

# EMC TEST REPORT



Report No.: 16020756-FCC-E

Supersede Report No.: N/A

Applicant	Shanghai Smarfid Security Equipment Co.,Ltd.	
Product Name	Magic Series 13.56MHz&125KHz Reader	
Main Model	LH322-8K	
Serial Model	LH322-8N	
Test Standard	FCC Part 15 Subpart C:2017, ANSI C63.10:2013	
Test Date	October 25 to December 06, 2017	
Issue Date	December 07, 2017	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification	<input checked="" type="checkbox"/>	
Equipment did not comply with the specification	<input type="checkbox"/>	
<i>Trety Lu</i>	<i>Deon Dai</i>	
Trety Lu Test Engineer	Deon Dai Engineer Reviewer	
This test report may be reproduced in full only 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
16020756-FCC-E	NONE	Original	December 07, 2017

## 2. Customer information

Applicant Name	Shanghai Smarfid Security Equipment Co.,Ltd.
Applicant Add	No. 88, Lane 600, XinLi Road, Minhang District, Shanghai, China
Manufacturer	Shanghai Smarfid Security Equipment Co.,Ltd.
Manufacturer Add	No. 88, Lane 600, XinLi Road, Minhang District, Shanghai, 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.	694825
IC Test Site No.	4842B-1
Test Software	EZ_EMG

#### 4. Equipment under Test (EUT) Information

Description of EUT: Magic Series 13.56MHz&125KHz Reader

Main Model: LH322-8K

Serial Model: LH322-8N

Date EUT received: October 23, 2017

Test Date(s): October 25 to December 06, 2017

Operating Frequency : 125KHz&13.56MHz

Antenna Gain  
125KHz: 6dBi  
13.56MHz: 6dBi

Type of Modulation:  
125KHz: ASK、FSK  
13.56MHz: ASK

Number of Channels:  
125KHz: 1CH  
13.56MHz: 1CH

Trade Name : N/A

FCC ID: X3A-LH3228K

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
§15.207; ANSI C63.10: 2013	AC Power Line Conducted Emissions	Compliance
§15.209; ANSI C63.10: 2013	Radiated Emissions	Compliance

### Measurement Uncertainty

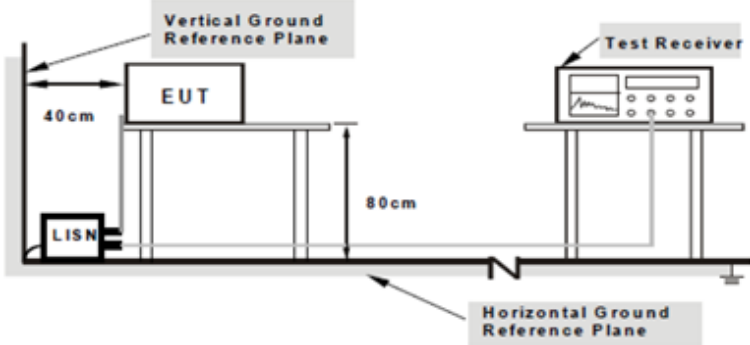
Emissions		
Test Item	Description	Uncertainty
Conducted Emissions & Radiated Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	1.634dB / 3.952dB

## 6. Measurements, Examination And Derived Results

### 6.1 AC Power Line Conducted Emissions

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	October 25, 2017
Tested By :	Trety Lu

#### Requirement(s):

Spec	Requirement	Applicable														
§15.207	<p>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 [μ]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 - 56</td> <td>56 - 46</td> </tr> <tr> <td>0.5 ~ 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 ~ 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency ranges (MHz)	Limit (dBμV)		QP	Average	0.15 ~ 0.5	66 - 56	56 - 46	0.5 ~ 5	56	46	5 ~ 30	60	50	☒
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	 <p>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.</p>															
Procedure	<ol style="list-style-type: none"> <li>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.</li> <li>The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.</li> <li>The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.</li> <li>All other supporting equipment were powered separately from another main supply.</li> <li>The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>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.</li> <li>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.</li> <li>Steps 6-7 were repeated for the LIVE line (for AC mains) or DC line (for DC power).</li> </ol>															
Remark																
Result	☒ Pass    ☐ Fail															



Test Data	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> N/A
Test Plot	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> N/A

**Data sample**

**Data sample**

No.	Frequency (MHz)	Reading (dBμV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
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Frequency (MHz) = Emission frequency in MHz

Reading (dBμV) = Receiver Reading Value

Detector=Quasi Peak Detector or Average Detector

Lisn/Isn= Insertion loss of LISN

Ps\_Lmt= Insertion loss of transient limiter (The transient limiter included 10dB attenuation)

Cab\_L= cable loss

Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

**Calculation Formula:**

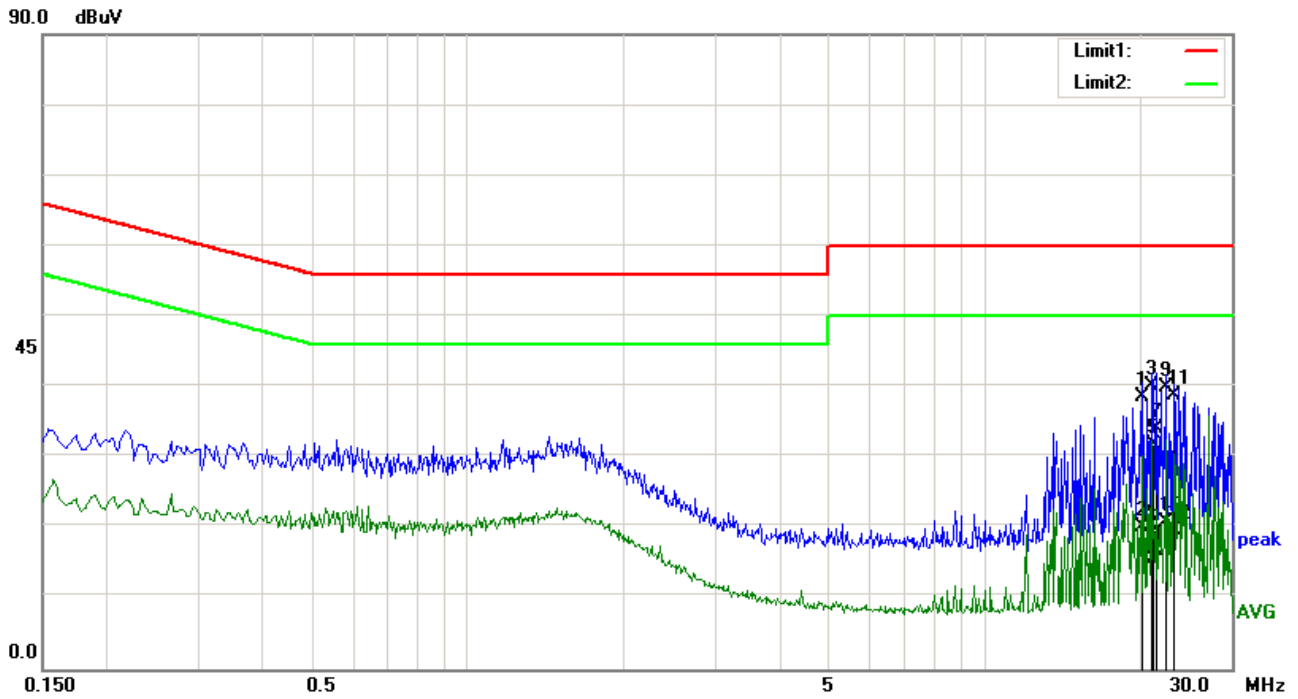
Margin (dB) = Result (dBμV) – limit (dBμV)

