APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Head-Direct (Kunshan) Co., LTD

Wireless Headphone
Model No.: ANANDA-BT

FCC ID: 2ATP3-ANANDABT

Prepared for	:	Head-Direct (Kunshan) Co., LTD
Address	:	No.88, Xueyuan Road, Bacheng Town, Kunshan City, Jiangsu Province, China
Prepared by	:	Shenzhen Accurate Technology Co., Ltd.
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Report No.	:	ATE20191067
Date of Test	:	July 20-24, 2019
Date of Report	:	July 29, 2019

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Test Report Certification

Applicant	:	Head-Direct (Kunshan) Co., LTD
Manufacturer	:	Head-Direct (Kunshan) Co., LTD
EUT Description	:	Wireless Headphone
Model No.	:	ANANDA-BT

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 August 24, 2018 KDB558074 D01 DTS Meas Guidance v05 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 :	July 20-24, 2019
Date of Report :	July 29, 2019

Prepared by : _____
(Bob Wang, Engineer)

Approved & Authorized Signer : _____
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

Model Number	:	ANANDA-BT
Bluetooth version	:	V4.2
Frequency Range	:	2402MHz-2480MHz
Number of Channels	:	40
Antenna Gain(Max)	:	1.8dBi
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.88, Xueyuan Road, Bacheng Town, Kunshan City, Jiangsu Province, China
Manufacturer	:	Head-Direct (Kunshan) Co., LTD
Address	:	No.88, Xueyuan Road, Bacheng Town, Kunshan City, Jiangsu Province, China

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

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 (ISEDC)
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
Conduction Emission Expanded Uncertainty (Telecommunication ports, 150kHz-30MHz)	:	U=2.94dB, k=2
Power disturbance Expanded Uncertainty	:	U=2.92dB, k=2
Harmonic current expanded uncertainty	:	U=0.512%, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Cal. Interval
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 05, 2019	One Year
EMI Test Receiver	Rohde&Schwarz	ESR	101817	Jan. 05, 2019	One Year
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 05, 2019	One Year
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 05, 2019	One Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 05, 2019	One Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 05, 2019	One Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 05, 2019	One Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 05, 2019	One Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 05, 2019	One Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 05, 2019	One Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 05, 2019	One Year
RF Coaxial Cable (Conducted Emission)	SUHNER	N-2m	No.2	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	RESENBERGER	N-12m	No.11	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	RESENBERGER	N-0.5m	No.12	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-2m	No.13	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-0.5m	No.15	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	SUHNER	N-2m	No.16	Jan. 05, 2019	One Year
RF Coaxial Cable (Radiated Emission)	RESENBERGER	N-6m	No.17	Jan. 05, 2019	One Year
Conducted Emission Measurement Software: ES-K1 V1.71					
Radiated Emission 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

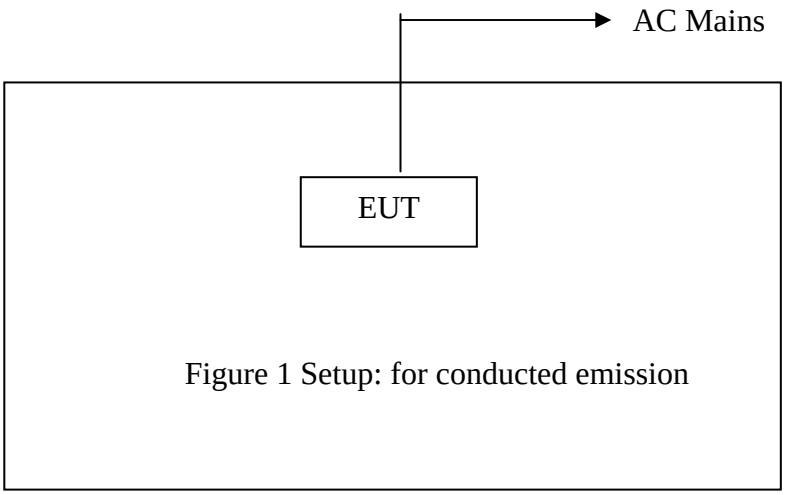


Figure 1 Setup: for conducted emission

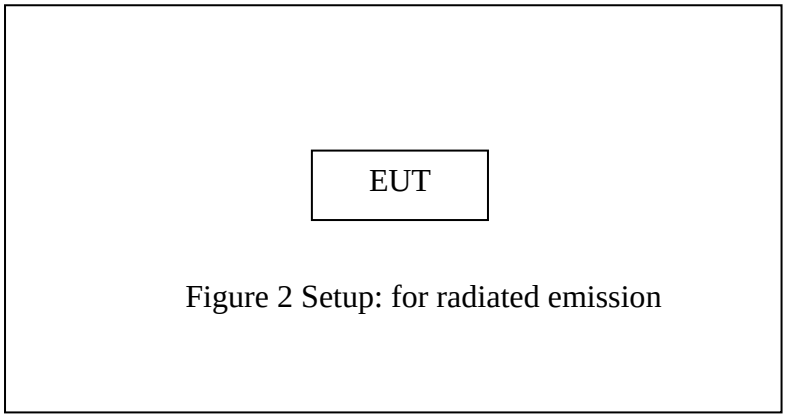


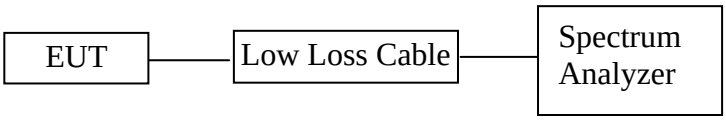
Figure 2 Setup: for radiated emission

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

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.

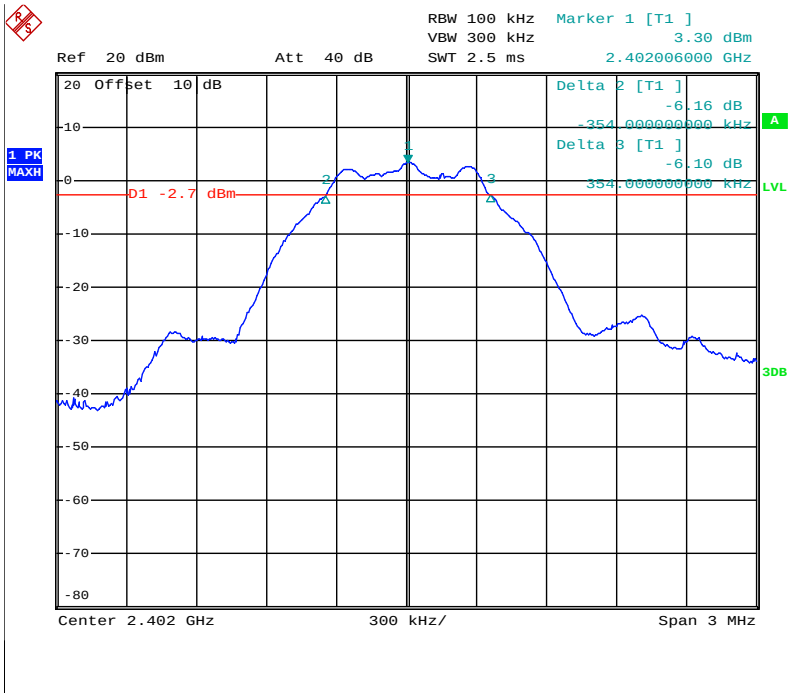
5.5.3.The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.6.Test Result

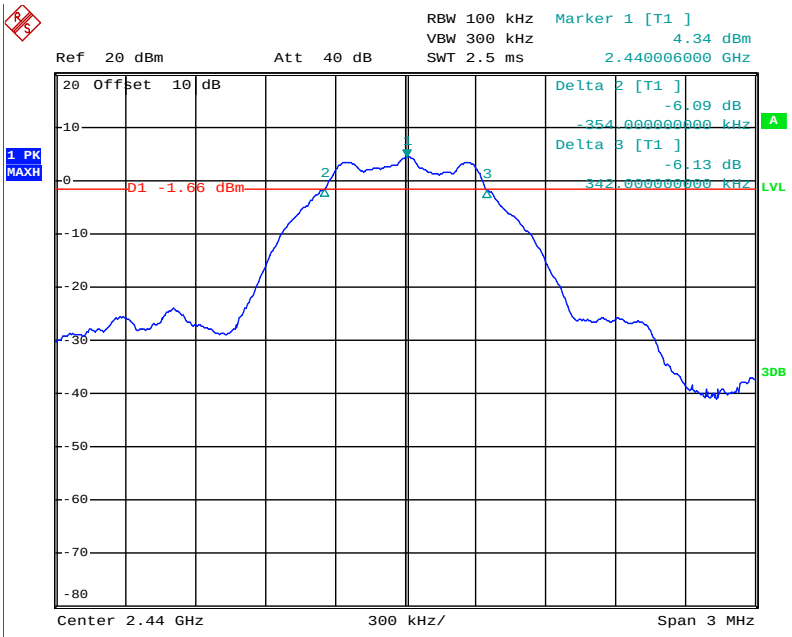
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit(MHz)	Result
0	2402	0.708	0.5	Pass
19	2440	0.696	0.5	Pass
39	2480	0.690	0.5	Pass

The spectrum analyzer plots are attached as below.

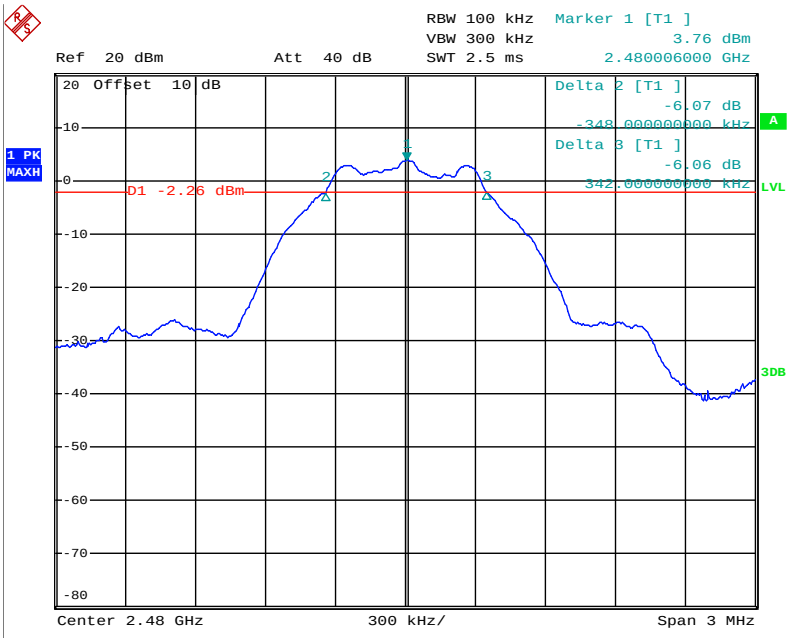
channel 0



channel 19

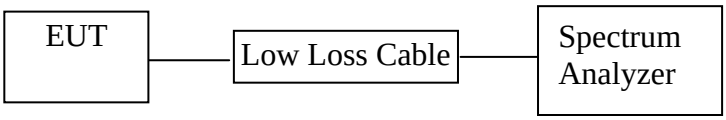


channel 39



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.

