EMC TEST REPORT

Report No.: 16020753-FCC-E
Supersede Report No.: N/A

Applicant	Shanghai Smarfid Security Equipment Co.,Ltd
Product Name	Magic Series 13.56MHZ&125KHZ Reader
Main Model	MH322-8K
Serial Model	MH322-8N、MT322-8K、MT322-8N
Test Standard	FCC Part 15 Subpart C:2016, ANSI C63.10:2013
Test Date	November 21 to November 22, 2016
Issue Date	November 28, 2016
Test Result	☒ Pass ☐ Fail
Equipment complied with the specification	☒
Equipment did not comply with the specification	☐

Louise Tu	Miro Bao	
Louise Tu Test Engineer	Miro Bao 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.

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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
16020753-FCC-E	NONE	Original	November 28, 2016

2. Customer information

Applicant Name	Shanghai Smarfid Security Equipment Co.,Ltd
Applicant Add	Room 301,4th Bldg., No.4 TongLi Road, SongJiang District,Shanghai 201615,China
Manufacturer	Shanghai Smarfid Security Equipment Co.,Ltd
Manufacturer Add	Room 301,4th Bldg., No.4 TongLi Road, SongJiang District,Shanghai 201615,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	EZ_EMC

4. Equipment under Test (EUT) Information

Description of EUT:	Magic Series 13.56MHZ&125KHZ Reader
Main Model:	MH322-8K
Serial Model:	MH322-8N、MT322-8K、MT322-8N
Date EUT received:	November 11, 2016
Test Date(s):	November 21 to November 22, 2016
Operating Frequency :	125KHz&13.56MHz
Antenna Gain	125KHz: 6dBi 13.56MHz: 6dBi
Type of Modulation:	ASK
Number of Channels:	1 CH
Trade Name :	N/A
FCC ID:	X3A-MH322

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

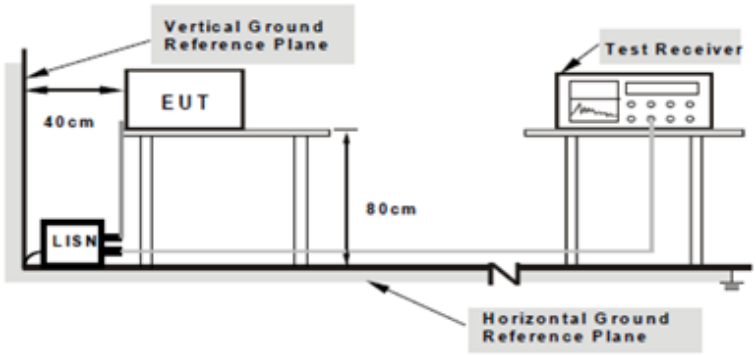
Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	November 21, 2016
Tested By :	Louise Tu

Requirement(s):

Spec	Requirement	Applicable
§15.207	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

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.
2. The power supply for the EUT was fed through a 50W/50mH 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 equipment were powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. 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.
7. 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.
8. 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
Data sample

No.	Frequency	Reading	Detector	Lisn/Isn	Ps_Lmt	Cab_L	Result	Limit	Margin
	(MHz)	(dBμV)		(dB}	(dB)	(dB)	(dBμV)	(dBμV)	(dB)

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)

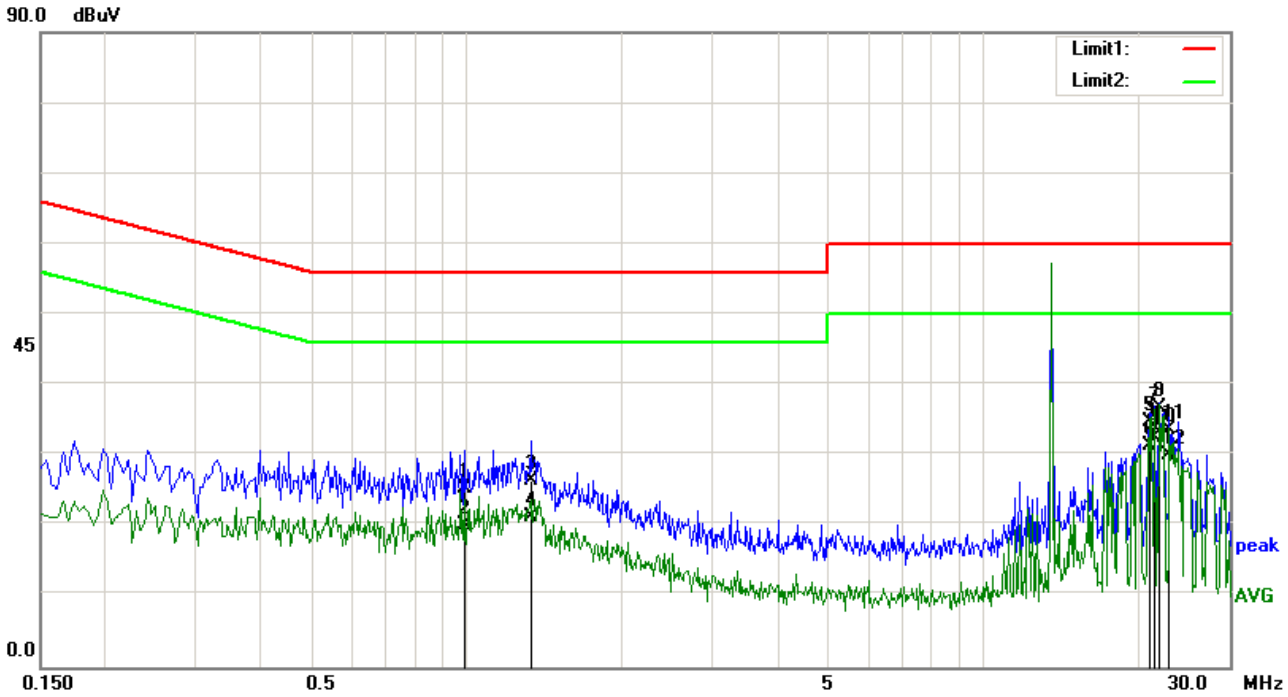
Cab_L= cable loss

Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

Calculation Formula:
Margin (dB) = Result (dBμV) – limit (dBμV)

