

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

	OF			
Product Name:	Smart Module			
Brand Name:	N/A			
Model No.:	SIMT 1502			
Model Difference: FCC ID: IC:	N/A UDV-20170406 8460A-20170406			
Report No.:	ER/2017/50040			
Issue Date:	Jul. 07, 2017			
FCC Rule Part:	§15.247, Cat: DTS			
IC Rule: Prepared for:	RSS-247 issue 2 Feb. 2017 SHANGHAI SIMCOM LIMITED Building A, SIM Technology Building, No.633, Jinzhong Road, Changning District, Shanghai			
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803			
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VERIFICATION OF COMPLIANCE

Applicant:	SHANGHAI SIMCOM LIMITED Building A, SIM Technology Building, No.633, Jinzhong Road Changning District, Shanghai			
Product Name:	Smart Module			
Brand Name:	N/A			
Model No.:	SIMT 1502			
Model Difference:	N/A			
FCC ID:	UDV-20170406			
IC :	8460A-20170406			
Report Number:	ER/2017/50040			
Date of test:	May 08, 2017 ~ Jul. 04, 2017			
Date of EUT Received:	May 08, 2017			

We hereby certify that:

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

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

Test By:	Ton Lis	Date:	Jul. 07, 2017
Prepared By:	Tin Lin / Engineer Karen Huang	Date:	Jul. 07, 2017
Approved By: 	Karen Huang / Clerk Jim Chang Jim Chang / Asst. Manager	Date:	Jul. 07, 2017

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Revision History

Report Number	Revision	Description	Issue Date
ER/2017/50040	Rev.00	Initial creation of document	Jul. 07, 2017

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GENERAL INFORMATION 1

1.1 Product description

General:

Product Name:	Smart Module
Brand Name:	N/A
Model No.:	SIMT 1502
Model Difference:	N/A
Product SW/HW version:	CB03_8909_V4.4_20160901/ V1.2
Radio SW/HW version:	N/A / N/A
Test SW Version:	N/A
RF power setting in TEST SW:	N/A
Power Supply:	3.8Vdc from DC power Supply

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Type of Emission 99%	Modulation Technology
11b/g	2412-2462	11	11 b: 19.75dBm g: 22.42dBm		DSSS, OFDM
11n	HT20 2412-2462	11	HT20: 22.41dBm	HT20:17M9D1D	OFDM
Antenna	Designation:	ation: External Antenna, Gain: 1.48dBi			
Modulati	on type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM			
Transitio	n Rate:	ate: 802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 72.2Mbps			

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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 Canada RSS-247 issue 2 Feb. 2017 Canada RSS-Gen issue 4 Nov. 2014 ANSI C63.10:2013 Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

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

(TAF code 0513)

FCC Registration Numbers are: 509634

Canada Registration Number: 4620A-5.

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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SYSTEM TEST CONFIGURATION 2

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.

Radiated Emissions 2.3.2

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. Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss and splitter. Offset = RF cable loss (dB)+ splitter(dB) =10.9 (dB)

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2.5 Configuration of Tested System

Fig. 2-1 Configuration of Conducted and Radiated Tested System



Fig. 2-2 Conduction

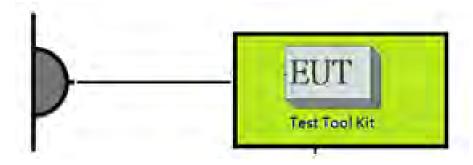


Table 2-1 Equipment Used in Tested System

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

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SUMMARY OF TEST RESULTS 3

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

DESCRIPTION OF TEST MODES 4

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		

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4.2 The Worst Test Modes and Channel Details

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

RADIATED EMISSION TEST:

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

RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE AVAILABLE TESTED CHANNEL 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		

Note:

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

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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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:

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

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

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

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CONDUCTED EMISSION TEST 6

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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.				
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018				
LISN	SCHWARZB ECK	NSLK 8127	8127-649	05/22/2016	05/21/2017				
LISN	MESS TEC	FCC-LISN-50/250-25-2-01	4034	03/19/2017	03/18/2018				
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2016	11/25/2017				

6.3 EUT Setup

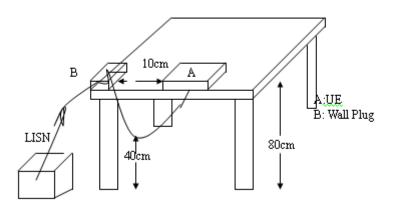
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

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

6.6 Measurement Result

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

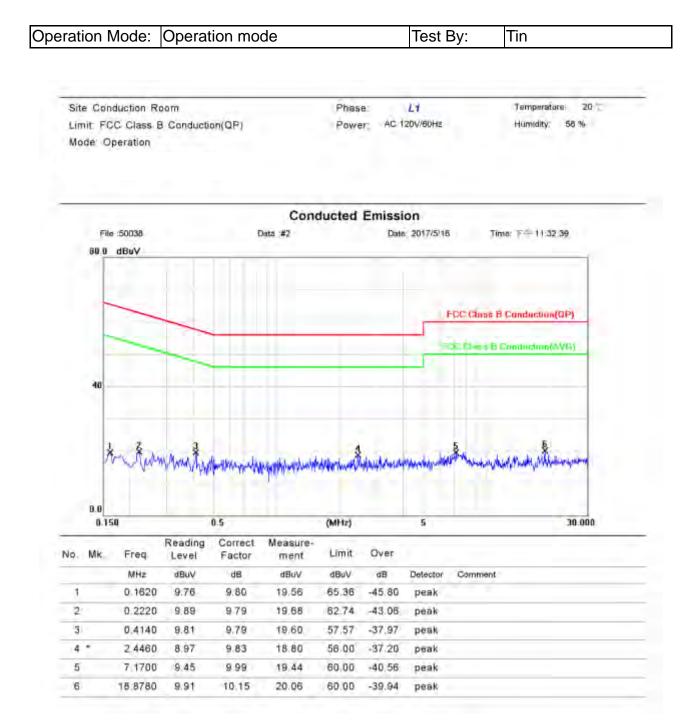
Note2: The * reveals the worst-case results that closet to the limit

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AC POWER LINE CONDUCTED EMISSION TEST DATA

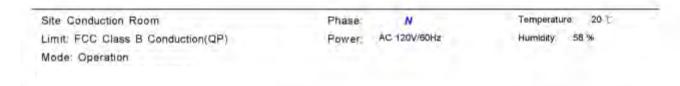


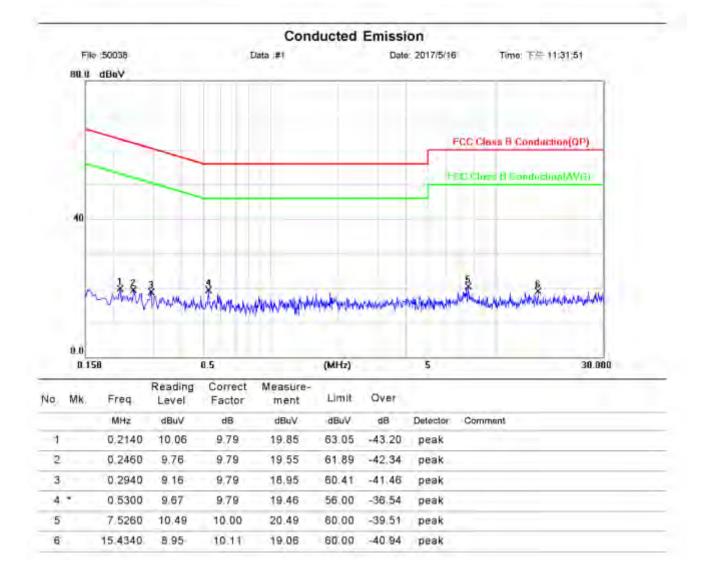
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DUTY CYCLE OF TEST SIGNAL 7

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	97.85	0.09
802.11g	87.41	0.58
802.11n_20	86.58	0.63

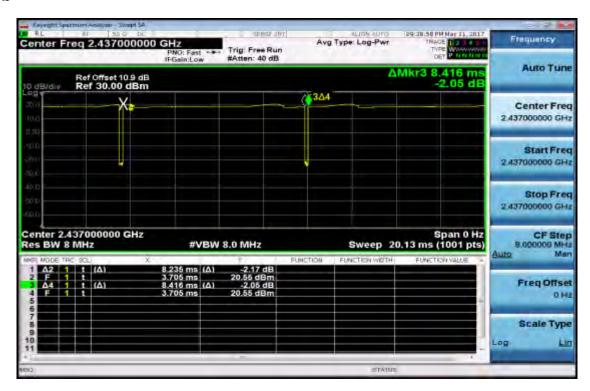
Duty Cycle Factor: $10 * \log(1/0.9785) = 0.09$ Duty Cycle Factor: $10 * \log(1/0.8741) = 0.58$ Duty Cycle Factor: 10 * log(1/0.8658) = 0.63

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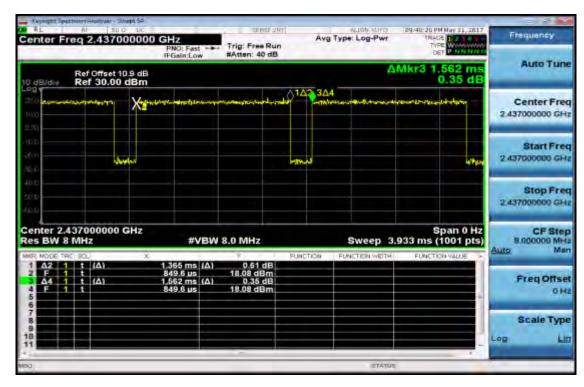
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7.1 DUTY CYCLE TEST SIGNAL Measurement Result 802.11 b



802.11 g



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802.11 n_20 MHz

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PEAK OUTPUT POWER MEASUREMENT 8

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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017					
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017					
EXA Spectrum Ana- lyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018					
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018					
Coaxial Cable	HUBER+SUH NER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018					
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018					
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018					
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017					
Temperature Chamber	TERCHY	MHG-120LF	911009	05/17/2016	05/16/2017					

Remark: Please note that the duration to conduct the test took place in the mean time when the calibration for several equipments is due, and therefore extra tables of equipment calibration is constructed to indicate the calibration work is still maintained.

