

FCC PART 15 SUBPART C TEST REPORT**FCC PART 15.249****Report Reference No.**..... : **BSL23081401-P01R02****FCC ID**..... : **2AYJK-GALE**Compiled by
(position+printed name+signature)..: Engineer/ Cindy ZhengSupervised by
(position+printed name+signature)..: Manager/Haley WenApproved by
(position+printed name+signature)..: RF Manager/ Vivian Jiang

Date of issue.....: August 25, 2023

Cindy Zheng

Haley Wen

Vivian Jiang

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**..... : **Shenzhen Warsong Technology Co., Ltd.**Address.....: D3.Tongfuyu Industrial Area , Street Community of Shajing Town,
BaoAn, ShenZhen, China**Test specification**..... :Standard.....: **FCC CFR Title 47 Part 15 Subpart C Section 15.249**
ANSI C63.10:2013**BSL Testing Co., Ltd.All rights reserved.**

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Equipment description.....: **Wireless Game Controller**

Trade Mark.....: BIGBIG WON

Manufacturer.....: Shenzhen Warsong Technology Co., Ltd.

Model/Type reference.....: Gale

Listed Models: Gale lite, Gale Ultra

Modulation: GFSK

Frequency.....: From 2402MHz to 2480MHz

Ratings.....: DC 3.7V from battery or DC 5.0V from USB Port

Result.....: **PASS**

TEST REPORT

Equipment under Test : **Wireless Game Controller**

Model /Type : Gale

Listed Models : Gale lite, Gale Ultra

Model Declaration : PCB board, structure and internal of these model(s) are the same,So no additional models were tested.

Applicant : **Shenzhen Warsong Technology Co., Ltd.**

Address : D3.Tongfuyu Industrial Area , Street Community of Shajing Town, BaoAn,ShenZhen, China

Manufacturer : Shenzhen Warsong Technology Co., Ltd.

Address : D3.Tongfuyu Industrial Area , Street Community of Shajing Town, BaoAn,ShenZhen, China

Test Result:	PASS
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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	:	August 14, 2023
Testing commenced on	:	August 15, 2023
Testing concluded on	:	August 23, 2023

2.2 Product Description

Product Description:	Wireless Game Controller
Model/Type reference:	Gale
Listed Models:	Gale lite, Gale Ultra
Power supply:	DC 3.7V from battery or DC 5.0V from USB Port
Adapter information (Auxiliary test supplied by testing Lab):	Model: EP-TA20CBC Input: AC 100-240V 50/60Hz Output: DC 5V 2A Firmware Version: EPTA5.14.2 Manufacture: Huizhou Dongyang Yienbi Electronics Co., Ltd
Testing sample ID:	BSL23081401-P01R02-1# (Engineer sample) BSL23081401-P01R02-2# (Normal sample)
2.4G	
Supported type:	2.4G
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	PCB antenna
Antenna gain:	-2.79 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 3.7V from battery or DC 5V From external circuit

2.4 Short description of the Equipment under Test (EUT)

This is a Wireless Game Controller.

For more details, refer to the user's manual of the EUT.

2.5 EUT operation mode

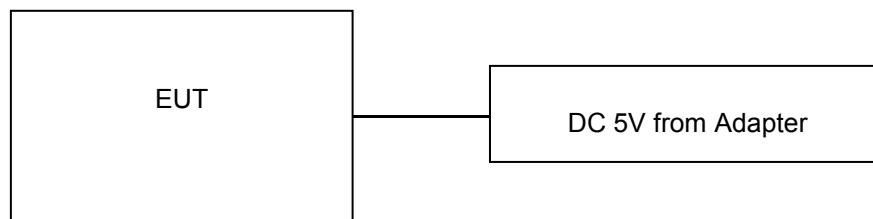
The Applicant provides communication tools software(Engineer mode) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 79 channels provided to the EUT and Channel 00/19/39 were selected to test.

Operation Frequency:

Channel	Frequency (MHz)
00	2402
01	2404
02	2406
⋮	⋮
19	2440
⋮	⋮
37	2476
38	2478
39	2480

Channel	Frequency
The lowest channel	2402 MHz
The middle channel	2440 MHz
The Highest channel	2480 MHz

2.6 Block Diagram of Test Setup



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	PASS	
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

