TEST REPORT

Applicant:	GL Grup-2015 Ltd.
Address of Applicant:	36 Vasil Levski street, 5370 Dryanovo, Bulgaria
Manufacturer:	GL Grup-2015 Ltd.
Address of Manufacturer:	36 Vasil Levski street, 5370 Dryanovo, Bulgaria

Equipment Under Test (EUT)

Product Name:	Wireless Headphone
Model No.:	PowerLocus Buddy
Trade Mark:	N/A
FCC ID:	2AYL2-BUDDY
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249
Date of sample receipt:	Dec. 24, 2020
Date of Test:	Dec. 24, 2020 - Jan. 07, 2021
Date of report issued:	Jan. 07, 2021
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	*Jan. 07, 2021*	*Original*

Prepared By:		***Date:***	*Jan. 07, 2021*
	Project Engineer		
Check By:		***Date:***	*Jan. 07, 2021*
	Reviewer		

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark：Test according to ANSI C63.10:2013.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	Wireless Headphone
Model No.:	PowerLocus Buddy
Serial No.:	N/A
Hardware Version:	HV01
Software Version:	SV01
Test sample(s) ID:	GTSL202012000313F01
Sample(s) Status	Engineered sample
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK, π/4-DQPSK
Antenna Type:	PCB Antenna
Antenna gain:	1.2dBi
Power supply:	DC 3.7V from battery DC 5V from host

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

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	Mode
The lowest channel	2402MHz	GFSK, π /4-DQPSK
The middle channel	2441MHz	
The Highest channel	2480MHz	

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: During the test, the dutycycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Pre-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	92.24	90.87	91.11

Final Test Mode:

The EUT was tested in GFSK, π/4-DQPSK modulation, and found the GFSK modulation is the worst case.

According to ANSI C63.10 standards, the test results are both the "worst case" and "worst setup":

X axis (see the test setup photo)

5.3 Description of Support Units

Manufacturer	Description	Model	Serial Number
GTS	Adapter(Input: AC 100-120V 60Hz Output: DC 5V/1A	GTS050100	/

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

● **IC —Registration No.: 9079A**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0d by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

5.7 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.8 Additional Instructions

Test Software	Special test command provided by manufacturer
Power level setup	Default

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 02 2020	July. 01 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June. 25 2020	June. 24 2021
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 25 2020	June. 24 2021
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 25 2020	June. 24 2021
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 25 2020	June. 24 2021
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 25 2020	June. 24 2021
9	Coaxial Cable	GTS	N/A	GTS211	June. 25 2020	June. 24 2021
10	Coaxial cable	GTS	N/A	GTS210	June. 25 2020	June. 24 2021
11	Coaxial Cable	GTS	N/A	GTS212	June. 25 2020	June. 24 2021
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 25 2020	June. 24 2021
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 25 2020	June. 24 2021
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 25 2020	June. 24 2021
15	Band filter	Amindeon	82346	GTS219	June. 25 2020	June. 24 2021
16	Power Meter	Anritsu	ML2495A	GTS540	June. 25 2020	June. 24 2021
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 25 2020	June. 24 2021
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 25 2020	June. 24 2021
19	Splitter	Agilent	11636B	GTS237	June. 25 2020	June. 24 2021
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 25 2020	June. 24 2021
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 18 2020	Oct. 17 2021
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 18 2020	Oct. 17 2021
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 18 2020	Oct. 17 2021
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 25 2020	June. 24 2021

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 25 2020	June. 24 2021
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 25 2020	June. 24 2021
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 25 2020	June. 24 2021
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 25 2020	June. 24 2021
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 25 2020	June. 24 2021

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 25 2020	June. 24 2021
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 25 2020	June. 24 2021
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 25 2020	June. 24 2021
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 25 2020	June. 24 2021
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 25 2020	June. 24 2021
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 25 2020	June. 24 2021
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 25 2020	June. 24 2021
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 25 2020	June. 24 2021

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 25 2020	June. 24 2021
2	Barometer	ChangChun	DYM3	GTS255	June. 25 2020	June. 24 2021

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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. **15.247(c) (1)(i) requirement:** (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.	
EUT Antenna:	
The antenna is PCB Antenna, the best case gain of the antenna is 1.2dBi, reference to the appendix II for details	

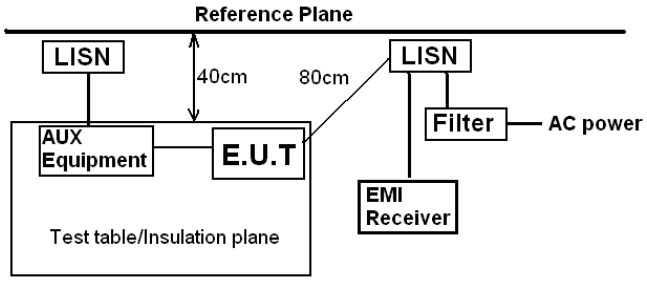
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	

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 setup:



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

Test procedure:

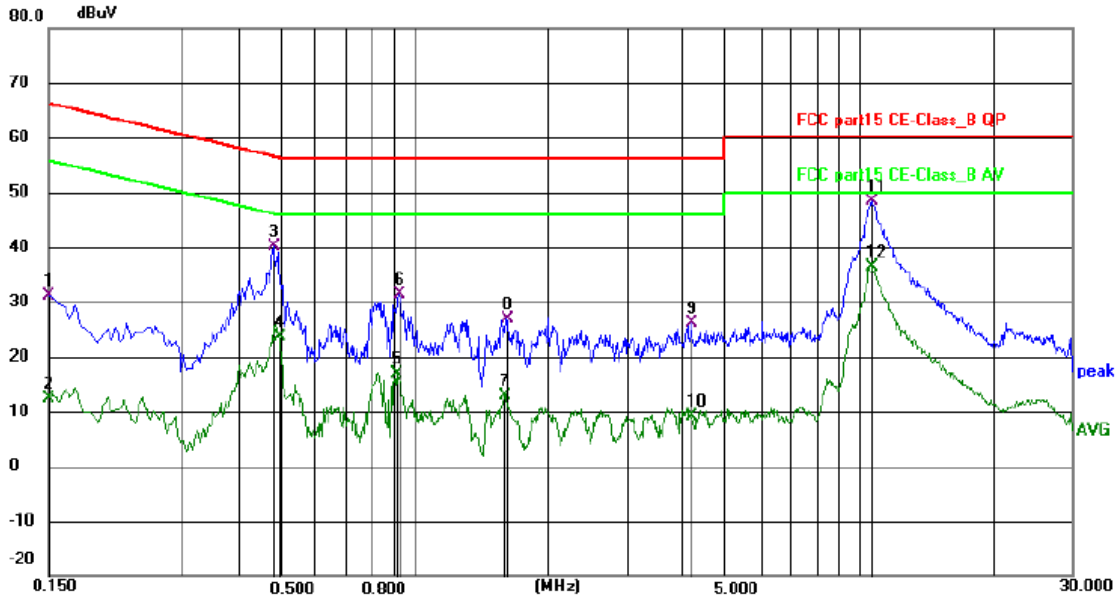
1. The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Remark: Both high and low voltages have been tested to show only the worst low voltages test data.

