FCC Test Report

Report No.: AGC02575191201FE03

FCC ID	:	O25-BIT3
APPLICATION PURPOSE	:	Class II Equipment
PRODUCT DESIGNATION	:	Bluetooth Helmet Headset
BRAND NAME	:	ChatterBox
MODEL NAME	:	BiT-3S
APPLICANT	:	Unimo Technology Co., Ltd.
DATE OF ISSUE	:	Jan. 15, 2020
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION	:	V1.0

***A**ttestation of **G**lobal **C**ompliance (Shenzhen) Co., Ltd*

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 15, 2020	Valid	Re-certification Report

Note:

The original test report Ref.No. AGC02575190803FE03 dated Aug. 28, 2019 was modified on Jan. 15, 2020 to include the following changes:

Change the model name;

Change the photo of EUT;

Change the Hardware Version and Software Version; The changes of them are not relative to RF characteristic;

Speaker and microphone connectors changed to solder joints;

- So the Conducted Emission and Radiated Emission had been tested for the Class II device.

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1. VERIFICATION OF CONFORMITY

Applicant	Unimo Technology Co., Ltd.
Address	4th Floor, 162 Bangbae-Ro Seocho-Gu, Seoul, Korea, 06588 South Korea
Manufacturer	Unimo Technology Co., Ltd.
Address	4th Floor, 162 Bangbae-Ro Seocho-Gu, Seoul, Korea, 06588 South Korea
Factory	Unimo Technology Co., Ltd.
Address	4th Floor, 162 Bangbae-Ro Seocho-Gu, Seoul, Korea, 06588 South Korea
Product Designation	Bluetooth Helmet Headset
Brand Name	ChatterBox
Test Model	BiT-3
Date of test	Jan. 06, 2020 to Jan. 15, 2020
Deviation	None
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/RF

We hereby certify that:
The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC PART 15.247.

Prepared By	Sky Dong (Project Engineer)	Jan. 15, 2020
Reviewed By	Max Zhang (Reviewer)	Jan. 15, 2020
Approved By	Forrest Lei (Authorized Officer)	Jan. 15, 2020

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as “Bluetooth Helmet Headset”. It is designed by way of utilizing the GFSK, Pi/4 DQPSK and 8DPSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
RF Output Power	7.276dBm(Max)
Bluetooth Version	V4.1
Modulation	BR ☒GFSK, EDR ☒π /4-DQPSK, ☒8DPSK BLE ☐GFSK 1Mbps ☐GFSK 2Mbps
Number of channels	79
Hardware Version	BiT-3S
Software Version	ChatterBox BiT-3S V4.02
Antenna Designation	Integral Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	0dBi
Power Supply	DC 3.7V by battery or DC 5V by adapter
Note: 1.The EUT doesn't support BLE. 2.The USB port only used for charging and can't be used to transfer data with PC.	

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2402~2480MHZ	0	2402MHZ
	1	2403MHZ
	:	:
	38	2440 MHZ
	39	2441 MHZ
	40	2442 MHZ
	:	:
	77	2479 MHZ
	78	2480 MHZ

2.3. RECEIVER INPUT BANDWIDTH

The input bandwidth of the receiver is 1.3MHZ,In every connection one Bluetooth device is the master and the other one is slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection(e.g. single of multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.
Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

2.4. EXAMPLE OF A HOPPING SEQUENCY IN DATA MODE

Example of a 79 hopping sequence in data mode:
40,21,44,23,42,53,46,55,48,33,52,35,50,65,54,67
56,37,60,39,58,69,62,71,64,25,68,27,66,57,70,59
72,29,76,31,74,61,78,63,01,41,05,43,03,73,07,75
09,45,13,47,11,77,15,00,64,49,66,53,68,02,70,06
01, 51, 03, 55, 05, 04

2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR

The generation of the hopping sequence in connection mode depends essentially on two input values:
1. LAP/UAP of the master of the connection.
2. Internal master clock
The LAP(lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP(upper address part) are the 24MSB's of the 48BD_ADDRESS
The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For ehavior zation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5us.The clock has a cycle of about one day(23h30).In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire. LAP(24 bits),4LSB's(4bits)(Input 1) and the 27MSB's of the clock(Input 2) are used. With this input values different mathematical procedures(permutations, additions, XOR-operations)are performed to generate te Sequence. This will be done at the beginning of every new transmission.
Regarding short transmissions the Bluetooth system has the following ehavior:
The first connection between the two devices is established, a hopping sequence was generated. For Transmitting the wanted data the complete hopping sequence was not used. The connection ended.
The second connection will be established. A new hopping sequence is generated. Due to the fact the Bluetooth clock has a different value, because the period between the two transmission is longer(and it Cannot be shorter) than the minimum resolution of the clock(312.5us).The hopping sequence will always Differ from the first one.

2.6. RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: O25-BIT3** filing to comply with the FCC PART 15.247 requirements.

2.7. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.8. SPECIAL ACCESSORIES

Refer to section 5.2.

2.9. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %
- Uncertainty of Dwell Time: Uc = ±2 %
- Uncertainty of Frequency: Uc = ±2 %

4. DESCRIPTION OF TEST MODES

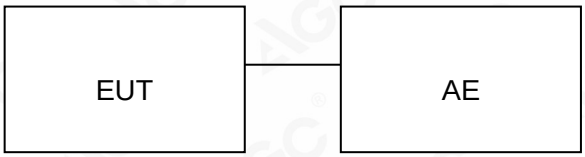
NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK
4	Low channel π/4-DQPSK
5	Middle channel π/4-DQPSK
6	High channel π/4-DQPSK
7	Low channel 8DPSK
8	Middle channel 8DPSK
9	High channel 8DPSK
10	Hopping mode GFSK
11	Hopping mode π/4-DQPSK
12	Hopping mode 8DPSK

Note: 1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
4.The test software is the Blue Test3 which can set the EUT into the individual test modes.

