

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**

OF

Active speaker

Model No.: INVISIBAR TV3, INVISIBAR 100, S10

Brand Name: Sinclair Audio, Ultimate, Sherwood

FCC ID: PQA-TV3

Report No.: KAD140421052E

Issue Date: July 15, 2014

Prepared for

**JAM INDUSTRIES LTD.
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Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	JAM INDUSTRIES LTD. 21000 Trans Canada Highway, Baie D'Urfe Quebec H9X 4B7 Canada
Manufacturer:	JAM INDUSTRIES LTD. 21000 Trans Canada Highway, Baie D'Urfe Quebec H9X 4B7 Canada
Product Description:	Active speaker
Brand Name:	Sinclair Audio, Ultimate, Sherwood
Model Number:	INVISIBAR TV3, INVISIBAR 100, S10 (Note: The samples are the same except trademark and model number. So we prepare INVISIBAR TV3 for test.)
File Number:	KAD140421052E
Date of Test:	May 20, 2014 to July 03, 2014

We hereby certify that:

The above equipment was tested by DONGGUAN EMTEK CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2013).

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

Approved By



**Sam.Lv / Q.A. Manager
DONGGUAN EMTEK CO., LTD.**

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	KAD140421052E

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1. GENERAL INFORMATION

1.1 Product Description

The JAM INDUSTRIES LTD. Model: INVISIBAR TV3 (referred to as the EUT in this report) The EUT is an short range, lower power transmitter as an Input Device. It is designed by way of utilizing the following modulation achieves the system operating.

The EUT has two RF modules, a major technical descriptions of EUT are described as following:

Technical Specifications	2.4G Module	Bluetooth 4.0 Module
Operation Frequency	2404-2479MHz	2402-2480MHz
Modulation	FSK	GFSK
Number of Channel	16	40
Channel space	5 MHz	2 MHz
Rated RF Output Power	8.17 dBm	5.41 dBm
Antenna Type	Metal PF Antenna	Internal PCB antenna
Antenna GAIN	2.0dBi	0dBi
Input Rating	AC 100-240V, 50/60Hz	
Note: The 2.4G module and BT module can transmit signals at the same.		

Declaration for FHSS Devices

Additional declaration part according to FCC 15.247(a) for a 2404 MHz to 2479 MHz FHSS devices.

1. Frequency range

The frequency range of this device is 2404-2479MHz as declared by the applicant.

2. hopping sequences

Example of a 16 hopping sequences:

1, 16, 5, 9, 5, 10, 12, 14, 15, 10, 3, 4, 8, 10, 11, 6, 5, 11

3. Equally average use of frequencies in data mode

The use of frequencies will be pseudo randomly generated by the use of different channel sequence tables.

So the used hopping sequence will be always different from the one before and an equally average use of the frequencies is guaranteed.

4. The receiver input bandwidth

The input bandwidth of the receiver is 2226 kHz. This will be part of the device manufacturing test.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: PQA-TV3 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules and FCC Public Notice DA 00-705.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03 (June 5, 2014) for compliance to FCC 47CFR 15.247 requirements.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

1.6 Test Facility

Site Description	
EMC Lab.	: Accredited by FCC, June 18, 2014 The Certificate Number is 247565
	Accredited by Industry Canada, February 19, 2014 The Certificate Number is 9444A.
Name of Firm	: DONGGUAN EMTEK CO., LTD
Site Location	: No.281, Guantai Road, Nancheng District, Dongguan, Guangdong, China

2. 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

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. 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 according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

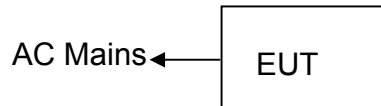


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	Active speaker	Sinclair Audio	INVISIBAR TV3	PQA-TV3	N/A	EUT

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.

3. Description of test modes

This is Digital Transmission System(DTS) , The EUT has two RF modules. The 3 channels of lower, medium and higher were chosen for test.

For RF Module 1(2.4G Module)

1. For lowest channel : 2404MHz(Channel 01)
2. For middle channel : 2444MHz(Channel 09)
3. For highest channel: 2479MHz(Channel 16)

Channel Lists:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2404	05	2424	09	2444	13	2464
02	2409	06	2429	10	2449	14	2469
03	2414	07	2434	11	2454	15	2474
04	2419	08	2439	12	2459	16	2479

For RF Module 2 (Bluetooth 4.0 Module)

1. For lowest channel : 2402MHz(Channel 01)
2. For middle channel : 2442MHz(Channel 21)
3. For highest channel: 2480MHz(Channel 40)

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	21	2442	31	2462
02	2404	12	2424	22	2444	32	2464
03	2406	13	2426	23	2446	33	2466
04	2408	14	2428	24	2448	34	2468
05	2410	15	2430	25	2450	35	2470
06	2412	16	2432	26	2452	36	2472
07	2414	17	2434	27	2454	37	2474
08	2416	18	2436	28	2456	38	2476
09	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

Note:

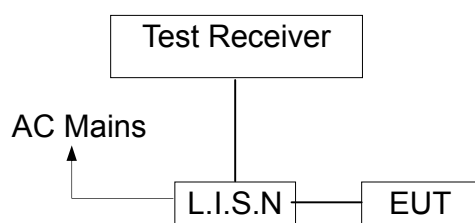
1. Test of channel was included the lowest middle and highest frequency in highest data rate and to perform the test, then record on this report.

Conducted Emissions Test

4.1 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 frequency measured was complete.

4.2 Test SET-UP (Block Diagram of Configuration)



4.3 Measurement Equipment Used:

Conducted Emission Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Last Cal.	Due date
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	May 16, 2014	May 15, 2015
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	May 16, 2014	May 15, 2015
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	May 16, 2014	May 15, 2015
50ΩCoaxial Switch	Anritsu	MP59B	M20531	May 16, 2014	May 15, 2015

4.4 Conducted Emission Limit

(7) Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

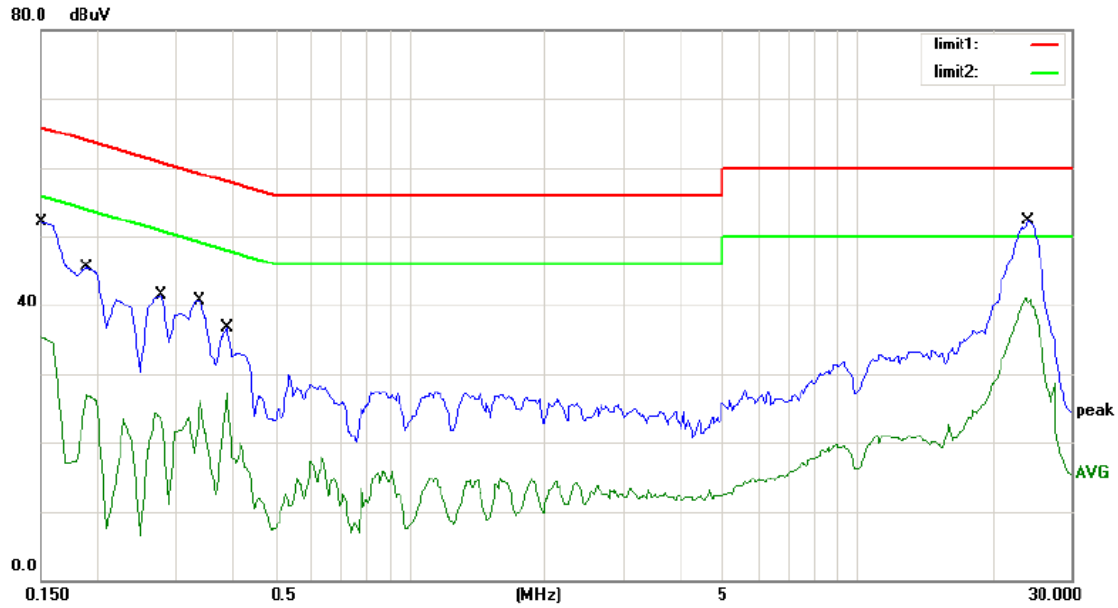
Note:

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

4.5 Measurement Result:

PASS.

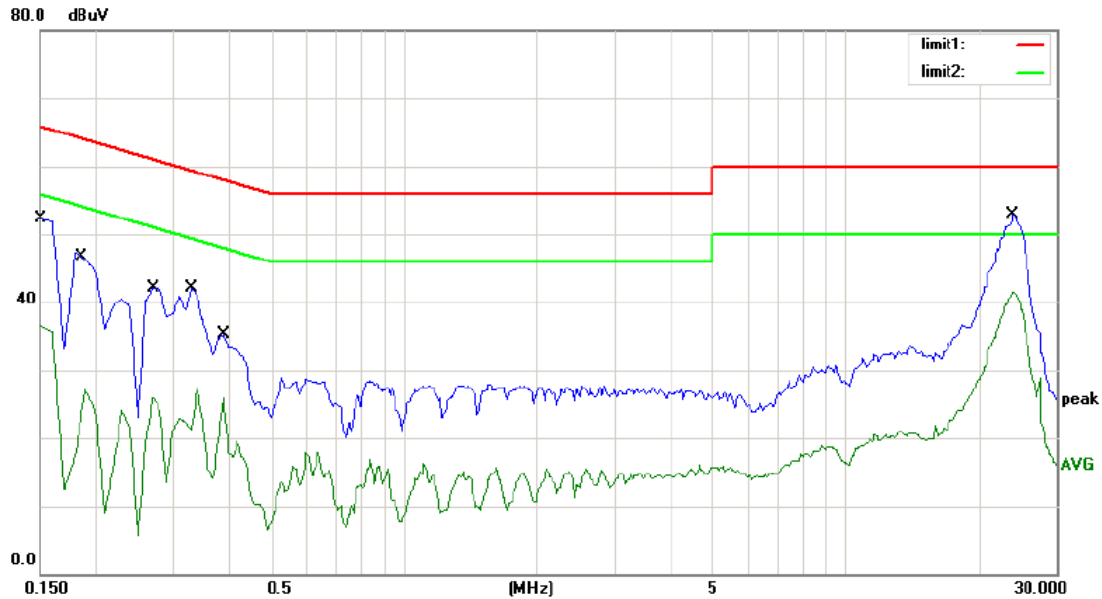
Please refer to the attached data.



Site site #1 Phase: **L1** Temperature: 24
Limit: (CE)FCC PART 15 class C_QP Power: AC 120V/60Hz Humidity: 55 %
Mode: 2.4G Link+BT Link
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	48.70	0.00	48.70	66.00	-17.30	QP	
2		0.1500	35.52	0.00	35.52	56.00	-20.48	AVG	
3		0.1914	45.31	0.00	45.31	63.98	-18.67	QP	
4		0.1914	26.92	0.00	26.92	53.98	-27.06	AVG	
5		0.2800	41.54	0.00	41.54	60.82	-19.28	QP	
6		0.2800	24.23	0.00	24.23	50.82	-26.59	AVG	
7		0.3400	40.71	0.00	40.71	59.20	-18.49	QP	
8		0.3400	26.02	0.00	26.02	49.20	-23.18	AVG	
9		0.3900	36.66	0.00	36.66	58.06	-21.40	QP	
10		0.3900	27.12	0.00	27.12	48.06	-20.94	AVG	
11		24.1000	49.50	0.00	49.50	60.00	-10.50	QP	
12	*	24.1000	41.15	0.00	41.15	50.00	-8.85	AVG	

*:Maximum data x:Over limit l:over margin Comment: Factor build in receiver.



