



TEST REPORT

Report Reference No...... : **TRE1609006301** R/C.....:24534
FCC ID..... : **2AKFJ-278RTW-RX**
Applicant's name..... : **Shenzhen Allied Control System Co.,LTD**
Address..... : 6-7th floor,Blk.C,Junxing Industrial Area B,HePing,Fuyong
Town,Bao An District,Shenzhen City,Guangdong
Province ,P.R..China
Manufacturer..... : Shenzhen Allied Control System Co.,LTD
Address..... : 6-7th floor,Blk.C,Junxing Industrial Area B,HePing,Fuyong
Town,Bao An District,Shenzhen City,Guangdong
Province ,P.R..China
Test item description : **Thermostat**
Trade Mark : RADIANT Cloudwarm
Model/Type reference..... : HRT-278RTW-RX
Listed Model(s) : -
Standard : **FCC CFR Title 47 Part 15 Subpart C Section 15.249**
Date of receipt of test sample..... : Sept. 13,2016
Date of testing..... : Sept. 14,2016 - Oct. 31,2016
Date of issue..... : Nov. 14,2016
Result..... : **PASS**

Compiled by
(position+printedname+signature)....: File administrators Becky Liang

Supervised by
(position+printedname+signature).....: Project Engineer Jeff Sun

Approved by
(position+printedname+signature).....: RF Manager Hans Hu

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

Address..... : 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao,
Gongming, Shenzhen, China

Shenzhen Huatongwei International Inspection Co., Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Huatongwei International Inspection Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Huatongwei International Inspection Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

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.

Contents

<u>1.</u>	<u>TEST STANDARDS AND TEST DESCRIPTION</u>	<u>3</u>
1.1.	Test Standards	3
1.2.	Report version	3
<u>2.</u>	<u>TEST DESCRIPTION</u>	<u>4</u>
<u>3.</u>	<u>SUMMARY</u>	<u>5</u>
3.1.	Client Information	5
3.2.	Product Description	5
3.3.	EUT operation mode	6
3.4.	EUT configuration	6
3.5.	Modifications	6
<u>4.</u>	<u>TEST ENVIRONMENT</u>	<u>7</u>
4.1.	Address of the test laboratory	7
4.2.	Test Facility	7
4.3.	Environmental conditions	8
4.4.	Statement of the measurement uncertainty	8
4.5.	Equipments Used during the Test	9
<u>5.</u>	<u>TEST CONDITIONS AND RESULTS</u>	<u>10</u>
5.1.	Antenna requirement	10
5.2.	AC Power Conducted Emission	11
5.3.	20 dB Occupied Bandwidth	14
5.4.	Radiated Emission	15
<u>6.</u>	<u>TEST SETUP PHOTOS OF THE EUT</u>	<u>18</u>
<u>7.</u>	<u>EXTERNAL AND INTERNAL PHOTOS OF THE EUT</u>	<u>20</u>

1. TEST STANDARDS AND TEST DESCRIPTION

1.1. 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.

1.2. Report version

Version No.	Date of issue	Description
00	Nov. 14, 2016	Original

2. Test Description

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
20dB Occpied Bandwidth	15.215/15.249	Pass
Field strength of the Fundamental signal	15.249(a)	Pass
Spurious Emissions	15.209/15.249(a)	Pass
Band edge	15.205/15.249(d)	Pass

Remark: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	Shenzhen Allied Control System Co.,LTD
Address:	6-7th floor,Blk.C,Junxing Industrial Area B,HePing,Fuyong Town,Bao An District,Shenzhen City,Guangdong Province ,P.R..China
Manufacturer:	Shenzhen Allied Control System Co.,LTD
Address:	6-7th floor,Blk.C,Junxing Industrial Area B,HePing,Fuyong Town,Bao An District,Shenzhen City,Guangdong Province ,P.R..China

3.2. Product Description

Name of EUT	Thermostat
Trade Mark:	RADIANT Cloudwarm
Model No.:	HRT-278RTW-RX
Listed Model(s):	-
Power supply:	AC 120V/60Hz
Adapter information:	Model: S005ANV0500100 Input: 100-240Va.c., 50/60Hz, 200mA; Output: 5.0Vd.c., 1000mA
Operation frequency:	915MHz
Channel number:	1
Modulation Type:	FSK
Antenna type:	Integral antenna
Antenna gain:	2.00dBi

3.3. EUT operation mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For AC power line conducted emissions:
The EUT was set to connect with large package sizes transmission.

3.4. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

○		Manufacturer :	/
		Model No. :	/
○		Manufacturer :	/
		Model No. :	/

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.

Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. 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/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No. 3902.01

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 December 31, 2016.

FCC-Registration No.: 317478

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 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377A&5377B

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 Dec. 31, 2013, valid time is until Dec. 31, 2016.

Two 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. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

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.

4.3. Environmental conditions

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

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.4. 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 according to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system according 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
Conducted spurious emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emission 1~18GHz	5.16 dB	(1)
Radiated Emission 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 $k=1.96$.

