

Page 1 of 118

## **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

## INTENTIONAL RADIATOR CERTIFICATION TO **FCC PART 15 SUBPART C REQUIREMENT**

**Product Name:** Vodafone MachineLink 4G "ML4G"

**Marketing Name:** Vodafone MachineLink 4G "ML4G"

**Brand Name:** Vodafone MachineLink 4G "ML4G"

Model No.: **NWL-22-02** 

**Model Difference:** N/A

**Report No.:** E2/2016/50094

**Issue Date:** Jun. 08, 2016

**FCC Rule Part:** §15.247, Cat: DTS

**NetComm Wireless** 

18-20 Orion Road Lane Cove Sydney NSW **Prepared for:** 

> 2066 Australia SGS Taiwan Ltd.

**Electronics & Communication Laboratory** Prepared by:

No.2, Keji 1st Rd., Guishan Township,

**Taoyuan County, Taiwan 333** 





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## **VERIFICATION OF COMPLIANCE**

Applicant: NetComm Wireless

18-20 Orion Road Lane Cove Sydney NSW 2066 Australia

**Product Name:** Vodafone MachineLink 4G "ML4G" **Brand Name:** Vodafone MachineLink 4G "ML4G" **Marketing Name:** Vodafone MachineLink 4G "ML4G"

Model No.: NWL-22-02

**Model Difference:** N/A

File Number: E2/2016/50094

Date of Test: May 27, 2016 ~ Jun. 08, 2016

May 27, 2016 Date of EUT Received:

## 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:	Aken Huang	Date:	Jun. 08, 2016
Prepared By:	Aken Hunag / Engineer Tiffany Kao	Date:	Jun. 08, 2016
Approved By:	Jim Chang / Asst. Manager	Date:	Jun. 08, 2016

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# **Revision History**

Report Number	Revision	Description	Issue Date
E2/2016/50094	Rev.00	Initial creation of document	Jun. 08, 2016
			TOUR LAND



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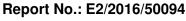
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## **GENERAL INFORMATION**

## 1.1 Product description

#### General:

acriciai.				
Product Name:	Vodafone MachineLink 4G "ML4G"			
Marketing Name:	Vodafone MachineLink 4G "ML4G"			
Brand Name:	Vodafone MachineLink 4G "ML4G"			
Model No.:	NWL-22-02			
Model Difference:	N/A			
Product SW/HW version:	v2.0.39.6 / V1.0			
Radio SW/HW version:	SWI9X15C_00.00.00_0324 / N/A			
Test SW Version:	N/A			
RF power setting in TEST SW:	N/A			
Test SW Version:	N/A			
RF power setting in TEST SW:	N/A			
Dawar Cumhu	12Vdc from AC/DC Adapter			
Power Supply:	Adapter: Model No.: S018KM1200150, Supplier: Tenpao			

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#### WLAN 2.4GHz:

/ <u>V L / (  V Z . + C</u>	<u> </u>					
Wi-Fi	Frequency Range	Channels	Rated Power / (EIRP)	Modulation Technology		
11b/g	2412-2462	11	b: 14.78dBm g: 17.81dBm	DSSS, OFDM		
11n	HT/VHT20 2412-2462	11	HT20:18.19dBm (MIMO Chain 0+1)	OFDM		
11n	HT/VHT40 2422-2452	7	HT40: 18.21dBm (MIMO Chain 0+1)	OFDM		
Antenna	a Designation		ntenna 2.4GHz Gain: 2.0 dBi .4GHz Gain: 2.0 dBi			
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transition Rate:		802.11 g: 802.11 n	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

ANSI C63.10:2013

#### Note:

- All test items have been performed and record as per the above standards.
- The composite system is compliance with FCC Subpart B is authorized under a 2. DoC procedure.

## 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: 628985

#### 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 5.9dB and 10dB attenuator.

#### Offset:

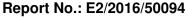
= RF cable loss (dB)+ attenuation factor(dB) dB =20.0dB)

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## 2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission / Conduction configuration

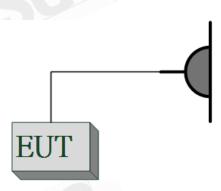
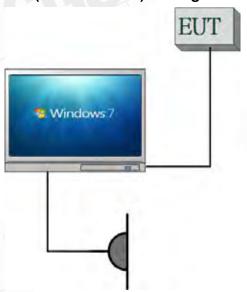


Fig. 2-2 Conducted (Antenna Port) Configuration Emission



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

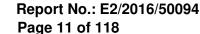
Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L430	R9-YYG88	shielded	Un-shielded

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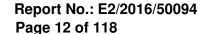
## **SUMMARY OF TEST RESULTS**

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	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

the provided for comments, comments granted comments.							
CHANNEL	FREQUENCY	CHANNEL	FREQUENCY				
1	2412 MHz	7	2442 MHz				
2	2417 MHz	8	2447 MHz				
3	2422 MHz	9	2452 MHz				
4	2427 MHz	10	2457 MHz				
5	2432 MHz	11	2462 MHz				

2437 MHz 6

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

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case H position was tested as resulted in pre-scanned measurement.

Pre-scanned was done on Antenna Main and Antenna Aux, and Antenna Main results higher emission at 2.4GHz. Therefore, the completed set of measurement was done on Antenna Main (2.4GHz) to be presented on this test report.

#### ANTENNA PORT CONDUCTED MEASUREMENT:

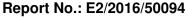
CONDUCTED TEST						
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT	
802.11b	1 to 11	1, 6, 11	DSSS	11	Main	
802.11g	1 to 11	1, 6, 11	OFDM	54	Main	
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO	
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO	

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#### **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 : Vertical)	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.

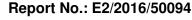
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## **CONDUCTED EMISSION TEST**

## 6.1 Standard Applicable

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

	mits (uV)
	Average
66 to 56	56 to 46
56	46
60	50
	Quasi-peak 66 to 56 56

#### 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

## 6.2 Measurement Equipment Used

	Conducted Emission Test Site												
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.								
TYPE		NUMBER	NUMBER	CAL.									
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2015	12/11/2016								
Coaxial Cables	N/A	N30N30-1042-150c m	N/A	02/07/2016	02/06/2017								
LISN	Schwarzbeck	NSLK 8127	8127-648	06/09/2015	06/08/2016								
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.								

## 6.3 EUT Setup

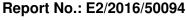
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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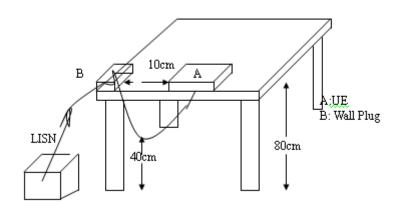
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## 6.4 Test SET-UP (Block Diagram of Configuration)



#### **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

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

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 Jun. 07, 2016 Test Date:

Temperature: 25

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Operation Mode: Operation mode Test Date: Jun. 07, 2016

Temperature: 25

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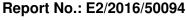
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## **DUTY CYCLE OF TEST SIGNAL**

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:**

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

## **Duty Cycle:**

	Duty Cycle (%)	Duty Factor (dB)
802.11b	100.00	0.00
802.11g	97.82	0.10
802.11n_20	95.38	0.21
802.11n_40	92.93	0.32

b = 100%, g = 97.82%,n ht 20 = 95.38%, n ht40 = 92.93%

Duty Cycle Factor:  $10 * \log(1/1) = 0$ 

Duty Cycle Factor:  $10 * \log(1/0.9782) = 0.1$ Duty Cycle Factor:  $10 * \log(1/0.9538) = 0.21$ Duty Cycle Factor:  $10 * \log(1/0.9293) = 0.32$ 

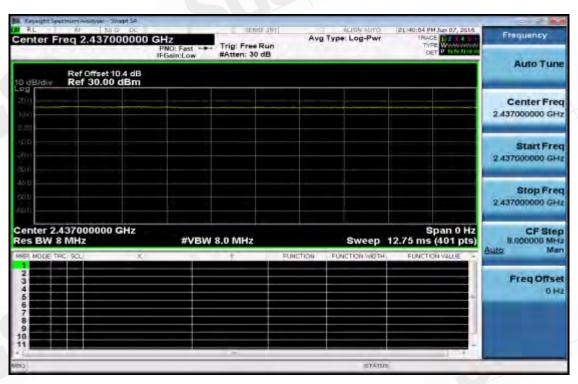
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## 7.1 DUTY CYCLE TEST SIGNAL Measurement Result 802.11 b



## 802.11 q



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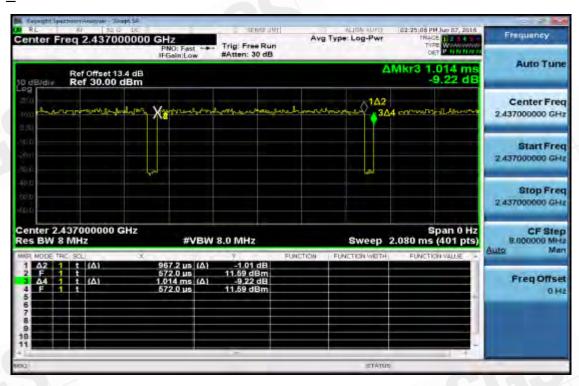
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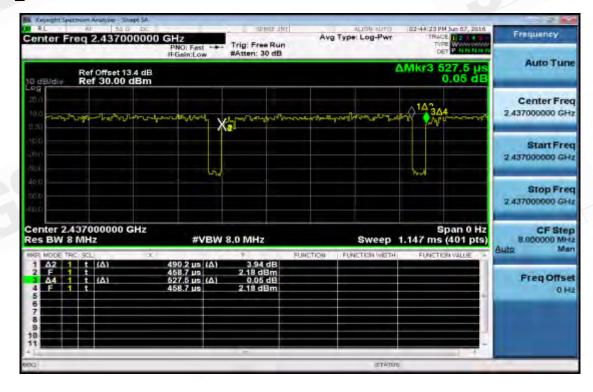
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## 802.11 n 20 MHz



## 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.

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.

Note:

2.00 dBi Antenna Gain: 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) = 2+3.01=5.01dBi

Limit: 30dBm - (5.01- 6dBi)=30

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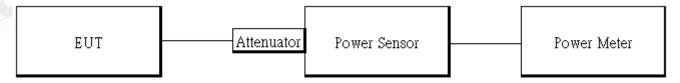
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## 8.2 Measurement Equipment Used

	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	06/23/2015	06/22/2016							
Power Sensor	Anritsu	MA2411B	1315048	06/23/2015	06/22/2016							
Power Sensor	Anritsu	MA2411B	1315049	06/23/2015	06/22/2016							
Coaxial Cable 30cm	WOKEN	00100A1F1A19 5C	RF01	12/12/2015	12/11/2016							
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016							
Splitter	RF-LAMBAD	RFLT2W1G18 G	RF35	12/12/2015	12/11/2016							
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016							
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. Guidance.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

#### **Power Meter:**

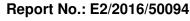
It is used as the auxiliary test equipment to conduct the output power measurement.