Test Mode:	Transmitting Mode

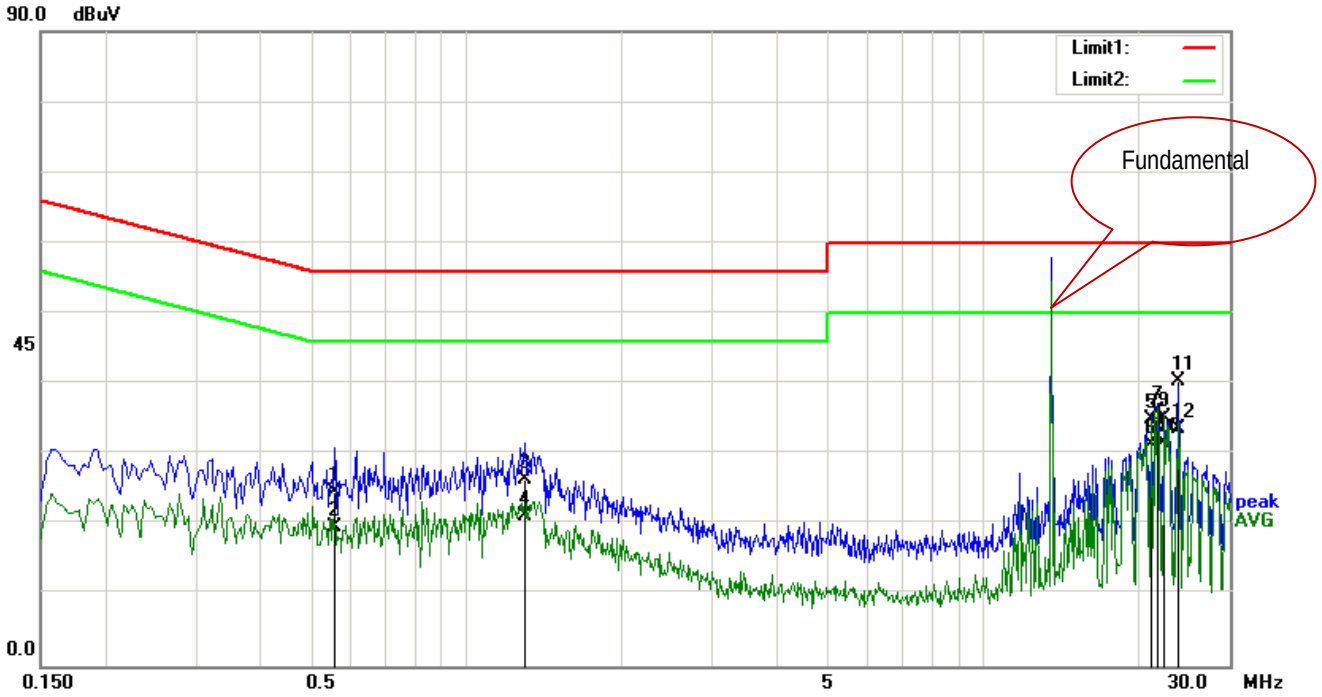


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.9900	14.88	QP	0.14	-10.00	0.19	25.21	56.00	-30.79
2	0.9900	9.71	AVG	0.14	-10.00	0.19	20.04	46.00	-25.96
3	1.3340	16.00	QP	0.15	-10.00	0.21	26.36	56.00	-29.64
4	1.3340	10.91	AVG	0.15	-10.00	0.21	21.27	46.00	-24.73
5	21.0020	23.05	QP	1.12	-10.00	0.67	34.84	60.00	-25.16
6	21.0020	19.57	AVG	1.12	-10.00	0.67	31.36	50.00	-18.64
7	21.5020	24.24	QP	1.14	-10.00	0.66	36.04	60.00	-23.96
8	21.5020	20.66	AVG	1.14	-10.00	0.66	32.46	50.00	-17.54
9	22.0020	24.93	QP	1.16	-10.00	0.65	36.74	60.00	-23.26
10	22.0020	21.46	AVG	1.16	-10.00	0.65	33.27	50.00	-16.73
11	23.0020	21.86	QP	1.21	-10.00	0.65	33.72	60.00	-26.28
12	23.0020	18.26	AVG	1.21	-10.00	0.65	30.12	50.00	-19.88

Test Mode:	Transmitting Mode



Test Data

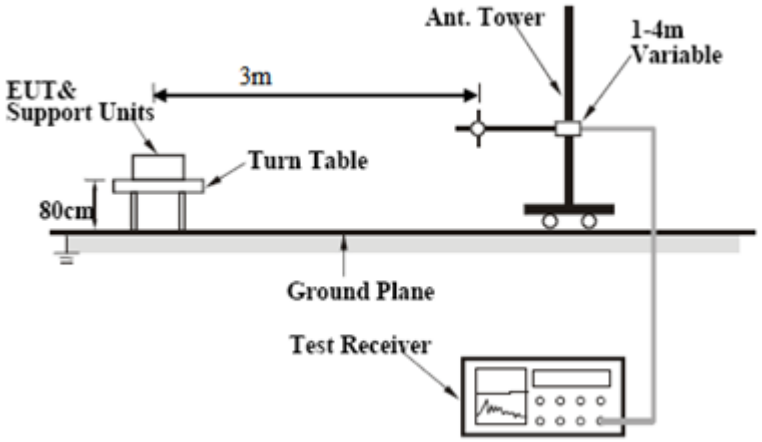
Phase Neutral Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/lsn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.5580	14.43	QP	0.11	-10.00	0.21	24.75	56.00	-31.25
2	0.5580	9.26	AVG	0.11	-10.00	0.21	19.58	46.00	-26.42
3	1.2980	16.01	QP	0.14	-10.00	0.21	26.36	56.00	-29.64
4	1.2980	10.86	AVG	0.14	-10.00	0.21	21.21	46.00	-24.79
5	21.2500	23.03	QP	1.25	-10.00	0.66	34.94	60.00	-25.06
6	21.2500	19.52	AVG	1.25	-10.00	0.66	31.43	50.00	-18.57
7	21.7500	24.15	QP	1.28	-10.00	0.65	36.08	60.00	-23.92
8	21.7500	20.69	AVG	1.28	-10.00	0.65	32.62	50.00	-17.38
9	22.5020	23.35	QP	1.31	-10.00	0.66	35.32	60.00	-24.68
10	22.5020	19.75	AVG	1.31	-10.00	0.66	31.72	50.00	-18.28
11	24.0100	28.34	QP	1.38	-10.00	0.65	40.37	60.00	-19.63
12	24.0100	21.71	AVG	1.38	-10.00	0.65	33.74	50.00	-16.26

6.2 Radiated Emissions

Temperature	22°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
Test date :	November 22, 2016
Tested By :	Louise Tu

Requirement(s):

Spec	Requirement	Applicable
§15.209	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 Frequency range (MHz) / Field Strength (μV/m) 30 – 88 / 100 88 – 216 / 150 216 – 960 / 200 Above 960 / 500	☒
Test Setup		
Procedure	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.	
Remark		
Result	☒ Pass ☐ Fail	
Test Data	☒Yes ☐N/A	
Test Plot	☒Yes ☐N/A	

Data sample

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

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) = Read ing Value + Corrected Value

Limit (dBμV/m) = Limit stated in standard

Height (cm) = Height of Receiver antenna

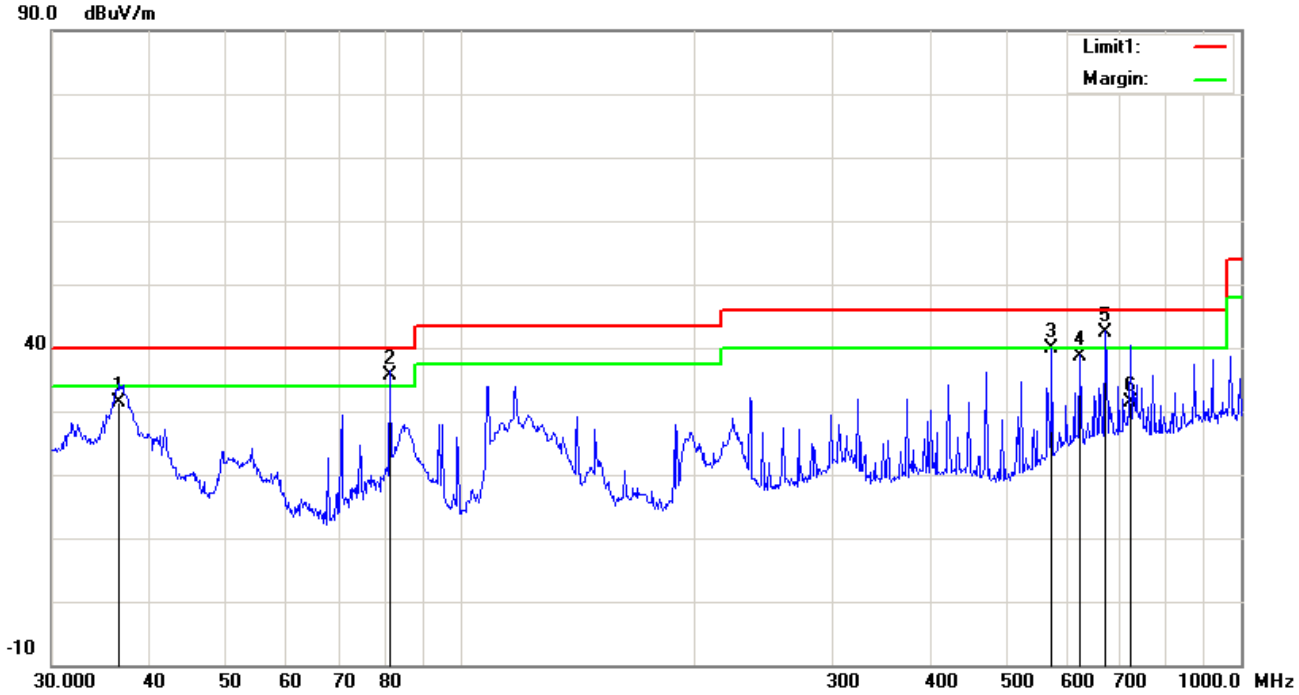
Degree = Turn table degree

Calculation Formula:

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

Test Mode:	Transmitting Mode

(30MHz - 1GHz)



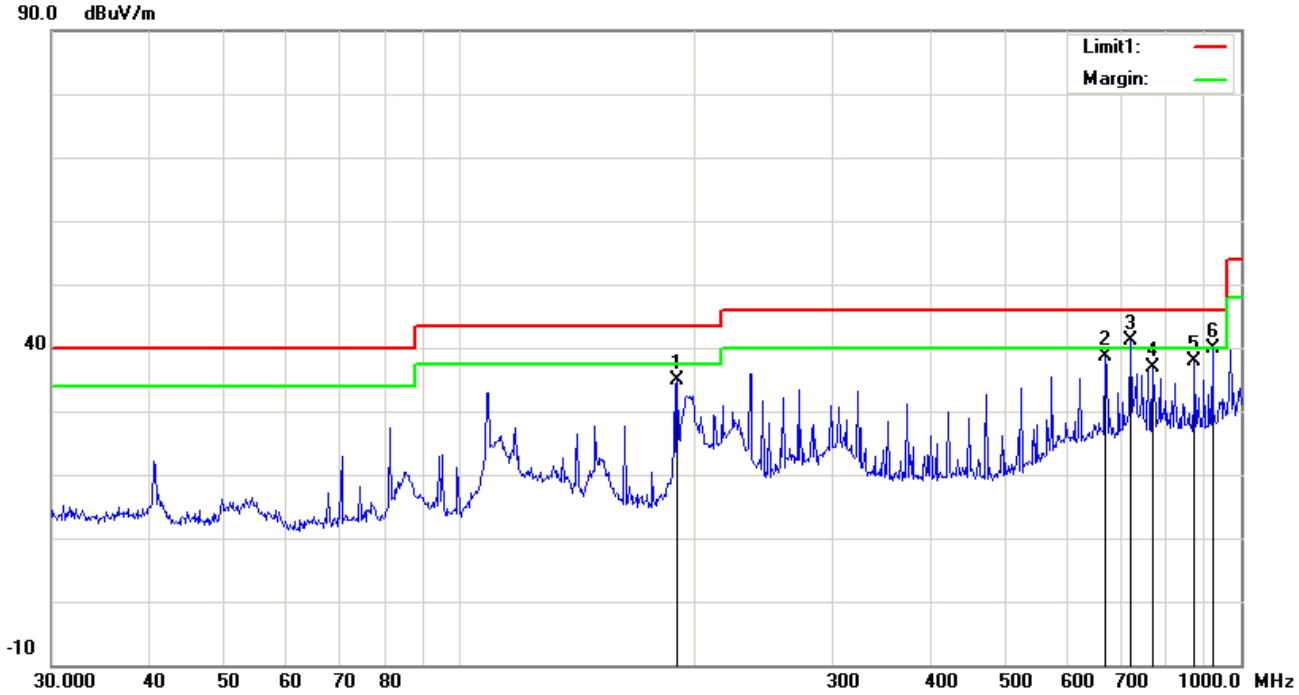
Test Data

Vertical Polarity Plot @3m

No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBμV/m)		(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(cm)	(°)
1	36.6375	58.36	QP	17.74	45.65	0.99	31.44	40.00	-8.56	100	177
2	81.2117	74.29	QP	7.55	47.71	1.45	35.58	40.00	-4.42	100	157
3	572.6144	65.55	peak	18.91	48.47	3.83	39.82	46.00	-6.18	100	16
4	620.7096	60.98	peak	20.74	46.97	4.00	38.75	46.00	-7.25	100	260
5	670.4893	64.20	QP	21.90	47.86	4.16	42.40	46.00	-3.60	100	101
6	721.7259	50.34	QP	22.36	45.71	4.31	31.30	46.00	-14.70	200	87

Test Mode:	Transmitting Mode

(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	189.7385	66.51	peak	12.79	46.69	2.22	34.83	43.50	-8.67	100	278
2	670.4893	60.32	peak	22.06	47.86	4.16	38.68	46.00	-7.32	100	228
3	721.7259	59.98	peak	22.53	45.71	4.31	41.11	46.00	-4.89	100	220
4	771.4486	55.24	peak	22.83	45.62	4.46	36.91	46.00	-9.09	100	179
5	872.1832	56.31	peak	22.78	46.06	4.77	37.80	46.00	-8.20	100	263
6	919.2866	58.48	peak	23.16	46.62	4.90	39.92	46.00	-6.08	100	257

0° 9 kHz -150kHz

Frequency (kHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Ant. Factor (dB/m)	Cable Loss (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
16.2	38.22	QP	78.3	0.01	116.53	123.41	-6.88
30.8	34.05	QP	73.9	0.02	107.97	117.83	-9.86
110.6	27.15	QP	70.2	0.05	97.40	106.73	-9.33

90° 9 kHz -150kHz

Frequency (kHz)	S.A. Reading (dBµV)	Detector (PK/AV)	Ant. Factor (dB/m)	Cable Loss (dB)	Cord. Amp. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
16.2	37.56	QP	78.3	0.01	115.87	123.41	-7.54
30.8	33.27	QP	73.9	0.02	107.19	117.83	-10.64
110.6	26.56	QP	70.2	0.05	96.81	106.73	-9.92

0° 150 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)
10.4	19.55	QP	39.4	0.1	59.05	69.54	-10.49
15.2	12.22	QP	37.0	0.2	49.42	69.54	-20.12
22.6	11.68	QP	36.1	0.3	48.08	69.54	-21.46

90° 150 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)
10.4	18.42	QP	39.4	0.1	57.92	69.54	-11.62
15.2	11.54	QP	37.0	0.2	48.74	69.54	-20.80
22.6	10.96	QP	36.1	0.3	47.36	69.54	22.18