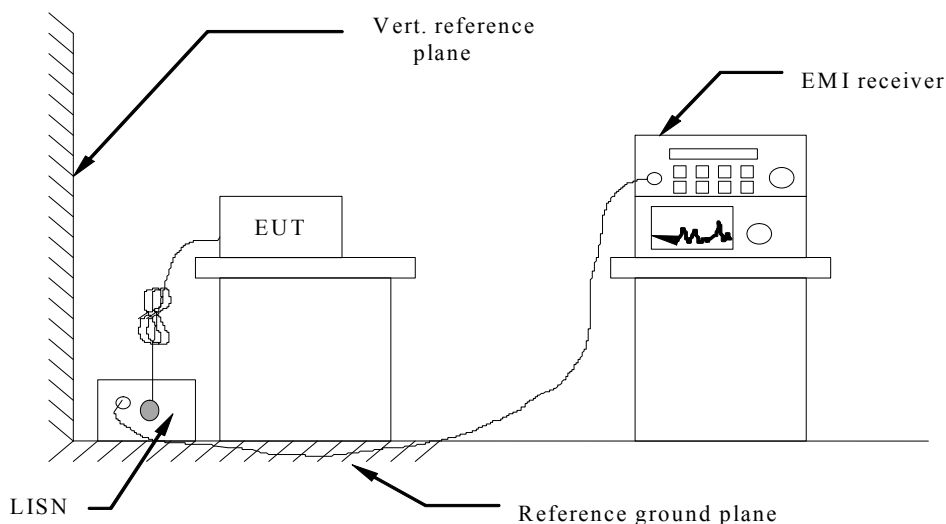
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2022-10-28	2023-10-27
Absorbing Clamp	ROHDE&SCHWARZ	MDS-21	100126	2022-10-28	2023-10-27
Electrostatic analog generator	LIONCEL	ESD-203B	0210502	2022-10-28	2023-10-27
Signal Generator	HP	8648A	3633A02081	2022-10-28	2023-10-27
Amplifier	A&R	500A100	17034	2022-10-28	2023-10-27
Amplifier	A&R	100W/1000M1	17028	2022-10-28	2023-10-27
Isotropic Field Monitor	A&R	FM2000	16829	2022-10-28	2023-10-27
Isotropic Field Probe	A&R	FLW220100	16755	2022-10-28	2023-10-27
Biconic Antenna	EMCO	EVOD PROTANK8	9507-2534	2022-10-28	2023-10-27
Log-periodic Antenna	A&R	AT1080	16812	2022-10-28	2023-10-27
Injection Clamp	EMTEST	F-2031-23MM	368	2022-10-28	2023-10-27
Attenuator	EMTEST	ATT6	0010222a	2022-10-28	2023-10-27
Computer	IBM	8434	1S8434KCE99BL XLO*	-	-
Oscillator	KENWOOD	AG-203D	3070002	2022-10-28	2023-10-27
Spectrum Analyzer	HAMEG	HM5012	-	-	-
Power Supply	LW	APS1502	-	-	-
5K VA AC Power Source	California Instruments	5001iX	56060	2022-10-28	2023-10-27
CDN	EM TEST	CDN M2/M3	-	2022-10-28	2023-10-27
Attenuation	EM TEST	ATT6/75	-	2022-10-28	2023-10-27
Resistance	EM TEST	R100	-	2022-10-28	2023-10-27
Electromagnetic Injection Clamp	LITTHI	EM101	35708	2022-10-28	2023-10-27
Inductive Components	EM TEST	MC2630	-	2022-10-28	2023-10-27
Antenna	EM TEST	MS100	-	2022-10-28	2023-10-27
Signal Generator	ROHDE&SCHWARZ	SMT03	100029	2022-10-28	2023-10-27
Power DJ MIXER	AR	150W1000	300999	2022-10-28	2023-10-27
Field probe	Holaday	HI-6005	105152	2022-10-28	2023-10-27
Bilog Antenna	Chase	CBL6111C	2576	2022-10-28	2023-10-27
Loop Antenna	EMCO	6502	00042960	2022-10-28	2023-10-27
ESPI Test Receiver	ROHDE&SCHWARZ	ESI7	838786/013	2022-10-28	2023-10-27
3m OATS	--	--	N/A	2022-10-28	2023-10-27
Horn Antenna	SCHWARZBECK	VULB9168	N/A	2022-10-28	2023-10-27
Horn Antenna	SCHWARZBECK	BBHA9120D	N/A	2022-10-28	2023-10-27
Power meter	Anritsu	ML2487A	6K00003613	2022-10-28	2023-10-27
Power sensor	Anritsu	MA2491A	32263	2022-10-28	2023-10-27
Bilog Antenna	Schwarzbeck	VULB9163	9163/340	2022-10-28	2023-10-27
9*6*6 Anechoic	--	--	N/A	2021-08-21	2024-8-20
Test Receiver	Rohde&Schwarz	ESC17(9kHz-7GHz)	100336	2022-10-28	2023-10-27
Broadband antenna	Schwarzbeck	VULB9168	01222	2022-10-28	2023-10-27
Horn antenna	Schwarzbeck	BBHA9120D	02476	2022-10-28	2023-10-27
Preamplifier	Schwarzbeck	BBV9745	00250	2022-10-28	2023-10-27
Preamplifier	N/A	TRLA-01018G440B	21081001	2022-10-28	2023-10-27

3M method semi anechoic chamber	SKET	9m*6m*6m	2021082304	2021-8-23	2024-8-22
Pointer hygrometer	M&G	ARC92570	N/A	2022-10-28	2023-10-27
Spectrometer	ROHDE&SCHWARZ	FSP 9kHz-40GHz	N/A	2022-10-28	2023-10-27
Synthesizer	ROHDE&SCHWARZ	CMW500	N/A	2022-10-28	2023-10-27
LISN	R&S	ENV216	308	2022-10-28	2023-10-27
LISN	R&S	ENV216	314	2022-10-28	2023-10-27

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.

