

APPLICATION CERTIFICATION FCC Part 15C

On Behalf of
Head-Direct (Kunshan) Co., LTD

True Wireless Stereo Earphones
Model No.: TWS800

FCC ID: 2ATP3-TWS800

Prepared for : Head-Direct (Kunshan) Co., LTD
Address : No.2001, Yingbin West Road, Bacheng Town, Kunshan City,
Jiangsu Province, China

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Report No. : RTZ200902008-00
Date of Test : September 3-7, 2020
Date of Report : September 15, 2020

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Test Report Certification

Applicant : Head-Direct (Kunshan) Co., LTD
Manufacturer : Head-Direct (Kunshan) Co., LTD
EUT Description : True Wireless Stereo Earphones
Model No. : TWS800

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247
ANSI C63.10: 2013

The EUT was tested according to DTS test procedure of April 02, 2019 KDB558074 D01 DTS Meas Guidance v0502 for compliance to FCC 47CFR 15.247 requirements.

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : September 3-7, 2020

Date of Report : September 15, 2020

Bob Wang

Test Engineer : (Bob Wang, Engineer)

Bob Wang

Prepared by :

(Bob Wang, Engineer)



Approved & Authorized Signer :

(Candy.Li, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Model Number : TWS800
 Bluetooth version : V5.0
 Frequency Range : 2402MHz-2480MHz
 Number of Channels : 40
 Antenna Gain(Max) : 2dBi
 Antenna type : Integral Antenna
 Modulation mode : GFSK
 Power supply : DC 3.7V (Powered by Lithium battery) or
 DC 5.0V (Powered by USB port)
 Trade Mark : HIFIMAN
 Applicant : Head-Direct (Kunshan) Co., LTD
 Address : No.2001, Yingbin West Road, Bacheng Town, Kunshan
 City, Jiangsu Province, China
 Manufacturer : Head-Direct (Kunshan) Co., LTD
 Address : No.2001, Yingbin West Road, Bacheng Town, Kunshan
 City, Jiangsu Province, China
 Date of sample received : RTZ200902008-RF-S1
 Date of Test : September 3-7, 2020

1.2. Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

1.3.Special Accessory and Auxiliary Equipment

AC/DC Power Adapter: (provided by laboratory)	:	Model:BEK-QC-001 INPUT: 120V~60Hz OUTPUT:5V/1A
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1.4.Description of Test Facility

EMC Lab	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358 Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2 Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193 Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.5.Measurement Uncertainty

Radiated emission expanded uncertainty (9kHz-30MHz)	:	U=2.66dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	:	U=4.28dB, k=2
Radiated emission expanded uncertainty (1G-18GHz)	:	U=4.98dB, k=2
Radiated emission expanded uncertainty (18G-26.5GHz)	:	U=5.06dB, k=2
Conduction Emission Expanded Uncertainty (Mains ports, 9kHz-30MHz)	:	U=2.72dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

2.1.For Conducted Emission Test

Item	Equipment	Manufacturer	Type	S/N	Calibrated dates	Validity
1.	Test Receiver	Rohde & Schwarz	ESCS30	100307	Jan. 04, 2020	1 Year
2.	L.I.S.N.	Schwarzbeck	NLSK8126	8126431	Jan. 04, 2020	1 Year
3.	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100815	Jan. 04, 2020	1 Year
4.	50ΩCoaxial Switch	Anritsu Corp	MP59B	6200283936	Jan. 04, 2020	1 Year
5.	RF Coaxial Cable (Conducted Emission)	SUHNER	N-2m	No.2	Jan. 04, 2020	1 Year
6.	Measurement Software: ES-K1 V1.71					

2.2.For Radiated Emission Test

Item	Equipment	Manufacturer	Type	S/N	Calibrated dates	Validity
1.	Test Receiver	Rohde & Schwarz	ESR	101817	Jan.04, 2020	1 Year
2.	Spectrum Analyzer	Rohde & Schwarz	FSV40	101495	Jan.04, 2020	1 Year
3.	Pre-Amplifier	Agilent	8447D	294A10619	Jan.04, 2020	1 Year
4.	Pre-Amplifier	Rohde & Schwarz	CBLU11835 40-01	3791	Jan.04, 2020	1 Year
5.	50 Coaxial Switch	Anritsu Corp	MP59B	6200237248	Jan.04, 2020	1 Year
6.	Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan.05, 2020	1 Year
7.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1067	Jan.05, 2020	1 Year
8.	Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan.05, 2020	1 Year
9.	RF Coaxial Cable (Radiated Emission)	SUHNER	N-5m	NO.3	Jan.04, 2020	1 Year
10.	RF Coaxial Cable (Radiated Emission)	SUHNER	N-5m	NO.4	Jan.04, 2020	1 Year

11.	RF Coaxial Cable (Radiated Emission)	SUHNER	N-1m	NO.5	Jan.04, 2020	1 Year
12.	RF Coaxial Cable (Radiated Emission)	SUHNER	N-1m	NO.6	Jan.04, 2020	1 Year
13.	Measurement Software: EZ EMC V1.1.4.2					

3. OPERATION OF EUT DURING TESTING

3.1. Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2402MHz

Middle Channel: 2440MHz

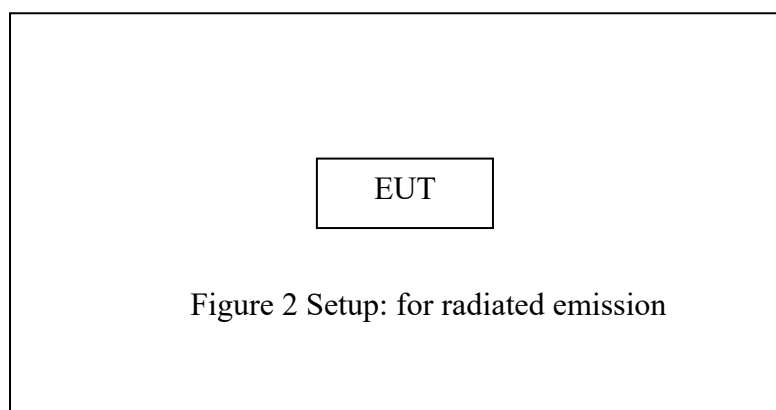
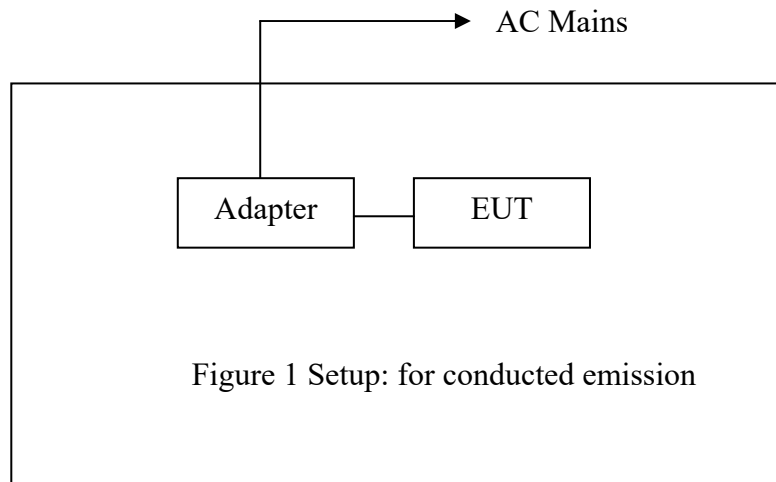
High Channel: 2480MHz

Note: The equipment under test (EUT) was tested under new battery.

The Bluetooth has been tested under continuous transmission mode.

Its duty cycle setting is greater than 98%.

3.2. Configuration and peripherals



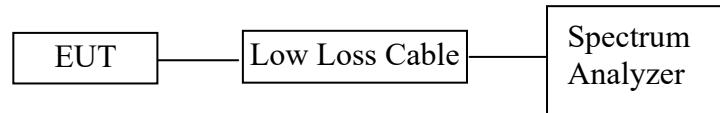
4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.247(a)(2)	6dB Bandwidth Test	Compliant
Section 15.247(b)(3)	Maximum Peak Output Power Test	Compliant
Section 15.247(e)	Power Spectral Density Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d) Section 15.209	Radiated Spurious Emission Test	Compliant
Section 15.207	AC Power Line Conducted Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

Note: The EUT is a pair of Bluetooth headphones. They have the same Bluetooth module and antenna, so we only tested one of them.

5. 6DB BANDWIDTH TEST

5.1. Block Diagram of Test Setup



5.2. The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3. EUT Configuration on Test

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

5.5. Test Procedure

5.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

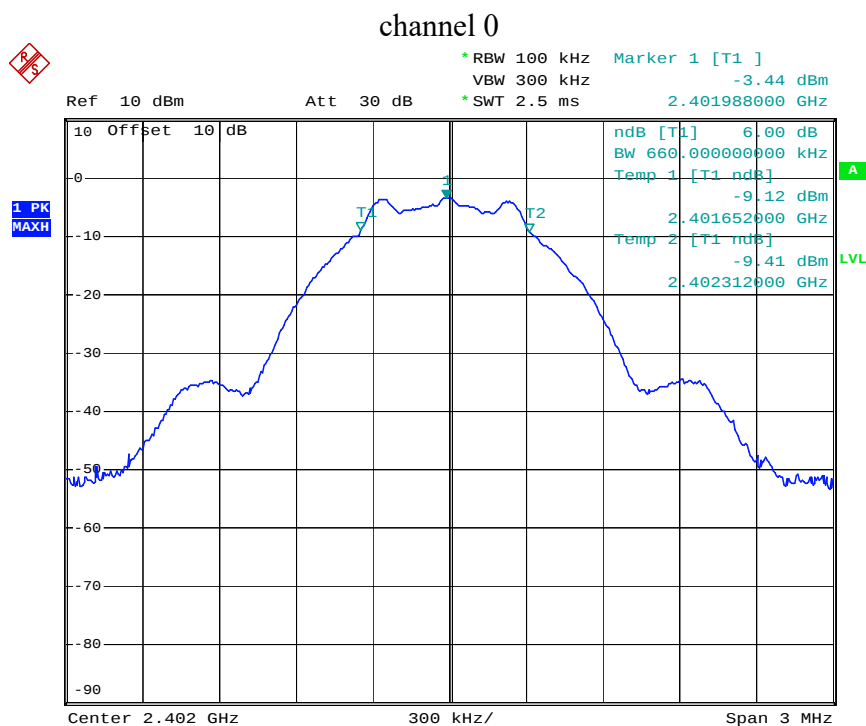
5.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

5.5.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

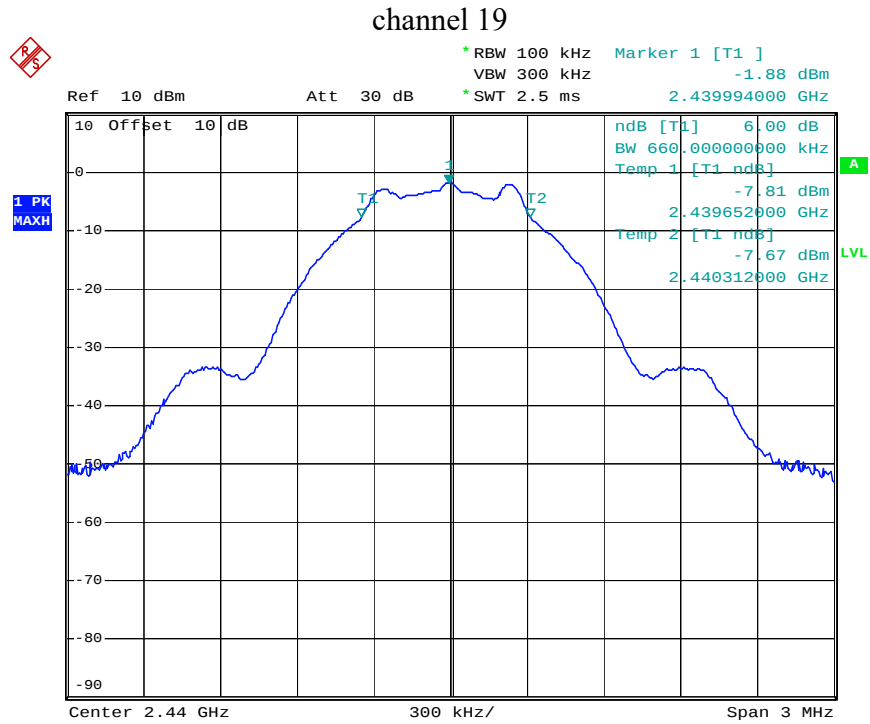
5.6. Test Result

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit(MHz)	Result
0	2402	0.660	0.5	Pass
19	2440	0.660	0.5	Pass
39	2480	0.660	0.5	Pass