4.5. Equipments Used during the Test

Line Conducted Emission (AC Main)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	R&S	ESCI	101247	2015/11/03
2	Artificial Mains	Shwarzbeck	NNLK 8121	573	2015/11/03
3	Pulse Limiter	R&S	ESH3-Z2	101488	2015/11/03
4	Test Software	R&S	ES-K1	N/A	N/A

20dB Occpied Bandwidth					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2015/11/02
2	Power Meter	Anritsu	ML2480B	100798	2015/11/02
3	Power Sensor	Anritsu	MA2411B	100258	2015/12/05
4	Test cable	/	/	/	/
5	Temporary antenna connector	/	/	/	/

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Field strength of the Fundamental signal/ Spurious Emissions/ Band edge					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	2015/11/02
2	RF Test Panel	Rohde&Schwarz	TS / RSP	335015/0017	N/A
3	EMI Test Software	Rohde&Schwarz	ESK1	N/A	N/A
4	Loop Antenna	Rohde&Schwarz	HZ-9	838622\013	2015/11/08
5	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2015/11/08
6	Horn Antenna	ShwarzBeck	9120D	1011	2015/11/08
7	Broadband Horn Antenna	Shwarzbeck	BBHA9170	BBHA917047 2	2015/11/08
8	Preamplifier	Shwarzbeck	BBV9742	9742-196	2015/11/02
9	Broadband Preamplifier	Shwarzbeck	BBV 9721	9721-102	2015/11/02
10	Broadband Preamplifier	Shwarzbeck	BBV 9718	9718-247	2015/11/02
11	Turn Table	MATURO	TT2.0	/	N/A
12	Antenna Mast	MATURO	TAM-4.0-P	/	N/A
13	EMI Test Software	Audix	E3	N/A	N/A
14	Test Software	R&S	ES-K1	N/A	N/A
15	Test cable	Siva Cables Italy	RG 58A/U	W14.02	2015/12/05

The Cal.Interval was one year

5. TEST CONDITIONS AND RESULTS

5.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

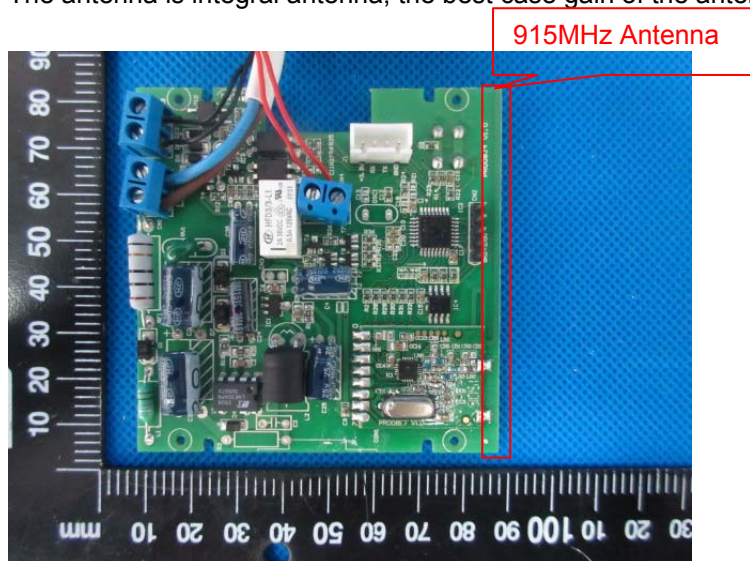
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

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.

Test Result:

The antenna is integral antenna, the best case gain of the antenna is 2.00dBi



5.2. AC Power Conducted Emission

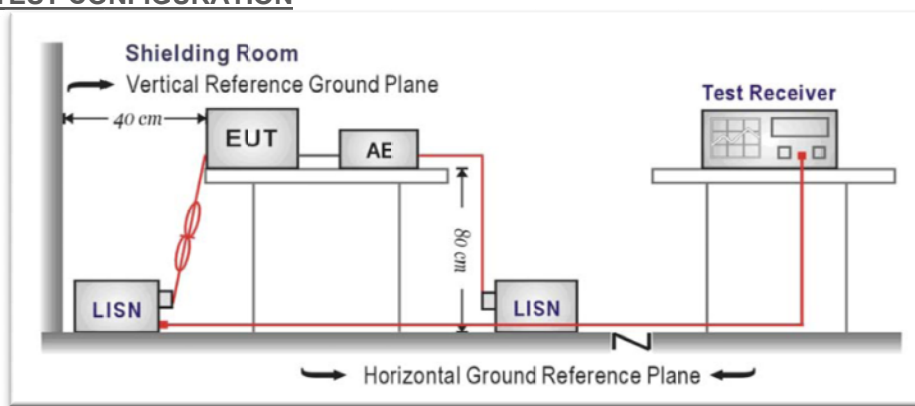
LIMIT

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBμV)	
	Q.P.	Ave.
0.15 - 0.50	66-56*	56-46*
0.50 - 5.00	56	46
5.00 - 30.0	60	50

