FCC RADIO TEST REPORT

FCC ID: 2AQQ8161616888

Product：	915MHz RF MODULAR
Trade Name：	Safari
Model Name：	RF TRANSCEIVER
Serial Model：	RF2W1KM
Report No.：	UNIA2018060904FR-01

Prepared for

Crystalla Glass Art Gallery Ent

Unit 27 Vmcc Complex. Granada Ave. Quezon, Philippines

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

TEST RESULT CERTIFICATION

Applicant's name	:	Crystalla Glass Art Gallery Ent
Address	:	Unit 27 Vmcc Complex. Granada Ave. Quezon, Philippines
Manufacture's Name	:	SUZHOU YINGHETECHONLOGY CO.,LTD
Address	:	Room401, 8 Buliding, Second-Stage, International technology industrial zone, Suzhou, China.

Product description

Product name	:	915MHz RF MODULAR
Trade Mark	:	Safari
Model and/or type reference	:	RF TRANSCEIVER, RF2W1KM
Standards	:	FCC Rules and Regulations Part 15 Subpart C Section 15.249 ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., 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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Date of Test :

Date (s) of performance of tests	:	Jul. 10, 2018 ~ Jul. 30, 2018
Date of Issue	:	Jul. 30, 2018
Test Result	:	Pass

Prepared by: Kahn yang/Editor

Reviewer: Sherwin Qian/Supervisor

Approved & Authorized Signer: Liuze/Manager

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20dB Occupied Bandwidth	COMPLIANT
Antenna requirement	COMPLIANT

1.2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The 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.

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty		
Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	915MHz RF MODULAR
Trade Mark	Safari
Model Name	RF TRANSCEIVER
Serial No.	RF2W1KM
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: RF TRANSCEIVER.
FCC ID	2AQQ8161616888
Antenna Type	PCB Antenna
Antenna Gain	0dBi
Operation frequency	915MHz
Number of Channels	1CH
Modulation Type	LORA
Battery	N/A
Power Source	DC 3.3V
Adapter Model	N/A

2.2 Carrier Frequency of Channels

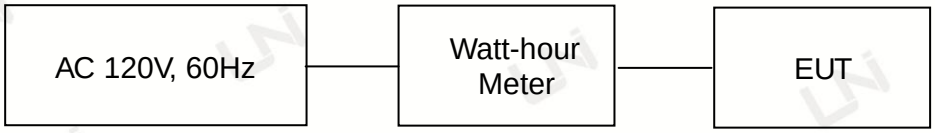
Operation Frequency each of channel	
Channel	Frequency
01	915MHz

2.3 Operation of EUT during testing

Operating Mode
The mode is used: Transmitting mode

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during testing:



Setup: Transmission mode

Table for auxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
Watt-hour Meter	Safari	CL-100	N/A

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
CONDUCTED EMISSIONS TEST					
1	AMN	Schwarzbeck	NNLK8121	8121370	2018.9.9
2	AMN	ETS	3810/2	00020199	2018.9.9
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2018.9.9
4	AAN	TESEQ	T8-Cat6	38888	2018.9.9
RADIATED EMISSION TEST					
1	Horn Antenna	Sunol	DRH-118	A101415	2018.9.29
2	BicoNlLog Antenna	Sunol	JB1 Antenna	A090215	2018.9.29
3	PREAMP	HP	8449B	3008A00160	2018.9.9
4	PREAMP	HP	8447D	2944A07999	2018.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2018.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2018.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2018.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2018.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2018.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2018.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2018.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2018.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2019.3.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2019.3.14
15	RF power divider	Anritsu	K241B	992289	2018.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2018.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2018.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2018.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2018.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2018.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2018.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2019.05.10

3 CONDUCTED EMISSION TEST

3.1 Test Limit

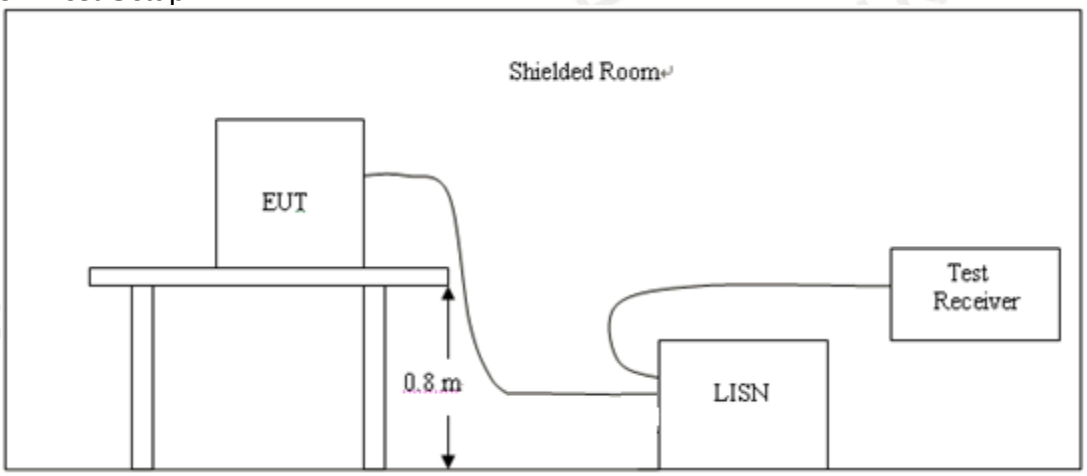
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage(dBμV)			
	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.

