

TEST REPORT

Applicant: Dalian Cloud Force Technologies Co., Ltd.

Address of Applicant: Unit1,Block B,6th Floor, No.23 Honggang Rd. Ganjingzi Distr. Dalian, Liaoning Province

Manufacturer: Dalian Cloud Force Technologies Co., Ltd.

Address of Manufacturer: Unit1,Block B,6th Floor, No.23 Honggang Rd. Ganjingzi Distr. Dalian, Liaoning Province

Equipment Under Test (EUT)

Product Name: Industrial-grade Wireless Smart Multi-Sensor Device GS1

Model No.: GS1-AETH1RS, GS1-A, GS1-AL4G1RS

Trade Mark: UbiBot

FCC ID: 2AMFC-GS1-AETH1RS

IC: 24405-GS1AETH1RS

Applicable standards: FCC Part 15.247
RSS 247 Issue 2, February 2017
RSS-GEN Issue 5
ANSI C63.10: 2013

Date of sample receipt: Nov.20,2019

Date of Test: Nov.20,2019-Dec.20,2019

Date of report issued: Dec.20,2019

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:


Robinson Lee

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	Dec.20,2019	<i>Original</i>

Prepared By:

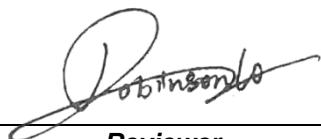


Project Engineer

Date:

Dec.20,2019

Check By:



Reviewer

Date:

Dec.20,2019

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4 Test Summary

IC/FCC Requirements		
RSS-Gen 8.8/§15.107(a)§15.207	AC Power Conducted Emission	PASS
RSS 247 5.2(a)/RSS GEN/§15.247(a)(2)	6dB Bandwidth & 99% Bandwidth	PASS
RSS 247 5.5/§15.247(d)	Spurious RF Conducted Emission	PASS
RSS 247 5.4 (d)/ §15.247(b)(1)	Maximum Conducted Output Power	PASS
RSS 247 5.2(b)/ §15.247(e)	Power Spectral Density	PASS
RSS-Gen 8.9/§15.247(d)	Radiated Emissions	PASS
RSS-Gen 8.10/§15.247(b)(1)	Band Edge	PASS
§15.247(b)(4)	Antenna gain	PASS

Remark: Test according to ANSI C63.10:2013 and RSS-Gen

Pass: The EUT complies with the essential requirements in the standard.

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

5 General Information

5.1 General Description of EUT

Product Name:	Industrial-grade Wireless Smart Multi-Sensor Device GS1
Model No.:	GS1-AETH1RS
Serial No.:	GS1-A, GS1-AL4G1RS
Test sample(s) ID:	GTS201911000086-1
Sample(s) Status	Engineer sample
Channel numbers:	802.11b/802.11g /802.11n(HT20): 11
Channel separation:	5MHz
Modulation technology:	802.11b: Direct Sequence Spread Spectrum (DSSS) 802.11g/802.11n(H20) Orthogonal Frequency Division Multiplexing (OFDM)
Antenna Type:	External ANT
Antenna Gain:	3.0dBi
Power Supply:	DC 3.7V From Battery and DC 5-12V From DC Port /DC 5V From TYPE-C
Auxiliary testing equipment	Mode:EP-TA20CBC Input:AC100-240V-50/60Hz, 0.5A Output:DC 5V,2A

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	Frequency (MHz)
	802.11b/802.11g/802.11n(HT20)
Lowest channel	2412MHz
Middle channel	2437MHz
Highest channel	2462MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode
<i>Remark: During the test, the dutycycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
Data rate	1Mbps	6Mbps	6.5Mbps	13Mbps

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

- **IC —Registration No.: 9079A**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

- **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.8 Additional Instructions

Test Software	Special test command provided by manufacturer
Power level setup	Default

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 26 2019	June. 25 2020
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 26 2019	June. 25 2020
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 26 2019	June. 25 2020
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 26 2019	June. 25 2020
7	EMI Test Software	FARAD	EZ-EMC	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 26 2019	June. 25 2020
9	Coaxial Cable	GTS	N/A	GTS211	June. 26 2019	June. 25 2020
10	Coaxial cable	GTS	N/A	GTS210	June. 26 2019	June. 25 2020
11	Coaxial Cable	GTS	N/A	GTS212	June. 26 2019	June. 25 2020
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 26 2019	June. 25 2020
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 26 2019	June. 25 2020
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 26 2019	June. 25 2020
15	Band filter	Amindeon	82346	GTS219	June. 26 2019	June. 25 2020
16	Power Meter	Anritsu	ML2495A	GTS540	June. 26 2019	June. 25 2020
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 26 2019	June. 25 2020
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 26 2019	June. 25 2020
19	Splitter	Agilent	11636B	GTS237	June. 26 2019	June. 25 2020
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 26 2019	June. 25 2020
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 19 2019	Oct. 18 2020
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 19 2019	Oct. 18 2020
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 19 2019	Oct. 18 2020
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 26 2019	June. 25 2020

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 26 2019	June. 25 2020
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 26 2019	June. 25 2020
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	FARAD	EZ-EMC	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 26 2019	June. 25 2020
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 26 2019	June. 25 2020
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 26 2019	June. 25 2020

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 26 2019	June. 25 2020
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 26 2019	June. 25 2020
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 26 2019	June. 25 2020
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 26 2019	June. 25 2020
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 26 2019	June. 25 2020
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 26 2019	June. 25 2020
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 26 2019	June. 25 2020

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020

Test results and Measurement Data

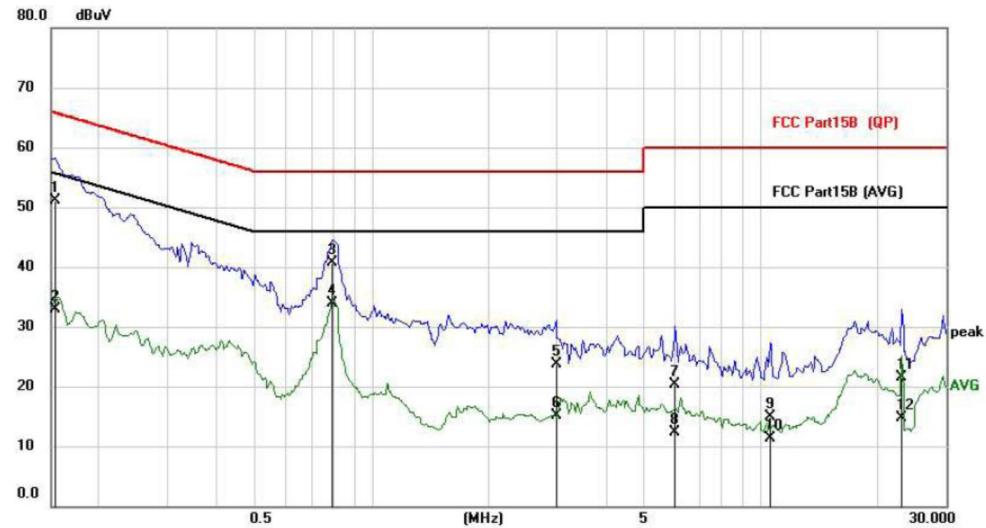
6.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna: The antennas are external antenna, the best case gain of the antennas are 3.0dBi, reference to the appendix II for details	

