FCC Part 15C Test Report
FCC ID:2BDSS-HC-3067KIR24

Applicant:	Ningbo Huancai Electronic Technology Co., Ltd.
Address:	3rd Floor, Building 4, No. 655-77 Qiming Road, Panhuo Street, Yinzhou District, Ningbo City, Zhejiang Province
Manufacturer:	Ningbo Huancai Electronic Technology Co., Ltd.
Address:	3rd Floor, Building 4, No. 655-77 Qiming Road, Panhuo Street, Yinzhou District, Ningbo City, Zhejiang Province
EUT:	Huancai Bluetooth Control Light
Trade Mark:	N/A
Model Number:	HC-3067KIR24,62833,HC-3067KIR24-1
Date of Receipt:	November. 28, 2023
Test Date:	November. 28, 2023 - December. 06, 2023
Date of Report:	December. 06, 2023
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Applicable Standards:	FCC PART 15 C 15.247 ANSI C63.10:2013
Test Result:	Pass
Report Number:	DL-20231127031E

Prepared (Test Engineer):	Pxing Huang
Reviewer (Supervisor):	Jack Bu
Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.205	Band Edge Emission	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(d)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 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** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±2.56dB
2	RF power,conducted	±0.42dB
3	Spurious emissions,conducted	±2.76dB
4	All emissions,radiated(<1G)	±3.65dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	Huancai Bluetooth Control Light
Trademark	N/A
Model No.:	HC-3067KIR24, 62833, HC-3067KIR24-1
Model Difference	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
BT Version:	4.2
Operation Frequency:	2402~2480MHz
Channel numbers:	40 Channels
Channel separation:	2M
Modulation technology:	GFSK
Antenna Type:	Internal Antenna
Antenna gain:	1.9dBi
Power supply:	DC 12V

Note:

1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.The EUT's all information provided by client.

2. Channel Lis

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	23	2444
02	2404	12	2424	24	2446
~	~	~	~		
9	2418	20	2440	39	2478
10	2420	21	2442	40	2480

2.2 DESCRIPTION OF TEST MODES

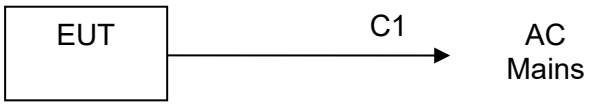
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH20
Mode 3	CH40
Mode 5	Link Mode
For Conducted Emission	
Final Test Mode	Description
Mode 5	Link Mode
For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH20
Mode 3	CH40

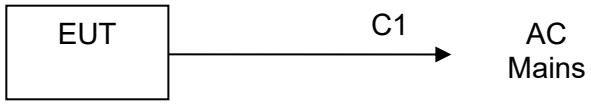
Note: 1. The measurements are performed at the highest, middle, lowest available channels.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Test software Version	Test program: AXDS1.0		
Frequency	2402 MHz	2440MHz	2480 MHz
Power Setting of Softwave	10	10	10

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4408B	MY50140780	Dec. 06, 2023	Dec. 07, 2024
2	Test Receiver (9kHz-7GHz)	R&S	ESRP7	101393	Dec. 06, 2023	Dec. 07, 2024
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB9162	00306	Dec. 06, 2023	Dec. 07, 2024
4	Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA9120D	02139	Dec. 06, 2023	Dec. 07, 2024
5	Horn Antenna (18GHz-40GHz)	A.H. Systems	SAS-574	588	Dec. 06, 2023	Dec. 07, 2024
6	Amplifier (9KHz-6GHz)	Schwarzbeck	BBV9743B	00153	Dec. 06, 2023	Dec. 07, 2024
7	Amplifier (1GHz-18GHz)	EMEC	EM01G8GA	00270	Dec. 06, 2023	Dec. 07, 2024
8	Amplifier (18GHz-40GHz)	Quanjuda	DLE-161	97	Dec. 06, 2023	Dec. 07, 2024
9	Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Dec. 06, 2023	Dec. 07, 2024
10	RF cables1 (9kHz-1GHz)	ChengYu	966	004	Dec. 06, 2023	Dec. 07, 2024
11	RF cables2 (1GHz-40GHz)	ChengYu	966	003	Dec. 06, 2023	Dec. 07, 2024
12	Antenna connector	Florida RF Labs	N/A	RF 01#	Dec. 06, 2023	Dec. 07, 2024
13	Power probe	KEYSIGHT	U2021XA	MY55210018	Dec. 06, 2023	Dec. 07, 2024
14	Signal Analyzer 9kHz-26.5GHz	Agilent	N9020A	MY55370280	Dec. 06, 2023	Dec. 07, 2024
15	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	Dec. 06, 2023	Dec. 07, 2024
16	D.C. Power Supply	LongWei	PS-305D	010964729	Dec. 06, 2023	Dec. 07, 2024

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	843 Shielded Room	ChengYu	843 Room	843	Nov. 24, 2022	Nov. 23, 2025
2	EMI Receiver	R&S	ESR	101421	Dec. 07, 2023	Dec. 06, 2024
3	LISN	R&S	ENV216	102417	Dec. 07, 2023	Dec. 06, 2024
4	843 Cable 1#	ChengYu	CE Cable	001	Dec. 07, 2023	Dec. 06, 2024

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

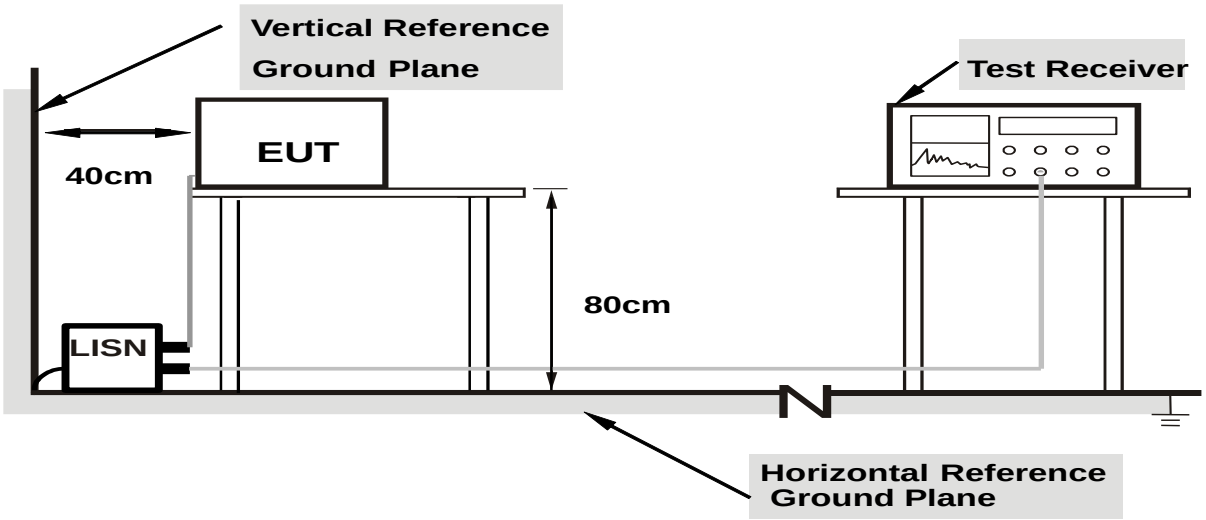
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



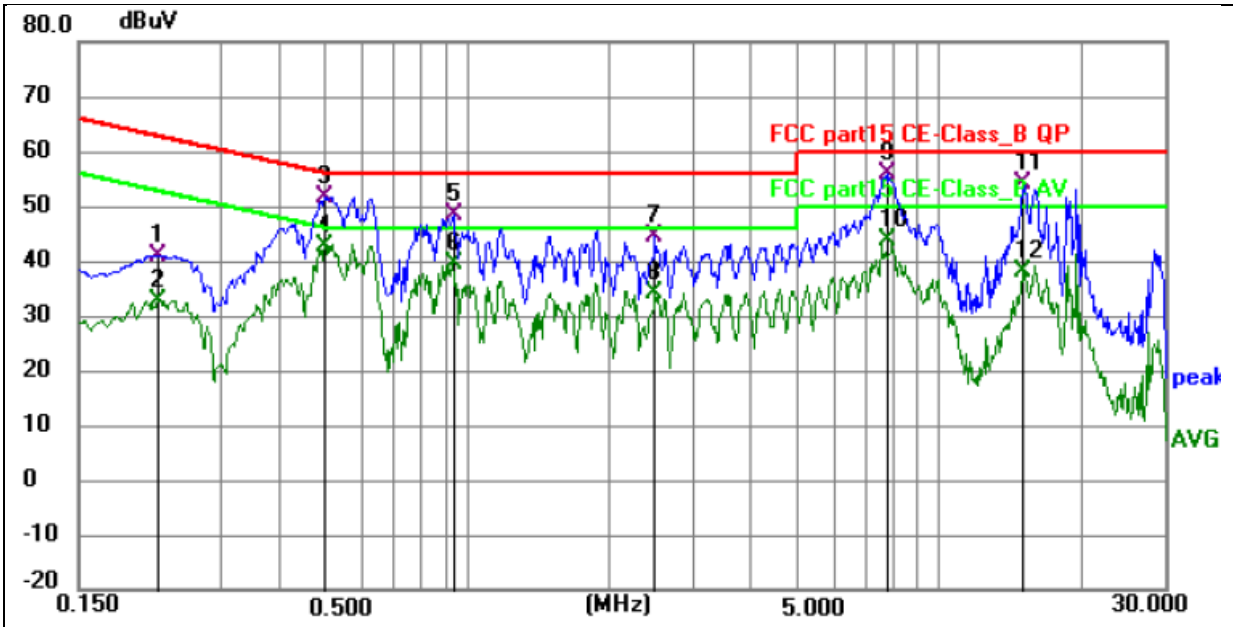
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4

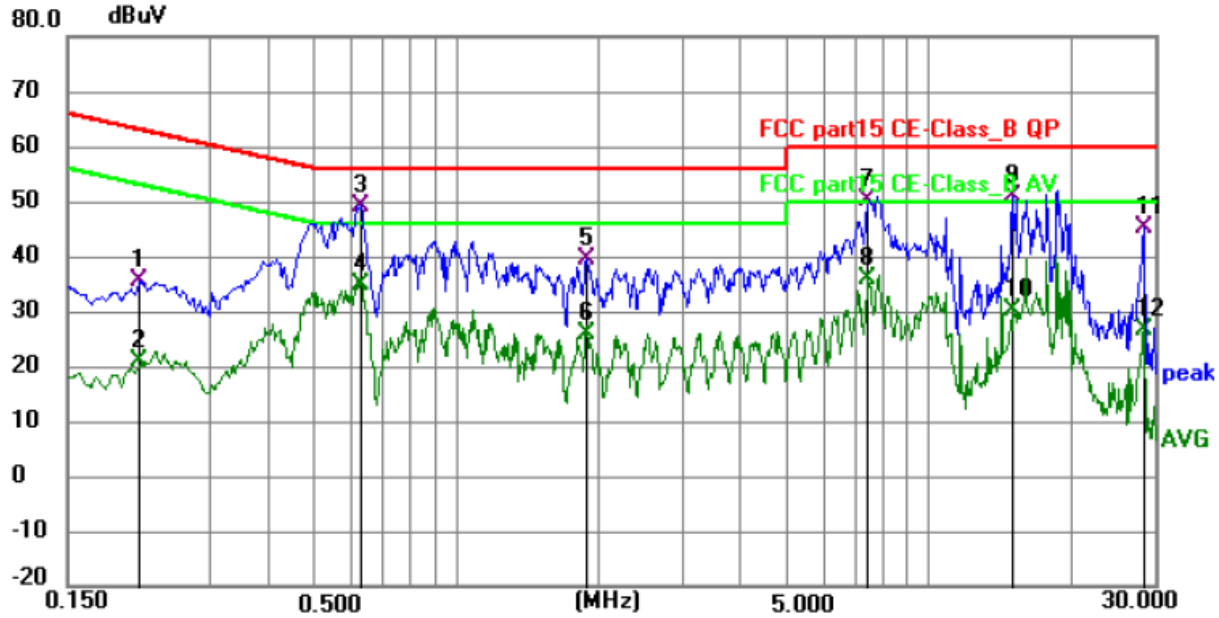


Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2220	31.35	9.45	40.80	62.74	-21.94	QP	P	
2	0.2220	23.15	9.45	32.60	52.74	-20.14	AVG	P	
3	0.5010	42.18	9.26	51.44	56.00	-4.56	QP	P	
4 *	0.5010	33.37	9.26	42.63	46.00	-3.37	AVG	P	
5	0.9375	38.91	9.34	48.25	56.00	-7.75	QP	P	
6	0.9375	30.23	9.34	39.57	46.00	-6.43	AVG	P	
7	2.4945	34.53	9.85	44.38	56.00	-11.62	QP	P	
8	2.4945	24.30	9.85	34.15	46.00	-11.85	AVG	P	
9	7.8000	45.99	10.03	56.02	60.00	-3.98	QP	P	
10	7.8000	33.63	10.03	43.66	50.00	-6.34	AVG	P	
11	15.0900	43.69	10.24	53.93	60.00	-6.07	QP	P	
12	15.0900	27.80	10.24	38.04	50.00	-11.96	AVG	P	

