

APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
Shenzhen Bade Electronic Technology Co., Ltd.

TWS Earbuds
Model No.: P2G-SP8, P2G-SP7, PNS-AP4

FCC ID: 2AUGP-P2GSP8

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Report No. : ATE20191328
Date of Test : September 4-9, 2019
Date of Report : September 10, 2019

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Test Report Certification

Applicant : Shenzhen Bade Electronic Technology Co., Ltd.
Manufacturer : Shenzhen Bade Electronic Technology Co., Ltd.
EUT Description : TWS Earbuds
Model No. : P2G-SP8, P2G-SP7, PNS-AP4
Brand Name : n.a.

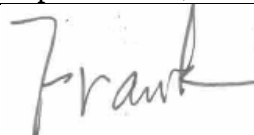
Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2018
ANSI C63.10: 2013

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.

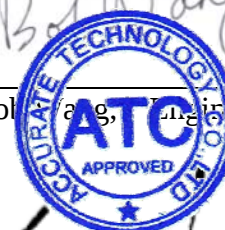
This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : September 4-9, 2019
Date of Report : September 10, 2019

Test Engineer : 
(Frank, Engineer)

Prepared by : 
(Bob Wang, Engineer)

Approved & Authorized Signer : 
(Sean Liu, Manager)



1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Model Number	: P2G-SP8, P2G-SP7, PNS-AP4 (Note: These samples are same except their appearance is different. So we prepare P2G-SP8 for test only.)
Bluetooth version	: V 5.0
Frequency Range	: 2402MHz-2480MHz
Number of Channels	: 79
Antenna Gain(Max)	: -0.58dBi
Antenna type	: Integral Antenna
Adapter Input Voltage	: DC 3.7V (Powered by Lithium battery) or DC 5V (Powered by USB port)
Modulation mode	: GFSK, $\pi/4$ DQPSK
Hardware version	: V1.1
Software version	: V1.0
Applicant	: Shenzhen Bade Electronic Technology Co., Ltd.
Address	: 1201, Building 12, Unit D, Zhonghang Gelan Garden, Guanlan Street, Longhua New District, Shenzhen, Guangdong, China
Manufacturer	: Shenzhen Bade Electronic Technology Co., Ltd.
Address	: 1201, Building 12, Unit D, Zhonghang Gelan Garden, Guanlan Street, Longhua New District, Shenzhen, Guangdong, China

1.2. Accessory and Auxiliary Equipment

Adapter:	Model: BEK-QC-001 INPUT: 120V~60Hz OUTPUT: 5V/1A
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1.3. 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

1.4. 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	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 05, 2019	1 Year
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 05, 2019	1 Year
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 05, 2019	1 Year
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 05, 2019	1 Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 05, 2019	1 Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 05, 2019	1 Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 05, 2019	1 Year
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 05, 2019	1 Year
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 05, 2019	1 Year
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 05, 2019	1 Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 05, 2019	1 Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 05, 2019	1 Year
RF COAXIAL CABLE	SUHNER	N-5m(Frequency range:9KHz-26.5GHz)	NO.3	Jan. 05, 2019	1 Year
RF COAXIAL CABLE	SUHNER	N-5m(Frequency range:9KHz-26.5GHz)	NO.4	Jan. 05, 2019	1 Year
RF COAXIAL CABLE	SUHNER	N-1m(Frequency range:9KHz-26.5GHz)	NO.5	Jan. 05, 2019	1 Year
RF COAXIAL CABLE	SUHNER	N-1m(Frequency range:9KHz-26.5GHz)	NO.6	Jan. 05, 2019	1 Year
Temporary antenna connector	NTGS	14AE	N/A	March 20, 2019	N/A

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: Transmitting mode

Low Channel: 2402MHz

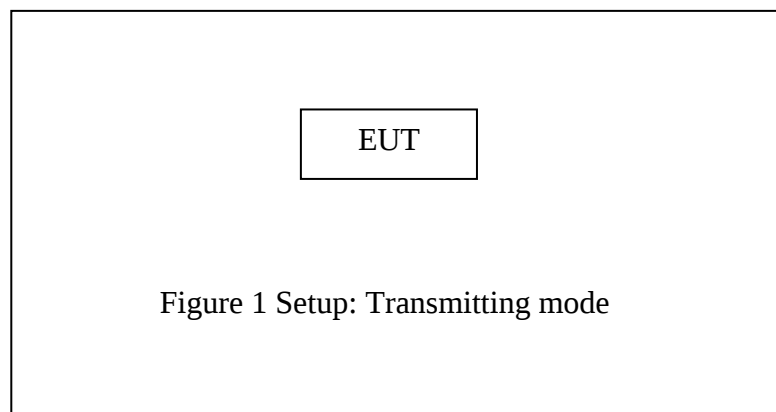
Middle Channel: 2441MHz

High Channel: 2480MHz

Hopping

Note: The equipment under test (EUT) was tested under fully-charged battery.
The Bluetooth has been tested under continuous transmission mode.

3.2.Configuration and peripherals



4. FREQUENCY HOPPING SYSTEM REQUIREMENTS

4.1. Standard and Limit

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

4.2. EUT Pseudorandom Frequency Hopping Sequence

Pseudorandom Frequency Hopping Sequence Table as below:

Channel: 08, 24, 40, 56, 34, 51, 72, 09, 01, 64, 22, 33, 41, 32, 47, 65, 73, 53, 69, 06, 17, 04, 20, 36, 52, 38, 66, 70, 78, 68, 76, 21, 29, 10, 26, 49, 00, 58, 44, 59, 75, 13, 03, 14, 11, 35, 43, 37, 50, 61, 77, 55, 71, 02, 23, 07, 27, 39, 54, 46, 48, 15, 63, 62, 67, 25, 31, 12, 28, 19, 60, 42, 57, 74, 16, 05, 18, 30, 45, etc.

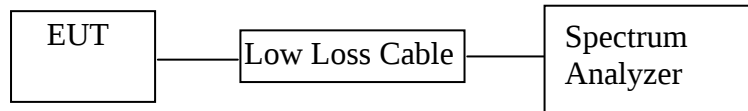
The system receiving have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

5. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission Test	Compliant
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)	Carrier Frequency Separation Test	Compliant
Section 15.247(a)(1)(iii)	Number Of Hopping Frequency Test	Compliant
Section 15.247(a)(1)(iii)	Dwell Time Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d) Section 15.209	Radiated Emission Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.203	Antenna Requirement	Compliant

6. 20DB BANDWIDTH TEST

6.1. Block Diagram of Test Setup



(EUT: TWS Earbuds)

6.2. The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.3. EUT Configuration on Measurement

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 5.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, 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 30 kHz and VBW to 100 kHz.

6.5.3. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

6.6. Test Result

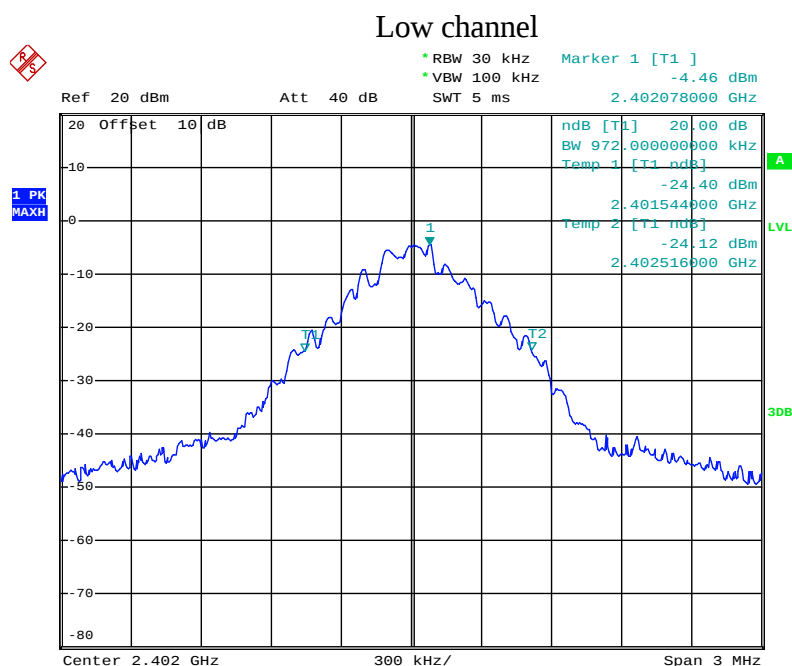
Test Lab: Shielding room

Test Engineer: Frank

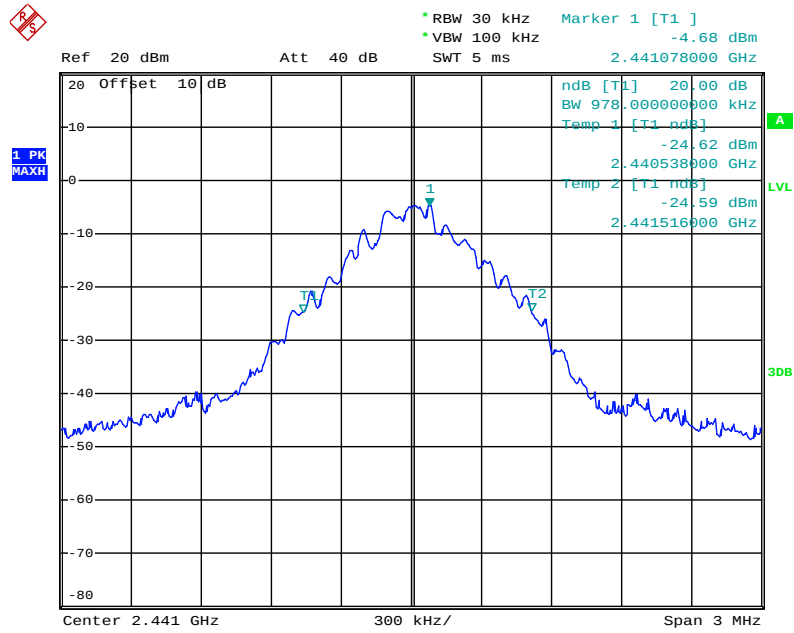
Channel	Frequency (MHz)	GFSK 20dB Bandwidth (MHz)	$\Pi/4$ -DQPSK 20dB Bandwidth (MHz)	Result
Low	2402	0.972	1.356	Pass
Middle	2441	0.978	1.356	Pass
High	2480	0.978	1.362	Pass

The spectrum analyzer plots are attached as below.

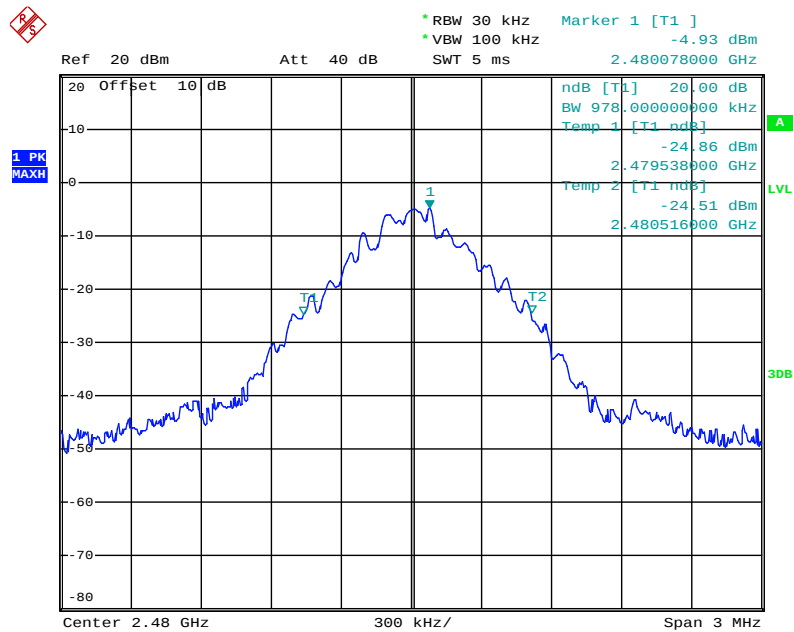
GFSK Mode



Middle channel

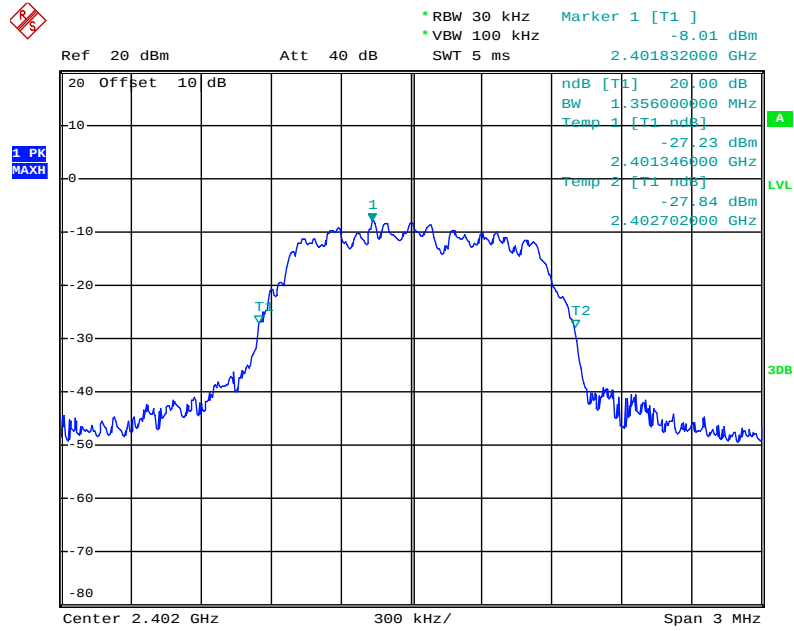


High channel

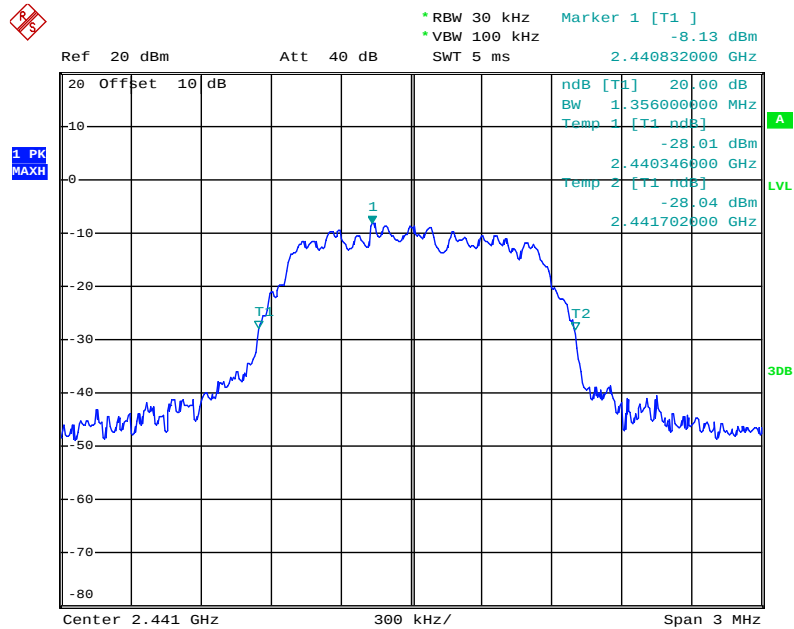


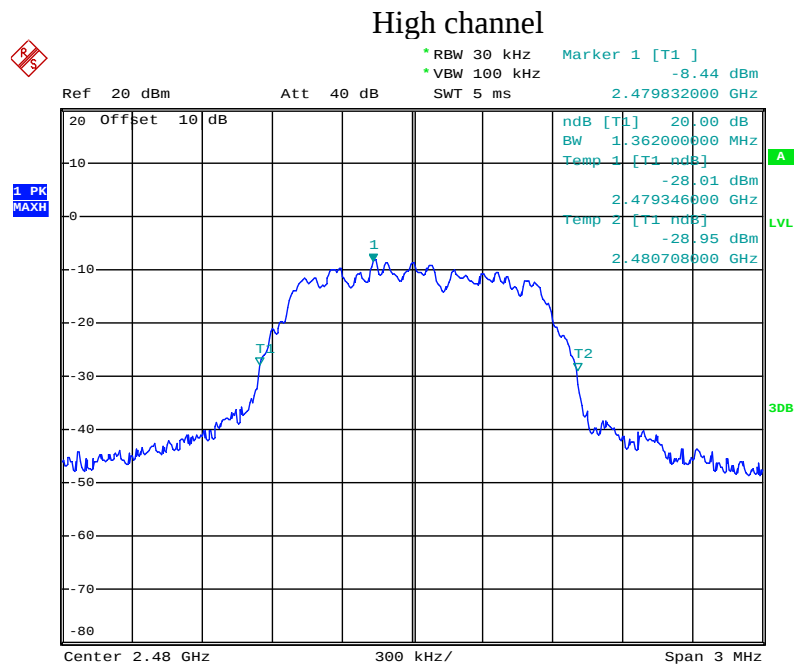
Π/4-DQPSK Mode

Low channel



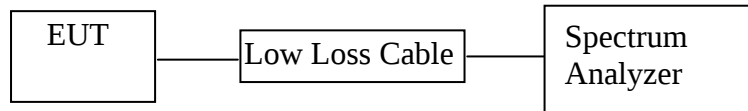
Middle channel





7. CARRIER FREQUENCY SEPARATION TEST

7.1. Block Diagram of Test Setup



(EUT: TWS Earbuds)

7.2. The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

7.3. EUT Configuration on Measurement

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 6.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, 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. Set RBW of spectrum analyzer to 30 kHz and VBW to 100 kHz. Adjust Span to 2MHz.

