FCC PART 15.249

EMI MEASUREMENT AND TEST REPORT

For

OBAN US LLC

135 Chestnut St Box 1778,New Britain,CT 06050-1778,U.S.A.

FCC ID:2AFFR60BEAT

Trade: 60BEAT

This Report Concerns: Original Report	Equipment Type: 60BEAT RANGER(sport watch)
Test Engineer:	Lisa Chen
Report No.:	BSL20150806-1
Receive EUT Date/Test Date:	July 29, 2015/ July 29 - August 6, 2015
Reviewed By:	Mike moo
Prepared By:	**BSL Testing Co.,LTD.** NO. 24, ZH Park, Nantou, Shenzhen, 518000 China Tel: 86- 755-26508703 Fax: 86- 755-26508703

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Report information

1.1.1.This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BSL approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BSL in any way guarantees the later performance of the product/equipment.

1.1.2.The sample/s mentioned in this report is/are supplied by Applicant, BSL therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

1.1.3.Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BSL, unless the applicant has authorized BSL in writing to do so.

Test Facility -
The test site used to collect the radiated data is located on the address of
BSL Testing Co.,LTD.
(FCC Registered Test Site Number: 191509) on
NO. 24, ZH Park, Nantou, Shenzhen, 518000 China
The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

The reported uncertainty of measurement y ± U,where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2,providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	+/-1.25dB
2	RF Power, Conducted	+/-0.20dB
3	Spurious emissions, conducted	+/-0.33dB
4	All emissions, radiated (<1G)	+/-3.47dB
5	All emissions, radiated (>1G)	+/-3.82dB
6	Temperature	+/-0.5°CdB
7	Humidity	+/-2%

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description	:	60BEAT RANGER(sport watch)
Applicant	:	OBAN US LLC 135 Chestnut St Box 1778,New Britain,CT 06050-1778,U.S.A.
Manufacturer	:	SPARK TECHNOLOGY LIMITED 25H, Sangda Yayuan, Hua Fa Bei Lu, Futian District, Shenzhen, P.R.C.
Model Number	:	range010
Modulation type	:	GFSK
Antenna gain	:	0dBi
BT	:	4.0BLE
Antenna type	:	built-in copper wire ANT Welding to PCB
Frequency	:	2402-2480MHz
Number of Channels	:	40 Channels
Power Supply	:	DC 3V Battery
Hardware version	:	VER 3.5
Software version	:	1.0
Serial Number	:	20150806

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	15	2430	29	2458
2	2404	16	2432	30	2460
3	2406	17	2434	31	2462
4	2408	18	2436	32	2464
5	2410	19	2438	33	2466
6	2412	20	2440	34	2468
7	2414	21	2442	35	2470
8	2416	22	2444	36	2472
9	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	\	\

2.2. Block Diagram of EUT Configuration

Radiated test :

Figure 1 EUT Setup

2.3. Support Equipment List

Name	Model No	S/N	Manufacturer	Used (Y/N)
-	-	-	-	-
-	-	-	-	-

2.4. Test Conditions

It must provide an operational voltage (3V DC by Battery) to turn on the 60BEAT RANGER and on one certain channel in service mode by means of company proprietary software.

the test software name: Bluetooth BLE CC2540 test Software.

After the preliminary test, we found to emit the worst emissions and therefore had been tested under operating condition.

during the test the eut use the new battery.

The EUT Themselves can enter the test mode.
Power setting parameters For mode:
GFSK (**PK Power:-3dbm**).

For the EUT was tested with Channel Frequency 2402MHz, 2440MHz and 2480MHz.

3. TEST RESULTS SUMMARY

FCC 15 Subpart C, Paragraph 15.249:2013

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	N/A
Section 15.249(a)	The fundamental field strength and the harmonics	Compliant
Section 15.209 Section 15.249(d)	Radiated Emission	Compliant
Section 15.249(d)	Band Edge	Compliant
Section 15.203	Antenna Requirement	Compliant
Section 15.249	20dB Bandwidth	Compliant

Remark: “N/A” means “Not applicable”.

N/A: The Eut Power Supply:DC 3V Battery

Statement: All testing was performed using the test procedures found in ANSI C63.4-2003.

Modifications

No modification was made.

