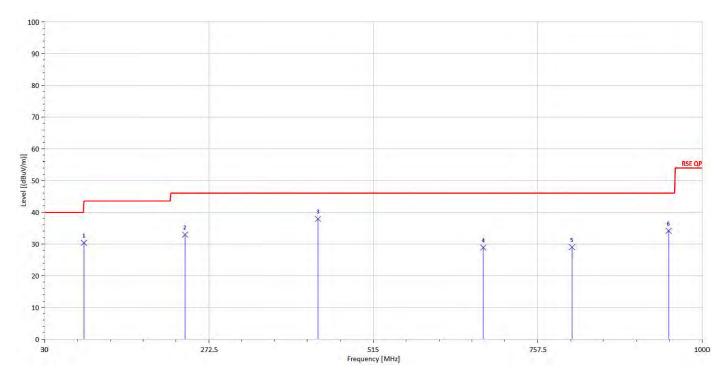
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
51.34	S	Peak	52.39	-19.88	32.51	40	-7.49
97.90	S	Peak	59.84	-18.10	41.74	43.5	-1.76
194.90	S	Peak	42.91	-17.85	25.06	43.5	-18.44
435.46	S	Peak	44.41	-9.20	35.21	46	-10.79
697.36	S	Peak	32.81	-5.14	27.67	46	-18.33
950.53	S	Peak	34.54	-2.06	32.48	46	-13.52

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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
88.20	S	Peak	50.11	-19.77	30.34	43.5	-13.16
237.58	S	Peak	48.50	-15.53	32.97	46	-13.03
433.52	S	Peak	47.52	-9.55	37.97	46	-8.03
676.99	S	Peak	34.00	-5.17	28.82	46	-17.18
807.94	S	Peak	32.17	-3.20	28.96	46	-17.04
950.53	S	Peak	36.22	-2.06	34.16	46	-11.84

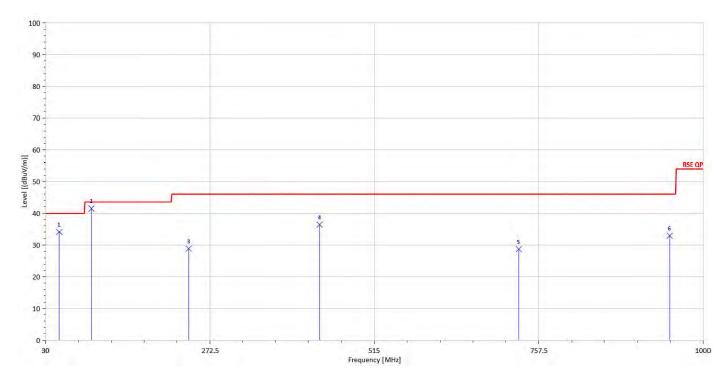
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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
50.37	S	Peak	53.67	-19.55	34.11	40	-5.89
97.90	S	Peak	59.59	-18.10	41.49	43.5	-2.01
241.46	S	Peak	44.04	-15.21	28.83	46	-17.17
434.49	S	Peak	45.87	-9.41	36.46	46	-9.54
728.40	S	Peak	33.30	-4.67	28.63	46	-17.37
950.53	S	Peak	34.98	-2.06	32.92	46	-13.08

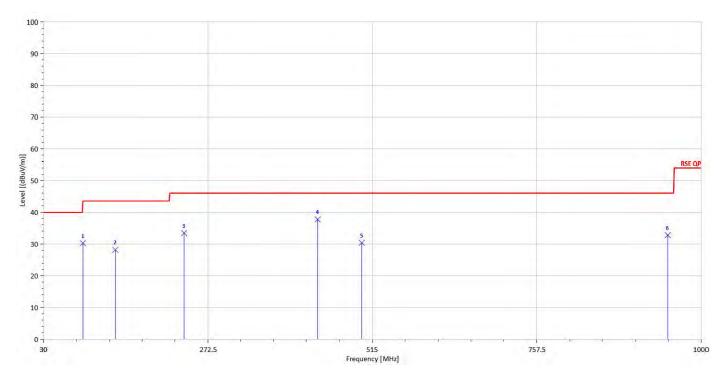
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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
88.20	S	Peak	50.00	-19.77	30.23	43.5	-13.27
135.73	S	Peak	43.83	-15.73	28.11	43.5	-15.39
237.58	S	Peak	48.99	-15.53	33.46	46	-12.54
434.49	S	Peak	47.21	-9.41	37.80	46	-8.20
499.48	S	Peak	38.04	-7.66	30.38	46	-15.62
950.53	S	Peak	34.85	-2.06	32.79	46	-13.21

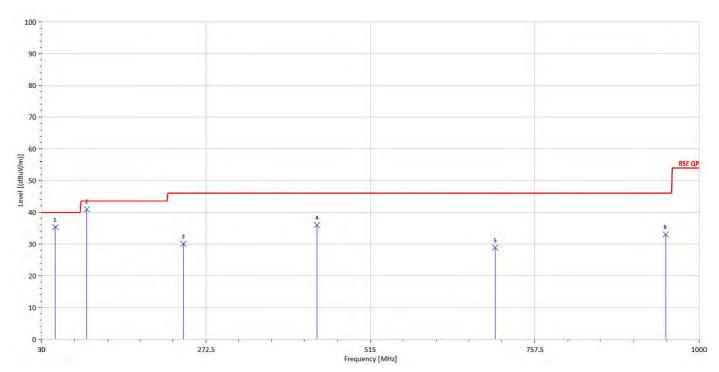
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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
50.37	S	Peak	54.89	-19.55	35.33	40	-4.67
96.93	S	Peak	59.25	-18.27	40.98	43.5	-2.52
239.52	S	Peak	45.34	-15.28	30.05	46	-15.95
436.43	S	Peak	45.21	-9.20	36.01	46	-9.99
699.30	S	Peak	33.89	-5.09	28.80	46	-17.20
950.53	S	Peak	35.09	-2.06	33.03	46	-12.97

