



FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.249

Report Reference No......: **GTSR16110047**

FCC ID.....: **2AJ9M-ESM-9013**

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Date of issue.....: Nov. 07, 2016

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Testing Laboratory Name **Shenzhen CTL Testing Technology Co., Ltd**

Address: 1/F.-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan
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Applicant's name.....: **Shenzhen Yisutongma Network Technology Co., Ltd.**

Address: Room 808, Minde Building, Minzhi Avenue, Longhua New District,
Shenzhen,china

Test specification

Standard: **FCC Part 15.249: Operation within the bands 902-928 MHz,
2400-2483.5 MHz ,5725-5850 MHz,and 24.0-24.25 GHz**

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Test item description: 2.4 G Wireless controller

Trade Mark: EasySMX

Manufacturer: **Shenzhen Yisutongma Network Technology Co., Ltd.**

Model/Type reference.....: ESM-9013

Listed Models: /

Modulation Type: GFSK

Operation Frequency.....: From 2412MHz to 2475MHz

EUT Type: Production Unit

Hardware Version: SL-9103C-1PCB

Software Version: V1.0

Rating: DC 3.0V

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

TEST REPORT

Test Report No. : GTSR16110047	Nov. 07, 2016 Date of issue
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Equipment under Test : 2.4 G Wireless controller

Model /Type : ESM-9013

Listed Models : /

Applicant : **Shenzhen Yisutongma Network Technology Co., Ltd.**

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Address : Room 808, Minde Building, Minzhi Avenue, Longhua New District, 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](#): Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 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	:	Oct. 24, 2016
Testing commenced on	:	Oct. 24, 2016
Testing concluded on	:	Nov. 07, 2016

2.2. Product Description

Name of EUT	2.4 G Wireless controller
Trade Mark	/
Model Number	ESM-9013
List Model	/
FCC ID	2AJ9M-ESM-9013
Antenna Type	Internal antenna
Operation frequency	From 2412MHz to 2475MHz
Modulation Type	GFSK
Antenna gain	-1.0dBi

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 3.0V

2.4. Short description of the Equipment under Test (EUT)

This is a 2.4 G Wireless controller.

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

2.5. EUT operation mode

There are 64 channels provided to the EUT. Channel 00/28/63 was selected to test.

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

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AJ9M-ESM-9013** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

2.8. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - Supplied by the lab

○ /	M/N: /
	Manufacturer: /

2.9. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.

1F, Building No. 13A, Zhonghaixin Science and Technology City, No.12,6 Road, Ganli Industrial Park, Buji Street, Longgang District, Shenzhen, Guangdong

Shenzhen CTL Testing Technology Co., Ltd.

1/F.-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, Guangdong, China

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 964637

Shenzhen Global Test Service Co.,Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 964637, Jul 24, 2015.

CNAS-Lab Code: L8169

Shenzhen Global Test Service Co.,Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories. Date of Registration: Dec. 11, 2015. Valid time is until Dec. 10, 2018.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Description

FCC PART 15.249		
FCC Part 15.249(a)	Field Strength of Fundamental	PASS
FCC Part 15.209	Spurious Emission	PASS
FCC Part 15.209	Band edge	PASS
FCC Part 15.215(c)	Occupied bandwidth	PASS
FCC Part 15.207	Conducted Emission	N/A
FCC Part 15.203	Antenna Requirement	PASS

Remark:

1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

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 CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service 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 Shenzhen GTS laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	2.20 dB	(1)
Occupied Bandwidth	0.01ppm	(1)
Radiated Emission 30~1000MHz	4.10dB	(1)
Radiated Emission Above 1GHz	4.32dB	(1)
Conducted Disturbance0.15~30MHz	3.20dB	(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

