FCC TEST REPORT

FCC ID: 2BF38-012-2402

Product	:	**Projection lamp**
Model Name	:	**012-2402, 012-2308, 012-2081, XB-7701, XB-7702, XB-7703, XB-7705, XB-7706, XB-7707, XB-7708, XB-7709, XB-7710, XB-7711, XB-7712, XB-7713, XB-7715, XB-7716, XB-7717, XB-7718, XB-7719, XB-7720**
Brand	:	**N/A**
Report No.	:	**NCT24017532E**

Prepared for

ShanTou City XingBao Technology Co., Ltd.

No.2, Building 60, Huachunyuan, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant's name	:	ShanTou City XingBao Technology Co., Ltd.
Address	:	No.2, Building 60, Huachunyuan, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China
Manufacture's name	:	ShanTou City XingBao Technology Co., Ltd.
Address	:	No.2, Building 60, Huachunyuan, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China
Product name	:	Projection lamp
Model name	:	012-2402, 012-2308, 012-2081, XB-7701, XB-7702, XB-7703, XB-7705, XB-7706, XB-7707, XB-7708, XB-7709, XB-7710, XB-7711, XB-7712, XB-7713, XB-7715, XB-7716, XB-7717, XB-7718, XB-7719, XB-7720
Standards	:	FCC CFR47 Part 15 Section 15.249
Test procedure	:	ANSI C63.10:2013
Date of Receipt	:	Apr. 23, 2024
Test Date	:	Apr. 23, 2024 - May. 06, 2024
Date of Issue	:	May. 06, 2024

This device described above has been tested by NCT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

Keven Wu / Engineer

Technical Manager:

Henry Wang / Manager

Shenzhen NCT Testing Technology Co., Ltd. 2008

Contents

Page

1 TEST RESULT CERTIFICATION **2**

2 TEST SUMMARY **5**

2.1 TEST SITE 6

3 GENERAL INFORMATION **7**

3.1 GENERAL DESCRIPTION OF E.U.T. 7

3.2 CHANNEL LIST 8

3.3 TEST SETUP CONFIGURATION 9

3.4 TEST MODE 10

4 EQUIPMENT DURING TEST **11**

4.1 EQUIPMENTS LIST 11

4.2 MEASUREMENT UNCERTAINTY 13

4.3 DESCRIPTION OF SUPPORT UNITS 13

5 CONDUCTED EMISSION **14**

5.1 E.U.T. OPERATION 14

5.2 EUT SETUP 14

5.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 15

5.4 MEASUREMENT PROCEDURE 15

5.5 CONDUCTED EMISSION LIMIT 15

5.6 MEASUREMENT DESCRIPTION 15

5.7 CONDUCTED EMISSION TEST RESULT 15

6 RADIATED SPURIOUS EMISSIONS **20**

6.1 EUT OPERATION 20

6.2 TEST SETUP 21

6.3 SPECTRUM ANALYZER SETUP 22

6.4 TEST PROCEDURE 23

6.5 SUMMARY OF TEST RESULTS 25
7 BANDWIDTH MEASUREMENT 36
7.1 TEST PROCEDURE 36
7.2 TEST RESULT 36
8 ANTENNA APPLICATION 42
8.1 ANTENNA REQUIREMENT 42
8.2 RESULT 42
9 TEST SETUP 43

2 Test Summary

Test Items	Test Requirement	Result
15.207	Conducted Emission	PASS
15.249(c)	Fundamental &Radiated Spurious Emission Measurement	PASS
15.205	Band Edge Emission	PASS
15.215	20dB Bandwidth	PASS
15.203	Antenna Requirement	PASS

Remark:

1. The EUT is powered by full-charged battery during the test.

2.1 Test Site

Site Description

EMC Lab. : Accredited by CNAS, 2022-09-27

The certificate is valid until 2028.01.07

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L8251

Designation Number: CN1347

Test Firm Registration Number: 894804

Accredited by A2LA, June 14, 2023

The Certificate Registration Number is 6837.01

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0150

Name of Firm : Shenzhen NCT Testing Technology Co., Ltd.

Site Location : A101&B2, Fuqiao 6th Area , Xintian Community, Fuhai Street,

Baoan District, Shenzhen, China

3 General Information

3.1 General Description of E.U.T.

Product Name	:	Projection lamp
Model Name	:	012-2402
Sample ID	:	NCT24017532#
Sample(s) Status:	:	Engineering Sample
Series Model	:	012-2308, 012-2081, XB-7701, XB-7702, XB-7703, XB-7705, XB-7706, XB-7707, XB-7708, XB-7709, XB-7710, XB-7711, XB-7712, XB-7713, XB-7715, XB-7716, XB-7717, XB-7718, XB-7719, XB-7720
Model Different.:	:	All models only model name and appearance color was different.
Operating frequency	:	2402-2480MHz
Number of Channels	:	40 channels For BLE 78 channels For EDR+BR
Type of Modulation	:	BLE: GFSK EDR+BR: GFSK, Π/4 DQPSK
Antenna installation	:	PCB Antenna
Antenna Gain	:	1.55 dBi
Power supply	:	DC 5V from Adapter
Hardware Version	:	N/A
Software Version	:	N/A
Remark:the Antenna gain is provided by customer from Antenna spec. and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.		

3.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The details of test channels and bandwidth were for RF conductive measurement.

BLE Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	**2402**	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	**19**	**2440**	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	**2480**
12	2426	26	2454		
13	2428	27	2456		

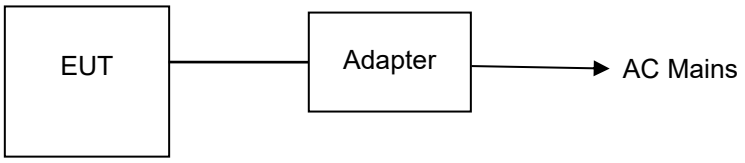
EDR+BR Channel List:

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	**2402**	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	**2441**	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	**2480**
25	2427	52	2454		
26	2428	53	2455		

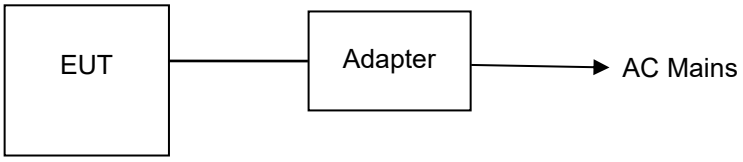
Note:
1. Test of channel was included the lowest, middle and highest frequency in highest data rate and to perform the test, then record on this report.

3.3 Test Setup Configuration

Conducted Emission



Radiated Emission



3.4 Test Mode

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 for BLE
	GFSK
Mode 1	2402MHz
Mode 2	2440MHz
Mode 3	2480MHz
Pretest Mode	Description for EDR+BR
	GFSK
Mode 4	2402MHz
Mode 5	2441MHz
Mode 6	2480MHz
Pretest Mode	Description for EDR+BR
	Π/4 DQPSK
Mode 7	2402MHz
Mode 8	2441MHz
Mode 9	2480MHz

4 Equipment During Test

4.1 Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	944 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESPI	101604	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	ENV 216	102796	Rohde & Schwarz	2023/6/21	2024/6/20
LISN	VN1-13S	004023	CRANAGE	2023/6/21	2024/6/20
Cable	RG223-1500MM	NA	RG	2023/6/21	2024/6/20

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2022/5/31	2025/5/30
EMI Test Receiver	ESCI	101178	Rohde & Schwarz	2023/6/21	2024/6/20
Amplifi （30MHz-1GHz）	BBV 9743 B	00374	SCHNWARZBECK	2023/6/21	2024/6/20
Bilog Antenna （30MHz-1GHz）	VULB9162	00473	SCHNWARZBECK	2023/3/19	2025/3/18
Horn antenna （1GHz-18GHz）	BBHA 9120 D	02622	SCHNWARZBECK	2023/3/19	2025/3/18
Pream plifier （1GHz-18GHz）	BBV 9718D	0024	SCHNWARZBECK	2023/6/21	2024/6/20
Spectrum Analyze （10Hz-40GHz）	FSV 40	100952	Rohde & Schwarz	2023/6/21	2024/6/20
Pream plifier （18GHz-40GHz）	BBV 9721	0056	SCHNWARZBECK	2023/6/21	2024/6/20
Double Ridge Guide Horn Antenna （18GHz-40GHz）	SAS-574	588	A.H.System	2023/3/19	2025/3/18
Loop Antenna (9KHz-30MHz)	FMZB 1513-60	00115	SCHNWARZBECK	2023/6/21	2024/6/20
Amplifier (9KHz-30MHz)	CVP 9222 C BBV 9745	00109	CHNWARZBECK	2023/6/21	2024/6/20
MXG Signal Analyzer	N9020A	MY50510202	Agilent	2023/6/21	2024/6/20

Comprehensive tester	CWM500	104995	Rohde & Schwarz	2023/6/21	2024/6/20
MXG Vector Signal Generator	N5182A	MY50140020	Agilent	2023/6/21	2024/6/20
MXG Analog Signal Generator	N5181A	MY47420919	Agilent	2023/6/21	2024/6/20
Power Sensor	TR1029-2	512364	Techoy	2023/6/21	2024/6/20
RF Swith	TR1029-1	512364	Techoy	2023/6/21	2024/6/20
Cable	DA800-4000MM	NA	DA	2023/6/21	2024/6/20
Cable	DA800-11000MM	NA	DA	2023/6/21	2024/6/20

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	AUDIX	e3	6.120718
2	EMC radiation test system	AUDIX	e3	6.120718
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

Peak Output Power Test Equipment

Peak Output Power					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Power Meter	E4419B	230480	Agilent	2023/6/21	2024/6/20
RF Cable	MWX322	MY50510202	1305G006	2023/6/21	2024/6/20
10dB Attenuator	2AS102-K10S3	N/A	Rosenberger	2023/6/21	2024/6/20

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10^{-6}
Bandwidth	± 1.5 x 10^{-6}
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	

4.3 Description of Support Units

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	Mfr/Brand	Model/Type No.	Series No.	Note
1	Projection lamp	N/A	012-2402	N/A	EUT
2	Notebook	Lenovo	G475	GB14477457	AE
3	Adapter	GAT	GAT-0501000U	N/A	AE

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

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

5 Conducted Emission

Test Requirement	:	FCC CFR 47 Part 15 Section 15.207
Test Method	:	ANSI C63.10: 2013
Test Result	:	PASS
Frequency Range	:	150kHz to 30MHz
Class/Severity	:	Class B

