

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: Wi-Fi Converter
Brand Name: KSH
Model No.: E-P132-WB, E-P132-WB-XXXXXXX
Model Difference: Difference in firmware
FCC ID: WRE EP132WBMODBUS
Report No.: ER/2016/30024
Issue Date: Apr. 06, 2016
FCC Rule Part: §15.247, Cat: DTS
Prepared for: KSH International Co., Ltd.
2F., No.17, Minsheng Rd., Xindian Dist., New
Taipei City 23150, Taiwan (R.O.C.)
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24803



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VERIFICATION OF COMPLIANCE

Applicant: KSH International Co., Ltd.
2F., No.17, Minsheng Rd., Xindian Dist., New Taipei City
23150,Taiwan (R.O.C.)

Product Name: Wi-Fi Converter

Brand Name: KSH

Model No.: E-P132-WB, E-P132-WB-XXXXXXX

Model Difference: Difference in firmware

FCC ID: WRE EP132WBMODBUS

Report Number: ER/2016/30024

Date of test: Mar. 10, 2016 ~ Apr. 06, 2016

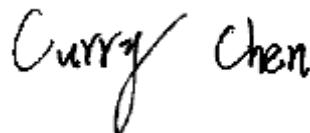
Date of EUT Received: Mar. 10, 2016

We hereby certify that:

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

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

Test By:

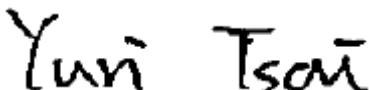


Date:

Apr. 06, 2016

Curry Chen / Engineer

Prepared By:

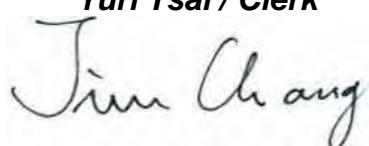


Date:

Apr. 06, 2016

Yuri Tsai / Clerk

Approved By:



Date:

Apr. 06, 2016

Jim Chang

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Revision History

Report Number	Revision	Description	Issue Date
ER/2016/30024	Rev.00	Initial creation of document	Apr. 06, 2016

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	Wi-Fi Converter		
Brand Name:	KSH		
Model No.:	E-P132-WB, E-P132-WB-XXXXXXX		
Model Difference:	Difference in firmware		
Software version:	N/A		
Hardware version:	N/A		
Power Supply:	12Vdc		
	Adapter:	Model No.: DSA-12PFA-09	Supplier: N/A

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11	b: 18.7dBm g: 21.44dBm	DSSS, OFDM
11n	HT20 2412-2462	11	HT20:21.43dBm	OFDM
11n	HT40 2422-2452	7	HT40:21.36dBm	OFDM
Antenna Designation:	Double Ridged Horn Antenna Gain: 2dBi			
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM			
Transition Rate:	802.11 b: up to 11 Mbps 802.11 g: up to 54 Mbps 802.11 n_20MHz: up to 72.2Mbps 802.11 n_40MHz: up to 150Mbps			

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1.2 Product Feature of Equipment Under Test

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

Product Feature	
Product Name:	Wi-Fi Converter
Brand Name:	KSH
Model No.:	E-P132-WB, E-P132-WB-XXXXXXX
Model Difference:	Difference in firmware
FCC ID:	WRE EP132WBMODBUS
Wi-Fi Specification	802.11b/g/n

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

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1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas.

ANSI C63.10:2013

Note:

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

1.4 Test Facility

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

(TAF code 0513)

FCC Registration Numbers are: 990257

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

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

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived attenuator factor.

Following shows an offset computation with 10dB attenuator.

offset = attenuation factor(dB)=10dB

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & Conducted Emission



Fig. 2-2 Conducted (Antenna Port)



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	DRTU	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L420	LR-7HXZA	Shielded	Un-Shielded
3.	DC Power Supply	HP	E3640A	KR93300208	N/A	Un-Shielded

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3 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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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n_HT20

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

7 channels are provided for 802.11n_HT40

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

4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

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RADIATED EMISSION TEST:

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

RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1
802.11g	1 to 11	1, 6, 11	OFDM	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	13.5

Note:

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

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	1
802.11g	1 to 11	1, 6, 11	OFDM	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	13.5

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5 MEASUREMENT UNCERTAINTY

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

Radiated Spurious Emission:

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

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

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

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

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

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/04/2015	05/03/2016
LISN	SCHWARZ BECK	NSLK 8127	8127-649	05/15/2015	05/14/2016
LISN	FCC	FCC-LISN-50/250-2 5-2-01	04034	03/13/2015	03/12/2016
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2015	11/25/2016

6.3 EUT Setup

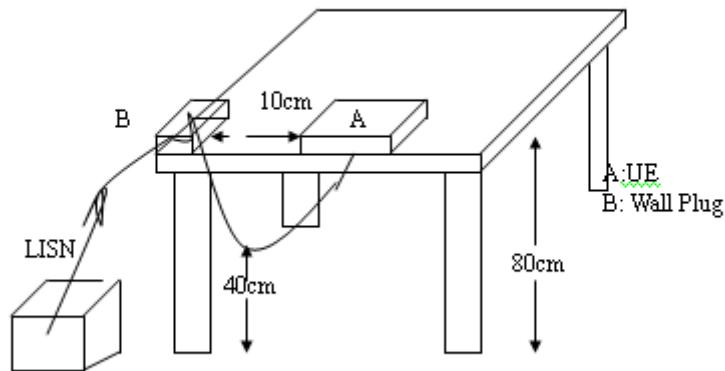
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

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

6.6 Measurement Result

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

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

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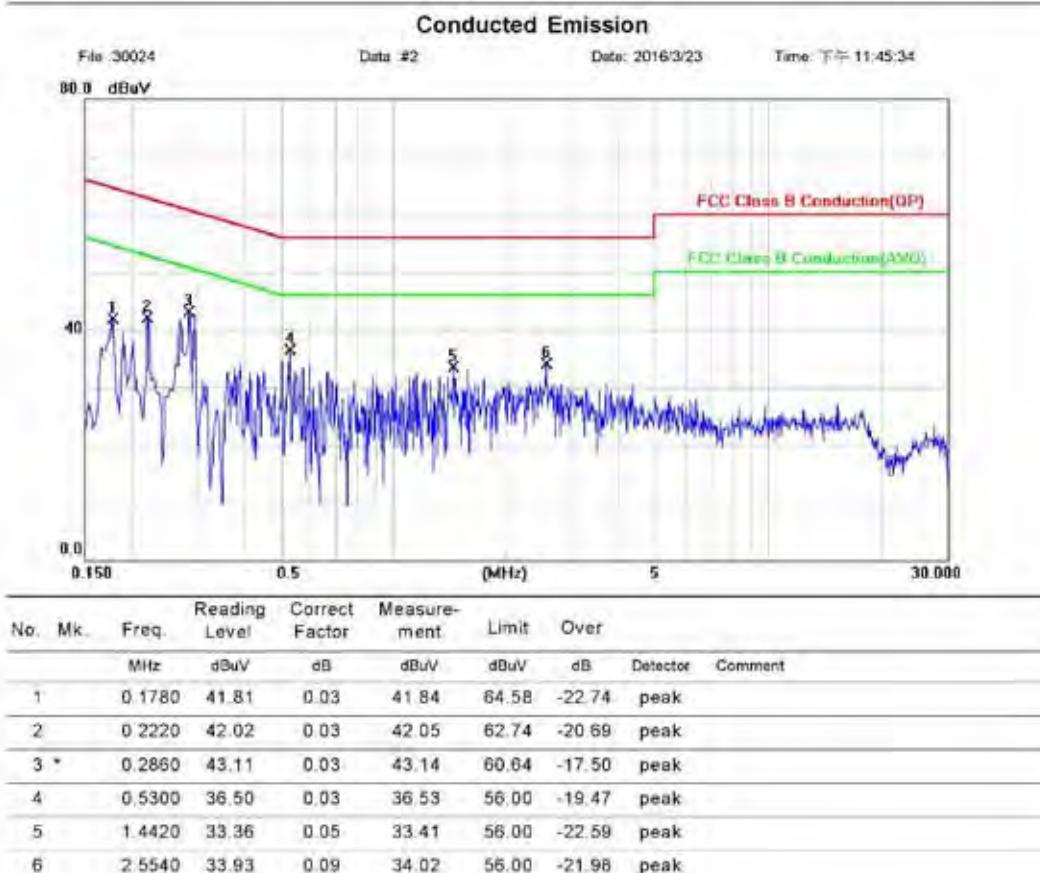
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Operation Mode:	operation mode			Test Date:	2016/03/23
Temperature:	26	Humidity:	60%	Test By:	Tin
Model No.:	DSA-12PFA-09			Probe:	L1 / N

Site: Conduction Room
Phase: L1
Temperature: 20 °C
Limit: FCC Class B Conduction(QP)
Power: AC 120V/50Hz
Mode: Operation
Humidity: 58 %
Note: Adapter: DSA-12PFA-09



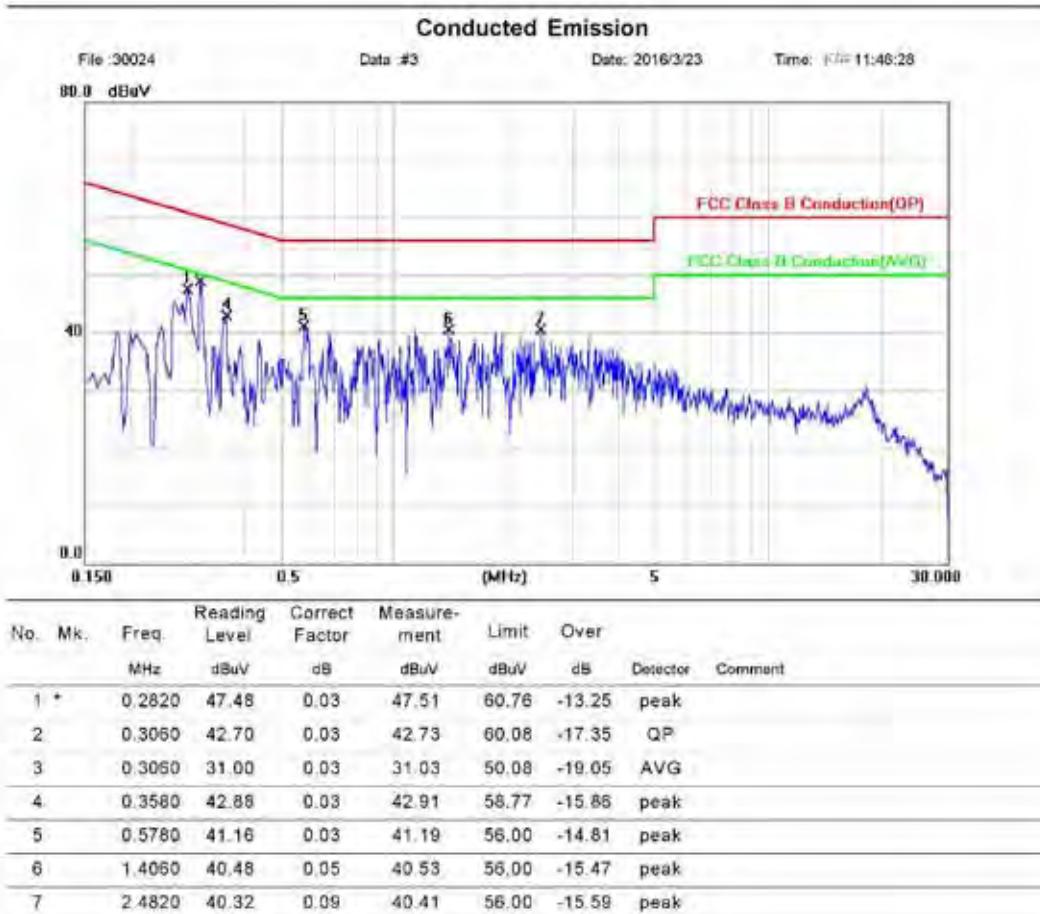
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Site Conduction Room
Limit: FCC Class B Conduction(QP)
Mode: Operation
Note: Adapter:DSA-12PFA-09

Phase: **N** Temperature: 20 °C
Power: AC 120V/60Hz Humidity: 58 %



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7 DUTY CYCLE OF TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

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

Measurement Procedure:

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

Duty Cycle:

	Duty Cycle (%)	Duty Factor (dB)
802.11b	99.99	0.00
802.11g	97.88	0.09
802.11n_20	97.66	0.10
802.11n_40	94.96	0.22

Duty Cycle Factor: $10 * \log(1/0.9999) = 0$

Duty Cycle Factor: $10 * \log(1/0.9788) = 0.09$

Duty Cycle Factor: $10 * \log(1/0.9766) = 0.1$

Duty Cycle Factor: $10 * \log(1/0.9496) = 0.22$

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7.1 DUTY CYCLE TEST SIGNAL Measurement Result

802.11 b



802.11 g



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802.11 n_20 MHz



802.11 n_40 MHz



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8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

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

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

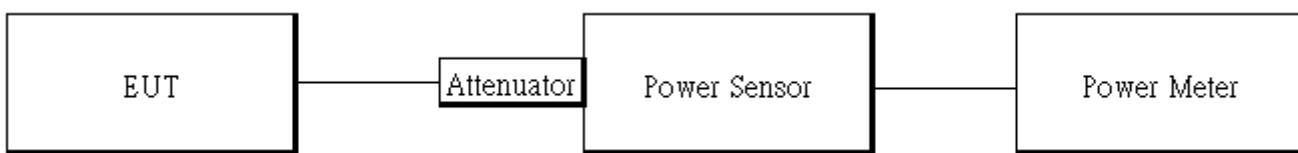
In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2495A	1005007	12/09/2015	12/08/2016
Power Sensor	Anritsu	MA2411B	917032	12/09/2015	12/08/2016
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

8.3 Test Set-up

Power Meter:



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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.
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.

8.5 Measurement Result

802.11b Main						
CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	1	18.7	74.13	1 Watt = 30.00 dBm	PASS
6	2437	1	18.6	72.44	1 Watt = 30.00 dBm	PASS
11	2462	1	18.69	73.96	1 Watt = 30.00 dBm	PASS
802.11b Main						
CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
1	2412	1	15.73	37.41	1 Watt = 30.00 dBm	PASS
6	2437	1	15.61	36.39	1 Watt = 30.00 dBm	PASS
11	2462	1	15.83	38.28	1 Watt = 30.00 dBm	PASS

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802.11g Main

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	6	16.33	42.95	1 Watt = 30.00 dBm	PASS
6	2437	6	21.44	139.32	1 Watt = 30.00 dBm	PASS
11	2462	6	17.33	54.08	1 Watt = 30.00 dBm	PASS

802.11g Main

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
1	2412	6	10.3	10.72	1 Watt = 30.00 dBm	PASS
6	2437	6	15.73	37.41	1 Watt = 30.00 dBm	PASS
11	2462	6	8.93	7.82	1 Watt = 30.00 dBm	PASS

802.11n_20M Main

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	MCS0	16.33	42.95	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	21.43	139.00	1 Watt = 30.00 dBm	PASS
11	2462	MCS0	17.34	54.20	1 Watt = 30.00 dBm	PASS

802.11n_20M Main

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
1	2412	MCS0	10.29	10.69	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	15.63	36.56	1 Watt = 30.00 dBm	PASS
11	2462	MCS0	8.93	7.82	1 Watt = 30.00 dBm	PASS

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802.11n_40M Main

CH	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2422	MCS0	16.38	43.45	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	21.36	136.77	1 Watt = 30.00 dBm	PASS
11	2452	MCS0	17.08	51.05	1 Watt = 30.00 dBm	PASS

802.11n_40M Main

CH	Frequency (MHz)	Data Rate	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
1	2422	MCS0	8.2	6.61	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	15.51	35.56	1 Watt = 30.00 dBm	PASS
11	2452	MCS0	8.1	6.46	1 Watt = 30.00 dBm	PASS

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

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9 6DB BANDWIDTH MEASUREMENT

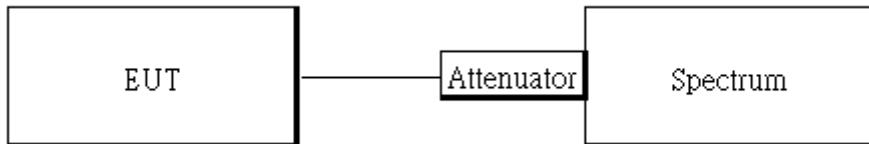
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

9.3 Test Set-up



9.4 Measurement Procedure

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

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9.5 Measurement Result

6dB Bandwidth

802.11b Main

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
2412	9110	> 500	PASS
2437	9100	> 500	PASS
2462	9111	> 500	PASS

802.11g Main

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
2412	16430	> 500	PASS
2437	16440	> 500	PASS
2462	16420	> 500	PASS

802.11_n20 Main

Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Result
2412	17120	> 500	PASS
2437	16030	> 500	PASS
2462	16430	> 500	PASS

802.11_n40 Main

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

*Refer to next page for plots

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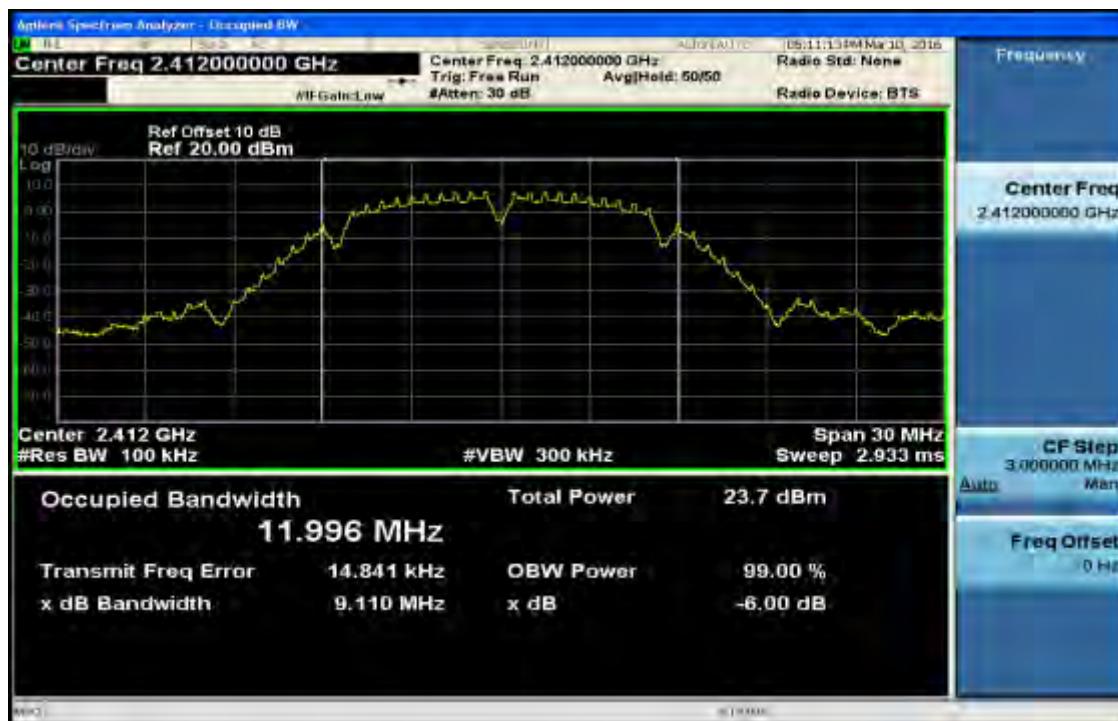
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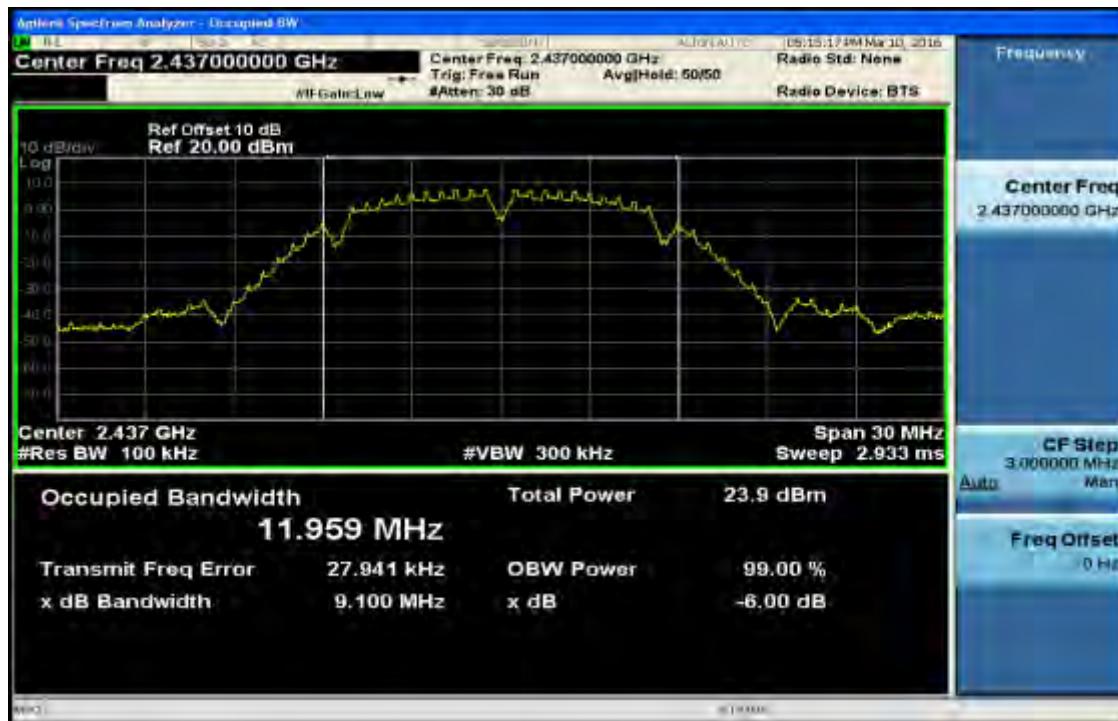
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802.11b

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid

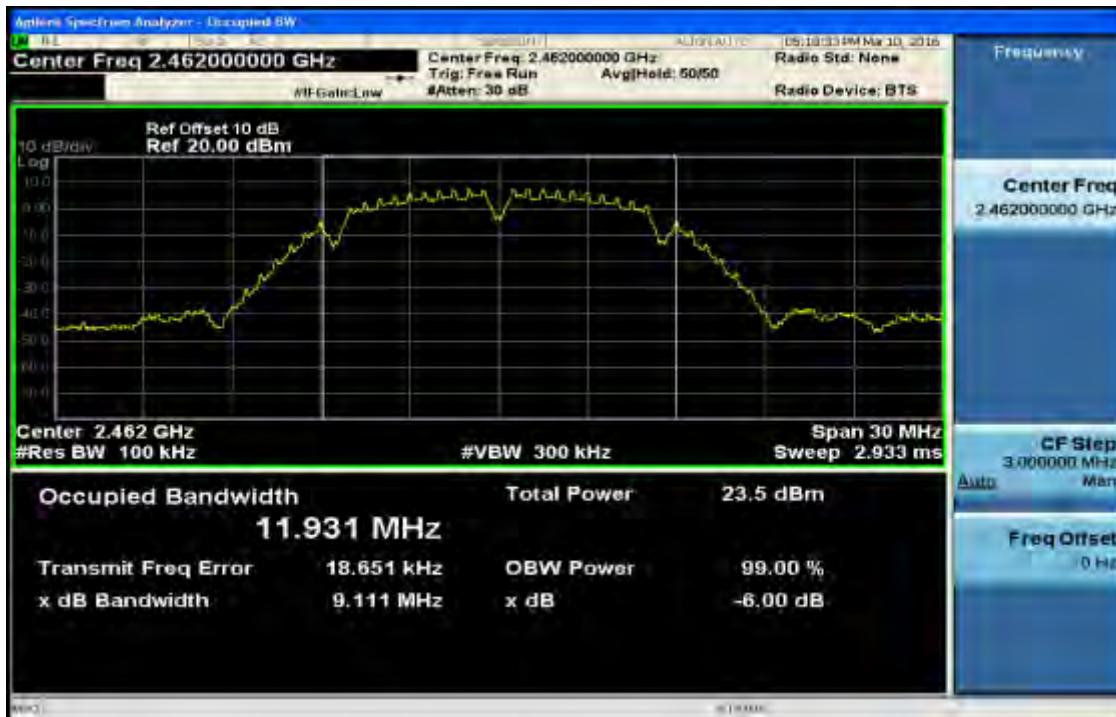


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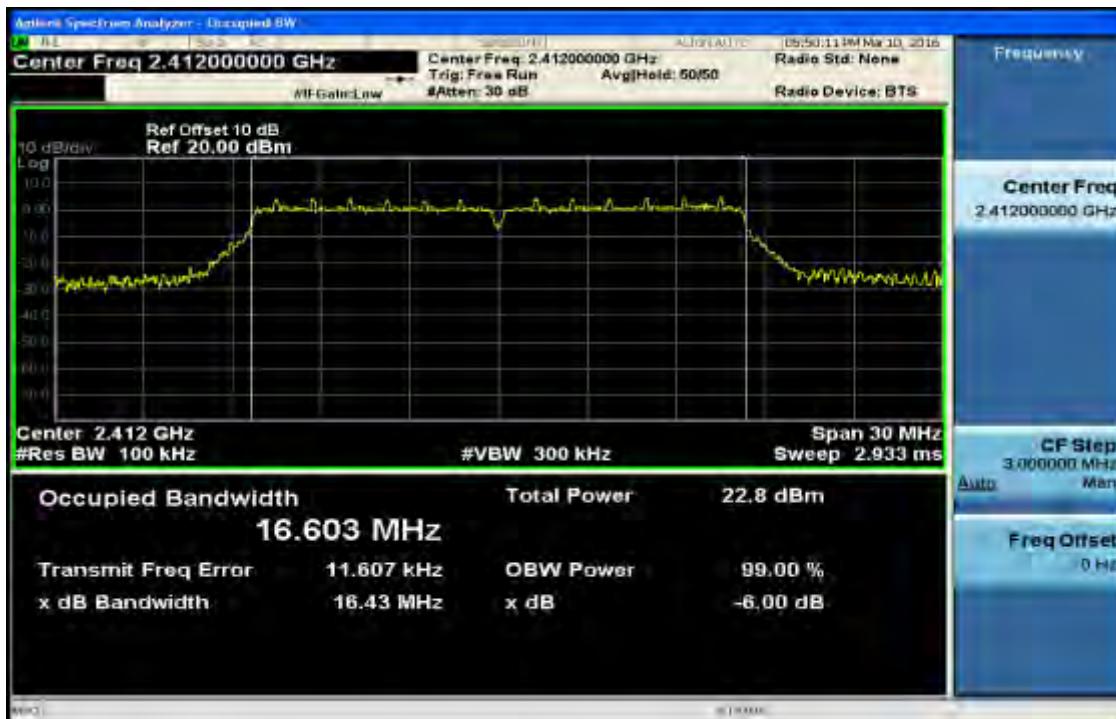
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6dB Band Width Test Data CH-High