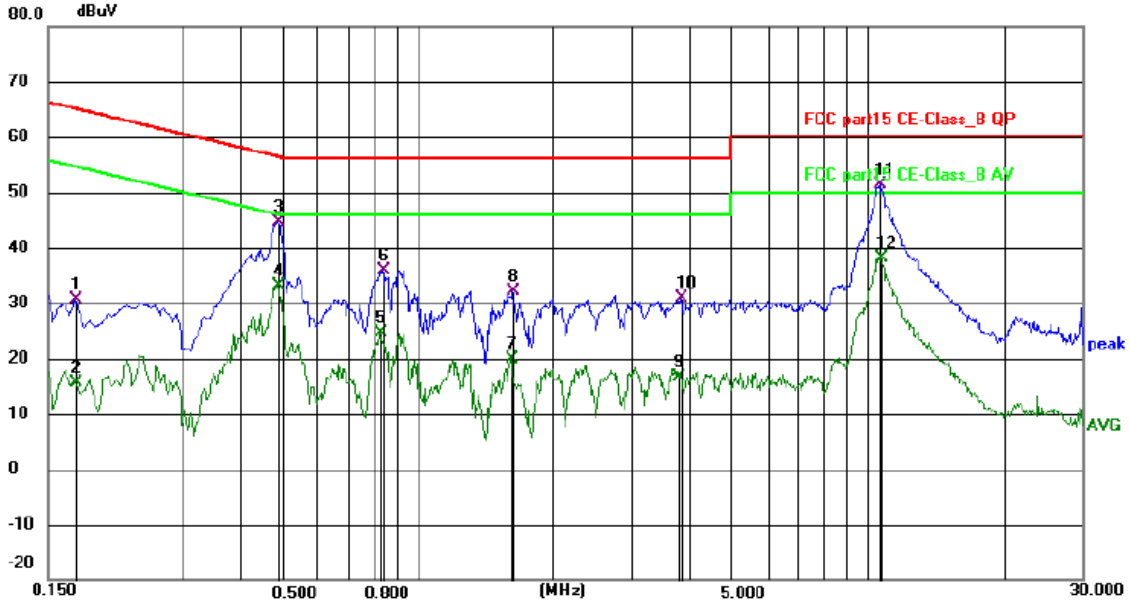
Measurement data

Line:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1500	20.63	10.60	31.23	66.00	34.77	QP	P	
2	0.1500	1.90	10.60	12.50	56.00	43.50	AVG	P	
3	0.4830	30.77	9.26	40.03	56.29	16.26	QP	P	
4	0.4965	14.43	9.27	23.70	46.10	22.40	AVG	P	
5	0.9104	7.29	9.68	16.97	46.00	29.03	AVG	P	
6	0.9194	21.70	9.68	31.38	56.00	24.62	QP	P	
7	1.5988	2.80	10.11	12.91	46.00	33.09	AVG	P	
8	1.6034	16.73	10.11	26.84	56.00	29.16	QP	P	
9	4.1910	16.14	10.09	26.23	56.00	29.77	QP	P	
10	4.1910	-0.90	10.09	9.19	46.00	36.81	AVG	P	
11 *	10.6395	37.98	10.35	48.33	60.00	11.67	QP	P	
12	10.6980	26.00	10.35	36.35	50.00	13.65	AVG	P	

Neutral:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1725	20.85	9.77	30.62	64.84	34.22	QP	P	
2	0.1725	5.83	9.77	15.60	55.36	39.76	AVG	P	
3	0.4875	35.28	9.45	44.73	56.21	11.48	QP	P	
4	0.4875	23.76	9.45	33.21	46.36	13.15	AVG	P	
5	0.8250	15.04	9.54	24.58	46.00	21.42	AVG	P	
6	0.8340	26.45	9.55	36.00	56.00	20.00	QP	P	
7	1.6035	9.82	10.14	19.96	46.00	26.04	AVG	P	
8	1.6215	21.95	10.15	32.10	56.00	23.90	QP	P	
9	3.8130	6.39	10.27	16.66	46.00	29.34	AVG	P	
10	3.8310	20.57	10.26	30.83	56.00	25.17	QP	P	
11 *	10.6665	40.86	10.53	51.39	60.00	8.61	QP	P	
12	10.7250	27.52	10.53	38.05	50.00	11.95	AVG	P	

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + Factor(LISN Factor + Cable Loss)
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 25GHz
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Remark
9kHz-150kHz	Quasi-peak	200Hz	300Hz	Quasi-peak Value
150kHz-30MHz	Quasi-peak	9kHz	10kHz	Quasi-peak Value
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:
(Field strength of the fundamental signal)

Frequency	Limit (dBuV/m @3m)	Remark
2400MHz-2483.5MHz	94.00	Average Value
	114.00	Peak Value

Limit:
(Spurious Emissions)

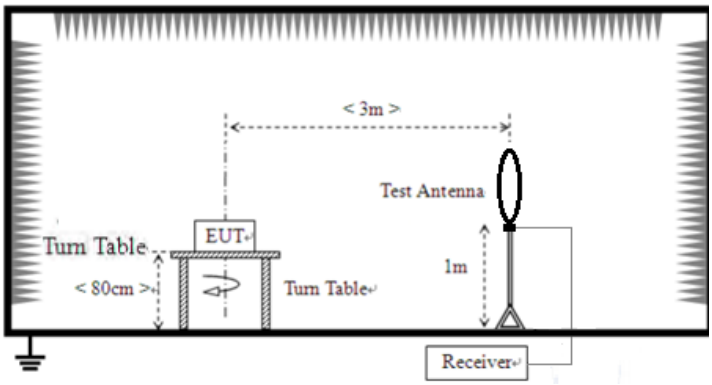
Frequency	Limit (uV/m)	Remark
0.009MHz-0.490MHz	2400/F(kHz) @300m	Quasi-peak Value
0.490MHz-1.705MHz	24000/F(kHz) @30m	Quasi-peak Value
1.705MHz-30.0MHz	30 @30m	Quasi-peak Value
30MHz-88MHz	100 @3m	Quasi-peak Value
88MHz-216MHz	150 @3m	Quasi-peak Value
216MHz-960MHz	200 @3m	Quasi-peak Value
960MHz-1GHz	500 @3m	Quasi-peak Value
Above 1GHz	500 @3m	Average Value
	5000 @3m	Peak Value

Limit:
(band edge)

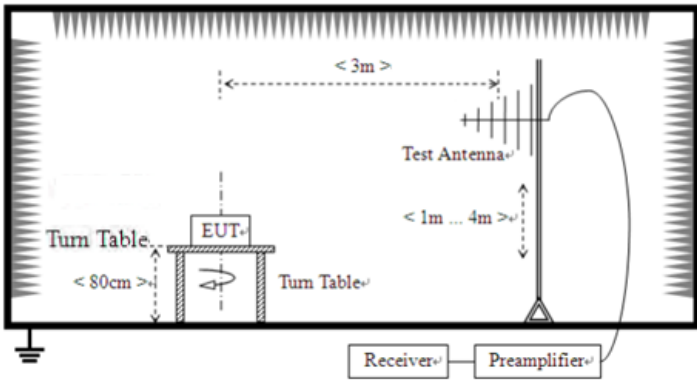
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Test setup:

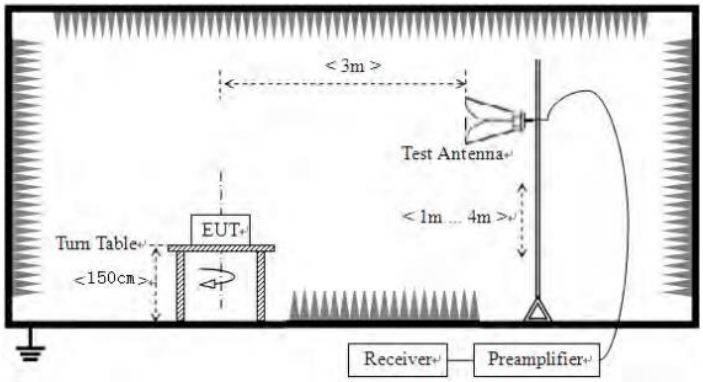
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 3.7V					
Test results:	Pass					

Measurement data:

7.3.1 Field Strength of The Fundamental Signal

GFSK

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	85.12	27.58	5.39	30.18	87.91	114	-26.09	Vertical
2402	84.04	27.58	5.39	30.18	86.83	114	-27.17	Horizontal
2441	83.74	27.55	5.43	30.06	86.66	114	-27.34	Vertical
2441	85.52	27.55	5.43	30.06	88.44	114	-25.56	Horizontal
2480	86.36	27.52	5.47	29.93	89.42	114	-24.58	Vertical
2480	84.51	27.52	5.47	29.93	87.57	114	-26.43	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	73.46	27.58	5.39	30.18	76.25	94	-17.75	Vertical
2402	74.25	27.58	5.39	30.18	77.04	94	-16.96	Horizontal
2441	76.07	27.55	5.43	30.06	78.99	94	-15.01	Vertical
2441	73.16	27.55	5.43	30.06	76.08	94	-17.92	Horizontal
2480	75.26	27.52	5.47	29.93	78.32	94	-15.68	Vertical
2480	71.88	27.52	5.47	29.93	74.94	94	-19.06	Horizontal

