

# Test Report of FCC Part 15 C for FCC Certificate

On Behalf of

## Guangzhou Liwei Electronics Co.,LTD.

**FCC ID:** VO8-B2  
**Product Description:** Bluetooth headset  
**Test Model:** B2  
**Trade Mark:** **Bluedio** 蓝弦®

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**Test by:**

**Reviewed By:**



Owen Li



Edmund Zou

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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: No.33 Zhenzhong North Rd,Shenshan Ind.Park BaiYun District,Guangzhou GuangDong,China

Manufacturer: **Guangzhou Liwei Electronics Co.,LTD.**  
Address of manufacturer: No.33 Zhenzhong North Rd,Shenshan Ind.Park BaiYun District,Guangzhou GuangDong,China

### General Description of E.U.T

Items	Description
EUT Description:	Bluetooth headset
Model No.:	B2
Type of Modulation:	FHSS
Frequency Band:	2402 MHz ~ 2480 MHz
Number of Channels:	79
Channel Bandwidth:	1 MHz
Antenna Type:	Integrated antenna, fixed on PCB
Antenna Gain:	0dBi
Rated Voltage:	DC 5V from USB , DC3.7V from battery

**Note:**

*\* The test data gathered are from the production sample provided by the manufacturer,*

## 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	07/19/2014
LISN	ETS-LINDGREN	3850/2	00051952	07/19/2014
LISN	R&S	ENV216	100098	07/19/2014
Voltage Probe	R&S	ESH2-Z3	100042	07/19/2014
Current Probe	R&S	EZ17	100106	07/19/2014
ISN	TESEQ GmbH	ISN T800	30297	07/19/2014

Control Room - Conducted disturbance Test (10m part)				
Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	R&S	ESCI	100435	07/19/2014
LISN	schwarzbeck	NNLK8121	8121-529	07/19/2014
Transient Limiter	ELECTRO-METRICS	EM-7600	806	07/29/2014
Voltage Probe	R&S	ESH2-Z3	100042	07/19/2014
Current Probe	R&S	EZ17	100106	07/19/2014
ISN	TESEQ GmbH	ISN T800	30297	07/19/2014
Horn Antenna	ETS-LINGREN	3117	00057407	07/19/2014

3M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	07/29/2014
Spectrum Analyzer	Agilent	E4440A	MY46185649	07/27/2014
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	401	07/21/2014
Multi device Controller	ETS-LINGREN	2090	00057230	N/A
Horn Antenna	ETS-LINGREN	3117	00057407	07/19/2014
Microwave Preamplifier	Agilent	8449B	3008A02425	07/29/2014

10M Semi-anechoic Chamber - Radiated disturbance Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
10M Chamber & Accessory Equipment	Rainford	--	--	07/06/2015
Receiver	R&S	ESCI	100435	07/19/2014
Spectrum Analyzer	R&S	FSP40	100416	07/26/2014
EMI test receiver	R&S	ESIB40	2023282915	07/24/2014

TRILOG Broadband Antenna	schwarzbeck	VULB 9163	484	07/21/2014
Horn Antenna	ETS-LINGREN	3117	00044562	07/27/2015
Microwave Preamplifier	Agilent	11909A	186871	07/26/2014
Microwave Preamplifier	HP	HP 8447F	2805A03379	07/26/2014
Microwave Preamplifier	CD	PAP-1G18G	2001	07/29/2014

<b>Shielding Room No. 2 - Harmonic / Flicker Test (EN 61000-3-2) / (EN 61000-3-3)</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	07/29/2014
Flicker & Harmonic Tester	California instruments	PACS-1	72492	07/29/2014

<b>Shielding Room No. 3 - ESD Test (IEC 61000-4-2)</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
ESD Simulator	EM TEST	ESD30C	V0603101091	07/30/2014
ESD Simulator	TESEQ	NSG437	478	08/22/2014

<b>3M Full-anechoic Chamber - Radio-frequency electromagnetic field Immunity Test (IEC 61000-4-3)</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	07/29/2014
ESG Vector signal generators	Agilent	E4438C	MY45095744	07/27/2014
Power Amplifier	AR	150W1000	0322288	07/29/2014
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	401	07/21/2014
Temperature & Humidity Chamber	ESPEC	DSW0540	ER-009	09/29/2014

<b>Shielding Room No. 3 - EFT / Surges Test (IEC 61000-4-4) (IEC 61000-4-5)</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
Compact Generator	EM-Test	UCS500M/6B	V0603101093	07/19/2014
Capacitive Clamp	EM-Test	C Clamp HFK	0306-43	07/19/2014
CDN for Telecom Port	EM-Test	CNV504S1	V0603101094	07/19/2014
EFT Generator	SCHAFFNER	NSG 2025	19878	07/29/2014
SURGE Generator	SCHAFFNER	NSG 2050	200313-135AR	07/29/2014
CDN	SCHAFFNER	CDN-131/133	34397	07/29/2014

<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	07/27/2014
Power Amplifier	AR	75A 250A	320297	07/29/2014
Attenuator	EM-Test	ATT6/75	0320837	07/19/2014
CDN	EM-Test	CDN M2/M3	0204-01	07/19/2014
EM-Clamp	EM-Test	EM101	35770	07/19/2014

<b>Shielding Room No. 2 - Power-frequency magnetic fields Immunity Test (IEC 61000-4-8)</b>				
Compact Generator	EM-Test	UCS500M/6B	V0603101093	07/19/2014
Induction Coil	EM-Test	MS100	0106-47	07/29/2014
Current Transformer	EM-Test	MC2630	0106-02	07/29/2014

<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	07/29/2014
Electronic output switch	California instruments	EOS-1	72616	07/29/2014

## 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	Conducted Emission	Pass
15.247(a)(1)	Hopping Channel Bandwidth	Pass
15.247(a)(1)	Hopping Channel Separation	Pass
15.247(a)(1)	Number of Hopping Frequency Used	Pass
15.247(a)(1)(iii)	Dwell Time of Each Frequency	Pass
15.247(b)(1)	Maximum Peak Output Power	Pass
15.247(d)	Band Edges Emission	Pass
15.247(d)	Spurious Radiated Emission	Pass
15.203/15.247(b)/(c)	Antenna Requirement	Pass

## 4. Conducted Emission Test

### 4.1 Applicable Standard

Section 15.247(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

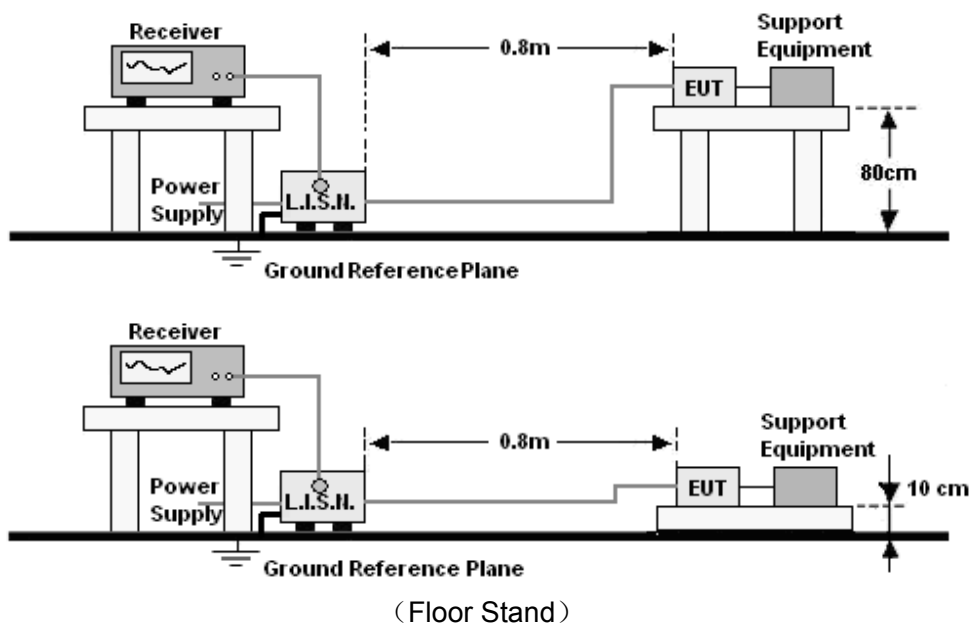
**NOTE:** The lower limit shall apply at the transition frequency.

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.

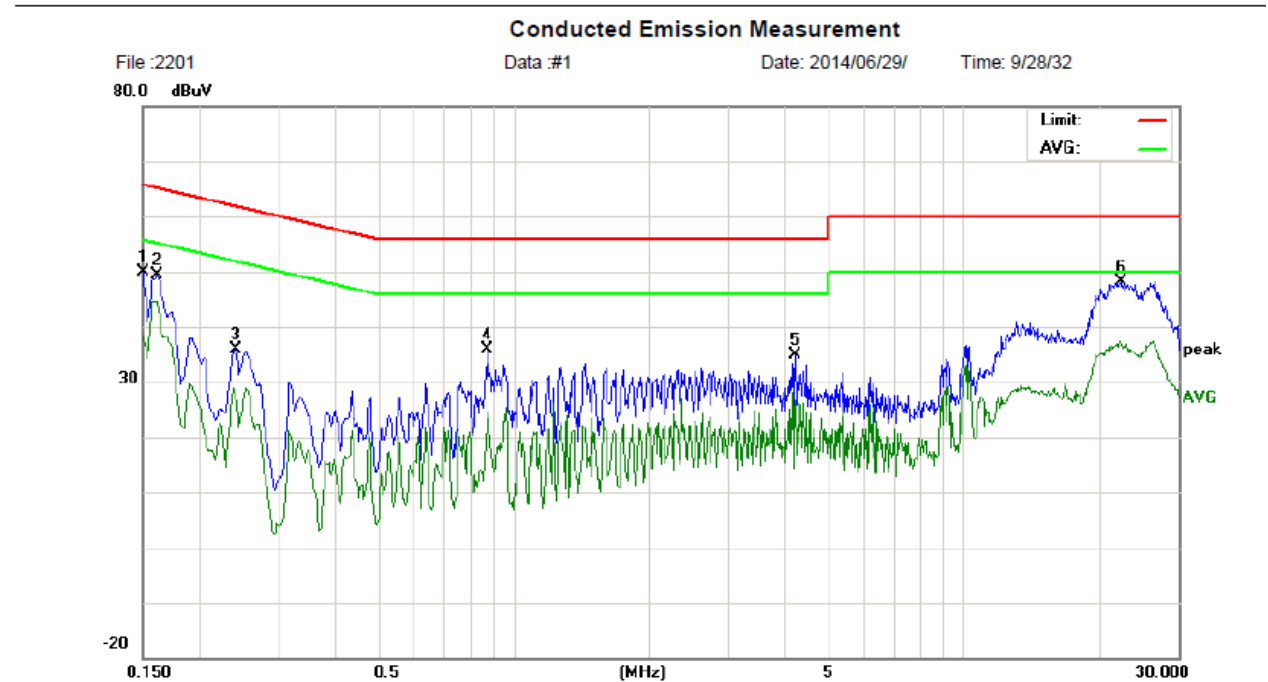
#### 4.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Transmit with charging

**NOTE:**The proformed test mode data is the worst test data.

## The Test Data Of Conducted Emission

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: Charging and BT working  
Test Site: CHAMBER  
Operator: Owen Li  
Comment: Line:L  
Tem:22°C Hum:55%

