



## Test Report of FCC Part 15 C for FCC Certificate

On Behalf of

**Guangzhou Liwei Electronics Co.,LTD.**

**FCC ID:** VO8-BS-3

**Product Description:** Bluetooth Stereo Speaker

**Test Model:** BS-3

**Supplement Model:** BS-2, CS-4, CS-4+, AS, US, J1, SS

**Brand:**

**Bluedio** 蓝弦®

**Applicant:** Guangzhou Liwei Electronics Co.,LTD.

Guotang Industrial Zone, Shenshan, Baiyun District, Guangzhou City, Guangdong Province, P.R.China

**Manufacturer:** Guangzhou Liwei Electronics Co.,LTD.

Guotang Industrial Zone, Shenshan, Baiyun District, Guangzhou City, Guangdong Province, P.R.China

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**Report No.:** LK15FR-0523E-1

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**Test Date:** July 1, 2015~ July 5, 2015

**Test by:**

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## 1. GENERAL INFORMATION

### 1.1 Product Description for Equipment Under Test (EUT)

#### Client Information

Applicant: **Guangzhou Liwei Electronics Co.,LTD.**  
Address of applicant: Guotang Industrial Zone, Shenshan, Baiyun District,  
Guangzhou City, Guangdong Province, P.R.China  
Manufacturer: **Guangzhou Liwei Electronics Co.,LTD.**  
Address of manufacturer: Guotang Industrial Zone, Shenshan, Baiyun District,  
Guangzhou City, Guangdong Province, P.R.China

#### General Description of E.U.T

Items	Description
EUT Description:	Bluetooth Speaker
Test Model No.:	BS-3
Supplement Model No.:	BS-2, CS-4, CS-4+, AS, US, J1, SS
Trade mark:	<b>Bluedio</b> 蓝弦®
Type of Modulation:	GFSK
Frequency Band:	2402 MHz ~ 2480 MHz
Number of Channels:	40
Channel Bandwidth:	2 MHz
Antenna Type:	Integrated antenna, fixed on PCB
Antenna Gain:	0dBi
Rated Voltage:	3.7V from battery and charged by USB DC5V
Bluetooth Version:	BT 4.1

#### Note:

\* The test data gathered are from the production sample provided by the manufacturer,  
All models just different with feature ,colour and model name.



## 1.2 Test Facility

All measurement required was performed at laboratory of Centre Testing International (ShenZhen) Corporation ,Location at Building C, Sienific Innovation Park,Tiegang Reservoir, Xixiang, Baoan District, Shenzhen, Guangdong, The site and apparatus are constructed in conformance with the requirements of ANSI C63.4, CISPR 16-1-1 and other equivalent standards.

The test facility is recognized, certified, or accredited by the following organizations:

### FCC – Registration No.: 565659

Centre Testing International (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 565659, expiration date is 01/27/2017.

### IC Registration No.: 7408B

The 3m alternate test site of CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7408B on December 29, 2009.

### CNAS - Registration No.: L1910

CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION,. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.The acceptance letter from the CNAS is maintained in our files: Registration:L1910,January 12,2010.

## 1.3 Related Submittal(s) / Grant (s)

This submittal(s) is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.209, and 15.247 rules.

## 1.4 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Conducted Emission	3.2
Radiated Emission	4.5



## 2. SYSTEM TEST CONFIGURATION

The tests documented in this report were performed in accordance with ANSI C63.4-2003 and FCC CFR 47 Part 15 Subpart C.

### 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 that intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

### 2.3 General Test Procedures

**Conducted Emissions** The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

**Radiated Emissions** The EUT is placed on a turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m/10m 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 maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.

## 2.4 List of Measuring Equipments

Test equipments list of CENTRE TESTING INTERNATIONAL (SHENZHEN) CORPORATION.

Shielding Room No. 1 - Conducted disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	R&S	ESCI	100009	06/19/2016
LISN	ETS-LINDGREN	3850/2	00051952	06/19/2016
LISN	R&S	ENV216	100098	06/19/2016
Voltage Probe	R&S	ESH2-Z3	100042	06/19/2016
Current Probe	R&S	EZ17	100106	06/19/2016
ISN	TESEQ GmbH	ISN T800	30297	06/19/2016

Control Room - Conducted disturbance Test (10m part)				
Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	R&S	ESCI	100435	06/19/2016
LISN	schwarzbeck	NNLK8121	8121-529	06/19/2016
Transient Limiter	ELECTRO-METRICS	EM-7600	806	06/29/2016
Voltage Probe	R&S	ESH2-Z3	100042	06/19/2016
Current Probe	R&S	EZ17	100106	06/19/2016
ISN	TESEQ GmbH	ISN T800	30297	06/19/2016
Horn Antenna	ETS-LINGREN	3117	00057407	06/19/2016

3M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	06/29/2016
Spectrum Analyzer	Agilent	E4440A	MY46185649	06/19/2016
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	401	06/21/2016
Multi device Controller	ETS-LINGREN	2090	00057230	N/A
Horn Antenna	ETS-LINGREN	3117	00057407	06/19/2016
Microwave Preamplifier	Agilent	8449B	3008A02425	06/29/2016

10M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
10M Chamber & Accessory Equipment	Rainford	--	--	07/06/2016
Receiver	R&S	ESCI	100435	06/19/2016
Spectrum Analyzer	R&S	FSP40	100416	06/29/2016
EMI test receiver	R&S	ESIB40	2023282915	06/15/2016





TRILOG Broadband Antenna	schwarzbeck	VULB 9163	484	06/27/2016
Horn Antenna	ETS-LINGREN	3117	00044562	07/27/2016
Power Divider	Weinschel	1506A	PM204	06/27/2016
Signal Generator	Rohde & Schwarz	SMR20	100047	06/27/2016
Microwave Preamplifier	Agilent	11909A	186871	06/29/2016
Microwave Preamplifier	HP	HP 8447F	2805A03379	06/21/2016
Microwave Preamplifier	CD	PAP-1G18G	2001	06/27/2016

**Shielding Room No. 2 - Harmonic / Flicker Test (EN 61000-3-2) / (EN 61000-3-3)**

Equipment	Manufacturer	Model	Serial No.	Due Date
5KVA AC POWER SOURCE	California instruments	5001iX-400-413	57344	06/29/2016
Flicker & Harmonic Tester	California instruments	PACS-1	72492	06/29/2016

**Shielding Room No. 3 - ESD Test (IEC 61000-4-2)**

Equipment	Manufacturer	Model	Serial No.	Due Date
ESD Simulator	EM TEST	ESD30C	V0603101091	06/29/2016
ESD Simulator	TESEQ	NSG437	478	06/29/2016

**3M Full-anechoic Chamber - Radio-frequency electromagnetic field Immunity Test (IEC 61000-4-3)**

Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	06/29/2016
ESG Vector signal generators	Agilent	E4438C	MY45095744	06/17/2016
Power Amplifier	AR	150W1000	0322288	06/19/2016
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	401	06/29/2016
Temperature & Humidity Chamber	ESPEC	DSW0540	ER-009	06/21/2016

**Shielding Room No. 3 - EFT / Surges Test (IEC 61000-4-4) (IEC 61000-4-5)**

Equipment	Manufacturer	Model	Serial No.	Due Date
Compact Generator	EM-Test	UCS500M/6B	V0603101093	06/19/2016
Capacitive Clamp	EM-Test	C Clamp HFK	0306-43	06/27/2016
CDN for Telecom Port	EM-Test	CNV504S1	V0603101094	06/27/2016
EFT Generator	SCHAFFNER	NSG 2025	19878	06/27/2016
SURGE Generator	SCHAFFNER	NSG 2050	200313-135AR	06/29/2016
CDN	SCHAFFNER	CDN-131/133	34397	06/29/2016



<b>Shielding Room No. 2 - Radio-frequency continuous conducted Immunity Test (IEC 61000-4-6)</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
Signal Generator	IFR	2023B	202307/883	06/27/2016
Power Amplifier	AR	75A 250A	320297	06/29/2016
Attenuator	EM-Test	ATT6/75	0320837	06/19/2016
CDN	EM-Test	CDN M2/M3	0204-01	06/19/2016
EM-Clamp	EM-Test	EM101	35770	06/19/2016

<b>Shielding Room No. 2 - Power-frequency magnetic fields Immunity Test (IEC 61000-4-8)</b>				
Compact Generator	EM-Test	UCS500M/6B	V0603101093	06/19/2016
Induction Coil	EM-Test	MS100	0106-47	06/29/2016
Current Transformer	EM-Test	MC2630	0106-02	06/29/2016

<b>Shielding Room No. 2 -Voltage dips and interruptions Test (IEC 61000-4-11)</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
5KVA AC POWER SOURCE	California instruments	5001iX-400-413	57344	06/29/2016
Electronic output switch	California instruments	EOS-1	72616	06/29/2016

## 2.5 List of auxiliary device

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Specification</b>	<b>Cert.</b>
Notebook	Lenovo	E46L	Input: DC20V ( 3.25A) Output: USB DC5V	FCC DoC, CE,CCC
Adapter	Lenovo	PA-1650-56LC	Input:100~240V (1.7A)50-60Hz Output: DC20V ( 3.25A)	FCC DoC, CE,CCC

### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
15.207(a)	Condcuted Emission Test	Pass
15.247(e)	Power Spectral Density	Pass
15.247(a)(2)	6dB Bandwidth	Pass
15.247(a)	Occupied Bandwidth	Pass
15.247(b)(1)	Maximum Peak Output Power	Pass
15.205	Emissions At Restricted Band	Pass
15.247(d),15.209	Spurious Radiated Emission	Pass
15.203	Antenna Requirement	Pass



## 4. Conducted Emission Test

### 4.1 Applicable Standard

Section 15.207(a): for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

### 4.2 Limits

Limits for Class A digital devices

Frequency range (MHz)	Limits dB( $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60

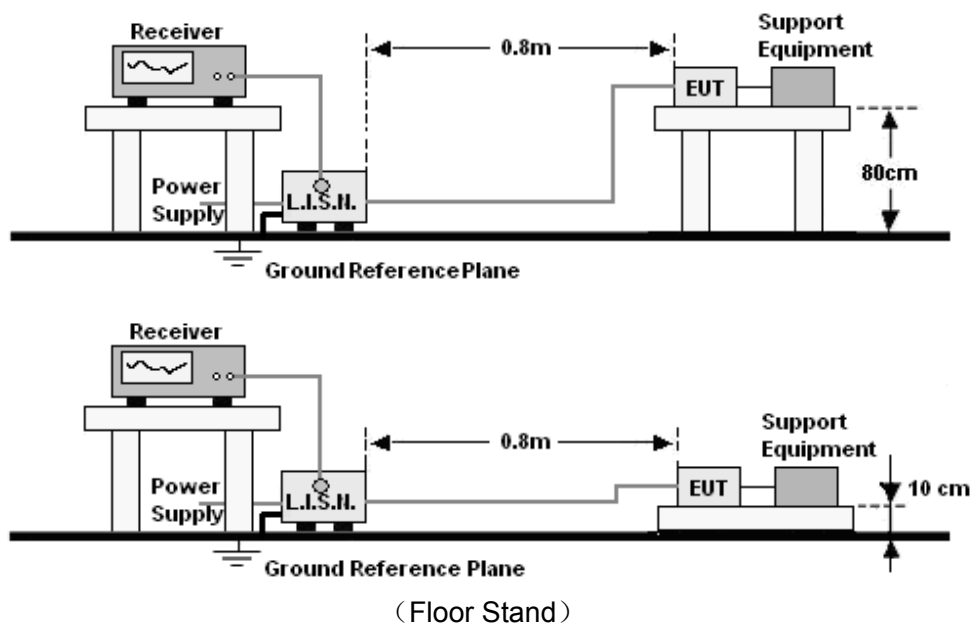
NOTE: The lower limit shall apply at the transition frequency.