**Test Mode:**

1	ASK Transmitting Mode	Worst Case
2	FSK Transmitting Mode	

Note: The worst case will be recorded in this report

Test Mode:	ASK Transmitting Mode
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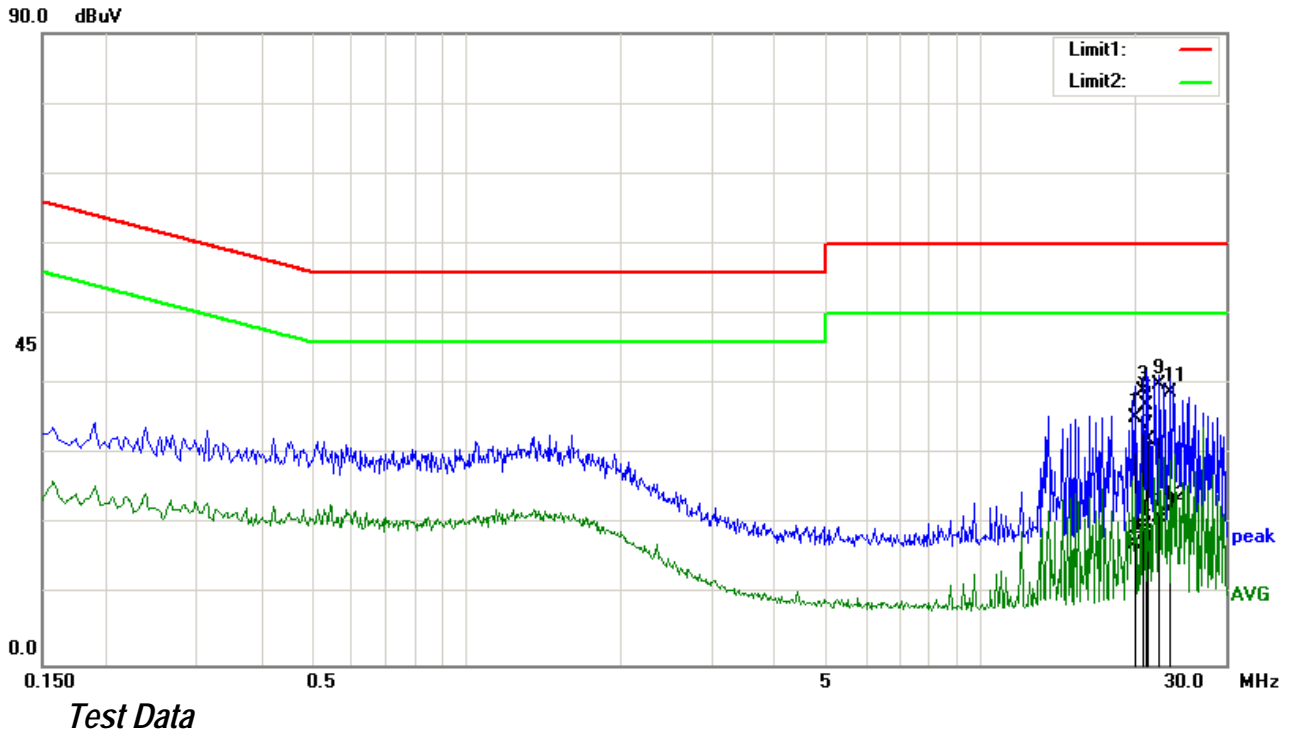


**Test Data**

**Phase Line Plot at DC12V**

No.	Frequency (MHz)	Reading (dBμV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	20.2500	26.79	QP	1.09	-10.00	0.63	38.51	60.00	-21.49
2	20.2500	8.53	AVG	1.09	-10.00	0.63	20.25	50.00	-29.75
3	21.0020	28.43	QP	1.12	-10.00	0.67	40.22	60.00	-19.78
4	21.0020	8.62	AVG	1.12	-10.00	0.67	20.41	50.00	-29.59
5	21.2460	20.16	QP	1.13	-10.00	0.66	31.95	60.00	-28.05
6	21.2460	3.87	AVG	1.13	-10.00	0.66	15.66	50.00	-34.34
7	21.5060	22.22	QP	1.14	-10.00	0.66	34.02	60.00	-25.98
8	21.5060	4.88	AVG	1.14	-10.00	0.66	16.68	50.00	-33.32
9	22.5020	28.12	QP	1.19	-10.00	0.66	39.97	60.00	-20.03
10	22.5020	8.95	AVG	1.19	-10.00	0.66	20.80	50.00	-29.20
11	23.2500	26.88	QP	1.22	-10.00	0.64	38.74	60.00	-21.26
12	23.2500	7.72	AVG	1.22	-10.00	0.64	19.58	50.00	-30.42

Test Mode:	ASK Transmitting Mode
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Phase Neutral Plot at DC12V

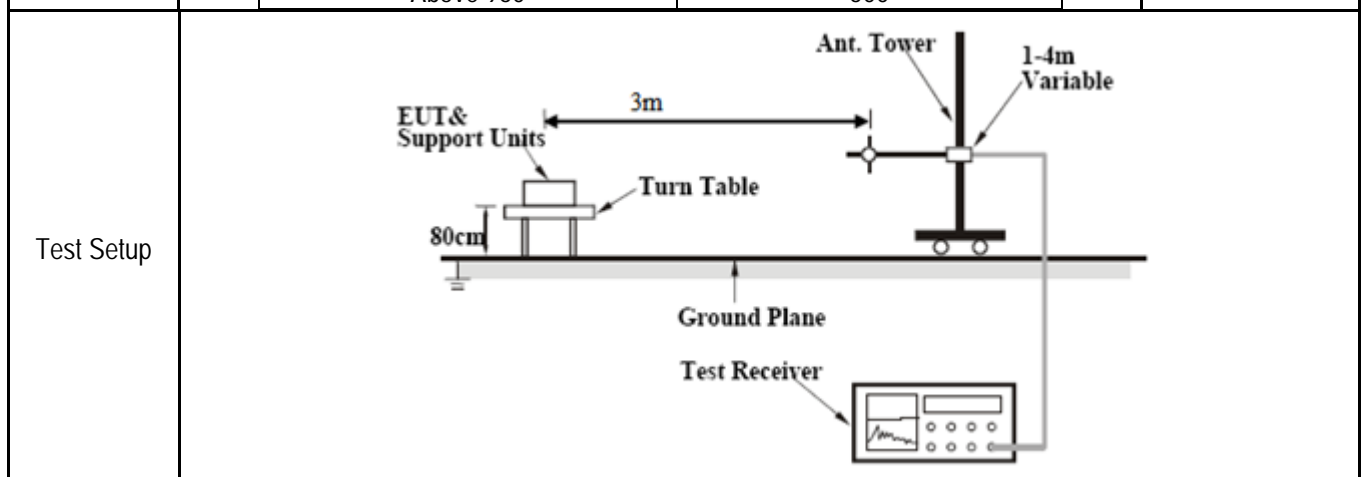
No.	Frequency (MHz)	Reading (dBμV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	19.9980	23.43	QP	1.20	-10.00	0.60	35.23	60.00	-24.77
2	19.9980	5.48	AVG	1.20	-10.00	0.60	17.28	50.00	-32.72
3	20.7500	27.24	QP	1.23	-10.00	0.66	39.13	60.00	-20.87
4	20.7500	8.11	AVG	1.23	-10.00	0.66	20.00	50.00	-30.00
5	20.9980	25.17	QP	1.24	-10.00	0.67	37.08	60.00	-22.92
6	20.9980	6.89	AVG	1.24	-10.00	0.67	18.80	50.00	-31.20
7	21.2460	20.17	QP	1.25	-10.00	0.66	32.08	60.00	-27.92
8	21.2460	3.66	AVG	1.25	-10.00	0.66	15.57	50.00	-34.43
9	22.2500	28.07	QP	1.30	-10.00	0.65	40.02	60.00	-19.98
10	22.2500	8.98	AVG	1.30	-10.00	0.65	20.93	50.00	-29.07
11	23.5020	26.73	QP	1.35	-10.00	0.67	38.75	60.00	-21.25
12	23.5020	9.96	AVG	1.35	-10.00	0.67	21.98	50.00	-28.02

