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FCC TEST REPORT

47 CFR FCC Part 15 Subpart C 15.249

Report Reference No. : TRE13010036 R/C:76145

FCC ID : N9STY-R-2400

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Wenliang Li

Date of issue : Mar 15, 2013

Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd**

Address : Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China

Applicant's name : **TOYO ELECTRIC MFG. Co., LTD**

Address : 9TH,FL 30 SEC 3 RENAI RD DAAN DISTRICT, TAIPEI 106
TAIWAN

Manufacturer's name : **T&Y ELECTRIC(SHENZHEN)Co., LTD**

Address : ANLIANG INDUSTRIAL ZONE, HENG GANG, LONG GANG
DISTRICT, GD, CHINA

Test specification:

Standard : **47 CFR FCC Part 15 Subpart C & 15.249**

ANSI C63.10: 2009

TRF Originator : Shenzhen Huatongwei International Inspection CO., Ltd

Master TRF : Dated 2006-06

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Equipment Under Test : **REMOTE TRANSMITTER**

Trade Mark : /

Model/Type reference : TY-R-2400

Listed Models : /

Modulation : GFSK

Result : Complied

TEST REPORT

Test Report No. :	TRE13010036	Mar 15, 2013 Date of issue
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Equipment under Test : REMOTE TRANSMITTER

Model /Type : TY-R-2400

Listed Models : /

Applicant : TOYO ELECTRIC MFG. Co., LTD

Address : 9TH,FL 30 SEC 3 RENAI RD DAAN DISTRICT, TAIPEI
106 TAIWAN

Manufacturer : T&Y ELECTRIC(SHENZHEN)Co., LTD

Address : ANLIANG INDUSTRIAL ZONE, HENG GANG,
LONG GANG DISTRICT, GD, 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:

47 CFR 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, 5725-5850 MHz and 24.0 - 24.25 GHz.

ANSI C63.10: 2009 – American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jan 08, 2013
Testing commenced on	:	Jan 10, 2013
Testing concluded on	:	Mar 15, 2013

2.2. Equipment Under Test

Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 12V from battery

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

2432MHz REMOTE TRANSMITTER (M/N: TY-R-2400)

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

Serial number: Prototype

2.4. EUT operation mode

The EUT has been tested under typical operating condition.

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

This submittal(s) (test report) is intended for **FCC ID: N9STY-R-2400** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Huatongwei International Inspection Co., Ltd
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

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

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection 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: Mar. 01, 2012. Valid time is until Feb 28, 2015.

A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until Sept. 30, 2013.

FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection 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 662850, Renewal date Jun. 01, 2012, valid time is until Jun. 01, 2015.

IC-Registration No.: 5377A

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Jan. 25, 2011, valid time is until Jan. 24, 2014.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

NEMKO-Aut. No.: ELA125

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10, the authorization is valid through July 07, 2013

VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2010. Valid time is until Dec. 23, 2013.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.

Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2010. Valid time is until May 06, 2013.

DNV

Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2013.

3.3. 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 Huatongwei International Inspection 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 Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.65 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	-----	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.4. Summary of standards and result

FCC Part 15 15.249 Requirement		
FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	PASS
§15.109, §15.205(a), §15.209(a), 15.249(a), §15.249(c), §15.35	Radiated Emissions	PASS
§15.207(a)	Conduction Emissions	N/A
§15.249(d)	Out of Band Emissions	PASS
§15.215(c)	20 dB Bandwidth	PASS

NOTE: 1) The detailed test result please see section 4.

2) The test report merely corresponds to the test sample.

3) It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

3.5. Environmental conditions

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

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

3.6. Equipments Used during the Test

Radiated Emissions / Band Edge Measurement					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	2012/10/27
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2012/10/27
3	RF TEST PANEL	Rohde&Schwarz	TS / RSP	335015/ 0017	2012/10/27
4	TURNTABLE	ETS	2088	2149	2012/10/27
5	ANTENNA MAST	ETS	2075	2346	2012/10/27
6	EMI TEST SOFTWARE	Rohde&Schwarz	ESK1	N/A	2012/10/27
7	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2012/10/27
8	Amplifier	Sonoma	310N	E009-13	2012/10/27
9	JS amplifier	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2012/10/27
10	High pass filter	Compliance Direction systems	BSU-6	34202	2012/10/27
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	470	2012/10/27
12	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2012/10/27
13	HORN ANTENNA	ShwarzBeck	9120D	1011	2012/10/27
14	TURNTABLE	MATURO	TT2.0	----	2012/10/27
15	ANTENNA MAST	MATURO	TAM-4.0-P	----	2012/10/27
16	Power Amplifier	Compliance Direction systems	PAP140	1589	2012/10/27
17	Loop ANTENNA	Rohde&Schwarz	HFH2-Z2	100020	2012/10/27

20dB Bandwidth					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2012/10/27

The Calibration Interval was one year.