Limits for Class B digital devices

Frequency range (MHz)	Limits dB( $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.  
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

### 4.3 EUT Test Setup



**4.4 Procedure Of Conducted Emission Test**

- a. The Product was placed on a nonconductive table above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

**4.5 Test Result**

Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Charging and BT working

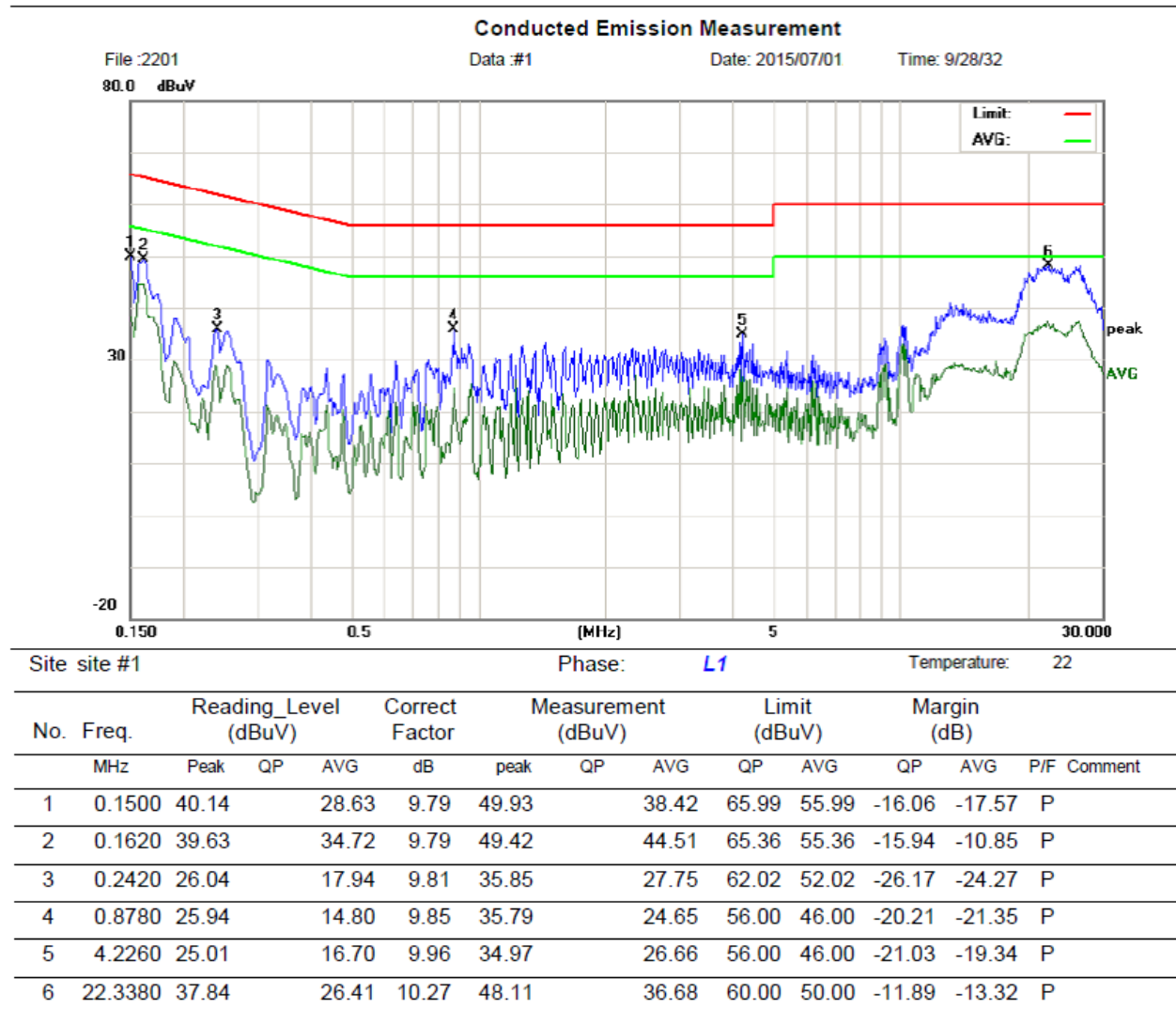
The charging and BT working mode test data worse than charging mode,so only record this mode test datas





## The Test Data Of Conducted Emission

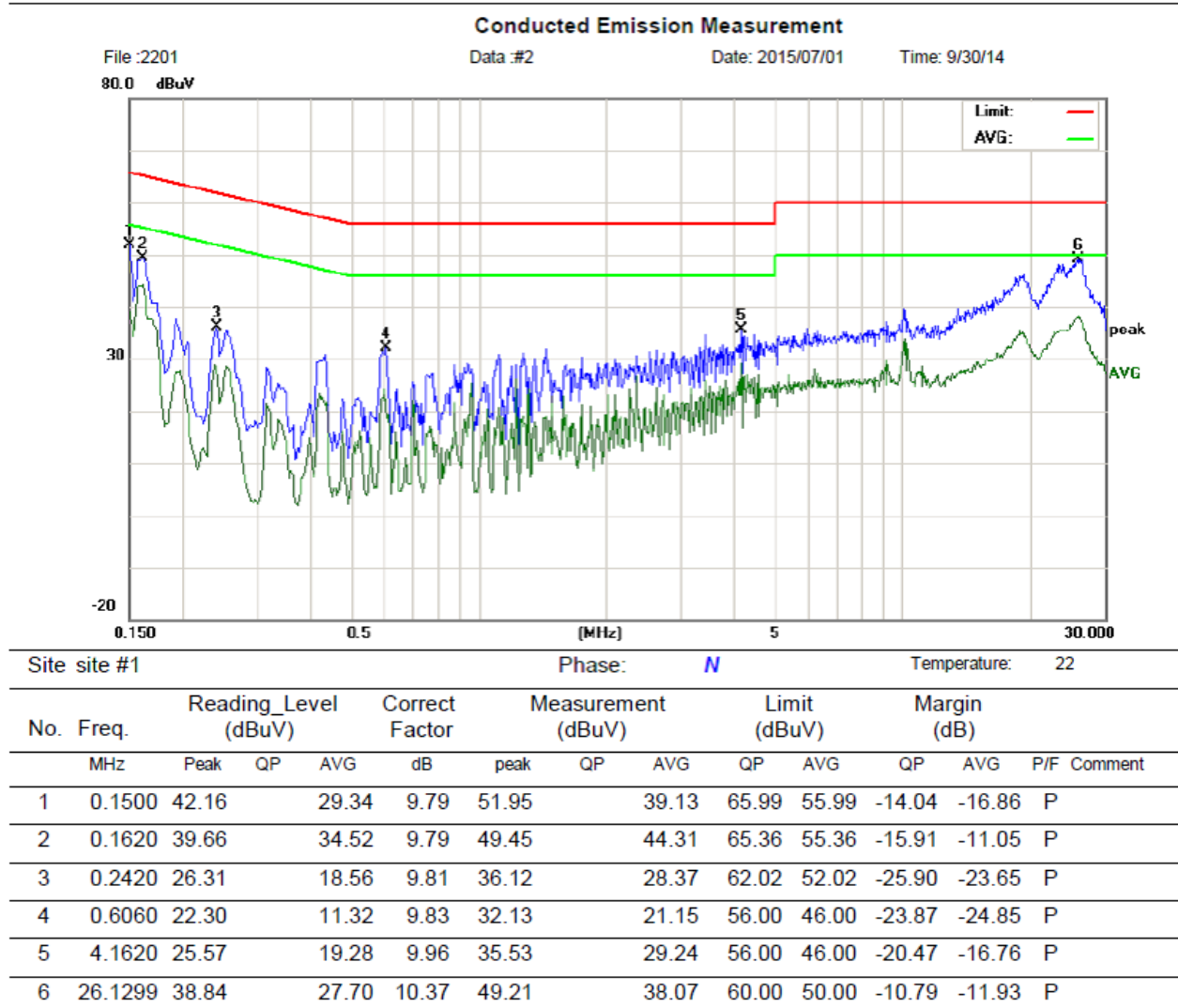
EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: Charging and BT working  
Test Site: CHAMBER  
Operator: Owen Li  
Comment: Line:L  
Tem:22°C Hum:50%





## The Test Data Of Conducted Emission

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: Charging and BT working  
Test Site: CHAMBER  
Operator: Owen Li  
Comment: Line:N  
Tem:22°C Hum:50%

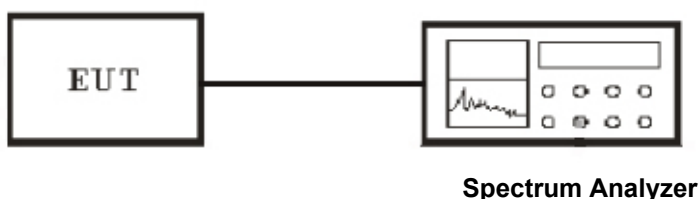


## 5. Power Spectral Density Measurement

### 5.1 Applicable Standard

According to §15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.2 EUT Setup



### 5.3 Test Equipment List and Details

See section 2.4.

