

FCC
EMC
TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
Bluetooth low energy module

ISSUED TO
MIR Medical International Research

via del Maggiotino 125, 00155 Rome Italy



Prepared by:



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(Reporting Specialist)

Date Nov 18, 2014

Approved by:

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(Chief Engineer)

Date Nov 18, 2014

Report No.: BL-SZ14B0057-401

EUT Type: Bluetooth low energy module

Model Name: MIR060

Brand Name: MIR

Test Standard: 47 CFR Part 15 Subpart B

FCC ID: TUKMIR059

Test conclusion: PASS

Test Date: Nov 14, 2014 ~ Nov 18, 2014

Date of Issue: Nov 18, 2014

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Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Nov 18, 2014</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6683 3402
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625. The laboratory has met the requirements of the IAS Accreditation Criteria for Testing Laboratories (AC89), has demonstrated compliance with ISO/IEC Standard 17025:2005. The accreditation certificate number is TL-588. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Announce

- (1) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (2) The test report is invalid if there is any evidence and/or falsification.
- (3) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (4) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant

Applicant	MIR Medical International Research
Address	via del Maggiotino 125, 00155 Rome Italy

2.2 Manufacturer

Manufacturer	MIR Medical International Research
Address	via del Maggiotino 125, 00155 Rome Italy

2.3 General Description for Equipment under Test (EUT)

EUT Type	Bluetooth low energy module
The Under Test Model Name	MIR060
Hardware Version	0
Software Version	1.5
Network and Wireless connectivity	Bluetooth 4.0 Low Energy (BLE)
About the Product	The equipment is Bluetooth low energy module, it is a pocket spirometer, with an optional pulse oximetry module. It can operate either in stand-alone mode or it can be connected to a PC or to a printer using any one of several methods: USB, Bluetooth.

2.4 Ancillary Equipment

Ancillary Equipment 1	Charger	
	Brand Name	N/A
	Model No	FW7662M/05
	Serial No	(N/A. marked #1 by test site)
	Input	~ 100V~240V, 50~60Hz, 150mA
	Output	= 5V, 1.1A
Ancillary Equipment 2	Battery	
	Brand Name	N/A
	Model No	1S1P/UF553450Z
	Serial No	(N/A. marked #1 by test site)
	Capacitance	1100mAh
	Rated Voltage	3.7V
	Extreme Voltage	Low: 3.3V / High: 4.2V

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	FCC 47 CFR Part 15 Subpart B (10-1-13 Edition)	Unintentional Radiators
2	ANSI C63.4-2014	American National Standard for Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Verdict

No.	Description	FCC Rule	Test Verdict	Result
1	Radiated Emission	15.109	PASS	Annex A .1
2	Conducted Emission, AC Ports	15.107	PASS	Annex A .2

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
Conducted emissions (9KHz-30MHz)	1.12 dB
Radiated emissions (30MHz-1GHz)	2.11 dB
Radiated emissions (1GHz-18GHz)	3.31 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment Parameter	Selected Values During Tests			
	Temperature	Voltage	Relative Humidity	Ambient Pressure
Normal Temperature, Normal Voltage (NTNV)	23°C~26°C	DC 5V	45%-55%	100 to 102 kPa

4.2 Test Equipment List

Radiated Emission Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2014.07.07	2015.07.06	☒
Test Antenna- Loop(9kHz- 30MHz)	SCHWARZBECK	FMZB 1519	1519-037	2013.07.02	2015.07.01	☒
Test Antenna- Bi-Log(30MHz -3GHz)	SCHWARZBECK	VULB 9163	9163-624	2013.07.03	2015.07.02	☒
Test Antenna- Horn(1- 18GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2013.07.02	2015.07.01	☒
Test Antenna- Horn(15- 26.5GHz)	SCHWARZBECK	BBHA 9170	9170-305	2013.07.02	2015.07.01	☐
Anechoic Chamber	RAINFORD	9m*6m*6 m	N/A	2014.10.07	2015.10.06	☒

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2014.07.07	2015.07.06	☒
LISN	SCHWARZBECK	NSLK 8127	8127-687	2014.07.07	2015.07.06	☒
AMN	SCHWARZBECK	NNBM812 4	8124-509	2014.07.07	2015.07.06	☐
AMN	SCHWARZBECK	NNBM812 4	8124-510	2014.07.07	2015.07.06	☐
ISN	TESEQ	ISN T800	34449	2014.07.07	2015.07.06	☐
Shielded Enclosure	ChangNing	CN-13070 1	130703	N/A	N/A	☒

4.3 Test Enclosure list

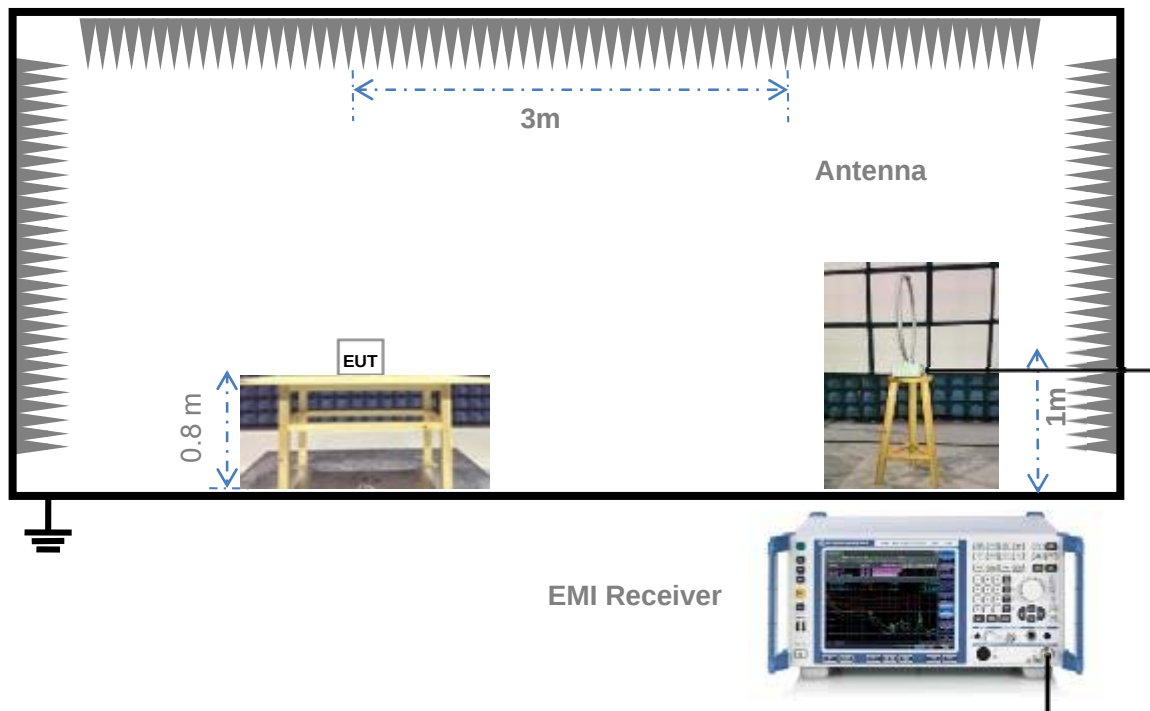
Description	Manufacturer	Model	Serial No.	Length	Description	Use
PC	N/A	N/A	N/A	N/A	Special Handled	☒
Printer	HP	DESKJET 1000	N/A	N/A	N/A	☒
Keyboard	Logitech	Y-BP62a	N/A	N/A	N/A	☒
Mouse	Logitech	M100	N/A	N/A	N/A	☒
USB disk	Kingston	N/A	N/A	N/A	N/A	☐
TF Card	Kingston	N/A	N/A	N/A	N/A	☐
VGA Cable	N/A	N/A	N/A	1.5m	Shielded with core	☐
HDMI Cable	N/A	N/A	N/A	1.5m	Shielded with core	☐
DVI Cable	N/A	N/A	N/A	1.5m	Shielded with core	☐
Coaxial video cable	N/A	N/A	N/A	2m	Shielded with core	☐
Phone	BBK	HCD007TSD	N/A	N/A	N/A	☐
laptop	LENOVO	K29	N/A	N/A	N/A	☐

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The PC Test mode</u> The EUT configuration of the emission tests is EUT + USB cable + PC+ Keyboard + Mouse + Printer. During the measurement, the EUT is connected to a PC via a USB cable (or to another computerised system) to configure the instrument. All spirometry test data including the related patient details stored inside the device can be transferred from the device to the PC and then viewed on the PC (Flow/volume curves, spirometry parameters, plus optional oximetry parameters). The EUT is connected with a Printer via a cable, the test data is printed by the printer.
TC02	<u>The Charge Test mode</u> The EUT configuration of the emission tests is EUT + Charger. During the measurement, the EUT is power on, and charged by the AC power.