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 4



Remark:

Margin = Limit – Level, Correct Factor = Cable lose + LISN insertion loss, Level= Reading + Correct factor

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.2130	26.48	8.92	35.40	63.09	-27.69	QP	P	
2	0.2130	11.83	8.92	20.75	53.09	-32.34	AVG	P	
3 *	0.6270	39.79	9.29	49.08	56.00	-6.92	QP	P	
4	0.6270	25.71	9.29	35.00	46.00	-11.00	AVG	P	
5	1.8870	29.59	9.88	39.47	56.00	-16.53	QP	P	
6	1.8870	16.03	9.88	25.91	46.00	-20.09	AVG	P	
7	7.4264	39.97	10.15	50.12	60.00	-9.88	QP	P	
8	7.4264	25.78	10.15	35.93	50.00	-14.07	AVG	P	
9	15.0945	40.64	10.39	51.03	60.00	-8.97	QP	P	
10	15.0945	19.96	10.39	30.35	50.00	-19.65	AVG	P	
11	28.5000	34.23	11.09	45.32	60.00	-14.68	QP	P	
12	28.5000	15.66	11.09	26.75	50.00	-23.25	AVG	P	

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below 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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
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

3.2.2 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 rotatable 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 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel, the middle channel, the Highest channel

Note:

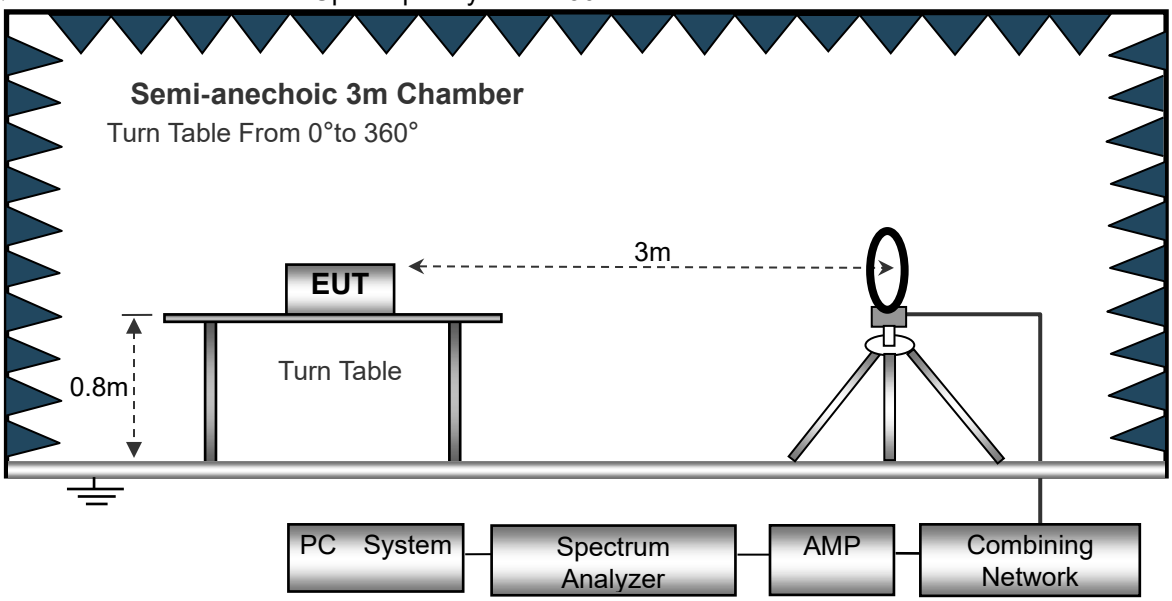
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

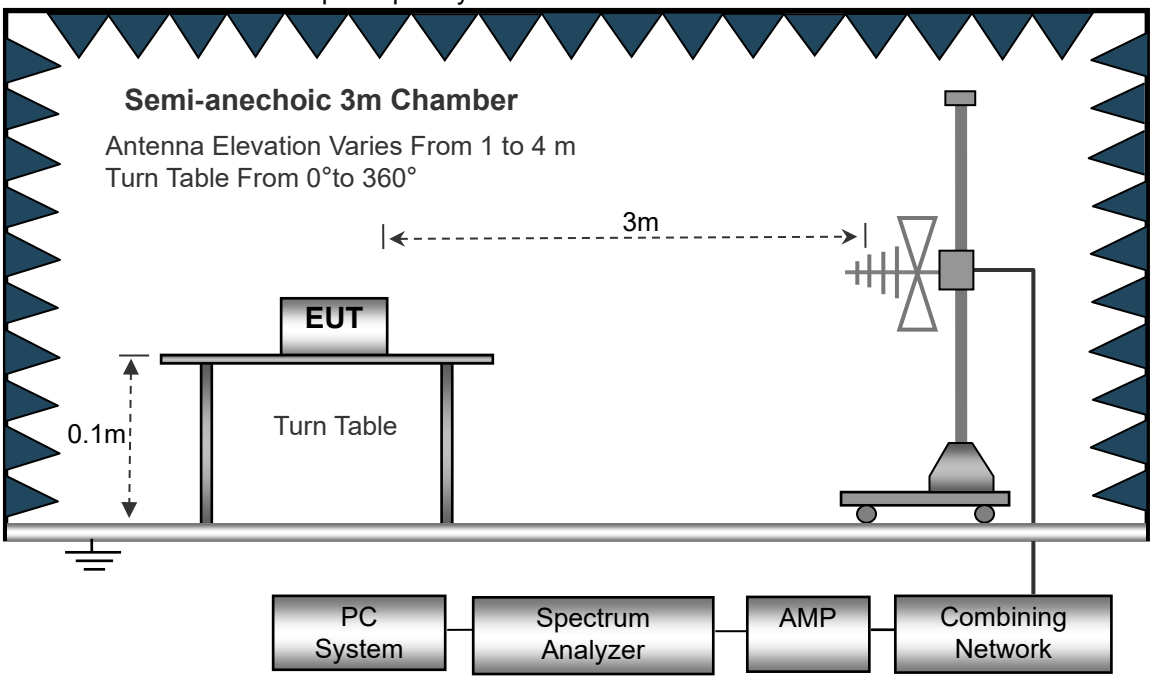
No deviation

3.2.4 TEST SETUP

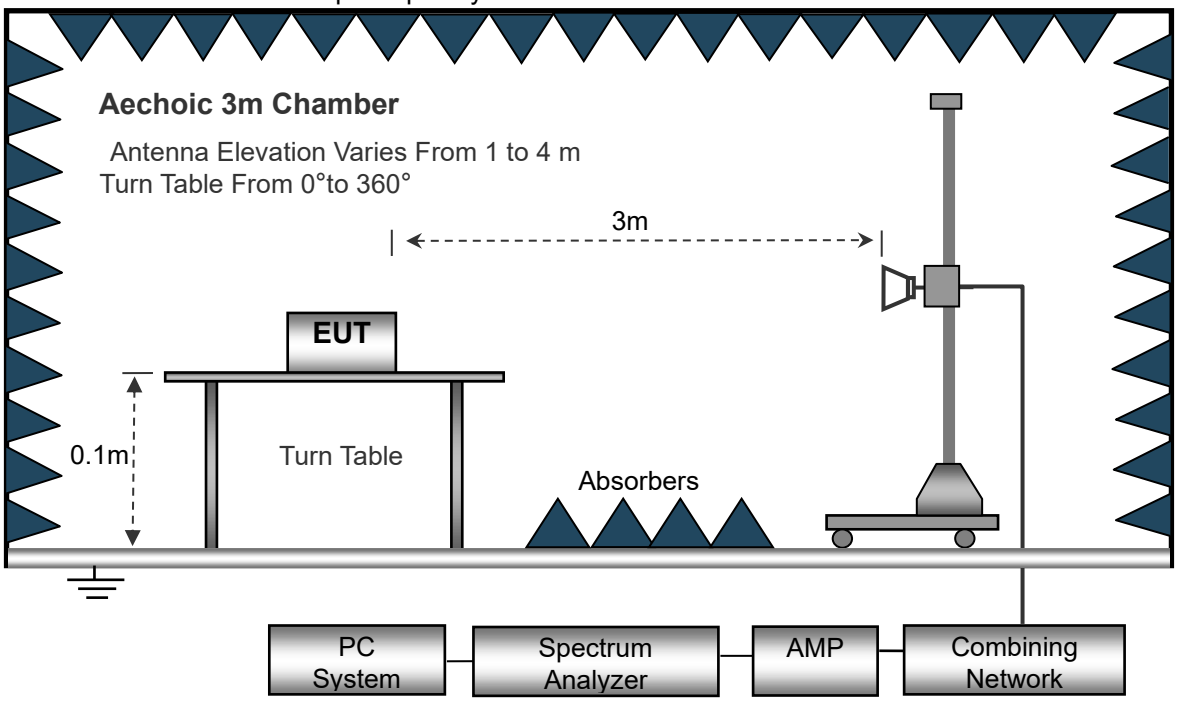
（A）Radiated Emission Test-Up Frequency Below 30MHz



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



（C）Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	20℃	Relative Humidtity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 12V
Test Mode :	Mode 5	Polarization :	--

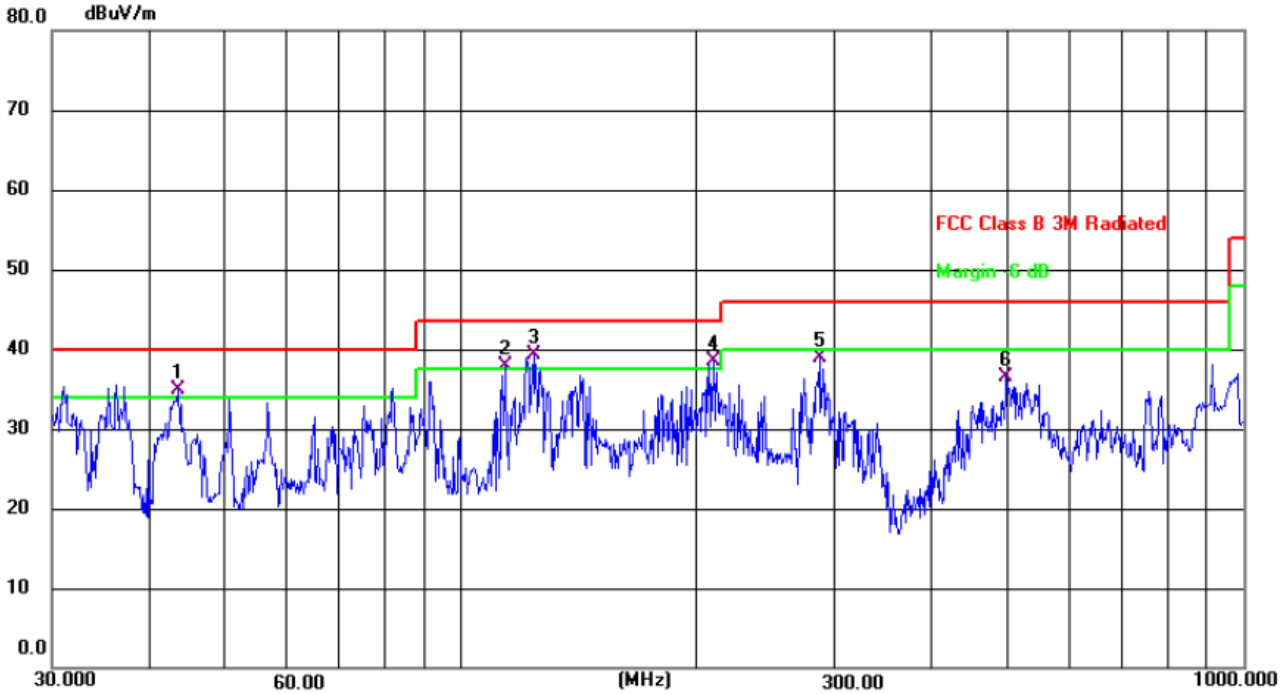
Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 12V		
Test Mode :	Mode 5		



