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FCC PART 15 SUBPART C TEST REPORT

FCC Part 15.249

Report Reference No. : CTL130305279-WF

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Date of issue : Mar. 13, 2013

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Test Firm : Bontek Compliance Testing Laboratory Ltd

Address : 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East
Road, Nanshan, Shenzhen, China

Applicant's name : SHENZHEN REMOTE TECH-DEVELOPING CO., LTD

Address : Building 2, Penghua Industrial Park, Heping West Road, Longhua
Street Office, Baoan District Shenzhen City, Guangdong Province,
China

Test specification:

Standard : FCC Part 15.249: Operation within the bands 920-928 MHz, 2400-
2483.5 MHz, 5725-5850 MHz and 24.0 - 24.25 GHz.

TRF Originator : Shenzhen CTL Electromagnetic Technology Co., Ltd.

Master TRF : Dated 2011-01

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placement and context.

Test item description : Air Mouse Remoter

Trade Mark : /

Models/Type reference : RF12G

Modulation : GFSK

Work Frequency : 2405 MHz~2476 MHz

Antenna Type : PCB Antenna

FCC ID : SAVRF12G

Result : Positive

TEST REPORT

Test Report No. :	CTL130305279-WF	Mar. 13, 2013 Date of issue
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Equipment under Test : Air Mouse Remoter

Model /Type : RF12G

Listed Models : /

Applicant : SHENZHEN REMOTE TECH-DEVELOPING CO., LTD

Address : Building 2, Penghua Industrial Park, Heping West Road, Longhua Street Office, Baoan District Shenzhen City, Guangdong Province, China

Manufacturer : SHENZHEN REMOTE TECH-DEVELOPING CO., LTD

Address : Building 2, Penghua Industrial Park, Heping West Road, Longhua Street Office, Baoan District Shenzhen City, Guangdong Province, China

Test Result according to the standards on page 4:	Positive
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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 C63.4-2003



2. SUMMARY

2.1. General Remarks

Date of receipt of test sample : Feb. 27, 2013

Testing commenced on : Feb. 28, 2013

Testing concluded on : Mar. 10, 2013

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage : 120V / 60 Hz 115V / 60Hz
 12 V DC 24 V DC
 Other (specified in blank below)

DC 3.7V from battery

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

The EUT is a 2.4GHz Air Mouse Remoter, work at 2405~2476 MHz.

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2405	27	2432	54	2459
01	2406	28	2433	55	2460
02	2407	29	2434	56	2461
03	2408	30	2435	57	2462
04	2409	31	2436	58	2463
05	2410	32	2437	59	2464
06	2411	33	2438	60	2465
07	2412	34	2439	61	2466
08	2413	35	2440	62	2467
09	2414	36	2441	63	2468
10	2415	37	2442	64	2469
11	2416	38	2443	65	2470
12	2417	39	2444	66	2471
13	2418	40	2445	67	2472
14	2419	41	2446	68	2473
15	2420	42	2447	69	2474
16	2421	43	2448	70	2475
17	2422	44	2449	71	2476
18	2423	45	2450		
19	2424	46	2451		
20	2425	47	2452		
21	2426	48	2453		
22	2427	49	2454		
23	2428	50	2455		
24	2429	51	2456		
25	2430	52	2457		
26	2431	53	2458		

Power Range: -10dBm~5dBm

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

Serial number: Prototype

Note: USB port only used for charge no any data transfer to PC.

2.4. EUT operation mode

Test Mode(TM)	Description	Remark
TM1	Bottom Channel Transmitting	/
TM2	Middle Channel Transmitting	/
TM3	Top Channel Transmitting	/
TM4	Charging	USB power by PC

The field strength of radiation emission was measured in the following position: EUT stand-up position (Y axis), lie-down position (X, Z axis).

The following data show only with the worst case setup.

The worst case of Y axis was reported.

Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report.

2.5. EUT configuration

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

○ - supplied by the manufacturer

● - supplied by the lab

● Notebook PC

Manufacturer : HP

Model No. : 4-1007TX

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

This submittal(s) (test report) is intended for FCC ID: **SAVRF12G** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

2.7. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Bontek Compliance Testing Laboratory Ltd
1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

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

IC Registration No.: 7631A

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on March, 2011.

FCC-Registration No.: 338263

Bontek Compliance Testing Laboratory 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 338263, March 24, 2008.

3.3. Environmental conditions

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

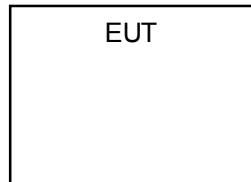
Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 950-1050mbar

3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System



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 Bontek Compliance Testing Laboratory 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 Bontek laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	1~26.5GHz	4.32dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

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

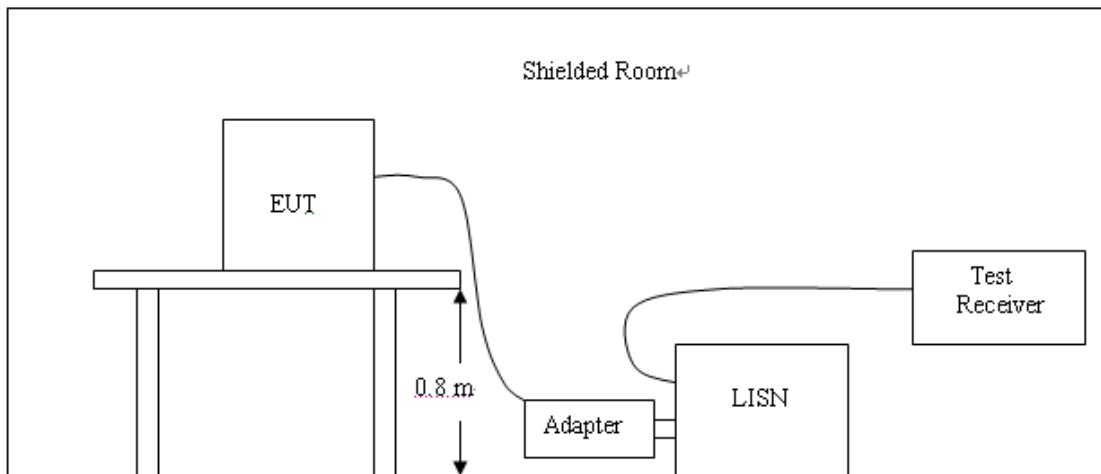
3.6. Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Last Cal.	Due. Date
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	2012/04/14	2013/04/13
2	Radio Communication Tester	ROHDE & SCHWARZ	CMU200	2012/04/14	2013/04/13
3	Dual Directional Coupler	Agilent	778D	2012/04/14	2013/04/13
4	10dB attenuator	SCHWARZBECK	MTAIMP-136	2012/04/14	2013/04/13
5	Tunable Bandreject filter	K&L	3TNF-800	2012/04/14	2013/04/13
6	Tunable Bandreject filter	K&L	5TNF-1700	2012/04/14	2013/04/13
7	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	2012/04/14	2013/04/13
8	High-Pass Filter	K&L	41H10-1375/U12750-O/O	2012/04/14	2013/04/13
9	Coaxial Cable	Huber+Suhner	AC4-RF-H	2012/04/14	2013/04/13
10	AC Power Supply	IDRC	CF-500TP	2012/04/14	2013/04/13
11	DC Power Supply	IDRC	CD-035-020PR	2012/04/14	2013/04/13
12	RF Current Probe	FCC	F-33-4	2012/04/14	2013/04/13
13	Temperature /Humidity Meter	zhicheng	ZC1-2	2012/04/14	2013/04/13
14	MICROWAVE AMPLIFIER	HP	8349B	2012/04/14	2013/04/13
15	Amplifier	HP	8447D	2012/04/14	2013/04/13
16	SIGNAL GENERATOR	HP	8647A	2012/04/14	2013/04/13
17	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	2012/04/14	2013/04/13
18	Horn Antenna	Schwarzbeck	BBHA9120A	2012/04/14	2013/04/13
19	EMI Test Receiver	R&S	ESPI	2012/04/14	2013/04/13
20	Loop Antenna	ZHINAN	ZN30900A	2012/04/14	2013/04/13
21	Horn Antenna	Schwarzbeck	BBHA9120D	2012/04/14	2013/04/13
22	Horn Antenna	Schwarzbeck	BBHA9170	2012/04/14	2013/04/13