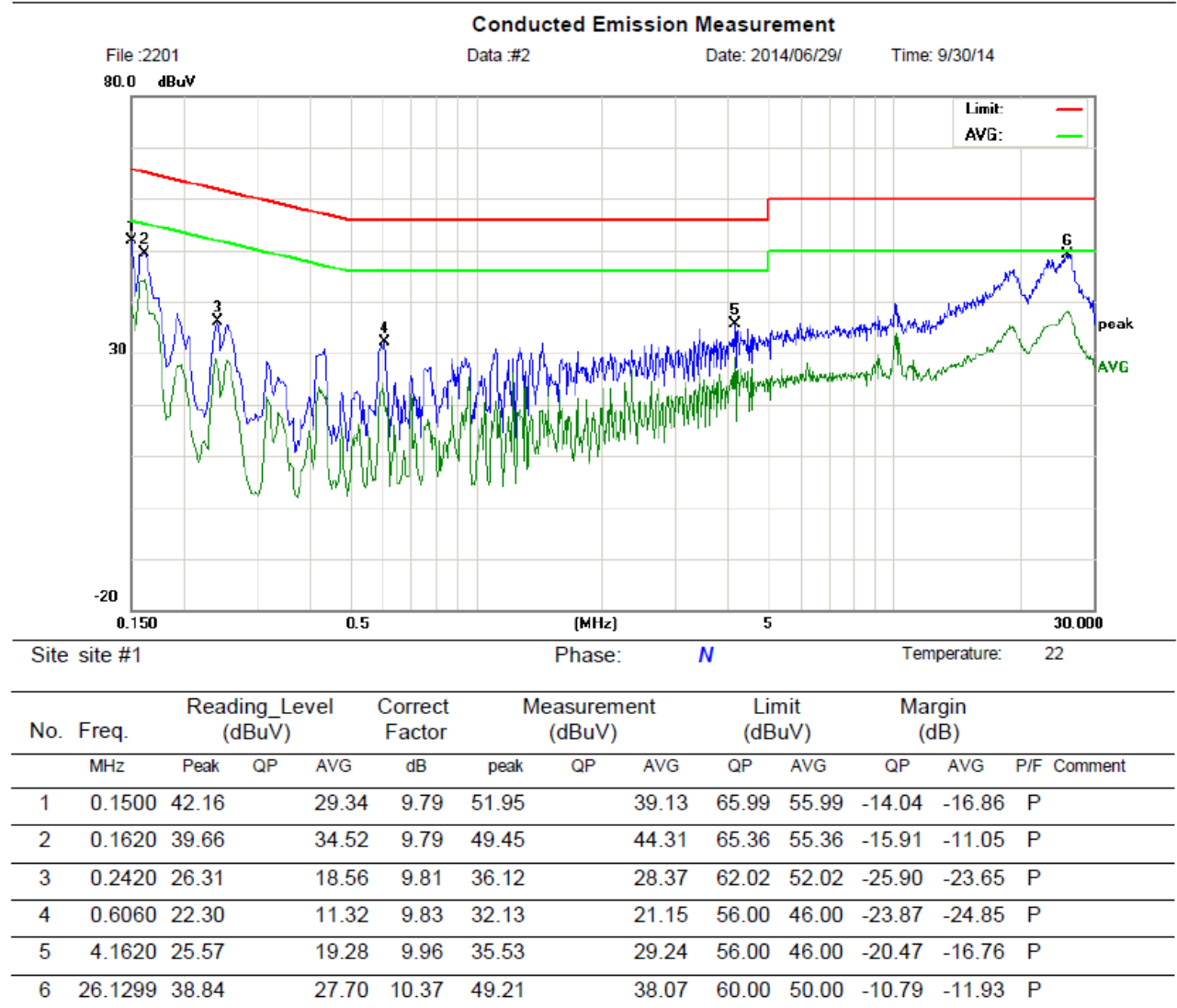


Site site #1      Phase: **L1**      Temperature: 22

No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor dB	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1500	40.14		28.63	9.79	49.93	38.42	65.99	55.99	-16.06	-17.57	P		
2	0.1620	39.63		34.72	9.79	49.42	44.51	65.36	55.36	-15.94	-10.85	P		
3	0.2420	26.04		17.94	9.81	35.85	27.75	62.02	52.02	-26.17	-24.27	P		
4	0.8780	25.94		14.80	9.85	35.79	24.65	56.00	46.00	-20.21	-21.35	P		
5	4.2260	25.01		16.70	9.96	34.97	26.66	56.00	46.00	-21.03	-19.34	P		
6	22.3380	37.84		26.41	10.27	48.11	36.68	60.00	50.00	-11.89	-13.32	P		

## The Test Data Of Conducted Emission

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: Charging and BT working  
Test Site: CHAMBER  
Operator: Owen Li  
Comment: Line:N  
Tem:22°C Hum:55%

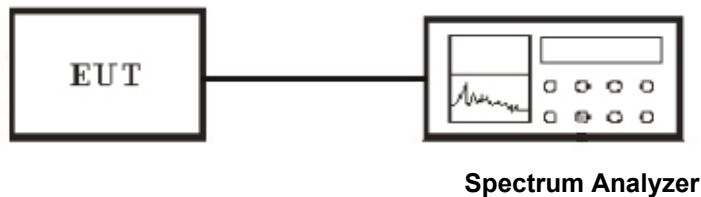


## 5. Test of Hopping Channel Bandwidth

### 5.1 Applicable Standard

Section 15.247(a)(1): 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.

### 5.2 EUT Setup



### 5.3 Test Equipment List and Details

See section 2.4.

### 5.4 Test Procedure

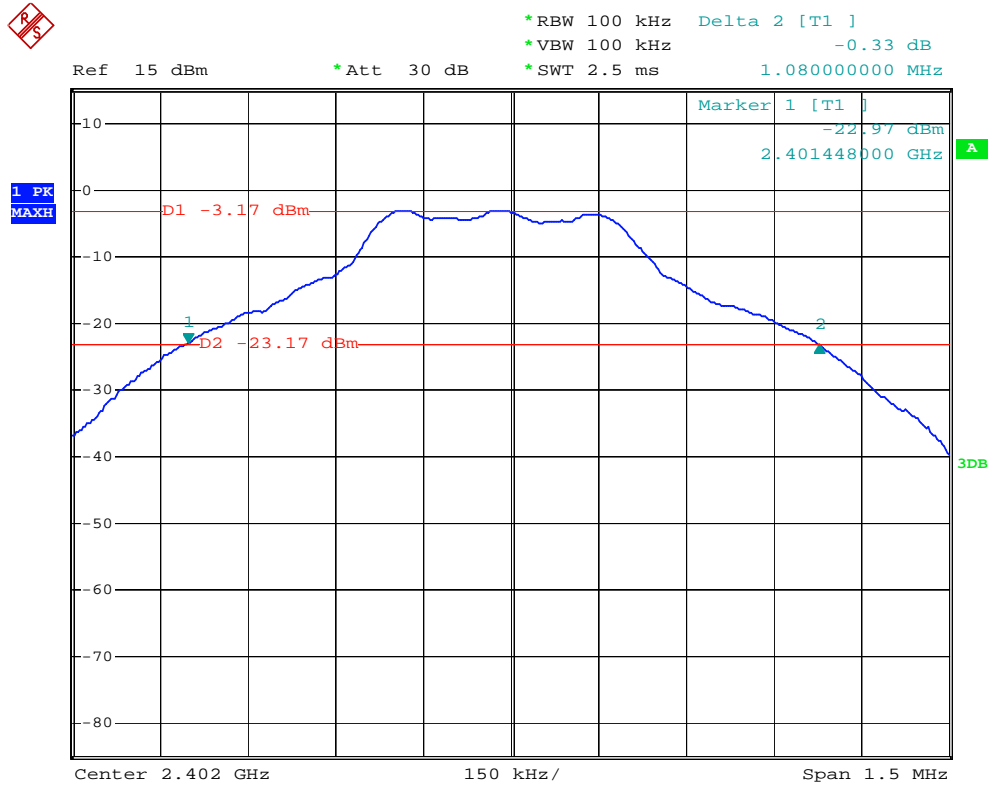
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. The spectrum width with level higher than 20dB below the peak level.
5. Repeat above 1~3 points for the low, middle and highest 3 channels of the EUT.

### 5.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

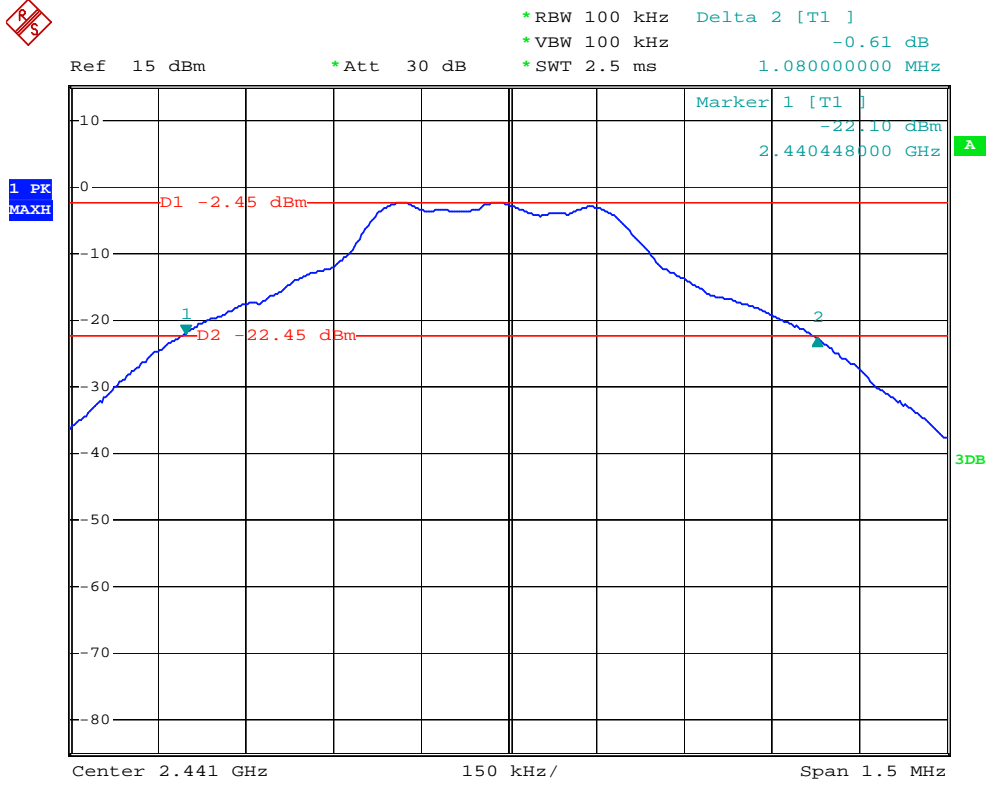
Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Result
Low	2402	1080	Pass
Middle	2441	1080	Pass
High	2480	1089	Pass

Channel Low :