## 6.2 Radiated Emissions

Temperature	22°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	October 25 to December 06, 2017
Tested By :	Trety Lu

### Requirement(s):

Spec	Requirement	Applicable																																		
§15.209	<p>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</p> <table border="1"> <thead> <tr> <th>Fundamental frequency (MHz)</th> <th>Field strength (microvolts/meter)</th> <th>Measurement distance (meters)</th> </tr> </thead> <tbody> <tr> <td>0.009-0.490</td> <td>2400/F(kHz)</td> <td>300</td> </tr> <tr> <td>0.490-1.705</td> <td>24000/F(kHz)</td> <td>30</td> </tr> <tr> <td>1.705-30.0</td> <td>30</td> <td>30</td> </tr> <tr> <td>30-88</td> <td>100**</td> <td>3</td> </tr> <tr> <td>88-246</td> <td>150**</td> <td>3</td> </tr> <tr> <td>216-960</td> <td>200**</td> <td>3</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>3</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (µV/m)</th> </tr> </thead> <tbody> <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> </tbody> </table>	Fundamental frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	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	88-246	150**	3	216-960	200**	3	Above 960	500	3	Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 – 960	200	Above 960	500	☒
Fundamental frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)																																		
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																																		
88-246	150**	3																																		
216-960	200**	3																																		
Above 960	500	3																																		
Frequency range (MHz)	Field Strength (µV/m)																																			
30 – 88	100																																			
88 – 216	150																																			
216 – 960	200																																			
Above 960	500																																			



Procedure	<ol style="list-style-type: none"> <li>1. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>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: <ol style="list-style-type: none"> <li>a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>b. The EUT was then rotated to the direction that gave the maximum emission.</li> <li>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> </ol>
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	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.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Test Data	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> N/A
Test Plot	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> N/A

**Data sample**

No.	Frequency (MHz)	Reading (dBμV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
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Frequency (MHz) = Emission frequency in MHz

Reading (dBμV/m) = Receiver Reading Value

Detector= Peak Detector or Quasi Peak Detector

Ant\_F=Antenna Factor

PA\_G=Pre-Amplifier Gain

Cab\_L=Cable Loss

Result (dBμV/m) = Reading Value + Corrected Value

Limit (dBμV/m) = Limit stated in standard

Height (cm) = Height of Receiver antenna

Degree = Turn table degree

**Calculation Formula:**

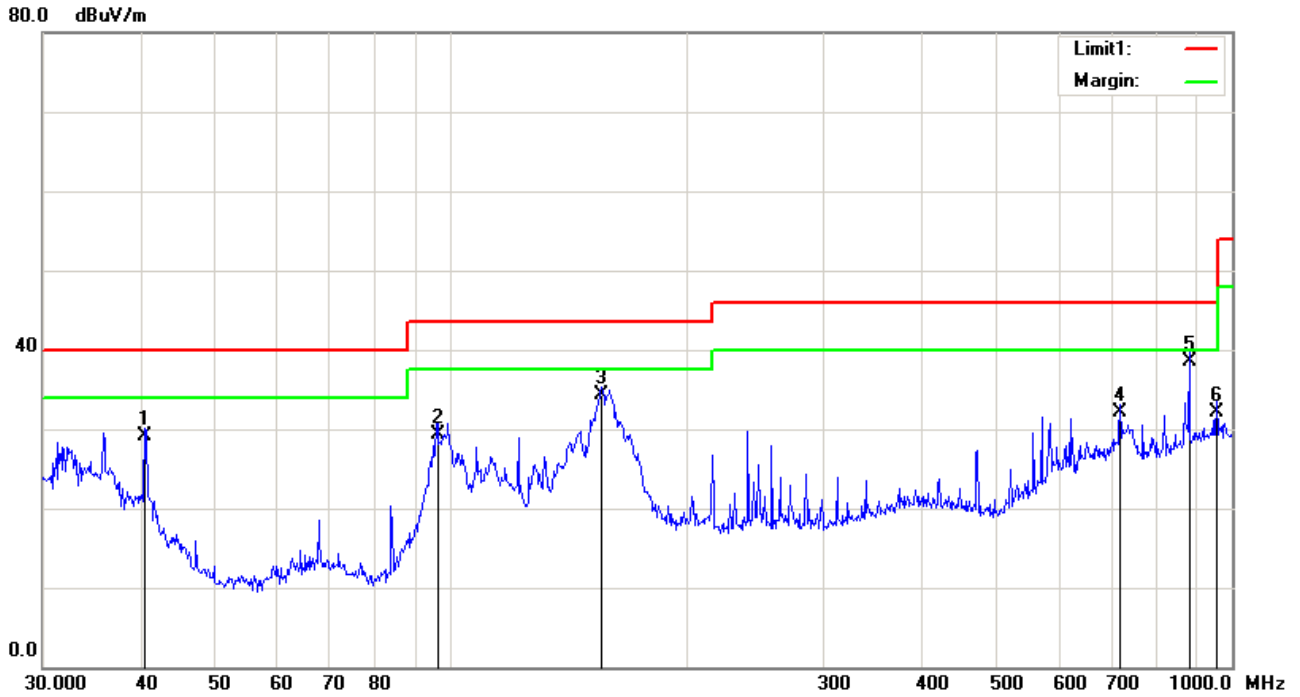
Margin (dB) = Result (dBμV/m) – limit (dBμV/m)

**Test Mode:**

1	ASK Transmitting Mode	Worst Case
2	FSK Transmitting Mode	
Note: The worst case will be recorded in this report		

Test Mode:	ASK Transmitting Mode
------------	-----------------------

(30MHz - 1GHz)



