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

OF

Bluetooth Keyboard

MODEL No.: 44041

FCC ID: 2AAOE13BW05003

REPORT NO: EN130716060F

ISSUE DATE: August 03, 2013

Prepared for

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Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	Shenzhen B&W Electronics Development Limited 4/F, No.2 Building, Guangxi Industrial Park, West of Jianshe Road, Longhua Town, Shenzhen City, China
Manufacturer:	Shenzhen B&W Electronics Development Limited 4/F, No.2 Building, Guangxi Industrial Park, West of Jianshe Road, Longhua Town, Shenzhen City, China
Product Description:	Bluetooth Keyboard
Brand Name:	N/A
Model Number:	44041
File Number:	EN130603007F
Date of Test:	July 25, 2013 to J August 02, 2013

We hereby certify that:

The above equipment was tested by NINGBO 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.

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

Approved By

Andy.wang/Manager
NINGBO EMTEK CO., LTD.

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1. General Information

1.1 Product Description

Shenzhen B&W Electronics Development Limited
Model: 44041 (referred to as the EUT in this report) The EUT (Bluetooth Keyboard) is an short range, lower power Device. It is designed by way of utilizing the GFSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 2402-2480MHz
B). Modulation: GFSK
C). Number of Channel: 79
D). Channel Space: 1MHz
E). BIT Rate of Transmission: 1Mbps
F). Antenna Type: Internal PCB antenna
G). Antenna Gain: 0dBi
H). Power Supply: DC 5V, Batery: DC 3.7V

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AAOE13BW05003 filing to comply with Section 15.247 of the FCC Part 15 Subpart C Rules.

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, June 14, 2011
The Certificate Registration Number is 463622.

Accredited by Industry Canada, May 2, 2011
The Certificate Registration Number is 46405-9469..

Name of Firm : NINGBO EMTEK CO., LTD.
Site Location : 1F Building 4, 1177#, Lingyun Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang, China

9kHz~26GHz Radiated emission item Subcontracted in Shenzhen Emtek:
EMC Lab. The Certificate Registration Number is 709623.
Name of Firm : SHENZHEN EMTEK CO., LTD.
Site Location : Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, 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 13.3 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 hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.4 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 20dB 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 >250 kHz	20dB bandwidth <1MHz	20dB bandwidth >1M Hz
902-928	50	25	NA	NA
2400-2483.5	NA	NA	75	15
5725-5850	NA	NA	75	NA

(4) Time of Occupancy(Dwell Time)

FCC Part 15, Subpart C Section 15.247

Frequency Range (MHz)	20dB bandwidth <250kHz(50Channel)	LIMIT(rms) 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	2400/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.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB); Limit line=Specific limits(dBuV) + distance extrapolation factor.

2.5 Configuration of Tested System

2.6 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
1.	Bluetooth Keyboard	N/A	44041	2AAOE13BW05003	N/A	EUT
2.	PC	Lenovo	ThinkCentre M6100t	N/A	EA05545184	/
3.	Mouse	Lenovo	M-UAE119	N/A	LZ10933003P	/
4.	Keyboard	Lenovo	LXB-JME7155P	N/A	OC011405	/

Note:

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

2.7 Description of Test Modes

The EUT (Bluetooth Keyboard) has been tested under normal operating condition. This EUT is a FHSS system. Pre-scanned tests, were conducted to determine the final configuration from all possible combinations. We use blue test to control the EUT, Let EUT hopping on and transmit with highest power, All the modes have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test

Channel	Frequency(MHz)
Low channel	2402
Middle channel	2441
High channel	2480

3. Summary of Test Results

FCC Rules	Description Of Test	Result
FCC Part 15.247(a)(1)	Channel Separation Test	Compliant
FCC Part 15.247(a)(1)	20dB Bandwidth	Compliant
FCC Part 15.247(a)(1)	Quantity of Hopping Channel	Compliant
FCC Part 15.247(a)(1)	Time of Occupancy (Dwell Time)	Compliant
FCC Part 15.247(b)	Max Peak Output Power Test	Compliant
FCC Part 15.247(d)	Band Edge Test	Compliant
FCC Part 15.207	Conducted Emission	Compliant
FCC Part 15.247(d)&15.209	Radiated Emission	Compliant
FCC Part 15.247(d)	Antenna Port Emission	Compliant
FCC Part 15.203&15.247(b)	Antenna Requirement	Compliant

4. Conducted Emissions Test

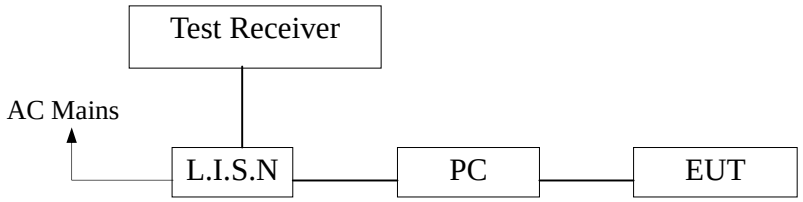
4.1 Measurement Procedure

1.The EUT was placed on a table which is 0.8m above ground plane.

2.Maximum procedure was performed on the three highest emissions to ensure EUT compliance.

3. Repeat above procedures until all frequency measured were complete.

4.2 Test SET-UP (Block Diagram of Configuration)



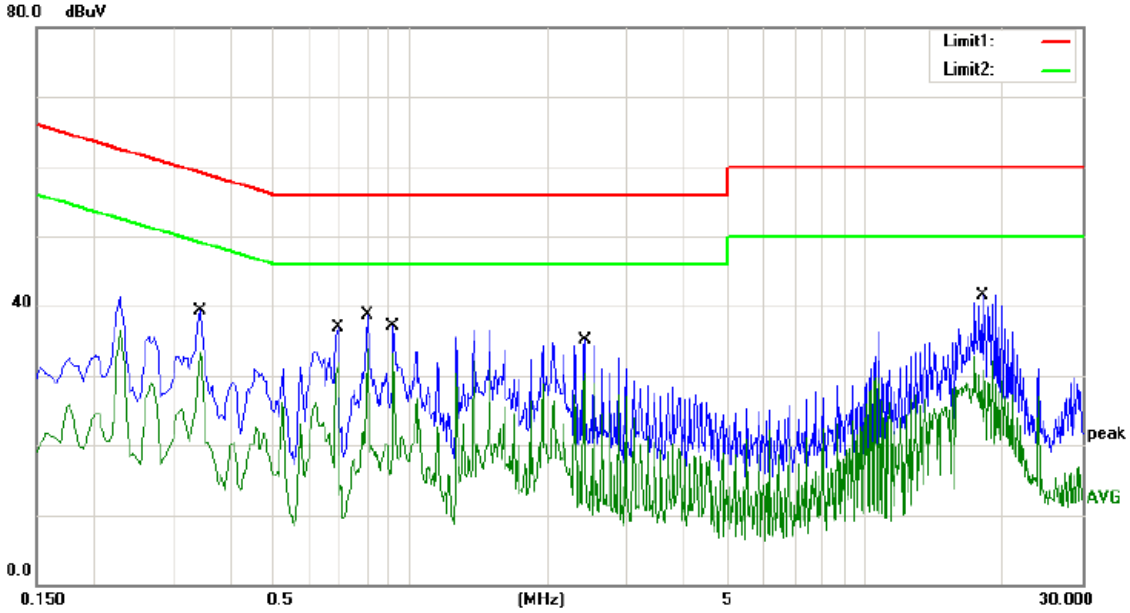
4.3 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Test Receiver	Rohde & Schwarz	ESCI	101108	08/02/2013	08/01/2014
L.I.S.N	Rohde & Schwarz	ENV216	101193	08/02/2013	08/01/2014
L.I.S.N	Schwarzbeck	NSLK 8126	8126-462	08/02/2013	08/01/2014
Pulse Limiter	MTS-systemtechnik	IMP-136	2611115-00 1-0033	08/02/2013	08/01/2014

4.4 Measurement Equipment Used

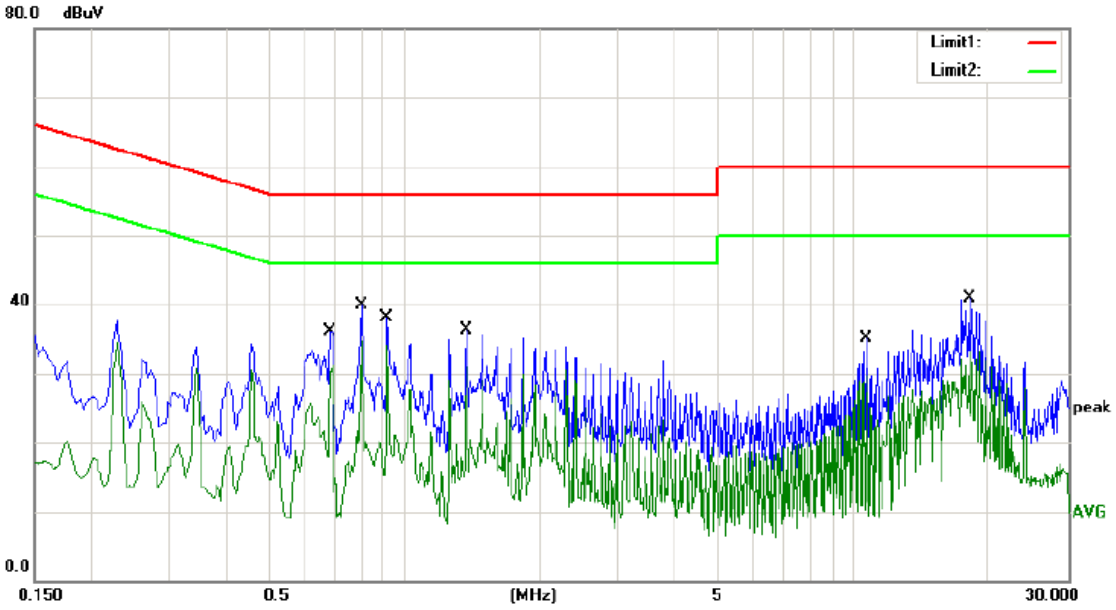
Pass.
Please refer to the following data.

Charging Mode



Site site #1 Phase: N Temperature: 20
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 55 %
Mode: Charging
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3460	28.30	11.00	39.30	59.06	-19.76	QP	
2		0.3460	22.30	11.00	33.30	49.06	-15.76	AVG	
3		0.6900	25.90	11.00	36.90	56.00	-19.10	QP	
4		0.6940	13.50	11.00	24.50	46.00	-21.50	AVG	
5		0.8060	27.70	11.00	38.70	56.00	-17.30	QP	
6		0.8060	21.80	11.00	32.80	46.00	-13.20	AVG	
7		0.9180	26.10	11.00	37.10	56.00	-18.90	QP	
8	*	0.9180	22.10	11.00	33.10	46.00	-12.90	AVG	
9		2.4100	24.00	11.00	35.00	56.00	-21.00	QP	
10		2.4100	5.60	11.00	16.60	46.00	-29.40	AVG	
11		18.0840	30.50	11.00	41.50	60.00	-18.50	QP	
12		18.0840	12.50	11.00	23.50	50.00	-26.50	AVG	



Site site #1 Phase: L1 Temperature: 20
Limit: (CE)FCC PART 15 class B_QP Power: AC 120V/60Hz Humidity: 55 %
Mode: Charging
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.6860	25.00	11.00	36.00	56.00	-20.00	QP	
2		0.6860	19.30	11.00	30.30	46.00	-15.70	AVG	
3		0.8020	28.80	11.00	39.80	56.00	-16.20	QP	
4		0.8020	21.40	11.00	32.40	46.00	-13.60	AVG	
5		0.9180	27.00	11.00	38.00	56.00	-18.00	QP	
6	*	0.9180	23.10	11.00	34.10	46.00	-11.90	AVG	
7		1.3740	25.30	11.00	36.30	56.00	-19.70	QP	
8		1.3740	19.90	11.00	30.90	46.00	-15.10	AVG	
9		10.6600	24.00	11.00	35.00	60.00	-25.00	QP	
10		10.6800	0.40	11.00	11.40	50.00	-38.60	AVG	
11		18.0840	29.80	11.00	40.80	60.00	-19.20	QP	
12		18.0840	13.70	11.00	24.70	50.00	-25.30	AVG	

5. Radiated Emission Test

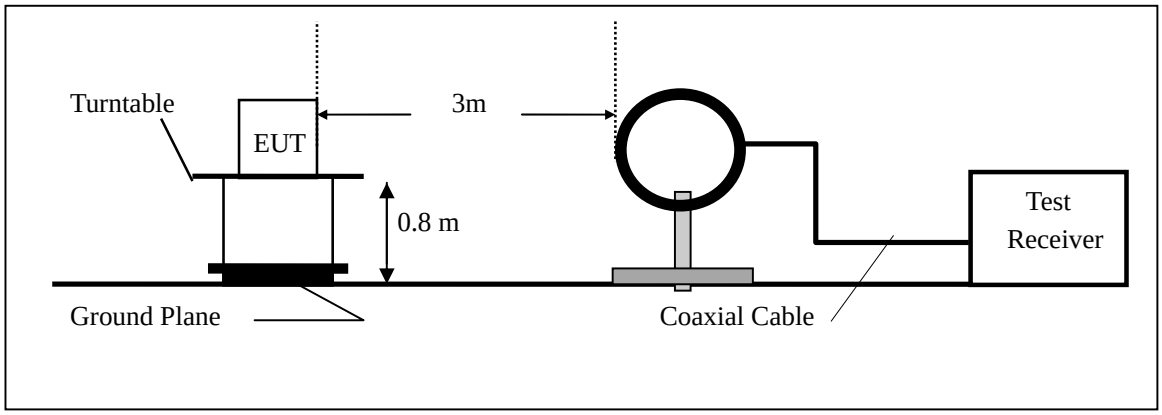
5.1 Measurement Procedure

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 was complete.