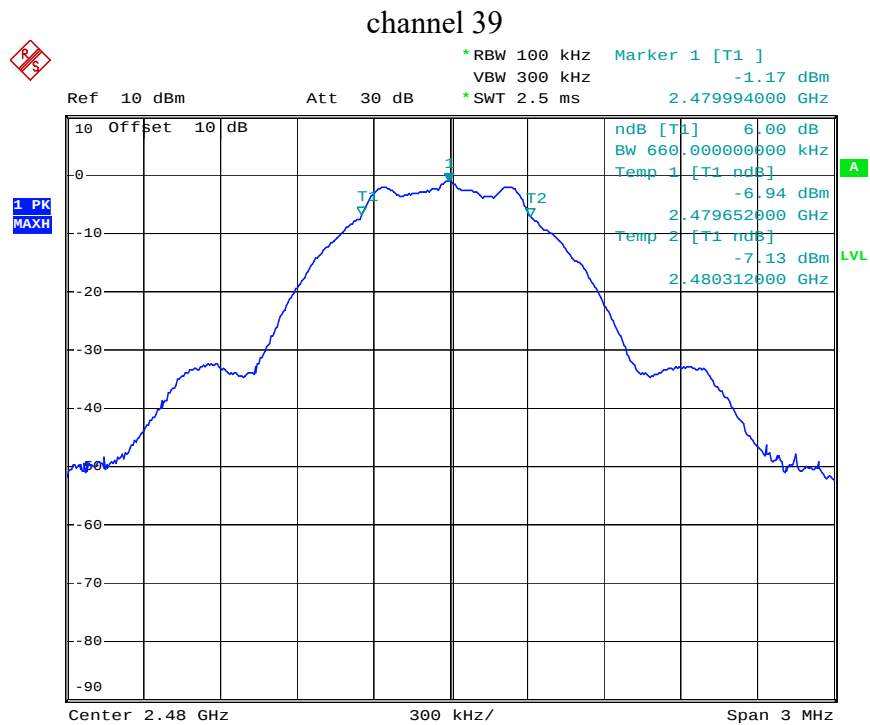
The spectrum analyzer plots are attached as below.



Date: 7.SEP.2020 09:59:09



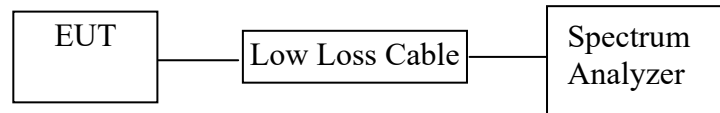
Date: 7.SEP.2020 09:58:05



Date: 7.SEP.2020 09:56:58

6. MAXIMUM PEAK OUTPUT POWER TEST

6.1. Block Diagram of Test Setup



6.2. The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

6.3. EUT Configuration on Test

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

6.5. Test Procedure

6.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

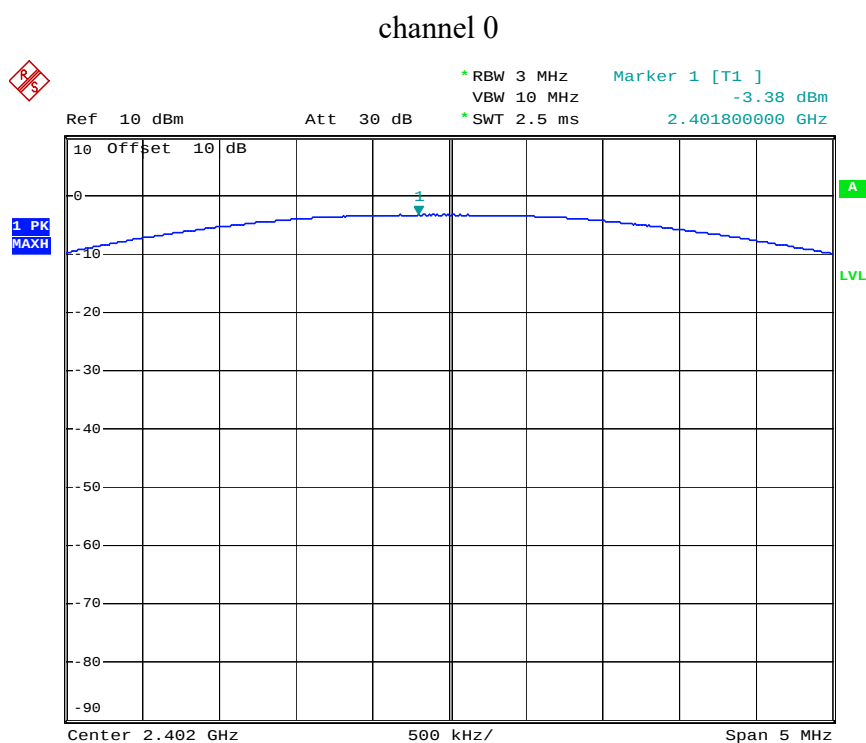
6.5.2. Set RBW of spectrum analyzer to 1 MHz and VBW to 3MHz.

6.5.3. Measurement the maximum peak output power.

6.6. Test Result

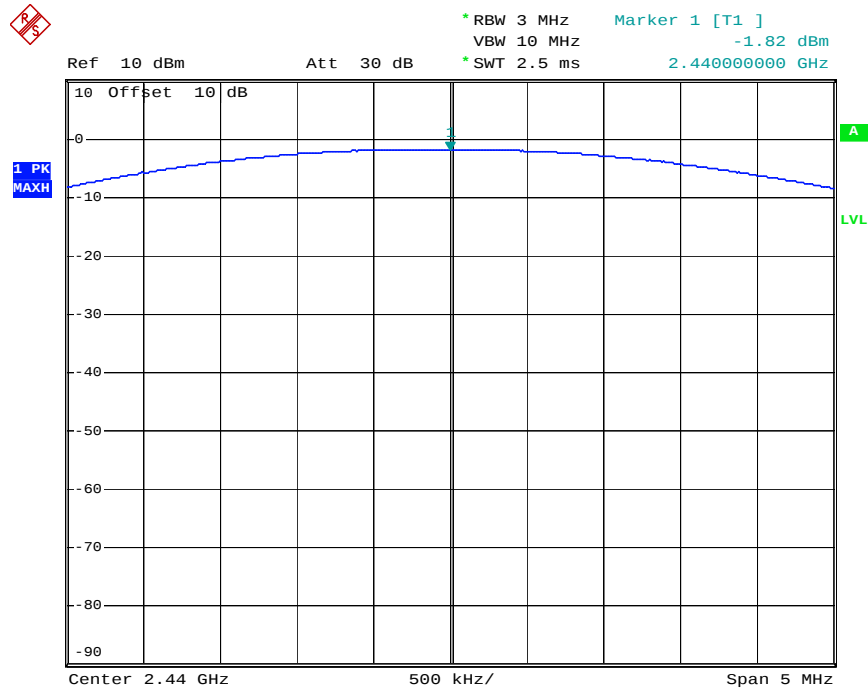
Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Result
0	2402	-3.38	30	Pass
19	2440	-1.82	30	Pass
39	2480	-1.06	30	Pass

The spectrum analyzer plots are attached as below.



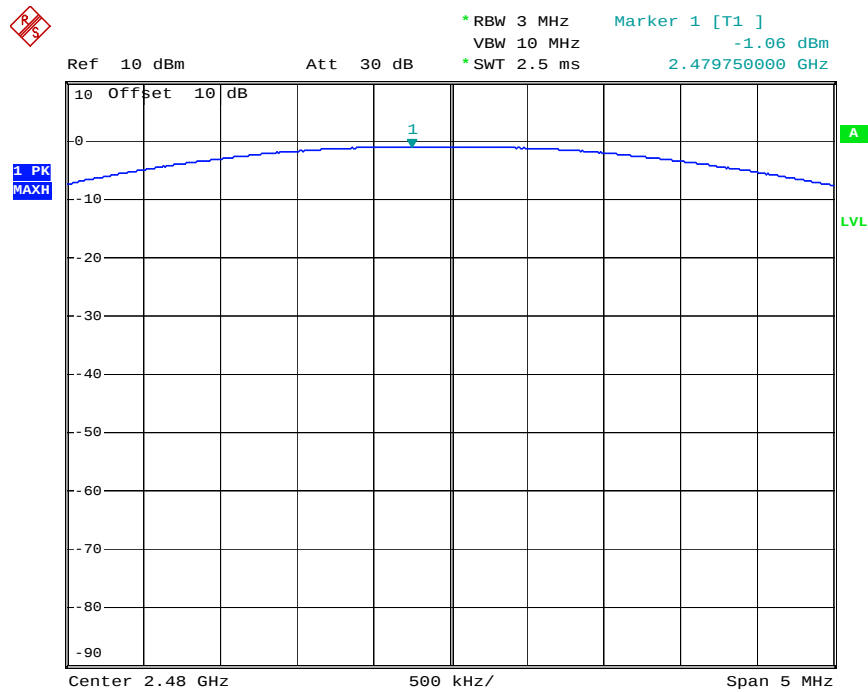
Date: 7.SEP.2020 09:34:06

channel 19



Date: 7.SEP.2020 09:40:13

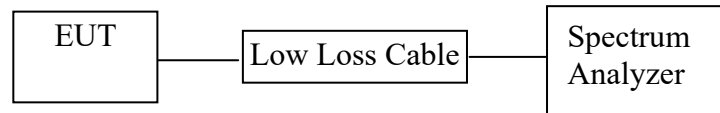
channel 39



Date: 7.SEP.2020 09:35:08

7. POWER SPECTRAL DENSITY TEST

7.1. Block Diagram of Test Setup



7.2. The Requirement For Section 15.247(e)

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

7.3. EUT Configuration on Test

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

7.5. Test Procedure

7.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2. Measurement Procedure PKPSD:

7.5.3. This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3kHz) and repeat.

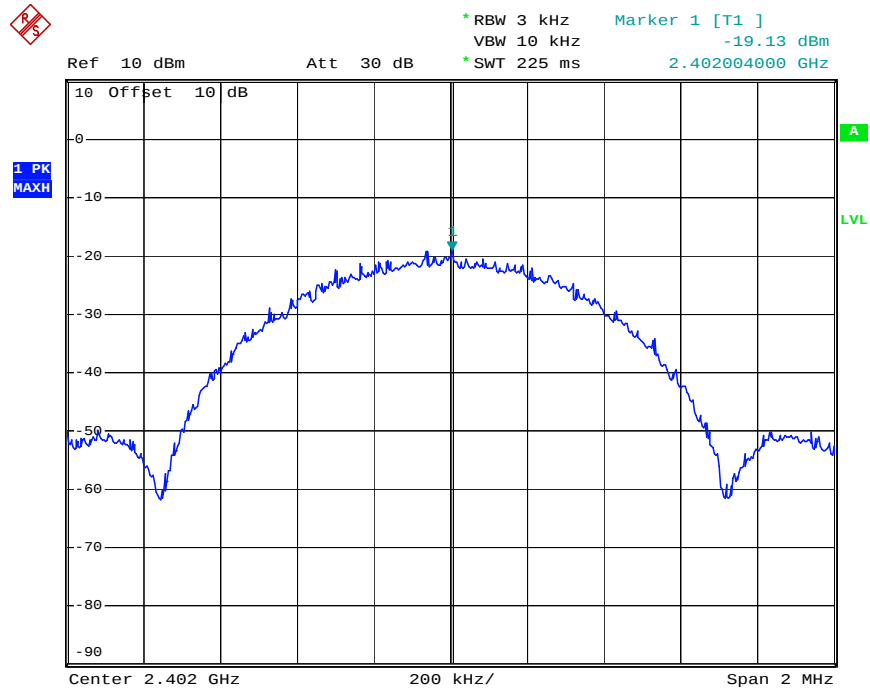
7.5.4. Measurement the maximum power spectral density.

