FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.249

Report Reference No.....	**: BSL24100154P01-R01**
FCC ID.....	**: 2BD58-HBD88-P33**
Compiled by (position+printed name+signature)..	: Engineer/ Cindy Zheng
Supervised by (position+printed name+signature)..	: Manager/Haley Wen
Approved by (position+printed name+signature)..	: RF Manager/ Vivian Jiang
Date of issue.....	: November 21, 2024

Testing Laboratory Name.....	: **BSL Testing Co., Ltd.**
Address.....	: 1/F, Building B, Xinshidai GR Park,Shiyan Street, Bao'an District, Shenzhen,Guangdong, 518052, People’s Republic of China
Applicant’s name.....	: **SHANTOU CHENGHAI HONGBAODA SCIENCE, EDUCATION AND CULTURE CO., LTD**
Address.....	: Chenghai District, Shantou City, Guangdong Province,China
Test specification.....	**:**
Standard.....	: **FCC CFR Title 47 Part 15 Subpart C Section 15.249** **ANSI C63.10:2013**

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Equipment description.....	**: toys**
Trade Mark.....	: Jovow; Eohemeral
Manufacturer.....	: SHANTOU CHENGHAI HONGBAODA SCIENCE, EDUCATION AND CULTURE CO., LTD
Model/Type reference.....	: HBD88-P33
Listed Models	: N/A
Modulation	: GFSK
Frequency.....	From 2405MHz to 2475MHz
Rating.....	: DC 3.0V
Result.....	: **PASS**

TEST REPORT

Equipment under Test	**:**	**toys**
Model /Type	:	HBD88-P33
Listed Models	:	N/A
Model Declaration	:	N/A
Applicant	**:**	**SHANTOU CHENGHAI HONGBAODA SCIENCE, EDUCATION AND CULTURE CO., LTD**
Address	:	Chenghai District, Shantou City, Guangdong Province,China
Manufacturer	**:**	**SHANTOU CHENGHAI HONGBAODA SCIENCE, EDUCATION AND CULTURE CO., LTD**
Address	:	No.9,West 1st Heng, Longtian Road, Guangyi Street, Chenghai District, Shantou City, Guangdong Province,China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.249: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz and 24.0-24.25 GHz
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	November 5, 2024
Testing commenced on	:	November 5, 2024
Testing concluded on	:	November 21, 2024

2.2 Product Description

Product Description:	toys
Model/Type reference:	HBD88-P33
Listed Models:	N/A
Power supply:	DC 3V
Hardware Version:	Ver.A
Software Version:	V5.32
Testing sample ID：	BSL24100154P01-R01-1# (Engineer sample) BSL24100154P01-R01-2# (Normal sample)
2.4G	
Supported type:	2.4G
Modulation:	GFSK
Operation frequency:	2405MHz to 2475MHz
Channel number:	25
Channel separation:	/
Antenna type:	Metal Antenna
Antenna gain:	0.17 dBi

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3V

2.4 Short description of the Equipment under Test (EUT)

This is a Children’s toys.
For more details, refer to the user’s manual of the EUT.

2.5 EUT operation mode

The Applicant provides communication tools software(Engineer mode) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .

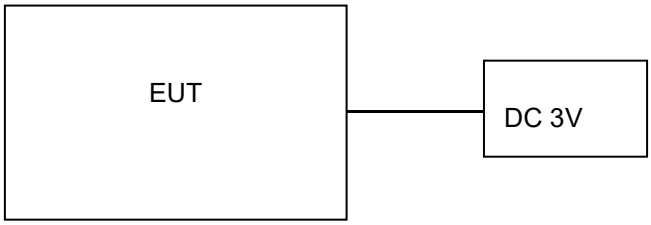
Operation Frequency：

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2405	11	2428	21	2471
02	2407	12	2435	22	2472
03	2408	13	2445	23	2473
04	2410	14	2451	24	2474
05	2411	15	2452	25	2475
06	2414	16	2453		
07	2418	17	2454		
08	2422	18	2462		
09	2425	19	2469		
10	2427	20	2470		

Channel	Frequency (MHz)
The lowest channel	2405
The middle channel	2435
The Highest channel	2475

2.6 Block Diagram of Test Setup

Radiated Spurious Emission Test



2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

2.8 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

BSL Testing Co., Ltd.
1/F, Building B, Xinshidai GR Park,Shiyan Street, Bao'an District, Shenzhen,Guangdong, 518052, People's Republic of China

3.2 Test Facility

FCC-Registration No.: 562200 Designation Number: CN1338
BSL Testing Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

Industry Canada Registration Number. Is: 11093A CAB identifier: CN0019
The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

A2LA-Lab Cert. No.: 4707.01
BSL Testing Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:
Radiated Emission:

Temperature:	23 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	24 ° C
Humidity:	47 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	24 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

3.4 Summary of measurement results

FCC Part15 (15.249) , Subpart C			
Standard Section	Test Item	Judgment	Remark
FCC part 15.203	Antenna requirement	PASS	
FCC part 15.207	AC Power Line Conducted Emission	N/A	
FCC part 15.249	Fundamental &Radiated Spurious Emission Measurement	PASS	
FCC part 15.215	20dB Channel Bandwidth	PASS	
FCC part 15.205	Band Edge	PASS	

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report
3. " N/A" denotes test is not applicable in this Test Report

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the BSL Testing Co., Ltd.quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for BSL Testing Co., Ltd.:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.82 dB	(1)
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)
Transmitter power conducted	1~40GHz	0.57 dB	(1)
Conducted spurious emission	1~40GHz	1.60 dB	(1)
OBW	1~40GHz	25 Hz	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6 Equipments Used during the Test