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018

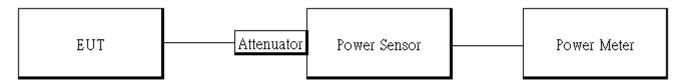
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8.3 **Test Set-up**

Power Meter:



8.4 Measurement Procedure

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

Power Meter:

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

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

8.5 Measurement Result

802.1	1b Main					
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	1	19.50	89.13	1 Watt = 30.00 dBm	PASS
6	2437	1	19.75	94.41	1 Watt = 30.00 dBm	PASS
11	2462	1	19.67	92.68	1 Watt = 30.00 dBm	PASS
802.1	1b Main					
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit	RESULT
1	2412	1	17.04	50.58	1 Watt = 30.00 dBm	PASS
6	2437	1	17.41	55.08	1 Watt = 30.00 dBm	PASS
11	2462	1	17.24	52.97	1 Watt = 30.00 dBm	PASS

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802.1	1g Main					
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	6	21.23	132.74	1 Watt = 30.00 dBm	PASS
6	2437	6	22.42	174.58	1 Watt = 30.00 dBm	PASS
11	2462	6	21.06	127.64	1 Watt = 30.00 dBm	PASS
802.1	1g Main					
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit	RESULT
1	2412	6	13.75	23.71	1 Watt = 30.00 dBm	PASS
6	2437	6	17.14	51.76	1 Watt = 30.00 dBm	PASS
11	2462	6	13.62	23.01	1 Watt = 30.00 dBm	PASS

802.1	1n_HT20	M Main				
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT
1	2412	MCS0	20.78	119.67	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	22.41	174.18	1 Watt = 30.00 dBm	PASS
11	2462	MCS0	20.61	115.08	1 Watt = 30.00 dBm	PASS
802.1	1n_HT20	M Main				
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit	RESULT
1	2412	MCS0	12.86	19.32	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	17.16	52.00	1 Watt = 30.00 dBm	PASS
11	2462	MCS0	12.69	18.58	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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EIRP

802.1	1b Main							
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limi	t	RESULT
1	2412	1	17.04	1.48	18.52	4W= 36	dBm	PASS
6	2437	1	17.41	1.48	18.89	4W= 36	dBm	PASS
11	2462	1	17.24	1.48	18.72	4W= 36	dBm	PASS

802.11	1g Main								
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit		RESULT
1	2412	6	13.75	1.48	15.23	4W=	36	dBm	PASS
6	2437	6	17.14	1.48	18.62	4W=	36	dBm	PASS
11	2462	6	13.62	1.48	15.10	4W=	36	dBm	PASS

802.11	In_HT20N	/I Main							
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)		Limit		RESULT
1	2412	MCS0	12.86	1.48	14.34	4W=	36	dBm	PASS
6	2437	MCS0	17.16	1.48	18.64	4W=	36	dBm	PASS
11	2462	MCS0	12.69	1.48	14.17	4W=	36	dBm	PASS

* Note: EIRP = Average Power + Gain

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6dB & 99% BANDWIDTH MEASUREMENT 9

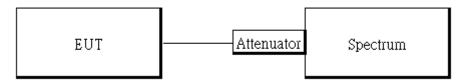
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

	Cond	ucted Emission	Test Site	-	
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018

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.

- 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

802 11h Main

002.110				002.110	INALLI		
Freq.	6dB BW	Limit	Result	Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)		(MHz)	(kHz)	(kHz)	Nesuit
2412	9044	> 500	PASS	2412	16420	> 500	PASS
2437	9057	> 500	PASS	2437	16390	> 500	PASS
2462	8595	> 500	PASS	2462	16380	> 500	PASS

802 11 a Main

802.11 n HT20 Main

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17630	> 500	PASS
2437	17620	> 500	PASS
2462	17580	> 500	PASS

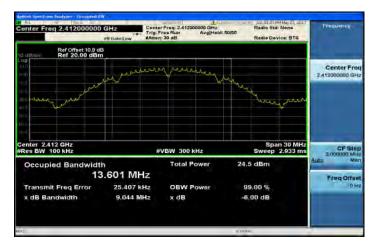
802.11b Ma	in			802.11n_HT	302.11n_HT20M Main		
Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)		
2412	13.709	2412	14.967	2412	17.829		
2437	13.614	2437	16.657	2437	17.703		
2462	13.670	2462	16.753	2462	17.864		

*Refer to next page for plots

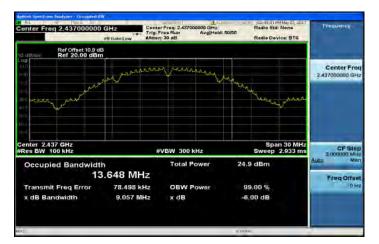
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6dB BW 802.11b CH-Low



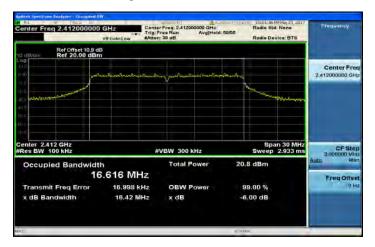
6dB BW 802.11b CH-Mid



6dB BW 802.11b CH-High



6dB BW 802.11g CH-Low



6dB BW 802.11g CH-Mid



6dB BW 802.11g CH-High



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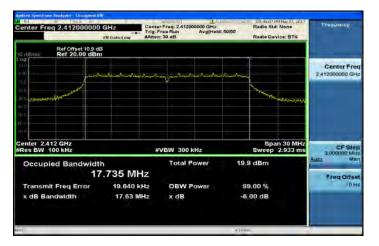
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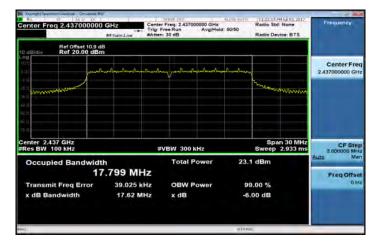
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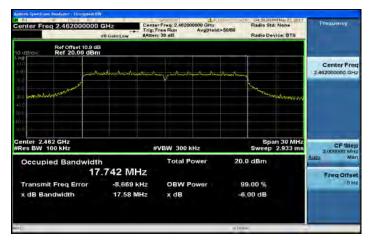
6dB BW 802.11n HT20M CH-Low



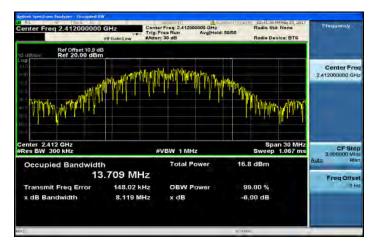
6dB BW 802.11n_HT20M CH-Mid



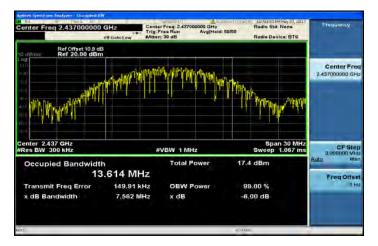
6dB BW 802.11n_HT20M CH-High



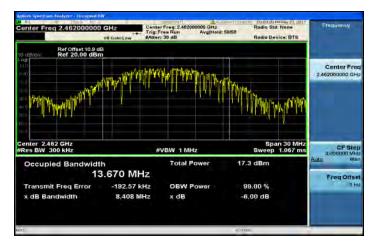
99% BW 802.11b CH-Low



99% BW 802.11b CH-Mid



99% BW 802.11b CH-High



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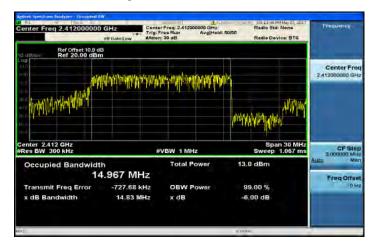
Since Statements in the statement of therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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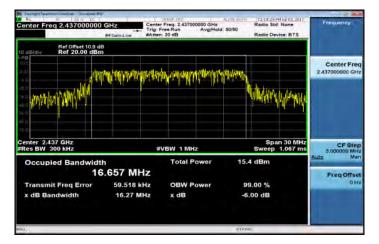
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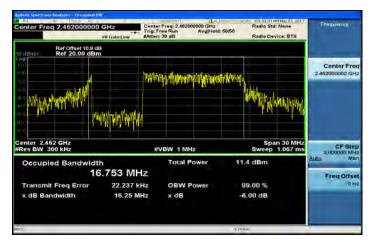
99% BW 802.11g CH-Low



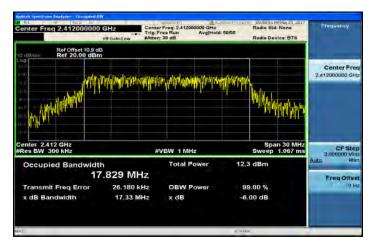
99% BW 802.11g CH-Mid



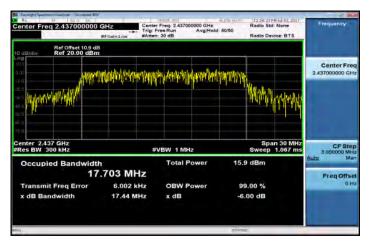
99% BW 802.11g CH-High



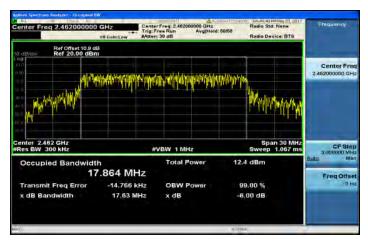
99% BW 802.11n HT20M CH-Low



99% BW 802.11n_HT20M CH-Mid



99% BW 802.11n_HT20M CH-High



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

As per KDB 558074 D01 11.1 a)

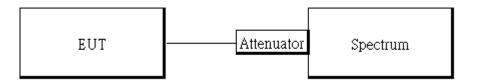
If the maximum peak conducted output power procedure was used to demonstrate compliance as described in 9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10 Table 6, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9 Table4 &5.