3.2 Test Setup



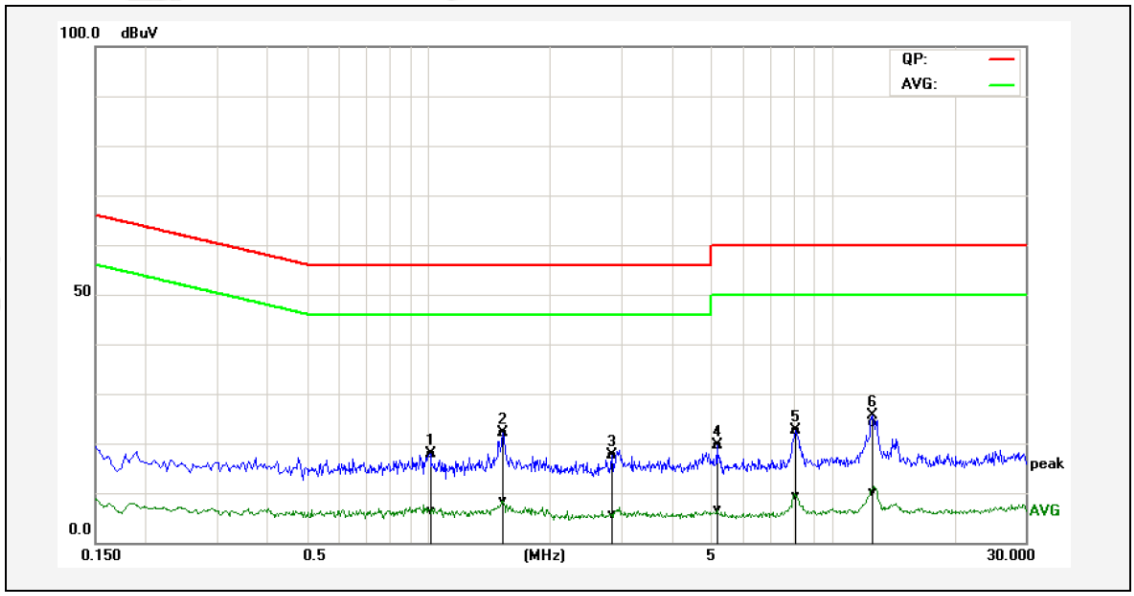
3.3 Test Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. 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. 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.

3.4 Test Result

PSSS

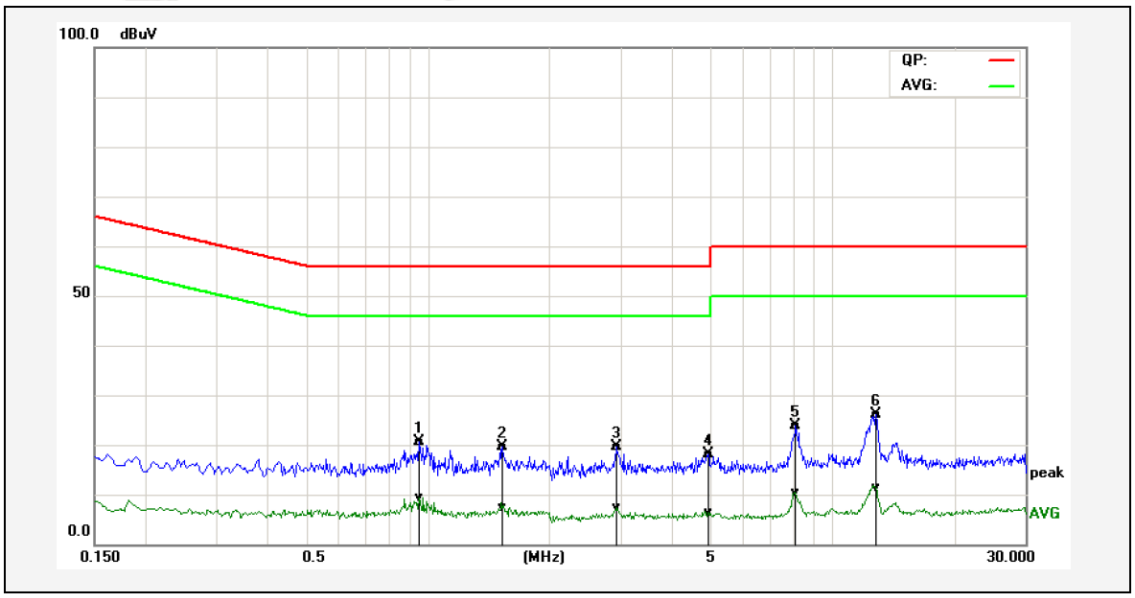
Temperature:	26℃	Relative Humidity:	40%
Test Date:	Jul. 12, 2018	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Transmitting mode		