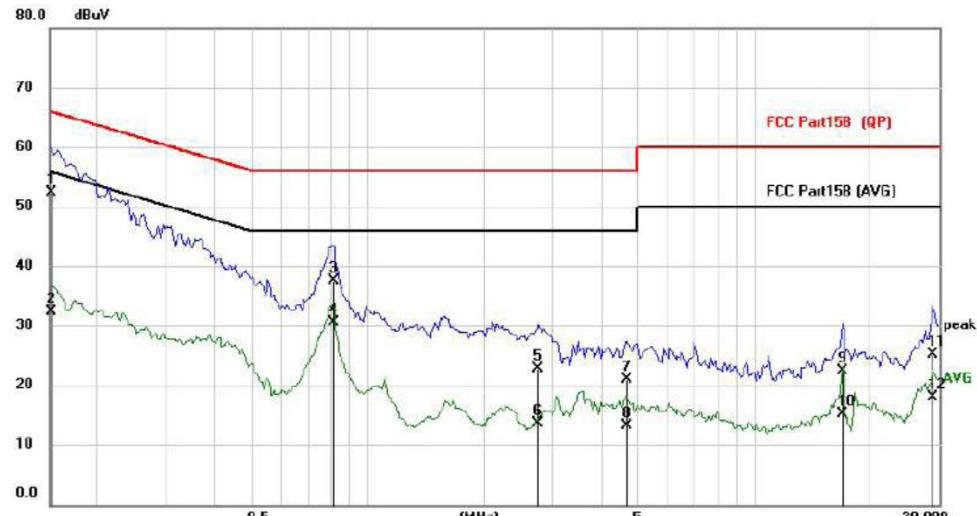
6.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207 and RSS Gen 8.8																
Test Method:	ANSI C63.10:2013																
Test Frequency Range:	150KHz to 30MHz																
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>			Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																
	Quasi-peak	Average															
0.15-0.5	66 to 56*	56 to 46*															
0.5-5	56	46															
5-30	60	50															
	* Decreases with the logarithm of the frequency.																
Test setup:	<p style="text-align: center;">Reference Plane</p> <p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>																
Test procedure:	<ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement. 																
Test Instruments:	Refer to section 6.0 for details																
Test mode:	Refer to section 5.2 for details																
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar											
Test voltage:	AC 120V, 60Hz																
Test results:	Pass																

Note ; We test all modes (DC 3.7V From Battery and DC 5-12V From DC Port /DC 5V From TYPE-C) and recorded the worst case at the Mode 802.11b CH11(DC 5V From TYPE-C by Adapter)

Measurement data
Line:


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Over Detector
1		0.1539	40.50	10.57	51.07	65.79	-14.72	QP
2		0.1539	22.28	10.57	32.85	55.79	-22.94	AVG
3		0.7935	29.80	10.98	40.78	56.00	-15.22	QP
4	*	0.7935	22.99	10.98	33.97	46.00	-12.03	AVG
5		2.9853	12.31	11.34	23.65	56.00	-32.35	QP
6		2.9853	3.72	11.34	15.06	46.00	-30.94	AVG
7		6.0303	8.65	11.65	20.30	60.00	-39.70	QP
8		6.0303	0.68	11.65	12.33	50.00	-37.67	AVG
9		10.6128	2.85	11.96	14.81	60.00	-45.19	QP
10		10.6128	-0.68	11.96	11.28	50.00	-38.72	AVG
11		23.0459	8.41	13.01	21.42	60.00	-38.58	QP
12		23.0459	1.69	13.01	14.70	50.00	-35.30	AVG

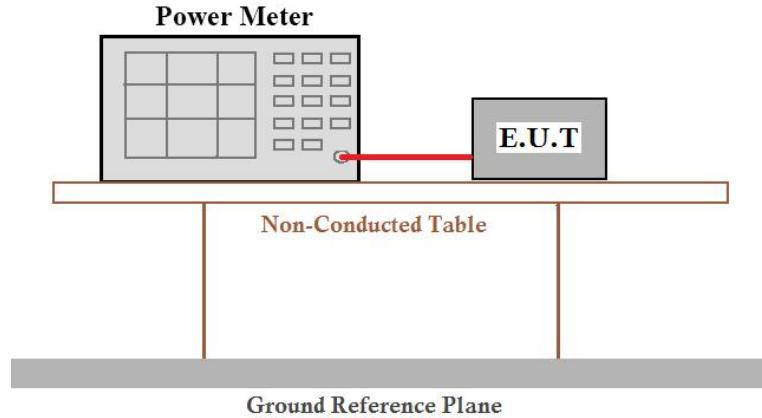
Neutral:


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV	dB	Detector
1 *		0.1516	41.76	10.57	52.33	65.91	-13.58 QP
2		0.1516	21.65	10.57	32.22	55.91	-23.69 AVG
3		0.8169	26.51	10.99	37.50	56.00	-18.50 QP
4		0.8169	19.45	10.99	30.44	46.00	-15.56 AVG
5		2.7552	11.29	11.32	22.61	56.00	-33.39 QP
6		2.7552	2.11	11.32	13.43	46.00	-32.57 AVG
7		4.6715	9.44	11.55	20.99	56.00	-35.01 QP
8		4.6715	1.65	11.55	13.20	46.00	-32.80 AVG
9		16.8645	9.80	12.54	22.34	60.00	-37.66 QP
10		16.8645	2.66	12.54	15.20	50.00	-34.80 AVG
11		28.8999	11.73	13.43	25.16	60.00	-34.84 QP
12		28.8999	4.52	13.43	17.95	50.00	-32.05 AVG

Notes:

- An initial pre-scan was performed on the line and neutral lines with peak detector.
- Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- Final Level =Receiver Read level + LISN Factor + Cable Loss
- If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

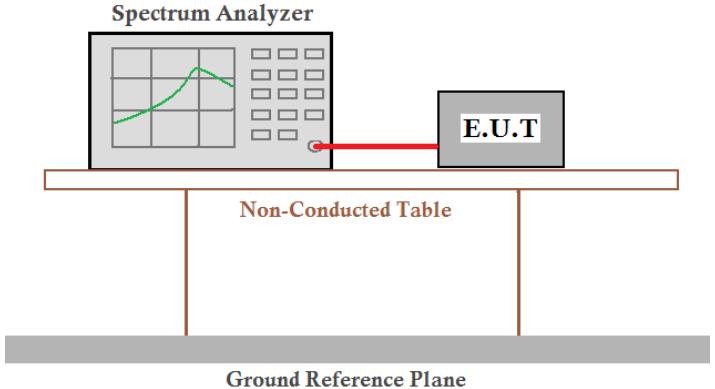
6.3 Conducted Peak Output Power

Test Requirement :	FCC Part15 C Section 15.247 (b)(3) and RSS 247 5.4 (d)
Test Method :	KDB558074 D01 DTS Meas Guidance V05or02
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Test CH	Peak Output Power (dBm)			Limit(dBm)	Result
	802.11b	802.11g	802.11n(HT20)		
Lowest	13.86	13.97	12.44	30.00	Pass
Middle	13.98	13.49	12.38		
Highest	14.06	12.32	10.61		