* Decreasing linearly with the logarithm of the frequency

TEST CONFIGURATION



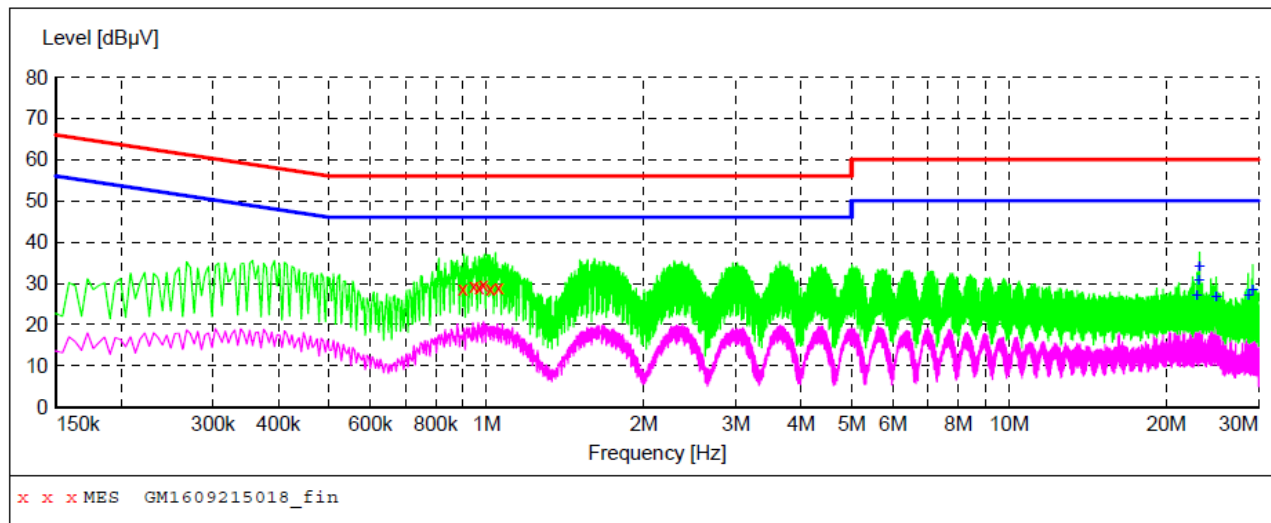
TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC5V power from the adapter, the 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.

TEST RESULTS

Test Line:

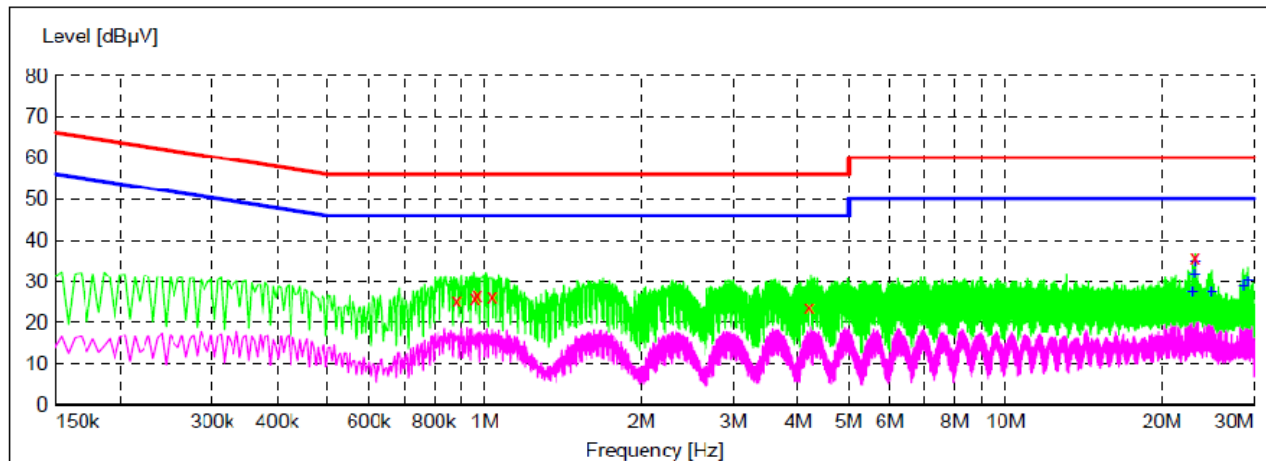
L



Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.901500	28.80	10.2	56	27.2	QP	L1	GND
0.946500	29.30	10.3	56	26.7	QP	L1	GND
0.969000	29.10	10.3	56	26.9	QP	L1	GND
0.987000	29.80	10.3	56	26.2	QP	L1	GND
1.018500	28.60	10.3	56	27.4	QP	L1	GND
1.054500	28.90	10.3	56	27.1	QP	L1	GND
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
22.888500	27.00	10.8	50	23.0	AV	L1	GND
23.068500	30.80	10.8	50	19.2	AV	L1	GND
23.131500	34.00	10.8	50	16.0	AV	L1	GND
24.900000	26.50	10.8	50	23.5	AV	L1	GND
28.689000	27.10	10.9	50	22.9	AV	L1	GND
29.238000	28.30	10.9	50	21.7	AV	L1	GND

Test Line:

N



x x x MES GM1609215017_fin

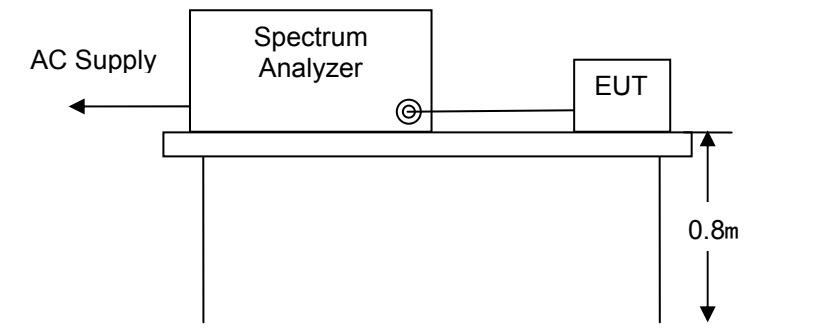
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.883500	25.40	10.2	56	30.6	QP	N	GND
0.960000	26.10	10.3	56	29.9	QP	N	GND
0.969000	26.80	10.3	56	29.2	QP	N	GND
1.032000	26.20	10.3	56	29.8	QP	N	GND
4.200000	23.80	10.4	56	32.2	QP	N	GND
23.131500	35.60	10.8	60	24.4	QP	N	GND
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
22.888500	27.50	10.8	50	22.5	AV	N	GND
23.068500	31.50	10.8	50	18.5	AV	N	GND
23.131500	34.70	10.8	50	15.3	AV	N	GND
24.900000	27.30	10.8	50	22.7	AV	N	GND
28.689000	28.80	10.9	50	21.2	AV	N	GND
29.238000	30.00	10.9	50	20.0	AV	N	GND

5.3. 20 dB Occpied Bandwidth

Limit

Operation frequency range 902MHz~928MHz.

TEST CONFIGURATION

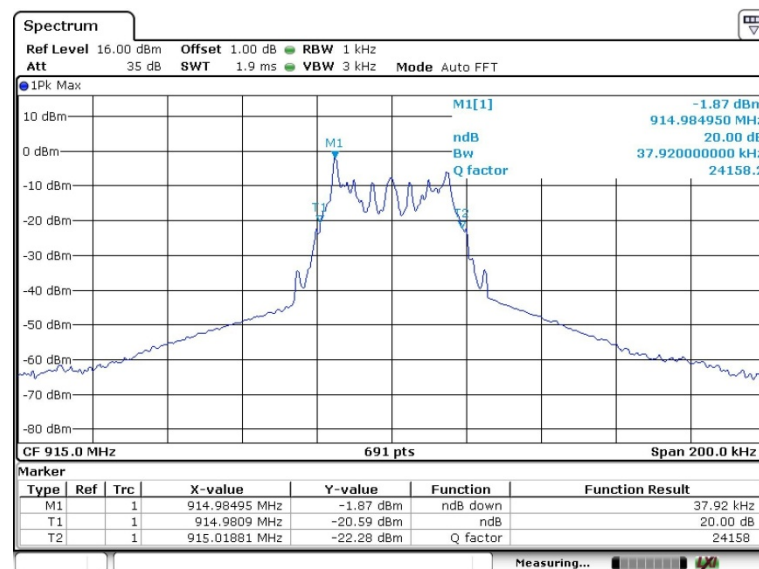


TEST PROCEDURE

1. As required by 47 CFR 15.215 and 47 CFR 15.249
2. The EUT connected to the spectrum analyzer was operated in linear scale and 2.0MHz span mode after tuning to the transmitter frequency.

TEST RESULTS

Channel Frequency(MHz)	20dB Bandwidth(kHz)	Result
915	37.92	PASS



5.4. Radiated Emission

LIMIT

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

Frequency (MHz)	Distance(Meters)	Radiated(dBμV/m)	Radiated(μV/m)
0.009 - 0.490	300	$20 \cdot \log(2400/F(\text{kHz}))$	$2400/F(\text{kHz})$
0.490 - 1.705	30	$20 \cdot \log(24000/F(\text{kHz}))$	$24000/F(\text{kHz})$
1.705 - 30.0	30	29.54	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

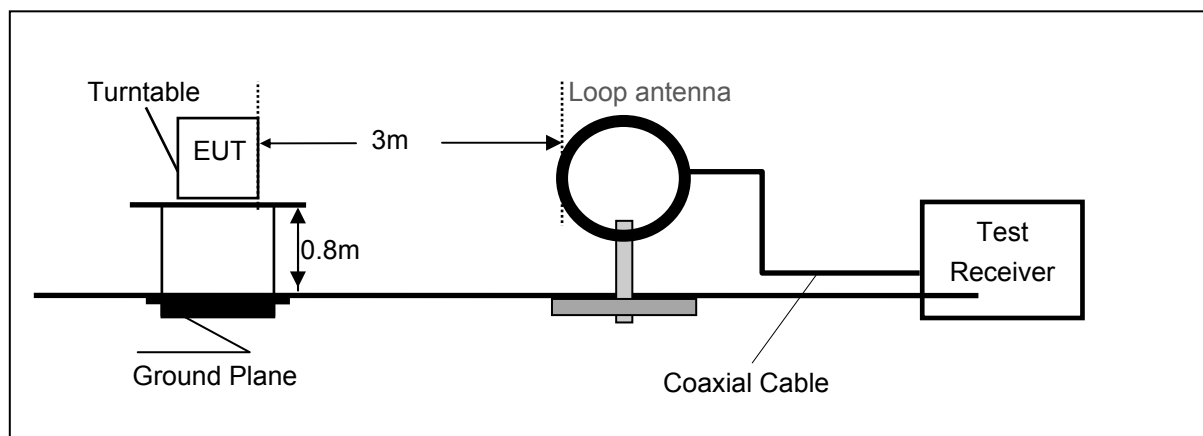
In addition to the provisions of §15.249, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500

