EMC TEST REPORT

SIEMIC
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Report No.: 16021447-FCC-E
Supersede Report No.: N/A

Applicant	Ringway Tech(Jiangsu) Co.,Ltd.
Product Name	DIGITAL PIANO
Main Model No.	AM-3
Serial Model	N/A
Test Standard	FCC Part 15 Subpart B Class B:2016, ANSI C63.4: 2014
Test Date	December 07, 2016
Issue Date	December 08 , 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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CONTENTS

1. REPORT REVISION HISTORY 5

2. CUSTOMER INFORMATION 5

3. TEST SITE INFORMATION 5

4. EQUIPMENT UNDER TEST (EUT) INFORMATION 6

5. TEST SUMMARY 7

6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS 8

6.1 AC POWER LINE CONDUCTED EMISSIONS 8

6.2 RADIATED EMISSIONS 14

ANNEX A. TEST INSTRUMENT 18

ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS 19

ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT 33

ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST 36

ANNEX E. DECLARATION OF SIMILARITY 37

1. Report Revision History

Report No.	Report Version	Description	Issue Date
16021447-FCC-E	NONE	Original	December 08 , 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	EZ_EMC

4. Equipment under Test (EUT) Information

Description of EUT:	DIGITAL PIANO
Main Model:	AM-3
Serial Model:	N/A
Date EUT received:	November 09, 2016
Test Date(s):	December 07, 2016
Port:	USB to Host Port, Headphones Port, SUSTAIN Port, Aux in Port, Line out Port, MIDI Out Port, Power Port
Input Power:	12Vdc 1000mA
Trade Name :	artesia
FCC ID:	OCDAM-3

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**
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

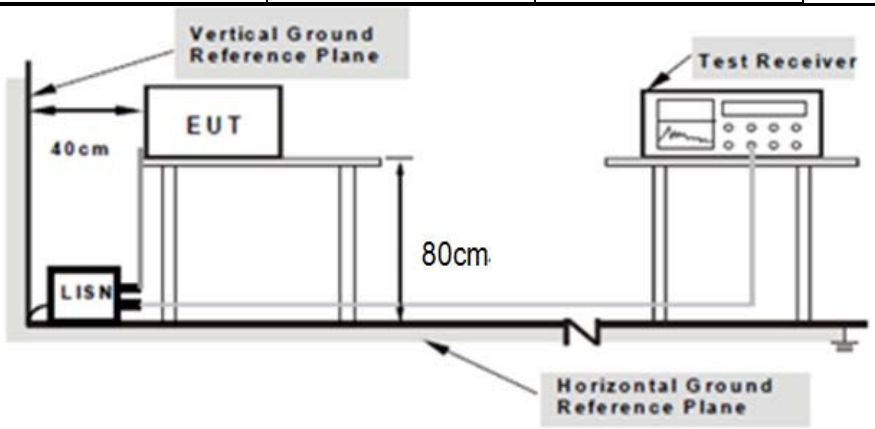
6. Measurements, Examination And Derived Results

6.1 AC Power Line Conducted Emissions

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1013mbar
Test date :	December 07, 2016
Tested By :	Amos Xia

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR §15.107</td><td>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
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>66 to 56</td><td>56 to 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>
</table>
Class A digital devices
<table>
<tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>QP</th><th>Average</th></tr>
<tr><td>0.15 ~ 0.5</td><td>79</td><td>66</td></tr>
<tr><td>0.5 ~ 30</td><td>73</td><td>60</td></tr>
</table></td><td>☒</td></tr>
<tr><td>Test Setup</td><td> 

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.</td><td></td></tr>
<tr><td>Procedure</td><td>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.</td><td></td></tr>
</table>

	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

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

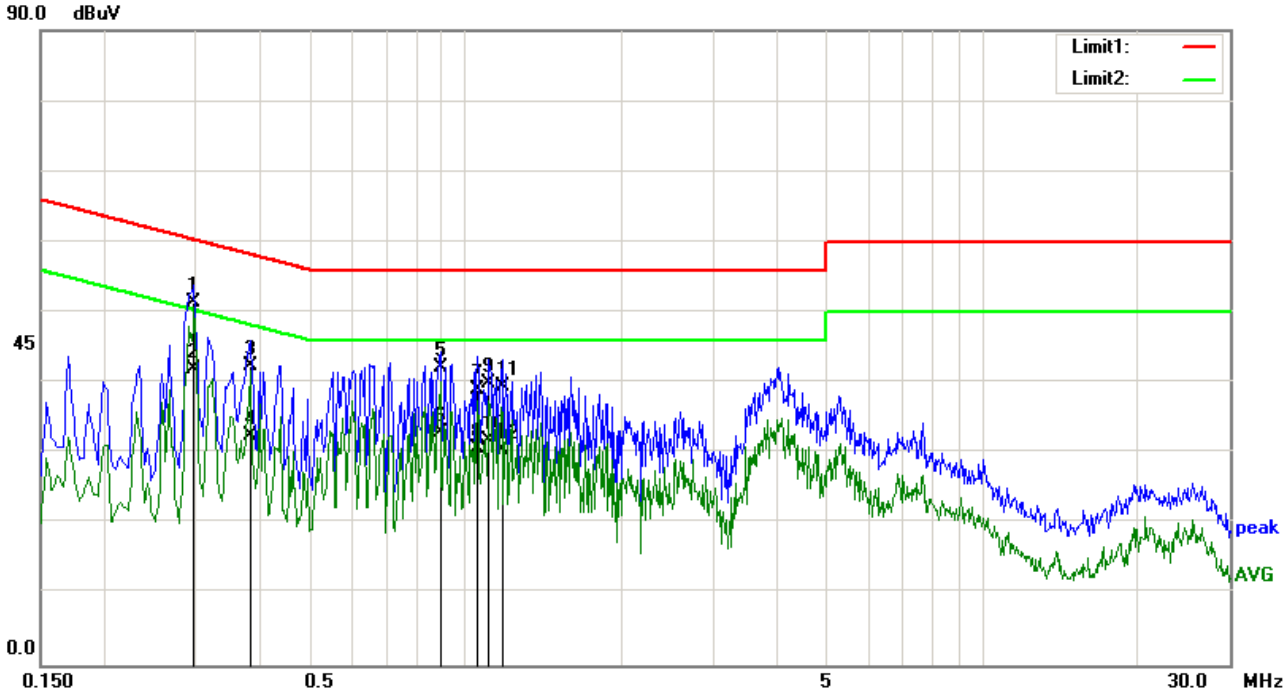
Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

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

Test Mode :	Normal Working Mode

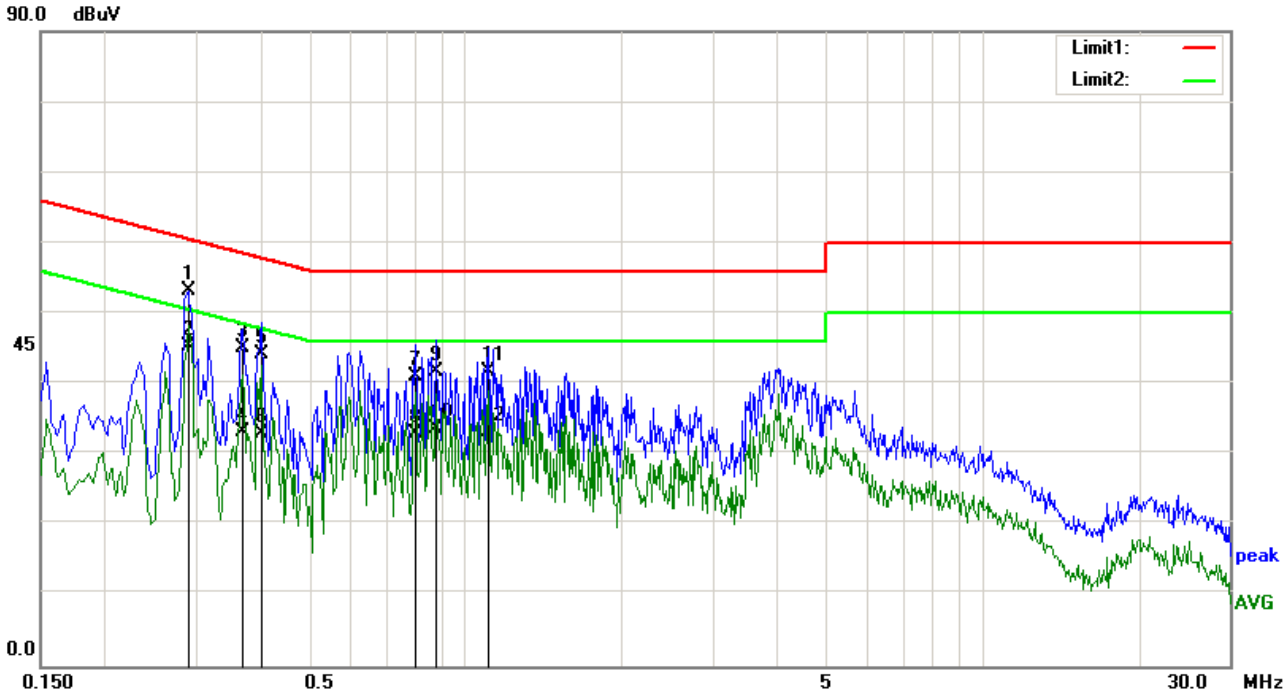


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.2980	41.15	QP	0.11	-10.00	0.20	51.46	60.30	-8.84
2	0.2980	31.74	AVG	0.11	-10.00	0.20	42.05	50.30	-8.25
3	0.3820	32.04	QP	0.11	-10.00	0.21	42.36	58.24	-15.88
4	0.3820	22.11	AVG	0.11	-10.00	0.21	32.43	48.24	-15.81
5	0.8900	31.76	QP	0.14	-10.00	0.19	42.09	56.00	-13.91
6	0.8900	22.69	AVG	0.14	-10.00	0.19	33.02	46.00	-12.98
7	1.0540	28.68	QP	0.14	-10.00	0.19	39.01	56.00	-16.99
8	1.0540	20.38	AVG	0.14	-10.00	0.19	30.71	46.00	-15.29
9	1.1100	29.58	QP	0.14	-10.00	0.20	39.92	56.00	-16.08
10	1.1100	21.53	AVG	0.14	-10.00	0.20	31.87	46.00	-14.13
11	1.1740	29.24	QP	0.14	-10.00	0.20	39.58	56.00	-16.42
12	1.1740	20.09	AVG	0.14	-10.00	0.20	30.43	46.00	-15.57