4. TEST CONDITIONS AND RESULTS

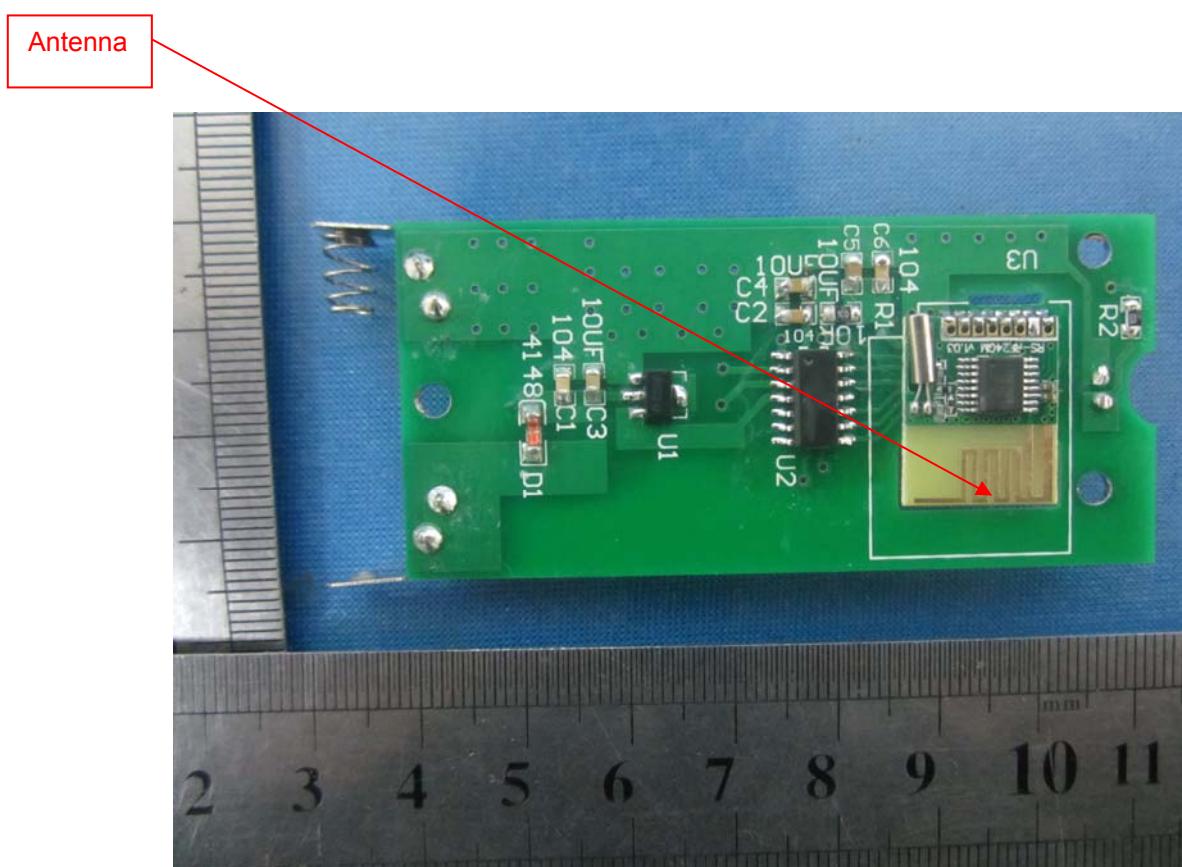
4.1. ANTENNA REQUIREMENT

According to FCC Part 15C § 15.203,

- a), An intentional radiator shall be de-signed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
- b), 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.

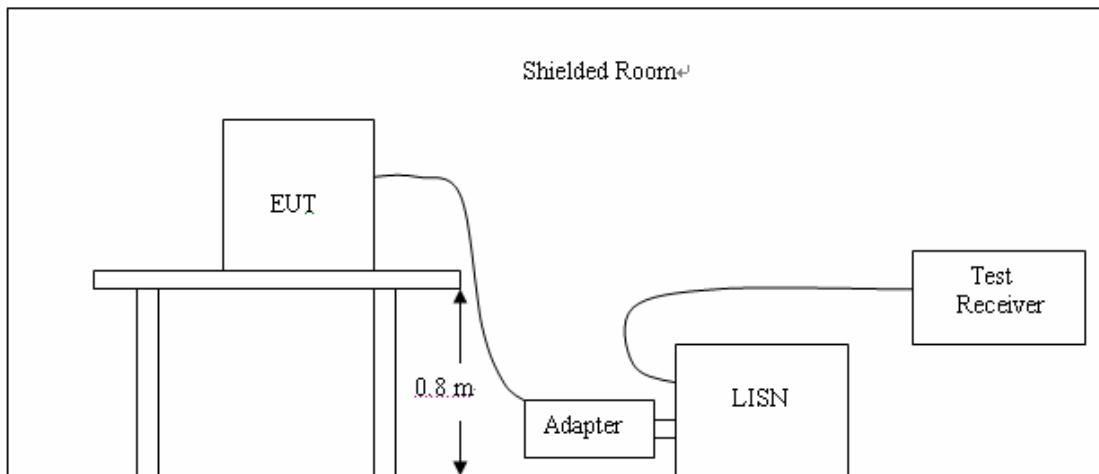
The EUT use of a PCB antenna. Please refer to the EUT Internal photos.

The EUT complied the antenna requirement. The maximum Gain of the antenna only 1dBi. please see the photo as following:



4.2. Conducted Emissions Test (Not Applicable)

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 Weather station Transmitter; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2 Support equipment, if needed, was placed as per ANSI C63.10.
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4 All support equipments received AC power from a second LISN, if any.
- 5 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.
- 6 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 7 During the above scans, the emissions were maximized by cable manipulation.