Site site #1 Phase: **N** Temperature: 24
Limit: (CE)FCC PART 15 class C_QP Power: AC 120V/60Hz Humidity: 55 %
Mode: 2.4G Link+BT Link
Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	52.33	0.00	52.33	66.00	-13.67	QP	
2		0.1500	36.65	0.00	36.65	56.00	-19.35	AVG	
3		0.1874	46.55	0.00	46.55	64.15	-17.60	QP	
4		0.1874	27.12	0.00	27.12	54.15	-27.03	AVG	
5		0.2700	42.01	0.00	42.01	61.12	-19.11	QP	
6		0.2700	25.86	0.00	25.86	51.12	-25.26	AVG	
7		0.3300	42.05	0.00	42.05	59.45	-17.40	QP	
8		0.3300	27.31	0.00	27.31	49.45	-22.14	AVG	
9		0.3900	35.38	0.00	35.38	58.06	-22.68	QP	
10		0.3900	25.86	0.00	25.86	48.06	-22.20	AVG	
11	*	24.0000	52.99	0.00	52.99	60.00	-7.01	QP	
12		24.0000	41.54	0.00	41.54	50.00	-8.46	AVG	

*:Maximum data x:Over limit !:over margin Comment: Factor build in receiver.

4.6 Conducted Measurement Photos:



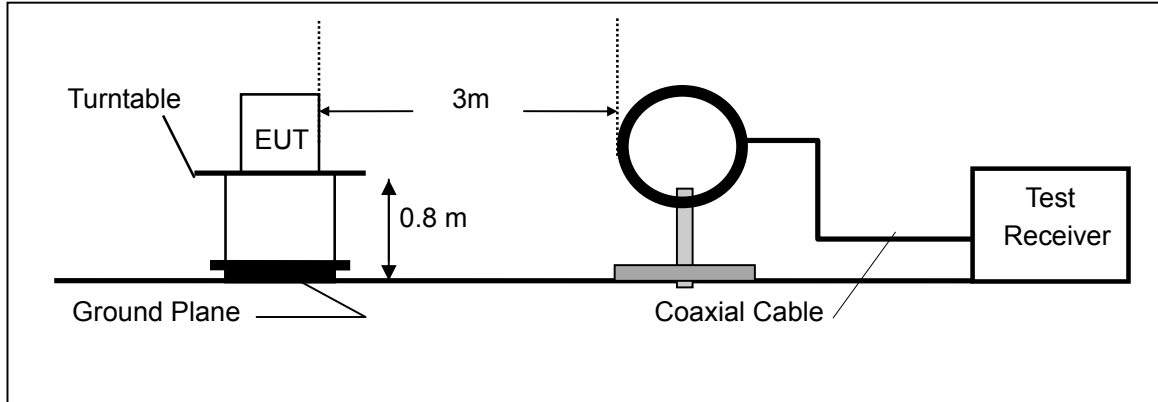
4. Radiated Emission Test

5.1 Measurement Procedure

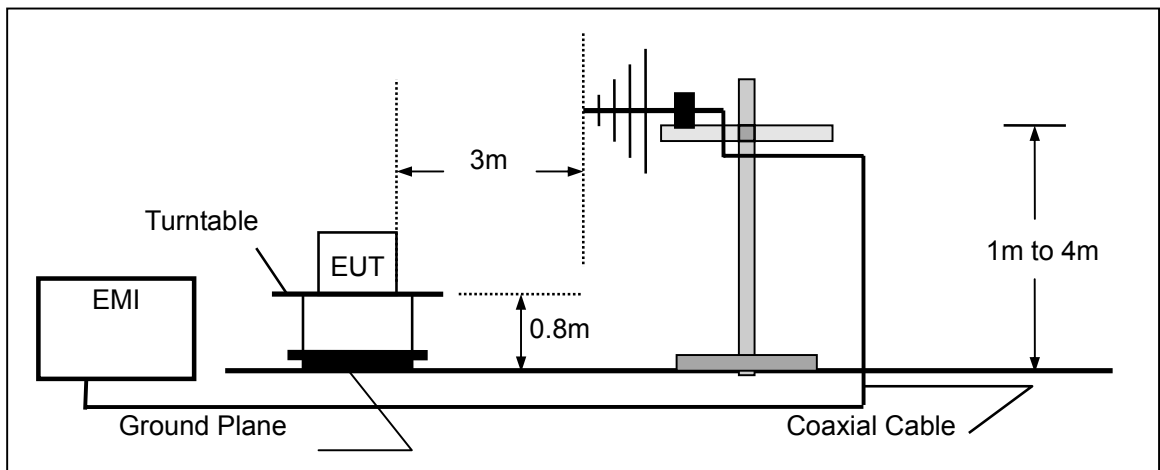
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

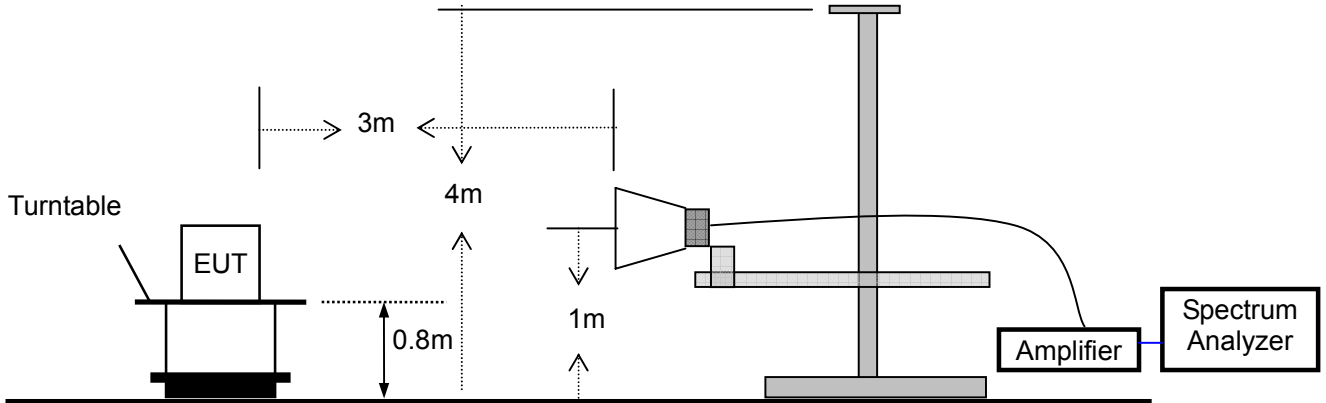
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



5.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 16, 2014	May 15, 2015
Pre-Amplifier	HP	8447D	2944A07999	May 16, 2014	May 15, 2015
Bilog Antenna	Schwarzbeck	VULB9163	142	May 16, 2014	May 15, 2015
Loop Antenna	Schwarzbeck	FMZB 1519	012	May 16, 2014	May 15, 2015
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 16, 2014	May 15, 2015
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 16, 2014	May 15, 2015
Cable	Schwarzbeck	AK9513	ACRX1	May 19, 2014	May 18, 2015
Cable	Rosenberger	N/A	FP2RX2	May 19, 2014	May 18, 2015
Cable	Schwarzbeck	AK9513	CRPX1	May 19, 2014	May 18, 2015
Cable	Schwarzbeck	AK9513	CRRX2	May 19, 2014	May 18, 2015
Pre-Amplifier	A.H.	PAM-0126	1415261	May 16, 2014	May 15, 2015

5.4 Radiated emission limit

Frequency MHz	Distance Meter	Field Strength	
		uV/m	dBuV/m
0.009 – 0.490	300	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	30	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	100* 30	20log 30 + 40
30~88	3	100	40.0
88~216	3	150	43.5
216~960	3	200	46.0
Above 960	3	500	54.0

Note: The frequencies above 1000MHz, as measured using instrumentation with a peak detector function was corresponding to 20dB above maximum permitted average limit.

5.5 Measurement Result

Operation Mode: TX Test Date : May 20, 2014
Frequency Range: 9KHz~30MHz Temperature : 28℃
Test Result: PASS Humidity : 65 %
Measured Distance: 3m Test By: WOLF

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
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Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Operation Mode: 2.4G Link+ BT Link Test Date : July 02, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50%
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
33.3400	V	36.59	40.00	-3.41	PK
99.6600	V	37.59	43.50	-5.91	PK
126.2200	V	35.77	43.50	-7.73	PK
173.6100	V	36.85	43.50	-6.65	PK
203.6700	V	39.54	43.50	-3.96	PK
370.2300	V	40.18	46.00	-5.82	PK
122.1200	H	38.59	43.50	-4.91	PK
137.6500	H	39.56	43.50	-3.94	PK
253.6700	H	41.25	46.00	-4.75	PK
299.5600	H	41.08	46.00	-4.92	PK
327.2300	H	40.26	46.00	-5.74	PK
469.7600	H	41.65	46.00	-4.35	PK

Note: (1) All Readings are Peak Value.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: 2.4G Link+ BT Link
Frequency Range: 1-25GHz
Test Result: PASS
Measured Distance: 3m

Test Date : July 01, 2014
Temperature : 25 °C
Humidity : 50 %
Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
3268.82	V	66.47	46.25	74	54	-7.53	-7.75
3455.17	V	65.12	45.71	74	54	-8.88	-8.29
3646.27	V	64.08	44.22	74	54	-9.92	-9.78
4018.28	V	63.22	43.98	74	54	-10.78	-10.02
4217.25	V	62.27	42.39	74	54	-11.73	-11.61
4559.28	V	61.46	41.25	54	74	-12.54	-12.75
3147.43	H	65.48	46.58	74	54	-8.52	-7.42
3268.28	H	64.22	45.22	74	54	-9.78	-8.78
3676.28	H	63.85	44.17	74	54	-10.15	-9.83
4733.97	H	62.18	43.27	74	54	-11.82	-10.73
4829.17	H	61.72	42.92	74	54	-12.28	-11.08
5329.28	H	60.28	41.08	74	54	-13.72	-12.92

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

For 2.4G Module:

Operation Mode: TX Mode(Channel 01) Test Date : May 20, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50%
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
33.8800	V	32.68	40.00	-7.32	PK
89.1700	V	33.31	43.50	-10.19	PK
122.1500	V	34.37	43.50	-9.13	PK
173.5600	V	35.49	43.50	-8.01	PK
203.6300	V	35.54	43.50	-7.96	PK
370.4700	V	41.30	46.00	-4.70	PK
122.1500	H	34.57	43.50	-8.93	PK
137.6700	H	33.43	43.50	-10.07	PK
253.1000	H	40.02	46.00	-5.98	PK
299.6600	H	39.21	46.00	-6.79	PK
323.9100	H	41.05	46.00	-4.95	PK
485.9000	H	41.18	46.00	-4.82	PK