	Conducted Emission					
Test Equipment	**Manufacturer**	**Model**	**Serial No.**	**Last Cal.**	**Date of Cal.**	**Due Date**
Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	BSL252	2023-10-28	2024-10-27	2025-10-26
EMI Test Receiver	R&S	ESCI 7	BSL552	2023-10-28	2024-10-27	2025-10-26
Coaxial Switch	ANRITSU CORP	MP59B	BSL225	2023-10-28	2024-10-27	2025-10-26
ENV216 2-L-V-NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	BSL226	2023-10-28	2024-10-27	2025-10-26
Coaxial Cable	BSL	N/A	BSL227	N/A	N/A	N/A
EMI Test Software	AUDIX	E3	N/A	N/A	N/A	N/A
Thermo meter	KTJ	TA328	BSL233	2023-10-28	2024-10-27	2025-10-26
Absorbing clamp	Elektronik-Feinmechanik	MDS21	BSL229	2023-10-28	2024-10-27	2025-10-26
LISN	R&S	ENV216	308	2023-10-28	2024-10-27	2025-10-26
LISN	R&S	ENV216	314	2023-10-28	2024-10-27	2025-10-26

	Radiation Test equipment					
Test Equipment	**Manufacturer**	**Model**	**Serial No.**	**Last Cal.**	**Date of Cal.**	**Due Date**
3m Semi-Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)*6.4(H)	BSL250	2023-10-28	2024-10-27	2025-10-26
Control Room	ZhongYu Electron	6.2(L)*2.5(W)*2.4(H)	BSL251	N/A	N/A	N/A
EMI Test Receiver	Rohde & Schwarz	ESU26	BSL203	2023-10-28	2024-10-27	2025-10-26
BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	BSL214	2023-10-28	2024-10-27	2025-10-26
Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	BSL208	2023-10-28	2024-10-27	2025-10-26
Horn Antenna	ETS-LINDGREN	3160	BSL217	2023-10-28	2024-10-27	2025-10-26
EMI Test Software	AUDIX	E3	N/A	N/A	N/A	N/A
Coaxial Cable	BSL	N/A	BSL213	2023-10-28	2024-10-27	2025-10-26
Coaxial Cable	BSL	N/A	BSL211	2023-10-28	2024-10-27	2025-10-26

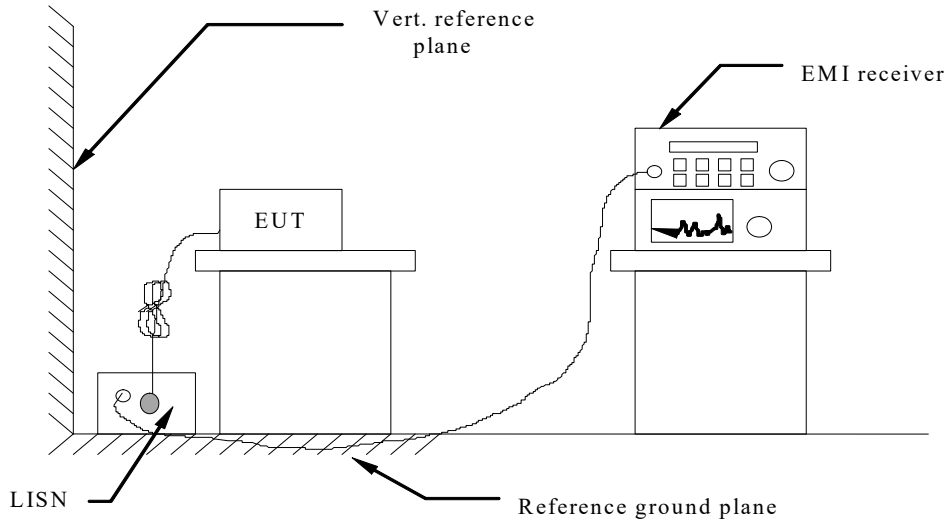
Coaxial cable	BSL	N/A	BSL210	2023-10-28	2024-10-27	2025-10-26
Coaxial Cable	BSL	N/A	BSL212	2023-10-28	2024-10-27	2025-10-26
Amplifier(100kHz-3GHz)	HP	8347A	BSL204	2023-10-28	2024-10-27	2025-10-26
Amplifier(2GHz-20GHz)	HP	84722A	BSL206	2023-10-28	2024-10-27	2025-10-26
Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	BSL218	2023-10-28	2024-10-27	2025-10-26
Band filter	Amindeon	82346	BSL219	2023-10-28	2024-10-27	2025-10-26
Power Meter	Anritsu	ML2495A	BSL540	2023-10-28	2024-10-27	2025-10-26
Power Sensor	Anritsu	MA2411B	BSL541	2023-10-28	2024-10-27	2025-10-26
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	BSL575	2023-10-28	2024-10-27	2025-10-26
Splitter	Agilent	11636B	BSL237	2023-10-28	2024-10-27	2025-10-26
Loop Antenna	ZHINAN	ZN30900A	BSL534	2023-10-28	2024-10-27	2025-10-26
Breitband hornantenne	SCHWARZBECK	BBHA 9170	BSL579	2023-10-28	2024-10-27	2025-10-26
Amplifier	TDK	PA-02-02	BSL574	2023-10-28	2024-10-27	2025-10-26
Amplifier	TDK	PA-02-03	BSL576	2023-10-28	2024-10-27	2025-10-26
PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	BSL578	2023-10-28	2024-10-27	2025-10-26
Antenna tower	SKET	BK-4AT	BSL589	2023-10-28	2024-10-27	2025-10-26