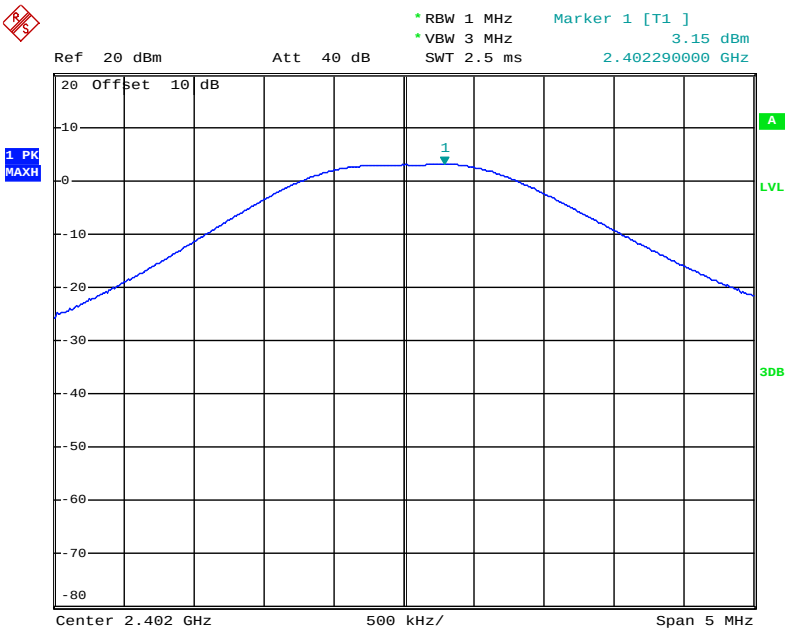
6.5.3.Measurement the maximum peak output power.

6.6.Test Result

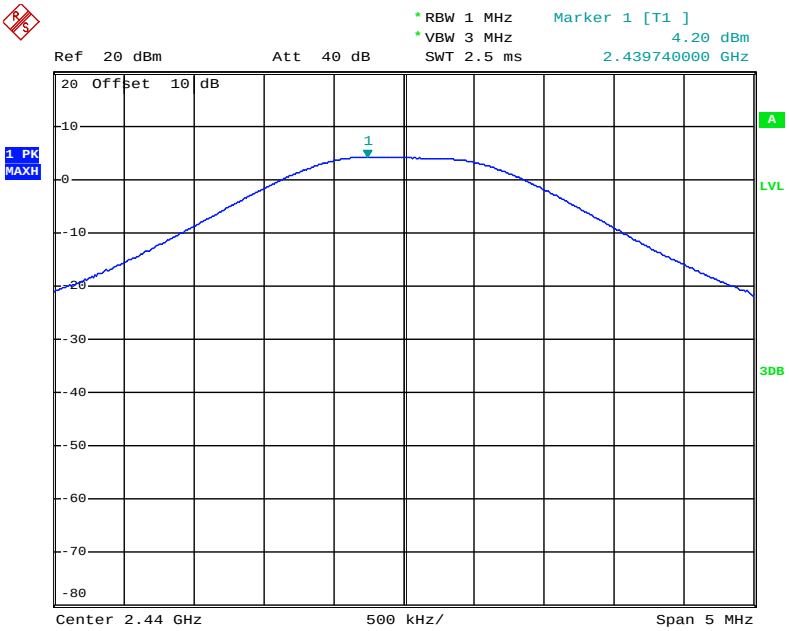
Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Result
0	2402	3.15	30	Pass
19	2440	4.20	30	Pass
39	2480	3.60	30	Pass

The spectrum analyzer plots are attached as below.

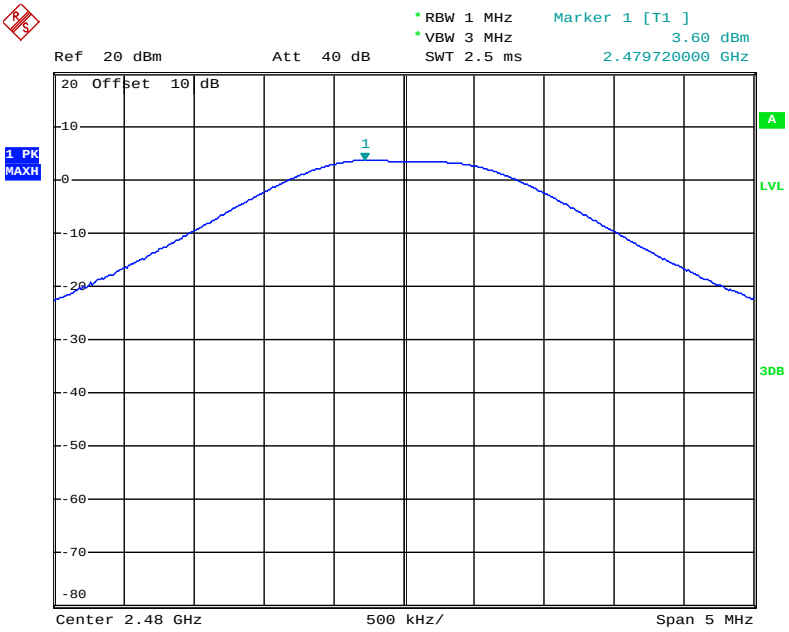
channel 0



channel 19

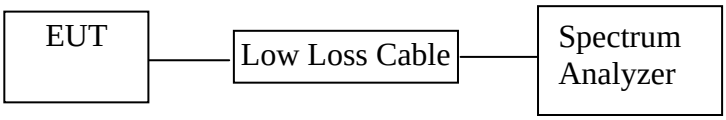


channel 39



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 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x 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.

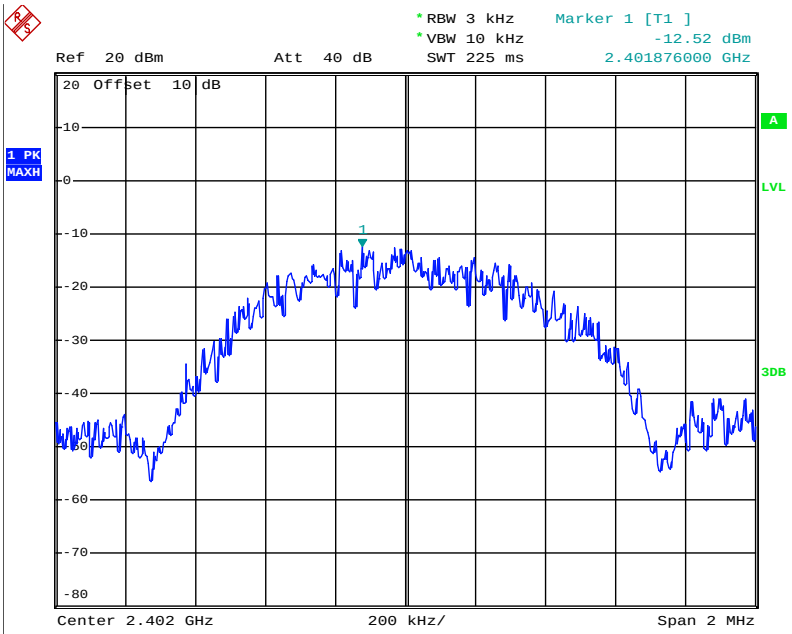
7.5.4.Measurement the maximum power spectral density.

7.6.Test Result

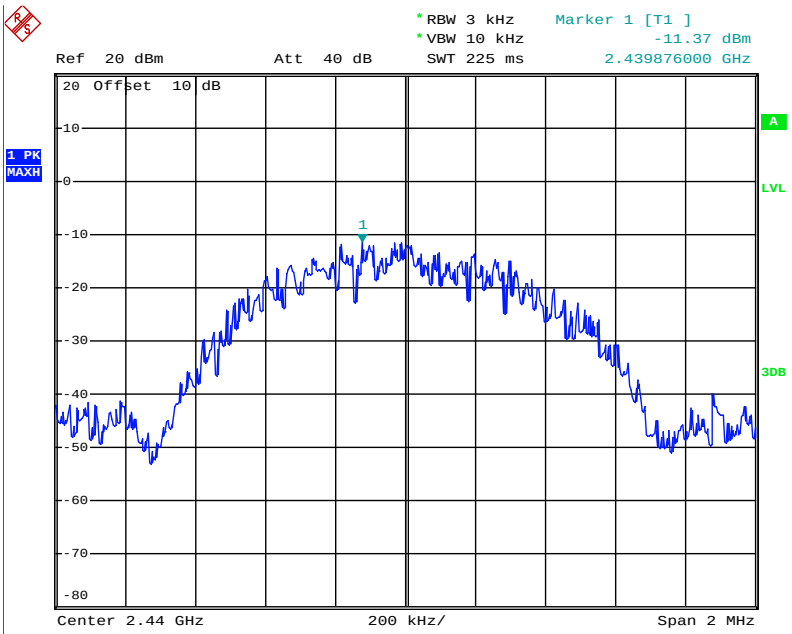
Channel	Frequency (MHz)	PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
0	2402	-12.52	8	Pass
19	2440	-11.37	8	Pass
39	2480	-11.86	8	Pass

The spectrum analyzer plots are attached as below.

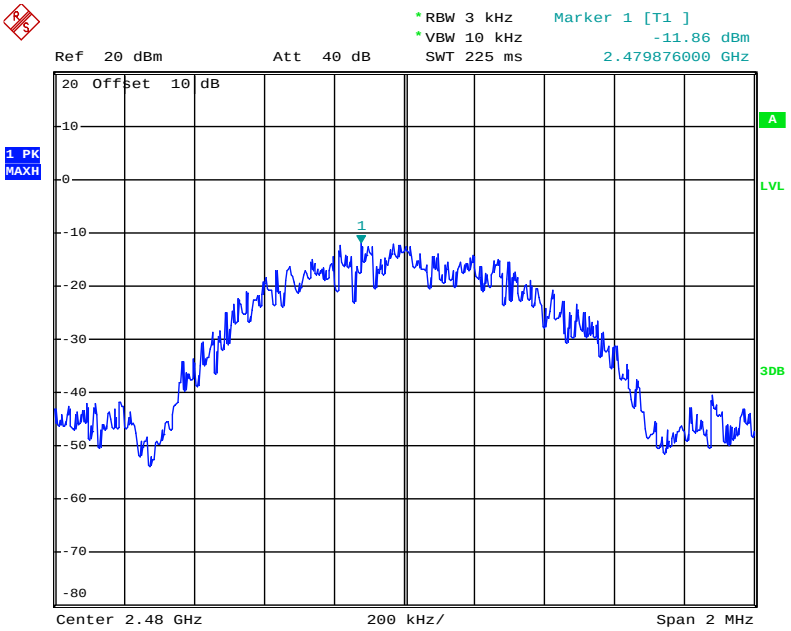
channel 0



channel 19

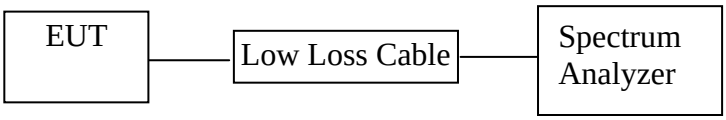


channel 39


RBW 3 kHz
VBW 10 kHz
SWT 225 ms
Marker 1 [T1]
-11.86 dBm
2.479876000 GHz
Ref 20 dBm
Att 40 dB
20 Offset 10 dB
1 PK
MAXH
A
LVL
3DB
Center 2.48 GHz
200 kHz/
Span 2 MHz

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 0.1m 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.

