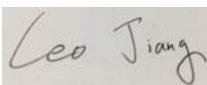
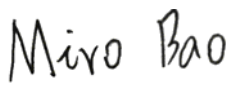


EMC TEST REPORT



Report No.: 16021348-FCC-E

Supersede Report No.: N/A

Applicant	Ringway Tech(Jiangsu) Co.,Ltd.	
Product Name	DIGITAL PIANO	
Main Model No.	KAG-100	
Serial Model	N/A	
Test Standard	FCC Part 15 Subpart B Class B:2016, ANSI C63.4: 2014	
Test Date	October 20, 2016	
Issue Date	October 24 , 2016	
Test Result	☒ Pass ☐ Fail	
Equipment complied with the specification	☒	
Equipment did not comply with the specification	☐	
		
Leo Jiang 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:

SIEMIC (Nanjing-China) Laboratories

2-1 Longcang Avenue Yuhua Economic and
Technology Development Park, Nanjing, China

Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email: China@siemic.com.cn

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
16021348-FCC-E	NONE	Original	October 24 , 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: KAG-100

Serial Model: N/A

Date EUT received: October 19, 2016

Test Date(s): October 20, 2016

Port: USB to Host Port, Headphones 1/2 Port,Bluetooth Port, Aux in Port, Line out Port, MIDI Out Port

Power: AC 110/220V ~50/60Hz

Trade Name : Young Chang

FCC ID: OCDKAG-100

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

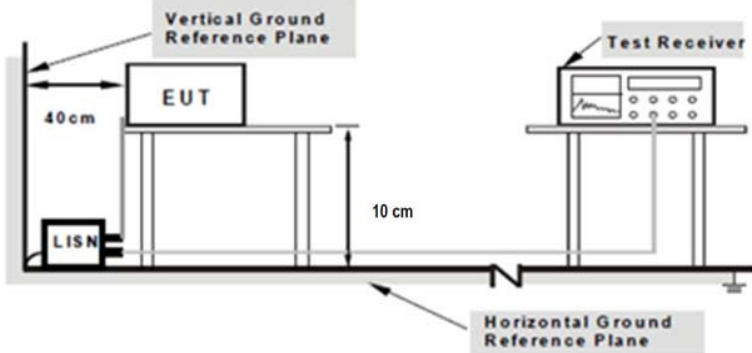
Emissions		
Test Item	Description	Uncertainty
Conducted Emissions & Radiated Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	1.634dB / 3.952dB

6. Measurements, Examination And Derived Results

6.1 AC Power Line Conducted Emissions

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1013mbar
Test date :	October 24, 2016
Tested By :	Leo Jiang

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 [μ]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges. Class B digital devices <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 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> </tbody> </table> Class A digital devices <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>79</td><td>66</td></tr> <tr> <td>0.5 ~ 30</td><td>73</td><td>60</td></tr> </tbody> </table>	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	Frequency ranges (MHz)	Limit (dBμV)		QP	Average	0.15 ~ 0.5	79	66	0.5 ~ 30	73	60	☒
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																									
Frequency ranges (MHz)	Limit (dBμV)																										
	QP	Average																									
0.15 ~ 0.5	79	66																									
0.5 ~ 30	73	60																									
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	- 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. - The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment were powered separately from another main supply. - The EUT was switched on and allowed to warm up to its normal operating condition. - 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. - 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. - Steps 6-7 were repeated for the LIVE line (for AC mains) or DC line (for DC power).																										
Remark																											

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

Data sample

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

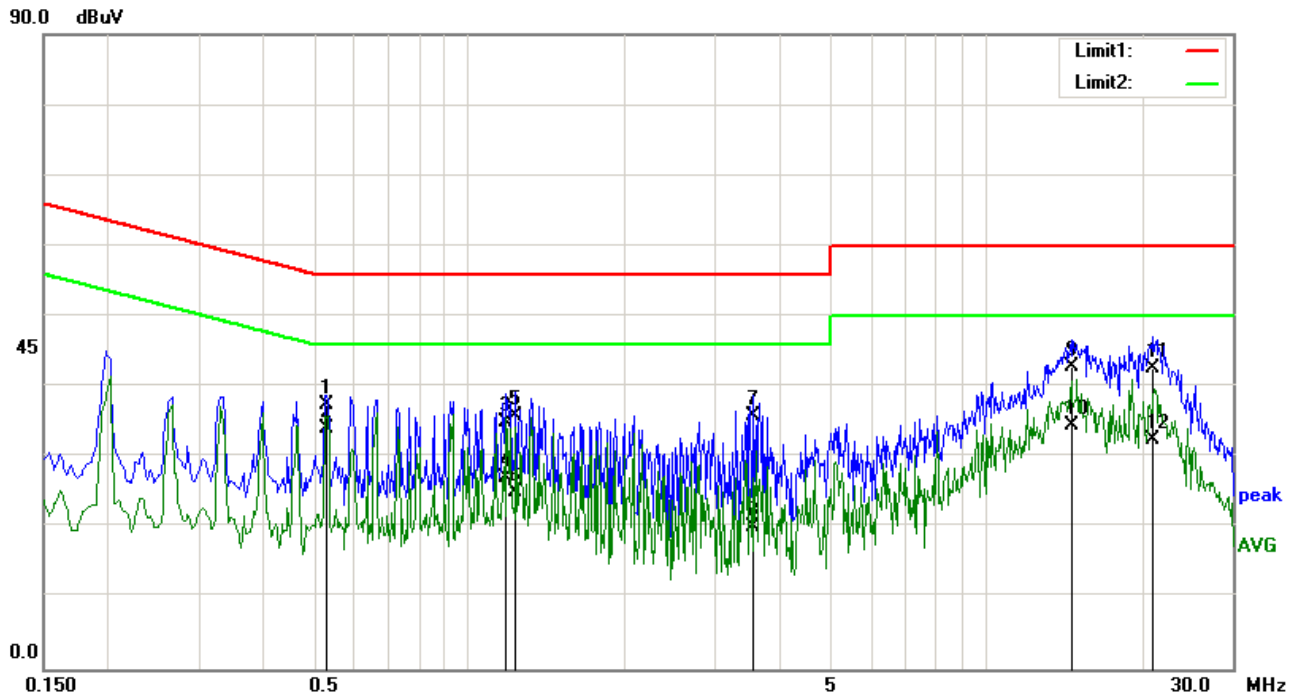
Result (dBμV) = Reading Value + Corrected Value

Limit (dBμV) = Limit stated in standard

Calculation Formula:

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

Test Mode : Normal Working Mode



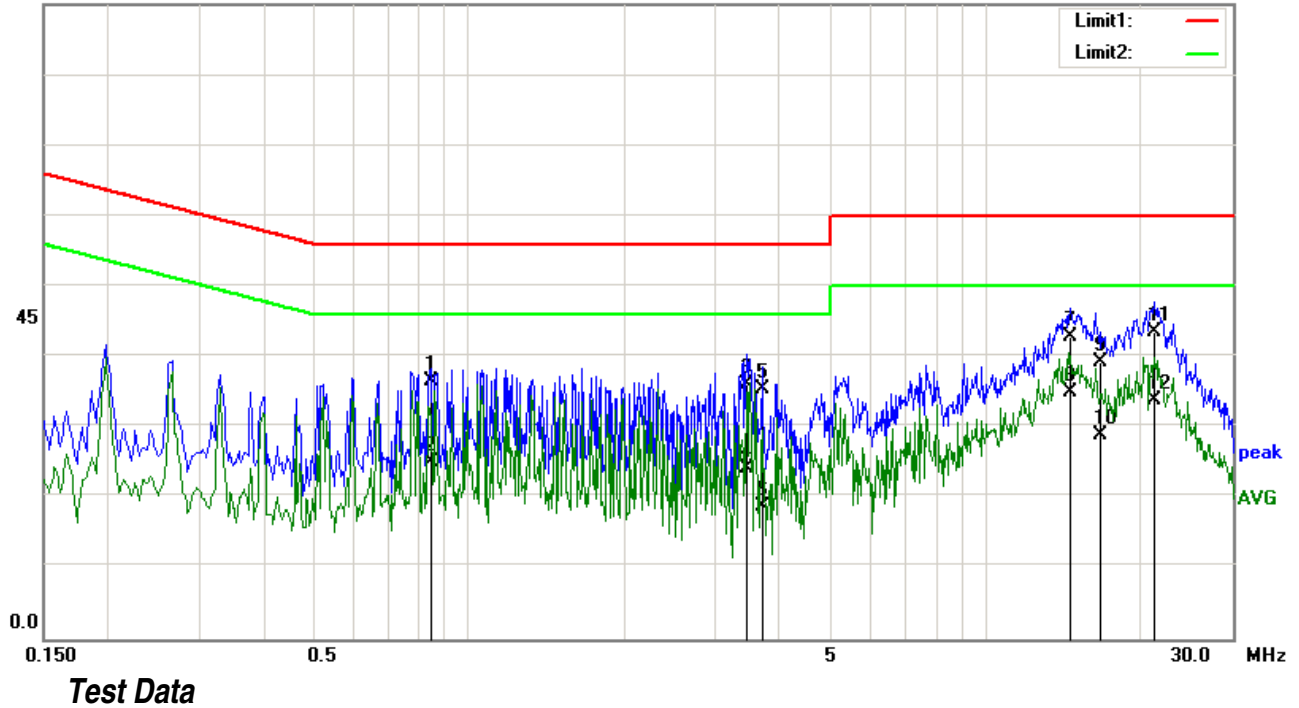
Test Data

Phase Line Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/Isn (dB)	Ps Lmt (dB)	Cab L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.5300	27.24	QP	0.12	-10.00	0.21	37.57	56.00	-18.43
2	0.5300	23.86	AVG	0.12	-10.00	0.21	34.19	46.00	-11.81
3	1.1820	24.64	QP	0.14	-10.00	0.20	34.98	56.00	-21.02
4	1.1820	16.82	AVG	0.14	-10.00	0.20	27.16	46.00	-18.84
5	1.2340	25.64	QP	0.14	-10.00	0.21	35.99	56.00	-20.01
6	1.2340	14.75	AVG	0.14	-10.00	0.21	25.10	46.00	-20.90
7	3.5540	25.38	QP	0.22	-10.00	0.25	35.85	56.00	-20.15
8	3.5540	9.62	AVG	0.22	-10.00	0.25	20.09	46.00	-25.91
9	14.6100	31.63	QP	0.83	-10.00	0.47	42.93	60.00	-17.07
10	14.6100	23.32	AVG	0.83	-10.00	0.47	34.62	50.00	-15.38
11	21.0580	30.75	QP	1.12	-10.00	0.67	42.54	60.00	-17.46
12	21.0580	20.68	AVG	1.12	-10.00	0.67	32.47	50.00	-17.53