CONDUCTED LIMIT

According to FCC Subpart 15 B § 15.207 AC Conducted Emission Limits is as following:

Frequency range (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.1~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

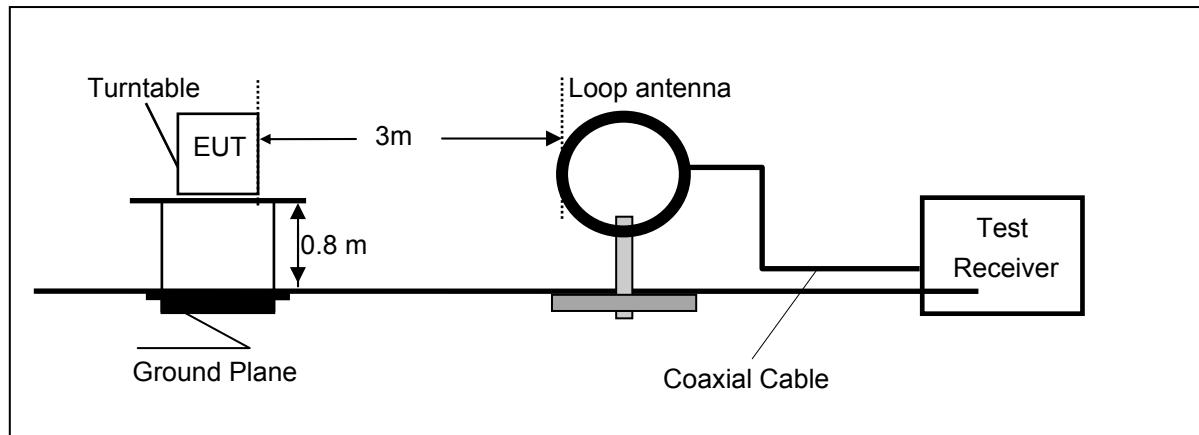
Not applicable to this device

4.3. Radiated Emission Test

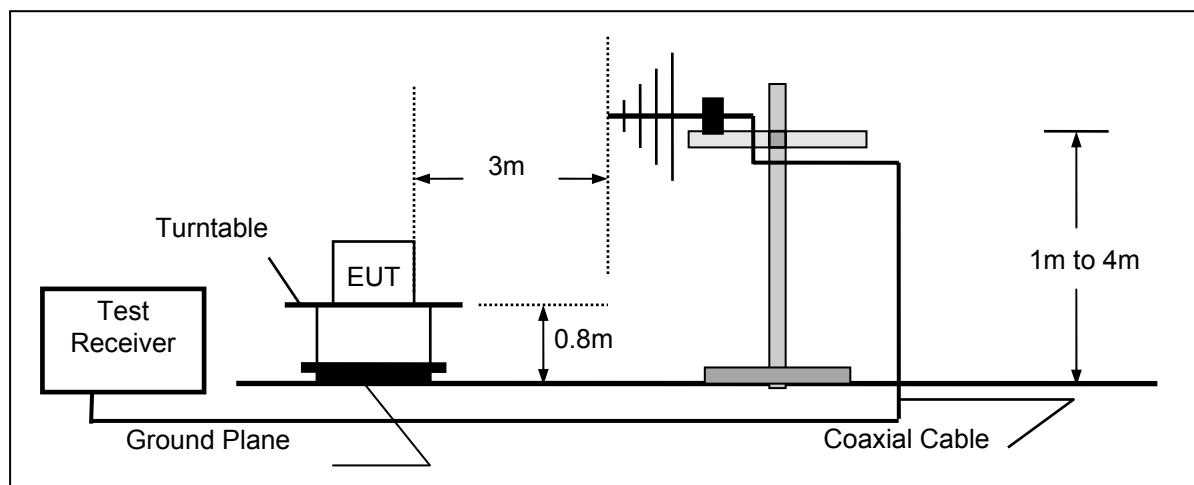
TEST CONFIGURATION

Radiated Emission Test Set-Up

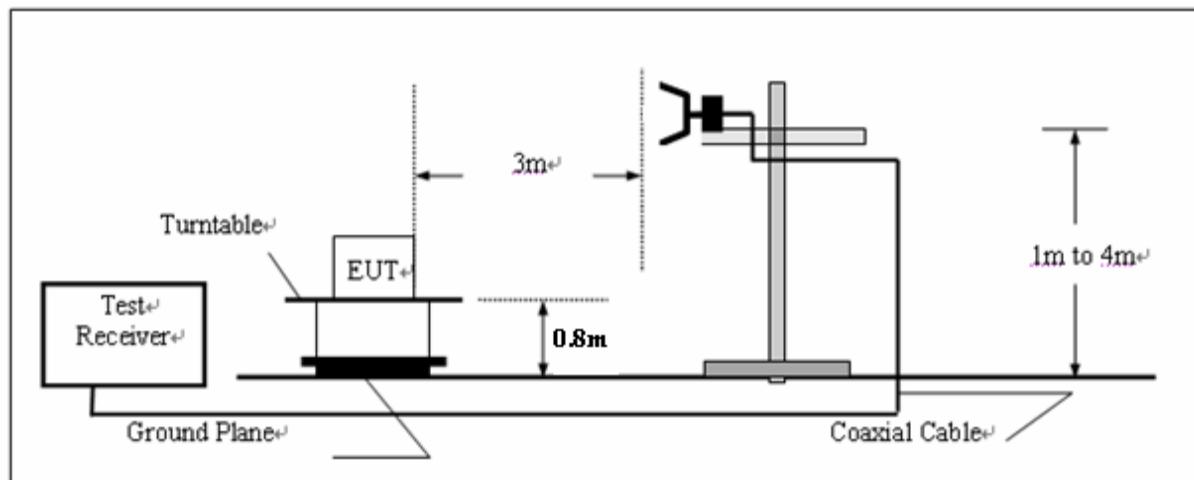
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



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. The minimum crystal frequency is 12MHz and the fundamental frequency is 2.432GHz, So the radiation emissions frequency range were tested from 9KHz to 25GHz.