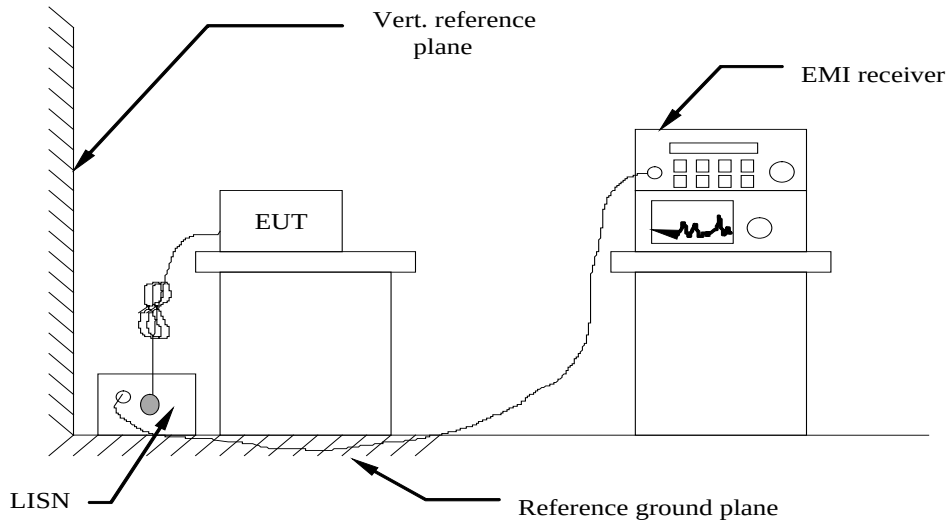
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2016/06/02	2017/06/01
EMI Test Receiver	R&S	ESCI	103710	2016/06/02	2017/06/01
Spectrum Analyzer	Agilent	E4407B	MY41440676	2016/05/21	2017/05/20
Controller	EM Electronics	Controller EM 1000	N/A	2016/05/21	2017/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2016/05/19	2017/05/18
Active Loop Antenna	SCHWARZBEC K	FMZB1519	1519-037	2016/05/19	2017/05/18
Amplifier	Agilent	8349B	3008A02306	2016/05/19	2017/05/18
Amplifier	Agilent	8447D	2944A10176	2016/05/19	2017/05/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2016/05/20	2017/05/19
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	N/A	2016/05/20	2017/05/19
High-Pass Filter	K&L	41H10-1375/U12750-O/O	N/A	2016/05/20	2017/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2016/06/02	2017/06/01
RF Cable	Megalon	RF-A303	N/A	2016/06/02	2017/06/01

Note: 1. The Cal.Interval was one year.

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 C63.10-2009.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2009
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
- 4 The EUT received DC5V power from PC, the adapter of PC received AC120V/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.

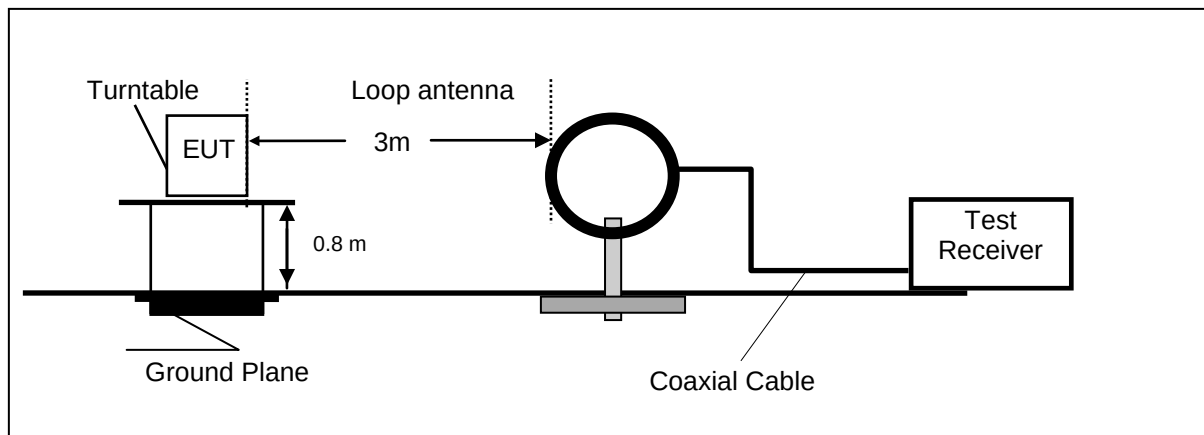
TEST RESULTS

The EUT is Power by battery. So this test item is not applicable for the EUT.