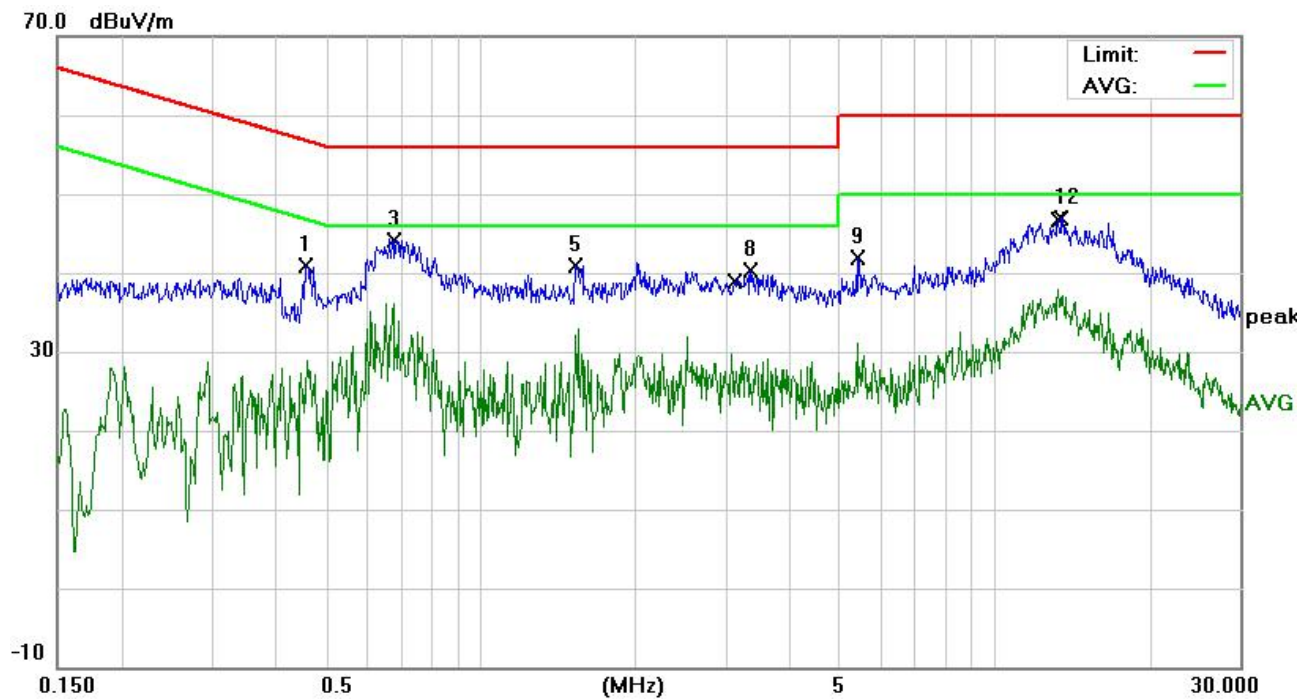
TEST RESULTS

Power supply:

DC 5V from Adapter AC
120V/60Hz

Polarization

L



No.	Mk.	Freq. MHz	Reading Level dBuV/m	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		0.4561	31.12	9.88	41.00	56.76	-15.76	peak
2		0.4586	18.99	9.88	28.87	46.72	-17.85	AVG
3		0.6753	34.21	9.89	44.10	56.00	-11.90	peak
4	*	0.6753	26.30	9.89	36.19	46.00	-9.81	AVG
5		1.5273	30.99	9.91	40.90	56.00	-15.10	peak
6		1.5436	23.03	9.91	32.94	46.00	-13.06	AVG
7		3.0737	19.73	9.92	29.65	46.00	-16.35	AVG
8		3.3456	30.49	9.91	40.40	56.00	-15.60	peak
9		5.3897	31.97	9.93	41.90	60.00	-18.10	peak
10		5.3897	21.18	9.93	31.11	50.00	-18.89	AVG
11		13.2666	36.94	1.00	37.94	50.00	-12.06	AVG
12		13.4792	46.00	1.00	47.00	60.00	-13.00	peak

Note: 1). Level (dBμV) = Reading (dBμV) + Factor (dB)

2). Factor (dB) = insertion loss of LISN (dB) + Cable loss (dB)

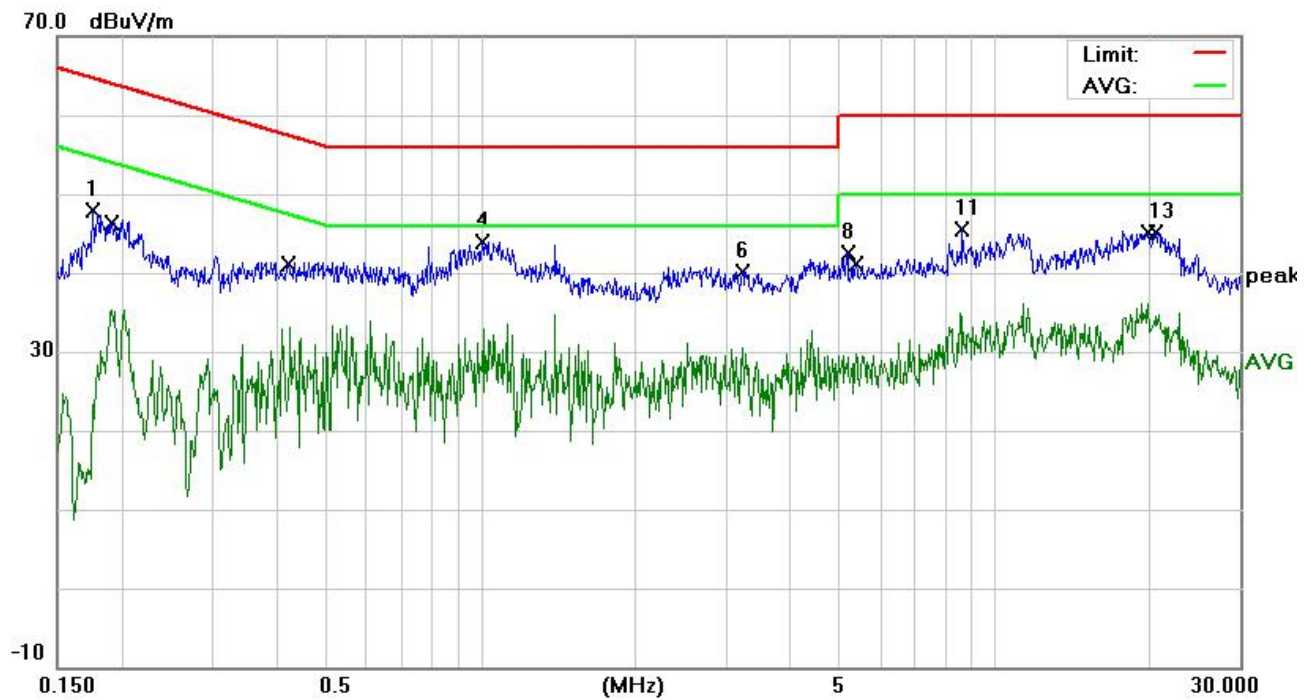
3). Margin (dB) = Limit (dBμV) - Level (dBμV)

