TEST REPORT

Product Name:	Pulsar Wireless CRAZYLIGHT 8K Dongle
FCC ID:	2A2TU-PCL8KDG01
Trademark:	Pulsar Gaming Gears
Model Number:	PCL8KDG01, PCL8KDG02, PCL8KDG03, PCL8KDG04, PCL8KDG05, PCL8KDG06, PCL8KDG07, PCL8KDG08, PCL8KDG09, PCL8KDG10, PCL8KDG11, PCL8KDG12, PCL8KDG13, PCL8KDG14, PCL8KDG15, PCL8KDG16, PCL8KDG17, PCL8KDG18, PCL8KDG19, PCL8KDG20
Prepared For:	AplusX Inc.
Address:	A-614, 58-1 Giheung-Ro, Giheung-Gu, Yongin-Si, Gyeonggi-Do, Korea
Manufacturer:	AplusX Technology (Shenzhen) Co.,Ltd.
Address:	RM801-1, 8/F, Block A, Xingzhan Plaza, No.446, Nan Huan Road, Shajing Town, Baoan District, Shenzhen, Guangdong, China 518104
Prepared By:	Shenzhen CTB Testing Technology Co., Ltd.
Address:	1&2/F., Building A, No.26, Xinhe Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	Nov. 08, 2024
Sample tested Date:	Nov. 08, 2024 to Dec. 06, 2024
Issue Date:	Dec. 06, 2024
Report No.:	CTB24110805914RF01
Test Standards	FCC CFR Title 47 Part 15 Subpart C Section 15.249 ANSI C63.10:2013
Test Results	PASS
Remark:	This is 2.4GHz radio test report.

Compiled by:	Reviewed by:	Approved by:
Zhou Kui	Arron Liu	Bin Mei
Zhou Kui	Arron Liu	Bin Mei / Director

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

TABLE OF CONTENT

(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB24110805914RF01	Dec. 06, 2024	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.215	20dB Bandwidth	PASS	
15.249	Fundamental &Radiated Spurious Emission Measurement	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

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

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Item	Uncertainty
Occupancy bandwidth	54.3kHz
Conducted output power Above 1G	0.9dB
Conducted output power below 1G	0.9dB
Power Spectral Density , Conduction	0.9dB
Conduction spurious emissions	2.0dB
Out of band emission	2.0dB
3m camber Radiated spurious emission(9KHz-30MHz)	4.8dB
3m camber Radiated spurious emission(30MHz-1GHz)	4.6dB
3m chamber Radiated spurious emission(1GHz-18GHz)	5.1dB
3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB
humidity uncertainty	5.5%
Temperature uncertainty	0.63℃
frequency	1×10-7
Conducted Emission (150KHz-30MHz)	3.2 dB
Radiated Emission(30MHz ~ 1000MHz)	4.8 dB
Radiated Emission(1GHz ~6GHz)	4.9 dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	PCL8KDG01, PCL8KDG02, PCL8KDG03, PCL8KDG04, PCL8KDG05, PCL8KDG06, PCL8KDG07, PCL8KDG08, PCL8KDG09, PCL8KDG10, PCL8KDG11, PCL8KDG12, PCL8KDG13, PCL8KDG14, PCL8KDG15, PCL8KDG16, PCL8KDG17, PCL8KDG18, PCL8KDG19, PCL8KDG20
Model Description:	All the model are the same circuit and RF module, only the model name and appearance are different. Test sample model: PCL8KDG01
Hardware Version:	DM161-NRF52840 V05
Software Version:	CS:44459019 V2.17

Operation Frequency:	2403-2480MHz
Type of Modulation:	GFSK
Antenna installation:	PCB antenna
Antenna Gain:	-1.66dBi
Ratings:	DC 5V by PC

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1.	Laptop	DELL	Vostro 5490	N/A	AE

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
01	2403	02	2472	03	2466	04	2458
05	2450	06	2462	07	2442	08	2468
09	2424	10	2474	11	2446	12	2464
13	2480	14	2444	15	2470	16	2452

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting GFSK	2403MHz	2442MHz	2480MHz

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(AC):	120V
Normal Temperature(℃)	23
Low Temperature(℃)	0
High Temperature(℃)	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at 1&2F., Building A, No. 26, Xinhe Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	A.14.16	2025/6/28
2	Power Sensor	Agilent	U2021XA	MY56120032	/	2025/6/28
3	Power Sensor	Agilent	U2021XA	MY56120034	/	2025/6/28
4	Communication test set	R&S	CMW500	108058	V3.5.80	2025/6/28
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/6/28
6	Signal Generator	Agilent	N5181A	MY50140365	A.01.60	2025/6/28
7	Vector signal generator	Agilent	N5182A	MY47420195	A.01.87	2025/6/28
8	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2025/6/28
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	/	2025/6/30
10	5 GHz Filter	Shenxiang	MSF5150-5850MS-1155	20181015001	/	2025/6/30
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	/	2025/6/30
12	BT&WI-FI Automatic test software	Micowave	MTS8310	Ver. 2.0.0.0	/	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	/	2025/6/28
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	/	2025/6/28
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	/	/
16	966 chamber	C.R.T.	966	/	/	2027/6/21
17	Receiver	R&S	ESPI	100362	RF_ATTEN_7 (104489/003)	2025/6/28
18	Amplifier	HP	8447E	2945A02747	/	2025/6/28
19	Amplifier	Agilent	8449B	3008A01838	/	2025/6/28
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2025/6/28
21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	/	2025/6/28

