

# FCC Test Report

Product Name	Wireless Headphones
Model No.	ATH-M50xBT
FCC ID.	JFZM50XBT

Applicant	Audio-Technica Corporation
Address	2-46-1 Nishi-naruse, Machida, Tokyo, 194-8666

Date of Receipt	Aug. 15, 2018
Issued Date	Sep. 06, 2018
Report No.	1880226R-RFUSP01V00-A
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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# Test Report

Issued Date: Sep. 06, 2018

Report No.: 1880226R-RFUSP01V00-A



Product Name	Wireless Headphones
Applicant	Audio-Technica Corporation
Address	2-46-1 Nishi-naruse, Machida, Tokyo, 194-8666
Manufacturer	Audio-Technica Corporation
Model No.	ATH-M50xBT
FCC ID.	JFZM50XBT
EUT Rated Voltage	DC 3.7V (Power by Battery)
EUT Test Voltage	DC 3.7V (Power by Battery)
Trade Name	Audio-Technica Corporation
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v04
Test Result	Complied

Documented By

:



( Senior Adm. Specialist / Joanne Lin )

Tested By

:



( Engineer / Bill Lin )

Approved By

:



( Director / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Wireless Headphones
Trade Name	Audio-Technica Corporation
Model No.	ATH-M50xBT
FCC ID.	JFZM50XBT
Frequency Range	2402 – 2480MHz
Channel Number	V5.0: 40CH
Type of Modulation	V5.0: GFSK(2Mbps)
Antenna Type	Chip Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	MITSUBISHI	AM03DP-ST01	Chip Antenna	1.2dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel: (For V5.0)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. The EUT is a Wireless Headphones with built-in Bluetooth V5.0 、 V2.1+EDR transceiver, this report for Bluetooth V5.0.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth V5.0 transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - BLE
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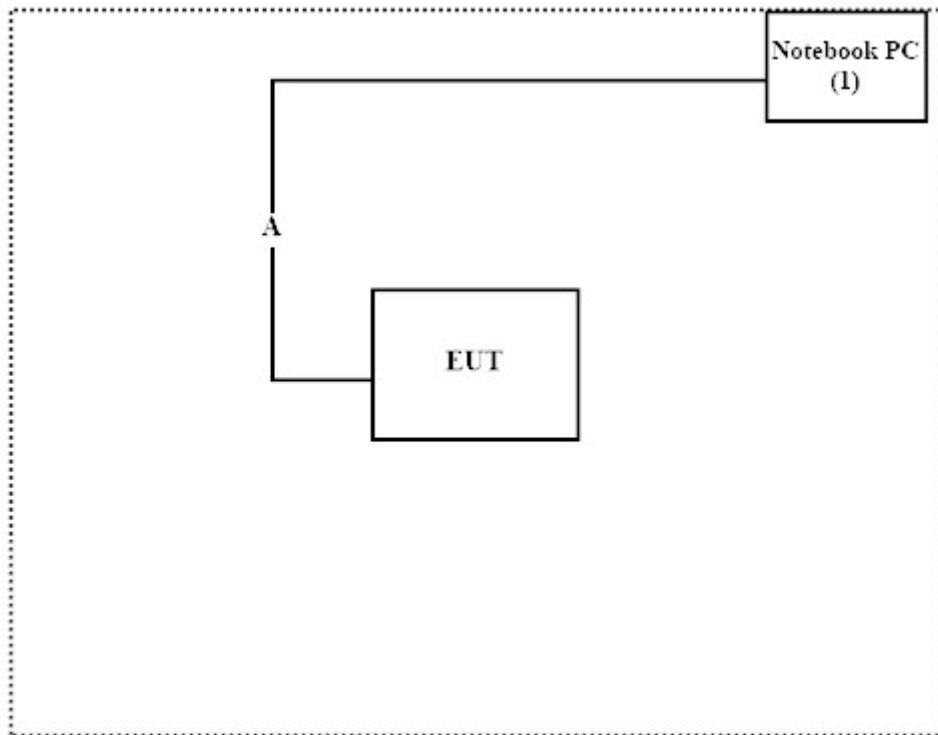
### 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	DELL	P62G	CY9FJC2	N/A

Signal Cable Type	Signal cable Description
A USB Cable	Shielded, 1.2m

### 1.4. Configuration of Tested System



### 1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute software “BlueTest3 Version 2.6.2” on the Notebook PC.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press “OK” to start the continuous Transmit.
- (5) Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

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FCC Accreditation Number: TW0023

## 1.7. List of Test Equipment

### For Conduction measurements / ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2018.02.08	2019.02.07
X	Two-Line V-Network	R&S	ENV216	101306	2018.03.09	2019.03.08
X	Two-Line V-Network	R&S	ENV216	101307	2018.03.20	2019.03.19
X	Coaxial Cable	Quietek	RG400_BNC	RF001	2018.05.24	2019.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

### For Conducted measurements / ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103464	2018.01.23	2019.01.22
X	Power Meter	Anritsu	ML2496A	1548003	2017.12.11	2018.12.10
X	Power Sensor	Anritsu	MA2411B	1531024	2017.12.11	2018.12.10
X	Power Sensor	Anritsu	MA2411B	1531025	2017.12.11	2018.12.10
	Bluetooth Tester	R&S	CBT	101238	2018.01.18	2019.01.17

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek Conduction Test System V8.0.110

### For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2018.01.26	2019.01.25
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2018.04.02	2019.04.01
X	Horn Antenna	ETS-Lindgren	3117	00203800	2017.11.10	2018.11.09
X	Horn Antenna	Com-Power	AH-840	101087	2018.06.01	2019.05.31
X	Pre-Amplifier	EMCI	EMC001330	980316	2018.06.01	2019.05.31
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2018.06.04	2019.06.03
X	Pre-Amplifier	EMCI	EMC05820SE	980310	2018.06.04	2019.06.03
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2018.05.16	2019.05.15
X	Filter	MICRO TRONICS	BRM50702	G249	2018.08.20	2019.08.19
	Filter	MICRO TRONICS	BRM50716	G187	2018.08.20	2019.08.19
X	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2018.02.08	2019.02.07
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2018.05.25	2019.05.24
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2018.05.16	2019.05.15

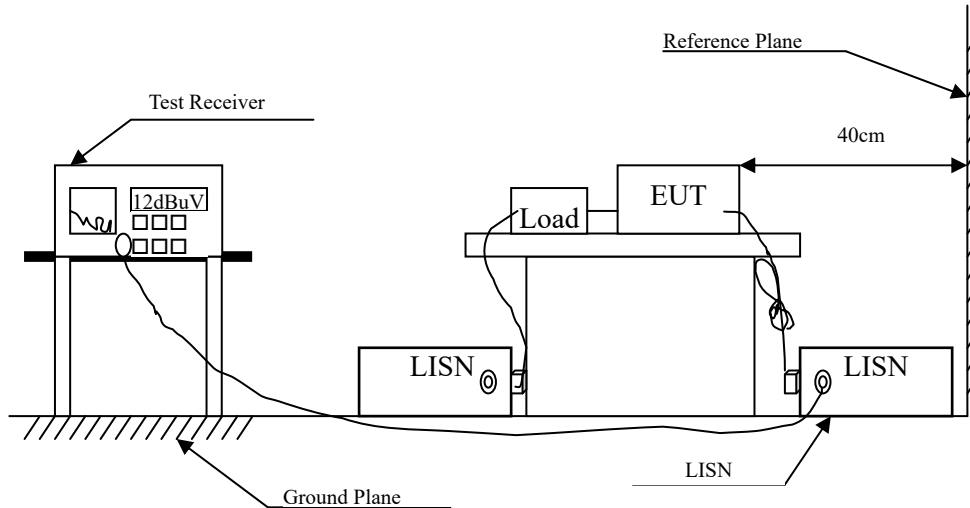
Note:

1. Loop Antenna is calibrated every two year, the other equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113



## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB $\mu$ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