6.4 Channel Bandwidth & 99% Occupy Bandwidth

Test Requirement :	FCC Part15 C Section 15.247 (a)(2) and RSS 247 5.2(a)
Test Method :	KDB558074 D01 DTS Meas Guidance V05or02
Limit:	>500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data**Note: We tested the all Mode and recorded the wrost case at the Middle channel**

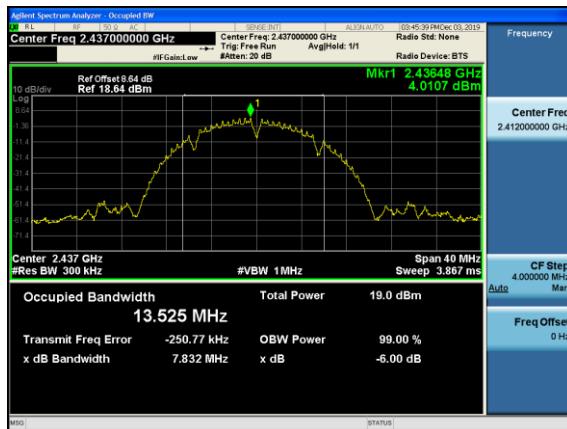
Test CH	Channel Bandwidth (MHz)			Limit(KHz)	Result
	802.11b	802.11g	802.11n(HT20)		
Middle	7.638	15.73	16.11	>500	Pass

Test CH	99% Occupy Bandwidth (MHz)			Limit(KHz)	Result
	802.11b	802.11g	802.11n(HT20)		
Middle	13.525	17.231	17.966	>500	Pass

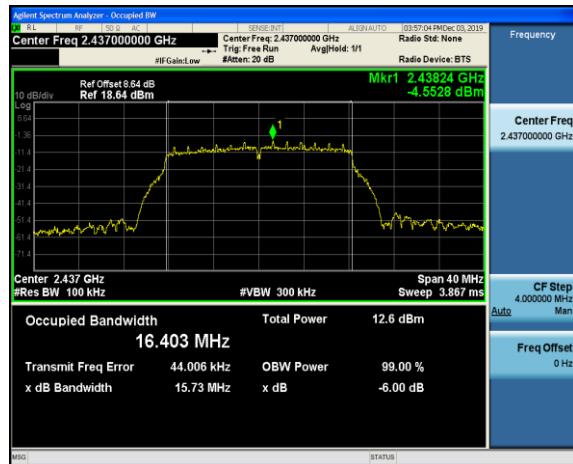
Test plot as follows:

802.11b

802.11g

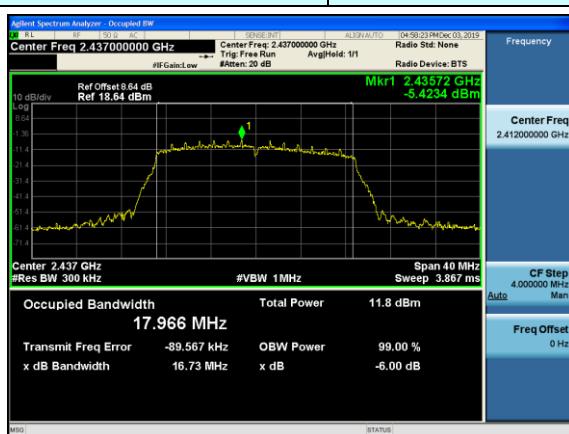


Middle channel 99% Occupy Bandwidth

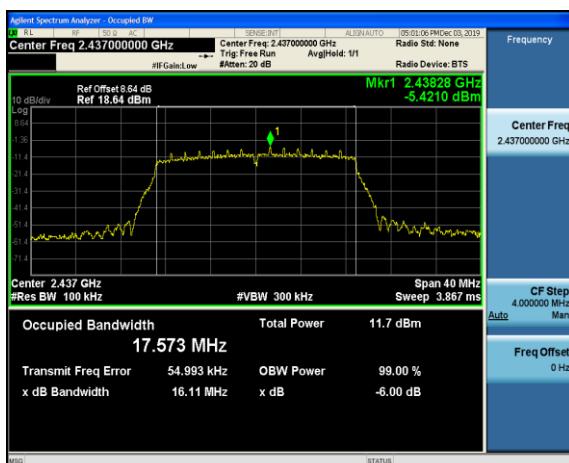


Middle channel Channel Bandwidth

802.11n

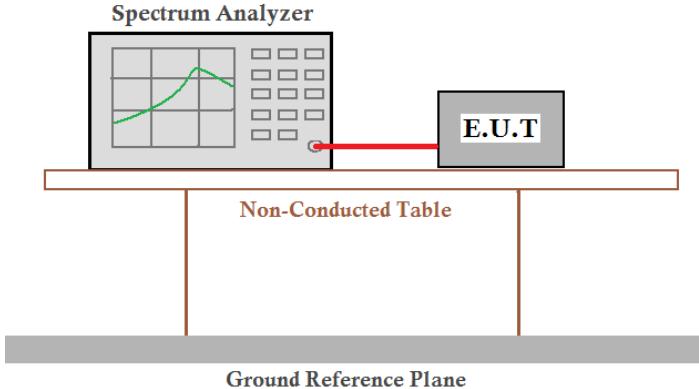


Middle channel 99% Occupy Bandwidth



Middle channel Channel Bandwidth

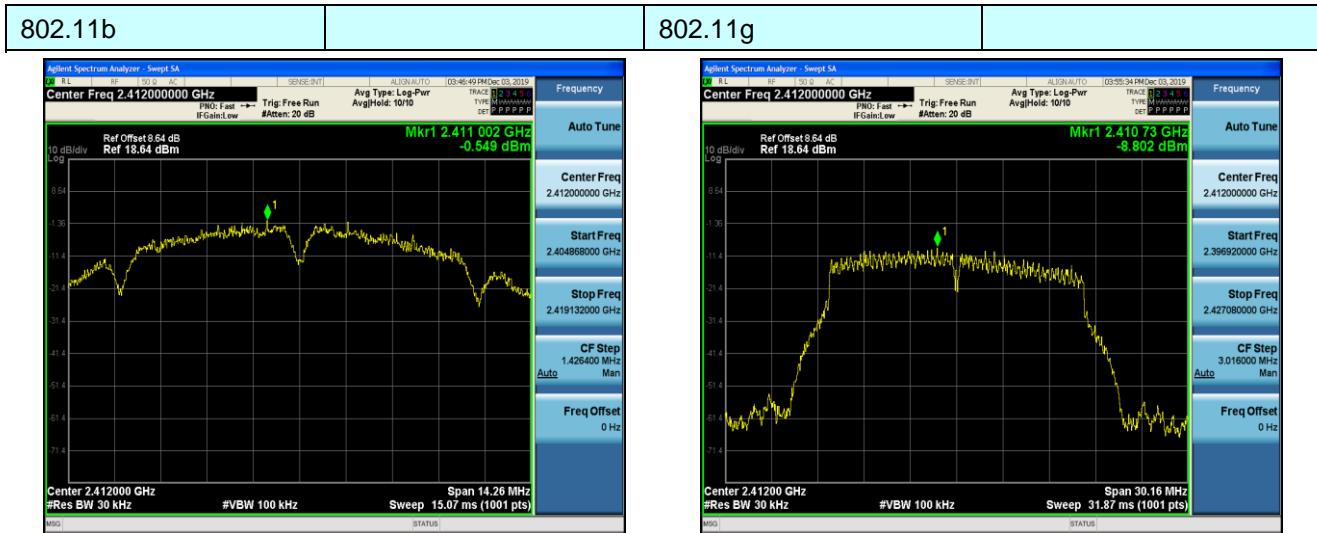
6.5 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e) and RSS 247 5.2(b)
Test Method:	KDB558074 D01 DTS Meas Guidance V05or02
Limit:	8dBm/3kHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to the E.U.T (Equipment Under Test) via a cable. The E.U.T is placed on a Non-Conducted Table. The entire assembly sits on a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

