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# FCC Test Report

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Report No.: AGC01838170601FE01

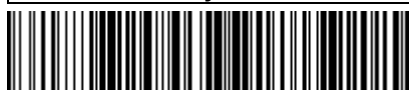
**FCC ID** : 2AMT9HSP-60PRO  
**APPLICATION PURPOSE** : Original Equipment  
**PRODUCT DESIGNATION** : HEAD Wireless Speaker  
**BRAND NAME** : HEAD  
**MODEL NAME** : HSP-60 PRO  
**CLIENT** : Born Global Ltd  
**DATE OF ISSUE** : Jul08, 2017  
**STANDARD(S)**  
**TEST PROCEDURE(S)** : FCC Part 15 Subpart C Section 15.249  
**REPORT VERSION** : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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**Report Revise Record**

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jul.08, 2017	Valid	Original Report

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## 1. VERIFICATION OF CONFORMITY

<b>Applicant</b>	Born Global Ltd
<b>Address</b>	Unit 2103-2104, 21st Floor., Eight Commercial Tower, Sun Yip Street, Chai Wan, Hong Kong, China
<b>Manufacturer</b>	SHENZHEN EPOCH TECHNOLOGY CO., LTD.
<b>Address</b>	No. 1108-1109, Baoyunda logistics information building, Xixiang, Baoan, Shenzhen, China
<b>Product Designation</b>	HEAD Wireless Speaker
<b>Brand Name</b>	HEAD
<b>Test Model</b>	HSP-60 PRO
<b>Date of test</b>	Jun.30, 2017 to Jul.01, 2017
<b>Deviation</b>	None
<b>Condition of Test Sample</b>	Normal
<b>Report Template</b>	AGCRT-US-BR/RF

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.249.

Tested By   
Henry Zhang(Zhang Zhuorui) Jul.01, 2017

Reviewed By   
Forrest Lei(Lei Yonggang) Jul.08, 2017

Approved By   
Solger Zhang(Zhang Hongyi)  
Authorized Officer Jul.08, 2017

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

<b>Operation Frequency</b>	2.402 GHz to 2.480GHz
<b>RF Output Power</b>	-0.09dBm(Max EIRP Power=Max radiation field-95.2)
<b>Bluetooth Version</b>	V4.2
<b>Modulation</b>	GFSK, $\pi/4$ -DQPSK, 8DPSK
<b>Number of channels</b>	79 for BR/EDR
<b>Hardware Version</b>	V1.0
<b>Software Version</b>	V1.0
<b>Antenna Designation</b>	PCB Antenna
<b>Antenna Gain</b>	0dBi
<b>Power Supply</b>	DC 3.7V by battery
Note: 1. The USB port only be used for charging and can't be used to transfer data with PC. 2. The EUT didn't support BLE.	

### 2.2. TABLE OF CARRIER FREQUENCIES

BR/EDR channel List

Frequency Band	Channel Number	Frequency
2400~2483.5MHz	0	2402MHz
	1	2403MHz
	:	:
	38	2440 MHz
	39	2441 MHz
	40	2442 MHz
	:	:
	77	2479 MHz
	78	2480 MHz

### 3. MEASUREMENT UNCERTAINTY

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

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 3.18\text{dB}$
2	All emissions, radiated	$\pm 3.91\text{dB}$
3	Temperature	$\pm 0.5^\circ\text{C}$
4	Humidity	$\pm 2\%$

### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel $\pi/4$ -DQPSK
5	Middle channel $\pi/4$ -DQPSK
6	High channel $\pi/4$ -DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	BT Link with charging
11	BT Link

Note:

1. All the test modes can be supply by battery, only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. The EUT used fully-charged battery when tested.

### Software Setting

The screenshot displays the 'Form\_Main' software interface. At the top, the title bar reads 'Form\_Main'. Below it, the 'Interface' section includes a dropdown menu set to 'COM UART', 'Port = 3', and 'Baudrate=115200'. There are 'Open' and 'Close' buttons, and a checked 'Download Patch' checkbox. A 'Hot Key' section is also present. The main area has tabs for 'Non Link Mode', 'Hopping', 'F/W', 'Options', 'LE Test', and 'LED'. The 'Options' tab is active, showing fields for 'Channel' (0), 'Packet Type' (DH1), 'Payload Type' (ALL'0'), 'Tx Packet Count' (0), 'Tx Gain Index' (6), and 'Tx Gain Value' (0xCE). To the right, there's a 'Pkt-Tx' section with 'Exec', 'Stop', and 'Clear Report' buttons. Below these is a table with two columns: 'Item' and 'Value'. The table contains two rows: 'Tx bits' with value '290088' and 'Tx Pkt Count' with value '1343'. Below the table are 'TX Report' and 'RX Report' buttons. At the bottom, a 'Message' log shows several status messages, including 'LMP\_Version=0x6', 'Version=0c', 'Is\_After\_PatchCode=1', 'Download patch code Success...', 'Enable TRX Thread Mode...!!', 'ActionControlExcute(Pkt-Tx) Success...!!', and 'ActionControlExcute(Pkt-Tx) Stop...!!'. On the far right, there's a 'Script' button and a 'Get BT Stage' section showing '0'.

Interface: 0 COM UART Port = 3 Baudrate=115200 Open Close ☒ Download Patch Hot Key

Non Link Mode Hopping F/W Options LE Test LED

Channel: 0 Packet Type: DH1 Payload Type: ALL'0' Tx Packet Count: 0 Tx Gain Index: 6 Tx Gain Value: 0xCE

Pkt-Tx: Exec Stop Clear Report

Item	Value
Tx bits	290088
Tx Pkt Count	1343

TX Report RX Report

Parameter 1 Parameter 2 Parameter 3 Table Cal

Message

```
>>LMP_Version=0x6
>>Version=0c
>>Is_After_PatchCode=1
>>Download patch code Success...
>>Enable TRX Thread Mode...!!
>>ActionControlExcute(Pkt-Tx) Success...!!
>>ActionControlExcute(Pkt-Tx) Stop...!!
```

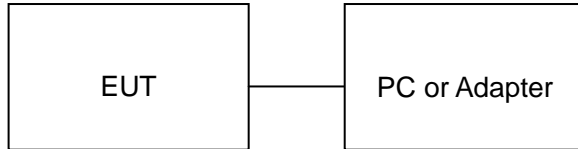
Script

Get BT Stage: 0

## 5. SYSTEM TEST CONFIGURATION

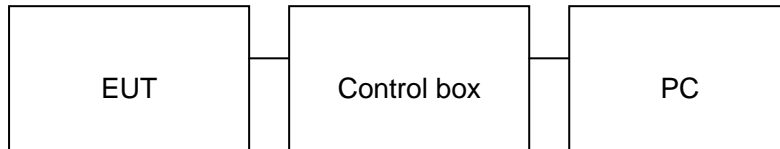
### 5.1. CONFIGURATION OF EUT SYSTEM

Configure 1: (Normal hopping)



**Note:** Owing to the EUT has own battery, Testing will be performed while PC or adapter remove.

Configure 2: (Control continuous TX)



### 5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	HEAD Wireless Speaker	HEAD	HSP-60 PRO	EUT
2	Battery	XHZ	2000mAh	Accessory
3	PC	SONY	E1412AYCW	A.E
4	PC Adapter	SONY	VGP-AC19V36	A.E
5	Control box	DOFLY	LY-USB-TIL V2.2	A.E
6	Adapter	IPRO	NTR-S01	A.E
7	USB Cable	N/A	1m unshielded	A.E

### 5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.249(a) §15.209	Radiated Emission	Compliant
§15.249(d)	Band Edges	Compliant
§15.207	Conduction Emission	Compliant
§15.215	Bandwidth	Compliant



## 6. TEST FACILITY

<b>Site</b>	Dongguan Precise Testing Service Co., Ltd.
<b>Location</b>	Building D,Baoding Technology Park,Guangming Road2,Dongcheng District, Dongguan, Guangdong, China,
<b>FCC Registration No.</b>	371540
<b>Description</b>	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014.

## 7.TEST METHOD

All measurements contained in this report were conducted with ANSI C63.10-2013

## 8. TEST EQUIPMENT LIST

FOR RADIATED EMISSION TEST (BELOW 1GHz)

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	ROHDE&SCHWARZ	ESCI	101417	July 4, 2016	July 3, 2017
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 4, 2016	July 3, 2017
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 4, 2016	July 3, 2017
RF Cable	SCHWARZBECK	AK9515E	96221	July 4, 2016	July 3, 2017
MULTI-DEVICE Positioning Controller	MAX-FULL	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	SCHWARZBECK	FMZB1519	1519-038	June 6, 2017	June 5, 2018
Spectrum analyzer	AGILENT	E4407B	MY46185649	June 6, 2017	June 5, 2018
Radiation Cable 1	MXT	RS1	R005	June 6, 2017	June 5, 2018
Radiation Cable 2	MXT	RS1	R006	June 6, 2017	June 5, 2018

FOR RADIATED EMISSION TEST (1GHz ABOVE)

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	ROHDE&SCHWARZ	ESCI	101417	July 4, 2016	July 3, 2017
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	July 11, 2016	July 10, 2017
Spectrum Analyzer	AGILENT	E4411B	MY4511453	July 4, 2016	July 3, 2017
Signal Amplifier	SCHWARZBECK	BBV 9718	9718-269	July 7, 2016	July 6, 2017
RF Cable	SCHWARZBECK	AK9515H	96220	July 8, 2016	July 7, 2017
MULTI-DEVICE Positioning Controller	MAX-FULL	MF-7802	MF780208339	N/A	N/A
Horn Ant (18G-40GHz)	SCHWARZBECK	BBHA 9170	9170-181	June 6, 2017	June 5, 2018
Radiation Cable 1	MXT	RS1	R005	June 6, 2017	June 5, 2018
Radiation Cable 2	MXT	RS1	R006	June 6, 2017	June 5, 2018

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	ROHDE&SCHWARZ	ESCI	101417	July 4, 2016	July 3, 2017
Artificial Mains Network	NARDA	L2-16B	000WX31025	July 8, 2016	July 7, 2017
Artificial Mains Network (AUX)	NARDA	L2-16B	000WX31026	July 8, 2016	July 7, 2017
RF Cable	SCHWARZBECK	AK9515E	96222	July 4, 2016	July 3, 2017
Shielded Room	CHENGYU	843	PTS-002	June 6, 2017	June 5, 2018
Conduction Cable	MXT	SE1	S003	June 6, 2017	June 5, 2018

## 9. RADIATED EMISSION

### 9.1 TEST LIMIT

#### Standard FCC15.249

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
900-928MHz	50	500
2400-2483.5MHz	50	500
5725-5875MHz	50	500
24.0-24.25GHz	250	2500

#### Standard FCC 15.209

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		$\mu$ V/m	dB( $\mu$ V)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	Other:74.0 dB( $\mu$ V)/m (Peak) 54.0 dB( $\mu$ V)/m (Average)	

Remark: (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$   
 (2) The smaller limit shall apply at the cross point between two frequency bands.  
 (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

## 9.2. MEASUREMENT PROCEDURE

1. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Below 1GHz)
2. The measuring distance of 3m shall used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Above 1GHz)
3. The height of the test antenna shall vary between 1m to 4m.Both horizontal and vertical polarization Of the antenna are set to make the measurement.
4. The initial step in collecting radiated emission data is a receive peak detector mode. Pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
5. All readings are peak unless otherwise stated QP in column of Note. Peak denoted that the Peak reading compliance with the QP limits and then QP Mode measurement didn't perform(Below 1GHz)
6. All readings are Peak mode value unless otherwise stated AVG in column of Note. If the Peak mode measured value compliance with the Peak limits and lower than AVG Limits, the EUT shall be deemed to meet Peak & AVG limits and then only Peak mode was measured, but AVG mode didn't perform.(Above 1GHz)

The following table is the setting of spectrum analyzer and receiver.

<b>Spectrum Parameter</b>	<b>Setting</b>
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz RBW 2MHz/ VBW 6MHz for Peak, RBW 1.5MHz/ VBW 10Hz for Average
<b>Receiver Parameter</b>	<b>Setting</b>
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

### 9.3. TEST SETUP

#### Radiated Emission Test-Setup Frequency Below 30MHz



#### RADIATED EMISSION TEST SETUP 30MHz-1000MHz



### RADIATED EMISSION TEST SETUP ABOVE 1000MHz



#### 9.4. TEST RESULT

(Worst modulation:GFSK)

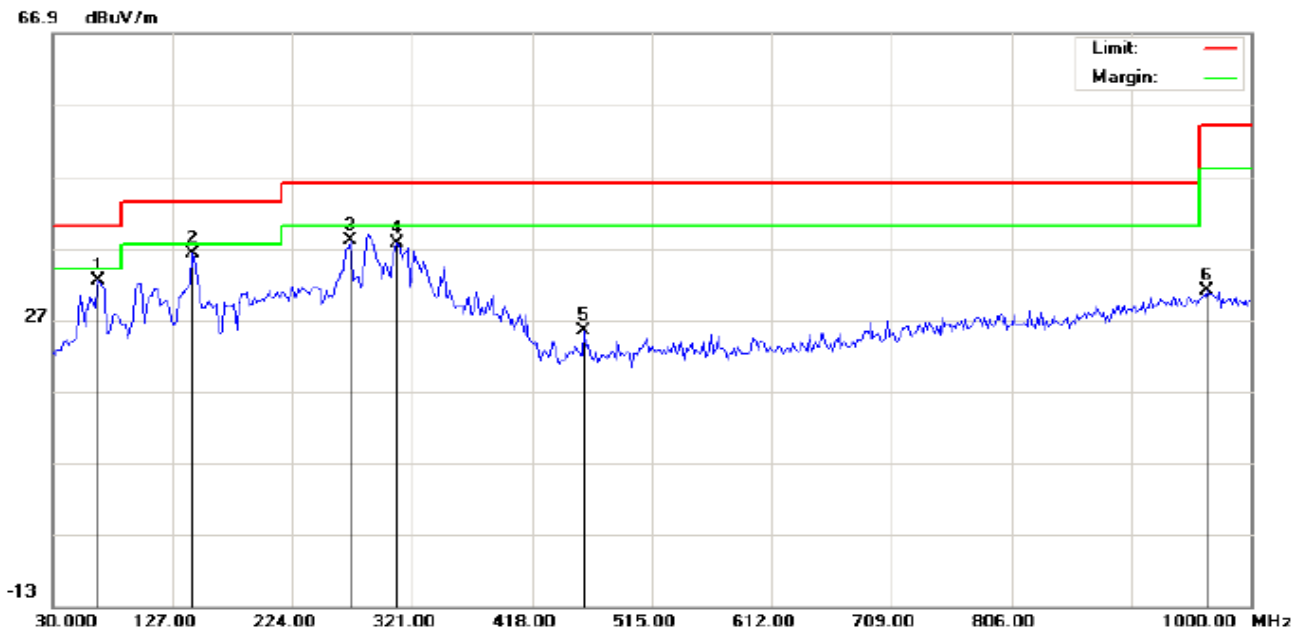
FOR BR/EDR

#### RADIATED EMISSION BELOW 30MHz

No emission found between lowest internal used/generated frequencies to 30MHz.

#### RADIATED EMISSION BELOW 1GHz

RADIATED EMISSION TEST- (30MHz-1GHz)-LOW CHANNEL-HORIZONTAL



Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: HEAD Wireless Speaker  
M/N:HSP-60 PRO  
Mode:Low Channel TX  
Note:

Polarization: **Horizontal**  
Power:  
Distance:

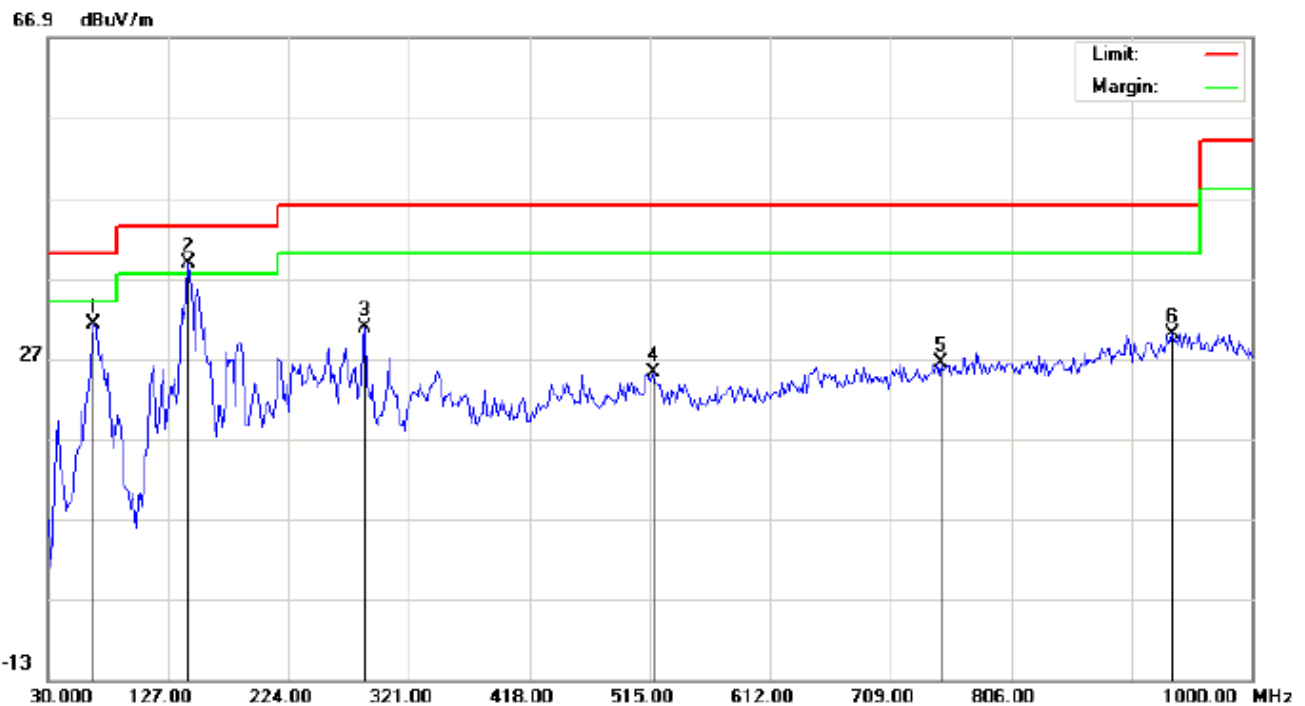
Temperature: 22.4  
Humidity: 52.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		67.1833	24.81	7.51	32.32	40.00	-7.68	peak			
2	*	143.1667	21.77	14.43	36.20	43.50	-7.30	peak			
3		270.8833	27.50	10.45	37.95	46.00	-8.05	peak			
4		308.0667	21.64	15.95	37.59	46.00	-8.41	peak			
5		460.0333	4.76	20.70	25.46	46.00	-20.54	peak			
6		964.4333	1.21	29.86	31.07	54.00	-22.93	peak			