	RF Conducted Test:					
Test Equipment	**Manufacturer**	**Model**	**Serial No.**	**Last Cal.**	**Date of Cal.**	**Due Date**
MXA Signal Analyzer	Agilent	N9020A	BSL566	2023-10-28	2024-10-27	2025-10-26
EMI Test Receiver	R&S	ESCI 7	BSL552	2023-10-28	2024-10-27	2025-10-26
Spectrum Analyzer	Agilent	E4440A	BSL533	2023-10-28	2024-10-27	2025-10-26
MXG vector Signal Generator	Agilent	N5182A	BSL567	2023-10-28	2024-10-27	2025-10-26
ESG Analog Signal Generator	Agilent	E4428C	BSL568	2023-10-28	2024-10-27	2025-10-26
USB RF Power Sensor	DARE	RPR3006W	BSL569	2023-10-28	2024-10-27	2025-10-26
RF Switch Box	Shongyi	RFSW3003328	BSL571	2023-10-28	2024-10-27	2025-10-26
Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	BSL572	2024-10-27	2024-10-27	2025-10-26

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

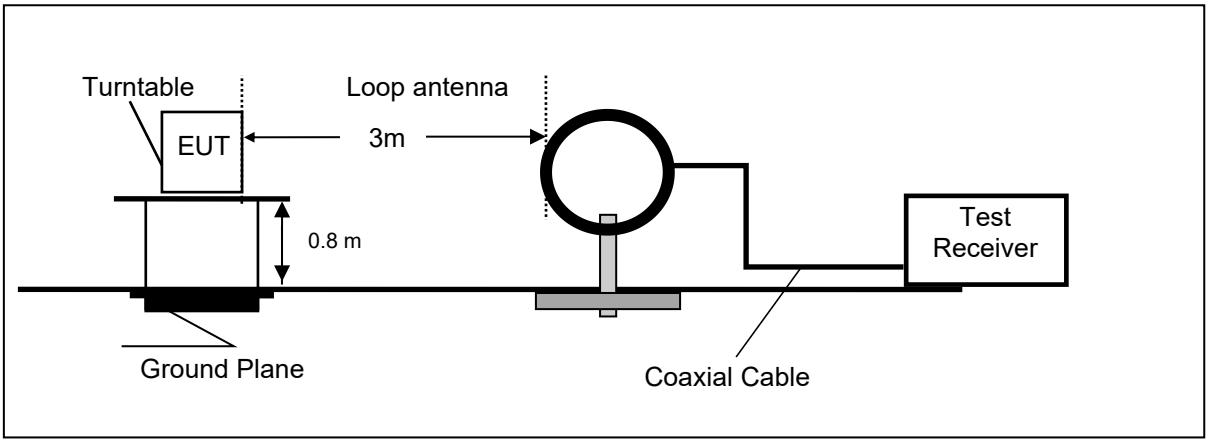
TEST RESULTS

The EUT is powered by the Battery,So this test item is not applicable for the EUT.