22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/28
24	loop antenna	ZHINAN	ZN30900A	GTS534	/	/
25	40G Horn antenna	A/H/System	SAS-574	588	/	2025/6/28
26	Amplifier	AEROFLEX	Aeroflex	097	/	2025/6/28
27	Power Metter	KEYSIGHT	N1912AP	N/A	A.05.00	2025/6/28

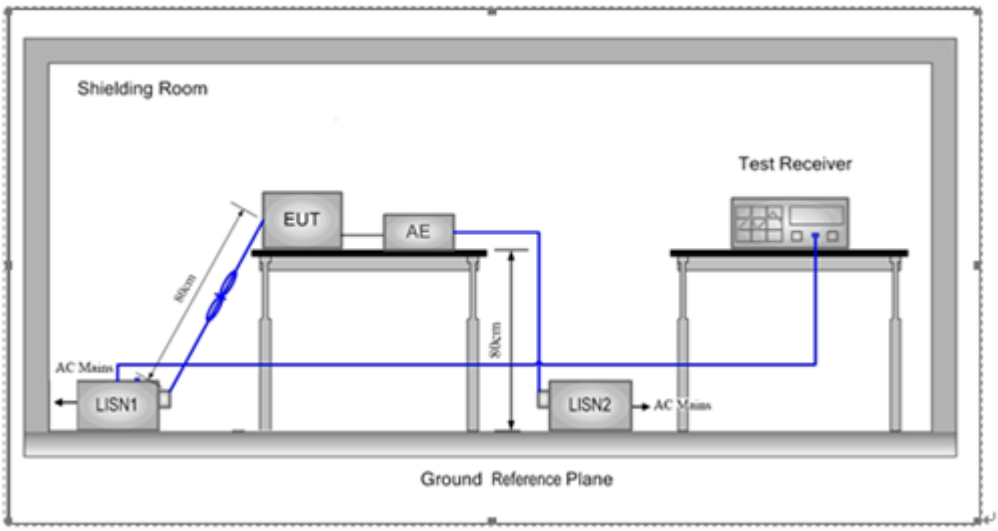
Continuous disturbance						
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated until
1	843 Shield Room	C/ R/ T	843	/	/	2027/6/21
2	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	/	2025/6/30
3	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	/	2025/6/28
4	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428	V4.42.SP3	2025/6/30
5	Coaxial cable	ZDECL	Z302S	18091904	/	2025/6/30
6	ISN	Schwarzbeck	NTFM8158	183	/	2025/6/30
7	Voltage sensor	Schwarzbeck	TK 9420	01189	/	2025/10/25
8	EZ-EMC	Frad	EMC-con3A1.1	/	/	/
9	Current Probe	FCC	F-52B	199453	/	2025/5/27
10	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/6/28
11	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/6/28

Radiated emission(No.2 Chamber)						
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated until
1	966 Chamber	C/ R/ T	966	/	/	2026/11/14
2	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	/	2026/7/07
3	Broadband Antenna	Schwarzbeck	VULB 9168	1471	/	2025/7/06
4	Amplifier	Agilent	8449B	3008A01838	/	2025/6/30
5	Preamplifier	Schwarzbeck	BBV 9743 B	00500	/	2025/5/23
6	EMI TEST RECEIVER	R&S	ESCI7	100861	/	2025/10/25
7	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/6/28
8	EMI test software	Farad	EZ-EMC	/	Ver. FARAD-3A1+	/
9	Coaxial cable	Rosenberg	8m	/	/	2025/10/25
10	Coaxial cable	Times	2m	/	/	2025/10/25
11	Coaxial cable	Times	2m	/	/	2025/10/25

12	Coaxial cable	Times	1m	/	/	2025/10/25
13	loop antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/29
14	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/6/28
15	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/6/28

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56[Note 1]	56 to 46[Note 1]
0.5 – 5	56	46
5 – 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50µH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane.

