



ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

Product Name: Diagnostic Ultrasound System

Brand Name: Qisda

9896054**** (* may be 0-9 or a-z or blank)/ Model No.:

Innosiaht

Model Difference: Marketed with different accessories.

FCC ID: VRSAPOLLO

Report No.: E2/2016/C0009

Issue Date: Dec. 23, 2016

FCC Rule Part: §15.247, Cat: DTS

Prepared for: QISDA CORPORATION

> NO.157, SHAN-YING ROAD, SHAN-TING LI, **GUEISHAN DIST., TAOYUAN CITY, Taiwan,**

R.O.C

Prepared by: SGS Taiwan Ltd.

Electronics & Communication Laboratory

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City, Taiwan 333





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VERIFICATION OF COMPLIANCE

Applicant: QISDA CORPORATION

NO.157, SHAN-YING ROAD, SHAN-TING LI, GUEISHAN DIST.,

TAOYUAN CITY, Taiwan, R.O.C

Product Name: Diagnostic Ultrasound System

Brand Name: Qisda

Model No.: 9896054***** (* may be 0-9 or a-z or blank)/ Innosight

Model Difference: Marketed with different accessories.

FCC ID: VRSAPOLLO

Report Number: E2/2016/C0009

Date of test: Dec. 07, 2016 ~ Dec. 12, 2016

Date of EUT Received: Apr. 08, 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:	Jerry Lu	Date:	Dec. 23, 2016
_	Jerry Lu / Sr. Engineer	· •	
Prepared By:	Allen Isai	Date:	Dec. 23, 2016
Approved By:	Allen Tsai / Engineer	Date:	Dec. 23, 2016
_	Jim Chang / Asst. Manager		

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Revision History

Report Number	Revision	Description	Issue Date
E2/2016/C0009	Rev.00	Initial creation of document	Dec. 23, 2016

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GENERAL INFORMATION

1.1 Product description

General:

general.	-			
Product Name:	Diagnostic Ultrasound System			
Brand Name:	Qisda			
Model No.:	9896054**	9896054***** (* may be 0-9 or a-z or blank)/ Innosight		
Model Difference:	Marketed v	with different accessories.		
Software version:	N/A			
Hardware version:	N/A			
Transducer:	 Model No.: TL117-160114004, Supplier: N/A Model No.: TP108-160114004, Supplier: N/A Model No.: TE080-160114004, Supplier: N/A Model No.: TC155-160114004, Supplier: N/A 			
	10.8Vdc fr	10.8Vdc from rechargeable battery or 19Vdc from AC/DC adapter		
Power Supply:	Battery:	Model No.: N/A; Supplier: T-GEE Electronic Co., Ltd.		
,	Adapter:	Model No.: EXM 80 5120-01 Supplier: power box		

WI AN 2.4GHz:

L/11 2.+G/12.				
Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11 b: 20.94dBm g: 22.14dBm		DSSS, OFDM
11n	HT20 2412-2462	11	HT20:22.29dBm	OFDM
Antenna Designation:		PIFA Antenna, Peak Gain:-0.77dBi		
Modulation type:		·	PSK, DBPSK for DSSS 6QAM, QPSK, BPSK for O	FDM
Transition Rate:		802.11 g: 6	1/2/5.5/11 Mbps 6/9/12/18/24/36/48/54 Mbp 20MHz: 6.5 – 72.2Mbps	s

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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

ANSI C63.10:2013

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

1.3 Test Facility

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

FCC Registration Numbers are: 735305

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 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.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss 1dB and 10dB attenu-

offset = RF cable loss (0.5dB)+ attenuation factor(10dB)=10.5dB)

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2.5 Configuration of Tested System

Fig. 2-1 Conducted Emission Configuration

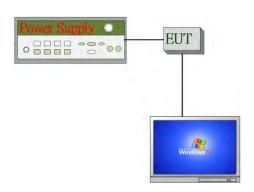


Fig 2-2 Radiated Emission Configuration

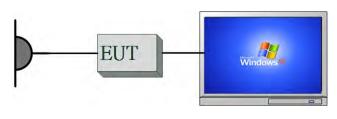


Table 2-1 Equipment Used in Tested System

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ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Qisda	DHR700	9HK7101T02 61600025DH R700	Shielded	Unshielded
2	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
3.	DC Power Supply	Agilent	E3640A	MY53140006	N/A	Unshielded

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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, 802.11a and 802.11n HT20

,	are provided for obe: 116, obe: 11g and obe: 1111_11120				
	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			

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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	MCS 0

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

Measurement uncertainty (Polarization : Horizontal)	9kHz – 30MHz: +/- 2.87 dB
	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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CONDUCTED EMISSION TEST

6.1 Standard Applicable

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

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

Note

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

6.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2016	12/11/2017			
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	02/07/2016	02/06/2017			
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017			
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.			

6.3 EUT Setup

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

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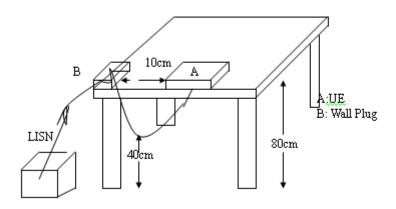
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

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

6.6 Measurement Result

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

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

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode: operation mode Test By: Jerry

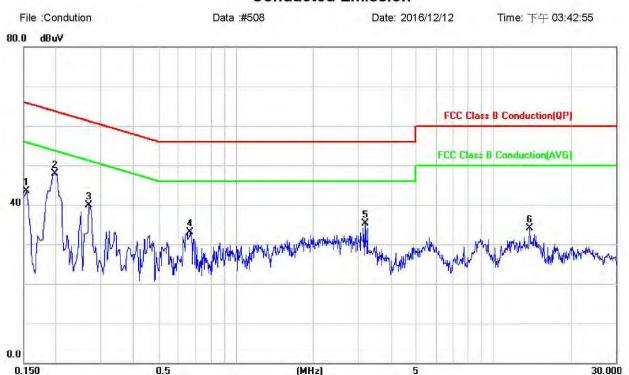
Temperature: 23 ℃ Site: Conduction Room Phase: L1 AC 120V/60Hz Humidity: Limit: FCC Class B Conduction(QP)

Power:

Mode: 佳世達

Note:

Conducted Emission



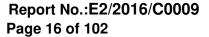
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1540	23.83	19.72	43.55	65.78	-22.23	peak	
2 *	0.1980	28.19	19.71	47.90	63.69	-15.79	peak	
3	0.2700	20.07	19.76	39.83	61.12	-21.29	peak	
4	0.6660	13.29	19.90	33.19	56.00	-22.81	peak	
5	3.1780	15.30	19.95	35.25	56.00	-20.75	peak	
6	13.8740	13.78	20.24	34.02	60.00	-25.98	peak	

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Site: Conduction Room

Phase:

Temperature: 23 ℃

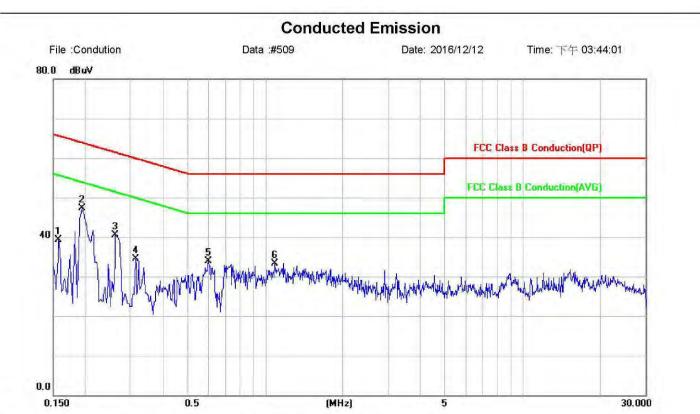
Limit: FCC Class B Conduction(QP)

AC 120V/60Hz Power:

Humidity: 65 %

Mode: 佳世達

Note:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	1	0.1580	19.50	19.73	39.23	65.57	-26.34	peak		
2	*	0.1940	27.54	19.72	47.26	63.86	-16.60	peak		
3		0.2620	20.84	19.76	40.60	61.37	-20.77	peak		
4		0.3140	14.81	19.79	34.60	59.86	-25.26	peak		
5		0.6020	14.02	19.91	33.93	56.00	-22.07	peak		
6		1.0900	13.35	19.92	33.27	56.00	-22.73	peak		

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DUTY CYCLE OF TEST SIGNAL

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

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

Formula:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

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

Duty Cycle:

	Duty Cycle (%)	Duty Factor (dB)
802.11b	97.50	0.11
802.11g	87.41	0.58
802.11n_20	86.64	0.62

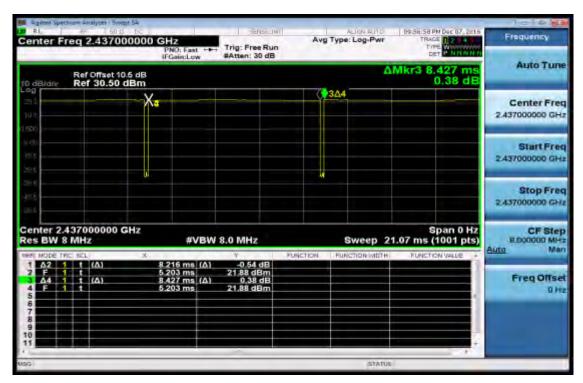
Duty Cycle Factor: $10 * \log(1/0.975) = 0.11$ Duty Cycle Factor: $10 * \log(1/0.8741) = 0.58$ Duty Cycle Factor: $10 * \log(1/0.8664) = 0.62$

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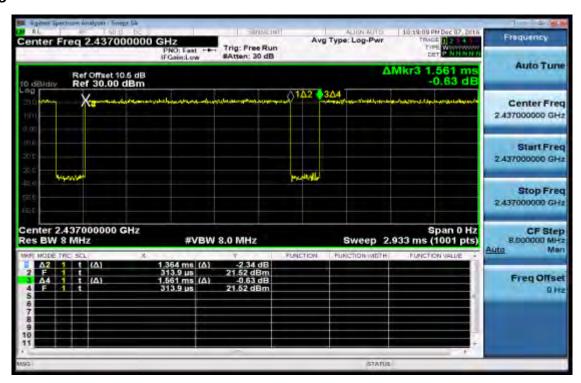
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7.1 DUTY CYCLE TEST SIGNAL Measurement Result 802.11 b



802.11 q



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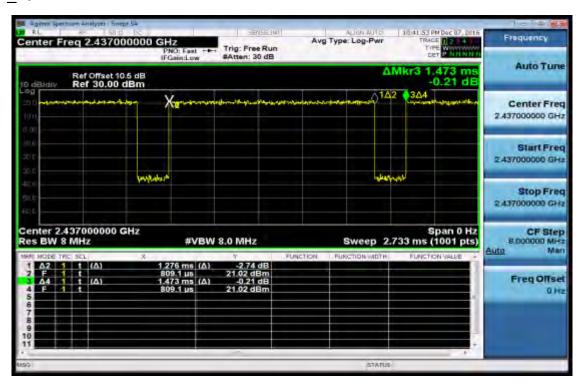
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802.11 n 20 MHz



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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.