7.6. Test Result

Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
0	2402	-19.13	8	Pass
19	2440	-18.27	8	Pass
39	2480	-17.27	8	Pass

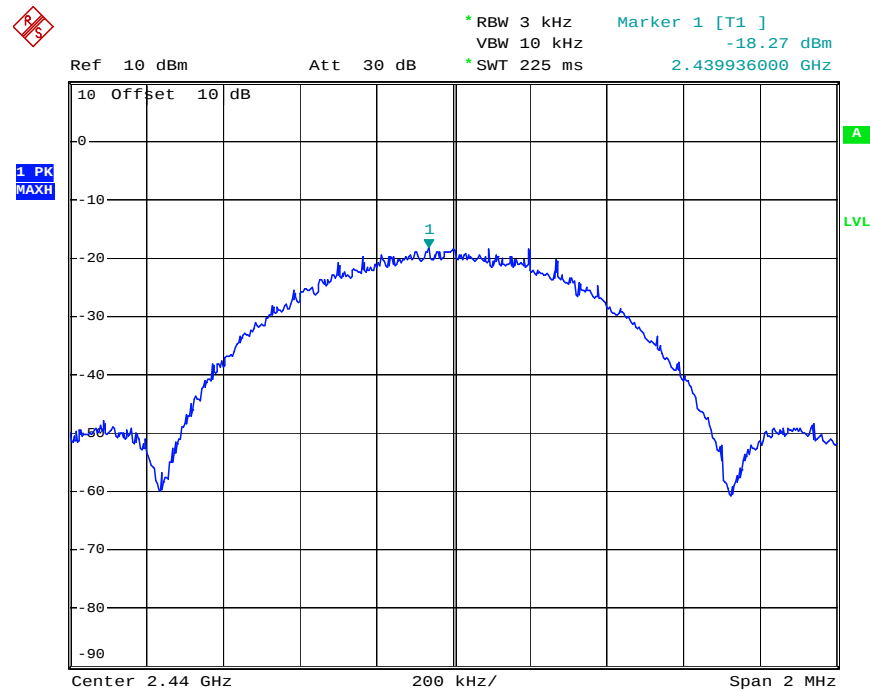
The spectrum analyzer plots are attached as below.

channel 0



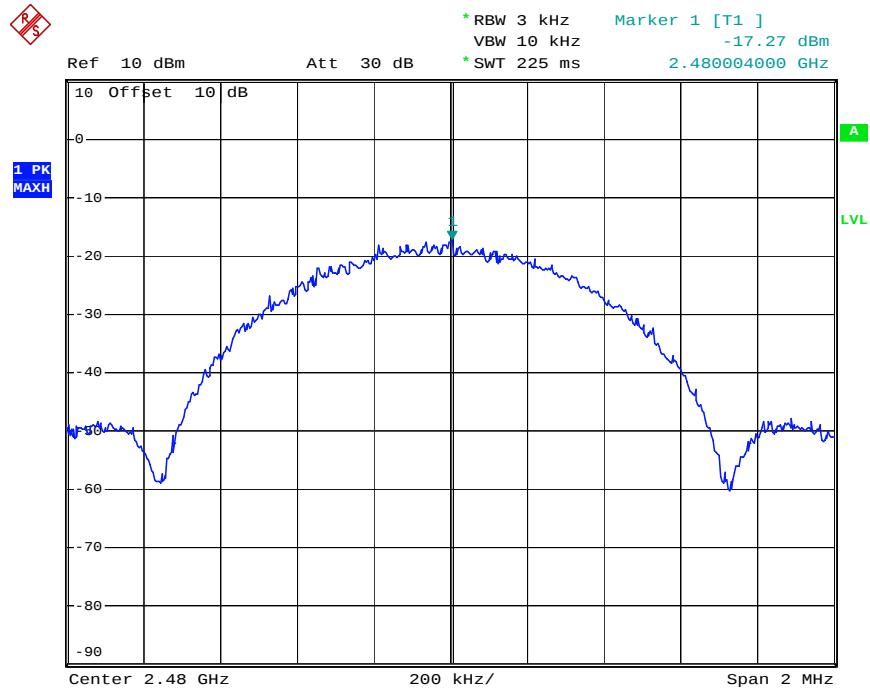
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channel 19



Date: 7.SEP.2020 09:42:51

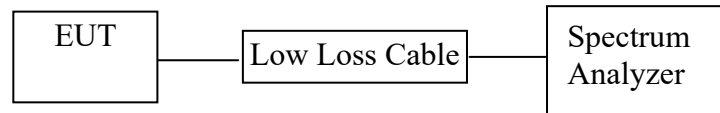
channel 39



Date: 7.SEP.2020 09:44:34

8. BAND EDGE COMPLIANCE TEST

8.1. Block Diagram of Test Setup



8.2. The Requirement For Section 15.247(d)

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

8.3. EUT Configuration on Test

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

8.5. Test Procedure

Conducted Band Edge:

8.5.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

8.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

Radiate Band Edge:

8.5.3. The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.

8.5.4. The turntable was rotated for 360 degrees to determine the position of maximum emission level.

8.5.5. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

8.5.6. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

8.5.7. RBW=1MHz, VBW=1MHz

8.5.8. The band edges was measured and recorded.

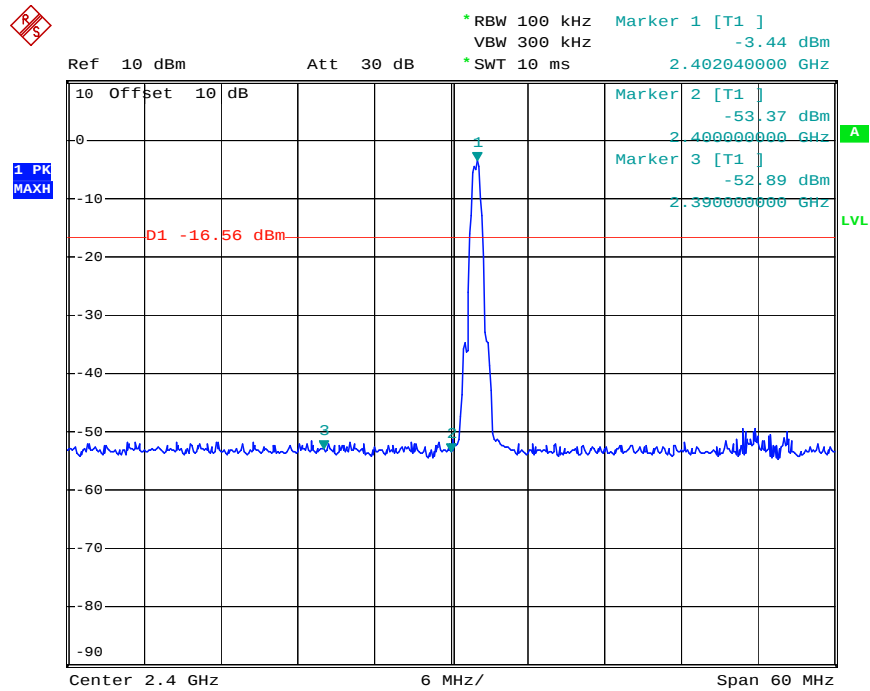
8.6. Test Result

Conducted Band Edge Result

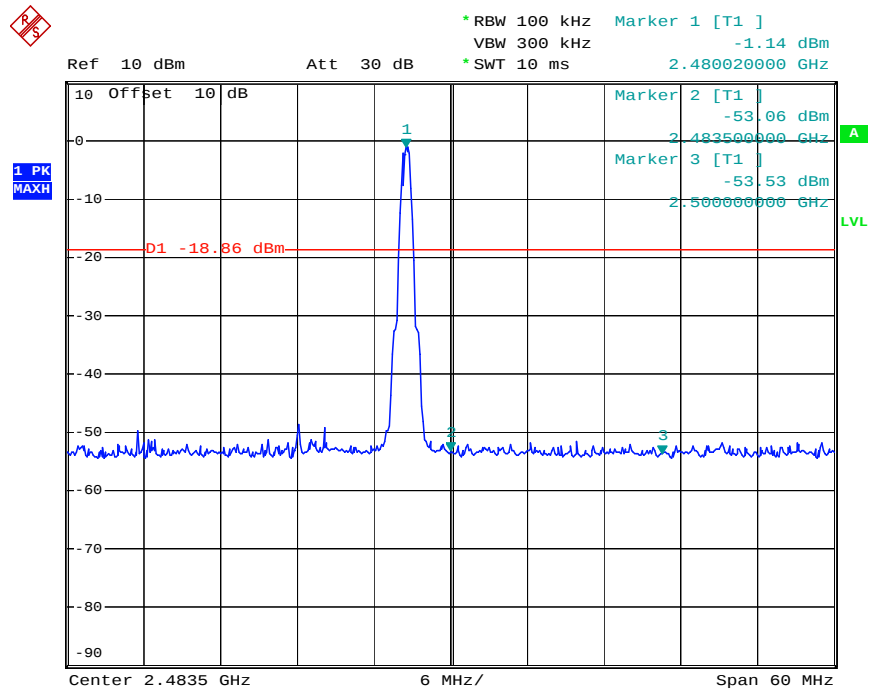
Channel	Frequency	Delta peak to band emission	Limit(dBc)	Result
0	2.402GHz	56.81	>20	Pass
39	2.480GHz	54.20	>20	Pass

The spectrum analyzer plots are attached as below.

channel 0



Date: 7.SEP.2020 09:51:26



Date: 7.SEP.2020 09:53:18

Radiated Band Edge Result



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: Bob #975

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2402MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

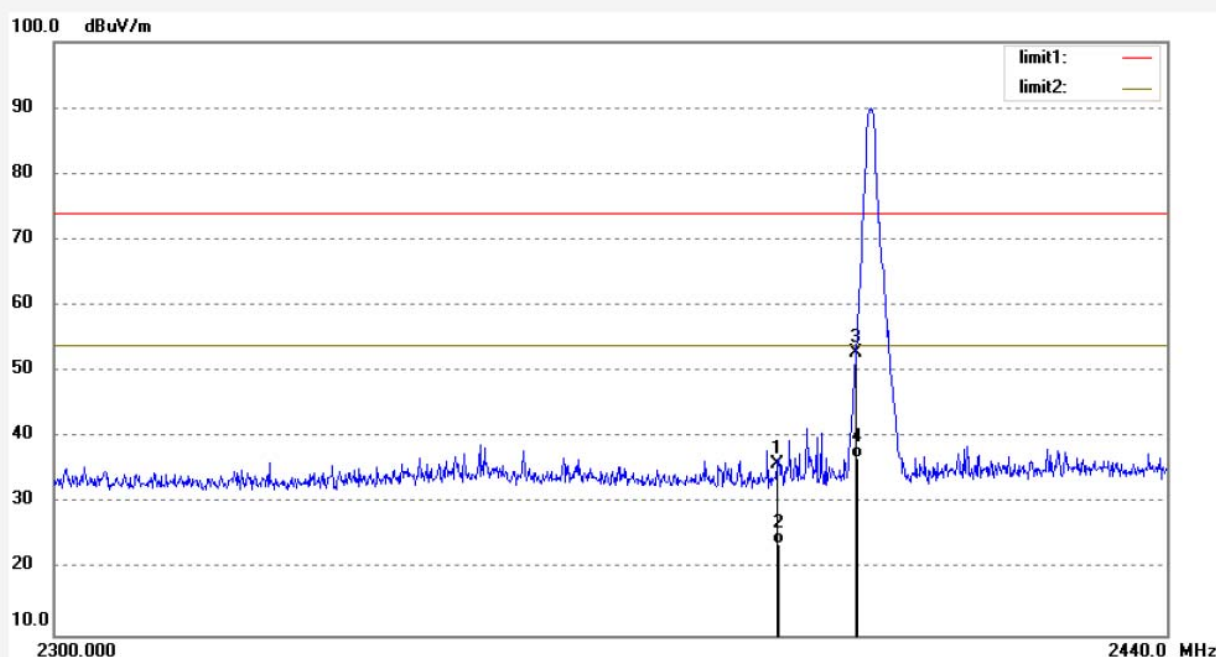
Date: 2020/09/7

Time: 11:55:30

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	42.21	-6.32	35.89	74.00	-38.11	peak	150	135	
2	2390.000	30.22	-6.32	23.90	54.00	-30.10	AVG	150	135	
3	2400.000	59.04	-6.27	52.77	74.00	-21.23	peak	150	196	
4	2400.000	43.07	-6.27	36.80	54.00	-17.20	AVG	150	196	

Job No.: Bob #974

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2402MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal

Power Source: DC 3.7V

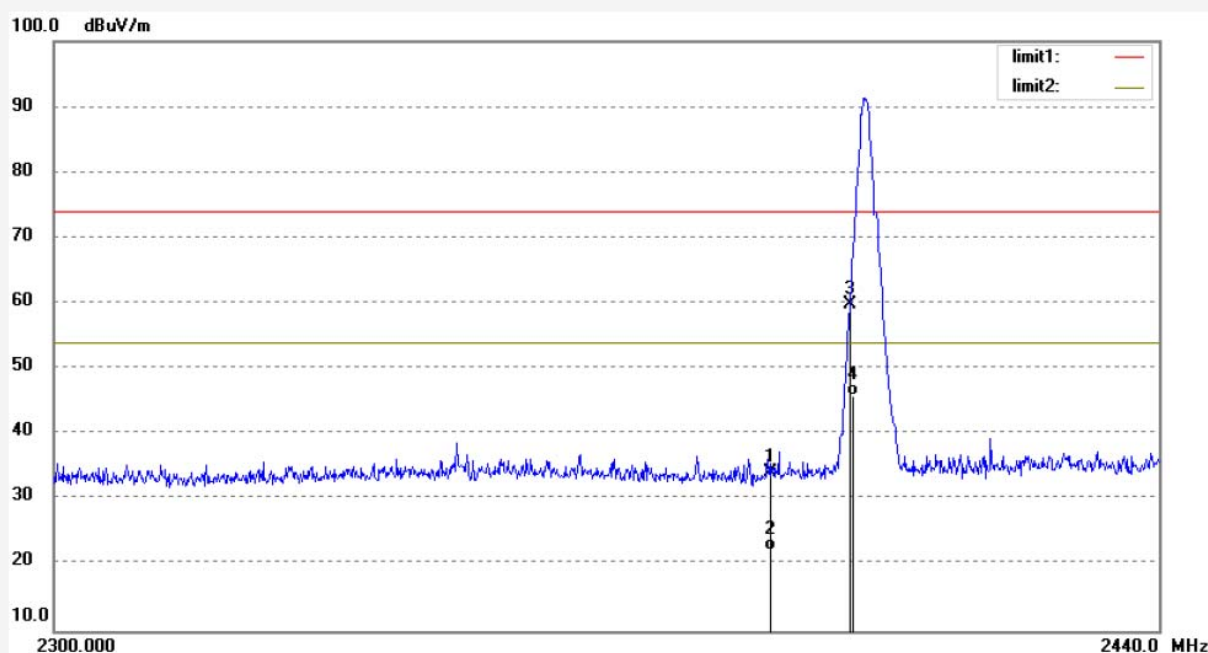
Date: 2020/09/7

Time: 11:49:20

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	40.50	-6.32	34.18	74.00	-39.82	peak	250	156	
2	2390.000	28.52	-6.32	22.20	54.00	-31.80	AVG	250	156	
3	2400.000	66.09	-6.27	59.82	74.00	-14.18	peak	250	215	
4	2400.000	52.07	-6.27	45.80	54.00	-8.20	AVG	250	215	



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Job No.: Bob #973

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2480MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal

Power Source: DC 3.7V

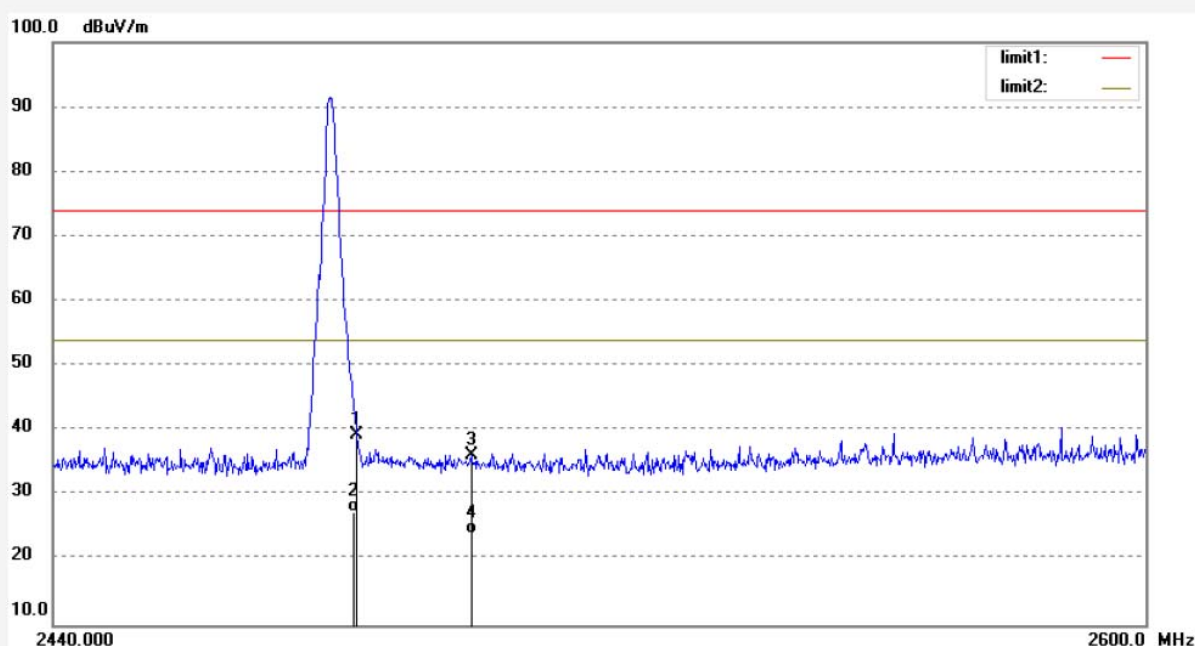
Date: 2020/09/7

Time: 11:45:14

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	45.22	-5.89	39.33	74.00	-34.67	peak	150	145	
2	2483.500	33.29	-5.89	27.40	54.00	-26.60	AVG	150	145	
3	2500.000	41.97	-5.81	36.16	74.00	-37.84	peak	150	256	
4	2500.000	29.91	-5.81	24.10	54.00	-29.90	AVG	150	256	



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Report No.: RTZ200902008-00

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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: Bob #972

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2480MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

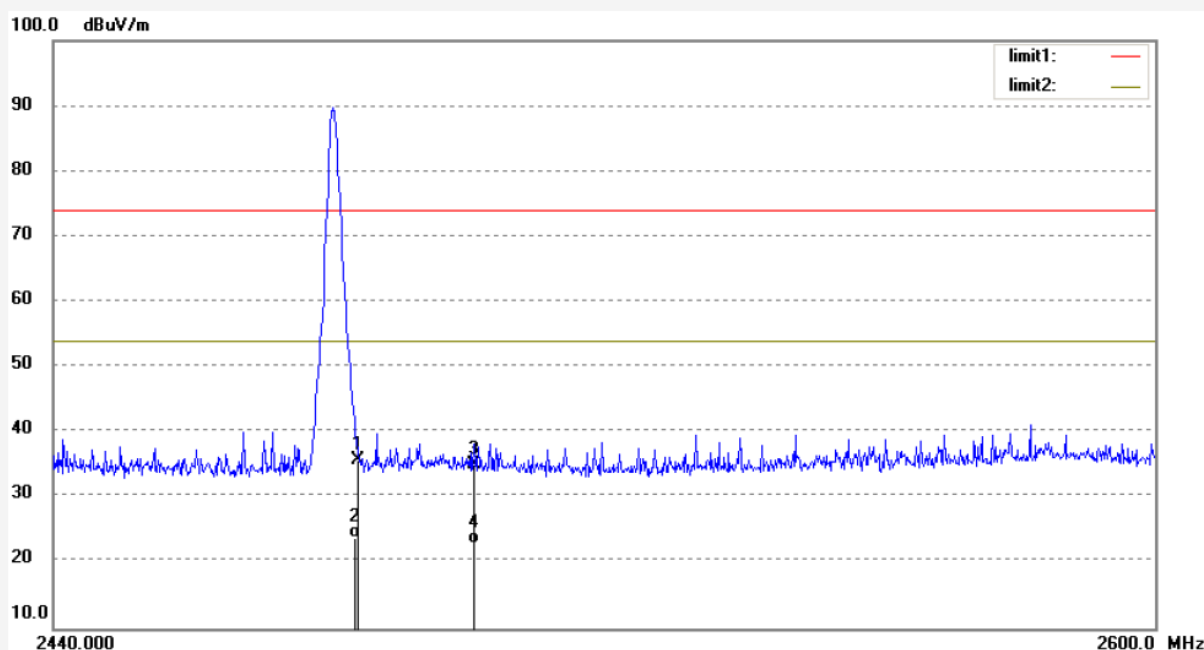
Date: 2020/09/7

Time: 11:40:11

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.350	41.60	-5.89	35.71	74.00	-38.29	peak	250	125	
2	2483.350	29.69	-5.89	23.80	54.00	-30.20	AVG	250	125	
3	2500.000	40.83	-5.81	35.02	74.00	-38.98	peak	250	196	
4	2500.000	28.81	-5.81	23.00	54.00	-31.00	AVG	250	196	

Note:

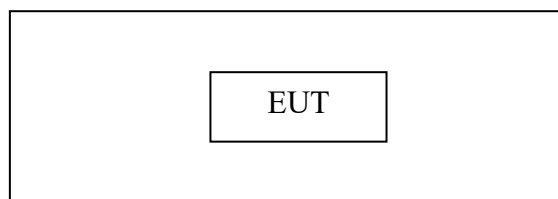
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

9. RADIATED SPURIOUS EMISSION TEST

9.1. Block Diagram of Test Setup

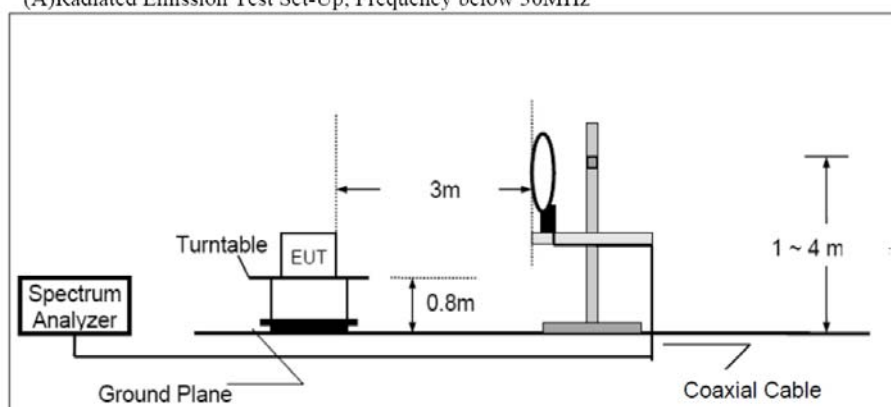
9.1.1. Block diagram of connection between the EUT and peripherals



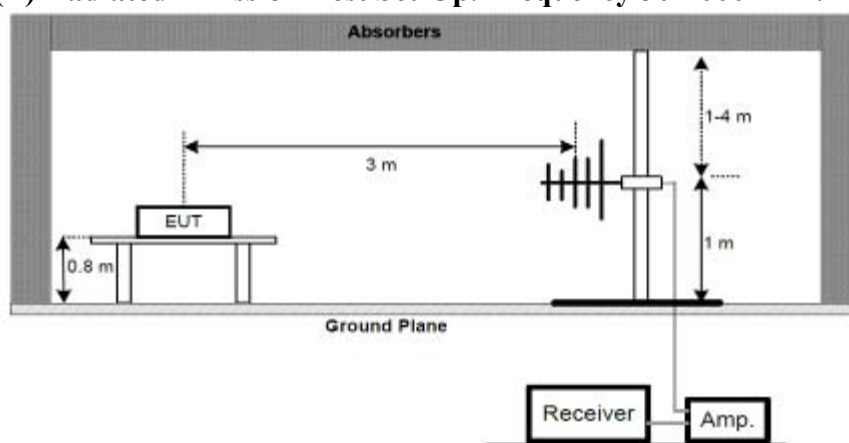
Setup: Transmitting mode

9.1.2. Semi-Anechoic Chamber Test Setup Diagram

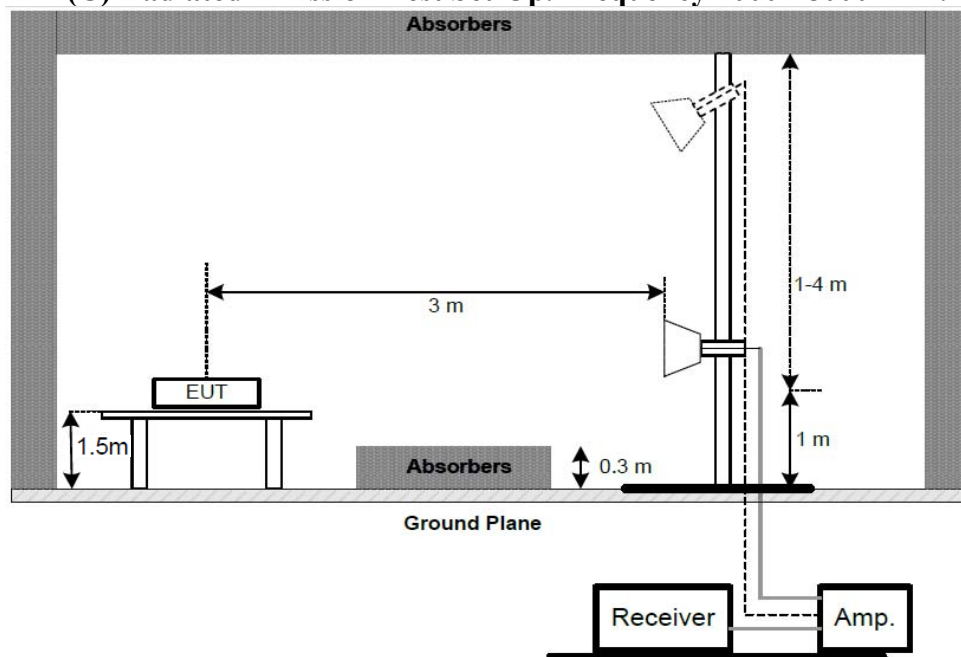
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30-1000MHz.