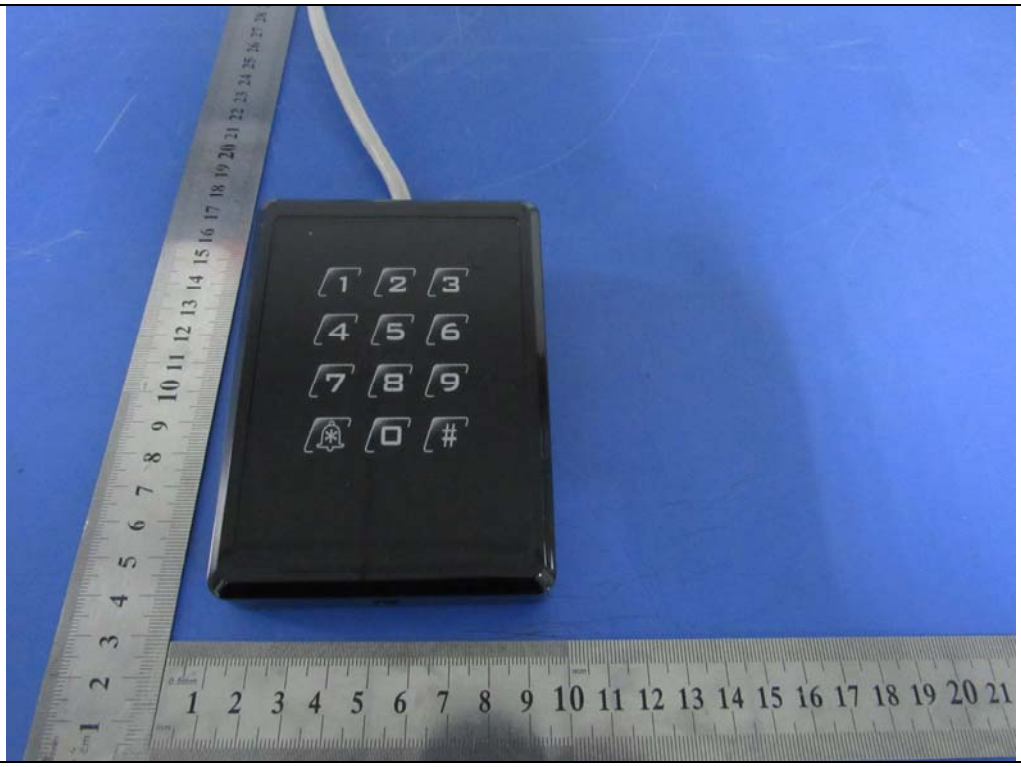
Note: The highest frequency of the internal sources of the EUT is less than 108MHz, so the measurement shall only be made up to 1GHz.

Annex A. TEST INSTRUMENT

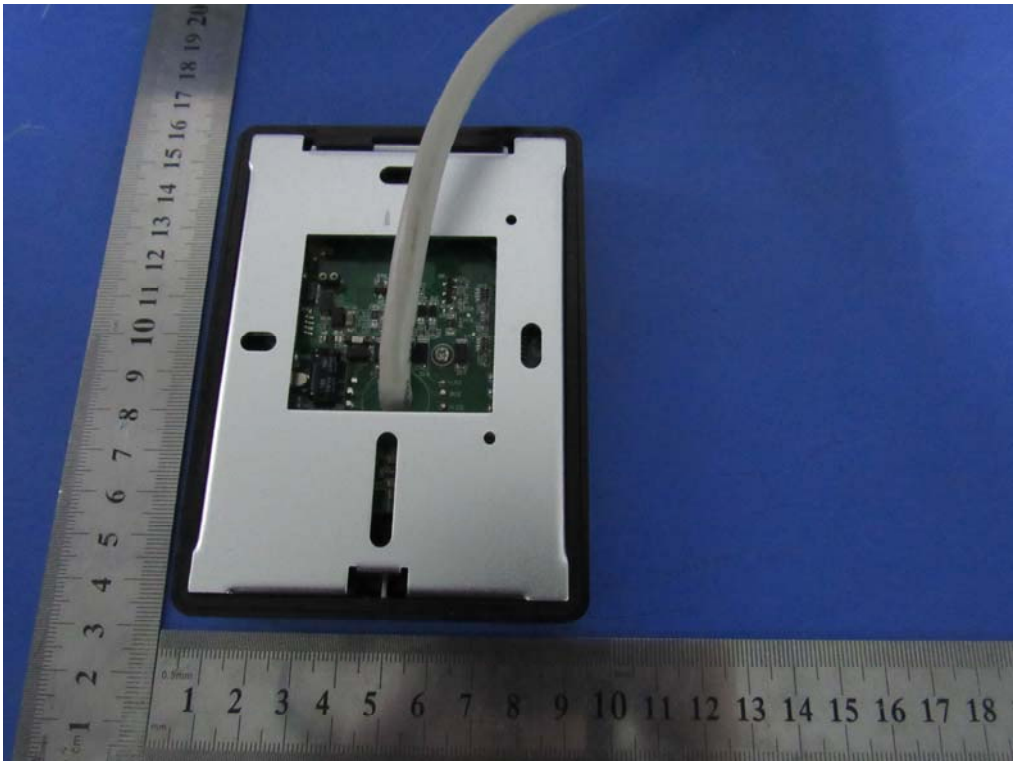
Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emissions					
R&S EMI Test Receiver	ESPI3	101216	03/31/2016	03/31/2017	☒
V-LISN	ESH3-Z5	838979/005	03/31/2016	03/31/2017	☒
SIEMIC EZ_EMC Conducted Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	☒
Radiated Emissions					
Agilent Technologies Spectrum Analyzer	N9010A	MY47191130	03/31/2016	03/31/2017	☒
R&S EMI Receiver	ESPI3	101216	03/31/2016	03/31/2017	☒
Antenna (30MHz~6GHz)	JB6	A121411	10/31/2016	10/31/2017	☒
EMCO Passive Loop Antenna	6509	9909-1469	10/09/2016	10/08/2017	☒
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2016	10/26/2017	☒
EMCO Passive Loop Antenna	6509	9909-1469	10/09/2016	10/08/2017	☒
SIEMIC EZ_EMC Radiated Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	☒

Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



EUT – Front View

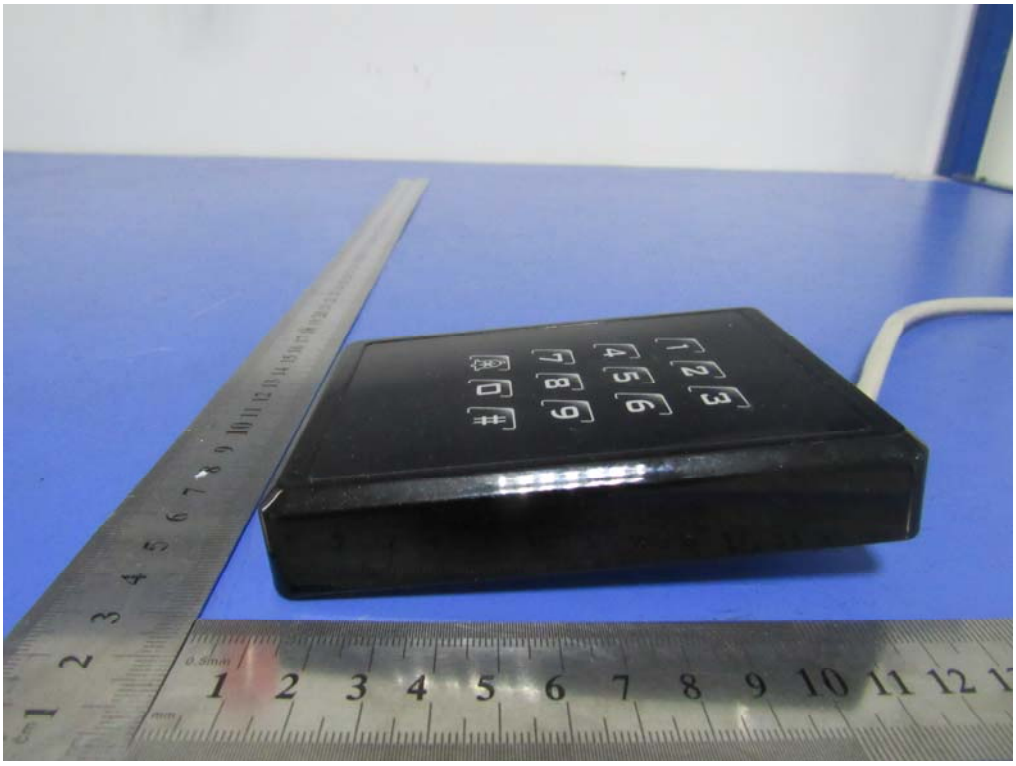


EUT – Rear View

EUT – Top View

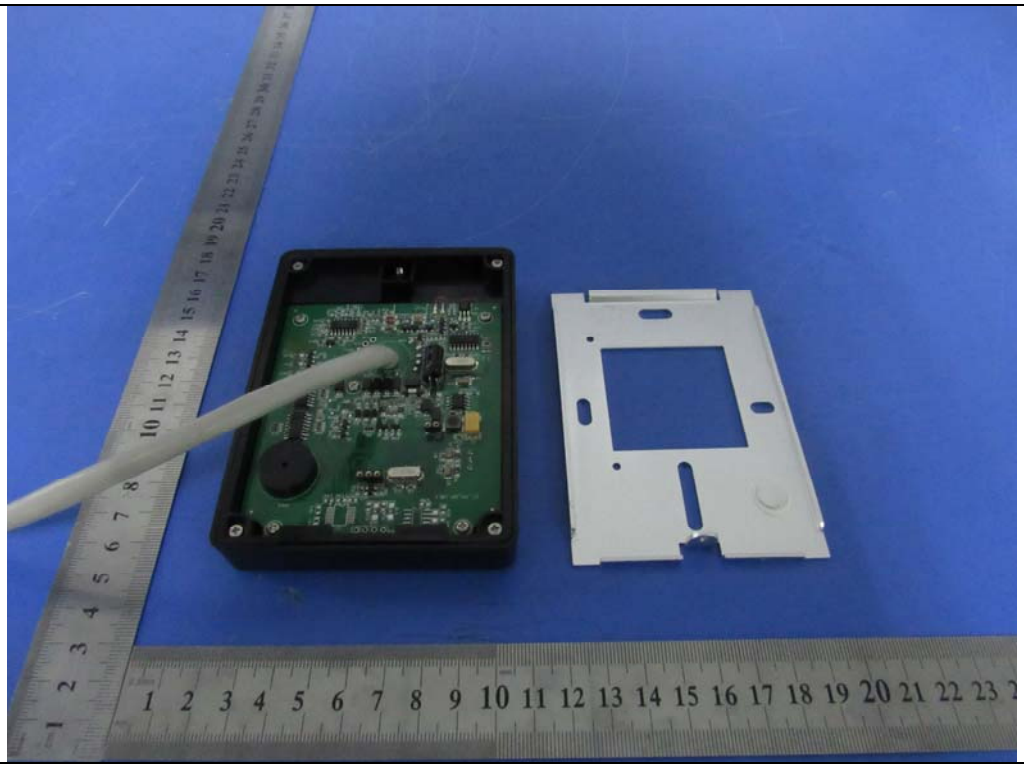
EUT – Bottom View

EUT – Left View

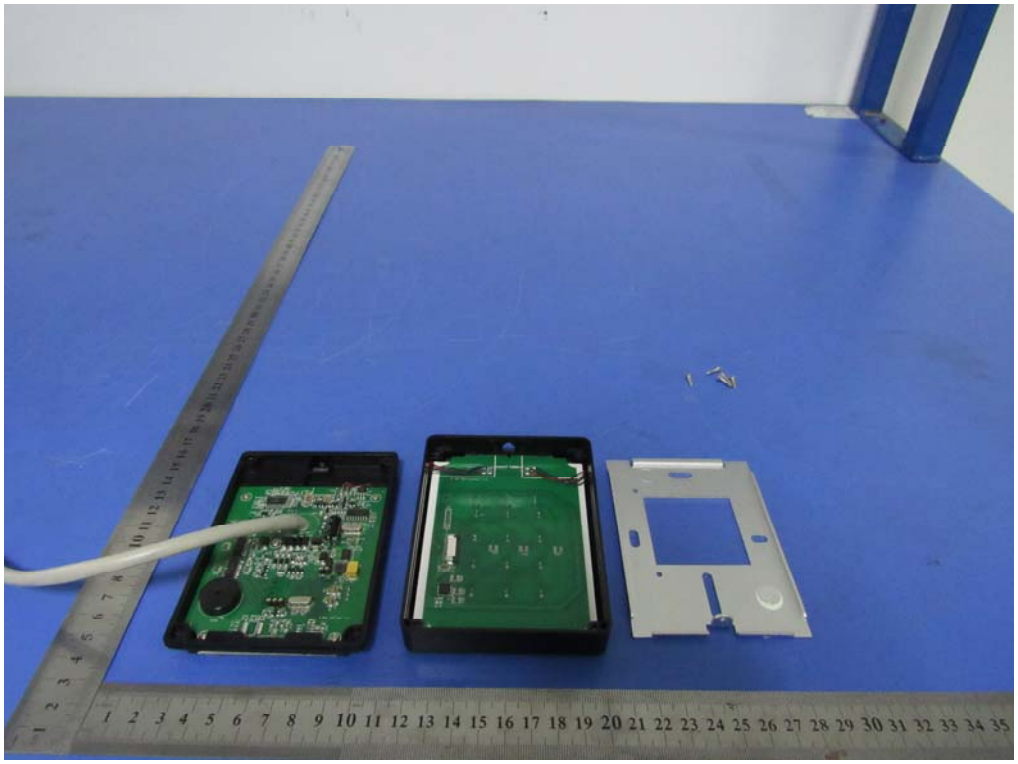


EUT – Right View

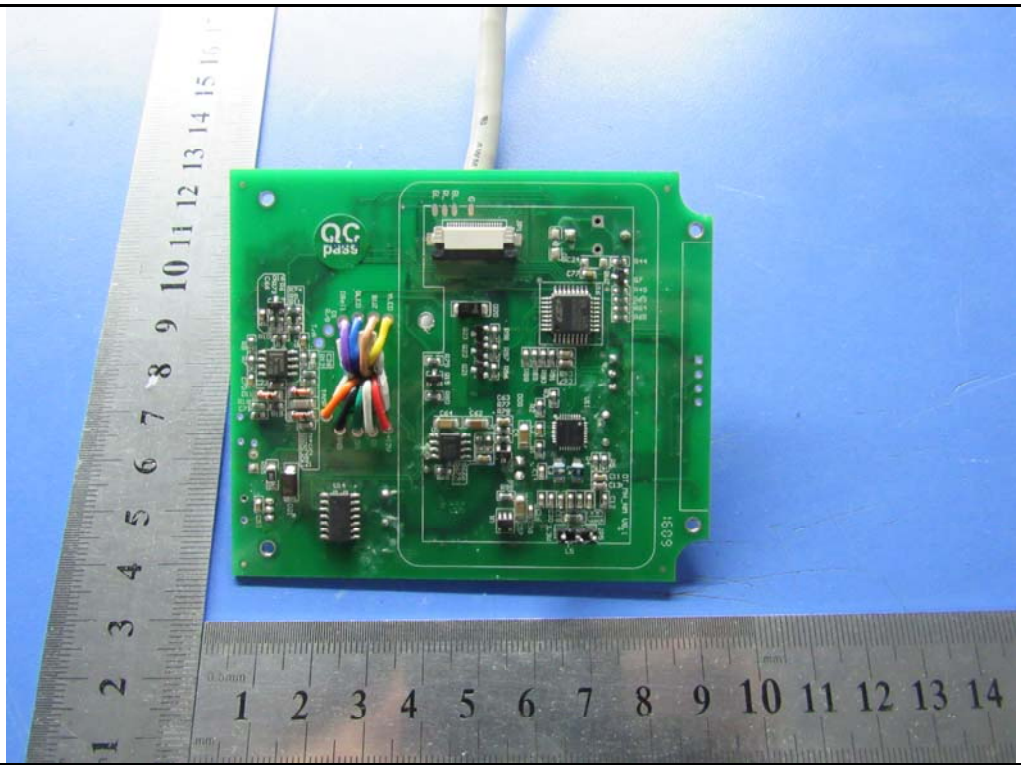
Annex B.ii. Photograph: EUT Internal Photo