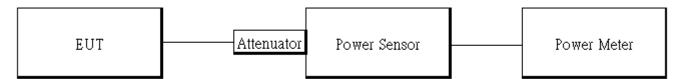
If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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.

8.2 Measurement Equipment Used

	Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
Power Meter	Anritsu	ML2496A	1326001	06/23/2016	06/22/2017				
Power Sensor	Anritsu	MA2411B	1315048	06/23/2016	06/22/2017				
Power Sensor	Anritsu	MA2411B	1315049	06/23/2016	06/22/2017				
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/13/2015	12/12/2016				
DC Block	PASTERNACK	PE8210	RF29	12/13/2015	12/12/2016				
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/13/2015	12/12/2016				
Attenuator	WOKEN	218FS-10	RF23	12/13/2015	12/12/2016				
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017				

8.3 Test Set-up



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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. Guid-
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

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

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

8.5 Measurement Result

802.11	b Main							
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	1	20.94	124.17	1 Watt =	30.00	dBm	PASS
6	2437	1	20.69	117.22	1 Watt =	30.00	dBm	PASS
11	2462	1	20.03	100.69	1 Watt =	30.00	dBm	PASS
802.11	b Main							
СН	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	I LIMIT I			RESULT
1	2412	1	18.57	71.94	1 Watt =	30.00	dBm	PASS
6	2437	1	18.68	73.79	1 Watt =	30.00	dBm	PASS
11	2462	1	17.45	55.59	1 Watt =	30.00	dBm	PASS

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802.11	02.11g Main							
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit		RESULT	
1	2412	6	22.01	158.85	1 Watt =	30.00	dBm	PASS
6	2437	6	22.14	163.68	1 Watt =	30.00	dBm	PASS
11	2462	6	21.23	132.74	1 Watt =	30.00	dBm	PASS
802.11	g Main							
СН	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	1	RESULT		
1	2412	6	15.11	32.43	1 Watt =	30.00	dBm	PASS
6	2437	6	17.87	61.24	1 Watt =	30.00	dBm	PASS
11	2462	6	13.33	21.53	1 Watt =	30.00	dBm	PASS

802.11	n_HT20M Main							
СН	Frequency (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit			RESULT
1	2412	MCS0	21.59	144.21	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	22.29	169.43	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	20.9	123.03	1 Watt =	30.00	dBm	PASS
802.11	n_HT20M Main							
СН	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	I LIMIT			RESULT
1	2412	MCS0	14.19	26.24	1 Watt =	30.00	dBm	PASS
6	2437	MCS0	17.89	61.52	1 Watt =	30.00	dBm	PASS
11	2462	MCS0	12.85	19.28	1 Watt =	30.00	dBm	PASS

Note:

offset 10.50 dB for SISO mode

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

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6DB BANDWIDTH MEASUREMENT

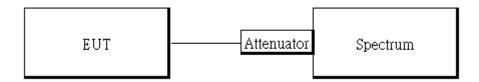
9.1 Standard Applicable

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	12/13/2015	12/12/2016		
Attenuator	WOKEN	218FS-10	RF23	12/13/2015	12/12/2016		
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017		

9.3 Test Set-up



9.4 Measurement Procedure

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

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9.5 Measurement Result

6dB Bandwidth

802.11b Main

802.11a Main

OOZ.11D WAIII								
Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result					
2412	8581	> 500	PASS					
2437	9562	> 500	PASS					
2462	8577	> 500	PASS					

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result
2412	16320	> 500	PASS
2437	16370	> 500	PASS
2462	16310	> 500	PASS

802.11_n_HT20 Main

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Result	
2412	17060	> 500	PASS	
2437	17600	> 500	PASS	
2462	17260	> 500	PASS	

*Refer to next page for plots

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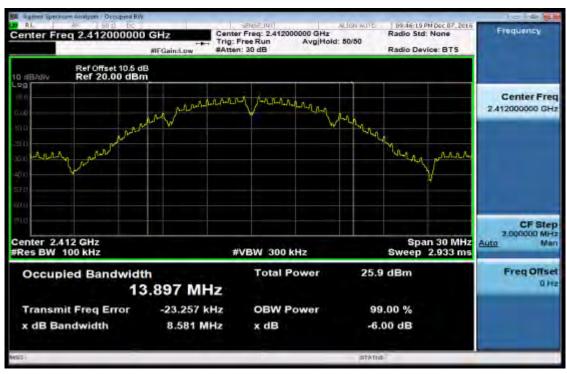
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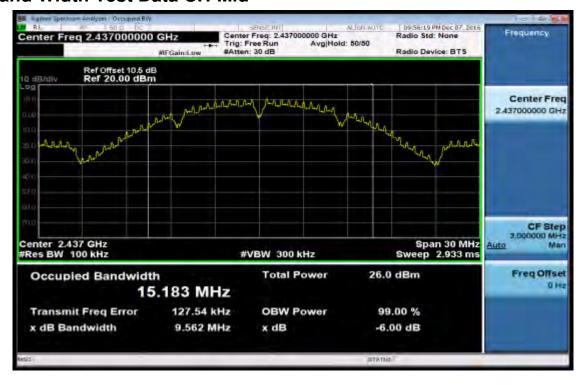
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802.11b 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High



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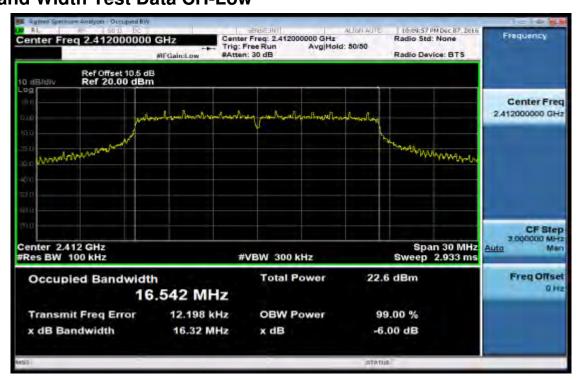
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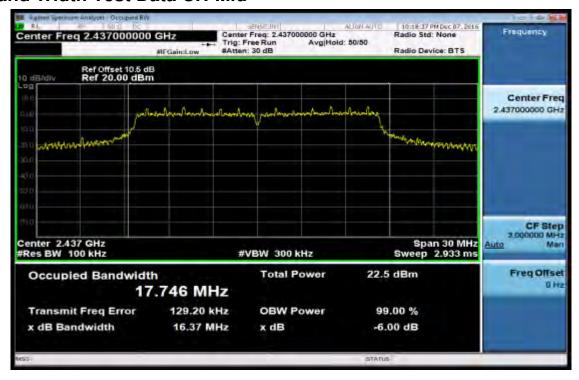
f (886-2) 2298-0488



802.11q 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid

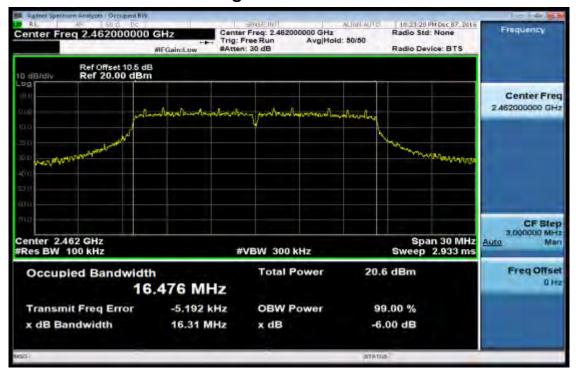


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6dB Band Width Test Data CH-High



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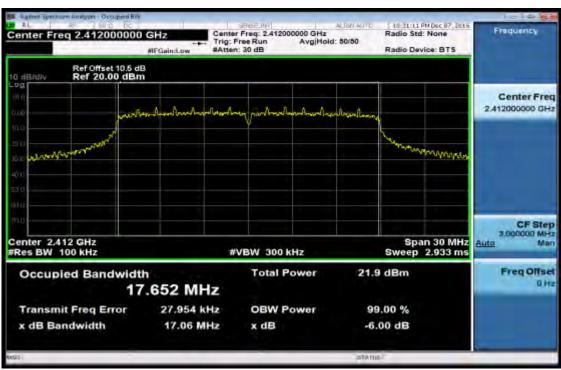
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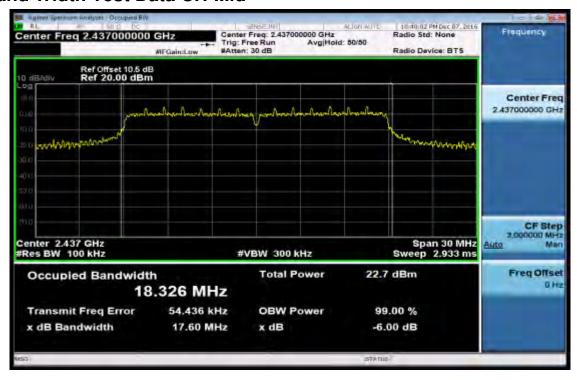
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802.11n HT20M 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High



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CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

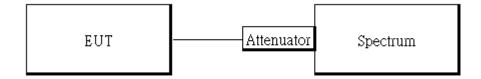
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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	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	12/13/2015	12/12/2016	
Attenuator	WOKEN	218FS-10	RF23	12/13/2015	12/12/2016	
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017	

10.3 Test SET-UP



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10.4 Measurement Procedure

Band Edge Limit Calculation:

- 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 = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

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. Guid-
- 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.