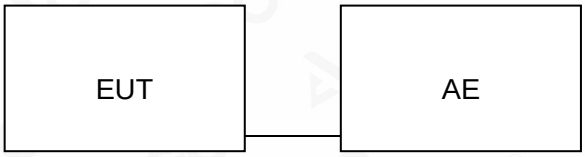
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure :



Conducted Emission Configure :



5.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Bluetooth Helmet Headset	BiT-3	O25-BIT3	EUT
2	Adapter	DYS602-050200W	DC 5V/1A	AE
3	Smart phone	P8	N/A	AE
4	Charger line	YH-005-VDE	1m	AE
5	Earphone	W800BT	1m	AE
6	Microphone	CUB627L-2048-2V-RNA-H(W)	N/A	AE

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Compliant

6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 11, 2020
LISN	R&S	ESH2-Z5	100086	Aug. 26, 2019	Aug. 25, 2020
Test software	R&S	ES-K1 (Ver V1.71)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	Jun. 12, 2019	Jun. 11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Feb. 27, 2019	Feb. 26, 2020
Attenuator	ZHINAN	E-002	N/A	Sep. 09, 2019	Sep. 08, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 14, 2018	Jun. 13, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 26, 2018	May. 25, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2018	Jan. 08, 2020
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

7. RADIATED EMISSION

7.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

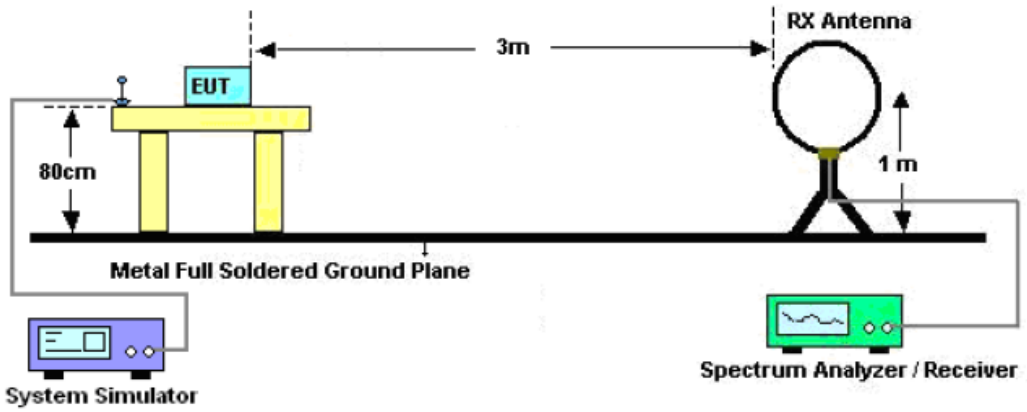
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/3MHz for Average

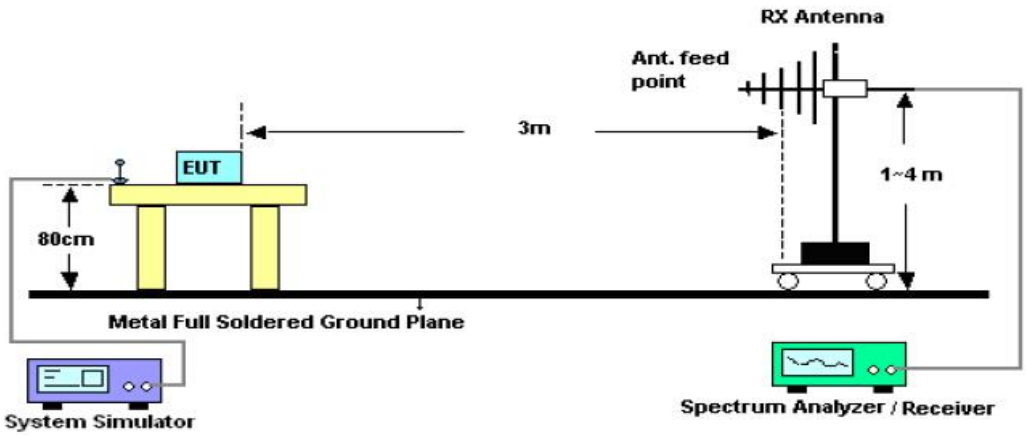
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

7.2. TEST SETUP

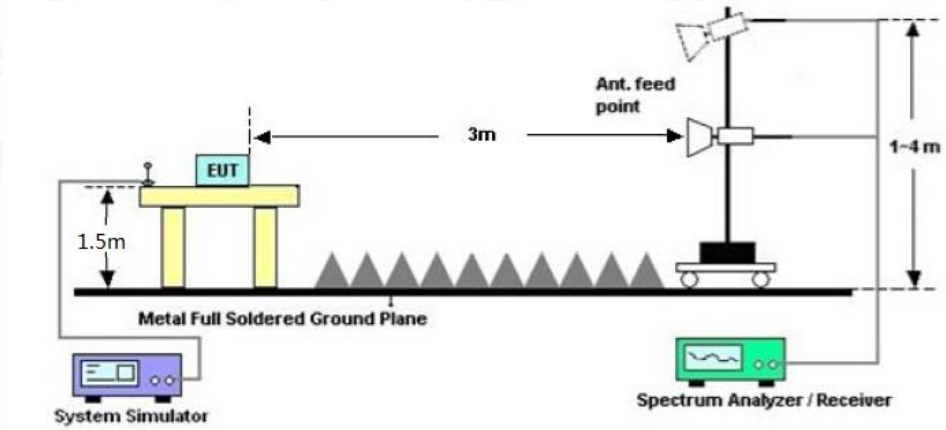
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



7.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission, the test records reported below are the worst result compared to other modes.

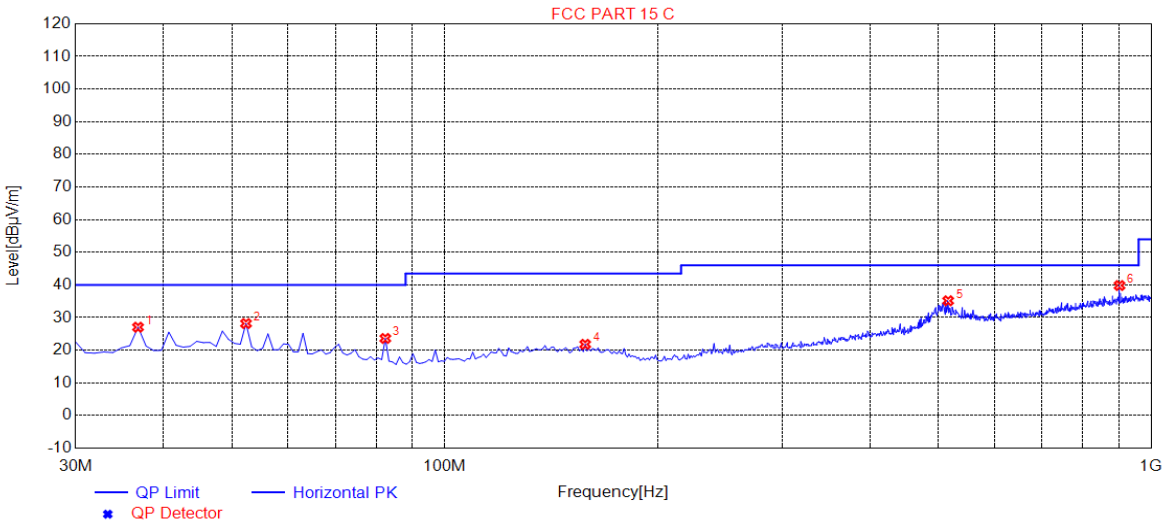
7.4. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHZ

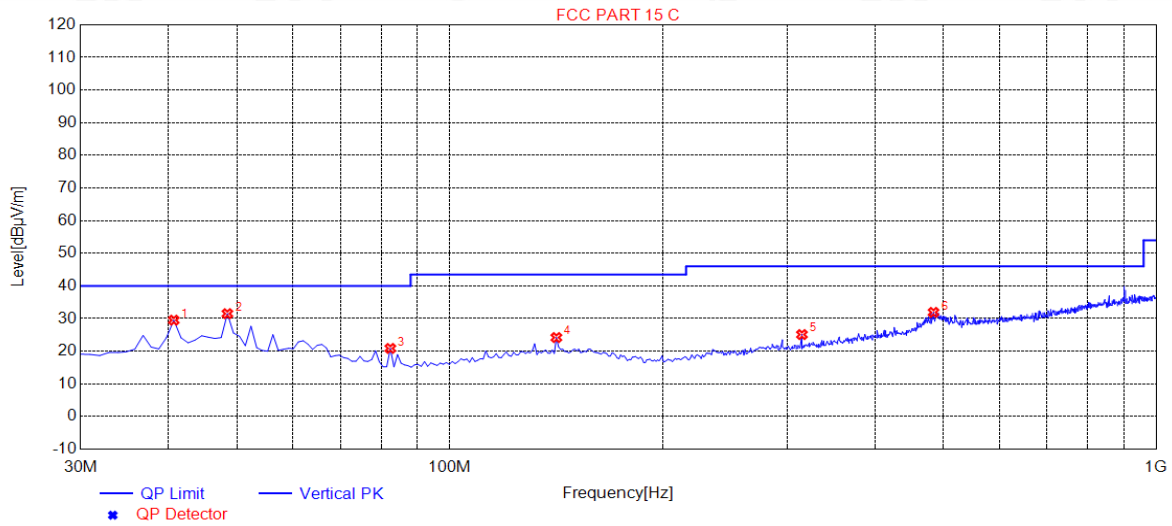
EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7900	27.06	14.16	40.00	12.94	150	251	Horizontal
2	52.3100	28.19	14.49	40.00	11.81	150	42	Horizontal
3	82.3800	23.62	10.17	40.00	16.38	150	345	Horizontal
4	158.0400	21.82	14.93	43.50	21.68	150	78	Horizontal
5	515.9700	35.16	22.51	46.00	10.84	150	115	Horizontal
6	902.0300	39.82	30.16	46.00	6.18	150	24	Horizontal

RESULT: PASS

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	40.6700	29.52	14.91	40.00	10.48	150	178	Vertical
2	48.4300	31.51	14.71	40.00	8.49	150	303	Vertical
3	82.3800	20.87	10.17	40.00	19.13	150	261	Vertical
4	141.5500	24.20	14.88	43.50	19.30	150	81	Vertical
5	315.1800	25.11	16.48	46.00	20.89	150	248	Vertical
6	483.9600	31.91	21.81	46.00	14.09	150	133	Vertical

RESULT: PASS

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. All test modes had been pre-tested. The mode 7 is the worst case and recorded in the report.

RADIATED EMISSION ABOVE 1GHZ

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.022	45.39	0.08	45.47	74.00	-28.53	peak
4804.022	41.03	0.08	41.11	54.00	-12.89	AVG
7206.033	42.87	2.21	45.08	74.00	-28.92	peak
7206.033	39.14	2.21	41.35	54.00	-12.65	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.022	44.29	0.08	44.37	74.00	-29.63	peak
4804.022	41.36	0.08	41.44	54.00	-12.56	AVG
7206.033	42.97	2.21	45.18	74.00	-28.82	peak
7206.033	38.64	2.21	40.85	54.00	-13.15	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 8	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.022	47.26	0.14	47.40	74.00	-26.60	peak
4882.022	43.59	0.14	43.73	54.00	-10.27	AVG
7323.033	44.38	2.36	46.74	74.00	-27.26	peak
7323.033	41.27	2.36	43.63	54.00	-10.37	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 8	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.022	45.96	0.14	46.10	74.00	-27.90	peak
4882.022	41.63	0.14	41.77	54.00	-12.23	AVG
7323.033	42.09	2.36	44.45	74.00	-29.55	peak
7323.033	39.74	2.36	42.10	54.00	-11.90	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.022	46.63	0.22	46.85	74.00	-27.15	peak
4960.022	42.07	0.22	42.29	54.00	-11.71	AVG
7440.033	43.29	2.64	45.93	74.00	-28.07	peak
7440.033	39.54	2.64	42.18	54.00	-11.82	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.022	45.93	0.22	46.15	74.00	-27.85	peak
4960.022	40.37	0.22	40.59	54.00	-13.41	AVG
7440.033	41.84	2.64	44.48	74.00	-29.52	peak
7440.033	38.19	2.64	40.83	54.00	-13.17	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note: Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

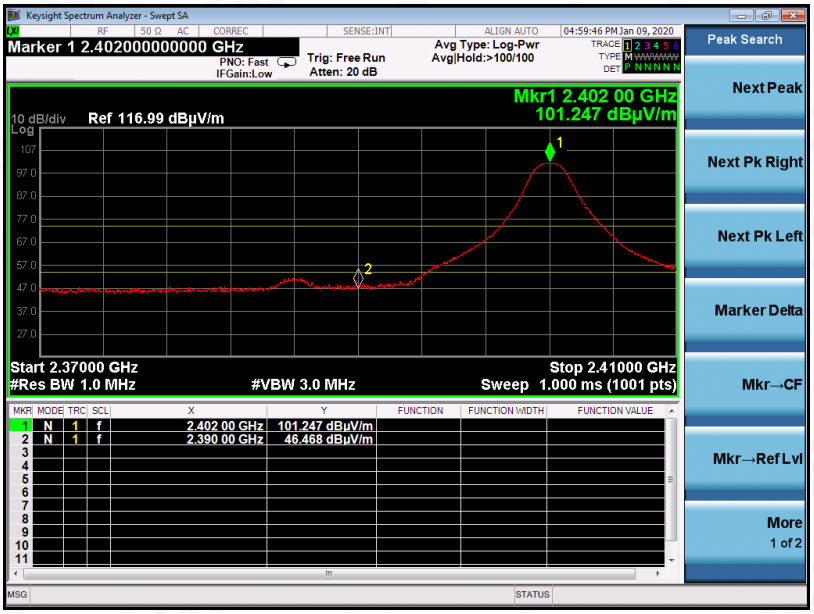
The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been tested. The 8DPSK modulation is the worst case and recorded in the report.