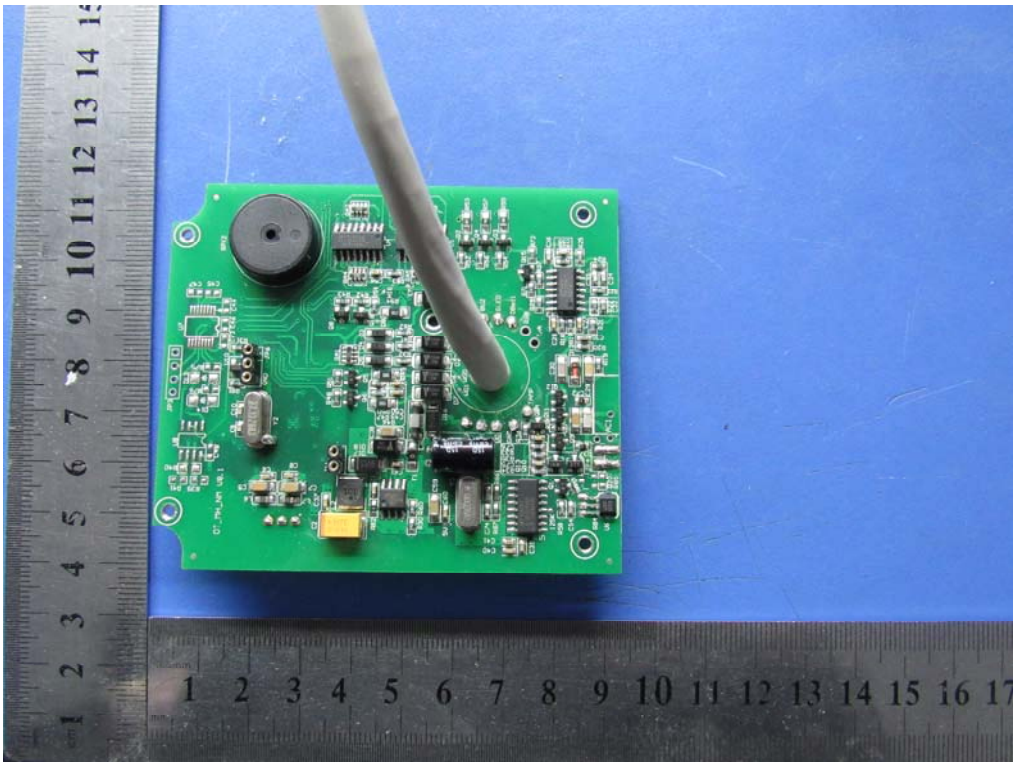
EUT – Uncover Front View 1



EUT – Uncover Front View 2

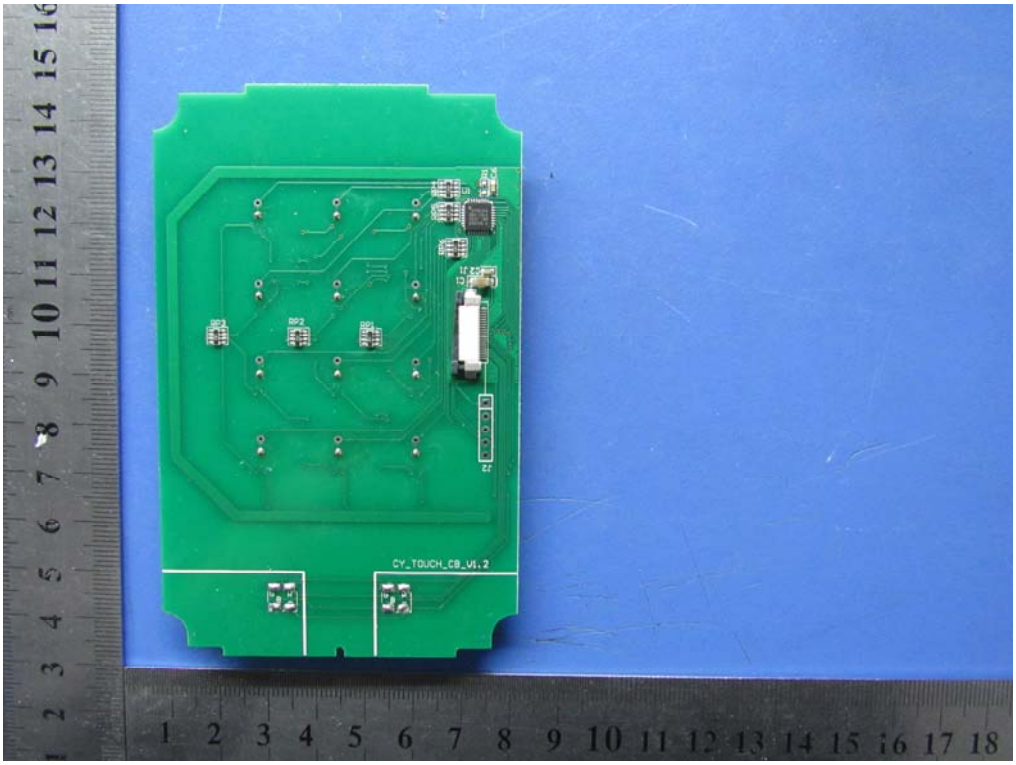


EUT – PCBA 1 Front View

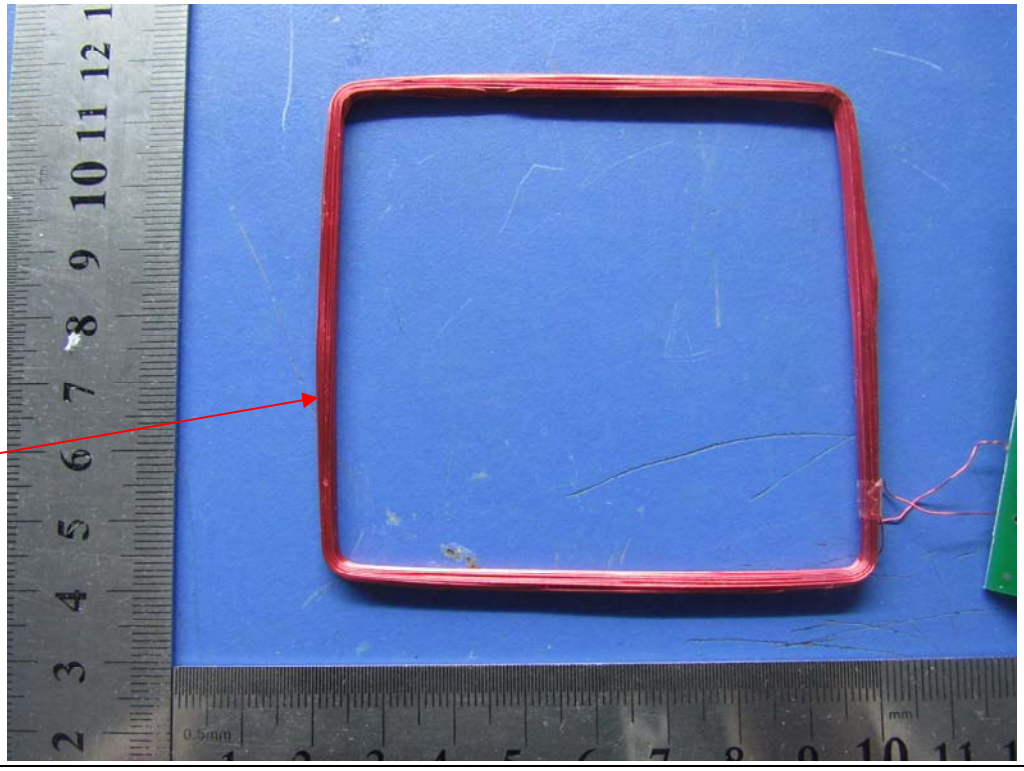


EUT – PCBA 1 Rear View

