

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

OF

Bluetooth Audio Phone

Model No.: BT400HM

Trade Mark: useasy

FCC ID: 2AD75-BT400HM

Report No.: KAD150126106E1

Issue Date: February 26, 2015

Prepared for

**Protel Communication Equipment(Huizhou) Co., Ltd.
Building A1, No.19, JinZhong Road, Huinan High-Tech Industrial Park,
Hui-Ao Avenue, HuiZhou City, GuangDong Province, PRC**

Prepared by

DONGGUAN EMTEK CO., LTD.

**No.281, Guantai Road, Nancheng District,
Dongguan, Guangdong, China
TEL: 86-769-22807078
FAX: 86-769-22807079**

**This report shall not be reproduced, except in full, without the written approval of
DONGGUAN EMTEK CO., LTD.**

VERIFICATION OF COMPLIANCE

Applicant:	Protel Communication Equipment(Huizhou) Co., Ltd. Building A1, No.19, JinZhong Road, Huinan High-Tech Industrial Park, Hui-Ao Avenue, HuiZhou City, GuangDong Province, PRC
Manufacturer:	Protel Communication Equipment(Huizhou) Co., Ltd. Building A1, No.19, JinZhong Road, Huinan High-Tech Industrial Park, Hui-Ao Avenue, HuiZhou City, GuangDong Province, PRC
Product Description:	Bluetooth Audio Phone
Trade Mark:	useasy
Model Number:	BT400HM
File Number:	KAD150126106E1
Date of Test:	January 26, 2015 to February 26, 2015

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 (2014) 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(2014).

Approved By



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

Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	KAD150126106E1

Table of Contents

1. GENERAL INFORMATION.....	6
1.1 PRODUCT DESCRIPTION	6
1.2 TEST METHODOLOGY	7
1.3 SPECIAL ACCESSORIES	7
1.4 EQUIPMENT MODIFICATIONS.....	7
1.5 TEST FACILITY	7
2. SYSTEM TEST CONFIGURATION	8
2.1 EUT CONFIGURATION	8
2.2 EUT EXERCISE	8
2.3 TEST PROCEDURE.....	8
2.4 CONFIGURATION OF TESTED SYSTEM.....	9
3. DESCRIPTION OF TEST MODES.....	10
4. CONDUCTED EMISSIONS TEST.....	11
4.1 MEASUREMENT PROCEDURE:.....	11
4.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	11
4.3 MEASUREMENT EQUIPMENT USED:.....	11
4.4 CONDUCTED EMISSION LIMIT	11
4.5 MEASUREMENT RESULT:	12
4.6 CONDUCTED MEASUREMENT PHOTOS:	15
5. RADIATED EMISSION TEST	16
5.1 MEASUREMENT PROCEDURE	16
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	17
5.3 MEASUREMENT EQUIPMENT USED:.....	18
5.4 RADIATED EMISSION LIMIT.....	18
5.5 MEASUREMENT RESULT.....	19
5.6 RADIATED MEASUREMENT PHOTOS:	25
6. 6DB BANDWIDTH MEASUREMENT	26
6.1 MEASUREMENT PROCEDURE	26
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	26
6.3 MEASUREMENT EQUIPMENT USED:.....	26
6.4 LIMIT.....	26
6.5 MEASUREMENT RESULTS:	26
7. MAXIMUM PEAK OUTPUT POWER TEST	29
7.1 MEASUREMENT PROCEDURE	29
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	29
7.3 MEASUREMENT EQUIPMENT USED:.....	29

7.4 PEAK POWER OUTPUT LIMIT	29
7.5 MEASUREMENT RESULTS:.....	29
8. POWER SPECTRAL DENSITY MEASUREMENT	32
8.1 MEASUREMENT PROCEDURE	32
8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	32
8.3 MEASUREMENT EQUIPMENT USED:	32
8.4 MEASUREMENT PROCEDURE	32
8.5 MEASUREMENT RESULTS:.....	33
9. BAND EDGE TEST.....	37
9.1 MEASUREMENT PROCEDURE.....	37
9.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	37
9.3 MEASUREMENT RESULTS:.....	38
10 ANTENNA APPLICATION	41
10.1 ANTENNA REQUIREMENT	41
10.2 RESULT	41

1. GENERAL INFORMATION

1.1 Product Description

The Protel Communication Equipment(Huizhou) Co., Ltd., Model: BT400HM (referred to as the EUT in this report) The EUT is an short range, lower power transmitter. It is designed by way of utilizing the following modulation achieves the system operating.

- A). Operation Frequency: 2402-2480MHz
- B). Kind of device: Bluetooth 4.0(Only BLE)
- C). Modulation: GFSK
- D). Number of Channel: 40
- E). Channel space: 2MHz
- F). Measured RF Output Power: 2.48dBm (0.00177W)
- G). Antenna Type: Internal PCB antenna
- H). Antenna GAIN: 0 dBi
- I). Input Rating: DC 5V

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

Note:

1. Test of channel was included the lowest 2402MHz, middle 2442MHz and highest frequency 2480MHz in highest data rate and to perform the test, then record on this report.

1.2 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2014). 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 v03r02 for compliance to FCC 47CFR 15.247 requirements.

1.3 Special Accessories

Not available for this EUT intended for grant.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Test Facility

Site Description

EMC Lab. : Registered on FCC, June 18, 2014
The Certificate Number is 247565

Registered on 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 transmission application.

2.2 EUT Exercise

The Transmitter was operated in the transmission 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 C63.4-2014. 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 was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2014.

2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

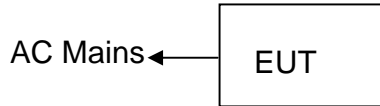


Table 2-1 Equipment Used in Tested System

Item	Equipment	Trade Mark	Model No.	FCC ID	Note
1.	Bluetooth Audio Phone	useasy	BT400HM	2AD75-BT400HM	<i>EUT</i>
2	Adapter	N/A	YSV6-0501000	N/A	<i>Support Equipment</i>

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.
- (2) All cases of EUT are tested, only the result of the worst case was recorded in the report.

3. Description of test modes

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

For Radiated: The EUT's antenna was pre-tested under the following modes:

Test Mode	Description
Mode A	X-Y axis
Mode B	Y-Z axis
Mode C	X-Z axis

From the above modes, the worst case was found in Mode A. Therefore only the test data of the mode was recorded in this report.

The details of test channels and bandwidth were for RF conductive measurement.

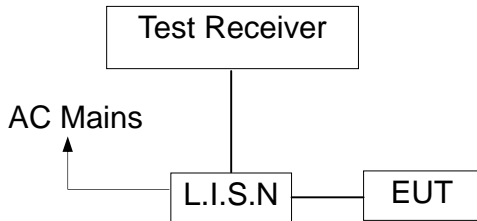
1. For lowest channel : 2402MHz(Channel 00)
2. For middle channel : 2442MHz(Channel 20)
3. For highest channel: 2480MHz(Channel 39)

4. 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					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Last Cal.	Due date
Test Receiver	Rohde & Schwarz	ESCS30	100018	05/16/2014	05/15/2015
L.I.S.N	Rohde & Schwarz	ENV216	100017	05/16/2014	05/15/2015
RF Switching Unit	CDS	RSU-M2	38401	05/16/2014	05/15/2015
Coaxial Cable	CDS	79254	46107086	05/16/2014	05/15/2015

4.4 Conducted Emission Limit

(7) Conducted Emission

Frequency(MHz)

0.15-0.5

0.5-5.0

5.0-30.0

Quasi-peak

66-56

56

60

Average

56-46

46

50

Note:

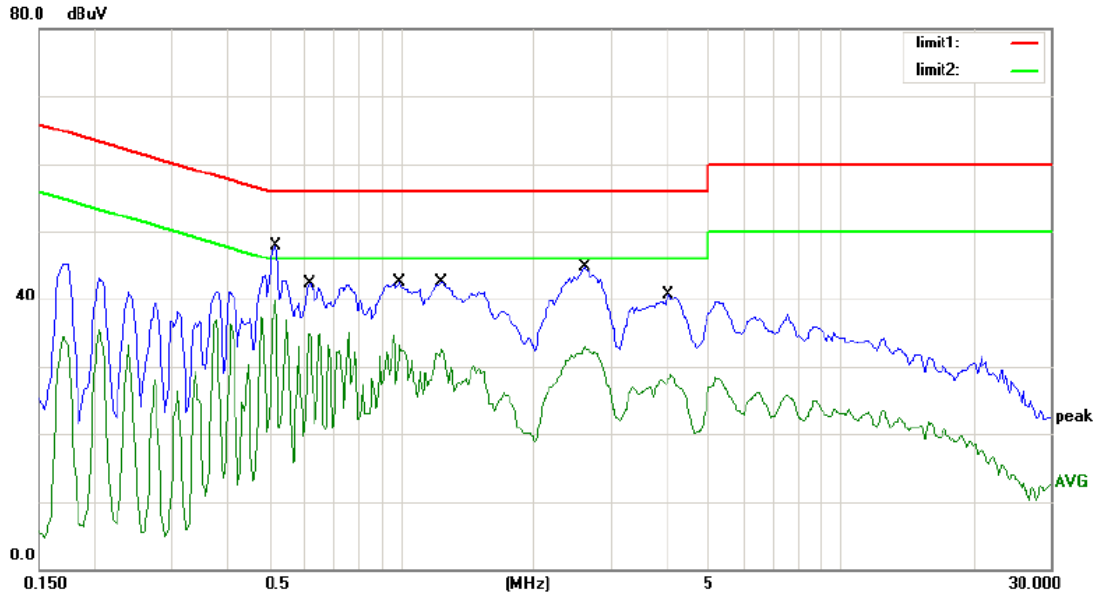
1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.5 Measurement Result:

Pass.

