

FCC PART 15 C  
EMI MEASUREMENT AND TEST REPORT  
For  
**SHENZHEN HOLIE ELECTRONICS CO.,LTD**

RM2304, Block C, Perfect Garden, ShenNan Road, Futian, Shenzhen , Guangdong, China

**FCC ID: TVB-HOLIE-HL-501**

December 21, 2005

<b>This Report Concerns:</b> <input type="checkbox"/> Original Report	<b>Equipment Type:</b> <b>Wireless Bluetooth Headset</b>
<b>Test Engineer:</b> Jimmy Li	
<b>Report No.:</b> SE05L-260E	
<b>Test Date:</b> Dec 14~Dec 19, 2005	
<b>Reviewed By:</b> <i>Tony Wu</i>	
<b>Prepared By:</b> <b>S&amp;E Technologies Laboratory Ltd</b> Room407,Block A Shennan Garden,Hi-Tech Industrial Park, Shenzhen 518057, P.R. China . Tel: 86-755-26636573, 26630631 Fax: 86-755-26630557	

**Note:** This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of S&E Product Technology Service Co., Ltd.

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## 1. GENERAL INFORMATION

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

#### Client Information

Applicant: **SHENZHEN HOLIE ELECTRONICS CO.,LTD**

Address of applicant: RM2304, Block C, Perfect Garden, ShenNan Road, Futian, Shenzhen , Guangdong, China  
Tel: 86-755-88318569      Fax: 86-755-88318418

Manufacturer: **SHENZHEN HOLIE ELECTRONICS CO.,LTD**

Address of manufacturer: RM2304, Block C, Perfect Garden, ShenNan Road, Futian, Shenzhen , Guangdong, China  
Tel: 86-755-88318569      Fax: 86-755-88318418

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

The **SHENZHEN HOLIE ELECTRONICS CO.,LTD.**'s product, model number: **HL-501** or the "EUT" as referred to in this report is a **Wireless Bluetooth Headset**. The EUT is measured approximately 64mm L x 28mm W x 30mmH

The technical data has been listed following:

Items	Description
Type of Modulation	GFSK(FHSS)
Frequency Band	2402 MHz ~ 2480 MHz
Bluetooth Specification	V1.2
Number of Channels	32
Channel Bandwidth	2 MHz
Range of operation	Max 10m line of sight
Antenna Type	Built-in Antenna
Temperature Range (Operating)	-20 ~ 55 °C
Output Power Class	Class 2
Battery Used	150mAh
Battery Voltage	3.7V DC
Charger	6.0 ± 5%V (type. 250mA)
Dimension & Weight	64mm*28mm*30mm/16g

Remark: \* The test data gathered are from the production sample provided by the manufacturer.

## 1.2 Objective

This document 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, 15.207, and 15.247 rules.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 - 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All measurement required was performed at laboratory of Shenzhen Huatongwei International Inspection Co., Ltd at Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China and The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.4 Test Facility

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

### FCC – Registration No.: 662850

Shenzhen Huatongwei International Inspection 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 662850, November 17, 2003.

### VCCI – Registration No.: 2218

Test site at Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been fully described in reports submitted to the Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Article 8 of the VCCI regulations on December 25, 1997. The VCCI Registration No.: 2218

The facility also complies with the radiated and AC line conducted test site criteria set forth in CISPR 16-1: 2002, CISPR16-2: 2002.

## **2. SYSTEM TEST CONFIGURATION**

### **2.1 Description of Test Configuration**

The EUT was configured for testing according to ANSI C63.4-2003.

The final qualification test was performed with the EUT operating at normal mode

### **2.2 Equipment Modifications**

No modifications were made to the EUT.

### **2.3 Configuration of Test Setup**



EUT

### **2.4 Test Setup Diagram**



## 2.5 List of Measuring Equipments Used

Items	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Calibration Period
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100038	2005/11	1 year
2	Artificial Mains	ROHDE & SCHWARZ	ESH2-Z5	100028	2005/11	1 year
3	Pulse Limiter	ROHDE & SCHWARZ	ESHSZ2	100044	2005/11	1 year
4	LISN	COM Power	LI-200	12212	2005/11	1 year
5	LISN	COM Power	LI-200	12019	2005/11	1 year
6	3m/5m Semi-Anechoic Chamber	ETS	N/A	N/A	2005/11	1 year
7	EMI Test Receiver	ROHDE & SCHWARZ	ESI 26	100009	2005/11	1 year
8	Receiver/ Spectrum Analyzer	ROHDE & SCHWARZ	ESCI	100106	2005/3	1 year
9	Spectrum Analyzer	HP	8593EM	3536A00107	2005/11	1 year
10	Spectrum Analyzer	HP	7405	US39440156	2005/11	1 year
11	Ultra-Broadband Antenna	R/S	HL562	100015	2005/11	1 year
12	Horn Antenna	R/S	HF906	100039	2005/11	1 year
13	Horn Antenna	Schwarzbeck	BBHA9170	154	2005/11	1 year
14	RF Test Panel	R/S	TS / RSP	335015/ 0017	N/A	N/A
15	Turntable	ETS	2088	2149	N/A	N/A
16	Antenna Mast	ETS	2075	2346	N/A	N/A

### 3. SUMMARY OF TEST RESULTS

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FCC Rules	Description of Test	Result
15.203/15.247(b)/(c)	Antenna Requirement	Pass
15.207	AC Power Line 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

## **4. ANTENNA REQUIREMENT**

### **4.1 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.

### **4.2 Antenna Connected Construction**

The antenna connector is designed with permanent attachment and no consideration of replacement.

## 5. TEST OF CONDUCTED EMISSION

### 5.1 Measurement Uncertainty

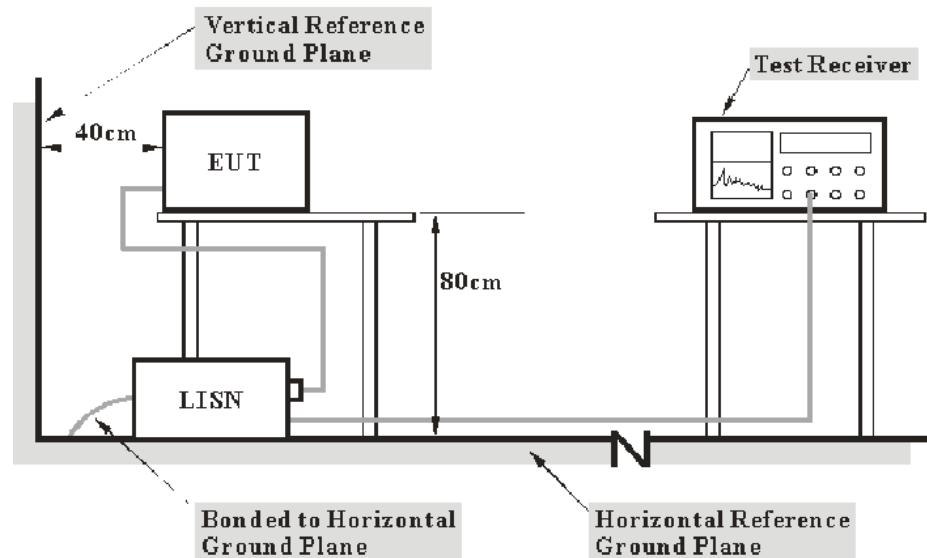
All test results complied with Section 15.207 requirements. Measurement Uncertainty is 2.4 dB.

### 5.2 Applicable Standard

Section 15.207: For a Low-power Radio-frequency Device is designed to be connected to the 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 below limits table.

Frequency Range (MHz)	Limits ( dBuV)	
	Quasi-Peak	Average
0.150 ~ 0.500	66 ~ 56	56 ~ 46
0.500 ~ 5.000	56	46
5.000 ~ 30.00	60	50

### 5.3 EUT Setup



Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMIN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC 15.207 limits.

The EUT was connected to a 120 VAC/ 60Hz power source

## 5.4 Instrument Setting

The test receiver was set with the following configurations:

Test Receiver Setting:

Frequency Range.....150 KHz to 30 MHz  
Detector.....Peak & Quasi-Peak & Average  
Sweep Speed.....Auto  
IF Band Width.....9 KHz

## 5.5 Test Equipment List and Details

See section 2.6.

## 5.6 Test Procedure

1. Configure the EUT according to ANSI C63.4.
2. The EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN)
4. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Use the Channel & Power Controlling software to make the EUT working on selected channel and expected output power, then use the "H" Patter Generator software to make the supporting equipments stay on working condition.
7. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. The measurement has to be done between each power line and ground at the power terminal for each RF channel. Only one RF channel has to be investigated since this test is independent with the RF channel selection.

## 5.7 Test Data

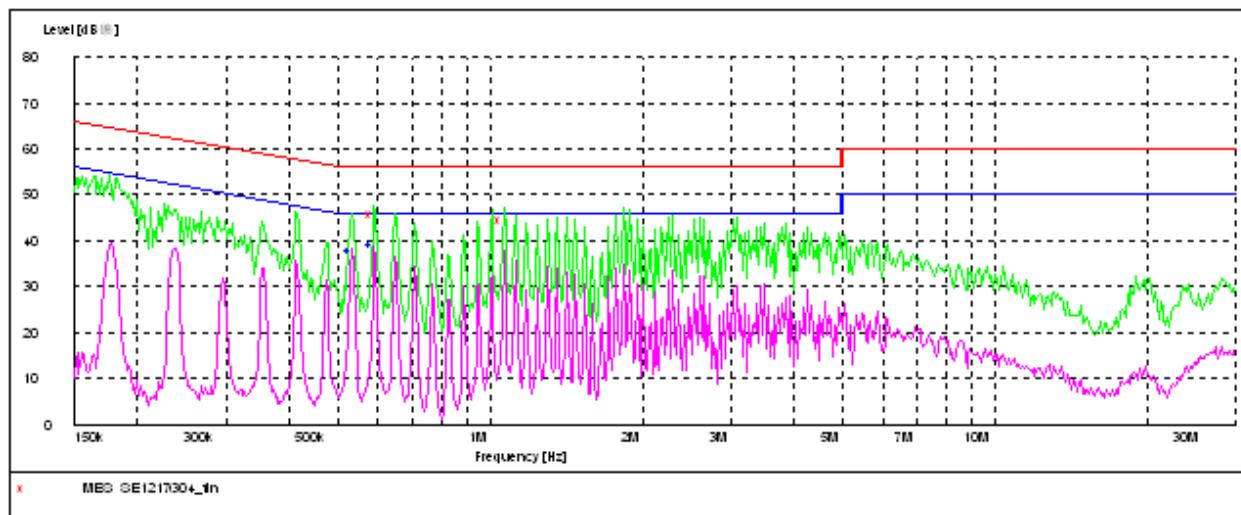
Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li

## CONDUCTED EMISSION TEST DATA

EUT: Wireless Bluetooth Headset  
 Operating Condition: Charging Mode  
 Test Site: HTW 3# Shielded Room  
 Operator: Andy  
 Test Specification: DC 5V from adaptor (AC 120V/60Hz)  
 Comment: Live Line  
 Start of Test: 12/17/05 / 2:47:21PM

## SCAN TABLE: "Voltage (150K-30M)QP"

Short Description:		150K-30M Voltage					
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	ESH2-Z5_1000280	
Average							



## MEASUREMENT RESULT: "SE1217304\_fin"

12/17/2005 2:51PM								
Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE	
0.590607	46.00	10.4	56	10.0	QP	L1	GND	
1.065073	44.60	10.6	56	11.4	QP	L1	GND	