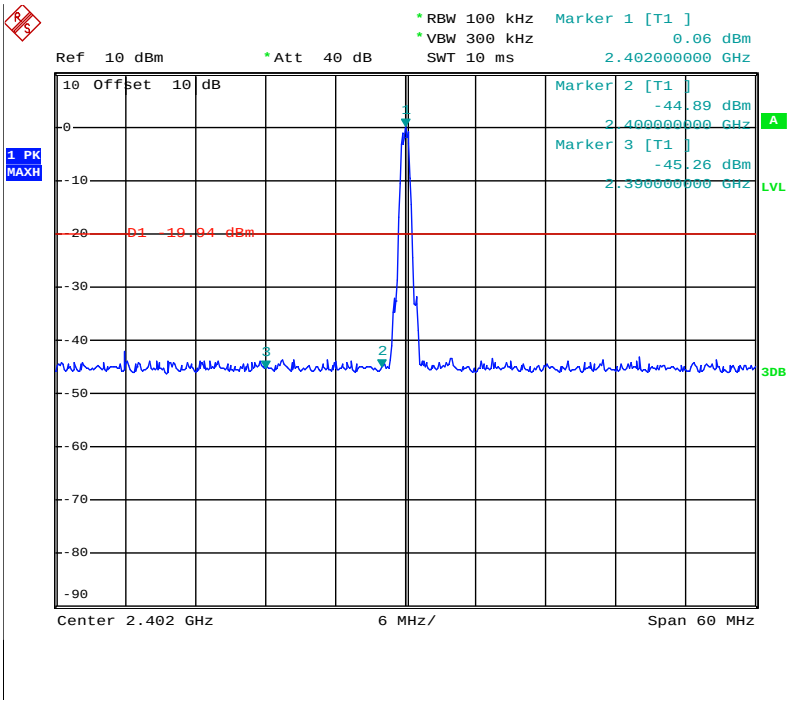
8.6.Test Result

Conducted Band Edge Result

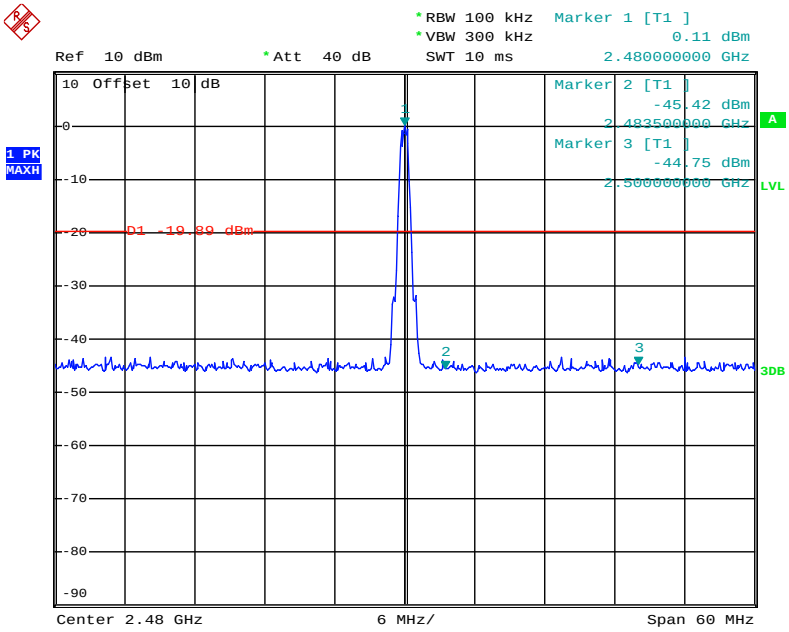
Channel	Frequency	Delta peak to band emission	Limit(dBc)	Result
0	2.402GHz	44.95	＞20	Pass
39	2.480GHz	45.53	＞20	Pass

The spectrum analyzer plots are attached as below.

channel 0



channel 39

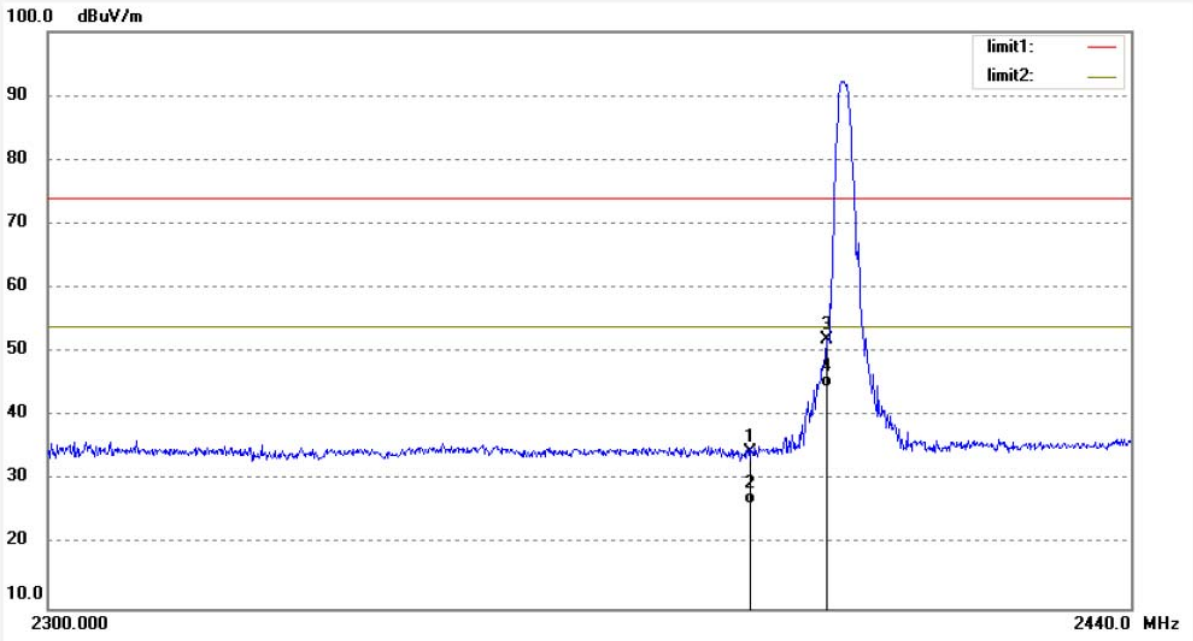


Radiated Band Edge Result

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 1# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: JP #117	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/38/16
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2402MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	40.68	-6.32	34.36	74.00	-39.64	peak	200	185	
2	2390.000	32.72	-6.32	26.40	54.00	-27.60	AVG	200	185	
3	2400.000	58.21	-6.27	51.94	74.00	-22.06	peak	200	242	
4	2400.000	50.87	-6.27	44.60	54.00	-9.40	AVG	200	242	

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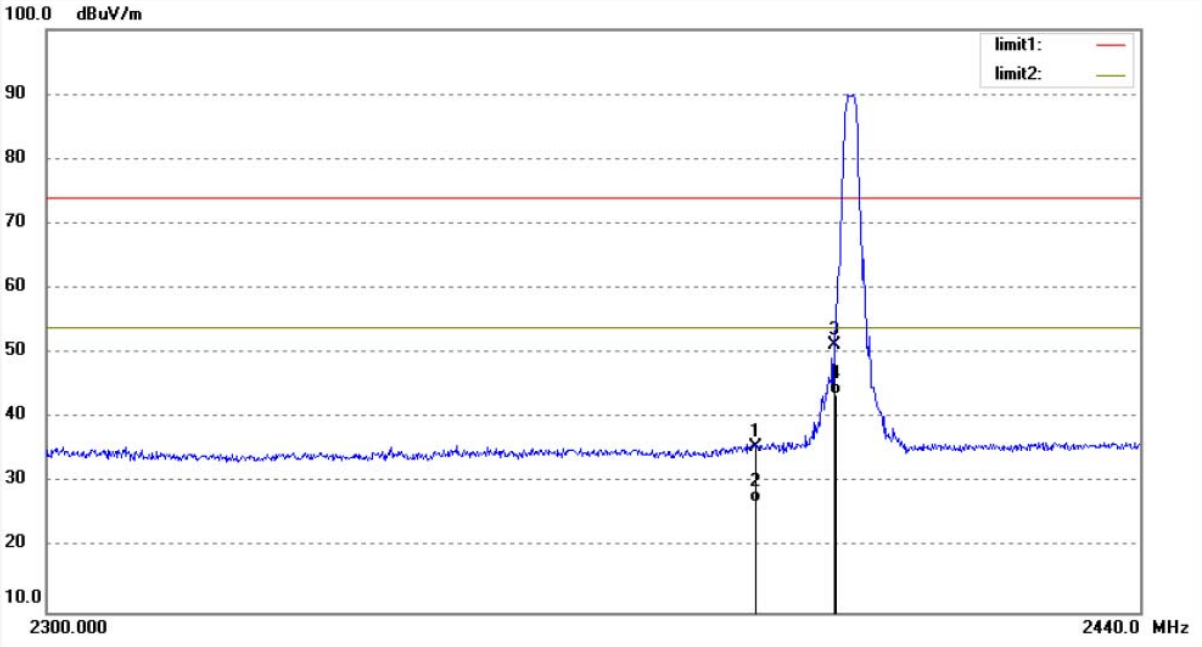
Job No.: JP #116	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/35/13
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2402MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	41.76	-6.32	35.44	74.00	-38.56	peak	150	315	
2	2390.000	33.32	-6.32	27.00	54.00	-27.00	AVG	150	315	
3	2400.000	57.50	-6.27	51.23	74.00	-22.77	peak	150	136	
4	2400.000	49.87	-6.27	43.60	54.00	-10.40	AVG	150	136	

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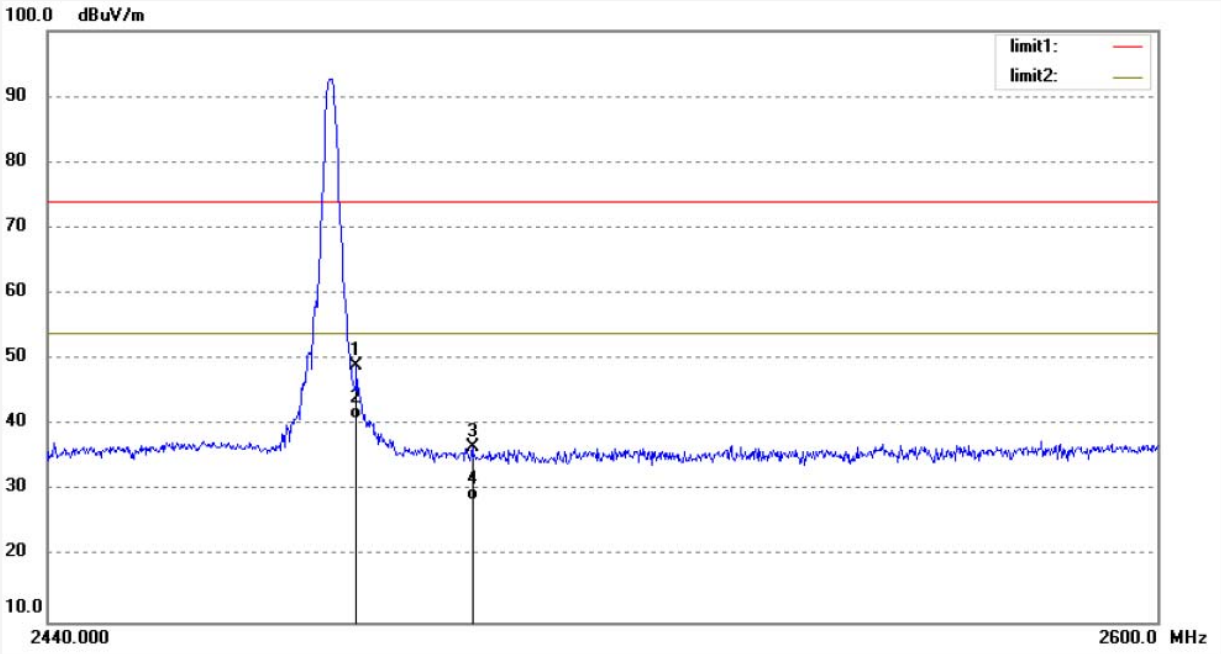
Job No.: JP #115	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/32/52
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2480MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	54.84	-5.89	48.95	74.00	-25.05	peak	200	186	
2	2483.500	46.89	-5.89	41.00	54.00	-13.00	AVG	200	186	
3	2500.000	42.38	-5.81	36.57	74.00	-37.43	peak	200	236	
4	2500.000	34.41	-5.81	28.60	54.00	-25.40	AVG	200	236	