4. TEST EQUIPMENT USED

EQUIPMENT/FACILITIES	MANUFACTURER	MODEL	SERIAL NO.	DATE OF CAL.	CAL. INTERVAL
3m Semi-Anechoic Chamber	Chengyu Electron	9 (L)*6 (W)* 6 (H)	BSL086	Aug. 23 2014	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCI3	BSL001	Sep. 28 2014	1 Year
BiConiLog Antenna	Rohde & Schwarz	HL562 (30MHz－3GHz)	BSL009	Sep. 28 2014	1 Year
Double -ridged waveguide horn	Rohde & Schwarz	BBHA9120D (1－18GHz)	BSL008	Aug. 27 2014	1 Year
Horn Antenna	AHS	SAS-574 (18GHz－40GHz)	BSL072	Dec. 28 2014	1 Year
Cable	PUTIANLE	BSL045 (9 kHz-40GHz)	BSL045	Aug. 27 2014	1 Year
Cable	PUTIANLE	BSL046 (9 kHz-40GHz)	BSL046	Aug. 27 2014	1 Year
Cable	PUTIANLE	BSL047 (9 kHz-40GHz)	BSL047	Aug. 27 2014	1 Year
Amplifier(100kHz-40GHz)	R&S	SMR40	BSL007	Sep. 28 2014	1 Year
Band filter	Amindeon	82346	BSL049	Aug. 27 2014	1 Year
Active Loop Antenna	Schwarzbeck	FMZB1519 (9 kHz - 30 MHz)	BSL011	Sep. 28 2014	1 Year
Coaxial Switch	YUANFANG	TA218B	BSL004	Aug. 27 2014	1 Year
Spectrum analyzer	Rohde & Schwarz	FSP40	BSL049	Sep. 28 2014	1 Year
EMI TEST SOFTWARE	AUDIX	E3	N/A	N/A	N/A
the temporary antenna connector	BSL	BSL102	BSL102	Aug. 27 2014	1 Year

the temporary antenna connector model number BSL102, impedance 50Ω, cable loss 1 dB.
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5. ANTENNA REQUIREMENT

5.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

5.2. Antenna Connected Construction

According to § 15.203, An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The antenna used for this product is a built-in copper wire ANT Welding to PCB.The antenna is permanently attached. Refer to the product photo.

5.3. Result

Compliance

6. CONDUCTED POWER LINE TEST

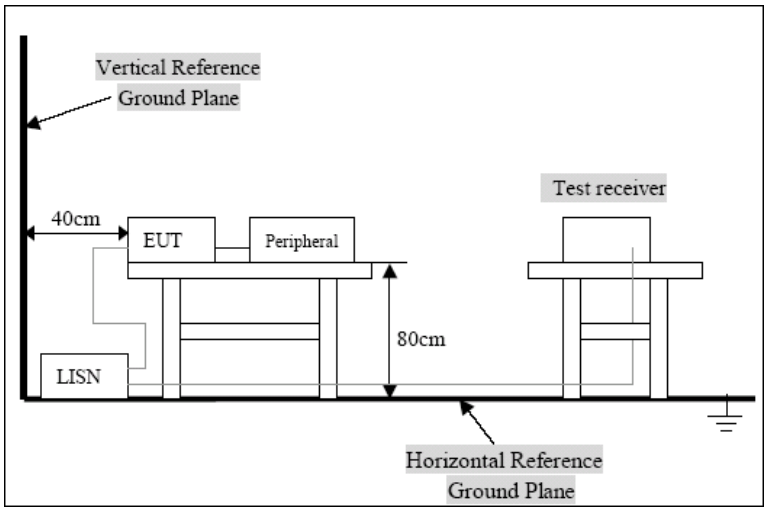
6.1. Test Equipment

Please refer to section 4 this report.

6.2. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.).This provides a 50ohm/50uh coupling inpedance for the measuring equipment.The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling inpedance with 50ohm termination.
Both sides of A.C. Line are check for maximum conducted interference.In order to find the maximum emission,the relative positions of equipment and all of the interface cables must be changed according to ASIN C63.4:2003 on conducted measurement .Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

6.3. Test Setup



For the actual test configuration,Please refer to the related items-Photos of testing

6.4. Conducted Power line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56-46
5.0-3.0	73/60	60-50

Note: In the above table, the tighter limit applies at the band edges.

