

Radio Equipment Directive-EMC  
for  
Shandong USR IOT Technology Limited

Serial to WIFI Module  
Model No.: USR-WIFI232-D2a, USR-WIFI232-D2b, USR-WIFI232-A,  
USR-WIFI232-B, USR-WIFI232-Ca, USR-WIFI232-Cb, USR-WIFI232-630

Prepared for : Shandong USR IOT Technology Limited  
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Report Number : R0116051015E  
Date of Test : Jun. 02~ Aug. 17, 2016  
Date of Report : Aug. 18, 2016

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**TEST REPORT**

Applicant : Shandong USR IOT Technology Limited  
Manufacturer : Shandong USR IOT Technology Limited  
EUT : Serial to WIFI Module  
Model No. : USR-WIFI232-D2a, USR-WIFI232-D2b, USR-WIFI232-A,  
USR-WIFI232-B, USR-WIFI232-Ca, USR-WIFI232-Cb,  
USR-WIFI232-630  
Serial No. : N.A.  
Trade Mark :   
Rating : DC 3.3V, 350mA

**Measurement Procedure Used:**

ETSI EN 301 489-1 V1.9.2 (2011-09)

ETSI EN 301 489-17 V2.2.1 (2012-09)

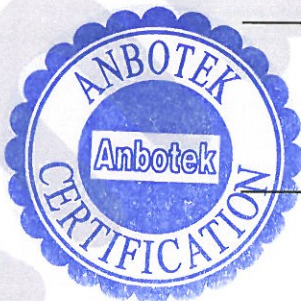
The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 301 489-1 & EN 301 489-17 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited

Date of Test :

Jun. 02~ Aug. 17, 2016

Prepared by :



(Engineer / Baron Wen)

Reviewer :

(Project Manager/Amy Ding)

Approved &amp; Authorized Signer :

(Manager/Tom Chen)

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

EUT	: Serial to WIFI Module
Model Number	: USR-WIFI232-D2a, USR-WIFI232-D2b, USR-WIFI232-A, USR-WIFI232-B, USR-WIFI232-Ca, USR-WIFI232-Cb, USR-WIFI232-630 (Note: All samples are the same except the model number and colour, so we prepare “USR-WIFI232-D2a” for test only.)
Test Power Supply	: AC 230V, 50Hz for adapter
Adapter	: Model No.: FLD121-120100-14513C Input: 100-240V~50/60Hz, 0.4A Max Output: DC 12.0V, 1.0A
Frequency	: 2412 ~ 2472MHz (13 channels)
Antenna Gain	: 0.4 dBi
Applicant Address	: Shandong USR IOT Technology Limited : Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu, 250101, Jinan, Shandong, China
Manufacturer Address	: Shandong USR IOT Technology Limited : Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu, 250101, Jinan, Shandong, China
Factory Address	: Shandong USR IOT Technology Limited : Floor 11, Building 1, No. 1166 Xinluo Street, Gaoxin Qu, 250101, Jinan, Shandong, China
Date of receiver	: Jun. 02, 2016
Date of Test	: Jun. 02~ Aug. 17, 2016

## 1.2. Auxiliary Equipment Used during Test

N/A

### 1.3. Description of Test Facility

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

**FCC-Registration No.: 752021**

Shenzhen Anbotek Compliance Laboratory Limited, 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 752021, July 06, 2016.

**IC-Registration No.: 8058A-1**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration 8058A, Jun. 13, 2016.

## Test Location

All Emissions tests were performed  
Shenzhen Anbotek Compliance Laboratory Limited. at 1/F., Building 1, SEC  
Industrial Park, No.0409 Qianhai Road, Nanshan District, Shenzhen, Guangdong,  
China

### 1.4. Measurement Uncertainty

Radiation Uncertainty : Ur = 4.1 dB (Horizontal)  
Ur = 4.3 dB (Vertical)

Conduction Uncertainty :  $U_c = 3.4 \text{ dB}$

### 1.5. Test Standards

## ETSI EN 301 489-1 V1.9.2 (2011-09)

Electromagnetic compatibility and Radio spectrum Matters (ERM);  
Electromagnetic Compatibility (EMC) standard for radio equipment and services;  
Part 1: Common technical requirements

**ETSI EN 301 489-17 V2.2.1 (2012-09)**

Electromagnetic compatibility and Radio spectrum Matters (ERM);  
Electromagnetic Compatibility (EMC) standard for radio equipment and services;  
Part 17: Specific conditions for 2,4GHz wideband transmission systems and 5GHz  
high performance RLAN equipment



## 2. MEASURING DEVICE AND TEST EQUIPMENT

Test equipments list of Shenzhen Anbotek Compliance Laboratory Limited.

### 2.1. Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Two-Line V-network	Rohde & Schwarz	ENV216	100055	Apr. 16, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Apr. 16, 2016	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Apr. 16, 2016	1 Year

### 2.2. Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Apr. 16, 2016	1 Year
2.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Apr. 19, 2016	1 Year
3.	Pre-amplifier	SONOMA	310N	186860	Apr. 16, 2016	1 Year

### 2.3. Electrostatic Discharge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	3ctest	ESD-30T	ES0131505	Jun. 20, 2016	1 Year

### 2.4. R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 29, 2016	1 year
2.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	May 29, 2016	1 year
3.	Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120 L3F	332	May 29, 2016	1 year
4.	Power Amplifier	PRANA	AP32MT215	N/A	May 29, 2016	1 year
5.	Power Amplifier	MILMEGA	AS0102-55	N/A	May 29, 2016	1 year
6.	Signal Generator	AEROFLEX	2023B	N/A	May 29, 2016	1 year
7.	Field Strength Meter	HOLADAY	HI-6005	N/A	May 29, 2016	1 year
8.	RS232 Fiber Optic Modem	HOLADAY	HI-4413P	N/A	May 29, 2016	1 year
9.	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	N/A	May 29, 2016	1 year

