

**Borqs BeiJing Ltd.**

**Presto**

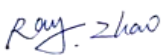


**Main Model: A2  
Serial Model: N/A**

**December 04, 2013  
Report No.: 13070507-FCC-R1-V1  
(This report supersedes NONE)**



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

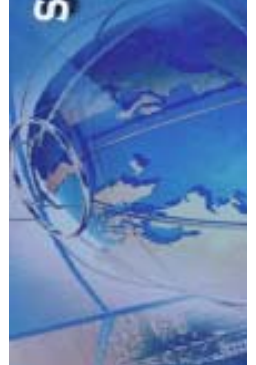
		
Ray Zhao Compliance Engineer	Alex Liu Technical Manager	

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Test result presented in this test report is applicable to the representative sample only.**

# RF Test Report

TO: FCC Part 15.225: 2013, ANSI C63.4: 2009

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## Laboratory Introduction

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### Accreditations for Conformity Assessment

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

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# 1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the Borqs BeiJing Ltd., Presto, and model: A2 against the current Stipulated Standards. The Presto has demonstrated compliance with the FCC Part 15.225: 2013, ANSI C63.4: 2009.

## EUT Information

<b>EUT Description</b>	:	<b>Presto</b>
<b>Model No</b>	:	<b>A2</b>
<b>Serial No</b>	:	<b>N/A</b>
<b>Antenna Gain</b>	:	<b>Bluetooth &amp; WIFI: 2dBi</b> <b>NFC: 2dBi</b>
<b>Input Power</b>	:	<b>Li-ion polymer:</b> <b>Model: PR-696876</b> <b>Spec: 3.7 Vdc, 11100 mAh</b> <b>Limited charger voltage: 4.2V</b>
<b>Classification Per Stipulated Test Standard</b>	:	<b>FCC Part 15.225: 2013, ANSI C63.4: 2009</b>

## **2 TECHNICAL DETAILS**

<b>Purpose</b>	<b>Compliance testing of Presto with stipulated standard</b>
<b>Applicant / Client</b>	<b>Borqs BeiJing Ltd. Tower A, Building B23, Universal Business Park, No. 10 Jiuxianqiao Road, Chaoyang District Beijing, 100015 China</b>
<b>Manufacturer</b>	<b>Borqs BeiJing Ltd. Tower A, Building B23, Universal Business Park, No. 10 Jiuxianqiao Road, Chaoyang District Beijing, 100015 China</b>
<b>Laboratory performing the tests</b>	<b>SIEMIC (Nanjing-China) Laboratories NO.2-1,Longcang Dadao, Yuhua Economic Development Zone, Nanjing, China Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email: China@siemic.com.cn</b>
<b>Test report reference number</b>	<b>13070507-FCC-R1-V1</b>
<b>Date EUT received</b>	<b>November 05, 2013</b>
<b>Standard applied</b>	<b>FCC Part 15.225: 2013, ANSI C63.4: 2009</b>
<b>Dates of test (from – to)</b>	<b>November 26 to December 04, 2013</b>
<b>No of Units :</b>	<b>#1</b>
<b>Equipment Category :</b>	<b>DXX</b>
<b>Trade Name :</b>	<b>E la Carte, Inc.</b>
<b>RF Operating Frequency (ies)</b>	<b>802.11b/g/n: 2412-2462 MHz Bluetooth: 2402-2480 MHz NFC: 13.56 MHz</b>
<b>Number of Channels</b>	<b>Bluetooth: 79CH 802.11b/g/n: 11CH NFC: 1CH</b>
<b>Modulation</b>	<b>802.11b/g/n: CCK/OFDM Bluetooth: GFSK NFC: ASK</b>
<b>Port</b>	<b>USB Port</b>
<b>FCC ID :</b>	<b>2ABDKPRESTOA211</b>

### **3 MODIFICATION**

**NONE**

## 4 TEST SUMMARY

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

### Test Results Summary

Test Standard	Description	Pass/Fail
<b>FCC Part 15.225:2013</b>		
15.203	Antenna Requirement	Pass
15.207(a)	Conducted Emissions Voltage	N/A
15.225(a)	Fundamental Field Strength	Pass
15.225(b)	Fundamental Field Strength	Pass
15.225(c)	Fundamental Field Strength	Pass
15.225(d),15.209	Radiated Emissions	Pass
15.225(e)	Frequency Stability	Pass
15.215(c)	Occupied Bandwidth	Pass
ANSI C63.4: 2009		
PS: All measurement uncertainties are not taken into consideration for all presented test result.		

## **5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS**

### **5.1 Antenna Requirement**

**Requirement(s):** 47 CFR §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 requirement must meet at least one of the following:

- a) Antenna must be permanently attached to the device.
- b) Antenna must use a unique type of connector to attach to the device.
- c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The antenna is permanently attached to the device.

## 5.2 Conducted Emissions Voltage

Requirement:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

\*Decreases with the logarithm of the frequency.

### Procedures:

- All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
- A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
- Conducted Emissions Measurement Uncertainty  
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is  $\pm 3.5\text{dB}$ .
- Environmental Conditions
 

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
- Test date : ---  
 Tested By : Ray Zhao

**Result:** N/A

**Battery Operated**

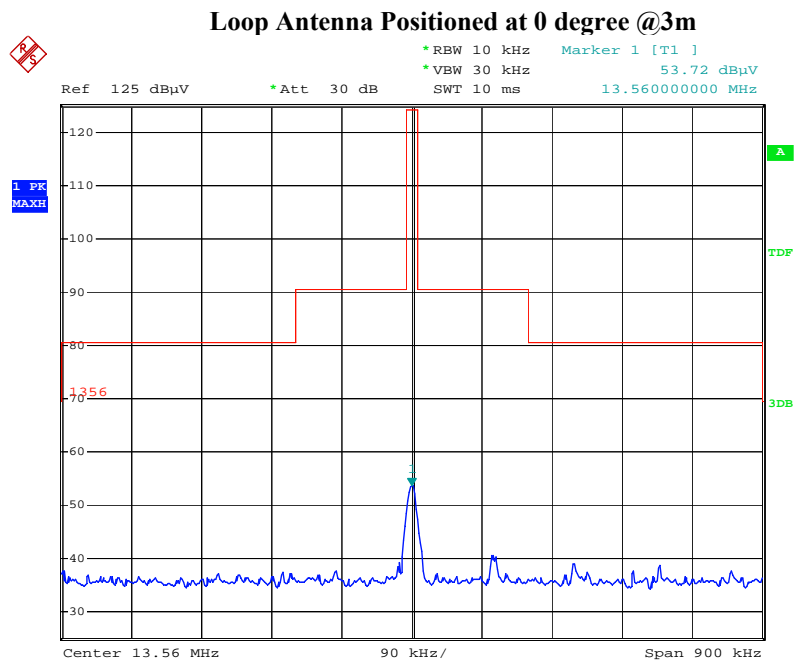
### **5.3 Fundamental Field Strength Test Result**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors are reported. All other emissions were relatively insignificant.
2. A “-ve” margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-6dB.
4. Environmental Conditions                      Temperature                      20°C  
   Relative Humidity                      50%  
   Atmospheric Pressure                      1019mbar
5. Test date : November 26, 2013  
Tested By : Ray Zhao

