

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

OF

Strum

Model No.: HL2515

Trade Mark: *Range*

FCC ID: PXX-HL2515

Report No.: KAD141117053E

Issue Date: December 18, 2014

Prepared for

**ECORE TECHNOLOGY COMPANY LIMITED
North of Bingang East Road, Huahu Development Zone, Ezhou city, Hubei
Province, China**

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:	ECORE TECHNOLOGY COMPANY LIMITED North of Bingang East Road, Huahu Development Zone, Ezhou city, Hubei Province, China
Manufacturer:	ECORE TECHNOLOGY COMPANY LIMITED North of Bingang East Road, Huahu Development Zone, Ezhou city, Hubei Province, China
Product Description:	Strum
Trade Mark:	
Model Number:	HL2515
File Number:	KAD141117053E
Date of Test:	November 17, 2014 to December 04, 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(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	/	KAD141117053E

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:	14
5. RADIATED EMISSION TEST	15
5.1 MEASUREMENT PROCEDURE	15
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	16
5.3 MEASUREMENT EQUIPMENT USED:.....	17
5.4 RADIATED EMISSION LIMIT.....	17
5.5 MEASUREMENT RESULT	18
5.6 RADIATED MEASUREMENT PHOTOS:	28
6. 6DB BANDWIDTH MEASUREMENT	29
6.1 MEASUREMENT PROCEDURE	29
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	29
6.3 MEASUREMENT EQUIPMENT USED:.....	29
6.4 LIMIT.....	29
6.5 MEASUREMENT RESULTS:	29
7. MAXIMUM PEAK OUTPUT POWER TEST	32
7.1 MEASUREMENT PROCEDURE	32
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	32
7.3 MEASUREMENT EQUIPMENT USED:.....	32

7.4 PEAK POWER OUTPUT LIMIT	32
7.5 MEASUREMENT RESULTS:.....	32
8. POWER SPECTRAL DENSITY MEASUREMENT	35
8.1 MEASUREMENT PROCEDURE	35
8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	35
8.3 MEASUREMENT EQUIPMENT USED:	35
8.4 MEASUREMENT PROCEDURE	35
8.5 MEASUREMENT RESULTS:.....	36
9. BAND EDGE TEST.....	40
9.1 MEASUREMENT PROCEDURE.....	40
9.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	40
9.3 MEASUREMENT RESULTS:.....	41
10 ANTENNA APPLICATION	44
10.1 ANTENNA REQUIREMENT	44
10.2 RESULT	44

1. GENERAL INFORMATION

1.1 Product Description

The ECORE TECHNOLOGY COMPANY LIMITED, Model: HL2515 (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
- C). Modulation: GFSK
- D). Number of Channel: 40
- E). Channel space: 2MHz
- F). Rated RF Output Power: 1.16dBm (0.001306W)
- G). Antenna Type: Internal PCB antenna
- H). Antenna GAIN: 0 dBi
- I). Input Rating: DC 5V, 1A

Channel List:

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

Note:

1. Test of channel was included the lowest 2402MHz, middle 2440MHz 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 (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 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. : 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 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 C63.4-2009.
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 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

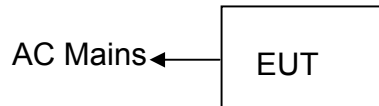


Table 2-1 Equipment Used in Tested System

Item	Equipment	Trade Mark	Model No.	FCC ID	Note
1.	Strum	<i>Range</i>	HL2515	PXK-HL2515	EUT
2	Adapter	N/A	YSV6-0501000	N/A	Support Equipment

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

This is Digital Transmission system(DTS) and have one type of modulation GFSK.

The 3 channels of lower, middle and higher were chosen for test.

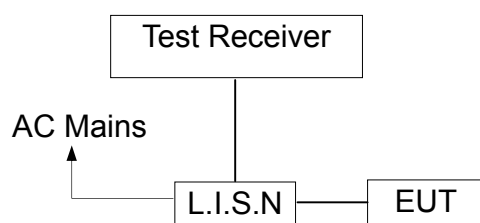
1. For lowest channel : 2402MHz(Channel 01)
2. For middle channel : 2440MHz(Channel 20)
3. For highest channel: 2480MHz(Channel 40)

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 # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Last Cal.	Due date
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/16/2014	05/15/2015
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/16/2014	05/15/2015
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/16/2014	05/15/2015
50ΩCoaxial Switch	Anritsu	MP59B	M20531	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

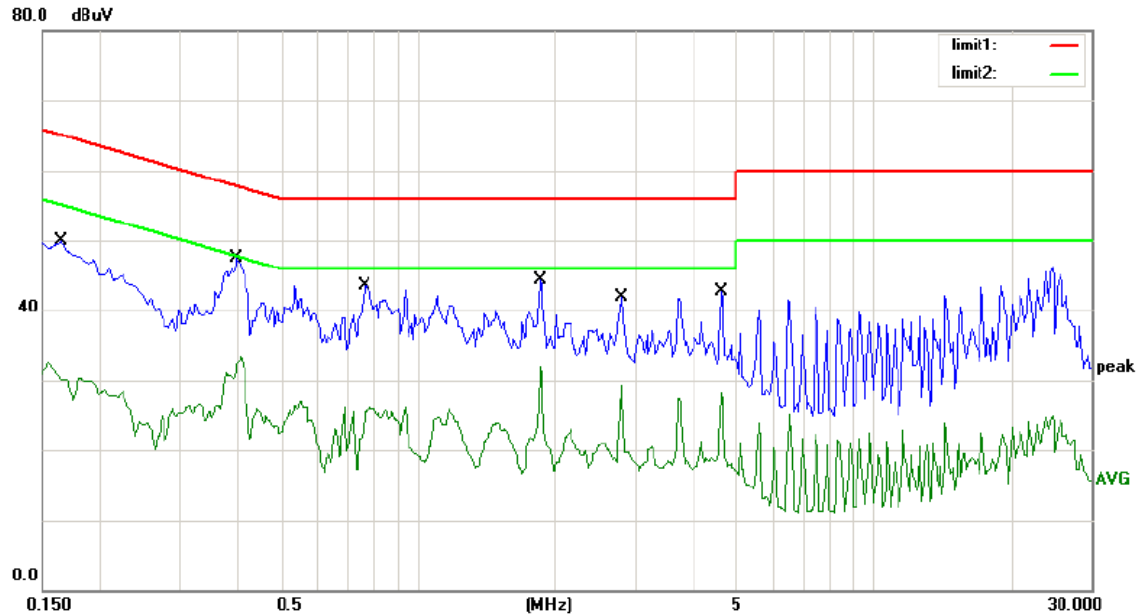
Quasi-peak
66-56
56
60

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:



Site site #1

Phase: **L1**

Temperature: 24

Limit: (CE)FCC PART 15 class C_QP

Power: AC 120V/60Hz

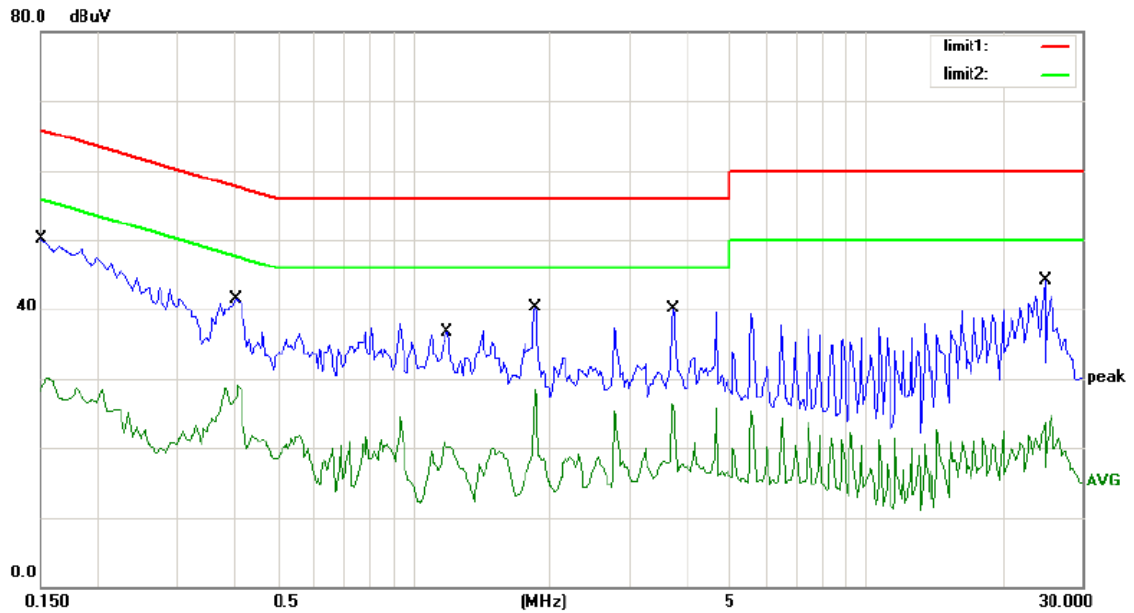
Humidity: 55 %

Mode: TX

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1650	46.30	0.00	46.30	65.21	-18.91	QP	
2		0.1650	32.53	0.00	32.53	55.21	-22.68	AVG	
3	*	0.4000	44.90	0.00	44.90	57.85	-12.95	QP	
4		0.4000	33.21	0.00	33.21	47.85	-14.64	AVG	
5		0.7650	40.70	0.00	40.70	56.00	-15.30	QP	
6		0.7650	26.05	0.00	26.05	46.00	-19.95	AVG	
7		1.8650	41.80	0.00	41.80	56.00	-14.20	QP	
8		1.8650	31.84	0.00	31.84	46.00	-14.16	AVG	
9		2.8100	38.60	0.00	38.60	56.00	-17.40	QP	
10		2.8100	29.33	0.00	29.33	46.00	-16.67	AVG	
11		4.6400	39.20	0.00	39.20	56.00	-16.80	QP	
12		4.6400	28.38	0.00	28.38	46.00	-17.62	AVG	