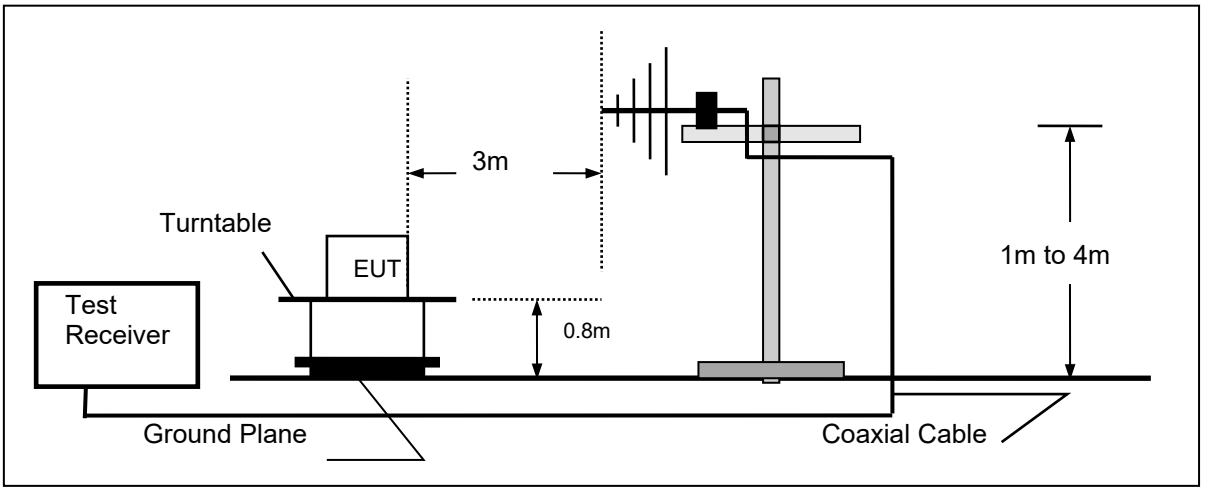
4.2 Radiated Emissions and Band Edge

TEST CONFIGURATION

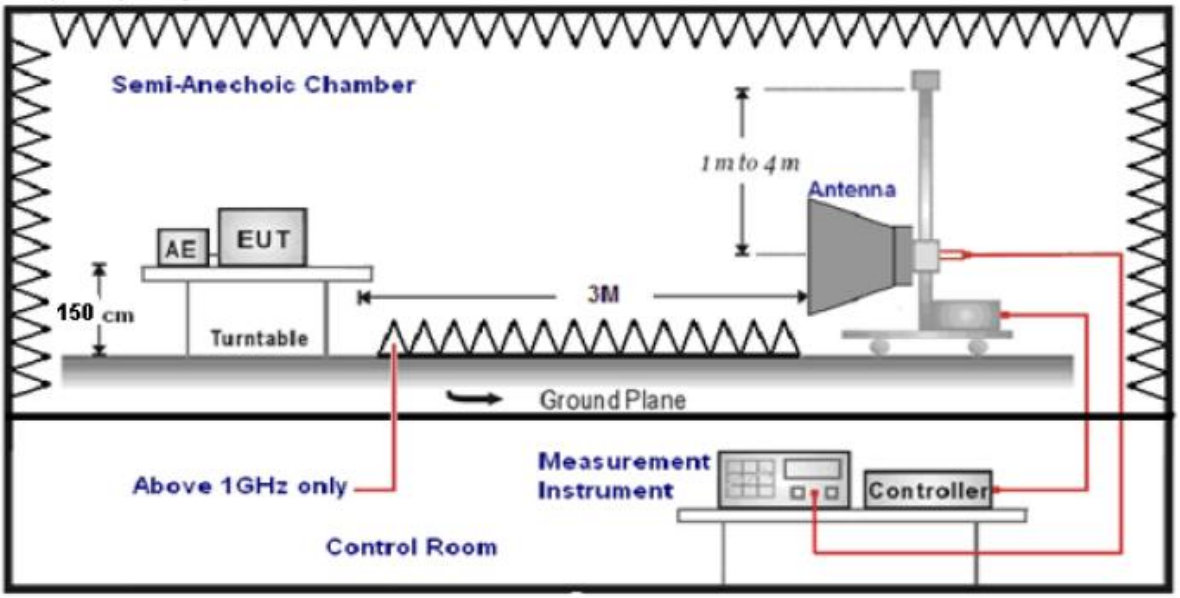
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

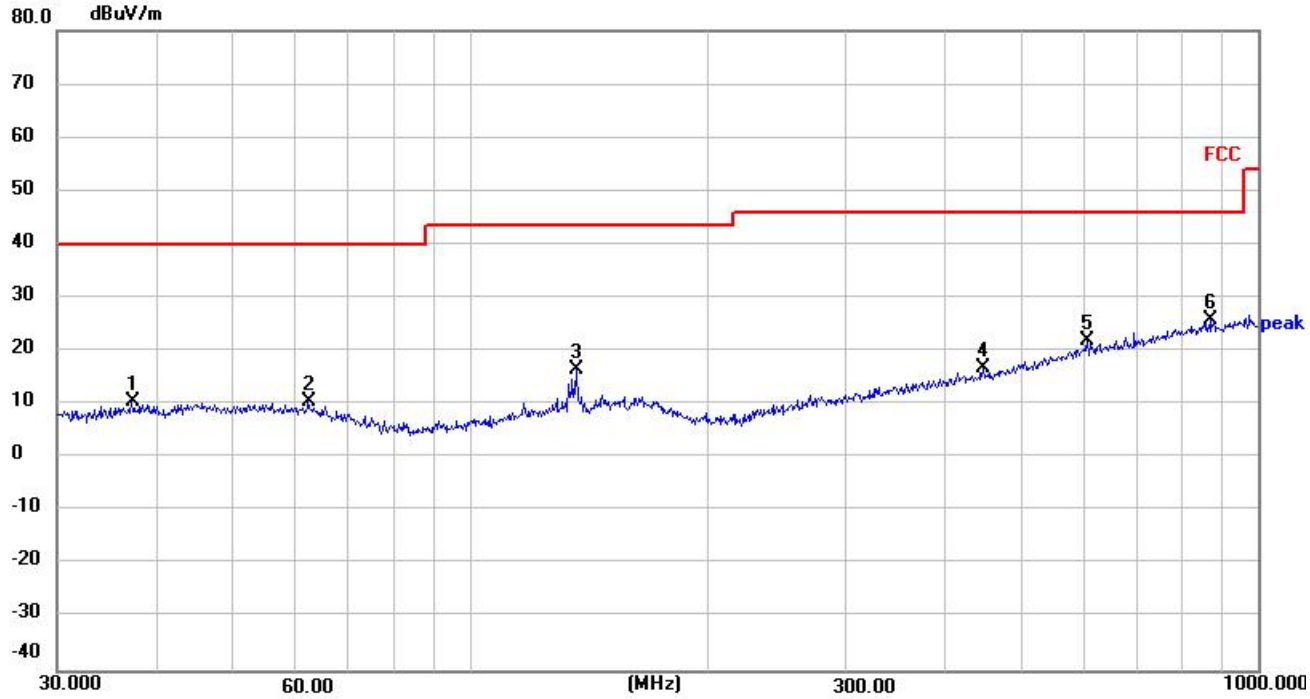
TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. 2.4G were tested at Low, Middle, and High channel and recorded worst mode at 2.4G 1Mpbs.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

