EMC TEST REPORT

Report No.: 15020148-FCC-E
Supersede Report No.: N/A

Applicant	Jiangsu SWR Science & Technology Co.,Ltd
Product Name	SenseDisc Data Logger
Main Model	SD00
Test Standard	FCC Part 15 Subpart B Class B:2014, ANSI C63.4: 2014
Test Date	March 25 to April 10, 2015
Issue Date	April 15, 2014
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Deon Dai	Herve Idoko	
Deon Dai Test Engineer	Herve Idoko Checked By	

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Test result presented in this test report is applicable to the tested sample only

Issued by:
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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
15020148-FCC-E	NONE	Original	April 15, 2014

2. Customer information

Applicant Name	Jiangsu SWR Science & Technology Co.,Ltd
Applicant Add	NO.14 Junnong Road,Qinhuai District ,Nanjing,Jiangsu Province,China
Manufacturer	Jiangsu SWR Science & Technology Co.,Ltd
Manufacturer Add	NO.14 Junnong Road,Qinhuai District ,Nanjing,Jiangsu Province,China

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	986914
IC Test Site No.	4842B-1
Test Software	Labview of SIEMIC version 1.0

4. Equipment under Test (EUT) Information

Description of EUT:	SenseDisc Data Logger
Main Model:	SD00
Serial Model:	SD0010, SD0020, SD0030, SD0040, SD0050
Date EUT received:	March 20, 2015
Test Date(s):	March 25 to April 10, 2015
Antenna Gain:	Bluetooth&BLE: 2 dBi
Type of Modulation:	Bluetooth: GFSK&π/4-DQPSK&8DPSK BLE: GFSK
RF Operating Frequency (ies):	Bluetooth&BLE: 2402-2480 MHz(TX/RX)
Number of Channels:	Bluetooth: 79CH BLE: 40CH
Port:	USB Port, Sensor Port*7
Input Power:	Adapter: Model: XHY050100UCB Input: AC 100-240V 50/60Hz 0.3A MAX Output: DC 5V 1.0A Battery: 3.7V 1800mAh
Trade Name :	SenseDisc
FCC ID:	2AEEJ-SD

Note: the difference between these models please refer to Annex E. DECLARATION OF SIMILARITY.

5. Test Summary

The product was tested in accordance with the following specifications.
All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.107; ANSI C63.4: 2014	AC Power Line Conducted Emissions	Compliance
§15.109; ANSI C63.4: 2014	Radiated Emissions	Compliance

Measurement Uncertainty

Test Item	Description	Uncertainty
Radiated Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	3.952dB

6. Measurements, Examination And Derived Results

6.1 AC Power Line Conducted Emissions

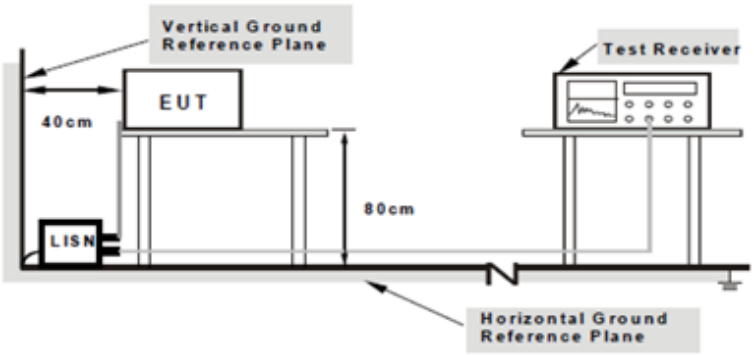
Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	April 10, 2015
Tested By :	Deon Dai

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.107	a)	1. For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	☑

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.

Procedure

2. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
3. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.
4. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
5. All other supporting equipment were powered separately from another main supply.
6. The EUT was switched on and allowed to warm up to its normal operating condition.
7. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
8. High peaks, relative to the limit line, were then selected, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz.
9. Steps 6-7 were repeated for the LIVE line (for AC mains) or DC line (for DC power).

Remark	
Result	☑ Pass ☐ Fail
Test Data	☑ Yes ☐ N/A
Test Plot	☑ Yes ☐ N/A

Data sample

Frequency (MHz)	Quasi-Peak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Factors (dB)
xxx	56.21	66.00	-9.79	39.20	56.00	-16.80	12.22

Frequency (MHz) = Emission frequency in MHz

Quais-Peak/Average (dBμV/m)=Receiver Reading(dBμV/m)+ Factor(dB)

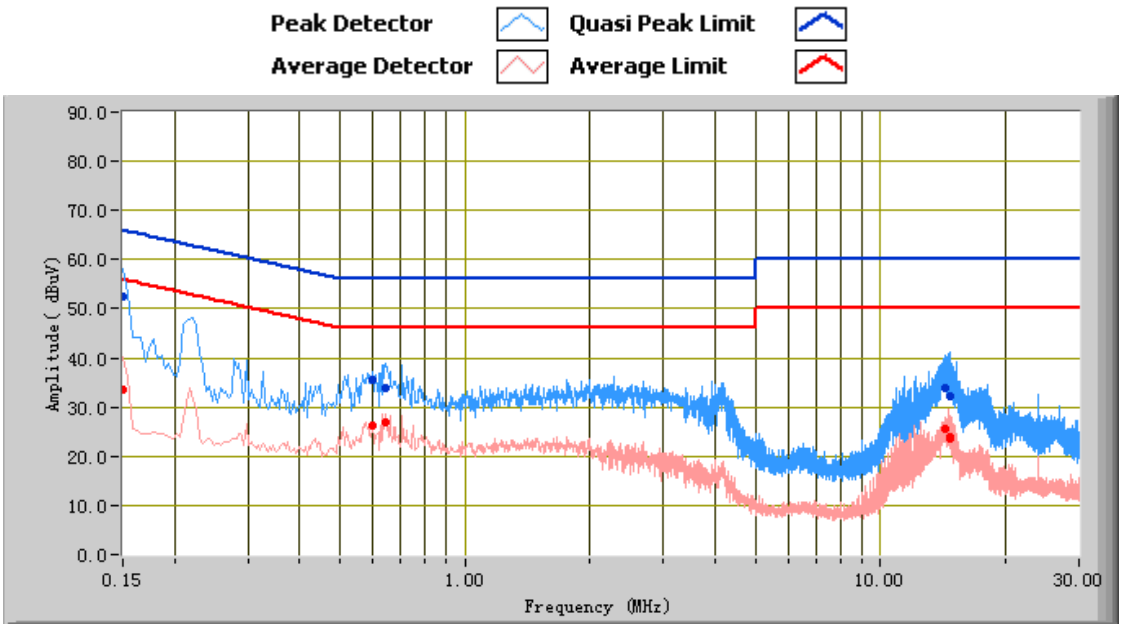
Limit(dBμV/m)=Limit stated in standard

Factor (dB)= cable loss+ Insertion loss of LISN+ Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Calculation Formula:

Margin (dB)=Quasi Peak / Average (dBμV/m) – limit (dBμV/m)

Test Mode:	Charging and Downloading

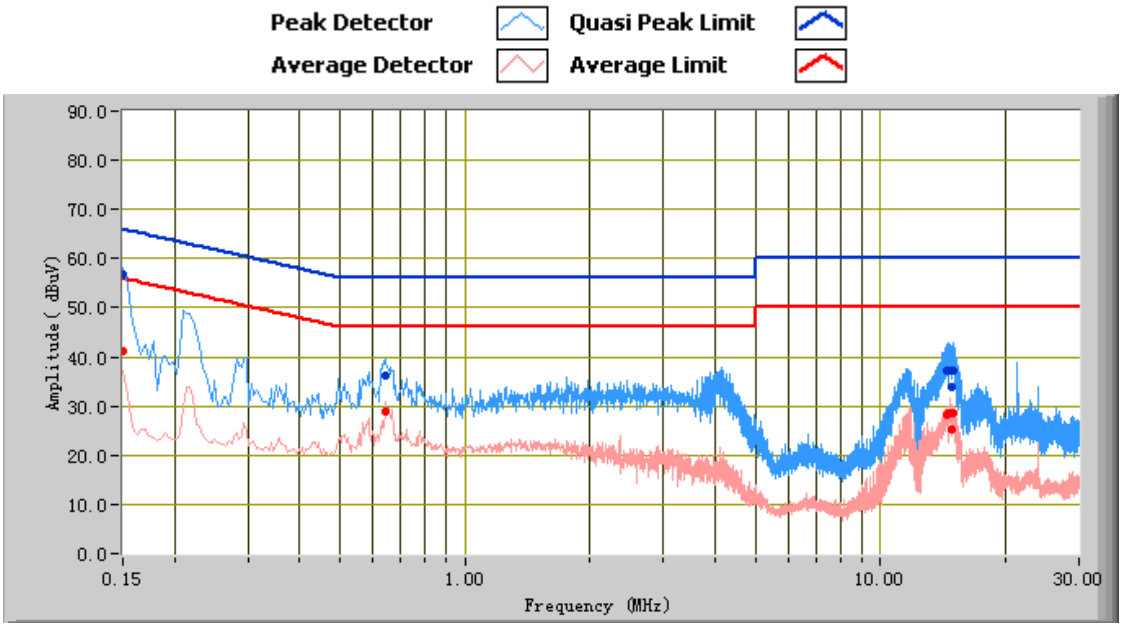


Test Data

Phase Line Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.15	52.56	66.00	-13.44	33.67	56.00	-22.33	12.22
0.64	33.88	56.00	-22.12	27.02	46.00	-18.98	10.97
0.60	35.41	56.00	-20.59	26.35	46.00	-19.65	11.01
14.64	32.31	60.00	-27.69	23.85	50.00	-26.15	11.39
14.73	32.33	60.00	-27.67	23.54	50.00	-26.46	11.39
14.30	33.80	60.00	-26.20	25.62	50.00	-24.38	11.37