**RESULT: PASS**



## RADIATED EMISSION TEST- (30MHz-1GHz)-LOW CHANNEL -VERTICAL



Site: site #1

Polarization: **Vertical**

Temperature: 22.4

Limit: FCC Class B 3M Radiation

Power:

Humidity: 52.5 %

EUT: HEAD Wireless Speaker

Distance:

M/N:HSP-60 PRO

Mode:Low Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		67.1833	25.90	5.36	31.26	40.00	-8.74	peak			
2	*	143.1667	23.57	15.22	38.79	43.50	-4.71	peak			
3		285.4333	15.86	14.97	30.83	46.00	-15.17	peak			
4		518.2333	3.61	21.62	25.23	46.00	-20.77	peak			
5		749.4167	-0.15	26.61	26.46	46.00	-19.54	peak			
6		935.3333	0.38	29.59	29.97	46.00	-16.03	peak			

**RESULT: PASS****Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

RADIATED EMISSION TEST- (30MHz-1GHz)-MIDDLE CHANNEL-HORIZONTAL



Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: HEAD Wireless Speaker  
M/N:HSP-60 PRO  
Mode:Middle Channel TX  
Note:

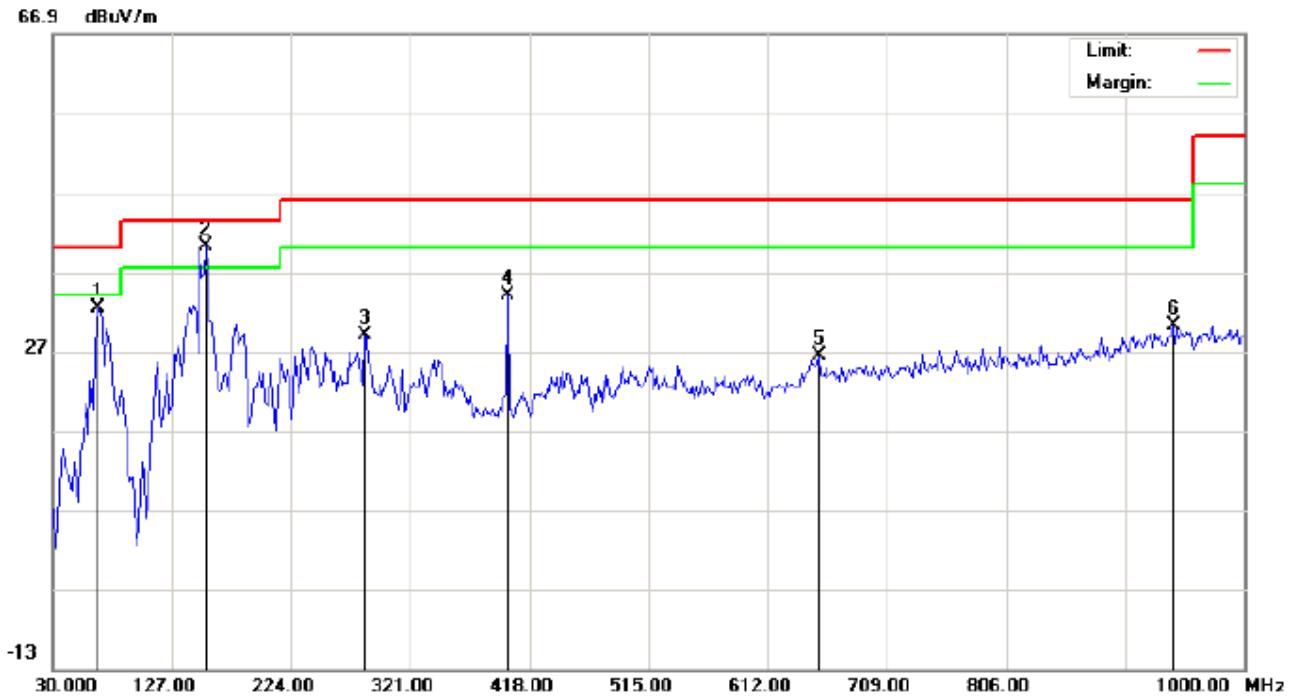
Polarization: **Horizontal**  
Power:  
Distance:

Temperature: 22.4  
Humidity: 52.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	!	67.1833	28.20	7.51	35.71	40.00	-4.29	peak			
2		144.7833	22.86	14.04	36.90	43.50	-6.60	peak			
3	!	183.5833	28.05	11.24	39.29	43.50	-4.21	peak			
4	*	285.4333	29.19	12.93	42.12	46.00	-3.88	peak			
5		396.9833	10.91	19.05	29.96	46.00	-16.04	peak			
6		962.8167	2.05	29.88	31.93	54.00	-22.07	peak			

RESULT: PASS

# RADIATED EMISSION TEST- (30MHz-1GHz)- MIDDLE CHANNEL -VERTICAL



Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: HEAD Wireless Speaker  
M/N:HSP-60 PRO  
Mode:Middle Channel TX  
Note:

Polarization: **Vertical**  
Power:  
Distance:

Temperature: 22.4  
Humidity: 52.5 %

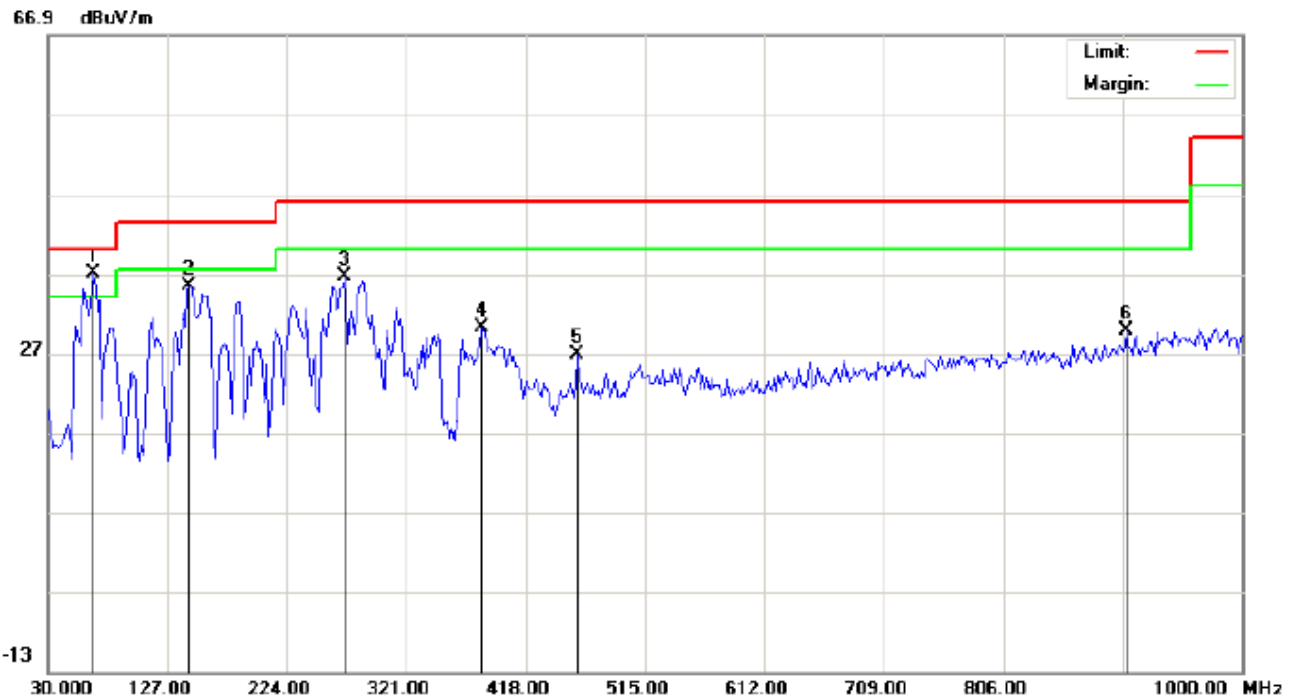
No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		67.1833	26.97	5.36	32.33	40.00	-7.67	peak			
2	*	154.4832	24.92	15.29	40.21	43.50	-3.29	peak			
3		283.8167	14.02	14.92	28.94	46.00	-17.06	peak			
4		400.2167	14.94	19.08	34.02	46.00	-11.98	peak			
5		654.0333	2.49	23.96	26.45	46.00	-19.55	peak			
6		941.8000	0.50	29.77	30.27	46.00	-15.73	peak			

**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

RADIATED EMISSION TEST- (30MHz-1GHz)-HIGH CHANNEL-HORIZONTAL



Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: HEAD Wireless Speaker  
M/N:HSP-60 PRO  
Mode:High Channel TX  
Note:

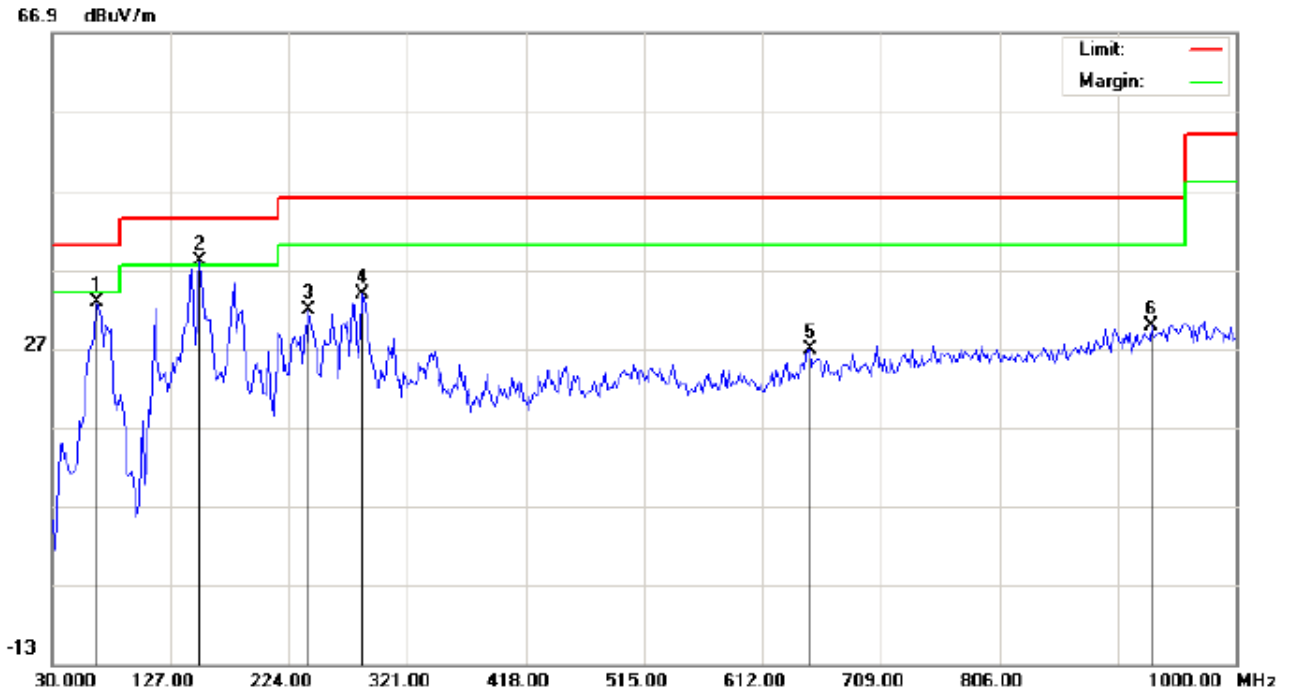
Polarization: *Horizontal*  
Power:  
Distance:

Temperature: 22.4  
Humidity: 52.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	67.1833	23.76	13.21	36.97	40.00	-3.03	peak			
2		144.7833	19.49	15.99	35.48	43.50	-8.02	peak			
3		270.8833	21.40	15.26	36.66	46.00	-9.34	peak			
4		382.4333	11.42	18.80	30.22	46.00	-15.78	peak			
5		460.0333	6.44	20.43	26.87	46.00	-19.13	peak			
6		906.2333	1.41	28.40	29.81	46.00	-16.19	peak			

RESULT: PASS

# RADIATED EMISSION TEST- (30MHz-1GHz)-HIGH CHANNEL -VERTICAL



Site: site #1  
Limit: FCC Class B 3M Radiation  
EUT: HEAD Wireless Speaker  
M/N:HSP-60 PRO  
Mode:High Channel TX  
Note:

Polarization: **Vertical**  
Power:  
Distance:

Temperature: 22.4  
Humidity: 52.5 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		67.1833	27.52	5.36	32.88	40.00	-7.12	peak			
2	*	151.2500	22.76	15.27	38.03	43.50	-5.47	peak			
3		240.1667	18.83	12.94	31.77	46.00	-14.23	peak			
4		283.8167	18.91	14.92	33.83	46.00	-12.17	peak			
5		650.8000	3.02	23.87	26.89	46.00	-19.11	peak			
6		930.4833	0.42	29.46	29.88	46.00	-16.12	peak			

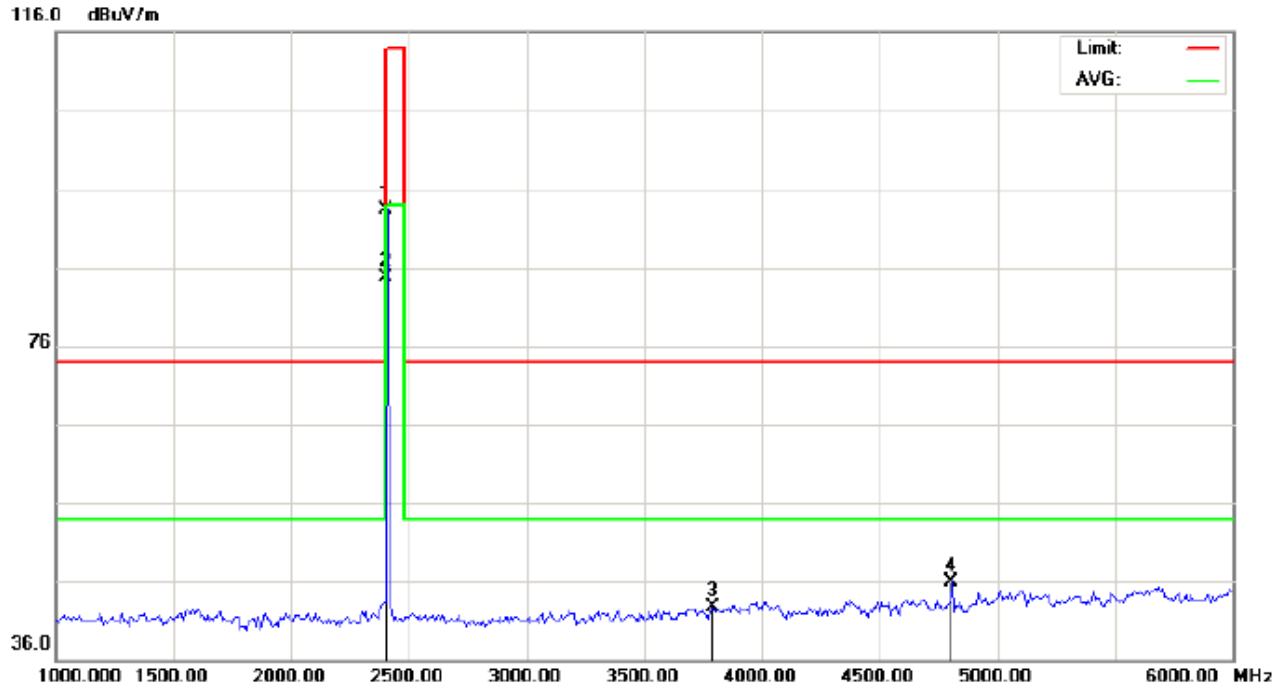
**RESULT: PASS**

**Note:** 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. The "Factor" value can be calculated automatically by software of measurement system.