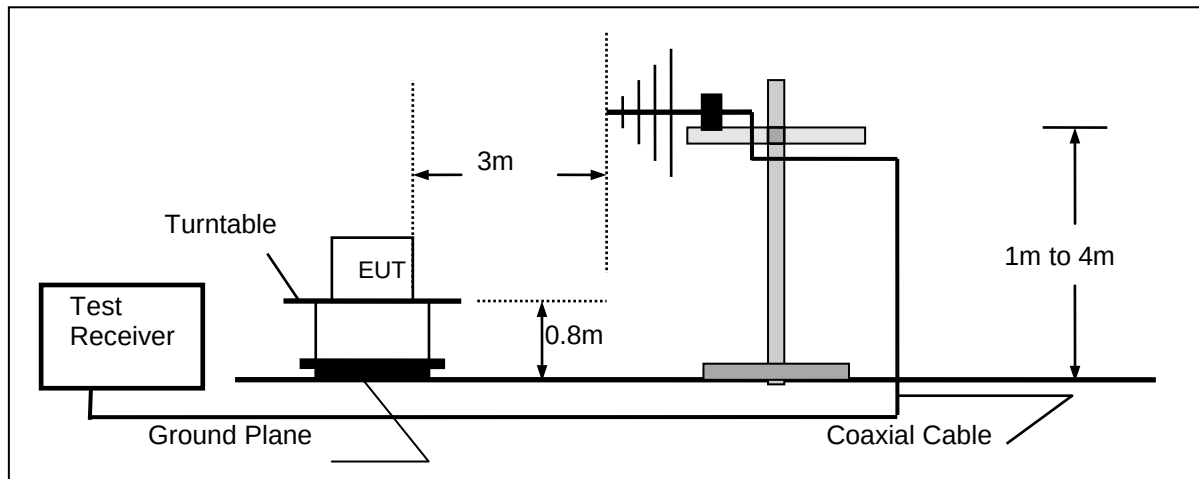
4.2. Radiated Emissions and Band Edge

TEST CONFIGURATION

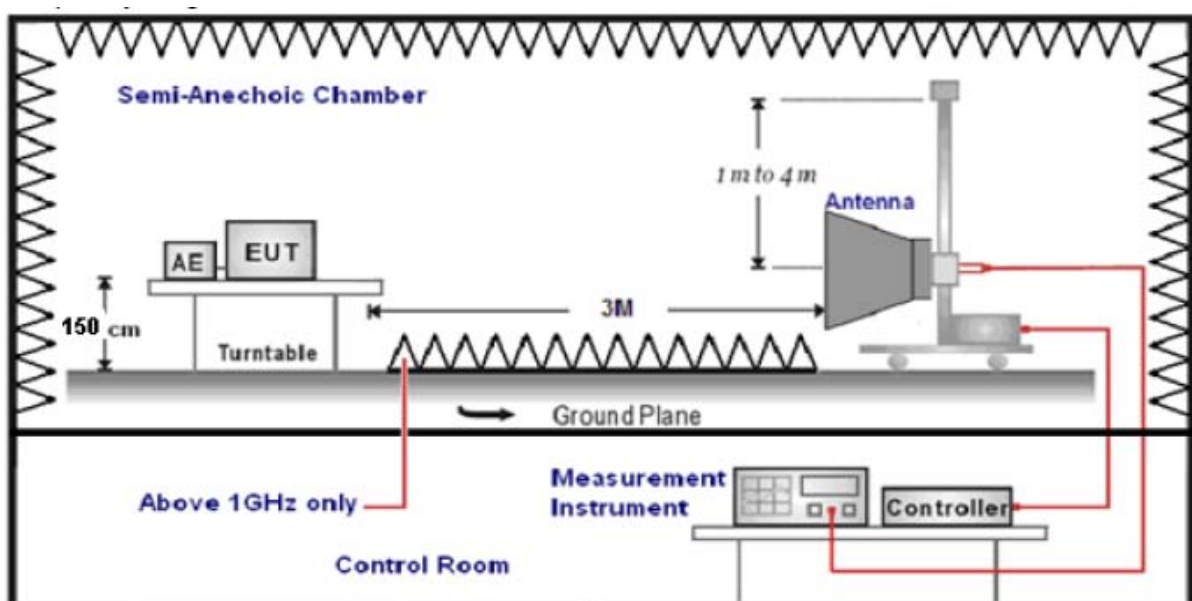
Frequency range 9 KHz – 30MHz



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.

LIMIT

According 15.249, the field strength of emissions from intentional radiators operated within 2400MHz-2483.5 MHz shall not exceed 94dBμV/m (50mV/m):

FCC PART 15.249(d) 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.

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)