### 5.4 Test Procedure

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 3 kHz.
4. Set the VBW  $\geq 3 \times$  RBW.
5. Set the span to 1.5 times the DTS channel bandwidth.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

### 5.5 Test Result

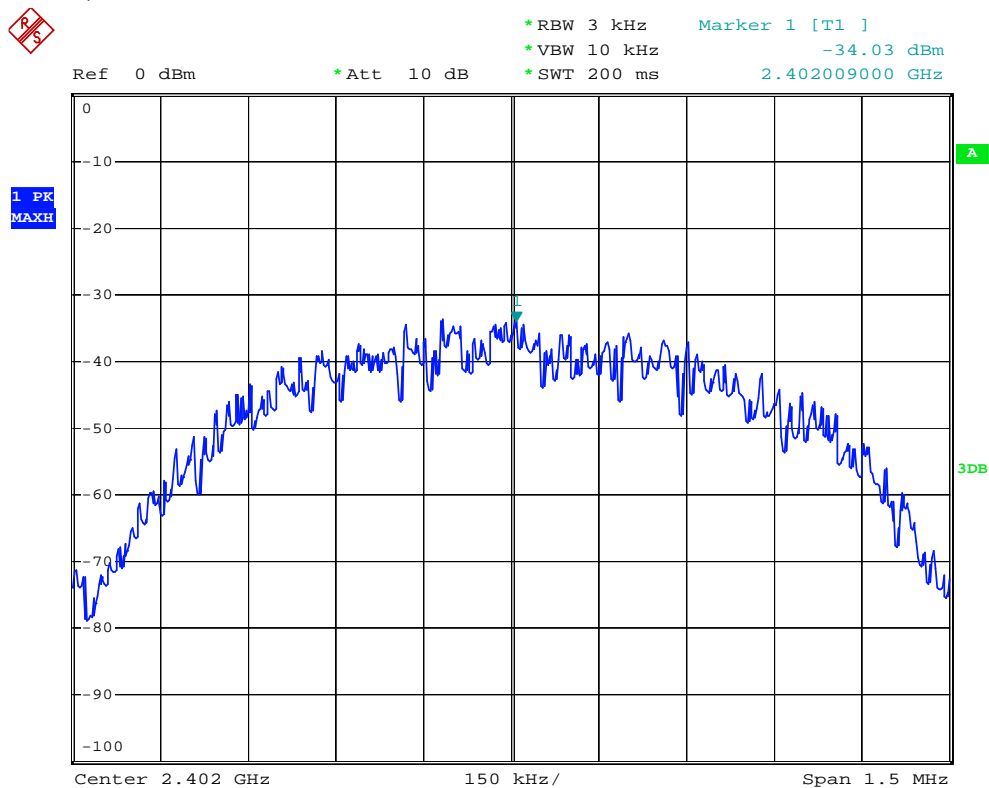
Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

Modulation	Frequency (MHz)	Reading Level (dBm)	Max. Limit (dBm/3KHz)	Result
GFSK	2402	-34.03	8	Pass
	2440	-30.15	8	Pass
	2480	-29.89	8	Pass

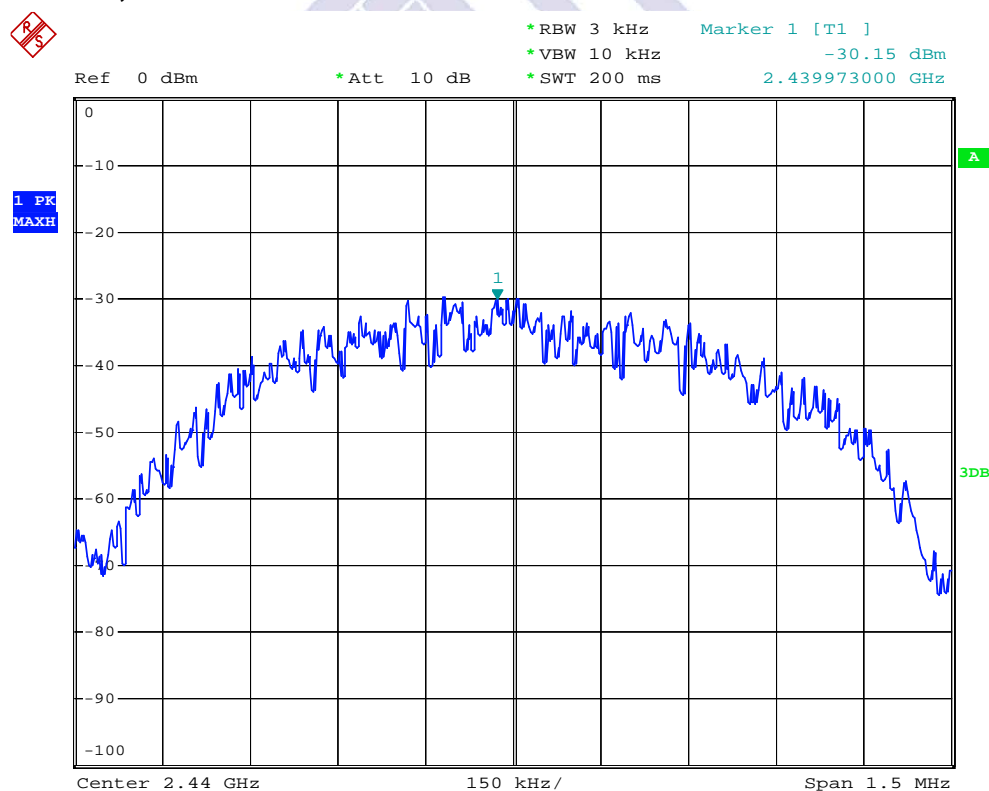




### Low Channel, 2402MHz

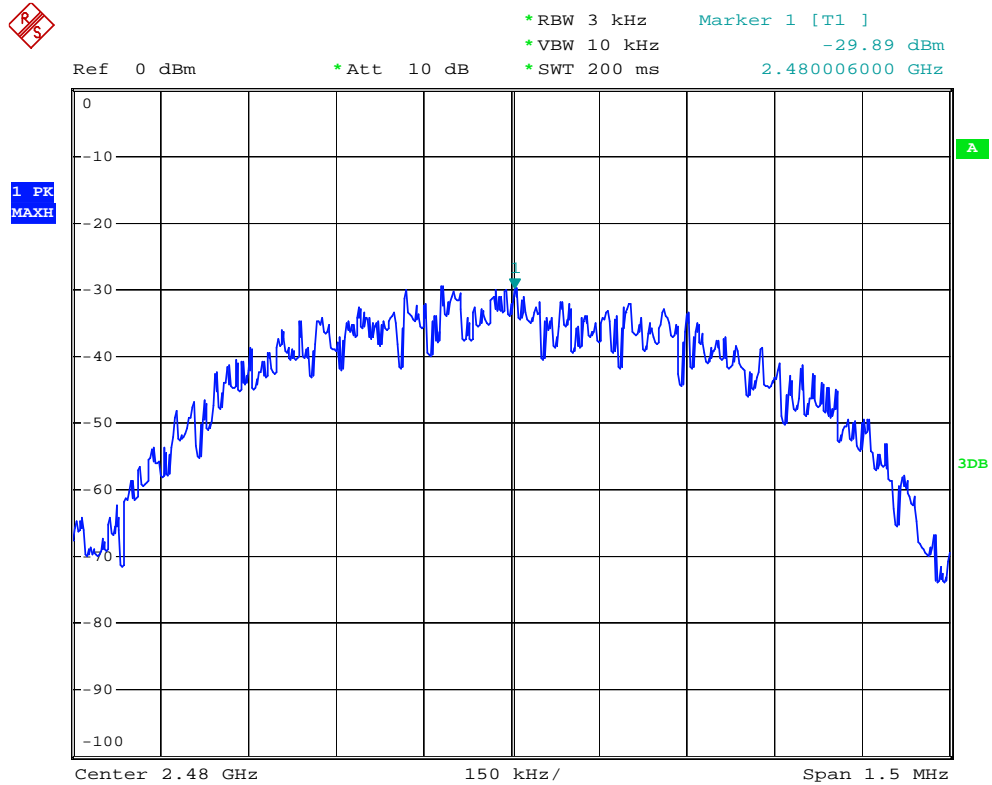


### Middle Channel, 2440MHz





High Channel, 2480MHz

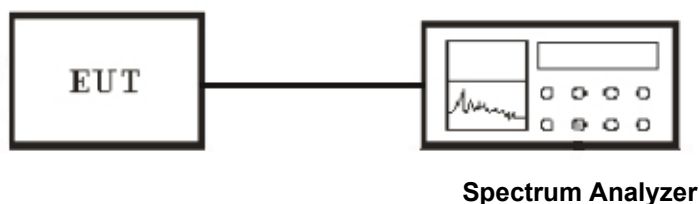


## 6. 6 dB Spectrum Bandwidth Measurement

### 6.1 Applicable Standard

According to §15.247(a)(2): For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

### 6.2 EUT Setup



### 6.3 Test Equipment List and Details

See section 2.4.

### 6.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The resolution bandwidth and the video bandwidth were set according to KDB558074.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is 100ms.

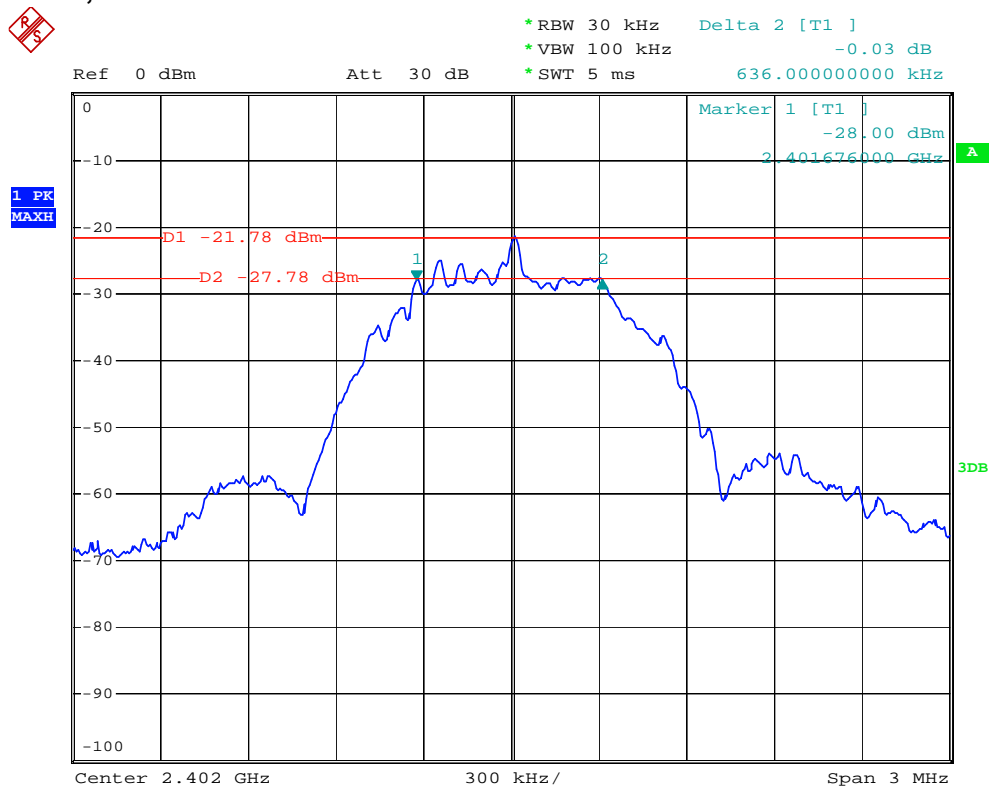
### 6.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

