

FCC PART 15.249
EMI MEASUREMENT AND TEST REPORT
For

Shenzhen Bells Electronics Co., Ltd.

Room 602, 86th Building, Zhangkeng 3rd Community, Minzhi Street, Baoan District,
Shenzhen, China

FCC ID: COS-BK6089

March 15, 2012

This Report Concerns: Original Report	Equipment Type: Wireless Keyboard
Test Engineer:	Eric Li 
Report No.:	BST12020335Y-1ER-3
Receive EUT Date/Test Date:	March 8, 2012/ March 9-14, 2012
Reviewed By:	Christina 
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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 BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST 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, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

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 BST, unless the applicant has authorized BST in writing to do so.

Test Facility -

The test site used to collect the radiated data is located on the address of

SinTek Laboratory Co.,Ltd.

(FCC Registered Test Site Number: 963441) on

No.7, Xinshidai Industrial, Guantian Village, Shiyan Town, Baoan District, Shenzhen, Guangdong 518108, China

The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

Available upon request.

2. PRODUCT DESCRIPTION

2.1. EUT Description

Description	: Wireless Keyboard
Applicant	: Shenzhen Bells Electronics Co., Ltd. Room 602, 86th Building, Zhangkeng 3rd Community, Minzhi Street, Baoan District, Shenzhen, China
Model Number	: BK6089, BK6089BA, BK6089BW, BK6089B2, K7, BK3012, BK3001, BK3002, BK3012B2
Trade Name	: voliee
Frequency	: 2402-2480MHz
Number of Channels	: 79
Power Supply	: DC 3.7V Li-ion Battery or DC 5V powered by USB

2.2. Block Diagram of EUT Configuration



Figure 1 EUT Setup of TX mode

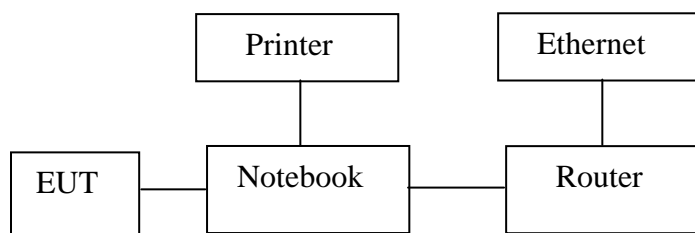


Figure 2 EUT Setup of Charging mode

2.3. Support Equipment List

Name	Model No	S/N	Manufacturer	Used “ ”
Notebook	A42J	--	ASUS	
Router	TL-R402M	07115200391	TP-LINK	
Printer	P320A	--	HP	

2.4. Test Conditions

Temperature: 20~25
Relative Humidity: 50~63 %

3. FCC ID LABEL

FCC ID: COS-BK6089

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1. This device may not cause harmful interference, and 2. This device must accept any interference received, including interference that may cause undesired operation.

Label Location on EUT

EUT View/ FCC ID Label Location



4. TEST RESULTS SUMMARY

FCC 15 Subpart C, Paragraph 15.249

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission	Compliant
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

Remark: "N/A" means "Not applicable".

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

Modifications

No modification was made.

5. TEST EQUIPMENT USED

Equipment/Facilities	Manufacturer	Model #	Serial no.	Date of Cal.	Cal. Interval
Cable	Resenberger	N/A	NO.1	Mar 10 , 2012	1 Year
Cable	SCHWARZBECK	N/A	NO.2	Mar 10 , 2012	1 Year
Cable	SCHWARZBECK	N/A	NO.3	Mar 10 , 2012	1 Year
LISN	Rohde & Schwarz	ESH3-Z5	100305	Mar 10 , 2012	1 Year
50 Coaxial Switch	ANRITSU CORP	MP59B	6200283933	Mar 10 , 2012	1 Year
EMI Test Receiver	Rohde & Schwarz	ESP13	100180	Oct.11,2011	1 Year
Spectrum Analyzer	Rohde & Schwarz	FSP40	100273	Sep.10,2011	1 Year
3m Semi-Anechoic Chamber	Albatross Projects	9mx6mx6m	N/A	Feb.20,2012	1 Year
Signal Generator	FLUKE	PM5418 + Y/C	LO747012	Feb.20,2012	1 Year
Signal Generator	FLUKE	PM5418TX	LO738007	Feb.20,2012	1 Year
Loop Antenna	SCHWARZBECK	FMZB1516	113	Jan.30,2012	1 Year
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4079	Sep.22,2011	1 Year
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-564	Sep.22,2011	1 Year
Ultra Broadband Antenna	Rohde & Schwarz	HL-562	100110	June.15,2011	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100196	Oct.11,2011	1 Year
AMN	Rohde & Schwarz	ESH3-Z5	100197	Oct.11,2011	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	N/A	N/A	N/A
Power Meter	Rohde & Schwarz	NRVD	100041	Feb.20,2012	1 Year
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Feb.20,2012	1 Year
Coaxial Cable with N-connectors	SCHWARZBECK	AK9515H	95549	Sep.22,2011	1 Year
Radio Communication Test Set	Rohde & Schwarz	CMS 54	846621/024	Feb.20,2012	1 Year
Modulation Analyzer	Hewlett-Packard	8901B	2303A00362	Feb.20,2012	1 Year
Absorbing clamp	Rohde & Schwarz	MDS-21	N/A	Oct.11,2011	1 Year