Radiated emission limits

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

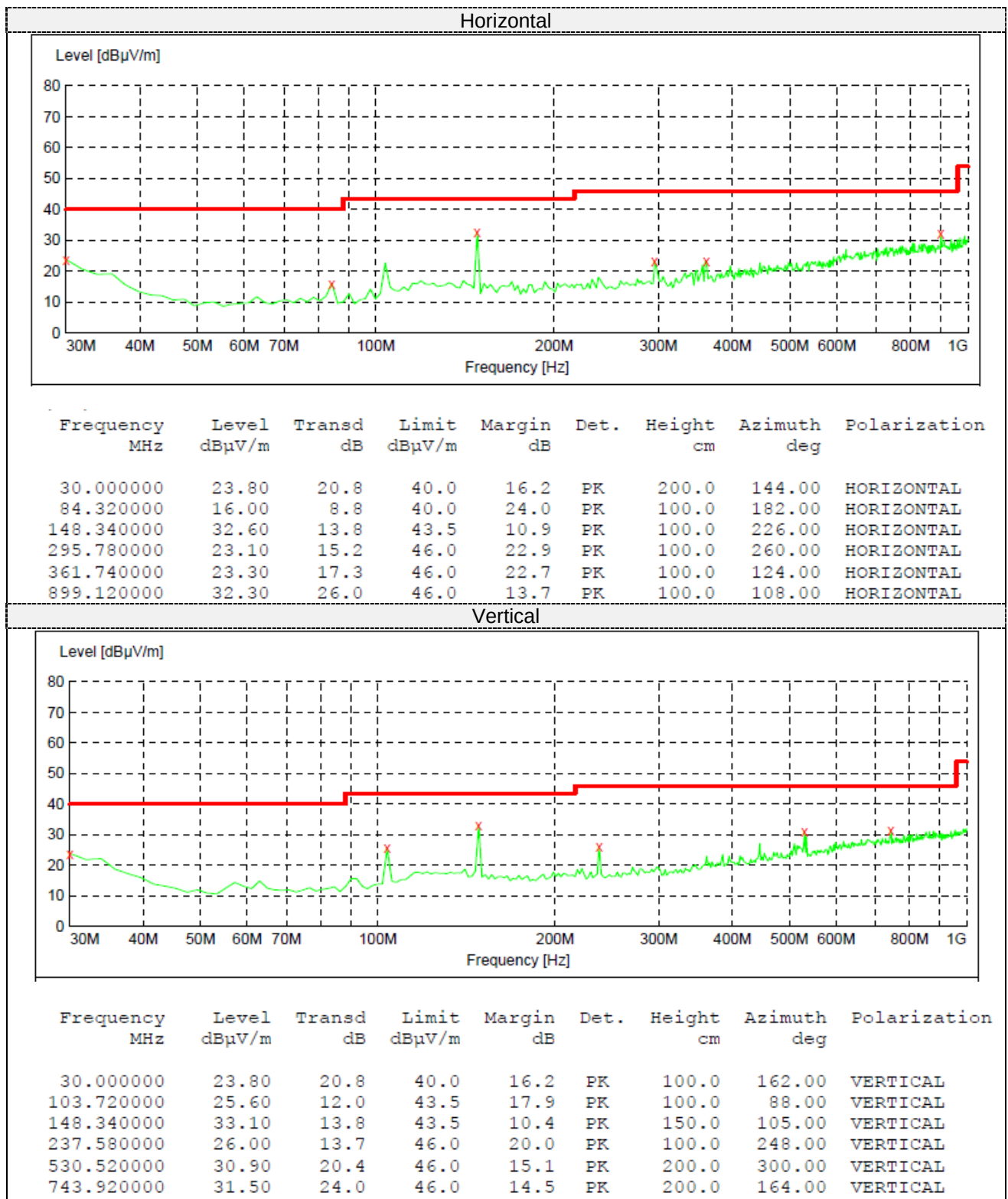
TEST RESULTS

Remark: Test site: Shenzhen CTL Testing Technology Co., Ltd.

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Result
0.39	47.46	95.78	48.32	QP	PASS
1.54	42.65	63.85	21.20	QP	PASS
20.27	46.94	69.54	22.60	QP	PASS
25.69	50.85	69.54	18.69	QP	PASS

For 30MHz to 1000MHz



For 1GHz to 25GHz

[illegible][illegible][illegible][illegible]

Frequency(MHz):				2475			Polarity:			HORIZONTAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	2475.00	101.45	PK	114.00	12.55	1.00	246	104.11	29.02	5.02	36.70	-2.66
1	2475.00	90.59	AV	94.00	3.41	1.00	246	93.25	29.02	5.02	36.70	-2.66
2	2483.00	57.21	PK	74.00	16.79	1.00	206	62.93	27.45	3.38	36.55	-5.72
2	2483.00	40.03	AV	54.00	13.97	1.00	206	45.75	27.45	3.38	36.55	-5.72
3	4950.00	53.71	PK	74.00	20.29	1.00	46	49.07	33.52	8.02	36.90	4.64
3	4950.00	41.88	AV	54.00	12.12	1.00	46	37.24	33.52	8.02	36.90	4.64