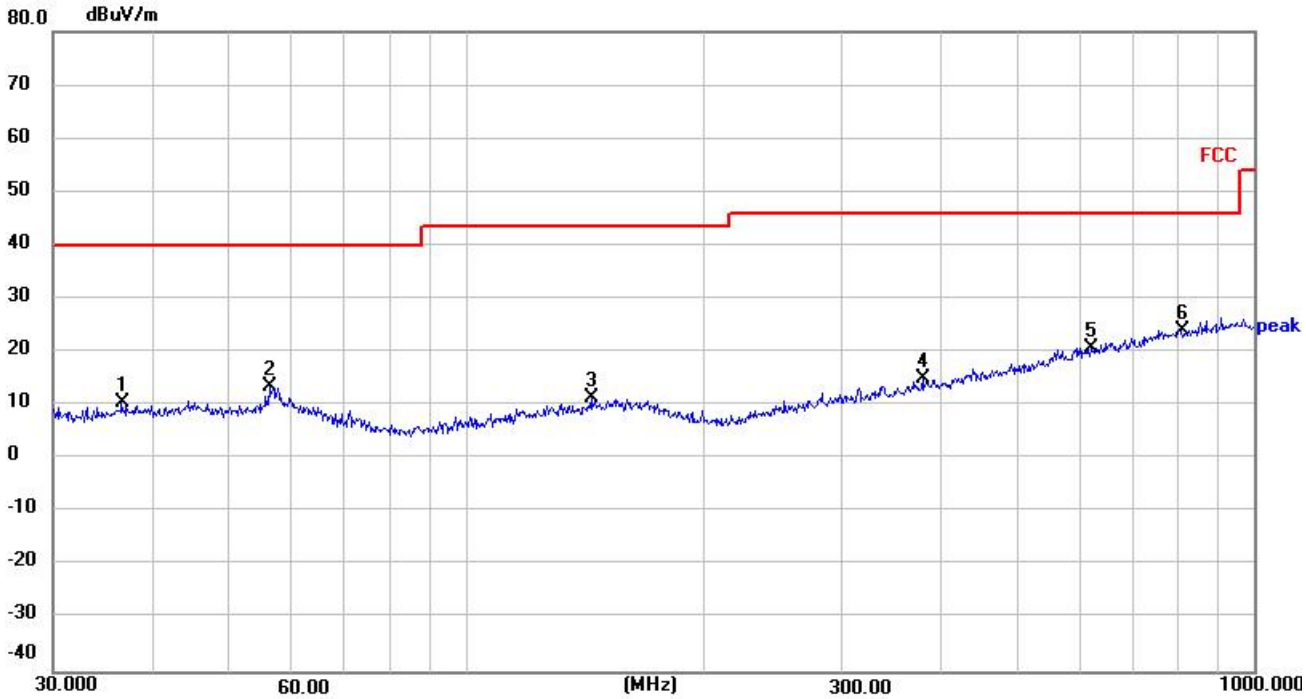
Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	37.2855	27.29	-16.71	10.58	40.00	-29.42	peak	100	0	P	
2	62.4314	27.99	-17.43	10.56	40.00	-29.44	peak	100	0	P	
3	136.4598	33.37	-16.92	16.45	43.50	-27.05	peak	100	0	P	
4	447.9822	28.68	-11.71	16.97	46.00	-29.03	peak	100	0	P	
5	607.7867	29.66	-7.73	21.93	46.00	-24.07	peak	100	0	P	
6 *	872.1832	29.86	-4.01	25.85	46.00	-20.15	peak	100	0	P	

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	36.6375	27.25	-16.82	10.43	40.00	-29.57	peak	100	360	P	
2	56.3948	30.50	-16.90	13.60	40.00	-26.40	peak	100	360	P	
3	144.3348	27.97	-16.40	11.57	43.50	-31.93	peak	100	360	P	
4	379.9141	28.57	-13.60	14.97	46.00	-31.03	peak	100	360	P	
5	620.7096	28.38	-7.52	20.86	46.00	-25.14	peak	100	360	P	
6 *	807.4291	28.73	-4.55	24.18	46.00	-21.82	peak	100	360	P	

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

For 1GHz to 25GHz

GFSK (above 1GHz)

Frequency(MHz):			**2405**			**Peak value**		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	55.89	21.52	3.52	33.12	47.81	74	-26.19	Horizontal
4810.00	51.26	23.65	4.56	33.08	46.39	74	-27.61	Vertical
7215.00	46.75	25.58	6.15	33.57	44.91	74	-29.09	Horizontal
7215.00	41.65	27.68	6.98	33.26	43.05	74	-30.95	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	45.56	21.52	3.52	33.12	37.48	54	-16.52	Horizontal
4810.00	40.32	23.65	4.56	33.08	35.45	54	-18.55	Vertical
7215.00	35.46	25.58	6.15	33.57	33.62	54	-20.38	Horizontal
7215.00	30.85	27.68	6.98	33.26	32.25	54	-21.75	Vertical

Frequency(MHz):			**2435**			**Peak value**		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4870.00	56.54	21.78	3.58	33.27	48.63	74	-25.37	Horizontal
4870.00	50.68	24.15	4.57	33.87	45.53	74	-28.47	Vertical
7305.00	45.79	26.04	6.24	33.19	44.88	74	-29.12	Horizontal
7305.00	40.56	27.98	7.18	33.68	42.04	74	-31.96	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4870.00	46.52	21.78	3.58	33.27	38.61	54	-15.39	Horizontal
4870.00	41.56	24.15	4.57	33.87	36.41	54	-17.59	Vertical
7305.00	35.96	26.04	6.24	33.19	35.05	54	-18.95	Horizontal
7305.00	30.46	27.98	7.18	33.68	31.94	54	-22.06	Vertical

Frequency(MHz):			**2475**			**Peak value**		
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4950.00	55.85	22.56	4.17	33.75	48.83	74	-25.17	Horizontal
4950.00	50.74	24.78	5.36	33.17	47.71	74	-26.29	Vertical
7425.00	45.26	27.14	6.97	33.62	45.75	74	-28.25	Horizontal
7425.00	40.13	28.16	7.65	33.58	42.36	74	-31.64	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4950.00	45.72	22.56	4.17	33.75	38.7	54	-15.3	Horizontal
4950.00	40.84	24.78	5.36	33.17	37.81	54	-16.19	Vertical
7425.00	35.42	27.14	6.97	33.62	35.91	54	-18.09	Horizontal
7425.00	30.19	28.16	7.65	33.58	32.42	54	-21.58	Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

