

**FCC TEST REPORT****47 CFR FCC Part 15 Subpart B**

<b>Report Reference No.</b> .....:	<b>LCS1511070542E-02</b>
<b>FCC ID</b> .....:	<b>WXL RAMV</b>
<b>Date of Issue</b> .....:	<b>Nov 09, 2015</b>
<b>Testing Laboratory Name</b> .....	<b>Shenzhen LCS Compliance Testing Laboratory Ltd.</b>
Address .....	1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
<b>Applicant's name</b> .....:	<b>Capricorn Electronics Ltd</b>
Address .....	SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG
<b>Test specification</b> .....	
Standard .....	<b>47 CFR FCC Part 15 Subpart B - Unintentional Radiators</b>
	<b>ANSI C63.4: 2014</b>
Test Report Form No .....	LCSEMC-1.0
TRF Originator.....:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....:	Dated 2011-03
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<b>Test item description</b> .....	<b>RAMV CELLULAR GATEWAY</b>
Trade Mark .....	N/A
<b>Manufacturer</b> .....:	<b>Capricorn Electronics Ltd</b>
Model/Type reference.....:	RAMV
Listed Models .....	/
Rating .....	DC 3.70V/DC 12V from Battery
Hardware version .....	RAM-HV-FCC-V001
Software version .....	RAM-SV-FCC-V001
Result.....:	<b>PASS</b>

Compiled by:



Kyle Yin/ File administrators

Supervised by:



Glin Lu/ Technique principal

Approved by:



Gavin Liang/ Manager

**TEST REPORT**

<b>Test Report No. :</b>	<b>LCS1511070542E-02</b>	Nov 09, 2015
		Date of issue

Equipment under Test : **RAMV CELLULAR GATEWAY**

Model /Type : RAMV

Listed Models : /

**Applicant** : **Capricorn Electronics Ltd**

Address : SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG

**Manufacturer** : **Capricorn Electronics Ltd**

Address : SUITE 1011, 10/FL., METRO CENTRE 1, 32 LAM HING STREET KOWLOON BAY, KOWLOON, HONG KONG

<b>Test Result:</b>	<b>PASS</b>
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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.

## Revision History

Revision	Issue Date	Revisions	Revised By
00	2015-11-09	Initial Issue	Gavin Liang

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# **1. TEST STANDARDS**

The tests were performed according to following standards:

[47 CFR FCC Part 15 Subpart B](#) - Unintentional Radiators

[ANSI C63.4: 2014](#) – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz

## 2. SUMMARY

### 2.1. General Remarks

Date of receipt of test sample	:	Oct 29, 2015
Testing commenced on	:	Oct 29,2015
Testing concluded on	:	Nov 09 ,2015

### 2.2. Product Description

The **Capricorn Electronics Ltd's** Model: RAMV or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	RAMV CELLULAR GATEWAY
FCC ID	WXL RAMV Contains FCC ID:R5Q-LISAC200A
Model number	RAMV
Modulation type	GFSK
Antenna type	Internal and maximum antenna gain is 0dBi for HFSS modular
Hardware version	RAM-HV-FCC-V001
Software version	RAM-SV-FCC-V001
Power supply	DC 3.70V / DC 12.0V from battery
Maximum work frequency	<512MHz (3G modular and Hopping frequency modular operate frequency was depending on 3G and Hopping frequency modular test report)

### 2.3. 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 3.70V

### 2.4. Short description of the Equipment under Test (EUT)

#### 2.4.1 General Description

RAM-V is RAMV CELLULAR GATEWAY with CDMA modular (FCC ID: R5Q-LISAC200A) and 910-924.7MHz Frequency Hopping transmit modular, RAM-V can connect PC to update software by USB port.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

### 2.5. EUT operation mode

The EUT has been tested under typical operating condition.

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

This submittal(s) (test report) is intended for **FCC ID: 2AFAP0AX1** filing to comply with FCC Part 15B Rules.

### 2.7. Modifications

No modifications were implemented to meet testing criteria.

### 2.8. EUT configuration

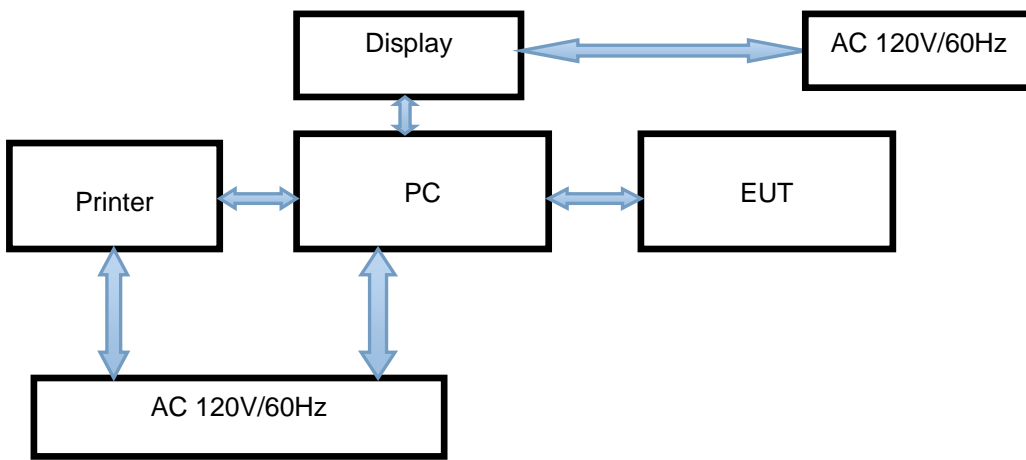
The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

○ Power Cable	Length (m) :	/
	Shield :	/
	Detachable :	/
○ Multimeter	Manufacturer :	/
	Model No. :	/

### 2.9. Configuration of Tested System

Configuration of Tested System



Equipment Used in Tested System

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/unshielded	Notes
1	PC	HP	HP280 G1 MT	1RNN42X	/	/	DOC
2	Printer	Brother	DCP-7057	820989	/	/	N/A
3	Display	DELL	U2412M	S404	/	/	N/A
4	USB Line	UGREEN	30132	/	0.60m	unshielded	DOC
5	VGA Line	SAMZHE	VM-2150	/	1.00m	unshielded	DOC

### 2.10. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: WXL RAMV** filing to comply with FCC Part 15B Rules.

### 2.11. Note

- The EUT with 910-924.7MHz hopping frequency transmitter modular and CDMA modular (FCC ID: R5Q-LISAC200A), the functions of the EUT listed as below:

	Test Standards	Reference Report
910-924.7MHz Hopping Frequency	FCC Part 15 C 15.247	LCS1511070542E-01
USB Port	FCC Part 15 B	LCS1511070542E-02
MPE	FCC Part 2.1091(d)	LCS1511070542E-03