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1P	1.0140	7.74	-3.75	10.13	17.87	6.38	56.00	46.00	-38.13	-39.62	Pass
2*	1.5300	11.98	-1.78	10.15	22.13	8.37	56.00	46.00	-33.87	-37.63	Pass
3P	2.8540	7.34	-4.50	10.18	17.52	5.68	56.00	46.00	-38.48	-40.32	Pass
4P	5.1740	9.56	-3.60	10.15	19.71	6.55	60.00	50.00	-40.29	-43.45	Pass
5P	8.0700	12.47	-0.76	10.05	22.52	9.29	60.00	50.00	-37.48	-40.71	Pass
6P	12.4180	13.95	-0.04	10.19	24.14	10.15	60.00	50.00	-35.86	-39.85	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

Temperature:	26℃	Relative Humidity:	40%
Test Date:	Jul. 12, 2018	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Transmitting mode		



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1P	0.9500	10.49	-0.76	10.11	20.60	9.35	56.00	46.00	-35.40	-36.65	Pass
2P	1.5300	9.40	-2.69	10.15	19.55	7.46	56.00	46.00	-36.45	-38.54	Pass
3P	2.9420	9.37	-2.90	10.18	19.55	7.28	56.00	46.00	-36.45	-38.72	Pass
4P	4.9420	7.90	-3.71	10.12	18.02	6.41	56.00	46.00	-37.98	-39.59	Pass
5P	8.1140	13.79	0.29	10.05	23.84	10.34	60.00	50.00	-36.16	-39.66	Pass
6*	12.8139	15.93	1.18	10.20	26.13	11.38	60.00	50.00	-33.87	-38.62	Pass

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

4 RADIATED EMISSION TEST

4.1 Test Limit

1. Limit (Field strength of the fundamental signal):

Frequency	Limit(dBuV/m@3m)	Remark
902MHz-928MHz	94.00	Average Value
	114.00	Peak Value

2. Limit (Spurious Emissions):

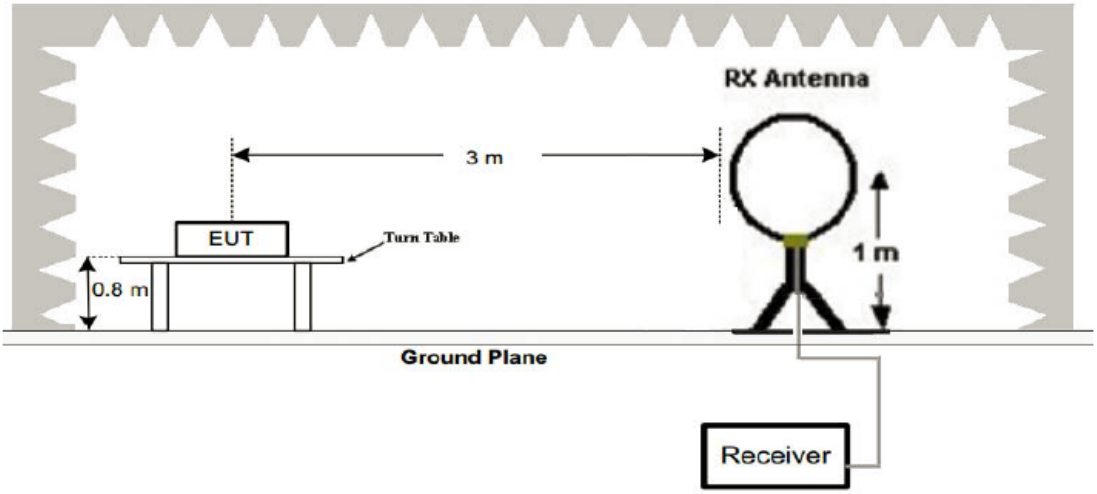
Frequency	Limit(dBuV/m@3m)	Remark
0.009-0.490	2400/F(KHz)	Quasi-peak Value
0.490-1.705	24000/F(KHz)	Quasi-peak Value
1.705-30	30	Quasi-peak Value
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