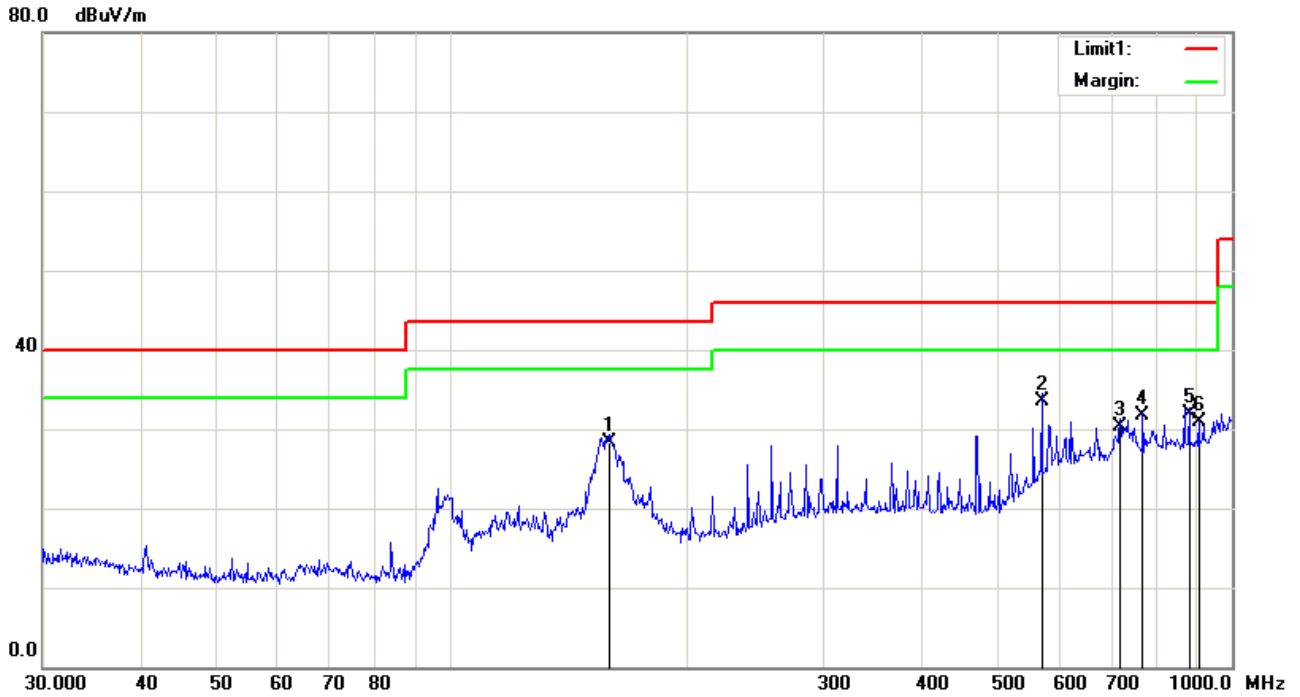
Test Data

Vertical Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBμV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	40.5591	58.42	QP	15.40	45.73	1.06	29.15	40.00	-10.85	100	356
2	96.0986	64.14	QP	10.28	46.66	1.57	29.33	43.50	-14.17	100	250
3	155.9101	66.25	QP	13.60	47.57	2.08	34.36	43.50	-9.14	100	308
4	719.1995	51.22	QP	22.39	45.75	4.31	32.17	46.00	-13.83	200	7
5	881.4067	56.38	QP	23.28	45.95	4.80	38.51	46.00	-7.49	100	92
6	955.4381	49.74	QP	23.64	46.16	4.97	32.19	46.00	-13.81	100	108

Test Mode:	ASK Transmitting Mode
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(30MHz - 1GHz)



Test Data

Horizontal Polarity Plot @3m

No.	Frequency (MHz)	Reading (dBμV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Degree (°)
1	159.7844	61.01	QP	12.51	47.30	2.07	28.29	43.50	-15.21	300	233
2	570.6100	58.37	QP	19.71	48.43	3.82	33.47	46.00	-12.53	200	269
3	719.1995	49.20	QP	22.52	45.75	4.31	30.28	46.00	-15.72	300	102
4	768.7482	49.99	QP	22.81	45.46	4.45	31.79	46.00	-14.21	200	230
5	881.4067	50.27	QP	22.76	45.95	4.80	31.88	46.00	-14.12	300	23
6	906.4824	49.71	QP	22.86	46.63	4.87	30.81	46.00	-15.19	200	294

<b>Test Mode:</b>	<b>ASK Transmitting Mode</b>
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0° 9 kHz -30MHz

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Ant. Factor (dB/m)	Cable Loss (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
0.099	30.65	QP	71.3	0.01	101.96	107.69	-5.73
0.103	31.98	QP	70.4	0.02	102.4	107.35	-4.95
1.25	13.61	QP	50.3	0.08	63.99	65.67	-1.68
14.5	18.39	QP	38.5	0.1	56.99	69.54	-12.55
25.7	14.24	QP	37.7	0.2	52.14	69.54	-17.4
27.3	14.27	QP	36.2	0.3	50.77	69.54	-18.77

90° 9 kHz -30MHz ( ASK Modulation is worst )

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Ant. Factor (dB/m)	Cable Loss (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
0.099	30.28	QP	71.3	0.01	101.59	107.69	-6.1
0.103	30.64	QP	70.4	0.02	101.06	107.35	-6.29
1.25	13.98	QP	50.3	0.08	64.36	65.67	-1.31
14.5	18.59	QP	38.5	0.1	57.19	69.54	-12.35
25.7	14.38	QP	37.7	0.2	52.28	69.54	-17.26
27.3	14.59	QP	36.2	0.3	51.09	69.54	-18.45

Note: The highest frequency of the internal sources of the EUT is less than 108MHz, so the measurement shall only be made up to 1GHz.



## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted Emissions</b>					
R&S EMI Test Receiver	ESPI3	101216	05/03/2017	05/03/2017	<input checked="" type="checkbox"/>
V-LISN	ESH3-Z5	838979/005	05/15/2017	05/15/2017	<input checked="" type="checkbox"/>
Com-Power LISN	LI-115	241091	05/15/2017	05/15/2017	<input checked="" type="checkbox"/>
SIEMIC EZ_EMG Conducted Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
Agilent Technologies Spectrum Analyzer	N9010A	MY47191130	05/03/2017	05/03/2017	<input checked="" type="checkbox"/>
R&S EMI Receiver	ESPI3	101216	05/03/2017	05/03/2017	<input checked="" type="checkbox"/>
Antenna (30MHz~6GHz)	JB6	A121411	10/31/2016	10/31/2017	<input checked="" type="checkbox"/>
EMCO Passive Loop Antenna	6509	9909-1469	10/09/2017	10/08/2018	<input checked="" type="checkbox"/>
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2016	10/26/2017	<input checked="" type="checkbox"/>
SIEMIC EZ_EMG Radiated Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	<input checked="" type="checkbox"/>