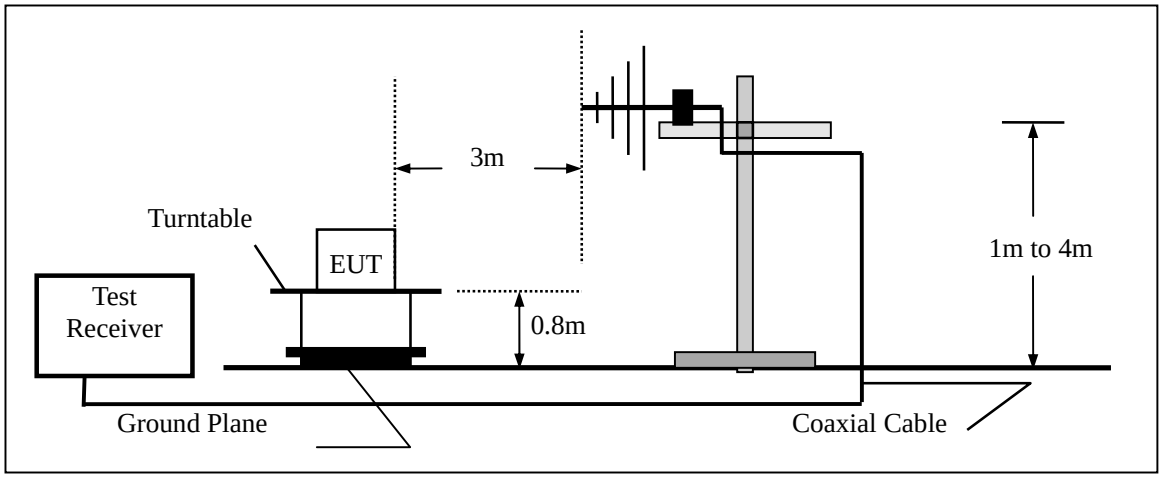
When spectrum scanned from 30 MHz to 1GHz setting resolution bandwidth 100 kHz and video bandwidth 300kHz. And spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz.

5.2 Test SET-UP (Block Diagram of Configuration)

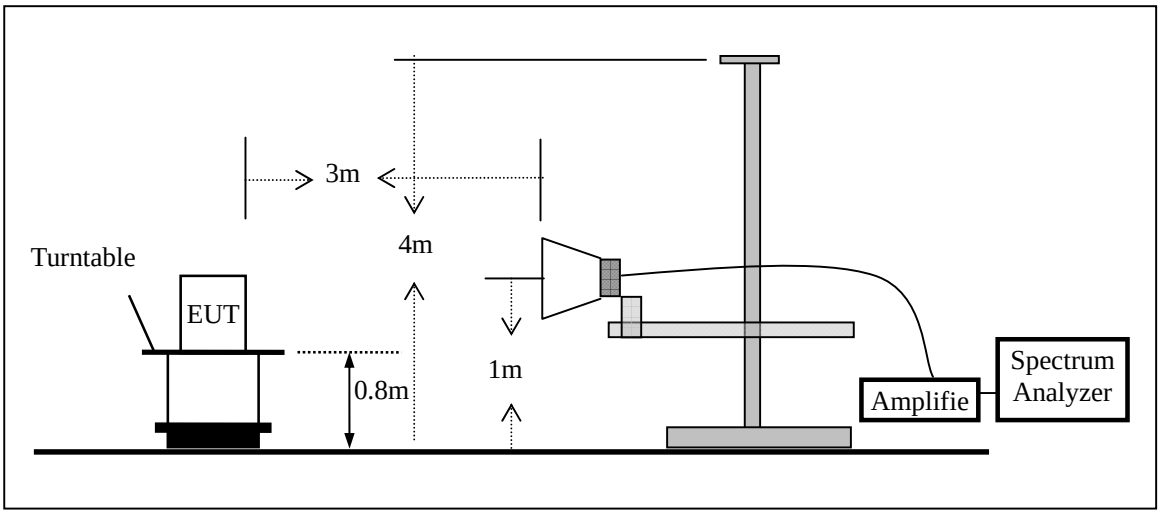
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



5.3 Measurement Equipment Used

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/29/2013	1 Year
2.	Pre-Amplifier	HP	8447D	2944A07999	05/29/2013	1 Year
3.	Pre-Amplifier	A.H.	PAM-0126	1415261	05/29/2013	1 Year
4.	Bilog Antenna	Schwarzbeck	VULB9163	142	05/29/2013	1 Year
5.	Loop Antenna	Schwarzbeck	FMZB 1519	1519-012	05/29/2013	1 Year
6.	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/29/2013	1 Year
7.	Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/29/2013	1 Year
8.	Cable	Schwarzbeck	AK9513	ACRX1	05/29/2013	1 Year
9.	Cable	Rosenberger	N/A	FP2RX2	05/29/2013	1 Year
10.	Cable	Schwarzbeck	AK9513	CRPX1	05/29/2013	1 Year
11.	Cable	Schwarzbeck	AK9513	CRRX2	05/29/2013	1 Year

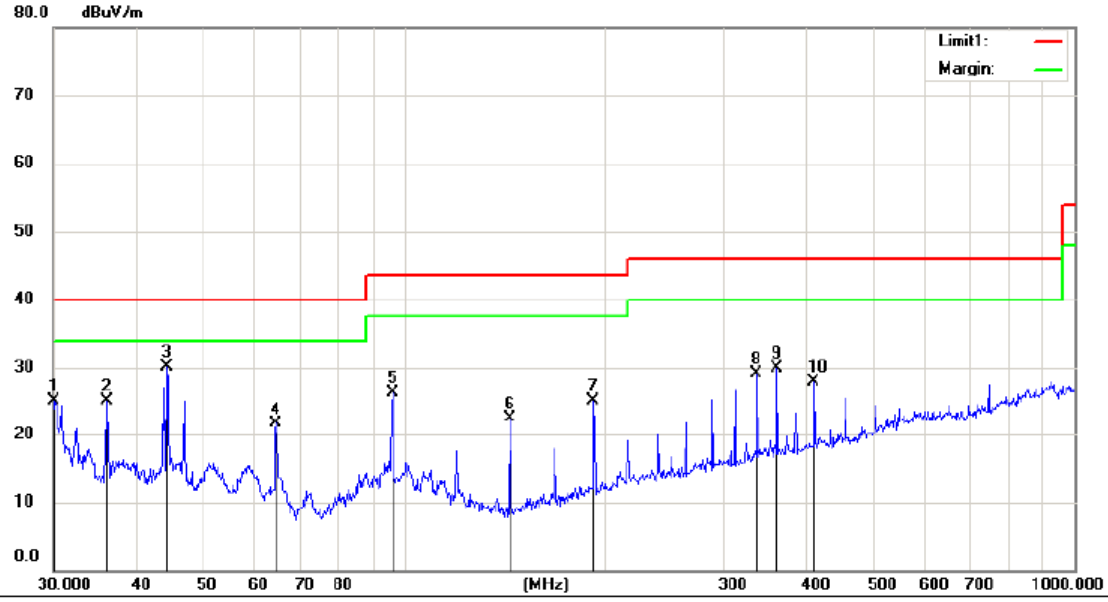
5.4 Measurement Result

(For range 9KHz~30MHz, The measured value is really too low to be recorded.)

Below 1000MHz:

Please refer to the following data.

Low channel



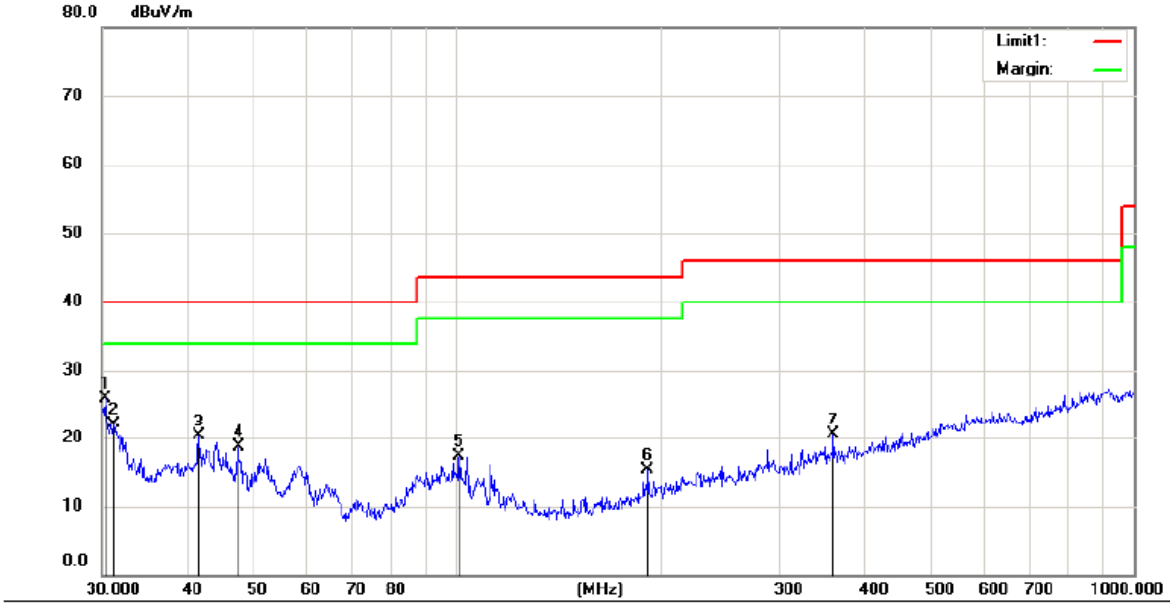
Site site #1 Polarization: *Horizontal* Temperature: 20 C

Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:GFSK, Low

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	Comment
1		30.0000	46.60	-21.58	25.02	40.00	-14.98	QP			
2		36.1272	46.53	-21.51	25.02	40.00	-14.98	QP			
3	*	44.2752	50.88	-20.72	30.16	40.00	-9.84	QP			
4		64.4331	44.82	-23.20	21.62	40.00	-18.38	QP			
5		96.0986	47.11	-20.88	26.23	43.50	-17.27	QP			
6		143.8295	47.52	-24.97	22.55	43.50	-20.95	QP			
7		191.7450	46.88	-21.80	25.08	43.50	-18.42	QP			
8		336.0352	45.96	-16.80	29.16	46.00	-16.84	QP			
9		360.4476	46.02	-16.18	29.84	46.00	-16.16	QP			
10		408.9460	42.87	-15.04	27.83	46.00	-18.17	QP			



Site site #1 Polarization: *Vertical* Temperature: 20 C

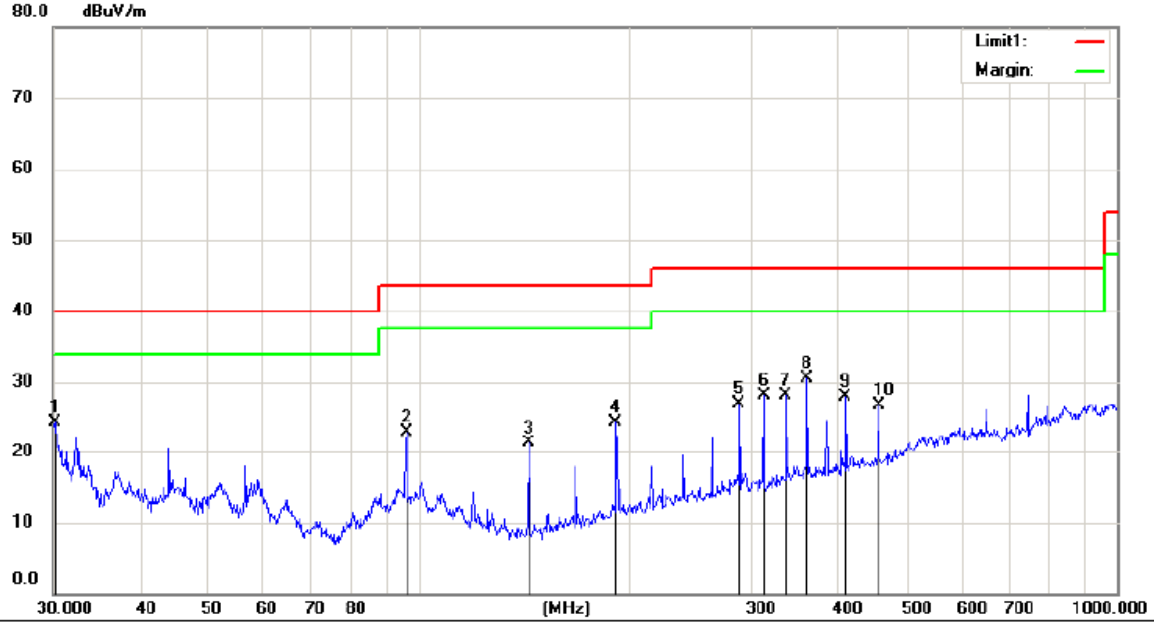
Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:GFSK, Low

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	Comment
1	*	30.3173	47.59	-21.59	26.00	40.00	-14.00	QP			
2		31.1798	43.83	-21.63	22.20	40.00	-17.80	QP			
3		41.7130	41.00	-20.67	20.33	40.00	-19.67	QP			
4		47.6586	39.70	-20.93	18.77	40.00	-21.23	QP			
5		100.9340	38.22	-20.87	17.35	43.50	-26.15	QP			
6		191.7450	37.06	-21.80	15.26	43.50	-28.24	QP			
7		360.4476	36.70	-16.18	20.52	46.00	-25.48	QP			