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



Site site #1

Limit: (CE)FCC PART 15 class C_QP

Mode: TX

Note:

Phase: **N**

Power: AC 120V/60Hz

Temperature: 24

Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1500	47.30	0.00	47.30	66.00	-18.70	QP	
2		0.1500	30.18	0.00	30.18	56.00	-25.82	AVG	
3		0.4050	38.60	0.00	38.60	57.75	-19.15	QP	
4		0.4050	29.06	0.00	29.06	47.75	-18.69	AVG	
5		1.1900	33.60	0.00	33.60	56.00	-22.40	QP	
6		1.1900	20.84	0.00	20.84	46.00	-25.16	AVG	
7		1.8650	37.90	0.00	37.90	56.00	-18.10	QP	
8	*	1.8650	28.42	0.00	28.42	46.00	-17.58	AVG	
9		3.7500	38.20	0.00	38.20	56.00	-17.80	QP	
10		3.7500	26.33	0.00	26.33	46.00	-19.67	AVG	
11		24.8500	41.20	0.00	41.20	60.00	-18.80	QP	
12		24.8500	24.66	0.00	24.66	50.00	-25.34	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:

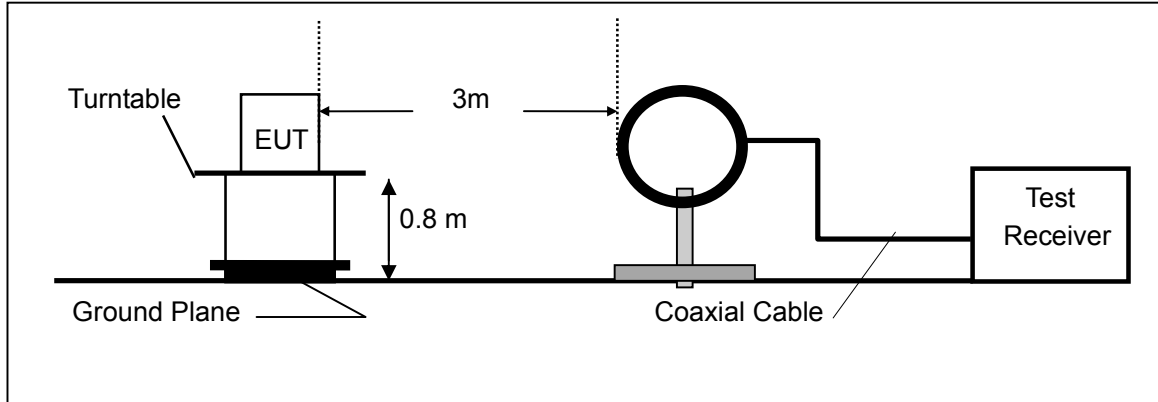
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

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

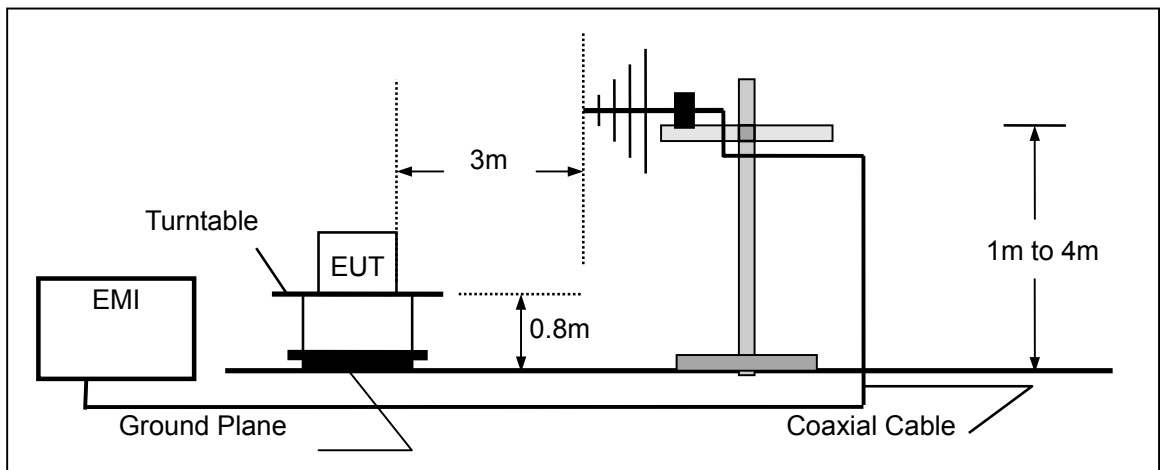
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Peak
Trace	Max hold

5.2 Test SET-UP (Block Diagram of Configuration)

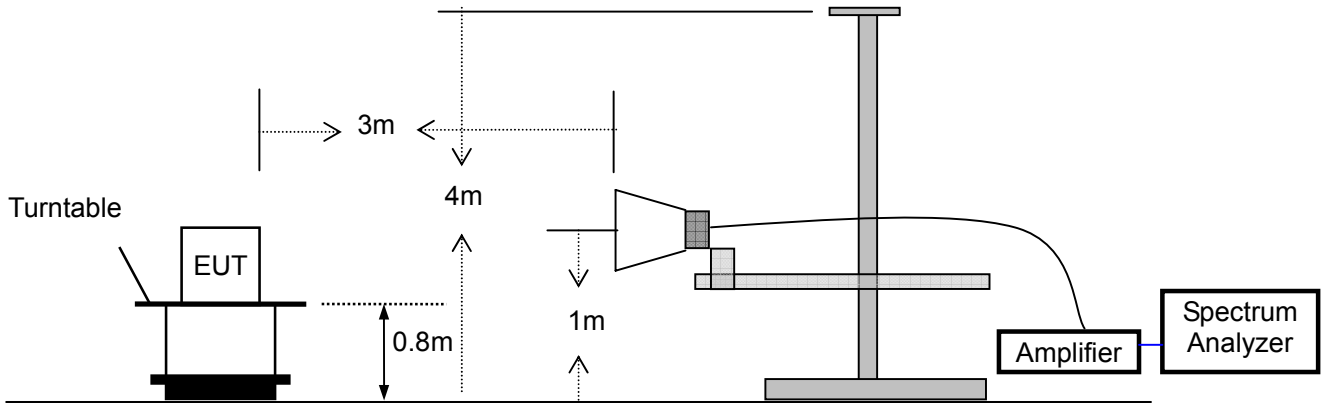
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(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	BBHA 9120	D143	05/16/2014	05/15/2015
Cable	Schwarzbeck	AK9513	ACRX1	05/19/2014	05/18/2015
Cable	Schwarzbeck	N/A	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	Field Strength 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

Below 30MHz:

Operation Mode:	TX	Test Date :	November 25, 2014
Frequency Range:	9KHz~30MHz	Temperature :	28℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m	Test By:	Andy

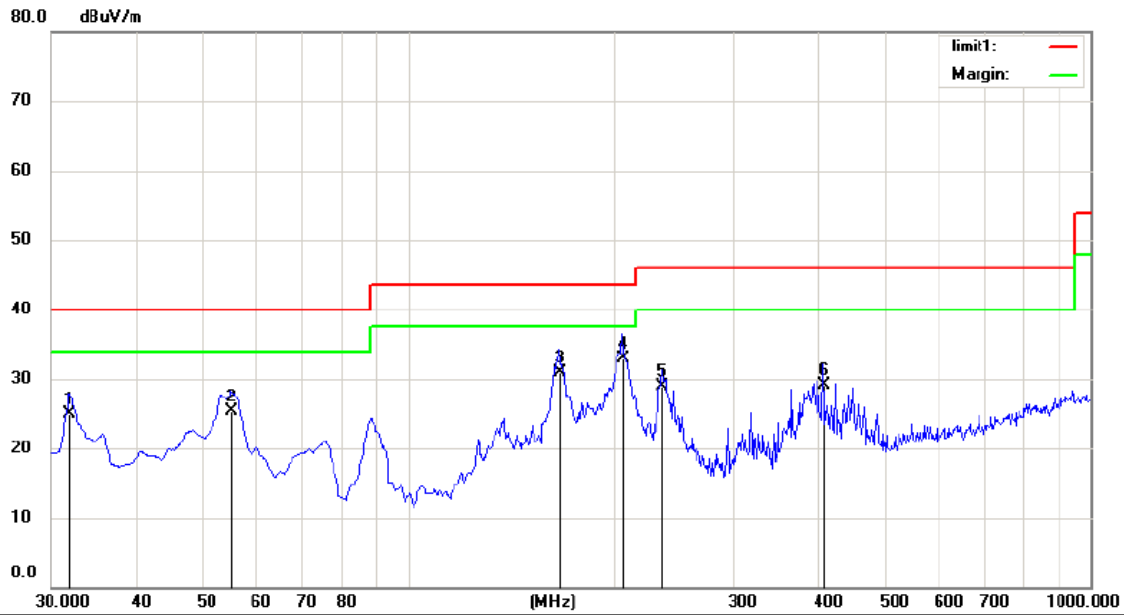
Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	--

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.

Please refer to the following data.