Test Mode : Normal Working Mode

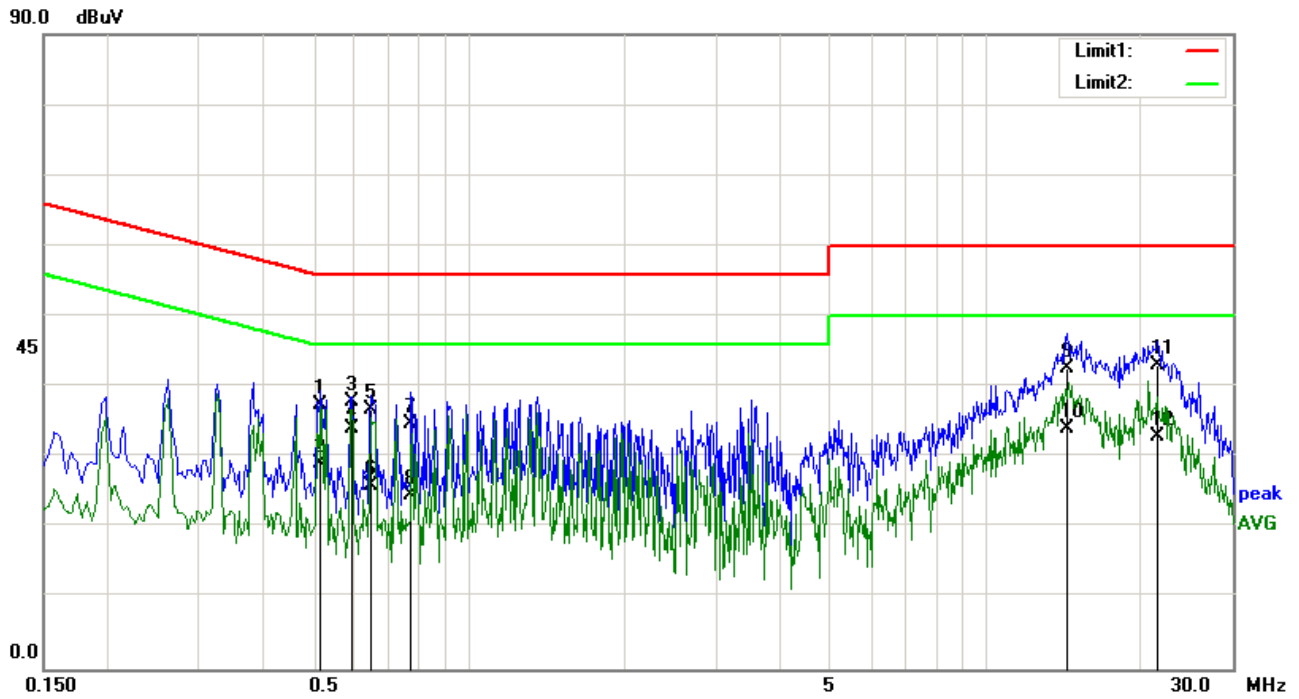
90.0 dBuV



Phase Neutral Plot at 120Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.8460	26.15	QP	0.12	-10.00	0.20	36.47	56.00	-19.53
2	0.8460	14.73	AVG	0.12	-10.00	0.20	25.05	46.00	-20.95
3	3.4380	25.60	QP	0.22	-10.00	0.25	36.07	56.00	-19.93
4	3.4380	13.74	AVG	0.22	-10.00	0.25	24.21	46.00	-21.79
5	3.6940	25.07	QP	0.23	-10.00	0.25	35.55	56.00	-20.45
6	3.6940	8.27	AVG	0.23	-10.00	0.25	18.75	46.00	-27.25
7	14.5940	31.49	QP	0.92	-10.00	0.47	42.88	60.00	-17.12
8	14.5940	23.52	AVG	0.92	-10.00	0.47	34.91	50.00	-15.09
9	16.6980	27.80	QP	1.03	-10.00	0.49	39.32	60.00	-20.68
10	16.6980	17.50	AVG	1.03	-10.00	0.49	29.02	50.00	-20.98
11	21.2100	31.68	QP	1.25	-10.00	0.66	43.59	60.00	-16.41
12	21.2100	21.86	AVG	1.25	-10.00	0.66	33.77	50.00	-16.23

Test Mode : Normal Working Mode



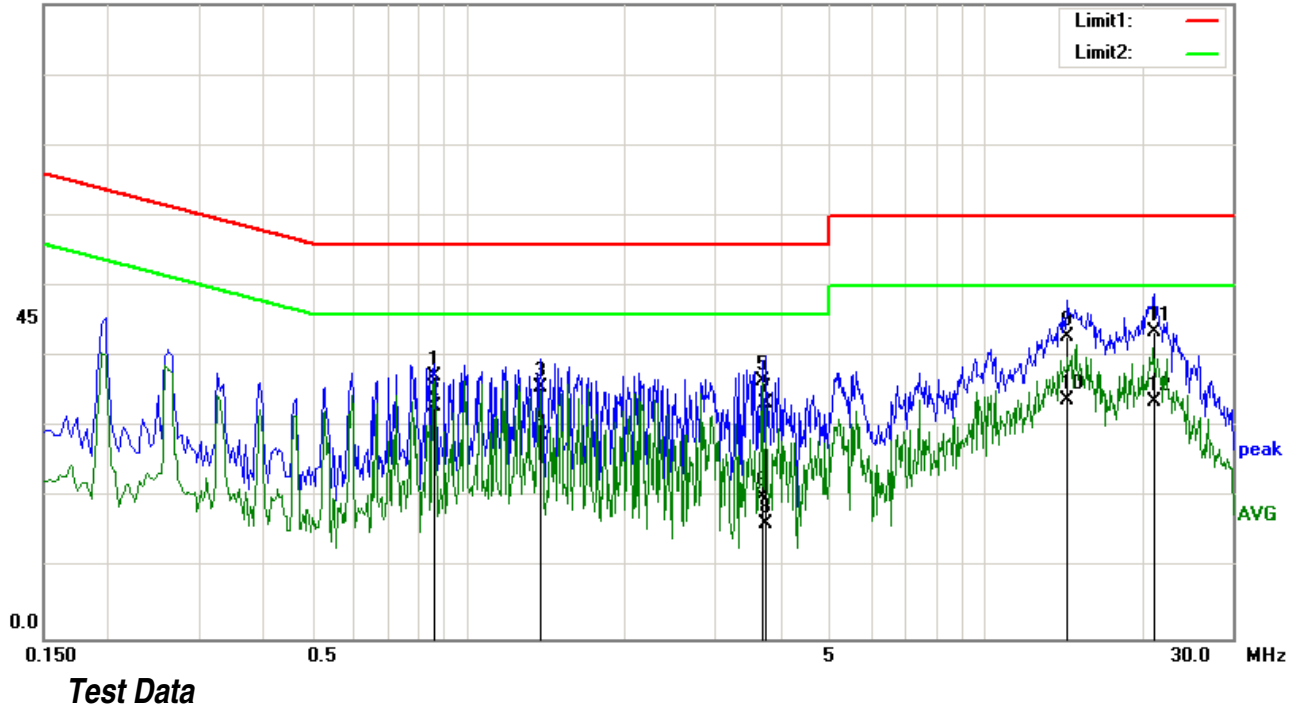
Test Data

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	0.5180	27.17	QP	0.12	-10.00	0.21	37.50	56.00	-18.50
2	0.5180	18.71	AVG	0.12	-10.00	0.21	29.04	46.00	-16.96
3	0.5940	27.51	QP	0.12	-10.00	0.21	37.84	56.00	-18.16
4	0.5940	23.84	AVG	0.12	-10.00	0.21	34.17	46.00	-11.83
5	0.6460	26.38	QP	0.13	-10.00	0.20	36.71	56.00	-19.29
6	0.6460	15.75	AVG	0.13	-10.00	0.20	26.08	46.00	-19.92
7	0.7740	24.54	QP	0.13	-10.00	0.20	34.87	56.00	-21.13
8	0.7740	14.38	AVG	0.13	-10.00	0.20	24.71	46.00	-21.29
9	14.3100	31.35	QP	0.81	-10.00	0.47	42.63	60.00	-17.37
10	14.3100	22.81	AVG	0.81	-10.00	0.47	34.09	50.00	-15.91
11	21.4860	31.34	QP	1.14	-10.00	0.66	43.14	60.00	-16.86
12	21.4860	21.16	AVG	1.14	-10.00	0.66	32.96	50.00	-17.04

Test Mode : Normal Working Mode

90.0 dBuV



Phase Neutral Plot at 240Vac, 60Hz

No.	Frequency (MHz)	Reading (dBuV)	Detector	Lisn/Isn (dB)	Ps_Lmt (dB)	Cab_L (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	0.8540	26.96	QP	0.13	-10.00	0.20	37.29	56.00	-18.71
2	0.8540	22.74	AVG	0.13	-10.00	0.20	33.07	46.00	-12.93
3	1.3740	25.36	QP	0.14	-10.00	0.21	35.71	56.00	-20.29
4	1.3740	18.53	AVG	0.14	-10.00	0.21	28.88	46.00	-17.12
5	3.6980	26.04	QP	0.23	-10.00	0.25	36.52	56.00	-19.48
6	3.6980	9.60	AVG	0.23	-10.00	0.25	20.08	46.00	-25.92
7	3.7540	22.98	QP	0.23	-10.00	0.25	33.46	56.00	-22.54
8	3.7540	5.73	AVG	0.23	-10.00	0.25	16.21	46.00	-29.79
9	14.4060	31.45	QP	0.90	-10.00	0.47	42.82	60.00	-17.18
10	14.4060	22.47	AVG	0.90	-10.00	0.47	33.84	50.00	-16.16
11	21.1500	31.59	QP	1.25	-10.00	0.66	43.50	60.00	-16.50
12	21.1500	21.64	AVG	1.25	-10.00	0.66	33.55	50.00	-16.45

