



TEST REPORT

APPLICANT : Dongguan Ruige Electronics Co., LTD

PRODUCT NAME : Wireless Earphones

MODEL No. : M190

TRADE MARK : N/A

FCC ID : 2BC8W-M190

STANDARD(S) : 47 CFR Part 15 Subpart C

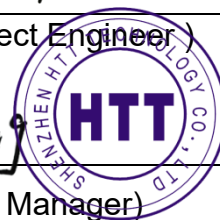
TEST RESULT : PASS

ISSUE DATE : Oct. 13, 2026

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**1 TEST SUMMARY**

Test Item	Test Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	PASS
Maximum Conducted Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	PASS
20dB Emission Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	PASS
Carrier Frequency Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	PASS
Number of Hopping Channels	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	PASS
Time of Occupancy	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)	PASS
Band Edge Measurements	47 CFR Part 15, Subpart C Section 15.247(d)	PASS
Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	PASS
Restricted bands around fundamental frequency	47 CFR Part 15, Subpart C Section 15.205/15.209	PASS



2 GENERAL INFORMATION

2.1 Client Information

Applicant:	Dongguan Ruige Electronics Co., LTD
Address of Applicant:	Room 201, Building 2, No. 60 Xinyang Middle Road, Lincun, Tangxia Town, Dongguan City, Guangdong Province
Manufacturer:	Dongguan Ruige Electronics Co., LTD
Address of Manufacturer:	Room 201, Building 2, No. 60 Xinyang Middle Road, Lincun, Tangxia Town, Dongguan City, Guangdong Province

2.2 General Description of EUT

Product Name:	Wireless Earphones
Model No.:	M190
Test Model No.:	M190
Trade mark:	N/A
Product Type:	☐ Mobile ☒ Portable ☐ Fix Location
Operation Frequency:	2402MHz-2480MHz
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Hopping Channel Type:	Adaptive Frequency Hopping systems
Antenna Type:	Chip Antenna
Antenna Gain:	2.70 dBi
Power Supply:	Headphone battery capacity:3.7V/40mAh (polymer battery) Charging bin battery capacity:3.7V/300mAh (polymer battery) Charging interface :USB Type-C
Test Voltage:	DC 3.7V From battery and DC 5.0V From adapter
Sample Received Date:	Sep. 30, 2026
Sample tested Date:	Sep. 30, 2026 ~ Oct. 13, 2026

Note 1: The EUT description presented in the report are provided by applicant and/or manufacturer, and the test laboratory is not responsible for the accuracy of the information. For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2.3 Channel List of EUT

Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency(MHz)
The lowest channel (CH0)	2402
The middle channel (CH39)	2441
The highest channel (CH78)	2480



2.4 Test Configuration

EUT Test Software Settings:		
Test Software:	BT_Tool	
EUT Power Grade:	7	
Use test software to set the lowest frequency, the middle frequency and the highest frequency keep transmitting of the EUT.		
Mode	Channel	Frequency(MHz)
DH1/DH3/DH5	CH0	2402
	CH39	2441
	CH78	2480
2DH1/2DH3/2DH5	CH0	2402
	CH39	2441
	CH78	2480
3DH1/3DH3/3DH5	CH0	2402
	CH39	2441
	CH78	2480



2.5 Test Environment

Operating Environment:	
Radiated Spurious Emissions:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
Conducted Emissions:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
RF Conducted:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar

2.6 Description of Support Units

The EUT has been tested independently.

2.7 Test Location

All tests were performed at:

Shenzhen HTT Technology Co.,Ltd.

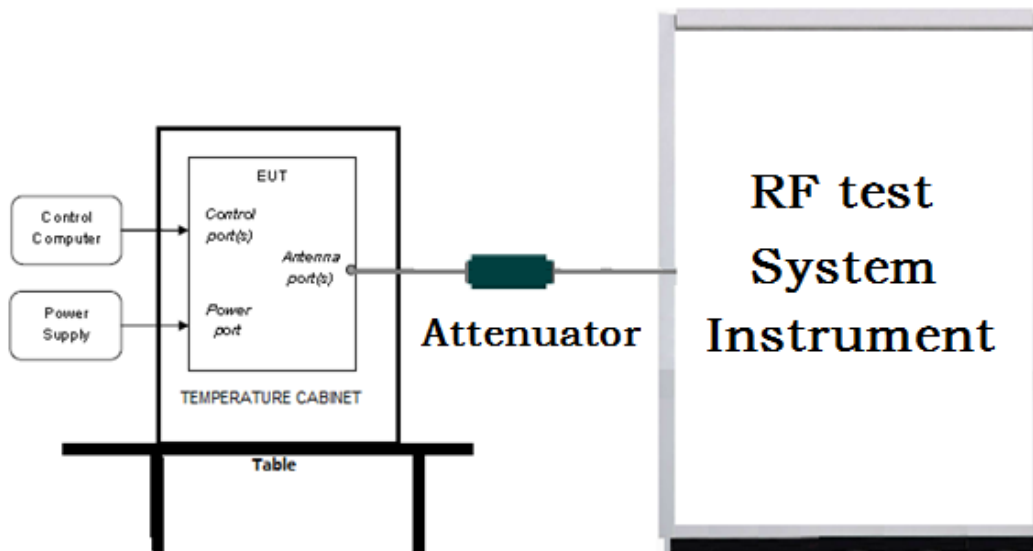
1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

Telephone: +86 (0) 755 -23595200 Fax: 0755-23595201

No tests were sub-contracted.

FCC-Registration No.: 779513 Designation Number: CN1319

2.8 Test Setup Layout Diagram



2.9 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen HTT Technology Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen HTT Technology Co.,Ltd. :

Test Item	Measurement Uncertainty	Notes
RF power, conducted	0.34 dB(Below 1GHz)	(1)
	0.43 dB(Above 1GHz)	(1)
Power Spectral Density	0.35 dB(Below 1GHz)	(1)
	0.46 dB(Above 1GHz)	(1)
Occupied Bandwidth	0.042 MHz	(1)
Conduction emission	3.14dB (9kHz-150kHz)	(1)
	2.64dB (150kHz-30MHz)	(1)
Radiated Spurious emission test	4.36 dB(30MHz-1GHz)	(1)
	4.5 dB(1GHz-18GHz)	(1)
	3.4 dB(18GHz-40GHz)	(1)
Temperature test	0.3°C	(1)
Humidity test	1.5%	(1)
DC power voltages	0.10%	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.



3 TEST EQUIPMENTS LIST

RF test system						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	DC power supply	Agilent	E3632A	HTT-E023	Jun. 03 2026	Jun. 02 2027
2	Spectrum Signal Analyzer	Agilent	N9020A	HTT-E024	Apr. 20 2026	Apr. 19 2027
3	Analog signal generator	Agilent	N5181A	HTT-E025	Apr. 20 2026	Apr. 19 2027
4	Vector signal generator	Agilent	N5182A	HTT-E026	Apr. 20 2026	Apr. 19 2027
5	RF Switch box	TST	Switchbox	HTT-E047	Apr. 20 2026	Apr. 19 2027
6	WIDEBAND RADIO COMMUNICATION TESTER	ROHDE&SCHWARZ	CMW 500	HTT-E036	Jun. 03 2026	Jun. 02 2027
7	RF Test Software	TST	panshanrf	N/A	N/A	N/A
8	Temperature and humidity meter	Shenzhen Anbiao Instrument Co., Ltd	TH10R	HTT-090	Apr. 22 2026	Apr. 21 2027