7.5.3. Set the adjacent channel of the EUT Maxhold another trace.

7.5.4. Measurement the channel separation

7.6. Test Result

Test Lab: Shielding room

Test Engineer: Frank

GFSK

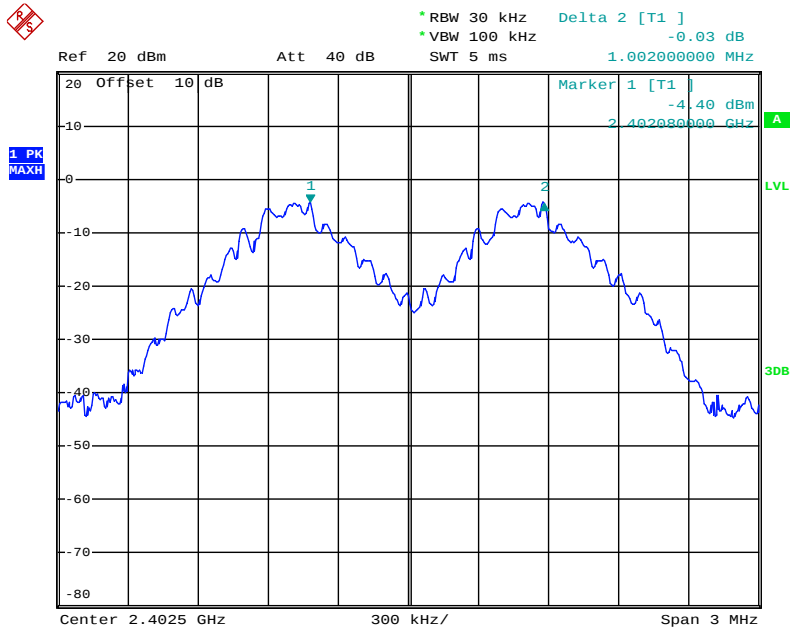
Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.002	25KHz or 2/3*20dB bandwidth	PASS
	2403			
Middle	2440	1.002	25KHz or 2/3*20dB bandwidth	PASS
	2441			
High	2479	1.002	25KHz or 2/3*20dB bandwidth	PASS
	2480			

Π/4-DQPSK

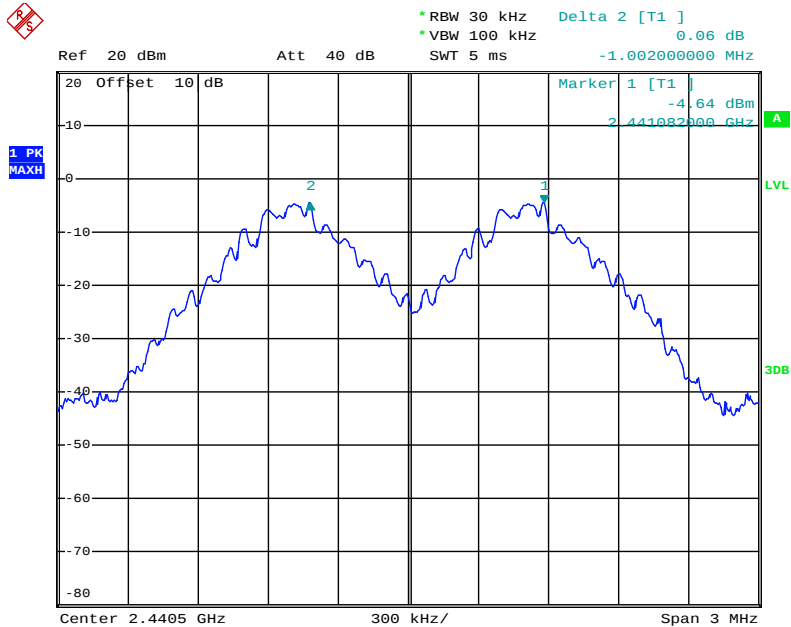
Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.014	25KHz or 2/3*20dB bandwidth	PASS
	2403			
Middle	2440	1.002	25KHz or 2/3*20dB bandwidth	PASS
	2441			
High	2479	1.002	25KHz or 2/3*20dB bandwidth	PASS
	2480			

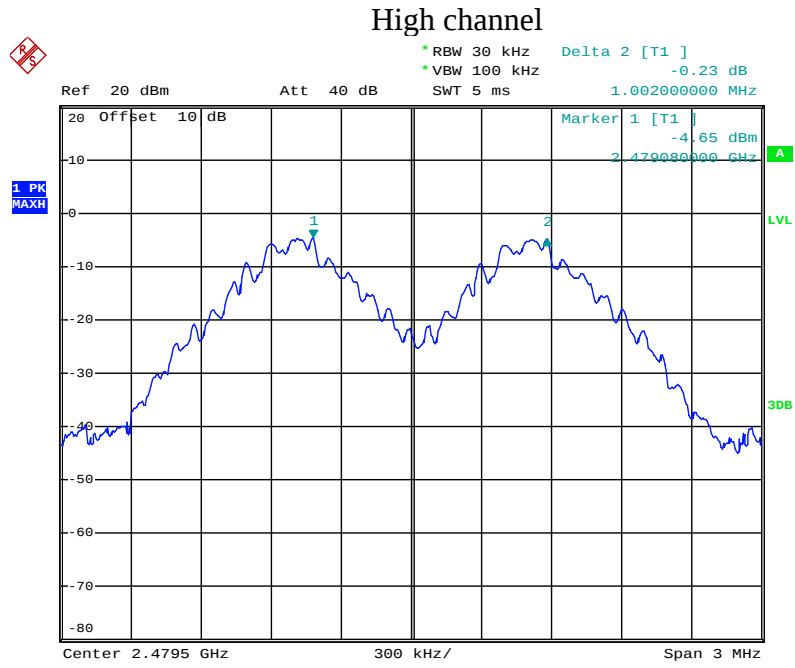
GFSK Mode

Low channel

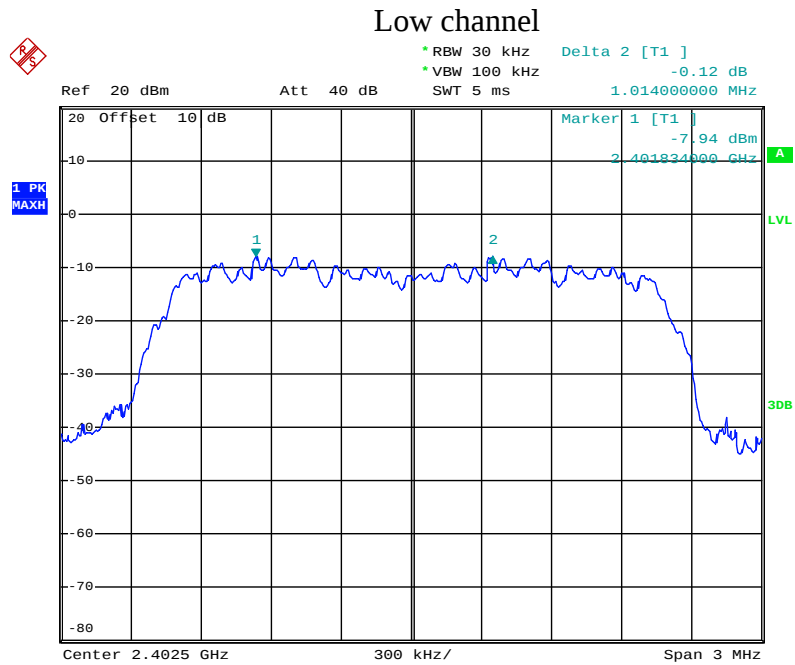


Middle channel

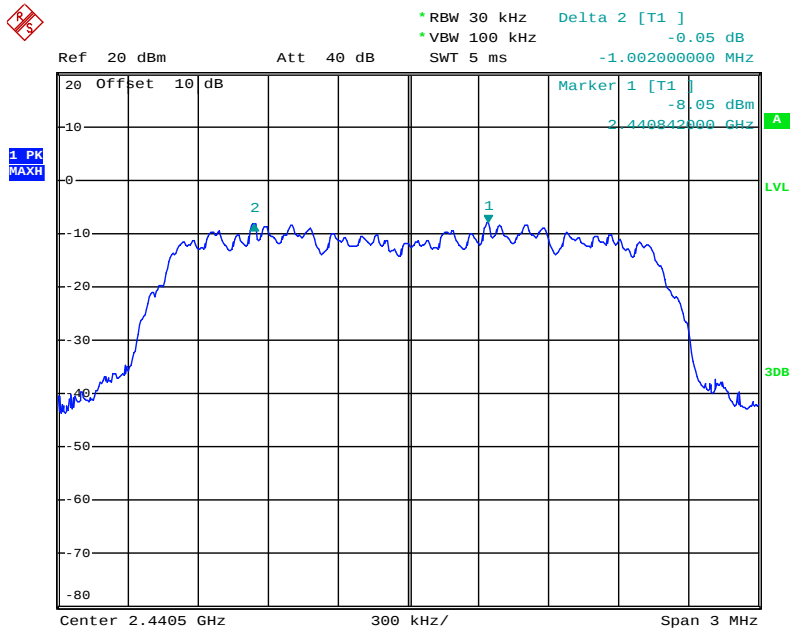




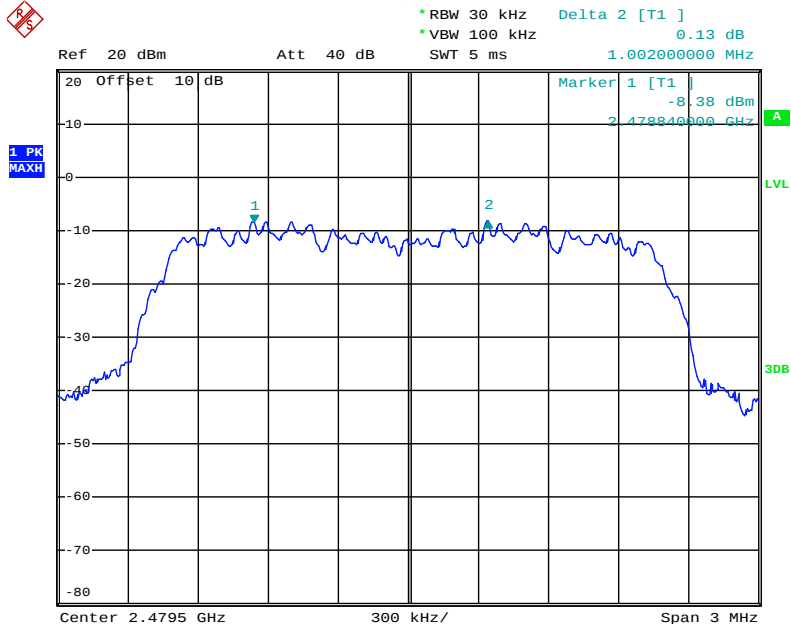
II/4-DQPSK Mode



Middle channel

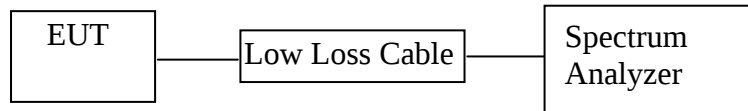


High channel



8. NUMBER OF HOPPING FREQUENCY TEST

8.1. Block Diagram of Test Setup



(EUT: TWS Earbuds)

8.2. The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

8.3. EUT Configuration on Measurement

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 7.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX (Hopping on) modes measure it.

8.5. Test Procedure

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

8.5.2. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz.

8.5.3. Max hold, view and count how many channel in the band.

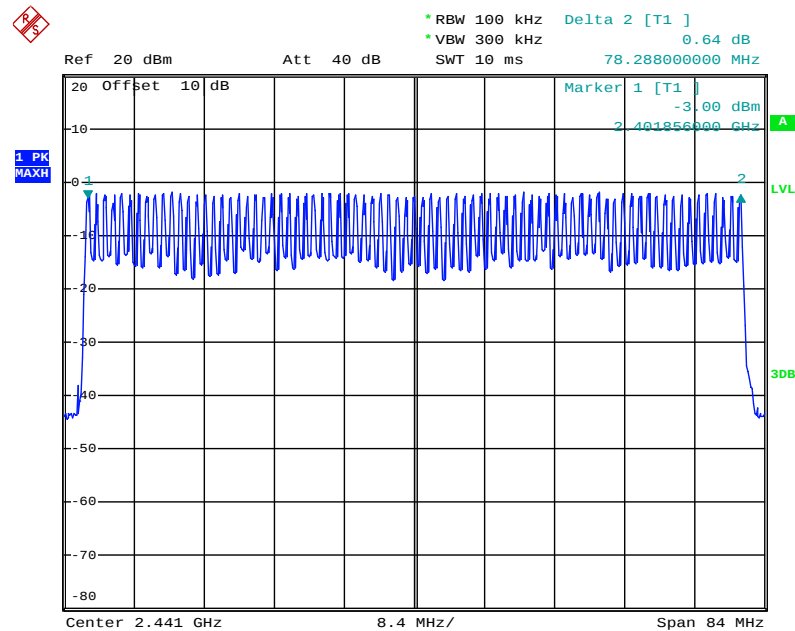
8.6.Test Result

Test Lab: Shielding room

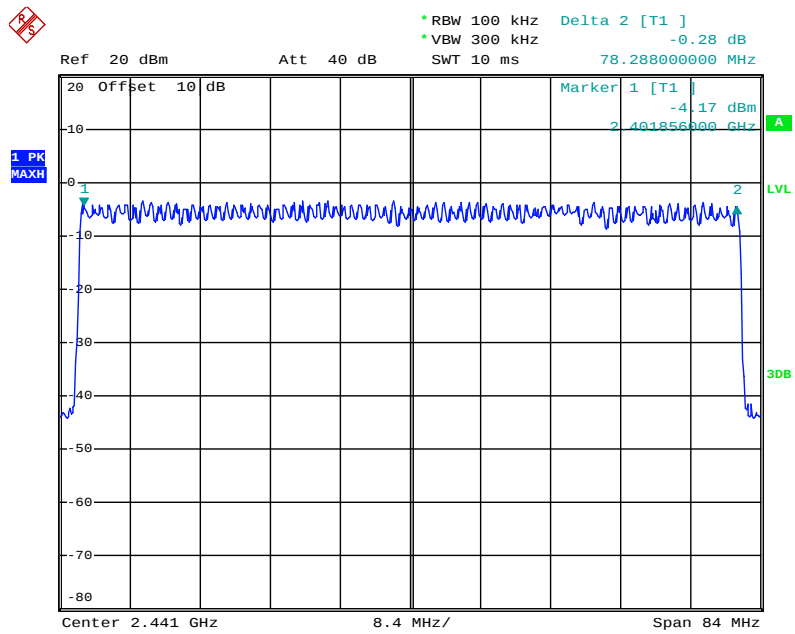
Test Engineer: Frank

Total number of hopping channel	Measurement result(CH)	Limit(CH)
	79	≥ 15

Number of hopping channels(GFSK)

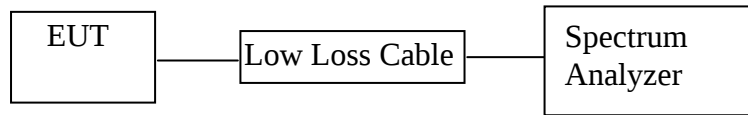


Number of hopping channels($\Pi/4$ -DQPSK)



9. DWELL TIME TEST

9.1. Block Diagram of Test Setup



(EUT: TWS Earbuds)

9.2. The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

9.3. EUT Configuration on Measurement

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.

9.4. Operating Condition of EUT

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

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

9.5. Test Procedure

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

9.5.2. Set center frequency of spectrum analyzer = operating frequency.

9.5.3. Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz, Adjust Sweep=5ms, 10ms, 15ms. Get the pulse time.