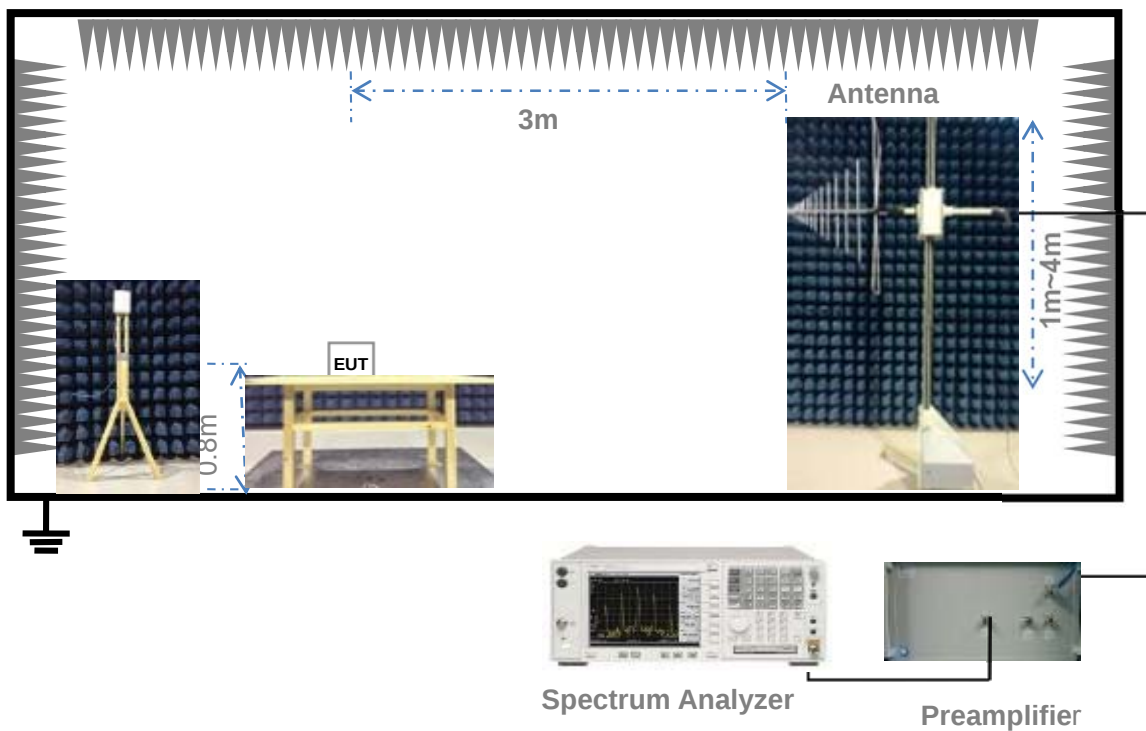
4.5 Test Setups

Test Setup 1



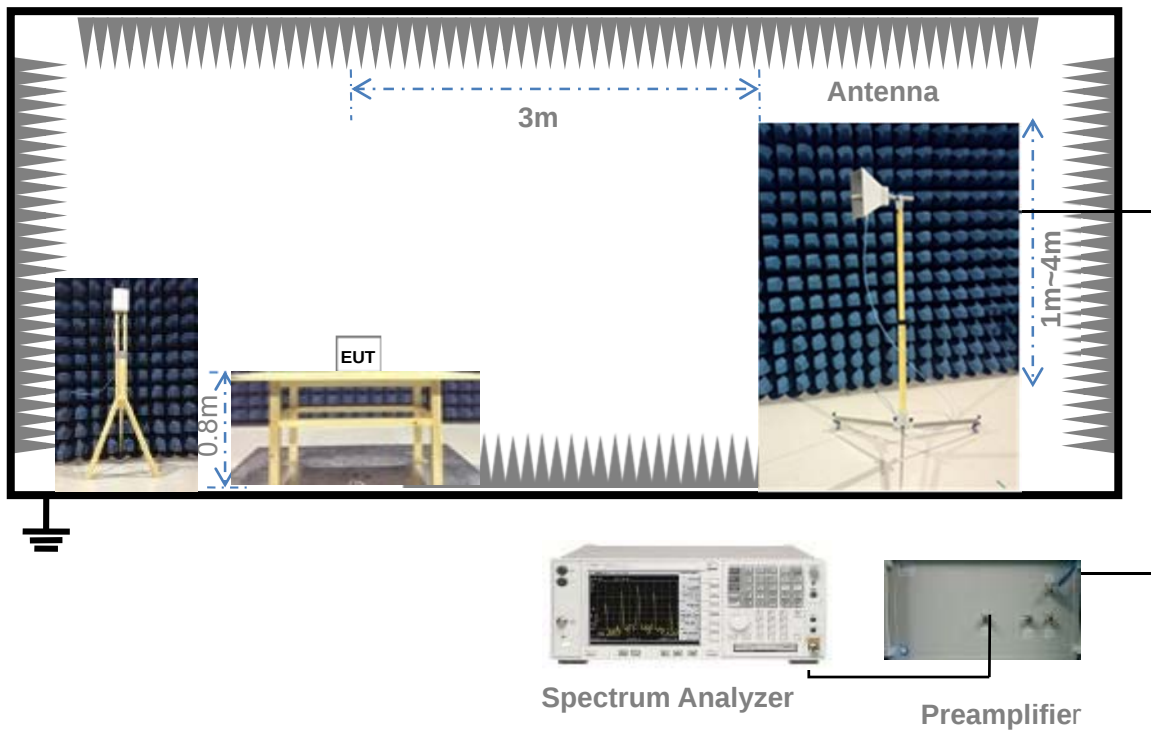
For Radiated Emission Test (Below 30MHz)

Test Setup 2



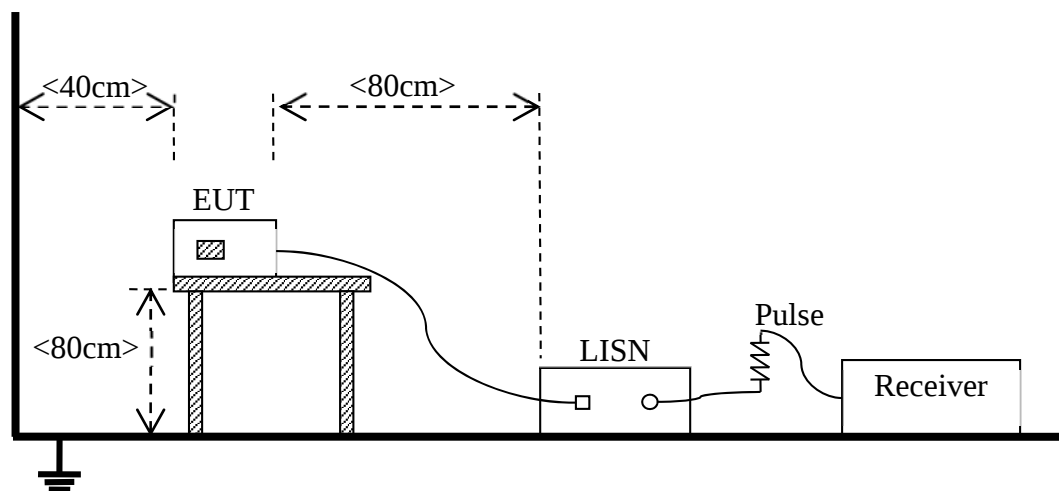
(For Radiated Emission Test (30MHz-1GHz))

Test Setup 3



(For Radiated Emission Test (above 1GHz))

Test Setup 4



(For Conducted Emission, AC Ports Test)

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Env.	NTNV
	Test Setup	Test Setup 1&3
	Test Configuration	TC01~TC02 ^{Note}
Conducted Emission, AC Ports	Test Env.	NTNV
	Test Setup	Test Setup 4
	Test Configuration	TC01~TC02 ^{Note}

Note: Because there is no instruction, and only the PC test mode is tested in this report.