Site Chamber #1

Polarization: **Horizontal**

Temperature: 26

Limit: (RE)FCC PART 15 class C 3m

Power: AC 120V/60Hz

Humidity: 55 %

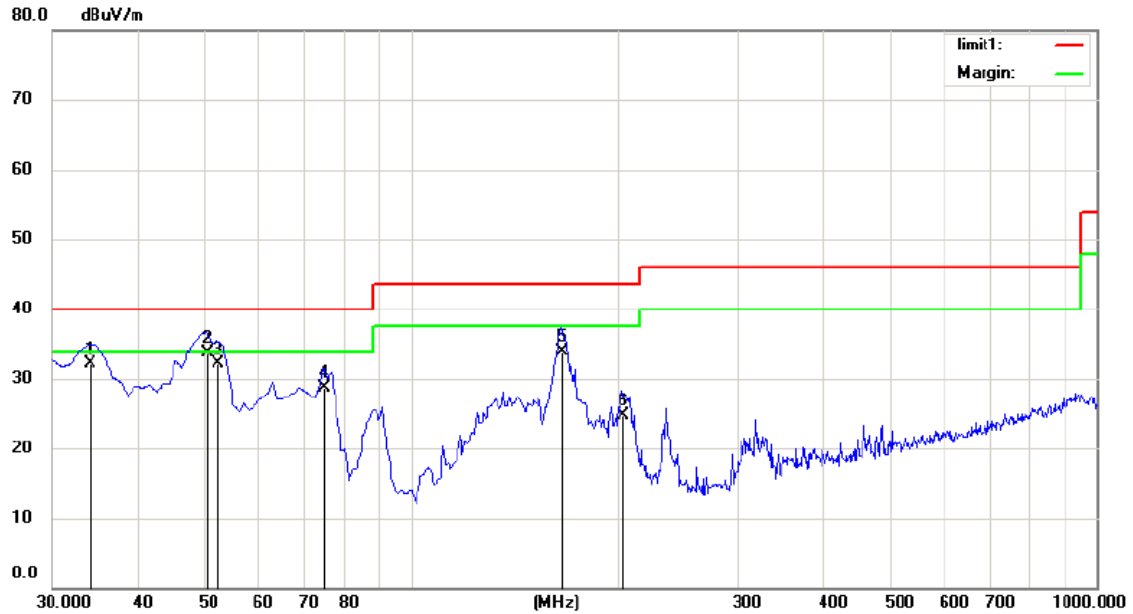
Mode: TX2402

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		31.9400	39.60	-14.63	24.97	40.00	-15.03	QP		
2		55.2200	42.80	-17.46	25.34	40.00	-14.66	QP		
3		166.7700	49.30	-18.40	30.90	43.50	-12.60	QP		
4	*	206.5400	50.20	-17.27	32.93	43.50	-10.57	QP		
5		236.6100	44.70	-15.83	28.87	46.00	-17.13	QP		
6		406.3600	40.50	-11.30	29.20	46.00	-16.80	QP		

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

Operator: QIU



Site Chamber #1

Polarization: **Vertical**

Temperature: 26

Limit: (RE)FCC PART 15 class C 3m

Power: AC 120V/60Hz

Humidity: 55 %

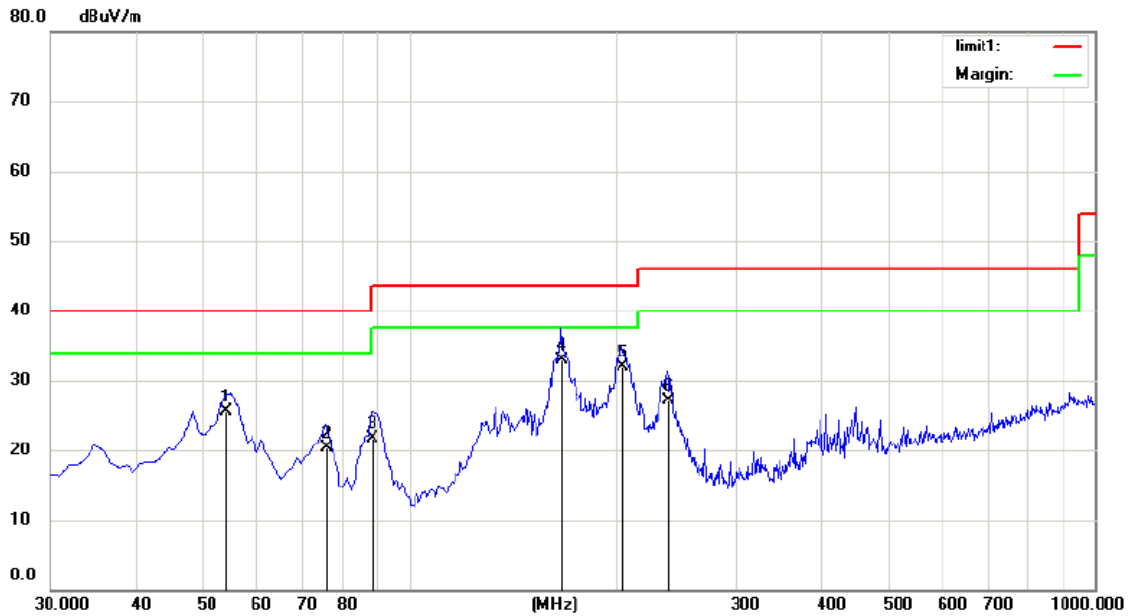
Mode: TX2402

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		34.1560	46.30	-14.26	32.04	40.00	-7.96	QP		
2	*	50.3700	49.20	-15.58	33.62	40.00	-6.38	QP		
3		52.3100	48.50	-16.32	32.18	40.00	-7.82	QP		
4		74.6200	51.40	-22.69	28.71	40.00	-11.29	QP		
5		165.8000	52.30	-18.40	33.90	43.50	-9.60	QP		
6		203.6300	42.10	-17.47	24.63	43.50	-18.87	QP		

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

Operator: QIU



Site Chamber #1

Polarization: **Horizontal**

Temperature: 26

Limit: (RE)FCC PART 15 class C 3m

Power: AC 120V/60Hz

Humidity: 55 %

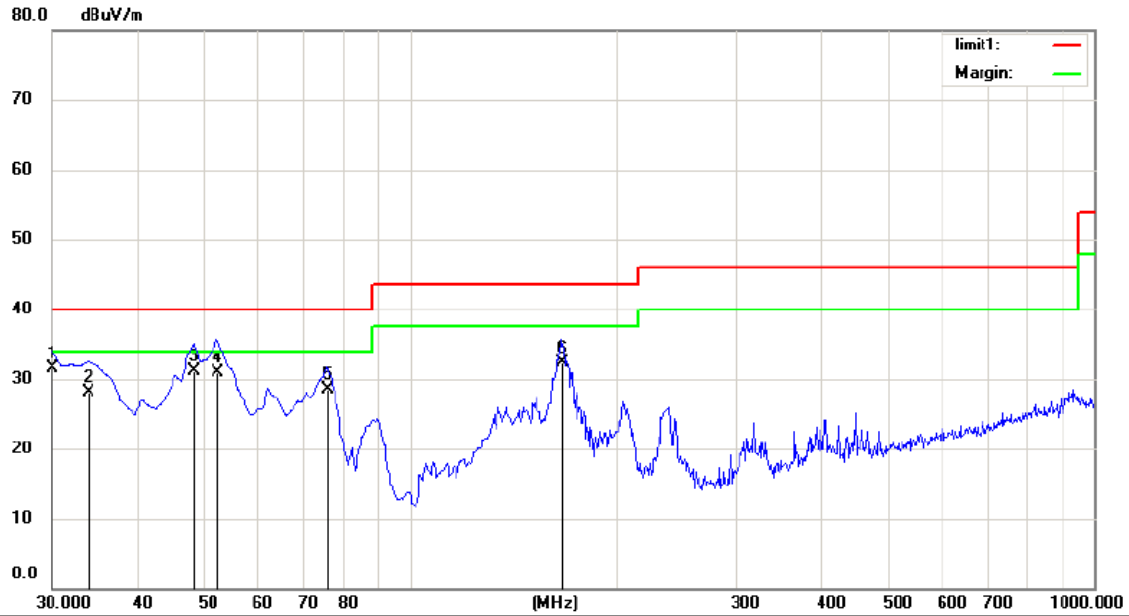
Mode: TX2440

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		54.2500	42.50	-17.08	25.42	40.00	-14.58	QP		
2		75.5900	43.10	-22.71	20.39	40.00	-19.61	QP		
3		88.2000	42.90	-21.21	21.69	43.50	-21.81	QP		
4	*	166.7700	51.30	-18.40	32.90	43.50	-10.60	QP		
5		204.6000	49.40	-17.40	32.00	43.50	-11.50	QP		
6		238.5500	42.80	-15.74	27.06	46.00	-18.94	QP		

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

Operator: QIU



Site Chamber #1

Polarization: **Vertical**

Temperature: 26

Limit: (RE)FCC PART 15 class C 3m

Power: AC 120V/60Hz

Humidity: 55 %

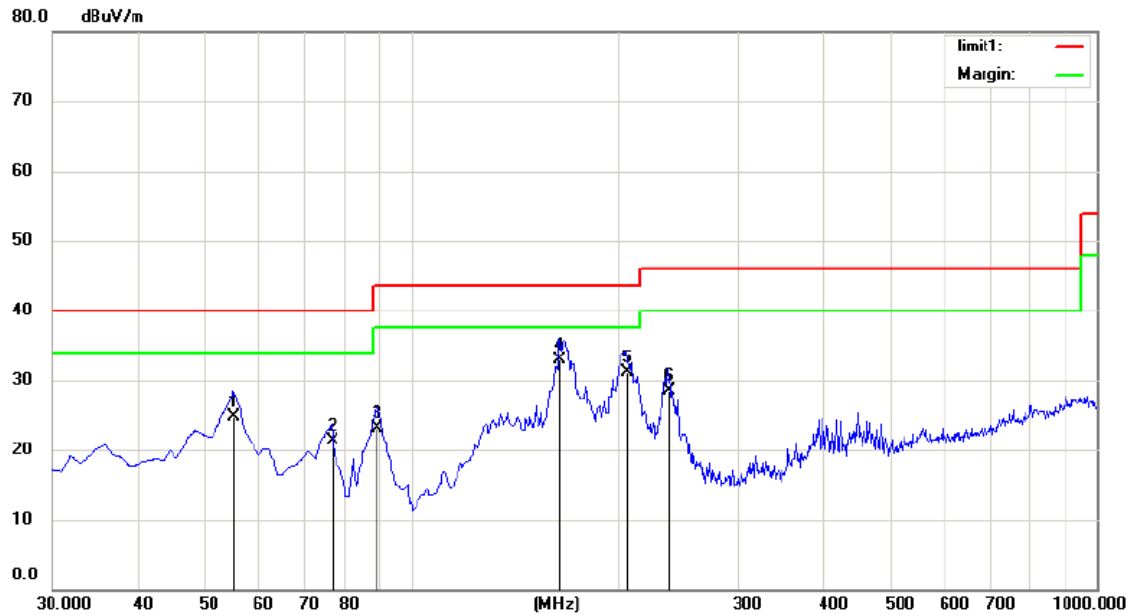
Mode: TX2440

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	30.0000	46.70	-15.15	31.55	40.00	-8.45	QP		
2		33.8800	42.40	-14.31	28.09	40.00	-11.91	QP		
3		48.4300	45.90	-14.74	31.16	40.00	-8.84	QP		
4		52.3100	47.30	-16.32	30.98	40.00	-9.02	QP		
5		75.5900	51.20	-22.71	28.49	40.00	-11.51	QP		
6		166.7700	50.80	-18.40	32.40	43.50	-11.10	QP		