### 2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

### 2.4. Uncertainty

±2.35dB

## 2.5. Test Result of Conducted Emission

Product : Wireless Headphones  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Mode : Mode 1: Transmit - BLE (2440MHz)  
 Test Date : 2018/08/27

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.154	9.611	36.084	45.694	-20.192	65.886
0.373	9.621	23.406	33.027	-26.602	59.629
0.616	9.630	9.422	19.052	-36.948	56.000
2.269	9.663	20.089	29.752	-26.248	56.000
3.631	9.706	19.911	29.617	-26.383	56.000
9.625	9.838	20.331	30.168	-29.832	60.000
<b>Average</b>					
0.154	9.611	20.347	29.958	-25.928	55.886
0.373	9.621	14.756	24.377	-25.252	49.629
0.616	9.630	5.068	14.698	-31.302	46.000
2.269	9.663	13.564	23.227	-22.773	46.000
3.631	9.706	10.125	19.831	-26.169	46.000
9.625	9.838	15.180	25.018	-24.982	50.000

### Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Wireless Headphones  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test Mode : Mode 1: Transmit - BLE (2440MHz)  
 Test Date : 2018/08/27

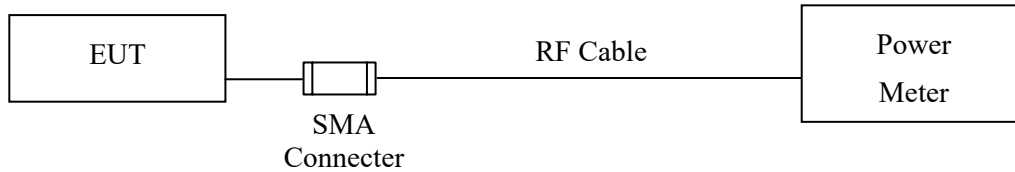
Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.150	9.601	37.898	47.500	-18.500	66.000
0.260	9.612	30.112	39.724	-23.133	62.857
0.411	9.617	22.844	32.462	-26.081	58.543
2.267	9.663	20.492	30.155	-25.845	56.000
3.613	9.706	20.249	29.955	-26.045	56.000
9.803	9.839	16.719	26.558	-33.442	60.000
<b>Average</b>					
0.150	9.601	15.013	24.615	-31.385	56.000
0.260	9.612	18.445	28.057	-24.800	52.857
0.411	9.617	11.647	21.264	-27.279	48.543
2.267	9.663	13.492	23.155	-22.845	46.000
3.613	9.706	10.133	19.839	-26.161	46.000
9.803	9.839	10.447	20.286	-29.714	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### 3. Peak Power Output

#### 3.1. Test Setup



#### 3.2. Limit

The maximum peak power shall be less 1Watt.

#### 3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

#### 3.4. Uncertainty

$\pm 0.86$  dB

### 3.5. Test Result of Peak Power Output

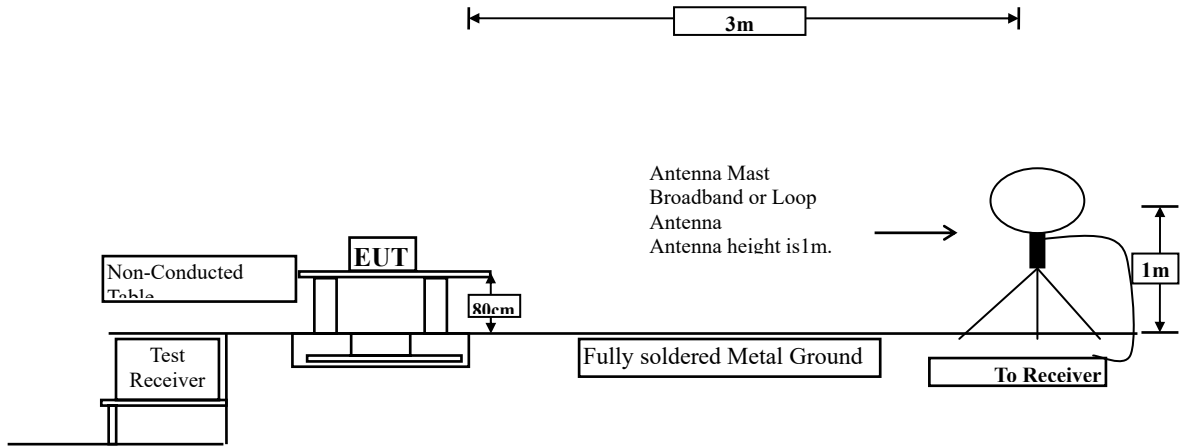
Product : Wireless Headphones  
Test Item : Peak Power Output  
Test Mode : Mode 1: Transmit - BLE  
Test Date : 2018/08/23

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	6.76	1 Watt= 30 dBm	Pass
Channel 19	2440.00	6.56	1 Watt= 30 dBm	Pass
Channel 39	2480.00	5.94	1 Watt= 30 dBm	Pass

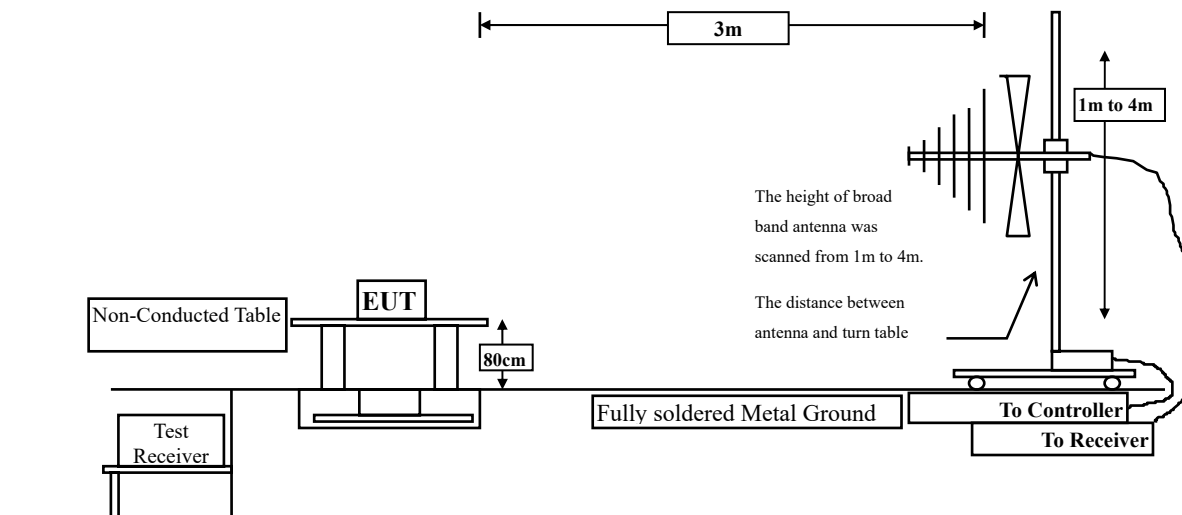
## 4. Radiated Emission

### 4.1. Test Setup

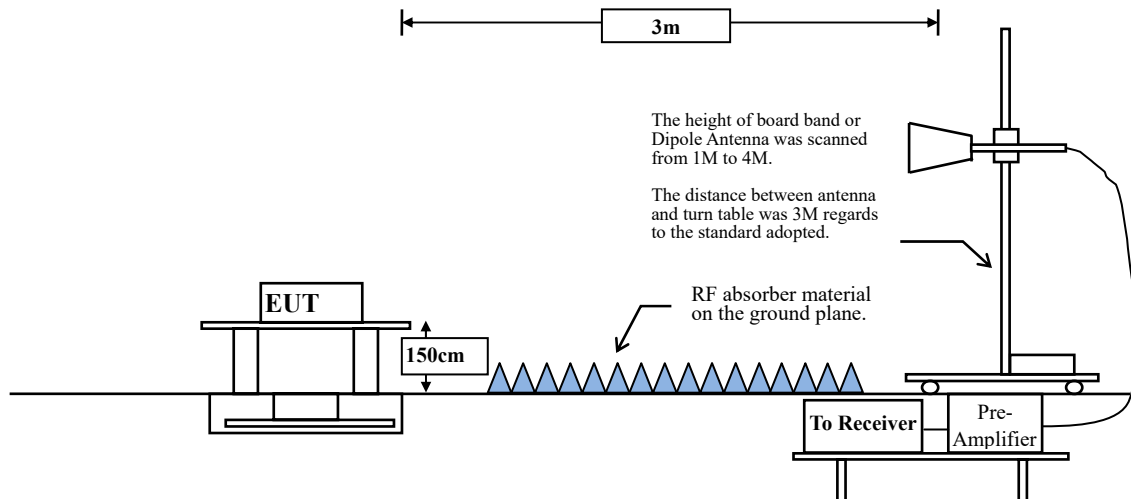
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



## 4.2. Limits

### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

<b>FCC Part 15 Subpart C Paragraph 15.209 Limits</b>		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dB $\mu$ V) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.



