



FCC Part 15C Test Report

FCC ID: 2ALOVRFRC

Product Name:	Remote control
Trademark:	N/A
Model Name :	RFRC-2.4G
Prepared For :	Shenzhen Shenyong Technology Co., Ltd.
Address :	905, 2 Building, 67th Area, Zhongliangchuangzhi Factory, Xinan Street, Baoan District, Shenzhen, China
Prepared By :	Shenzhen BCTC Technology Co., Ltd.
Address :	No.101, Yousong Road, Longhua New District, Shenzhen, China
Test Date:	Mar. 23 - Mar. 31, 2017
Date of Report :	Mar. 31, 2016
Report No.:	BCTC-FY170301401E



TEST RESULT CERTIFICATION

Applicant's name : Shenzhen Shenyong Technology Co., Ltd.

Address : 905, 2 Building, 67th Area, Zhongliangchuangzhi Factory, Xinan Street, Baoan District, Shenzhen, China

Manufacture's Name : Shenzhen Shenyong Technology Co., Ltd.

Address : 905, 2 Building, 67th Area, Zhongliangchuangzhi Factory, Xinan Street, Baoan District, Shenzhen, China

Product description

Product name : Remote control

Trademark : N/A

Model and/or type reference : RFRC-2.4G

Standards : FCC Part15.249

ANSI C63.10-2013

This device described above has been tested by BCTC, 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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Testing Engineer : 

Eric Yang

Reviewer : 

Jade Yang

Approved & : 

Carson Zhang

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.249) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	
15.249	Radiated Spurious Emission	PASS	
15.249	Bandwidth	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen BCTC Technology Co., Ltd.

Add. : No.101, Yousong Road, Longhua New District, Shenzhen, China

FCC Registered No.: 187086

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power, conducted	$\pm 0.16\text{dB}$
3	Spurious emissions, conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^\circ\text{C}$
7	Humidity	$\pm 2\%$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Remote control												
Trademark	N/A												
Model Name	RFRC-2.4G												
Model Difference	N/A												
Product Description	<p>The EUT is a Remote control</p> <table border="1"><tr><td>Operation Frequency:</td><td>2482MHz</td></tr><tr><td>Modulation Type:</td><td>GFSK</td></tr><tr><td>Bit Rate of Transmitter</td><td>1Mbps</td></tr><tr><td>Number Of Channel</td><td>1 CH</td></tr><tr><td>Antenna type:</td><td>PCB antenna</td></tr><tr><td>Antenna Gain (dBi)</td><td>0dBi</td></tr></table> <p>Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</p>	Operation Frequency:	2482MHz	Modulation Type:	GFSK	Bit Rate of Transmitter	1Mbps	Number Of Channel	1 CH	Antenna type:	PCB antenna	Antenna Gain (dBi)	0dBi
Operation Frequency:	2482MHz												
Modulation Type:	GFSK												
Bit Rate of Transmitter	1Mbps												
Number Of Channel	1 CH												
Antenna type:	PCB antenna												
Antenna Gain (dBi)	0dBi												
Channel List	Please refer to the Note 2.												
Power	DC 3.0V												
hardware version	--												
Software version	--												
Serial number	--												
Connecting I/O Port(s)	Please refer to the User's Manual												

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2.

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2482	/	/	/	/	/	/

2.2 DESCRIPTION OF TEST MODES

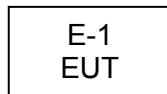
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH00
Mode 2	Link Mode
For Conducted & Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	Link Mode

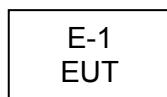


2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Emission Test



Conducted Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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	Remote control	N/A	RFRC-2.4G	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

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.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	1166.5950K 03-101165-ha	2016.06.06	2017.06.05	1 year
2	LISN	R&S	NSLK81 26	812646 6	2016.08.24	2017.08.23	1 year
3	LISN	R&S	NSLK81 26	812648 7	2016.08.24	2017.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	620026441 7	2016.06.07	2017.06.06	1 year
5	RF cables	R&S	R204	R20X	2016.07.06	2017.07.05	1 year

Radiation test, Band-edge test and 20db bandwidth test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY4510804 0	2016.07.06	2017.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2016.06.07	2017.06.06	1 year
3	Bilog Antenna	R&S	VULB 9168	VULB91 68-438	2016.07.06	2017.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	620026441 6	2016.06.07	2017.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2016.06.07	2017.06.06	1 year
6	Horn Antenna	R&S	HF906	10027	2016.07.06	2017.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2016.07.06	2017.07.05	1 year
8	Amplifier	R&S	BBV9743	9743-01 9	2016.08.25	2017.08.24	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2016.06.08	2017.06.07	1 year
10	RF cables	R&S	R203	R20X	2016.07.06	2017.07.05	1 year
11	Antenna connector	Florida RFLabs	Lab-Fle	RF 01#	2016.07.06	2017.07.05	1 year



