EMC TEST REPORT

SIEMIC
GLOBAL TESTING & CERTIFICATIONS
YOUR CHOICE FOR- TCB FCB CB NB CAB RCB

Report No.: 16020930-FCC-E
Supersede Report No.: N/A

Applicant	Ringway Tech(Jiangsu) Co.,Ltd.
Product Name	DIGITAL PIANO
Main Model No.	AG-50
Serial Model	AG-30
Test Standard	FCC Part 15 Subpart B Class B:2014, ANSI C63.4: 2014
Test Date	July 22 to July 25, 2016
Issue Date	July 29 , 2016
Test Result	☑ Pass ☐ Fail
Equipment complied with the specification	☑
Equipment did not comply with the specification	☐

Amos. Xia	Miro Bao	
Amos Xia Test Engineer	Miro Bao Checked By	

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
16020930-FCC-E	NONE	Original	July 29 , 2016

2. Customer information

Applicant Name	Ringway Tech(Jiangsu) Co.,Ltd.
Applicant Add	No. 101 West Hanjiang Road, Changzhou,Jiangsu, China
Manufacturer	Ringway Tech(Jiangsu) Co.,Ltd.
Manufacturer Add	No. 101 West Hanjiang Road, Changzhou,Jiangsu, China

3. Test site information

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Add	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:	DIGITAL PIANO
Main Model:	AG-50
Serial Model:	AG-30
Date EUT received:	July 18, 2016
Test Date(s):	July 22 to July 25, 2016
Port:	USB to Host Port, Headphones 1/2 Port,Bluetooth Port, Aux in Port, Line out Port, PEDAL Port, Power Port, MIDI Out Port
Power:	AC 110/220V ~50/60Hz
Trade Name :	Artesia
FCC ID:	OCDAG-50

Note: the difference between the two models please refer to Annex E. DECLARATION OF SIMILARITY in this report.

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

Emissions		
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	24°C
Relative Humidity	50%
Atmospheric Pressure	1013mbar
Test date :	July 25, 2016
Tested By :	Amos Xia

Requirement(s):

Spec	Requirement	Applicable
47CFR §15.107	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.	☑

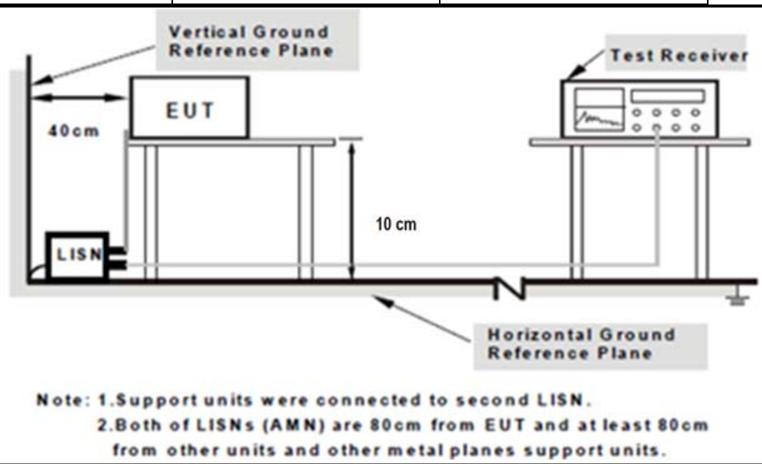
Class B digital devices

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

Class A digital devices

Frequency ranges (MHz)	Limit (dBμV)	
	QP	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

Test Setup



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 0.1m 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

Frequency (MHz)	Quasi-Peak (dBμV)	Limit (dBμV)	Margin (dB)	Average (dBμV)	Limit (dBμV)	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)=Receiver Reading(dBμV)+ Factor(dB)

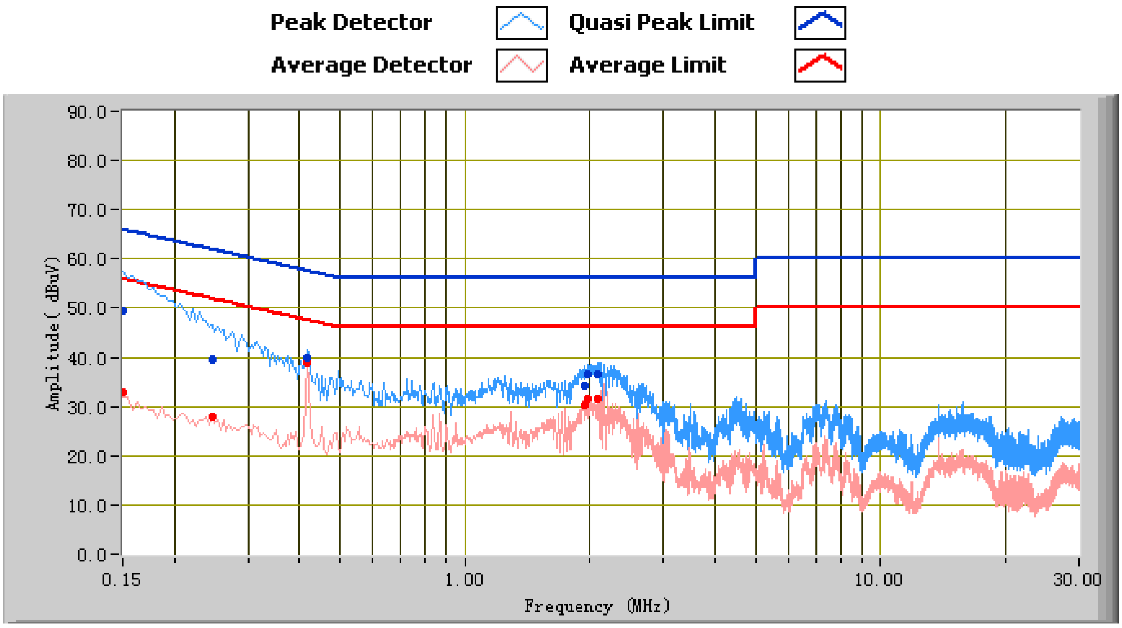
Limit(dBμV)=Limit stated in standard

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

<u>Calculation Formula:</u>

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

Test Mode :	Normal Working Mode

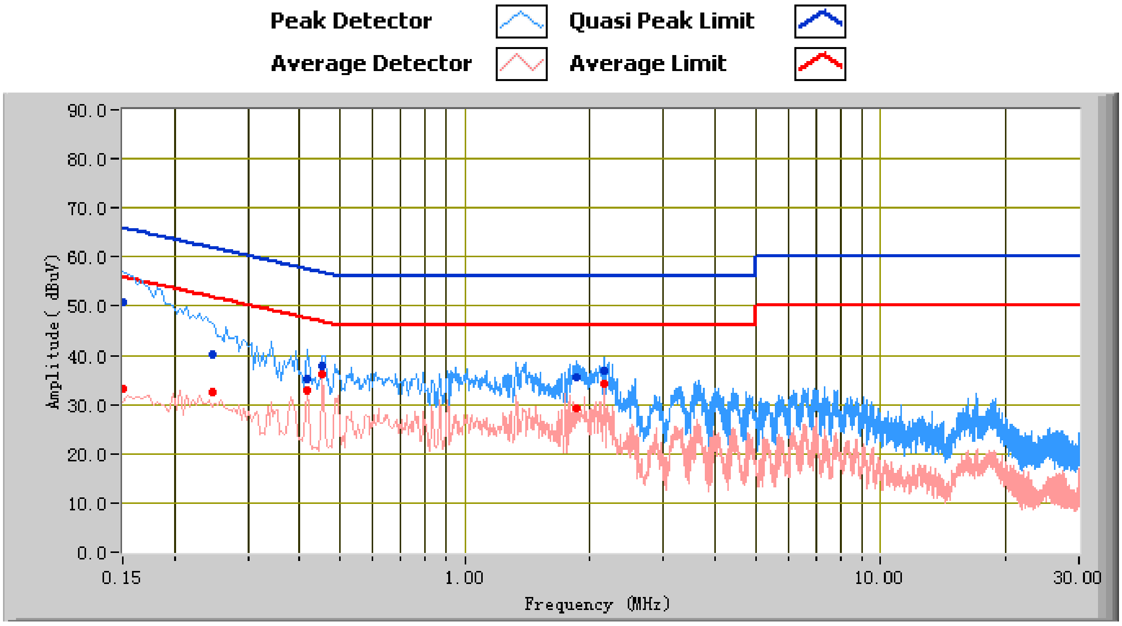


Test Data

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	49.49	66.00	-16.51	32.90	56.00	-23.10	12.22
0.25	39.41	61.89	-22.48	27.76	51.89	-24.13	11.46
0.42	39.97	57.49	-17.52	38.89	47.49	-8.60	11.21
2.09	36.61	56.00	-19.39	31.43	46.00	-14.57	10.88
1.97	36.40	56.00	-19.60	31.41	46.00	-14.59	10.87
1.95	34.09	56.00	-21.91	30.16	46.00	-15.84	10.87