This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

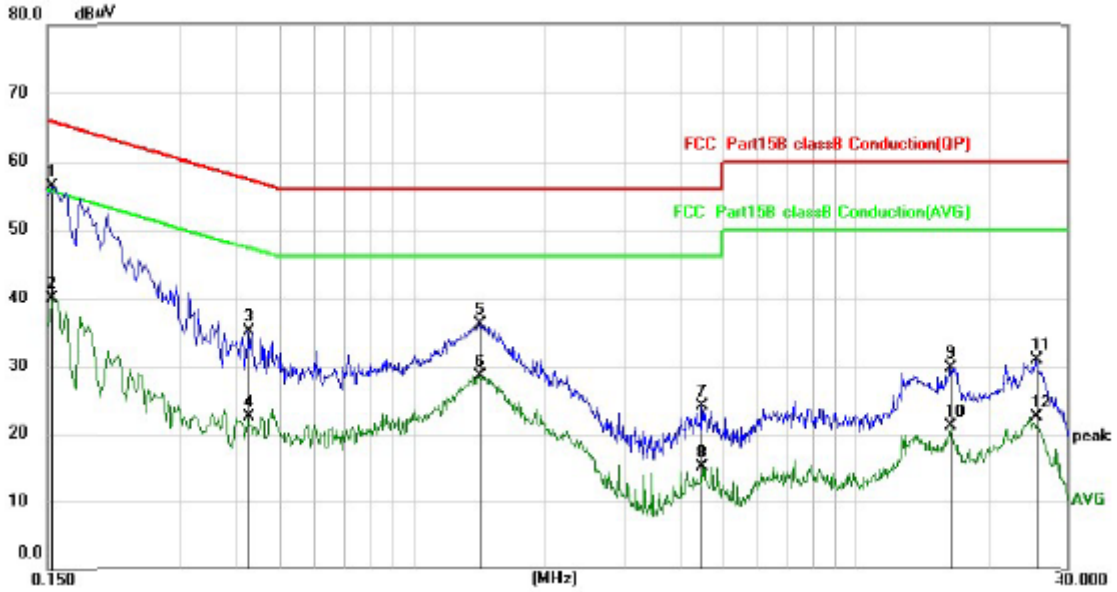
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement**.**

6) All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.

7) If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

6.4 Test Result

L: Worst case-GFSK(low channel)

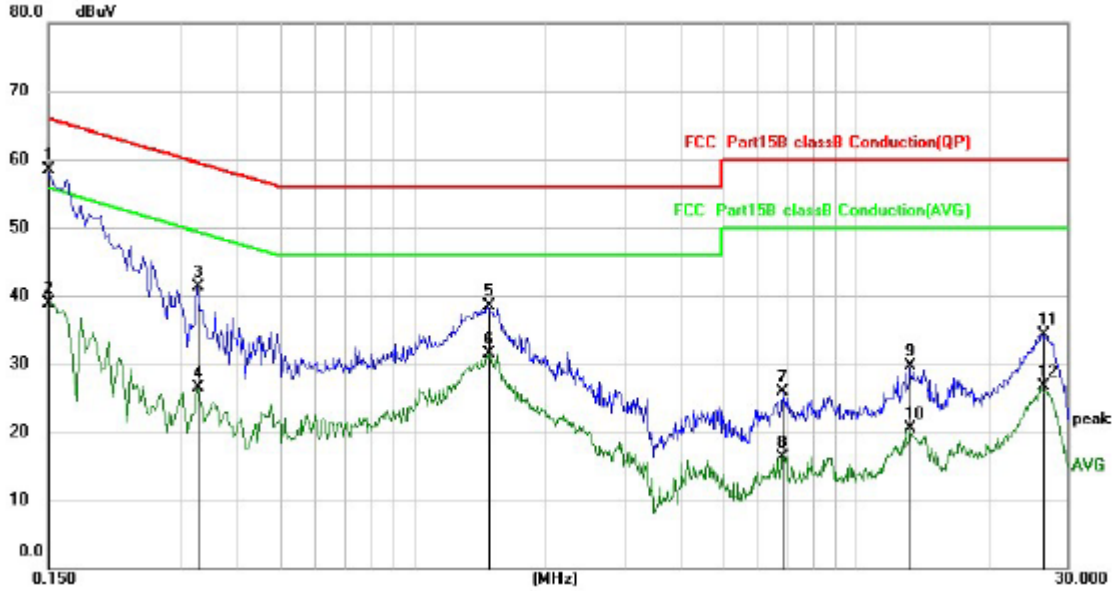


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	45.44	10.88	56.32	65.79	-9.47	QP
2		0.1539	28.96	10.88	39.84	55.79	-15.95	AVG
3		0.4260	24.47	10.55	35.02	57.33	-22.31	QP
4		0.4260	11.90	10.55	22.45	47.33	-24.88	AVG
5		1.4140	24.93	11.21	36.14	56.00	-19.86	QP
6		1.4140	17.36	11.21	28.57	46.00	-17.43	AVG
7		4.4899	11.98	12.13	24.11	56.00	-31.89	QP
8		4.4899	2.97	12.13	15.10	46.00	-30.90	AVG
9		16.3540	16.37	13.41	29.78	60.00	-30.22	QP
10		16.3540	7.68	13.41	21.09	50.00	-28.91	AVG
11		25.4580	16.89	14.06	30.95	60.00	-29.05	QP
12		25.4580	8.50	14.06	22.56	50.00	-27.44	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1500	47.59	10.89	58.48	66.00	-7.52	QP
2		0.1500	28.06	10.89	38.95	56.00	-17.05	AVG
3		0.3260	30.74	10.62	41.36	59.55	-18.19	QP
4		0.3260	15.90	10.62	26.52	49.55	-23.03	AVG
5		1.4780	27.28	11.25	38.53	56.00	-17.47	QP
6		1.4780	20.31	11.25	31.56	46.00	-14.44	AVG
7		6.8140	13.01	12.87	25.88	60.00	-34.12	QP
8		6.8140	3.51	12.87	16.38	50.00	-33.62	AVG
9		13.2660	16.40	13.31	29.71	60.00	-30.29	QP
10		13.2660	7.17	13.31	20.48	50.00	-29.52	AVG
11		26.3580	20.22	14.15	34.37	60.00	-25.63	QP
12		26.3580	12.59	14.15	26.74	50.00	-23.26	AVG