Test Mode:	Charging and Downloading

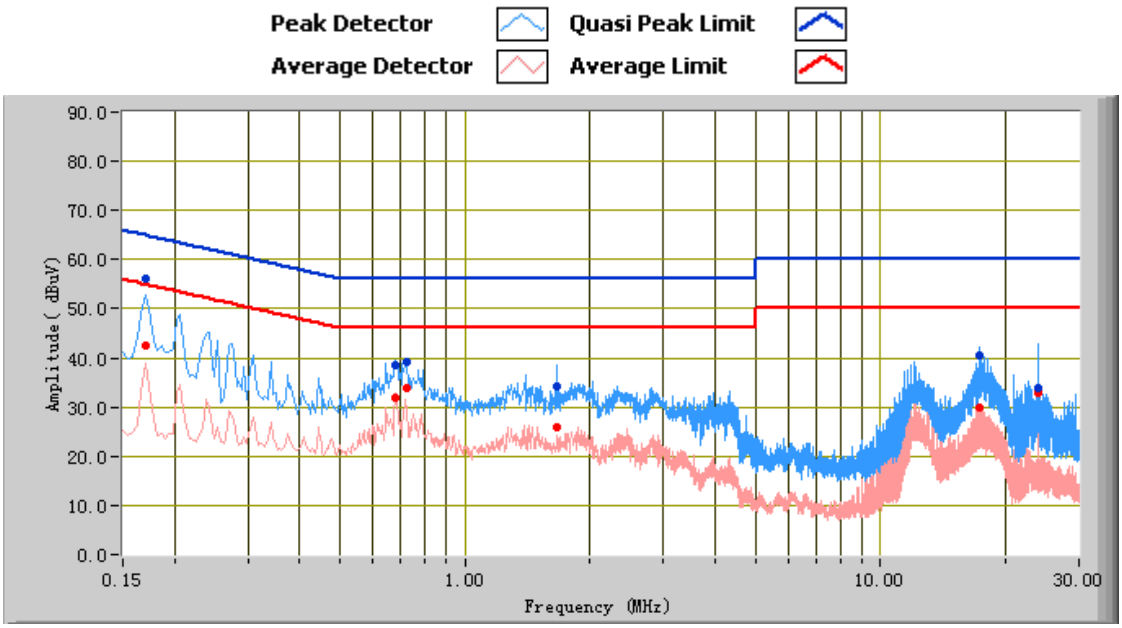


Test Data

Phase Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.15	56.72	66.00	-9.28	41.27	56.00	-14.73	12.21
0.64	36.22	56.00	-19.78	29.01	46.00	-16.99	10.96
14.95	37.06	60.00	-22.94	28.56	50.00	-21.44	11.39
14.61	37.32	60.00	-22.68	28.70	50.00	-21.30	11.37
14.41	37.18	60.00	-22.82	28.29	50.00	-21.71	11.36
14.87	33.71	60.00	-26.29	25.23	50.00	-24.77	11.38

Test Mode:	Charging and Downloading

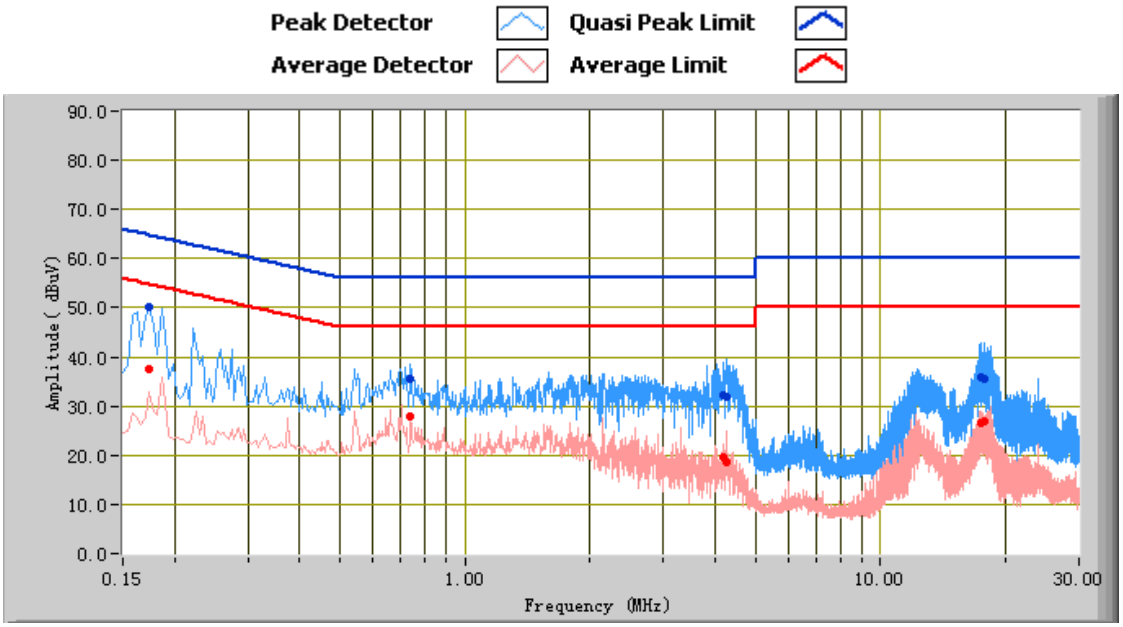


Test Data

Phase Line Plot at 230Vac, 50Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.17	56.02	64.96	-8.94	42.40	54.96	-12.56	11.93
0.68	38.37	56.00	-17.63	32.04	46.00	-13.96	10.94
24.00	33.73	60.00	-26.27	32.98	50.00	-17.02	11.67
1.67	34.13	56.00	-21.87	26.02	46.00	-19.98	10.81
17.29	40.60	60.00	-19.40	29.83	50.00	-20.17	11.47
0.73	39.04	56.00	-16.96	33.78	46.00	-12.22	10.90

Test Mode:	Charging and Downloading



Test Data

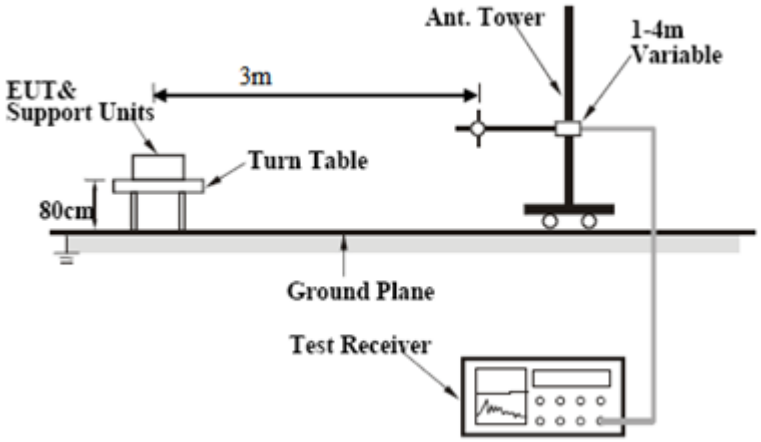
Phase Neutral Plot at 230Vac, 50Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.17	50.26	64.77	-14.51	37.55	54.77	-17.21	11.87
4.27	31.93	56.00	-24.07	18.73	46.00	-27.27	10.94
4.18	32.23	56.00	-23.77	19.49	46.00	-26.51	10.94
17.39	35.87	60.00	-24.13	26.45	50.00	-23.55	11.48
17.84	35.59	60.00	-24.41	26.77	50.00	-23.23	11.50
0.74	35.39	56.00	-20.61	28.00	46.00	-18.00	10.89

6.2 Radiated Emissions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	March 25, 2015
Tested By :	Deon Dai

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.107(d)</td><td>a)</td><td>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (μV/m)</th></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>200</td></tr>
<tr><td>Above 960</td><td>500</td></tr>
</table></td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 
</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
b. The EUT was then rotated to the direction that gave the maximum emission.
c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz resolution bandwidth respectively for each frequency measured.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</td></tr>
<tr><td>Remark</td><td colspan="3"></td></tr>
<tr><td>Result</td><td colspan="3">☑ Pass ☐ Fail</td></tr>
</table>

Test Data ☑ Yes ☐ N/A

Test Plot ☑ Yes (See below) ☐ N/A

Data sample

Frequency (MHz)	Quasi Peak (dBμV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBμV/m)	Margin (dB)
xxx	32.23	181.00	H	350.00	-38.23	40.00	-7.77

Frequency (MHz) = Emission frequency in MHz

Quais-Peak (dBμV/m)= Receiver Reading(dBμV/m)+ Factor(dB)