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

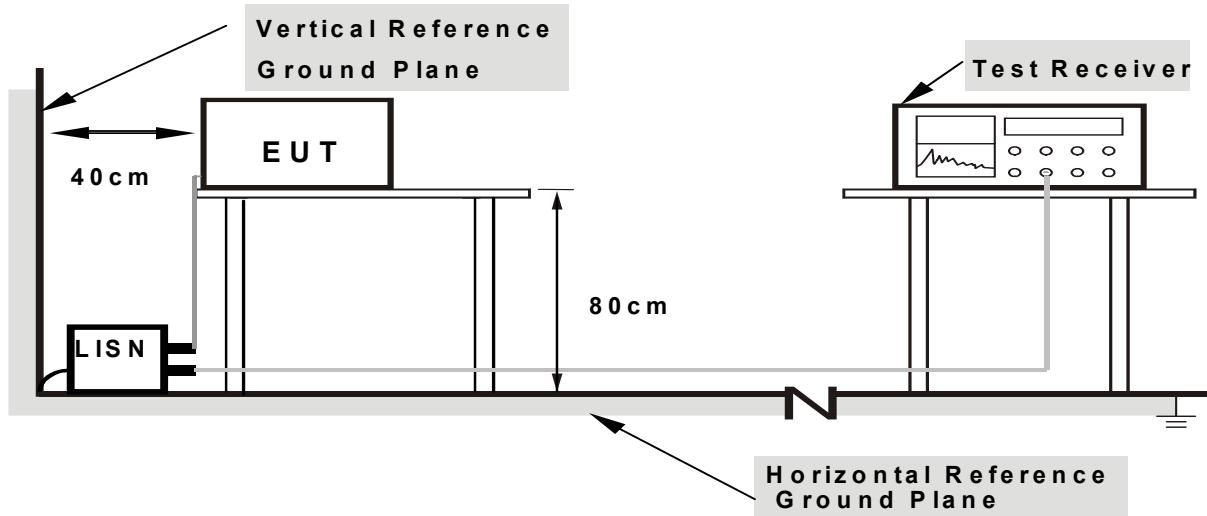
3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 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.
- b. 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.
- c. 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.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

NOTE: This EUT is powered by the Battery only, this test item is not applicable.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable 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.

Above 1GHz test procedure as below:

- g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
- h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

Note:

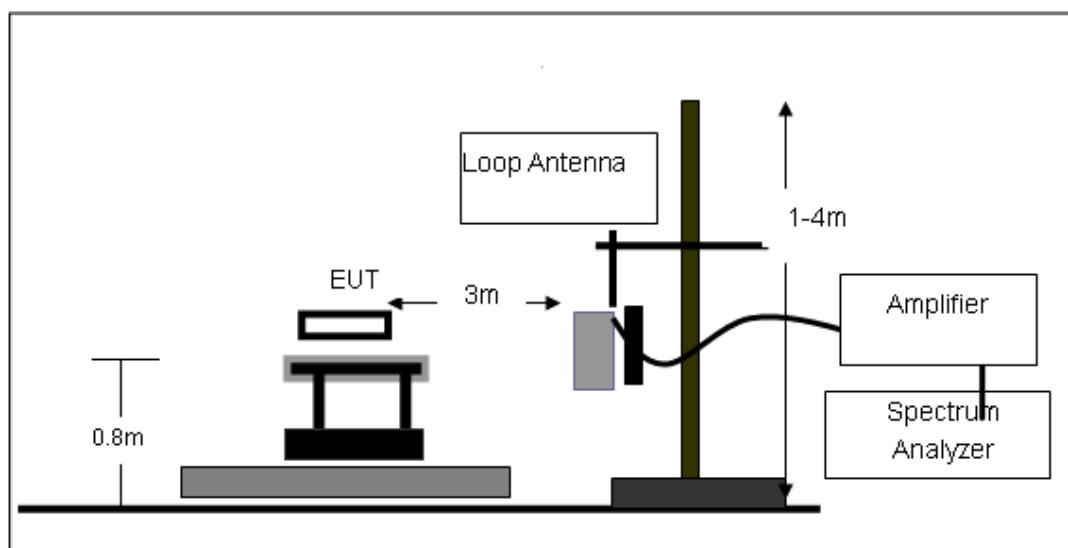
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