9.5.4. Repeat above procedures until all frequency measured were complete.

9.6. Test Result

Test Lab: Shielding room

Test Engineer: Frank

GFSK Mode (Worst case)

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2441	0.42	134.4	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2 \times 79)) \times 31.6$				
DH3	2441	1.70	272.0	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4 \times 79)) \times 31.6$				
DH5	2441	2.96	315.7	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6 \times 79)) \times 31.6$				

Π/4-DQPSK (Worst case)

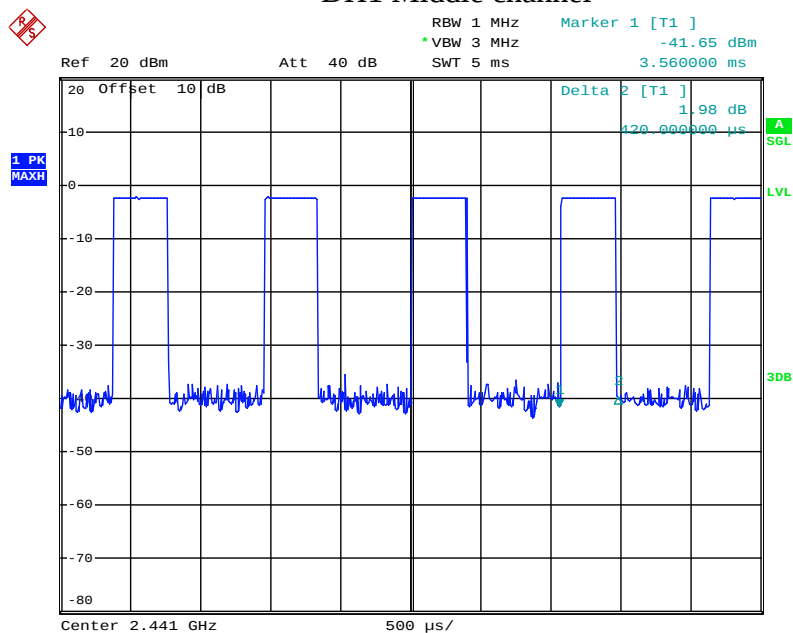
Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2441	0.42	134.4	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2 \times 79)) \times 31.6$				
DH3	2441	1.70	272.0	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4 \times 79)) \times 31.6$				
DH5	2441	2.96	315.7	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6 \times 79)) \times 31.6$				

Note: We tested GFSK mode and Π/4-DQPSK mode the low, middle and high channel and recorded the worst case data for all test mode.

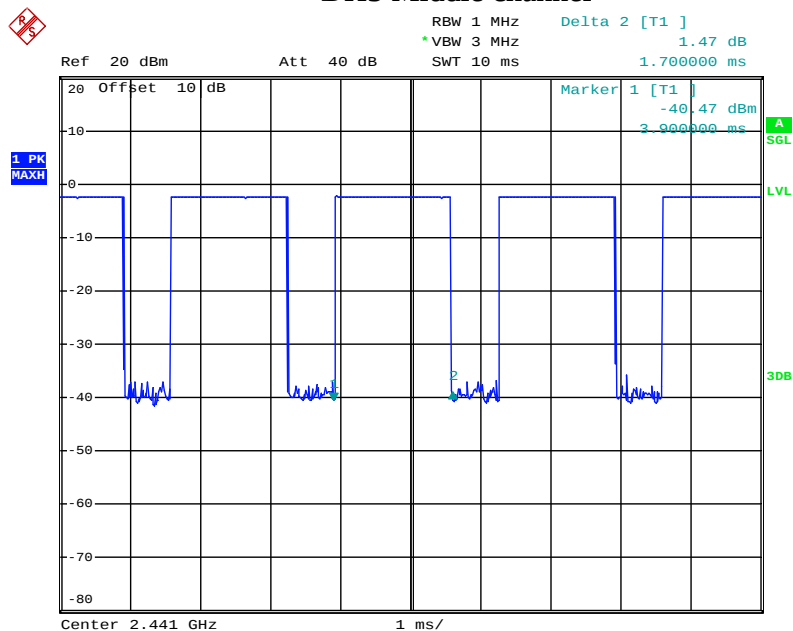
The spectrum analyzer plots are attached as below.

GFSK Mode

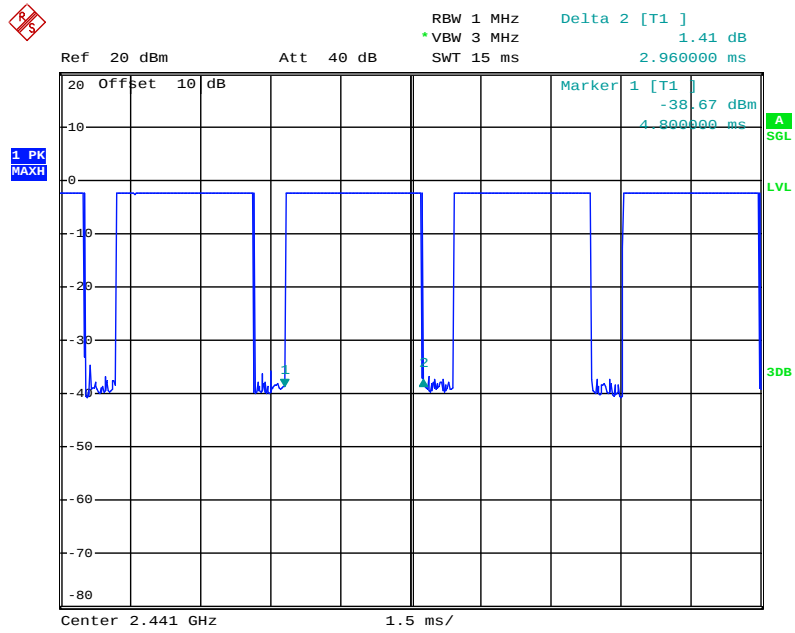
DH1 Middle channel



DH3 Middle channel

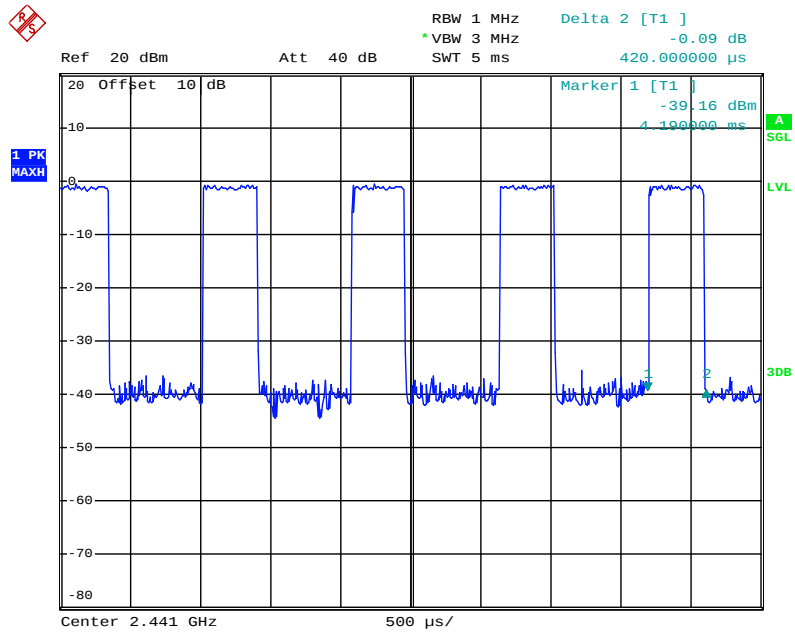


DH5 Middle channel

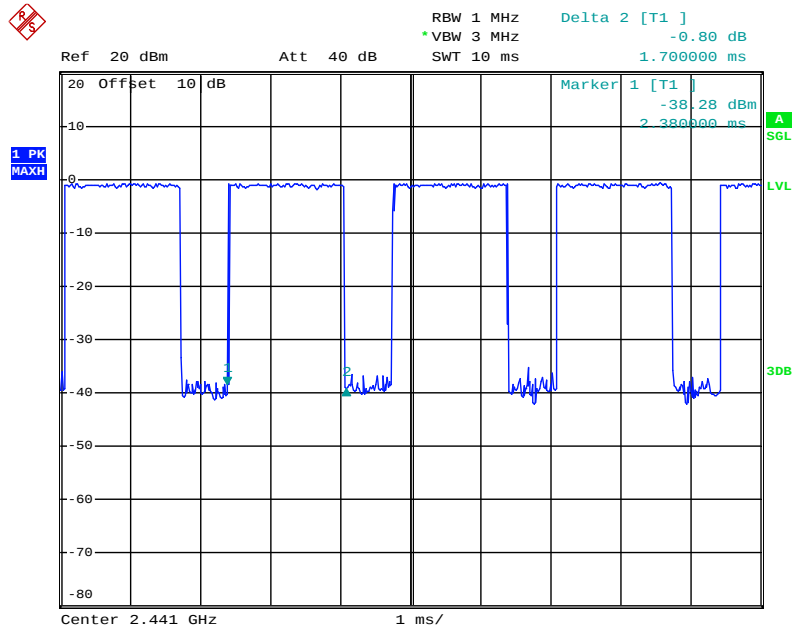


II/4-DQPSK

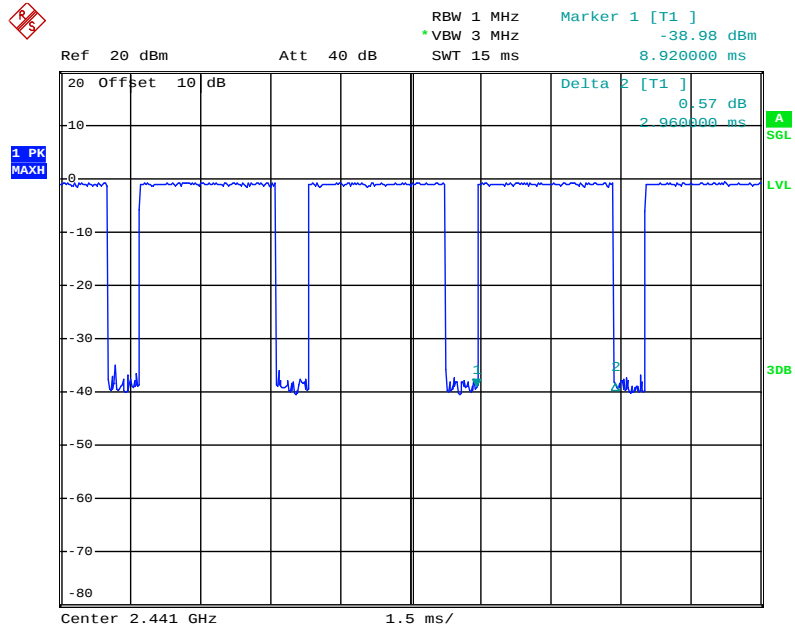
2DH1 Middle channel



2DH3 Middle channel

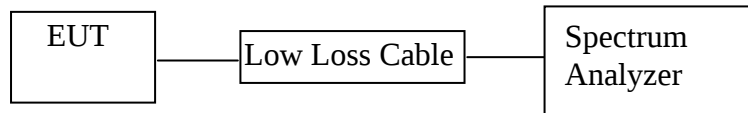


2DH5 Middle channel



10. MAXIMUM PEAK OUTPUT POWER TEST

10.1. Block Diagram of Test Setup



(EUT: TWS Earbuds)

10.2. The Requirement For Section 15.247(b)(1)

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

10.3. EUT Configuration on Measurement

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.

10.4. Operating Condition of EUT

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

10.4.2. Turn on the power of all equipment.

10.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

10.5. Test Procedure

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

10.5.2. Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz.

10.5.3. Measurement the maximum peak output power.

10.6.Test Result

Test Lab: Shielding room

Test Engineer: Frank

GFSK Mode

Channel	Frequency (MHz)	Peak Output Power (dBm/W)	Limits dBm / W
Low	2402	-1.92/0.0006	21 / 0.125
Middle	2441	-2.18/0.0006	21 / 0.125
High	2480	-2.35/0.0006	21 / 0.125

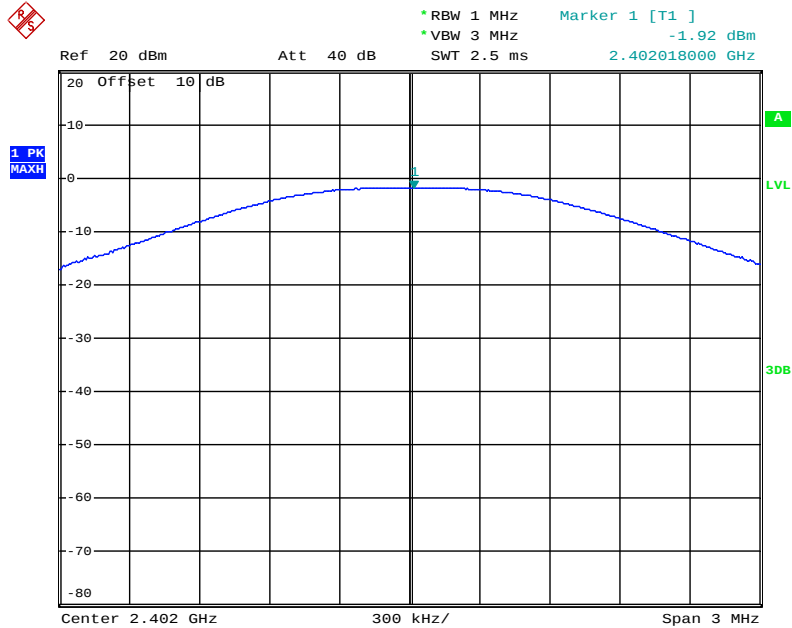
II/4-DQPSK Mode

Channel	Frequency (MHz)	Peak Output Power (dBm/W)	Limits dBm / W
Low	2402	0.37/0.0011	21 / 0.125
Middle	2441	0.10/0.0010	21 / 0.125
High	2480	-0.03/0.0010	21 / 0.125

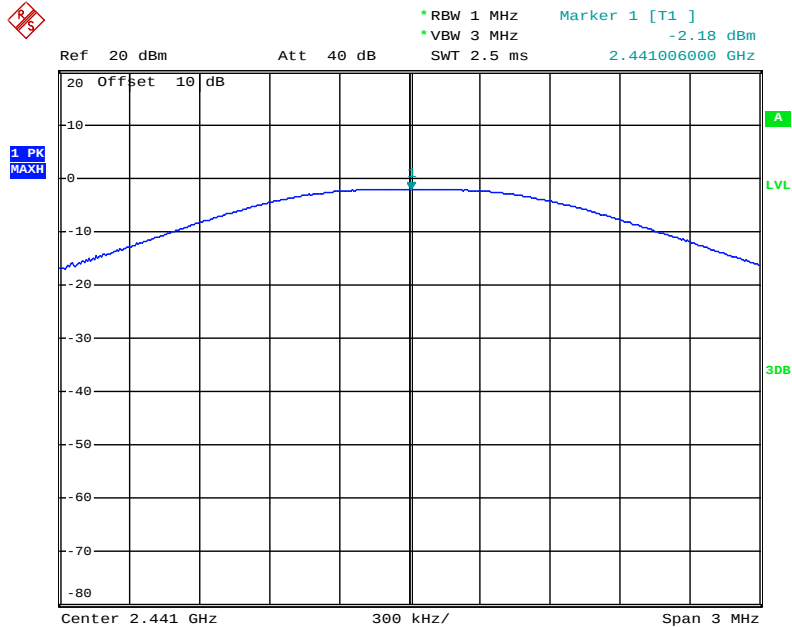
The spectrum analyzer plots are attached as below.

