Shenzhen Huaxia Testing Technology Co., Ltd

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua District, Shenzhen, China

Telephone: +86-755-26648640
Fax: +86-755-26648637
Website: www.cqa-cert.com

Report Template Version: V03
Report Template Revision Date: Mar.1st, 2017

FCC Test Report

Report No. :	CQASZ20180500067E-01
Applicant:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD.
Address of Applicant:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China. 518054
Manufacturer:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD.
Address of Manufacturer:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China. 518054
Factory:	Dongguan Tengsheng Industrial Co., Ltd.
Address of Factory:	A22# Luyi Street, Tianxin Village, Tangxia Town, Dongguan, China.
Equipment Under Test (EUT):	
Product:	Hubsan HT011 Transmitter
Model No.:	HT011A, HT011B
Test Model No.:	HT011A
Brand Name:	HUBSAN
FCC ID:	2AN75-T011ATX
Standards:	47 CFR Part 15, Subpart C
Date of Test:	2018-05-25 to 2018-06-08
Date of Issue:	2018-06-08
Test Result :	**PASS***

Tested By: Aaron Ma

(Aaron Ma)

Reviewed By: Owen Zhou

(Owen Zhou)

Approved By:

(Jack Ai)

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

The test report is effective only with both signature and specialized stamp, The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CQA, this report can't be reproduced except in full.

2 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20180500067E-01	Rev.01	Initial report	2018-06-08

3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	N/A
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	KDB558074 D01 v04	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	KDB558074 D01 v04	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	KDB558074 D01 v04	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	KDB558074 D01 v04	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	KDB558074 D01 v04	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

N/A: Not applicable, the EUT power supply by battery.

4 Contents

Page

1 COVER PAGE 1

2 VERSION 2

3 TEST SUMMARY 3

4 CONTENTS 4

5 GENERAL INFORMATION 5

5.1 CLIENT INFORMATION 5
5.2 GENERAL DESCRIPTION OF EUT 5
5.3 TEST ENVIRONMENT AND MODE 6
5.4 DESCRIPTION OF SUPPORT UNITS 6
5.5 TEST LOCATION 7
5.6 TEST FACILITY 7
5.7 STATEMENT OF THE MEASUREMENT UNCERTAINTY 8
5.8 DEVIATION FROM STANDARDS 8
5.9 ABNORMALITIES FROM STANDARD CONDITIONS 8
5.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER 8
5.11 EQUIPMENT LIST 9

6 TEST RESULTS AND MEASUREMENT DATA 10

6.1 ANTENNA REQUIREMENT 10
6.2 CONDUCTED AVERAGE OUTPUT POWER 11
6.3 6DB OCCUPY BANDWIDTH 12
6.4 POWER SPECTRAL DENSITY 15
6.5 BAND-EDGE FOR RF CONDUCTED EMISSIONS 18
6.6 RF CONDUCTED SPURIOUS EMISSIONS 24
6.7 RADIATED SPURIOUS EMISSIONS 31
6.7.1 Radiated emission below 1GHz 34
6.7.2 Transmitter emission above 1GHz 36
6.8 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY 38

7 PHOTOGRAPHS - EUT TEST SETUP 42

7.1 RADIATED SPURIOUS EMISSION 42

8 PHOTOGRAPHS - EUT CONSTRUCTIONAL DETAILS 44

5 General Information

5.1 Client Information

Applicant:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD.
Address of Applicant:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China. 518054
Manufacturer:	SHENZHEN HUBSAN TECHNOLOGY CO., LTD.
Address of Manufacturer:	13th Floor, Bldg 1C, Shenzhen Software Industry Base, Xuefu Road, Nanshan District, Shenzhen, China. 518054
Factory:	Dongguan Tengsheng Industrial Co., Ltd.
Address of Factory:	A22# Luyi Street, Tianxin Village, Tangxia Town, Dongguan, China.

5.2 General Description of EUT

Product Name:	Hubsan HT011 Transmitter
Model No.:	HT011A, HT011B
Trade Mark:	HUBSAN
Hardware version:	V1.0
Software version:	V1.0
Operation Frequency:	IEEE 802.11b/g/n(HT20/40): 2452MHz (manufacturer declare)
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20/40: 1 Channel (manufacturer declare)
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20/40) : OFDM (64QAM, 16QAM,QPSK,BPSK)
Sample Type:	portable production
Test Software of EUT:	QATool_Dbg (manufacturer declare)
Antenna Type:	Integral antenna
Antenna Gain:	-2.0dBi
Power Supply:	High performance battery: DC7.4V 1300mAh

Note:

1. Only the model HT011A was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

2. The EUT had two Antennas, they can not transmitting at the same time. Antenna 1 and Antenna 2 had tested, the Antenna 1 is the worst case data, only recorded the worst case data in the report.

Operation Frequency each of channel(802.11b/g/n HT20/40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
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:

For 802.11b/g/n (HT20/40):

Channel	Frequency
9	2452MHz

5.3 Test Environment and Mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1008 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate. ＞98% duty cycle

5.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC certification
PC	Lenovo	ThinkPad E450c	Provide by lab	ID

5.5 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

5.6 Test Facility

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

- **CNAS (No. CNAS L5785)**

CNAS has accredited Shenzhen Huaxia Testing Technology Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **ISED Registration No.: 22984-1**

The 3m Semi-anechoic chamber of Shenzhen Huaxia Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology 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 our files. Registration No.:522263

5.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

Test	Range	Uncertainty	Notes
Radiated Emission	Below 1GHz	±5.12dB	(1)
Radiated Emission	Above 1GHz	±4.60dB	(1)
Conducted Disturbance	0.15~30MHz	±3.34dB	(1)

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

5.8 Deviation from Standards

None.

5.9 Abnormalities from Standard Conditions

None.

5.10 Other Information Requested by the Customer

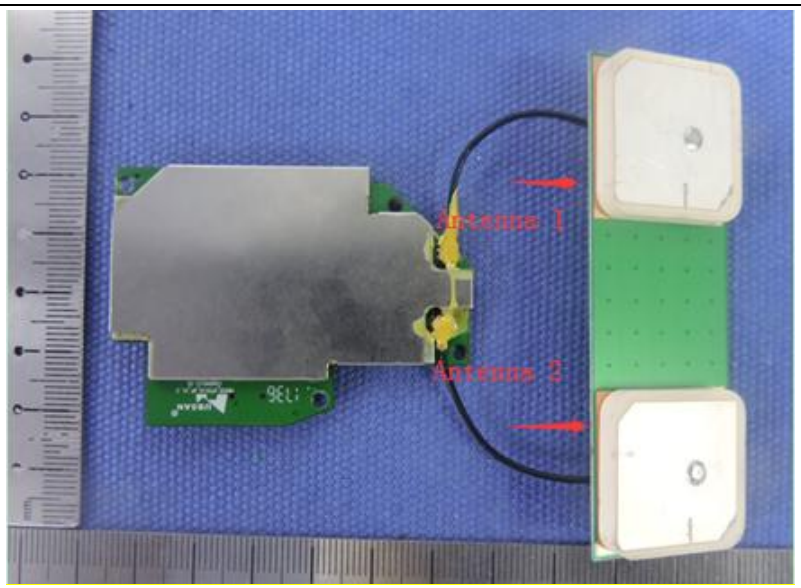
None.

5.11 Equipment List

Item	Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Due Date
1	EMI Test Receiver	R&S	ESR7	CQA-005	2018/9/24
2	Spectrum analyzer	R&S	FSU26	CQA-038	2018/9/24
3	Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2018/9/24
4	Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2018/9/24
5	Loop antenna	ZHINAN	ZN30900A	CQA-087	2019/3/21
6	Bilog Antenna	R&S	HL562	CQA-011	2018/9/24
7	Horn Antenna	R&S	HF906	CQA-012	2018/9/24
8	Horn Antenna	R&S	BBHA 9170	CQA-088	2018/9/24
9	Coax cable (9KHz~40GHz)	CQA	RE-low-01	CQA-077	2018/9/24
10	Coax cable (9KHz~40GHz)	CQA	RE-high-02	CQA-078	2018/9/24
11	Antenna Connector	CQA	RFC-01	CQA-080	2018/9/24
12	RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2018/9/24
13	Power Sensor	Anritsu	MA2411B	CQA-089	2018/9/24
14	Wideband Peak Power Meter	Anritsu	ML2495A	CQA-090	2018/9/24

6 Test results and Measurement Data

6.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C 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(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is integral antenna. The best case gain of the antenna is -2.0dBi.	

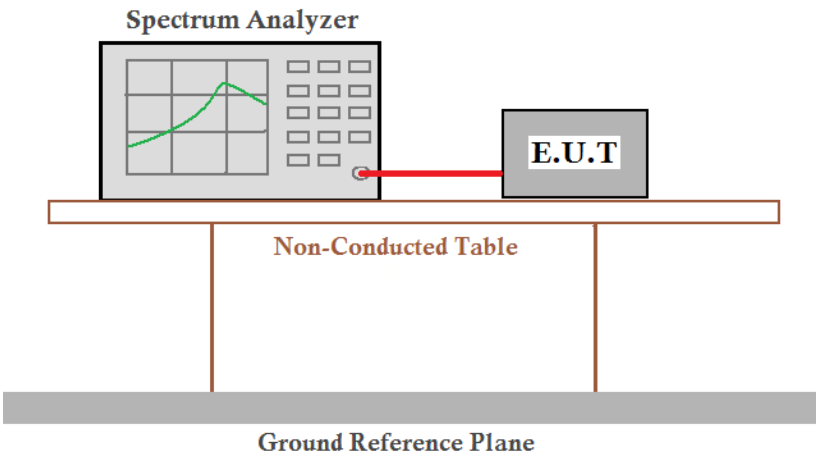
6.2 Conducted Average Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	KDB558074 D01 v04
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) , 13.5Mbps of rate is the worst case of 802.11n(HT40) Only the worst case is recorded in the report.
Limit:	30dBm
Test Results:	Pass

Measurement Data

802.11b mode			
Test channel	Average Output Power (dBm)	Limit (dBm)	Result
2452MHz	7.92	30.00	Pass
802.11g mode			
Test channel	Average Output Power (dBm)	Limit (dBm)	Result
2452MHz	7.86	30.00	Pass
802.11n(HT20)mode			
Test channel	Average Output Power (dBm)	Limit (dBm)	Result
2452MHz	7.84	30.00	Pass
802.11n(HT40)mode			
Test channel	Average Output Power (dBm)	Limit (dBm)	Result
2452MHz	7.89	30.00	Pass

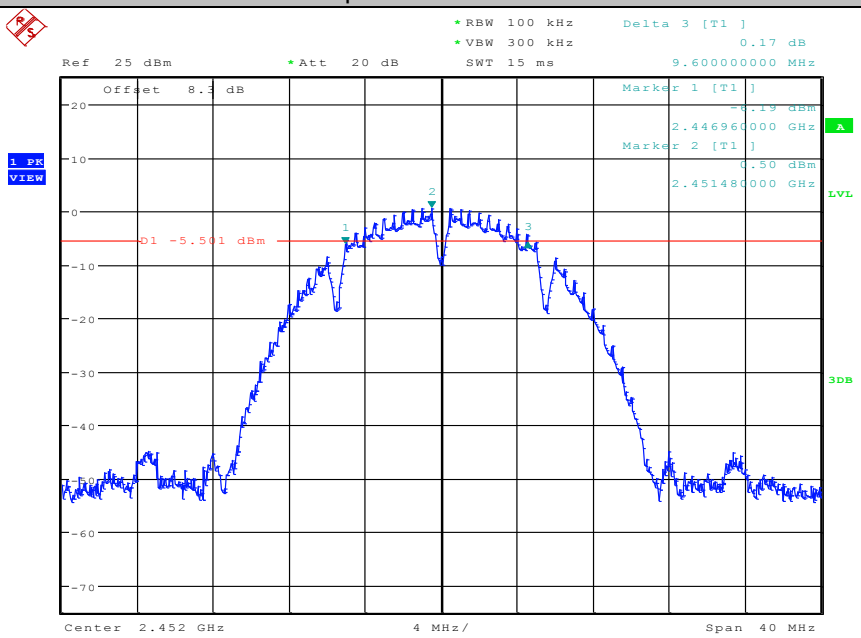
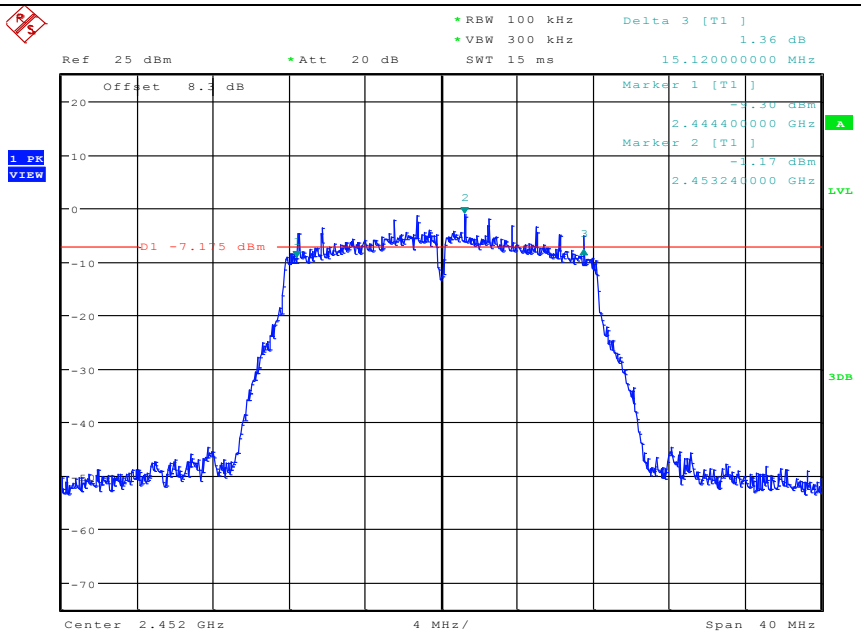
6.3 6dB Occupy Bandwidth