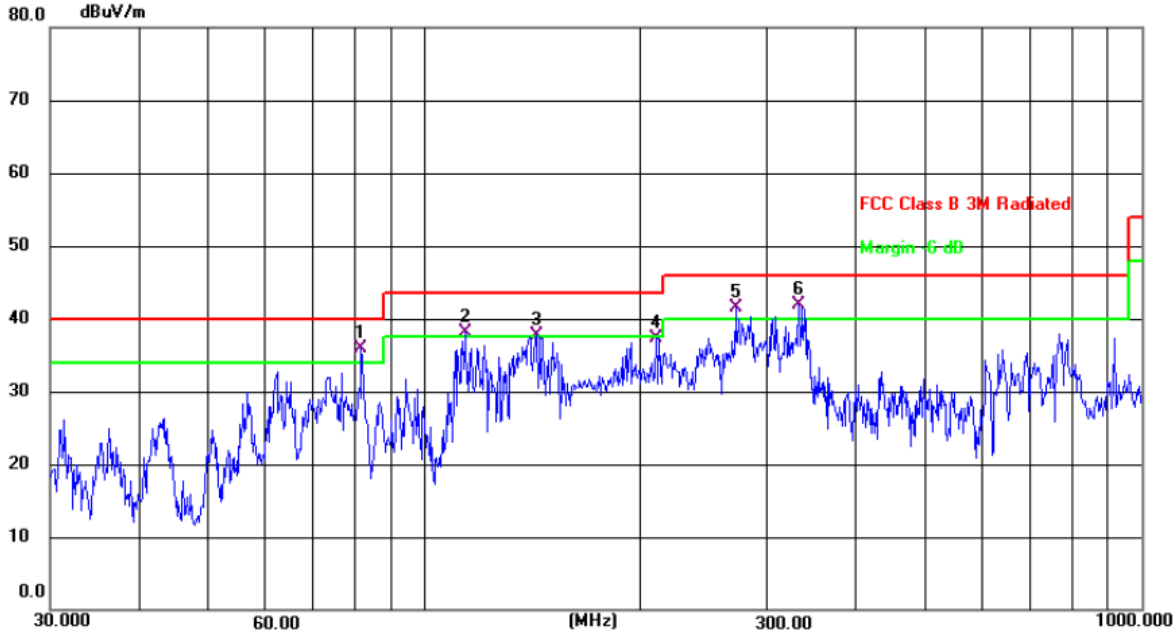
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	!	43.5057	48.50	-13.61	34.89	40.00	-5.11	QP			
2	!	113.7143	54.50	-16.52	37.98	43.50	-5.52	QP			
3	*	123.6984	55.89	-16.67	39.22	43.50	-4.28	QP			
4	!	210.0481	52.91	-14.34	38.57	43.50	-4.93	QP			
5		286.9823	50.58	-11.76	38.82	46.00	-7.18	QP			
6		497.6764	44.07	-7.59	36.48	46.00	-9.52	QP			

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 12V		
Test Mode :	Mode 5		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	!	81.4970	53.29	-17.47	35.82	40.00	-4.18	QP			
2	!	113.7143	54.64	-16.52	38.12	43.50	-5.38	QP			
3	!	143.3260	55.33	-17.55	37.78	43.50	-5.72	QP			
4		210.0481	51.63	-14.34	37.29	43.50	-6.21	QP			
5	!	271.3245	53.65	-12.18	41.47	46.00	-4.53	QP			
6	*	332.5187	52.88	-10.89	41.99	46.00	-4.01	QP			

Remark:

Correct Factor = Cable loss + Antenna factor – Preamplifier;

Level = Reading Level + Correct Factor; Margin = Limit – Level;

3.2.8 TEST RESULTS (1GHZ~25GHZ)

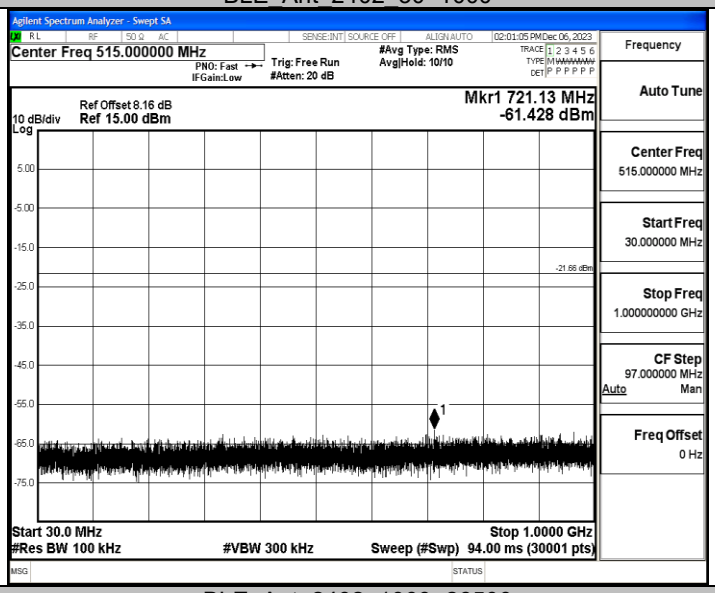
Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	4804.00	63.50	51.74	3.08	31.25	46.09	74	-27.91	PK
V	4804.00	54.12	51.74	3.08	31.25	36.71	54	-17.29	AV
V	7236.00	64.11	49.98	7.16	36.63	57.92	74	-16.08	PK
V	7236.00	52.80	49.98	7.16	36.63	46.61	54	-7.39	AV
V	16087.00	43.48	51.53	11.34	41.52	44.81	74	-29.19	PK
H	4804.00	66.08	51.74	3.08	31.25	48.67	74	-25.33	PK
H	4804.00	58.28	51.74	3.08	31.25	40.87	54	-13.13	AV
H	7236.00	62.92	49.98	7.16	36.63	56.73	74	-17.27	PK
H	7236.00	54.76	49.98	7.16	36.63	48.57	54	-5.43	AV
H	16087.00	47.44	51.53	11.34	41.52	48.77	74	-25.23	PK
operation frequency:2440									
V	4880.00	66.47	51.77	3.03	31.34	49.07	74	-24.93	PK
V	4880.00	59.11	51.77	3.03	31.34	41.71	54	-12.29	AV
V	7311.00	63.61	50.02	7.24	36.63	57.46	74	-16.54	PK
V	7311.00	55.61	50.02	7.24	36.63	49.46	54	-4.54	AV
V	16087.00	46.74	51.53	11.34	41.52	48.07	74	-25.93	PK
H	4880.00	64.84	51.77	3.03	31.34	47.44	74	-26.56	PK
H	4880.00	59.30	51.77	3.03	31.34	41.90	54	-12.10	AV
H	7311.00	65.67	50.02	7.24	36.63	59.52	74	-14.48	PK
H	7311.00	53.14	50.02	7.24	36.63	46.99	54	-7.01	AV
H	16087.00	44.92	51.53	11.34	41.52	46.25	74	-27.75	PK
operation frequency:2480									
V	4960.00	63.25	51.69	3.05	31.39	46.00	74	-28.00	PK
V	4960.00	57.11	51.69	3.05	31.39	39.86	54	-14.14	AV
V	7386.00	65.42	50.11	7.25	36.58	59.14	74	-14.86	PK
V	7386.00	55.54	50.11	7.25	36.58	49.26	54	-4.74	AV
V	16087.00	43.55	51.53	11.34	41.52	44.88	74	-29.12	PK
H	4960.00	65.23	51.69	3.05	31.39	47.98	74	-26.02	PK
H	4960.00	52.03	51.69	3.05	31.39	34.78	54	-19.22	AV
H	7386.00	66.29	50.11	7.25	36.58	60.01	74	-13.99	PK
H	7386.00	54.55	50.11	7.25	36.58	48.27	54	-5.73	AV
H	16087.00	41.15	51.53	11.34	41.52	42.48	74	-31.52	PK

Remark:

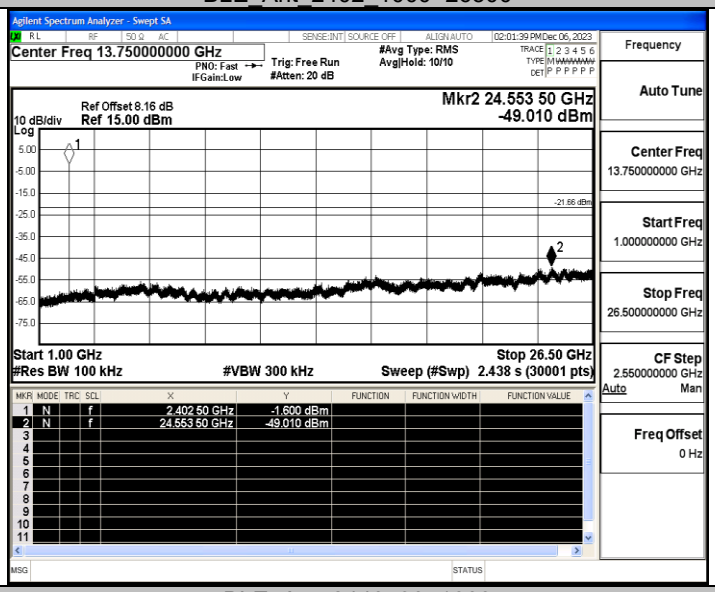
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For Conducted