Test Mode :	Normal Working Mode

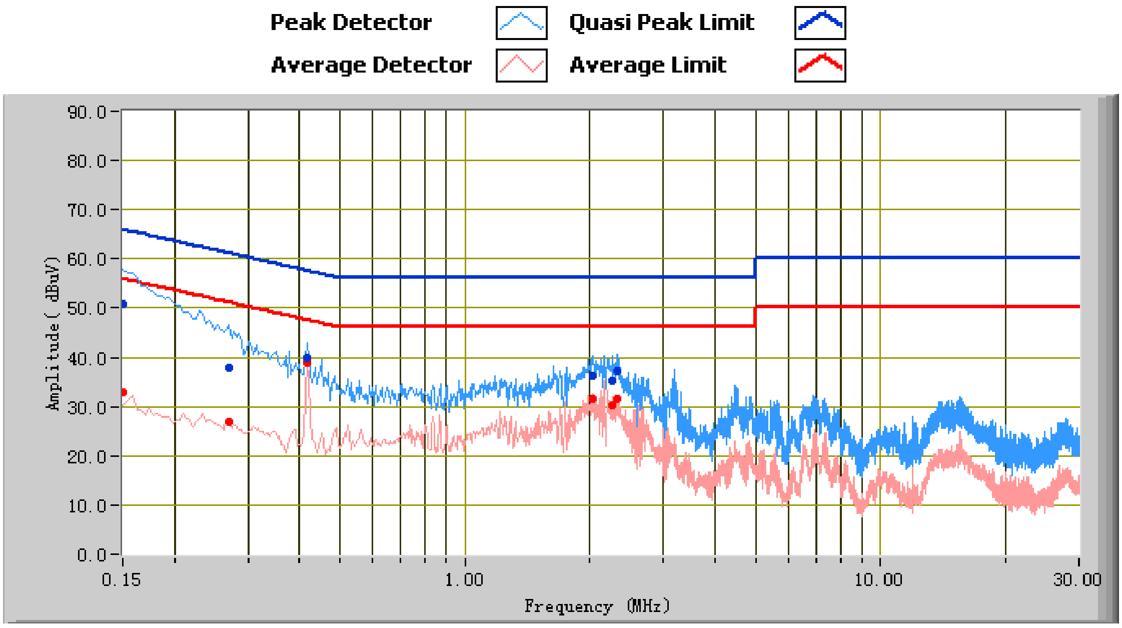


Test Data

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	50.94	66.00	-15.06	33.11	56.00	-22.89	12.21
0.25	40.29	61.89	-21.60	32.54	51.89	-19.35	11.46
0.42	35.22	57.49	-22.26	33.02	47.49	-14.47	11.19
2.16	36.94	56.00	-19.06	34.22	46.00	-11.78	10.92
0.45	37.80	56.80	-19.00	36.22	46.80	-10.58	11.13
1.85	35.66	56.00	-20.34	29.23	46.00	-16.77	10.89

Test Mode :	Normal Working Mode

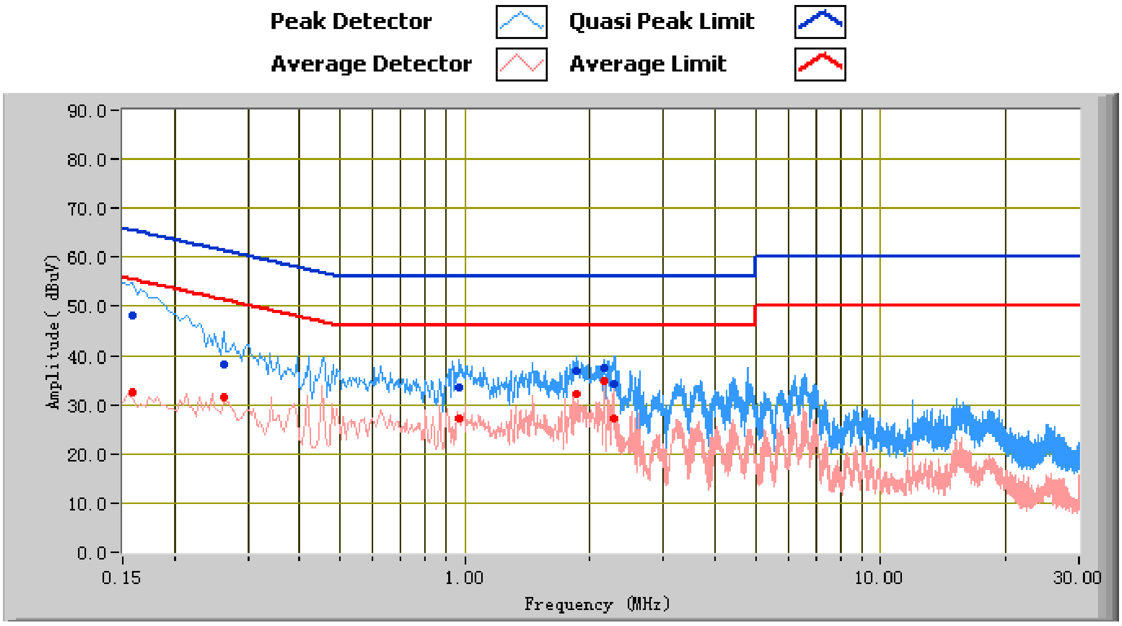


Test Data

Phase Line Plot at 240Vac, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.15	50.75	66.00	-15.25	32.83	56.00	-23.17	12.22
0.27	37.97	61.12	-23.15	26.96	51.12	-24.16	11.42
0.42	39.98	57.49	-17.51	38.87	47.49	-8.62	11.21
2.31	37.10	56.00	-18.90	31.47	46.00	-14.53	10.88
2.03	36.32	56.00	-19.68	31.71	46.00	-14.29	10.88
2.26	35.30	56.00	-20.70	30.37	46.00	-15.63	10.88

Test Mode :	Normal Working Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

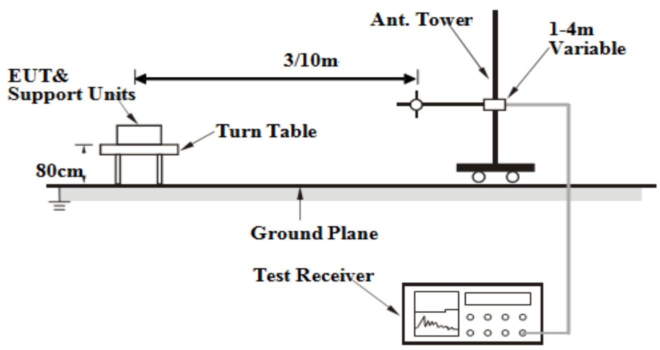
Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.16	48.03	65.57	-17.54	32.48	55.57	-23.09	12.10
1.85	36.89	56.00	-19.11	32.15	46.00	-13.85	10.89
2.28	34.09	56.00	-21.91	27.34	46.00	-18.66	10.92
0.26	38.15	61.37	-23.22	31.58	51.37	-19.79	11.44
2.16	37.42	56.00	-18.58	34.71	46.00	-11.29	10.92
0.97	33.42	56.00	-22.58	27.31	46.00	-18.69	10.73

6.2 Radiated Emissions

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1013mbar
Test date :	July 22, 2016
Tested By :	Amos Xia

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR §15.109</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
Class A digital devices (3m)
<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>
Class A digital devices(10m)
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (µV/m)</th></tr>
<tr><td>30 – 88</td><td>90</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 – 960</td><td>210</td></tr>
<tr><td>Above 960</td><td>300</td></tr>
</table>
</td><td>☑</td></tr>
<tr><td>Test Setup</td><td colspan="2">



</td></tr>
<tr><td>Procedure</td><td colspan="2">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="2"></td></tr>
</table>

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

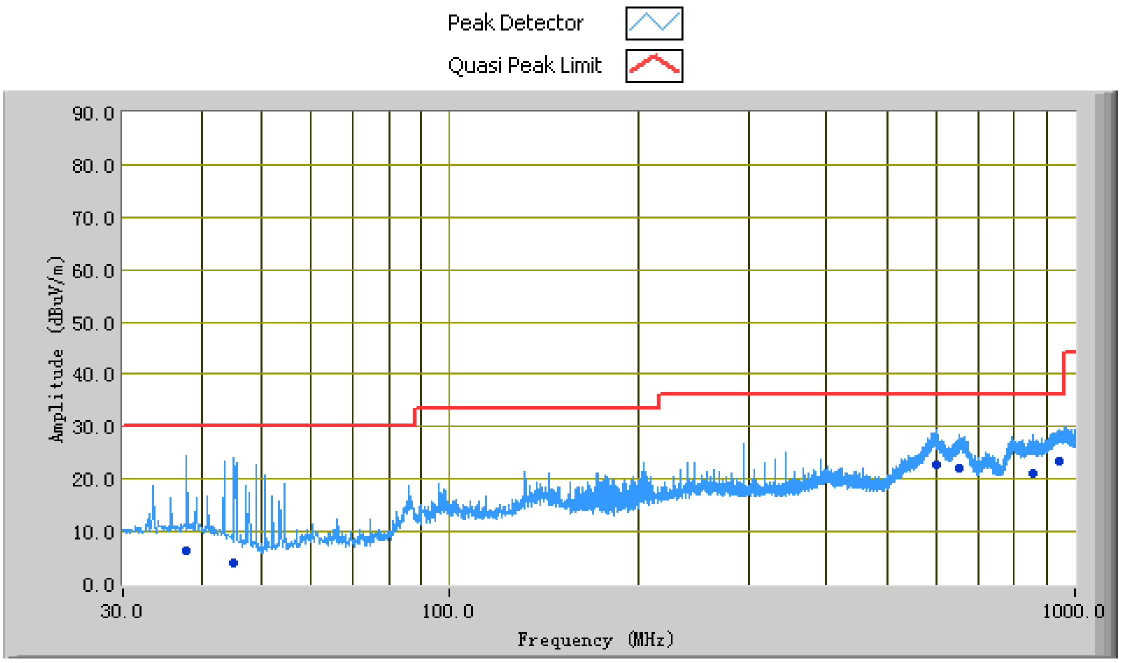
Limit (dBμV/m)=Limit stated in standard

Calculation Formula:

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

Test Mode:	Normal Working Mode

(Below 1GHz)