Azimuth=Position of turn table

Polarity=Polarity of Receiver antenna

Height(cm)= Height of Receiver antenna

Factor (dB)=Antenna factor + cable loss- antenna gain

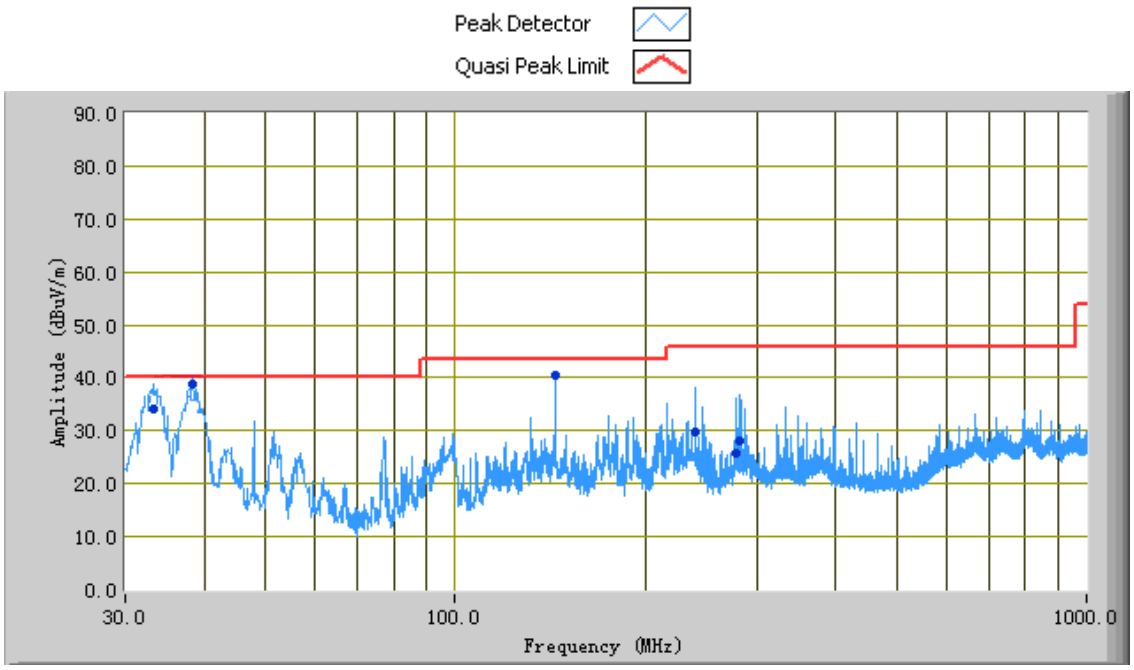
Limit (dBμV/m)=Limit stated in standard

Calculation Formula:

Margin (dB)=Quasi Peak (dBμV/m) – limit (dBμV/m)

Test Mode:	Charging and Downloading(Worse Case)

(Below 1GHz)



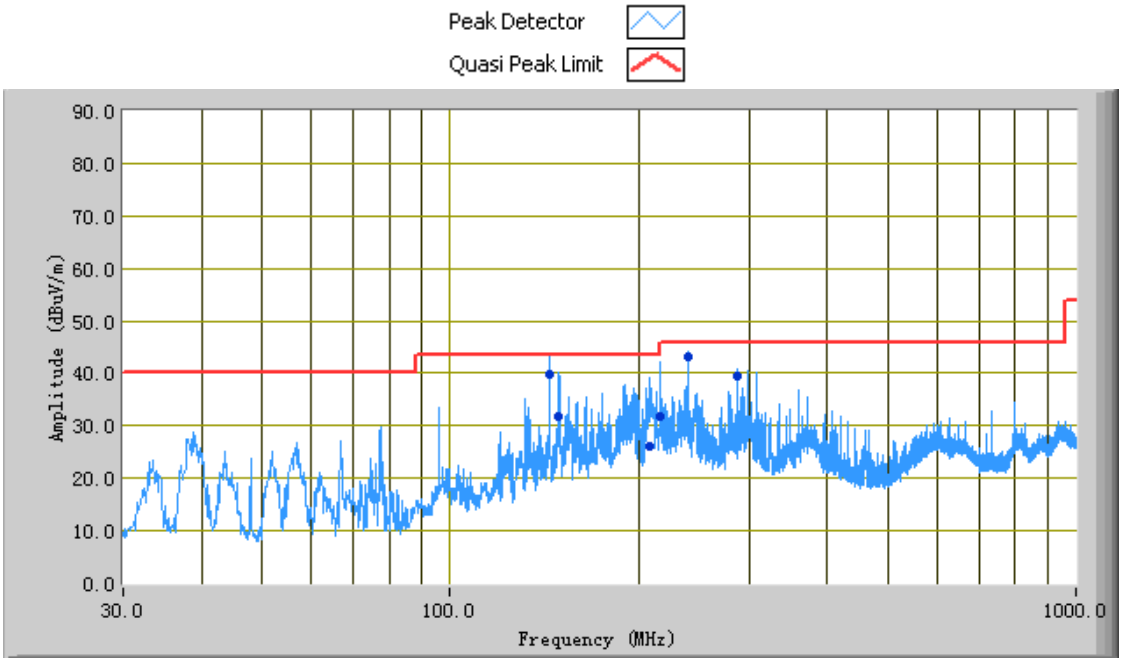
Test Data

Vertical Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
38.46	38.87	232.00	V	111.00	-28.44	40.00	-1.13
144.02	40.44	164.00	V	109.00	-31.11	43.50	-3.06
33.52	33.37	232.00	V	110.00	-29.18	40.00	-6.63
239.98	29.92	204.00	V	100.00	-29.90	46.00	-16.08
282.93	28.04	126.00	V	196.00	-29.71	46.00	-17.96
277.90	25.77	175.00	V	250.00	-29.73	46.00	-20.23

Test Mode:	Charging and Downloading(Worse Case)

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
144.00	39.80	200.00	H	100.00	-31.45	43.50	-3.70
240.00	43.30	252.00	H	123.00	-28.50	46.00	-2.70
148.94	31.65	118.00	H	198.00	-31.45	43.50	-11.85
216.59	31.76	195.00	H	114.00	-30.29	46.00	-14.24
207.94	26.21	102.00	H	307.00	-30.93	43.50	-17.29
287.99	39.57	325.00	H	118.00	-29.00	46.00	-6.43

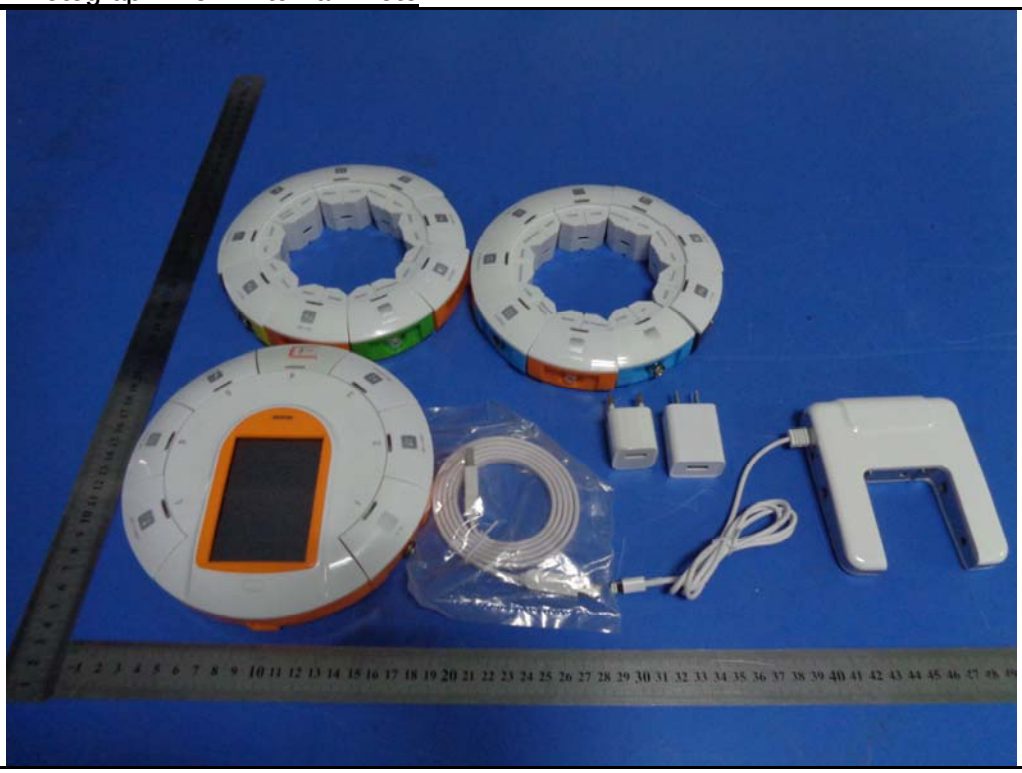
Note: The data above 1 GHz which below 20 dB to the limit was not recorded.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
V-LISN	ESH3-Z5	838979/005	09/27/2014	09/26/2015	☑
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2014	10/08/2015	☑
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A	☑
Radiated Emissions					
Hp Spectrum Analyzer	8563E	3821A09023	10/09/2014	10/08/2015	☑
R&S EMI Receiver	ESPI3	101216	11/04/2014	11/03/2015	☑
Antenna (30MHz~6GHz)	JB6	A121411	04/15/2014	04/14/2015	☑
EMCO Horn Antenna (1 ~18GHz)	3115	N/A	11/15/2014	11/14/2015	☑
INFOMW Antenna (1 ~18GHz)	JXTXLB-10180	J2031081120092	10/09/2014	10/08/2015	☑
Horn Antenna (18~40GHz)	AH-840	101013	04/22/2014	04/22/2015	☑
Microwave Pre-Amp (18~40GHz)	PA-840	181250	05/29/2014	05/28/2015	☑
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2014	10/26/2015	☑
MITEQ Pre-Amplifier (0.1 ~ 18GHz)	LPA-6-30	1451709	06/25/2014	06/24/2015	☑
SIEMIC Labview Radiated Emissions software	V1.0	N/A	N/A	N/A	☑

