FCC TEST REPORT
FCC ID: 2BGYU-XBELCS9022BK

Product	**:**	**Smart Lock**
Model Name	**:**	**XB-EL-CS9022-BK**
Brand	**:**	**N/A**
Report No.	**:**	**SZNTT26022833E1-1**

Prepared for

Shenzhen Xriver Technology Co., LTD

1105, Huafeng New Energy Building, Yuye Community, Xixiang Street, Baoan District, Shenzhen,China

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Xriver Technology Co., LTD
Address	:	1105, Huafeng New Energy Building, Yuye Community, Xixiang Street, Baoan District, Shenzhen,China
Manufacture's name	:	Shenzhen Xriver Technology Co., LTD
Address	:	1105, Huafeng New Energy Building, Yuye Community, Xixiang Street, Baoan District, Shenzhen,China
Product name	:	Smart Lock
Model name	:	XB-EL-CS9022-BK
Standards	:	FCC CFR47 Part 15 Section 15.247
Test procedure	:	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024 KDB 558074 D01 15.247 Meas Guidance v05r02
Test Date	:	May 28, 2026 to Jul 28, 2026
Date of Issue	:	Jul 28, 2026
Test Result	:	Pass

This device described above has been tested by NTT, 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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2 Test Summary

Test Items	Test Requirement	Result
AC Power Line conducted emission	FCC part 15.207	PASS
Radiated Spurious Emissions	FCC part 15.205/15.209	PASS
Conducted Spurious Emission	FCC part 15. 247(d)	PASS
Band edge	FCC part 15.247(d)	PASS
6dB&99% Bandwidth	FCC part 15.247 (a)(2)	PASS
Maximum Peak Output Power	FCC part 15.247 (b)(3)	PASS
Power Spectral Density	FCC part 15.247 (e)	PASS
Antenna Requirement	FCC part 15.203/15.247 (b)(4)	PASS

Remark:

1. “N/A” denotes test is not applicable in this Test Report.

3 TEST FACILITY

Site Description

EMC Lab.	:	Designation Number: CN3446 Test Firm Registration Number: 129414 Accredited by ANAB, Dec. 19, 2025 The Certificate Registration Number is AT-3446
Name of Firm	:	Shenzhen NTT Testing Technology Co., Ltd.
Site Location	:	1B, Building 2, Factory Building & 103, Building 3, Factory Building, Dayang Industrial Park No.4, Industrial Avenue, Tangwei Community, Fuhai Sub-district,Bao 'an District, Shenzhen City, China

4 General Information

4.1 General Description of E.U.T.

Product Name	:	Smart Lock
Model Name	:	XB-EL-CS9022-BK
Sample ID	:	SZNTT26022833E1-001#
Sample(s) Status:	:	Engineer sample
Additional model	:	XB-EL-CS9022-SL
Model Difference	:	Except for the model and appearance color, all models have the same circuit and module.
Operating frequency	:	2402-2480MHz
Numbers of Channel	:	40 channels
Type of Modulation	:	GFSK
Rate	:	1Mbps
Antenna Type	:	Internal Antenna
Antenna Gain	:	2.21dBi
Power supply	:	DC 6V(AAA*4) DC 5V(Type-C Emergency Power Port)
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.		

4.2 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 C63.10-2020 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.

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		

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.

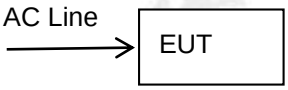
Test Channel:

	Channel	Frequency(MHz)
Low Channel	0	2402
Mid Channel	19	2440
High Channel	39	2480

4.3 Test Setup Configuration

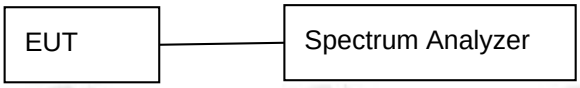
Conducted Emission

Radiated Emission



Radiated Spurious

RF Conducted Test



4.4 Test Mode

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

Test Software	The EUT enters engineering mode
Power level setup	0 dBm

5 Equipment During Test

5.1 Equipments List

Conducted emission Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
944 Shielded Room	HSRCE944	/	HTEC	2025/4/30	2028/4/29
EMI Test Receiver	ESCI	/	RS	2025/9/8	2026/9/7
LISN	NNLK 8129	00603	Schwarzbeck	2025/9/8	2026/9/7
LISN	NNHV 8123-400	00694	Schwarzbeck	2025/9/8	2026/9/7
LISN	NNHV 8123-400	00680	Schwarzbeck	2025/9/8	2026/9/7
Cable	RG223-1500MM	NA	RG	2025/9/8	2026/9/7