4. TEST CONDITIONS AND RESULTS

4.1. Conducted Emissions Test

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 C63.4.
- 2 Support equipment, if needed, was placed as per ANSI C63.4.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- 4 If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter 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.

CONDUCTED POWER LINE EMISSION LIMIT

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

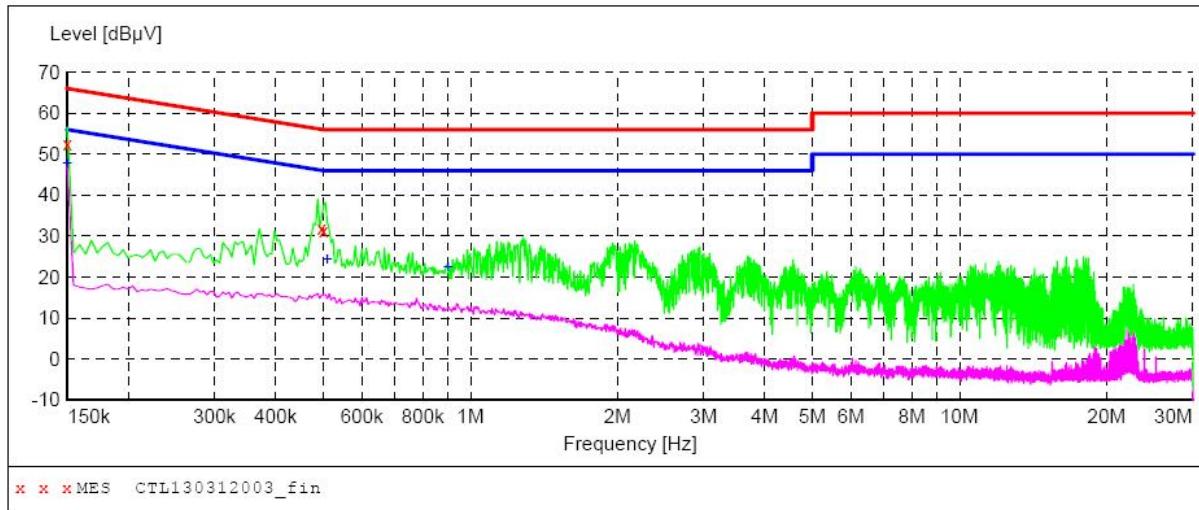
* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

TEST RESULTS

Test mode: TM4

SCAN TABLE: "Voltage (9K-30M) FIN"
Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL130312003_fin"**

3/12/2013 11:59AM

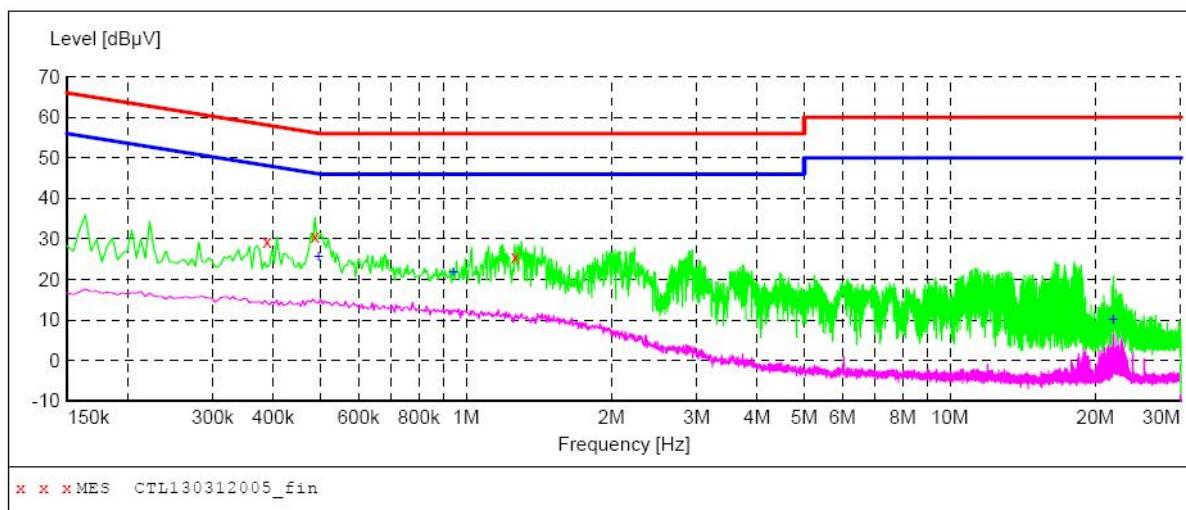
Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.150000	52.60	10.2	66	13.4	QP	L1	GND
0.496500	32.00	10.2	56	24.1	QP	L1	GND
0.501000	31.40	10.2	56	24.6	QP	L1	GND

MEASUREMENT RESULT: "CTL130312003_fin2"

3/12/2013 11:59AM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.150000	47.60	10.2	56	8.4	AV	L1	GND
0.510000	24.40	10.2	46	21.6	AV	L1	GND
0.901500	22.30	10.2	46	23.7	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M) FIN"
 Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL130312005_fin"