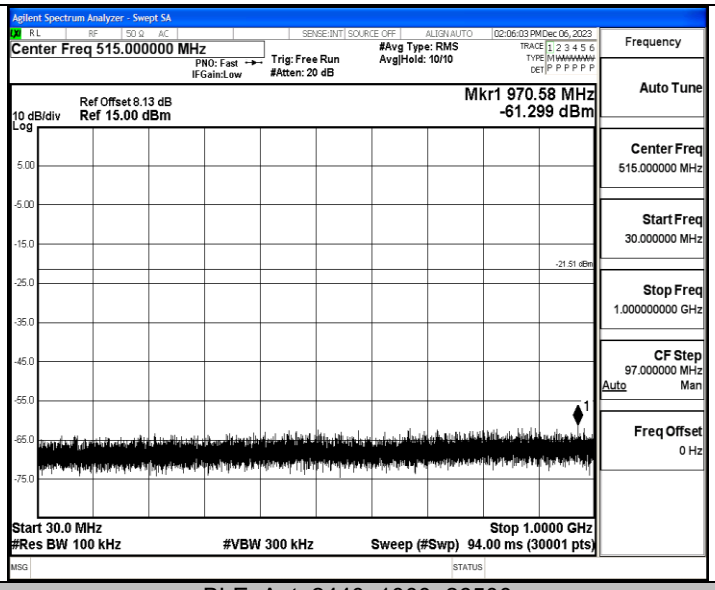
BLE_Ant_2402_30~1000



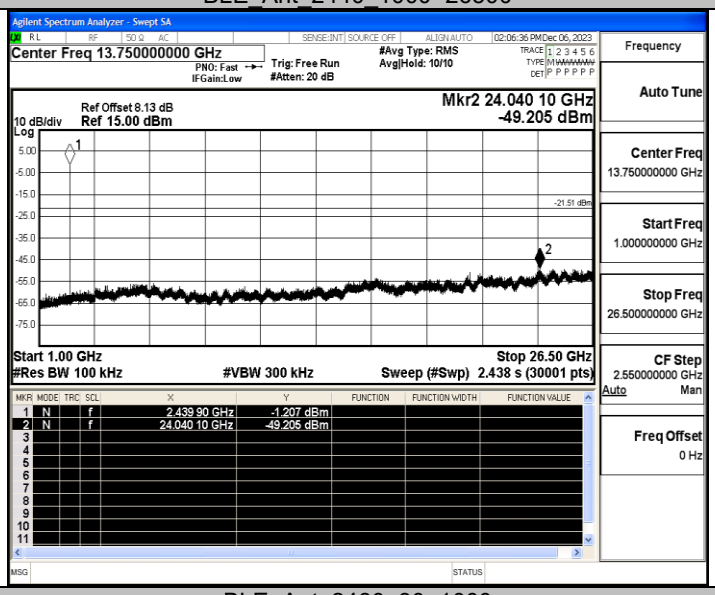
BLE_Ant_2402_1000~26500



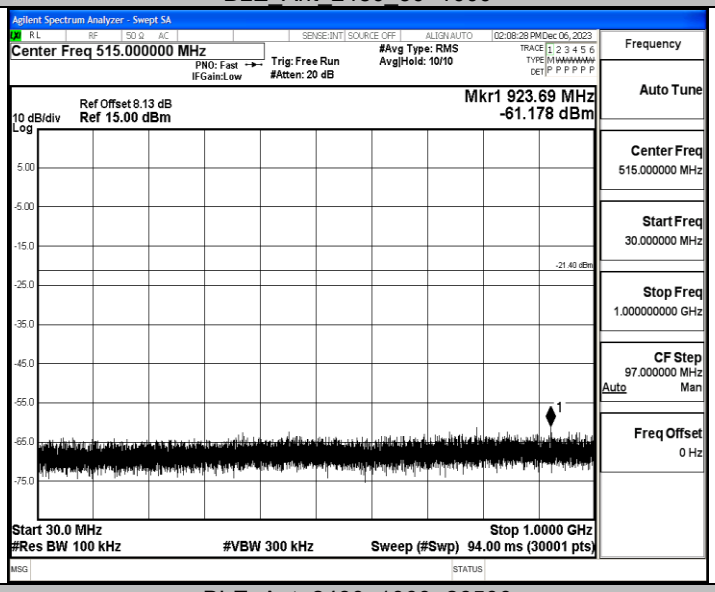
BLE_Ant_2440_30~1000



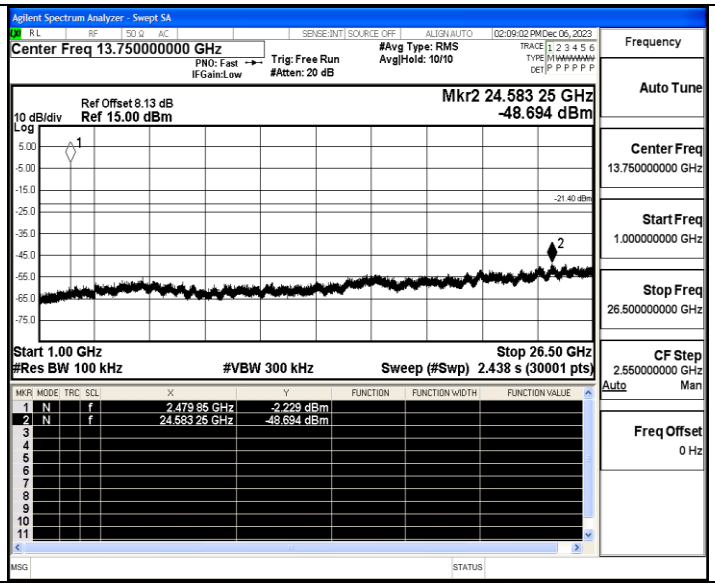
BLE_Ant_2440_1000~26500



BLE_Ant_2480_30~1000



BLE_Ant_2480_1000~26500


Agilent Spectrum Analyzer - Swept SA
Center Freq 13.750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
02:09:02 PM Dec 06, 2023
Ref Offset 8.13 dB
10 dB/div Ref 15.00 dBm
Log
Mkr2 24.583 25 GHz
-48.694 dBm
-21.40 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep (#Swp) 2.438 s (30001 pts)
1 N f 2.479 85 GHz -2.229 dBm
2 N f 24.583 25 GHz -48.694 dBm
Frequency
Auto Tune
Center Freq
13.750000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
2.550000000 GHz
Auto Man
Freq Offset
0 Hz

3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter 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 and the rota 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.

g. Test the EUT in the lowest channel,the Highest channel

Note:

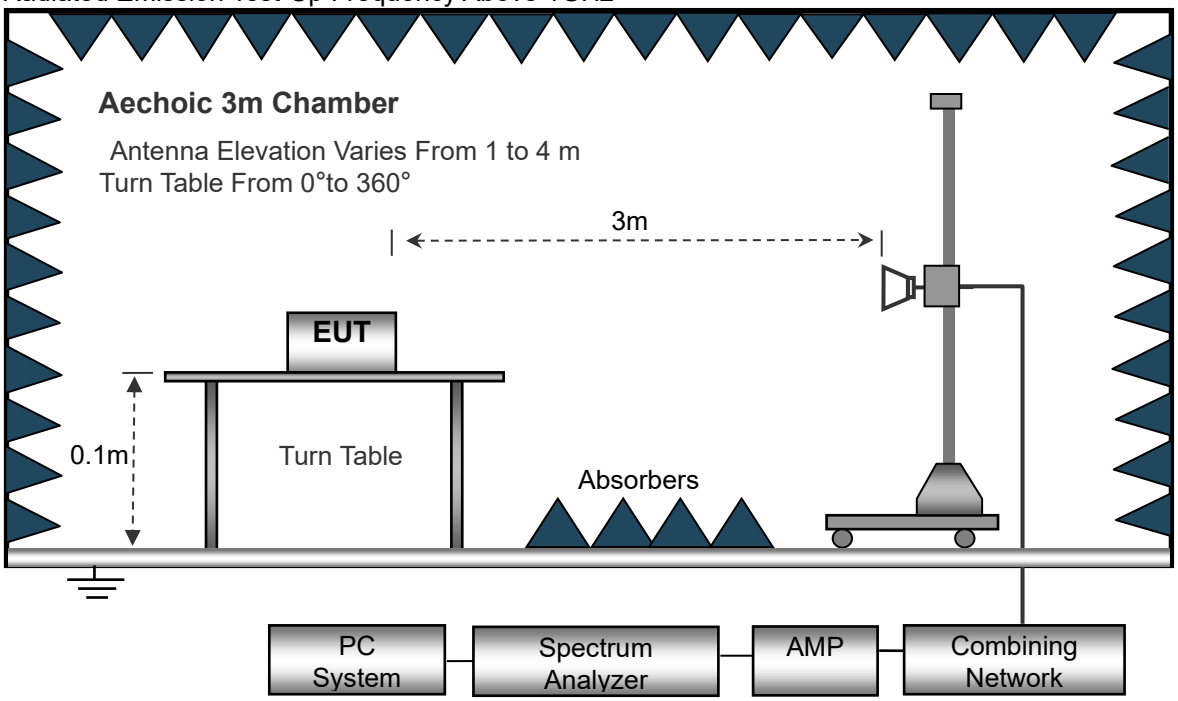
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.6 TEST RESULT

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	2390.00	74.63	52.12	2.73	27.38	52.62	74	-21.38	PK
V	2390.00	66.14	52.12	2.73	27.38	44.13	54	-9.87	AV
V	2400.00	76.95	52.16	2.78	27.41	54.98	74	-19.02	PK
V	2400.00	63.80	52.16	2.78	27.41	41.83	54	-12.17	AV
H	2390.00	74.96	52.12	2.73	27.38	52.95	74	-21.05	PK
H	2390.00	62.34	52.12	2.73	27.38	40.33	54	-13.67	AV
H	2400.00	74.96	52.16	2.78	27.41	52.99	74	-21.01	PK
H	2400.00	64.73	52.16	2.78	27.41	42.76	54	-11.24	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2480									
V	2483.50	74.71	52.23	2.86	27.44	52.78	74	-21.22	PK
V	2483.50	62.33	52.23	2.86	27.44	40.40	54	-13.60	AV
V	2500.00	75.97	52.26	2.88	27.49	54.08	74	-19.92	PK
V	2500.00	65.33	52.26	2.88	27.49	43.44	54	-10.56	AV
H	2483.50	75.07	52.23	2.86	27.44	53.14	74	-20.86	PK
H	2483.50	66.37	52.23	2.86	27.44	44.44	54	-9.56	AV
H	2500.00	74.34	52.26	2.88	27.49	52.45	74	-21.55	PK
H	2500.00	65.11	52.26	2.88	27.49	43.22	54	-10.78	AV

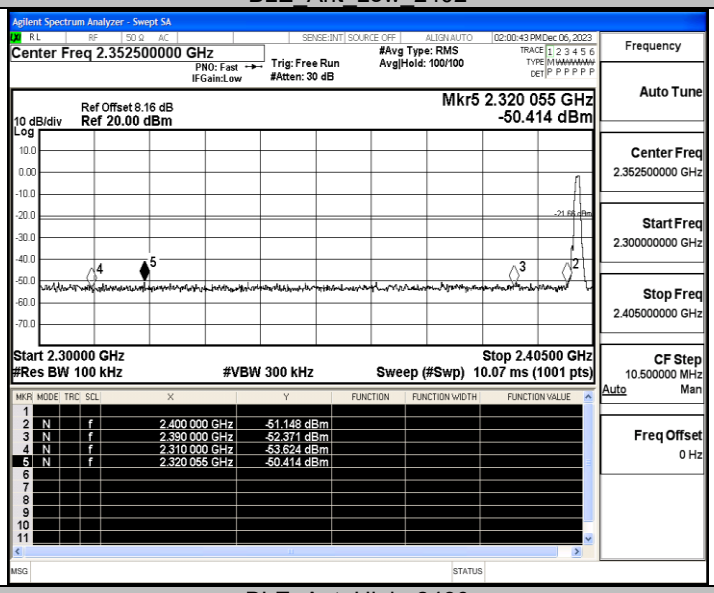
Remark:

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

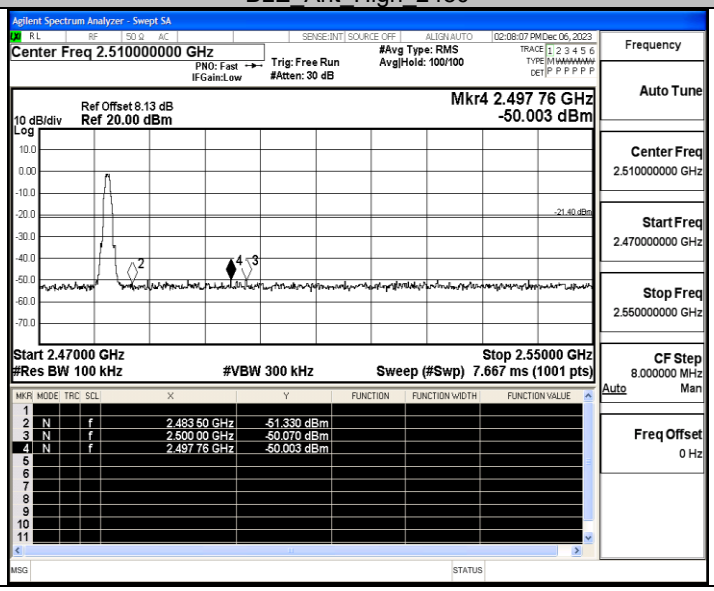
For Conducted

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE	Ant	Low	2402	-1.66	-50.41	≤-21.66	PASS
		High	2480	-1.40	-50	≤-21.4	PASS