## Annex B. EUT And Test Setup Photographs

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



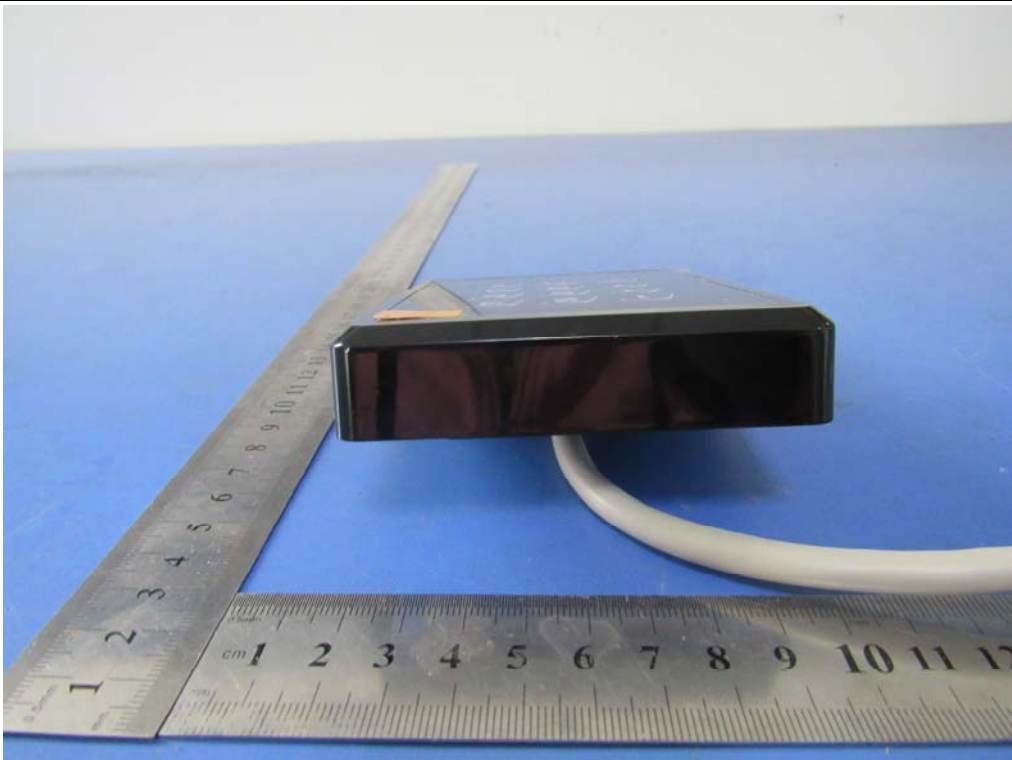
EUT – Front View



EUT – Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



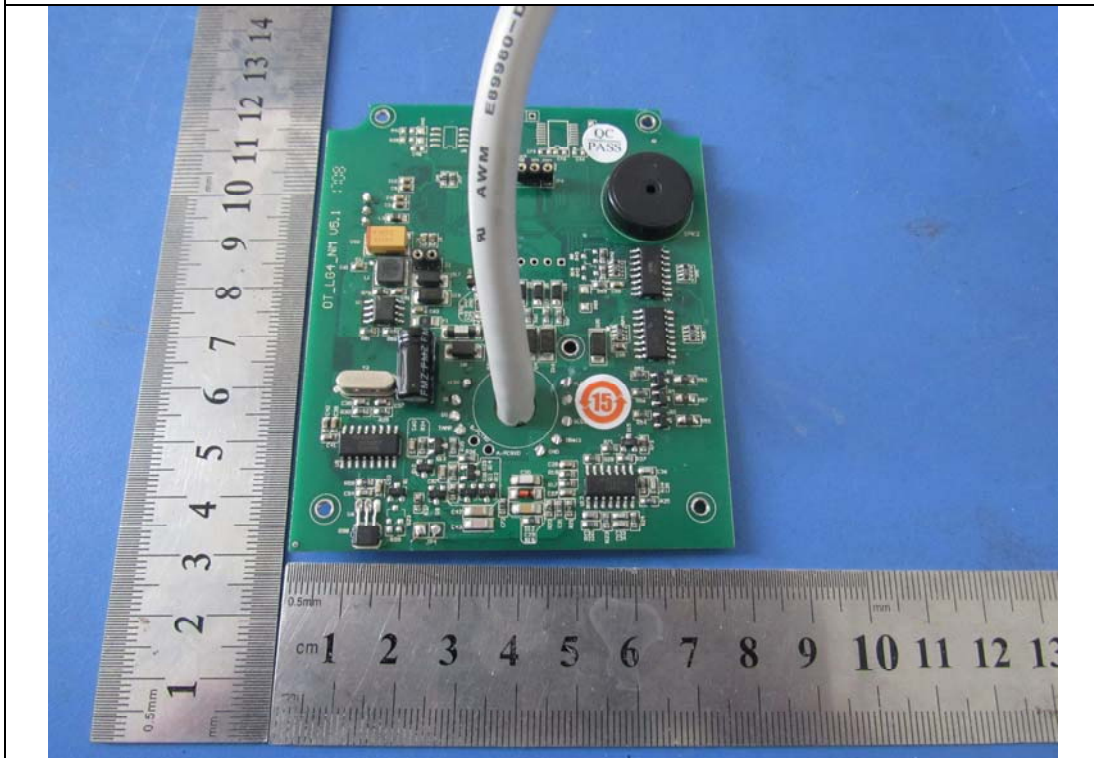
EUT - Right View



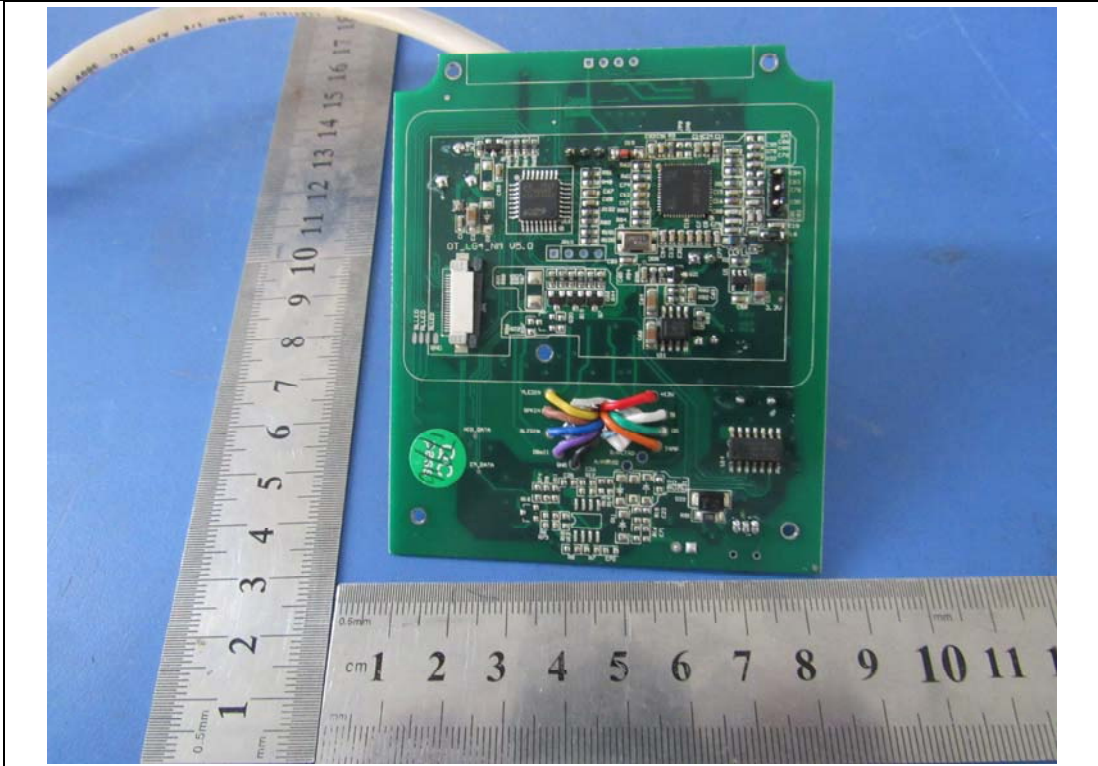
**Annex B.ii. Photograph: EUT Internal Photo**



