

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

Product Name: Smart Phone

FCC ID: APYHRO00251

Report No.: ER/2017/80149

Issue Date: Sep. 07, 2017

FCC Rule Part: §15.247, Cat: DTS

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Testing Laboratory

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VERIFICATION OF COMPLIANCE

Sharp Corporation, IoT Communication B.U.

2-13-1, Hachihonmatsu-lida, Higashi-hiroshima-shi, Hiroshima **Applicant:**

739-0192, Japan

Sharp Corporation Manufacturer:

1 Takumi-cho, Sakai-ku, Sakai-Shi, Osaka 590-8522, Japan

Product Name: Smart Phone

APYHRO00251 FCC ID: **Report Number:** ER/2017/80149

Date of test: Aug. 14, 2017 ~ Sep. 04, 2017

Date of EUT Received: Aug. 14, 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: Sep. 07, 2017 Date: Tin Lin / Engineer

Prepared By: Sep. 07, 2017 Date:

Violetta Tang / Clerk

Approved By: Sep. 07, 2017 Date:

Jim Chang / Asst. Manager

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Revision History

Report Number	Revision	Description	Issue Date
ER/2017/80149	Rev.00	Initial creation of document	Sep. 07, 2017

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GENERAL INFORMATION

1.1 Product description

General:

on or an				
Product Name:	Smart Phone			
Hardware Version:	DVT			
Software Version:	A809G			
	3.85V from Rechargeable Li-ion Battery			
Power Supply:	Battery:	Mode No.: UBATIA283AFN2, Supplier: SCUD(FUJIAN) Electronics Co., Ltd.		

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11	b: 16.51dBm g: 20.75dBm	DSSS, OFDM
11n	HT20 2412-2462	11	20.74dBm	OFDM
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Antenna Designation:		ILA Antenna, Gain: 1dBi		
Transition Rate:		802.11 b: up to 11Mbps; 802.11 g: up to 54Mbps 802.11 n_20MHz: up to 65.5Mbps		

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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.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

(TAF code 0513)

FCC Registration Numbers are: 509634

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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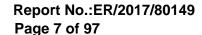
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SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

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

2.3.2 Radiated Emissions

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

2.4 Measurement Results Explanation Example

For all conducted test items:

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

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss 1.2dB, and 10dB attenuator (SISO).

SISO mode offset = RF cable loss (dB)+ attenuation factor(dB) =11.2(dB)

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & AC Power Line Conducted Emission



Fig. 2-2 Conducted (Antenna Port) Emission

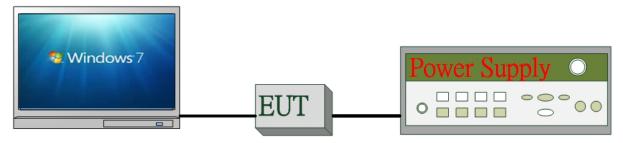


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	DC Power Supply	Agilent	E3640A	MY40000811	N/A	Unshielded
3.	Notebook	Lenovo	L430	P0000081	Shielded	Unshielded

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SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Compli	
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB 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

DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

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

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

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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	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	1, 6, 11	OFDM	6	Main
	RADIATED EMISSION TEST (ABOVE 1 GHz)				
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	Main
802.11g	1 to 11	1, 6, 11	OFDM	6	Main
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	Main

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)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	Main
802.11g	1 to 11	1, 6, 11	OFDM	6	Main
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	Main

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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:

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

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

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

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CONDUCTED EMISSION TEST

6.1 Standard Applicable

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

Frequency range	Lin dB(
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 DU										
TYPE		NUMBER	NUMBER	CAL.						
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018					
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/22/2017	05/21/2018					
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.

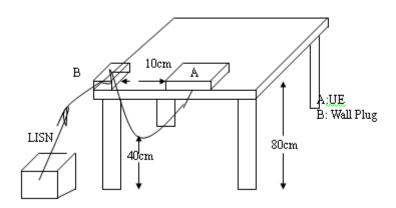
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6.4 Test SET-UP (Block Diagram of Configuration)



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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20 T

Temperature:

Humidity: 58 %



AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode			Test Date:	Aug. 17, 2017
Temperature:	20	Humidity:	56 %	Test By:	Tin
				Phase:	L1

Phase:

Power:

L1

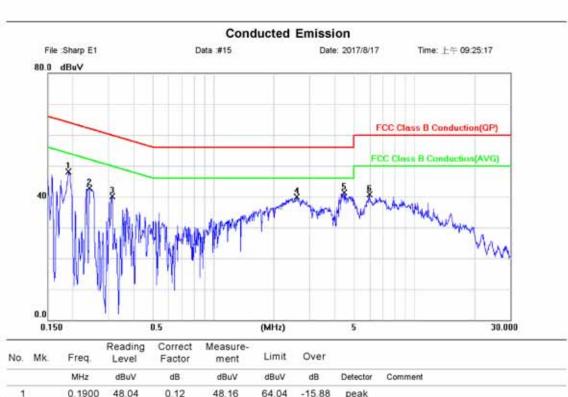
AC 120V/60Hz

Site Conduction Room

Limit: FCC Class B Conduction(QP)

Mode: Operation mode

Note:



No.	Mk.	Freq.	Level	Factor	ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1		0.1900	48.04	0.12	48.16	64.04	-15.88	peak		
2		0.2420	42.52	0.12	42.64	62.03	-19.39	peak		
3		0.3140	40.04	0.11	40.15	59.86	-19.71	peak		
4		2,5980	39.66	0.17	39.83	56.00	-16.17	peak		
5 •		4.4700	40.97	0.26	41.23	56.00	-14.77	peak		
6		5.9820	40.42	0.32	40.74	60.00	-19.26	peak		

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Site Conduction Room

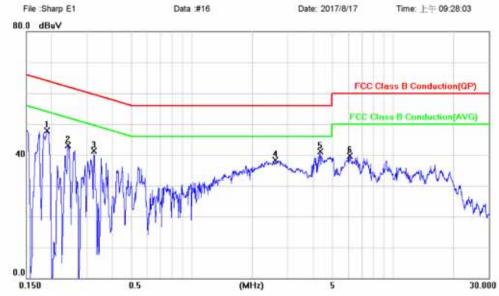
Limit: FCC Class B Conduction(QP)

Mode: Operation mode

Note:



Conducted Emission Date: 2017/8/17 Time: 1: 109:28:03



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1		0.1900	47.86	0.07	47.93	64.04	-16.11	peak		
2		0.2420	43.07	0.07	43.14	62.03	-18.89	peak		
3		0.3260	41.19	0.08	41.27	59,55	-18.28	peak		
4		2.5980	38.10	0.14	38.24	56.00	-17.76	peak		
5	•	4.3580	40.84	0.23	41.07	56.00	-14.93	peak		
6	8	6.1060	39.45	0.28	39.73	60.00	-20.27	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	99.00	0.04
802.11g	99.00	0.04
802.11n_20	99.00	0.04

b = 99%, g = 99%, $n_ht_20 = 99\%$

Duty Cycle Factor: 10 * log(1/0.99) = 0.04 Duty Cycle Factor: $10 * \log(1/0.99) = 0.04$ Duty Cycle Factor: $10 * \log(1/0.99) = 0.04$

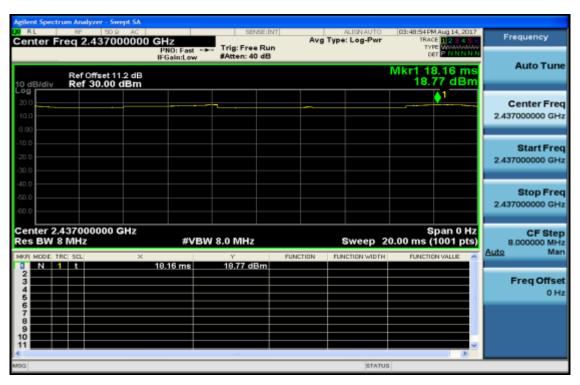
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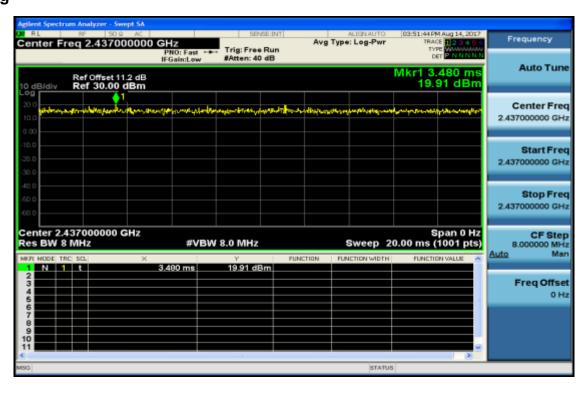
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7.1 Duty Cycle Test Signal Measurement Result 802.11 b



802.11 g



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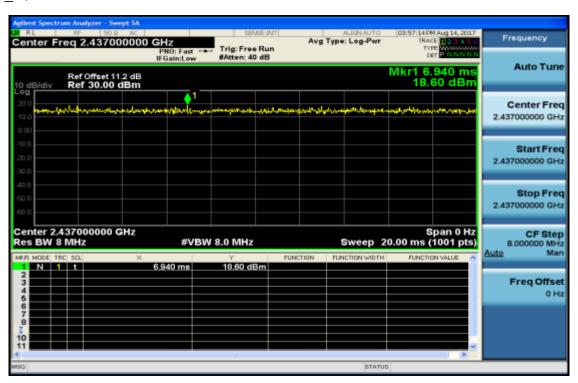
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802.11 n_20 MHz



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SCSTANDALIS*

INDICATE AND ACCOUNTS

**INDICATE



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.