4.3 BANDWIDTH OF FREQUENCY BAND EDGE

4.3.1 Test Requirement:

<table>
<tr><td>Test Requirement:</td><td colspan="5">FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td colspan="5">ANSI C63.10: 2013</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="5">All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.</td></tr>
<tr><td>Test site:</td><td colspan="5">Measurement Distance: 3m</td></tr>
<tr><td rowspan="3">Receiver setup:</td><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak</td></tr>
<tr><td>Average</td><td>1MHz</td><td>3MHz</td><td>Average</td></tr>
</table>

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

4.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 1.5 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:

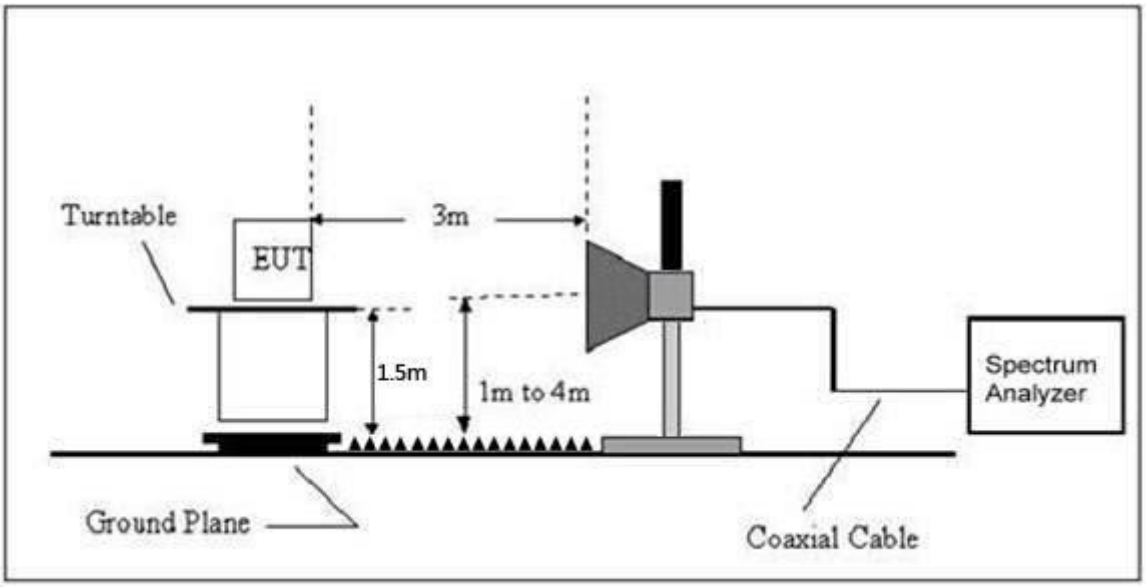
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

4.3.3 DEVIATION FROM TEST STANDARD

No deviation

4.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



4.3.5 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.

4.3.6 TEST RESULT

2405MHz
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310	56.41	21.25	3.26	33.14	47.78	74	-26.22	Horizontal
2390	53.65	21.54	3.42	33.26	45.35	74	-28.65	Horizontal
2400	51.52	21.75	3.54	33.42	43.39	74	-30.61	Horizontal
2310	49.85	21.54	3.42	33.26	41.55	74	-32.45	Vertical
2390	47.65	21.25	3.26	33.14	39.02	74	-34.98	Vertical
2400	45.19	21.75	3.54	33.42	37.06	74	-36.94	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310	52.16	21.25	3.26	33.14	43.53	54	-10.47	Horizontal
2390	50.42	21.54	3.42	33.26	42.12	54	-11.88	Horizontal
2400	48.53	21.75	3.54	33.42	40.4	54	-13.6	Horizontal
2310	46.43	21.25	3.26	33.14	37.8	54	-16.2	Vertical
2390	44.75	21.54	3.42	33.26	36.45	54	-17.55	Vertical
2400	42.31	21.75	3.54	33.42	34.18	54	-19.82	Vertical

2475MHz
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.5	55.76	22.12	3.65	33.54	47.99	74	-26.01	Horizontal
2500	52.25	22.35	3.98	33.27	45.31	74	-28.69	Horizontal
2483.5	50.49	22.12	3.65	33.54	42.72	74	-31.28	Vertical
2500	48.62	22.35	3.98	33.27	41.68	74	-32.32	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.5	53.27	22.12	3.65	33.54	45.5	54	-8.5	Horizontal
2500	51.49	22.35	3.98	33.27	44.55	54	-9.45	Horizontal
2483.5	48.34	22.12	3.65	33.54	40.57	54	-13.43	Vertical
2500	45.86	22.35	3.98	33.27	38.92	54	-15.08	Vertical

Remark: Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
All of the restriction bands were tested, and only the data of worst case was exhibited.