### 4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

### RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$ .

**Table 1 —RBW as a function of frequency**

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle  $\geq 98\%$

$VBW \geq 1/T$ , when duty cycle  $< 98\%$

( T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	71.43	0.4493	2226	3k

Note: Duty Cycle Refer to Section 9

## 4.4. Uncertainty

Horizontal polarization :

30-300MHz:  $\pm 4.08$ dB ; 300M-1GHz:  $\pm 3.86$ dB ; 1-18GHz:  $\pm 3.77$ dB ; 18-40GHz:  $\pm 3.98$ dB

Vertical polarization :

30-300MHz:  $\pm 4.81$ dB ; 300M-1GHz:  $\pm 3.87$ dB ; 1-18GHz:  $\pm 3.83$ dB ; 18-40GHz:  $\pm 3.98$ dB

#### 4.5. Test Result of Radiated Emission

Product : Wireless Headphones  
 Test Item : Harmonic Radiated Emission  
 Test Mode : Mode 1: Transmit - BLE(2402MHz)  
 Test Date : 2018/08/29

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4804.000	-6.081	52.330	46.249	-27.751	74.000
7206.000	-3.033	49.100	46.067	-27.933	74.000
9608.000	-0.774	46.120	45.347	-28.653	74.000
<b>Average Detector:</b>					
--					54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4804.000	-6.081	51.650	45.569	-28.431	74.000
7206.000	-3.033	49.370	46.337	-27.663	74.000
9608.000	-0.774	46.350	45.577	-28.423	74.000
<b>Average Detector:</b>					
--					54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Headphones  
 Test Item : Harmonic Radiated Emission  
 Test Mode : Mode 1: Transmit - BLE (2440MHz)  
 Test Date : 2018/08/29

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4880.000	-6.045	51.490	45.445	-28.555	74.000
7320.000	-2.959	50.890	47.931	-26.069	74.000
9760.000	-0.492	46.120	45.628	-28.372	74.000
<b>Average Detector:</b>					
--					54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4880.000	-6.045	50.800	44.755	-29.245	74.000
7320.000	-2.959	50.110	47.151	-26.849	74.000
9760.000	-0.492	46.420	45.928	-28.072	74.000
<b>Average Detector:</b>					
--					54.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Headphones  
 Test Item : Harmonic Radiated Emission  
 Test Mode : Mode 1: Transmit - BLE (2480MHz)  
 Test Date : 2018/08/29

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4960.000	-6.041	50.780	44.739	-29.261	74.000
7440.000	-2.805	50.140	47.335	-26.665	74.000
9920.000	-0.260	45.130	44.870	-29.130	74.000
<b>Average Detector:</b>					
--					54.000
<b>Vertical</b>					
<b>Peak Detector:</b>					
4960.000	-6.041	50.860	44.819	-29.181	74.000
7440.000	-2.805	50.260	47.455	-26.545	74.000
9920.000	-0.260	45.440	45.180	-28.820	74.000
<b>Average Detector:</b>					
--					54.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : Wireless Headphones  
 Test Item : General Radiated Emission  
 Test Mode : Mode 1: Transmit - BLE (2440MHz)  
 Test Date : 2018/08/28

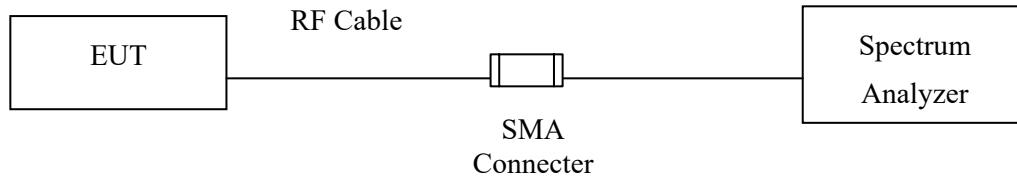
Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
49.681	-10.918	35.818	24.899	-15.101	40.000
111.536	-14.244	43.788	29.544	-13.956	43.500
249.304	-12.090	41.796	29.705	-16.295	46.000
360.362	-8.943	34.824	25.882	-20.118	46.000
468.609	-6.481	37.350	30.870	-15.130	46.000
947.986	0.327	31.132	31.459	-14.541	46.000
<b>Vertical</b>					
59.522	-12.096	41.830	29.734	-10.266	40.000
105.913	-15.111	40.481	25.370	-18.130	43.500
224.000	-13.137	44.210	31.073	-14.927	46.000
492.507	-6.078	31.173	25.095	-20.905	46.000
822.870	-1.300	31.642	30.342	-15.658	46.000
973.290	0.659	30.680	31.338	-22.662	54.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