Note: (1) All Readings are Peak Value.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode(Channel 09) Test Date : May 20, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
34.1200	V	32.23	40.00	-7.77	PK
86.4500	V	34.78	43.50	-8.72	PK
120.4700	V	34.67	43.50	-8.83	PK
178.2700	V	35.79	43.50	-7.71	PK
233.4300	V	35.44	43.50	-8.06	PK
356.5600	V	41.78	46.00	-4.22	PK
114.7500	H	34.22	43.50	-9.28	PK
177.5600	H	33.53	43.50	-9.97	PK
246.2200	H	40.56	46.00	-5.44	PK
249.6700	H	39.26	46.00	-6.74	PK
366.9400	H	41.44	46.00	-4.56	PK
475.5600	H	42.39	46.00	-3.61	PK

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode(Channel 16) Test Date : May 20, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
33.2800	V	36.34	40.00	-3.66	PK
89.4500	V	34.67	43.50	-8.83	PK
122.2100	V	36.37	43.50	-7.13	PK
173.4500	V	35.34	43.50	-8.16	PK
203.4500	V	38.67	43.50	-4.83	PK
370.4200	V	41.32	46.00	-4.68	PK
122.4500	H	37.45	43.50	-6.05	PK
137.6700	H	33.23	43.50	-10.27	PK
253.1000	H	40.65	46.00	-5.35	PK
299.6600	H	39.22	46.00	-6.78	PK
323.3100	H	42.45	46.00	-3.55	PK
467.5400	H	41.13	46.00	-4.87	PK

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode (Channel 01) Test Date : May 22, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2404	V	63.54	49.23	74	54	-10.46	-4.77
4808	V	62.54	48.56	74	54	-11.46	-5.44
7212	V	61.56	47.13	74	54	-12.44	-6.87
9616	V	60.23	46.56	74	54	-13.77	-7.44
12020	V	59.34	45.13	74	54	-14.66	-8.87
2404	H	64.22	50.45	74	54	-9.78	-3.55
4808	H	63.54	48.56	74	54	-10.46	-5.44
7212	H	61.34	48.34	74	54	-12.66	-5.66
9616	H	60.33	47.45	74	54	-13.67	-6.55
12020	H	59.56	46.56	74	54	-14.44	-7.43

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode (Channel 09) Test Date : May 22, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2444	V	64.26	50.01	74	54	-9.74	-3.99
4888	V	63.11	49.33	74	54	-10.89	-4.67
7332	V	62.45	48.56	74	54	-11.55	-5.44
9776	V	60.28	47.22	74	54	-13.72	-6.78
12220	V	58.39	46.25	74	54	-15.61	-7.75
2444	H	63.27	49.32	74	54	-10.73	-4.68
4888	H	62.67	48.56	74	54	-11.33	-5.44
7332	H	61.48	47.32	74	54	-12.52	-6.68
9776	H	60.25	46.45	74	54	-13.75	-7.55
12220	H	59.89	45.81	74	54	-14.11	-8.19

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode (Channel 16) Test Date : May 22, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2479	V	64.41	49.12	74	54	-9.59	-4.88
4958	V	63.34	48.34	74	54	-10.66	-5.66
7437	V	62.35	48.13	74	54	-11.65	-5.87
9916	V	61.23	47.45	74	54	-12.77	-6.55
12395	V	60.45	46.34	74	54	-13.55	-7.66
2479	H	65.55	49.45	74	54	-8.45	-4.55
4958	H	64.26	48.47	74	54	-9.74	-5.53
7437	H	63.21	47.15	74	54	-10.79	-6.85
9916	H	62.45	46.23	74	54	-11.55	-7.77
12395	H	60.22	45.64	74	54	-13.78	-8.36

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

For Bluetooth 4.0 Module:

Operation Mode: TX Mode(Channel 01) Test Date : May 20, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50%
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
34.8500	V	34.68	40.00	-5.32	PK
76.5600	V	33.37	40.00	-6.63	PK
122.1500	V	33.00	43.50	-10.50	PK
216.2400	V	35.32	46.00	-10.68	PK
382.1100	V	40.20	46.00	-5.80	PK
418.9700	V	38.89	46.00	-7.11	PK
122.1500	H	33.96	43.50	-9.54	PK
145.4300	H	36.64	43.50	-6.86	PK
247.2800	H	38.70	46.00	-7.30	PK
299.6600	H	35.83	46.00	-10.17	PK
450.0100	H	34.52	46.00	-11.48	PK
567.3800	H	36.83	46.00	-9.17	PK

Note: (1) All Readings are Peak Value.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode(Channel 21) Test Date : May 20, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
54.2300	V	34.62	40.00	-5.38	PK
82.6300	V	33.45	40.00	-6.55	PK
132.4500	V	37.34	43.50	-6.16	PK
203.2300	V	35.56	46.00	-10.44	PK
322.4500	V	40.45	46.00	-5.55	PK
424.9200	V	36.22	46.00	-9.78	PK
132.2500	H	33.54	43.50	-9.96	PK
145.4500	H	33.64	43.50	-9.86	PK
247.3800	H	36.34	46.00	-9.66	PK
293.5500	H	38.15	46.00	-7.85	PK
434.2200	H	34.56	46.00	-11.44	PK
567.5600	H	36.42	46.00	-9.58	PK

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode(Channel 40) Test Date : May 20, 2014
Frequency Range: 30~1000MHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Note
39.1100	V	36.22	40.00	-3.78	PK
89.4500	V	34.65	43.50	-8.85	PK
122.2100	V	35.45	43.50	-8.05	PK
173.4500	V	36.22	43.50	-7.28	PK
203.4500	V	37.23	43.50	-6.27	PK
370.4200	V	39.61	46.00	-6.39	PK
122.4500	H	38.41	43.50	-5.09	PK
137.6700	H	35.06	43.50	-8.44	PK
253.1000	H	40.34	46.00	-5.66	PK
299.6600	H	39.55	46.00	-6.45	PK
323.3100	H	40.31	46.00	-5.69	PK
467.5400	H	38.23	46.00	-7.77	PK

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode (Channel 01) Test Date : May 22, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2402	V	63.32	49.22	74	54	-10.68	-4.78
4804	V	62.51	48.56	74	54	-11.49	-5.44
7206	V	61.45	47.11	74	54	-12.55	-6.89
9608	V	60.22	46.55	74	54	-13.78	-7.45
12010	V	59.65	45.56	74	54	-14.35	-8.44
2402	H	64.57	50.22	74	54	-9.43	-3.78
4804	H	63.67	48.66	74	54	-10.33	-5.34
7206	H	61.12	48.39	74	54	-12.88	-5.61
9608	H	60.67	47.45	74	54	-13.33	-6.55
12010	H	59.65	46.55	74	54	-14.35	-7.45

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

Operation Mode: TX Mode (Channel 21) Test Date : May 22, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2442	V	66.18	49.15	74	54	-7.82	-4.85
4884	V	65.79	48.25	74	54	-8.21	-5.75
7326	V	64.05	47.15	74	54	-9.95	-6.85
9768	V	63.85	46.58	74	54	-10.15	-7.42
12210	V	62.26	45.01	74	54	-11.74	-8.99
2442	H	65.28	48.75	74	54	-8.72	-5.25
4884	H	64.18	47.25	74	54	-9.82	-6.75
7326	H	63.05	46.95	74	54	-10.95	-7.05
9768	H	62.88	45.28	74	54	-11.12	-8.72
12210	H	61.28	44.08	74	54	-12.72	-9.92

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

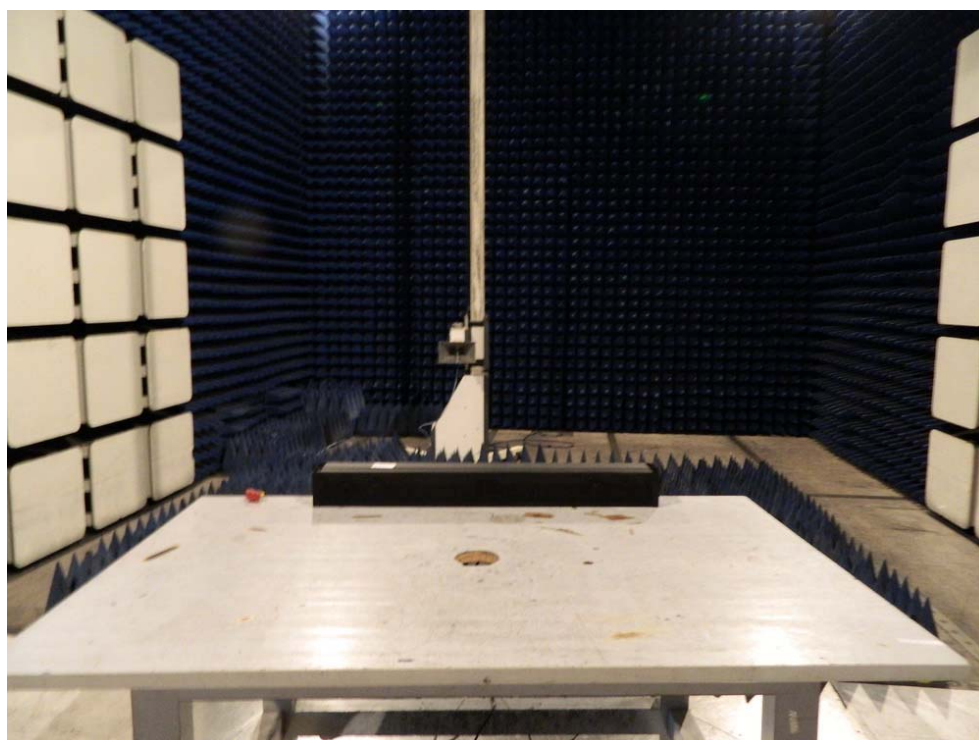
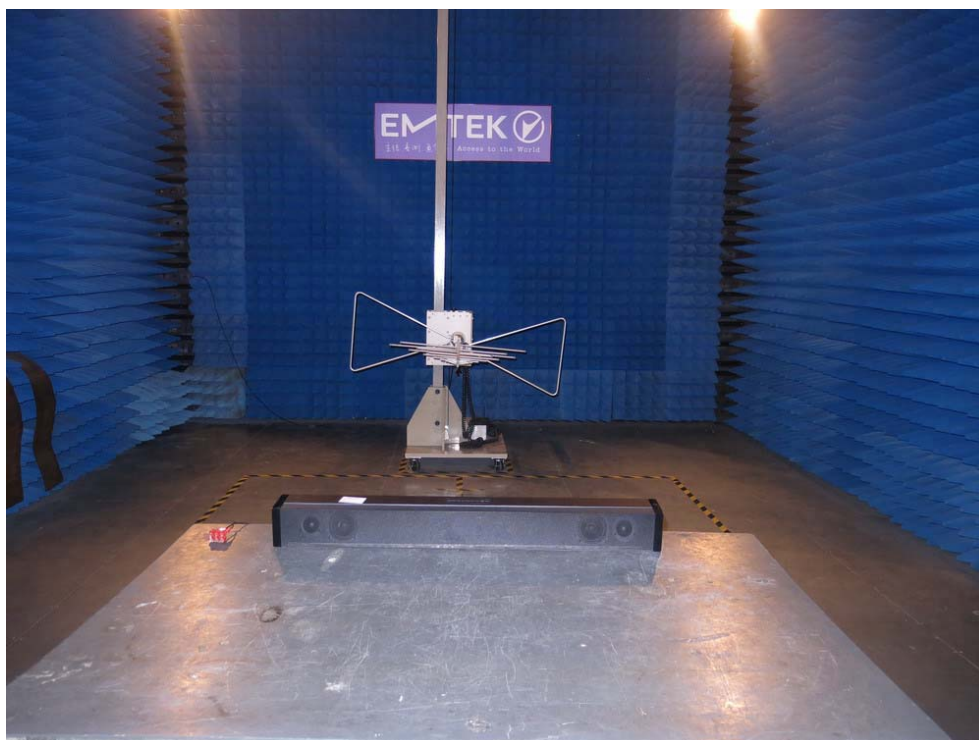
Operation Mode: TX Mode (Channel 40) Test Date : May 22, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
2480	V	64.22	49.56	74	54	-9.78	-4.44
4960	V	63.45	48.78	74	54	-10.55	-5.22
7440	V	62.36	48.33	74	54	-11.64	-5.67
9920	V	61.67	47.67	74	54	-12.33	-6.33
12400	V	60.36	46.34	74	54	-13.64	-7.66
2480	H	65.78	49.46	74	54	-8.22	-4.54
4960	H	64.24	48.33	74	54	-9.76	-5.67
7440	H	63.67	47.11	74	54	-10.33	-6.89
9920	H	62.33	46.45	74	54	-11.67	-7.55
12400	H	61.75	45.34	74	54	-12.25	-8.66

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
(3) The average measurement was not performed when the peak measured data under the limit of average detection.