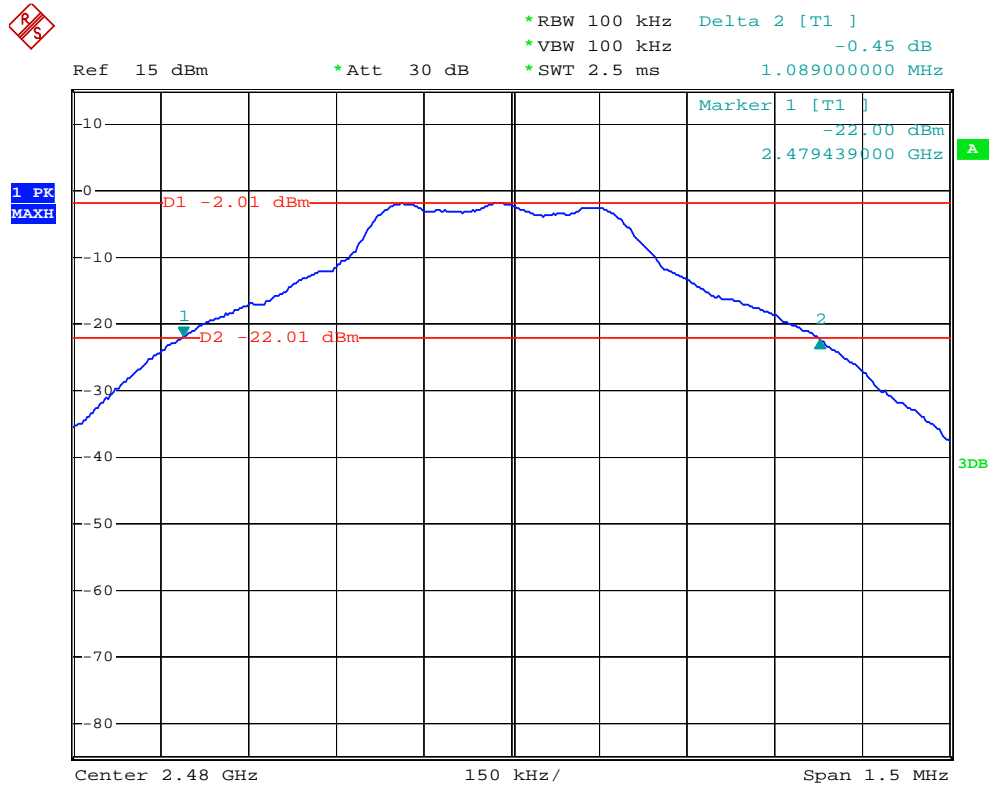




**Channel Middle :**



### Channel High:

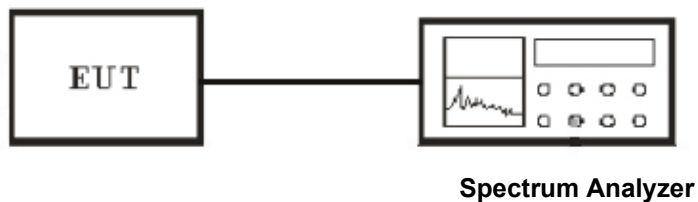


## 6. Test of Hopping Channel Separation

### 6.1 Applicable Standard

Section 15.247(a)(1): 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.

### 6.2 EUT Setup



### 6.3 Test Equipment List and Details

See section 2.4.

### 6.4 Test Procedure

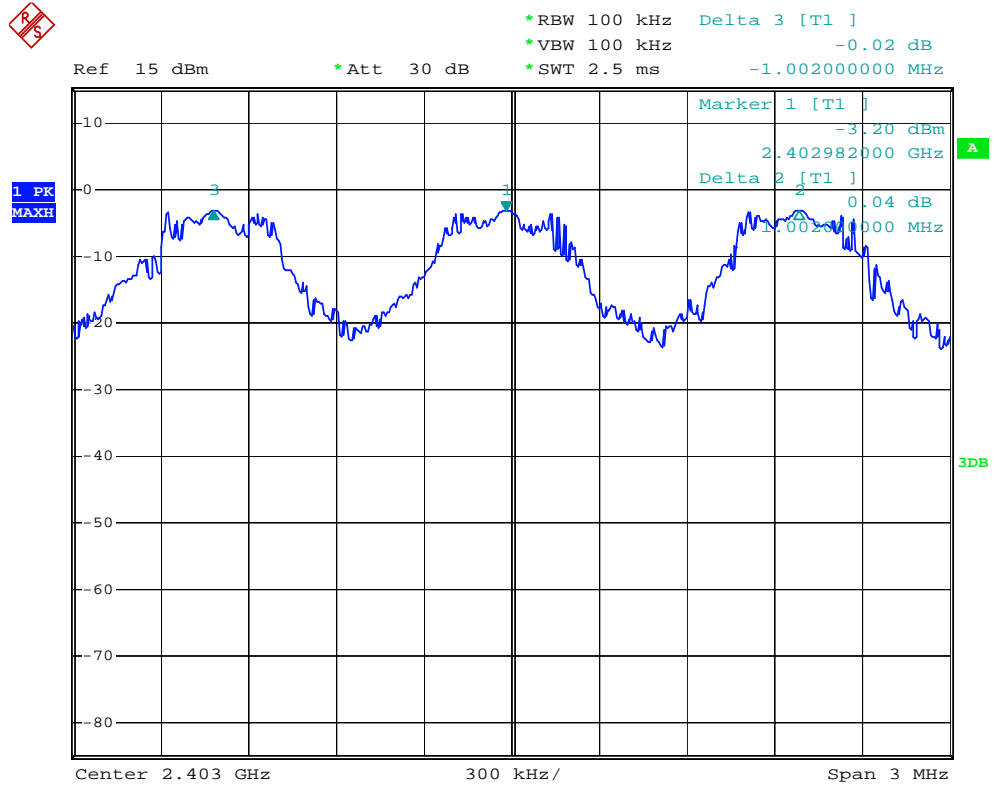
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.

### 6.5 Test Result

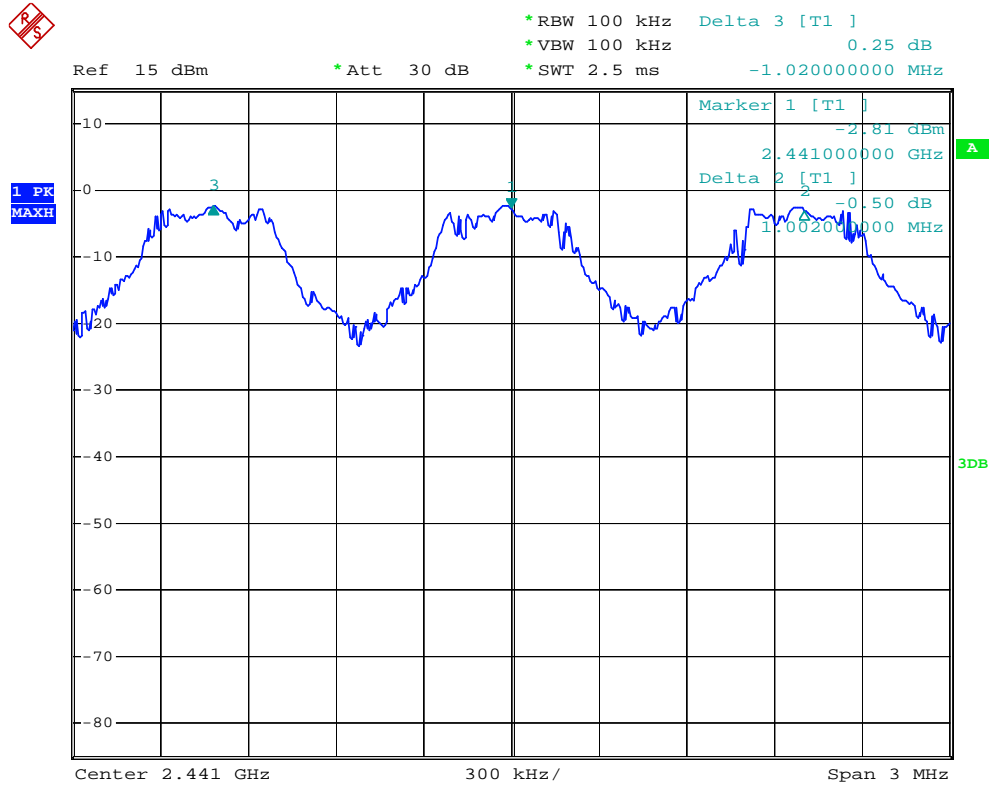
Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Normal Mode

Channel No.	Frequency (MHz)	Channel Separation (kHz)	Limit (kHz)	Result
Low	2402	1002	≥25 KHz or 2/3 20 dB BW	Pass
Middle	2441	1020		
High	2480	1002		

**Channel Low :**



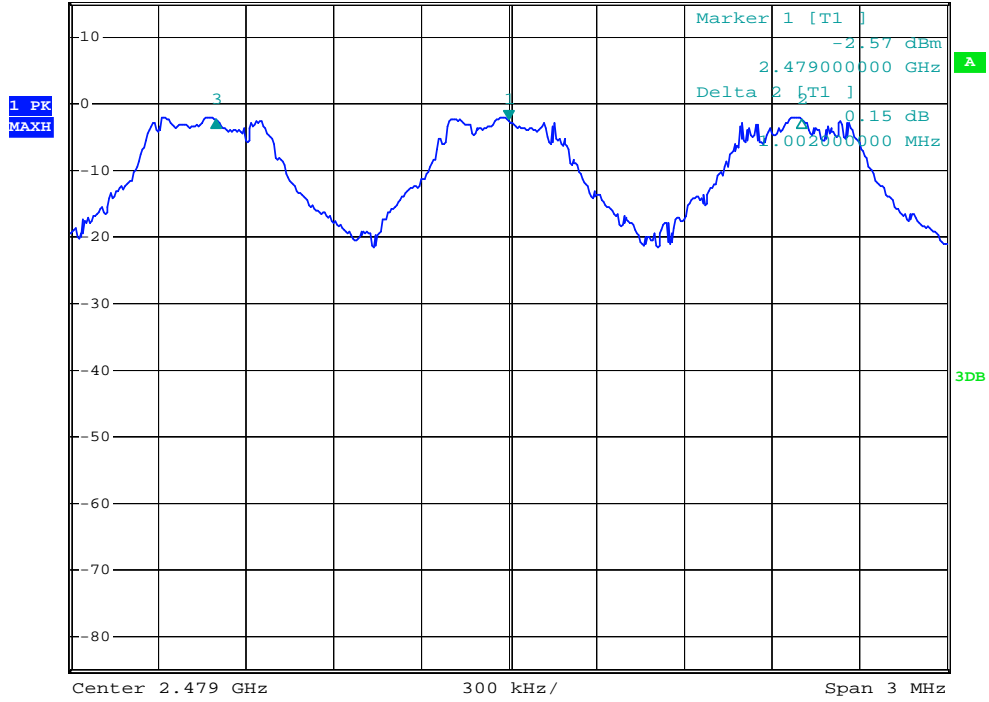
**Channel Middle :**



**Channel High :**



Ref 15 dBm      \*Att 30 dB      \*RBW 100 kHz      Delta 3 [T1 ]  
 \*VBW 100 kHz      0.01 dB  
 \*SWT 2.5 ms      -1.002000000 MHz

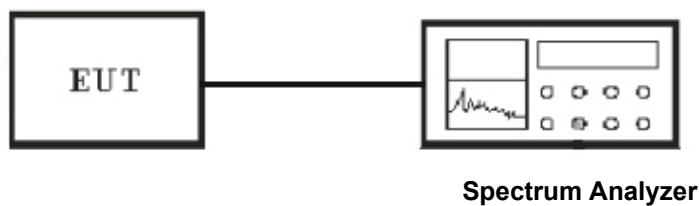


## 7. Test of Number of Hopping Frequency

### 7.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 non-overlapping hopping channels. Frequency hopping system which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping system may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

### 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. Set RBW of spectrum analyzer to 100KHz and VBW to 1MHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.