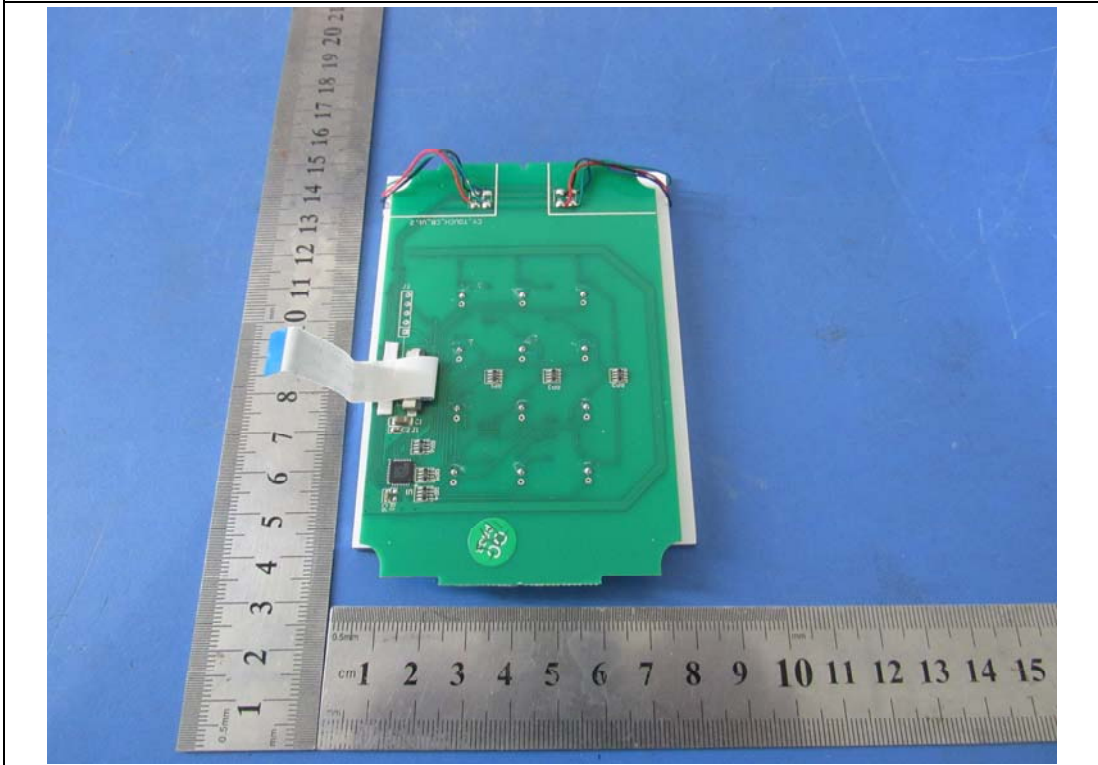
EUT – Uncover Front View 1



EUT – PCBA 1 Front View

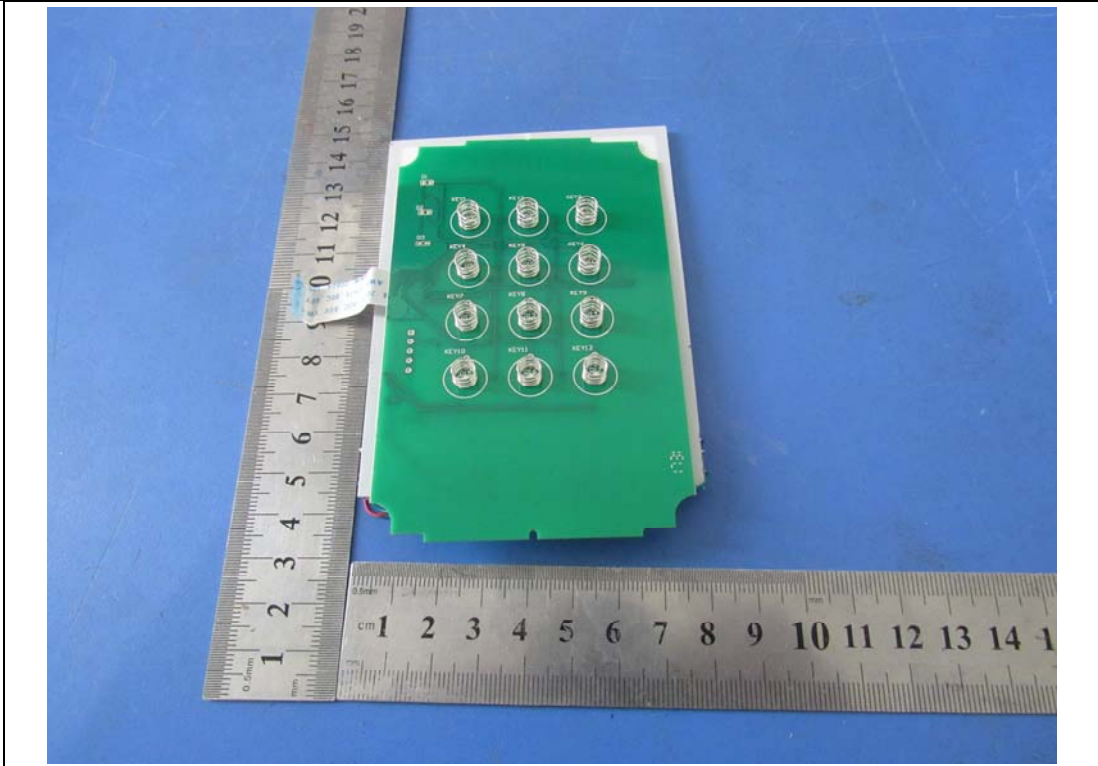


EUT - PCBA 1 Rear View

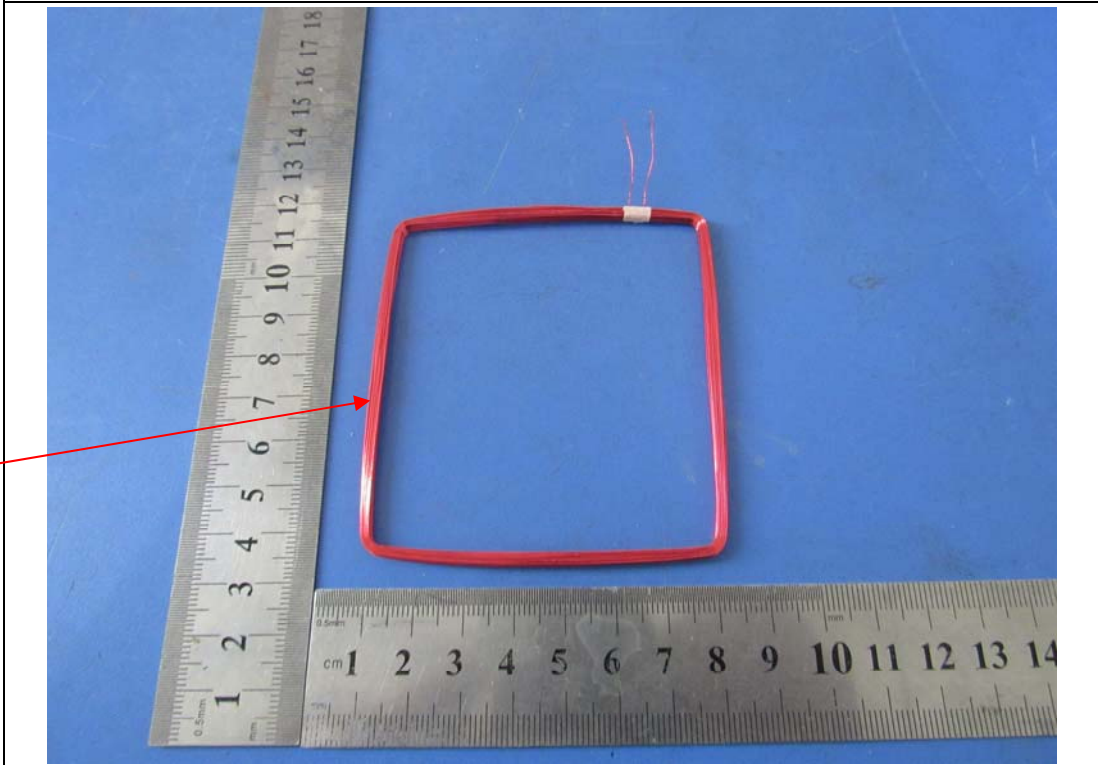


EUT - PCBA 2 Front View

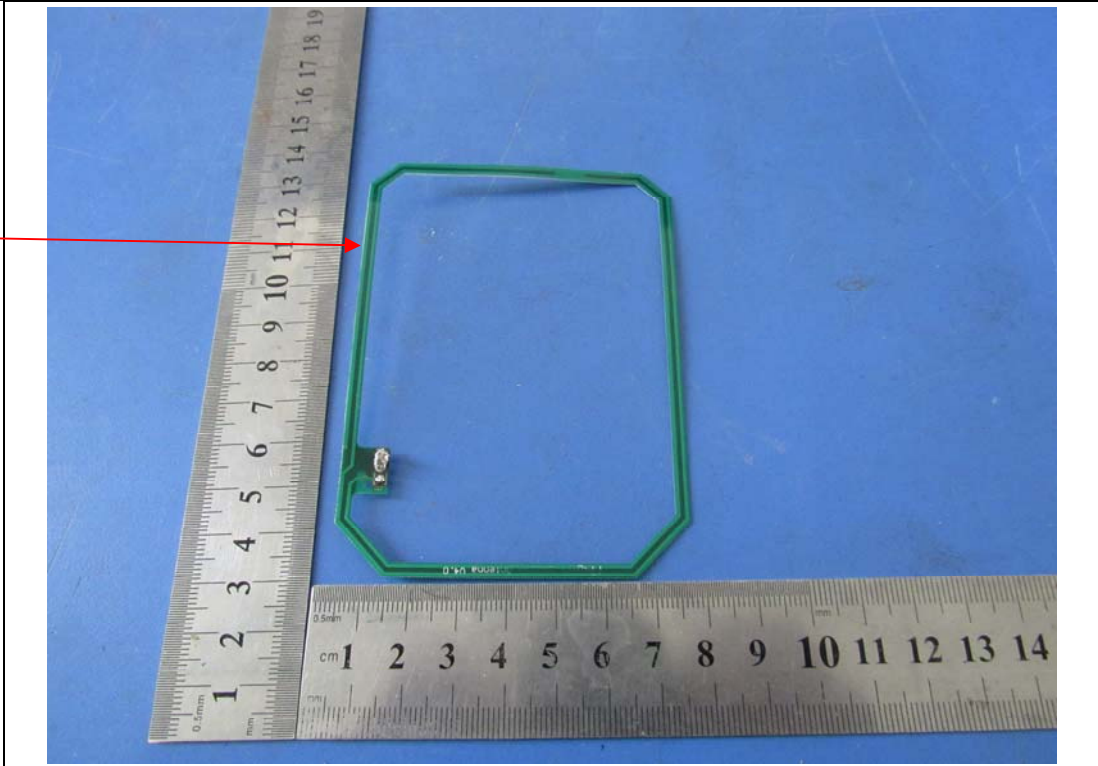




EUT - PCBA 2 Rear View



EUT - Antenna Front View