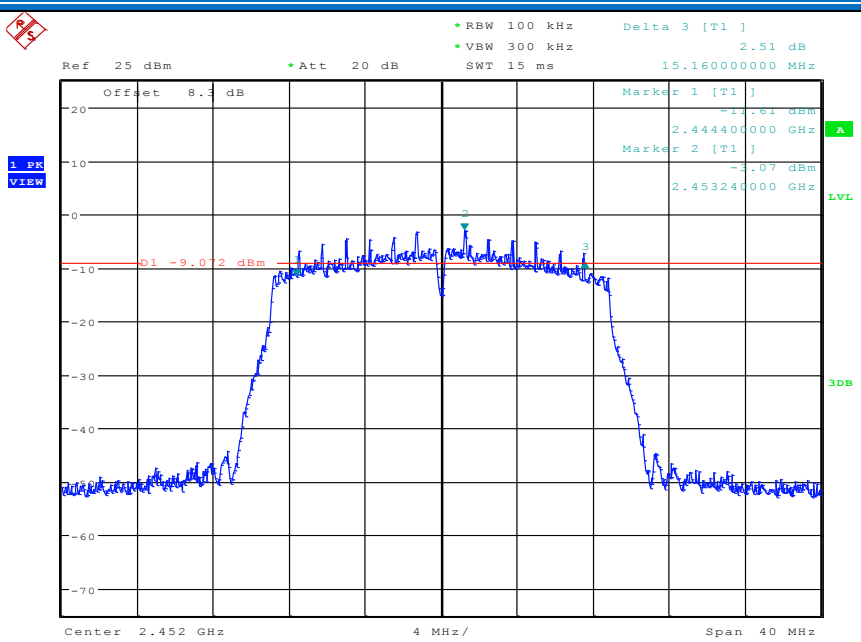
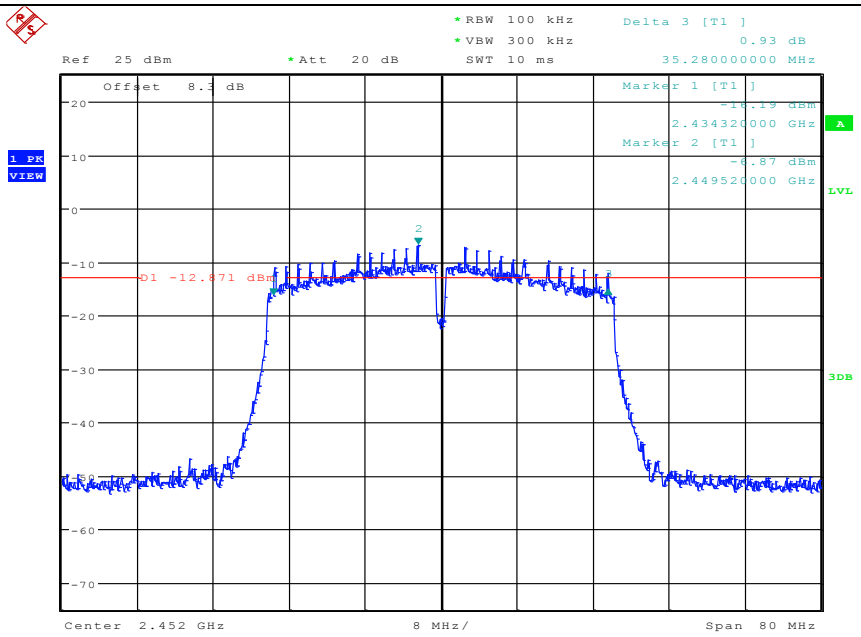
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	KDB558074 D01 v04
Test Setup:	 *Remark: Offset = cable loss + attenuation factor*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20), 13.5Mbps of rate is the worst case of 802.11n(HT40)
Limit:	≥ 500 kHz
Test Results:	Pass

Measurement Data

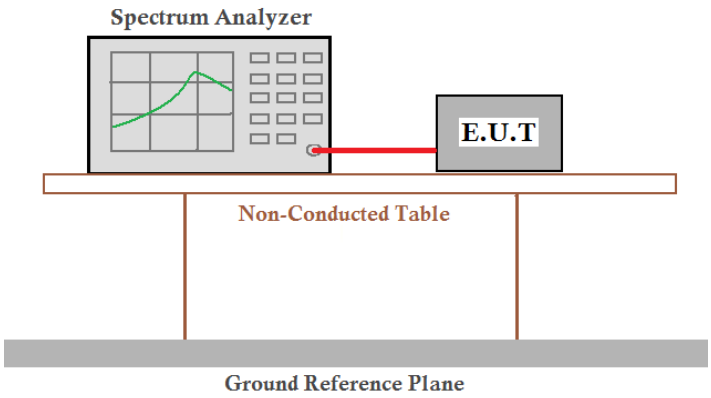
802.11b mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
2452MHz	9.600	≥500	Pass
802.11g mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
2452MHz	15.120	≥500	Pass
802.11n(HT20) mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
2452MHz	15.160	≥500	Pass
802.11n(HT40) mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
2452MHz	35.280	≥500	Pass

Test plot as follows:

Graphs	
11B/2452MHz	 Date: 29.MAY.2018 11:36:17
11G/2452MHz	 Date: 29.MAY.2018 11:39:23

11N20SISO/2452MHz	 Date: 29.MAY.2018 11:43:12
11N40SISO/2452MHz	 Date: 29.MAY.2018 11:47:16

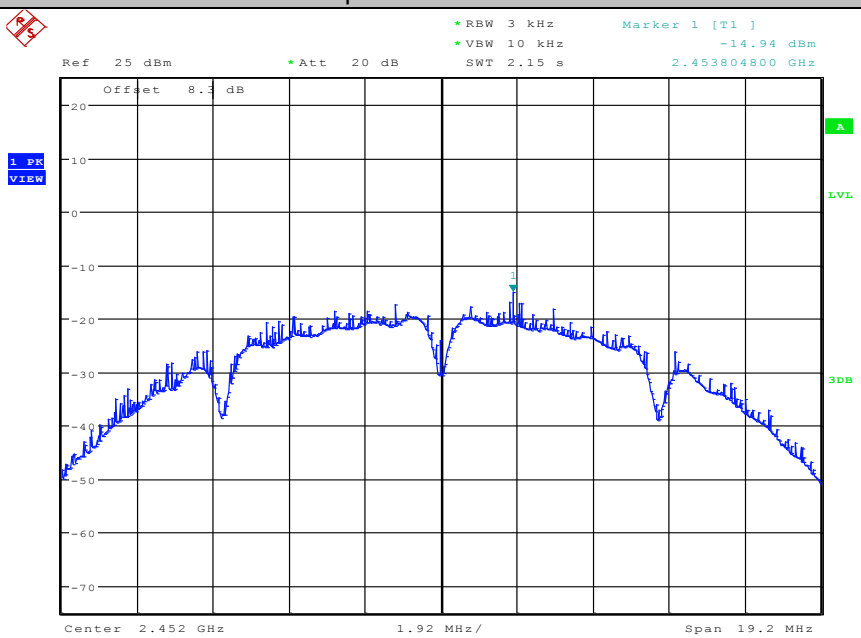
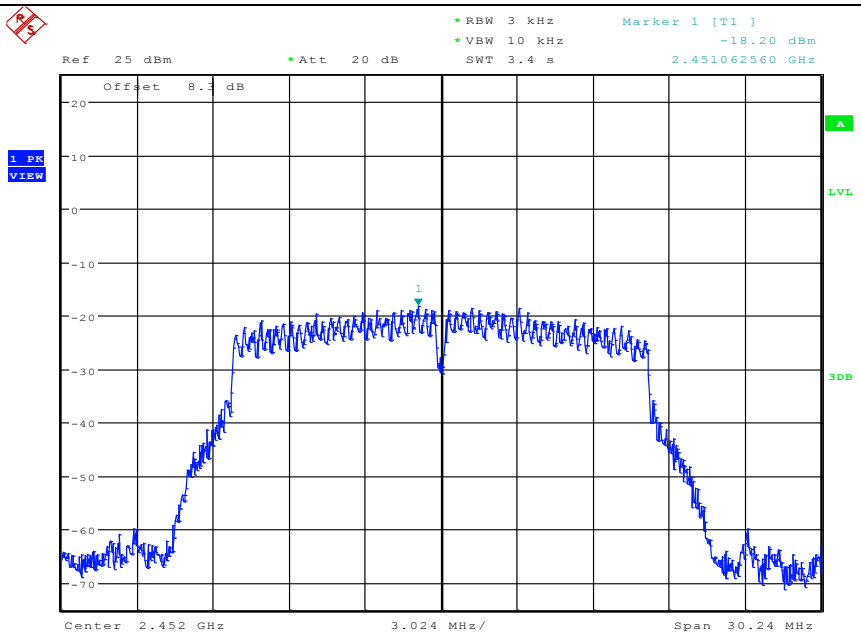
6.4 Power Spectral Density

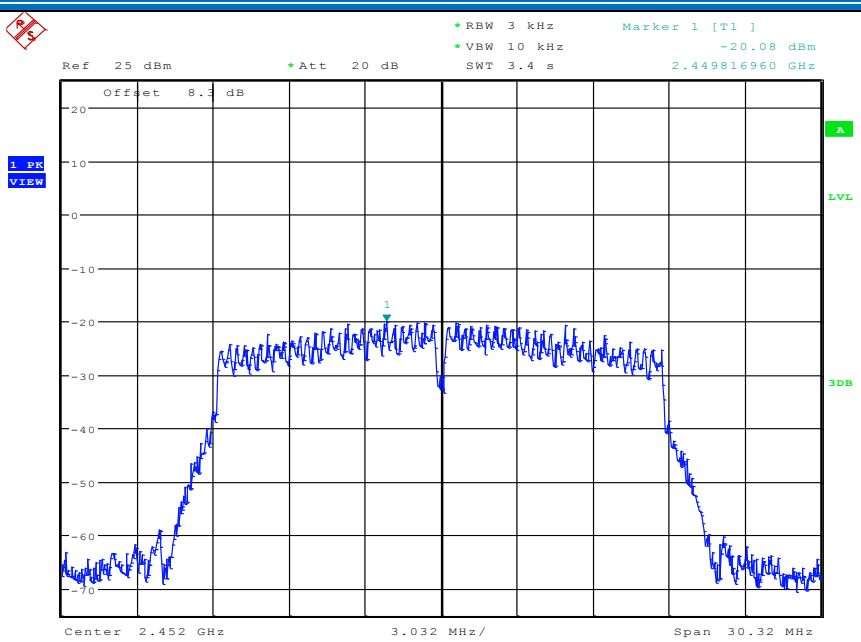
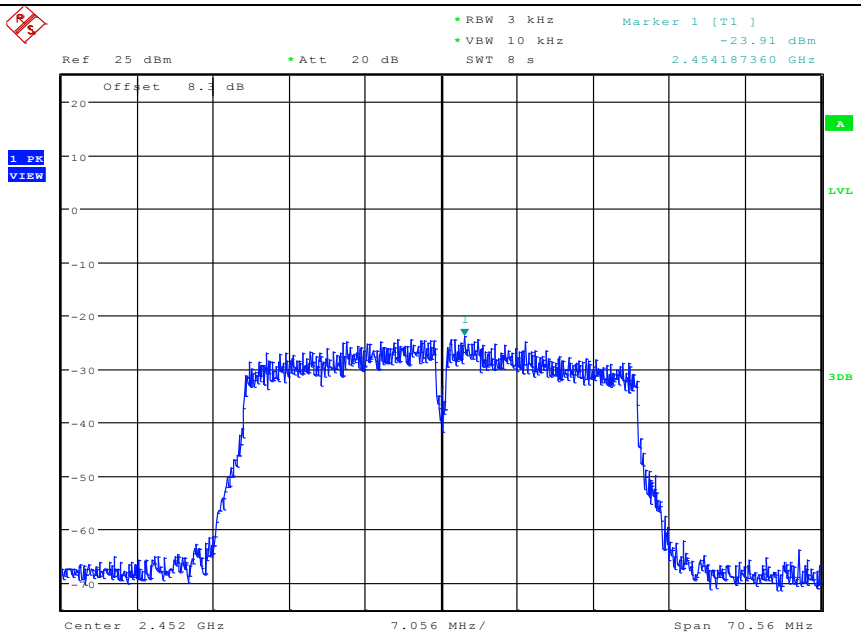
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	KDB558074 D01 v04
Test Setup:	 *Remark: Offset = cable loss + attenuation factor*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40)
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

Measurement Data

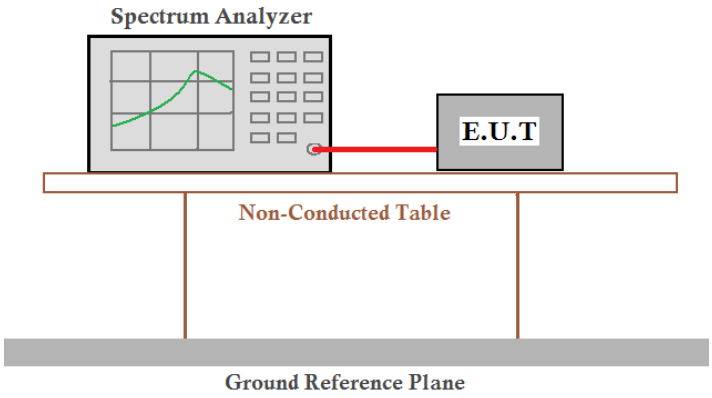
802.11b mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2452MHz	-14.940	≤8.00	Pass
802.11g mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2452MHz	-18.200	≤8.00	Pass
802.11n(HT20) mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2452MHz	-20.080	≤8.00	Pass
802.11n(HT40) mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2452MHz	-23.910	≤8.00	Pass

Test plot as follows:

Graphs	
11B/2452MHz	 Date: 29.MAY.2018 11:37:24
11G/2452MHz	 Date: 29.MAY.2018 11:40:31

11N20SISO/2452MHz	 Date: 29.MAY.2018 11:44:44
11N40SISO/2452MHz	 Date: 29.MAY.2018 11:48:48

