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

OF

Superior Indoor/Outdoor Speakers

MODEL No.: HL2065

TRADE MARK: N/A

FCC ID: 2ABRF-HL2065

REPORT NO: KAD131223047E

ISSUE DATE: February 12, 2014

Prepared for

Hammacher Schlemmer
9307 N. Milwaukee Niles, IL 60714, USA

Prepared by

DONGGUAN EMTEK CO., LTD.

No.281, Guantai Road, Nancheng District,
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VERIFICATION OF COMPLIANCE

Applicant:	Hammacher Schlemmer 9307 N. Milwaukee Niles, IL 60714, USA
Manufacturer:	ECORE TECHNOLOGY COMPANY LIMITED North of Bingang East Road, Huahu Development Zone, Ezhou, Hubei, China
Product Description:	Superior Indoor/Outdoor Speakers
Trade Mark:	N/A
Model Number:	HL2065
File Number:	KAD130829075E
Date of Test:	December 23, 2013 to January 20, 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 History

Rev.	Summary	Date of Rev.	Report No.
V1.0	Original Report	2014-02-12	KAD131223047E

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1. GENERAL INFORMATION

1.1 Product Description

The Hammacher Schlemmer, Model No.: HL2065 (referred to as the EUT in this report) The EUT is an short range, lower power, Superior Indoor/Outdoor Speakers designed as an Input Device. It is designed by way of utilizing the following modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 2405-2478MHz
B). Modulation: GFSK
C). Number of Channel: 68 (There are several channel were replaced.)
D). Channel space: 1MHz
E). Rated RF Output Power: 3.14dBm(2.061mW)
F). Antenna Type: Internal PCB antenna
G). Antenna GAIN: 2dBi
H). Input Rating: DC 5V, 2A come from Adapter
I). Adapter information:
Model: YN12W-0500200UZ
Input: AC 100-240V, 50/60Hz, 0.3A
Output: DC 5V, 2A

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2ABRF-HL2065 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.

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, Aug. 18, 2011 The Certificate Number is 247565. Accredited by Industry Canada, January 13, 2011 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 a placed on as 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 a placed on as 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 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 Limitation

(1) Channel Separation test

FCC Part 15, Subpart C Section 15.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 Bandwidth of the hopping channel, whichever is greater.

Frequency Range (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

(2) 20dB Bandwidth

Frequency Range(MHz)	Quantity of Hopping Channel	Limit(kHz) 50	25	15	75
902-928		<250	>250	NA	NA
2400-2483.5		NA	NA	>1000	<1000

(3) Quantity of Hopping Channel

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Limit(Quantity of Hopping Channel) 20dB bandwidth <250kHz	20dB bandwidth >250kHz	20dB bandwidth <1MHz	20dB bandwidth >1MHz
902-928	50	25	NA	NA
2400-2483.5	NA	NA	15	15
5725-5850	NA	NA	75	NA

(4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	LIMIT(rms) 20dB bandwidth <250kHz(50Channel)	20dB bandwidth >250kHz(25Channel)	20dB bandwidth <1MHz(75Channel)
902-928	400(20S)	400(10S)	NA
2400-2483.5	NA	NA	400(30S)
5725-5850	NA	NA	400(30S)

Note: The "()"is all channel's average time of occupancy.

(5) Maximum Peak Output Power

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	Quantity of Hopping Channel	LIMIT(W) 50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

(6) Band edge

FCC Part15, Subpart C Section 15.247, In any 100kHz bandwidth outside the frequency band in with the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

Operating Frequency Range(MHz)	Spurious emission frequency	Limit	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902-928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400-2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725-5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

(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.

(8) Radiated Emission

FCC Part 15, Subpart C Section 15.209 limit of radiated emission for frequency below 1000GHz. The emissions from an intentional radiator shall not exceed the field strength level specified in the following table:

Frequency (MHz)	Field strength μV/m	Distance(m)	Field strength at 3m dBμV/m
0.009-0.490	2400/F(kHz)	300	/
0.490-1.705	24000/F(kHz)	30	/
1.705-30.0	30	30	/
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Remark : 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

FCC Part 15, Section 15.35(b) limit of radiated emission for frequency above 1000MHz

Frequency(MHz)	Class A(dBμV/m)(at 3m)		Class B(dBμV/m)(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Frequency(MHz)	Filed Strength of Fundamental(at 3m)		Filed Strength of Harmonics(at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
902-928	114	94	74.0	54.0
2400-2483.5	114	94	74.0	54.0
5725-5875	114	94	74.0	54.0
24000-24250	128	108	88.0	68.0

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

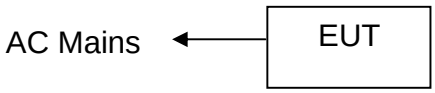


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model No.	FCC ID	Note
1.	Superior Indoor/Outdoor Speakers	N/A	HL2065	2ABRF-HL2065	***EUT***

Note:

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

3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.247(a)(1)	Channel Separation test	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§15.247(a)(1)(iii)	Time of Occupancy(Dwell Time)	Compliant
§15.247(b)	Max Peak output Power test	Compliant
§15.247(d)	Band edge test	Compliant
§15.207	AC Power Conducted Emission	Compliant
§15.247(d),§15.209	Radiated Emission	Compliant
§15.203	Antenna Requirement	Compliant
§1.1310	RF Exposure	Compliant

4. Description of test modes

The EUT (Superior Indoor/Outdoor Speakers) has been tested under normal operating condition.

According to software, there are 68 channels are found in product, there are several channels(2407MHz, 2422MHz, 2423MHz, 2443MHz, 2446MHz, 2447MHz) were replaced. And 26 hopping channels were configured by system. EUT was tested with channel: 2405MHz, 2438MHz, 2478MHz. And have one type of modulation GFSK.

Channel List:

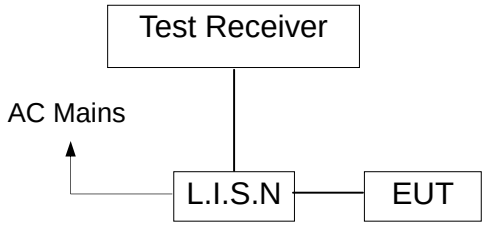
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
2405	2416	2427	2437		2457	2467	2477
2406	2417	2428	**2438**	2448	2458	2468	**2478**
	2418	2429	2439	2449	2459	2469	
2408	2419	2430	2440	2450	2460	2470	
2409	2420	2431	2441	2451	2461	2471	
2410	2421	2432	2442	2452	2462	2472	
2411		2433		2453	2463	2473	
2412		2434	2444	2454	2464	2474	
2413	2424	2435	2445	2455	2465	2475	
2414	2425	2436		2456	2466	2476	

5. Conducted Emissions Test

5.1 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.