### 3. Technical Test

#### 3.1. Summary of Test Results

No Deviations from the technical specification(s) were ascertained in the course of the tests Performed	
Final Verdict: (only "Passed" if all single measurements are "Passed")	Passed

#### 3.2. Test Report

##### Emission (EMI)

EMI Phenomenon	Port	Requirement		EUT Setup	Result	Applicability
		Standard	Basic Standard			
Conducted Interference Voltage	AC Mains	ETSI EN 301 489-1:2011 Clause 8.4	EN 55022	Refer to Section 5	Complies	Applicable
Conducted Interference Voltage	DC Mains	ETSI EN 301 489-1:2011 Clause 8.3	EN 55022	Refer to Section 4	N/A	Not Applicable
Radiated Interference Field Strength 30~1000MHz	Enclosure	ETSI EN 301 489-1:2011 Clause 8.2	EN 55022	Refer to Section 4	Complies	Applicable
Harmonic Current Emissions	AC Mains Input Port	ETSI EN 301 489-1:2011 Clause 8.5	EN 61000-3-2	Refer to Section 5	N/A	Not Applicable
Flicker & Voltage Fluctuation	AC Mains Input Port	ETSI EN 301 489-1:2011 Clause 8.6	EN 61000-3-3	Refer to Section 5	N/A	Not Applicable

##### Immunity (EMS)

EMS Phenomenon	Port	Requirement		EUT Setup	Result	Applicability
		Standard	Basic Standard			
Electronic Discharge (ESD)	Enclosure	ETSI EN 301 489-1:2011 Clause 9.3	IEC 61000-4-2	Refer to Section 5	Complies	Applicable
RF-Electro-Magnetic Field (80-1000MHz and 1400-2000 MHz)	Enclosure	ETSI EN 301 489-1:2011 Clause 9.2	IEC 61000-4-3	Refer to Section 5	Complies	Applicable
Fast Transients, Burst	Power Line	ETSI EN 301 489-1:2011 Clause 9.4	IEC 61000-4-4	Refer to Section 5	N/A	Not Applicable
Surge	Power Line (1 Phase)	ETSI EN 301 489-1:2011 Clause 9.8	IEC 61000-4-5	Refer to Section 5	N/A	Not Applicable

Transients & Surges Vehicular Environment	Power Line (Car Charge)	ETSI EN 301 489-1:2011 Clause 9.6	ISO 7367-1 ISO 7367-2	N/A	N/A	Not Applicable
RF Common Mode (0.15-80MHz)	Power Line	ETSI EN 301 489-1:2011 Clause 9.5	IEC 61000-4-6	Refer to Section 5	N/A	Not Applicable
Vol. Dips, Interruptions & Fluctuations (AC Power)	Power Line	ETSI EN 301 489-1:2011 Clause 9.7	IEC 61000-4-11	Refer to Section 5	N/A	Not Applicable

N/A=Not Applicable

- Performance criteria A for immunity tests with phenomena of a continuous nature;  
Communication between the Tx and Rx in the front of pings should not drop during the test.
- Performance criteria B for immunity tests with phenomena of a transient nature;  
N/A
- Performance criteria C for immunity tests with power interruptions exceeding a certain time.  
N/A

Note: For details see subclause 6.2 ETSI EN 301 489-17.



### 3.2.1. Emission Test – Radiated Emissions

This test assesses that ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

#### According to EMC basic standard (EN 55022)

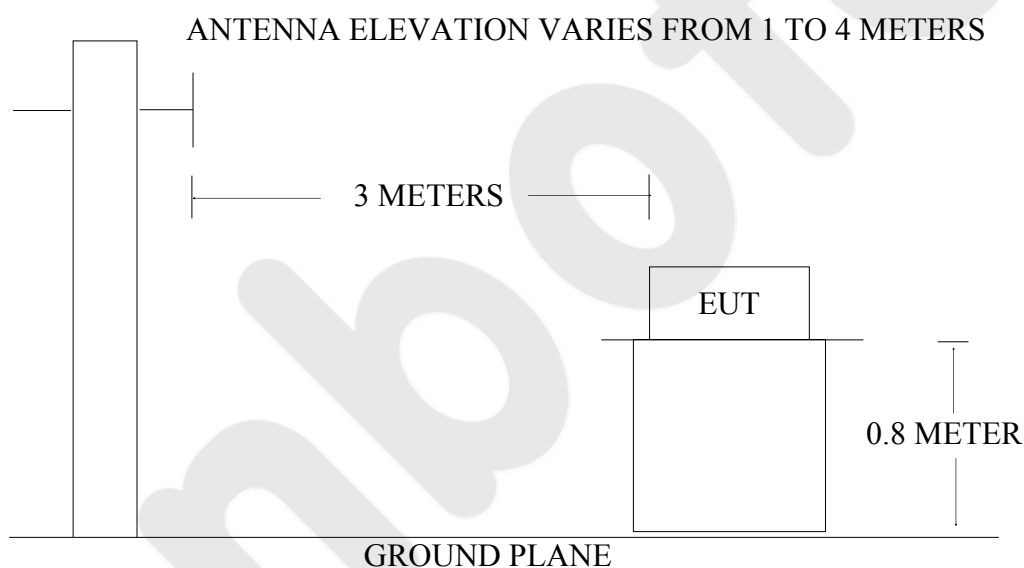
Measurement according to EMC basic standard, The test results correspond to the 3m-OATS result. The EUT and it simulators are placed on a turntable which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to EN 55013 and EN 55022 on radiated measurement.

Radiated emissions were invested over the frequency range from 30MHz to 1GHz using a receiver bandwidth of 120kHz. Radiated was performed at an antenna to EUT distance of 3 meters.