6.2 Radiated Emissions

Temperature	24°C
Relative Humidity	50%
Atmospheric Pressure	1013mbar
Test date :	October 20, 2016
Tested By :	Leo Jiang

Requirement(s):

Spec	Requirement	Applicable																				
47CFR §15.109	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>	Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 – 960	200	Above 960	500	Frequency range (MHz)	Field Strength (µV/m)	30 – 88	90	88 – 216	150	216 – 960	210	Above 960	300	
Frequency range (MHz)	Field Strength (µV/m)																					
30 – 88	100																					
88 – 216	150																					
216 – 960	200																					
Above 960	500																					
Frequency range (MHz)	Field Strength (µV/m)																					
30 – 88	90																					
88 – 216	150																					
216 – 960	210																					
Above 960	300																					
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																						

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

Data sample

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

Frequency (MHz) = Emission frequency in MHz

Reading (dB μ V/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 (dB μ V/m) = Reading Value + Corrected Value

Limit (dB μ V/m) = Limit stated in standard

Height (cm) = Height of Receiver antenna

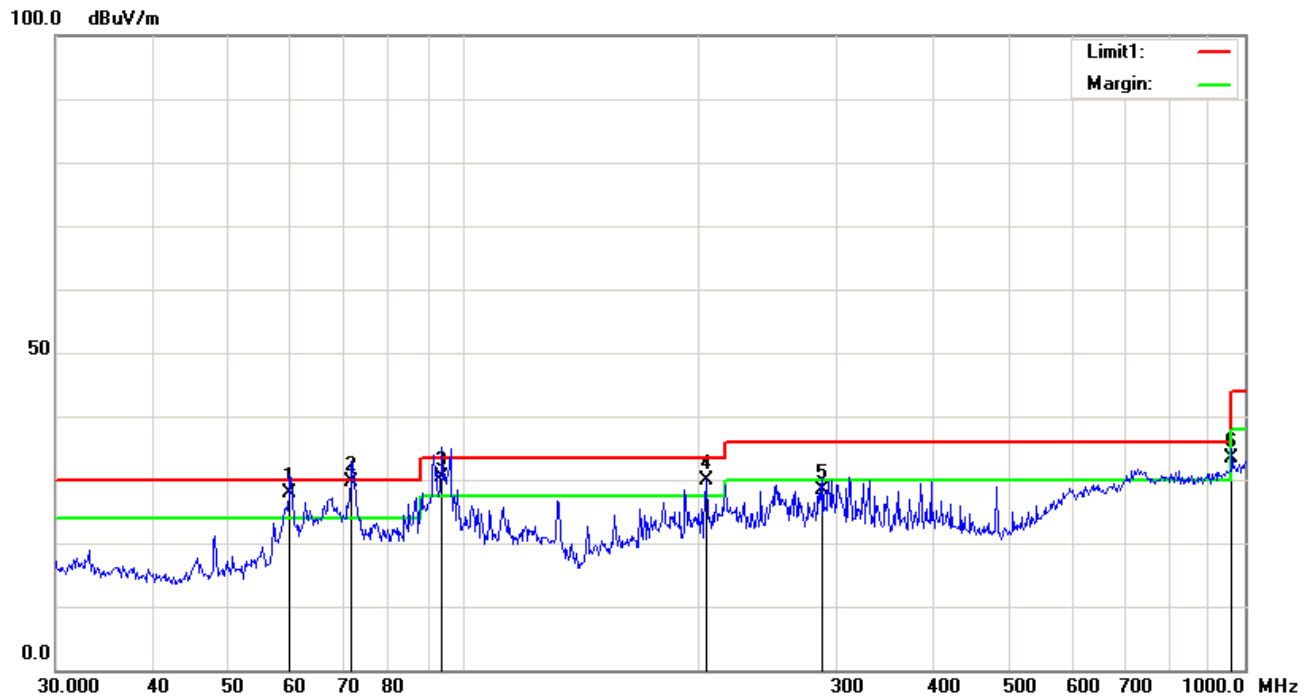
Degree = Turn table degree

Calculation Formula:

Margin (dB) = Result (dB μ V/m) – limit (dB μ V/m)

Test Mode: Normal Working Mode

(Below 1GHz)