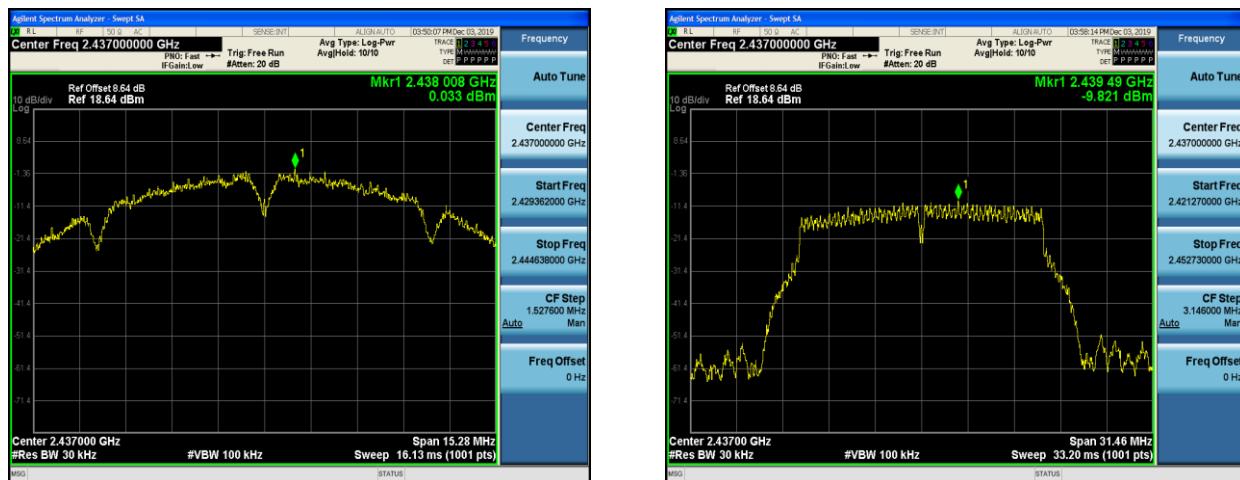
Measurement Data

Test CH	Power Spectral Density (dBm/3kHz)			Limit (dBm/3kHz)	Result
	802.11b	802.11g	802.11n(HT20)		
Lowest	-0.55	-8.80	-9.57		
Middle	0.03	-9.82	-10.24		
Highest	-1.47	-10.65	-10.67	8.00	Pass

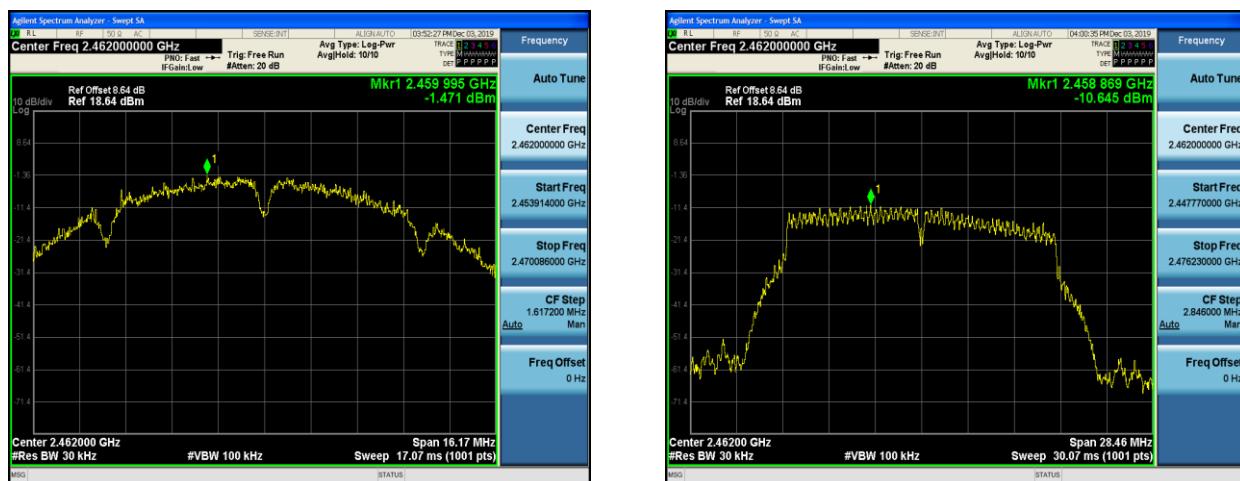
Test plot as follows:



Lowest channel



Middle channel



Highest channel

802.11n



Lowest channel



Middle channel



Highest channel

Global United Technology Services Co., Ltd.

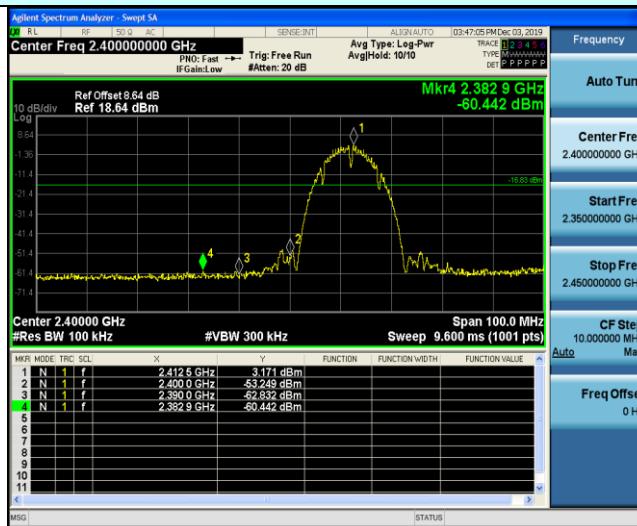
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6.6 Band edges