3/12/2013 1:39PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dBµV	dB	dBµV	dB			
	0.388500	29.50	10.2	58	28.6	QP	N	GND
	0.487500	30.70	10.2	56	25.5	QP	N	GND
	1.266000	25.50	10.3	56	30.5	QP	N	GND

MEASUREMENT RESULT: "CTL130312005_fin2"

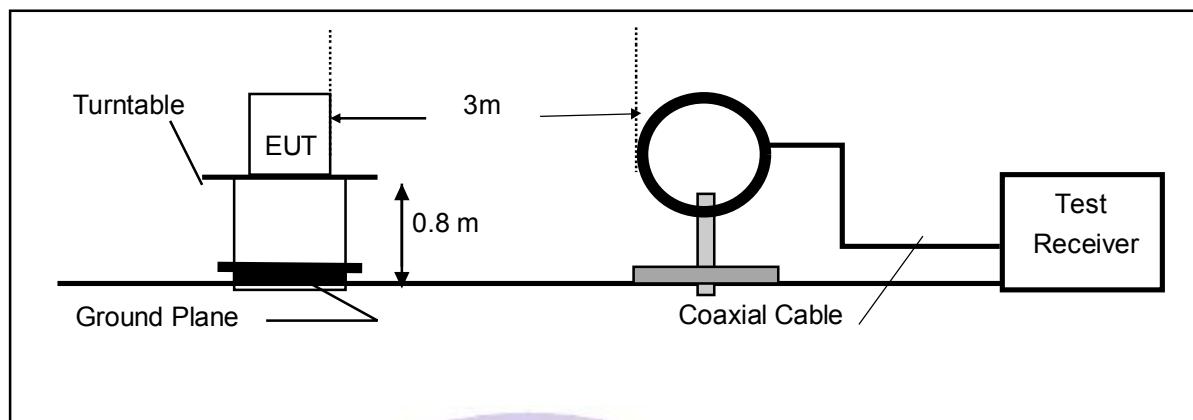
3/12/2013 1:39PM	Frequency	Level	Transd	Limit	Margin	Detector	Line	PE
	MHz	dBµV	dB	dBµV	dB			
	0.496500	25.70	10.2	46	20.4	AV	N	GND
	0.942000	21.90	10.3	46	24.1	AV	N	GND
	21.763500	10.00	10.9	50	40.0	AV	N	GND

Electromagnetic

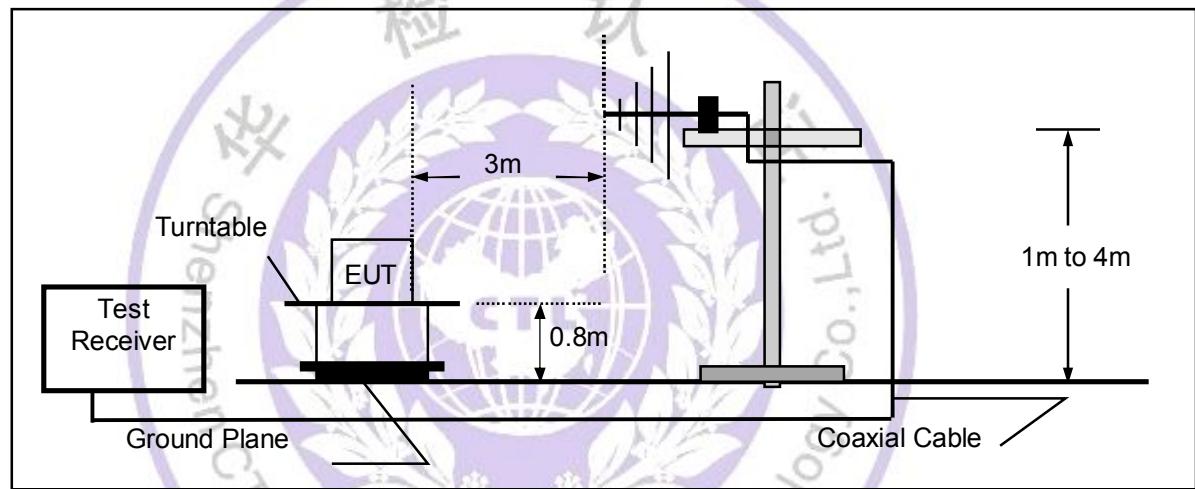
4.2. Radiated Emission Test

TEST CONFIGURATION

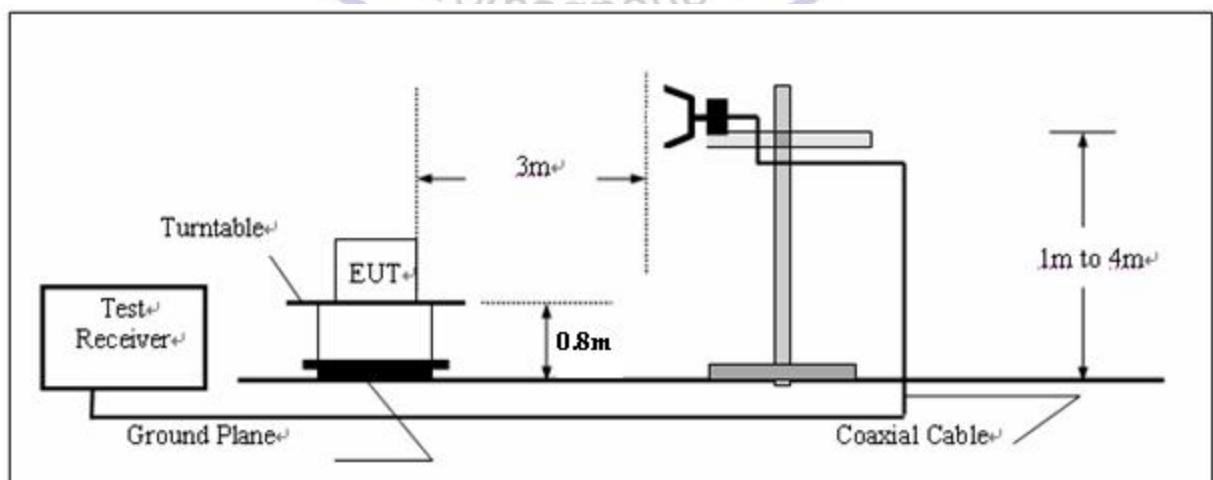
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



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	

RADIATION LIMIT

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Based on the Frequency Generator in the device include 8MHz and 16MHz. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

Three axes are chosen for pretest, the Z axis is the worst mode for final test.