BLE_Ant_Low_2402



BLE_Ant_High_2480



4. PEAK OUTPUT POWER

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

4.1.1 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW > the 20 dB bandwidth of the emission being measured

Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel

VBW ≥ RBW

Sweep = auto

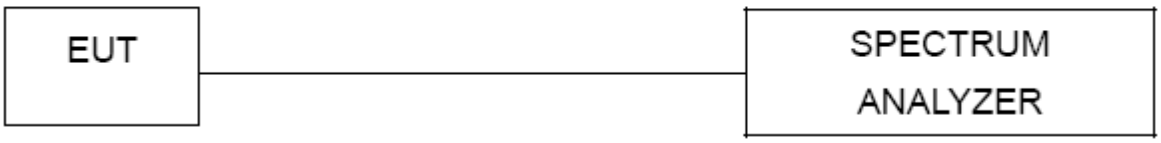
Detector function = peak

Trace = max hold

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION CONDITIONS

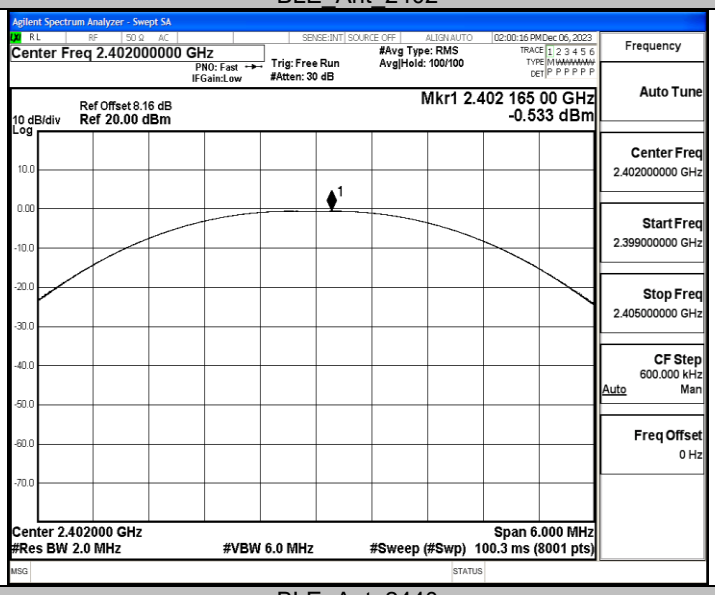
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

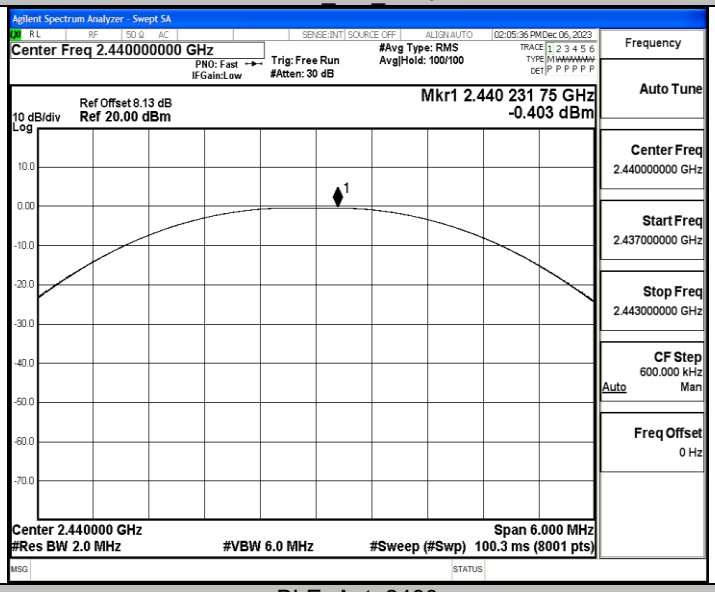
Temperature:	25 ℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage :	DC 12V

Test Channel	Peak Output Power (dBm)	LIMIT (dBm)
Low	-0.53	30.00
Moddle	-0.4	30.00
High	-0.31	30.00

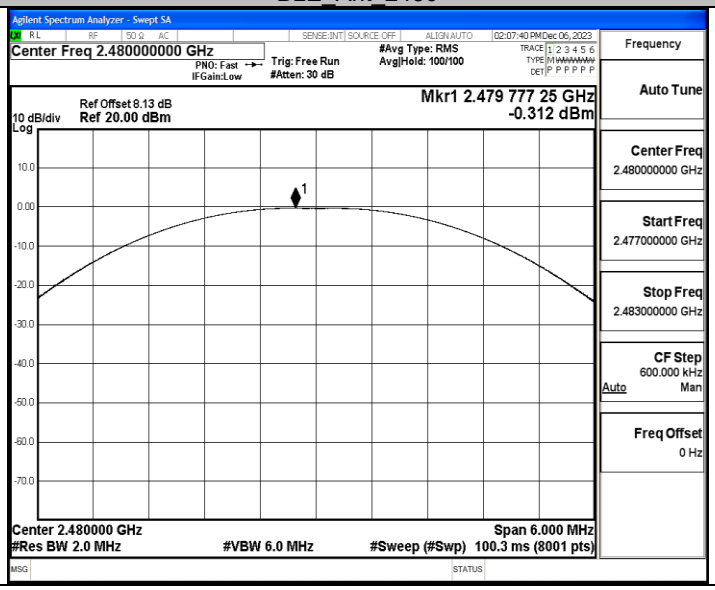
BLE_Ant_2402



BLE_Ant_2440



BLE_Ant_2480



5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 3kHz
VB	VBW ≥ 3RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

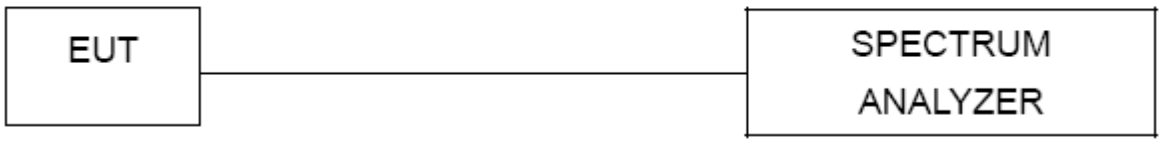
5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



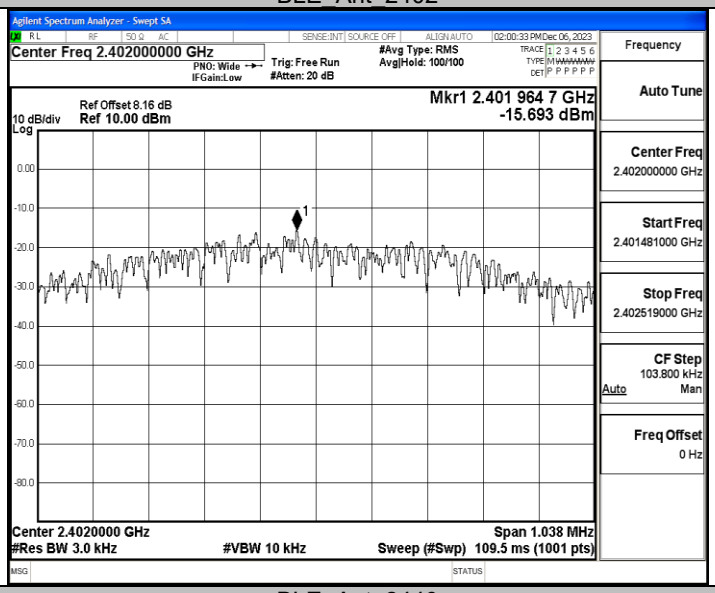
5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

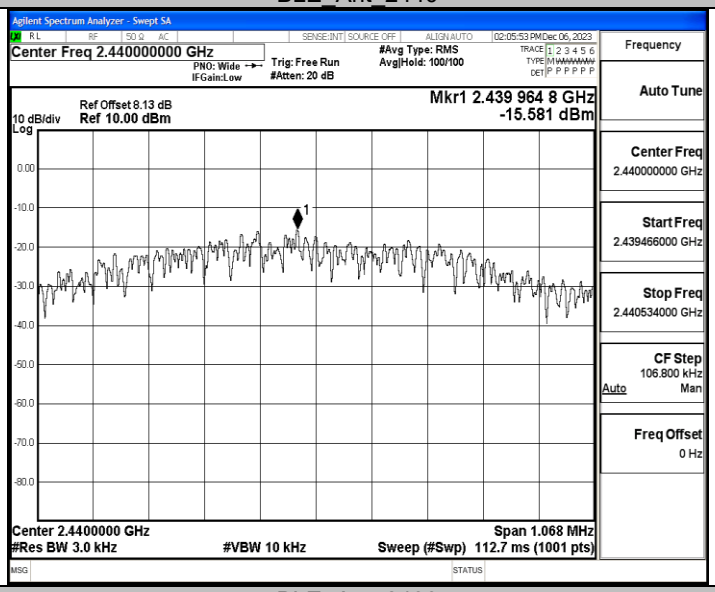
5.1.5 TEST RESULTS

Test Channel	Reading Level (dBm)	Limit(dBm)	Result
Low	-15.69	8	PASS
Moddle	-15.58	8	PASS
High	-15.59	8	PASS

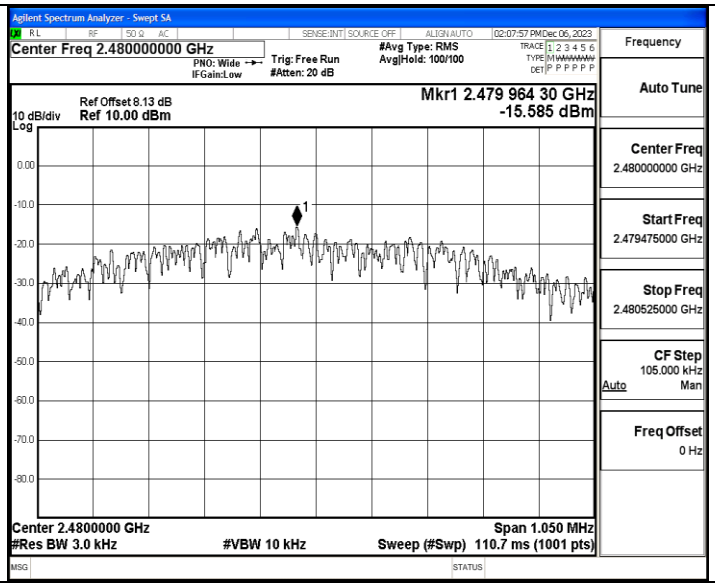
BLE_Ant_2402



BLE_Ant_2440



BLE_Ant_2480


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 100/100
02:07:57 PM Dec 06, 2023
Frequency
Auto Tune
Ref Offset 8.13 dB
10 dB/div Ref 10.00 dBm
Log
Mkr1 2.479 964 30 GHz
-15.585 dBm
Center Freq
2.480000000 GHz
Start Freq
2.479475000 GHz
Stop Freq
2.480525000 GHz
CF Step
105.000 kHz
Auto Man
Freq Offset
0 Hz
Center 2.4800000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.050 MHz
Sweep (#Swp) 110.7 ms (1001 pts)

6. 6DB BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range(MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

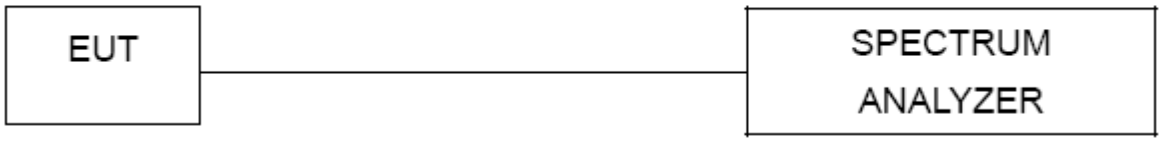
6.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥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 frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