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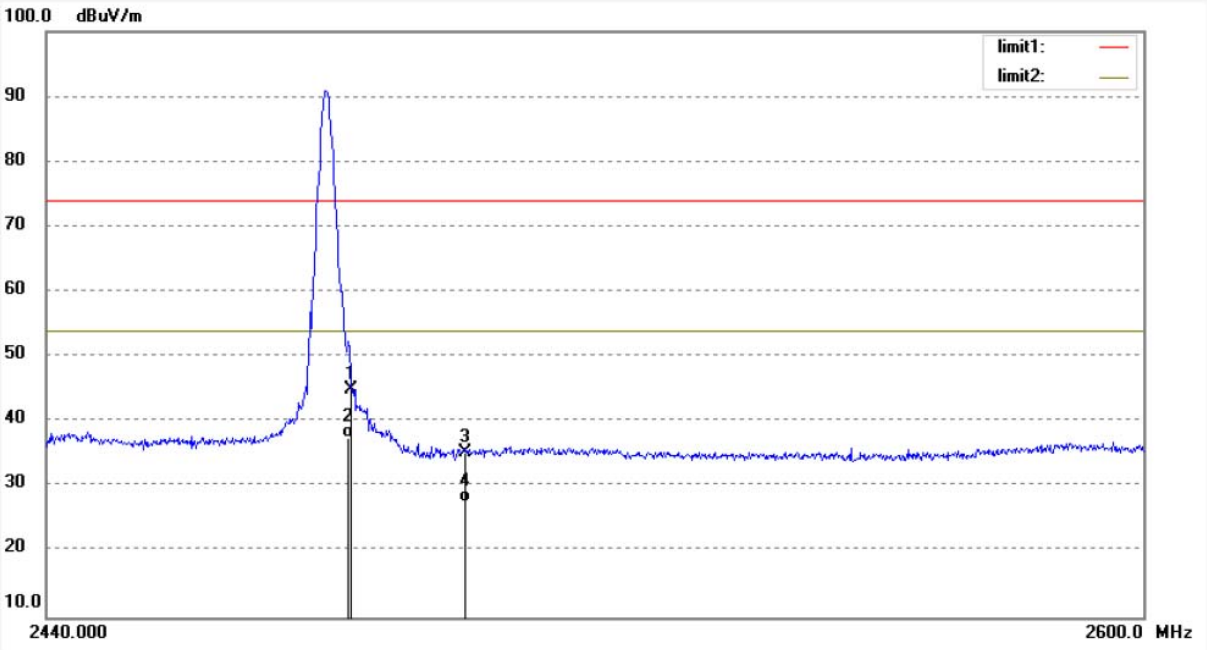
Job No.: JP2019 #114	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16/29/13
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2480MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	50.90	-5.89	45.01	74.00	-28.99	peak	150	286	
2	2483.500	43.49	-5.89	37.60	54.00	-16.40	AVG	150	286	
3	2500.000	41.12	-5.81	35.31	74.00	-38.69	peak	150	186	
4	2500.000	33.51	-5.81	27.70	54.00	-26.30	AVG	150	186	

Note:

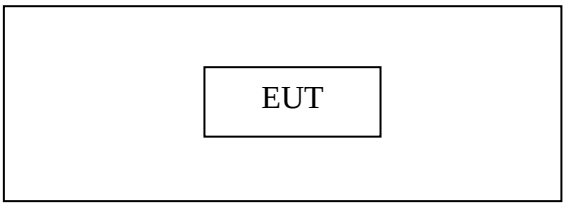
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is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

   Result = Reading + Corrected Factor

9. RADIATED SPURIOUS EMISSION TEST

9.1.Block Diagram of Test Setup

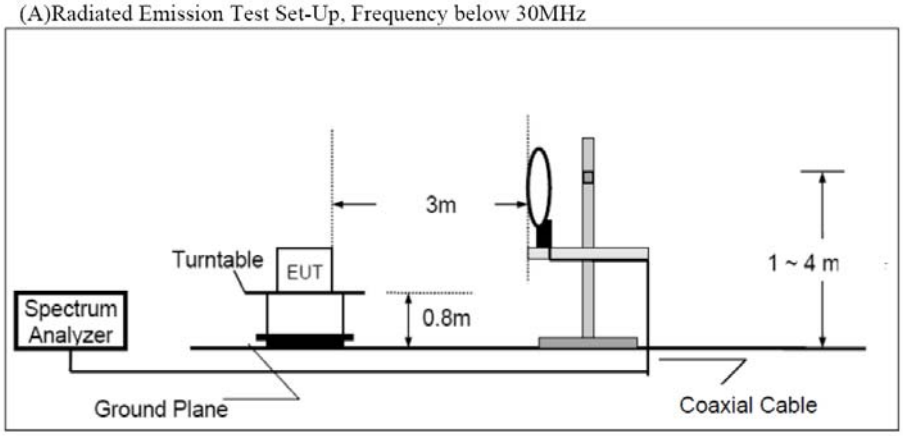
9.1.1.Block diagram of connection between the EUT and peripherals



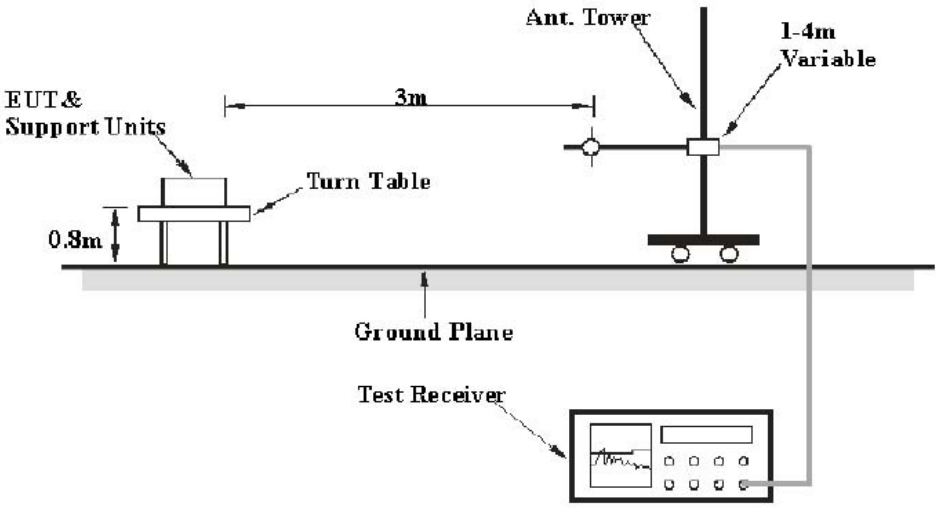
Setup: Transmitting mode

9.1.2.Semi-Anechoic Chamber Test Setup Diagram

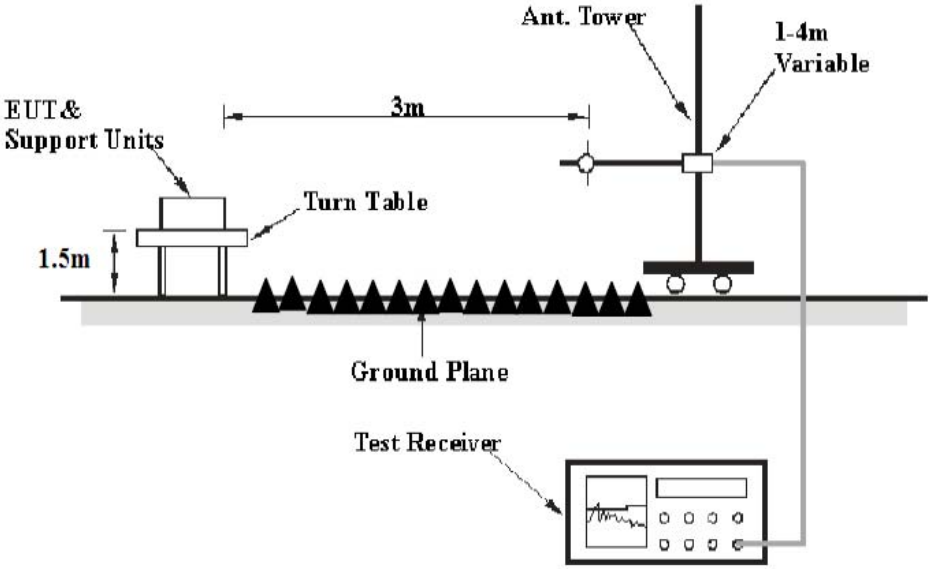
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



(B)Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



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			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 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 Section15.209 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 1GHz). 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 (dBμv)	Factor (dB/m)	Result (dBμv/m)	Limit (dBμv/m)	Margin (dB)	Remark
X.XX	43.85	-22.22	21.63	43.5	-21.87	QP

Frequency(MHz) = Emission frequency in MHz
Reading(dBμv) = Uncorrected Analyzer/Receiver reading
Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain
Result(dBμv/m) = Reading(dBμv) + Factor(dB/m)
Limit (dBμv/m) = Limit stated in standard
Margin (dB) = Result(dBμv/m) - Limit (dBμv/m)
QP = Quasi-peak Reading

Calculation Formula:
Margin(dB) = Result (dBμV/m)–Limit(dBμV/m)
Result(dBμV/m)= Reading(dBμV)+ 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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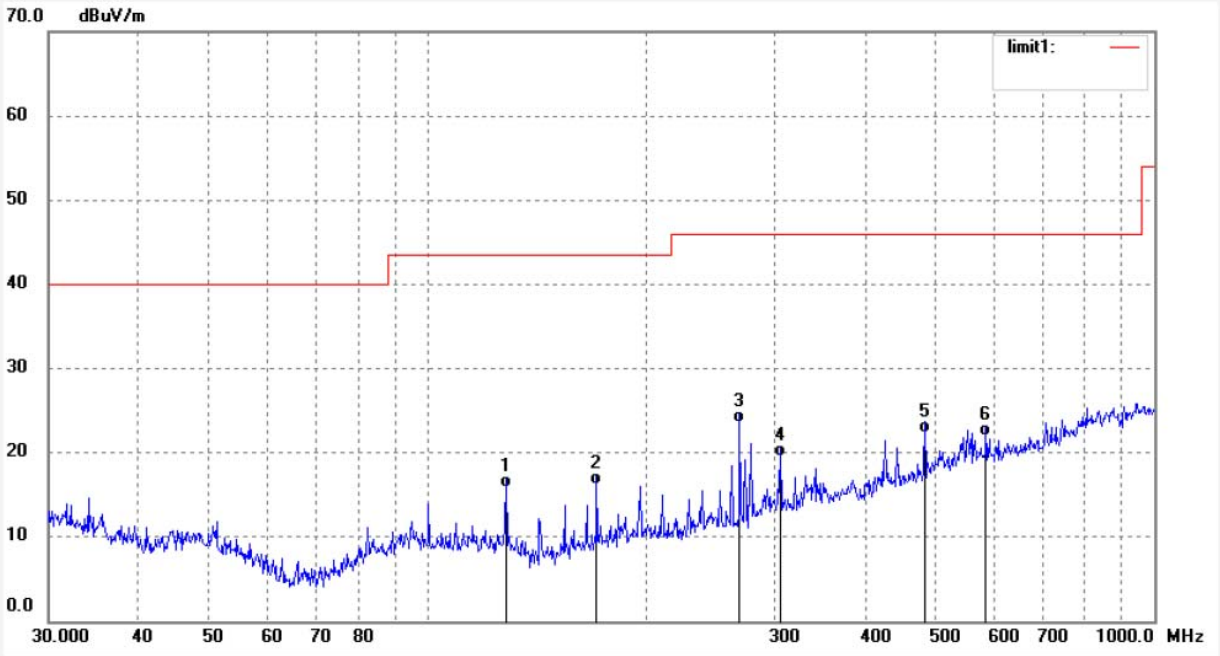
Job No.: JP2019 #210	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 2019/07/20
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:06:50
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2402MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	128.0356	42.07	-26.17	15.90	43.50	-27.60	QP	100	126	
2	170.7878	41.91	-25.81	16.10	43.50	-27.40	QP	100	165	
3	268.7212	46.33	-22.83	23.50	46.00	-22.50	QP	100	196	
4	306.0282	40.88	-21.38	19.50	46.00	-26.50	QP	100	215	
5	483.2060	39.02	-16.72	22.30	46.00	-23.70	QP	100	253	
6	586.2172	36.03	-14.13	21.90	46.00	-24.10	QP	100	315	