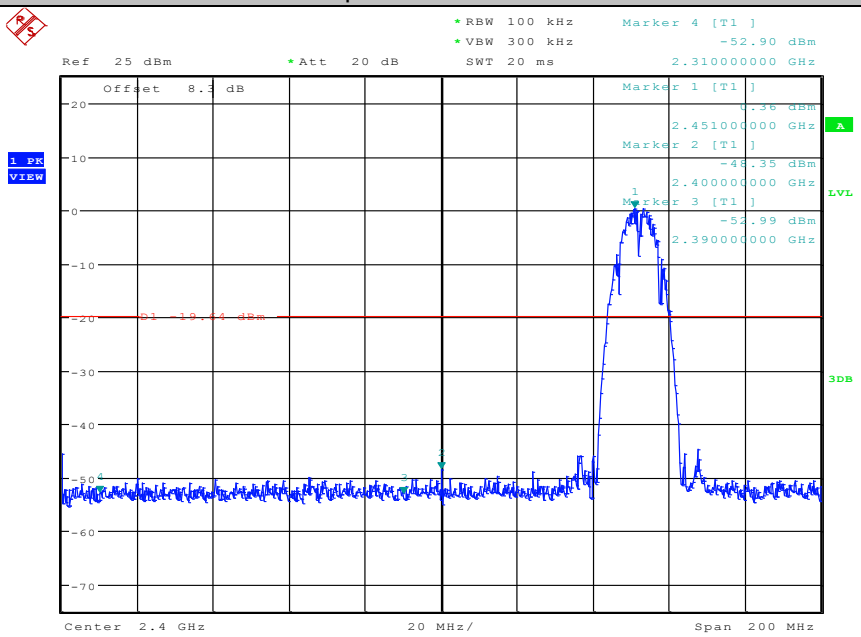
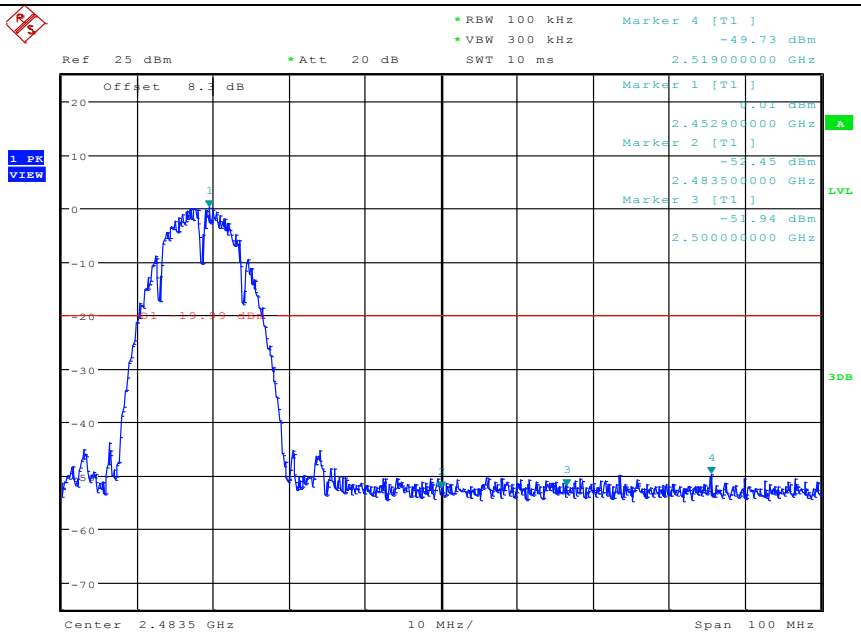
6.5 Band-edge for RF Conducted Emissions

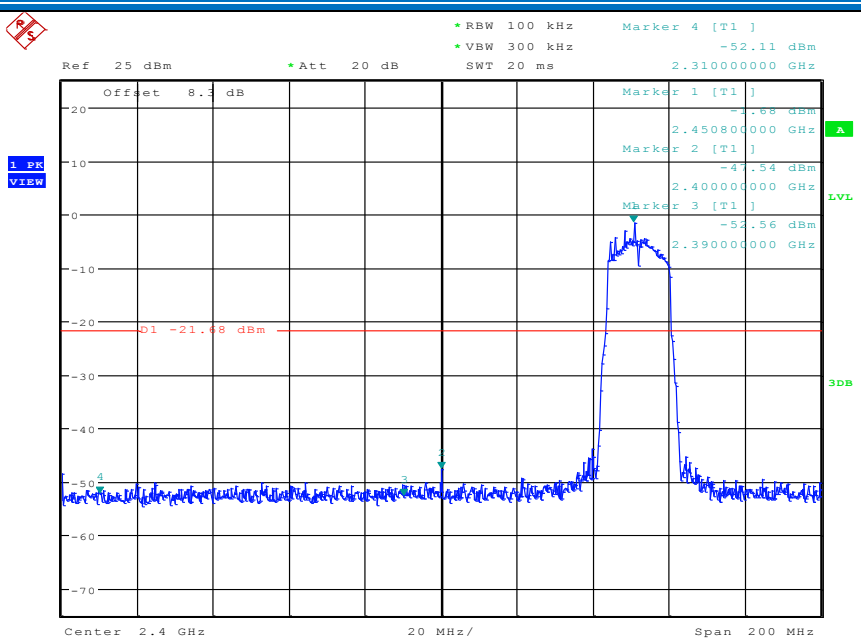
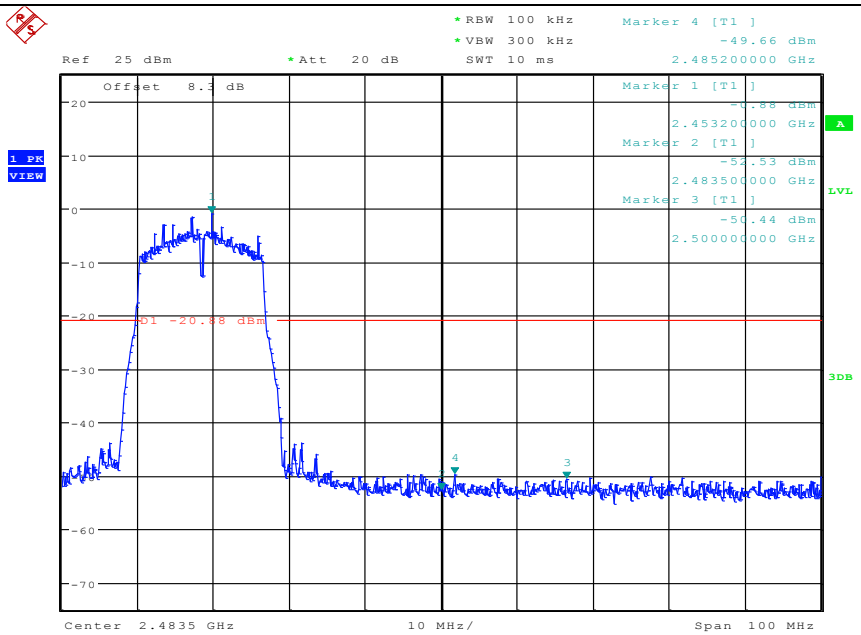
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	KDB558074 D01 v04
Test Setup:	 *Remark: Offset = cable loss + attenuation factor*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
. Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40)
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 Results:	Pass

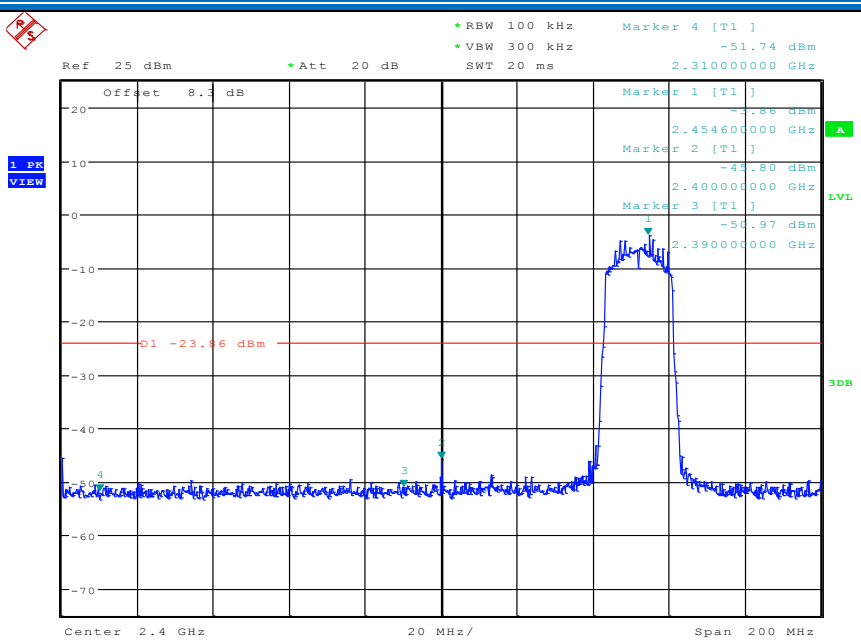
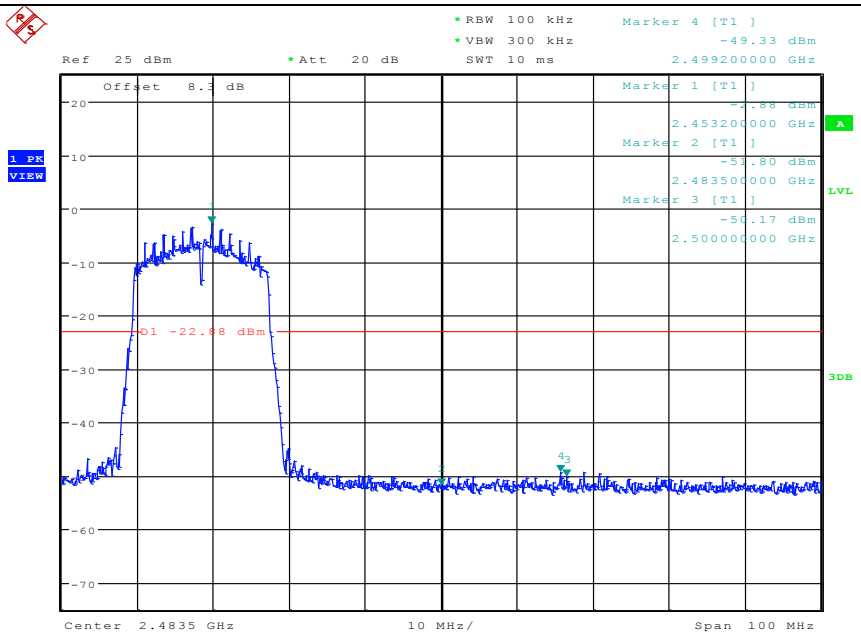
Test Data:

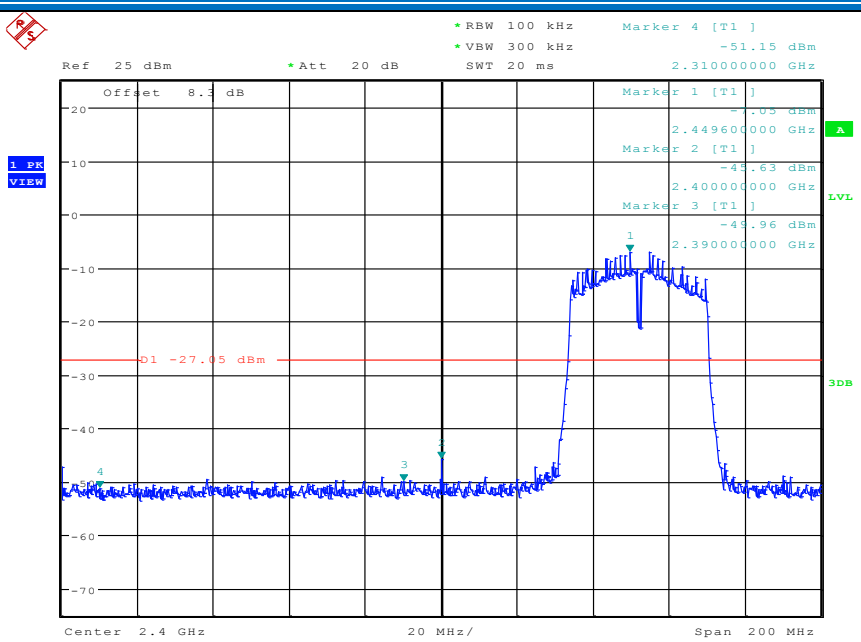
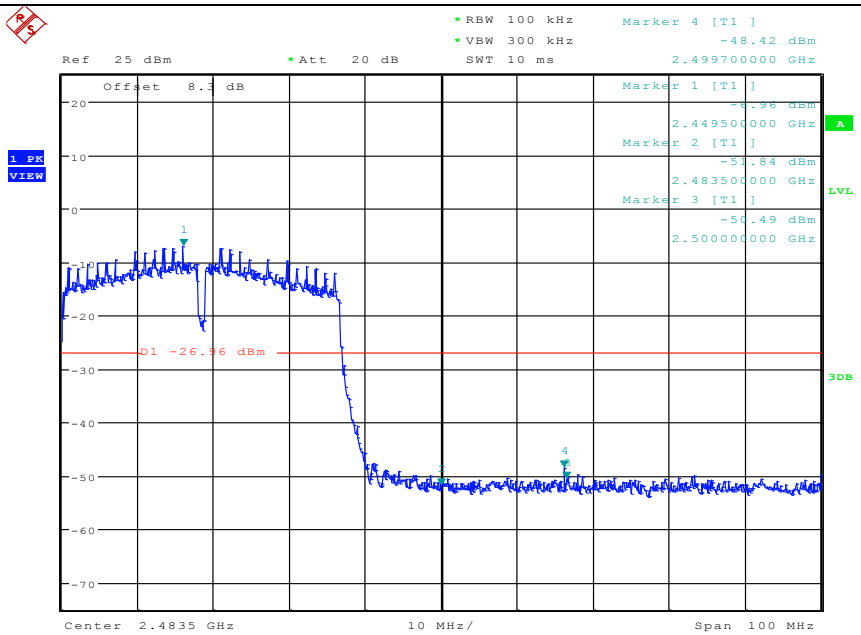
Test mode: 802.11b				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
2452MHz	2400	-48.350	-19.64	Pass
	2483.5	-52.450	-19.99	Pass
Test mode: 802.11g				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
2452MHz	2400	-47.540	-21.68	Pass
	2483.5	-52.530	-20.88	Pass
Test mode: 802.11n(HT20)				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
2452MHz	2400	-45.800	-23.86	Pass
	2483.5	-51.800	-22.88	Pass
Test mode: 802.11n(HT40)				
Test channel	Frequency(MHz)	Emission Level(dBm)	Limit(dBm)	Result
2452MHz	2400	-45.630	-27.05	Pass
	2483.5	-51.840	-26.96	Pass

Test plot as follows:

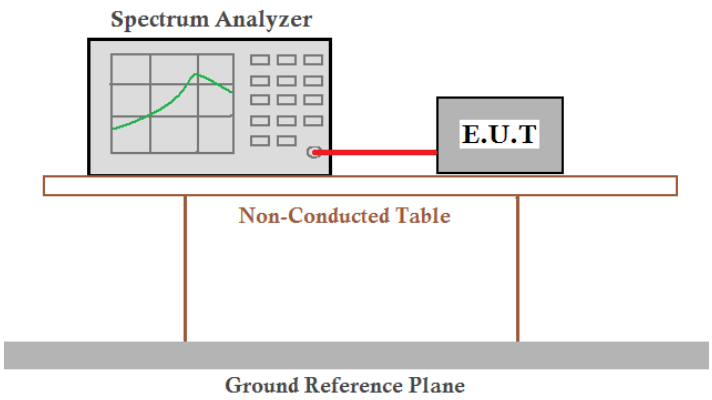
Graphs	
11B/2452MHz	 Date: 29.MAY.2018 11:35:57
11B/2452MHz	 Date: 29.MAY.2018 11:37:37