3. Limit (Band edge):

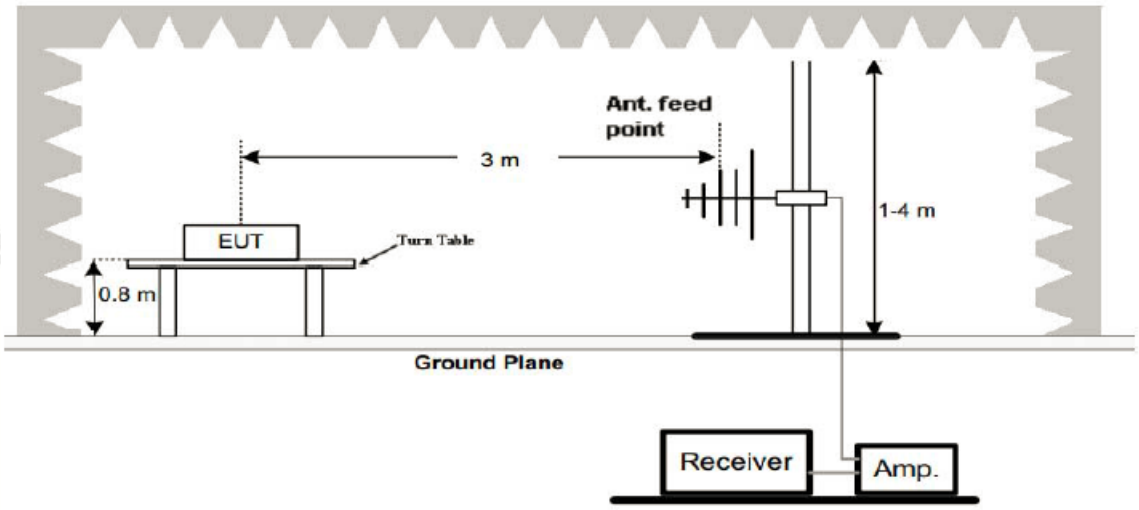
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

4.2 Test Setup

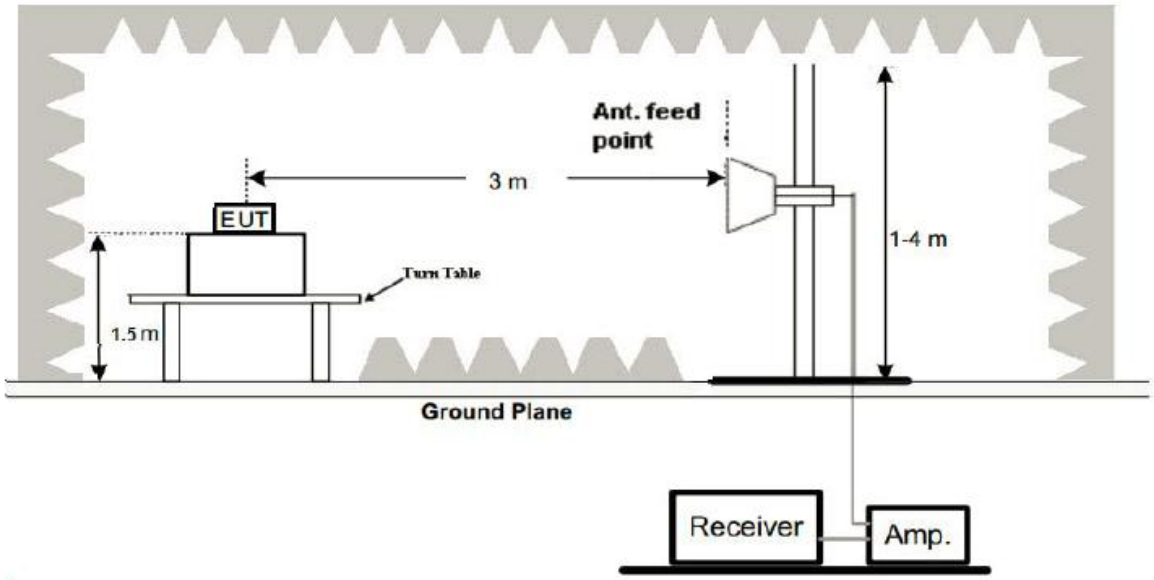
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



4. Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value
150kHz-30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

4.3 Test Procedure

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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.

4.4 Test Result

Field Strength of Fundamental:

Frequency (MHz)	Emission PK/AV (dBuV/m)	Ant. Pol.	Limits PK/AV (dBuV/m)	Margin (dB)
915	95.36(PK)	H	114/94	-18.64
915	82.24(AV)	H	114/94	-11.76
915	95.21(PK)	V	114/94	-18.79
915	81.96(AV)	V	114/94	-12.04