### 3. TEST ENVIRONMENT

#### 3.1. Test Facility

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

CNAS Registration Number. is L4595.  
 FCC Registration Number. is 899208.  
 Industry Canada Registration Number. is 9642A-1.  
 VCCI Registration Number. is C-4260 and R-3804.  
 ESMD Registration Number. is ARCB0108.  
 UL Registration Number. is 100571-492.  
 TUV SUD Registration Number. is SCN1081.  
 TUV RH Registration Number. is UA 50296516-001

#### 3.2. Environmental conditions

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

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

#### 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 LCS Compliance Testing Laboratory Ltd. 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 LCS Compliance Testing Laboratory Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.80 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)

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

#### 3.4. Equipments Used during the Test

Radiated Emission & Radiated Bandedge Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date	Cal. Interval
1	EMC Receiver	Rohde&Schwarz	ESCi3	101142	2015/06/18	1 year
2	AMN	Rohde&Schwarz	ENV216	101288	2015/06/18	1 year
3	RF Cable	HUBER+SUHNER	/	03CH03-CE	2015/06/18	3 year
10	EMC Test Software	Audix	E3	/	/	/

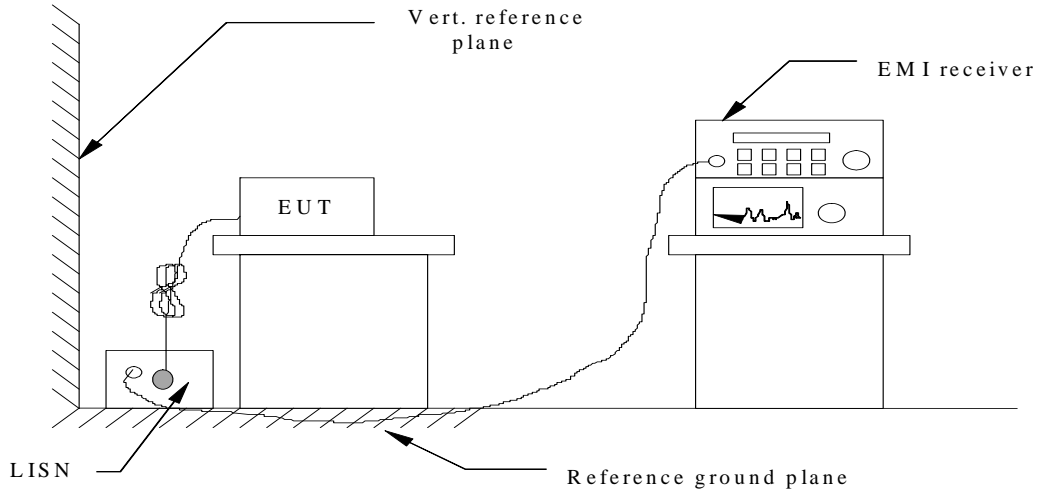


Radiated Emission & Radiated Bandedge Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date	Cal. Interval
1	EMC Receiver	Rohde&Schwarz	ESPI7	100174	2015/06/18	1 year
2	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2015/06/18	3 year
3	Loop Antenna	Rohde&Schwarz	HFH2-Z2	860004/001	2015/06/18	3 year
4	Horn Antenna	EMCO	3115	6741	2015/06/10	3 year
5	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2015/06/10	3 year
6	Signal Analyzer	Agilent	N9020A	MY50510140	2015/10/22	1 year
7	RF Cable-R03m	Jye Bao	RG142	CB021	2015/06/18	3 year
8	RF Cable-HIGH	HUBER+SUHNER	/	03CH03-HY	2015/06/18	3 year
9	Amplifier	Agilent	8449B	3008A02120	2015/07/16	1 year
10	EMC Test Software	Audix	E3	/	/	/

## 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 C63.4-2014.
2. Support equipment, if needed, was placed as per ANSI C63.4-2014.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2014.
4. The EUT 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 (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

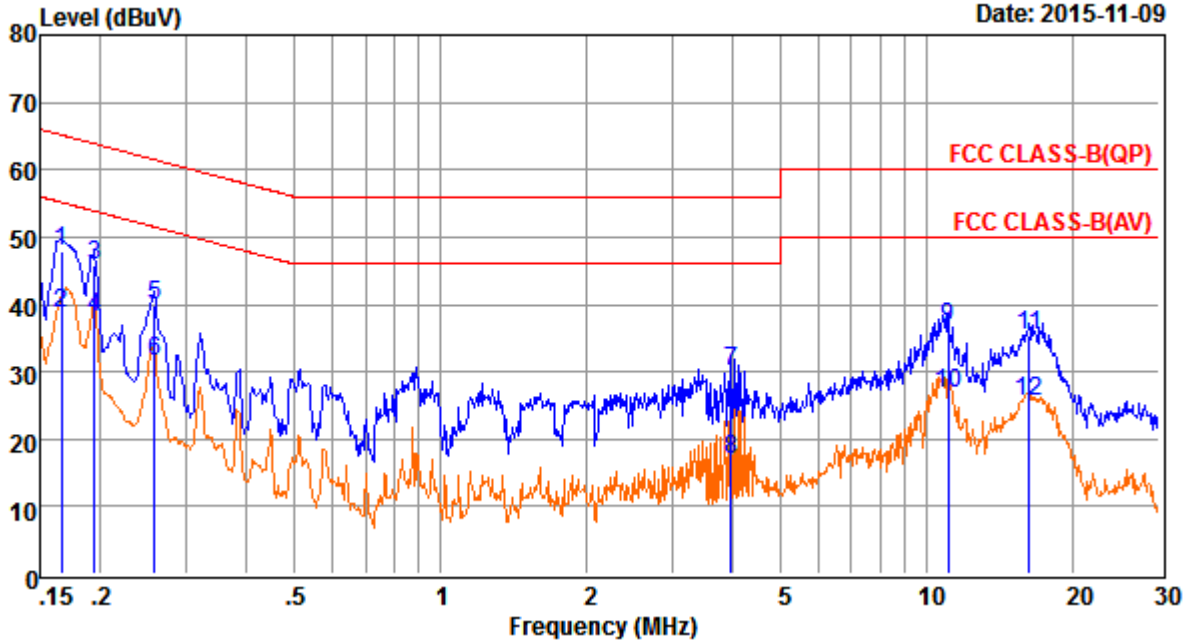
#### TEST RESULTS

Note: Mode: Data transmission (connected PC)

Data: 216

File: E:\2015 REPORT DATA\CHAZ.EM6 (219)