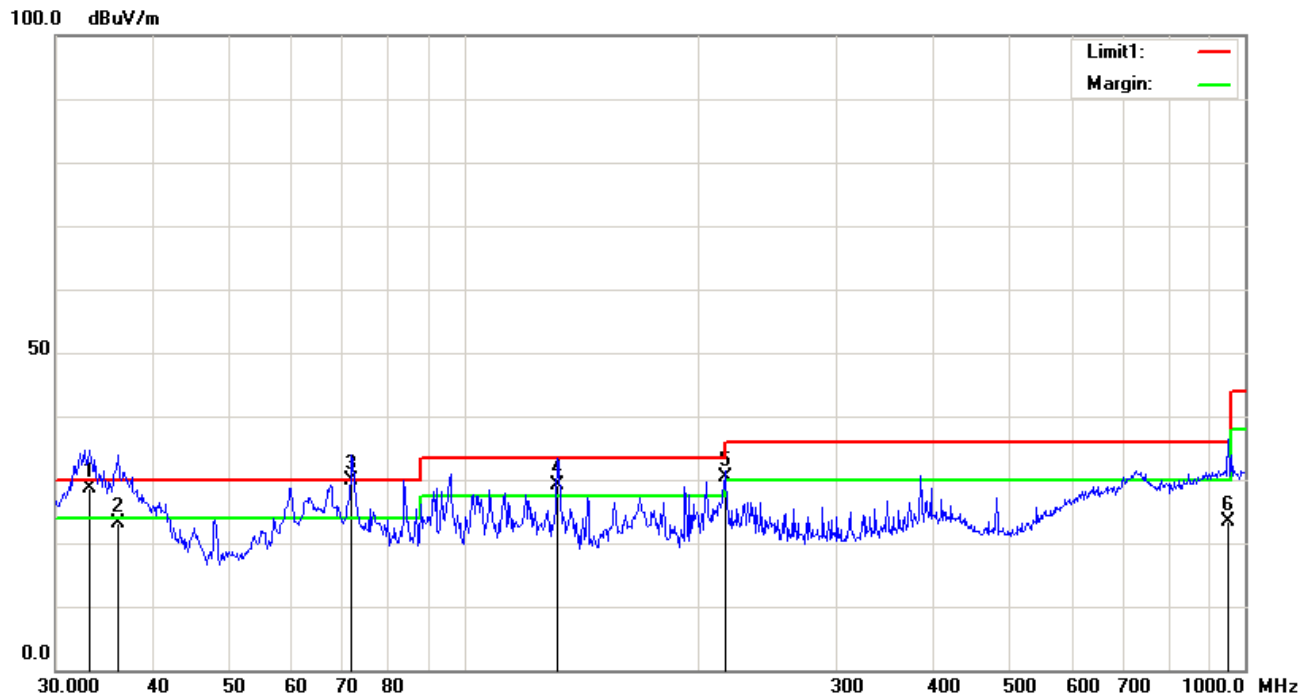
Test Data

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	59.8588	64.37	QP	7.99	47.26	1.30	27.90	30.00	-2.10	400	13
2	71.8320	65.67	QP	7.50	47.91	1.44	29.70	30.00	-0.30	400	183
3	93.7685	65.14	QP	9.80	46.79	1.55	30.50	33.50	-3.00	400	172
4	204.2377	61.52	QP	13.25	47.44	2.28	29.90	33.50	-3.60	400	341
5	287.9904	57.49	QP	14.26	48.38	2.71	28.30	36.00	-7.70	300	353
6	962.1623	50.62	QP	23.45	46.29	4.98	33.50	44.00	-10.50	100	264

Test Mode: Normal Working Mode

(Below 1GHz)



Test Data

Vertical Polarity Plot @10m

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant F (dB/m)	PA G (dB)	Cab L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	33.0950	53.52	QP	19.06	45.65	0.93	28.60	30.00	-1.40	100	60
2	36.1272	49.78	QP	16.58	45.65	0.98	23.15	30.00	-6.85	100	40
3	71.8320	66.35	QP	7.50	47.91	1.44	29.76	30.00	-0.24	400	314
4	131.7577	58.96	QP	14.86	47.42	1.88	29.09	33.50	-4.41	200	306
5	216.0240	60.86	QP	13.39	47.72	2.34	30.34	36.00	-5.66	100	0
6	952.0937	40.82	QP	23.41	46.09	4.96	23.34	36.00	-12.66	100	35

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 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	10/31/2015	10/31/2016	☒
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