3M Semi-anechoic Chamber - Radiated disturbance Test						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	Shenzhen C.R.T technology co., LTD	9*6*6	HTT-E028	Aug. 10 2024	Aug. 09 2027
2	EMI Test Receiver	Rohde&Schwar	ESCI7	HTT-E022	Apr. 20 2026	Apr. 19 2027
3	Spectrum Analyzer	ROHDE&SCHWARZ	FSV40-N	HTT-E050	Apr. 20 2026	Apr. 19 2027
4	Composite logarithmic antenna	Schwarzbeck	VULB 9168	HTT-E017	Apr. 18 2026	Apr. 17 2027
5	Loop Antenna	Zhinan	ZN30900C	HTT-E039	Apr. 21 2026	Apr. 20 2027
6	Horn Antenna	Schwarzbeck	BBHA9120D	HTT-E016	Apr. 18 2026	Apr. 17 2027
7	Horn Antenna	A.H. Systems, inc.	SAS-574	HTT-E040	Jun. 06 2026	Jun. 05 2027
8	low frequency Amplifier	Sonoma Instrument	310	HTT-E015	Apr. 20 2026	Apr. 19 2027
9	Amplifier(18-40G)	/	LNA-18004000-50G35	HTT-E053	Jun. 03 2026	Jun. 02 2027
10	Amplifier(1-18G)	/	DLNA8-1-18G-9562	HTT-E059	Jun. 03 2026	Jun. 02 2027
11	Radiated Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
12	Variable frequency power supply	Shenzhen Anbiao Instrument Co., Ltd	ANB-10VA	HTT-082	Apr. 20 2026	Apr. 19 2027
13	EMI Test Receiver	Rohde & Schwarz	ESCI3	HTT-E043	Apr. 20 2026	Apr. 19 2027
14	Coaxial Cable	/	ZT26-NJ-0.6M	HTT-E018	Apr. 20 2026	Apr. 19 2027
15	Coaxial Cable	ZDECL	ZT26-NJ-SMAJ-8.5M	HTT-E021	Apr. 20 2026	Apr. 19 2027
16	Coaxial Cable	Shenzhen Enchuang Electronic Technology Co., Ltd.	ZT26-NMMN-5M	HTT-E062	Apr. 20 2026	Apr. 19 2027
17	Coaxial Cable	DEEB	DCA9-2.92M10002.92 M3.6-1494	HTT-E051	Jun. 03 2026	Jun. 02 2027
18	Coaxial Cable	DEEB	DCA9-2.92M50002.92 M3.6-1326	HTT-E052	Jun. 03 2026	Jun. 02 2027



Conducted disturbance Test						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Conducted Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
2	LISN	Rohde & Schwarz	ESH3-Z5	HTT-E006	Apr. 20 2026	Apr. 19 2027
3	LISN	Rohde & Schwarz	ENV-216	HTT-E038	Apr. 20 2026	Apr. 19 2027
4	Cable Line	Robinson	Z302S-NJ-BNCJ- 1.5M	HTT-E001	Apr. 20 2026	Apr. 19 2027
5	Filter	ROHDE&SCHWARZ	ESH3-Z2	HTT-E045	Apr. 20 2026	Apr. 19 2027
6	Variable frequency power supply	Shenzhen Yanghong Electric Co., Ltd	YF-650 (5KVA)	HTT-E032	Apr. 20 2026	Apr. 19 2027



4 TEST CONDITIONS AND RESULTS

4.1 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1) (I):

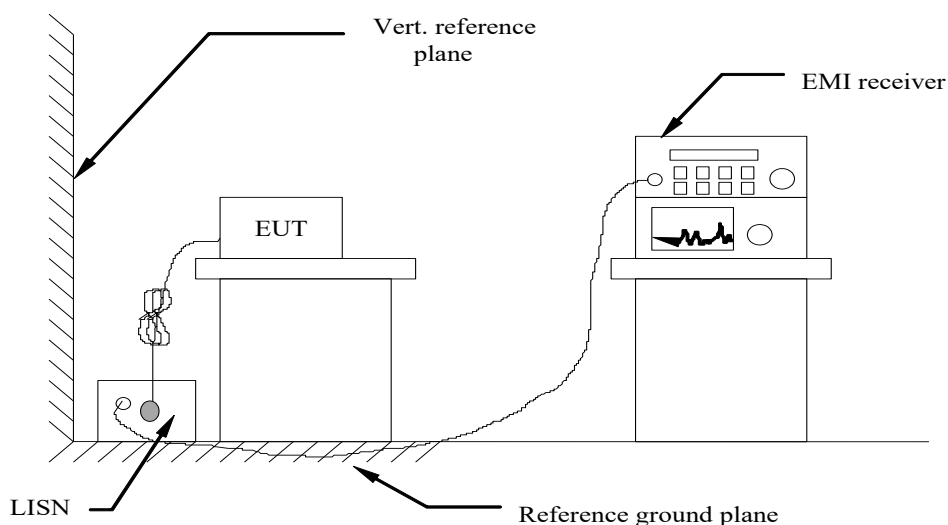
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

Antenna Connected Construction

The Chip Antenna maximum gain of Ant1 was 2.70 dBi.



TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2020.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2020
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2020
- 4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST RESULTS

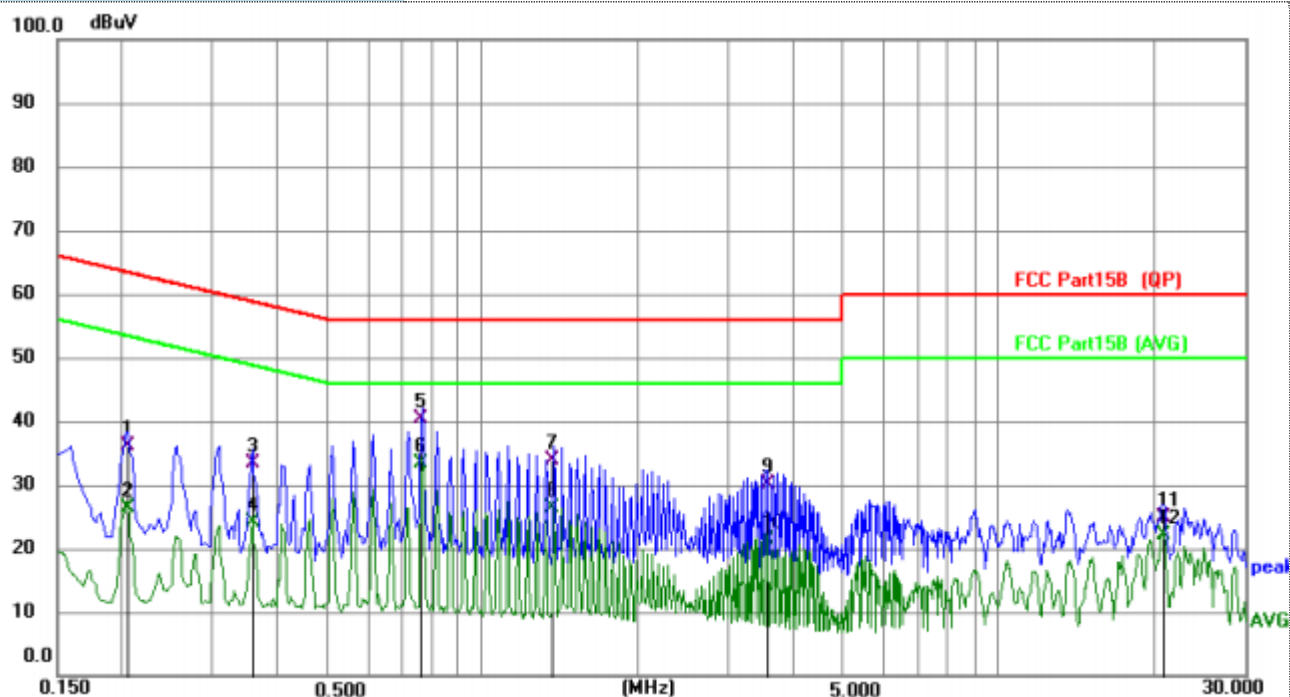
Remark:

1. All modes of GFSK, $\pi/4$ DQPSK and 8DPSK were test at Low, Middle, and High channel; only the worst result of 8DPSK high Channel was reported as below:



Polarization:

L



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			
				dB	dBμV	dBμV	dB	Detector
1		0.2043	25.99	10.07	36.06	63.43	-27.37	QP
2		0.2043	16.37	10.07	26.44	53.43	-26.99	AVG
3		0.3574	23.15	10.11	33.26	58.79	-25.53	QP
4		0.3574	13.96	10.11	24.07	48.79	-24.72	AVG
5		0.7647	30.39	10.07	40.46	56.00	-15.54	QP
6	*	0.7647	23.27	10.07	33.34	46.00	-12.66	AVG
7		1.3766	23.77	10.14	33.91	56.00	-22.09	QP
8		1.3766	16.15	10.14	26.29	46.00	-19.71	AVG
9		3.5702	19.96	10.11	30.07	56.00	-25.93	QP
10		3.5702	11.35	10.11	21.46	46.00	-24.54	AVG
11		20.8167	13.99	11.00	24.99	60.00	-35.01	QP
12		20.8167	11.14	11.00	22.14	50.00	-27.86	AVG

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)

2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)