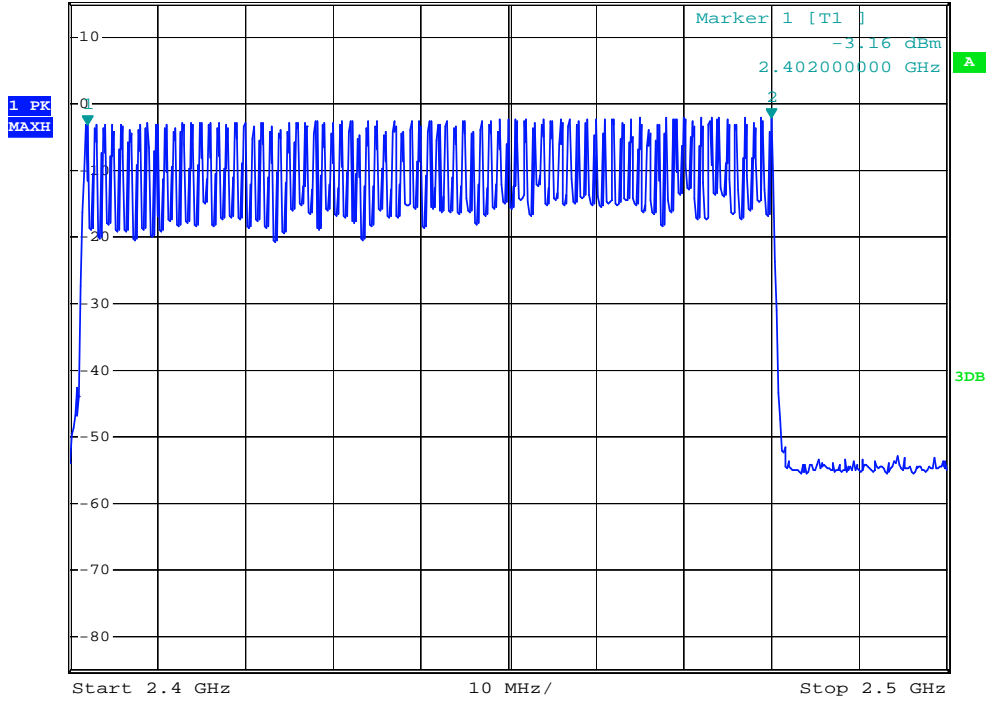
### 7.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Normal Mode

Modulation Type	Frequency (MHz)	Number of Hopping Channels	Min. Limit (kHz)
FHSS	2402~2480	79	>15



Ref 15 dBm \*Att 30 dB \*RBW 100 kHz Marker 2 [T1 ]  
\*VBW 1 MHz -2.18 dBm  
\*SWT 10 ms 2.480000000 GHz



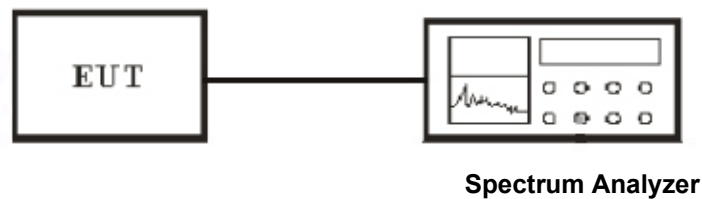


## 8. Test of Dwell Time of Each Frequency

### 8.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4seconds multiplied by the number of hopping channels employed.

### 8.2 EUT Setup



### 8.3 Test Equipment List and Details

See section 2.4.

### 8.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1000kHz and VBW to 1000kHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is more than once pulse time.
4. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
5. Measure the maximum time duration of one single pulse.

### 8.5 Test Result

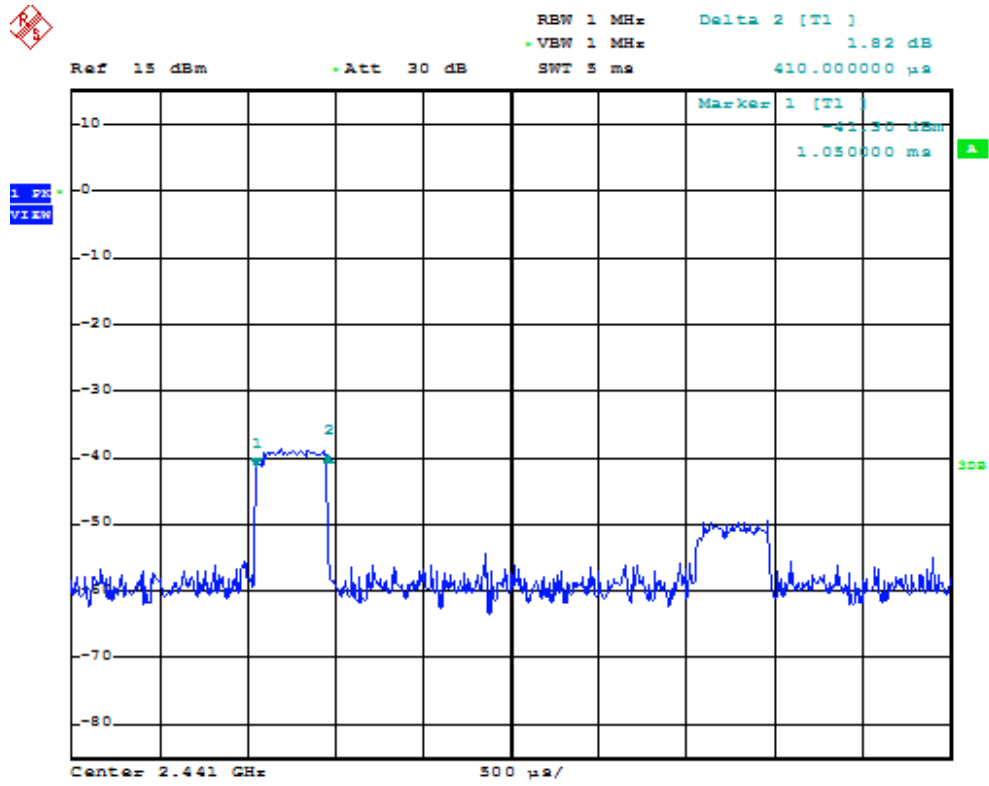
Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Normal Mode

**Note:**The channel mid test data is the worst case in channel low, mid and high there modes test results

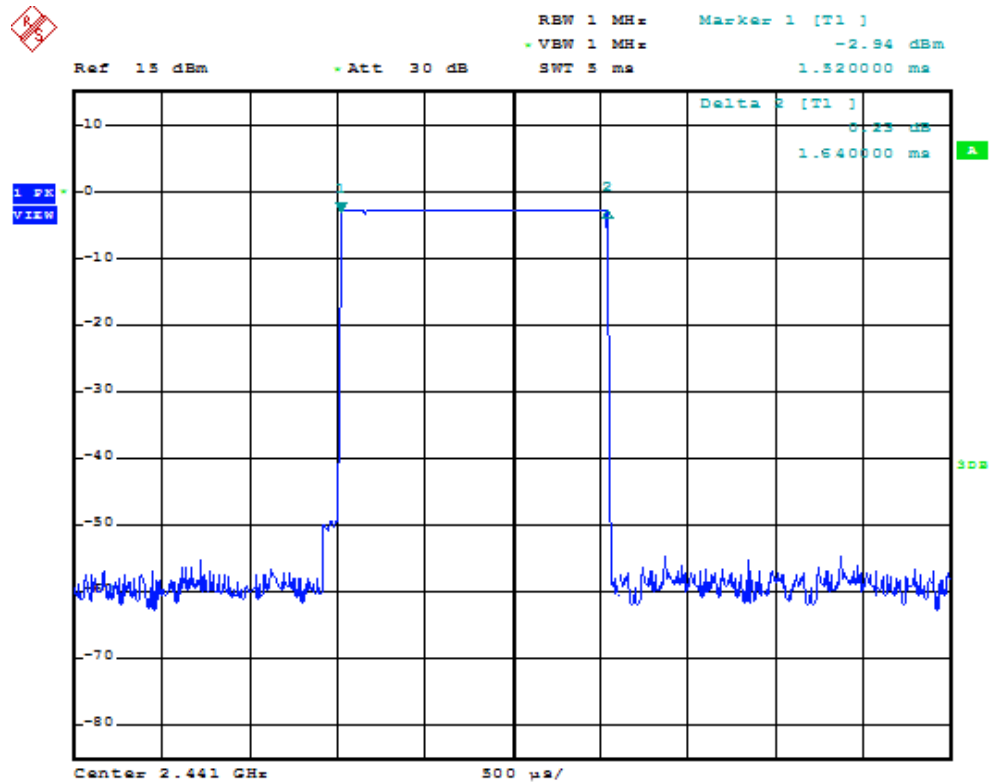
Test Data (Worset case )

Packet	Frequency (MHz)	Pulse Wide (ms)	Number of Hopping Pulses in 0.4*channel number	Dwell Time (ms)	Limit (ms)
DH1	2441	0.41	*(1600/(2*79))*31.6	131.2	400
DH3	2441	1.64	*(1600/(4*79))*31.6	262.4	400
DH5	2441	2.92	*(1600/(6*79))*31.6	311.5	400

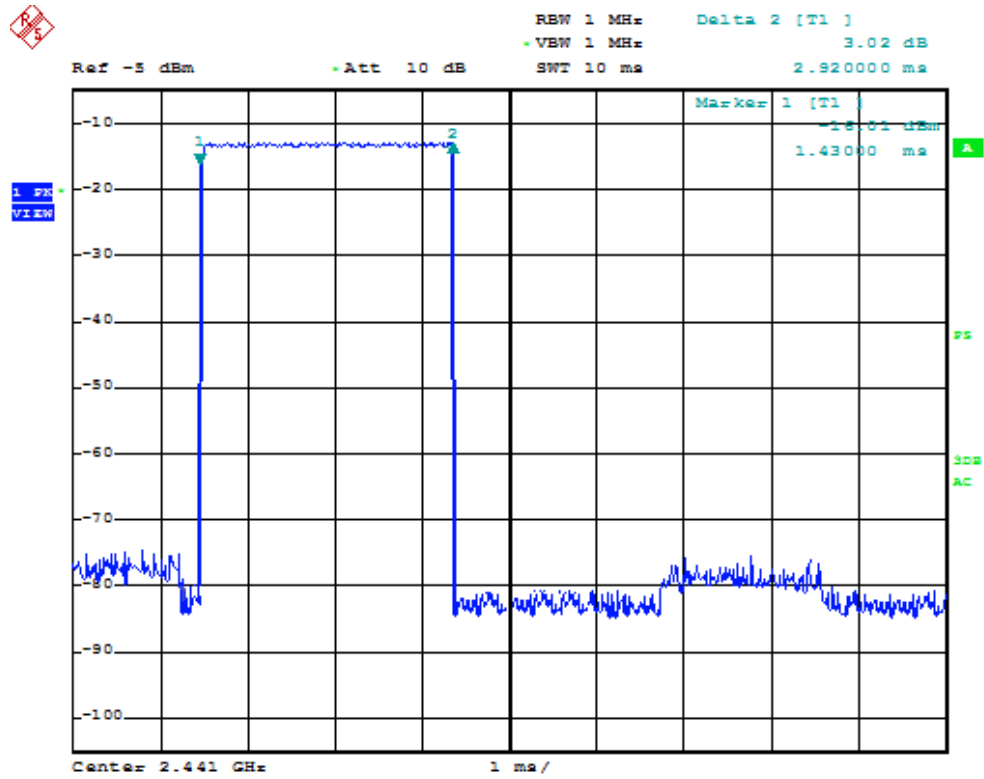
DH1:



DH3:



DH5:

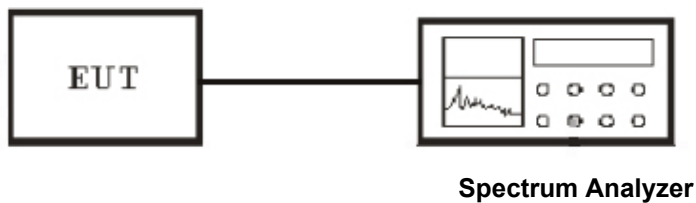


## 9. Test of Maximum Peak Output Power

### 9.1 Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and The maximum peak output power shall not exceed 1 watt. For all other frequency hopping systems in this frequency band, The maximum peak output power shall not exceed 0.125 watt.

### 9.2 EUT Setup



### 9.3 Test Equipment List and Details

See section 2.4.