RADIATION LIMIT

according to § 15.209, the field strength of radiated emissions limits comply with the following:

Frequency (MHz)	Field strength (microvolts/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

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.

As per §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per §15.249 (c), Field strength limits are specified at a distance of 3 meters.

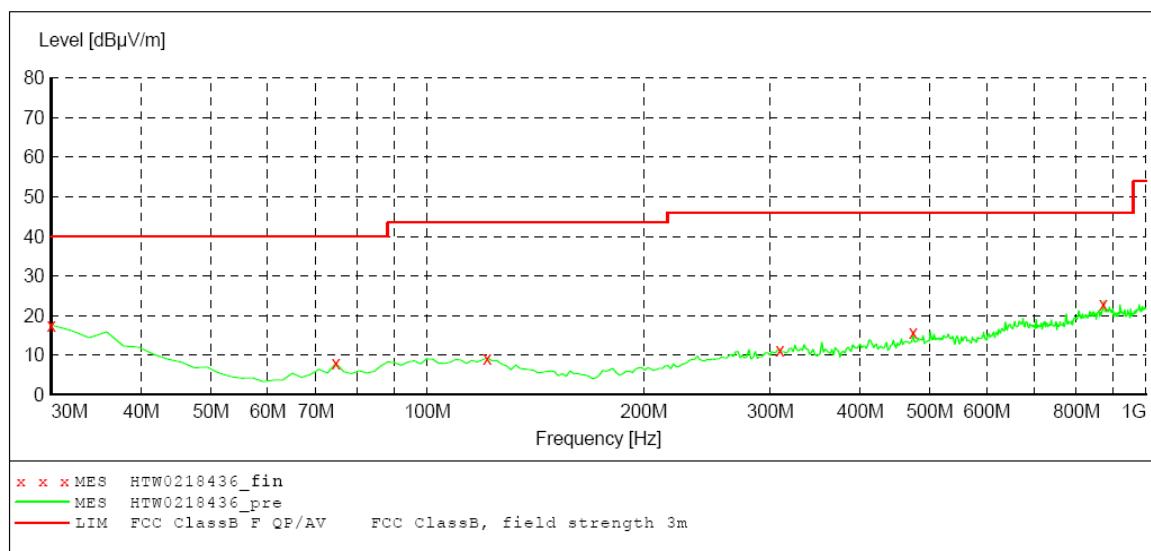
TEST RESULTS

Radiated emission (below 30MHz)

Frequency (MHz)	Corrected Reading (dB μ V/m)@3m	FCC Limit (dB μ V/m) @3m	Margin (dB)	Detector	Result
16.00	54.15	69.54	15.39	QP	Pass
21.36	47.38	69.54	22.16	QP	Pass
24.58	43.57	69.54	25.97	QP	Pass

Radiated emission (30MHz- 1G)***SWEEP TABLE: "test (30M-1G)"***

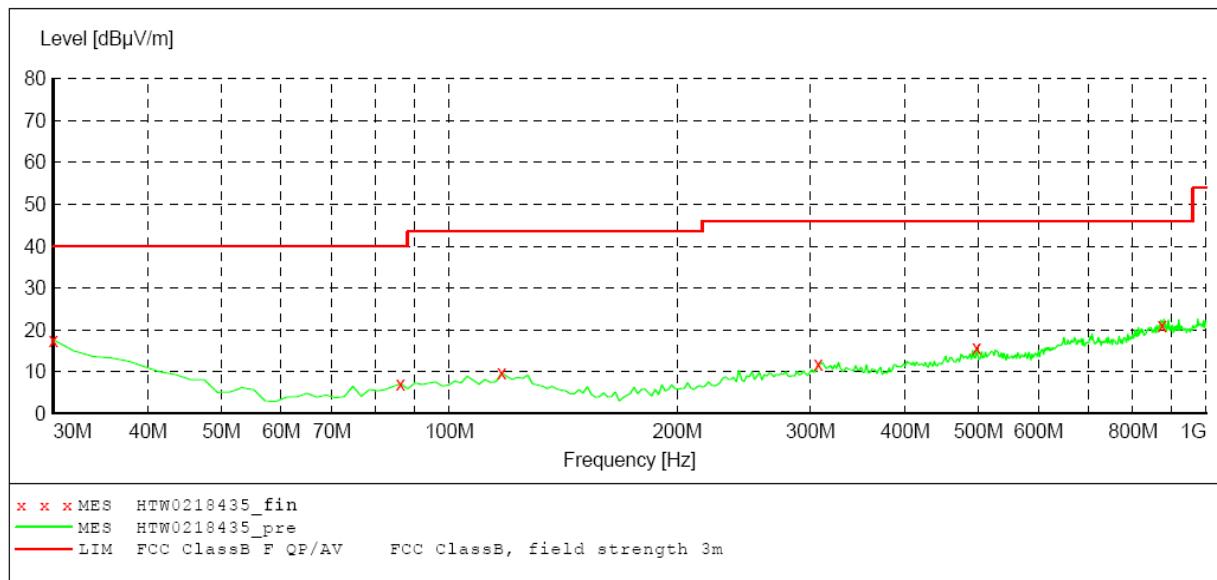
Short Description: Field Strength
 Start Stop Detector Meas. IF Transducer
 Frequency Frequency Time Bandw.
 30.0 MHz 1.0 GHz MaxPeak Coupled 120 kHz HL562