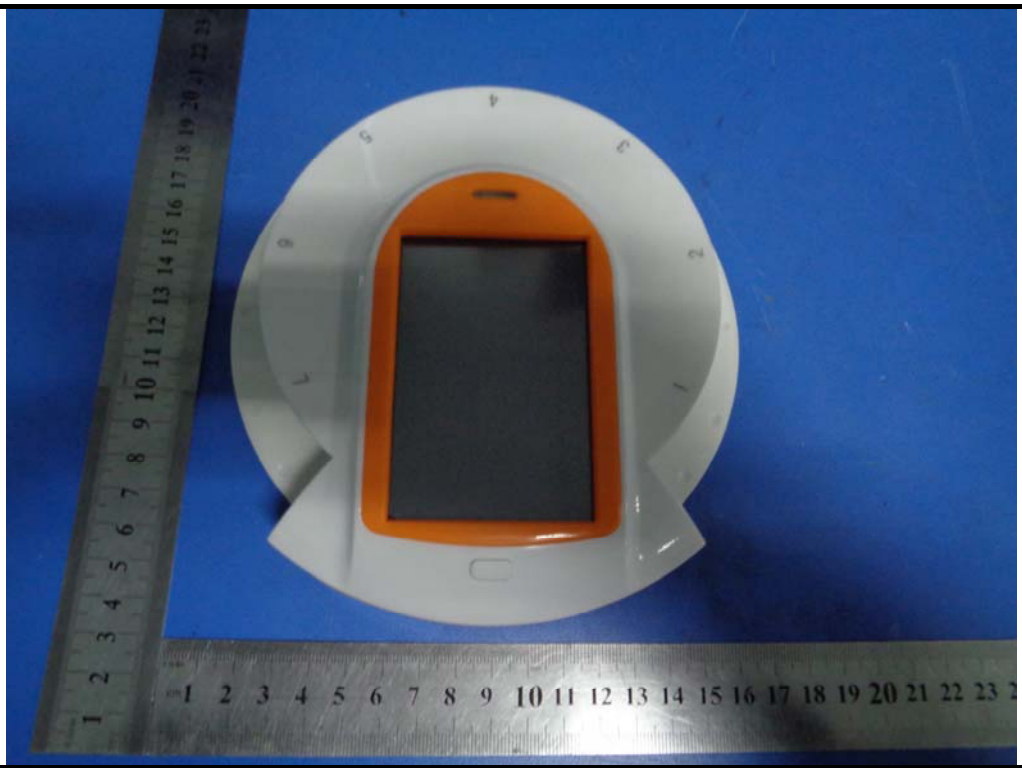
Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