### 9.4 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,

### 9.5 Test Result

Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

Channel	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
Low	2402	1.07	30	28.93
Middle	2441	1.16	30	28.84
High	2480	0.89	30	29.11

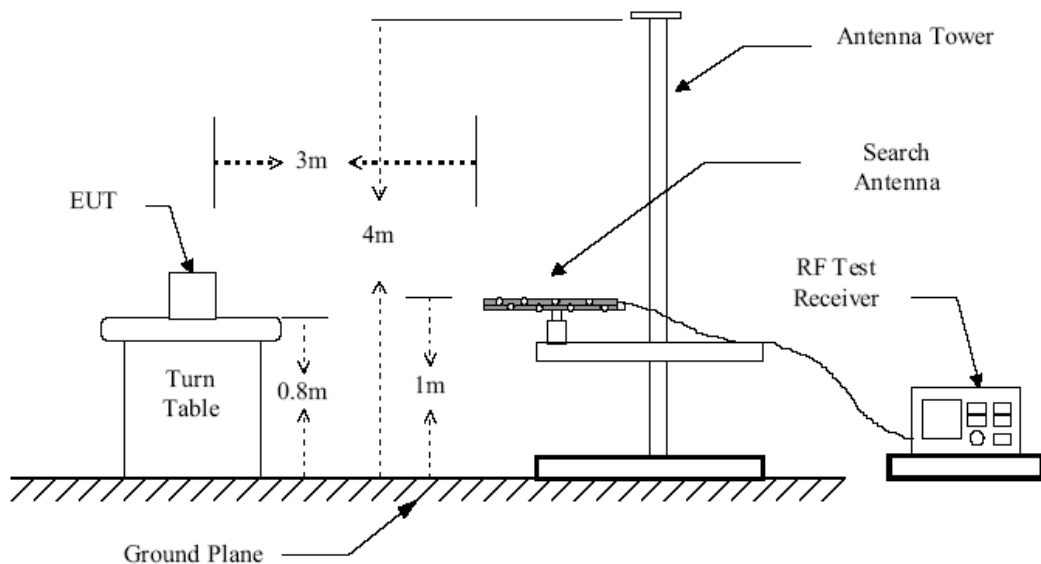
## 10. Test of Band Edges Emission

### 10.1 Applicable Standard

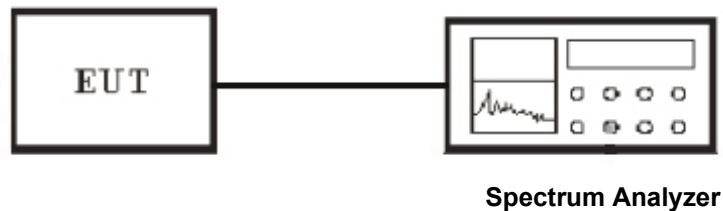
Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band 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.

### 10.2 EUT Setup

#### Radiated Measurement Setup



#### Conducted Measurement Setup



### 10.3 Test Equipment List and Details

See section 2.4.

### 10.4 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.

### 10.5 Test Result

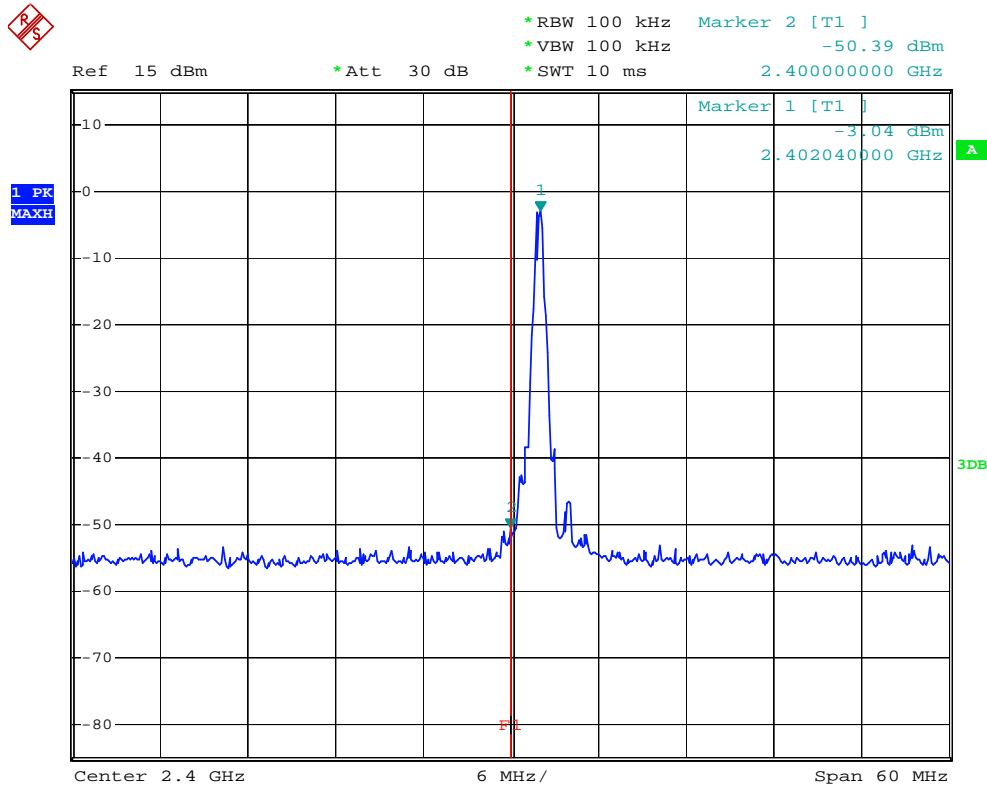
Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

Note: Channel low, mid and high, 30MHz-25GHz conducted emissions all more than 20 dB below fundamental.

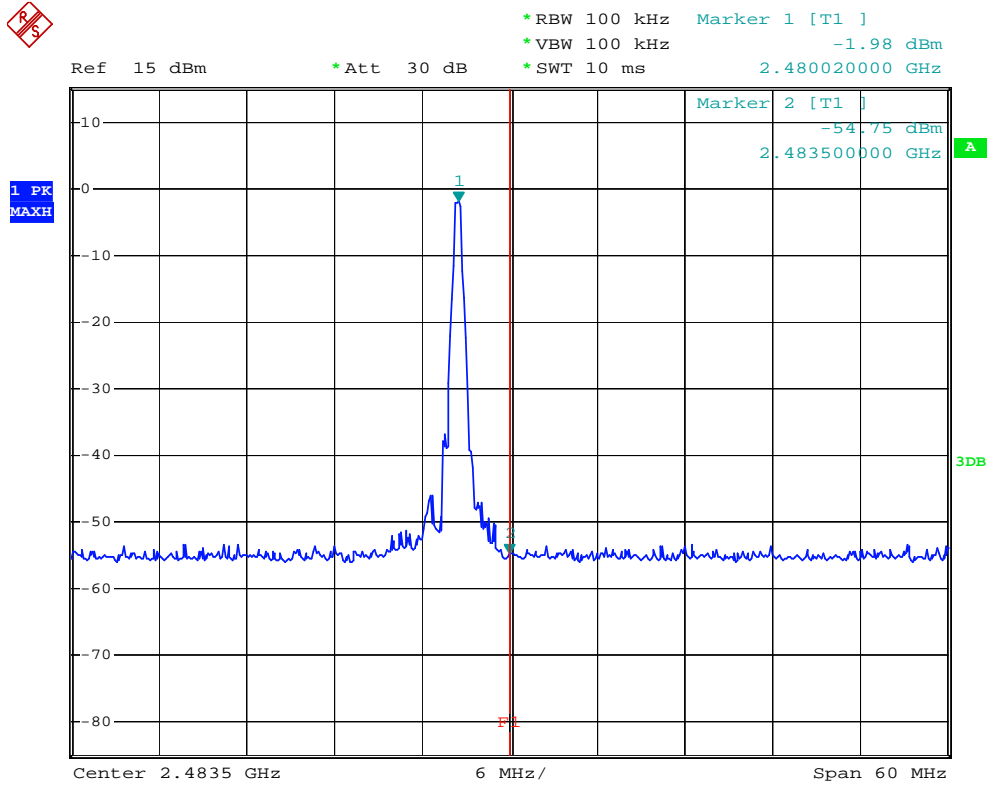
#### Radiated Test Result

Frequency(MHz)
<2400
>2483.5

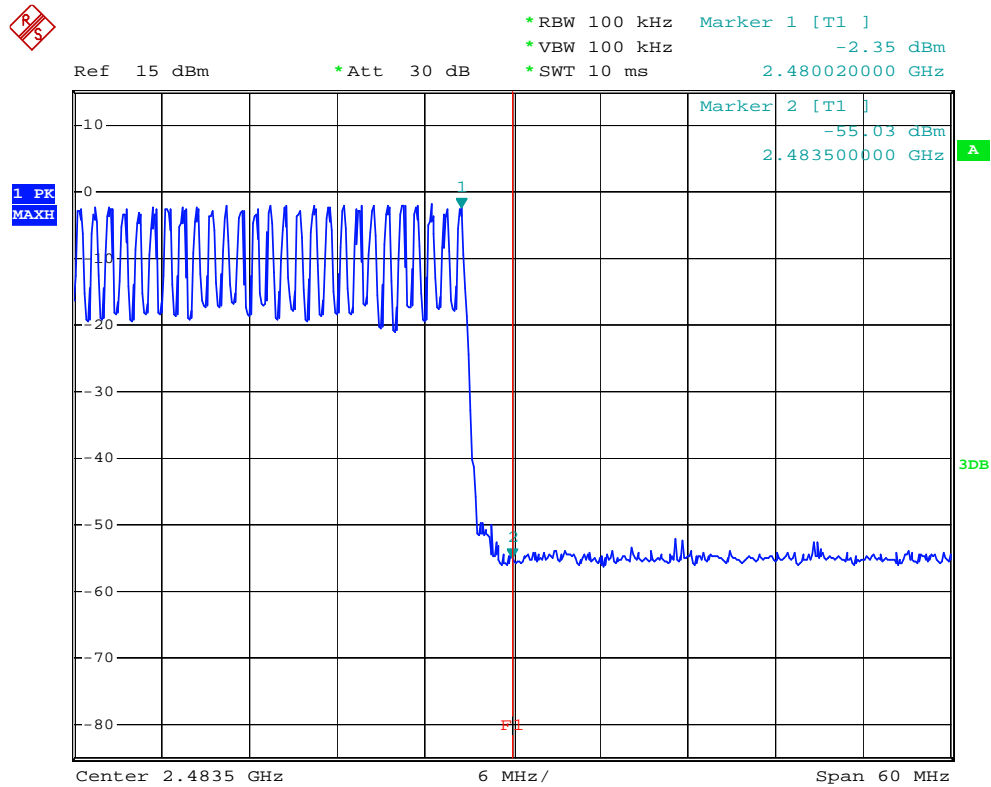
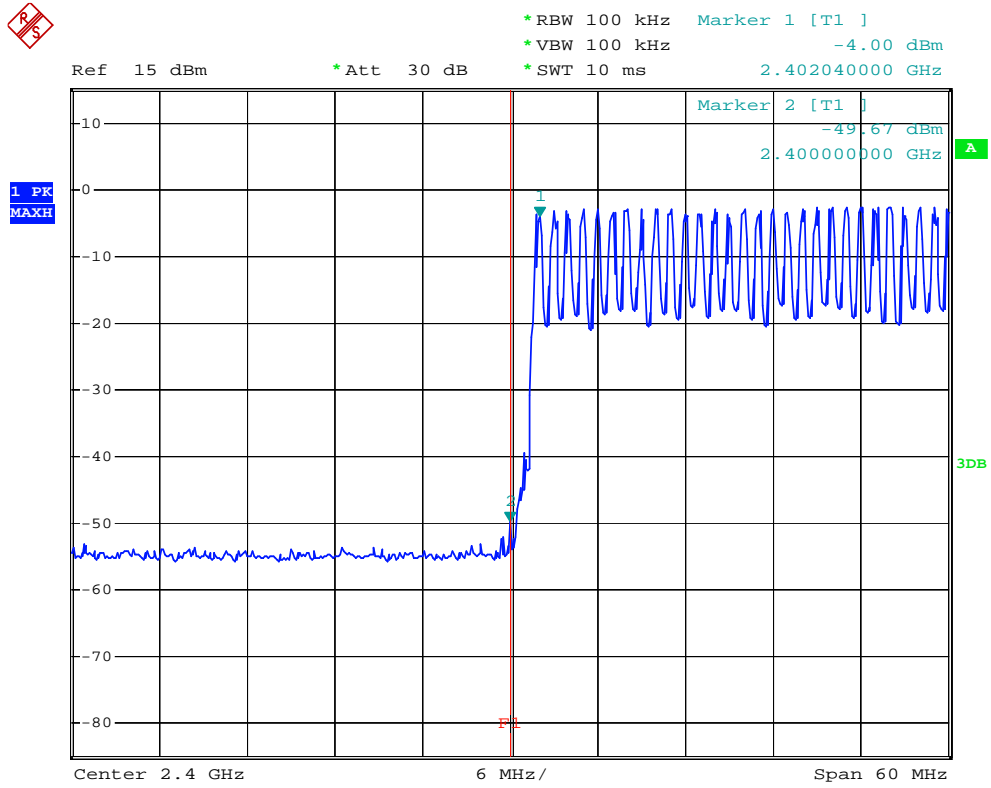
The worst frequency range of continual TX Low Channel