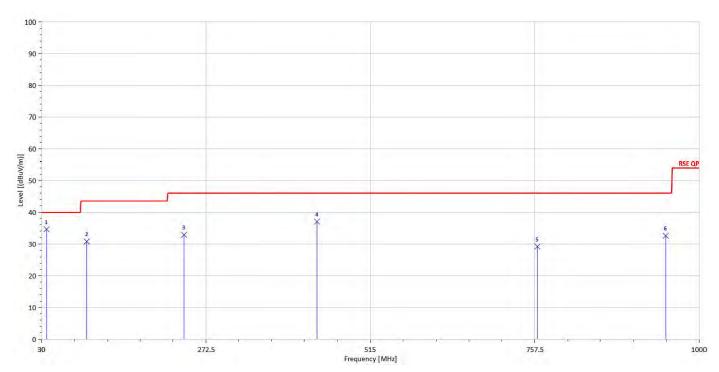
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Operation Mode:	802.11g	Test Date :	2017/3/16
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
37.76	S	Peak	46.15	-11.49	34.66	40	-5.34
96.93	S	Peak	49.04	-18.27	30.77	43.5	-12.73
240.49	S	Peak	48.10	-15.21	32.88	46	-13.12
436.43	S	Peak	46.32	-9.20	37.11	46	-8.89
761.38	S	Peak	33.17	-4.00	29.17	46	-16.83
950.53	S	Peak	34.65	-2.06	32.59	46	-13.41

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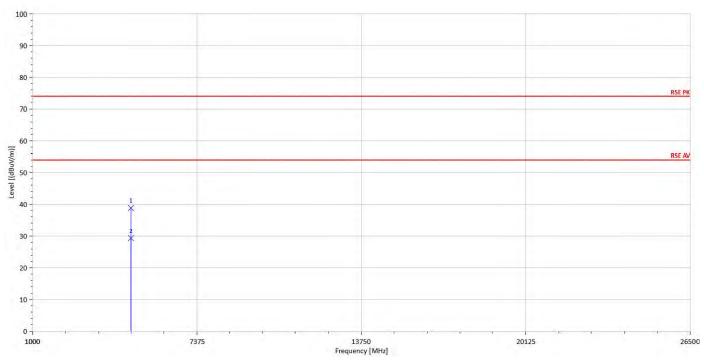
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#### **Above 1GHz Data:**

### Radiated Spurious Emission Measurement Result (802.11 b)

Operation Mode:	802.11b	Test Date :	2017/3/18
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



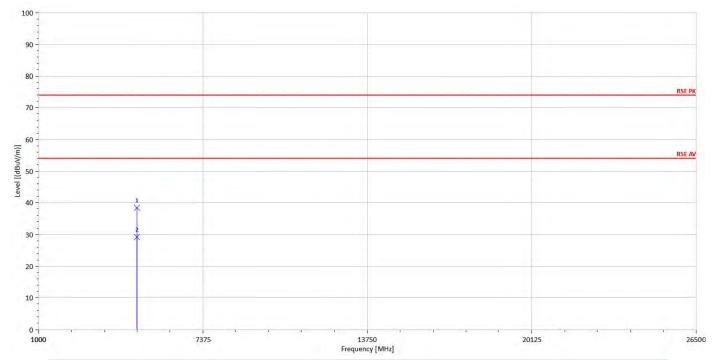
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	31.29	7.58	38.87	74	-35.13
4824.00	Н	Average	21.72	7.58	29.30	54	-24.70

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Operation Mode:	802.11b	Test Date :	2017/3/18
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	30.82	7.58	38.40	74	-35.60
4824.00	Н	Average	21.63	7.58	29.21	54	-24.79

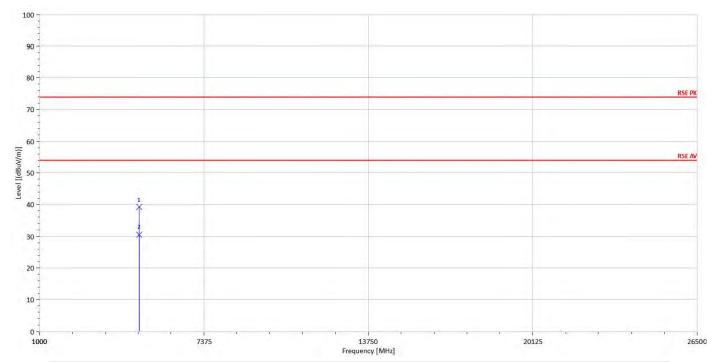
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Operation Mode:	802.11b	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	31.36	7.91	39.27	74	-34.73
4874.00	Н	Average	22.66	7.91	30.57	54	-23.43

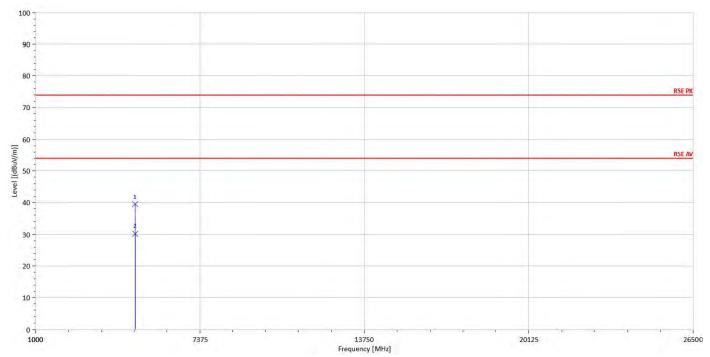
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Operation Mode:	802.11b	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	31.62	7.91	39.53	74	-34.47
4874.00	Н	Average	22.34	7.91	30.25	54	-23.75