(C) Radiated Emission Test Set-Up. Frequency 1000-18000MHz.



9.2.The Limit For Section 15.247(d)

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

9.3. Restricted bands of operation

9.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

9.4.Configuration of EUT on Test

The equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.5. Operating Condition of EUT

9.5.1. Setup the EUT and simulator as shown as Section 9.1.

9.5.2. Turn on the power of all equipment.

9.5.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

9.6. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

The bandwidth of test receiver is set at 9 kHz in below 30MHz. and set at 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The final measurement in band 9-90 kHz, 110-490 kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector. The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading.

9.7.Data Sample

Frequency (MHz)	Reading (dB μ v)	Factor (dB/m)	Result (dB μ v/m)	Limit (dB μ v/m)	Margin (dB)	Remark
X.XX	43.85	-22.22	21.63	43.5	-21.87	QP

Frequency(MHz) = Emission frequency in MHz

Reading(dB μ v) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain

Result(dB μ v/m) = Reading(dB μ v) + Factor(dB/m)

Limit (dB μ v/m) = Limit stated in standard

Margin (dB) = Result(dB μ v/m) - Limit (dB μ v/m)

QP = Quasi-peak Reading

Calculation Formula:

Margin(dB) = Result (dB μ V/m)–Limit(dB μ V/m)

Result(dB μ V/m)= Reading(dB μ V)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

9.8.Test Result

Pass.

Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz and 18 to 26.5GHz.

The spectrum analyzer plots are attached as below.

Below 1GHz



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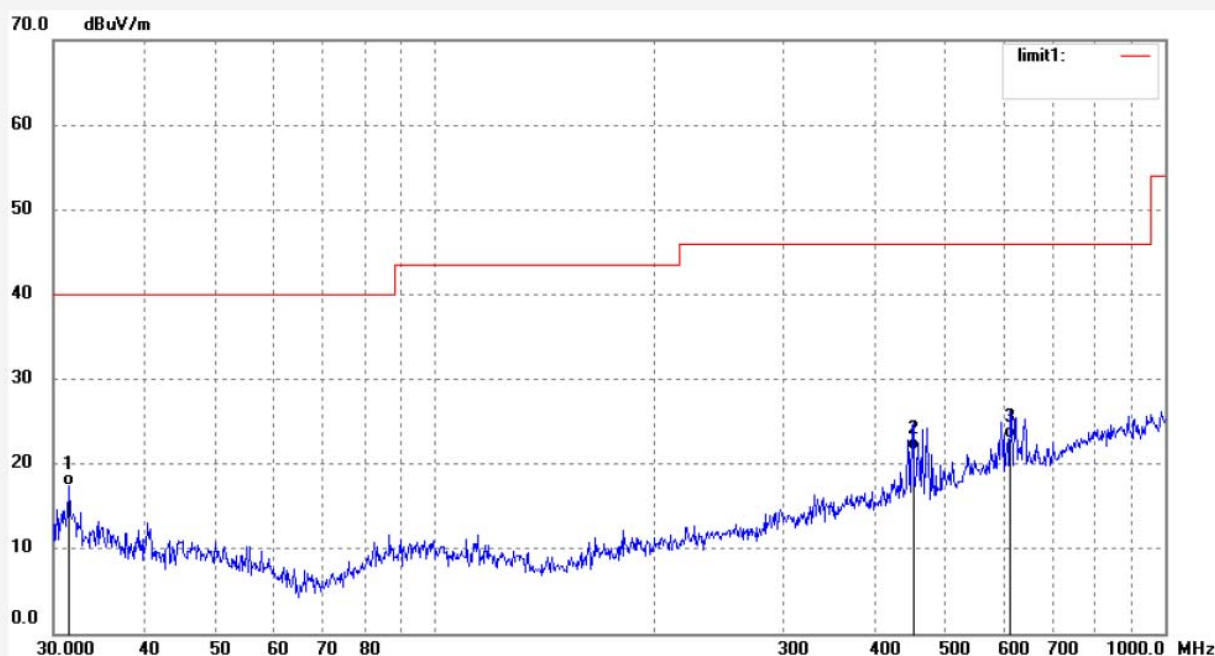
Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: Bob #948
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: True Wireless Stereo Earphones
Mode: TX 2402MHz
Model: TWS800
Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 2020/09/04
Time: 09:57:50
Engineer Signature: Bob
Distance: 3m

Note: Report No.: RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	31.5126	38.92	-21.52	17.40	40.00	-22.60	QP			
2	452.0013	38.98	-17.32	21.66	46.00	-24.34	QP			
3	613.6145	36.84	-13.80	23.04	46.00	-22.96	QP			



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Job No.: Bob #949

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2402MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

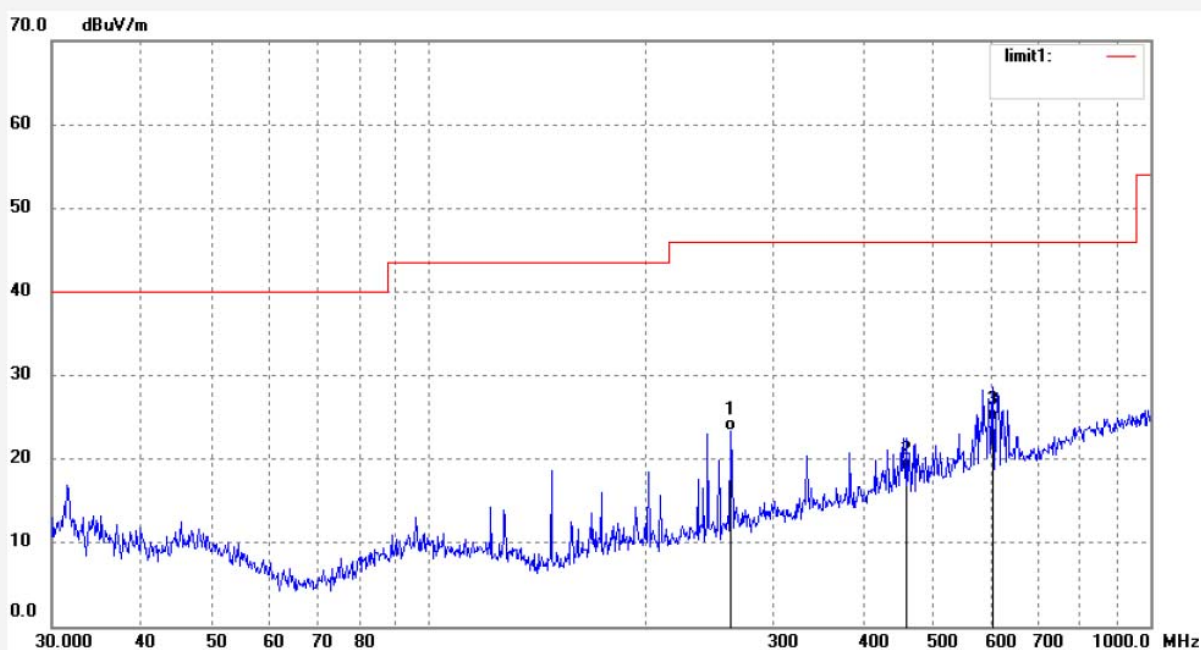
Date: 2020/09/04

Time: 09:59:55

Engineer Signature: Bob

Distance: 3m

Note: Report No.: RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	262.1926	46.48	-23.16	23.32	46.00	-22.68	QP			
2	458.3987	35.87	-17.19	18.68	46.00	-27.32	QP			
3	605.0509	38.47	-13.96	24.51	46.00	-21.49	QP			



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Job No.: Bob #950

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2440MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

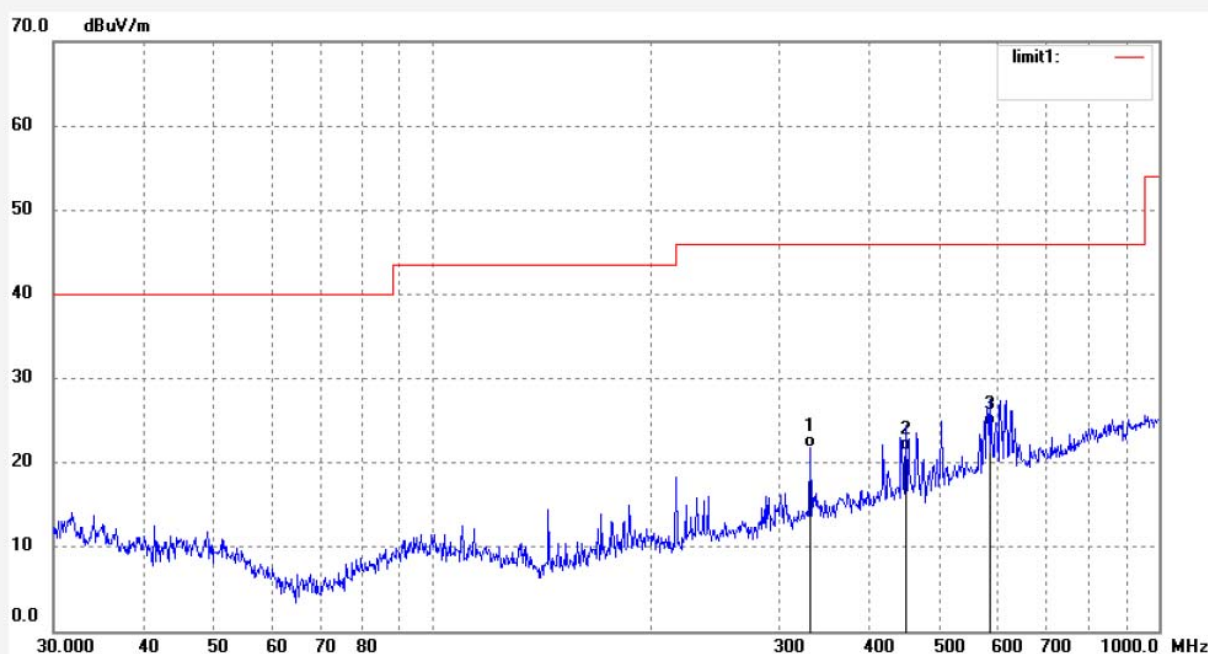
Date: 2020/09/04

Time: 10:02:44

Engineer Signature: Bob

Distance: 3m

Note: Report No.: RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	330.6220	42.13	-20.37	21.76	46.00	-24.24	QP			
2	448.8361	38.74	-17.37	21.37	46.00	-24.63	QP			
3	586.2172	38.56	-14.13	24.43	46.00	-21.57	QP			



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Job No.: Bob #951

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2440MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal

Power Source: DC 3.7V

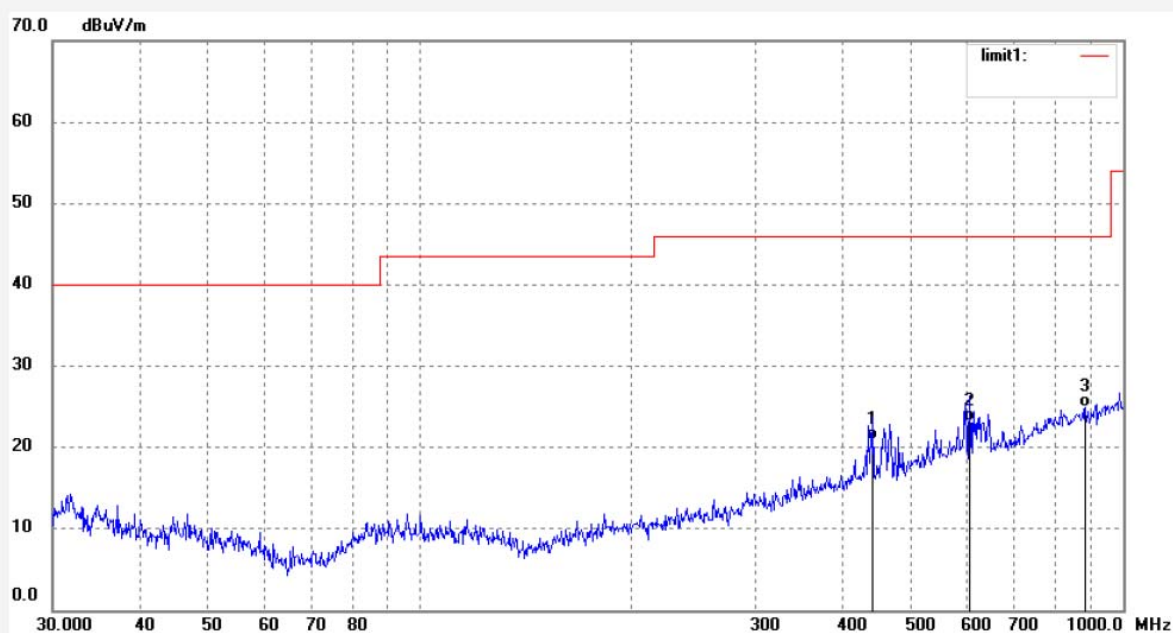
Date: 2020/09/04

Time: 10:05:50

Engineer Signature: Bob

Distance: 3m

Note: Report No.: RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	441.0199	38.41	-17.50	20.91	46.00	-25.09	QP			
2	605.0509	37.11	-13.96	23.15	46.00	-22.85	QP			
3	884.2853	33.87	-8.89	24.98	46.00	-21.02	QP			