Conducted Emission Test Site EQUIPMENT MODEL SERIAL LAST CAL DUE. MFR TYPE NUMBER NUMBER CAL. EXA Spectrum MY53120760 03/21/2017 Agilent N9030A 03/20/2018 Analyzer DC Block **Mini-Circuits** BLK-18-S+ 1 01/05/2017 01/04/2018 Mini-Circuit BW-S10W2+ 01/05/2017 01/04/2018 Attenuator 2

10.2 Measurement Equipment Used

10.3 Test SET-UP



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10.4 Measurement Procedure

Band Edge Limit Calculation:

- 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 = 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:

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

Conducted Spurious Emission:

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

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10.5 **Measurement Result**

Bande	edge Limi	t 802.11b MODE Bandedge Limit 802.11g MODE Bandedge Limit 802.11n20 MO				802.11n20 MODE		
Freq. (MHz)	PSD (dBm)	Band edge Limit (dBm)	Freq. (MHz)	PSD (dBm)	Band edge Limit (dBm)	Freq. (MHz)	PSD (dBm)	Band edge Limit (dBm)
2412	8.80	-11.20	2412	2.40	-17.60	2412	1.35	-18.65
2462	9.15	-10.85	2462	2.76	-17.24	2462	1.91	-18.09

802.11b PSD for Bandedge 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)



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802.11n_HT20 PSD FOR BANDEDGE LIMIT (CH-Low)



802.11n_HT20 PSD FOR BANDEDGE LIMIT (CH-High)

Frequency	DALBERS PAR May 21, 2017 TRACE TYPE TYPE DATE: D	Avg Type: Log-Pwr	Trig: Free Run #Atten: 30 dB	2000000 GHz PND: Fast IFGain:Low	RL Center Freq 2.46
Auto Tuni	2.455 79 GHz 1.91 dBm	Mkr		et 10.9 dB 00 dBm	Ref Offse
Center Free 2.462000000 GH				1	10.0
Start Free 2,447000000 GH		and month with a with a surger	straitury pertone	produced and months	9 ab
Stop Free 2,477000000 GH	Marshall March Merch			nd l	an antal alerta average
CF Step 3.000000 MH Auto Ma					10 0
Freq Offse 0 H					10.0
	top 2.47700 GHz		21.10.		itart 2.44700 GHz
	33 ms (1001 pts)	Sweep 2	300 kHz	#VBW	Res BW 100 kHz

802.11b Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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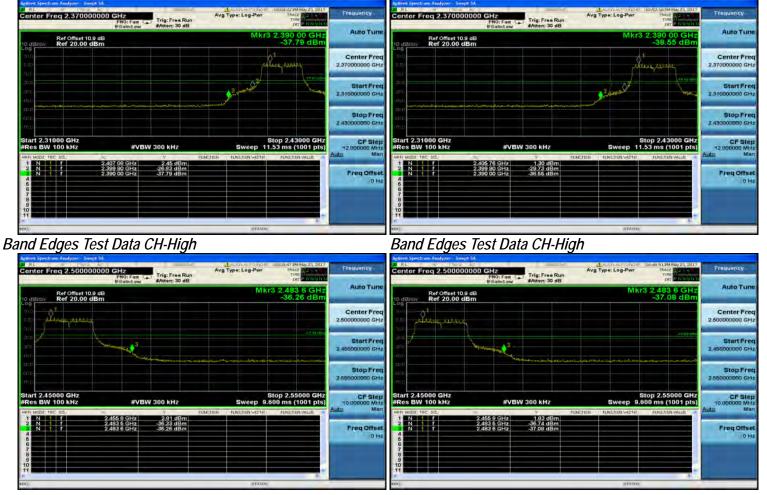
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802.11q Band Edges Test Data CH-Low

802.11n_HT20 Band Edges Test Data CH-Low



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802.11b Spurious Emission Test Data CH-Low

Center Freq 1.51500000	PND: Fast Trig: Free Run FSGint.ow #Atten: 30 dB	Avg Type: Log-Pwr	102:40:24 04 May 23, 2017 16ACE 1 2 2 4 1742 04040400 1667 P 10107011	Frequency
Ref Offset 10.9 dB		Mkr	1 2.411 9 GHz 7.65 dBm	Auto Tune
- 00 (000) 9.00 - 100			1	Center Fred 1.516000000 GH;
2012 2012 (0.0	ف الجاء الرام مل من المراجع الم المراجع الم المراجع الم الم			Start Free 30,000000 MH
spip and an				Stop Fred 3.00000000 GH
Start 30 MHz Res BW 100 kHz	#VBW 300 kHz	Sweep 28	Stop 3.000 GHz 3.9 ms (1001 pts)	CF Step 297.000000 MH
IN II ()	2,411 9 GHz 7,65 dBm	UNERGN - FUNERGN WATH	FUNCTION VALUE	Auto Man Freq Offset 0 Hz
8				

Frequency	TRACE THE PARTY	: Log-Pwr		ee Run 30 dB	Trig: Free #Atten: 30	GHZ PNO: Fast C	50000000		RL enter f
Auto Tun	476 5 GHz 25.10 dBm	Mkr1 3					et 10.9 dB .00 dBm	Ref Offse Ref 20.	dBraiv
Center Fre 14,75000000 GH									24 (10) (10)
Start Fre 3,000000000 CH	mann	Jan a said a		and the second second	مریابی رو سریابی رو				0:0 0:0
Stop Fre 26.50000000 GH									
CF Ste 2.350000000 GH Auto Ma	op 26.50 GHz 6 s (1001 pts)	Sweep 2.	UNICTION	-	300 kHz	#VBW	×	V 100 KHz	tart 3.0 Res BV
Freq Offs 01				dBm	-25.10 dE	i 5 GHz	26.476		N 2334465677899

Spurious Emission Test Data CH-Mid

Agilient Spectrum Analyzer - Swept SA		-100000147		02:49:18 PM May 23, 2817	ALT IN A DECIMAL
Center Freq 1.51500000	PNO: Fast	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	TYPE	Frequency
Ref Offset 10.9 dB			Mk	1 2.438 7 GHz 7.93 dBm	Auto Tuni
00 (00) 0.03				1 The second se	Center Free 1.516000000 GH
3010 2010 	والمعكان والمار		مر المراجع الم		Start Free 30,000000 MH
spip emp mg					Stop Free 3.00000000 GH
Start 30 MHz Res BW 100 kHz	#VBW	300 kHz		Stop 3.000 GHz 3.9 ms (1001 pts)	CF Step 297.000000 MH Auto: Mai
I TO THE SEL OF	2.438 7 GHz	7.93 dBm	NETION FUNCTION WOTH	FUNCTION WALLS	- man
2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5					Freq Offse
7 10 10 10 10 10 10 10 10 10 10 10 10 10					
N()			STATUS		

enter Freq 14.750000000	GHZ PNO: Fast Trig: Free Run IFGain:Low JAtten: 30 dB	Avg Type: Log-Pwr	TYPE DESCRIPTION	Frequency
Ref Offset 10.9 dB Ref 20.00 dBm		Mkr	26.335 5 GHz -24.72 dBm	Auto Tune
100 100 100				Center Fred 14,750000000 GH;
			sur three	Start Freq 3,00000000 GHa
				Stop Free 26.50000000 GH
art 3.00 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2.360000000 GH
	35 5 GHz -24.72 dBm	INCTION ILNETION WADTHE	FUNCTION WALLIE	Auto Mar
2334666677				Freq Offse 0 H

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Spurious Emission Test Data CH-High

enter Freq 1.51500	DNO: East () Ir	ig: Free Run Itten: 30 dB	Avg Type: Log-Pwr	102:90:10 PM May 23, 2817 1RACE 1 2 : - 1Y80 1Y80 1 P N MITTH	Frequency
Ref Offset 10 Ref 20.00			Mkr	1 2.462 4 GHz 8.61 dBm	Auto Tune
29 000 010					Center Freq 1 51600000 GHa
	الدائية ويستر والمالي			N. Stranger Stranger - 100	Start Free 30,000000 MHz
					Stop Fred 3.00000000 GH
tart 30 MHz Res BW 100 kHz	#VBW 300			Stop 3.000 GHz 3.9 ms (1001 pts)	CF Step 297.000000 MHz Auto Mar
N HODE THE SC.		Y 2014 9.61 dBm	CTION FUNCTION MOTH	PUNCTION VALUE	Freq Offset

enter Freq 14.7500000	PNO: Fast Calification Trig: Free Run FGaint.ow #Atten: 30 dB	Avg Type: Log-Pwr	1 02:50:45 PM May 23, 2017 TRACE 1 2 - 4 TVTE 0 4440000 DET P TUTIEND	Frequency
Ref Offset 10.9 dB Ref 20.00 dBm		Mkr	1 26.382 5 GHz -25.31 dBm	Auto Tune
			11 22 42	Center Fred 14,75000000 GHz
	مرجران مراجع الموسا المراجع الم	a second and a second and	1 مسلمان مسیم رسانه م	Start Freq 3,000000000 GHz
				Stop Fred 26.50000000 GHz
tart 3.00 GHz Res BW 100 kHz	#VBW 300 kHz	Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2.350000000 GHz Auto Mar
1 N 1 F 26	382 5 GHz .25 31 dBm			Freq Offset 0 Hi

802.11g Spurious Emission Test Data CH-Low

Center Freq 1.51500000	0 GHz PNO: Fast C	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	103:00:44 PM May 22, 2017 TRACE 12 PM TYPE Normalization DET PT MILLION	Frequency
10 dB/div Ref Offset 10.9 dB			Mki	1 2 414 9 GHz 1.95 dBm	Auto Tune
100 0.00				1	Center Fred 1.515000000 GHa
100 200 201		وموضوعة وم		-11.12 (51)	Start Free 30,000000 MH;
SD D entr					Stop Fred 3.00000000 GHz
Start 30 MHz #Res BW 100 KHz			Sweep 28	Stop 3.000 GHz 3.9 ms (1001 pts)	CF Step 297.000000 MHz Auto Man
	2.414 9 GHz	1.95 dBm			Freq Offset 0 Hz
			STATUS	-	

enter Freq 14.750000000 G	GHZ PNO: Fast C Trig: Free Gain:Low Atten: 30	Run	Type: Log-Pwr	10910315144 May 20, 2017 TRACE 122 TVTC Disconstruction DET P To March 1	Frequency
Ref Offset 10.9 dB Ref 20.00 dBm			Mkr1	26 265 0 GHz -25.55 dBm	Auto Tune
M 100 101					Center Fred 14,750000000 GH;
		مى مەربىمى ئىسىر مەربىلىمىر	and the second and th		Start Fred 3,00000000 CH;
					Stop Free 26.500000000 GH
art 3.00 GHz es BW 100 kHz	#VBW 300 kHz		Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2.360000000 GH
					Auto: Mar
N HODE THE SEL SC N 1 7 26.255	5 0 GHz .25 55 dB	MUNICIPAL	FUNCTION SHOTH	FUNCTION VALUE	