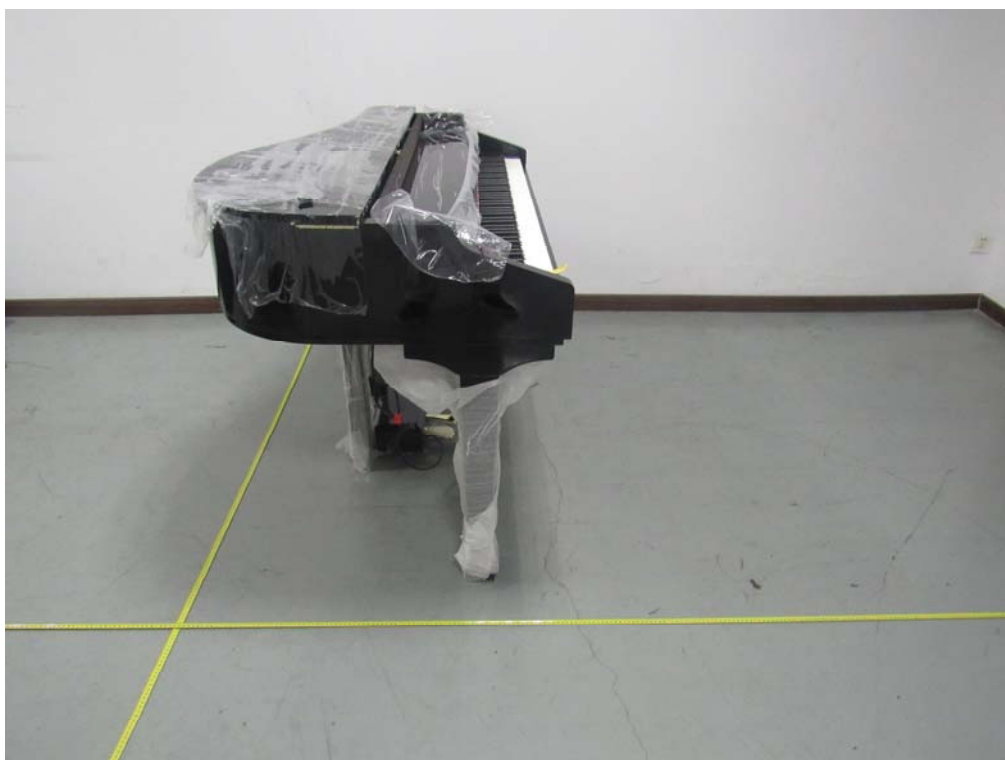


Front View of EUT



Rear View of EUT

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Left View of EUT



Right View of EUT

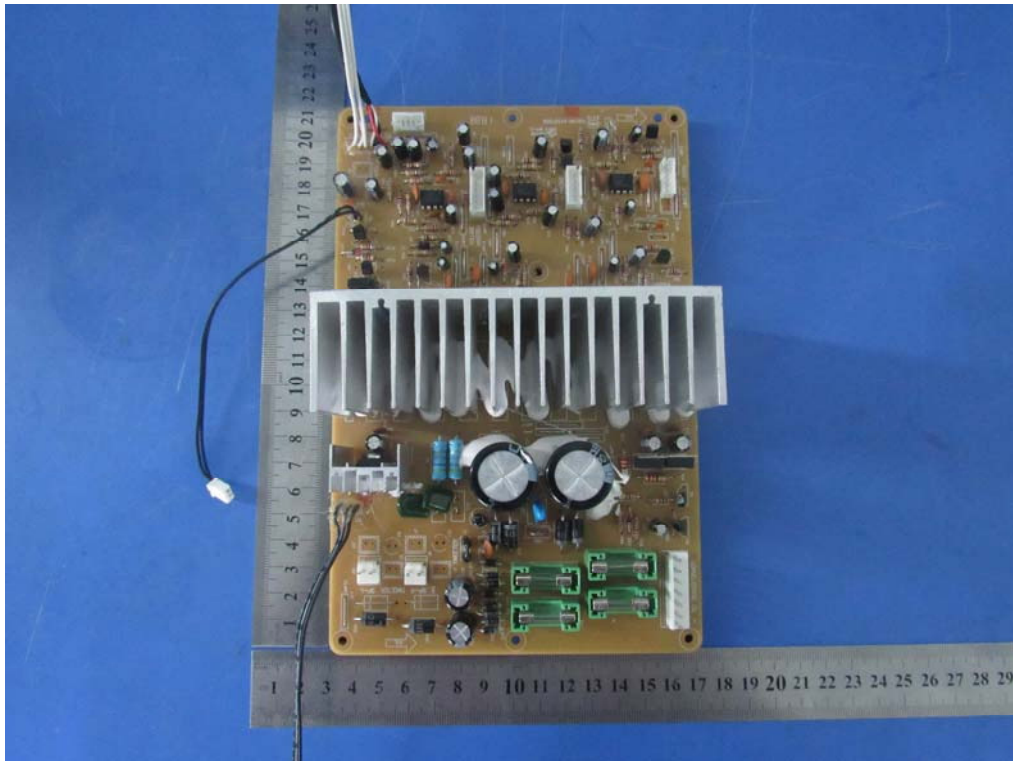
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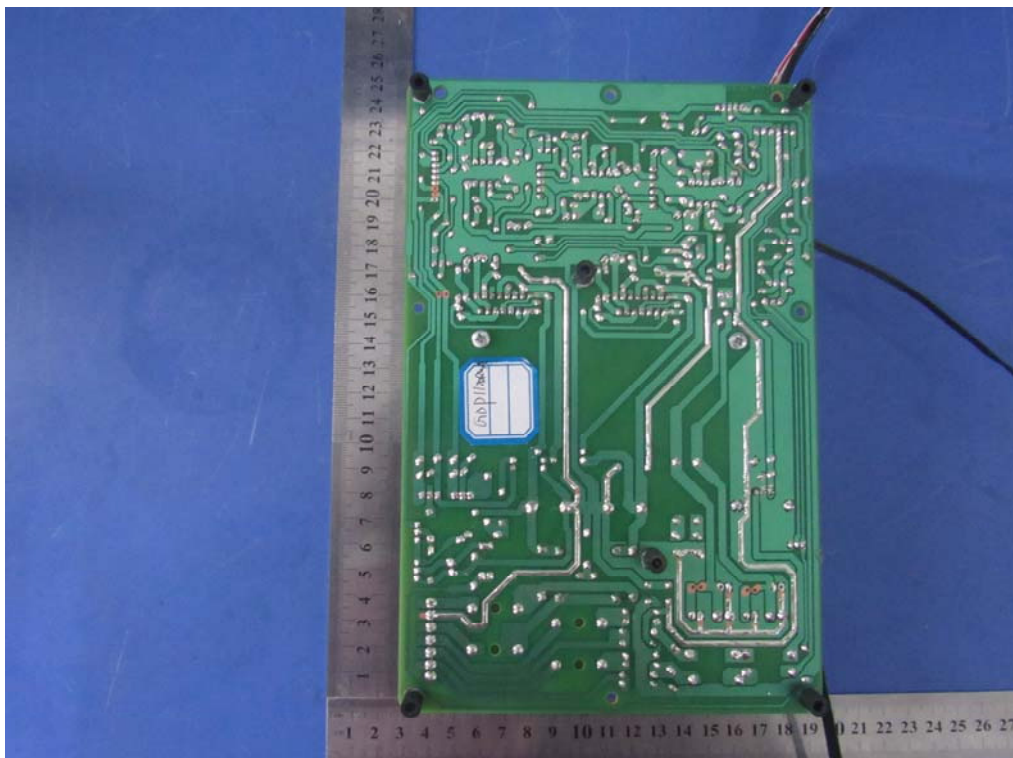
EUT – Port Front View

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Annex B.ii. Photograph EUT Internal Photo