4	7425.00	40.82	PK	74.00	33.18	1.00	132	28.93	38.85	9.24	36.20	11.89
4	7425.00	--	AV	--	--	--	--	--	--	--	--	--

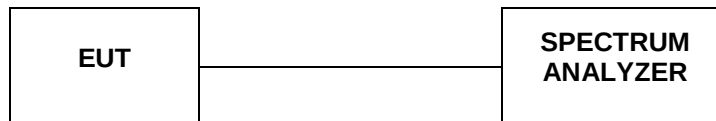
Frequency(MHz):				2475			Polarity:			VERTICAL		
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	2475.00	100.83	PK	114.00	13.17	1.00	189	103.49	29.02	5.02	36.70	-2.66
1	2475.00	90.74	AV	94.00	3.26	1.00	189	93.40	29.02	5.02	36.70	-2.66
2	2483.50	57.80	PK	74.00	16.20	1.00	150	63.52	27.45	3.38	36.55	-5.72
2	2483.50	40.24	AV	54.00	13.76	1.00	150	45.96	27.45	3.38	36.55	-5.72
3	4950.00	54.88	PK	74.00	19.12	1.00	164	50.24	33.52	8.02	36.90	4.64
3	4950.00	42.90	AV	54.00	11.10	1.00	164	38.26	33.52	8.02	36.90	4.64
4	7425.00	41.76	PK	74.00	32.24	1.00	268	29.87	38.85	9.24	36.20	11.89
4	7425.00	--	AV	--	--	--	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.
6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
7. For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value ; RMS detector is for AV value.