6.5. Conducted Power Line Test Result

N/A: The Eut Power Supply DC 3V Battery

7. RADIATED EMISSION TEST

7.1. Test Equipment

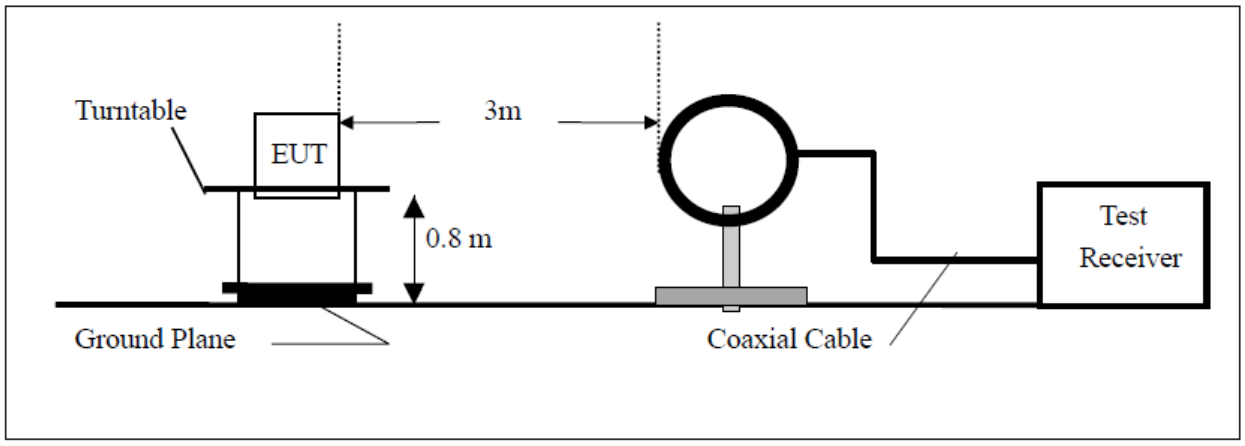
Please refer to section 4 this report.

7.2. Test Procedure

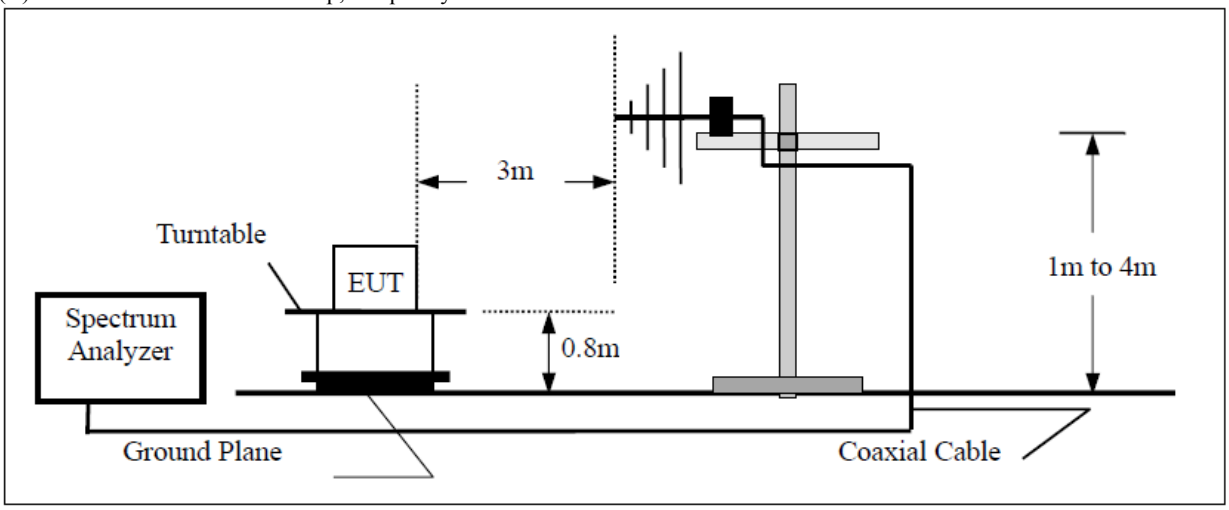
The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level.
Calibrated Loop antenna is used as receiving antenna for frequencies below 30MHz, Calibrated Bilog antenna is used as receiving antenna for frequencies between 30 MHz and 1 GHz, Calibrated Horn antenna is used as receiving antenna for frequencies above 1000MHz. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.
The bandwidth of test receiver is set at 9kHz in below 30MHz. and set at 120kHz in 30-1000MHz, and 1MHz in above 1000MHz.
The frequency range from 9kHz to 25GHz is checked.
The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Peak detector and Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit. And X direction is worst mode.

7.3. Radiated Test Setup

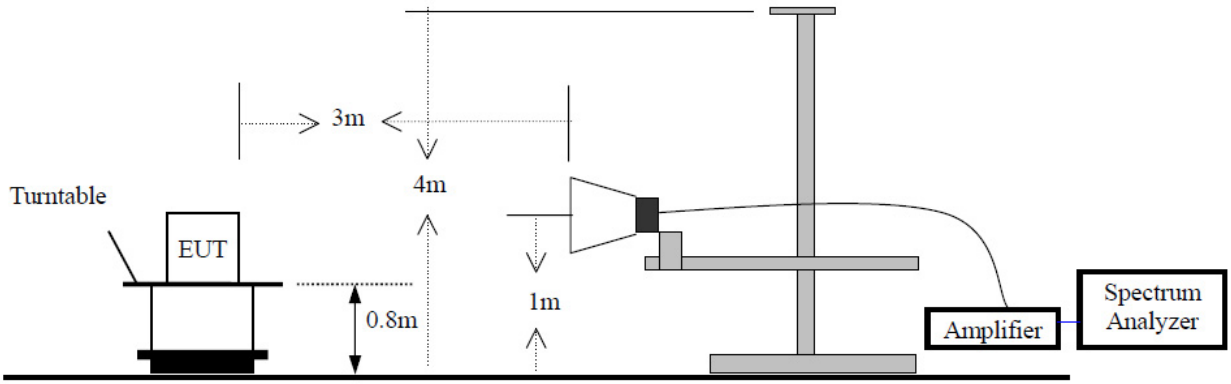
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