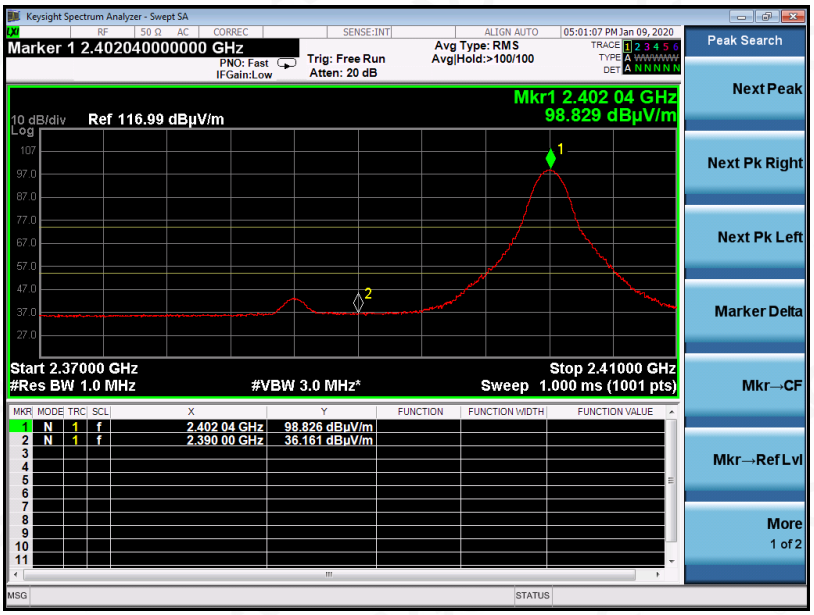
TEST RESULT FOR RESTRICTED BANDS REQUIREMENTS

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal

PK



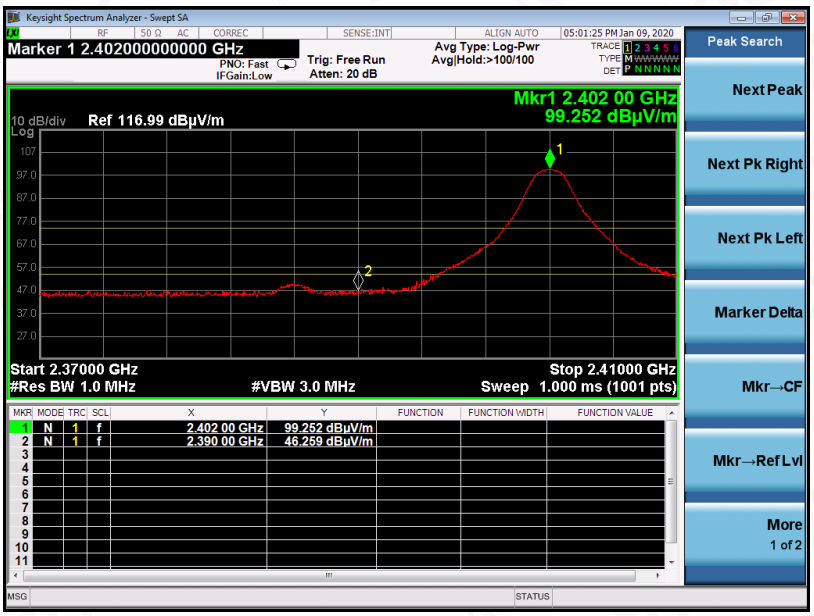
AV



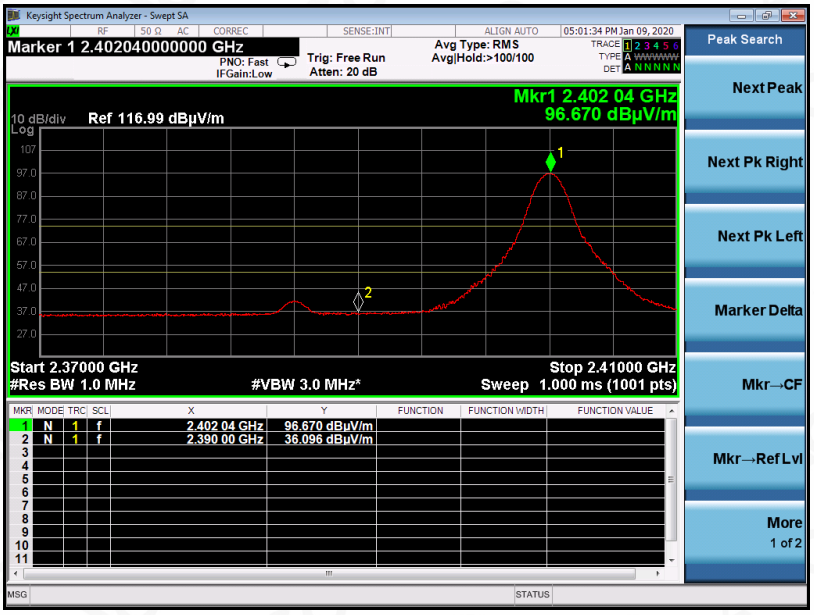
RESULT: PASS

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical

PK



AV



RESULT: PASS

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Horizontal

PK

AV

RESULT: PASS

EUT	Bluetooth Helmet Headset	Model Name	BiT-3S
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical

PK

AV

RESULT: PASS

Note: The factor had been edited in the "Input Correction" of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(µV) to represent the Amplitude. Use the F dB(µV/m) to represent the Field Strength. So A=F. All test modes had been pre-tested. The 8DPSK modulation is the worst case and recorded in the report.

8. FCC LINE CONDUCTED EMISSION TEST

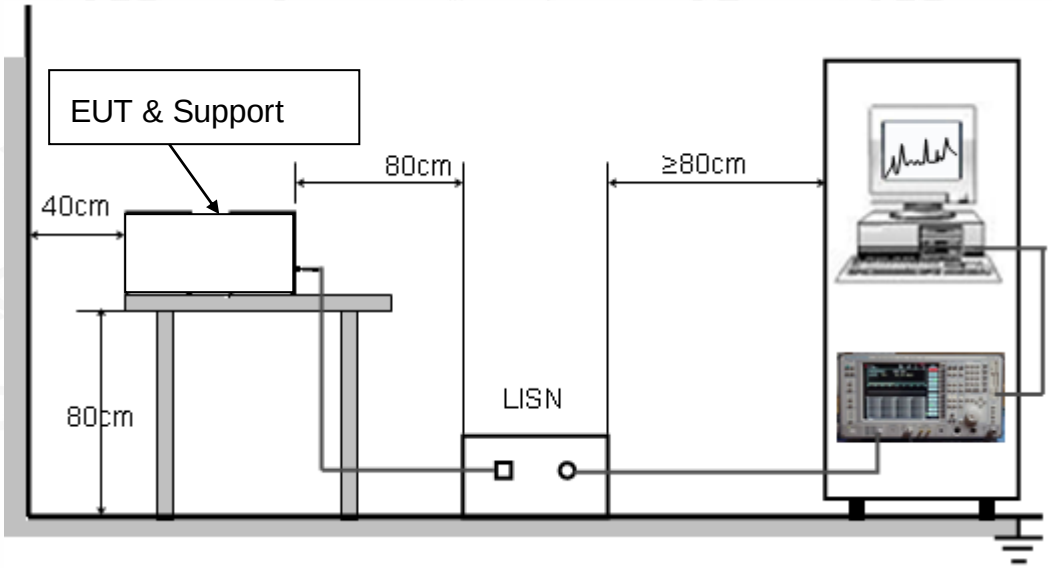
8.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

8.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



8.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When 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 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
6. The 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.
9. The test mode(s) were scanned during the preliminary test.