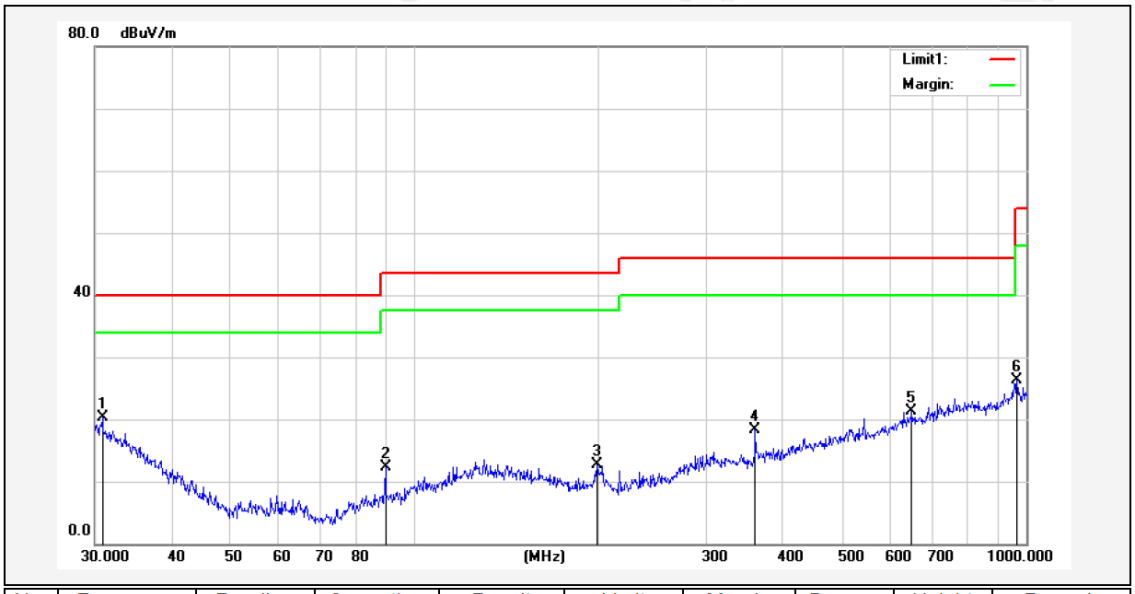
Spurious Emissions:

For 9 kHz-30MHz Test Results:

Note: The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

For 30MHz-1GHz Test Results:

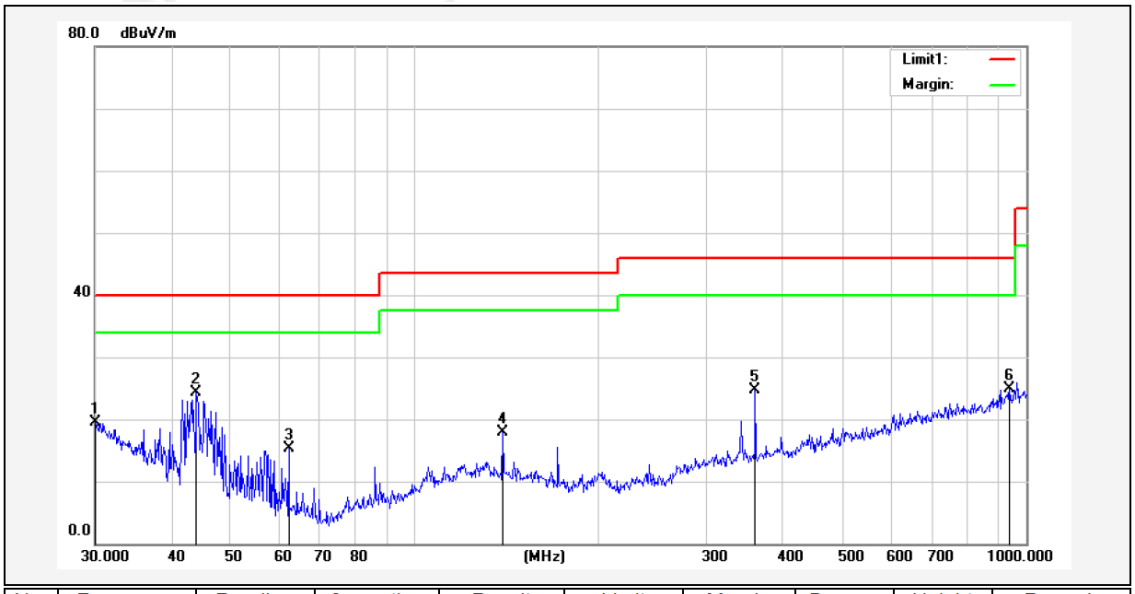
Temperature:	22℃	Relative Humidity:	46%
Test Date:	Jul. 12, 2018	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Horizontal
Test Mode:	Transmitting mode		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	30.8535	27.69	-7.31	20.38	40.00	-19.62			peak
2	89.5900	31.52	-19.19	12.33	43.50	-31.17			peak
3	198.5880	26.83	-14.10	12.73	43.50	-30.77			peak
4	360.4477	30.00	-11.61	18.39	46.00	-27.61			peak
5	649.6597	27.78	-6.40	21.38	46.00	-24.62			peak
6	965.5421	28.32	-2.08	26.24	54.00	-27.76			peak

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	22℃	Relative Humidity:	46%
Test Date:	Jul. 12, 2018	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Vertical
Test Mode:	Transmitting mode		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	30.1054	26.10	-6.62	19.48	40.00	-20.52			peak
2*	43.9658	42.11	-17.74	24.37	40.00	-15.63			peak
3	62.2128	36.26	-20.98	15.28	40.00	-24.72			peak
4	139.3613	31.92	-14.05	17.87	43.50	-25.63			peak
5	360.4477	36.26	-11.61	24.65	46.00	-21.35			peak
6	938.8326	27.13	-2.31	24.82	46.00	-21.18			peak