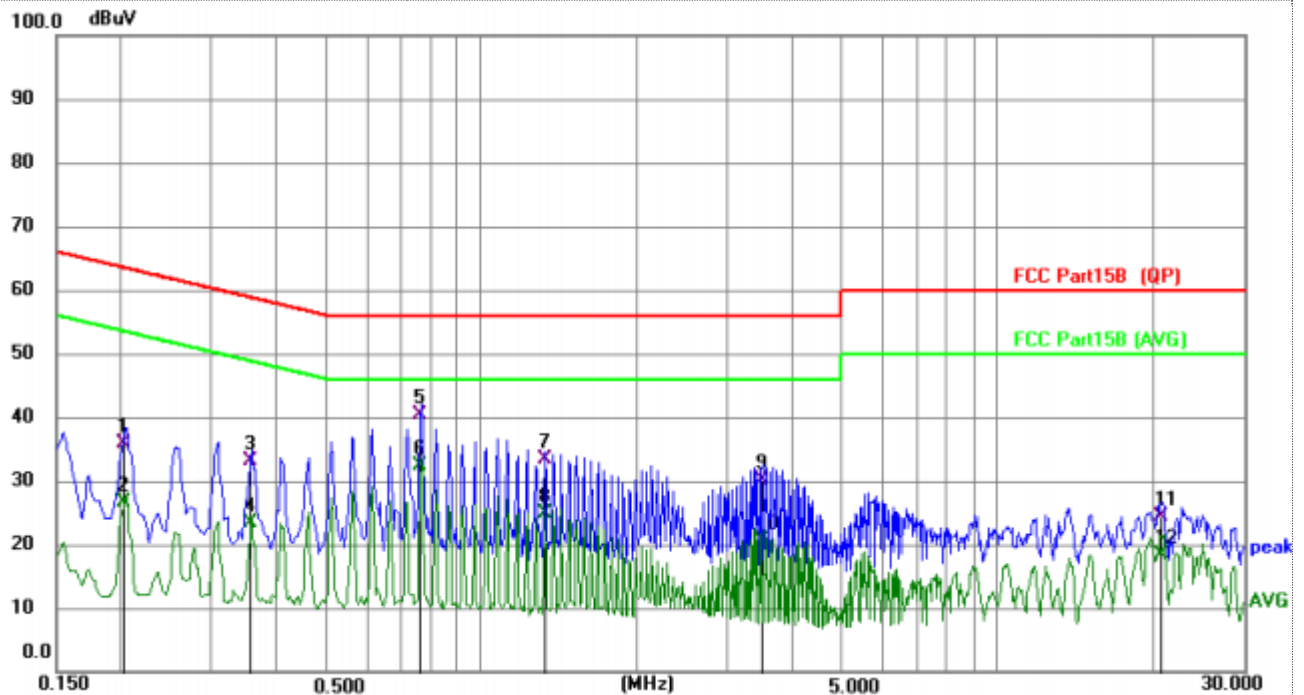
3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)

4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)



Polarization:

N



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
				dB	dBμV	dBμV	dB	
1		0.2034	25.71	10.07	35.78	63.47	-27.69	QP
2		0.2034	16.68	10.07	26.75	53.47	-26.72	AVG
3		0.3564	22.95	10.11	33.06	58.81	-25.75	QP
4		0.3564	13.27	10.11	23.38	48.81	-25.43	AVG
5		0.7656	30.22	10.07	40.29	56.00	-15.71	QP
6	*	0.7656	22.27	10.07	32.34	46.00	-13.66	AVG
7		1.3259	23.16	10.14	33.30	56.00	-22.70	QP
8		1.3259	14.65	10.14	24.79	46.00	-21.21	AVG
9		3.5199	19.91	10.11	30.02	56.00	-25.98	QP
10		3.5199	10.46	10.11	20.57	46.00	-25.43	AVG
11		20.8120	13.48	11.00	24.48	60.00	-35.52	QP
12		20.8120	7.44	11.00	18.44	50.00	-31.56	AVG

Note:1).QP Value (dBμV)= QP Reading (dBμV)+ Factor (dB)

2). Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). QPMargin(dB) = QP Limit (dBμV) - QP Value (dBμV)

4). AVMargin(dB) = AV Limit (dBμV) - AV Value (dBμV)



4.3 Maximum Conducted Output Power

Limit

According to FCC section 15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the powersensor.

Method PM is Measurement using an RF Peak power sensor. The procedure for this method is as follows:

1. The testing follows the ANSI C63.10 Section 7.8.5
2. The maximum peak conducted output power may be measured using a broadband peak RF power sensor.
3. The power sensor shall have a video bandwidth that is greater than or equal to the 20db bandwidth and shall use a fast-responding diode detector.

Test Configuration

Refer to chapter 2.8 in this report.

Test Mode

Refer to chapter 2.4 in this report.

Test Results

Please refer to Appendix RF Test Data for BT.



4.4 20dB Emission Bandwidth

Limit

According to FCC section 15.247(a)(1), the 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth ($10 \cdot \log 1\% = 20 \text{ dB}$) taking the total RF output power.

Test Procedure

The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW. The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW was 1% to 5% of the OBW and VBW shall be at least three times RBW.

- a) Span: shall be between two times and five times the OBW.
- b) RBW: 1% to 5% of the OBW.
- c) Video bandwidth (VBW) $\geq 3\text{RBW}$
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max-hold.
- g) Allow the trace to stabilize

Test Configuration

Refer to chapter 2.8 in this report.

Test Mode

Refer to chapter 2.4 in this report.

Test Results

Please refer to Appendix RF Test Data for BT.



4.5 Frequency Separation

LIMIT

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Wide enough to capture the peaks of two adjacent channels.
- b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- c) Video (or average) bandwidth (VBW) $\geq$ RBW
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max-hold.
- g) Allow the trace to stabilize

Test Configuration

Refer to chapter 2.8 in this report.

Test Mode

Refer to chapter 2.4 in this report.

TEST RESULTS

Please refer to Appendix RF Test Data for BT.



4.6 Number of hopping frequency

Limit

According to FCC section 15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator.

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: The frequency band of operation. Depending on the number of channels the device supports, it could be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- c) VBW $\geq$ RBW.
- d) Sweep: Auto time.
- e) Detector function: Peak.
- f) Trace: Max-hold.
- g) Allow the trace to stabilize

Test Configuration

Refer to chapter 2.8 in this report.

Test Mode

Refer to chapter 2.4 in this report.

Test Results

Please refer to Appendix RF Test Data for BT.



4.7 Time of Occupancy (Dwell Time)

Limit

According to FCC section 15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping 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.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and $VBW \geq RBW$, Span 0Hz.

Test Configuration

Refer to chapter 2.8 in this report.

Test Mode

Refer to chapter 2.4 in this report.

Test Results

Please refer to Appendix RF Test Data for BT.



4.8 Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

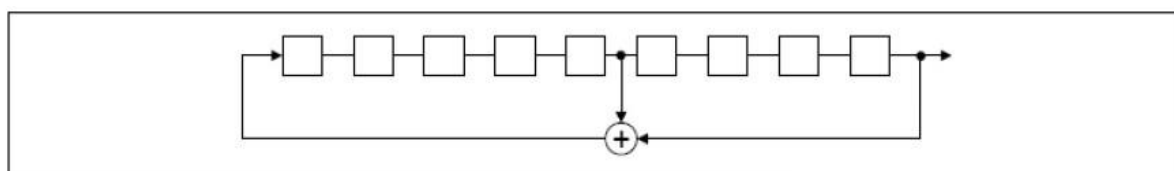
For 47 CFR Part 15C section 15.247 (a) (1) requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping 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 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 hop-ping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

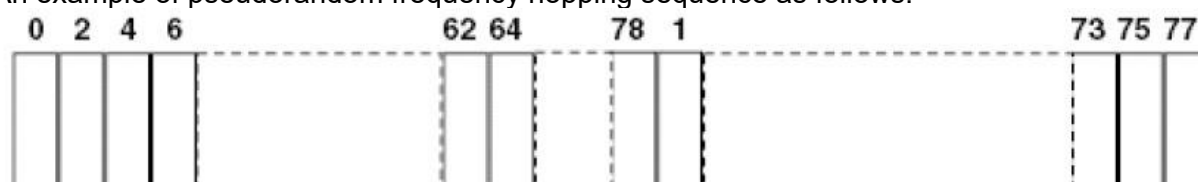
The pseudorandom frequency hopping sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.