GFSK Mode

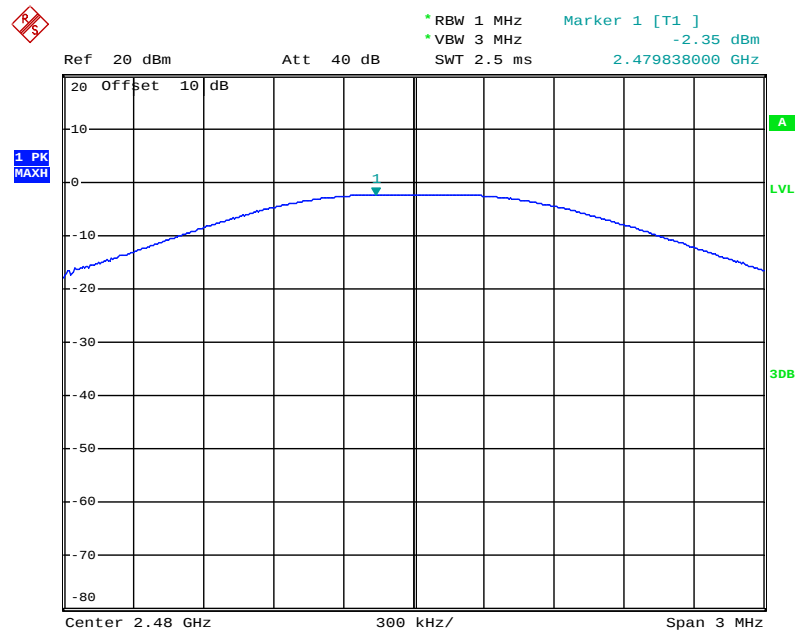
Low channel



Middle channel

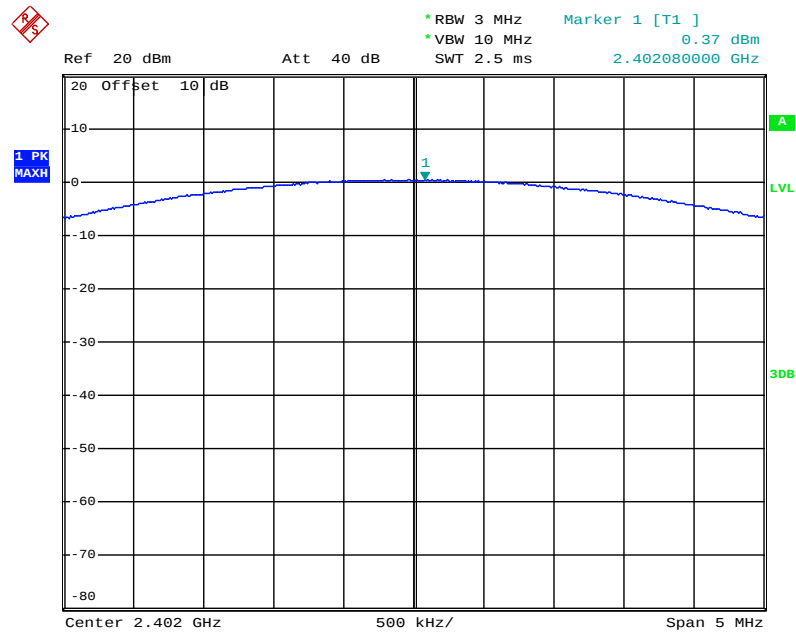


High channel

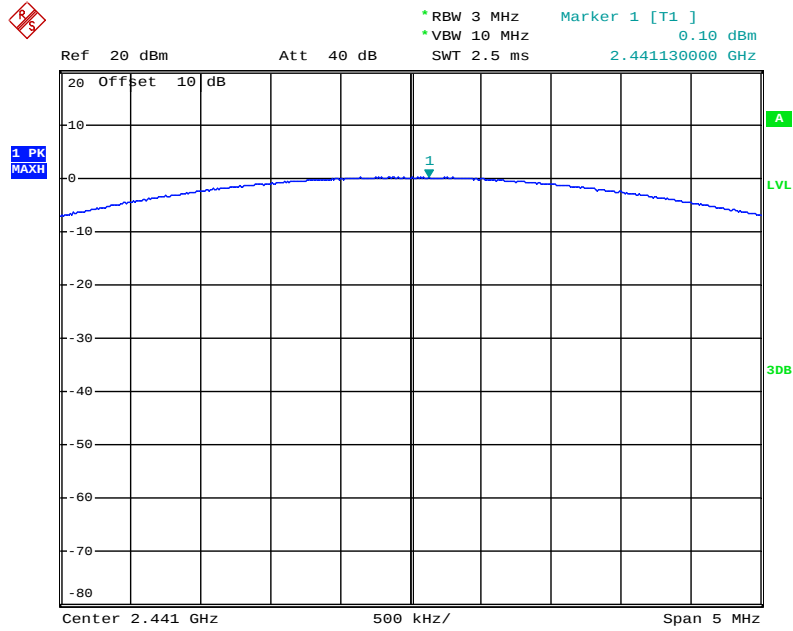


II/4-DQPSK Mode

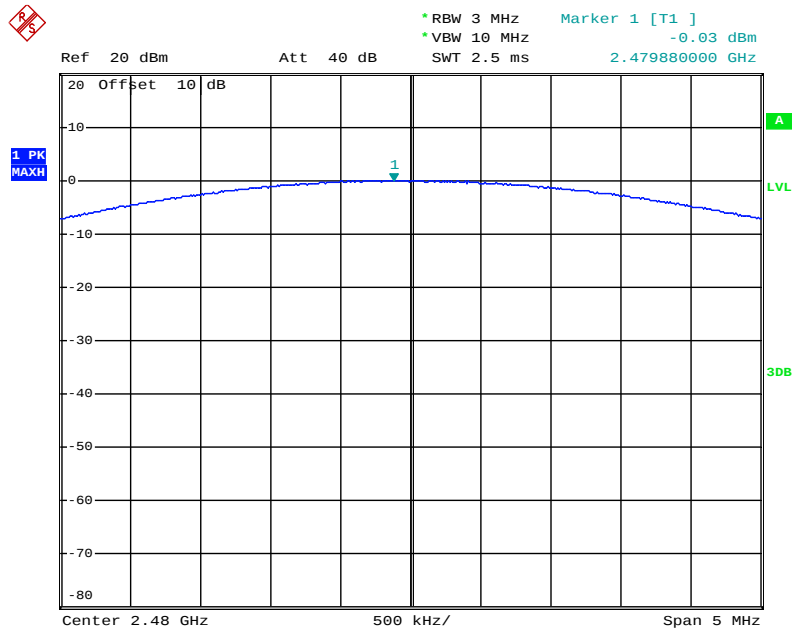
Low channel



Middle channel



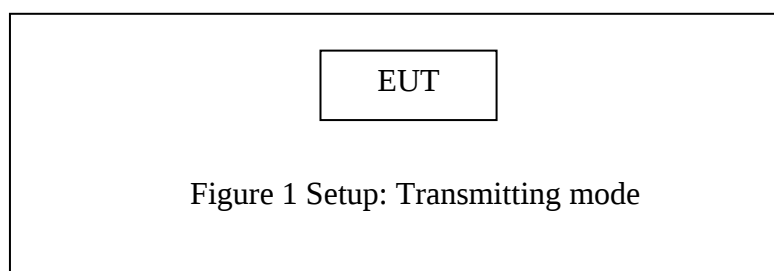
High channel



11.RADIATED EMISSION TEST

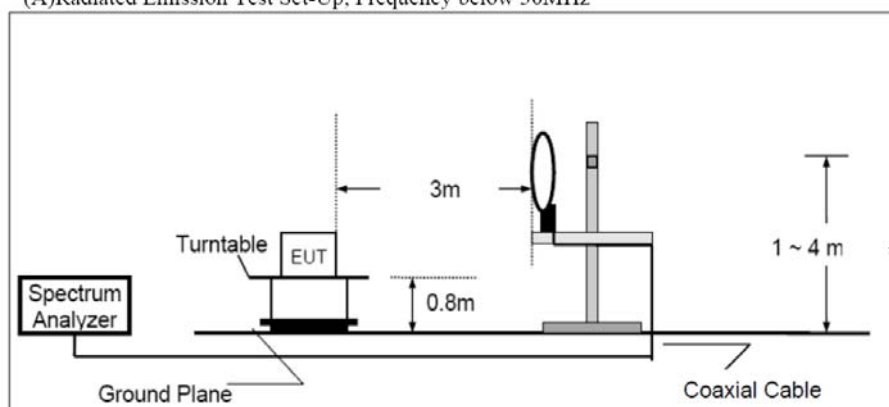
11.1.Block Diagram of Test Setup

11.1.1.Block diagram of connection between the EUT and peripherals

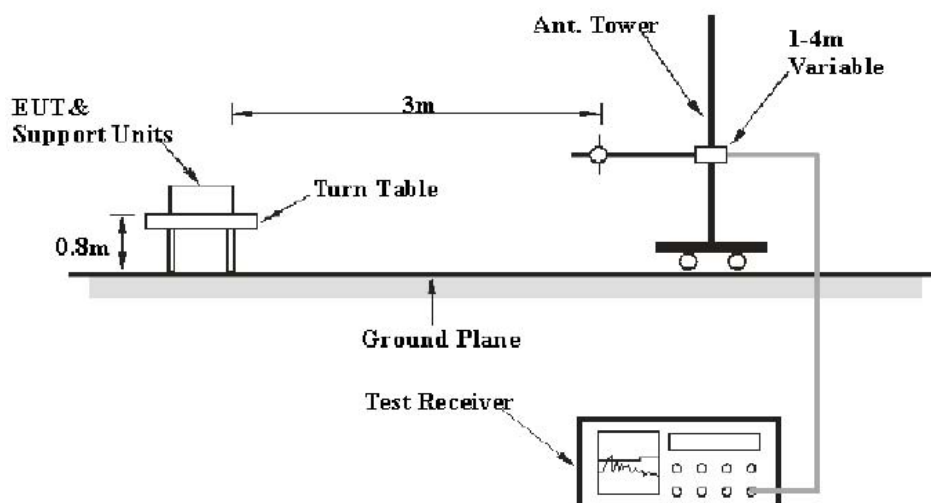


11.1.2.Semi-Anechoic Chamber Test Setup Diagram

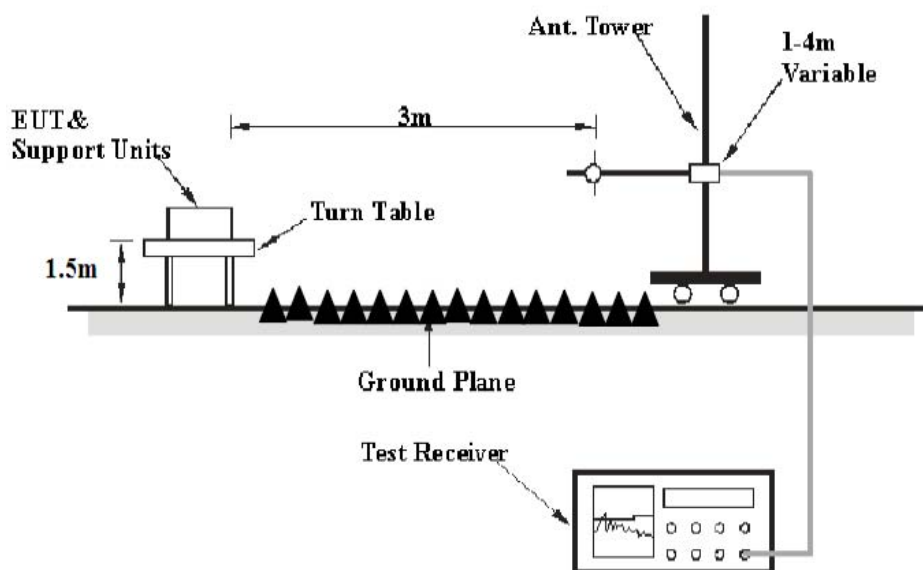
(A)Radiated Emission Test Set-Up, Frequency below 30MHz



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



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



11.2.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).

11.3.Restricted bands of operation

11.3.1.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.

11.4.Configuration of EUT on Measurement

The equipment is 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.

11.5. Operating Condition of EUT

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

11.5.2. Turn on the power of all equipment.

11.5.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

11.6. 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.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

11.7.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	48.69	-13.35	35.34	46	-10.66	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.

11.8.The Field Strength of Radiation Emission Measurement Results

PASS.

Test Lab: 3m Anechoic chamber

Test Engineer: Frank

Note: 1.We tested GFSK mode, $\Pi/4$ -DQPSK Mode and recorded the worst case data (GFSK mode) for all test mode.

2. 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.: JP2018 #764

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: TX 2402MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

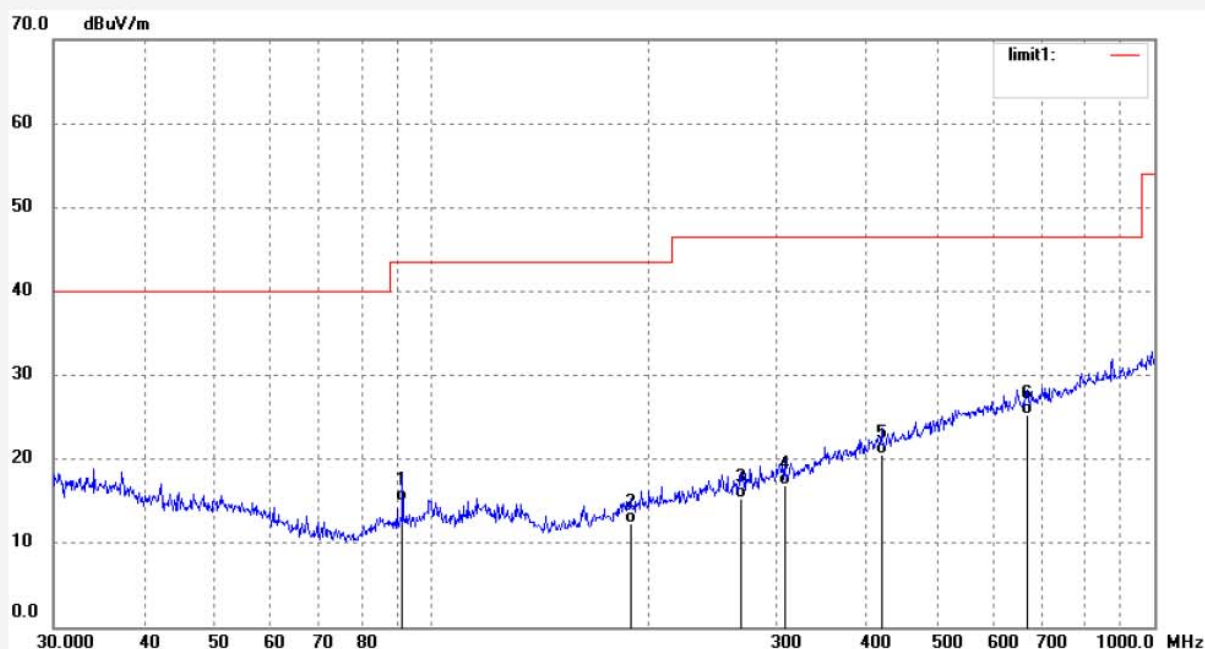
Date: 19/09/04/

Time: 10/16/25

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	91.1746	29.86	-14.96	14.90	43.50	-28.60	QP	200	106	
2	188.4125	24.80	-12.50	12.30	43.50	-31.20	QP	200	145	
3	267.5455	25.46	-10.06	15.40	46.50	-31.10	QP	200	196	
4	307.8313	25.70	-8.80	16.90	46.50	-29.60	QP	200	206	
5	419.1081	26.39	-5.79	20.60	46.50	-25.90	QP	200	275	
6	665.8035	26.83	-1.53	25.30	46.50	-21.20	QP	200	316	



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Job No.: JP2018 #765

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: TX 2402MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

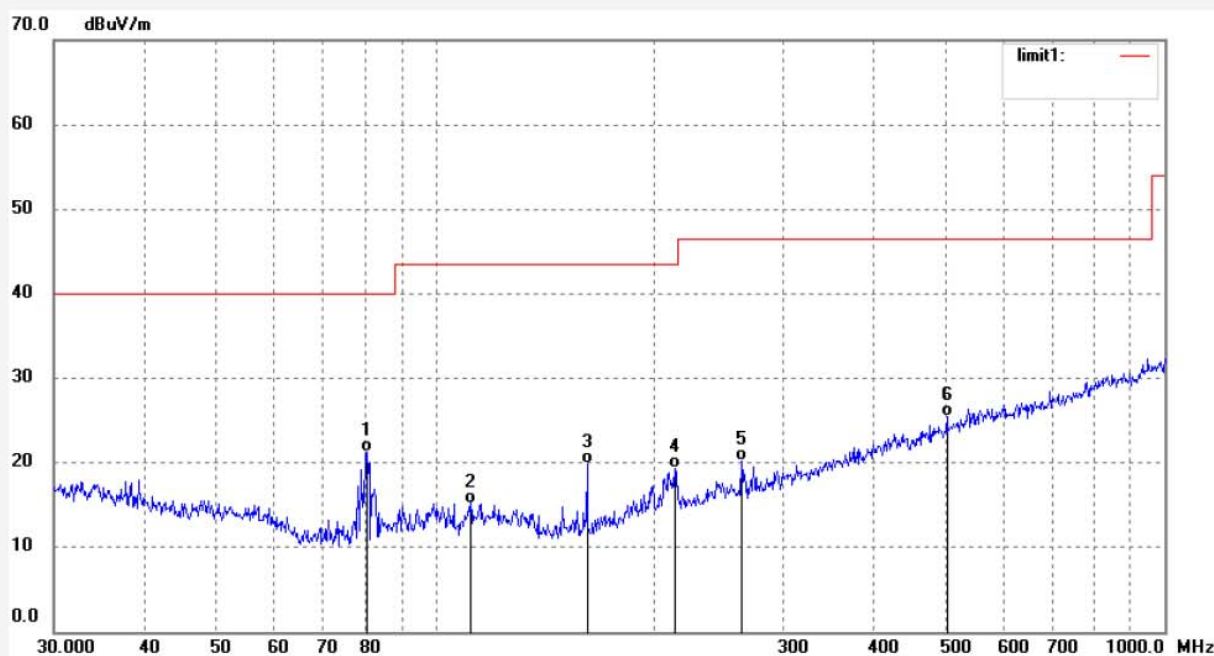
Date: 19/09/04/

Time: 10/17/28

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	80.6442	37.61	-16.31	21.30	40.00	-18.70	QP	100	126	
2	111.7380	28.76	-13.56	15.20	43.50	-28.30	QP	100	156	
3	161.4742	34.28	-14.38	19.90	43.50	-23.60	QP	100	203	
4	213.0151	31.21	-11.81	19.40	43.50	-24.10	QP	100	235	
5	262.8955	30.51	-10.31	20.20	46.50	-26.30	QP	100	275	
6	502.9395	29.77	-4.27	25.50	46.50	-21.00	QP	100	309	



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Job No.: JP2018 #766

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: TX 2441MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