6. ANTENNA REQUIREMENT

6.1. 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.

6.2. 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 in this product is PCB antenna. The antenna is permanently attached. Refer to the product photo.

6.3. Result

Compliance

7. CONDUCTED POWER LINE TEST

7.1. Test Equipment

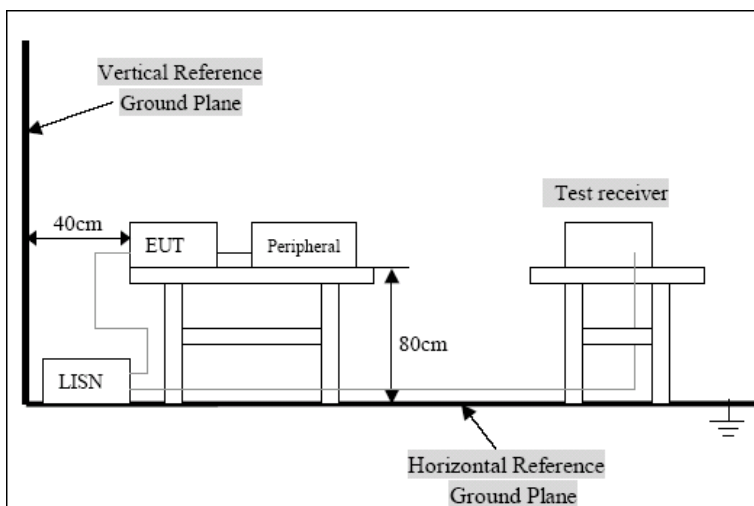
Please refer to section 5 this report.

7.2. 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 impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uh coupling impedance with 50ohm termination.

Both sides of A.C. Line are checked 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 measured over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9KHz.

7.3. Test Setup



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

7.4. 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.

7.5. Conducted Power Line Test Result

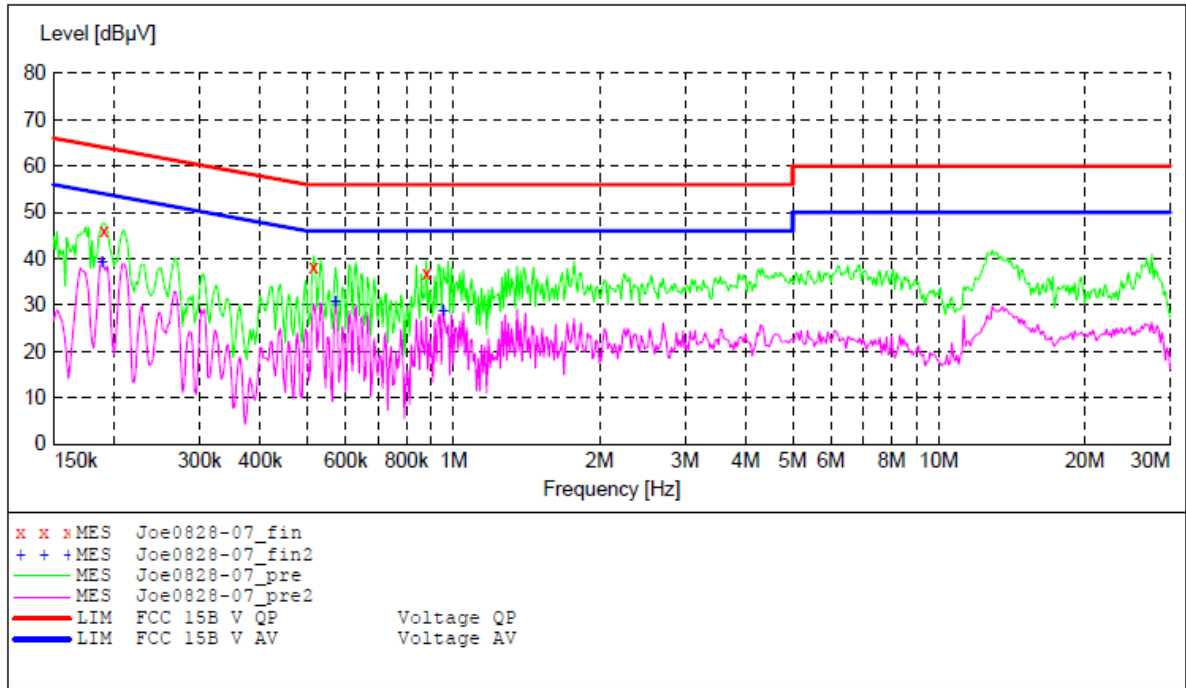
Pass.