Power supply:

DC 5V from Adapter AC
120V/60Hz

Polarization

N



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV/m	dB	dBuV/m	dBuV/m	dB	
1		0.1758	38.06	9.84	47.90	64.68	-16.78	peak
2		0.1912	25.47	9.84	35.31	53.98	-18.67	AVG
3		0.4259	23.17	9.88	33.05	47.33	-14.28	AVG
4	*	1.0048	34.10	9.90	44.00	56.00	-12.00	peak
5		1.0102	23.07	9.90	32.97	46.00	-13.03	AVG
6		3.2238	30.28	9.92	40.20	56.00	-15.80	peak
7		3.2238	20.51	9.92	30.43	46.00	-15.57	AVG
8		5.1660	32.57	9.93	42.50	60.00	-17.50	peak
9		5.3615	19.80	9.93	29.73	50.00	-20.27	AVG
10		8.5462	25.01	9.95	34.96	50.00	-15.04	AVG
11		8.6372	35.65	9.95	45.60	60.00	-14.40	peak
12		19.8445	35.05	1.00	36.05	50.00	-13.95	AVG
13		20.4854	44.20	1.00	45.20	60.00	-14.80	peak

Note: 1). Level (dBμV) = Reading (dBμV) + Factor (dB)

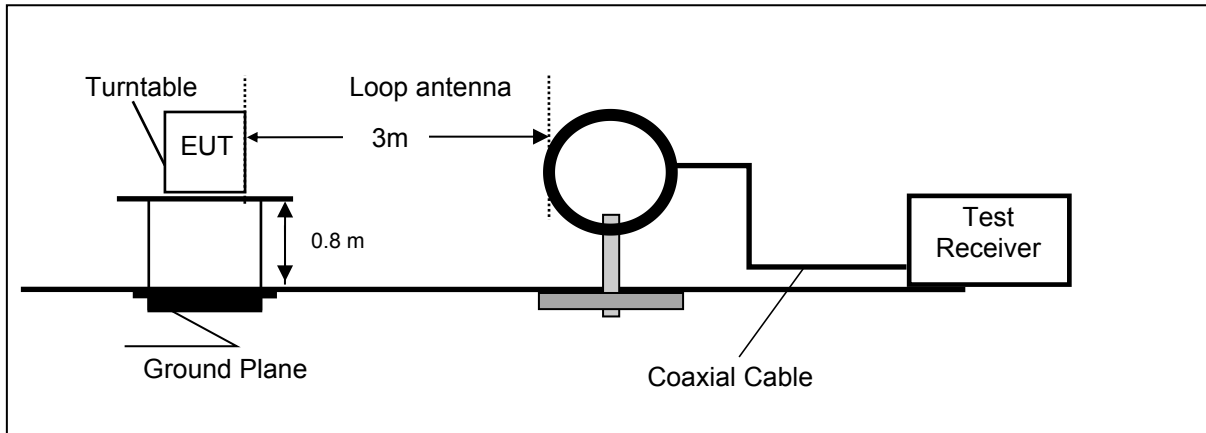
2). Factor (dB) = insertion loss of LISN (dB) + Cable loss (dB)

3). Margin (dB) = Limit (dBμV) - Level (dBμV)