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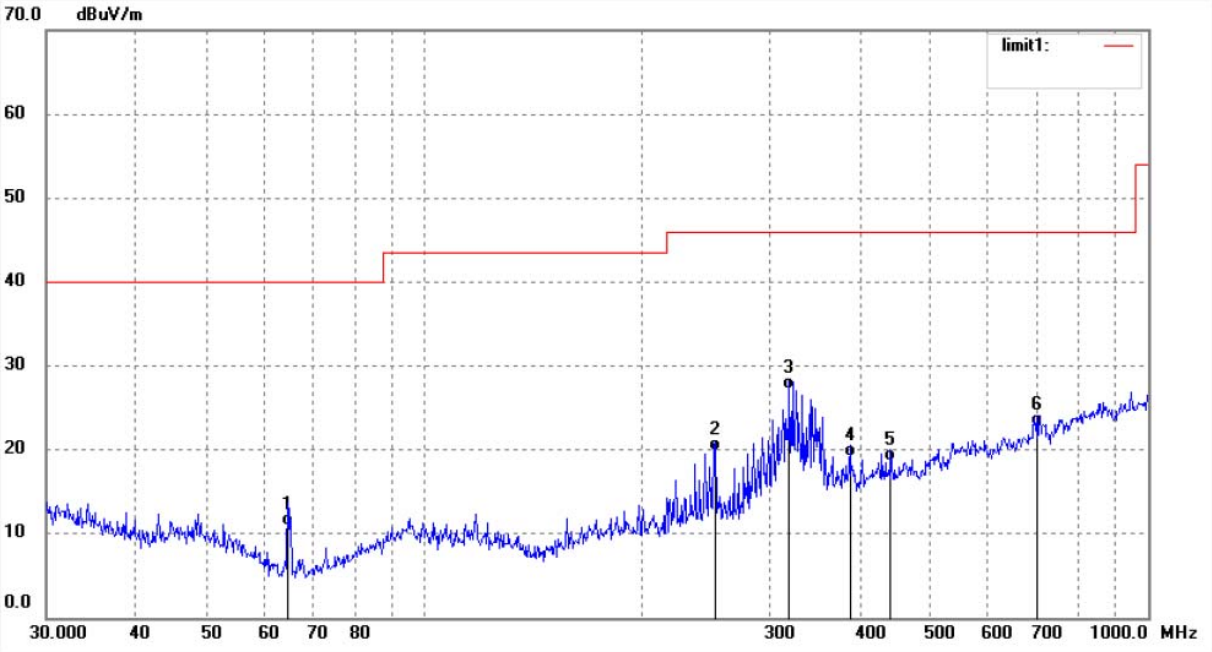
Job No.: JP2019 #211	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 2019/07/20
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:08:58
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2402MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	64.9869	40.02	-29.02	11.00	40.00	-29.00	QP	200	126	
2	252.2523	43.06	-23.28	19.78	46.00	-26.22	QP	200	163	
3	319.2071	48.09	-20.89	27.20	46.00	-18.80	QP	200	196	
4	387.2565	38.14	-19.04	19.10	46.00	-26.90	QP	200	205	
5	441.0199	36.20	-17.50	18.70	46.00	-27.30	QP	200	215	
6	701.2631	35.29	-12.49	22.80	46.00	-23.20	QP	200	302	

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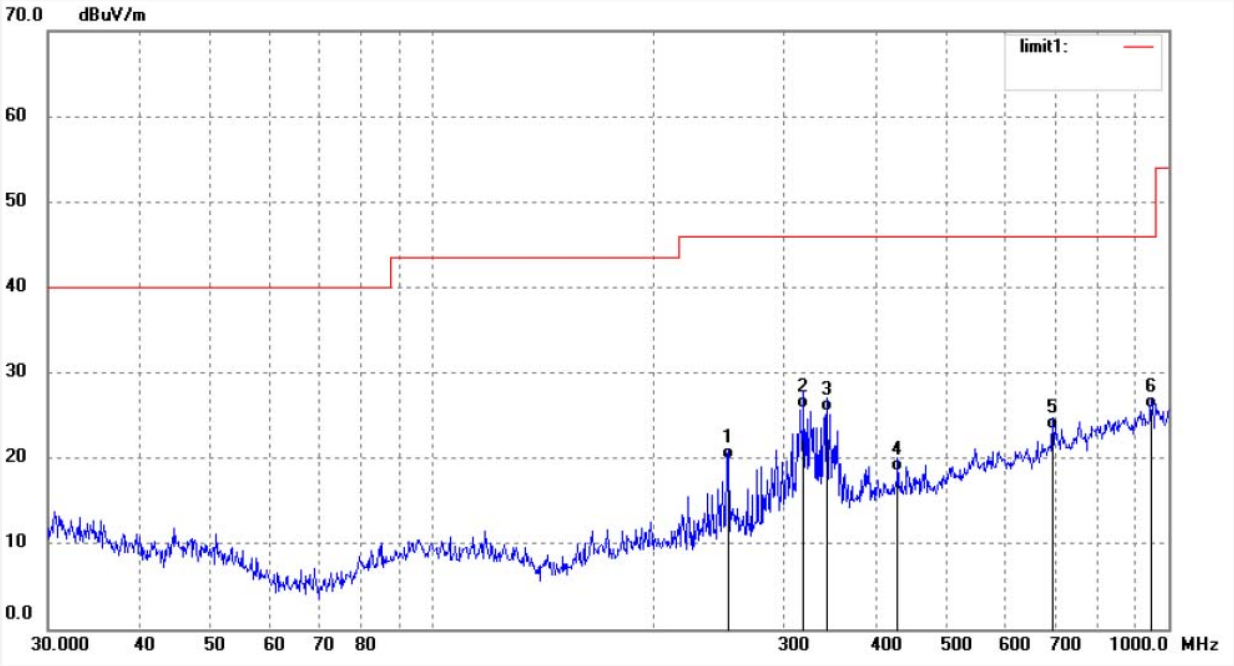
Job No.: JP2019 #212	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 2019/07/20
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:10:57
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2440MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	252.2523	43.08	-23.28	19.80	46.00	-26.20	QP	200	95	
2	319.2071	46.79	-20.89	25.90	46.00	-20.10	QP	200	126	
3	343.6506	45.28	-19.88	25.40	46.00	-20.60	QP	200	186	
4	428.7960	36.12	-17.72	18.40	46.00	-27.60	QP	200	202	
5	696.3525	36.04	-12.64	23.40	46.00	-22.60	QP	200	263	
6	948.6610	34.08	-8.18	25.90	46.00	-20.10	QP	200	325	

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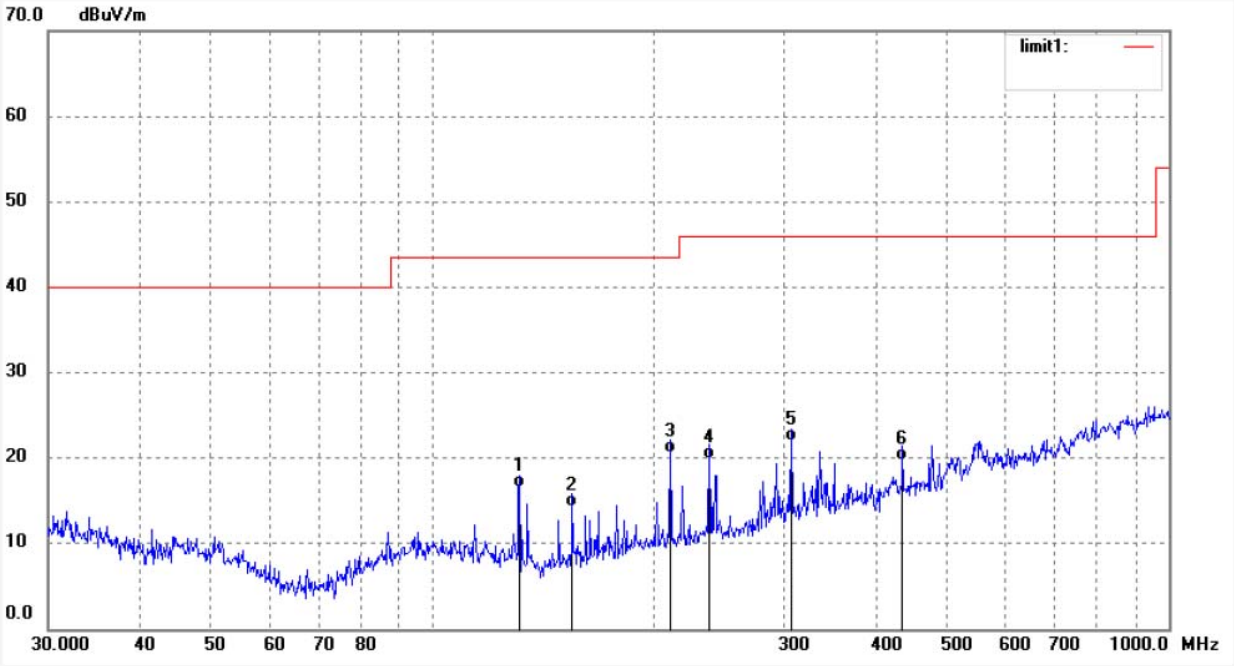
Job No.: JP2019 #213	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 2019/07/20
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:12:53
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2440MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	131.2235	42.82	-26.22	16.60	43.50	-26.90	QP	100	103	
2	154.7857	41.32	-27.12	14.20	43.50	-29.30	QP	100	163	
3	210.1294	45.04	-24.54	20.50	43.50	-23.00	QP	100	186	
4	237.6262	43.18	-23.38	19.80	46.00	-26.20	QP	100	215	
5	307.1053	43.33	-21.33	22.00	46.00	-24.00	QP	100	263	
6	434.8650	37.16	-17.56	19.60	46.00	-26.40	QP	100	315	