## MEASUREMENT RESULT: "SE1217304\_fin2"

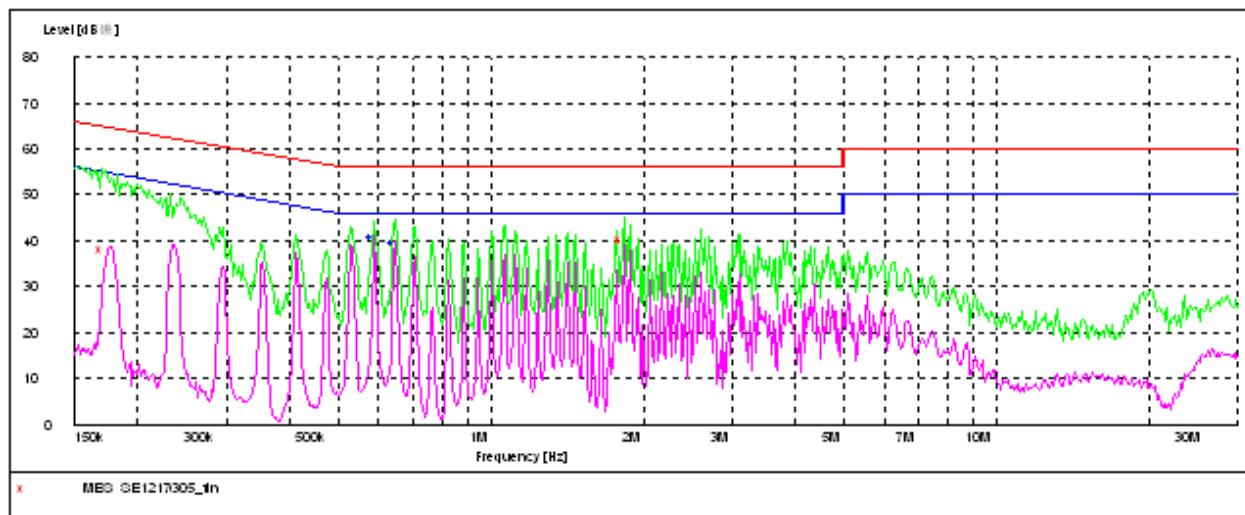
12/17/2005 2:51PM								
Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE	
0.532486	37.90	10.3	46	8.1	AV	L1	GND	
0.590607	39.00	10.4	46	7.0	AV	L1	GND	

## CONDUCTED EMISSION TEST DATA

EUT: Wireless Bluetooth Headset  
 Operating Condition: Charging Mode  
 Test Site: HTW 3# Shielded Room  
 Operator: Andy  
 Test Specification: DC 5V from adaptor(AC 120V/60Hz)  
 Comment: Neutral Line  
 Start of Test: 12/17/05 / 2:53:37PM

## SCAN TABLE: "Voltage (150K-30M)QP"

Short Description:		150K-30M Voltage					
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	ESH2-Z5_1000280	
Average							



## MEASUREMENT RESULT: "SE1217305\_fin"

12/17/2005 2:56PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dB $\mu$ V	dB	dB $\mu$ V	dB			
	0.171750	38.30	11.2	65	26.6	QP	N	GND
	1.831042	40.30	10.5	56	15.7	QP	N	GND

## MEASUREMENT RESULT: "SE1217305\_fin2"

12/17/2005 2:56PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dB $\mu$ V	dB	dB $\mu$ V	dB			
	0.590607	40.70	10.4	46	5.3	AV	N	GND
	0.649868	39.40	10.4	46	6.6	AV	N	GND

## 6. Test of Hopping Channel Bandwidth

### 6.1 Measurement Uncertainty

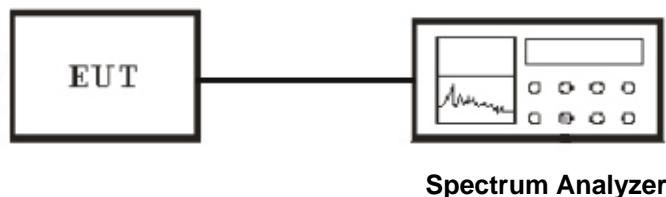
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer and cable loss.

All test results complied with Section 15.247(a)(1) requirements. Measurement Uncertainty is  $1 \times 10^{-5}$  dB.

### 6.2 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.

### 6.3 EUT Setup



### 6.4 Instrument Setting

Refer to section 6.6 Test Procedure.

### 6.5 Test Equipment List and Details

See section 2.6.

### 6.6 Test Procedure

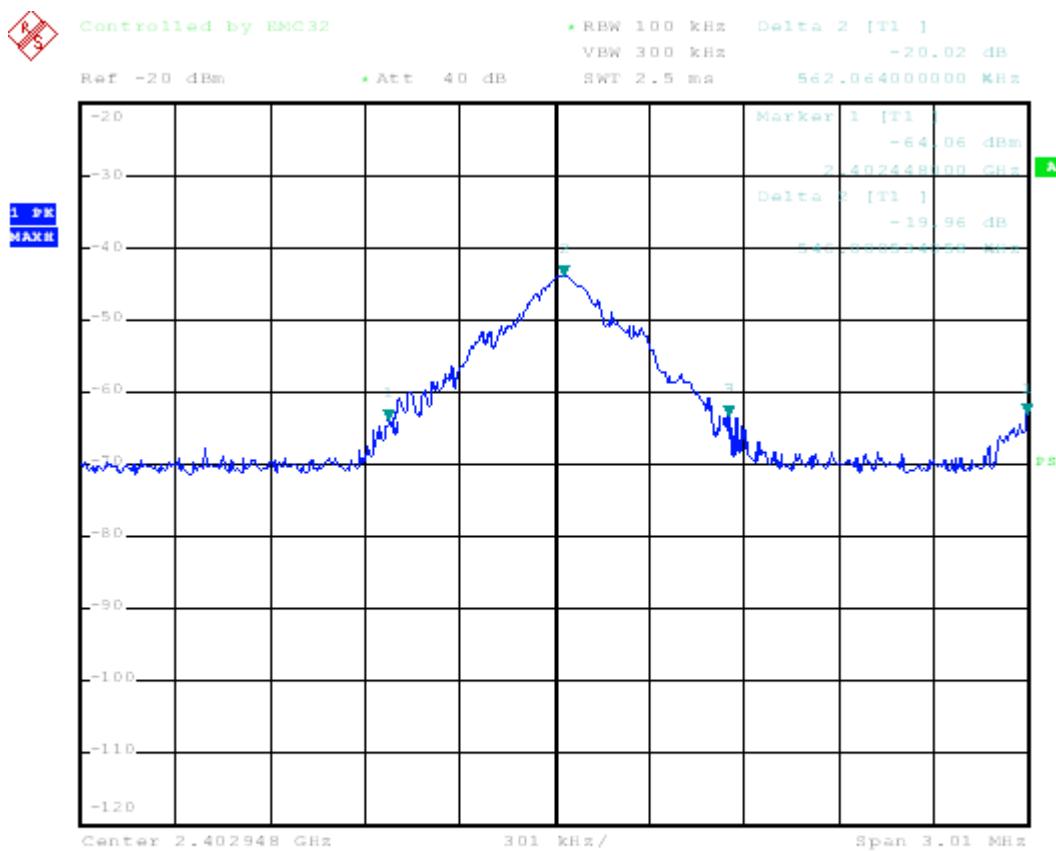
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 30KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. The spectrum width with level higher than 20dB below the peak level.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

## 6.7 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li

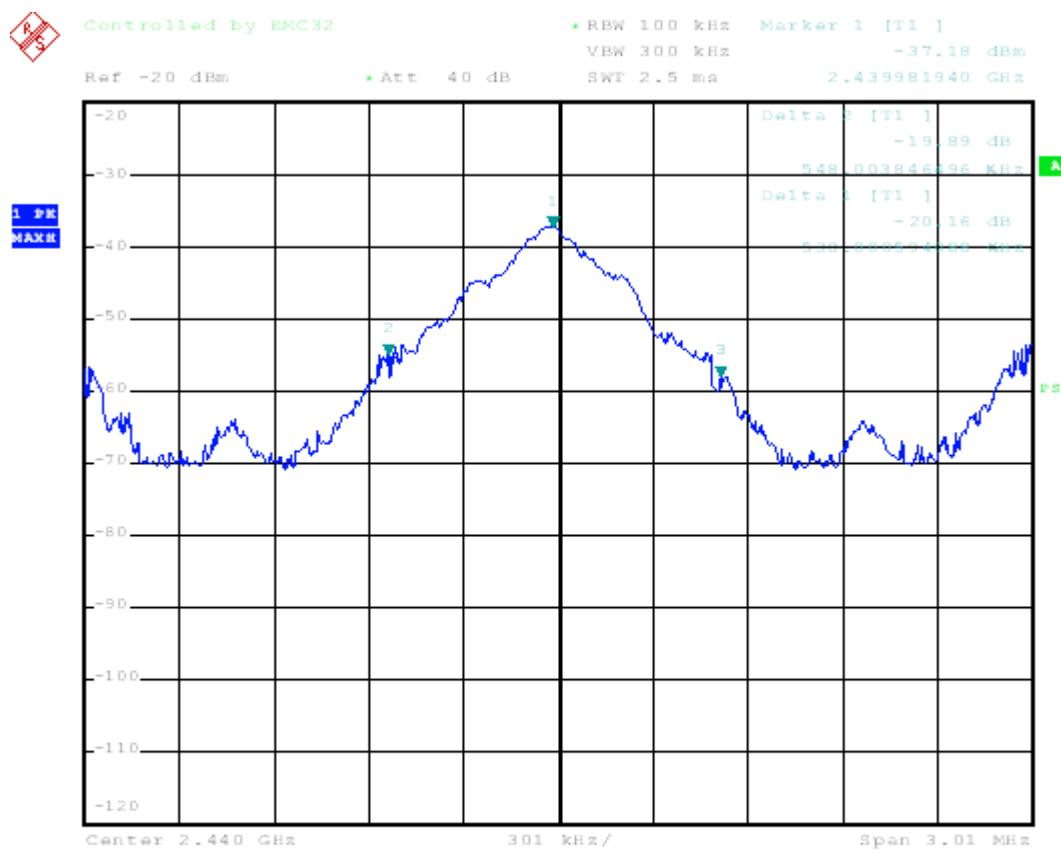
Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
GFSK(FHSS)	Low	2402.99	1108	>25
GFSK(FHSS)	MID	2439.98	1078	>25
GFSK(FHSS)	HIG	2479.99	1079	>25

## Channel Low :



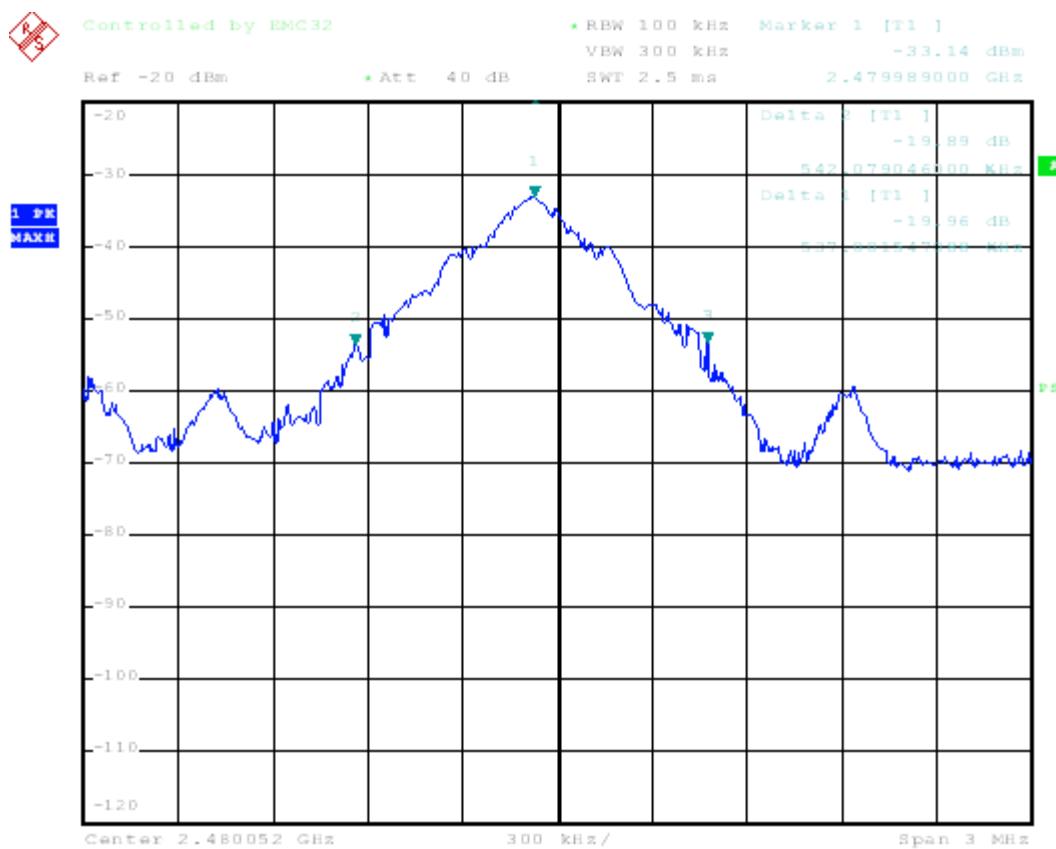
Date: 17-DEC-2005 14:33:15

## Channel MID :



Date: 17.DEC.2005 14:27:26

## Channel HIG :



Date: 17.DEC.2005 14:30:07

## 7. Test of Hopping Channel Separation

### 7.1 Measurement Uncertainty

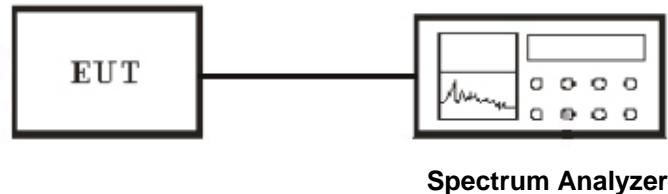
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer and cable loss.