**RADIATED EMISSION ABOVE 1GHz**  
**(Worst modulation: GFSK)**  
**FOR BR/EDR**

**RADIATED EMISSION TEST- (ABOVE 1GHz)-LOW CHANNEL-HORIZONTAL**



Site: site #1  
Limit: FCC Class B 3M Radiation above 1GHz(PK)-  
EUT: HEAD Wireless Speaker  
M/N: HSP-60 PRO  
Mode: Low Channel TX  
Note:

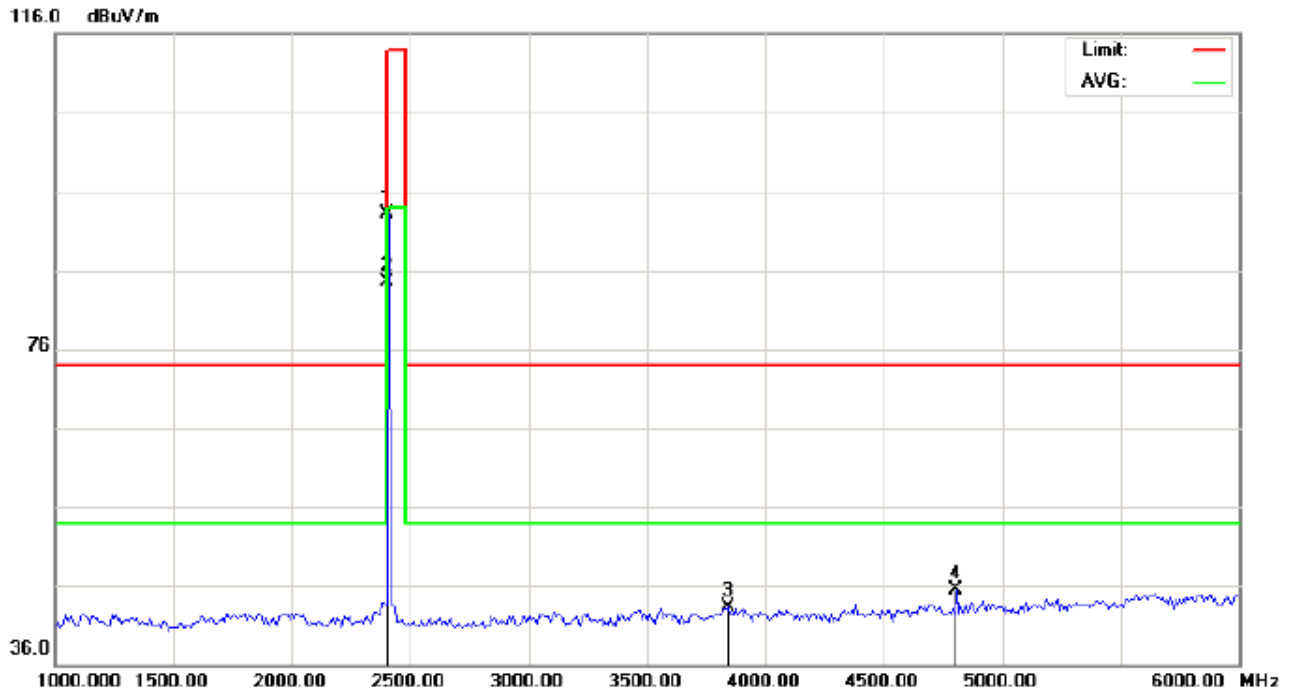
Polarization: *Horizontal*  
Power:  
Distance:

Temperature: 22.7  
Humidity: 53.6 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2402.000	82.96	10.32	93.28	114.00	-20.72	peak			
2	*	2402.000	74.35	10.32	84.67	94.00	-9.33	AVG	100	64	
3		3791.667	28.86	13.91	42.77	74.00	-31.23	peak			
4		4804.000	38.24	7.69	45.93	74.00	-28.07	peak			

**RESULT: PASS**

# RADIATED EMISSION TEST- (ABOVE 1GHz)-LOW CHANNEL- VERTICAL

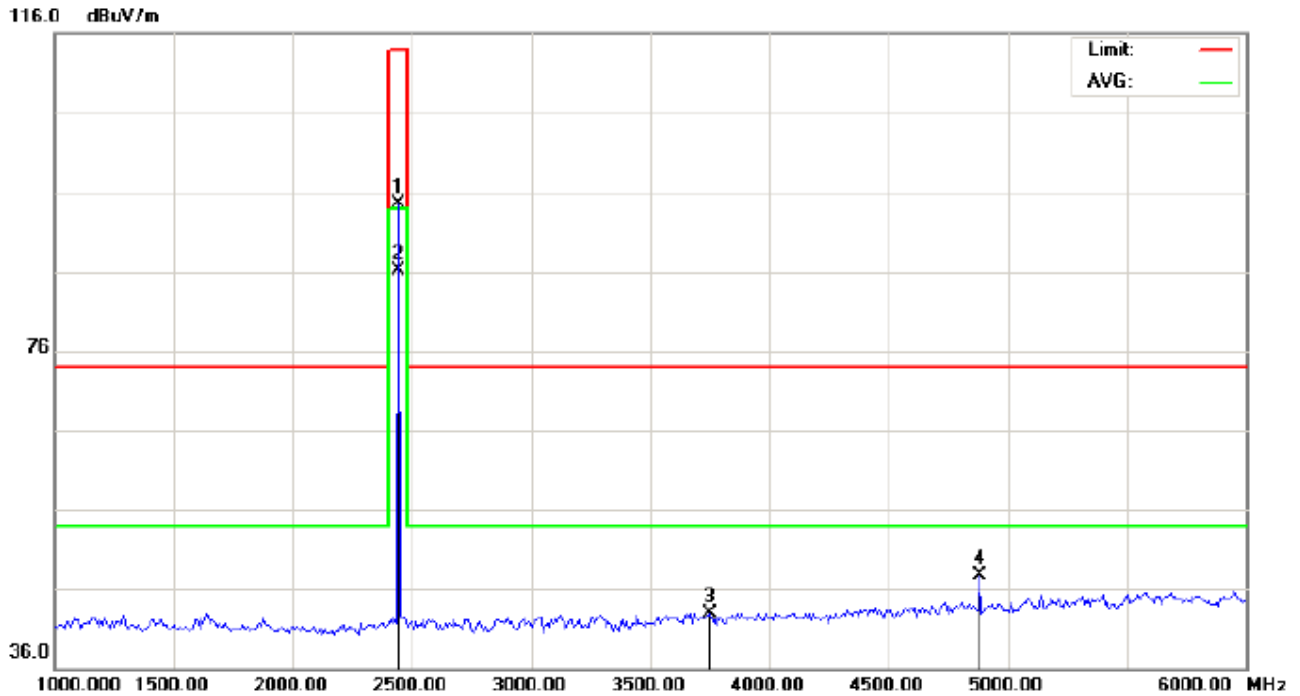


Site: site #1 Polarization: **Vertical** Temperature: 22.7  
Limit: FCC Class B 3M Radiation above 1GHz(PK)- Power: Humidity: 53.6 %  
EUT: HEAD Wireless Speaker Distance:  
M/N: HSP-60 PRO  
Mode: Low Channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2402.000	82.71	10.32	93.03	114.00	-20.97	peak			
2	*	2402.000	74.17	10.32	84.49	94.00	-9.51	AVG	100	58	
3		3841.667	29.00	14.21	43.21	74.00	-30.79	peak			
4		4804.000	37.88	7.69	45.57	74.00	-28.43	peak			

**RESULT: PASS**

# RADIATED EMISSION TEST- (ABOVE 1GHz)-MIDDLE CHANNEL-HORIZONTAL



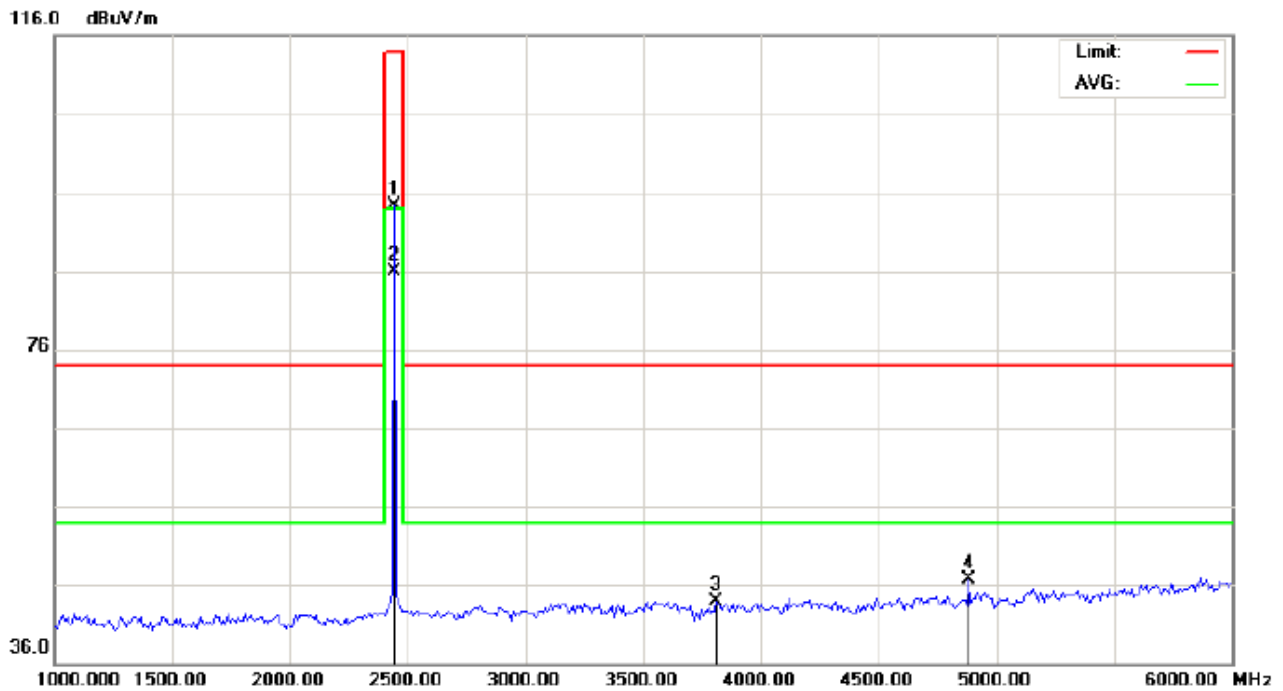
Site: site #1 Polarization: **Horizontal** Temperature: 22.7  
Limit: FCC Class B 3M Radiation above 1GHz(PK)- Power: Humidity: 53.6 %  
EUT: HEAD Wireless Speaker Distance:  
M/N: HSP-60 PRO  
Mode: Middle Channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2441.000	84.24	10.36	94.60	114.00	-19.40	peak			
2	*	2441.000	75.79	10.36	86.15	94.00	-7.85	AVG	100	66	
3		3750.000	29.29	13.65	42.94	74.00	-31.06	peak			
4		4882.000	39.88	7.89	47.77	74.00	-26.23	peak			

**RESULT: PASS**



## RADIATED EMISSION TEST- (ABOVE 1GHz)-MIDDLE CHANNEL- VERTICAL



Site: site #1

Polarization: **Vertical**

Temperature: 22.7

Limit: FCC Class B 3M Radiation above 1GHz(PK)-

Power:

Humidity: 53.6 %

EUT: HEAD Wireless Speaker

Distance:

M/N: HSP-60 PRO

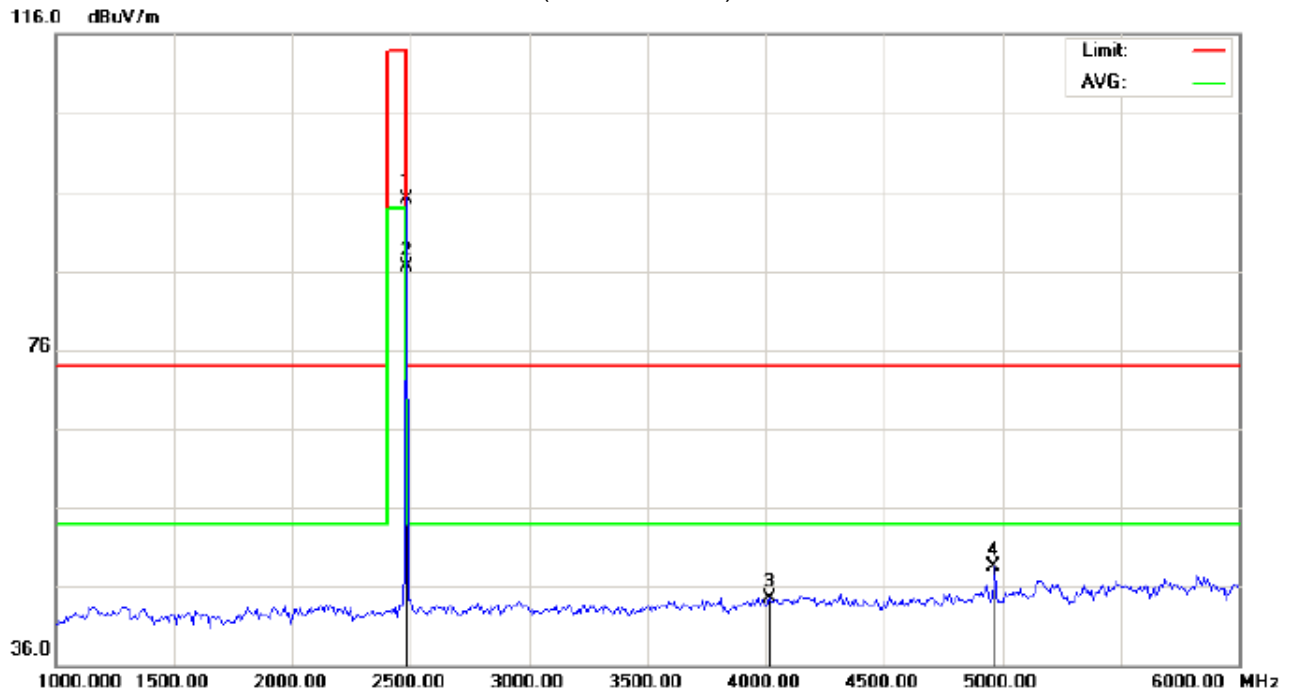
Mode: Middle Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2441.000	83.99	10.36	94.35	114.00	-19.65	peak			
2	*	2441.000	75.53	10.36	85.89	94.00	-8.11	AVG	100	52	
3		3808.333	29.85	14.01	43.86	74.00	-30.14	peak			
4		4882.000	38.81	7.89	46.70	74.00	-27.30	peak			

**RESULT: PASS**

# RADIATED EMISSION TEST- (ABOVE 1GHz)-HIGH CHANNEL-HORIZONTAL

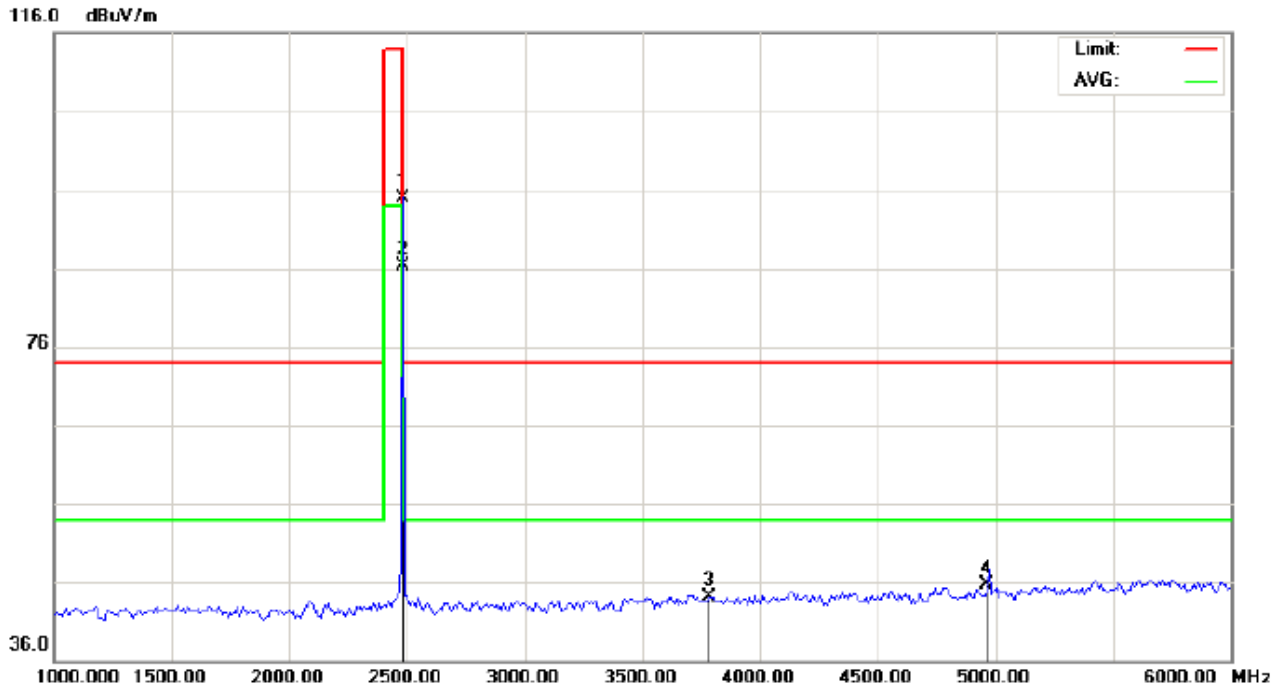


Site: site #1 Polarization: *Horizontal* Temperature: 22.7  
Limit: FCC Class B 3M Radiation above 1GHz(PK)- Power: Humidity: 53.6 %  
EUT: HEAD Wireless Speaker Distance:  
M/N: HSP-60 PRO  
Mode: High Channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2480.000	84.70	10.41	95.11	114.00	-18.89	peak			
2	*	2480.000	76.10	10.41	86.51	94.00	-7.49	AVG	100	68	
3		4016.667	29.61	14.91	44.52	74.00	-29.48	peak			
4		4960.000	40.51	8.09	48.60	74.00	-25.40	peak			

**RESULT: PASS**

## RADIATED EMISSION TEST- (ABOVE 1GHz)-HIGH CHANNEL- VERTICAL



Site: site #1

Polarization: **Vertical**

Temperature: 22.7

Limit: FCC Class B 3M Radiation above 1GHz(PK)-

Power:

Humidity: 53.6 %

EUT: HEAD Wireless Speaker

Distance:

M/N: HSP-60 PRO

Mode: High Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2480.000	84.46	10.41	94.87	114.00	-19.13	peak			
2	*	2480.000	75.96	10.41	86.37	94.00	-7.63	AVG	100	59	
3		3783.333	30.26	13.86	44.12	74.00	-29.88	peak			
4		4960.000	37.66	8.09	45.75	74.00	-28.25	peak			

**RESULT: PASS****Note:** 6~25GHz at least have 20dB margin. No recording in the test report.

Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

**Field strength of the fundamental signal**

**1Mbps Result:**

**Peak value**

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	82.96	10.32	93.28	114	-20.72	Horizontal
2402	82.71	10.32	93.03	114	-20.97	Vertical
2441	84.24	10.36	94.60	114	-19.40	Horizontal
2441	83.99	10.36	94.35	114	-19.65	Vertical
2480	84.70	10.41	95.11	114	-18.89	Horizontal
2480	84.46	10.41	94.87	114	-19.13	Vertical

**Average value**

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	74.35	10.32	84.67	94	-9.33	Horizontal
2402	74.17	10.32	84.49	94	-9.51	Vertical
2441	75.79	10.36	86.15	94	-7.85	Horizontal
2441	75.53	10.36	85.89	94	-8.11	Vertical
2480	76.10	10.41	86.51	94	-7.49	Horizontal
2480	75.96	10.41	86.37	94	-7.63	Vertical

**2Mbps Result:**

**Peak value**

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	82.89	10.32	93.21	114	-20.79	Horizontal
2402	82.63	10.32	92.95	114	-21.05	Vertical
2441	84.16	10.36	94.52	114	-19.48	Horizontal
2441	83.92	10.36	94.28	114	-19.72	Vertical
2480	84.62	10.41	95.03	114	-18.97	Horizontal
2480	84.41	10.41	94.82	114	-19.18	Vertical