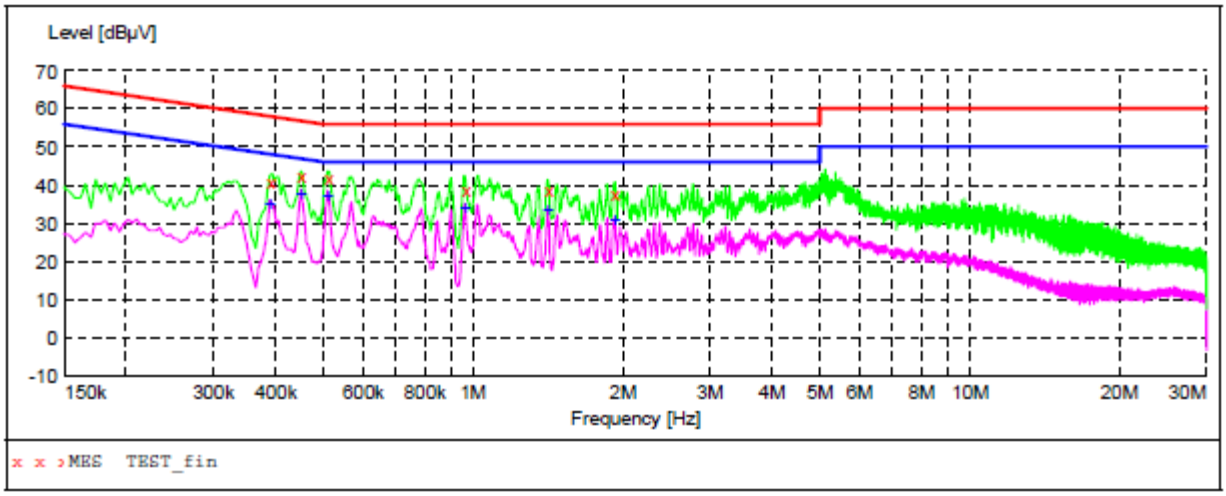
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

8.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

8.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "TEST_fin"

1/7/2020 13:00PM

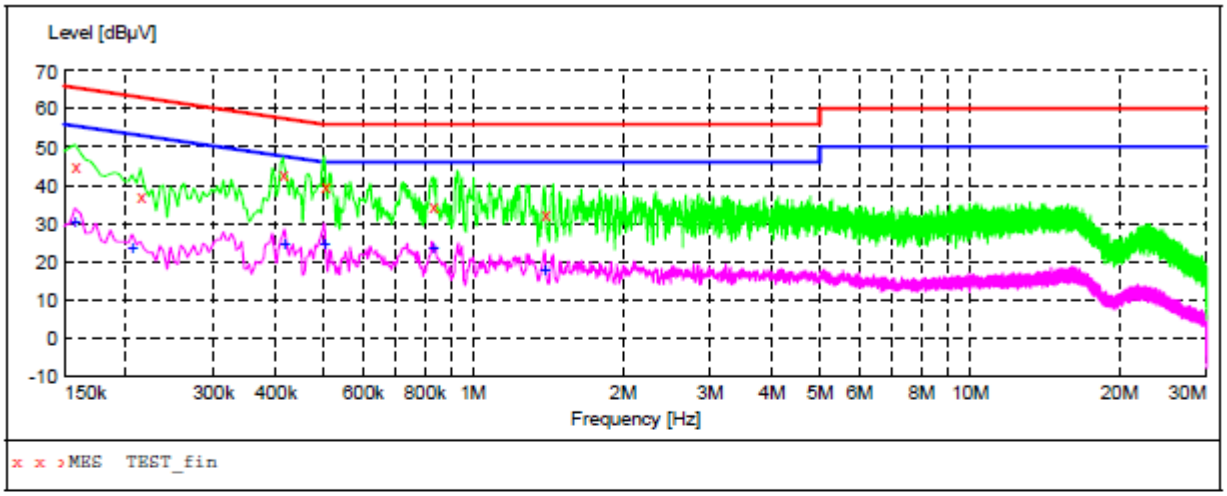
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.390000	40.80	10.3	58	17.3	QP	L1	FLO
0.450000	42.10	10.8	57	14.8	QP	L1	FLO
0.510000	41.90	11.1	56	14.1	QP	L1	FLO
0.966000	38.60	11.3	56	17.4	QP	L1	FLO
1.414000	38.80	10.9	56	17.2	QP	L1	FLO
1.922000	37.70	10.5	56	18.3	QP	L1	FLO

MEASUREMENT RESULT: "TEST_fin2"

1/7/2020 13:00PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.390000	35.20	10.3	48	12.9	AV	L1	FLO
0.450000	37.80	10.8	47	9.1	AV	L1	FLO
0.510000	37.20	11.1	46	8.8	AV	L1	FLO
0.962000	34.20	11.3	46	11.8	AV	L1	FLO
1.414000	33.30	10.9	46	12.7	AV	L1	FLO
1.926000	30.90	10.5	46	15.1	AV	L1	FLO

Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "TEST_fin"

1/7/2020 12:49PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.158000	44.90	10.3	66	20.7	QP	N	FLO
0.214000	37.00	10.3	63	26.0	QP	N	FLO
0.414000	42.70	10.4	58	14.9	QP	N	FLO
0.502000	39.80	11.2	56	16.2	QP	N	FLO
0.830000	34.30	10.9	56	21.7	QP	N	FLO
1.394000	32.30	10.9	56	23.7	QP	N	FLO

MEASUREMENT RESULT: "TEST_fin2"