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

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#### 8.5 Measurement Result

802.1	1b Main				•			
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	ι	-imit		RESULT
1	2412	1	14.58	28.71	1 Watt =	30.00	dBm	PASS
6	2437	1	14.78	30.06	1 Watt =	30.00	dBm	PASS
11	2462	1	14.30	26.92	1 Watt =	30.00	dBm	PASS
802.1	1b Main							_
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit			RESULT
1	2412	1	12.31	17.02	1 Watt =	30.00	dBm	PASS
6	2437	1	12.47	17.66	1 Watt =	30.00	dBm	PASS
11	2462	1	12.24	16.75	1 Watt =	30.00	dBm	PASS

802.11	1b Aux							
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	1	14.55	28.51	1 Watt =	30.00	dBm	PASS
6	2437	1	14.66	29.24	1 Watt =	30.00	dBm	PASS
11	2462	1	14.25	26.61	1 Watt =	30.00	dBm	PASS
802.11	1b Aux							
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)		Limit		RESULT
1	2412	1	12.27	16.87	1 Watt =	30.00	dBm	PASS
6	2437	1	12.3	16.98	1 Watt =	30.00	dBm	PASS
11	2462	1	12.07	16.11	1 Watt =	30.00	dBm	PASS

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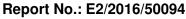
802.1	1g Main							
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	ι	RESULT		
1	2412	6	16.67	46.45	1 Watt =	30.00	dBm	PASS
6	2437	6	17.81	60.39	1 Watt =	30.00	dBm	PASS
11	2462	6	15.87	38.64	1 Watt =	30.00	dBm	PASS
802.1	1g Main	-						
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)		RESULT		
1	2412	6	9.41	8.73	1 Watt =	30.00	dBm	PASS
6	2437	6	11.79	15.10	1 Watt =	30.00	dBm	PASS
11	2462	6	8.27	6.71	1 Watt =	30.00	dBm	PASS

802.11	1g Aux					76		
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	6	16.59	45.60	1 Watt =	30.00	dBm	PASS
6	2437	6	17.71	59.02	1 Watt =	30.00	dBm	PASS
11	2462	6	15.62	36.48	1 Watt =	30.00	dBm	PASS
802.11	1g Aux							
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	ι	_imit		RESULT
1	2412	6	9.39	8.69	1 Watt =	30.00	dBm	PASS
6	2437	6	11.65	14.62	1 Watt =	30.00	dBm	PASS
11	2462	6	7.97	6.27	1 Watt =	30.00	dBm	PASS

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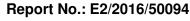
802.1	1n_HT20M Mair	1						
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	MCS0	16.84	48.31	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	16.61	45.81	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	16.44	44.06	1 Watt =	30.00	dBm	PASS
802.1	1n_HT20M Mair	1				4 6		
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit			RESULT
1	2412	MCS0	9.64	9.20	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	9.61	9.14	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	9.66	9.25	1 Watt =	30.00	dBm	PASS

000 11	15 UTOOM A.IV							
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	ı	imit	8	RESULT
1	2412	MCS0	16.51	44.77	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	16.48	44.46	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	16.41	43.75	1 Watt =	30.00	dBm	PASS
802.11	1n_HT20M Aux				-			
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	L	imit		RESULT
1	2412	MCS0	9.31	8.53	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	9.58	9.08	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	9.13	8.18	1 Watt =	30.00	dBm	PASS

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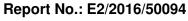
802.1	1n_HT20M MII	MO								
СН	Frequency (MHz)	Data Rate	Po	Output wer Bm)	Total Peak Output Power	Total Peak Output Power	Limit		RESULT	
			CH 0	CH 1	(dBm)	(mW)				
1	2412	MCS8	15.17	15.19	18.19	65.92	1 Watt =	30.00	dBm	PASS
6	2437	MCS8	15.21	14.87	18.05	63.88	1 Watt =	30.00	dBm	PASS
11	2462	MCS8	15.01	14.78	17.91	61.76	1 Watt =	30.00	dBm	PASS
802.1	1n_HT20M MII	MO								
СН	Frequency (MHz)	Data Rate	Po	Output wer Bm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	er Limit			RESULT
			CH 0	CH 1	(4211)	()				
1	2412	MCS8	6.81	6.88	9.86	9.67	1 Watt =	30.00	dBm	PASS
6	2437	MCS8	6.94	6.31	9.65	9.22	1 Watt =	30.00	dBm	PASS
11	2462	MCS8	6.97	6.46	9.73	9.40	1 Watt =	30.00	dBm	PASS

802 1	1n HT40M Mair	•						
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limi		RESULT	
3	2422	MCS0	15.31	33.96	1 Watt = 30	0.00 dBm	PASS	
6	2437	MCS0	15.91	38.99	1 Watt = 30	0.00 dBm	PASS	
9	2452	MCS0	15.89	38.82	1 Watt = 30	0.00 dBm	PASS	
802.1	802.11n HT40M Main							
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limi	RESULT		
3	2422	MCS0	7.38	5.47	1 Watt = 30	0.00 dBm	PASS	
6	2437	MCS0	8.71	7.43	1 Watt = 30	0.00 dBm	PASS	
9	2452	MCS0	8.73	7.46	1 Watt = 30	0.00 dBm	PASS	

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802.1	1n_HT40M Aux							
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit		RESULT	
3	2422	MCS0	15.21	33.19	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	15.84	38.37	1 Watt =	30.00	dBm	PASS
9	2452	MCS0	15.82	38.19	1 Watt =	30.00	dBm	PASS
802.1°	1n_HT40M Aux							
СН	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit		RESULT	
3	2422	MCS0	7.3	5.37	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	8.61	7.26	1 Watt =	30.00	dBm	PASS
9	2452	MCS0	8.57	7.19	1 Watt =	30.00	dBm	PASS

802.1	1n_HT40M MII	MO								
СН	Frequency (MHz)	Data Rate			Total Peak Output Power	Total Peak Output Power	Limit			RESULT
			CH 0	CH 1	(dBm)	(mW)				
3	2422	MCS8	15.36	15.04	18.21	66.27	1 Watt =	30.00	dBm	PASS
6	2437	MCS8	15.21	15.14	18.19	65.85	1 Watt =	30.00	dBm	PASS
9	2452	MCS8	15.13	15.04	18.10	64.50	1 Watt =	30.00	dBm	PASS
802.1	1n_HT40M MII	MO					-			•
СН	Frequency (MHz)	Data Rate	Pov	Output wer Bm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit			RESULT
			CH 0	CH 1	(ubiii)	(,				
3	2422	MCS8	4.92	4.52	7.73	5.94	1 Watt =	30.00	dBm	PASS
6	2437	MCS8	5.85	5.74	8.81	7.60	1 Watt =	30.00	dBm	PASS
9	2452	MCS8	5.91	5.66	8.80	7.58	1 Watt =	30.00	dBm	PASS

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

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#### **6DB BANDWIDTH MEASUREMENT**

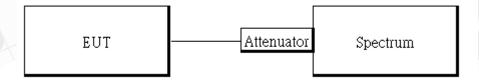
#### 9.1 Standard Applicable

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	12/12/2015	12/11/2016				
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016				

## 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.

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## 9.5 Measurement Result 6dB Bandwidth

#### 802 11h Main

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result	
2412	10121	> 500	PASS	
2437	10117	> 500	PASS	
2462	10107	> 500	PASS	

802 11a Main

OUZ.11g Wall							
Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result				
2412	16350	> 500	PASS				
2437	16370	> 500	PASS				
2462	16380	> 500	PASS				

802.11 n HT20 Main

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2412	17670	> 500	PASS
2437	17650	> 500	PASS
2462	17690	> 500	PASS

802.11 n HT20 Aux

302111_11_11							
Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result				
2412	17680	> 500	PASS				
2437	17670	> 500	PASS				
2462	17680	> 500	PASS				

802.11 n HT40 Main

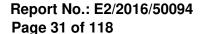
Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2422	36120	> 500	PASS
2437	36170	> 500	PASS
2452	36130	> 500	PASS

802.11 n HT40 Aux

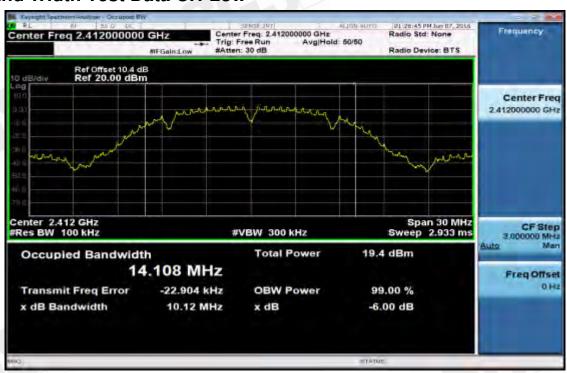
Frequency (MHz)	6dB Ban dwidth (kHz)	Limit (kHz)	Result
2422	36140	> 500	PASS
2437	36130	> 500	PASS
2452	36170	> 500	PASS

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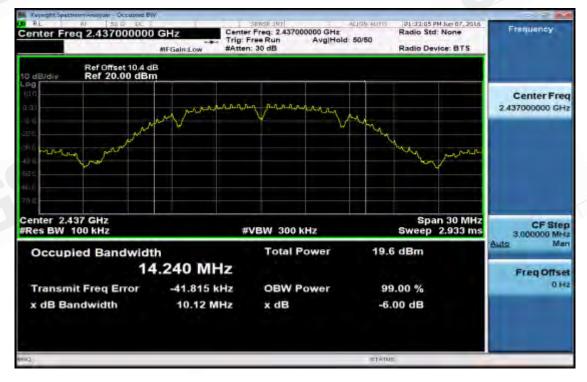
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## 802.11b (Main) 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



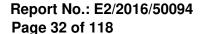
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## 6dB Band Width Test Data CH-High



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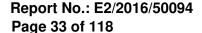
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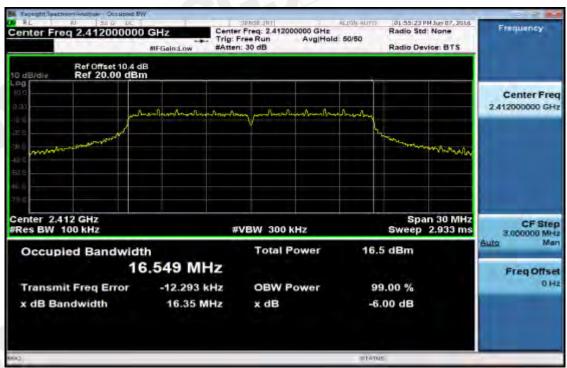
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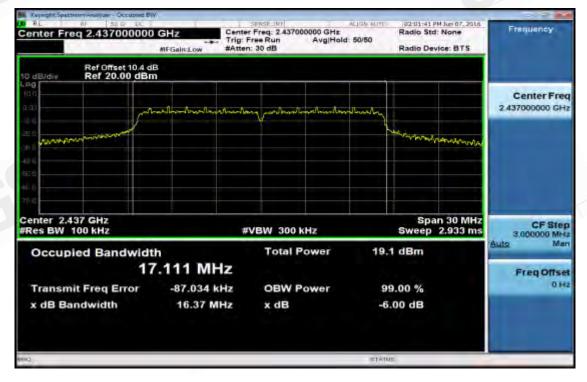




802.11g (Main) 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



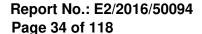
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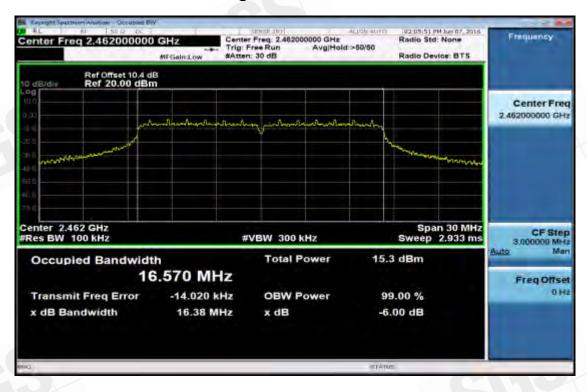
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6dB Band Width Test Data CH-High



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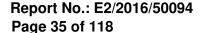
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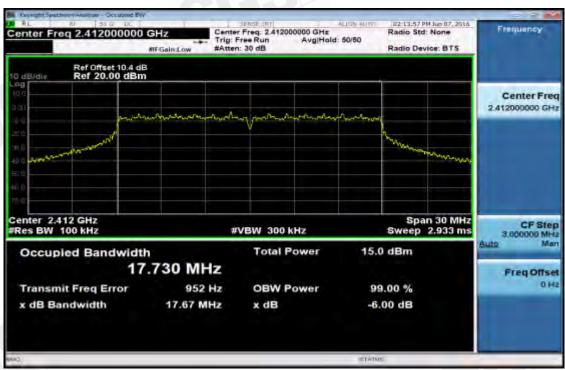
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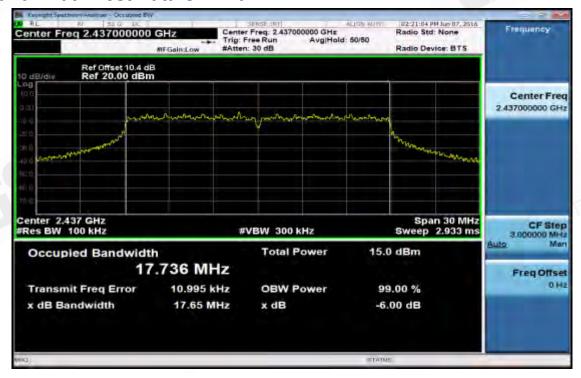




## 802.11n 20M (Main) 6dB Band Width Test Data CH-Low



## 6dB Band Width Test Data CH-Mid



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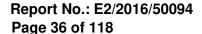
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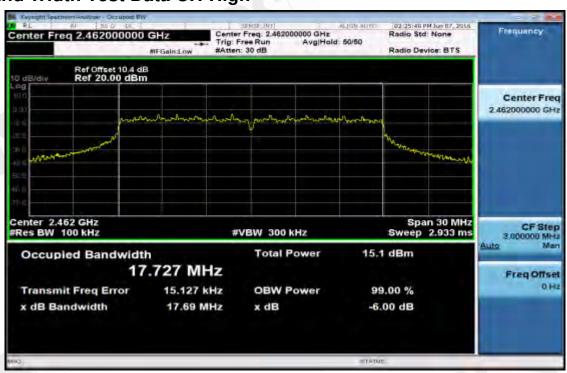
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## 6dB Band Width Test Data CH-High