EUT - Antenna Front View



**Annex B.iii. Photograph Test Setup Photo**



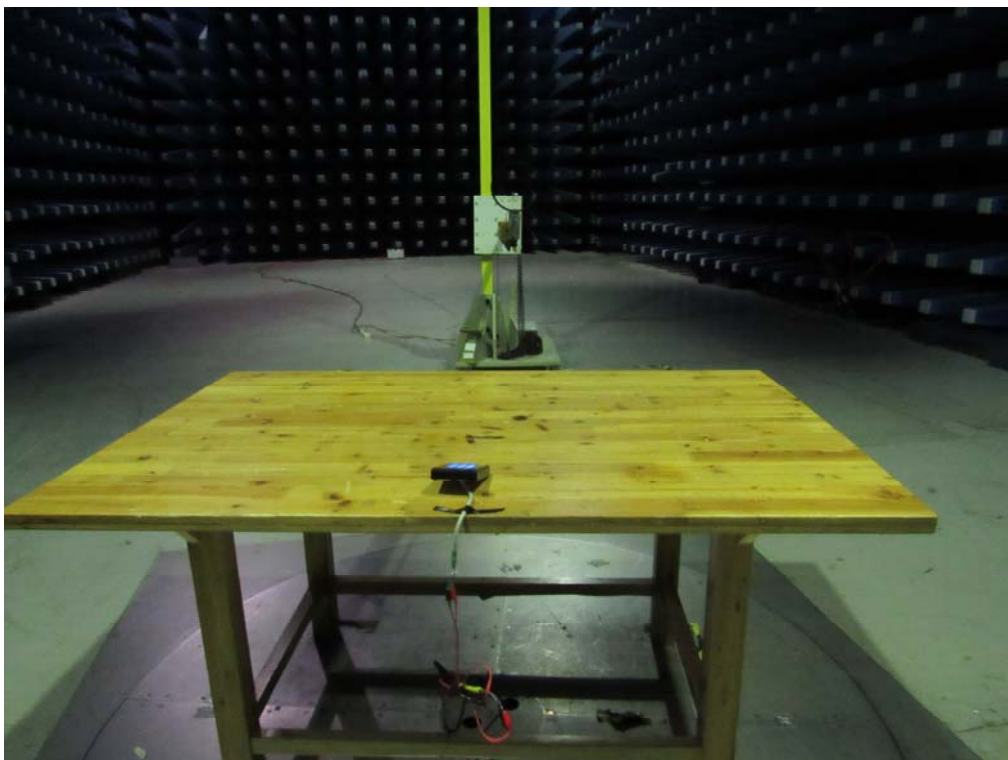
Conducted Emissions Setup Front View



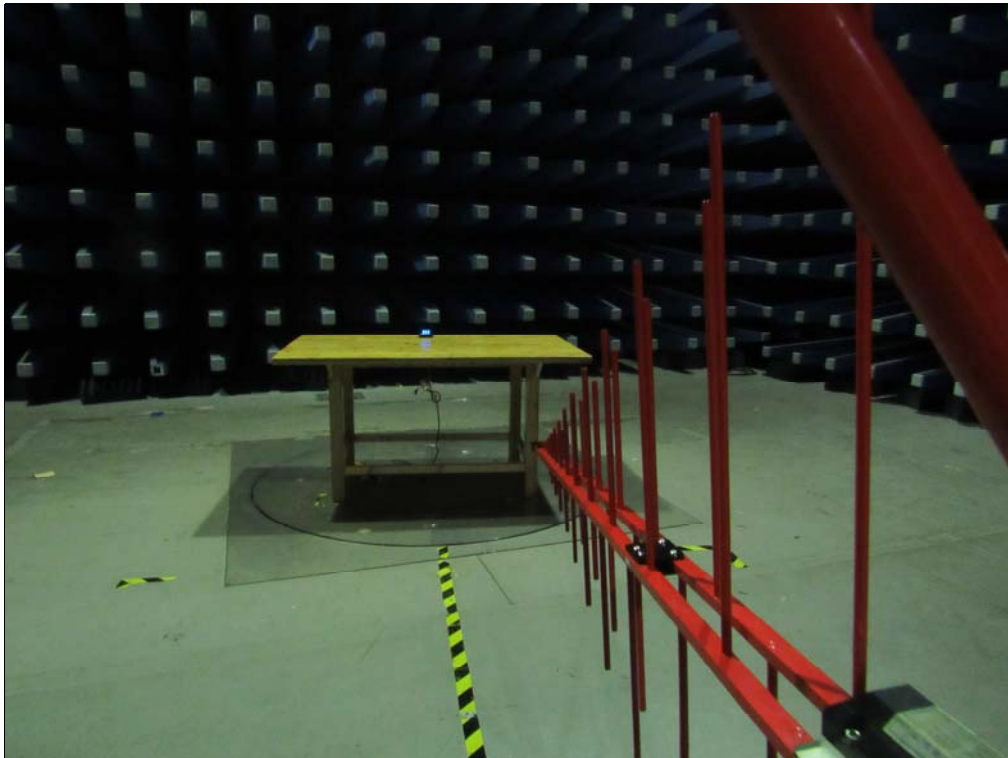
Conducted Emissions Setup Side View



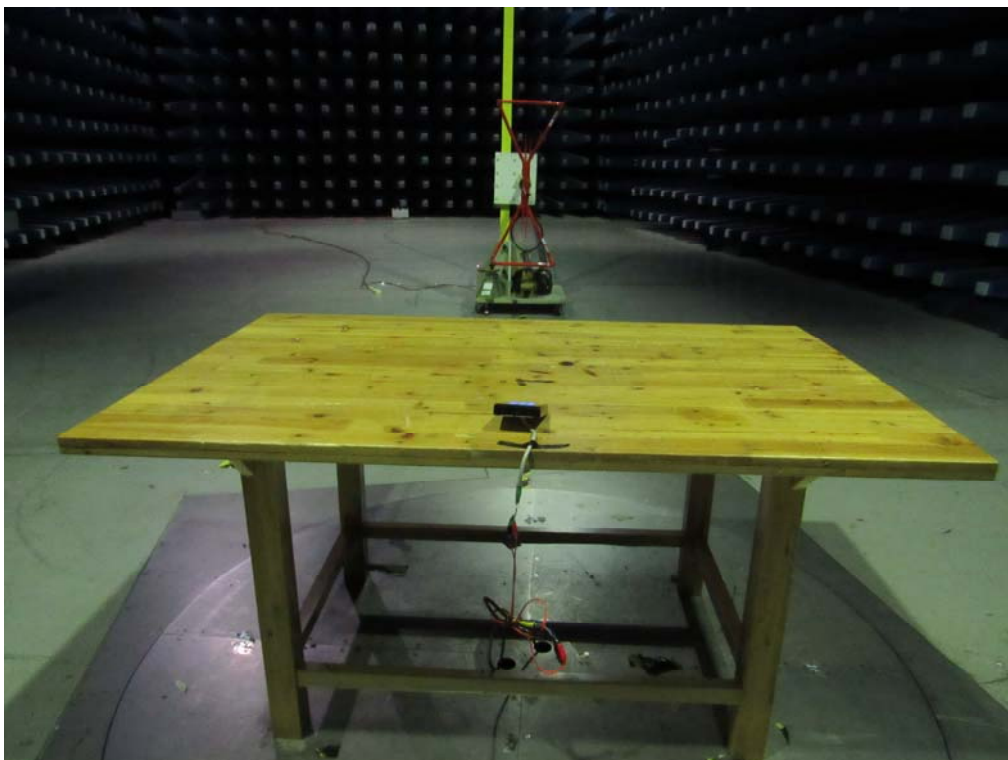
Front View of Radiated Emissions Test Setup below 30MHz