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Report No.: ER/2017/50040 Page 35 of 90

Spurious Emission Test Data CH-Mid

	Avg Type: Log-Pwr	103:16:21 PM May 23, 2017 TRACE 12:2:3 TVTC MONTHLE	Frequency
B N	Mk	1 2.441 6 GHz 2.60 dBm	Auto Tune
		<u>,</u> '	Center Fred 1,516000000 GHa
		0740 09	Start Fred 30,000000 MHz
مىمىلەر بەر يىلەر يىلەر يىلەر يەرىپەر ي مەرىپەر يەرىپەر			Stop Free 3.000000000 GH
#VBW 300 kHz			CF Step 297.000000 MH Auto Mar
	FUNCTION FUNCTION WODTH	PUNCTION VALUE	
			Freq Offse
	PhO: Fast C. Trig: Frae Ru (#Gaint.ow #WEW 300 KHz X Y EW 300 KHz	IPDD Fast (FGBINLOW Trig: Free Run Action: 30 dB B Mk #VBW 300 kHz Sweep 26 X Y Sweep 26	Industries Trig: Free Run Atten: 30 dB Trig: Free Run Atten: 30 dB B Mkr1 2.441 6 GHz 2.60 dBm Image: State Stat

nter Fred	14.75000	10000 GHz PNO: Fast IFGain:Low	Trig: Free Run #Atten: 30 dB	Ave	Type: Log-Pwr	16A	MAR 21, 2017	Frequency
Ref Offset 10.9 dB Mkr1 26.382 5 GHz Ref 20.00 dBm -24.87 dBm						Auto Tune		
0 0 0								Center Free 14,75000000 GH
			and the second second second	مرجد مودور	and a start and a start and a		1741 = 1 	Start Free 3,00000000 GHz
								Stop Free 26.50000000 GH
nt 3.00 G		#VE	300 kHz		Sweep	Stop 2 2.246 s (6.50 GHz 1001 pts)	CF Step 2.350000000 GH
NODE THE A		26.382 5 GHz	-24.87 dBm	PUNCTION	FUNCTION SADTHE	PUNCT	IN WALLE	Auto Mar
								Freq Offse

Spurious Emission Test Data CH-High

Center Freq 1.515000000 G	Avg Type: Log-Pwr Nace 122 addition of the top 23 and 7 Avg Type: Log-Pwr Nace 122 addition of the top 23 30 dB cer D top 2011	
O dBraw Ref Offset 10.9 dB Ref 20.00 dBm	Mkr1 2.462 4 GHz Auto' 2.12 dBm	Tun
1000	Center 1.51600000	
	Start 30,0000	
	Stop	
tart 30 MHz Res BW 100 kHz	tz Sweep 283.9 ms (1001 pts) 297.00000	Ster 0 MH
N I F 246 2 3 -	CIGATION ILUICIONISCTI I TUNICIONISCUE PARA	
	STATUS	

enter F	Freq 14.75	0000000 GHz PNO: Fast IFGain:Low	Trig: Free Run	Avg Type: Log-Pwr	In Logicality Per May 20, 2017 TRACE 1, 2 19 TVTC Liver Diversion Cett Production	Frequency Auto Tune
) dB/div						
10 10						Center Free 14,75000000 GH
		and the second section of	and the second			Start Free 3,00000000 GH;
10						Stop Free
x0						201000000000000
tart 3.0 Res BV	0 GHz / 100 kHz	#VE	3W 300 kHz	Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2,350000000 GH
tart 3.0 Res BW	100 kHz	#VE 25.288 5 GHz		Sweep		CF Step 2.36000000 GH: <u>Auto</u> Mar

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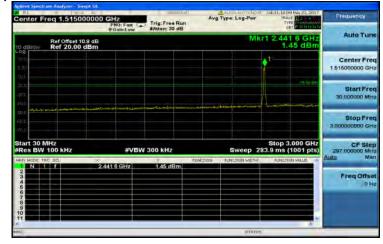


802.11n_HT20 Spurious Emission Test Data CH-Low

Center Freq 1.515000		Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	18ACE 12 State	Frequency
Ref Offset 10.9 0 dB/div Ref 20.00 dB			Mkr	1.30 dBm	Auto Tuni
1000 1010					Center Free 1.516000000 GH
2012		and a list from the second			Start Free 30,000000 MH
					Stop Fre 3.00000000 GH
Res BW 100 kHz	#VBW	300 kHz	Sweep 283	Stop 3.000 GHz 3.9 ms (1001 pts)	CF Step 297.000000 MH Auto Ma
N 1 F	2.406 0 GHz	1.30 dBm			Freq Offse 0 H
2	_		STATUS		

enter Freq 14.75000000	PNO: Fast Irig:	Free Run	Avg Type: Log-Pwr	TRACE 122 C	Frequency
dB/div Ref 0ffset 10.9 dB			Mkr	26 265 0 GHz -24.67 dBm	Auto Tune
29 00 20					Center Free 14,750000000 GH
		an and the state of the state o	وليترو وسيري والمراجع	anne 1	Start Free 3,000000000 GH
					Stop Fre 26.50000000 GH
art 3.00 GHz Res BW 100 kHz	#VBW 300 F	PENETIO		Stop 26.50 GHz 2.246 s (1001 pts)	2,350000000 GH Auto Ma
N 1 7 263	265 0 GHz24,6	7 dBm			Freq Offse 0 H

Spurious Emission Test Data CH-Mid



	#Atten: 30 dB		DET P TOTOTOTO	Contraction (Contraction)
Ref Offset 10 9 dB Mkr1 26.335 5 GHz 0 dB/gr Ref 20.00 dBm -24.45 dBm				Auto Tuni
				Center Fre 14,75000000 GH
	معلمه المعادين	فالاستريبان والماستان المساور ومراجع	and the second	Start Fre 3.00000000 CH
- Constant and the constant of the				Stop Fre 26 50000000 GH
art 3.00 GHz tes BW 100 kHz \$VBW 300 kHz \$veep 2.246 s (1001 pts) host the ct.				CF Ste 2.36000000 GH Auto Ma
26.335 5 GHz	-24,46 dBm	UNCTION FUNCTION SADTH	FUNCTION WALLE	
				Freq Offs
	: #VBI	**************************************		

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Spurious Emission Test Data CH-High

Center Freq 1.5150000	PNO: Fast Trig: Free Run #Raten: 30 dB	Avg Type: Log-Pwr	TVPC	dunucy
Ref Offset 10.9 d O dEvalv Ref 20.00 dBn	в	Mkr1 2.	459 5 GHz 1.10 dBm	Auto Tune
1000 1010		1- 1-		enter Fred 000000 GHa
200 200	الم موجود المراجع الم			Start Fred
50 0 60 0 76 1)	and a second			Stop Fred
Start 30 MHz Res BW 100 kHz	#VBW 300 kHz	Sweep 283.9 n	p 3.000 GHz 1s (1001 pts) NETICN VALLE	CF Step 000000 MHz Mar
2 3 4 5 5 6 7 8 5 7 8	2.499.5 GHZ 1,10 0Bm			req Offset 0 Hz
9 10 11				

enter Freg 14.75000000	0 GHz	THE	Avg Type: Log-Pwr	III (DAVADHO DAI MAY 21, 2017) TRACE	Frequency
	PHO: Fast Trig	ten: 30 dB		DET PTUDIO 701	1000
o dBraw Ref Offset 10.9 dB			Mk	r1 26.359 0 GHz -24.03 dBm	Auto Tuni
1000 9.00					Center Free 14.750000000 GH
200 200 000		البسم مهيد المعد المسل			Start Free 3,000000000 GH;
					Stop Free
m.)					2010000000000
Start 3.00 GHz Res BW 100 kHz	#VBW 300			Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2,350000000 GH
Start 3.00 GHz Res BW 100 kHz	Y		SWCCP	2.246 s (1001 pts)	CF Stej 2.35000000 GH Auto Ma Freq Offse
Start 3.00 GHz Res BW 100 kHz wrv.wooc 10: 50. 20 1 N 1 f 26.	Y			2.246 s (1001 pts)	CF Ste 2.350000000 GF Auto Mi

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11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 & RSS-Gen §8.10 Table 6 limit as below.

And according to §15.33(a) (1) & RSS-Gen §8.9 Table 4 & 5, for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level ($dB\mu V/m$) = 20 log Emission level ($dB\mu V/m$)

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11.2 Measurement Equipment Used:

		966 Chamber			
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2016	09/19/2017
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/01/2016	07/31/2017
Pre-Amplifier	Agilent	8447D	2944A07676	01/05/2017	01/04/2018
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/05/2017	01/04/2018
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	01/05/2017	01/04/2018
3m Site NSA	SGS	966 chamber	N/A	07/01/2016	06/30/2017
Low Loss Cable	Huber Suhner	966 TX	1	01/05/2017	01/04/2018
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/05/2017	01/04/2018

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

Remark: Please note that the duration to conduct the test took place in the mean time when the calibration for several equipments is due, and therefore extra tables of equipment calibration is constructed to indicate the calibration work is still maintained.