4.3. Occupied Bandwidth Measurement

TEST CONFIGURATION



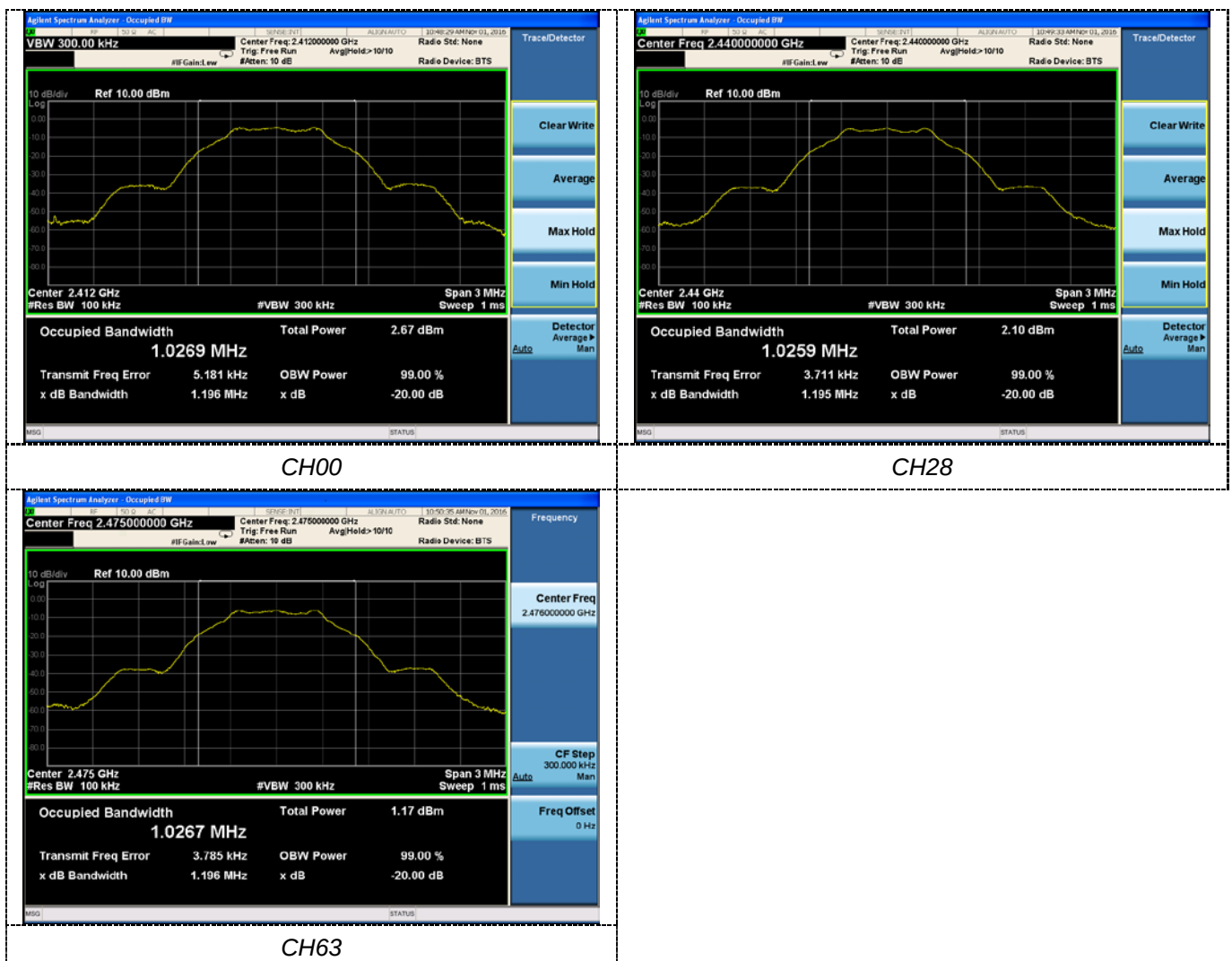
TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW.