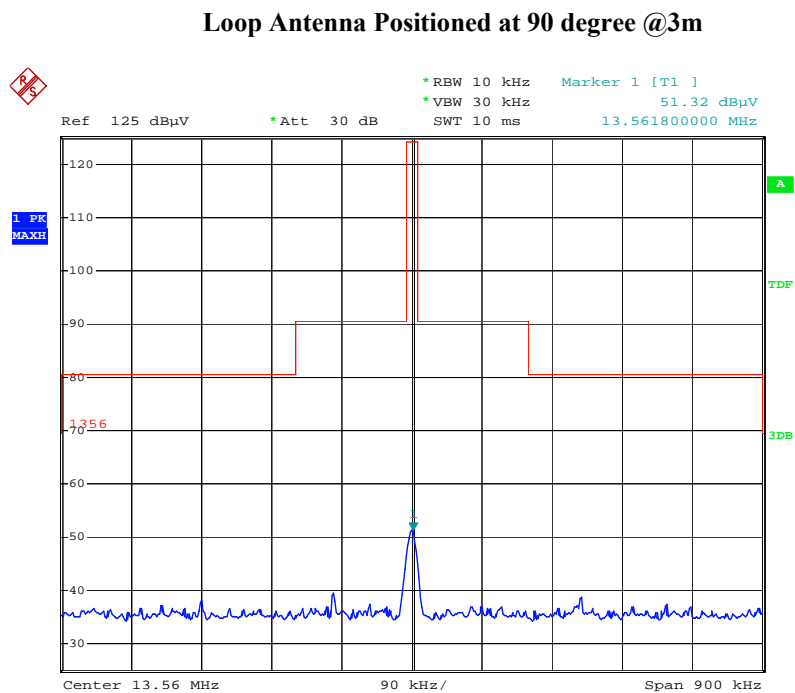
#### **Test Requirement:**

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

**15.225(a), 15.225(b) and 15.225(c) Test Result:**



Date: 26.NOV.2013    20:09:49



Date: 26.NOV.2013    20:13:41

## 5.4 Radiated Emissions

**Requirement(s):** 47 CFR §15.209; 47 CFR§15.225(d)

**Procedures:** For >30MHz, Radiated emissions were measured according to ANSIC63.4. The EUT was set to transmit at the highest output power. The EUT was set 3 meter away from the measuring antenna. The Log periodic antenna was positioned 1 meter above the ground from the centre of the antenna. The measuring bandwidth was set to 120kHz. (Note: During testing the receive antenna was raise from 1-4meters to maximize the emission from the EUT.)

The limit is converted from microvolt/meter to decibel microvolt/meter.

Sample Calculation: Corrected Amplitude=Raw Amplitude (dBuV/m)+ACF(dB)+Cable Loss(dB)-Distance Correction Factor

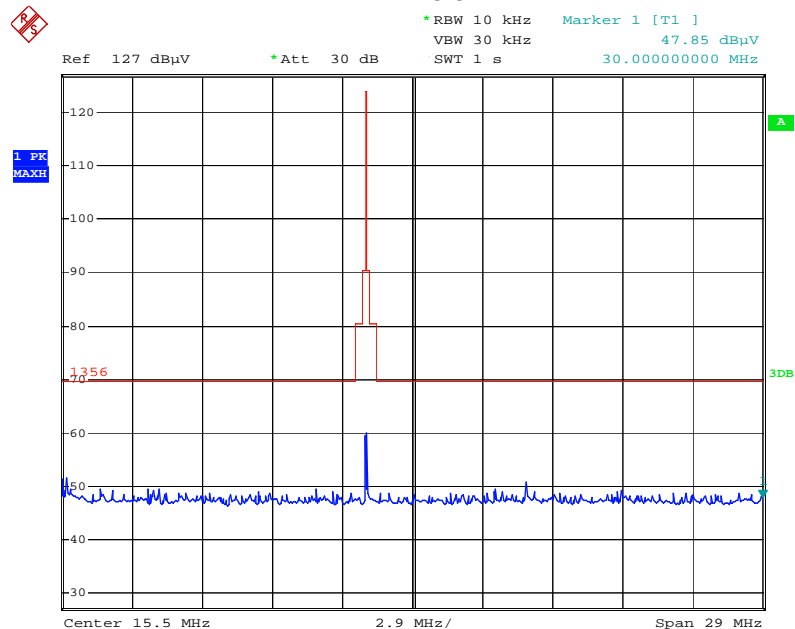
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors are reported. All other emissions were relatively insignificant.
2. A “-ve” margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-6dB.
4. Environmental Conditions

Temperature	20°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
5. Test date : December 04, 2013  
Tested By : Ray Zhao

**The result: Pass**

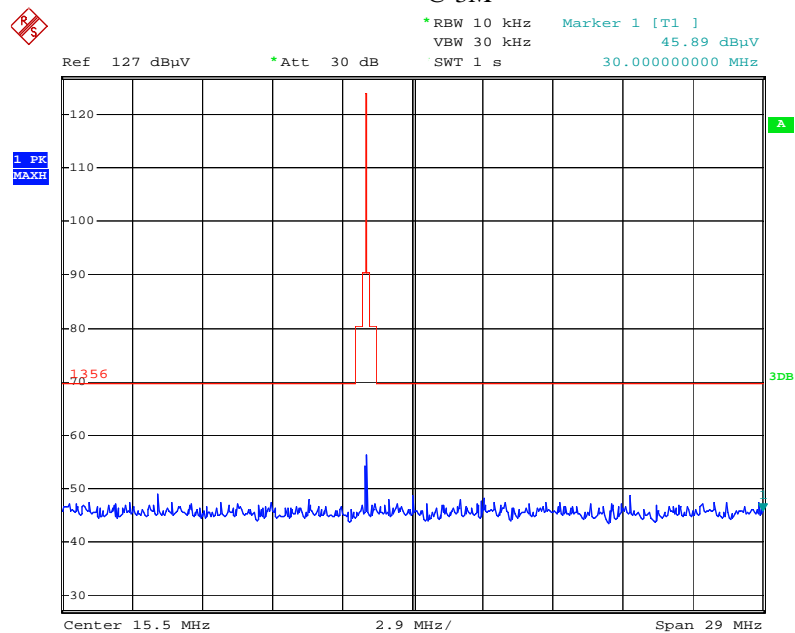
Transmit mode:

1MHz to 30MHz Test result  
Loop Antenna at 0 degree:  
@ 3M



Date: 4.DEC.2013 10:39:31

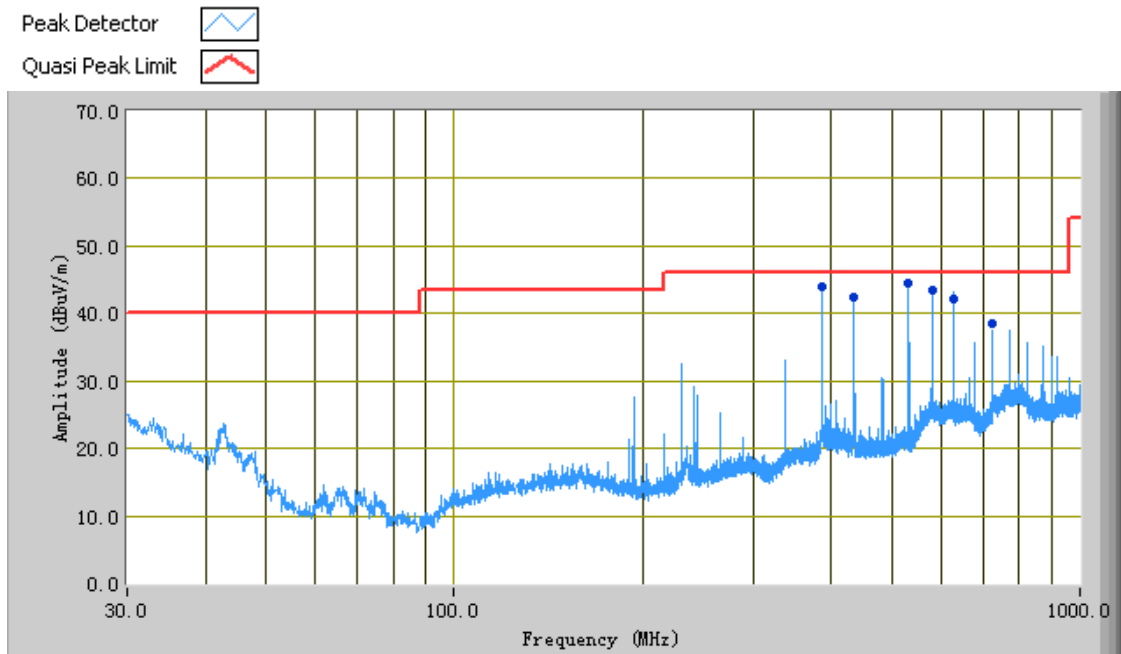
Loop Antenna at 90 degree:  
@ 3M



Date: 4.DEC.2013 10:40:36

Note: Emissions from 9kHz to 1MHz is very low under transmit mode so test data is not presented in this report

<b>Test Mode:</b>	<b>Transmitting</b>
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### Test Data

#### Vertical & Horizontal Polarity Plot at 3m

Frequency (MHz)	Quasi Peak (dB $\mu$ V/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
531.99	45.14	286.00	H	185.00	-27.85	46.00	-0.86
386.89	43.93	288.00	H	101.00	-29.97	46.00	-2.07
580.34	43.49	295.00	H	167.00	-23.27	46.00	-2.51
628.72	38.87	209.00	V	109.00	-21.05	46.00	-7.13
435.24	42.34	289.00	H	101.00	-28.87	46.00	-3.66
725.45	41.22	241.00	H	120.00	-21.50	46.00	-4.78

*Note: Testing measured to beyond the tenth harmonic of the highest fundamental frequency and complies with FCC rule.*

## 5.5 Frequency Stability

**Requirement(s):** 47 CFR §15.225(e)

**Procedures:** Frequency Stability was measured according to 47 CFR§2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.

Limit:  $\pm 0.01\%$  of 13.56MHz=1356Hz

- |    |                               |                      |          |
|----|-------------------------------|----------------------|----------|
| 1. | Environmental Conditions      | Temperature          | 20°C     |
|    |                               | Relative Humidity    | 50%      |
|    |                               | Atmospheric Pressure | 1019mbar |
| 2. | Test date : November 28, 2013 |                      |          |
|    | Tested By : Ray Zhao          |                      |          |

**The result: Pass**

**Frequency Stability versus Temperature:** The Frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of -20°C to +50°C at normal supply voltage.

Reference Frequency: 13.56MHz at -20°C to +50°C 3.7DC

Temperature (°C)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
50	13.5608	800	<0.01	Pass
40	13.5606	600	<0.01	Pass
30	13.5603	300	<0.01	Pass
20	Reference			
10	13.5608	800	<0.01	Pass
0	13.5605	500	<0.01	Pass
-10	13.5605	500	<0.01	Pass
-20	13.5604	400	<0.01	Pass

**Frequency Stability versus Input Voltage:** The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$ , the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at 20°C environmental temperature.

Carrier Frequency: 13.56MHz at 20°C at 3.7VDC

Measured Voltage $\pm 15\%$ of nominal(DC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
3.2	13.5606	600	<0.01	Pass
4.3	13.5608	800	<0.01	Pass

## 5.6 Occupied Bandwidth

**Requirement(s):** 47 CFR§15.215(e)

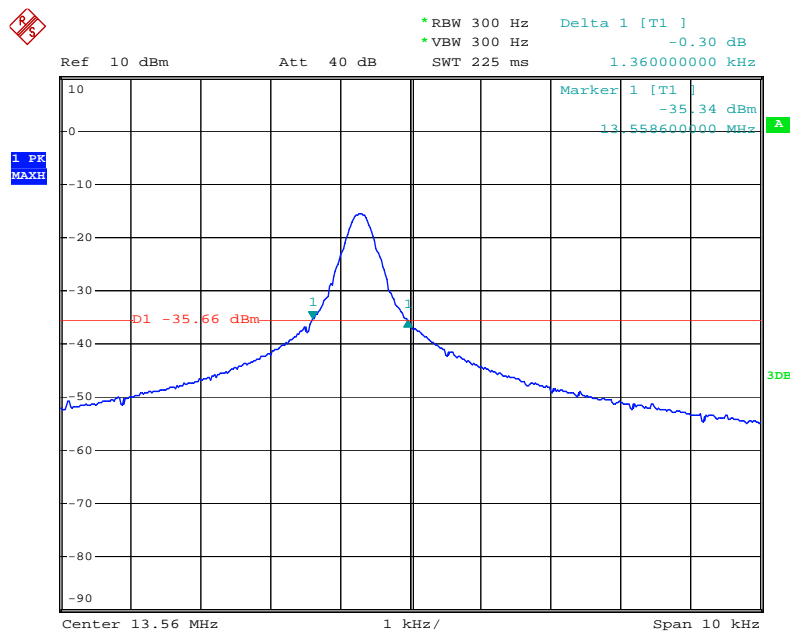
**Procedures:** Occupied Bandwidth was measured according to 47 CFR§2.1049. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz.

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors are reported. All other emissions were relatively insignificant.
2. A “-ve” margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-6dB.
4. Environmental Conditions
 

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
5. Test date :November 28, 2013  
Tested By : Ray Zhao

**Test Result: Pass**

Frequency (MHz)	20dB BW (kHz)
13.5586	1.36



Date: 28.NOV.2013 19:49:56

## **Annex A. TEST INSTRUMENT & METHOD**

### **Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES**

Instrument	Model	Serial #	Calibration Date	Calibration Due Date
<b>AC Line Conducted Emissions</b>				
R&S EMI Test Receiver	ESPI3	101216	09/27/2013	09/26/2014
ROHDE&SCHWARZ V-LISN	ESH3-Z5	838979/005	09/27/2013	09/26/2014
Com-Power Transient Limiter	LIT-153	531021	09/27/2013	09/26/2014
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A
<b>Radiated Emissions</b>				
R&S EMI Receiver	ESPI3	101216	09/27/2013	09/26/2014
Antenna (30MHz~6GHz)	JB6	A121411	03/27/2013	03/26/2014
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2013	10/26/2014
EMCO Passive Loop Antenna	6509	9909-1469	10/18/2013	10/17/2014
Pro.Temp.&Humi.Chamber	MHP-150-1C	MHA090510A	11/03/2013	11/02/2014
SIEMIC Labview Radiated Emissions software	V1.0	N/A	N/A	N/A

## **Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION**

### **Test Set-up**

1. 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, as shown in Annex B.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipments were powered separately from another main supply.