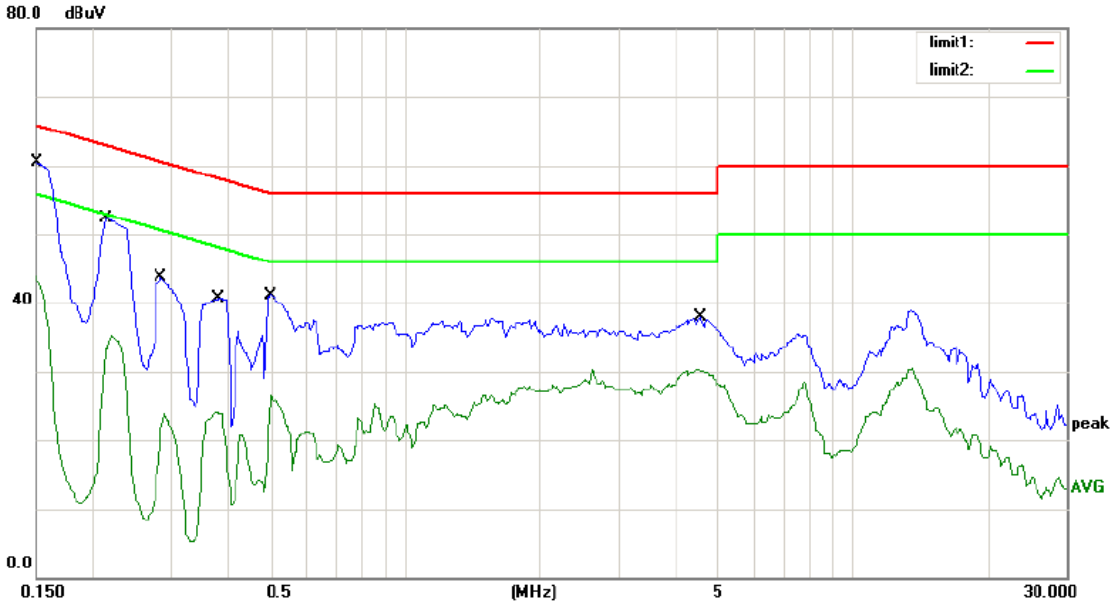
5.2 Test SET-UP (Block Diagram of Configuration)



5.3 Measurement Equipment Used:

Conducted Emission Test Site # 4					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Receiver	Rohde & Schwarz	ESCS30	100018	05/29/2013	05/28/2014
L.I.S.N	Rohde & Schwarz	ENV216	100017	05/29/2013	05/28/2014
RF Switching Unit	CDS	RSU-M2	38401	05/29/2013	05/28/2014

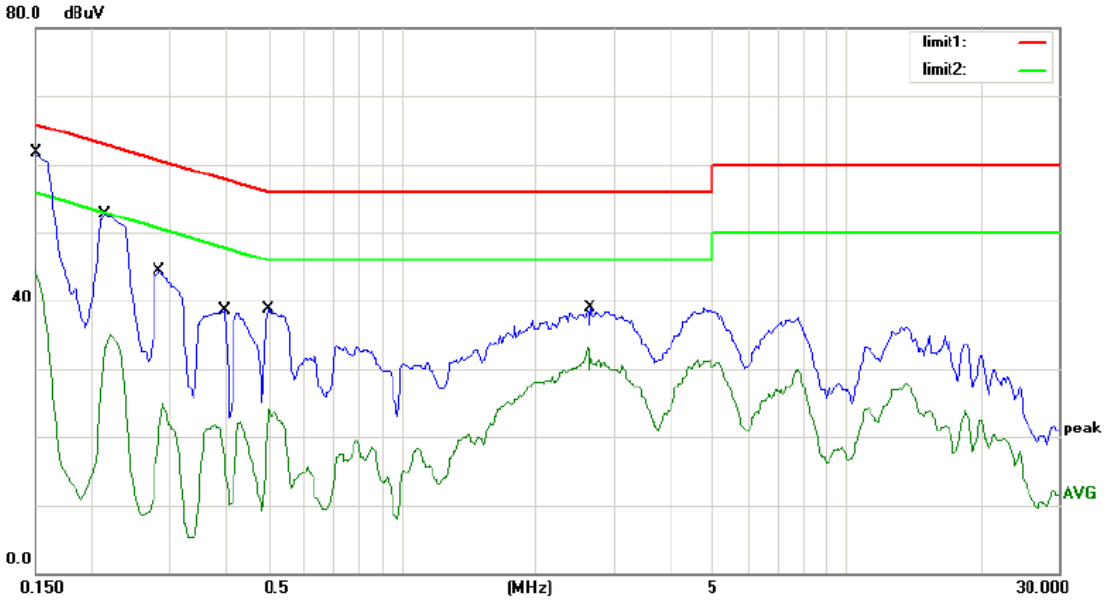
5.4 Measurement Result:



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.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	57.30	0.00	57.30	66.00	-8.70	QP	
2		0.1500	43.81	0.00	43.81	56.00	-12.19	AVG	
3		0.2150	49.60	0.00	49.60	63.01	-13.41	QP	
4		0.2150	35.20	0.00	35.20	53.01	-17.81	AVG	
5		0.2850	40.20	0.00	40.20	60.67	-20.47	QP	
6		0.2850	23.94	0.00	23.94	50.67	-26.73	AVG	
7		0.3871	37.40	0.00	37.40	58.13	-20.73	QP	
8		0.3871	24.10	0.00	24.10	48.13	-24.03	AVG	
9		0.4967	37.50	0.00	37.50	56.06	-18.56	QP	
10		0.4967	26.46	0.00	26.46	46.06	-19.60	AVG	
11		4.5500	35.80	0.00	35.80	56.00	-20.20	QP	
12		4.5500	30.33	0.00	30.33	46.00	-15.67	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 C_QP Power: AC 120V/60Hz Humidity: 55 %
Mode: TX
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1500	58.30	0.00	58.30	66.00	-7.70	QP	
2		0.1500	44.49	0.00	44.49	56.00	-11.51	AVG	
3		0.2150	49.60	0.00	49.60	63.01	-13.41	QP	
4		0.2150	34.45	0.00	34.45	53.01	-18.56	AVG	
5		0.2850	41.30	0.00	41.30	60.67	-19.37	QP	
6		0.2850	23.41	0.00	23.41	50.67	-27.26	AVG	
7		0.4000	35.60	0.00	35.60	57.85	-22.25	QP	
8		0.4000	13.84	0.00	13.84	47.85	-34.01	AVG	
9		0.5000	35.40	0.00	35.40	56.00	-20.60	QP	
10		0.5000	24.10	0.00	24.10	46.00	-21.90	AVG	
11		2.6600	36.70	0.00	36.70	56.00	-19.30	QP	
12		2.6600	31.43	0.00	31.43	46.00	-14.57	AVG	