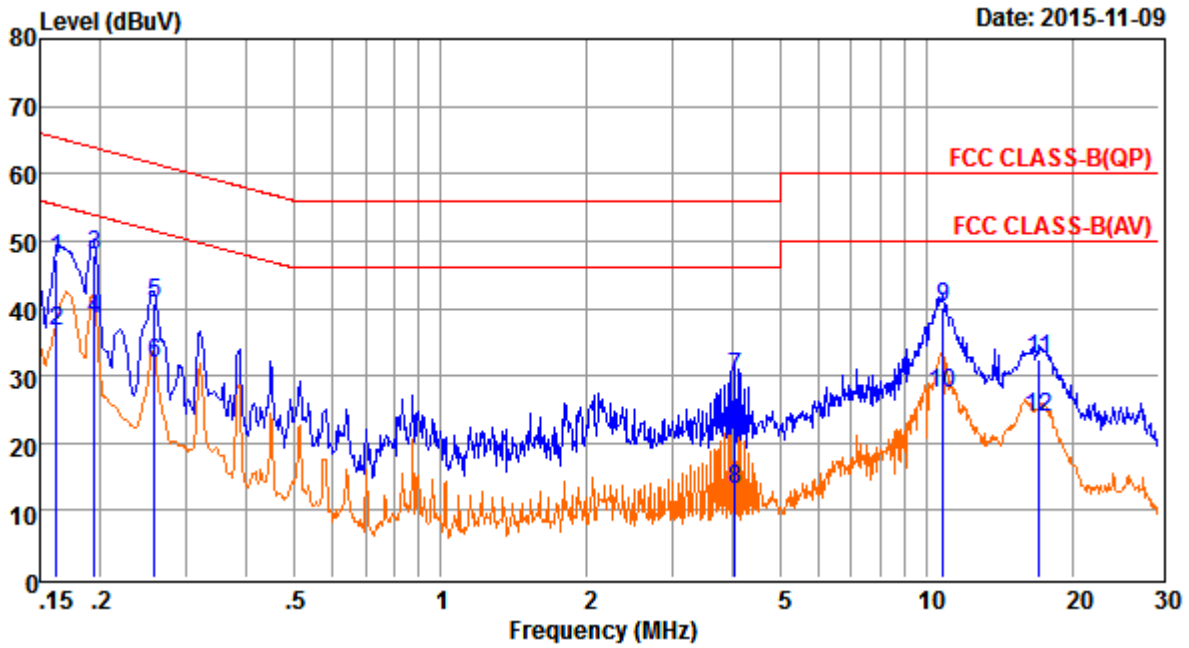
Date: 2015-11-09



Line	Frequency MHz	Reading dBuV	LISN Factor dB	Cable Loss dB	Atten_Fac dB	Measured dBuV	Limit dBuV	Margin	Detector	Line
								dB		
1	0.16589	28.06	9.66	0.02	10.00	47.74	65.16	-17.42	QP	N
2	0.16599	19.12	9.66	0.02	10.00	38.80	55.16	-16.36	AV	N
3	0.19447	26.27	9.60	0.02	10.00	45.89	63.84	-17.95	QP	N
4	0.19457	18.59	9.60	0.02	10.00	38.21	53.84	-15.63	AV	N
5	0.25751	20.19	9.60	0.03	10.00	39.82	61.51	-21.69	QP	N
6	0.25761	11.91	9.60	0.03	10.00	31.54	51.51	-19.97	AV	N
7	3.96395	10.22	9.65	0.06	10.00	29.93	56.00	-26.07	QP	N
8	3.96495	-2.70	9.65	0.06	10.00	17.01	46.00	-28.99	AV	N
9	11.07969	16.70	9.73	0.09	10.00	36.52	60.00	-23.48	QP	N
10	11.08069	6.85	9.73	0.09	10.00	26.67	50.00	-23.33	AV	N
11	16.22564	15.41	9.75	0.11	10.00	35.27	60.00	-24.73	QP	N
12	16.22664	5.63	9.75	0.11	10.00	25.49	50.00	-24.51	AV	N

Remark:

1. Measured = Reading + LISN Factor + Cable Loss + Atten\_Fac
2. Margin = Measured - Limit
3. The emission levels that are 20dB below the official limit are not reported.



Line	Frequency MHz	Reading dBuV	LISN Factor dB	Cable Loss dB	Atten_Fac dB	Measured dBuV	Limit dBuV	Margin	Detector	Line
								dB		
1	0.16241	27.75	9.59	0.02	10.00	47.53	65.34	-17.98	QP	L
2	0.16251	16.99	9.59	0.02	10.00	36.60	55.34	-18.73	AV	L
3	0.19447	28.37	9.62	0.02	10.005	48.01	63.84	-15.83	QP	L
4	0.19457	18.75	9.62	0.02	10.00	38.39	53.84	-15.45	AV	L
5	0.25751	20.97	9.63	0.03	10.00	40.63	61.51	-20.88	QP	L
6	0.25761	12.02	9.63	0.03	10.00	31.68	51.51	-19.83	AV	L
7	4.02746	9.96	9.65	0.06	10.00	29.67	56.00	-26.33	QP	L
8	4.02846	-6.62	9.65	0.06	10.00	13.09	46.00	-32.91	AV	L
9	10.79003	20.46	9.69	0.08	10.00	40.23	60.00	-19.77	QP	L
10	10.79103	7.58	9.69	0.08	10.00	27.35	50.00	-22.65	AV	L
11	17.01810	12.57	9.73	0.11	10.00	32.41	60.00	-27.59	QP	L
12	17.01910	3.91	9.73	0.11	10.00	23.75	50.00	-26.25	AV	L

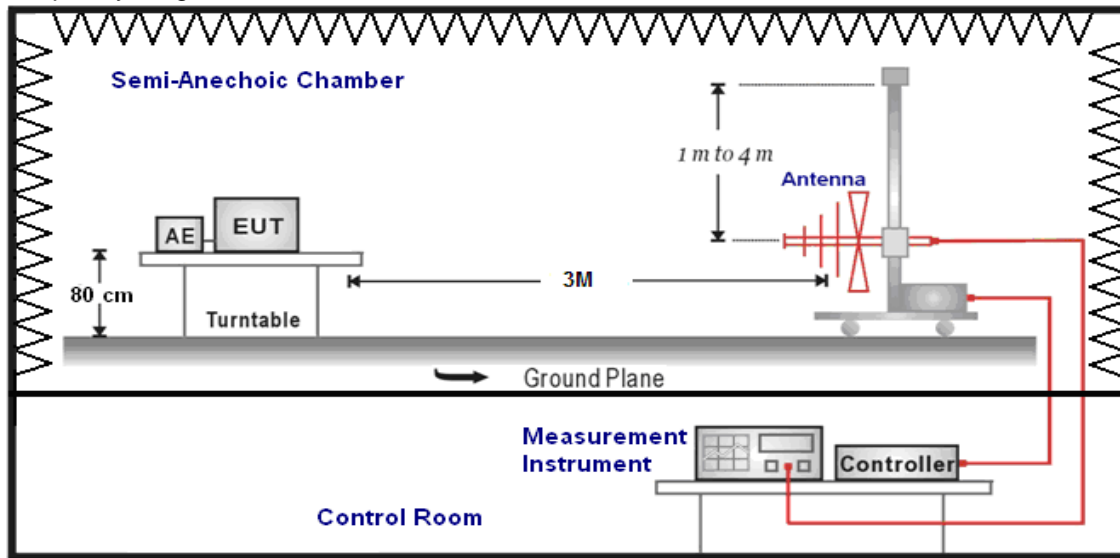
Remark:

1. Measured = Reading + LISN Factor + Cable Loss + Atten\_Fac
2. Margin = Measured – Limit
3. The emission levels that are 20dB below the official limit are not reported.