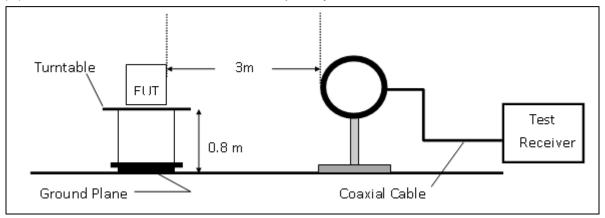
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
3m Site NSA	SGS	966 chamber	N/A	07/01/2017	06/30/2018

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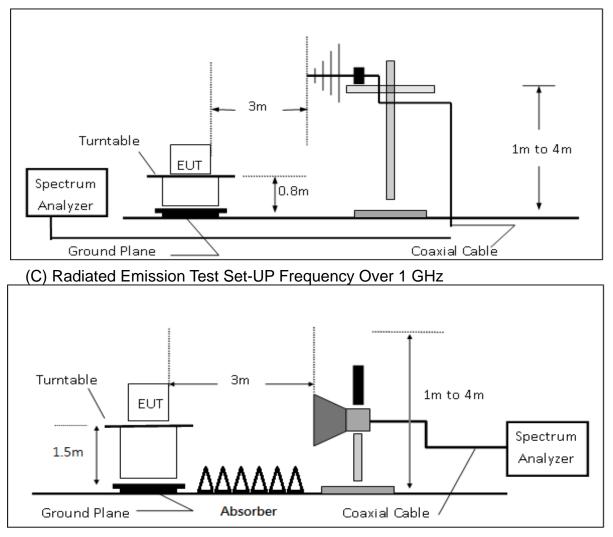


11.3 Test SET-UP

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



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



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11.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 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	0	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(dBµV/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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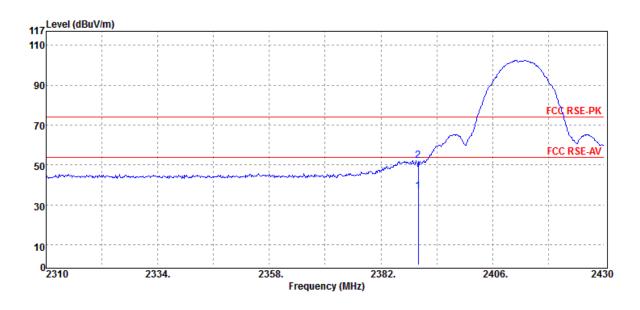
Radiated Band Edge Measurement Result (802.11b)

Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11b :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	38.65	-1.74	36.91	54.00	-17.09
2390.00	E	Peak	53.99	-1.74	52.25	74.00	-21.75

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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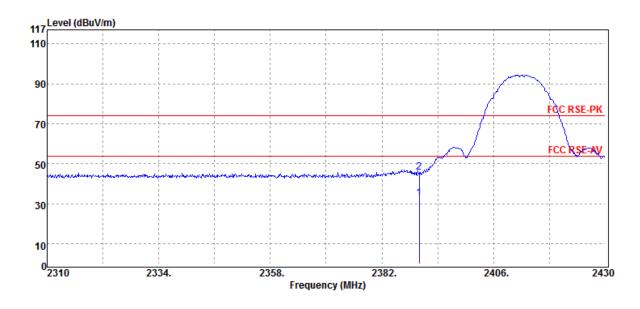


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11b :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	34.69	-1.74	32.95	54.00	-21.05
2390.00	E	Peak	47.40	-1.74	45.66	74.00	-28.34

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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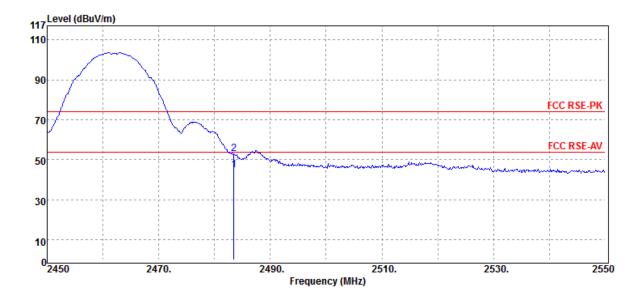


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11b :2462 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :VERTICAL



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
_	2483.50	E	Average	46.40	-1.62	44.78	54.00	-9.22
	2483.50	E	Peak	54.53	-1.62	52.91	74.00	-21.09

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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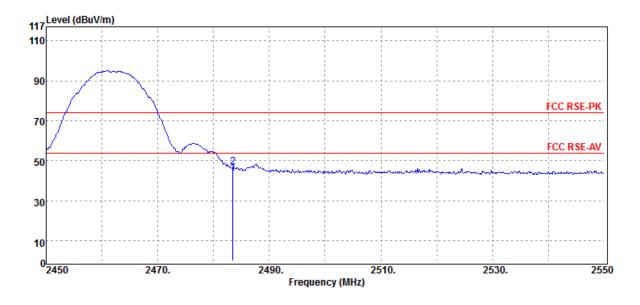


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11b :2462 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	45.36	-1.62	43.74	54.00	-10.26
2483.50	E	Peak	48.41	-1.62	46.79	74.00	-27.21

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

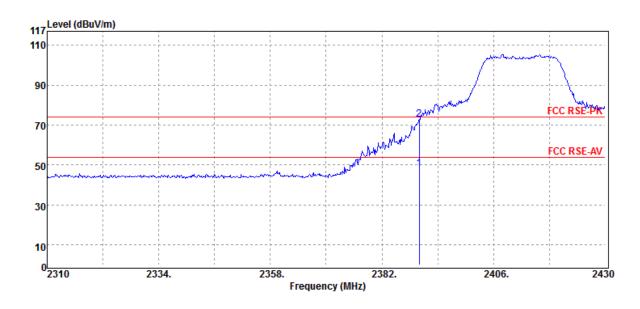
Radiated Band Edge Measurement Result (802.11g)

Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11g :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
2390.00	E	Average	49.97	-1.74	48.23	54.00	-5.77	-
2390.00	E	Peak	74.79	-1.74	73.05	74.00	-0.95	

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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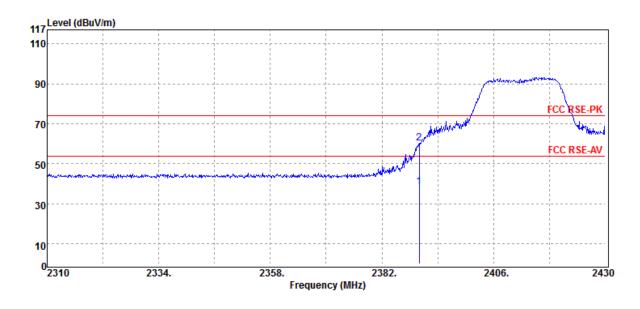


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11g :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	40.26	-1.74	38.52	54.00	-15.48
2390.00	E	Peak	62.01	-1.74	60.27	74.00	-13.73

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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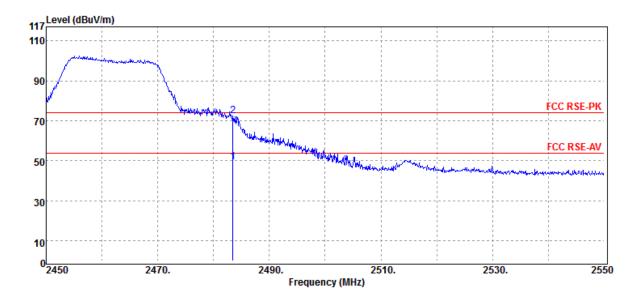


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11g :2462 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	51.01	-1.62	49.39	54.00	-4.61
2483.50	Е	Peak	74.26	-1.62	72.64	74.00	-1.36

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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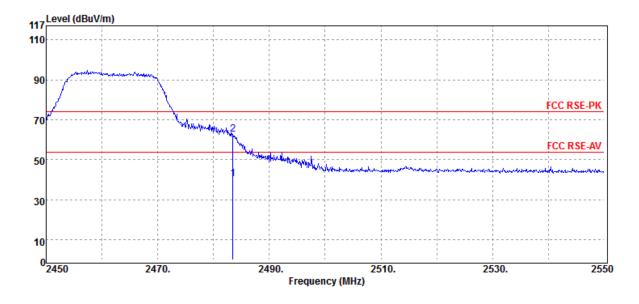


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11g :2462 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :HORIZONTAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	42.21	-1.62	40.59	54.00	-13.41
2483.50	E	Peak	64.29	-1.62	62.67	74.00	-11.33

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



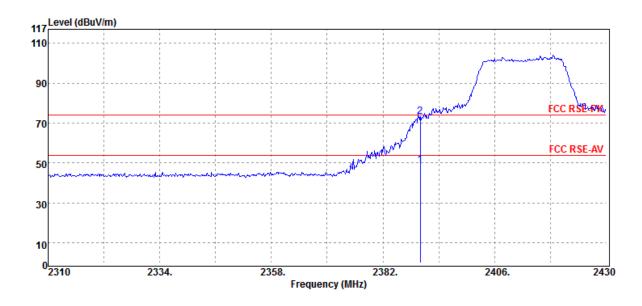
Radiated Band Edge Measurement Result (802.11_HT20)

Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11n20 :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	50.87	-1.74	49.13	54.00	-4.87
2390.00	Е	Peak	74.86	-1.74	73.12	74.00	-0.88

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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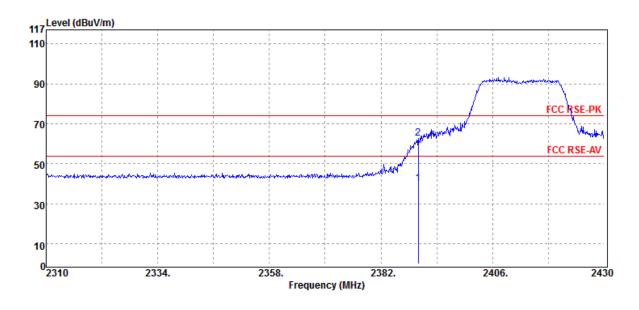


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11n20 :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :HORIZONTAL



Fre	eq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
M	Ηz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
239	0.00	E	Average	41.86	-1.74	40.12	54.00	-13.88
239	0.00	E	Peak	64.56	-1.74	62.82	74.00	-11.18

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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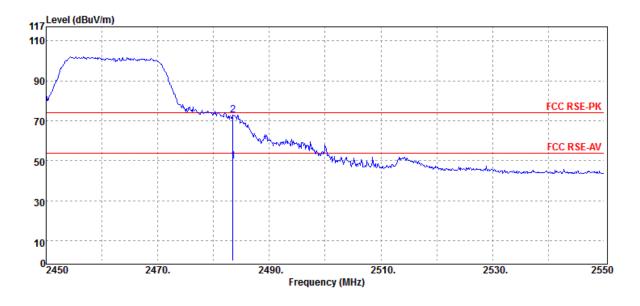


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11n20 :2462 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	51.36	-1.62	49.74	54.00	-4.26
2483.50	Е	Peak	74.42	-1.62	72.80	74.00	-1.20

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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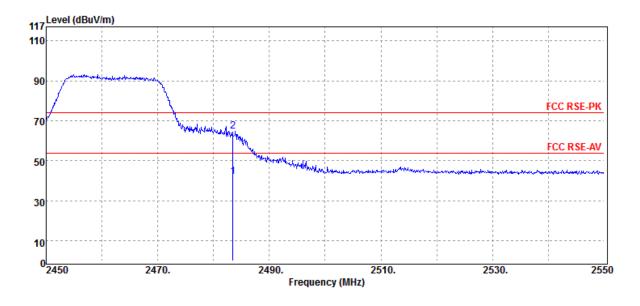


Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11n20 :2462 MHz :Bandedge CH HIGH :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-05-12 :22 deg_C / 61 RH :Mike :HORIZONTAL



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
_	2483.50	E	Average	43.72	-1.62	42.10	54.00	-11.90
	2483.50	E	Peak	66.26	-1.62	64.64	74.00	-9.36

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



Below 1GHz Worst-Case Data:

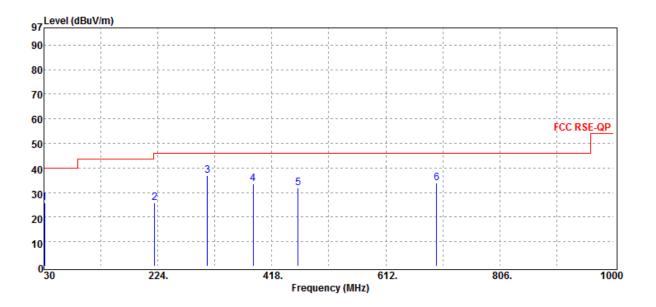
Radiated Spurious Emission Measurement Result (802.11 g)

Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11 g :2412 MHz :Tx CH LOW :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

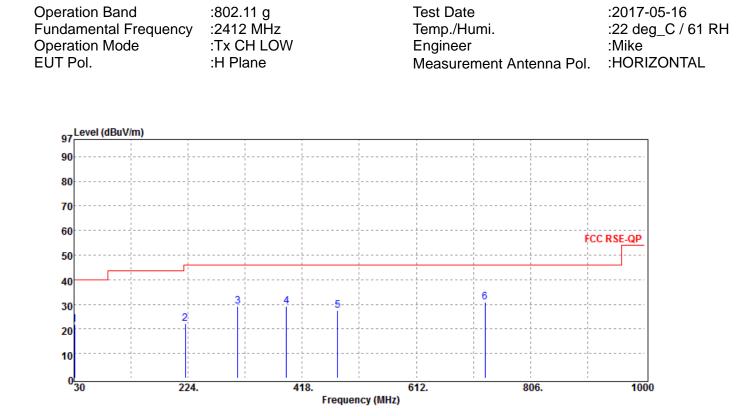
:2017-05-16 :22 deg C / 61 RH :VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	S	Peak	34.90	-9.15	25.75	40.00	-14.25
218.18	S	Peak	35.10	-9.33	25.77	46.00	-20.23
308.39	S	Peak	42.61	-5.57	37.04	46.00	-8.96
385.99	S	Peak	37.91	-4.31	33.60	46.00	-12.40
462.62	S	Peak	34.45	-2.56	31.89	46.00	-14.11
698.33	S	Peak	32.35	1.40	33.75	46.00	-12.25

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	S	Peak	31.13	-9.15	21.98	40.00	-18.02
219.15	S	Peak	31.45	-9.28	22.17	46.00	-23.83
308.39	S	Peak	34.72	-5.57	29.15	46.00	-16.85
390.84	S	Peak	33.49	-4.18	29.31	46.00	-16.69
478.14	S	Peak	29.93	-2.43	27.50	46.00	-18.50
728.40	S	Peak	29.28	1.65	30.93	46.00	-15.07

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Operation Band Test Date :2017-07-04 :802.11 g Fundamental Frequency :2437 MHz Temp./Humi. :22 deg_C / 61 RH **Operation Mode** :Tx CH MID Engineer :Mike EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol. 97 90 80 70 60 FCC RSE-OP 50 40 6 30 20 10 0<mark>___</mark> 224. 418. 612. 806. 1000 Frequency (MHz)

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	S	Peak	34.95	-9.15	25.80	40.00	-14.20
232.73	S	Peak	34.80	-8.73	26.07	46.00	-19.93
308.39	S	Peak	40.67	-5.57	35.10	46.00	-10.90
385.99	S	Peak	39.79	-4.31	35.48	46.00	-10.52
462.62	S	Peak	35.98	-2.56	33.42	46.00	-12.58
700.27	S	Peak	30.03	1.44	31.47	46.00	-14.53

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

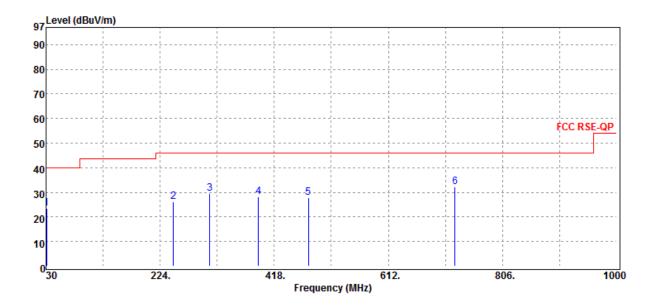


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Operation Band Test Date :802.11 g Fundamental Frequency :2437 MHz Temp./Humi. **Operation Mode** :Tx CH MID Engineer EUT Pol. :H Plane

:Mike Measurement Antenna Pol.

:2017-07-04 :22 deg_C / 61 RH :HORIZONTAL



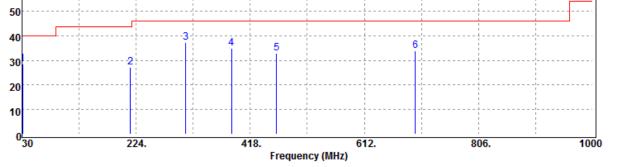
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	S	Peak	32.64	-9.15	23.49	40.00	-16.51
246.31	S	Peak	34.23	-8.01	26.22	46.00	-19.78
308.39	S	Peak	35.17	-5.57	29.60	46.00	-16.40
390.84	S	Peak	32.36	-4.18	28.18	46.00	-17.82
476.20	S	Peak	30.22	-2.45	27.77	46.00	-18.23
725.49	S	Peak	30.36	1.74	32.10	46.00	-13.90

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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:2017-05-16 **Operation Band** Test Date :802.11 g Fundamental Frequency :2462 MHz Temp./Humi. :22 deg_C / 61 RH **Operation Mode** :Tx CH HIGH Engineer :Mike EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol. 97 90 80 70 60 FCC RSE-OP



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	S	Peak	37.61	-9.15	28.46	40.00	-11.54
214.30	S	Peak	36.69	-9.55	27.14	43.50	-16.36
308.39	S	Peak	42.77	-5.57	37.20	46.00	-8.80
385.99	S	Peak	39.16	-4.31	34.85	46.00	-11.15
462.62	S	Peak	35.29	-2.56	32.73	46.00	-13.27
698.33	S	Peak	32.37	1.40	33.77	46.00	-12.23

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

40

30

20 10

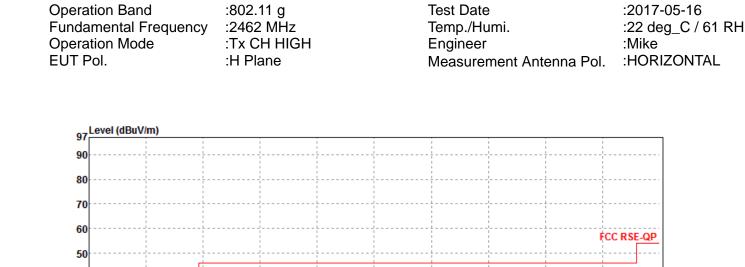
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2

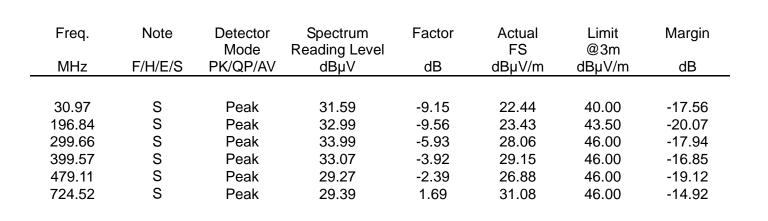
224.

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1000



418.



Frequency (MHz)

612.

6

806.

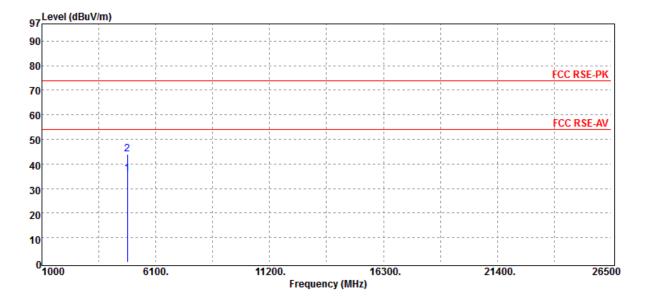
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



Above 1GHz Data:

Radiated Spurious Emission Measurement Result (802.11 b)

Operation Band	:802.11b	Test Date	:2017-07-03
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH LOW	Engineer	:Mike
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	31.06	4.93	35.99	54.00	-18.01
4824.00	Н	Peak	39.06	4.93	43.99	74.00	-30.01

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



4824.00

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		ency :	:802.11b :2412 MHz :Tx CH LOW :H Plane		-	Test Date Temp./Humi. Engineer Measurement Antenna Pol.			:2017-07-03 :21 deg_C / 62 RH :Mike :HORIZONTAL	
97 <mark>Le</mark>	evel (dBuV/m)									
90										
80		 						EC	C RSE-PK	
70							1 1 1 1 		C NJL-FN	
60								FC	C RSE-AV	
50		2								
40										
30							1 1 1 1 			
20										
10								·		
0	000	6100.		11200.	1	6300.	21400.		26500)
				Frequenc			2			
Freq. MHz			Detector Mode PK/QP/AV	Spectrum Reading Lev dBµV		Factor dB	Actual FS dBµV/m	@;	mit 3m V/m	Safe Margin dB
4824.0			Average	36.56		4.93	41.49	•	.00	-12.51

Peak

42.33

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. 除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms and conditions.htm</u> and, for elec-tronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms_e-document.htm</u></u>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction form exercising all their rights and obligations under the transaction documents is unlawful and offenders may be prosecuted to the fullest extent of the law. SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeilndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號

4.93

47.26

74.00

-26.74



4874.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11b :2437 MHz :Tx CH MID :H Plane		Test Date Temp./Hu Engineer Measure	umi.	:Mike	_C / 62 RH
97 Level (d	BuV/m)						
90	· ¹			·			
80				·		FCC RSE-PK	
70							
60				·		FCC RSE-AV	
50				·			
40	· J			 		 	
30							
20	·						
10						 	
0 <mark></mark>	610	0.	11200.	16300.	21400.	2650	0
			Frequency (MH				-
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Safe Margin dB
	r/n/e/3		υσμν	UD	ασμν/Π	υσμν/Π	UD
4874.00	Н	Average	44.59	5.13	49.72	54.00	-4.28