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

Operator: QIU



Site Chamber #1

Polarization: **Horizontal**

Temperature: 26

Limit: (RE)FCC PART 15 class C 3m

Power: AC 120V/60Hz

Humidity: 55 %

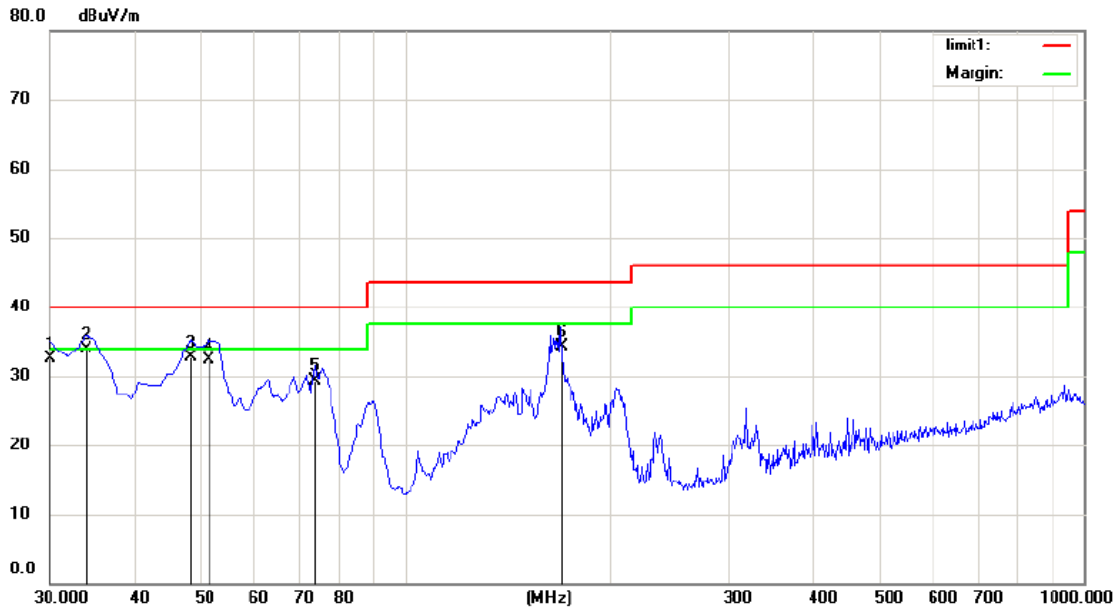
Mode: TX2480

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		55.2200	42.20	-17.46	24.74	40.00	-15.26	QP		
2		76.5600	43.90	-22.66	21.24	40.00	-18.76	QP		
3		89.1700	44.10	-21.04	23.06	43.50	-20.44	QP		
4	*	164.8300	51.30	-18.39	32.91	43.50	-10.59	QP		
5		206.5400	48.30	-17.27	31.03	43.50	-12.47	QP		
6		237.5800	44.20	-15.78	28.42	46.00	-17.58	QP		

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

Operator: QIU



Site Chamber #1

Polarization: **Vertical**

Temperature: 26

Limit: (RE)FCC PART 15 class C 3m

Power: AC 120V/60Hz

Humidity: 55 %

Mode:TX2480

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	Comment
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1		30.0000	47.60	-15.15	32.45	40.00	-7.55	QP		
2	*	33.8800	48.20	-14.31	33.89	40.00	-6.11	QP		
3		48.4300	47.50	-14.74	32.76	40.00	-7.24	QP		
4		51.3400	48.20	-15.96	32.24	40.00	-7.76	QP		
5		73.6500	51.90	-22.57	29.33	40.00	-10.67	QP		
6		169.6800	52.80	-18.42	34.38	43.50	-9.12	QP		

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

Operator: QIU

Above 1000MHz

Operation Mode: TX Mode (CH01: 2402MHz) Test Date : November 25, 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
4804	V	64.69	46.33	74	54	-9.31	-7.67
7206	V	62.58	47.51	74	54	-11.42	-6.49
9608	V	63.84	43.37	74	54	-10.16	-10.63
12010	V	61.52	42.26	74	54	-12.48	-11.74
14412	V	62.27	40.78	74	54	-11.73	-13.22
16814	V	61.83	41.79	74	54	-12.17	-12.21
4804	H	63.34	44.51	74	54	-10.66	-9.49
7206	H	64.16	42.94	74	54	-9.84	-11.06
9608	H	58.25	43.31	74	54	-15.75	-10.69
12010	H	60.46	40.38	74	54	-13.54	-13.62
14412	H	57.35	41.06	74	54	-16.65	-12.94
16814	H	56.68	40.28	74	54	-17.32	-13.72

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: 2440MHz) Test Date : November 25, 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
4880	V	63.03	43.79	74	54	-10.97	-10.21
7320	V	64.32	42.64	74	54	-9.68	-11.36
9760	V	62.14	45.51	74	54	-11.86	-8.49
12200	V	63.96	42.39	74	54	-10.04	-11.61
14640	V	65.48	41.84	74	54	-8.52	-12.16
17080	V	62.31	42.61	74	54	-11.69	-11.39
4880	H	61.14	41.56	74	54	-12.86	-12.44
7320	H	62.35	41.36	74	54	-11.65	-12.64
9760	H	61.82	42.58	74	54	-12.18	-11.42
12200	H	60.05	40.12	74	54	-13.95	-13.88
14640	H	61.37	42.55	74	54	-12.63	-11.45
17080	H	61.13	41.09	74	54	-12.87	-12.91

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.

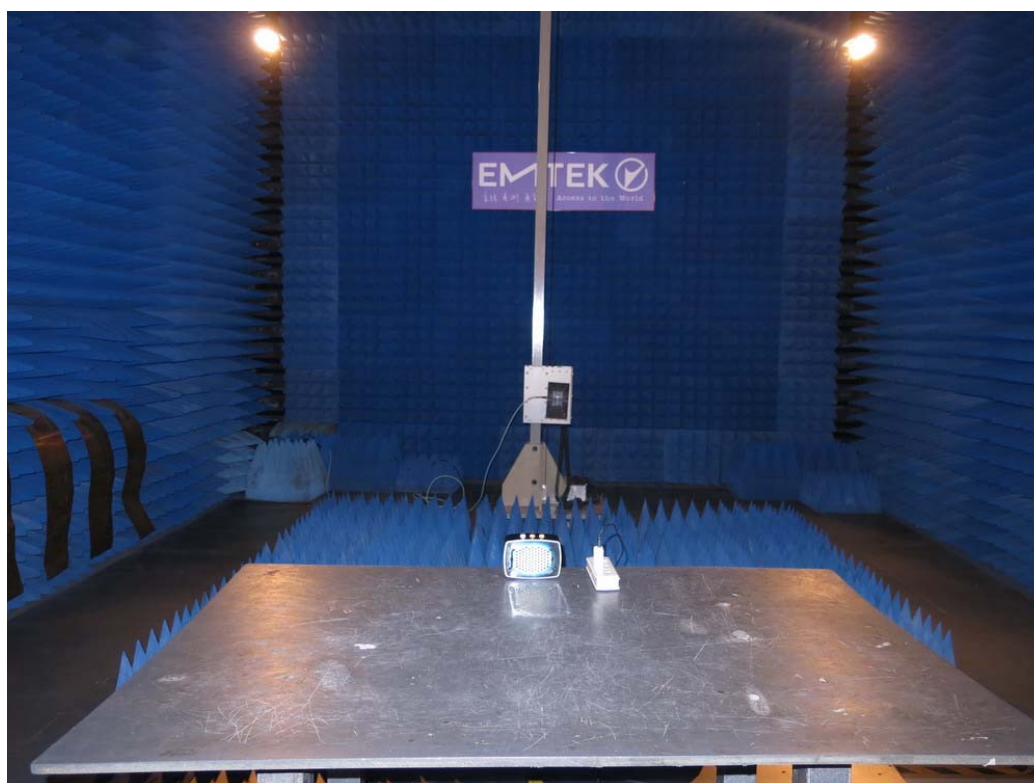
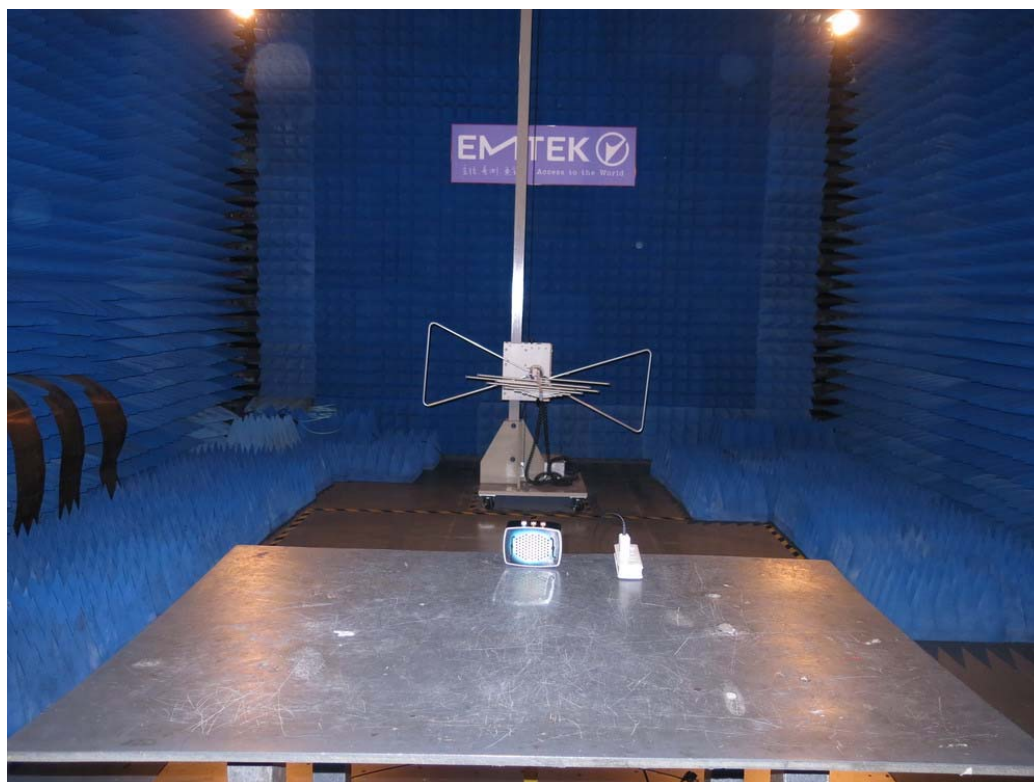
Operation Mode: TX Mode (CH40: 2480MHz) Test Date : November 25, 2014
Frequency Range: 1-25GHz Temperature : 25 °C
Test Result: PASS Humidity : 50 %
Measured Distance: 3m Test By: Andy