802.11g

6dB Band Width Test Data CH-Low

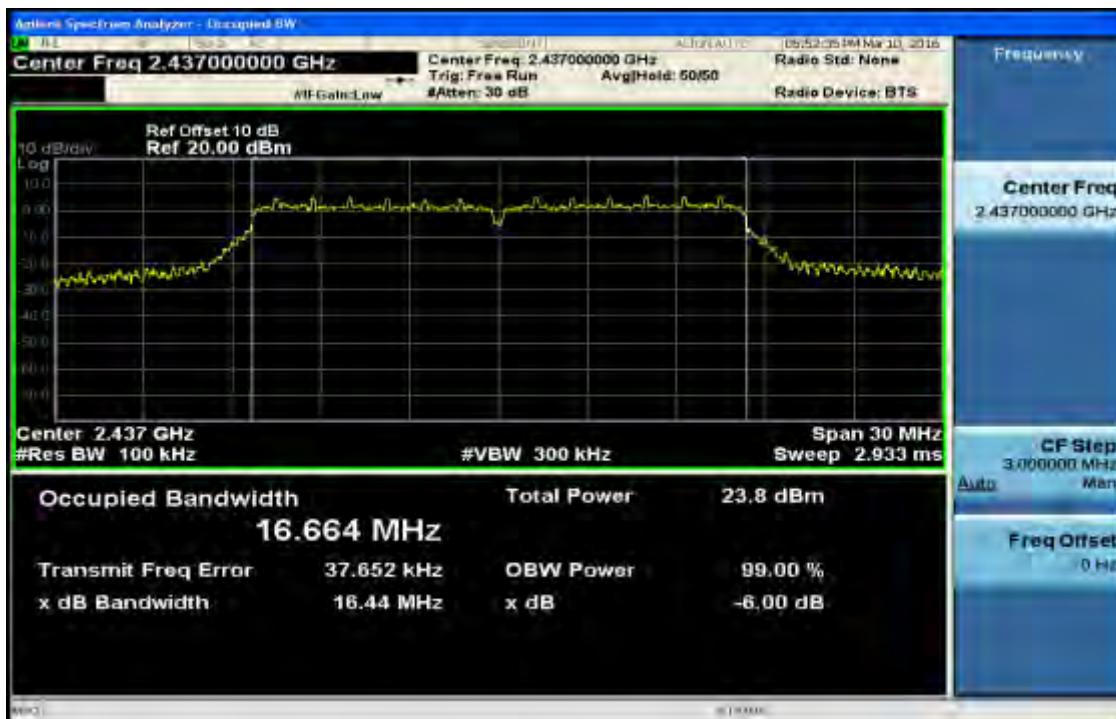


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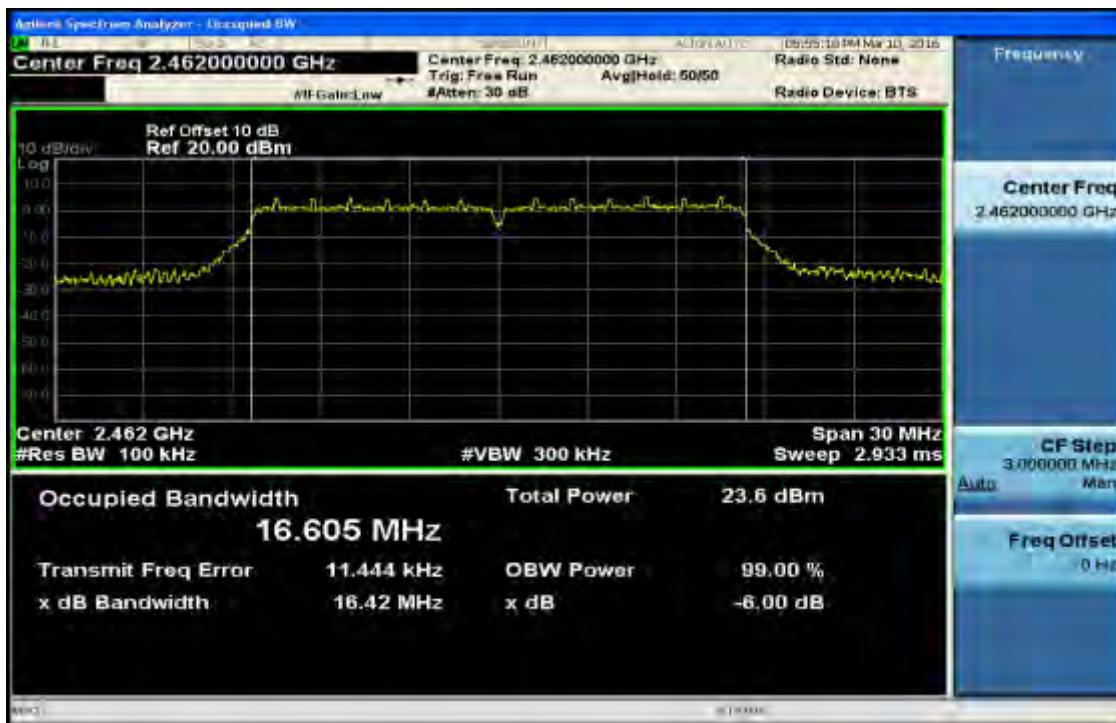
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



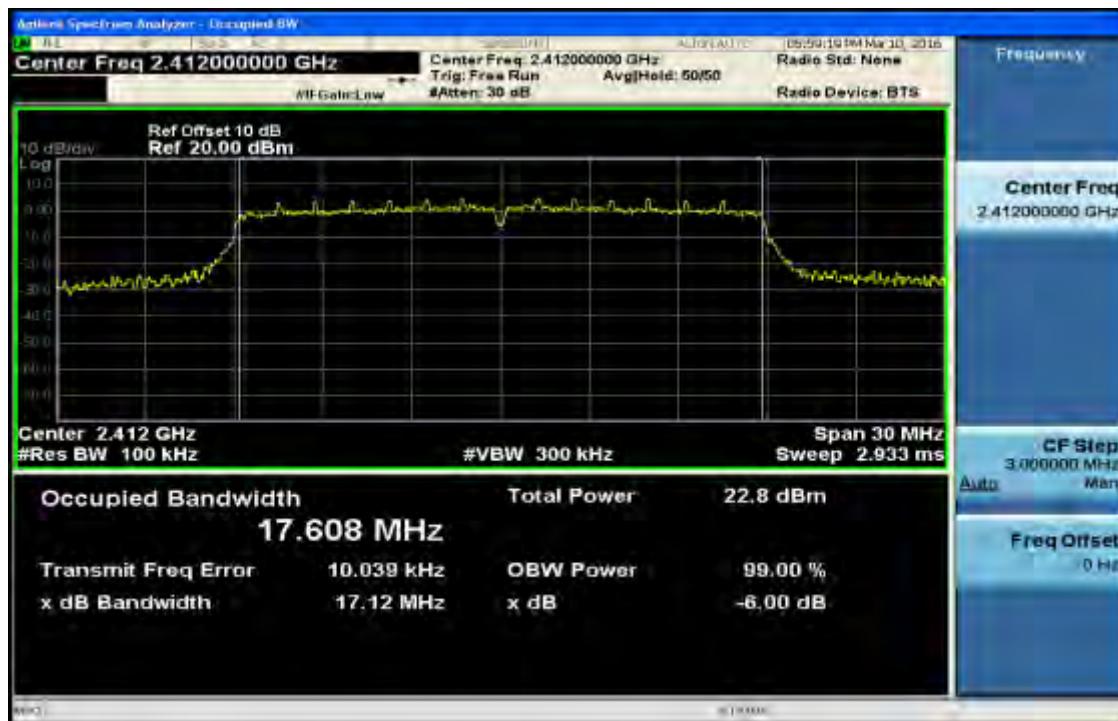
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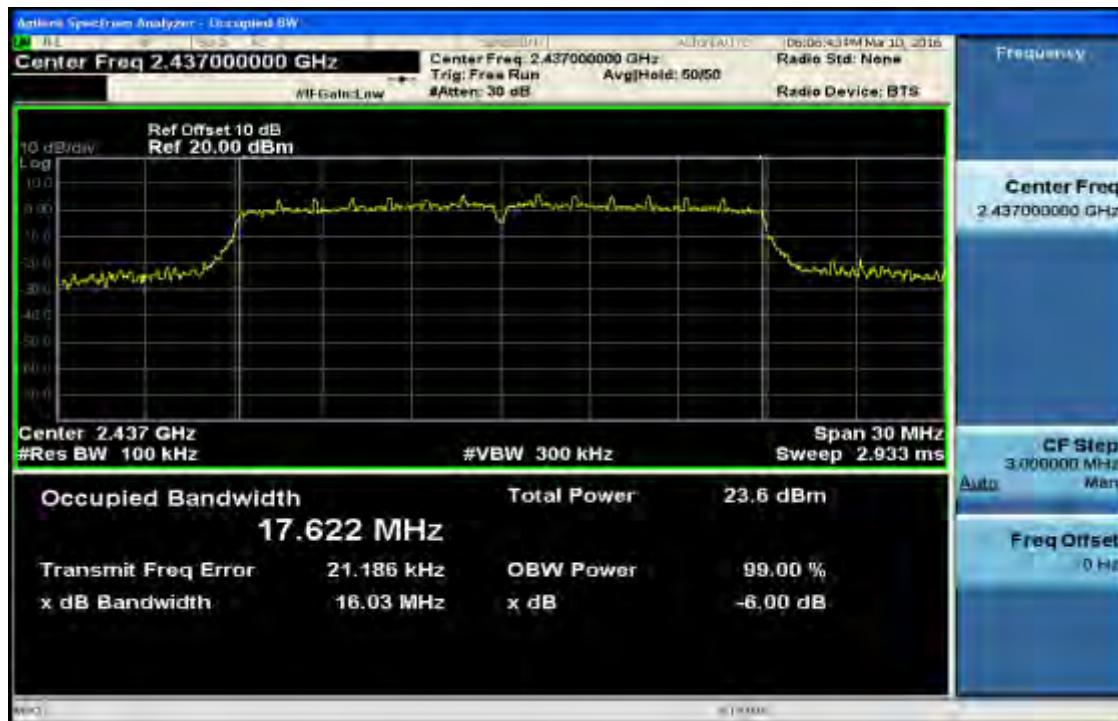
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802.11n_20M

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



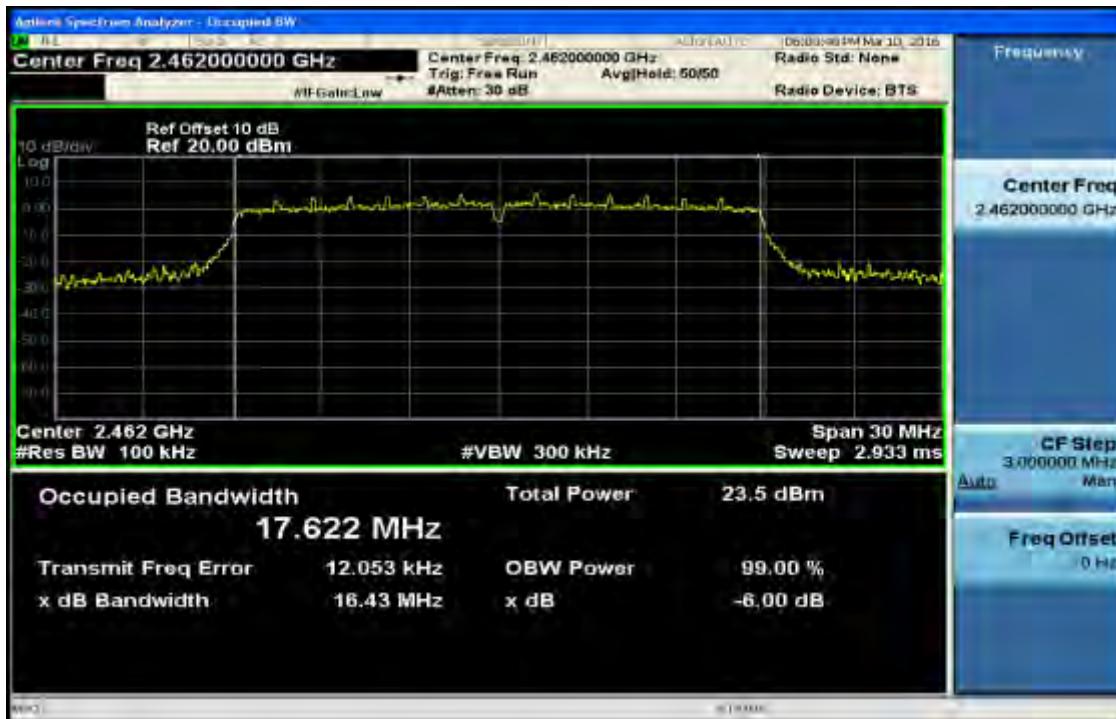
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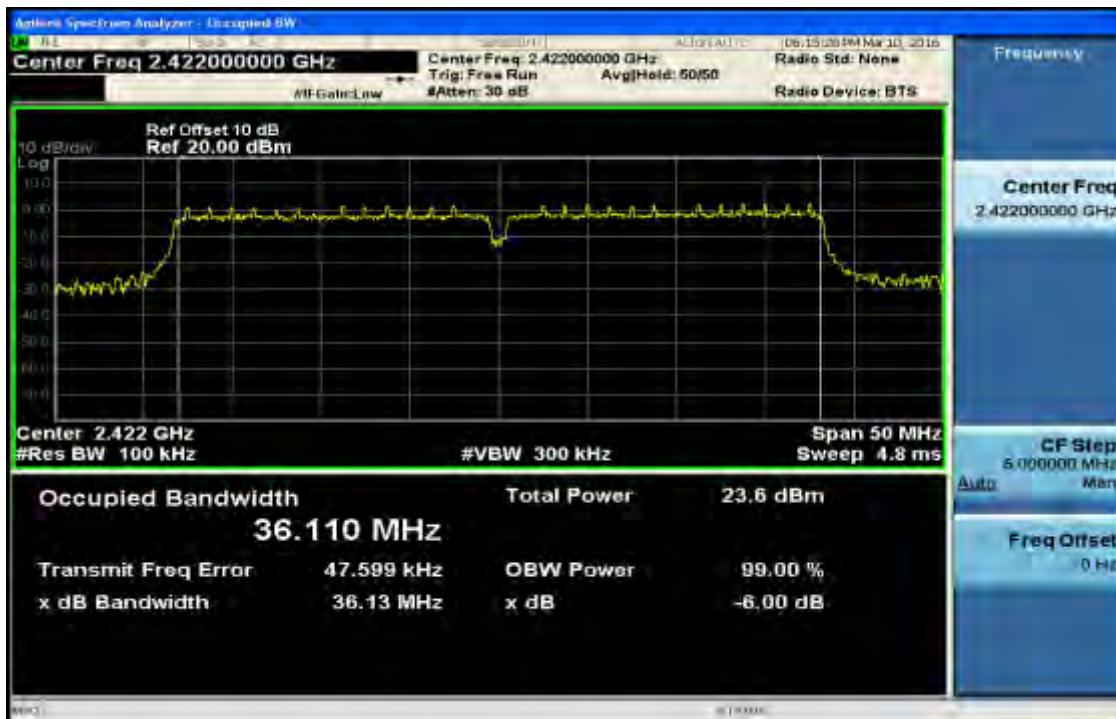
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6dB Band Width Test Data CH-High



802.11n_40M

6dB Band Width Test Data CH-Low

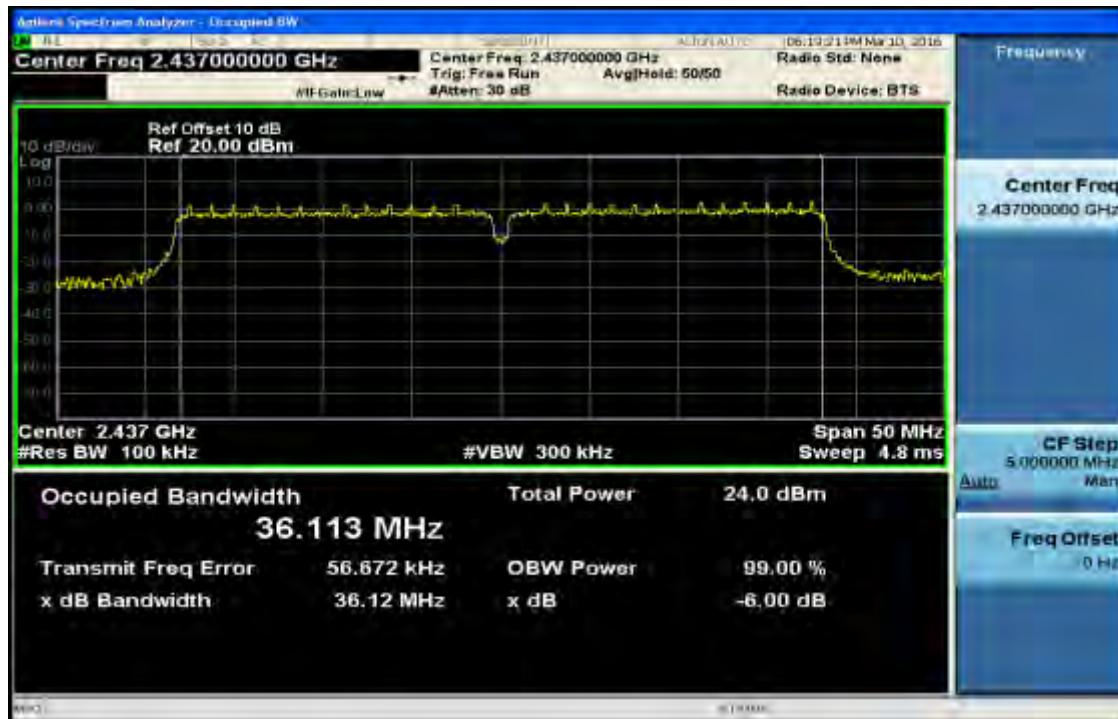


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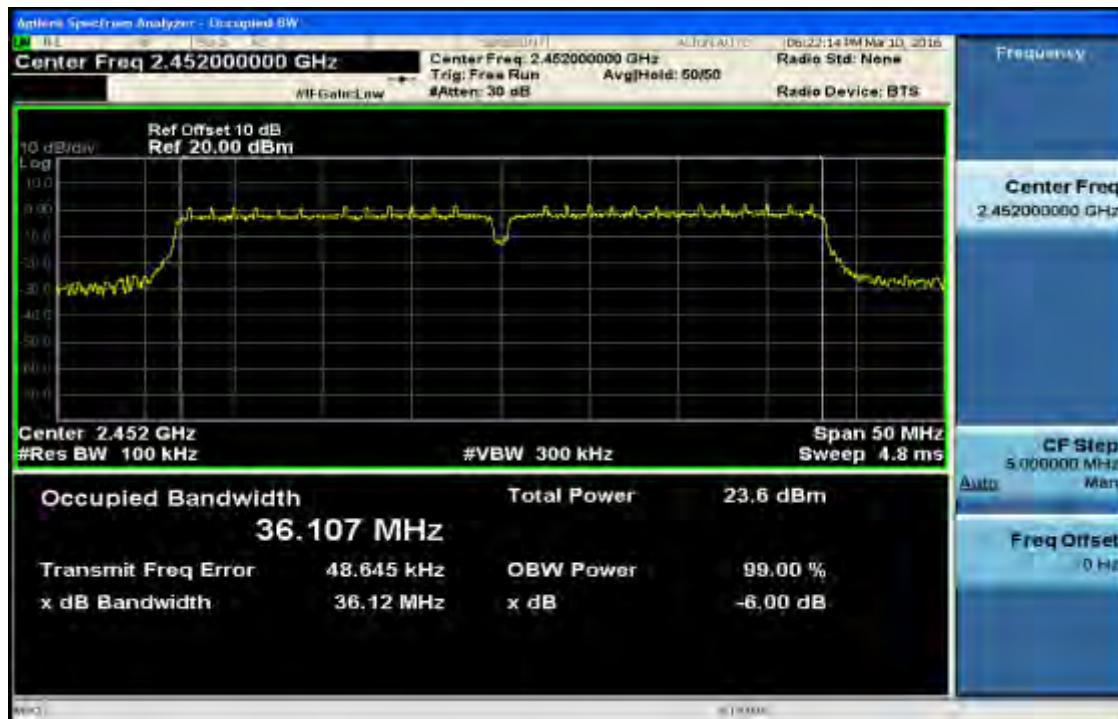
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

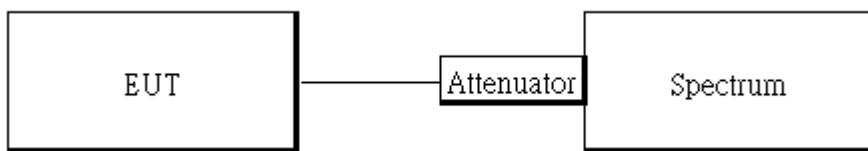
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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).