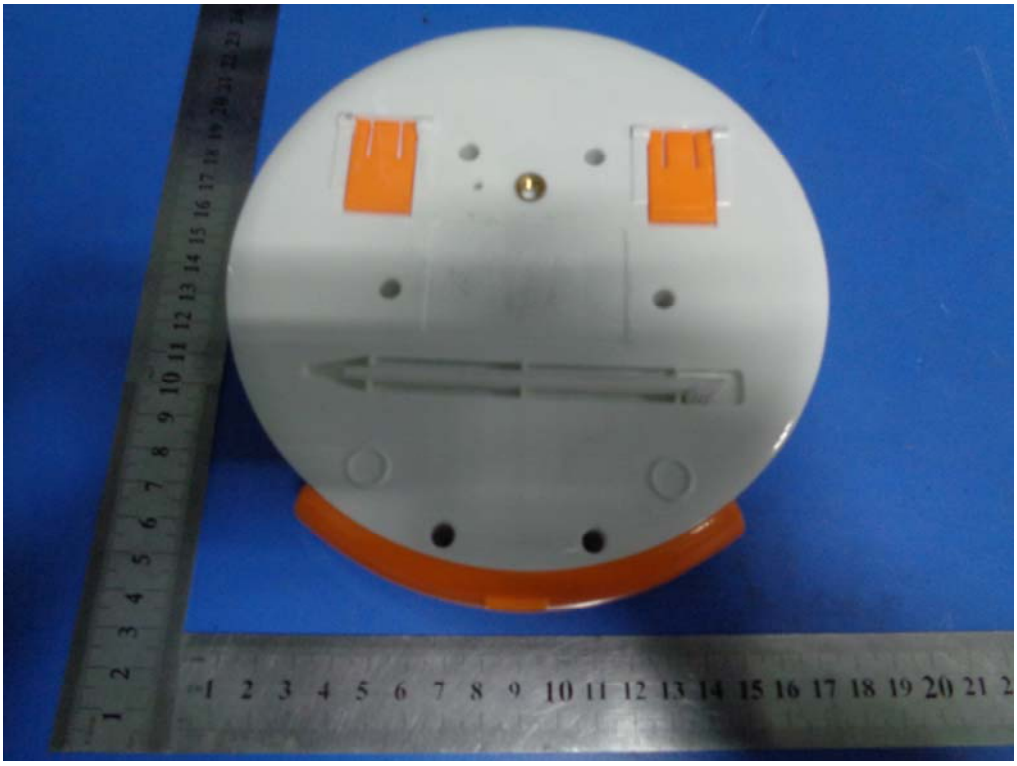


Whole Package - Top View 1

Whole Package - Top View 2

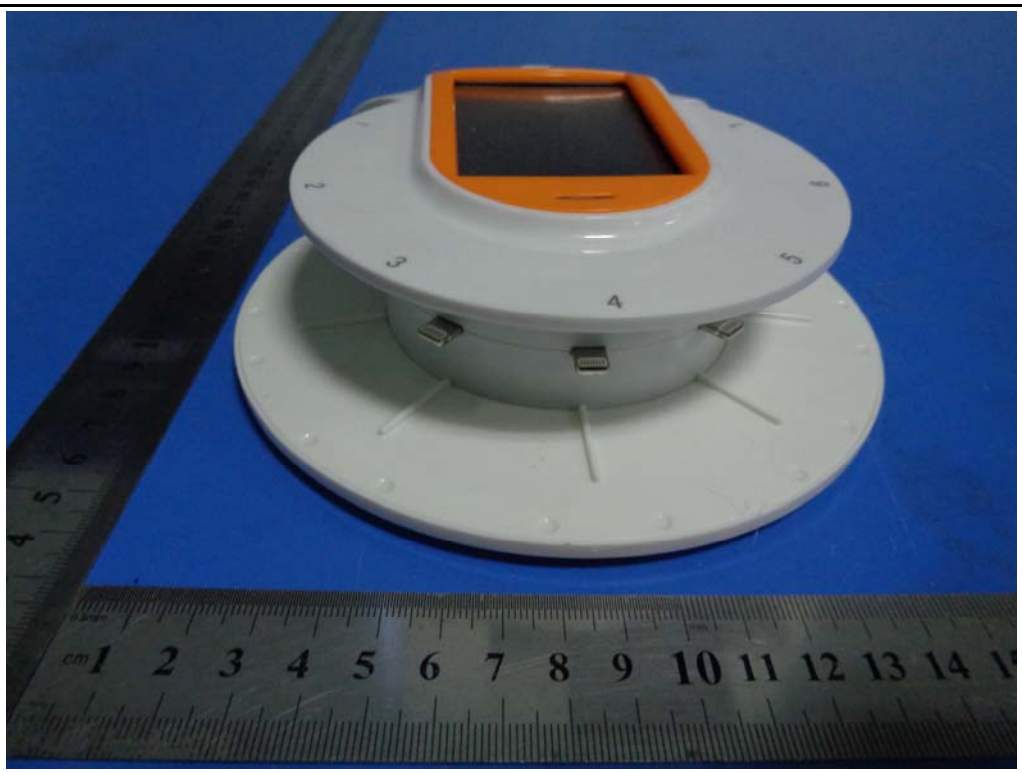


EUT - Front View



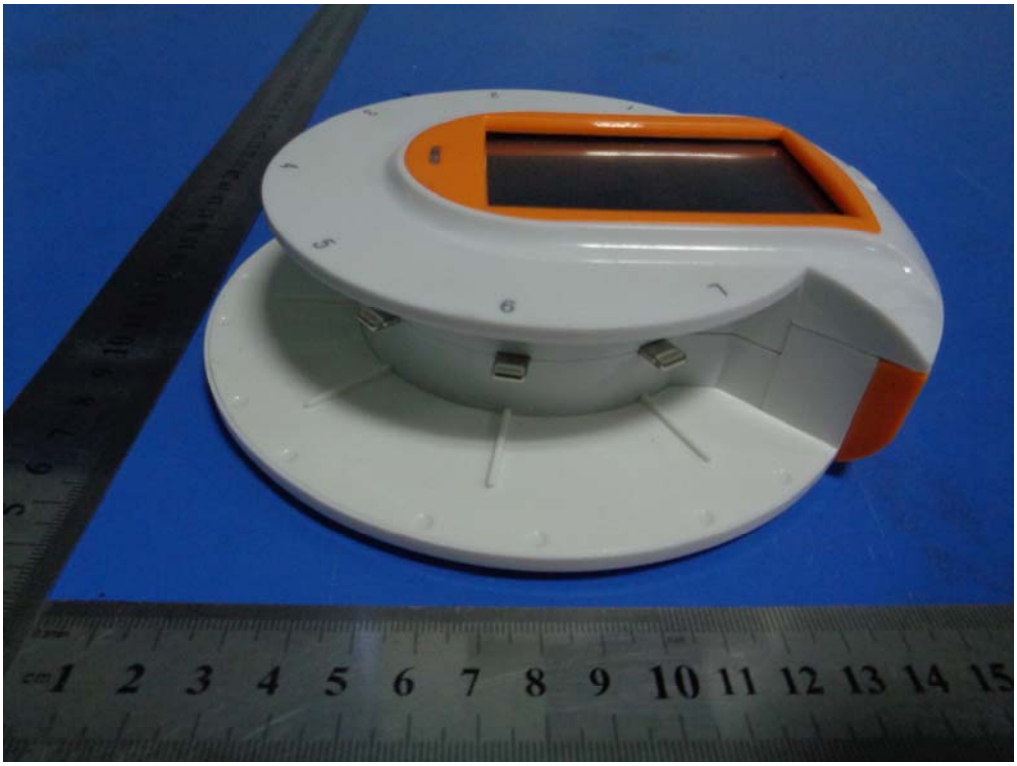
EUT - Rear View

EUT - Top View



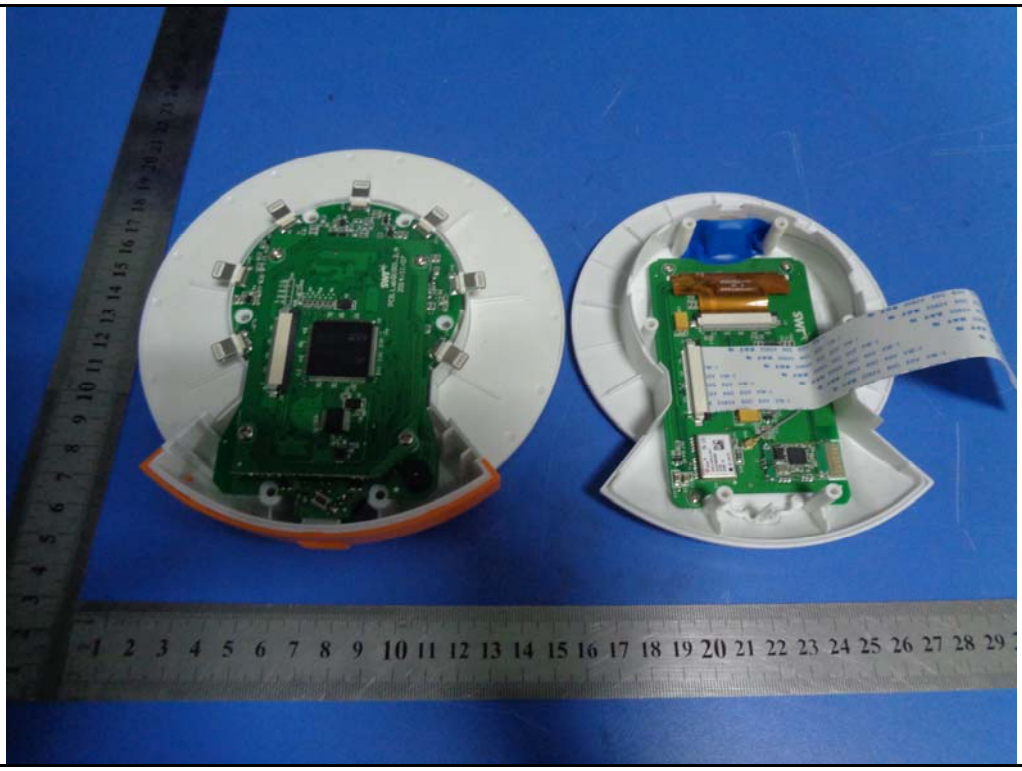
EUT - Bottom View

EUT – Left View

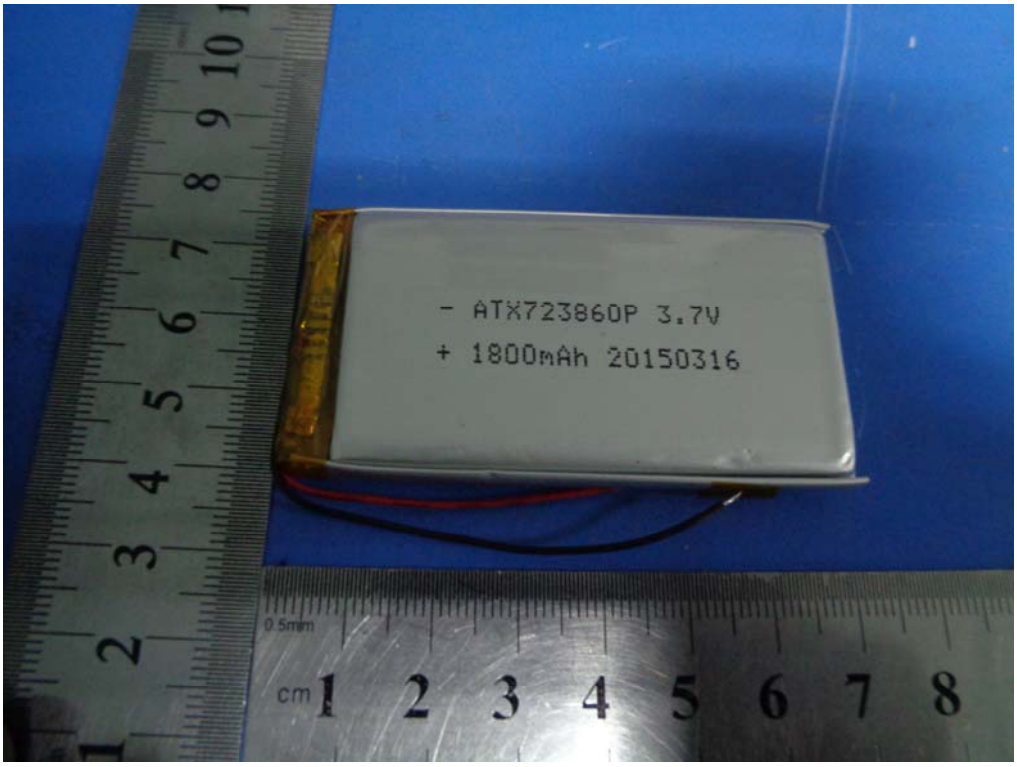


EUT – Right View

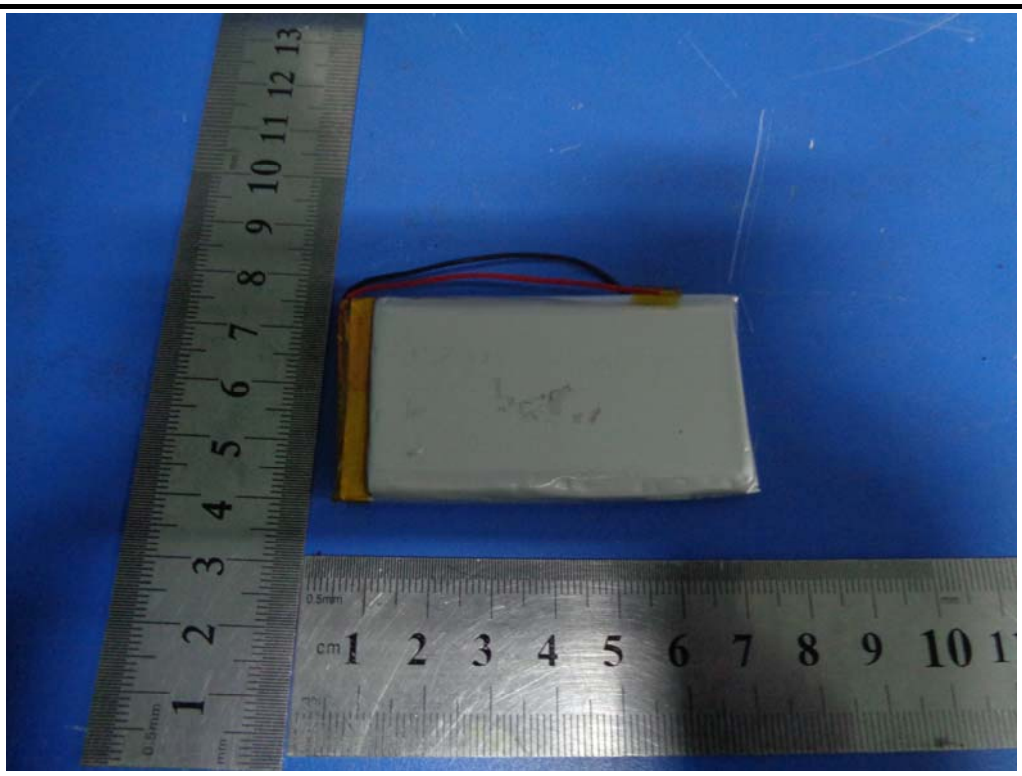
Annex B.ii. Photograph: EUT Internal Photo