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

For Above 1GHz Test Results:

Frequency (MHz)	Ant. Pol.	PK Reading (dBμV)	AV Reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin Peak(dB)
					Peak (dBμV/m)	AV (dBμV/m)			
1830	H	51.82	---	-4.12	47.70	---	74.00	54.00	-6.30
2745	H	51.64	---	-0.58	51.06	---	74.00	54.00	-2.94
1830	V	55.72	---	-4.17	51.55	---	74.00	54.00	-2.45
2745	V	52.06	---	-0.58	51.48	---	74.00	54.00	-2.52

Note:
1. Emission Level = Peak Reading + Correction Factor; Correction Factor = Antenna Factor + Cable loss – Pre-amplifier
2. Margin = Emission - Limit
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown "---" in the above table mean that the reading of emissions is attenuated more than 20dB below the limits or the field strength is too small to be measured.

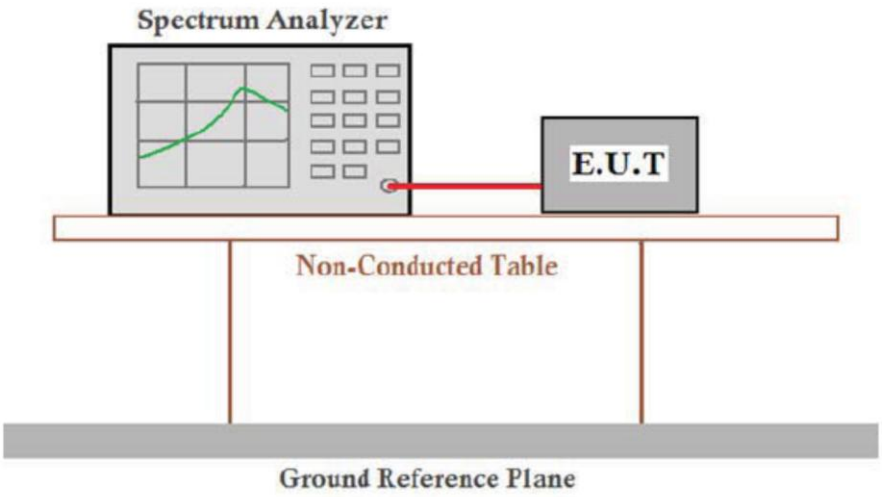
Band Edge Requirement:

Frequency (MHz)	Ant. Pol.	PK Reading (dBμV)	AV Reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin Peak(dB)
					Peak (dBμV/m)	AV (dBμV/m)			
902	H	54.28	---	-3.8	50.48	---	74	---	-23.52
928	H	55.12	---	-3.7	51.42		74	---	-22.58
902	V	54.73	---	-3.8	50.93		74	---	-23.07
928	V	53.94	---	-4.3	49.64		74	---	-24.36

Note:
1. Emission Level = Peak Reading + Correction Factor; Correction Factor = Antenna Factor + Cable loss – Pre-amplifier
2. Margin = Emission - Limit
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
5. Data of measurement shown "---" in the above table mean that the reading of emissions is attenuated more than 20dB below the limits or the field strength is too small to be measured.

5 OCCUPIED BANDWIDTH TEST

5.1 Test Setup



5.2 Rules and specifications

CFR 47 Part 15.215(c)