Test Mode :	Normal Working Mode

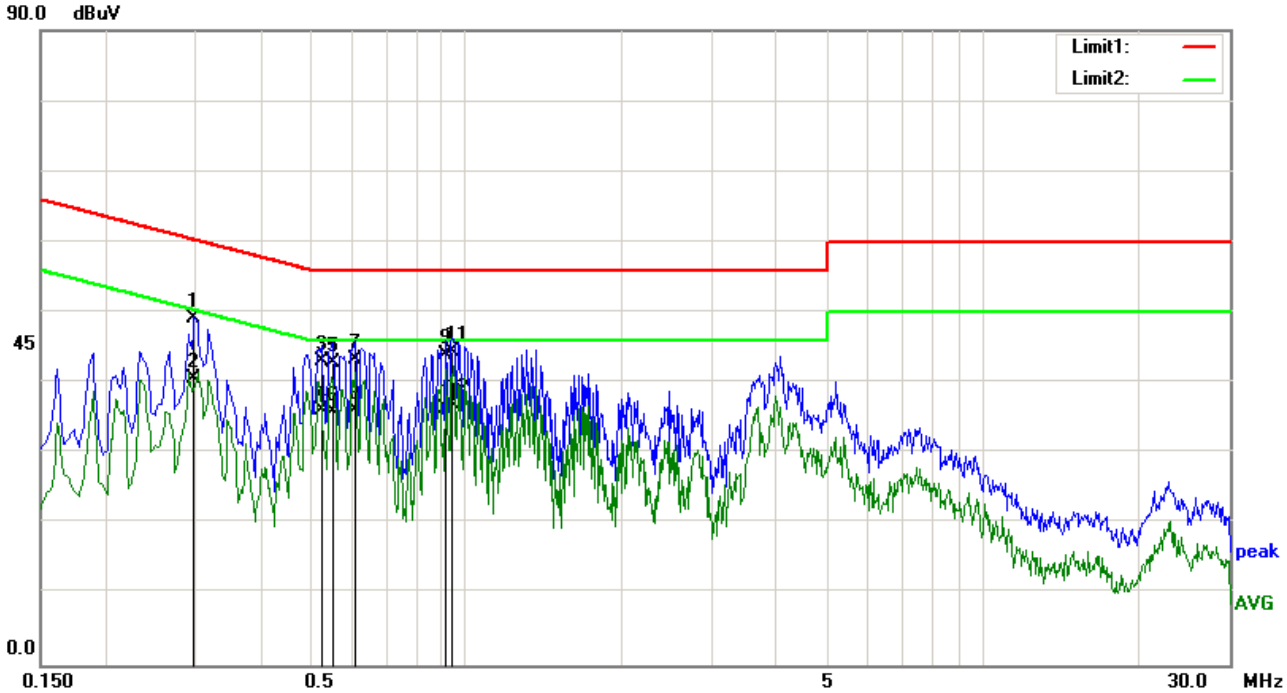


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.2900	42.81	QP	0.10	-10.00	0.20	53.11	60.52	-7.41
2	0.2900	35.04	AVG	0.10	-10.00	0.20	45.34	50.52	-5.18
3	0.3700	34.79	QP	0.11	-10.00	0.20	45.10	58.50	-13.40
4	0.3700	22.99	AVG	0.11	-10.00	0.20	33.30	48.50	-15.20
5	0.4020	33.84	QP	0.11	-10.00	0.21	44.16	57.81	-13.65
6	0.4020	22.59	AVG	0.11	-10.00	0.21	32.91	47.81	-14.90
7	0.7980	30.68	QP	0.12	-10.00	0.20	41.00	56.00	-15.00
8	0.7980	22.57	AVG	0.12	-10.00	0.20	32.89	46.00	-13.11
9	0.8740	31.32	QP	0.13	-10.00	0.20	41.65	56.00	-14.35
10	0.8740	23.27	AVG	0.13	-10.00	0.20	33.60	46.00	-12.40
11	1.1060	31.46	QP	0.13	-10.00	0.20	41.79	56.00	-14.21
12	1.1060	22.91	AVG	0.13	-10.00	0.20	33.24	46.00	-12.76

Test Mode :	Normal Working Mode

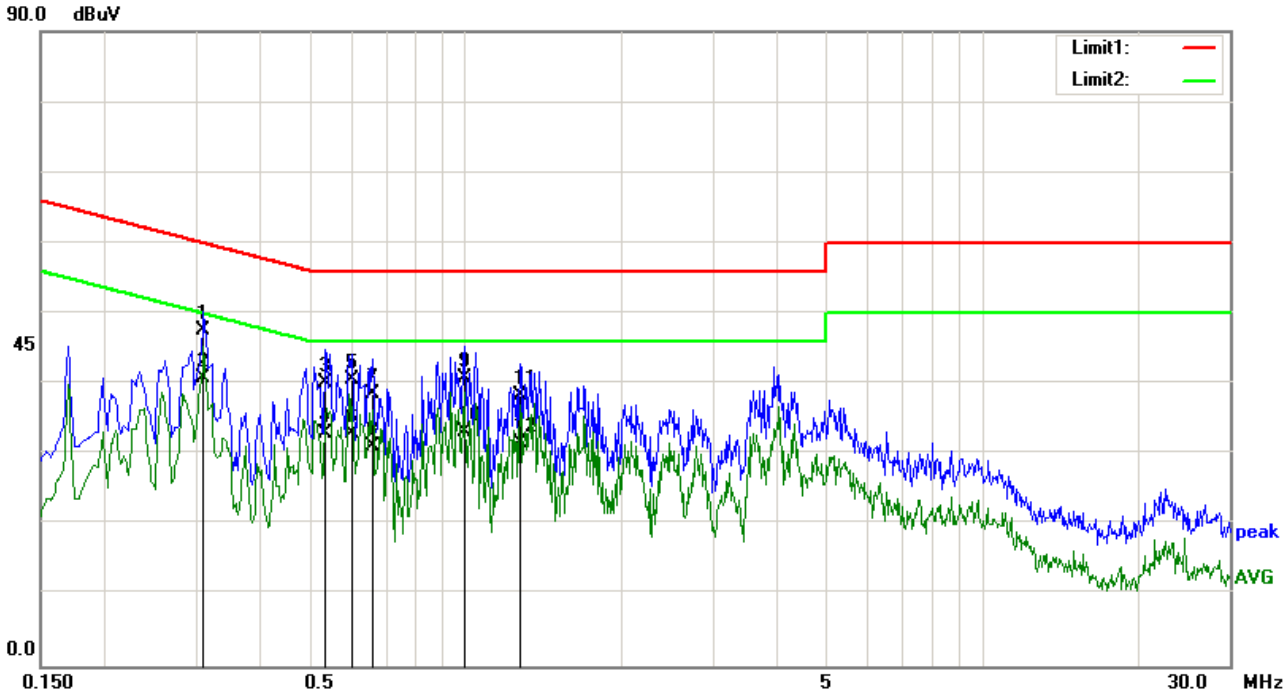


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.2980	38.92	QP	0.11	-10.00	0.20	49.23	60.30	-11.07
2	0.2980	30.23	AVG	0.11	-10.00	0.20	40.54	50.30	-9.76
3	0.5260	32.65	QP	0.12	-10.00	0.21	42.98	56.00	-13.02
4	0.5260	25.73	AVG	0.12	-10.00	0.21	36.06	46.00	-9.94
5	0.5540	32.52	QP	0.12	-10.00	0.21	42.85	56.00	-13.15
6	0.5540	25.67	AVG	0.12	-10.00	0.21	36.00	46.00	-10.00
7	0.6100	32.94	QP	0.13	-10.00	0.21	43.28	56.00	-12.72
8	0.6100	25.79	AVG	0.13	-10.00	0.21	36.13	46.00	-9.87
9	0.9100	33.61	QP	0.14	-10.00	0.19	43.94	56.00	-12.06
10	0.9100	26.10	AVG	0.14	-10.00	0.19	36.43	46.00	-9.57
11	0.9420	34.08	QP	0.14	-10.00	0.19	44.41	56.00	-11.59
12	0.9420	26.64	AVG	0.14	-10.00	0.19	36.97	46.00	-9.03

Test Mode :	Normal Working Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

No.	Frequency (MHz)	Reading (dBµV)	Detector	Lisn/Isn (dB}	Ps_Lmt (dB)	Cab_L (dB)	Result (dBµV)	Limit (dBµV)	Margin (dB)
1	0.3100	37.19	QP	0.10	-10.00	0.20	47.49	59.97	-12.48
2	0.3100	30.53	AVG	0.10	-10.00	0.20	40.83	49.97	-9.14
3	0.5340	29.95	QP	0.11	-10.00	0.21	40.27	56.00	-15.73
4	0.5340	22.54	AVG	0.11	-10.00	0.21	32.86	46.00	-13.14
5	0.6020	30.31	QP	0.12	-10.00	0.21	40.64	56.00	-15.36
6	0.6020	22.65	AVG	0.12	-10.00	0.21	32.98	46.00	-13.02
7	0.6580	28.28	QP	0.12	-10.00	0.20	38.60	56.00	-17.40
8	0.6580	20.93	AVG	0.12	-10.00	0.20	31.25	46.00	-14.75
9	0.9900	30.43	QP	0.13	-10.00	0.19	40.75	56.00	-15.25
10	0.9900	22.85	AVG	0.13	-10.00	0.19	33.17	46.00	-12.83
11	1.2700	28.12	QP	0.14	-10.00	0.21	38.47	56.00	-17.53
12	1.2700	21.28	AVG	0.14	-10.00	0.21	31.63	46.00	-14.37