6.6.1 Conducted Emission Method

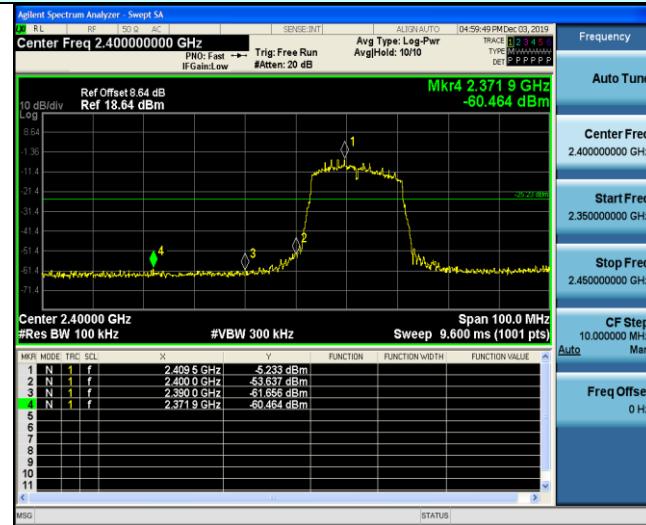
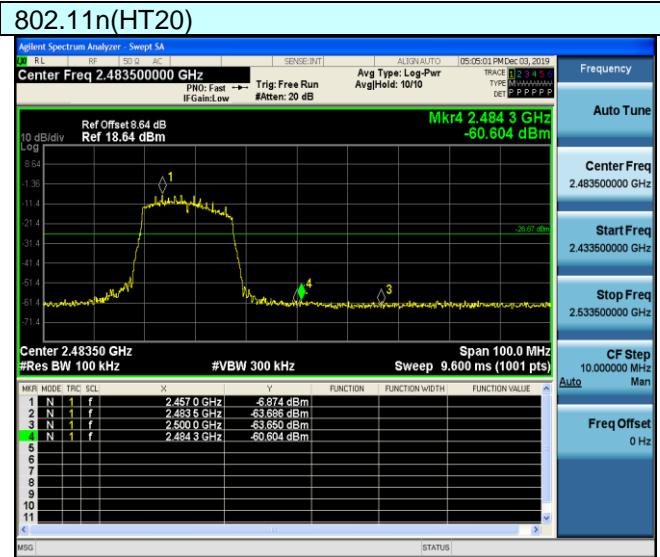
Test Requirement:	FCC Part15 C Section 15.247 (d) and RSS-Gen 8.10
Test Method:	KDB558074 D01 DTS Meas Guidance V05or02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional 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.
Test setup:	<p style="text-align: center;">Spectrum Analyzer</p> <p>The diagram illustrates the test setup for conducted emissions. A Spectrum Analyzer is positioned above a Non-Conducted Table. A red cable connects the Spectrum Analyzer to the table. On the table, there is a grey rectangular box labeled "E.U.T". Below the table is a horizontal grey bar representing the "Ground Reference Plane".</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:
Test mode:

802.11b

Lowest channel
Highest channel
Test mode:

802.11g

Lowest channel
Highest channel

Test mode:

Lowest channel

Highest channel

6.6.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and RSS-Gen 8.9										
Test Method:	ANSI C63.10: 2013										
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.										
Test site:	Measurement Distance: 3m										
Receiver setup:	Frequency	Detector	RBW	VBW	Value						
	Above 1GHz	Peak	1MHz	3MHz	Peak						
Limit:	Average	1MHz	3MHz	Average							
	Frequency	Limit (dBuV/m @3m)		Value							
	Above 1GHz	54.00		Average							
Test setup:											
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report. 										
Test Instruments:	Refer to section 6.0 for details										
Test mode:	Refer to section 5.2 for details										
Test results:	Pass										

Measurement data:

Note: 802.11b/802.11g/802.11n (H20)/802.11n (H40) and all have been tested, only worse case 802.11b is reported

Horizontal: 802.11b Mode TX CH Low (2412MHz)

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2390	64.68	-5.68	59	74	-15	
2390	47.59	-5.68	41.91	54	-12.09	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical: 802.11b Mode TX CH Low (2412MHz)

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2390	65.26	-5.68	59.58	74	-14.42	
2390	49.75	-5.68	44.07	54	-9.93	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Horizontal: 802.11b Mode TX CH HIGH (2462MHz)

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	65.36	-5.85	59.51	74	-14.49	
2483.5	48.28	-5.85	42.43	54	-11.57	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical: 802.11b Mode TX CH HIGH (2462MHz)

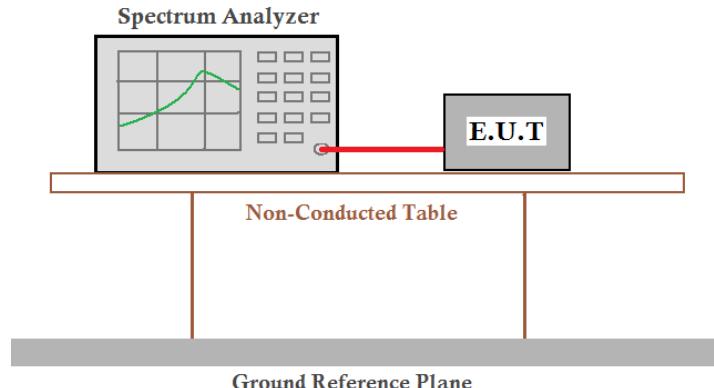
Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	66.62	-5.65	60.97	74	-13.03	peak
2483.5	49.18	-5.85	43.33	54	-10.67	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

6.7 Spurious Emission

6.7.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d) and RSS-Gen 8.9
Test Method:	KDB558074 D01 DTS Meas Guidance V05or02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