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

5.5 Conducted Measurement Photos:

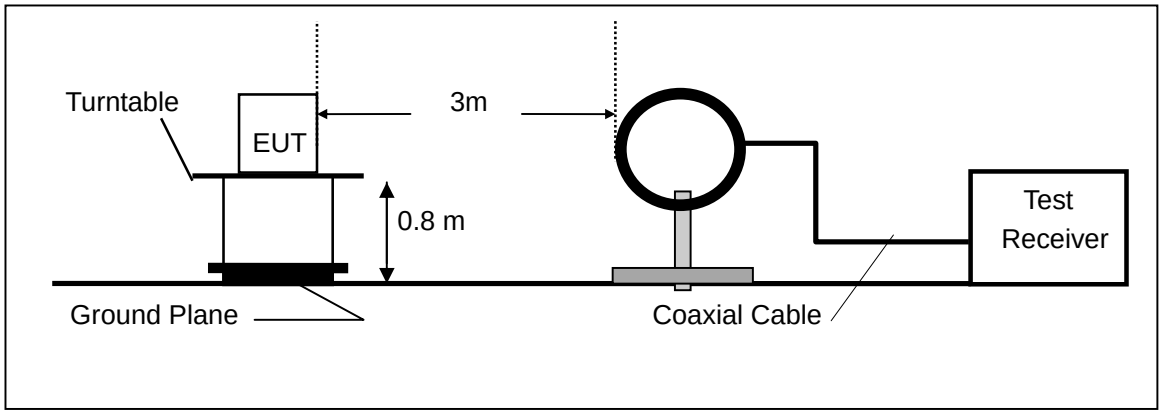
6. Radiated Emission Test

6.1 Measurement Procedure

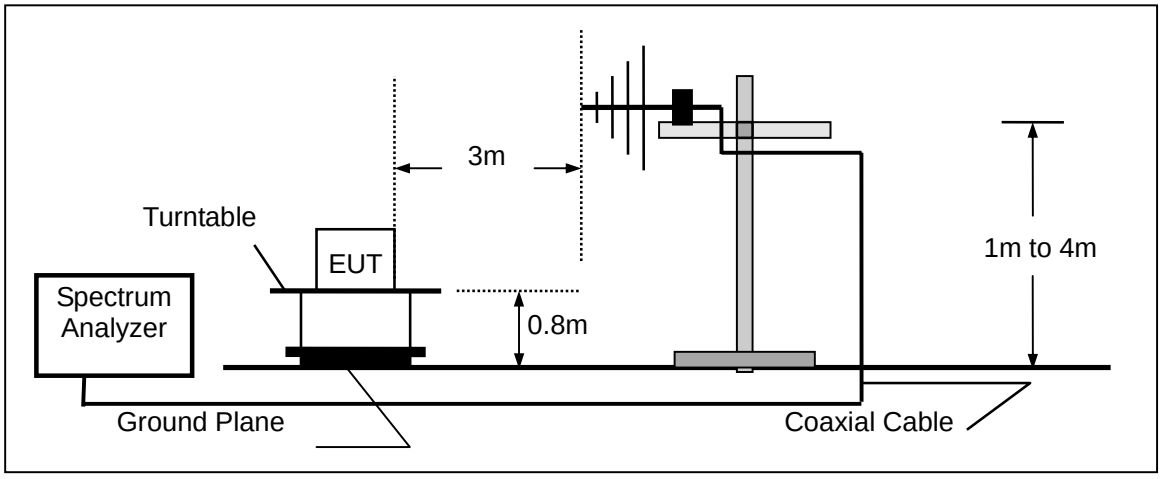
1 The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.
5. For range 9KHz~30MHz, The measured value is really too low to be recorded.

6.2 Test SET-UP (Block Diagram of Configuration)

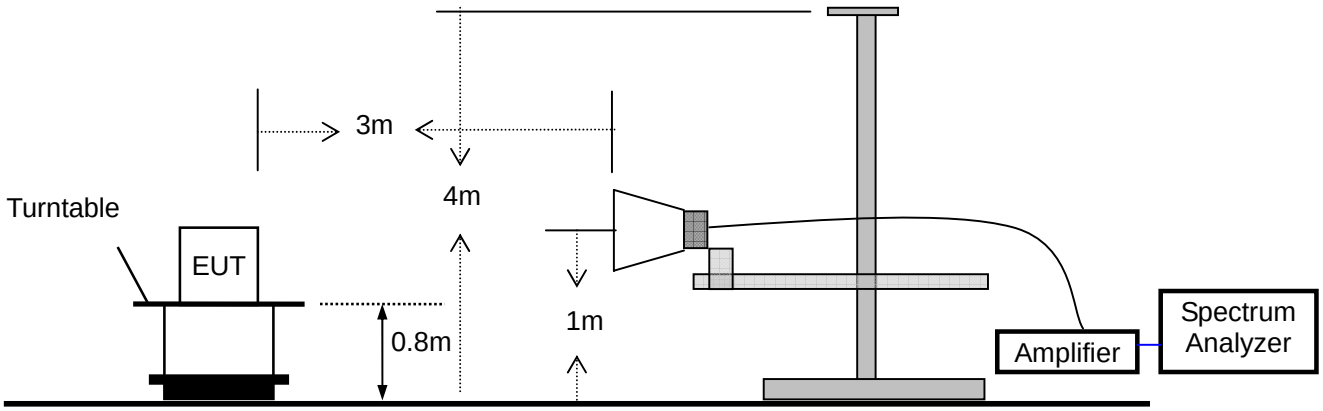
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



6.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2013	05/28/2014
Spectrum Analyzer	HP	E4407B	839840481	05/29/2013	05/28/2014
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/29/2013	05/28/2014
Pre-Amplifier	HP	8447D	2944A07999	05/29/2013	05/28/2014
Bilog Antenna	Schwarzbeck	VULB9163	142	05/29/2013	05/28/2014
Loop Antenna	ARA	PLA-1030/B	1029	05/29/2013	05/28/2014
Horn Antenna	Electro-Metrics	EM-6961	103314	05/29/2013	05/28/2014
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/29/2013	05/28/2014