π /4-DQPSK

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	85.46	27.58	5.39	30.18	88.25	114	-25.75	Vertical
2402	84.85	27.58	5.39	30.18	87.64	114	-26.36	Horizontal
2441	86.74	27.55	5.43	30.06	89.66	114	-24.34	Vertical
2441	84.35	27.55	5.43	30.06	87.27	114	-26.73	Horizontal
2480	83.96	27.52	5.47	29.93	87.02	114	-26.98	Vertical
2480	83.34	27.52	5.47	29.93	86.40	114	-27.60	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2402	75.35	27.58	5.39	30.18	78.14	94	-15.86	Vertical
2402	72.45	27.58	5.39	30.18	75.24	94	-18.76	Horizontal
2441	74.36	27.55	5.43	30.06	77.28	94	-16.72	Vertical
2441	72.15	27.55	5.43	30.06	75.07	94	-18.93	Horizontal
2480	71.74	27.52	5.47	29.93	74.80	94	-19.20	Vertical
2480	74.36	27.52	5.47	29.93	77.42	94	-16.58	Horizontal

7.3.2 Spurious emissions

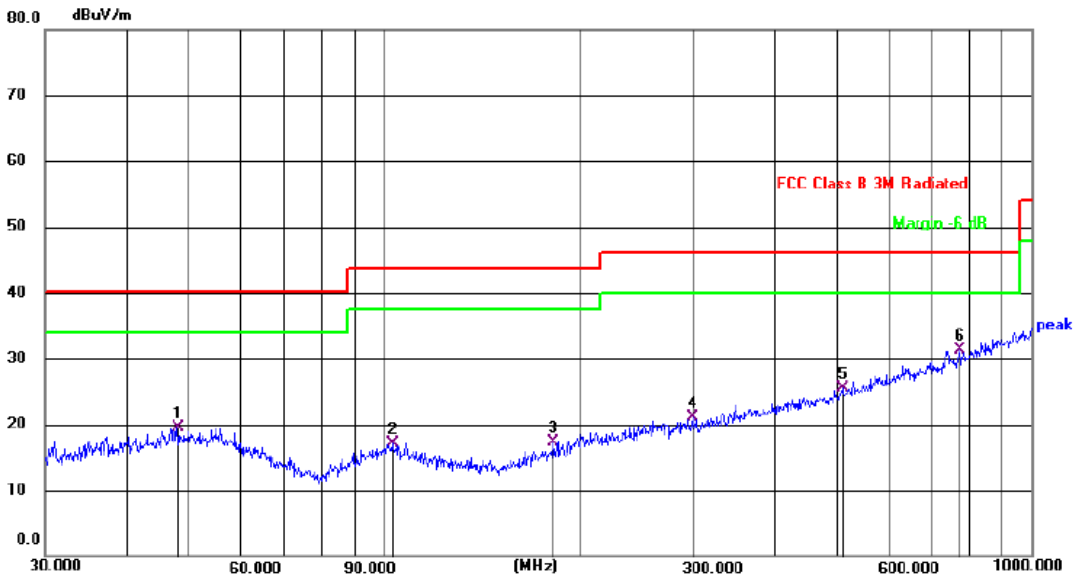
- Below 30MHz

  The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

- Below 1GHz

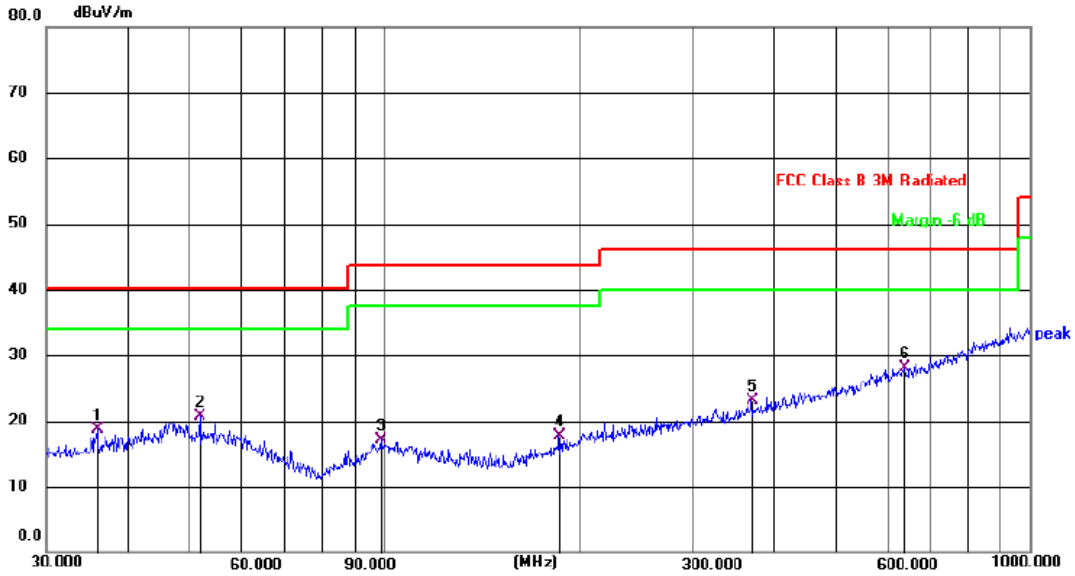
  We pretest all mode, the GFSK low channel was worst mode, and the data recording in the report.

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	Comment
1		47.9940	33.25	-13.78	19.47	40.00	20.53	QP	
2		103.0800	33.23	-16.06	17.17	43.50	26.33	QP	
3		182.5592	34.26	-17.03	17.23	43.50	26.27	QP	
4		299.3158	34.05	-13.01	21.04	46.00	24.96	QP	
5		510.0436	34.13	-8.58	25.55	46.00	20.45	QP	
6	*	774.1584	35.05	-3.70	31.35	46.00	14.65	QP	

Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	Comment
1		36.0007	34.08	-15.41	18.67	40.00	21.33	QP	
2		51.8430	34.38	-13.77	20.61	40.00	19.39	QP	
3		98.8326	33.02	-15.96	17.06	43.50	26.44	QP	
4		186.4409	34.37	-16.73	17.64	43.50	25.86	QP	
5		370.7023	34.34	-11.29	23.05	46.00	22.95	QP	
6	*	638.3686	34.15	-6.00	28.15	46.00	17.85	QP	