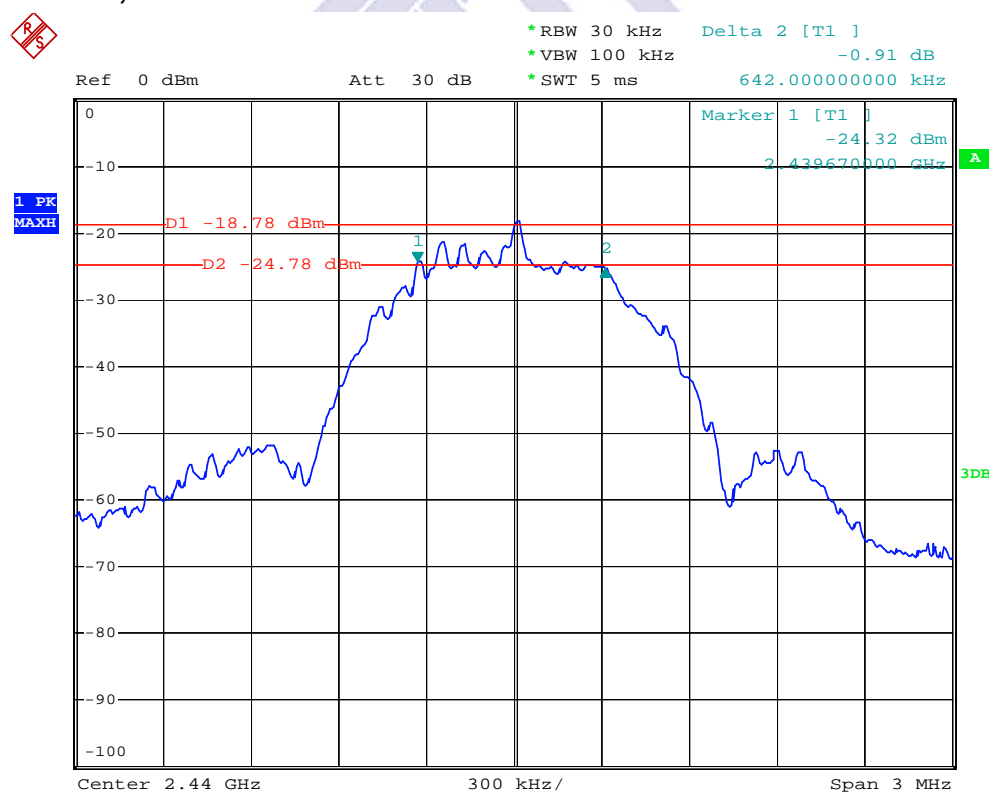
Modulation Type	Frequency (MHz)	6dB Bandwidth (KHz)	Min. Limit (KHz)	Result
GFSK	2402	636.00	500	Pass
	2440	642.00	500	Pass
	2480	630.00	500	Pass



### Low Channel, 2402MHz

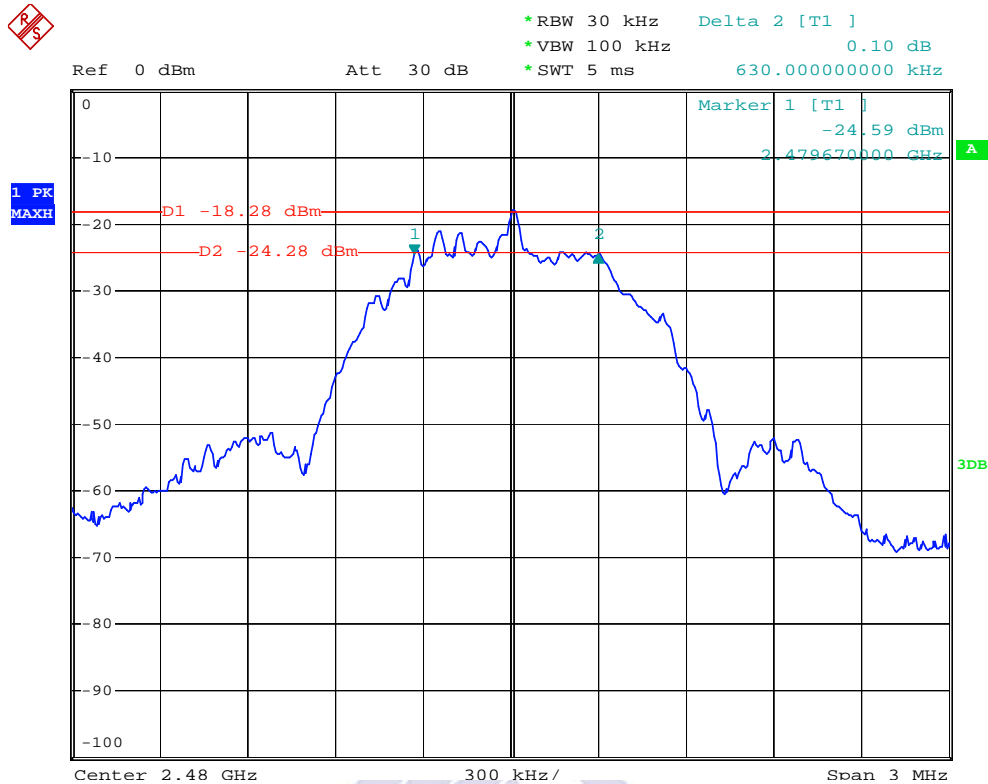


### Middle Channel, 2440MHz





High Channel, 2480MHz



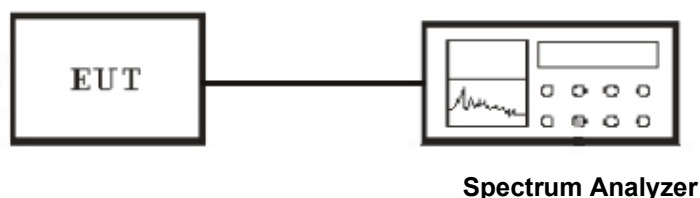
## 7. Occupied Bandwidth

### 7.1 Applicable Standard

According to §15.247(a): Operation under the provisions of this section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

For systems using digital modulation techniques, the EUT may operate in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

### 7.2 EUT Setup



### 7.3 Test Equipment List and Details

See section 2.4.

### 7.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth measurement function is utilized.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is 100ms.
4. Set the Span >RBW.

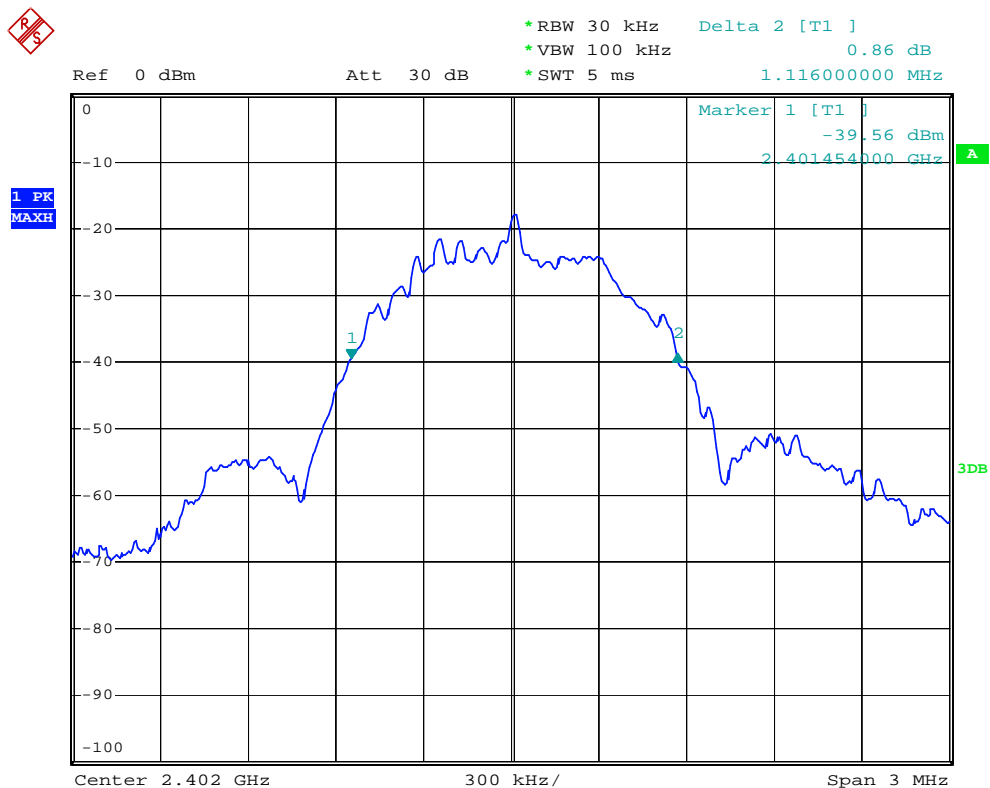
### 7.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

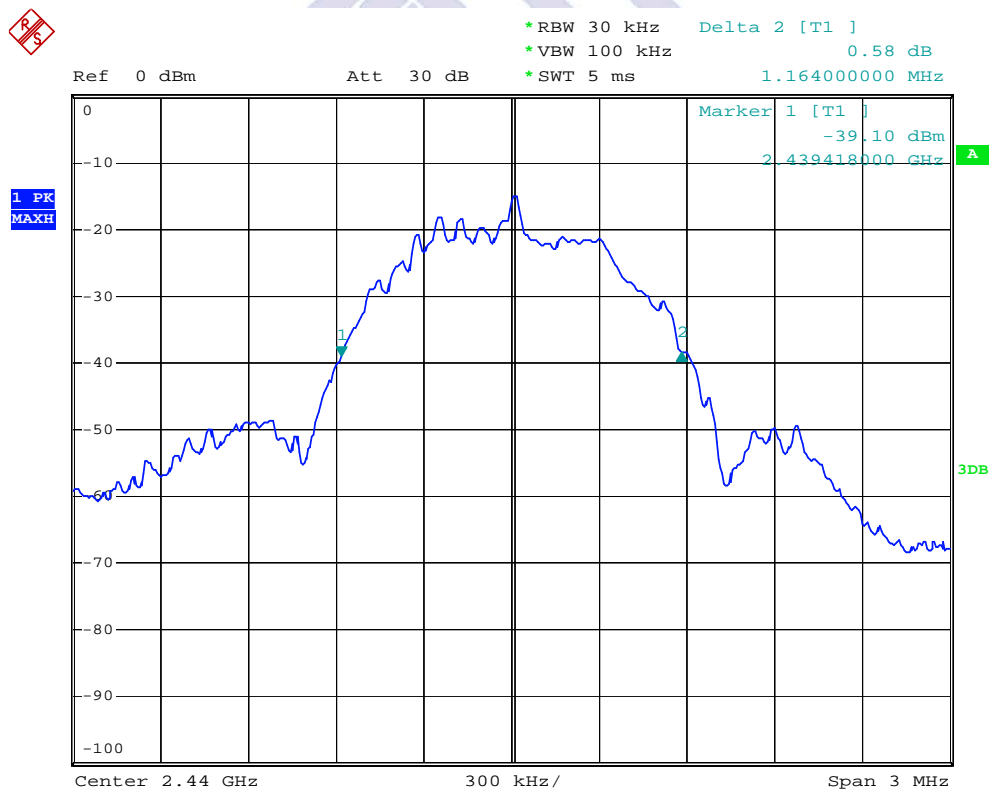
Channel	Frequency	99% OBW (MHz)
1	2402	1.104
20	2440	1.151
40	2480	1.106