**MEASUREMENT RESULT: "HTW0218436_fin"**

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	17.60	-11.1	40.0	22.4	QP	300.0	285.00	HORIZONTAL
74.620000	8.10	-22.5	40.0	31.9	QP	300.0	157.00	HORIZONTAL
121.180000	9.40	-19.3	43.5	34.1	QP	100.0	354.00	HORIZONTAL
309.360000	11.40	-16.5	46.0	34.6	QP	300.0	113.00	HORIZONTAL
474.260000	15.90	-14.0	46.0	30.1	QP	100.0	259.00	HORIZONTAL
871.960000	22.80	-6.9	46.0	23.2	QP	100.0	215.00	HORIZONTAL

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	120 kHz	HL562

***MEASUREMENT RESULT: "HTW0218435_fin"***

2/18/2013 3:18PM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	17.60	-11.1	40.0	22.4	QP	100.0	62.00	VERTICAL
86.260000	7.10	-20.9	40.0	32.9	QP	100.0	216.00	VERTICAL
117.300000	9.80	-19.4	43.5	33.7	QP	100.0	116.00	VERTICAL
307.420000	11.80	-16.7	46.0	34.2	QP	100.0	360.00	VERTICAL
497.540000	15.90	-13.6	46.0	30.1	QP	100.0	342.00	VERTICAL
873.900000	21.10	-7.0	46.0	24.9	QP	100.0	54.00	VERTICAL

Radiated emission (above 1G)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (2432MHz)												
No.	Frequency (MHz)	Emssion 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	*2432.00	70.57	PK	114.00	43.43	1.00 H	160	73.97	28.3	4.90	-36.6	-3.40
1	*2432.00	54.51	AV	94.00	39.49	1.00 H	65	57.91	28.3	4.90	-36.6	-3.40
2	4864.00	50.98	PK	74.00	23.02	1.00 H	39	47.78	32.7	7.00	-36.5	3.20
3	7296.00	55.17	PK	74.00	18.83	1.00 H	252	45.77	35.8	8.90	-35.3	9.40
4	9728.00	51.02	PK	74.00	22.98	1.00 H	240	38.42	37.2	10.20	-34.8	12.60

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (2432MHz)												
No.	Frequency (MHz)	Emssion 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	*2432.00	64.12	PK	114.00	49.88	1.00 V	24	67.52	28.3	4.90	-36.6	-3.40
1	*2432.00	53.06	AV	94.00	40.94	1.00 V	229	56.46	28.3	4.90	-36.6	-3.40
2	4864.00	53.69	PK	74.00	20.31	1.00 V	33	50.49	32.7	7.00	-36.5	3.20
3	7296.00	57.69	PK	74.00	16.31	1.00 V	320	48.29	35.8	8.90	-35.3	9.40
4	9728.00	50.64	PK	74.00	23.36	1.00 V	12	38.04	37.2	10.20	-34.8	12.60

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. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The limit value is defined as per 15.249
6. “*”: Fundamental frequency

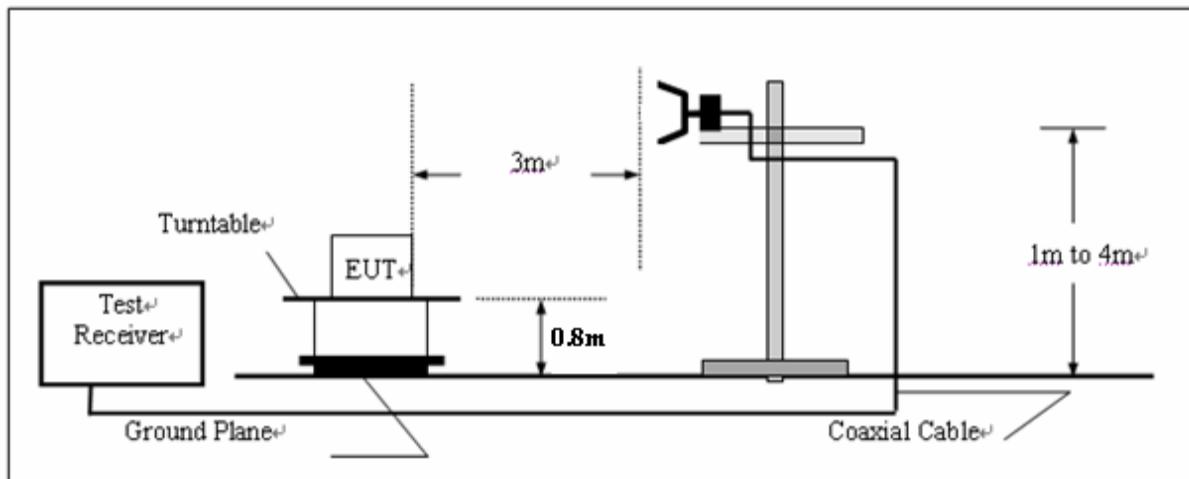
4.4. Out of band emissions

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 1MHz and VBM to 3MHz 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.