■ Above 1GHz

Test channel:	GFSK Lowest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	35.55	31.78	8.60	32.09	43.84	74	-30.16	Vertical
7206.00	34.63	38.14	11.65	32.00	52.42	74	-21.58	Vertical
9608.00	30.47	38.45	14.14	31.62	51.44	74	-22.56	Vertical
12010.00	*							Vertical
14412.00	*							Vertical
4804.00	36.25	29.65	8.60	32.09	42.41	74	-31.59	Horizontal
7206.00	32.34	35.62	11.65	32.00	47.61	74	-26.39	Horizontal
9608.00	31.15	42.58	14.14	31.62	56.25	74	-17.75	Horizontal
12010.00	*							Horizontal
14412.00	*							Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	26.06	31.78	8.60	32.09	34.35	54	-19.65	Vertical
7206.00	21.85	36.15	11.65	32.00	37.65	54	-16.35	Vertical
9608.00	20.36	37.95	14.14	31.62	40.83	54	-13.17	Vertical
12010.00	*							Vertical
14412.00	*							Vertical
4804.00	24.14	31.78	8.60	32.09	32.43	54	-21.57	Horizontal
7206.00	25.55	36.15	11.65	32.00	41.35	54	-12.65	Horizontal
9608.00	21.96	37.95	14.14	31.62	42.43	54	-11.57	Horizontal
12010.00	*							Horizontal
14412.00	*							Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	GFSK Middle channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4882.00	35.34	31.85	8.67	32.12	43.74	74	-30.26	Vertical
7323.00	33.63	36.37	11.72	31.89	49.83	74	-24.17	Vertical
9764.00	30.57	38.35	14.25	31.62	51.55	74	-22.45	Vertical
12205.00	*							Vertical
14646.00	*							Vertical
4882.00	36.65	31.85	8.67	32.12	45.05	74	-28.95	Horizontal
7323.00	34.34	36.37	11.72	31.89	50.54	74	-23.46	Horizontal
9764.00	31.14	38.35	14.25	31.62	52.12	74	-21.88	Horizontal
12205.00	*							Horizontal
14646.00	*							Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4880.00	26.33	31.85	8.67	32.12	34.73	54	-19.27	Vertical
7320.00	23.74	36.37	11.72	31.89	39.94	54	-14.06	Vertical
9760.00	22.31	38.35	14.25	31.62	43.29	54	-10.71	Vertical
12200.00	*							Vertical
14640.00	*							Vertical
4880.00	25.65	31.85	8.67	32.12	34.05	54	-19.95	Horizontal
7320.00	22.35	36.37	11.72	31.89	38.55	54	-15.45	Horizontal
9760.00	21.54	38.35	14.25	31.62	42.52	54	-11.48	Horizontal
12200.00	*							Horizontal
14640.00	*							Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	GFSK Highest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	36.56	31.93	8.73	32.16	45.06	74	-28.94	Vertical
7440.00	34.37	36.59	11.79	31.78	50.97	74	-23.03	Vertical
9920.00	31.54	38.81	14.38	31.88	52.85	74	-21.15	Vertical
12400.00	*							Vertical
14880.00	*							Vertical
4960.00	37.25	31.93	8.73	32.16	45.75	74	-28.25	Horizontal
7440.00	30.33	36.59	11.79	31.78	46.93	74	-27.07	Horizontal
9920.00	30.46	38.81	14.38	31.88	51.77	74	-22.23	Horizontal
12400.00	*							Horizontal
14880.00	*							Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	26.38	31.93	8.73	32.16	34.88	54	-19.12	Vertical
7440.00	24.63	36.59	11.79	31.78	41.23	54	-12.77	Vertical
9920.00	22.54	38.81	14.38	31.88	43.85	54	-10.15	Vertical
12400.00	*							Vertical
14880.00	*							Vertical
4960.00	25.74	31.93	8.73	32.16	34.24	54	-19.76	Horizontal
7440.00	23.33	36.59	11.79	31.78	39.93	54	-14.07	Horizontal
9920.00	21.26	38.81	14.38	31.88	42.57	54	-11.43	Horizontal
12400.00	*							Horizontal
14880.00	*							Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	π /4-DQPSK Lowest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	35.03	31.78	8.60	32.09	43.32	74	-30.68	Vertical
7206.00	32.15	38.14	11.65	32.00	49.94	74	-24.06	Vertical
9608.00	32.53	38.45	14.14	31.62	53.50	74	-20.50	Vertical
12010.00	*							Vertical
14412.00	*							Vertical
4804.00	36.78	29.65	8.60	32.09	42.94	74	-31.06	Horizontal
7206.00	31.23	35.62	11.65	32.00	46.50	74	-27.50	Horizontal
9608.00	29.16	42.58	14.14	31.62	54.26	74	-19.74	Horizontal
12010.00	*							Horizontal
14412.00	*							Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4804.00	24.45	31.78	8.60	32.09	32.74	54	-21.26	Vertical
7206.00	23.71	36.15	11.65	32.00	39.51	54	-14.49	Vertical
9608.00	23.24	37.95	14.14	31.62	43.71	54	-10.29	Vertical
12010.00	*							Vertical
14412.00	*							Vertical
4804.00	23.16	31.78	8.60	32.09	31.45	54	-22.55	Horizontal
7206.00	22.54	36.15	11.65	32.00	38.34	54	-15.66	Horizontal
9608.00	21.26	37.95	14.14	31.62	41.73	54	-12.27	Horizontal
12010.00	*							Horizontal
14412.00	*							Horizontal

Remark:

4. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
5. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
6. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	π /4-DQPSK Middle channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4882.00	34.37	31.85	8.67	32.12	42.77	74	-31.23	Vertical
7323.00	30.29	36.37	11.72	31.89	46.49	74	-27.51	Vertical
9764.00	31.36	38.35	14.25	31.62	52.34	74	-21.66	Vertical
12205.00	*							Vertical
14646.00	*							Vertical
4882.00	35.54	31.85	8.67	32.12	43.94	74	-30.06	Horizontal
7323.00	30.77	36.37	11.72	31.89	46.97	74	-27.03	Horizontal
9764.00	30.19	38.35	14.25	31.62	51.17	74	-22.83	Horizontal
12205.00	*							Horizontal
14646.00	*							Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4882.00	24.36	31.85	8.67	32.12	32.76	54	-21.24	Vertical
7323.00	20.57	36.37	11.72	31.89	36.77	54	-17.23	Vertical
9764.00	19.19	38.35	14.25	31.62	40.17	54	-13.83	Vertical
12205.00	*							Vertical
14646.00	*							Vertical
4882.00	23.26	31.85	8.67	32.12	31.66	54	-22.34	Horizontal
7323.00	20.45	36.37	11.72	31.89	36.65	54	-17.35	Horizontal
9764.00	19.33	38.35	14.25	31.62	40.31	54	-13.69	Horizontal
12205.00	*							Horizontal
14646.00	*							Horizontal

Remark:

4. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
5. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
6. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	π /4-DQPSK Highest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	35.26	31.93	8.73	32.16	43.76	74	-30.24	Vertical
7440.00	30.57	36.59	11.79	31.78	47.17	74	-26.83	Vertical
9920.00	31.36	38.81	14.38	31.88	52.67	74	-21.33	Vertical
12400.00	*							Vertical
14880.00	*							Vertical
4960.00	36.45	31.93	8.73	32.16	44.95	74	-29.05	Horizontal
7440.00	31.74	36.59	11.79	31.78	48.34	74	-25.66	Horizontal
9920.00	30.33	38.81	14.38	31.88	51.64	74	-22.36	Horizontal
12400.00	*							Horizontal
14880.00	*							Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4960.00	25.53	31.93	8.73	32.16	34.03	54	-19.97	Vertical
7440.00	20.64	36.59	11.79	31.78	37.24	54	-16.76	Vertical
9920.00	19.73	38.81	14.38	31.88	41.04	54	-12.96	Vertical
12400.00	*							Vertical
14880.00	*							Vertical
4960.00	24.26	31.93	8.73	32.16	32.76	54	-21.24	Horizontal
7440.00	20.59	36.59	11.79	31.78	37.19	54	-16.81	Horizontal
9920.00	20.11	38.81	14.38	31.88	41.42	54	-12.58	Horizontal
12400.00	*							Horizontal
14880.00	*							Horizontal

Remark:

4. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
5. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
6. *"*", means this data is the too weak instrument of signal is unable to test.*

7.3.3 Bandedge emissions

All of the restriction bands were tested, and only the GFSK data of worst case was exhibited.