7.4. Radiated Emission Limit

All emission from a digital device,including any network of conductors and apparatus connected thereto,shall not exceed the level of field strength specified below :

A. Fundamental and Harmonics Radiated Emissions 15.249(a) Limit

Fundamental Frequency (MHZ)	Field as trength of Fundamental(3m)			Field as trength of Harmonics(3m)		
	mV/m	dBuV/m		uV/m	dBuV/m	
902-928	50	94(QP)	114(Peak)	500	54(AV)	74(Peak)
2400-2483.5	50	94(AV)	114(Peak)	500	54(AV)	74(Peak)

Note: (1) RF Voltage (dBuV)=20 log Voltage(uV)

(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(3) The emission limit in this paragraph os based on measurement instrumentation employing an average detector.Measurement using instrumentation with a peak detector function,corresponding to 20dB above the maximum permitted average limit.

B. Spurious Radiated Emissions.

Frequency (MHz)	Limit			
	Field Strength of Quasi-peak Value (microvolts/m)	Field Strength of Quasi-peak Value (dBμV/m)	Measurement distance (m)	The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.
0.009 - 0.490	2400/F(kHz)	/	300	
0.490 - 1.705	24000/F(kHz)	/	30	
1.705-30	30	29.5	30	
30 - 88	100	40	3	
88 - 216	150	43.5	3	
216 - 960	200	46	3	
Above 960	500	54	3	

Note: (1) RF Voltage (dBuV)=20 log Voltage(uV)

(2) In the Above Table,the tighter limit applies at the band edges.

(3) Distaqnce refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

7.5. Radiated Emission Test Result

Pass

A. Fundamental Radiated Emissions Data

CH Low

Freq. (MHz)	Read Level (dBuV) AV/PK	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission (dBuV/m) AV/PK	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2402	77.48/87.55	27.47	5.42	30.17	80.2/90.27	VERT	94/114	-13.8/-23.73
2402	79.59/89.44	27.47	5.42	30.17	82.31/92.16	HORIZ	94/114	-11.69/-21.84

CH Middle

Freq. (MHz)	Read Level (dBuV) AV/PK	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission (dBuV/m) AV/PK	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2440	78.64/88.05	27.40	5.40	30.15	81.29/90.7	VERT	94/114	-12.71/-23.3
2440	79.82/89.66	27.40	5.40	30.15	82.47/92.31	HORIZ	94/114	-11.53/-21.69

CH High

Freq. (MHz)	Read Level (dBuV) AV/PK	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission (dBuV/m) AV/PK	HORIZ/ VERT	Limits (dBuV/m) AV/PK	Margin (dB)
2480	77.34/86.78	27.50	5.46	29.98	80.32/88.65	VERT	94/114	-13.68/-24.24
2480	79.28/88.73	27.50	5.46	29.98	82.26/91.71	HORIZ	94/114	-11.74/-22.29

Remark:
Final Emission =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

B. General Radiated Emissions Data

For below 9kHz-30MHz Spurious

Freq. (MHz)	Emission(dBuV/m) PK / AV	Limits(dBuV/m) PK / AV	Margin (dB)
-	-	-	-
-	-	-	-