Measurement data:
Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2405	101.16	22.55	3.25	33.45	93.51	114	-20.49	Vertical
2405	98.57	22.55	3.25	33.45	90.92	114	-23.08	Horizontal
2435	96.24	23.05	3.36	33.15	89.50	114	-24.50	Vertical
2435	95.24	23.05	3.36	33.15	88.50	114	-25.50	Horizontal
2475	93.42	23.57	3.67	33.68	86.98	114	-27.02	Vertical
2475	91.24	23.57	3.67	33.68	84.80	114	-29.20	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2405	92.48	22.55	3.25	33.45	84.83	94	-9.17	Vertical
2405	90.34	22.55	3.25	33.45	82.69	94	-11.31	Horizontal
2435	88.63	23.05	3.36	33.15	81.89	94	-12.11	Vertical
2435	86.46	23.05	3.36	33.15	79.72	94	-14.28	Horizontal
2475	84.26	23.57	3.67	33.68	77.82	94	-16.18	Vertical
2475	81.65	23.57	3.67	33.68	75.21	94	-18.79	Horizontal

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

4.4 Channel Bandwidth

Test Requirement:	FCC Part15 C Section 15.215
Test Method:	ANSI C63.10: 2013

4.4.1 Applied procedures / limit

FCC Part15 (15.215) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.215	Bandwidth	2400-2483.5	PASS

4.4.2 TEST PROCEDURE

1) Span equal to approximately 1.5 times the OBW, centered on the carrier frequency
2) RBW, prefer 1% to 5% of OBW, or a minimum of 1 MHz if this is not possible due to a large OBW
3) VBW approximately 3 × RBW
4) Set the reference level of the instrument as required to reduce the chance of the signal amplitude exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.1.6.
5) Sweep = No faster than coupled (auto) time.
6) Detector function = peak.
7) Trace = max-hold.

4.4.3 DEVIATION FROM STANDARD

No deviation.

4.4.4TEST SETUP

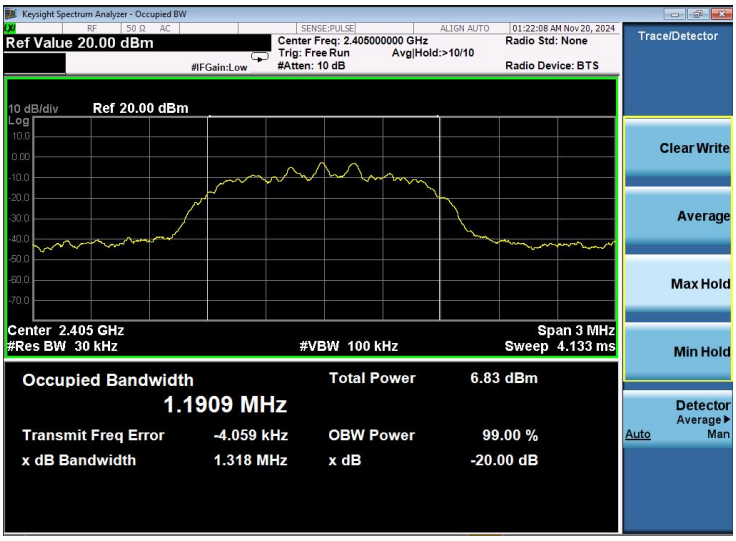
4.4.5 EUT OPERATION CONDITIONS

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.