#### Test Setup

EUT was setup on a 3m standard OATS



#### Limits

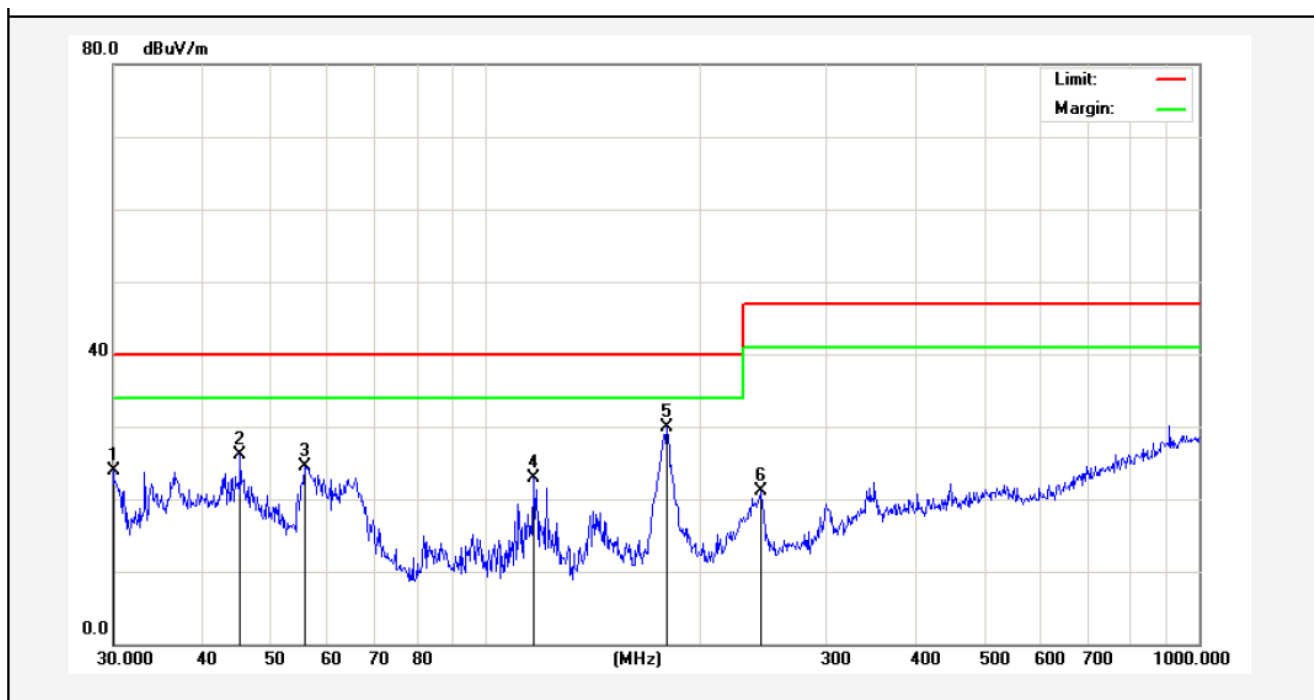
Freq. Range (MHz)	Distance (m)	Field Strength (dBμV/m)
30 – 230	3	40
230 – 1000	3	47

#### Results

Receiving Antenna Directed to	Angle of Turntable	Hori. / Vert.	Comment	Result (Passed / Failed)
--	0° - 360°	H/V	EUT Operating Normal	Passed

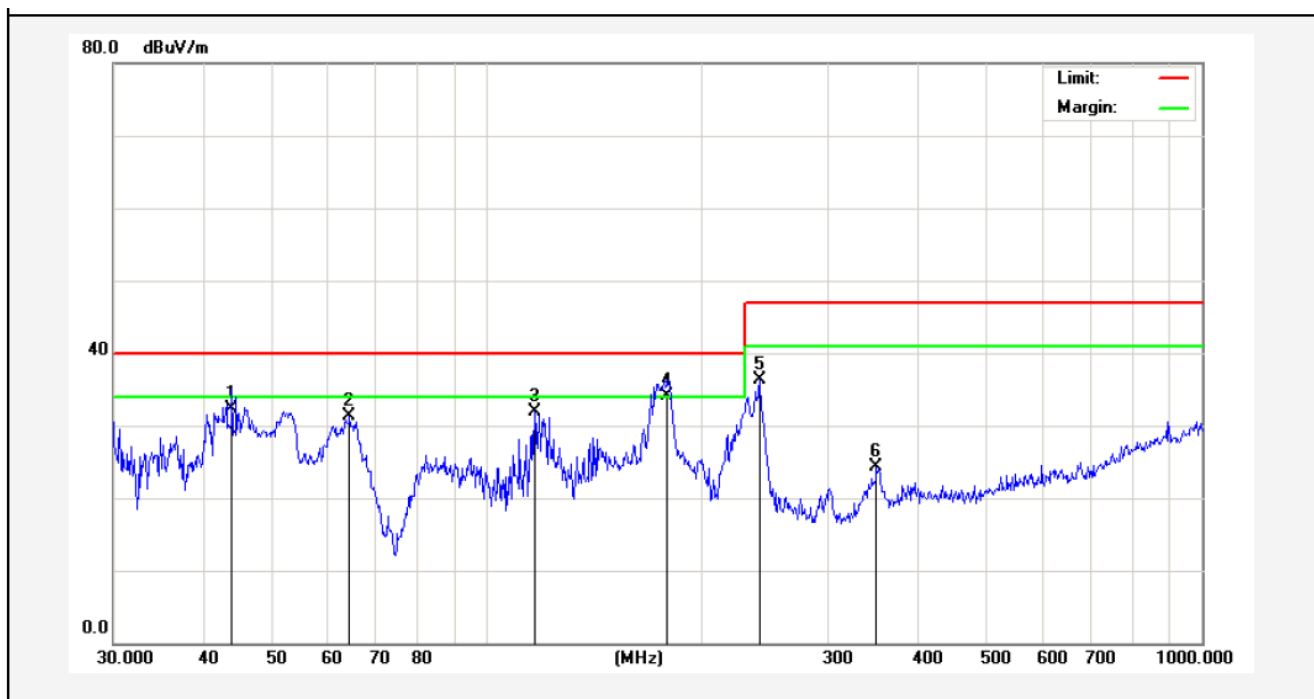
Please refer the following pages.