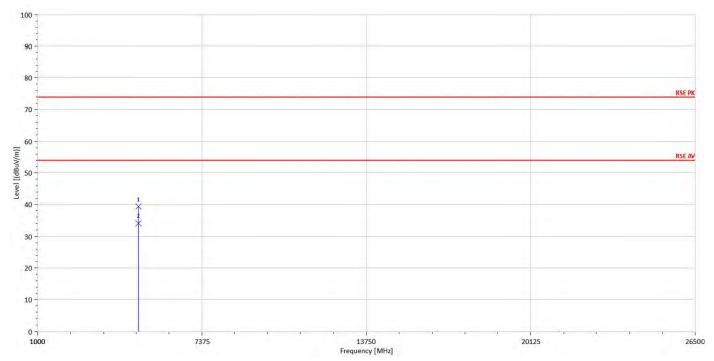
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Operation Mode:	802.11b	Test Date :	2017/3/18
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	31.48	7.92	39.41	74	-34.59
4924.00	Н	Average	26.16	7.92	34.08	54	-19.92

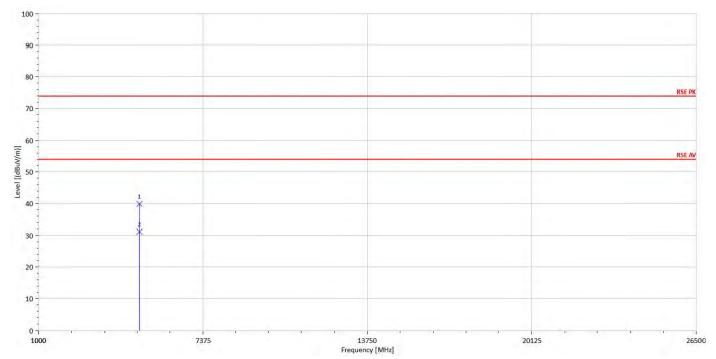
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Operation Mode:	802.11b	Test Date :	2017/3/18
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	32.04	7.92	39.96	74	-34.04
4924.00	Н	Average	23.23	7.92	31.15	54	-22.85

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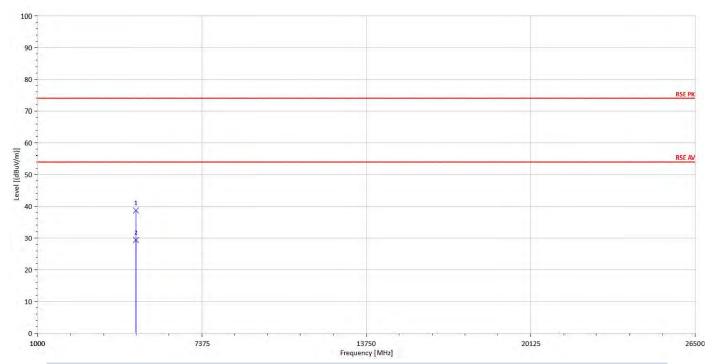
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# Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode:	802.11g	Test Date :	2017/3/18
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



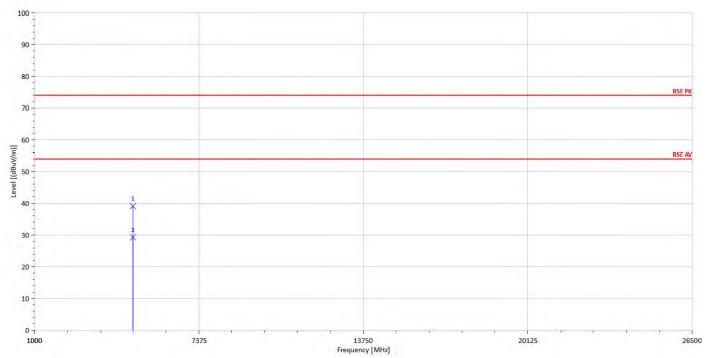
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	31.16	7.58	38.73	74	-35.27
4824.00	Н	Average	21.76	7.58	29.34	54	-24.66

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Operation Mode:	802.11g	Test Date :	2017/3/18
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	31.58	7.58	39.15	74	-34.85
4824.00	Н	Average	21.64	7.58	29.22	54	-24.78

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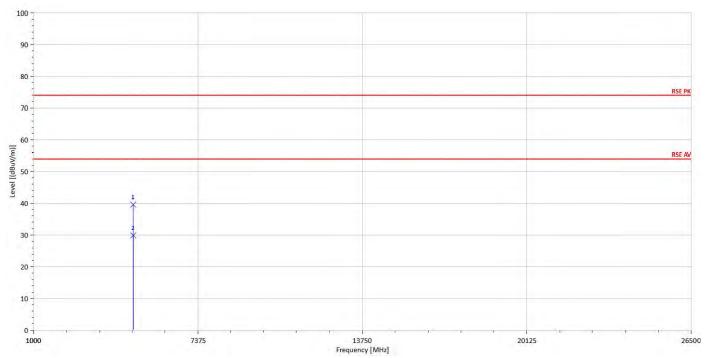
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Operation Mode:	802.11g	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	31.74	7.91	39.65	74	-34.35
4874.00	Н	Average	21.94	7.91	29.85	54	-24.15

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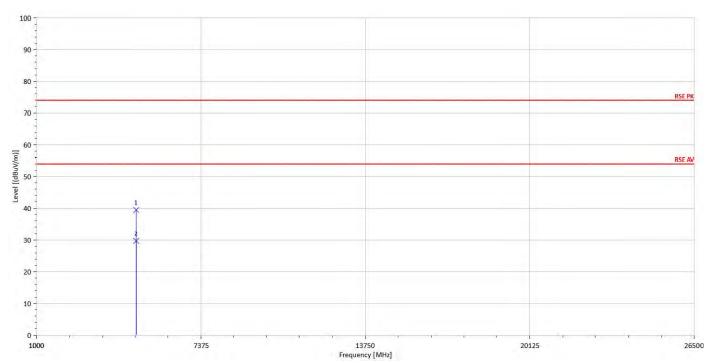
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Operation Mode:	802.11g	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	31.61	7.91	39.52	74	-34.48
4874.00	Н	Average	21.78	7.91	29.69	54	-24.31