Rear View of Radiated Emissions Test Setup below 30MHz



Radiated Emissions Setup Below 1GHz Front View

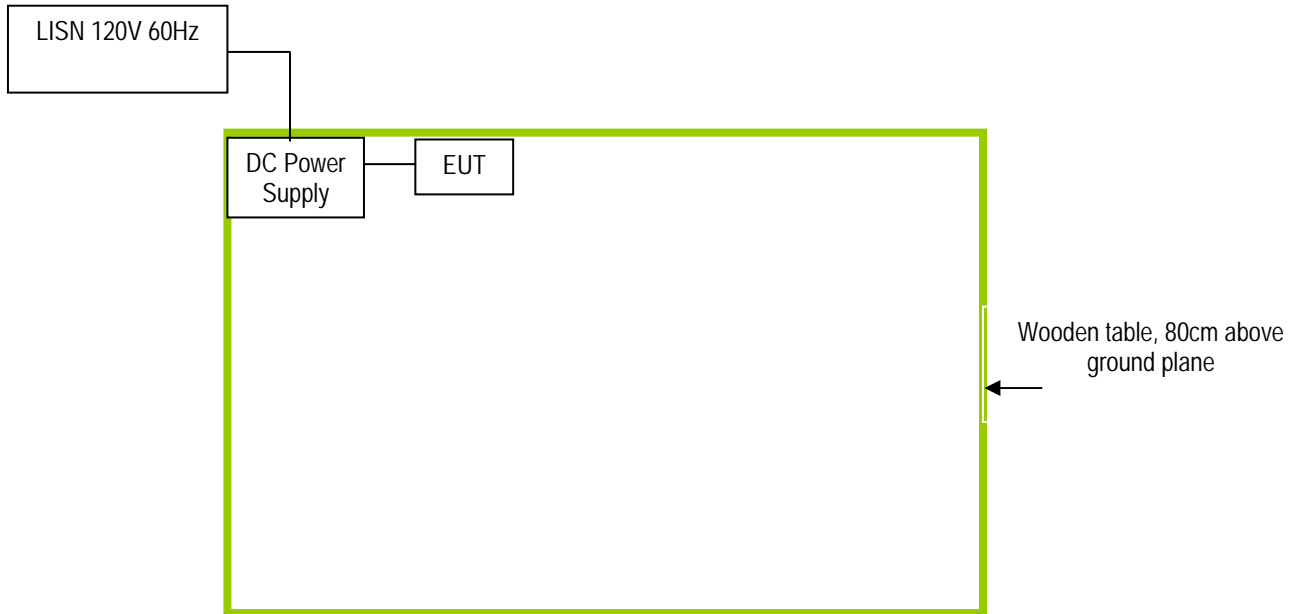


Radiated Emissions Setup Below 1GHz Rear View

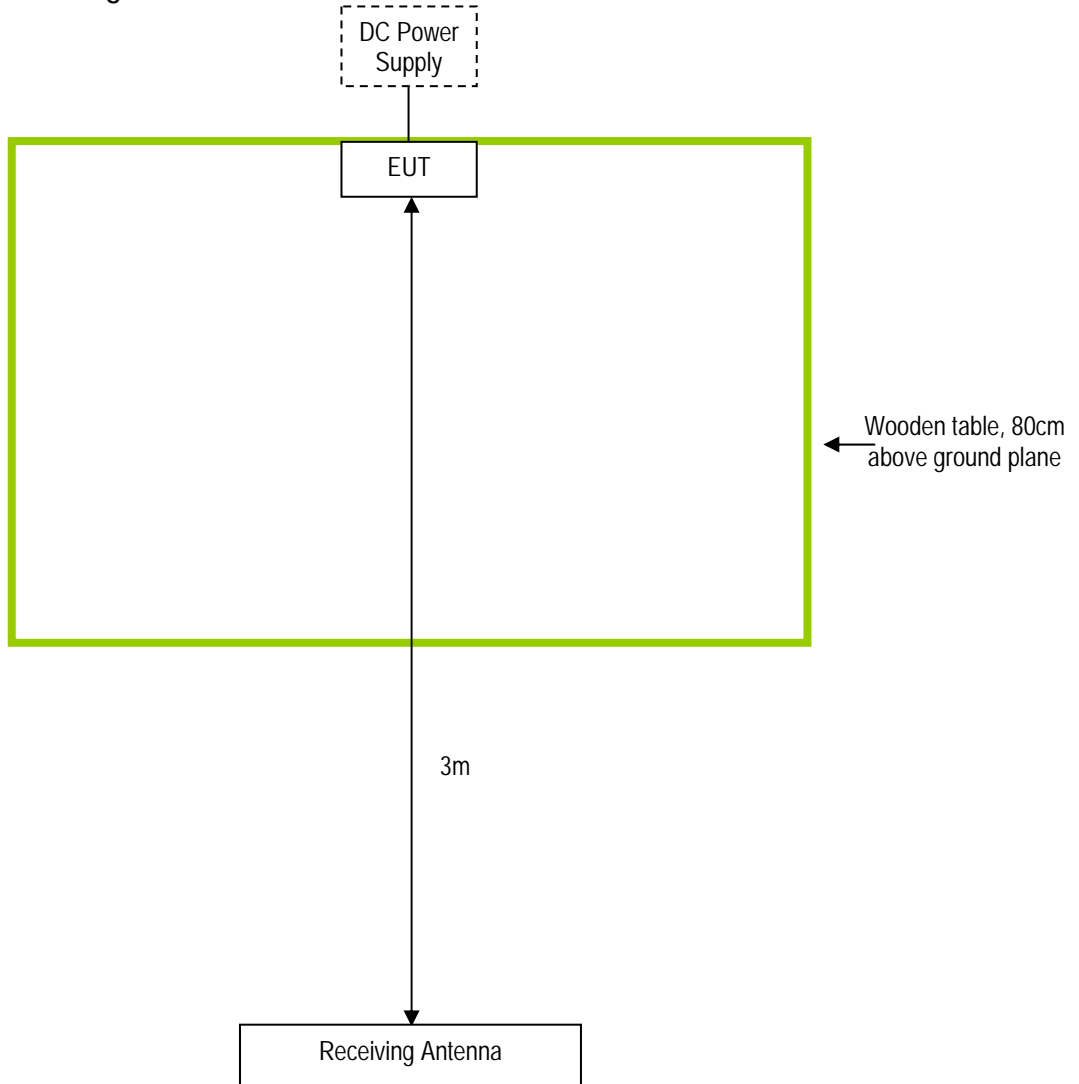
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### 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	Cal Date	Cal Due Date
BK PRECISION	DC Power Supply	1786B	N/A	N/A

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

Please see Attachment



## Annex E. DECLARATION OF SIMILARITY

# SMARFID

Shanghai Smarfid Security Equipment Co., Ltd.  
Add: No. 88, Lane 600, XinLi Road, Minhang District, Shanghai, 201199, China  
Tel: (86-21) 54260103, 54260132 ext.215 Fax: (86-21) 54260132 ext.222

To:

## Declaration letter

Dear Sir/Madam:

For our business issue and marketing requirement, we would like to list different models numbers on the FCC ID certificates and reports, as following:

FCC ID: X3ALH3228K

Model No: LH322-8K,

LH322-8N

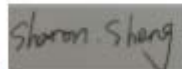
The two models have the same Circuits, components and color.

**Apart from the different model name, the two models differ from each other by:**

LH322-8K has the button function, but LH322-8N has no button function.

Thank you!

Signature:



Printed name/title: Sharon Sheng