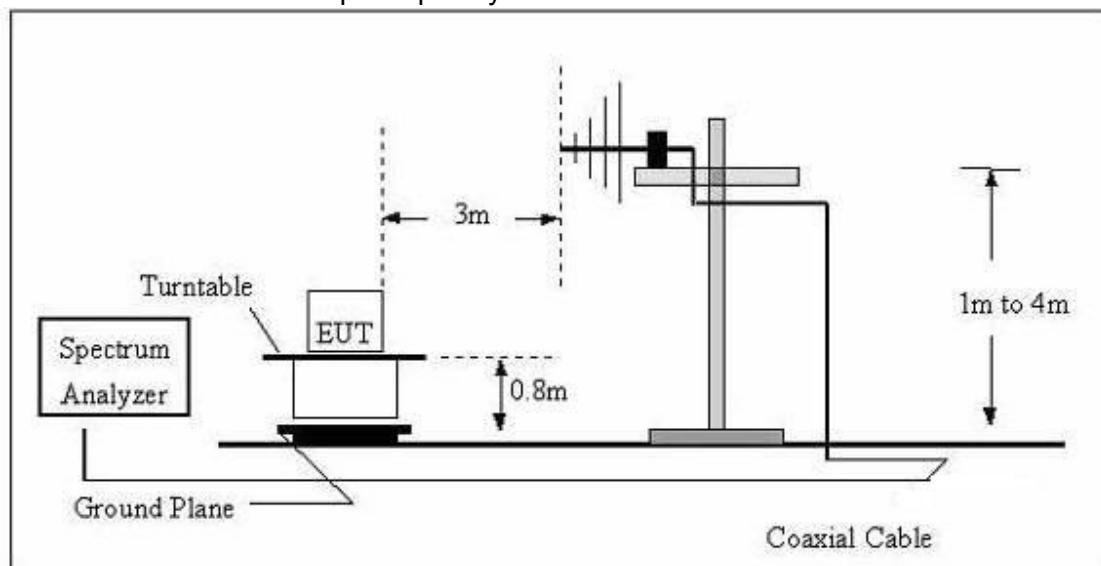
No deviation

3.2.4 TEST SETUP

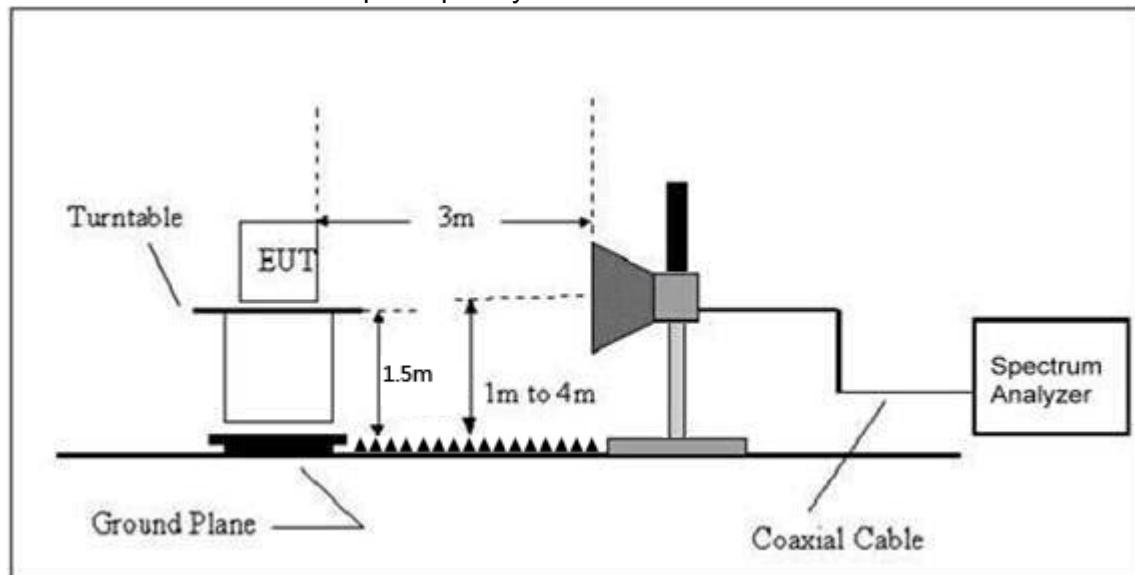
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 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.