6.4 Measurement Result

Operation Mode: TX Mode (Lowest Channel: 2405MHz) Test Date : January 07, 2014

Frequency Range: 30~1000MHz Temperature : 25 ℃

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
30.9700	V	34.45	40.00	-5.55	PK
53.2800	V	35.75	40.00	-4.25	PK
62.0100	V	35.38	40.00	-4.62	PK
104.6900	V	32.18	43.50	-11.32	PK
123.1200	V	28.10	43.50	-15.40	PK
159.0100	V	26.82	43.50	-16.68	PK
71.7100	H	24.39	40.00	-15.61	PK
107.6000	H	24.22	43.50	-19.28	PK
143.4900	H	31.45	43.50	-12.05	PK
179.3800	H	29.26	43.50	-14.24	PK
215.2700	H	31.32	43.50	-12.18	PK
294.8100	H	37.97	46.00	-8.03	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 (Middle Channel: 2438MHz)	Test Date :	January 07, 2014
Frequency Range:	30~1000MHz	Temperature :	25 ℃
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
49.1200	V	34.45	40.00	-5.55	PK
89.2500	V	35.35	40.00	-4.65	PK
95.3400	V	35.67	40.00	-4.33	PK
114.6500	V	32.16	43.50	-11.34	PK
133.6700	V	28.87	43.50	-14.63	PK
155.0200	V	26.81	43.50	-16.69	PK
49.7500	H	24.34	40.00	-15.66	PK
127.7600	H	24.27	43.50	-19.23	PK
156.3900	H	31.45	43.50	-12.05	PK
176.7600	H	29.67	43.50	-13.83	PK
205.2400	H	31.13	43.50	-12.37	PK
295.2300	H	37.57	46.00	-8.43	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 (Highest Channel : 2478MHz)	Test Date :	January 07, 2014
Frequency Range:	30~1000MHz	Temperature :	25 ℃
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
49.1700	V	34.12	40.00	-5.88	PK
55.2500	V	35.35	40.00	-4.65	PK
72.4500	V	35.36	40.00	-4.64	PK
104.3400	V	32.15	43.50	-11.35	PK
125.1600	V	28.87	43.50	-14.63	PK
159.7600	V	26.52	43.50	-16.98	PK
71.2300	H	26.67	40.00	-13.33	PK
107.7600	H	24.54	43.50	-18.96	PK
143.2900	H	31.41	43.50	-12.09	PK
179.5600	H	30.64	43.50	-12.86	PK
215.2300	H	35.11	43.50	-8.39	PK
284.5600	H	37.64	46.00	-8.36	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 (Lowest Channel: 2405MHz)	Test Date :	January 07, 2014
Frequency Range:	1-25GHz	Temperature :	25 ℃
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
2405	V	66.45	49.43	74	54	-7.55	-4.57
4810	V	65.41	48.56	74	54	-8.59	-5.44
7215	V	64.54	47.34	74	54	-9.46	-6.66
9620	V	62.34	46.56	74	54	-11.66	-7.44
12025	V	61.42	45.45	74	54	-12.58	-8.55
2405	H	65.26	49.76	74	54	-8.74	-4.24
4810	H	64.45	48.62	74	54	-9.55	-5.38
7215	H	63.34	47.45	74	54	-10.66	-6.55
9620	H	62.12	46.67	74	54	-11.88	-7.33
12025	H	61.65	45.44	74	54	-12.35	-8.56

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 (Middle Channel: 2438MHz)	Test Date :	January 07, 2014
Frequency Range:	1-25GHz	Temperature :	25 ℃
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
2438	V	66.56	49.43	74	54	-7.44	-4.57
4876	V	65.23	48.53	74	54	-8.77	-5.47
7314	V	64.15	47.46	74	54	-9.85	-6.54
9752	V	63.65	46.45	74	54	-10.35	-7.55
12190	V	62.34	45.36	74	54	-11.66	-8.64
2438	H	67.65	48.44	74	54	-6.35	-5.56
4876	H	66.22	47.23	74	54	-7.78	-6.77
7314	H	63.53	46.15	74	54	-10.47	-7.85
9752	H	62.45	45.45	74	54	-11.55	-8.55
12190	H	61.34	44.12	74	54	-12.66	-9.88

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.

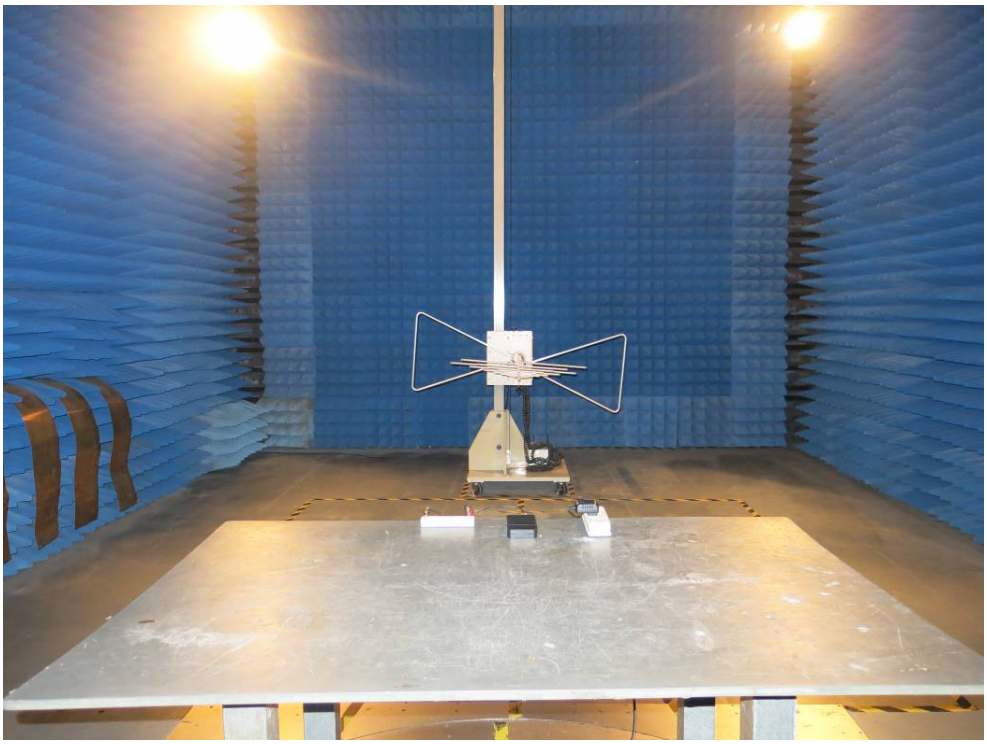
Operation Mode:	TX Mode (Highest Channel: 2478MHz)	Test Date :	January 07, 2014
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Andy