All test results complied with Section 15.247(a)(1) requirements. Measurement Uncertainty is  $1 \times 10^{-5}$  dB.

### 7.2 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.

### 7.3 EUT Setup



### 7.4 Instrument Setting

Refer to section 7.6 Test Procedure.

### 7.5 Test Equipment List and Details

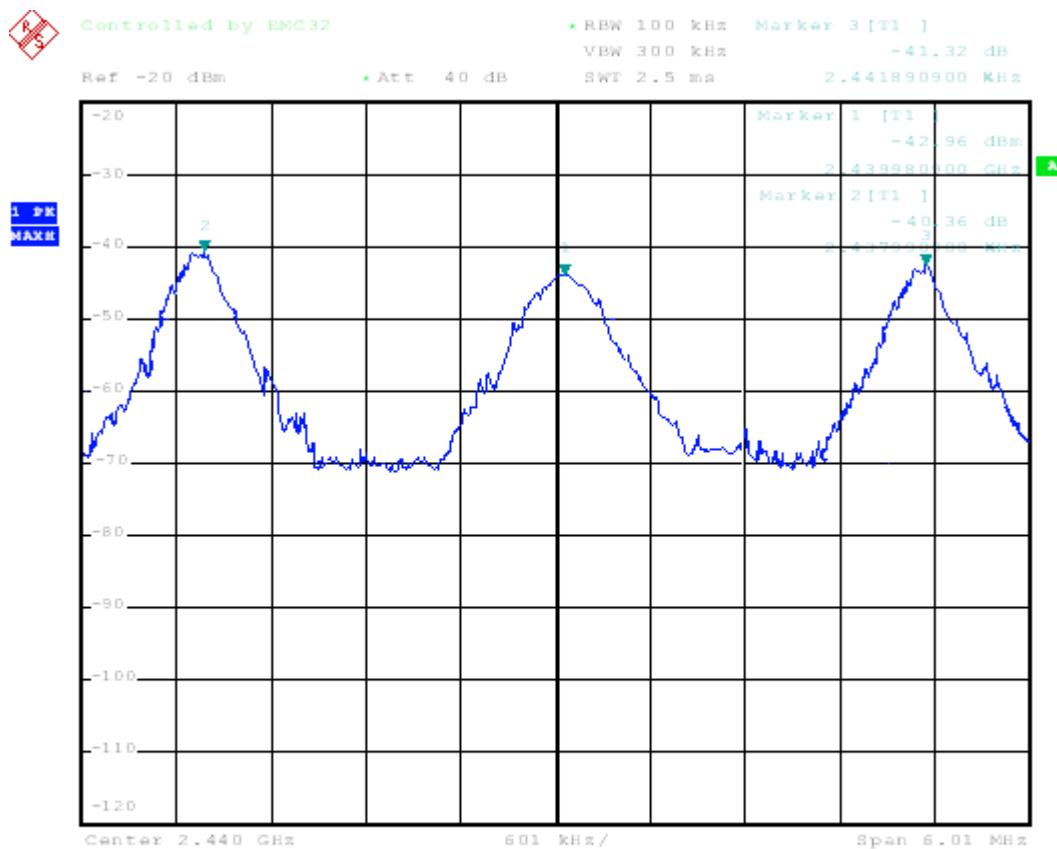
See section 2.6.

### 7.6 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 Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

## 7.7 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li



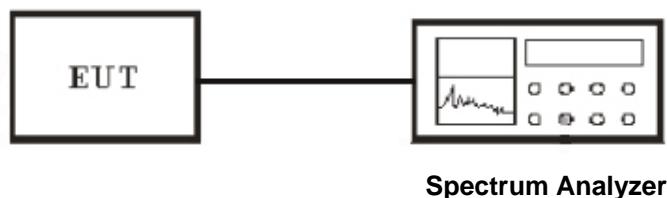
Date: 17.DEC.2005 15:13:25

## 8. Test of Number of Hopping Frequency

### 8.1 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.

### 8.2 EUT Setup



### 8.3 Instrument Setting

Refer to section 8.6 Test Procedure.

### 8.4 Test Equipment List and Details

See section 2.6.

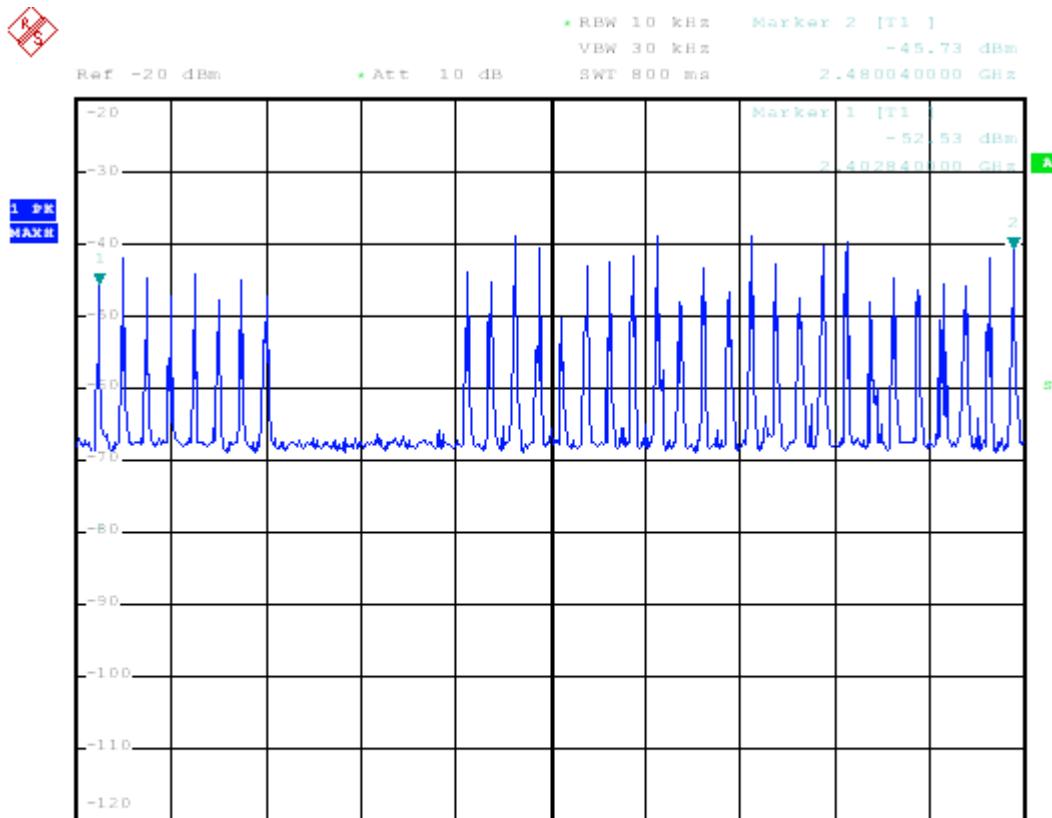
### 8.5 Test Procedure

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. Observe frequency hopping in 2400MHz~2483.5MHz, there are at least 32 non-overlapping channels.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

## 8.6 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li

Modulation Type	Frequency (MHz)	Number of Hopping Channel (Channels)	Min. Limit (kHz)
GFSK(FHSS)	2402.9~2479.9	32	>15



Date: 19.DEC.2005 20:47:11

## 9. Test of Dwell Time of Each Frequency

### 9.1 Measurement Uncertainty

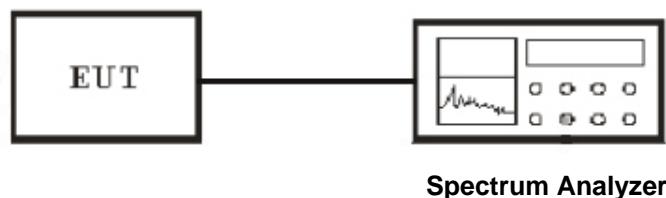
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer and cable loss.

All test results complied with Section 15.247(a)(1)(iii) requirements. Measurement Uncertainty is  $1 \times 10^{-5}$ .

### 9.2 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.

### 9.3 EUT Setup



### 9.4 Instrument Setting

Refer to section 9.6 Test Procedure.

### 9.5 Test Equipment List and Details

See section 2.6.

### 9.6 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.

## 9.7 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li

Modulation Type	Channel No.	Frequency (MHz)	Dwell Time (μs)	Min. Limit (ms)
GFSK(FHSS)	Low	2402.99	161	400
GFSK(FHSS)	MID	2439.98	161	400
GFSK(FHSS)	HIG	2479.99	159	400

The period is  $0.4(\text{Sec}) * 32(\text{Channels}) = 12.8\text{sec}$

$12.8(\text{Sec}) * 10(\text{hoping/sec}) = 128(\text{hops})$

Per one period of On time is: 1.26ms(Channel Low) , 1.26ms (Channel MID), 1.24ms(Channel HIG)

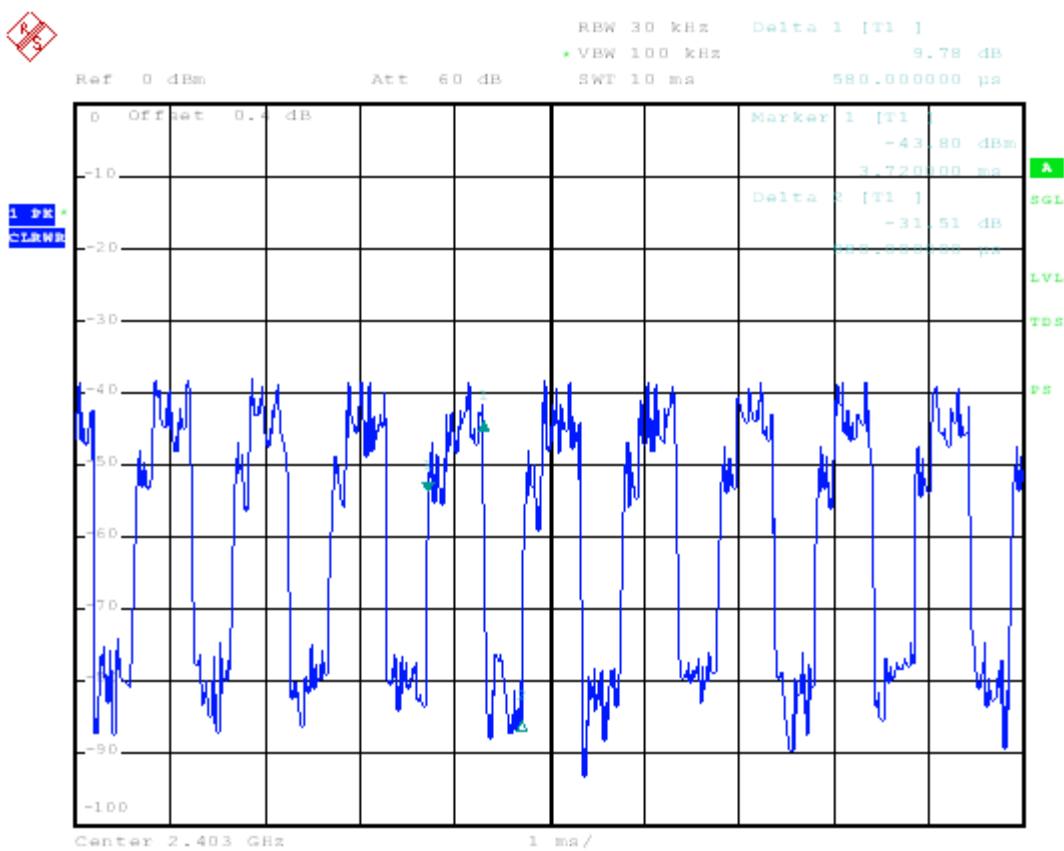
The Result is:

Channel Low the dwell time is  $1.26 * 128 = 161\text{ms}$

Channel MID the dwell time is  $1.26 * 128 = 161\text{ms}$

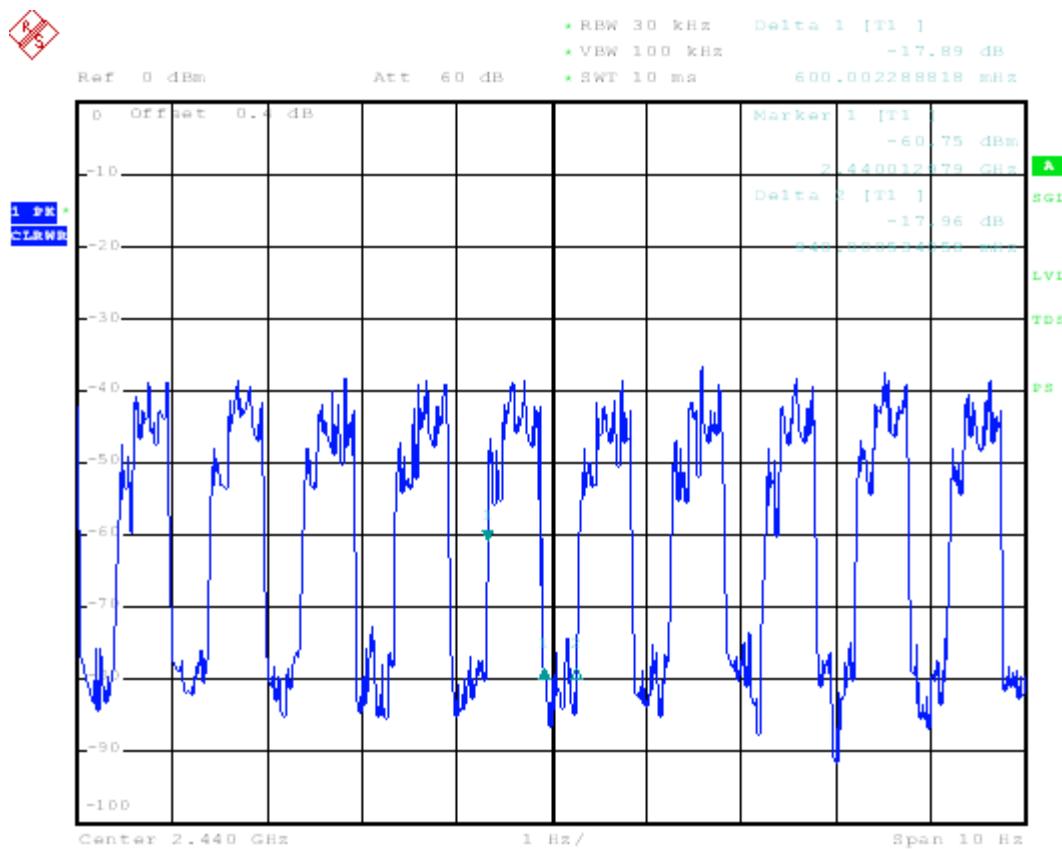
Channel HIG the dwell time is  $1.24 * 128 = 159\text{ms}$

## Channel Low :



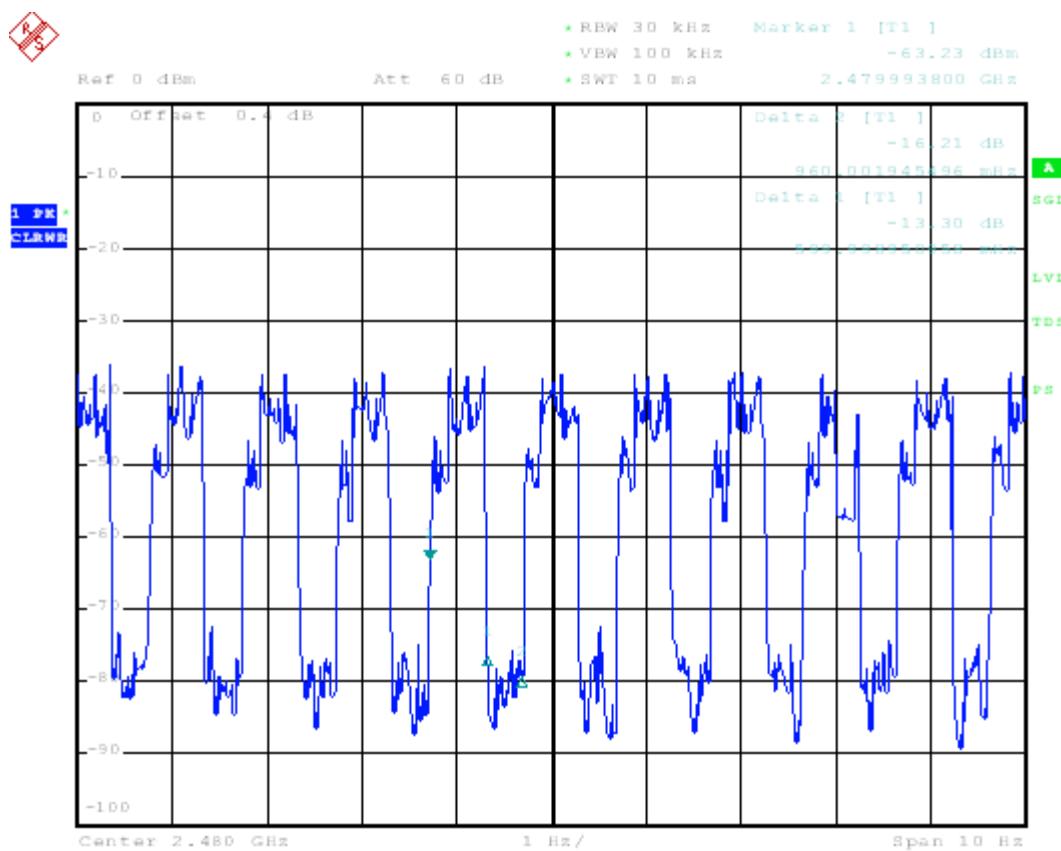
Date: 16.DEC.2005 19:40:25

**Channel MID :**



Date: 16.DEC.2005 20:08:11

## Channel HIG :



Date: 16.DEC.2005 19:37:53

## **10. Test of Maximum Peak Output Power**

### **10.1 Measurement Uncertainty**

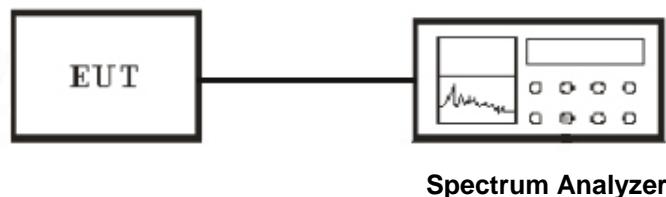
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer and cable loss.

All test results complied with Section 15.247(b)(1) requirements. Measurement Uncertainty is 1.5dB.

### **10.2 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.

### **10.3 EUT Setup**



### **10.4 Instrument Setting**

Refer to section 10.6 Test Procedure.

### **10.5 Test Equipment List and Details**

See section 2.6.

### **10.6 Test Procedure**

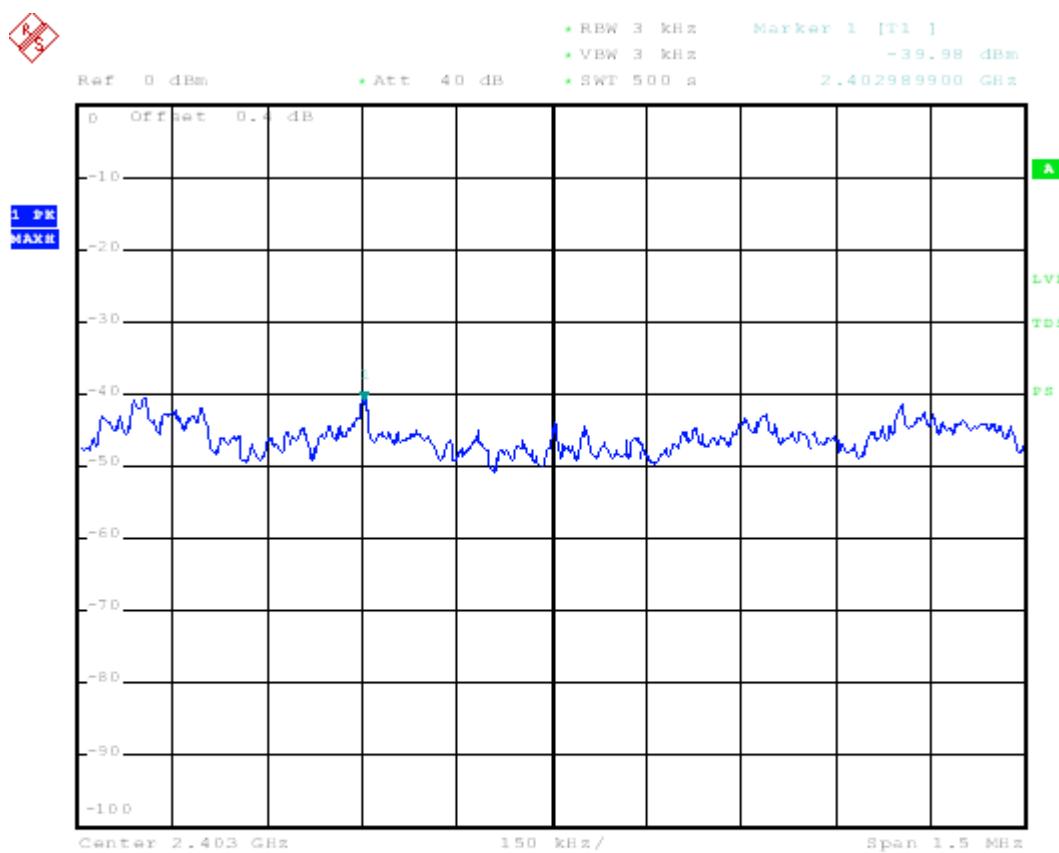
1. The transmitter output was connected to the peak power meter and recorded the peak value.
2. Peak power meter parameter set to auto attenuator and filter is the same as.
3. Repeated the 1 for the middle and highest channel of the EUT.

## 10.7 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li

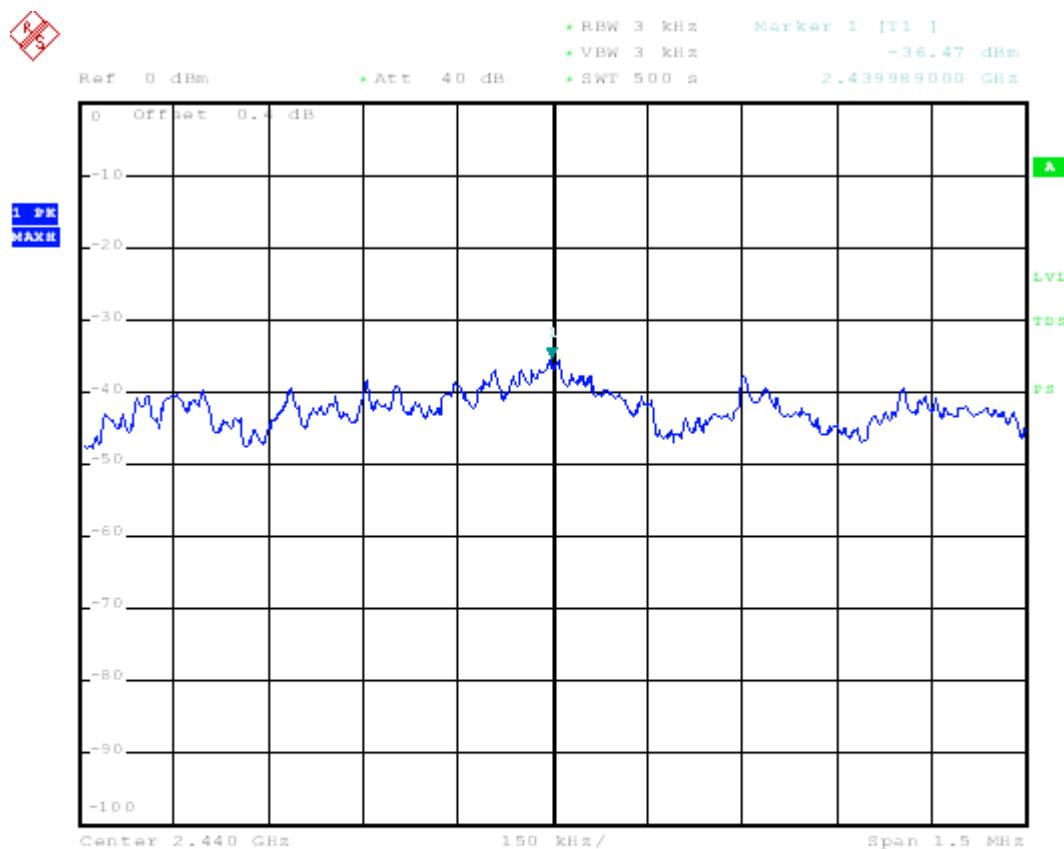
Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dBm)
GFSK(FHSS)	Low	2402.99	-39.98	20.9	60.9
GFSK(FHSS)	MID	2439.98	-36.47	20.9	57.4
GFSK(FHSS)	HIG	2479.99	-38.83	20.9	59.7