All the modulation modes were tested the data of the worst mode (GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

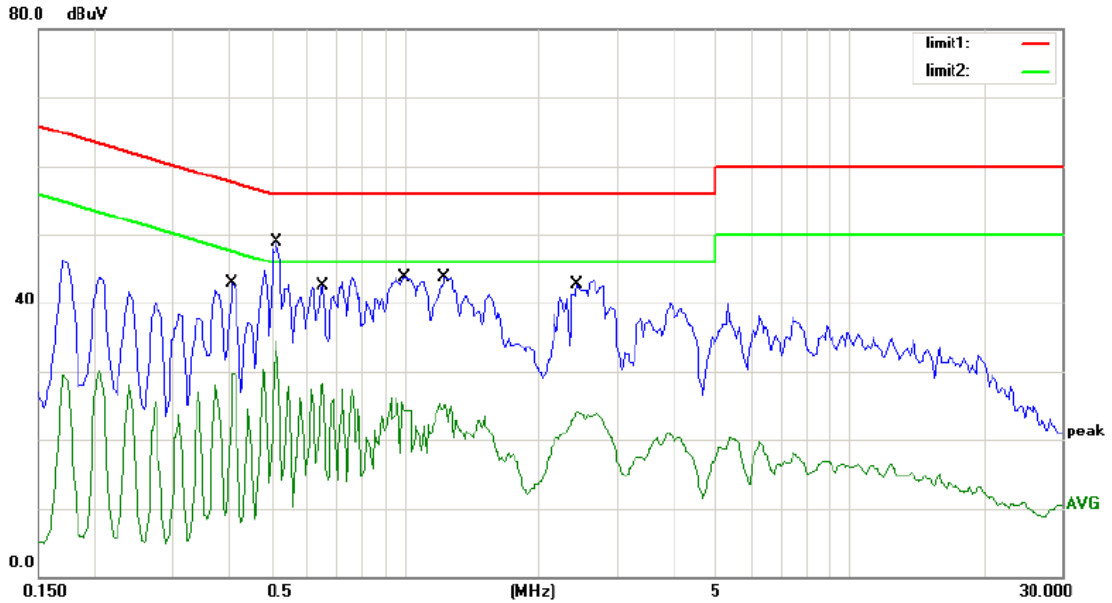
Please refer to the following data.



Site site #1 Phase: **L1** Temperature: 24
 Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 55 %
 Mode: TX2402
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.5200	47.94	0.00	47.94	56.00	-8.06	QP	
2	*	0.5200	39.75	0.00	39.75	46.00	-6.25	AVG	
3		0.6200	42.35	0.00	42.35	56.00	-13.65	QP	
4		0.6200	34.98	0.00	34.98	46.00	-11.02	AVG	
5		0.9950	42.44	0.00	42.44	56.00	-13.56	QP	
6		0.9950	33.12	0.00	33.12	46.00	-12.88	AVG	
7		1.2400	42.48	0.00	42.48	56.00	-13.52	QP	
8		1.2400	32.44	0.00	32.44	46.00	-13.56	AVG	
9		2.6100	44.76	0.00	44.76	56.00	-11.24	QP	
10		2.6100	32.88	0.00	32.88	46.00	-13.12	AVG	
11		4.0600	40.78	0.00	40.78	56.00	-15.22	QP	
12		4.0600	28.84	0.00	28.84	46.00	-17.16	AVG	

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



Site site #1 Phase: **N** Temperature: 24
 Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 55 %
 Mode: TX 2402
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.4100	42.86	0.00	42.86	57.65	-14.79	QP	
2		0.4100	29.79	0.00	29.79	47.65	-17.86	AVG	
3	*	0.5150	48.84	0.00	48.84	56.00	-7.16	QP	
4		0.5150	34.44	0.00	34.44	46.00	-11.56	AVG	
5		0.6550	42.46	0.00	42.46	56.00	-13.54	QP	
6		0.6550	28.31	0.00	28.31	46.00	-17.69	AVG	
7		1.0000	43.79	0.00	43.79	56.00	-12.21	QP	
8		1.0000	26.11	0.00	26.11	46.00	-19.89	AVG	
9		1.2350	43.73	0.00	43.73	56.00	-12.27	QP	
10		1.2350	25.18	0.00	25.18	46.00	-20.82	AVG	
11		2.4400	42.73	0.00	42.73	56.00	-13.27	QP	
12		2.4400	24.09	0.00	24.09	46.00	-21.91	AVG	

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

4.6 Conducted Measurement Photos:



5. 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.

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz and video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	120KHz
VB	300KHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Peak
Trace	Max hold

For Average Measurement:

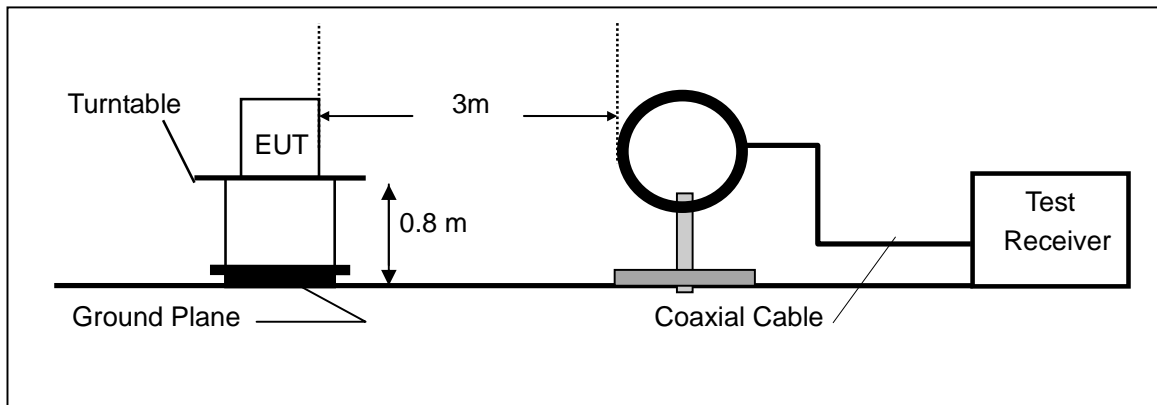
VBW=10Hz, when duty cycle is no less than 98 percent.

$VBW \geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

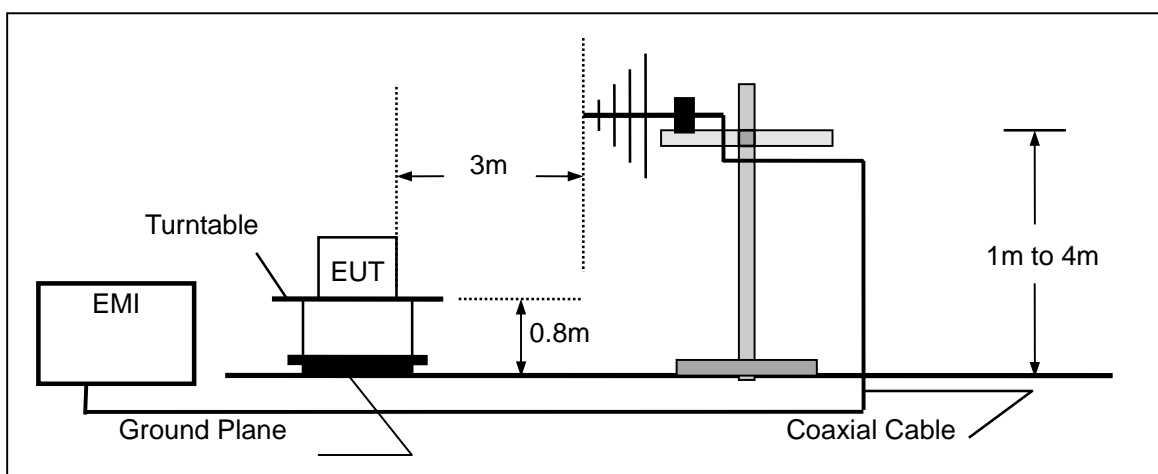
Band	Duty Cycle(%)	T(μ s)	1/T(KHz)	Average Correction Factor	VBW Setting
2402-2480	100	-	-	0	10Hz