Freq. (MHz)	Ant. Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4960	V	64.19	46.63	74	54	-9.81	-7.37
7440	V	65.88	45.76	74	54	-8.12	-8.24
9920	V	63.74	43.23	74	54	-10.26	-10.77
12400	V	64.16	42.28	74	54	-9.84	-11.72
14880	V	65.81	43.31	74	54	-8.19	-10.69
17360	V	63.37	41.48	74	54	-10.63	-12.52
4960	H	64.58	42.07	74	54	-9.42	-11.93
7440	H	61.92	41.79	74	54	-12.08	-12.21
9920	H	62.86	40.59	74	54	-11.14	-13.41
12400	H	61.52	43.61	74	54	-12.48	-10.39
14880	H	60.54	41.44	74	54	-13.46	-12.56
17360	H	60.21	40.18	74	54	-13.79	-13.82

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:

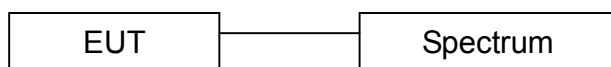


6. 6dB Bandwidth Measurement

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

6.4 Limit

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

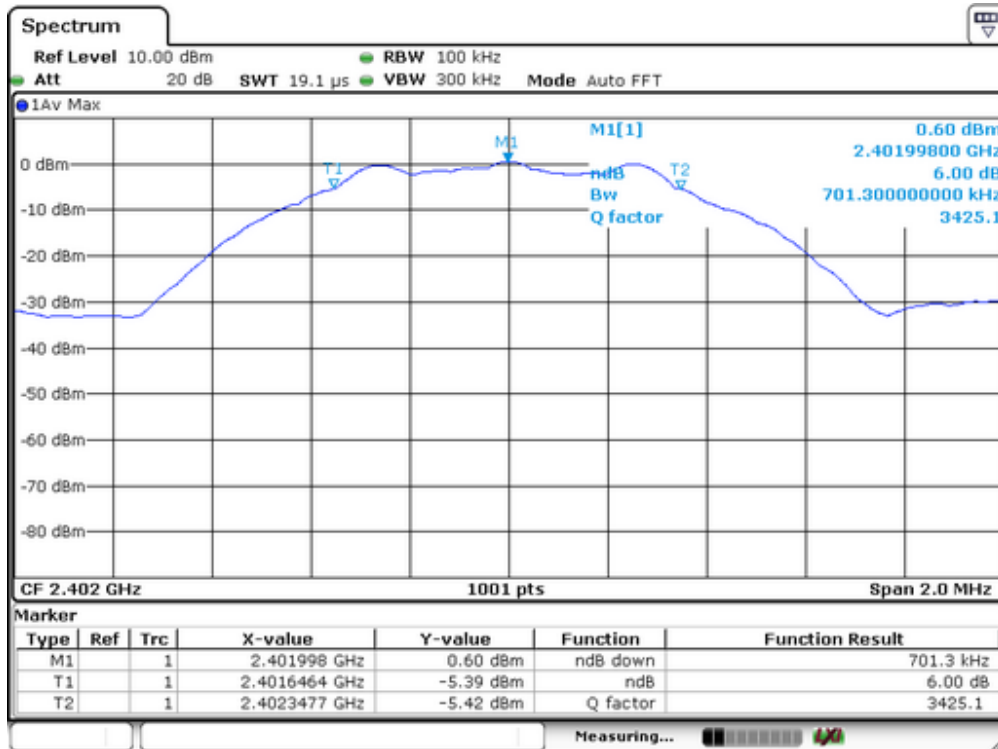
6.5 Measurement Results:

Refer to attached data chart.

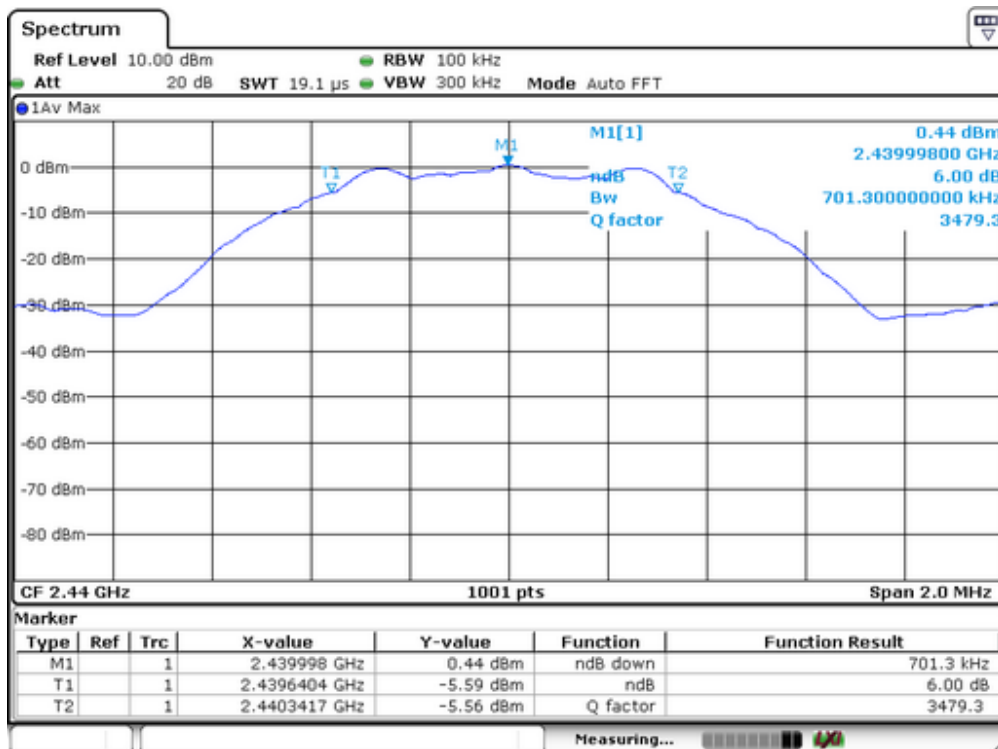
Spectrum Detector:	PK	Test Date :	November 25, 2014
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

Channel number	Channel frequency (MHz)	Measurement level (KHz)	Required Limit (KHz)
01	2402	701	>500
20	2440	701	>500
40	2480	699	>500

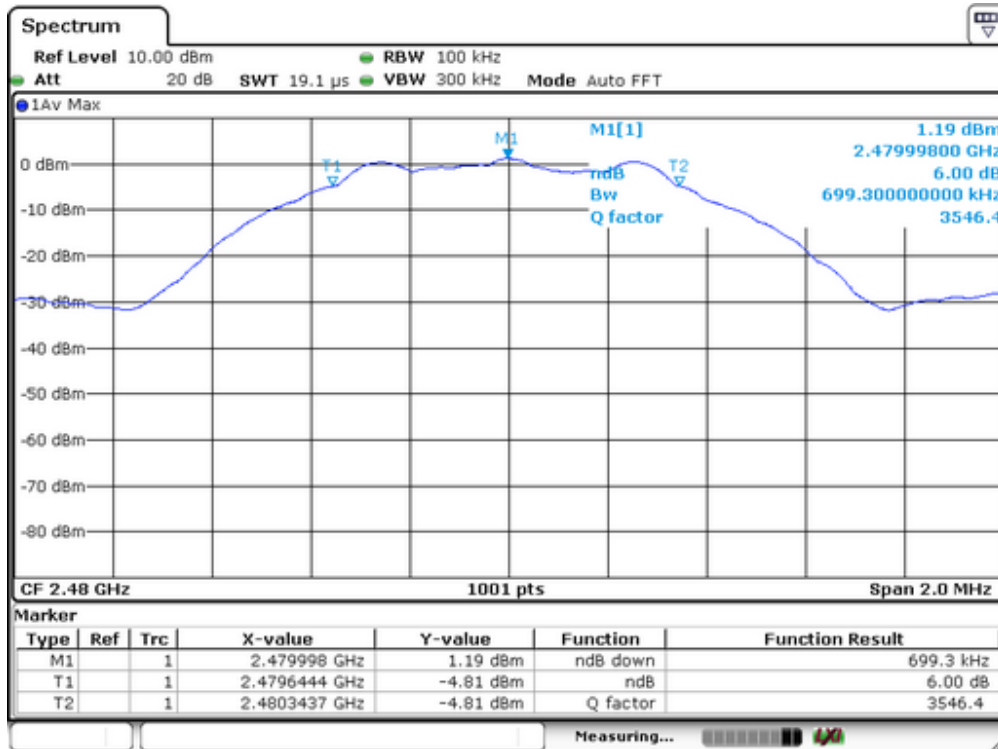
Channel 01:



Channel 20:



Channel 40:

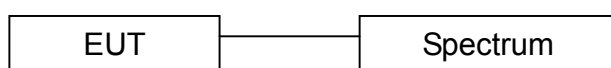


7. MAXIMUM PEAK OUTPUT POWER TEST

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

7.4 Peak Power output limit

The maximum peak power shall be less 1Watt.