3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	20°C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 3.0V
Test Mode :	Mode 2	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

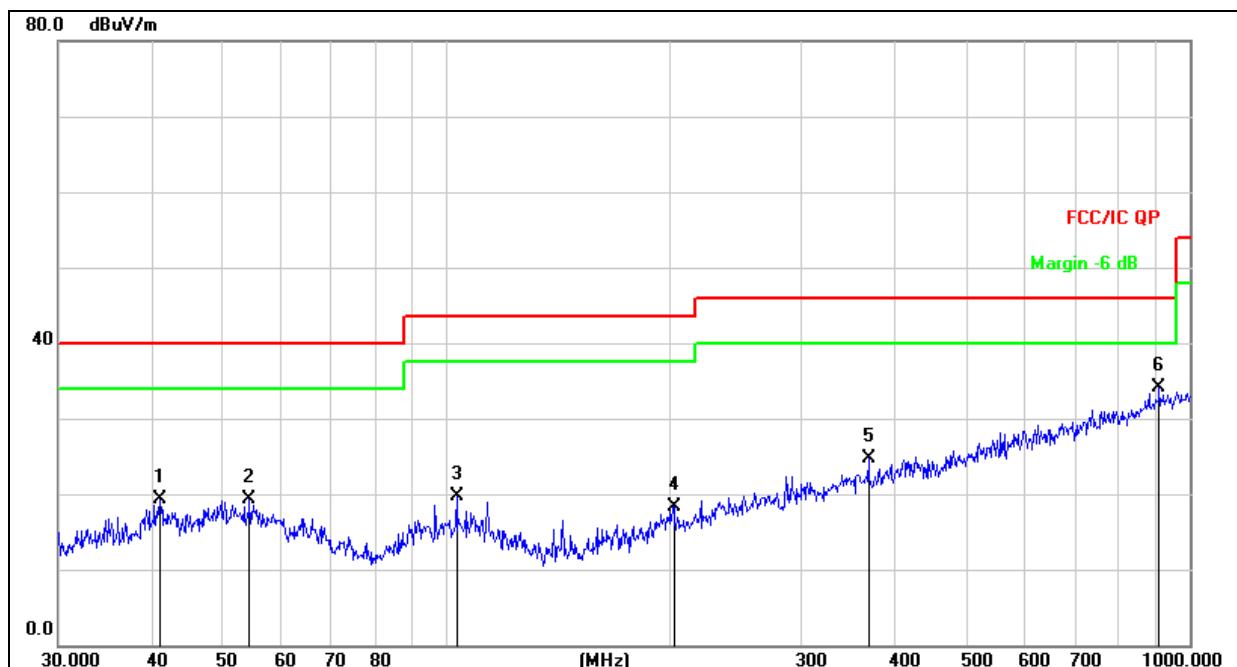
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log(\text{specific distance}/\text{test distance})$ (dB);
Limit line = specific limits(dBuV) + distance extrapolation factor.



3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature :	26°C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 3.0V		
Test Mode :	Mode 2		



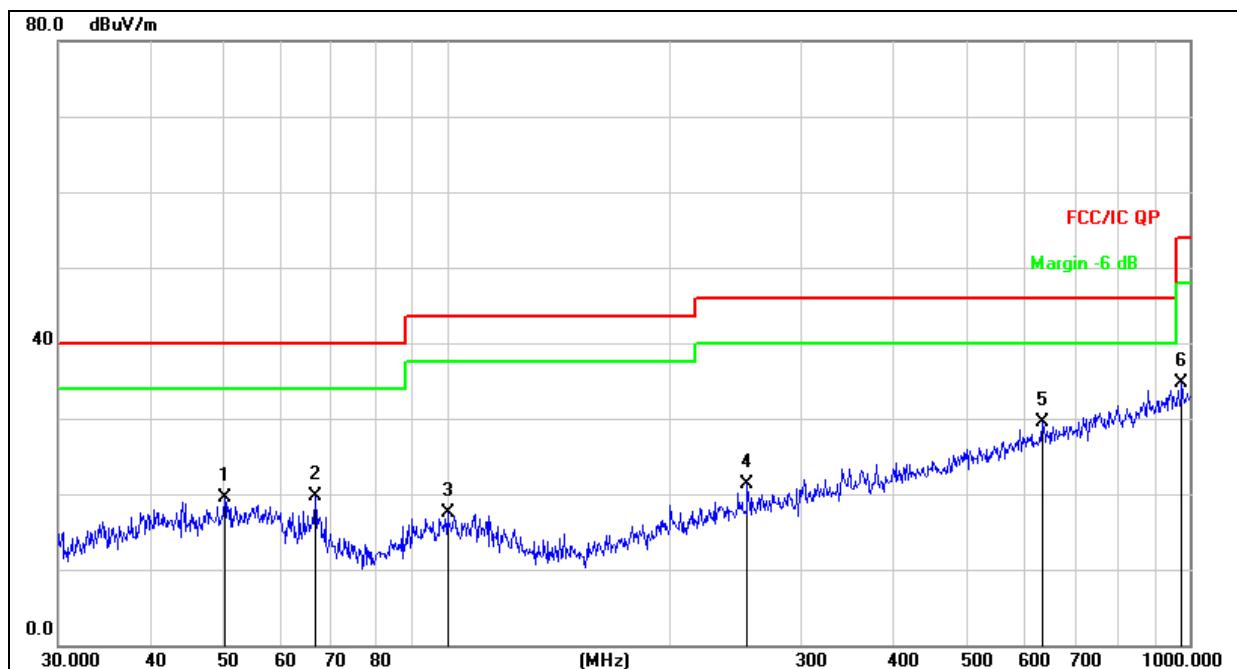
Remark:

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

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV/m	dB/m	dB
1		41.1320	34.67	-15.40	19.27	40.00	-20.73
2		54.2610	34.22	-14.94	19.28	40.00	-20.72
3		103.0800	35.94	-16.28	19.66	43.50	-23.84
4		202.1005	33.93	-15.69	18.24	43.50	-25.26
5		369.4047	35.03	-10.38	24.65	46.00	-21.35
6	*	909.6667	33.35	0.81	34.16	46.00	-11.84



Temperature :	26°C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 3.0V		
Test Mode :	Mode 2		



Remark:

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

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		50.2324	34.27	-14.77	19.50	40.00	-20.50	QP
2		66.4989	37.08	-17.35	19.73	40.00	-20.27	QP
3		100.2286	33.95	-16.47	17.48	43.50	-26.02	QP
4		253.8367	34.87	-13.62	21.25	46.00	-24.75	QP
5	*	633.9073	33.56	-4.09	29.47	46.00	-16.53	QP
6		975.7529	33.16	1.64	34.80	54.00	-19.20	QP



3.2.8 TEST RESULTS (1GHZ~25GHZ)

Channel 2482MHz	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dB μ V)	(PK/QP/Ave)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	
	2482.00	87.65	PK	H	14.76	102.41	114.00	Pass
	2482.00	68.21	Ave	H	14.76	82.97	94.00	Pass
	4964.00	49.76	PK	H	19.73	69.49	74.00	Pass
	4964.00	37.73	Ave	H	19.73	57.46	54.00	Pass
	7446.00	31.53	PK	H	23.24	54.77	74.00	Pass
	9928.00	23.41	PK	H	24.52	47.93	74.00	Pass
	12410	20.83	PK	H	27.17	48	74.00	Pass
	14892	21.64	PK	H	31.62	53.26	74.00	Pass
	17374	22.58	PK	H	36.49	59.07	74.00	Pass
	19856	24.65	PK	H	38.23	62.88	74.00	Pass
	2482.00	85.19	PK	V	14.76	99.95	114.00	Pass
	2482.00	66.37	Ave	V	14.76	81.13	94.00	Pass
	4964.00	42.25	PK	V	19.73	61.98	74.00	Pass
	4964.00	30.74	Ave	V	19.73	50.47	54.00	Pass
	7446.00	25.36	PK	V	23.24	48.6	74.00	Pass
	9928.00	22.94	PK	V	24.52	47.46	74.00	Pass
	12410	21.17	PK	V	27.17	48.34	74.00	Pass
	14892	22.52	PK	V	31.62	54.14	74.00	Pass
	17374	22.45	PK	V	36.49	58.94	74.00	Pass
	19856	25.18	PK	V	38.23	63.41	74.00	Pass

Remark:

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

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 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:

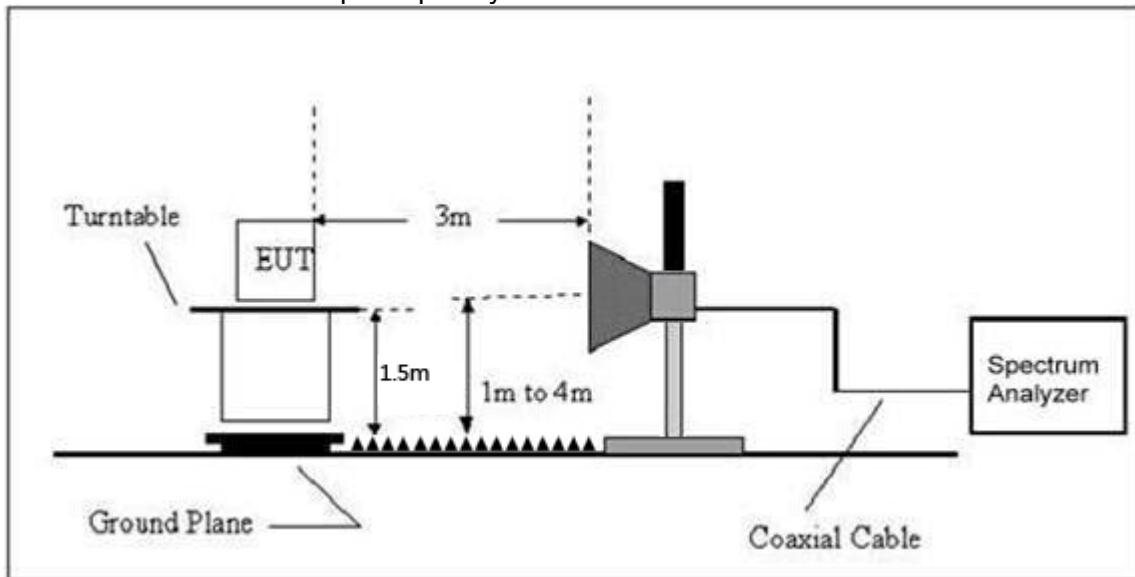
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



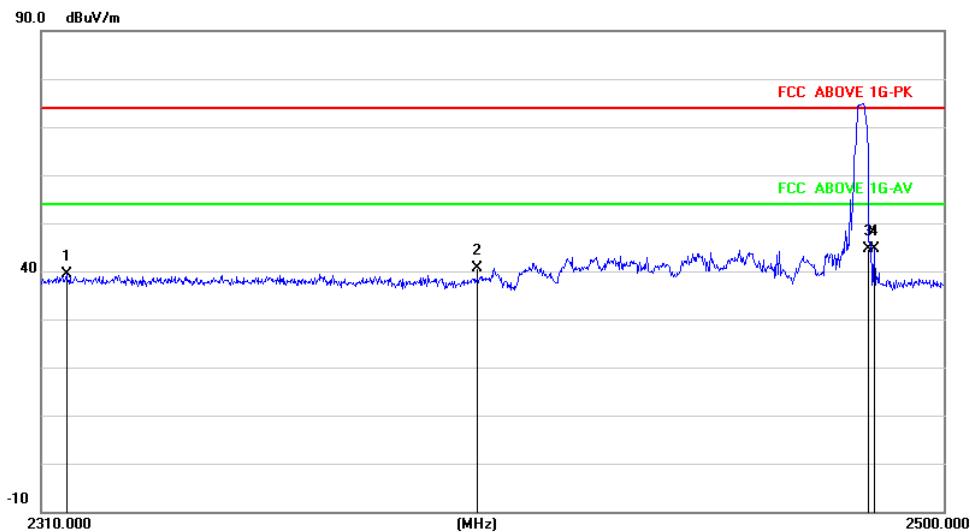
3.3.5 EUT OPERATING CONDITIONS

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.