TEST CONFIGURATION



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

Test Mode: Transmitting

Frequency (MHz)	Corrected Reading (dB μ V/m)@3m	FCC Limit (dB μ V/m) @3m	Margin (dB)	Detector	Polarization
Out of left side band					
2390.00	48.14	74	25.86	PK	Horizontal
2390.00	38.13	54	15.87	AV	Horizontal
2390.00	46.70	74	27.30	PK	Vertical
2390.00	36.77	54	17.23	AV	Vertical
Out of right side band					
2483.50	50.99	74	23.01	PK	Horizontal
2483.50	37.57	54	16.43	AV	Horizontal
2483.50	48.56	74	25.44	PK	Vertical
2483.50	38.57	54	15.43	AV	Vertical

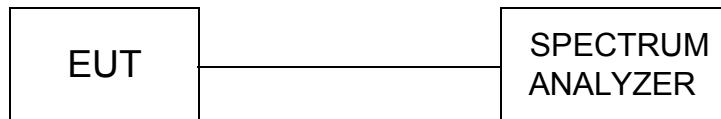
Note: 1. The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.

2. The average measurement was not performed when the peak measured data under the limit of average detection.

3. The test data is the worst case data in the restrict band.

4.5. 20dB Bandwidth Measurement

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW is set to 100 KHz and VBW is set 300 KHz.

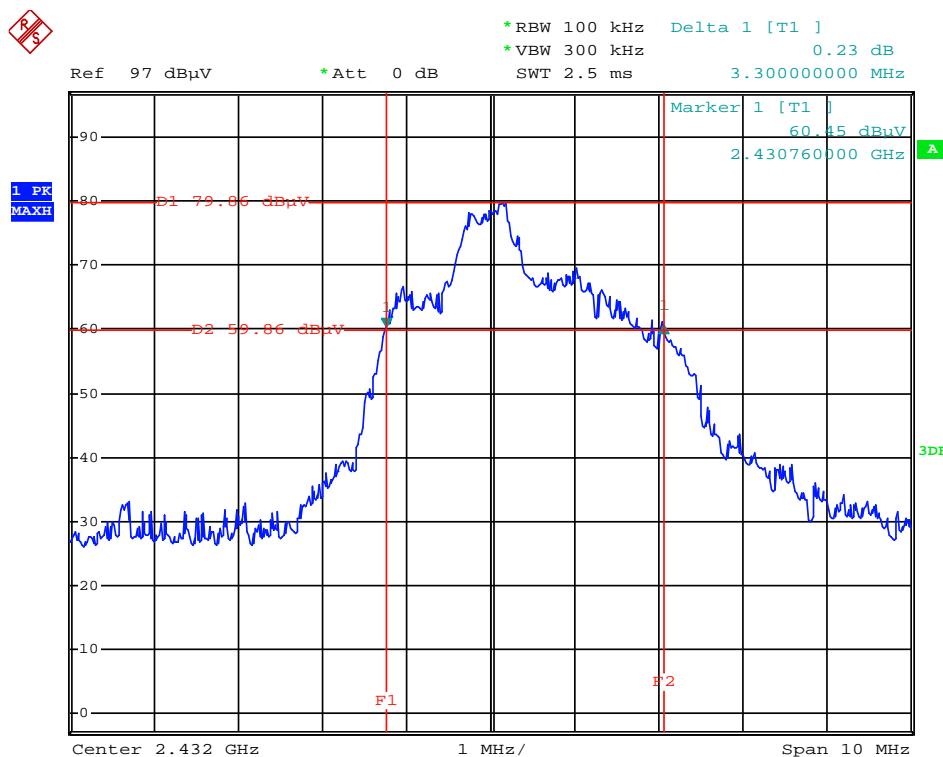
LIMIT

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

TEST RESULTS

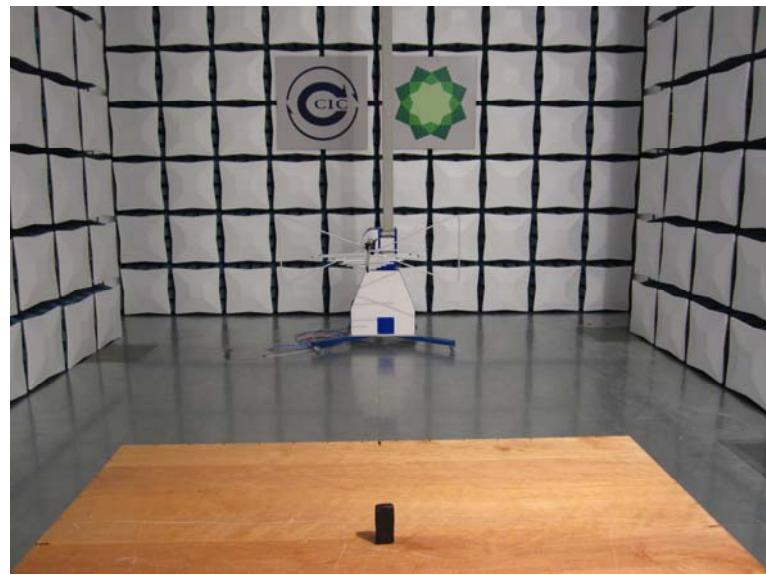
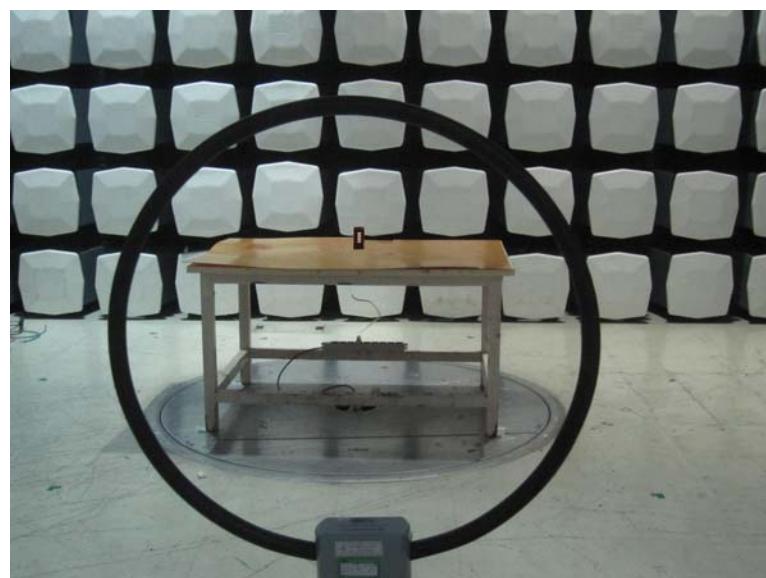
Operating Frequency (MHz)	Limits(MHz)		Result
	Lower Frequency (MHz)	Upper Frequency (MHz)	
2432	>2400	<2483.5	PASS