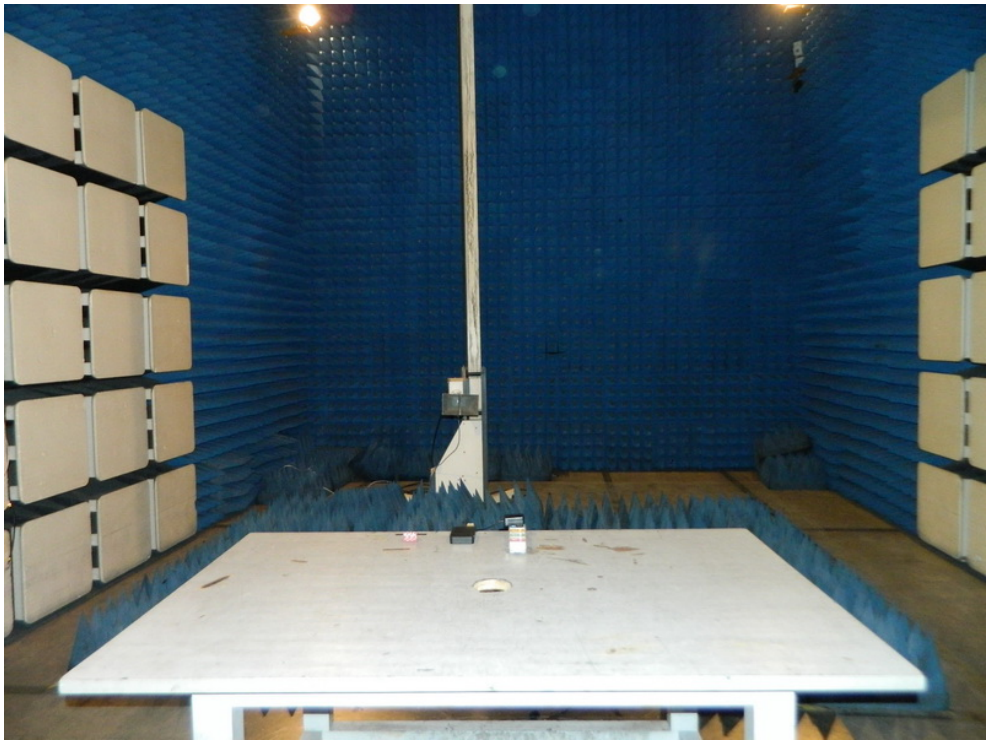
Freq.	Ant. Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
2478	V	67.34	48.34	74	54	-6.66	-5.66
4956	V	66.13	47.56	74	54	-7.87	-6.44
7434	V	65.77	46.22	74	54	-8.23	-7.78
9912	V	64.34	45.56	74	54	-9.66	-8.44
12390	V	62.51	44.34	74	54	-11.49	-9.66
2478	H	66.56	47.45	74	54	-7.44	-6.55
4956	H	64.03	46.34	74	54	-9.97	-7.66
7434	H	63.45	45.67	74	54	-10.55	-8.33
9912	H	62.22	45.24	74	54	-11.78	-8.76
12390	H	61.56	44.45	74	54	-12.44	-9.55

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.

6.5 Radiated Measurement Photos:



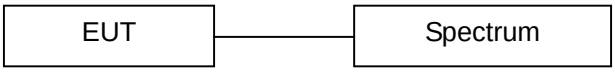


7. Channel Separation test

7.1 Measurement Procedure

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

7.2 Test SET-UP (Block Diagram of Configuration)



7.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

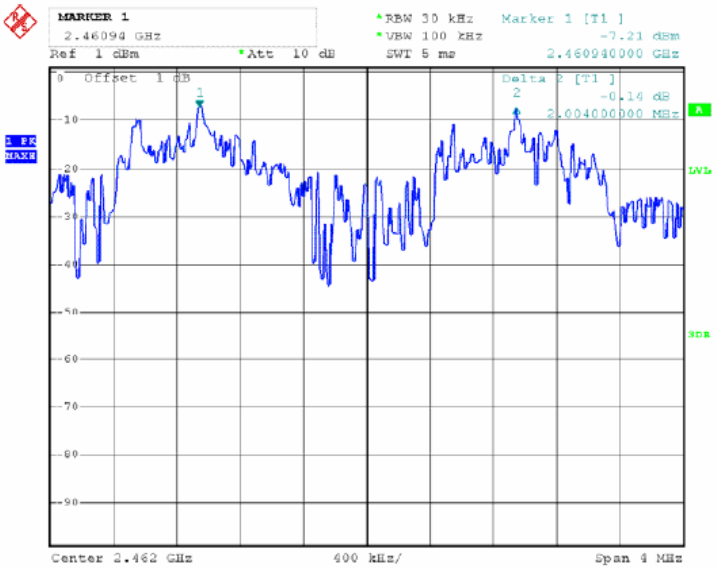
7.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	January 09, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

Channel	frequency (MHz)	Separation Read Value (MHz)	Limit(MHz)	Result
55	2462	2.004	1.513	Pass

Note: The channel 55 was the less spacing with other hopping channel.

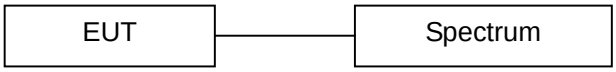


8. 20dB Bandwidth test

8.1 Measurement Procedure

The EUT was operating in hopping 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:

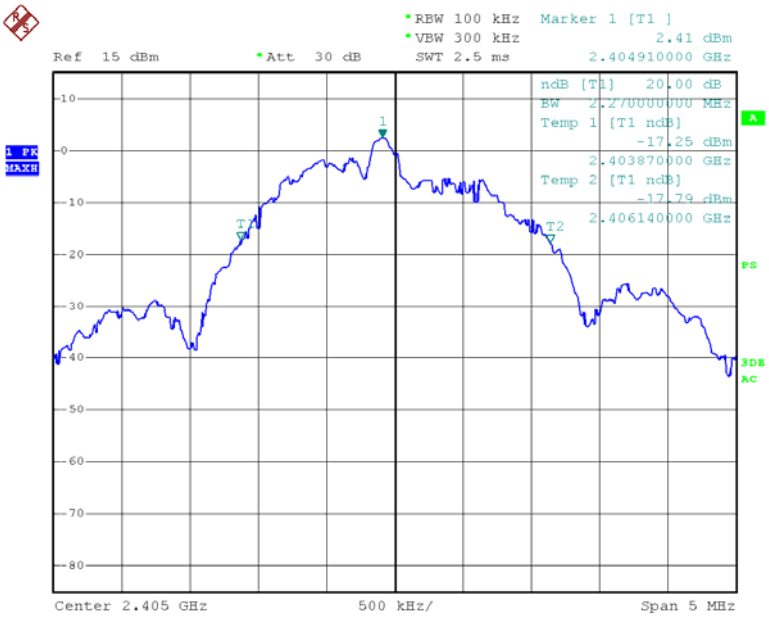
Same as 6.3 Radiated Emission Measurement.

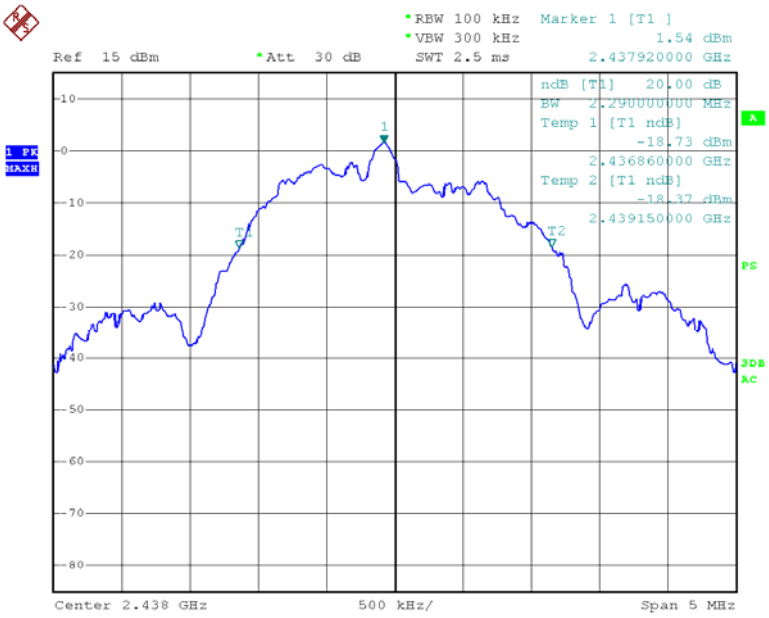
8.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	January 04, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