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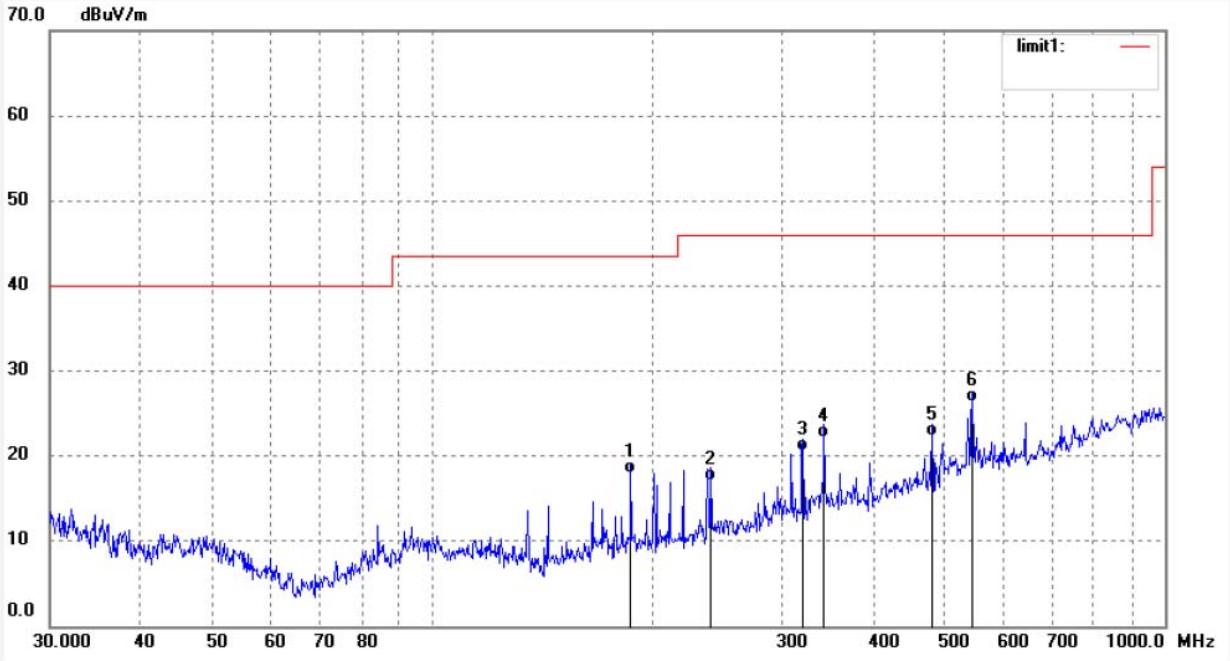
Job No.: JP2019 #214	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 2019/07/20
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:14:41
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2480MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	186.4684	42.81	-24.91	17.90	43.50	-25.60	QP	100	103	
2	240.1442	40.28	-23.28	17.00	46.00	-29.00	QP	100	136	
3	320.3306	41.45	-20.85	20.60	46.00	-25.40	QP	100	165	
4	342.4453	42.14	-19.94	22.20	46.00	-23.80	QP	100	206	
5	481.5112	39.16	-16.76	22.40	46.00	-23.60	QP	100	245	
6	546.4368	41.08	-14.78	26.30	46.00	-19.70	QP	100	326	

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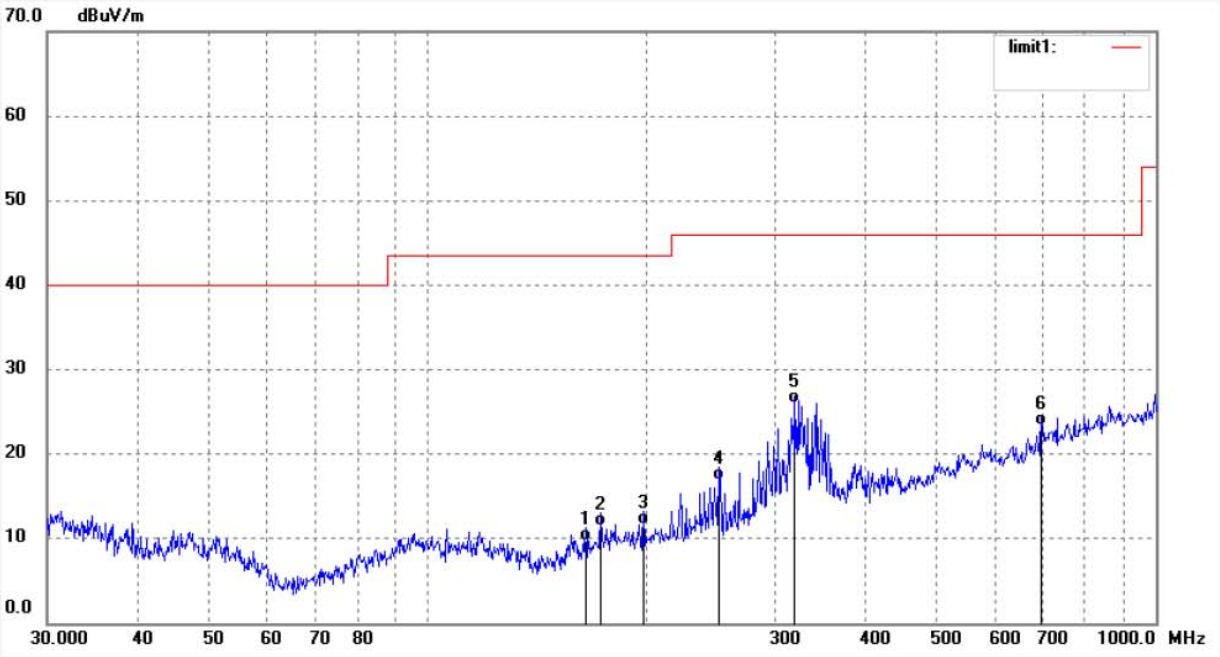
Job No.: JP2019 #215	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3.7V
Test item: Radiation Test	Date: 2019/07/20
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 16:16:52
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2480MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	164.8912	36.25	-26.55	9.70	43.50	-33.80	QP	200	103	
2	172.5976	37.20	-25.80	11.40	43.50	-32.10	QP	200	165	
3	197.9457	36.36	-24.76	11.60	43.50	-31.90	QP	200	196	
4	251.3676	40.17	-23.27	16.90	46.00	-29.10	QP	200	245	
5	319.2071	46.89	-20.89	26.00	46.00	-20.00	QP	200	263	
6	696.3525	35.94	-12.64	23.30	46.00	-22.70	QP	200	312	

Above 1GHz

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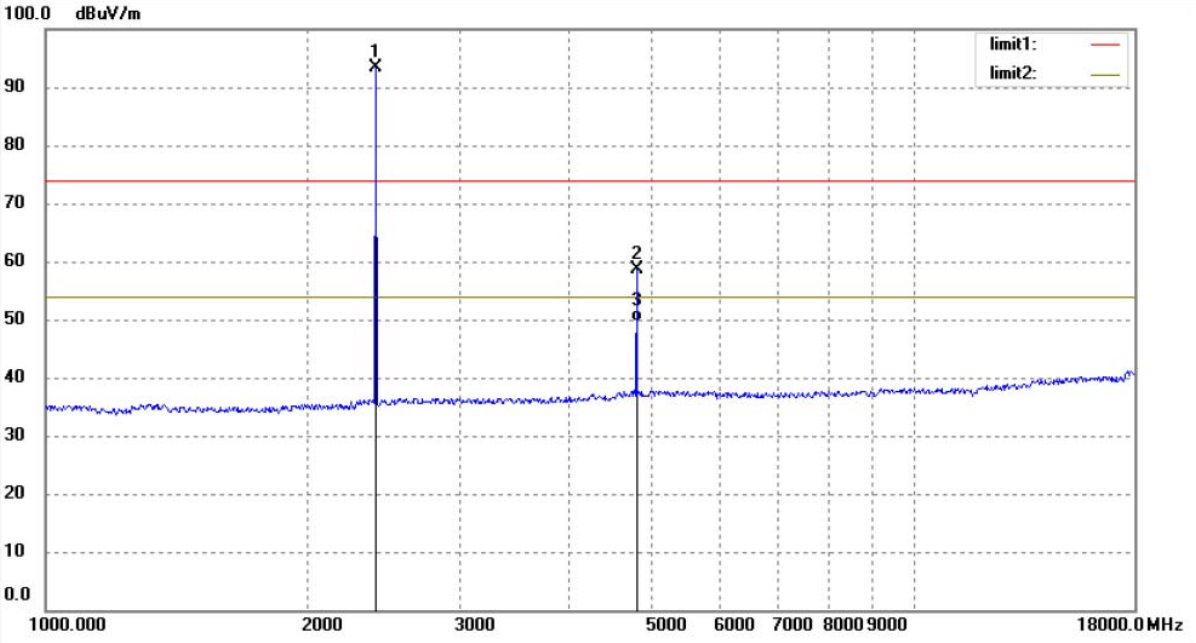
Job No.: JP2019 #226	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13/49/46
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2402MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	99.54	-6.27	93.27			peak	200	156	
2	4804.000	57.53	1.00	58.53	74.00	-15.47	peak	200	268	
3	4804.000	48.60	1.00	49.60	54.00	-4.40	AVG	200	268	

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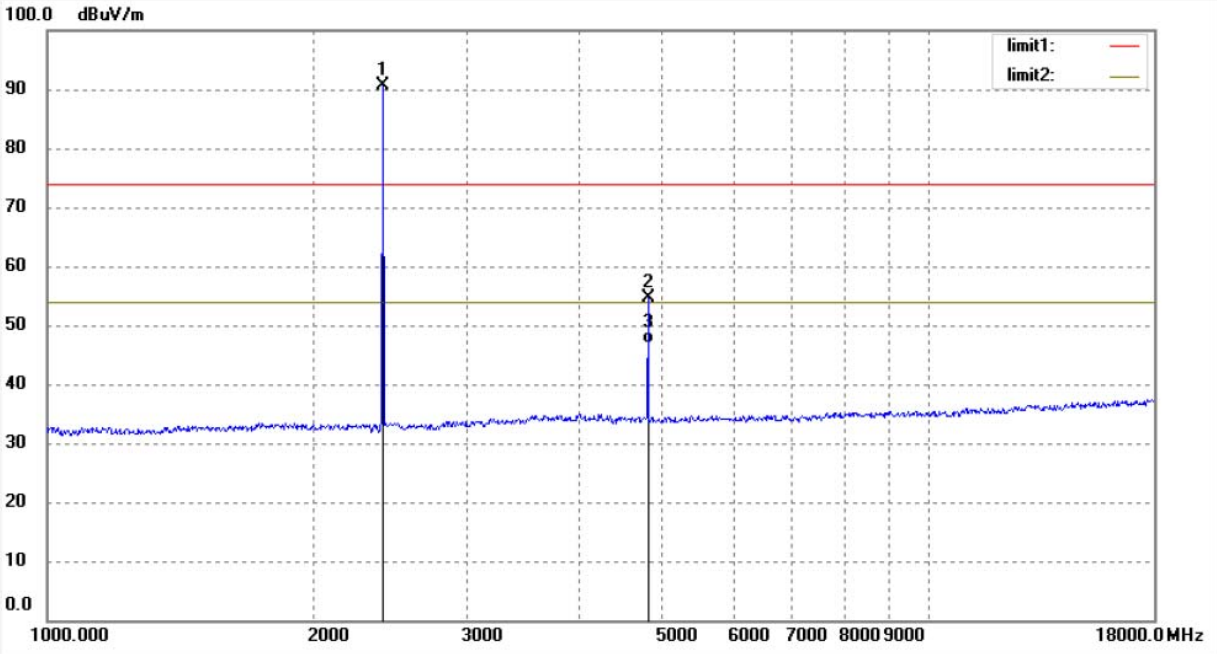
Job No.: JP2019 #227	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13/51/41
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2402MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	96.86	-6.27	90.59			peak	150	155	
2	4804.000	53.64	1.00	54.64	74.00	-19.36	peak	150	136	
3	4804.000	46.00	1.00	47.00	54.00	-7.00	AVG	150	136	