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



4.9 Band Edge Measurements and Conducted Spurious Emission

Limit

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

Test Procedure

The testing follows the ANSI C63.10 Section 11.11.2 and 11.11.3 and 6.10.4:

●Reference level measurement

Establish a reference level by using the following procedure:

- Set instrument center frequency to DTS channel center frequency.
- Set the span to ≥ 1.5 times the DTS bandwidth.
- Set the RBW = 100 kHz.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

●Emission level measurement

Establish an emission level by using the following procedure:

- Set the center frequency and span to encompass frequency range to be measured.
- Set the RBW = 100 kHz.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Test Configuration

Refer to chapter 2.8 in this report.

Test Mode

Refer to chapter 2.4 in this report.

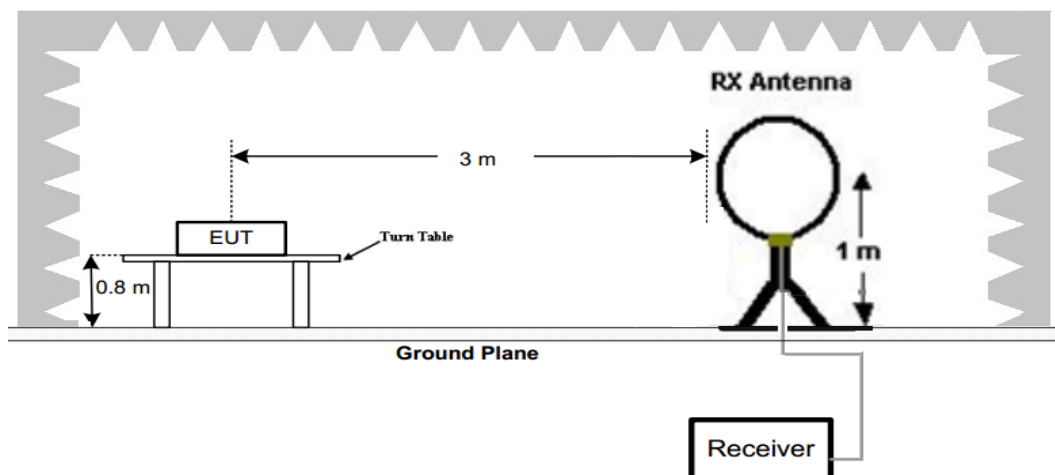
Test Results

Please refer to Appendix RF Test Data for BT.

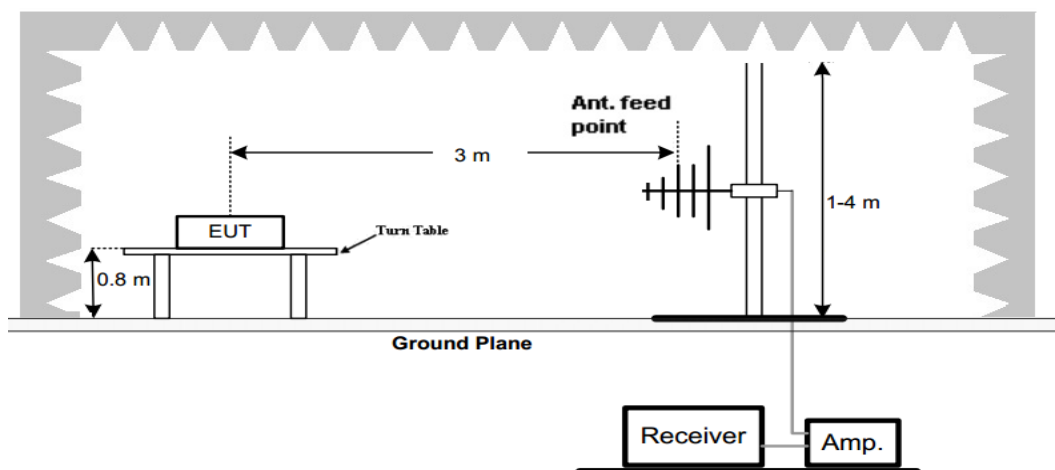
4.10 Radiated Spurious Emission & Restricted bands

TEST CONFIGURATION

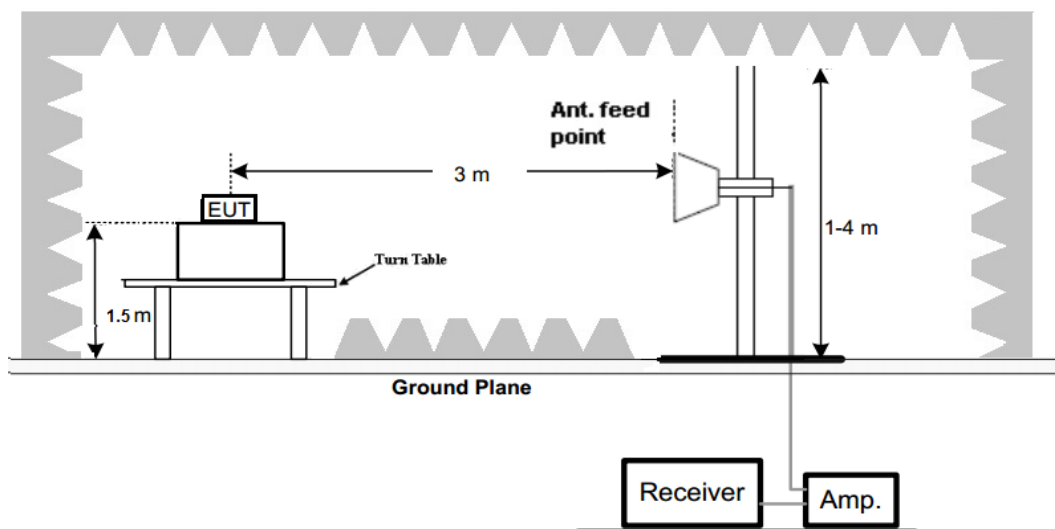
Frequency range 9 KHz – 30MHz

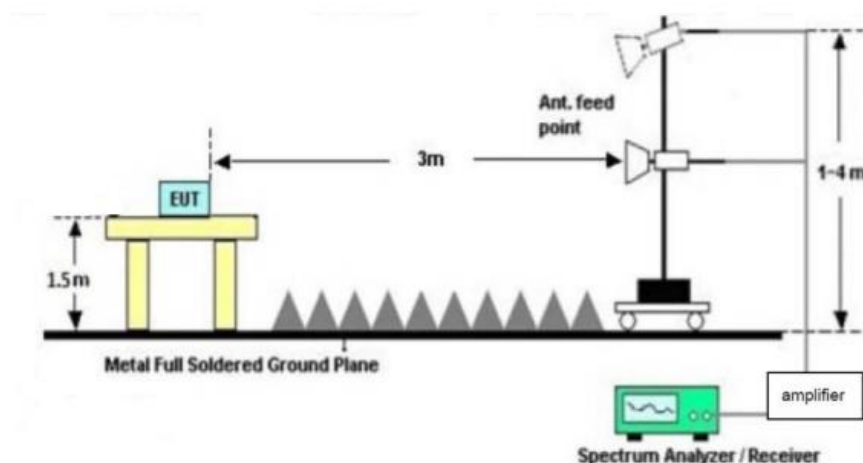


Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz





TEST PROCEDURE

- The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
- Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until all frequency measurements have been completed.
- The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	3

- Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
Above 1GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=10KHz, Sweep time=Auto	Average