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10.5 Measurement Result

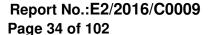
Bandedge Limit 802.11b MODE			
Frequency	RF Power	Bandedge	
(MHz)	Density	Limit	
	(dBm)	(dBm)	
2412	10.16	-9.84	
2462	9.38	-10.62	

Bandedge Limit 802.11 g MODE		Bandedge Limit 802.11n20 MODE			
Frequency	RF Power	Bandedge	Frequency	RF Power	Bandedge
(MHz)	Density	Limit	(MHz)	Density	Limit
(IVII IZ)	(dBm)	(dBm)		(dBm)	(dBm)
2412	4.73	-15.27	2412	3.92	-16.08
2462	3.39	-16.61	2462	2.63	-17.37

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



802.11b PSD for Bandedge Limit(CH-High)



802.11g PSD for Bandedge Limit(CH-Low)



802.11g PSD for Bandedge Limit(CH-High)



802.11n HT20 PSD for Bandedge Limit(CH-Low)



802.11n_HT20 PSD for Bandedge Limit(CH-High)



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



Band Edges Test Data CH-High



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802.11q **Band Edges Test Data CH-Low**



Band Edges 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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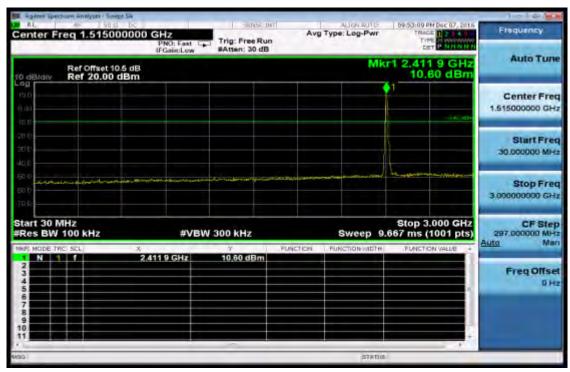
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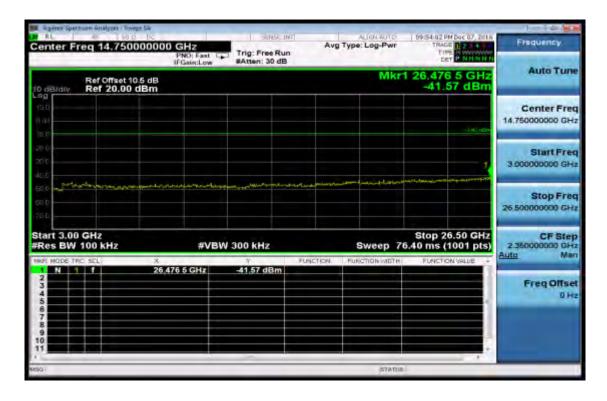
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802.11b **Spurious Emission Test Data CH-Low**





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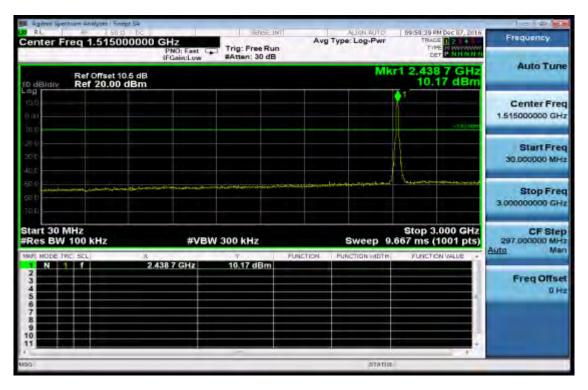
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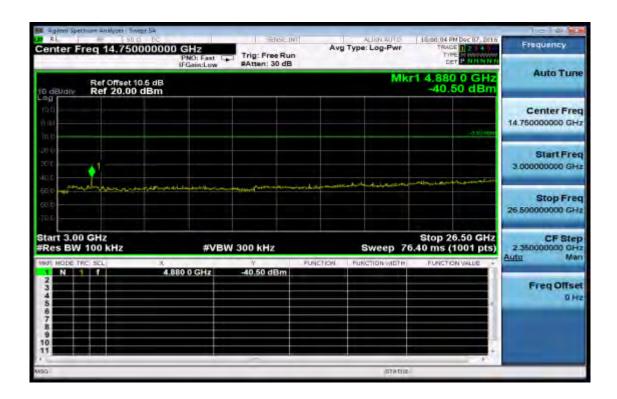
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Spurious Emission Test Data CH-Mid





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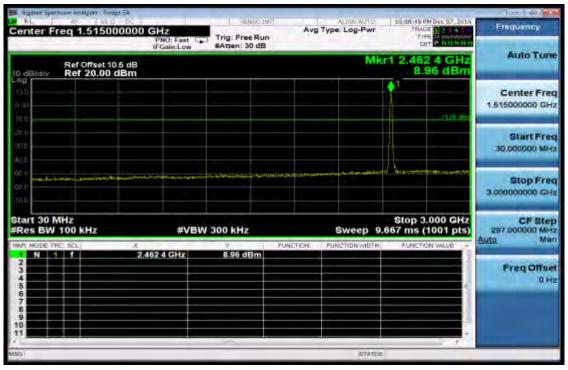
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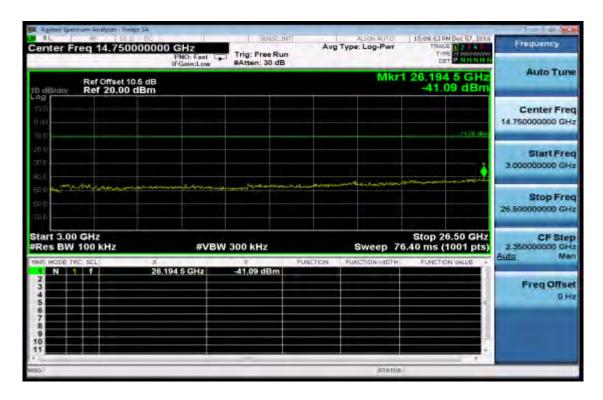
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Spurious Emission Test Data CH-High





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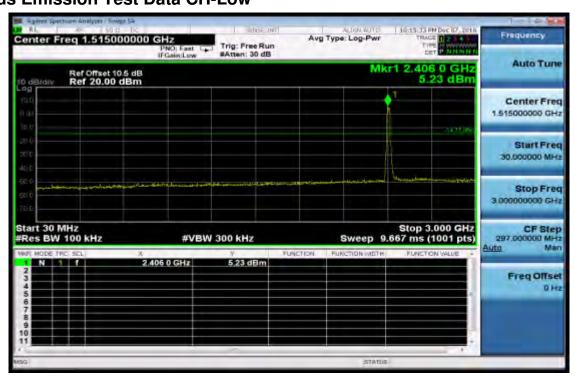
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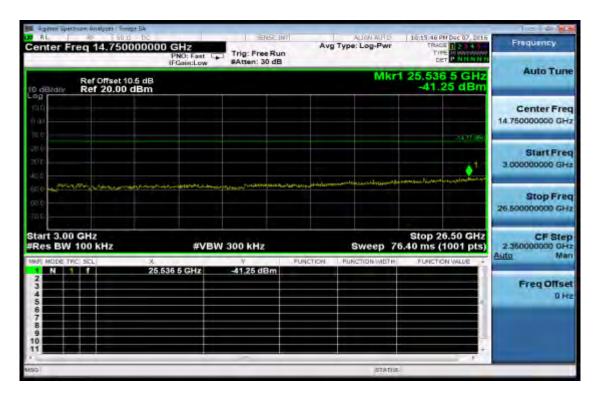
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802.11g **Spurious Emission Test Data CH-Low**





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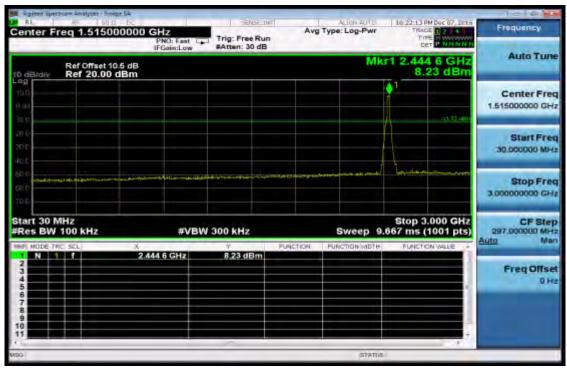
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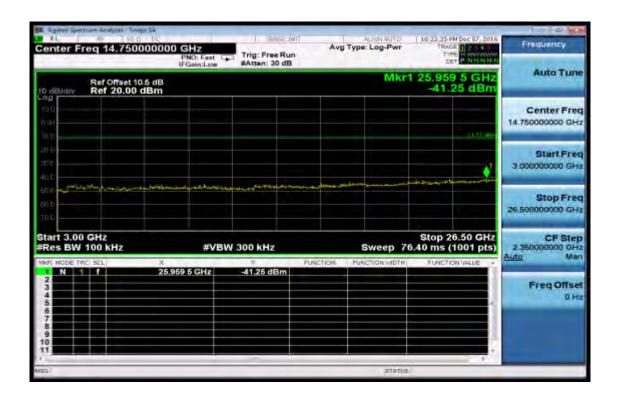
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Spurious Emission Test Data CH-Mid





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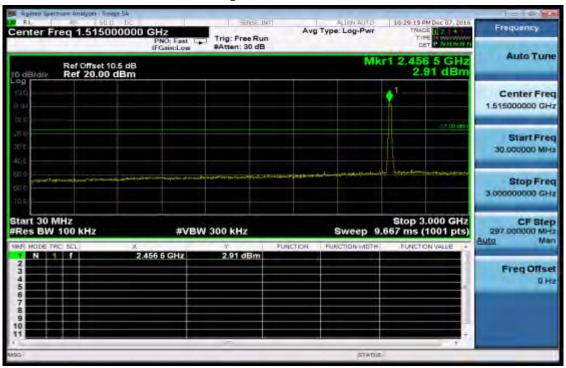
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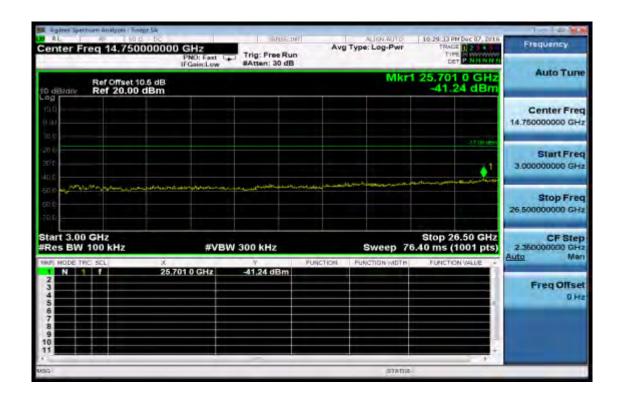
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Spurious Emission Test Data CH-High





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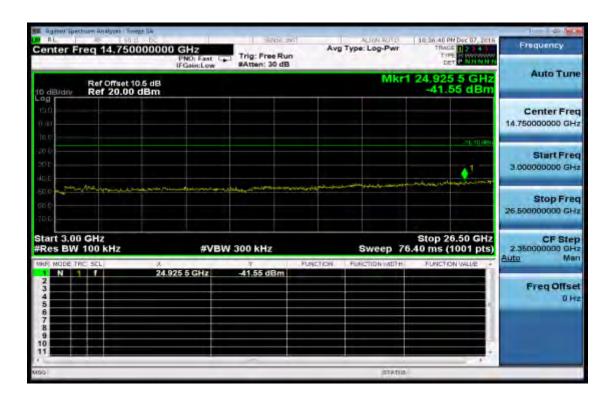
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802.11n HT20