Low Channel:



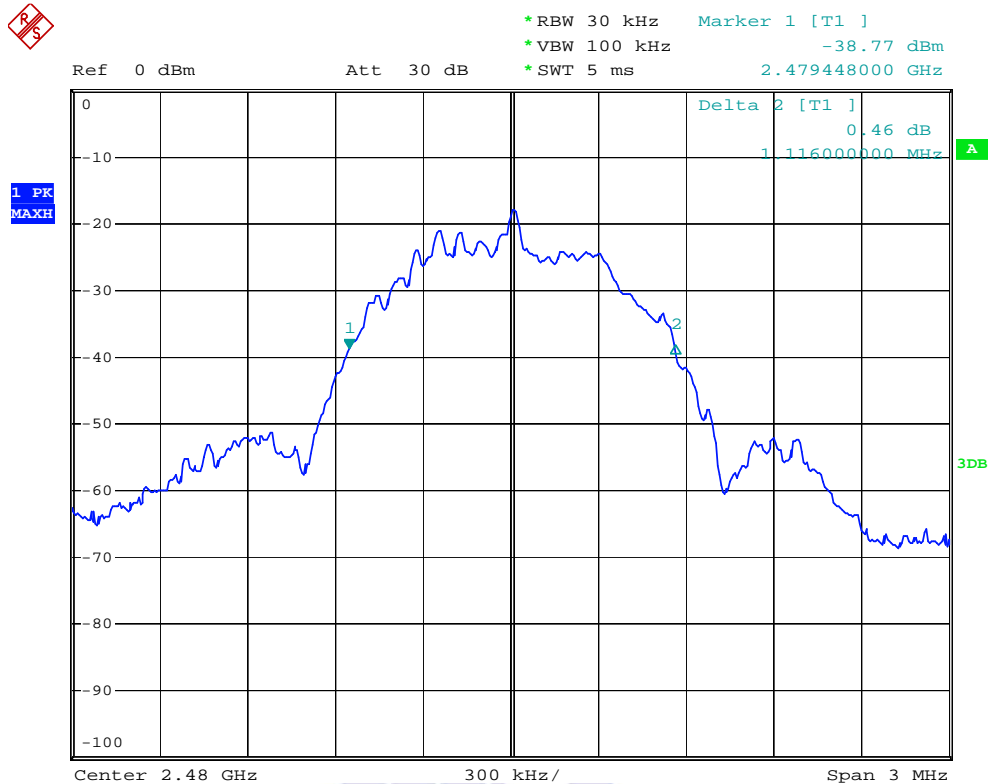
Middle Channel:







High Channel:



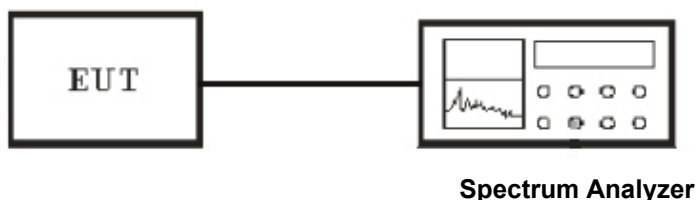
## 8. Test of Maximum Peak Output Power

### 8.1 Applicable Standard

According to §15.247(b): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.

### 8.2 EUT Setup



### 8.3 Test Equipment List and Details

See section 2.4.

### 8.4 Test Equipment List and Details

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 3MHz and VBW to 3MHz.Span to10MHz
3. Set Detector to Peak,

### 8.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

Channel	Frequency (MHz)	Output Power EIRP(dBm)	Output Power EIRP(mW)	Limits (mW)	Result
GFSK	2402	3.34	2.16	1000	Pass
	2440	3.29	2.13	1000	Pass
	2480	3.45	2.21	1000	Pass

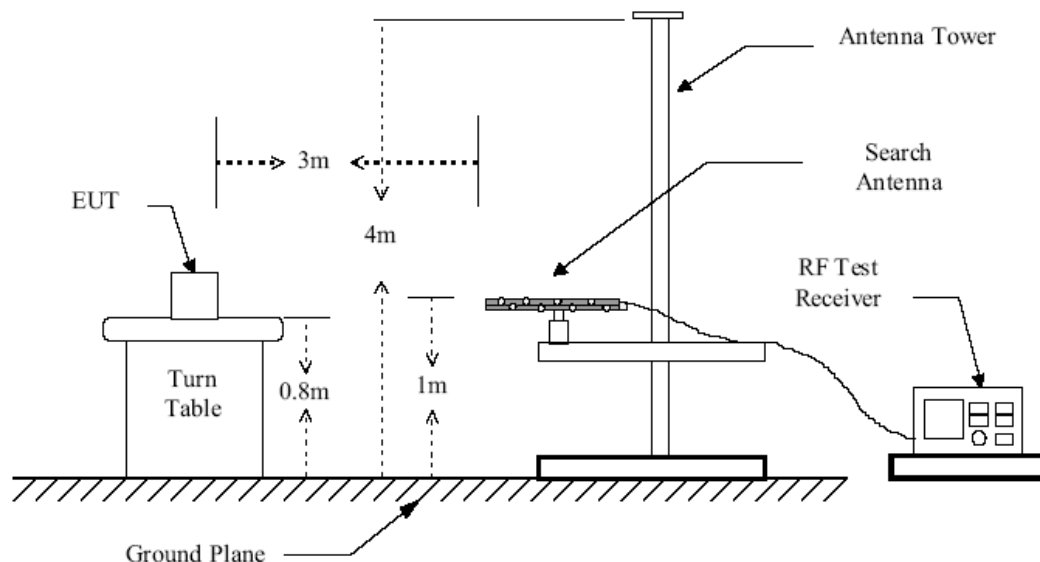
## 9. Test of Band Edges Emission

### 9.1 Applicable Standard

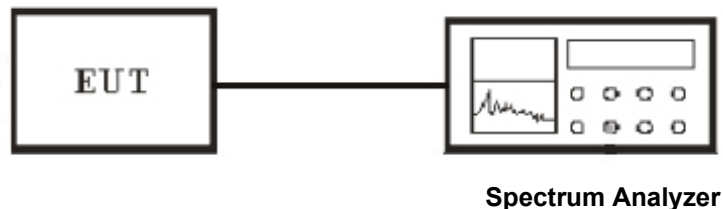
Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

### 9.2 EUT Setup

#### Radiated Measurement Setup



#### Conducted Measurement Setup



### 9.3 Test Equipment List and Details

See section 2.4.

### 9.4 Test Procedure

#### Conducted Measurement

1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

#### Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2003
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
4. For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For band edge emission, use 1MHz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

### 9.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode hopping mode

Note:Channel low,mid and high,30MHz-25GHz conducted emissions all more than 20 dB below fundamental.And only record the worst band edge test datas.

#### Radiated Test Result

Frequency(MHz)
<2400
>2483.5

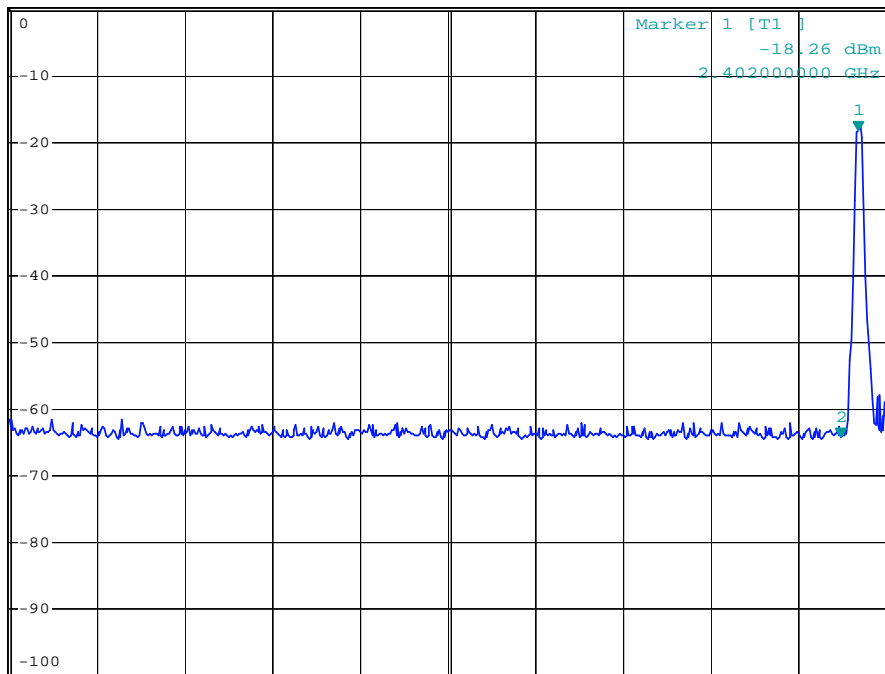


\*RBW 100 kHz Marker 2 [T1 ]  
\*VBW 300 kHz -64.21 dBm  
\*SWT 10 ms 2.40000000 GHz