Date of Test:	March 12, 2012	Temperature:	25°C
EUT:	Wireless Keyboard	Humidity:	50%
Model No.:	BK6089	Power Supply:	DC 5V power by PC USB port PC power: AC120V/60Hz
Test Mode:	Charging	Test Engineer:	Eric Li

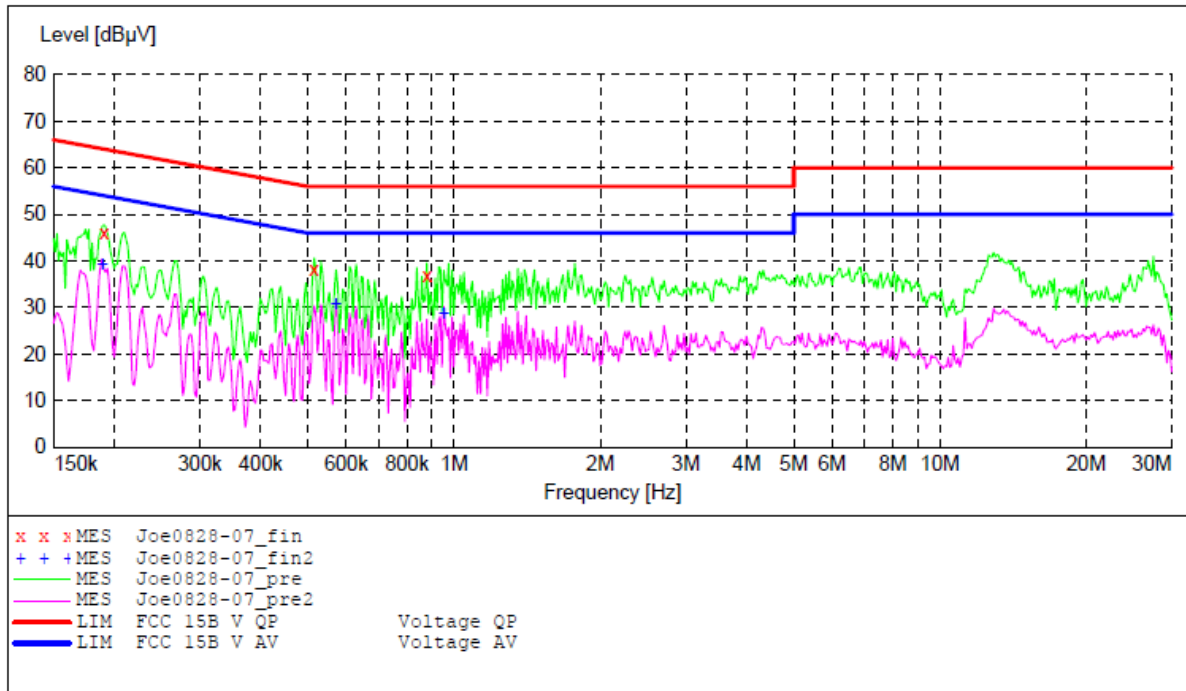
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.188993	45.30	11.2	64	18.8	QP	L1	GND
0.515791	38.00	12.0	56	18.0	QP	L1	GND
0.975700	37.10	11.8	56	18.9	QP	L1	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.188993	37.80	11.2	54	16.3	AV	L1	GND
0.629487	30.40	11.9	46	15.6	AV	L1	GND
1.048241	29.20	11.8	46	16.8	AV	L1	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190505	46.10	11.2	64	17.9	QP	N	GND
0.515791	38.20	12.0	56	17.8	QP	N	GND
0.879689	36.90	11.9	56	19.1	QP	N	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.188993	39.10	11.2	54	15.0	AV	N	GND
0.572085	30.80	12.0	46	15.2	AV	N	GND
0.952653	28.70	11.8	46	17.3	AV	N	GND

The spectral diagrams in below display the measurement of peak values.