Spurious Emission Test Data CH-Low





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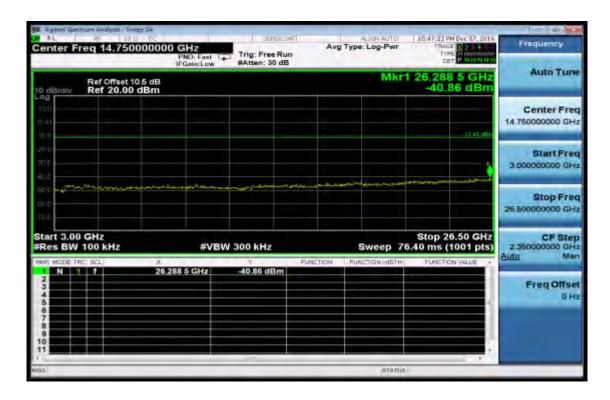
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Spurious Emission Test Data CH-Mid





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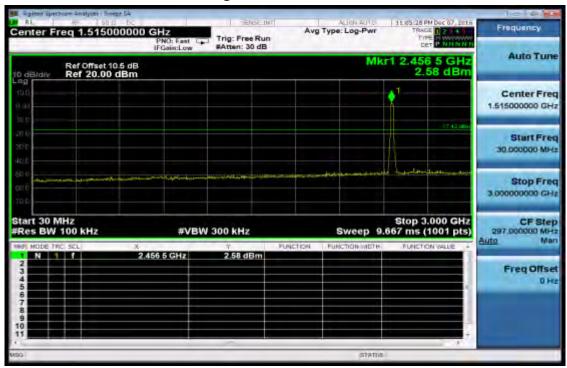
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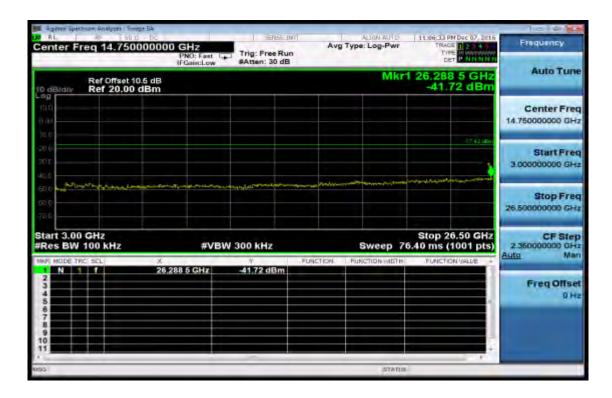
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Spurious Emission Test Data CH-High





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

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11.2 Measurement Equipment Used:

	966 Chamber								
EQUIPMENT	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	11/03/2016	11/02/2017				
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016				
Horn Antenna	Schwarzbeck	BBHA9170	185	07/24/2016	07/23/2017				
Pre Amplifier	EMC Instruments	EMC330	980096	12/13/2015	12/12/2016				
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/13/2015	12/12/2016				
Pre Amplifier	R&S	SCU-18	10204	12/13/2015	12/12/2016				
Pre Amplifier	R&S	SCU-26	100780	12/13/2015	12/12/2016				
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/13/2015	12/12/2016				
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/13/2015	12/12/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/13/2015	12/12/2016				
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/13/2015	12/12/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/13/2015	12/12/2016				
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/13/2015	12/12/2016				
Attenuator	WOKEN	218FS-10	RF27	12/13/2015	12/12/2016				
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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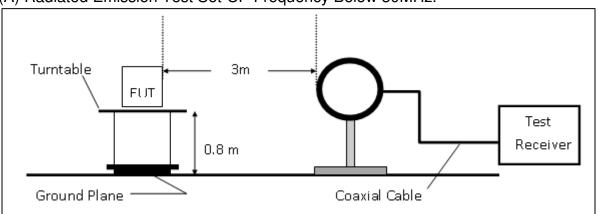
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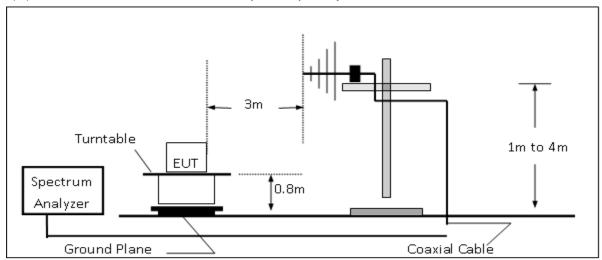


11.3 Test SET-UP

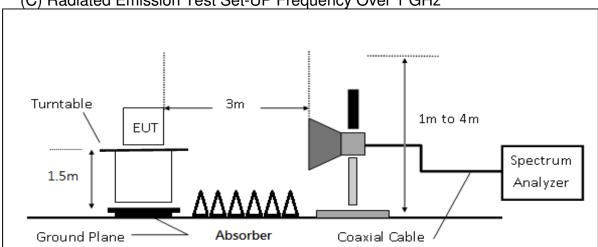
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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 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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SGS Taiwan Ltd.

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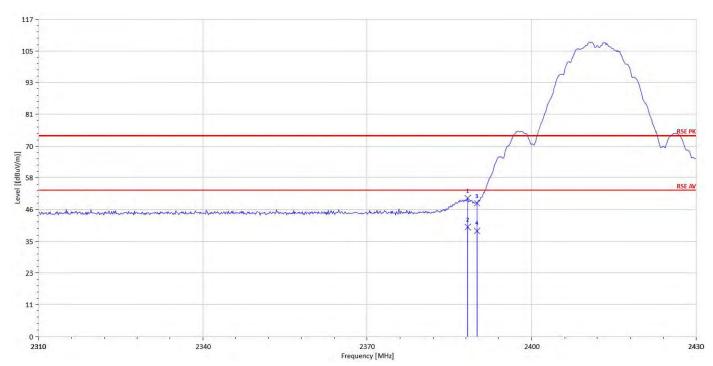


Radiated Band Edge Measurement Result (802.11b)

Operation Mode: Test Date: 2016/12/7 802.11b

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

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

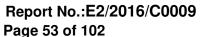


Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2388.36	S	Peak	50.15	0.90	51.04	74	-22.96
2388.36	S	Average	39.46	0.90	40.36	54	-13.64
2390.00	E	Peak	48.20	0.92	49.12	74	-24.88
2390.00	Е	Average -	38.06	0.92	38.98	54	-15.02

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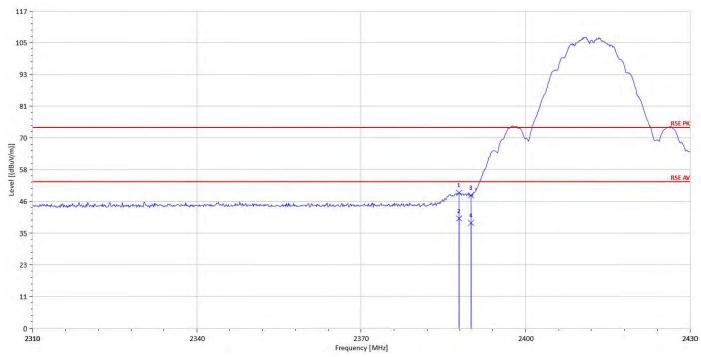




Operation Mode: Test Date: 802.11b 2016/12/7

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

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



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
2387.88	S	Peak	49.14	0.89	50.04	74	-23.96
2387.88	S	Average	39.58	0.89	40.47	54	-13.53
2390.00	E	Peak	48.16	0.92	49.08	74	-24.92
2390.00	E	Average	37.89	0.92	38.81	54	-15.19

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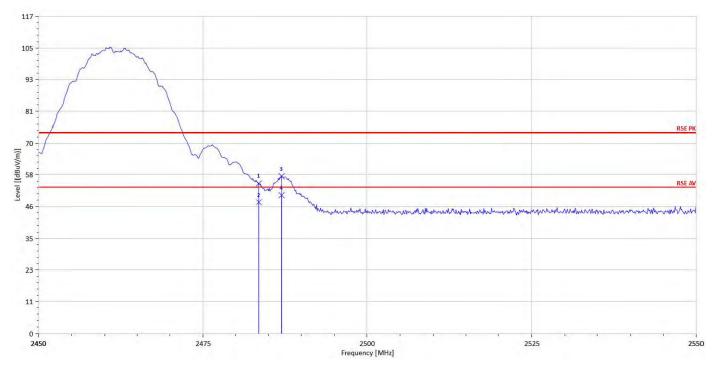
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Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg_C/57RH

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



Freq.	Note	Detector	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	54.18	1.16	55.34	74	-18.66
2483.50	Е	Average	47.25	1.16	48.41	54	-5.59
2487.00	S	Peak	56.81	1.15	57.96	74	-16.04
2487.00	S	Average -	49.86	1.15	51.01	54	-2.99

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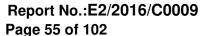
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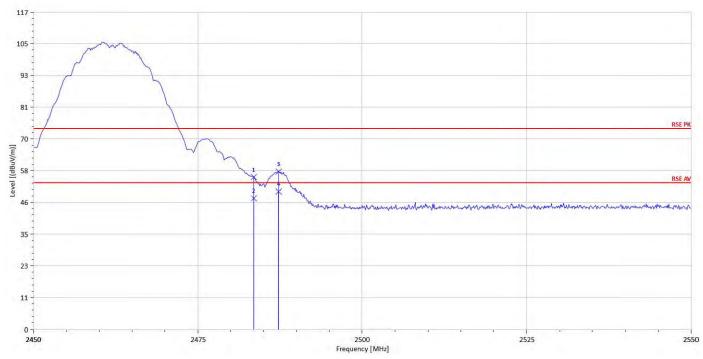




Operation Mode: Test Date: 802.11b 2016/12/7

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

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



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	54.93	1.16	56.09	74	-17.91
2483.50	Е	Average	47.19	1.16	48.35	54	-5.65
2487.30	S	Peak	57.00	1.15	58.15	74	-15.85
2487.30	S	Average	49.65	1.15	50.80	54	-3.20

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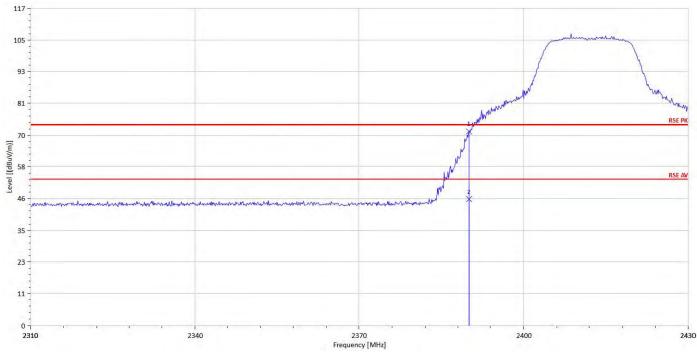


Radiated Band Edge Measurement Result (802.11g)

Operation Mode: Test Date: 2016/12/7 802.11g

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

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

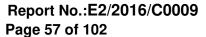


Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	70.66	0.92	71.58	74	-2.42
2390.00	Е	Average	45.66	0.92	46.58	54	-7.42