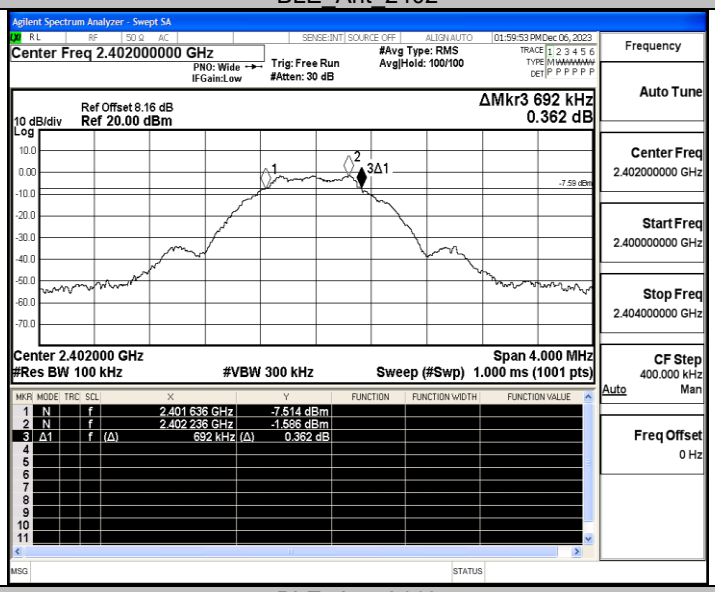
6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

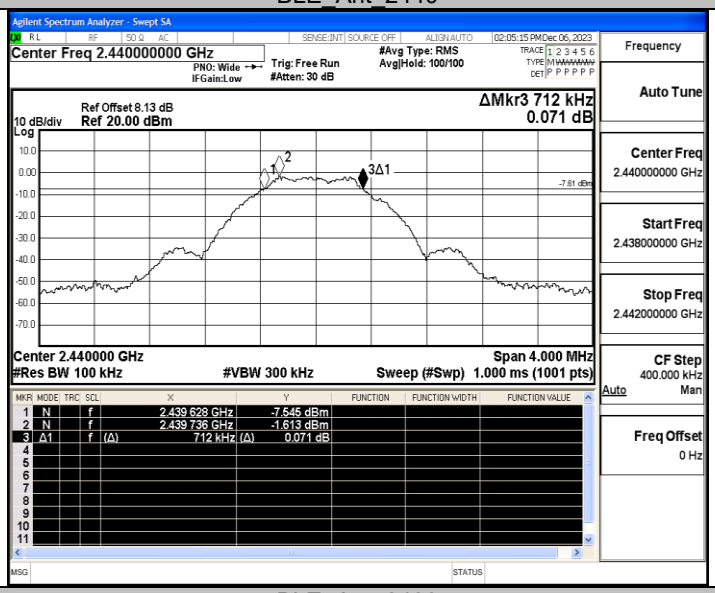
6.1.5 TEST RESULTS

Test Channel	6dB Bandwidth (MHz)	Limit (MHz)	Result
Low	0.692	0.5	Pass
Middle	0.712	0.5	Pass
High	0.700	0.5	Pass

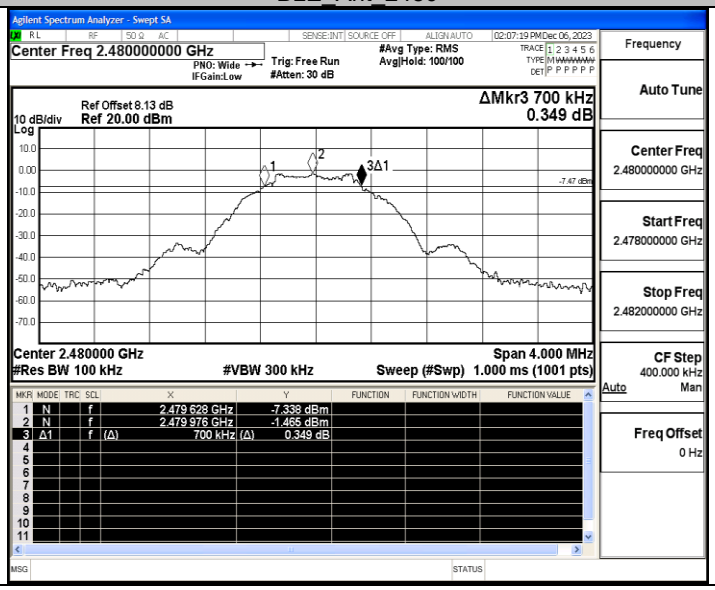
BLE_Ant_2402



BLE_Ant_2440



BLE_Ant_2480



6.1.6. ANTENNA REQUIREMENT

6.2 STANDARD REQUIREMENT

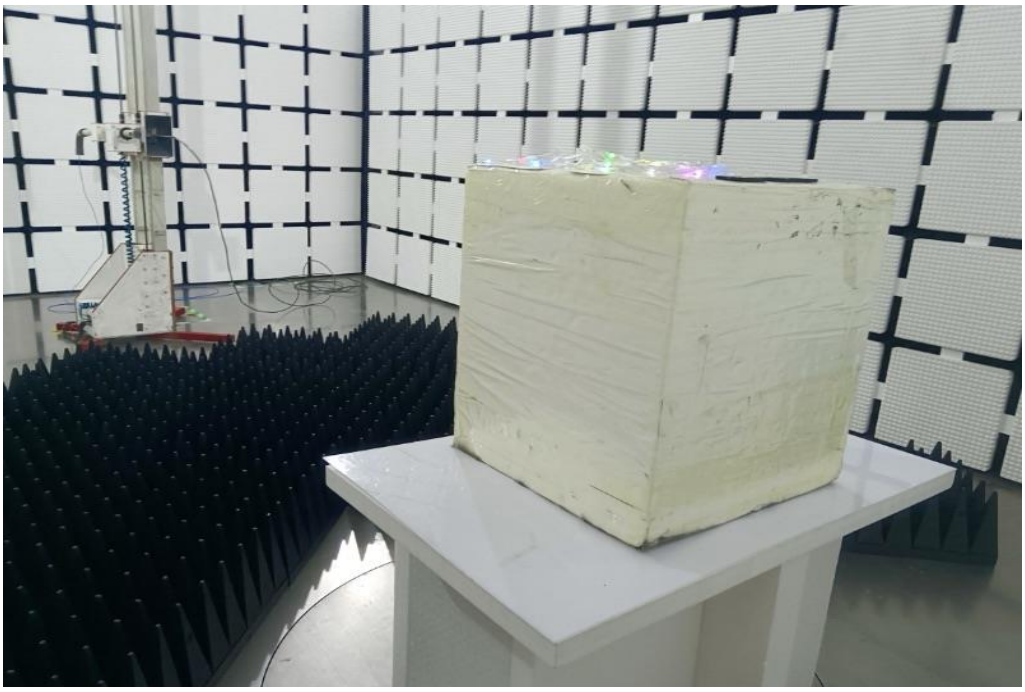
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

6.3 EUT ANTENNA

The EUT antenna is internal antenna and maximum antenna gain is 1.90 dBi,. It comply with the standard requirement.