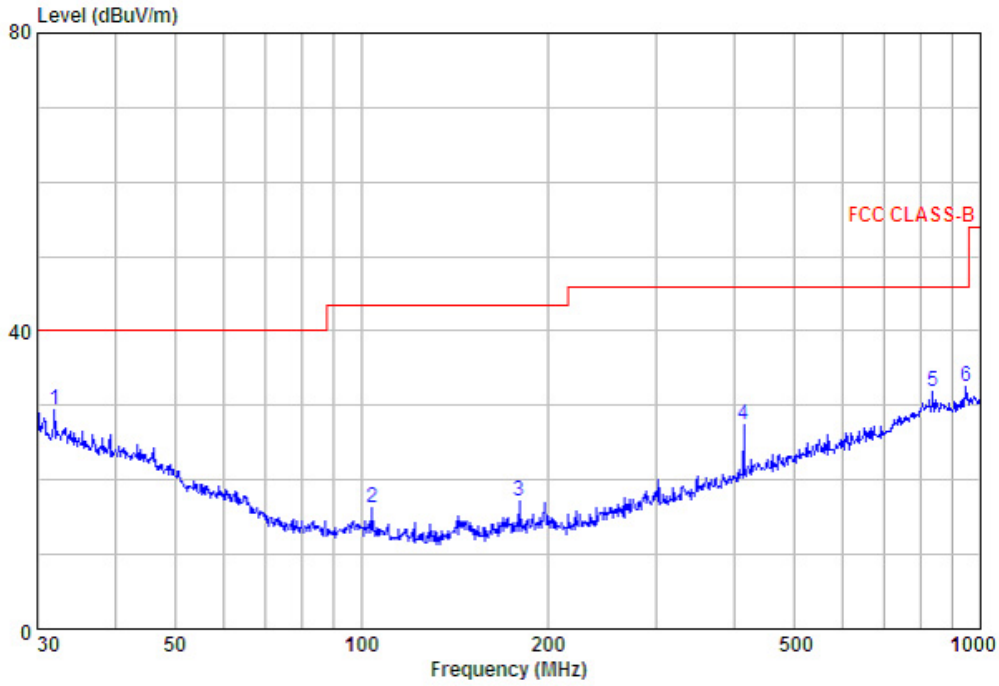
Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.

For 30M-1000MHz Spurious

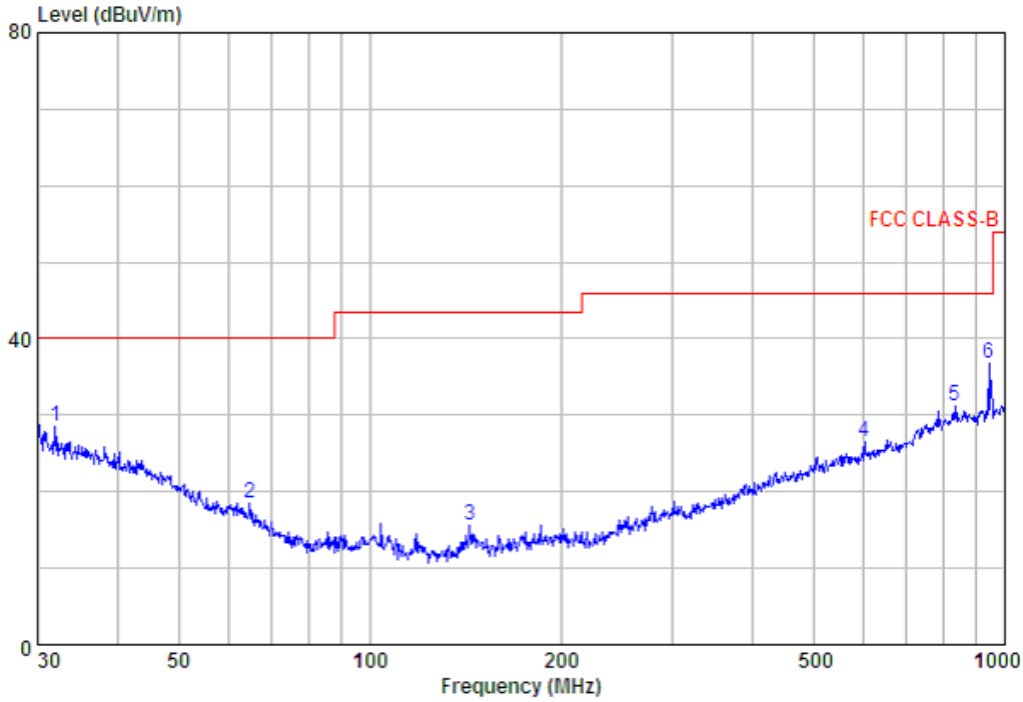
Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

2402*M*Hz Transmitting(Wo*rst case mode)*



Condition : FCC CLASS-B 3m HORIZONTAL
: RBW:120.000KHz VBW:300.000KHz SWT:Auto

	Freq	Limit Line	Level	Over Limit	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1 max	31.955	40.0	29.5	-10.5	QP	HORIZONTAL
2	104.170	43.5	16.3	-27.2	QP	HORIZONTAL
3	180.017	43.5	17.3	-26.2	QP	HORIZONTAL
4	414.722	46.0	27.5	-18.5	QP	HORIZONTAL
5	836.244	46.0	31.8	-14.2	QP	HORIZONTAL
6	948.761	46.0	32.5	-13.5	QP	HORIZONTAL