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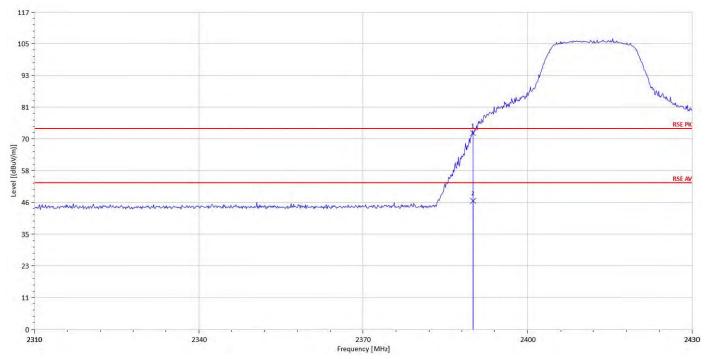




Operation Mode: Test Date: 802.11g 2016/12/7

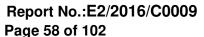
Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg_C/57RH

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



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	dΒμV/m	dB
2390.00	E	Peak	71.40	0.92	72.32	74	-1.68
2390.00	Е	Average	46.48	0.92	47.40	54	-6.60

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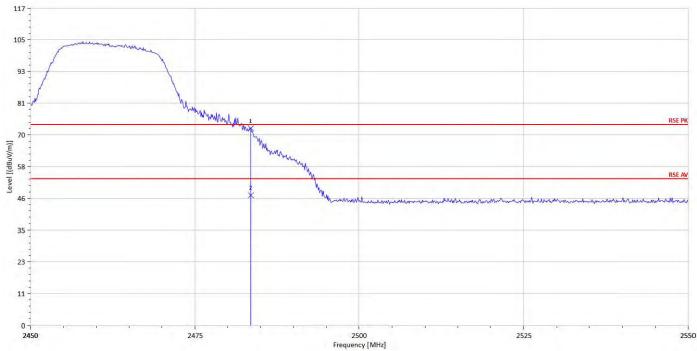




Operation Mode: Test Date: 802.11g 2016/12/7

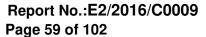
Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg_C/57RH

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



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
2483.50	Е	Peak	71.41	1.16	72.57	74	-1.43	-
2483.50	Е	Average	46.82	1.16	47.98	54	-6.02	

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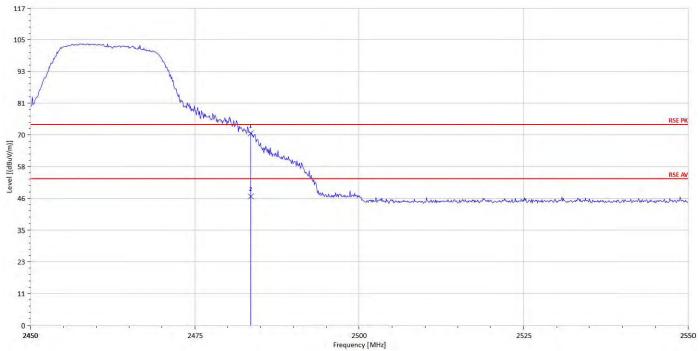




Operation Mode: Test Date: 802.11g 2016/12/7

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

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



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	69.55	1.16	70.71	74	-3.29	•
2483.50	F	Average	46.43	1.16	47.59	54	-6.41	

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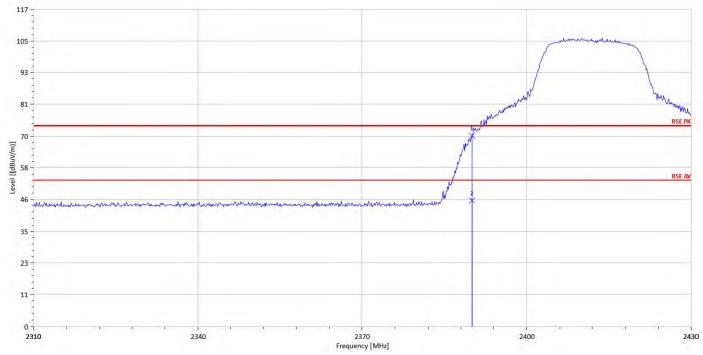


Radiated Band Edge Measurement Result (802.11_HT20)

Operation Mode: 802.11n20 Test Date: 2016/12/7

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

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



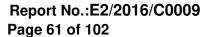
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	69.46	0.92	70.39	74	-3.61
2390.00	Ε	Average	45.48	0.92	46.40	54	-7.60

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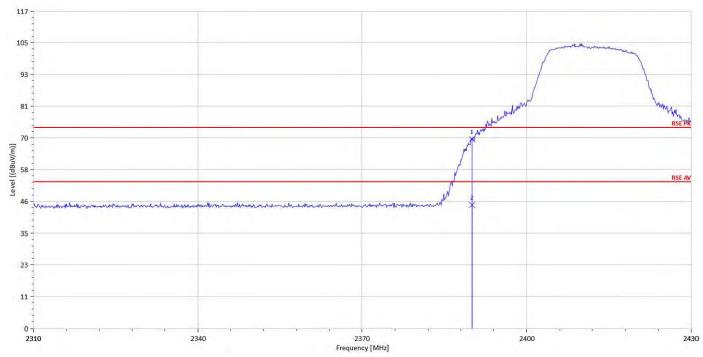




Operation Mode: Test Date: 802.11n20 2016/12/7

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

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



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dΒμV/m	dΒμV/m	dB
2390.00	Е	Peak	68.73	0.92	69.65	74	-4.35
2390.00	E	Average	44.58	0.92	45.50	54	-8.50

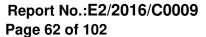
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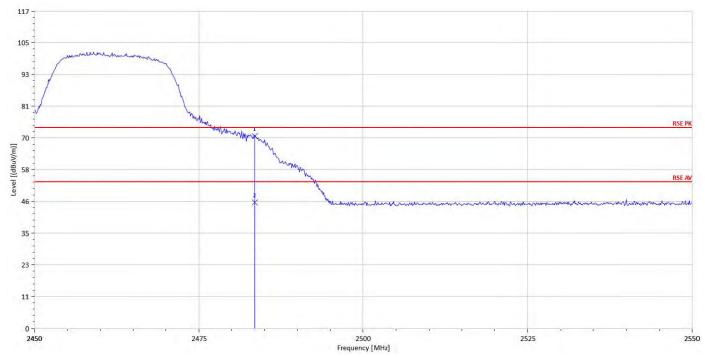




Operation Mode: Test Date: 802.11n20 2016/12/7

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

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



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dΒμV/m	dΒμV/m	dB
2483.50	Е	Peak	69.65	1.16	70.81	74	-3.19
2483.50	E	Average	45.30	1.16	46.46	54	-7.54

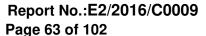
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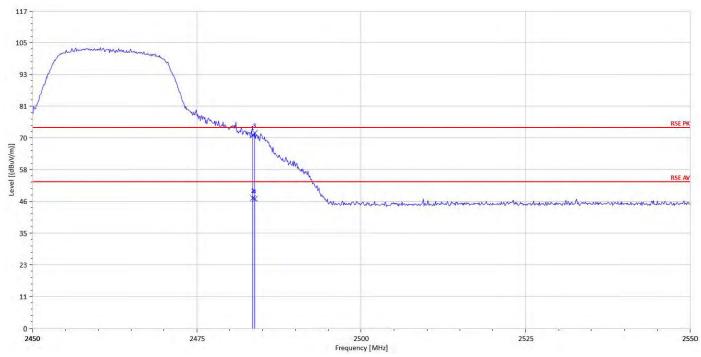




Operation Mode: Test Date: 802.11n20 2016/12/7

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

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



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	69.94	1.16	71.10	74	-2.90
2483.50	E	Average	46.89	1.16	48.05	54	-5.95
2483.80	S	Peak	70.80	1.16	71.96	74	-2.04
2483.80	S	Average	46.63	1.16	47.79	54	-6.21

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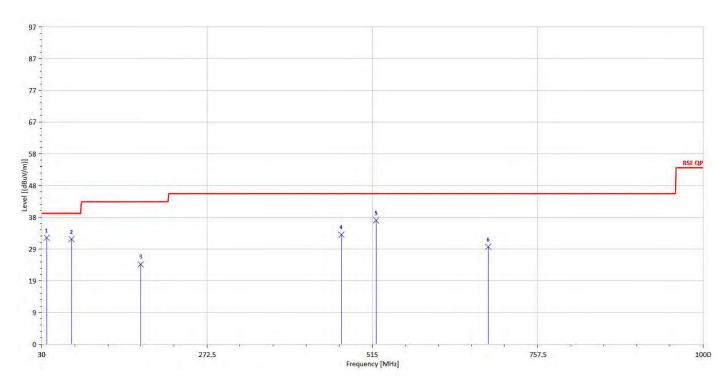
Below 1GHz Worst-Case Data:

Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode: Test Date: 2016/12/12 802.11g

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

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	dBµV	dB	dBμV/m	dBµV/m	dB
37.76	S	Peak	44.00	-11.49	32.51	40	-7.49
73.65	S	Peak	53.58	-21.46	32.12	40	-7.88
175.50	S	Peak	42.96	-18.51	24.44	43.5	-19.06
469.41	S	Peak	41.27	-7.76	33.50	46	-12.50
520.82	S	Peak	45.26	-7.35	37.91	46	-8.09
684.75	S	Peak	35.12	-5.35	29.77	46	-16.23

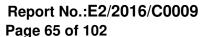
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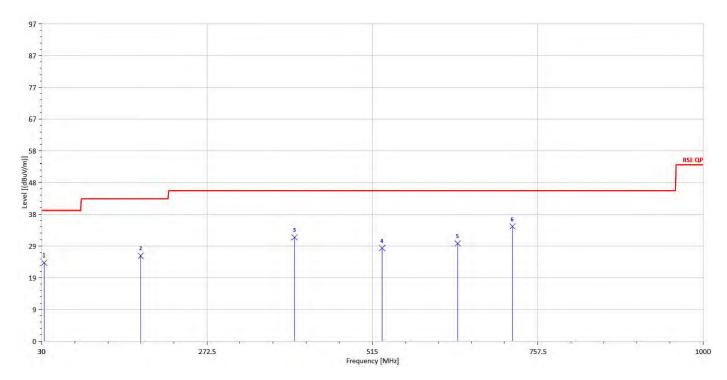
SGS Taiwan Ltd.