High channel



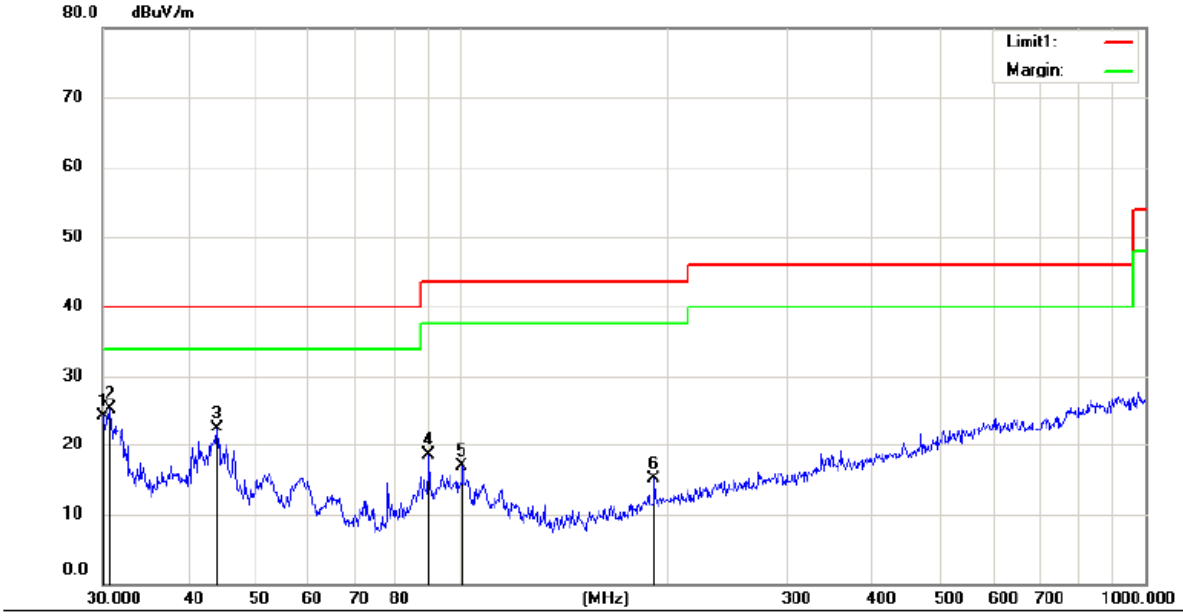
Site site #1 Polarization: *Horizontal* Temperature: 20 C

Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:GFSK, High

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	Comment
1		30.2111	45.93	-21.59	24.34	40.00	-15.66	QP			
2		96.0986	43.78	-20.88	22.90	43.50	-20.60	QP			
3		143.8295	46.31	-24.97	21.34	43.50	-22.16	QP			
4		191.7450	46.03	-21.80	24.23	43.50	-19.27	QP			
5		287.9904	45.19	-18.32	26.87	46.00	-19.13	QP			
6		312.1794	45.85	-17.70	28.15	46.00	-17.85	QP			
7		336.0352	44.95	-16.80	28.15	46.00	-17.85	QP			
8	*	360.4476	46.71	-16.18	30.53	46.00	-15.47	QP			
9		408.9460	42.94	-15.04	27.90	46.00	-18.10	QP			
10		455.9058	40.92	-14.13	26.79	46.00	-19.21	QP			



Site site #1 Polarization: *Vertical* Temperature: 20 C

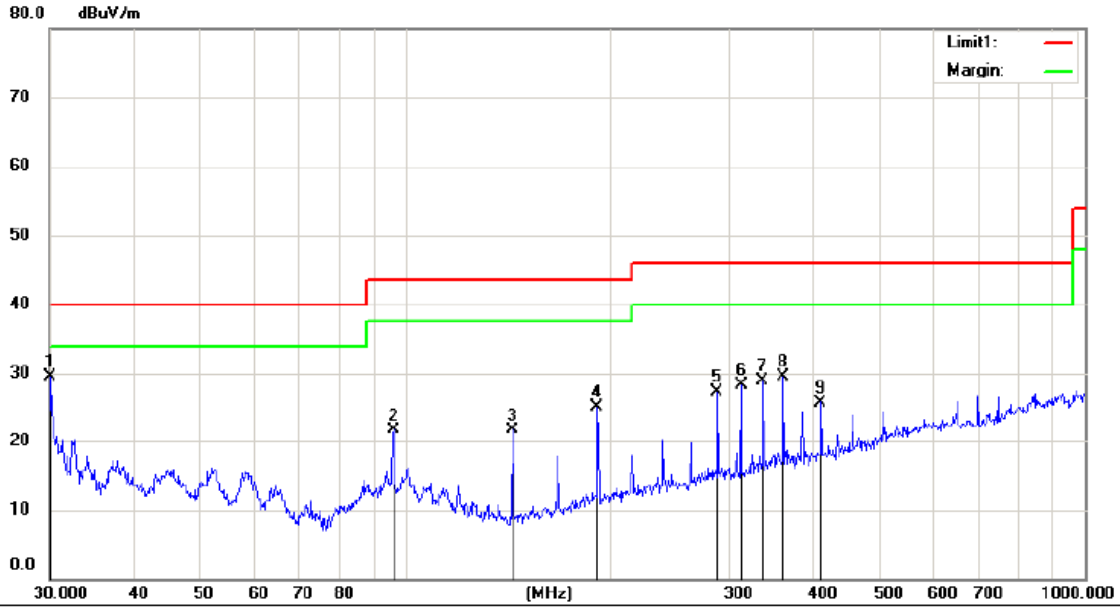
Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:GFSK, High

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	Comment
1		30.0000	45.84	-21.58	24.26	40.00	-15.74	QP			
2	*	30.7455	46.99	-21.60	25.39	40.00	-14.61	QP			
3		44.1202	43.24	-20.73	22.51	40.00	-17.49	QP			
4		89.9047	40.22	-21.66	18.56	43.50	-24.94	QP			
5		100.5806	37.70	-20.84	16.86	43.50	-26.64	QP			
6		191.7450	37.00	-21.80	15.20	43.50	-28.30	QP			

Middle channel



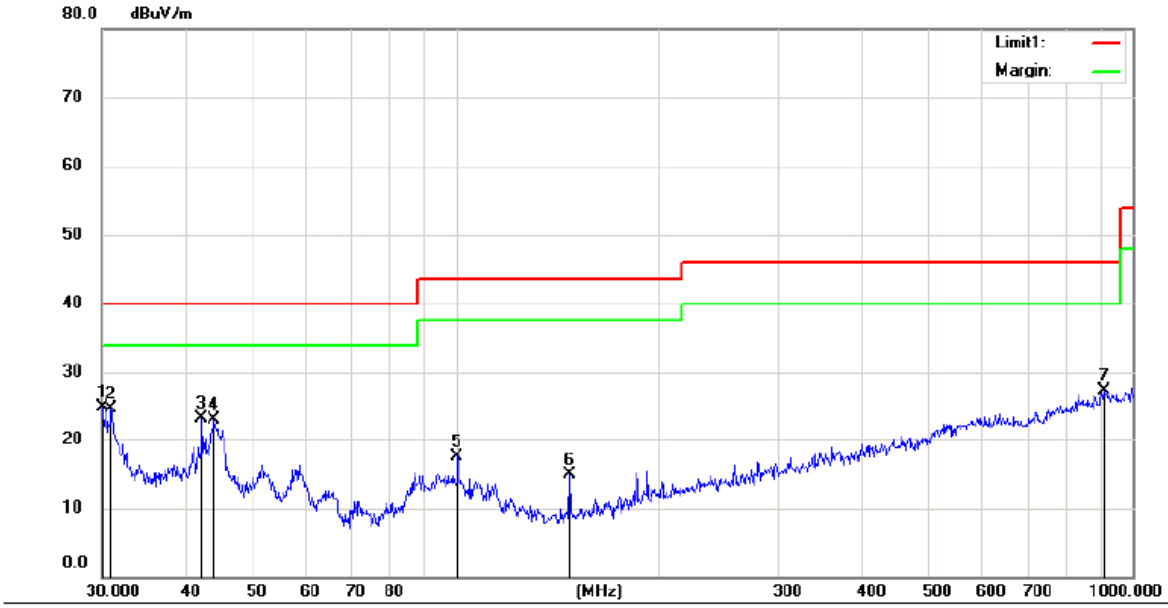
Site site #1 Polarization: *Horizontal* Temperature: 20 C

Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:GFSK, Mid

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	Comment
1	*	30.1054	51.10	-21.58	29.52	40.00	-10.48	QP			
2		96.0986	42.52	-20.88	21.64	43.50	-21.86	QP			
3		143.8295	46.64	-24.97	21.67	43.50	-21.83	QP			
4		191.7450	46.93	-21.80	25.13	43.50	-18.37	QP			
5		287.9904	45.57	-18.32	27.25	46.00	-18.75	QP			
6		312.1794	46.01	-17.70	28.31	46.00	-17.69	QP			
7		336.0352	45.63	-16.80	28.83	46.00	-17.17	QP			
8		360.4476	45.72	-16.18	29.54	46.00	-16.46	QP			
9		408.9460	40.84	-15.04	25.80	46.00	-20.20	QP			



Site site #1 Polarization: *Vertical* Temperature: 20 C

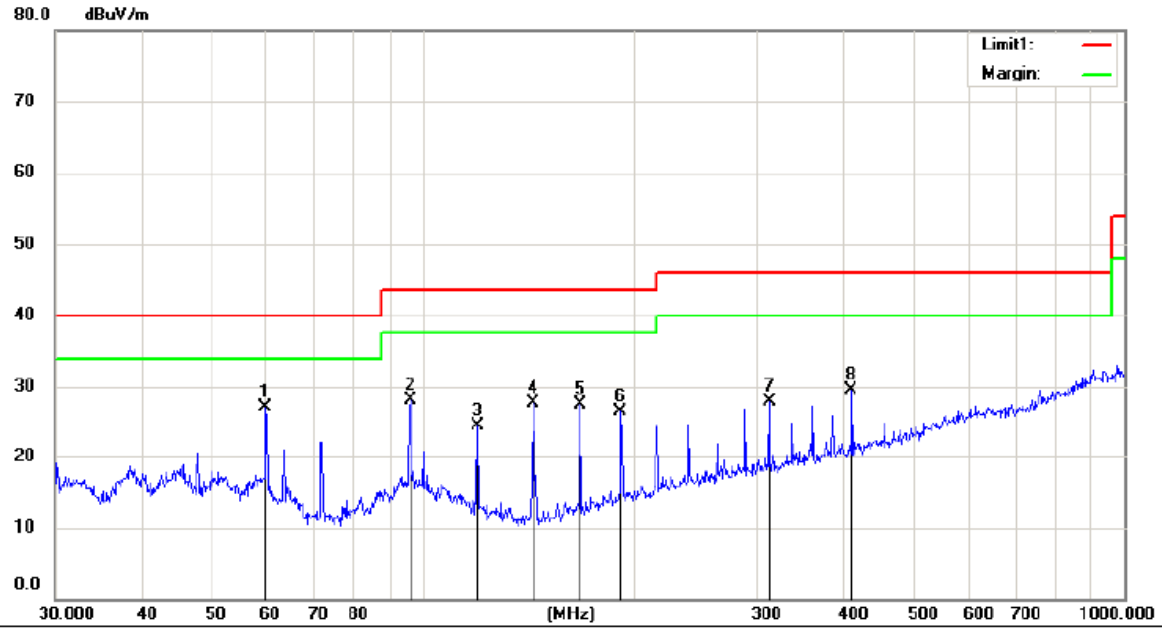
Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:GFSK, Mid

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	Comment
1	*	30.0000	46.46	-21.58	24.88	40.00	-15.12	QP			
2		30.9618	46.26	-21.62	24.64	40.00	-15.36	QP			
3		42.1541	43.97	-20.68	23.29	40.00	-16.71	QP			
4		43.9658	43.86	-20.73	23.13	40.00	-16.87	QP			
5		100.5806	38.44	-20.84	17.60	43.50	-25.90	QP			
6		147.4036	39.70	-24.86	14.84	43.50	-28.66	QP			
7		906.4824	32.74	-5.45	27.29	46.00	-18.71	QP			

Charging Mode



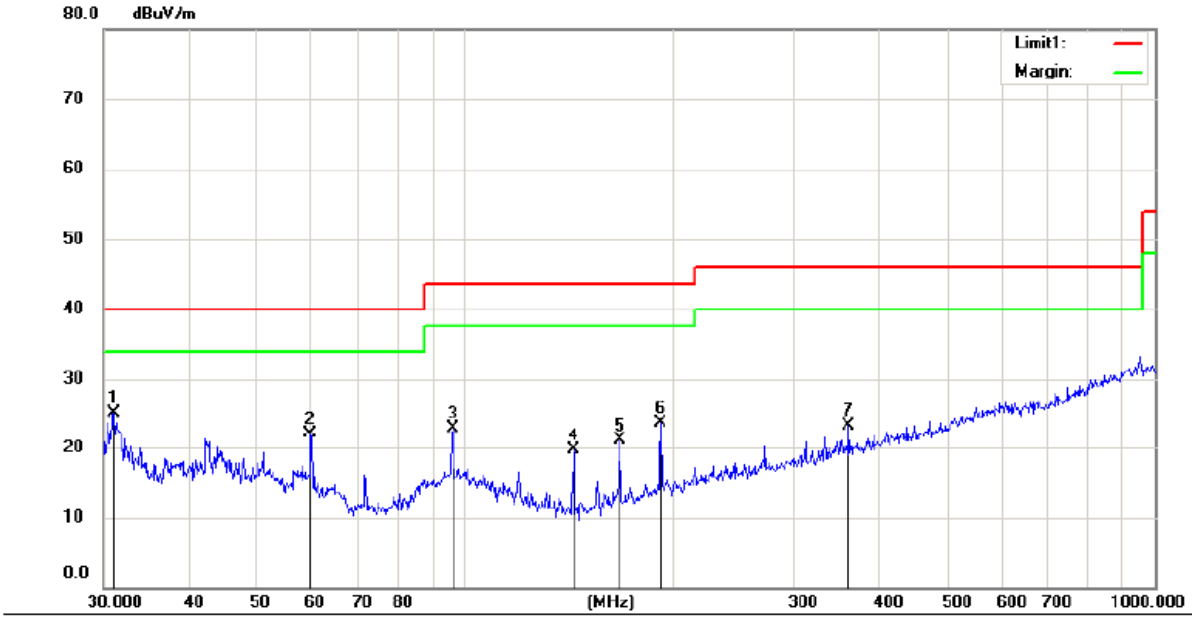
Site site #1 Polarization: *Horizontal* Temperature: 20 C

Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:Charging+TX

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	Comment
1	*	59.8588	48.55	-21.46	27.09	40.00	-12.91	QP			
2		96.0985	48.90	-20.88	28.02	43.50	-15.48	QP			
3		119.8556	47.79	-23.27	24.52	43.50	-18.98	QP			
4		143.8295	52.68	-24.97	27.71	43.50	-15.79	QP			
5		167.8242	51.33	-23.82	27.51	43.50	-15.99	QP			
6		191.7450	48.32	-21.80	26.52	43.50	-16.98	QP			
7		312.1794	45.66	-17.70	27.96	46.00	-18.04	QP			
8		408.9460	44.51	-15.04	29.47	46.00	-16.53	QP			