**Average value**

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	74.30	10.32	84.62	94	-9.38	Horizontal
2402	74.11	10.32	84.43	94	-9.57	Vertical
2441	75.73	10.36	86.09	94	-7.91	Horizontal
2441	75.47	10.36	85.83	94	-8.17	Vertical
2480	76.01	10.41	86.42	94	-7.58	Horizontal
2480	75.91	10.41	86.32	94	-7.68	Vertical

**3Mbps Result:****Peak value**

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	82.82	10.32	93.14	114	-20.86	Horizontal
2402	82.57	10.32	92.89	114	-21.11	Vertical
2441	84.09	10.36	94.45	114	-19.55	Horizontal
2441	83.86	10.36	94.22	114	-19.78	Vertical
2480	84.54	10.41	94.95	114	-19.05	Horizontal
2480	84.34	10.41	94.75	114	-19.25	Vertical

**Average value**

Frequency	Reading Level	Factor	Measurement	Limit	Over	Antenna
(MHz)	(dBuv)	(dB/m)	(dBuv/m)	(dBuv/m)	(dB)	Polarization
2402	74.24	10.32	84.56	94	-9.44	Horizontal
2402	74.02	10.32	84.34	94	-9.66	Vertical
2441	75.65	10.36	86.01	94	-7.99	Horizontal
2441	75.39	10.36	85.75	94	-8.25	Vertical
2480	75.95	10.41	86.36	94	-7.64	Horizontal
2480	75.87	10.41	86.28	94	-7.72	Vertical

## 10. BAND EDGE EMISSION

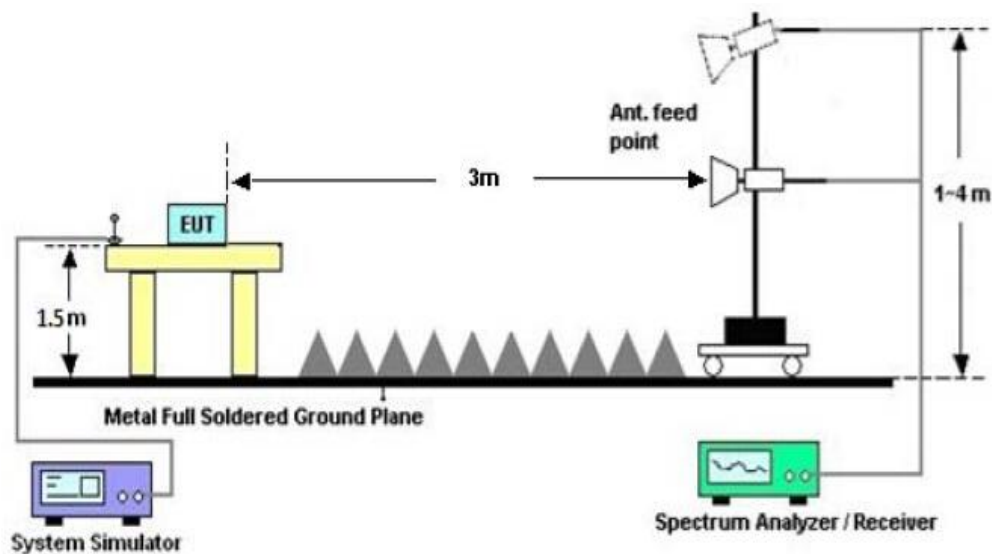
### 10.1. MEASUREMENT PROCEDURE

- 1The EUT operates at hopping-off test mode. The lowest or highest channels are tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.
- 2Max hold the trace of the setup 1, and the EUT operates at hopping-on test mode to verify the largest spurious emissions power.
- 3Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission.

Start frequency(MHz)	Stop frequency(MHz)
2200	2405
2478	2500

### 10.2 TEST SETUP

RADIATED EMISSION TEST SETUP

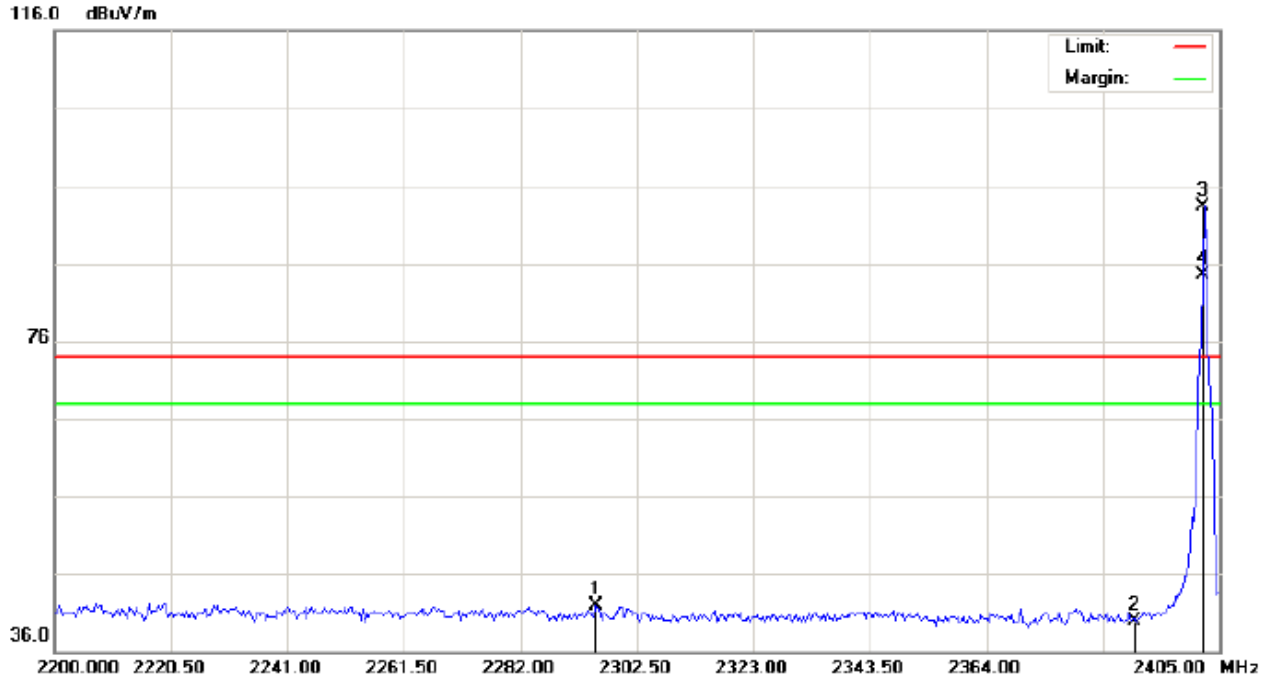


### 10.3 RADIATED TEST RESULT

(Worst modulation: GFSK)

FOR BR/EDR

TEST PLOT OF BAND EDGE FOR LOW CHANNEL-Horizontal

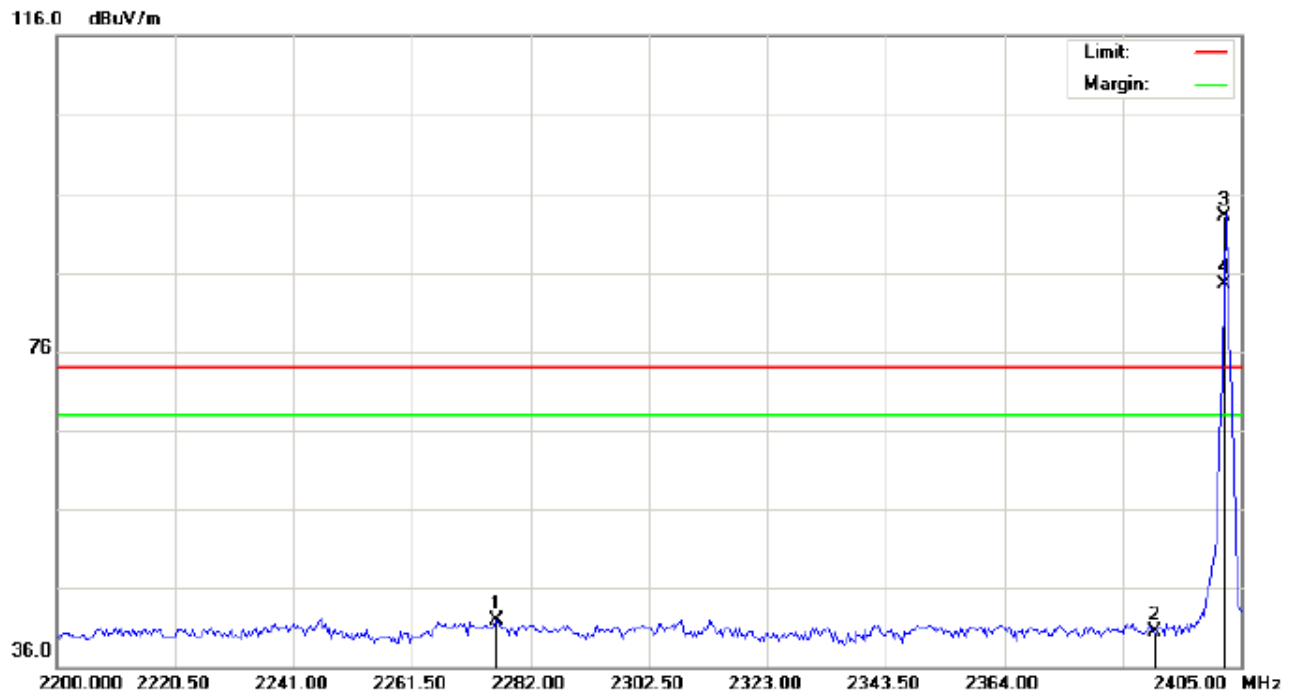


Site: site #1	Polarization: <b>Horizontal</b>	Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHz(PK)	Power:	Humidity: 60 %
EUT: HEAD Wireless Speaker	Distance:	
M/N: HSP-60 PRO		
Mode: Low Channel TX		
Note:		

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2295.325	31.69	10.20	41.89	74.00	-32.11	peak			
2		2390.000	29.50	10.31	39.81	74.00	-34.19	peak			
3	*	2402.000	82.92	10.32	93.24	74.00	19.24	peak			
4	X	2402.000	74.26	10.32	84.58	74.00	10.58	AVG	100	64	



## TEST PLOT OF BAND EDGE FOR LOW CHANNEL -Vertical



Site: site #1

Limit: FCC Class B 3M Radiation above 1GHz(PK)

EUT: HEAD Wireless Speaker

M/N: HSP-60 PRO

Mode: Low Channel TX

Note:

Polarization: **Vertical**

Power:

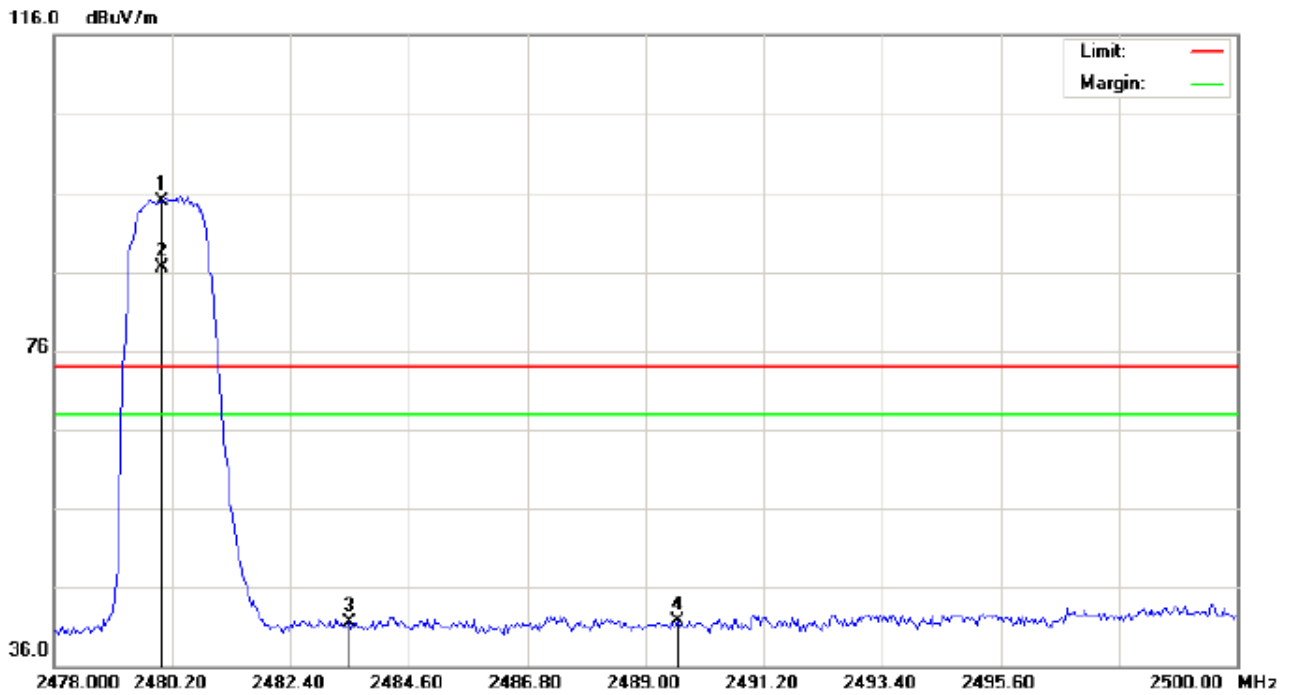
Distance:

Temperature: 26

Humidity: 60 %

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		2276.192	31.65	10.18	41.83	74.00	-32.17	peak			
2		2390.000	30.21	10.31	40.52	74.00	-33.48	peak			
3	*	2402.000	82.69	10.32	93.01	74.00	19.01	peak			
4	X	2402.000	74.10	10.32	84.42	74.00	10.42	AVG	100	57	

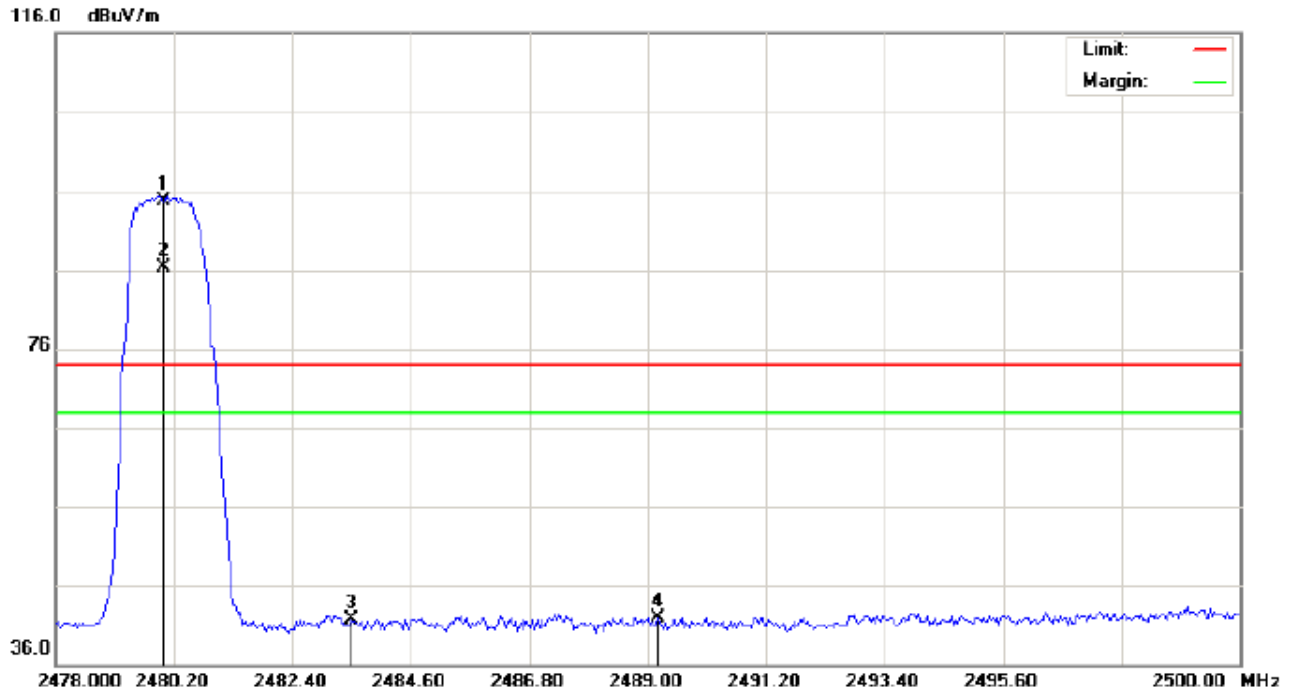
TEST PLOT OF BAND EDGE FOR HIGH CHANNEL -Horizontal



Site: site #1 Polarization: *Horizontal* Temperature: 26  
Limit: FCC Class B 3M Radiation above 1GHz(PK) Power: Humidity: 60 %  
EUT: HEAD Wireless Speaker Distance:  
M/N: HSP-60 PRO  
Mode: High Channel TX  
Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	84.55	10.41	94.96	74.00	20.96	peak			
2	X	2480.000	76.10	10.41	86.51	74.00	12.51	AVG	100	62	
3		2483.500	31.19	10.41	41.60	74.00	-32.40	peak			
4		2489.587	31.25	10.42	41.67	74.00	-32.33	peak			

## TEST PLOT OF BAND EDGE FOR HIGH CHANNEL-Vertical



Site: site #1

Polarization: **Vertical**

Temperature: 26

Limit: FCC Class B 3M Radiation above 1GHz(PK)

Power:

Humidity: 60 %

EUT: HEAD Wireless Speaker

Distance:

M/N: HSP-60 PRO

Mode: High Channel TX

Note:

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1	*	2480.000	84.32	10.41	94.73	74.00	20.73	peak			
2	X	2480.000	75.86	10.41	86.27	74.00	12.27	AVG	100	54	
3		2483.500	31.26	10.41	41.67	74.00	-32.33	peak			
4		2489.183	31.57	10.42	41.99	74.00	-32.01	peak			

**RESULT: PASS****Note:** Factor=Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The "Factor" value can be calculated automatically by software of measurement system.