ANSI C63.10: 2013

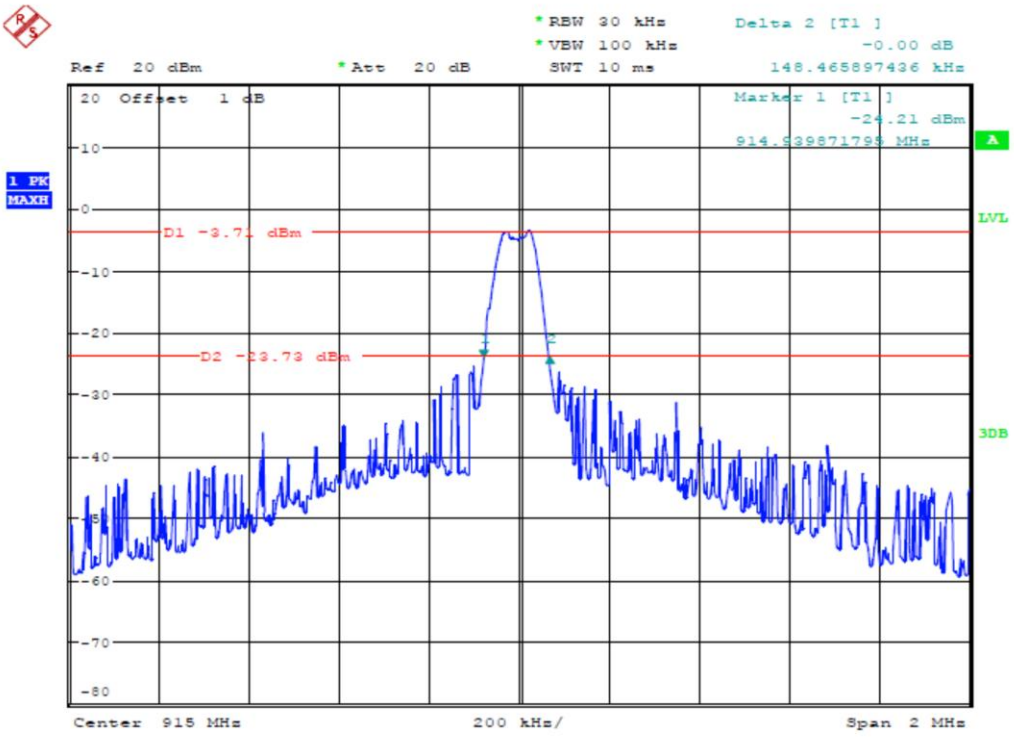
5.3 Test Procedure

1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW≥1% of the 20dB bandwidth; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold.
4. Measure and record the results in the test report.

5.4 Test Result

PASS

Mode	Frequency(MHz)	20dB Bandwidth (KHz)	Limit (kHz)	Conclusion
TX	915	148.47	/	PASS

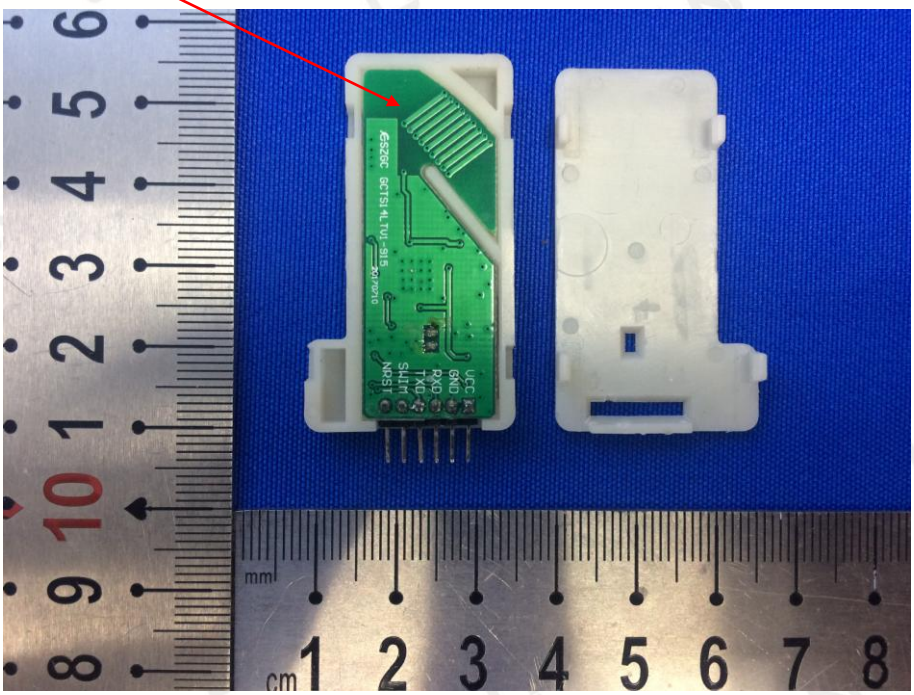


6 ANTENNA REQUIREMENT

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.

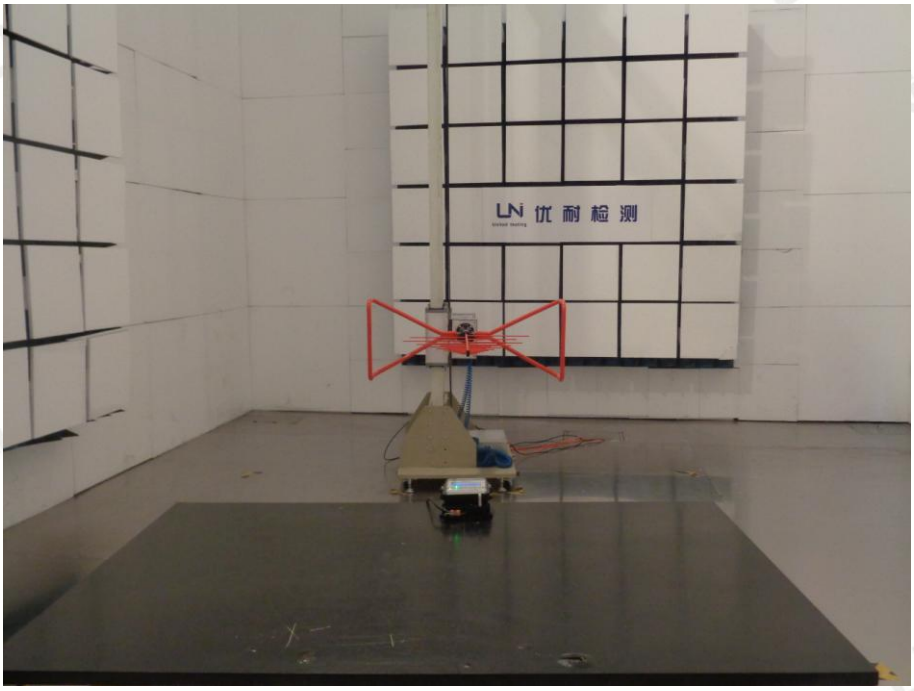
Antenna Connected Construction
The antenna used in this product is a PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