1/7/2020 12:49PM

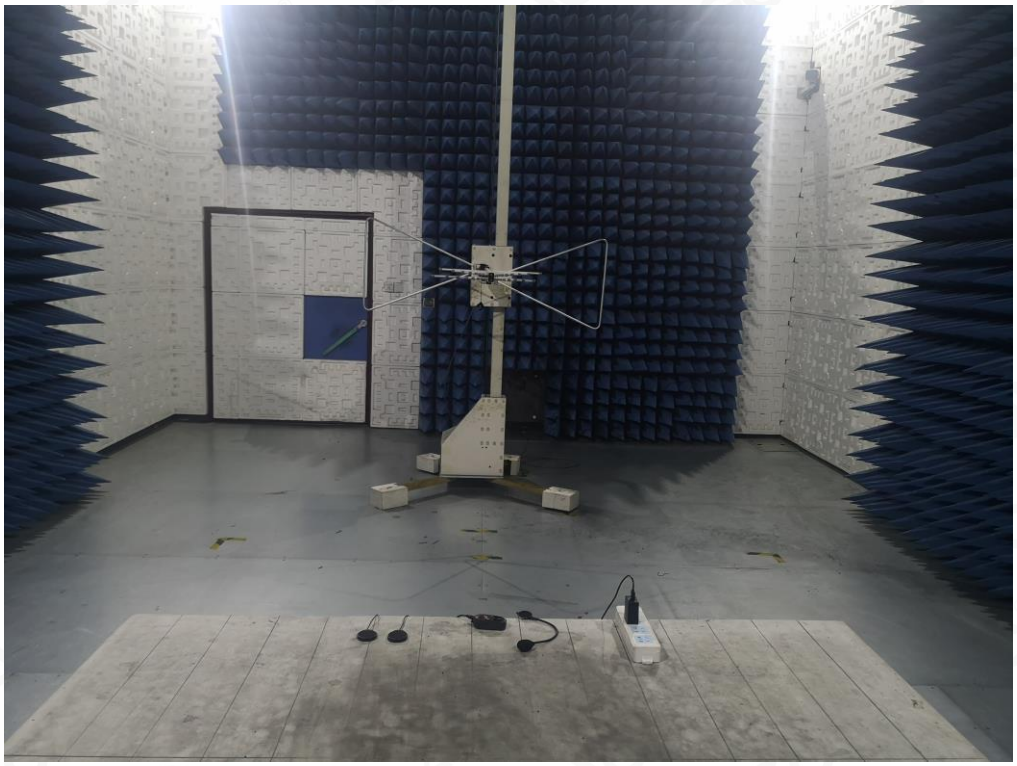
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.158000	30.30	10.3	56	25.3	AV	N	FLO
0.206000	23.40	10.3	53	30.0	AV	N	FLO
0.418000	24.30	10.5	48	23.2	AV	N	FLO
0.502000	24.40	11.2	46	21.6	AV	N	FLO
0.830000	23.40	10.9	46	22.6	AV	N	FLO
1.394000	17.90	10.9	46	28.1	AV	N	FLO

RESULT: PASS

Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHZ



RADIATED EMISSION TEST SETUP ABOVE 1GHZ

CONDUCTED EMISSION TEST SETUP

APPENDIX B: PHOTOGRAPHS OF EUT

ALL VIEW OF EUT

TOP VIEW OF EUT

BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

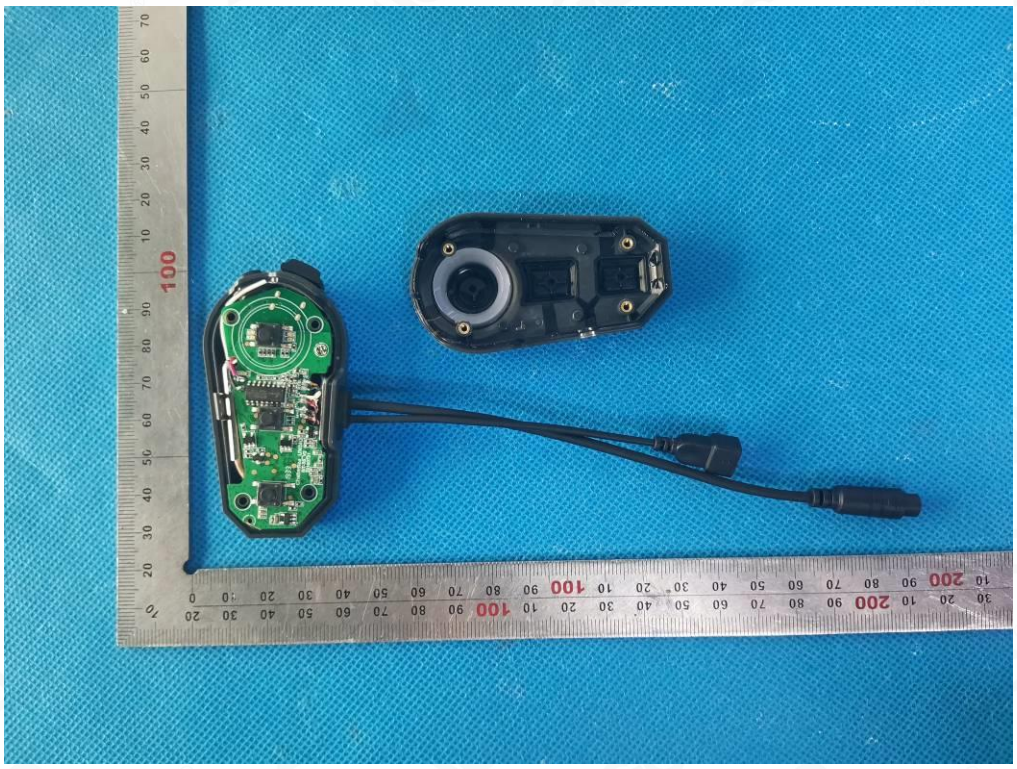
BACK VIEW OF EUT

LEFT VIEW OF EUT

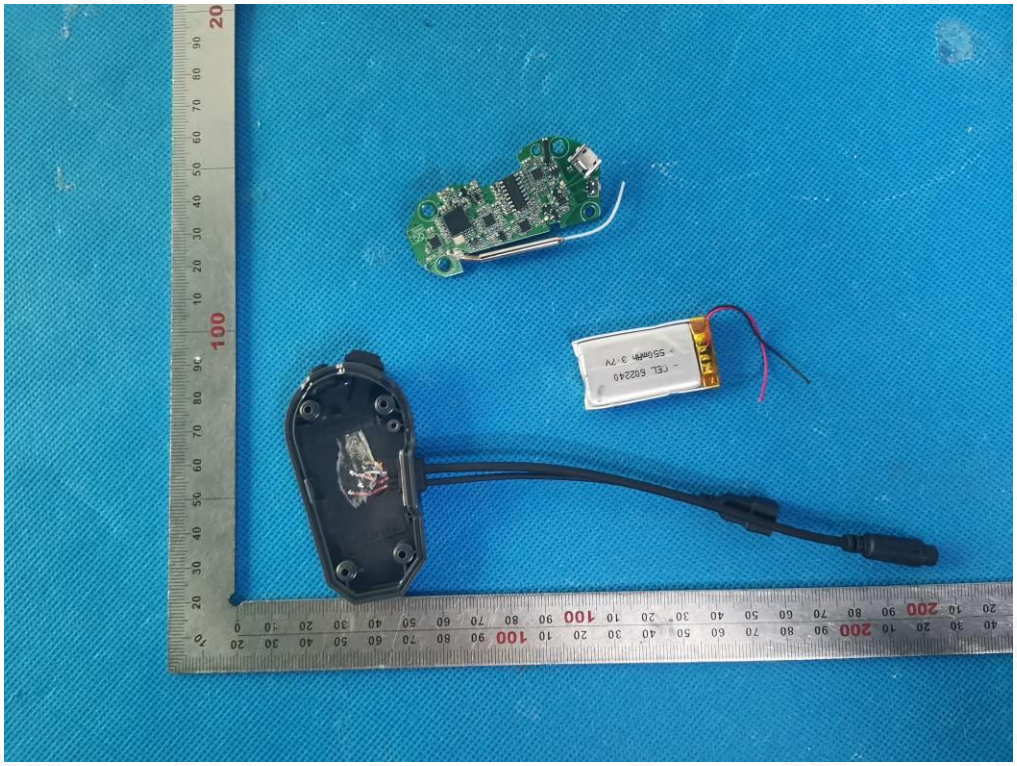
RIGHT VIEW OF EUT

VIEW OF EUT(PORT)