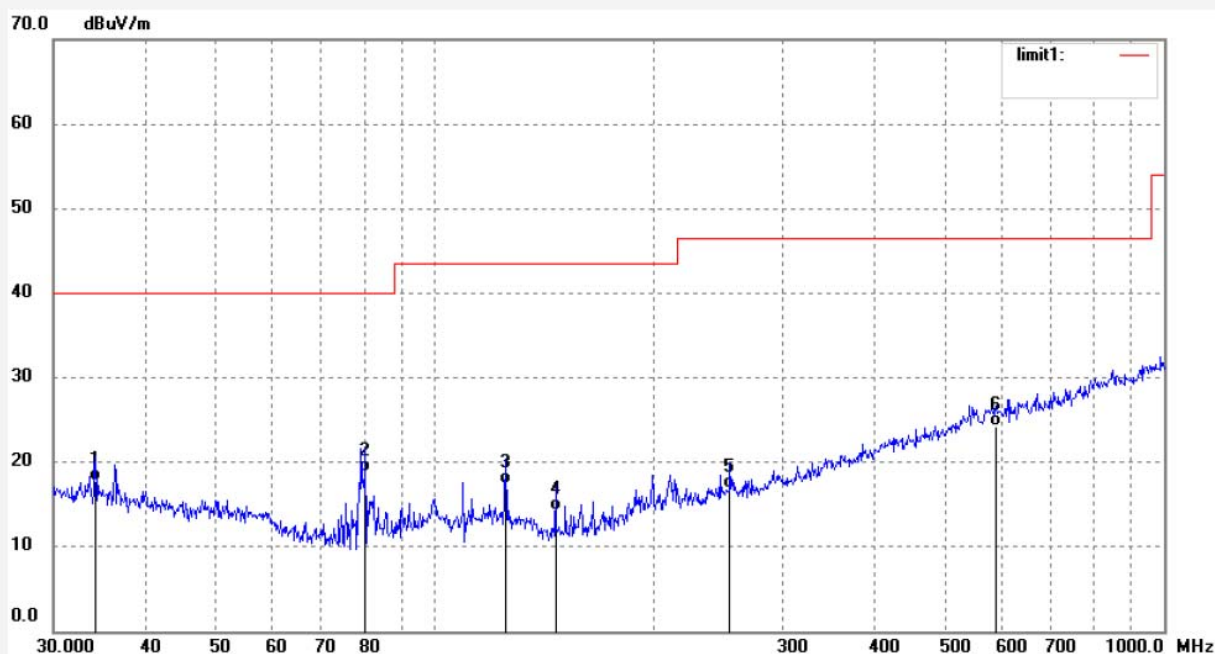
Date: 19/09/04/

Time: 10/18/15

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	34.2760	28.05	-10.35	17.70	40.00	-22.30	QP	100	103	
2	80.3619	35.18	-16.38	18.80	40.00	-21.20	QP	100	145	
3	125.0066	31.03	-13.63	17.40	43.50	-26.10	QP	100	163	
4	146.3735	29.39	-15.09	14.30	43.50	-29.20	QP	100	215	
5	253.8367	27.43	-10.53	16.90	46.50	-29.60	QP	100	265	
6	586.8437	26.81	-2.51	24.30	46.50	-22.20	QP	100	326	



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Job No.: JP2018 #767

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: TX 2441MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

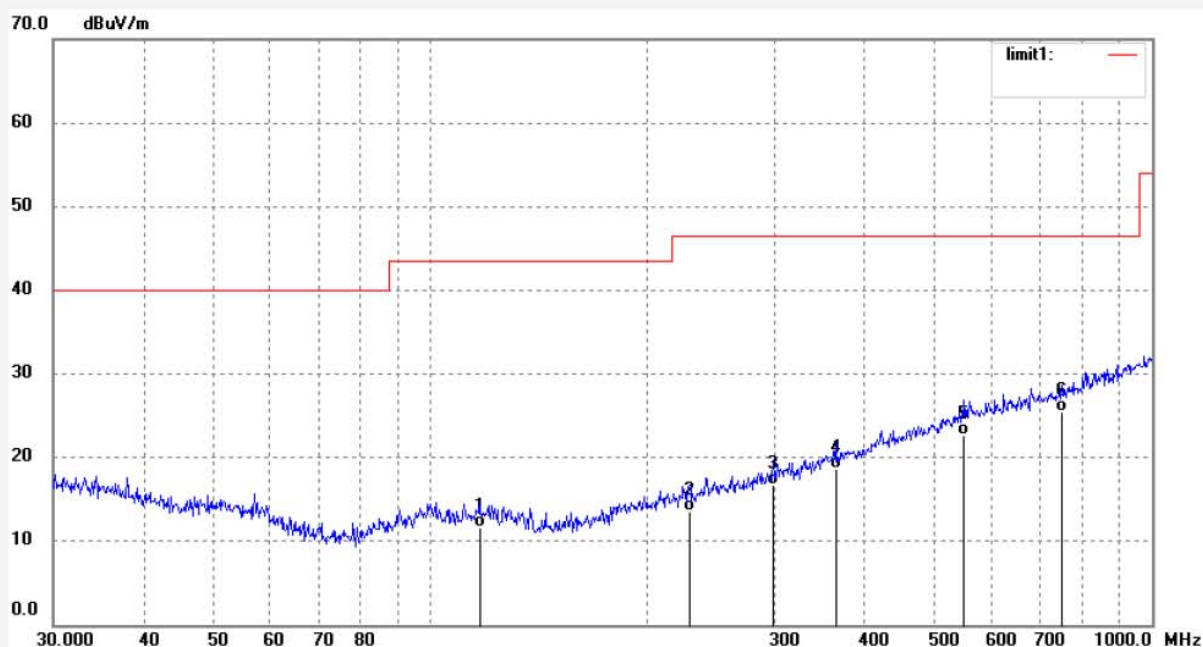
Date: 19/09/04/

Time: 10/19/17

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	116.9495	24.76	-13.06	11.70	43.50	-31.80	QP	200	106	
2	228.4904	24.75	-11.15	13.60	46.50	-32.90	QP	200	125	
3	298.2681	25.84	-9.04	16.80	46.50	-29.70	QP	200	186	
4	364.2595	25.93	-7.23	18.70	46.50	-27.80	QP	200	215	
5	549.0195	25.71	-3.11	22.60	46.50	-23.90	QP	200	265	
6	750.1083	25.79	-0.29	25.50	46.50	-21.00	QP	200	325	



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Job No.: JP2018 #768

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: TX 2480MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

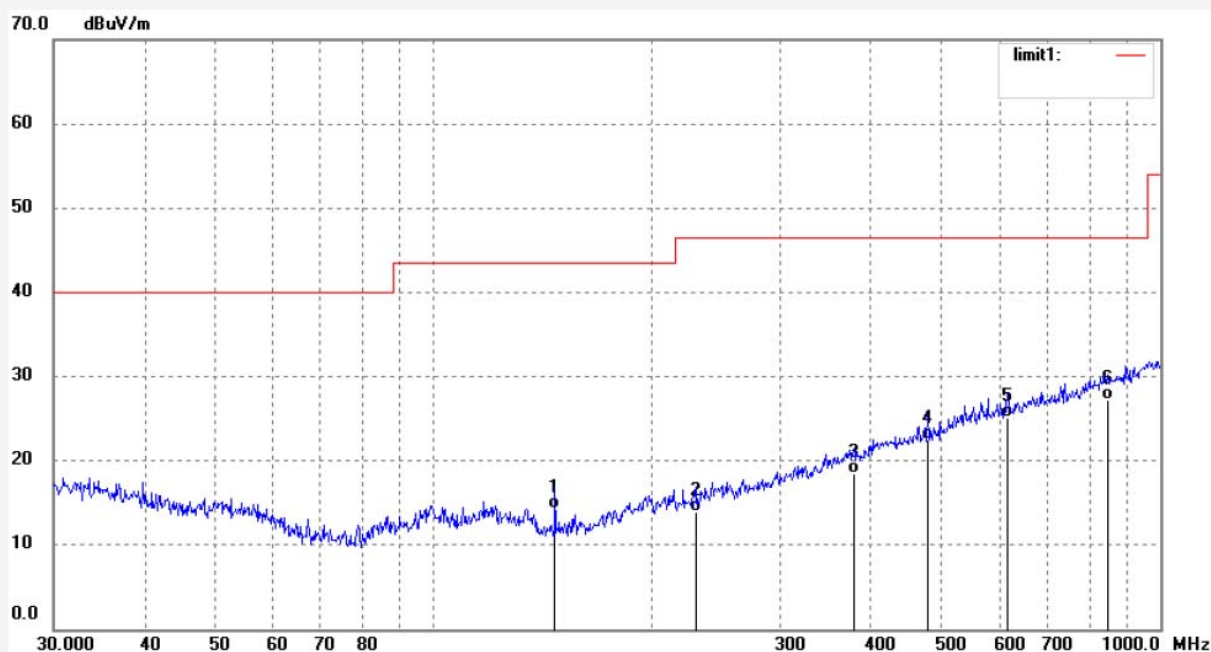
Date: 19/09/04/

Time: 10/20/24

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	146.8876	29.28	-15.08	14.20	43.50	-29.30	QP	200	102	
2	229.2931	25.12	-11.12	14.00	46.50	-32.50	QP	200	136	
3	378.5842	25.44	-7.01	18.43	46.50	-28.07	QP	200	175	
4	478.8455	27.40	-4.90	22.50	46.50	-24.00	QP	200	185	
5	616.3718	27.24	-2.14	25.10	46.50	-21.40	QP	200	201	
6	845.0878	25.77	1.53	27.30	46.50	-19.20	QP	200	245	



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Job No.: JP2018 #769

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: TX 2480MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

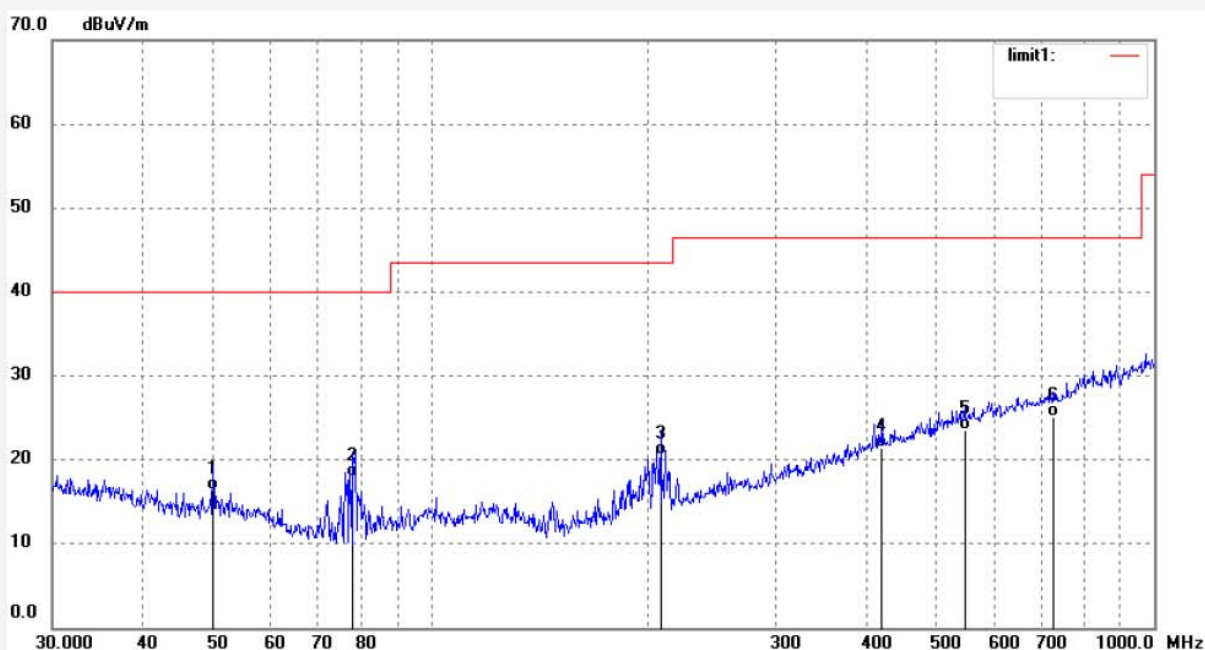
Date: 19/09/04/

Time: 10/21/21

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	50.0566	28.89	-12.59	16.30	40.00	-23.70	QP	100	115	
2	78.1389	34.56	-16.56	18.00	40.00	-22.00	QP	100	128	
3	207.8501	32.55	-12.05	20.50	43.50	-23.00	QP	100	175	
4	420.5803	27.15	-5.75	21.40	46.50	-25.10	QP	100	215	
5	547.0977	26.77	-3.17	23.60	46.50	-22.90	QP	100	245	
6	724.2611	25.80	-0.70	25.10	46.50	-21.40	QP	100	303	

Above 1GHz



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Job No.: JPZRLK #26

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2402MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

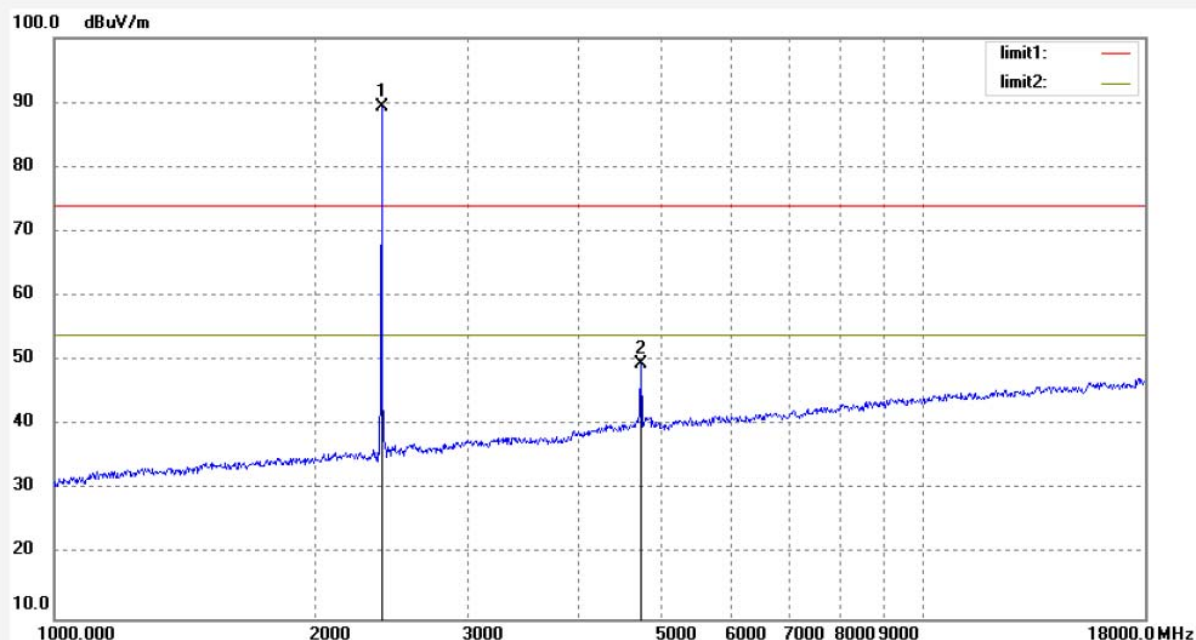
Date: 2019/09/06

Time: 11:25:10

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2401.719	95.63	-6.37	89.26			peak	200	103	
2	4801.957	48.80	0.70	49.50	74.00	-24.50	peak	200	196	



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Job No.: JPZRLK #27

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2402MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

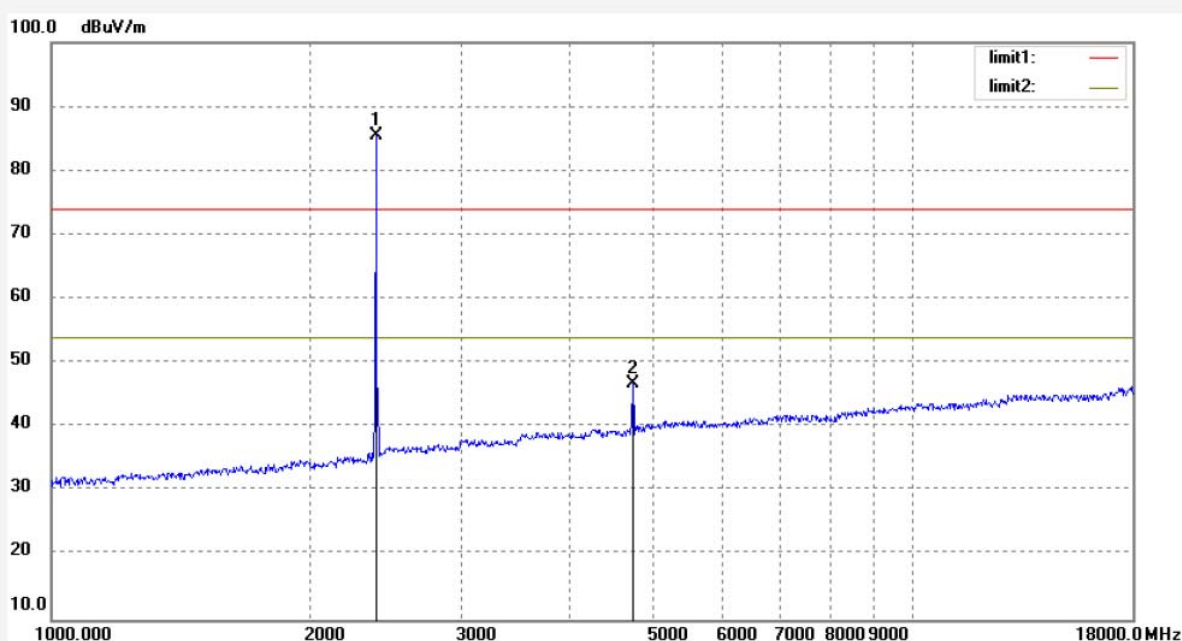
Date: 2019/09/06

Time: 11:27:25

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2401.719	91.79	-6.37	85.42			peak	150	136	
2	4801.957	46.02	0.70	46.72	74.00	-27.28	peak	150	245	