L Line



N Line



8. RADIATED EMISSION TEST

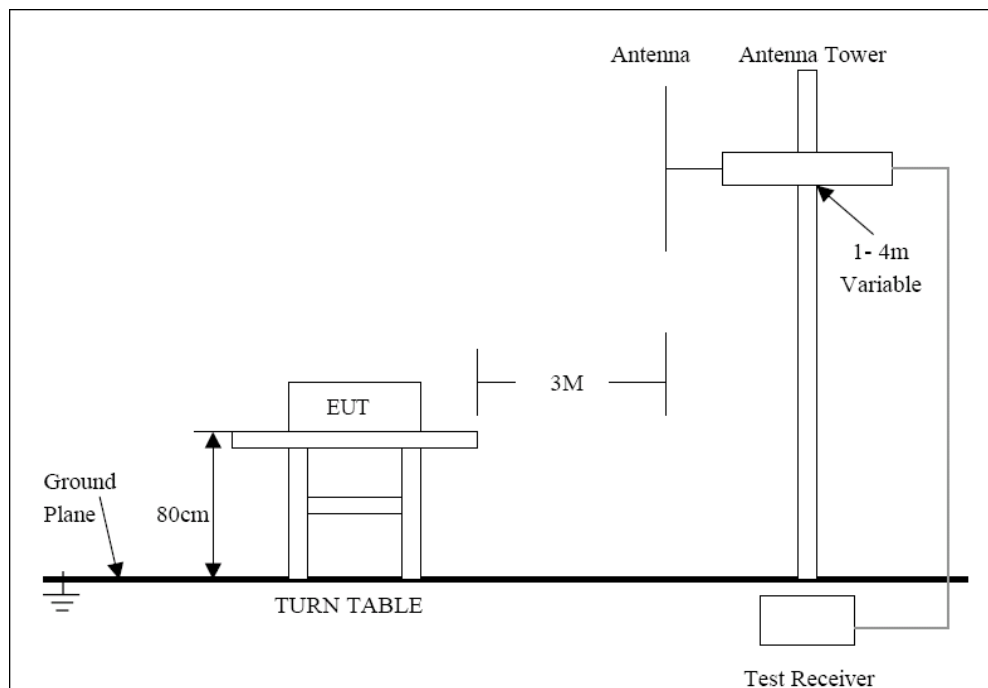
8.1. Test Equipment

Please refer to section 5 this report.

8.2. Test Procedure

1. The EUT was tested according C63.4-2003. The radiated test was performed at FCC Registration laboratory .
2. The EUT, peripherals were put on the turntable which table size of 1m×1.5m, table high 0.8m. All set up is according to ANSI C63.4-2003.
3. The frequency spectrum from 30MHz to 1 GHz was investigated. All readings from 30MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1GHz , peak values with a resolution bandwidth of 1 MHz. Measurements were made at 3 meters.
4. The antenna high is varied from 1m to 4m high to find the maximum emission for each frequency.
5. Maximizing procedure was performed on the six(6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 Db of specification limit), and are distinguished with a "QP" in the data table.
6. The antenna polarization: Vertical polarization and Horizontal polarization.
7. Through three orthogonal axes to determine which attitude and equipment arrangement produces the highest emission relative to the limit.

8.3. Radiated Test Setup



For the actual test configuration, please refer to the related items-photos of Testing.

8.4. 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(AV)	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.

8.5. Radiated Emission Test Result

Pass

A. Fundamental Radiated Emissions Data

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2402	84.21/89.37	VERT	94/114	9.79/24.63
2402	87.25/92.43	HORIZ	94/114	6.75/21.57

CH Middle

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2441	84.00/89.18	VERT	94/114	10.00/24.82
2441	87.47/92.67	HORIZ	94/114	6.53/21.33

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
2480	84.32/89.44	VERT	94/114	9.68/24.56
2480	87.32/92.45	HORIZ	94/114	6.68/21.55

B. Harmonics Radiated Emissions Data

CH Low

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4804.0	47.65/52.83	VERT	54.0/74.0	6.35/21.17
4804.0	47.80/52.95	HORIZ	54.0/74.0	6.20/21.05