Radiated emission & Radio Frequency Test Equipment

Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
966 Shielded Room	966 Room	/	EMToni	2025/7/24	2028/7/23
EMI Test Receiver	ESCI	101018	RS	2025/9/8	2026/9/7
Amplifi（30MHz-1GHz）	BBV 9718D	00042	SCHWARZBECK	2025/9/8	2026/9/7
Bilog Antenna（30MHz-1GHz）	VULB9168	1858	SCHWARZBECK	2025/9/9	2026/9/8
Horn antenna（1GHz-18GHz）	BBHA 9120 D	02622	SCHWARZBECK	2025/9/9	2026/9/8
Pream plifier（1GHz-18GHz）	BBV 9718D	0024	SCHWARZBECK	2025/9/8	2026/9/7
Spectrum Analyze（10Hz-40GHz）	FSV 40	100952	Rohde & Schwarz	2025/9/8	2026/9/7
Pream plifier（18GHz-40GHz）	BBV 9721	0056	SCHWARZBECK	2025/9/8	2026/9/7
Double Ridge Guide Horn Antenna（18GHz-40GHz）	SAS-574	588	A.H.System	2025/9/8	2026/9/7
Loop Antenna (9KHz-30MHz)	FMZB1519B	014	SCHWARZBECK	2025/9/8	2026/9/7
Amplifier (9KHz-30MHz)	CVP 9222 C	00109	SCHWARZBECK	2025/9/8	2026/9/7
MXG Signal Analyzer	N9020A	MY50510202	Agilent	2025/9/8	2026/9/7

MXG Vector Signal Generator	N5182A	MY50140020	Agilent	2025/9/8	2026/9/7
MXG Analog Signal Generator	N5181A	MY47420919	Agilent	2025/9/8	2026/9/7
Power Sensor	TR1029-2	512364	Techoy	2025/9/8	2026/9/7
RF Swith	TR1029-1	512364	Techoy	2025/9/8	2026/9/7
Cable	DA800-4000MM	NA	DA	2025/9/8	2026/9/7
Cable	DA800-11000MM	NA	DA	2025/9/8	2026/9/7

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ-EMC	Ver.EMC-CON 3A1.1+
2	EMC radiation test system	FALA	EZ-EMC	Ver.FA-03A2 RE+
3	RF test system	TACHOY	RFTest	V1.0.0
4	RF communication test system	TACHOY	RFTest	V1.0.0

5.2 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(9KHz~30MHz)	±4.51dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Remark:When making a conformity declaration based on test results for regulations/standards or specifications,the default is to use Clause 4.2.1of ILAC-G8:09/2019 and the guidelines on decision rules and conformity declaration in IEC Guide 115:2023.	

5.3 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
E-1	Smart Lock	/	XB-EL-CS9022-BK	N/A	EUT

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.

6 Conducted Emission

Test Requirement	:	FCC CFR 47 Part 15 Section 15.207
Test Method	:	ANSI C63.10: 2020
Test Result	:	PASS
Frequency Range	:	150kHz to 30MHz
Class/Severity	:	Class B

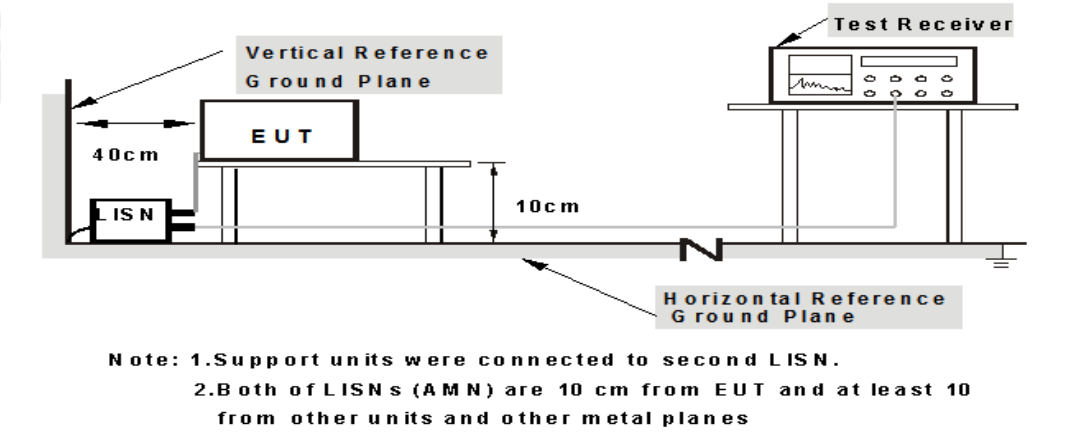
6.1 E.U.T. Operation

Operating Environment **:**

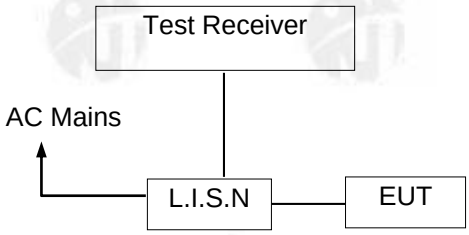
Temperature	:	26.1 °C
Humidity	:	54.1 % RH
Atmospheric Pressure	:	101.2kPa

6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.



6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure

1. The EUT was placed 0.1 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.

2. 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.

3. 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.

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

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

6.5 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.