5.2 Test SET-UP (Block Diagram of Configuration)

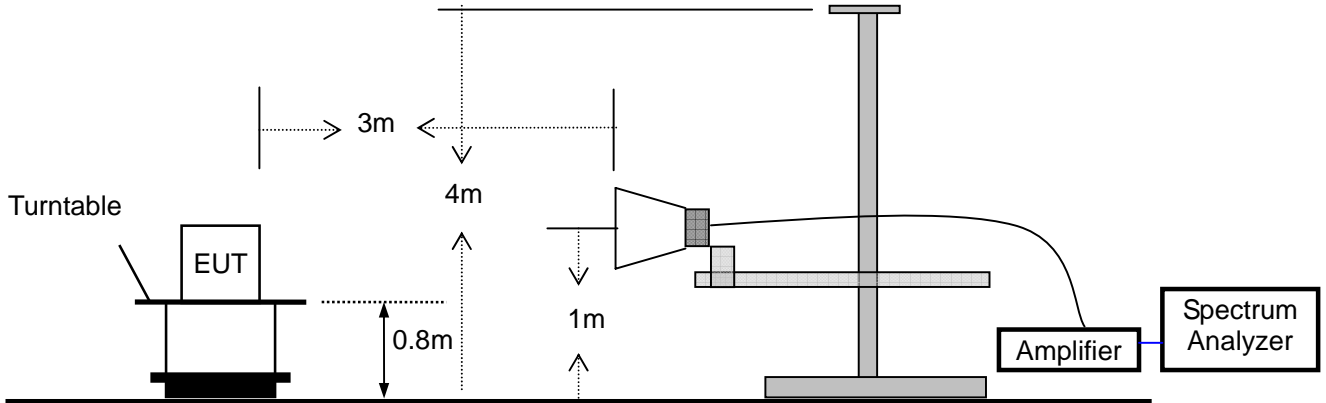
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(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	05/16/2014	05/15/2015
Pre-Amplifier	HP	8447D	2944A07999	05/16/2014	05/15/2015
Bilog Antenna	SCHWARZBECK	VULB9163	142	05/16/2014	05/15/2015
Loop Antenna	ARA	PLA-1030/B	1029	05/16/2014	05/15/2015
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170399	05/16/2014	05/15/2015
Horn Antenna	Schwarzbeck	BBHA9120D	D143	05/16/2014	05/15/2015
Cable	Schwarzbeck	AK9513	ACRX1	05/19/2014	05/18/2015
Cable	Schwarzbeck	AK9515E	FP2RX2	05/19/2014	05/18/2015
Cable	Schwarzbeck	AK9513	CRPX1	05/19/2014	05/18/2015
Cable	Schwarzbeck	AK9513	CRRX2	05/19/2014	05/18/2015

5.4 Radiated emission limit

Frequency MHz	Distance Meter	Field Strength	
		uV/m	dBuV/m
0.009 – 0.490	300	10000 *	20log 2400/F(KHz) + 80
		2400/F(KHz)	
0.490 – 1.705	30	100 *	20log 24000/F(KHz) +
		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

5.5 Measurement Result

Below 30MHz:

Operation Mode: TX Test Date : January 28, 2015
Frequency Range: 9KHz~30MHz Temperature : 28°C
Test Result: PASS Humidity : 65 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	--

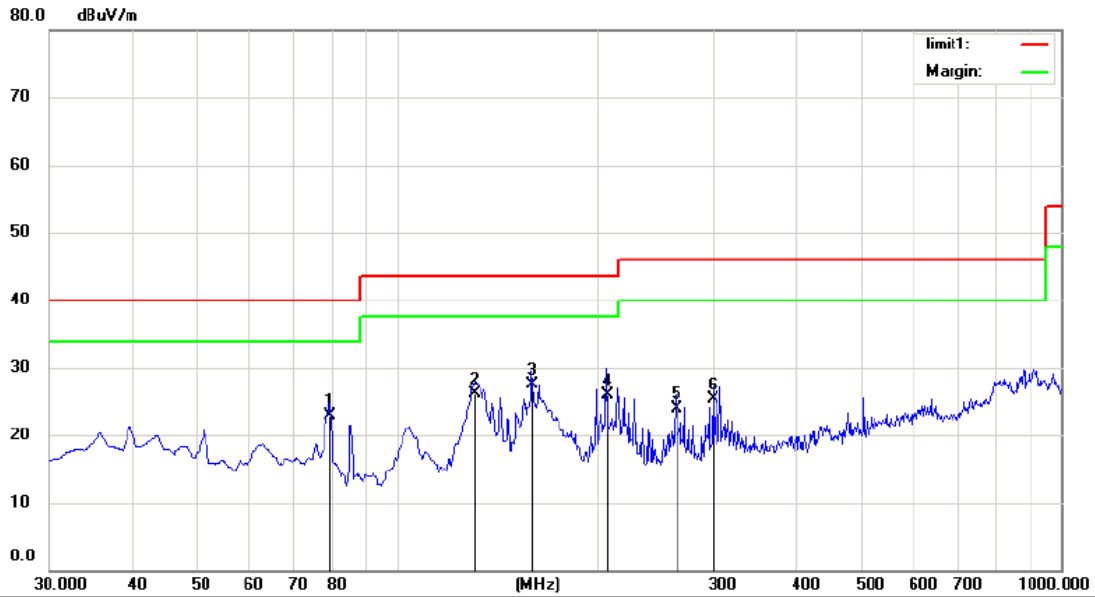
Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Below 1000MHz:

Pass.

All the modulation modes were tested the data of the worst mode (GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following data.

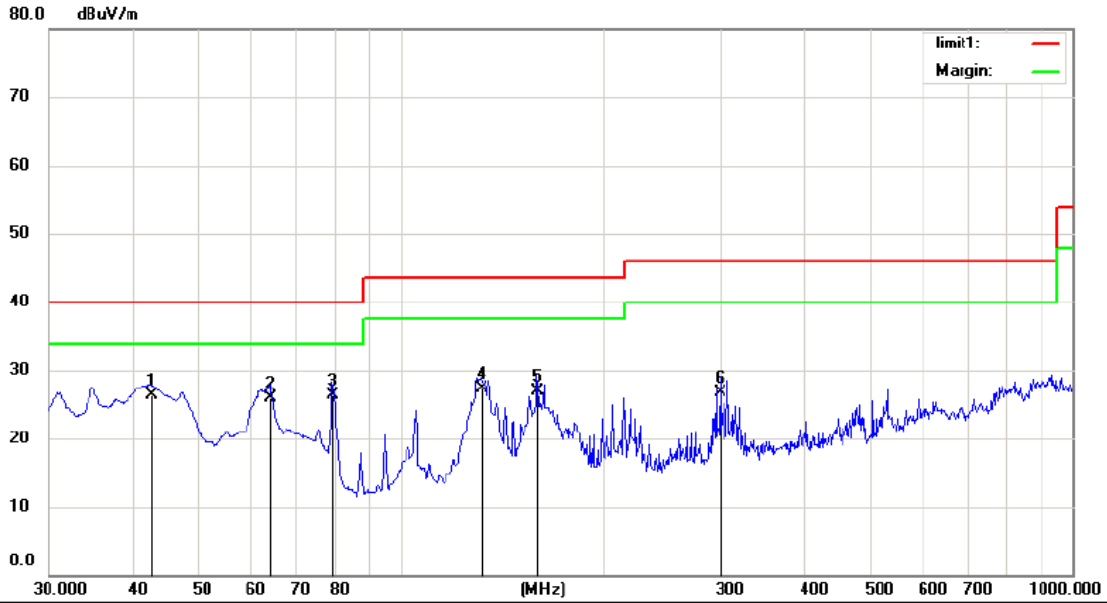


Site Chamber #1 Polarization: **Horizontal** Temperature: 24
 Limit: (RE)FCC PART 15 class B 3m Power: AC 120V/60Hz Humidity: 55 %
 Mode: TX2402
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		79.4700	45.41	-22.50	22.91	40.00	-17.09	QP		
2		130.8800	42.36	-16.29	26.07	43.50	-17.43	QP		
3	*	159.9800	45.98	-18.44	27.54	43.50	-15.96	QP		
4		207.5100	43.15	-17.20	25.95	43.50	-17.55	QP		
5		263.7700	39.29	-15.34	23.95	46.00	-22.05	QP		
6		299.6600	39.67	-14.34	25.33	46.00	-20.67	QP		

*:Maximum data x:Over limit !:over margin

Operator: Snake



Site Chamber #1 Polarization: **Vertical** Temperature: 24
 Limit: (RE)FCC PART 15 class B 3m Power: AC 120V/60Hz Humidity: 55 %
 Mode: TX2402
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	42.6100	39.84	-13.49	26.35	40.00	-13.65	QP		
2		63.9500	46.56	-20.56	26.00	40.00	-14.00	QP		
3		79.4700	48.75	-22.50	26.25	40.00	-13.75	QP		
4		131.8500	43.78	-16.40	27.38	43.50	-16.12	QP		
5		159.9800	45.33	-18.44	26.89	43.50	-16.61	QP		
6		299.6600	41.02	-14.34	26.68	46.00	-19.32	QP		

*:Maximum data x:Over limit !:over margin

Operator: Snake

Above 1000MHz

Operation Mode: TX Mode (CH00: 2402MHz) Test Date : January 28, 2015
 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
4804	V	65.72	45.72	74	54	-8.28	-8.28
7206	V	64.13	44.82	74	54	-9.87	-9.18
9608	V	63.92	43.92	74	54	-10.08	-10.08
12010	V	62.18	42.78	74	54	-11.82	-11.22
14412	V	61.03	41.16	74	54	-12.97	-12.84
16814	V	60.88	40.76	74	54	-13.12	-13.24
4804	H	64.72	46.95	74	54	-9.28	-7.05
7206	H	63.92	45.72	74	54	-10.08	-8.28
9608	H	62.85	44.15	74	54	-11.15	-9.85
12010	H	61.18	43.85	74	54	-12.82	-10.15
14412	H	60.89	42.55	74	54	-13.11	-11.45
16814	H	59.48	40.95	74	54	-14.52	-13.05

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 (CH20: 2442MHz) Test Date : January 28, 2015
 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
4884	V	65.33	44.33	74	54	-8.67	-9.67
7326	V	64.18	43.95	74	54	-9.82	-10.05
9768	V	63.82	42.72	74	54	-10.18	-11.28
12210	V	62.95	41.69	74	54	-11.05	-12.31
14652	V	61.72	40.25	74	54	-12.28	-13.75
17094	V	60.53	38.95	74	54	-13.47	-15.05
4884	H	66.33	45.72	74	54	-7.67	-8.28
7326	H	65.82	44.69	74	54	-8.18	-9.31
9768	H	64.79	43.15	74	54	-9.21	-10.85
12210	H	63.59	42.85	74	54	-10.41	-11.15
14652	H	62.02	41.69	74	54	-11.98	-12.31
17094	H	60.78	40.57	74	54	-13.22	-13.43

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.