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

10.3 Test SET-UP



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10.4 Measurement Procedure

Conducted Band Edge:

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

Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas.
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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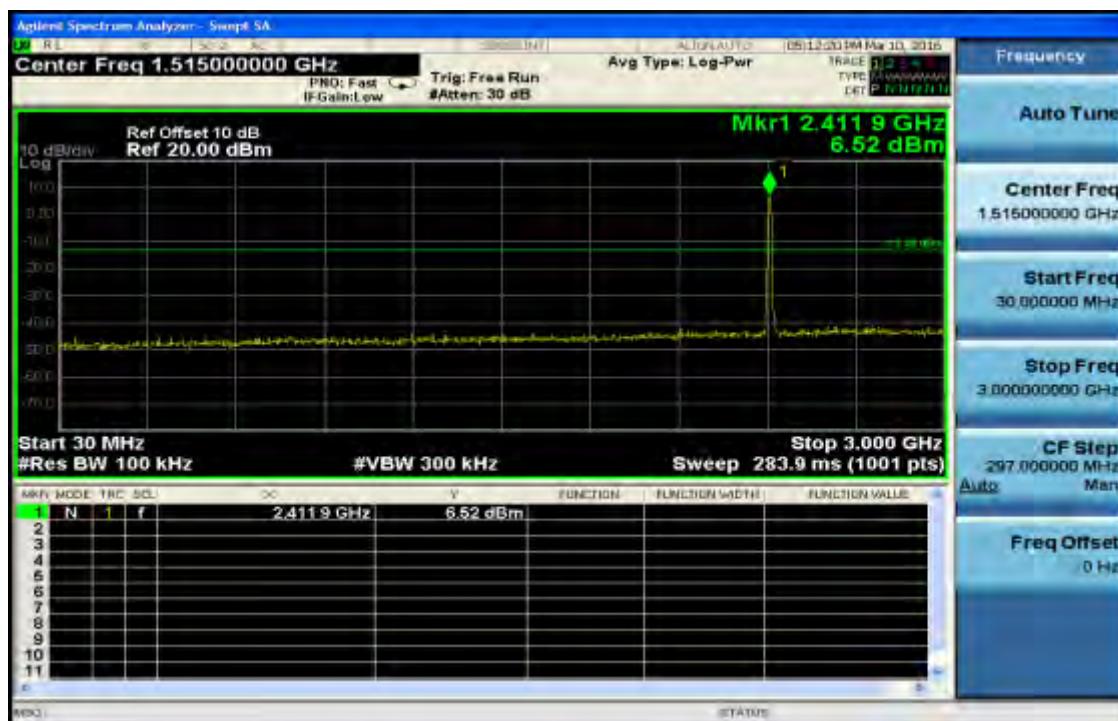
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802.11b

Spurious Emission Test Data CH-Low



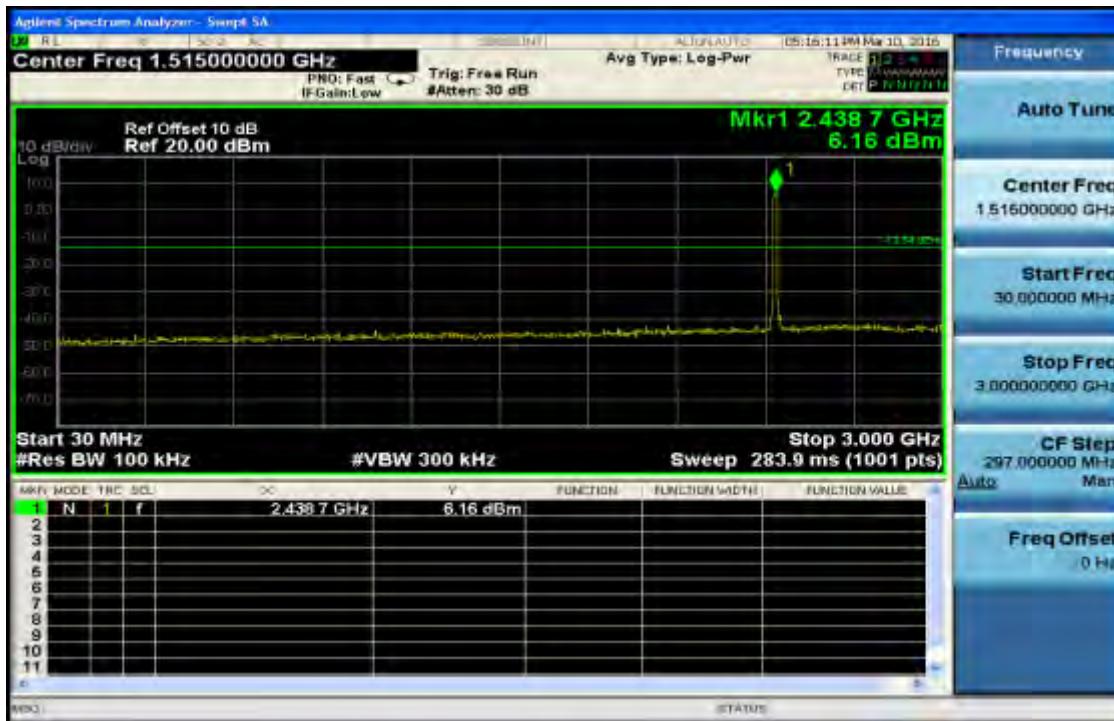
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Spurious Emission Test Data CH-Mid

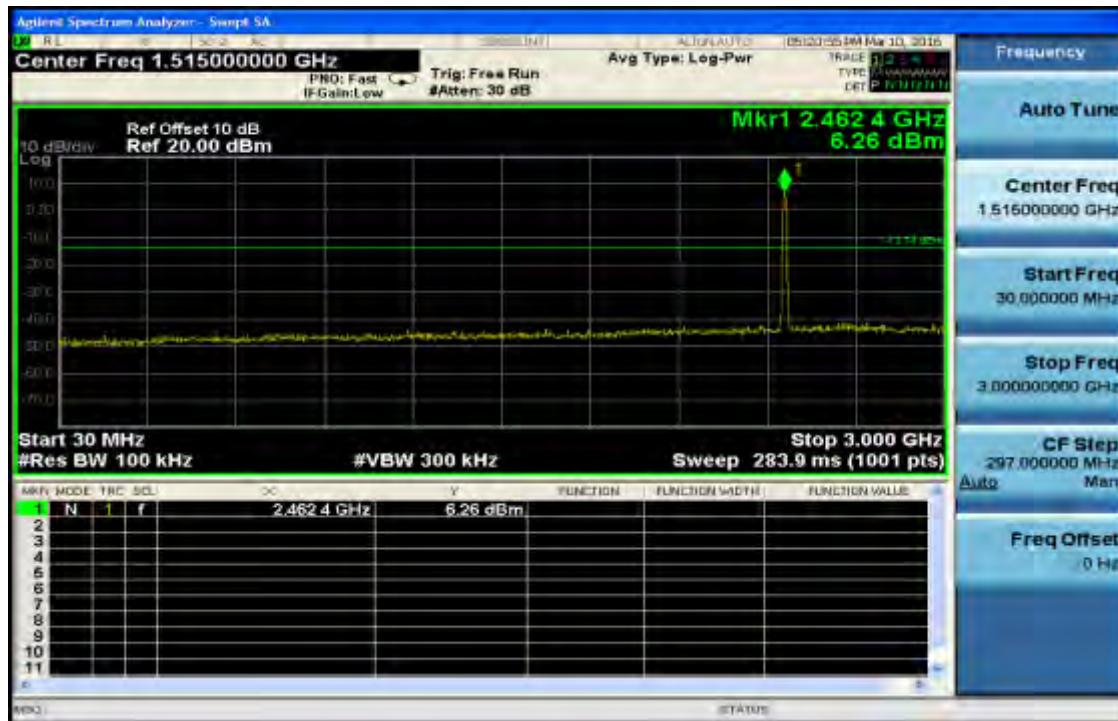


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Spurious Emission Test Data CH-High



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802.11g

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



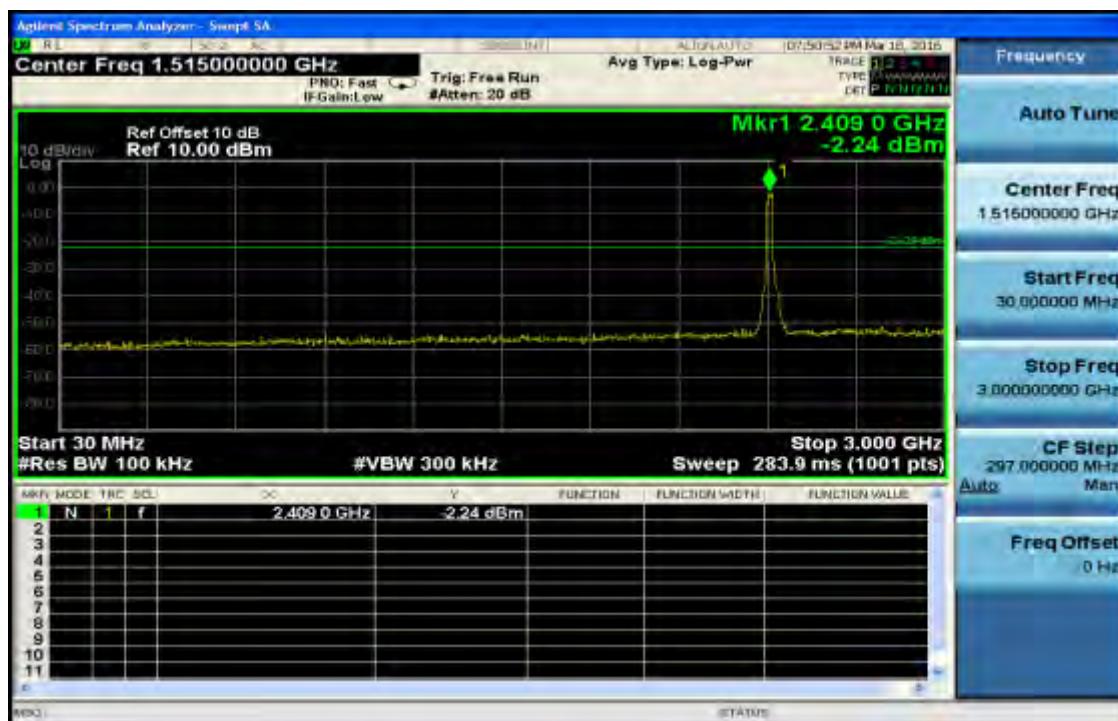
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802.11g

Spurious Emission Test Data CH-Low

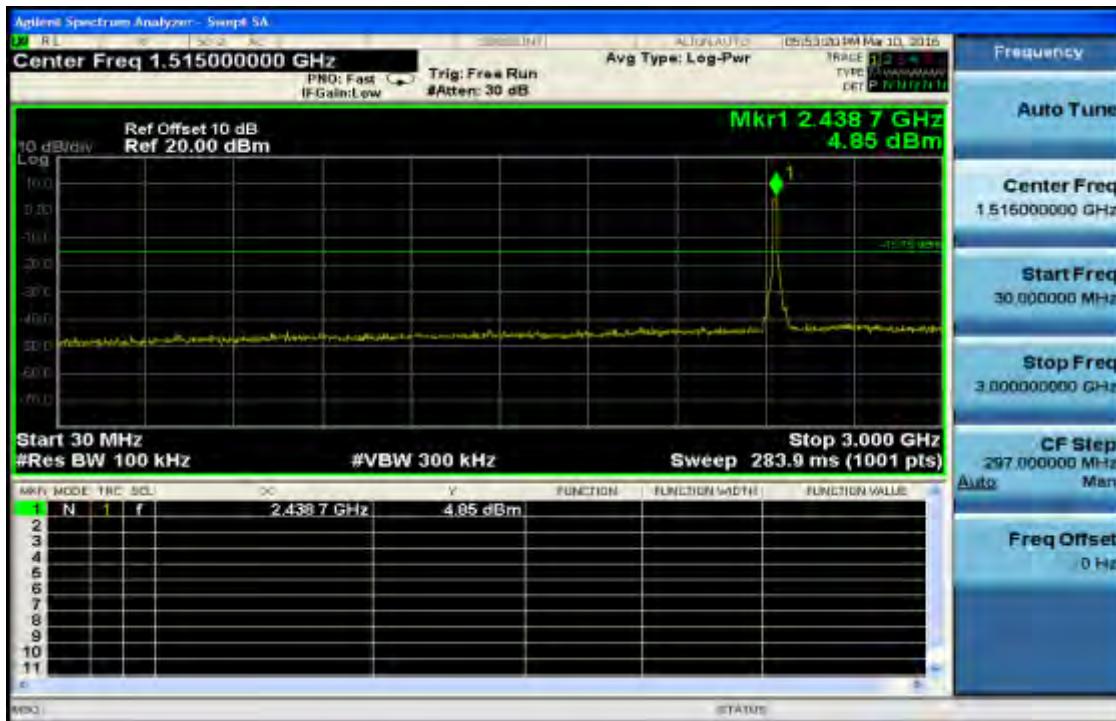


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Spurious Emission Test Data CH-Mid

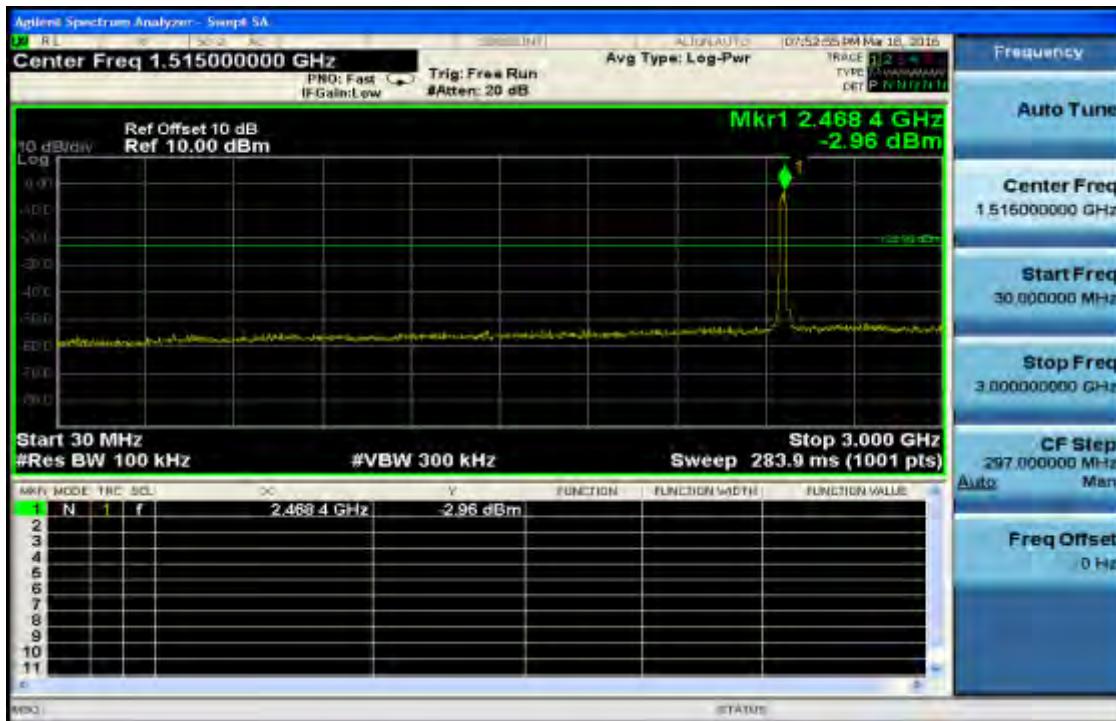


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Spurious Emission Test Data CH-High



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802.11n_HT20

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



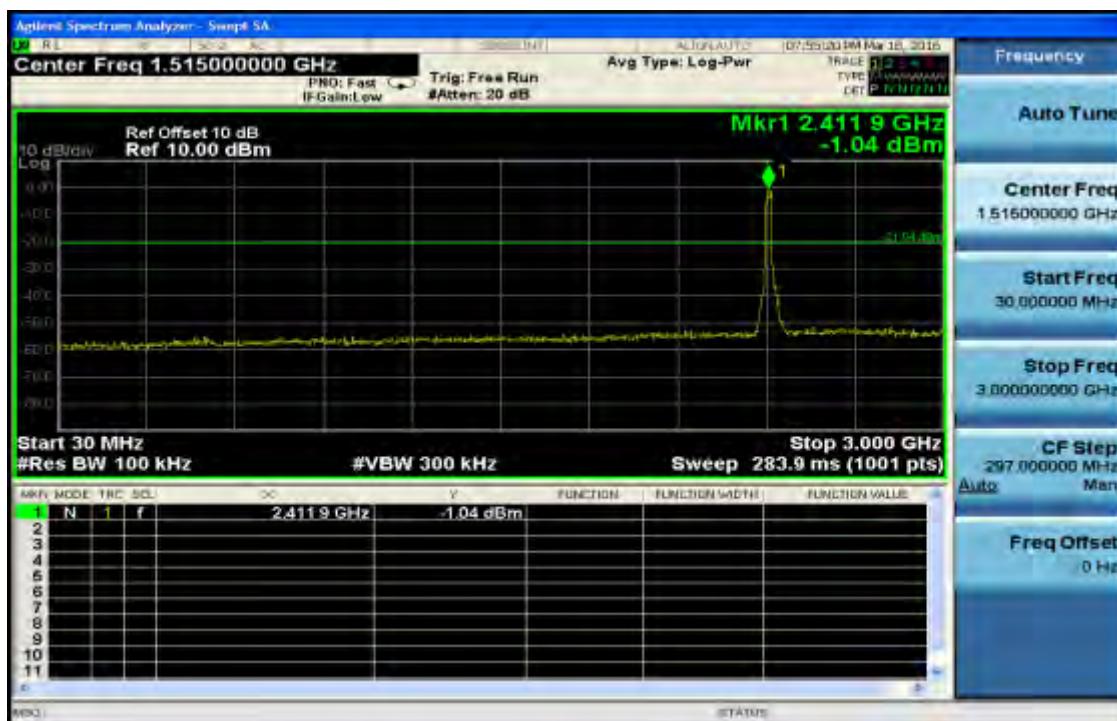
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802.11n_HT20

Spurious Emission Test Data CH-Low

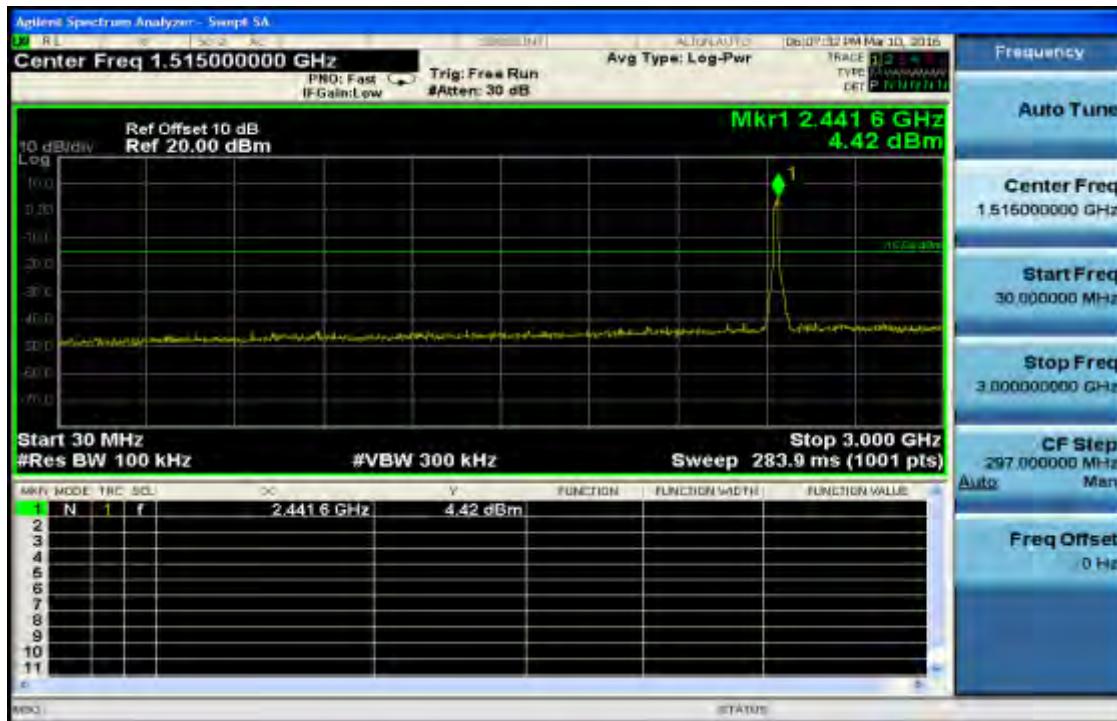


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Spurious Emission Test Data CH-Mid

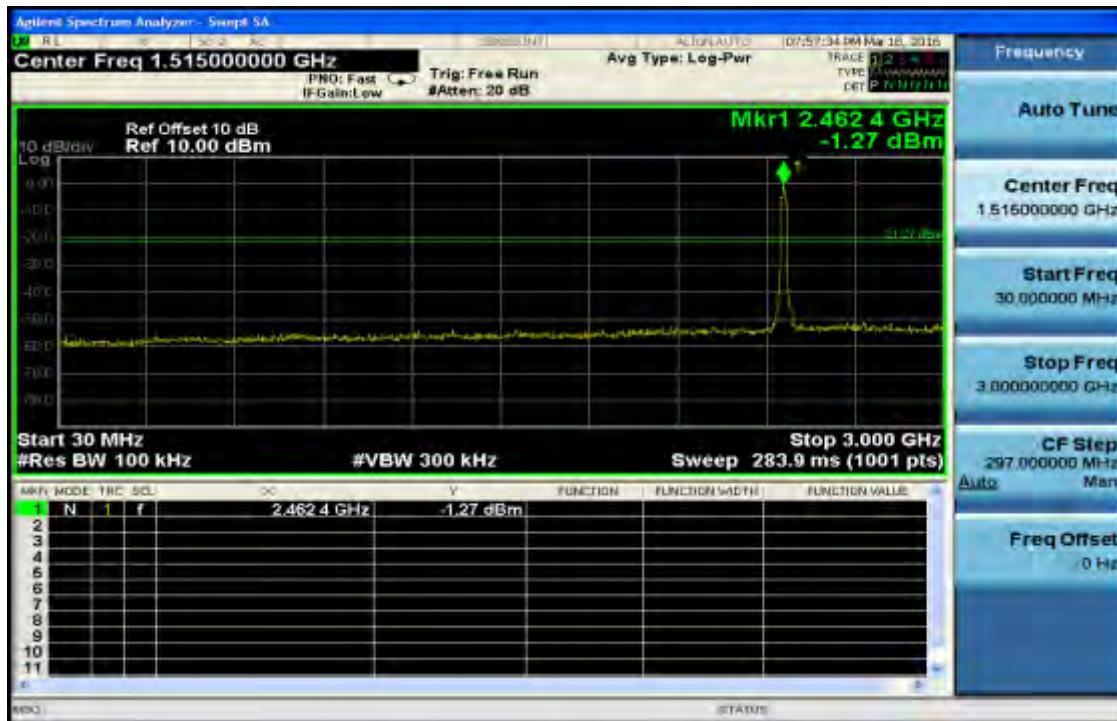


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Spurious Emission Test Data CH-High



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802.11n_HT40

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



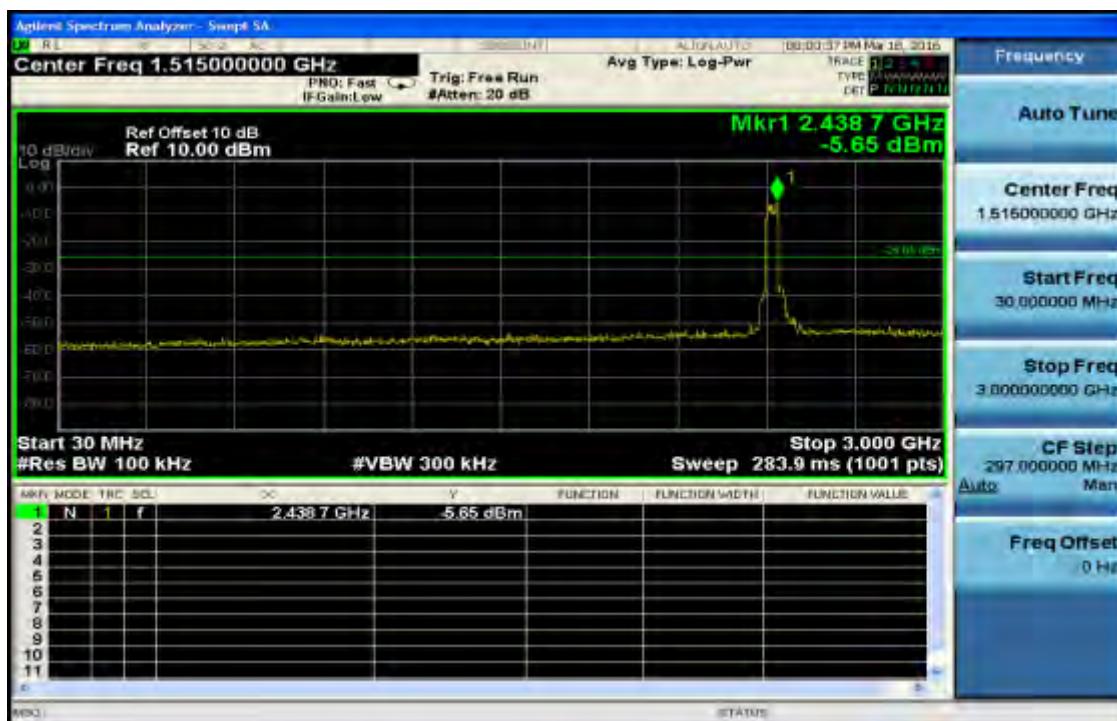
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802.11n_HT40

Spurious Emission Test Data CH-Low

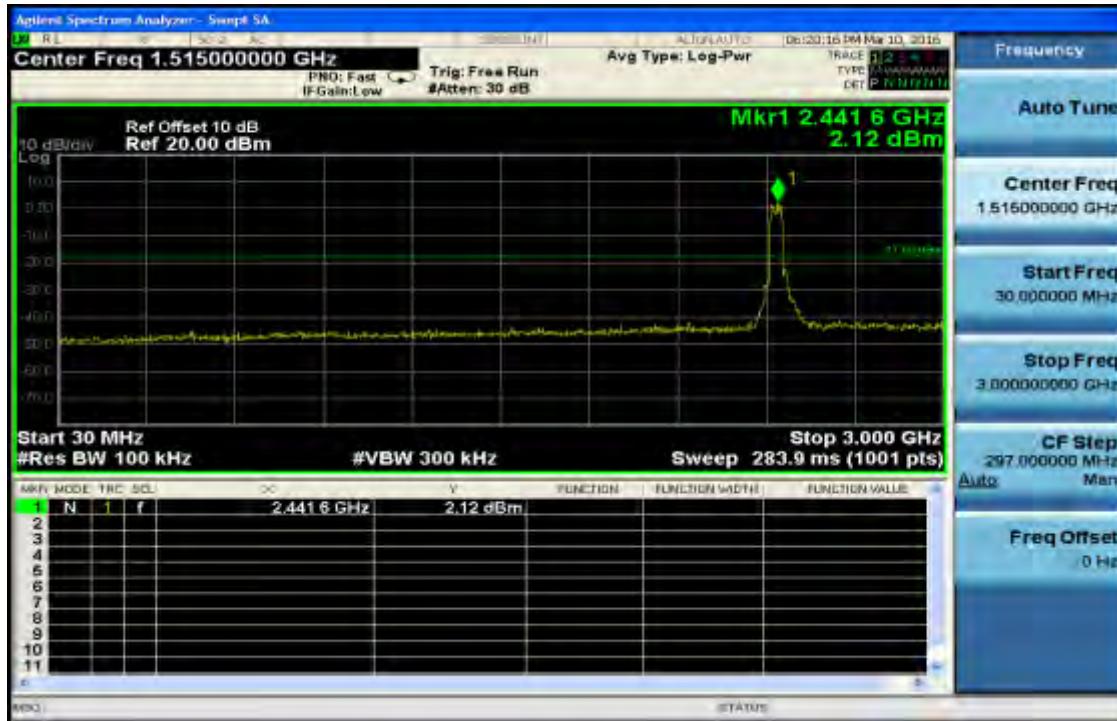


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Spurious Emission Test Data CH-Mid