Condition : FCC CLASS-B 3m VERTICAL
: RBW:120.000KHz VBW:300.000KHz SWT:Auto

	Freq	Limit Line	Level	Over Limit	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	31.955	40.0	28.6	-11.4	QP	VERTICAL
2	64.659	40.0	18.6	-21.4	QP	VERTICAL
3	143.830	43.5	15.7	-27.8	QP	VERTICAL
4	601.427	46.0	26.5	-19.5	QP	VERTICAL
5	833.317	46.0	31.3	-14.7	QP	VERTICAL
6 max	945.440	46.0	36.7	-9.3	QP	VERTICAL

For 1000MHz-25000MHz Spurious

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4804	36.69/46.62	VERT	54.0/74.0	-17.31/-27.38
7206	40.65/50.62		54.0/74.0	-13.35/-23.38
9608	38.64/48.64		54.0/74.0	-15.36/-25.36
4804	35.56/47.23	HORIZ	54.0/74.0	-18.44/-26.77
7206	43.1/53.1		54.0/74.0	-10.9/-20.9
9608	44.59/54.59		54.0/74.0	-9.41/-19.41

CH Middle

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4880	31.59/41.67	VERT	54.0/74.0	-22.41/-32.33
7320	37.48/47.43		54.0/74.0	-16.52/-26.57
9760	36.41/46.44		54.0/74.0	-17.59/-27.56
4880	31.67/41.7	HORIZ	54.0/74.0	-22.33/-32.3
7320	39.74/49.74		54.0/74.0	-14.26/-24.26
9760	44.48/54.47		54.0/74.0	-9.52/-19.53

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4960	34.69/44.73	VERT	54.0/74.0	-19.31/-29.27
7440	38.56/48.56		54.0/74.0	-15.44/-25.44
9920	39.6/49.69		54.0/74.0	-14.4/-24.31
4960	33.96/43.96	HORIZ	54.0/74.0	-20.04/-30.04
7440	38.65/47.5		54.0/74.0	-15.35/-26.5
9920	40.65/49.58		54.0/74.0	-13.35/-24.42

Note:

1. The average measurement was not performed when the peak measured data under the limit of average detection.
2. Emissions attenuated more than 20 dB below the permissible value are not reported.

8. BAND EDGE

8.1. Test Equipment

Please refer to Section 4 this report.

8.2. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement. The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz respectively.

8.3. Band Edge FCC 15.249(d) Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

8.4. Band Edge Test Result

Pass

ALL of the restriction bands were tested,and only the data of worst case was exhibited.

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2390	40.94/48.73	VERT	54.0/74.0	-13.06/-25.27
2400	46.21/55.63		54.0/74.0	-7.79/-18.37
2390	41.67/50.74	HORIZ	54.0/74.0	-12.33/-23.26
2400	43.9/56.85		54.0/74.0	-10.1/-17.15

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2483.5	42.3/53.63	VERT	54.0/74.0	-11.7/-20.37
2500.00	39.33/49.22		54.0/74.0	-14.67/-24.78
2483.5	43.66/54.22	HORIZ	54.0/74.0	-10.34/-19.78
2500.00	40.22/48.37		54.0/74.0	-13.78/-25.63

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

9. 20-DB BANDWIDTH

9.1. Test Equipment

Please refer to Section 4 this report.