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

$$Transd=AF +CL-AG$$



For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

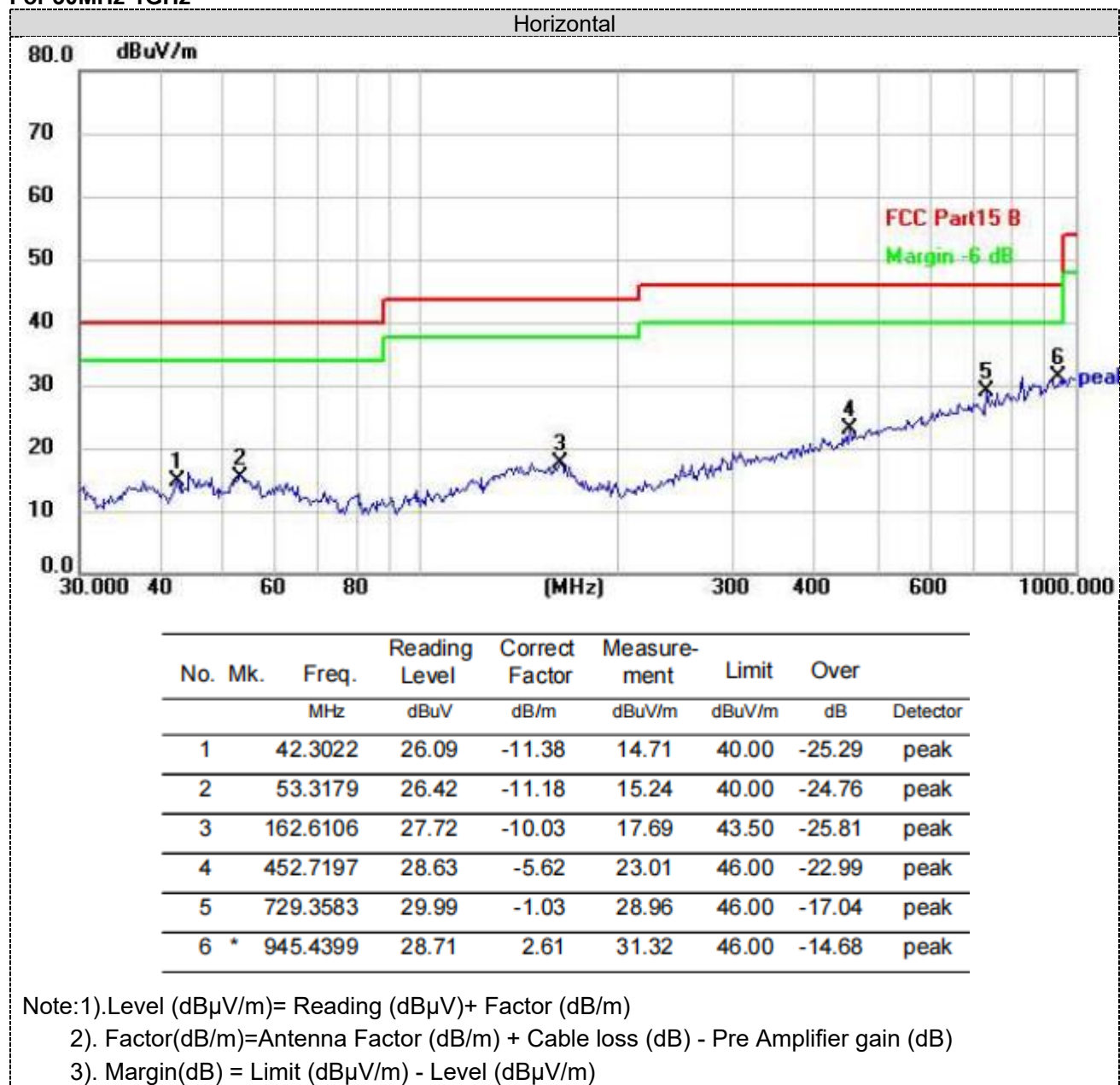
TEST RESULTS

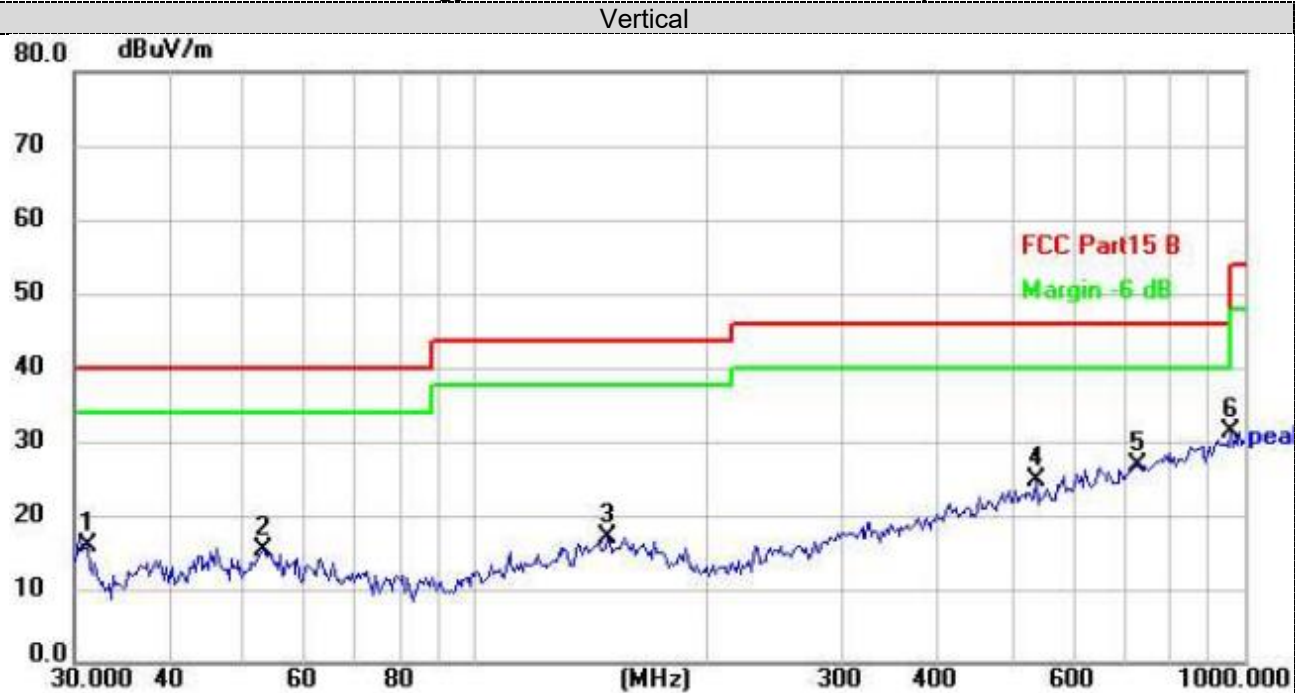
Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. We measured Radiated Emission at GFSK, $\pi/4$ DQPSK and 8DPSK mode from 9 KHz to 25GHz and recorded worst case at 8DPSK 3DH5 mode.
3. Scan from 9kHz to 25GHz, the disturbance above 10GHz and below 30MHz was very low. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. The report records the lowest Peak value. If the Peak value is greater than 54dBμV/m, then the Average value at that time is recorded.



For 30MHz-1GHz





No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		31.2893	28.54	-12.65	15.89	40.00	-24.11	peak
2		52.9453	26.47	-11.10	15.37	40.00	-24.63	peak
3		148.4410	26.51	-9.62	16.89	43.50	-26.61	peak
4		535.7073	28.90	-4.19	24.71	46.00	-21.29	peak
5		724.2611	27.92	-1.14	26.78	46.00	-19.22	peak
6	*	958.7943	28.28	2.88	31.16	46.00	-14.84	peak

Note:1).Level (dB μ V/m)= Reading (dB μ V)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dB μ V/m) - Level (dB μ V/m)



For 1GHz to 25GHz

Note: GFSK, $\pi/4$ DQPSK and 8DPSK all have been tested, only worse case GFSK is reported.**GFSK (above 1GHz)**

Frequency(MHz):			2402		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	59.56	PK	74	14.44	53.86	31	6.5	31.8	5.7
4804.00	43.14	AV	54	10.86	37.44	31	6.5	31.8	5.7
7206.00	54.41	PK	74	19.59	41.76	36	8.15	31.5	12.65
7206.00	43.53	AV	54	10.47	30.88	36	8.15	31.5	12.65

Frequency(MHz):			2402		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4804.00	58.73	PK	74	15.27	53.03	31	6.5	31.8	5.7
4804.00	42.40	AV	54	11.60	36.70	31	6.5	31.8	5.7
7206.00	52.78	PK	74	21.22	40.13	36	8.15	31.5	12.65
7206.00	43.76	AV	54	10.24	31.11	36	8.15	31.5	12.65

Frequency(MHz):			2441		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4882.00	60.00	PK	74	14.00	53.84	31.2	6.61	31.65	6.16
4882.00	44.98	AV	54	9.02	38.82	31.2	6.61	31.65	6.16
7323.00	53.48	PK	74	20.52	40.53	36.2	8.23	31.48	12.95
7323.00	44.90	AV	54	9.10	31.95	36.2	8.23	31.48	12.95

Frequency(MHz):			2441		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4882.00	60.77	PK	74	13.23	54.61	31.2	6.61	31.65	6.16
4882.00	43.99	AV	54	10.01	37.83	31.2	6.61	31.65	6.16
7323.00	53.11	PK	74	20.89	40.16	36.2	8.23	31.48	12.95
7323.00	44.54	AV	54	9.46	31.59	36.2	8.23	31.48	12.95

Frequency(MHz):			2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	63.08	PK	74	10.92	56.42	31.4	6.76	31.5	6.66
4960.00	41.44	AV	54	12.56	34.78	31.4	6.76	31.5	6.66
7440.00	54.14	PK	74	19.86	40.84	36.4	8.35	31.45	13.3
7440.00	46.09	AV	54	7.91	32.79	36.4	8.35	31.45	13.3

Frequency(MHz):			2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
4960.00	64.24	PK	74	9.76	57.58	31.4	6.76	31.5	6.66
4960.00	43.14	AV	54	10.86	36.48	31.4	6.76	31.5	6.66
7440.00	53.82	PK	74	20.18	40.52	36.4	8.35	31.45	13.3



7440.00	44.38	AV	54	9.62	31.08	36.4	8.35	31.45	13.3
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REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier
3. Margin value = Limit value - Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

Results of Band Edges Test (Radiated)

Note: GFSK, $\pi/4$ DQPSK and 8DPSK all have been tested, only worse case GFSK is reported.