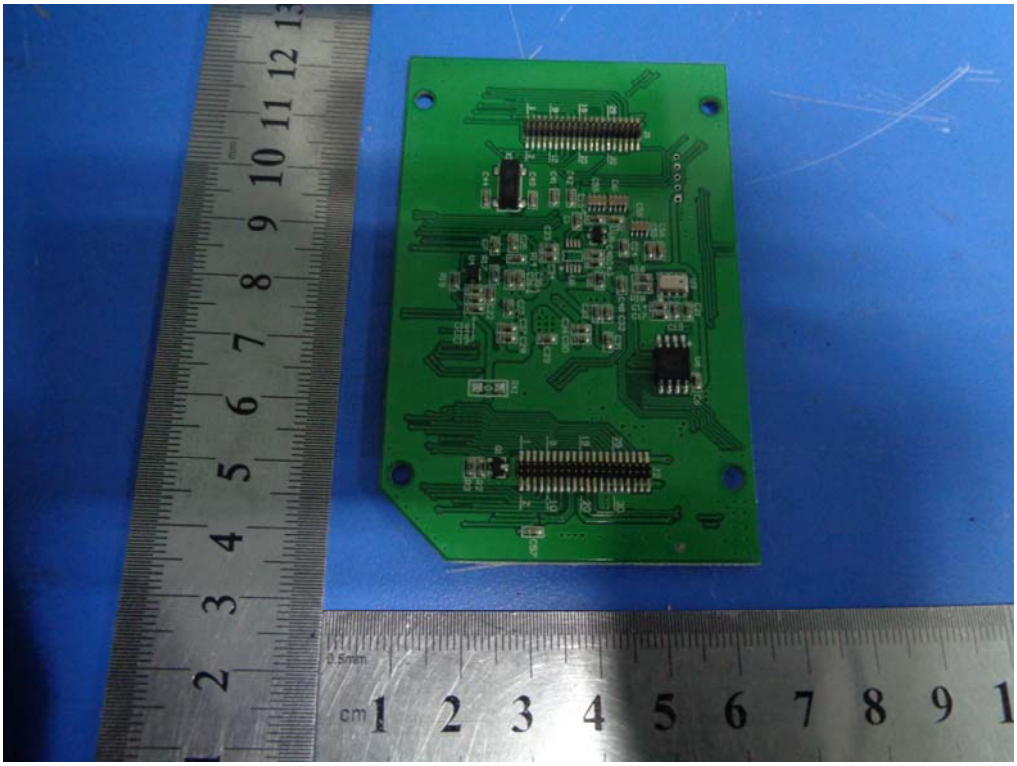
EUT – Uncover Front View



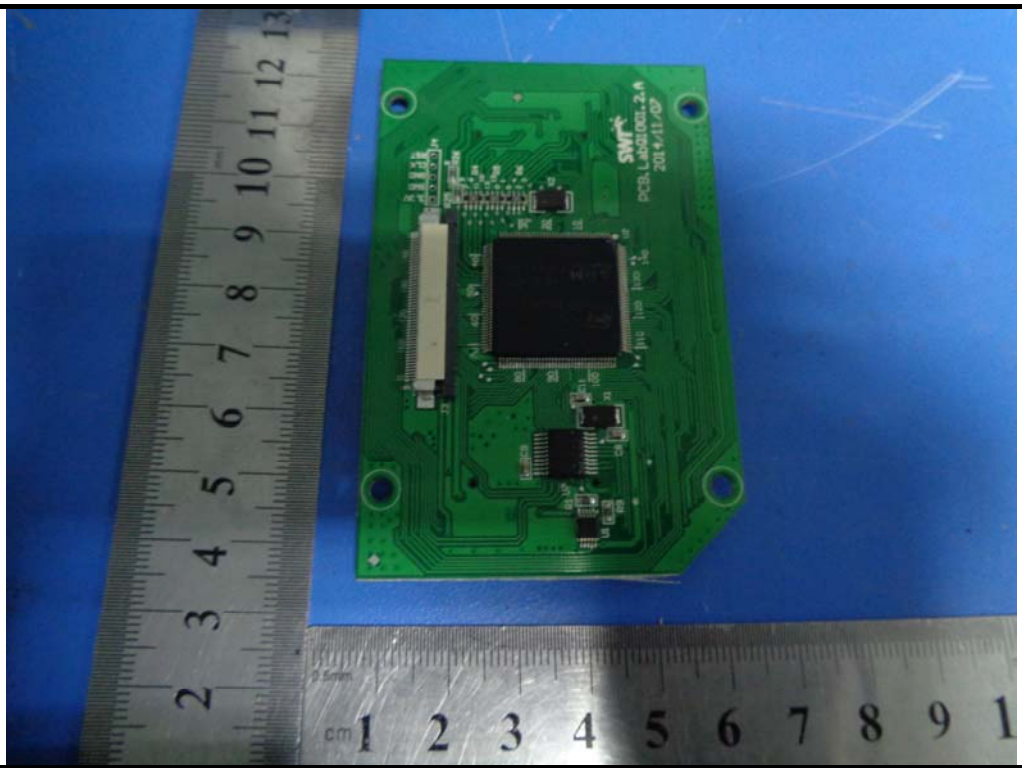
EUT – Battrey Front View



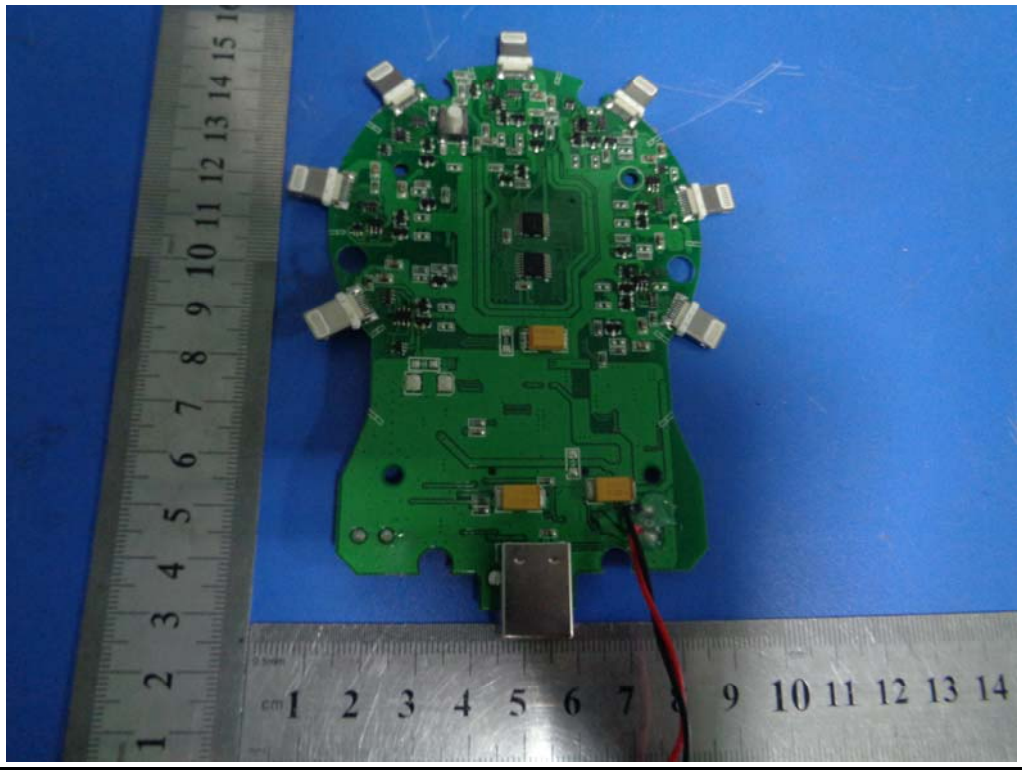
EUT – Battrey Rear View



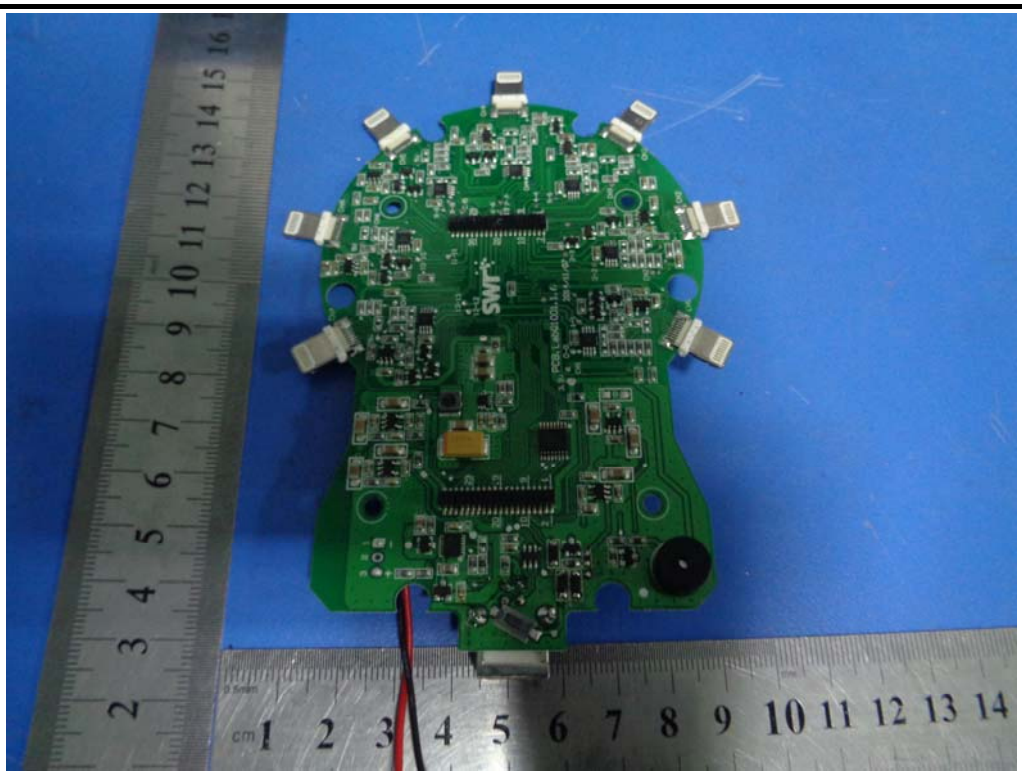
EUT – PCBA 1 Front View



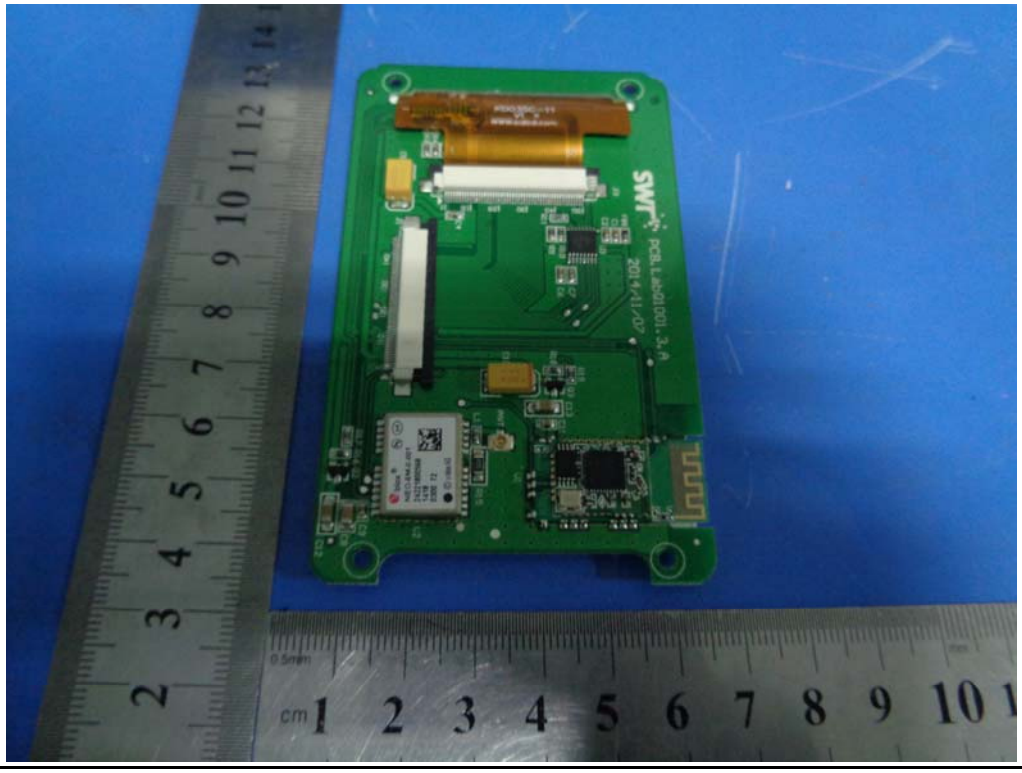
EUT – PCBA 1 Rear View