9.2. Test Procedure

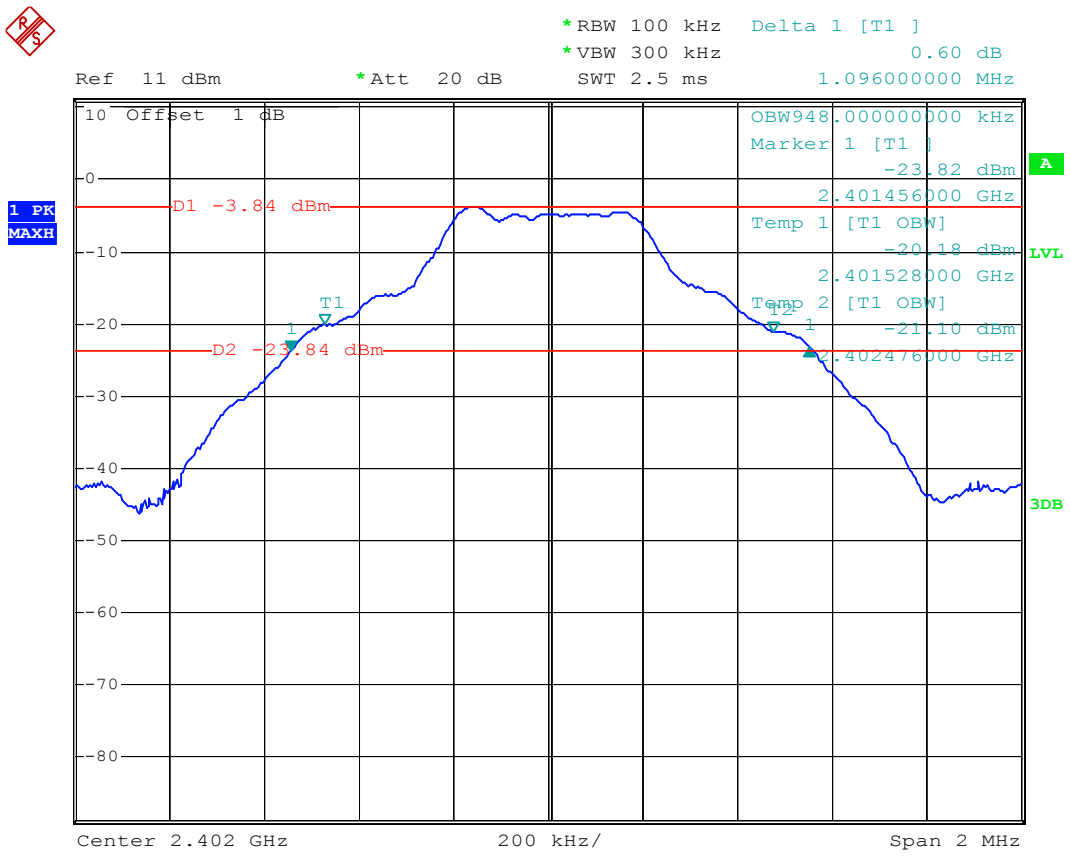
1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer = operating frequency.
3. The spectrum analyzer as RBW=100 KHz, VBW=300 KHz, Sweep=2.5ms.
4. Mark the peak frequency and –20dB (upper and lower) frequency.