Test Channel	Channel frequency (MHz)	20dB Down BW(kHz)
Lowest	2405	2270
Middle	2438	2290
Highest	2478	2290


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
2.41 dBm
2.404910000 GHz
Ref 15 dBm
Att 30 dB
ndB [T1] 20.00 dB
BW 2.270000000 MHz
Temp 1 [T1 ndB]
-17.25 dBm
2.403870000 GHz
Temp 2 [T1 ndB]
-17.79 dBm
2.406140000 GHz
Center 2.405 GHz
500 kHz/
Span 5 MHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
1.54 dBm
2.437920000 GHz
Ref 15 dBm
Att 30 dB
ndB [T1] 20.00 dB
BW 2.290000000 MHz
Temp 1 [T1 ndB]
-18.73 dBm
2.436860000 GHz
Temp 2 [T1 ndB]
-18.37 dBm
2.439150000 GHz
Center 2.438 GHz
500 kHz/
Span 5 MHz

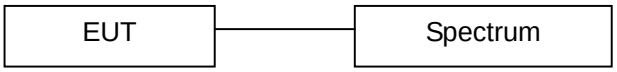

RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Marker 1 [T1]
0.91 dBm
2.477920000 GHz
Ref 15 dBm
Att 30 dB
ndB [T1] 20.00 dB
BW 2.290000000 MHz
Temp 1 [T1 ndB]
-19.56 dBm
2.476870000 GHz
Temp 2 [T1 ndB]
-19.22 dBm
2.479160000 GHz
1 PK MAXH
-10
-0
-10
-20
-30
-40
-50
-60
-70
-80
T1
T2
1
A
PS
3DB
AC
Center 2.478 GHz
500 kHz/
Span 5 MHz

9. Quantity of Hopping Channel Test

9.1 Measurement Procedure

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

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used:

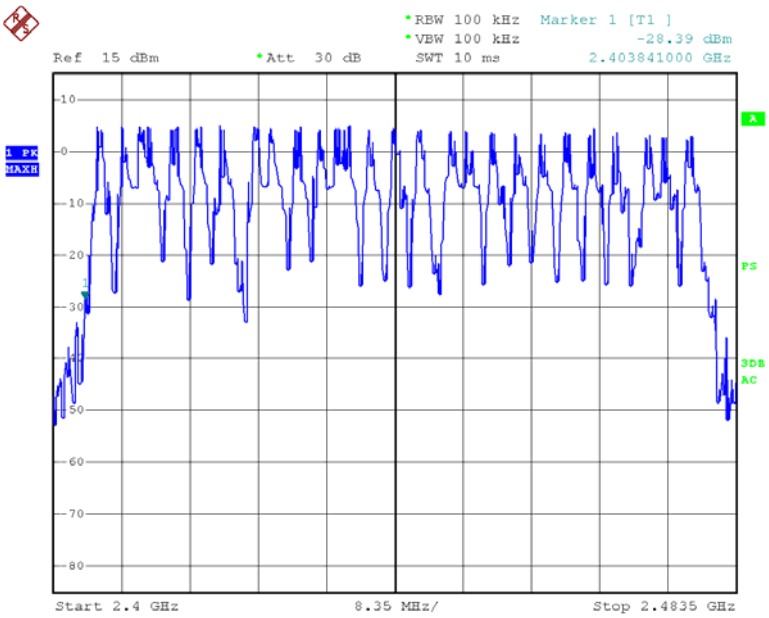
Same as 6.3 Radiated Emission Measurement.

9.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	September 12, 2013
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel
2405-2478	26	＞15



10. Time of Occupancy (Dwell Time) test

10.1 Test Description

The Equipment Under Test (EUT) was set up to perform the dwell time measurements. The EUT was connected to the spectrum analyzer via a short coax cable.

10.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6seconds.Refer to attached data chart.

10.3 Test Protocol

During each transmission, only 26 channels will be used.
Observe time=26 channels*0.4s=10.4
Figure 1(Refer to next page) for shows One pulse=0.244ms
Figure 2(Refer to next page) for shows 10 pulse within 100ms
Therefore, the average channel occupancy times(ms):
Dwell Time=26*0.4*10*10*0.244ms=253.76ms
So, total transmitting time is 0.254s (<0.4s).

Channel Frequency	Time slot length(ms)	Dwell time (s)	Limit (s)	Result
2405	0.244	0.254	0.4	Pass

10.4 Test result: Dwell time

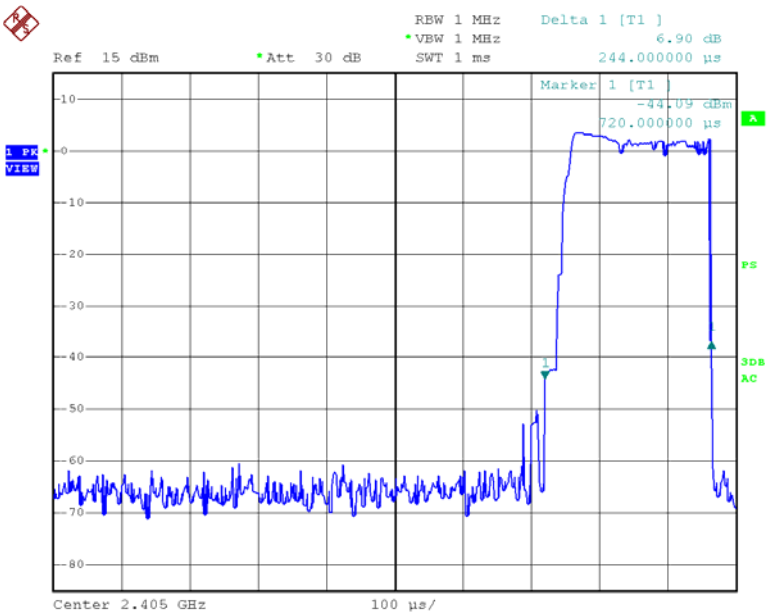


Figure 1

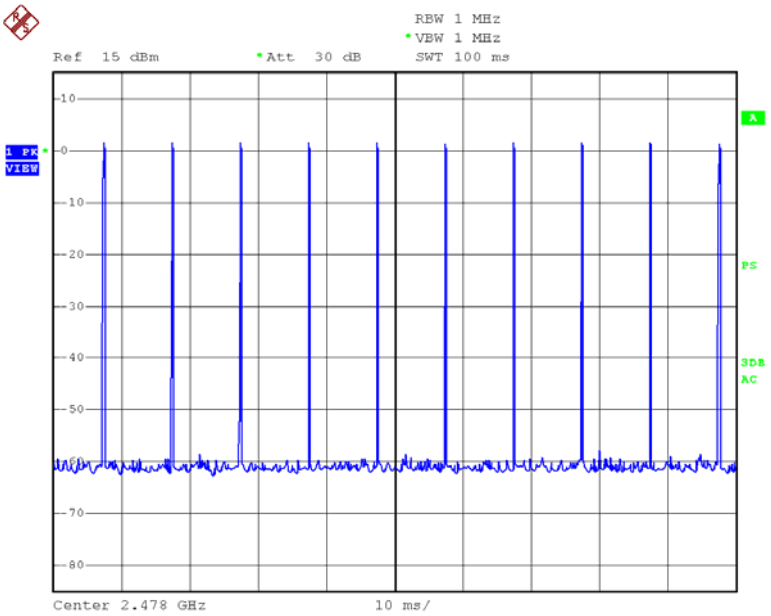


Figure 2

11. M AX IMUM PEAK OUTPUT POWER TEST

11.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.