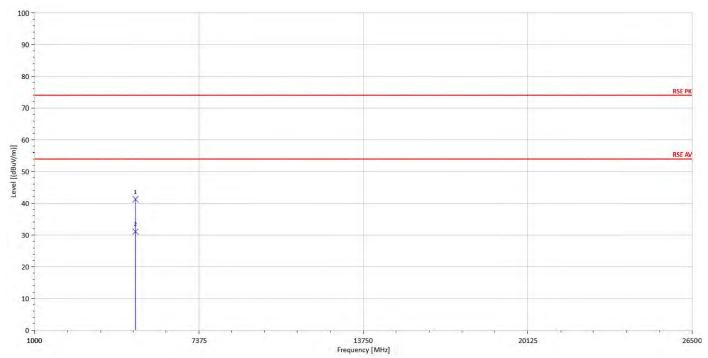
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Operation Mode:	802.11g	Test Date :	2017/3/18
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	33.26	8.00	41.27	74	-32.73
4924.00	Н	Average	23.06	8.00	31.06	54	-22.94

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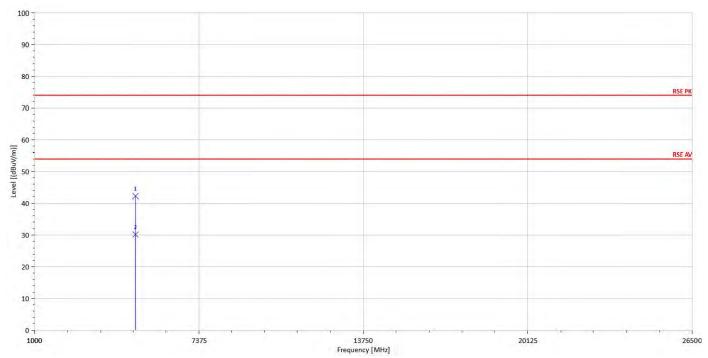
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Operation Mode:	802.11g	Test Date :	2017/3/18
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	34.21	8.00	42.22	74	-31.78
4924.00	Н	Average	22.12	8.00	30.12	54	-23.88

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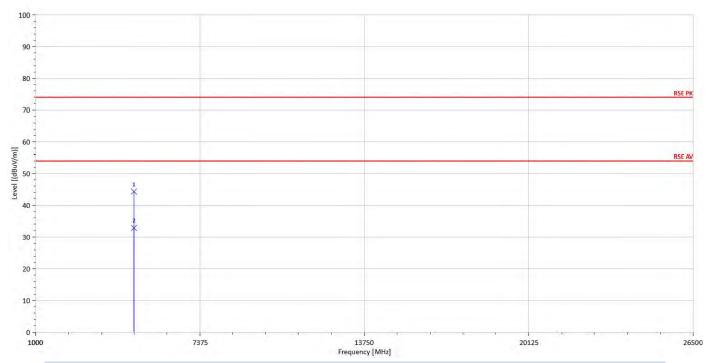
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## Radiated Spurious Emission Measurement Result (802.11\_HT20)

Operation Mode:	802.11n20	Test Date :	2017/3/18
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



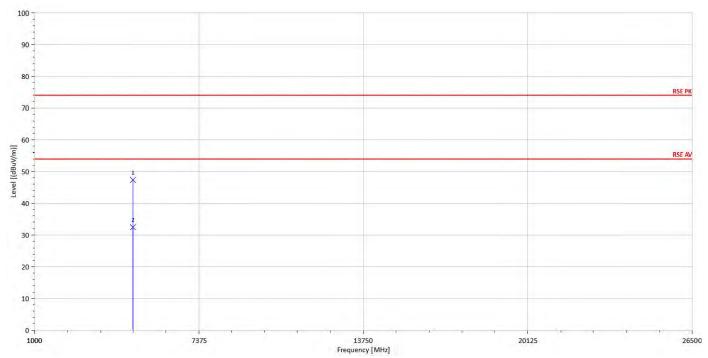
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	36.71	7.59	44.30	74	-29.70
4824.00	Н	Average	25.27	7.59	32.86	54	-21.14

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Operation Mode :	802.11n20	Test Date :	2017/3/18
Fundamental Frequency:	2412 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	39.76	7.59	47.35	74	-26.65
4824.00	Н	Average	24.85	7.59	32.44	54	-21.56

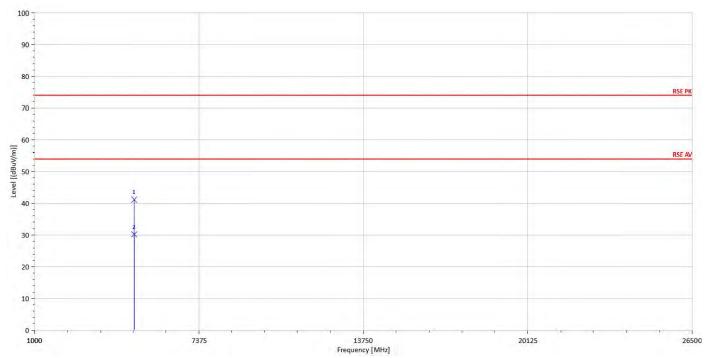
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Operation Mode:	802.11n20	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	33.28	7.87	41.15	74	-32.85
4874.00	Н	Average	22.32	7.87	30.19	54	-23.81