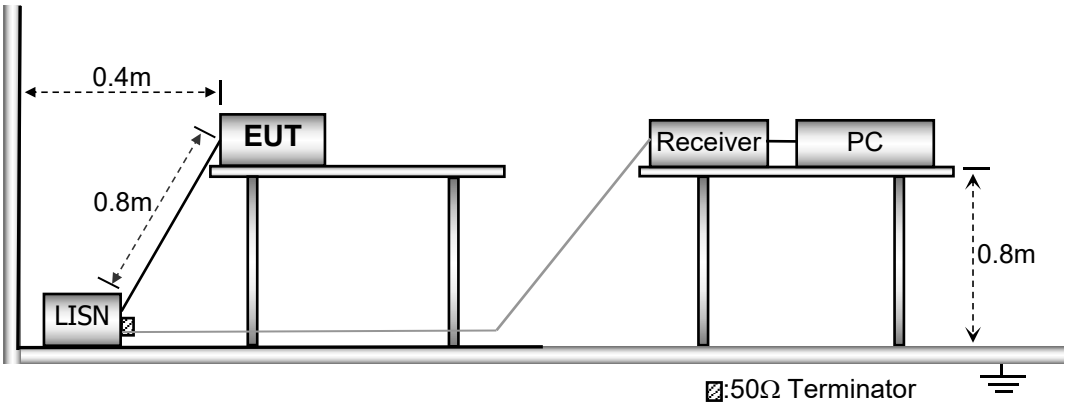
5.1 E.U.T. Operation

Operating Environment :

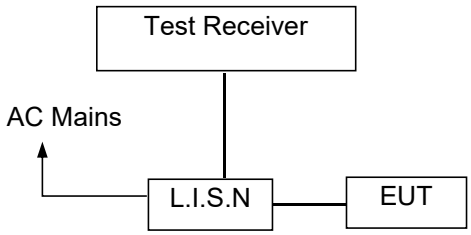
Temperature	:	25.5 °C
Humidity	:	51 % RH
Atmospheric Pressure	:	101.2kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies

2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.6 Measurement Description

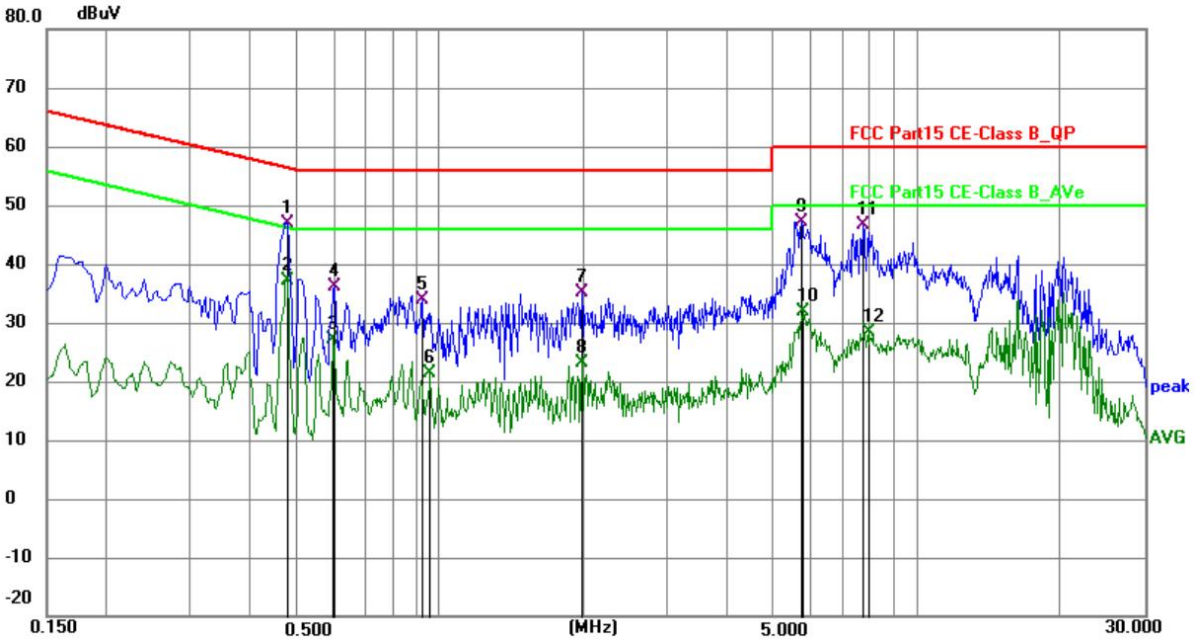
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

Pass.

All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.
All modes of EDR+BR and BLE were Pre tested, only EDR+BR worst GFSK Low Channel and worst BLE Low Channel were reported in the report.

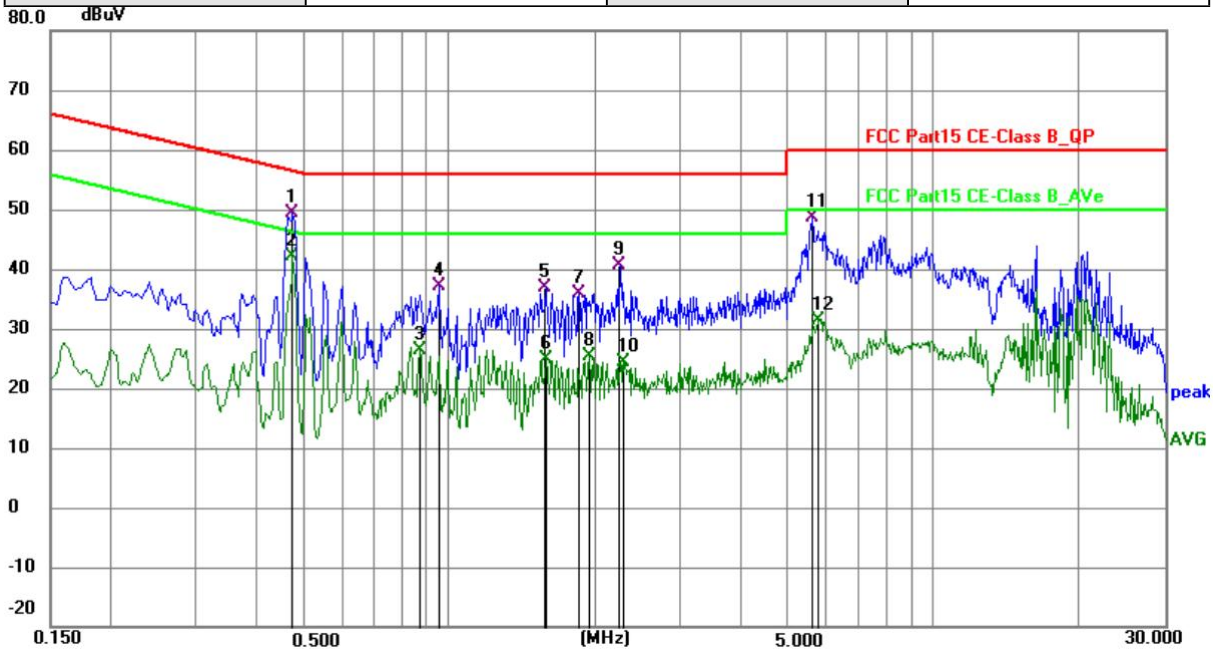
Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4784	36.40	10.57	46.97	56.37	-9.40	QP
2 *	0.4784	26.57	10.57	37.14	46.37	-9.23	AVG
3	0.5955	16.46	10.63	27.09	46.00	-18.91	AVG
4	0.6000	25.48	10.63	36.11	56.00	-19.89	QP
5	0.9194	23.09	10.67	33.76	56.00	-22.24	QP
6	0.9555	10.59	10.67	21.26	46.00	-24.74	AVG
7	1.9815	24.33	10.68	35.01	56.00	-20.99	QP
8	1.9815	12.38	10.68	23.06	46.00	-22.94	AVG
9	5.7344	36.47	10.76	47.23	60.00	-12.77	QP
10	5.7705	21.09	10.76	31.85	50.00	-18.15	AVG
11	7.6920	35.75	10.80	46.55	60.00	-13.45	QP
12	7.8990	17.65	10.81	28.46	50.00	-21.54	AVG

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.

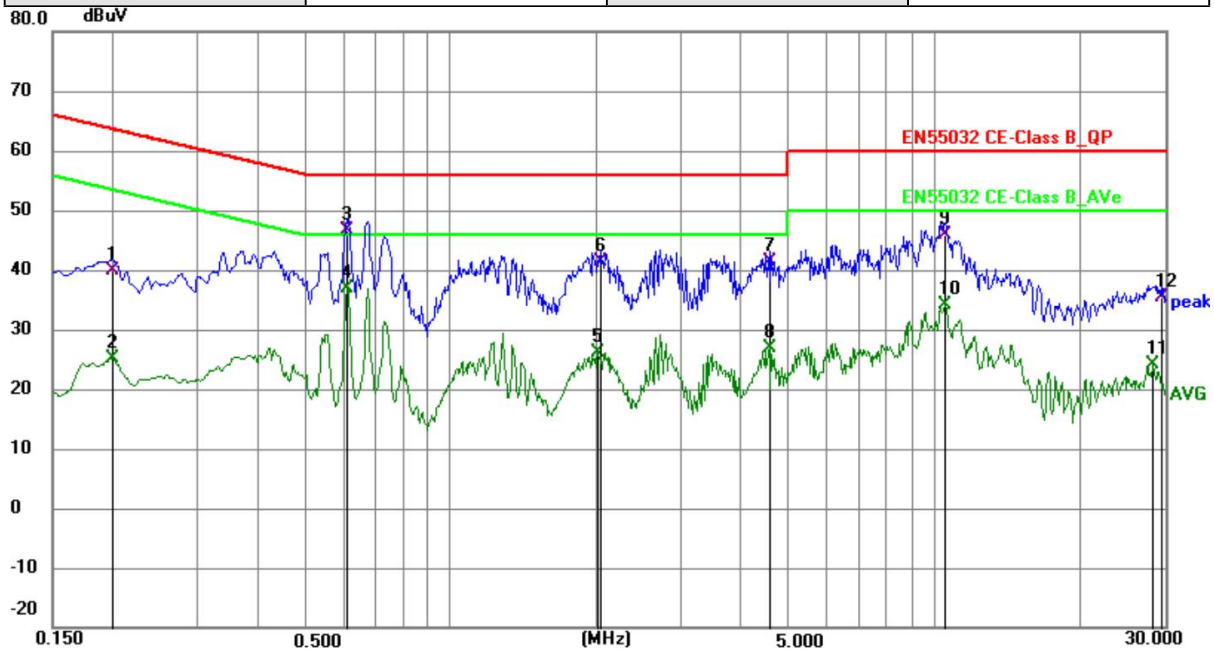
Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.4740	38.84	10.57	49.41	56.44	-7.03	QP
2 *	0.4740	31.59	10.57	42.16	46.44	-4.28	AVG
3	0.8700	15.71	10.68	26.39	46.00	-19.61	AVG
4	0.9555	26.39	10.67	37.06	56.00	-18.94	QP
5	1.5809	26.10	10.66	36.76	56.00	-19.24	QP
6	1.5900	14.16	10.66	24.82	46.00	-21.18	AVG
7	1.8554	25.23	10.67	35.90	56.00	-20.10	QP
8	1.9410	14.82	10.68	25.50	46.00	-20.50	AVG
9	2.2559	29.96	10.67	40.63	56.00	-15.37	QP
10	2.2920	13.72	10.67	24.39	46.00	-21.61	AVG
11	5.5994	37.90	10.75	48.65	60.00	-11.35	QP
12	5.7705	20.72	10.76	31.48	50.00	-18.52	AVG

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.