5.6 Radiated Measurement Photos:

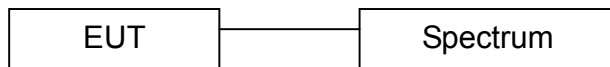


5. 6dB Bandwidth Measurement

6.1 Measurement Procedure

The EUT was operating in Wireless mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

6.2 Test SET-UP (Block Diagram of Configuration)

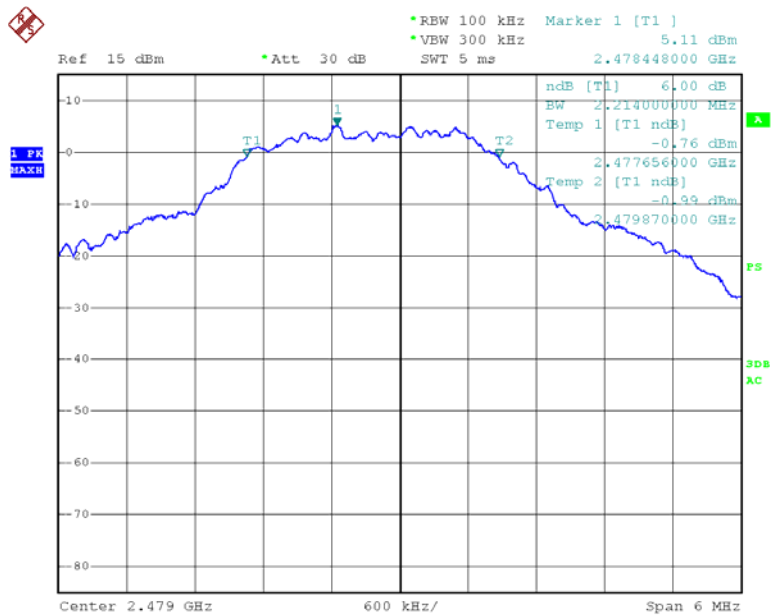
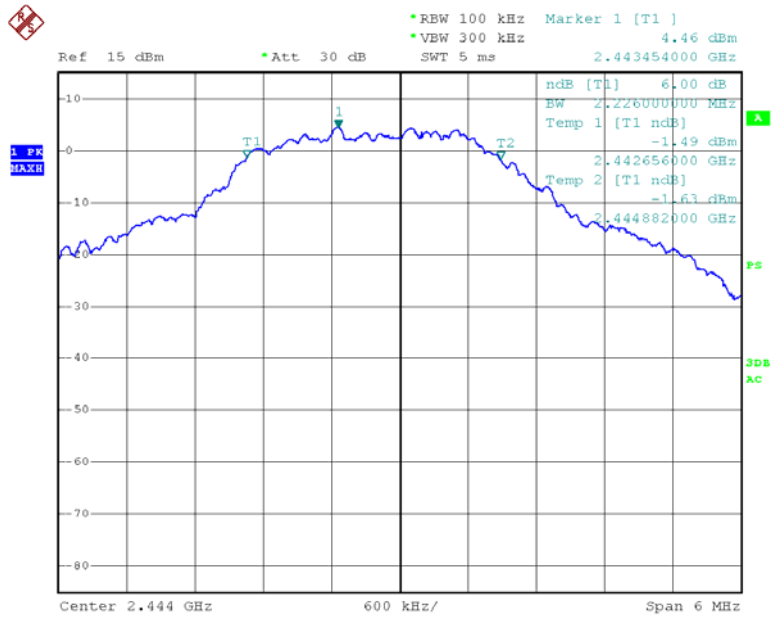


6.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 1	Rohde & Schwarz	ESCI	1166.5950.03	05/16/2014	05/15/2015
Spectrum Analyzer 2	Rohde & Schwarz	FSV30	1321.3008K	05/16/2014	05/15/2015

6.4 Limit

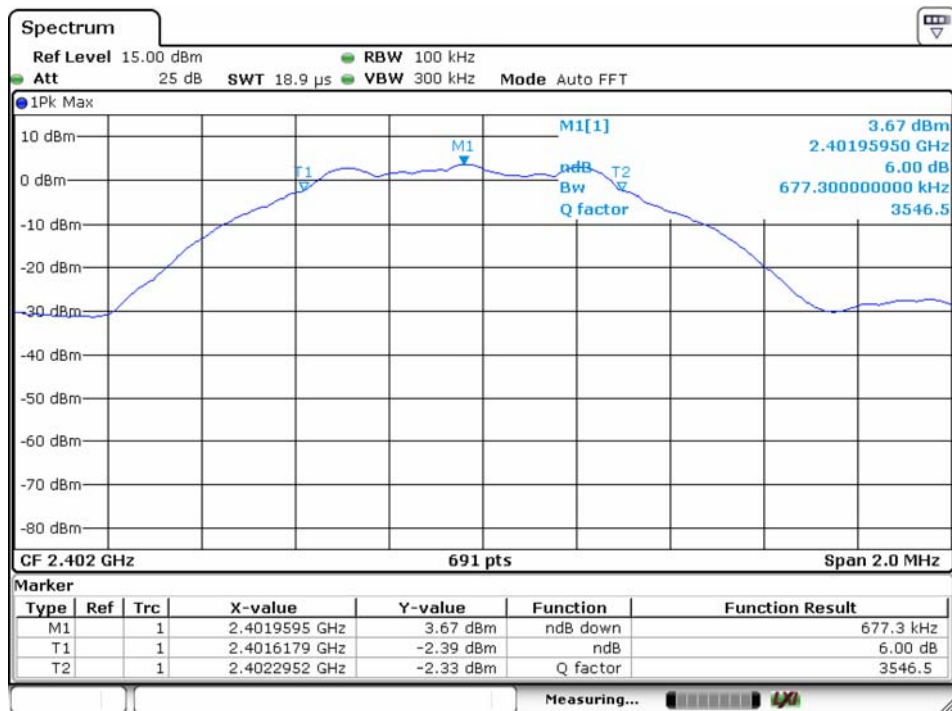
The minimum 6dB bandwidth shall be at least 500kHz.

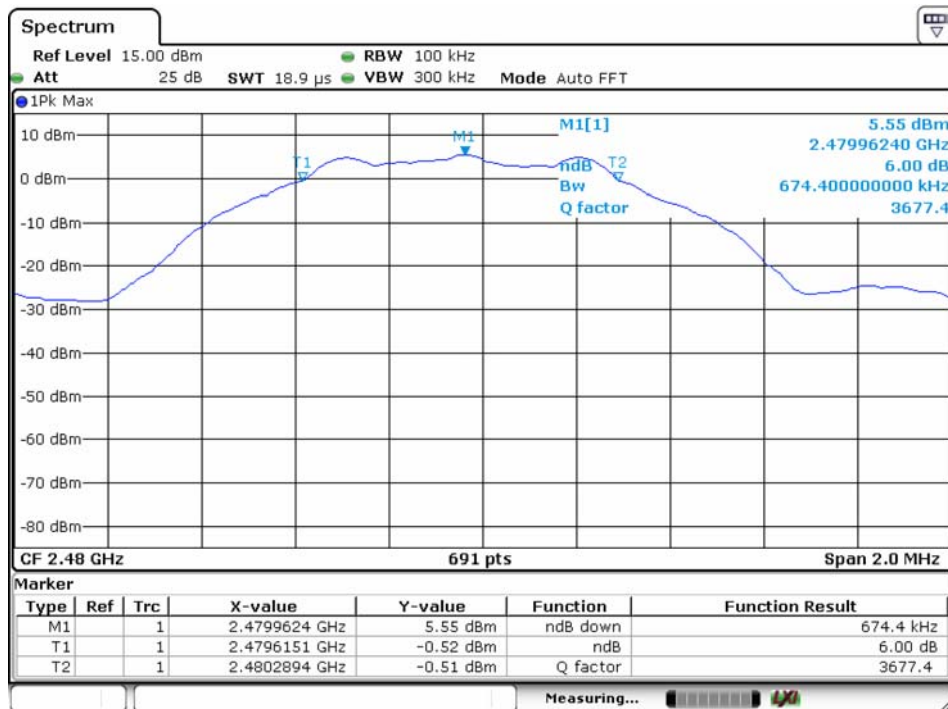
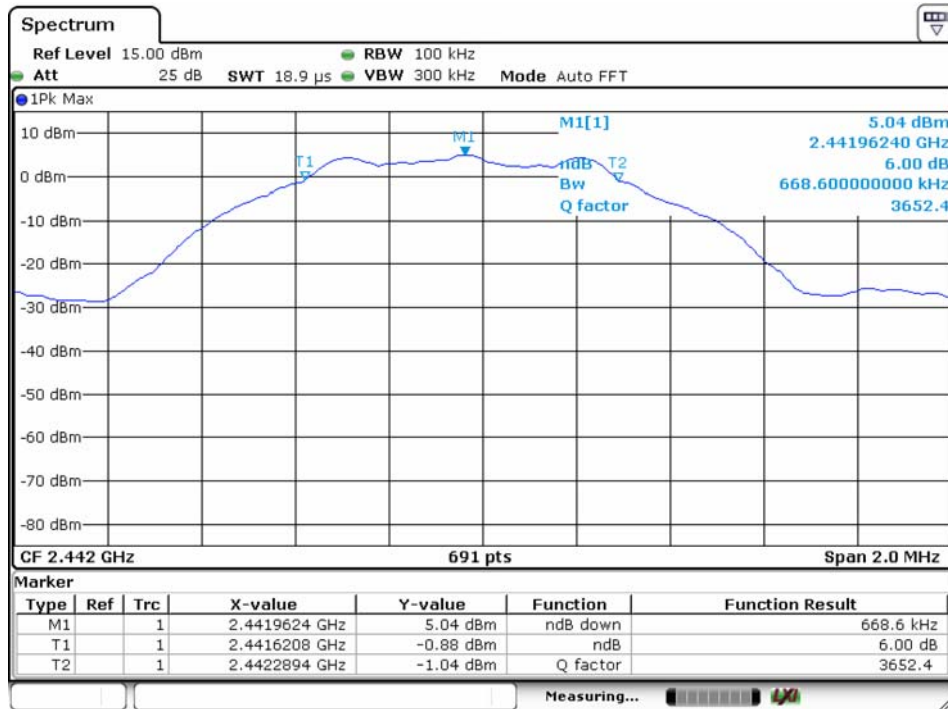


For Bluetooth 4.0 Module:

Channel number	Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)
01	2402	677	>500
21	2442	668	>500
40	2480	674	>500

Test Plot



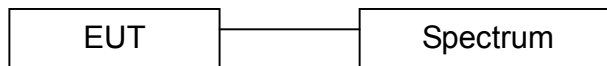


7. MAXIMUM PEAK OUTPUT POWER TEST

7.1 Measurement Procedure

- The Transmitter output (antenna port) was connected to the spectrum Analyzer.
- Turn on the EUT and then record the peak power value.
- Repeat above procedures on all channels needed to be tested.