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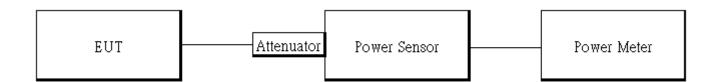
Member of SGS Group



8.2 Measurement Equipment Used

	SGS Conducted Room									
Name of Equipment	Manufacturer	Model	Serial Num- ber	Calibration Date	Calibration 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 Analyzer	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+SUHNER	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	05/19/2017	05/18/2018					

8.3 Test Set-up



8.4 Measurement Procedure

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

Power Meter:

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

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

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8.5 Measurement Result

802.	302.11b Main							
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit	RESULT			
1	2412	1	16.51	1 Watt = 30.00 dBm	PASS			
6	2437	1	16.43	1 Watt = 30.00 dBm	PASS			
11	2462	1	16.24	1 Watt = 30.00 dBm	PASS			
802.	11b Ma	in						
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Limit	RESULT			
1	2412	1	13.97	1 Watt = 30.00 dBm	PASS			
6	2437	1	13.91	1 Watt = 30.00 dBm	PASS			
11	2462	1	13.81	1 Watt = 30.00 dBm	PASS			

802.	302.11g Main							
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit	RESULT			
1	2412	6	20.09	1 Watt = 30.00 dBm	PASS			
6	2437	6	20.75	1 Watt = 30.00 dBm	PASS			
11	2462	6	20.62	1 Watt = 30.00 dBm	PASS			
802.	11g Ma	in						
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Limit	RESULT			
1	2412	6	11.76	1 Watt = 30.00 dBm	PASS			
6	2437	6	11.86	1 Watt = 30.00 dBm	PASS			
11	2462	6	11.93	1 Watt = 30.00 dBm	PASS			

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802.	802.11n_HT20M Main							
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit		RESULT		
1	2412	MCS0	20.62	1 Watt = 30.00	dBm	PASS		
6	2437	MCS0	20.74	1 Watt = 30.00	dBm	PASS		
11	2462	MCS0	20.71	1 Watt = 30.00	dBm	PASS		
802.	11n_H	Γ20M M	ain					
				1				
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Limit		RESULT		
CH	-		Power	Limit 1 Watt = 30.00	dBm	RESULT PASS		
	(MHz)	Rate	Power (dBm)		dBm dBm			

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



6DB BANDWIDTH MEASUREMENT

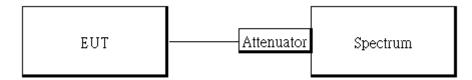
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

SGS Conducted Room							
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration 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.
- 5. Mark the peak frequency and –6dB (upper and lower) frequency.
- 6. Repeat above procedures until all frequency of interest measured was complete.

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9.5 Measurement Result

802.11b Main

802.11g Main

Freq.	6dB BW	Limit	5 ,,
(MHz)	(kHz)	(kHz)	Result
2412	9586	> 500	PASS
2437	10072	> 500	PASS
2462	9575	> 500	PASS

Freq.	6dB BW	Limit	Result	
(MHz)	(kHz)	(kHz)		
2412	16370	> 500	PASS	
2437	16430	> 500	PASS	
2462	16410	> 500	PASS	

802.11 n HT20 Main

Freq.	6dB BW	Limit	Result	
(MHz)	(kHz)	(kHz)		
2412	17220	> 500	PASS	
2437	17610	> 500	PASS	
2462	17600	> 500	PASS	

*Refer to next page for plots

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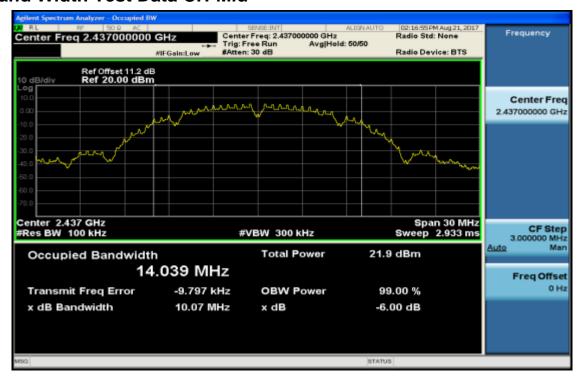
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802.11b (Main) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High



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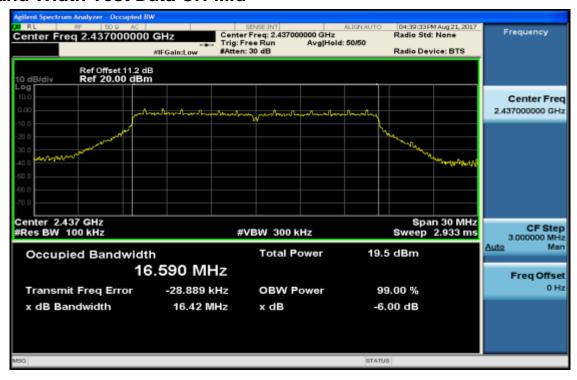
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802.11g (Main) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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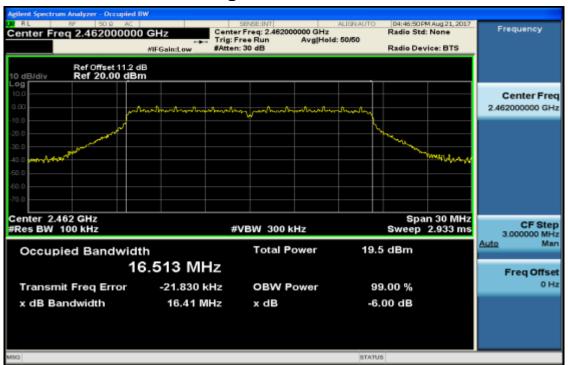
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6dB Band Width Test Data CH-High



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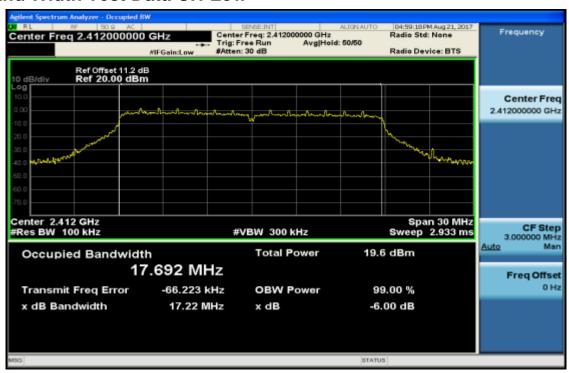
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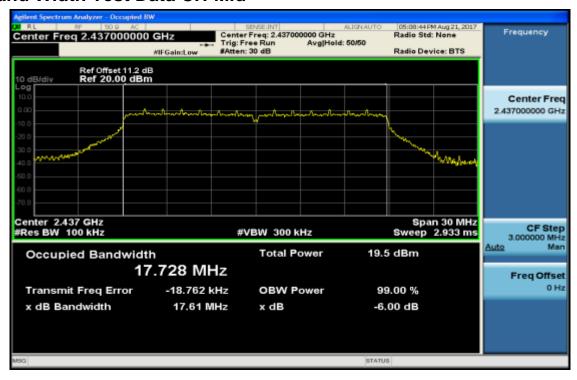
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802.11n_20M (Main) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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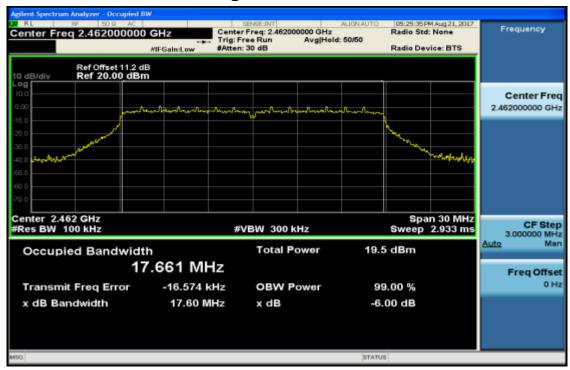
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6dB Band Width Test Data CH-High



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

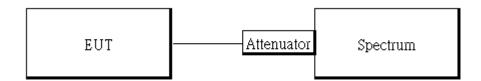
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the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

If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.2 Measurement Equipment Used

SGS Conducted Room								
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration 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			

10.3 Test SET-UP



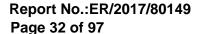
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10.4 Measurement Procedure

Conducted Band Edge:

- To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guid-
- 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.
- Repeat above procedures until all default test channel (low, middle, and high) was complete.

Conducted Spurious Emission:

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

10.5 Measurement Result

- 1. Refer to next page spectrum analyzer data chart and tabular data sheets.
- 2. For restricted Band Edge Limit, please refer to section 12.5 of this report for measurement result.