GFSK

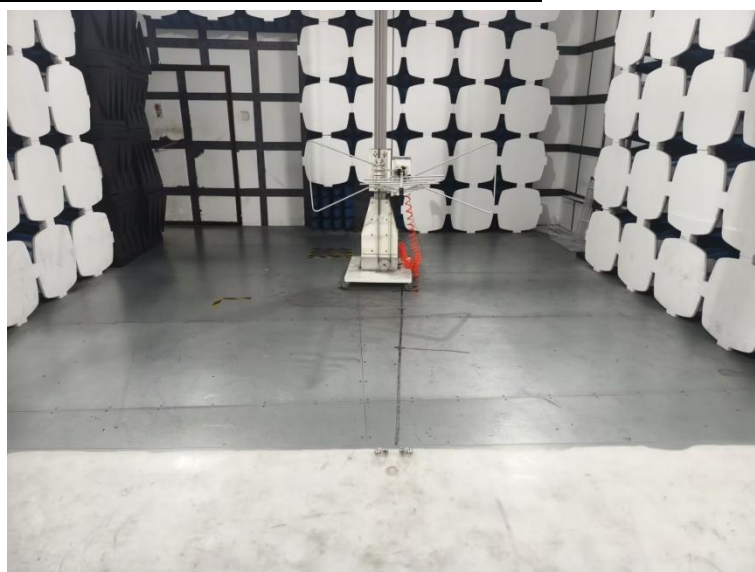
Frequency(MHz):			2402		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	59.39	PK	74	14.61	60.78	27.2	4.31	32.9	-1.39
2390.00	45.10	AV	54	8.90	46.49	27.2	4.31	32.9	-1.39
Frequency(MHz):			2402		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2390.00	58.91	PK	74	15.09	60.30	27.2	4.31	32.9	-1.39
2390.00	45.58	AV	54	8.42	46.97	27.2	4.31	32.9	-1.39
Frequency(MHz):			2480		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	55.87	PK	74	18.13	56.80	27.4	4.47	32.8	-0.93
2483.50	44.95	AV	54	9.05	45.88	27.4	4.47	32.8	-0.93
Frequency(MHz):			2480		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
2483.50	55.01	PK	74	18.99	55.94	27.4	4.47	32.8	-0.93
2483.50	44.53	AV	54	9.47	45.46	27.4	4.47	32.8	-0.93

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier
3. Margin value = Limit value - Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.



5 Test Setup Photos of the EUT



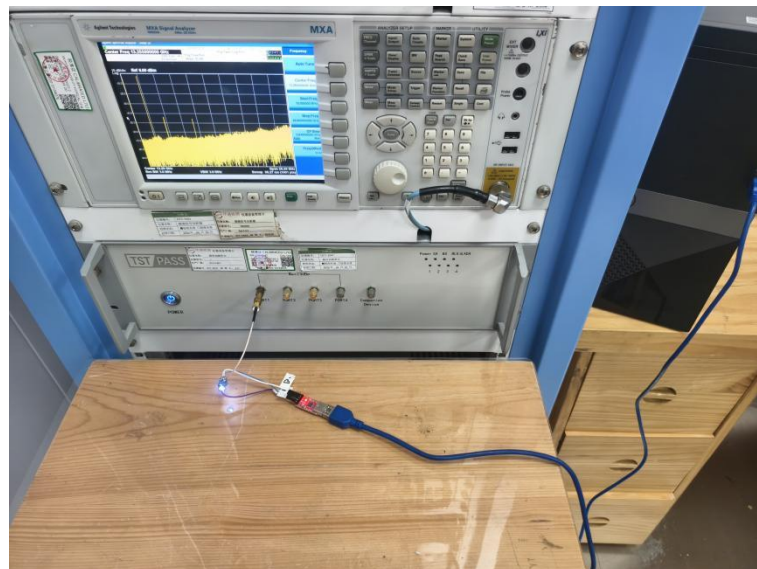
Radiated spurious emission Test Setup-1(Below 1GHz)



Radiated spurious emission Test Setup-2(Above 1GHz)