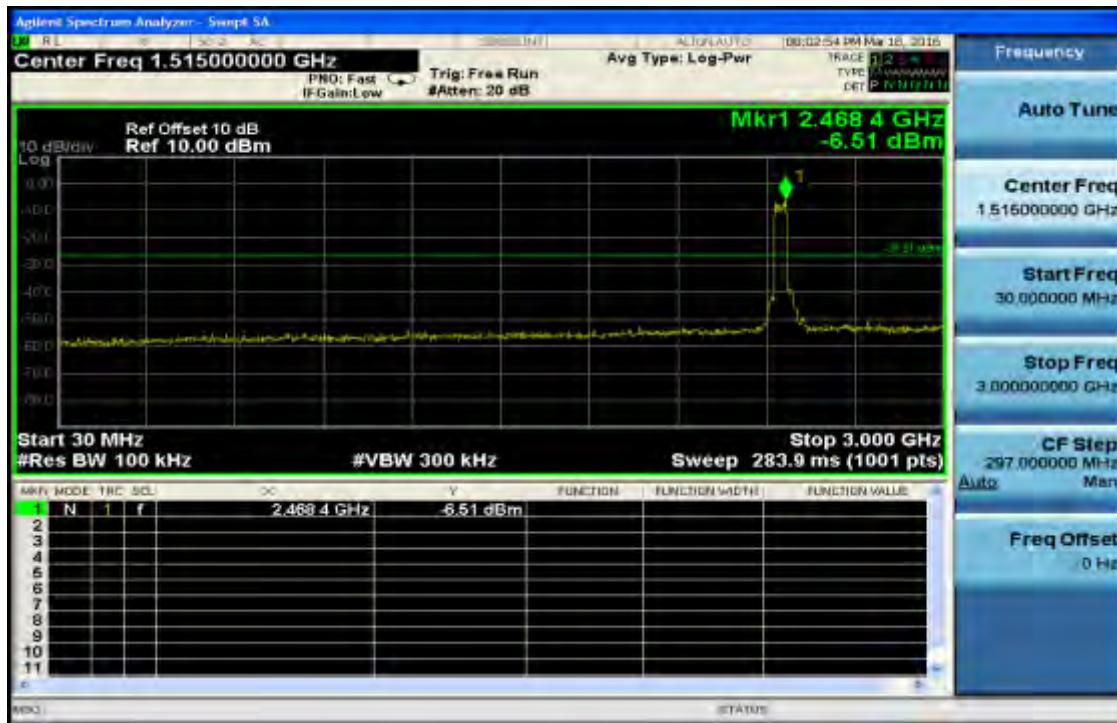


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11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

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.
2. Emission level (dB μ V/m) = 20 log Emission level (dB μ V/m)

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11.2 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/04/2015	05/03/2016
Spectrum Analyzer	Agilent	E4446A	MY51100003	01/28/2016	01/27/2017
Loop Antenna	ETS.LINDGREN	6502	148045	09/07/2015	09/06/2016
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/14/2015	12/13/2016
Horn antenna	ETS.LINDGREN	3117	123995	05/05/2015	05/04/2016
Pre-Amplifier	Agilent	8447D	2944A07676	01/02/2016	01/01/2017
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/02/2016	01/01/2017
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2016	01/01/2017
3m Site NSA	SGS	966 chamber	N/A	07/02/2015	07/01/2016

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

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台灣檢驗科技股份有限公司

t (886-2) 2299-3279

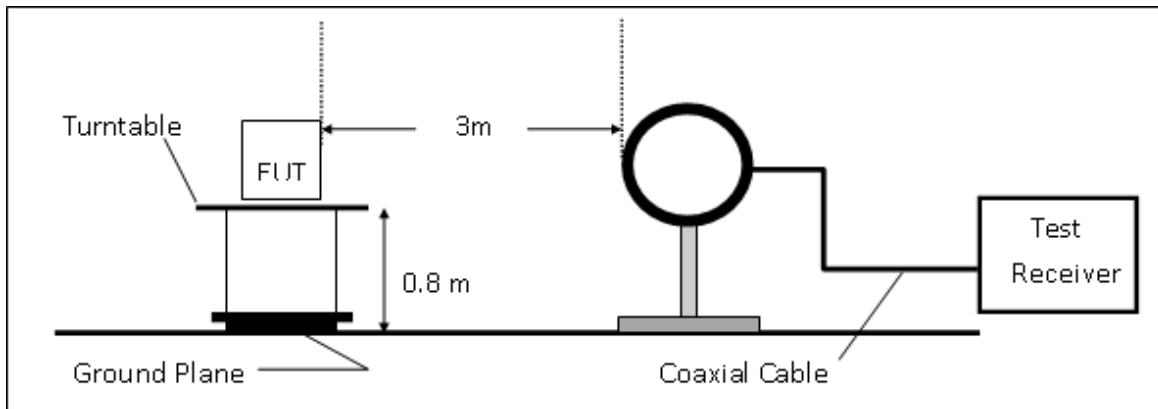
f (886-2) 2298-0488

www.tw.sgs.com

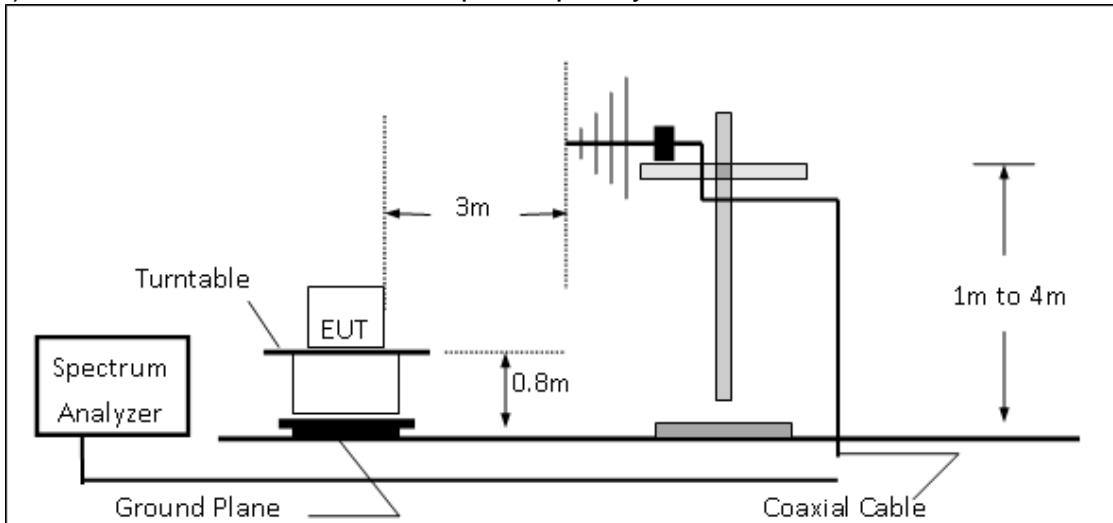
Member of SGS Group

11.3 Test SET-UP

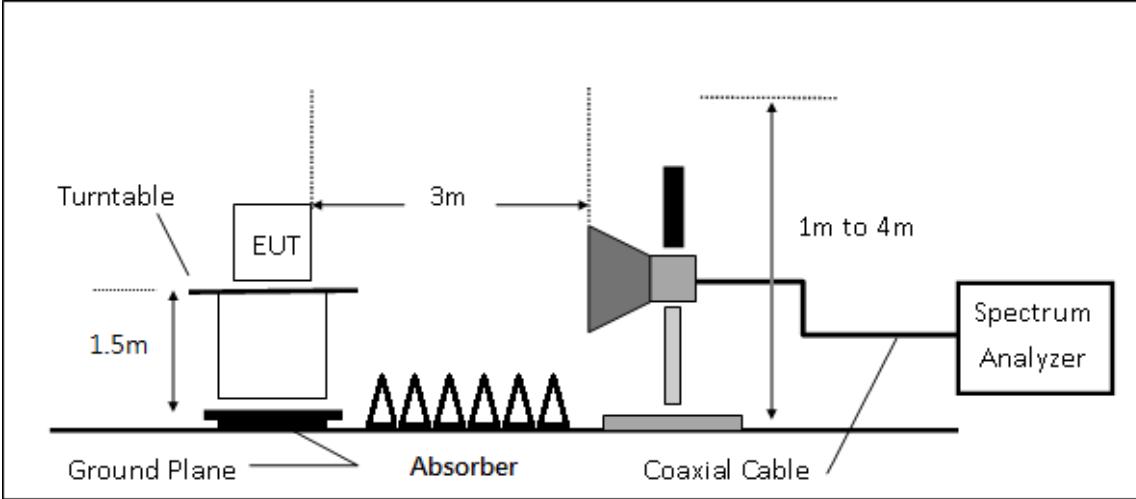
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW \geq 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\mathbf{FS = RA + AF + CL - AG}$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

Actual FS(dB μ V/m) = SPA. Reading level(dB μ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB μ 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 : 03/10/2016 17:35:48
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2390.00	E	46.27	48.01	-1.74	54.00	-7.73
2390.00	E	55.61	57.35	-1.74	74.00	-18.39

Operation Mode : 802.11b Test Date : 03/10/2016 17:40:11
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2390.00	E	40.40	42.14	-1.74	54.00	-13.60
2390.00	E	40.89	42.64	-1.74	74.00	-33.11

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Operation Mode : 802.11b Test Date : 03/10/2016 17:45:17
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m dBuV/m	Margin
		dBuV/m	dBuV	dB	dB	
2483.50	E	43.87	45.49	-1.62	54.00	-10.13
2483.50	E	51.87	53.48	-1.62	74.00	-22.13

Operation Mode : 802.11b Test Date : 03/10/2016 17:49:04
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m dBuV/m	Margin
		dBuV/m	dBuV	dB	dB	
2483.50	E	43.99	45.61	-1.62	54.00	-10.01
2483.50	E	52.11	53.73	-1.62	74.00	-21.89

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Radiated Band Edge Measurement Result (802.11g)

Operation Mode : 802.11g Test Date : 03/14/2016 09:32:49
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2390.00	E	47.30	49.04	-1.74	54.00	-6.70
2390.00	E	72.67	74.41	-1.74	74.00	-1.33

Operation Mode : 802.11g Test Date : 03/14/2016 09:38:10
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2390.00	E	42.88	44.62	-1.74	54.00	-11.12
2390.00	E	64.30	66.04	-1.74	74.00	-9.70

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Operation Mode : 802.11g Test Date : 03/14/2016 09:54:56
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2483.50	E	43.54	45.16	-1.62	54.00	-10.46
2483.50	E	71.92	73.54	-1.62	74.00	-2.08

Operation Mode : 802.11g Test Date : 03/14/2016 09:56:53
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2483.50	E	40.06	41.68	-1.62	54.00	-13.94
2483.50	E	65.29	66.91	-1.62	74.00	-8.71

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Radiated Band Edge Measurement Result (802.11-HT20)

Operation Mode : 802.11n20 Test Date : 03/14/2016 10:03:51
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m dBuV/m	Margin
		dBuV/m	dBuV	dB	dB	
2390.00	E	46.46	48.20	-1.74	54.00	-7.54
2390.00	E	72.82	74.57	-1.74	74.00	-1.18

Operation Mode : 802.11n20 Test Date : 03/14/2016 10:05:51
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m dBuV/m	Margin
		dBuV/m	dBuV	dB	dB	
2390.00	E	42.60	44.34	-1.74	54.00	-11.40
2390.00	E	66.24	67.98	-1.74	74.00	-7.76

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Operation Mode : 802.11n20 Test Date : 03/14/2016 10:17:18
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2483.50	E	44.34	45.96	-1.62	54.00	-9.66
2483.50	E	70.05	71.67	-1.62	74.00	-3.95
2484.50	S	43.79	45.41	-1.62	54.00	-10.21
2484.50	S	72.14	73.75	-1.62	74.00	-1.86

Operation Mode : 802.11n20 Test Date : 03/14/2016 10:19:43
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2483.50	E	39.70	41.32	-1.62	54.00	-14.30
2483.50	E	63.51	65.13	-1.62	74.00	-10.49

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Radiated Band Edge Measurement Result (802.11_HT40)

Operation Mode : 802.11n40 Test Date : 03/14/2016 10:34:38
 Fundamental Frequency : 2422 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Bandedge CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2388.24	S	45.87	47.61	-1.74	54.00	-8.13
2388.24	S	72.14	73.88	-1.74	74.00	-1.86
2390.00	E	46.08	47.82	-1.74	54.00	-7.92
2390.00	E	71.39	73.14	-1.74	74.00	-2.61

Operation Mode : 802.11n40 Test Date : 03/14/2016 10:37:04
 Fundamental Frequency : 2422 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Bandedge CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2388.24	S	41.72	43.46	-1.74	54.00	-12.28
2388.24	S	67.38	69.12	-1.74	74.00	-6.62
2390.00	E	41.96	43.70	-1.74	54.00	-12.04
2390.00	E	66.86	68.61	-1.74	74.00	-7.14

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Operation Mode : 802.11n40 Test Date : 03/14/2016 10:44:15
Fundamental Frequency : 2452 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2483.50	E	45.53	47.15	-1.62	54.00	-8.47
2483.50	E	72.49	74.10	-1.62	74.00	-1.51
2486.80	S	45.02	46.64	-1.62	54.00	-8.98
2486.80	S	72.69	74.31	-1.62	74.00	-1.31

Operation Mode : 802.11n40 Test Date : 03/14/2016 10:52:53
Fundamental Frequency : 2452 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Bandedge CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL

Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
2483.50	E	39.10	40.72	-1.62	54.00	-14.90
2483.50	E	64.42	66.04	-1.62	74.00	-9.58

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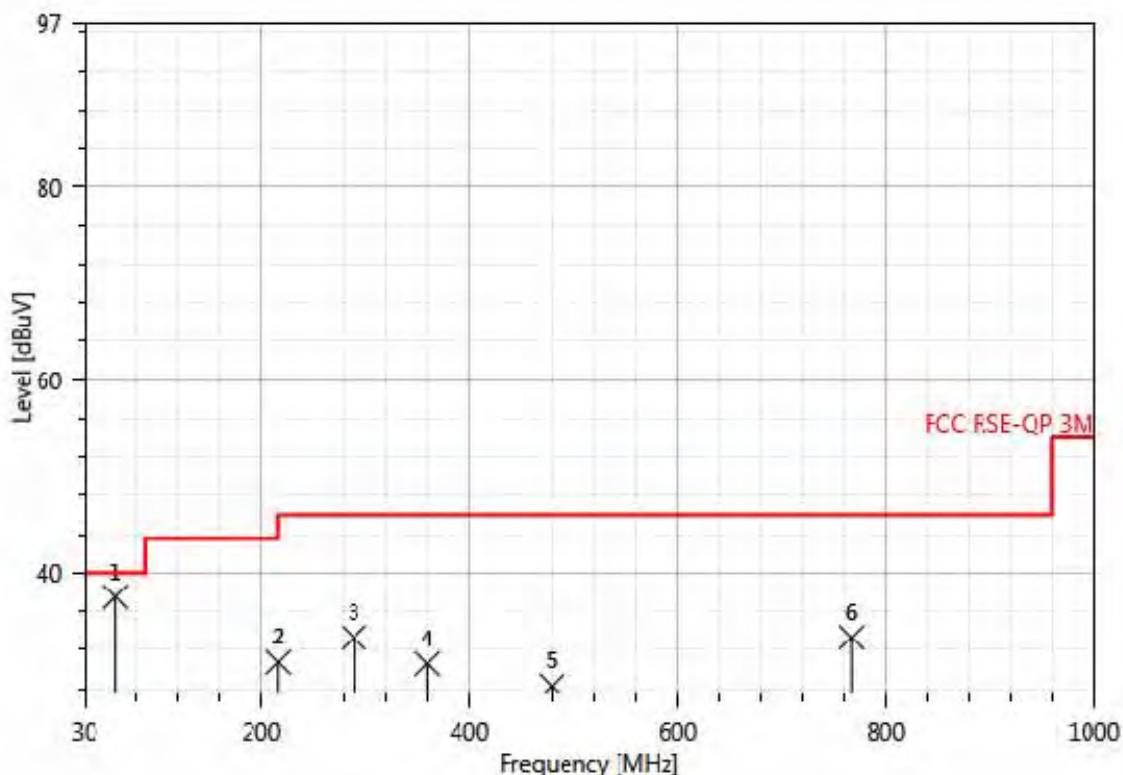
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Below 1GHz Worst-Case Data:**Radiated Spurious Emission Measurement Result (802.11 g)**

Operation Mode : 802.11g Test Date : 03/10/2016 22:42:17
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



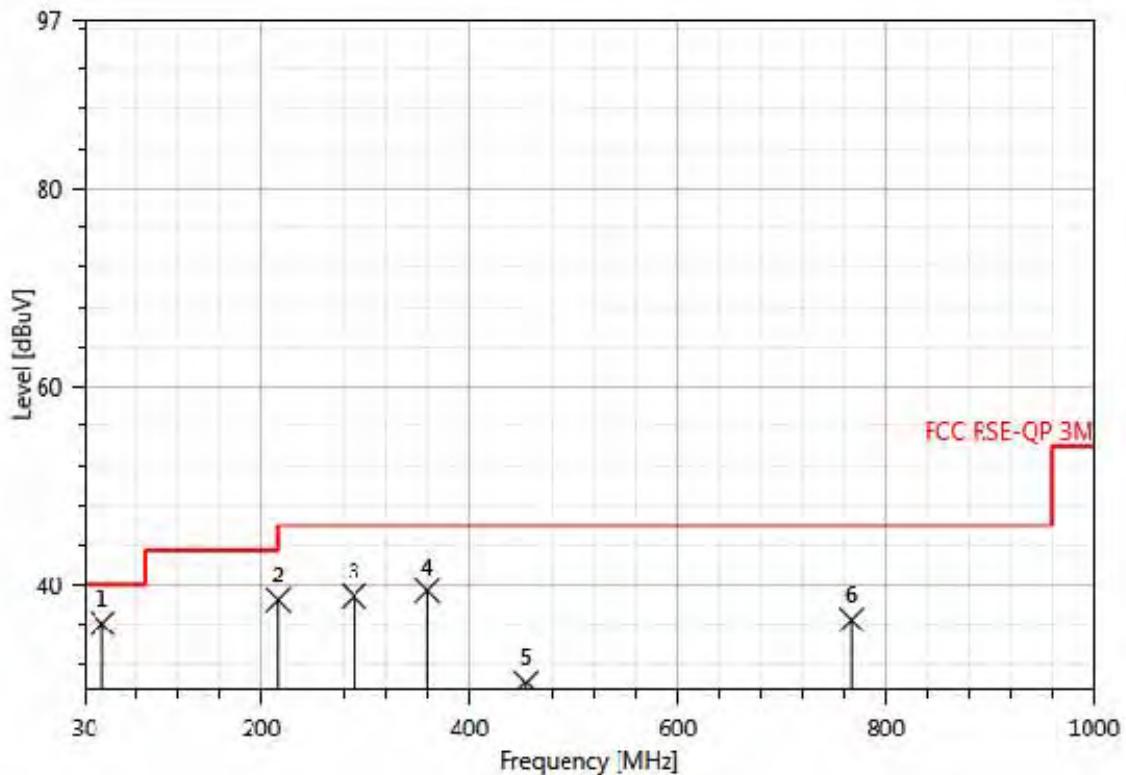
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
60.07	S	37.51	45.56		-8.05	40.00	-2.49
216.24	S	30.72	40.15		-9.43	46.00	-15.28
288.99	S	33.30	39.38		-6.08	46.00	-12.70
359.80	S	30.58	35.38		-4.80	46.00	-15.42
479.11	S	28.30	30.69		-2.39	46.00	-17.70
767.20	S	33.31	30.17		3.14	46.00	-12.69

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Operation Mode : 802.11g Test Date : 03/10/2016 22:42:18
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Level	Reading Level			
47.46	S	36.13	43.98	-7.85	40.00	-3.87	
216.24	S	38.49	47.92	-9.43	46.00	-7.51	
288.99	S	38.87	44.95	-6.08	46.00	-7.13	
359.80	S	39.41	44.21	-4.80	46.00	-6.59	
454.86	S	30.20	32.84	-2.65	46.00	-15.80	
767.20	S	36.51	33.38	3.14	46.00	-9.49	

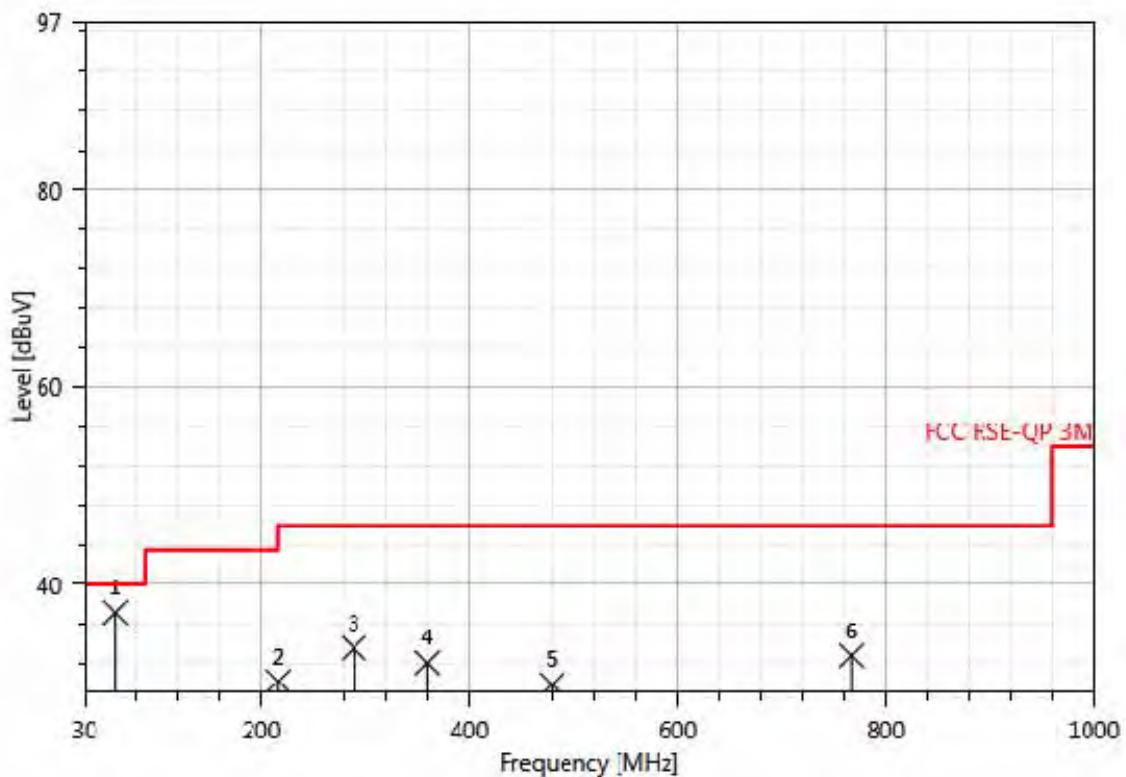
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Operation Mode : 802.11g
 Fundamental Frequency : 2437 MHz
 Operation Band : Tx CH MID
 EUT Pol. : E2 Plane

Test Date : 03/10/2016 22:42:19
 Temp. / Humi. : 21 deg_C / 62 RH
 Test Engineer : Tin
 Measurement Antenna Pol. : VERTICAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Level	Reading Level			
60.07	S	37.17	45.22		-8.05	40.00	-2.83
216.24	S	30.21	39.64		-9.43	46.00	-15.79
288.99	S	33.57	39.65		-6.08	46.00	-12.43
359.80	S	32.07	36.87		-4.80	46.00	-13.93
479.11	S	29.90	32.29		-2.39	46.00	-16.10
767.20	S	32.80	29.66		3.14	46.00	-13.20

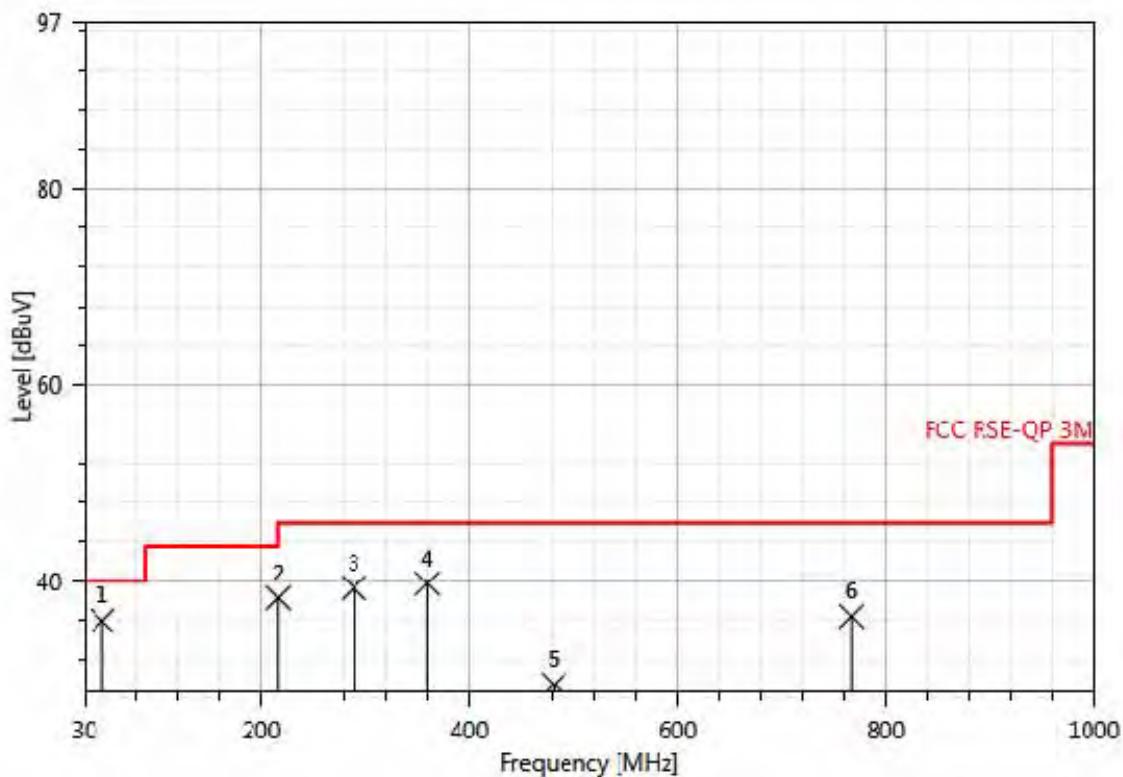
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Operation Mode : 802.11g
 Fundamental Frequency : 2437 MHz
 Operation Band : Tx CH MID
 EUT Pol. : E2 Plane