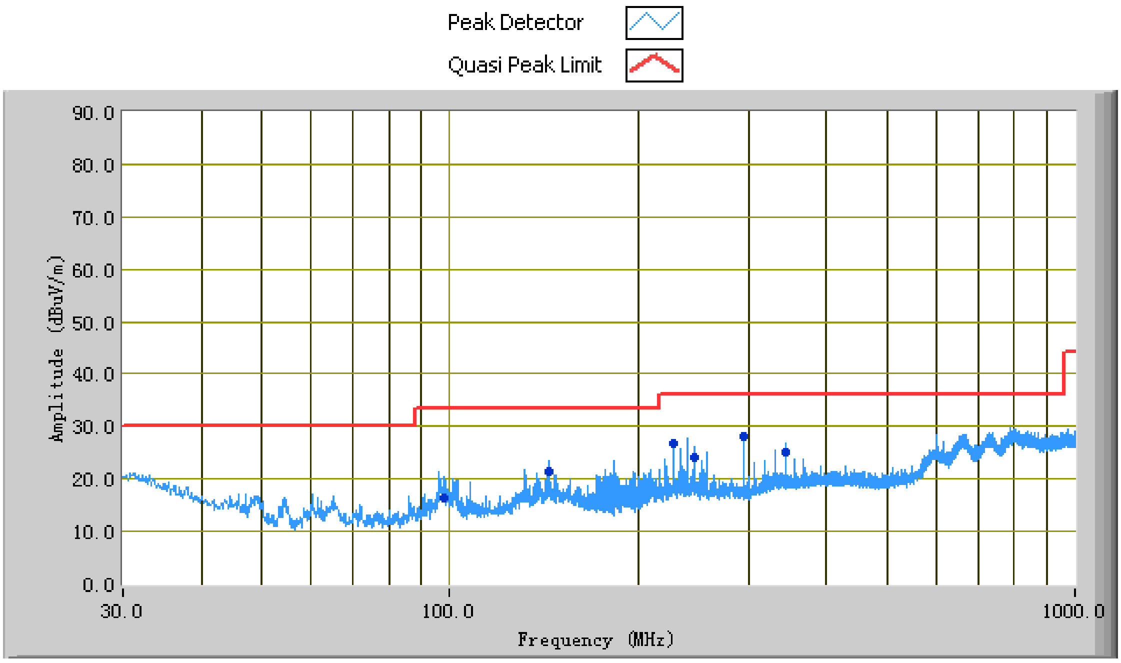
Test Data

Horizontal Polarity Plot @10m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
37.95	6.43	8.00	H	295.00	-34.01	30.00	-23.57
45.10	3.99	100.00	H	109.00	-36.31	30.00	-26.01
598.69	22.79	324.00	H	159.00	-20.83	36.00	-13.21
942.01	23.33	111.00	H	127.00	-16.85	36.00	-12.67
655.08	22.10	69.00	H	262.00	-21.18	36.00	-13.90
856.22	21.07	180.00	H	160.00	-19.27	36.00	-14.93

Test Mode:	Normal Working Mode

(Below 1GHz)



Test Data

Vertical Polarity Plot @10m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
294.95	28.06	144.00	V	112.00	-29.65	36.00	-7.94
228.00	26.85	178.00	V	101.00	-30.54	36.00	-9.15
344.06	24.98	132.00	V	113.00	-28.45	36.00	-11.02
245.78	24.00	257.00	V	106.00	-29.87	36.00	-12.00
144.01	21.36	291.00	V	101.00	-31.11	33.50	-12.14
97.74	16.27	1.00	V	128.00	-34.23	33.50	-17.23

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	☑
Com-Power Transient Limiter	LIT-153	531021	10/30/2015	10/30/2016	☑
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A	☑
Radiated Emissions					
R&S EMI Receiver	ESPI3	101216	03/31/2016	03/31/2017	☑
Antenna (30MHz~6GHz)	JB6	A121411	10/31/2015	10/31/2016	☑
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 Internal Photo

Front View of EUT

Rear View of EUT

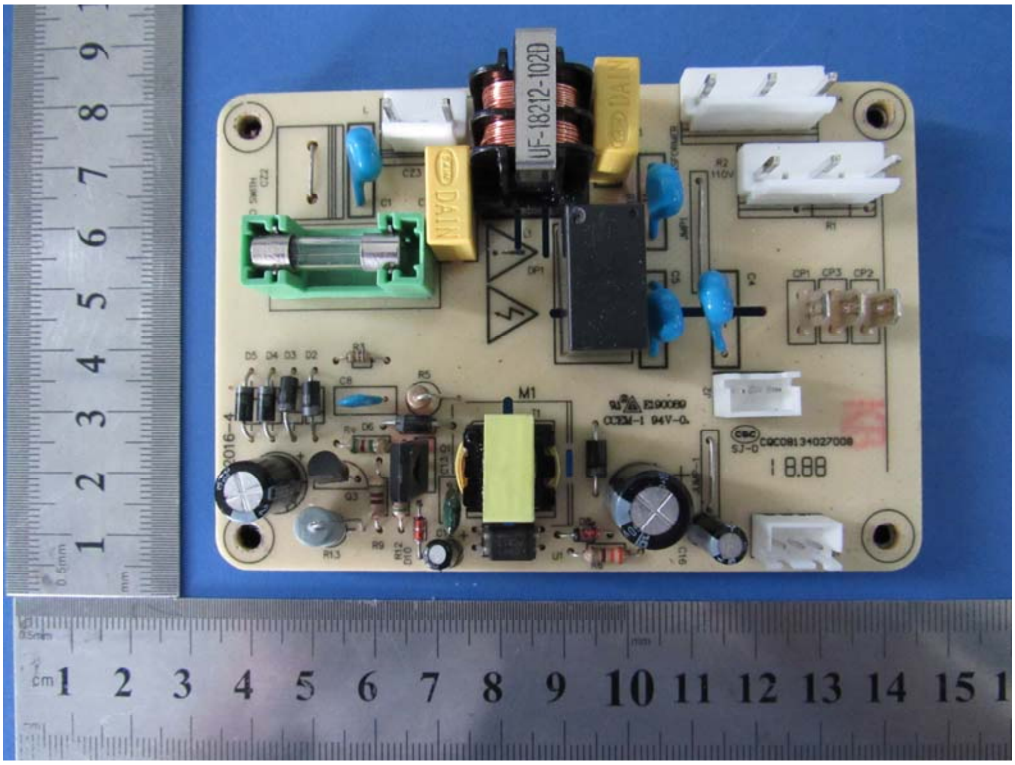
Top View of EUT

Left View of EUT

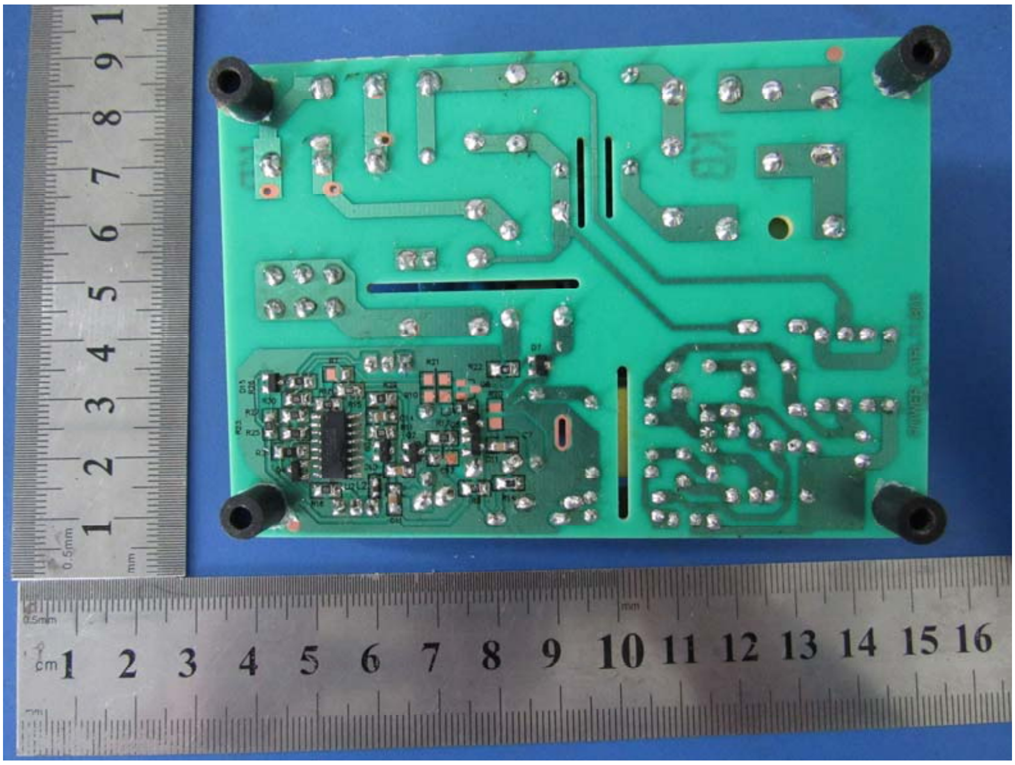
Right View of EUT

EUT – Port Front View

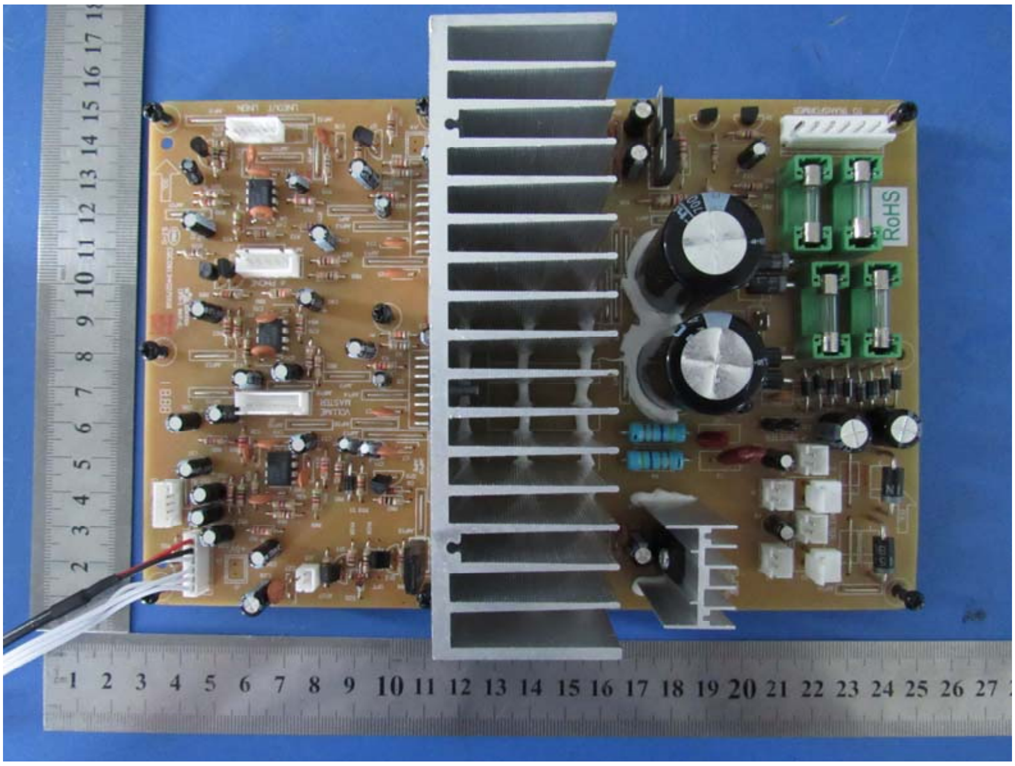
Annex B.ii. Photograph EUT Internal Photo