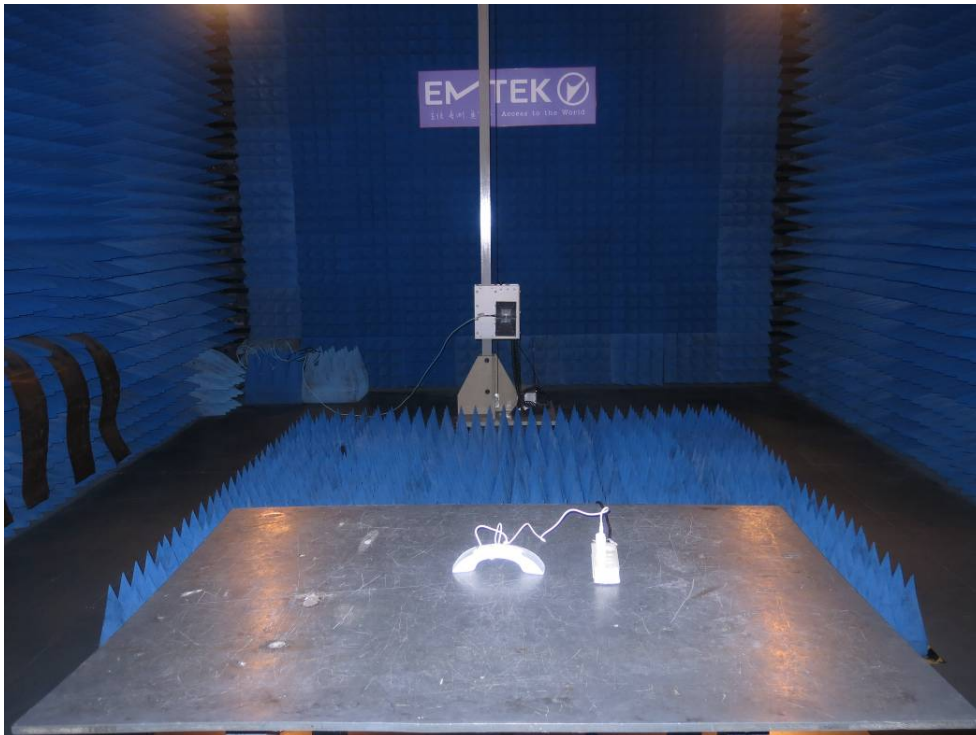
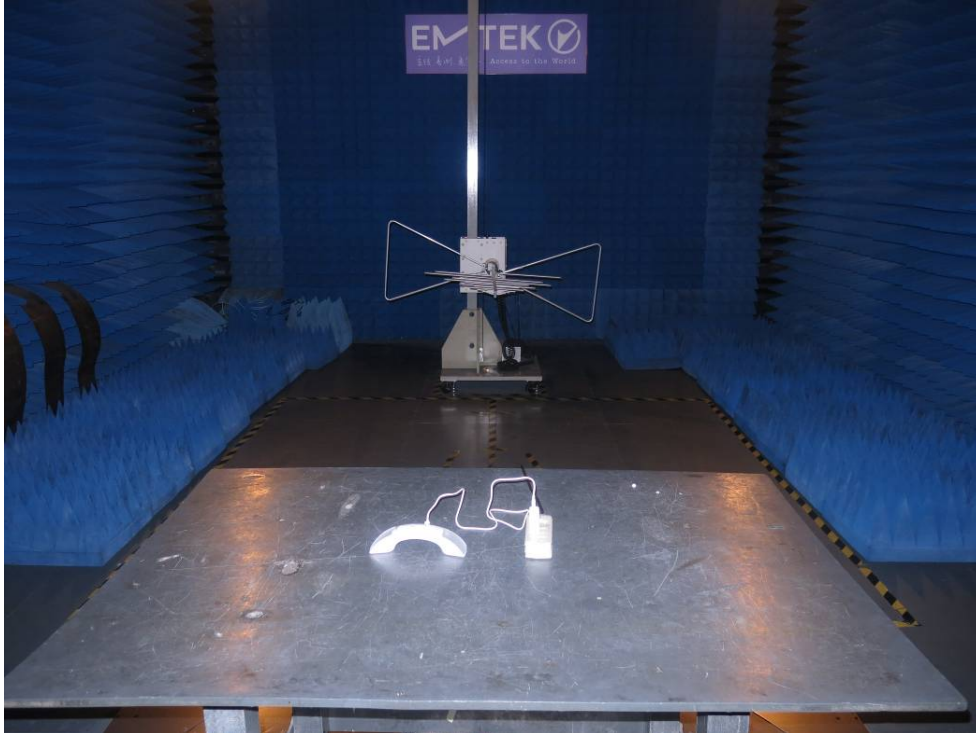
Operation Mode: TX Mode (CH39: 2480MHz) Test Date : January 28, 2015
 Frequency Range: 1-25GHz Temperature : 25 °C
 Test Result: PASS Humidity : 50 %
 Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4960	V	65.79	45.72	74	54	-8.21	-8.28
7440	V	64.33	44.13	74	54	-9.67	-9.87
9920	V	63.85	43.05	74	54	-10.15	-10.95
12400	V	62.79	42.13	74	54	-11.21	-11.87
14880	V	61.03	41.08	74	54	-12.97	-12.92
17360	V	60.85	40.95	74	54	-13.15	-13.05
4960	H	66.95	44.73	74	54	-7.05	-9.27
7440	H	65.75	43.16	74	54	-8.25	-10.84
9920	H	64.73	42.85	74	54	-9.27	-11.15
12400	H	63.92	41.72	74	54	-10.08	-12.28
14880	H	62.35	40.33	74	54	-11.65	-13.67
17360	H	60.79	38.75	74	54	-13.21	-15.25

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:

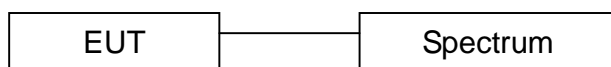


6. 6dB Bandwidth Measurement

6.1 Measurement Procedure

The EUT was operating in Bluetooth 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	Rohde & Schwarz	FSV30	1321.3008K	05/16/2014	05/15/2015
Coaxial Cable	CDS	79254	46107086	05/16/2014	05/15/2015

6.4 Limit

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

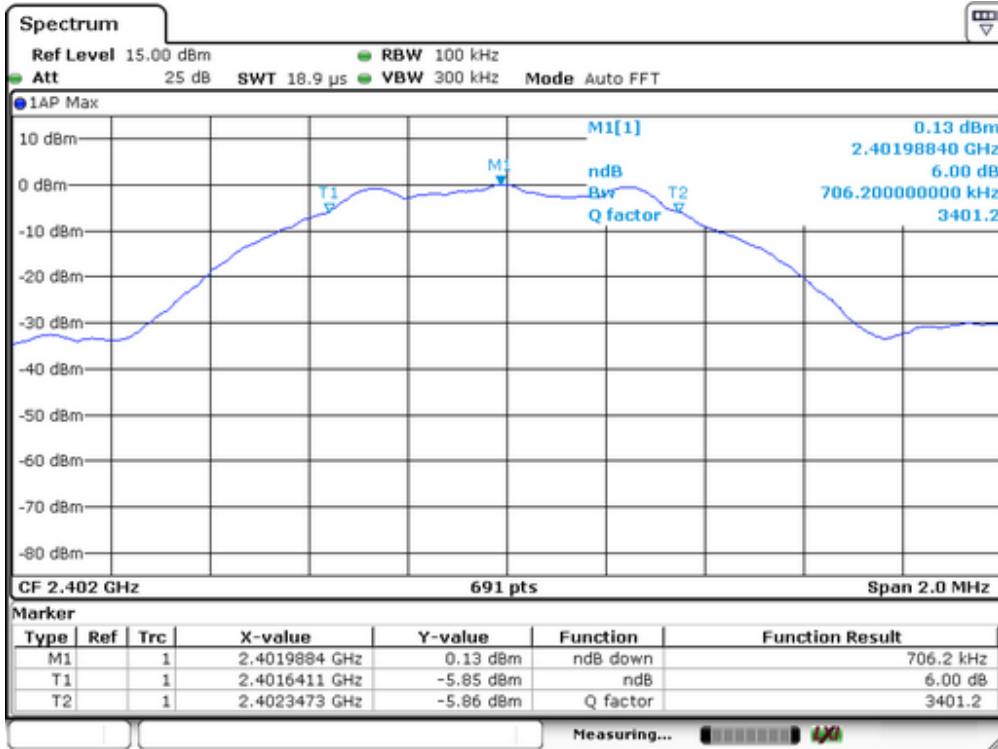
6.5 Measurement Results:

Refer to attached data chart.