11G/2452MHz	 Date: 29.MAY.2018 11:39:04
11G/2452MHz	 Date: 29.MAY.2018 11:40:44

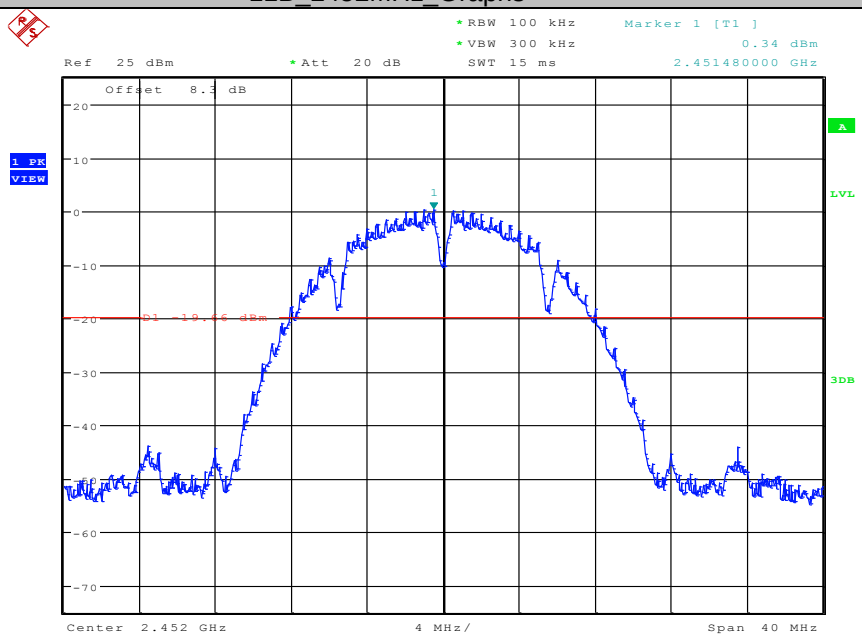
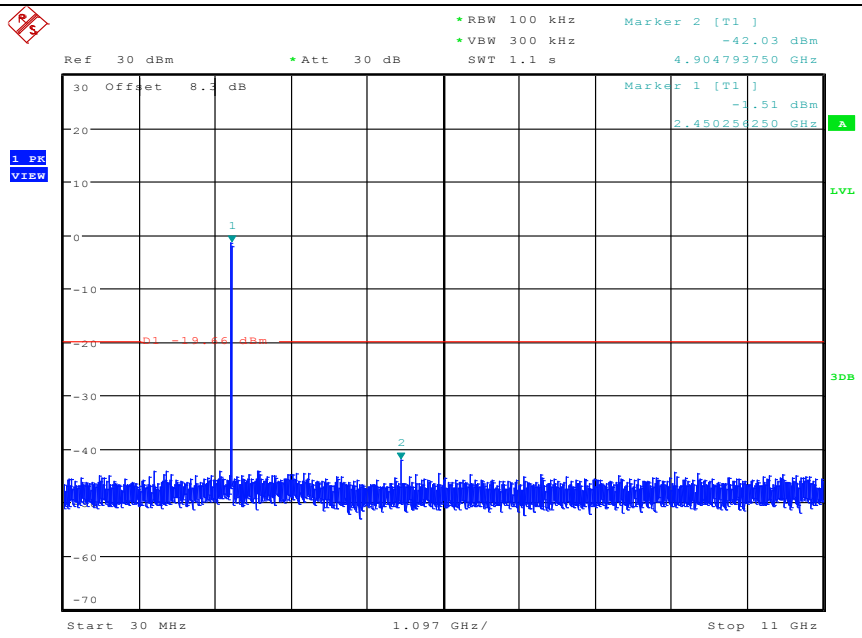
11N20SISO/2452MHz	 Date: 29.MAY.2018 11:42:38
11N20SISO/2452MHz	 Date: 29.MAY.2018 11:45:04

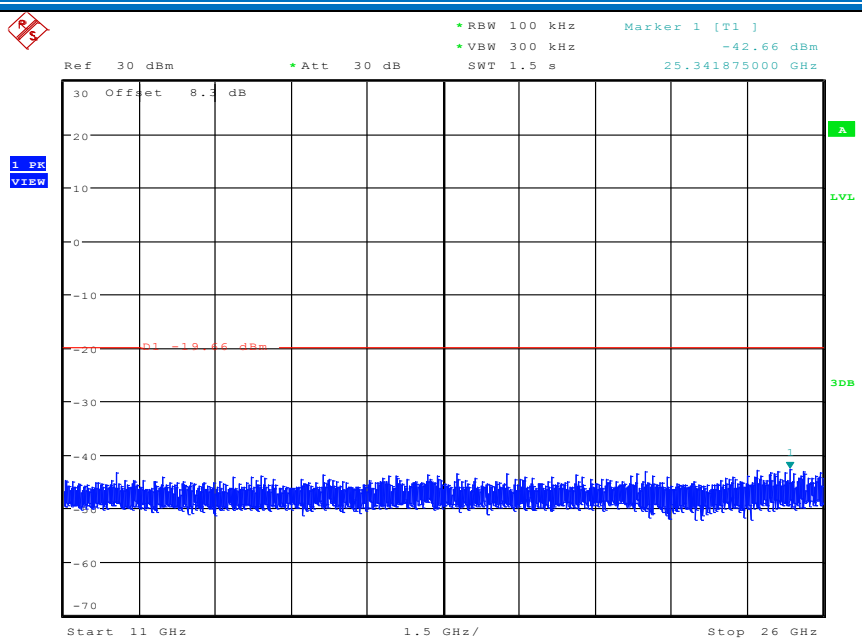
11N40SISO/2452MHz	 Date: 29.MAY.2018 11:46:42
11N40SISO/2452MHz	 Date: 29.MAY.2018 11:49:08

6.6 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	KDB558074 D01 v04
Test Setup:	 *Remark: Offset = cable loss + attenuation factor*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40)
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 Results:	Pass

Test plot as follows:

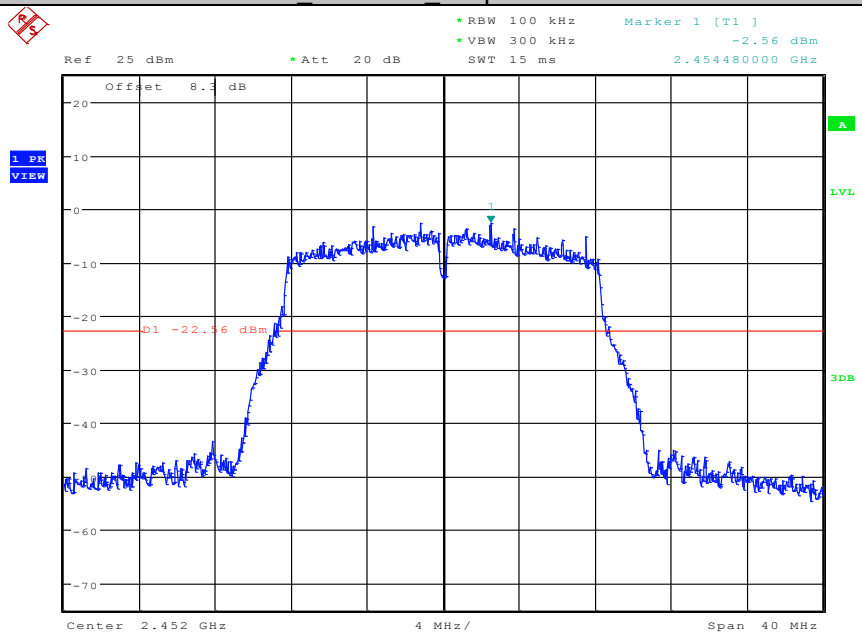
11B_2452MHz_Graphs	
Pref/11B	 Date: 29.MAY.2018 11:37:50
Puw/11B	 Date: 29.MAY.2018 11:38:01



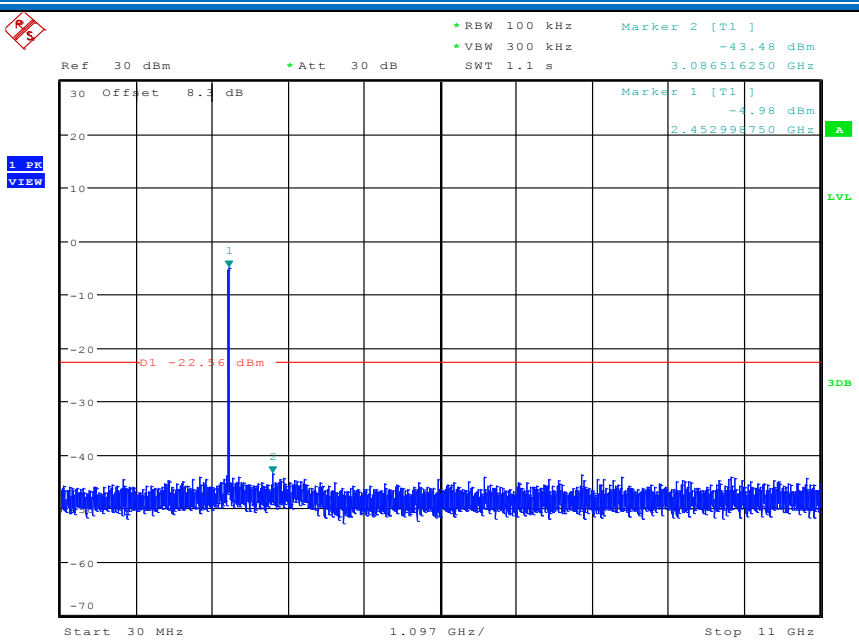
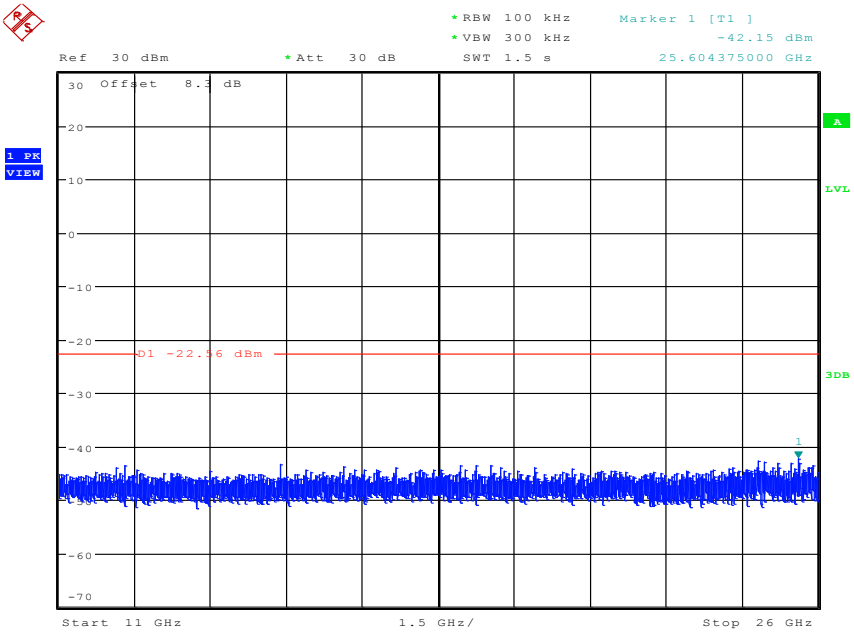
Date: 29.MAY.2018 11:38:11

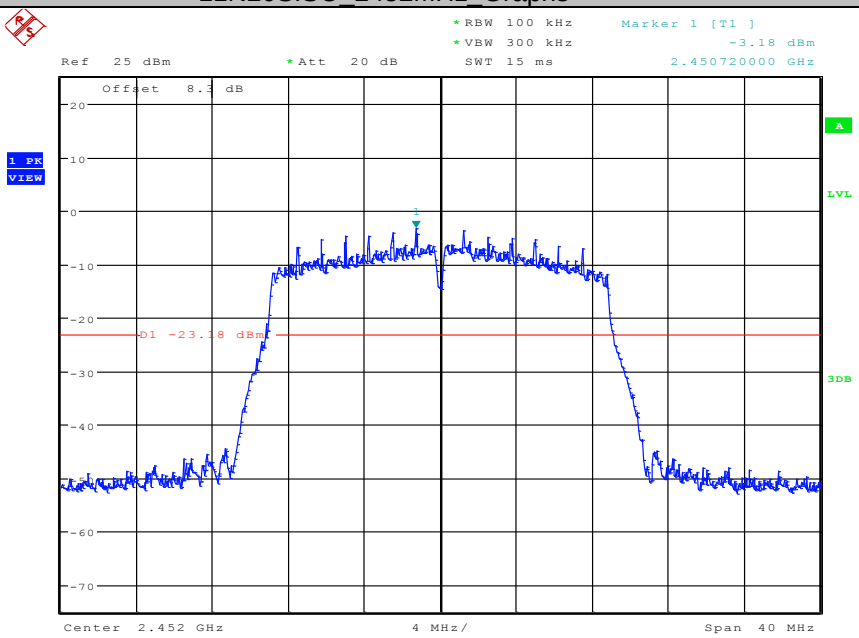
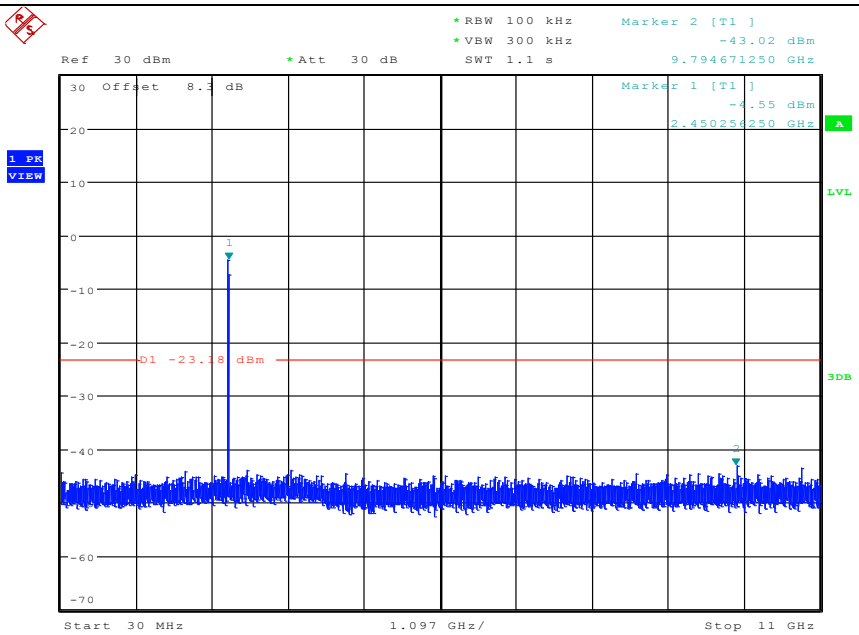
11G_2452MHz_Graphs