7. TEST SEUUP PHOTO

Radiated Measurement Photos



Conducted Measurement Photos

8. EUT PHOTO

Fig. 1

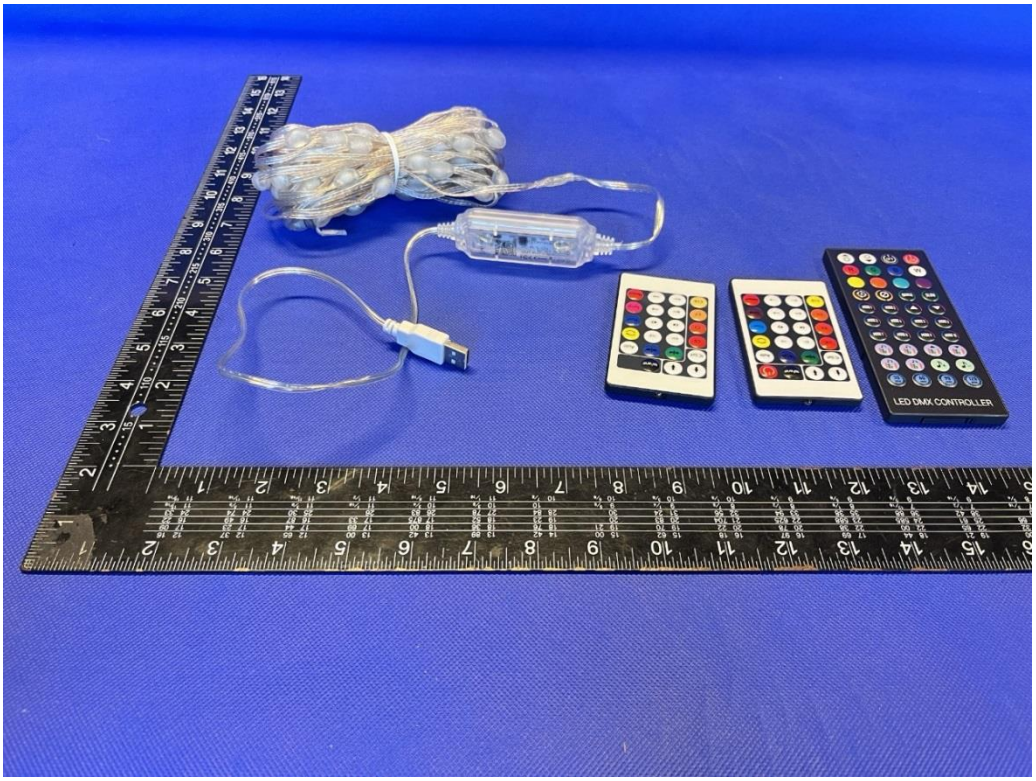


Fig. 2

Fig. 3

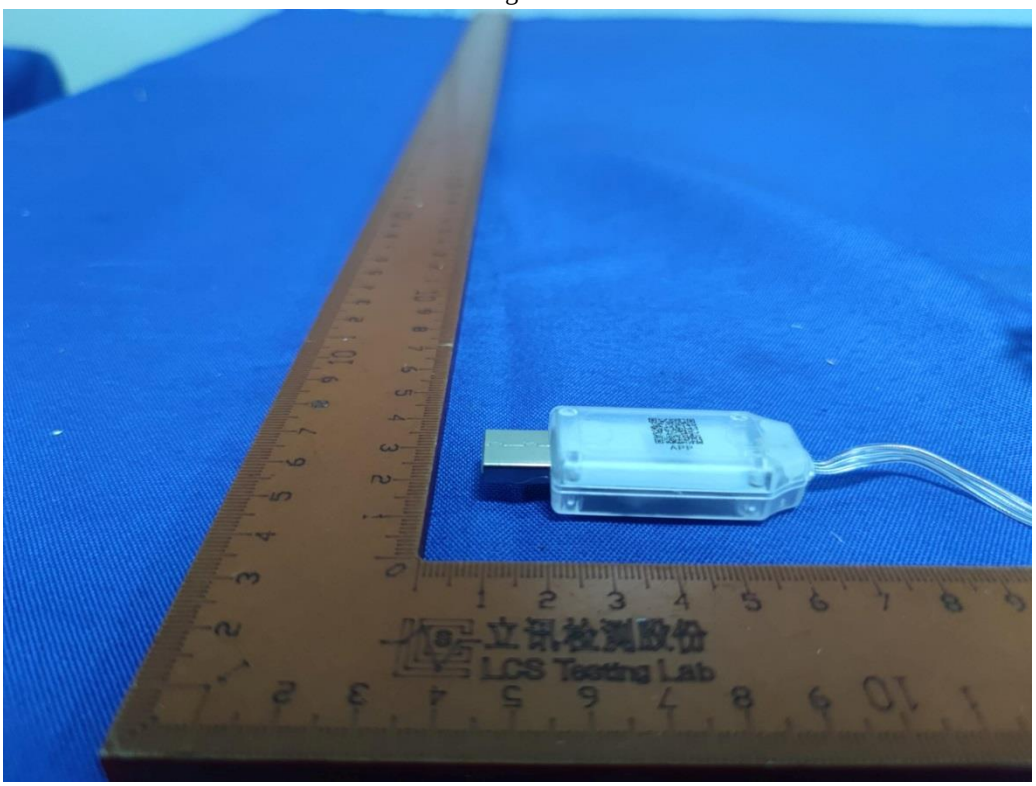


Fig. 4

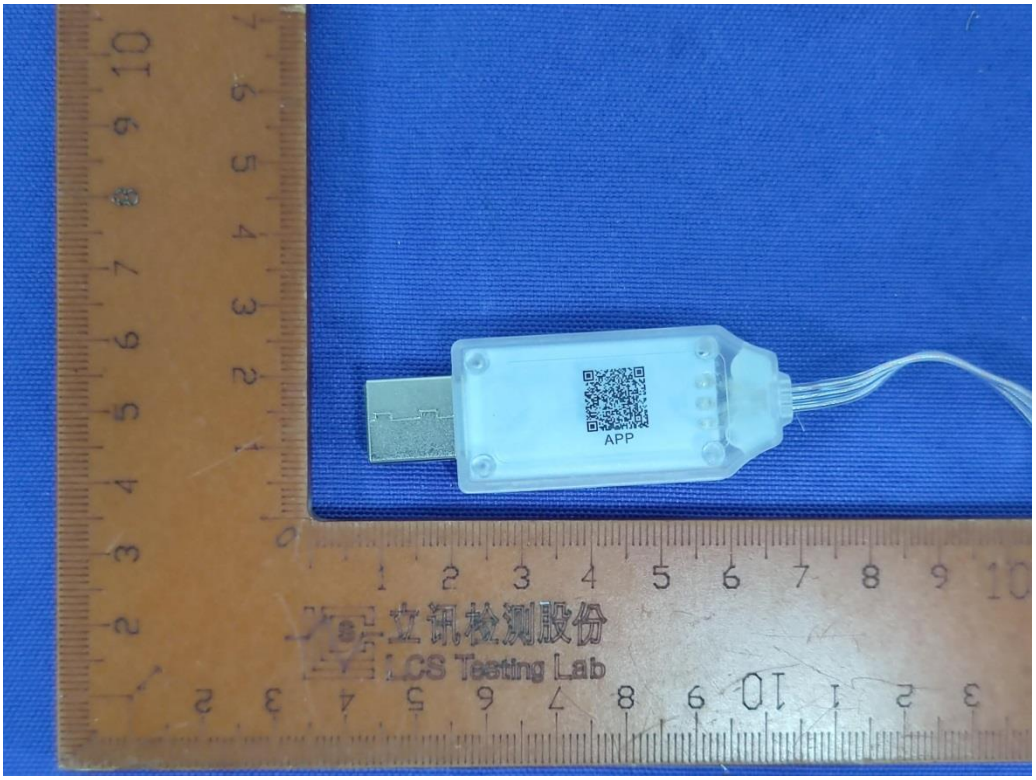


Fig. 5

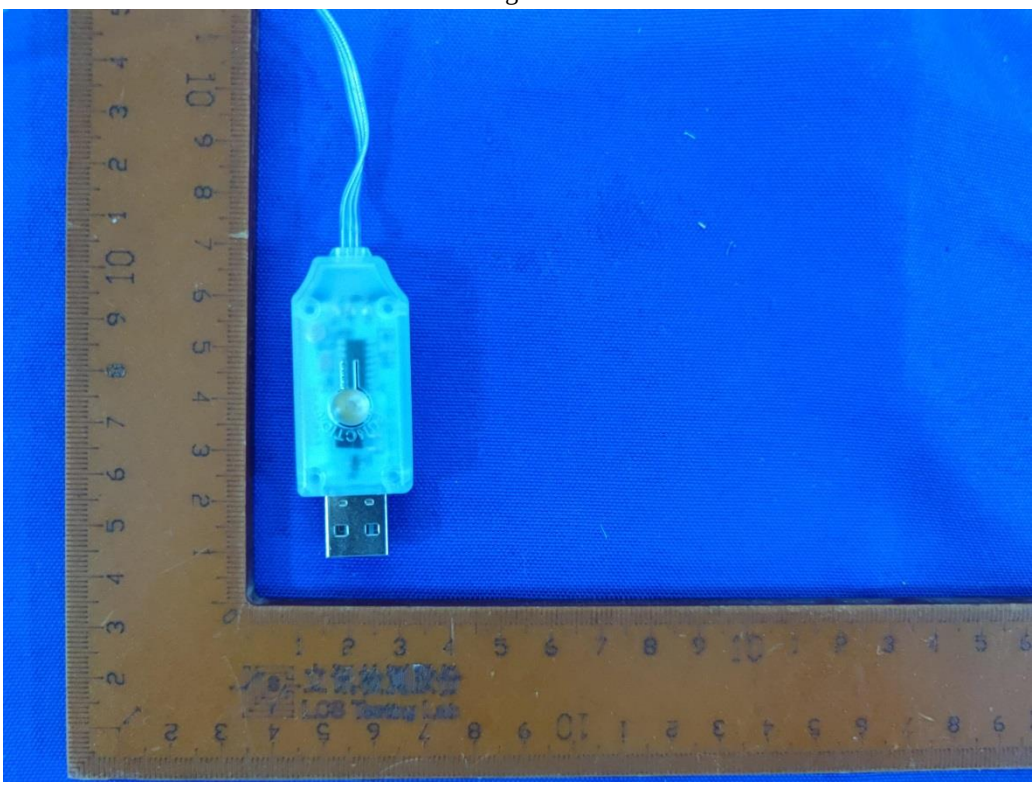


Fig. 6

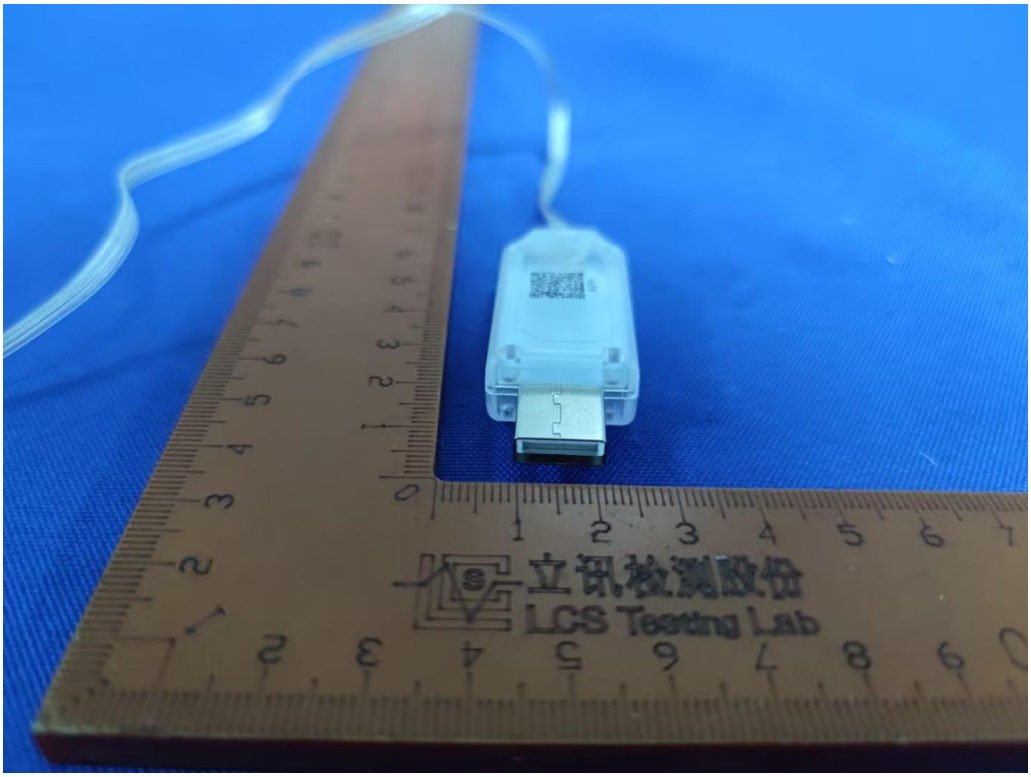