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



Band Edges Test Data CH-High

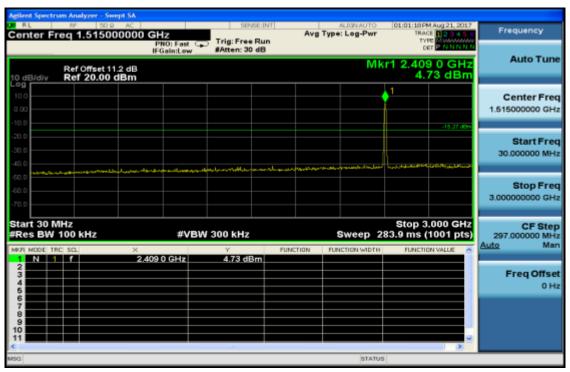


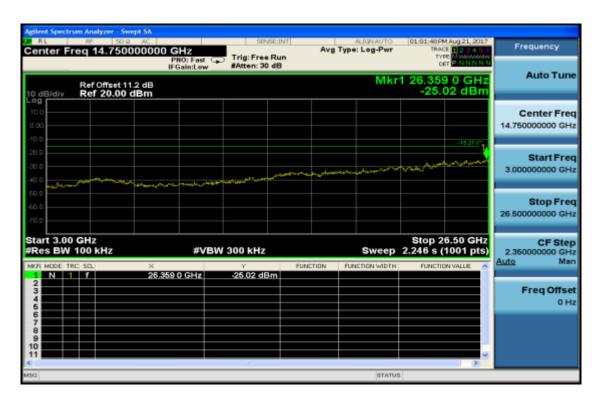
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802.11b **Spurious Emission Test Data CH-Low**





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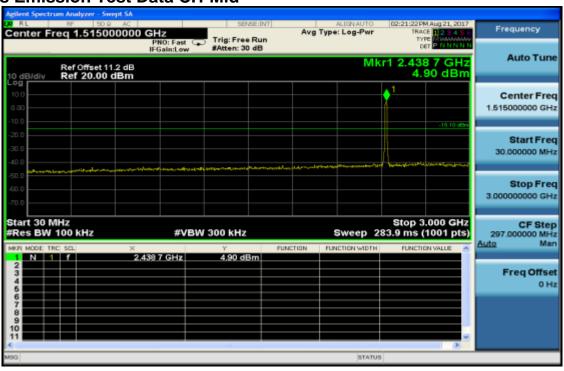
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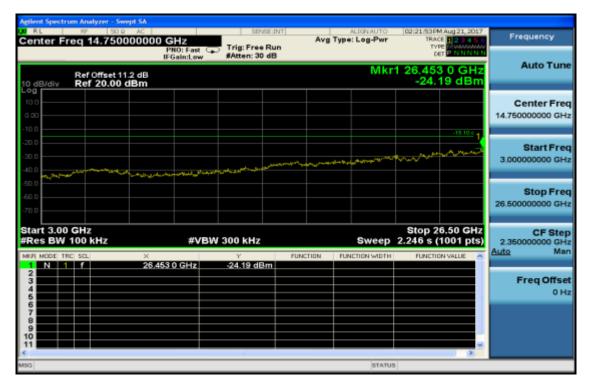
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Spurious Emission Test Data CH-Mid





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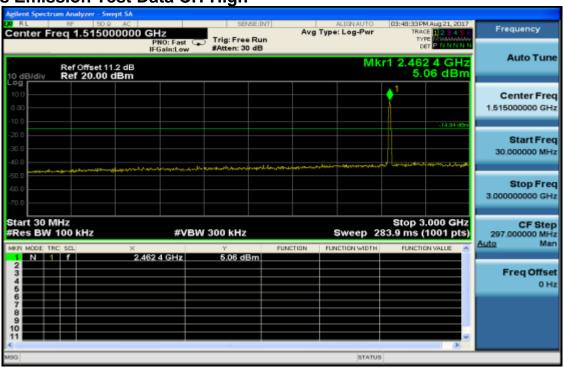
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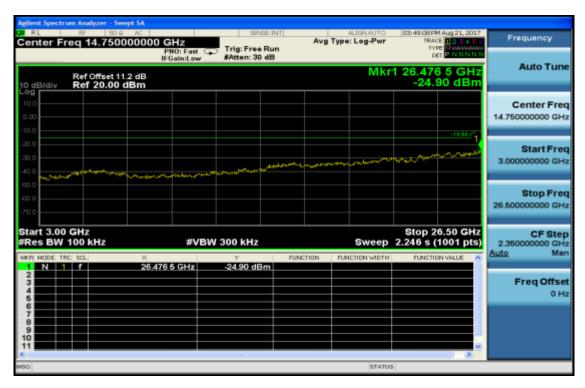
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Spurious Emission Test Data CH-High





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



Band Edges Test Data CH-High



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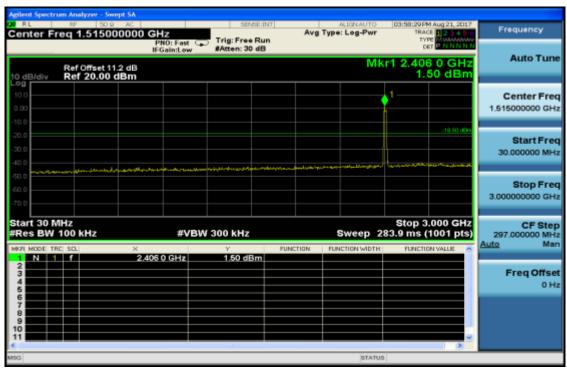
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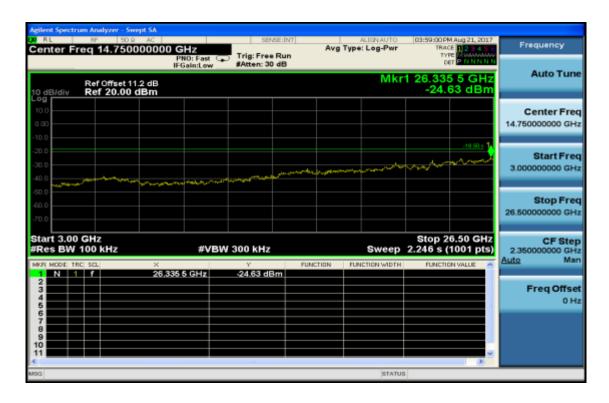
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802.11g

Spurious Emission Test Data CH-Low





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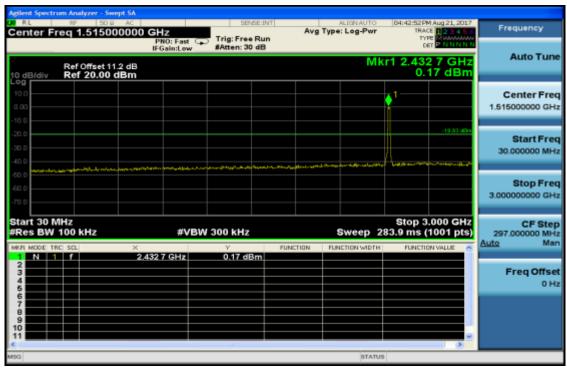
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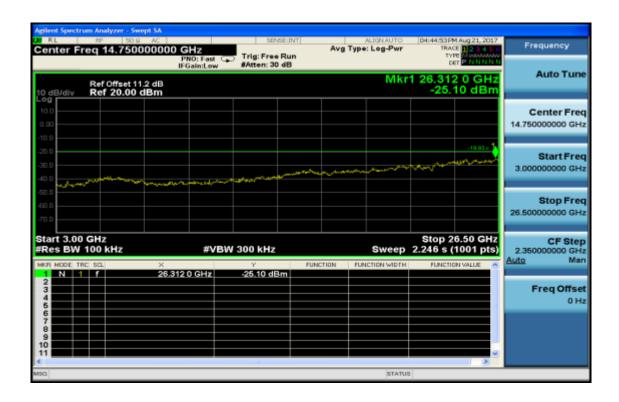
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Spurious Emission Test Data CH-Mid





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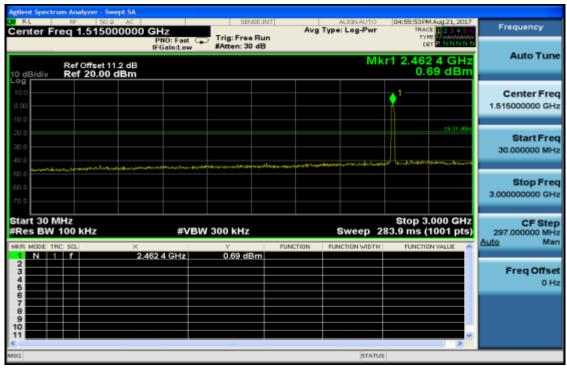
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Spurious Emission Test Data CH-High





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802.11n_HT20 **Band Edges Test Data CH-Low**



Band Edges Test Data CH-High



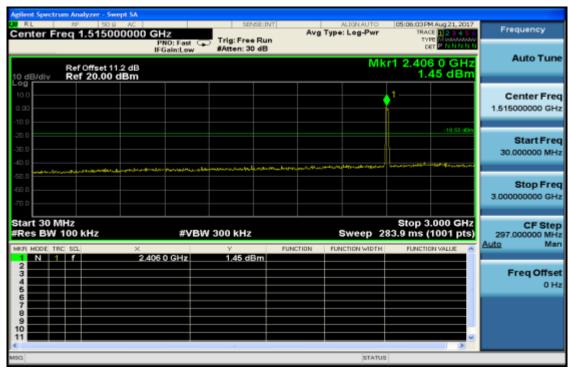
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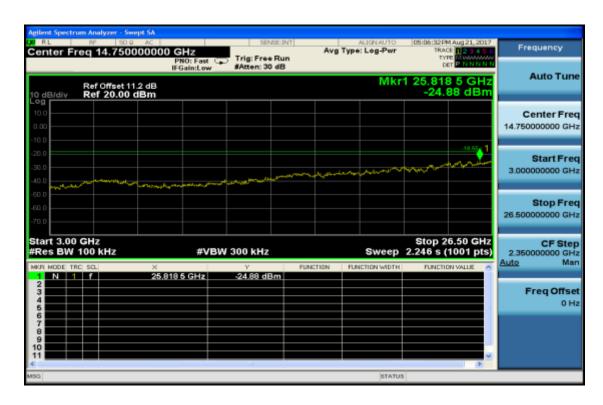
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802.11n HT20 **Spurious Emission Test Data CH-Low**