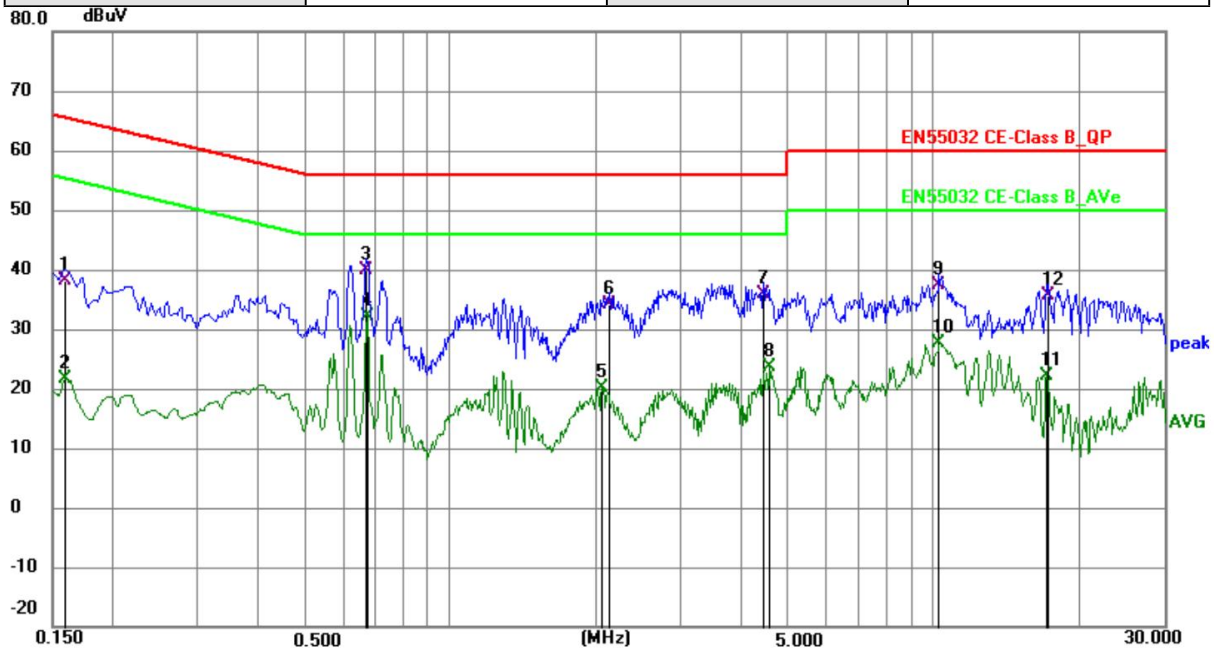
Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1995	29.66	10.21	39.87	63.63	-23.76	QP
2	0.1995	14.99	10.21	25.20	53.63	-28.43	AVG
3	0.6134	36.30	10.25	46.55	56.00	-9.45	QP
4 *	0.6134	26.63	10.25	36.88	46.00	-9.12	AVG
5	2.0175	15.80	10.24	26.04	46.00	-19.96	AVG
6	2.0354	31.19	10.24	41.43	56.00	-14.57	QP
7	4.5510	31.08	10.24	41.32	56.00	-14.68	QP
8	4.5510	16.71	10.24	26.95	46.00	-19.05	AVG
9	10.5585	35.62	10.33	45.95	60.00	-14.05	QP
10	10.5585	23.87	10.33	34.20	50.00	-15.80	AVG
11	28.3515	14.37	9.79	24.16	50.00	-25.84	AVG
12	29.3865	25.65	9.80	35.45	60.00	-24.55	QP

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.

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1590	28.02	10.13	38.15	65.52	-27.37	QP
2	0.1590	11.60	10.13	21.73	55.52	-33.79	AVG
3	0.6674	29.52	10.25	39.77	56.00	-16.23	QP
4 *	0.6720	21.88	10.25	32.13	46.00	-13.87	AVG
5	2.0625	9.79	10.30	20.09	46.00	-25.91	AVG
6	2.1345	23.74	10.29	34.03	56.00	-21.97	QP
7	4.4474	25.58	10.21	35.79	56.00	-20.21	QP
8	4.5600	13.35	10.21	23.56	46.00	-22.44	AVG
9	10.2570	26.99	10.39	37.38	60.00	-22.62	QP
10	10.3063	17.22	10.38	27.60	50.00	-22.40	AVG
11	17.1554	12.11	9.91	22.02	50.00	-27.98	AVG
12	17.2094	25.80	9.91	35.71	60.00	-24.29	QP

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.

6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

6.1 EUT Operation

Operating Environment :

Temperature : 23.5 °C

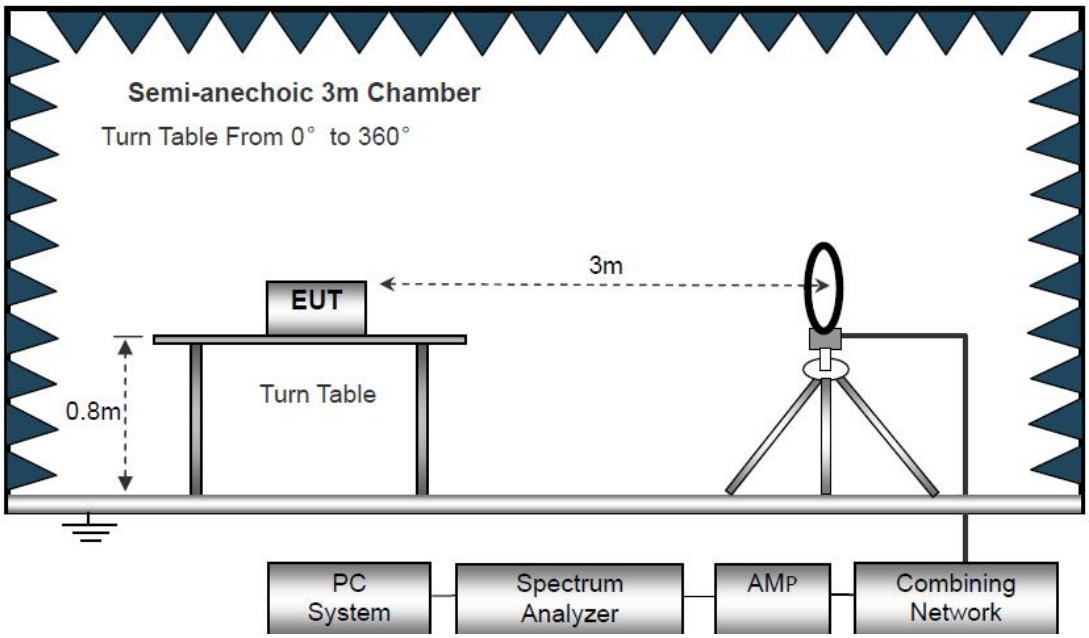
Humidity : 51.1 % RH

Atmospheric Pressure : 101.2kPa

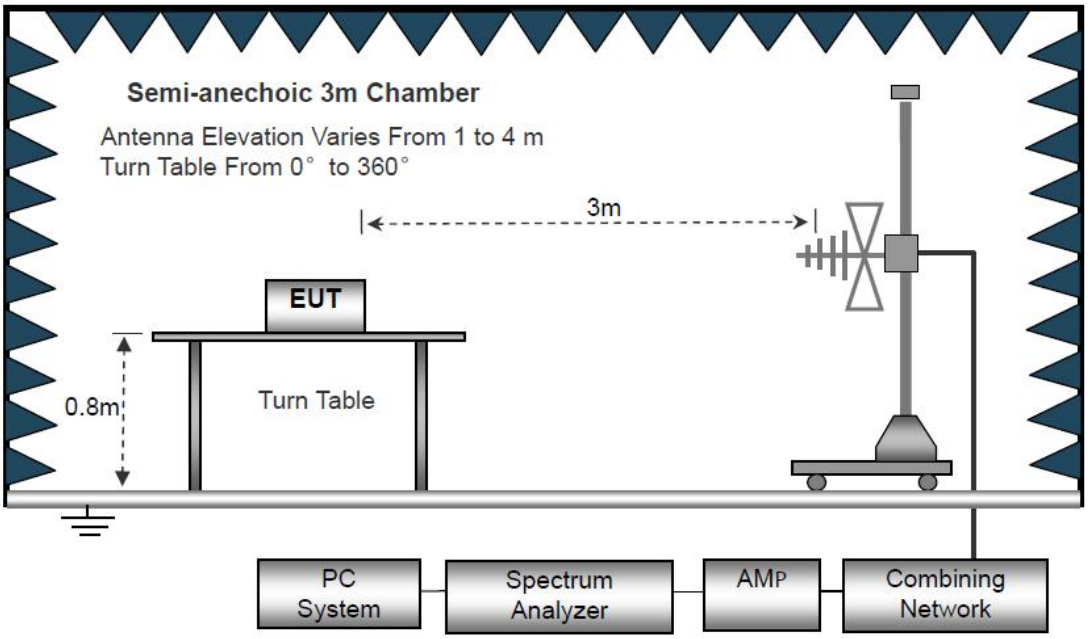
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

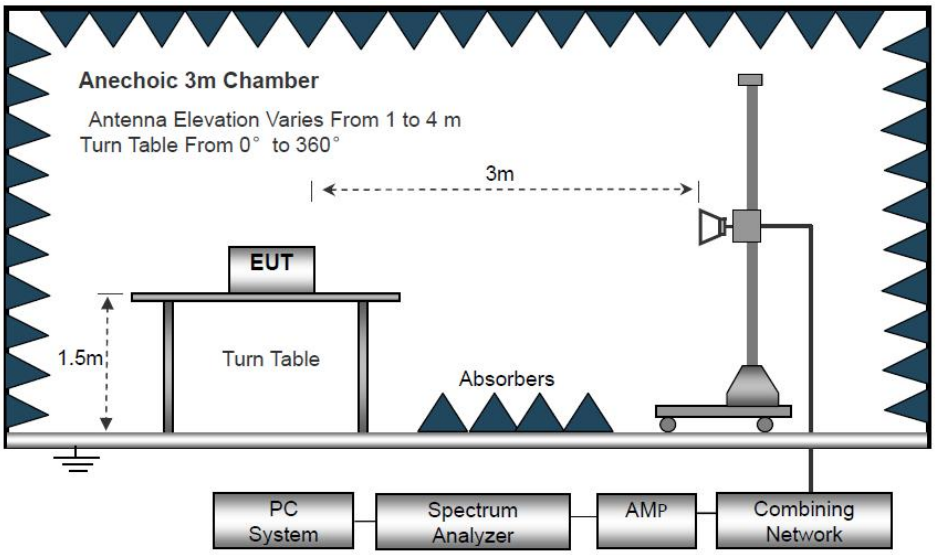
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

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

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

For Average Measurement:

VBW=10Hz, when duty cycle is no less than 98 percent.