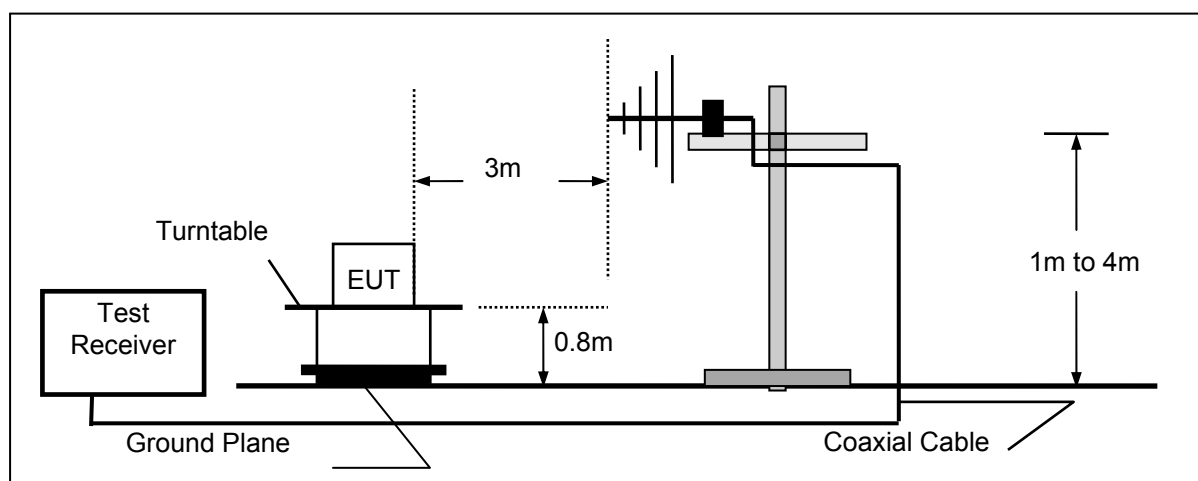
TEST CONFIGURATION

Radiated Emission Test Set-Up

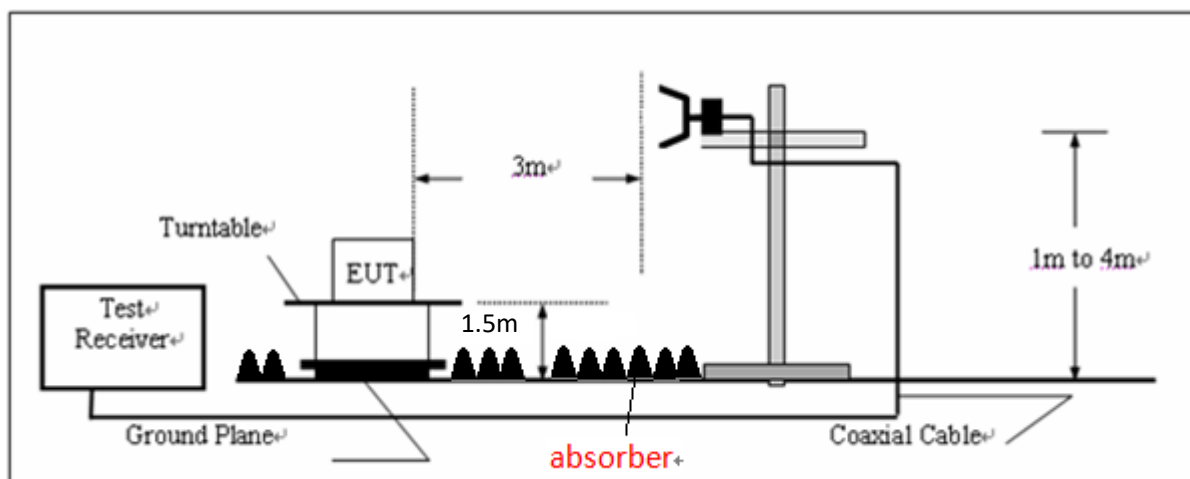
Frequency range 9KHz–30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The fundamental frequency is 915MHz, So the radiation emissions frequency range were tested from 9KHz to 10GHz.