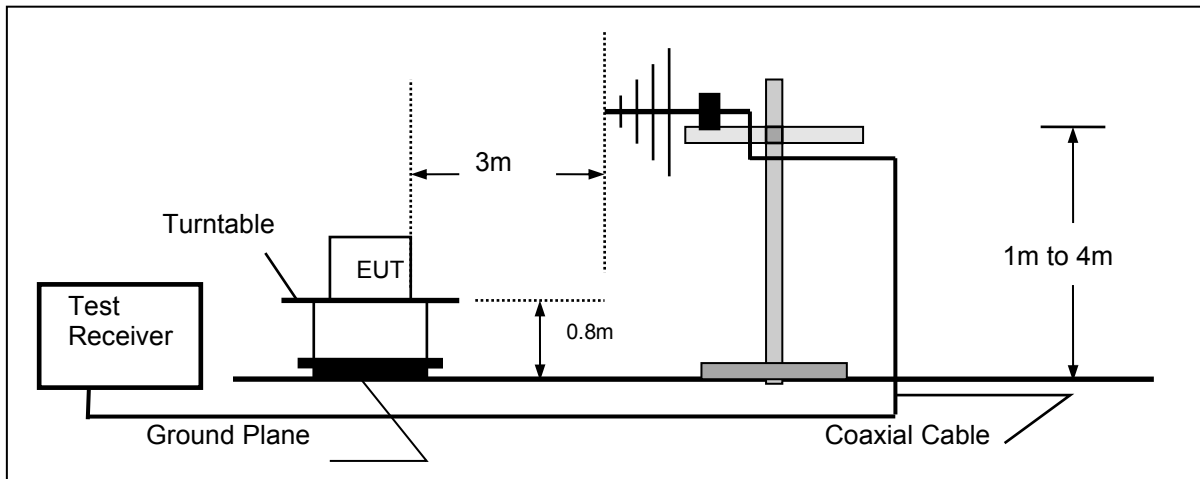
4.2 Radiated Emissions and Band Edge

TEST CONFIGURATION

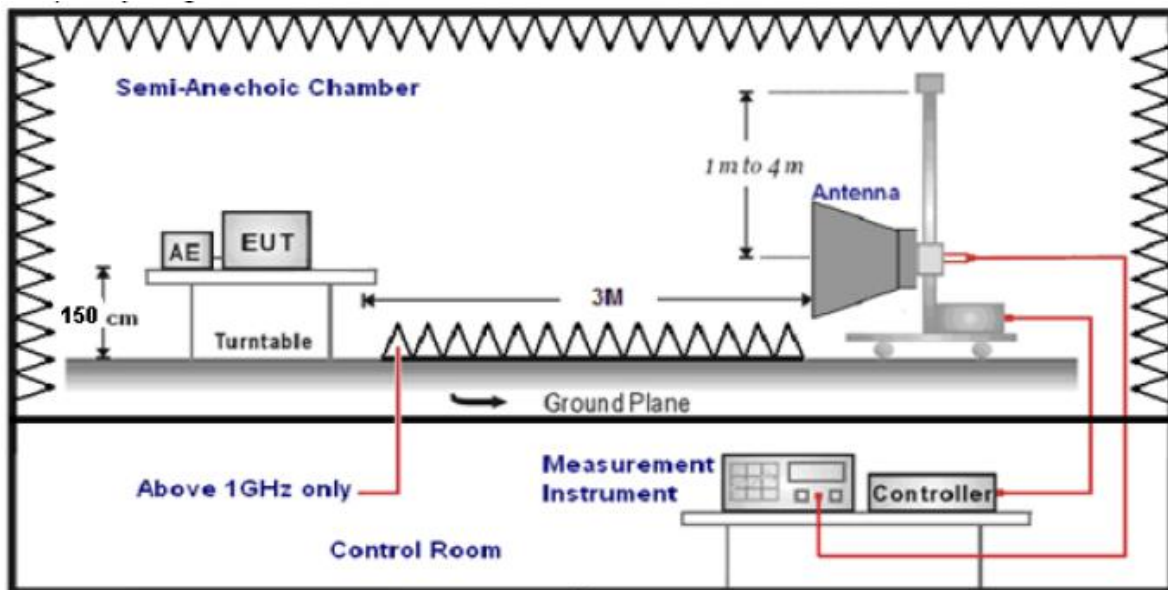
Frequency range 9 KHz – 30MHz



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°C to 360°C 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 Antenna	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	

$$\text{Transd}=AF +CL-AG$$

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 the 100kHz 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.

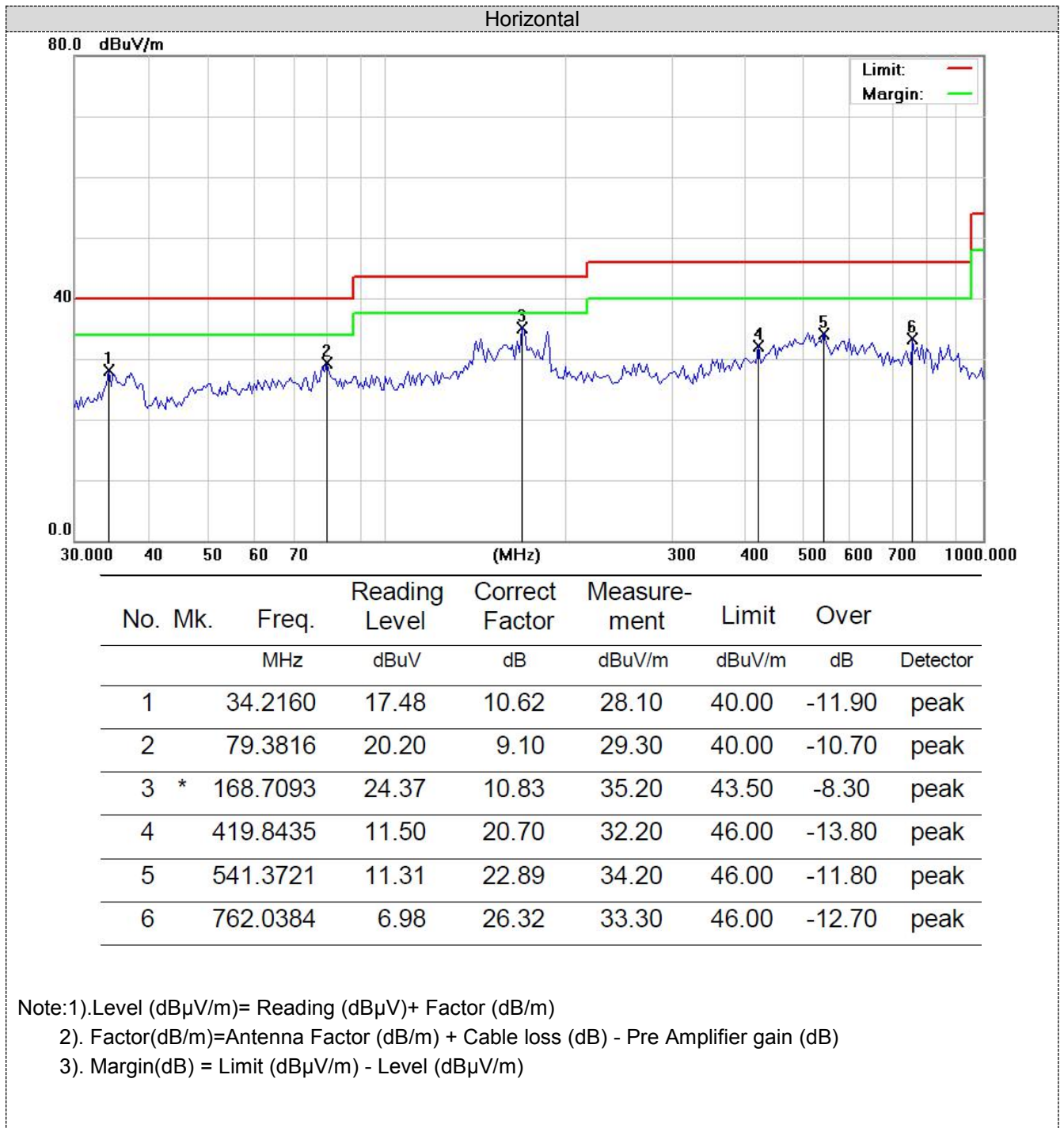
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960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