Job No.: Bob #952

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2480MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal

Power Source: DC 3.7V

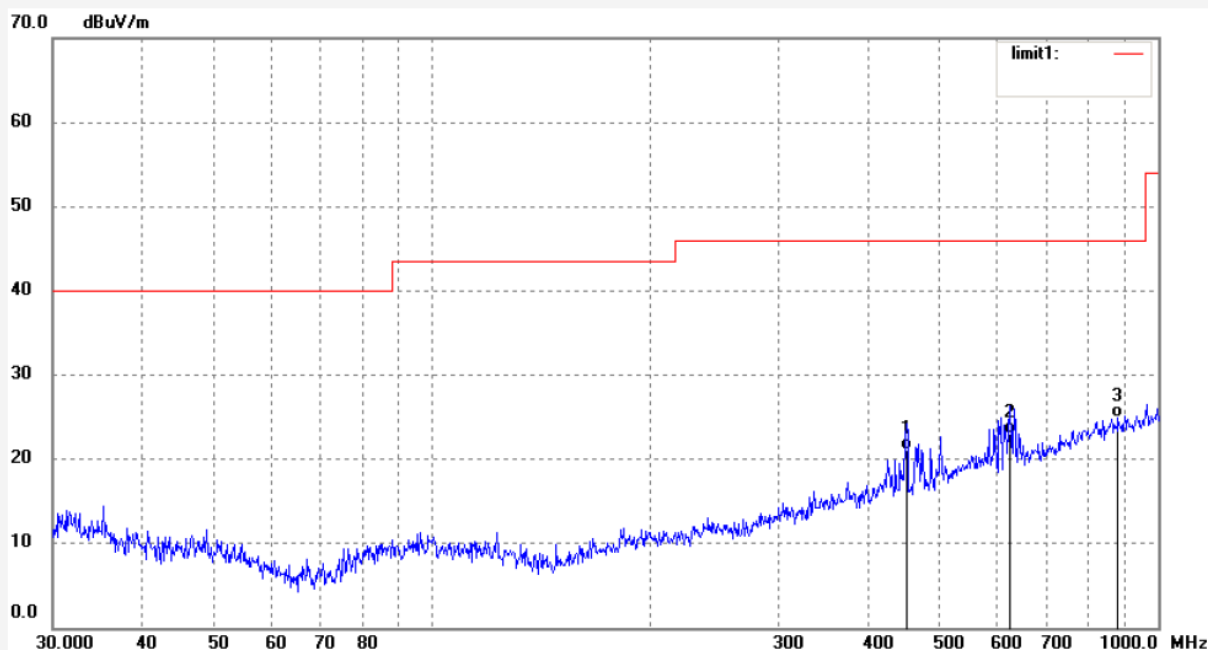
Date: 2020/09/04

Time: 10:08:43

Engineer Signature: Bob

Distance: 3m

Note: Report No.: RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	450.4159	38.47	-17.35	21.12	46.00	-24.88	QP			
2	624.4897	36.65	-13.64	23.01	46.00	-22.99	QP			
3	881.1838	33.87	-8.93	24.94	46.00	-21.06	QP			



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Job No.: Bob #953

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2480MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

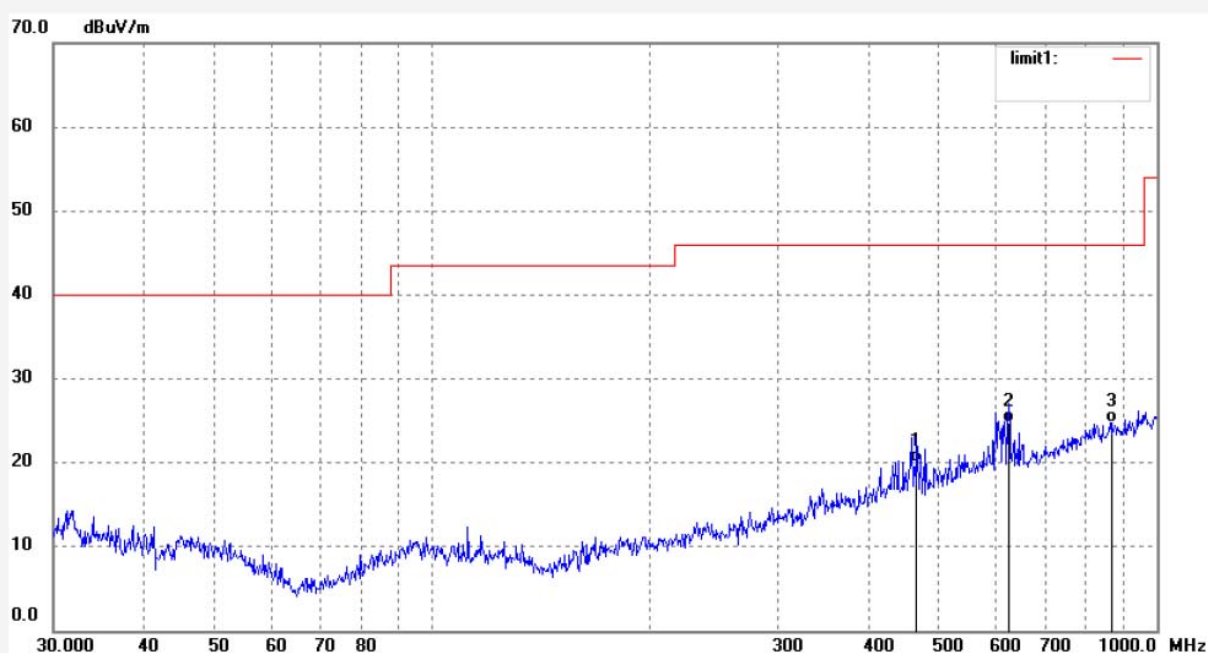
Date: 2020/09/04

Time: 10:11:54

Engineer Signature: Bob

Distance: 3m

Note: Report No.: RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	466.5230	37.02	-17.05	19.97	46.00	-26.03	QP			
2	624.4897	38.41	-13.64	24.77	46.00	-21.23	QP			
3	868.8860	33.78	-9.04	24.74	46.00	-21.26	QP			

Above 1GHz



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Job No.: Bob #966

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2402MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

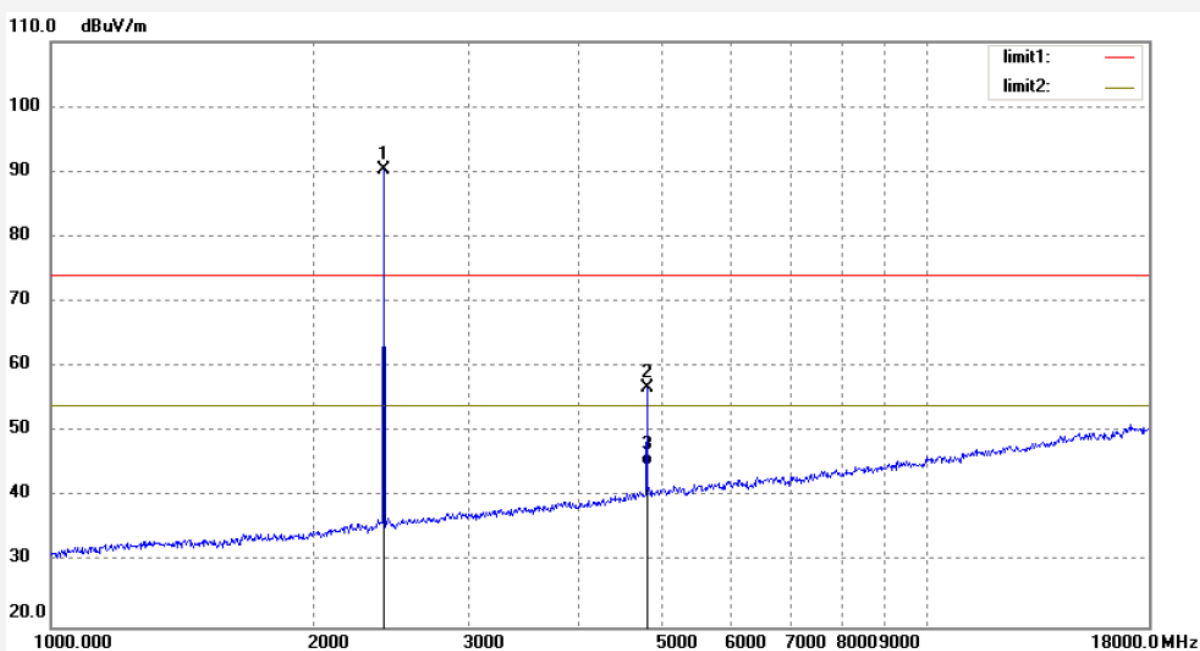
Date: 2020/09/7

Time: 11:20:01

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	96.58	-6.27	90.31			peak	150	152	
2	4804.000	55.88	1.00	56.88	74.00	-17.12	peak	150	196	
3	4804.000	43.80	1.00	44.80	54.00	-9.20	AVG	150	196	



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Job No.: Bob #967

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2402MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal

Power Source: DC 3.7V

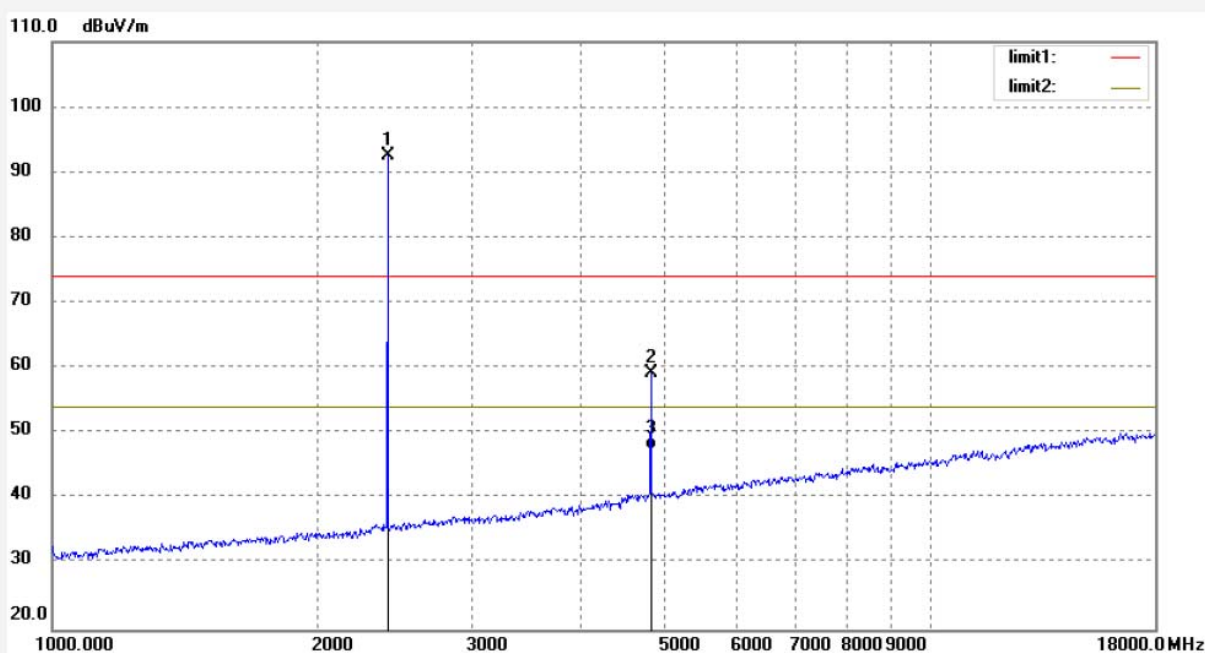
Date: 2020/09/7

Time: 11:23:24

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	98.76	-6.24	92.52			peak	250	156	
2	4804.000	58.36	1.00	59.36	74.00	-14.64	peak	250	175	
3	4804.000	46.50	1.00	47.50	54.00	-6.50	AVG	250	175	