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

NOTE:

- 1) Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log [\text{Field Strength } (\mu\text{V/m})]$.
- 2) In the emission tables above, the tighter limit applies at the band edges.
- 3) For above 1000MHz, limit field strength of harmonics: $54\text{dB}\mu\text{V/m}@3\text{m}$ (AV) and $74\text{dB}\mu\text{V/m}@3\text{m}$ (PK)

5.1.1.2 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- 1) The limit is applicable to Class B ITE.
- 2) The lower limit shall apply at the band edges.
- 3) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

5.1.2.2 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

ANNEX A TEST RESULTS

A.1 Radiated Emission

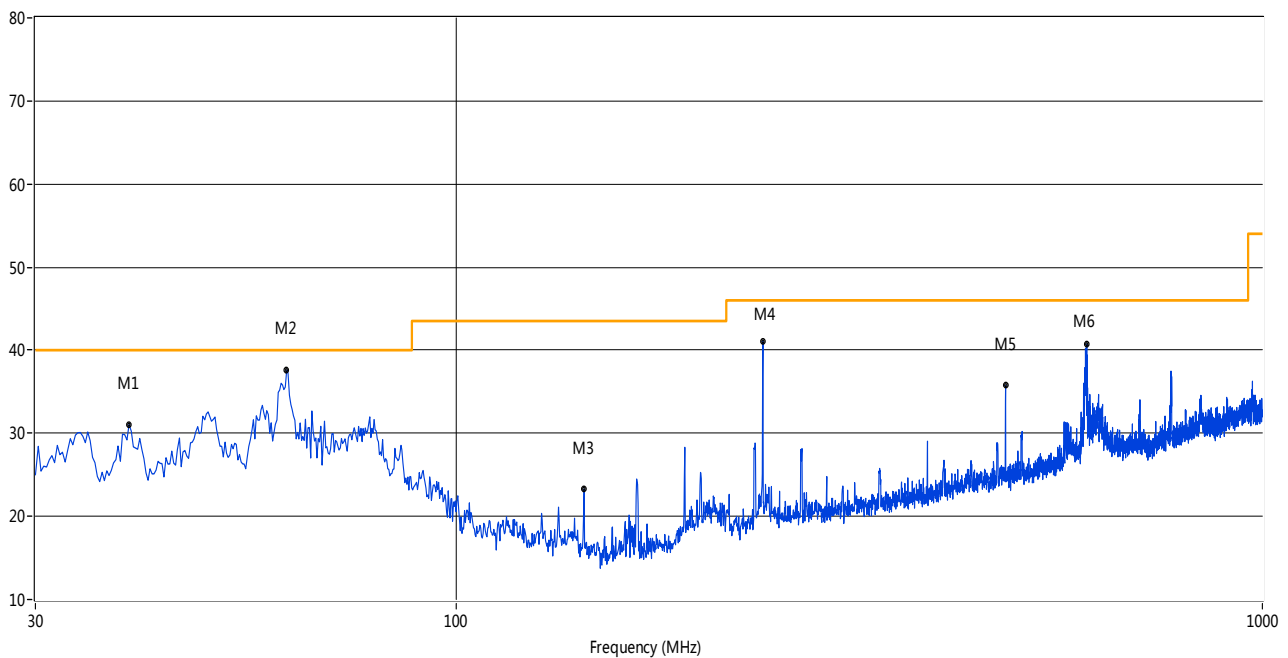
Note 1: The symbol of “--” in the table which means not application.

Note 2: For the test data above 1GHz, According the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Test Data and Plots (PC test mode)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

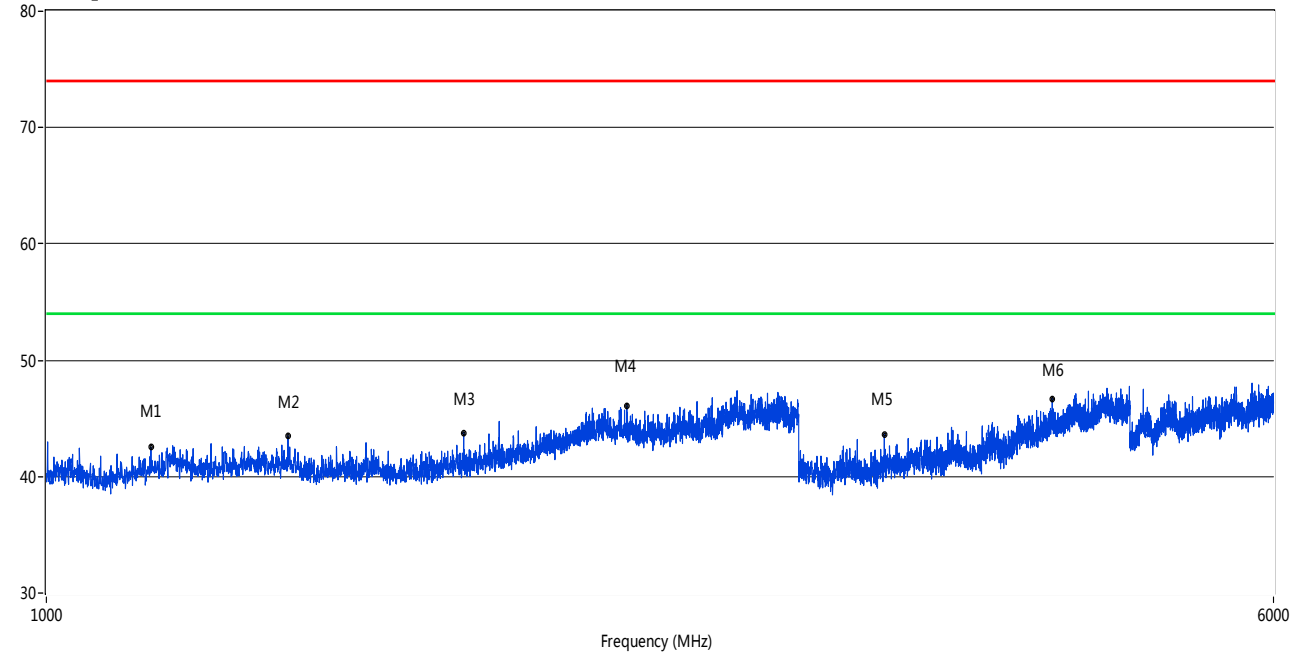
A.1.1 Test Antenna Vertical, 30MHz – 1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	39.21	31.05	-19.96	40.0	8.95	Peak	71.60	100	Vertical	PASS
2	61.52	37.62	-20.23	40.0	2.38	Peak	343.40	100	Vertical	PASS
2*	61.52	33.67	-20.23	40.0	6.33	QP	343.40	100	Vertical	PASS
3	143.95	23.31	-23.56	43.5	20.19	Peak	66.00	100	Vertical	PASS
4	239.95	41.08	-19.10	46.0	4.92	Peak	82.70	100	Vertical	PASS
5	479.97	35.76	-13.81	46.0	10.24	Peak	337.80	100	Vertical	PASS
6	605.31	40.75	-10.66	46.0	5.25	Peak	160.10	100	Vertical	PASS

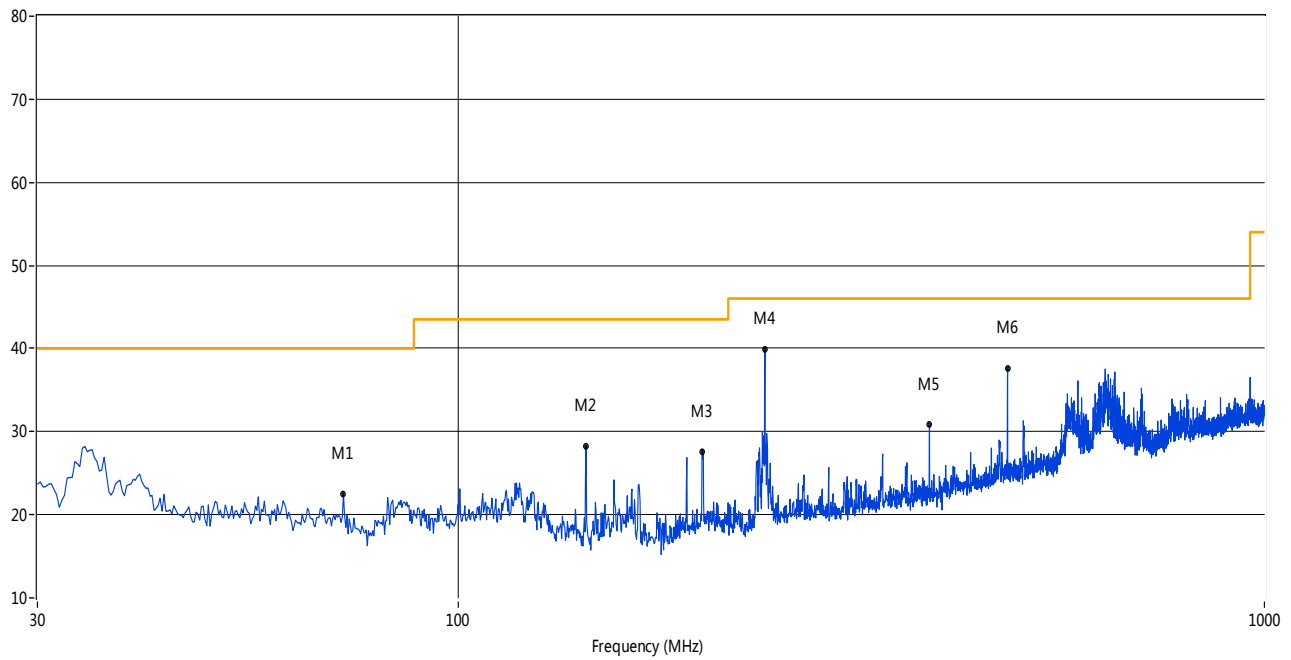
A.1.2 Test Antenna Vertical, 1GHz – 6GHz