Test channel:	GFSK Lowest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	39.34	27.59	5.38	30.18	42.13	74	-31.87	Horizontal
2400.00	55.52	27.58	5.39	30.18	58.31	74	-15.69	Horizontal
2390.00	39.16	27.59	5.38	30.18	41.95	74	-32.05	Vertical
2400.00	54.08	27.58	5.39	30.18	56.87	74	-17.13	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	32.44	27.59	5.38	30.18	35.23	54	-18.77	Horizontal
2400.00	41.35	27.58	5.39	30.18	44.14	54	-9.86	Horizontal
2390.00	31.74	27.59	5.38	30.18	34.53	54	-19.47	Vertical
2400.00	43.26	27.58	5.39	30.18	46.05	54	-7.95	Vertical

Test channel:	GFSK Highest channel

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	44.26	27.53	5.47	29.93	47.33	74	-26.67	Horizontal
2500.00	42.33	27.55	5.49	29.93	45.44	74	-28.56	Horizontal
2483.50	41.74	27.53	5.47	29.93	44.81	74	-29.19	Vertical
2500.00	40.35	27.55	5.49	29.93	43.46	74	-30.54	Vertical

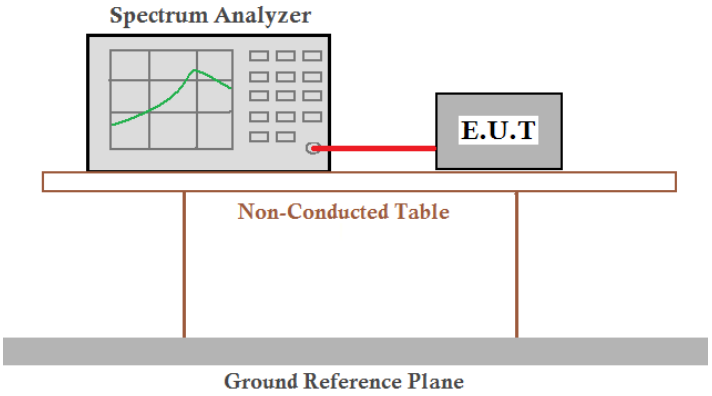
Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	33.42	27.53	5.47	29.93	36.49	54	-17.51	Horizontal
2500.00	31.06	27.55	5.49	29.93	34.17	54	-19.83	Horizontal
2483.50	34.57	27.53	5.47	29.93	37.64	54	-16.36	Vertical
2500.00	30.34	27.55	5.49	29.93	33.45	54	-20.55	Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*

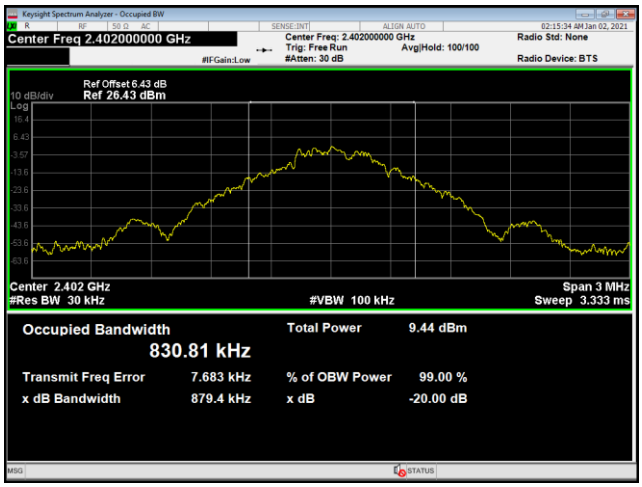
7.4 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

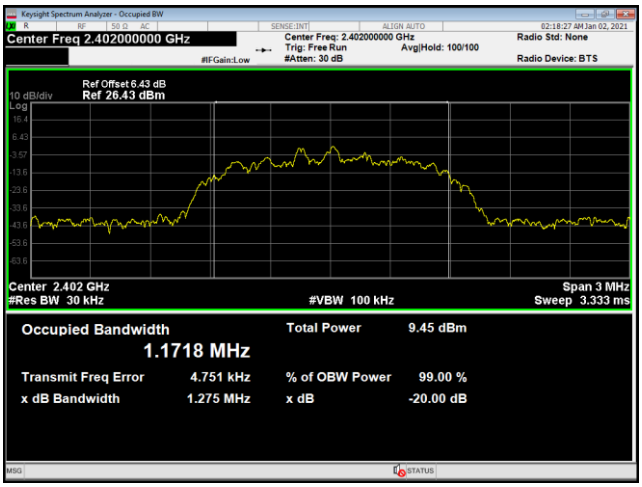
Measurement Data

Mode	Test channel	20dB bandwidth(MHz)	Result
GFSK	Lowest	0.879	Pass
	Middle	0.859	Pass
	Highest	0.876	Pass
π/4-DQPSK	Lowest	1.275	Pass
	Middle	1.284	Pass
	Highest	1.254	Pass

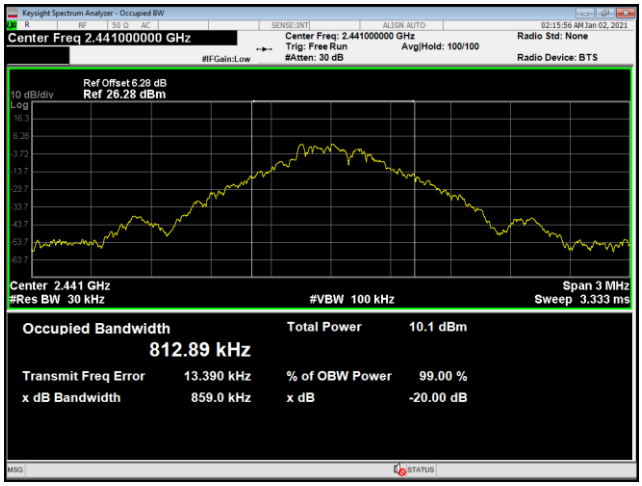
Test plot as follows:



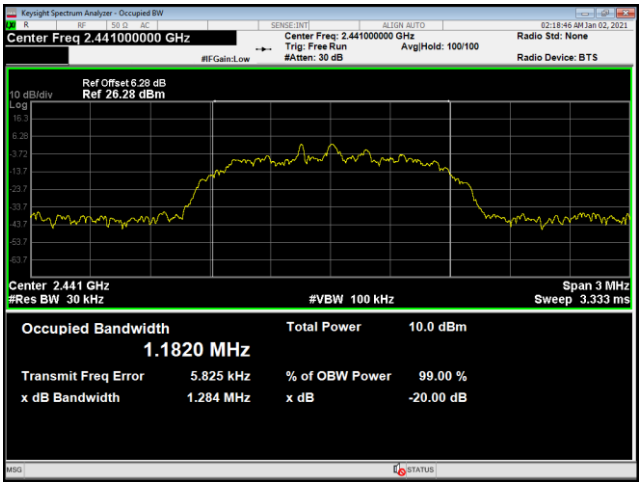
GFSK Lowest channel



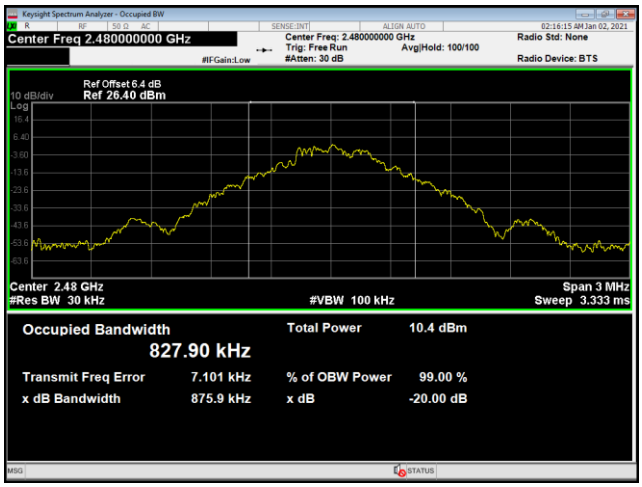
π /4-DQPSK Lowest channel



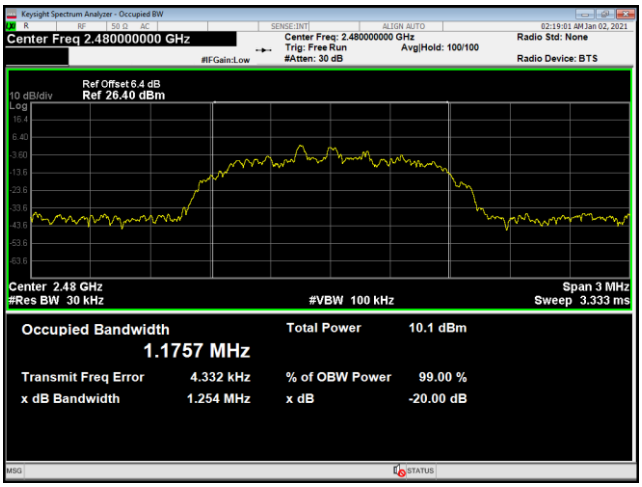
GFSK Middle channel



π /4-DQPSK Middle channel



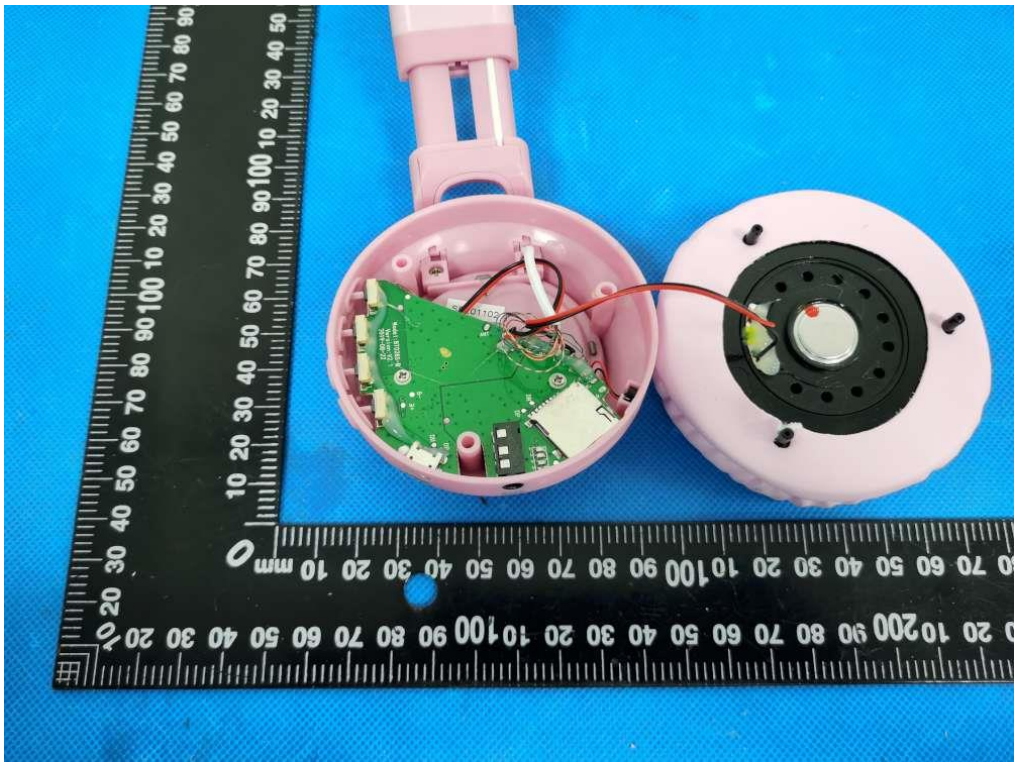
GFSK Highest channel

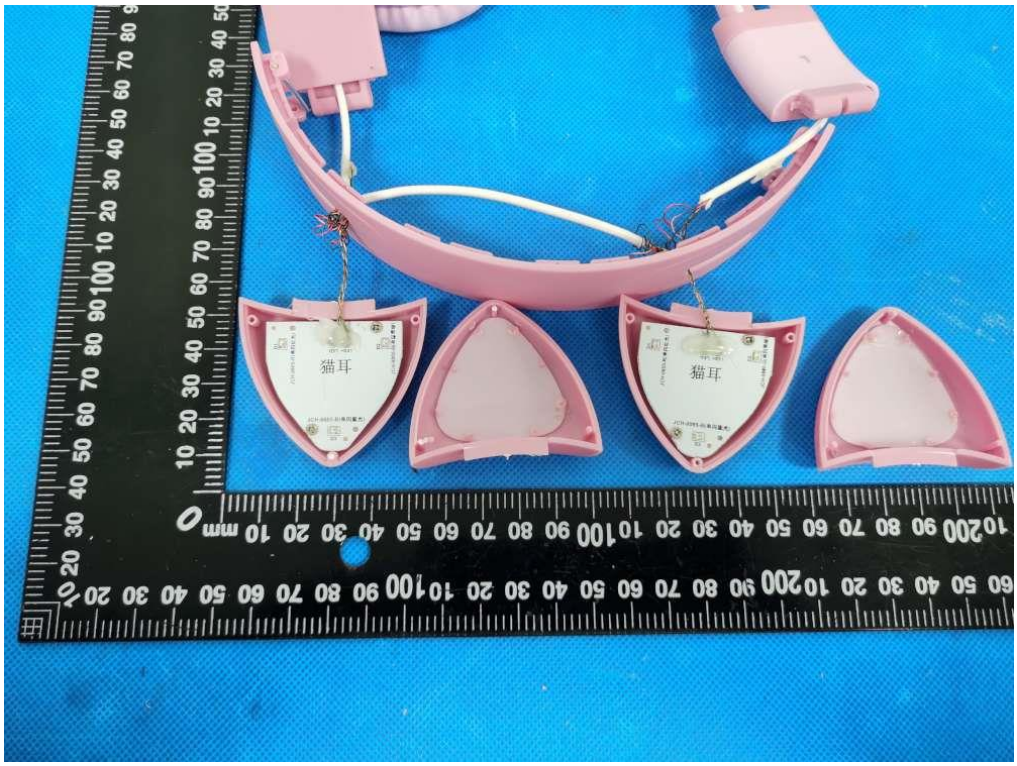


π /4-DQPSK Highest channel