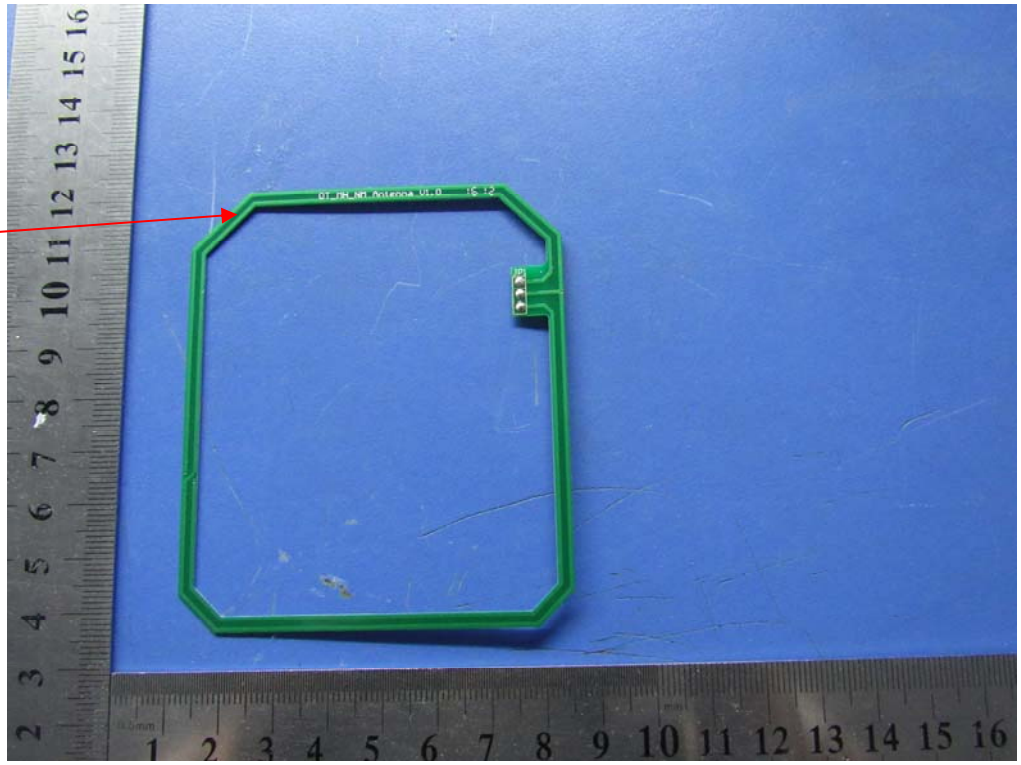
EUT – PCBA 2 Front View



EUT – PCBA 2 Rear View



EUT – Antenna Front View

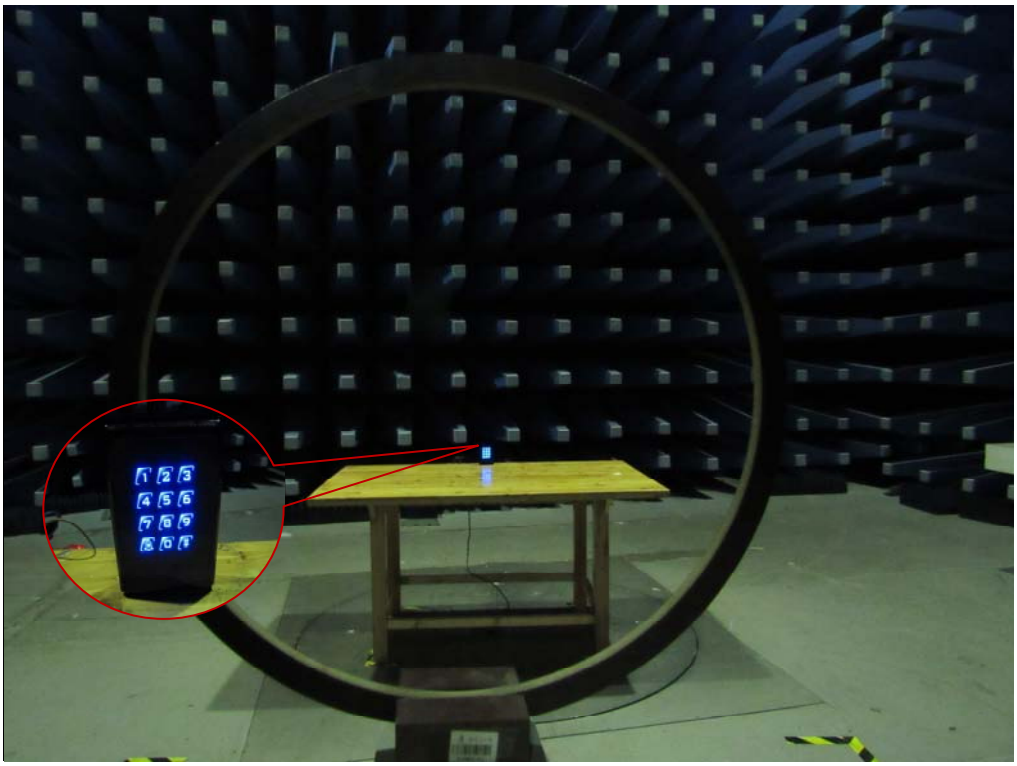


EUT – Antenna Front View

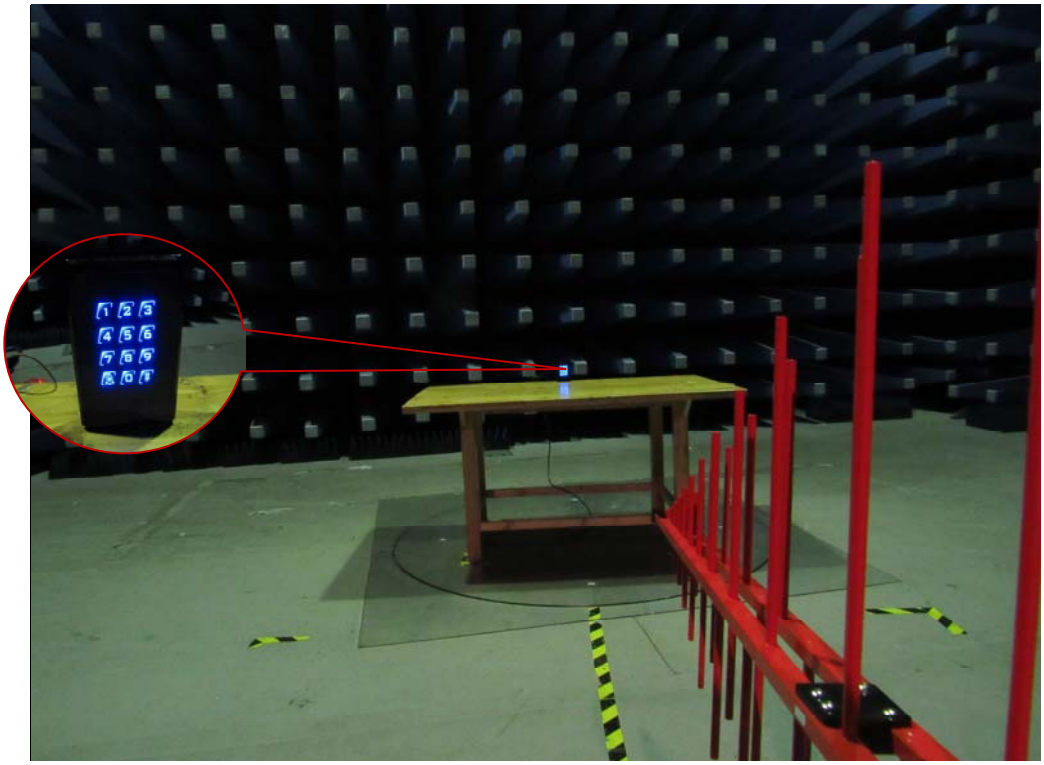
Annex B.iii. Photograph Test Setup Photo