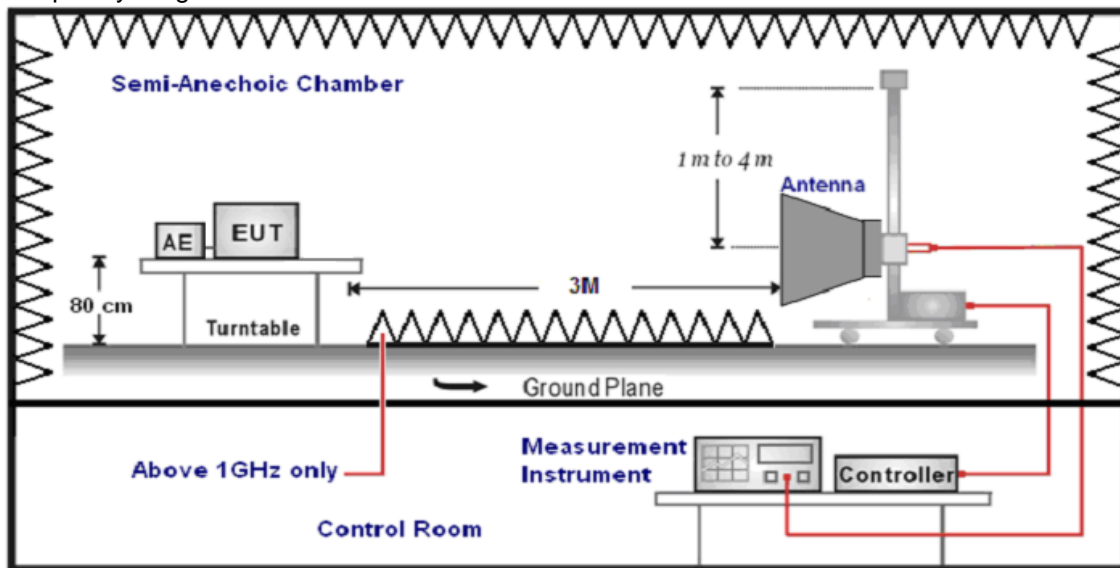
## 4.2. Radiated Emission Test

### TEST CONFIGURATION

Frequency range: 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



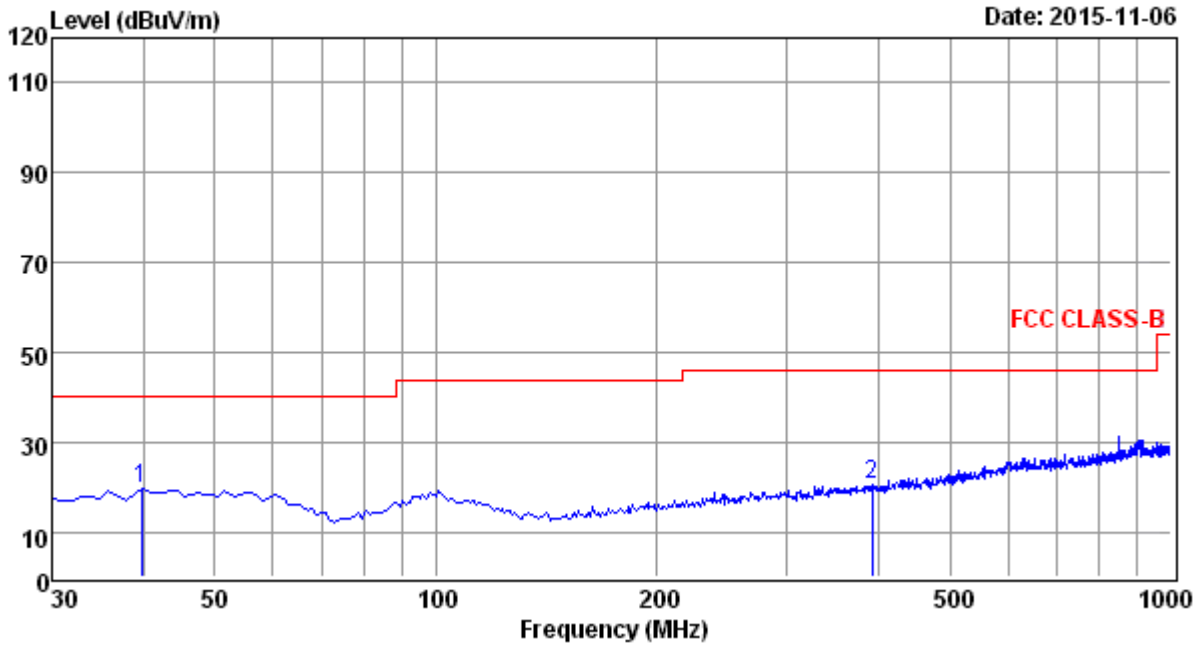
### TEST PROCEDURE

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 maximum CPU frequency was less than 512MHz, the radiated emission test frequency from 30 MHz to 6GHz.

### FIELD STRENGTH CALCULATION

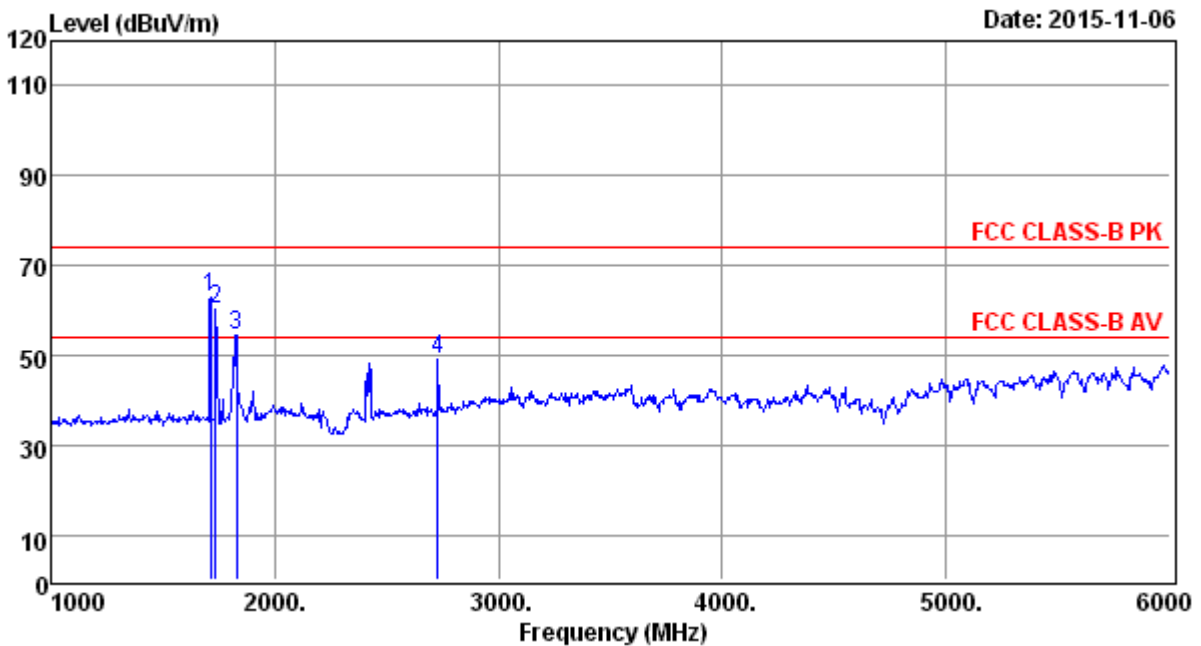
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:



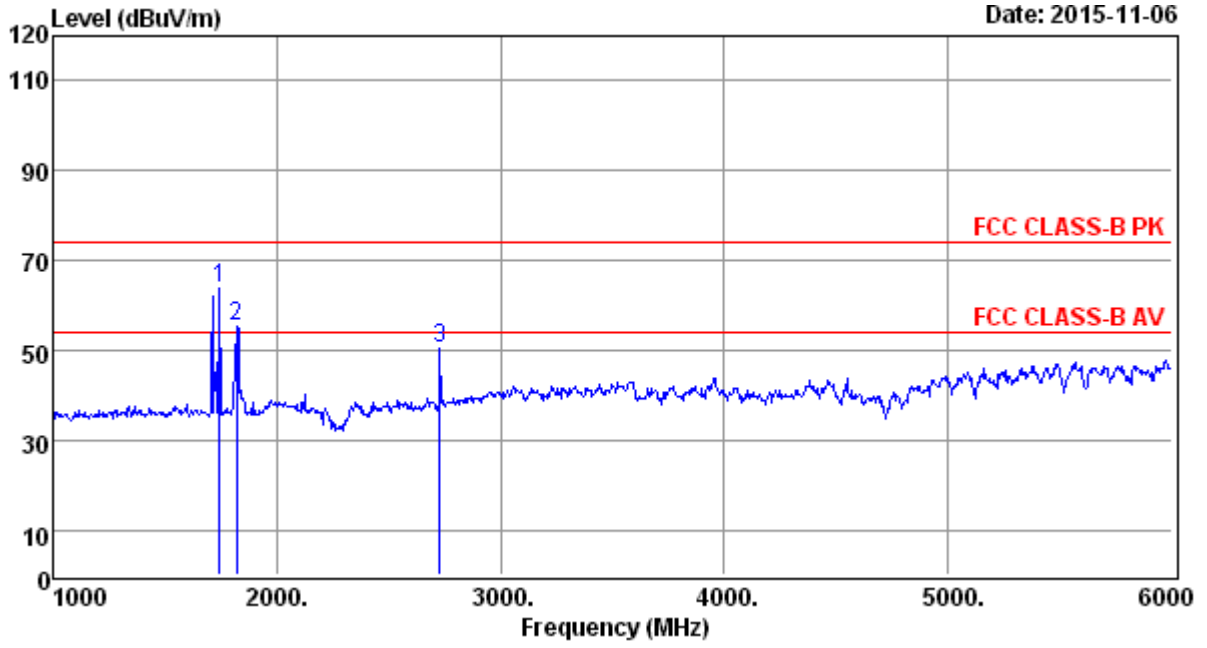


	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	39.70	5.67	0.38	13.50	19.55	40.00	-20.45	QP	V
2	391.81	4.31	1.20	14.87	20.38	46.00	-25.62	QP	V
3	---	---	---	---	---	---	---	---	V

**For 1GHz-6GHz**



	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifier Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1715.00	69.16	4.44	26.41	36.91	63.10	74.00	-10.99	Peak	H
1	1715.00	50.09	4.44	26.41	36.91	44.03	54.00	-9.97	AV	H
2	1735.00	66.23	4.45	26.42	37.01	60.09	74.00	-13.91	Peak	H
2	1735.00	49.10	4.45	26.42	37.01	42.96	54.00	-11.04	AV	H
3	1830.00	60.60	4.47	26.47	37.03	54.51	74.00	-19.49	Peak	H
3	1830.00	46.85	4.47	26.47	37.03	40.76	54.00	-13.24	AV	H
4	2730.00	52.48	5.52	28.37	37.08	49.29	74.00	-24.71	Peak	H

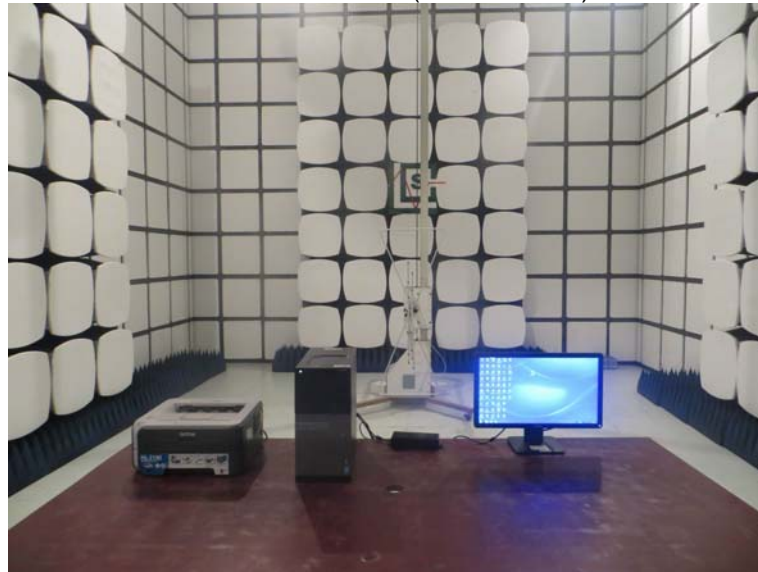


	Frequency MHz	Reading dBuV/m	Cable Loss dB	Antenna Factor dB/m	Amplifier Gain dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Pol.
1	1745.00	69.74	4.45	26.42	37.01	63.60	74.00	-10.40	Peak	H
1	1745.00	50.26	4.45	26.42	37.01	44.12	54.00	-9.88	AV	H
2	1820.00	61.34	4.46	26.46	37.02	55.24	74.00	-18.76	Peak	H
2	1820.00	45.87	4.46	26.46	37.02	39.77	54.00	-14.23	AV	H
3	2730.00	53.76	5.52	28.37	37.08	50.57	74.00	-23.43	Peak	H



## 5. Test Setup Photos of the EUT

Radiated emission (30MHz-1GHz)