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

CH Middle

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4882.0	42.24/47.60	VERT	54.0/74.0	11.60/26.24
4882.0	42.40/47.43	HORIZ	54.0/74.0	11.44/26.41

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

CH High

Freq. (MHz)	Emission(dBuV/m) AV/PK	HORIZ/ VERT	Limits(dBuV/m) AV/PK	Margin (dB)
4960.0	44.87/50.01	VERT	54.0/74.0	9.13/23.99
4960.0	43.91/49.04	HORIZ	54.0/74.0	10.09/24.96

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

C. General Radiated Emissions Data

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

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

9. BAND EDGE

9.1. Test Equipment

Please refer to Section 5 this report.

9.2. Test Procedure

1. The EUT was tested according C63.4-2003.The radiated test was performed at FCC Registration laboratory .
2. The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.
- 3.As the radiation test ,set the Lowest and Highest Transmitting Channel,observed the outside band of 2400MHz to 2438.5MHz,than mark the higher-level emission for comparing with the FCC rules.

9.3. Band Edge FCC 15.249(d) Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating,the radio frequency power that is produced by the intentional radiator shall be at least 50dB

below that in the 100kHz bandwidth within the band that contains the desired power,based on either an RF conducted or a radited 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 specitfied in Section 15.209(a) (see Section 15.205(c)).

9.4. Band Edge Test Result

Pass

TX 2402MHz

Frequency (MHz)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	AV	PEAK	AV	PEAK	AV	PEAK	
2400.000	44.33	50.21	54	74	9.67	23.79	Vertical
2400.000	44.82	50.48	54	74	9.18	23.52	Horizontal

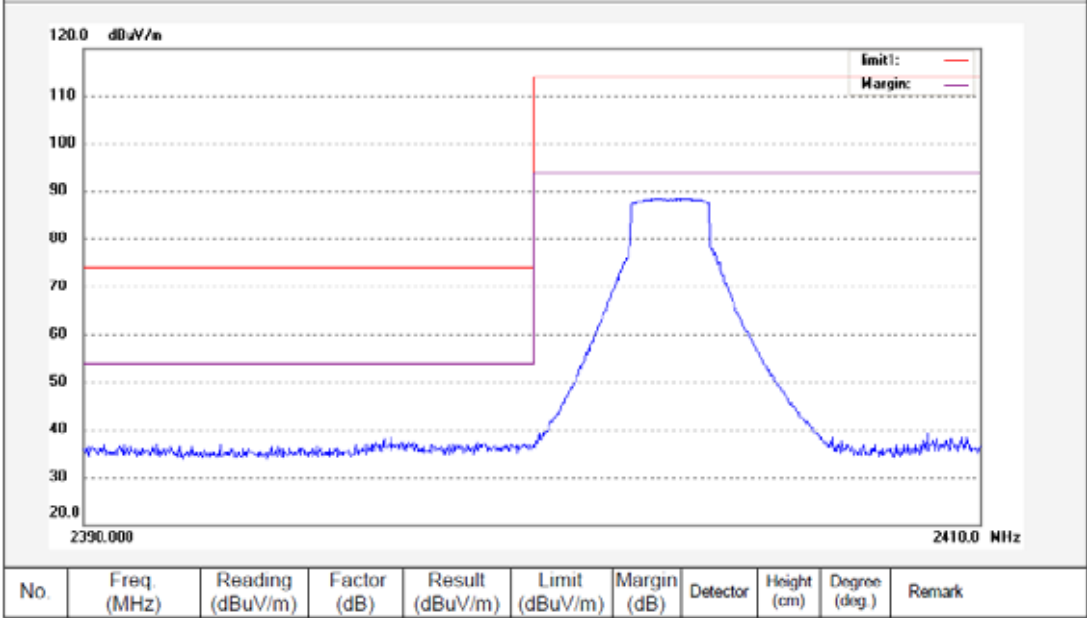
Emissions attenuated more than 20 dB below the permissible value are not reported.