Job No.:	AT0116051015S	Polarization:	Horizontal
Standard:	(RE)EN301489_Class B_3m	Power Source:	AC 230V, 50Hz for adapter
Test item:	Radiation Test	Temp.(C)/Hum.(%RH):	24.3(C)/55%RH
Test Mode:	On	Distance:	3m



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.0000	40.77	-16.95	23.82	40.00	-16.18	peak			
2	45.2166	38.63	-12.43	26.20	40.00	-13.80	peak			
3	55.8047	39.50	-15.00	24.50	40.00	-15.50	peak			
4	116.5401	44.09	-21.09	23.00	40.00	-17.00	peak			
5	179.3863	51.72	-21.89	29.83	40.00	-10.17	peak			
6	242.5253	39.28	-18.21	21.07	47.00	-25.93	peak			

<b>Job No.:</b>	<b>AT0116051015S</b>	<b>Polarization:</b>	<b>Vertical</b>
<b>Standard:</b>	<b>(RE)EN301489_Class B_3m</b>	<b>Power Source:</b>	<b>AC 230V, 50Hz for adapter</b>
<b>Test item:</b>	<b>Radiation Test</b>	<b>Temp.(C)/Hum.(%RH):</b>	<b>24.3(C)/55%RH</b>
<b>Test Mode:</b>	<b>On</b>	<b>Distance:</b>	<b>3m</b>



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	43.9658	44.21	-11.92	32.29	40.00	-7.71	QP	100	0	
2	64.2074	48.51	-17.15	31.36	40.00	-8.64	peak			
3	116.5400	48.07	-16.09	31.98	40.00	-8.02	peak			
4	178.7582	51.13	-16.94	34.19	40.00	-5.81	QP	100	360	
5	240.8302	50.31	-14.09	36.22	47.00	-10.78	peak			
6	350.4768	37.25	-12.97	24.28	47.00	-22.72	peak			

### 3.2.2. Emission Test – AC Mains Power Line Conducted Emissions

This test is applicable for radio equipment and ancillary equipment for fixed use that may have DC cables longer than 3 m (see clause 5.1 - manufacturer's declaration) and for vehicular use irrespective of cable length.

#### According to EMC basic standard (EN 55022)

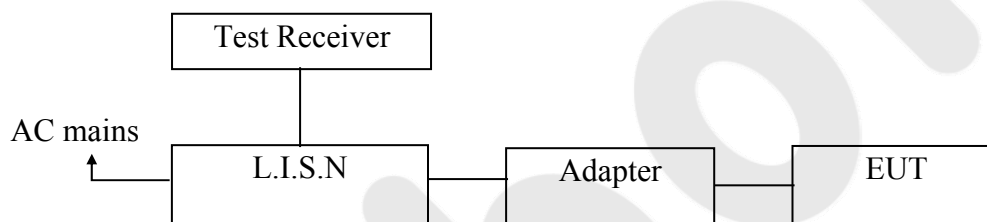
The test method shall be in accordance with EN 55022 [7] and the Artificial Mains Networks (AMNs) shall be connected to the AC mains power source.

The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies (see clause 4.3) for measurements in the transmit mode of operation.

For emission measurements on AC output ports of the EUT the relevant port shall be connected via an AMN to a load drawing the rated current of the source. In case where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

#### Test Setup

EUT was setup as before.



#### Limits

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.

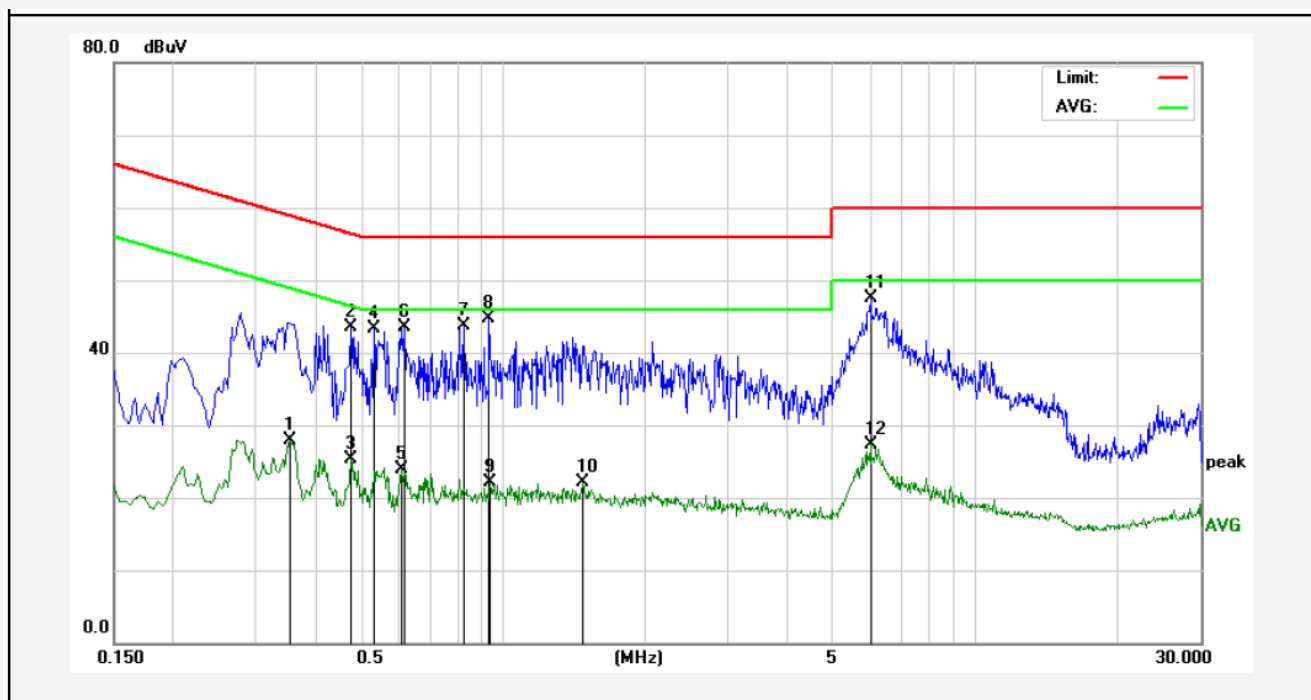
NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

#### Results

Please refer the following pages.