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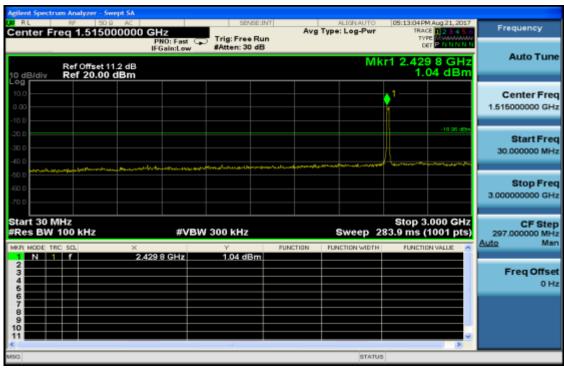
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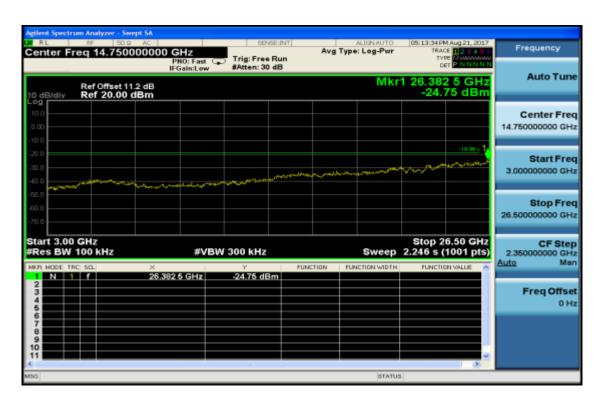
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Spurious Emission Test Data CH-Mid





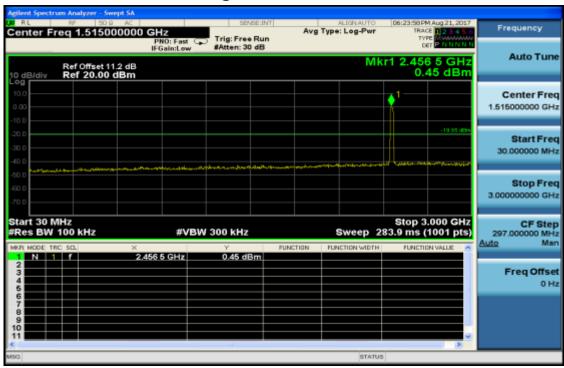
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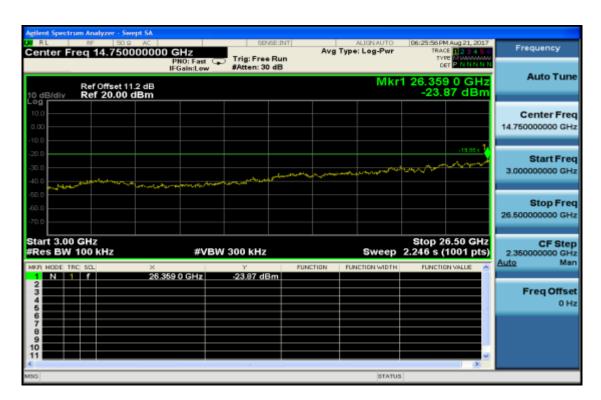
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Spurious Emission Test Data CH-High





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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:

SGS SAC-III											
Name of Equip- ment	Manufacturer	Model	Serial Num- ber	Calibration Date	Calibration 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	08/04/2017	08/03/2018						
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2017	01/02/2018						
Pre-Amplifier	EMC Instru- ments Corp.	EMC0126530	980038	01/03/2017	01/02/2018						
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	07/01/2017	06/30/2018						
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 Instru- ments Corp.	EMC184045	980135	01/05/2017	01/04/2018						

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

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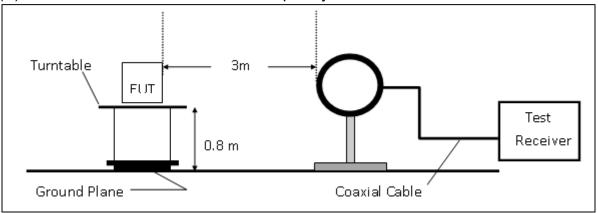
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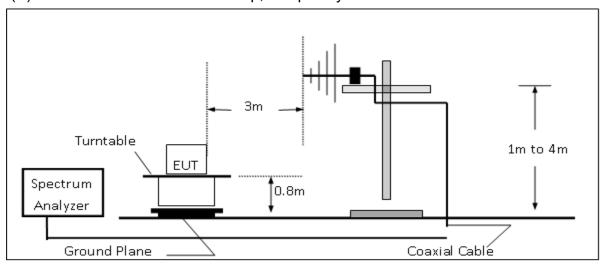


11.3 Test SET-UP

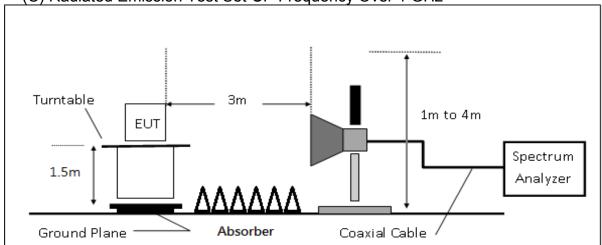
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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11.4 Measurement Procedure

- The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. 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	<u> </u>	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

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

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

Note:

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

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

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

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

11.7 Measurement Result

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

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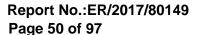
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Measurement Antenna Pol.

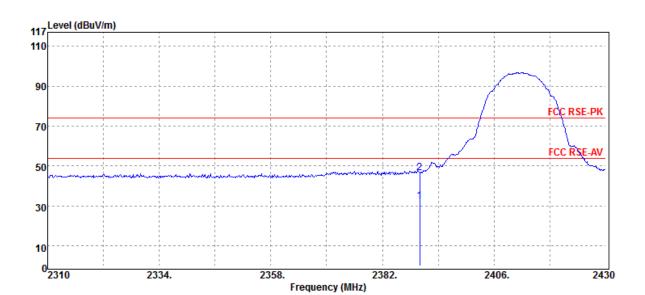


Radiated Band Edge Measurement Result (802.11b)

Operation Band :802.11b **Test Date** :2017-08-15

Fundamental Frequency :2412 MHz Temp./Humi. :22 deg_C / 61 RH

Operation Mode :Bandedge CH LOW Engineer :Tin EUT Pol. :H Plane :VERTICAL

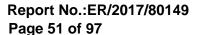


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	Е	Average	34.14	-1.74	32.40	54.00	-21.60
2390.00	Е	Peak	48.46	-1.74	46.72	74.00	-27.28

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:802.11b :2412 MHz

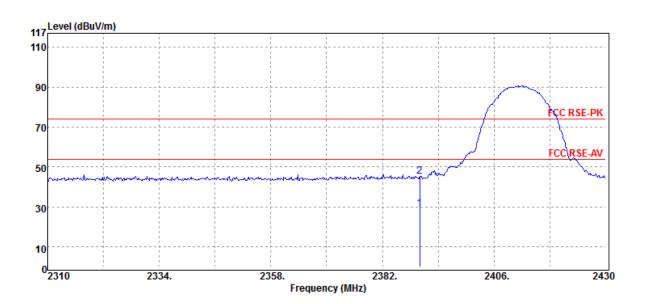
:Bandedge CH LOW

EUT Pol. :H Plane **Test Date** :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
	2390.00	E	Average	30.78	-1.74	29.04	54.00	-24.96
	2390.00	Е	Peak	47.01	-1.74	45.27	74.00	-28.73

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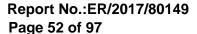
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Operation Mode

EUT Pol.

:802.11b :2462 MHz

:Bandedge CH HIGH

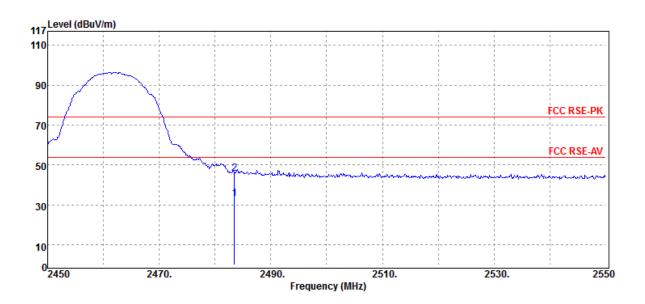
:H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	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	Average	34.82	-1.62	33.20	54.00	-20.80
2483.50	Е	Peak	47.47	-1.62	45.85	74.00	-28.15

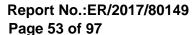
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:802.11b :2462 MHz

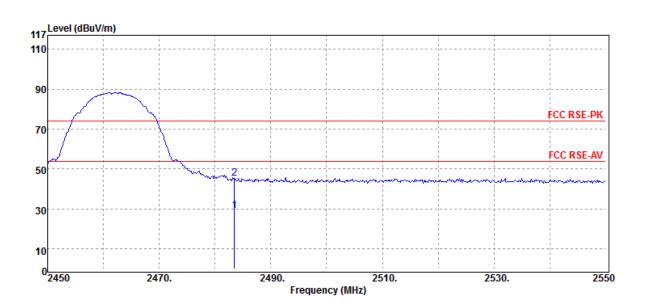
:Bandedge CH HIGH

EUT Pol. :H Plane **Test Date** :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dΒμV/m	dB
2483.50	Е	Average	30.89	-1.62	29.27	54.00	-24.73
2483.50	Е	Peak	46.82	-1.62	45.20	74.00	-28.80

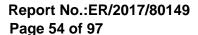
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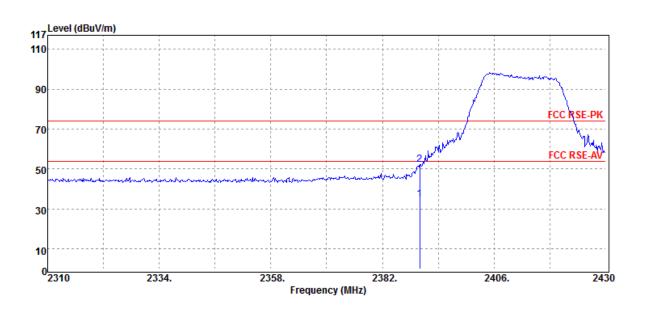
Radiated Band Edge Measurement Result (802.11g)

Operation Band :802.11g **Test Date** :2017-08-15

Fundamental Frequency :2412 MHz Temp./Humi. :22 deg_C / 61 RH

Operation Mode :Bandedge CH LOW Engineer :Tin

EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol.