8 Test Setup Photo

9 EUT Constructional Details

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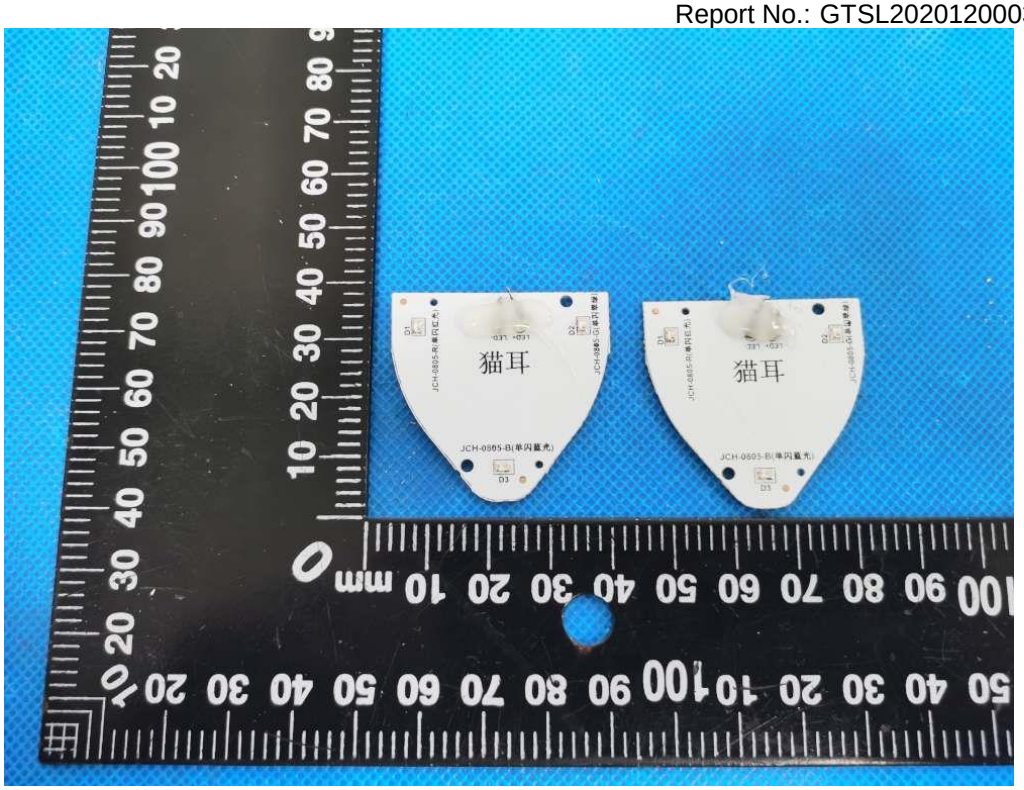
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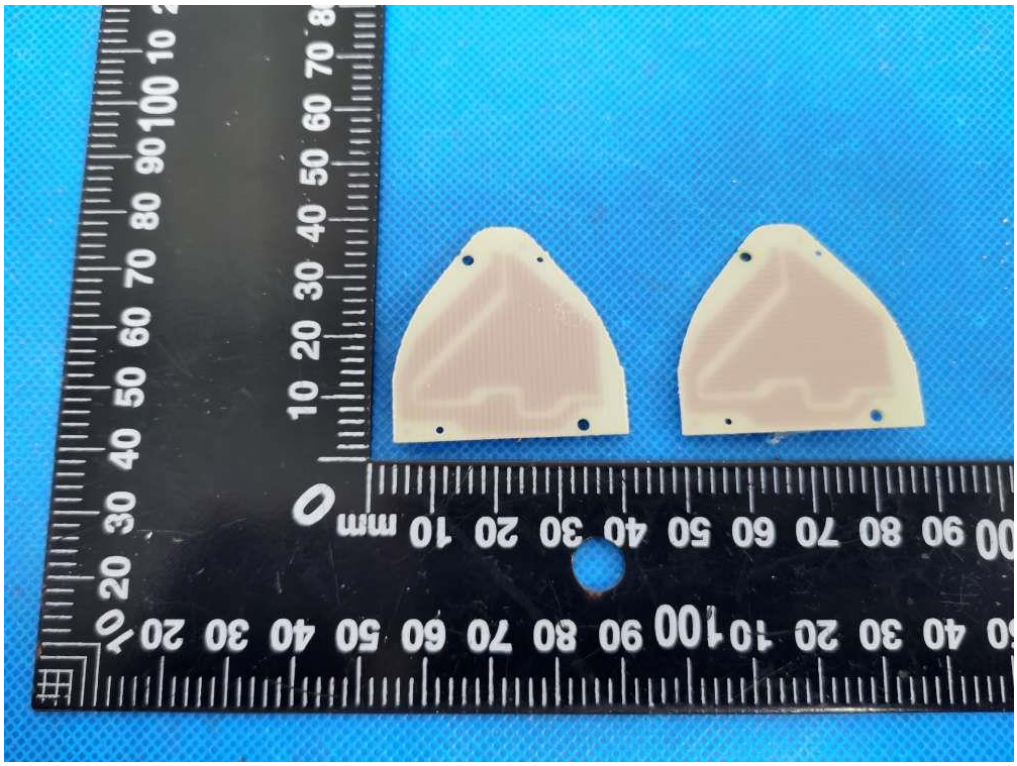

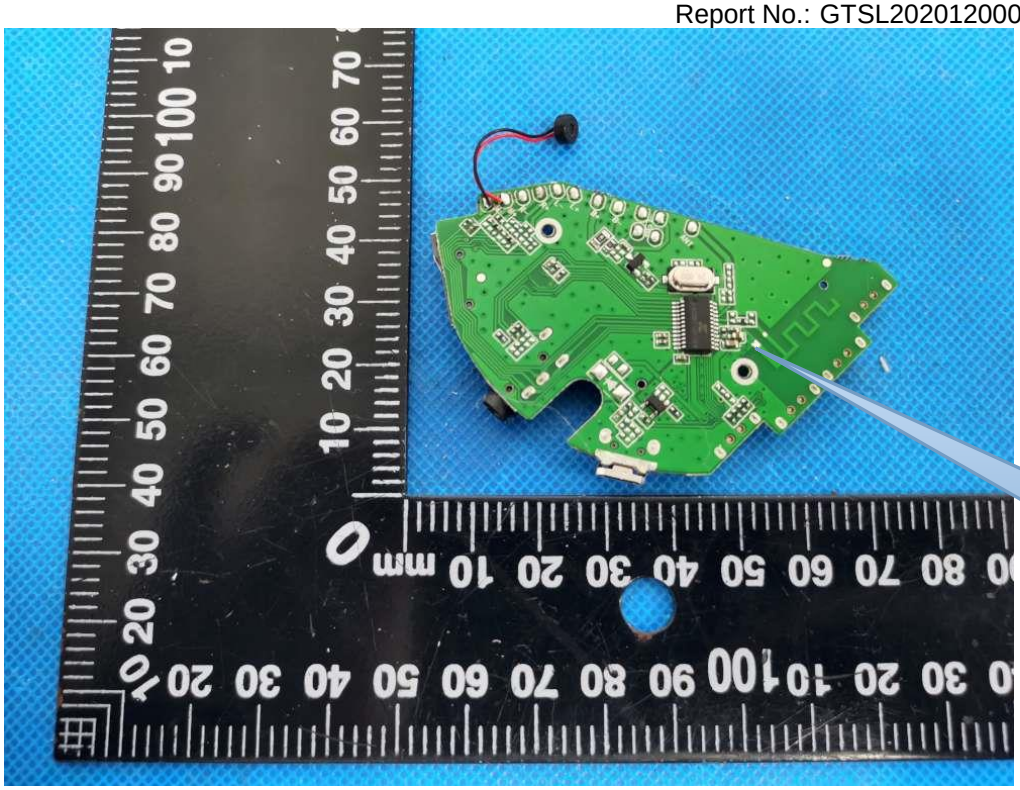
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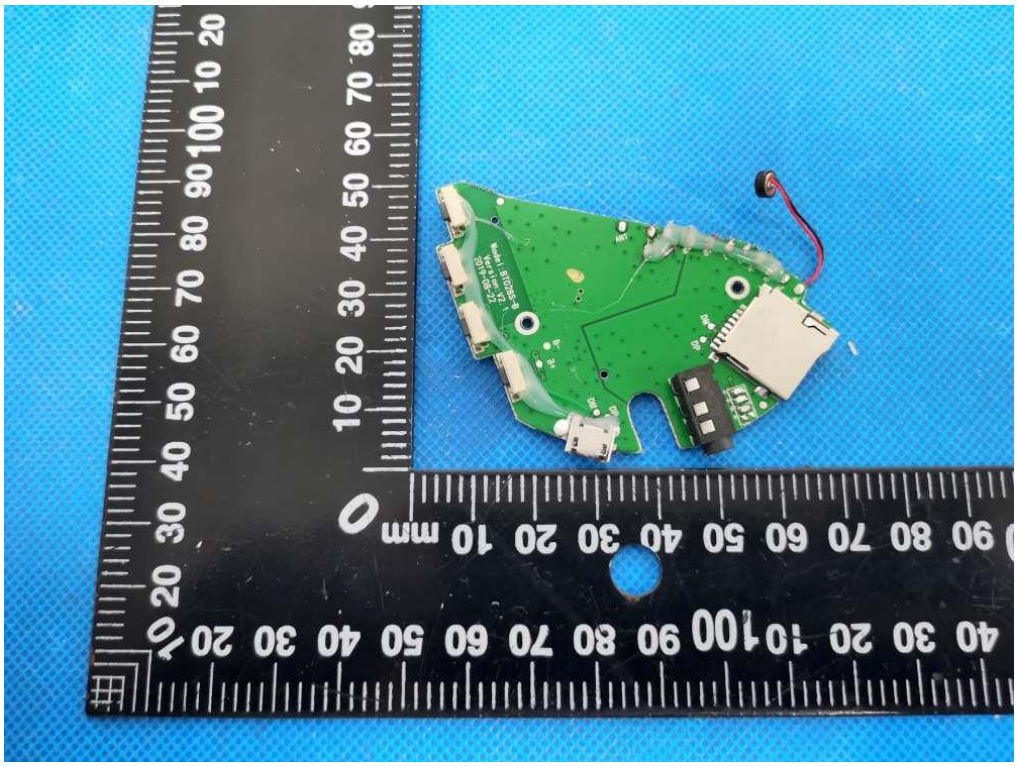