## Channel Low :



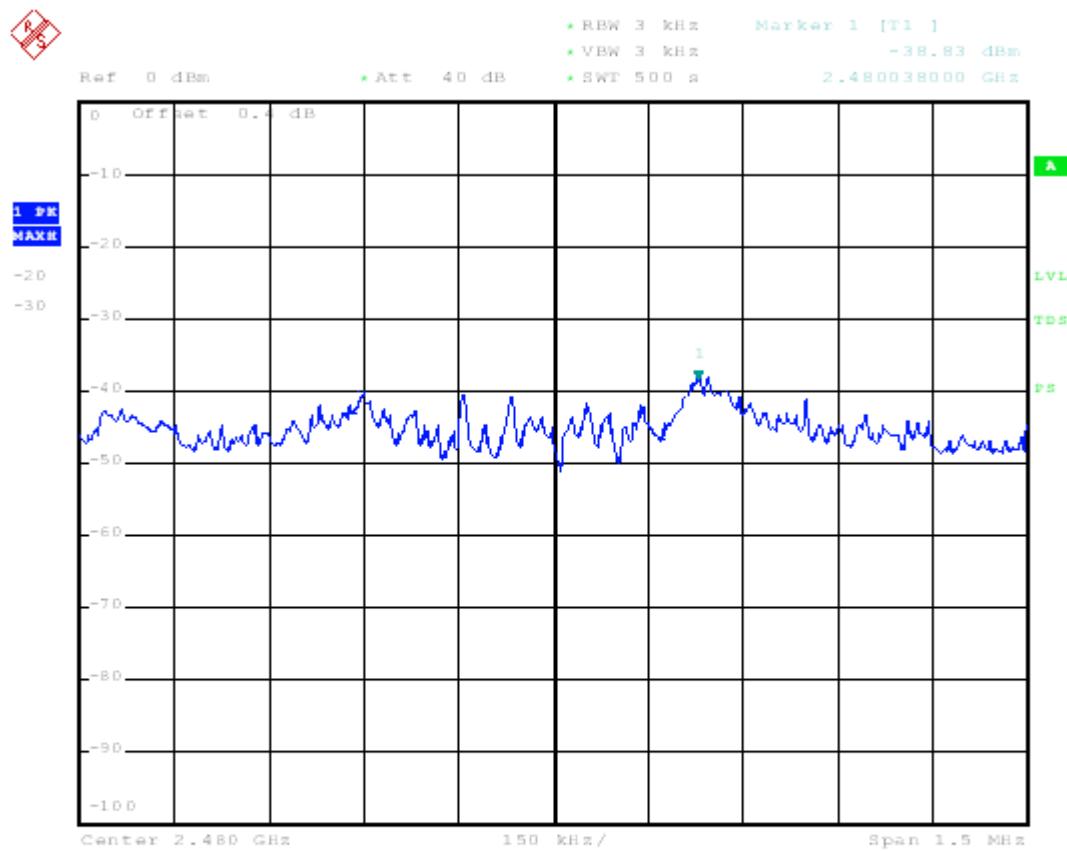
Date: 16.DEC.2005 20:15:39

## Channel MID :



Date: 16.DEC.2005 19:05:12

## Channel HIG :



Date: 16.DEC.2005 20:24:11

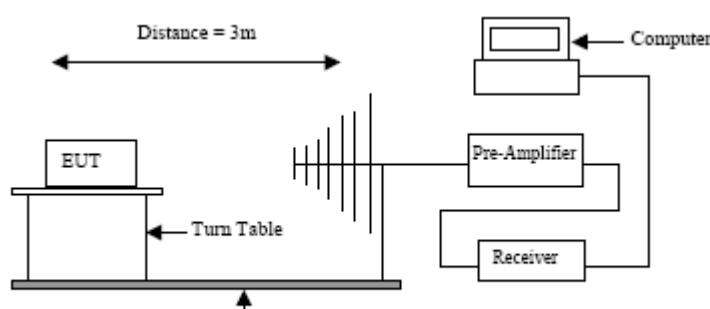
## 11. Test of Band Edges Emission

### 11.1 Measurement Uncertainty

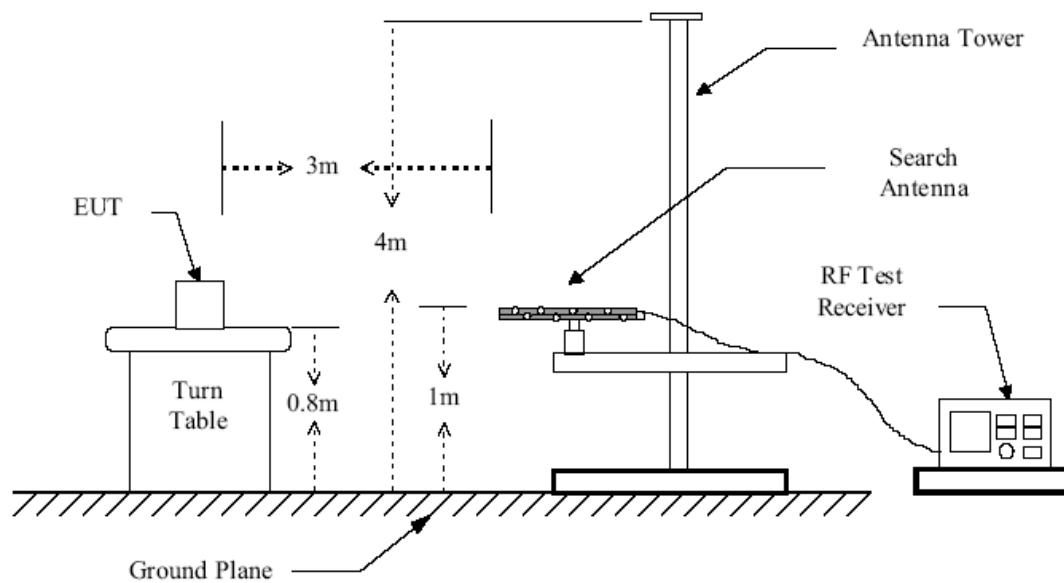
All test results complied with Section 15.247(d) requirements. Measurement Uncertainty is 2.6 dB.

### 11.2 Applicable Standard

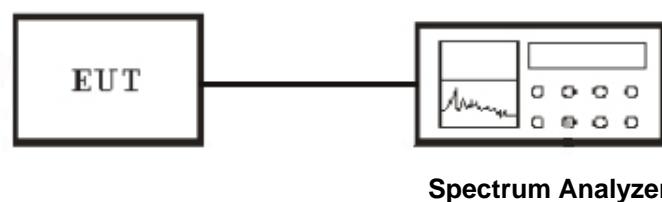
Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth



power, based on either an RF emissions that fall in the restricted radiated emission limits specified



### Conducted Measurement Setup



## 11.4 Instrument Setting

Refer to section 11.6 Test Procedure.

## 11.5 Test Equipment List and Details

See section 2.6.

## 11.6 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.
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 10Hz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

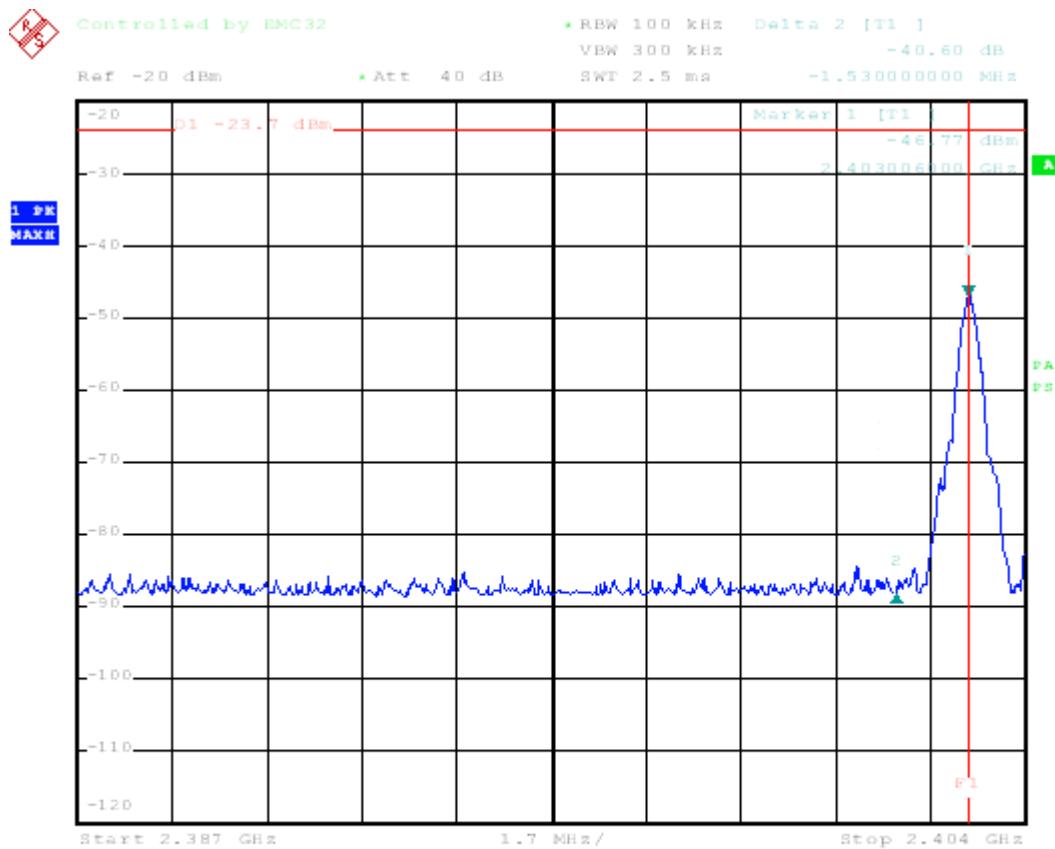
## 11.7 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	Jimmy Li

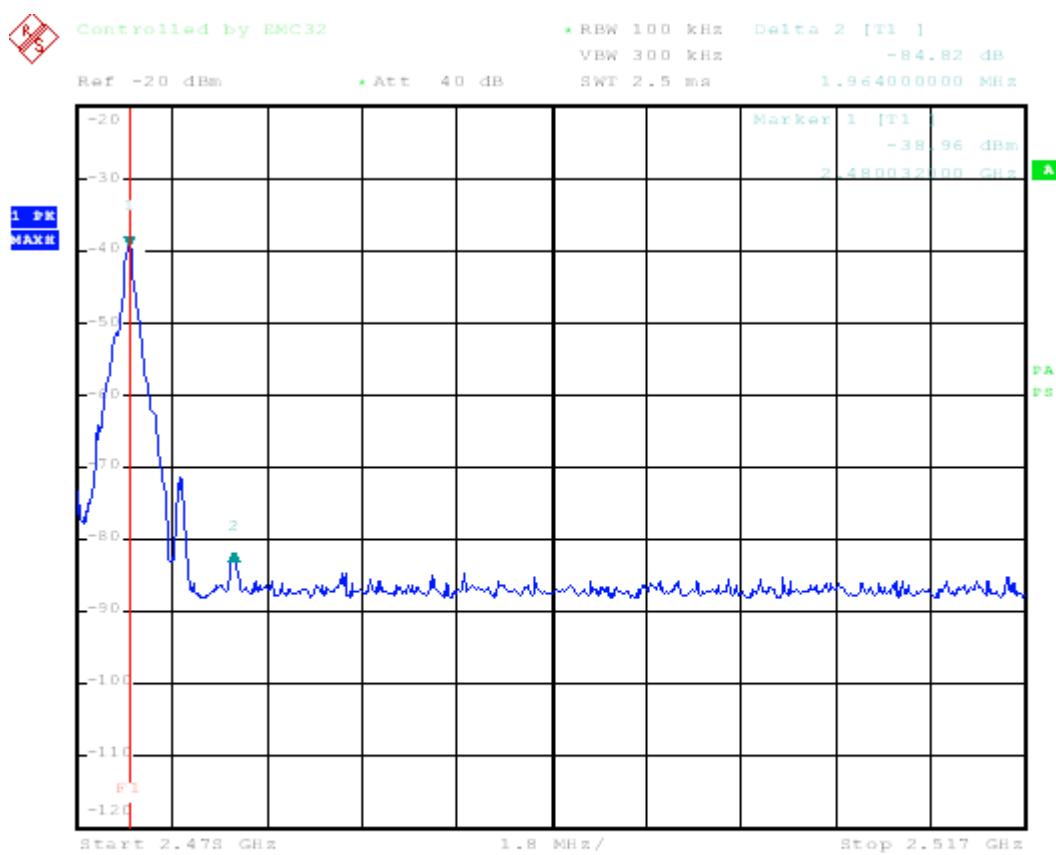
## Radiated Test Result

Frequency (MHz)	Antenna Polarization	Emission Read Value (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)
<2400	H	34.51	54
>2483.5	H	38.87	54

## Conducted Test Result



Date: 16.DEC.2005 21:38:30



Date: 16.DEC.2005 21:36:58

## 12. Test of Spurious Radiated Emission

### 12.1 Measurement Uncertainty

All test results complied with Section 15.247(d) requirements. Measurement Uncertainty is 2.6 dB.