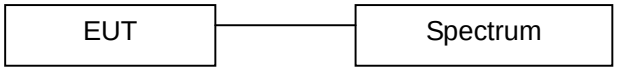
b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

11.2 Test SET-UP (Block Diagram of Configuration)



11.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSP7	839511/010	05/29/2013	05/28/2014

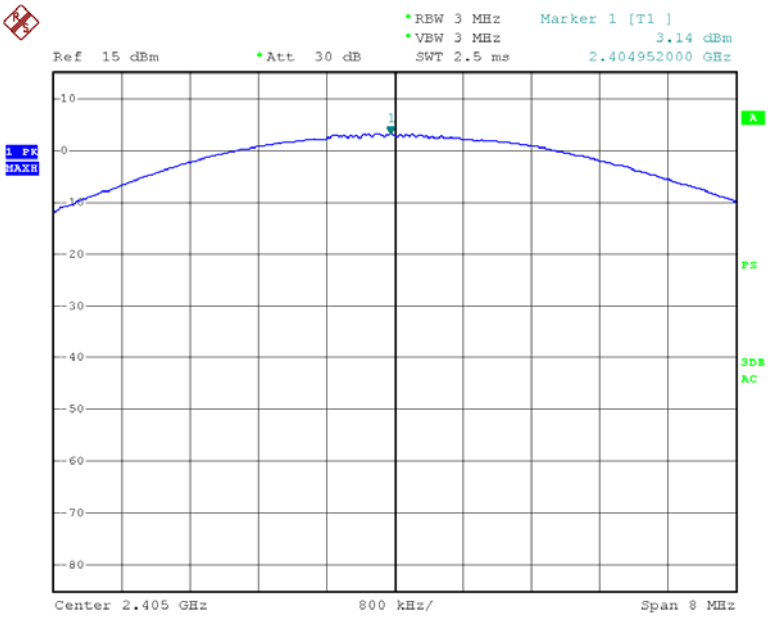
11.4Measurement Results:

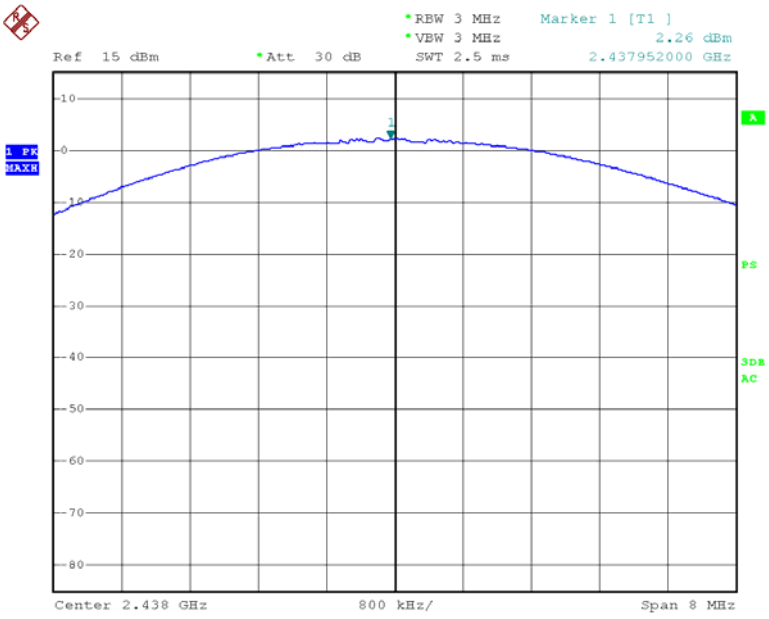
Refer to attached data chart.

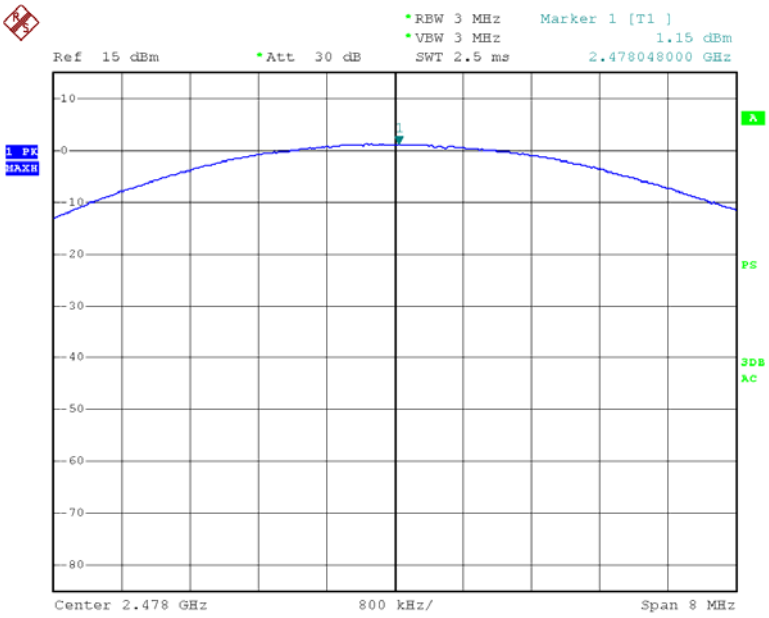
Spectrum Detector:	PK	Test Date :	January 07, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

Test Channel	Channel Frequency (MHz)	Peak Power output(mW)	Peak Power output(dBm)	Peak Power Limit(mW)	Pass/Fail
Lowest	2405	**2.061**	**3.14**	125	PASS
Middle	2438	1.683	2.26	125	PASS
Highest	2478	1.303	1.15	125	PASS

Test Plot:




RBW 3 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
2.26 dBm
2.437952000 GHz
Ref 15 dBm
Att 30 dB
1 PK
MAXH
A
PS
3DB
AC
Center 2.438 GHz
800 kHz/
Span 8 MHz


RBW 3 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
1.15 dBm
2.478048000 GHz
Ref 15 dBm
Att 30 dB
1 PK
MAXH
A
PS
3DB
AC
Center 2.478 GHz
800 kHz/
Span 8 MHz

12. Band EDGE test

12.1 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.