Remark:
Factor = Cable loss + LISN factor, Margin = Measurement – Limit

7. RADIATED SPURIOUS EMISSION

7.1 Block Diagram Of Test Setup

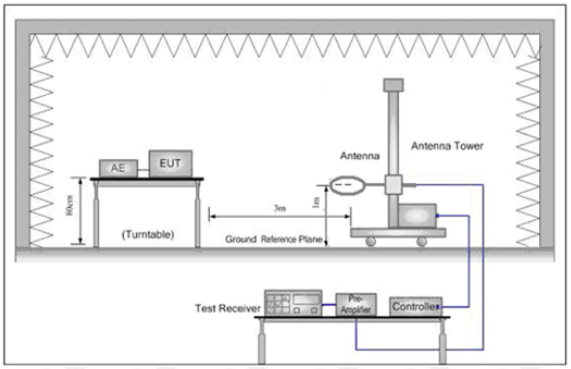


Figure 1. Below 30MHz

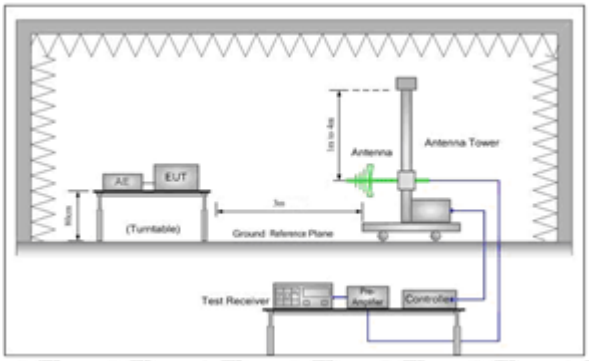
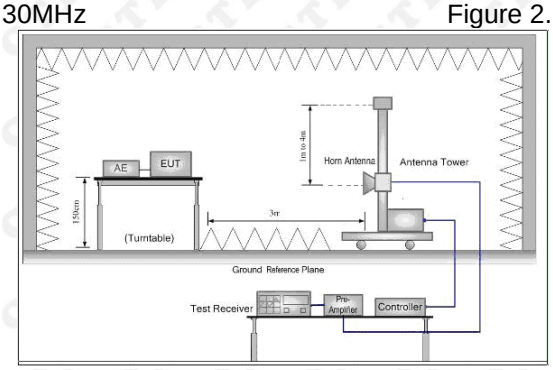


Figure 2. 30MHz to 1GHz



7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

7.3 Test procedure

Below 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.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.

d.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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f.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.

Above 1GHz test procedure as below:

g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel

j.Repeat above procedures until all frequencies measured was complete.