TEST RESULTS

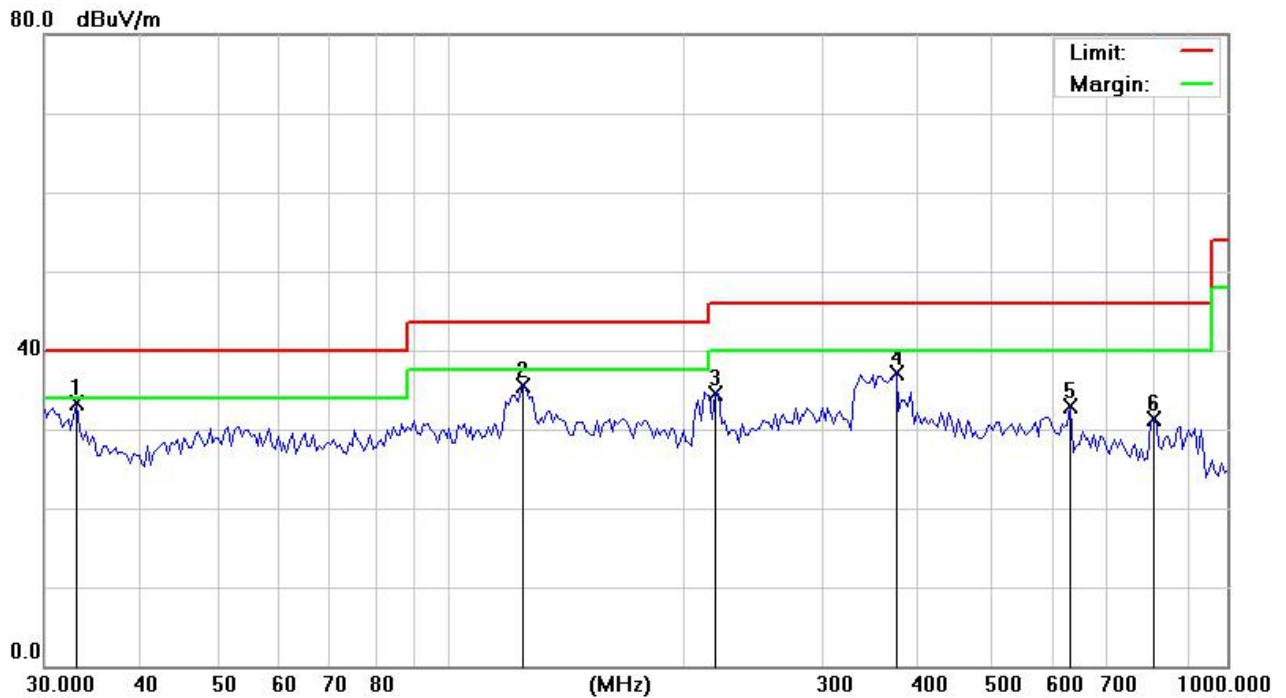
Remark:

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 1Mbps.
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



Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	*	33.0369	22.26	11.04	33.30	40.00	-6.70	peak
2		124.1329	23.73	11.87	35.60	43.50	-7.90	peak
3		219.4598	21.21	13.39	34.60	46.00	-11.40	peak
4		374.6225	18.05	19.15	37.20	46.00	-8.80	peak
5		628.3745	9.01	23.89	32.90	46.00	-13.10	peak
6		803.1933	3.17	28.13	31.30	46.00	-14.70	peak

Note:1).Level (dB μ V/m)= Reading (dB μ V)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dB μ V/m) - Level (dB μ V/m)