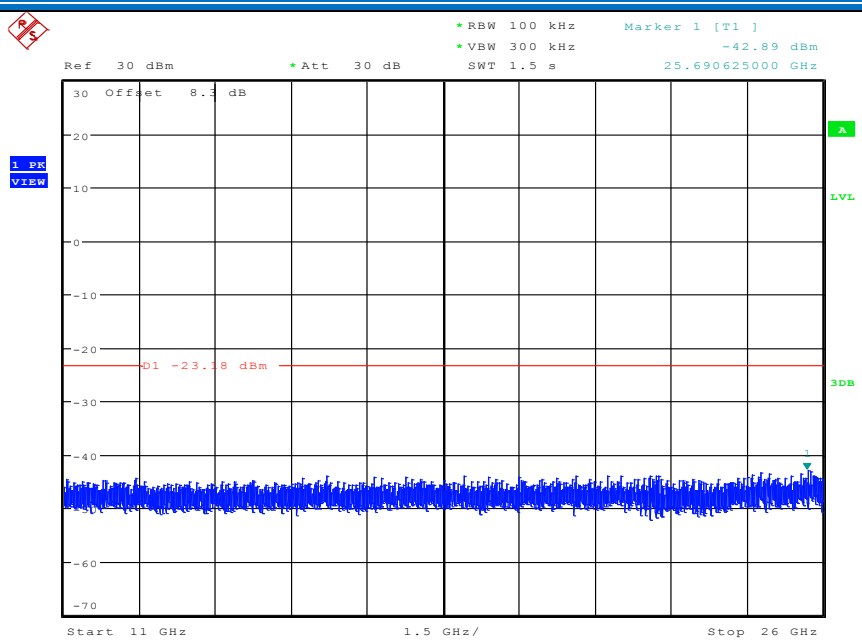
Pref/11G



Date: 29.MAY.2018 11:40:57

	 Date: 29.MAY.2018 11:41:09
Puw/11G	 Date: 29.MAY.2018 11:41:18

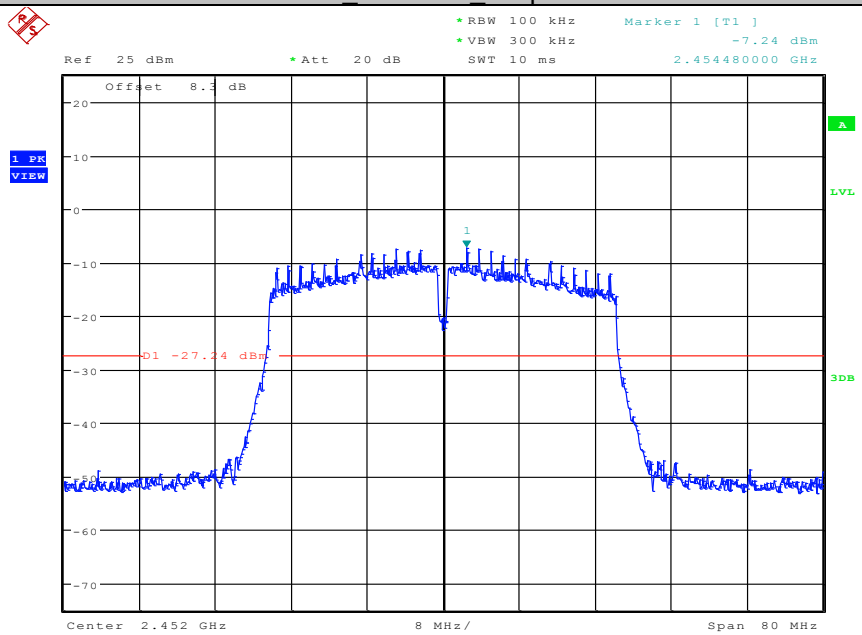
11N20SISO_2452MHz_Graphs	
Pref/11N20SISO	 Date: 29.MAY.2018 11:45:25
Puw/11N20SISO	 Date: 29.MAY.2018 11:45:36



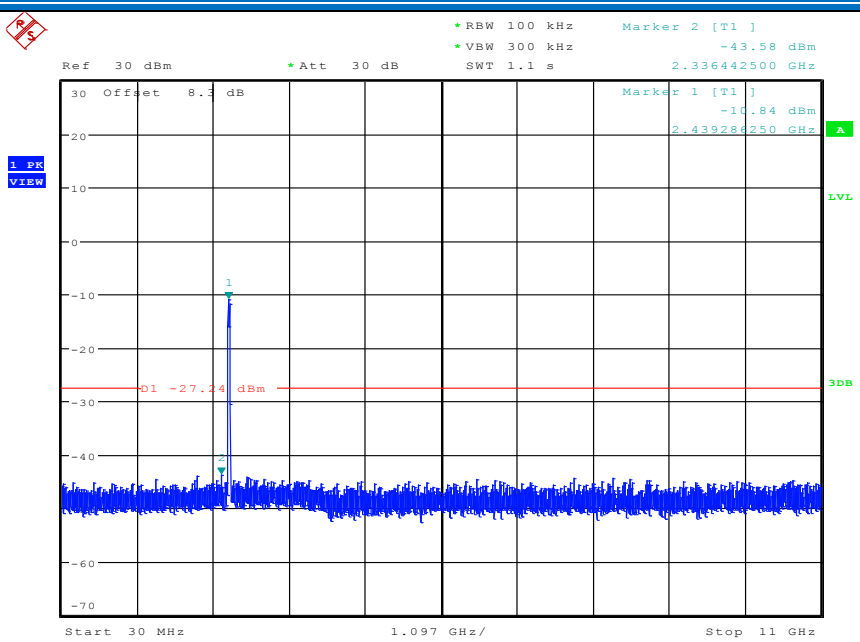
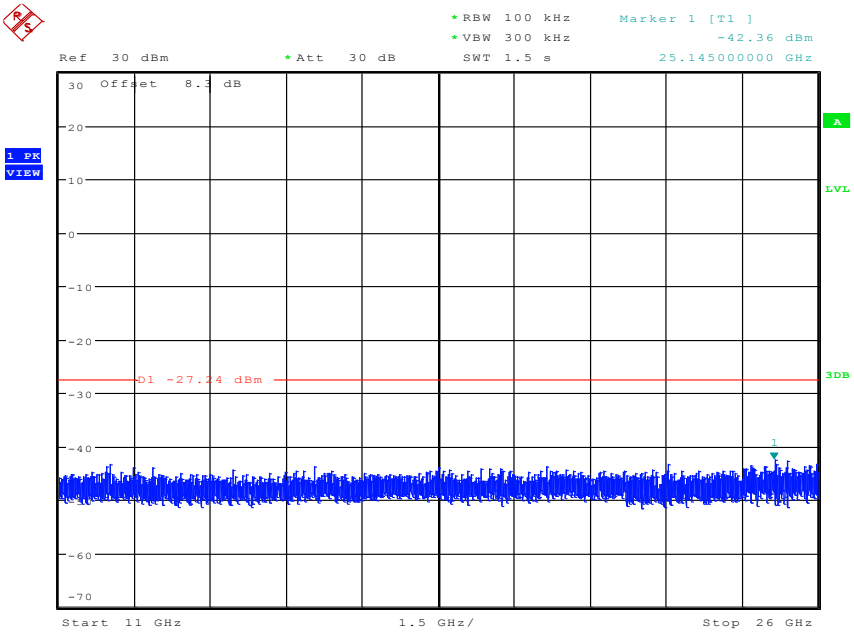
Date: 29.MAY.2018 11:45:46

11N40SISO_2452MHz_Graphs

Pref/11N40SISO



Date: 29.MAY.2018 11:49:29

Puw/11N40SISO	 Date: 29.MAY.2018 11:49:40  Date: 29.MAY.2018 11:49:50

Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

6.7 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Setup:

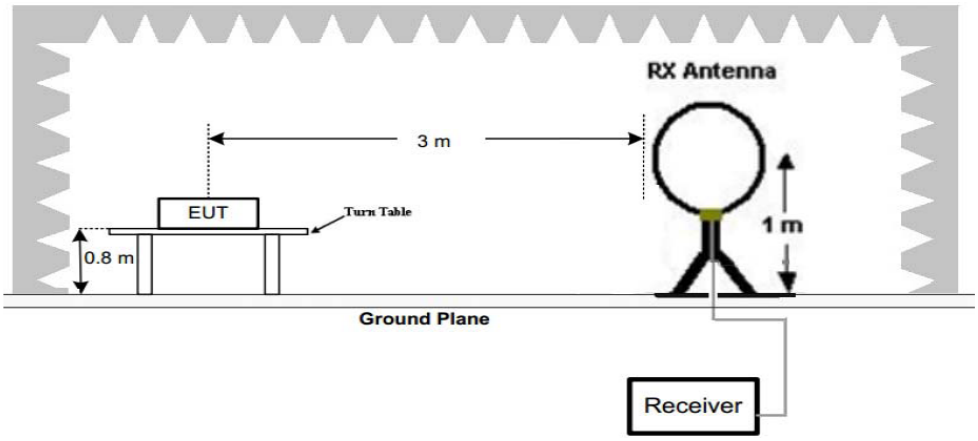


Figure 1. Below 30MHz

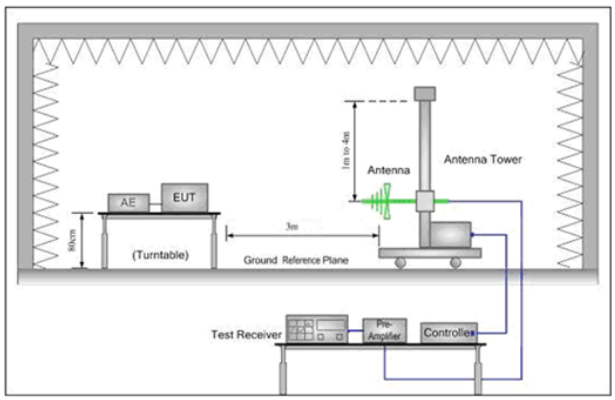


Figure 2. 30MHz to 1GHz

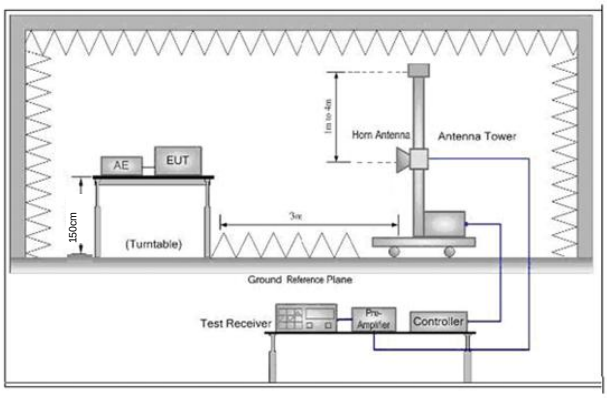


Figure 3. Above 1 GHz

Test Procedure:

a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

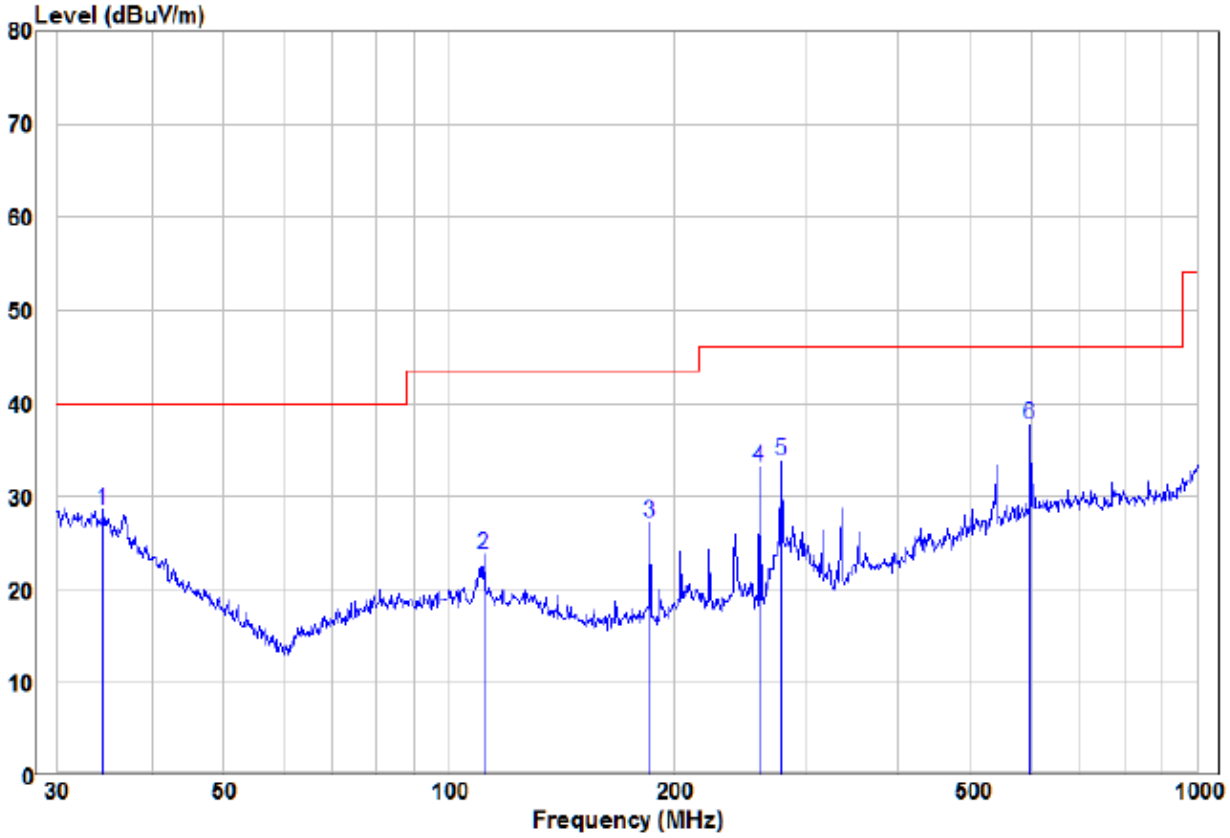
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. 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(for

	the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. 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. g. Test the EUT in the lowest channel ,the middle channel ,the Highest channel h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11b is the worst case. Only the worst case is recorded in the report.
Test Results:	Pass