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Job No.: JPZRLK #28

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2480MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

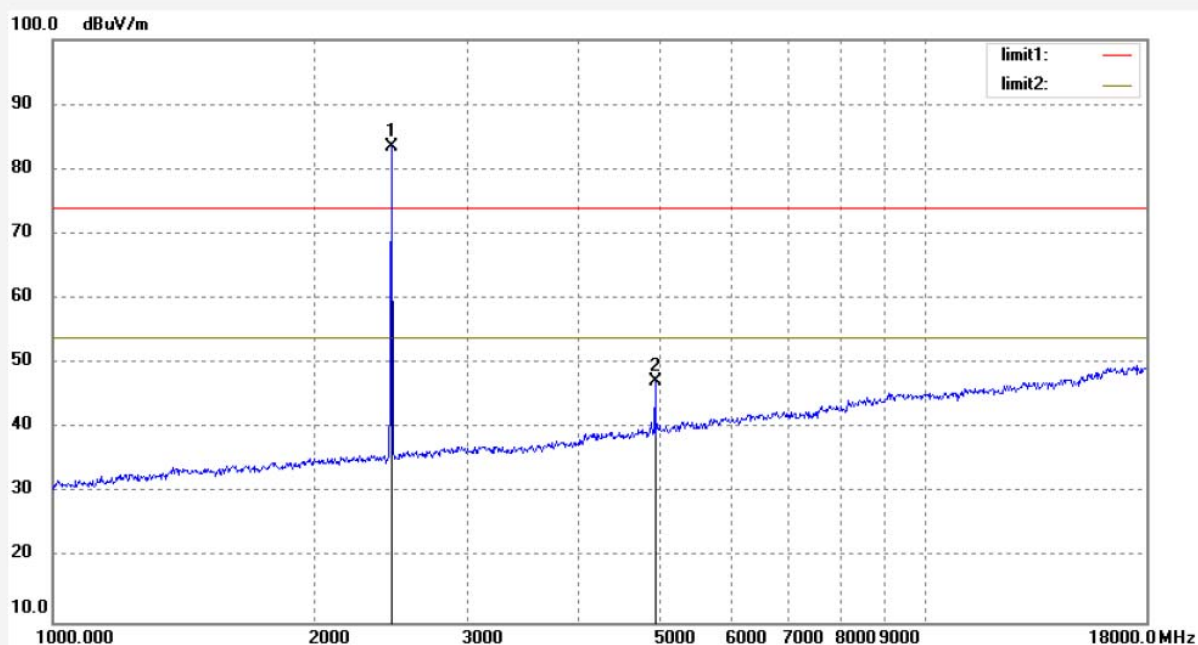
Date: 2019/09/06

Time: 11:28:59

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.034	89.50	-6.04	83.46			peak	150	146	
2	4959.444	45.85	1.50	47.35	74.00	-26.65	peak	150	286	



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Job No.: JPZRLK #29

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2480MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

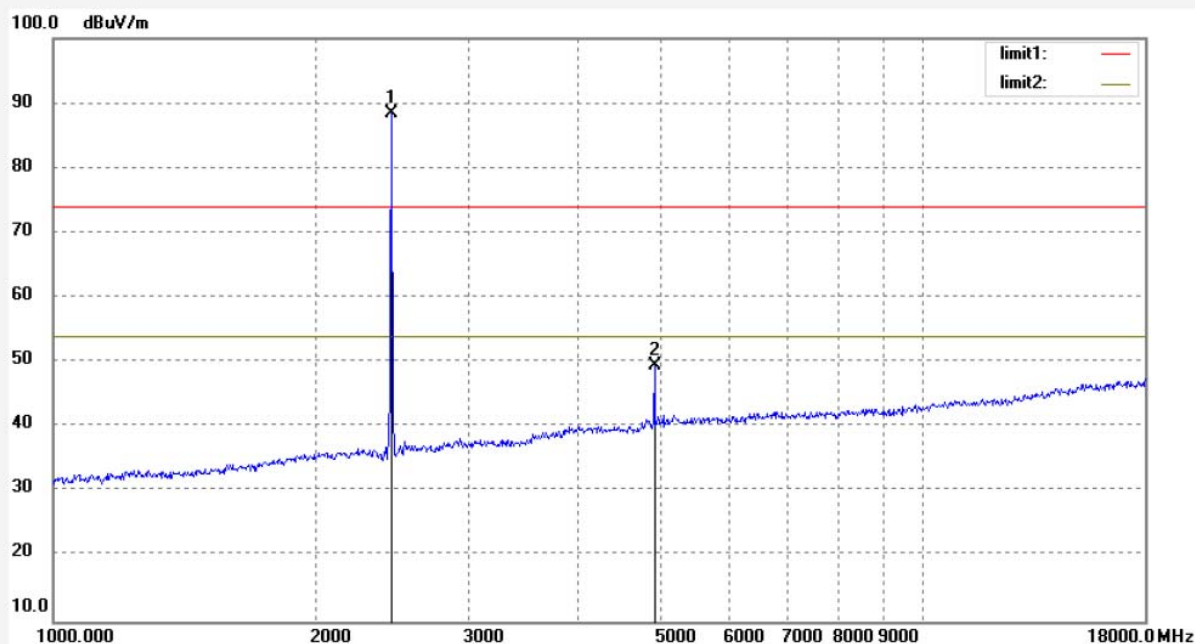
Date: 2019/09/06

Time: 11:30:49

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.034	94.39	-6.04	88.35			peak	200	96	
2	4959.444	48.00	1.50	49.50	74.00	-24.50	peak	200	216	



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Job No.: JPZRLK #30

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2441MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

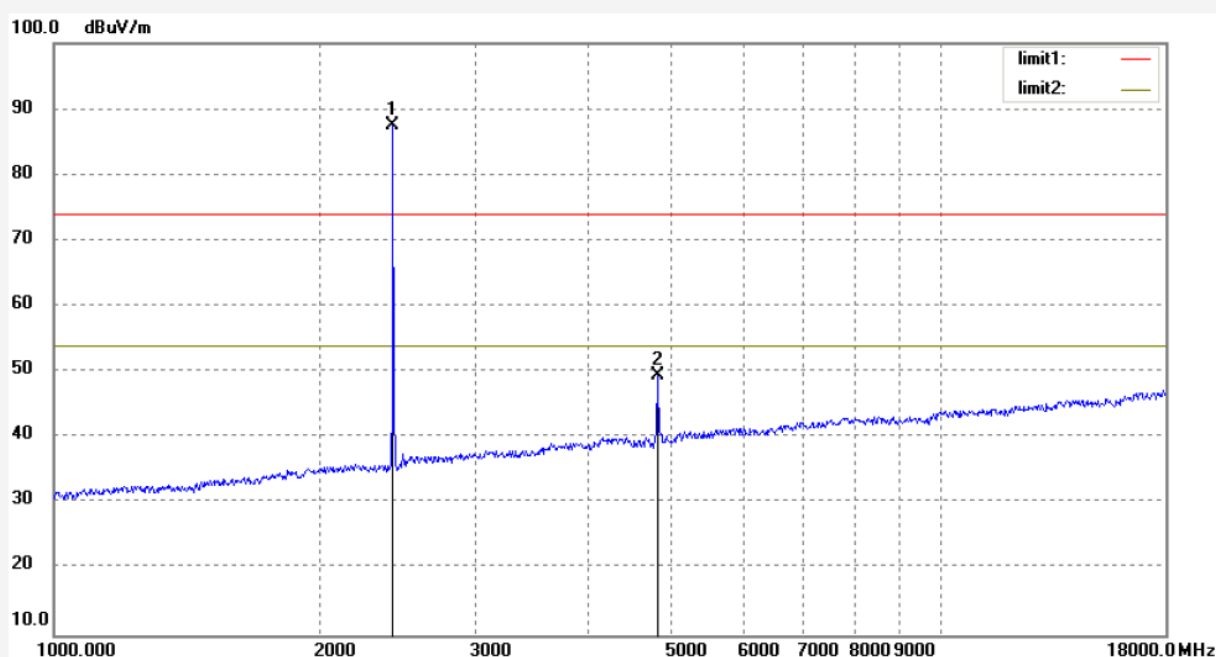
Date: 2019/09/06

Time: 11:32:22

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.621	93.69	-6.20	87.49			peak	200	178	
2	4879.328	48.40	1.00	49.40	74.00	-24.60	peak	200	296	



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Job No.: JPZRLK #31

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2441MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

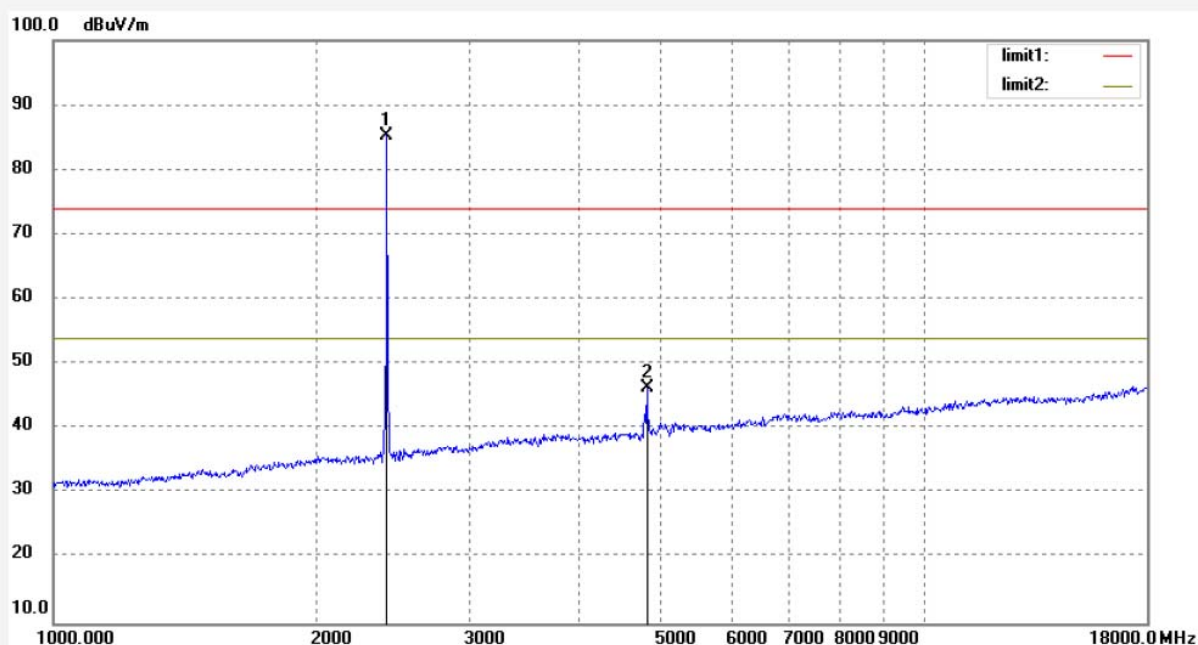
Date: 2019/09/06

Time: 11:33:42

Engineer Signature: Frank

Distance: 3m

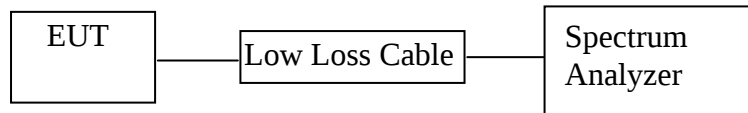
Note: Report NO.:ATE20191328



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.621	91.45	-6.20	85.25			peak	150	186	
2	4879.328	45.39	1.00	46.39	74.00	-27.61	peak	150	216	

12.BAND EDGE COMPLIANCE TEST

12.1.Block Diagram of Test Setup



(EUT: TWS Earbuds)

12.2.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).

12.3.EUT Configuration on Measurement

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.

12.4.Operating Condition of EUT

12.4.1.Setup the EUT and simulator as shown as Section 11.1.

12.4.2.Turn on the power of all equipment.

12.4.3.Let the EUT work in TX (Hopping off, Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

12.5. Test Procedure

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

12.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with convenient frequency span including 100 kHz bandwidth from band edge.

12.5.3. The band edges were measured and recorded.

12.6. Test Result

Test Lab: Shielding room

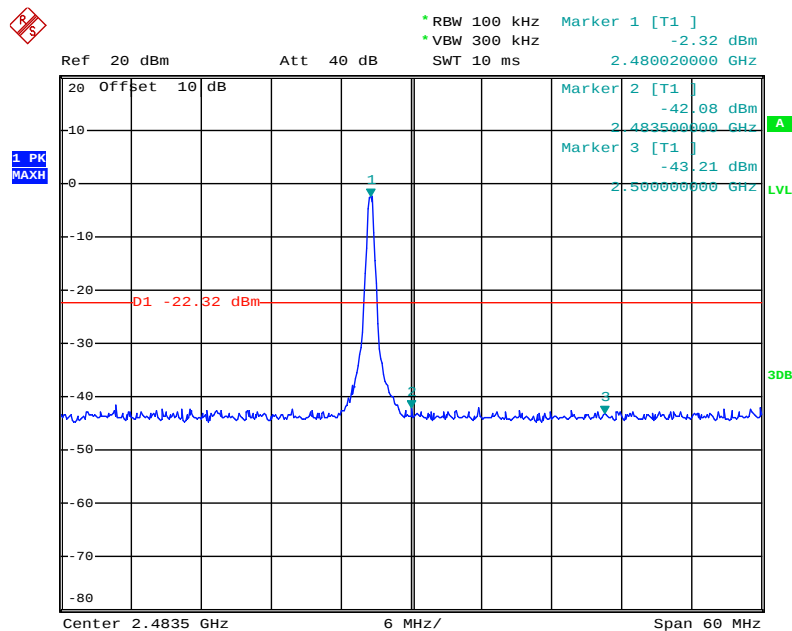
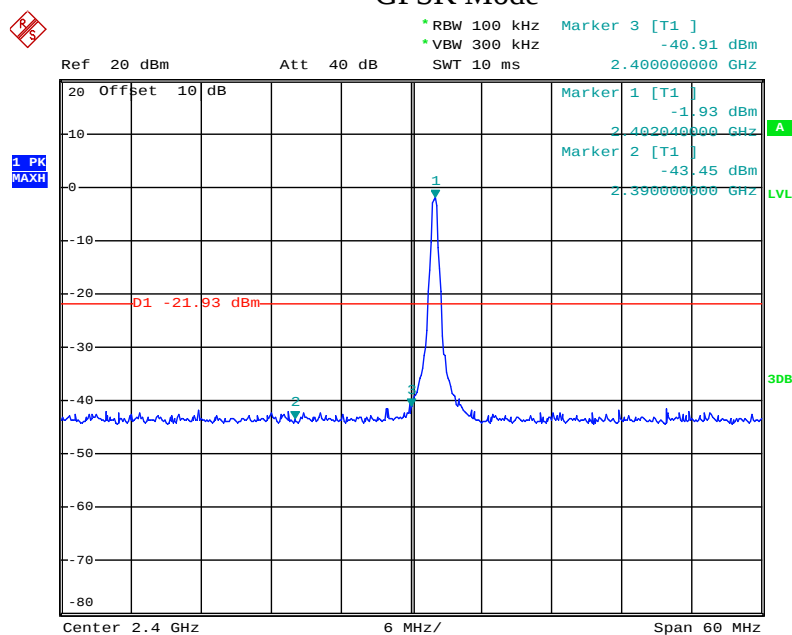
Test Engineer: Frank

Note: Both hopping-on mode and hopping-off mode had been pre-tested, and only the worst case was recorded in the test report.