## 5. RF Antenna Conducted Test

### 5.1. Test Setup



### 5.2. Limits

According to FCC 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

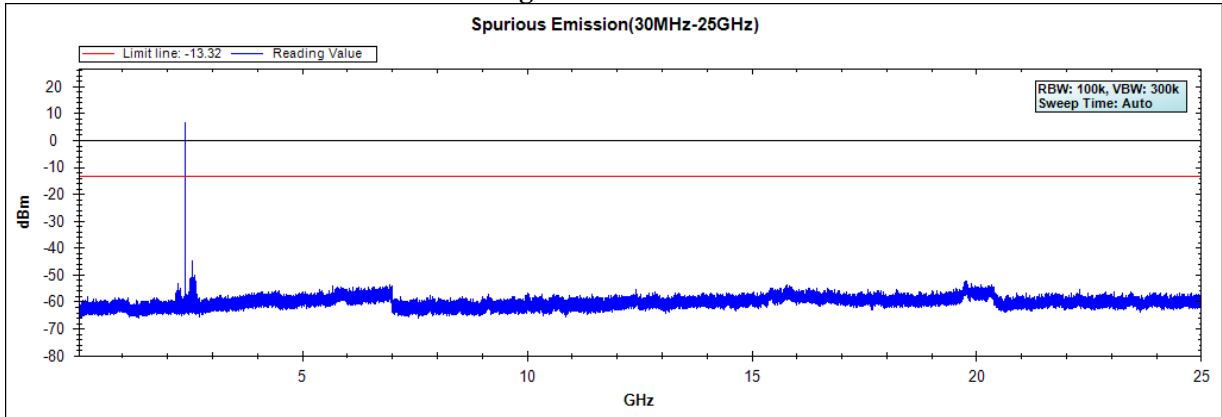
### 5.4. Uncertainty

±1.23dB

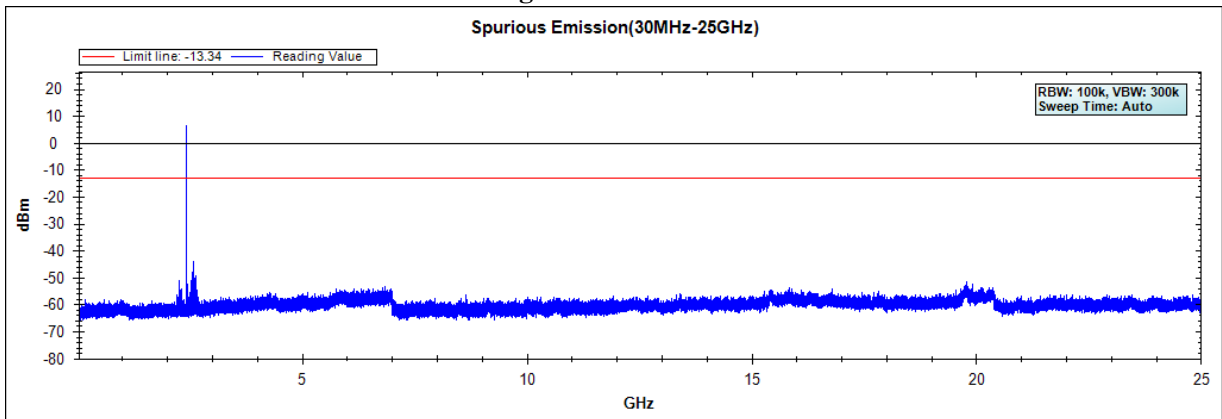
### 5.5. Test Result of RF Antenna Conducted Test

Product : Wireless Headphones  
 Test Item : RF Antenna Conducted Test  
 Test Mode : Mode 1: Transmit - BLE  
 Test Date : 2018/08/23

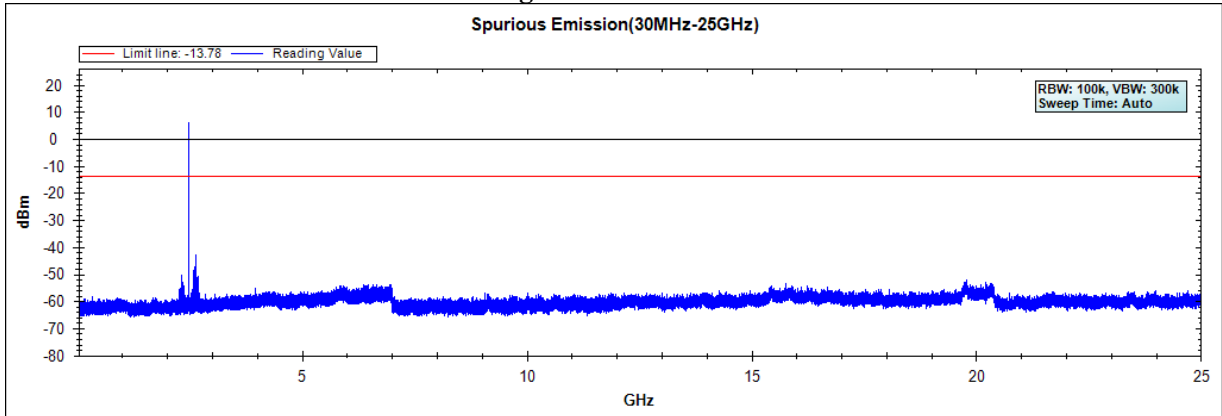
**Figure Channel 00:**



**Figure Channel 19:**



**Figure Channel 39:**



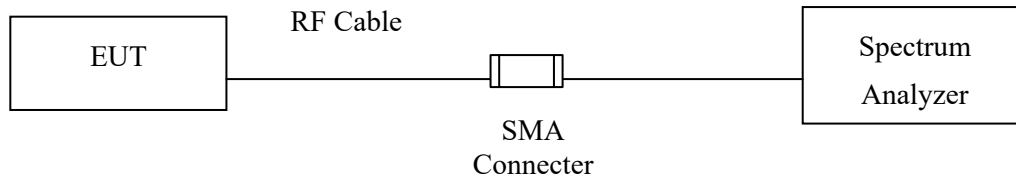
Note: The above test pattern is synthesized by multiple of the frequency range.



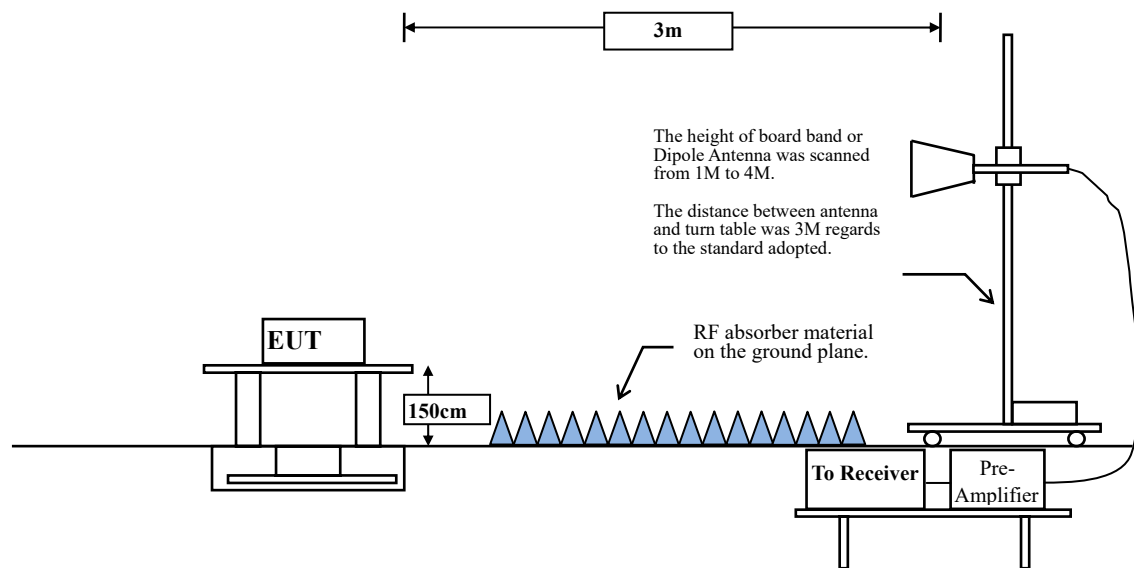
## 6. Band Edge

### 6.1. Test Setup

#### RF Conducted Measurement



#### RF Radiated Measurement:



## 6.2. Limit

According to FCC 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 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, 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) (see Section 15.205(c)).

## 6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

**RBW and VBW Parameter setting:**

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

VBW  $\geq$  3 x RBW.

**Table 1- RBW as a function of frequency**

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle  $\geq$  98 %

VBW  $\geq$  1/T, when duty cycle < 98 %

( T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	71.43	0.4493	2226	3k

Note: Duty Cycle Refer to Section 9

**6.4. Uncertainty**

Conducted:  $\pm$ 1.23dB

Radiated:

Horizontal polarization : 1-18GHz:  $\pm$ 3.77dB

Vertical polarization : 1-18GHz :  $\pm$ 3.83dB

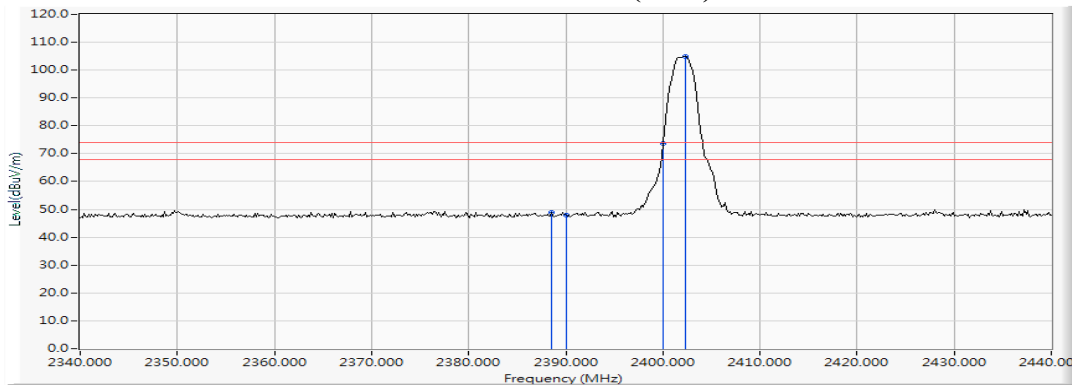
### 6.5. Test Result of Band Edge

Product : Wireless Headphones  
 Test Item : Band Edge  
 Test Mode : Mode 1: Transmit - BLE  
 Test Date : 2018/08/27