6.6 Measurement Description

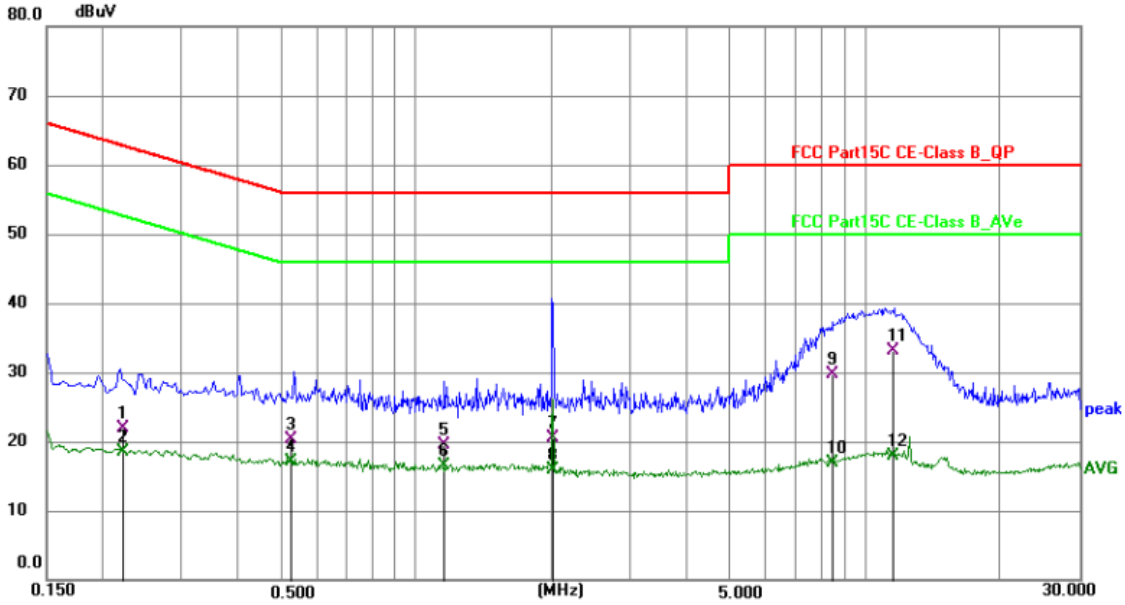
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7 Conducted Emission Test Result

Pass.

Conducted emission at both 120V & 240V is assessed, and emission at 120V represents the worst case. the worst mode is recorded in the following pages.

Temperature:	26.1 ℃	Relative Humidity:	54.1%
Pressure:	1012hPa	Phase :	L
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2222	11.84	10.16	22.00	62.74	-40.74	QP	P
2	0.2222	8.36	10.16	18.52	52.74	-34.22	AVG	P
3	0.5257	10.14	10.13	20.27	56.00	-35.73	QP	P
4	0.5257	6.94	10.13	17.07	46.00	-28.93	AVG	P
5	1.1531	9.31	10.13	19.44	56.00	-36.56	QP	P
6	1.1531	6.36	10.13	16.49	46.00	-29.51	AVG	P
7	2.0167	10.25	10.16	20.41	56.00	-35.59	QP	P
8	2.0167	5.78	10.16	15.94	46.00	-30.06	AVG	P
9	8.5096	19.41	10.32	29.73	60.00	-30.27	QP	P
10	8.5096	6.64	10.32	16.96	50.00	-33.04	AVG	P
11 *	11.5755	22.72	10.40	33.12	60.00	-26.88	QP	P
12	11.5755	7.60	10.40	18.00	50.00	-32.00	AVG	P

Note:

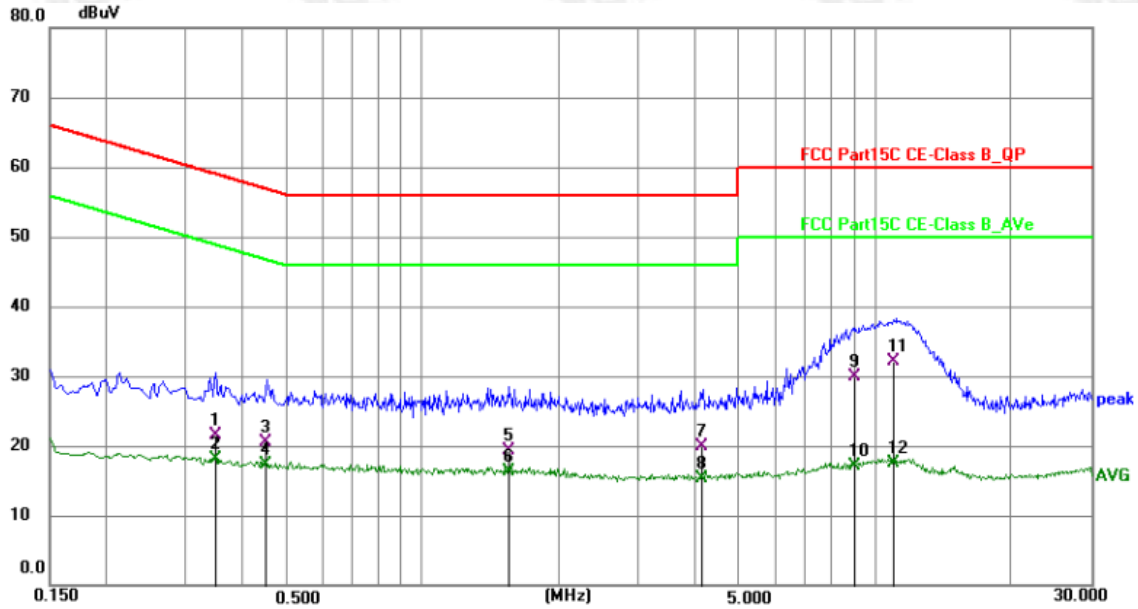
1. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.