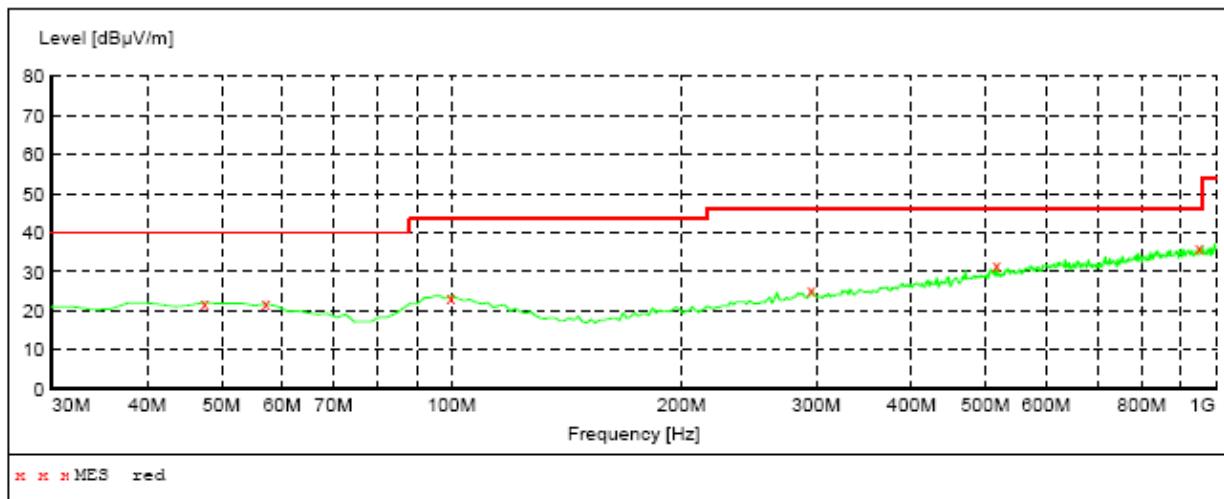
For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST RESULTS

All the test modes (TM1, TM2, TM3 and TM4) completed for test. The worst case of Radiated Emission is TM4; the test data of this mode was reported.

Below 1GHz Test Results:

SWEEP TABLE: "test (30M-1G)"
 Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz VULB9163 NEW

**MEASUREMENT RESULT:**

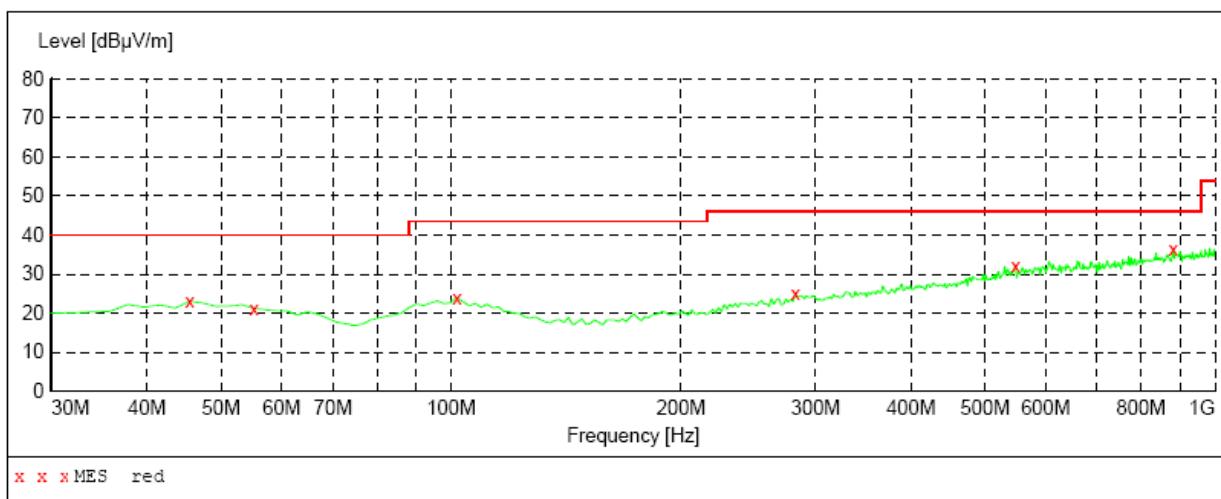
Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	22.10	15.8	40.0	17.9	---	100.0	0.00	VERTICAL
57.160000	21.80	15.1	40.0	18.2	---	100.0	0.00	VERTICAL
99.840000	23.60	17.5	43.5	19.9	---	100.0	0.00	VERTICAL
295.780000	25.20	18.6	46.0	20.8	---	100.0	0.00	VERTICAL
516.940000	31.50	24.2	46.0	14.5	---	100.0	0.00	VERTICAL
951.500000	36.10	29.6	46.0	9.9	---	100.0	0.00	VERTICAL

Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

SWEET TABLE: "test (30M-1G)"

Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz VULB9163 NEW

***MEASUREMENT RESULT:***

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.520000	23.10	15.9	40.0	16.9	---	100.0	0.00	HORIZONTAL
55.220000	21.20	15.6	40.0	18.8	---	100.0	0.00	HORIZONTAL
101.780000	24.00	17.3	43.5	19.5	---	100.0	0.00	HORIZONTAL
282.200000	24.90	18.2	46.0	21.1	---	100.0	0.00	HORIZONTAL
547.980000	32.20	24.9	46.0	13.8	---	100.0	0.00	HORIZONTAL
881.660000	36.30	29.0	46.0	9.7	---	100.0	0.00	HORIZONTAL

Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2476	V	Peak	73.41	-3.30	70.11	113.98	-43.87	F
2476	H	Peak	65.65	-3.30	62.35	113.98	-51.63	F
4952	V	Peak	46.42	3.90	50.32	74.00	-23.68	H
4952	H	Peak	42.40	3.90	46.30	74.00	-27.70	H
7428	V		---					H
7428	H		---					H
Others			---					

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2439	V	Peak	73.72	-3.40	70.32	113.98	-43.66	F
2439	H	Peak	64.70	-3.40	61.30	113.98	-52.68	F
4878	V	Peak	45.33	3.70	49.03	74.00	-24.97	H
4878	H	Peak	38.30	3.70	42.00	74.00	-32.00	H
7317	V		---					H
7317	H		---					H
Others			---					

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2405	V	Peak	74.36	-3.30	71.06	113.98	-42.92	F
2405	H	Peak	69.68	-3.30	66.38	113.98	-47.60	F
4810	V	Peak	48.63	3.50	52.13	74.00	-21.87	H
4810	H	Peak	41.38	3.50	44.88	74.00	-29.12	H
7215	V		---					H
7215	H		---					H
Others			---					

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "—" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 25MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 71.06dBuV/m(PK Value) <93.98(AV Limit), at harmonic 52.13 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

4.3. Band Edge Measurement

TEST CONFIGURATION

Same as Section 4.2

TEST PROCEDURE

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength.