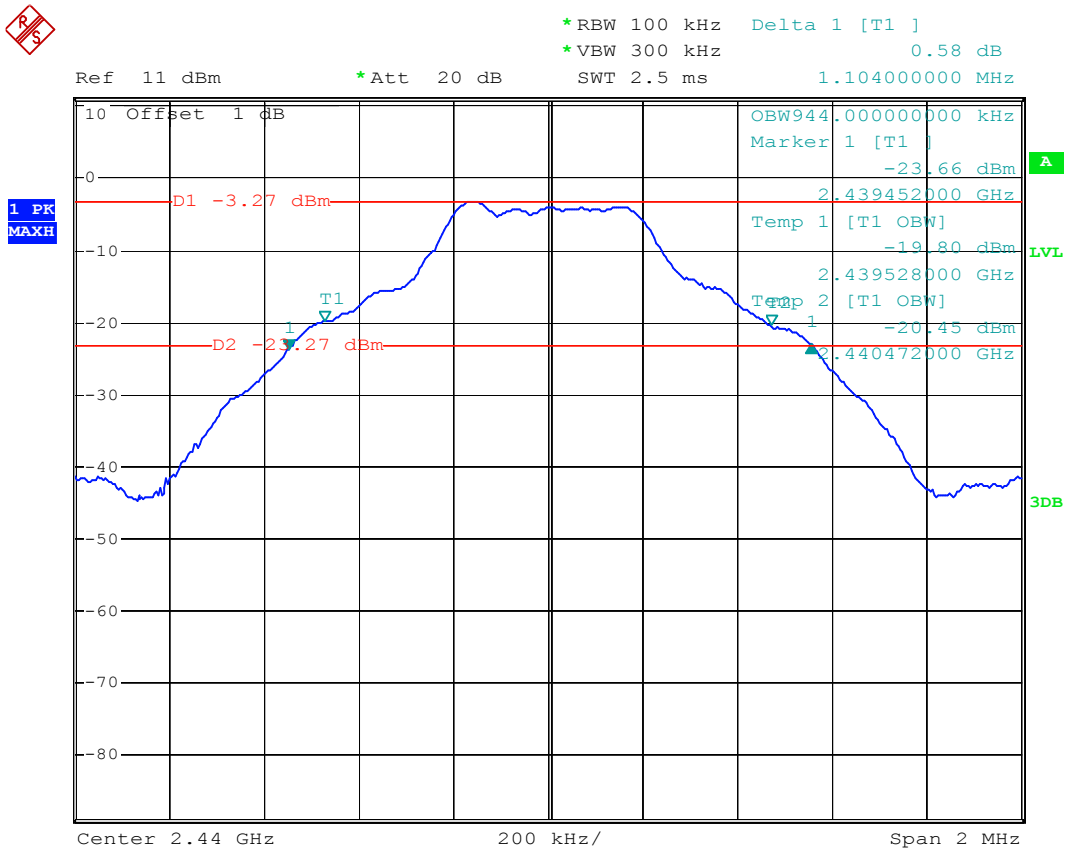
9.3. Limit

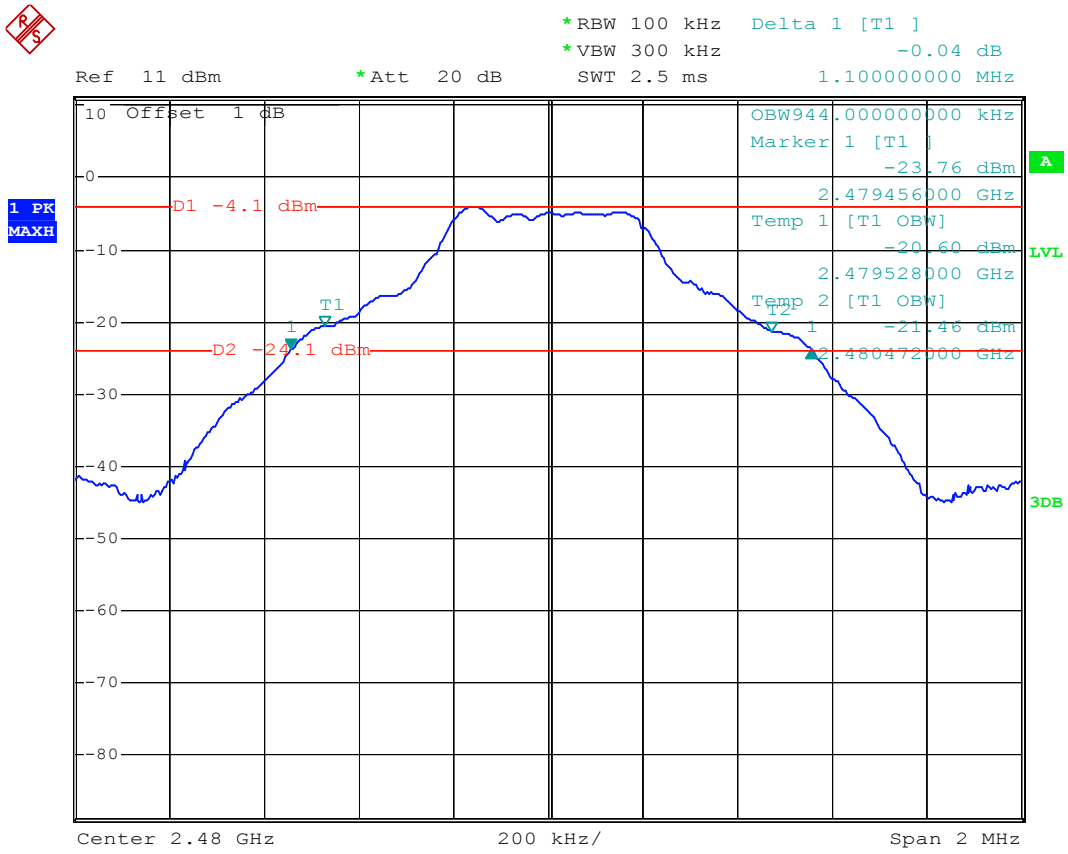
Please refer section15.249

9.4. Test Result /Plots

Limit	Channel Frequency (MHz)	20dB Bandwidth (MHz)
/	2402	1.096
/	2440	1.104
/	2480	1.100


*RBW 100 kHz
*VBW 300 kHz
Ref 11 dBm
*Att 20 dB
SWT 2.5 ms
Delta 1 [T1]
0.60 dB
1.096000000 MHz
10 Offset 1 dB
OBW948.000000000 kHz
Marker 1 [T1]
-23.82 dBm
2.401456000 GHz
Temp 1 [T1 OBW]
-20.18 dBm
2.401528000 GHz
Temp 2 [T1 OBW]
-21.10 dBm
2.402476000 GHz
D1 -3.84 dBm
D2 -23.84 dBm
T1
T2
1 PK
MAXH
A
LVL
3DB
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.402 GHz
200 kHz/
Span 2 MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
0.58 dB
1.104000000 MHz
Ref 11 dBm
*Att 20 dB
10 Offset 1 dB
OBW944.000000000 kHz
Marker 1 [T1]
-23.66 dBm
2.439452000 GHz
Temp 1 [T1 OBW]
-19.80 dBm
2.439528000 GHz
Temp 2 [T1 OBW]
-20.45 dBm
2.440472000 GHz
D1 -3.27 dBm
D2 -23.27 dBm
1 PK
MAXH
A
LVL
3DB
Center 2.44 GHz
200 kHz/
Span 2 MHz



End Of The Report