# **CONDUCTED EMISSION TEST DATA**

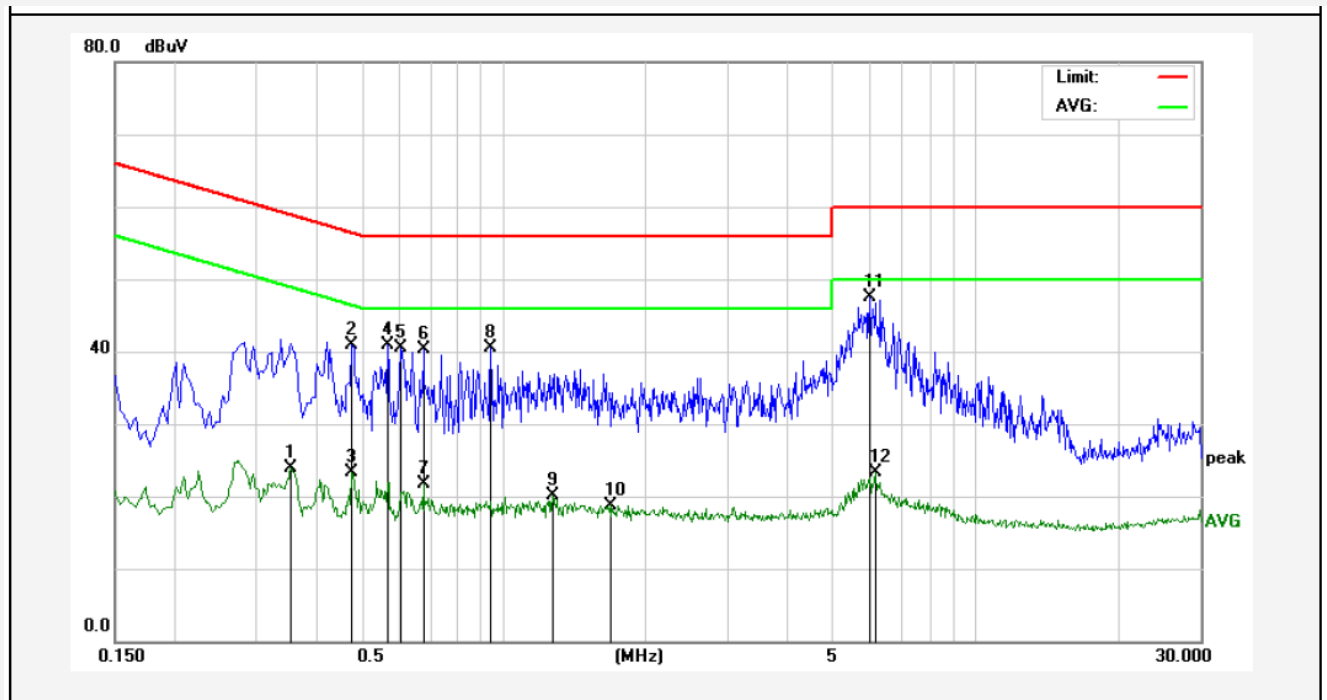
Test Site: 1# Shielded Room  
Operating Condition: On  
Test Specification: AC 230V, 50Hz for adapter  
Comment: Live Line  
Tem.:24℃ Hum.:49%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.3540	27.81	0.00	27.81	48.87	-21.06	AVG	
2	0.4780	43.52	0.00	43.52	56.37	-12.85	QP	
3	0.4780	25.39	0.00	25.39	46.37	-20.98	AVG	
4	0.5340	43.31	0.00	43.31	56.00	-12.69	QP	
5	0.6100	23.84	0.00	23.84	46.00	-22.16	AVG	
6	0.6180	43.51	0.00	43.51	56.00	-12.49	QP	
7	0.8300	43.62	0.00	43.62	56.00	-12.38	QP	
8	0.9380	44.80	0.00	44.80	56.00	-11.20	QP	
9	0.9420	22.02	0.00	22.02	46.00	-23.98	AVG	
10	1.4740	22.09	0.00	22.09	46.00	-23.91	AVG	
11	6.0220	47.53	0.00	47.53	60.00	-12.47	QP	
12	6.0220	27.34	0.00	27.34	50.00	-22.66	AVG	

### CONDUCTED EMISSION TEST DATA

Test Site: 1# Shielded Room  
Operating Condition: On  
Test Specification: AC 230V, 50Hz for adapter  
Comment: Neutral Line  
Tem.:24℃ Hum.:49%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.3540	24.00	0.00	24.00	48.87	-24.87	AVG	
2	0.4780	40.99	0.00	40.99	56.37	-15.38	QP	
3	0.4780	23.31	0.00	23.31	46.37	-23.06	AVG	
4	0.5700	40.82	0.00	40.82	56.00	-15.18	QP	
5	0.6060	40.52	0.00	40.52	56.00	-15.48	QP	
6	0.6780	40.38	0.00	40.38	56.00	-15.62	QP	
7	0.6780	21.79	0.00	21.79	46.00	-24.21	AVG	
8	0.9420	40.42	0.00	40.42	56.00	-15.58	QP	
9	1.2740	20.02	0.00	20.02	46.00	-25.98	AVG	
10	1.6820	18.80	0.00	18.80	46.00	-27.20	AVG	
11	5.9620	47.59	0.00	47.59	60.00	-12.41	QP	
12	6.1460	23.23	0.00	23.23	50.00	-26.77	AVG	