Ref 0 dBm

Att 30 dB

1 PK  
MAXH



Center 2.3575 GHz

9.5 MHz/

Span 95 MHz

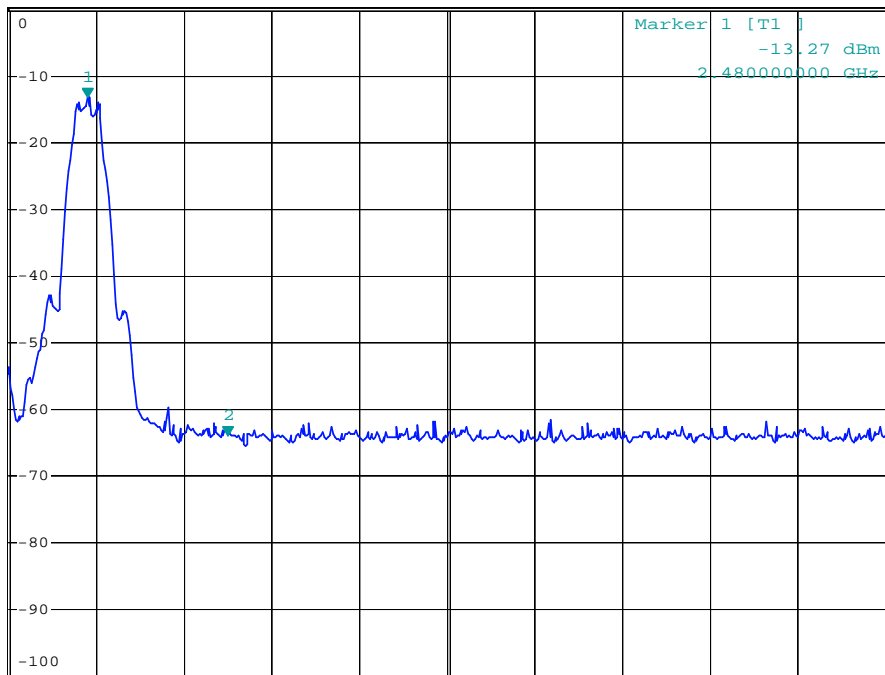


\*RBW 100 kHz Marker 2 [T1 ]  
\*VBW 300 kHz -63.95 dBm  
\*SWT 10 ms 2.48350000 GHz

Ref 0 dBm

Att 30 dB

1 PK  
MAXH



Start 2.478 GHz

2.2 MHz/

Stop 2.5 GHz

## 10. Test of Spurious Radiated Emission

### 10.1 Applicable Standard

Section 15.247(d): 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

**Limits for Class B digital devices**

Frequency (MHz)	limits at 3m dB( $\mu$ V/m)
30-88	40.0
88-216	43.5
216-960	46.0
Above 960	54.0

- NOTE:** 1. The lower limit shall apply at the transition frequency.  
2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.  
3. The limits shown above are based on measuring equipment employing an average detector function for frequencies above 1000MHz.

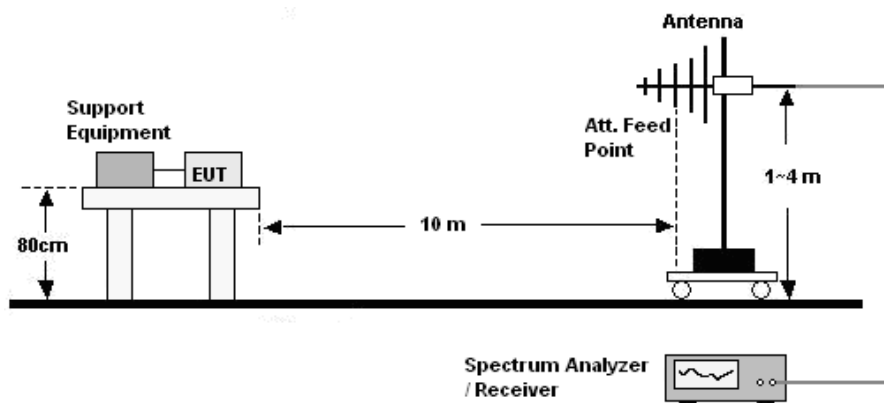
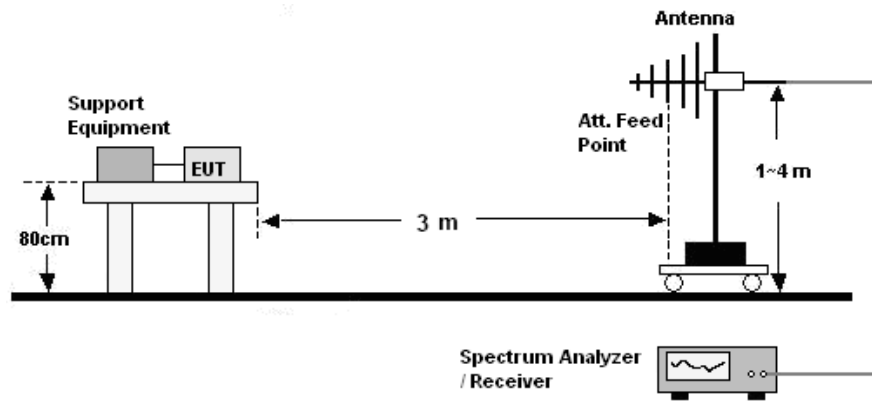
**Limits for Class B digital devices**

Frequency (MHz)	limits at 10m dB( $\mu$ V/m)
30-88	30.0
88-216	33.5
216-960	56.0
Above 960	64.0

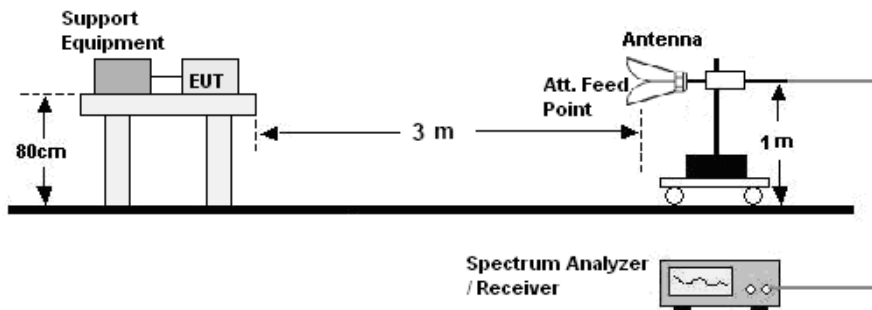
- NOTE:** 1. The lower limit shall apply at the transition frequency.  
2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.  
3. The limits shown above are based on measuring equipment employing an average detector function for frequencies above 1000MHz.

## 10.2 Radiated Measurement Setup

30MHz ~ 1GHz:



Above 1GHz:





### 10.3 Test Equipment List and Details

See section 2.4.

### 10.4 Radiated Measurement Test Procedure

#### 30MHz ~ 1GHz:

- The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

#### Above 1GHz:

- The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.
- Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
- For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

### 10.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Speaker
Humidity (%RH) : 50~54	M/N:BS-3
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Normal operation

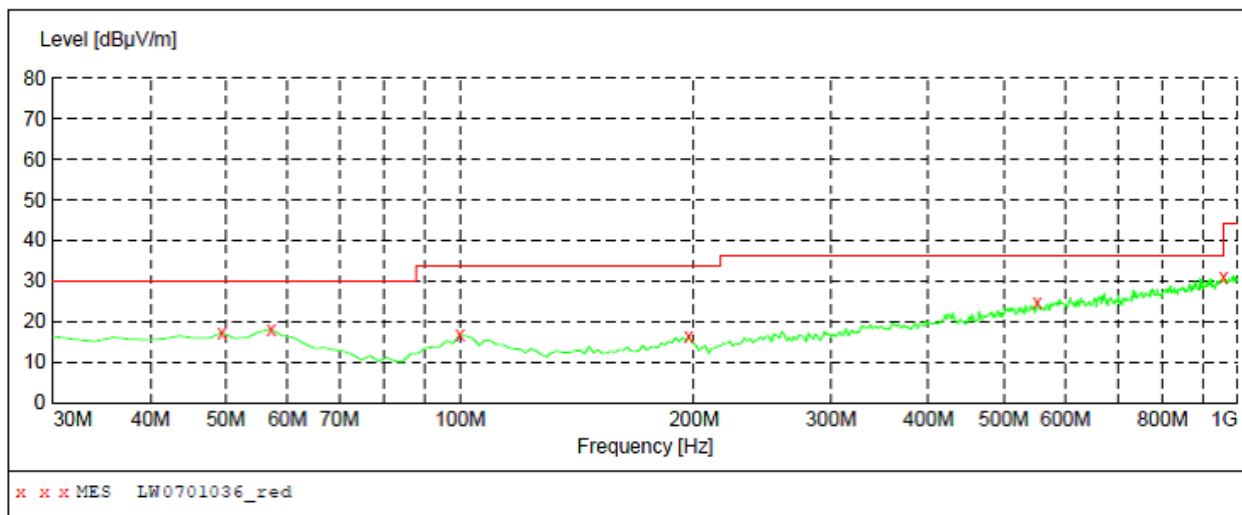


## The Spurious Emission (30~1000MHz) Of Horizontal (BT TX Model L)

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: BT TX Channel Low  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 3.7V  
Comment: Polarization: Horizontal  
Tem:23℃ Hum:50%

### SWEEP TABLE: "test (30M-1G) 8447F"

Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163-484



### MEASUREMENT RESULT: "LW0701036\_red"

7/1/2015 1:42PM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.438878	17.10	-11.1	30.0	12.9	---	100.0	98.00	HORIZONTAL
57.214429	18.00	-10.9	30.0	12.0	---	100.0	191.00	HORIZONTAL
99.979960	16.60	-12.4	33.5	16.9	---	100.0	362.00	HORIZONTAL
197.174349	16.30	-12.9	33.5	17.2	---	100.0	252.00	HORIZONTAL
552.905812	24.60	-5.4	36.0	11.4	---	100.0	313.00	HORIZONTAL
959.178357	31.10	0.3	36.0	4.9	---	100.0	37.00	HORIZONTAL

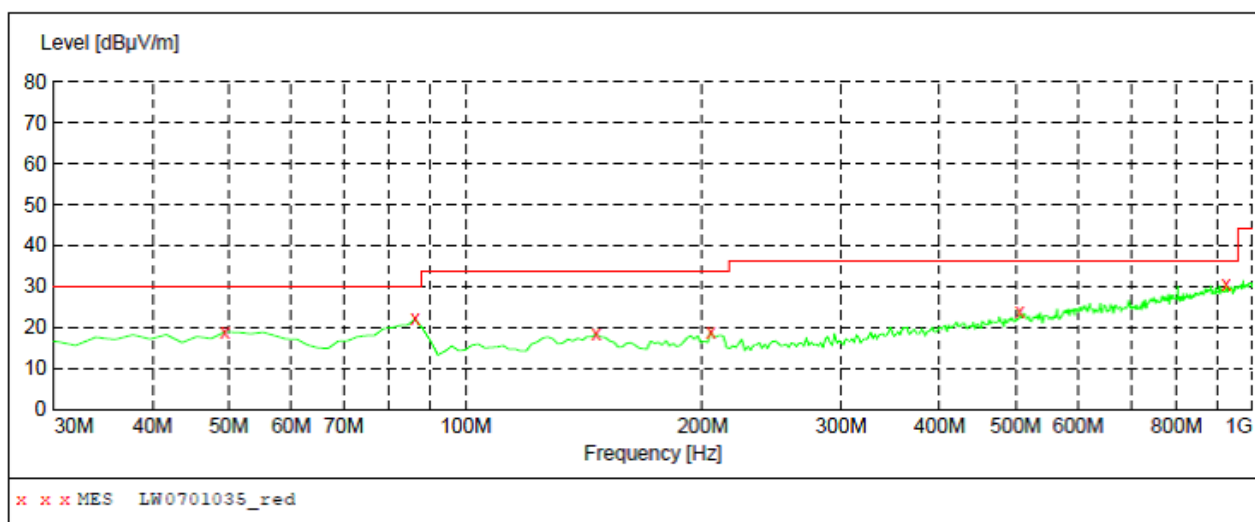


## The Spurious Emission (30~1000MHz) Of Vertical (BT TX Model L)

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: BT TX Channel Low  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 3.7V  
Comment: Polarization: Vertical  
Tem:23°C Hum:50%