Test Date : 03/10/2016 22:42:20
 Temp. / Humi. : 21 deg_C / 62 RH
 Test Engineer : Tin
 Measurement Antenna Pol. : HORIZONTAL



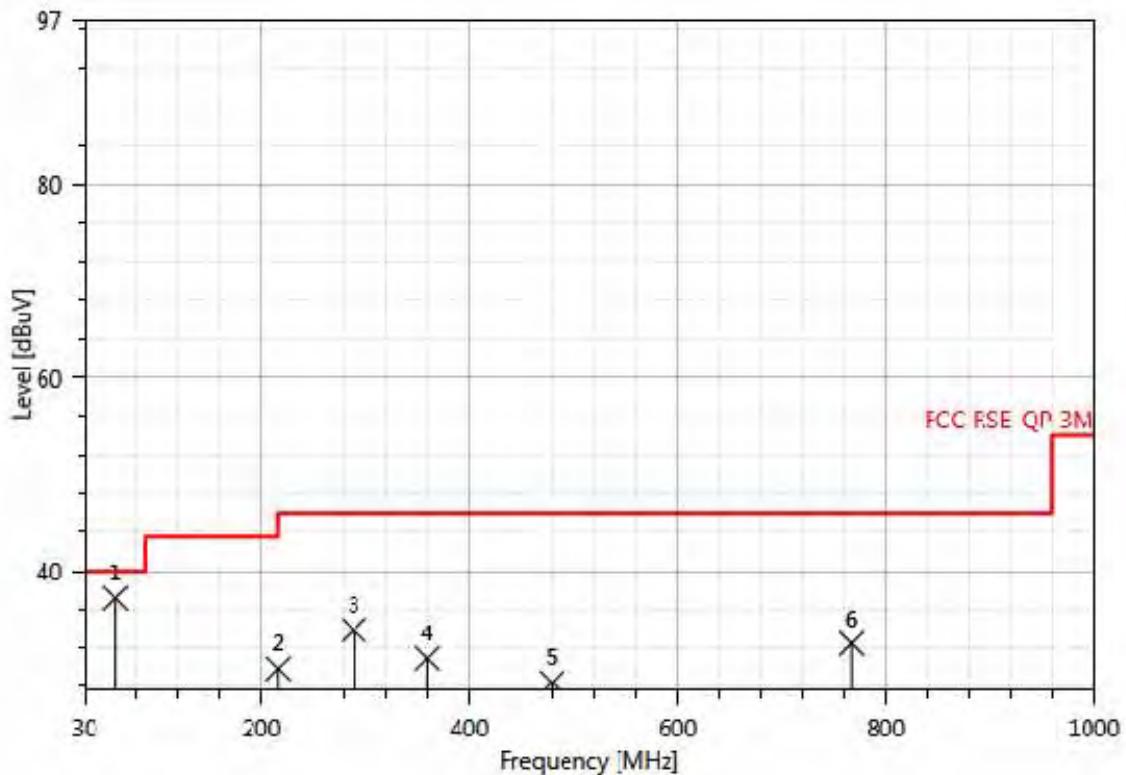
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum		Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	Level dBuV			
47.46	S	35.97	43.82		-7.85	40.00	-4.03
216.24	S	38.28	47.71		-9.43	46.00	-7.72
288.99	S	39.32	45.40		-6.08	46.00	-6.68
359.80	S	39.76	44.56		-4.80	46.00	-6.24
481.05	S	29.48	31.85		-2.37	46.00	-16.52
767.20	S	36.43	33.29		3.14	46.00	-9.57

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Operation Mode : 802.11g Test Date : 03/10/2016 22:42:21
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH HIGH Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum		Factor dB	Limit @3m dBuV/m	Margin dB
			Reading	Level dBuV			
60.07	S	37.17	45.22	-8.05	40.00	-2.83	
216.24	S	29.91	39.33	-9.43	46.00	-16.09	
288.99	S	33.89	39.97	-6.08	46.00	-12.11	
359.80	S	30.97	35.77	-4.80	46.00	-15.03	
479.11	S	28.47	30.86	-2.39	46.00	-17.53	
767.20	S	32.49	29.35	3.14	46.00	-13.51	

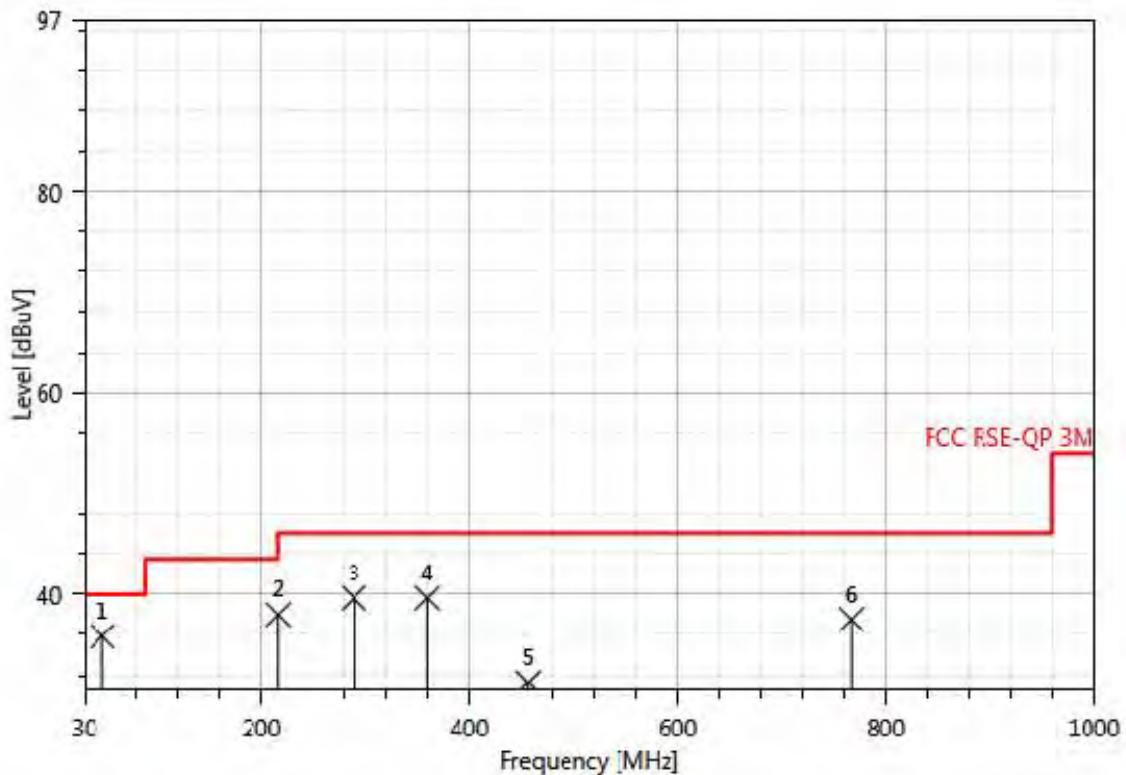
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Operation Mode : 802.11g Test Date : 03/10/2016 22:42:22
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH HIGH Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Level	Reading Level			
47.46	S	35.85	43.70	43.70	-7.85	40.00	-4.15
216.24	S	38.00	47.43	47.43	-9.43	46.00	-8.00
288.99	S	39.64	45.72	45.72	-6.08	46.00	-6.36
359.80	S	39.62	44.42	44.42	-4.80	46.00	-6.38
456.80	S	31.28	33.93	33.93	-2.65	46.00	-14.72
767.20	S	37.52	34.38	34.38	3.14	46.00	-8.48

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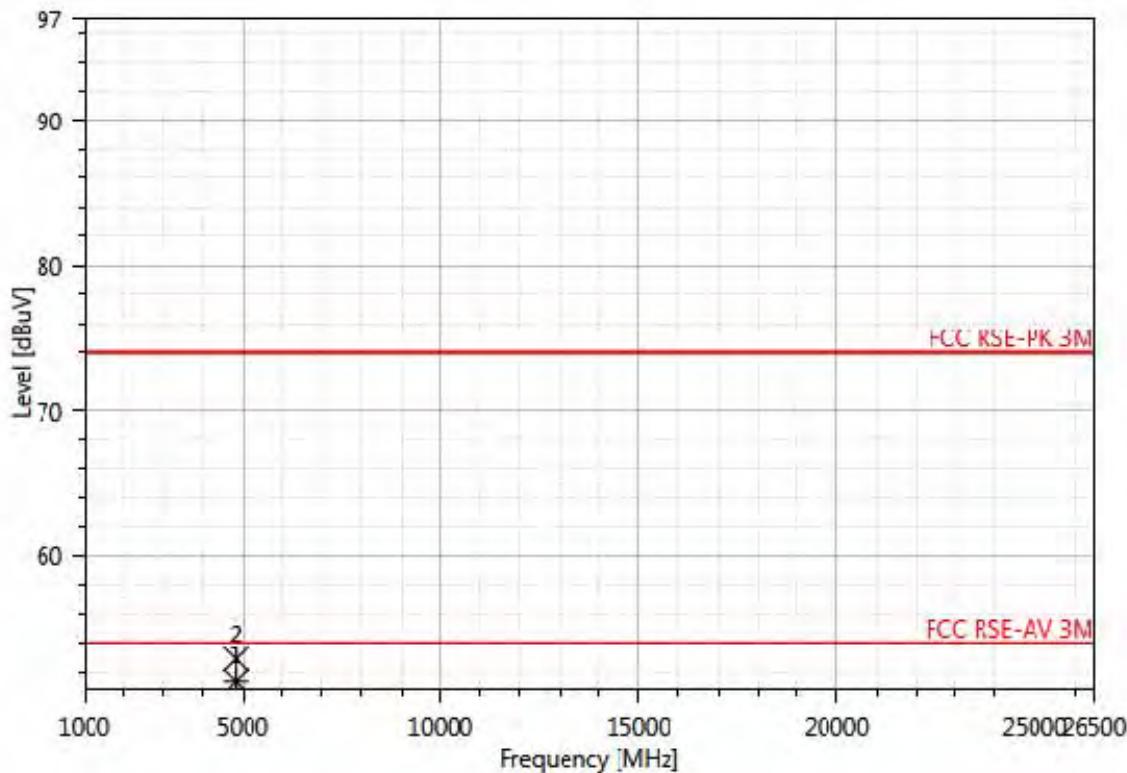
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Above 1GHz Data:**Radiated Spurious Emission Measurement Result (802.11 b)**

Operation Mode : 802.11b Test Date : 03/10/2016 19:15:20
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



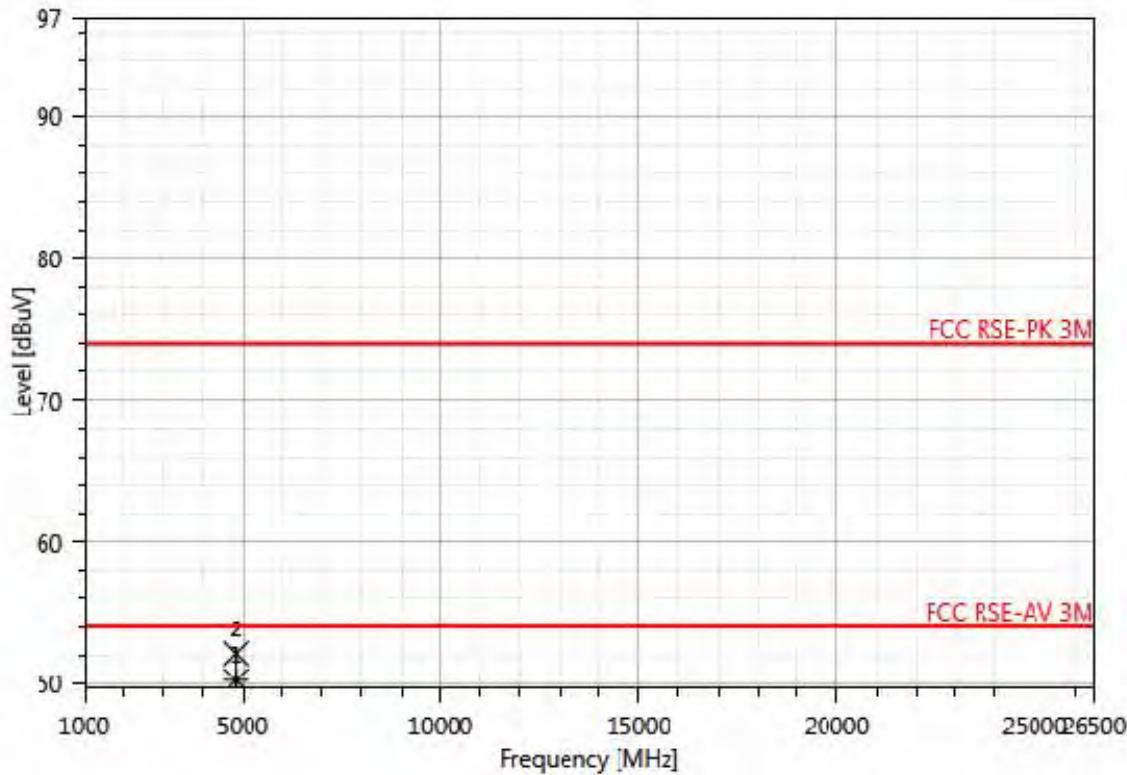
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Level dBuV	Reading Level dBuV			
4824.00	H	51.39	46.45	46.45	4.94	54.00	-2.61
4824.00	H	52.89	47.95	47.95	4.94	74.00	-21.11

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Operation Mode : 802.11b Test Date : 03/10/2016 19:27:37
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level		Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
		MHz	dBuV/m	dBuV				
4824.00	H	50.23	45.29	4.94	54.00	-3.77		
4824.00	H	52.12	47.17	4.94	74.00	-21.88		

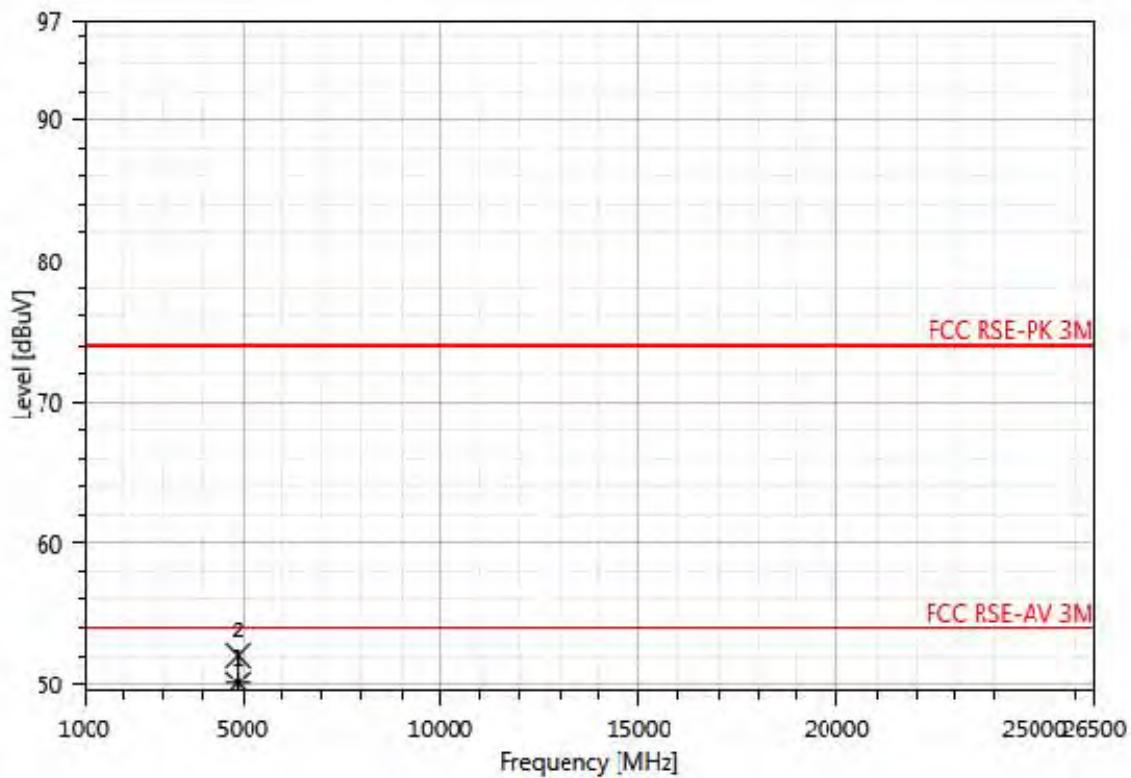
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Operation Mode : 802.11b
 Fundamental Frequency : 2437 MHz
 Operation Band : Tx CH MID
 EUT Pol. : E2 Plane

Test Date : 03/10/2016 19:58:16
 Temp. / Humi. : 21 deg_C / 62 RH
 Test Engineer : Tin
 Measurement Antenna Pol. : VERTICAL



Freq. MHz	Note F/H/E/S	Emission Level		Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
		MHz	dBuV/m	dBuV	dBuV			
4874.00	H	50.07	50.07	44.94	44.94	5.13	54.00	-3.93
4874.00	H	52.04	52.04	46.90	46.90	5.13	74.00	-21.96

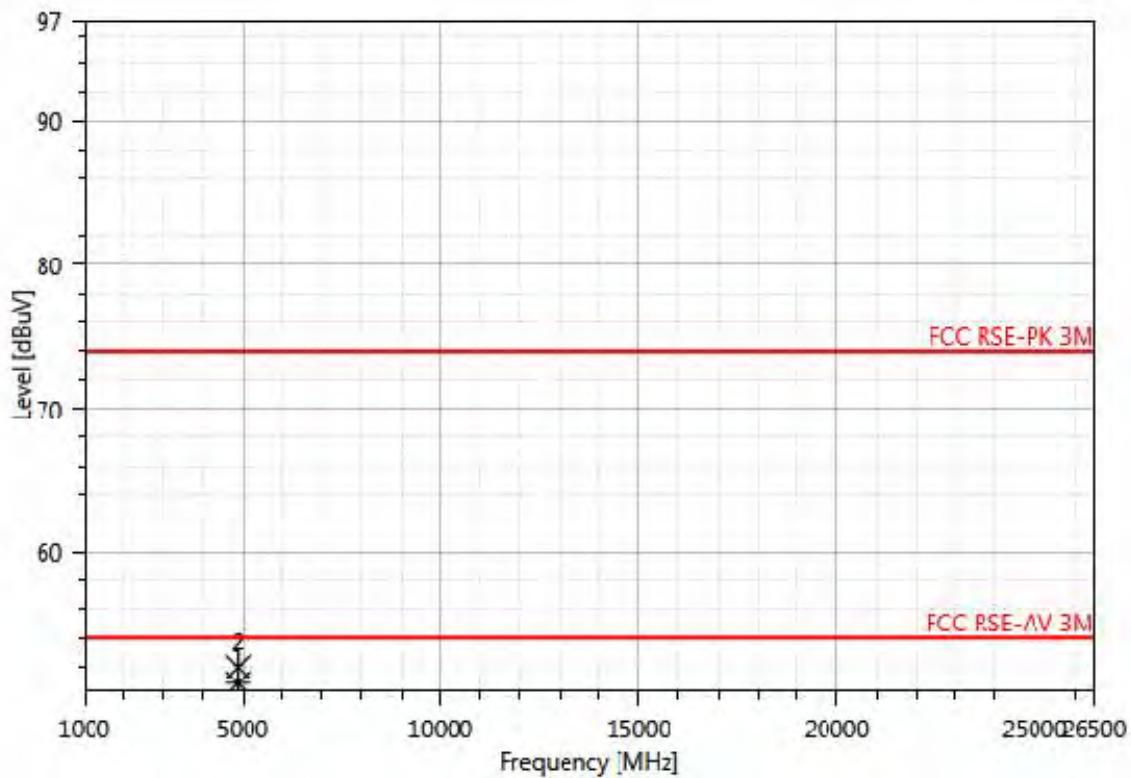
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Operation Mode : 802.11b
Fundamental Frequency : 2437 MHz
Operation Band : Tx CH MID
EUT Pol. : E2 Plane

Test Date : 03/10/2016 20:02:08
Temp. / Humi. : 21 deg_C / 62 RH
Test Engineer : Tin
Measurement Antenna Pol. : HORIZONTAL



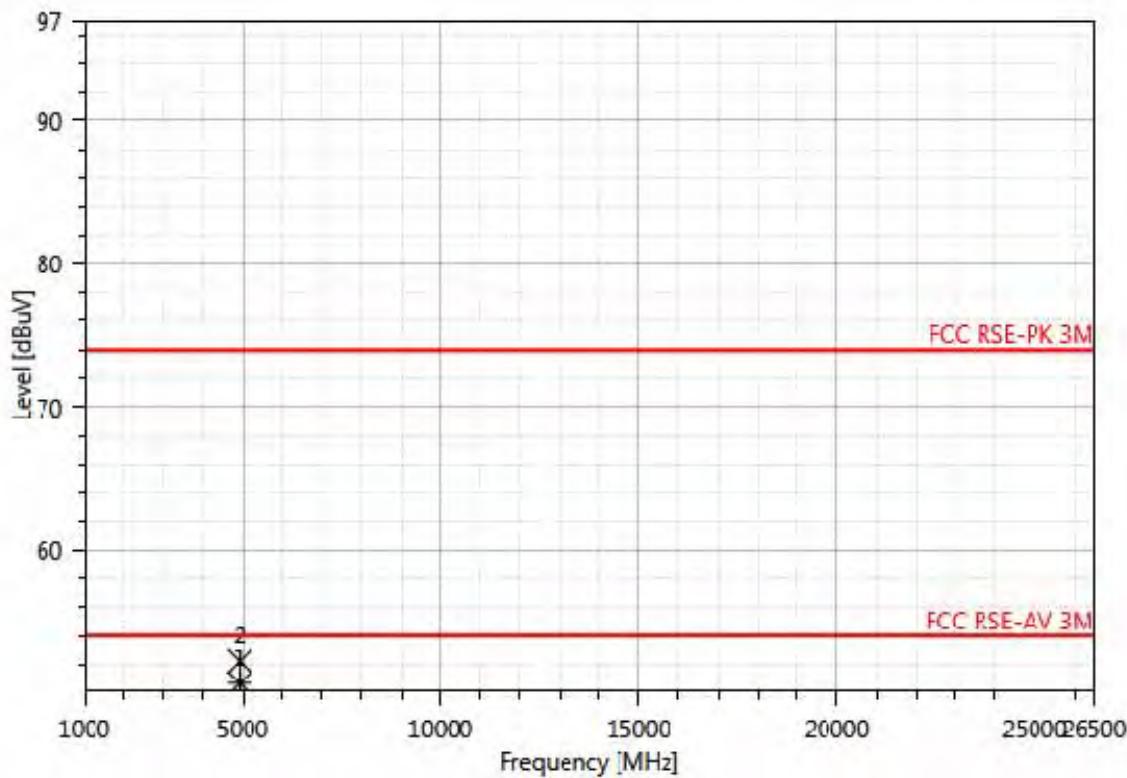
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	50.87	45.73	5.13	54.00	-3.13
4874.00	H	51.99	46.86	5.13	74.00	-22.01

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Operation Mode : 802.11b Test Date : 03/10/2016 20:09:07
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