TEST RESULTS

Type	Channel	99% OBW (MHz)	20dB bandwidth (MHz)	Result
GFSK	00	1.0269	1.196	Pass
	28	1.0259	1.195	
	63	1.0267	1.196	

Note: 1.The test results including the cable lose.



4.4. Antenna Requirement

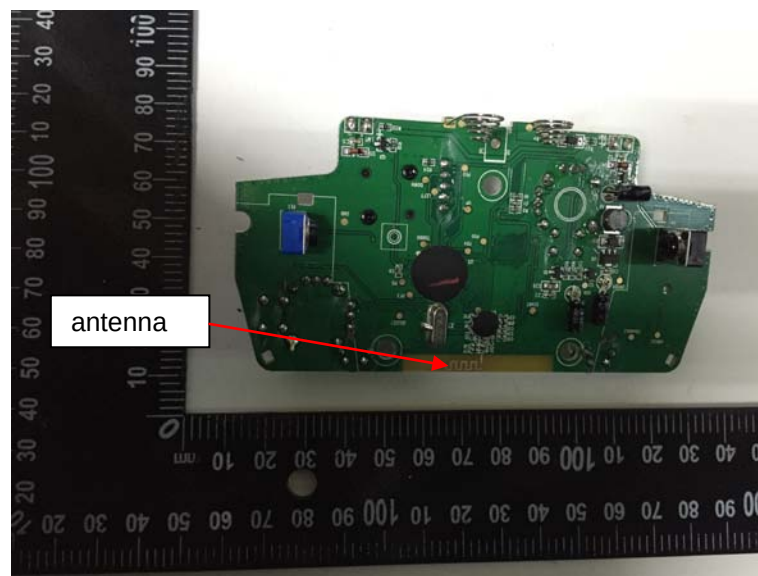
Standard Applicable

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.

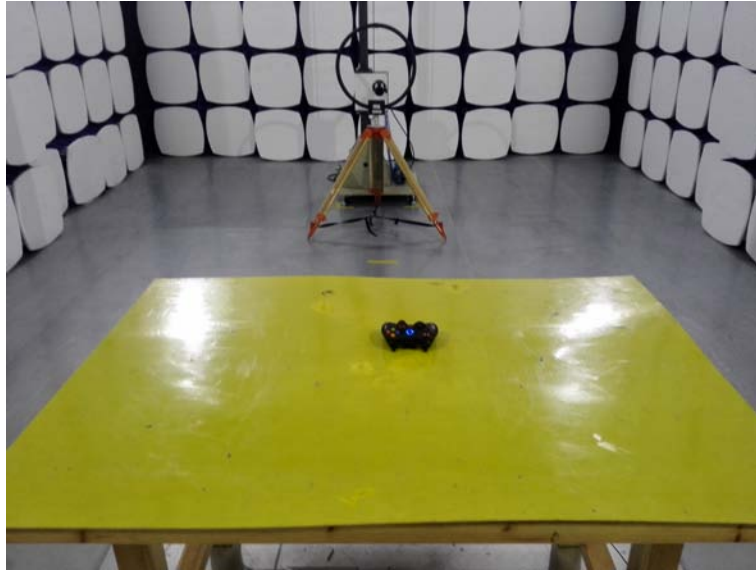
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Antenna Information

The antenna is layout on PCB board, The directional gains of antenna used for transmitting is -1.00 dBi.