RE Test case_FCC 15B 1GHz-6GHz



Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1164.96	42.53	--	--	-5.95	74.0	--	54.0	11.47	11.60	100	Vertical	PASS
1422.89	43.50	--	--	-5.04	74.0	--	54.0	10.50	256.80	100	Vertical	PASS
1839.29	43.79	--	--	-3.87	74.0	--	54.0	10.21	177.20	100	Vertical	PASS
2333.67	46.10	--	--	-1.03	74.0	--	54.0	7.90	67.00	100	Vertical	PASS
3398.90	43.66	--	--	8.74	74.0	--	54.0	10.34	358.50	100	Vertical	PASS
4343.66	46.73	--	--	11.64	74.0	--	54.0	7.27	360.30	100	Vertical	PASS

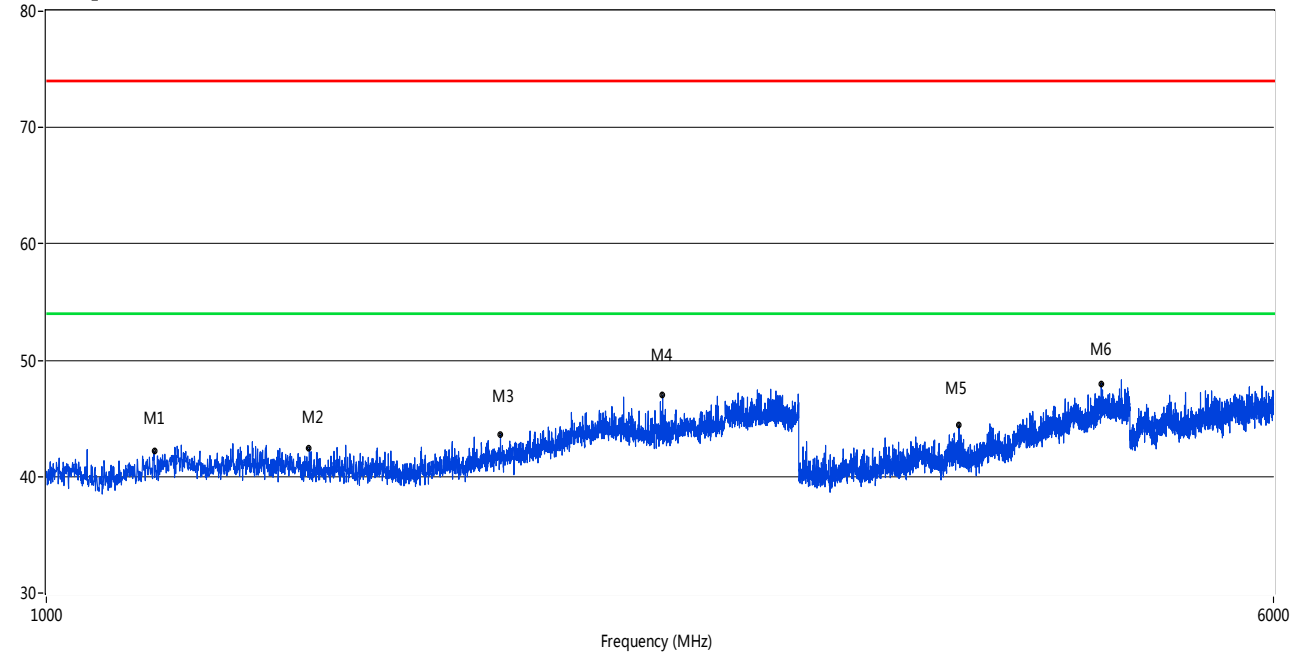
A.1.3 Test Antenna Horizontal, 30MHz – 1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	71.94	22.54	-23.54	40.0	17.46	Peak	104.60	100	Horizontal	PASS
2	143.95	28.28	-23.56	43.5	15.22	Peak	26.40	100	Horizontal	PASS
3	200.68	27.57	-20.19	43.5	15.93	Peak	76.50	100	Horizontal	PASS
4	239.95	39.87	-19.10	46.0	6.13	Peak	76.50	100	Horizontal	PASS
5	383.96	30.79	-15.58	46.0	15.21	Peak	71.00	100	Horizontal	PASS
6	479.97	37.60	-13.81	46.0	8.40	Peak	71.00	100	Horizontal	PASS

A.1.4 Test Antenna Horizontal, 1GHz – 6GHz

RE Test case_FCC 15B 1GHz-6GHz

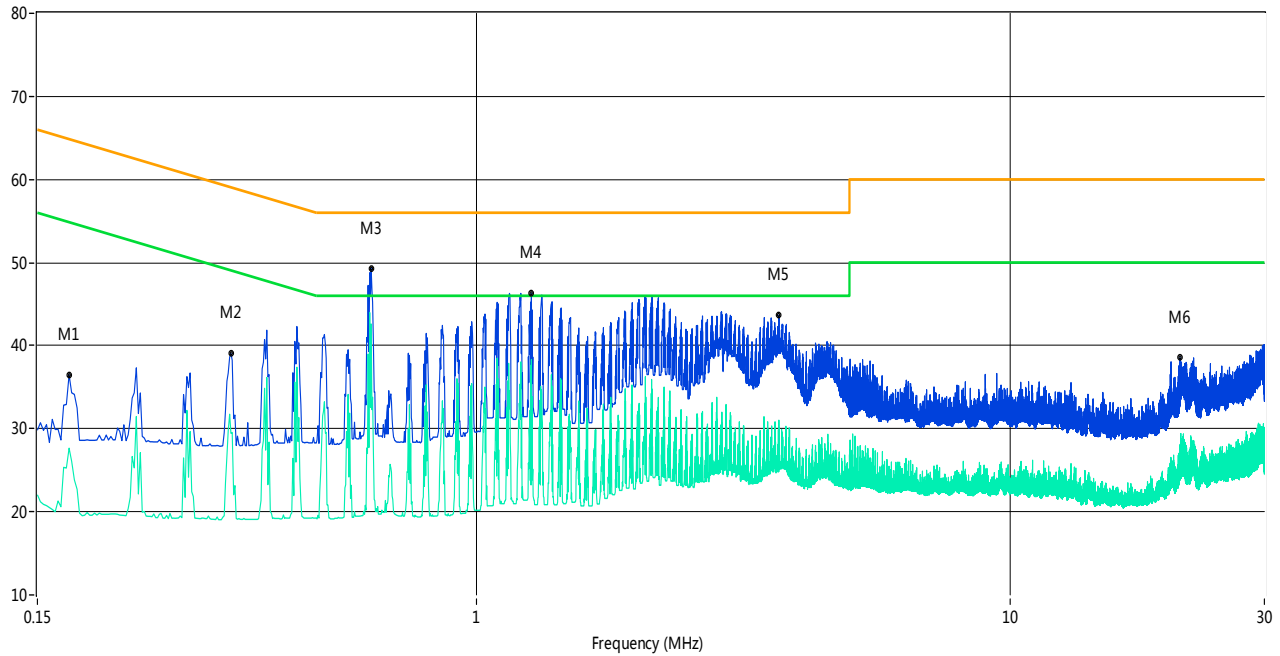


Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
1170.46	42.15	--	--	-5.87	74.0	--	54.0	11.85	221.80	100	Horizontal	PASS
1467.88	42.50	--	--	-4.61	74.0	--	54.0	11.50	284.80	100	Horizontal	PASS
1940.76	43.64	--	--	-2.98	74.0	--	54.0	10.36	39.50	100	Horizontal	PASS
2459.14	46.99	--	--	-0.62	74.0	--	54.0	7.01	277.00	100	Horizontal	PASS
3790.30	44.39	--	--	10.21	74.0	--	54.0	9.61	219.50	100	Horizontal	PASS
4666.08	48.01	--	--	12.58	74.0	--	54.0	5.99	13.40	100	Horizontal	PASS