The worst frequency range of continual TX High Channel



The worst frequency range of Hopping Mode





## 11. Test of Spurious Radiated Emission

### 11.1 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.

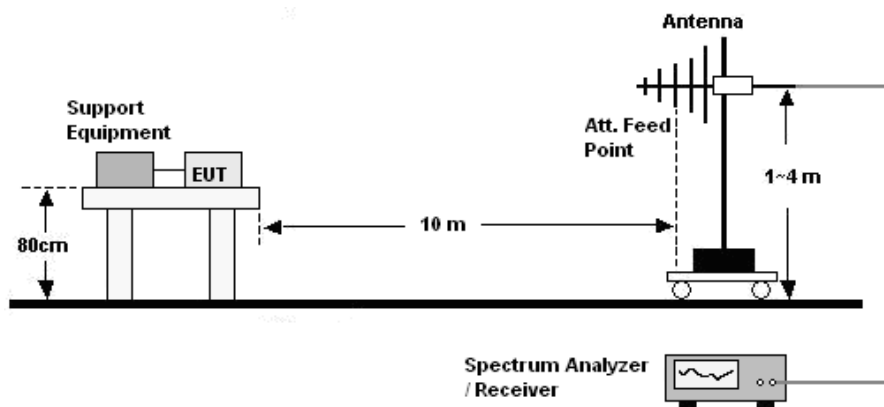
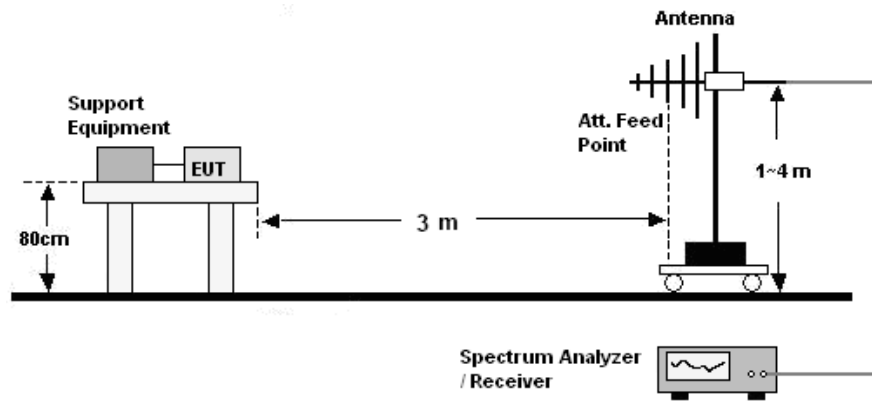
**Limits for Class B digital devices**

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

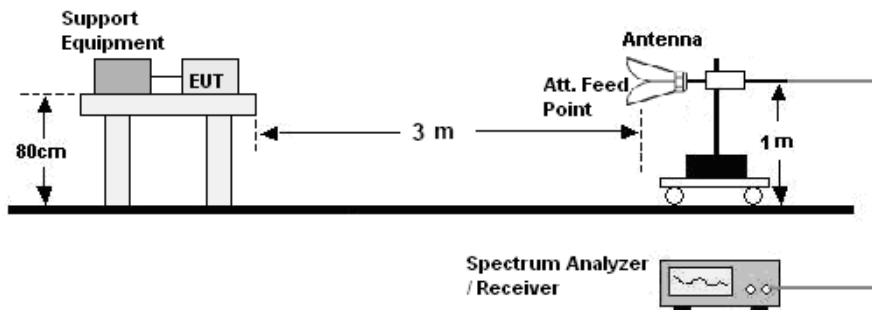
- NOTE:**
1. The lower limit shall apply at the transition frequency.
  2. The limits shown above are based on measuring equipment employing a CISPR quasi-peak detector function for frequencies below or equal to 1000MHz.
  3. The limits shown above are based on measuring equipment employing an average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

## 11.2 Radiated Measurement Setup

30MHz ~ 1GHz:



Above 1GHz:



### 11.3 Test Equipment List and Details

See section 2.4.

### 11.4 Radiated Measurement Test Procedure

#### 30MHz ~ 1GHz:

- a. The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.
- b. 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.
- c. 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:

- a. The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.
- b. 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.
- c. 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.

### 11.5 Test Result

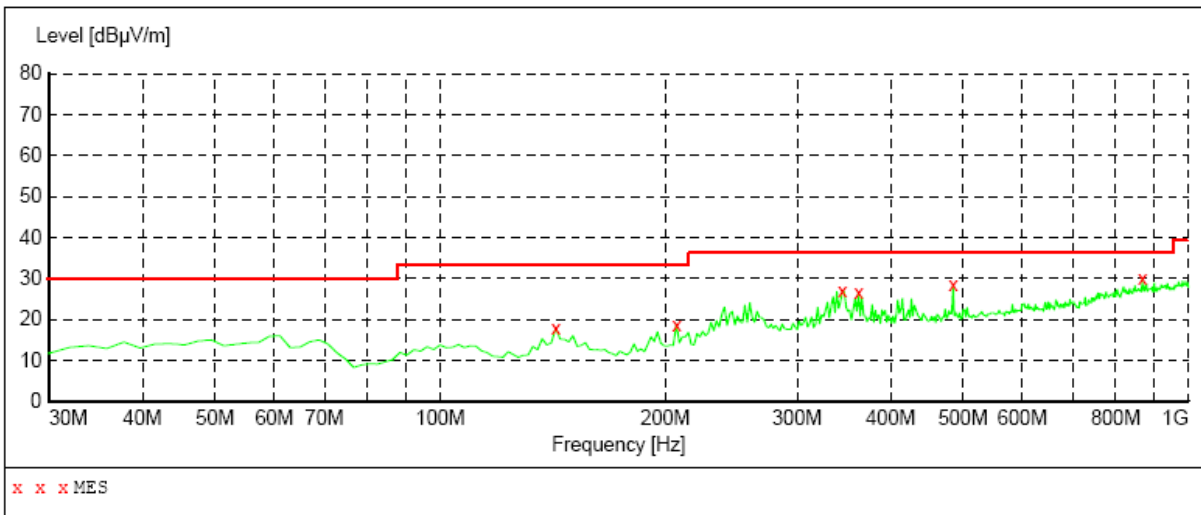
Temperature ( °C ) : 22~23	EUT: Bluetooth Headset
Humidity (%RH) : 50~54	M/N: B2
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Normal operation

## The Spurious Emission (30~1000MHz) Of Horizontal (Charging mode)

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: Charging  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
Comment: Polarization: Horizontal  
Tem:23°C Hum:50%

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

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



### MEASUREMENT RESULT:

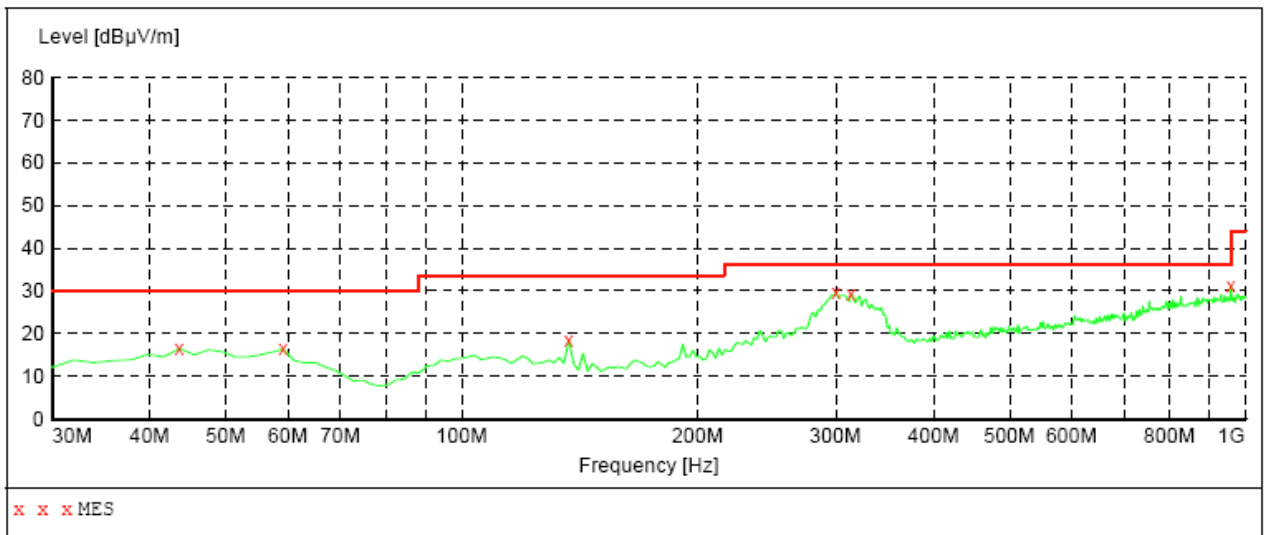
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
142.745491	17.90	-15.6	33.5	15.6	---	100.0	179.00	HORIZONTAL
206.893788	18.80	-12.6	33.5	14.7	---	100.0	88.00	HORIZONTAL
344.909820	27.10	-8.1	36.5	9.4	---	100.0	268.00	HORIZONTAL
362.404810	26.60	-8.2	36.5	9.9	---	100.0	284.00	HORIZONTAL
484.869739	28.50	-6.2	36.5	8.0	---	100.0	370.00	HORIZONTAL
867.815631	29.90	0.4	36.5	6.6	---	100.0	120.00	HORIZONTAL

## The Spurious Emission (30~1000MHz) Of Vertical (Charging mode)

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: Charging  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
Comment: Polarization: Vertical  
Tem:23°C Hum:50%