5. Test Setup Photos of the EUT



6. External and Internal Photos of the EUT

External Photos

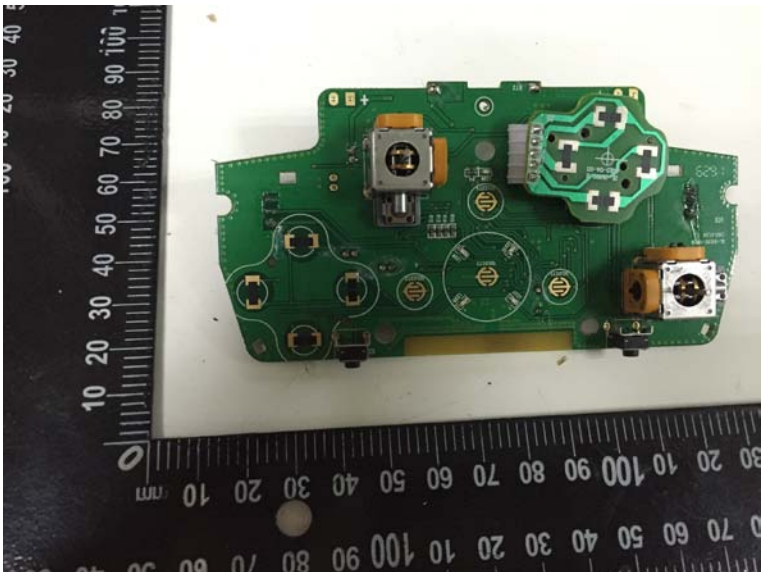
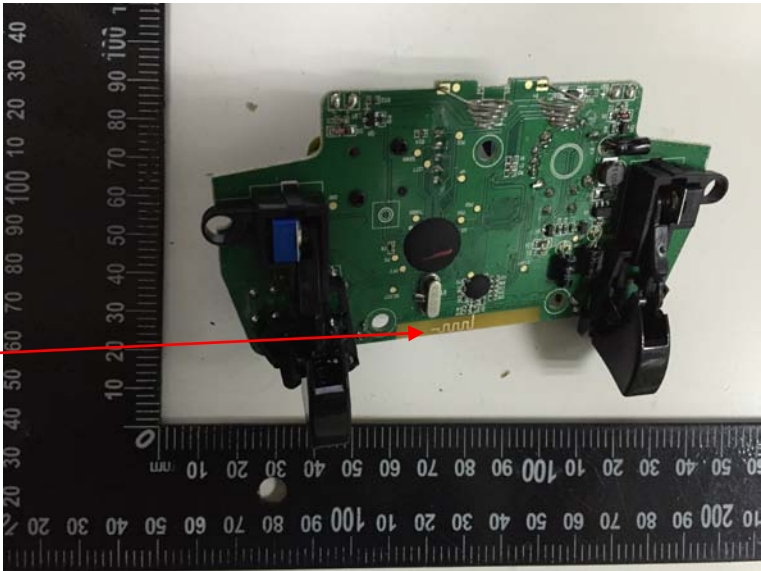


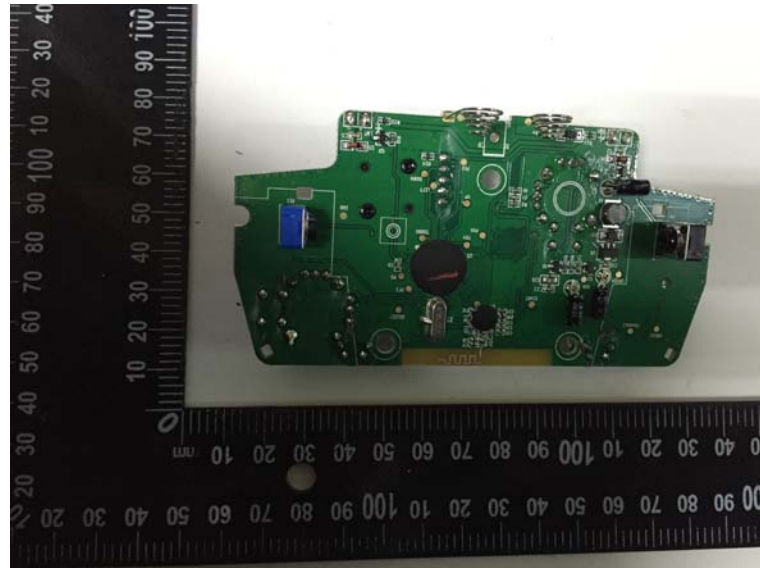


Internal Photos



Antenna





.....End of Report.....