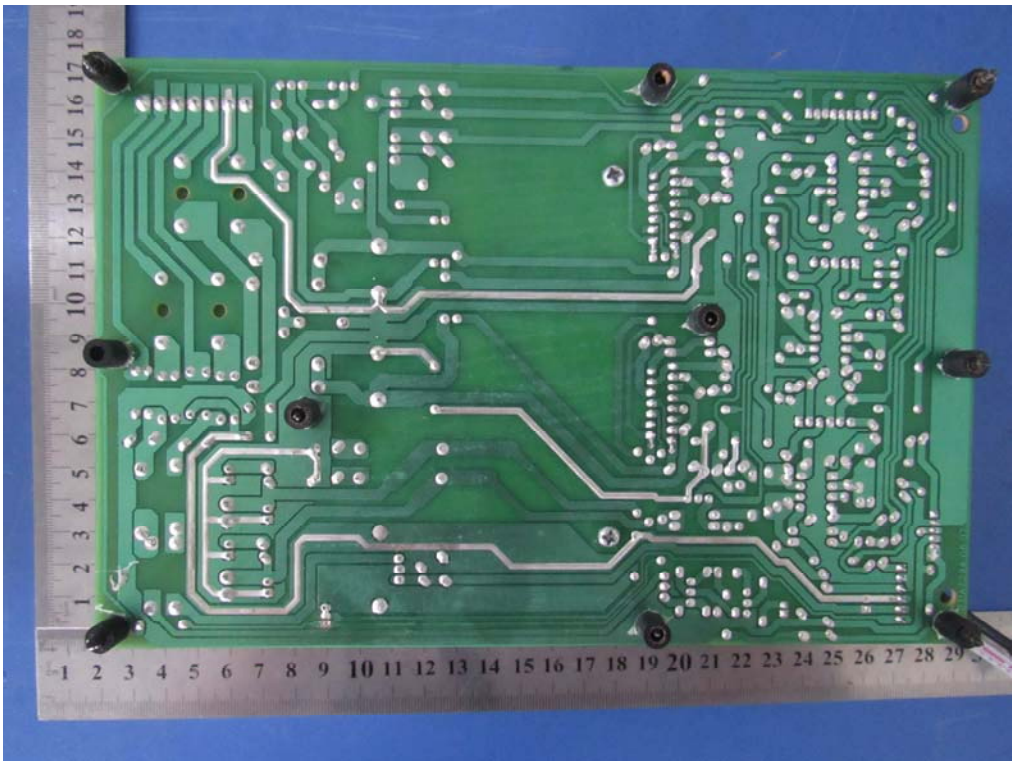
EUT PCBA 1 – Front View



EUT PCBA 1 – Rear View

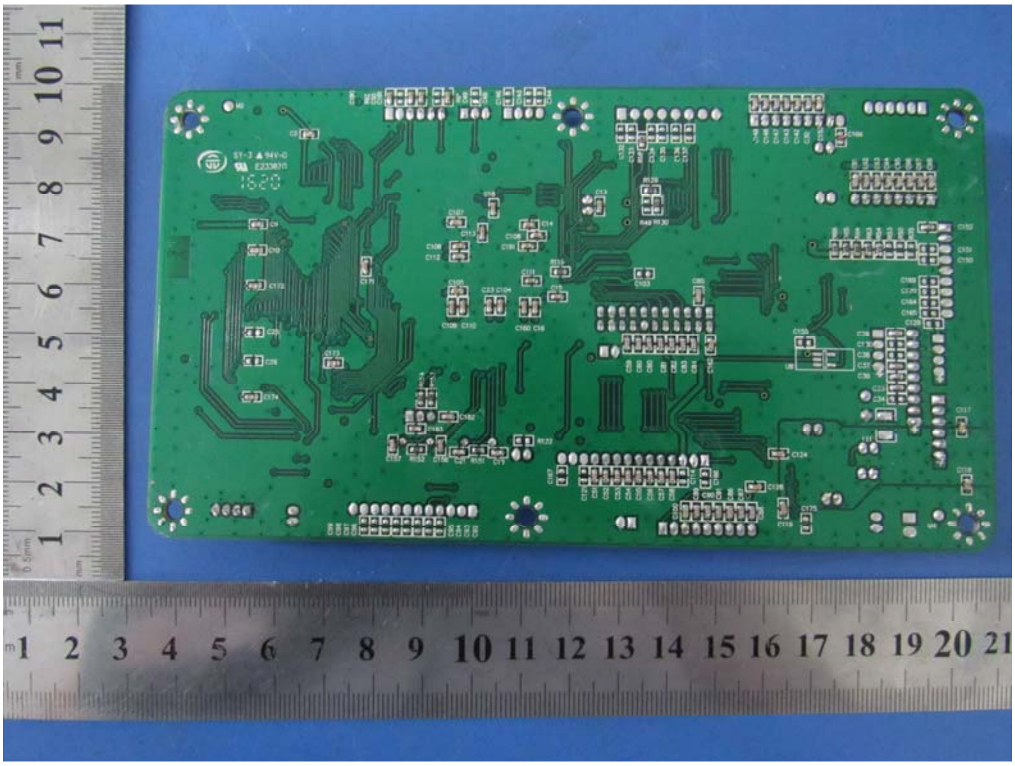


EUT PCBA 2 – Front View

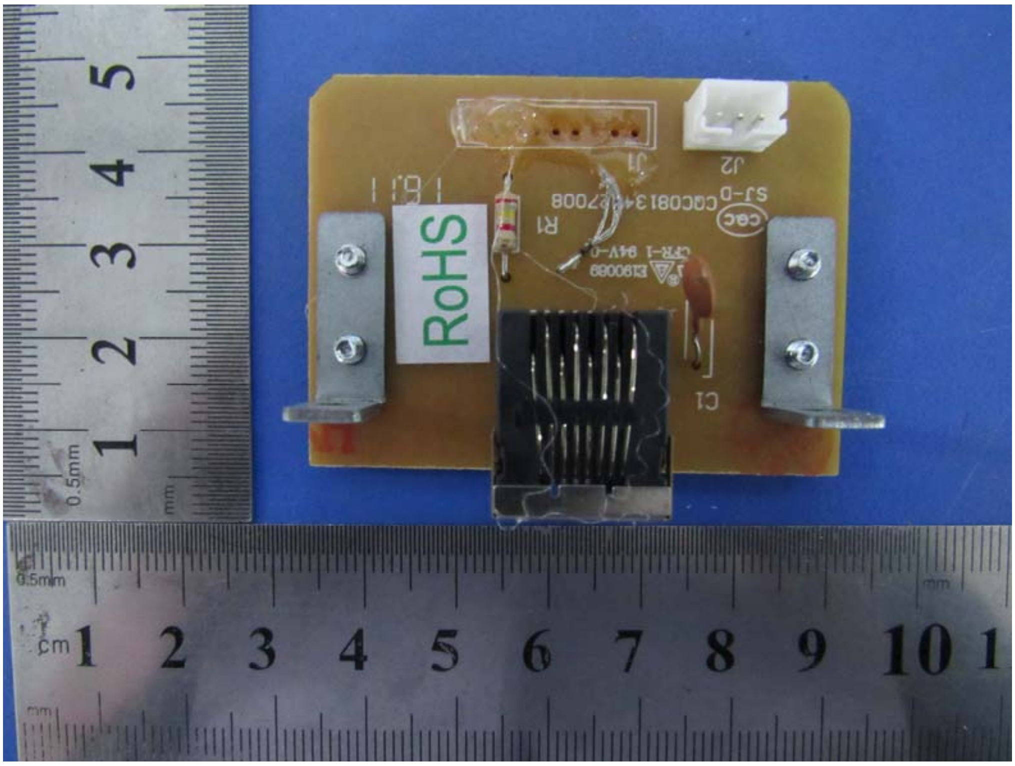


EUT PCBA 2 – Rear View

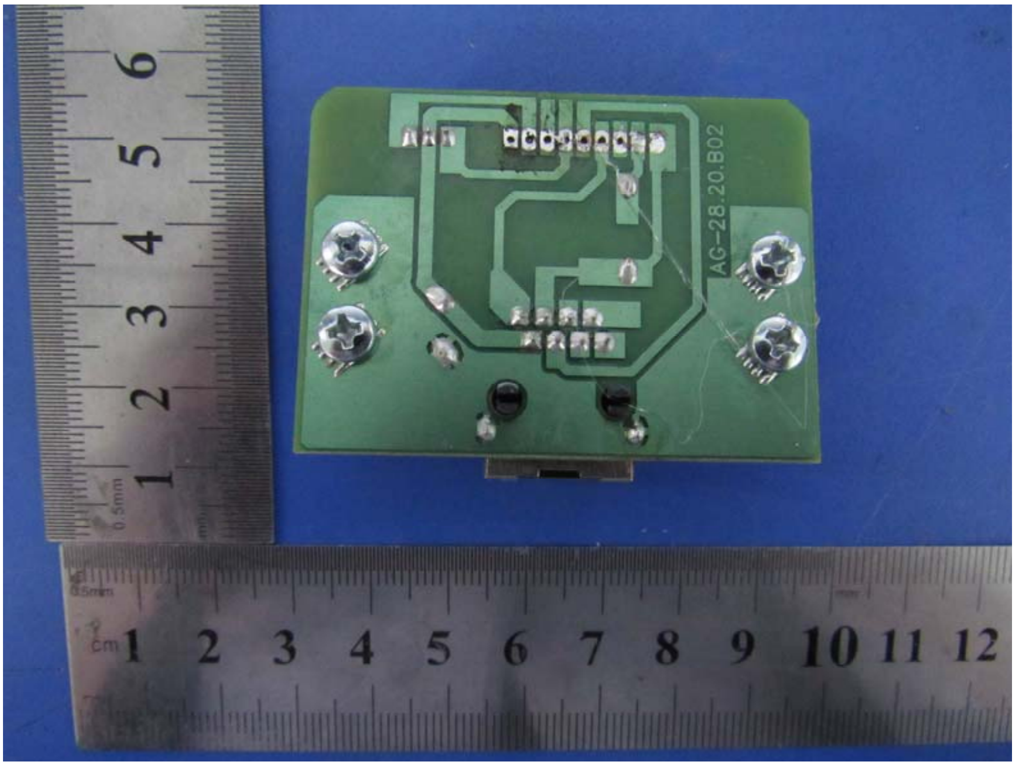
EUT PCBA 3 – Front View



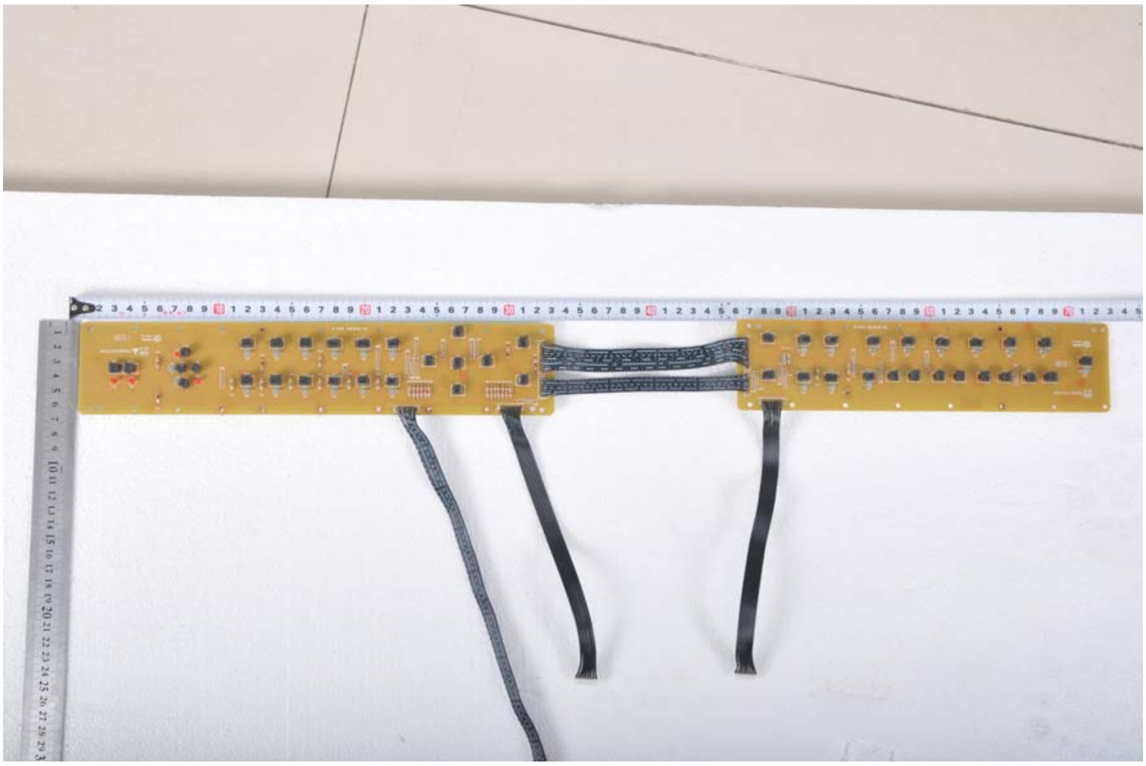
EUT PCBA 3 – Rear View



EUT PCBA 4 – Front View

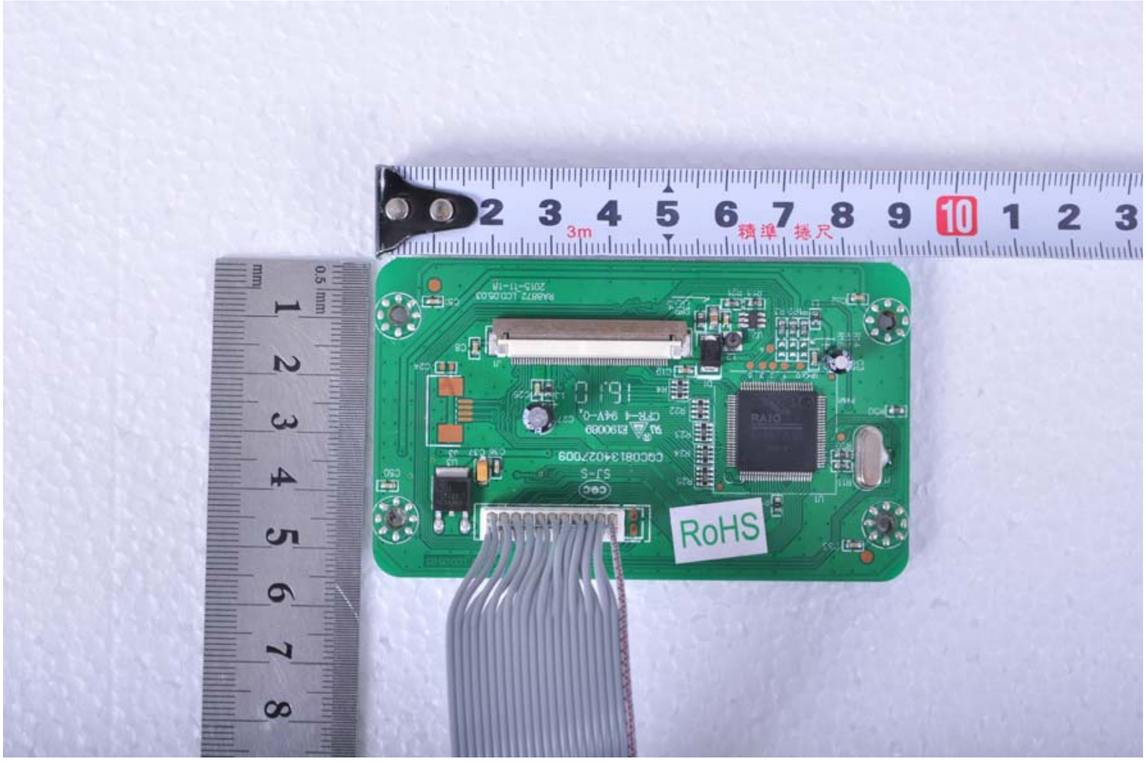


EUT PCBA 4 – Rear View