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 1	Rohde & Schwarz	ESCI	1166.5950.03	05/16/2014	05/15/2015
Spectrum Analyzer 2	Rohde & Schwarz	FSV30	1321.3008K	05/16/2014	05/15/2015

7.4 Peak Power output limit

The maximum peak power shall be less 1Watt.

7.5 Measurement Results:

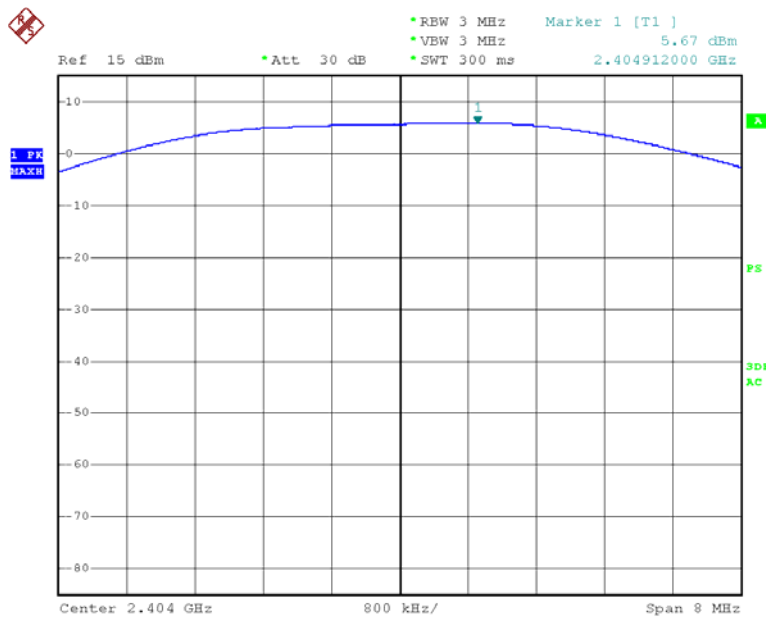
Refer to attached data chart.

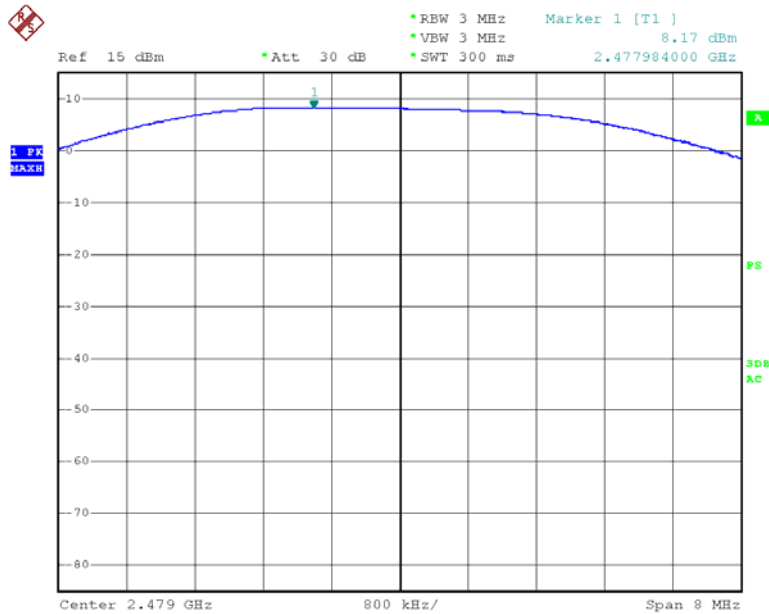
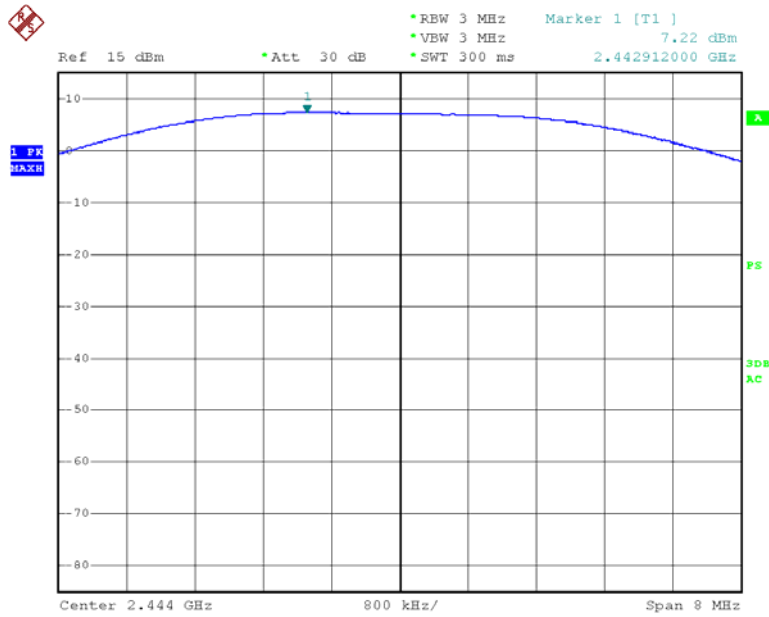
Spectrum Detector:	PK	Test Date :	May 25, 2014
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

For 2.4G Module:

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power Limit(W)	Pass/Fail
01	2404	5.67	1W(30dBm)	PASS
09	2444	7.22	1W(30dBm)	PASS
16	2479	8.17	1W(30dBm)	PASS

Test Plot:

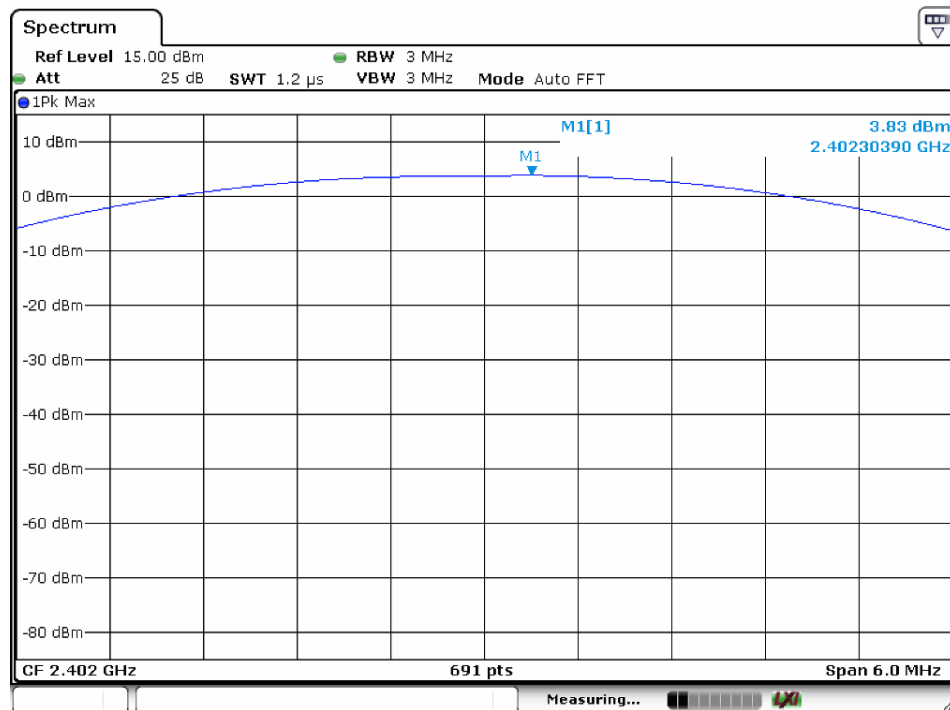


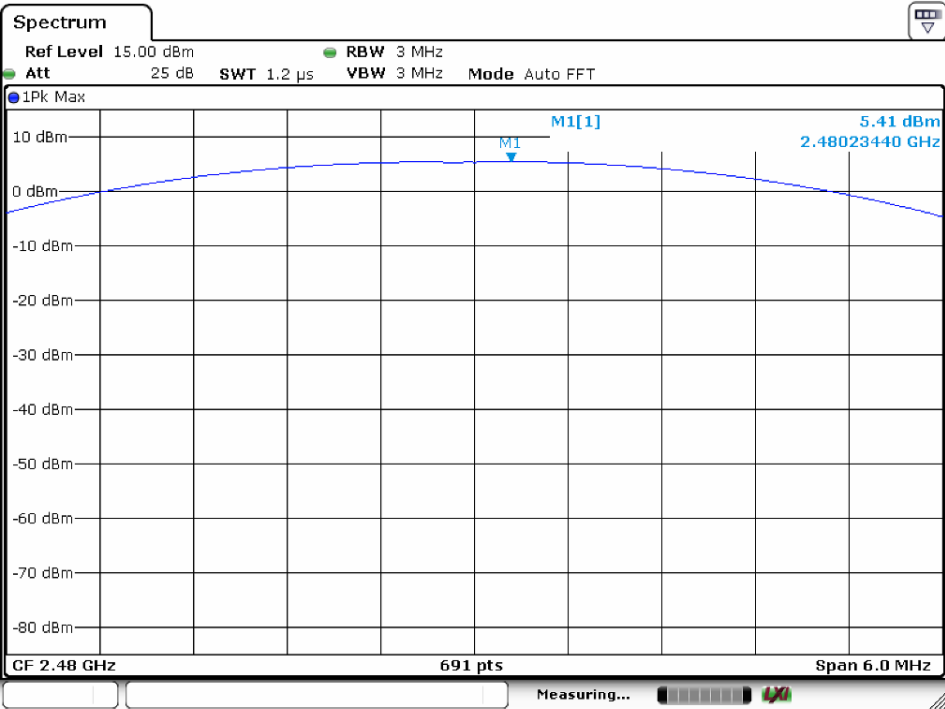
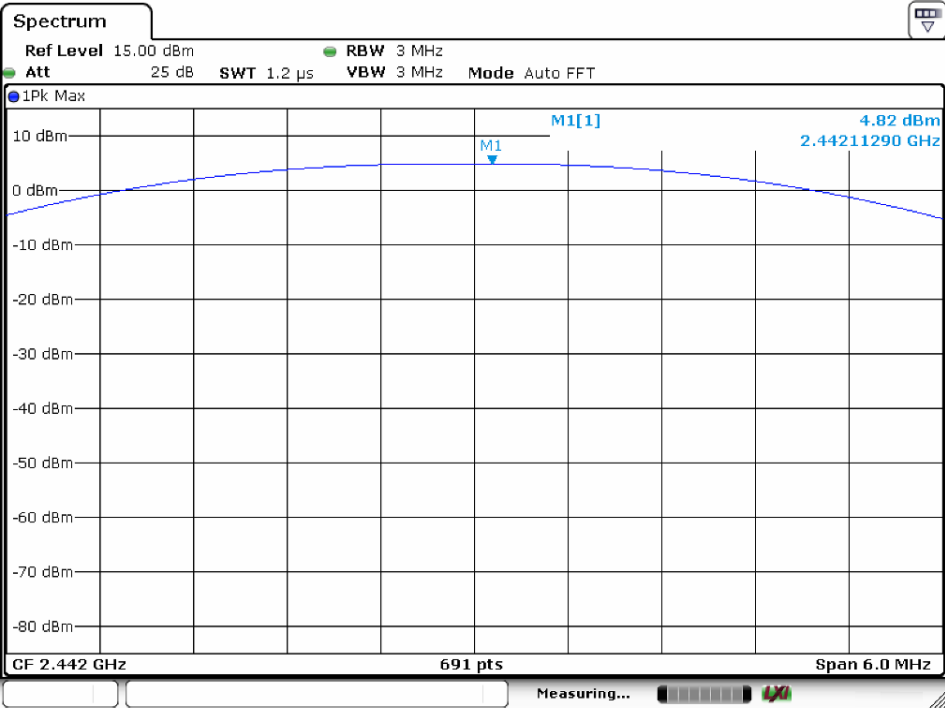