Fig. 7

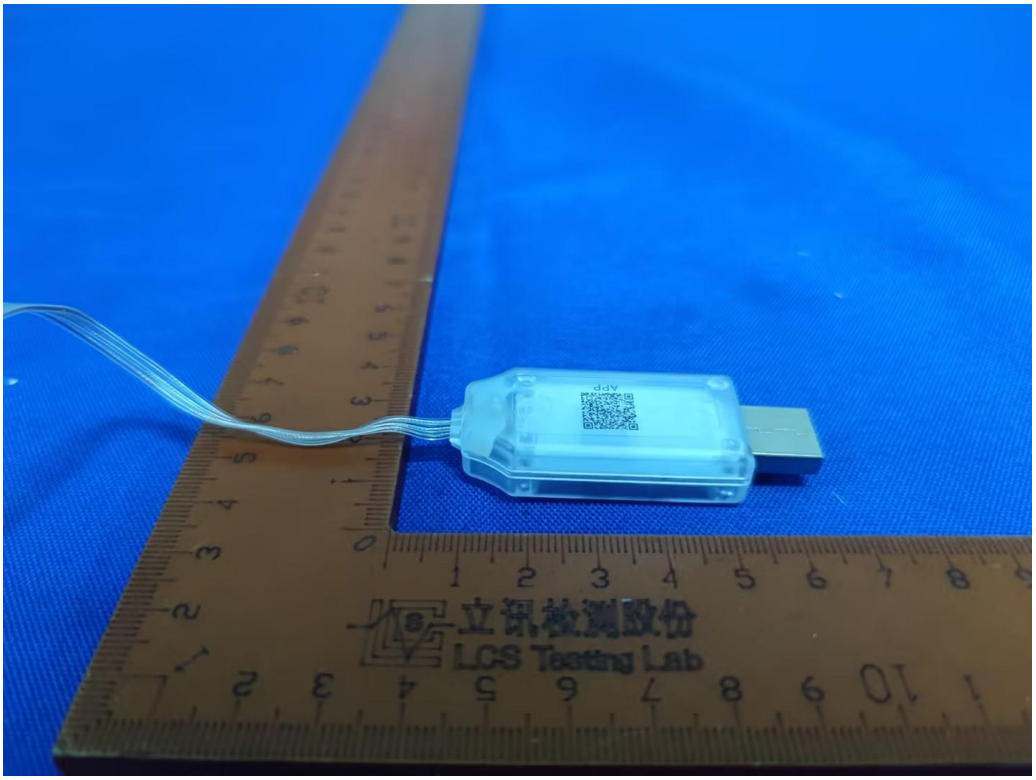


Fig. 8

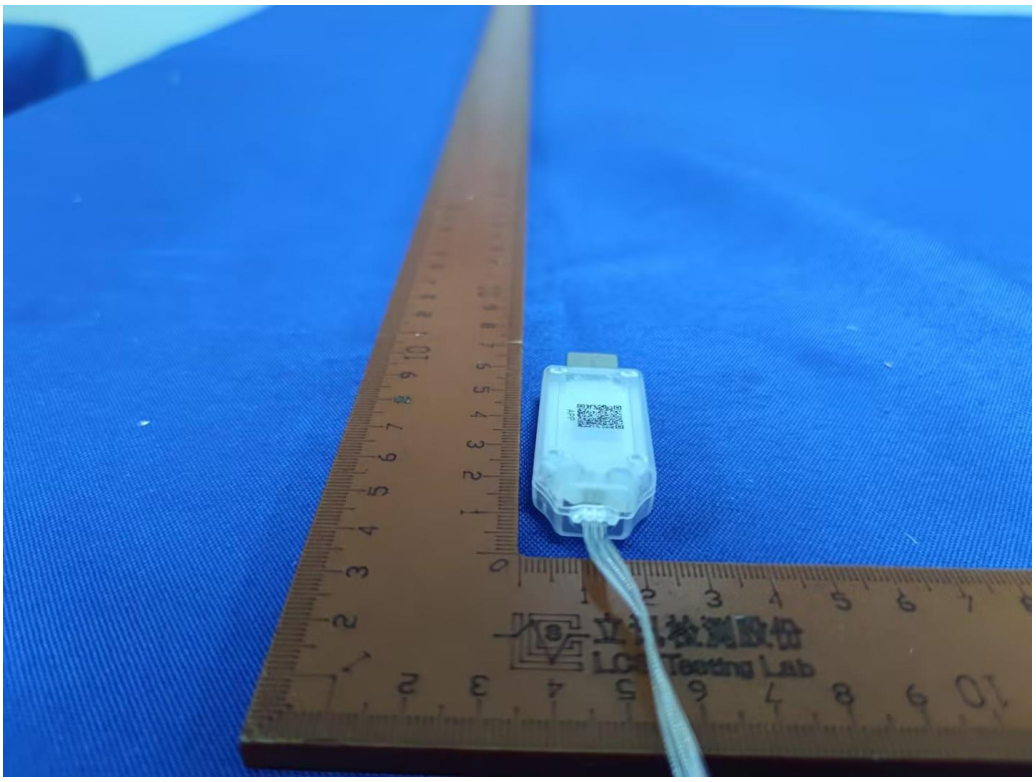


Fig. 9

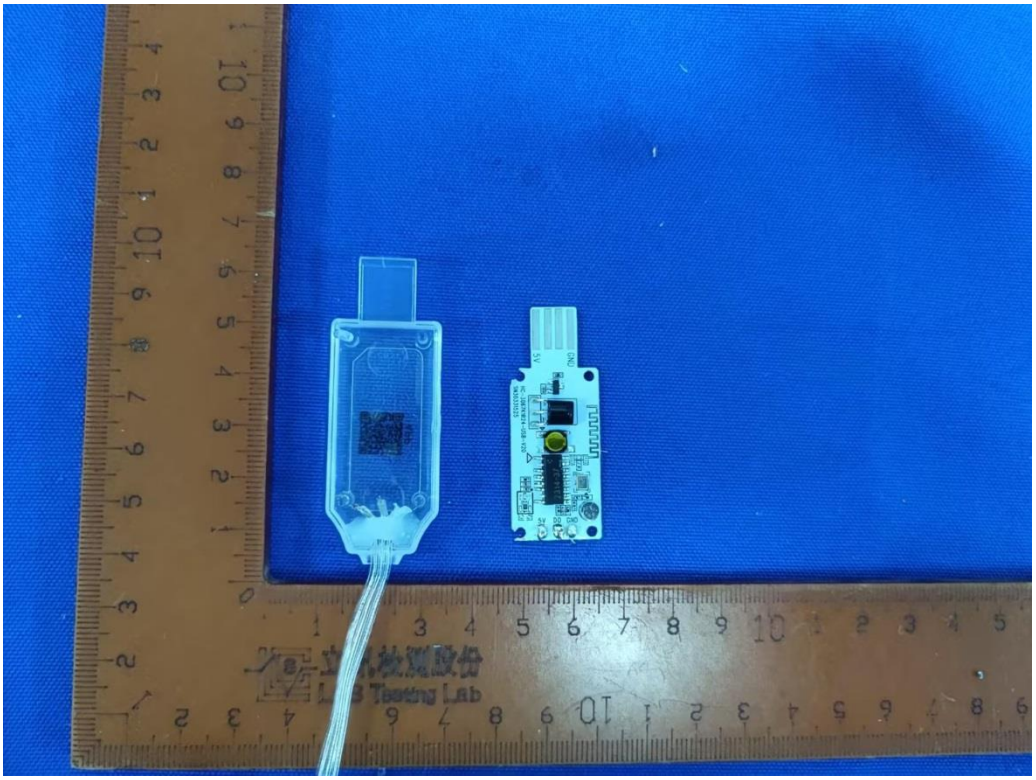


Fig. 10

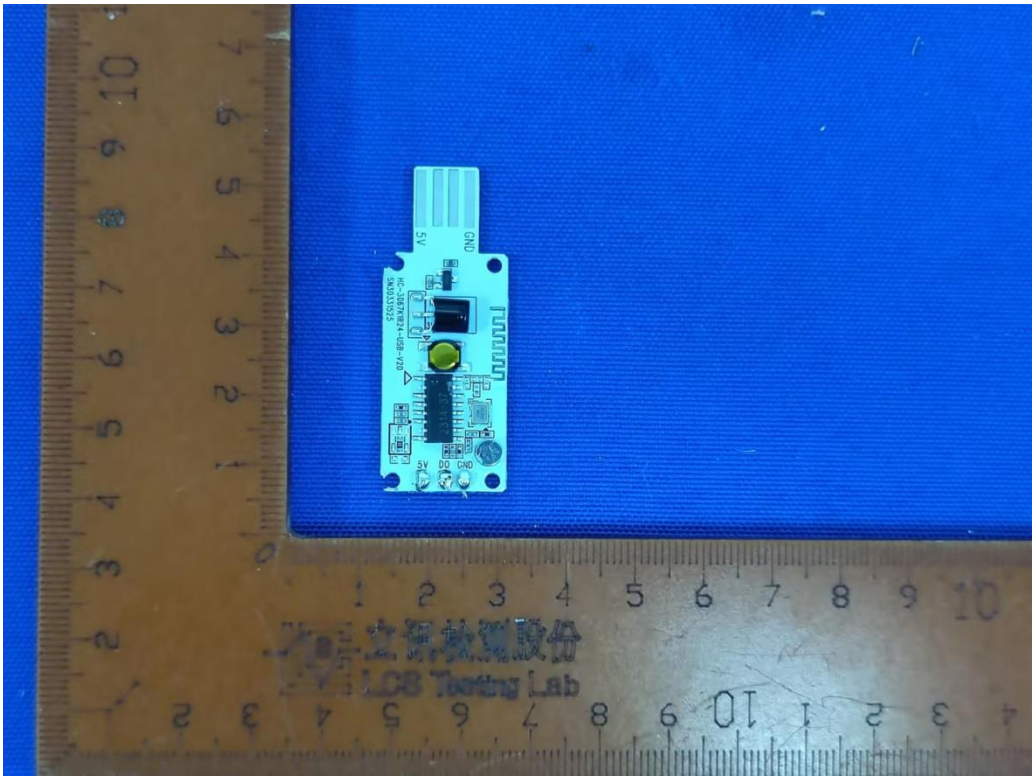


Fig. 11

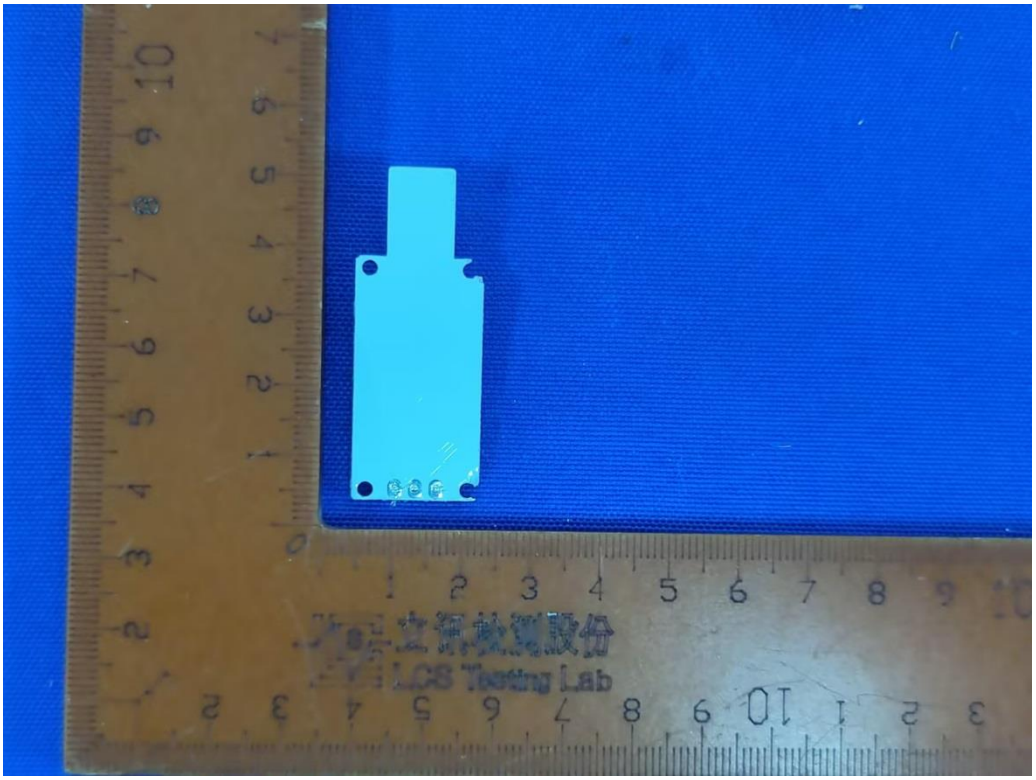


Fig. 12

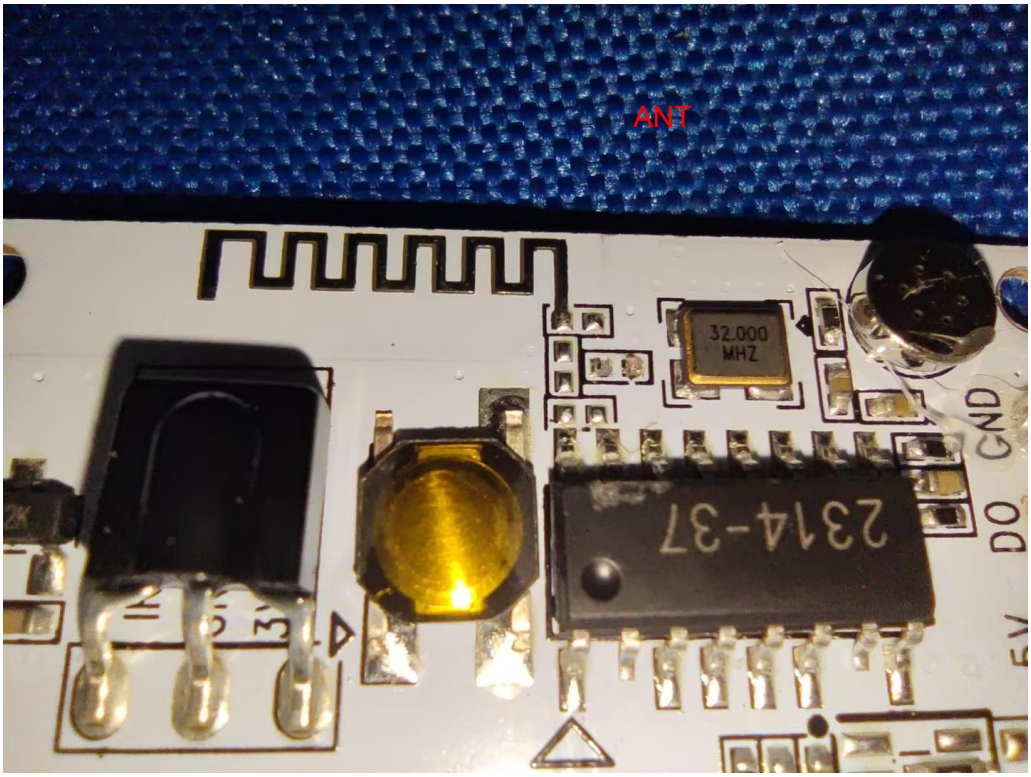


Fig. 13

※※※※※ **END OF REPORT** ※※※※※