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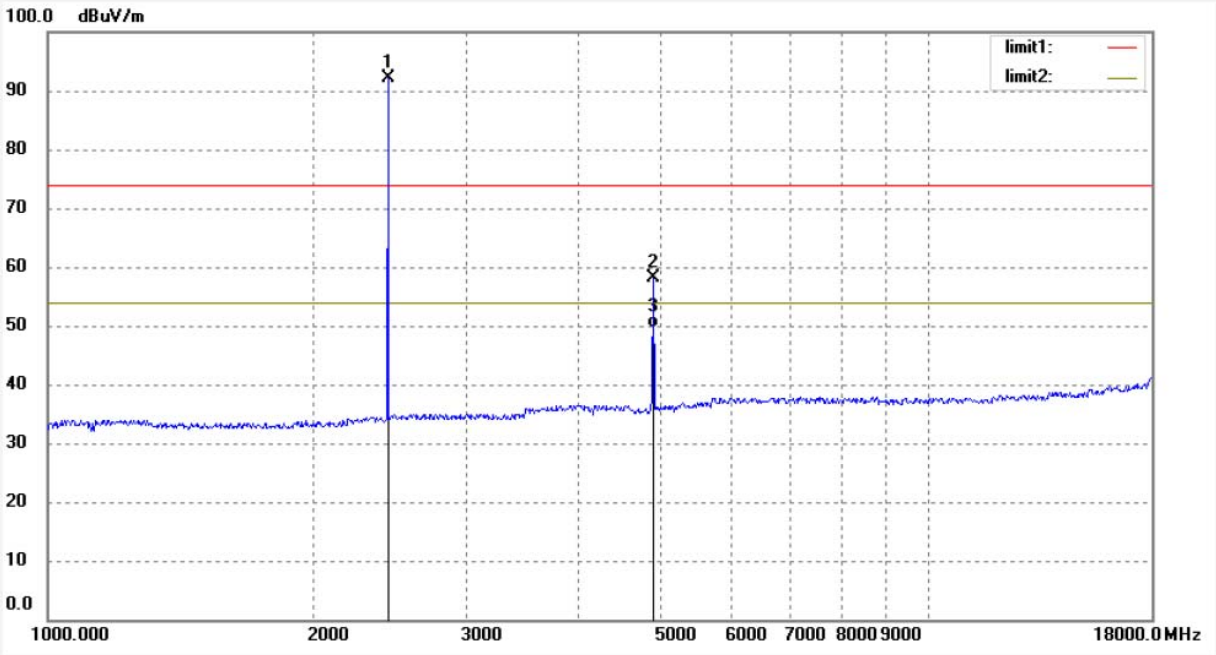
Job No.: JP2019 #228	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13/53/24
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2440MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	98.19	-6.10	92.09			peak	200	125	
2	4880.000	56.89	1.36	58.25	74.00	-15.75	peak	200	236	
3	4880.000	48.34	1.36	49.70	54.00	-4.30	AVG	200	236	

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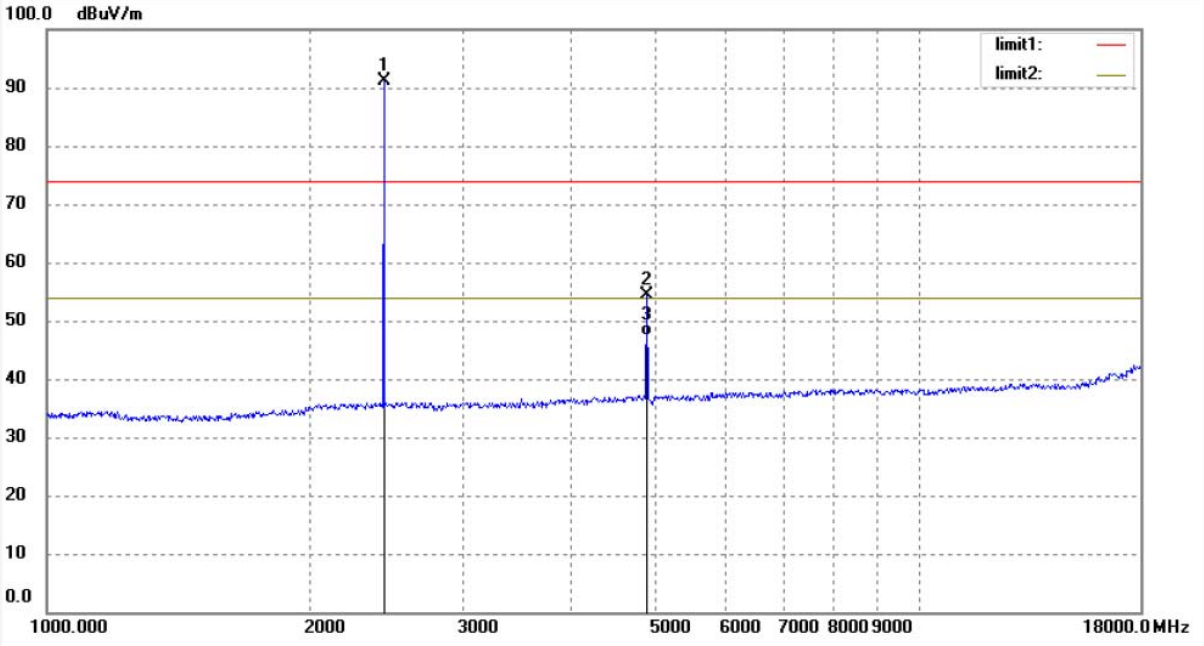
Job No.: JP2019 #229	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13/55/35
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2440MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	97.33	-6.10	91.23			peak	150	111	
2	4880.000	53.02	1.36	54.38	74.00	-19.62	peak	150	186	
3	4880.000	45.94	1.36	47.30	54.00	-6.70	AVG	150	186	

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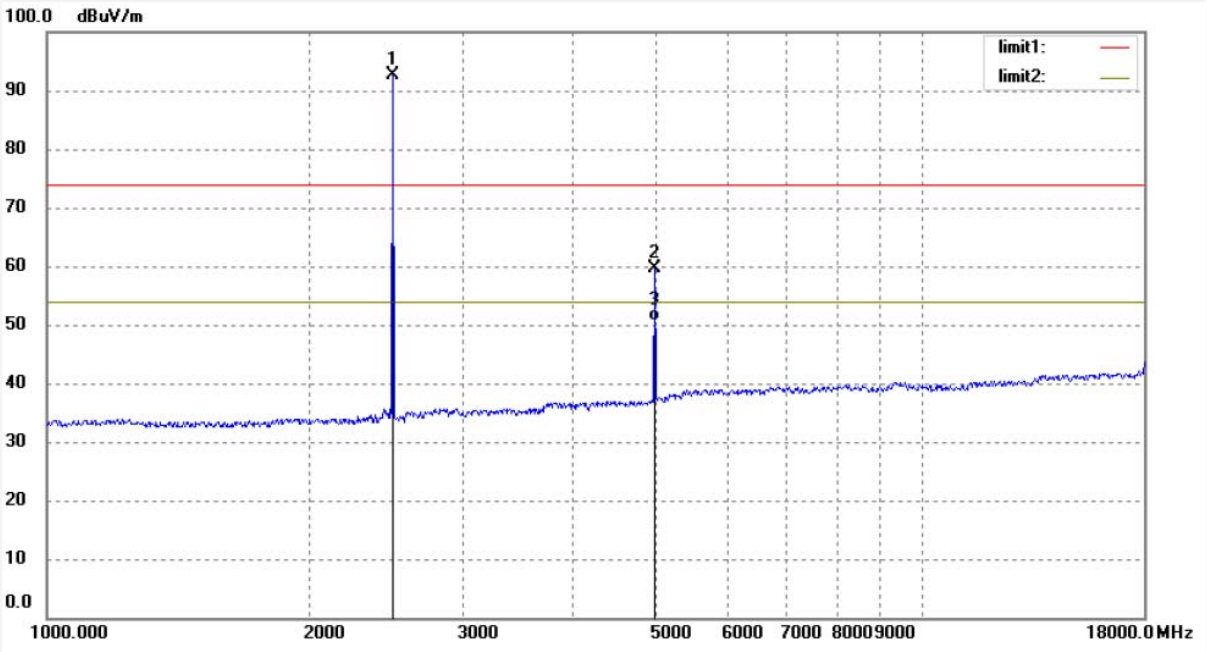
Job No.: JP2019 #230	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13/57/23
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2480MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

Note: Report NO.:ATE20191067



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	98.41	-5.90	92.51			peak	200	195	
2	4960.000	57.88	1.68	59.56	74.00	-14.44	peak	20	196	
3	4960.000	48.92	1.68	50.60	54.00	-3.40	AVG	200	196	

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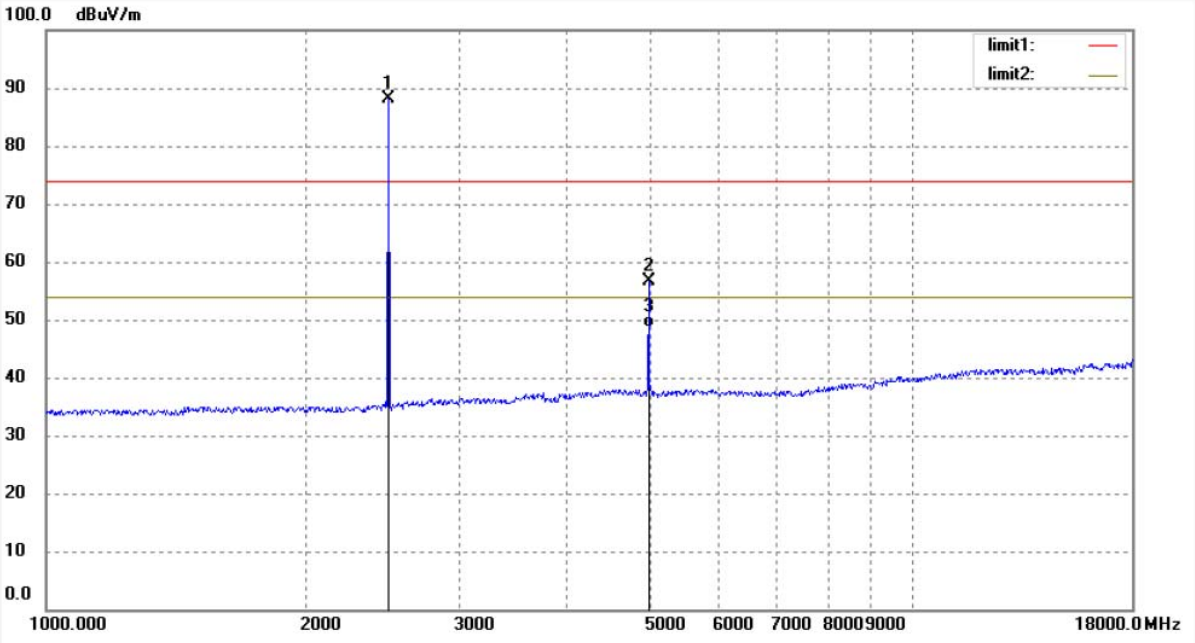
Job No.: JP2019 #231	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3.7V
Test item: Radiation Test	Date: 19/07/26/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 13/59/07
EUT: Wireless Headphone	Engineer Signature: Ben
Mode: TX 2480MHz	Distance: 3m
Model: ANANDA-BT	
Manufacturer: Head-Direct	