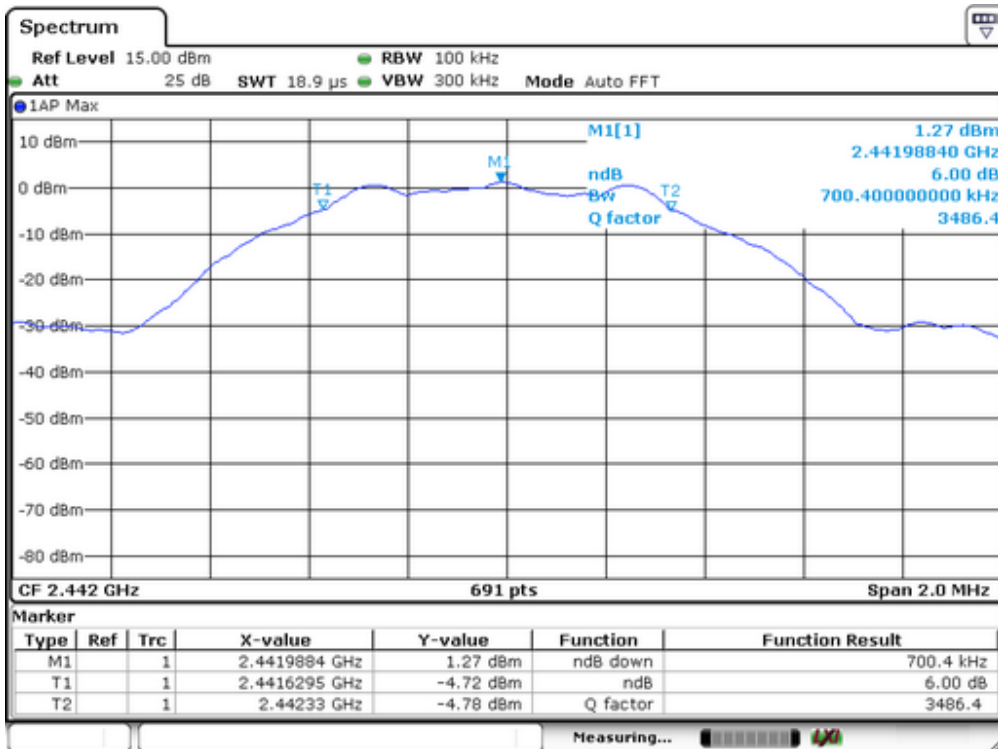
Spectrum Detector:	PK	Test Date :	January 28, 2015
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

Channel number	Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)
00	2402	706	>500
20	2442	700	>500
39	2480	712	>500

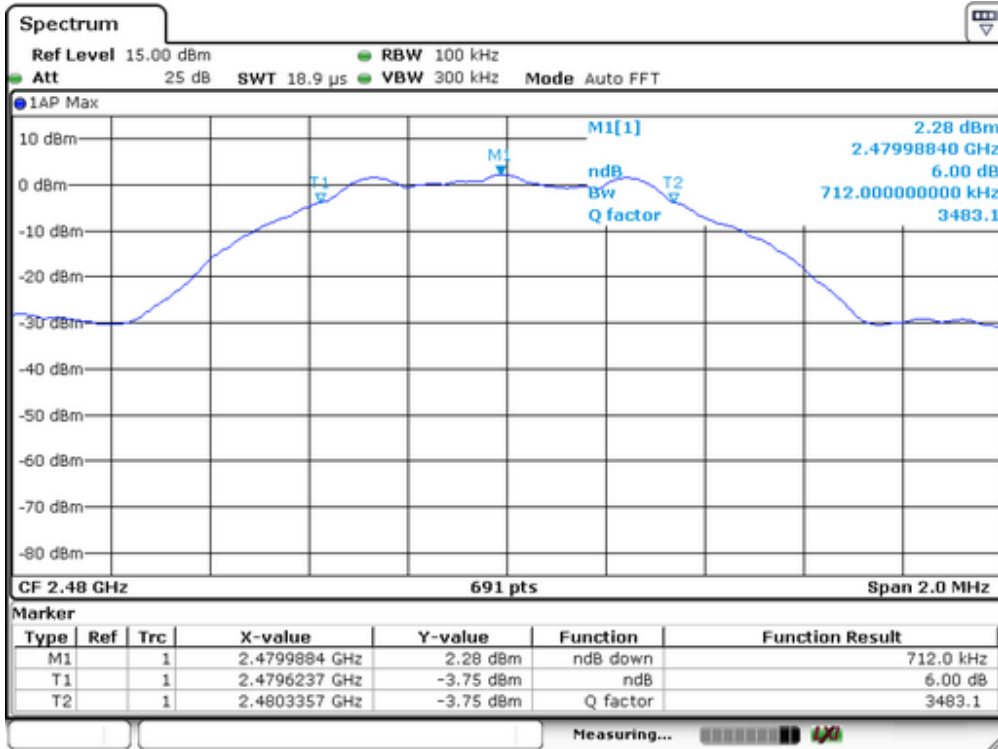
Channel 00:



Channel 20:



Channel 39:

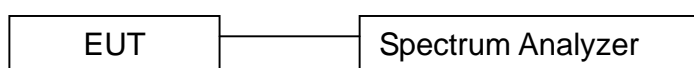


7. MAXIMUM PEAK OUTPUT POWER TEST

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	Rohde & Schwarz	FSV30	1321.3008K	05/16/2014	05/15/2015
Coaxial Cable	CDS	79254	46107086	05/16/2014	05/15/2015

7.4 Peak Power output limit

The maximum peak power shall be less 1Watt.

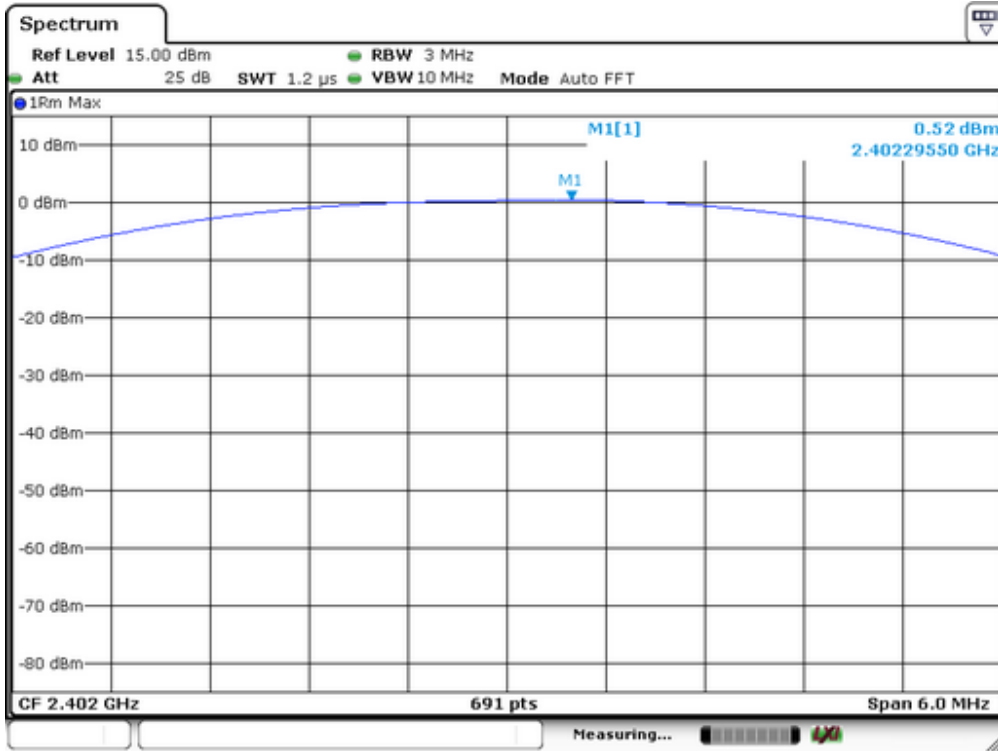
7.5 Measurement Results:

Refer to attached data chart.