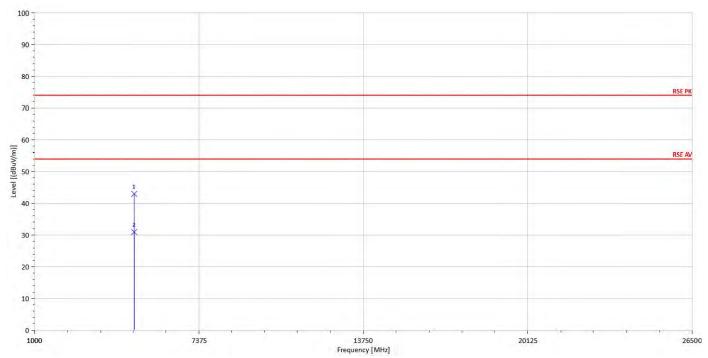
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Operation Mode:	802.11n20	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	35.04	7.87	42.91	74	-31.09
4874.00	Н	Average	23.03	7.87	30.90	54	-23.10

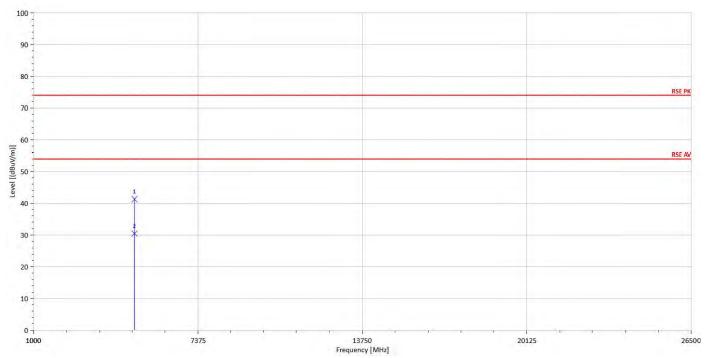
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Operation Mode:	802.11n20	Test Date :	2017/3/18
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	33.37	7.93	41.30	74	-32.70
4924.00	Н	Average	22.50	7.93	30.43	54	-23.57

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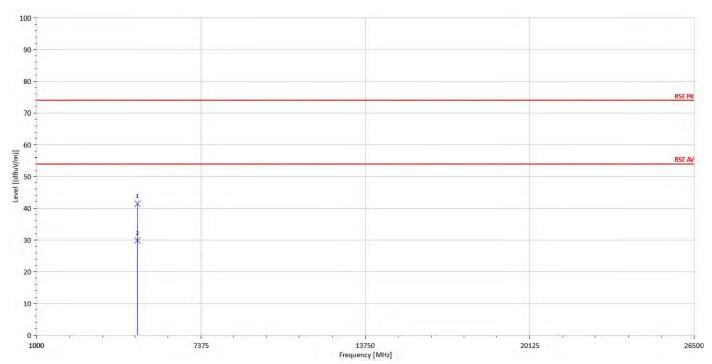
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Operation Mode:	802.11n20	Test Date :	2017/3/18
Fundamental Frequency:	2462 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	33.46	8.00	41.47	74	-32.53
4924.00	Н	Average	21.80	8.00	29.80	54	-24.20

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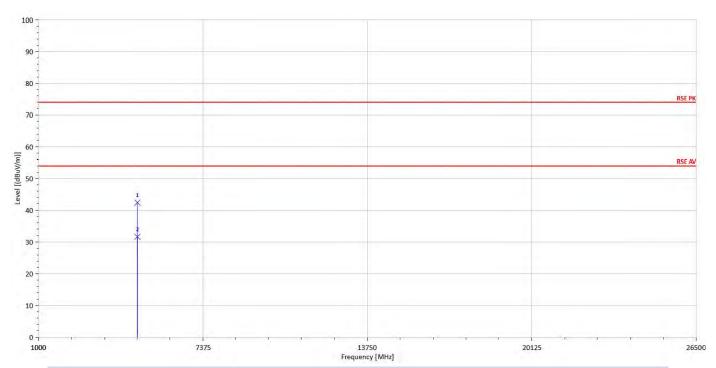
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## Radiated Spurious Emission Measurement Result (802.11\_HT40)

Operation Mode:	802.11n40	Test Date :	2017/3/18
Fundamental Frequency:	2422 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol. :	Vertical



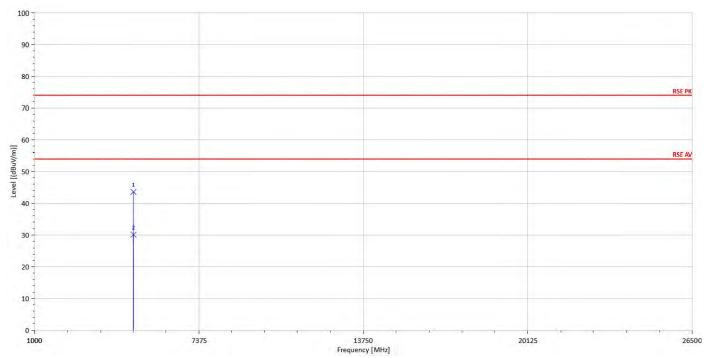
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4844.00	Н	Peak	34.81	7.54	42.35	74	-31.65
4844.00	Н	Average	24.09	7.54	31.63	54	-22.37

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Operation Mode:	802.11n40	Test Date :	2017/3/18
Fundamental Frequency:	2422 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH Low	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4844.00	Н	Peak	35.99	7.54	43.53	74	-30.47
4844.00	Н	Average	22.54	7.54	30.08	54	-23.92

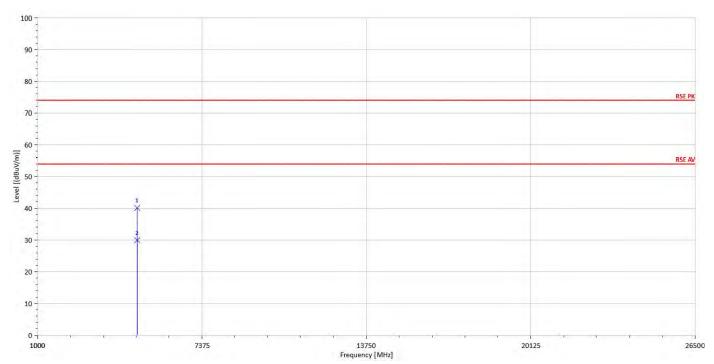
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Operation Mode :	802.11n40	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	32.27	7.91	40.18	74	-33.82
4874.00	Н	Average	22.01	7.91	29.92	54	-24.08