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

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



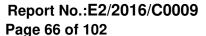
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	33.30	-9.27	24.03	40	-15.97
175.50	S	Peak	44.61	-18.51	26.10	43.5	-17.40
400.54	S	Peak	41.49	-9.76	31.73	46	-14.27
529.55	S	Peak	35.64	-7.21	28.42	46	-17.58
640.13	S	Peak	35.25	-5.37	29.88	46	-16.12
720.64	S	Peak	39.95	-4.83	35.12	46	-10.88

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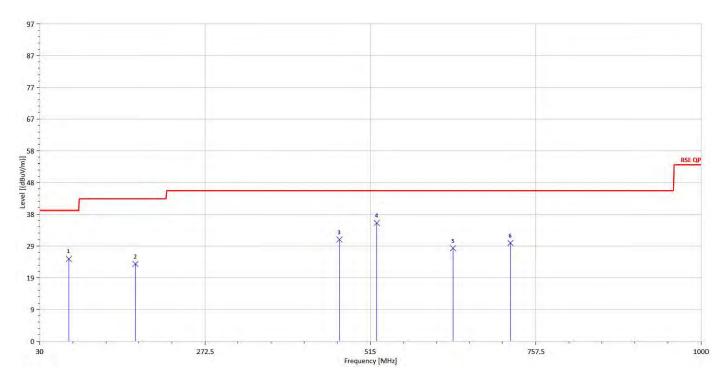
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

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



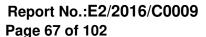
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
72.68	S	Peak	46.75	-21.55	25.20	40	-14.80
170.65	S	Peak	41.99	-18.31	23.67	43.5	-19.83
469.41	S	Peak	38.84	-7.76	31.08	46	-14.92
524.70	S	Peak	43.69	-7.50	36.19	46	-9.81
636.25	S	Peak	33.62	-5.25	28.38	46	-17.62
720.64	S	Peak	34.80	-4.83	29.97	46	-16.03

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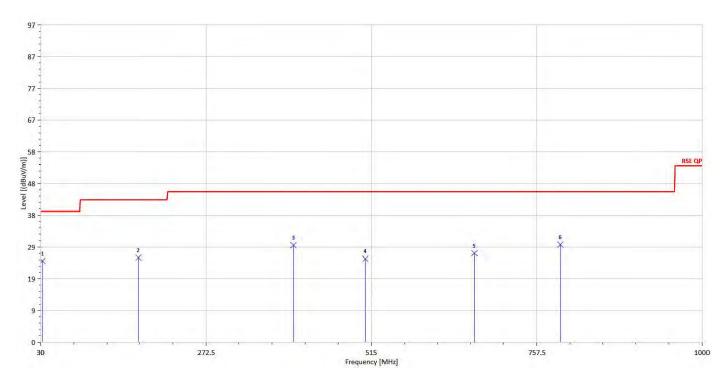
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

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



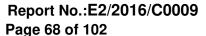
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
32.91	S	Peak	33.62	-8.75	24.88	40	-15.12
173.56	S	Peak	44.25	-18.36	25.88	43.5	-17.62
400.54	S	Peak	39.42	-9.76	29.66	46	-16.34
506.27	S	Peak	33.58	-8.08	25.51	46	-20.49
666.32	S	Peak	32.43	-5.25	27.17	46	-18.83
792.42	S	Peak	34.00	-4.18	29.82	46	-16.18

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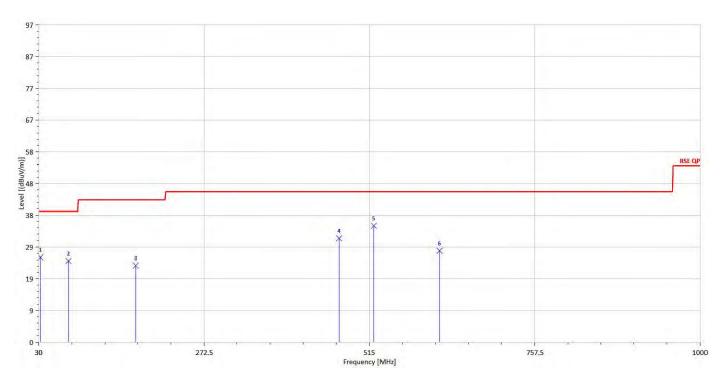
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Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Measurement Antenna Pol. : Н 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
32.91	S	Peak	34.69	-8.75	25.94	40	-14.06
73.65	S	Peak	46.34	-21.46	24.88	40	-15.12
172.59	S	Peak	41.82	-18.37	23.46	43.5	-20.04
470.38	S	Peak	39.58	-7.85	31.74	46	-14.26
521.79	S	Peak	42.87	-7.26	35.61	46	-10.39
617.82	S	Peak	34.62	-6.70	27.92	46	-18.08

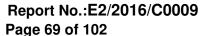
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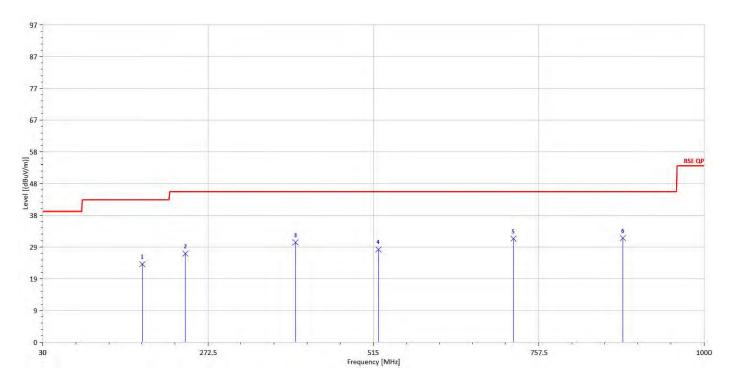
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Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Measurement Antenna Pol. : Н 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
176.47	S	Peak	42.43	-18.52	23.91	43.5	-19.59
239.52	S	Peak	42.31	-15.28	27.03	46	-18.97
400.54	S	Peak	40.25	-9.76	30.49	46	-15.51
522.76	S	Peak	35.55	-7.25	28.30	46	-17.70
720.64	S	Peak	36.46	-4.83	31.63	46	-14.37
880.69	S	Peak	34.80	-2.98	31.82	46	-14.18

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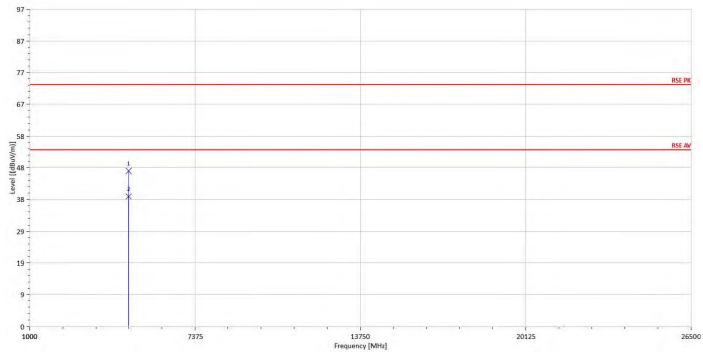
Above 1GHz Data:

Radiated Spurious Emission Measurement Result (802.11 b)

Test Date: Operation Mode: 802.11b 2016/12/9

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

Operation Band: Test Engineer: Tx CH Low Ashton EUT Pol.: Measurement Antenna Pol.: Vertical 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
4824.00	Н	Peak	39.96	7.58	47.54	74	-26.46
4824.00	Н	Average	32.17	7.58	39.75	54	-14.25

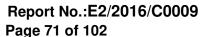
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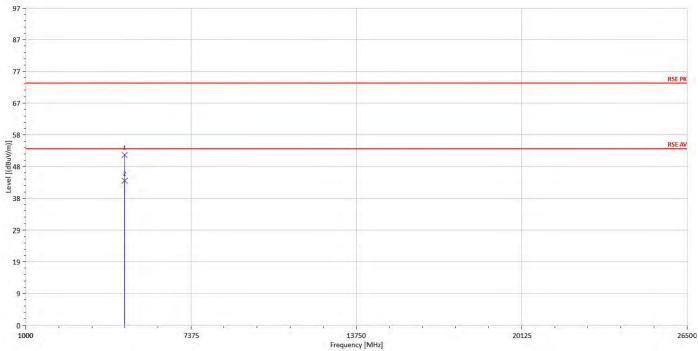




Operation Mode: Test Date: 2016/12/9 802.11b

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

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



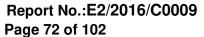
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB	
4824.00	Н	Peak	44.51	7.58	52.09	74	-21.91	•
4824.00	Н	Average	36.55	7.58	44.13	54	-9.87	

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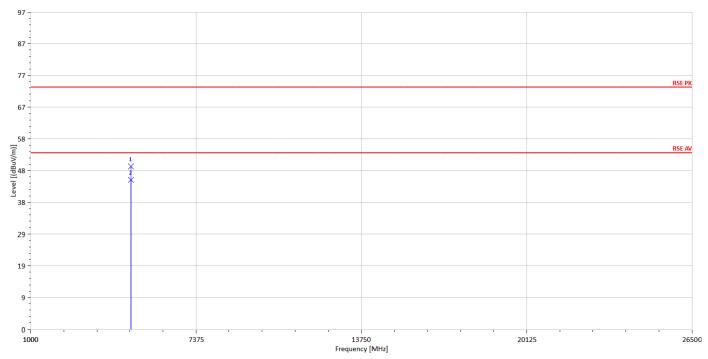




Operation Mode: Test Date: 802.11b 2016/12/9

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

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



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	41.87	7.91	49.78	74	-24.22
4874.00	Н	Average	37.73	7.91	45.64	54	-8.36

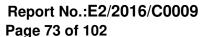
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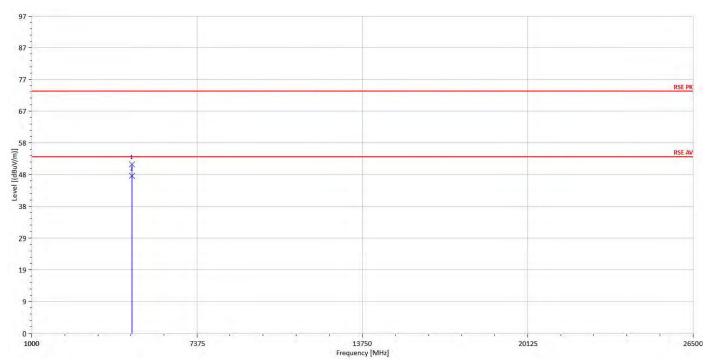




Operation Mode: Test Date: 2016/12/9 802.11b

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

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



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	43.74	7.91	51.65	74	-22.35
4874.00	Н	Average	40.19	7.91	48.10	54	-5.90