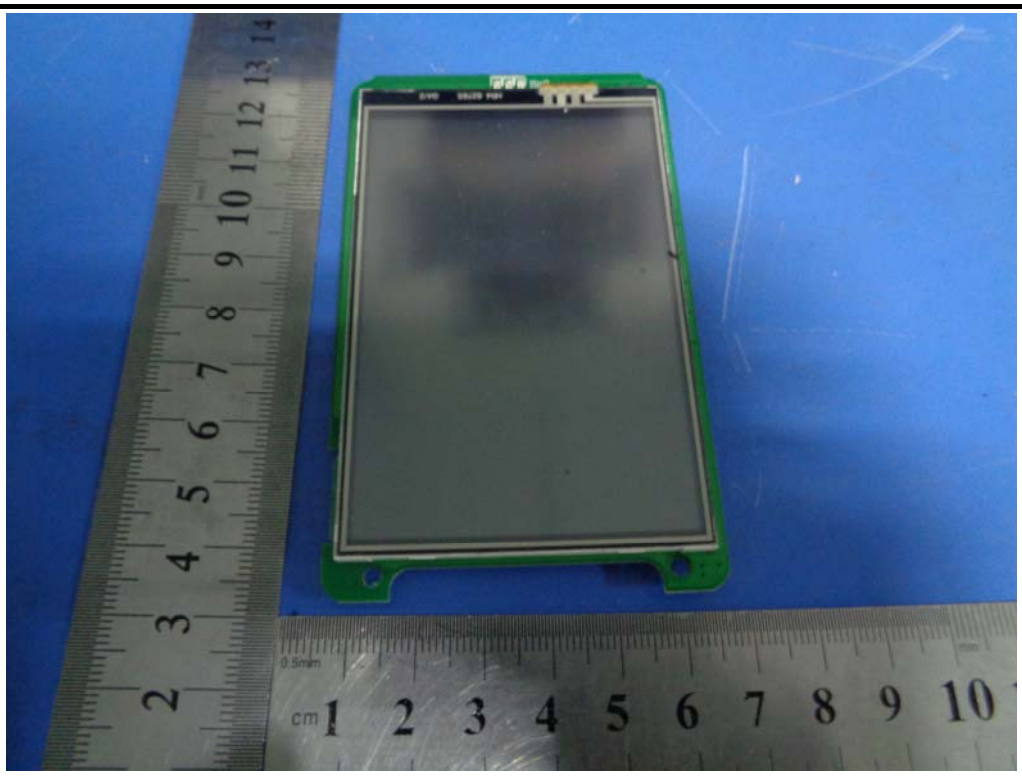
EUT – PCBA 2 Front View



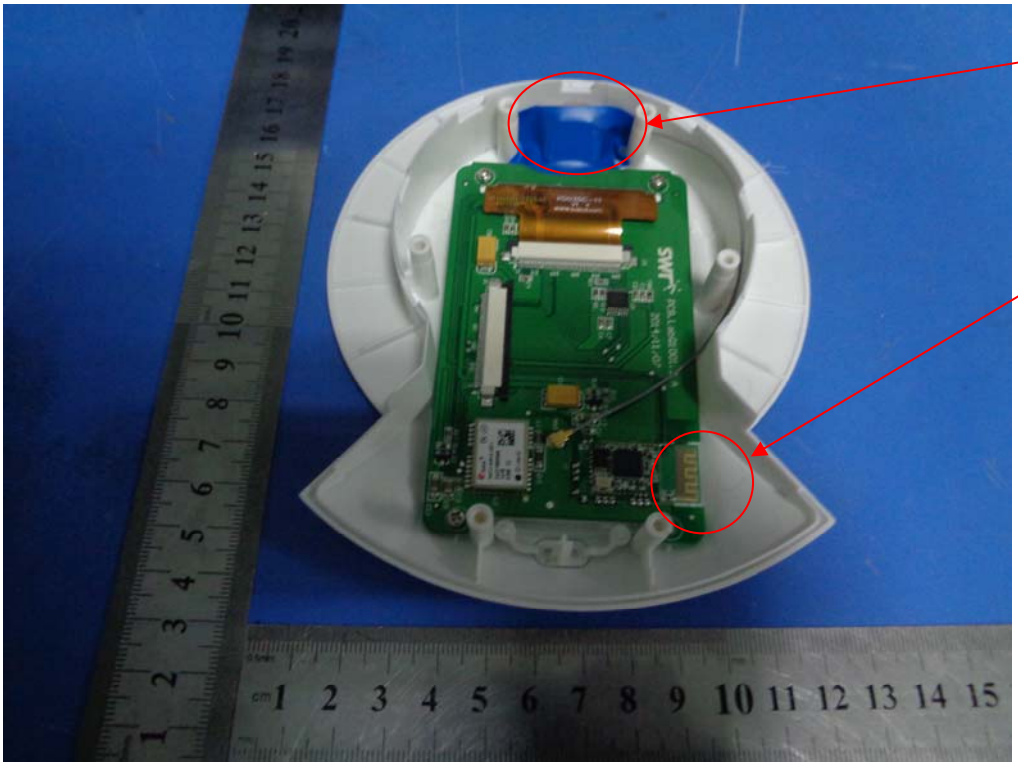
EUT – PCBA 2 Rear View



EUT – PCBA 3 Front View



EUT – PCBA 3 Rear View

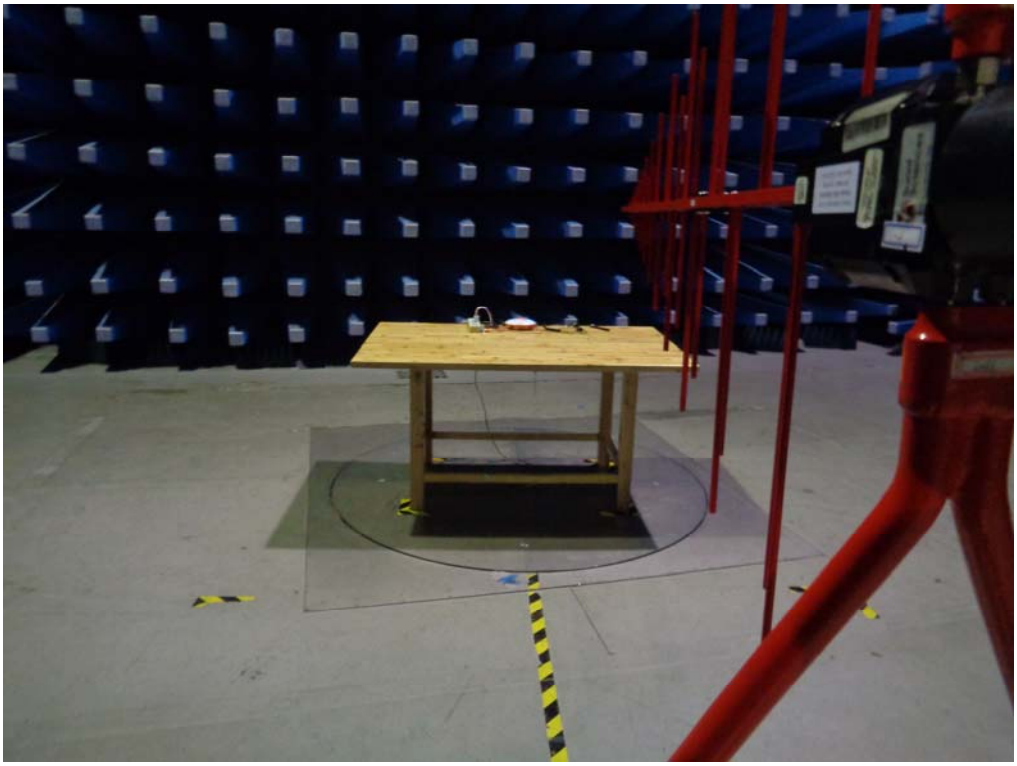


Antenna – Front View

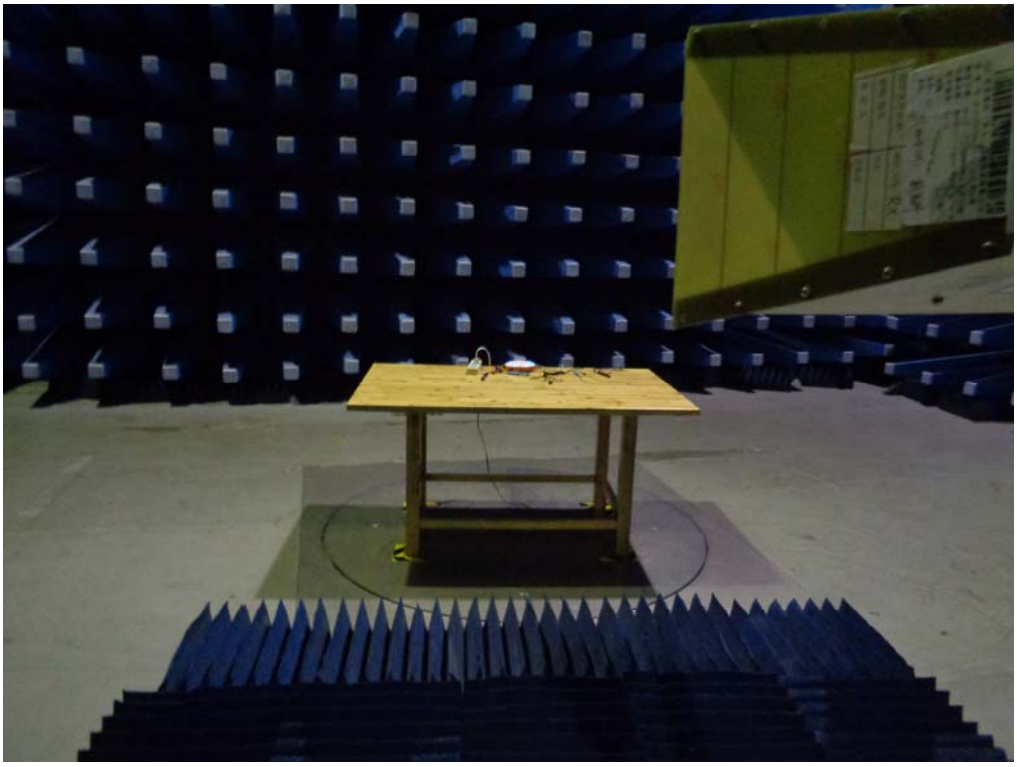
Annex B.iii. Photograph: Test Setup Photo