A.2 Conducted Emission

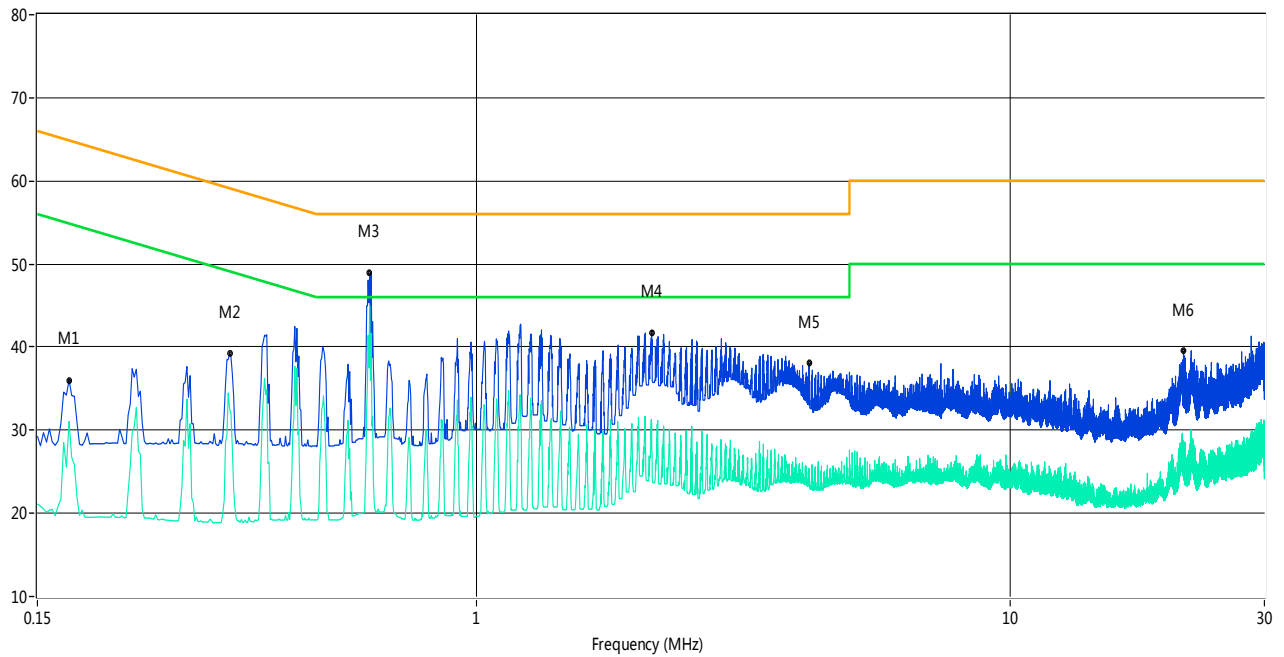
Test Data and Plots (PC test mode)

A.2.1 L Phase



Frequency (MHz)	Peak Level (dBuV)	Q-peak Level (dBuV)	Average Level (dBuV)	Factor (dB)	QP Limit (dBuV)	AV Limit (dBuV)	Margin (dB)	Line	Verdict
0.17	36.5	--	27.7	13.00	65.4	55.4	27.70	L Line	PASS
0.35	39.0	--	29.5	13.00	60.4	50.4	20.90	L Line	PASS
0.63	49.3	--	42.6	13.00	56.0	46.0	3.40	L Line	PASS
1.27	46.3	--	38.3	13.00	56.0	46.0	7.70	L Line	PASS
3.69	43.6	--	31.0	13.00	56.0	46.0	15.00	L Line	PASS
20.84	38.5	--	27.7	13.00	60.0	50.0	22.30	L Line	PASS

A.2.2 N Phase



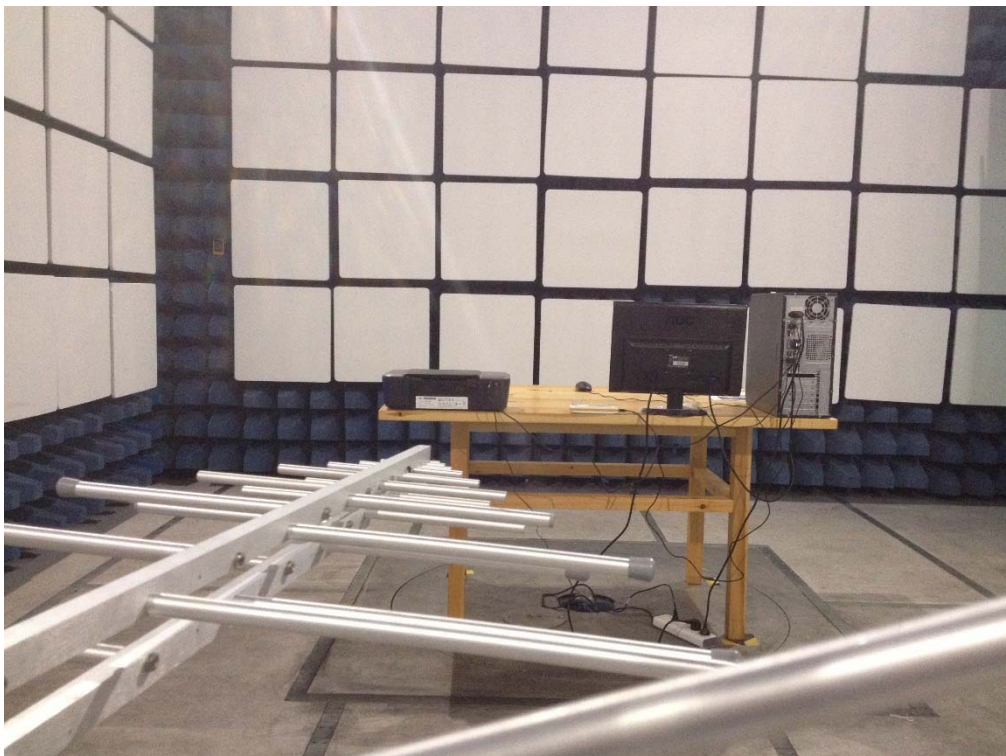
Frequency (MHz)	Peak Level (dBuV)	Q-peak Level (dBuV)	Average Level (dBuV)	Factor (dB)	QP Limit (dBuV)	AV Limit (dBuV)	Margin (dB)	Line	Verdict
0.17	36.0	--	31.0	13.00	65.4	55.4	24.40	N Line	PASS
0.34	39.2	--	32.5	13.00	60.5	50.5	18.00	N Line	PASS
0.63	48.9	--	45.0	13.00	56.0	46.0	1.00	N Line	PASS
2.13	41.7	--	30.9	13.00	56.0	46.0	15.10	N Line	PASS
4.20	38.0	--	25.0	13.00	56.0	46.0	21.00	N Line	PASS
21.16	39.5	--	27.7	13.00	60.0	50.0	22.30	N Line	PASS