### **Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. 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.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 KHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

### **Sample Calculation Example**

At 20 MHz

limit = 250 μV = 47.96 dBμV

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver = 40.00 dBμV  
(Calibrated for system losses)

Therefore, Q-P margin = 47.96 – 40.00 = 7.96 **i.e. 7.96 dB below limit**

## **Annex A. iii. RADIATED EMISSIONS TEST DESCRIPTION**

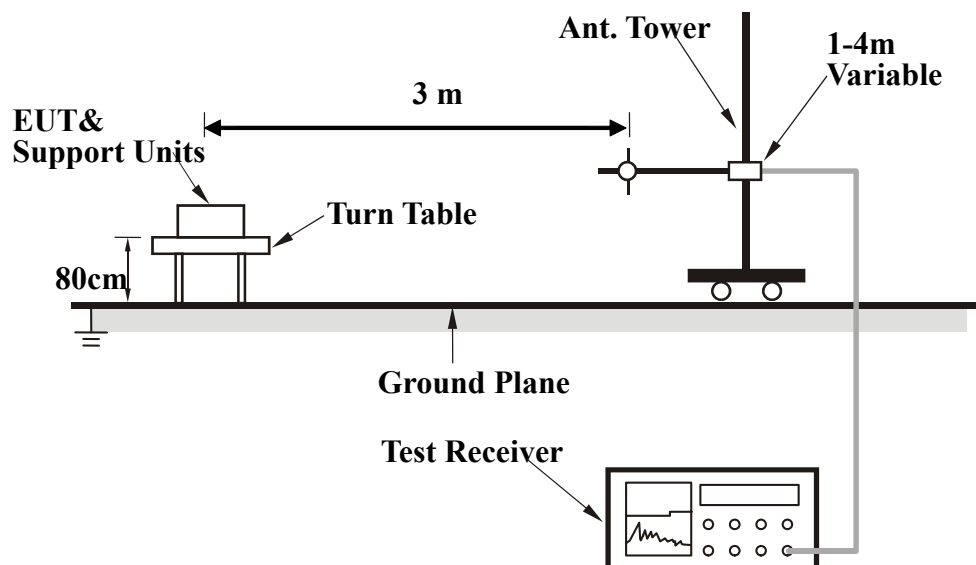
### **EUT Characterisation**

EUT characterisation, over the frequency range from 30MHz to 10<sup>th</sup> Harmonic, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS).

### **Test Set-up**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



## **Test Method**

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

### **Final Radiated Emission Measurement**

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

## **Sample Calculation Example**

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

$$\begin{aligned} \text{Average} &= \text{Peak Value} + \text{Duty Factor or} \\ \text{Set RBW} &= 1\text{MHz, VBW} = 10\text{Hz.} \end{aligned}$$

Note:

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

## **Annex B. EUT AND TEST SETUP PHOTOGRAPHS**

### **Annex B.i. Photograph 1: EUT External Photo**



EUT - Front View



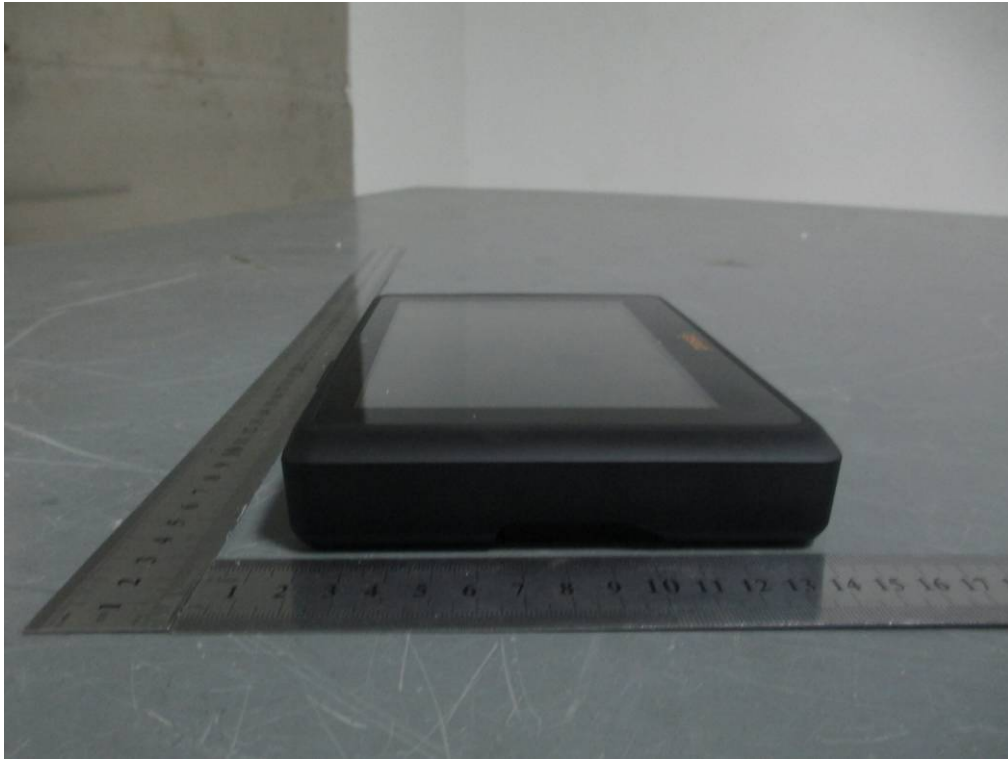
EUT - Rear View



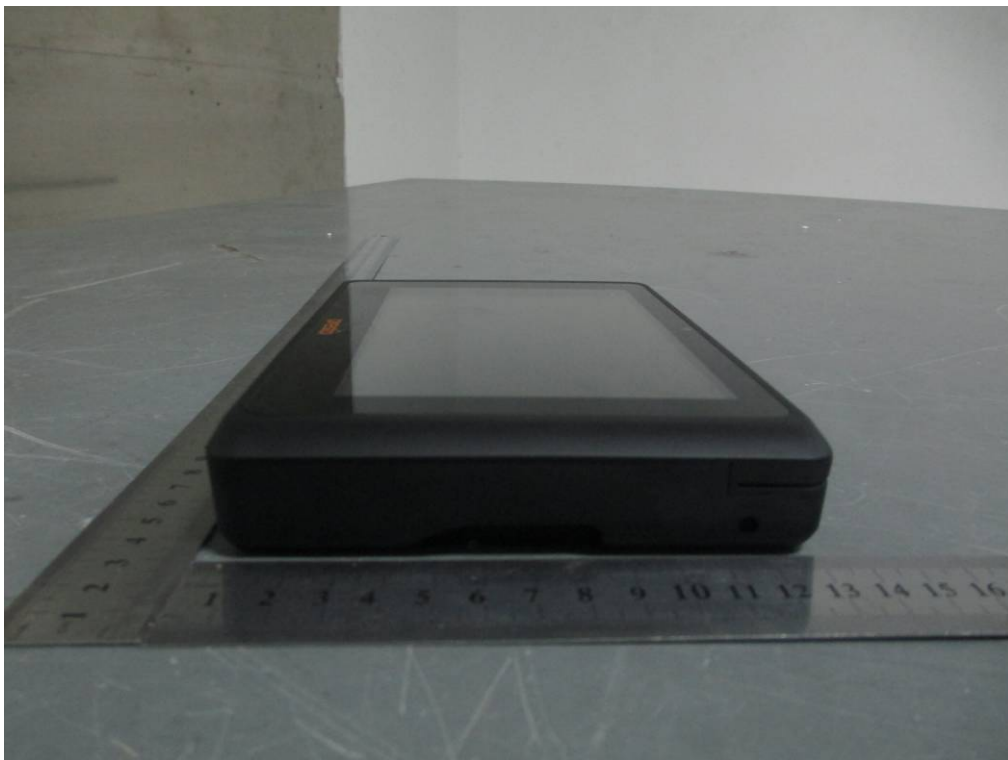
EUT - Top View



EUT - Bottom View

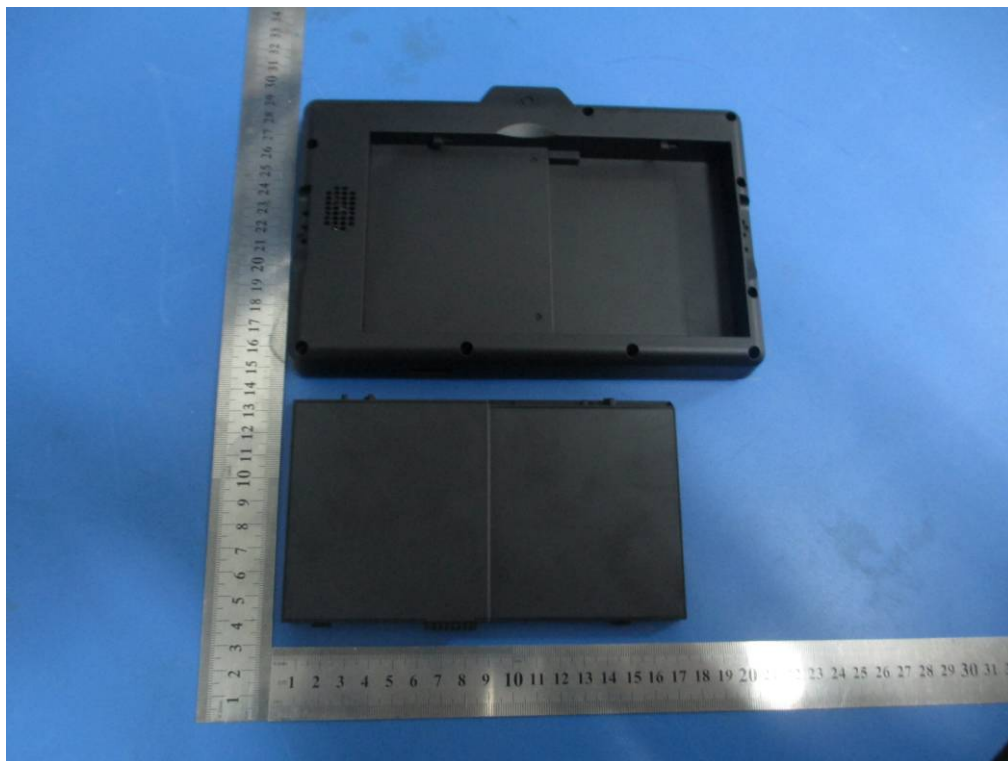


EUT - Left View



EUT - Right View

**Annex B.ii. Photograph 2: EUT Internal Photo**



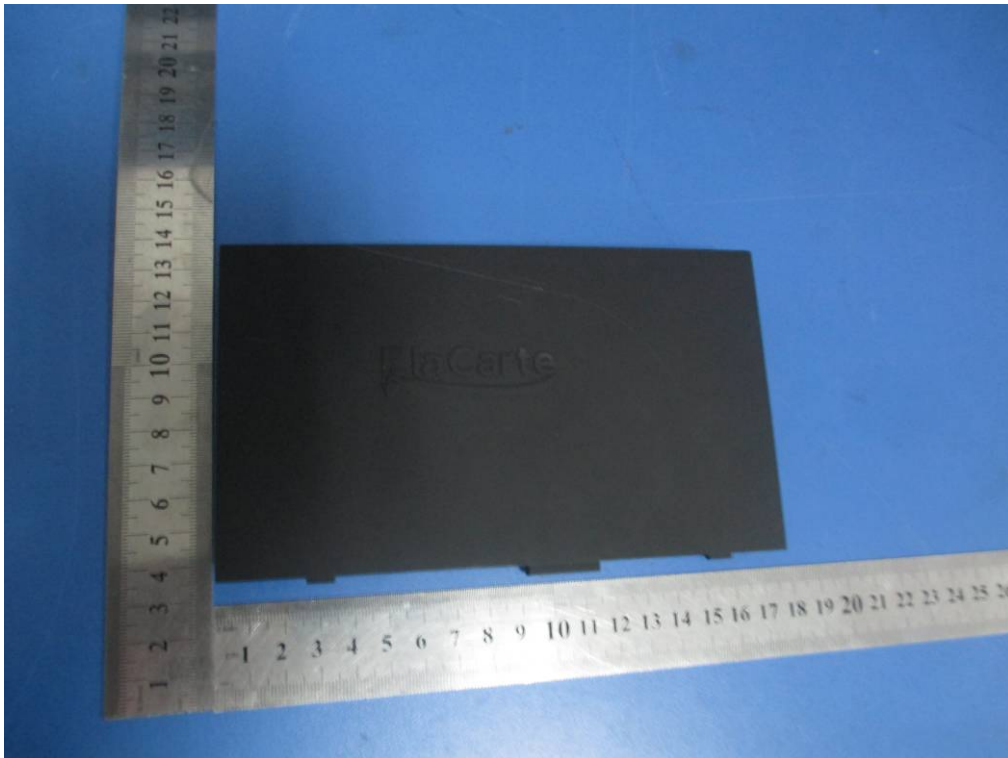