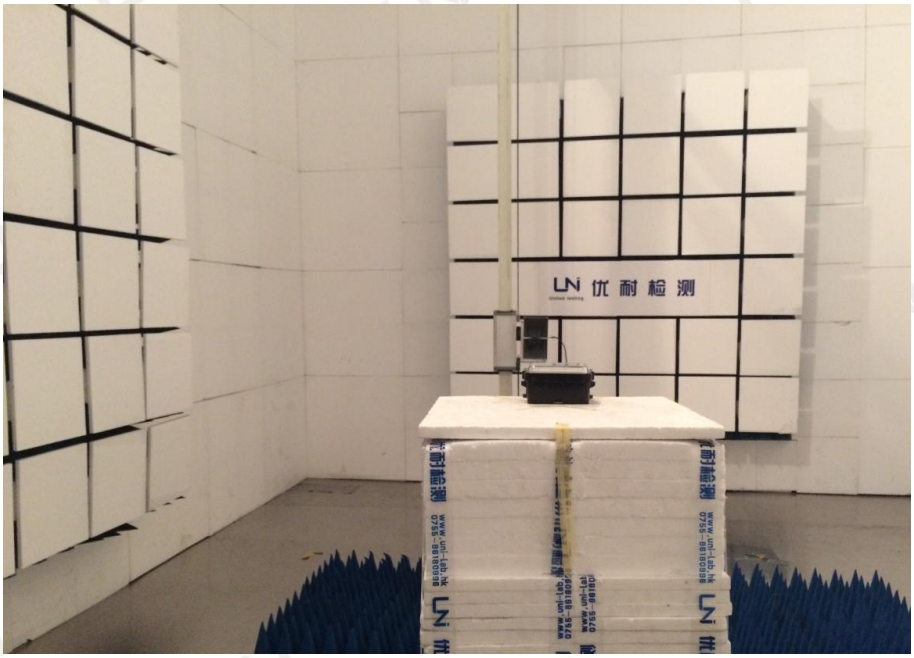
ANTENNA



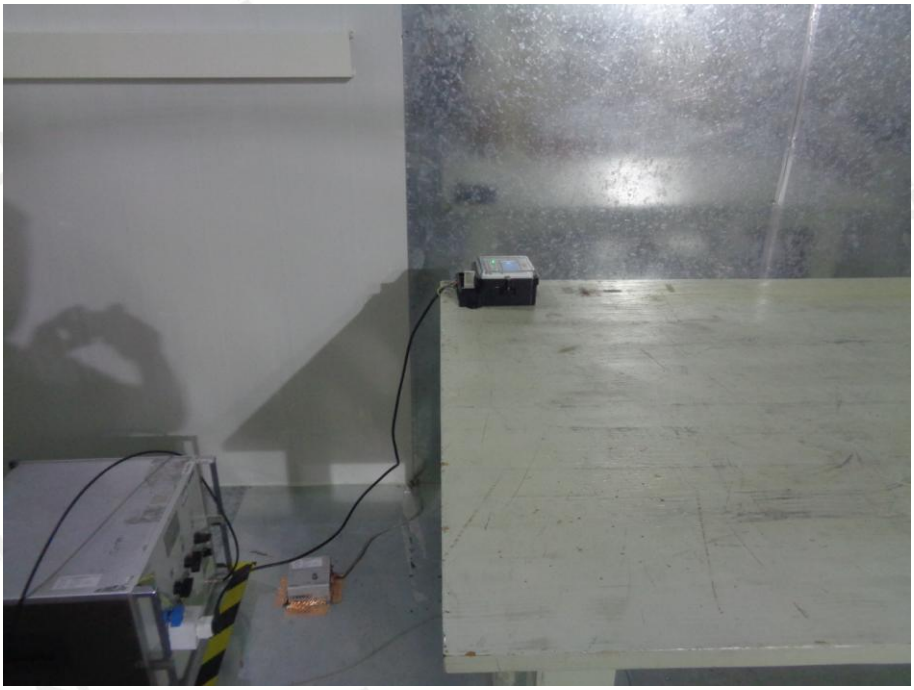
7 PHOTOGRAPH OF TEST

7.1 Radiated Emission





7.2 Conducted Emission



End of Report