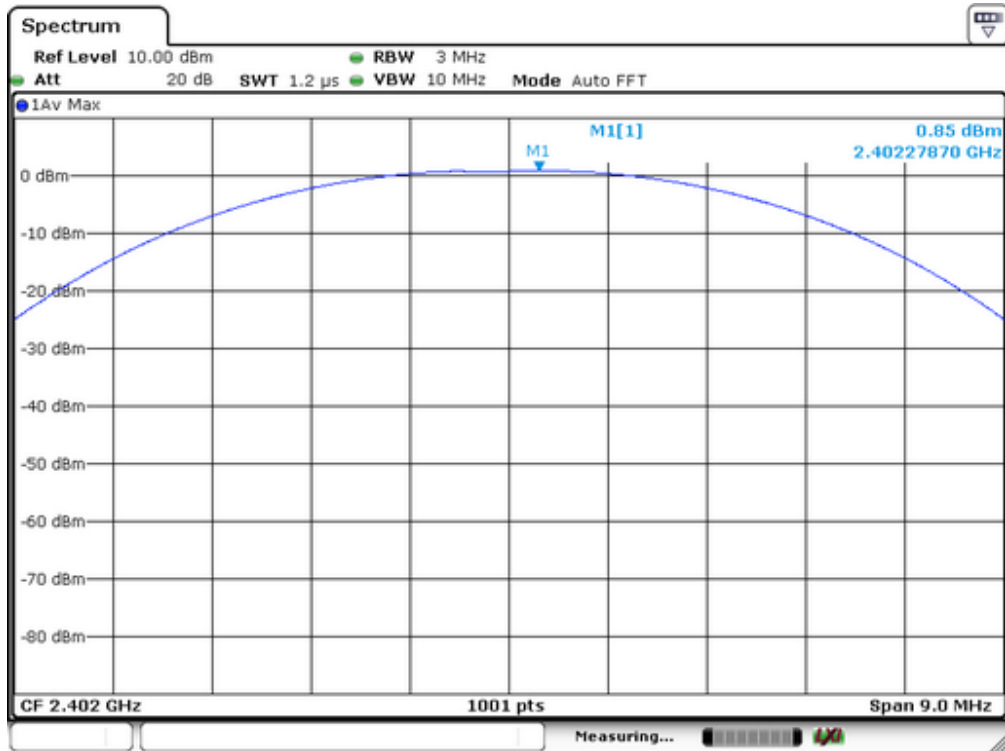
7.5 Measurement Results:

Refer to attached data chart.

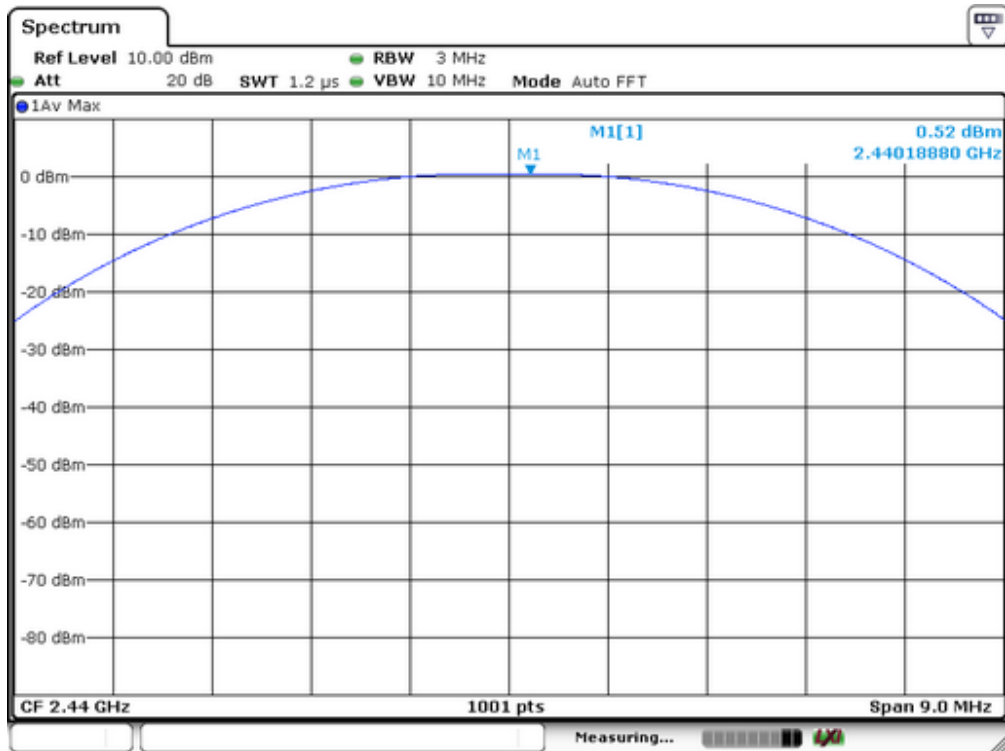
Spectrum Detector:	PK	Test Date :	November 25, 2014
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(W)	Pass/Fail
01	2402	0.85	1.216	1W(30dBm)	PASS
20	2440	0.52	1.127	1W(30dBm)	PASS
40	2480	1.16	1.306	1W(30dBm)	PASS

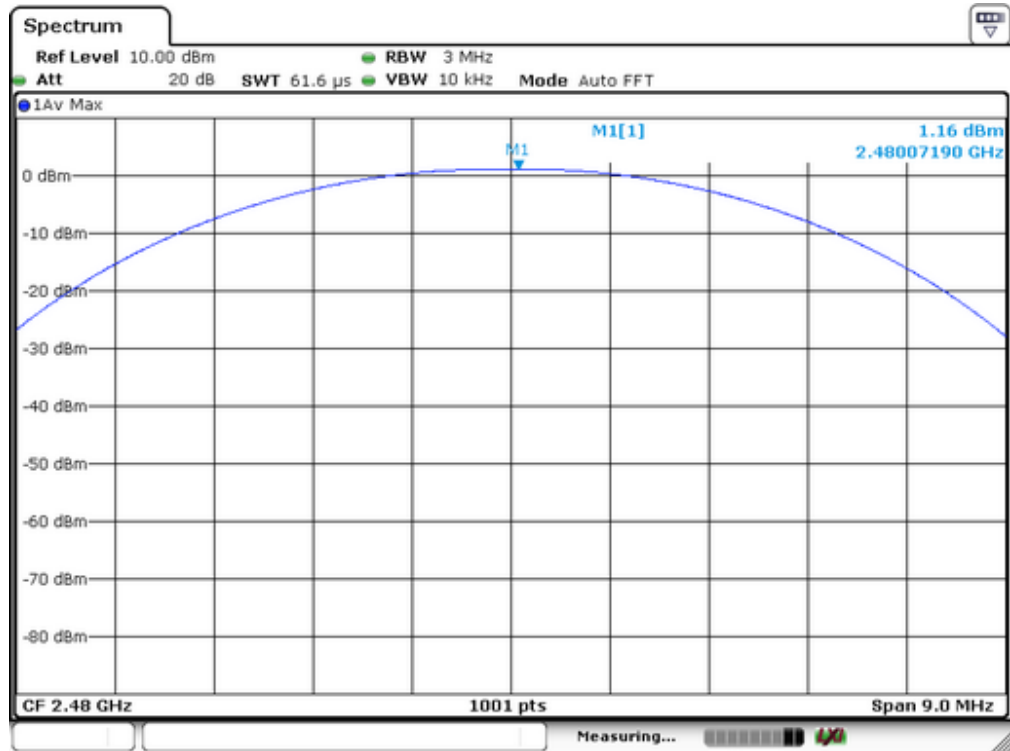
Channel 01:



Channel 20:



Channel 40:

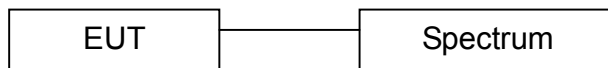


8. Power Spectral Density Measurement

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

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.