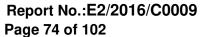
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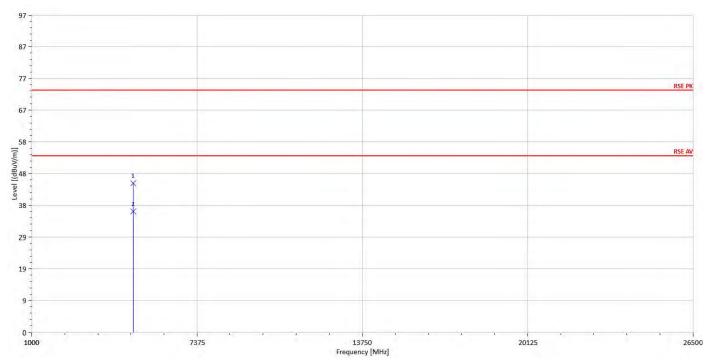




Operation Mode: Test Date: 802.11b 2016/12/9

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	37.62	7.92	45.54	74	-28.46
4924.00	Н	Average	29.04	7.92	36.96	54	-17.04

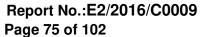
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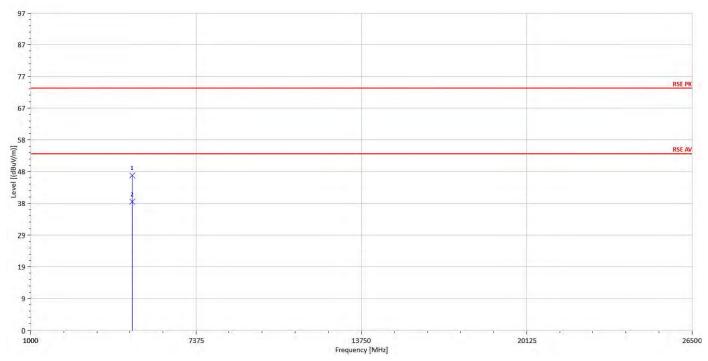




Operation Mode: Test Date: 802.11b 2016/12/9

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	dΒμV/m	dB
4924.00	Н	Peak	39.40	7.92	47.32	74	-26.68
4924.00	Н	Average	31.43	7.92	39.35	54	-14.65

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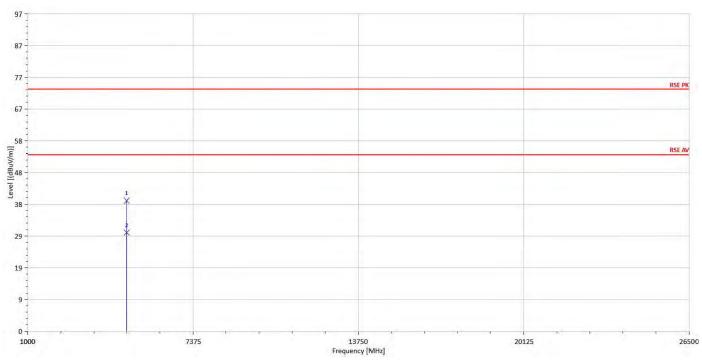


Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode: 802.11g Test Date: 2016/12/9

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

Operation Band: Test Engineer: Tx CH Low 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	32.33	7.58	39.91	74	-34.09	-
4824.00	Н	Average	22.55	7.58	30.13	54	-23.87	

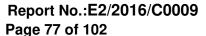
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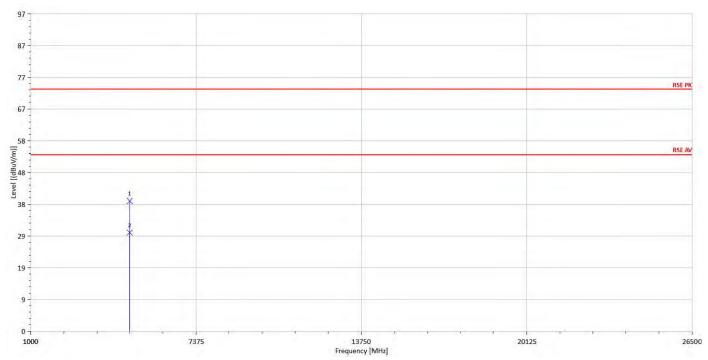
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Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

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



Freq.	Note	Detector	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	32.25	7.58	39.83	74	-34.17
4824.00	Н	Average	22.54	7.58	30.12	54	-23.88

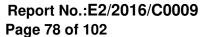
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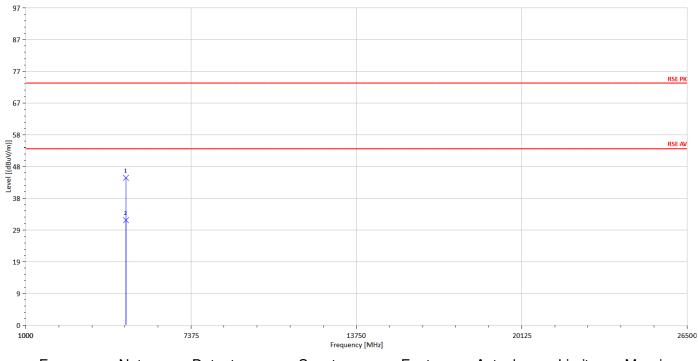
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

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

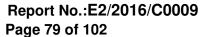


Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	$dB\mu V/m$	dB
4874.00	Н	Peak	37.12	7.91	45.03	74	-28.97
4874.00	Н	Average	24.18	7.91	32.09	54	-21.91

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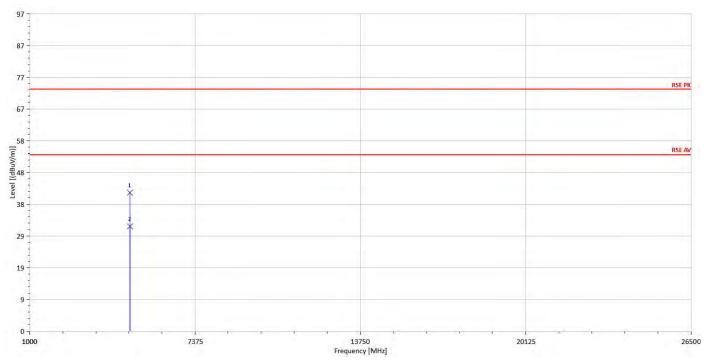
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

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



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	34.42	7.91	42.33	74	-31.67
4874.00	Н	Average	24.12	7.91	32.03	54	-21.97

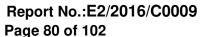
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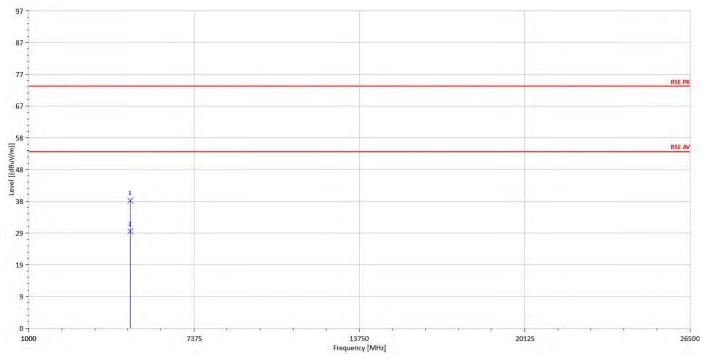
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Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Test Engineer: Tx CH High **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	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	31.13	7.92	39.06	74	-34.94
4924.00	Н	Average	21.68	7.92	29.60	54	-24.40

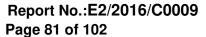
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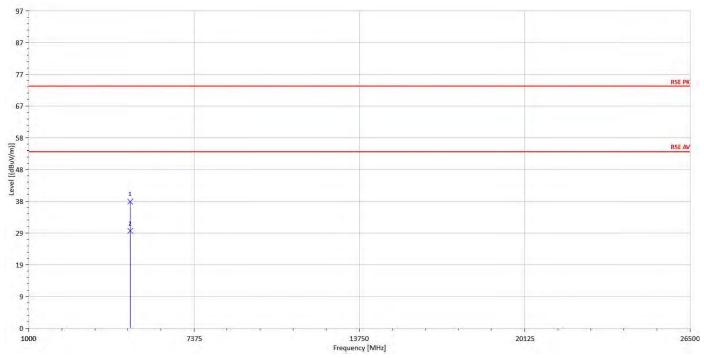
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Fundamental Frequency: 2462 MHz Temp. / Humi. : 22.7deg C/57RH

Operation Band: Test Engineer: Tx CH High **Ashton** EUT Pol.: Н 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	30.83	7.92	38.75	74	-35.25
4924.00	Н	Average	21.81	7.92	29.73	54	-24.27

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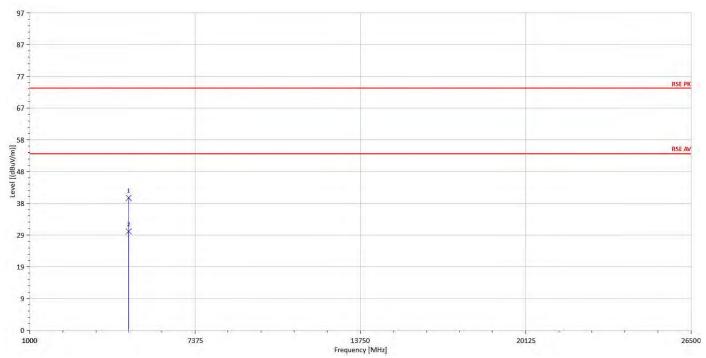


Radiated Spurious Emission Measurement Result (802.11_HT20)

Operation Mode: 802.11n20 Test Date: 2016/12/9

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

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



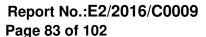
	Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
•	4824.00	Н	Peak	32.86	7.58	40.43	74	-33.57
	4824.00	Н	Average	22.60	7.58	30.18	54	-23.82

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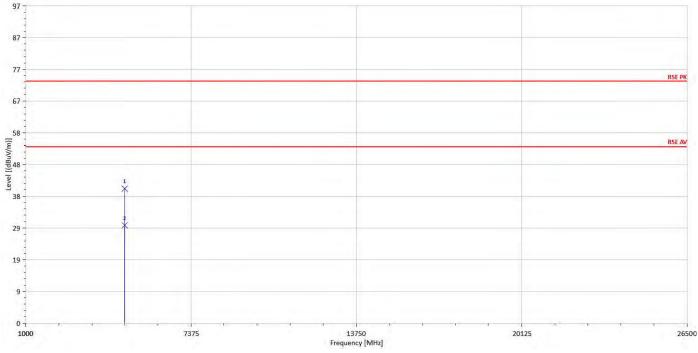
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Fundamental Frequency: 2412 MHz Temp. / Humi.: 22.7deg C/57RH

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



Freq.	Note	Detector	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	33.51	7.58	41.08	74	-32.92
4824.00	Н	Average	22.33	7.58	29.91	54	-24.09