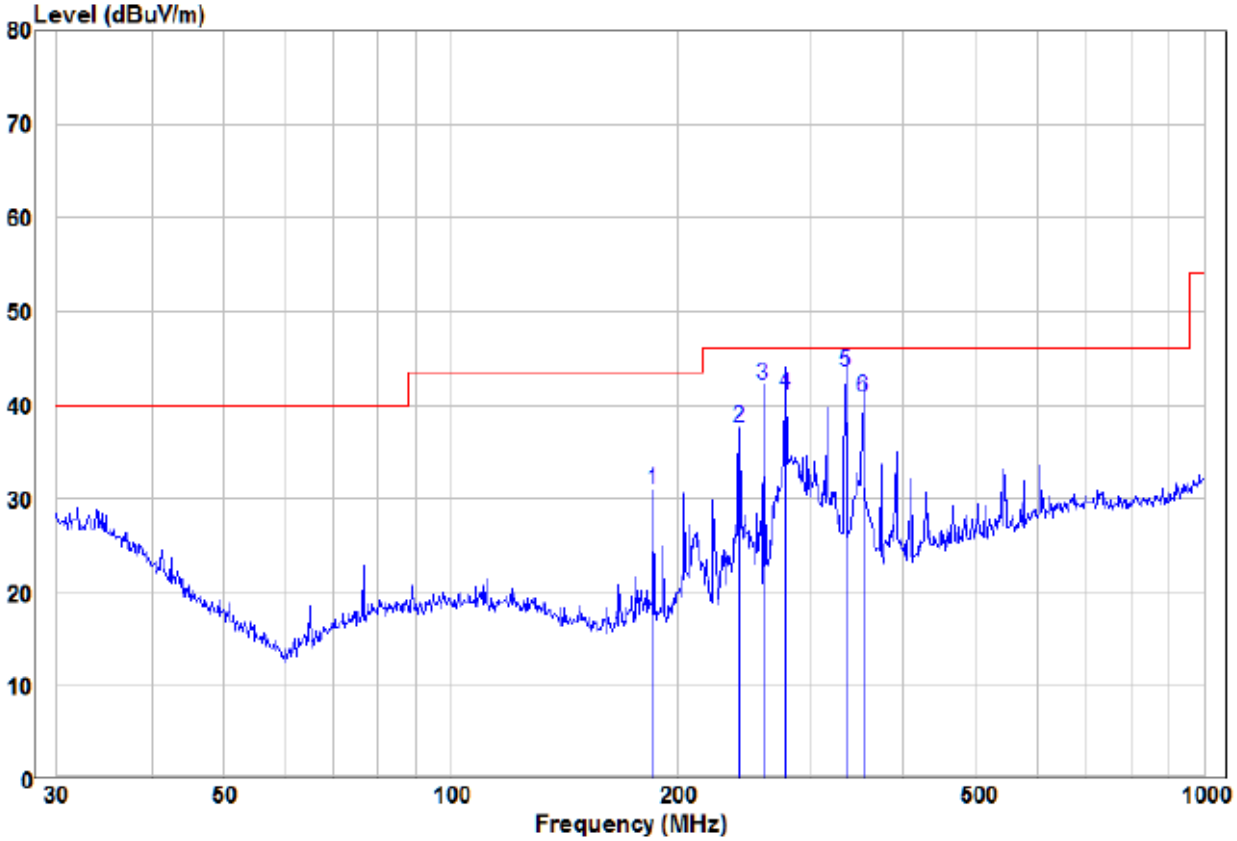
6.7.1 Radiated emission below 1GHz

30MHz~1GHz		
Test mode:	Transmitting	Vertical



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	34.52	9.87	18.55	28.42	40.00	-11.58	QP	VERTICAL
2	111.35	13.43	10.33	23.76	43.50	-19.74	QP	VERTICAL
3	185.79	19.04	8.17	27.21	43.50	-16.29	QP	VERTICAL
4	260.14	23.86	9.26	33.12	46.00	-12.88	QP	VERTICAL
5	279.04	24.79	9.06	33.85	46.00	-12.15	QP	VERTICAL
6 pp	599.32	19.52	18.19	37.71	46.00	-8.29	QP	VERTICAL

Test mode:	Transmitting	Horizontal



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	185.79	22.70	8.17	30.87	43.50	-12.63	QP	HORIZONTAL
2	241.68	28.57	9.04	37.61	46.00	-8.39	QP	HORIZONTAL
3	260.14	32.84	9.26	42.10	46.00	-3.90	QP	HORIZONTAL
4	279.04	32.14	9.06	41.20	46.00	-4.80	QP	HORIZONTAL
5 pp	334.86	31.24	12.22	43.46	46.00	-2.54	QP	HORIZONTAL
6	352.94	27.13	13.62	40.75	46.00	-5.25	QP	HORIZONTAL

6.7.2 Transmitter emission above 1GHz

Test mode:		802.11b(1Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4904.000	53.24	-4.24	49.00	74	-25.00	peak	H
4904.000	37.38	-4.24	33.14	54	-20.86	AVG	H
7356.000	50.43	1.2	51.63	74	-22.37	peak	H
7356.000	38.85	1.2	40.05	54	-13.95	AVG	H
4904.000	55.01	-4.24	50.77	74	-23.23	peak	V
4904.000	38.13	-4.24	33.89	54	-20.11	AVG	V
7356.000	51.05	1.2	52.25	74	-21.75	peak	V
7356.000	35.94	1.2	37.14	54	-16.86	AVG	V

Test mode:		802.11g(6Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4904.000	53.15	-4.24	48.91	74	-25.09	peak	H
4904.000	37.44	-4.24	33.20	54	-20.80	AVG	H
7356.000	50.28	1.2	51.48	74	-22.52	peak	H
7356.000	37.35	1.2	38.55	54	-15.45	AVG	H
4904.000	54.91	-4.24	50.67	74	-23.33	peak	V
4904.000	39.35	-4.24	35.11	54	-18.89	AVG	V
7356.000	51.53	1.2	52.73	74	-21.27	peak	V
7356.000	36.21	1.2	37.41	54	-16.59	AVG	V

Test mode:		802.11n20(13.5Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4904.000	53.86	-4.24	49.62	74	-24.38	peak	H
4904.000	37.69	-4.24	33.45	54	-20.55	AVG	H
7356.000	50.95	1.2	52.15	74	-21.85	peak	H
7356.000	37.55	1.2	38.75	54	-15.25	AVG	H
4904.000	54.95	-4.24	50.71	74	-23.29	peak	V
4904.000	38.53	-4.24	34.29	54	-19.71	AVG	V
7356.000	50.29	1.2	51.49	74	-22.51	peak	V
7356.000	35.52	1.2	36.72	54	-17.28	AVG	V

Test mode:		802.11n40(13.5Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4904.000	53.23	-4.24	48.99	74	-25.01	peak	H
4904.000	36.61	-4.24	32.37	54	-21.63	AVG	H
7356.000	51.36	1.2	52.56	74	-21.44	peak	H
7356.000	37.44	1.2	38.64	54	-15.36	AVG	H
4904.000	54.59	-4.24	50.35	74	-23.65	peak	V
4904.000	38.33	-4.24	34.09	54	-19.91	AVG	V
7356.000	50.74	1.2	51.94	74	-22.06	peak	V
7356.000	36.86	1.2	38.06	54	-15.94	AVG	V

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz,The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

6.8 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 2013
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

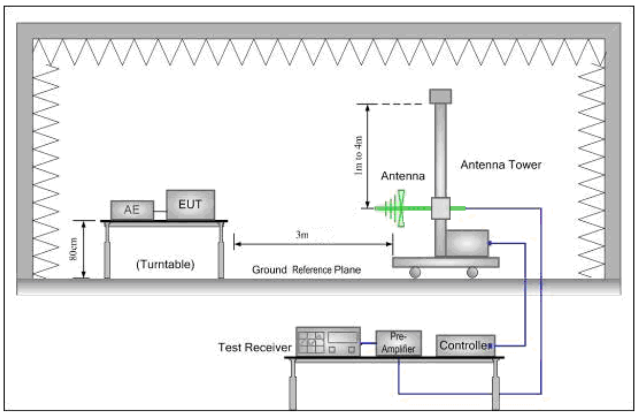


Figure 1. 30MHz to 1GHz

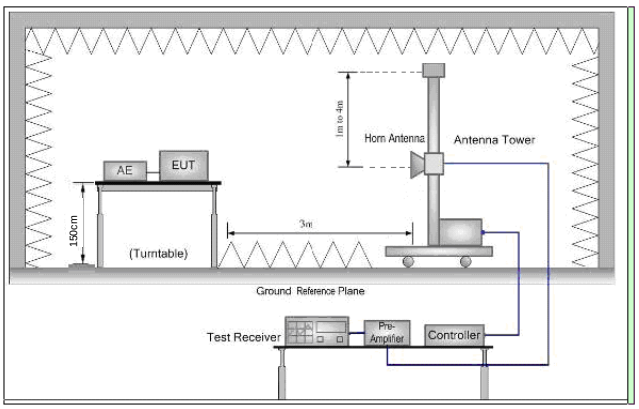


Figure 2. Above 1 GHz

Test Procedure:

a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. 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.

	d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel g. Test the EUT in the lowest channel , the Highest channel h. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) ; 13.5Mbps of rate is the worst case of 802.11n(HT40) Only the worst case is recorded in the report.
Test Results:	Pass

Test data:

Worse case mode:		802.11b(1Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	58.54	-9.2	49.34	74	-24.66	peak	H
2390.000	44.51	-9.2	35.31	54	-18.69	AVG	H
2400.000	59.98	-9.39	50.59	74	-23.41	peak	H
2400.000	46.55	-9.39	37.16	54	-16.84	AVG	H
2483.500	57.53	-9.29	48.24	74	-25.76	peak	H
2483.500	44.23	-9.29	34.94	54	-19.06	AVG	H
2390.000	58.47	-9.2	49.27	74	-24.73	peak	V
2390.000	44.96	-9.2	35.76	54	-18.24	AVG	V
2400.000	59.38	-9.39	49.99	74	-24.01	peak	V
2400.000	46.00	-9.39	36.61	54	-17.39	AVG	V
2483.500	57.89	-9.29	48.60	74	-25.40	peak	V
2483.500	45.81	-9.29	36.52	54	-17.48	AVG	V

Worse case mode:		802.11g(6Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	59.12	-9.2	49.92	74	-24.08	peak	H
2390.000	44.96	-9.2	35.76	54	-18.24	AVG	H
2400.000	59.99	-9.39	50.60	74	-23.40	peak	H
2400.000	46.73	-9.39	37.34	54	-16.66	AVG	H
2483.500	58.17	-9.29	48.88	74	-25.12	peak	H
2483.500	43.94	-9.29	34.65	54	-19.35	AVG	H
2390.000	58.28	-9.2	49.08	74	-24.92	peak	V
2390.000	44.59	-9.2	35.39	54	-18.61	AVG	V
2400.000	59.99	-9.39	50.60	74	-23.40	peak	V
2400.000	46.48	-9.39	37.09	54	-16.91	AVG	V
2483.500	58.39	-9.29	49.10	74	-24.90	peak	V
2483.500	45.90	-9.29	36.61	54	-17.39	AVG	V

Worse case mode:		802.11n20(6.5Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	58.34	-9.2	49.14	74	-24.86	peak	H
2390.000	44.96	-9.2	35.76	54	-18.24	AVG	H
2400.000	60.16	-9.39	50.77	74	-23.23	peak	H
2400.000	45.98	-9.39	36.59	54	-17.41	AVG	H
2483.500	58.37	-9.29	49.08	74	-24.92	peak	H
2483.500	43.50	-9.29	34.21	54	-19.79	AVG	H
2390.000	59.16	-9.2	49.96	74	-24.04	peak	V
2390.000	44.72	-9.2	35.52	54	-18.48	AVG	V
2400.000	59.26	-9.39	49.87	74	-24.13	peak	V
2400.000	46.23	-9.39	36.84	54	-17.16	AVG	V
2483.500	57.51	-9.29	48.22	74	-25.78	peak	V
2483.500	45.77	-9.29	36.48	54	-17.52	AVG	V

Worse case mode:		802.11n40(13.5Mbps)		Test channel:		2452MHz	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	58.57	-9.2	49.37	74	-24.63	peak	H
2390.000	44.80	-9.2	35.60	54	-18.40	AVG	H
2400.000	60.15	-9.39	50.76	74	-23.24	peak	H
2400.000	46.43	-9.39	37.04	54	-16.96	AVG	H
2483.500	58.15	-9.29	48.86	74	-25.14	peak	H
2483.500	43.97	-9.29	34.68	54	-19.32	AVG	H
2390.000	58.78	-9.2	49.58	74	-24.42	peak	V
2390.000	44.81	-9.2	35.61	54	-18.39	AVG	V
2400.000	60.11	-9.39	50.72	74	-23.28	peak	V
2400.000	46.63	-9.39	37.24	54	-16.76	AVG	V
2483.500	57.99	-9.29	48.70	74	-25.30	peak	V
2483.500	46.07	-9.29	36.78	54	-17.22	AVG	V

Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

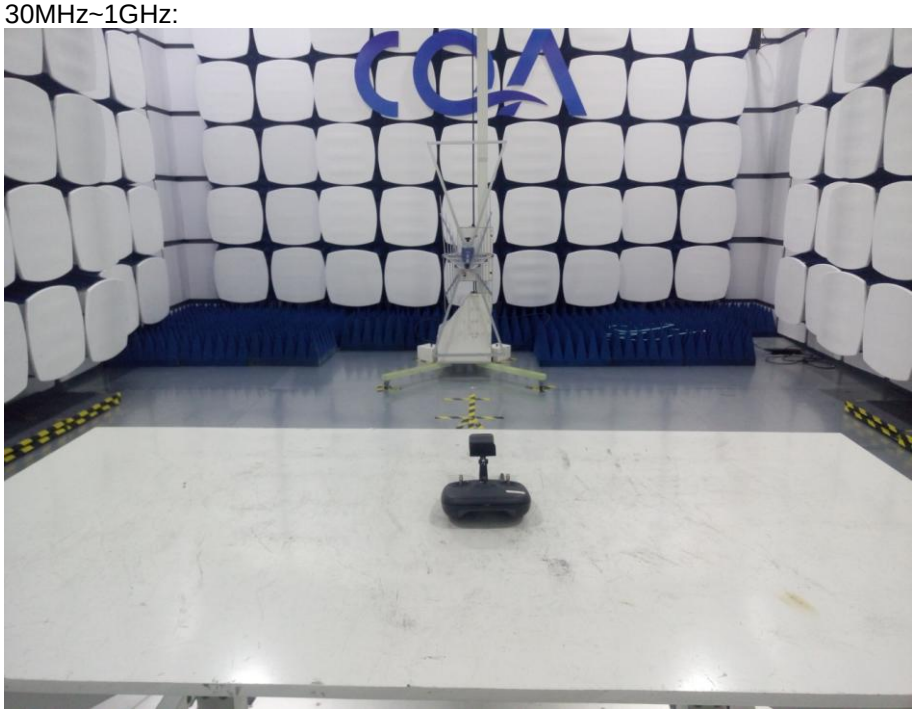
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