For 1GHz to 25GHz

GFSK (above 1GHz)

Frequency(MHz):			2402			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
4804.00	60.25	21.52	3.52	33.12	52.17	74	-21.83	Vertical
4804.00	55.44	23.65	4.56	33.08	50.57	74	-23.43	Vertical
7206.00	50.28	25.58	6.15	33.57	48.44	74	-25.56	Horizontal
7206.00	45.15	27.68	6.98	33.26	46.55	74	-27.45	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
4804.00	45.63	21.52	3.52	33.12	37.55	54	-16.45	Vertical
4804.00	40.36	23.65	4.56	33.08	35.49	54	-18.51	Vertical
7206.00	35.86	25.58	6.15	33.57	34.02	54	-19.98	Horizontal
7206.00	30.45	27.68	6.98	33.26	31.85	54	-22.15	Horizontal

Frequency(MHz):			2440			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
4880.00	59.69	21.78	3.58	33.27	51.78	74	-22.22	Vertical
4880.00	55.63	24.15	4.57	33.87	50.48	74	-23.52	Vertical
7320.00	50.25	26.04	6.24	33.19	49.34	74	-24.66	Horizontal
7320.00	45.87	27.98	7.18	33.68	47.35	74	-26.65	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
4880.00	46.32	21.78	3.58	33.27	38.41	54	-15.59	Vertical
4880.00	41.25	24.15	4.57	33.87	36.1	54	-17.9	Vertical
7320.00	36.85	26.04	6.24	33.19	35.94	54	-18.06	Horizontal
7320.00	31.26	27.98	7.18	33.68	32.74	54	-21.26	Horizontal

Frequency(MHz):			2480			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
4960.00	60.12	22.56	4.17	33.75	53.1	74	-20.9	Vertical
4960.00	55.36	24.78	5.36	33.17	52.33	74	-21.67	Vertical
7440.00	50.48	27.14	6.97	33.62	50.97	74	-23.03	Horizontal
7440.00	45.65	28.16	7.65	33.58	47.88	74	-26.12	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
4960.00	45.64	22.56	4.17	33.75	38.62	54	-15.38	Vertical
4960.00	40.85	24.78	5.36	33.17	37.82	54	-16.18	Vertical
7440.00	35.96	27.14	6.97	33.62	36.45	54	-17.55	Horizontal
7440.00	31.16	28.16	7.65	33.58	33.39	54	-20.61	Horizontal

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:

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

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:

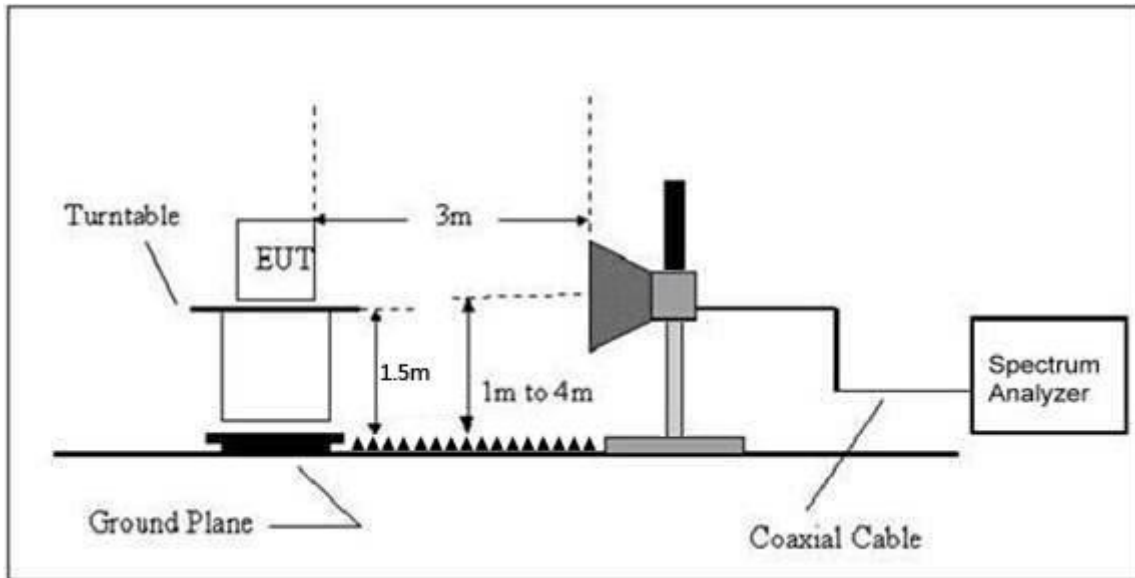
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

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

2402MHz
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	55.65	21.25	3.26	33.14	47.02	74	-26.98	Horizontal
2400	53.12	21.75	3.54	33.42	44.99	74	-29.01	Horizontal
2310	51.24	21.25	3.26	33.14	42.61	74	-31.39	Vertical
2400	50.02	21.75	3.54	33.42	41.89	74	-32.11	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	53.14	21.25	3.26	33.14	44.51	54	-9.49	Horizontal
2400	51.34	21.75	3.54	33.42	43.21	54	-10.79	Horizontal
2310	48.62	21.25	3.26	33.14	39.99	54	-14.01	Vertical
2400	42.21	21.75	3.54	33.42	34.08	54	-19.92	Vertical