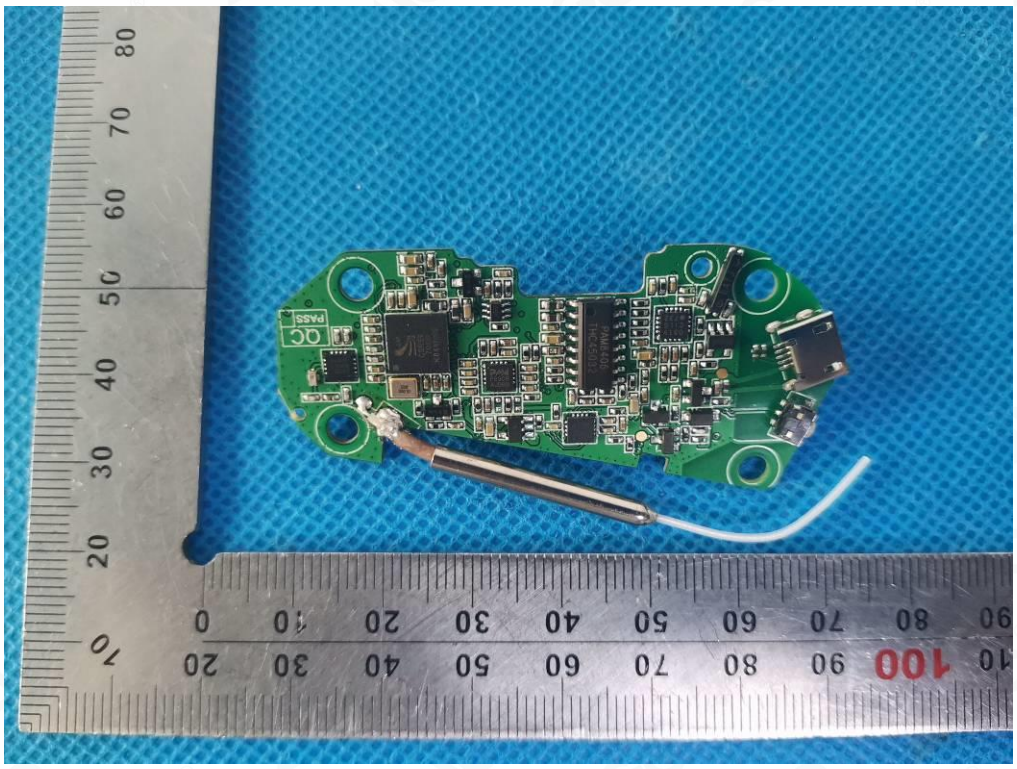
OPEN VIEW OF EUT-1



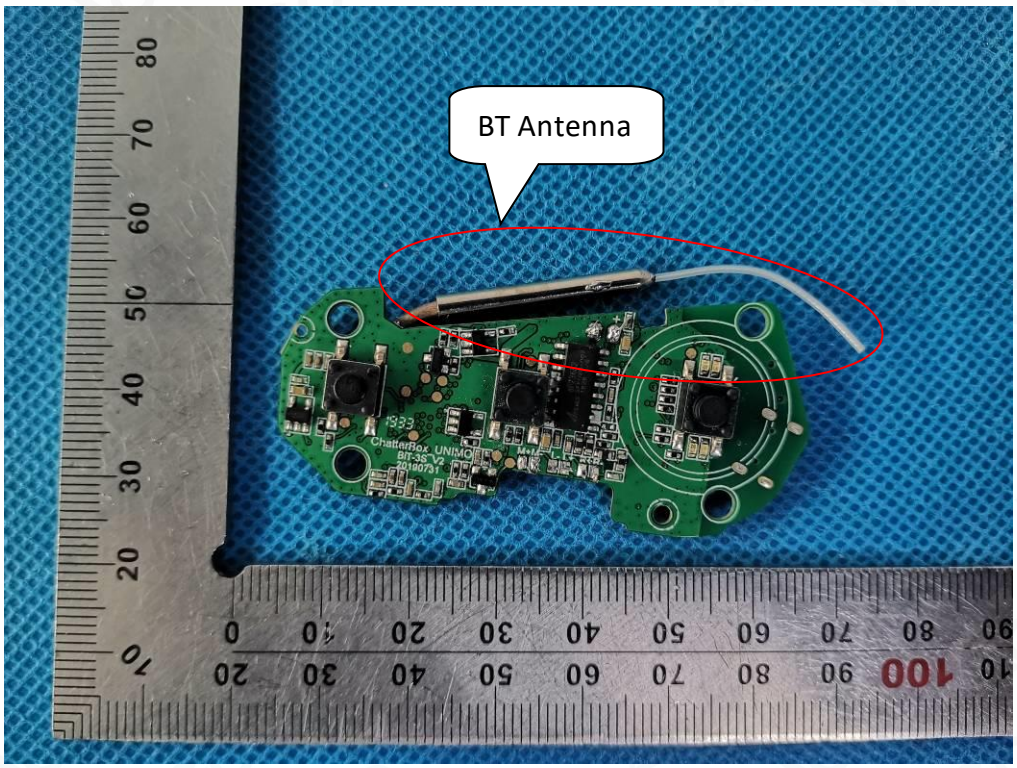
OPEN VIEW OF EUT-2



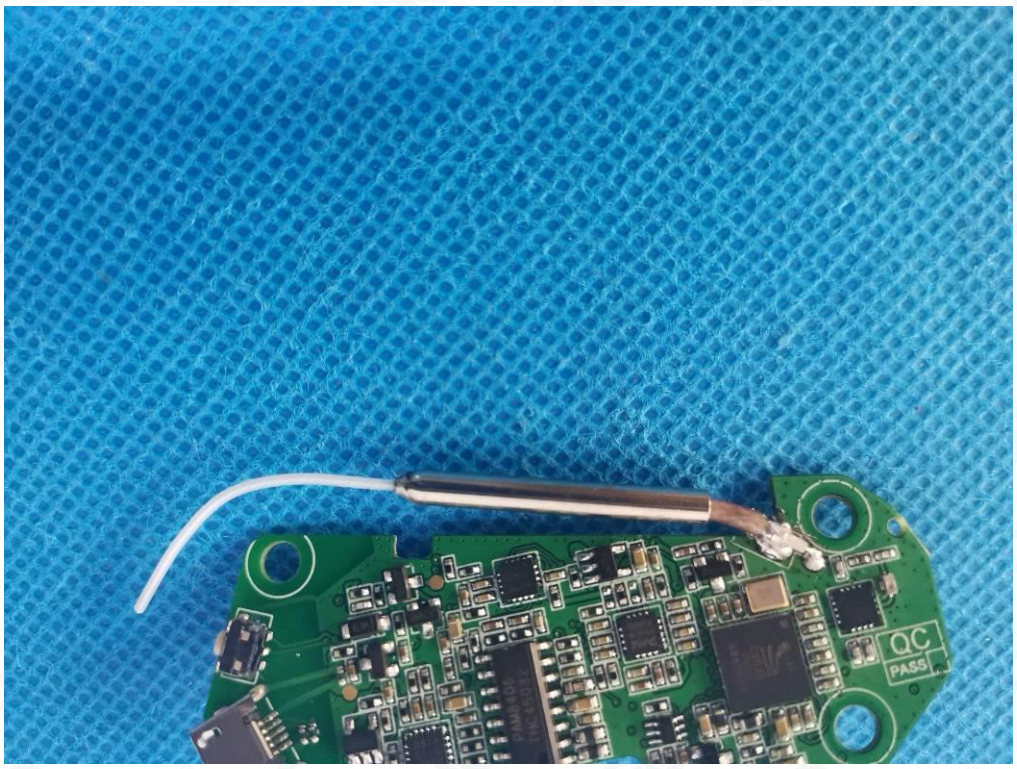
INTERNAL VIEW OF EUT-1