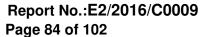
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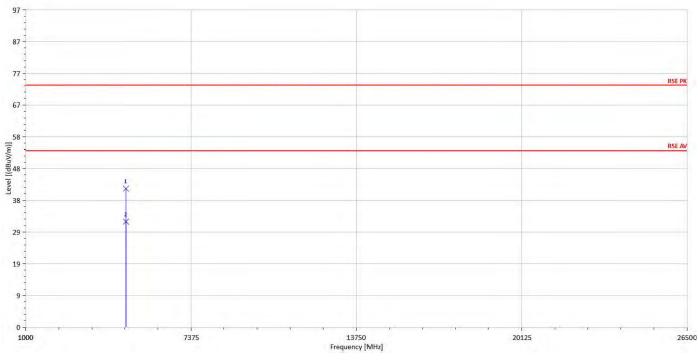
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

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



Freq.	Note	Detector	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	34.41	7.91	42.32	74	-31.68
4874.00	Н	Average	24.37	7.91	32.28	54	-21.72

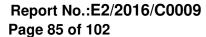
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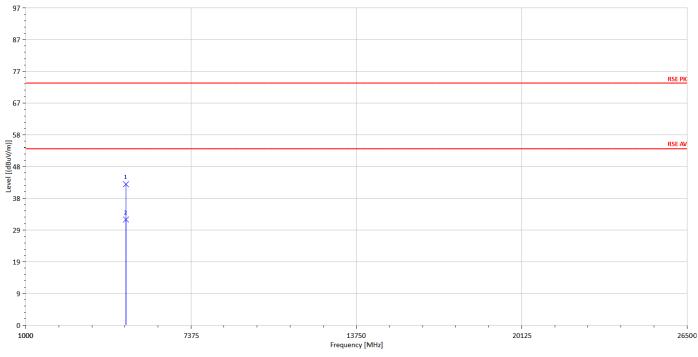
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Fundamental Frequency: 2437 MHz Temp. / Humi.: 22.7deg C/57RH

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



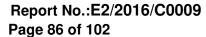
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Peak	35.14	7.91	43.05	74	-30.95
4874.00	Н	Average	24.38	7.91	32.29	54	-21.71

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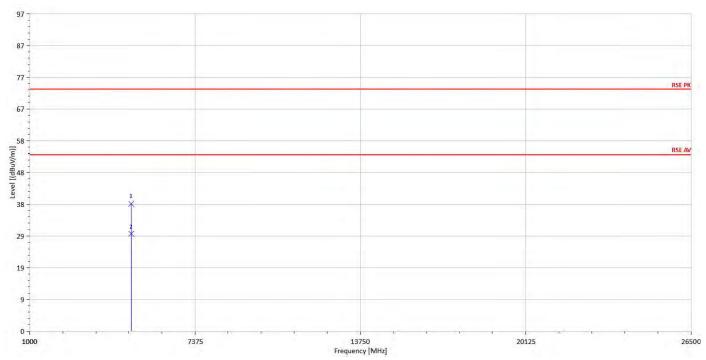
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Fundamental Frequency: 2462 MHz Temp. / Humi.: 22.7deg C/57RH

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



Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Peak	31.08	7.92	39.00	74	-35.00
4924.00	Н	Average	21.85	7.92	29.77	54	-24.23

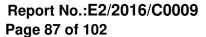
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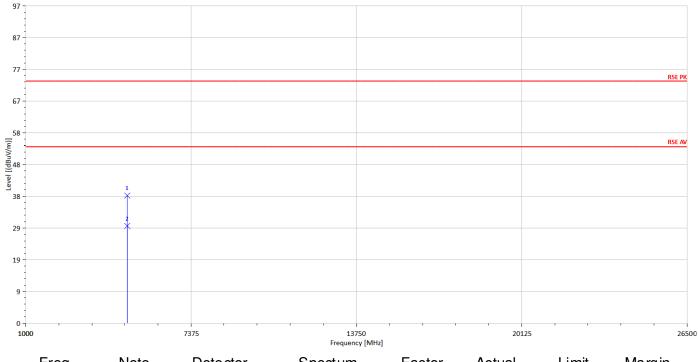
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Fundamental Frequency: 2462 MHz Temp. / Humi.: 22.7deg C/57RH

Operation Band: Tx CH High Test Engineer: **Ashton** EUT Pol.: Η 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	31.15	7.92	39.07	74	-34.93
4924.00	Н	Average	21.79	7.92	29.71	54	-24.29

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12 PEAK POWER SPECTRAL DENSITY

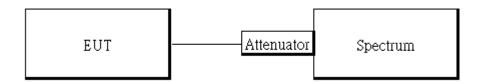
12.1 Standard Applicable

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	12/13/2015	12/12/2016		
Attenuator	WOKEN	218FS-10	RF23	12/13/2015	12/12/2016		
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017		

12.3 Test Set-up



12.4 Measurement Procedure

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz & VBW = 10 kHz.
- 5. For defining Restricted Band Edge Limit: Set the RBW = 100kHz & VBW = 300 kHz.
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

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12.5 Measurement Result

POWER	POWER DENSITY 802.11b MODE			POWER DENSITY 802.11g MODE				ODE
Eroguenev	RF Power	Maximum		ÌΓ	Eroguenov	RF Power	Maximum	
Frequency (MHz)	Density	Limit	Result	sult Frequency (MHz)		Density	Limit	Result
(1011 12)	(dBm)	(dBm)			(1011 12)	(dBm)	(dBm)	
2412	-3.19	8.00	PASS		2412	-8.22	8.00	PASS
2437	-3.53	8.00	PASS		2437	-5.70	8.00	PASS
2462	-4.04	8.00	PASS		2462	-10.33	8.00	PASS

POWER DENSITY 802.11n HT20 MODE							
Eroguenov	RF Power	Maximum					
Frequency (MHz)	Density	Limit	Result				
(1011 12)	(dBm)	(dBm)					
2412	-9.57	8.00	PASS				
2437	-6.04	8.00	PASS				
2462	-10.84	8.00	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)



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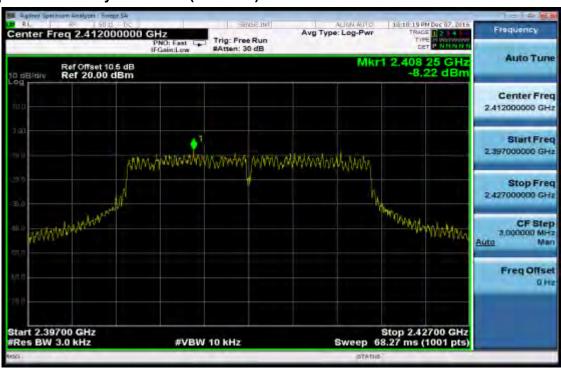
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802.11g

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



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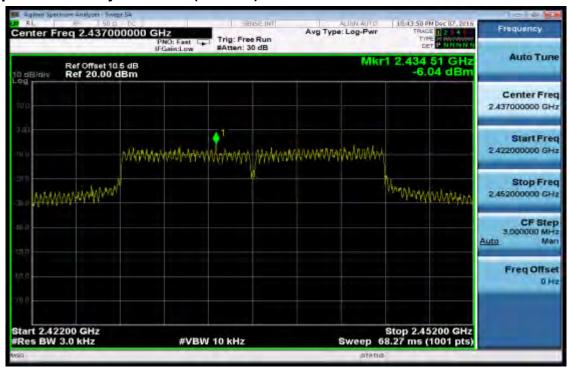


802.11n HT20

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



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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.

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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 ²)	(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

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^{* =} Plane-wave equipment power density



14.2 Maximum Permissible Exposure (MPE) Evaluation

802.11	802.11b Main							
СН	Frequency (MHz)	Data Rate	Max. Output include tune up tolerance Power (dBm)	Max. Output include tune up tolerance Power (mW)	Limit		RESULT	
1	2412	1	18.57	71.94	1 Watt =	30.00	dBm	PASS
6	2437	1	18.68	73.79	1 Watt =	30.00	dBm	PASS
11	2462	1	17.45	55.59	1 Watt =	30.00	dBm	PASS

MPE Prediction (802.11b 2412~2462)

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

Where: S = Power 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

Max. output power including tune-up tolerancel:	18.68	(dBm)
Max. output power including tune-up tolerancel:	73.790423	(mW)
Duty cycle:	97.5	(%)
Maximum Pav :	71.945662	(mW)
Peak Antenna gain (Maximum):	-0.77	(dBi)
Peak Antenna gain (linear):	0.8375293	(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)	0.011994	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.011994 mW/cm2.

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

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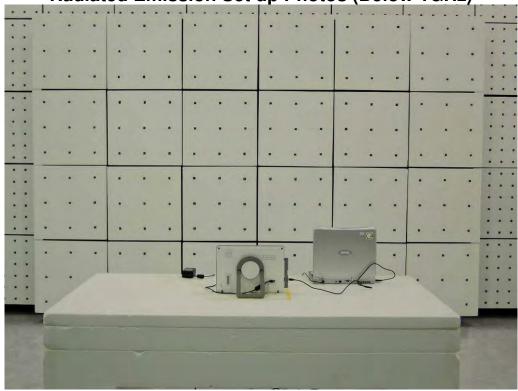
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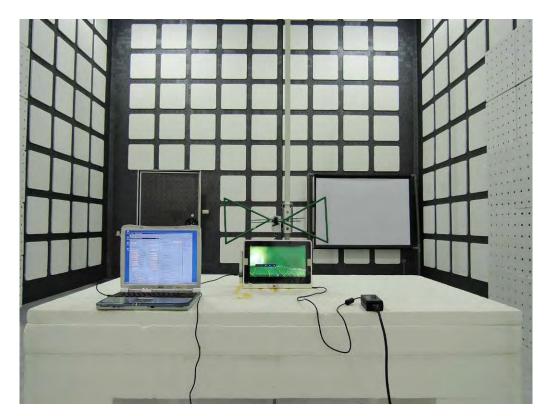
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PHOTOGRAPHS OF SET UP

Radiated Emission Set up Photos (Below 1GHz)





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Radiated Emission Set up Photos (Above 1GHz)





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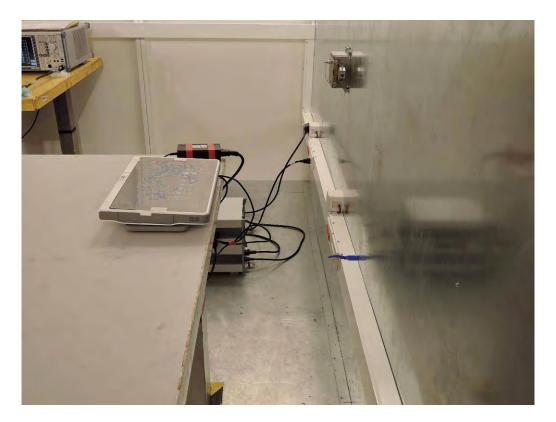
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Conducted Setup Photo (Measurement at AC Power Line)





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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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