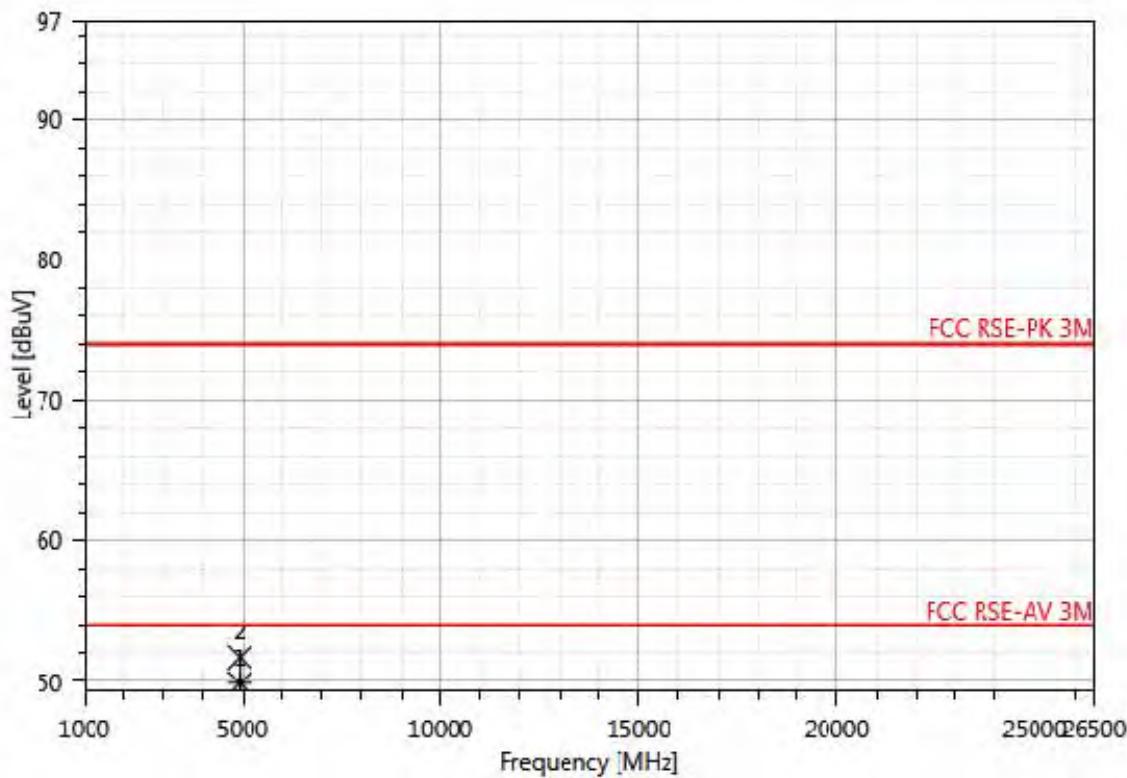
Freq. MHz	Note F/H/E/S	Emission Level		Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
		dBuV/m	dBuV	dBuV	dBuV/m			
4924.00	H	50.70	45.45	5.25	54.00	-3.30		
4924.00	H	52.26	47.01	5.25	74.00	-21.74		

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Operation Mode : 802.11b Test Date : 03/10/2016 20:13:06
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
4924.00	H	49.84	44.59	5.25	54.00	-4.16
4924.00	H	51.68	46.43	5.25	74.00	-22.32

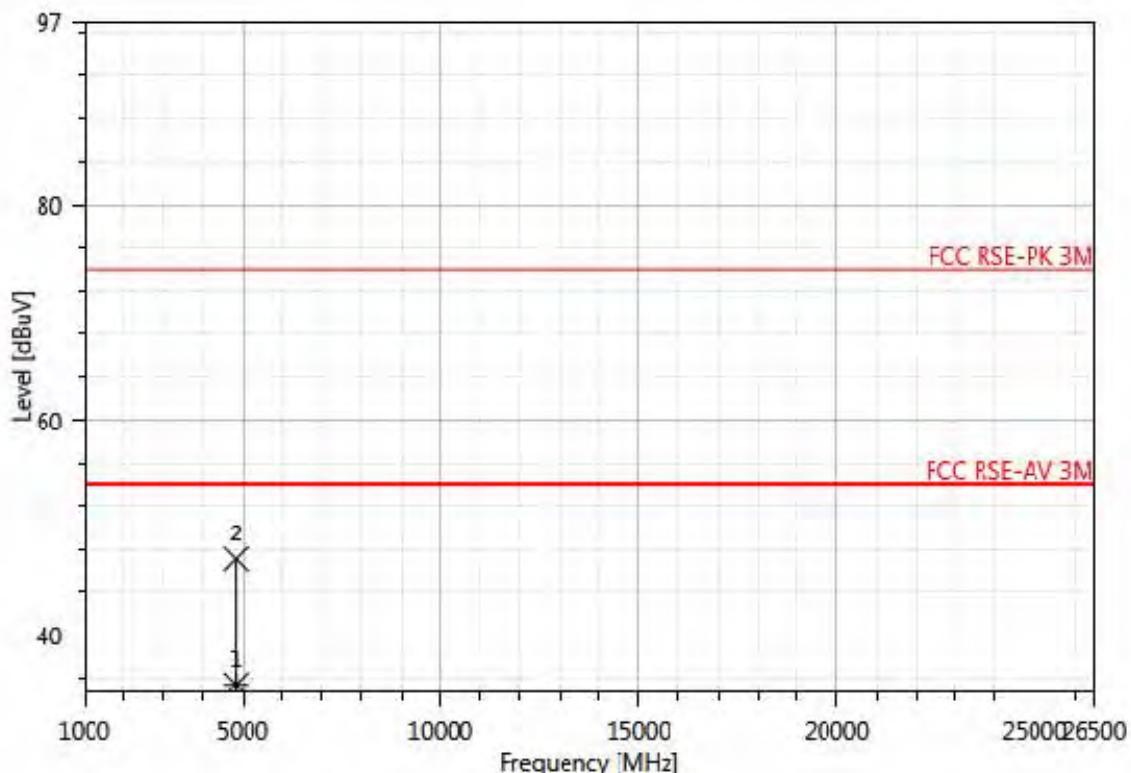
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Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode : 802.11g Test Date : 03/10/2016 20:20:58
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



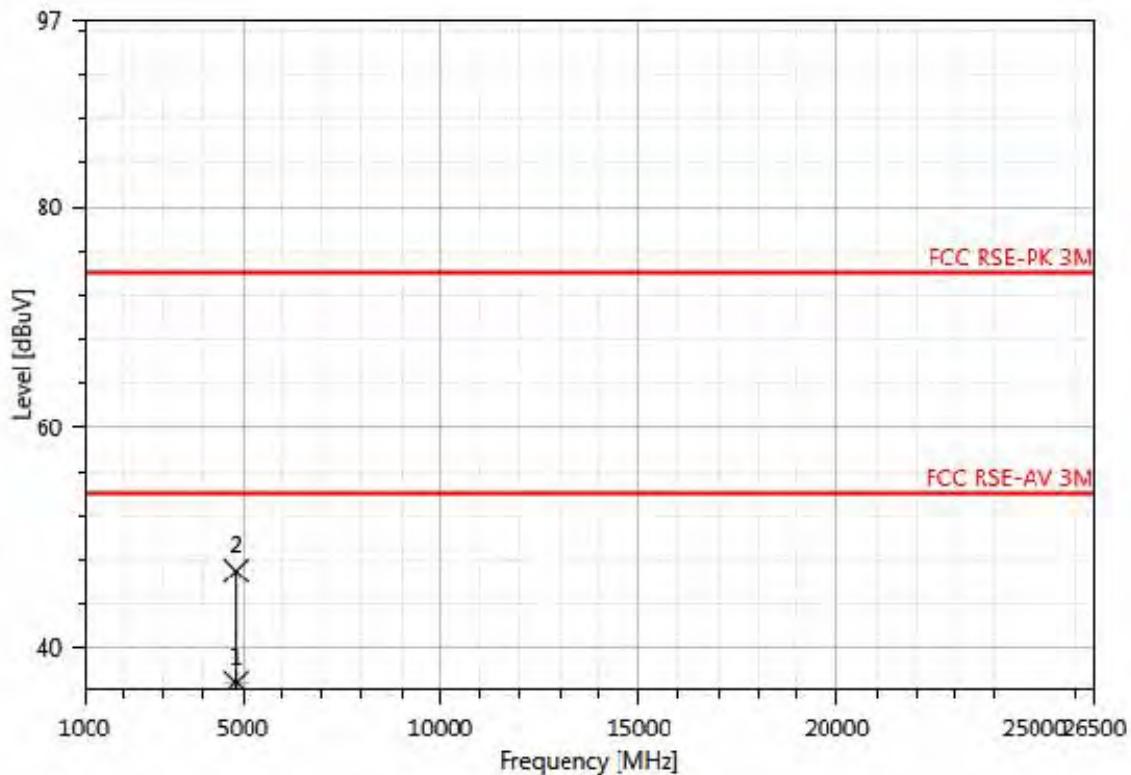
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor dB	Limit @3m dBuV/m			
4824.00	H	35.45	30.51	4.94	54.00	-18.55	
4824.00	H	47.13	42.19	4.94	74.00	-26.87	

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Operation Mode : 802.11g Test Date : 03/10/2016 20:25:04
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



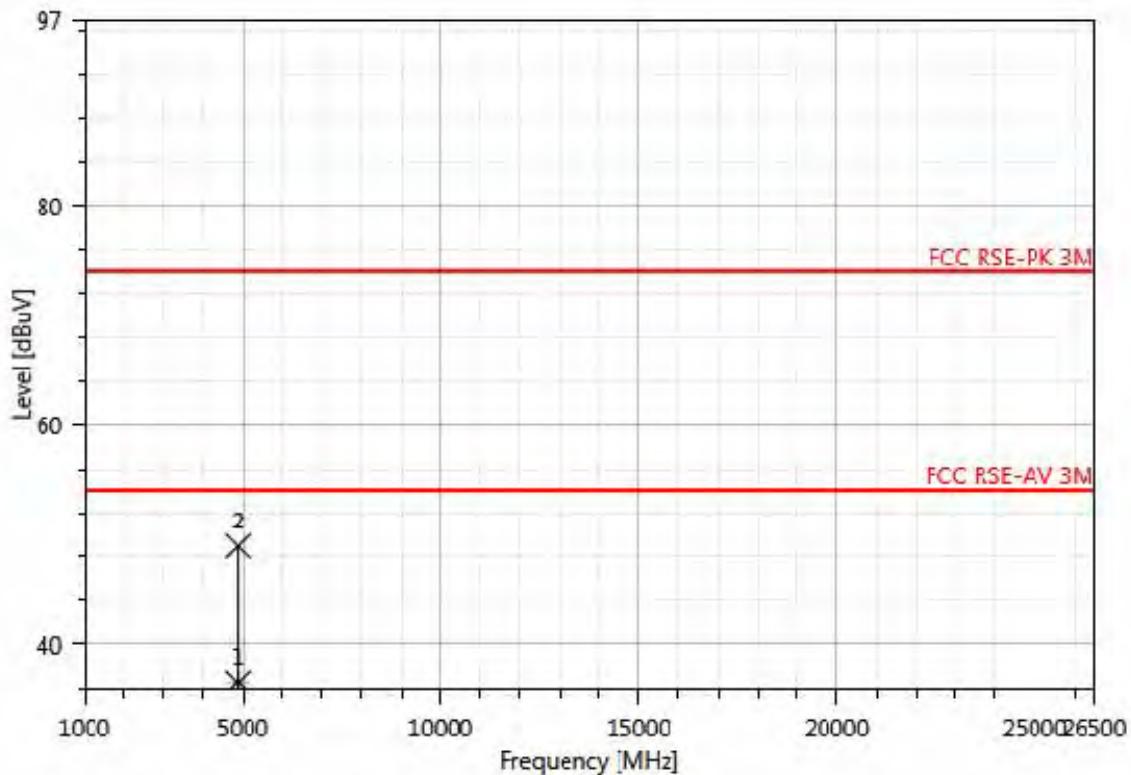
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor dB	Limit @3m dBuV/m			
4824.00	H	36.85	31.91	4.94	54.00	-17.15	
4824.00	H	46.98	42.04	4.94	74.00	-27.02	

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Operation Mode : 802.11g Test Date : 03/10/2016 20:34:43
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH MID Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



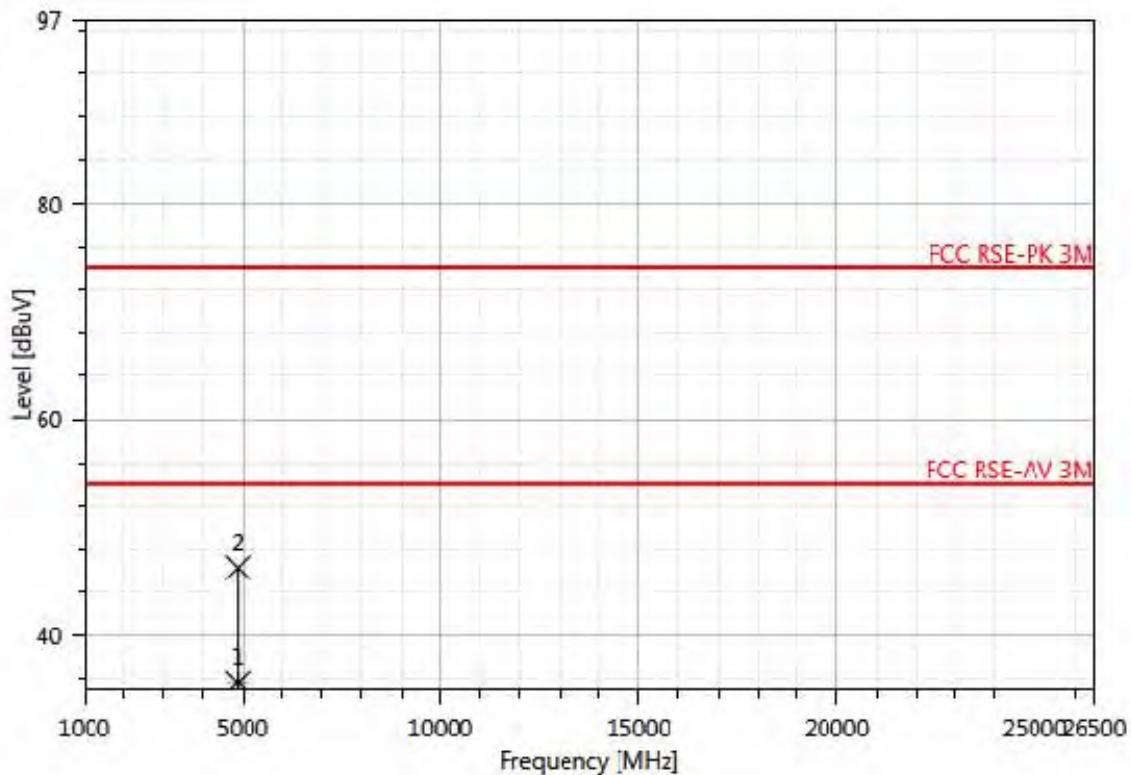
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor dB	Limit @3m dBuV/m			
4874.00	H	36.52	31.39	5.13	54.00	-17.48	
4874.00	H	48.97	43.83	5.13	74.00	-25.03	

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Operation Mode : 802.11g Test Date : 03/10/2016 20:38:13
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH MID Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



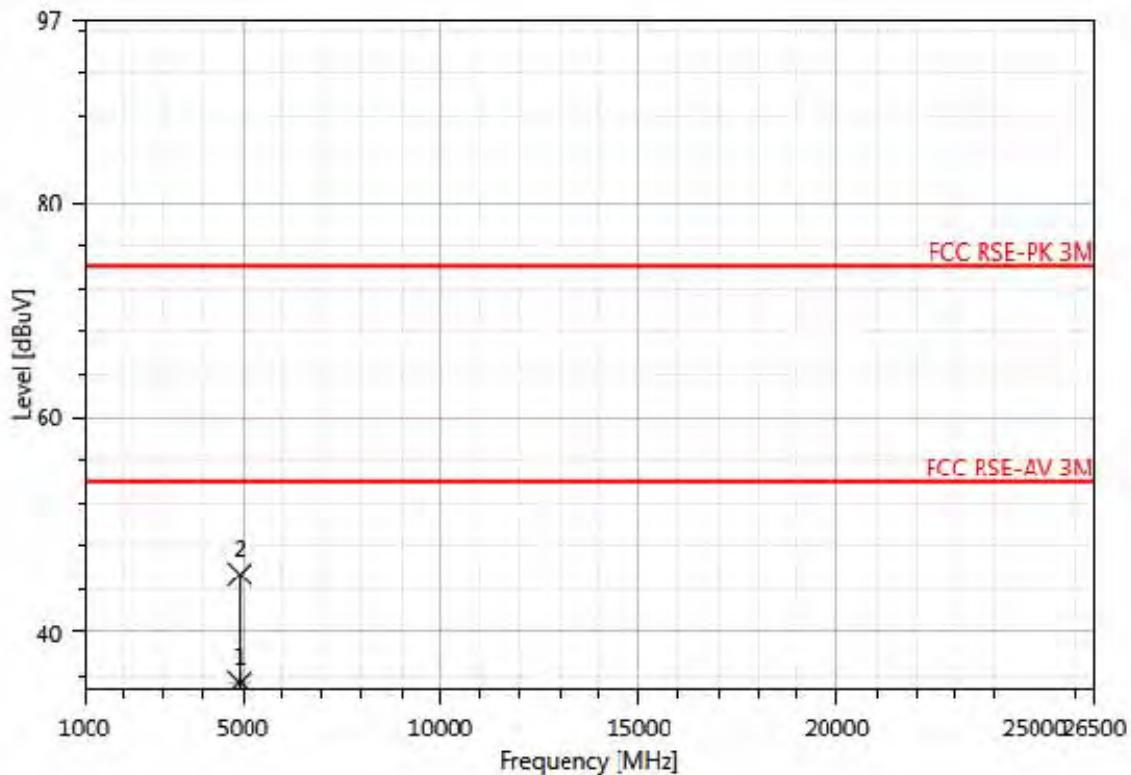
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	35.66	30.53	5.13	54.00	-18.34
4874.00	H	46.30	41.17	5.13	74.00	-27.70

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Operation Mode : 802.11g Test Date : 03/10/2016 20:44:28
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH HIGH Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



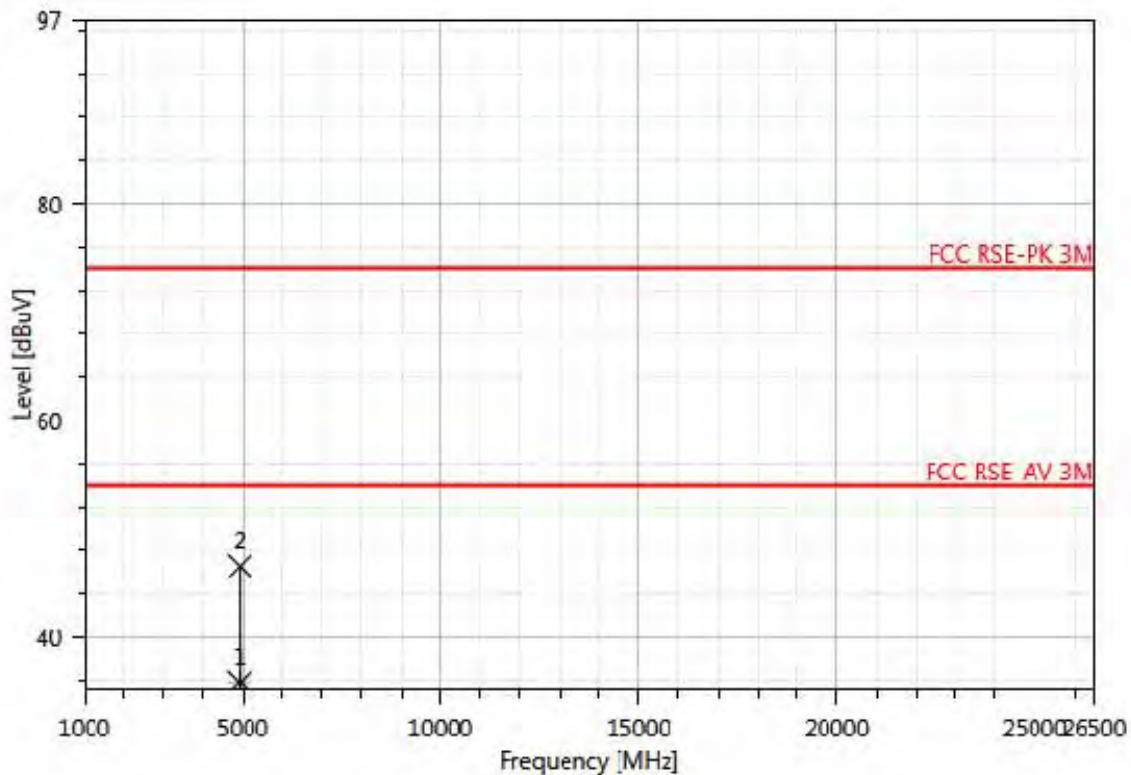
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor dB	Limit @3m dBuV/m			
4924.00	H	35.35	30.10	5.25	54.00	-18.65	
4924.00	H	45.40	40.15	5.25	74.00	-28.60	

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Operation Mode : 802.11g Test Date : 03/10/2016 20:48:52
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Level	Reading			
4924.00	H	35.85	30.60	30.60	5.25	54.00	-18.15
4924.00	H	46.60	41.34	41.34	5.25	74.00	-27.40

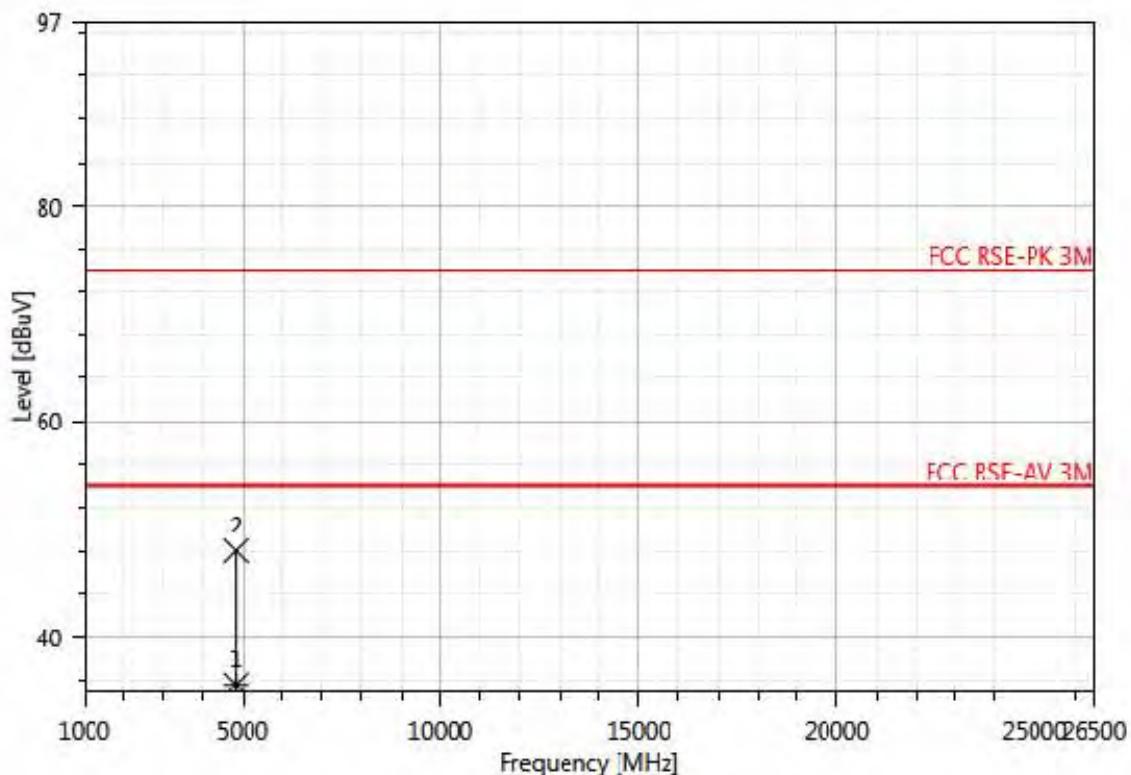
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Radiated Spurious Emission Measurement Result (802.11_HT20)

Operation Mode : 802.11n20 Test Date : 03/10/2016 20:56:23
Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



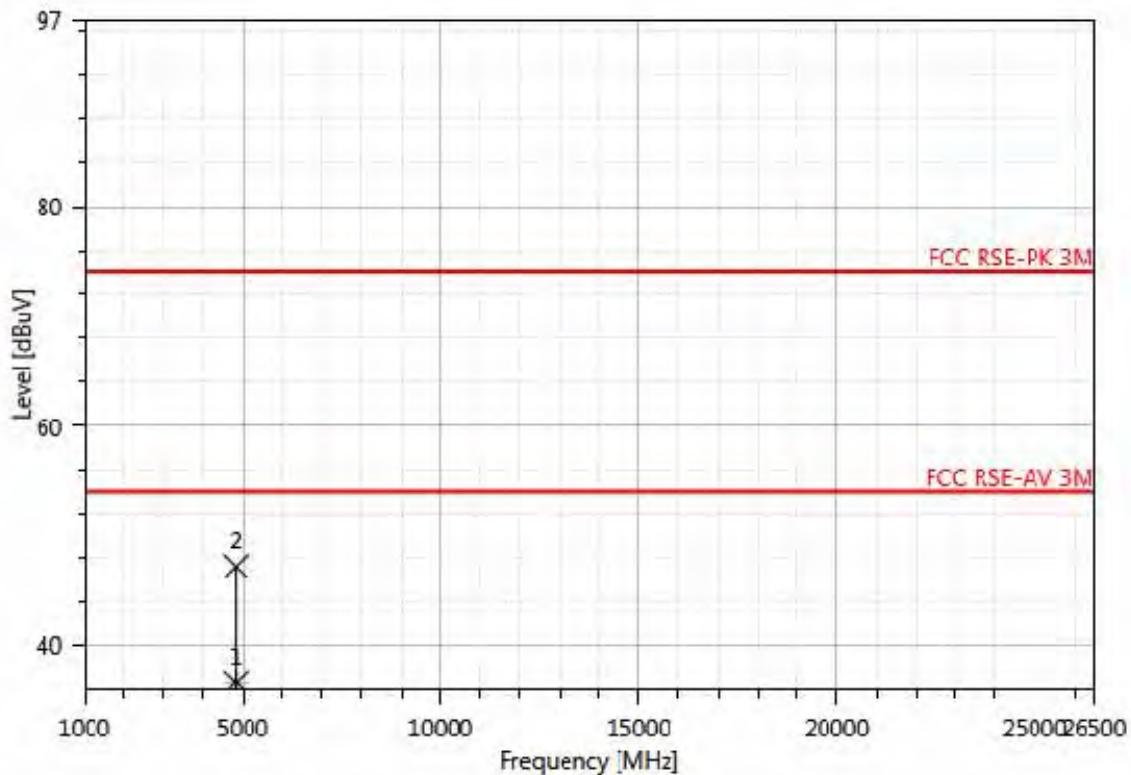
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Reading Level dBuV	Factor dB			
4824.00	H	35.62	30.68	4.94	54.00	-18.38	
4824.00	H	48.00	43.06	4.94	74.00	-26.00	