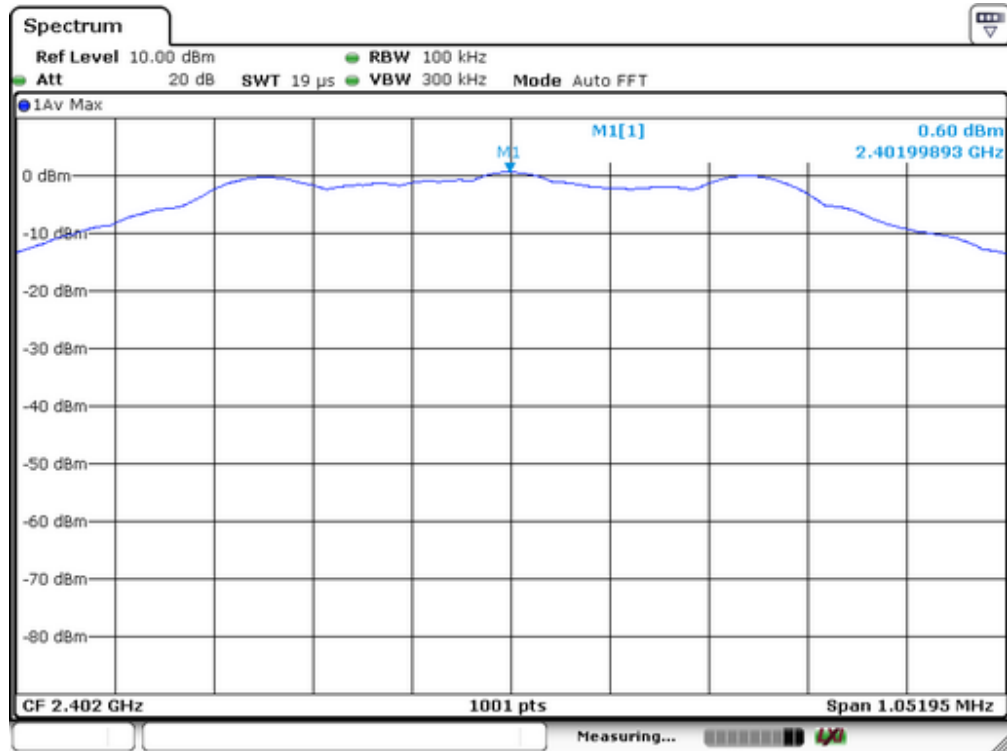
Spectrum Detector:	PK	Test Date :	November 25, 2014
Test By:	Andy	Temperature :	25 °C
Test Result:	PASS	Humidity :	50 %

Channel number	Channel frequency (MHz)	Measurement level (dBm)		Required Limit (dBm/3kHz)	Pass/Fail
		PSD/100kHz	PSD/3kHz		
01	2402	0.60	-15.01	8	PASS
20	2440	0.44	-14.86	8	PASS
40	2480	1.19	-13.88	8	PASS

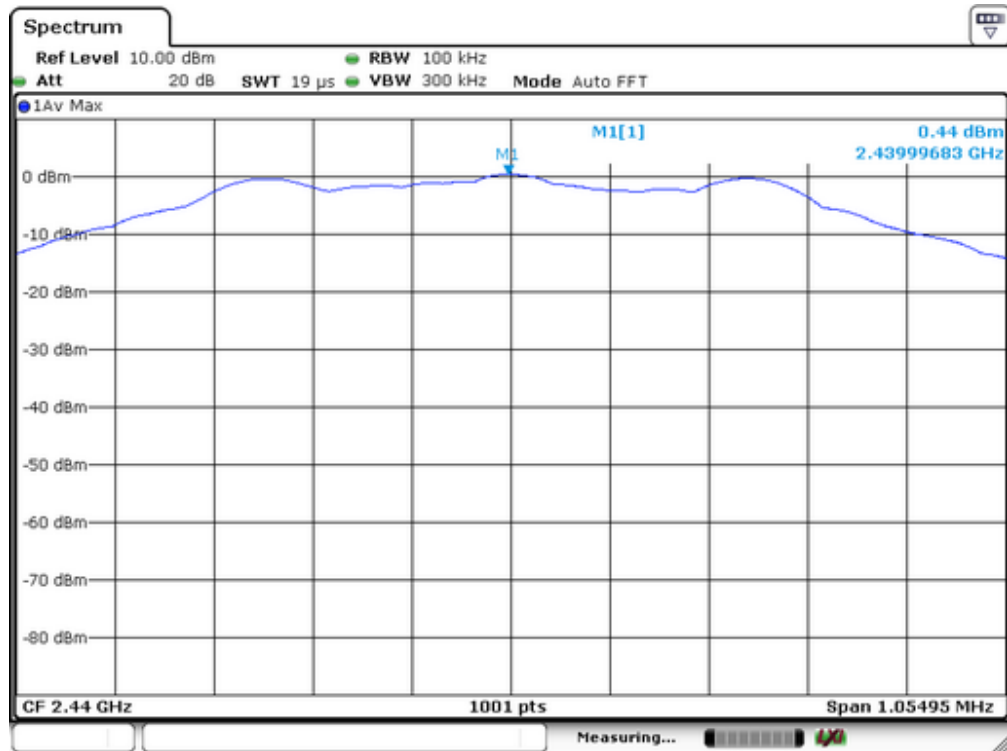
Note:

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.