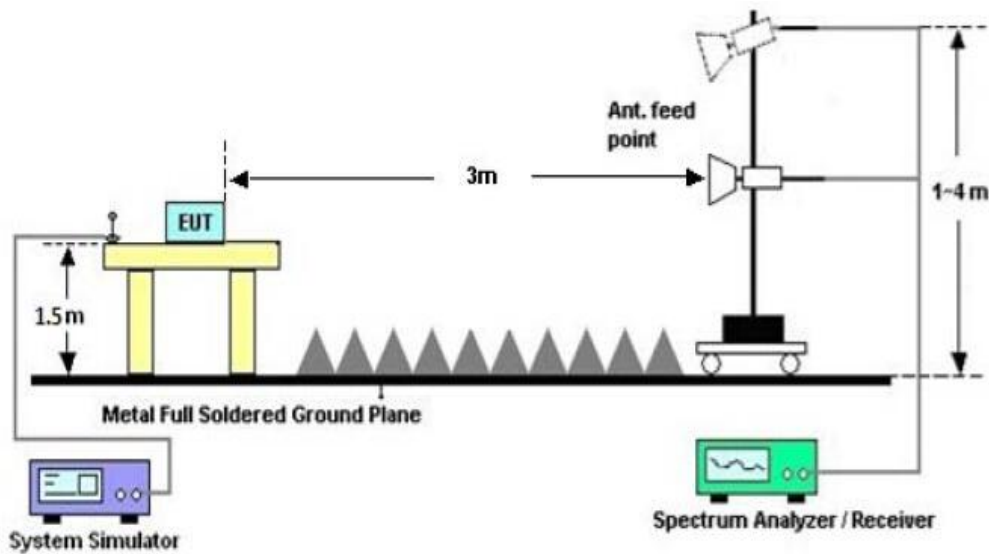
Hopping on mode and Hopping off mode have been tested, but only worst case reported.

## 11. 20DB BANDWIDTH

### 11.1. MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
2. Set Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  
RBW  $\geq$  1% of the 20 dB bandwidth, VBW  $\geq$  RBW; Sweep = auto; Detector function = peak
3. Set SPA Trace 1 Max hold, then View.

### 11.2. TEST SET-UP

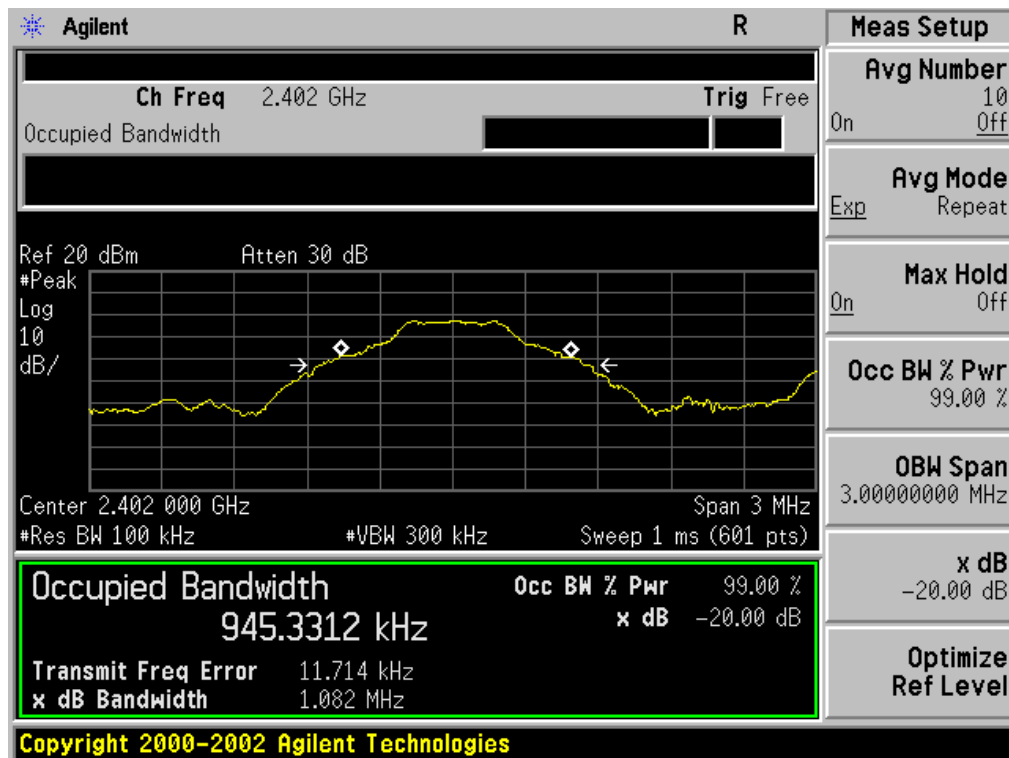


### 11.3. LIMITS AND MEASUREMENT RESULTS

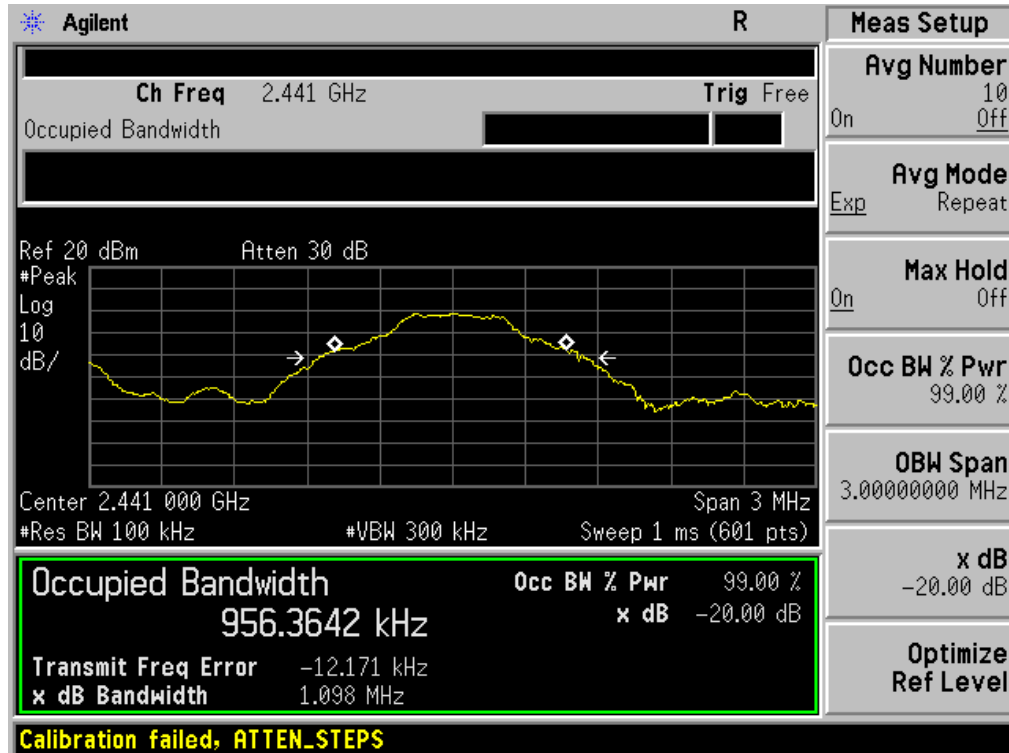
#### FOR BR/EDR

BLUETOOTH 1MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	0.945	1.082	PASS
	Middle Channel	0.956	1.098	PASS
	High Channel	0.929	1.055	PASS

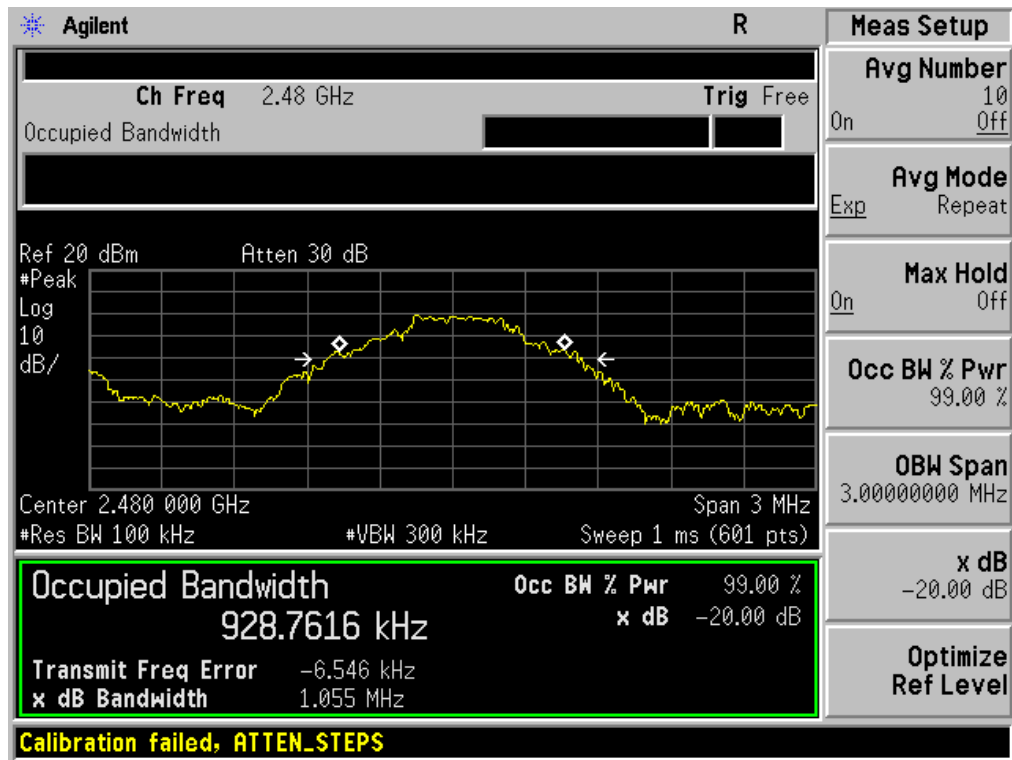
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

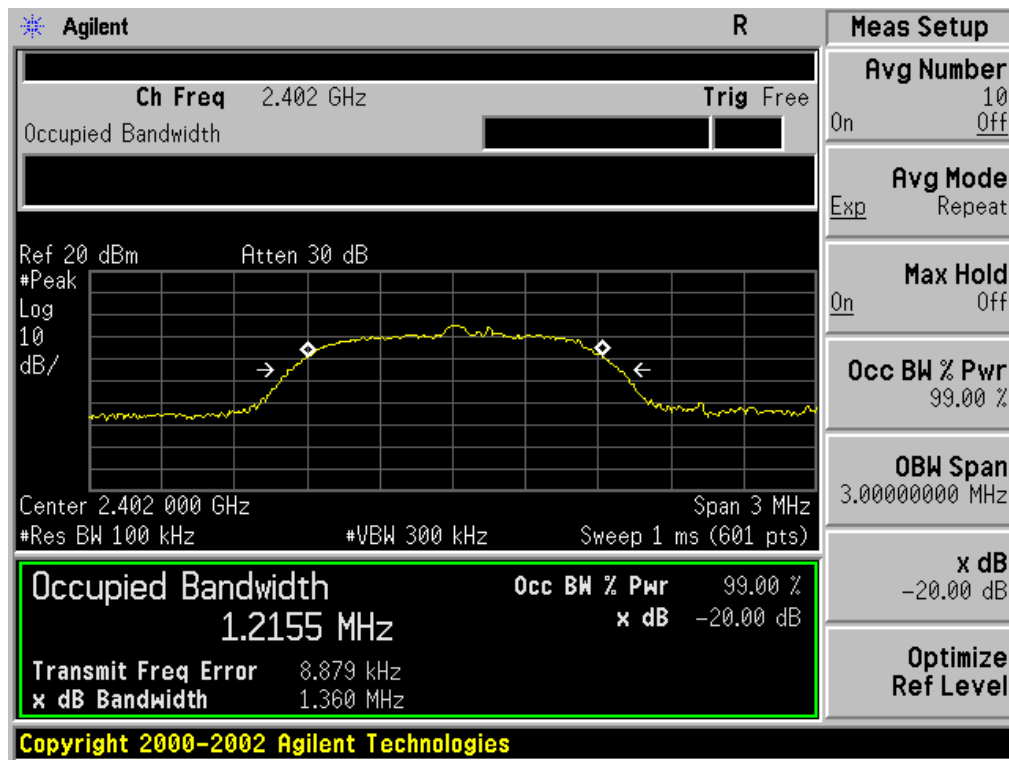


TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

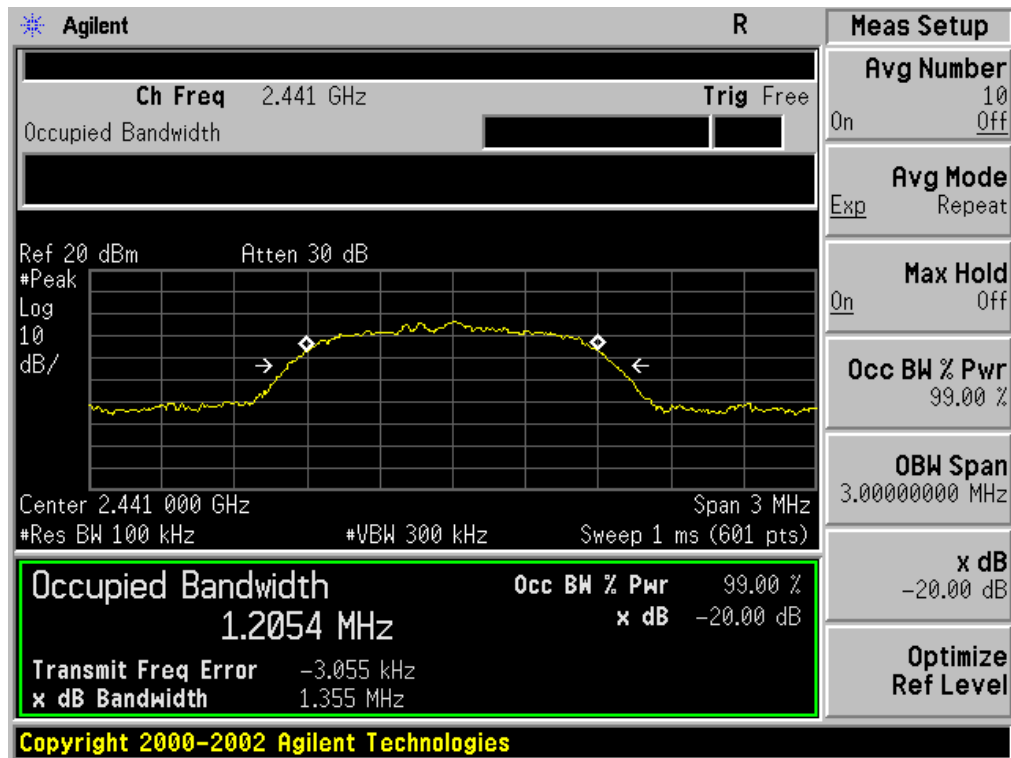


BLUETOOTH 2MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	1.216	1.360	PASS
	Middle Channel	1.205	1.355	PASS
	High Channel	1.206	1.362	PASS

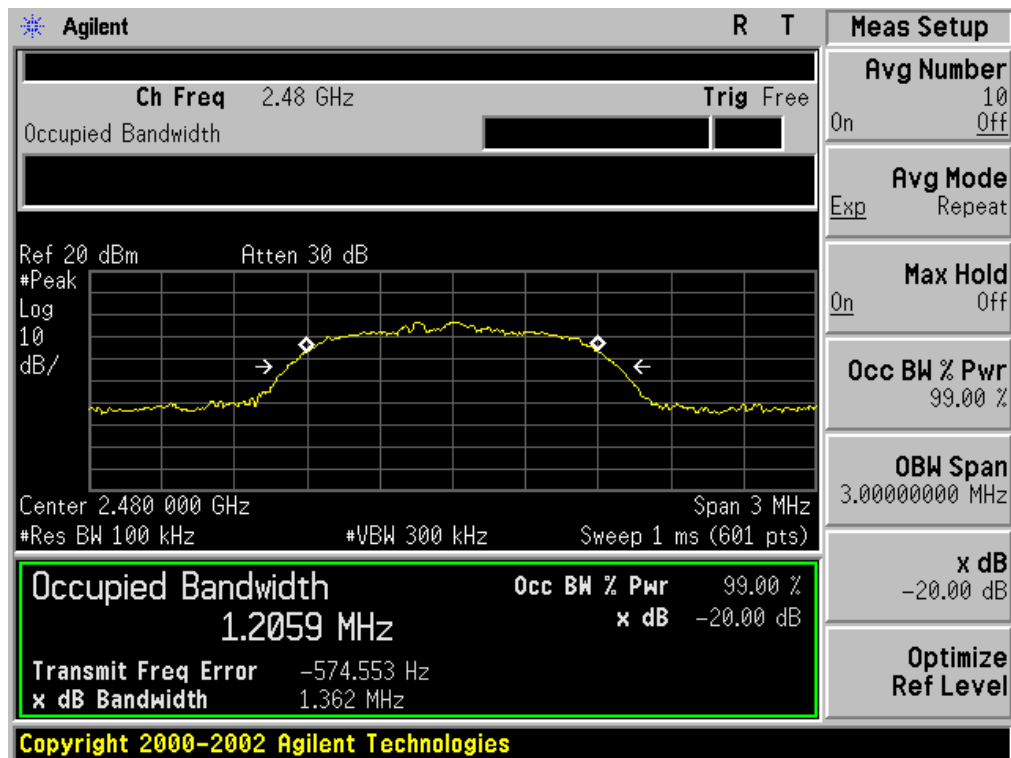
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