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

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



### MEASUREMENT RESULT:

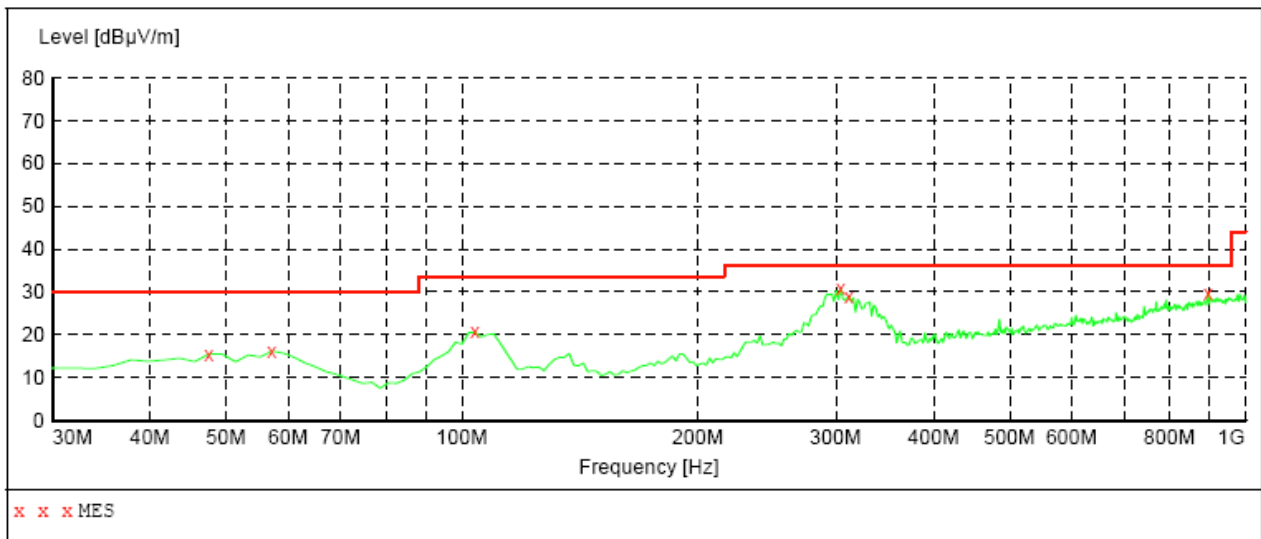
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.607214	16.50	-11.4	30.0	13.5	---	100.0	33.00	VERTICAL
59.158317	16.40	-11.3	30.0	13.6	---	100.0	355.00	VERTICAL
136.913828	18.50	-15.4	33.5	15.0	---	100.0	58.00	VERTICAL
300.200401	29.70	-9.3	36.0	6.3	---	100.0	227.00	VERTICAL
313.807615	29.40	-9.1	36.0	6.6	---	100.0	227.00	VERTICAL
957.234469	31.10	1.3	36.0	4.9	---	100.0	339.00	VERTICAL

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

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: BT TX Channel Low  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
Comment: Polarization: Horizontal  
Tem:23°C Hum:50%

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

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



### MEASUREMENT RESULT:

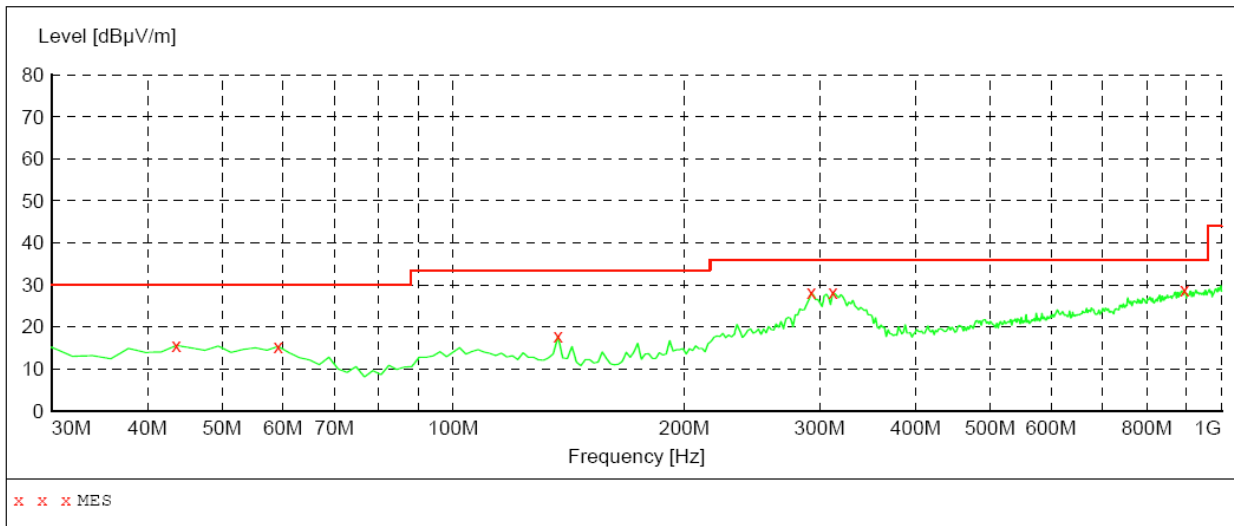
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.494990	15.50	-11.1	30.0	14.5	---	100.0	255.00	HORIZONTAL
57.214429	16.20	-10.8	30.0	13.8	---	100.0	190.00	HORIZONTAL
103.867735	20.60	-12.2	33.5	12.9	---	100.0	158.00	HORIZONTAL
304.088176	30.90	-9.2	36.0	5.1	---	100.0	134.00	HORIZONTAL
311.863727	29.00	-9.1	36.0	7.0	---	100.0	134.00	HORIZONTAL
895.030060	29.70	0.9	36.0	6.3	---	100.0	341.00	HORIZONTAL

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

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: BT TX Channel Low  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
Comment: Polarization: Vertical  
Tem:23°C Hum:50%

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

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



### MEASUREMENT RESULT:

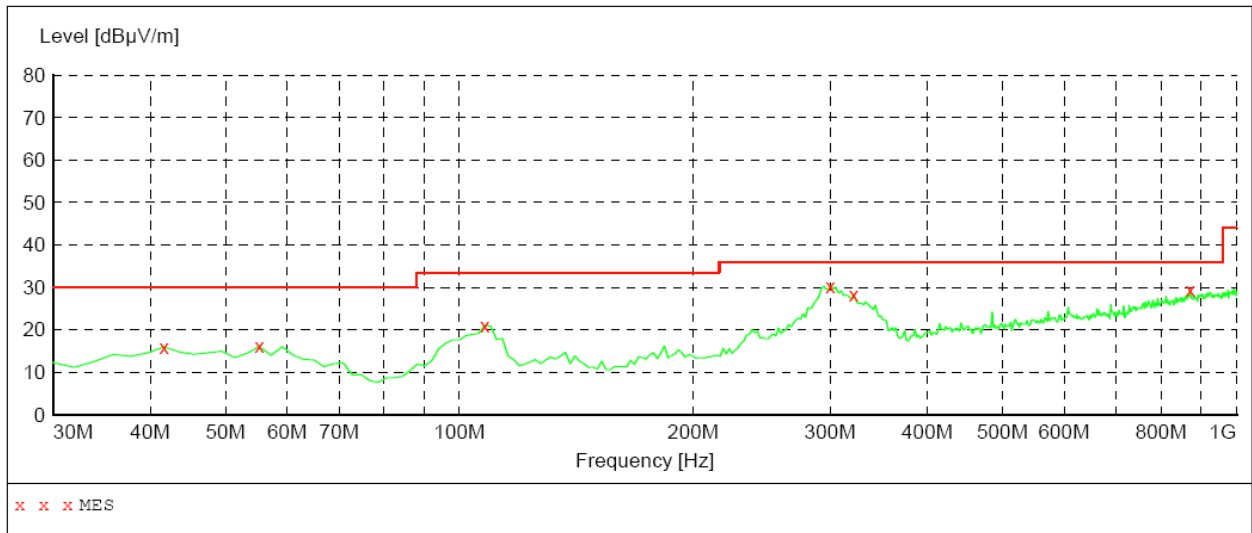
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.607214	15.60	-11.4	30.0	14.4	---	100.0	181.00	VERTICAL
59.158317	15.40	-11.3	30.0	14.6	---	100.0	229.00	VERTICAL
136.913828	17.80	-15.4	33.5	15.7	---	100.0	294.00	VERTICAL
292.424850	28.20	-9.5	36.0	7.8	---	100.0	222.00	VERTICAL
311.863727	28.20	-9.1	36.0	7.8	---	100.0	222.00	VERTICAL
895.030060	28.90	0.9	36.0	7.1	---	100.0	157.00	VERTICAL

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

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: BT TX Channel Middle  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
Comment: Polarization: Horizontal  
Tem:23°C Hum:50%

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

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



### MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.663327	16.00	-11.5	30.0	14.0	---	100.0	352.00	HORIZONTAL
55.270541	16.10	-10.8	30.0	13.9	---	100.0	303.00	HORIZONTAL
107.755511	21.10	-12.4	33.5	12.4	---	100.0	173.00	HORIZONTAL
300.200401	30.30	-9.3	36.0	5.7	---	100.0	197.00	HORIZONTAL
321.583166	28.30	-8.9	36.0	7.7	---	100.0	197.00	HORIZONTAL
871.703407	29.50	0.5	36.0	6.5	---	100.0	60.00	HORIZONTAL

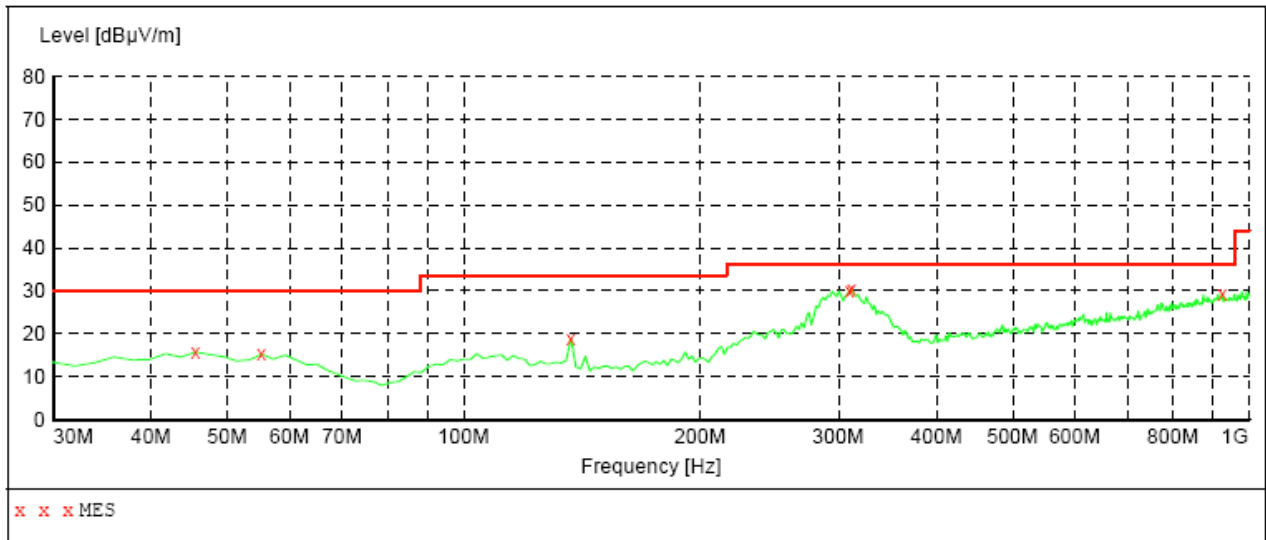


## The Spurious Emission (30~1000MHz) Of Vertical (BT TX Model M)

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: BT TX Channel Middle  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
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 30.0 MHz	Frequency 1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163