ANNEX B TEST SETUP PHOTOS

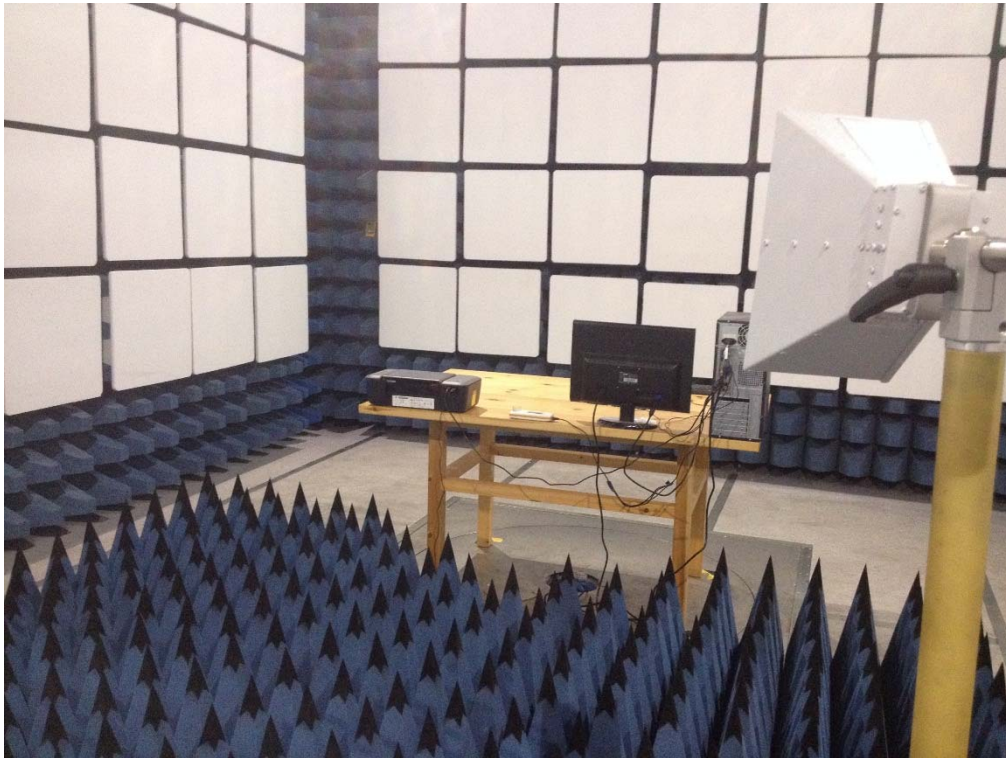
B.1 Radiated Field Strength Measurement



30MHz-1GHz (Charge test mode) Front

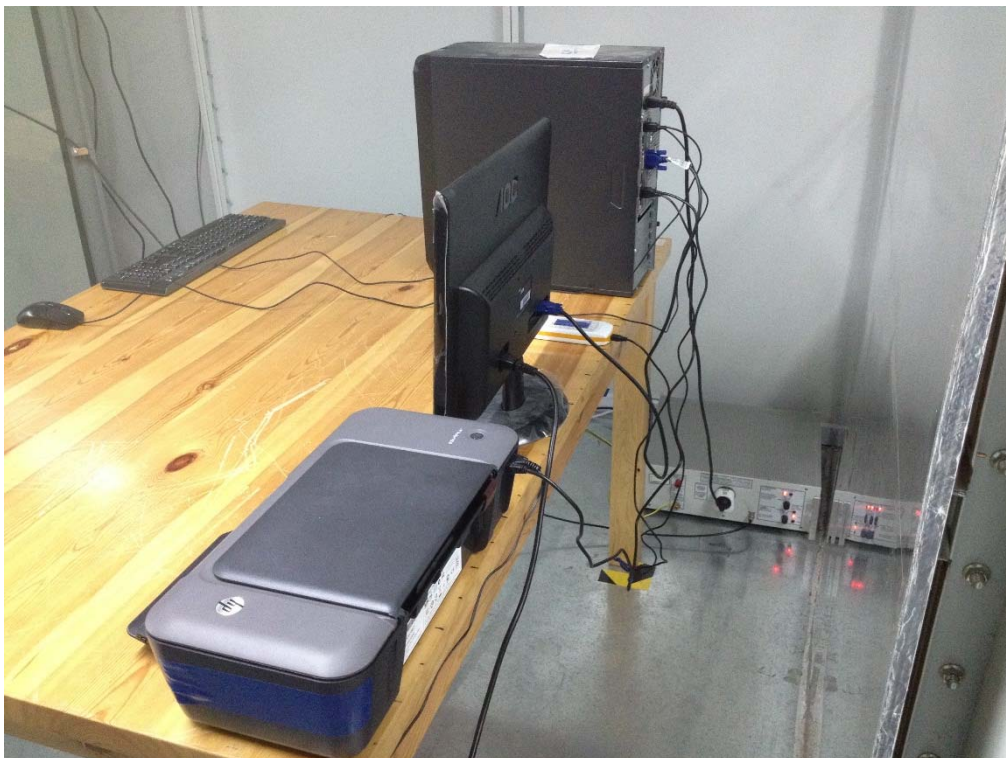


30MHz-1GHz (Charge test mode) Back



1GHz-6GHz (Charge test mode)