The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBM to 300 KHz, to measure the conducted peak band edge.

LIMIT

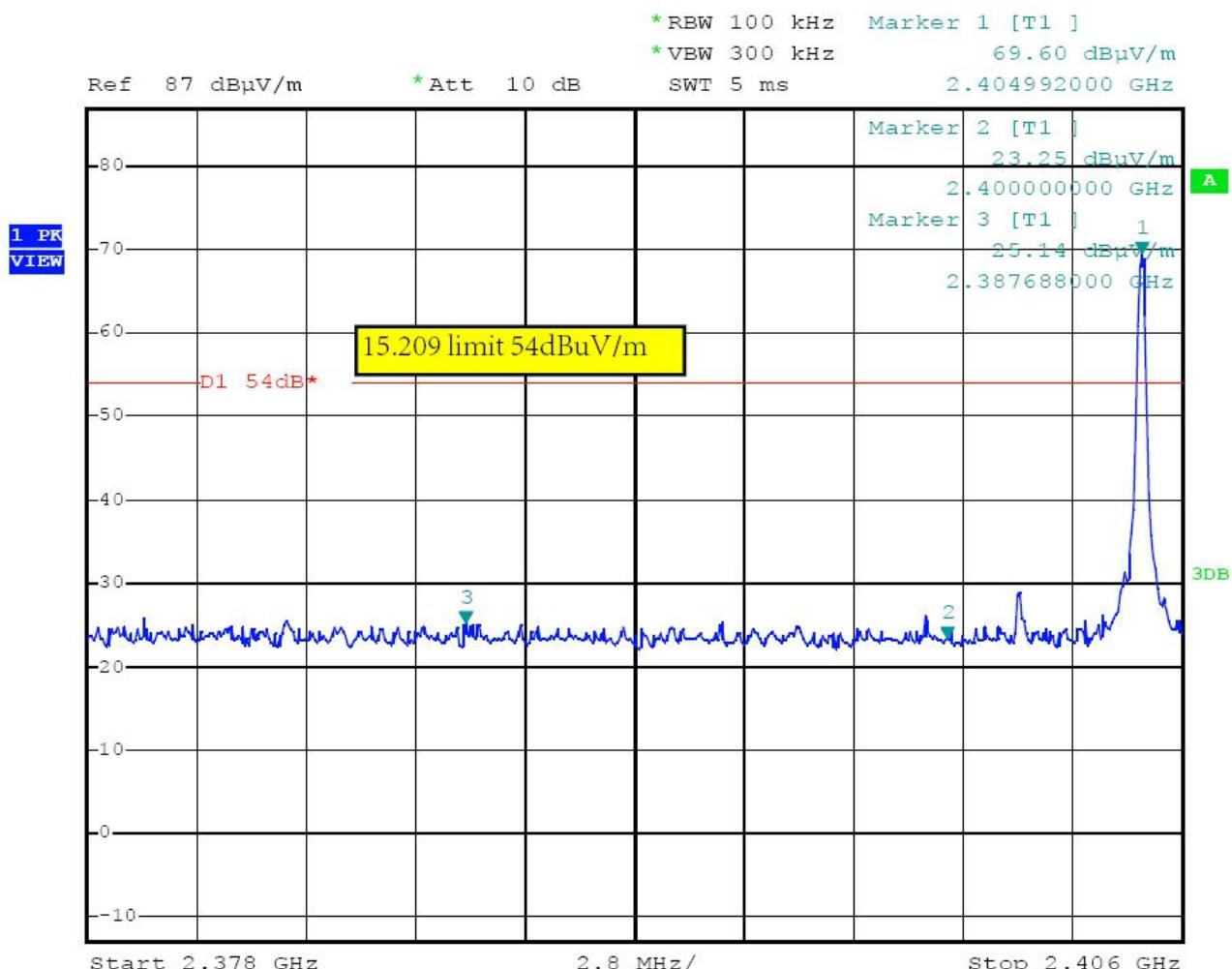
FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

TEST RESULTS

Radiated Test:

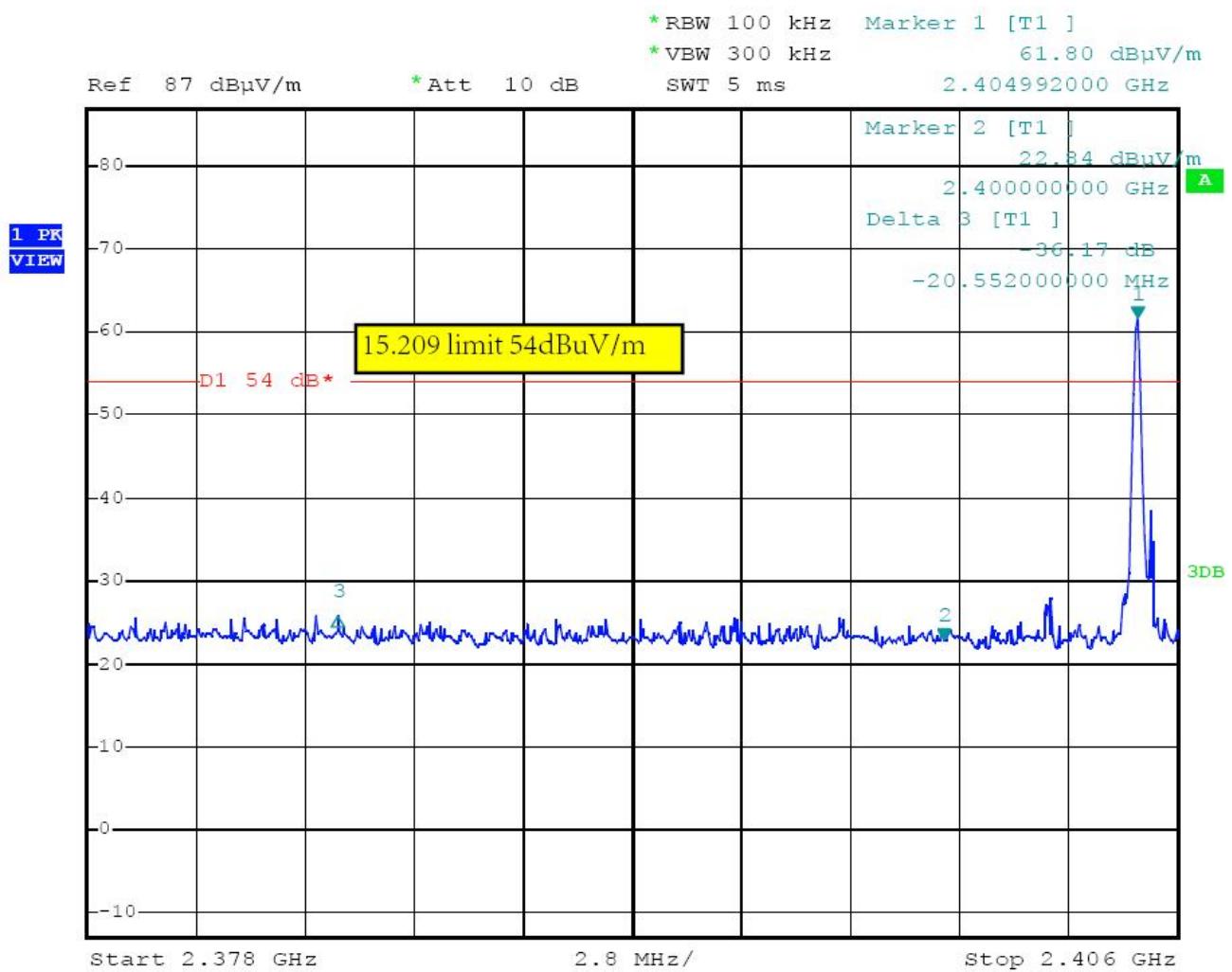
Operation Mode: TX on Bot Channel

Polarity: Hor.



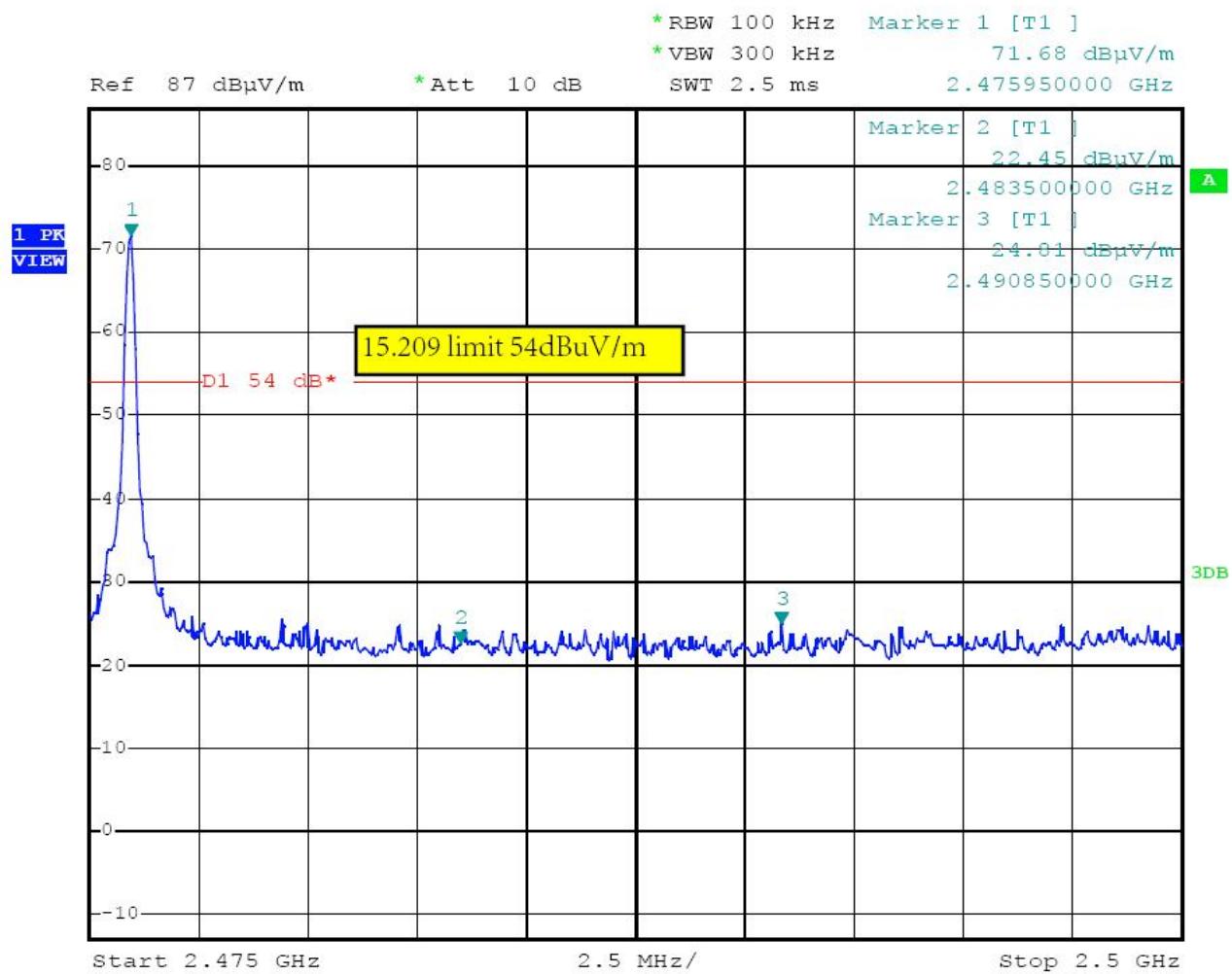
Operation Mode: TX on Bot Channel

Polarity: Ver.