Conducted Emission Test Setup

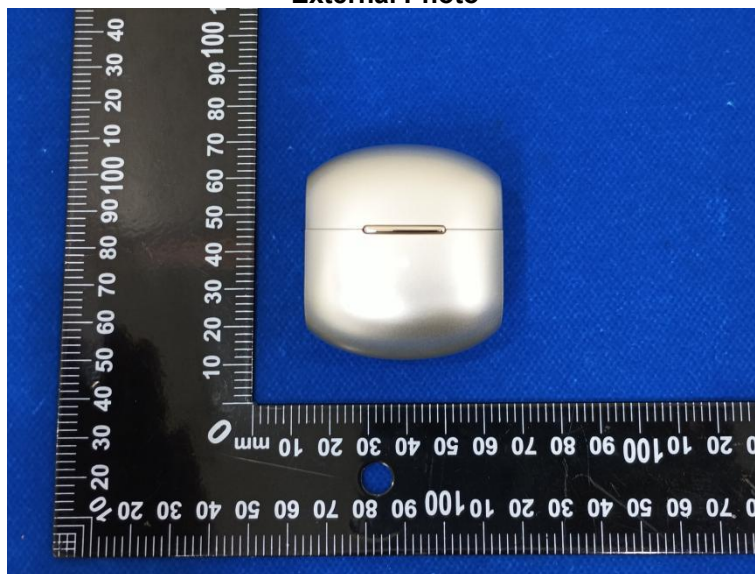


RF Conducted Test Setup

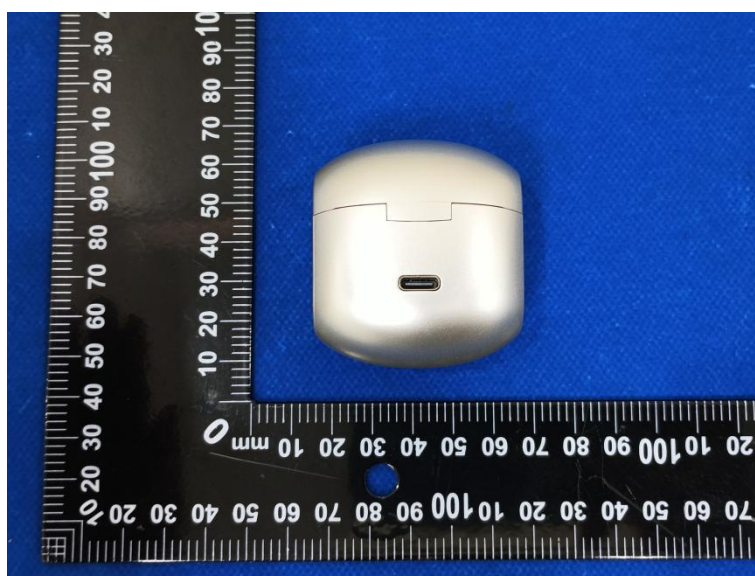


6 Photos of the EUT

External Photo



View Of Product - 1



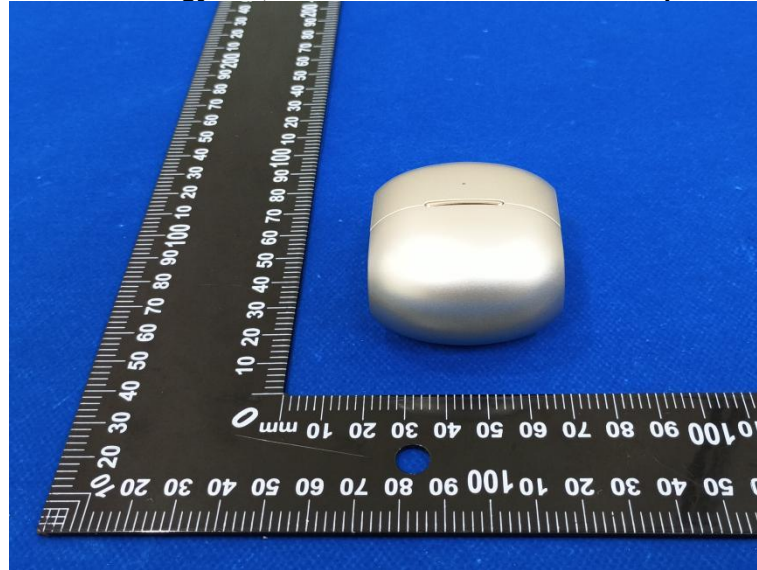
View Of Product - 2



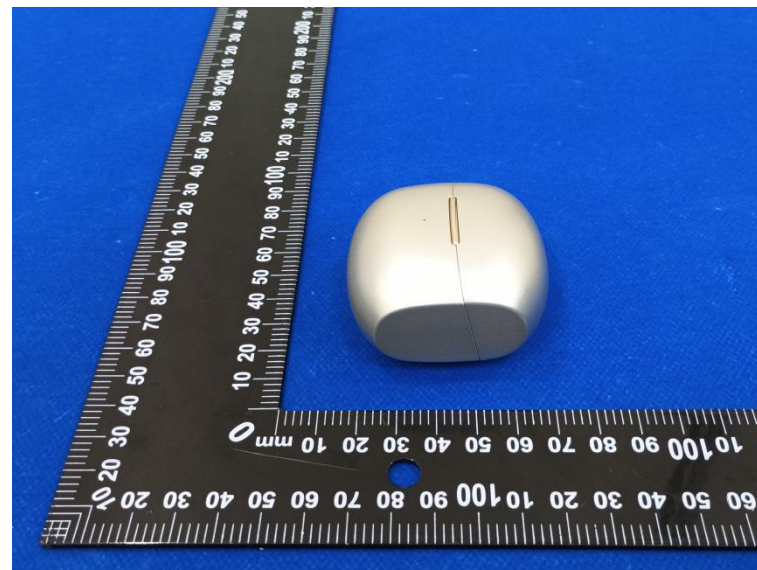
View Of Product - 3



View Of Product - 4



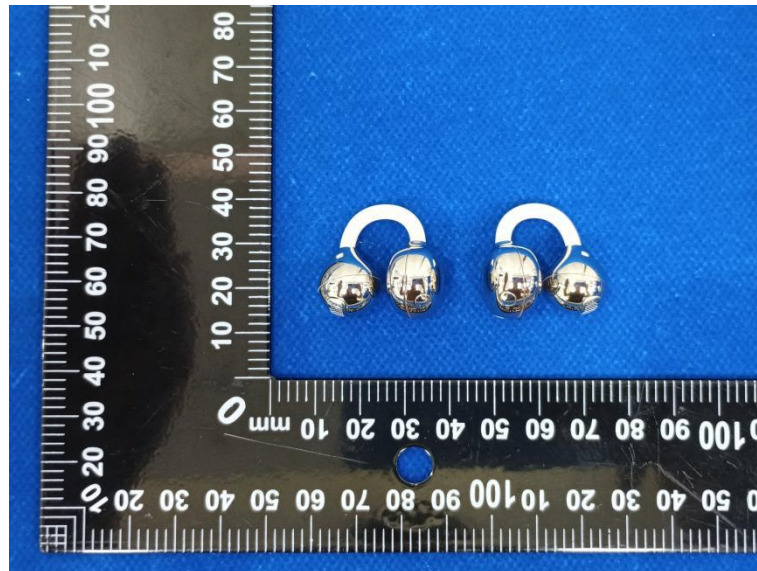
View Of Product - 5



View Of Product - 6



View Of Product - 7



View Of Product - 8



View Of Product - 9



View Of Product - 10



View Of Product - 11



View Of Product - 12

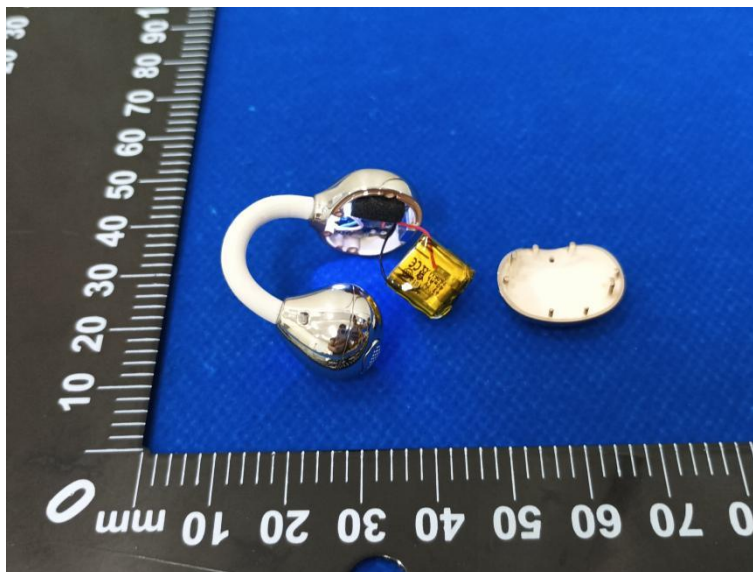


View Of Product - 13