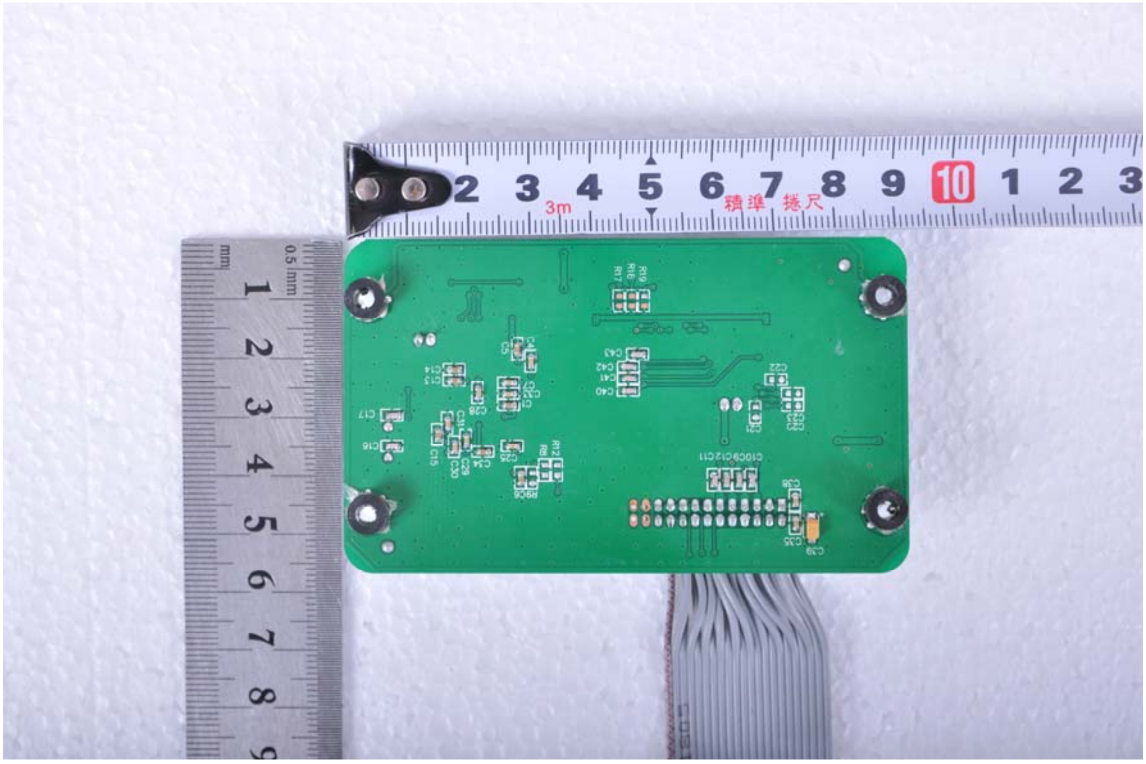


EUT PCBA 5 – Front View

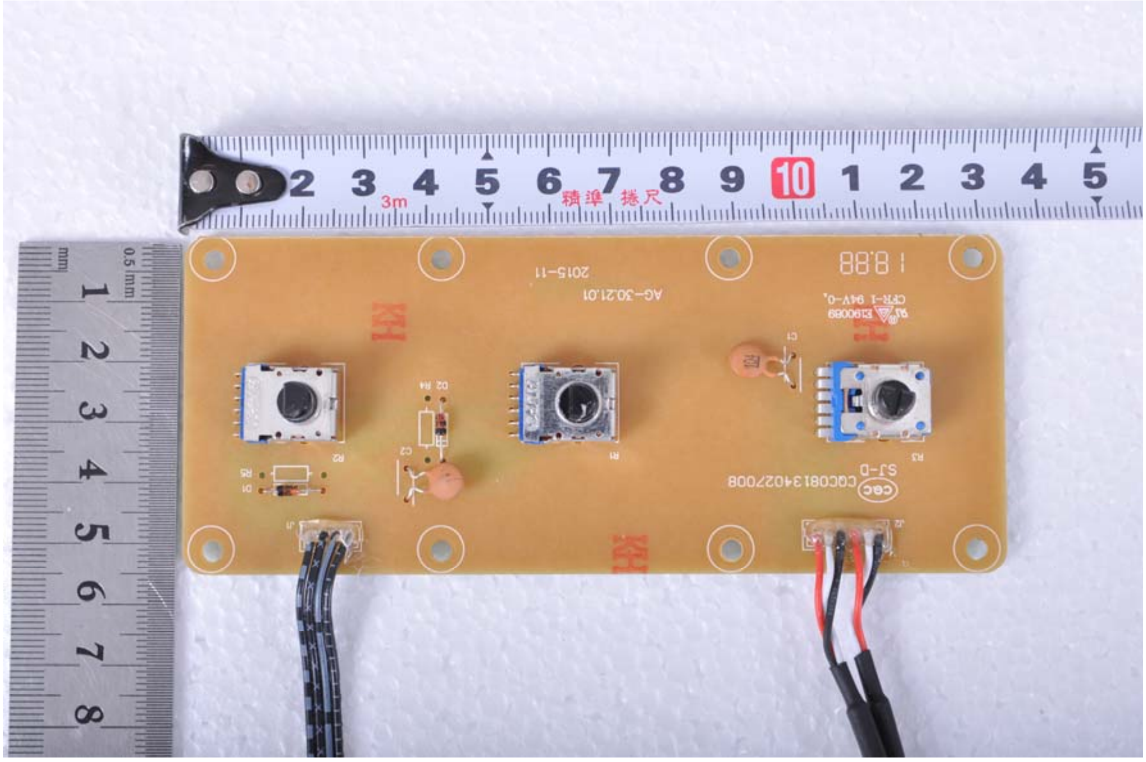
EUT PCBA 5 – Rear View



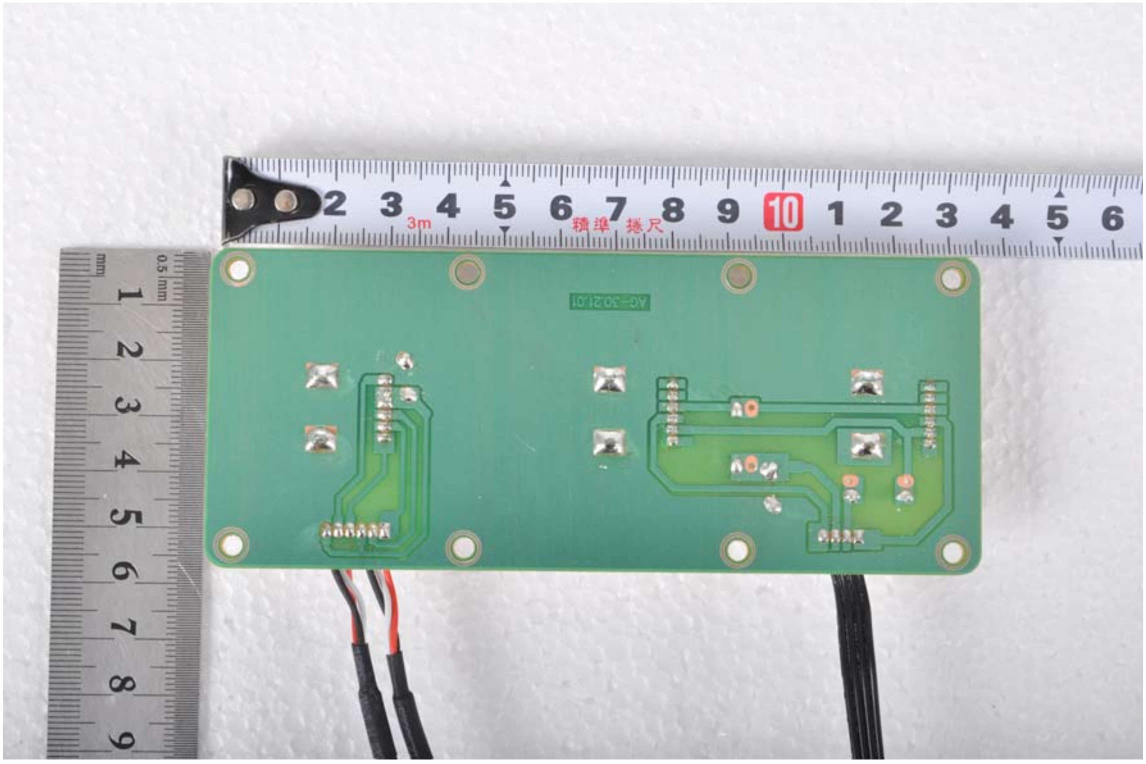
EUT PCBA 6 – Front View



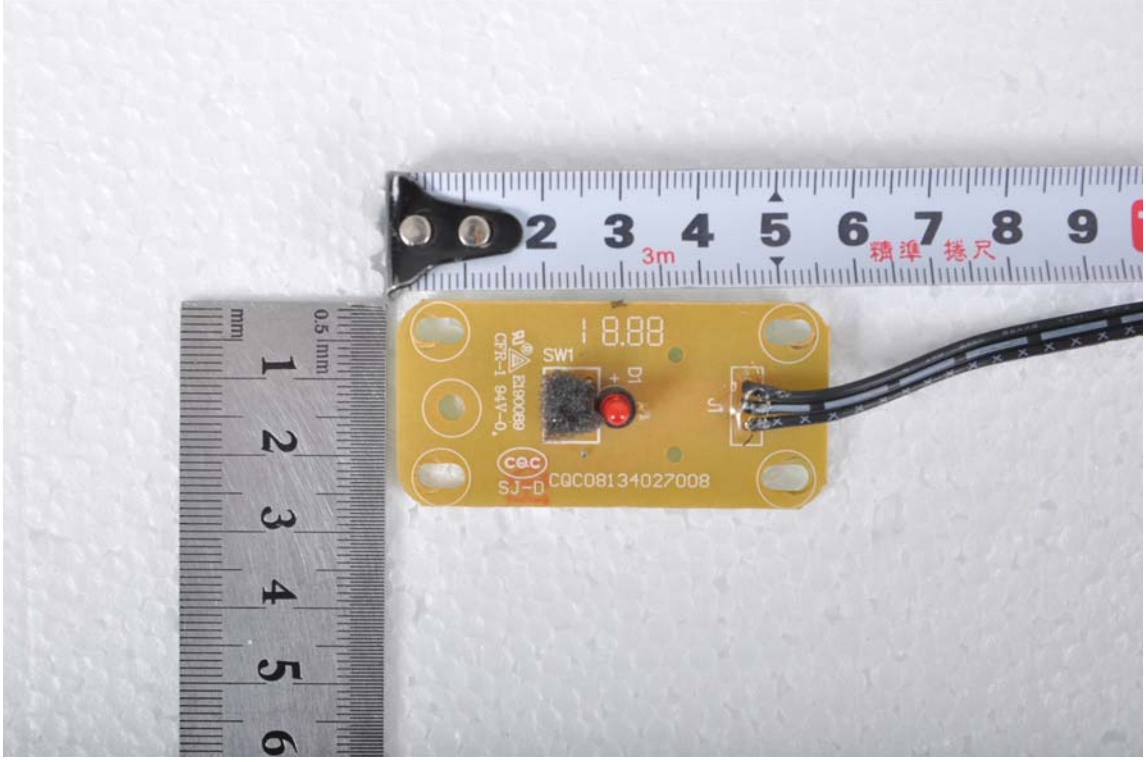
EUT PCBA 6 – Rear View



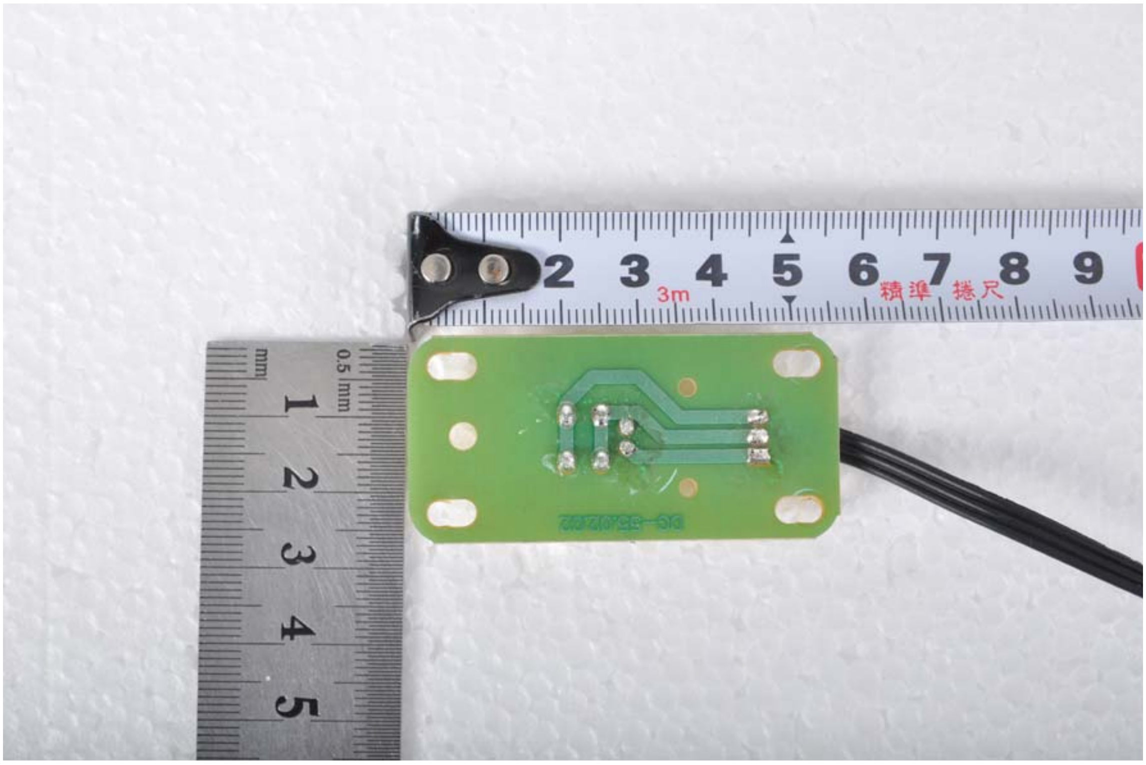
EUT PCBA 7 – Front View



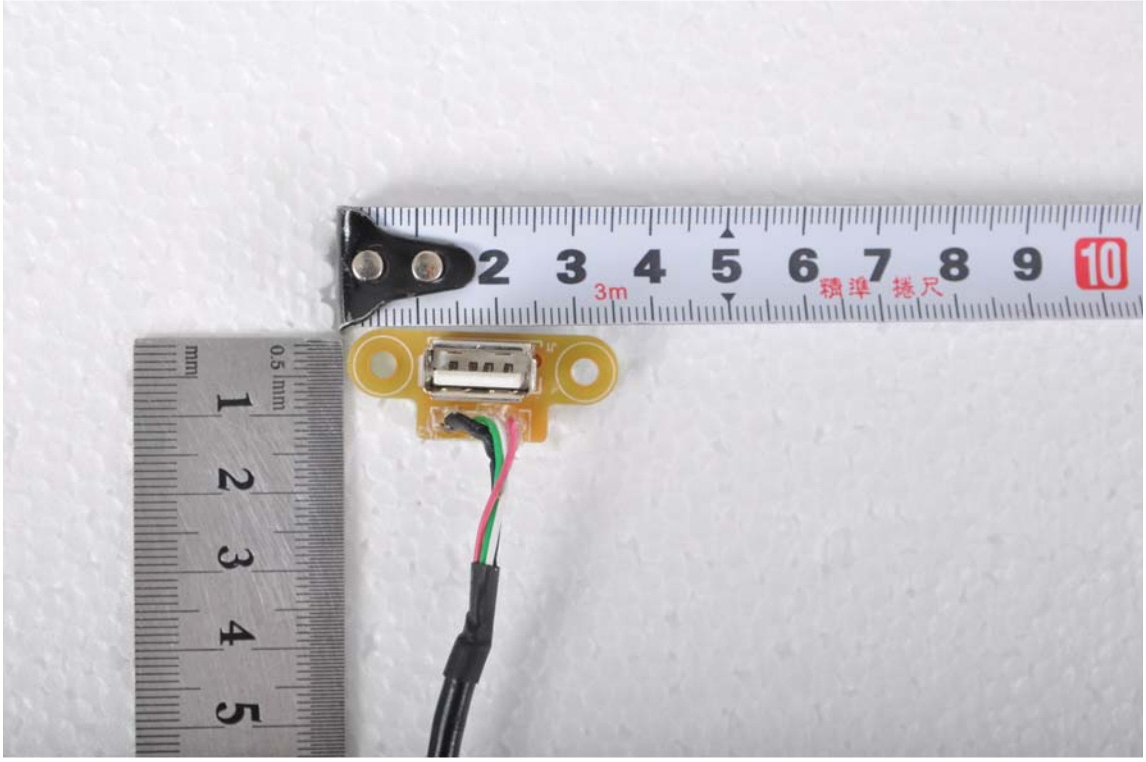
EUT PCBA 7 – Rear View



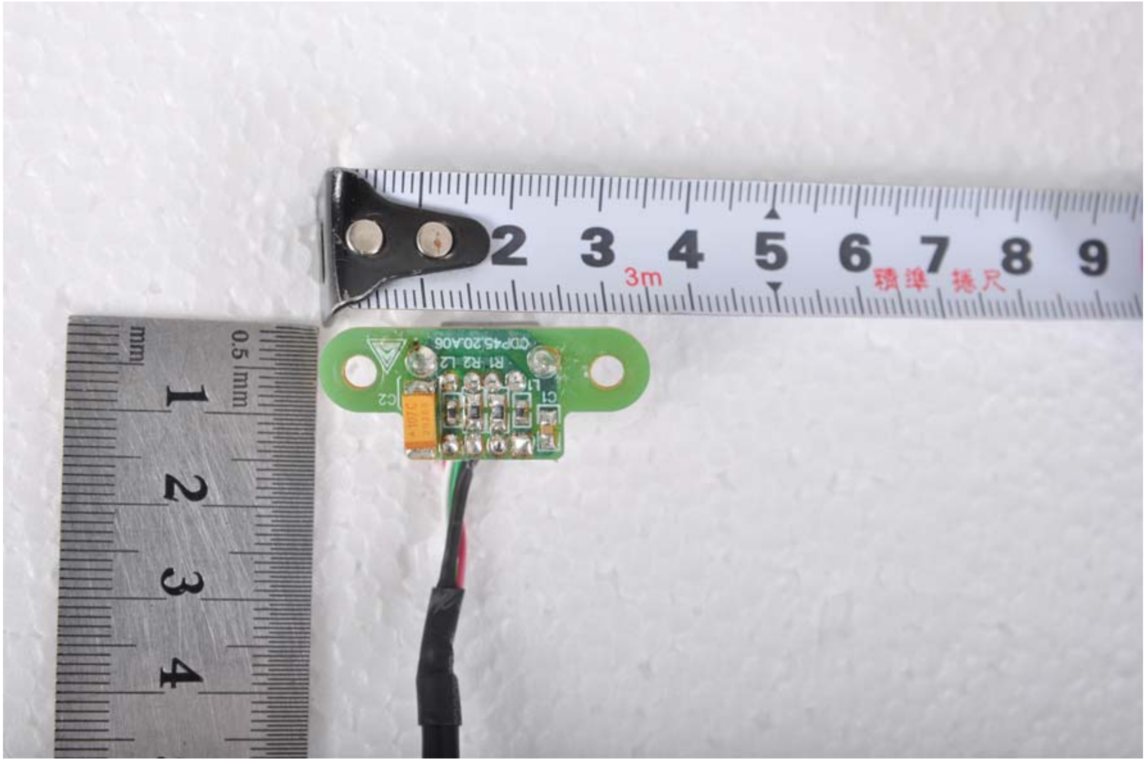
EUT PCBA 8 – Front View



EUT PCBA 8 – Rear View