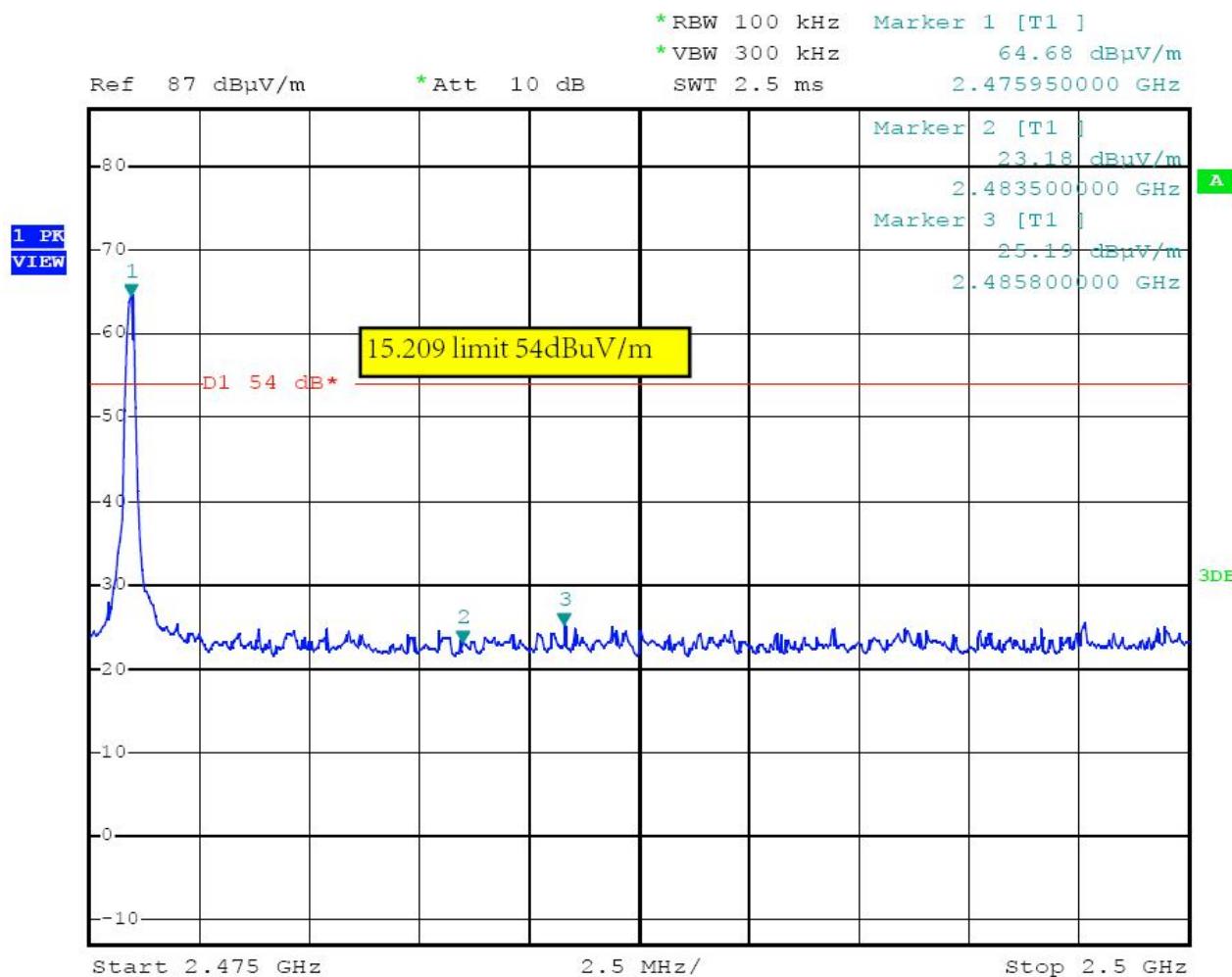
Operation Mode: TX on Top Channel

Polarity: Hor.



Operation Mode: TX on Top Channel

Polarity: Ver.



Note:

1. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.
2. The average measurement was not performed when the peak measured data under the limit of average detection.

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.

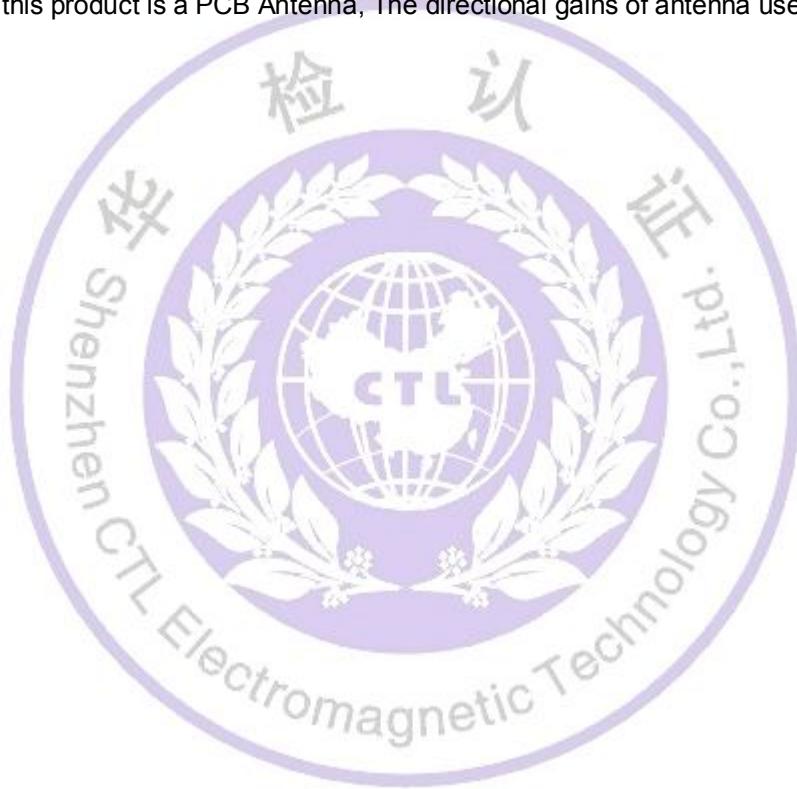
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

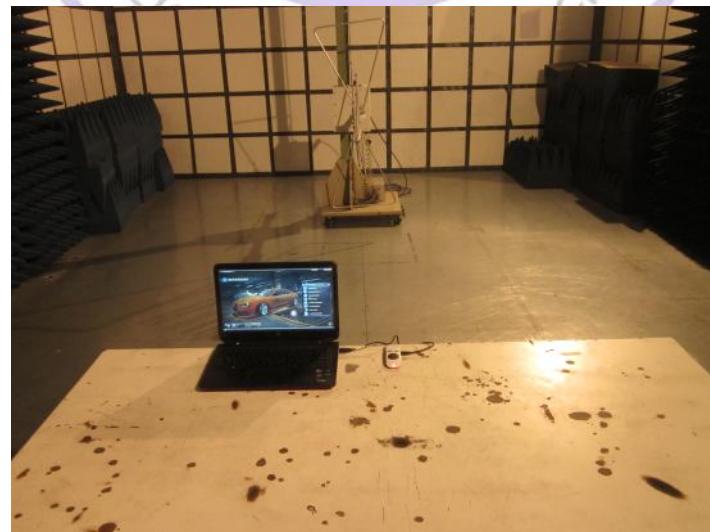
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

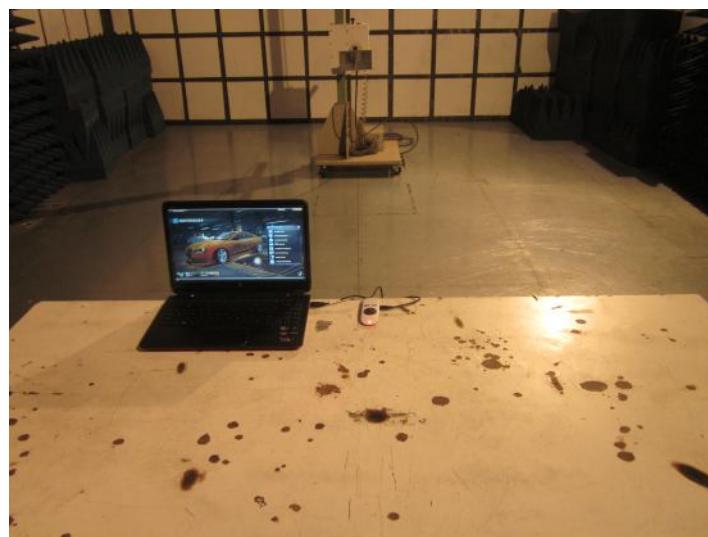
Antenna Connected Construction

The antenna used in this product is a PCB Antenna, The directional gains of antenna used for transmitting is -2.0 dBi.