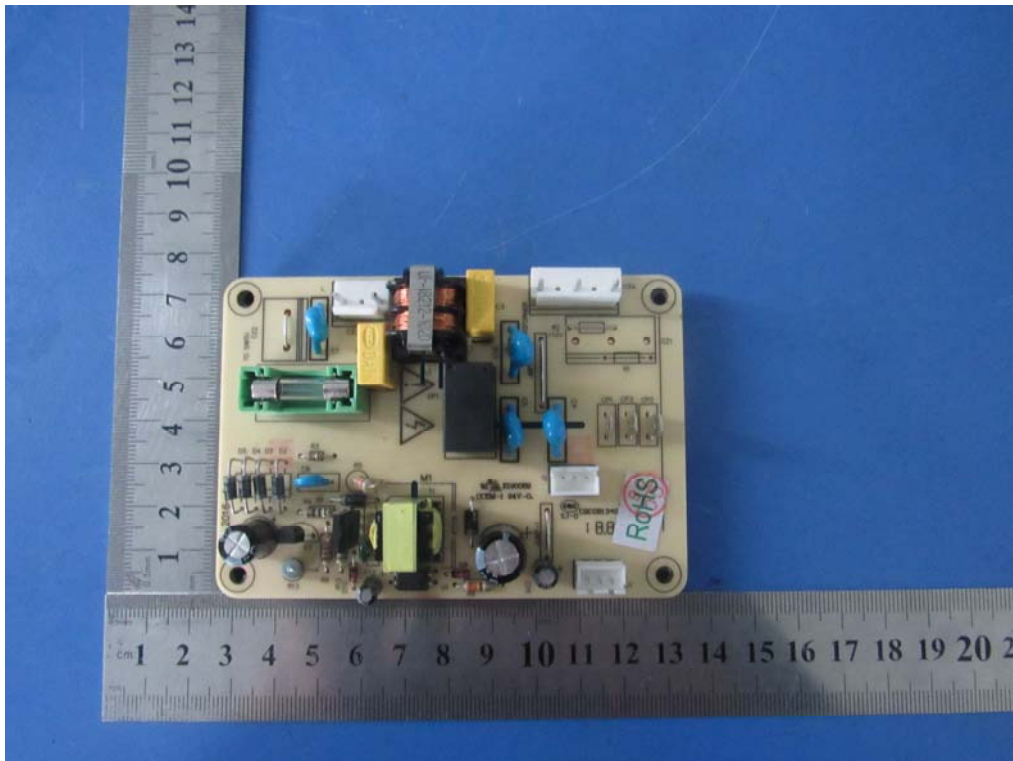


EUT PCBA 1 – Front View

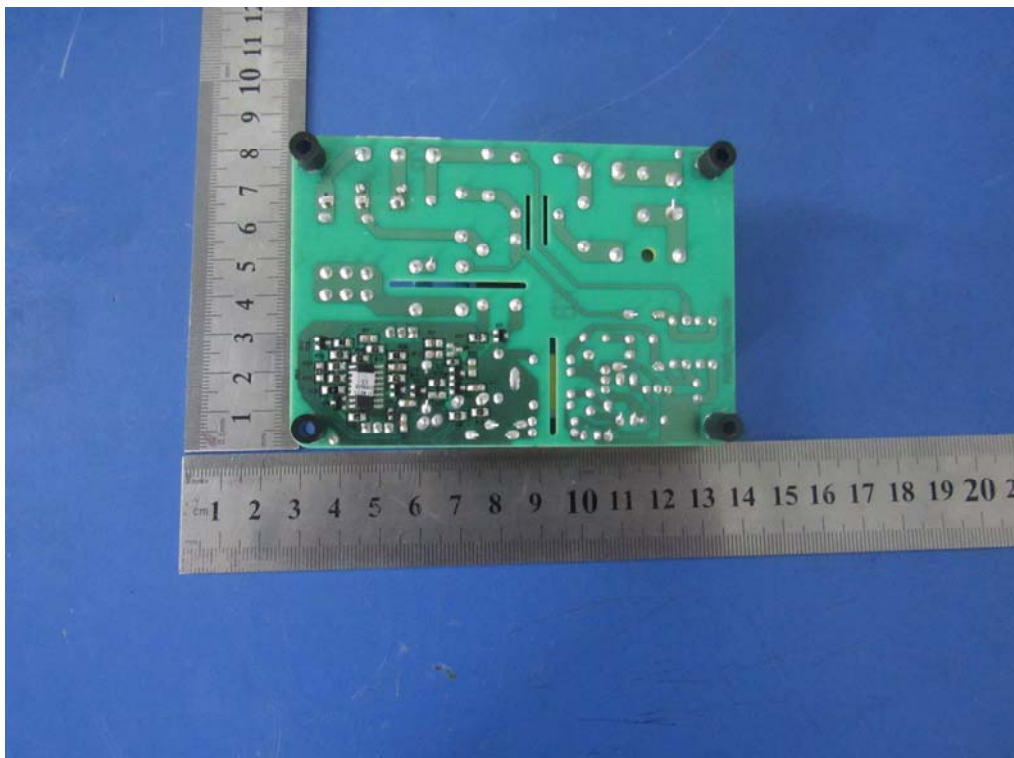


EUT PCBA 1 – Rear View

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EUT PCBA 2 – Front View

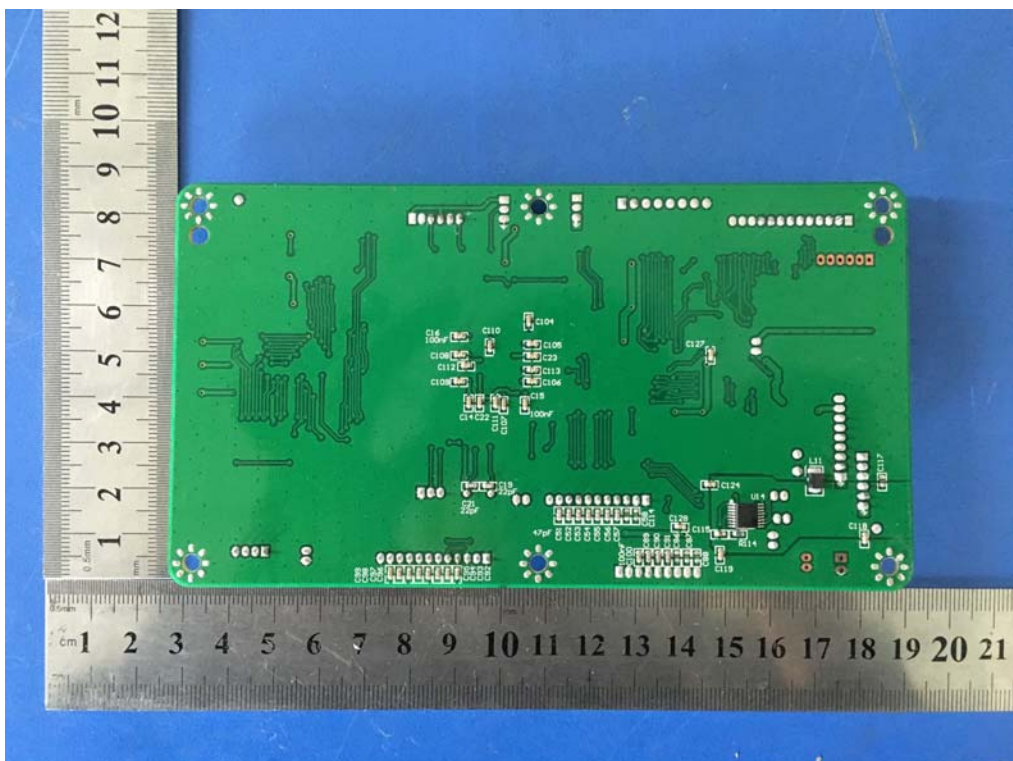


EUT PCBA 2 – Rear View

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EUT PCBA 3 – Front View



EUT PCBA 3 – Rear View

Annex B.iii. Photograph Test Setup Photo



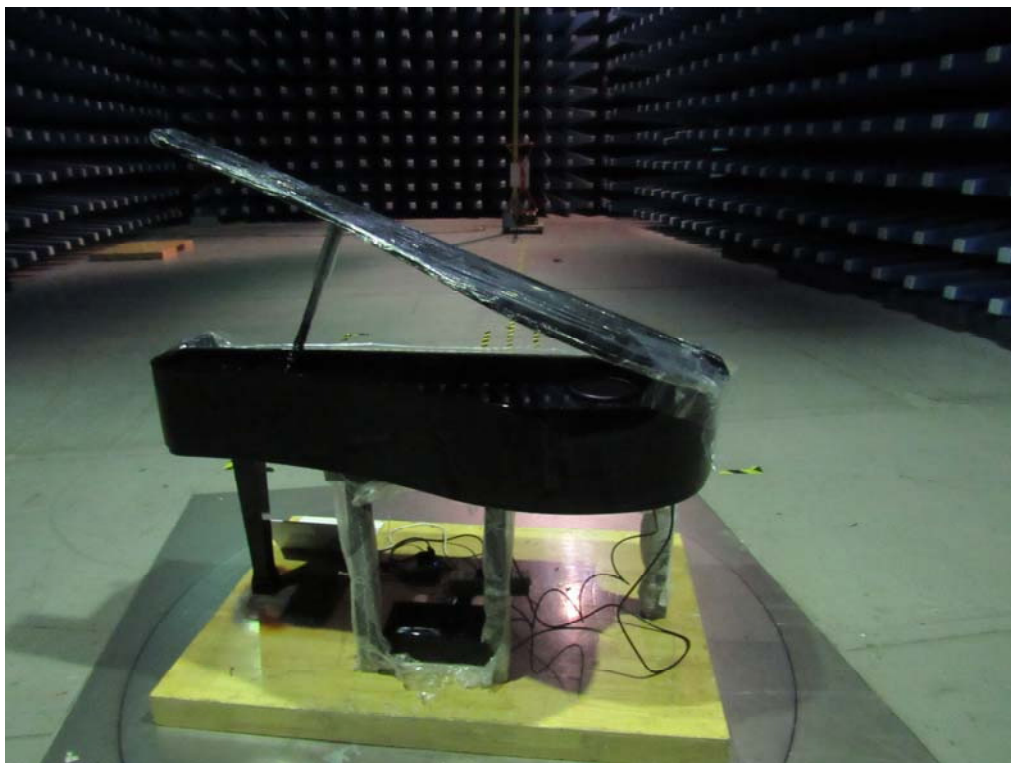
Conducted Emissions Setup Front View



Conducted Emissions Setup Side View