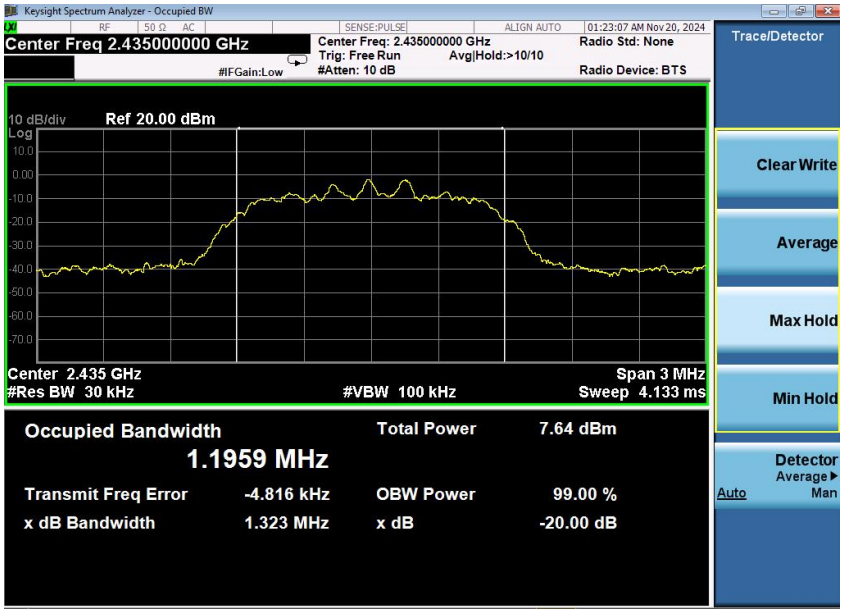
4.4.6 TEST RESULTS

Temperature：	26℃	Relative Humidity：	54%
Test Mode ：	GFSK	Test Voltage ：	DC 3.0V

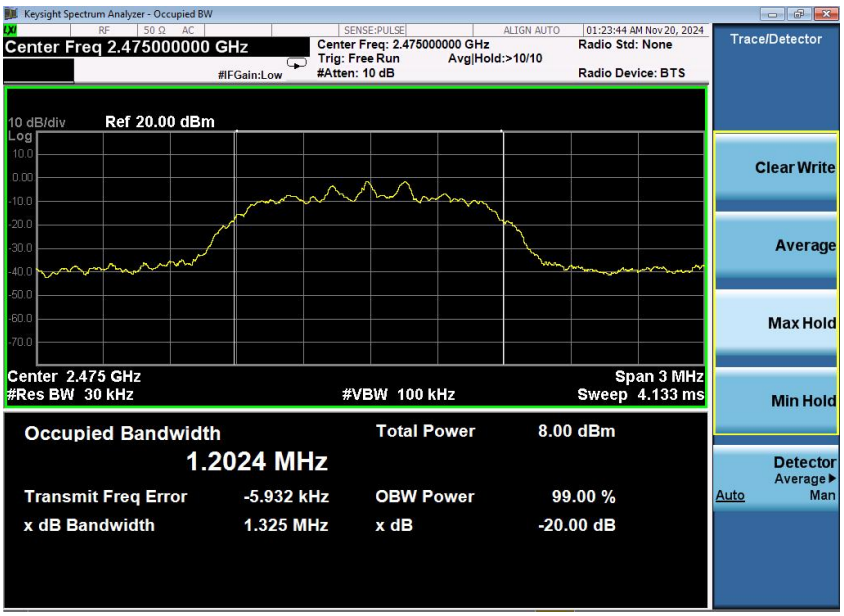
Test channel	Channel Bandwidth (MHz)	Result
2405MHz	1.318	Pass
2435MHz	1.323	
2475MHz	1.325	



Lowest channel



Middle channel



Highest channel

4.5 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

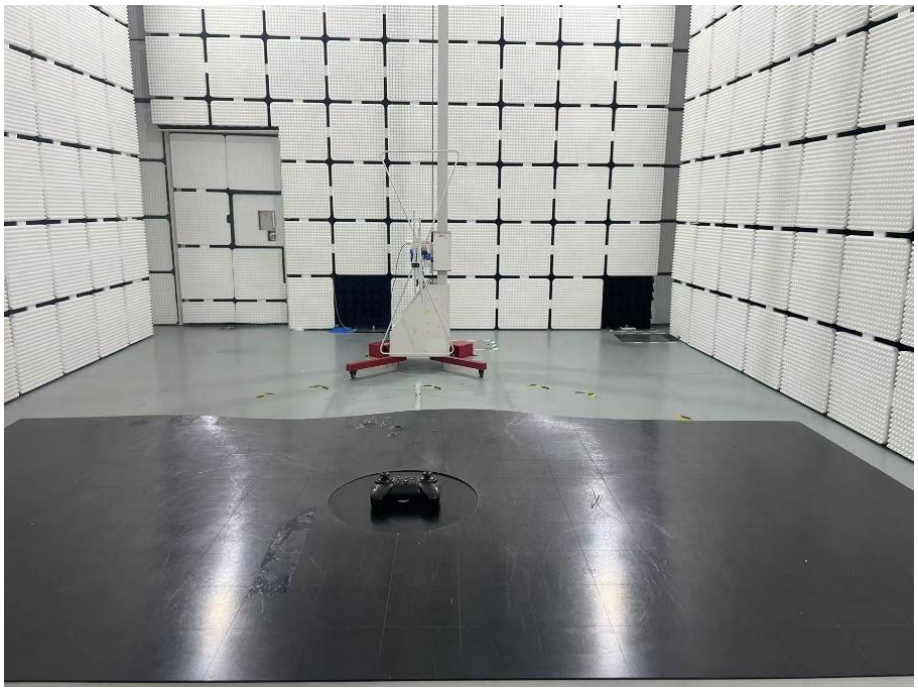
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

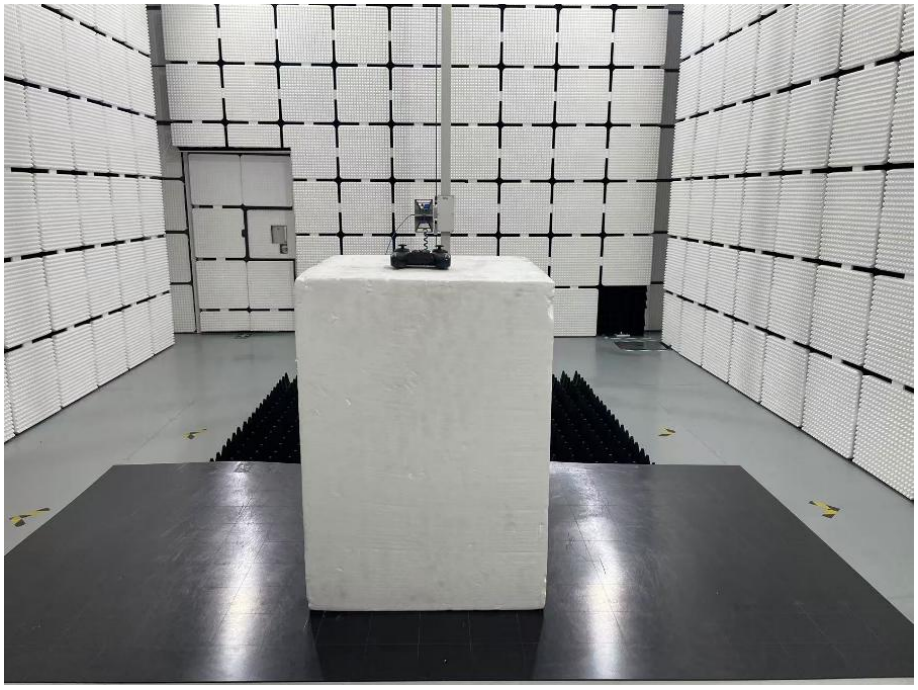
Antenna Connected Construction

The maximum gain of antenna was 0.17 dBi.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, BSL Testing Co., Ltd. does not assume any responsibility.

5 Test Setup Photos of the EUT





6 Photos of the EUT

Reference to the report ANNEX A of external photos and ANNEX B of internal photos.

********** **End of Report** **********