Conducted Emissions Setup Front View

Conducted Emissions Setup Side View



Front View of Radiated Emissions Test Setup below 30MHz

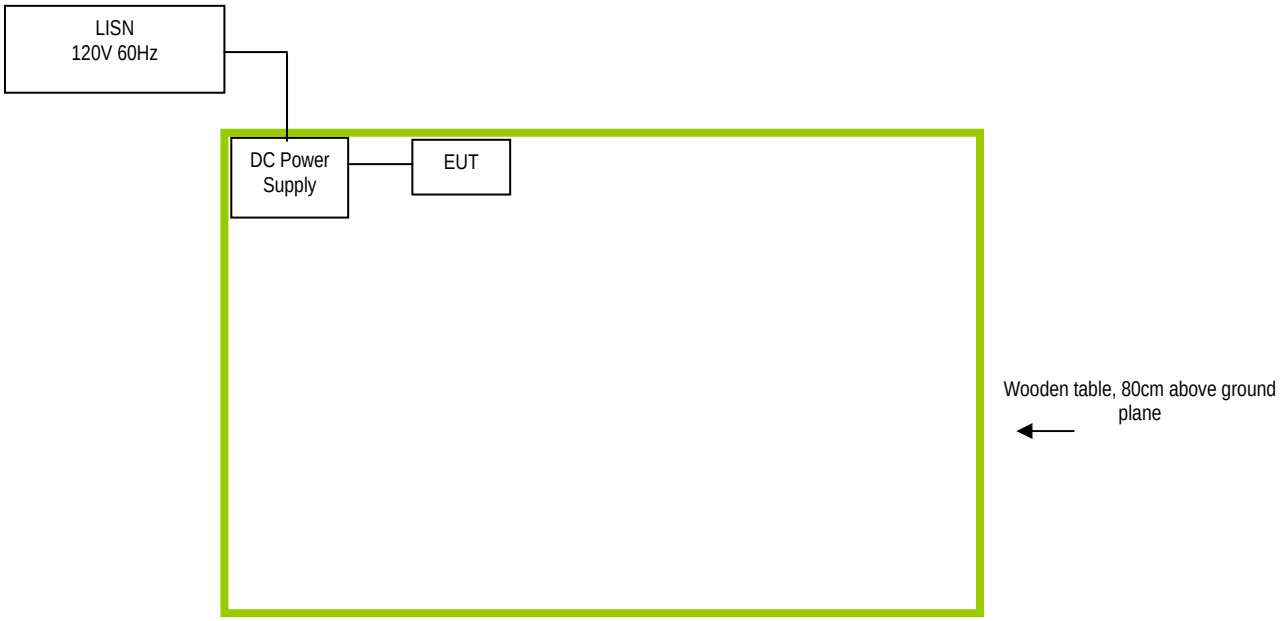


Radiated Emissions Setup Below 1GHz Front View

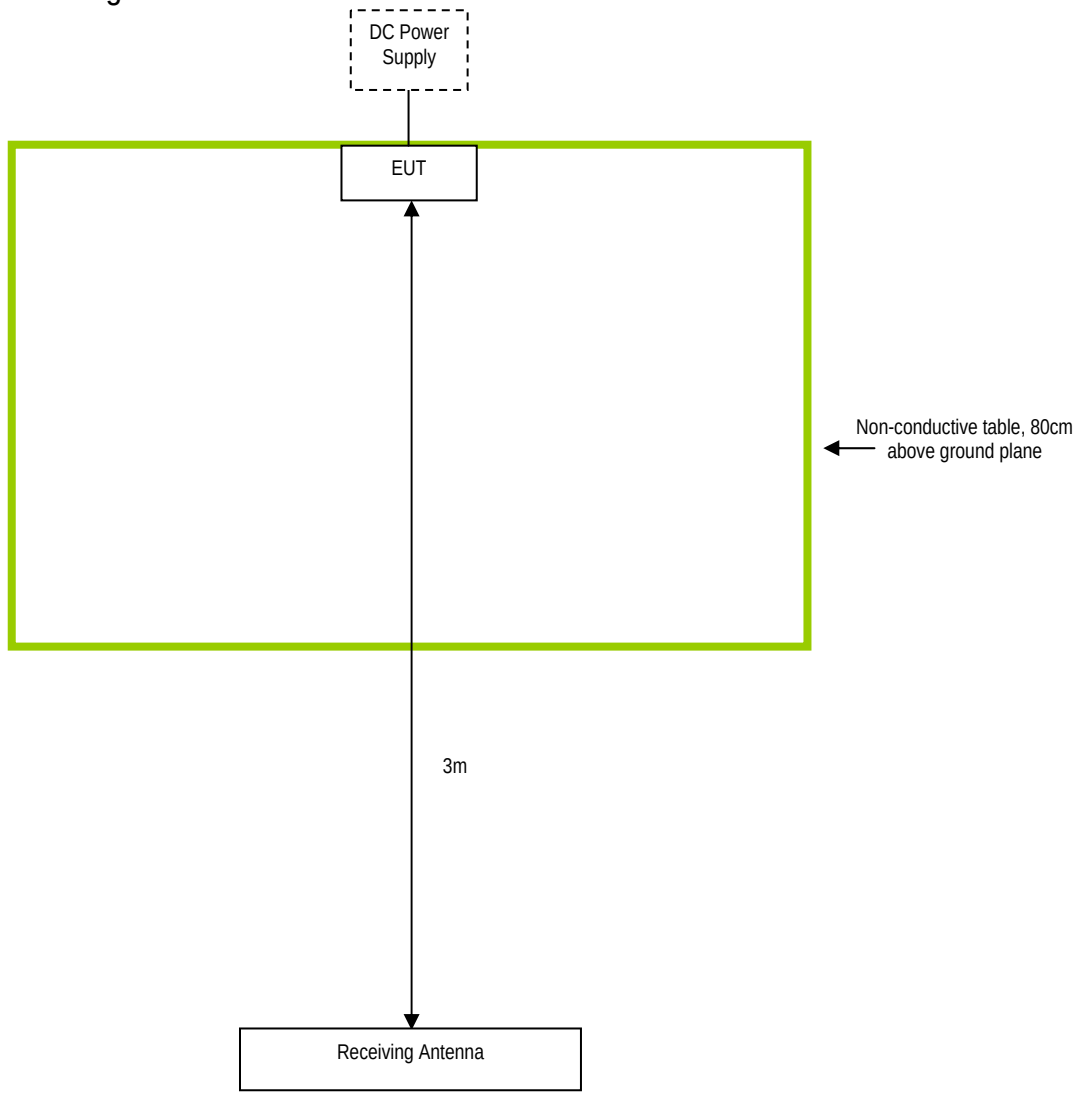
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

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

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

Please see Attachment

Annex E. DECLARATION OF SIMILARITY

SMARFID

Shanghai Smarfid Security Equipment Co., Ltd.
Add: Room 301, 4th Bldg., No.4 TongLi Road, SongJiang District, Shanghai 201615, China
Tel: （86-21) 54260103, 54260132 ext.215 Fax: (86-21) 54260132 ext.222

To:

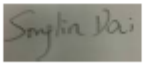
Declaration letter

Dear Sir/Madam:

For our business issue and marketing requirement, we would like to list different models numbers on the FCC certificates and reports, as following:
Model No: MH322-8K
MH322-8N、MT322-8K、MT322-8N
The two models have the same Circuits, components and color.

Apart from the different model name, the two models differ from each other by:
MH322-8K、MT322-8K has the button function, but MH322-8N、MT322-8N has no button function.

Thank you!

Signature: 
Printed name/title: Songlin Dai