### 12.2 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.

### 12.3 EUT Setup

#### Radiated Measurement Setup

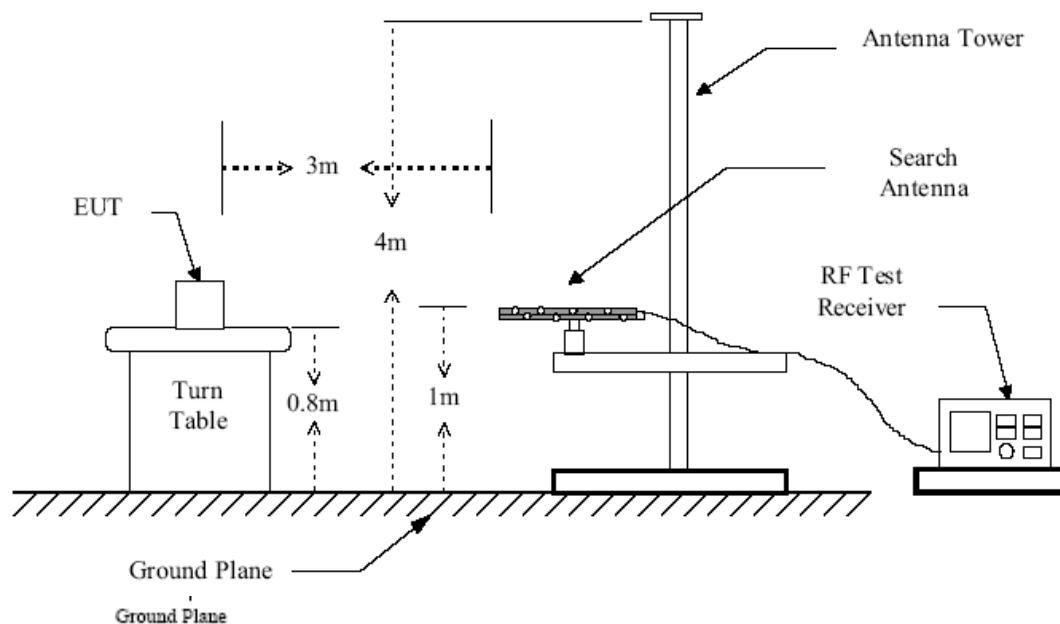


Figure 1 : Frequencies measured below 1 GHz configuration

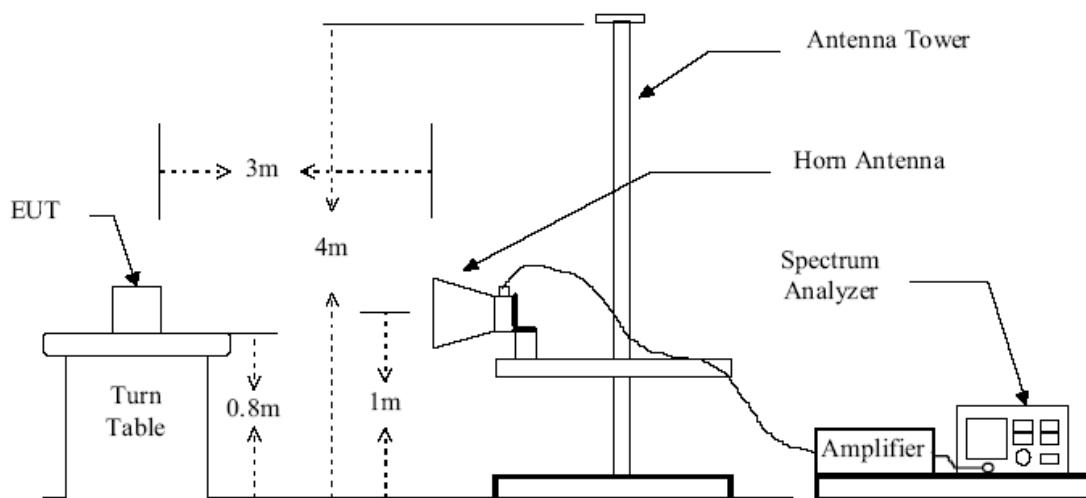
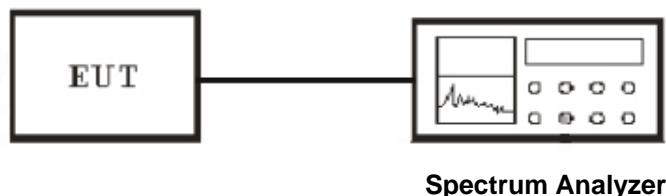


Figure 2 : Frequencies measured above 1 GHz configuration

### Conducted Measurement Setup



### 12.4 Instrument Setting

Refer to section 12.6 Test Procedure.

### 12.5 Test Equipment List and Details

See section 2.6.

### 12.6 Test Procedure

#### Radiated Measurement

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turntable 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
4. Power on the EUT and all the supporting units.

5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
6. 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.
7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

### Conducted Measurement

1. For emission above 1GHz, conducted measurement method is used.
2. The transmitter is set to the lowest channel.
3. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
4. Set RBW to 1 MHz and VBW to 3 MHz, Then detector set to peak and max hold this trace.
5. The lowest band edges emission was measured and recorded.
6. The transmitter set to the highest channel and repeated 2~4.

### 12.7 Test Data

Temperature ( )	22~23
Humidity ( %RH )	50~54
Barometric Pressure ( mbar )	950~1000
EUT	Wireless Bluetooth Headset
M/N	HL-501
Operation Condition	GFSK(FHSS)
Testing Engineer	East Wang

**Remark:** (1) When PK reading is less than relevant limit 20dB, the QP reading and AV reading will not be recorded.

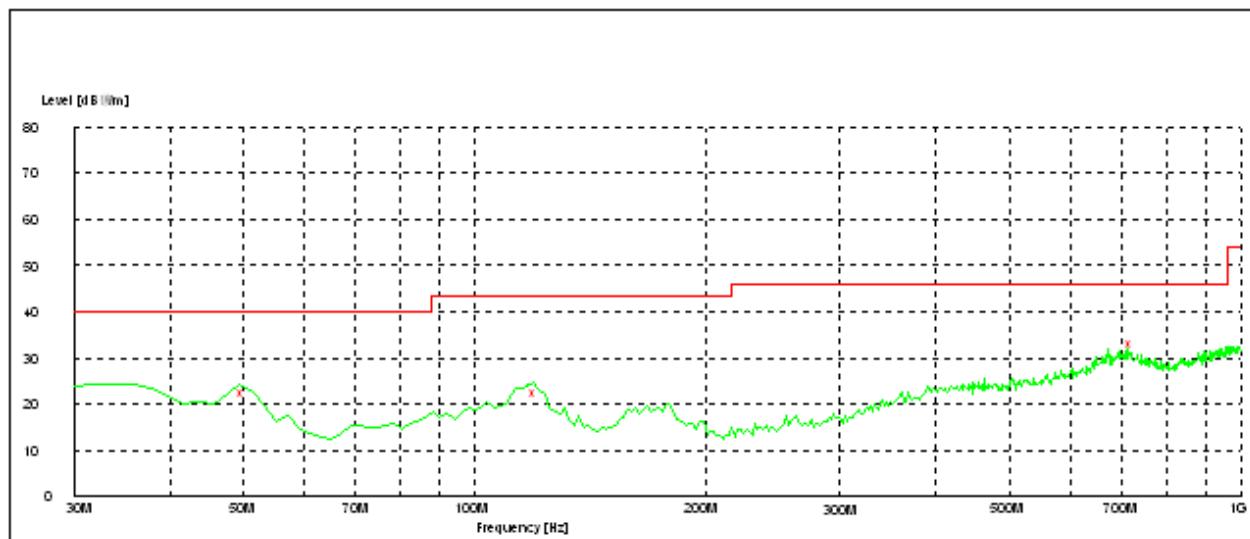
(2) Where QP reading is less than relevant AV limit, the AV reading will not be measured

## RADIATED EMISSION TEST DATA

EUT: Wireless Bluetooth Headset  
 Operating Condition: Charging  
 Test Site: 3m CHAMBER  
 Operator: Jimmy  
 Test Specification: DC 5V from adaptor (AC 120V/60Hz)  
 Comment: Polarisation: Vertical  
 Start of Test: 12/15/05 / 3:58:45PM

**SCAN TABLE: "test Field(30M-1G)"**

Short Description:		Field Strength(30M-1G)			Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width	Detector				
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562new	

**MEASUREMENT RESULT: "SE1215412\_fin QP "**

12/15/05 4:03PM

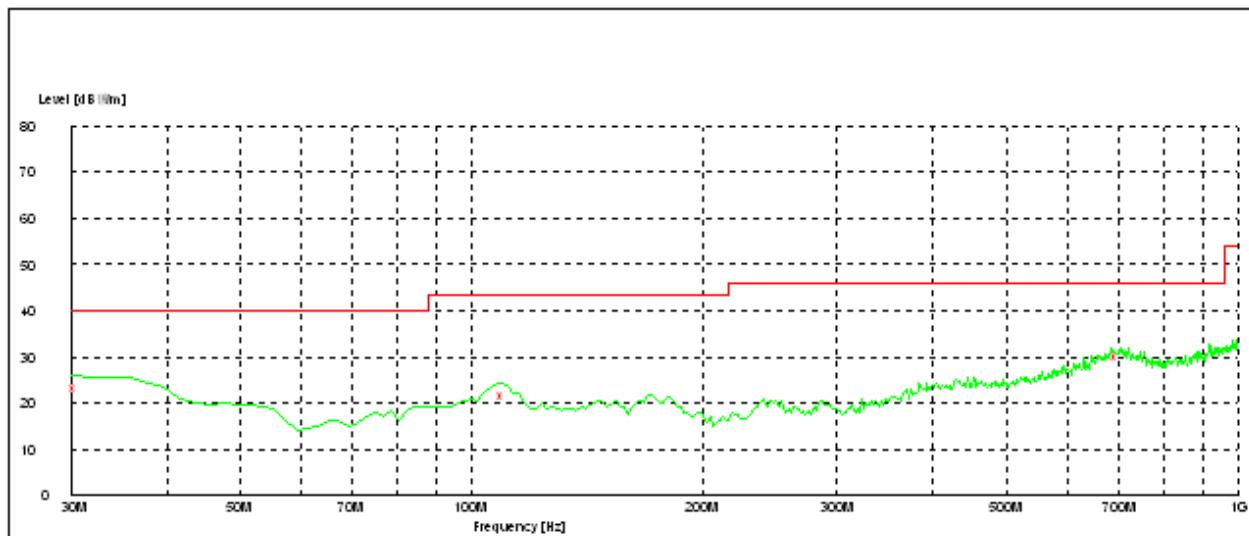
Frequency MHz	Level dB $\mu$ V/m	Azimuth deg	Height cm	Polarisation	Transd dB	Limit dB $\mu$ V/m	Margin dB
49.438878	22.23	17.00	120.0	VER	9.8	40.0	17.8
119.418838	22.72	17.00	140.0	VER	11.9	43.5	20.8
710.360721	33.42	73.00	140.0	VER	26.6	46.0	12.6