For Bluetooth 4.0 Module:

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power Limit(W)	Pass/Fail
01	2402	3.83	1W(30dBm)	PASS
21	2442	4.82	1W(30dBm)	PASS
40	2480	5.41	1W(30dBm)	PASS

Test Plot:





For 2.4G Module +Bluetooth 4.0 Module :

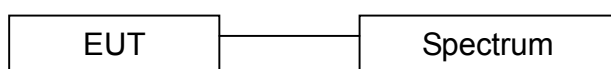
Test Channel	Peak Power output(dBm)	Peak Power Limit(W)	Pass/Fail
Low	7.856	1W(30dBm)	PASS
Middle	9.193	1W(30dBm)	PASS
High	10.015	1W(30dBm)	PASS

8. Power Spectral Density Measurement

8.1 Measurement Procedure

The EUT was operating in Wireless mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)



8.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 1	Rohde & Schwarz	ESCI	1166.5950.03	05/16/2014	05/15/2015
Spectrum Analyzer 2	Rohde & Schwarz	FSV30	1321.3008K	05/16/2014	05/15/2015

8.4 Measurement Procedure

8.4.1 The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

8.4.2. Set to the maximum power setting and enable the EUT transmit continuously.

8.4.3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)

8.4.4. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.

8.4.5. Measure and record the results in the test report.

8.4.6. The Measured power density (dBm)/ 100KHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

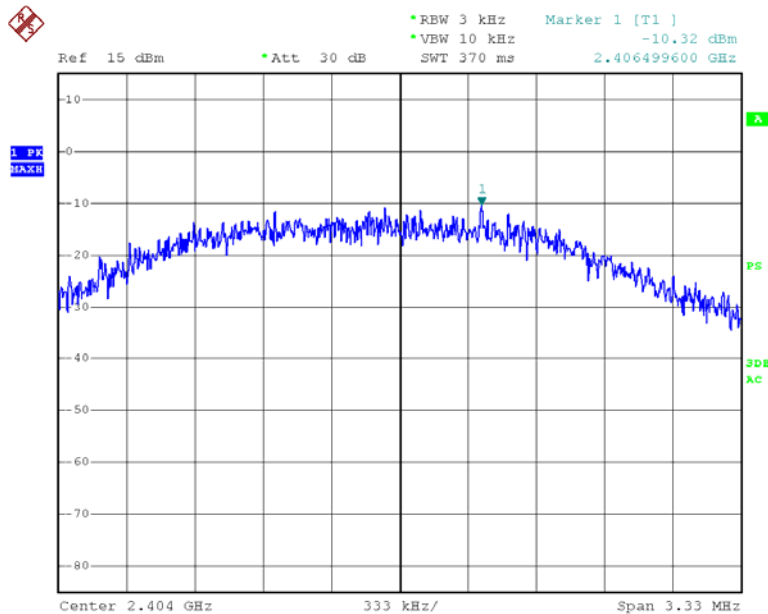
8.5 Measurement Results:

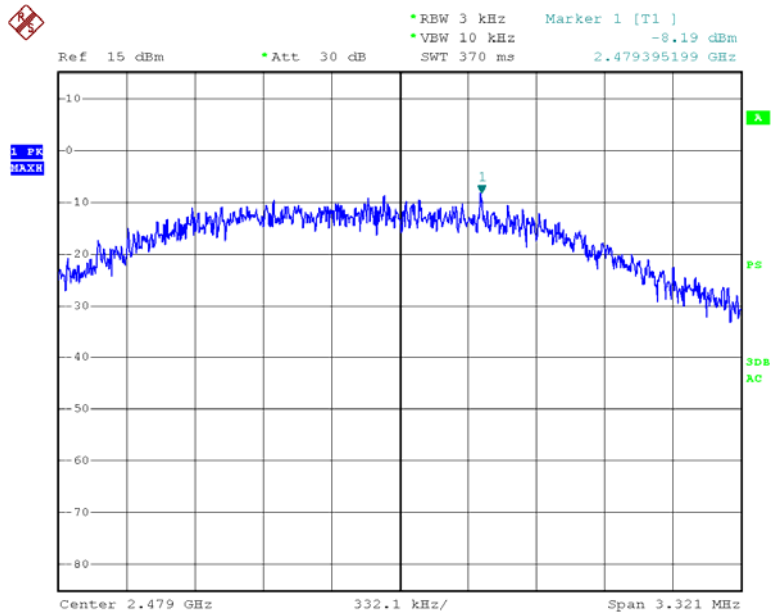
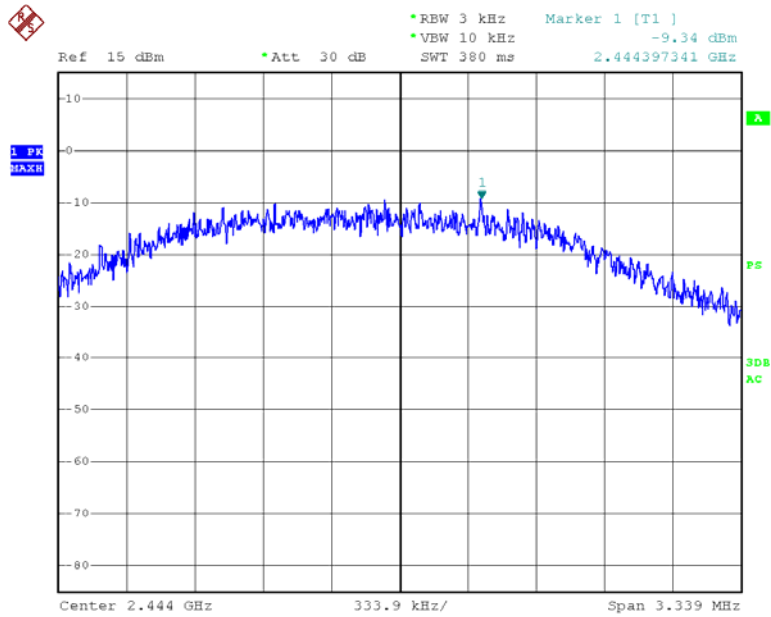
Refer to attached data chart.

Spectrum Detector: PK Test Date : May 25, 2014
Test By: Andy Temperature : 25 °C
Test Result: PASS Humidity : 50 %

For 2.4G Module:

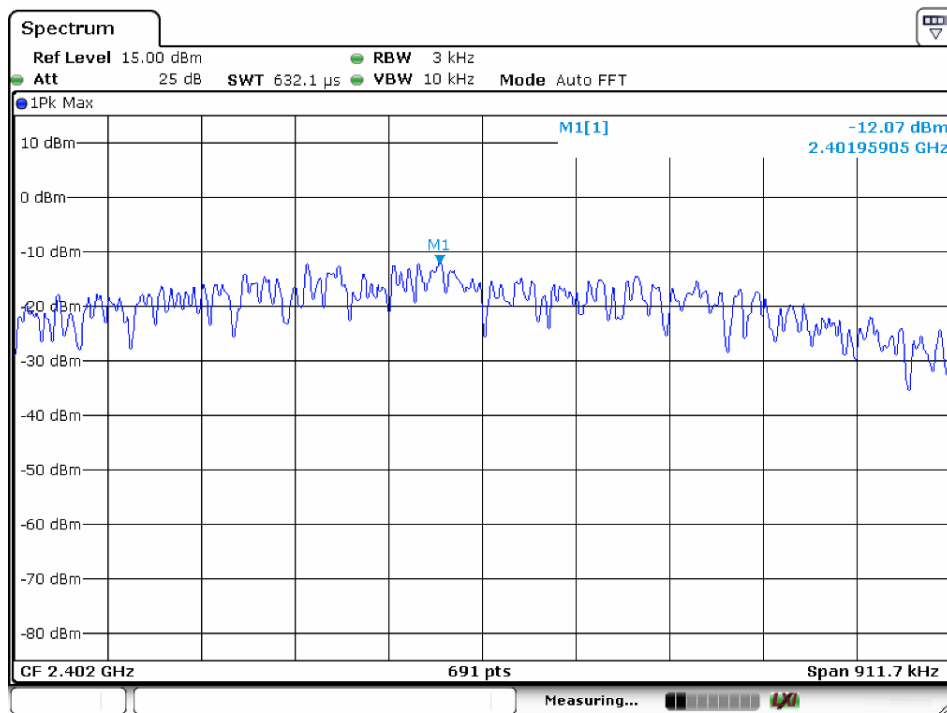
Channel number	Channel frequency (MHz)	Measurement level (dBm)	Required Limit (dBm)	Pass/Fail
01	2404	-10.32	8	PASS
09	2444	-9.34	8	PASS
16	2479	-8.19	8	PASS