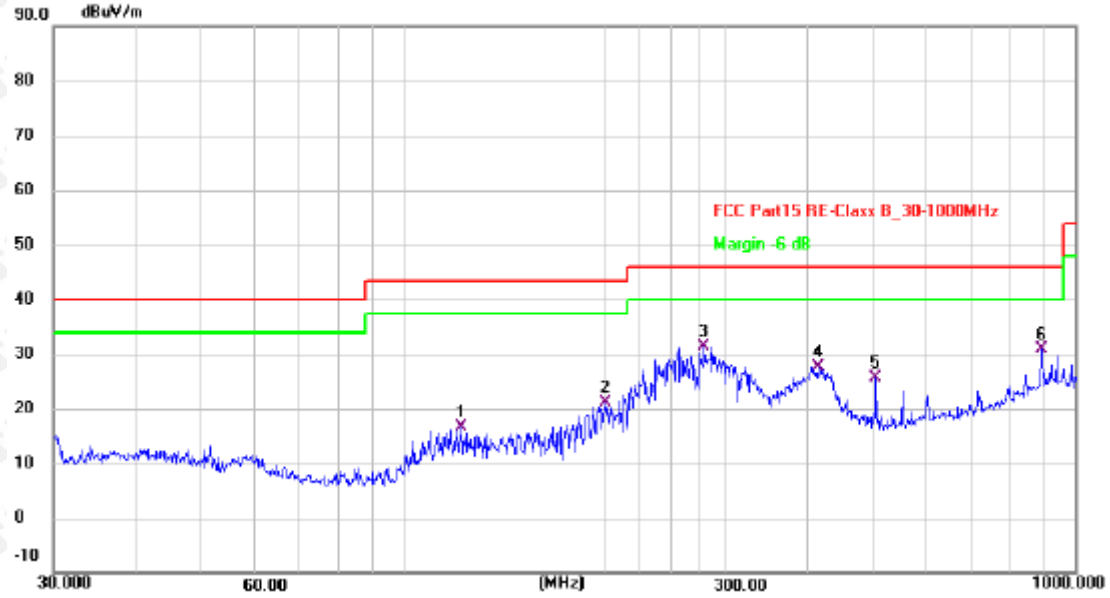
j. Full battery is usedduring test

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

7.4 Test Result

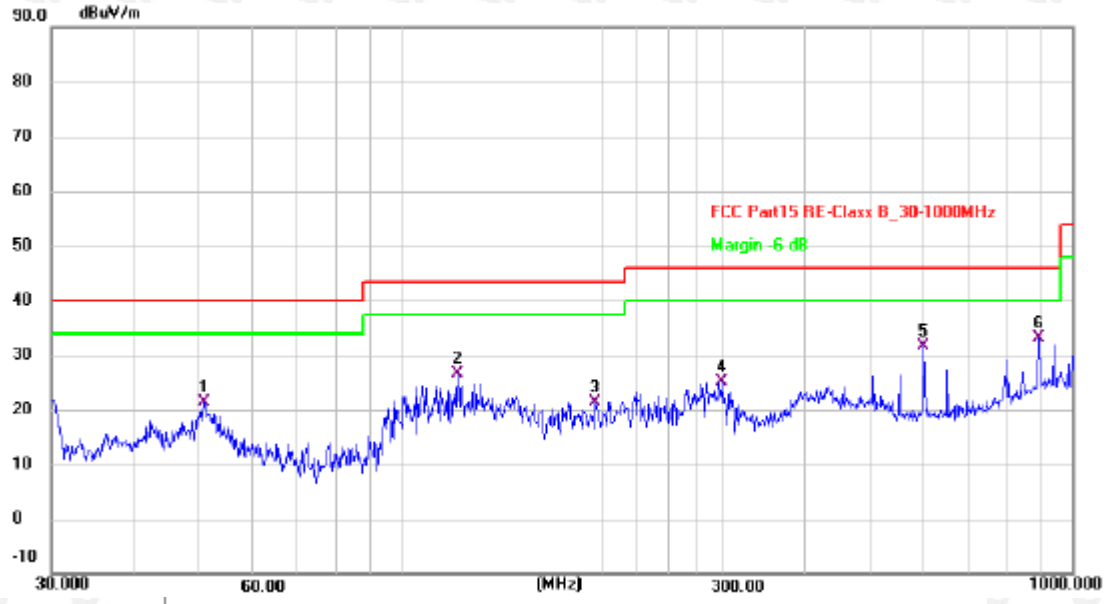
Below 1GHz Test Results:
Antenna polarity: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	121.5486	32.38	-15.80	16.58	43.50	-26.92	QP
2	199.2855	38.08	-17.04	21.04	43.50	-22.46	QP
3 *	280.0237	46.24	-14.83	31.41	46.00	-14.59	QP
4	413.2706	39.68	-12.00	27.68	46.00	-18.32	QP
5	504.7062	34.84	-9.14	25.70	46.00	-20.30	QP
6	890.7278	31.46	-0.54	30.92	46.00	-15.08	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Antenna polarity: V



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	50.7637	36.09	-14.59	21.50	40.00	-18.50	QP
2	121.1231	42.35	-15.84	26.51	43.50	-16.99	QP
3	193.7728	38.41	-17.00	21.41	43.50	-22.09	QP
4	300.3672	38.99	-13.78	25.21	46.00	-20.79	QP
5	599.3212	38.24	-6.49	31.75	46.00	-14.25	QP
6 *	890.7278	33.70	-0.54	33.16	46.00	-12.84	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