## RADIATED EMISSION TEST DATA

EUT: Wireless Bluetooth Headset  
 Operating Condition: Charging  
 Test Site: 3m CHAMBER  
 Operator: Jimmy  
 Test Specification: DC 5V from adaptor (AC 120V/60Hz)  
 Comment: Polarisation: Horizontal  
 Start of Test: 12/15/05 / 4:10:13PM

**SCAN TABLE: "test Field(30M-1G)"**

Short Description:		Field Strength(30M-1G)			Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width	Detector				
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562new	

**MEASUREMENT RESULT: "SE1215413\_fin"**

12/15/05 4:15PM

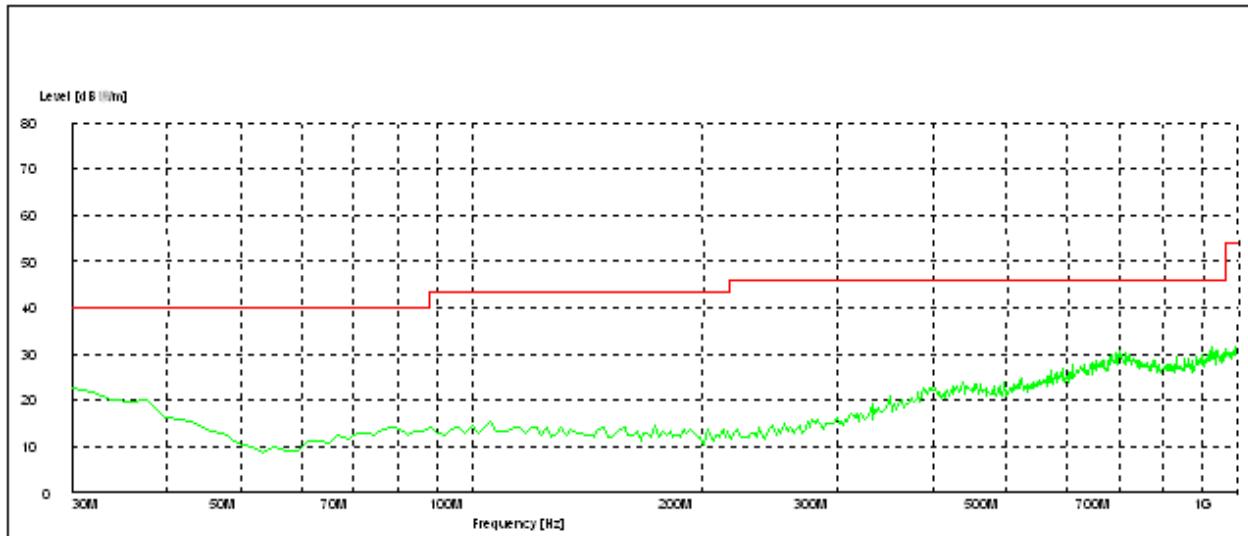
Frequency MHz	Level dB $\mu$ V/m	Azimuth deg	Height cm	Polarisation	Transd dB	Limit dB $\mu$ V/m	Margin dB
30.000000	22.92	25.00	185.0	HOR	21.2	40.0	17.1
107.755511	21.35	36.00	160.0	HOR	11.7	43.5	32.2
689.849699	29.89	179.00	138.0	HOR	21.7	46.0	19.1

## Radiated Emission Test Data

EUT: Wireless Bluetooth Headset  
Operating Condition: Transmitting  
Operator: Jimmy  
Test Specification: DC 5V  
Comment: Polarisation: Horizontal  
Start of Test: 12/15/05 / 4:16:27PM

### SCAN TABLE: "test Field(30M-1G)"

Short Description:		Field Strength(30M-1G)			Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width	Detector				
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562new	

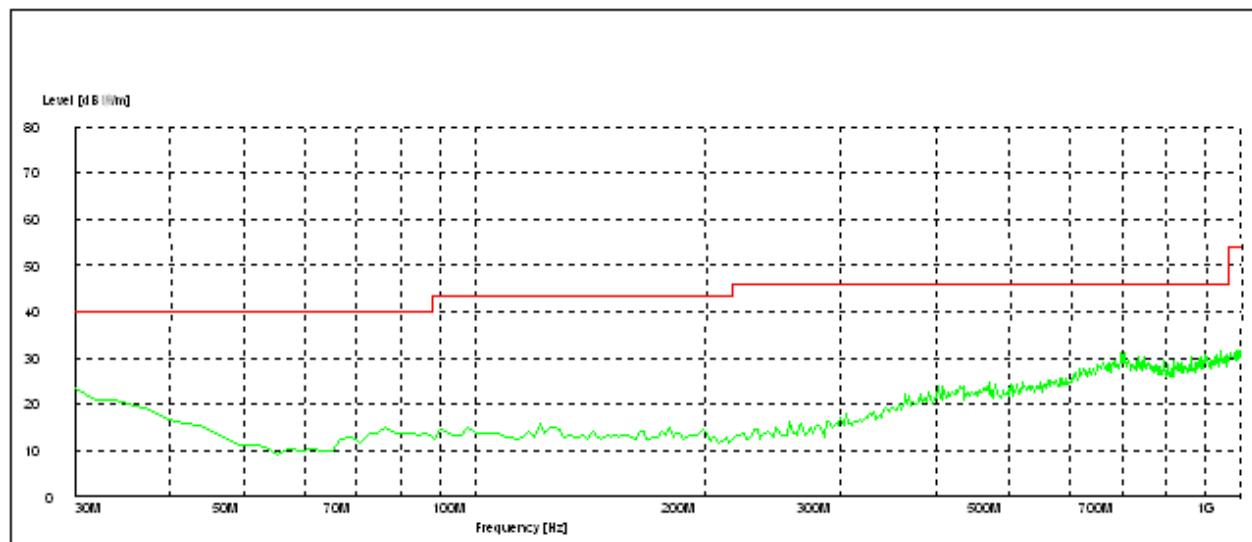


**Radiated Emission Test Data**

EUT: Wireless Bluetooth Headset  
Operating Condition: Transmitting  
Operator: Jimmy  
Test Specification: DC 5V  
Comment: Polarisation: Vertical  
Start of Test: 12/15/05 / 4:19:05PM

**SCAN TABLE: "test Field(30M-1G)"**

Short Description:		Field Strength(30M-1G)			Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width	Detector				
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562new	

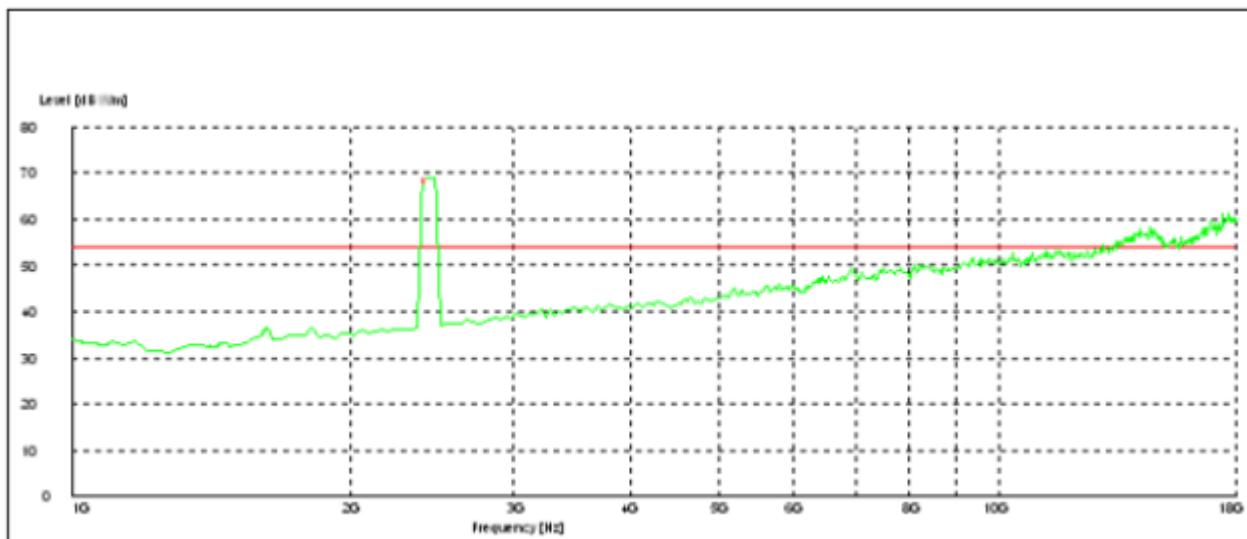


**RADIATED EMISSION TEST DATA**

EUT: Wireless Bluetooth Headset  
Operating Condition: Transmitting  
Test Site: 3m CHAMBER  
Operator: Jimmy  
Test Specification: DC 5V  
Comment: Polarisation: Horizontal  
Start of Test: 12/15/05 / 4:23:34PM

**SCAN TABLE: "test Field(1G -18G)"**

Short Description:		Field Strength(1G -18G)			Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width	Detector				
1GHz	18.0 GHz	60.0 kHz	Peak	1.0 s	1MHz	HF906new	

**MEASUREMENT RESULT: "SE1215419\_pre PK"**

12/15/05 4:28PM

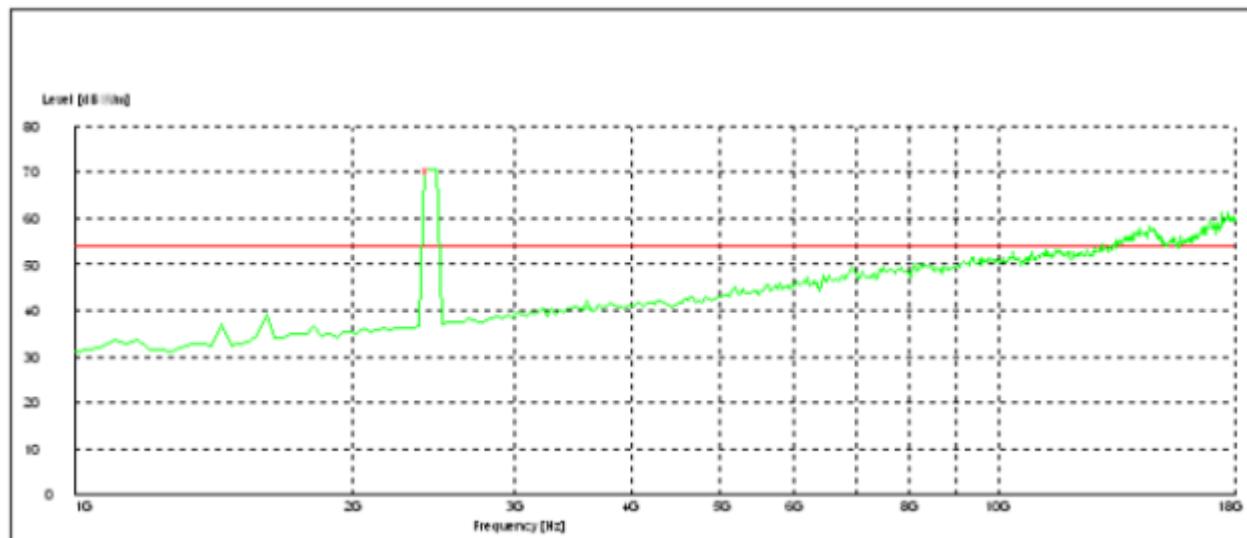
Frequency MHz	Level dBµV/m	Azimuth deg	Height cm	Polarisation	Transd dB	Limit dBµV/m	Margin dB
2408.057852	68.92	102.00	100.0	HOR	-3.3	54.0	-18.9

**RADIATED EMISSION TEST DATA**

EUT: Wireless Bluetooth Headset  
Operating Condition: Transmitting  
Test Site: 3m CHAMBER  
Operator: Jimmy  
Test Specification: DC 5V  
Comment: Polarisation: Vertical  
Start of Test: 12/15/05 / 4:29:56PM