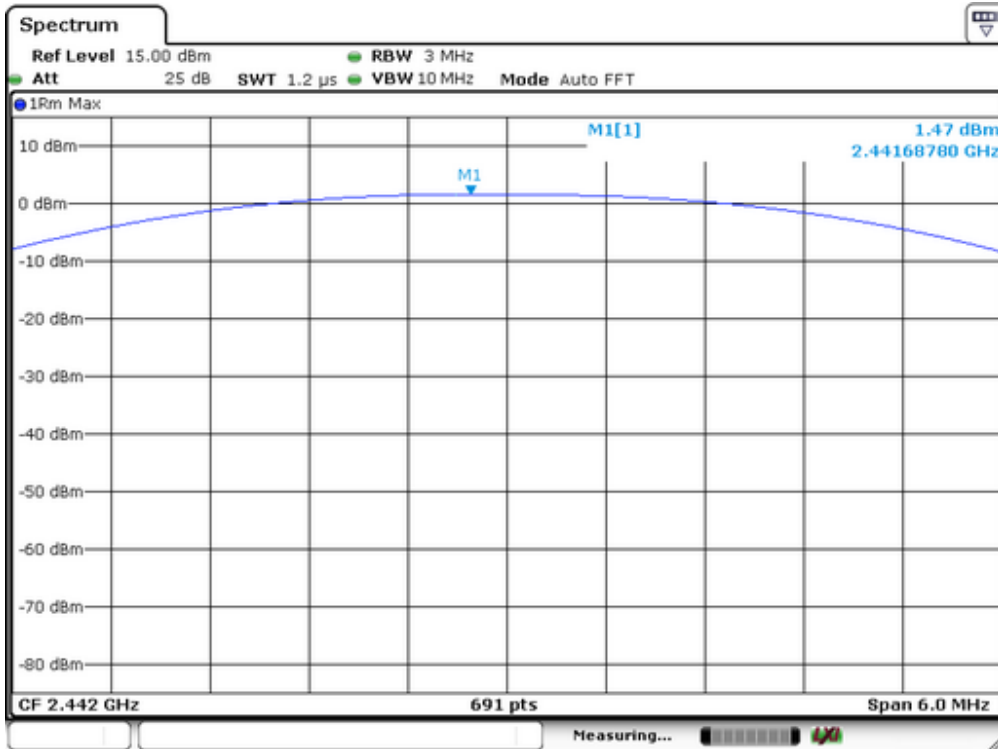
Spectrum Detector: PK Test Date : January 28, 2015
 Test By: Andy Temperature : 25 °C
 Test Result: PASS Humidity : 50 %

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(W)	Pass/Fail
0	2402	0.52	1.127	1W(30dBm)	PASS
20	2442	1.47	1.403	1W(30dBm)	PASS
39	2480	2.48	1.770	1W(30dBm)	PASS

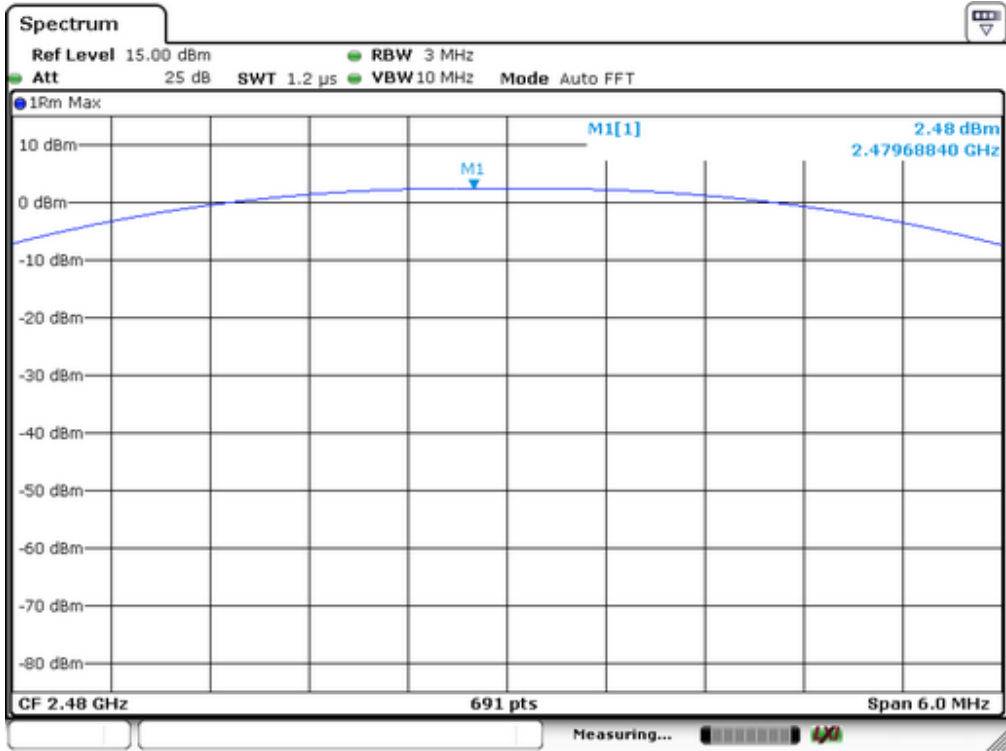
Channel 00:



Channel 20:



Channel 39:

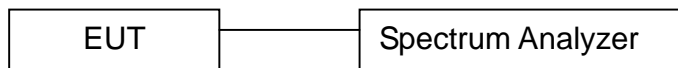


8. Power Spectral Density Measurement

8.1 Measurement Procedure

The EUT was operating in Bluetooth 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	Rohde & Schwarz	FSV30	1321.3008K	05/16/2014	05/15/2015
Coaxial Cable	CDS	79254	46107086	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:

The following table is the setting of spectrum analyzer.

Spectrum analyzer	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS bandwidth.
RB	3KHz
VB	10KHz
Detector	Peak
Trace	Max hold
Sweep Time	Automatic

Refer to attached data chart.

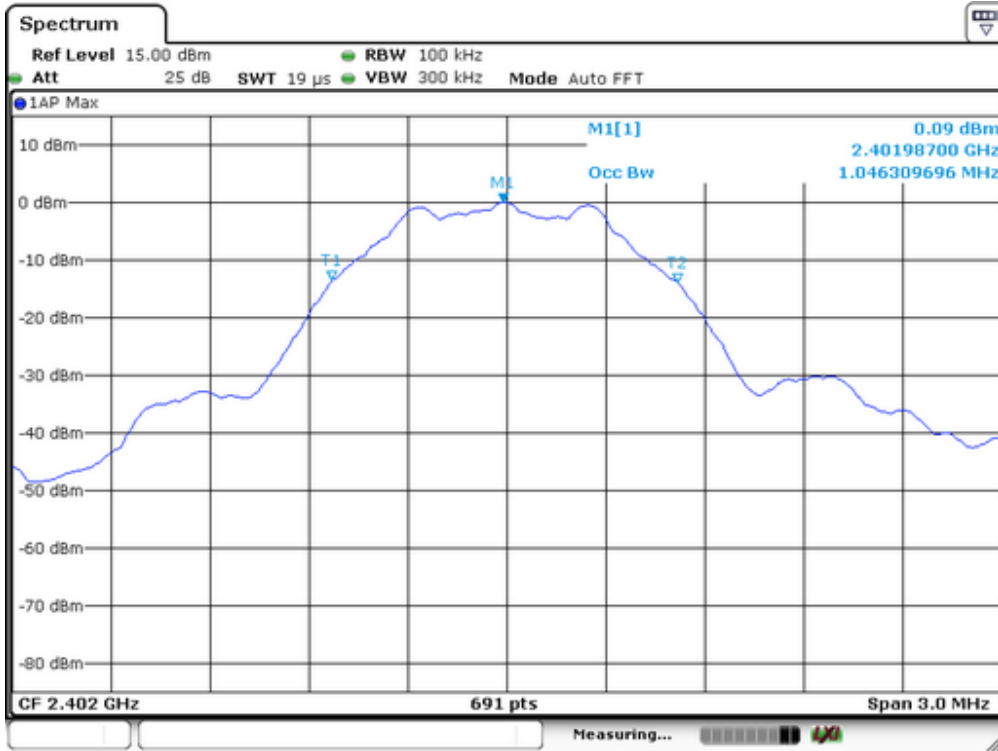
Spectrum Detector:	PK	Test Date :	January 28, 2015
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

Channel number	Channel frequency (MHz)	Measurement level (dBm)		Required Limit (dBm/3kHz)	Pass/Fail
		PSD/100kHz	PSD/3kHz		
00	2402	0.09	-15.45	8	PASS
20	2442	1.35	-14.01	8	PASS
39	2480	2.34	-12.78	8	PASS

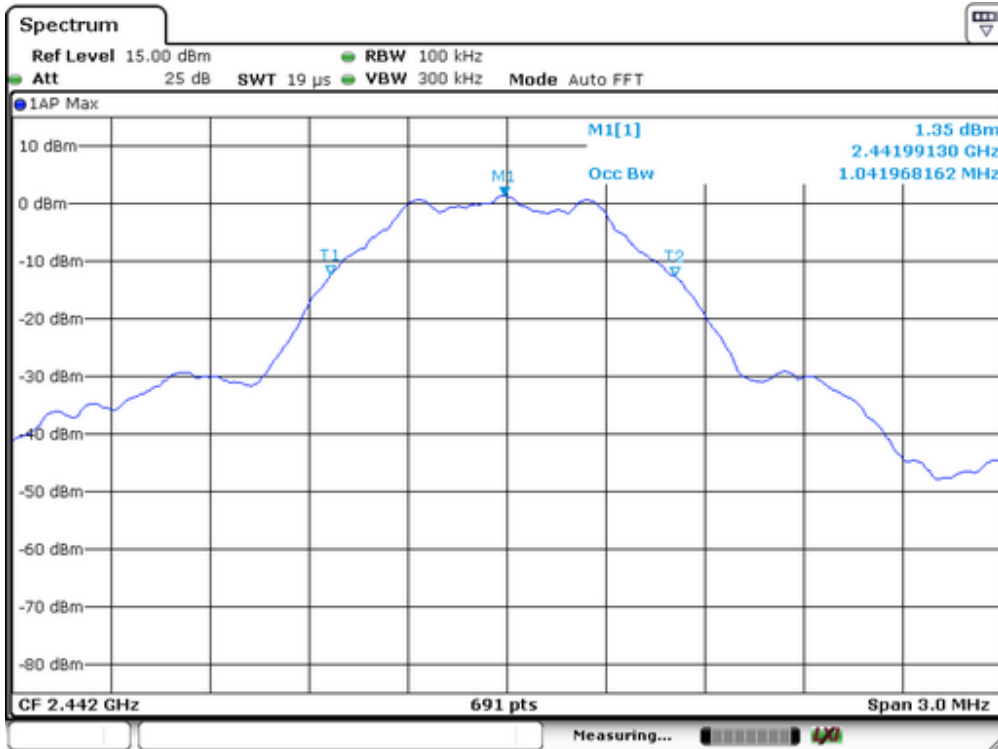
Note:

1. Measured power density(dBm) has offset with cable loss.
2. The measured power density(dBm)/100KHz is reference level and used as 20dBc down for Conducted Band Edges and Conducted Spurious Emission limit line.