2. An initial pre-scan was performed on the line and neutral lines with peak detector.

3. Correct Factor = Insertion loss of LISN + Cable loss.

4. Margin = Reading level + Correct Factor - Limit.

Temperature:	26.1 ℃	Relative Humidity:	54.1%
Pressure:	1012hPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.3499	11.36	10.12	21.48	58.96	-37.48	QP	P
2	0.3499	7.97	10.12	18.09	48.96	-30.87	AVG	P
3	0.4500	10.30	10.12	20.42	56.88	-36.46	QP	P
4	0.4500	7.24	10.12	17.36	46.88	-29.52	AVG	P
5	1.5549	9.23	10.14	19.37	56.00	-36.63	QP	P
6	1.5549	6.26	10.14	16.40	46.00	-29.60	AVG	P
7	4.1638	9.72	10.22	19.94	56.00	-36.06	QP	P
8	4.1638	5.13	10.22	15.35	46.00	-30.65	AVG	P
9	9.0358	19.61	10.33	29.94	60.00	-30.06	QP	P
10	9.0358	6.77	10.33	17.10	50.00	-32.90	AVG	P
11 *	10.9836	21.67	10.38	32.05	60.00	-27.95	QP	P
12	10.9836	7.20	10.38	17.58	50.00	-32.42	AVG	P

Note:

1. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.

2. An initial pre-scan was performed on the line and neutral lines with peak detector.

3. Correct Factor = Insertion loss of LISN + Cable loss.

4. Margin = Reading level + Correct Factor - Limit.

7 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method : ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.

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	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment :

Temperature : 26.1 °C

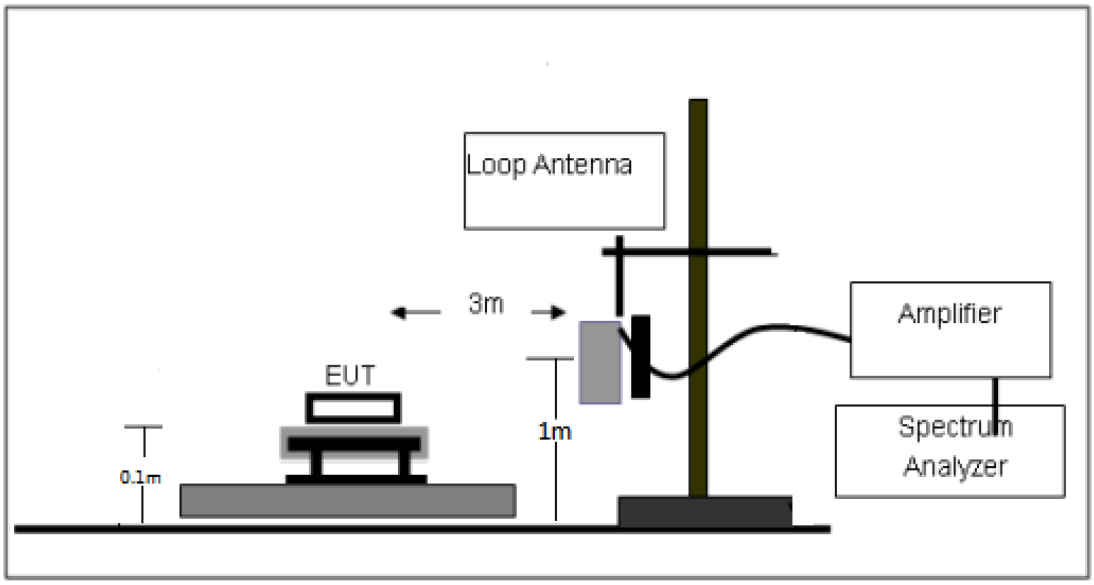
Humidity : 54.1 % RH

Atmospheric Pressure : 101.2kPa

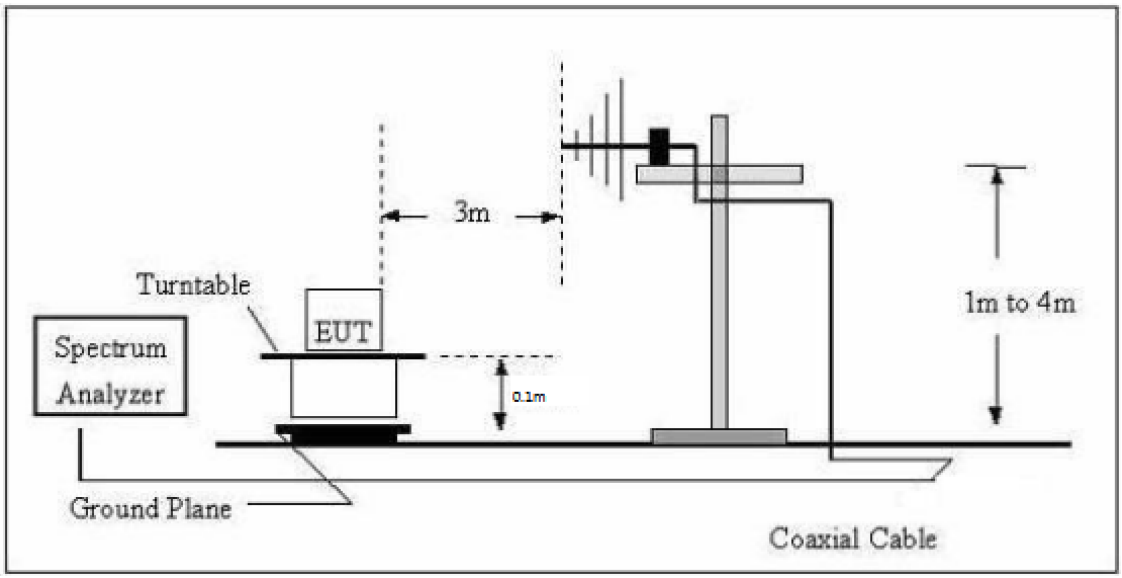
7.2 Test Setup

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

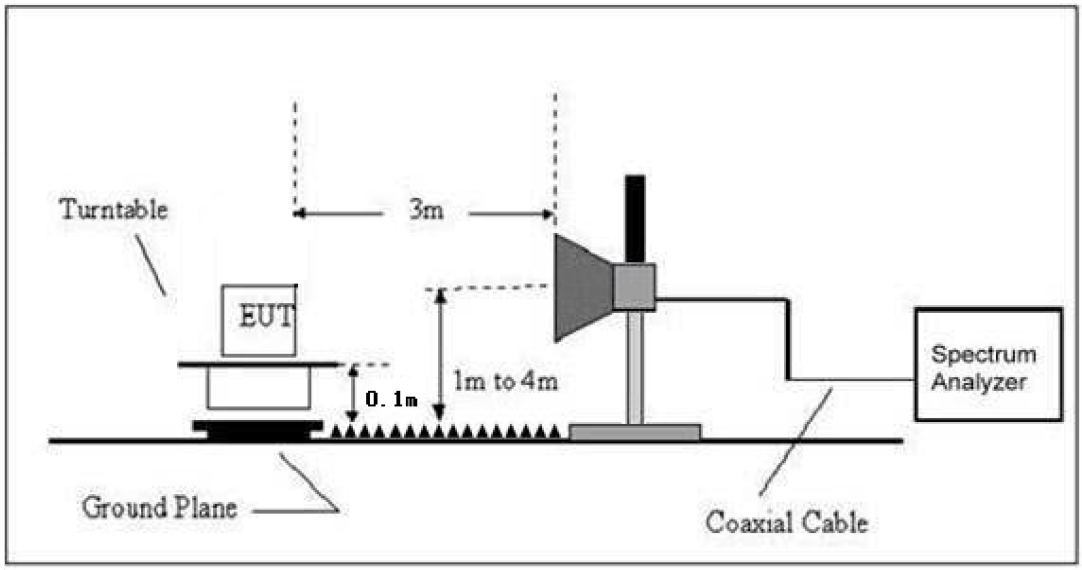
The test setup for emission measurement below 30MHz



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



The test setup for emission measurement above 1 GHz



7.3 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

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.1m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 0.1m 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 analyzer 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.

7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

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

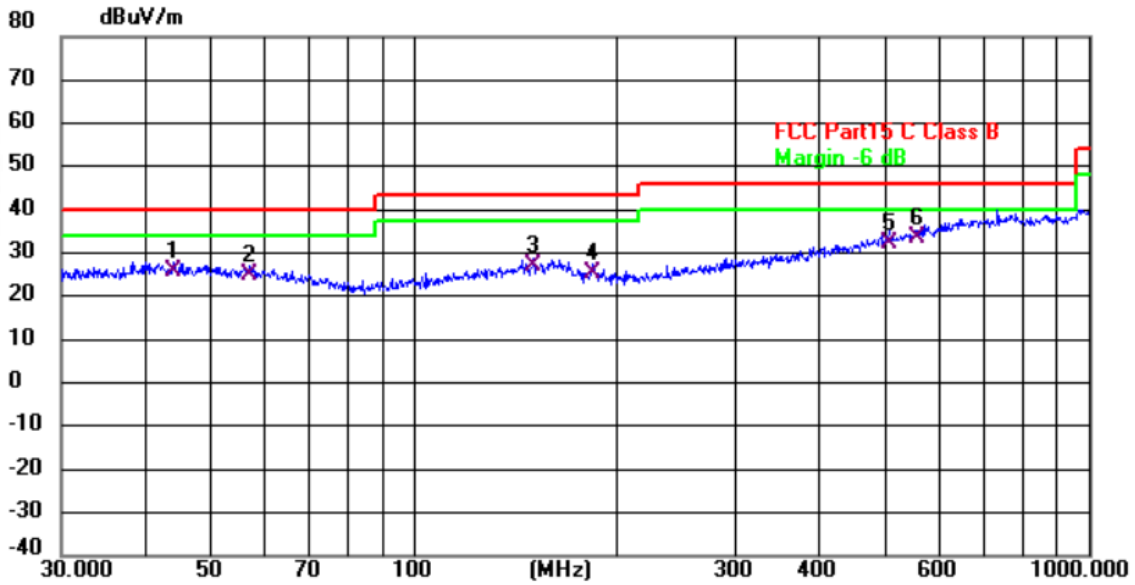
Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