Job No.: Bob #968

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2440MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

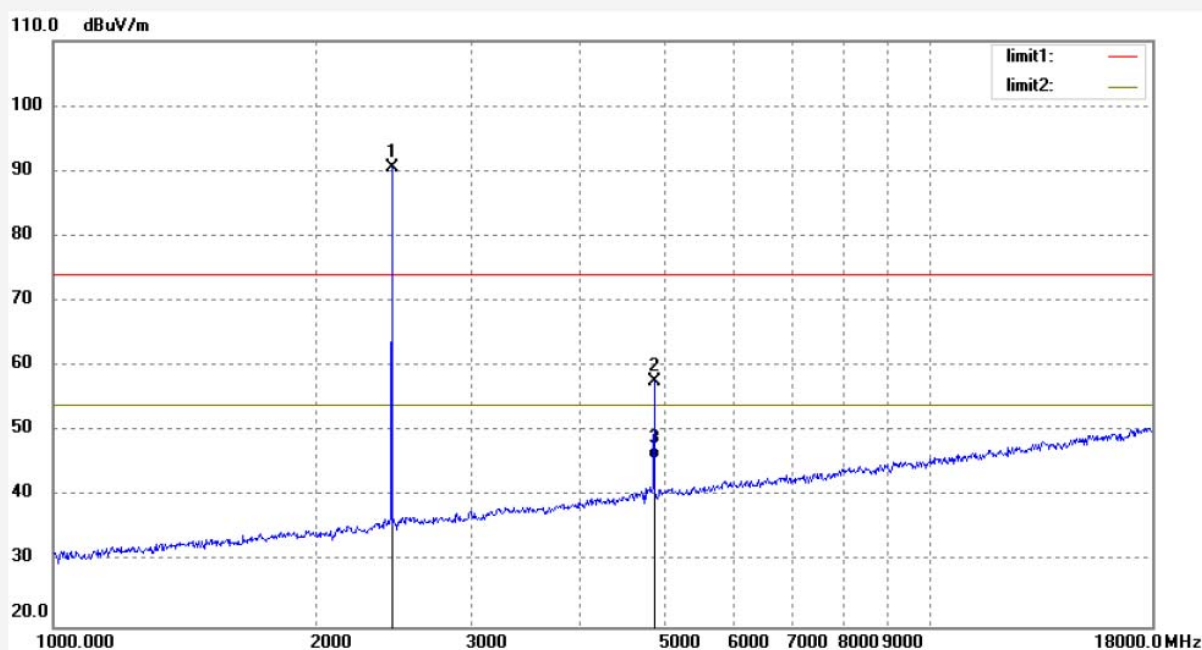
Date: 2020/09/7

Time: 11:27:35

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.000	96.56	-6.10	90.46			peak	150	129	
2	4880.000	56.41	1.25	57.66	74.00	-16.34	peak	150	186	
3	4880.000	44.55	1.25	45.80	54.00	-8.20	AVG	150	186	

Job No.: Bob #969

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2440MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal

Power Source: DC 3.7V

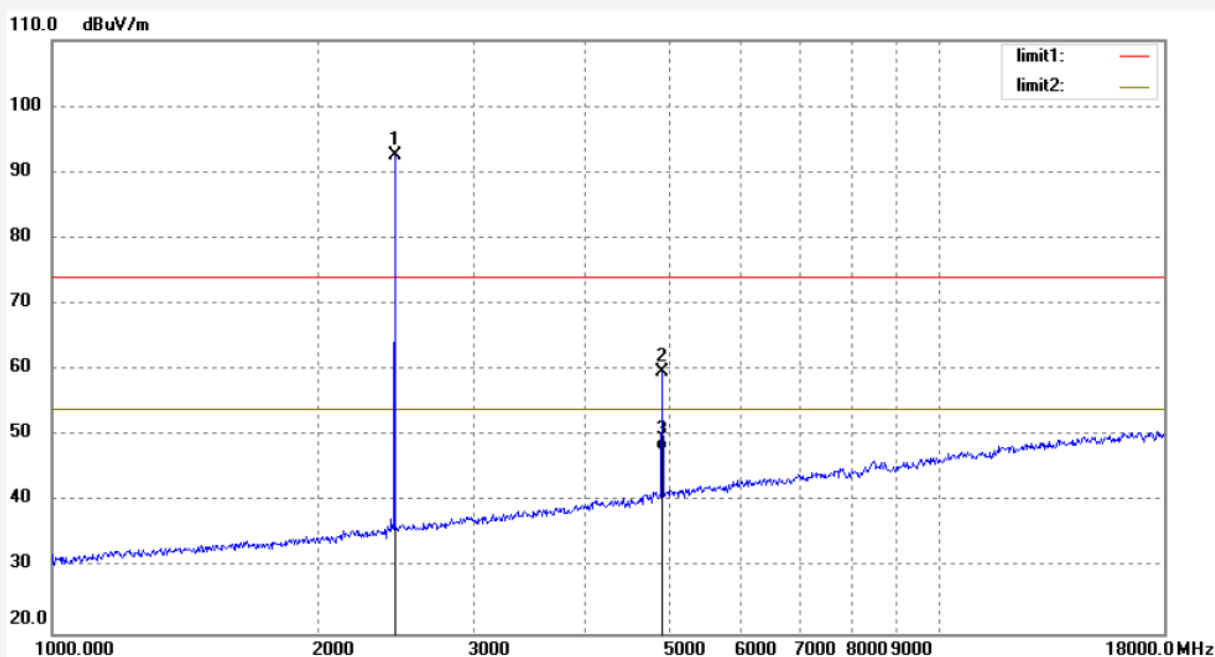
Date: 2020/09/7

Time: 11:30:07

Engineer Signature: Bob

Distance: 3m

Note: Report NO.:RTZ200902008-00

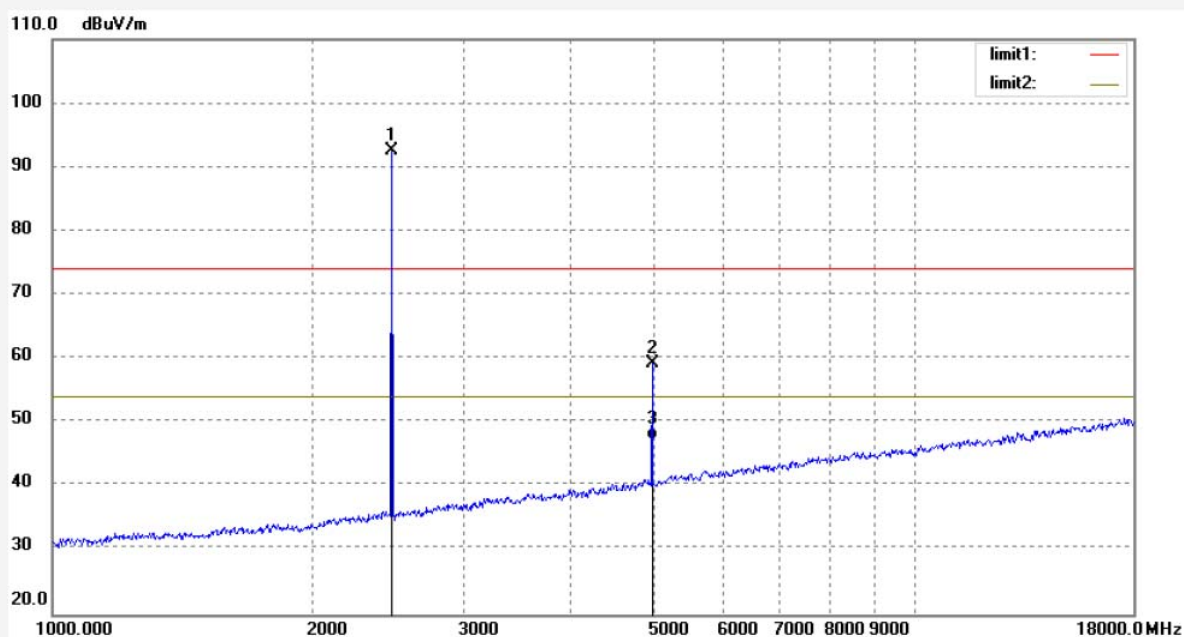


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.000	98.66	-6.10	92.56			peak	250	156	
2	4880.000	58.28	1.36	59.64	74.00	-14.36	peak	250	196	
3	4880.000	46.34	1.36	47.70	54.00	-6.30	AVG	250	196	

Job No.: Bob #970
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: True Wireless Stereo Earphones
Mode: TX 2480MHz
Model: TWS800
Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Horizontal
Power Source: DC 3.7V
Date: 2020/09/7
Time: 11:33:20
Engineer Signature: Bob
Distance: 3m

Note: Report NO.:RTZ200902008-00



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	98.43	-5.90	92.53			peak	250	136	
2	4960.000	57.59	1.75	59.34	74.00	-14.66	peak	250	186	
3	4960.000	45.65	1.75	47.40	54.00	-6.60	AVG	250	186	

Job No.: Bob #971

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: True Wireless Stereo Earphones