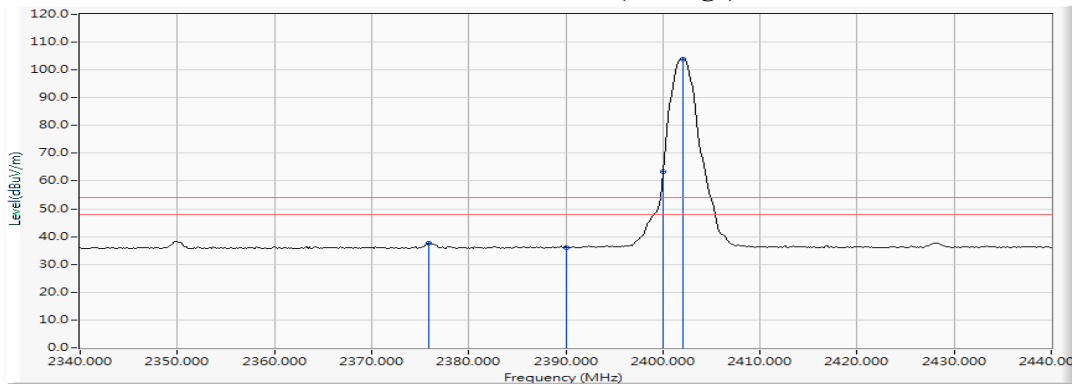
#### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2388.551	10.256	38.624	48.880	74.00	54.00	Pass
00 (Peak)	2390.000	10.262	37.600	47.862	74.00	54.00	Pass
00 (Peak)	2400.000	10.304	63.501	73.804	--	--	--
00 (Peak)	2402.319	10.312	94.613	104.926	--	--	--
00 (Average)	2375.942	10.205	27.475	37.680	74.00	54.00	Pass
00 (Average)	2390.000	10.262	25.892	36.154	74.00	54.00	Pass
00 (Average)	2400.000	10.304	52.975	63.278	--	--	--
00 (Average)	2402.029	10.312	93.722	104.034	--	--	--

**Figure Channel 00: Horizontal (Peak)**



**Figure Channel 00: Horizontal (Average)**



Note:

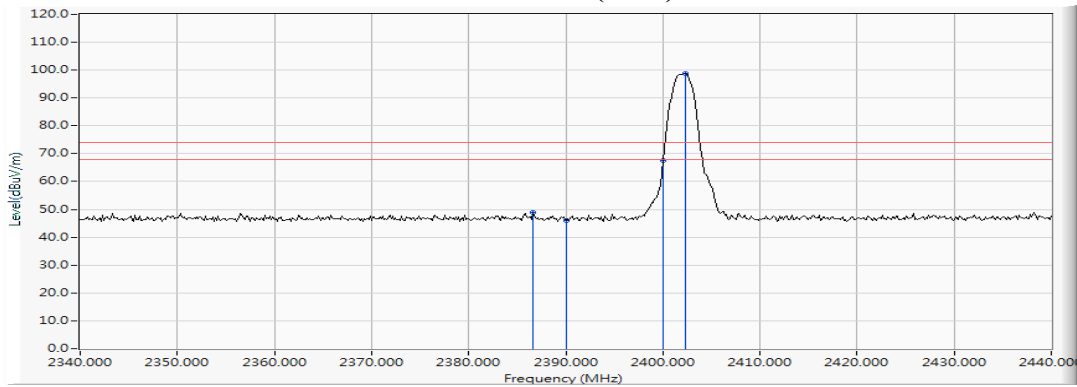
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Headphones  
 Test Item : Band Edge  
 Test Mode : Mode 1: Transmit - BLE  
 Test Date : 2018/08/27

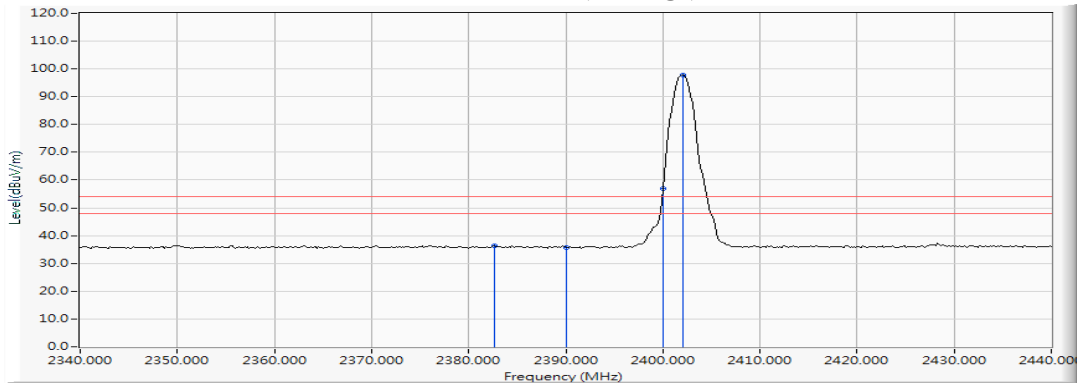
**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2386.667	10.248	38.685	48.933	74.00	54.00	Pass
00 (Peak)	2390.000	10.262	35.843	46.105	74.00	54.00	Pass
00 (Peak)	2400.000	10.304	57.236	67.539	--	--	--
00 (Peak)	2402.319	10.312	88.392	98.705	--	--	--
00 (Average)	2382.609	10.231	26.113	36.344	74.00	54.00	Pass
00 (Average)	2390.000	10.262	25.587	35.849	74.00	54.00	Pass
00 (Average)	2400.000	10.304	46.636	56.939	--	--	--
00 (Average)	2402.029	10.312	87.494	97.806	--	--	--

**Figure Channel 00: Vertical (Peak)**



**Figure Channel 00: Vertical (Average)**



Note:

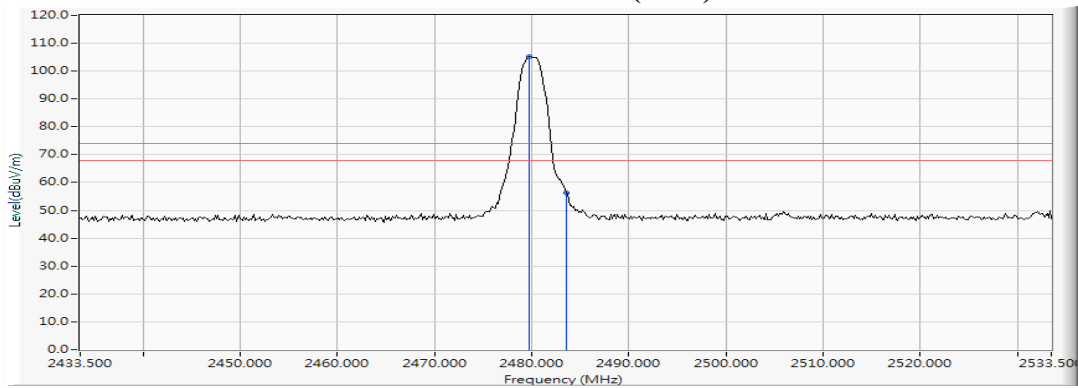
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Headphones  
 Test Item : Band Edge  
 Test Mode : Mode 1: Transmit - BLE  
 Test Date : 2018/08/27