### 3.2.3. Immunity Test – Radiated, RF Electromagnetic Fields

#### According to EMC basic standard (IEC 61000-4-3)

- Type of Port: Enclosure
- Performance Criterion: CT/CR
- The distance between the turn-table axis and TX&RX antenna is 3m.
- Field strength = 3V/m
- Start Frequency: 80MHz ~ 1000MHz, 1400MHz ~ 2700 MHz
- Frequency Step = lin 1MHz
- Modulation = AM, 400Hz, 1kHz, 80%
- Test Mode: On

#### Results

Frequency (MHz)	Antenna Polarity	Radiation to	Reaction of the EUT During and after test	Result
80-1000, 1400-2700	Horizontal	Front	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Front	No reactions recognized	Passed
80-1000, 1400-2700	Horizontal	Rear	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Rear	No reactions recognized	Passed
80-1000, 1400-2700	Horizontal	Left	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Left	No reactions recognized	Passed
80-1000, 1400-2700	Horizontal	Right	No reactions recognized	Passed
80-1000, 1400-2700	Vertical	Right	No reactions recognized	Passed

Note: Performance criteria A observed.

#### Test Procedure

The EUT and load, which are placed on a table that is 0.8 meter above ground, are placed with one coincident with the calibration plane such that the distance from antenna to the EUT was 3 meters. Both horizontal and vertical polarization of the antenna and four sides of the EUT are set on measurement.

In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

The Project in IEC 61000-4-3 was tested in Shenzhen EMTEK Co., Ltd.

### 3.2.4. Immunity Test – Electrostatic Discharge

#### According to EMC basic standard (IEC 61000-4-2)

- Type of Port: Enclosure
- Performance Criterion: CT/CR  
For the table top EUT the distance to the reference ground plane should be 80cm.  
Direct contact discharge on conducting surfaces of EUT  
Indirect air discharge on insulating surfaces of EUT  
±2kV, ±4kV direct discharge & ±2kV, ±4kV, ±8kV air discharge
- Test Mode: On

#### Test Results

Item	Contact Discharge to conducted surfaces and to coupling planes		Air Discharge at insulating surfaces
	Direct Contact Discharge	Indirect Contact Discharge	
Test Voltage	Reaction of EUT / Result	Reaction of EUT / Result	Reaction of EUT / Result
+2kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
-2kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
+4kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
-4kV	n.r.r. Passed	n.r.r. Passed	n.r.r. Passed
+6kV	-	-	n.r.r. Passed
-6kV	-	-	n.r.r. Passed
+8kV	-	-	n.r.r. Passed
-8kV	-	-	n.r.r. Passed

Remarks: n.r.r. = no reaction recognized

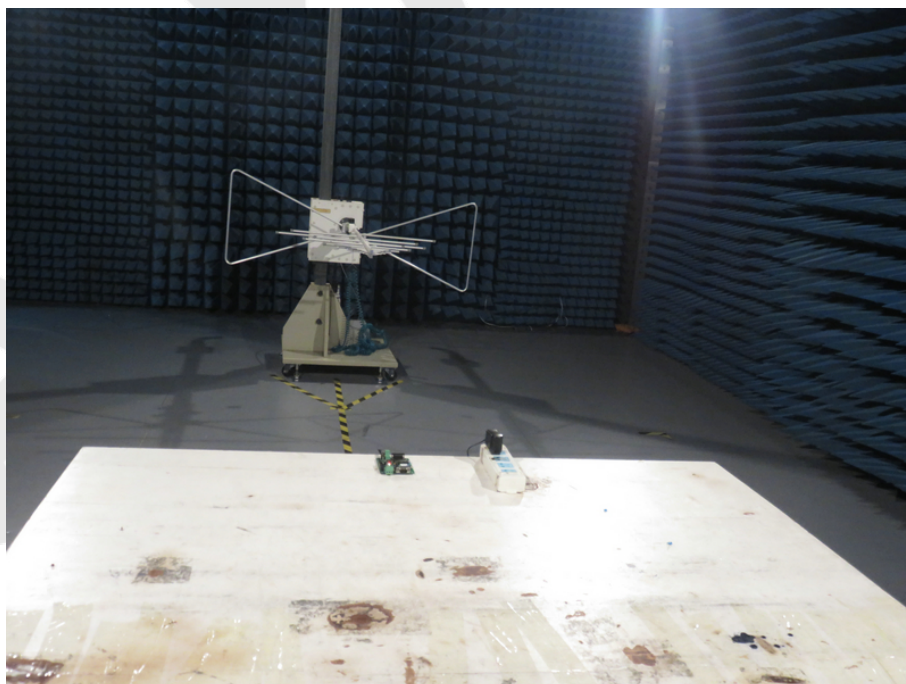
Performance Criteria A observed and No any function degraded during the tests.