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Operation Mode : 802.11n20 Test Date : 03/10/2016 20:59:56
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH LOW Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



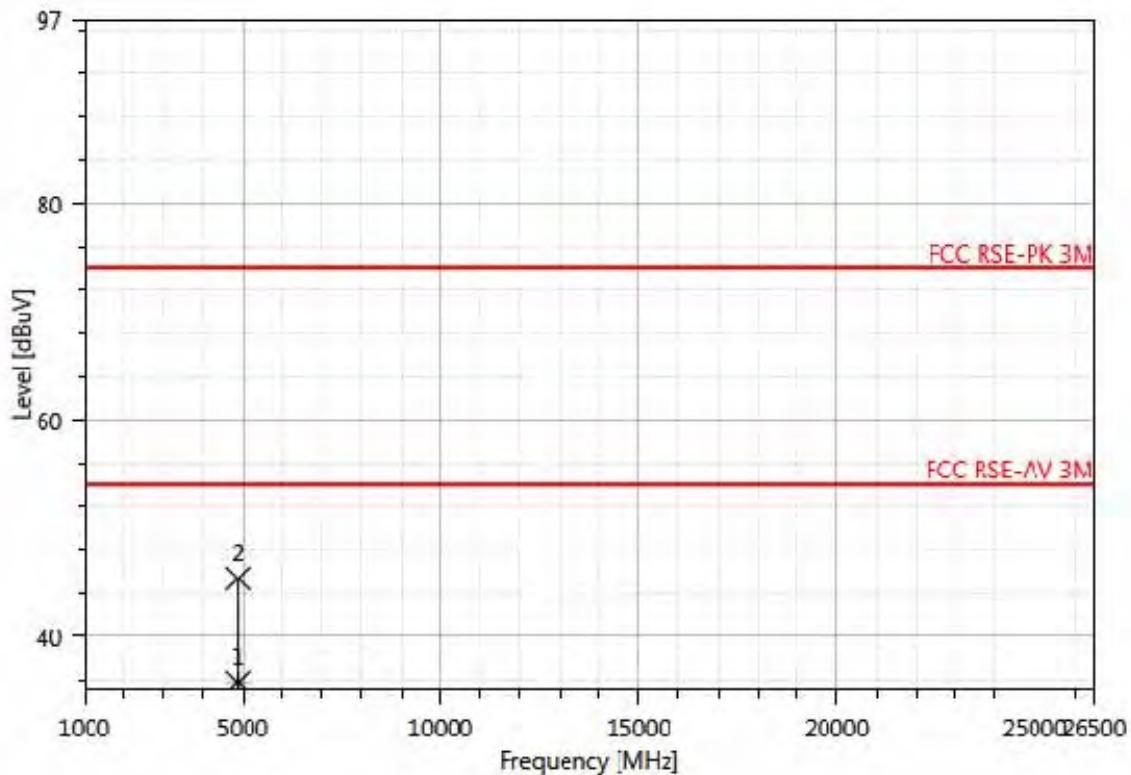
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor dB	Limit @3m dBuV/m			
4824.00	H	36.64	31.70	4.94	54.00	-17.36	
4824.00	H	47.21	42.27	4.94	74.00	-26.79	

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Operation Mode : 802.11n20 Test Date : 03/10/2016 21:06:14
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH MID Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



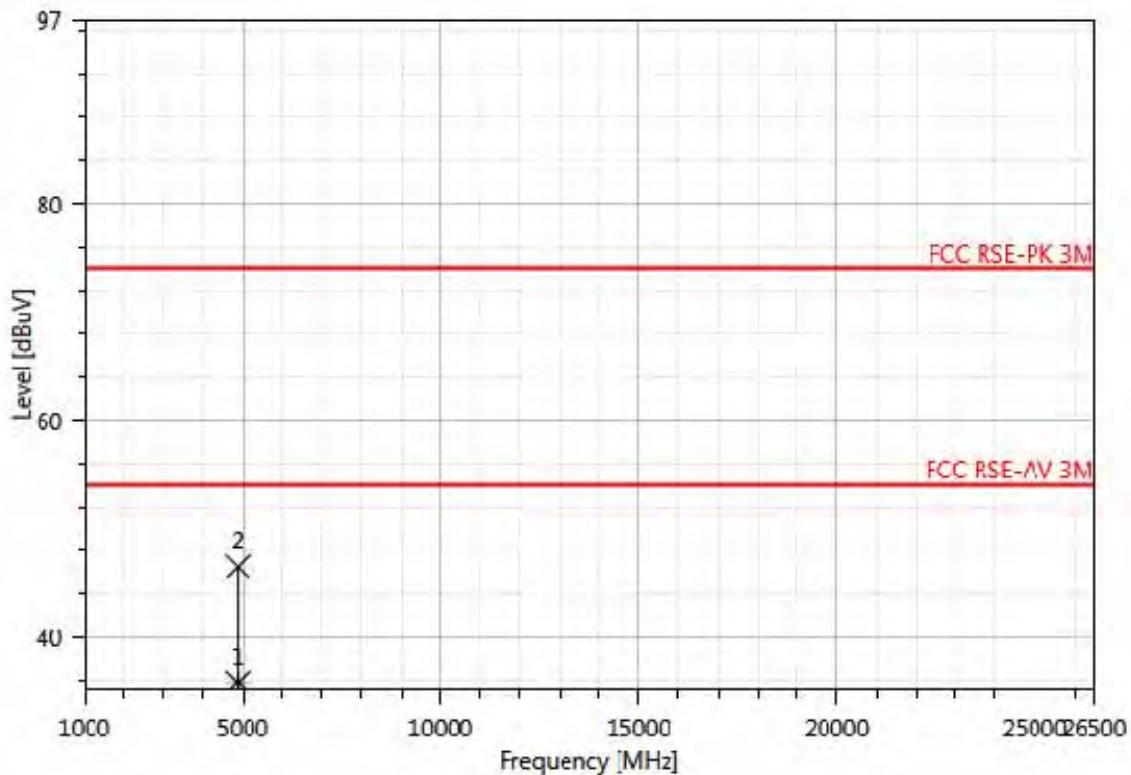
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor dB	Margin dB			
4874.00	H	35.73	30.60	5.13	54.00	-18.27	
4874.00	H	45.34	40.21	5.13	74.00	-28.66	

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Operation Mode : 802.11n20 Test Date : 03/10/2016 21:09:56
Fundamental Frequency : 2437 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH MID Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



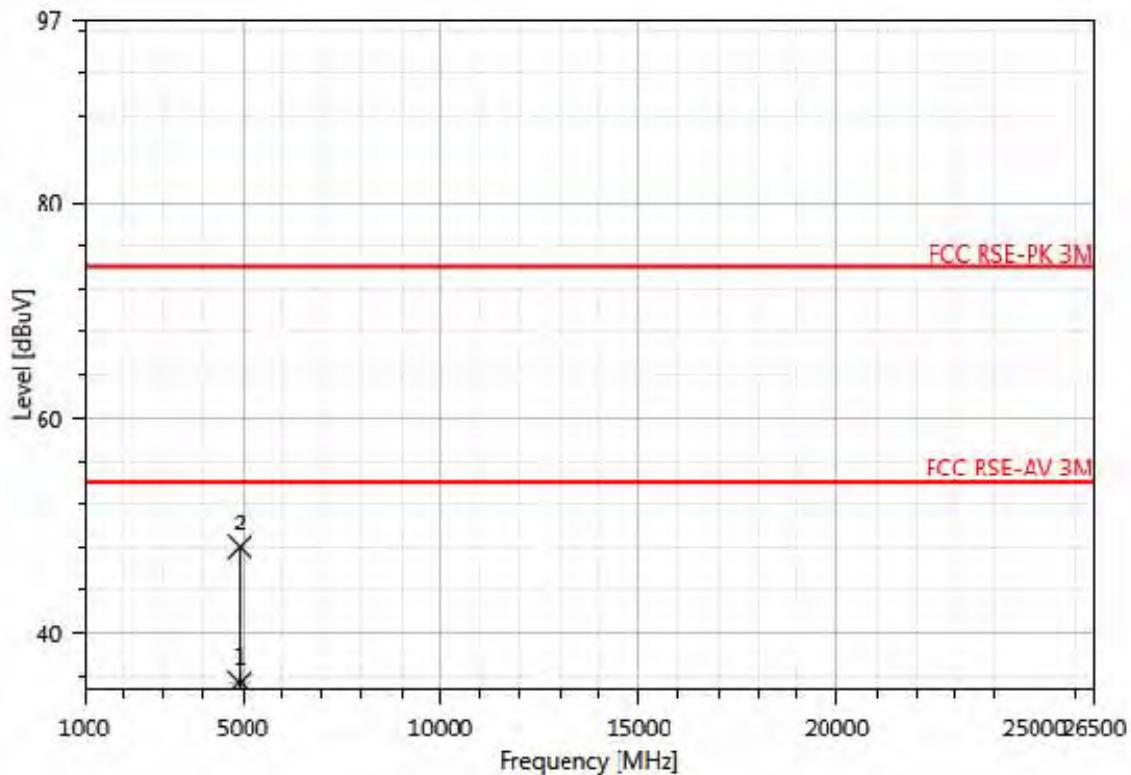
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV	Factor dB	Limit @3m dBuV/m	Margin dB
4874.00	H	35.81	30.68	5.13	54.00	-18.19
4874.00	H	46.53	41.40	5.13	74.00	-27.47

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Operation Mode : 802.11n20 Test Date : 03/10/2016 21:17:02
Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



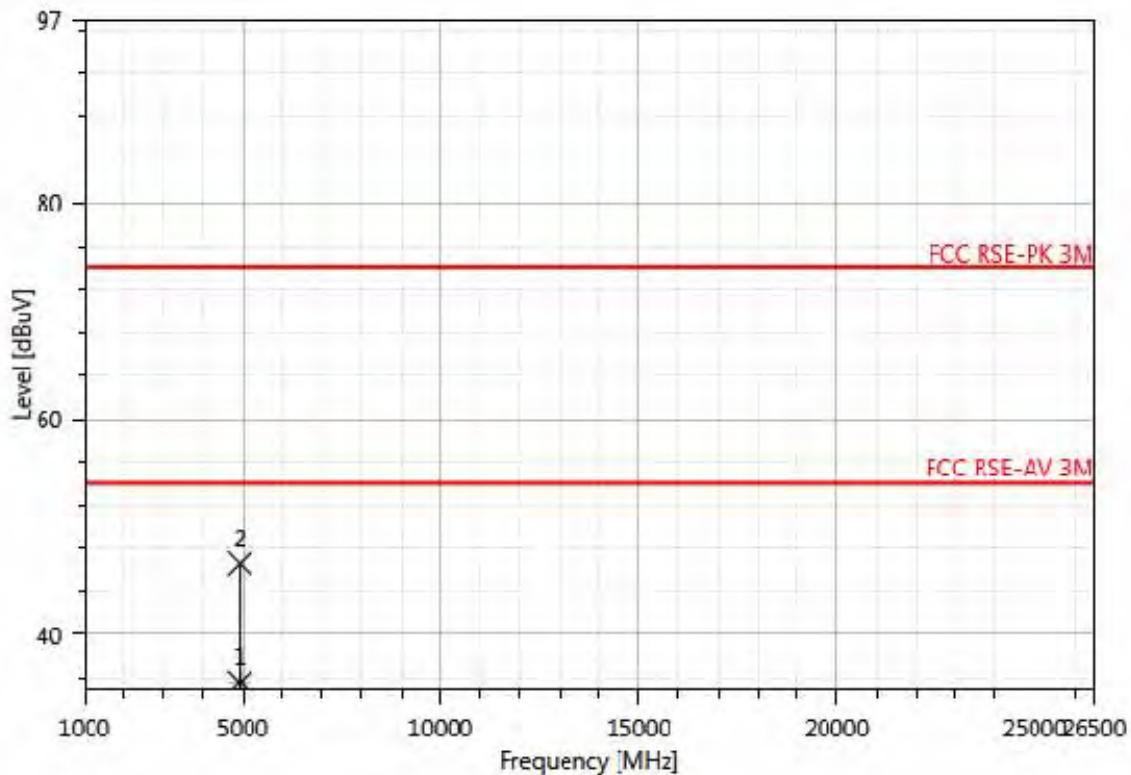
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV	Factor dB	Limit @3m dBuV/m	Margin dB
4924.00	H	35.45	30.20	5.25	54.00	-18.55
4924.00	H	48.02	42.77	5.25	74.00	-25.98

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Operation Mode : 802.11n20 Test Date : 03/10/2016 21:20:47
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH HIGH Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor	Margin			
4924.00	H	35.56	30.31	5.25	54.00	54.00	-18.44
4924.00	H	46.62	41.37	5.25	74.00	74.00	-27.38

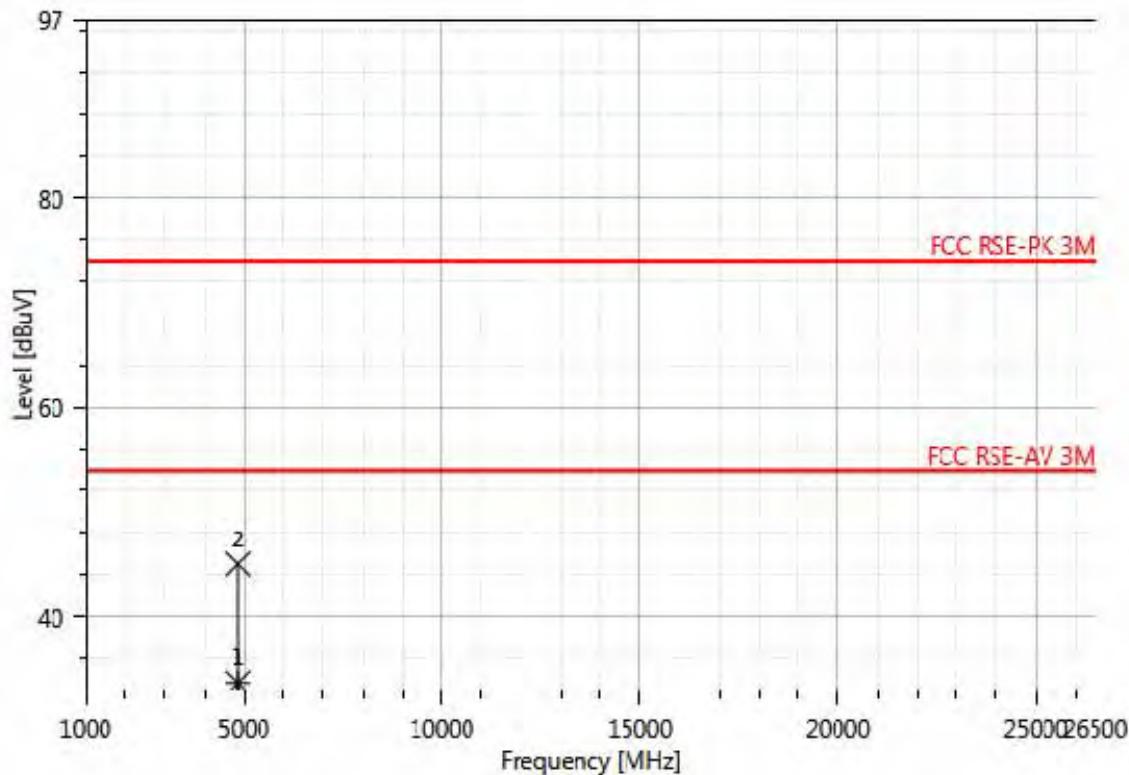
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Radiated Spurious Emission Measurement Result (802.11_HT40)

Operation Mode : 802.11n40 Test Date : 03/10/2016 21:27:19
Fundamental Frequency : 2422 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



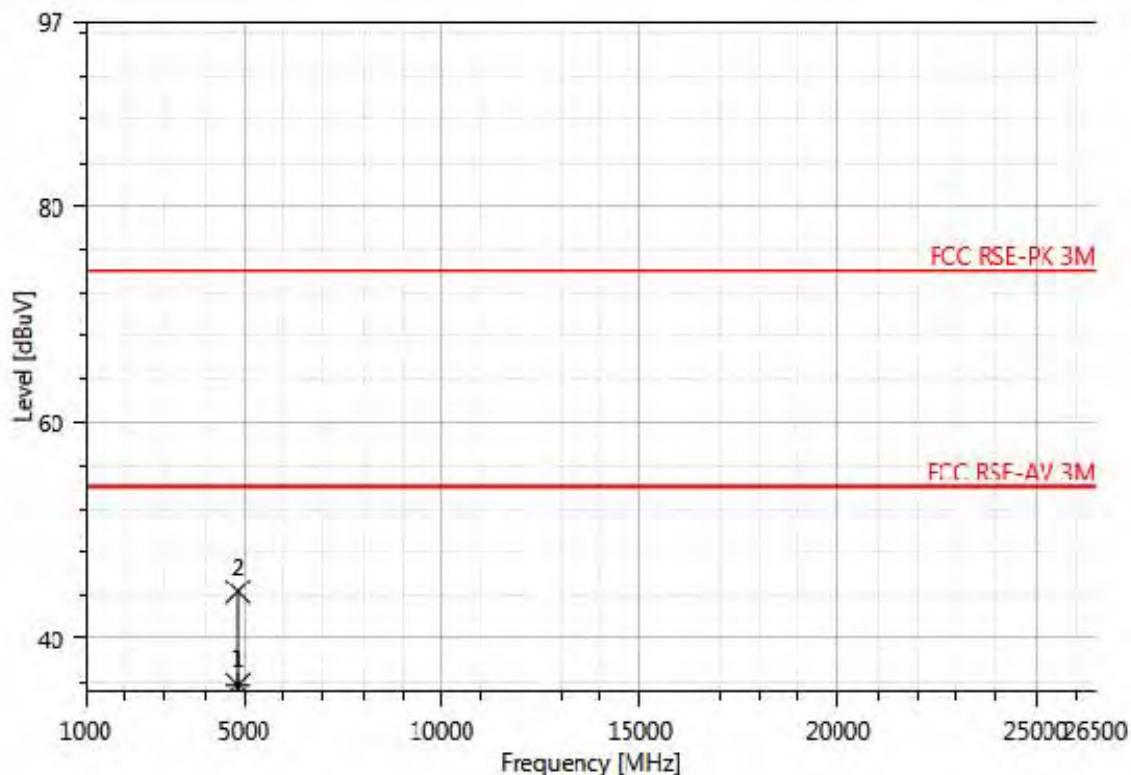
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level		Factor dB	Limit @3m dBuV/m	Margin dB
			Level dBuV	Reading Level dBuV			
4844.00	H	33.67	28.70	4.97	54.00	-20.33	
4844.00	H	45.04	40.07	4.97	74.00	-28.96	

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Operation Mode : 802.11n40 Test Date : 03/10/2016 21:31:18
Fundamental Frequency : 2422 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH LOW Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
4844.00	H	35.77	30.80	4.97	54.00	-18.23
4844.00	H	44.34	39.37	4.97	74.00	-29.66

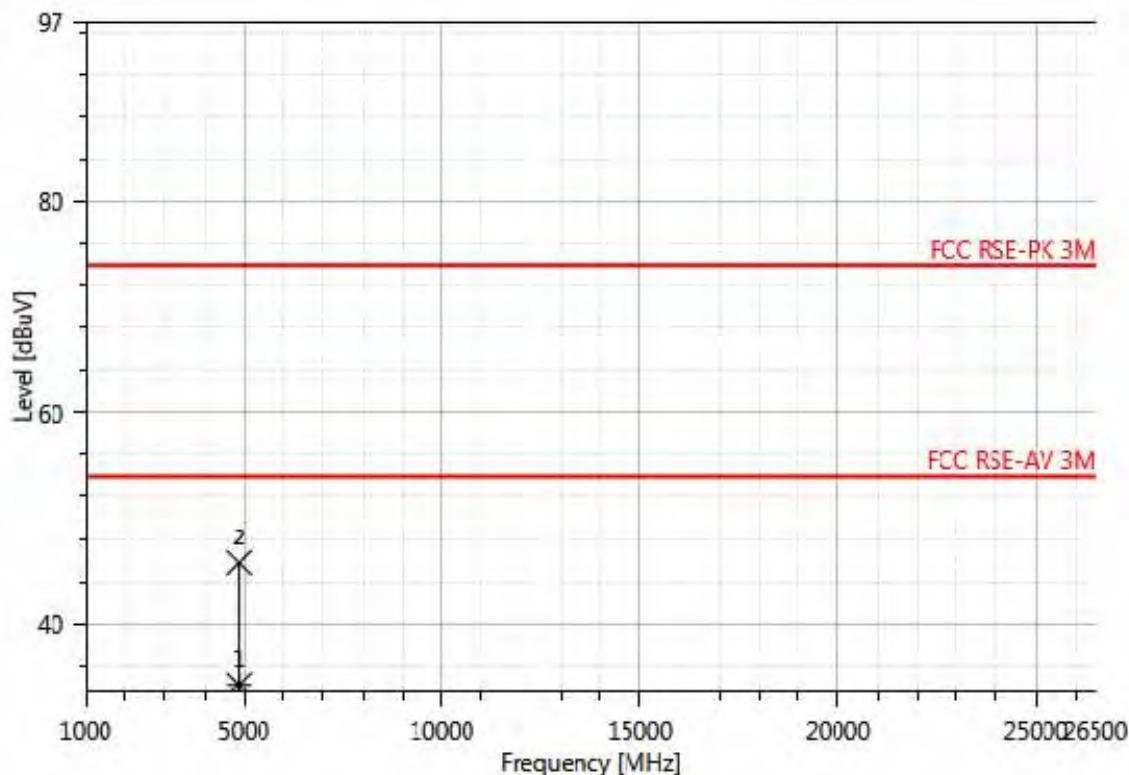
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Operation Mode : 802.11n40
Fundamental Frequency : 2437 MHz
Operation Band : Tx CH MID
EUT Pol. : E2 Plane

Test Date : 03/10/2016 21:37:27
Temp. / Humi. : 21 deg_C / 62 RH
Test Engineer : Tin
Measurement Antenna Pol. : VERTICAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Level	Reading Level			
4874.00	H	34.20	29.07	5.13	54.00	-19.80	
4874.00	H	45.77	40.64	5.13	74.00	-28.23	

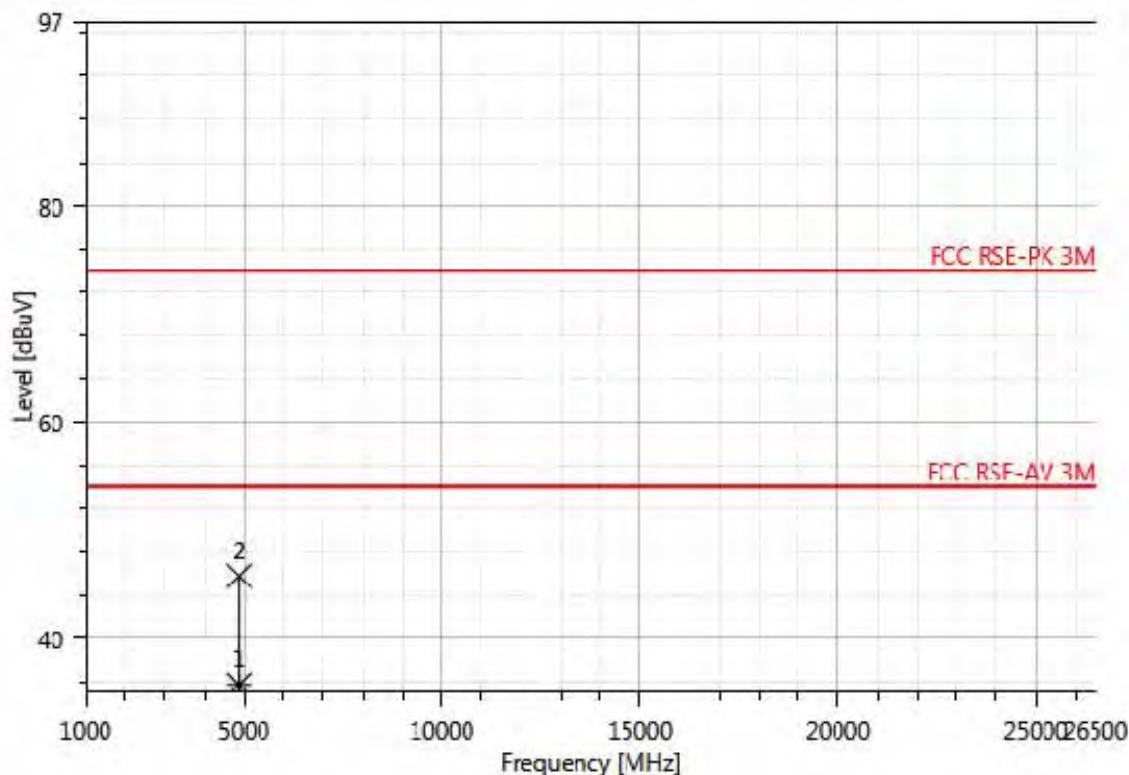
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Operation Mode : 802.11n40
Fundamental Frequency : 2437 MHz
Operation Band : Tx CH MID
EUT Pol. : E2 Plane