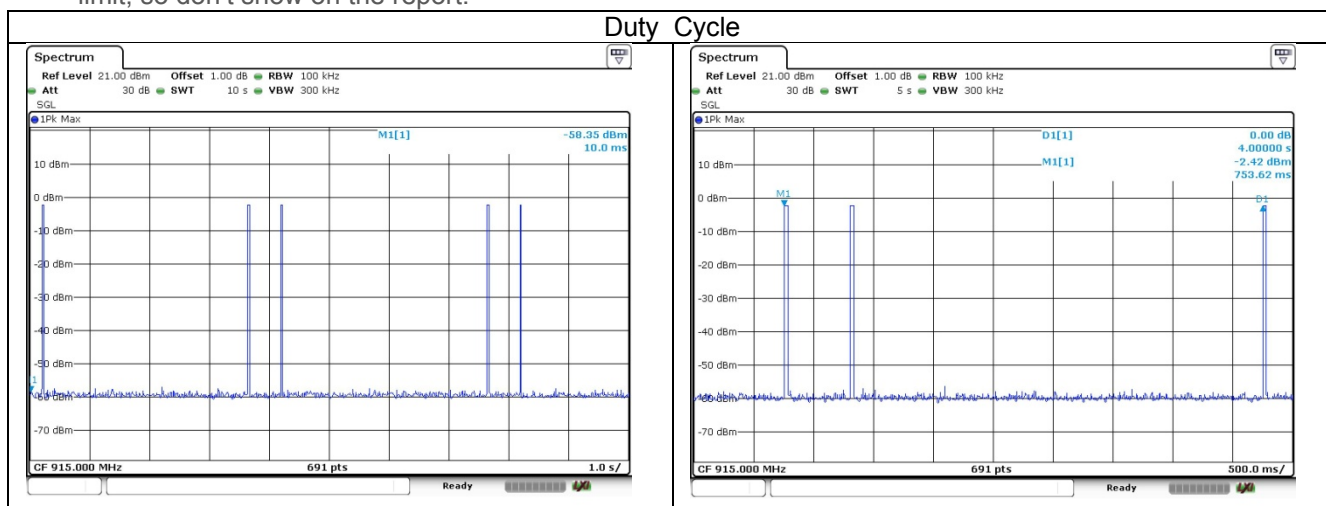
For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

TEST RESULTS

■ 9kHz ~ 30MHz

The EUT was pre-scanned the frequency band (9KHz~30MHz), found the radiated level lower than the limit, so don't show on the report.



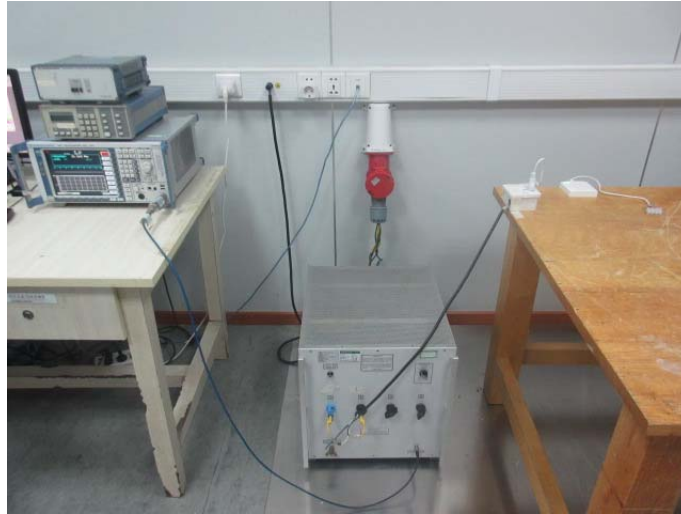
Radiated emission of fundamental emission									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m) @3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Polarization
915.00	72.53	22.62	3.76	29.75	65.24	94	-28.76	Peak	Horizontal
915.00	68.85	22.62	3.76	29.75	61.23	94	-32.77	Peak	Vertical

Spurious radiated emission									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m) @3m	FCC Limit (dBuV/m) @3m	Margin (dB)	Detector	Polarization
935.98	45.66	13.66	0.93	28.05	32.2	46	-13.80	QP	Horizontal
1830.00	56.17	24.7	5.28	36.59	49.56	74	-24.44	PK	Horizontal
1830.00	48.92	24.7	5.28	36.59	42.31	54	-11.69	AV	Horizontal
2745.00	53.61	27.88	6.84	37.87	50.46	74	-23.54	PK	Horizontal
2745.00	46.67	27.88	6.84	37.87	43.52	54	-10.48	AV	Horizontal
3660.00	61.82	29.35	7.57	37.75	60.99	74	-13.01	PK	Horizontal
3660.00	48.39	29.35	7.57	37.75	47.56	54	-6.44	AV	Horizontal
4575.00	58.39	30.96	9.44	37.25	61.54	74	-12.46	PK	Horizontal
4575.00	39.41	30.96	9.44	37.25	42.56	54	-11.44	AV	Horizontal
5490.00	51.71	32.78	9.65	36.99	57.15	74	-16.85	PK	Horizontal
5490.00	41.81	32.78	9.65	36.99	47.25	54	-6.75	AV	Horizontal
6405.00	33.35	35.98	11.88	35.05	46.16	74	-27.84	PK	Horizontal
6405.00	28.41	35.98	11.88	35.05	41.22	54	-12.78	AV	Horizontal
30.00	49.68	8.99	0.68	27.19	32.16	40	-7.84	QP	Horizontal
1830.00	49.59	24.7	5.28	36.59	42.98	74	-31.02	PK	Vertical
1830.00	42.39	24.7	5.28	36.59	35.78	54	-18.22	AV	Vertical
2745.00	58.01	27.88	6.84	37.87	54.86	74	-19.14	PK	Vertical
2745.00	50.50	27.88	6.84	37.87	47.35	54	-6.65	AV	Vertical
3660.00	62.99	29.35	7.57	37.75	62.16	74	-11.84	PK	Vertical
3660.00	46.09	29.35	7.57	37.75	45.26	54	-8.74	AV	Vertical
4575.00	57.71	30.96	9.44	37.25	60.86	74	-13.14	PK	Vertical
4575.00	46.46	30.96	9.44	37.25	49.61	54	-4.39	AV	Vertical
5490.00	52.72	32.78	9.65	36.99	58.16	74	-15.84	PK	Vertical
5490.00	43.72	32.78	9.65	36.99	49.16	54	-4.84	AV	Vertical
6405.00	34.45	35.98	11.88	35.05	47.26	74	-26.74	PK	Vertical
6405.00	22.96	35.98	11.88	35.05	35.77	54	-18.23	AV	Vertical