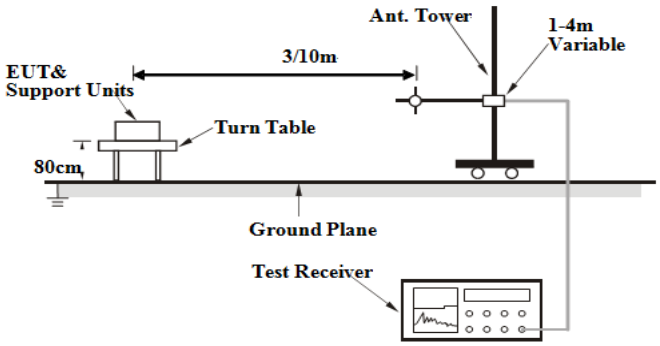
6.2 Radiated Emissions

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1013mbar
Test date :	December 07, 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 B 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> 
</td><td></td></tr>
<tr><td>Procedure</td><td>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><td></td></tr>
<tr><td>Remark</td><td></td><td></td></tr>
</table>

Result	☒ Pass ☐ Fail
Test Data	☒Yes ☐N/A
Test Plot	☒Yes ☐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 (°)

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

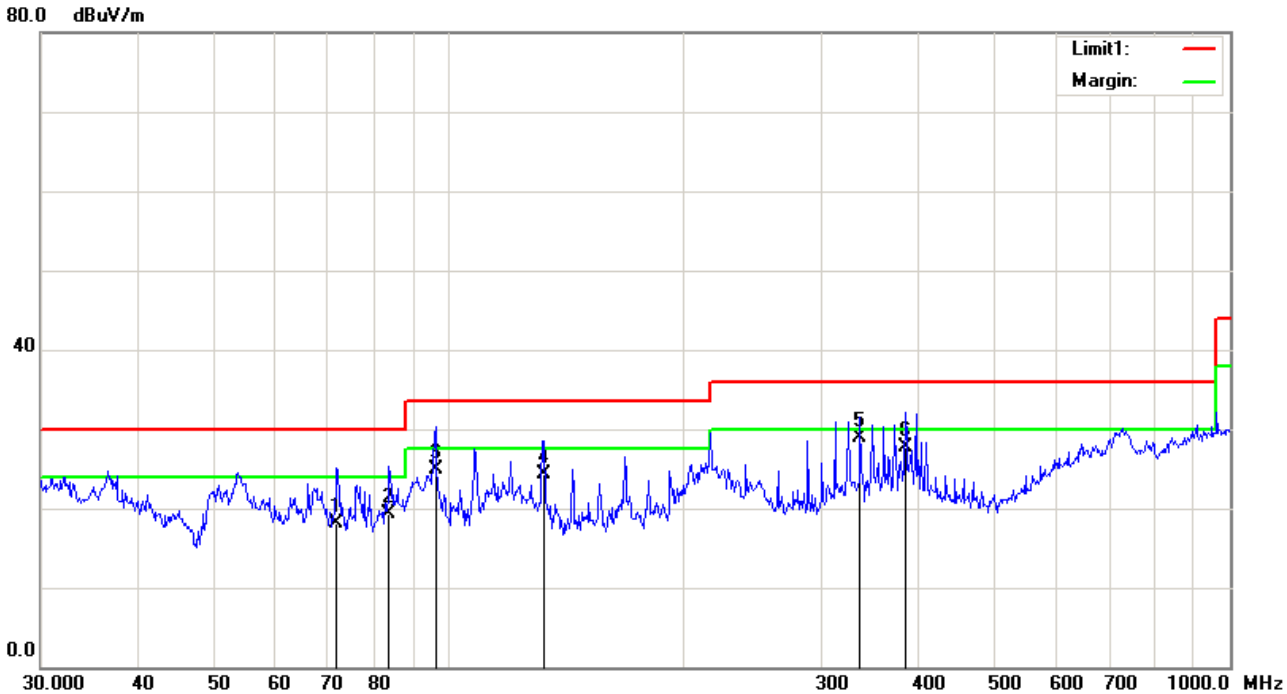
Degree = Turn table degree

Calculation Formula:

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

Test Mode:	Normal Working Mode

(Below 1GHz)



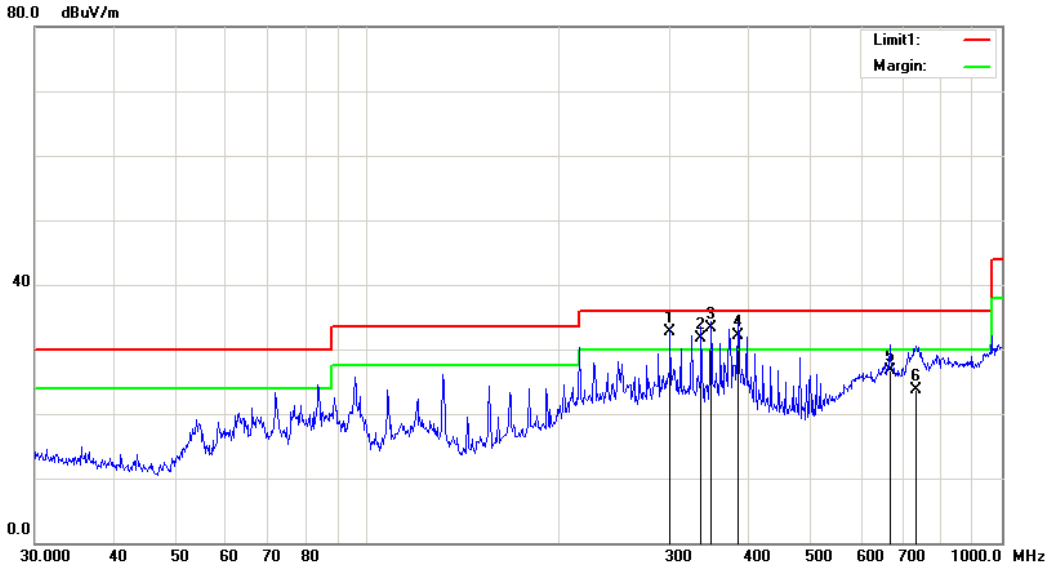
Test Data

Vertical Polarity Plot @10m

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	71.8320	54.78	QP	9.88	47.91	1.44	18.19	30.00	-11.81	177	360
2	83.8156	57.41	QP	7.98	47.58	1.46	19.27	30.00	-10.73	200	239
3	96.0986	59.69	QP	10.28	46.66	1.57	24.88	33.50	-8.62	200	359
4	132.2206	54.33	QP	15.50	47.45	1.89	24.27	33.50	-9.23	167	360
5	336.0352	59.12	QP	15.69	48.86	2.93	28.88	36.00	-7.12	100	52
6	383.9318	56.74	QP	16.67	48.80	3.16	27.77	36.00	-8.23	100	34

Test Mode:	Normal Working Mode

(Below 1GHz)



Test Data

Horizontal Polarity Plot @10m

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	300.3673	61.37	QP	16.90	48.28	2.77	32.76	36.00	-3.24	300	157
2	336.0352	61.04	QP	16.58	48.86	2.93	31.69	36.00	-4.31	300	147
3	348.0274	62.64	QP	16.47	48.85	2.99	33.25	36.00	-2.75	199	166
4	383.9318	61.58	QP	16.14	48.80	3.16	32.08	36.00	-3.92	200	250
5	665.8035	48.81	QP	22.01	48.35	4.14	26.61	36.00	-9.39	200	60
6	731.9203	42.23	QP	22.59	45.38	4.34	23.78	36.00	-12.22	200	239

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.

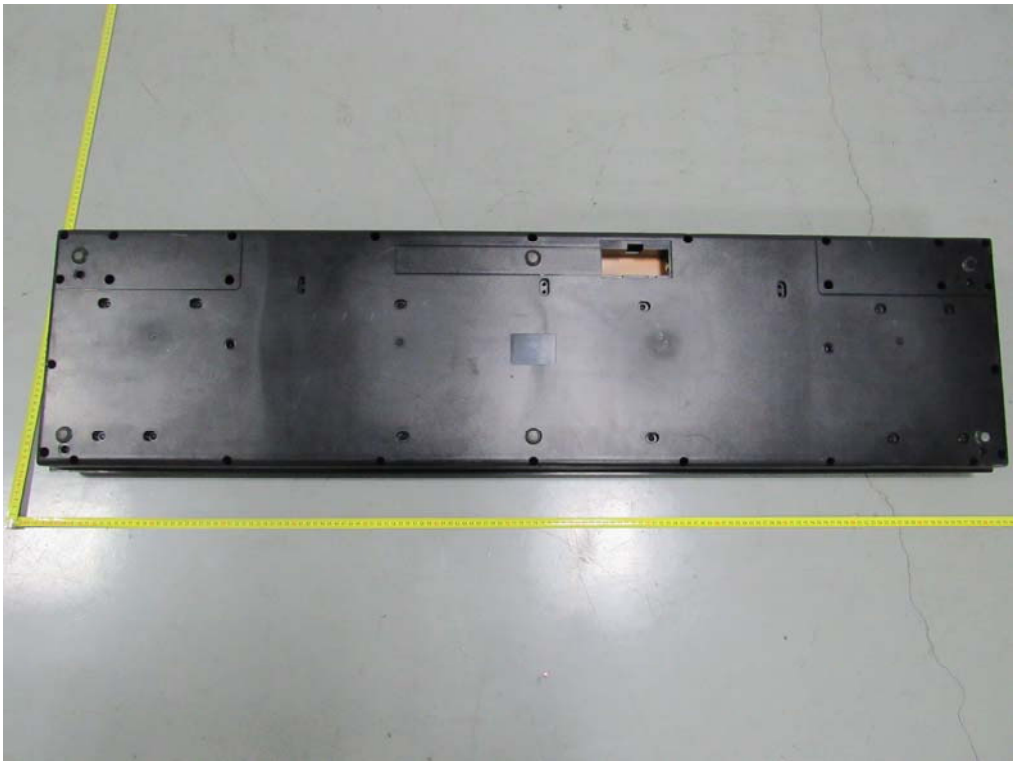
Annex A. TEST INSTRUMENT

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	10/30/2016	10/30/2017	☒
SIEMIC EZ_EMC Conducted Emissions software	Ver.ICP-03A1	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	10/31/2016	10/31/2017	☒
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 Internal Photo