Test Frequency: 30MHz ~ 1GHz

Pass.

Please refer to the following test plots for the worst test mode (GFSK, Lowest Channel).

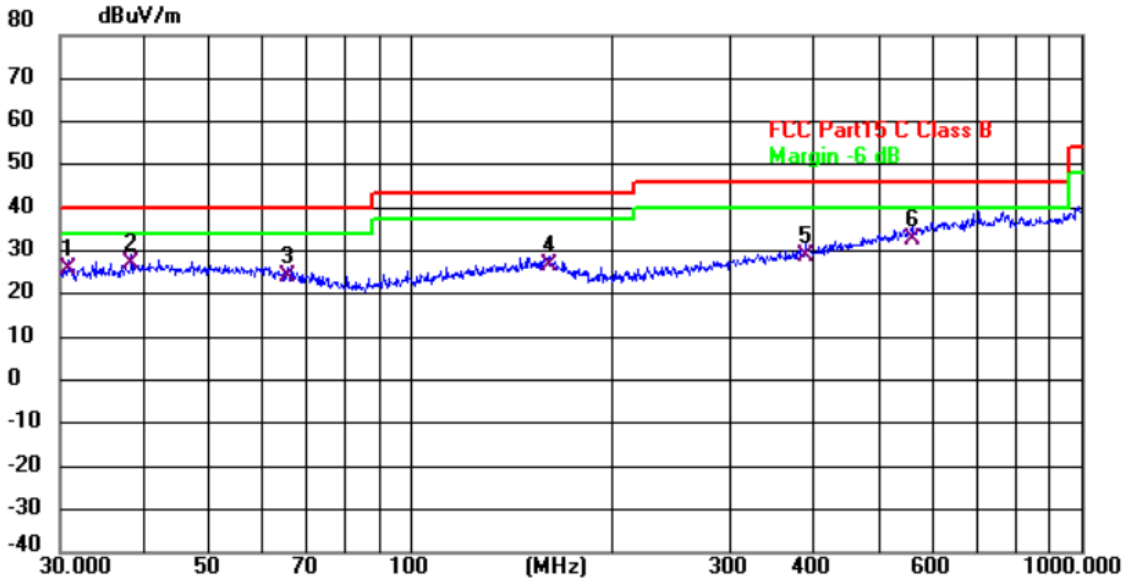
Temperature:	26.3 ℃	Relative Humidity:	54.2%
Pressure:	1012hPa	Phase :	Vertical
Test Voltage :	DC 6V		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	44.1202	11.11	14.49	25.60	40.00	-14.40	QP
2	56.9912	10.97	13.83	24.80	40.00	-15.20	QP
3	150.5377	11.53	15.37	26.90	43.50	-16.60	QP
4	184.4898	12.46	12.84	25.30	43.50	-18.20	QP
5	506.4790	11.36	20.94	32.30	46.00	-13.70	QP
6 *	556.7743	11.21	22.19	33.40	46.00	-12.60	QP

Note:
1. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
2. An initial pre-scan was performed on the line and neutral lines with peak detector.
3. Correct Factor = Antenna Factor + Cable Loss– pre-amplifier.
4. Margin = Reading level + Correct Factor - Limit

Temperature:	26.3 ℃	Relative Humidity:	54.2%
Pressure:	1012hPa	Phase :	Horizontal
Test Voltage :	DC 6V		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.9618	12.09	13.61	25.70	40.00	-14.30	QP
2 *	38.3462	12.78	14.32	27.10	40.00	-12.90	QP
3	65.5727	11.38	12.72	24.10	40.00	-15.90	QP
4	160.9090	10.76	15.74	26.50	43.50	-17.00	QP
5	387.9920	10.80	17.80	28.60	46.00	-17.40	QP
6	558.7301	10.26	22.24	32.50	46.00	-13.50	QP

Note:
1. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
2. An initial pre-scan was performed on the line and neutral lines with peak detector.
3. Correct Factor = Antenna Factor + Cable Loss– pre-amplifier.
4. Margin = Reading level + Correct Factor - Limit