VBW≥1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	T(μs)	1/T(KHz)	Average Correction Factor	VBW Setting
2402-2480	100	-	-	0	10Hz

6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq.	Ant.Pol.	Emission Level	Limit 3m	Over
(MHz)	H/V	(dBuV/m)	(dBuV/m)	(dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Pass.

All modes of EDR+BR and BLE were Pre tested, only EDR+BR worst GFSK Low Channel and worst BLE Low Channel were reported in the report.

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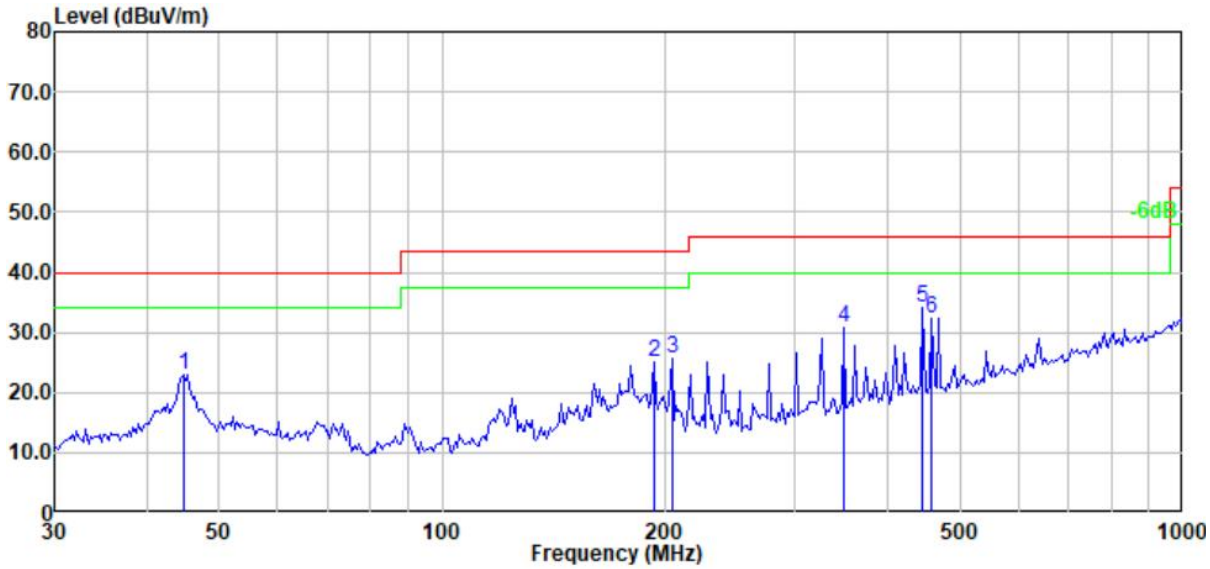
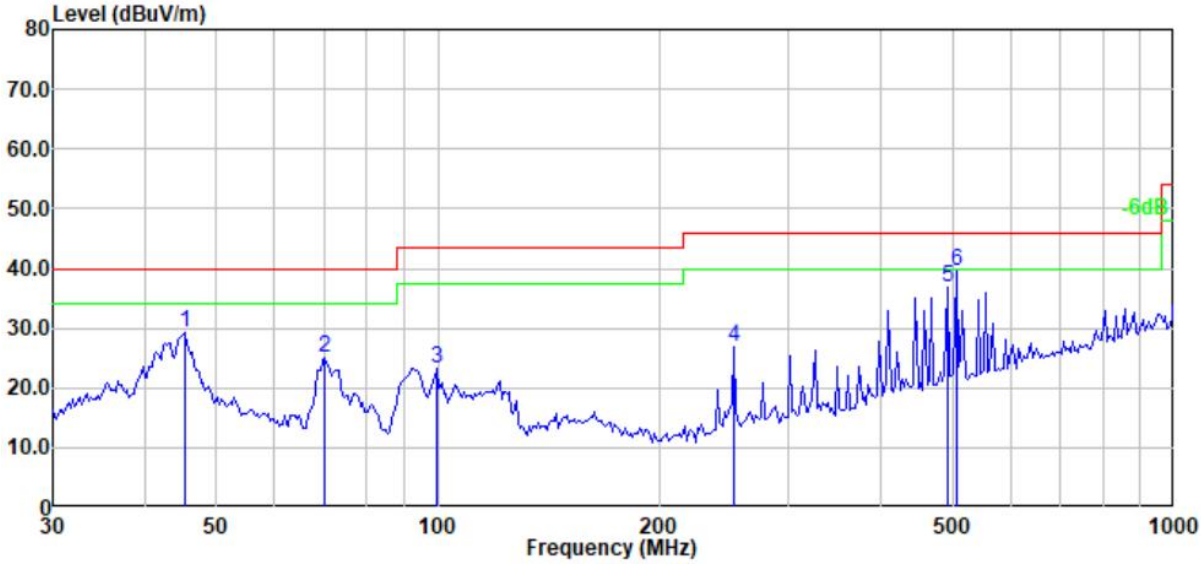
Temperature:	26℃	Relative Humidity:	53%
Pressure:	101kPa	Polarization:	Horizontal
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 1



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dBuV/m	dB/m	dBuV/m	dB		
1	44.779	35.42	23.04	-12.38	40.00	-16.96	Horizontal	QP
2	193.137	38.79	24.94	-13.85	43.50	-18.56	Horizontal	QP
3	204.305	39.85	25.75	-14.10	43.50	-17.75	Horizontal	QP
4	348.515	40.64	30.88	-9.76	46.00	-15.12	Horizontal	QP
5	445.693	40.47	34.03	-6.44	46.00	-11.97	Horizontal	QP
6	458.399	38.72	32.44	-6.28	46.00	-13.56	Horizontal	QP

Remark: Level=Reading Level + Factor; Factor = Antenna Factor + Cable Loss - Pre-amplifier.

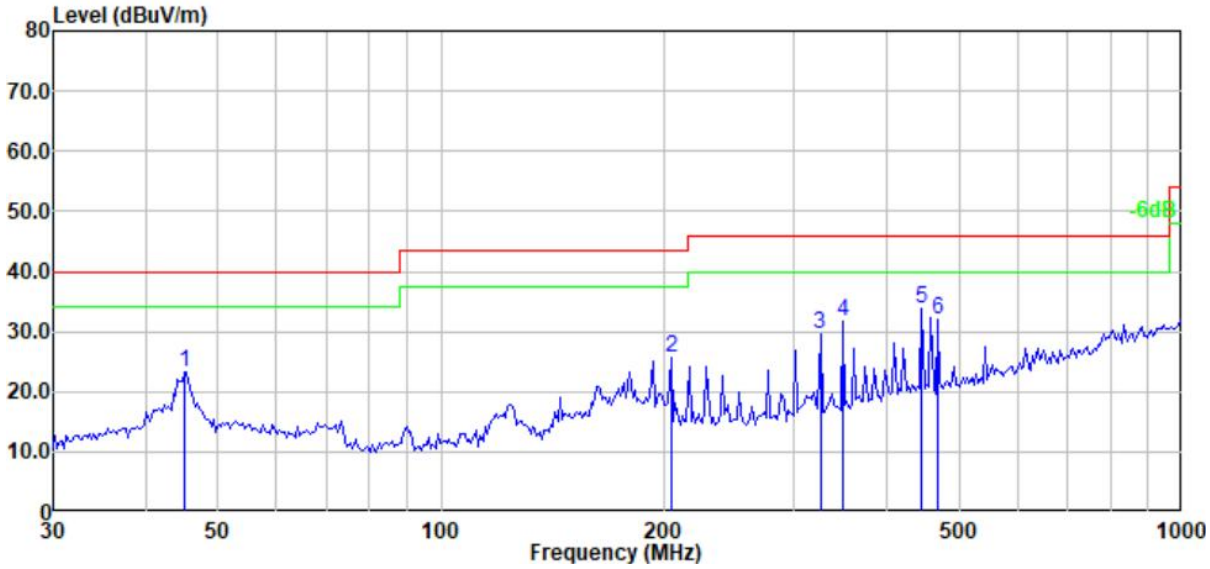
Temperature:	26℃	Relative Humidity:	53%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 1



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dBuV/m	dB/m	dBuV/m	dB		
1	45.413	41.73	29.34	-12.39	40.00	-10.66	Vertical	QP
2	70.210	39.71	25.13	-14.58	40.00	-14.87	Vertical	QP
3	99.768	38.62	23.25	-15.37	43.50	-20.25	Vertical	QP
4	252.252	39.15	26.73	-12.42	46.00	-19.27	Vertical	QP
5	491.770	42.82	36.90	-5.92	46.00	-9.10	Vertical	QP
6	505.789	45.19	39.54	-5.65	46.00	-6.46	Vertical	QP

Remark: Level=Reading Level + Factor; Factor = Antenna Factor + Cable Loss - Pre-amplifier.