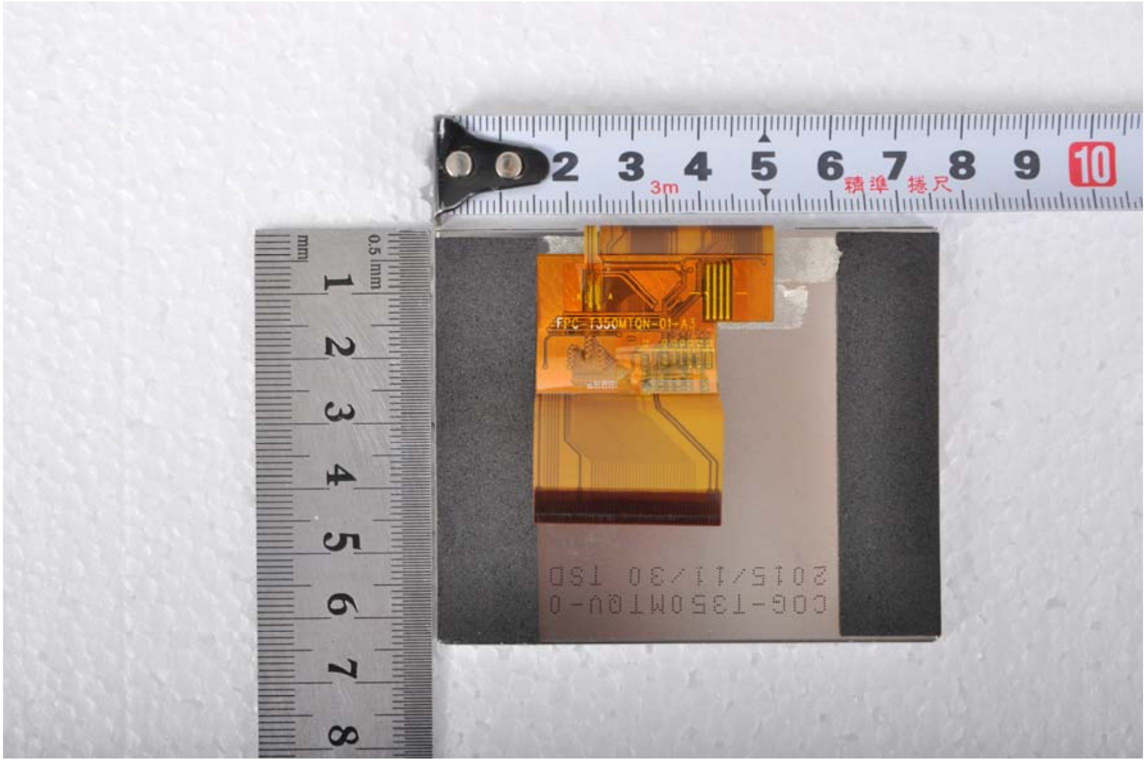


EUT PCBA 9 – Front View



EUT PCBA 9 – Rear View

EUT Screen – Front View

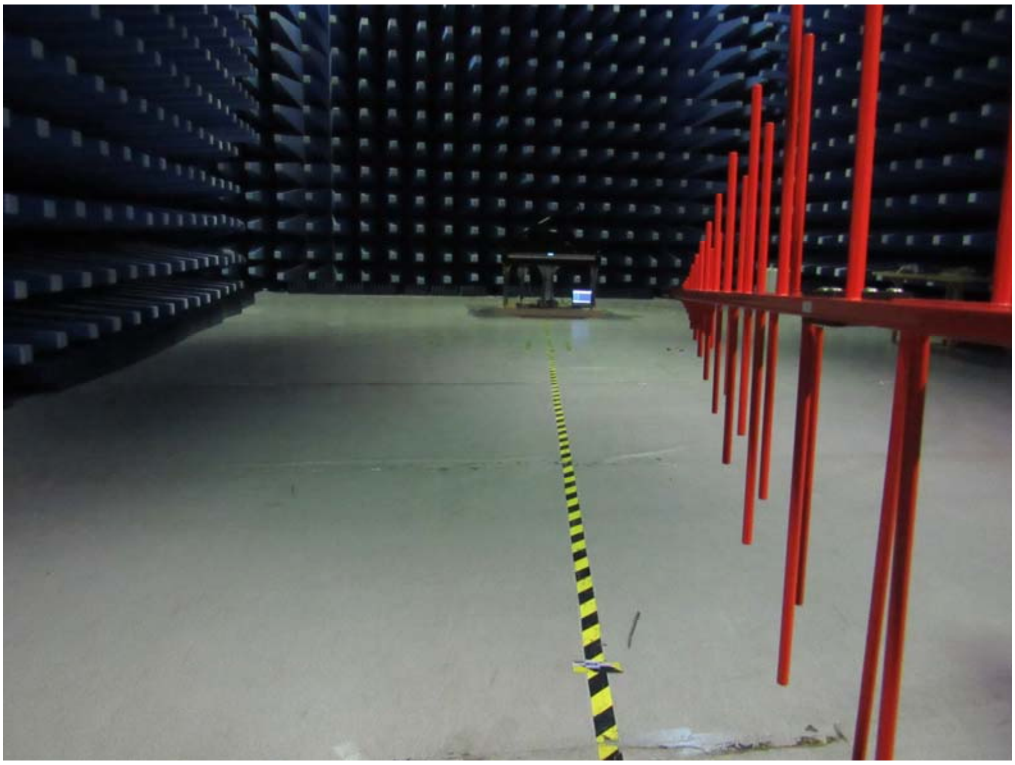


EUT Screen – Rear View

Annex B.iii. Photograph Test Setup Photo

Conducted Emissions Setup Front View

Conducted Emissions Setup Side View

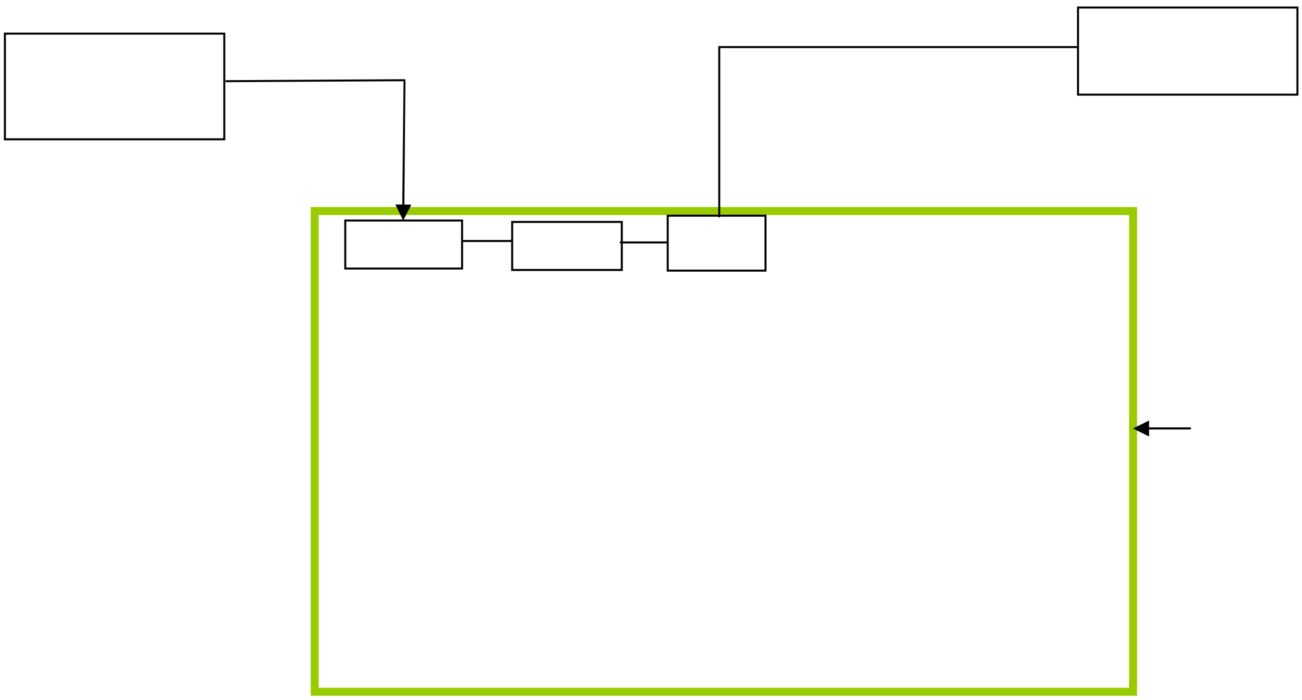


Radiated Emissions Setup Below 1GHz Front View

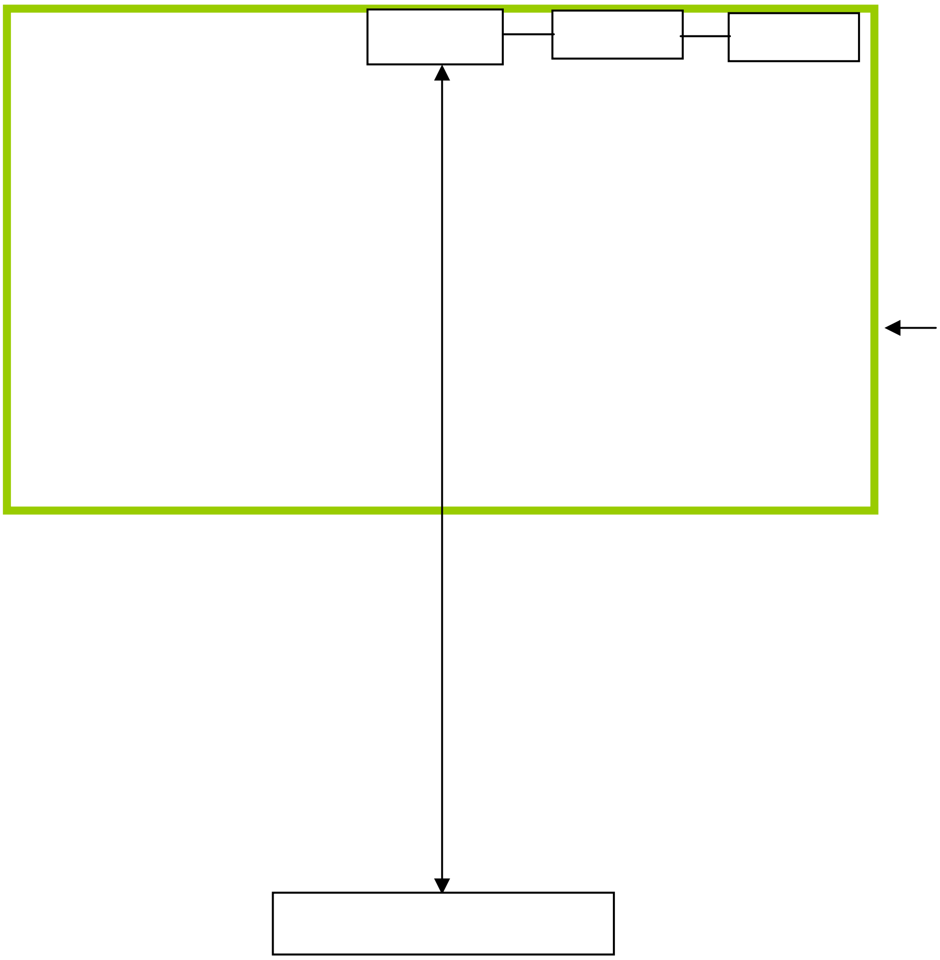
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

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 Due Date
Dell	Laptop	Inspiron14-3421	N/A

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

Please see Attachment

Annex E. DECLARATION OF SIMILARITY

Ringway Tech(Jiangsu) Co.,Ltd.

To: SIEMIC(Nanjing-China) Laboratories

Declaration Letter

Dear Sir,

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.: AG-50, AG-30
FCC ID:OCDAG-50

The difference between the two models AG-50 and AG-30 are as follows:

1. The shape of the wooden parts is different.
2. There are 8 speakers in AG-50; there are 6 speakers in AG-30.
3. The main control board, power supply board, transformer, amplifier board and other boards are same.
4. Because quantity of speaker is not same, some values of assembled parts are different between AG-50 and AG-30.

Thank you!

Signature:

Printed name/title:

Address: No. 101 West Hanjiang Road, Changzhou, Jiangsu, China