Front View of EUT



Rear View of EUT

Top View of EUT

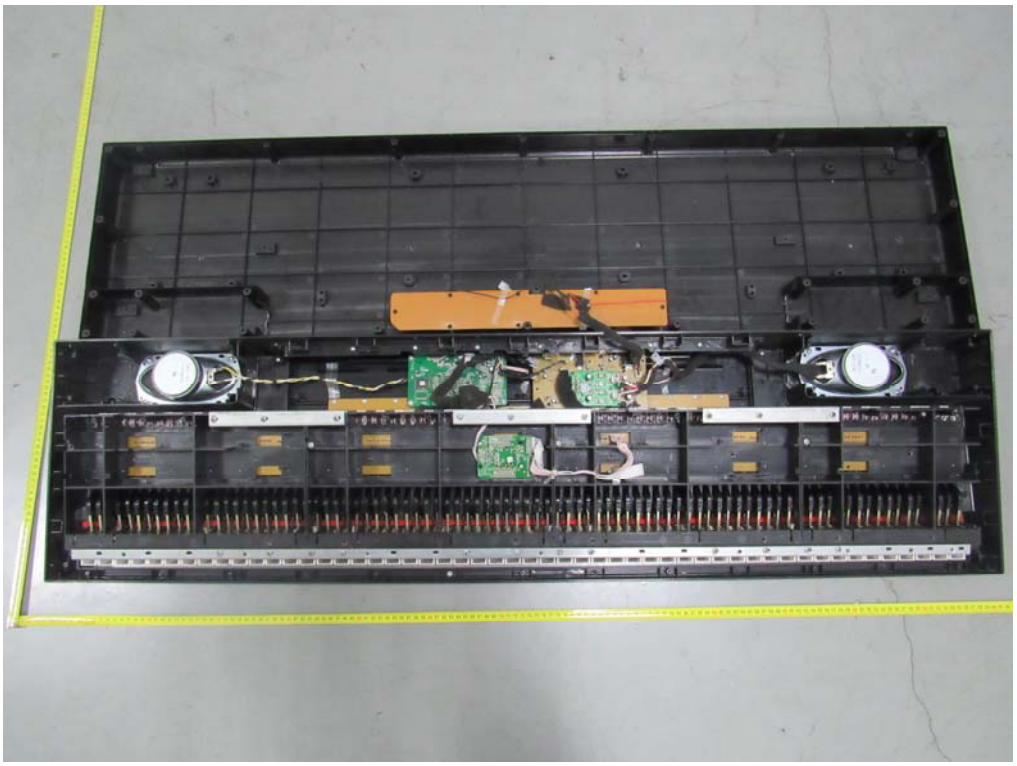
Bottom View of EUT

Left View of EUT

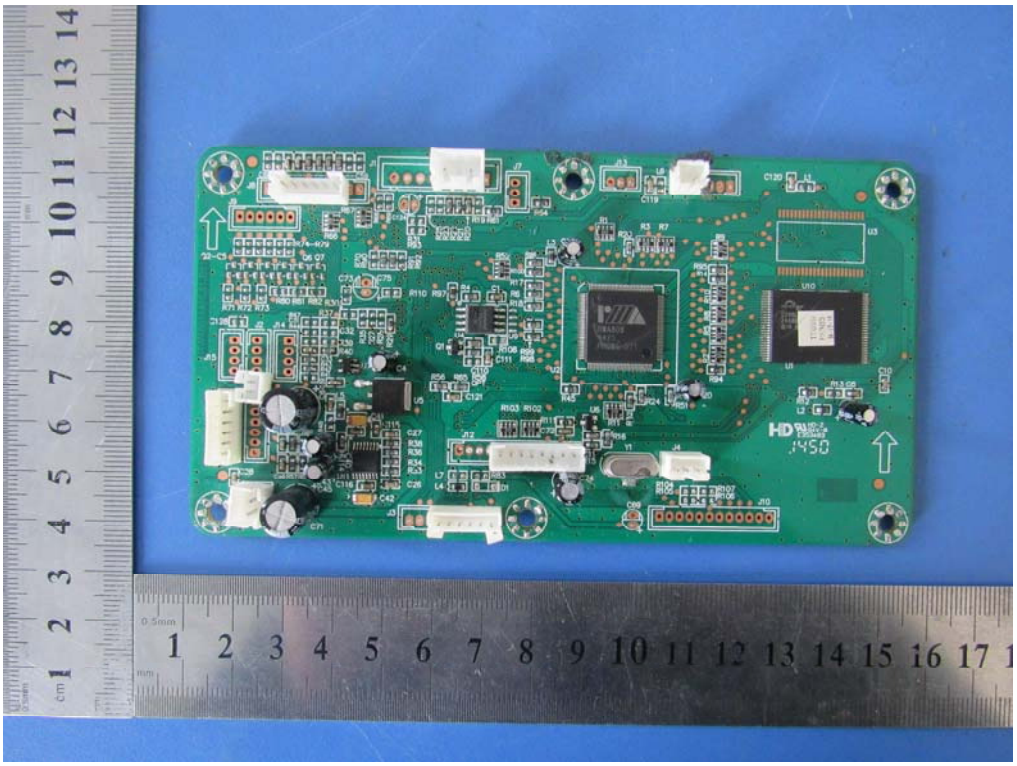
Right View of EUT

EUT – Port Front View

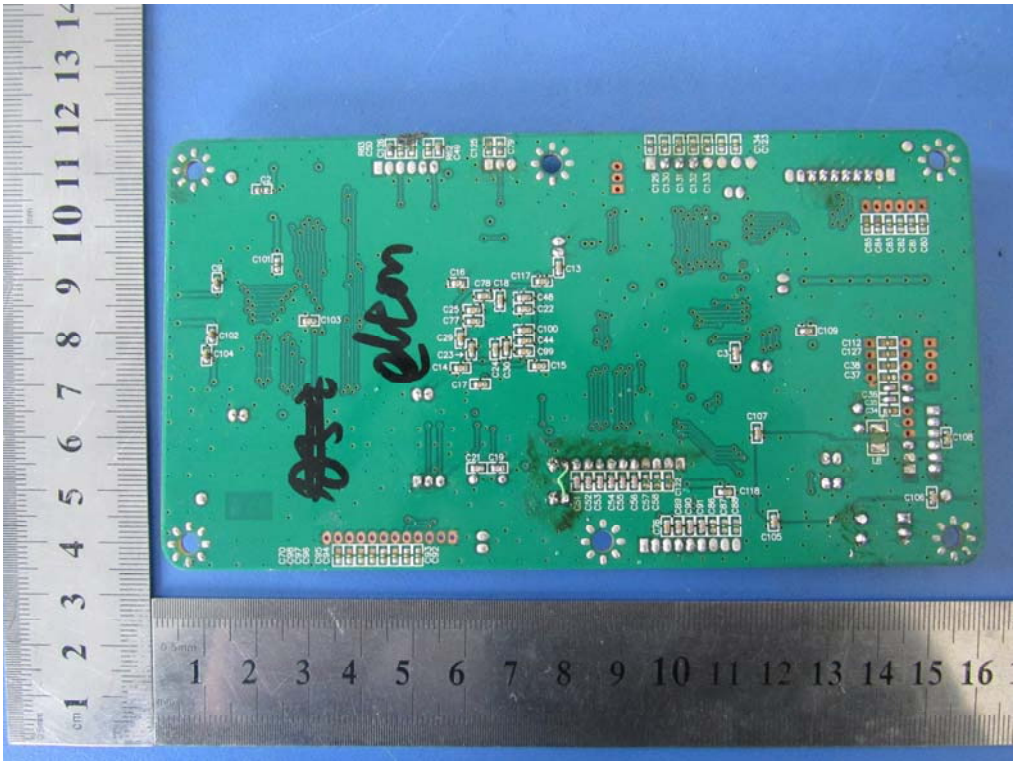
Annex B.ii. Photograph EUT Internal Photo