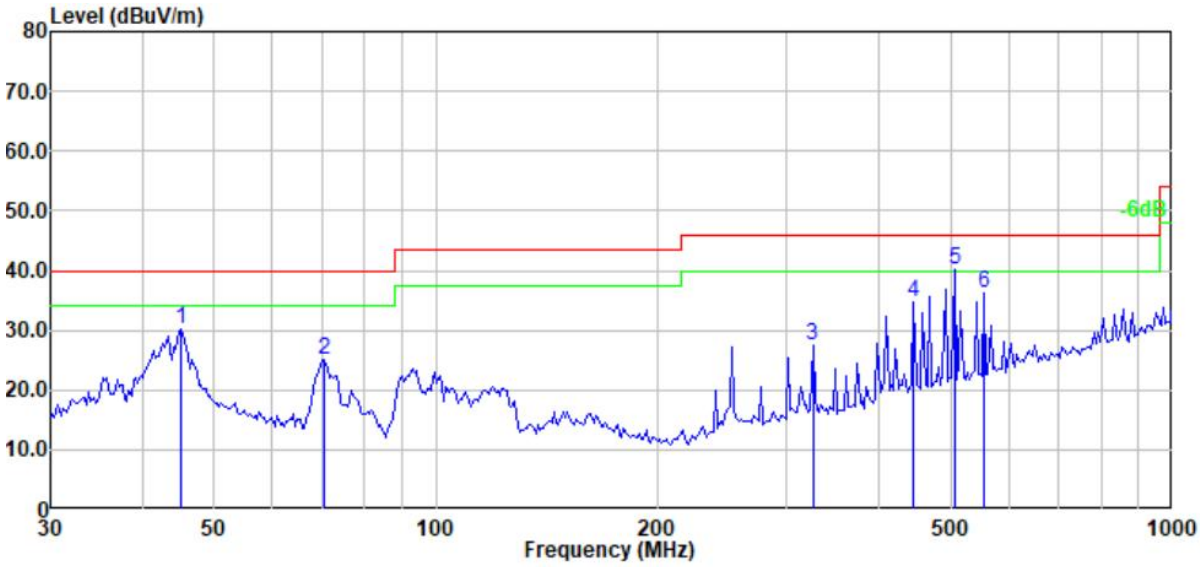
Temperature:	26℃	Relative Humidity:	53%
Pressure:	101kPa	Polarization:	Horizontal
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dBuV/m	dB/m	dBuV/m	dB		
1	45.095	35.58	23.19	-12.39	40.00	-16.81	Horizontal	QP
2	204.305	39.71	25.61	-14.10	43.50	-17.89	Horizontal	QP
3	324.865	38.79	29.44	-9.35	46.00	-16.56	Horizontal	QP
4	348.515	41.32	31.56	-9.76	46.00	-14.44	Horizontal	QP
5	445.693	40.26	33.82	-6.44	46.00	-12.18	Horizontal	QP
6	468.165	38.36	32.15	-6.21	46.00	-13.85	Horizontal	QP

Remark: Level=Reading Level + Factor; Factor = Antenna Factor + Cable Loss - Pre-amplifier.

Temperature:	26℃	Relative Humidity:	53%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage :	AC 120V/60Hz	Test Mode :	Mode 4



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dBuV/m	dB/m	dBuV/m	dB		
1	45.095	42.60	30.21	-12.39	40.00	-9.79	Vertical	QP
2	70.705	39.67	25.06	-14.61	40.00	-14.94	Vertical	QP
3	324.865	36.71	27.36	-9.35	46.00	-18.64	Vertical	QP
4	445.693	41.15	34.71	-6.44	46.00	-11.29	Vertical	QP
5	505.789	45.68	40.03	-5.65	46.00	-5.97	Vertical	QP
6	554.171	40.66	36.25	-4.41	46.00	-9.75	Vertical	QP

Remark: Level=Reading Level + Factor; Factor = Antenna Factor + Cable Loss - Pre-amplifier.

Test Frequency 1GHz-25GHz:

BLE

GFSK Low Channel (2402MHz)								
Detector: Peak Value								
Frequency	Reading Level	Ant. Factor	Cable Loss	Pre-Amp. Gain (dB)	Emission Level	Limit	Margin	Polarity
(MHz)	(dBuV)	(dB/m)	(dB)		(dBuV/m)	(dBuV/m)	(dB)	(H/V)
2402	100.45	29.56	5.78	37.45	98.34	114.00	-15.66	V
2402	100.38	29.56	5.78	37.45	98.27	114.00	-15.73	H
4804	53.75	30.16	6.66	38.32	52.25	74.00	-21.75	V
4804	51.35	30.16	6.66	38.32	49.85	74.00	-24.15	H
7206	52.28	30.22	6.69	38.49	50.70	74.00	-23.30	V
7206	53.43	30.22	6.69	38.49	51.85	74.00	-22.15	H
9608	54.38	30.59	6.72	39.15	52.54	74.00	-21.46	V
9608	54.62	30.59	6.72	39.15	52.78	74.00	-21.22	H
Detector: Average Value								
2402	87.77	29.56	5.78	37.45	85.66	94.00	-8.34	V
2402	87.62	29.56	5.78	37.45	85.51	94.00	-8.49	H
4804	41.34	30.16	6.66	38.32	39.84	54.00	-14.16	V
4804	41.46	30.16	6.66	38.32	39.96	54.00	-14.04	H
7206	40.26	30.22	6.69	38.49	38.68	54.00	-15.32	V
7206	41.18	30.22	6.69	38.49	39.60	54.00	-14.40	H
9608	41.18	30.59	6.72	39.15	39.34	54.00	-14.66	V
9608	40.21	30.59	6.72	39.15	38.37	54.00	-15.63	H
GFSK Middle Channel (2440MHz)								
Detector: Peak Value								
Frequency	Reading Level	Ant. Factor	Cable Loss	Pre-Amp. Gain (dB)	Emission Level	Limit	Margin	Polarity
(MHz)	(dBuV)	(dB/m)	(dB)		(dBuV/m)	(dBuV/m)	(dB)	(H/V)
2440	100.47	29.69	5.86	37.63	98.39	114.00	-15.61	V
2440	100.43	29.69	5.86	37.63	98.35	114.00	-15.65	H
4880	54.52	30.18	6.68	38.52	52.86	74.00	-21.14	V
4880	52.28	30.18	6.68	38.52	50.62	74.00	-23.38	H
7320	51.18	30.22	6.73	39.46	48.67	74.00	-25.33	V
7320	51.54	30.22	6.73	39.46	49.03	74.00	-24.97	H
9760	52.17	30.54	6.81	40.71	48.81	74.00	-25.19	V
9760	52.14	30.54	6.81	40.71	48.78	74.00	-25.22	H

Detector: Average Value								
2440	87.73	29.69	5.86	37.63	85.65	94.00	-8.35	V
2440	87.67	29.69	5.86	37.63	85.59	94.00	-8.41	H
4880	39.22	30.18	6.68	38.52	37.56	54.00	-16.44	V
4880	39.06	30.18	6.68	38.52	37.40	54.00	-16.60	H
7320	40.32	30.22	6.73	39.46	37.81	54.00	-16.19	V
7320	39.17	30.22	6.73	39.46	36.66	54.00	-17.34	H
9760	39.13	30.54	6.81	40.71	35.77	54.00	-18.23	V
9760	40.25	30.54	6.81	40.71	36.89	54.00	-17.11	H
GFSK High Channel (2480MHz)								
Detector: Peak Value								
Frequency	Reading Level	Ant. Factor	Cable Loss	Pre-Amp. Gain (dB)	Emission Level	Limit	Margin	Polarity
(MHz)	(dBuV)	(dB/m)	(dB)		(dBuV/m)	(dBuV/m)	(dB)	(H/V)
2480	100.28	29.73	5.91	37.68	98.24	114.00	-15.76	V
2480	100.31	29.73	5.91	37.68	98.27	114.00	-15.73	H
4960	52.37	30.33	6.68	38.52	50.86	74.00	-23.14	V
4960	50.53	30.33	6.68	38.52	49.02	74.00	-24.98	H
7440	53.19	30.34	6.73	39.46	50.80	74.00	-23.20	V
7440	51.66	30.34	6.73	39.46	49.27	74.00	-24.73	H
9920	52.35	30.68	6.81	40.71	49.13	74.00	-24.87	V
9920	51.38	30.68	6.81	40.71	48.16	74.00	-25.84	H
Detector: Average Value								
2480	87.63	29.73	5.91	37.68	85.59	94.00	-8.41	V
2480	87.46	29.73	5.91	37.68	85.42	94.00	-8.58	H
4960	40.66	30.33	6.75	40.18	37.56	54.00	-16.44	V
4960	39.41	30.33	6.75	40.18	36.31	54.00	-17.69	H
7440	39.25	30.34	6.79	41.23	35.15	54.00	-18.85	V
7440	38.54	30.34	6.79	41.23	34.44	54.00	-19.56	H
9920	39.64	30.68	6.83	42.17	34.98	54.00	-19.02	V
9920	40.16	30.68	6.83	42.17	35.5	54.00	-18.50	H

Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.

3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor
Margin=Emission Level-Limit

(EDR+BR Worst Case)

GFSK Low Channel (2402MHz)								
Detector: Peak Value								
Frequency	Reading Level	Ant. Factor	Cable Loss	Pre-Amp. Gain (dB)	Emission Level	Limit	Margin	Polarity
(MHz)	(dBuV)	(dB/m)	(dB)		(dBuV/m)	(dBuV/m)	(dB)	(H/V)
2402	100.64	29.56	5.78	37.45	98.53	114.00	-15.47	V
2402	100.34	29.56	5.78	37.45	98.23	114.00	-15.77	H
4804	53.56	30.16	6.66	38.32	52.06	74.00	-21.94	V
4804	51.42	30.16	6.66	38.32	49.92	74.00	-24.08	H
7206	52.46	30.22	6.69	38.49	50.88	74.00	-23.12	V
7206	53.39	30.22	6.69	38.49	51.81	74.00	-22.19	H
9608	54.43	30.59	6.72	39.15	52.59	74.00	-21.41	V
9608	54.65	30.59	6.72	39.15	52.81	74.00	-21.19	H
Detector: Average Value								
2402	87.73	29.56	5.78	37.45	85.62	94.00	-8.38	V
2402	87.53	29.56	5.78	37.45	85.42	94.00	-8.58	H
4804	41.25	30.16	6.66	38.32	39.75	54.00	-14.25	V
4804	41.43	30.16	6.66	38.32	39.93	54.00	-14.07	H
7206	40.23	30.22	6.69	38.49	38.65	54.00	-15.35	V
7206	41.15	30.22	6.69	38.49	39.57	54.00	-14.43	H
9608	41.13	30.59	6.72	39.15	39.29	54.00	-14.71	V
9608	40.26	30.59	6.72	39.15	38.42	54.00	-15.58	H
GFSK Middle Channel (2441MHz)								
Detector: Peak Value								
Frequency	Reading Level	Ant. Factor	Cable Loss	Pre-Amp. Gain (dB)	Emission Level	Limit	Margin	Polarity
(MHz)	(dBuV)	(dB/m)	(dB)		(dBuV/m)	(dBuV/m)	(dB)	(H/V)
2441	100.54	29.70	5.87	37.64	98.47	114.00	-15.53	V
2441	100.49	29.70	5.87	37.64	98.42	114.00	-15.58	H
4882	54.52	30.19	6.69	38.53	52.87	74.00	-21.13	V
4882	52.28	30.19	6.69	38.53	50.63	74.00	-23.37	H
7323	51.18	30.23	6.74	39.47	48.68	74.00	-25.32	V
7323	51.54	30.23	6.74	39.47	49.04	74.00	-24.96	H
9764	52.17	30.55	6.82	40.72	48.82	74.00	-25.18	V
9764	52.14	30.55	6.82	40.72	48.79	74.00	-25.21	H