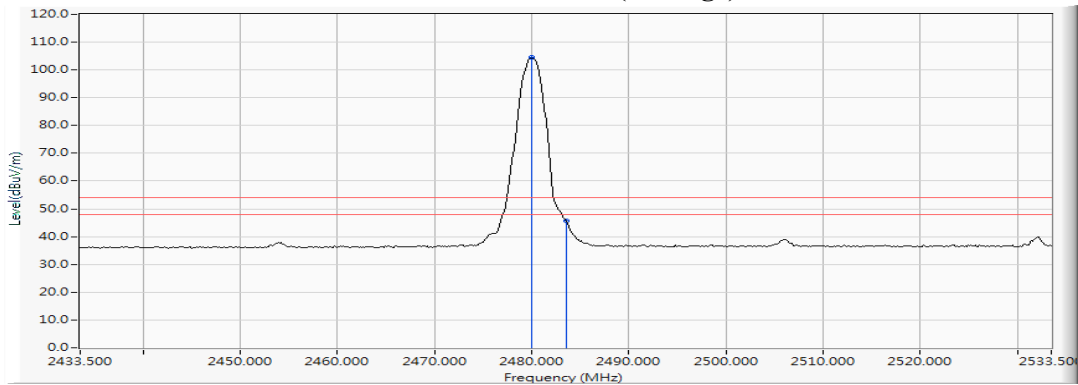
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.732	10.627	94.510	105.137	--	--	--
39 (Peak)	2483.500	10.640	45.726	56.367	74.00	54.00	Pass
39 (Average)	2480.022	10.628	93.769	104.397	--	--	--
39 (Average)	2483.500	10.640	35.075	45.716	74.00	54.00	Pass

**Figure Channel 39: Horizontal (Peak)**



**Figure Channel 39: Horizontal (Average)**



**Note:**

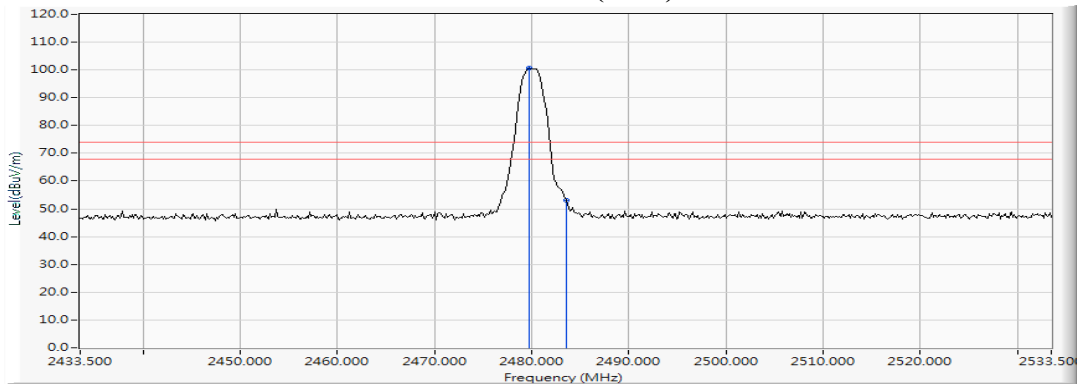
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Wireless Headphones  
 Test Item : Band Edge  
 Test Mode : Mode 1: Transmit - BLE  
 Test Date : 2018/08/27

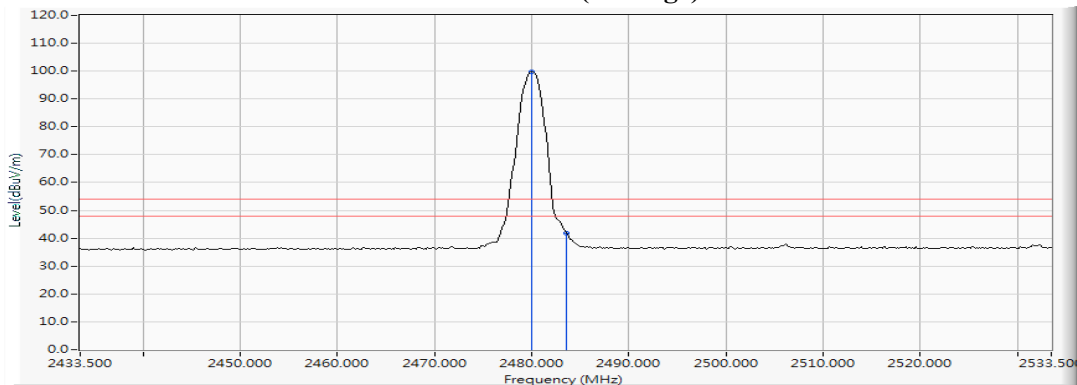
**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.732	10.627	89.911	100.538	--	--	--
39 (Peak)	2483.500	10.640	42.556	53.197	74.00	54.00	Pass
39 (Average)	2480.022	10.628	89.192	99.820	--	--	--
39 (Average)	2483.500	10.640	31.293	41.934	74.00	54.00	Pass

**Figure Channel 39: Vertical (Peak)**



**Figure Channel 39: Vertical (Average)**

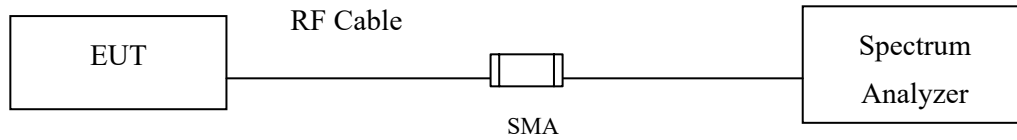


Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

## 7. 6dB Bandwidth

### 7.1. Test Setup



### 7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

### 7.3. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth,  $VBW \geq 3 * RBW$

### 7.4. Uncertainty

$\pm 279.2\text{Hz}$

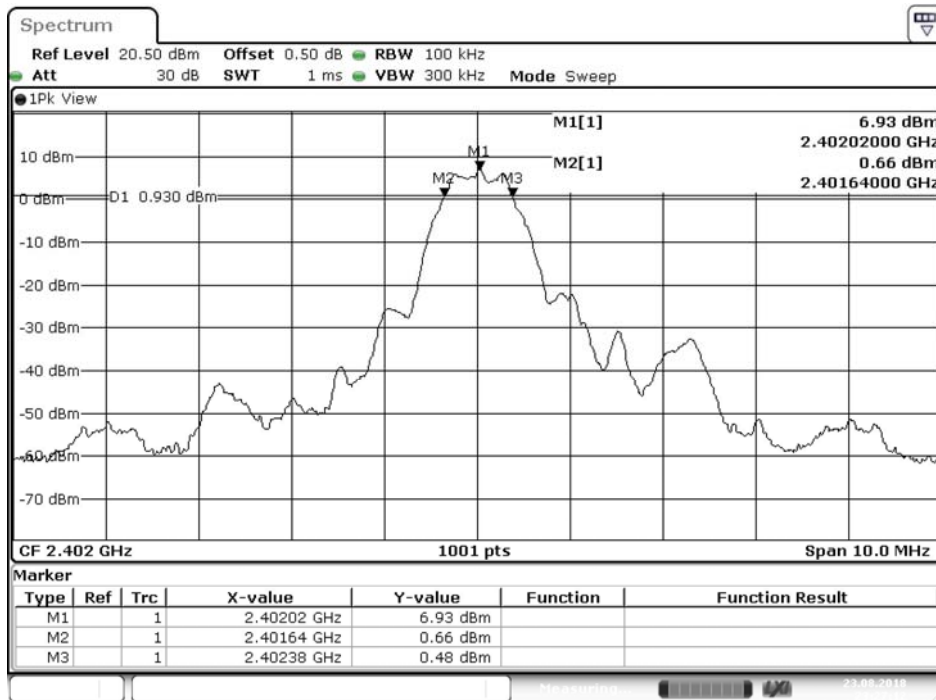


### 7.5. Test Result of 6dB Bandwidth

Product : Wireless Headphones  
Test Item : 6dB Bandwidth Data  
Test Mode : Mode 1: Transmit - BLE