B.2 Conducted Emission





ANNEX C EUT PHOTOS

C.1 Appearance of the EUT



THE FRONT OF EUT



THE BACK OF EUT



THE LEFT OF EUT



THE RIGHT OF EUT



THE UP OF EUT



THE DOWN OF EUT



CHARGER

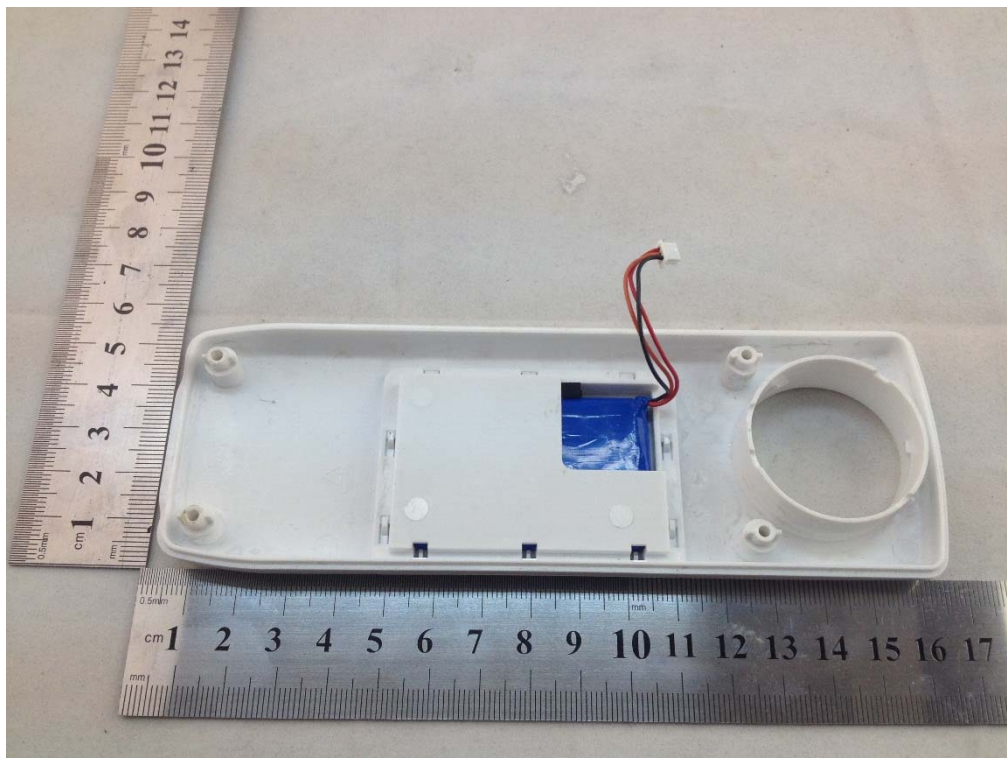


DATA CABLE

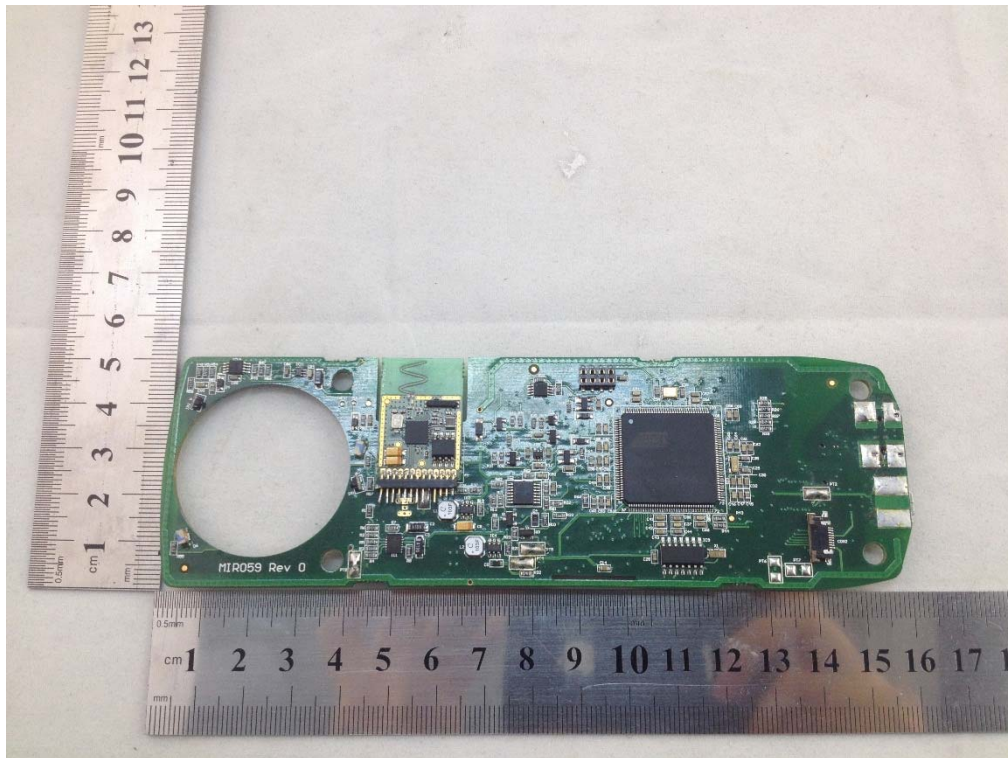
C.2 Inside of the EUT



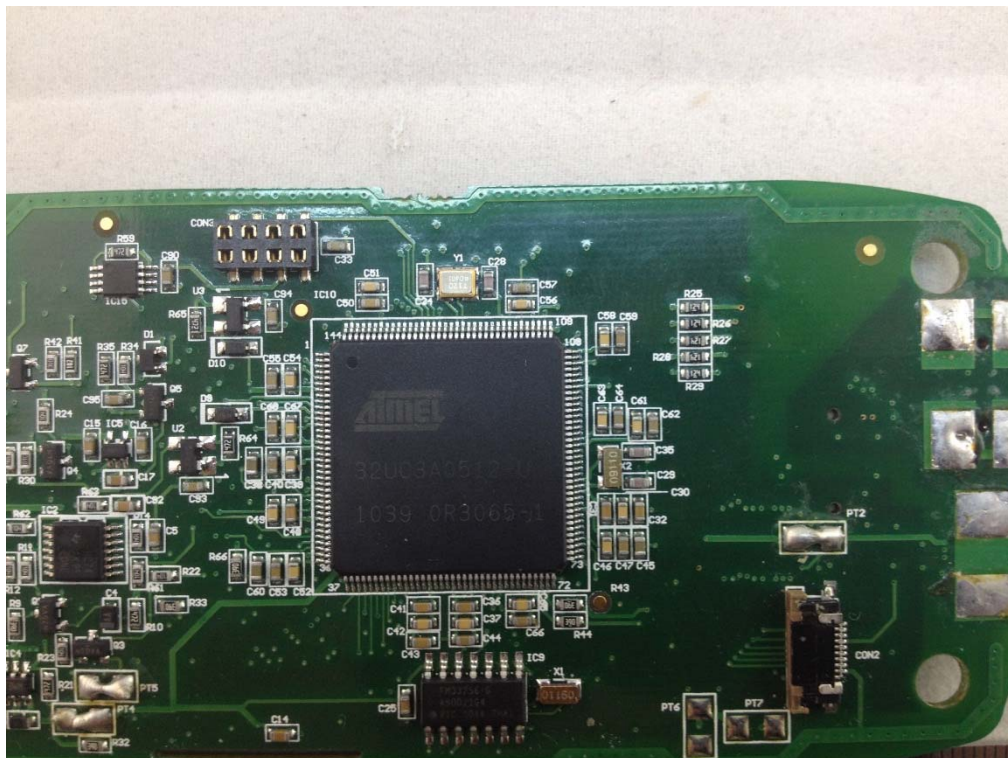
EUT UNCOVER VIEW 1



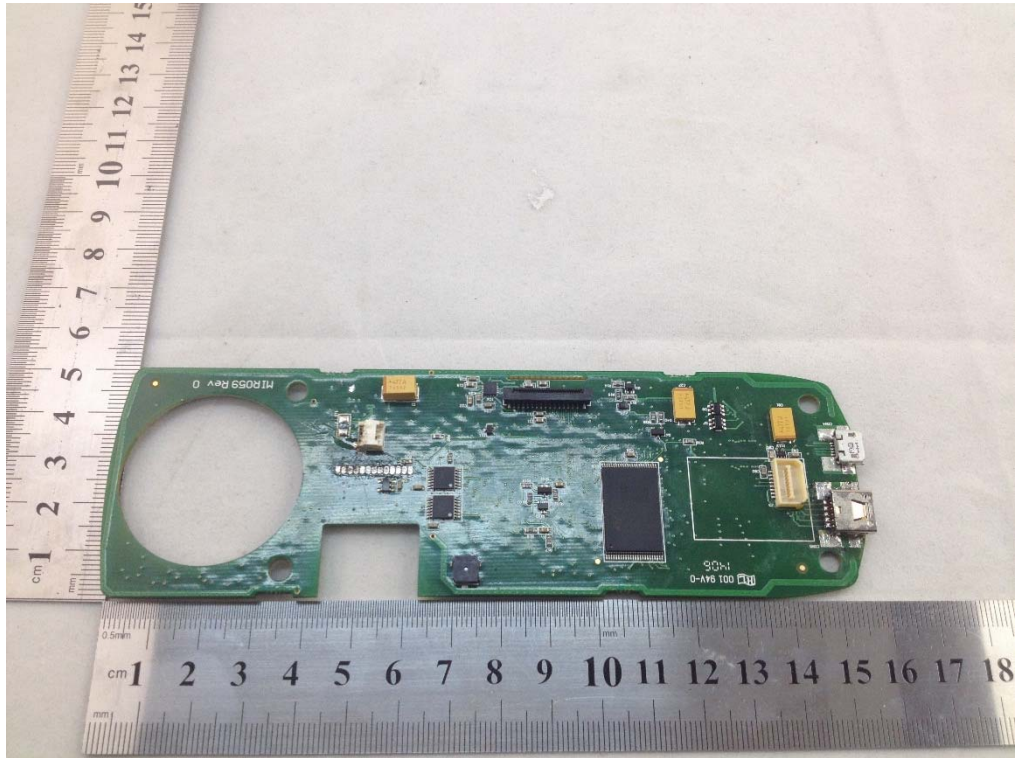