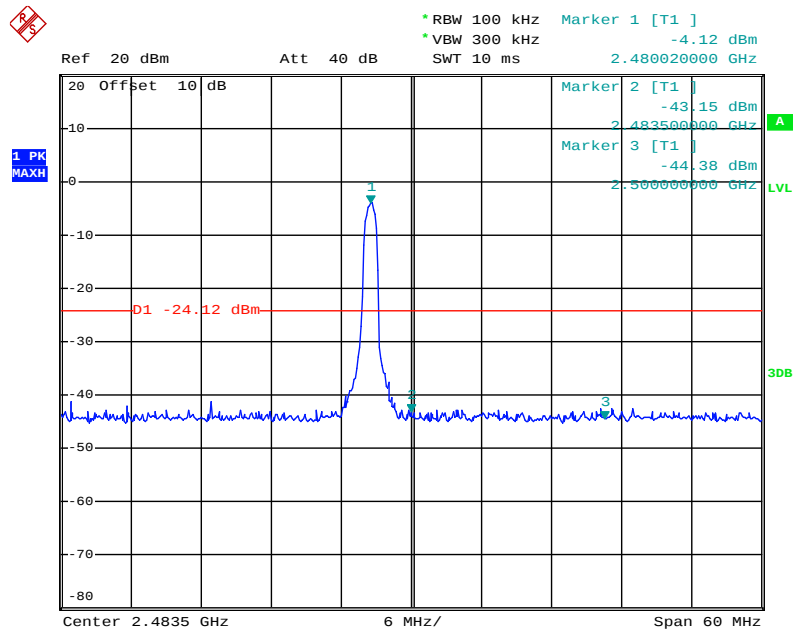
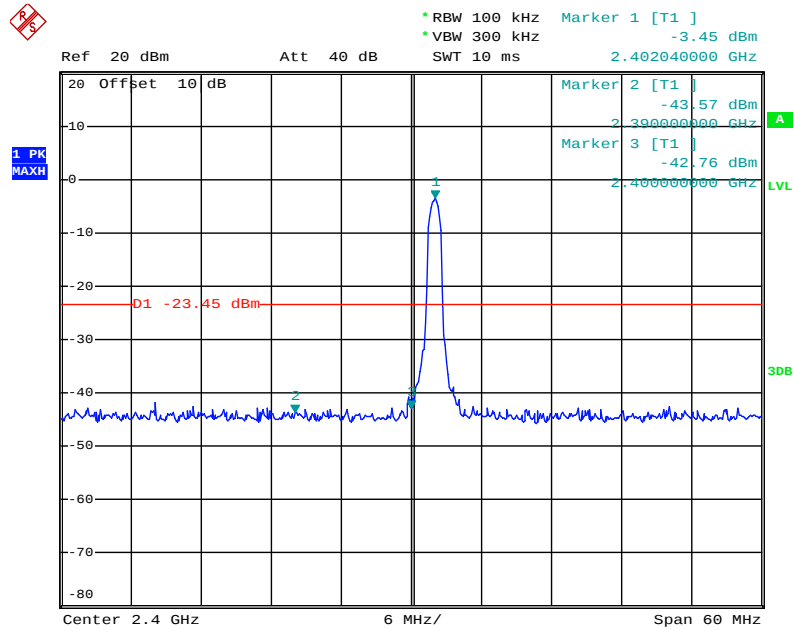
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
GFSK Mode		
2400.00	38.98	> 20dBc
2483.50	39.76	> 20dBc
II/4-DQPSK Mode		
2400.00	39.31	> 20dBc
2483.50	39.03	> 20dBc

The spectrum analyzer plots are attached as below.

GFSK Mode



Π/4-DQPSK Mode



Radiated Band Edge Result

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

3. Display the measurement of peak values.

Test Procedure:

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. The EUT was tested in 3 orthogonal planes.

Let the EUT work in TX (Hopping off, Hopping on) modes measure it.
We select 2402MHz, 2480MHz TX frequency to transmit(Hopping off mode).
We select 2402-2480MHz TX frequency to transmit(Hopping on mode).

During the radiated emission test, the spectrum analyzer was set with the following configurations:

- 1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
- 2.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- 3.All modes of operation were investigated and the worst case (GFSK mode) emissions are reported.

Test Lab: 3m Anechoic chamber

Test Engineer: Frank

Non-hopping mode



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Job No.: JPZRLK #32

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2402MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

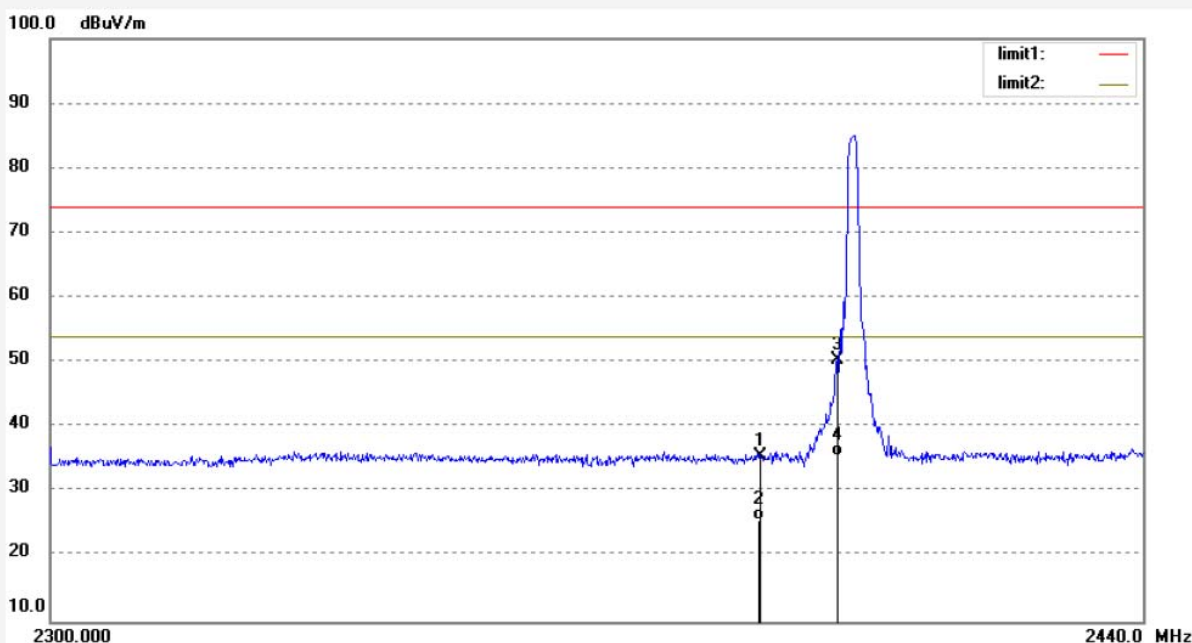
Date: 2019/09/06

Time: 11:35:19

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



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	41.90	-6.32	35.58	74.00	-38.42	peak	150	98	
2	2390.000	31.92	-6.32	25.60	54.00	-28.40	AVG	150	146	
3	2400.000	56.75	-6.27	50.48	74.00	-23.52	peak	150	159	
4	2400.000	41.77	-6.27	35.50	54.00	-18.50	AVG	150	256	

Note: Average measurement with peak detection at No.2&4



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Job No.: JPZRLK #33

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2402MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

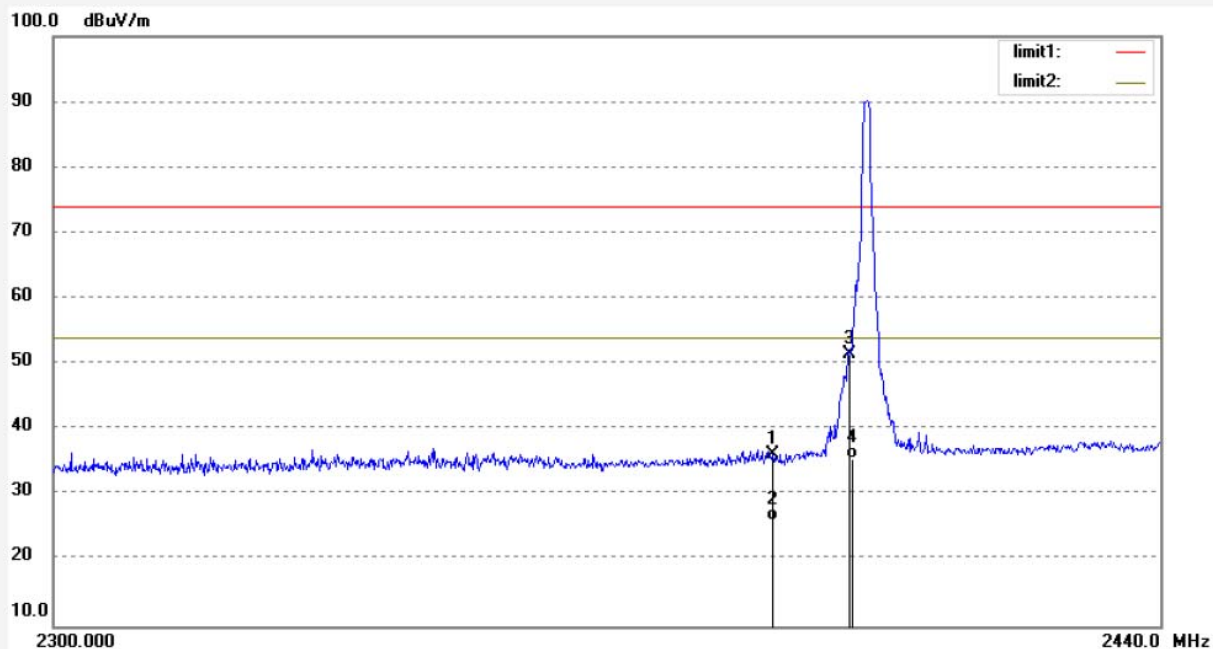
Date: 2019/09/06

Time: 11:36:36

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



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	42.54	-6.32	36.22	74.00	-37.78	peak	200	86	
2	2390.000	32.52	-6.32	26.20	54.00	-27.80	AVG	200	186	
3	2400.000	57.71	-6.27	51.44	74.00	-22.56	peak	200	216	
4	2400.000	41.77	-6.27	35.50	54.00	-18.50	AVG	200	293	

Note: Average measurement with peak detection at No.2&4



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Job No.: JPZRLK #34

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2480MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

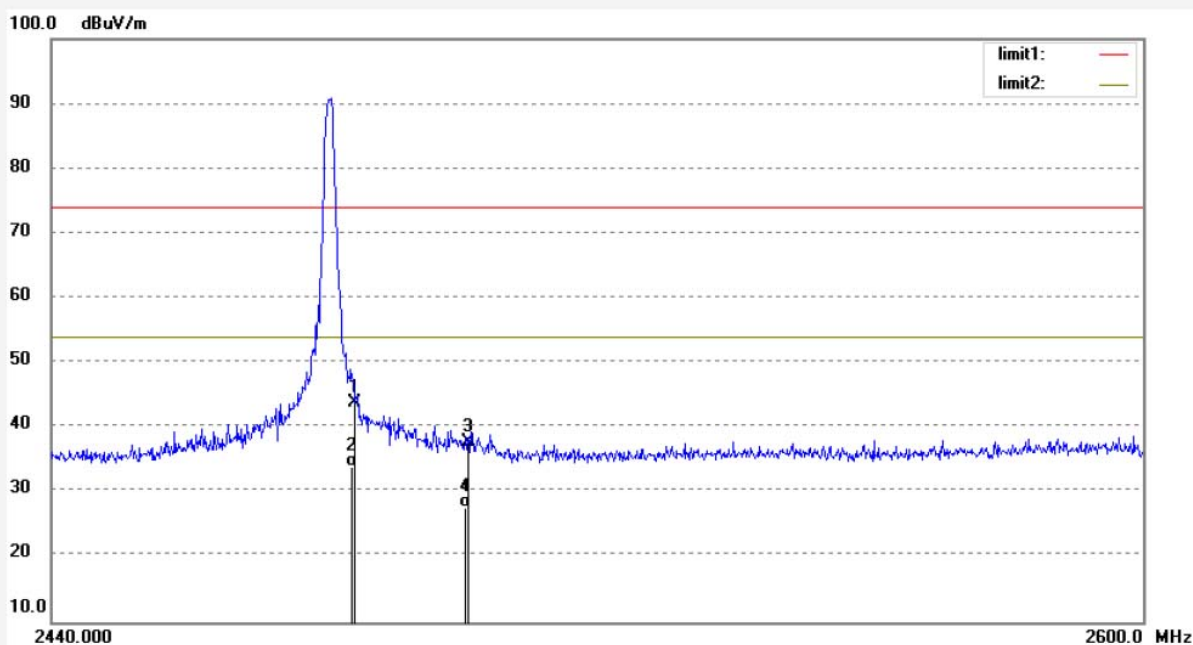
Date: 2019/09/06

Time: 11:39:20

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



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	49.74	-5.89	43.85	74.00	-30.15	peak	200	75	
2	2483.500	39.79	-5.89	33.90	54.00	-20.10	AVG	200	123	
3	2500.000	43.55	-5.81	37.74	74.00	-36.26	peak	200	215	
4	2500.000	33.51	-5.81	27.70	54.00	-26.30	AVG	200	296	

Note: Average measurement with peak detection at No.2&4



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Job No.: JPZRLK #35

Standard: FCC PK

Test item: Radiation Test

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

EUT: TWS Earbuds

Mode: TX 2480MHz

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

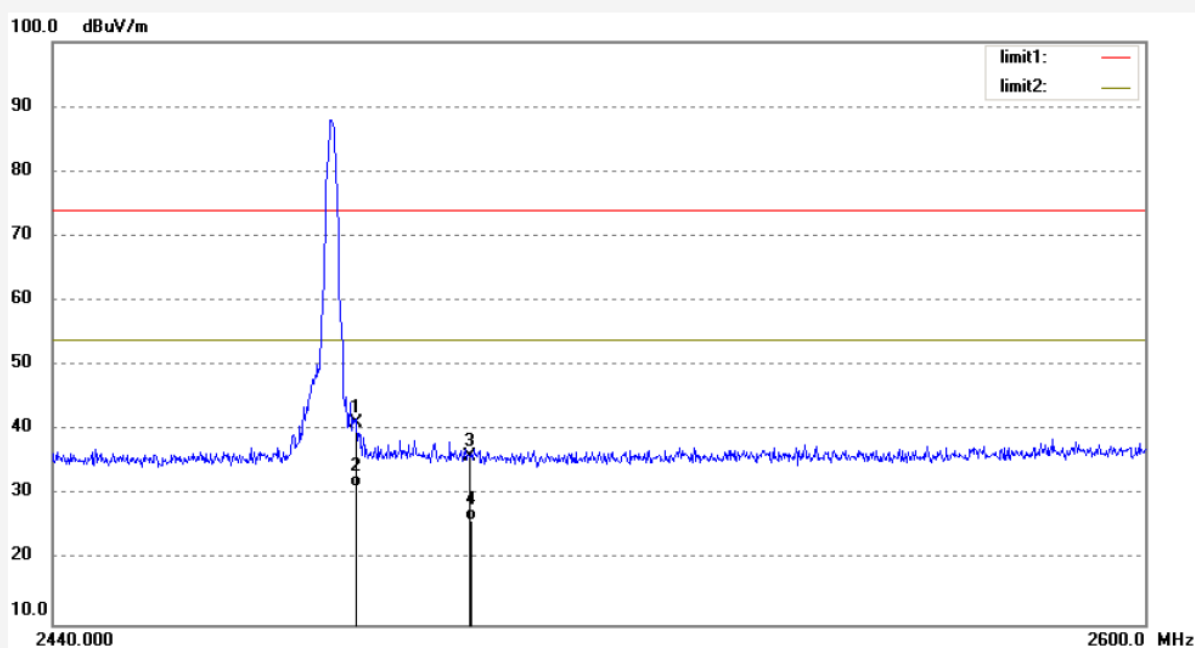
Date: 2019/09/06

Time: 11:41:32

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



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	47.04	-5.89	41.15	74.00	-32.85	peak	150	81	
2	2483.500	37.09	-5.89	31.20	54.00	-22.80	AVG	150	186	
3	2500.000	41.86	-5.81	36.05	74.00	-37.95	peak	150	203	
4	2500.000	31.81	-5.81	26.00	54.00	-28.00	AVG	150	296	

Note: Average measurement with peak detection at No.2&4

Hopping mode



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Job No.: JP2018 #771

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: HOPPING

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

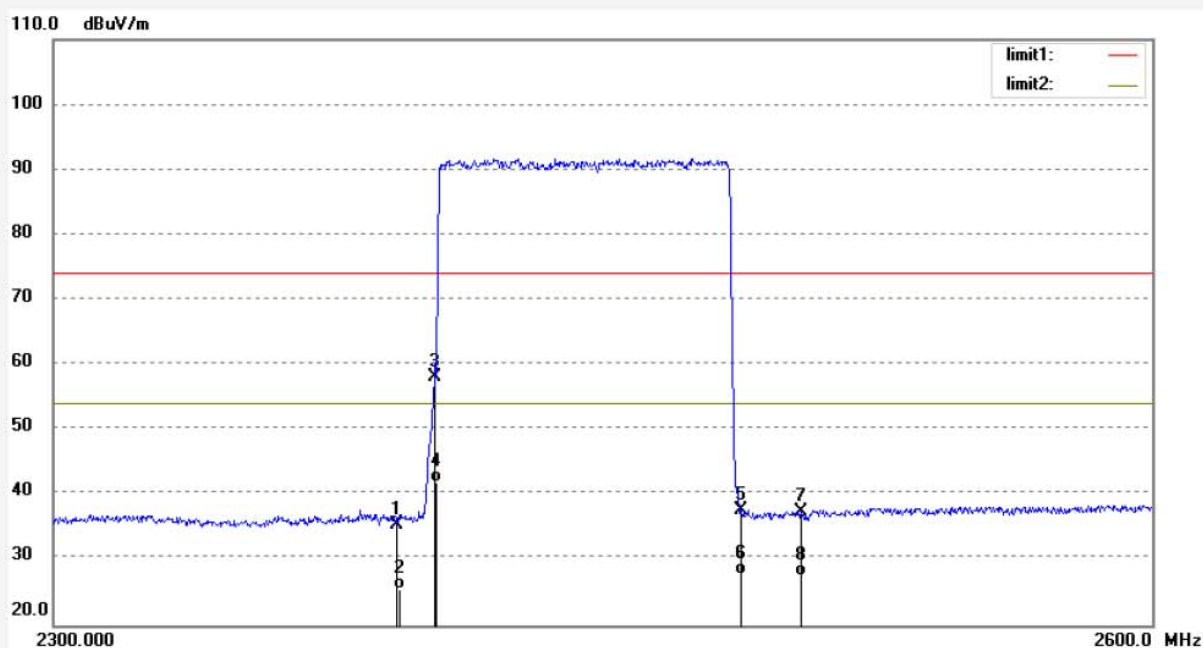
Date: 2019/09/06

Time: 17:08:44

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



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	34.71	0.79	35.50	74.00	-38.50	peak			
2	2390.000	24.71	0.79	25.50	54.00	-28.50	AVG			
3	2400.000	57.17	0.88	58.05	74.00	-15.95	peak			
4	2400.000	41.12	0.88	42.00	54.00	-12.00	AVG			
5	2483.500	36.60	1.10	37.70	74.00	-36.30	peak			
6	2483.500	26.60	1.10	27.70	54.00	-26.30	AVG			
7	2500.000	36.43	1.10	37.53	74.00	-36.47	peak			
8	2500.000	26.40	1.10	27.50	54.00	-26.50	AVG			