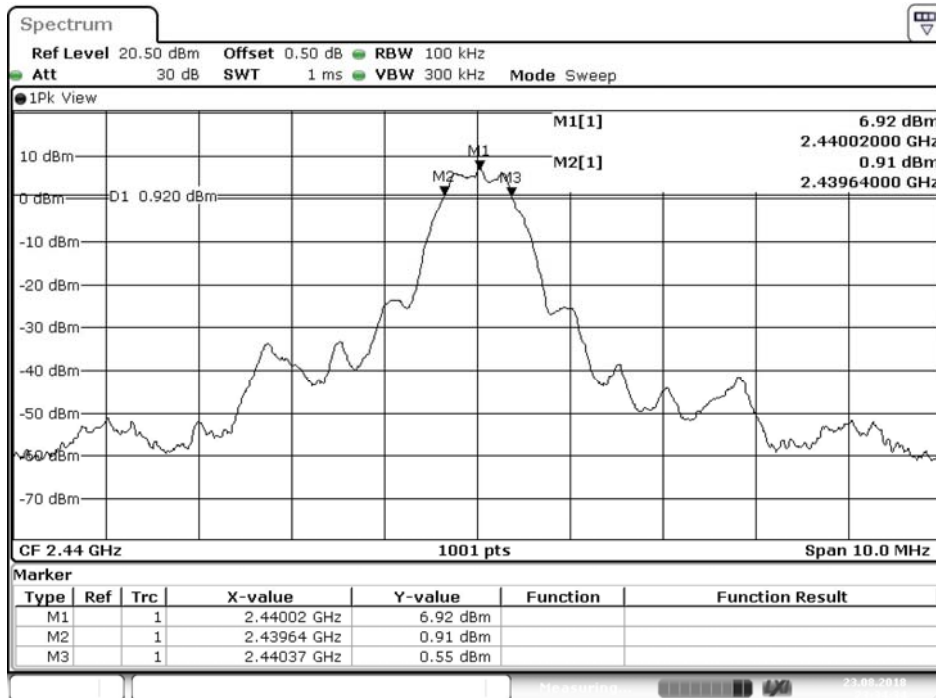
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	740	>500	Pass
19	2440	730	>500	Pass
39	2480	730	>500	Pass

Figure Channel 00:



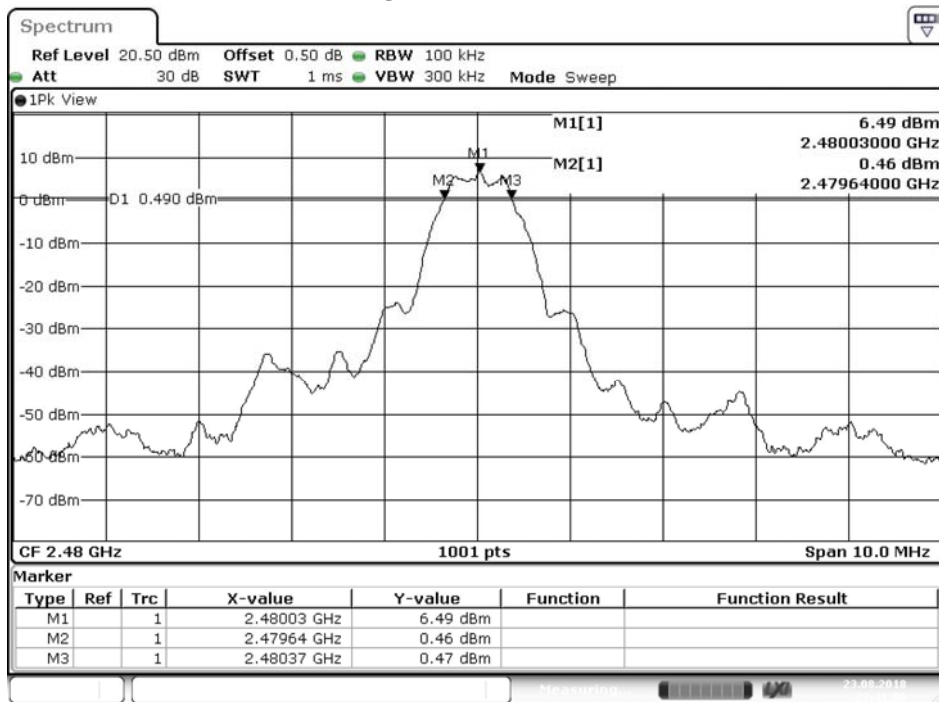
Date: 23.AUG.2018 23:27:13

Figure Channel 19:



Date: 23.AUG.2018 23:34:34

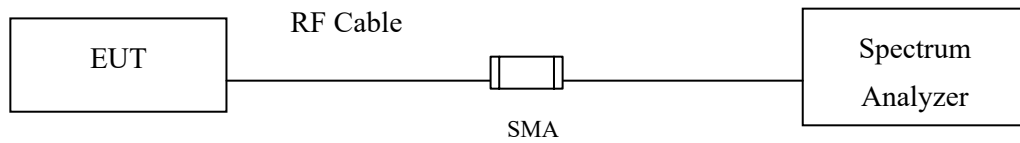
Figure Channel 39:



Date: 23.AUG.2018 23:41:00

## 8. Power Density

### 8.1. Test Setup



### 8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

### 8.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

### 8.4. Uncertainty

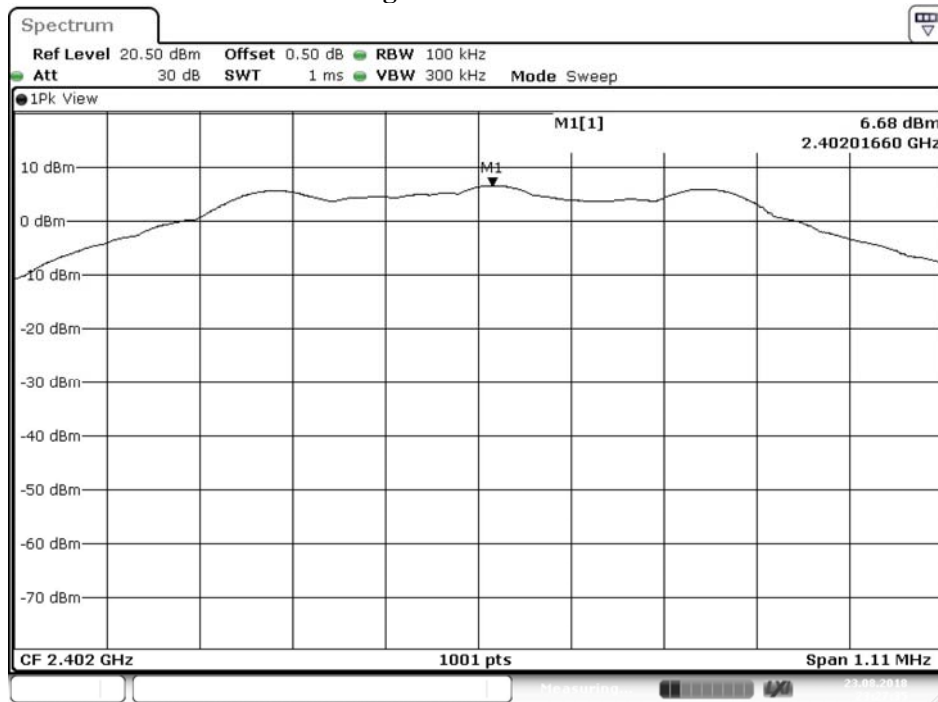
$\pm 1.23\text{dB}$

### 8.5. Test Result of Power Density

Product : Wireless Headphones  
Test Item : Power Density Data  
Test Mode : Mode 1: Transmit - BLE