2480MHz
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	54.12	22.12	3.65	33.54	46.35	74	-27.65	Horizontal
2500	52.14	22.35	3.98	33.27	45.2	74	-28.8	Horizontal
2483.5	50.29	22.12	3.65	33.54	42.52	74	-31.48	Vertical
2500	48.34	22.35	3.98	33.27	41.4	74	-32.6	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	50.11	22.12	3.65	33.54	42.34	54	-11.66	Horizontal
2500	48.54	22.35	3.98	33.27	41.6	54	-12.4	Horizontal
2483.5	45.32	22.12	3.65	33.54	37.55	54	-16.45	Vertical
2500	42.15	22.35	3.98	33.27	35.21	54	-18.79	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
2402	103.15	22.55	3.25	33.45	95.50	114	-18.5	Vertical
2402	101.25	22.55	3.25	33.45	93.60	114	-20.4	Horizontal
2441	99.54	23.05	3.36	33.15	92.80	114	-21.2	Vertical
2441	97.45	23.05	3.36	33.15	90.71	114	-23.29	Horizontal
2480	95.24	23.57	3.67	33.68	88.80	114	-25.2	Vertical
2480	93.14	23.57	3.67	33.68	86.70	114	-27.3	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
2402	90.14	22.55	3.25	33.45	82.49	94	-11.51	Vertical
2402	88.36	22.55	3.25	33.45	80.71	94	-13.29	Horizontal
2441	85.36	23.05	3.36	33.15	78.62	94	-15.38	Vertical
2441	83.14	23.05	3.36	33.15	76.4	94	-17.6	Horizontal
2480	81.24	23.57	3.67	33.68	74.8	94	-19.2	Vertical
2480	78.36	23.57	3.67	33.68	71.92	94	-22.08	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. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

4.4.3 DEVIATION FROM STANDARD

No deviation.

4.4.4 TEST 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.

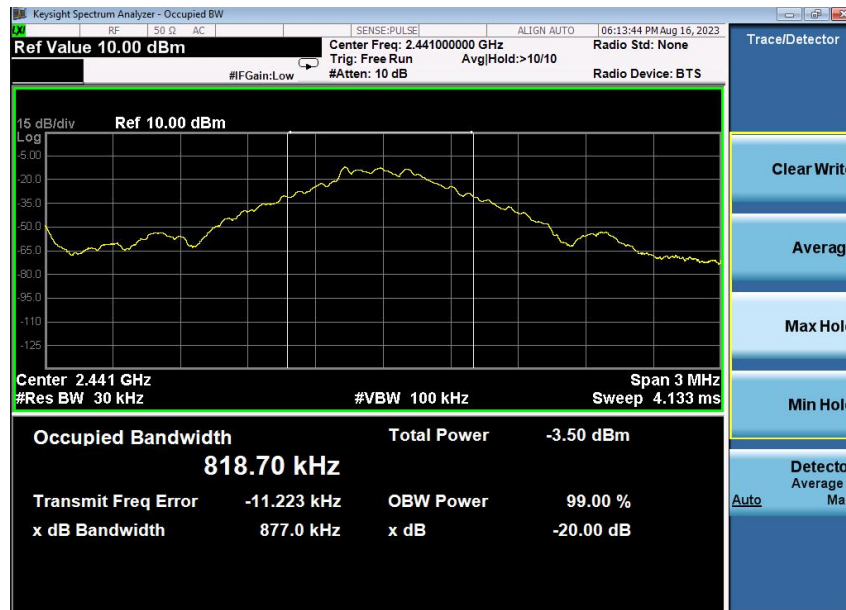
4.4.6 TEST RESULTS

Temperature:	26℃	Relative Humidity:	54%
Test Mode :	GFSK	Test Voltage :	DC 5V

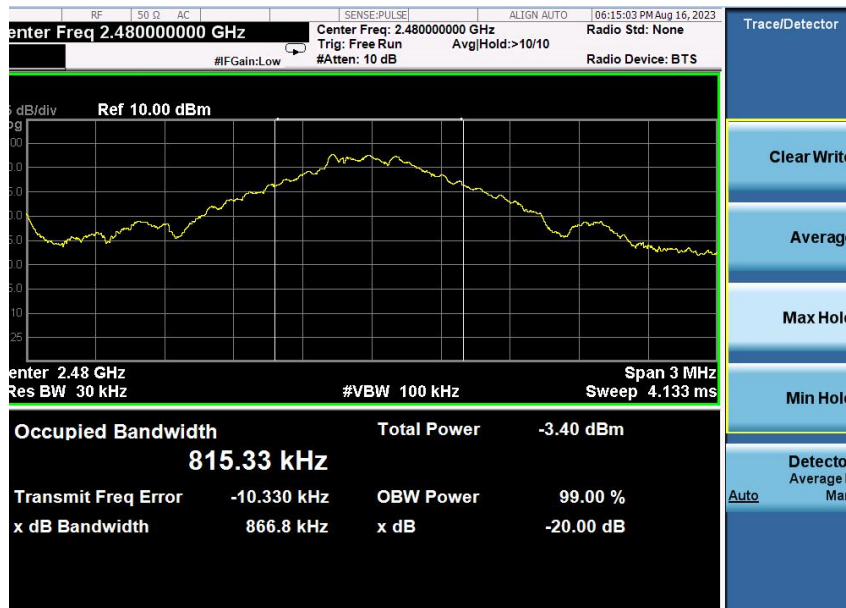
Test channel	Channel Bandwidth (MHz)	Result
Lowest	0.876	Pass
Middle	0.877	
Highest	0.867	



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 -2.79 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.