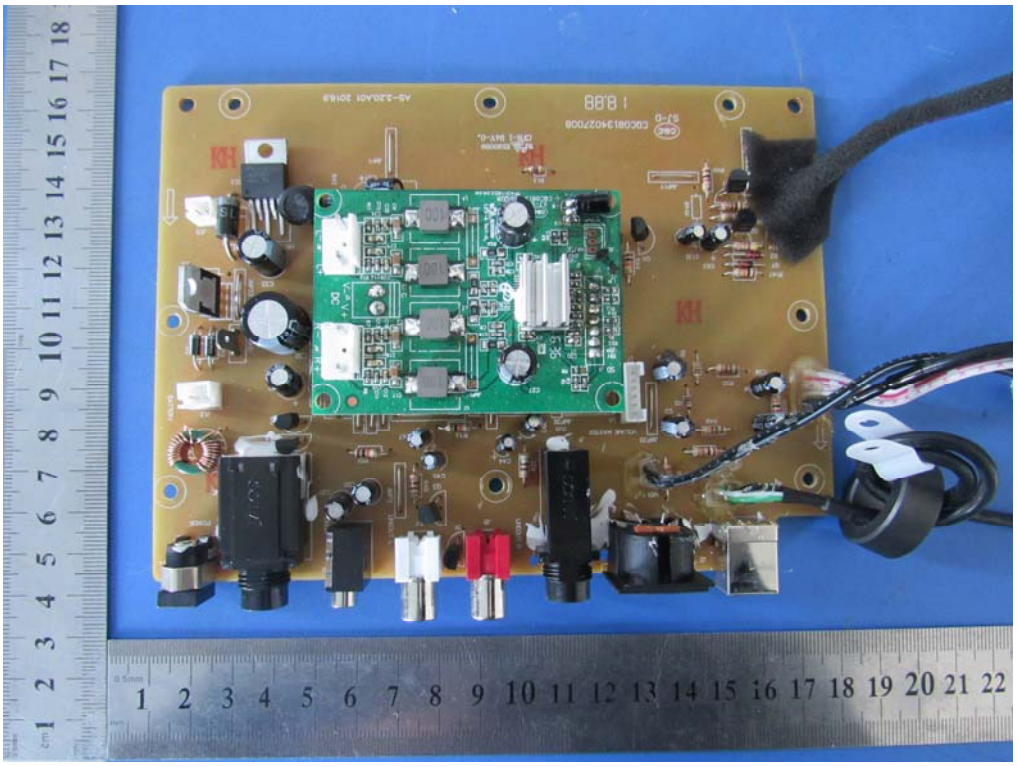
EUT Uncover – Front View



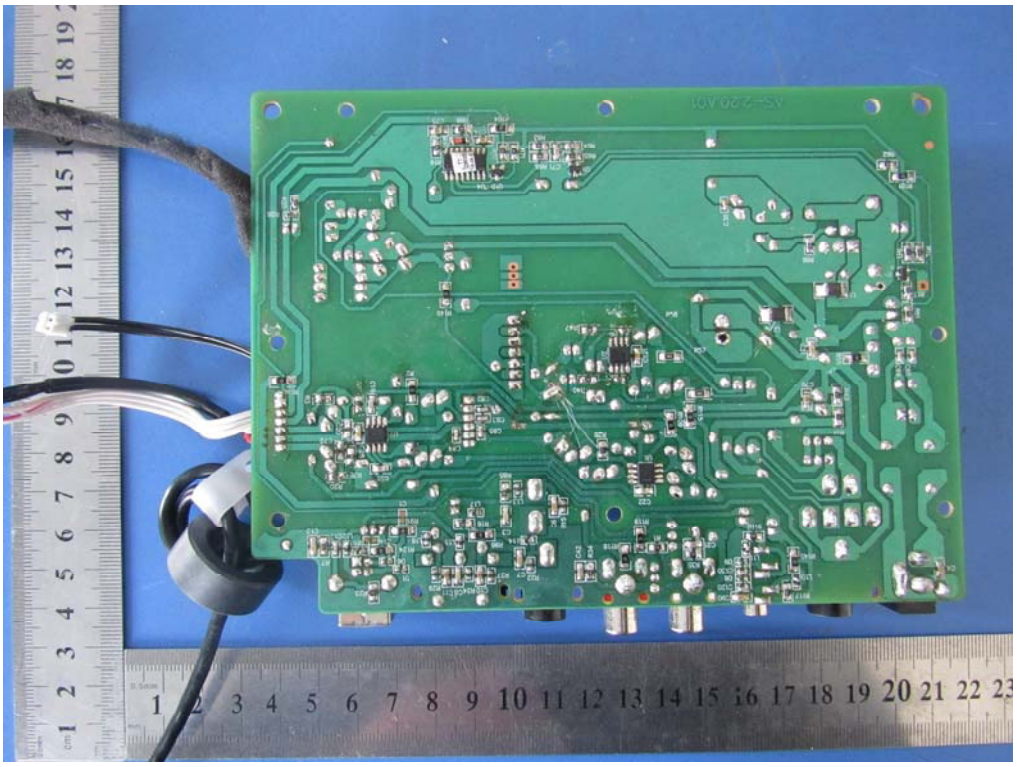
EUT PCBA – Front View



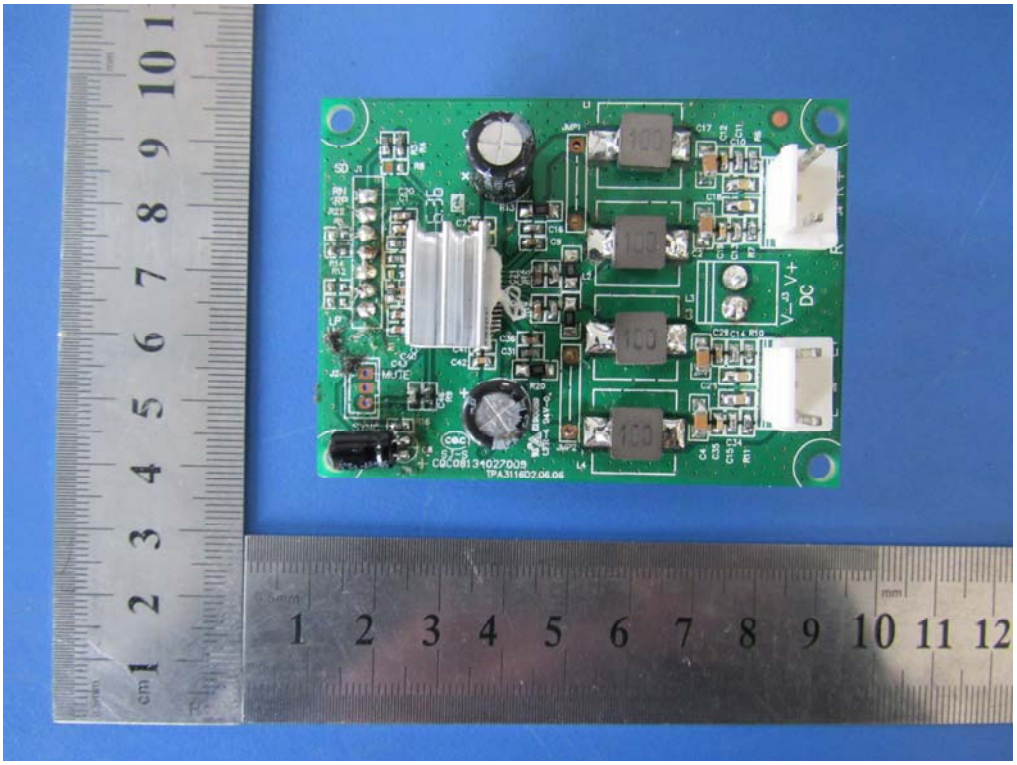
EUT PCBA 1 – Rear View



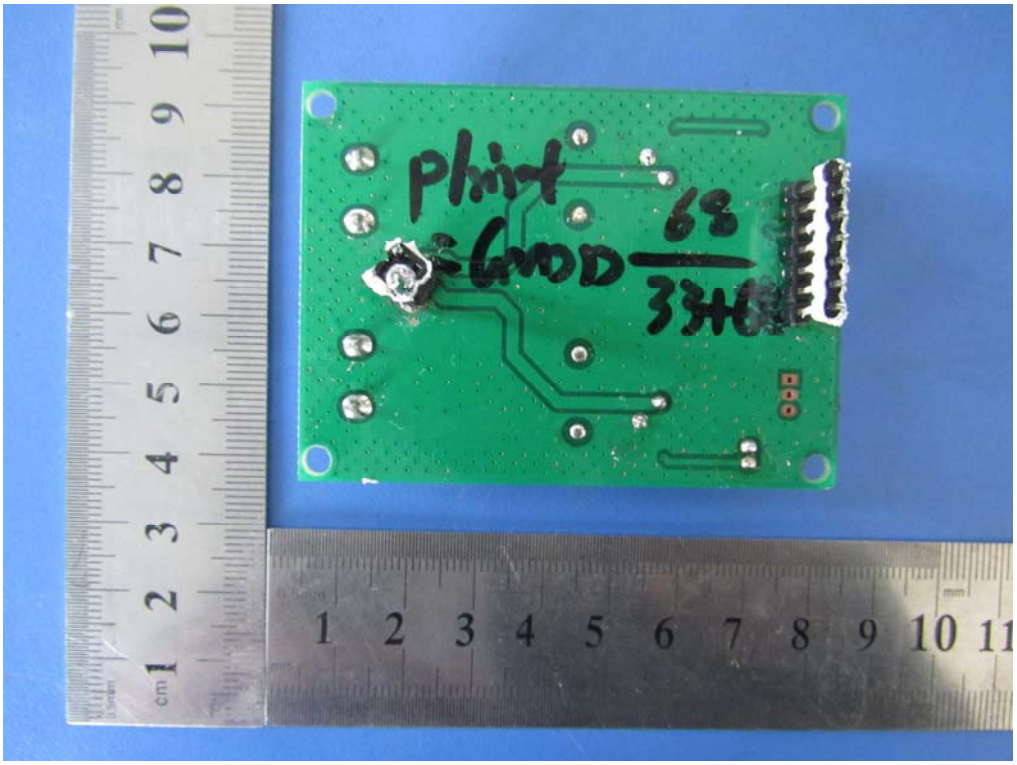
EUT PCBA 2 – Front View



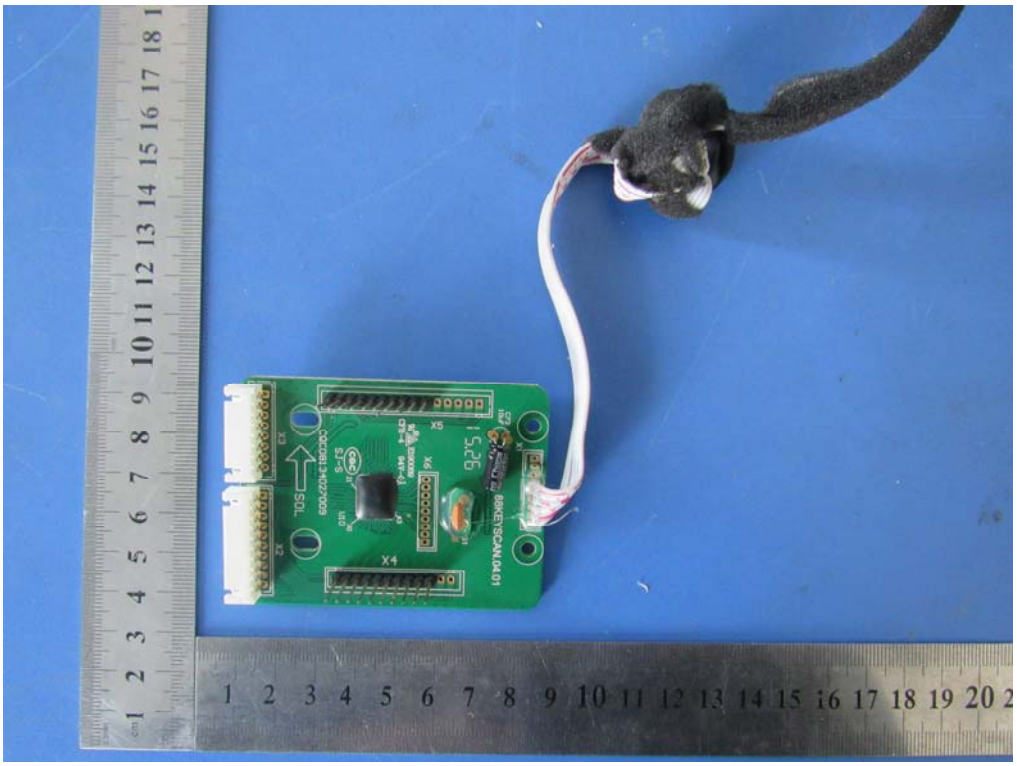
EUT PCBA 2 – Rear View



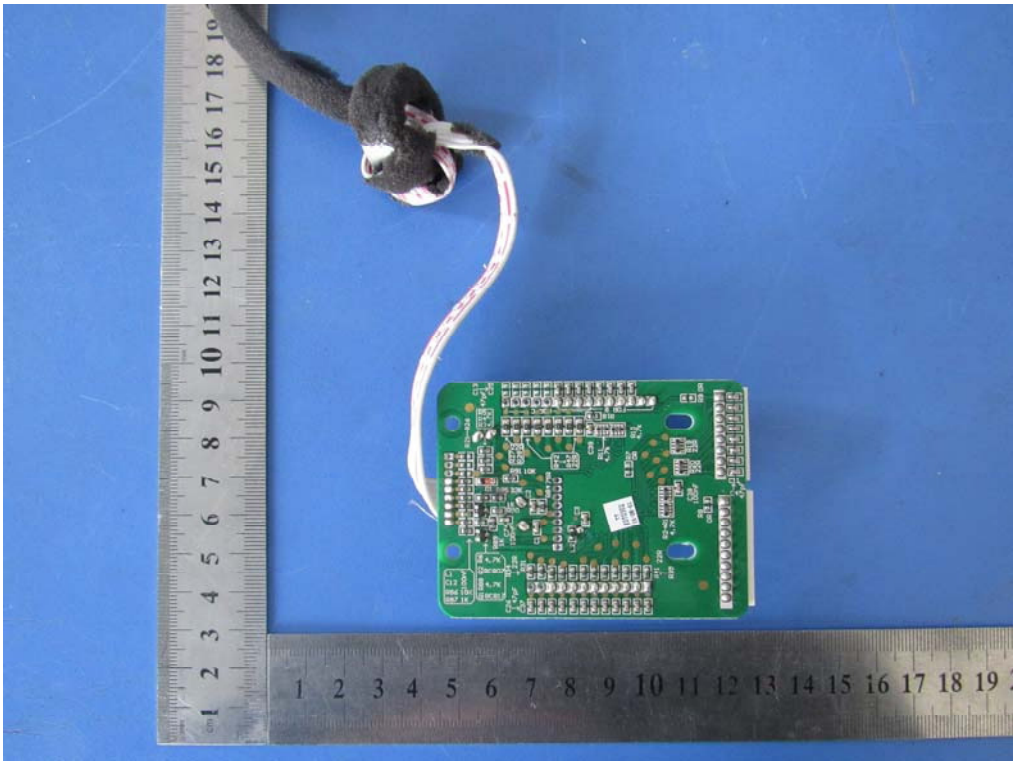