EUT UNCOVER VIEW 2



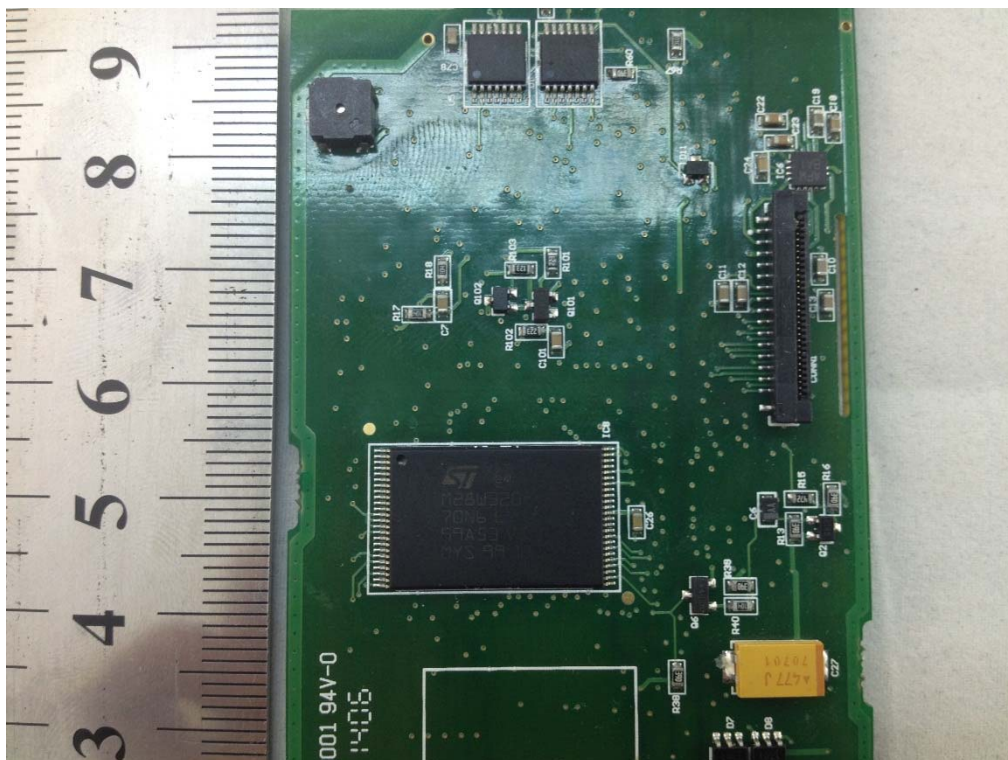
MAIN BOARD VIEW 1



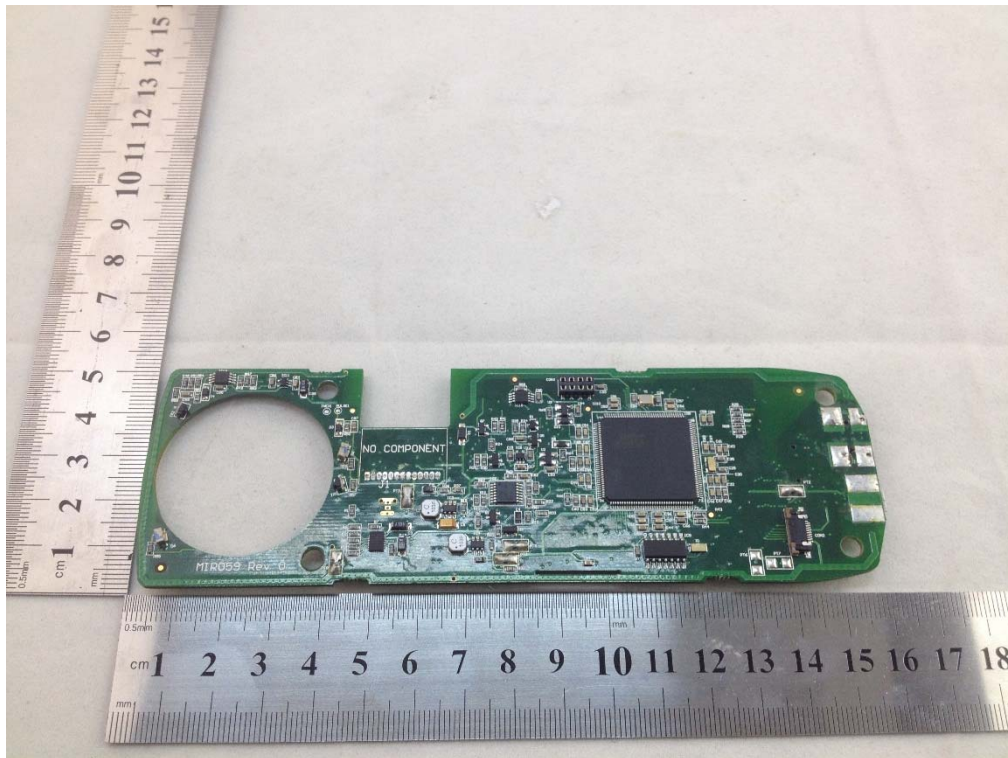
MAIN BOARD VIEW 2



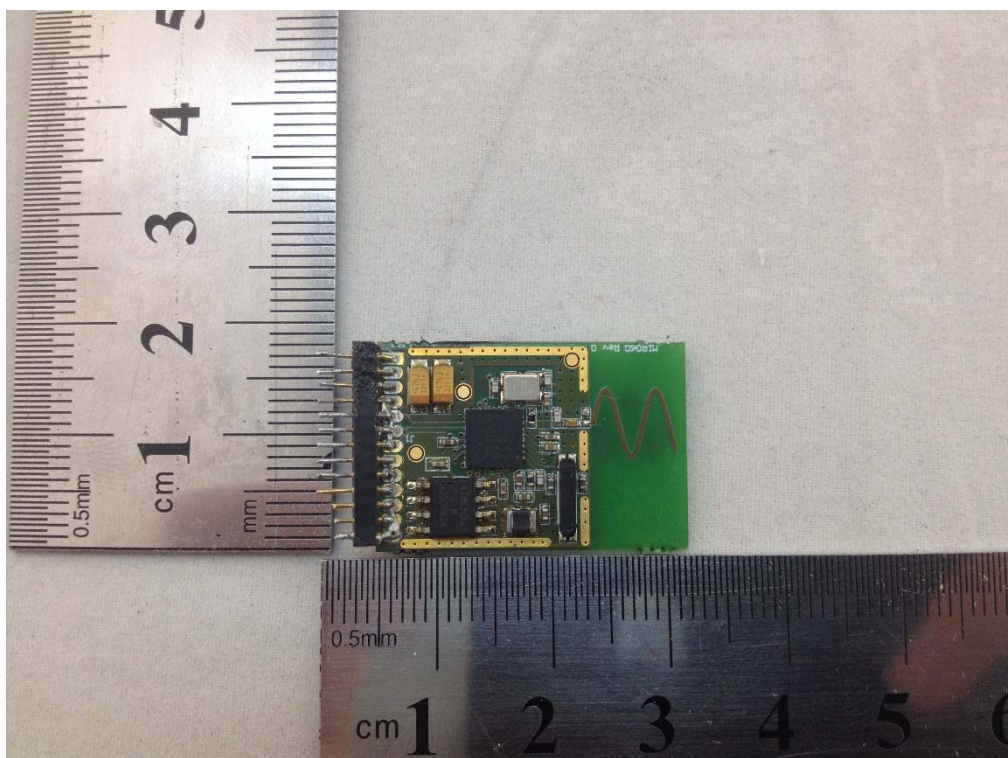
MAIN BOARD VIEW 3



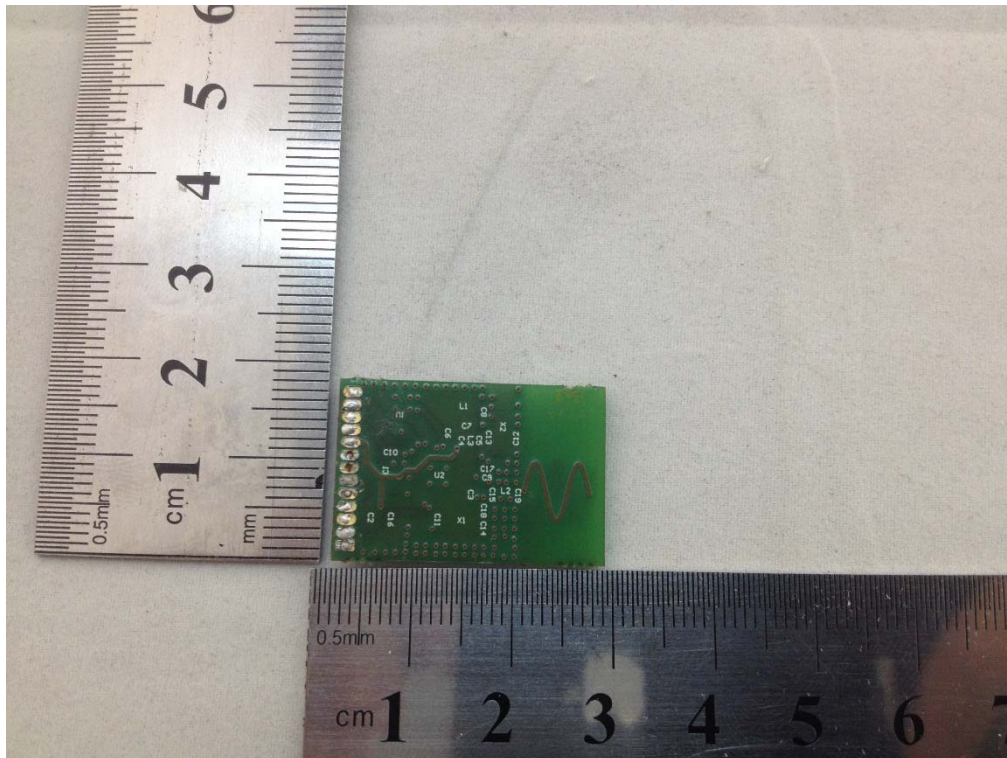
MAIN BOARD VIEW 4



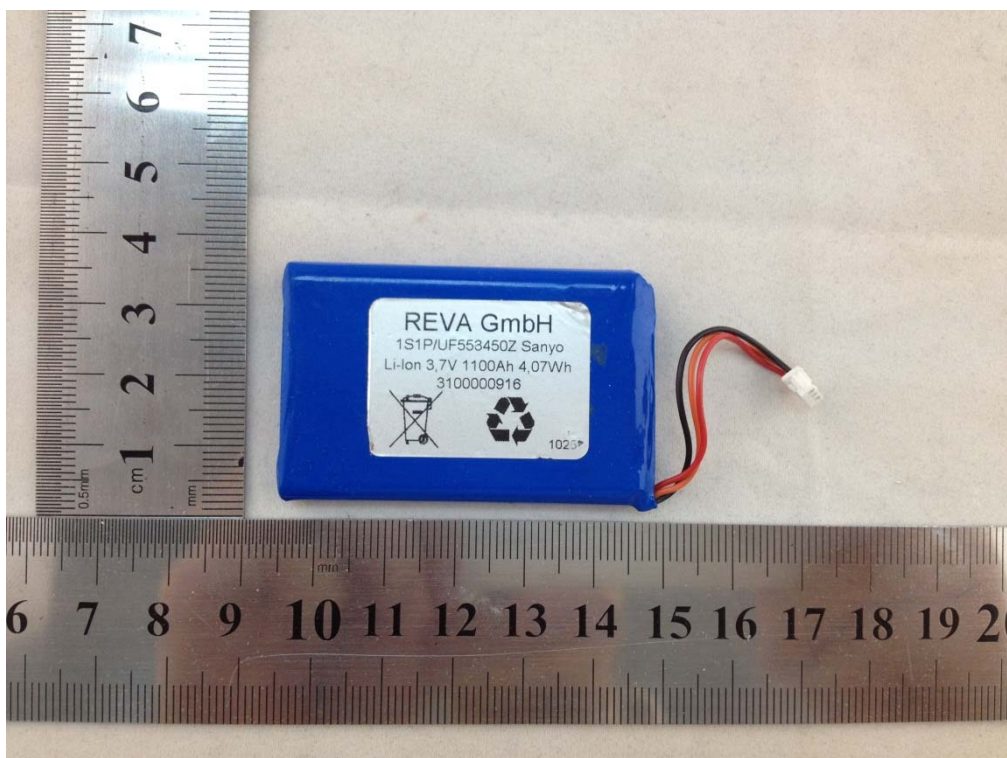
MAIN BOARD VIEW 5



MAIN BOARD VIEW 6



MAIN BOARD BACK VIEW 6



Battery

--END OF REPORT--