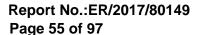


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
2390.00	E	Average	36.53	-1.74	34.79	54.00	-19.21
2390.00	Е	Peak	54.02	-1.74	52.28	74.00	-21.72

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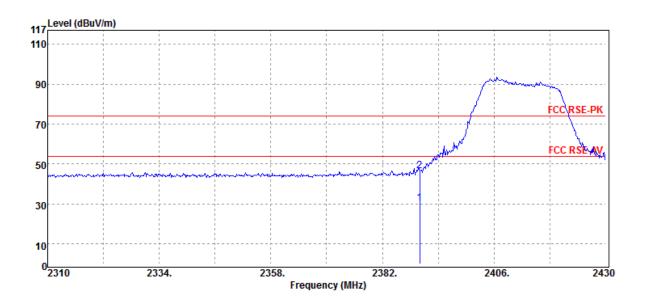
:802.11g :2412 MHz

:Bandedge CH LOW

EUT Pol. :H Plane **Test Date** Temp./Humi. :2017-08-15 :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	
	2390.00	E	Average	32.10	-1.74	30.36	54.00	-23.64	
	2390.00	Е	Peak	48.43	-1.74	46.69	74.00	-27.31	

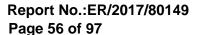
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Operation Mode

EUT Pol.

:802.11g :2462 MHz

:Bandedge CH HIGH

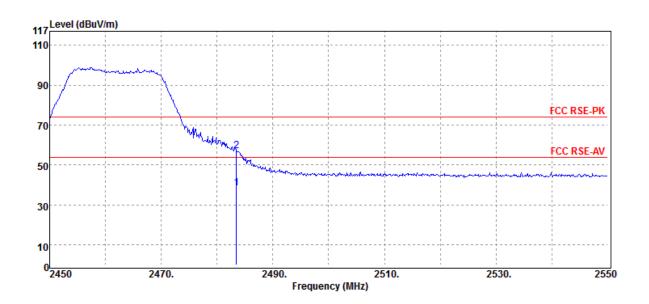
:H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:VERTICAL Measurement Antenna Pol.



	Freq.	Note	Detector	Spectrum	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	Average	40.06	-1.62	38.44	54.00	-15.56	
	2483.50	Е	Peak	58.62	-1.62	57.00	74.00	-17.00	

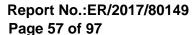
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EUT Pol.

:802.11g :2462 MHz

:Bandedge CH HIGH

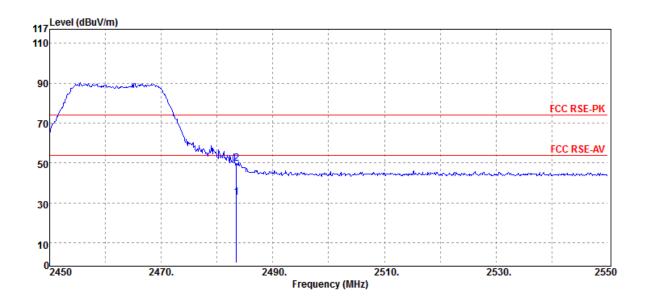
:H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	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	Average	34.38	-1.62	32.76	54.00	-21.24
2483.50	Е	Peak	51.34	-1.62	49.72	74.00	-24.28

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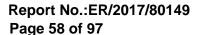
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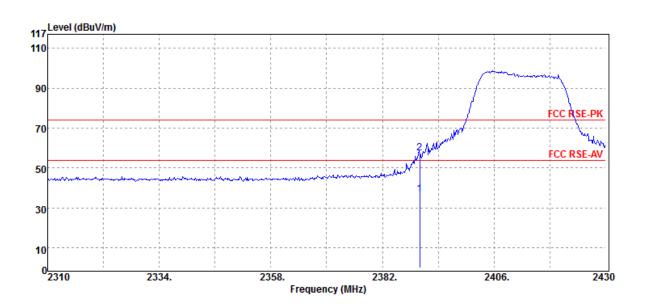
Radiated Band Edge Measurement Result (802.11_HT20)

:2017-08-15 **Operation Band** :802.11n20 **Test Date**

Fundamental Frequency :2412 MHz Temp./Humi. :22 deg_C / 61 RH

Operation Mode :Bandedge CH LOW Engineer :Tin

EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol.

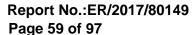


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Level		FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB	
2390.00	Е	Average	38.46	-1.74	36.72	54.00	-17.28	
2390.00	Е	Peak	59.19	-1.74	57.45	74.00	-16.55	

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:802.11n20 :2412 MHz :Bandedge CH LOW

Operation Mode

EUT Pol.

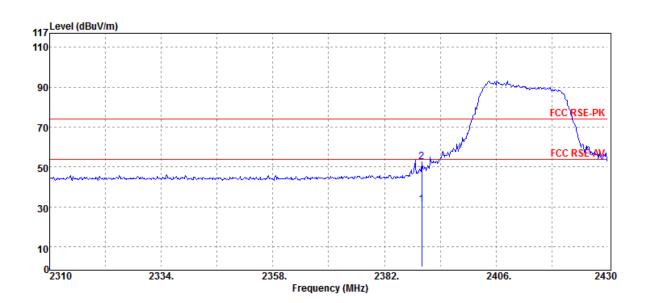
:H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	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	Average	33.09	-1.74	31.35	54.00	-22.65
2390.00	Е	Peak	54.33	-1.74	52.59	74.00	-21.41

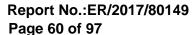
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Operation Mode

EUT Pol.

:802.11n20 :2462 MHz

:Bandedge CH HIGH

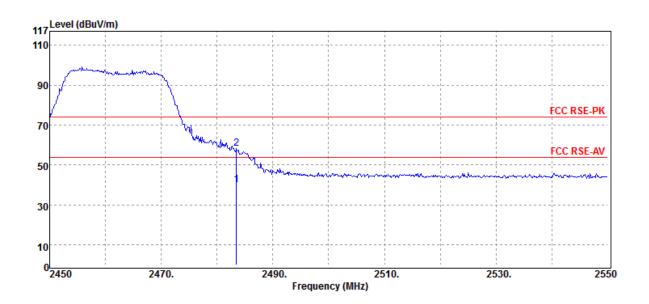
:H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:VERTICAL Measurement Antenna Pol.



	Freq.	Note	Detector	Spectrum	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	Average	41.83	-1.62	40.21	54.00	-13.79	
	2483.50	Е	Peak	59.78	-1.62	58.16	74.00	-15.84	

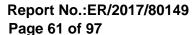
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Operation Mode

EUT Pol.

:802.11n20 :2462 MHz

:Bandedge CH HIGH

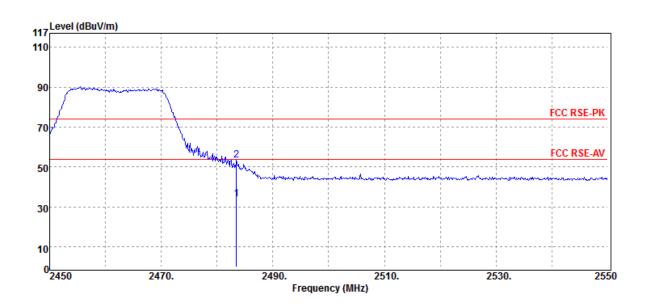
:H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	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	Average	35.82	-1.62	34.20	54.00	-19.80	
2483.50	Е	Peak	55.24	-1.62	53.62	74.00	-20.38	

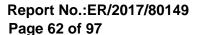
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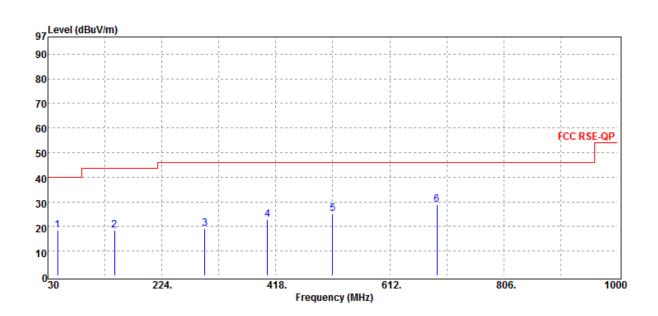
Below 1GHz Worst-Case Data:

Radiated Spurious Emission Measurement Result (802.11 g)

Operation Band :802.11g **Test Date** :2017-08-15

Fundamental Frequency :2412 MHz Temp./Humi. :22 deg_C / 61 RH

Operation Mode :Tx CH LOW Engineer :Tin EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
46.49	S	Peak	26.33	-7.91	18.42	40.00	-21.58
143.49	S	Peak	26.54	-8.09	18.45	43.50	-25.05
296.75	S	Peak	25.14	-5.98	19.16	46.00	-26.84
403.45	S	Peak	26.80	-3.93	22.87	46.00	-23.13
515.00	S	Peak	27.10	-1.94	25.16	46.00	-20.84
692.51	S	Peak	27.28	1.47	28.75	46.00	-17.25

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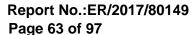
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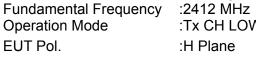


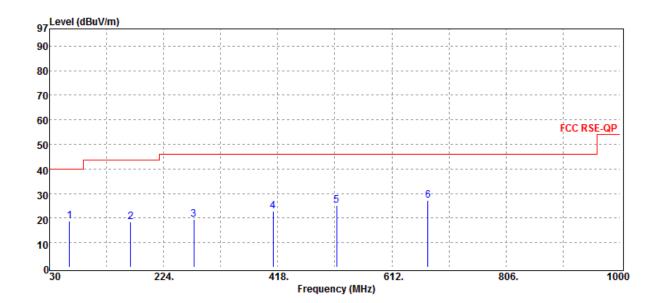


:802.11g :2412 MHz :Tx CH LOW **Test Date** :2017-08-15 :22 deg_C / 61 RH

Temp./Humi. Engineer

:HORIZONTAL Measurement Antenna Pol.





Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
63.95	S	Peak	27.67	-8.93	18.74	40.00	-21.26
167.74	S	Peak	25.80	-7.46	18.34	43.50	-25.16
275.41	S	Peak	25.99	-6.63	19.36	46.00	-26.64
410.24	S	Peak	26.53	-3.62	22.91	46.00	-23.09
517.91	S	Peak	26.90	-1.82	25.08	46.00	-20.92
673.11	S	Peak	26.94	0.32	27.26	46.00	-18.74

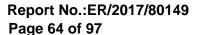
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EUT Pol.

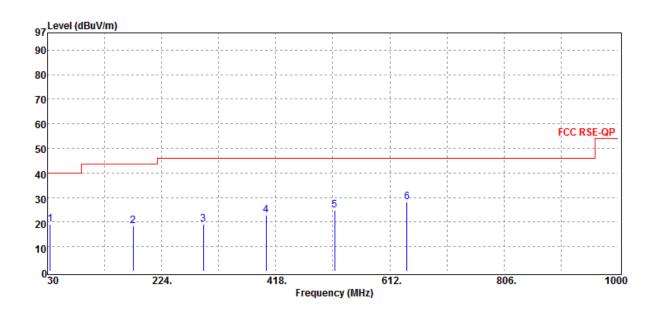
:802.11g :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@ 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
34.85	S	Peak	28.26	-8.99	19.27	40.00	-20.73
175.50	S	Peak	26.63	-8.20	18.43	43.50	-25.07
294.81	S	Peak	25.29	-6.02	19.27	46.00	-26.73
401.51	S	Peak	26.92	-3.95	22.97	46.00	-23.03
517.91	S	Peak	26.58	-1.82	24.76	46.00	-21.24
641.10	S	Peak	27.88	0.48	28.36	46.00	-17.64

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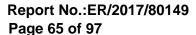
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EUT Pol.

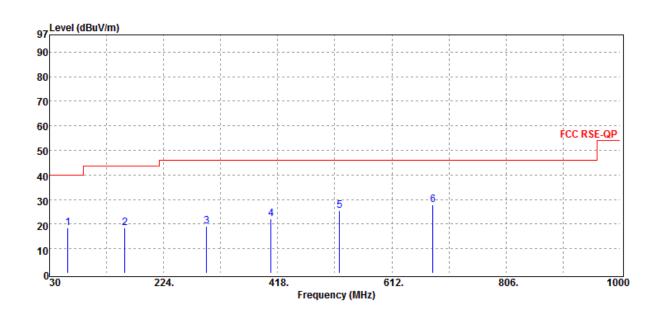
:802.11g :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@ 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
61.04	S	Peak	26.77	-8.25	18.52	40.00	-21.48
158.04	S	Peak	25.89	-7.45	18.44	43.50	-25.06
296.75	S	Peak	25.18	-5.98	19.20	46.00	-26.80
406.36	S	Peak	25.88	-3.59	22.29	46.00	-23.71
522.76	S	Peak	27.03	-1.66	25.37	46.00	-20.63
681.84	S	Peak	26.86	0.92	27.78	46.00	-18.22

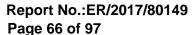
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Operation Mode EUT Pol.

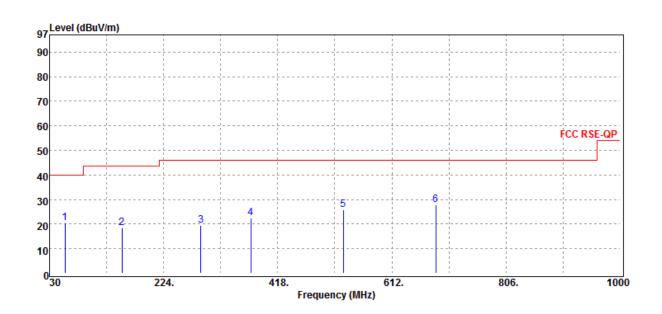
:802.11g :2462 MHz :Tx CH HIGH :H Plane

Test Date Temp./Humi.

:2017-08-15 :22 deg_C / 61 RH

Engineer

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@ 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
56.19	S	Peak	28.39	-7.91	20.48	40.00	-19.52
153.19	S	Peak	26.23	-7.71	18.52	43.50	-24.98
287.05	S	Peak	25.51	-6.19	19.32	46.00	-26.68
372.41	S	Peak	26.97	-4.54	22.43	46.00	-23.57
529.55	S	Peak	27.02	-1.25	25.77	46.00	-20.23
686.69	S	Peak	26.74	1.21	27.95	46.00	-18.05

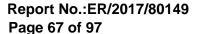
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:2462 MHz **Operation Mode** :Tx CH HIGH EUT Pol.

:H Plane

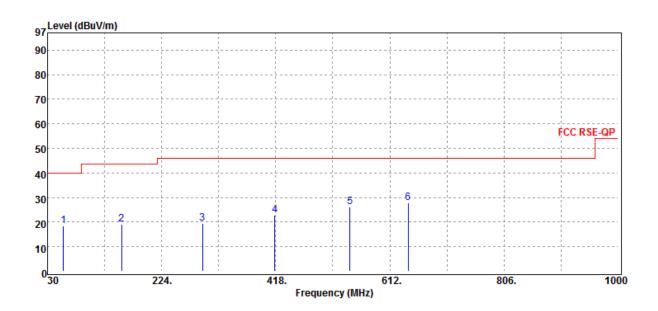
:802.11g

Test Date :2017-08-15

Temp./Humi. :22 deg_C / 61 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@ 3m	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
57.16	S	Peak	26.28	-7.98	18.30	40.00	-21.70
156.10	S	Peak	26.66	-7.61	19.05	43.50	-24.45
293.84	S	Peak	25.38	-6.04	19.34	46.00	-26.66
416.06	S	Peak	26.25	-3.27	22.98	46.00	-23.02
544.10	S	Peak	27.64	-1.59	26.05	46.00	-19.95
643.04	S	Peak	27.14	0.65	27.79	46.00	-18.21

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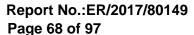
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Above 1GHz Data:

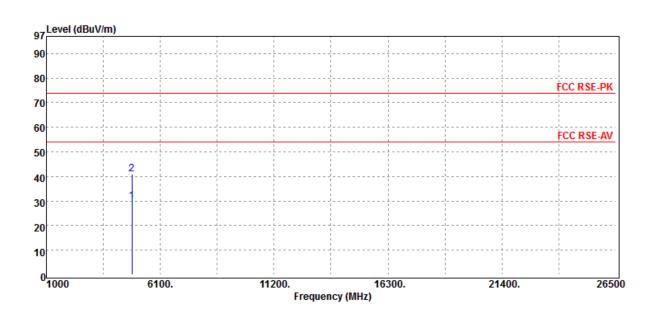
Radiated Spurious Emission Measurement Result (802.11 b)

Operation Band :802.11b **Test Date** :2017-08-15

Fundamental Frequency :2412 MHz Temp./Humi. :21 deg_C / 62 RH

Measurement Antenna Pol.

Operation Mode :Tx CH LOW Engineer :Tin EUT Pol. :H Plane :VERTICAL

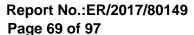


Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB
4824.00	Н	Average	24.83	4.93	29.76	54.00	-24.24
4824.00	Н	Peak	36.17	4.93	41.10	74.00	-32.90

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EUT Pol.

:802.11b :2412 MHz :Tx CH LOW

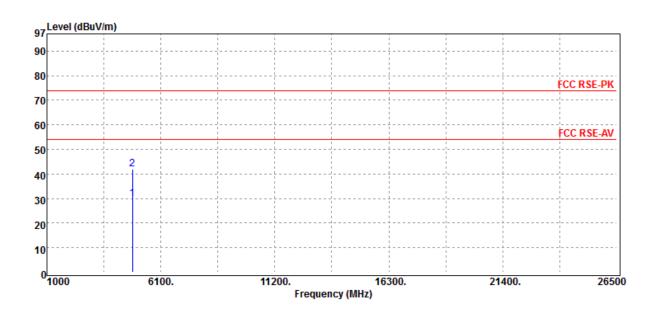
:H Plane

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4824.00	Н	Average	24.96	4.93	29.89	54.00	-24.11
4824.00	Н	Peak	36.98	4.93	41.91	74.00	-32.09

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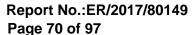
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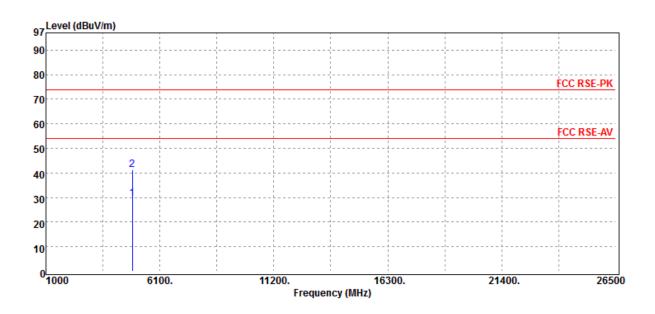
EUT Pol.