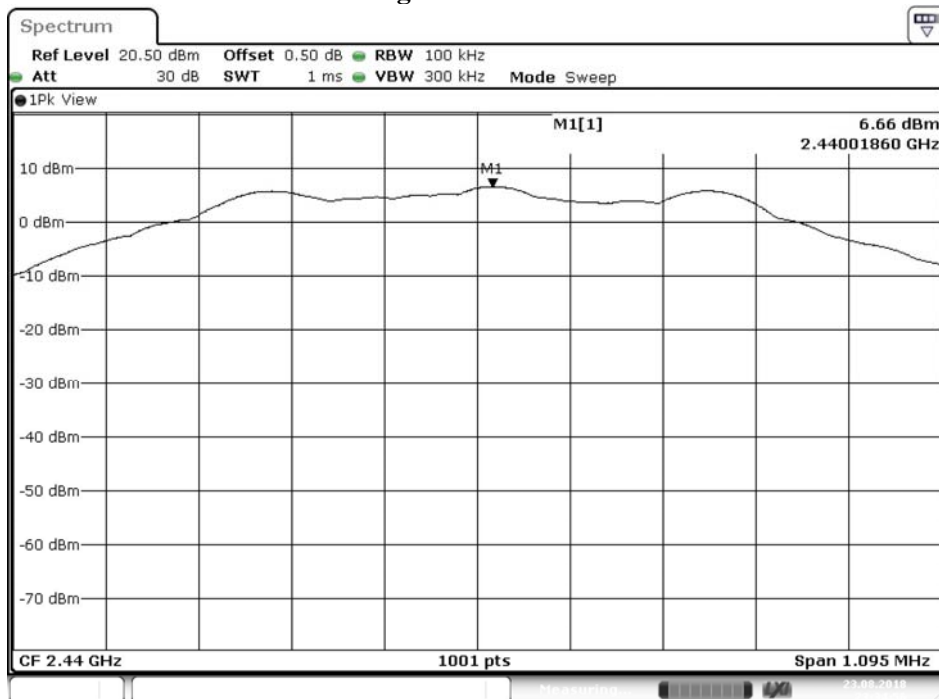
Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	6.680	$\leq 8$ dBm	Pass
19	2440	6.660	$\leq 8$ dBm	Pass
39	2480	6.220	$\leq 8$ dBm	Pass

Figure Channel 00:



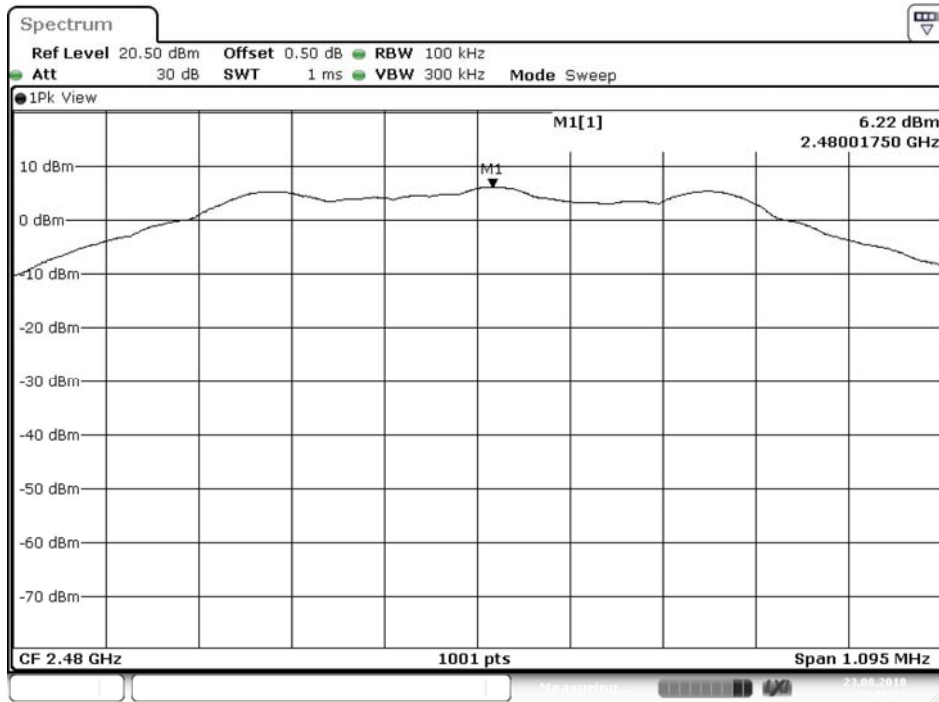
Date: 23.AUG.2018 23:27:35

Figure Channel 19:



Date: 23.AUG.2018 23:34:56

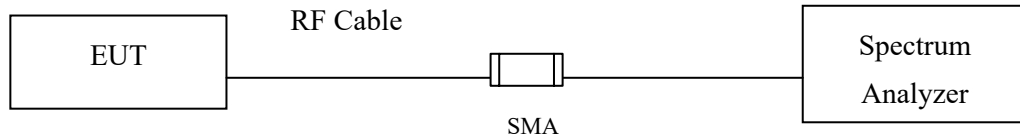
Figure Channel 39:



Date: 23.AUG.2018 23:41:23

## 9. Duty Cycle

### 9.1. Test Setup



### 9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### 9.3. Uncertainty

$\pm 2.31\text{msec}$



### 9.4. Test Result of Duty Cycle

Product : Wireless Headphones  
 Test Item : Duty Cycle  
 Test Mode : Mode 1: Transmit - BLE

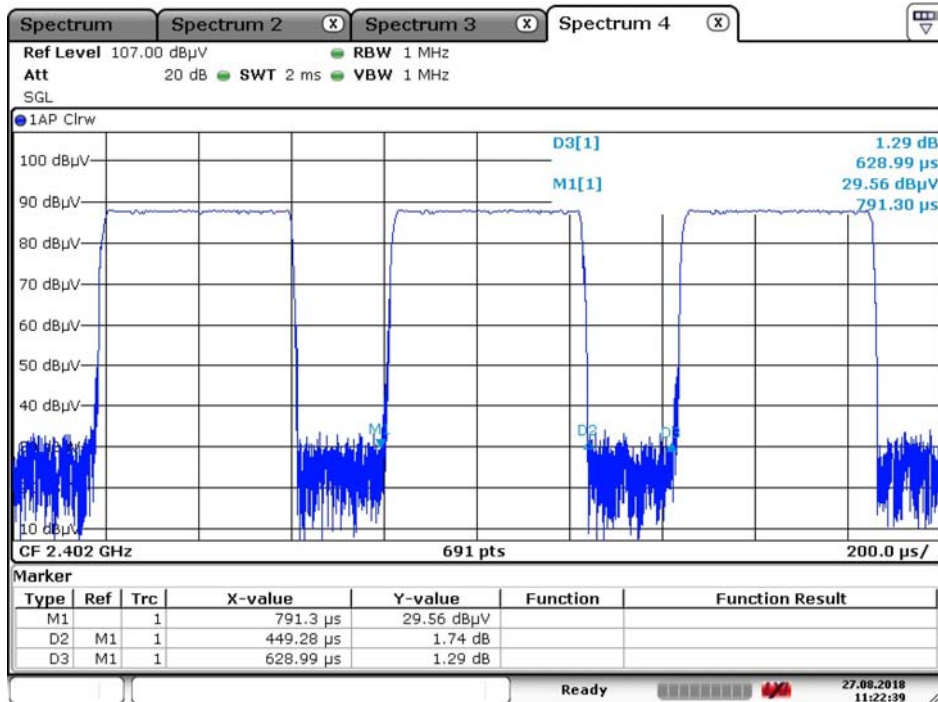
Duty Cycle Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

$$\text{Duty Factor} = 10 \text{ Log} (1/\text{Duty Cycle})$$

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE	0.4493	0.6290	71.43	1.46



Date: 27.AUG.2018 11:22:39

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**10. EMI Reduction Method During Compliance Testing**

No modification was made during testing.