Detector: Average Value								
2441	87.89	29.70	5.87	37.64	85.82	94.00	-8.18	V
2441	87.73	29.70	5.87	37.64	85.66	94.00	-8.34	H
4882	39.27	30.19	6.69	38.53	37.62	54.00	-16.38	V
4882	39.17	30.19	6.69	38.53	37.52	54.00	-16.48	H
7323	40.38	30.23	6.74	39.47	37.88	54.00	-16.12	V
7323	39.18	30.23	6.74	39.47	36.68	54.00	-17.32	H
9764	39.18	30.55	6.82	40.72	35.83	54.00	-18.17	V
9764	40.23	30.55	6.82	40.72	36.88	54.00	-17.12	H
GFSK High Channel (2480MHz)								
Detector: Peak Value								
Frequency	Reading Level	Ant. Factor	Cable Loss	Pre-Amp. Gain (dB)	Emission Level	Limit	Margin	Polarity
(MHz)	(dBuV)	(dB/m)	(dB)		(dBuV/m)	(dBuV/m)	(dB)	(H/V)
2480	100.33	29.73	5.91	37.68	98.29	114.00	-15.71	V
2480	100.46	29.73	5.91	37.68	98.42	114.00	-15.58	H
4960	52.56	30.33	6.68	38.52	51.05	74.00	-22.95	V
4960	50.57	30.33	6.68	38.52	49.06	74.00	-24.94	H
7440	53.24	30.34	6.73	39.46	50.85	74.00	-23.15	V
7440	51.62	30.34	6.73	39.46	49.23	74.00	-24.77	H
9920	52.37	30.68	6.81	40.71	49.15	74.00	-24.85	V
9920	51.41	30.68	6.81	40.71	48.19	74.00	-25.81	H
Detector: Average Value								
2480	87.79	29.73	5.91	37.68	85.75	94.00	-8.25	V
2480	87.61	29.73	5.91	37.68	85.57	94.00	-8.43	H
4960	40.76	30.33	6.75	40.18	37.66	54.00	-16.34	V
4960	39.49	30.33	6.75	40.18	36.39	54.00	-17.61	H
7440	39.36	30.34	6.79	41.23	35.26	54.00	-18.74	V
7440	38.48	30.34	6.79	41.23	34.38	54.00	-19.62	H
9920	39.68	30.68	6.83	42.17	35.02	54.00	-18.98	V
9920	40.15	30.68	6.83	42.17	35.49	54.00	-18.51	H

Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.

3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

Margin=Emission Level-Limit

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

BLE

Test Mode: GFSK Low Channel 2402MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2390.00	55.65	28.08	5.54	37.12	52.15	74.00	-21.85	H	Peak
2390.00	34.68	28.08	5.54	37.12	31.18	54.00	-22.82	H	Average
2390.00	56.32	28.08	5.54	37.12	52.82	74.00	-21.18	V	Peak
2390.00	36.78	28.08	5.54	37.12	33.28	54.00	-20.72	V	Average
2400.00	56.88	28.12	5.67	37.18	53.49	74.00	-20.51	H	Peak
2400.00	35.75	28.12	5.67	37.18	32.36	54.00	-21.64	H	Average
2400.00	57.23	28.12	5.67	37.18	53.84	74.00	-20.16	V	Peak
2400.00	37.33	28.12	5.67	37.18	33.94	54.00	-20.06	V	Average

Test Mode: GFSK High Channel 2480MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.50	57.12	29.12	6.15	36.29	56.10	74.00	-17.90	H	Peak
2483.50	38.23	29.12	6.15	36.29	37.21	54.00	-16.79	H	Average
2483.50	55.45	29.12	6.68	36.79	54.46	74.00	-19.54	V	Peak
2483.50	38.99	29.12	6.68	36.79	38.00	54.00	-16.00	V	Average

(EDR+BR Worst Case)

Test Mode:GFSK Low Channel 2402MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2390.00	55.74	28.08	5.54	37.12	52.24	74.00	-21.76	H	Peak
2390.00	34.74	28.08	5.54	37.12	31.24	54.00	-22.76	H	Average
2390.00	56.38	28.08	5.54	37.12	52.88	74.00	-21.12	V	Peak
2390.00	36.82	28.08	5.54	37.12	33.32	54.00	-20.68	V	Average
2400.00	56.91	28.12	5.67	37.18	53.52	74.00	-20.48	H	Peak
2400.00	35.78	28.12	5.67	37.18	32.39	54.00	-21.61	H	Average
2400.00	57.28	28.12	5.67	37.18	53.89	74.00	-20.11	V	Peak
2400.00	37.35	28.12	5.67	37.18	33.96	54.00	-20.04	V	Average

Test Mode: GFSK High Channel 2480MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.50	57.23	29.12	6.15	36.29	56.21	74.00	-17.79	H	Peak
2483.50	38.31	29.12	6.15	36.29	37.29	54.00	-16.71	H	Average
2483.50	55.48	29.12	6.68	36.79	54.49	74.00	-19.51	V	Peak
2483.50	37.32	29.12	6.68	36.79	36.33	54.00	-17.67	V	Average

7 Bandwidth Measurement

Test Requirement : FCC Part15 (15.249), Subpart C

Test Method : ANSI C63.10:2013

Test Limit : N/A

7.1 Test Procedure

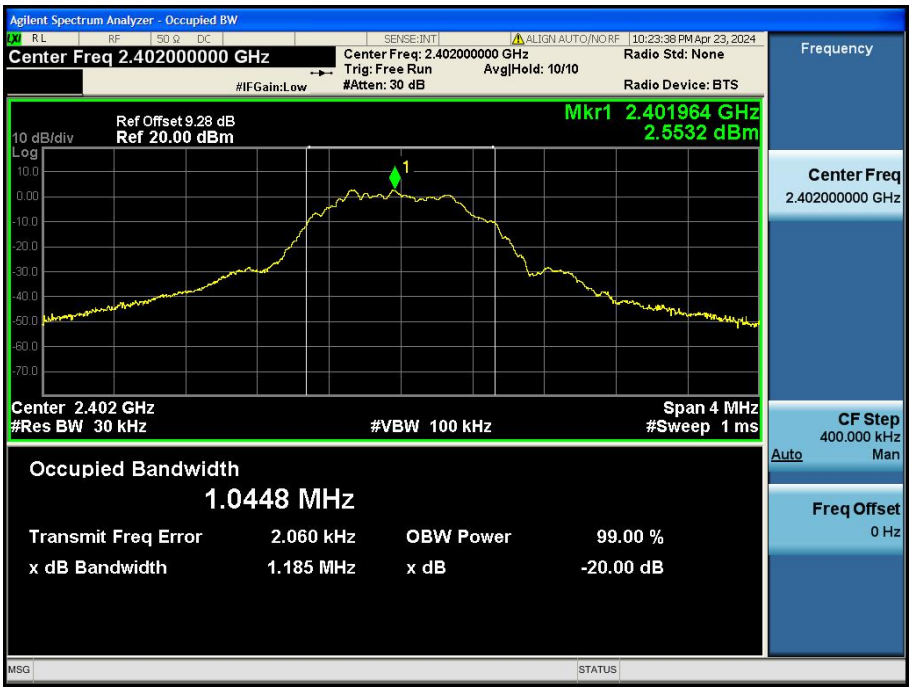
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

7.2 Test Result

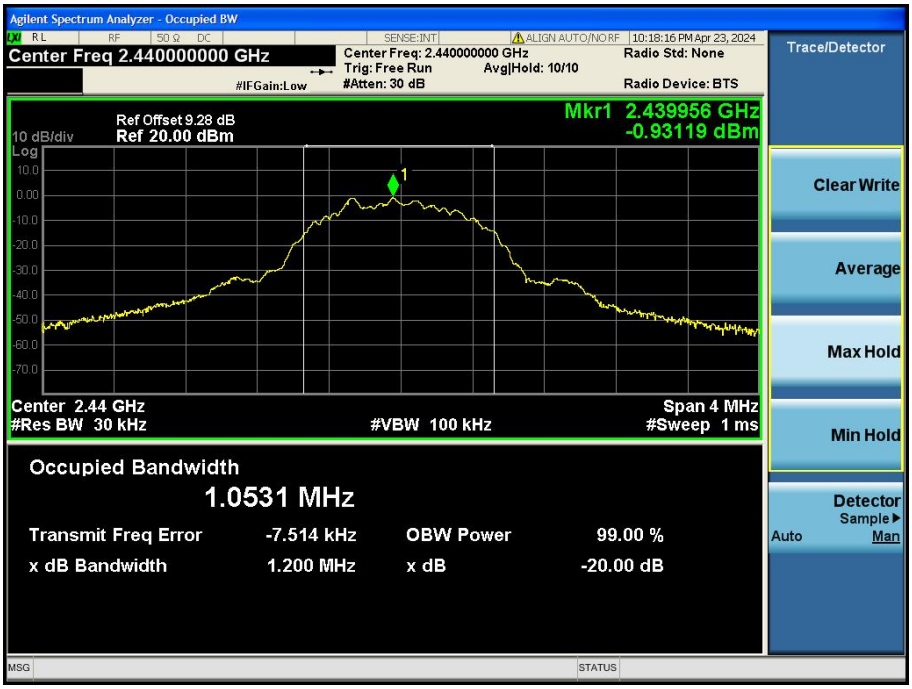
BLE			
Modulation	Channel frequency (MHz)	Measurement level (MHz)	Result
GFSK	2402	1.185	Pass
	2440	1.200	Pass
	2480	1.196	Pass
EDR+BR			
Modulation	Channel frequency (MHz)	Measurement level (MHz)	Result
GFSK	2402	0.921	Pass
	2441	0.931	Pass
	2480	0.875	Pass
Π/4 DQPSK	2402	1.354	Pass
	2441	1.325	Pass
	2480	1.382	Pass