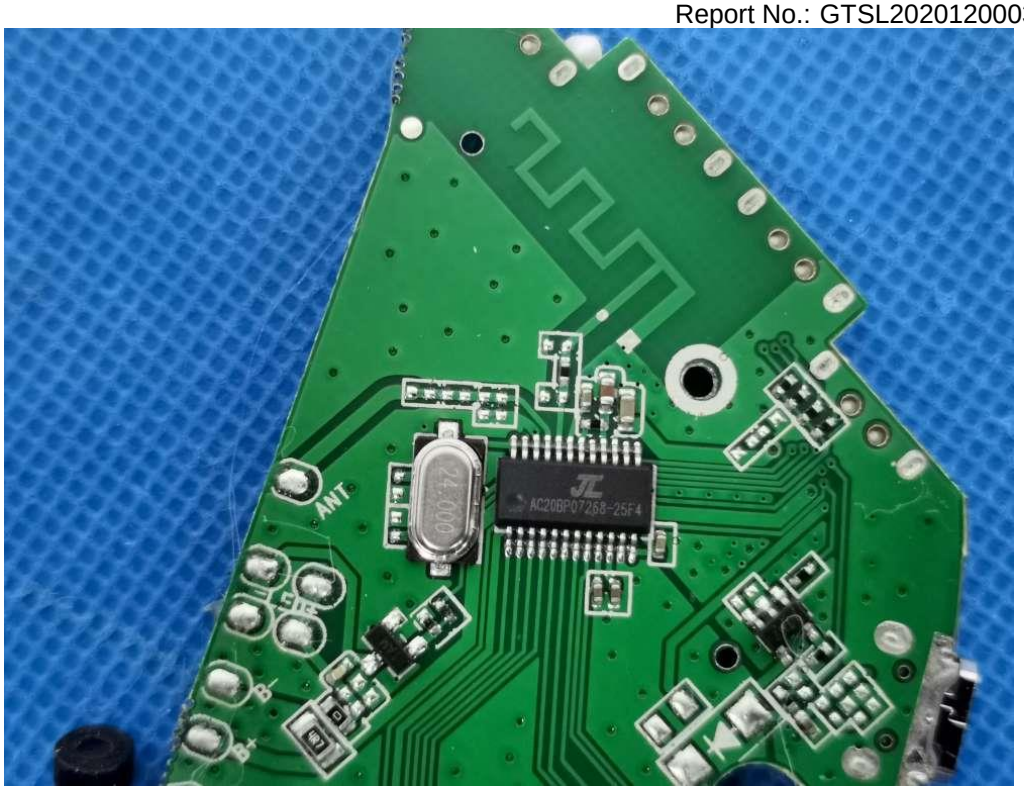
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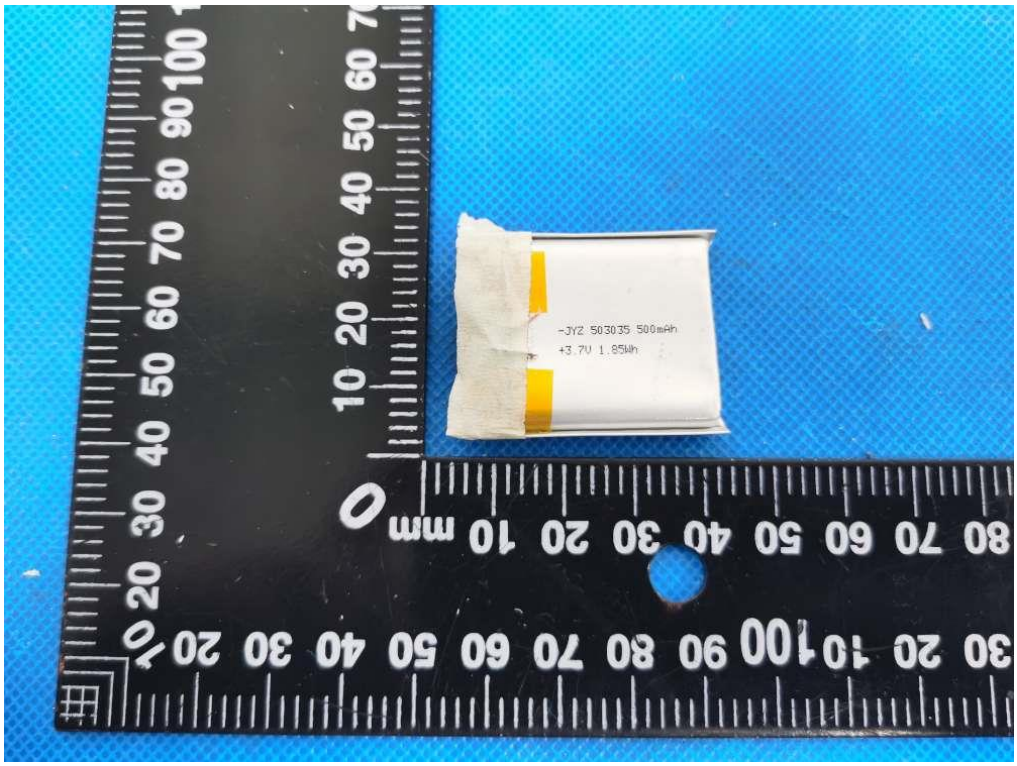
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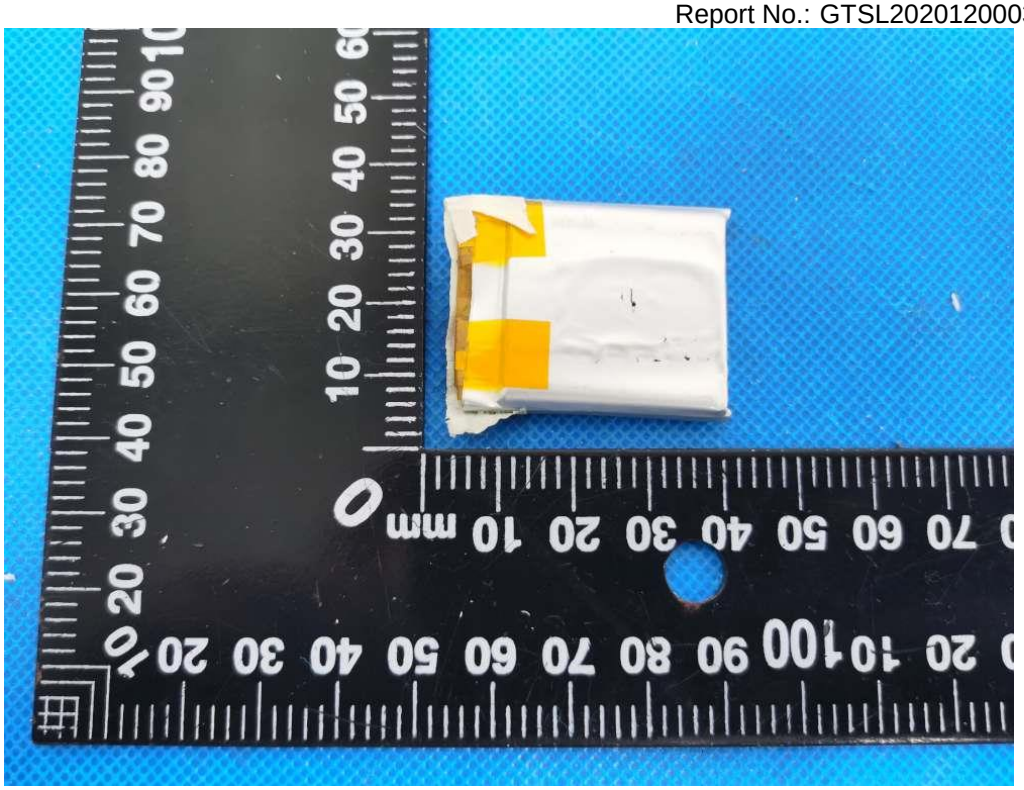
+3.7V 1.85Wh



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