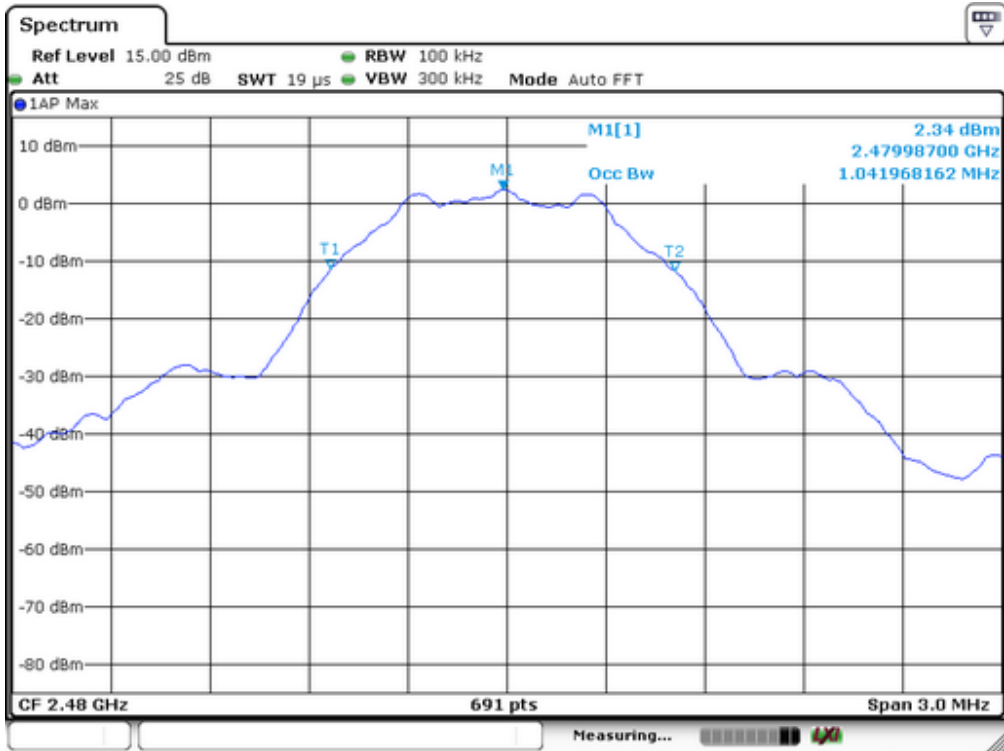
PSD 100kHz Plot:
Channel 00



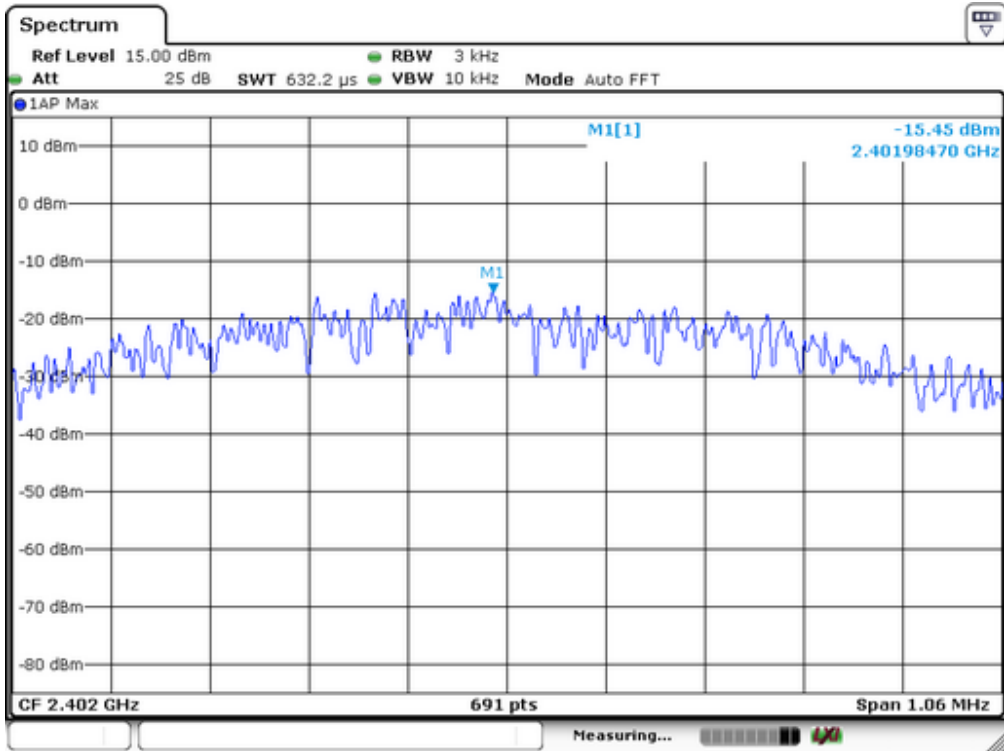
Channel 20



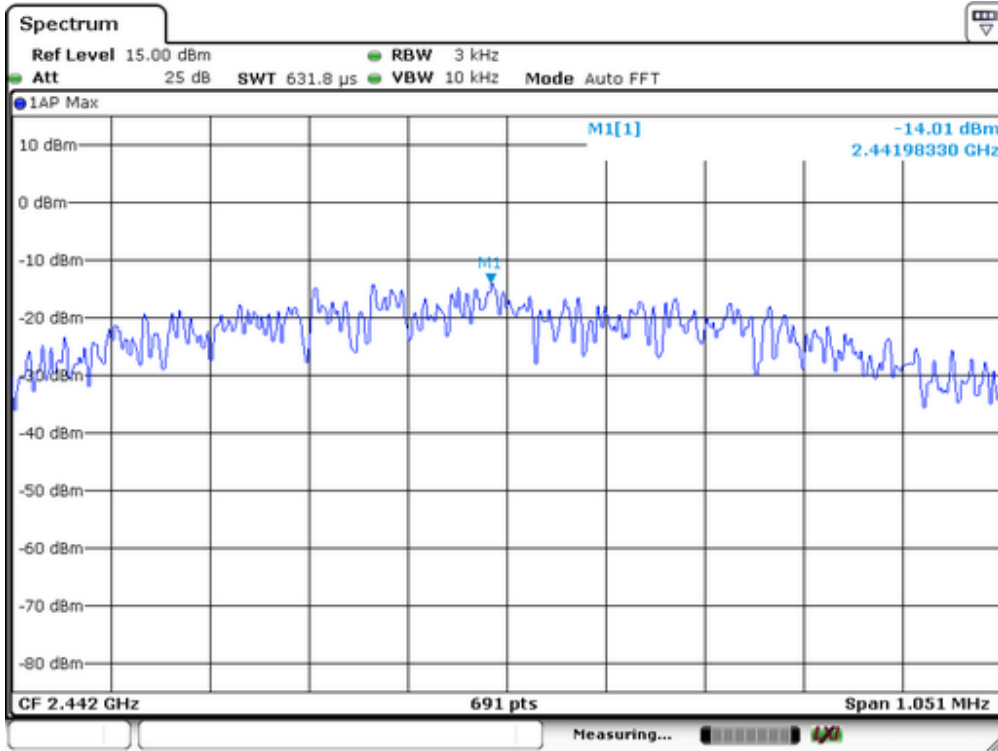
Channel 39



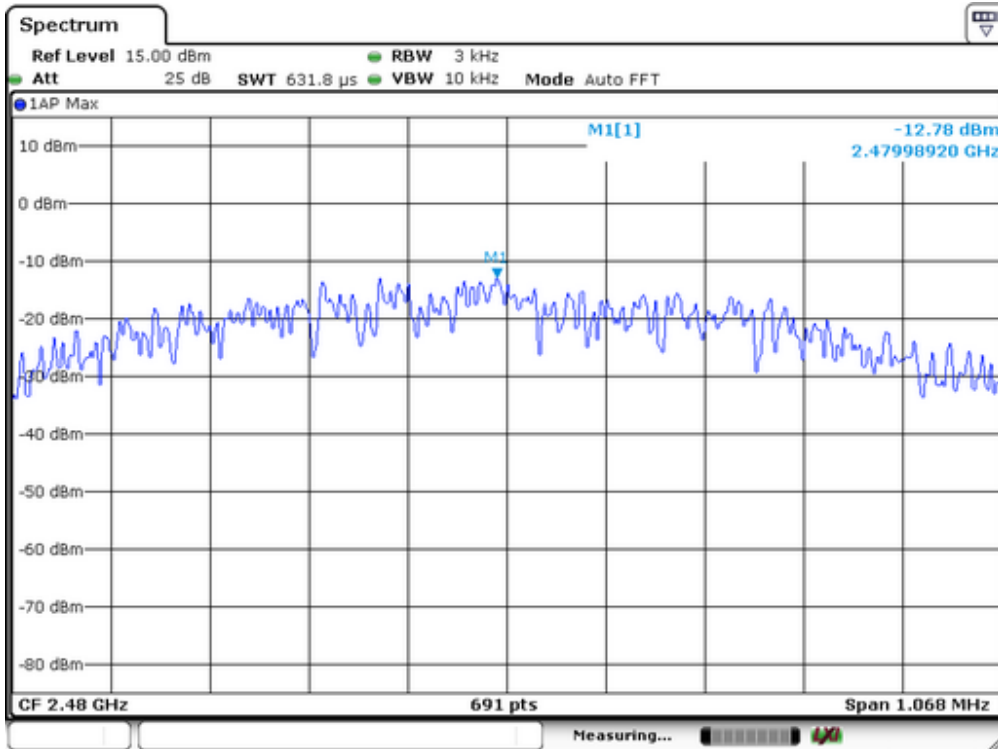
PSD 3KHz Plot:
Channel 00



Channel 20



Channel 39



9. Band EDGE test

9.1 Measurement Procedure

For Conducted Test

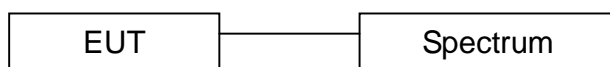
1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.
3. Preliminary tests on individual chains, and on all chains with a combiner, were performed. The worst-case configuration was with a combiner, therefore final test were performed with all chains feeding a combiner.

For Radiated emission Test

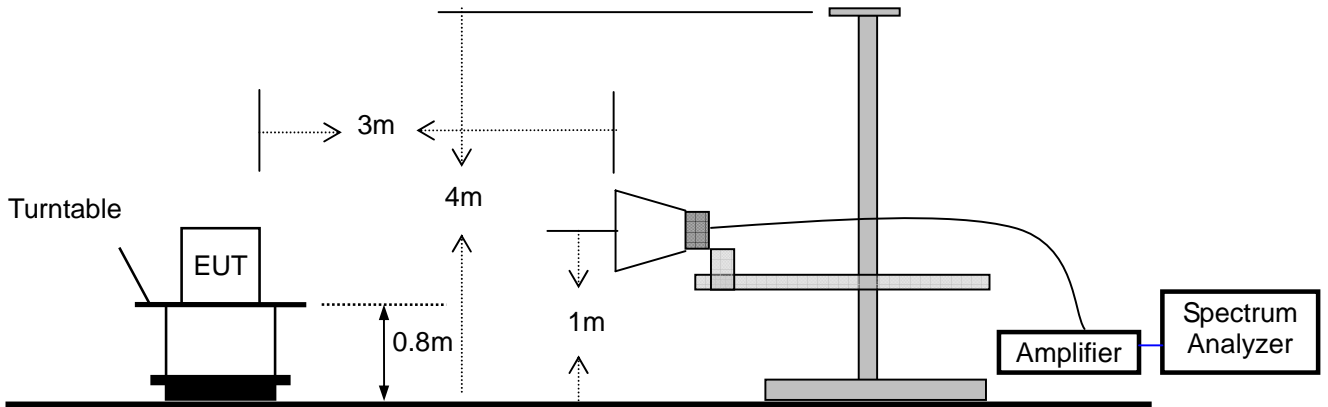
1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
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)

For Conducted Test



For Radiated emission Test



9.3 Measurement Results:

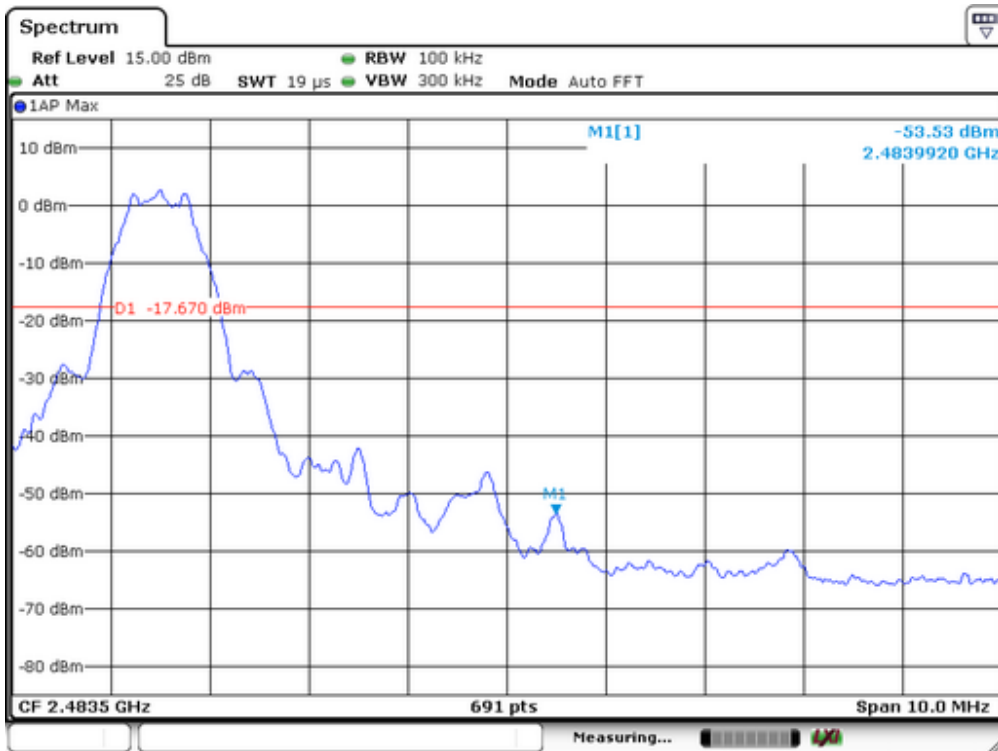