EUT PCBA 3 – Front View



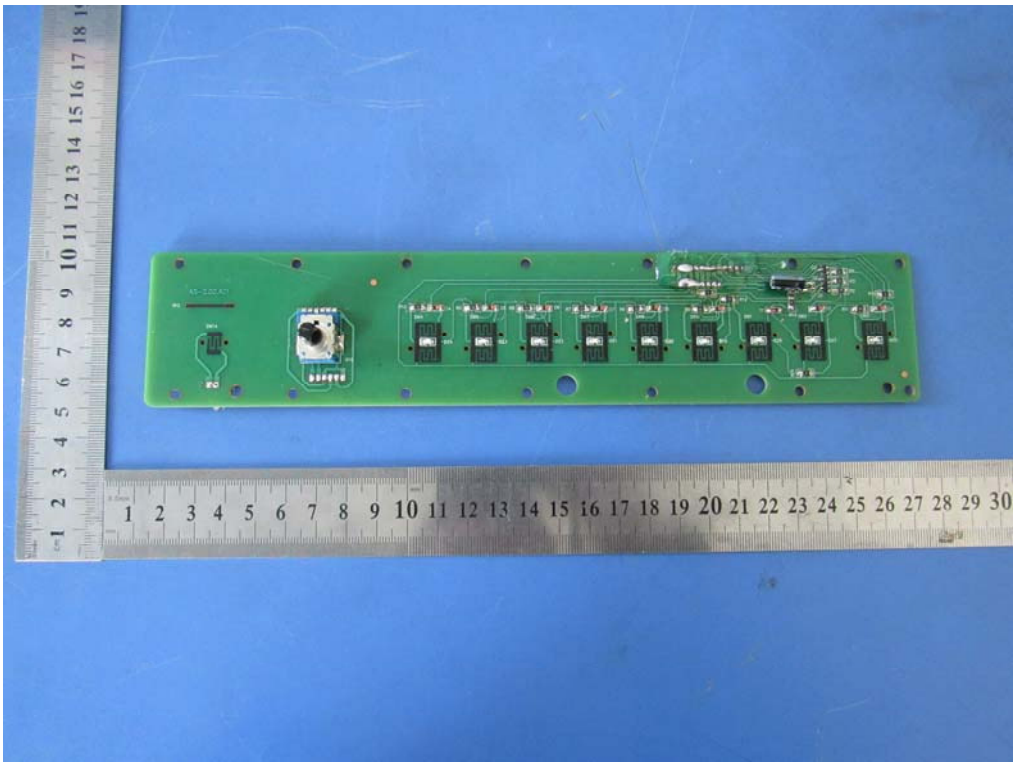
EUT PCBA 3 – Rear View



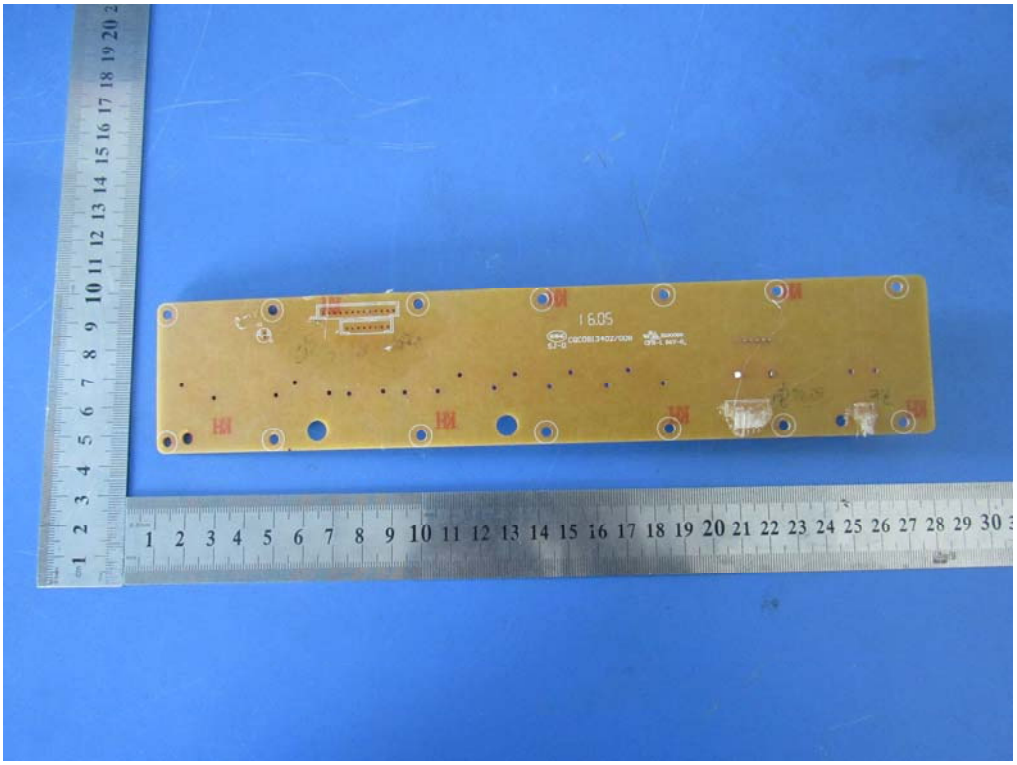
EUT PCBA 4 – Front View



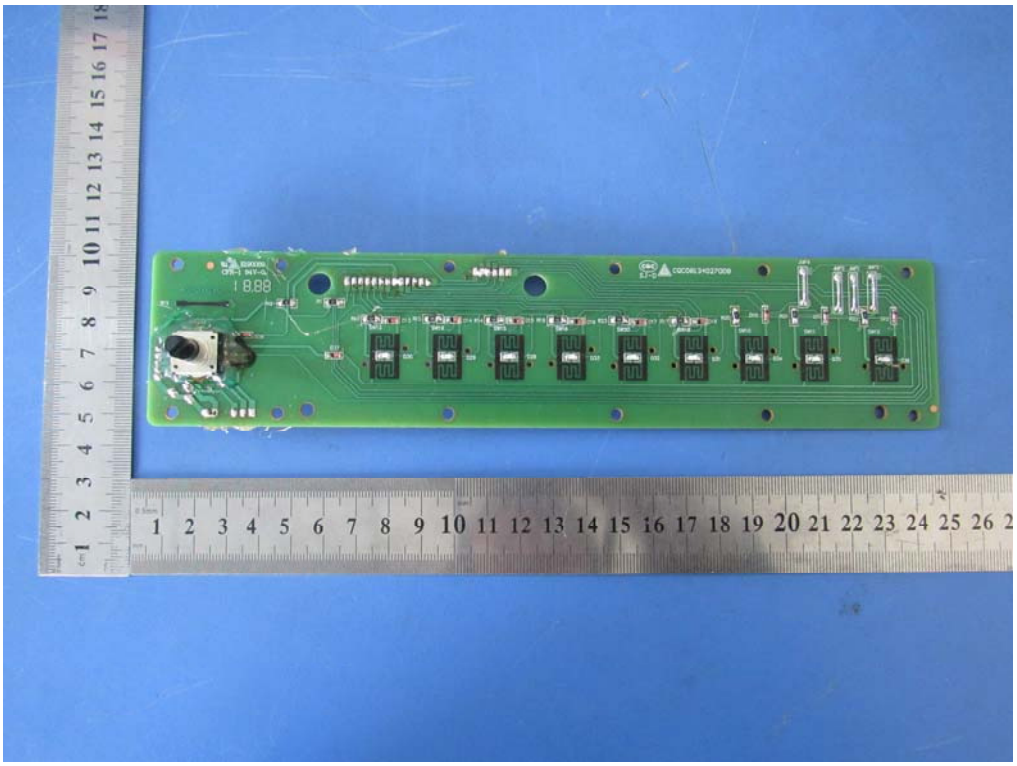
EUT PCBA 4 – Rear View



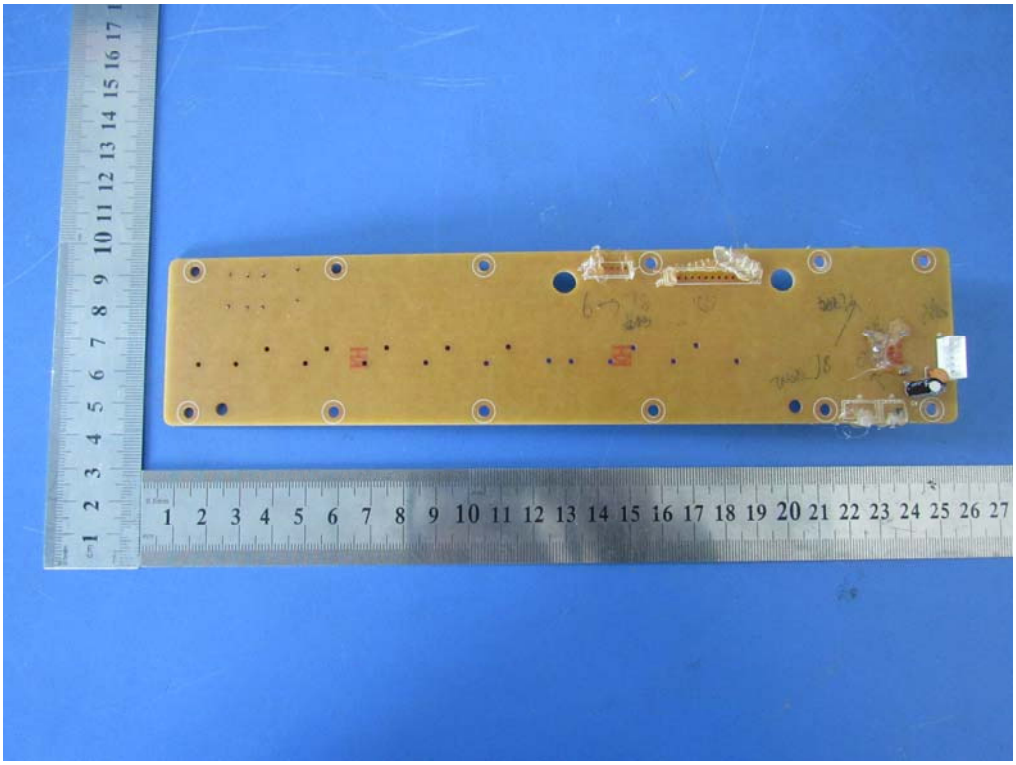
EUT PCBA 5 – Front View



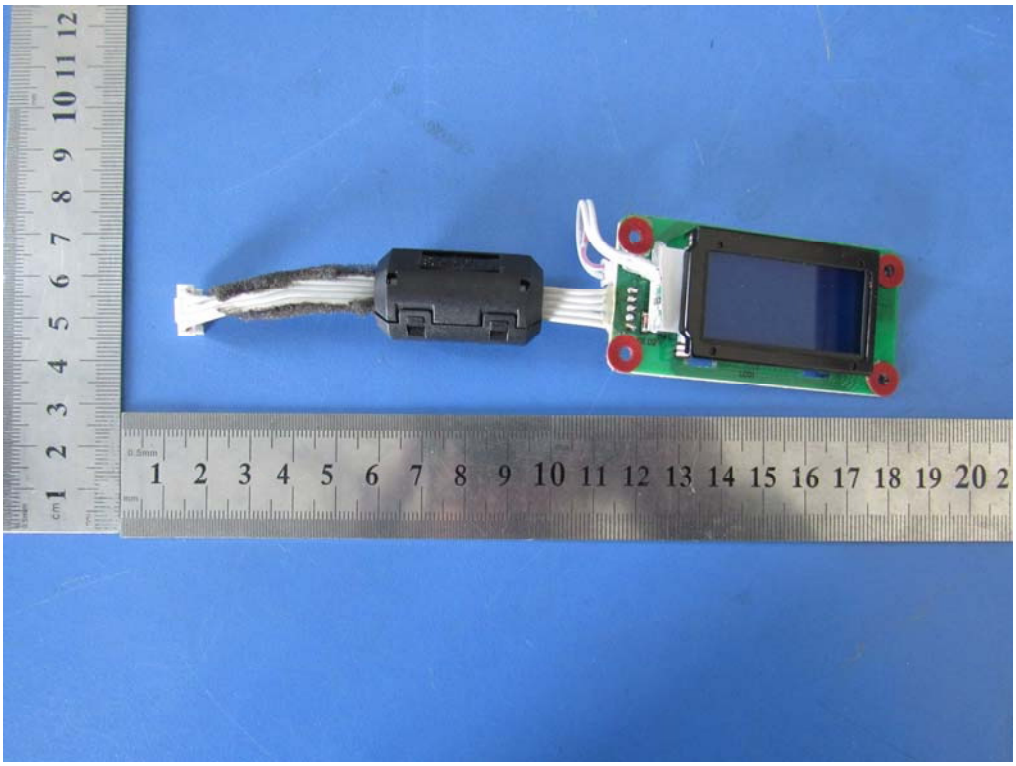
EUT PCBA 5 – Rear View