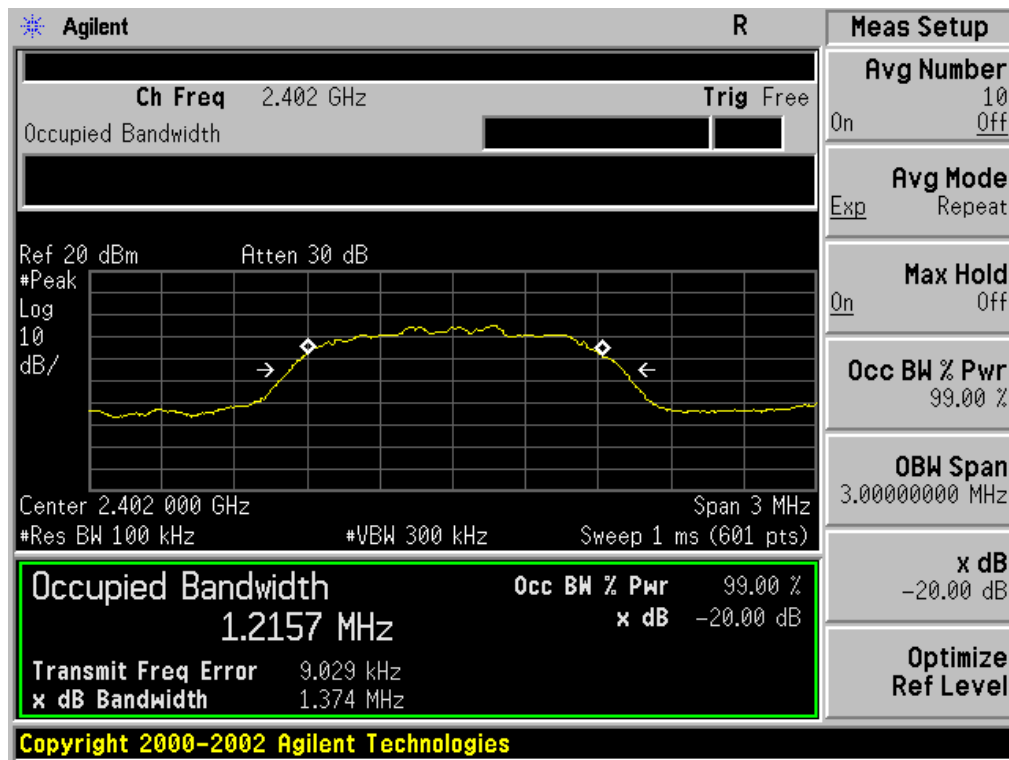
### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



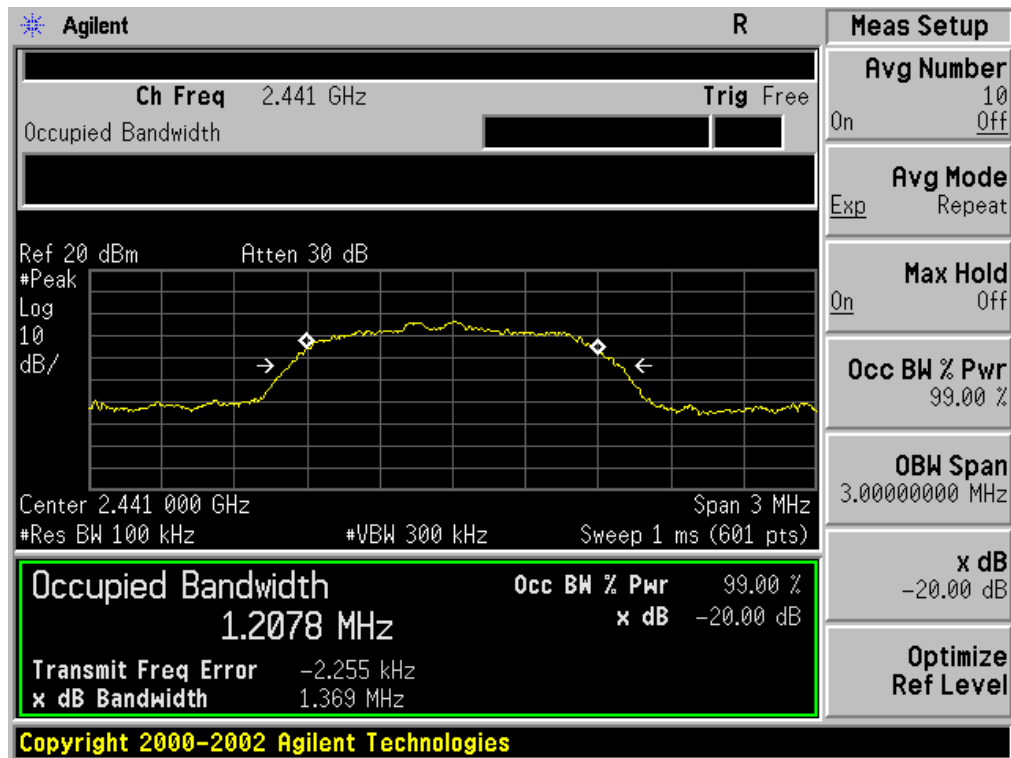


BLUETOOTH 3MBPS LIMITS AND MEASUREMENT RESULT				
Applicable Limits	Measurement Result			
	Test Data (MHz)			Result
		99%OBW (MHz)	-20dB BW(MHz)	
N/A	Low Channel	1.216	1.374	PASS
	Middle Channel	1.208	1.369	PASS
	High Channel	1.199	1.345	PASS

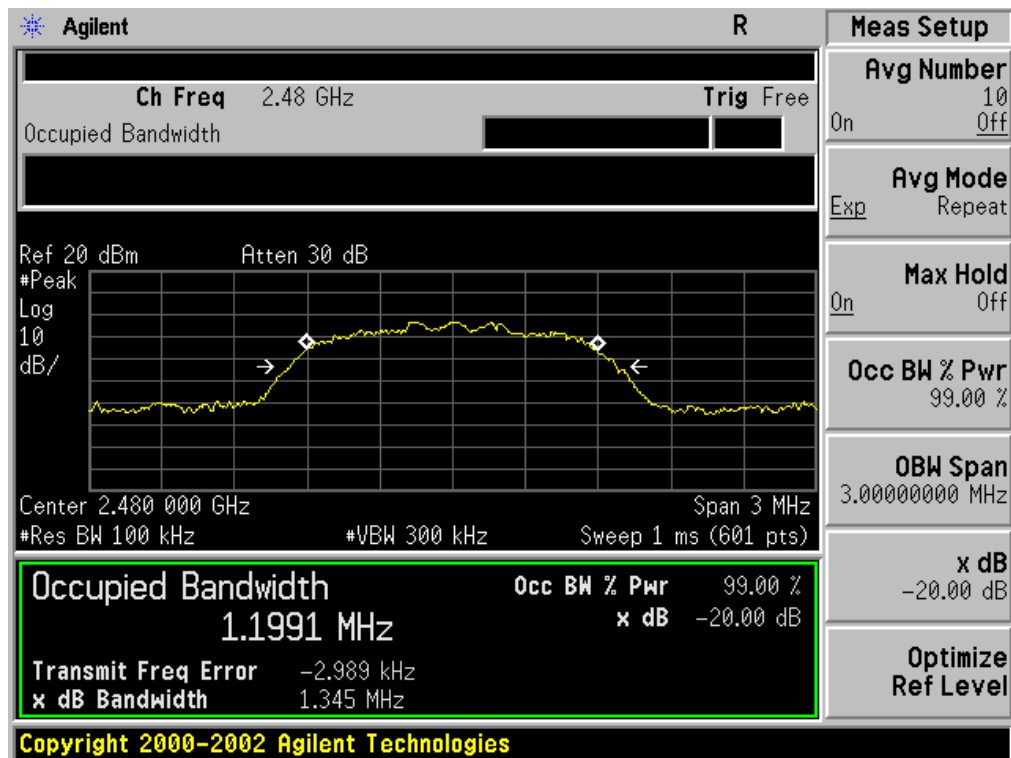
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



## 12. FCC LINE CONDUCTED EMISSION TEST

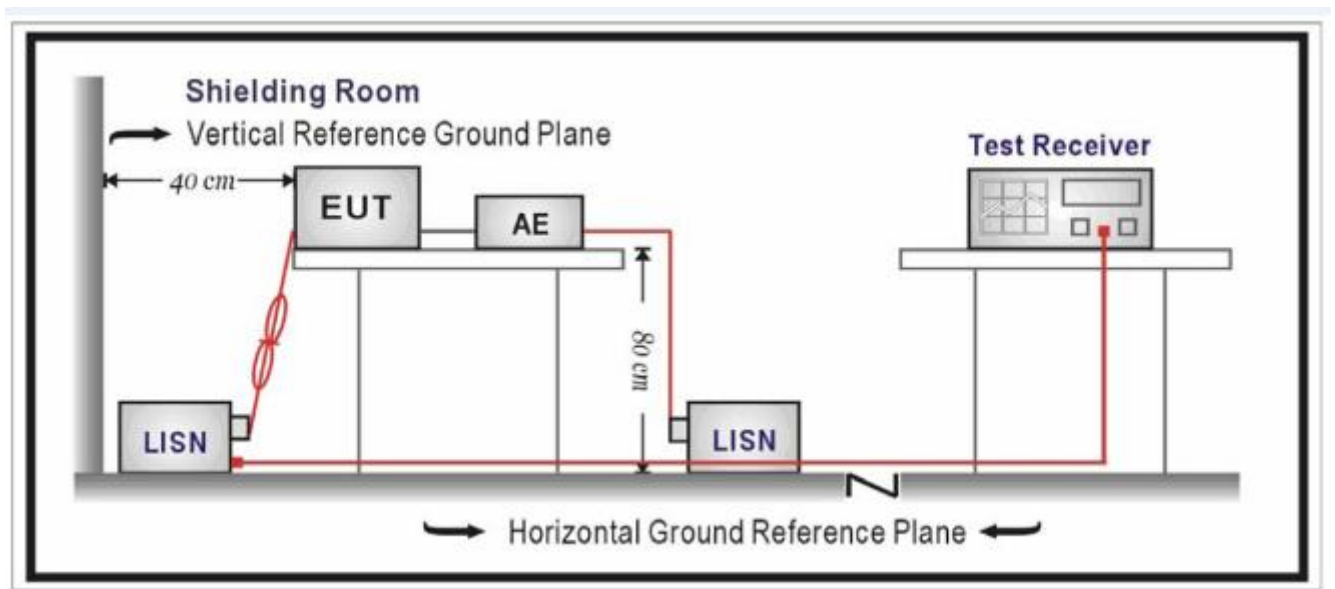
### 12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.( dBuV)	Average( dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

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

### 12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



### **12.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST**

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC charging voltage by adapter or PC which received 120V/60Hz power by a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

### **12.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST**

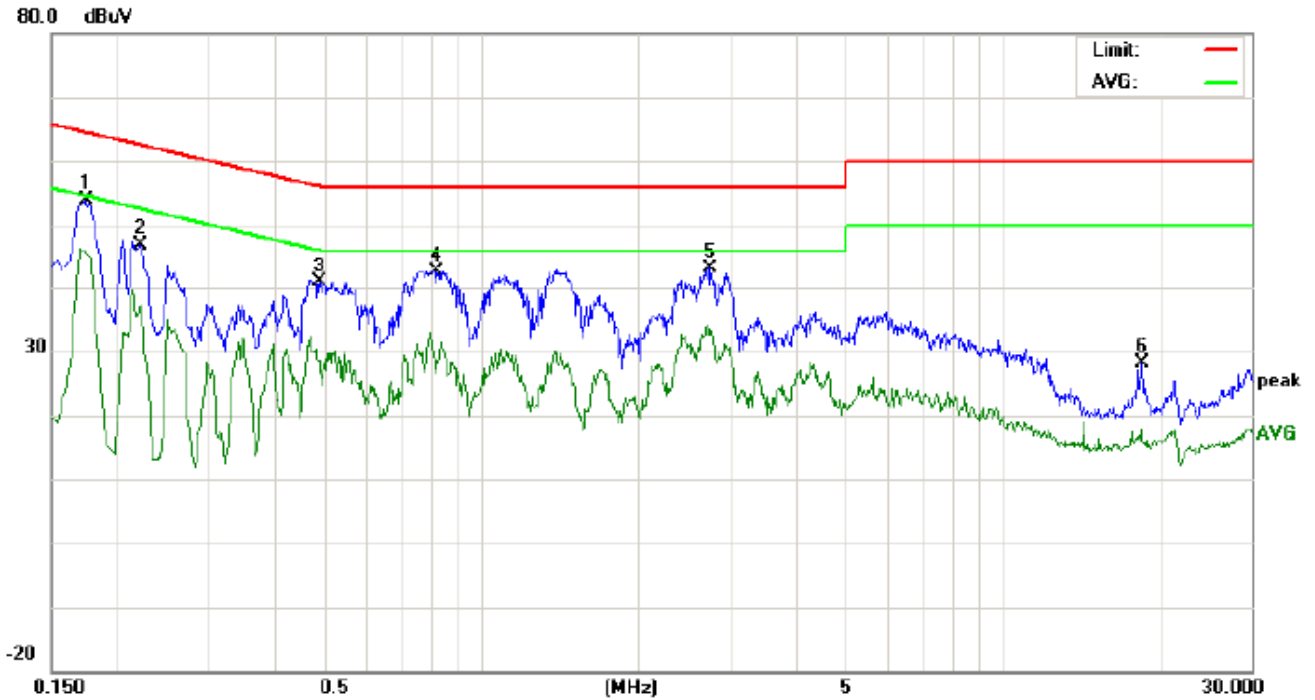
1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

## 12.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

By adapter(worst case)

FOR BR/EDR

Line Conducted Emission Test Line 1-L



Site: Conduction

Phase: **L1**

Temperature: 26

Limit: FCC Class B Conduction(QP)

Power:

Humidity: 60 %

EUT: HEAD Wireless Speaker

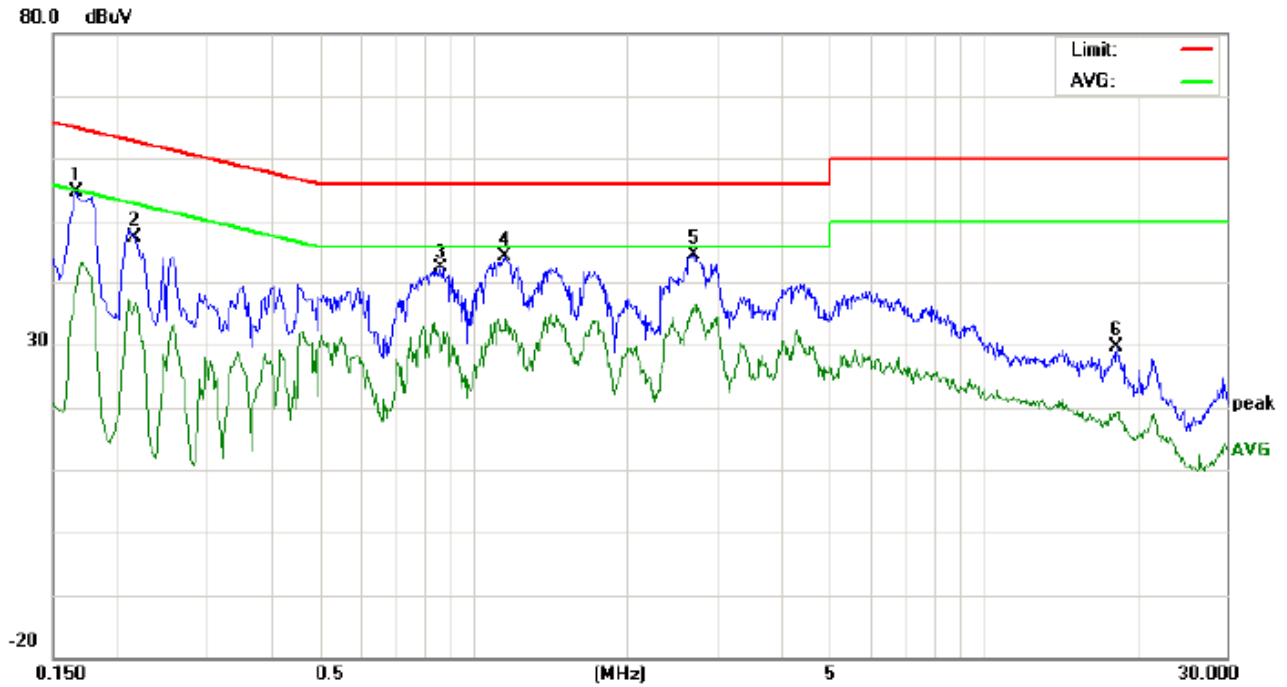
M/N:HSP-60 PRO

Mode: BT Link with charging

Note:

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	0.1737	43.62		35.58	10.19	53.81		45.77	64.78	54.78	-10.97	-9.01	P	
2	0.2220	36.75		26.92	10.24	46.99		37.16	62.74	52.74	-15.75	-15.58	P	
3	0.4899	30.42		18.30	10.39	40.81		28.69	56.17	46.17	-15.36	-17.48	P	
4	0.8256	32.29		18.38	10.31	42.60		28.69	56.00	46.00	-13.40	-17.31	P	
5	2.7378	32.62		22.33	10.49	43.11		32.82	56.00	46.00	-12.89	-13.18	P	
6	18.5819	17.99		6.00	10.12	28.11		16.12	60.00	50.00	-31.89	-33.88	P	

Line Conducted Emission Test Line 2-N

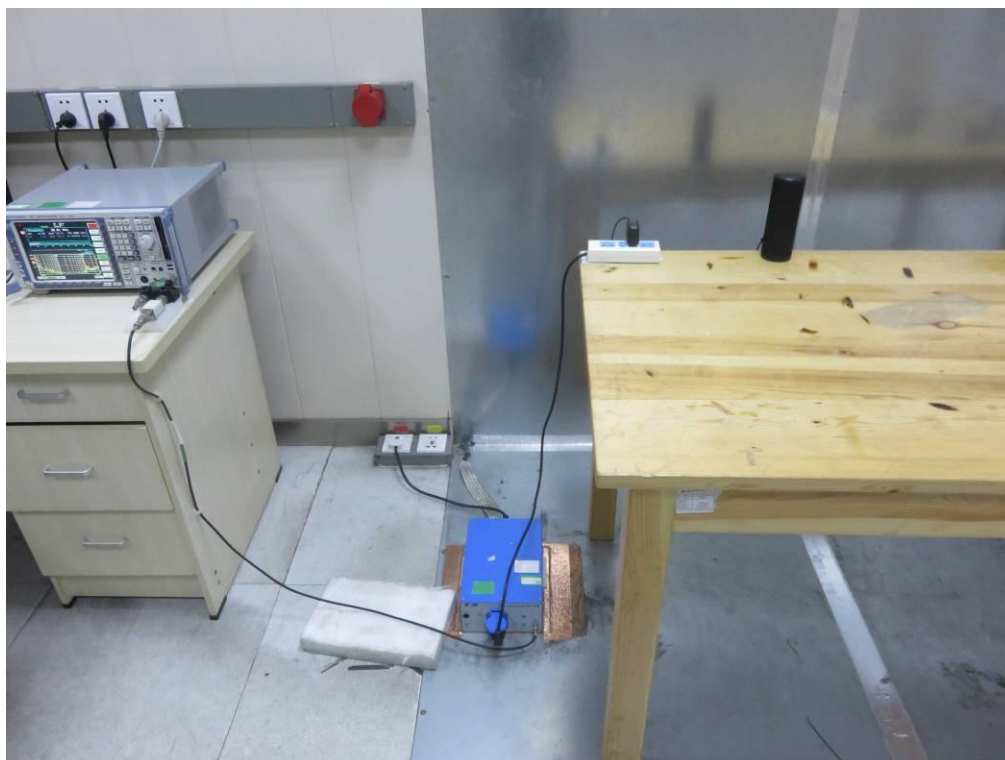


Site: Conduction Phase: **N** Temperature: 26  
Limit: FCC Class B Conduction(QP) Power: Humidity: 60 %  
EUT: HEAD Wireless Speaker  
M/N:HSP-60 PRO  
Mode: BT Link with charging  
Note:

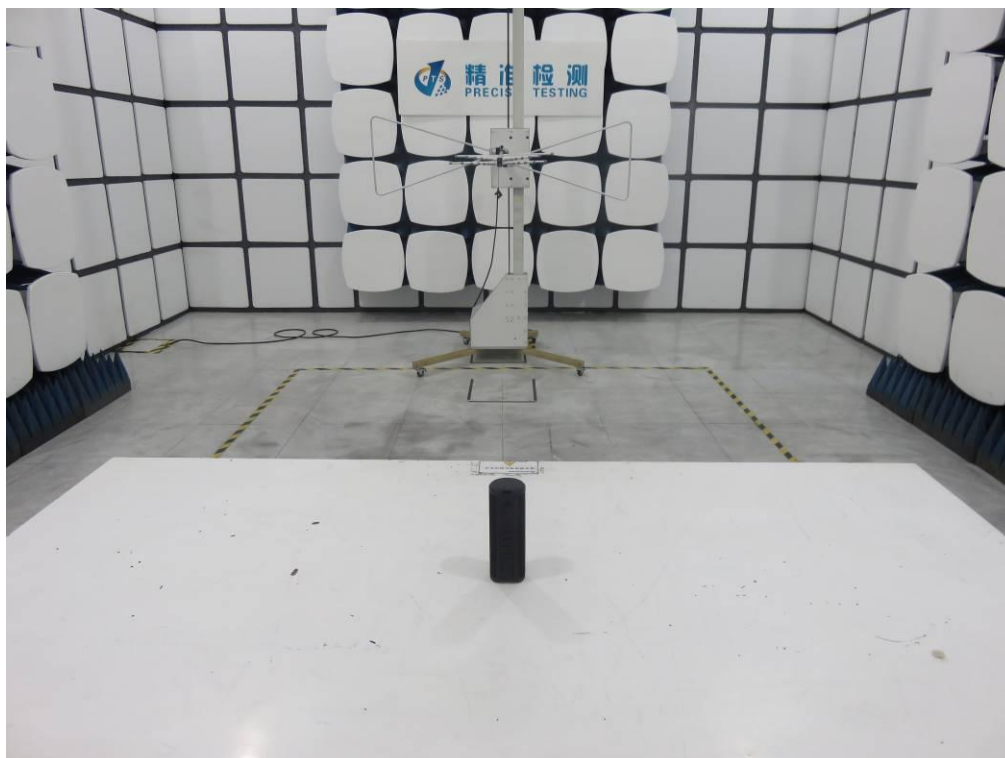
No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1660	44.35		28.72	10.18	54.53		38.90	65.15	55.15	-10.62	-16.25	P	
2	0.2179	33.75		10.52	10.23	43.98		20.75	62.89	52.89	-18.91	-32.14	P	
3	0.8659	31.95		18.60	10.37	42.32		28.97	56.00	46.00	-13.68	-17.03	P	
4	1.1492	33.97		21.95	10.37	44.34		32.32	56.00	46.00	-11.66	-13.68	P	
5	2.7179	34.13		24.93	10.48	44.61		35.41	56.00	46.00	-11.39	-10.59	P	
6	18.3139	19.52		8.88	10.12	29.64		19.00	60.00	50.00	-30.36	-31.00	P	

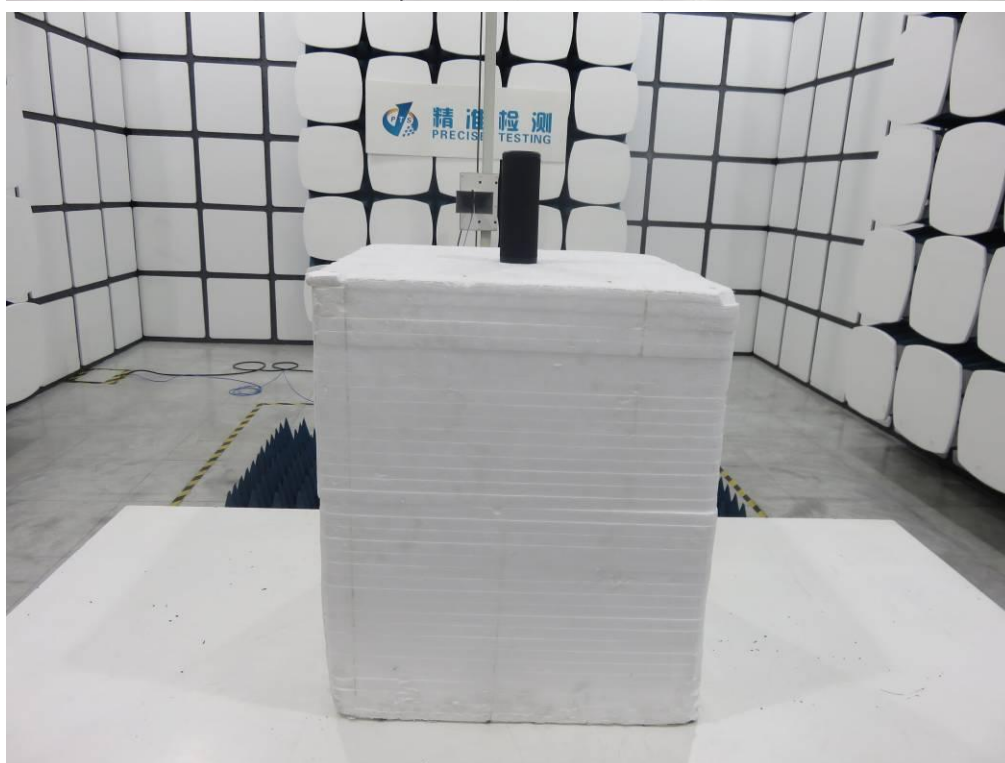
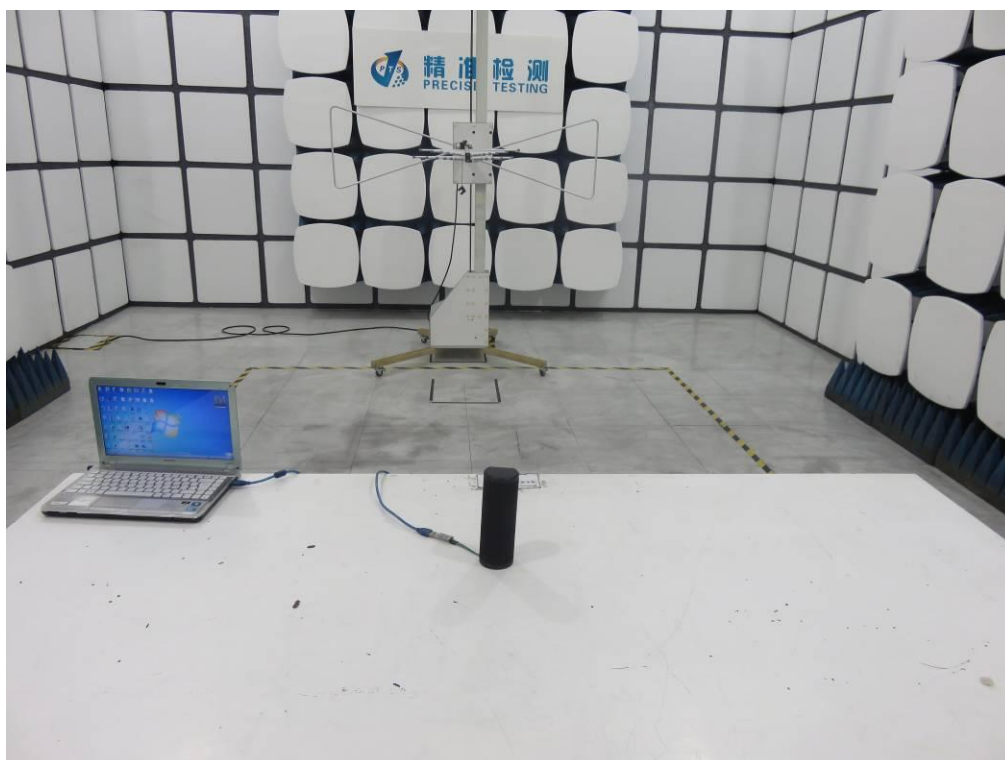
## APPENDIX A: PHOTOGRAPHS OF TEST SETUP