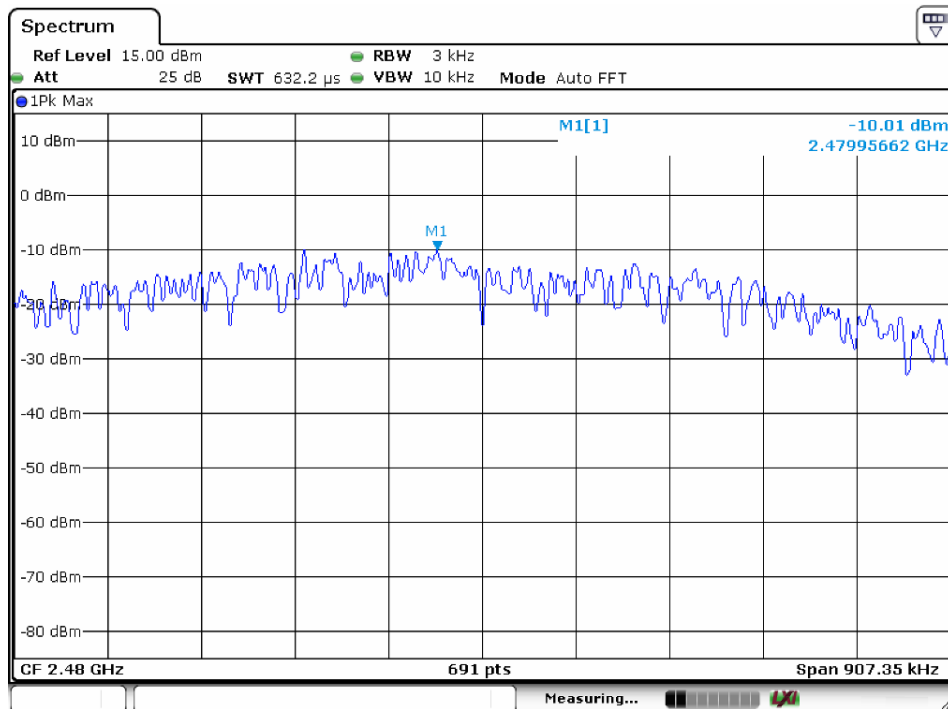
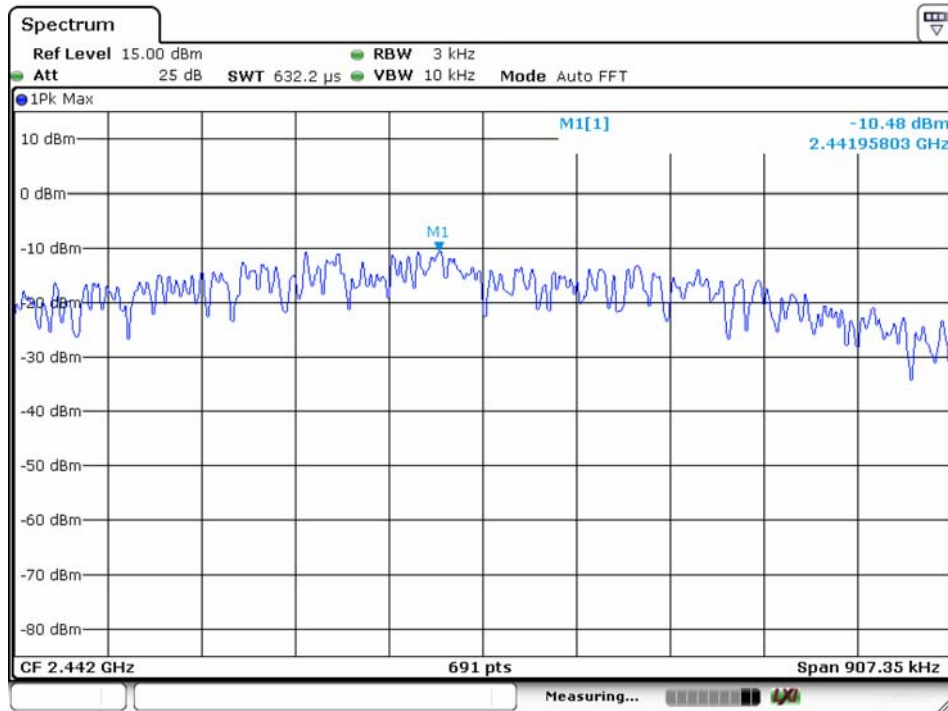




For Bluetooth 4.0 Module:

Channel number	Channel frequency (MHz)	Measurement level (dBm)	Required Limit (dBm)	Pass/Fail
01	2402	-12.07	8	PASS
21	2442	-10.48	8	PASS
40	2480	-10.01	8	PASS





For 2.4G Module +Bluetooth 4.0 Module:

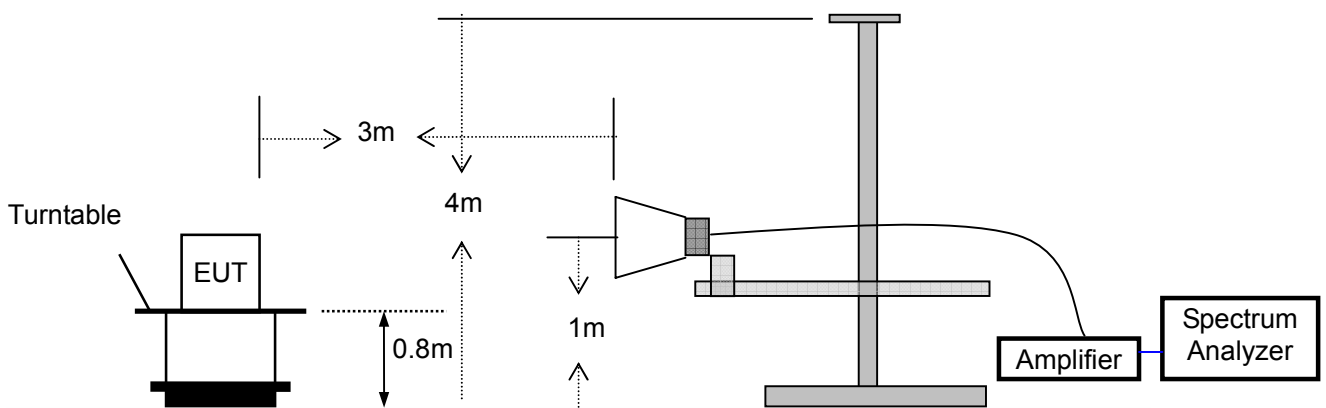
Test Channel	Measurement level (dBm)	Required Limit (dBm)	Pass/Fail
Low	-8.09	8	PASS
Middle	-6.86	8	PASS
High	-5.98	8	PASS

9. Band EDGE test

9.1 Measurement Procedure

1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measured were complete.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

Same as 5.3 Radiated Emission Measurement.

9.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector: PK Test Date : May 25, 2014
Test By: Andy Temperature : 25 °C
Test Result: PASS Humidity : 50 %

For 2.4G Module:

1. Conducted Test

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	5.67	-40.57	46.24	>20dBc
>2483.5	8.17	-59.27	67.44	>20dBc

2. Radiated emission Test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	H	51.34	38.34	74.00	54.00
	V	52.36	37.55	74.00	54.00
>2483.5	H	49.45	38.62	74.00	54.00
	V	45.32	36.23	74.00	54.00

For Bluetooth 4.0 Module:

1. Conducted Test

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	3.83	-43.01	46.84	>20dBc
>2483.5	5.41	-52.75	58.16	>20dBc

2. Radiated emission Test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	H	52.45	40.34	74.00	54.00
	V	54.11	42.87	74.00	54.00
>2483.5	H	50.45	38.22	74.00	54.00
	V	49.36	41.78	74.00	54.00

For 2.4G Module +Bluetooth 4.0 Module:

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	H	55.29	45.58	74.00	54.00
	V	56.95	46.25	74.00	54.00
>2483.5	H	55.47	45.22	74.00	54.00
	V	57.29	47.65	74.00	54.00

10. Antenna Application

10.1 Antenna requirement

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

10.2 Result

The EUT has two antennas. One is a metal PF antenna and its antenna gain is 2.0dBi. The other is an internal PCB antenna and its antenna's gain is 0dBi. All antenna gain meets the requirement.

11.RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure(MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm ²)	Average Time
(A) Limits for Occupational/Control Exposures				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

13.1 Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} =output power to antenna in Mw

G = gain of antenna in linear scale

π =3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

13.2 Measurement Result.

For 2.4G Module:

Channel Frequency (MHz)	Output Peak power (mW)	Peak Power output(dBm)	Antenna Gain (dBi)	Antenna Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
2404	3.690	5.67	2.0	1.584	0.0011628	1
2444	5.272	7.22	2.0	1.584	0.0016613	1
2479	6.561	8.17	2.0	1.584	0.0020675	1

For BT4.0 Module:

Channel Frequency (MHz)	Output Peak power (mW)	Peak Power output(dBm)	Antenna Gain (dBi)	Antenna Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
2402	2.415	3.83	0	1	0.0004804	1
2442	3.034	4.82	0	1	0.0006036	1
2480	3.475	5.41	0	1	0.0006913	1

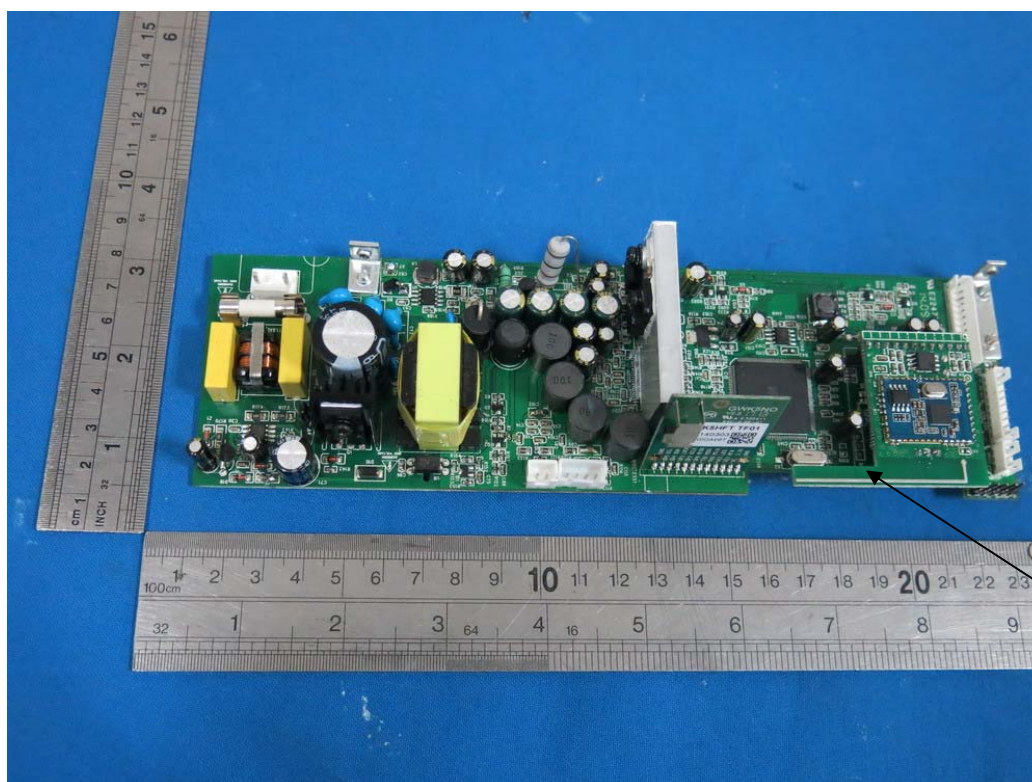
For 2.4G Module + BT4.0 Module:

Test Channel	Output Peak power (mW)	Peak Power output(dBm)	Antenna Gain (dBi)	Antenna Gain (numeric)	Power density at 20cm (mW/cm ²)	Power density Limits (mW/cm ²)
Low	6.105	7.856	2.0	1.584	0.0019251	1
Middle	8.306	9.193	2.0	1.584	0.0026191	1
High	10.036	10.015	2.0	1.584	0.0031646	1

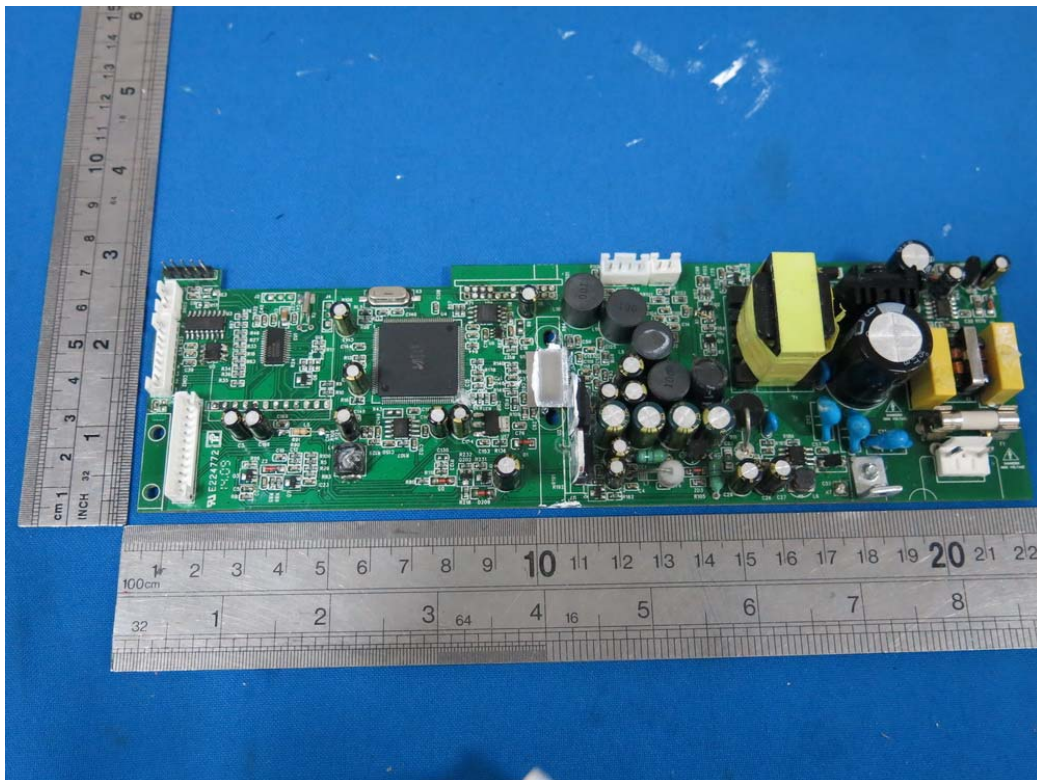
APPENDIX I (Photos of EUT)

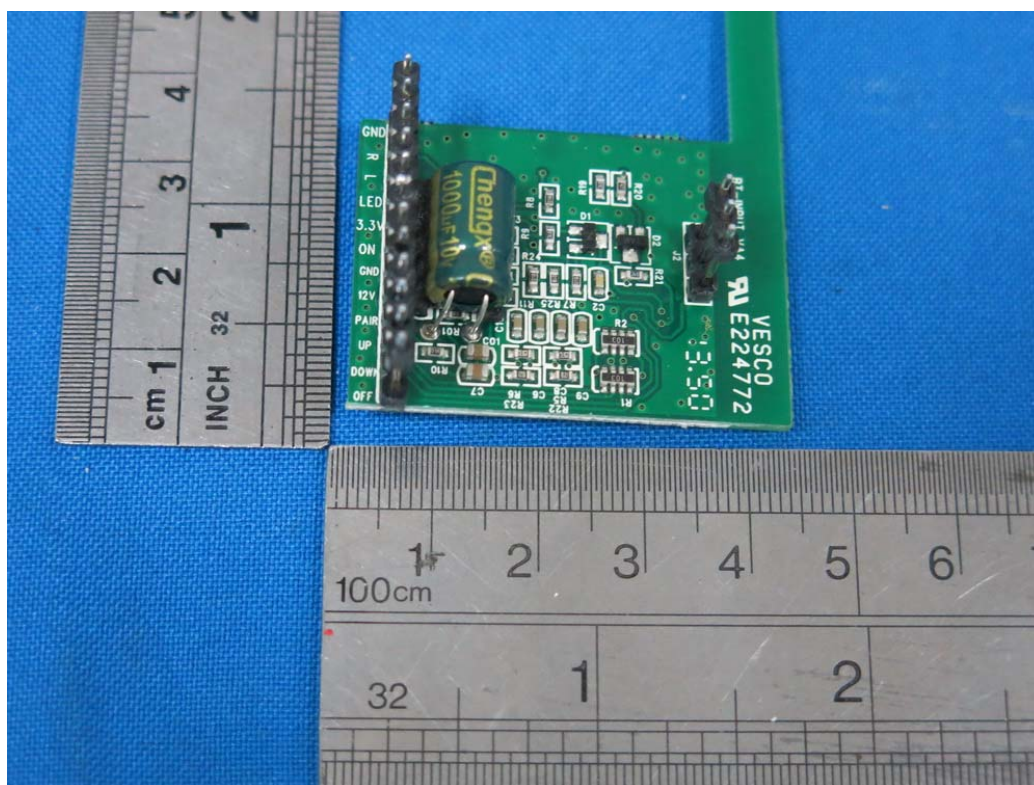
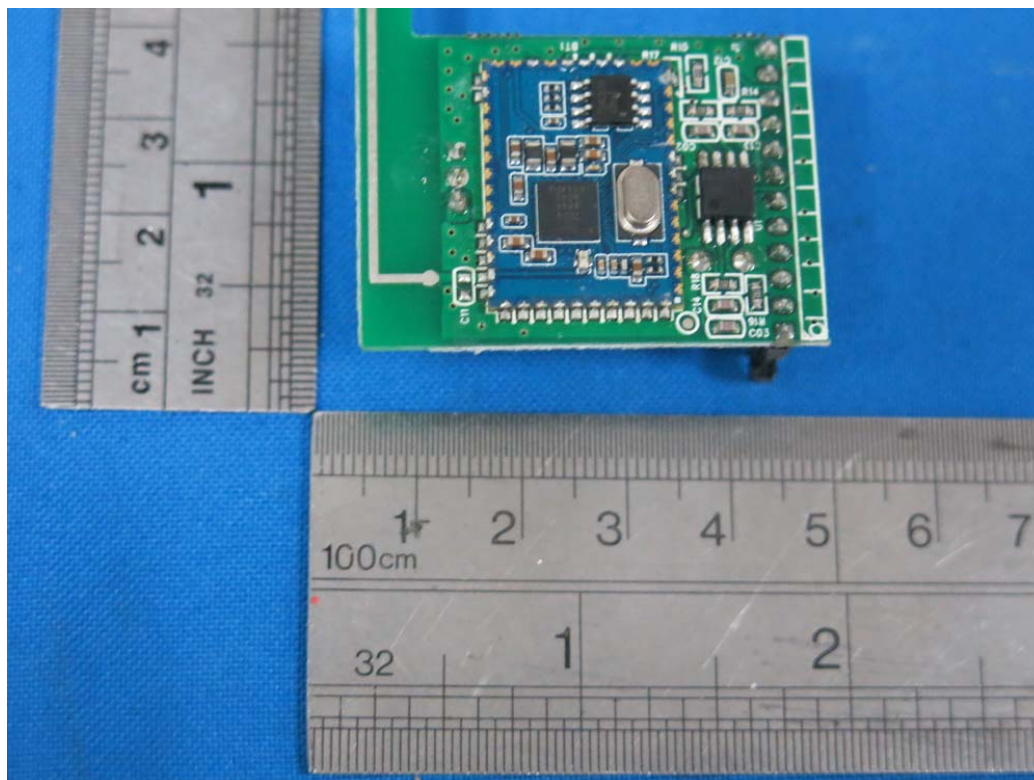
General Appearance of the EUT

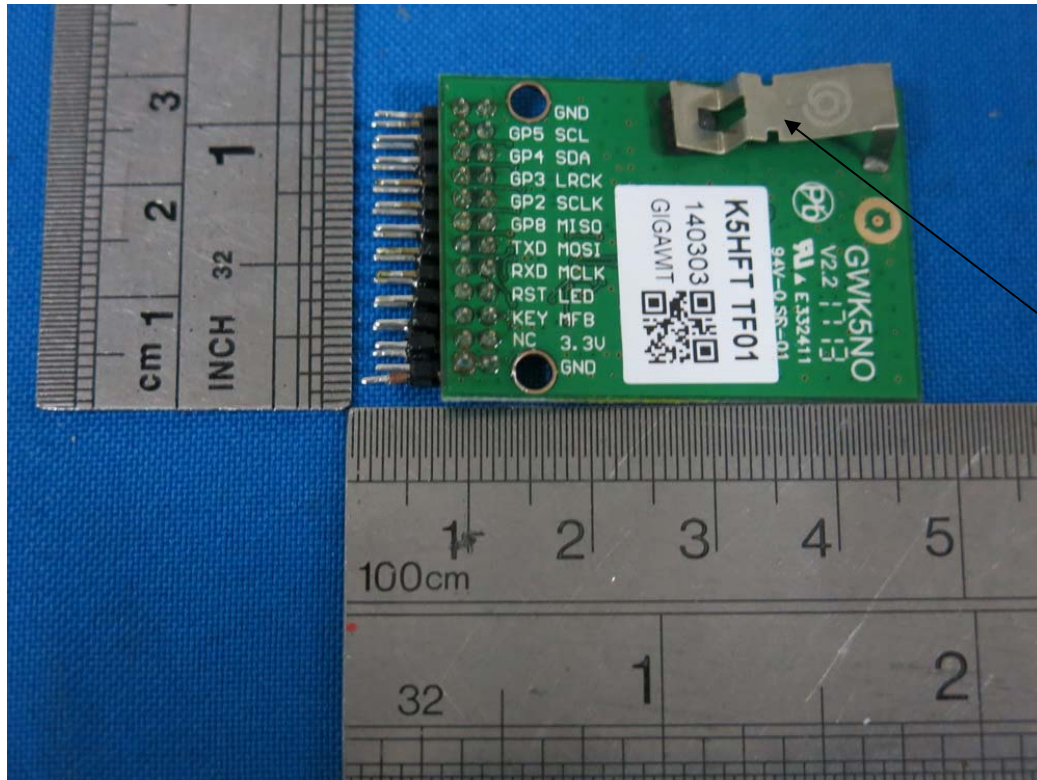




BT 4.0 Module
Antenna







2.4G
Module
Antenna