Note: Average measurement with peak detection at No.2&4&6&8



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Job No.: JP2018 #772

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: TWS Earbuds

Mode: HOPPING

Model: P2G-SP8

Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

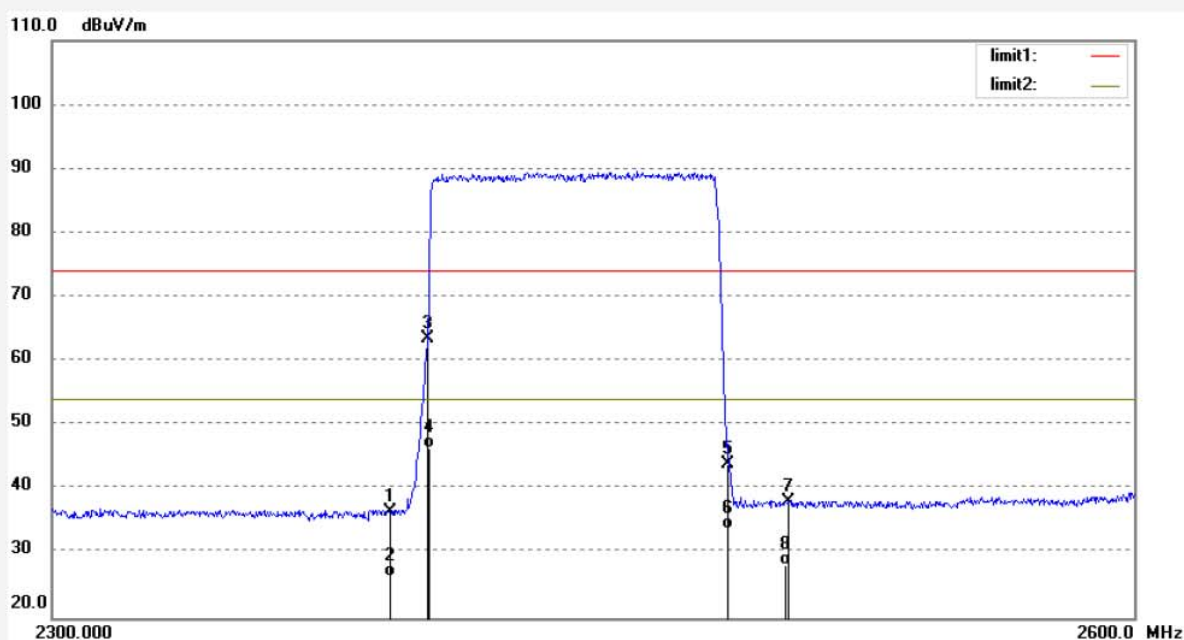
Date: 2019/09/06

Time: 17:11:14

Engineer Signature: Frank

Distance: 3m

Note: Report NO.:ATE20191328



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	35.77	0.79	36.56	74.00	-37.44	peak			
2	2390.000	25.71	0.79	26.50	54.00	-27.50	AVG			
3	2400.000	62.64	0.88	63.52	74.00	-10.48	peak			
4	2400.000	45.62	0.88	46.50	54.00	-7.50	AVG			
5	2483.500	42.80	1.10	43.90	74.00	-30.10	peak			
6	2483.500	32.80	1.10	33.90	54.00	-20.10	AVG			
7	2500.000	37.02	1.10	38.12	74.00	-35.88	peak			
8	2500.000	27.00	1.10	28.10	54.00	-25.90	AVG			

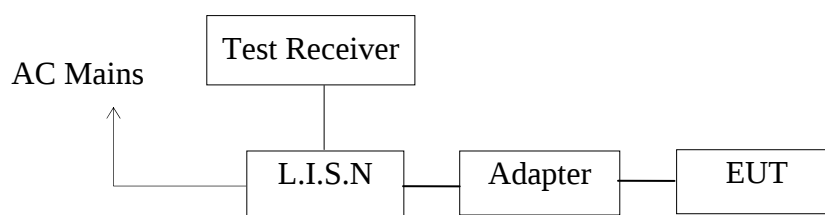
Note: Average measurement with peak detection at No.2&4&6&8

13.AC POWER LINE CONDUCTED EMISSION FOR FCC PART

15 SECTION 15.207(A)

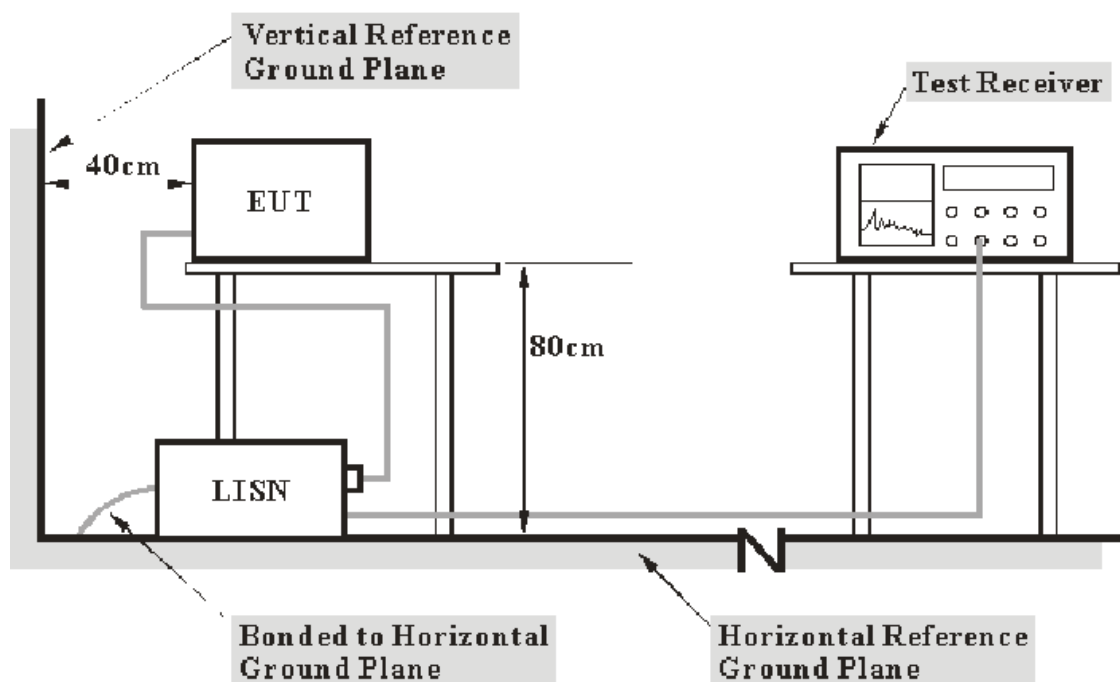
13.1.Block Diagram of Test Setup

13.1.1.Block diagram of connection between the EUT and simulators



(EUT: TWS Earbuds)

13.1.2.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.

13.2.Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μ V)	
	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.		

13.3.Configuration of EUT on Measurement

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.

13.4.Operating Condition of EUT

13.4.1.Setup the EUT and simulator as shown as Section 12.1.

13.4.2.Turn on the power of all equipment.

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

13.5.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 (R & S ESCS30) is set at 9kHz.

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

13.6.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

Margin = Limit (dBμV) - Level (dBμV)

Calculation Formula:

Margin = Limit (dBμV) - Level (dBμV)

13.7.Power Line Conducted Emission Measurement Results

PASS.

Test Lab: Shielding room

Test Engineer: Frank

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.

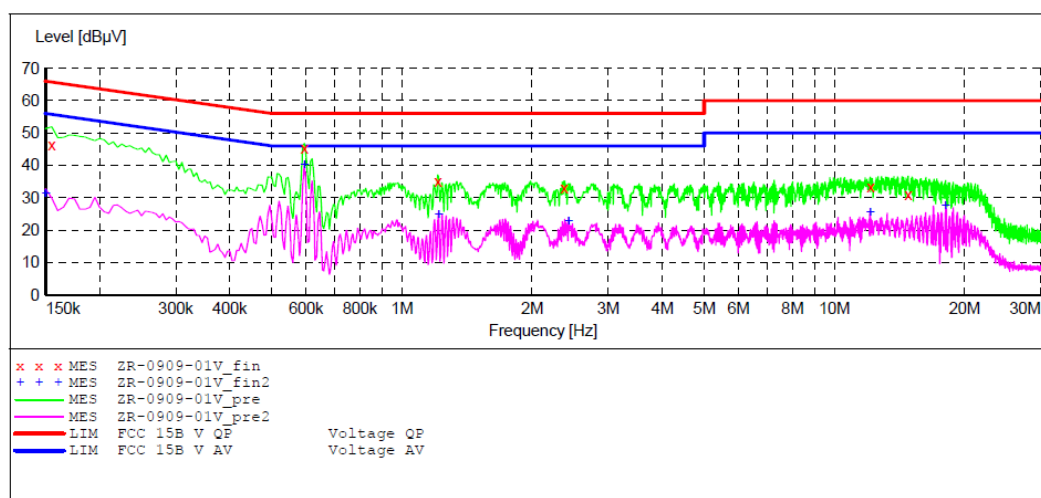
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: TWS Earbuds M/N:P2G-SP8
 Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.
 Operating Condition: Charging and operating
 Test Site: 1#Shielding Room
 Operator: Ben
 Test Specification: N 120V/60Hz
 Comment: Report NO.:ATE20191328
 Start of Test: 9/9/2019 / 11:26:24AM

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: "ZR-0909-01V_fin"

9/9/2019 11:30AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.155000	46.20	10.5	66	19.5	QP	N	GND
0.595000	45.20	10.6	56	10.8	QP	N	GND
1.210000	34.90	10.7	56	21.1	QP	N	GND
2.370000	32.80	10.7	56	23.2	QP	N	GND
12.115000	33.40	10.9	60	26.6	QP	N	GND
14.815000	30.80	10.9	60	29.2	QP	N	GND

MEASUREMENT RESULT: "ZR-0909-01V_fin2"

9/9/2019 11:30AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	31.20	10.5	56	24.8	AV	N	GND
0.595000	40.00	10.6	46	6.0	AV	N	GND
1.215000	24.80	10.7	46	21.2	AV	N	GND
2.430000	22.90	10.8	46	23.1	AV	N	GND
12.115000	25.60	10.9	50	24.4	AV	N	GND
18.085000	27.40	11.0	50	22.6	AV	N	GND

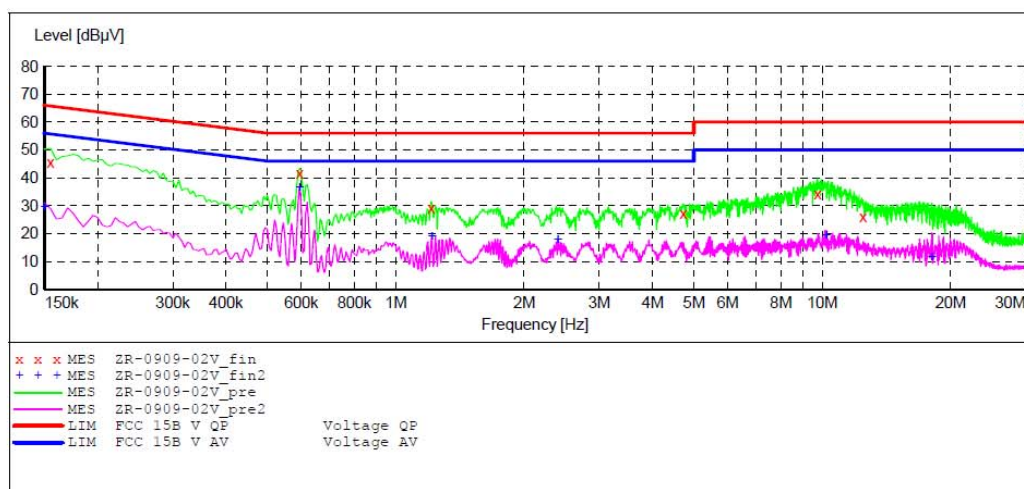
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15B

EUT: TWS Earbuds M/N:P2G-SP8
 Manufacturer: Shenzhen Bade Electronic Technology Co., Ltd.
 Operating Condition: Charging and operating
 Test Site: 1#Shielding Room
 Operator: Ben
 Test Specification: L 120V/60Hz
 Comment: Report NO.:ATE20191328
 Start of Test: 9/9/2019 / 11:30:49AM

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: "ZR-0909-02V_fin"

9/9/2019 11:34AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.155000	45.40	10.5	66	20.3	QP	L1	GND
0.595000	41.60	10.6	56	14.4	QP	L1	GND
1.210000	29.20	10.7	56	26.8	QP	L1	GND
4.720000	27.00	10.8	56	29.0	QP	L1	GND
9.750000	34.30	10.9	60	25.7	QP	L1	GND
12.460000	26.00	10.9	60	34.0	QP	L1	GND

MEASUREMENT RESULT: "ZR-0909-02V_fin2"

9/9/2019 11:34AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	29.50	10.5	56	26.5	AV	L1	GND
0.595000	36.50	10.6	46	9.5	AV	L1	GND
1.215000	19.00	10.7	46	27.0	AV	L1	GND
2.400000	17.90	10.8	46	28.1	AV	L1	GND
10.225000	19.30	10.9	50	30.7	AV	L1	GND
18.085000	11.50	11.0	50	38.5	AV	L1	GND

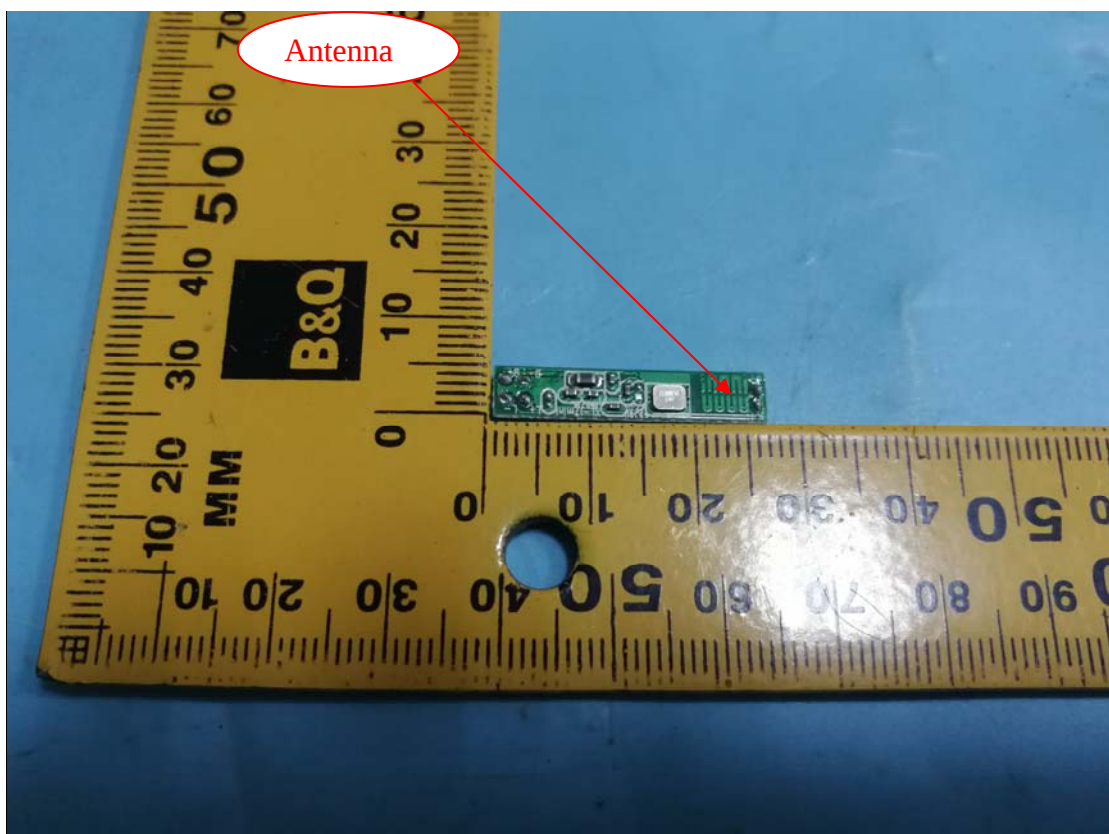
14.ANTENNA REQUIREMENT

14.1.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.

14.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Max Antenna gain of EUT is -0.58dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.



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