Cover Off - Front View 1



BT/WIFI  
Antenna

NFC  
Antenna

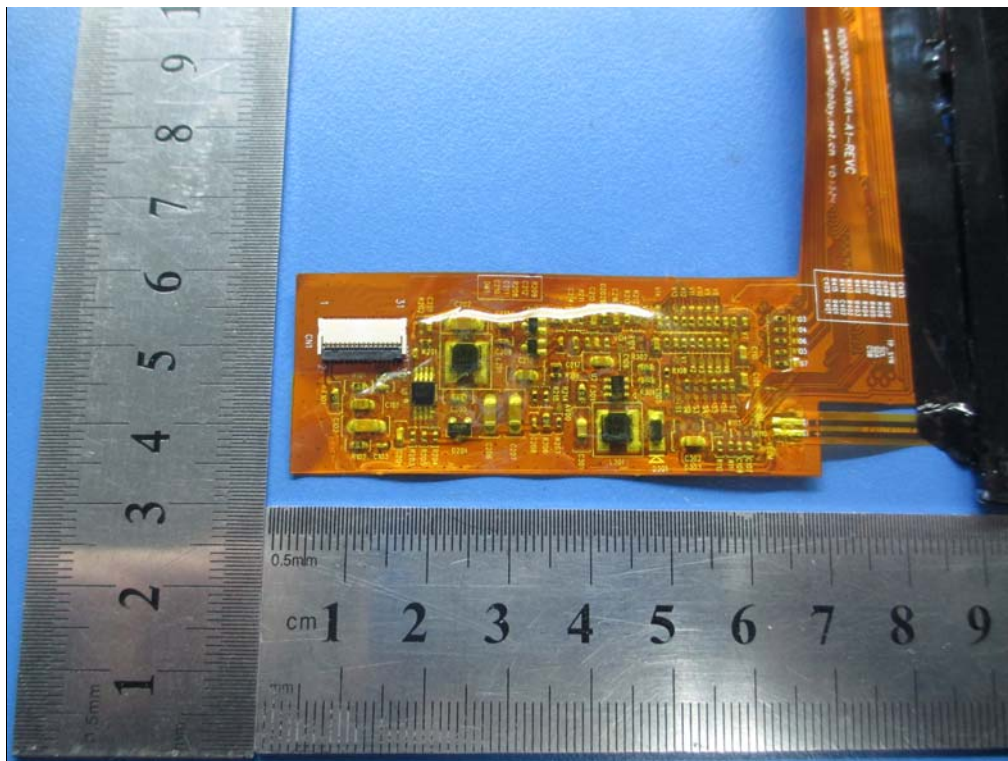
Cover Off - Front View 2



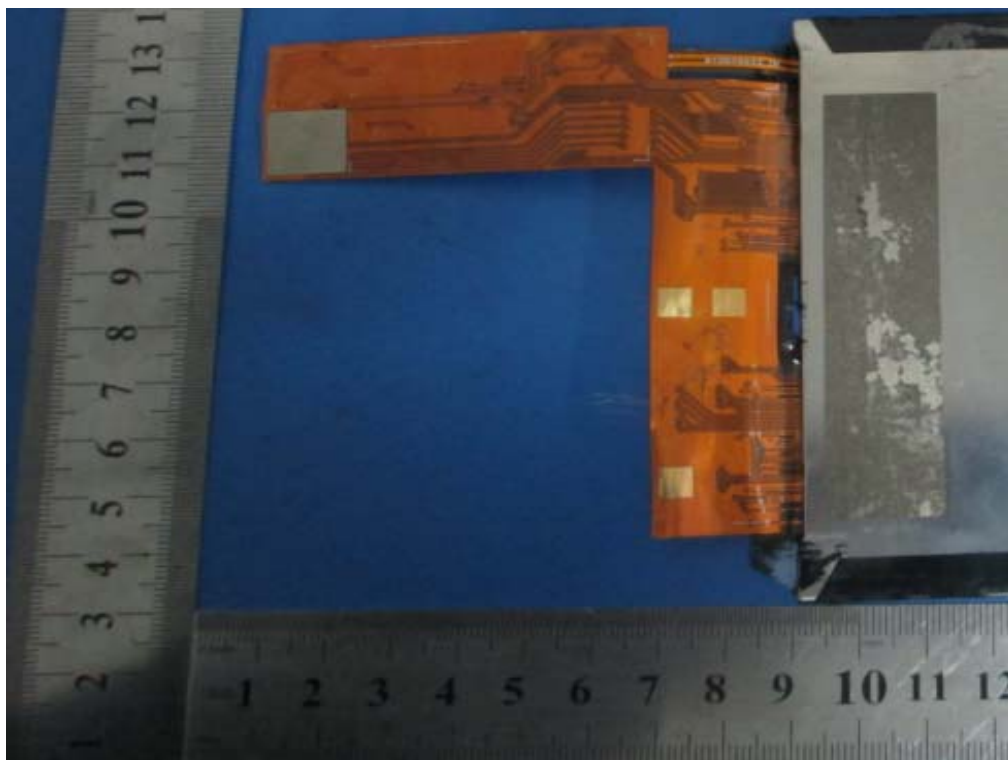
Battery - Top View



Battery - Bottom View



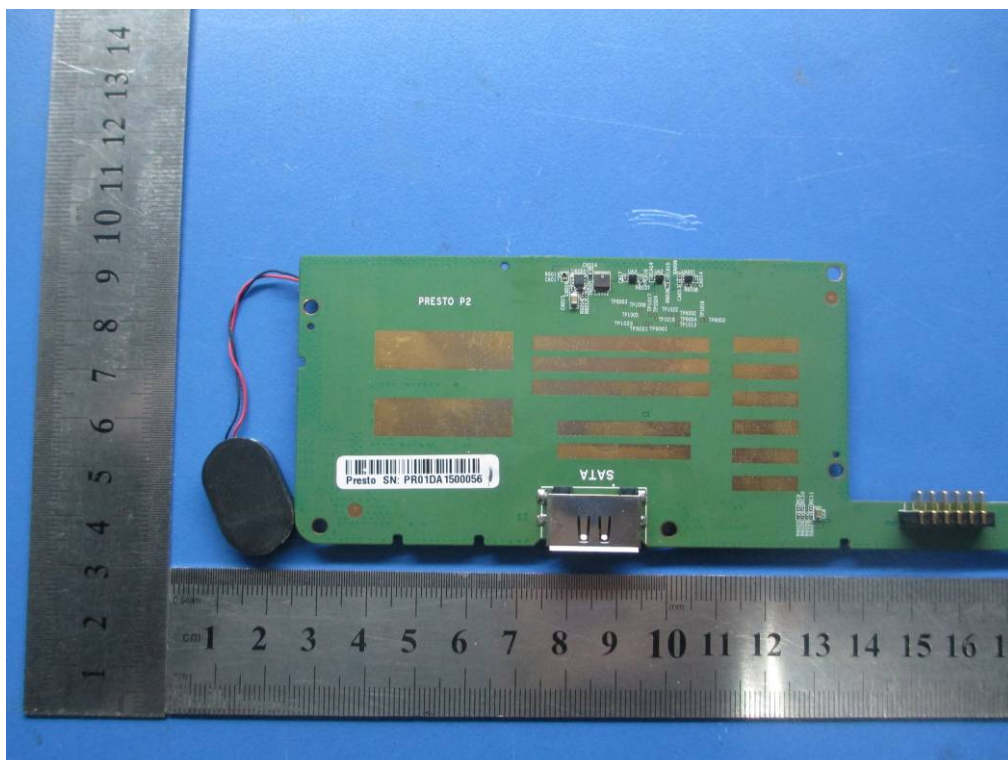
PCB 1 - Front View



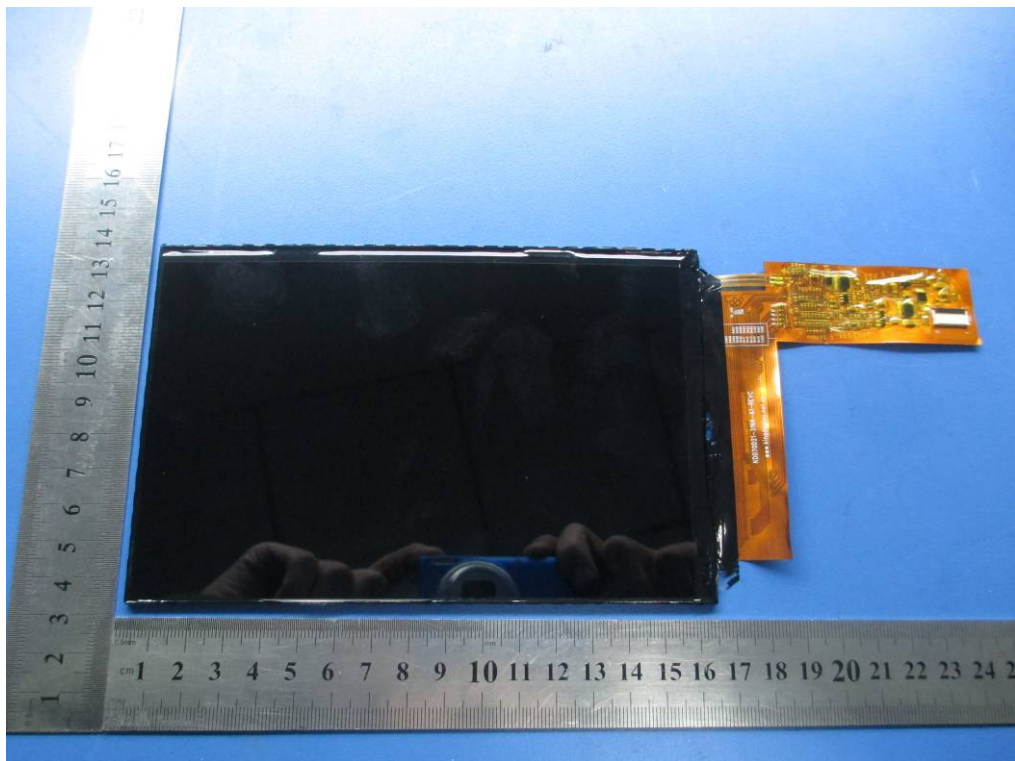
PCB 1 - Rear View



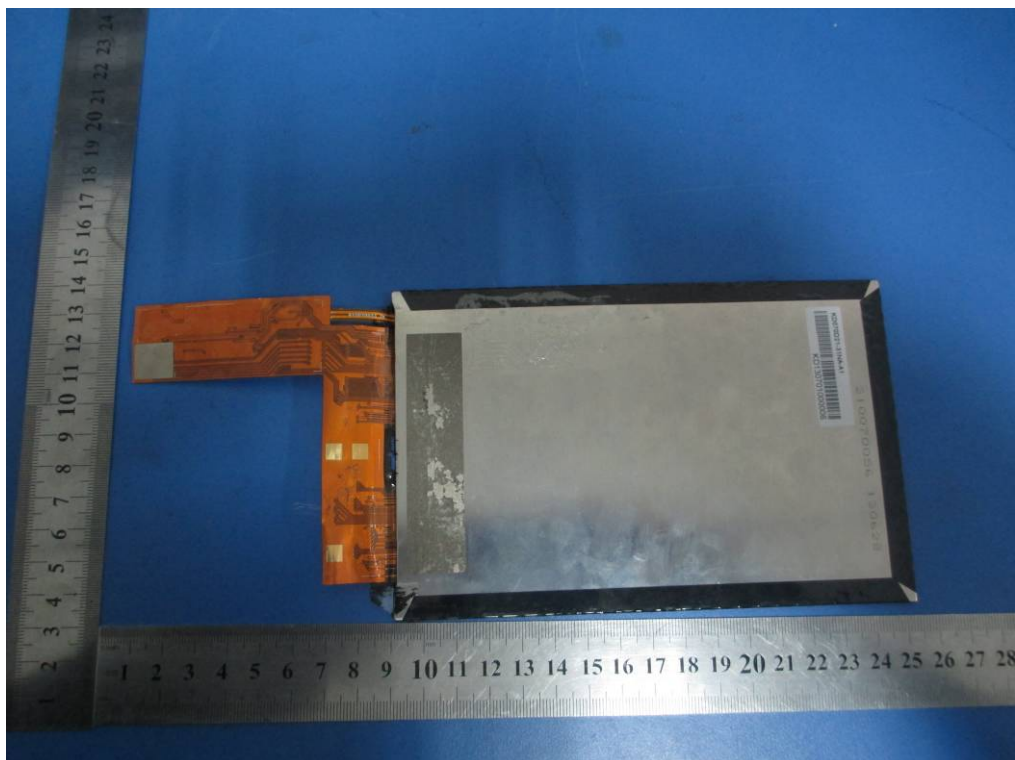
PCB 2 – Front View



PCB 2 – Rear View

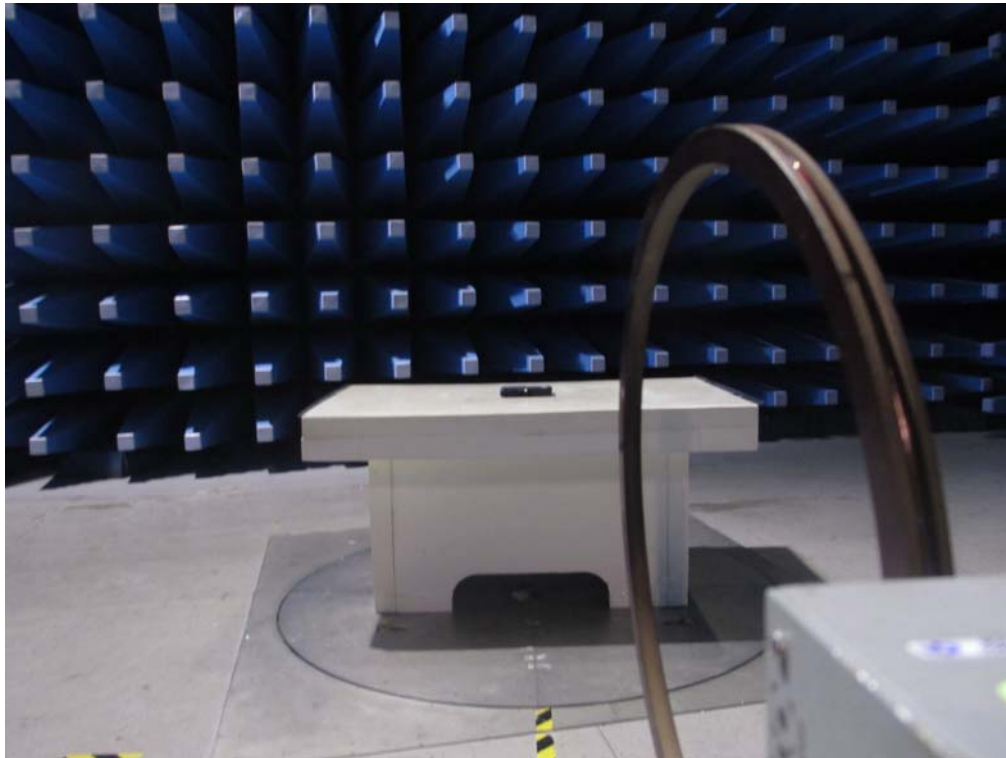