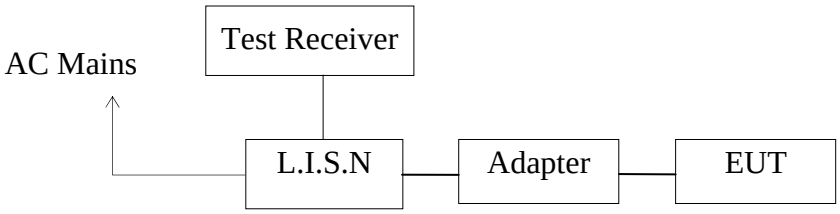
Note: Report NO.:ATE20191067



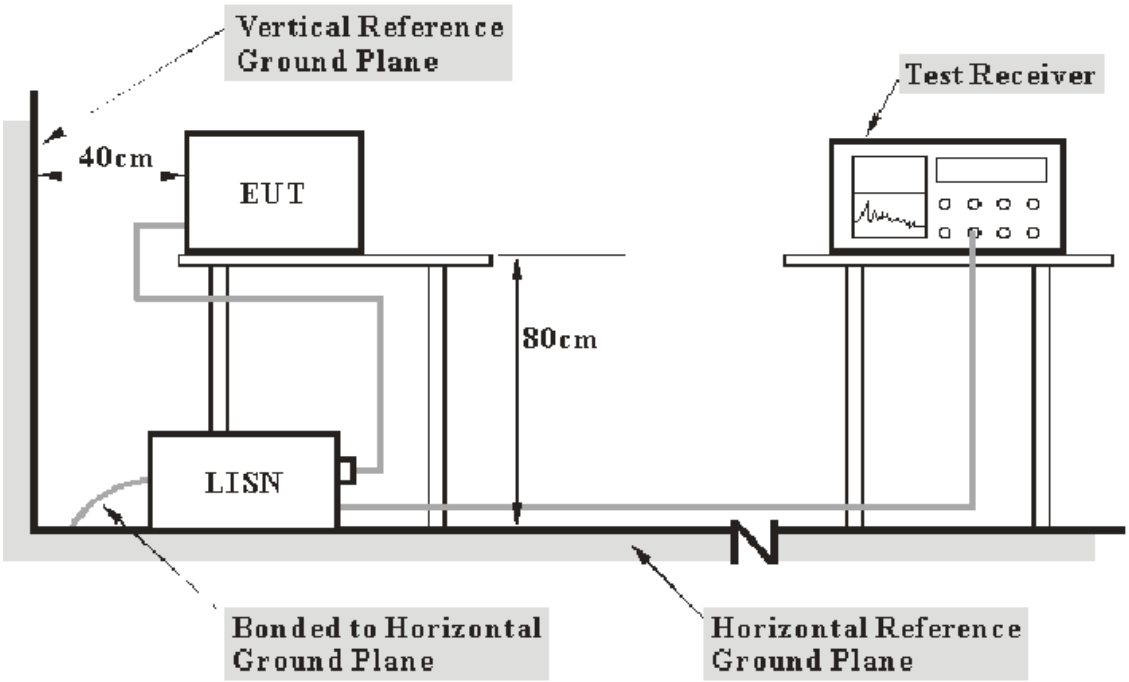
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	94.09	-5.90	88.19			peak	150	254	
2	4960.000	54.81	1.75	56.56	74.00	-17.44	peak	150	263	
3	4960.000	46.95	1.75	48.70	54.00	-5.30	AVG	150	263	

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.

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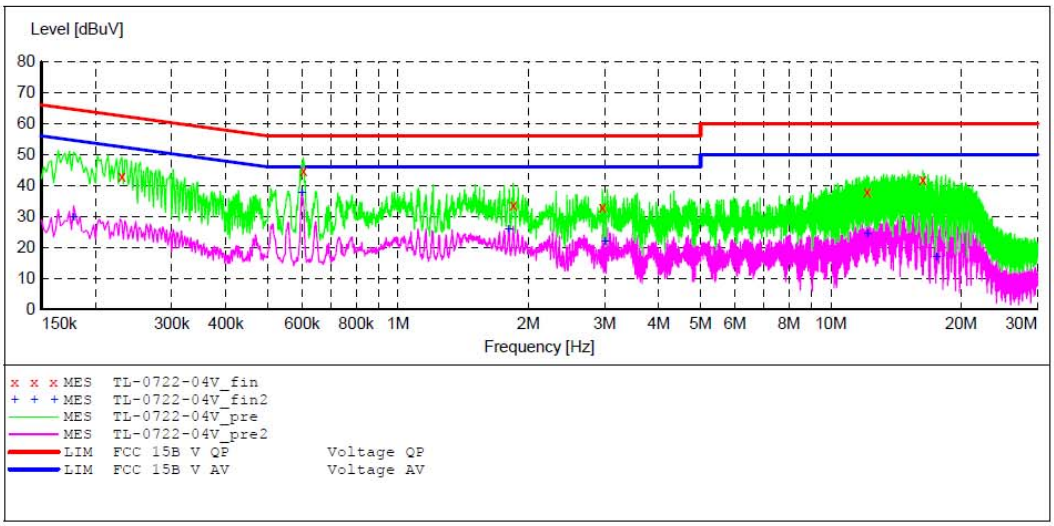
CONDUCTED EMISSION STANDARD FCC PART 15B

```
EUT:                  Wireless Headphone M/N:ANANDA-BT
Manufacturer:         Head-Direct
Operating Condition:  BT communication
Test Site:            2#Shielding Room
Operator:             Ben
Test Specification:   N  120V 60Hz
Comment:              Report NO.:ATE20191067
Start of Test:        2019-7-22 / 8:45:03
```

SCAN TABLE: "V 150K-30MHz fin"

```
  Short Description:            _SUB_STD_VTERM2 1.70
  Start      Stop       Step       Detector  Meas.     IF      Transducer
  Frequency  Frequency  Width                Time      Bandw.
  150.0 kHz  30.0 MHz   4.5 kHz    QuasiPeak 1.0 s     9 kHz   NSLK8126 2008
                                   Average
```



MEASUREMENT RESULT: "TL-0722-04V_fin"

2019-7-22 8:46

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.230000	42.90	10.9	62	19.5	QP	N	GND
0.604000	44.80	11.0	56	11.2	QP	N	GND
1.846000	33.60	11.2	56	22.4	QP	N	GND
2.965000	33.00	11.3	56	23.0	QP	N	GND
12.140000	38.20	11.6	60	21.8	QP	N	GND
16.310000	41.90	11.7	60	18.1	QP	N	GND

MEASUREMENT RESULT: "TL-0722-04V_fin2"

2019-7-22 8:46

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.178000	29.70	10.8	55	24.9	AV	N	GND
0.600000	37.80	11.0	46	8.2	AV	N	GND
1.800000	26.00	11.2	46	20.0	AV	N	GND
3.010000	21.80	11.3	46	24.2	AV	N	GND
12.140000	24.50	11.6	50	25.5	AV	N	GND
17.545000	16.80	11.7	50	33.2	AV	N	GND

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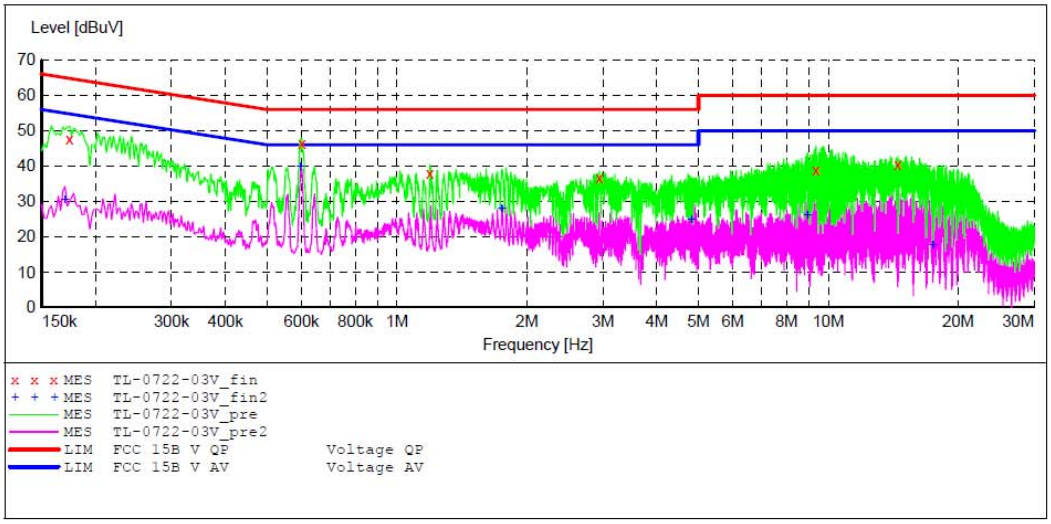
CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: Wireless Headphone M/N:ANANDA-BT
Manufacturer: Head-Direct
Operating Condition: BT communication
Test Site: 2#Shielding Room
Operator: Ben
Test Specification: L 120V 60Hz
Comment: Report NO.:ATE20191067
Start of Test: 2019-7-22 / 8:42:13

SCAN TABLE: "V 150K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	4.5 kHz	QuasiPeak Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "TL-0722-03V_fin"

2019-7-22 8:43

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.174000	47.60	10.8	65	17.2	QP	L1	GND
0.602000	46.30	11.0	56	9.7	QP	L1	GND
1.192000	37.90	11.2	56	18.1	QP	L1	GND
2.945000	36.60	11.3	56	19.4	QP	L1	GND
9.365000	39.00	11.6	60	21.0	QP	L1	GND
14.495000	40.40	11.6	60	19.6	QP	L1	GND

MEASUREMENT RESULT: "TL-0722-03V_fin2"

2019-7-22 8:43

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.170000	30.50	10.8	55	24.5	AV	L1	GND
0.598000	39.70	11.0	46	6.3	AV	L1	GND
1.748000	28.10	11.2	46	17.9	AV	L1	GND
4.820000	24.90	11.4	46	21.1	AV	L1	GND
8.950000	26.20	11.5	50	23.8	AV	L1	GND
17.480000	17.50	11.7	50	32.5	AV	L1	GND

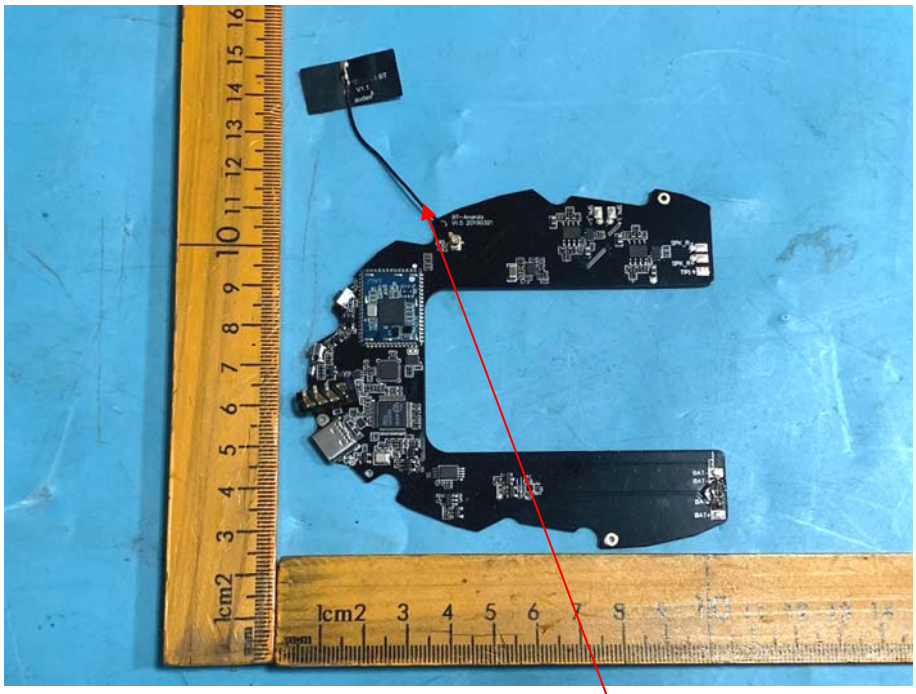
11. ANTENNA REQUIREMENT

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 1.8dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



Antenna

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