### FCC LINE CONDUCTED EMISSION TEST SETUP

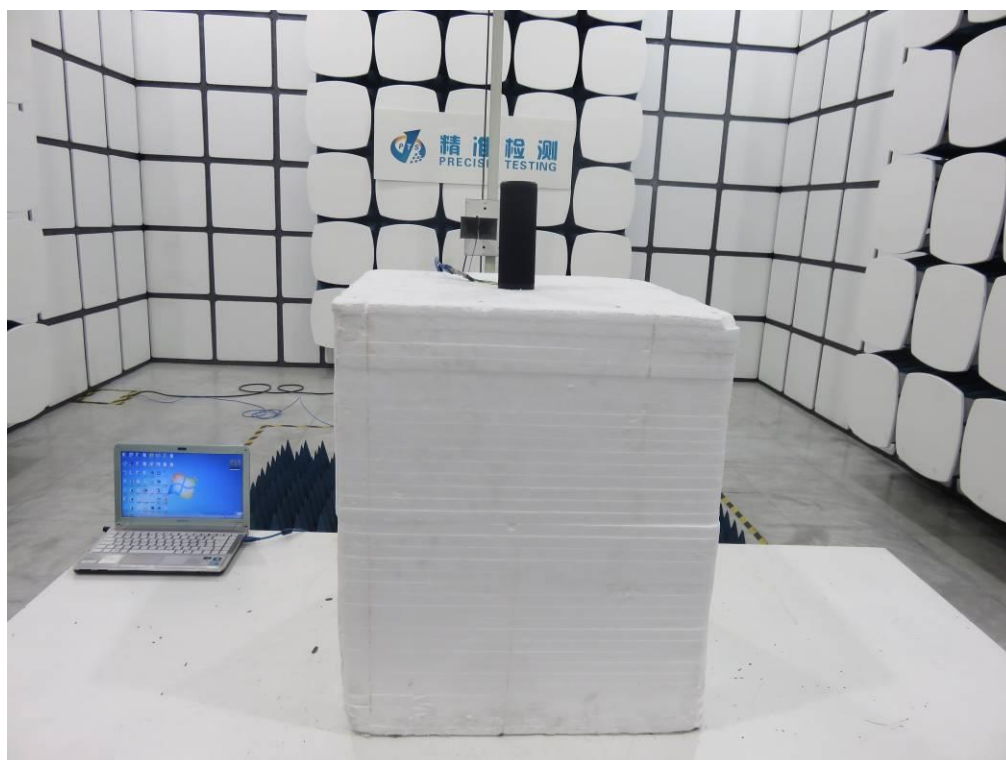


### FCC RADIATED EMISSION TEST SETUP



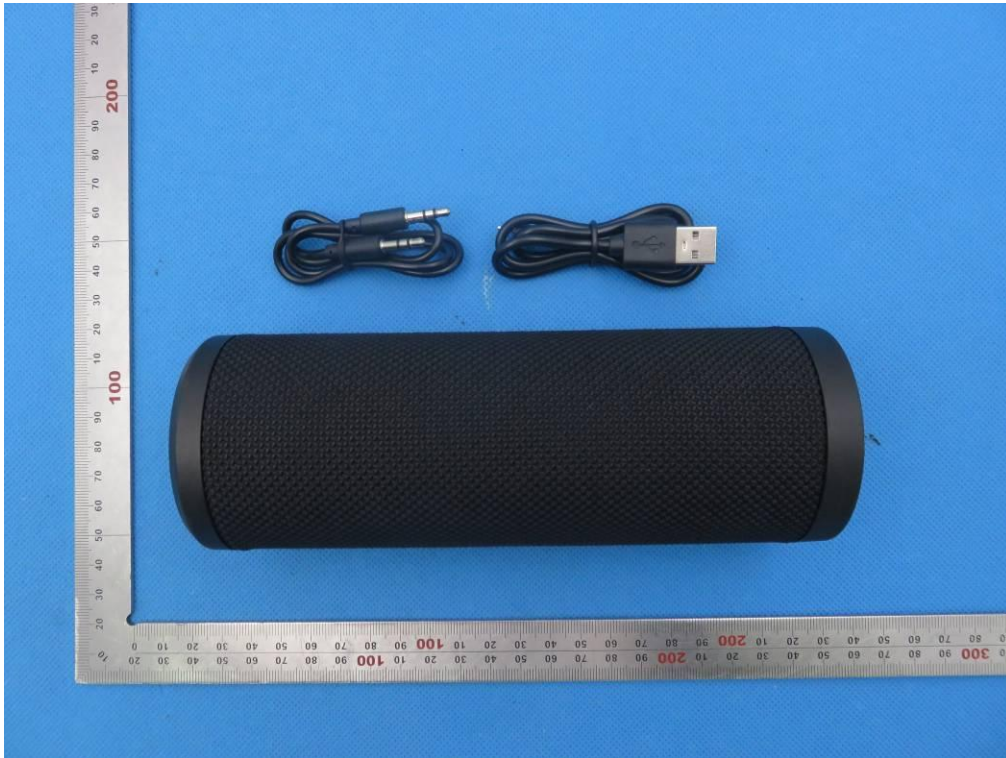




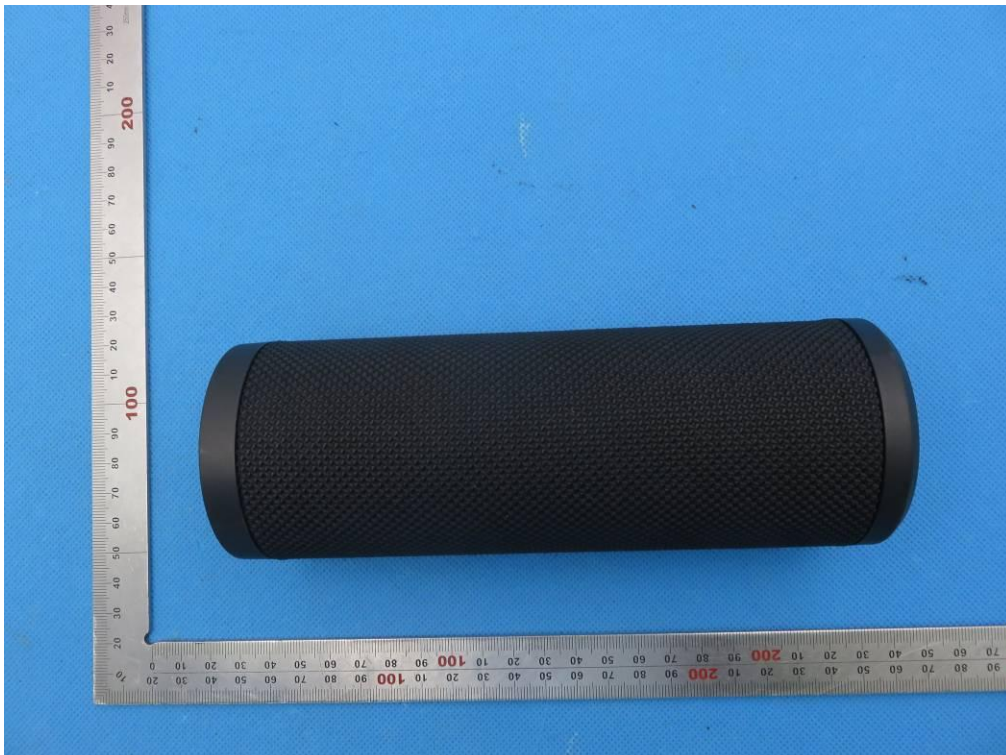


## APPENDIX B: PHOTOGRAPHS OF EUT

### WHOLE VIEW OF EUT



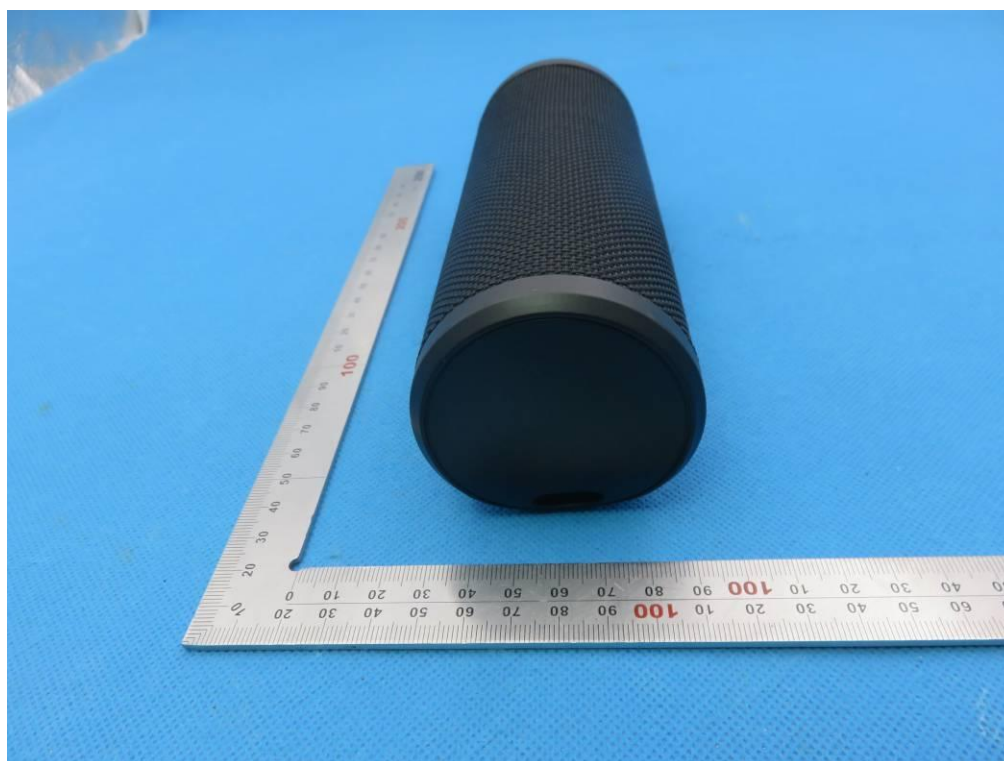
### TOP VIEW OF EUT



BOTTOM VIEW OF EUT

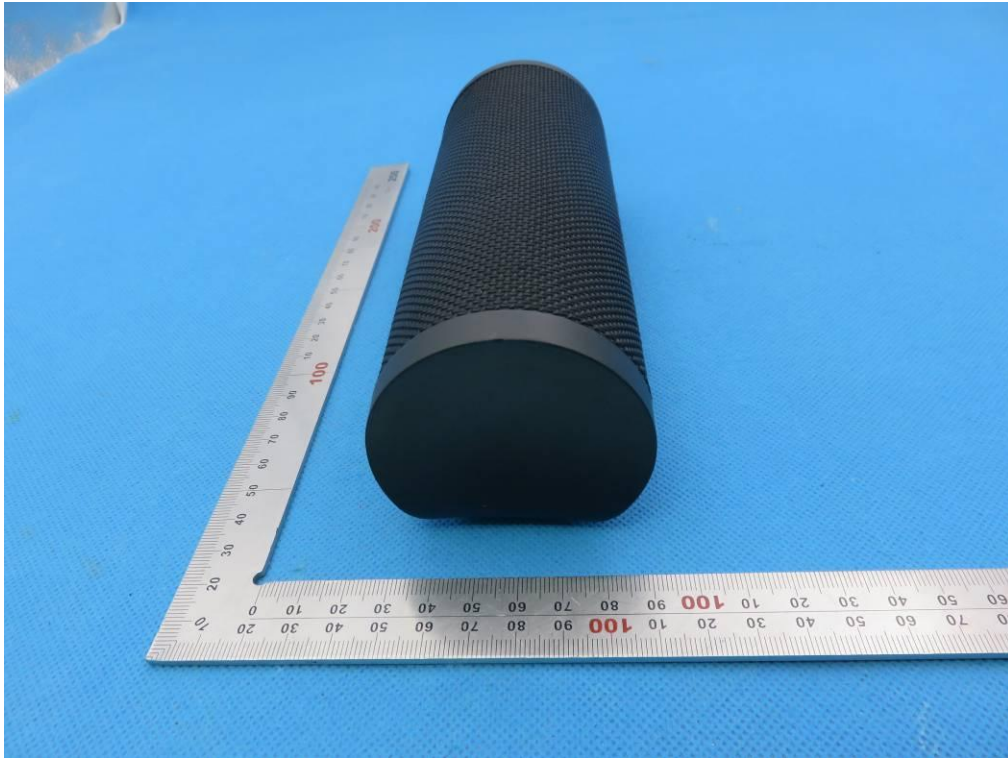


FRONT VIEW OF EUT





BACK VIEW OF EUT



LEFT VIEW OF EUT



RIGHT VIEW OF EUT

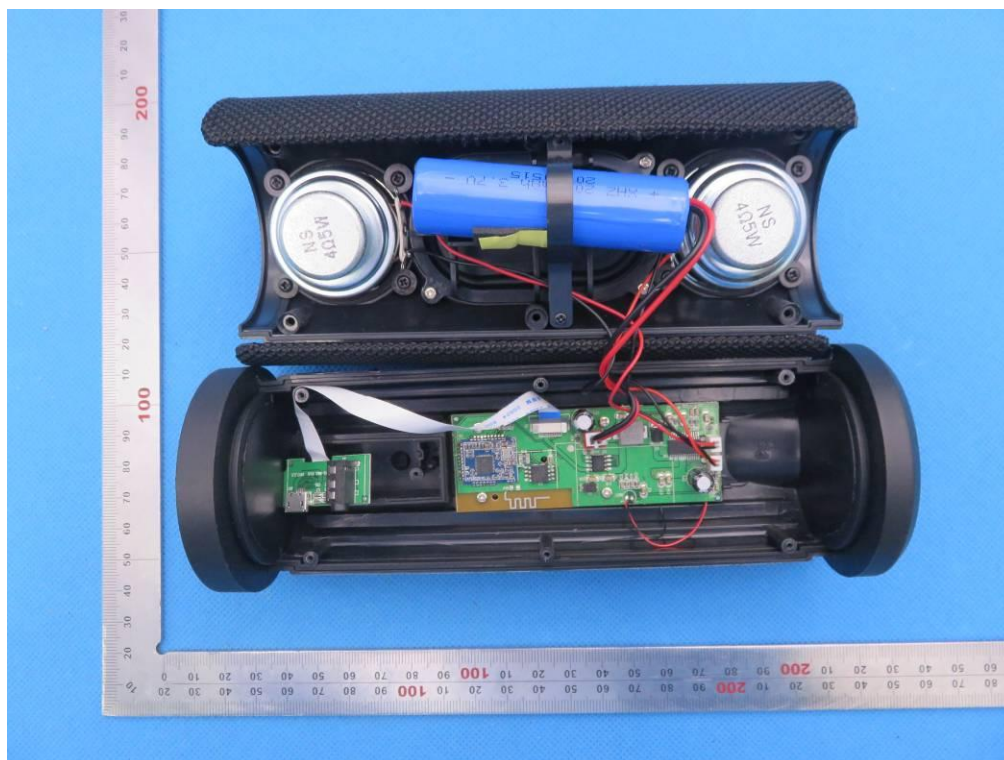


VIEW OF EUT (PORT)

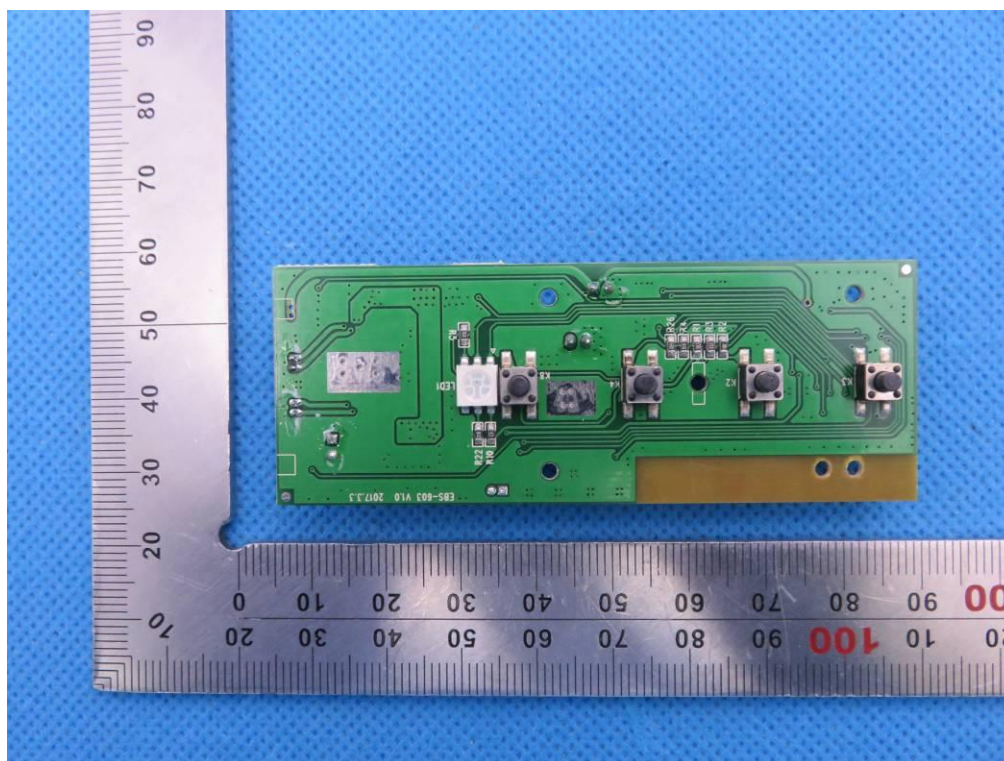




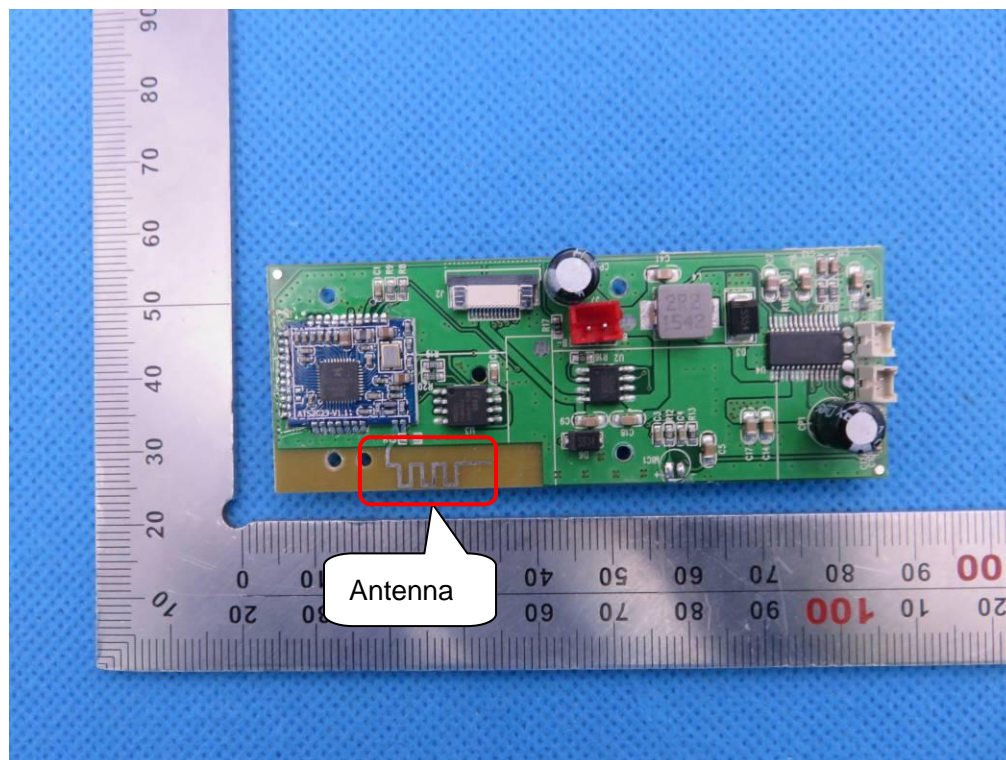
### OPEN VIEW OF EUT



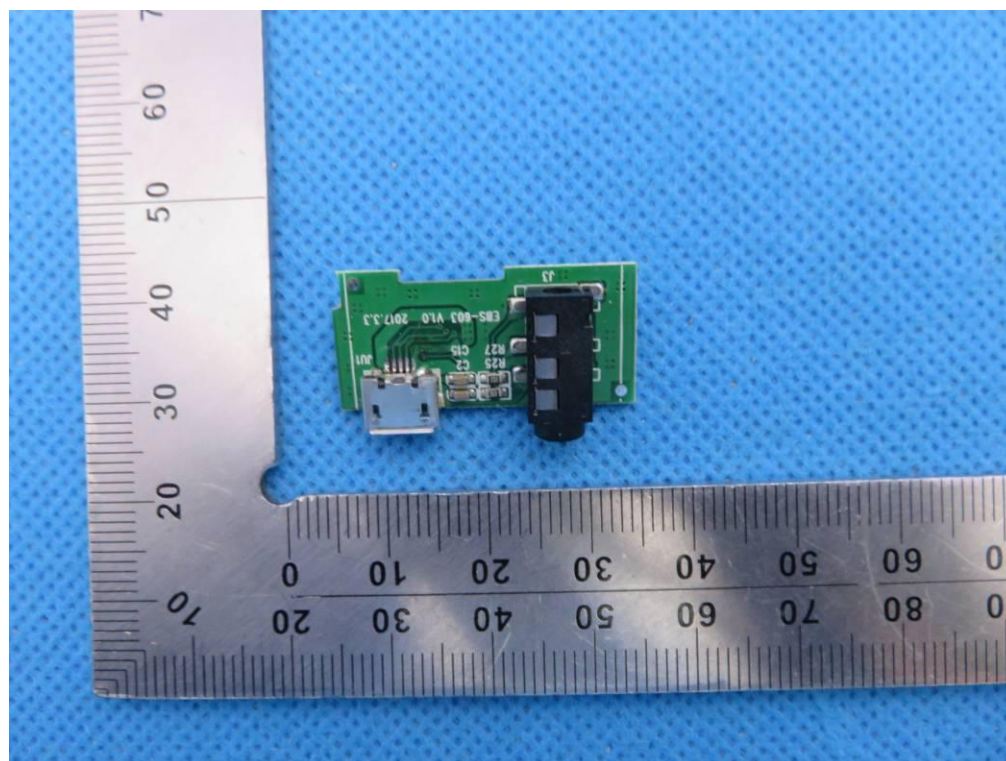
### INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2

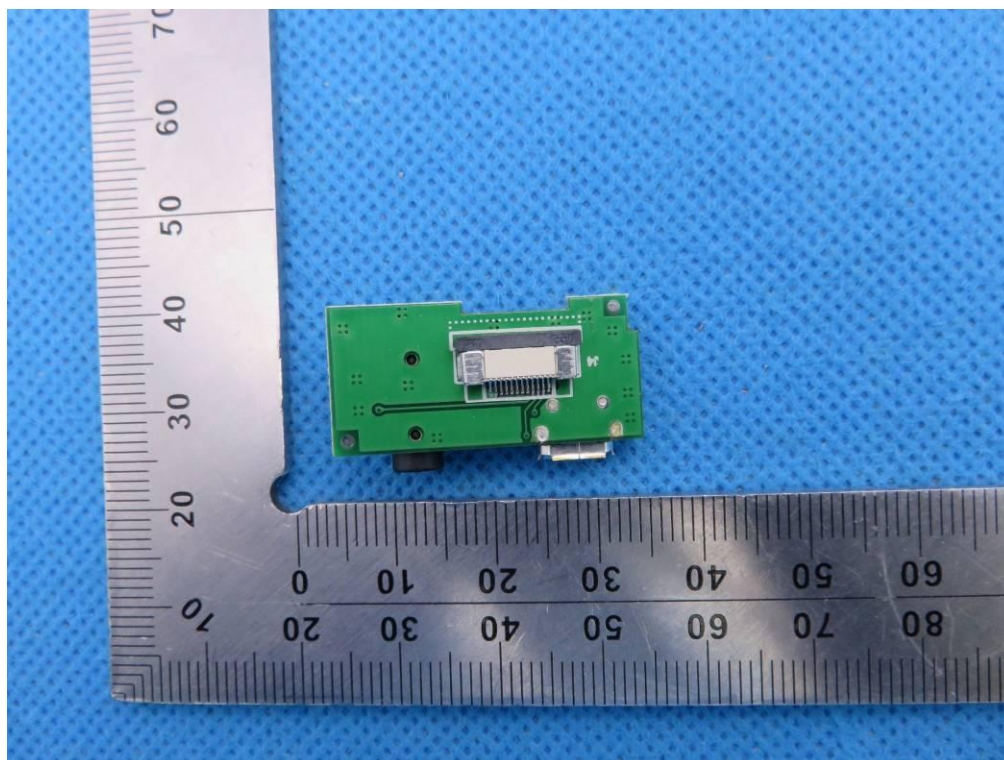


INTERNAL VIEW OF EUT-3

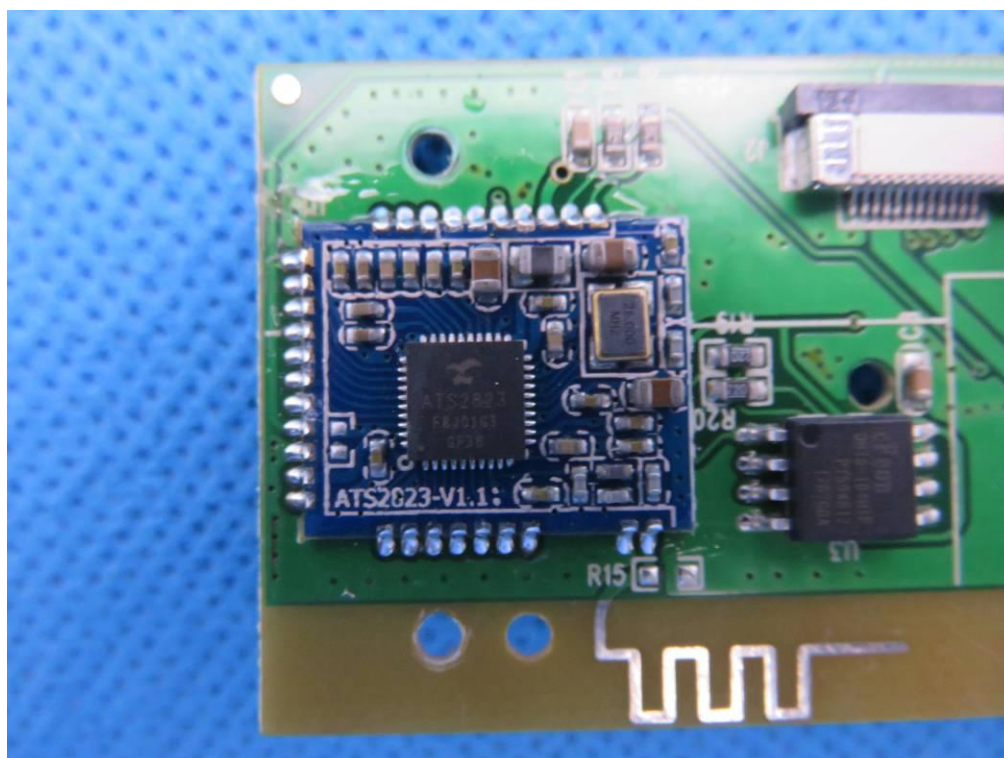




INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5





VIEW OF ADAPTER(AE)



The adapter was supplied by AGC

----END OF REPORT----