Conducted Emissions Setup Front View

Conducted Emissions Setup Side View



Radiated Emissions Setup Below 1GHz Front View

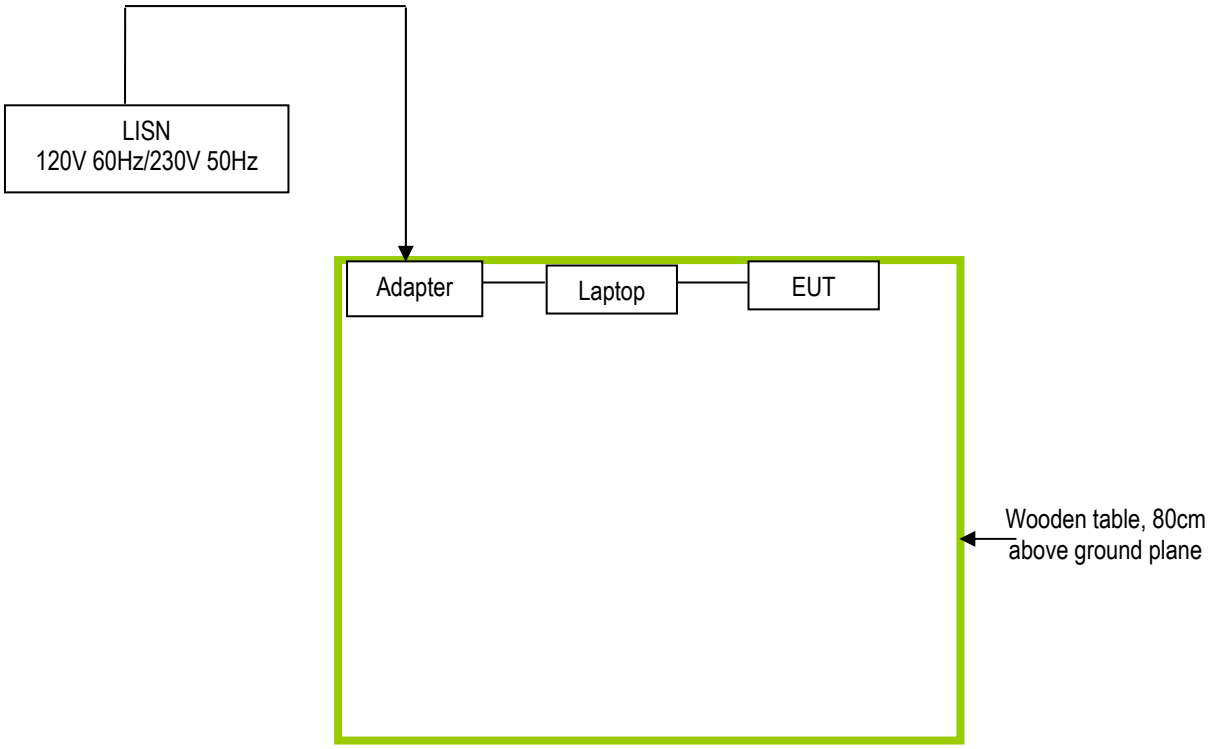


Radiated Emissions Setup Above 1GHz Front View

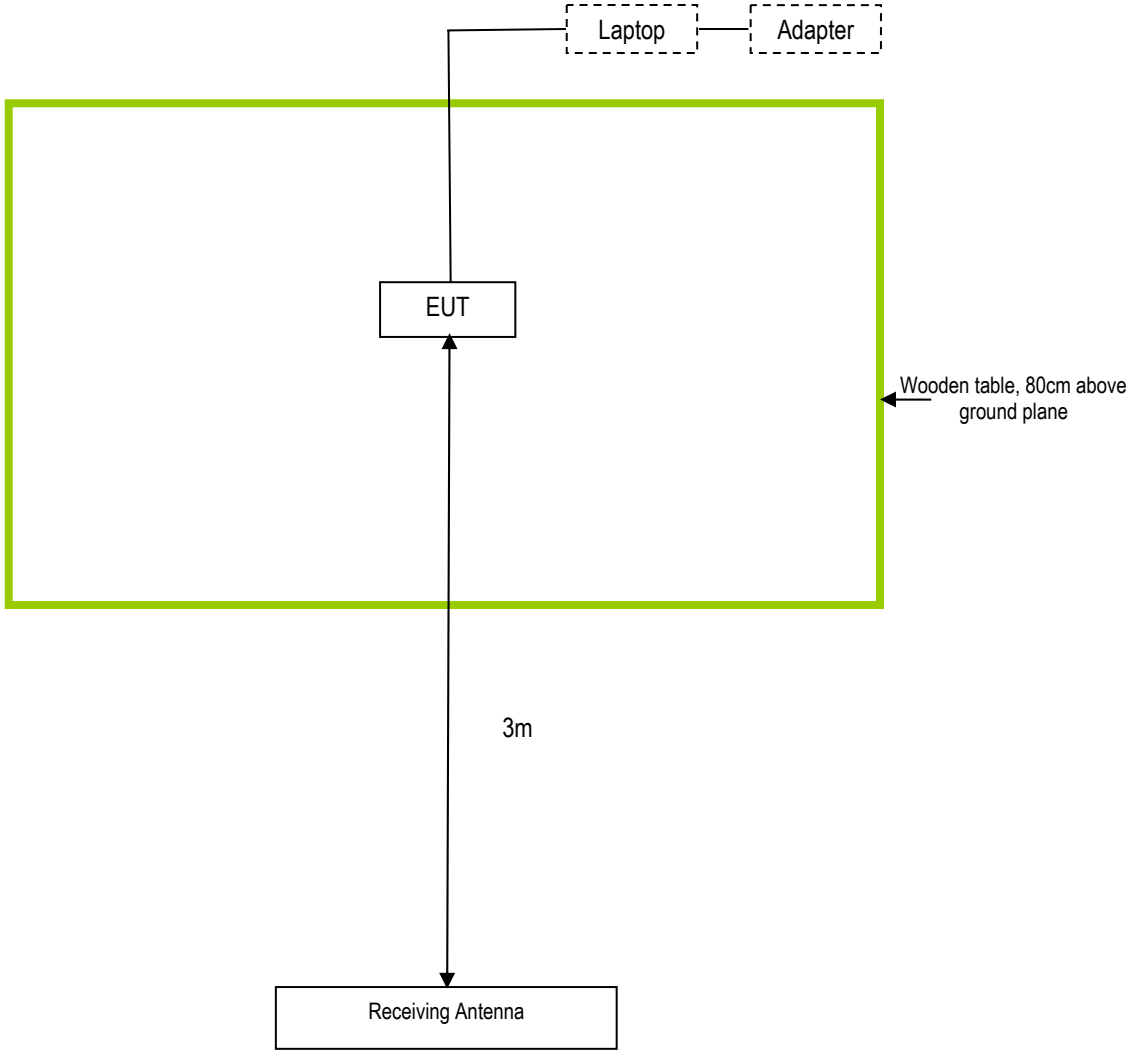
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description	Model	Calibration Date
Gateway	Gateway Laptop	MS2288 & LXWHF02013951C3CA92200	N/A

Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see Attachment

Annex E. DECLARATION OF SIMILARITY

Five Models of SenseDisc							
Sensors			Models				
No.	Name	SD00	SD0010 Basic	SD0020 Advanced	SD0030 Physics	SD0040 Biochemistry	SD0050 Environment
			(yellow)	(orange)	(grey)	(blue)	(green)
1	Voltage sensor						
2	Current sensor						
3	Temperature sensor						
4	Motion sensor						
5	Force sensor						
6	Photogate sensor						
7	Sound level sensor						
8	Air pressure sensor						
9	Humidity sensor						
10	Light sensor						
11	DO sensor						
12	pH sensor						
13	Conductivity sensor						
14	Heart rate sensor						
15	Thermocouple sensor						
16	mV sensor						
17	UV sensor						
18	UI						
Built-in sensors	GPS						
	Ambient temperature						
	Barometer						
	Accelerometer(3 Axis)						

For our business issue and marketing requirement, we would like to list different model numbers on the FCC reports and certification as following:modelSD00，model SD0010, model SD0020, model SD0030, model SD0040 model SD0050.The five models have the same Circuits, and PCB. The difference of these models are have different sensor and color, the different sensor does not affect the RF power . FCC ID：2AEEJ-SD

Client's signature 

Client's name / title Ningjiang Xiao /Manager

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