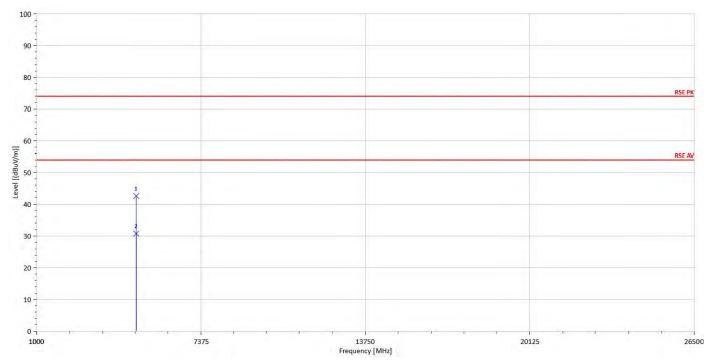
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Operation Mode:	802.11n40	Test Date :	2017/3/18
Fundamental Frequency:	2437 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH Mid	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	34.81	7.77	42.58	74	-31.42
4874.00	Н	Average	22.97	7.77	30.74	54	-23.26

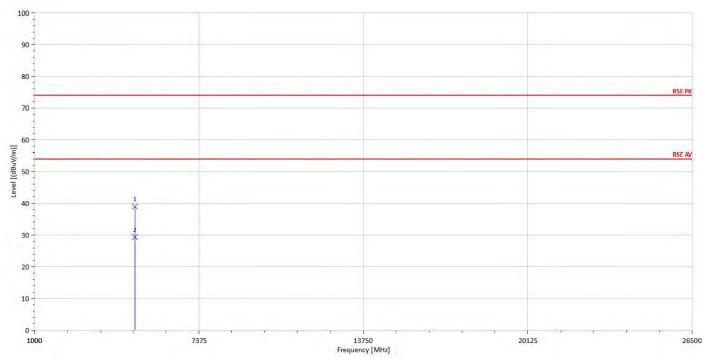
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Operation Mode:	802.11n40	Test Date :	2017/3/18
Fundamental Frequency:	2452 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band :	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Vertical



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4904.00	Н	Peak	31.59	7.44	39.03	74	-34.97
4904.00	Н	Average	21.88	7.44	29.32	54	-24.68

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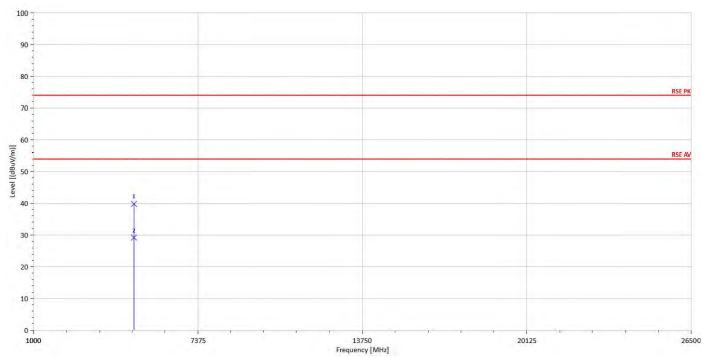
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Operation Mode:	802.11n40	Test Date :	2017/3/18
Fundamental Frequency:	2452 MHz	Temp. / Humi. :	20.1deg_C/50RH
Operation Band:	Tx CH High	Test Engineer:	Penny
EUT Pol. :	E2	Measurement Antenna Pol.:	Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4904.00	Н	Peak	32.42	7.44	39.86	74	-34.14
4904.00	Н	Average	21.70	7.44	29.14	54	-24.86

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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.

Note:

Antenna Gain: 3.82 dBi Aux1 Antenna Gain: 3.82 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)

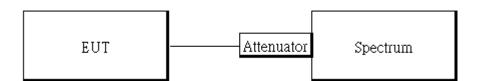
Effective Legacy Gain (dBi) = 3.82+3.01=6.83dBi

Limit: 8dBm - (6.83-6dBi)=7.17dBm

#### 12.2 Measurement Equipment Used

Conducted Emission Test Site									
EQUIPMENT MFR MODEL SERIAL LAST CAL DUE.									
	IVITIX	_			CAL DUL.				
TYPE		NUMBER	NUMBER	CAL.					
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017				
DC Block	PASTERNACK	PE8210	RF29	12/12/2016	12/11/2017				
Attenuator	WOKEN	218FS-10	RF23	12/12/2016	12/11/2017				

#### 12.3 Test Set-up



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#### 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 & 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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#### 12.5 Measurement Result

I	POWER DENSITY 802.11b MODE				POWER DENSITY 802.11g MODE			
	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result
	2412	0.82	8.00	PASS	2412	-11.95	8.00	PASS
	2437	3.59	8.00	PASS	2437	-10.39	8.00	PASS
	2462	-10.91	8.00	PASS	2462	-11.90	8.00	PASS

POW	R DENSITY	′ 802.11n HT	20 MODE	POWER DENSITY 802.11n HT40 MODE			
Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result
2412	-10.50	7.17	PASS	2422	-12.19	7.17	PASS
2437	-10.18	7.17	PASS	2437	-12.46	7.17	PASS
2462	-10.75	7.17	PASS	2452	-11.8	7.17	PASS

<sup>\*</sup>Refer to next page for plots

Bandedge Limit 802.11b MODE							
Freq. PSD Bandedge Limi							
(MHz)	(dBm)	(dBm)					
2412	5.38	-14.62					
2462	5.69	-14.31					