## APPENDIX I (TEST PHOTOGRAPHS)

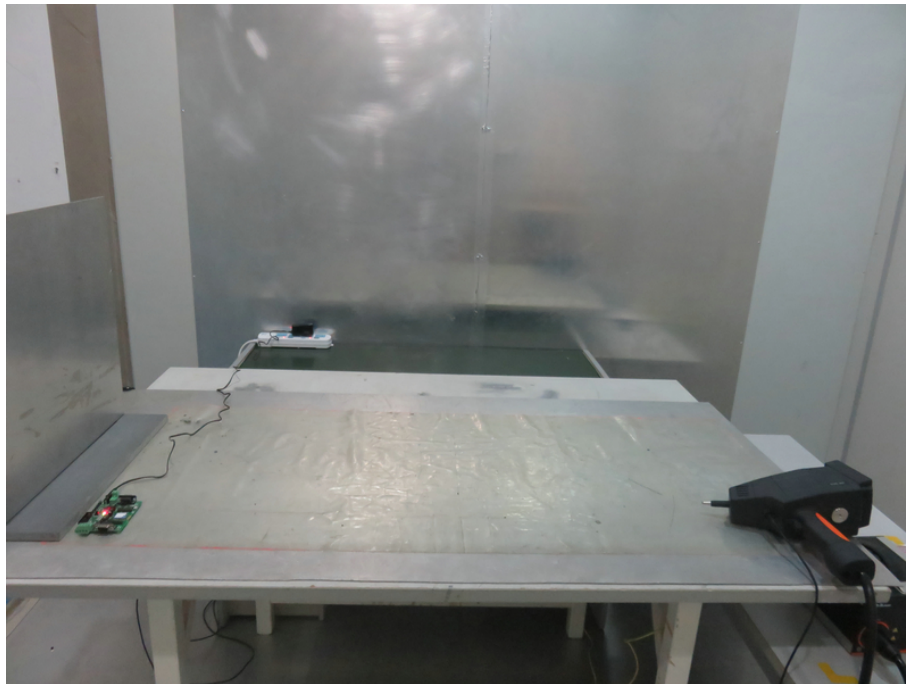
### 1. Photo of Power Line Conducted Emission Test



### 2. Photo of Radiated Emission Test



### 3. Photo of Electrostatic Discharge Test



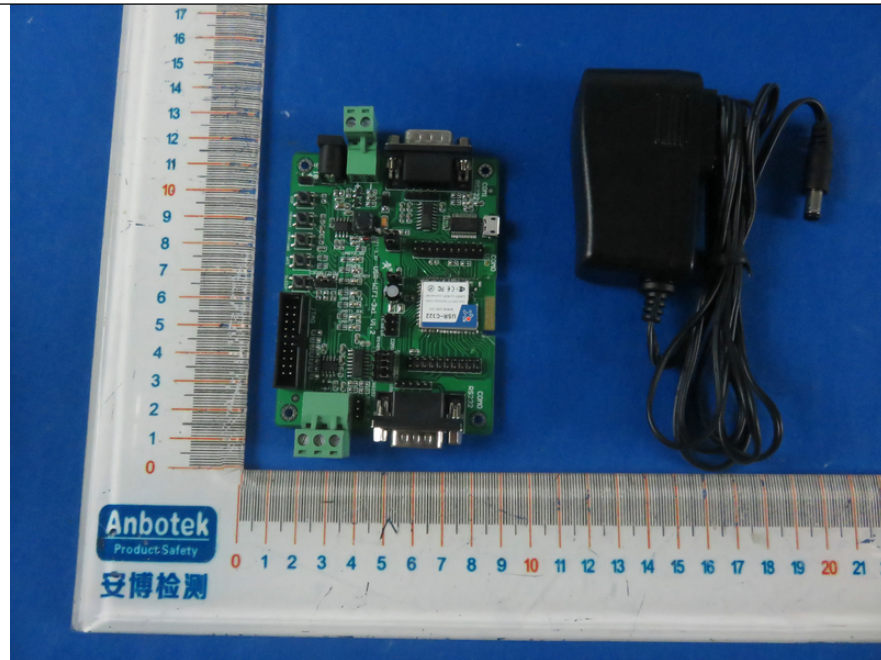
### 4. Photo of RF Field Strength Susceptibility Test