BLE

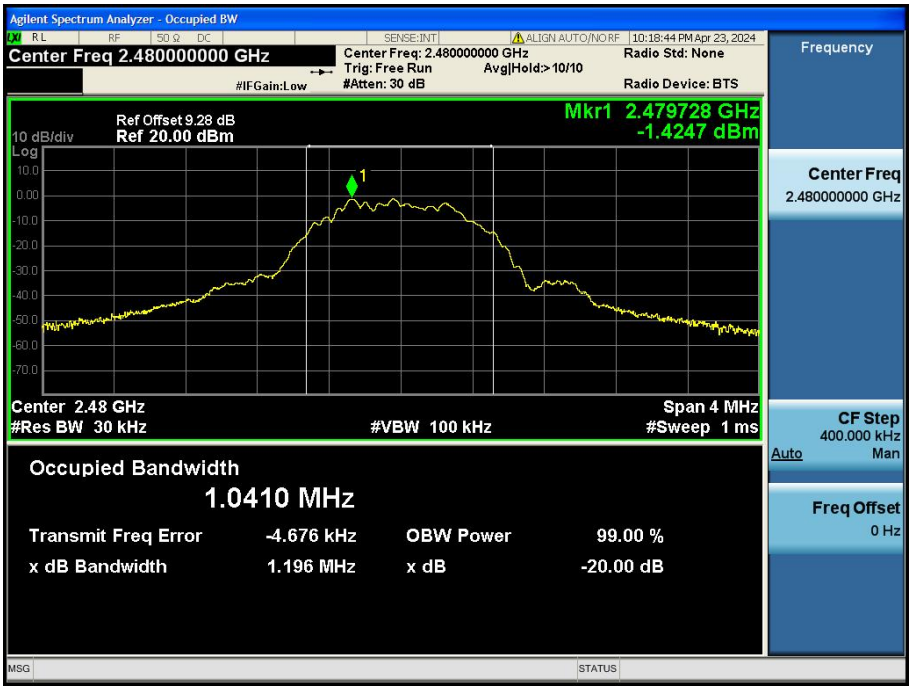
GFSK: 2402MHz



GFSK: 2440MHz

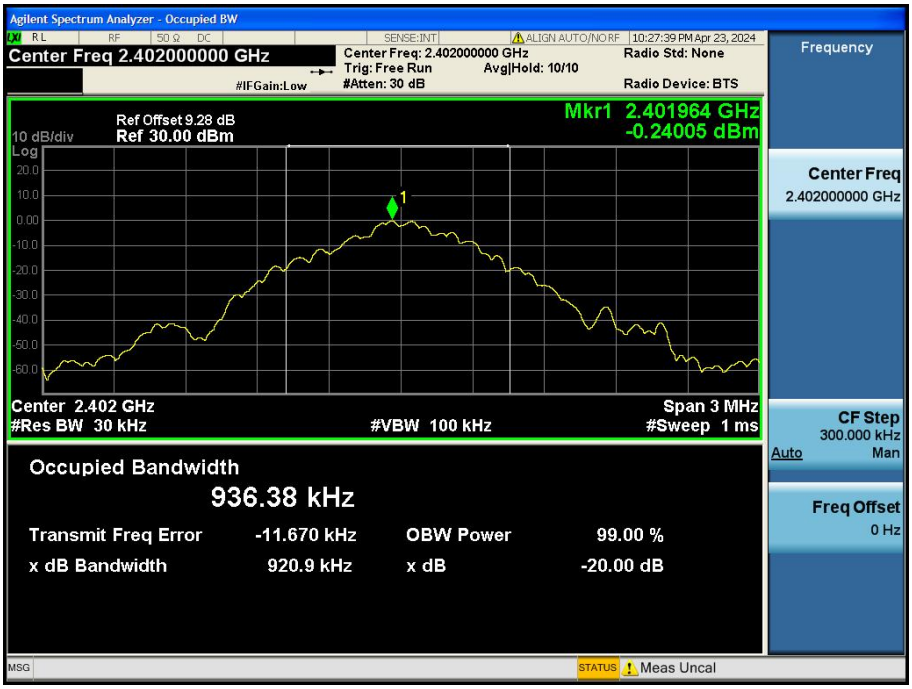


GFSK: 2480MHz

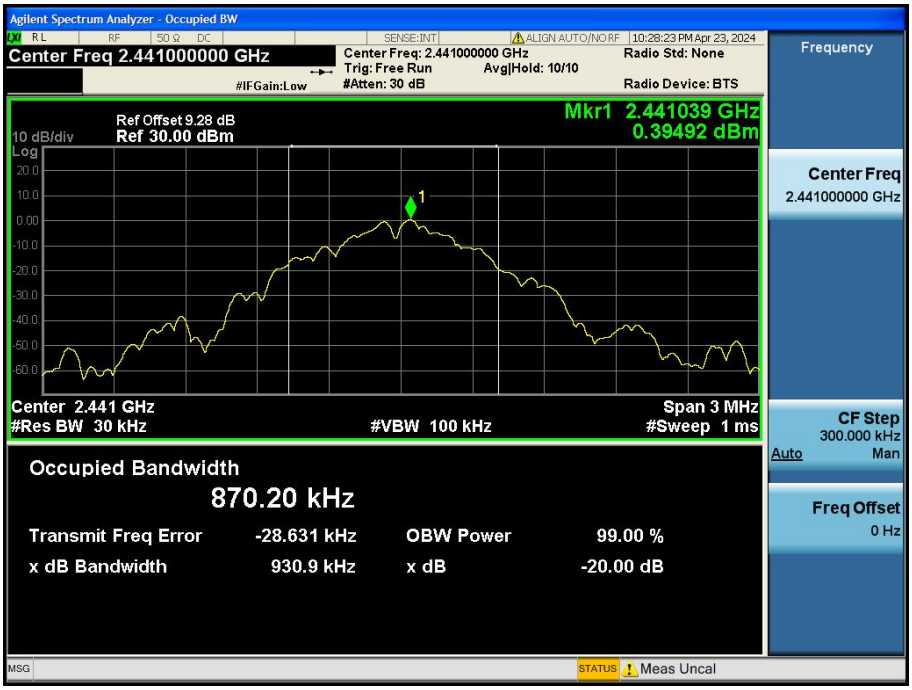


EDR+BR

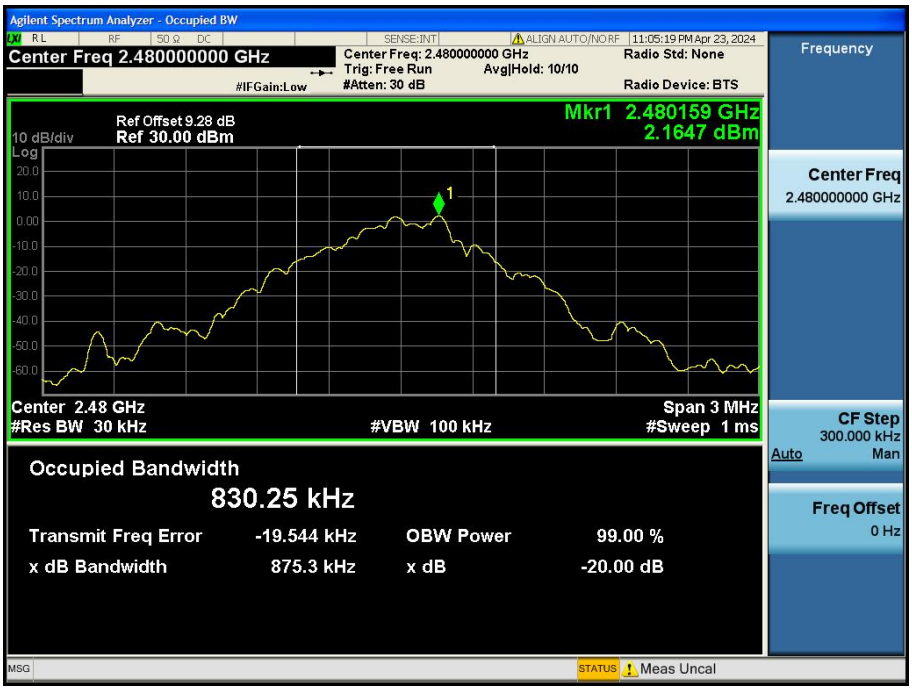
GFSK: 2402MHz



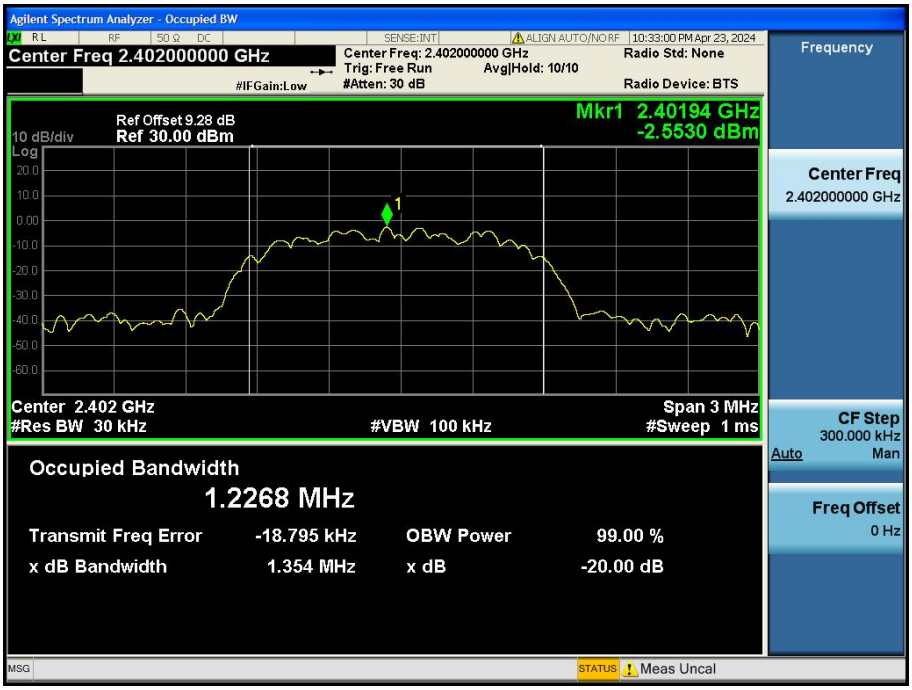
GFSK: 2441MHz



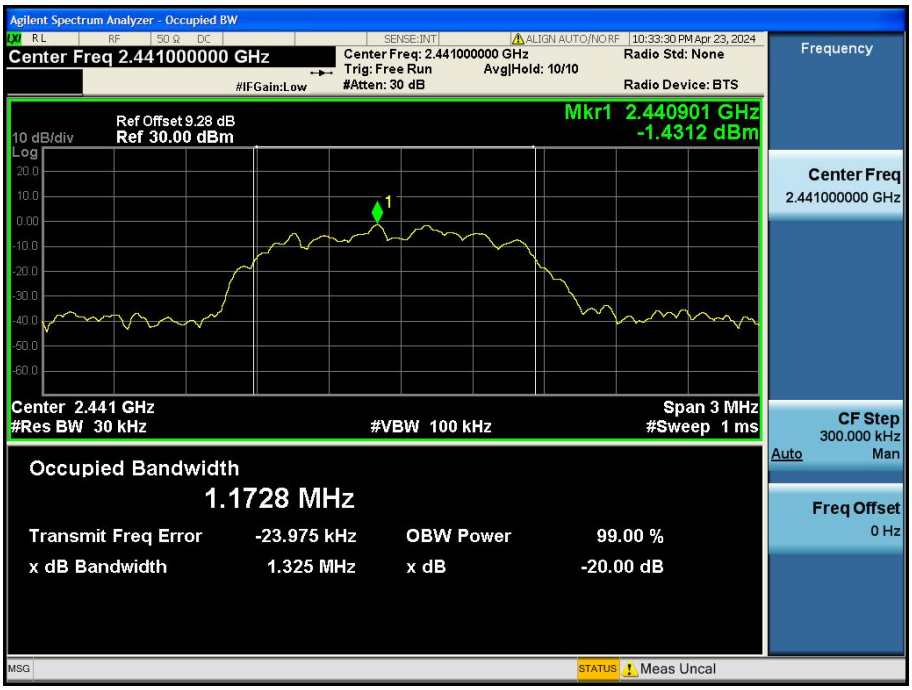
GFSK: 2480MHz



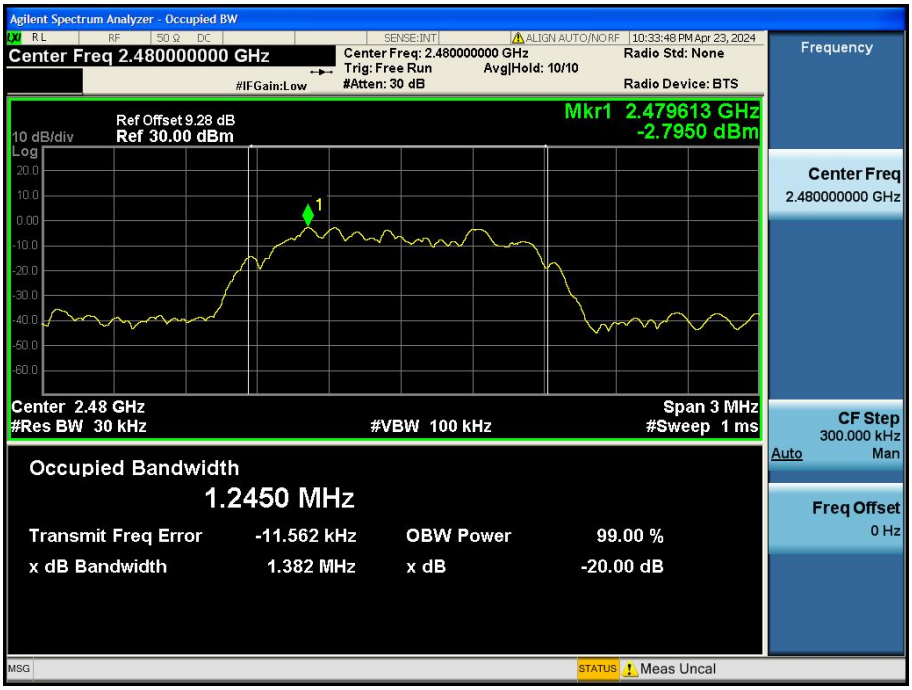
Π/4 DQPSK: 2402MHz



Π/4 DQPSK: 2441MHz