CH Low (2403MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2403.00	102.04	-5.84	96.20	114	-17.80	peak
2403.00	93.88	-5.84	88.04	94	-5.96	AVG
4806.00	56.98	-3.64	53.34	74	-20.66	peak
4806.00	47.80	-3.64	44.16	54	-9.84	AVG
7209.00	58.63	-0.95	57.68	74	-16.32	peak
7209.00	48.58	-0.95	47.63	54	-6.37	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2403.00	101.10	-5.84	95.26	114	-18.74	peak
2403.00	93.29	-5.84	87.45	94	-6.55	AVG
4806.00	56.68	-3.64	53.04	74	-20.96	peak
4806.00	47.28	-3.64	43.64	54	-10.36	AVG
7209.00	60.45	-0.95	59.50	74	-14.50	peak
7209.00	49.84	-0.95	48.89	54	-5.11	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (2442MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2442.00	98.67	-5.71	92.96	114	-21.04	peak
2442.00	92.26	-5.71	86.55	94	-7.45	AVG
4884.00	54.48	-3.51	50.97	74	-23.03	peak
4884.00	46.99	-3.51	43.48	54	-10.52	AVG
7326.00	57.94	-0.82	57.12	74	-16.88	peak
7326.00	47.78	-0.82	46.96	54	-7.04	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2442.00	98.59	-5.71	92.88	114	-21.12	peak
2442.00	92.87	-5.71	87.16	94	-6.84	AVG
4884.00	55.31	-3.51	51.80	74	-22.20	peak
4884.00	45.04	-3.51	41.53	54	-12.47	AVG
7326.00	57.81	-0.82	56.99	74	-17.01	peak
7326.00	46.36	-0.82	45.54	54	-8.46	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH High (2480MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480.00	98.57	-5.65	92.92	114	-21.08	peak
2480.00	92.61	-5.65	86.96	94	-7.04	AVG
4960.00	55.94	-3.43	52.51	74	-21.49	peak
4960.00	47.05	-3.43	43.62	54	-10.38	AVG
7440.00	55.62	-0.75	54.87	74	-19.13	peak
7440.00	45.95	-0.75	45.20	54	-8.80	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480.00	98.50	-5.65	92.85	114	-21.15	peak
2480.00	92.88	-5.65	87.23	94	-6.77	AVG
4960.00	55.58	-3.43	52.15	74	-21.85	peak
4960.00	46.26	-3.43	42.83	54	-11.17	AVG
7440.00	56.73	-0.75	55.98	74	-18.02	peak
7440.00	46.85	-0.75	46.10	54	-7.90	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Remark:
(1) Measuring frequencies from 9KHz to the 25 GHz.
(2). All modes of GFSK were test at Low, Middle, and High channel, only the worst result of GFSK Low Channel was reported for below 1GHz test.
(3). For 2.4G above 1GHz test all modes of GFSK were test at Low, Middle, and High channel, only the worst result of GFSK Low Channel was reported.
(4). By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.
(5). Radiated emission test from 9kHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9kHz to 30MHz and not recorded in this report.

8. BAND EDGE AND RF COUNDUCTED SPURIOUS EMISSIONS

8.1 Block Diagram Of Test Setup

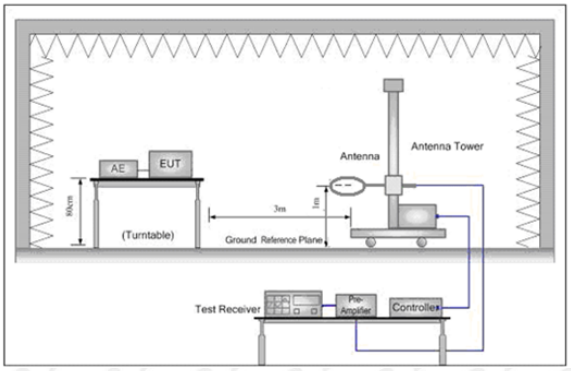


Figure 1. Below 30MHz

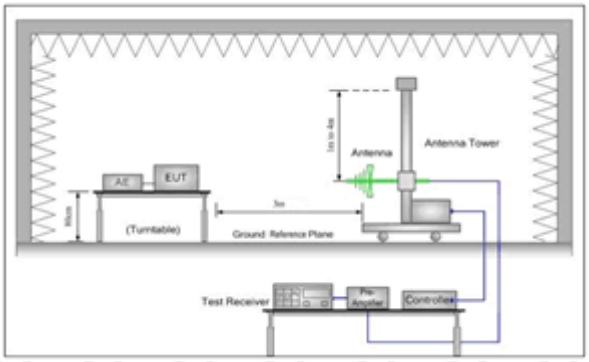
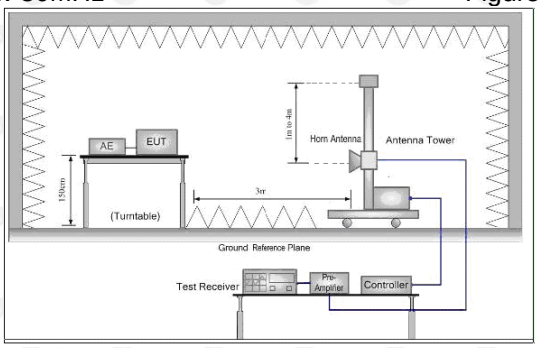


Figure 2. 30MHz to 1GHz



8.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

8.3 Test procedure

a.The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c.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.
d.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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f.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.