7 Photographs - EUT Test Setup

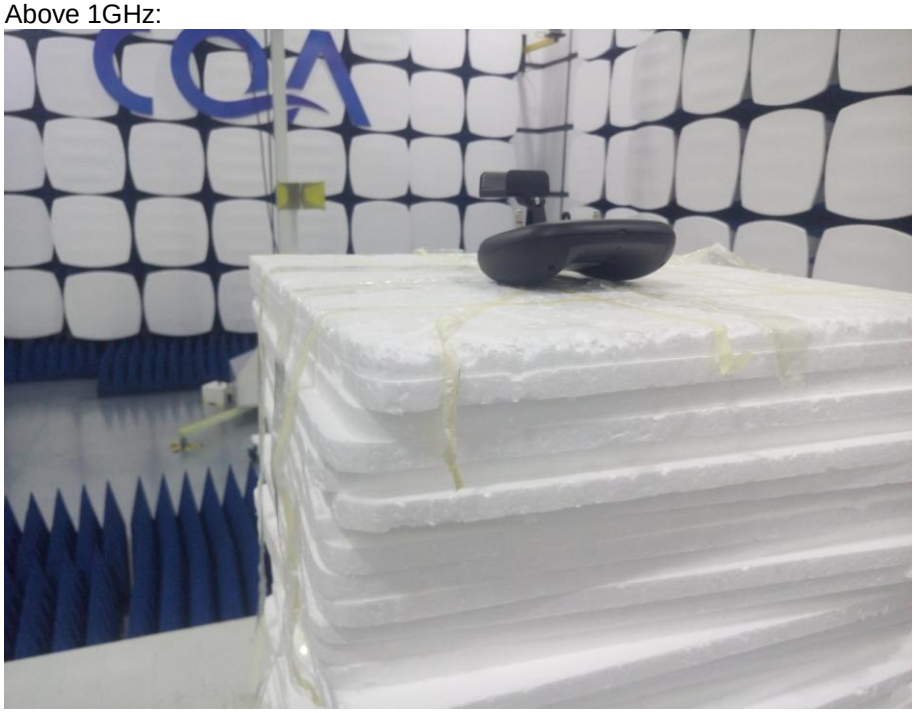
7.1 Radiated Spurious Emission

9kHz~30MHz:

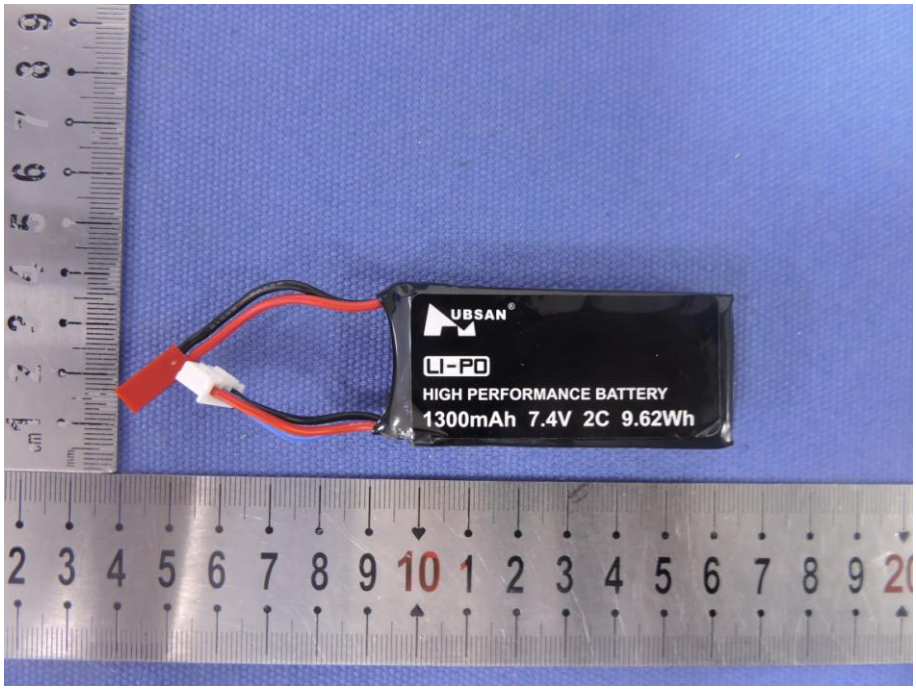
30MHz~1GHz:



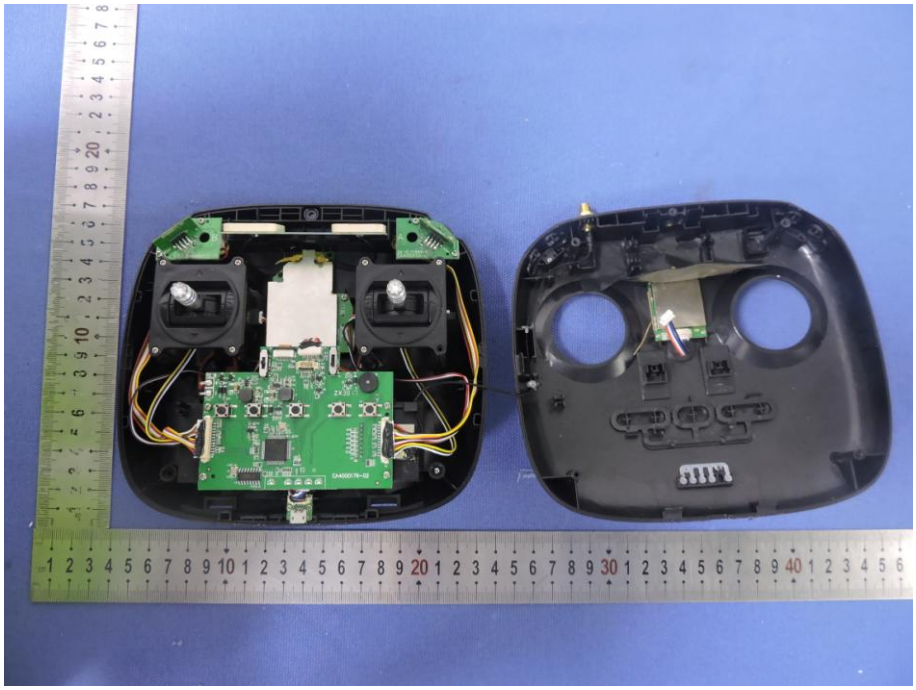
Above 1GHz:

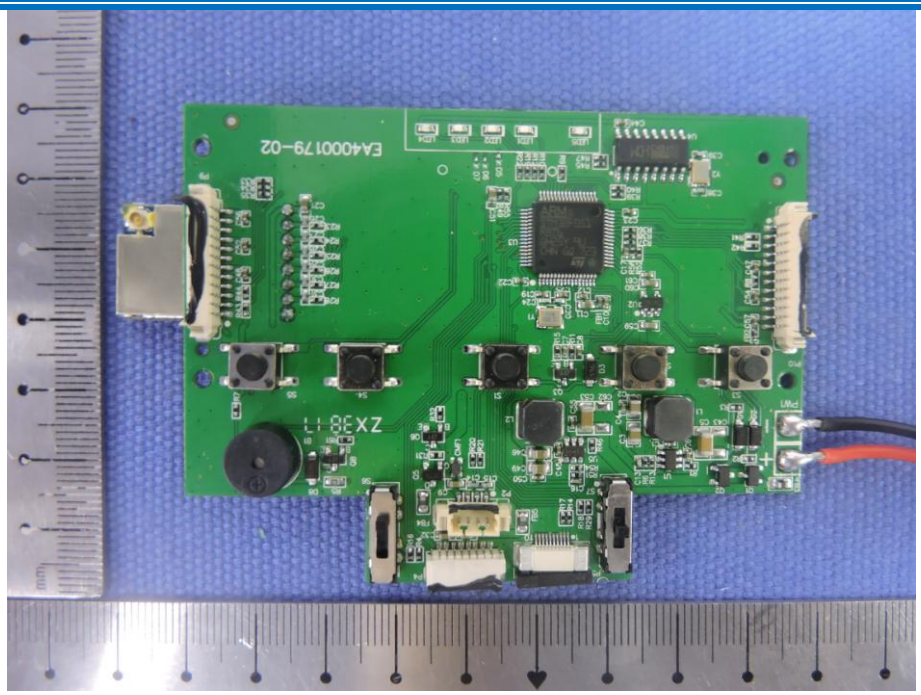


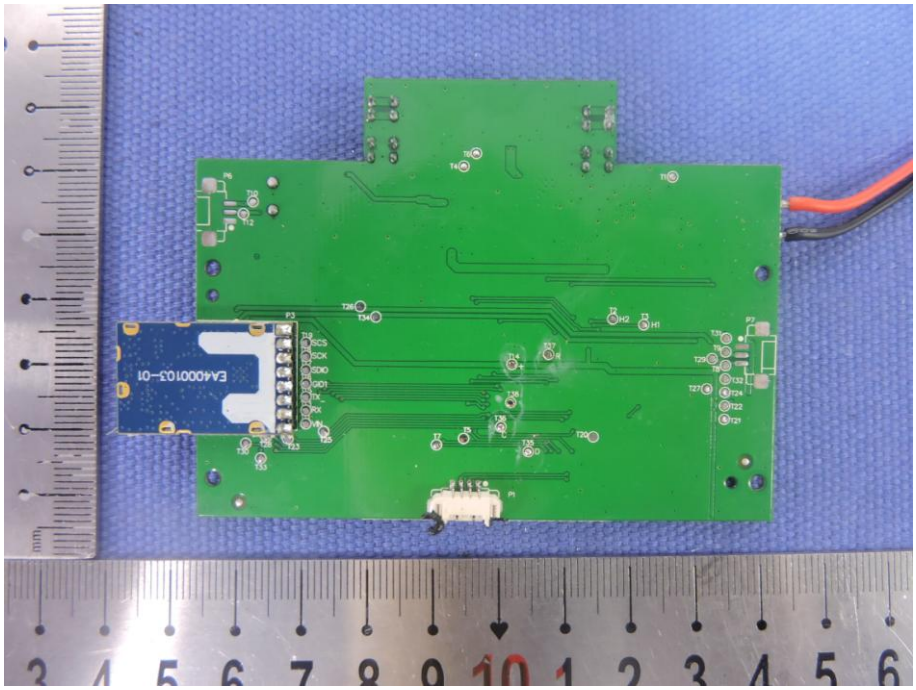
8 Photographs - EUT Constructional Details


UBSAN
LI-PO
HIGH PERFORMANCE BATTERY
1300mAh 7.4V 2C 9.62Wh

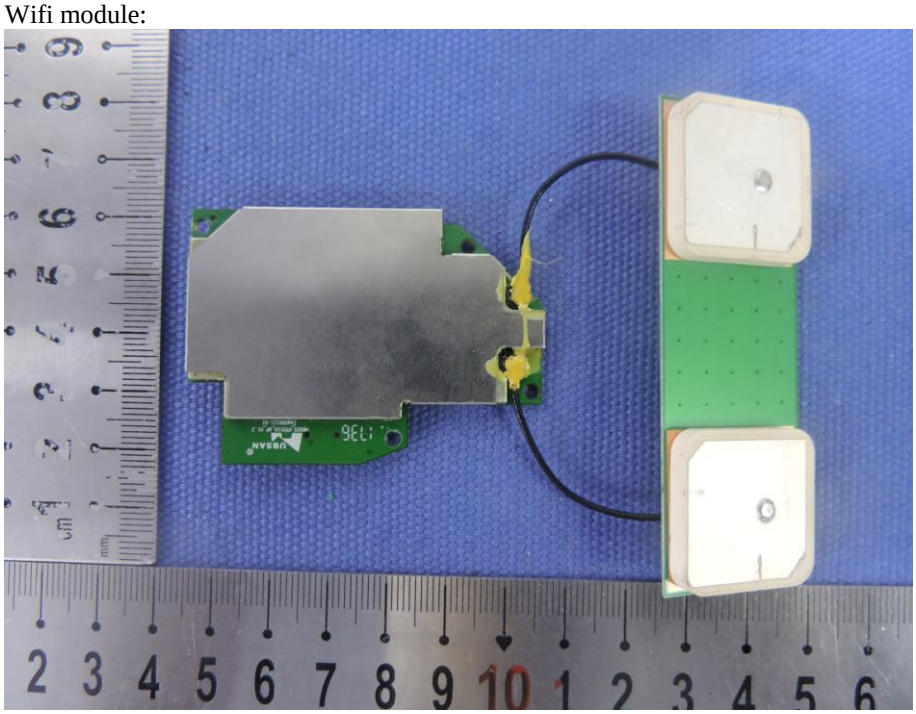
WARNING
Read the entire instruction and disclaimer information included in the package. Improper operation may cause permanent damage to the battery and the enviroment result in serious injury.
1. Never use or charge the lipo battery that has ballooned or swelled, leaks or its temperature over 160°F (71°C), or anything else abnormal occurs.
2. Do not discharge the batteries with the current exceeding the max discharging current. Otherwise, it will lead to batteries overheat and result in battery deterioration burst balloon or may even cause fire or explosion
3. Never disassemble, puncture, shock or crash the lipo battery; Never put the battery into fire.
4. Never overcharge the lipo battery; improper use, such as short circuit or overcharge might cause explosion or fire.
5. Charge and store lipo battery in a location where a battery fire or explosion will not endanger life or property.
6. Put the battery or pack at a safe place where infants or kids can not reach.
7. The above suggests the danger of using the battery. The user will take the full responsibility of the result of using this battery.
MADE IN CHINA