46.94

Peak

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5.13

52.07

74.00

-21.93



4874.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11b :2437 MHz :Tx CH MID :H Plane		Test Date Temp./Hu Engineer Measurer	ımi.	:Mike	07-03 _C / 62 RH CONTAL
97	BuV/m)		······				
90							
80						FCC RSE-PK	
70							
60						FCC RSE-AV	
50							
40							
30							
20							
10						 	
0				10000			
0 ^L 1000	610	10.	11200. Frequency (MH	16300. z)	21400.	2650	U
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
MHz	F/H/E/S	Mode PK/QP/AV	Reading Level dBµV	dB	FS dBµV/m	@3m dBµV/m	Margin dB
4874.00	Н	Average	43.12	5.13	48.25	54.00	-5.75

Peak

46.32

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5.13

51.45

74.00

-22.55



4924.00

Fundamental Frequency :: Operation Mode		:802.11b :2462 MHz :Tx CH HIG :H Plane	:2462 MHz :Tx CH HIGH		e ımi. ment Antenna	:21 deg :Mike	:2017-07-03 :21 deg_C / 62 RH :Mike :VERTICAL	
97 Level (d	BuV/m)							
90		·						
80				1 1 1 1		FCC RSE-PK		
70								
60						FCC RSE-AV		
50	2							
40		·		· · · · · · · · · · · · · · · · · · ·				
30				1 		1 1 1 1		
20						 		
10		 				 		
0 <mark></mark> 1000	610	00.	11200. Frequency (MH	16300. z)	21400.	2650	0	
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4924.00	н	Average	36.54	5.25	41.79	54.00	-12.21	
-5200		Average	00.04	0.20	T1.75	54.00		

Peak

39.76

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5.25

45.01

74.00

-28.99



4924.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11b :2462 MHz :Tx CH HIG :H Plane	iΗ	Test Date Temp./Hu Engineer Measurer	ımi.	:Mike	17-03 C / 62 RH CONTAL
97 Level (d	BuV/m)						
90							
80				·		FCC RSE-PK	
70	·						
60						FCC RSE-AV	
50	2			·			
40				·			
30		 		·			
20				·			
10		 					
0 <mark></mark> 1000	610	00.	11200. Frequency (MH	16300. z)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	37.20	5.25	42.45	54.00	-11.55

40.29

Peak

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5.25

45.54

74.00

-28.46



10

0^L 1000

6100.

Radiated Spurious Emission Measurement Result (802.11 g)

		· · · · · · · · · · · · · · · · · · ·	
peration Band	:802.11g	Test Date	:2017-07-03
undamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 62 RH
peration Mode	:Tx CH LOW	Engineer	:Mike
UT Pol.	:H Plane	Measurement Antenna Po	ol. :VERTICAL
97 Level (dBuV/m)			
90			
80			FCC RSE-PK
70			
60			FCC RSE-AV
50			· ·
2			
40			
30			· · · · · · · · · · · · · · · · · · ·
20		· · · · · · · · · · · · · · · · · · ·	

	11200.	16300.		
	1	1	1	
1		 1		
1		1		
1		1		
1		1		

21400.

26500

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	28.90	4.93	33.83	54.00	-20.17
4824.00	Н	Peak	36.08	4.93	41.01	74.00	-32.99



4824.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11g :2412 MHz :Tx CH LO\ :H Plane	N	Test Date Temp./Hu Engineer Measure	umi.	:Mike	07-03 J_C / 62 RH CONTAL
97 Level (d	BuV/m)						
90							
80							
70	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			 		FCC RSE-PK	
60							
50				1		FCC RSE-AV	
	2			, , , ,			
40	1						
30				· · · · · · · · · · · · · · · · · · ·			
20				· · · · · · · · · · · · · · · · · · ·		 I I I	
10				 1 1			
0 <mark></mark> 1000	610	00.	11200. Frequency (MH	16300. z)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	28.91	4.93	33.84	54.00	-20.16

Peak

36.41

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4.93

41.34

74.00

-32.66



4874.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11g :2437 MHz :Tx CH MID :H Plane)	Test Date Temp./Hu Engineer Measurer	ımi.	:Mike	_C / 62 RH
97	BuV/m)						
90							
80						FCC RSE-PK	
70				·			
60	· · · · · · · · · · · · · · · · · · ·			·		FCC RSE-AV	
50							
40	2					 	
30						 	
20				·		 	
10		 		 		 	
0 <mark></mark> 1000	610	0.	11200. Frequency (MH	16300. z)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	26.66	5.13	31.79	54.00	-22.21

35.26

Peak

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5.13

40.39

74.00

-33.61



4874.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11g :2437 MHz :Tx CH MID :H Plane		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:21 deg :Mike		
97 Level (d	BuV/m)							
90								
80						FCC RSE-PK		
70								
60						FCC RSE-AV		
50								
40	2							
30								
20								
10						 		
0 <mark>1000</mark>	610	00.	11200. 16300. Frequency (MHz)		21400.	2650	26500	
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4874.00	Н	Average	26.72	5.13	31.85	54.00	-22.15	

Peak

34.91

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5.13

40.04

74.00

-33.96



4924.00

Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11g :2462 MHz :Tx CH HIGH :H Plane		Test Date Temp./Hu Engineer Measure	umi.	:21 deg :Mike	:2017-07-03 :21 deg_C / 62 RH :Mike :VERTICAL		
97 Level (d	BuV/m)								
90									
80						FCC RSE-PK			
70	· J			1 					
60	·					FCC RSE-AV			
50	· · · · · · · · · · · · · · · · · · ·			 					
40	2								
30						 			
20	·								
10	· · · · · · · · · · · · · · · · · · ·			1 1 1 1		 			
0	610	0	11200.	16300.	21400.	2650	0		
⁶ 1000 6100. 11200. 16300. 21400. 26500 Frequency (MHz)									
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4924.00	Н	Average	29.41	5.25	34.66	54.00	-19.34		

Peak

36.32

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5.25

41.57

74.00

-32.43



Н

4924.00

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11g :2462 MHz :Tx CH HIGH :H Plane		Test Date Temp./Hu Engineer Measurer	ımi.	:21 deg :Mike	:2017-07-03 :21 deg_C / 62 RH :Mike :HORIZONTAL		
97	BuV/m)								
90									
80									
70			· · · · · · · · · · · · · · · · · · ·			FCC RSE-PK			
60									
						FCC RSE-AV			
50	2	1							
40	1								
30			· · · · · · · · · · · · · · · · · · ·			 			
20									
10									
0	610	0.	11200.	16300.	21400.	2650	0		
Frequency (MHz)									
Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Safe Margin dB		
4924.00	Н	Average	29.14	5.25	34.39	54.00	-19.61		

35.15

Peak

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5.25

40.40

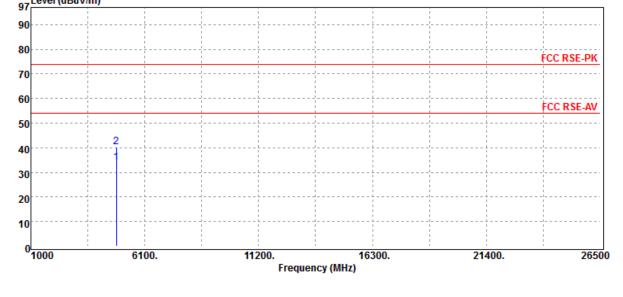
74.00

-33.60



Radiated Spurious Emission Measurement Result (802.11 HT20)

•		· — /	
Operation Band	:802.11n20	Test Date	:2017-07-03
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C / 62 RH
Operation Mode	:Tx CH LOW	Engineer	:Mike
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL
Level (dBuV/m)			



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	28.88	4.93	33.81	54.00	-20.19
4824.00	Н	Peak	35.34	4.93	40.27	74.00	-33.73

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4824.00

Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:802.11n20 :2412 MHz :Tx CH LOV :H Plane	N	Test Date Temp./Hu Engineer Measure	ımi.	:Mike	07-03 J_C / 62 RH CONTAL
97 Level (d	BuV/m)						
90	· · · · · · · · · · · · · · · · · · ·						
80						FCC RSE-PK	
70	· J			 1 1			
60						FCC RSE-AV	
50				1 			
40	2						
30				· · · · · · · · · · · · · · · · · · ·			
20							
10							
0 <mark></mark>	610	0.	11200.	16300.	21400.	2650	0
			Frequency (MH	z)			
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	28.88	4.93	33.81	54.00	-20.19

Peak

35.90

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4.93

40.83

74.00

-33.17



4874.00

Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:802.11n20 :2437 MHz :Tx CH MID :H Plane)	Test Date Temp./Hu Engineer Measurer	ımi.	:Mike	_C / 62 RH
97 Level (d	BuV/m)						
90							
80						FCC RSE-PK	
70		 					
60						FCC RSE-AV	
50				·		 	
40	2	 		1 		 	
30				·		 	
20				·			
10							
0 <mark>1000</mark>	610	0.	11200. Frequency (MH	16300. z)	21400.	2650	D
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	26.60	5.13	31.73	54.00	-22.27

Peak

34.49

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5.13

39.62

74.00

-34.38



4874.00

Operation Ba Fundamental Operation Mo EUT Pol.	I Frequency	:802.11n20 :2437 MHz :Tx CH MID :H Plane)	Test Date Temp./Hu Engineer Measurer	ımi.	:Mike	07-03 _C / 62 RH CONTAL
97 Level (d	BuV/m)						
90	· · · · · · · · · · · · · · · · · · ·			·			
80				·		FCC RSE-PK	
70	· · · · · · · · · · · · · · · · · · ·			·			
60						FCC RSE-AV	
50							
40	2						
30							
20							
10							
0 <mark></mark>	610)0.	11200.	16300.	21400.	2650	0
			Frequency (MH	Z)			
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	26.62	5.13	31.75	54.00	-22.25