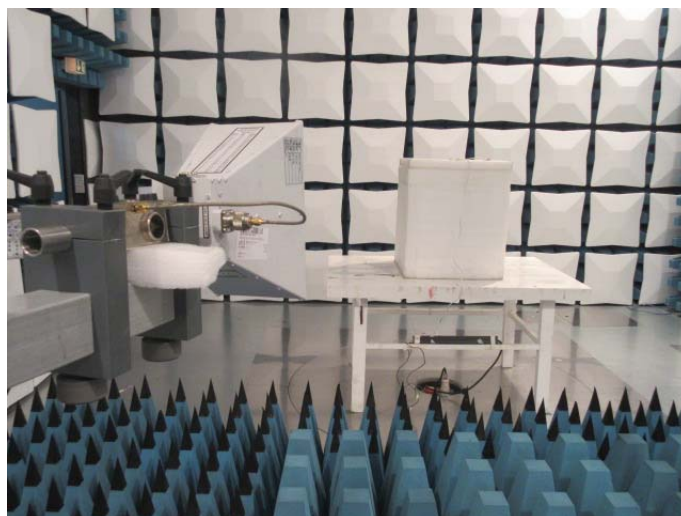
Bandedge emission									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
902	22.16	22.02	3.56	29.34	18.40	46	-27.60	Horizontal	QP
928	27.46	22.73	3.61	29.46	24.34	46	-21.66	Horizontal	
902	23.24	22.02	3.56	29.34	19.48	46	-26.52	Vertical	QP
928	26.97	22.73	3.61	29.46	23.85	46	-22.15	Vertical	