**SCAN TABLE: "test Field(1G -18G)"**

Short Description:		Field Strength(1G -18G)			Meas. Time	IF Bandw.	Transducer
Start Frequency	Stop Frequency	Step Width	Detector				
1GHz	18.0 GHz	60.0 kHz	iPeak	1.0 s	1MHz	HF906new	

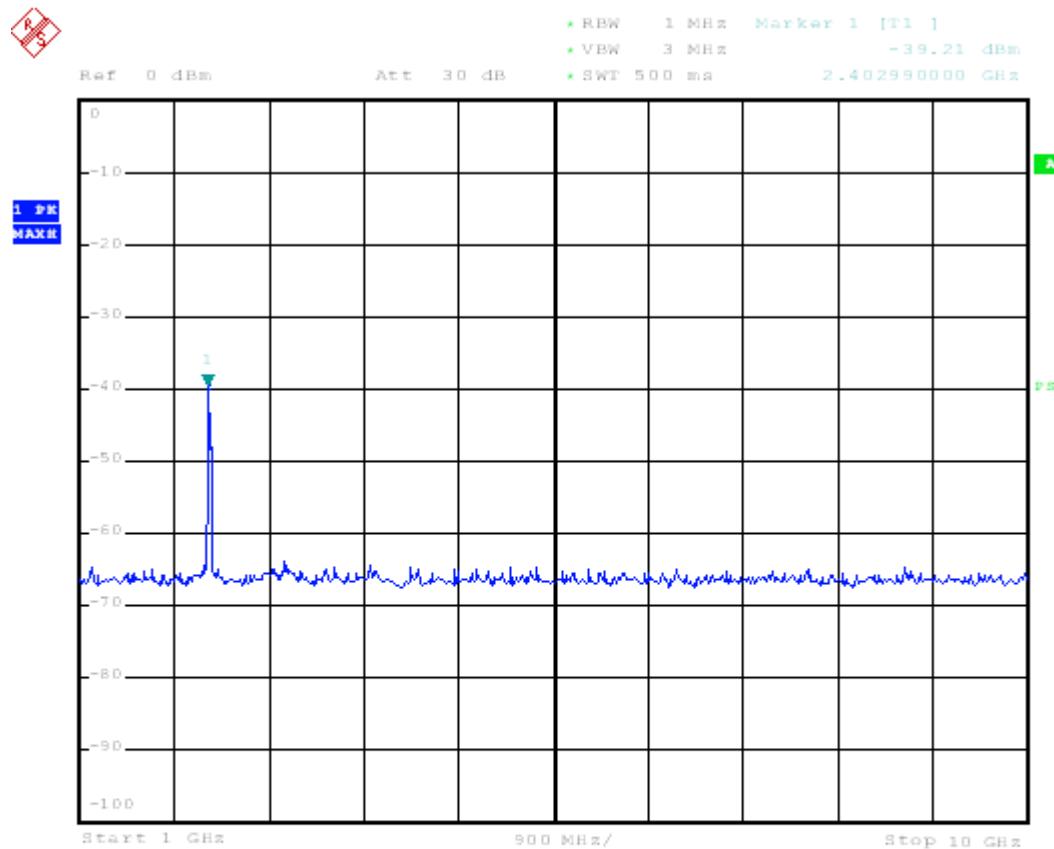
**MEASUREMENT RESULT: "SE1215420\_pre PK"**

12/15/05 4:34PM

Frequency MHz	Level dB $\mu$ V/m	Azimuth deg	Height cm	Polarisation	Transd dB	Limit dB $\mu$ V/m	Margin dB
2414.929860	70.23	177.00	100.0	VER	-3.4	54.0	-16.2

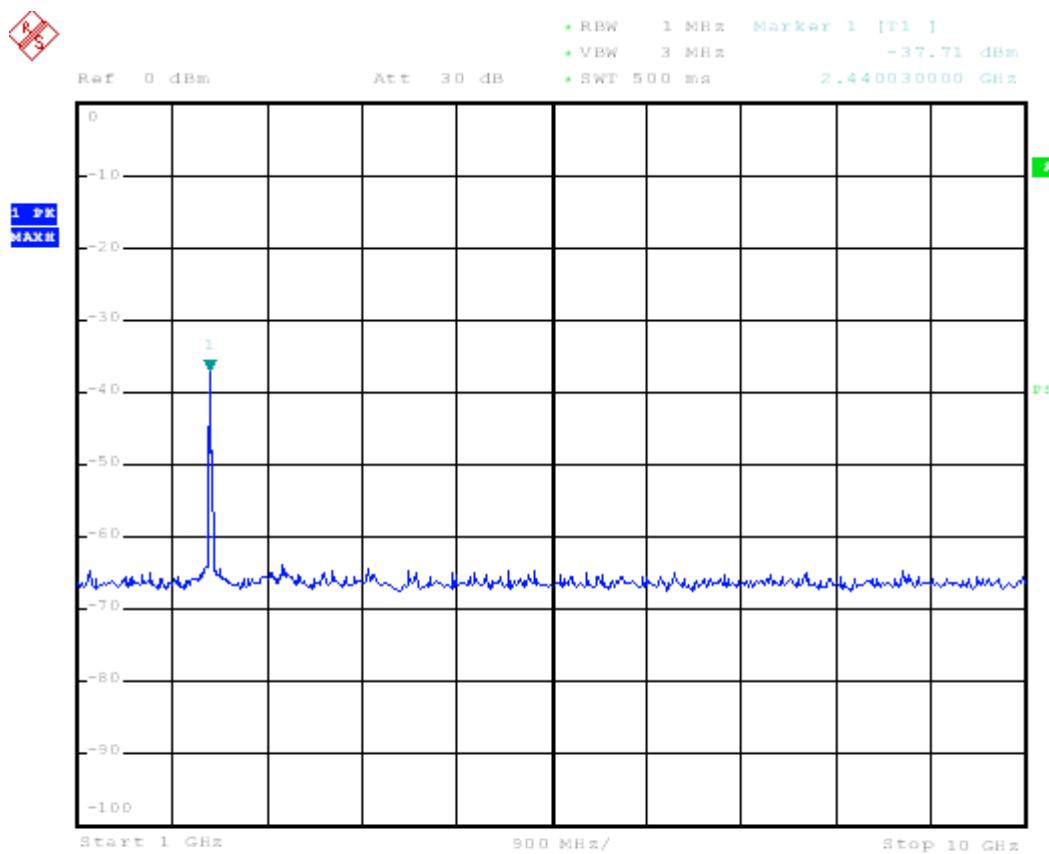
## CONDUCTED TEST RESULT

Channel Low :



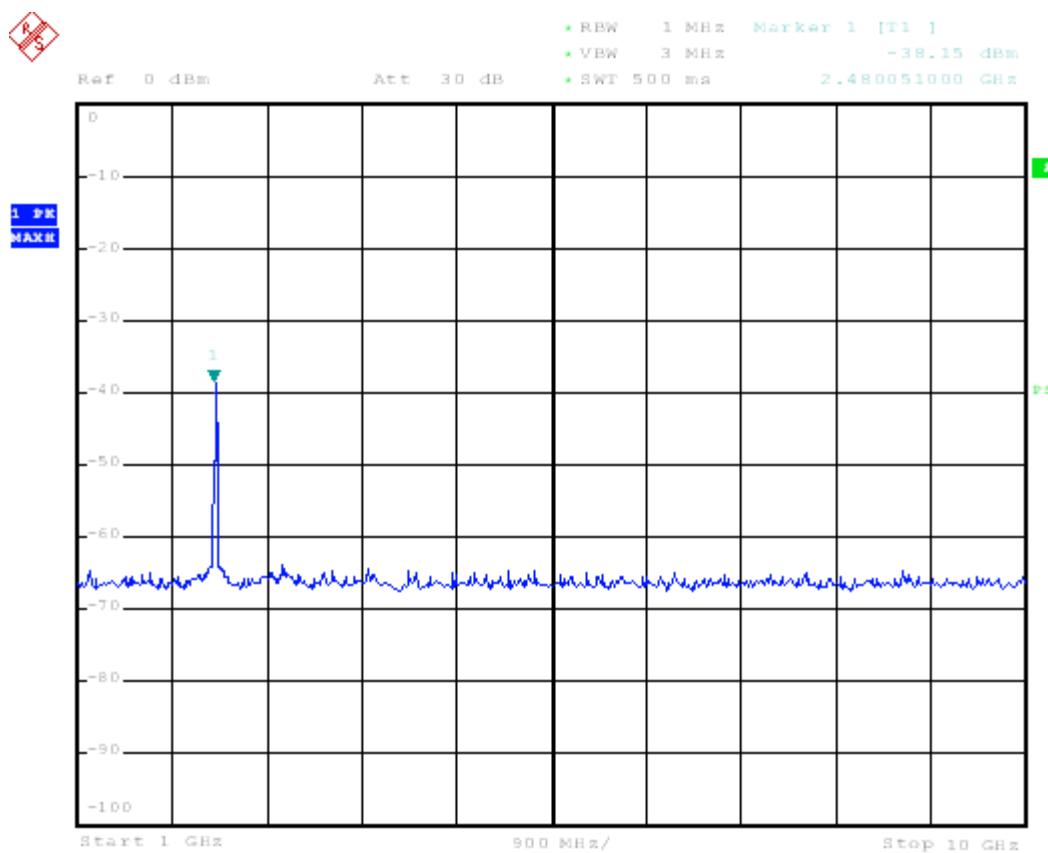
Date: 19.DEC.2005 10:13:41

## Channel MID :

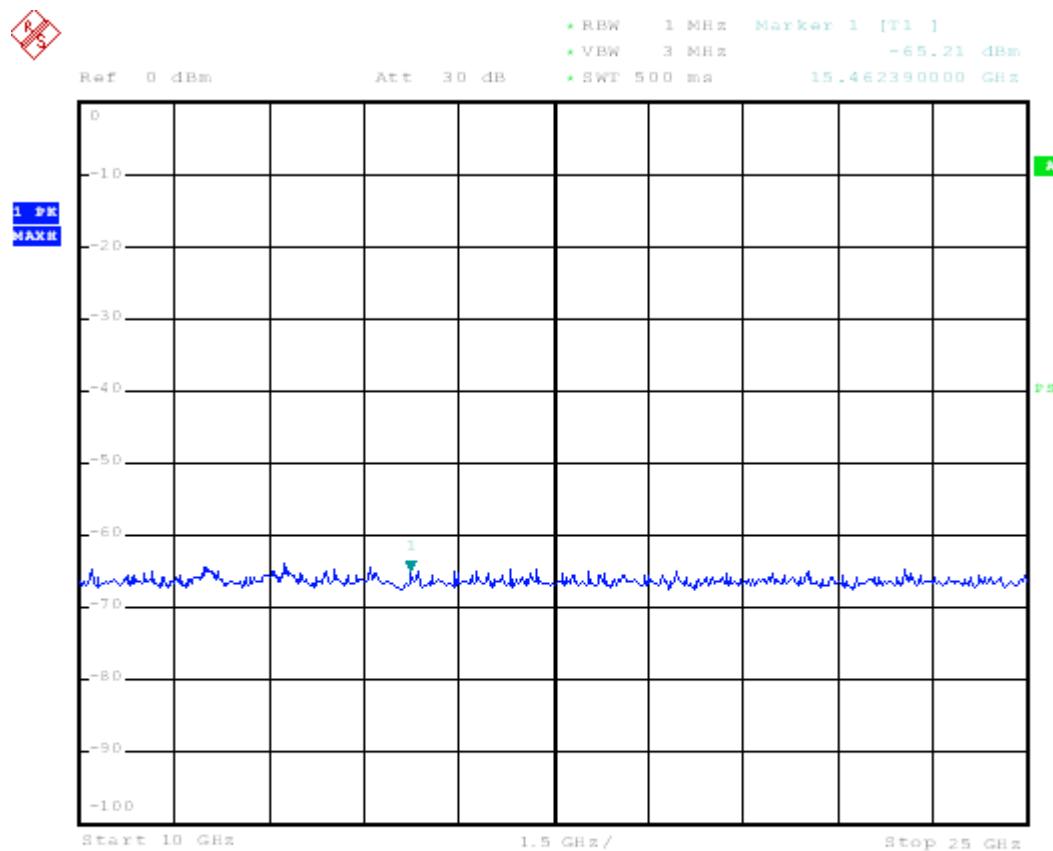


Date: 19.DEC.2005 10:29:01

## Channel HIG :



Date: 19.DEC.2005 10:35:54



Date: 17.DEC.2005 14:25:01