Radiated Emissions Setup Below 1GHz Front View

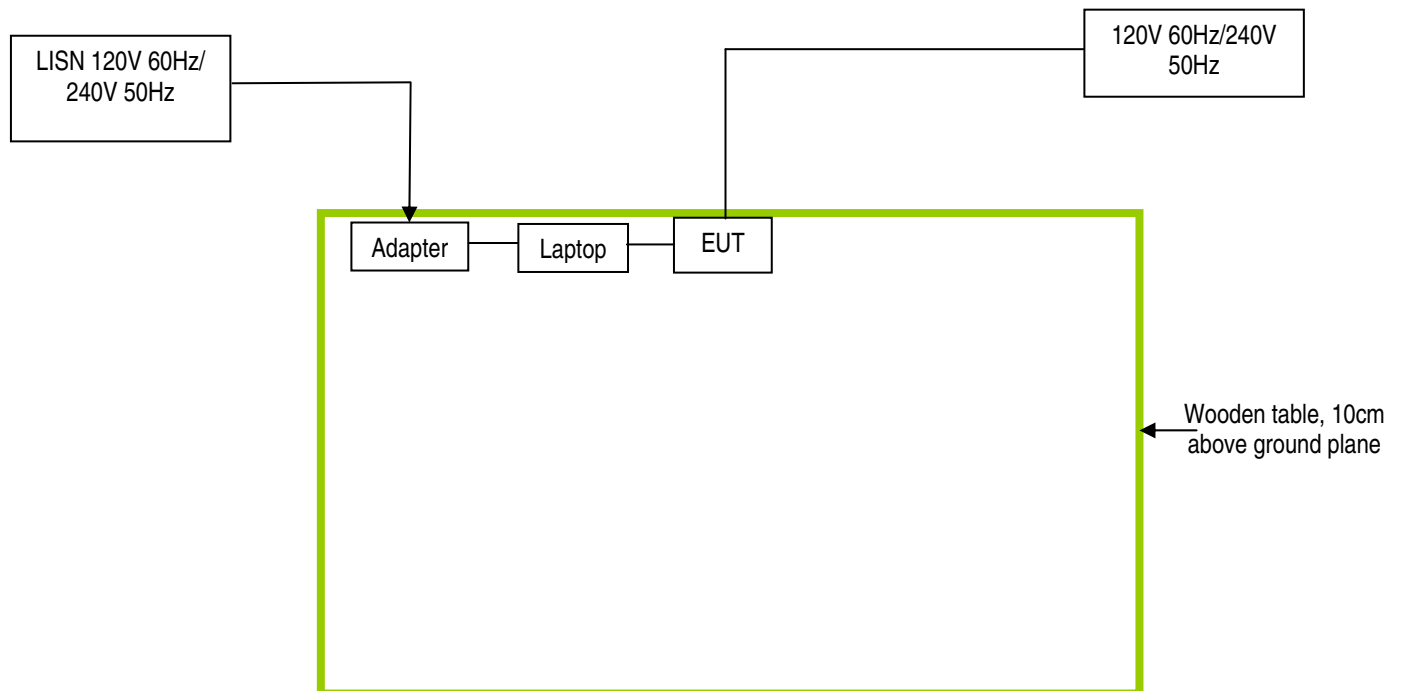


Radiated Emissions Setup Below 1GHz Rear View

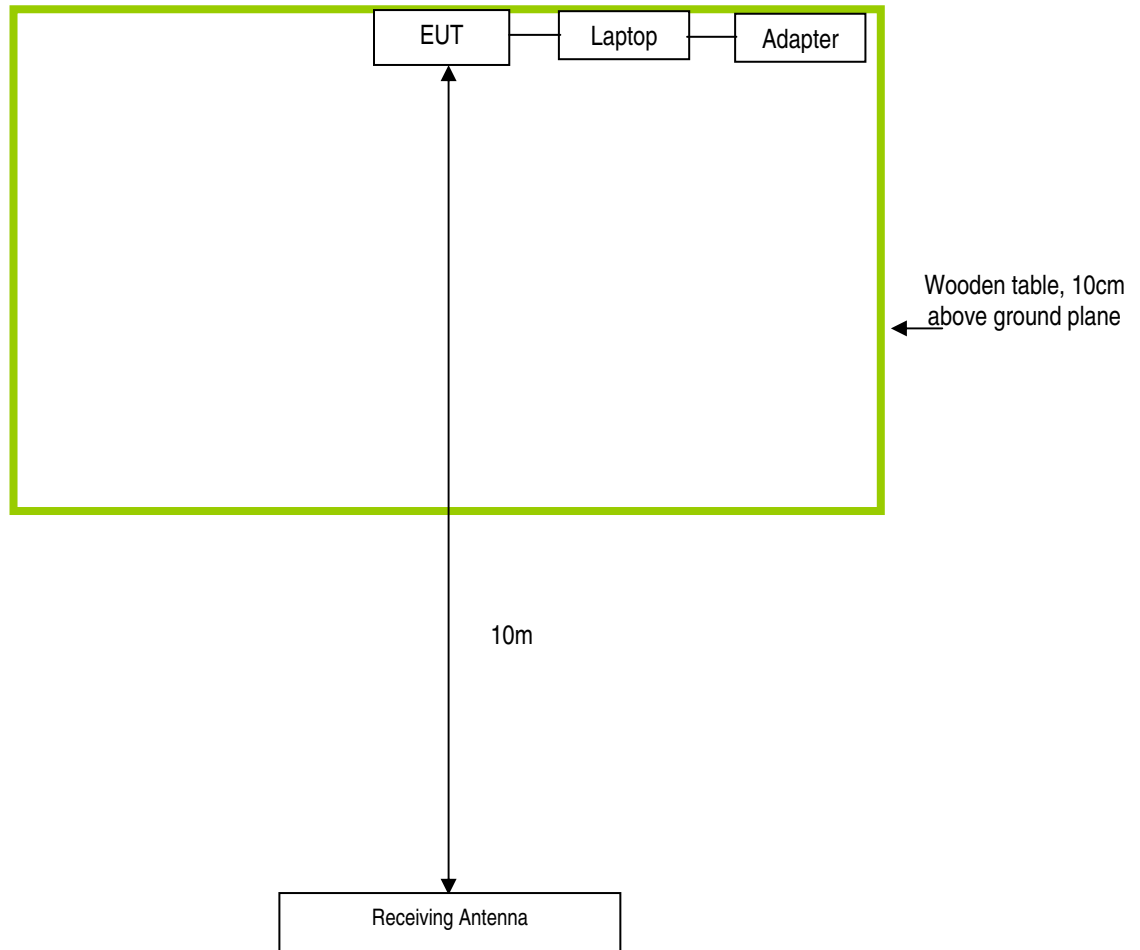
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions



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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

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

Please see Attachment

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Annex E. DECLARATION OF SIMILARITY

N/A