Site site #1 Polarization: *Vertical* Temperature: 20 C

Limit: FCC Part15 Class B 3M Radiation Power: Battery Humidity: 55 %

Mode:Charging+TX

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	Comment
1	*	31.0706	46.75	-21.62	25.13	40.00	-14.87	QP			
2		59.8588	43.62	-21.46	22.16	40.00	-17.84	QP			
3		96.0985	43.88	-20.88	23.00	43.50	-20.50	QP			
4		143.8295	44.72	-24.97	19.75	43.50	-23.75	QP			
5		167.8242	44.96	-23.82	21.14	43.50	-22.36	QP			
6		192.4185	45.40	-21.79	23.61	43.50	-19.89	QP			
7		360.4476	39.49	-16.18	23.31	46.00	-22.69	QP			

Above 1000MHz:

Frequency Range:	1GHz~25GHz	Test Date :	07/31/2013
Measured Distance:	3m	Temperature :	24 ℃
Test Result:	PASS	Humidity :	53%
Test By:	Rujianbo		

Low channel							
Freq.	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4804	V	55.19	41.09	74	54	-18.81	-12.91
7206	V	51.10	33.12	74	54	-22.90	-20.88
9608	V	45.48	32.77	74	54	-28.52	-21.23
--	--	--	--	--	--	--	--
4804	H	56.17	39.25	74	54	-17.83	-14.75
7206	H	51.62	33.44	74	54	-22.38	-20.56
9608	H	50.37	32.95	74	54	-23.63	-21.05
--	--	--	--	--	--	--	--

Middle channel							
Freq.	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4882	V	56.80	41.43	74	54	-17.20	-12.57
7323	V	52.30	33.76	74	54	-21.70	-20.24
9764	V	45.95	32.68	74	54	-28.05	-21.32
--	--	--	--	--	--	--	--
4882	H	55.85	33.55	74	54	-18.15	-20.45
7323	H	52.32	34.08	74	54	-21.68	-19.92
9764	H	47.27	32.14	74	54	-26.73	-21.86
--	--	--	--	--	--	--	--

High channel							
Freq.	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
4960	V	55.38	42.32	74	54	-18.62	-11.68
7440	V	53.05	34.23	74	54	-20.95	-19.77
9920	V	44.58	32.13	74	54	-29.42	-21.87
--	--	--	--	--	--	--	--
4960	H	55.64	33.47	74	54	-18.36	-20.53
7440	H	51.95	33.62	74	54	-22.05	-20.38
9920	H	48.83	33.72	74	54	-25.17	-20.28
--	--	--	--	--	--	--	--

Charging+TX							
Freq.	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
(MHz)	H/V	PK	AV	PK	AV	PK	AV
1208.33	V	50.16	32.11	74	54	-23.84	-23.84
4804.00	V	55.79	41.61	74	54	-18.21	-12.39
7206.00	V	52.15	33.7	74	54	-21.85	-20.3
9608.00	V	45.34	32.53	74	54	-28.66	-21.47
--	--	--	--	--	--	--	--
4804.00	H	55.89	35.42	74	54	-18.11	-18.58
7206.00	H	51.96	33.71	74	54	-22.04	-20.29
9608.00	H	48.82	32.94	74	54	-25.18	-21.06
--	--	--	--	--	--	--	--

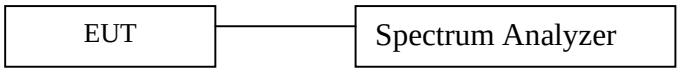
Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

6. Channel Separation Test

6.1 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.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/02/2013	08/01/2014

6.4 Measurement Results

The following table is the setting of spectrum analyzer.

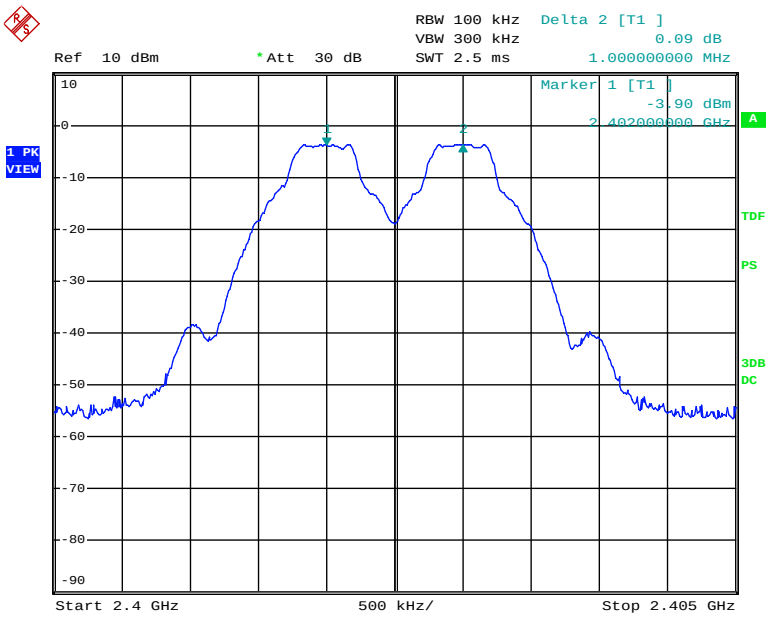
Attenuation	Auto
RB	100KHz
VB	300KHz
Detector	Peak
Trace	Max hold

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	07/26/2013
Test By:	Jary	Temperature :	20 ℃
Test Result:	PASS	Humidity :	55 %

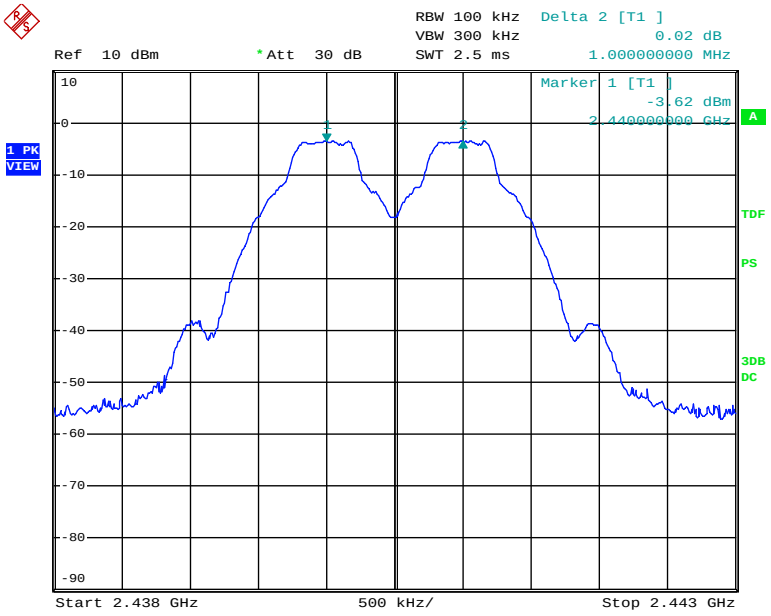
Test Channel	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3*20dB Down BW(kHz)
Low Channel	2402	1000.00	>674 kHz
Adjacency Chanel	2403		
Middle channel	2441	1000.00	>728 kHz
Adjacency Chanel	2440		
High Channel	2480	1000.00	>680 kHz
Adjacency Chanel	2479		

Low channel



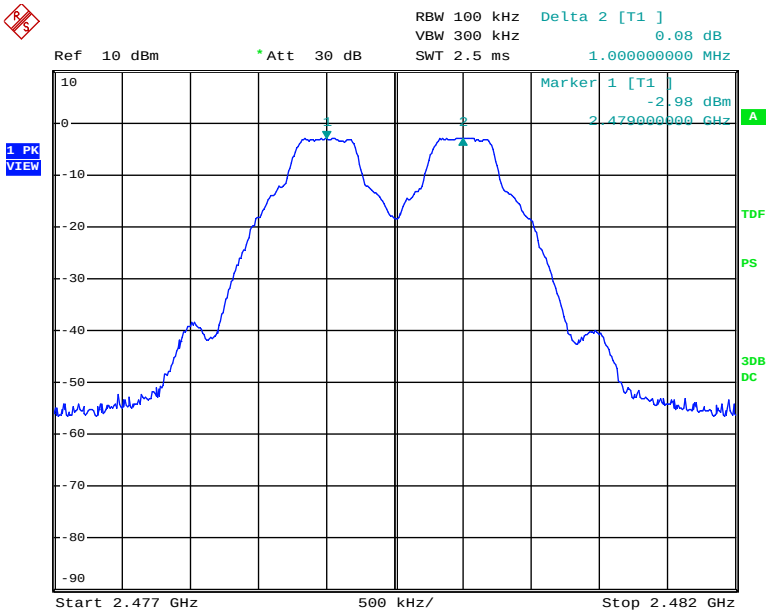
Date: 26.JUL.2013 09:14:43

Middle channel



Date: 26.JUL.2013 09:17:41

High channel



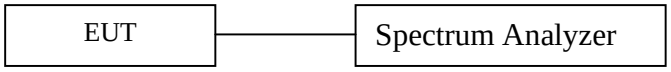
Date: 26.JUL.2013 09:20:57

7. Bandwidth 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

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/02/2013	08/01/2014

7.4 Measurement Results

The following table is the setting of spectrum analyzer.

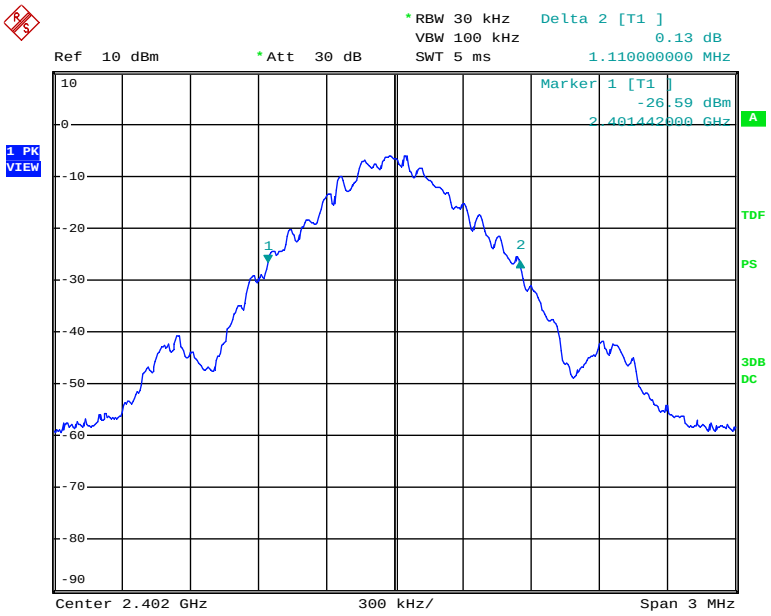
Attenuation	Auto
SPAN	3MHz
RB	30KHz
VB	100KHz
Detector	Peak
Trace	Max hold

20dB Bandwidth test data Chart:
Refer to attached data chart.

Spectrum Detector:	PK	Test Date:	06/19/2013
Test By:	Jary	Temperature:	20 ℃
Test Result:	PASS	Humidity:	55 %

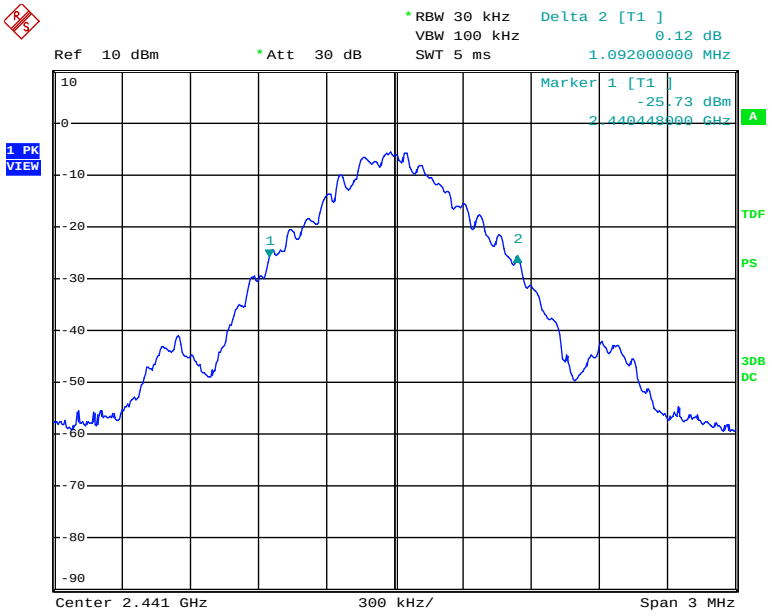
Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
Low channel	2402	1011
Middle channel	2441	1092
High channel	2480	1020