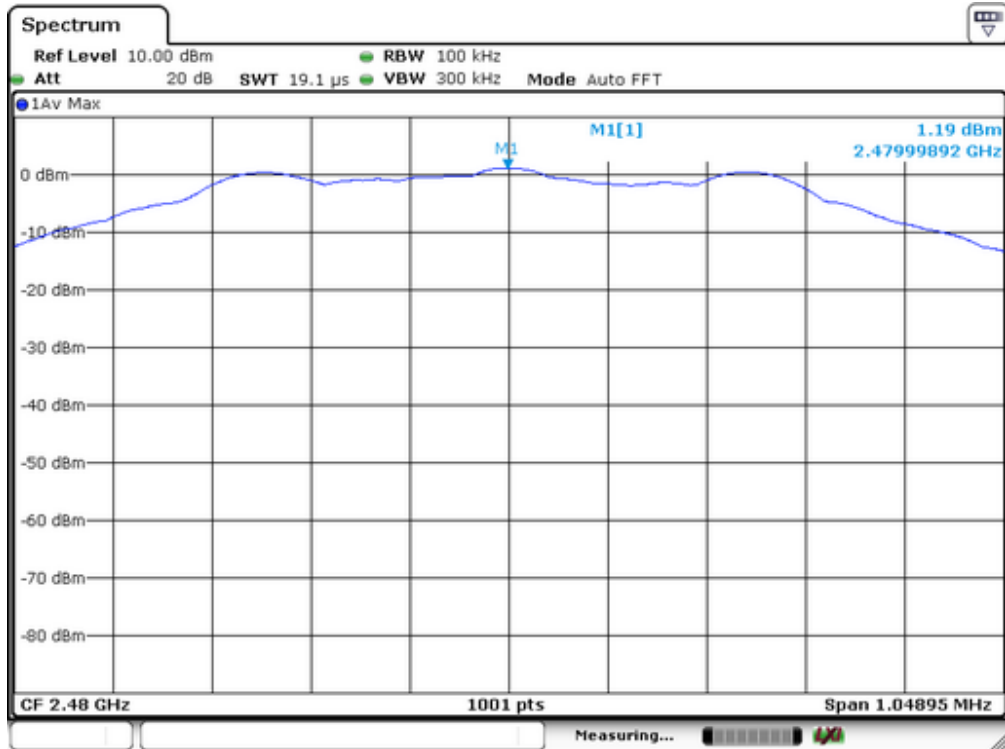
PSD 100kHz Plot:
 Channel 01



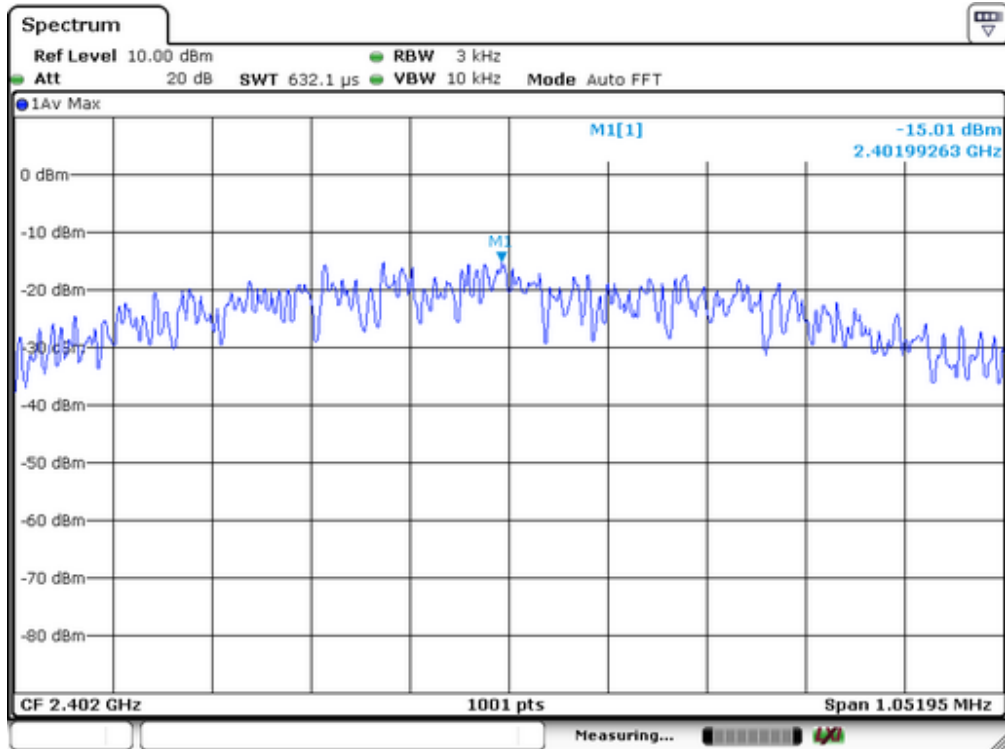
Channel 20



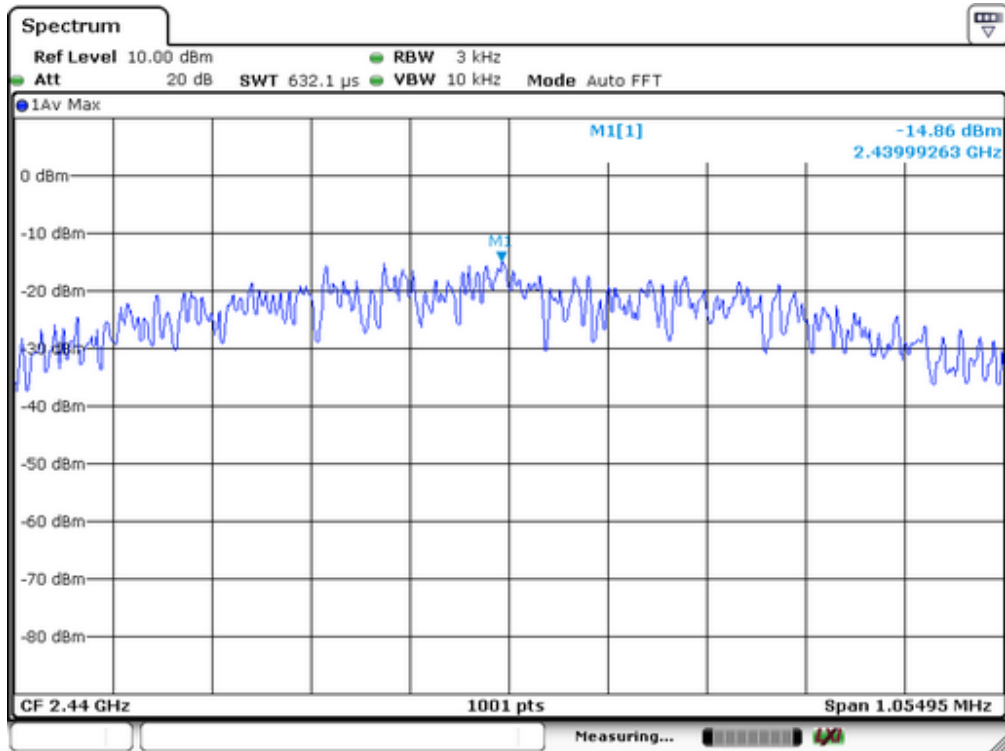
Channel 40



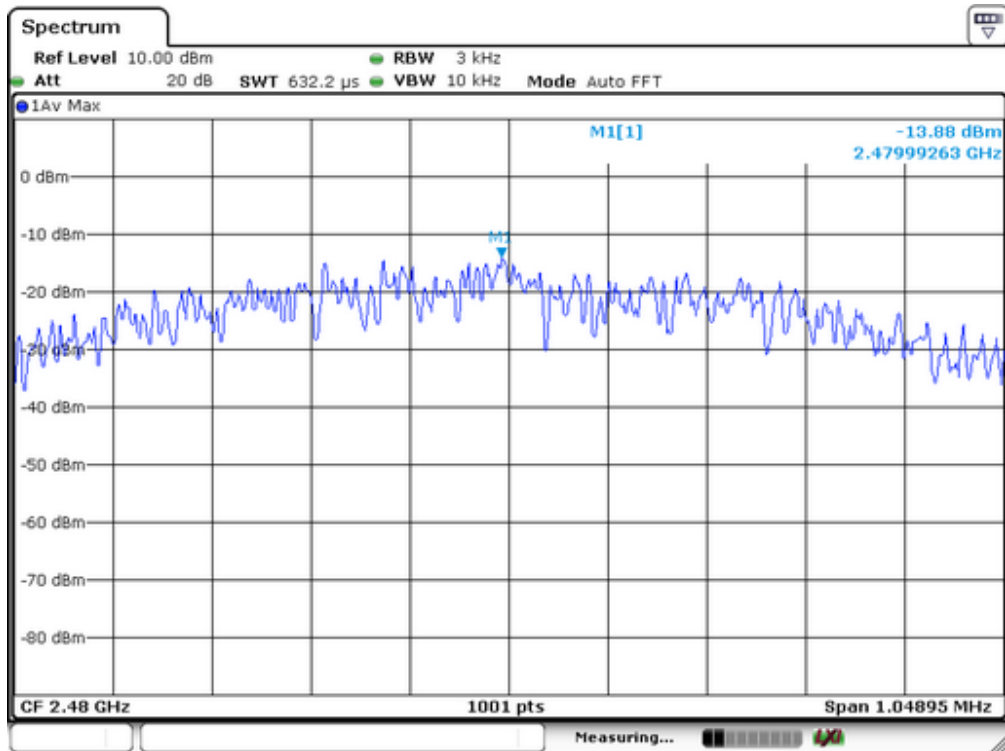
PSD 3KHz Plot: Channel 01



Channel 20



Channel 40



9. Band EDGE test

9.1 Measurement Procedure

For Conducted Test

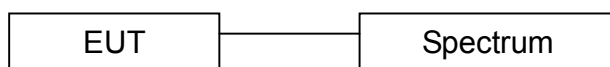
1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.
3. Preliminary tests on individual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

For Radiated emission Test

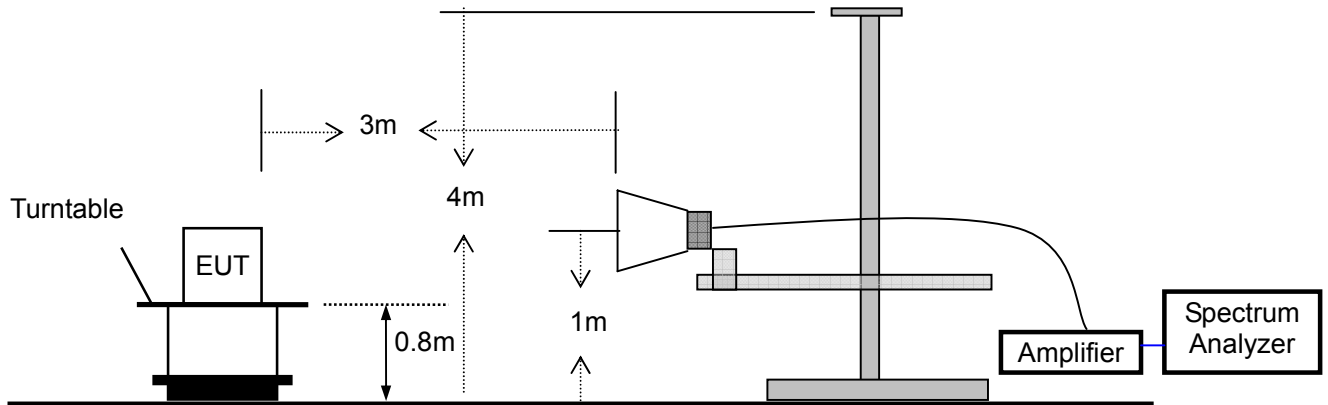
1. The EUT was Operating in hopping mode or could be controlled its channel. Printed out test result from the spectrum by hard copy function.
2. The EUT was placed on a turn table which is 0.8m above ground plane.
3. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.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

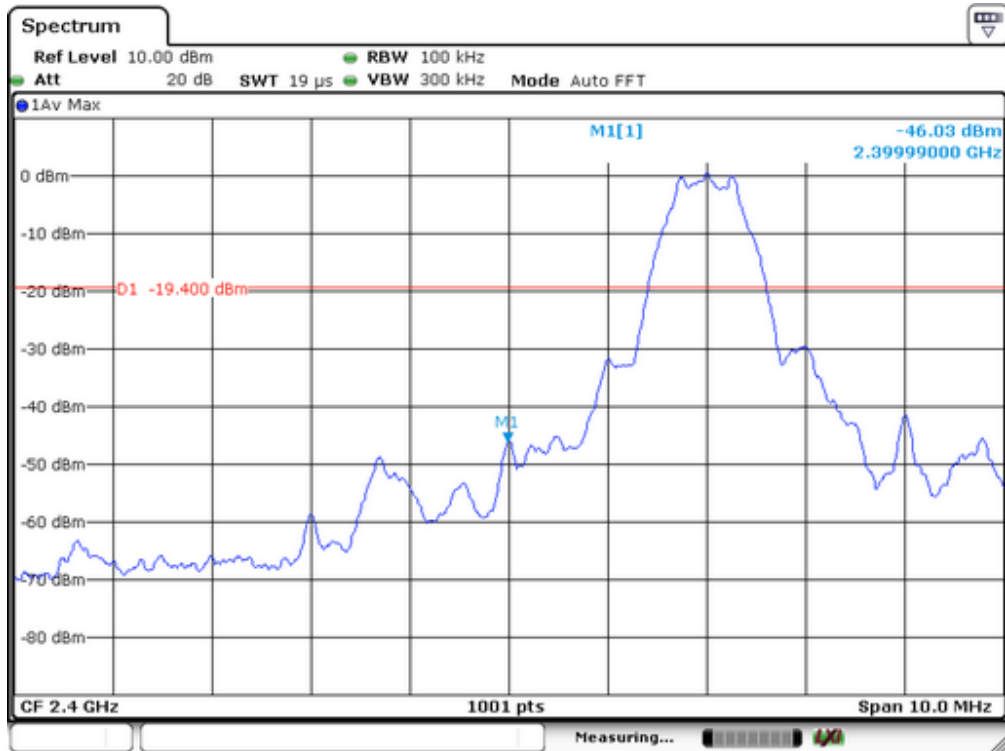
Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	November 25, 2014
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)
<2400	0.85	-46.03	46.88	>20dBc
>2483.5	1.16	-54.37	55.53	>20dBc

Test Plot:



2. Radiated emission Test

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	H	65.06	44.12	74.00	54.00
<2400	V	54.93	43.23	74.00	54.00
>2483.5	H	64.72	45.09	74.00	54.00
>2483.5	V	60.04	40.95	74.00	54.00

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)