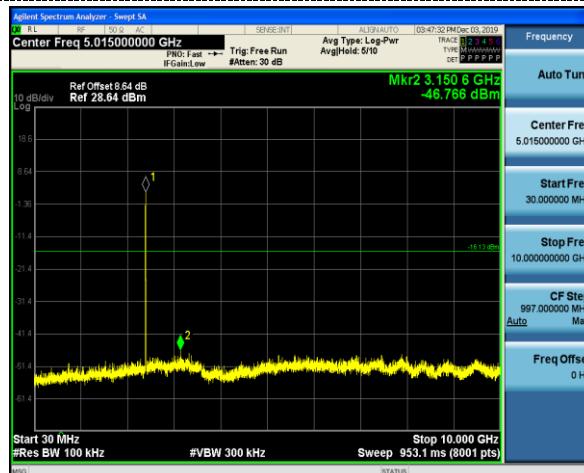
802.11b CH01



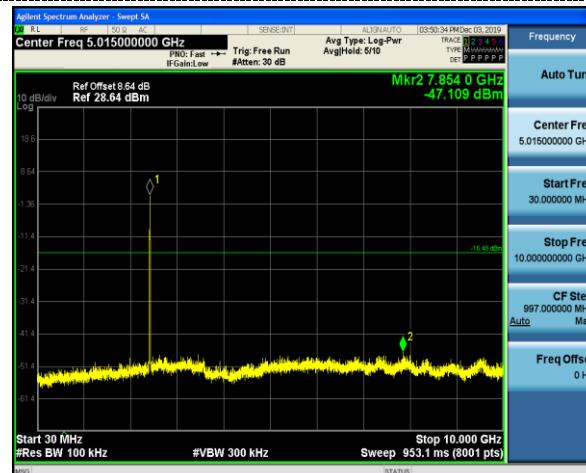
802.11b CH06



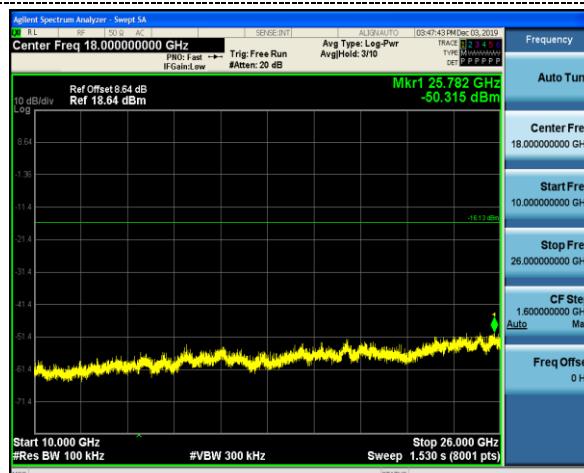
Reference



Reference



30MHz-3GHz

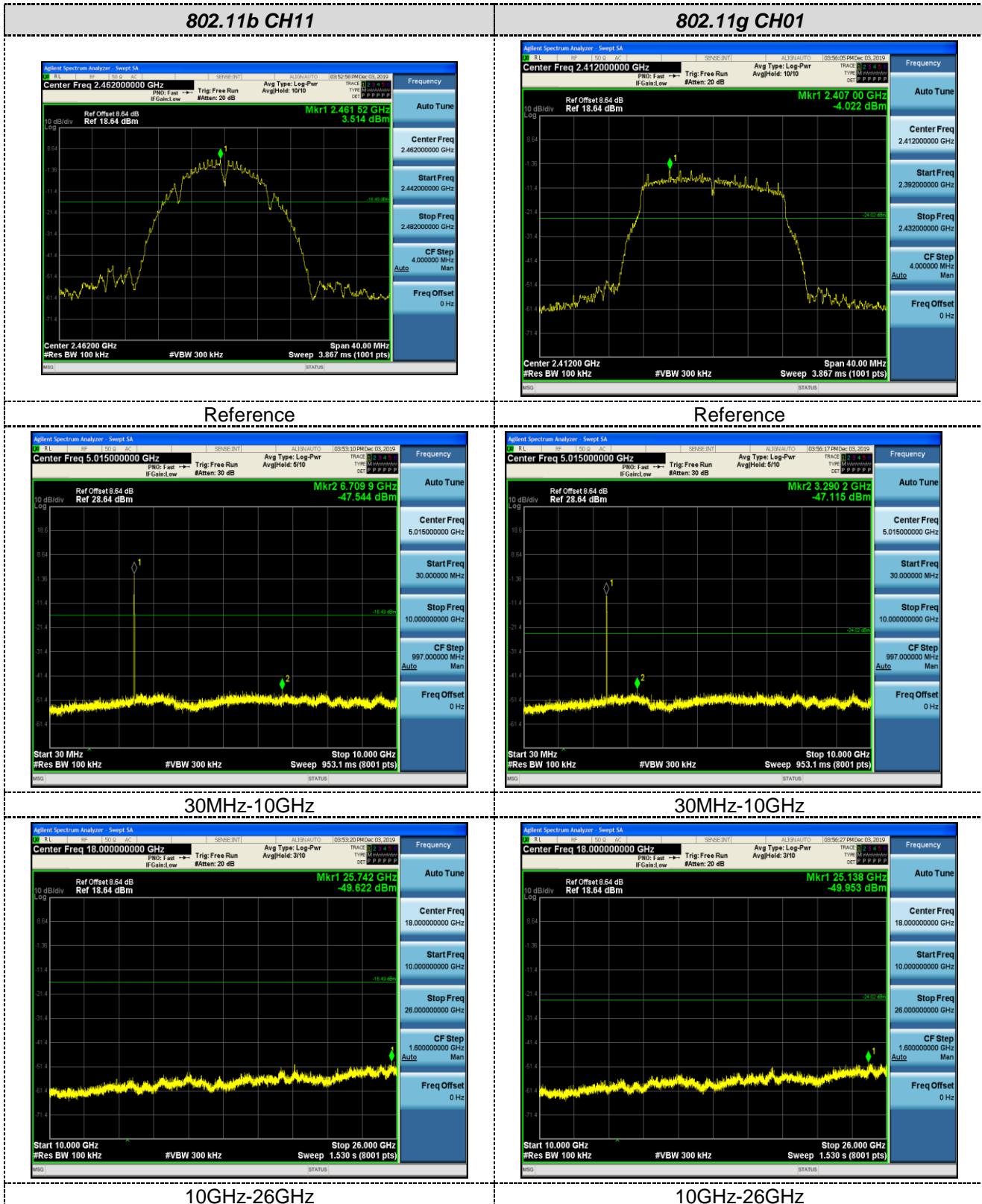


30MHz-3GHz



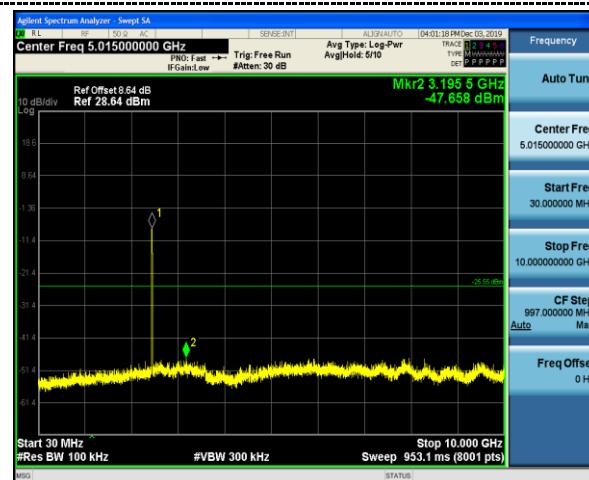
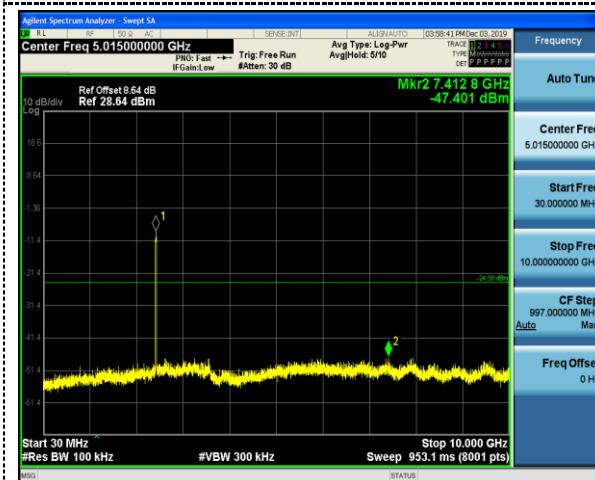
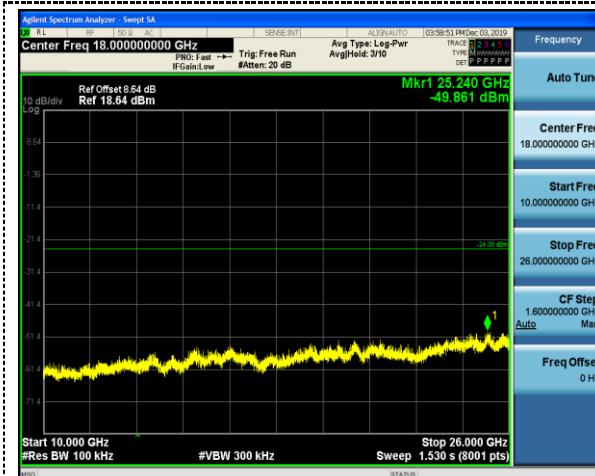
3GHz-25GHz