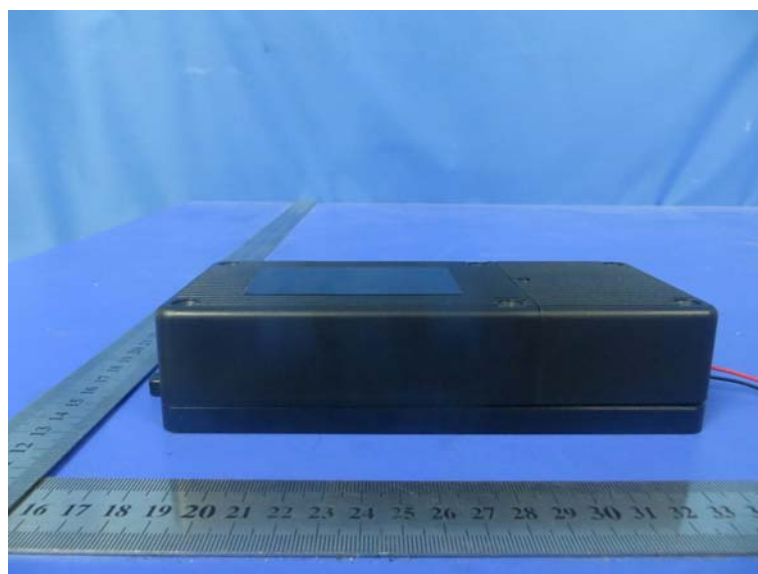
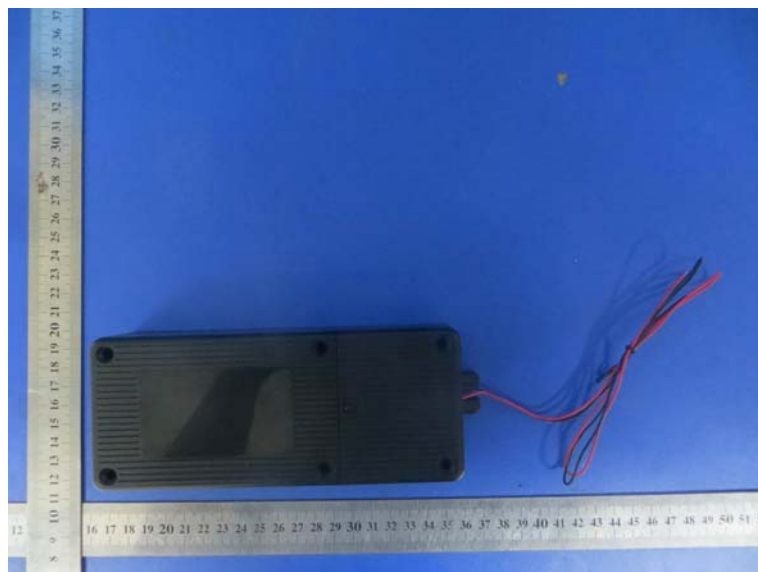
Radiated emission (1GHz-10GHz)

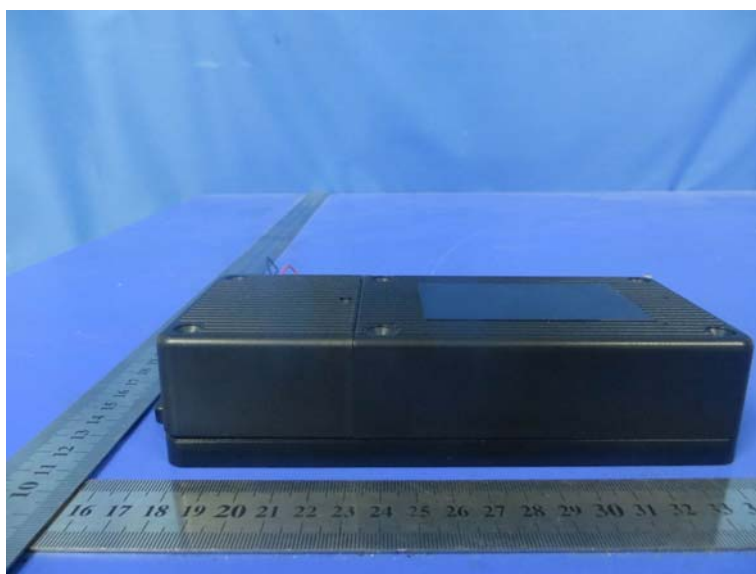
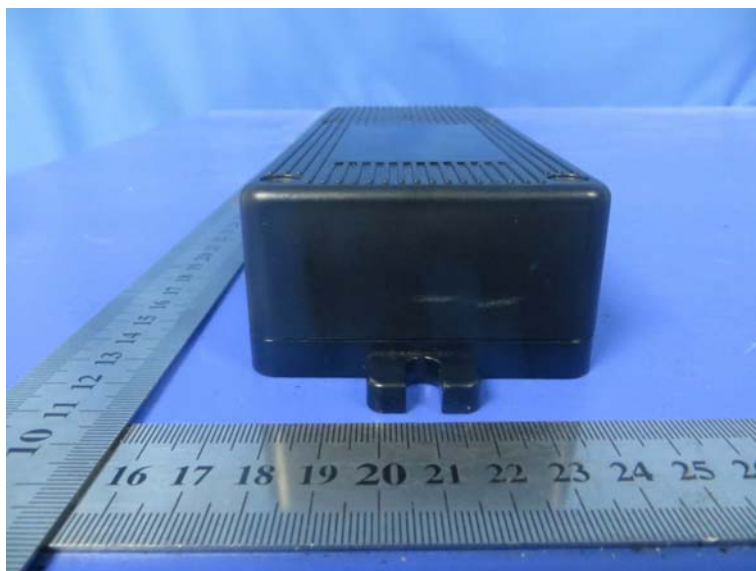


Conducted emission (0.15MHz-30MHz)