Low channel



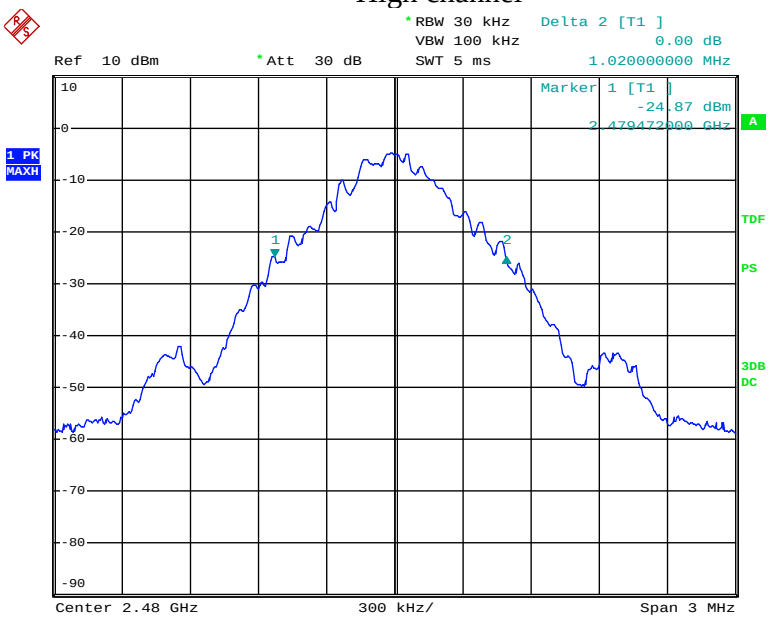
Date: 26.JUL.2013 09:34:36

Middle channel



Date: 26.JUL.2013 09:32:14

High channel



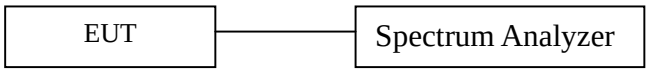
Date: 26.JUL.2013 09:28:42

8. Quantity of Hopping Channel 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

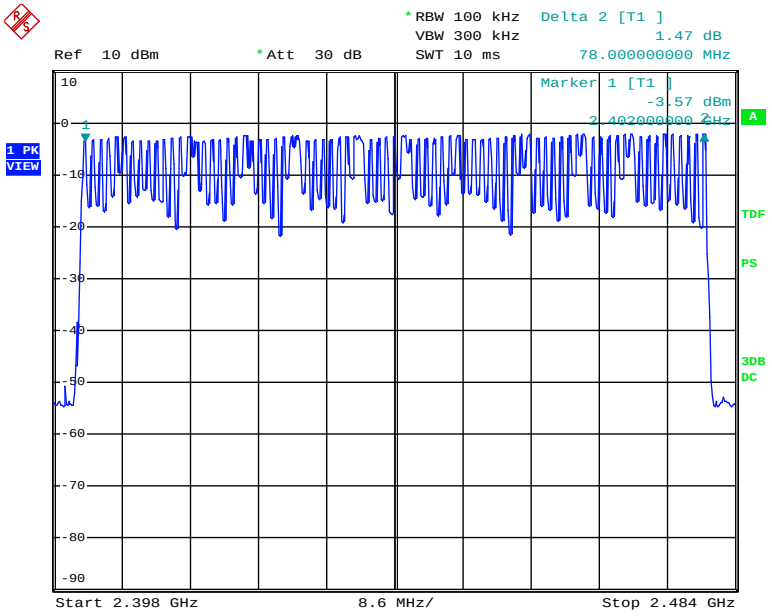
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/02/2013	08/01/2014

8.4 Measurement Results

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	07/26/2013
Test By:	Jary	Temperature :	20 ℃
Test Result:	PASS	Humidity :	55 %

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel limit
2402-2480	79	>15



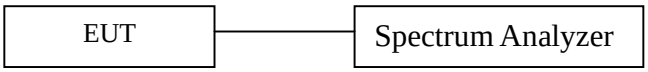
Date: 26.JUL.2013 09:56:17

9. Time of Occupancy (Dwell Time) Test

9.1 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 its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

9.2 Test SET-UP (Block Diagram of Configuration)



9.3 Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/02/2013	08/01/2014

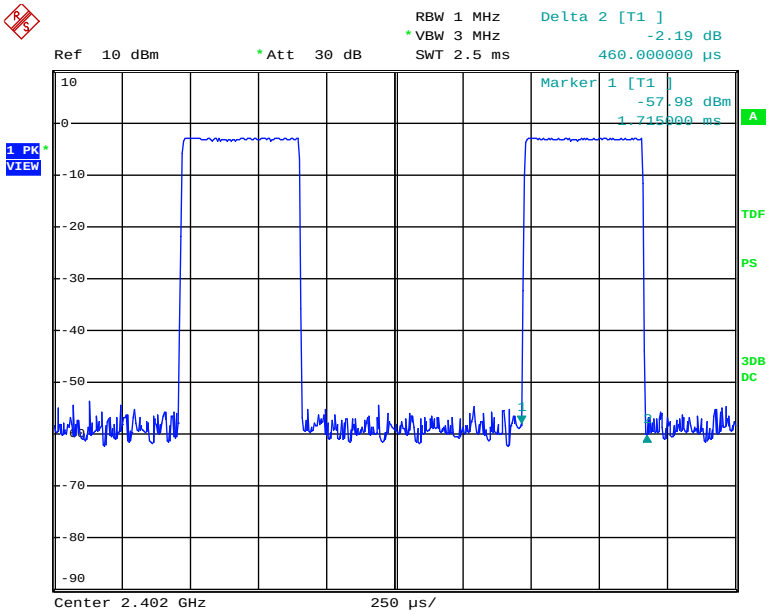
9.4 Measurement Results

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	07/27/2013
Test By:	Jary	Temperature :	20 ℃
Test Result:	PASS	Humidity :	55 %

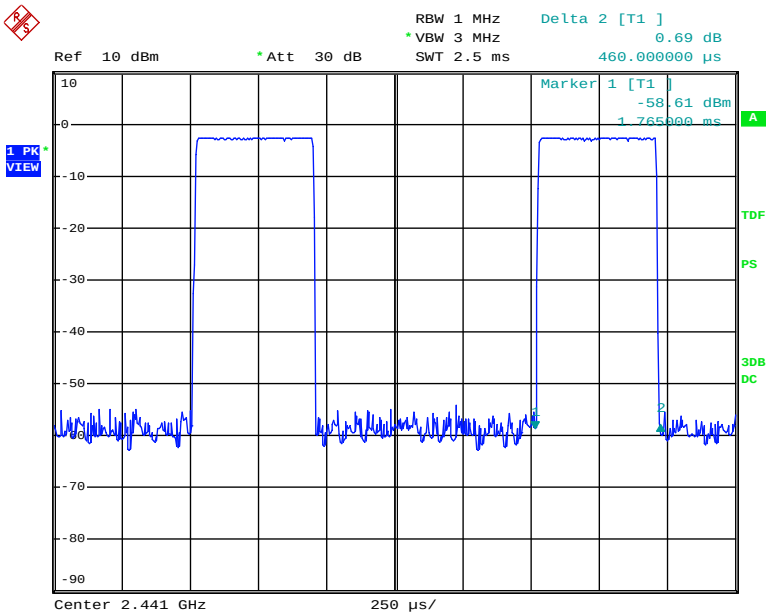
Mode	Channel	Pulse Width (ms)	Dwell Time (ms)	Limit (ms)	Result
DH1	Low channel	0.460	147.2	400	Pass
	Middle channel	0.460	147.2	400	Pass
	High channel	0.460	147.2	400	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second				
DH3	Low channel	1.730	276.8	400	Pass
	Middle channel	1.735	277.6	400	Pass
	High channel	1.730	276.8	400	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second				
DH5	Low channel	3.000	320.0	400	Pass
	Middle channel	2.999	319.9	400	Pass
	High channel	3.000	320.0	400	Pass
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second				