Bandedge Limit 802.11g MODE							
Freq.	PSD	Bandedge Limit					
(MHz)	(dBm)	(dBm)					
2412	5.65	-14.35					
2462	5.03	-14.97					

Bandedge Limit 802.11n20 MODE								
Freq.	PSD	Bandedge Limit						
(MHz)	(dBm)	(dBm)						
2412	7.26	-12.74						
2462	6.47	-13.53						

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#### 802.11b

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



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



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



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## 802.11g

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



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



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



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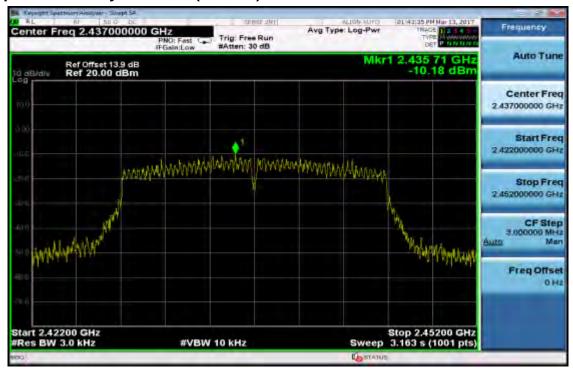


## 802.11n\_HT20 (MIMO)

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



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



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



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## 802.11n\_HT40 (MIMO)

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



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

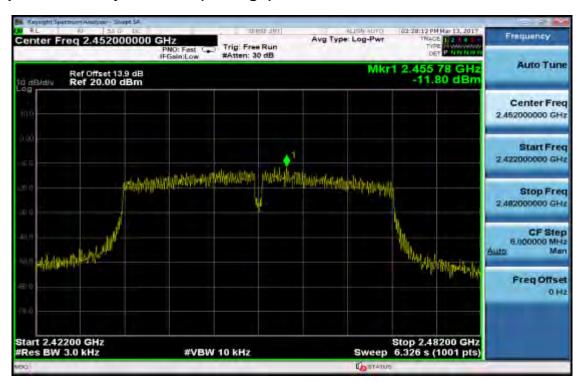


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## **Power Spectral Density Test Plot (CH-High)**



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## 802.11b PSD for Band edge Limit (CH-Low)



## 802.11b PSD for Bandedge Limit(CH-High)



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## 802.11g PSD for Bandedge Limit(CH-Low)



# 802.11g PSD for Bandedge Limit(CH-High)



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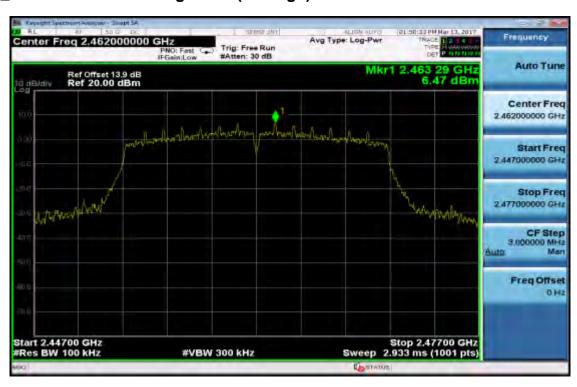
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802.11n\_HT20 PSD for Bandedge Limit(CH-Low)



## 802.11n\_HT20 PSD for Bandedge Limit(CH-High)



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802.11n\_HT40 PSD for Bandedge Limit(CH-Low)



# 802.11n\_HT40 PSD 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.

#### 13.2 Antenna Connected Construction

An embedded-in antenna design is used.

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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

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## 14 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

#### **Standard Applicable** 14.1

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range	Electric Field	tric Field Magnetic Field		Averaging Time				
(MHz)	Strength (V/m)	Strength (A/m)	(mW/cm <sup>2</sup> )	(minute)				
Limits for General Population/Uncontrolled Exposure								
0.3-1.34	614	1.63	*(100)	30				
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	30				
30-300	27.5	0.073	0.2	30				
300-1500	/	/ F/1500		30				
1500-15000	/	/	1.0	30				

F = frequency in MHz

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<sup>\* =</sup> Plane-wave equipment power density



## Maximum Permissible Exposure (MPE) Evaluation (worst case)

uni Fermissible Exposure (MFE) Evaluation (Worst case)									
802.1	l1g Mair	1							
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit		RESULT		
1	2412	6	23.06	202.30	1 Watt = 30.00	dBm	PASS		
6	2437	6	23.15	206.54	1 Watt = 30.00	dBm	PASS		
11	2462	6	23.46	221.82	1 Watt = 30.00	dBm	PASS		
802.1	1g Mair	า	•	•	•		-		
СН	Freq. (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit		RESULT		
1	2412	6	14.92	31.05	1 Watt = 30.00	dBm	PASS		
6	2437	6	14.97	31.41	1 Watt = 30.00	dBm	PASS		
11	2462	6	15.46	35.16	1 Watt = 30.00	dBm	PASS		

# MPE Prediction (802.11b 2412~2462)

Prediction of MPE limit at a given distance Equation from page 18 of OET Bulletin 65, Edition 97-01  $S=PG/4\pi R^2$ 

Where: S = Power densityP = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Max. output power including tune-up tolerancel:	15.46	(dBm)
Max. output power including tune-up tolerancel:	35.15604405	(mW)
Duty cycle:	89.64	(%)
Maximum Pav :	31.51387789	(mW)
Peak Antenna gain (Maximum):	3.82	(dBi)
Peak Antenna gain (linear):	2.409905429	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.015	(mW/cm^2)

## Measurement Result

The predicted power density level at 20 cm is 0.015 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2462MHz.