Test Frequency 1GHz-25GHz

GFSK

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:2402MHz									
V	4804.00	54.36	34.12	5.03	32.39	57.66	74.00	-16.34	PK
V	4804.00	40.24	34.12	5.03	32.39	43.54	54.00	-10.46	AV
V	7206.00	47.11	32.54	6.29	35.86	56.72	74.00	-17.28	PK
V	7206.00	32.06	32.54	6.29	35.86	41.67	54.00	-12.33	AV
V	9608.00	44.21	32.98	7.55	38.40	57.18	74.00	-16.82	PK
V	9608.00	30.11	32.98	7.55	38.40	43.08	54.00	-10.92	AV
V	12010.00	41.28	32.09	8.93	39.00	57.12	74.00	-16.88	PK
V	12010.00	26.03	32.09	8.93	39.00	41.87	54.00	-12.13	AV
H	4804.00	24.01	34.12	5.03	32.39	27.31	74.00	-46.69	PK
H	4804.00	38.96	34.12	5.03	32.39	42.26	54.00	-11.74	AV
H	7206.00	46.87	32.54	6.29	35.86	56.48	74.00	-17.52	PK
H	7206.00	33.26	32.54	6.29	35.86	42.87	54.00	-11.13	AV
H	9608.00	42.59	32.98	7.55	38.40	55.56	74.00	-18.44	PK
H	9608.00	29.01	32.98	7.55	38.40	41.98	54.00	-12.02	AV
H	12010.00	41.04	32.09	8.93	39.00	56.88	74.00	-17.12	PK
H	12010.00	26.66	32.09	8.93	39.00	42.5	54.00	-11.50	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:2441MHz									
V	4882.00	53.69	34.12	5.03	32.39	56.99	74.00	-17.01	PK
V	4882.00	39.85	34.12	5.03	32.39	43.15	54.00	-10.85	AV
V	7323.00	46.65	32.54	6.29	35.86	56.26	74.00	-17.74	PK
V	7323.00	31.85	32.54	6.29	35.86	41.46	54.00	-12.54	AV
V	9764.00	43.59	32.98	7.55	38.40	56.56	74.00	-17.44	PK
V	9764.00	30.24	32.98	7.55	38.40	43.21	54.00	-10.79	AV
V	12205.00	41.22	32.09	8.93	39.00	57.06	74.00	-16.94	PK
V	12205.00	26.31	32.09	8.93	39.00	42.15	54.00	-11.85	AV
H	4882.00	53.33	34.12	5.03	32.39	56.63	74.00	-17.37	PK
H	4882.00	38.46	34.12	5.03	32.39	41.76	54.00	-12.24	AV
H	7323.00	45.93	32.54	6.29	35.86	55.54	74.00	-18.46	PK
H	7323.00	33.18	32.54	6.29	35.86	42.79	54.00	-11.21	AV
H	9764.00	42.24	32.98	7.55	38.40	55.21	74.00	-18.79	PK
H	9764.00	29.33	32.98	7.55	38.40	42.3	54.00	-11.7	AV
H	12205.00	41.58	32.09	8.93	39.00	57.42	74.00	-16.58	PK
H	12205.00	26.05	32.09	8.93	39.00	41.89	54.00	-12.11	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:2480MHz									
V	4960.00	52.53	34.12	5.03	32.39	55.83	74.00	-18.17	PK
V	4960.00	38.63	34.12	5.03	32.39	41.93	54.00	-12.07	AV
V	7440.00	45.21	32.54	6.29	35.86	54.82	74.00	-19.18	PK
V	7440.00	32.22	32.54	6.29	35.86	41.83	54.00	-12.17	AV
V	9920.00	42.97	32.98	7.55	38.40	55.94	74.00	-18.06	PK
V	9920.00	29.63	32.98	7.55	38.40	42.60	54.00	-11.40	AV
V	12400.00	40.57	32.09	8.93	39.00	56.41	74.00	-17.59	PK
V	12400.00	26.39	32.09	8.93	39.00	42.23	54.00	-11.77	AV
H	4960.00	52.22	34.12	5.03	32.39	55.52	74.00	-18.48	PK
H	4960.00	38.34	34.12	5.03	32.39	41.64	54.00	-12.36	AV
H	7440.00	44.79	32.54	6.29	35.86	54.40	74.00	-19.60	PK
H	7440.00	32.61	32.54	6.29	35.86	42.22	54.00	-11.78	AV
H	9920.00	42.19	32.98	7.55	38.40	55.16	74.00	-18.84	PK
H	9920.00	29.05	32.98	7.55	38.40	42.02	54.00	-11.98	AV
H	12400.00	40.59	32.09	8.93	39.00	56.43	74.00	-17.57	PK
H	12400.00	26.63	32.09	8.93	39.00	42.47	54.00	-11.53	AV

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
4. All the modes have tested and recorded the worst mode(GFSK) in the report