:802.11b :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15 Temp./Humi. :21 deg_C / 62 RH

Engineer

:VERTICAL Measurement Antenna Pol.



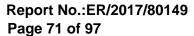
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	24.54	5.13	29.67	54.00	-24.33
4874.00	Н	Peak	36.11	5.13	41.24	74.00	-32.76

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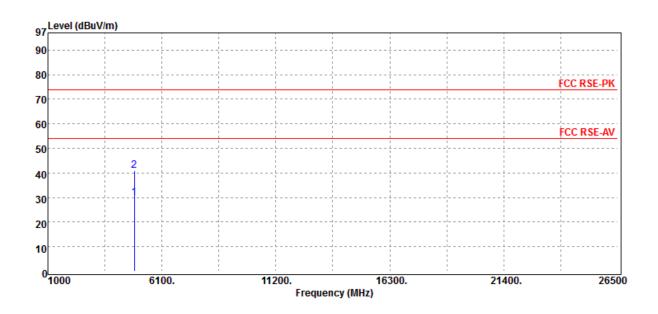
EUT Pol.

:802.11b :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15 Temp./Humi. :21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



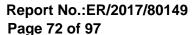
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB	
4874.00	Н	Average	24.77	5.13	29.90	54.00	-24.10	
4874.00	Н	Peak	35.85	5.13	40.98	74.00	-33.02	

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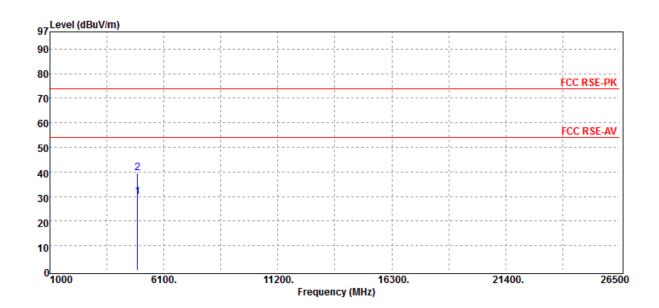
EUT Pol.

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

Test Date Temp./Humi. Engineer

:2017-08-15 :21 deg_C / 62 RH

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4924.00	Н	Average	24.61	5.25	29.86	54.00	-24.14
4924.00	Н	Peak	34.37	5.25	39.62	74.00	-34.38

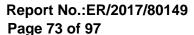
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EUT Pol.

:802.11b :2462 MHz :Tx CH HIGH

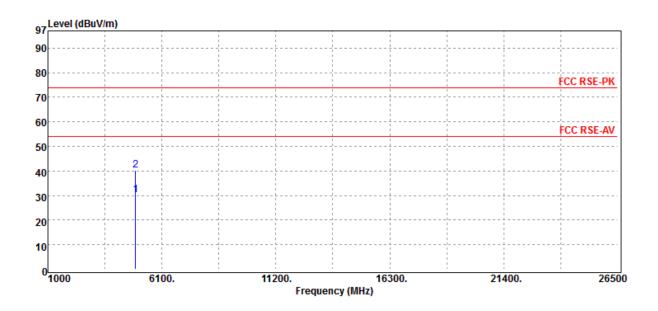
:H Plane

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



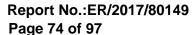
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	24.95	5.25	30.20	54.00	-23.80
4924.00	Н	Peak	34.99	5.25	40.24	74.00	-33.76

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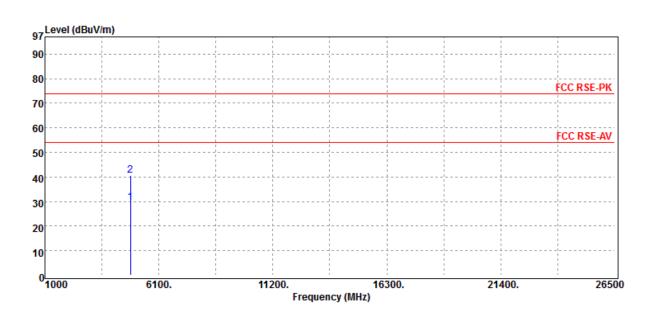


Radiated Spurious Emission Measurement Result (802.11 g)

Test Date **Operation Band** :802.11g :2017-08-15 :21 deg_C / 62 RH

Fundamental Frequency :2412 MHz Temp./Humi. :Tx CH LOW **Operation Mode** Engineer

EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol.



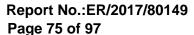
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	
4824.00	Н	Average	24.77	4.93	29.70	54.00	-24.30	
4824.00	Н	Peak	35.65	4.93	40.58	74.00	-33.42	

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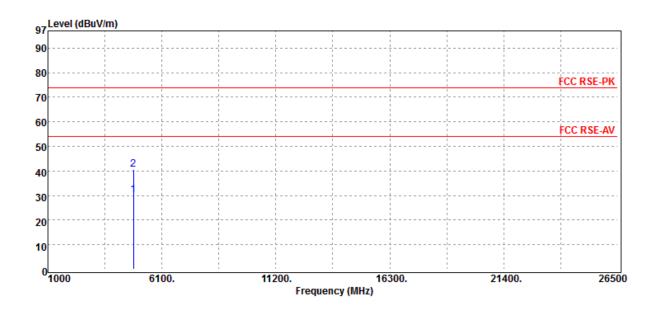
EUT Pol.

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

Test Date Temp./Humi. :2017-08-15 :21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



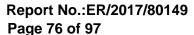
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	25.12	4.93	30.05	54.00	-23.95
4824.00	Н	Peak	35.80	4.93	40.73	74.00	-33.27

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EUT Pol.

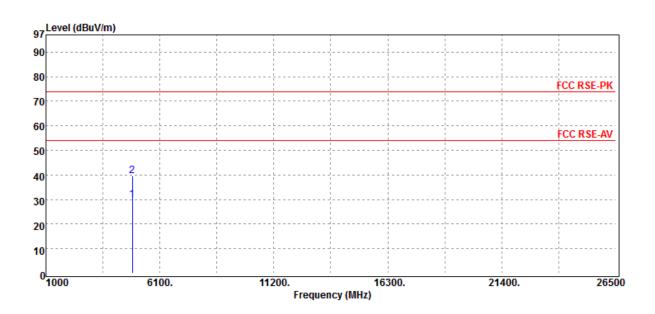
:802.11g :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	
4874.00	Н	Average	24.68	5.13	29.81	54.00	-24.19	
4874.00	Н	Peak	34.61	5.13	39.74	74.00	-34.26	

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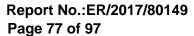
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台灣檢驗科技股份有限公司





EUT Pol.

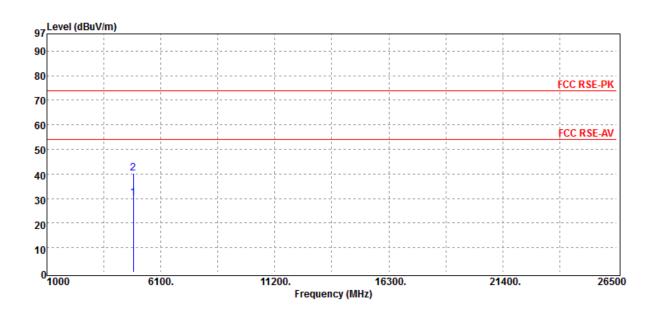
:802.11g :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	24.98	5.13	30.11	54.00	-23.89
4874.00	Н	Peak	35.26	5.13	40.39	74.00	-33.61

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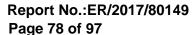
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Member of SGS Group





Operation Band Fundamental Frequency

Operation Mode

EUT Pol.

:802.11g :2462 MHz :Tx CH HIGH

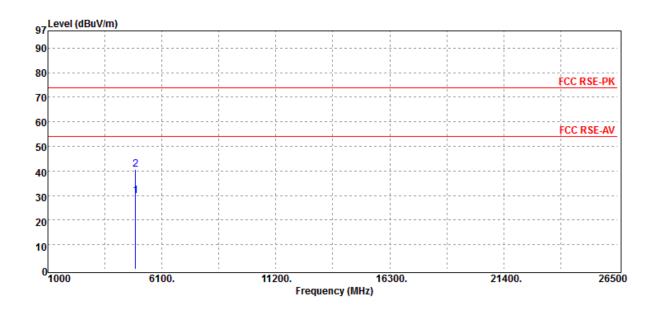
:H Plane

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:VERTICAL Measurement Antenna Pol.



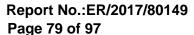
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	24.78	5.25	30.03	54.00	-23.97
4924.00	Н	Peak	35.25	5.25	40.50	74.00	-33.50

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EUT Pol.

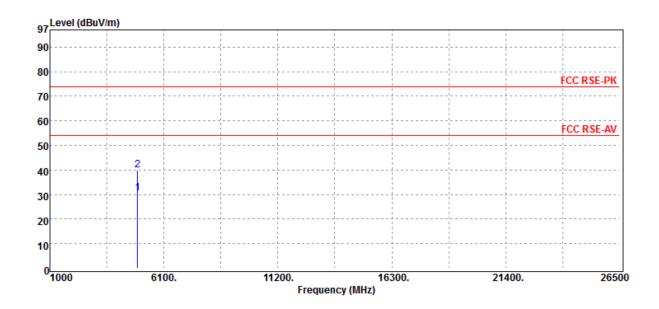
:802.11g :2462 MHz :Tx CH HIGH :H Plane

Test Date Temp./Humi. Engineer

:2017-08-15

:21 deg_C / 62 RH

:HORIZONTAL Measurement Antenna Pol.