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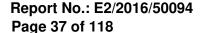
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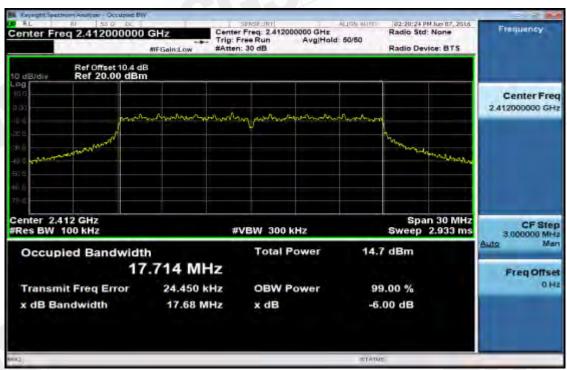
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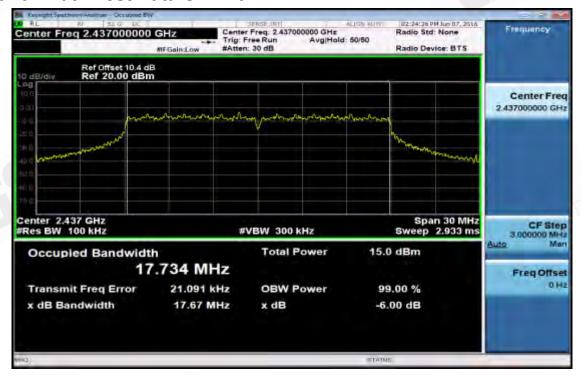




# 802.11n 20M (AUX) 6dB Band Width Test Data CH-Low



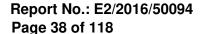
### 6dB Band Width Test Data CH-Mid



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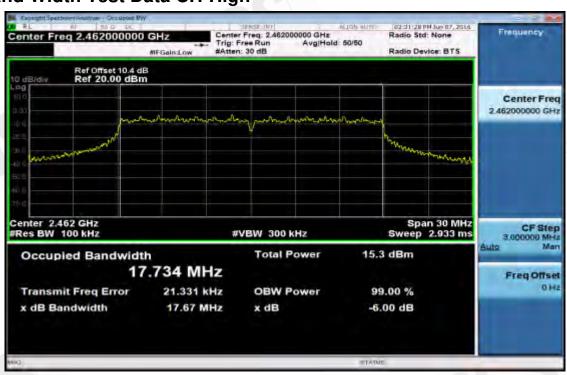
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# 6dB Band Width Test Data CH-High



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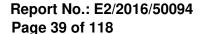
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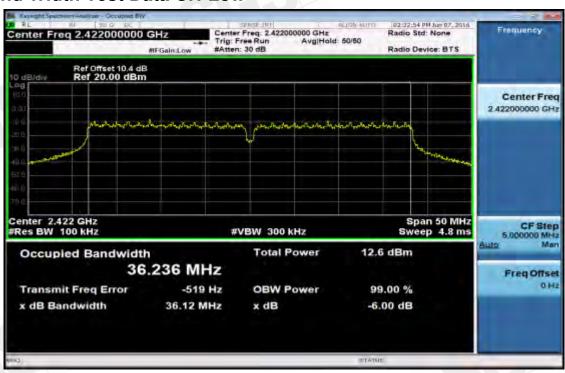
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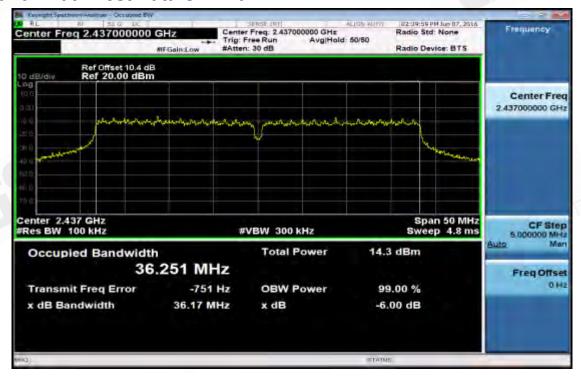




# 802.11n 40M (Main) 6dB Band Width Test Data CH-Low



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



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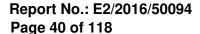
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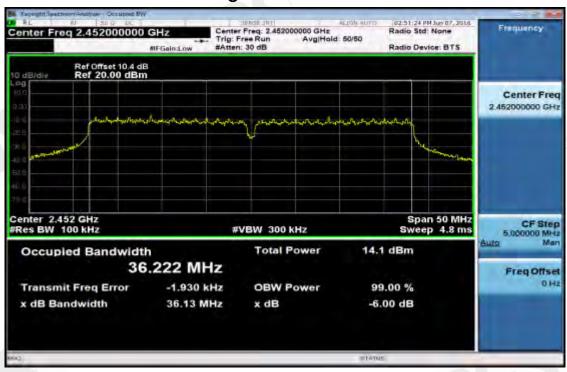
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# 6dB Band Width Test Data CH-High



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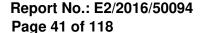
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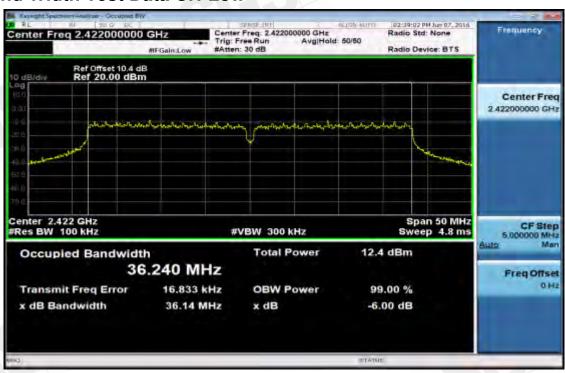
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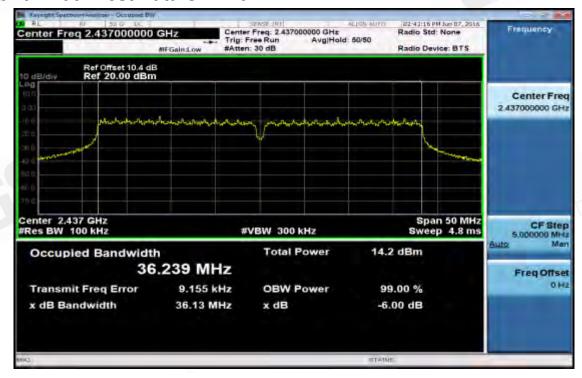




802.11n\_40M (AUX) 6dB Band Width Test Data CH-Low



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



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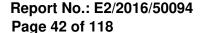
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# 6dB Band Width Test Data CH-High



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### 10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

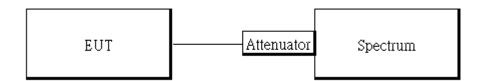
### 10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

#### 10.2 Measurement Equipment Used

Conducted Emission Test Site									
EQUIPMENT MFR MODEL SERIAL LAST CA									
TYPE		NUMBER	NUMBER	CAL.					
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017				
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016				
Attenuator	12/12/2015	12/11/2016							

#### 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

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

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



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



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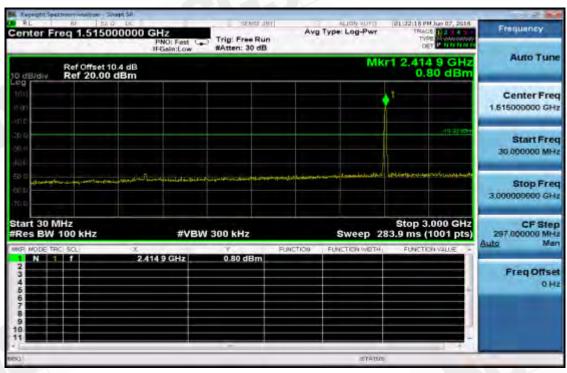
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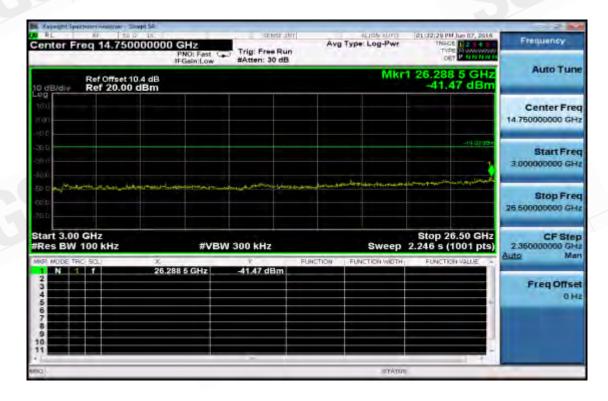
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# 802.11b **Spurious Emission Test Data CH-Low**





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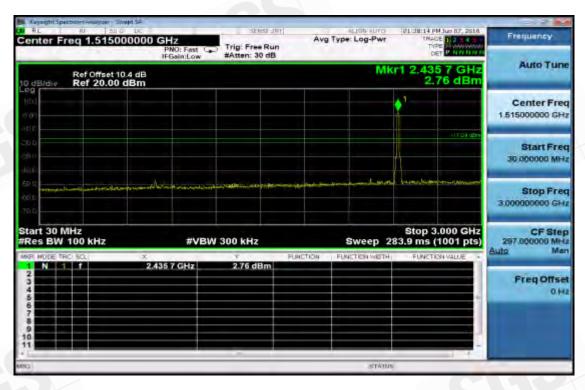
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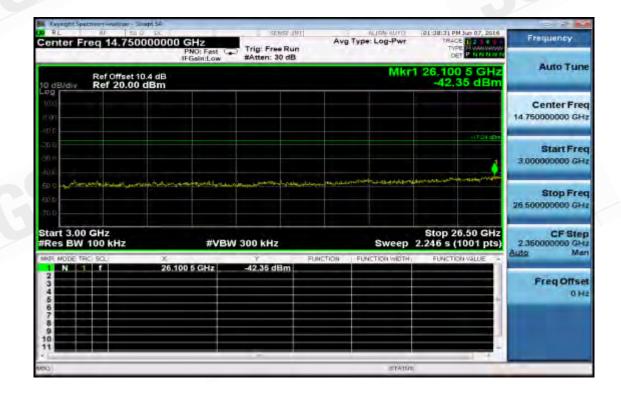
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## **Spurious Emission Test Data CH-Mid**





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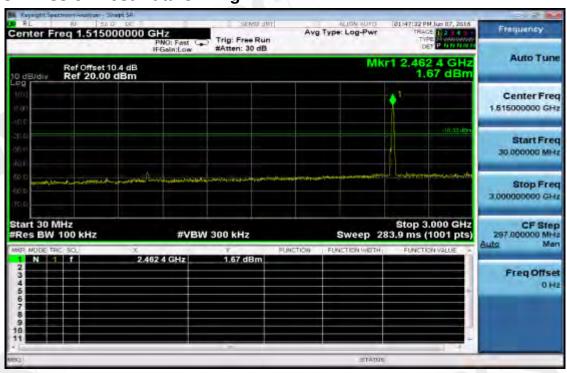
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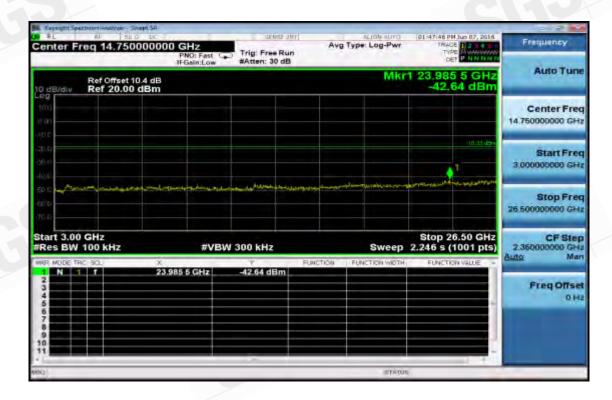
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# **Spurious Emission Test Data CH-High**





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



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



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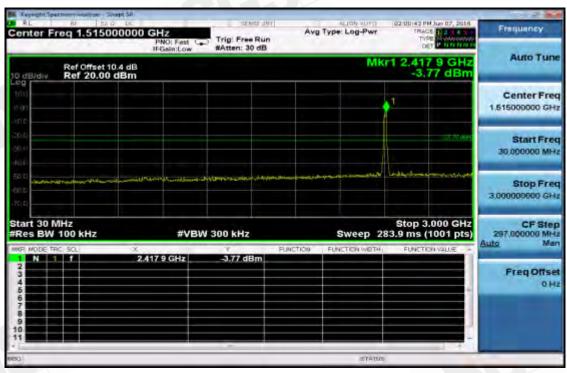
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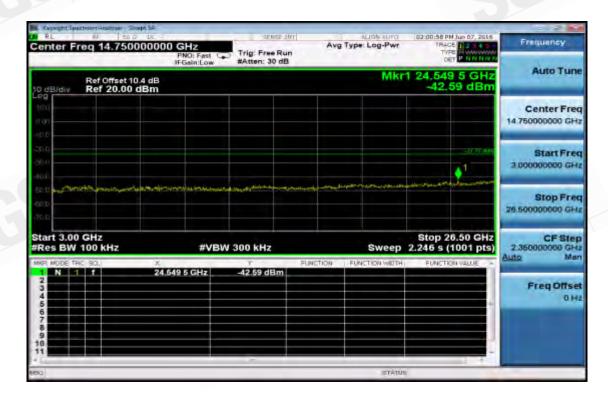
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# 802.11g **Spurious Emission Test Data CH-Low**