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

	Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
GFSK	Low Channel: 2402MHz									
	H	2390.00	45.22	35.17	3.48	27.49	41.02	74.00	-32.98	PK
	H	2390.00	41.52	35.17	3.48	27.49	37.32	54.00	-16.68	AV
	H	2400.00	61.57	35.16	3.49	27.52	57.42	74.00	-16.58	PK
	H	2400.00	48.79	35.16	3.49	27.52	44.64	54.00	-9.36	AV
	V	2390.00	45.06	35.17	3.48	27.49	40.86	74.00	-33.14	PK
	V	2390.00	41.88	35.17	3.48	27.49	37.68	54.00	-16.32	AV
	V	2400.00	62.06	35.16	3.49	27.52	57.91	74.00	-16.09	PK
	V	2400.00	50.11	35.16	3.49	27.52	45.96	54.00	-8.04	AV
	High Channel: 2480MHz									
	H	2483.50	60.25	35.17	3.48	27.49	56.05	74.00	-17.95	PK
	H	2483.50	47.33	35.17	3.48	27.49	43.13	54.00	-10.87	AV
	H	2500.00	45.82	35.16	3.49	27.52	41.67	74.00	-32.33	PK
	H	2500.00	40.97	35.16	3.49	27.52	36.82	54.00	-17.18	AV
	V	2483.50	59.96	35.17	3.48	27.49	55.76	74.00	-18.24	PK
	V	2483.50	47.24	35.17	3.48	27.49	43.04	54.00	-10.96	AV
	V	2500.00	46.35	35.16	3.49	27.52	42.20	74.00	-31.8	PK
	V	2500.00	40.25	35.16	3.49	27.52	36.10	54.00	-17.9	AV

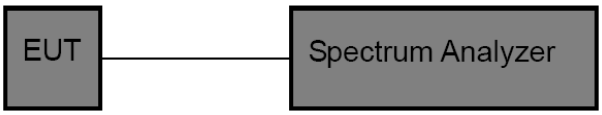
Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit

8 Conduct Band Edge And Spurious Emissions Measurement

Test Requirement	:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	:	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
Test Limit	:	Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the Radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

8.1 Test Setup



8.2 Test Procedure

For Spurious Emissions:

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:

a) Set instrument center frequency to DTS channel center frequency.

b) Set the span to _ 1.5 times the DTS bandwidth.

c) Set the RBW = 100 kHz.

d) Set the VBW _ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

For Band Edge:

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.

4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.

5. Repeat above procedures until all measured frequencies were complete.

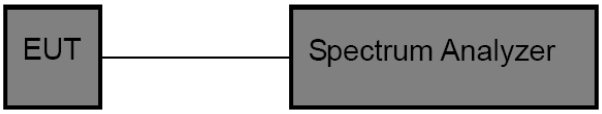
8.3 Test Result

Please see the Appendix for the BLE data

9 -6dB Bandwidth and 99% Bandwidth Measurement

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
Test Limit		Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

9.1 Test Setup



9.2 Test Procedure

For 6dB Bandwidth Measurement

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2.The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1(i.e, RBW= 100 kHz VBW>3 x RBW,and peak detector with maximum hold) is implemented by the instrumentation function.When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ⩾6 dB.

3. The steps for the first option are as follows:

a.Set RBW= shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.

b.Set the VBW[3 x RBW].

c.Detector = peak

d.Trace mode = max-hold.

e.Sweep = No faster than coupled (auto) time.

f.Allow the trace to stabilize.

g.Measure the maximum width of the emission by placing two markers, one at the lowest frequencyand the other at the highest frequency of the envelope of the spectral display, such that each markeris at or slightly below the "-6 dB down amplitude". If a marker is below this "-6 dB down amplitude?' value, then it shalil be as close as possible to this value.

For 99% Bandwidth Measurement

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 = 1%-5% OBW, VBW ⩾ 3RBW

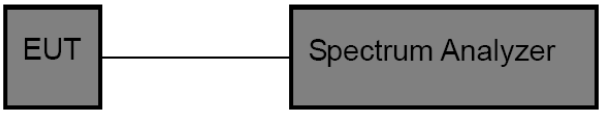
9.3 Test Result

Please see the Appendix for the BLE data

10 Maximum Peak Output Power

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
Test Limit	:	Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

10.1 Test Setup



10.2 Test Procedure

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

a)Set the RBW ⩾ DTS bandwidth.

b)Set VBW ⩾ 3 RBW.

c)Set span ⩾ 3 x RBW

d)Sweep time = auto couple.

e)Detector = peak.

f)Trace mode = max hold.

g)Allow trace to fully stabilize.

h)Use peak marker function to determine the peak amplitude level.

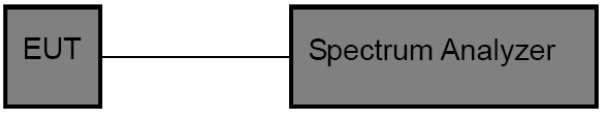
10.3 Test Result

Please see the Appendix for the BLE data

11 Power Spectral density

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
Test Limit	:	Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.1 Test Setup



11.2 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 = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.3 Test Result

Please see the Appendix for the BLE data

12 Antenna Application

12.1 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.

12.2 Result

The antenna is Internal Antenna, the Max gain of the antennas is 2.21 dBi, reference to the attachment for details.

13 Test Setup Photos and EUT Photos

Please see the attachment for details.

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