Test Date : 03/10/2016 21:41:48
Temp. / Humi. : 21 deg_C / 62 RH
Test Engineer : Tin
Measurement Antenna Pol. : HORIZONTAL



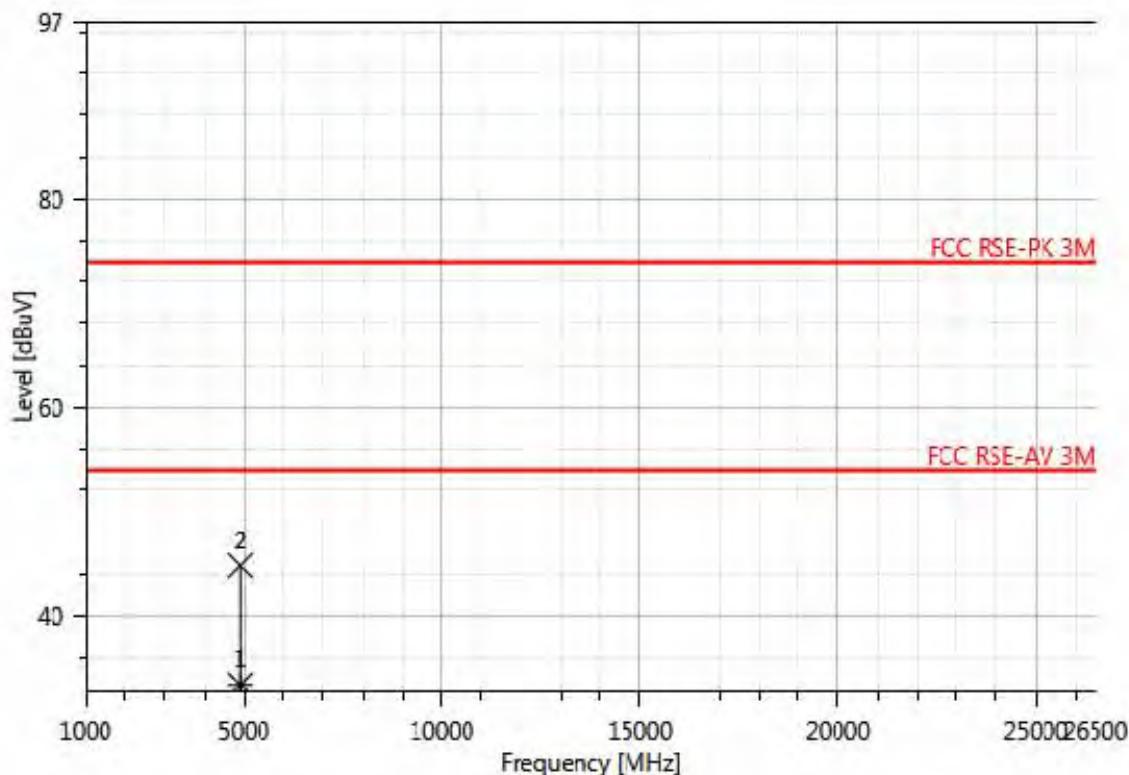
Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor	Limit			
4874.00	H	35.73	30.60	5.13	54.00	54.00	-18.27
4874.00	H	45.79	40.66	5.13	74.00	74.00	-28.21

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Operation Mode : 802.11n40 Test Date : 03/10/2016 21:48:39
Fundamental Frequency : 2452 MHz Temp. / Humi. : 21 deg_C / 62 RH
Operation Band : Tx CH HIGH Test Engineer : Tin
EUT Pol. : E2 Plane Measurement Antenna Pol. : VERTICAL



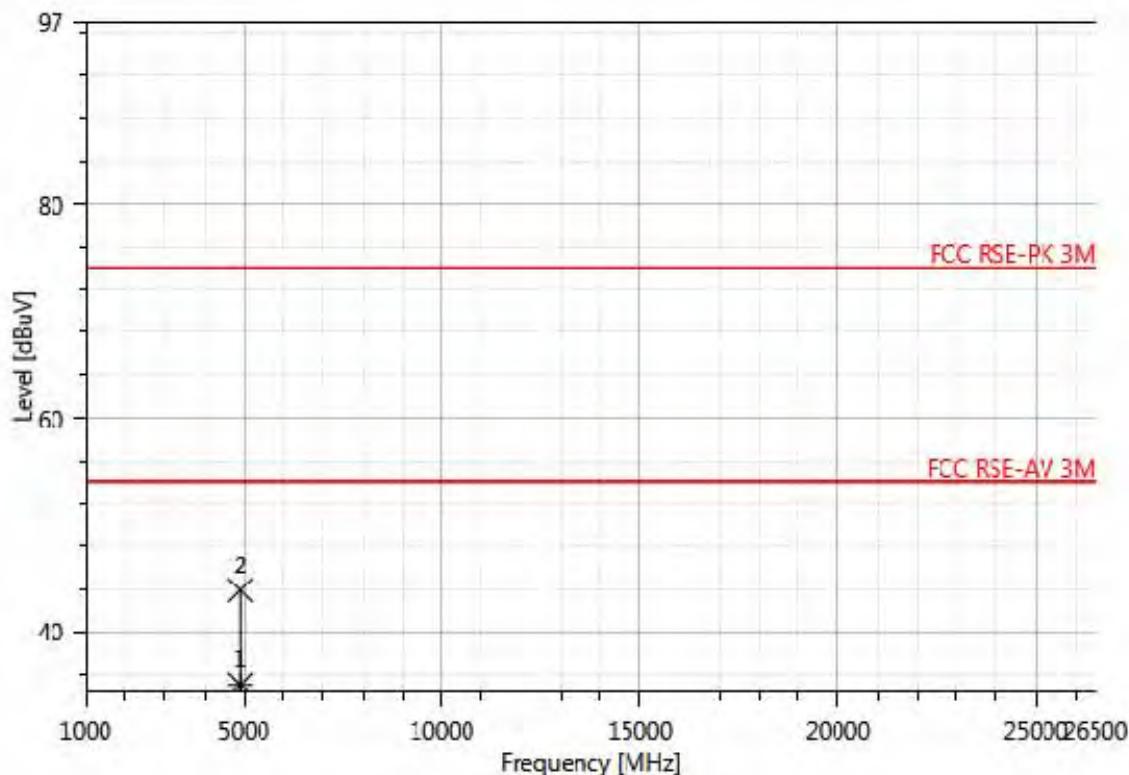
Freq. MHz	Note F/H/E/S	Emission Level	Spectrum Reading Level	Factor	Limit @3m	Margin
		dBuV/m	dBuV	dB	dBuV/m	dB
4904.00	H	33.38	28.15	5.23	54.00	-20.62
4904.00	H	44.83	39.60	5.23	74.00	-29.17

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Operation Mode : 802.11n40 Test Date : 03/10/2016 21:52:27
 Fundamental Frequency : 2452 MHz Temp. / Humi. : 21 deg_C / 62 RH
 Operation Band : Tx CH HIGH Test Engineer : Tin
 EUT Pol. : E2 Plane Measurement Antenna Pol. : HORIZONTAL



Freq. MHz	Note F/H/E/S	Emission Level dBuV/m	Spectrum Reading Level dBuV		Factor dB	Limit @3m dBuV/m	Margin dB
			Factor	Limit			
4904.00	H	35.10	29.87	5.23	54.00	-18.90	
4904.00	H	43.92	38.69	5.23	74.00	-30.08	

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12 PEAK POWER SPECTRAL DENSITY

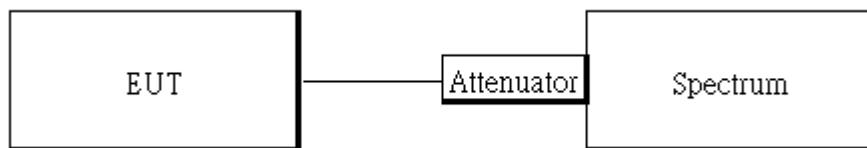
12.1 Standard Applicable

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

12.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY50420195	12/21/2015	12/20/2016
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2016	01/01/2017
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2016	01/01/2017

12.3 Test Set-up



12.4 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas.
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.

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12.5 Measurement Result

POWER DENSITY 802.11b MODE			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2412	-6.33	8	PASS
2437	-5.29	8	PASS
2462	-6.17	8	PASS

POWER DENSITY 802.11g MODE			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2412	-14.02	8	PASS
2437	-9.31	8	PASS
2462	-16.63	8	PASS

POWER DENSITY 802.11n HT20 MODE			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2412	-13.66	8	PASS
2437	-9.08	8	PASS
2462	-15.71	8	PASS

POWER DENSITY 802.11n HT40 MODE			
Frequency (MHz)	RF Power Density (dBm)	Maximum Limit (dBm)	Result
2422	-20.29	8	PASS
2437	-11.73	8	PASS
2452	-20.54	8	PASS

*Refer to next page for plots

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802.11b

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



802.11g

Power Spectral Density Test Plot (CH-Low)



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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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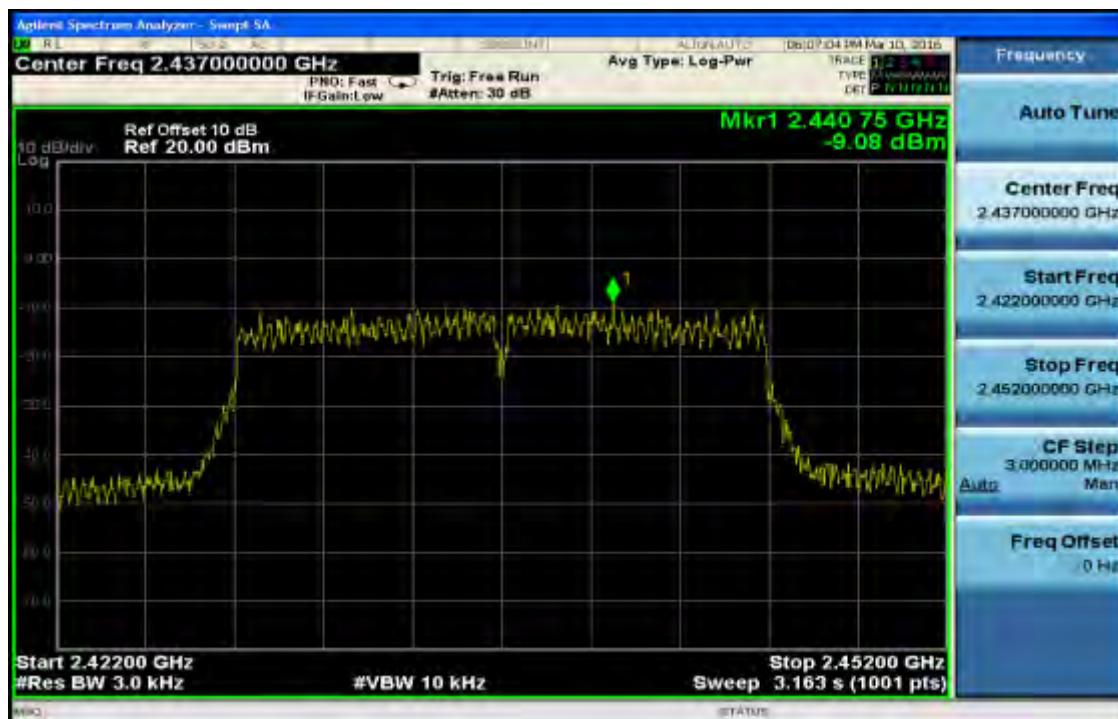
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802.11n_HT20

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



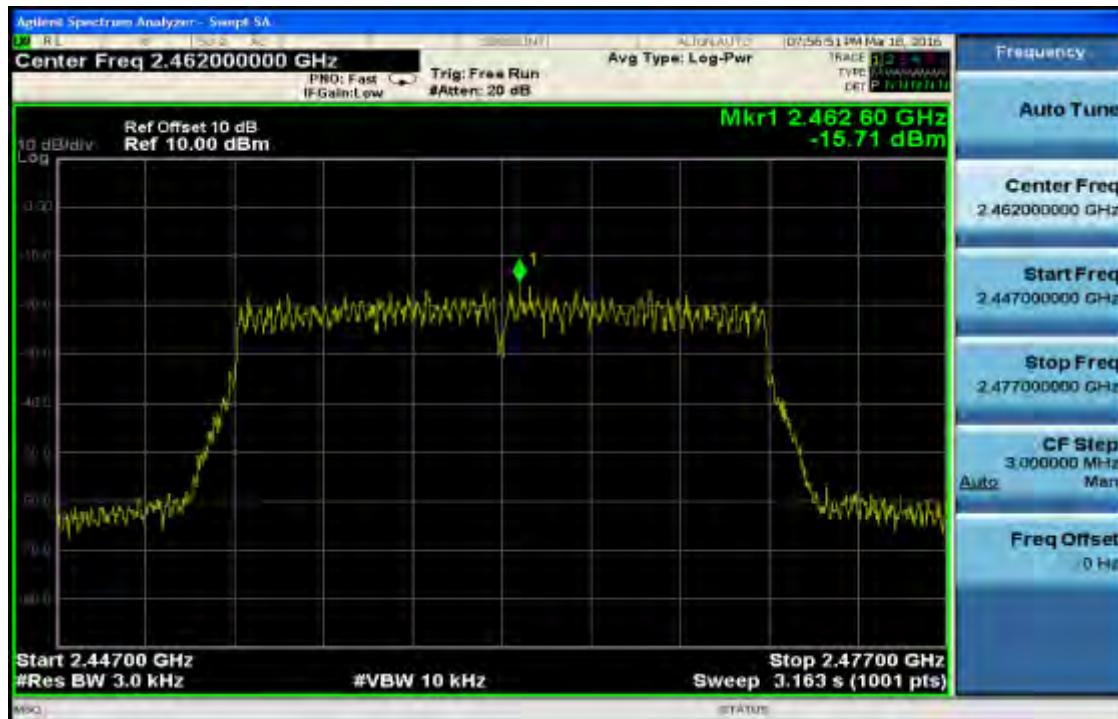
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Power Spectral Density Test Plot (CH-High)



802.11n_HT40

Power Spectral Density Test Plot (CH-Low)



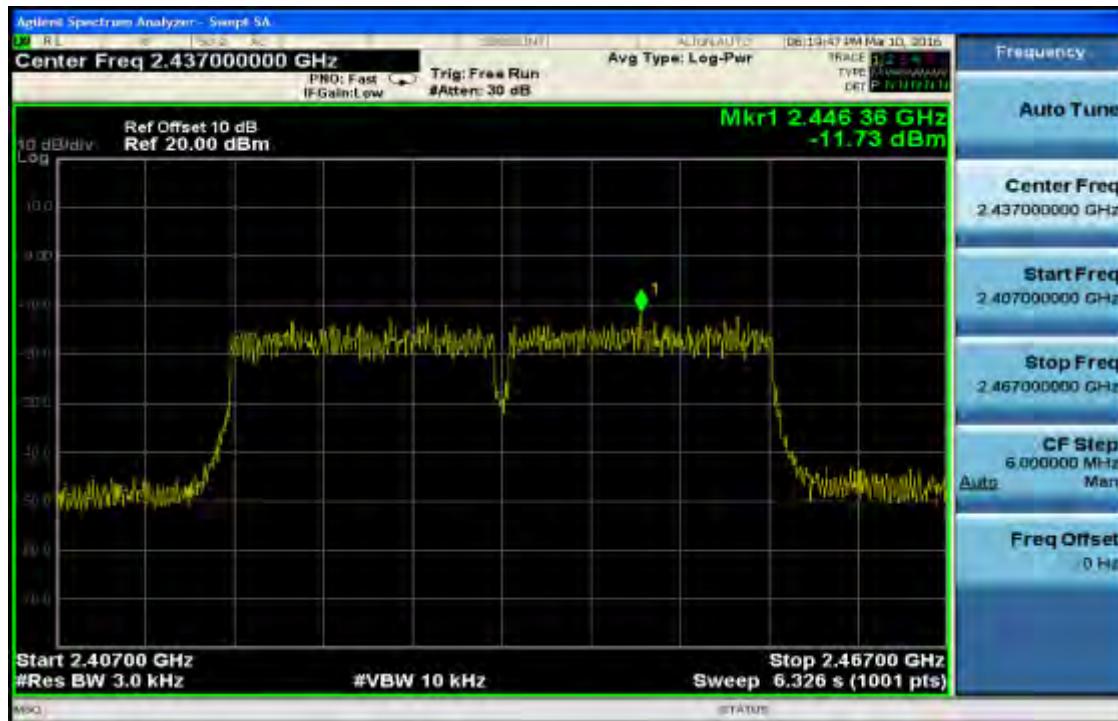
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Power Spectral Density Test Plot (CH-Mid)



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

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

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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 (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (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 ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

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14.2 Maximum Permissible Exposure (MPE) Evaluation

MPE Prediction (802.11b 2412~2462)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Average output power at antenna input terminal:	15.83	(dBm)
Average output power at antenna input terminal:	38.282474	(mW)
Duty cycle:	99.99	(%)
Maximum Pav :	38.278646	(mW)
Peak Antenna gain (Maximum):	2	(dBi)
Peak Antenna gain (linear):	1.5848932	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2462	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.012	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.012 mW/cm².

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

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14.3 Maximum Permissible Exposure (MPE) Evaluation

MPE Prediction (802.11g 2412~2462)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Average output power at antenna input terminal:	15.73	(dBm)
Average output power at antenna input terminal:	37.411059	(mW)
Duty cycle:	97.88	(%)
Maximum Pav :	36.617944	(mW)
Peak Antenna gain (Maximum):	2	(dBi)
Peak Antenna gain (linear):	1.5848932	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.012	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.012 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 2437MHz.

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14.4 Maximum Permissible Exposure (MPE) Evaluation

MPE Prediction (802.11n20 2412~2462)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Average output power at antenna input terminal:	15.63	(dBm)
Average output power at antenna input terminal:	36.559479	(mW)
Duty cycle:	97.66	(%)
Maximum Pav :	35.703987	(mW)
Peak Antenna gain (Maximum):	2	(dBi)
Peak Antenna gain (linear):	1.5848932	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.011	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.011 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 2437MHz.

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14.5 Maximum Permissible Exposure (MPE) Evaluation

MPE Prediction (802.11n40 2422~2452)

Prediction of MPE limit at a given distance

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

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

Where: S = Power density

P = Power input to antenna

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

R = Distance to the center of radiation of the antenna

Average output power at antenna input terminal:	15.51	(dBm)
Average output power at antenna input terminal:	35.563132	(mW)
Duty cycle:	94.96	(%)
Maximum Pav :	33.77075	(mW)
Peak Antenna gain (Maximum):	2	(dBi)
Peak Antenna gain (linear):	1.5848932	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.011	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.011 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 2437MHz.

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PHOTOGRAPHS OF SET UP**Radiated Emission Set up Photos (Below 1GHz)**

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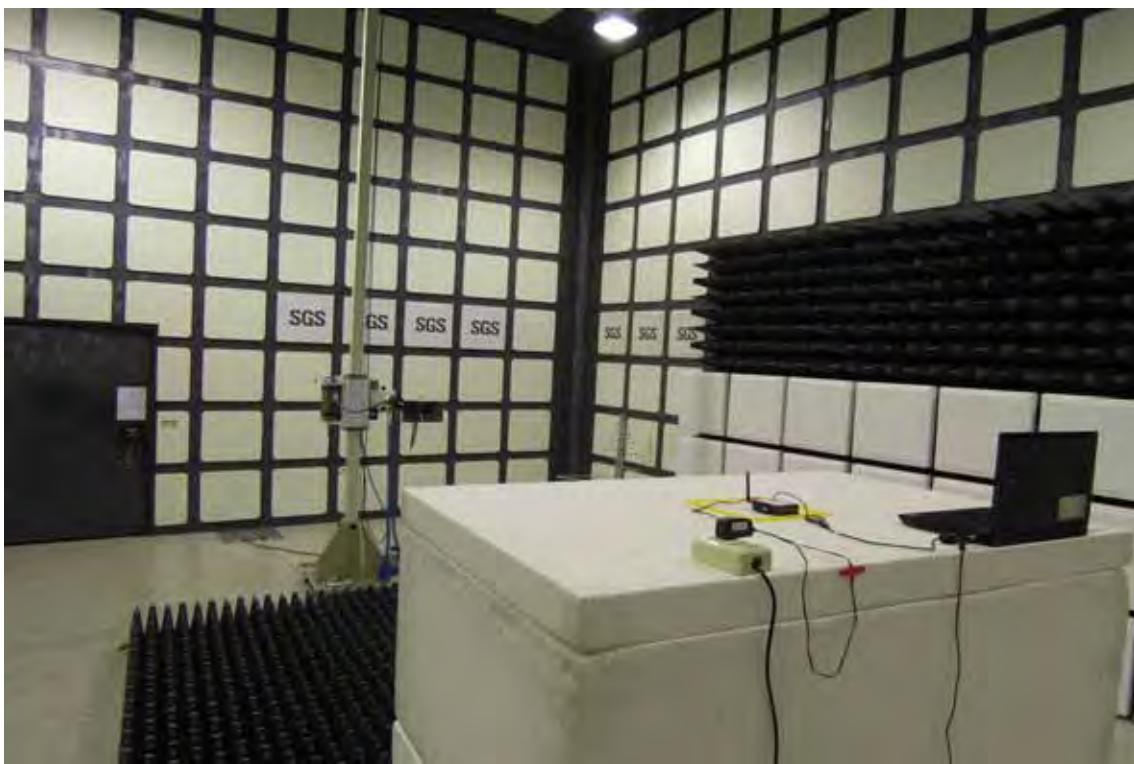
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Radiated Emission Set up Photos (Above 1GHz)

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Conduction Setup Photo (AC power line)

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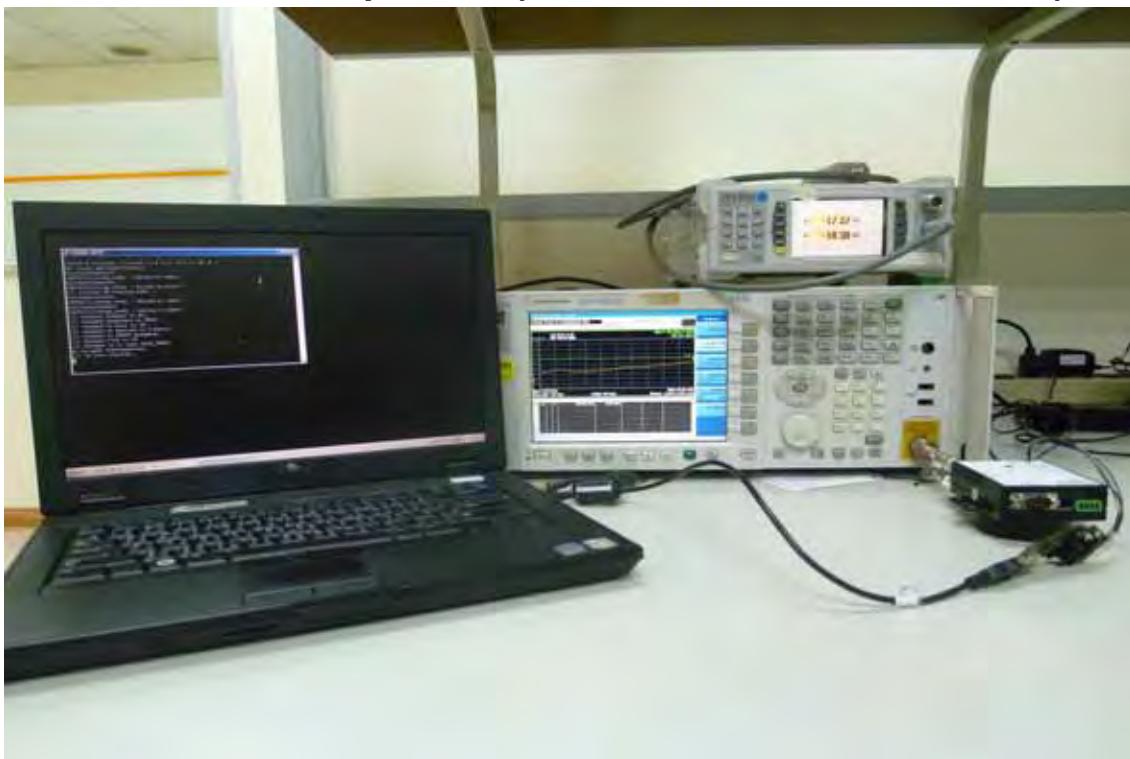
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Conducted Setup Photo (Measurement at Antenna Port)**PHOTOGRAPHS OF EUT**

Please refer to the attached file(EUT Photo)

~ End of Report ~

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