6. Test Setup Photos of the EUT



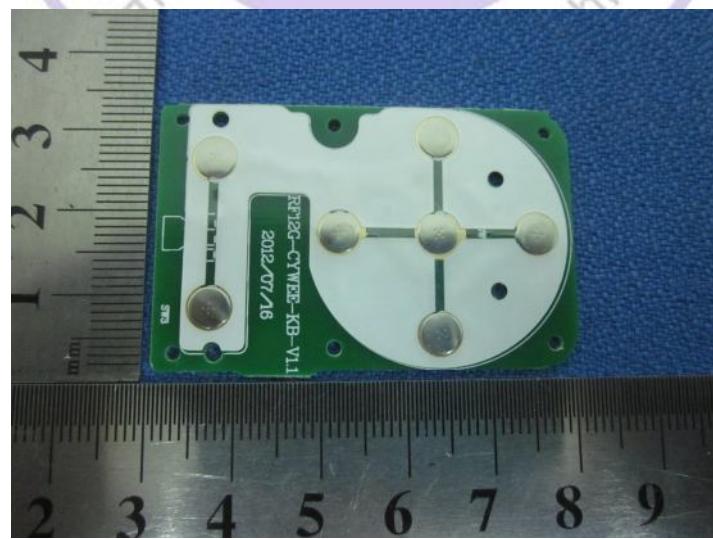
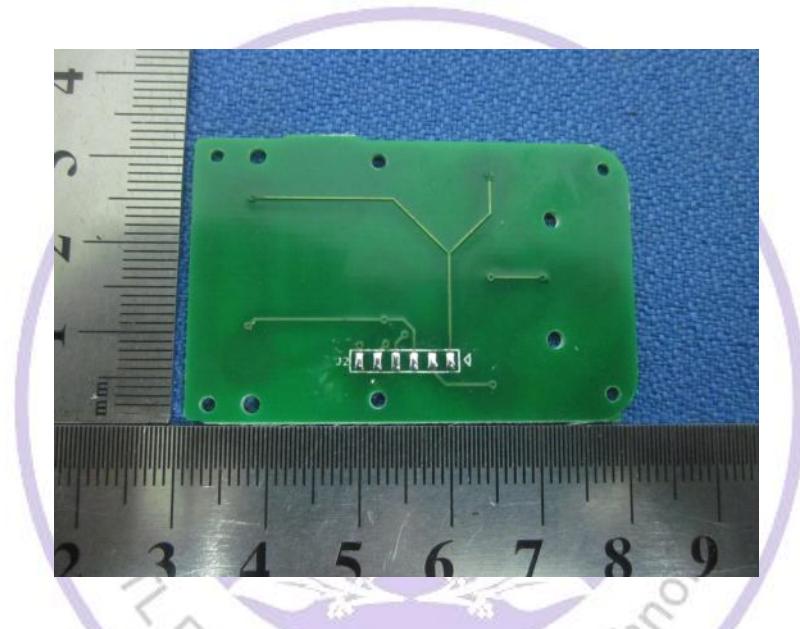


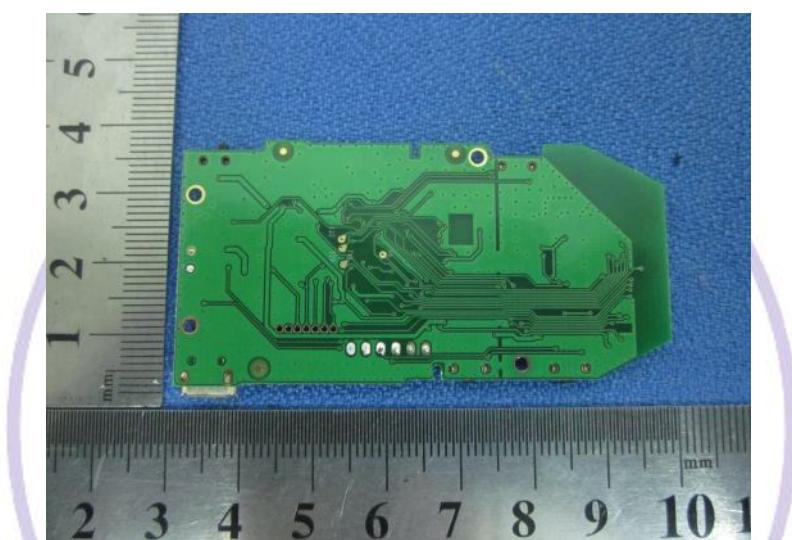
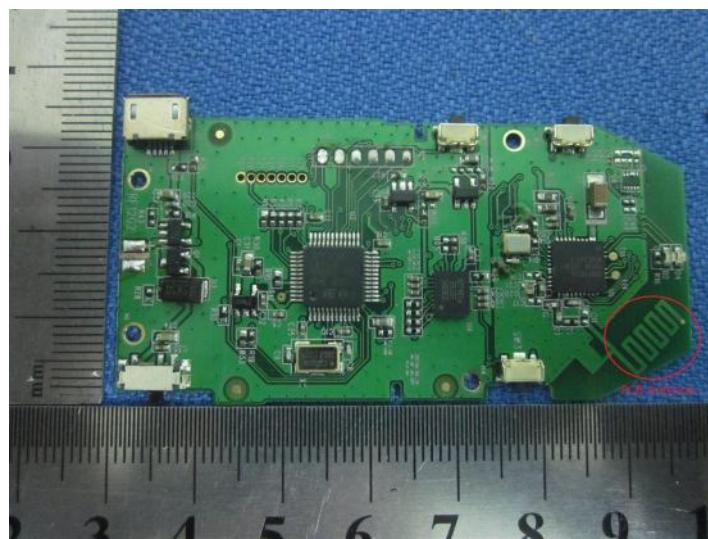
7. External and Internal Photos of the EUT

External Photos





Internal Photos



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