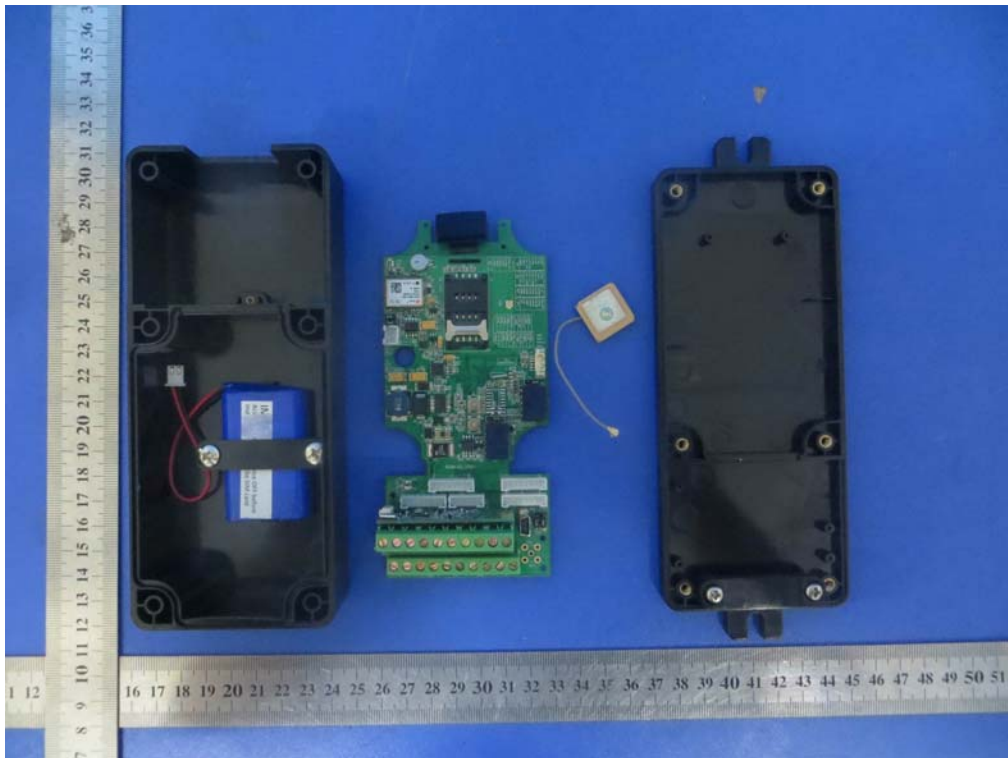


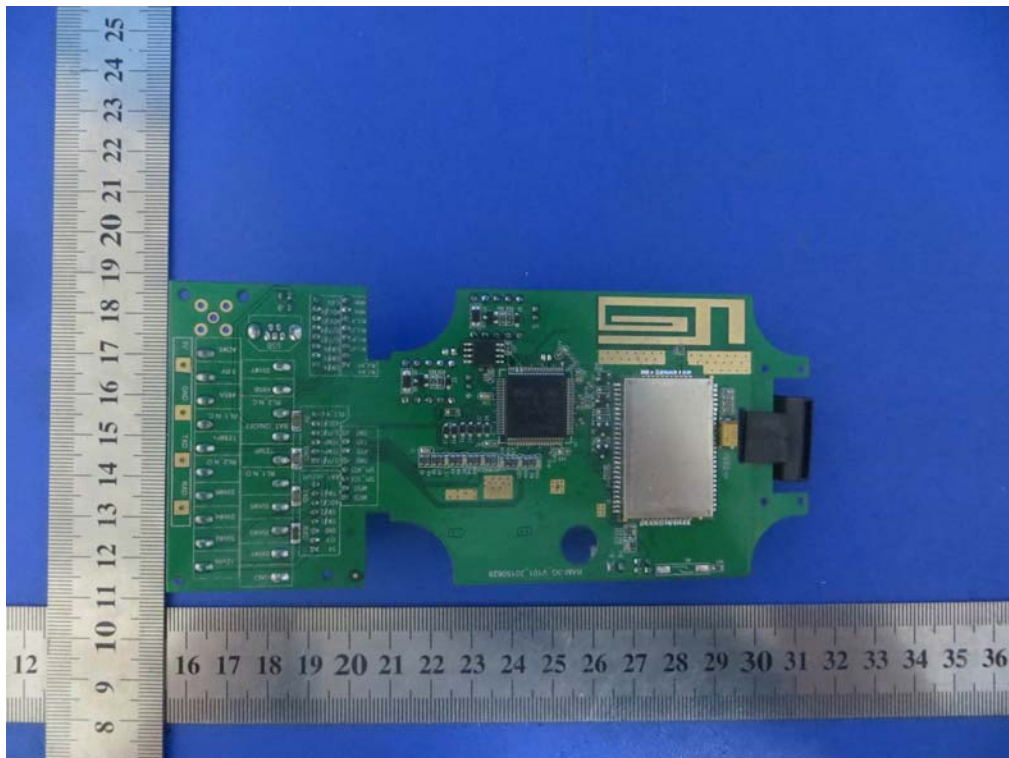
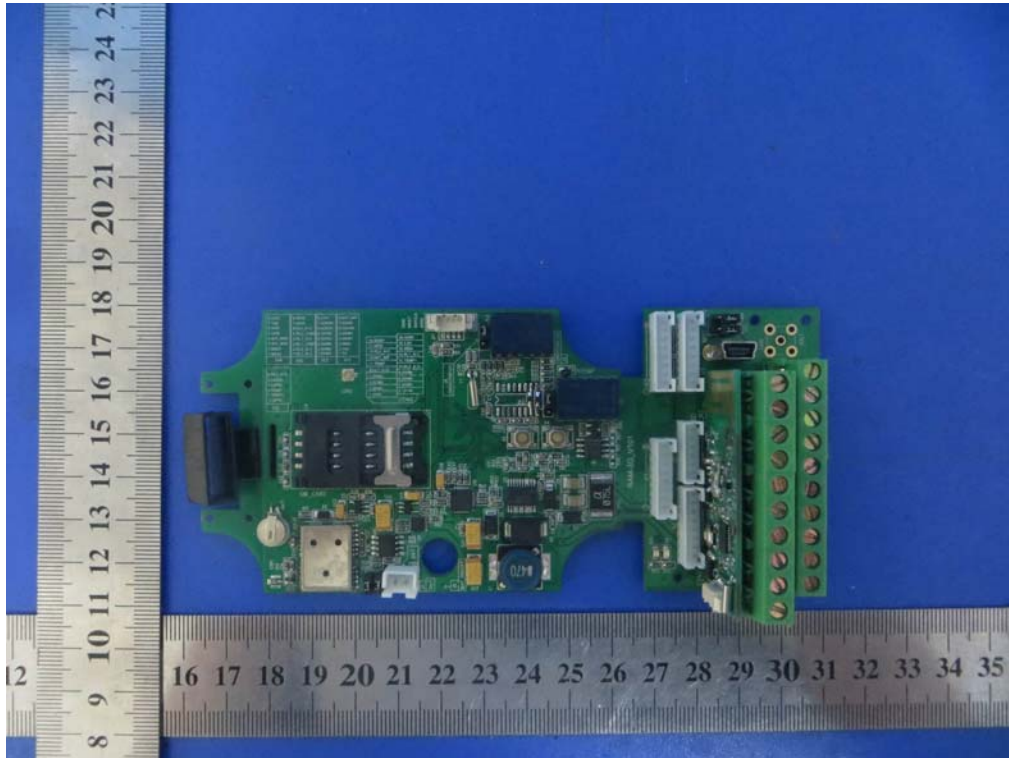
## 6. External Photos of the EUT