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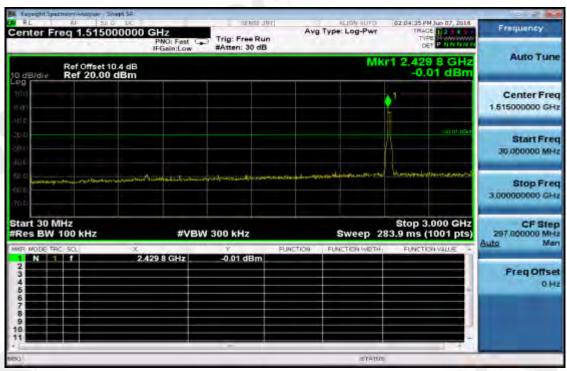
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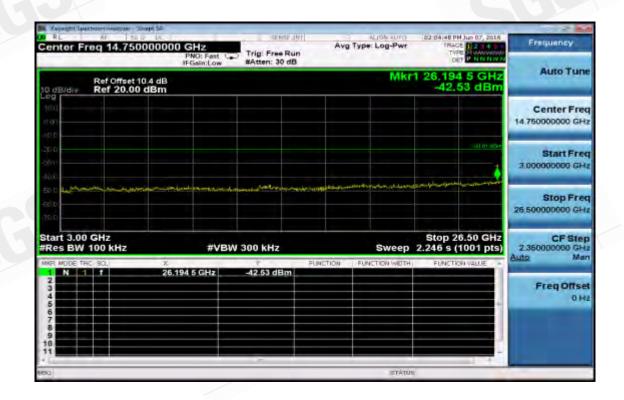
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### **Spurious Emission Test Data CH-Mid**





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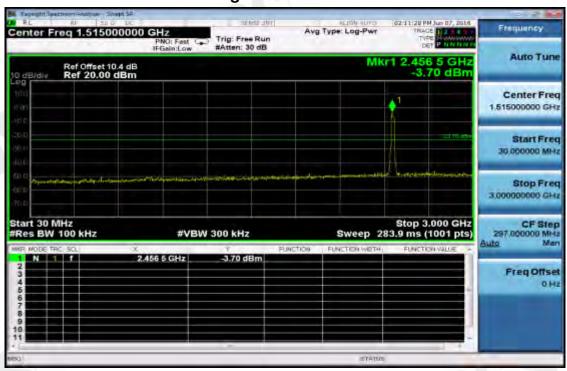
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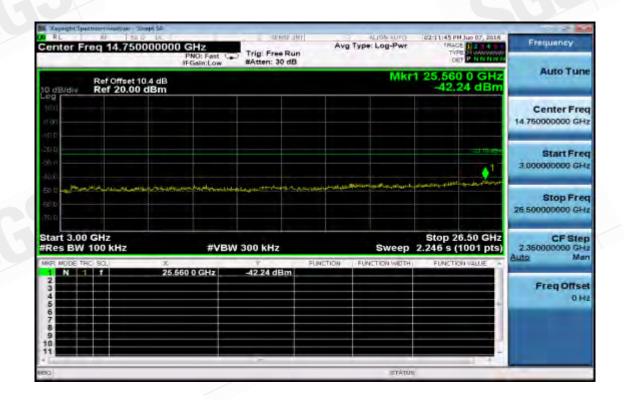
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# **Spurious Emission Test Data CH-High**





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



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



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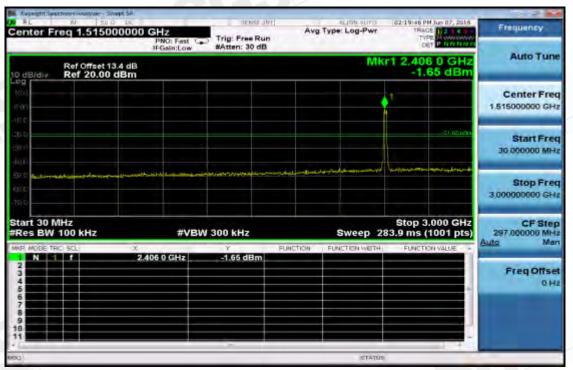
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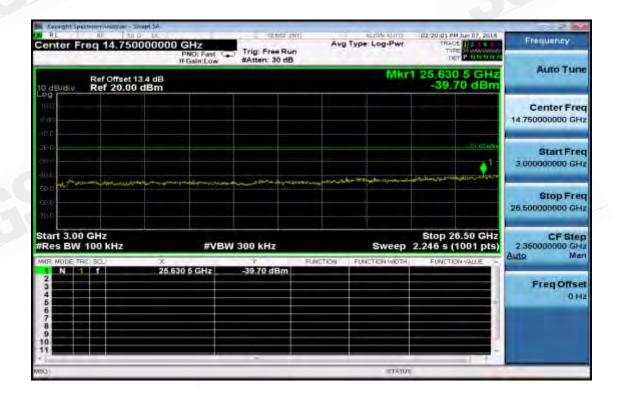
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# 802.11n HT20 **Spurious Emission Test Data CH-Low**





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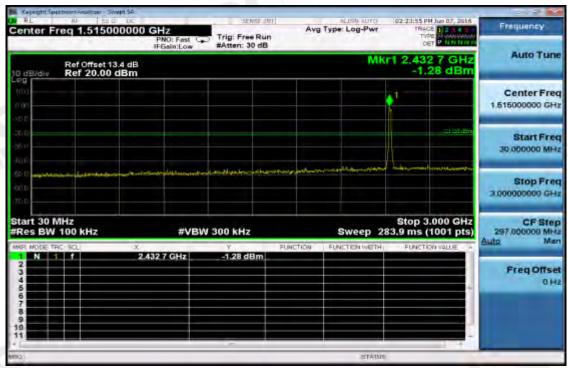
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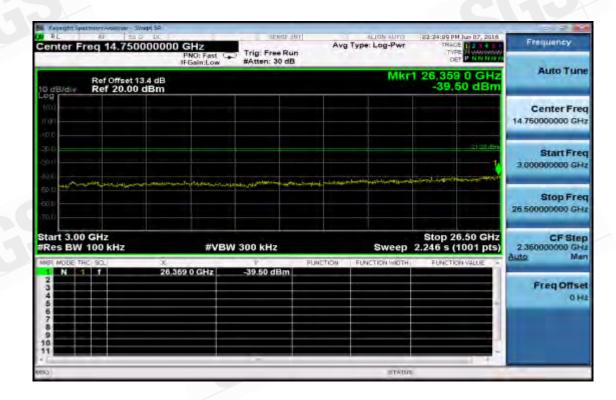
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## **Spurious Emission Test Data CH-Mid**





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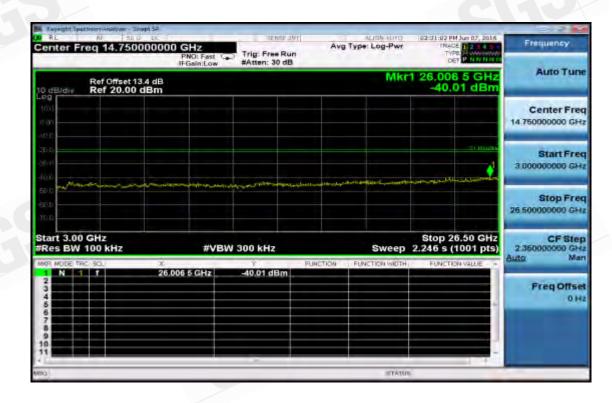
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## **Spurious Emission Test Data CH-High**





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



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



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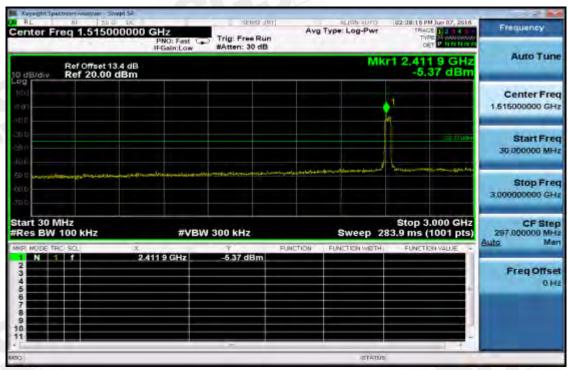
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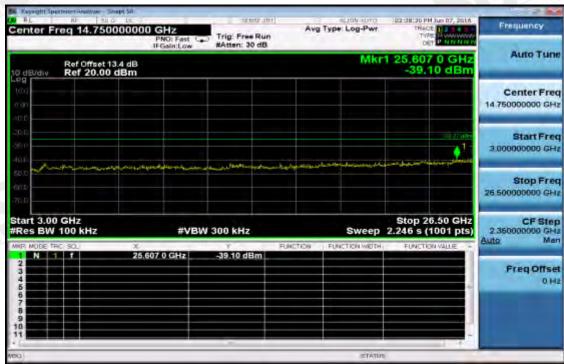
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# 802.11n HT40 **Spurious Emission Test Data CH-Low**





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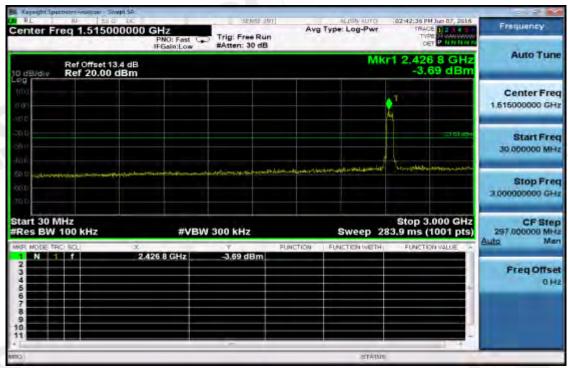
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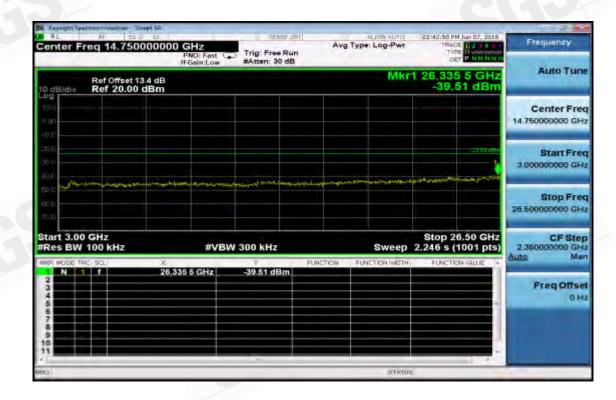
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## **Spurious Emission Test Data CH-Mid**





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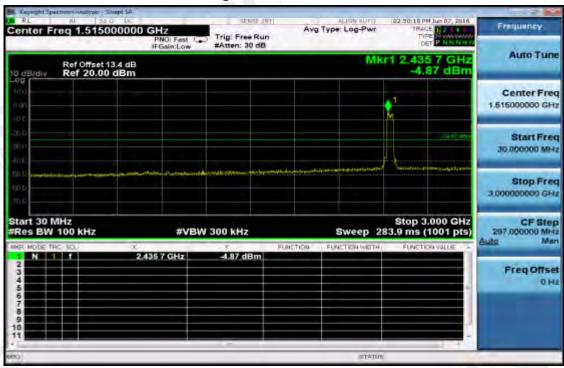
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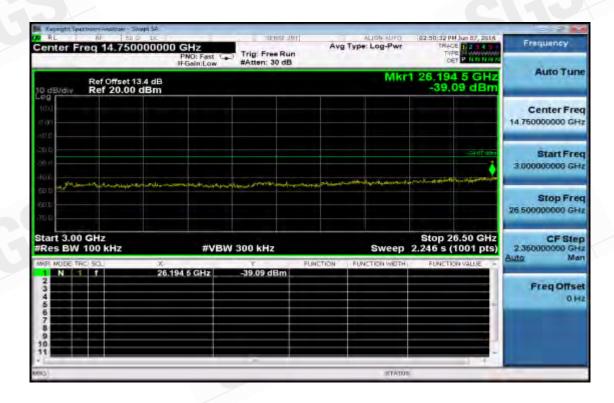
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## **Spurious Emission Test Data CH-High**





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#### 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 limit as below.