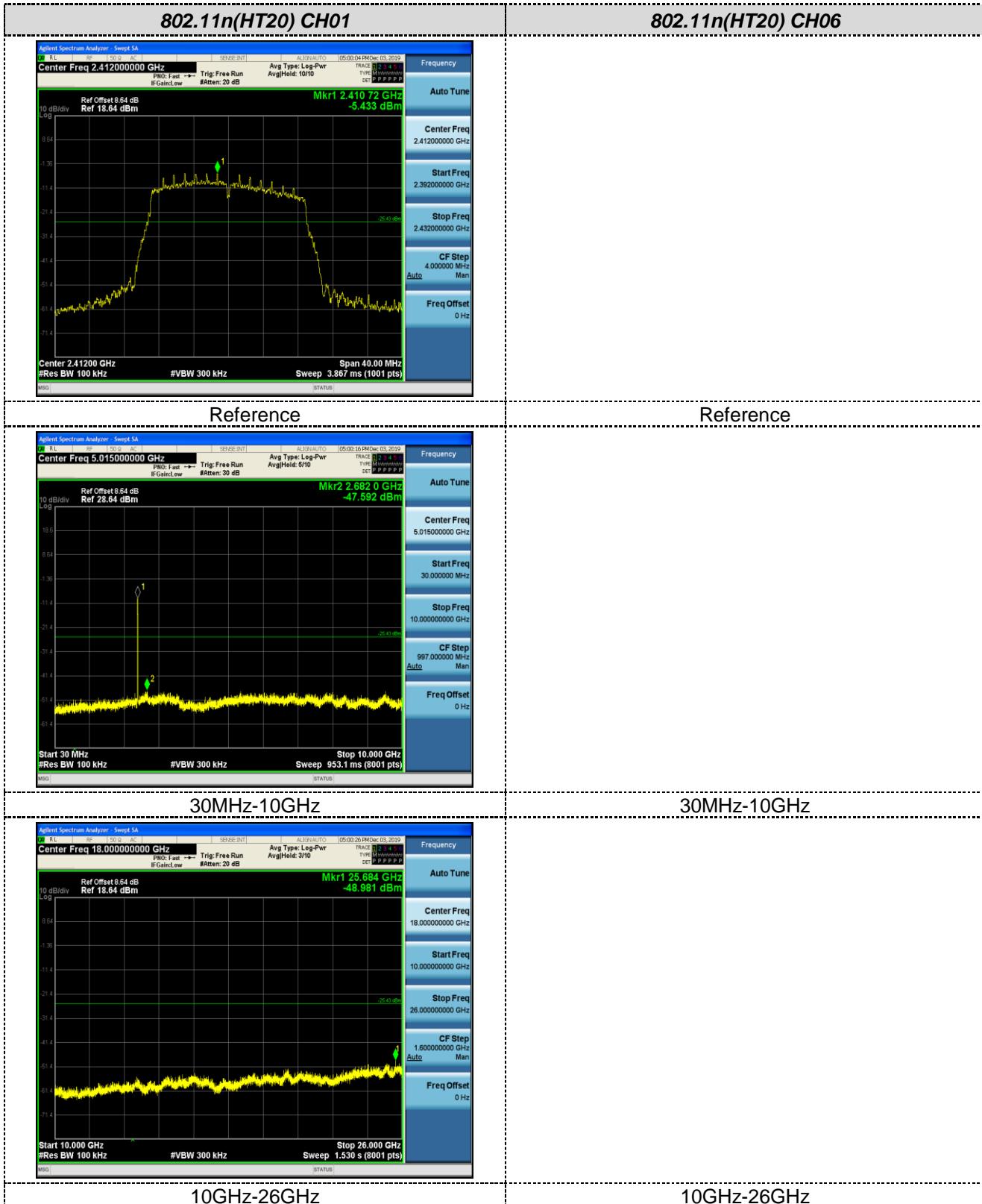
3GHz-25GHz



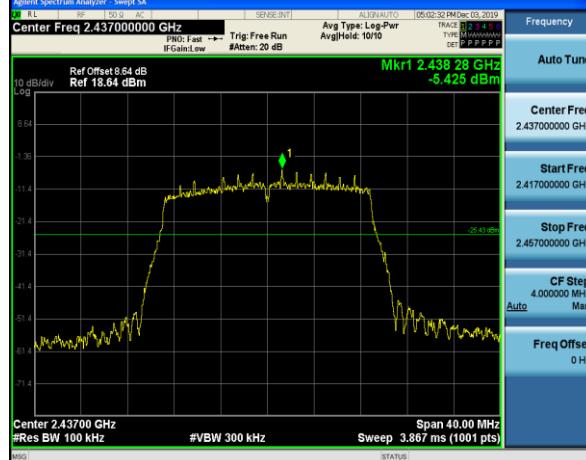
802.11g CH06

802.11g CH11

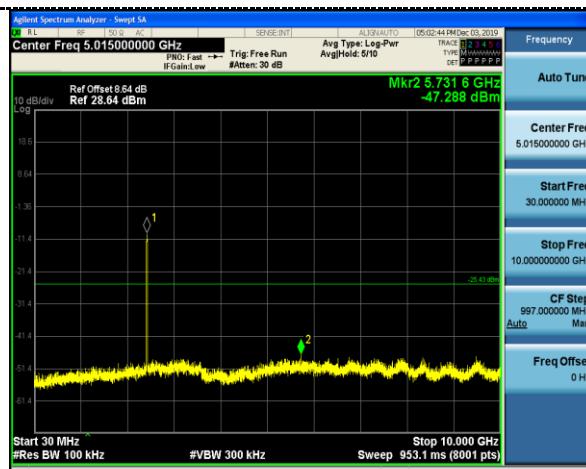
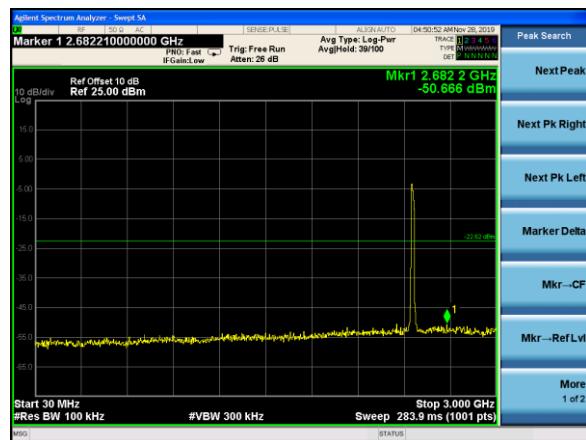
Reference