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## Maximum Permissible Exposure (MPE) Evaluation (worst case)

802.1	1n_HT20	OM MIMO							
СН	Freq. (MHz)	Data Rate		Output ower	Total Peak Output Power	Total Peak Output Power	Limit		RESULT
	,		CH 0	CH 1	(dBm)	(mW)			
1	2412	MCS8	21.64	21.22	24.45	278.32	1 Watt = 29.17	dBm	PASS
6	2437	MCS8	21.35	21.30	24.34	271.35	1 Watt = 29.17	dBm	PASS
11	2462	MCS8	21.12	21.01	24.08	255.60	1 Watt = 29.17	dBm	PASS
802.1	1n_HT20	OMIM MI							
СН	Freq. (MHz)	Data Rate	Po	Output ower IBm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit		RESULT
			CH 0	CH 1	(abiii)	(11144)			
1	2412	MCS8	12.62	12.31	15.48	35.30	1 Watt = 29.17	dBm	PASS
6	2437	MCS8	12.22	12.32	15.28	33.73	1 Watt = 29.17	dBm	PASS
11	2462	MCS8	12.52	12.31	15.43	34.89	1 Watt = 29.17	dBm	PASS

## MPE Prediction (802.11n\_HT20 2412~2462)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01  $S=PG/4\pi R^2$ 

Where: S = Power density P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

MIMO Gain: 3.82+3.01=6.83dBi

Max. output power including tune-up tolerancel:	15.48	(dBm)
Max. output power including tune-up tolerancel:	35.31831698	(mW)
Duty cycle:	80.87	(%)
Maximum Pav :	28.56192294	(mW)
Peak Antenna gain (Maximum):	6.83	(dBi)
Peak Antenna gain (linear):	4.819477976	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.027	(mW/cm^2)

## Measurement Result

The predicted power density level at 20 cm is 0.027 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2412MHz.

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## Maximum Permissible Exposure (MPE) Evaluation (worst case)

802.1	11n_HT40	OMIM MC							
СН	Freq. (MHz)	Data Rate		Output ower	Total Peak Output Power	Total Peak Output Power	Limit		RESULT
	(141112)	Nate	CH 0	CH 1	(dBm)	(mW)			
3	2422	MCS8	22.19	22.04	25.13	325.53	1 Watt = 29.17	dBm	PASS
6	2437	MCS8	22.17	22.29	25.24	334.25	1 Watt = 29.17	dBm	PASS
9	2452	MCS8	22.35	22.24	25.31	339.29	1 Watt = 29.17	dBm	PASS
802.1	802.11n_HT40M MIMO								
СН	Freq. (MHz)	Data Rate	Po	Output ower  Bm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit		RESULT
			CH 0	CH 1	(4.2)	(,			
3	2422	MCS8	12.87	12.31	15.61	36.39	1 Watt = 29.17	dBm	PASS
6	2437	MCS8	12.61	12.35	15.49	35.42	1 Watt = 29.17	dBm	PASS
9	2452	MCS8	12.66	12.43	15.56	35.95	1 Watt = 29.17	dBm	PASS

#### MPE Prediction (802.11n\_HT40 2422~2452)

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

 $S=PG/4\pi R^2$ 

Where: S = Power densityP = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

MIMO Gain: 3.28+3.01=6.83dBi

Max. output power including tune-up tolerancel:	15.61	(dBm)
Max. output power including tune-up tolerancel:	36.39150361	(mW)
Duty cycle:	68.49	(%)
Maximum Pav :	24.92454082	(mW)
Peak Antenna gain (Maximum):	6.83	(dBi)
Peak Antenna gain (linear):	4.819477976	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2422	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.024	(mW/cm^2)
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## Measurement Result

The predicted power density level at 20 cm is 0.024 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2422MHz.

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# 15 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

## 15.1 Standard Applicable

According to RSS 102 March 19,2015 issue 5 §2.5.2 RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz<sub>6</sub> and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $22.48/f_{0.5}W$  (adjusted for tune-up tolerance), where f is in MHz; at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x  $10-2 f_{0.6834}$  W (adjusted for tune-up tolerance), where f is in MHz;

This is a Mobile device, at which separation distance between the user and the device's antenna is 20cm. Therefore, section 2.5.2 shall be complied with

# 1.1 Maximum Permissible Exposure (MPE) Exemption

## 802.11 g:

Max. output power including tune-up tolerance:	15.46	(dBm)	
Max. output power including tune-up tolerance:	35.15604405	(mW)	
Antenna gain (Peak):	3.82	(dBi)	
Maximum antenna gain:	2.409905429	(numeric)	
Frenquency	2462	MHz	
Limit	W		
Evaluation Result			
The radiated power is 15.46 + 3.82 = 19.28 dBm(EIRP) =84.723mV			
that is less than or equal to 2.722W. Hence, following section 2.5.2 of RSS102 issue 5,			
RF exposure evaluation is no longer required.			

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#### 802.11 n HT20(MIMO):

Max. output power including tune-up tolerance:	15.48	(dBm)	
Max. output power including tune-up tolerance:	35.31831698	(mW)	
Antenna gain (Peak):	6.83	(dBi)	
Maximum antenna gain:	4.819477976	(numeric)	
Frenquency	2412	MHz	
Limit	2.6840	W	
Evaluation Result			
The radiated power is 15.48 + 6.83 = 22.31 dBm(EIRP) =170.216mW =0.170216W			
that is less than or equal to 2.684W. Hence, following section 2.5.2 of RSS102 issue 5,			
RF exposure evaluation is no longer required.			

#### 802.11 n HT40(MIMO):

-·····			
Max. output power including tune-up tolerance:	15.61	(dBm)	
Max. output power including tune-up tolerance:	36.39150361	(mW)	
Antenna gain (Peak):	6.83	(dBi)	
Maximum antenna gain:	4.819477976	(numeric)	
Frenquency	2422	MHz	
Limit	2.6916	W	
Evaluation Result			
The radiated power is $15.61 + 6.83 = 22.44 \text{ dBm}(EIRP) = 175.388m$			
that is less than or equal to 2.692W. Hence, following section 2.5.2 of RSS102 issue 5,			
RF exposure evaluation is no longer required.			

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