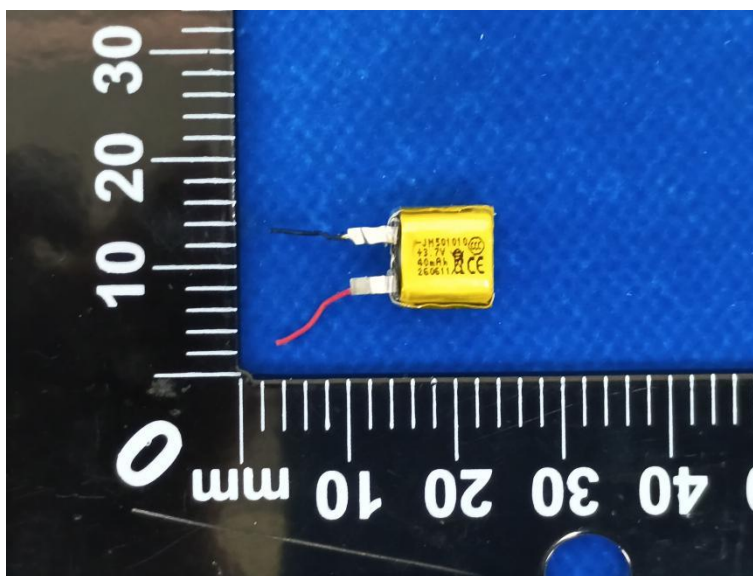


Internal Photo

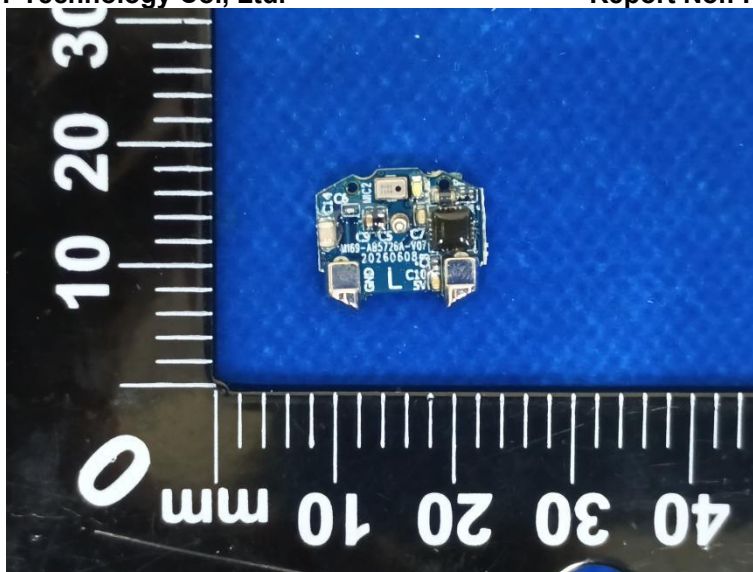
Left side Photo



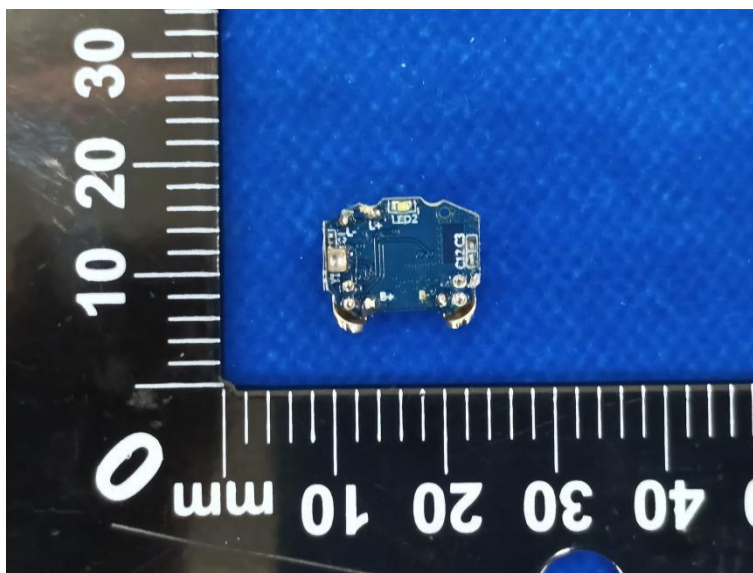
View Of Product - 14



View Of Product - 15



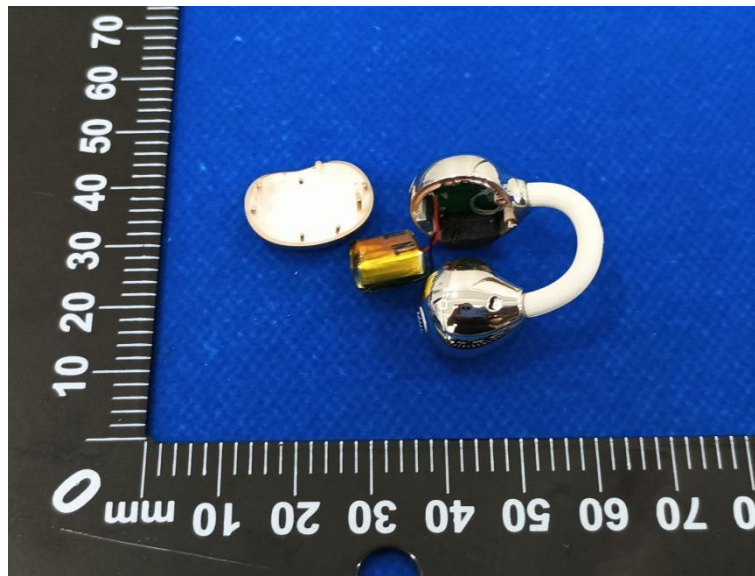
View Of Product - 16



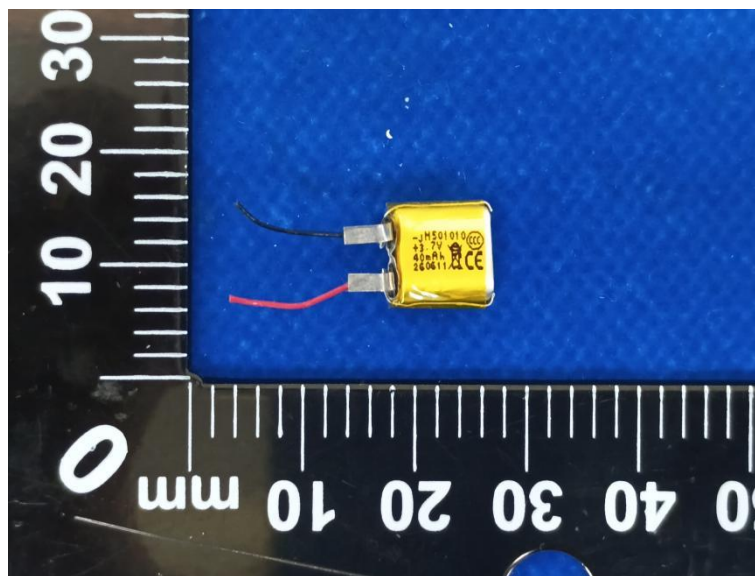
View Of Product - 17



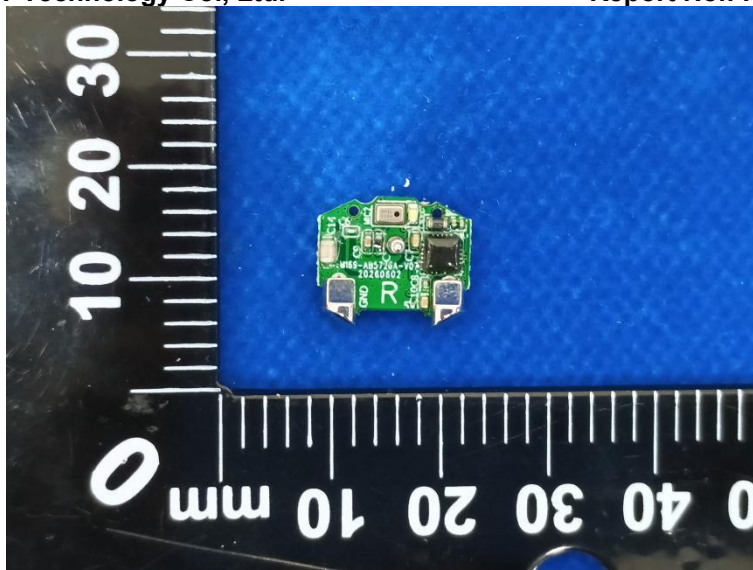
View Of Product - 18



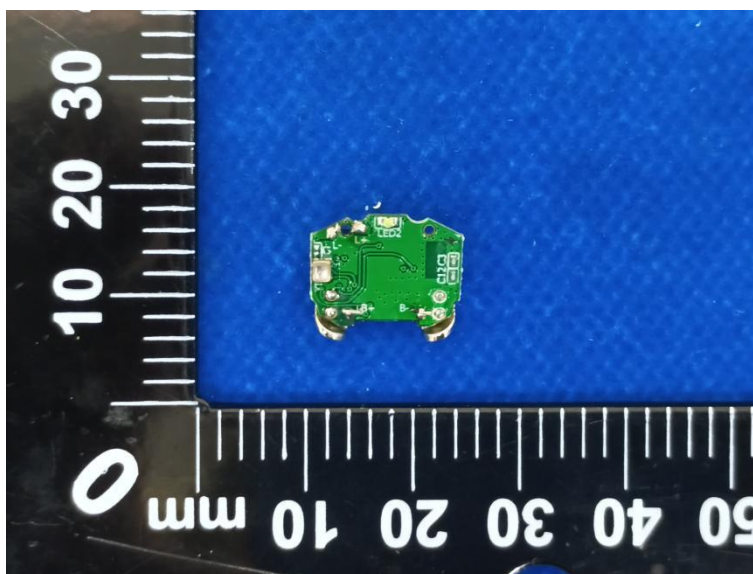
View Of Product - 19



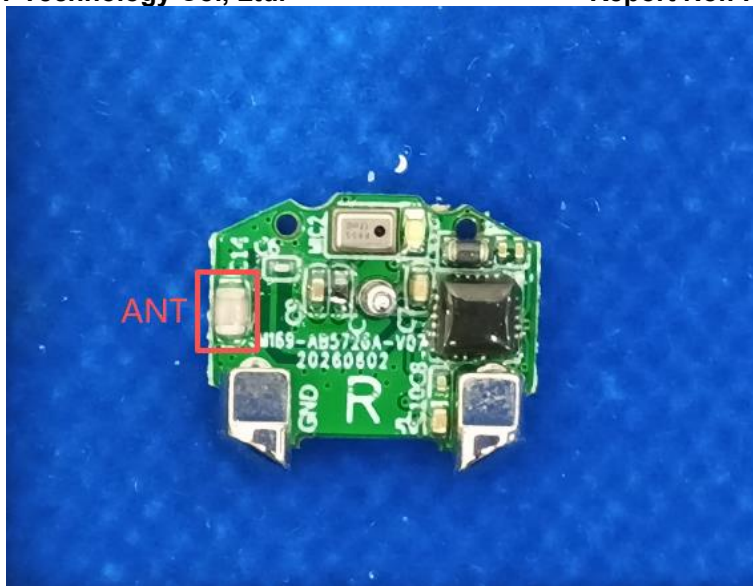
View Of Product - 20



View Of Product - 21



View Of Product - 22



View Of Product - 23

***** End of Reprt *****