LCD - Front View

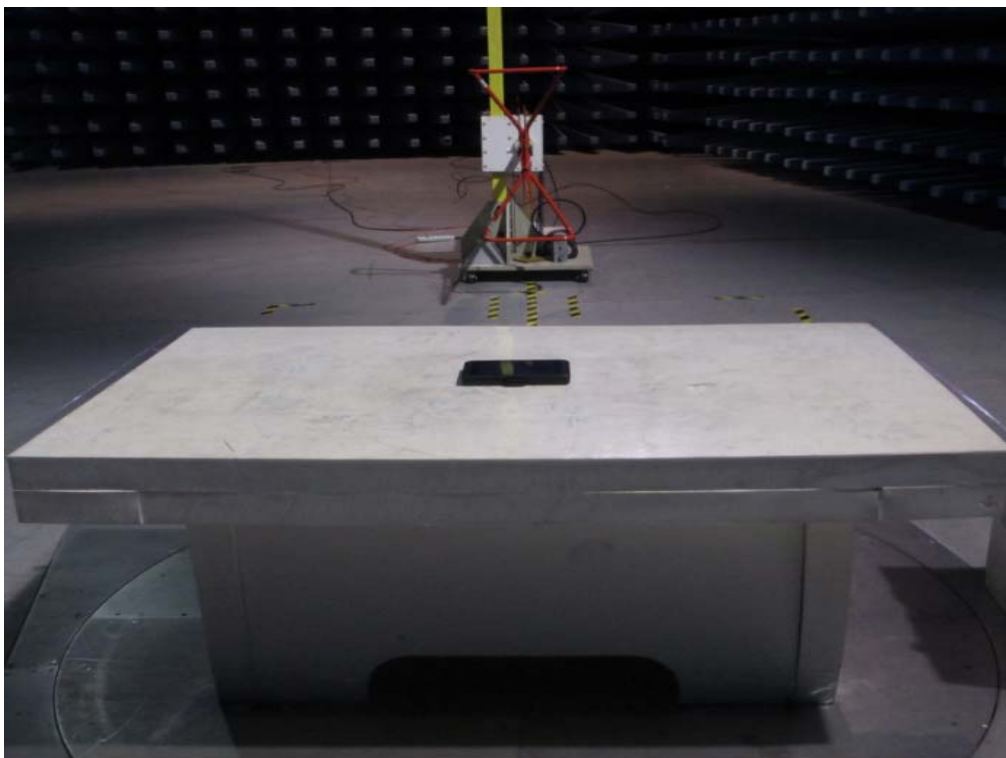


LCD - Rear View

### Annex B.iii. Photograph: Test Setup Photo



Front View of Radiated Emissions Test Setup below 30MHz



Front View of Radiated Emissions Test Setup (30MHz-1GHz)

## **Annex C. TEST SETUP AND SUPPORTING EQUIPMENT**

### **EUT TEST CONDITIONS**

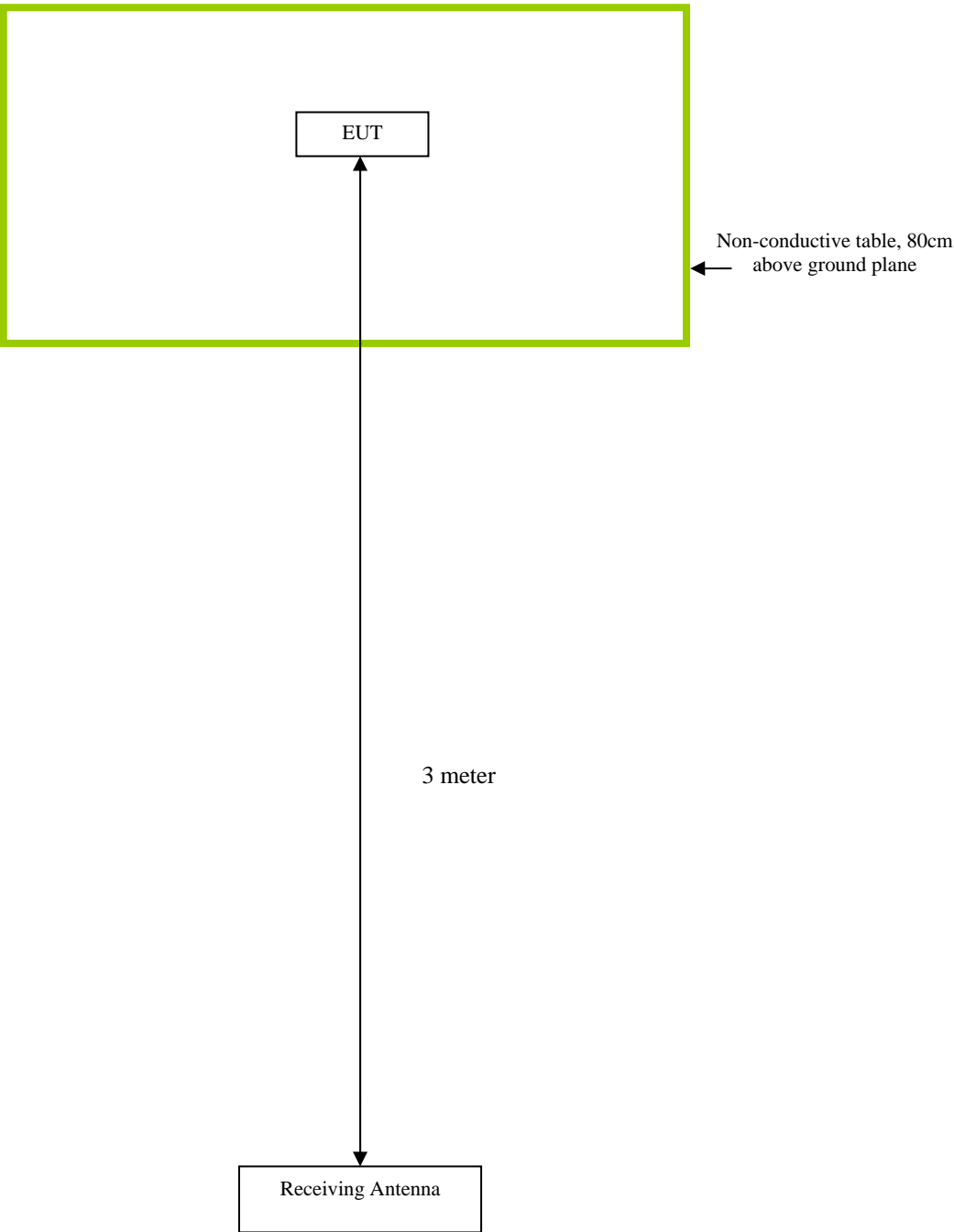
#### **Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION**

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

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
N/A	N/A	N/A

**Block Configuration Diagram for Conducted Emissions**  
N/A

**Block Configuration Diagram for Radiated Emissions**



## **Annex C.ii. EUT OPERATING CONDITIONS**

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was continuously transmitting to stimulate the worst case.

## **Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST**

**Please see attachment**

## **Annex E. DECLARATION OF SIMILARITY**

**N/A**