Π/4 DQPSK: 2480MHz



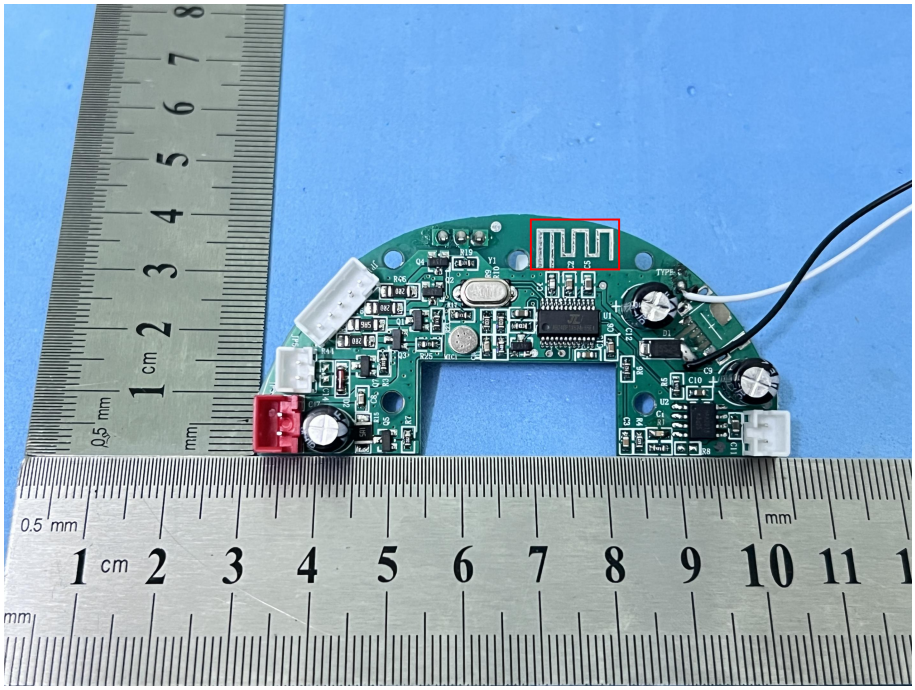
8 Antenna Application

8.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

8.2 Result

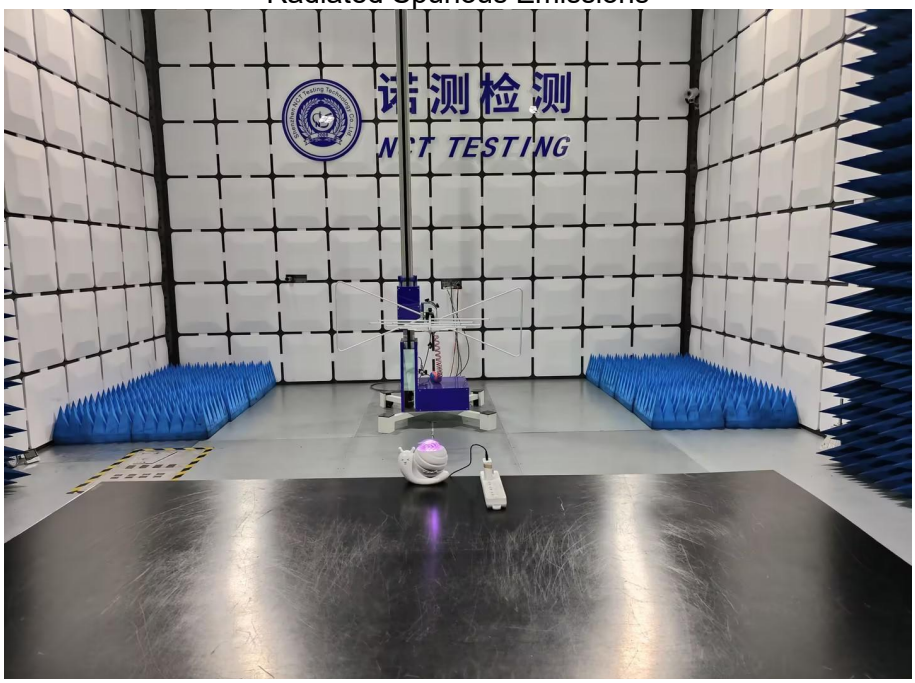
The EUT'S antenna, permanent attached antenna, is internal PCB antenna. The antenna's gain is 1.55 dBi and meets the requirement.

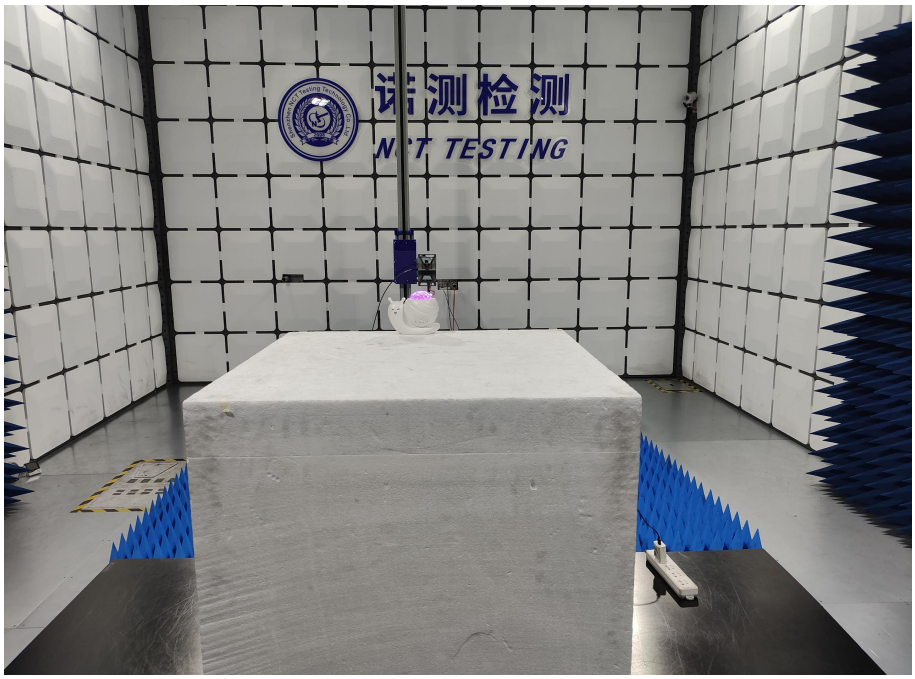


9 Test Setup

Conducted Emissions

Radiated Spurious Emissions





********THE END REPORT********