### SWEEP TABLE: "test (30M-1G) 8447F"

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163-484



### MEASUREMENT RESULT: "LW0701035\_red"

7/1/2015 1:37PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.438878	18.80	-11.1	30.0	11.2	---	100.0	94.00	VERTICAL
86.372745	22.00	-15.7	30.0	8.0	---	100.0	10.00	VERTICAL
146.633267	18.30	-16.1	33.5	15.2	---	100.0	34.00	VERTICAL
204.949900	19.00	-12.9	33.5	14.5	---	100.0	339.00	VERTICAL
506.252505	23.80	-5.8	36.0	12.2	---	100.0	10.00	VERTICAL
926.132265	30.50	0.3	36.0	5.5	---	100.0	360.00	VERTICAL

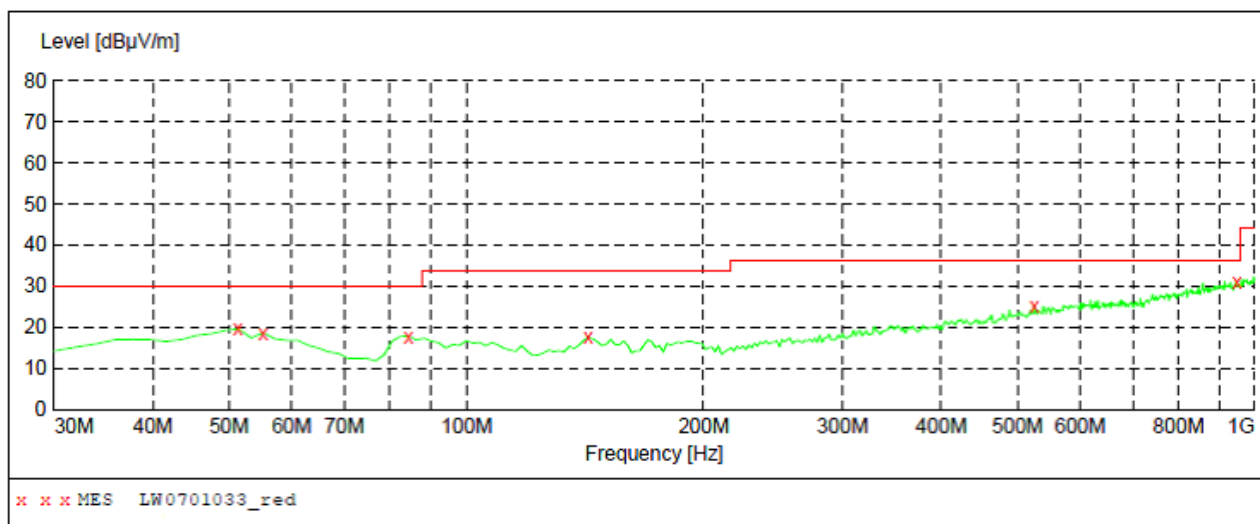


The Spurious Emission (30~1000MHz) Of Horizontal (BT TX Model M)

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: BT TX Channel Middle  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 3.7V  
Comment: Polarization: Horizontal  
Tem:23℃ Hum:50%

**SWEEP TABLE: "test (30M-1G) 8447F"**

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163-484



**MEASUREMENT RESULT: "LW0701033\_red"**

7/1/2015 1:22PM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
51.382766	19.60	-11.3	30.0	10.4	---	400.0	282.00	HORIZONTAL
55.270541	18.60	-10.9	30.0	11.4	---	100.0	362.00	HORIZONTAL
84.428858	17.80	-16.5	30.0	12.2	---	400.0	40.00	HORIZONTAL
142.745491	17.50	-16.1	33.5	16.0	---	400.0	40.00	HORIZONTAL
525.691383	25.20	-5.5	36.0	10.8	---	200.0	319.00	HORIZONTAL
949.458918	31.10	0.2	36.0	4.9	---	100.0	346.00	HORIZONTAL

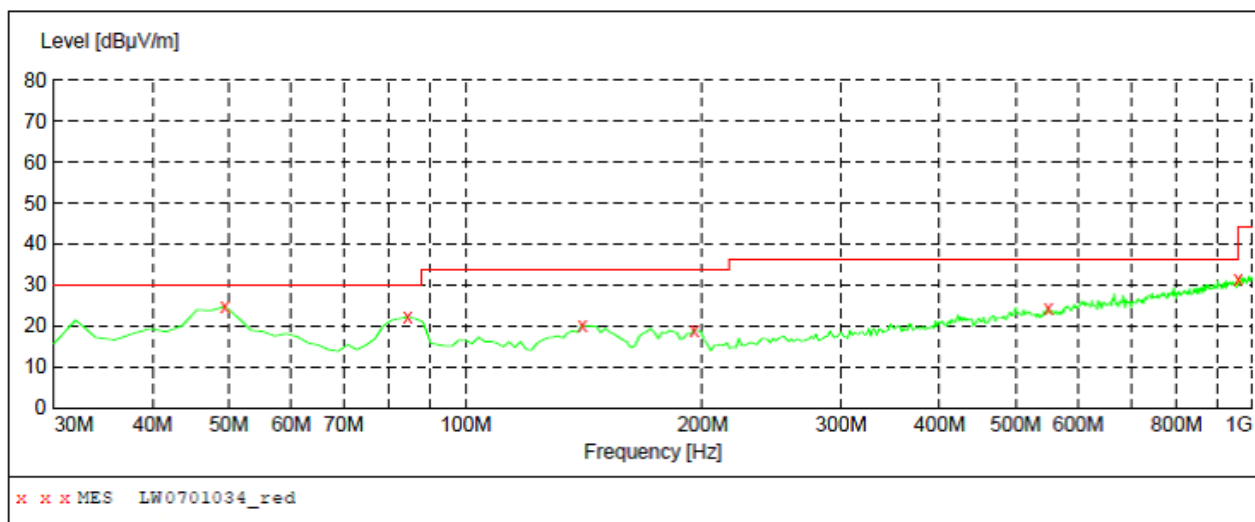


The Spurious Emission (30~1000MHz) Of Vertical (BT TX Model M)

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: BT TX Channel Middle  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 3.7V  
Comment: Polarization: Vertical  
Tem:23°C Hum:50%

**SWEEP TABLE: "test (30M-1G) 8447F"**

Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163-484



**MEASUREMENT RESULT: "LW0701034\_red"**

7/1/2015 1:28PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.438878	24.70	-11.1	30.0	5.3	---	100.0	190.00	VERTICAL
84.428858	22.10	-16.5	30.0	7.9	---	100.0	10.00	VERTICAL
140.801603	20.10	-16.1	33.5	13.4	---	100.0	342.00	VERTICAL
195.230461	19.00	-12.6	33.5	14.5	---	100.0	370.00	VERTICAL
550.961924	24.40	-5.4	36.0	11.6	---	300.0	10.00	VERTICAL
959.178357	31.50	0.3	36.0	4.5	---	300.0	360.00	VERTICAL

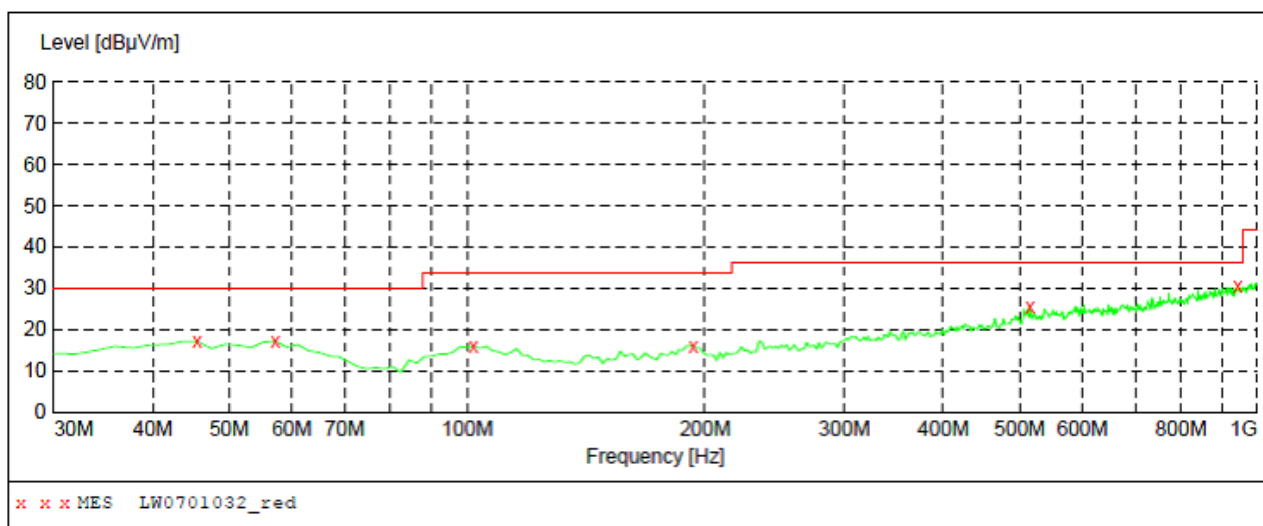


## The Spurious Emission (30~1000MHz) Of Horizontal (BT TX Model H)

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: BT TX Channel High  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 3.7V  
Comment: Polarization: Horizontal  
Tem:23℃ Hum:50%

### SWEEP TABLE: "test (30M-1G) 8447F"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency 30.0 MHz	Frequency 1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163-484



### MEASUREMENT RESULT: "LW0701032\_red"

7/1/2015 12:00PM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.551102	17.10	-11.1	30.0	12.9	---	100.0	369.00	HORIZONTAL
57.214429	17.10	-10.9	30.0	12.9	---	100.0	253.00	HORIZONTAL
101.923848	16.00	-12.3	33.5	17.5	---	100.0	284.00	HORIZONTAL
193.286573	16.10	-12.4	33.5	17.4	---	100.0	284.00	HORIZONTAL
515.971944	25.60	-5.6	36.0	10.4	---	100.0	223.00	HORIZONTAL
945.571142	30.40	0.1	36.0	5.6	---	100.0	362.00	HORIZONTAL