Frequency	Detector	RBW	VBW	Remark
2310MHz-2400MHz	peak	1MHz	3MHz	peak
2483.5MHz-2500MHz	peak	1MHz	3MHz	peak

8.4 Test Result

CH Low:
Horizontal:

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.2564	26.61	-4.28	22.32	54	-31.68	peak
2	2343.6497	27.22	-4.34	22.89	54	-31.11	peak
3	2378.0751	30.01	-4.45	25.56	54	-28.44	peak
4	2389.6898	27.31	-4.90	22.41	54	-31.59	peak
5	2439.9279	29.48	-3.94	25.54	54	-28.46	peak

Vertical:

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.1881	29.44	-4.31	25.13	54	-28.87	peak
2	2343.9032	30.06	-4.33	25.73	54	-28.27	peak
3	2378.3883	30.96	-4.45	26.52	54	-27.48	peak
4	2390.057	27.73	-4.88	22.85	54	-31.15	peak
5	2440.1518	29.85	-3.91	25.94	54	-28.06	peak

CH High:
Horizontal:

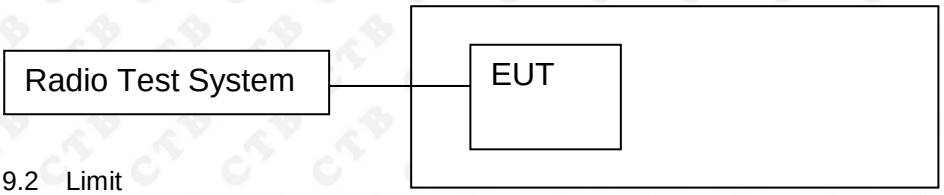
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2484.0008	32.01	-4.34	27.67	54	-26.33	peak
2	2488.6689	29.60	-4.27	25.33	54	-28.67	peak
3	2490.3517	29.14	-4.47	24.67	54	-29.33	peak
4	2493.4244	33.34	-4.89	28.45	54	-25.55	peak
5	2496.0046	27.24	-3.99	23.25	54	-30.75	peak

Vertical:

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2484.0383	30.71	-4.27	26.44	54	-27.56	peak
2	2488.7851	30.73	-4.32	26.41	54	-27.59	peak
3	2490.1025	29.11	-4.47	24.64	54	-29.36	peak
4	2493.1642	33.70	-4.88	28.83	54	-25.17	peak
5	2495.8762	27.58	-3.99	23.59	54	-30.41	peak

9. BANDWIDTH TEST

9.1 Block Diagram Of Test Setup



9.2 Limit

FCC Part15 (15.249) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.249	Bandwidth	2402-2483.5	PASS

9.3 Test procedure

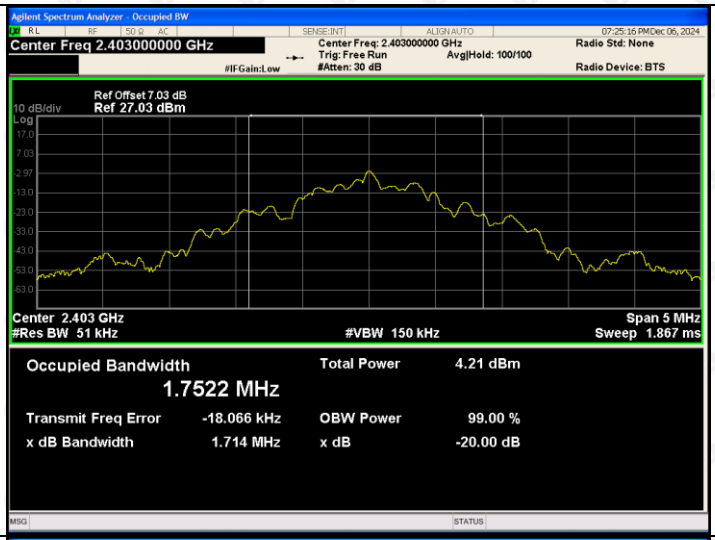
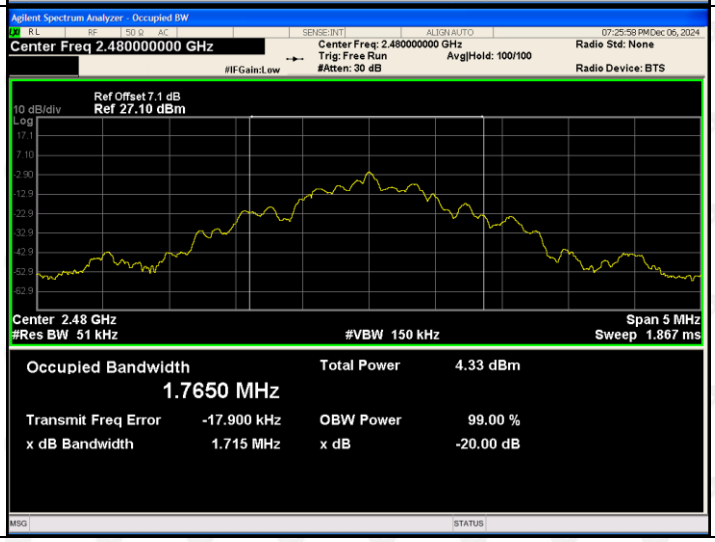
1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

9.4 Test Result

Test Mode	Frequency (MHz)	20dB Bandwidth (MHz)	Result
GFSK	Low channel	1.714	PASS
	Mid channel	1.551	PASS
	High channel	1.715	PASS