### MEASUREMENT RESULT:

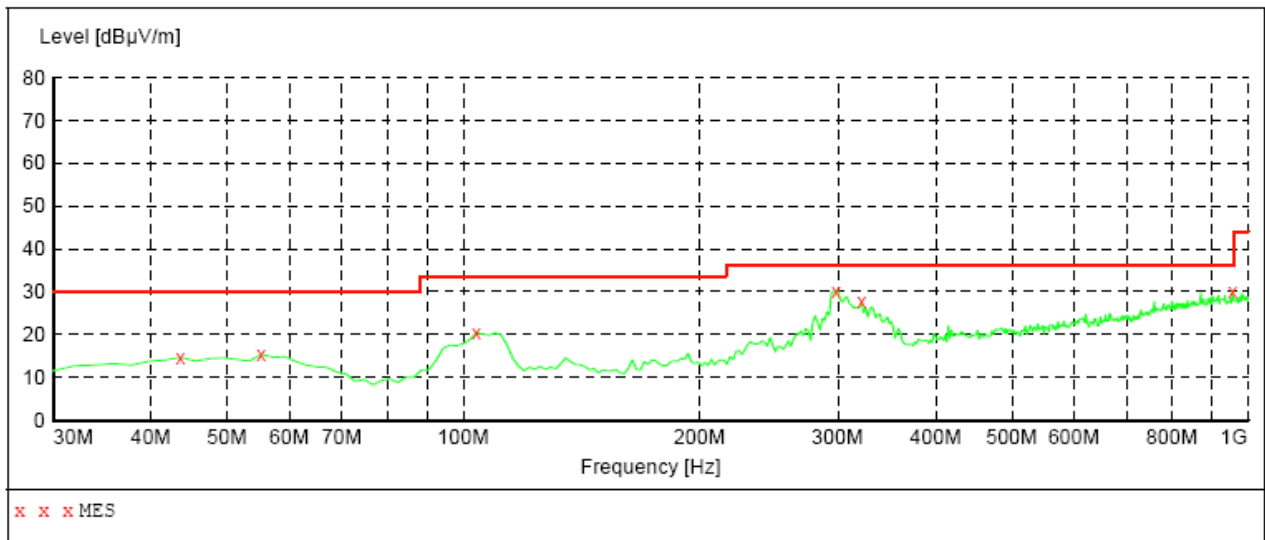
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.551102	15.70	-11.2	30.0	14.3	---	100.0	239.00	VERTICAL
55.270541	15.20	-10.8	30.0	14.8	---	100.0	69.00	VERTICAL
136.913828	19.00	-15.4	33.5	14.5	---	100.0	60.00	VERTICAL
309.919840	30.10	-9.1	36.0	5.9	---	100.0	222.00	VERTICAL
311.863727	30.30	-9.1	36.0	5.7	---	100.0	222.00	VERTICAL
924.188377	29.30	1.3	36.0	6.7	---	100.0	239.00	VERTICAL

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

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: BT TX Channel High  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
Comment: Polarization: Horizontal  
Tem:23°C Hum:50%

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

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



### MEASUREMENT RESULT:

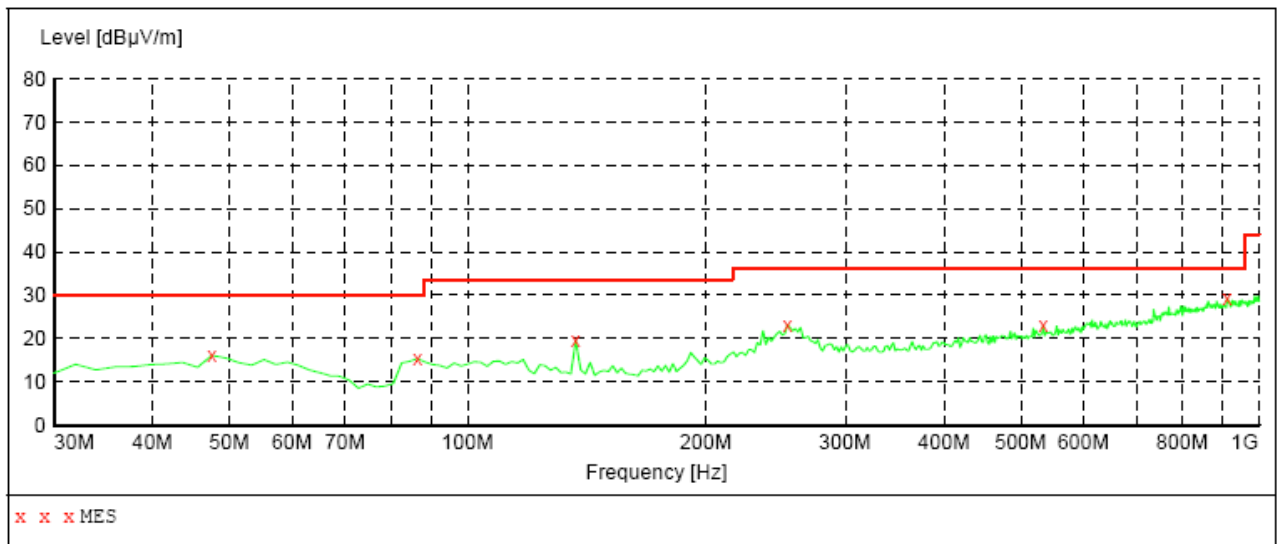
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.607214	14.70	-11.4	30.0	15.3	---	100.0	231.00	HORIZONTAL
55.270541	15.40	-10.8	30.0	14.6	---	100.0	117.00	HORIZONTAL
103.867735	20.50	-12.2	33.5	13.0	---	100.0	134.00	HORIZONTAL
298.256513	30.20	-9.3	36.0	5.8	---	100.0	198.00	HORIZONTAL
321.583166	27.60	-8.9	36.0	8.4	---	100.0	134.00	HORIZONTAL
955.290581	30.00	1.3	36.0	6.0	---	100.0	150.00	HORIZONTAL

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

EUT: Bluetooth Headset  
M/N: B2  
Operating Condition: BT TX Channel High  
Test Site: 10m CHAMBER  
Operator: Owen Li  
Test Specification: DC 5V  
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
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VBLU9163



### MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.494990	16.10	-11.1	30.0	13.9	---	100.0	116.00	VERTICAL
86.372745	15.30	-15.7	30.0	14.7	---	100.0	28.00	VERTICAL
136.913828	19.60	-15.4	33.5	13.9	---	100.0	116.00	VERTICAL
253.547094	23.20	-10.5	36.0	12.8	---	100.0	181.00	VERTICAL
533.466934	23.00	-5.6	36.0	13.0	---	100.0	109.00	VERTICAL
910.581162	29.30	1.1	36.0	6.7	---	100.0	165.00	VERTICAL

## The Spurious Emission (Above 1GHz)

Test Results-(Measurement Distance: 3m)_Channel low							
Frequency (MHz)	Measurement value			Limit		Antenna (H/V)	Result (P/F)
	PK (dB $\mu$ V/m)	AV factor (dB)	AV (dB $\mu$ V/m)	PK (dB $\mu$ V/m)	AV (dB $\mu$ V/m)		
2402.000*	91.42	---	---	---	---	H	P
4804.000	38.75	---	---	74	54	H	P
7206.000	32.31	---	---	74	54	H	P
2402.000*	91.27	---	---	---	---	V	P
4804.000	37.41	---	---	74	54	V	P
7206.000	32.53	---	---	74	54	V	P

\*: fundamental frequency

Test Results-(Measurement Distance: 3m)_Channel middle							
Frequency (MHz)	Measurement value			Limit		Antenna (H/V)	Result (P/F)
	PK (dB $\mu$ V/m)	AV factor (dB)	AV (dB $\mu$ V/m)	PK (dB $\mu$ V/m)	AV (dB $\mu$ V/m)		
2441.000*	91.84	---	---	---	---	H	P
4882.000	38.54	---	---	74	54	H	P
7323.000	32.67	---	---	74	54	H	P
2441.000*	90.79	---	---	---	---	V	P
4882.000	36.81	---	---	74	54	V	P
7323.000	30.46	---	---	74	54	V	P

\*: fundamental frequency

Test Results-(Measurement Distance: 3m)_ Channel high							
Frequency (MHz)	Measurement value			Limit		Antenna (H/V)	Result (P/F)
	PK (dB $\mu$ V/m)	AV factor (dB)	AV (dB $\mu$ V/m)	PK (dB $\mu$ V/m)	AV (dB $\mu$ V/m)		
2480.000*	91.62	---	---	---	---	H	P
4960.000	37.57	---	---	74	54	H	P
7440.000	32.18	---	---	74	54	H	P
2480.000*	90.65	---	---	---	---	V	P
4960.000	36.87	---	---	74	54	V	P
7440.000	29.93	---	---	74	54	V	P

\*: fundamental frequency

Remark:

1. The above tables show that the frequencies peak data are all below the average limit, so the average data of these frequencies are deemed to fulfill the average limits and not reported.
2. 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.

## **12. ANTENNA REQUIREMENT**

### **12.1 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.

### **12.2 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.

## 13. RF EXPOSURE

### 13.1 Standard Applicable

15.247(b)(4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 13.2 Limit

According to KDB447498 General RF Exposure Guidance v05

#### SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	SAR Test Exclusion Threshold (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	
MHz	30	35	40	45	50	mm
150	232	271	310	349	387	SAR Test Exclusion Threshold (mW)
300	164	192	219	246	274	
450	134	157	179	201	224	
835	98	115	131	148	164	
900	95	111	126	142	158	
1500	73	86	98	110	122	
1900	65	76	87	98	109	
2450	57	67	77	86	96	
3600	47	55	63	71	79	
5200	39	46	53	59	66	
5400	39	45	52	58	65	
5800	37	44	50	56	62	

**Note:** 10-g Extremity SAR Test Exclusion Power Thresholds are 2.5 times higher than the 1-g SAR Test Exclusion Thresholds indicated above. These thresholds do not apply, by extrapolation or other means, to occupational exposure limits.

### 13.3 Result

The Max Conducted Peak Output Power is 1.16dBm(1.31mW) in middle channel, and the Max Conducted Average Output Power is less than 1.31mW.

The best case gain of the antenna is 0dBi.

0 dBi logarithmic terms convert to numeric result is nearly 1.

According to the formula. calculate the EIRP test result:

$$\text{EIRP} < P \times G = 1.31\text{mW} \times 1 = 1.31\text{mW} \text{ ①}$$

SAR requirement:

$$\text{Limit} = 10\text{mW} @ 5\text{mm} \text{ ②} ;$$

$$\text{①} < \text{②}.$$

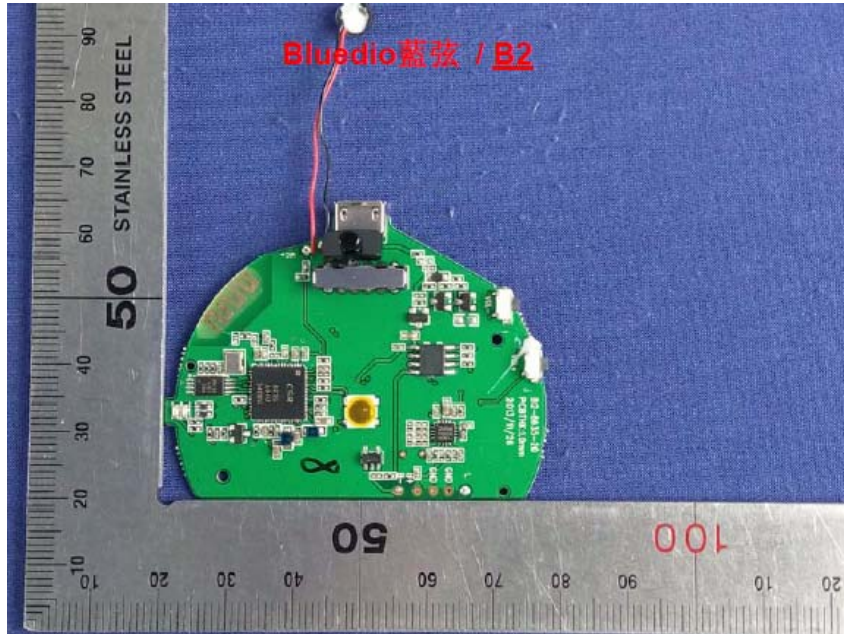
So the SAR report is not required.



## APPENDIX A - External Photographs



## APPENDIX B - Internal Photographs



## APPENDIX C - Test Setup Photographs

### Conducted Emission Test



### Radiated Emission Test