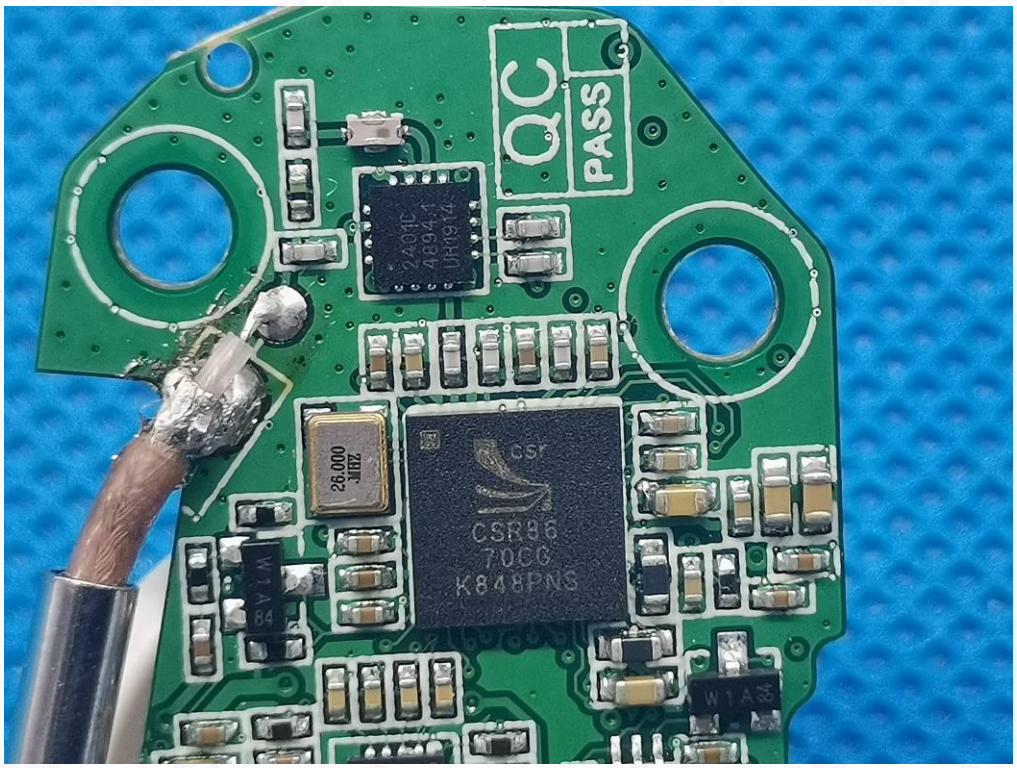
INTERNAL VIEW OF EUT-2



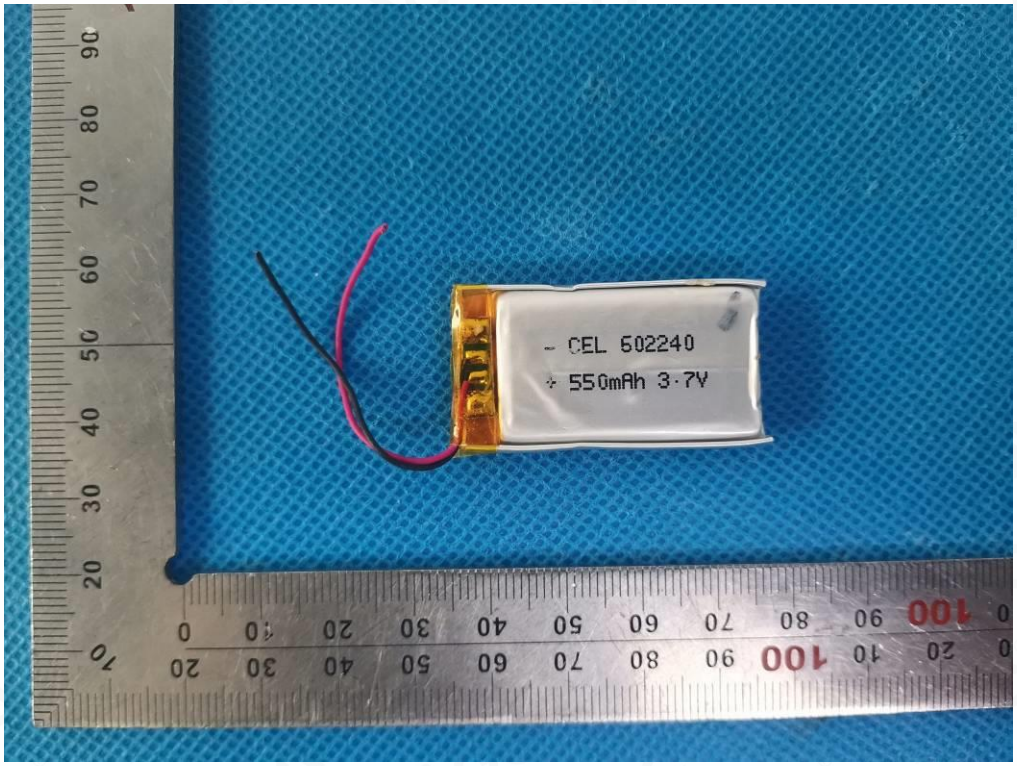
INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



VIEW OF BATTERY-1



----END OF REPORT----