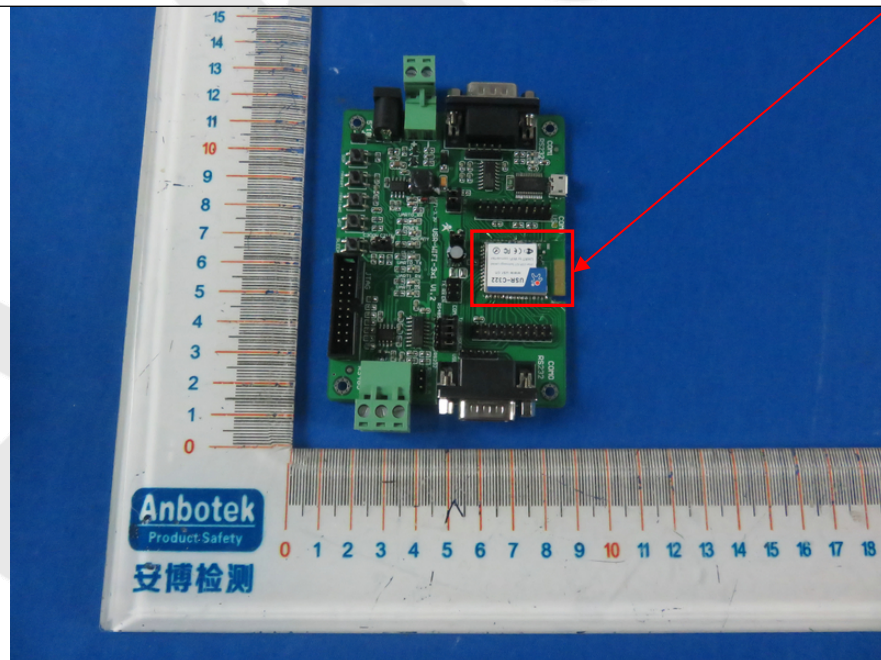


## APPENDIX II (EXTERNAL PHOTOS)

1. Figure  
The EUT-Overall View

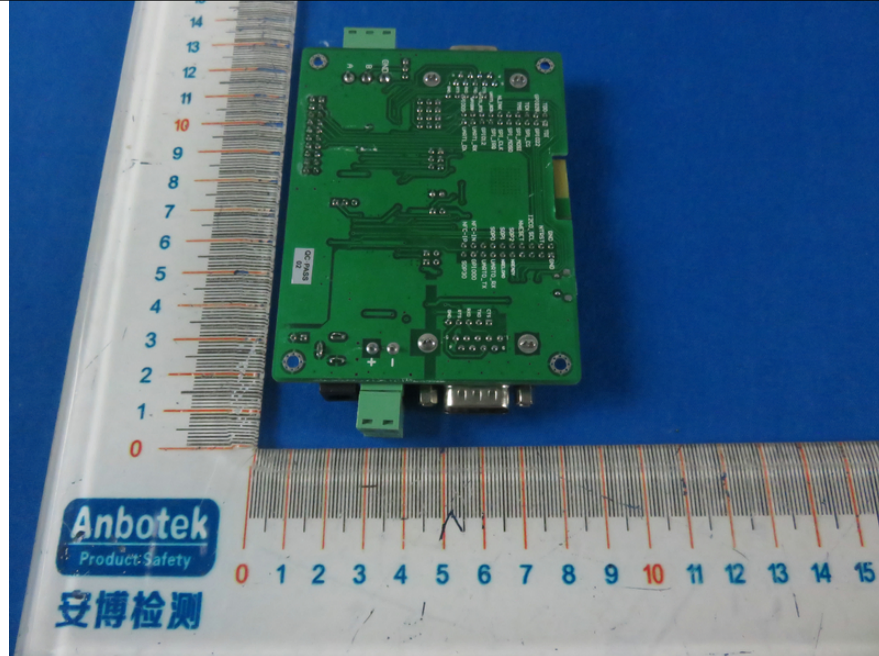


2. Figure  
The EUT-Front View



EUT is placed  
on the host

3. Figure  
The EUT-Back View

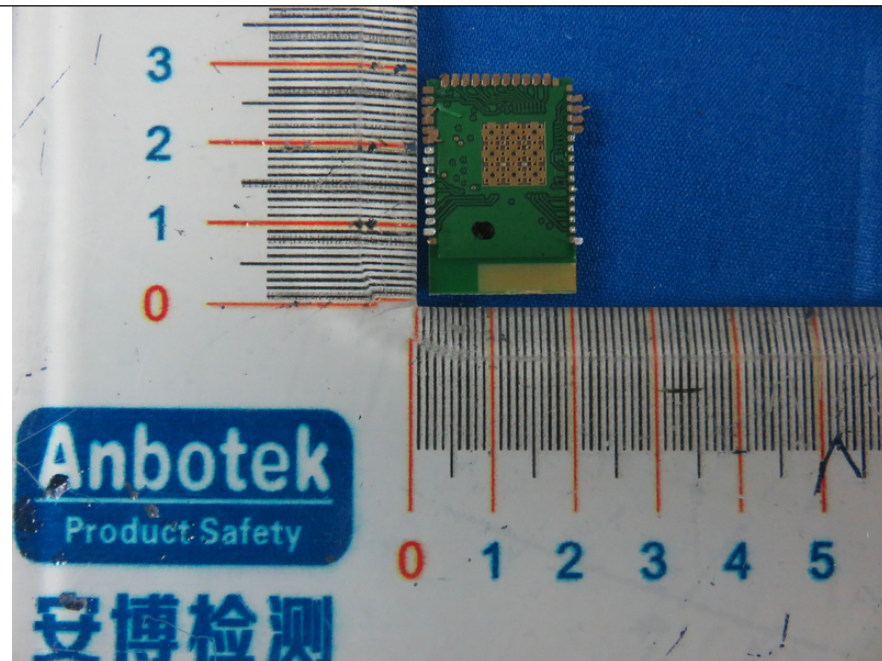


4. Figure  
The EUT-Front View



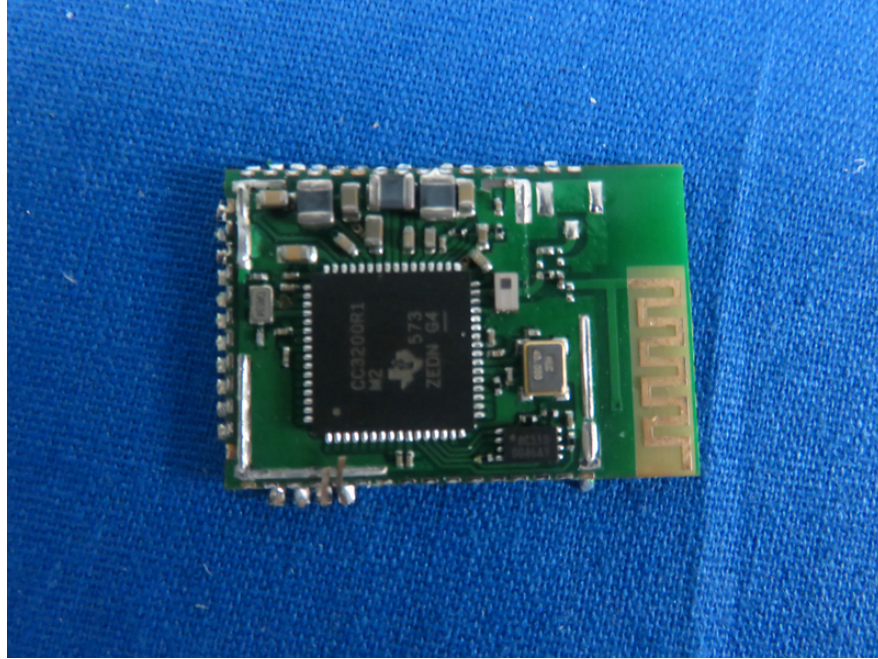


5. Figure  
The EUT-Back View



### APPENDIX III (INTERNALPHOTOS)

1. Figure  
The EUT-Inside View



2. Figure  
The EUT-Inside View