And according to §15.33(a) (1), 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	12/23/2015	12/22/2016				
Broadband Antenna	TESEQ	CBL 6112D	35240	10/28/2015	10/27/2016				
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016				
Horn Antenna	Schwarzbeck	BBHA9170	185	07/24/2015	07/23/2016				
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2015	12/11/2016				
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2015	12/11/2016				
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016				
Pre Amplifier	R&S	SCU-26	100780	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016				
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016				
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017				
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017				
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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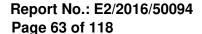
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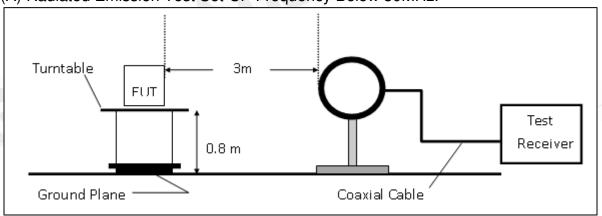
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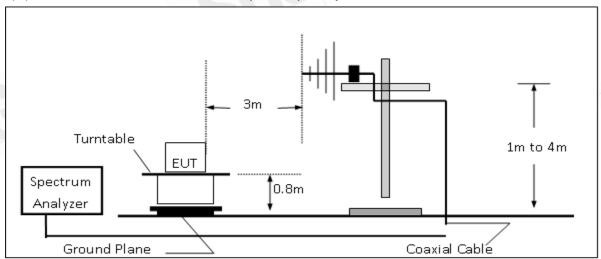


11.3 Test SET-UP

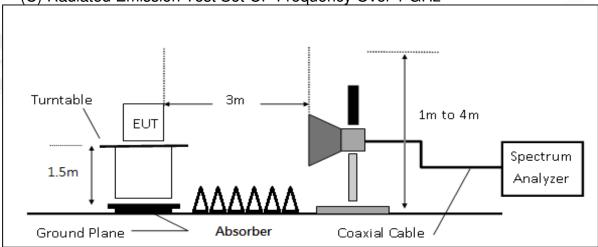
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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#### 11.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. 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	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

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

#### Note:

"F": denotes Fundamental Frequency.; "H": denotes Harmonic Frequency.

"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency.

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

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

#### 11.7 Measurement Result

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

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### Radiated Band Edge Measurement Result (802.11b)

Operation Mode: 802.11b Test Date: 2016/6/2

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol. : Vertical

	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
-	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
	2332.08	S	Peak	54.66	0.69	55.35	74	-18.65
	2332.08	S	Average	35.31	0.69	36.00	54	-18.00
	2390.00	Е	Peak	48.50	0.92	49.43	74	-24.57
	2390.00	E	Average	35.06	0.92	35.98	54	-18.02

802.11b Operation Mode: Test Date: 2016/6/2

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: BE CH Low Ashton EUT Pol.: Measurement Antenna Pol. : Horizontal Η

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	44.55	0.92	45.48	74	-28.52
2390.00	Е	Average	32.68	0.92	33.60	54	-20.40

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Operation Mode: 802.11b Test Date: 2016/6/2

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Test Engineer: BE CH High Ashton EUT Pol.: 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	E	Peak	48.06	1.16	49.22	74	-24.78
2483.50	E	Average	35.73	1.16	36.89	54	-17.11
2542.40	S	Peak	51.19	1.53	52.72	74	-21.28
2542.40	S	Average	33.80	1.53	35.33	54	-18.67

Operation Mode: 802.11b Test Date: 2016/6/2

Fundamental Frequency: 22.7deg\_C/57RH 2462 MHz Temp. / Humi.:

Operation Band: Test Engineer: BE CH High Ashton EUT Pol. : Measurement Antenna Pol.: Horizontal Η

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Peak	45.46	1.16	46.62	74	-27.38
2483.50	Е	Average	32.95	1.16	34.11	54	-19.89

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## Radiated Band Edge Measurement Result (802.11g)

Operation Mode: 802.11g Test Date: 2016/6/2

Fundamental Frequency: 2412 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Peak	68.86	0.92	69.79	74	-4.21
2390.00	E	Average	44.66	0.92	45.58	54	-8.42

Operation Mode: 802.11g Test Date: 2016/6/2

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: 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	E	Peak	57.10	0.92	58.03	74	-15.97
2390.00	E	Average	35.85	0.92	36.77	54	-17.23

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Operation Mode: Test Date: 2016/6/2 802.11g

Fundamental Frequency: 2462 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Peak	71.23	1.16	72.39	74	-1.61
2483.50	E	Average	44.95	1.16	46.11	54	-7.89

Operation Mode: Test Date: 2016/6/2 802.11g

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg\_C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Horizontal

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Peak	62.39	1.16	63.55	74	-10.45
2483.50	E	Average	38.14	1.16	39.30	54	-14.70

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

802.11n20 Operation Mode: Test Date: 2016/6/2

Fundamental Frequency: 2412 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol. : Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Peak	71.87	0.92	72.79	74	-1.21
2390.00	E	Average	49.09	0.92	50.01	54	-3.99

Operation Mode: 802.11n20 Test Date: 2016/6/2

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol. : Horizontal

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	гЗ dBμV/m	dBµV/m	dB
2390.00	E	Peak	59.53	0.92	60.45	74	-13.55
2390.00	Ε	Average	40.20	0.92	41.12	54	-12.88

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Operation Mode: 802.11n20 Test Date: 2016/6/2

Fundamental Frequency: 2462 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Vertical

Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Peak	71.22	1.16	72.38	74	-1.62
2483.50	E	Average	49.56	1.16	50.72	54	-3.28

Operation Mode: 802.11n20 Test Date: 2016/6/2

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg\_C/57RH

Operation Band: Test Engineer: BE CH High Ashton EUT Pol.: 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	E	Peak	62.43	1.16	63.59	74	-10.41
2483.50	E	Average	41.04	1.16	42.20	54	-11.80
2484.50	S	Peak	63.37	1.16	64.53	74	-9.47
2484.50	S	Average	39.52	1.16	40.68	54	-13.32

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

802.11n40 Operation Mode: Test Date: 2016/6/2

Fundamental Frequency: 2422 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: BE CH Low Test Engineer: Ashton EUT Pol.: 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
2389.44	S	Peak	68.96	0.91	69.87	74	-4.13
2389.44	S	Average	44.85	0.91	45.76	54	-8.24
2390.00	Е	Peak	66.77	0.92	67.69	74	-6.31
2390.00	E	Average	44.92	0.92	45.84	54	-8.16

802.11n40 Operation Mode: Test Date: 2016/6/2

Fundamental Frequency: 2422 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Test Engineer: BE CH Low Ashton EUT Pol. : Measurement Antenna Pol. : Horizontal Η

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
2386.92	S	Peak	60.34	0.88	61.22	74	-12.78
2386.92	S	Average	35.56	0.88	36.44	54	-17.56
2390.00	E	Peak	55.44	0.92	56.36	74	-17.64
2390.00	Е	Average	36.65	0.92	37.57	54	-16.43

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Operation Mode: 802.11n40 Test Date: 2016/6/2

Fundamental Frequency: 2452 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: 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	E	Peak	66.49	1.16	67.65	74	-6.35
2483.50	E	Average	47.49	1.16	48.65	54	-5.35
2485.60	S	Peak	71.56	1.15	72.71	74	-1.29
2485.60	S	Average	47.06	1.15	48.21	54	-5.79

Operation Mode: 802.11n40 Test Date: 2016/6/2

Fundamental Frequency: 2452 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: BE CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Horizontal

	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
y	2483.50	E	Peak	59.17	1.16	60.33	74	-13.67
	2483.50	Е	Average	41.32	1.16	42.48	54	-11.52
	2487.10	S	Peak	64.32	1.15	65.47	74	-8.53
	2487.10	S	Average	40.10	1.15	41.25	54	-12.75

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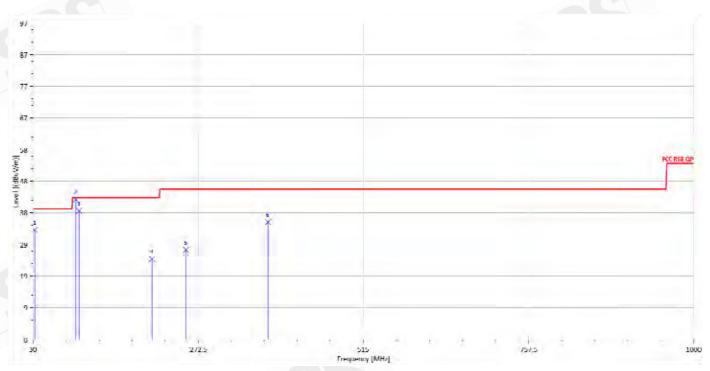
#### **Below 1GHz Worst-Case Data:**

# Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 22.7deg\_C/57RH 2412 MHz Temp. / Humi.:

Operation Band: Tx CH Low Test Engineer: **Ashton** EUT Pol.: Measurement Antenna Pol. : Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
32.91	S	Peak	42.28	-8.75	33.53	40	-6.47
93.05	S	QP	61.90	-18.95	42.95	43.5	-0.55
97.90	S	Peak	57.56	-18.10	39.46	43.5	-4.04
204.60	S	Peak	42.00	-17.32	24.68	43.5	-18.82
255.04	S	Peak	41.77	-14.25	27.52	46	-18.48
375.32	S	Peak	46.50	-10.53	35.97	46	-10.03

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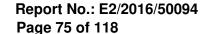
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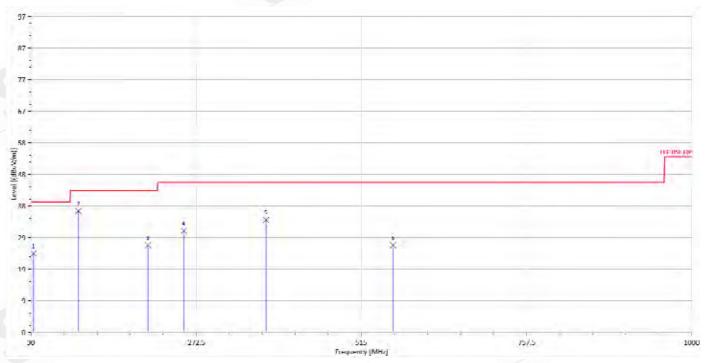
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Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH Low Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	33.51	-9.27	24.24	40	-15.76
99.84	S	Peak	55.05	-17.77	37.28	43.5	-6.22
201.69	S	Peak	44.11	-17.41	26.69	43.5	-16.81
255.04	S	Peak	45.38	-14.25	31.13	46	-14.87
375.32	S	Peak	45.08	-10.53	34.55	46	-11.45
561.56	S	Peak	33.14	-6.42	26.73	46	-19.27

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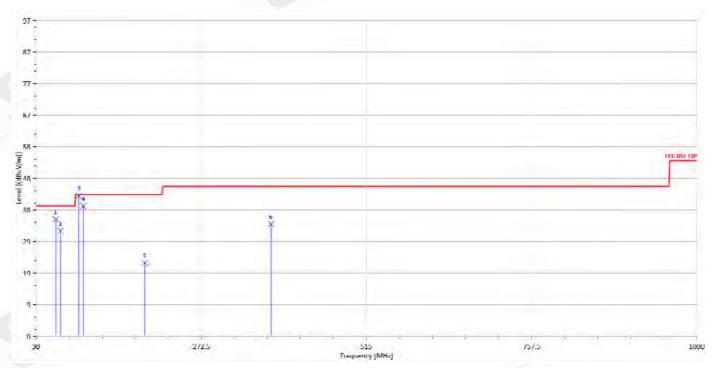


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
59.10	S	Peak	58.58	-22.63	35.95	40	-4.05
65.89	S	Peak	54.65	-22.29	32.36	40	-7.64
93.05	S	QP	61.98	-18.95	43.03	43.5	-0.47
99.84	S	Peak	57.74	-17.77	39.97	43.5	-3.53
190.05	S	Peak	40.85	-18.32	22.53	43.5	-20.97
375.32	S	Peak	44.98	-10.53	34.45	46	-11.55

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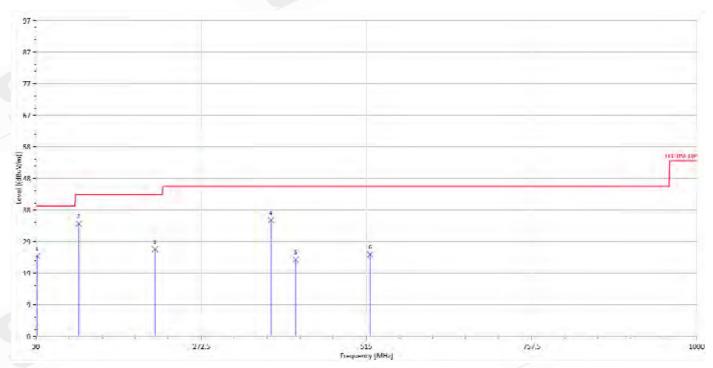