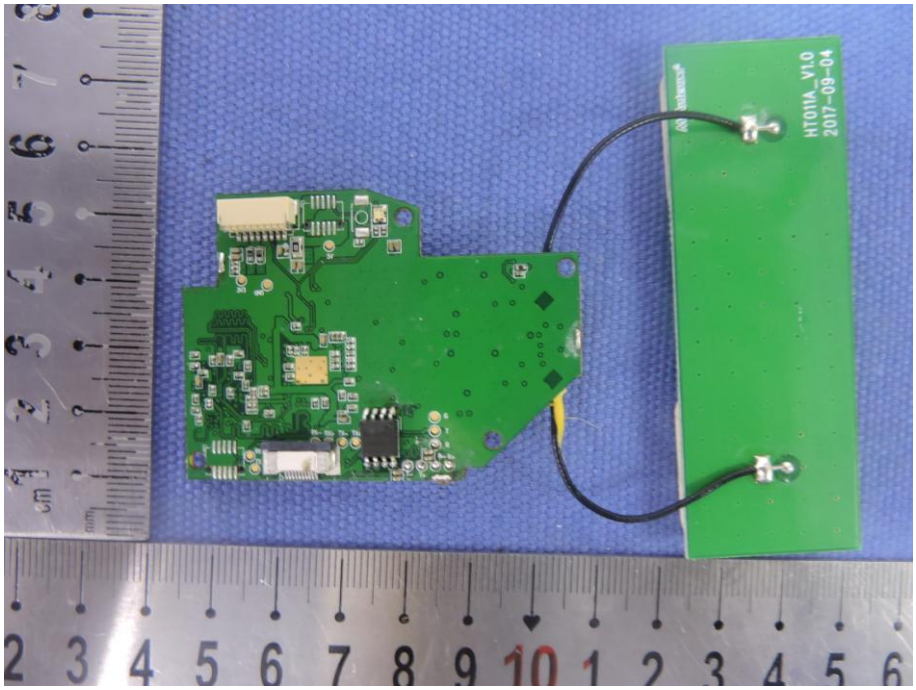


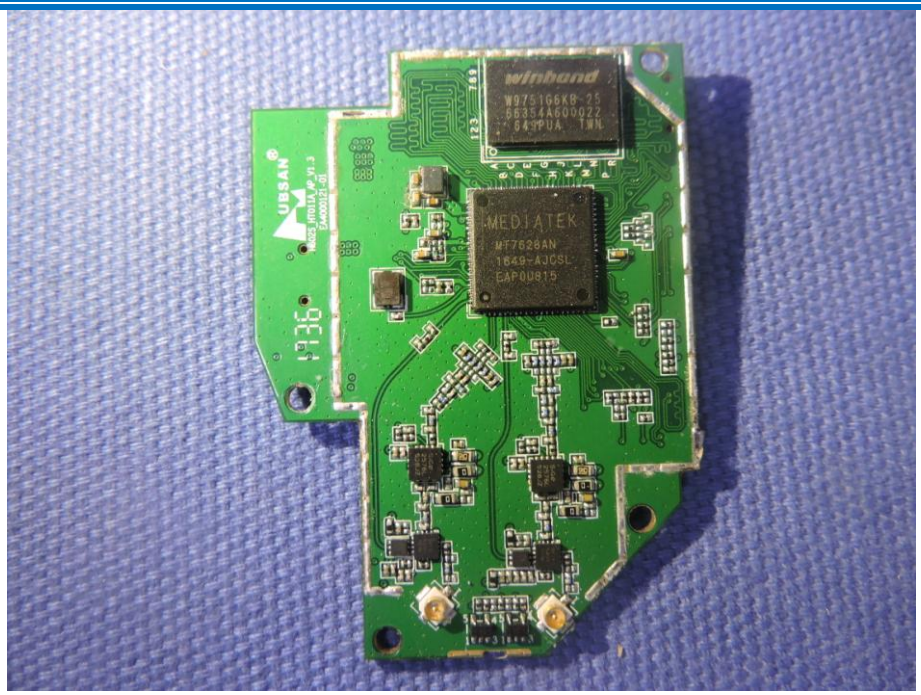

EA40001 79-02
ZX38-11


EA40001 03-01

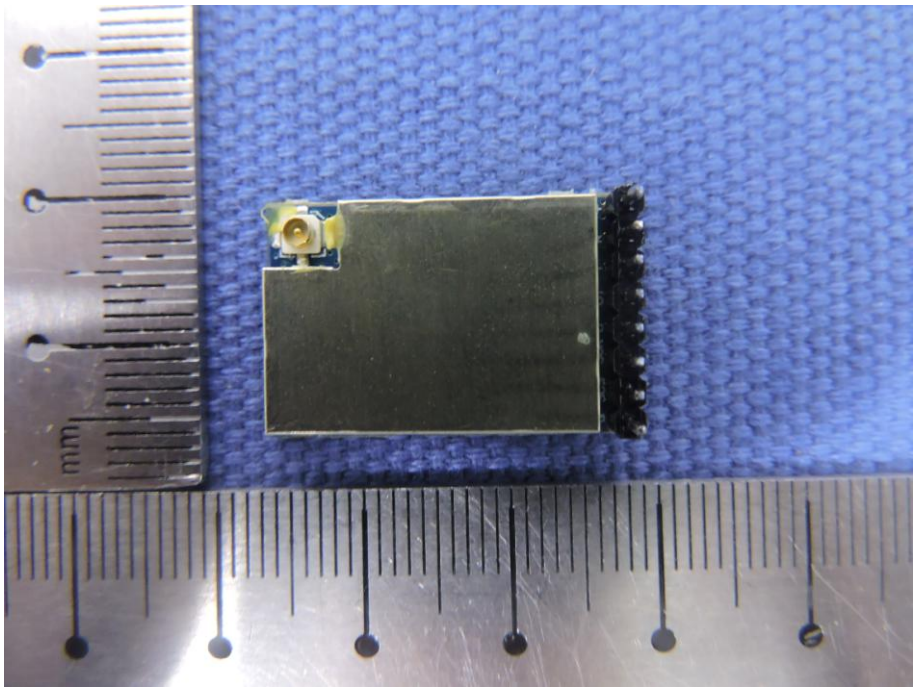
Wifi module:

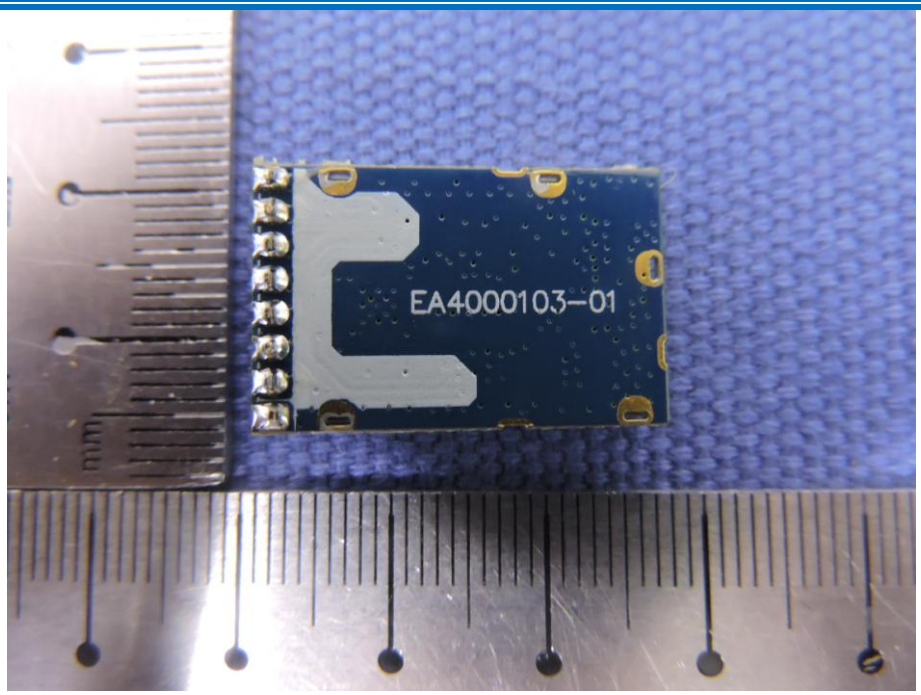


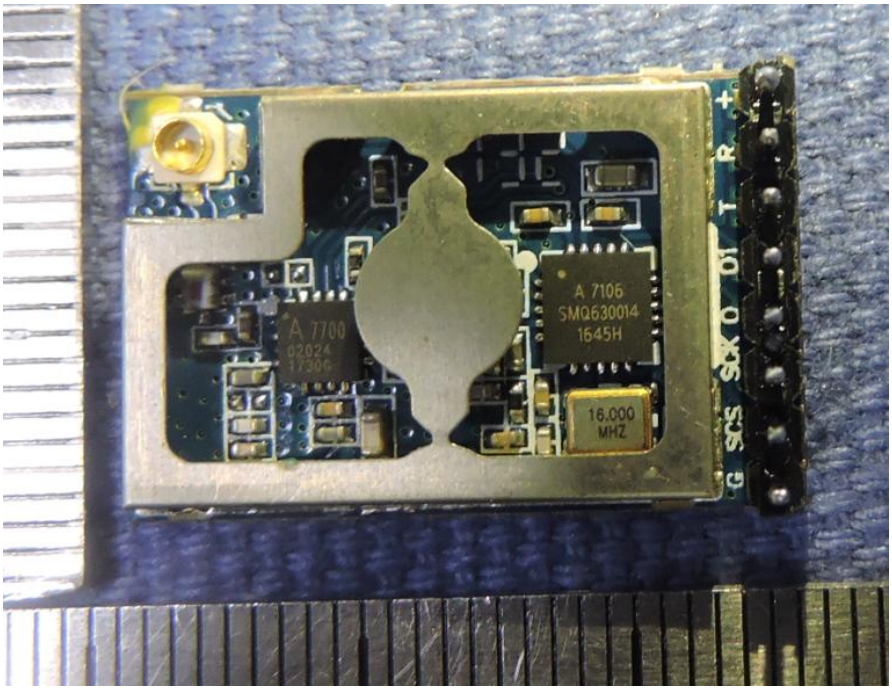




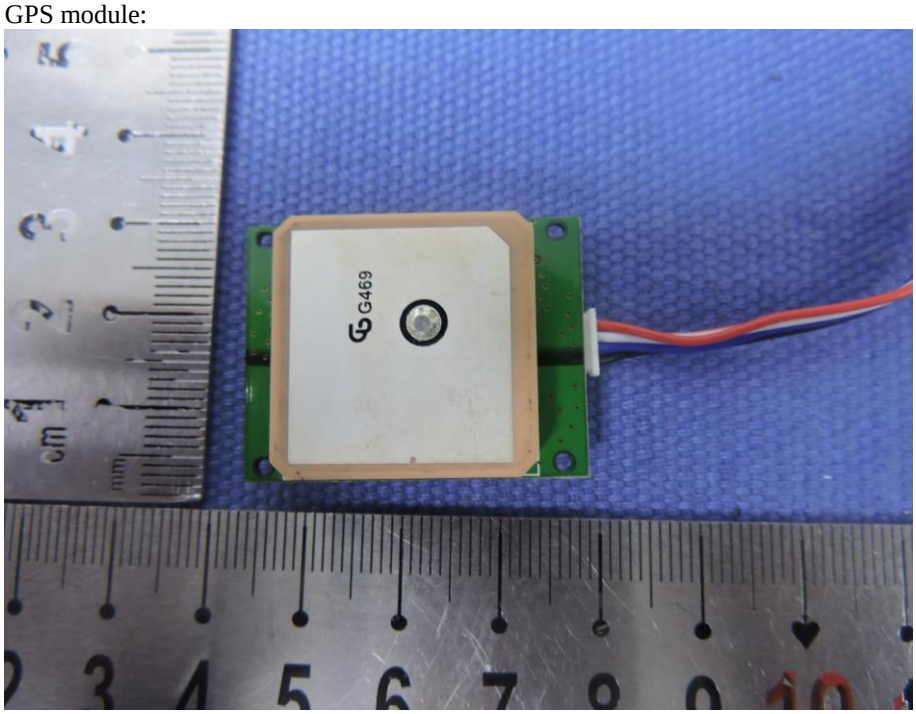
2.4GHz Module:

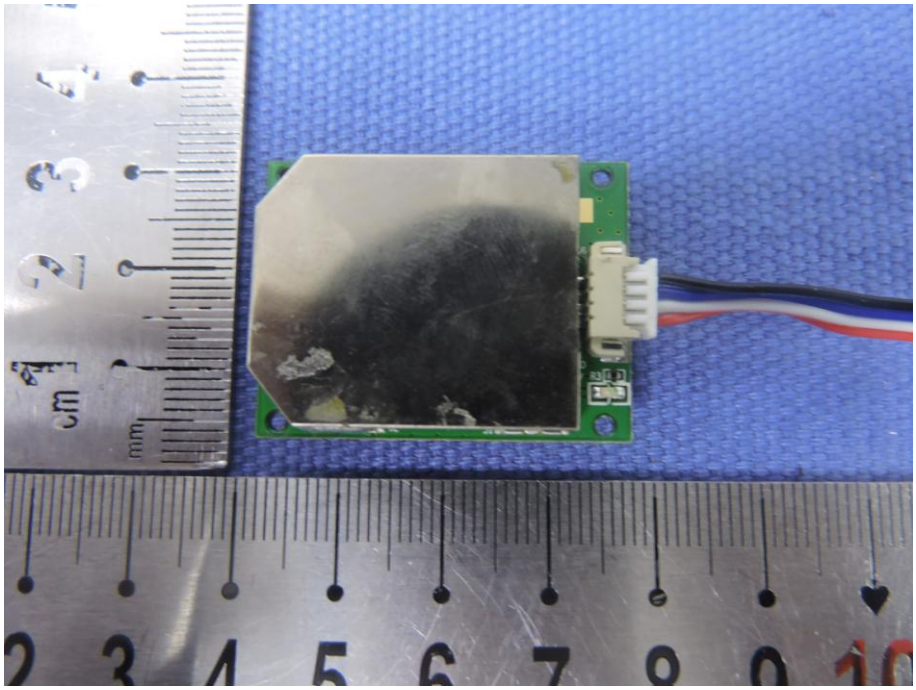


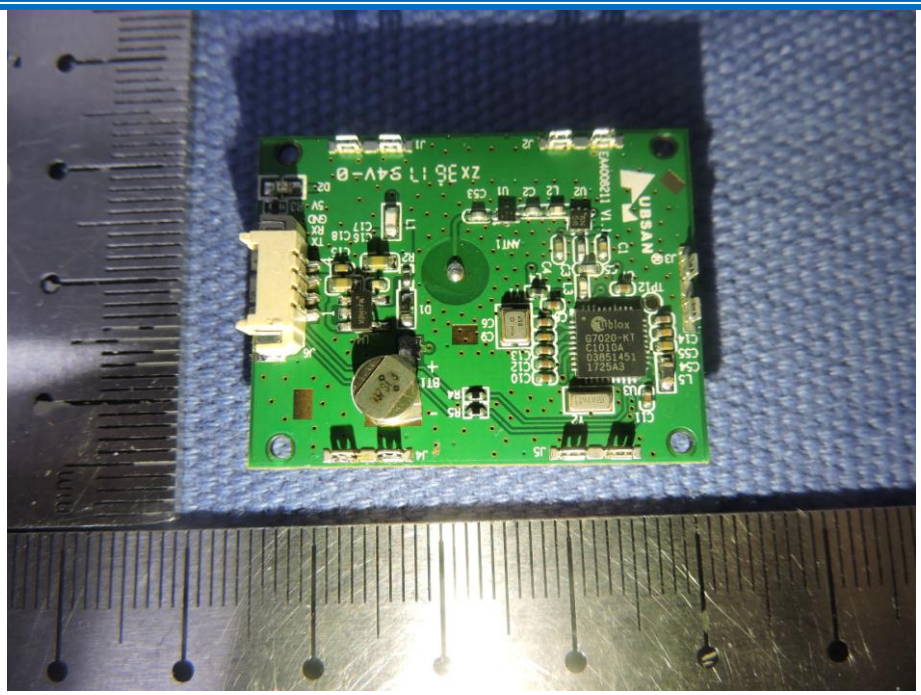

EA4000103-01


A 7106
SMQ630014
1645H
16.000
MHZ
A 7700

GPS module:







--End of Report--