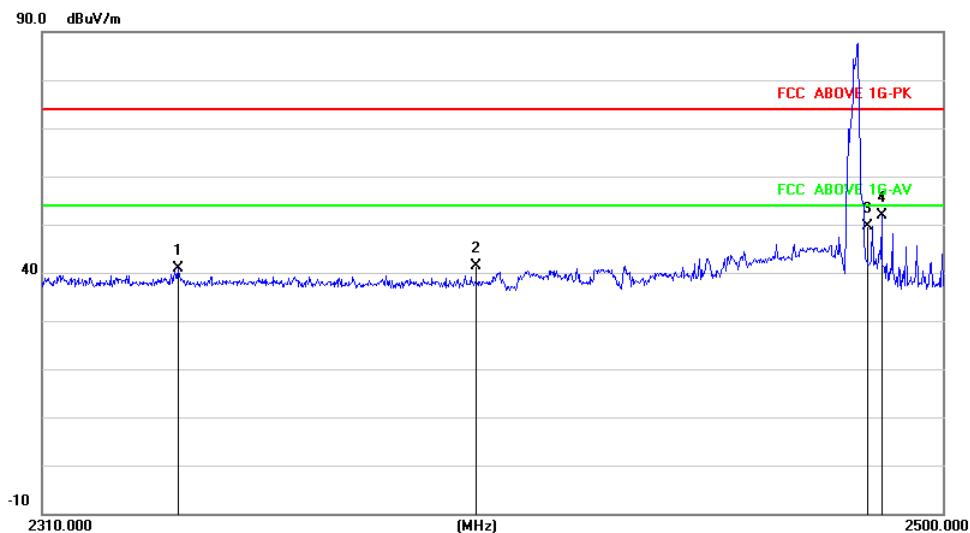
3.3.6 TEST RESULT

2482MHz Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2315.130	43.54	-4.27	39.27	74.00	-34.73	peak
2	2400.000	45.36	-4.77	40.59	74.00	-33.41	peak
3	2483.500	49.77	-5.08	44.69	74.00	-29.31	peak
4	2484.990	49.77	-5.08	44.69	74.00	-29.31	peak

2482MHz Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2337.740	45.30	-4.40	40.90	74.00	-33.10	peak
2	2400.000	46.24	-4.77	41.47	74.00	-32.53	peak
3	2483.500	54.62	-5.08	49.54	74.00	-24.46	peak
4	2486.700	56.90	-5.08	51.82	74.00	-22.18	peak



4. BANDWIDTH TEST

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.249) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.249	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

4.1.1 TEST PROCEDURE

1. Set RBW = 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 frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION 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.

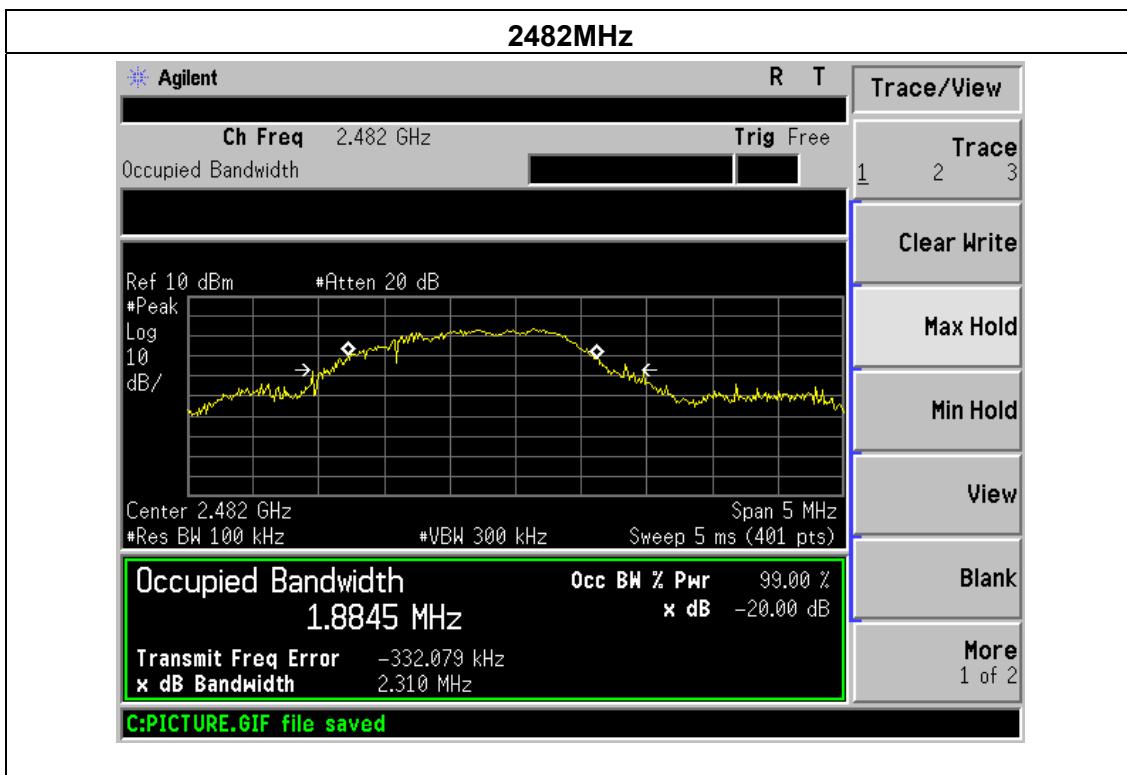


4.1.5 TEST RESULTS

Temperature :	25°C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 3.0V
Test Mode :	TX Mode		