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
31.94	S	Peak	32.88	-8.22	24.65	40	-15.35
93.05	S	Peak	53.52	-18.95	34.56	43.5	-8.94
204.60	S	Peak	44.03	-17.32	26.71	43.5	-16.79
375.32	S	Peak	46.19	-10.53	35.66	46	-10.34
411.21	S	Peak	32.76	-9.19	23.57	46	-22.43
520.82	S	Peak	32.50	-7.35	25.15	46	-20.85

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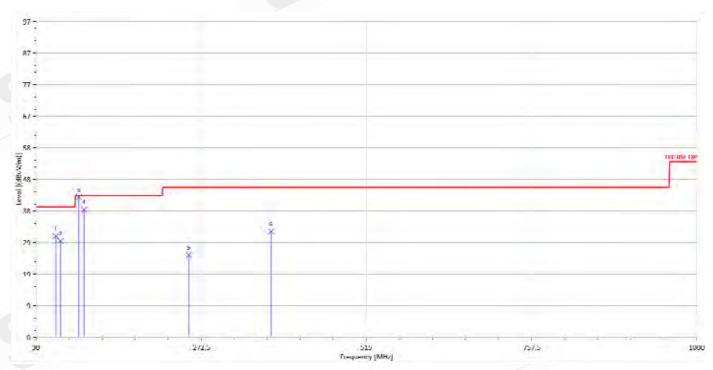


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
59.10	S	Peak	53.70	-22.63	31.07	40	-8.93
65.89	S	Peak	51.80	-22.29	29.51	40	-10.49
93.05	S	QP	61.93	-18.95	42.98	43.5	-0.52
100.81	S	Peak	56.88	-17.64	39.24	43.5	-4.26
255.04	S	Peak	39.52	-14.25	25.27	46	-20.73
375.32	S	Peak	43.02	-10.53	32.49	46	-13.51

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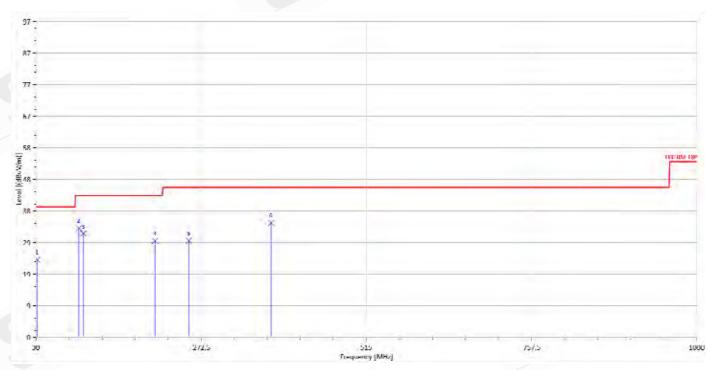


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
31.94	S	Peak	32.08	-8.22	23.86	40	-16.14
93.05	S	Peak	52.45	-18.95	33.50	43.5	-10.00
99.84	S	Peak	49.62	-17.77	31.85	43.5	-11.65
204.60	S	Peak	46.88	-17.32	29.56	43.5	-13.94
255.04	S	Peak	43.89	-14.25	29.64	46	-16.36
375.32	S	Peak	45.67	-10.53	35.14	46	-10.86

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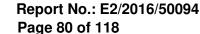
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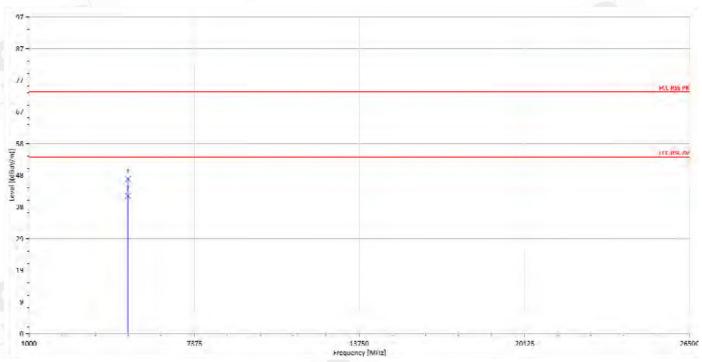
**Above 1GHz Data:** 

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

Operation Mode: 802.11b Test Date: 2016/6/7

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: Ashton EUT Pol.: H Measurement Antenna Pol. : Vertical



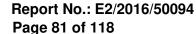
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
-		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	39.76	7.58	47.34	74	-26.66
4824.00	Н	Average	34.59	7.58	42.17	54	-11.83

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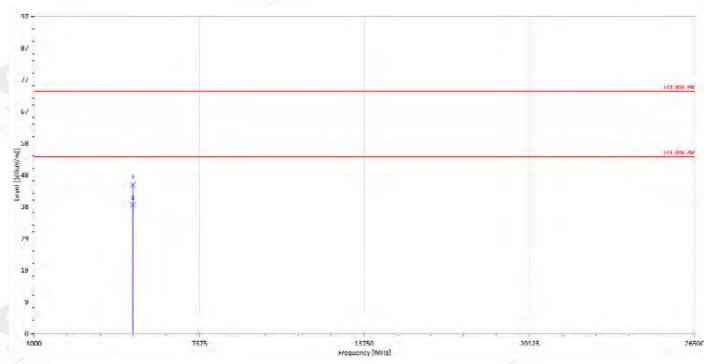
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Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

Test Engineer: Operation Band: Tx CH Low **Ashton** EUT Pol.: 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	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Peak	37.76	7.58	45.34	74	-28.66
4824.00	Н	Average	31.74	7.58	39.32	54	-14.68

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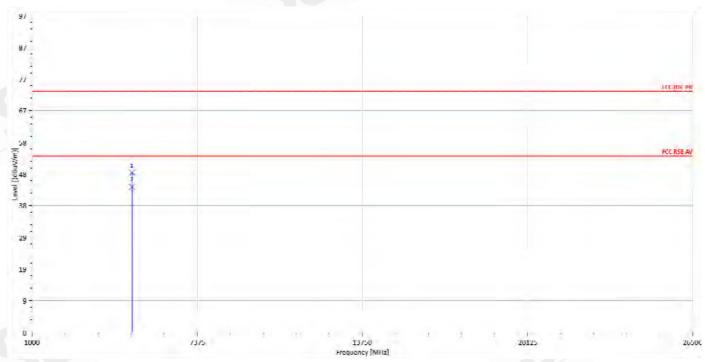


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Operation Mode: 802.11b Test Date: 2016/6/7

Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Measurement Antenna Pol. : Vertical



	Freq.	Note	Detector	Spectum	Factor	Actual FS	Limit	Margin
	MHz	F/H/E/S	Mode PK/QP/AV	Reading Level dBµV	dB	dBµV/m	@3m dBµV/m	dB
-	4874.00	Н	Peak	41.12	7.91	49.03	74	-24.97
	4874.00	Н	Average	36.77	7.91	44.68	54	-9.32

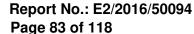
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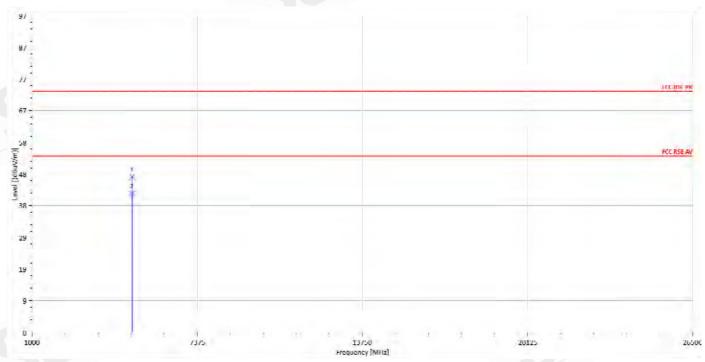
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Mid Test Engineer: Ashton EUT Pol.: 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	39.81	7.91	47.72	74	-26.28
	4874.00	Н	Average	34.65	7.91	42.56	54	-11.44

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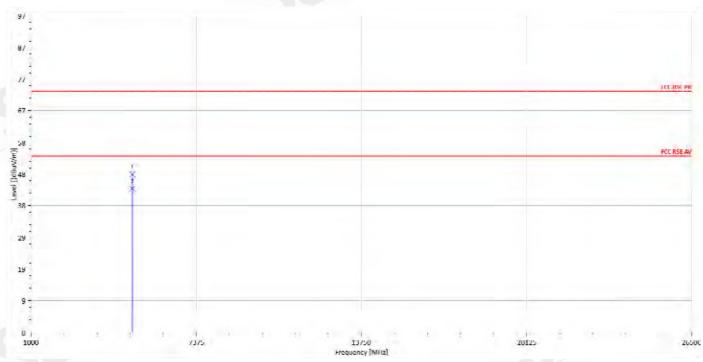


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Operation Mode: 802.11b Test Date: 2016/6/7

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg\_C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: 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	40.61	7.92	48.53	74	-25.47
4924.00	Н	Average	36.22	7.92	44.14	54	-9.86

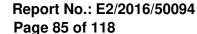
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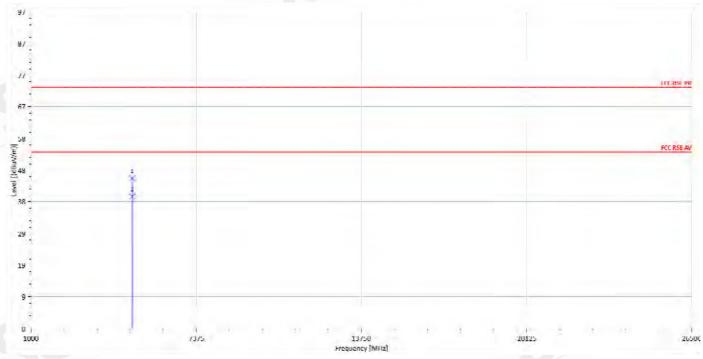
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Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg\_C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: 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	38.17	7.92	46.09	74	-27.91
4924.00	Н	Average	32.48	7.92	40.40	54	-13.60

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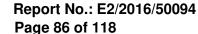
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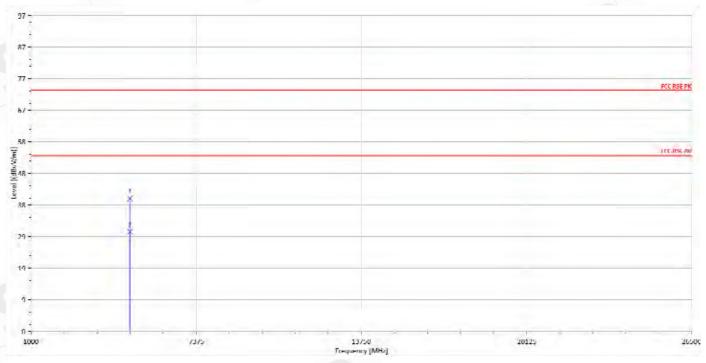


Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol. : Н Vertical



	Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
	•		Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
	4824.00	Н	Peak	33.11	7.58	40.69	74	-33.31	
	4824.00	Н	Average	22.94	7.58	30.52	54	-23.48	

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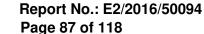
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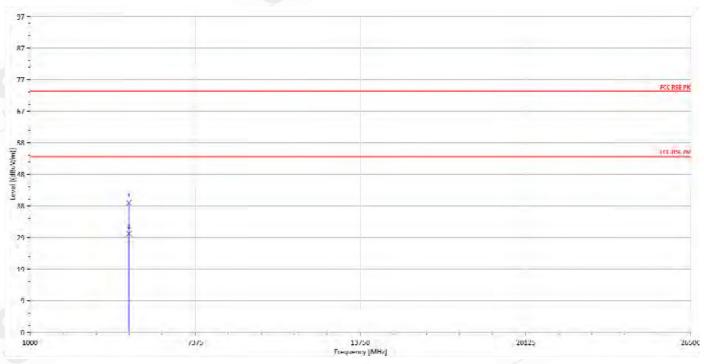
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Fundamental Frequency: 2412 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH Low Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
-	4824.00	Н	Peak	32.22	7.58	39.80	74	-34.20
	4824.00	Н	Average	22.66	7.58	30.24	54	-23.76