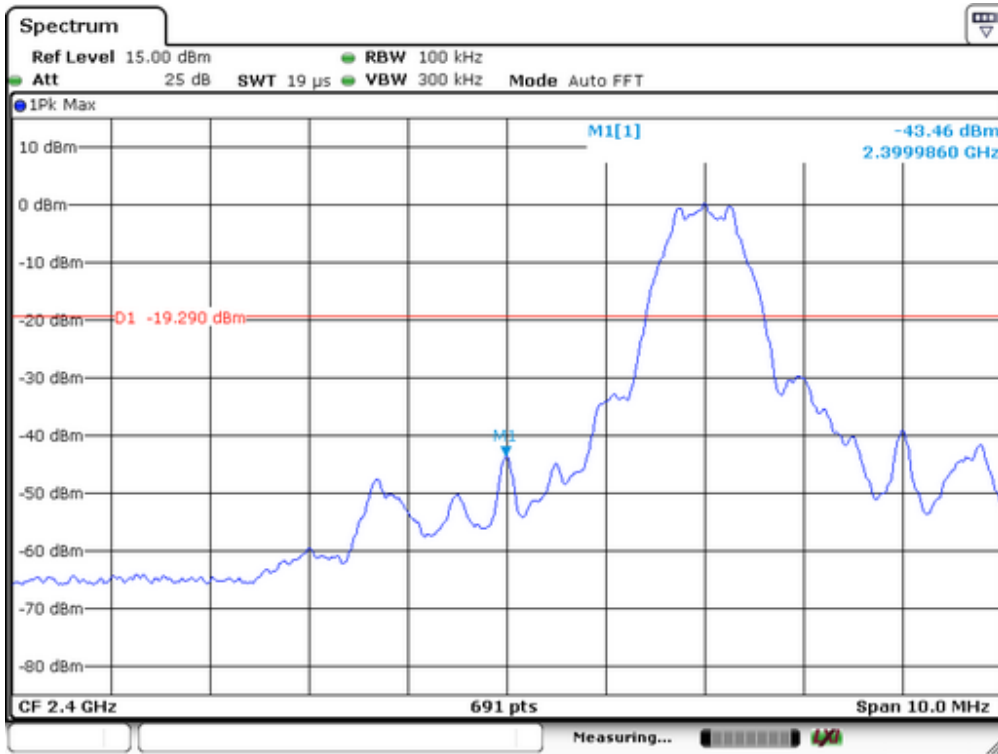
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	January 28, 2015
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

1. Conducted Test

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
2399.986	0.5	-43.46	43.96	>20dBc
2483.992	2.44	-53.53	55.97	>20dBc

Test Plot:



2. Radiated emission Test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)		Margin (dB)	
		PK	AV	PK	AV	PK	AV
2398.452	H	65.72	46.38	74	54	-8.28	-7.62
2399.153	V	60.33	40.32	74	54	-13.67	-13.68
2483.654	H	66.92	45.19	74	54	-7.08	-8.81
2484.059	V	59.15	40.52	74	54	-14.85	-13.48

10 Antenna Application

10.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247.

FCC part 15C section 15.247 requirements:

Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

10.2 Result

The EUT's antenna used a PCB antenna and integrated on PCB, The antenna's gain is 0 dBi and meets the requirement.

APPENDIX I (PHOTOS OF EUT)