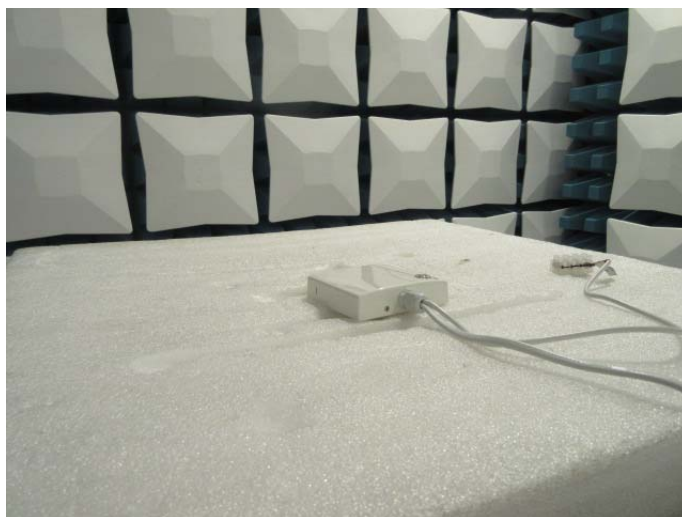
6. Test Setup Photos of the EUT

Conducted Emission



Radiated Emission

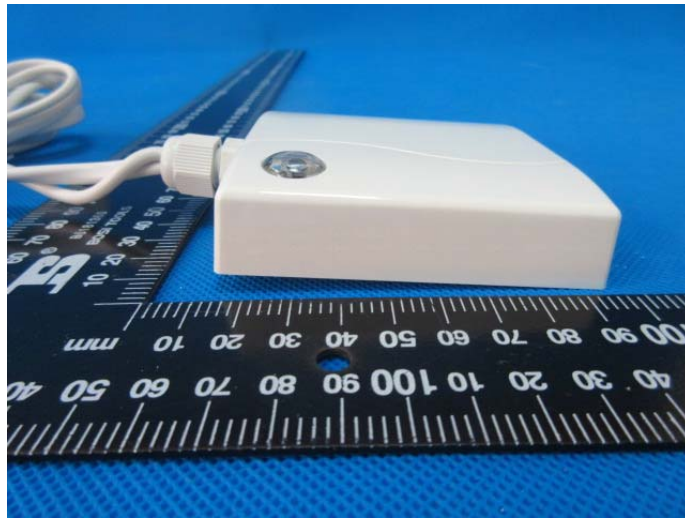




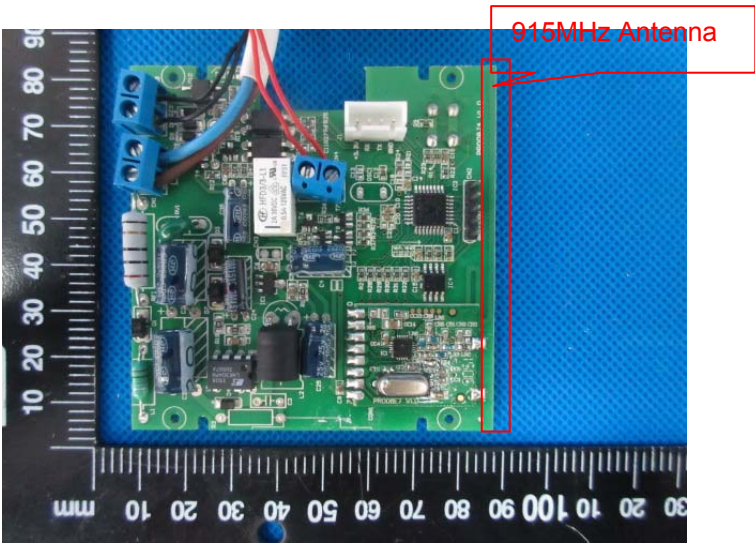
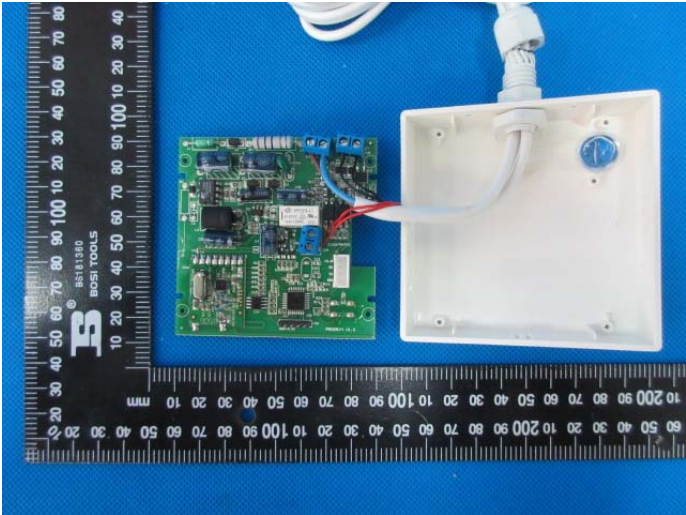
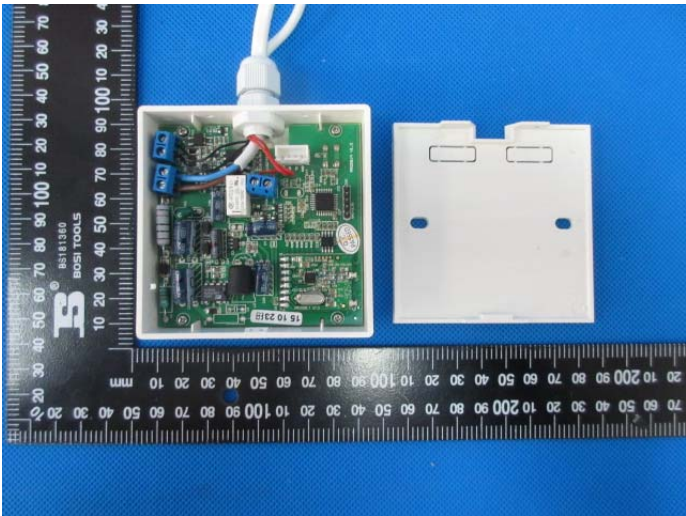
7. External and Internal Photos of the EUT

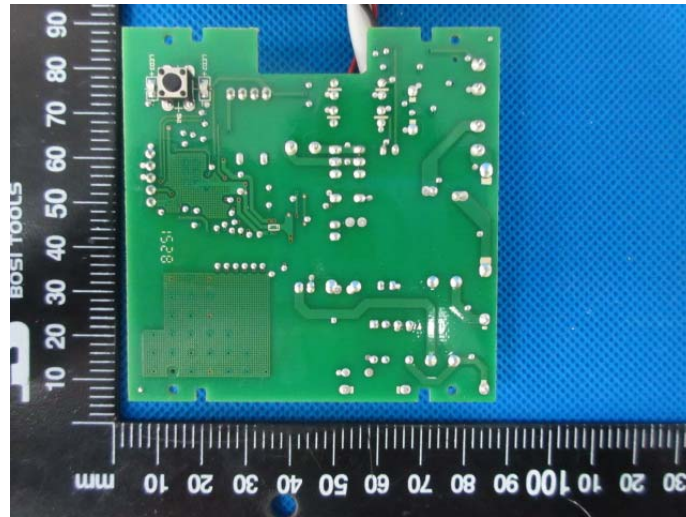
External Photos





Internal Photos





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