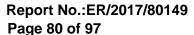
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4924.00	Н	Average	25.16	5.25	30.41	54.00	-23.59
4924.00	Н	Peak	34.63	5.25	39.88	74.00	-34.12

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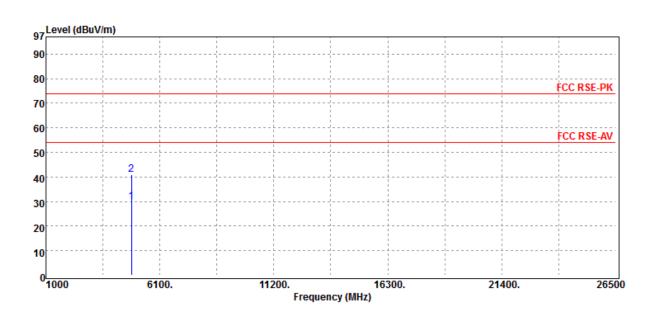


Radiated Spurious Emission Measurement Result (802.11_HT20)

Operation Band Test Date :802.11n20 :2017-08-15 :21 deg_C / 62 RH

Fundamental Frequency :2412 MHz Temp./Humi. :Tx CH LOW **Operation Mode** Engineer

EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	_
4824.00	Н	Average	24.83	4.93	29.76	54.00	-24.24	
4824.00	Н	Peak	35.87	4.93	40.80	74.00	-33.20	

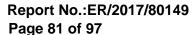
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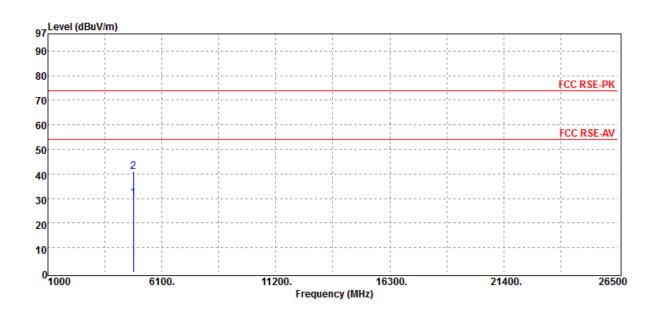
EUT Pol.

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

Test Date Temp./Humi. :2017-08-15

:21 deg_C / 62 RH Engineer

:HORIZONTAL Measurement Antenna Pol.



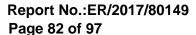
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBμV/m	dB
4824.00	Н	Average	25.15	4.93	30.08	54.00	-23.92
4824.00	Н	Peak	36.06	4.93	40.99	74.00	-33.01

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Operation Band Fundamental Frequency

Operation Mode

EUT Pol. :H Plane

:802.11n20

:2437 MHz

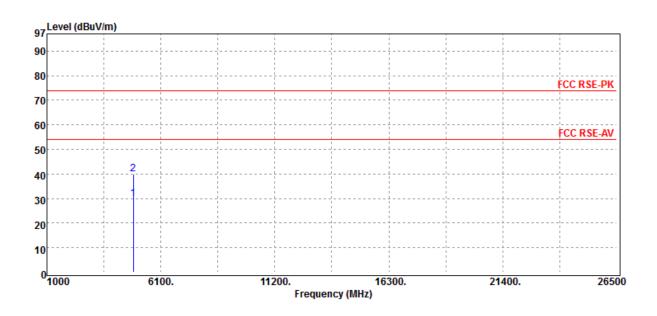
:Tx CH MID

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:VERTICAL Measurement Antenna Pol.



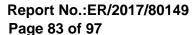
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	24.85	5.13	29.98	54.00	-24.02
4874.00	Н	Peak	34.75	5.13	39.88	74.00	-34.12

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EUT Pol.

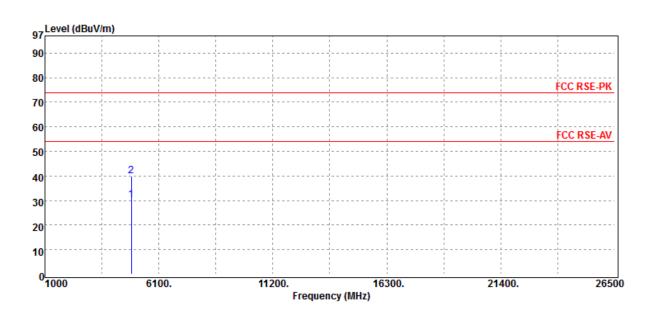
:802.11n20 :2437 MHz :Tx CH MID :H Plane

Test Date :2017-08-15

Temp./Humi. :21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



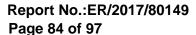
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4874.00	Н	Average	25.09	5.13	30.22	54.00	-23.78
4874.00	Н	Peak	34.98	5.13	40.11	74.00	-33.89

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:2462 MHz :Tx CH HIGH

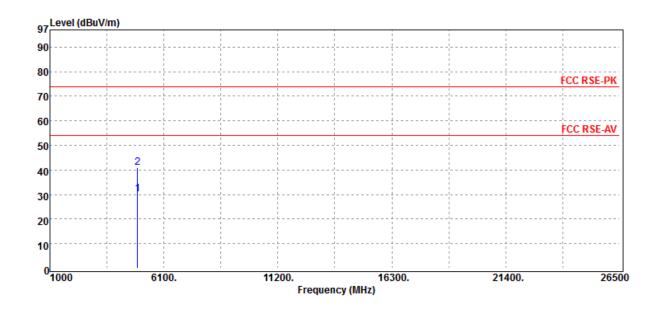
:802.11n20

Test Date Temp./Humi. :2017-08-15

:21 deg_C / 62 RH Engineer

:VERTICAL Measurement Antenna Pol.





Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	24.97	5.25	30.22	54.00	-23.78
4924.00	Н	Peak	35.63	5.25	40.88	74.00	-33.12

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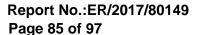
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f (886-2) 2298-0488





EUT Pol.

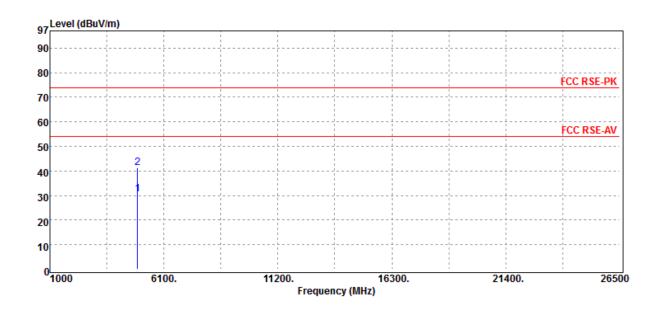
:802.11n20 :2462 MHz :Tx CH HIGH :H Plane

Test Date Temp./Humi. :2017-08-15

:21 deg_C / 62 RH

Engineer

:HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dΒμV	dB	dBμV/m	dBμV/m	dB
4924.00	Н	Average	25.22	5.25	30.47	54.00	-23.53
4924.00	Н	Peak	36.06	5.25	41.31	74.00	-32.69

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12 PEAK POWER SPECTRAL DENSITY

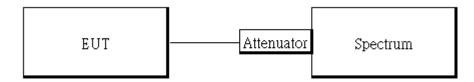
12.1 Standard Applicable

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

SGS Conducted Room							
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration 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

- 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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SGS Taiwan Ltd.



12.5 Measurement Result

	POWER DENSITY 802.11b						
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	I) i i†\/	PPSD With Duty Factor (dBm)	Limit (dBm)	Result		
2412	-6.52	0.04	-6.48	8.00	PASS		
2437	-8.18	0.04	-8.14	8.00	PASS		
2462	-8.31	0.04	-8.27	8.00	PASS		

POWER DENSITY 802.11g					
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit	Result
2412	-11.55	0.04	-11.51	8.00	PASS
2437	-11.34	0.04	-11.30	8.00	PASS
2462	-11.03	0.04	-10.99	8.00	PASS

	POWER DENSITY 802.11n HT20					
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	I)) (†\/	PPSD With Duty Factor (dBm)	Limit (dBm)	Result	
2412	-12.04	0.04	-12.00	8.00	PASS	
2437	-12.11	0.04	-12.07	8.00	PASS	
2462	-11.94	0.04	-11.90	8.00	PASS	

Bandedge Limit 802.11b MODE					
Freq.	PSD (dBm)	Bandedge Limit			
		(dBm)			
2412	5.76	-14.24			
2462	5.42	-14.58			

Bandedge Limit 802.11g MODE					
Freq.		Bandedge Limit			
(MHz)	(dBm)	(dBm)			
2412	1.56	-18.44			
2462	0.91	-19.09			

Bandedge Limit 802.11n20 MODE				
Freq.		Bandedge Limit		
(MHz)	(dBm)	(dBm)		
2412	1.58	-18.42		
2462	0.76	-19.24		

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802.11b

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



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802.11g

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



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802.11n HT20

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



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



802.11b PSD for Bandedge Limit(CH-High)



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802.11g PSD for Bandedge Limit(CH-Low)



802.11g PSD for Bandedge Limit(CH-High)



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802.11n_HT20 PSD for Bandedge Limit(CH-Low)



802.11n_HT20 PSD for Bandedge Limit(CH-High)



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13 ANTENNA REQUIREMENT

13.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

In case of point-to-point operation, the power shall be reduced by the one dB for every 3 dB that the directional gain of antenna exceeds 6dBi.

13.2 Antenna Connected Construction

An embedded-in antenna design is used.

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

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

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