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:

GFSK Low channel		
GFSK Mid channel		
GFSK High channel		

10. ANTENNA REQUIREMENT

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(b) (4) requirement:
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

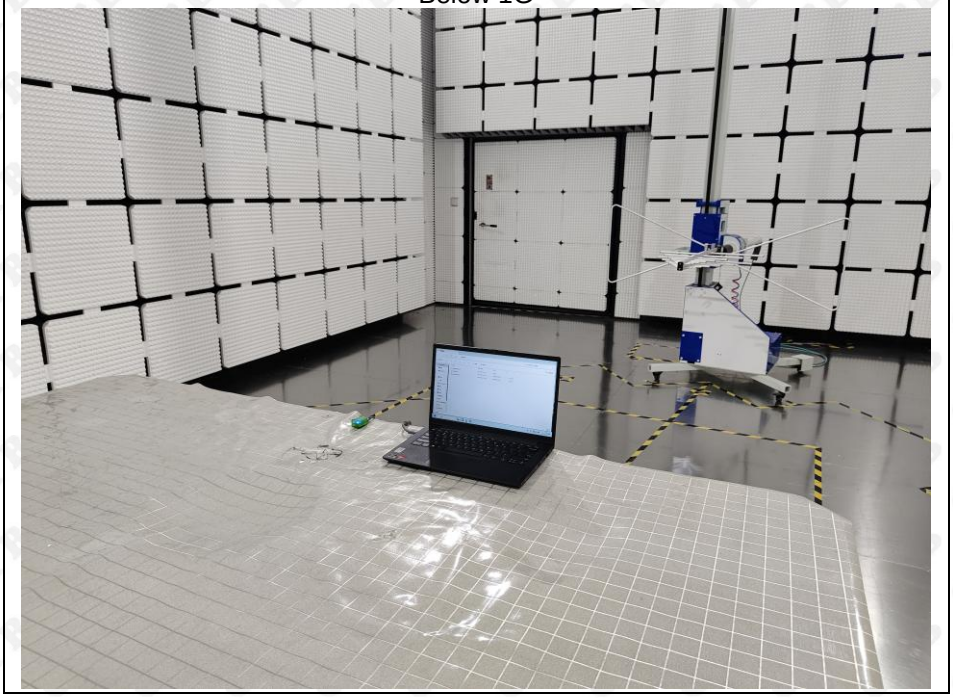
EUT Antenna:

The antenna is PCB Antenna. The best case gain of the antenna is -1.66dBi.

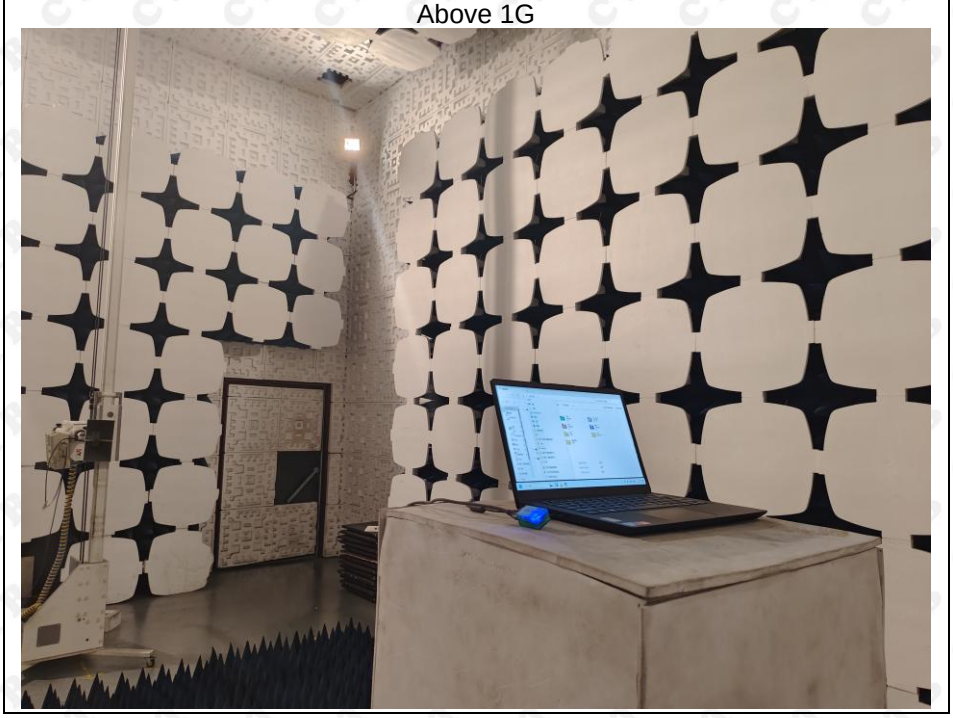
11. EUT TEST SETUP PHOTOGRAPHS

Radiated Emissions

Below 1G



Above 1G



Conducted emission

※※※※※ **END OF REPORT** ※※※※※