DH1: Low channel



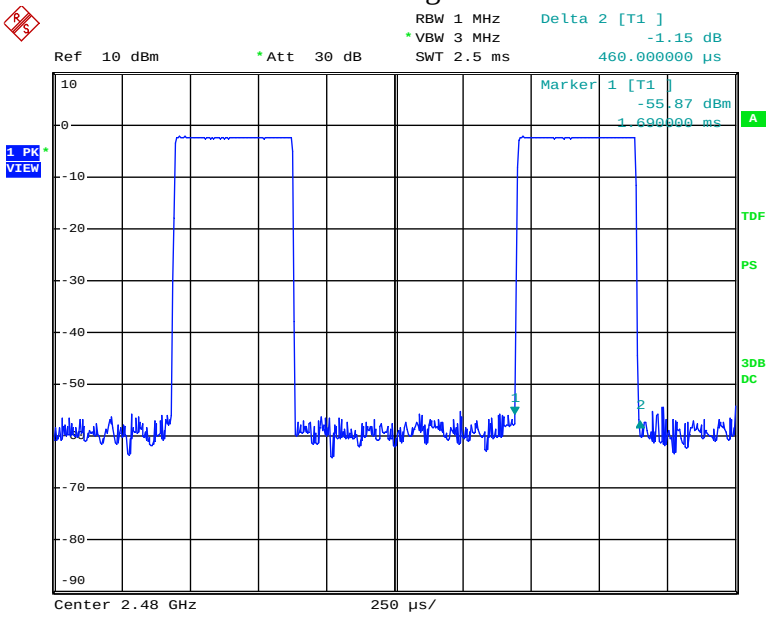
Date: 27.JUL.2013 05:30:20

DH1: Middle channel



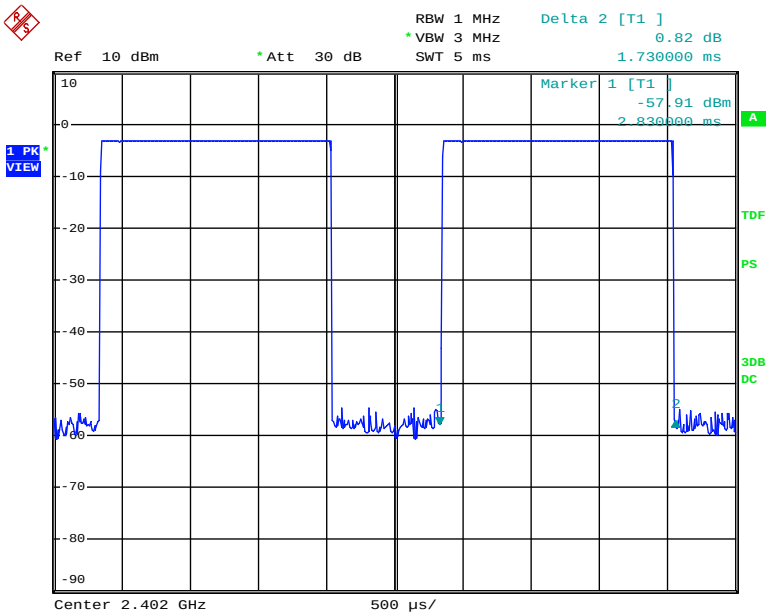
Date: 27.JUL.2013 05:34:54

DH1: High channel



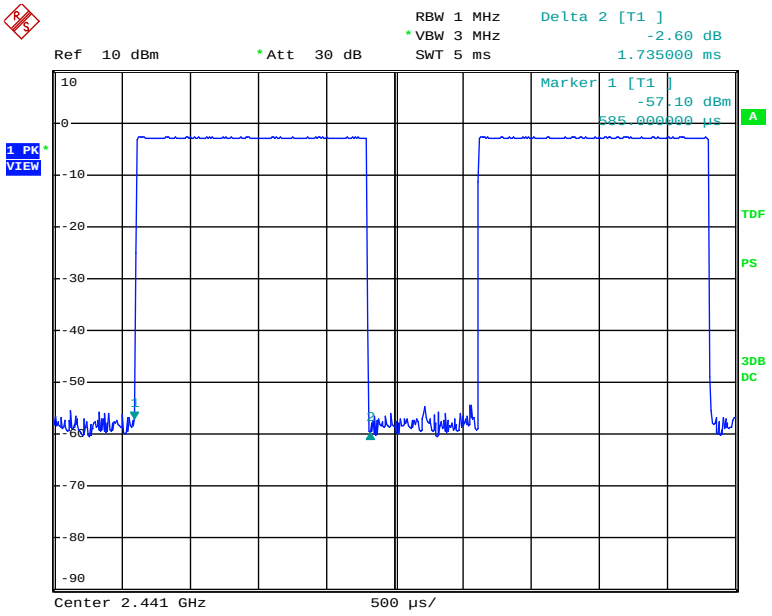
Date: 27.JUL.2013 05:33:34

DH3: Low channel



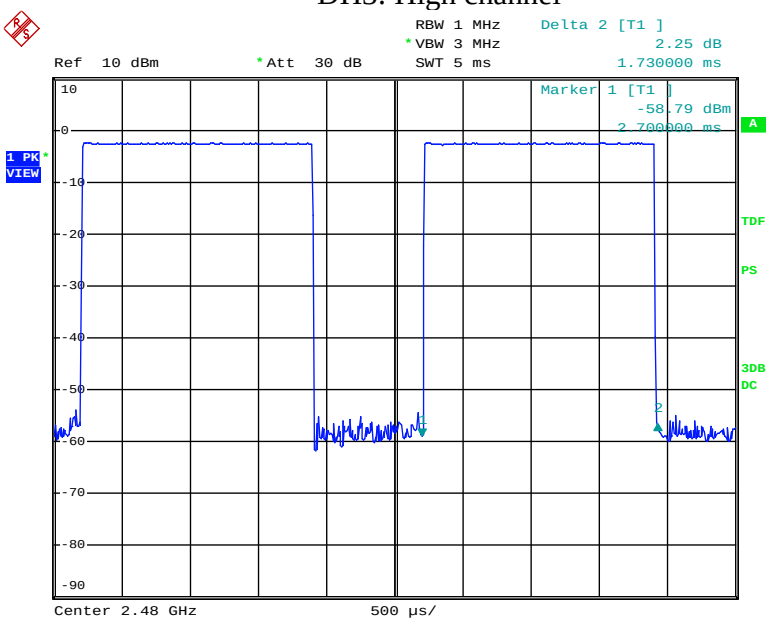
Date: 27.JUL.2013 05:43:02

DH3: Middle channel



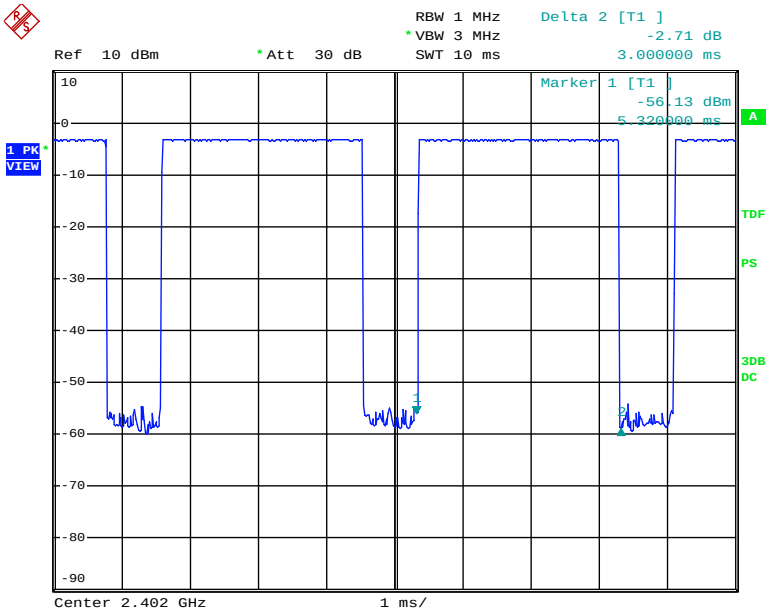
Date: 27.JUL.2013 05:37:48

DH3: High channel



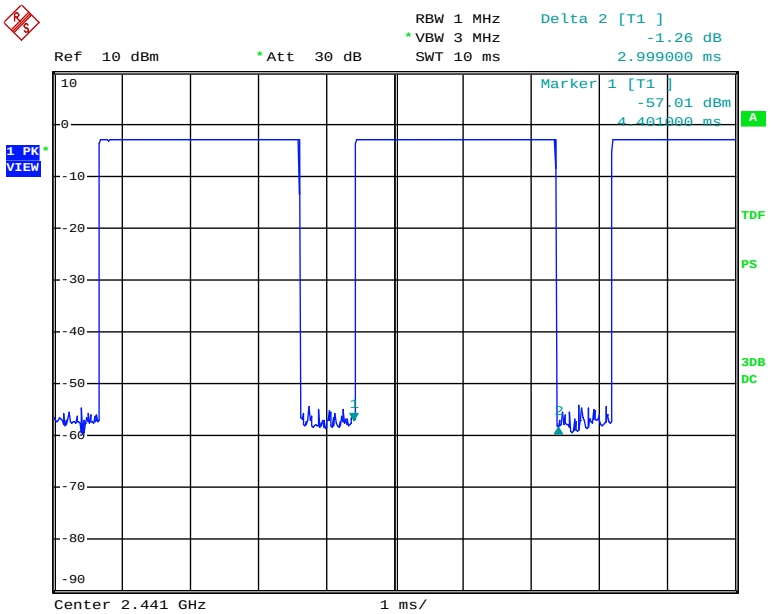
Date: 27.JUL.2013 05:44:48

DH5: Low channel



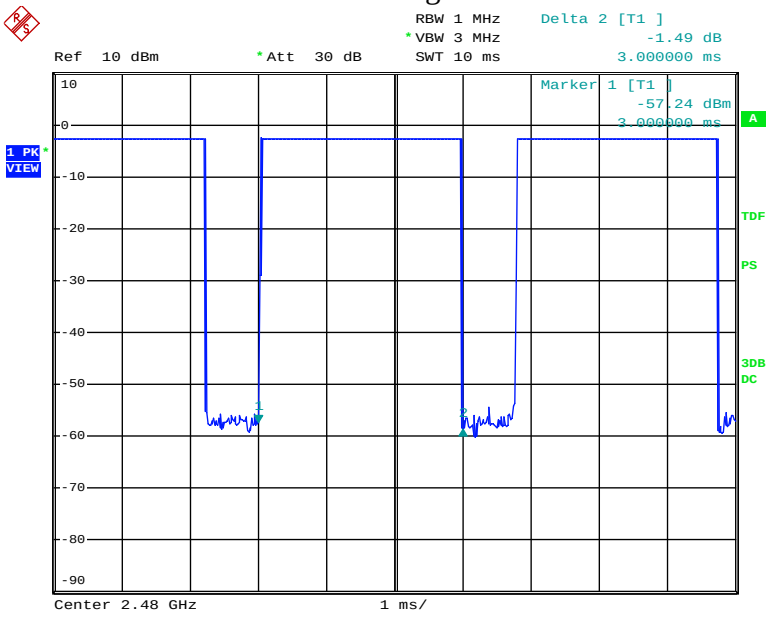
Date: 27.JUL.2013 05:51:43

DH5: Middle channel



Date: 27.JUL.2013 05:50:23

DH5: High channel



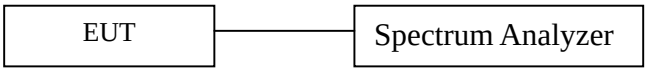
Date: 27.JUL.2013 05:47:33

10. Maximum Peak Output Power Test

10.1 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.

10.2 Test SET-UP (Block Diagram of Configuration)



10.3 Measurement Equipment Used

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	ESCI	10017	08/02/2013	08/01/2014

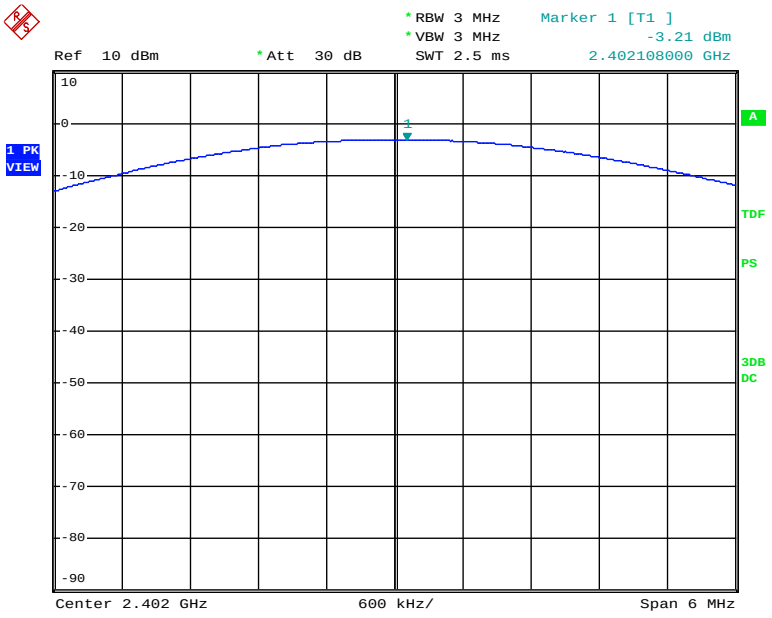
10.4 Measurement Results

Refer to attached data chart.

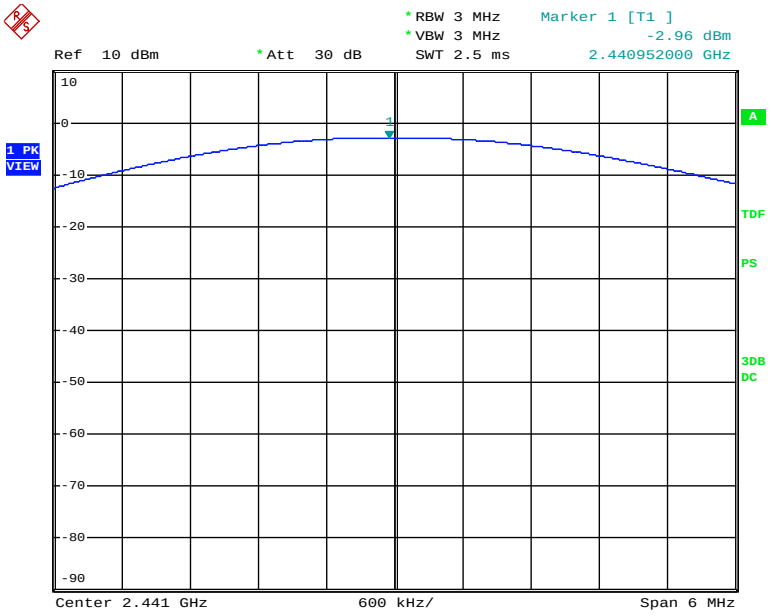
Spectrum Detector:	PK	Temperature :	20 ℃
Test By:	Jary	Humidity :	55 %
Test Result:	PASS	Test Date :	07/27/2013

Channel	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
Low channel	2402.00	-3.21	0.48	1000	PASS
Middle channel	2441.00	-2.96	0.51	1000	PASS
High channel	2480.00	-2.57	0.55	1000	PASS

Low channel

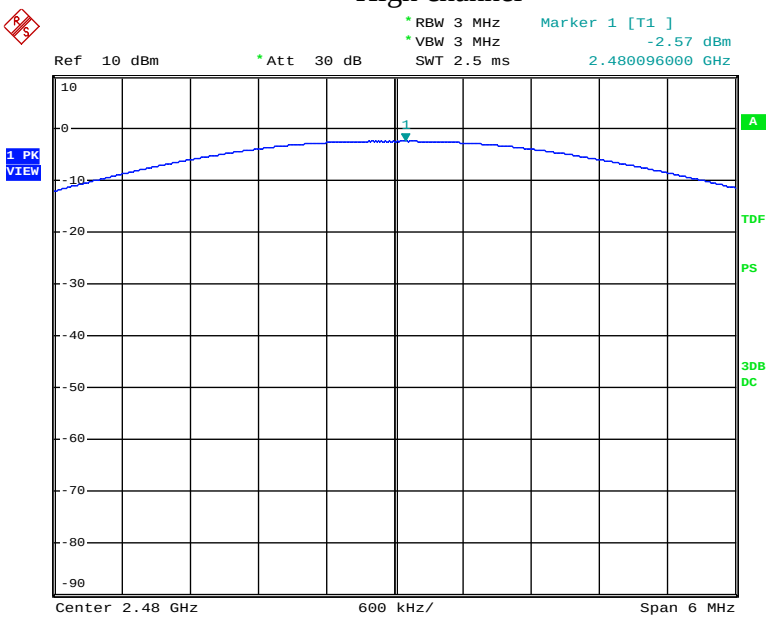


Middle channel



Date: 27.JUL.2013 06:01:16

High channel



Date: 27.JUL.2013 06:02:55

11. Band Edge Test

11.1 Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

11.3 Test SET-UP (Block Diagram of Configuration)

Same as 5.2 Radiated Emission Set-up.

11.4 Measurement Equipment Used

Same as 5.3 Radiated Emission Measurement.

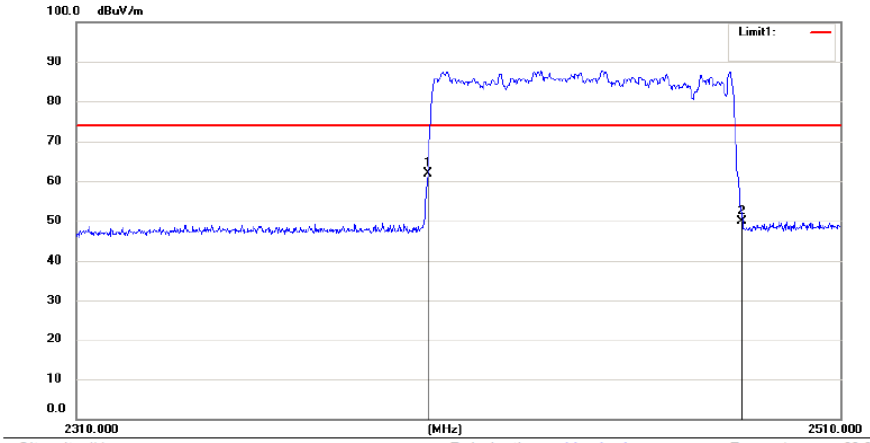
11.5 Measurement Results

Pass
Refer to attached data chart.

(A). Hopping mode

PK

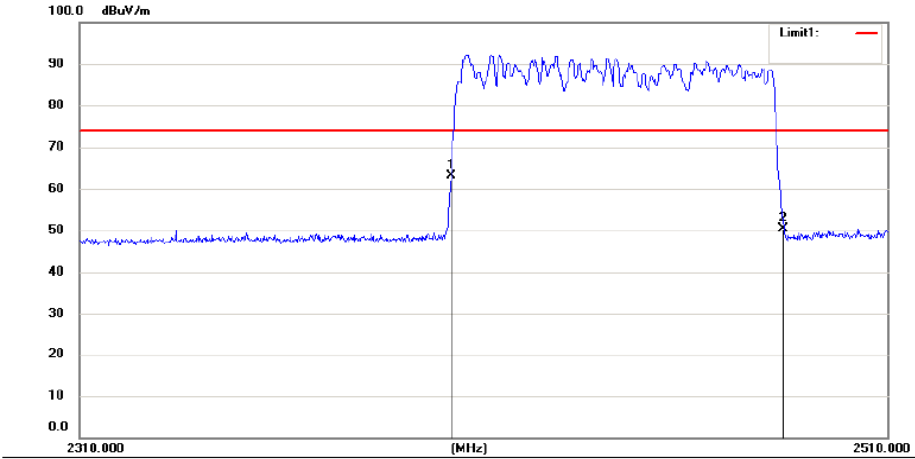
Vertical:



Site site #1 Polarization: *Vertical* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Peak Power: Battery Humidity: 55 %
Mode:Hopping
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	Comment
1	*	2400.000	50.52	11.33	61.85	73.90	-12.05	peak			
2		2483.500	37.73	12.13	49.86	73.90	-24.04	peak			

Horizontal:

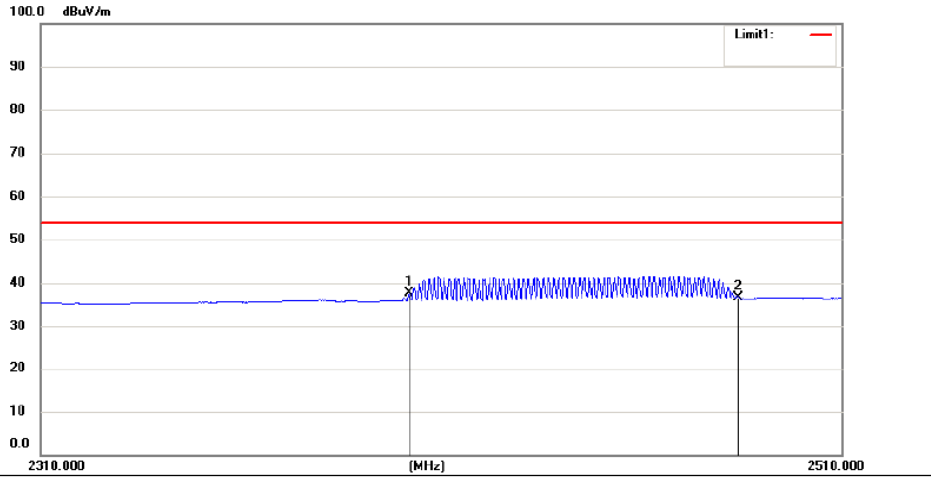


Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Peak Power: Battery Humidity: 55 %
Mode:Hopping
Note:

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	Comment
1	*	2400.000	51.76	11.33	63.09	73.90	-10.81	peak			
2		2483.500	38.15	12.13	50.28	73.90	-23.62	peak			

AVG

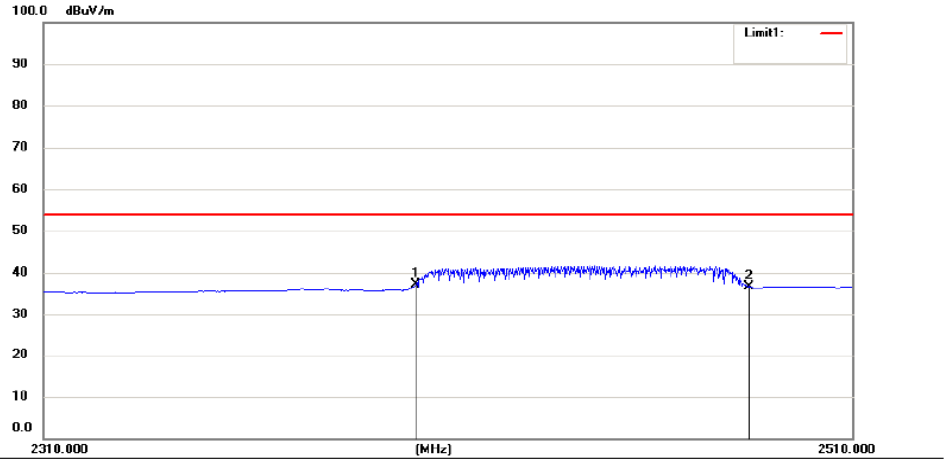
Vertical:



Site site #1 Polarization: *Vertical* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Avg Power: Battery Humidity: 55 %
Mode:Hopping
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	Comment
1	*	2400.000	26.20	11.33	37.53	53.90	-16.37	AVG			
2		2483.500	24.50	12.13	36.63	53.90	-17.27	AVG			

Horizontal:



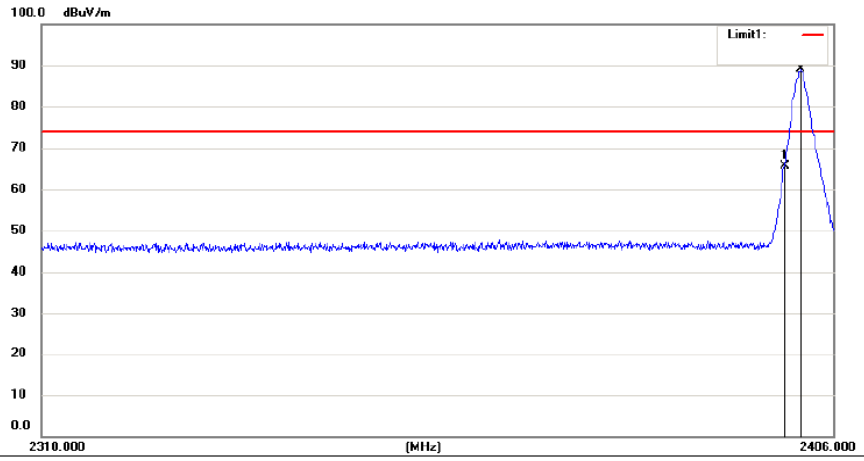
Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Avg Power: Battery Humidity: 55 %
Mode:Hopping
Note:

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	Comment
1	*	2400.000	25.90	11.33	37.23	53.90	-16.67	peak			
2		2483.500	24.61	12.13	36.74	53.90	-17.16	peak			

(B). Non-hopping mode

Peak

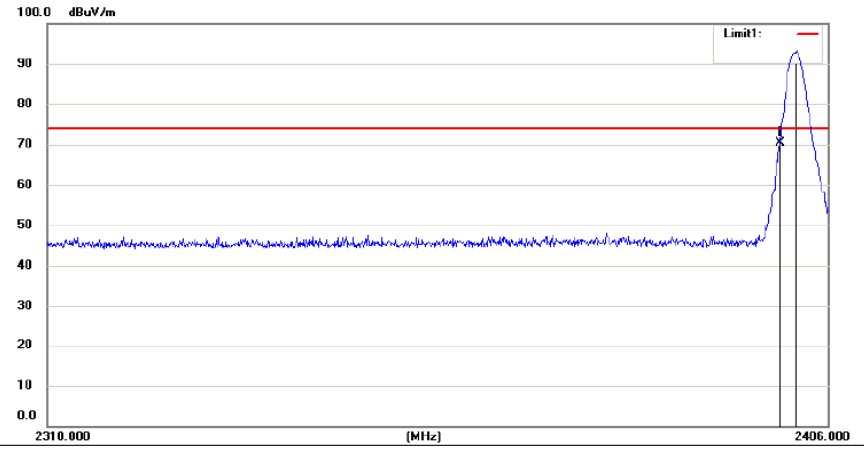
Low Channel (H):



Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Peak Power: Battery Humidity: 55 %
Mode:GFSK, Low
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	Comment
1		2400.000	54.20	11.33	65.53	73.90	-8.37	peak			
2	*	2402.000	77.69	11.35	89.04	73.90	15.14	peak			

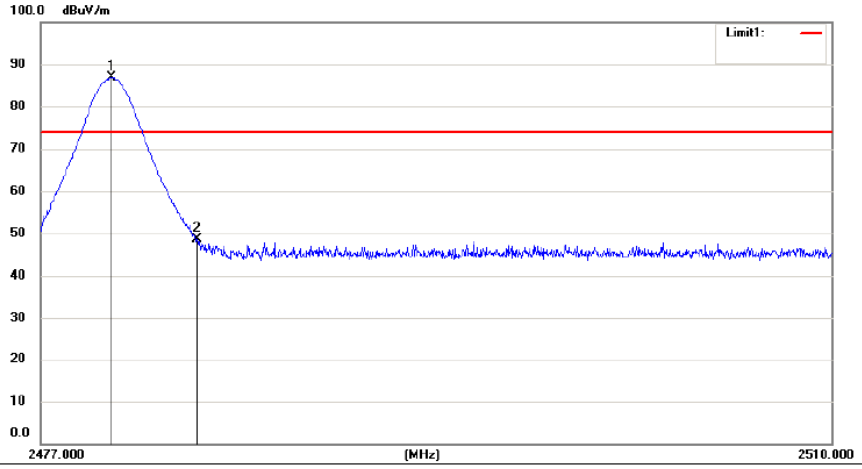
Low Channel (V):



Site site #1 Polarization: *Vertical* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Peak Power: Battery Humidity: 55 %
Mode:GFSK, Low
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	Comment
1		2400.000	58.98	11.33	70.31	73.90	-3.59	peak			
2	*	2402.000	81.40	11.35	92.75	73.90	18.85	peak			

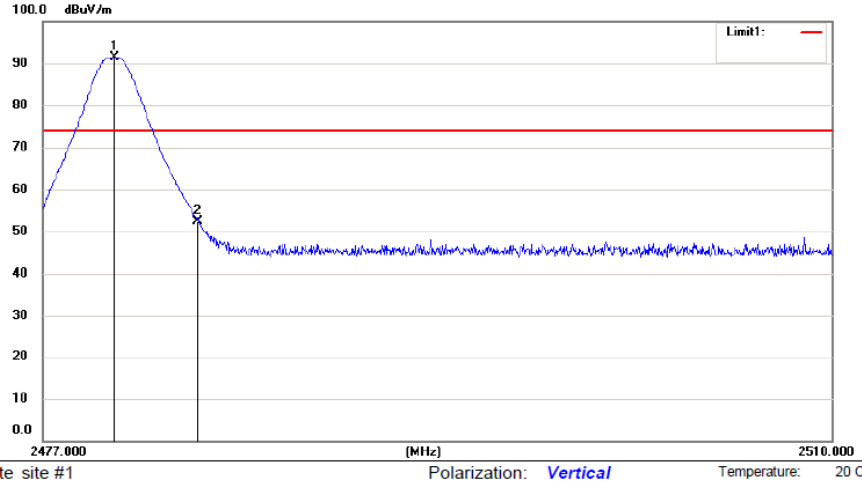
High Channel (H)



Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Peak Power: Battery Humidity: 55 %
Mode:GFSK, High
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	Comment
1	*	2480.000	74.88	12.10	86.98	73.90	13.08	peak			
2		2483.500	36.49	12.13	48.62	73.90	-25.28	peak			

High Channel (V)

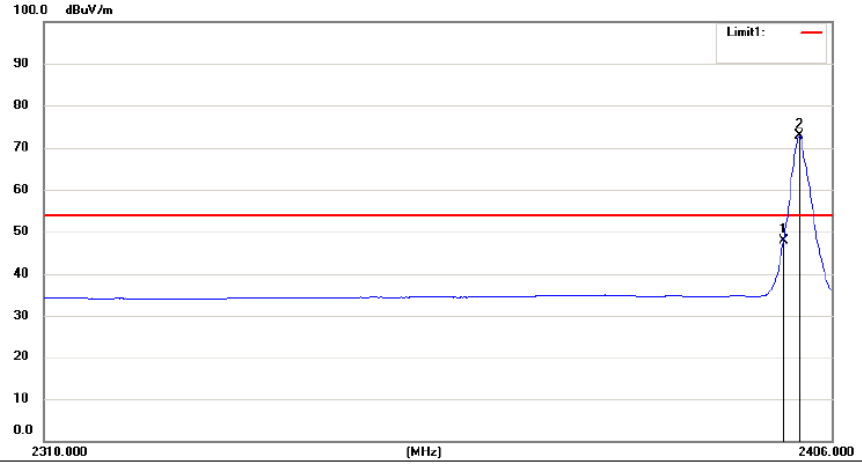


Site site #1 Polarization: *Vertical* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Peak Power: Battery Humidity: 55 %
Mode:GFSK, High
Note:

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	Comment
1	*	2480.000	79.22	12.10	91.32	73.90	17.42	peak			
2		2483.500	40.23	12.13	52.36	73.90	-21.54	peak			

AVG

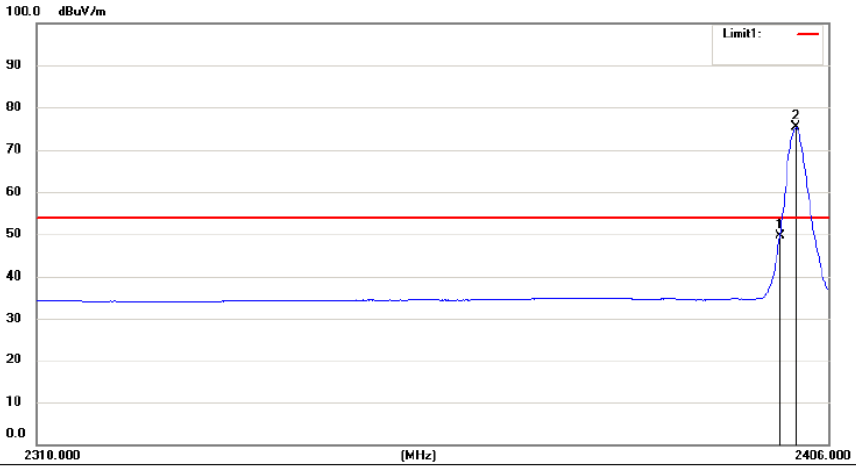
Low Channel (H):



Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Avg Power: Battery Humidity: 55 %
Mode:GFSK, Low
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	Comment
1		2400.000	36.52	11.33	47.85	53.90	-6.05	AVG			
2	*	2402.000	61.47	11.35	72.82	53.90	18.92	AVG			

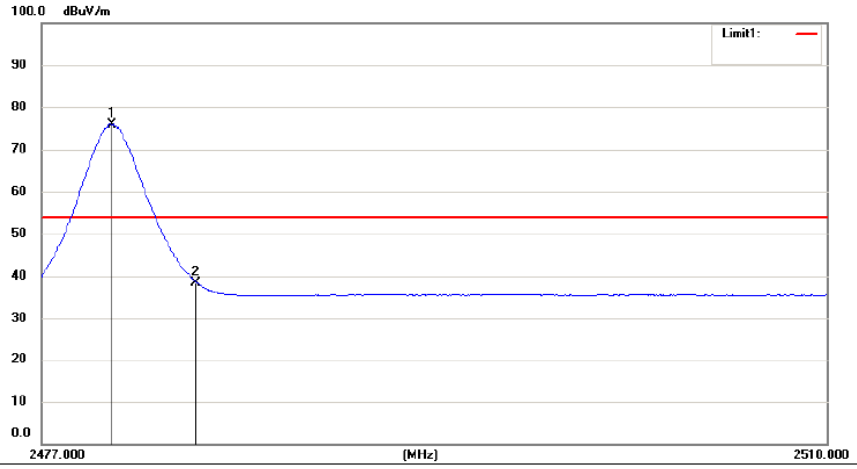
Low Channel (V):



Site site #1 Polarization: *Vertical* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Avg Power: Battery Humidity: 55 %
Mode:GFSK, Low
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	Comment
1		2400.000	38.37	11.33	49.70	53.90	-4.20	AVG			
2	*	2402.000	64.01	11.35	75.36	53.90	21.46	AVG			

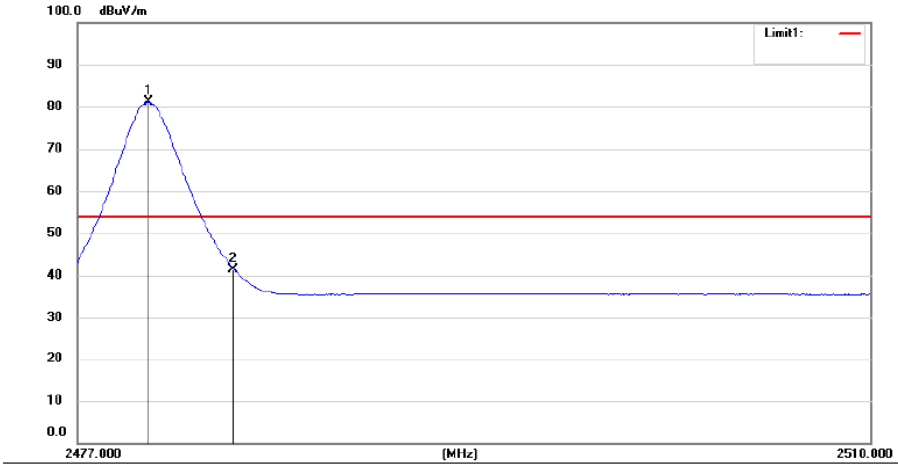
High Channel (H)



Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Avg Power: Battery Humidity: 55 %
Mode:GFSK, High
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	Comment
1	*	2480.000	63.73	12.10	75.83	53.90	21.93	AVG			
2		2483.500	26.37	12.13	38.50	53.90	-15.40	AVG			

High Channel (V)



Site site #1 Polarization: *Vertical* Temperature: 20 C
Limit: (RE)FCC Part15 Class B_Avg Power: Battery Humidity: 55 %
Mode:GFSK, High
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	Comment
1	*	2480.000	69.03	12.10	81.13	53.90	27.23	AVG			
2		2483.500	29.30	12.13	41.43	53.90	-12.47	AVG			

12. Antenna Port Emission

12.1 Test Equipment

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	MY45107013	05/29/2013	05/28/2013

12.2 Measuring Instruments and setting

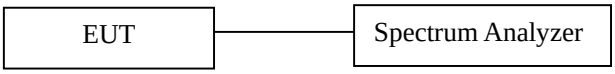
The following table is the setting of spectrum analyzer.