Mode: TX 2480MHz

Model: TWS800

Manufacturer: Head-Direct (Kunshan) Co., LTD

Polarization: Vertical

Power Source: DC 3.7V

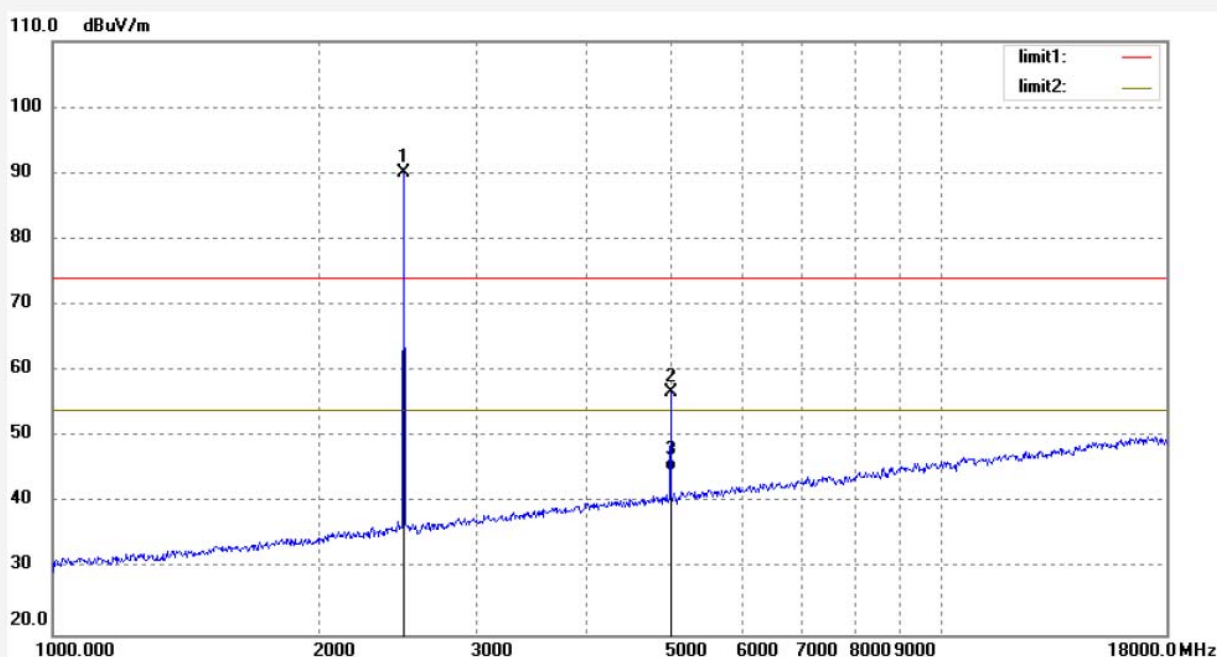
Date: 2020/09/7

Time: 11:33:50

Engineer Signature: Bob

Distance: 3m

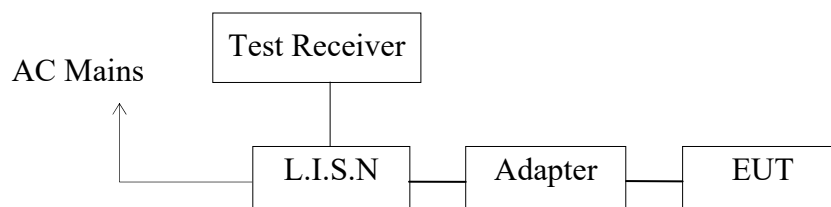
Note: Report NO.:RTZ200902008-00



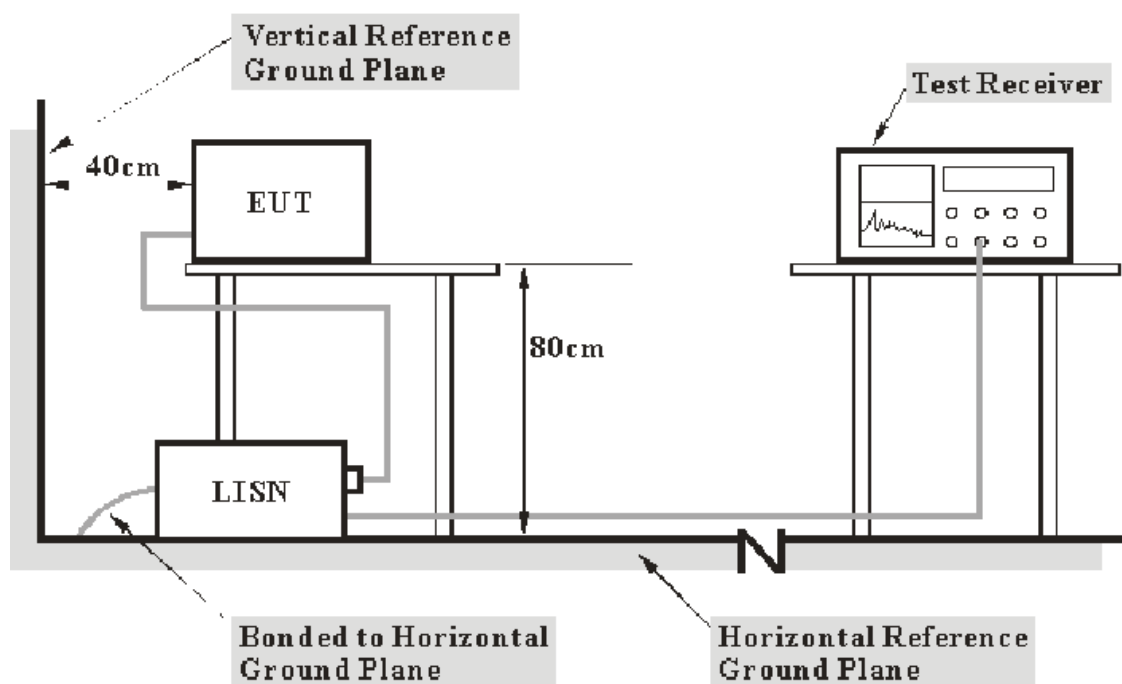
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	95.86	-5.87	89.99			peak	150	102	
2	4960.000	55.10	1.75	56.85	74.00	-17.15	peak	150	163	
3	4960.000	43.15	1.75	44.90	54.00	-9.10	AVG	150	163	

10. POWER LINE CONDUCTED EMISSION TEST

10.1. Block Diagram of Test Setup



10.2. Test System Setup



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

10.3.Test Limits

Frequency (MHz)	Limit dB(μV)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies.		
NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

10.4.Configuration of EUT on Test

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

10.5.Operating Condition of EUT

10.5.1.Setup the EUT and simulator as shown as Section 10.1.

10.5.2.Turn on the power of all equipment.

10.5.3.Let the EUT work in test mode and measure it.

10.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10: 2013 on Conducted Emission Measurement.

The bandwidth of test receiver is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

10.7.Data Sample

Frequency (MHz)	Transducer value (dB)	QuasiPeak Level (dBμV)	Average Level (dBμV)	QuasiPeak Limit (dBμV)	Average Limit (dBμV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	10.5	51.1	34.2	56.0	46.0	4.9	11.8	Pass

Frequency(MHz) = Emission frequency in MHz

Transducer value(dB) = Insertion loss of LISN + Cable Loss

Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

Margin = Limit (dBμV) - Level (dBμV)

10.8.Test Result

Pass.

The frequency range from 150kHz to 30MHz is checked.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

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

All data was recorded in the Quasi-peak and average detection mode.

The spectral diagrams are attached as below.

ACCURATE TECHNOLOGY CO.,LTD

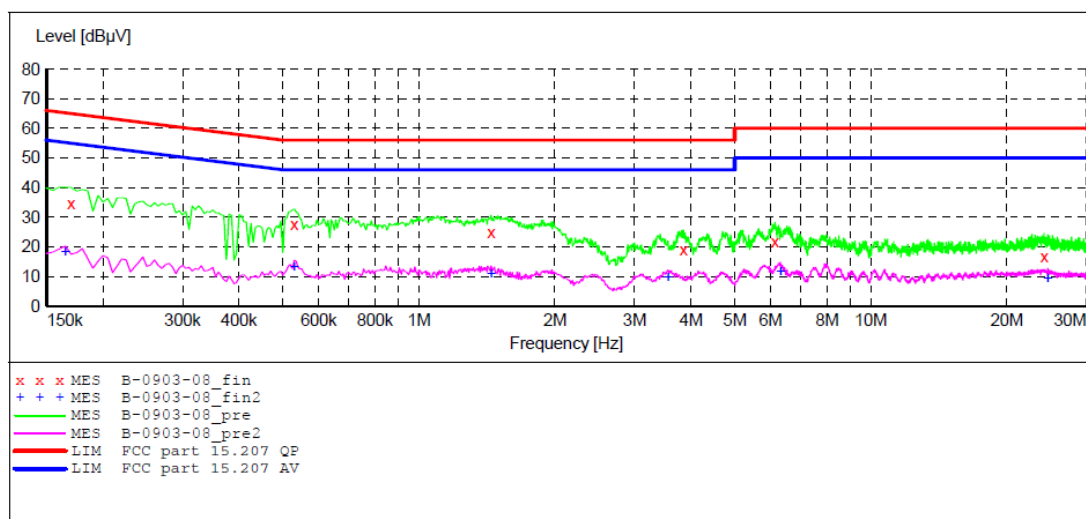
CONDUCTED EMISSION STANDARD FCC part 15.207

EUT: True Wireless Stereo Earphones M/N: TWS800
 Manufacturer: Head-Direct (Kunshan) Co., LTD
 Operating Condition: Charging
 Test Site: 1#Shielding Room
 Operator: Bob
 Test Specification: L 120V/60Hz
 Comment: Report No.: RTZ200902008-00
 Start of Test: 9/3/2020 / 3:59:42PM

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "B-0903-08_fin"

9/3/2020 4:03PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.170000	34.50	10.5	65	30.5	QP	L1	GND
0.530000	27.50	10.7	56	28.5	QP	L1	GND
1.445000	24.70	10.9	56	31.3	QP	L1	GND
3.850000	19.00	11.1	56	37.0	QP	L1	GND
6.140000	21.50	11.2	60	38.5	QP	L1	GND
24.190000	16.70	11.5	60	43.3	QP	L1	GND

MEASUREMENT RESULT: "B-0903-08_fin2"

9/3/2020 4:03PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.165000	18.00	10.5	55	37.2	AV	L1	GND
0.530000	13.30	10.7	46	32.7	AV	L1	GND
1.445000	10.70	10.9	46	35.3	AV	L1	GND
3.560000	9.60	11.1	46	36.4	AV	L1	GND
6.310000	11.60	11.2	50	38.4	AV	L1	GND
24.640000	9.30	11.5	50	40.7	AV	L1	GND

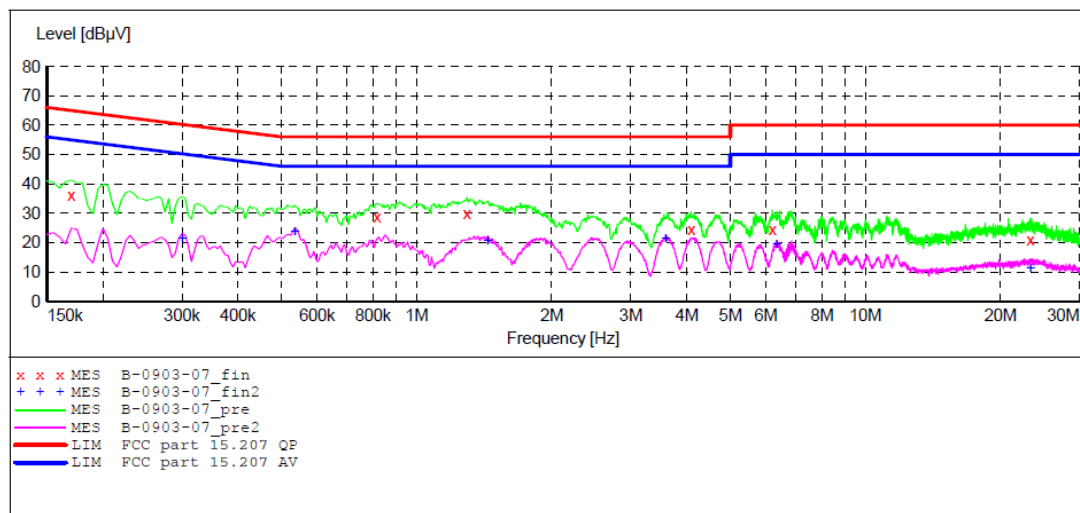
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC part 15.207

EUT: True Wireless Stereo Earphones M/N: TWS800
 Manufacturer: Head-Direct (Kunshan) Co., LTD
 Operating Condition: Charging
 Test Site: 1#Shielding Room
 Operator: Bob
 Test Specification: N 120V/60Hz
 Comment: Report No.: RTZ200902008-00
 Start of Test: 9/3/2020 / 3:55:22PM

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008
 Average
 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "B-0903-07_fin"

9/3/2020 3:58PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.170000	36.10	10.5	65	28.9	QP	N	GND
0.815000	28.70	10.8	56	27.3	QP	N	GND
1.295000	29.70	10.9	56	26.3	QP	N	GND
4.090000	24.30	11.1	56	31.7	QP	N	GND
6.200000	24.50	11.2	60	35.5	QP	N	GND
23.320000	20.80	11.5	60	39.2	QP	N	GND

MEASUREMENT RESULT: "B-0903-07_fin2"

9/3/2020 3:58PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.300000	21.20	10.6	50	29.0	AV	N	GND
0.535000	23.70	10.7	46	22.3	AV	N	GND
1.440000	20.50	10.9	46	25.5	AV	N	GND
3.590000	21.30	11.1	46	24.7	AV	N	GND
6.350000	19.50	11.2	50	30.5	AV	N	GND
23.305000	11.30	11.5	50	38.7	AV	N	GND

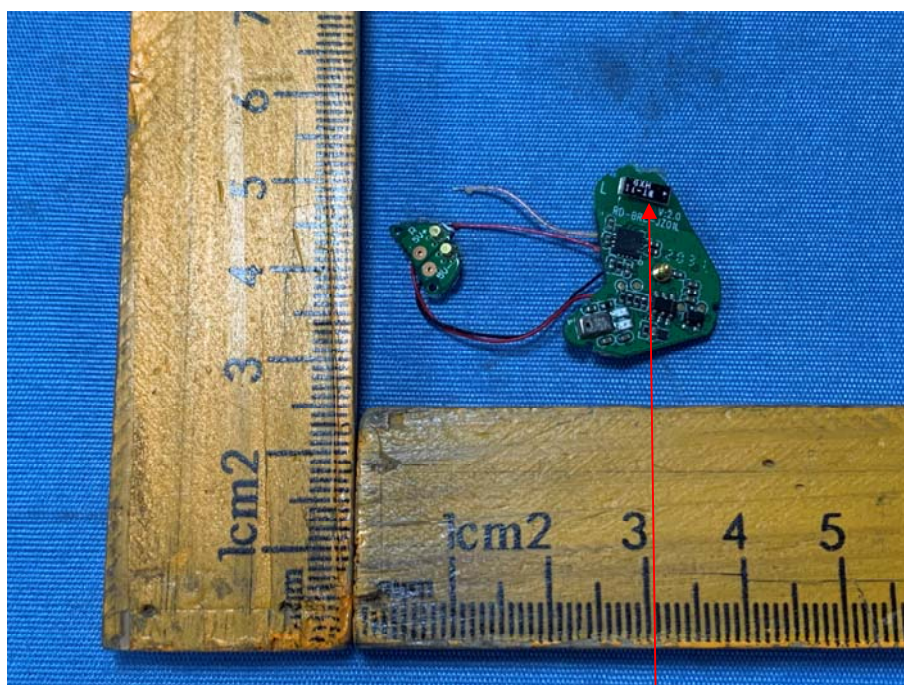
11.ANTENNA REQUIREMENT

11.1.The Requirement

According to 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.

11.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Max Antenna gain of EUT is 2dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna

***** End of Test Report *****