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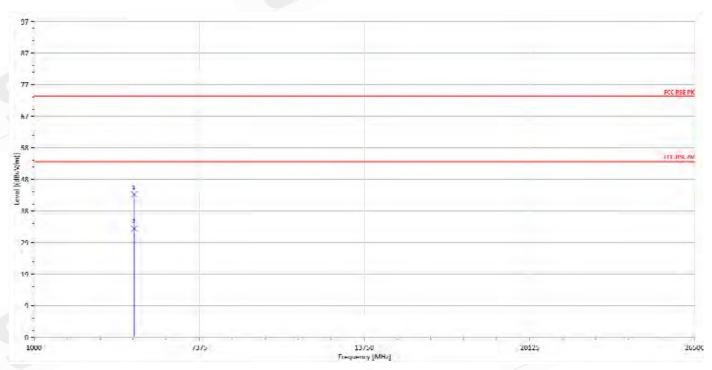
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Fundamental Frequency: 2437 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dB <sub>µ</sub> V	dB	dΒμV/m	dBµV/m	dB	
4874.00	Н	Peak	35.97	7.91	43.88	74	-30.12	
4874.00	Н	Average	25.48	7.91	33.39	54	-20.61	

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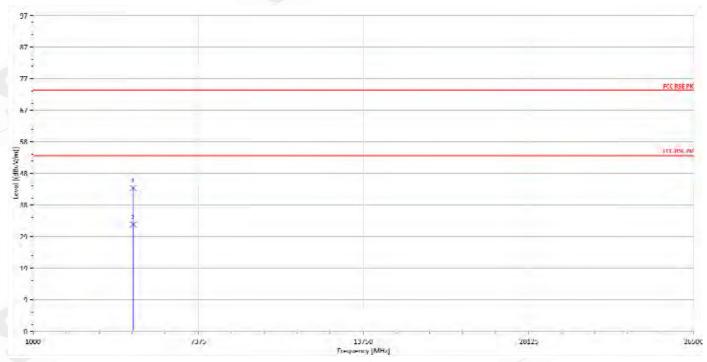


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2437 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	36.03	7.91	43.94	74	-30.06
4874.00	Н	Average	24.89	7.91	32.80	54	-21.20

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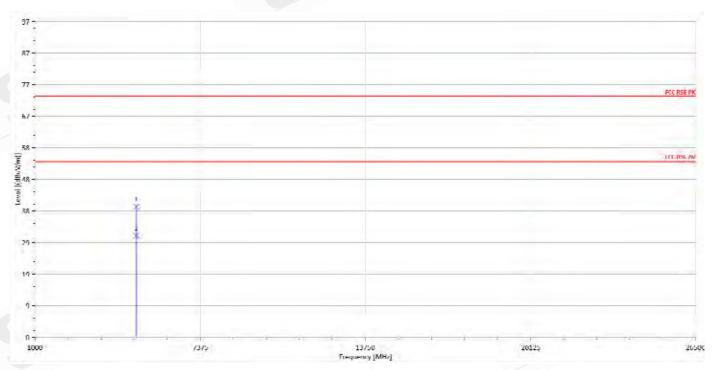


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg\_C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: 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	dBµV	dB	dBµV/m	dBµV/m	dB
-	4924.00	Н	Peak	32.20	7.92	40.12	74	-33.88
	4924.00	Н	Average	23.22	7.92	31.14	54	-22.86

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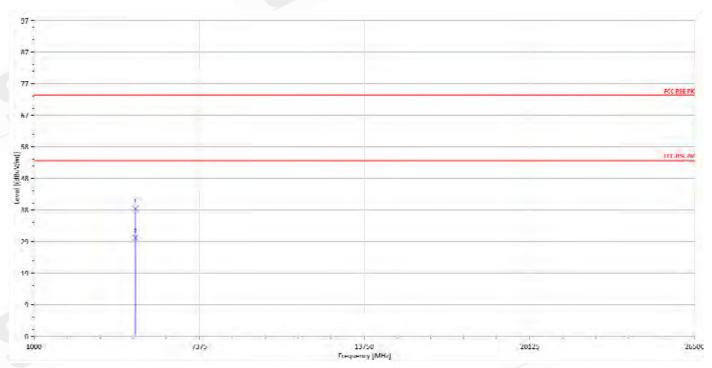


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Operation Mode: 802.11g Test Date: 2016/6/7

Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: Ashton EUT Pol.: Measurement Antenna Pol.: Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
-	4924.00	Н	Peak	31.32	7.92	39.24	74	-34.76
	4924.00	Н	Average	22.30	7.92	30.22	54	-23.78

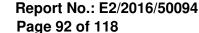
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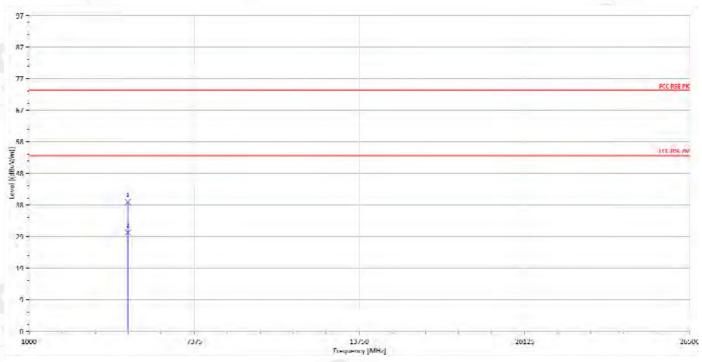


Radiated Spurious Emission Measurement Result (802.11\_HT20)

Operation Mode: 802.11n20 Test Date: 2016/6/7

Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: Ashton EUT Pol.: Н Measurement Antenna Pol.: Vertical



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
•	4824.00	Н	Peak	32.10	7.58	39.67	74	-34.33
	4824.00	Н	Average	22.71	7.58	30.29	54	-23.71

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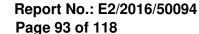
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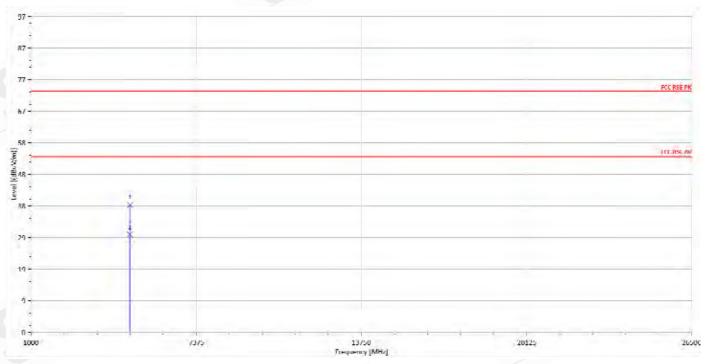
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Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
-	4824.00	Н	Peak	31.57	7.58	39.15	74	-34.85
	4824.00	Н	Average	22.41	7.58	29.99	54	-24.01

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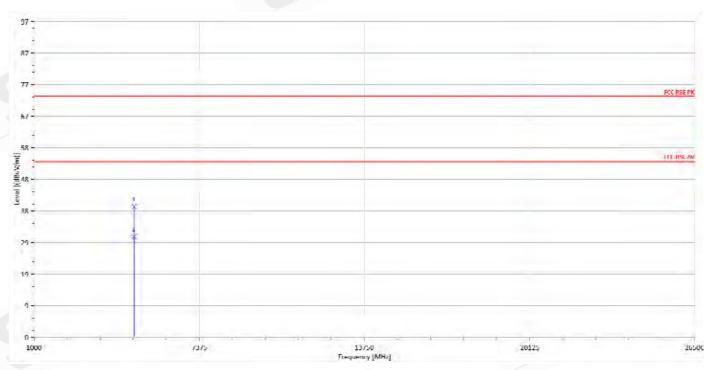


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Operation Mode: 802.11n20 Test Date: 2016/6/7

Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dB <sub>µ</sub> V	dB	dΒμV/m	dBµV/m	dB	_
4874.00	Н	Peak	32.21	7.91	40.12	74	-33.88	
4874.00	Н	Average	22.93	7.91	30.84	54	-23.16	

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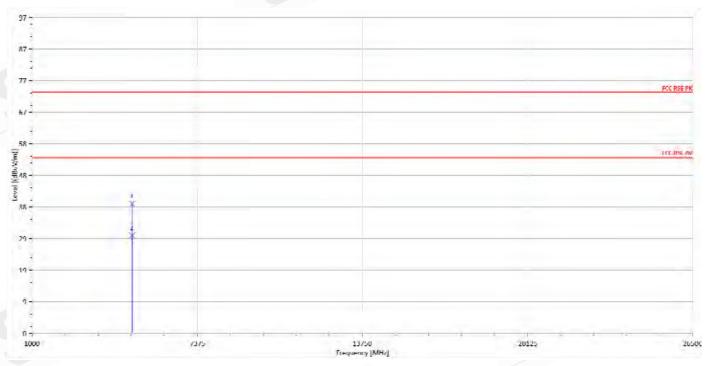
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
-	4874.00	Н	Peak	31.87	7.91	39.78	74	-34.22
	4874.00	Н	Average	22.08	7.91	29.99	54	-24.01

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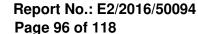
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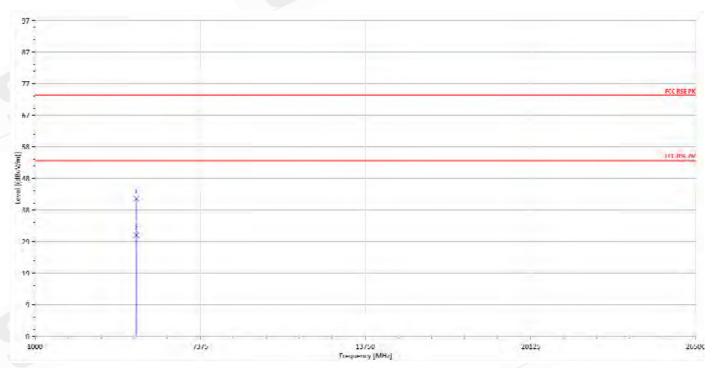
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Fundamental Frequency: 2462 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Vertical



Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
4924.00	Н	Peak	34.32	7.92	42.24	74	-31.76	
4924.00	Н	Average	23.14	7.92	31.06	54	-22.94	

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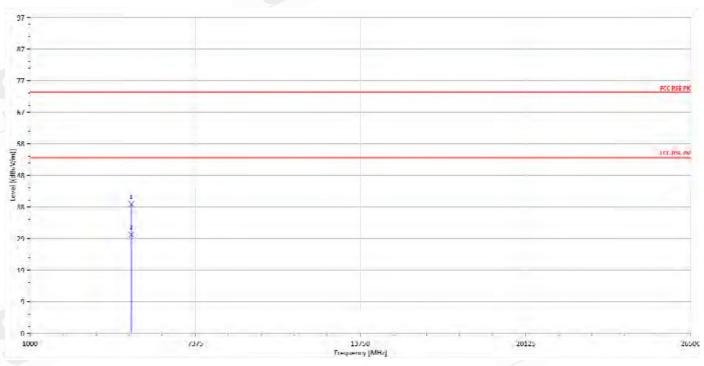
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Fundamental Frequency: 2462 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
-	4924.00	Н	Peak	31.75	7.92	39.67	74	-34.33
	4924.00	Н	Average	22.33	7.92	30.25	54	-23.75

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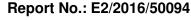
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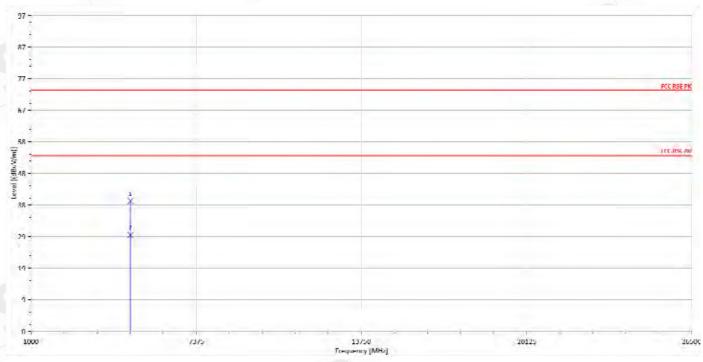
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#### Radiated Spurious Emission Measurement Result (802.11\_HT40)

Operation Mode: 802.11n40 Test Date: 2016/6/7

Fundamental Frequency: 2422 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: Ashton EUT Pol.: Н Measurement Antenna Pol.: Vertical



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
•	4844.00	Н	Peak	32.44	7.55	39.99	74	-34.01
	4844.00	Н	Average	21.94	7.55	29.49	54	-24.51

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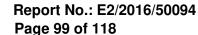
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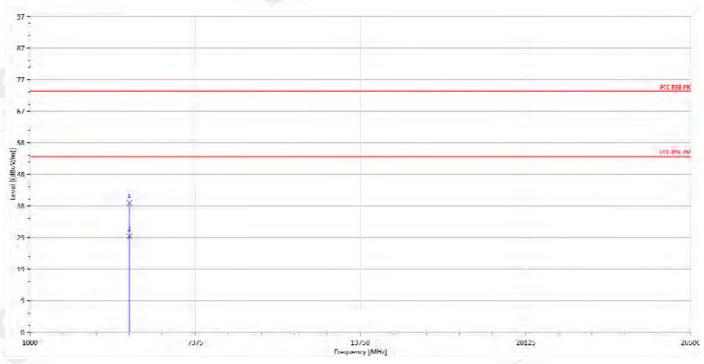
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Fundamental Frequency: 2422 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Low Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
-	4844.00	Н	Peak	32.16	7.55	39.71	74	-34.29
	4844.00	Н	Average	21.84	7.55	29.39	54	-24.61