12.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Set-up.

12.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

12.4Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	January 07, 2014
Test By:	Andy	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

1. Conducted Test

For Non-Hopping Mode:

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	2.18	-47.48	49.66	>20dBc
>2483.5	0.11	-42.90	43.01	>20dBc

For Hopping Mode:

Frequency (MHz)	Peak Power Output(dBm)	Emission read Value(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
<2400	4.35	-45.96	50.31	>20dBc
>2483.5	2.00	-46.67	48.67	>20dBc

2. Radiated emission Test

For Non-Hopping Mode:

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	V	51.34	38.52	74.00	54.00
	H	52.39	37.46	74.00	54.00
>2483.5	V	49.76	36.56	74.00	54.00
	H	50.34	35.48	74.00	54.00

For Hopping Mode:

Frequency (MHz)	Antenna polarization (H/V)	Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV
<2400	V	51.04	37.24	74.00	54.00
	H	50.47	36.94	74.00	54.00
>2483.5	V	52.67	39.54	74.00	54.00
	H	53.17	37.26	74.00	54.00

13. Antenna Application

13.1 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 2405-2478MHz 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.

13.2 Result

The EUT's antenna used a PCB antenna. The antenna's gain is 2dBi and meets the requirement.

14. 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**

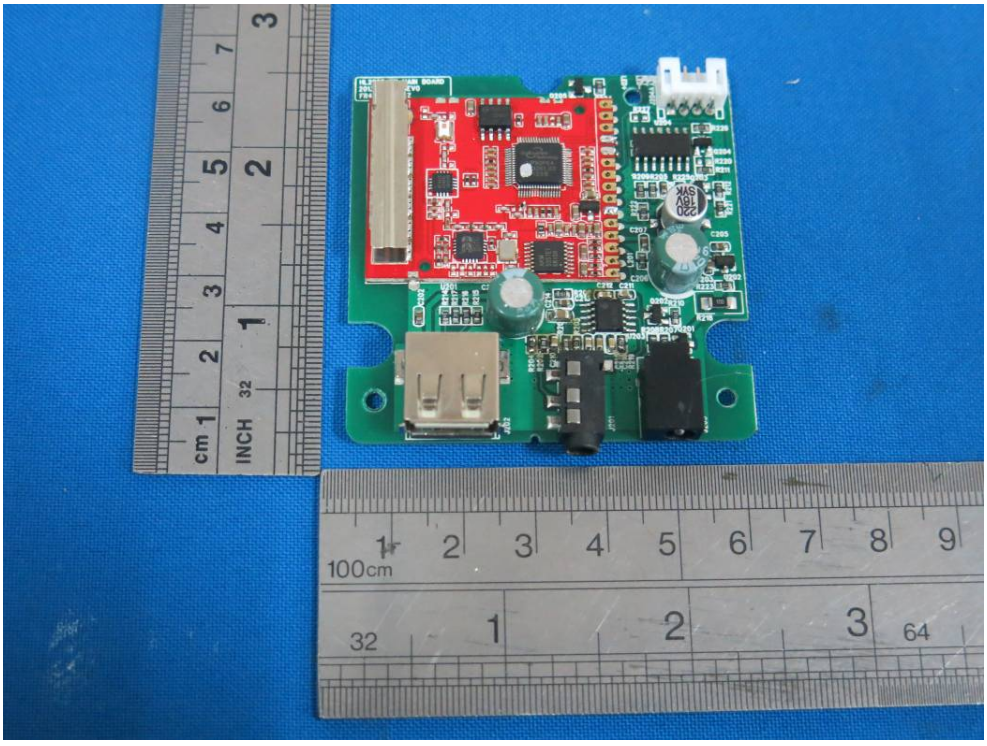
14.1 Friis transmission formula: Pd=(Pout*G)\(4*pi*R2)

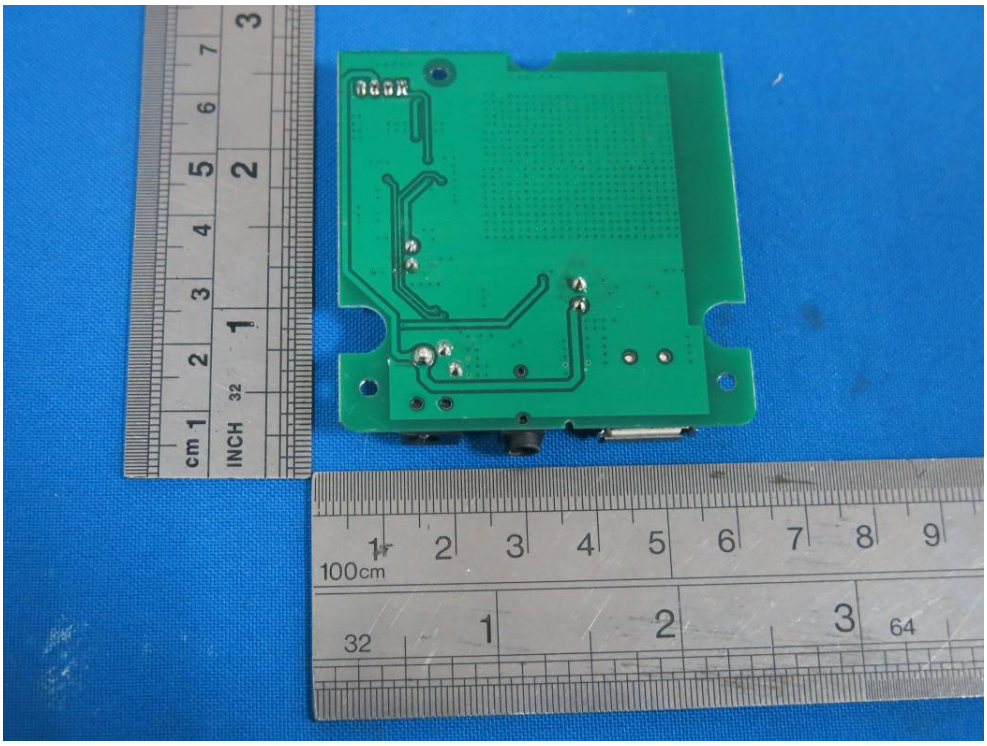
Where
Pd= Power density in mW/cm2
Pout=output power to antenna in Mw
G= gain of antenna in linear scale
Pi=3.1416
R= distance between observation point and center of the radiator in cm
Pd the limit of MPE, 1mW/cm2. If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

14.2 Measurement Result.

Test Channel	Channel Frequency (MHz)	Output Peak power (mW)	Antenna Gain (dBi)	Power density at 20cm (mW/ cm2)	Power density Limits (mW/cm^2)
Lowest	2405	2.061	2	0.000649885	1
Middle	2438	1.683	2	0.000530692	1
Highest	2478	1.303	2	0.000410868	1

APPENDIX I
(Photos of EUT)




cm 1
INCH 32
100cm
32
64