	Frequency (MHz)	20dB bandwidth (kHz)	Result
GFSK	2482	2310	Pass

GFSK





5. ANTENNA REQUIREMENT

5.1 STANDARD REQUIREMENT

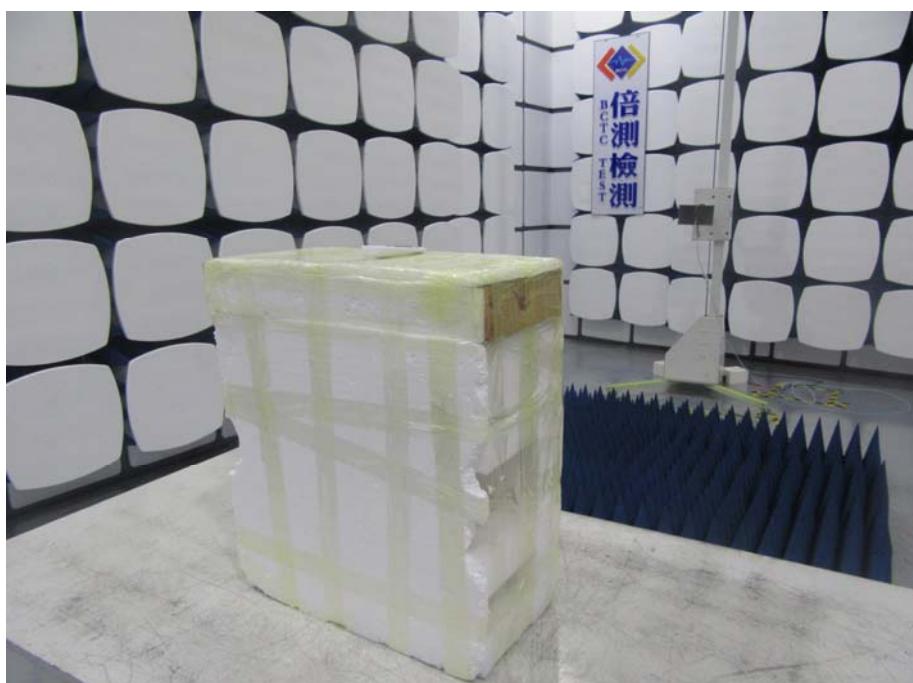
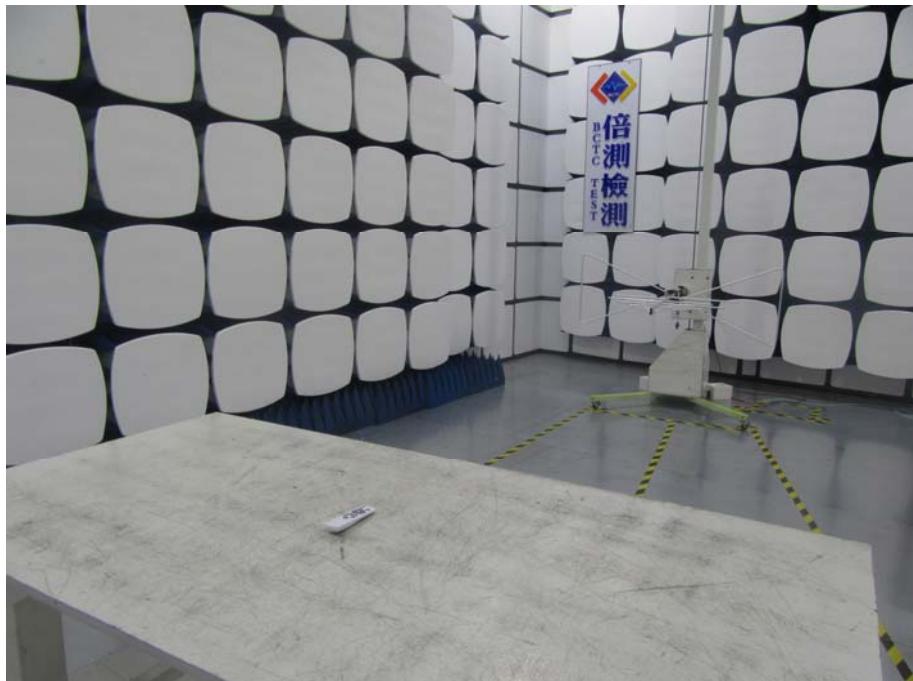
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

5.2 EUT ANTENNA

The EUT antenna is PCB antenna,. It comply with the standard requirement.

6. TEST SEUUP PHOTO

Radiated Measurement Photos



7. EUT PHOTO



***** END OF REPORT *****