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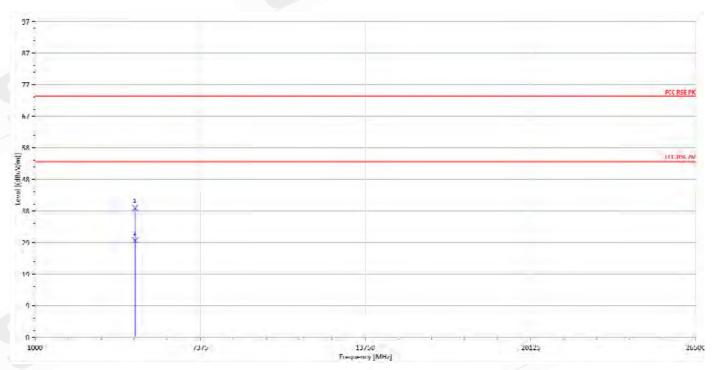
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Operation Mode: 802.11n40 Test Date: 2016/6/7

Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н 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	dBµV	dB	dBµV/m	dBµV/m	dB
	4874.00	Н	Peak	31.80	7.91	39.71	74	-34.29
	4874.00	Н	Average	21.79	7.91	29.70	54	-24.30

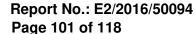
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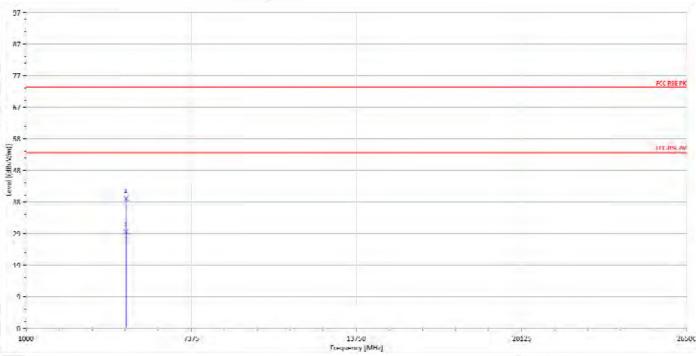
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH Mid Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectum	Factor	Actual FS	Limit	Margin	
		Mode	Reading Level		F9	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4874.00	Н	Peak	31.98	7.91	39.89	74	-34.11	
4874.00	Н	Average	21.70	7.91	29.61	54	-24.39	

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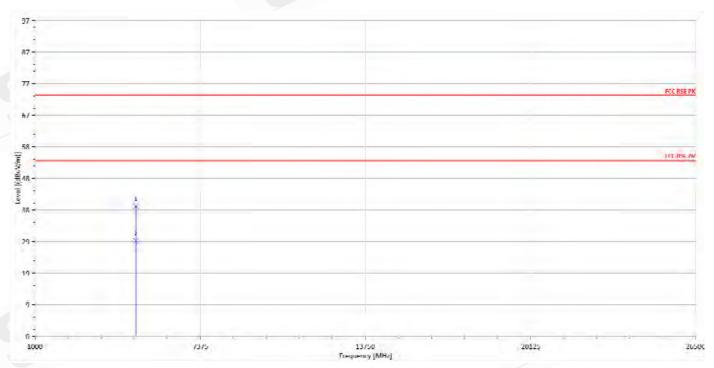
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Operation Mode: 802.11n40 Test Date: 2016/6/7

Fundamental Frequency: 2452 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Vertical



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
-	4904.00	Н	Peak	32.45	7.44	39.89	74	-34.11
	4904.00	Н	Average	21.89	7.44	29.33	54	-24.67

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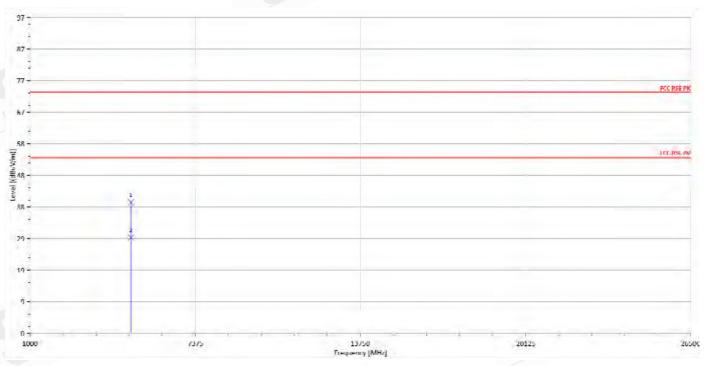
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f (886-2) 2298-0488



Fundamental Frequency: 2452 MHz Temp. / Humi.: 22.7deg\_C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Н Measurement Antenna Pol. : Horizontal



	Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
-	4904.00	Н	Peak	32.79	7.44	40.23	74	-33.77
	4904.00	Н	Average	21.90	7.44	29.34	54	-24.66

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#### 12 PEAK POWER SPECTRAL DENSITY

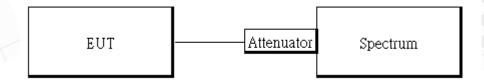
## 12.1 Standard Applicable

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

#### 12.2 Measurement Equipment Used

	Conducted Emission Test Site						
EQUIPMENT 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	12/12/2015	12/11/2016		
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016		

## 12.3 Test Set-up



#### 12.4 Measurement Procedure

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz.
- 5. Set the VBW = 10 kHz.
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.
- 11.802.11n MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

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Note:

2.00 dBi Antenna Gain: Number Antenna: 2 pcs 8 dBm Limit:

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 element

Effective Legacy Gain (dBi) = 2+3.01=5.01dBi

Limit: 8dBm - (5.01-6dBi)=8

#### 12.5 Measurement Result

POWER DENSITY 802.11b MODE						
Frequency	RF Power	Maximum				
(MHz)	Density	Limit	Result			
(1011 12)	(dBm)	(dBm)				
2412	-11.12	8.00	PASS			
2437	-11.62	8.00	PASS			
2462	-11.84	8.00	PASS			

POWER D	POWER DENSITY 802.11n HT20 MODE						
Frequency	RF Power   Maximum						
(MHz)	Density	Limit	Result				
(1011 12)	(dBm)	(dBm)					
2412	-16.79	8.00	PASS				
2437	-15.19	8.00	PASS				
2462	-14.93	8.00	PASS				

	POWER DENSITY 802.11g MODE							
	Frequency (MHz)	RF Power	Maximum					
		Density	Limit	Result				
	(1011 12)	(dBm)	(dBm)					
	2412	-16.08	8.00	PASS				
	2437	-13.20	8.00	PASS				
	2462	-18.03	8.00	PASS				

POWER DENSITY 802.11n HT40 MODE						
Frequency (MHz)	RF Power	Maximum				
	Density	Limit	Result			
	(dBm)	(dBm)				
2422	-21.23	8.00	PASS			
2437	-20.61	8.00	PASS			
2452	-20.19	8.00	PASS			

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



#### 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)



802.11q **Power Spectral Density Test Plot (CH-Low)** 



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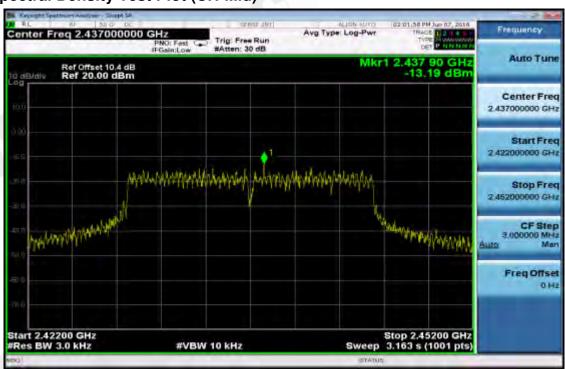
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#### **Power Spectral Density Test Plot (CH-Mid)**



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



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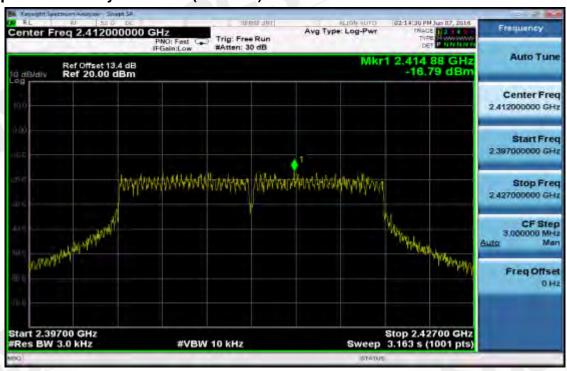
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# 802.11n HT20 (MIMO)

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



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



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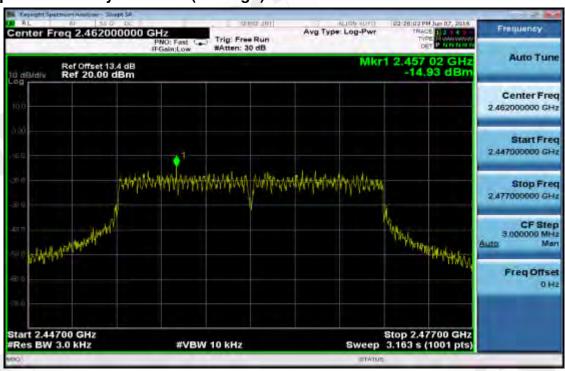
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#### Power Spectral Density Test Plot (CH-High)



#### 802.11n HT40 (MIMO)

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



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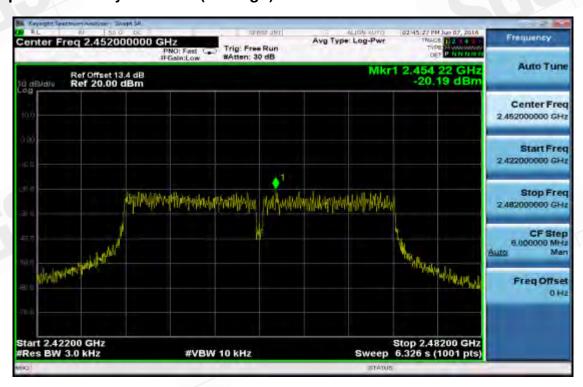
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#### **Power Spectral Density Test Plot (CH-Mid)**



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



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#### 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)

#### 14.1 **Standard Applicable**

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	Magnetic Field	Power Density	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	/	1	F/1500	30		
1500-15000	/	/	1.0	30		

F = frequency in MHz

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



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# **Maximum Permissible Exposure (MPE) Evaluation**



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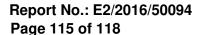
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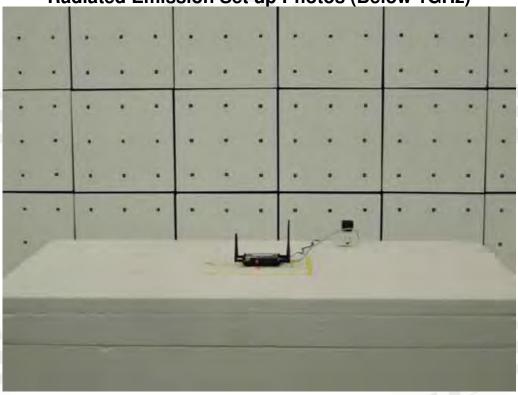
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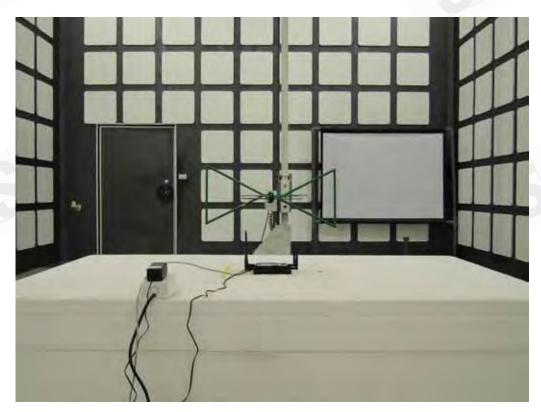




## PHOTOGRAPHS OF SET UP

# Radiated Emission Set up Photos (Below 1GHz)



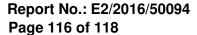


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# Radiated Emission Set up Photos (Above 1GHz)



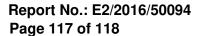


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**Conduction Setup Photo (AC Power Line)** 





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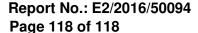
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**Conducted Setup Photo (Measurement at Antenna Port)** 



## PHOTOGRAPHS OF EUT

Please refer to the attached file(EUT Photo)

~ End of Report ~

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