TX 2480MHz

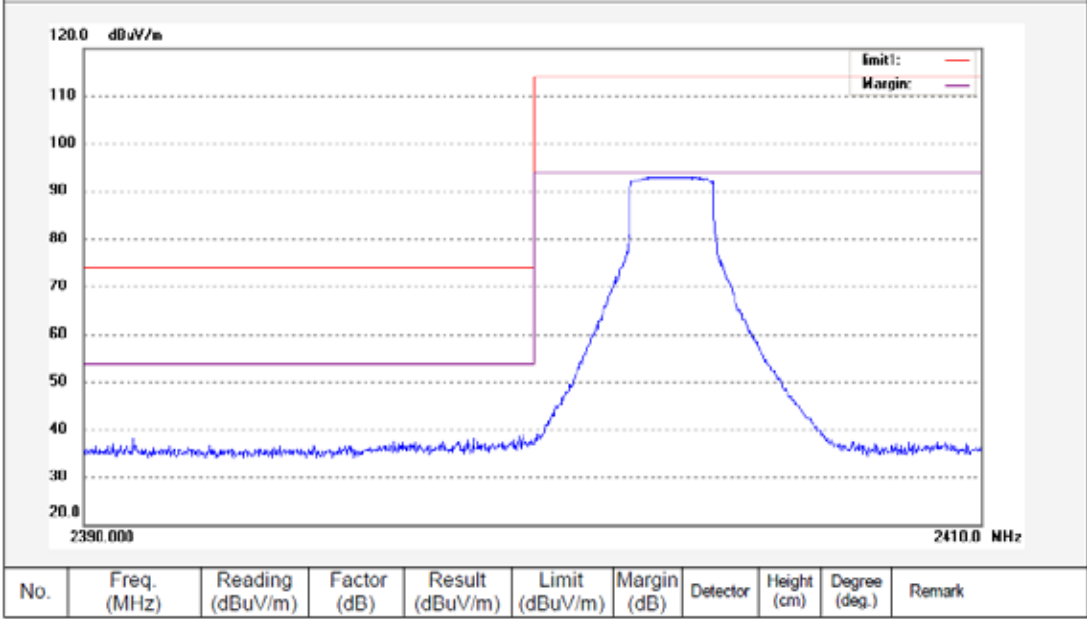
Frequency (MHz)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	AV	PEAK	AV	PEAK	AV	PEAK	
2483.500	37.84	43.14	54	74	16.16	30.86	Vertical
2483.500	37.27	42.89	54	74	16.73	31.11	Horizontal

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

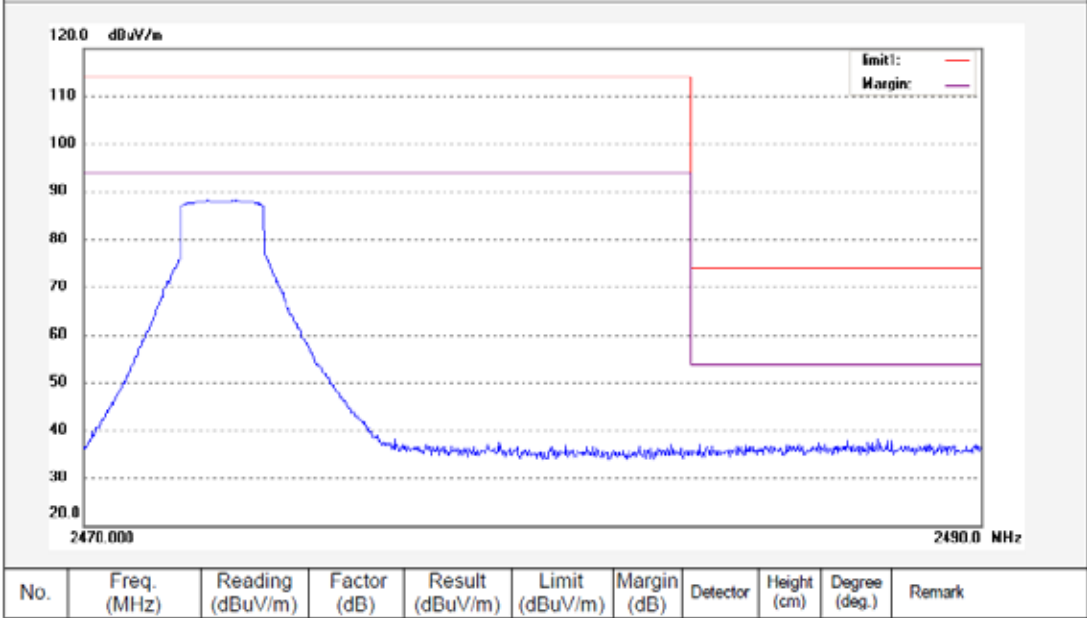
Vertical TX 2402MHz



Horizontal TX 2402MHz



Vertical TX 2480MHz



Horizontal TX 2480MHz