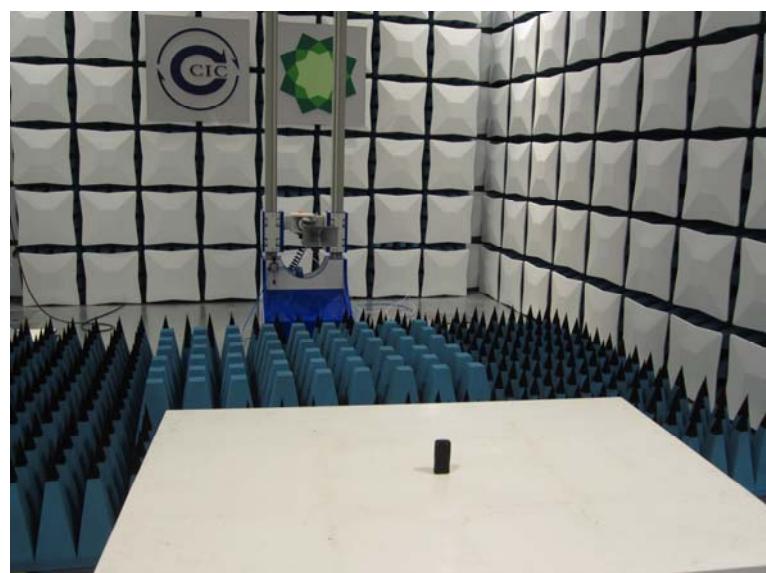
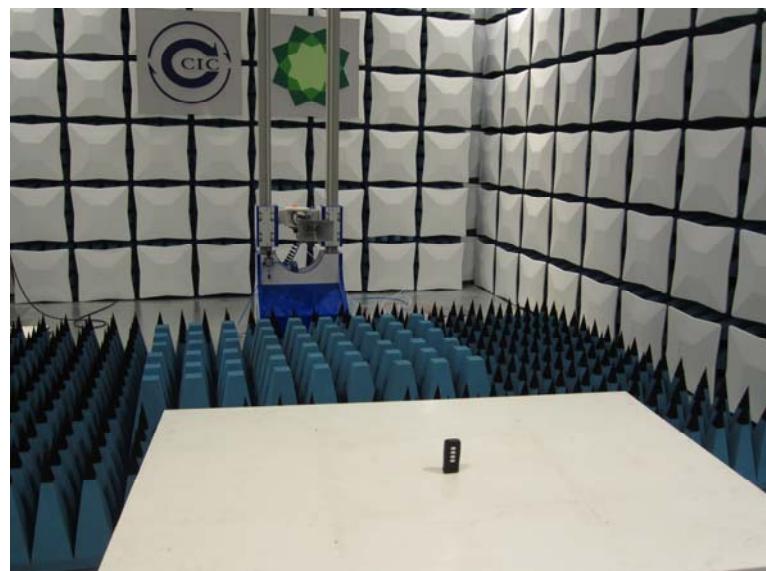
Low Channel