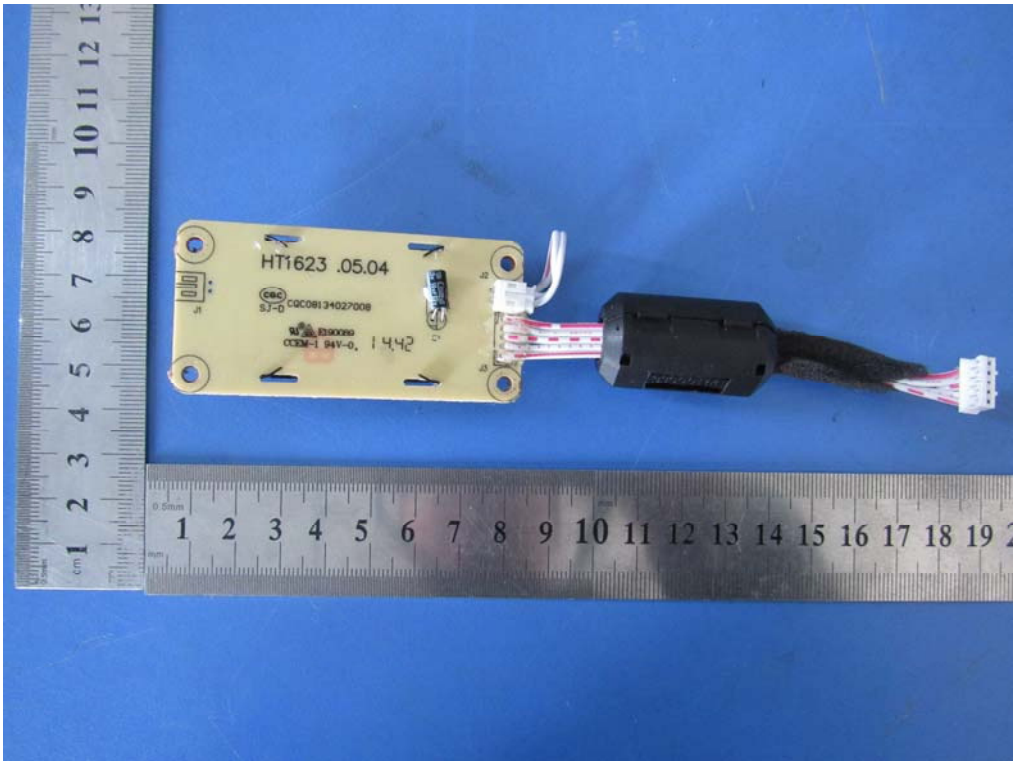
EUT PCBA 6 – Front View



EUT PCBA 6 – Rear View



EUT PCBA 7 – Front View



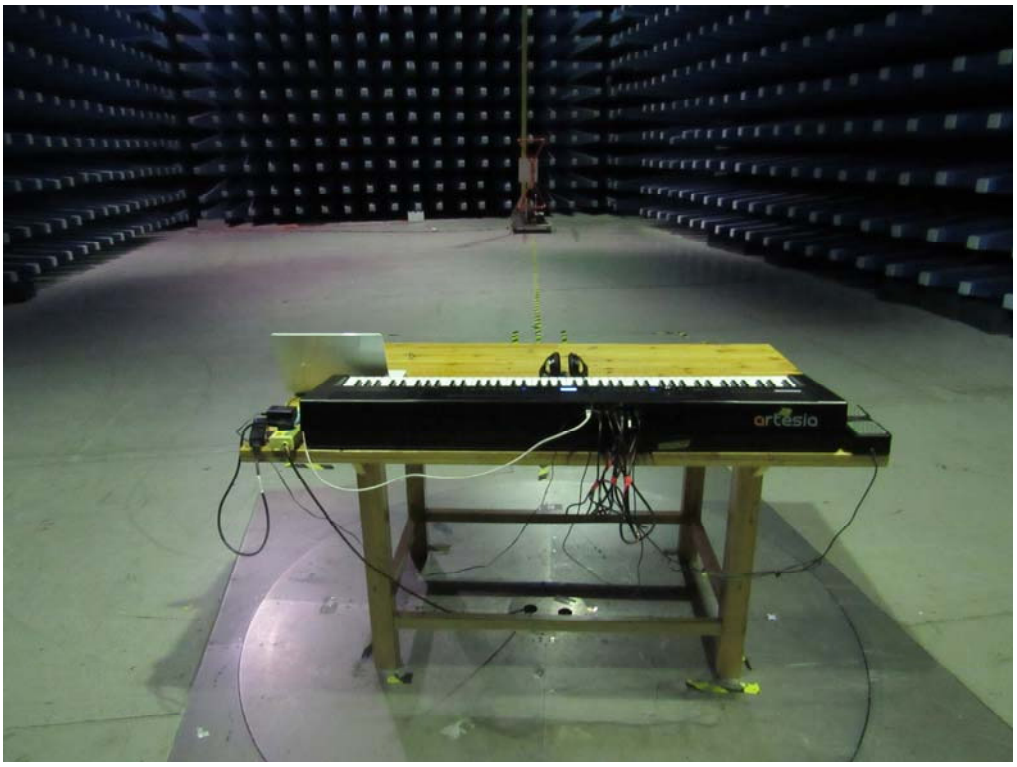
EUT PCBA 7 – Rear View

Annex B.iii. Photograph Test Setup Photo

Conducted Emissions Setup Front View

Conducted Emissions Setup Side View

Radiated Emissions Setup Below 1GHz Front View

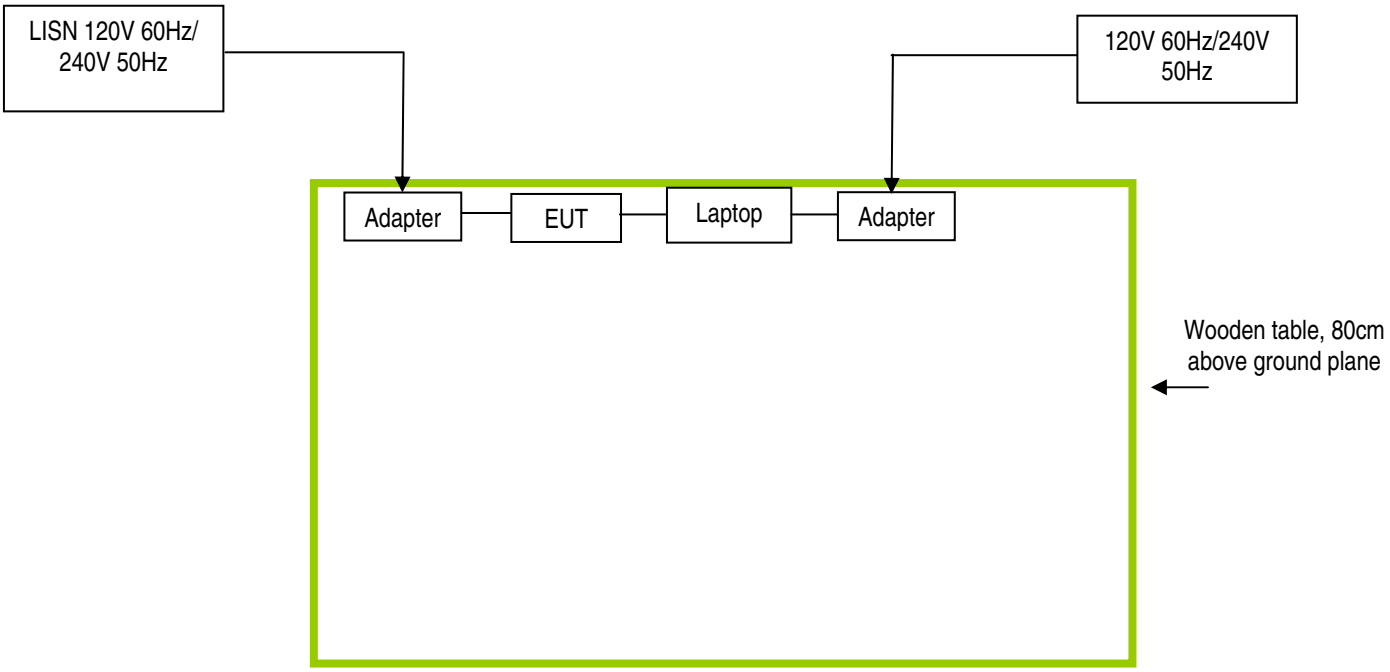