Attenuation	Auto
RB	100kHz
VB	300kHz
Detector	Peak
Trace	Max hold

12.3 Test Procedures

The conducted spurious emissions were measured conducted using a spectrum analyzer at low, mid, and hi channels, The limit was determined by attenuation 20dB of the RF peak power output.

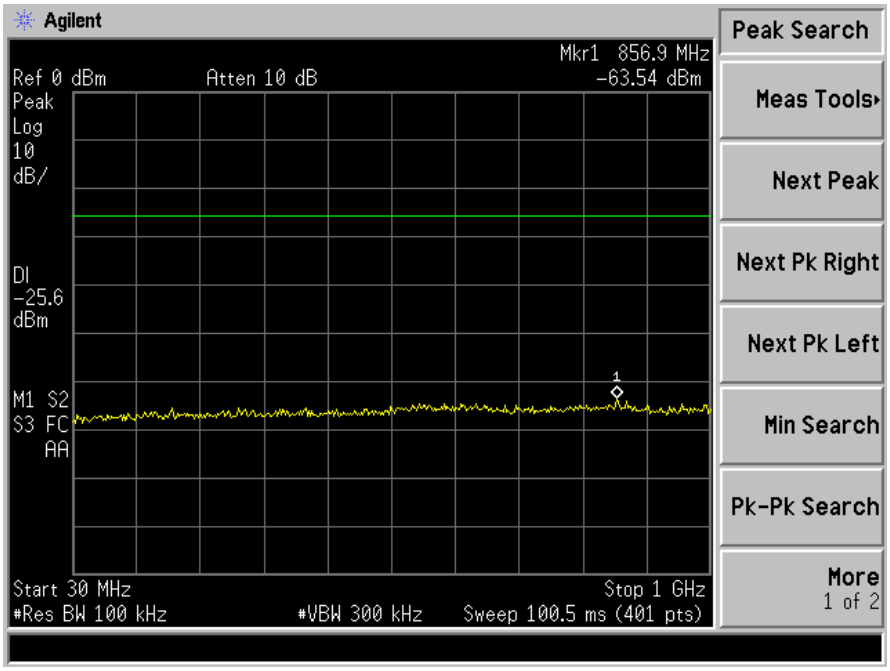
12.4 Block Diagram of Test setup

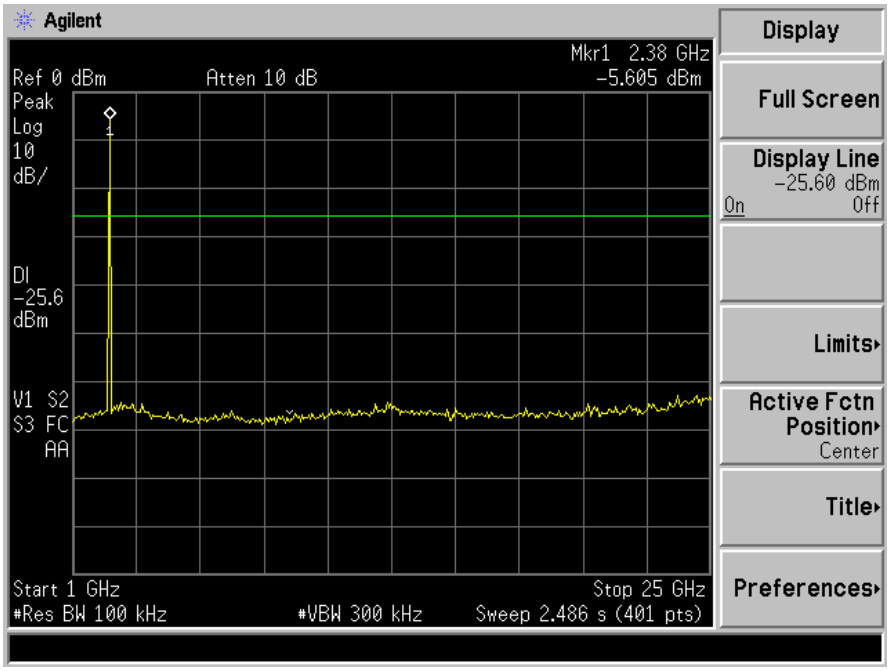


12.5 Test Result

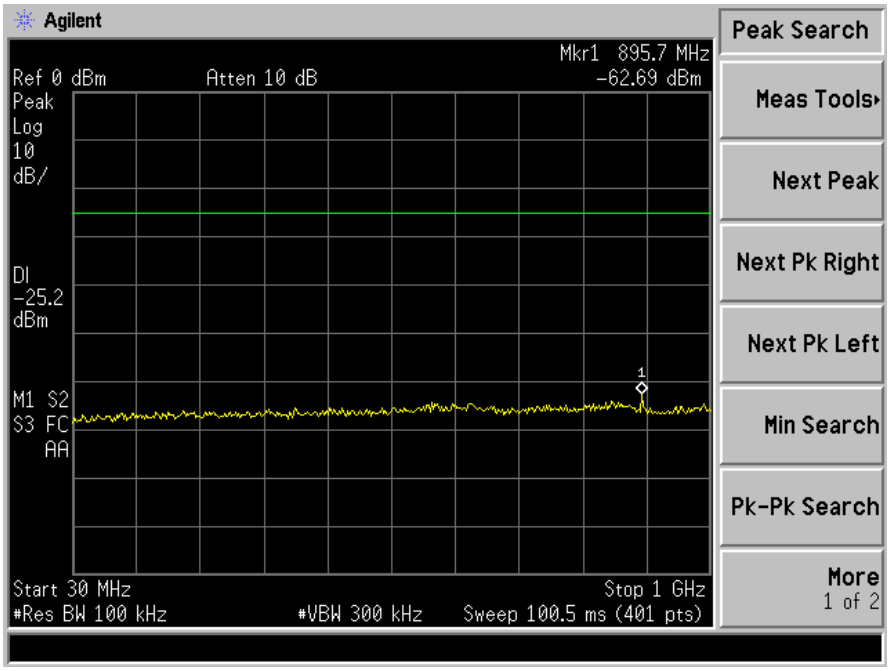
PASS.

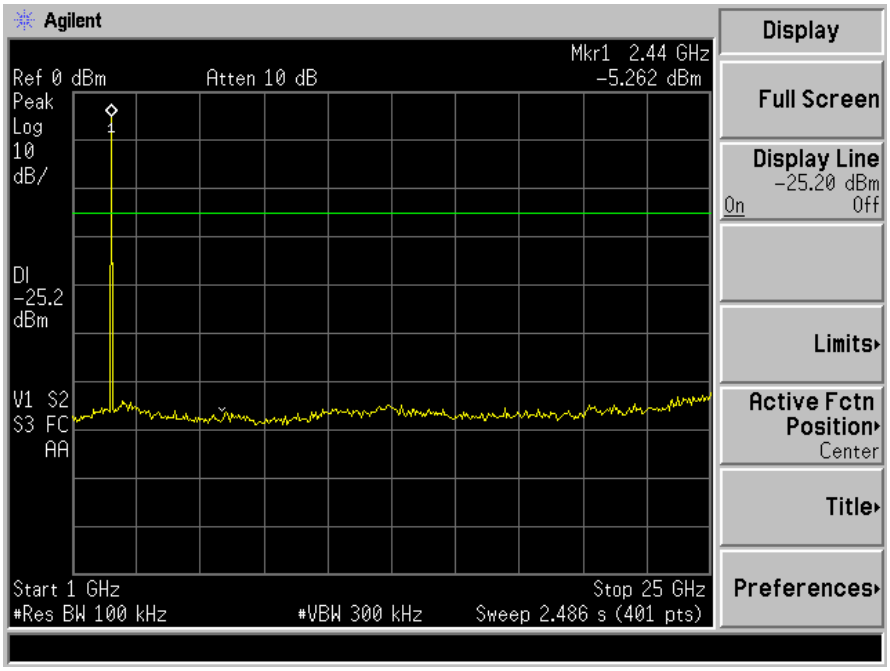
Low channel


Agilent
Mkr1 856.9 MHz
Ref 0 dBm
Atten 10 dB
-63.54 dBm
Peak
Log
10
dB/
Dl
-25.6
dBm
M1 S2
S3 FC
AA
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 1 GHz
Sweep 100.5 ms (401 pts)
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

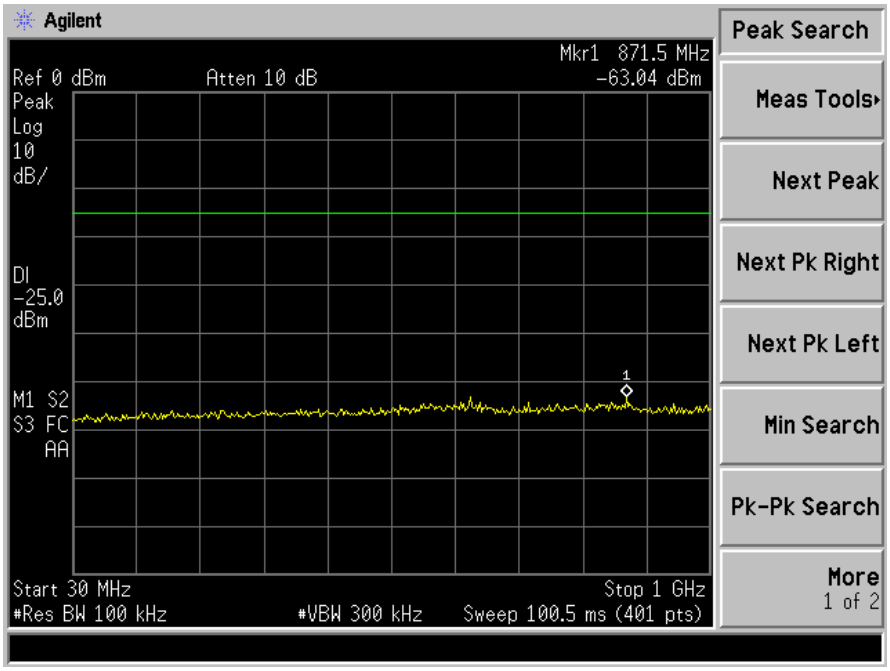

Agilent
Mkr1 2.38 GHz
Ref 0 dBm
Atten 10 dB
-5.605 dBm
Peak
Log
10
dB/
Dl
-25.6
dBm
V1 S2
S3 FC
AA
Start 1 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25 GHz
Sweep 2.486 s (401 pts)
Display
Full Screen
Display Line
-25.60 dBm
On
Off
Limits
Active Fctn
Position
Center
Title
Preferences

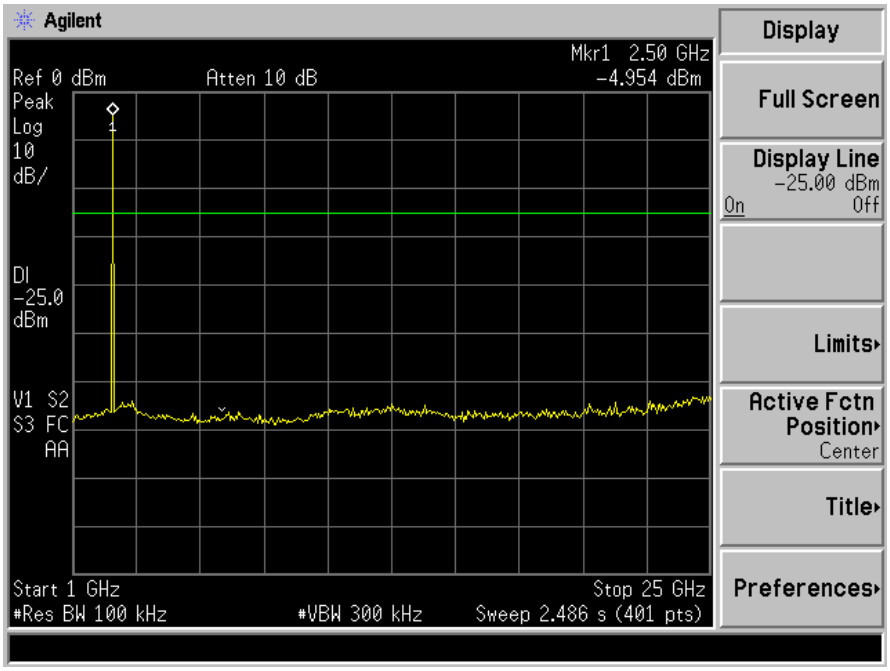
Middle channel





High channel





13. Antenna Application

13.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.240.

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.

13.2 Result

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