Date: 30.JAN.2013 11:34:45

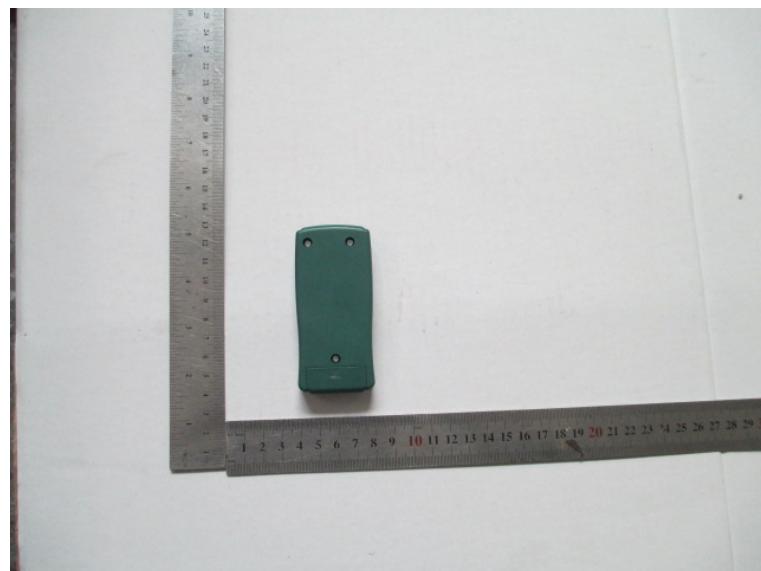
5. Test Setup Photos of the EUT





6. External and Internal Photos of the EUT

External Photos



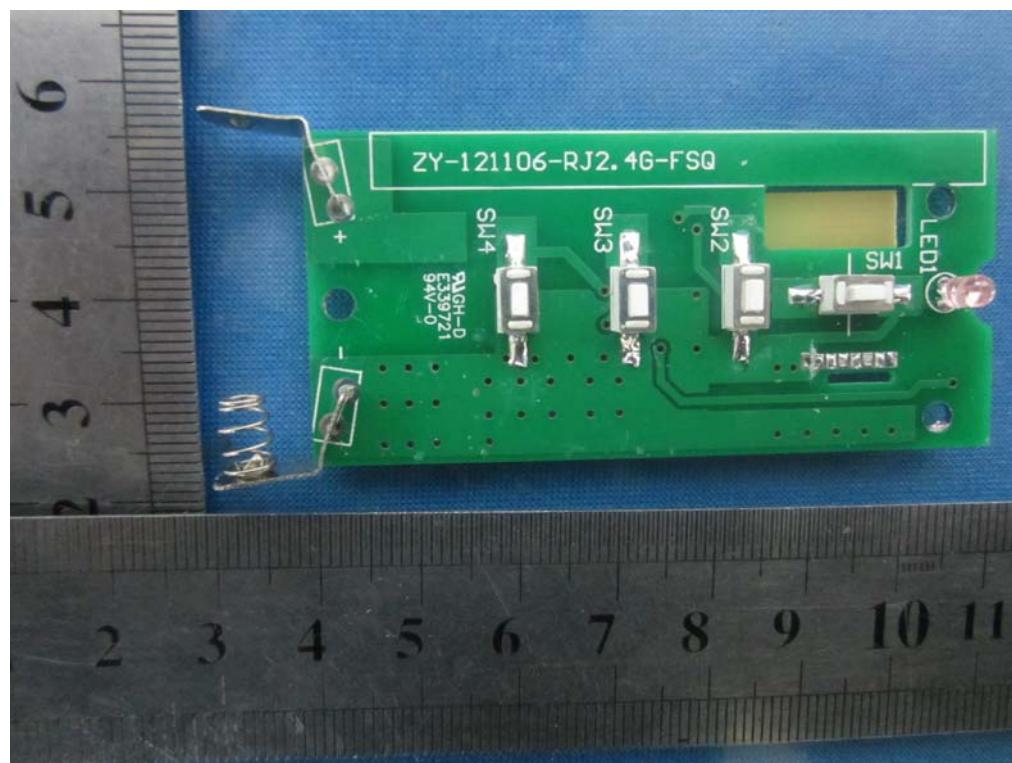
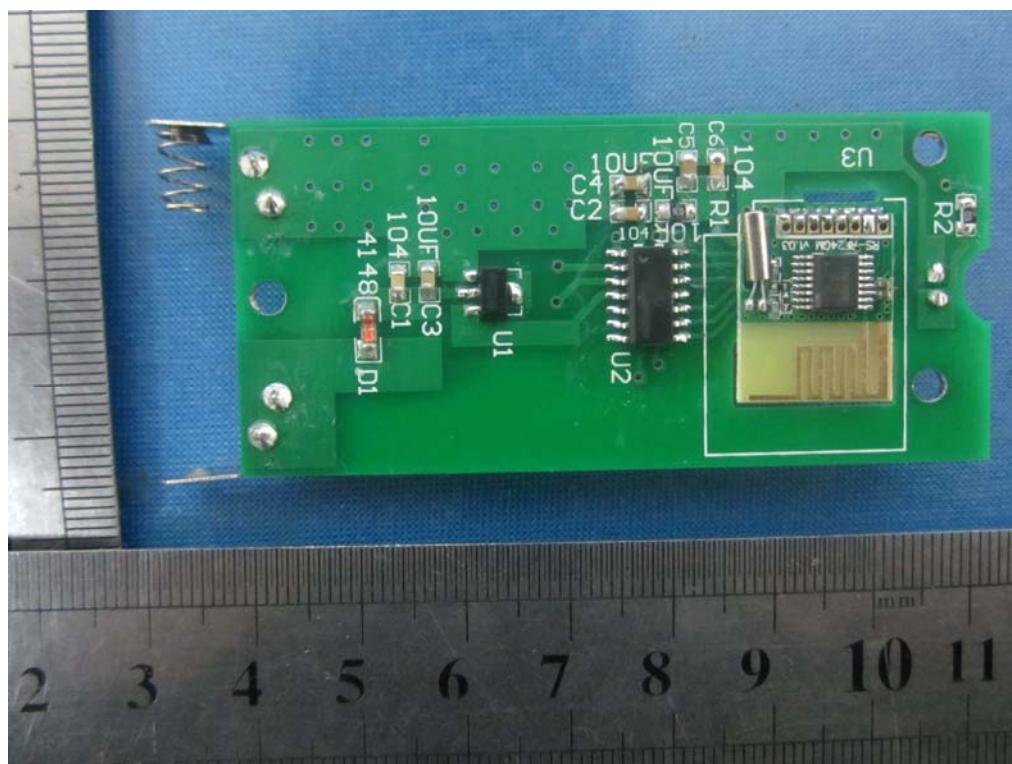




Note: There are two samples, they have the identical circuit design, PCB layout, shielding and interface with, only the colour is difference.

Internal Photos





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