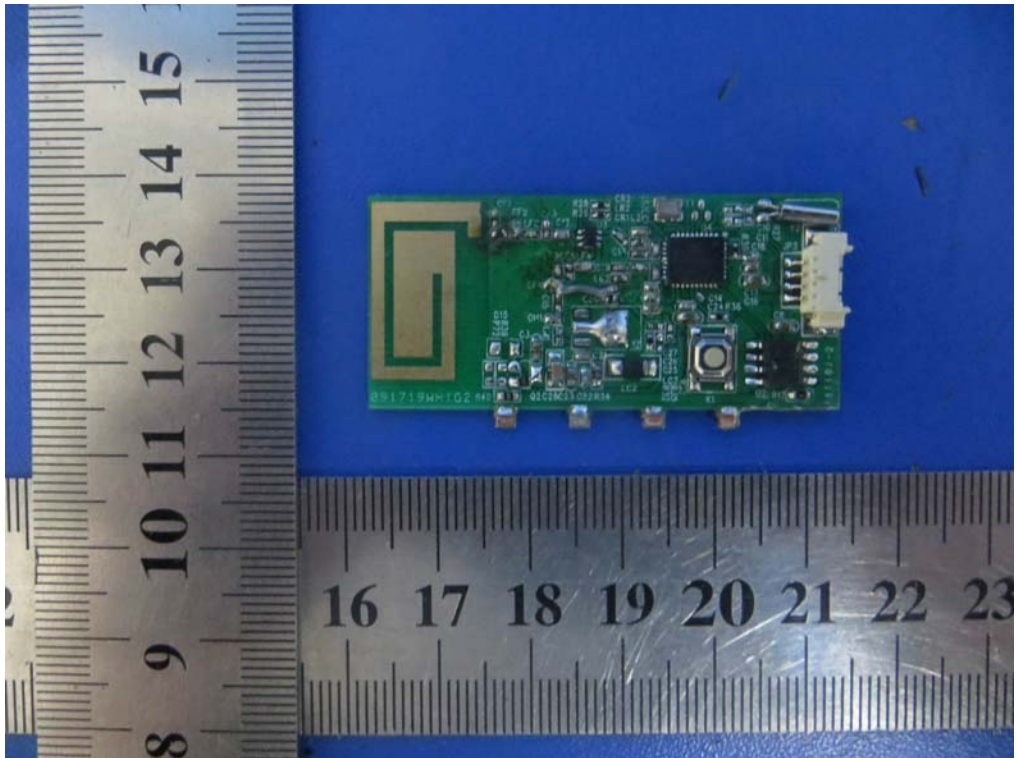
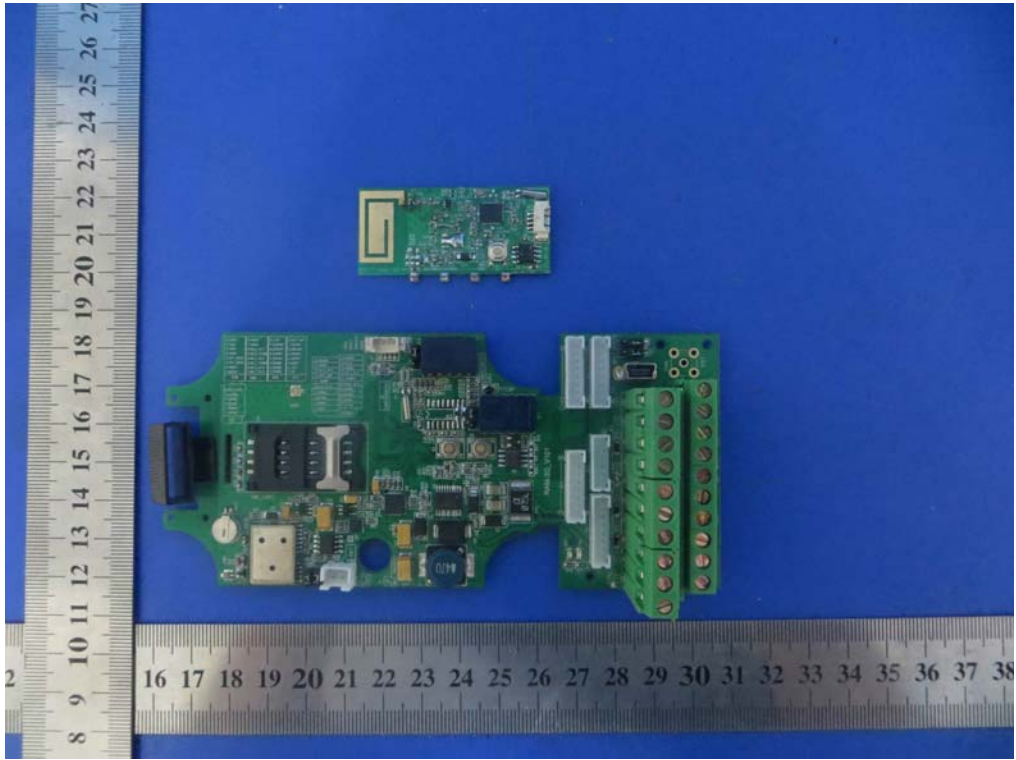


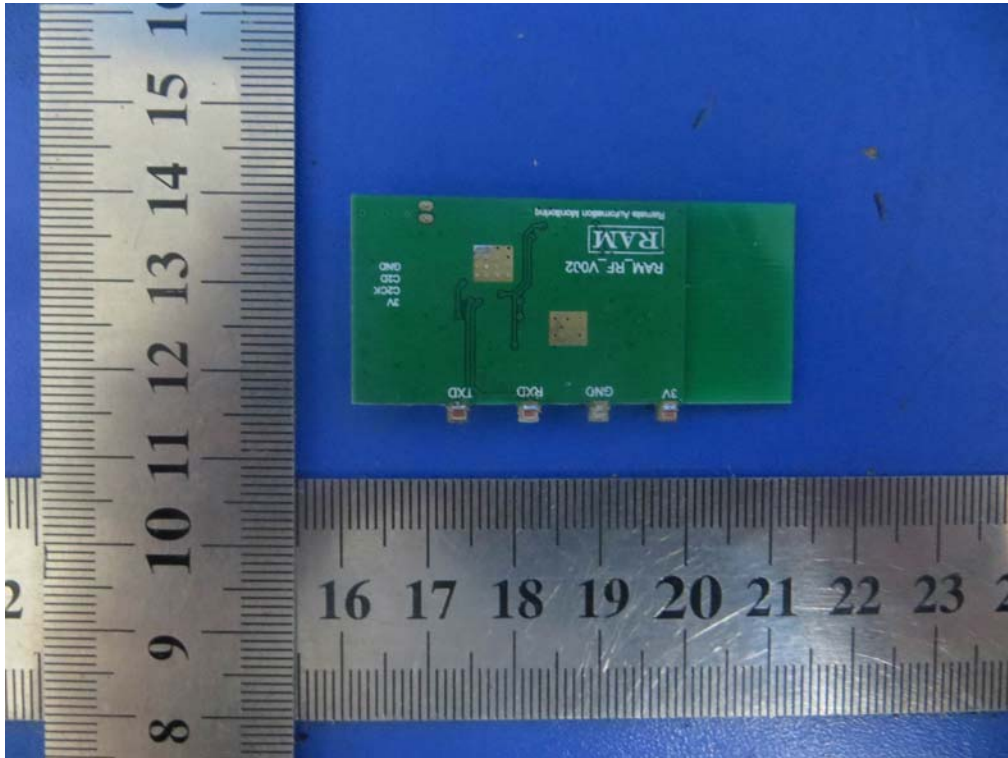


## 7. Internal Photos of the EUT









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