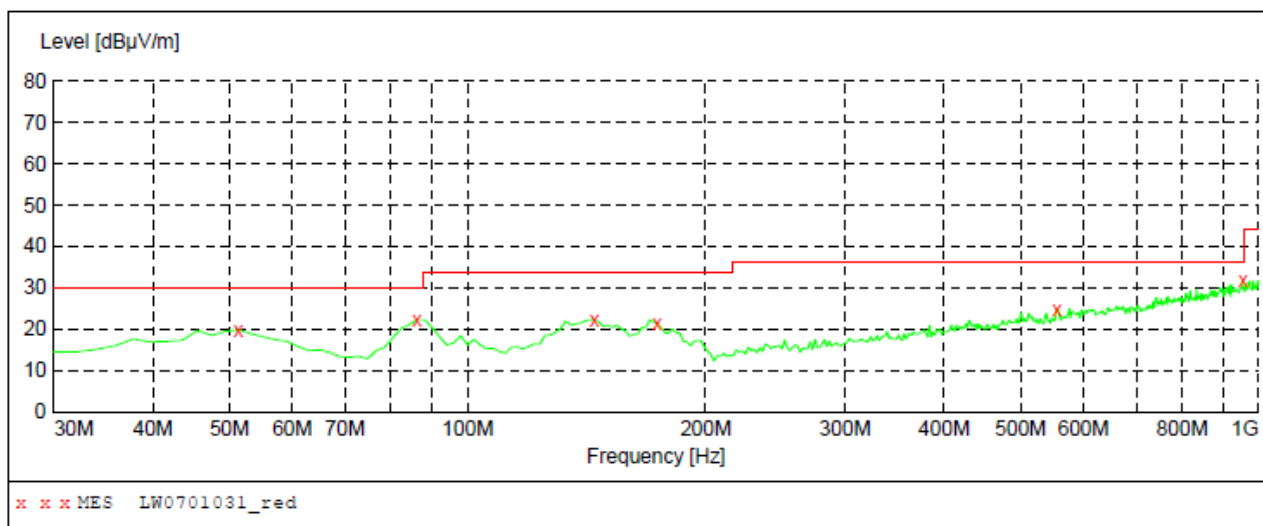


## The Spurious Emission (30~1000MHz) Of Vertical (BT TX Model H)

EUT: Bluetooth Speaker  
M/N: BS-3  
Operating Condition: BT TX Channel High  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 3.7V  
Comment: Polarization: Vertical  
Tem:23°C Hum:50%

### SWEEP TABLE: "test (30M-1G) 8447F"

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency				
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163-484



### MEASUREMENT RESULT: "LW0701031\_red"

7/1/2015 11:54AM

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
51.382766	19.80	-11.3	30.0	10.2	---	100.0	283.00	VERTICAL
86.372745	22.20	-15.7	30.0	7.8	---	100.0	283.00	VERTICAL
144.689379	22.30	-16.1	33.5	11.2	---	100.0	370.00	VERTICAL
173.847695	21.40	-14.6	33.5	12.1	---	100.0	36.00	VERTICAL
556.793587	24.90	-5.3	36.0	11.1	---	100.0	252.00	VERTICAL
955.290581	31.70	0.3	36.0	4.3	---	100.0	160.00	VERTICAL





### The Spurious Emission (Above 1GHz)

Test Results-(Measurement Distance: 3m)_Channel low							
Frequency (MHz)	Measurement value		Correction Factor (dB)	Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	(dB)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2402.000*	106.82	105.44	1.5	---	---	H	P
4804.000	46.31	45.29	3.7	74	54	H	P
7206.000	34.23	33.67	6.3	74	54	H	P
2402.000*	105.64	104.38	1.3	---	---	V	P
4804.000	45.81	44.76	3.4	74	54	V	P
7206.000	34.19	33.27	6.1	74	54	V	P

\*: fundamental frequency

Remark:

- According to the emissions below 18GHz, the data curve is lower than the limit, and the data between 18GHz to 25GHz will be lower than the limit, so they are not recorded in the report.  
All outside of operating frequency band and restricted band specified are below 15.209.

- Calculation of result is:

$$\text{Measurement value(dB}\mu\text{V/m)} = \text{Reading Value(dB}\mu\text{V/m)} + \text{Correction Factor (dB)}$$

- The Measurement value must be less than limit,the result is Pass.

Test Results-(Measurement Distance: 3m)_Channel middle							
Frequency (MHz)	Measurement value		Correction Factor (dB)	Limit		Antenna	Result
	PK (dBμV/m)	AV (dBμV/m)	(dB)	PK (dBμV/m)	AV (dBμV/m)	(H/V)	(P/F)
2440.000*	107.52	106.36	1.8	---	---	H	P
4880.000	47.38	45.89	4.1	74	54	H	P
7320.000	36.47	35.18	6.8	74	54	H	P
2440.000*	106.94	106.15	1.7	---	---	V	P
4880.000	46.63	45.74	3.8	74	54	V	P
7320.000	35.82	34.47	6.5	74	54	V	P

\*: fundamental frequency

Remark:

- According to the emissions below 18GHz, the data curve is lower than the limit, and the data between 18GHz to 25GHz will be lower than the limit, so they are not recorded in the report.  
All outside of operating frequency band and restricted band specified are below 15.209.

- Calculation of result is:

$$\text{Measurement value(dB}\mu\text{V/m)} = \text{Reading Value(dB}\mu\text{V/m)} + \text{Correction Factor (dB)}$$

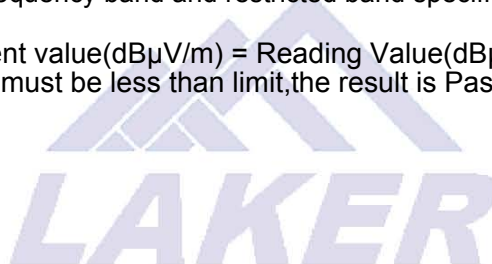
- The Measurement value must be less than limit,the result is Pass.

Test Results-(Measurement Distance: 3m)_Channel High							
Frequency (MHz)	Measurement value		Correction Factor (dB)	Limit		Antenna	Result
	PK (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	(dB)	PK (dB $\mu$ V/m)	AV (dB $\mu$ V/m)	(H/V)	(P/F)
2480.000*	109.32	108.75	2.2	---	---	H	P
4960.000	47.63	45.82	4.4	74	54	H	P
7440.000	36.84	36.05	7.3	74	54	H	P
2480.000*	108.47	106.83	2.1	---	---	V	P
4960.000	45.61	44.34	4.0	74	54	V	P
7440.000	35.13	33.28	7.2	74	54	V	P

\*: fundamental frequency

Remark:

- According to the emissions below 18GHz, the data curve is lower than the limit, and the data between 18GHz to 25GHz will be lower than the limit, so they are not recorded in the report.  
All outside of operating frequency band and restricted band specified are below 15.209.
- Calculation of result is:  
Measurement value(dB $\mu$ V/m) = Reading Value(dB $\mu$ V/m) + Correction Factor (dB)
- The Measurement value must be less than limit,the result is Pass.



## **11. ANTENNA REQUIREMENT**

### **11.1 Standard Applicable**

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. 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.

Section 15.247(b)/(c):

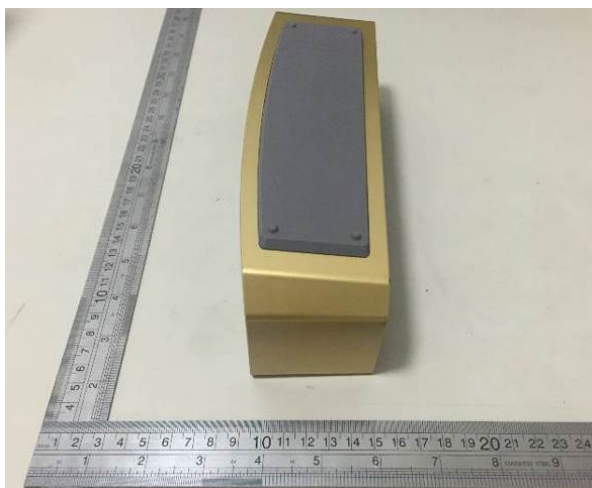
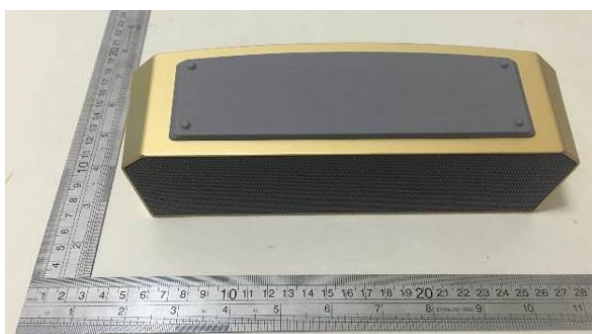
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

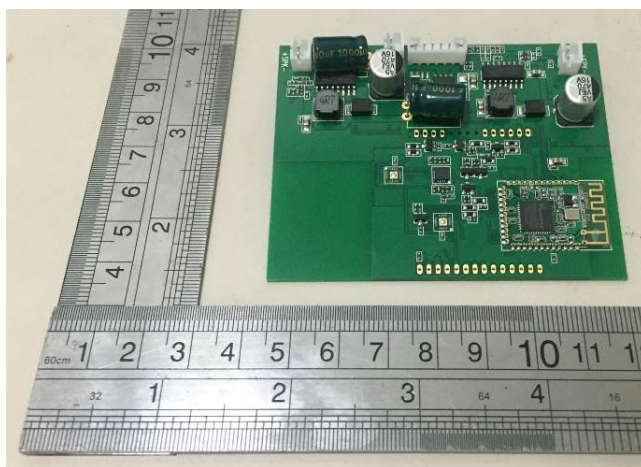
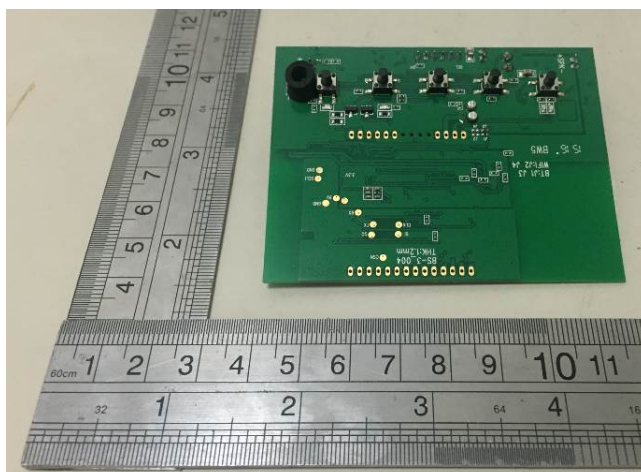
### **11.2 Antenna Connected Construction**

The antenna used in this product is complied with Standard. The maximum Gain of the antenna lower than 6.0dBi and the antenna is integrated, fixed on PCB.

## APPENDIX A - External Photographs



## APPENDIX B - Internal Photographs





## APPENDIX C - Test Setup Photographs

### Conducted Emission Test



### Radiated Emission Test