30MHz-10GHz

10GHz-26GHz
10GHz-26GHz



802.11n(HT20) CH11



Reference

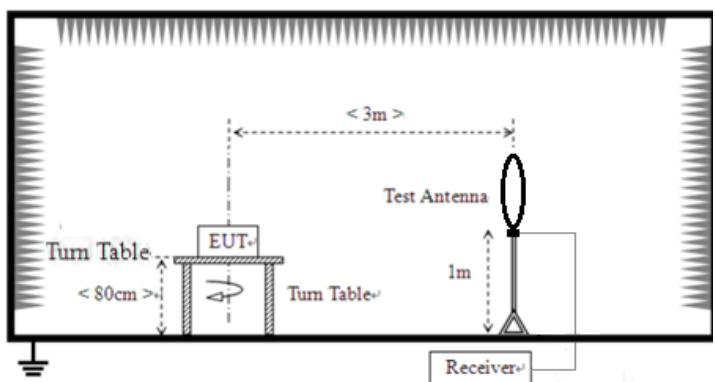


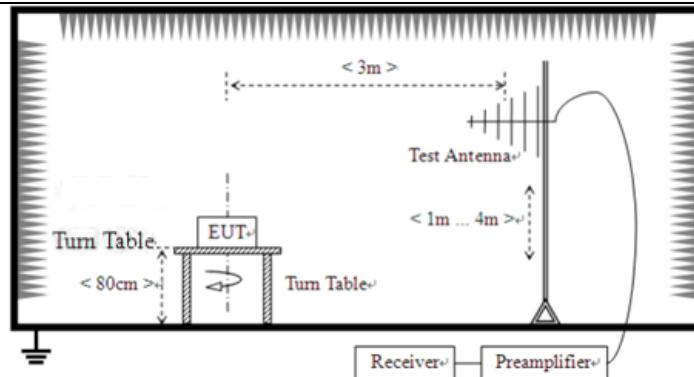
30MHz-10GHz



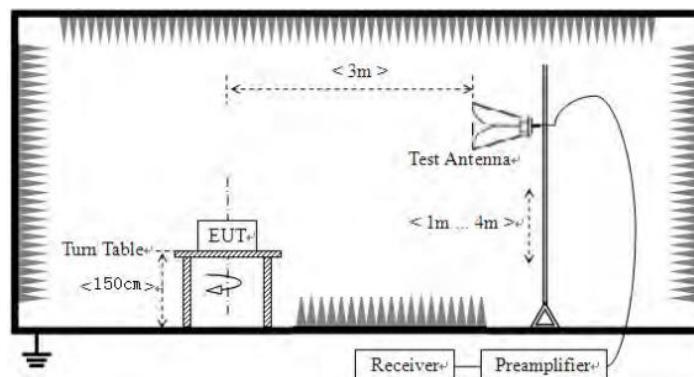
10GHz-26GHz

6.7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209						
Test Method:	ANSI C63.10: 2013						
Test Frequency Range:	9kHz to 25GHz						
Test site:	Measurement Distance: 3m						
Receiver setup:	Frequency	Detector	RBW	VBW	Value		
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak		
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak		
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak		
	Above 1GHz	Peak	1MHz	3MHz	Peak		
		Peak	1MHz	10Hz	Average		
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance 3m			
	0.009MHz-0.490MHz	2400/F(KHz)	QP				
	0.490MHz-1.705MHz	24000/F(KHz)	QP				
	1.705MHz-30MHz	30	QP				
	30MHz-88MHz	100	QP				
	88MHz-216MHz	150	QP				
	216MHz-960MHz	200	QP				
	960MHz-1GHz	500	QP				
	Above 1GHz	500	Average				
		5000	Peak				
Test setup:	For radiated emissions from 9kHz to 30MHz						
							
	For radiated emissions from 30MHz to 1GHz						



For radiated emissions above 1GHz



Test Procedure:

1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:	Refer to section 6.0 for details				
Test mode:	Refer to section 5.2 for details				
Test voltage:	AC120V 60Hz				
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:
Test voltage:	AC 120V, 60Hz				
Test results:	Pass				

Remarks:

1. Only the worst case Main Antenna test data.
2. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

Measurement data:

■ **9kHz~30MHz**

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

■ Below 1GHz

Note ; We test all modes (DC 3.7V From Battery and DC 5-12V From DC Port /DC 5V From TYPE-C) and recorded the worst case at the Mode 802.11b CH11(DC 5V From TYPE-C by Adapter)

Horizontal:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Over Detector
1		84.1100	46.59	-21.02	25.57	40.00	-14.43	QP
2		150.0108	52.19	-17.60	34.59	43.50	-8.91	QP
3		199.9856	54.40	-20.19	34.21	43.50	-9.29	QP
4		225.3080	56.26	-19.34	36.92	46.00	-9.08	QP
5	*	275.1570	56.18	-19.00	37.18	46.00	-8.82	QP
6		366.8231	50.91	-17.67	33.24	46.00	-12.76	QP

Vertical:


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Over Detector
1		44.5868	46.60	-18.26	28.34	40.00	-11.66	QP
2	*	74.9191	53.53	-20.36	33.17	40.00	-6.83	QP
3		125.0066	55.53	-19.60	35.93	43.50	-7.57	QP
4		150.0108	50.19	-17.60	32.59	43.50	-10.91	QP
5		250.3012	55.83	-19.37	36.46	46.00	-9.54	QP
6		275.1570	54.29	-19.41	34.88	46.00	-11.12	QP

■ **Above 1GHz**

Note: 802.11b/802.11g/802.11n (H20) and all have been tested, only worse case 802.11b is reported

Horizontal: LOW CH1 (802.11b Mode)/2412

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits	Margin (dB)	Detector Type
4824	65.12	-3.67	61.45	74	-12.55	peak
4824	47.57	-3.64	43.93	54	-10.07	AVG
7236	60.17	-0.9	59.27	74	-14.73	peak
7236	44.59	-0.9	43.69	54	-10.31	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical: LOW CH1 (802.11b Mode)/2412

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits	Margin (dB)	Detector Type
4824	65.22	-3.67	61.55	74	-12.45	peak
4824	46.09	-3.64	42.45	54	-11.55	AVG
7236	59.67	-0.9	58.77	74	-15.23	peak
7236	43.48	-0.9	42.58	54	-11.42	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Horizontal: MID CH6 (802.11b Mode)/2437

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4874	62.82	-3.53	59.29	74	-14.71	peak
4874	45.73	-3.53	42.2	54	-11.8	AVG
7311	58.92	-0.85	58.07	74	-15.93	peak
7311	44.05	-0.85	43.2	54	-10.8	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical: MID CH6 (802.11b Mode)/2437

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4874	63.62	-3.53	60.09	74	-13.91	peak
4874	47.17	-3.53	43.64	54	-10.36	AVG
7311	60.35	-0.85	59.5	74	-14.5	peak
7311	44.06	-0.85	43.21	54	-10.79	AVG
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---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Horizontal: HIGH CH11 (802.11b Mode)/2462

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4924	63.87	-3.49	60.38	74	-13.62	peak
4924	46.11	-3.49	42.62	54	-11.38	AVG
7386	58.38	-0.78	57.6	74	-16.4	peak
7386	43.7	-0.78	42.92	54	-11.08	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical: HIGH CH11 (802.11b Mode)/2462

Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4924	62.16	-3.49	58.67	74	-15.33	peak
4924	46.84	-3.49	43.35	54	-10.65	AVG
7386	64.15	-0.78	63.37	74	-10.63	peak
7386	43.11	-0.78	42.33	54	-11.67	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

(1) Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(2) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed.

7 Test Setup Photo

Reference to the **appendix I** for details.

8 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----