Peak

35.22

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5.13

40.35

74.00

-33.65



4924.00

-33.24

74.00

Operation Ba Fundamental Operation Mo EUT Pol.	I Frequency	:802.11n20 :2462 MHz :Tx CH HIG :H Plane	Ή	Test Date Temp./Hu Engineer Measure	ımi.	:Mike	_C / 62 RH
97 Level (d	BuV/m)						
90	· · · · · · · · · · · · · · · · · · ·						
80	· · · · · · · · · · · · · · · · · · ·					FCC RSE-PK	
70		 		 			
60	· J			 		FCC RSE-AV	
50							
40	2						
30							
20				· · · · · · · · · · · · · · · · · · ·		 	
10				·		 	
0 <mark></mark> 1000	610	00.	11200. Frequency (MH	16300. z)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	29.17	5.25	34.42	54.00	-19.58

Peak

35.51

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5.25

40.76



4924.00

Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:802.11n20 :2462 MHz :Tx CH HIG :H Plane	Η	Test Date Temp./Hu Engineer Measurer	ımi.	:Mike	07-03 J_C / 62 RH CONTAL
97 Level (d	BuV/m)						1
90							
80				· · · · · · · · · · · · · · · · · · ·		FCC RSE-PK	
70							
60	·			· · · · · · · · · · · · · · · · · · ·		FCC RSE-AV	
50	2			1 1 			
40		 				 	
30				·		 	
20				 			
10							
0 <mark>1000</mark>	610	0.	11200. Frequency (MH	16300. z)	21400.	2650	0
Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	29.23	5.25	34.48	54.00	-19.52

Peak

35.72

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5.25

40.97

74.00

-33.03



12 PEAK POWER SPECTRAL DENSITY

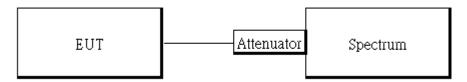
12.1 **Standard Applicable**

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

12.2 **Measurement Equipment Used**

	Conducted Emission Test Site									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018					
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018					
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018					

12.3 Test Set-up



12.4 **Measurement Procedure**

10. Set analyzer center frequency to DTS channel center frequency.

- 11. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
- 12. Set the span to 1.5 times the DTS channel bandwidth.
- 13. Set the RBW = 3 kHz & VBW = 10 kHz.
- 14. For defining Restricted Band Edge Limit: Set the RBW = 100kHz & VBW = 300 kHz
- 15. Detector = peak.
- 16. Sweep time = auto couple.
- 17. Trace mode = max hold.
- 18. Allow trace to fully stabilize.
- 19. Use the peak marker function to determine the maximum amplitude level.

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12.5 **Measurement Result**

POWER DENSITY 802.11b MODE							
Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result				
2412	-5.11	8.00	PASS				
2437	-5.49	8.00	PASS				
2462	-3.80	8.00	PASS				

POWER DENSITY 802.11g MODE

Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result
2412	-12.00	8.00	PASS
2437	-10.44	8.00	PASS
2462	-12.18	8.00	PASS

POWER DENSITY 802.11n HT20 MODE						
Freq. PSD Limit (MHz) (dBm) (dBm) Result						
2412	-12.74	8.00	PASS			
2437	-9.89	8.00	PASS			
2462	-13.39	8.00	PASS			

*Refer to next page for plots

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802.11b CH-Low

SGS



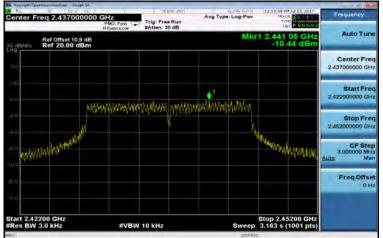
802.11g CH-Low



802.11b CH-Mid



802.11g CH-Mid



802.11b CH-High



802.11g CH-High



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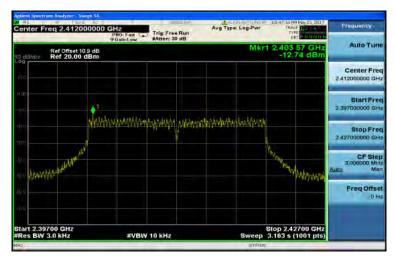
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802.11n_20 CH-Low



802.11n_20 CH-Mid



802.11n_20 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 §2.1091 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 Genera	al Population/Uncor	trolled 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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Maximum Permissible Exposure (MPE) Evaluation (Worst Case) 14.2

802.11b Main								
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Peak Output Power (mW)	Limit	RESULT		
1	2412	1	19.50	89.13	1 Watt = 30.00 dBm	PASS		
6	2437	1	19.75	94.41	1 Watt = 30.00 dBm	PASS		
11	2462	1	19.67	92.68	1 Watt = 30.00 dBm	PASS		
802.11b Main								
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit	RESULT		
1	2412	1	17.04	50.58	1 Watt = 30.00 dBm	PASS		
6	2437	1	17.41	55.08	1 Watt = 30.00 dBm	PASS		
11	2462	1	17.24	52.97	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:	17.41	(dBm)				
Max. output power including tune-up tolerancel:	55.08077	(mW)				
Duty cycle:	97.85	(%)				
Maximum Pav :	53.896533	(mW)				
Peak Antenna gain (Maximum):	1.48	(dBi)				
Peak Antenna gain (linear):	1.4060475	(numeric)				
Prediction distance:	20	(cm)				
Prediction frequency:	2437	(MHz)				
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)				
Power density at predication frequency at 20 (cm)	0.015	(mW/cm2)				
Measurement Result						
The predicted power density level at 20 cm is 0.015 mW/cm2.						
This is below the uncontrolled exposure limit of 1 mW/cm2 at 2437MHz.						

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15 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

15.1 Standard Applicable

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

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

below 20 MHz₆ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

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

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

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

15.2 Maximum Permissible Exposure (MPE) Exemption (Worst Case)

Max. output power including tune-up tolerance:	17.41	(dBm)
Max. output power including tune-up tolerance:	55.08077	(mW)
Antenna gain (Peak):	1.48	(dBi)
Maximum antenna gain:	1.4060475	(numeric)
Frenquency	2437	MHz
Limit	2.7030	W
EIRP	0.0774	W

Evaluation Result

The radiated power is 17.41 + 1.48 = 18.89 dBm(EIRP) =77.446mW =0.077446W *that is less than or equal to* 2.703W. *Hence, following section* 2.5.2 *of* RSS102 *issue* 5, *RF exposure evaluation is no longer required.*

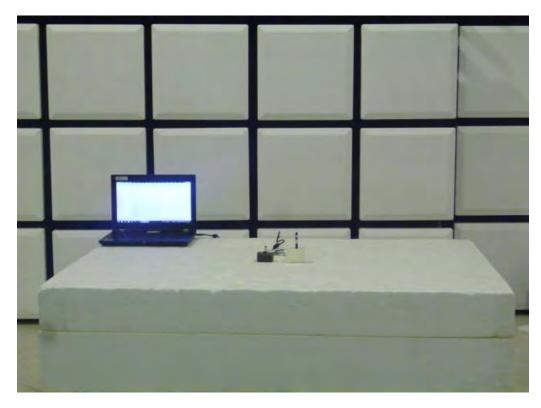
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PHOTOGRAPHS OF SET UP Radiated Emission Set up Photos (Below 1GHz)



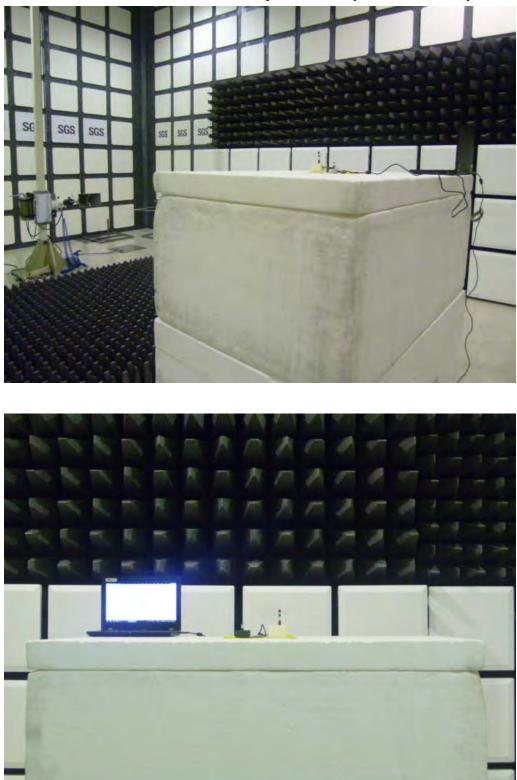


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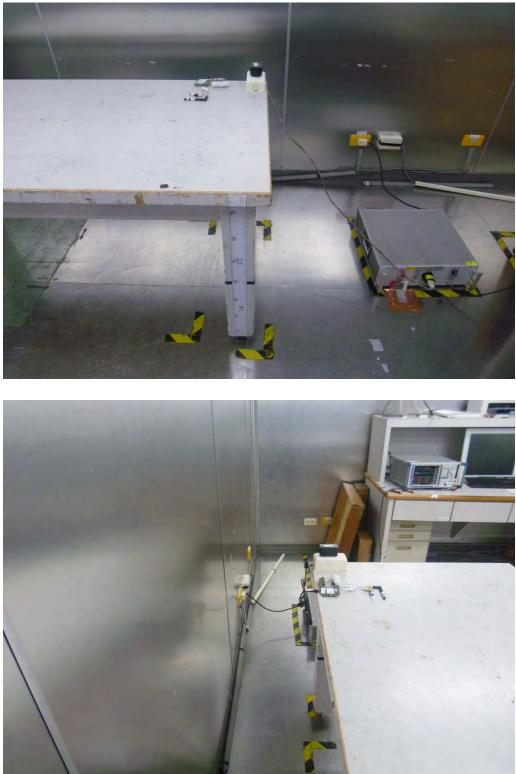


Radiated Emission Set up Photos (Above 1GHz)

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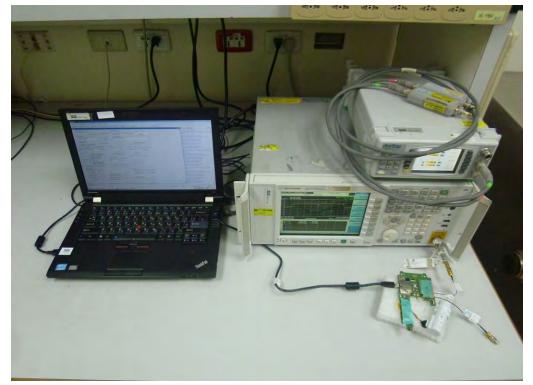


AC Power-line Conducted Emission Set up Photo

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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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