Radiated Emissions Setup Below 1GHz Rear View

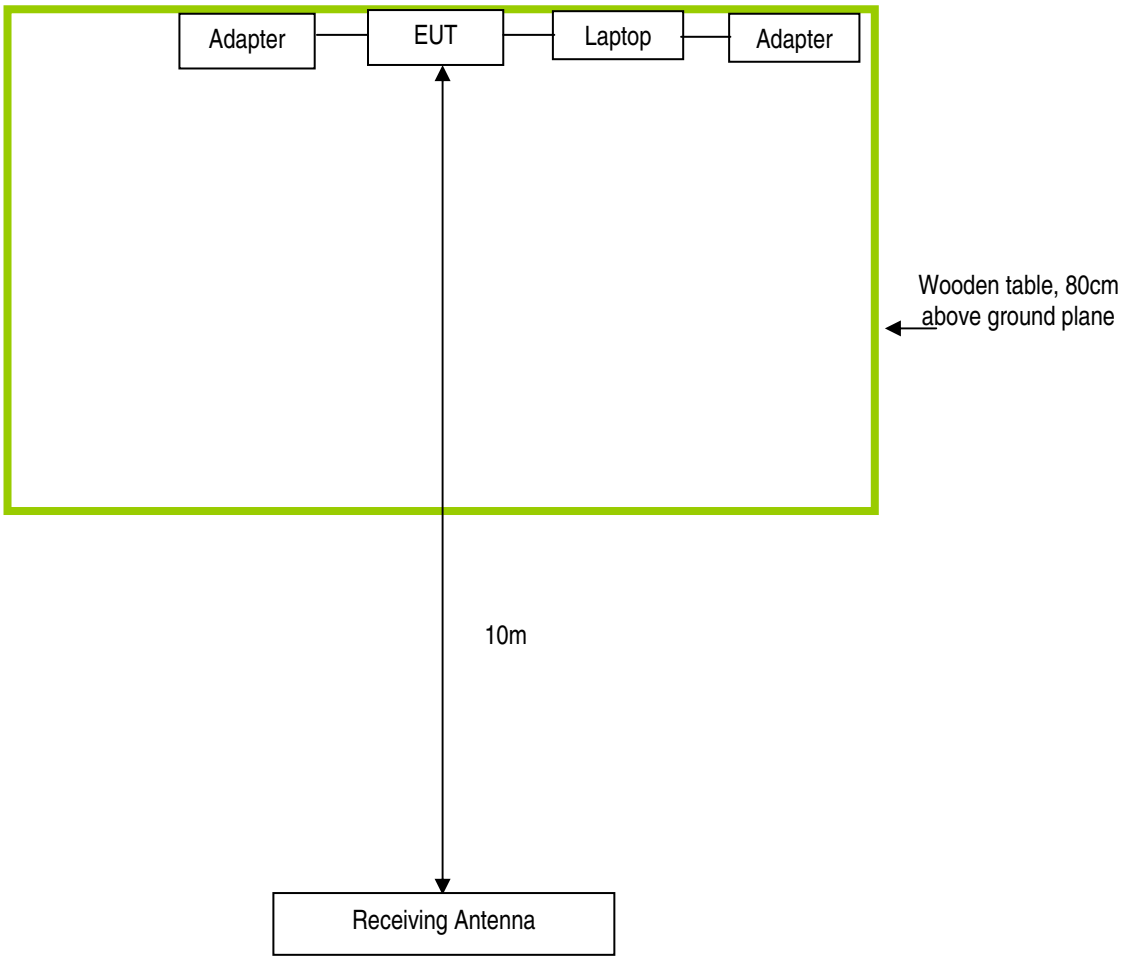
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

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	Serial No
SAMSUNG	Laptop	905S3Q	NP905S3G-K06CN

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

Please see Attachment

Annex E. DECLARATION OF SIMILARITY

N/A