EMC TEST REPORT



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

Applicant	Ringway Tech(Jiai	ngsu) Co.,Ltd.		
Product Name	DIGITAL PIANO			
Main Model No.	AM-3			
Serial Model	N/A			
Test Standard	FCC Part 15 Subp	art B Class B:2016,	, ANSI C63.4: 20	14
Test Date	December 07, 2016			
Issue Date	December 08 , 2016			
Test Result	Pass Fail			
Equipment complied	l with the specifica	ation	V	
Equipment did not comply with the specification				
Amos. Xia Miro Bao				
Amos Xia Test Engineer		Miro B Checked		
This test report may be reproduced in full only				
Test resu	It presented in this	s test report is app	licable to the te	sted sample only

Issued by: SIEMIC (Nanjing-China) Laboratories

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Laboratories Introduction

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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

Acordinations for Companity Acordination		
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
16021447-FCC-E	NONE	Original	December 08, 2016

2. <u>Customer information</u>

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
Lab Add	Technology Development Park, Nanjing, China
FCC Test Site No.	986914
IC Test Site No.	4842B-1
Test Software	EZ_EMC



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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



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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 Uncertaint						
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				



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6. Measurements, Examination And Derived Results

<u>6.1 AC Power Line Conducted Emissions</u>

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

Requirement(s):

Spec	Requirement			Applicable
	For Low-power radio-frequency developmer line, the radio frequency volt frequency or frequencies, within the following table, as measured using (LISN). The lower limit applies at the			
47CFR	(MHz)	QP	dBµV) Average	<u> </u>
§15.107	0.15 ~ 0.5	66 to 56	56 to 46	
3.0	0.5 ~ 5	56		
	5 ~ 30	60	50	
		Class A digital devices	(ID. 10)	
	Frequency ranges		dBµV)	
	(MHz)	<u>QP</u> 79	Average	
	0.15 ~ 0.5 0.5 ~ 30		66	
Test Setup	2.Both of LISM from other u	nits and other metal pl	n EUT and at least 80cm	of the standard on top
Procedure	of a 1.5m x 1m x 0.1m high, 2. The power supply for the EU 3. The RF OUT of the EUT LIS 4. All other supporting equipme 5. The EUT was switched on ar 6. A scan was made on the NE frequency range using an EN 7. High peaks, relative to the lin	non-metallic table. T was fed through a 50W/5 N was connected to the EM nt were powered separatel nd allowed to warm up to its UTRAL line (for AC mains) Il test receiver. nit line, were then selected,	50mH EUT LISN, connected to All test receiver via a low-loss or ly from another main supply.	filtered mains. oaxial cable. ver the required en tuned to the



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	8. Steps 6-7 were	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 ($dB\mu V$) = 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 ($dB\mu V$) = Reading Value + Corrected Value

Limit ($dB\mu V$) = Limit stated in standard

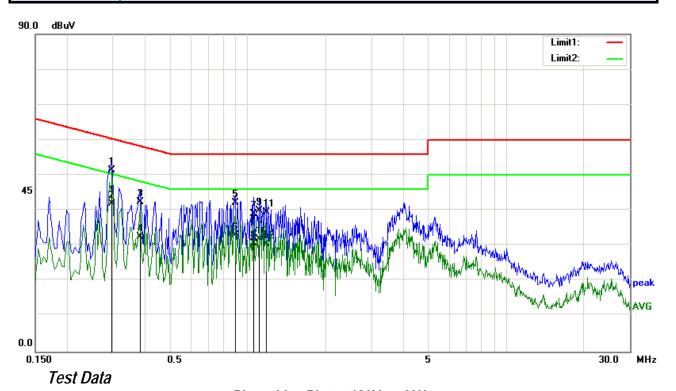
Calculation Formula:

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



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Test Mode : Normal Working Mode



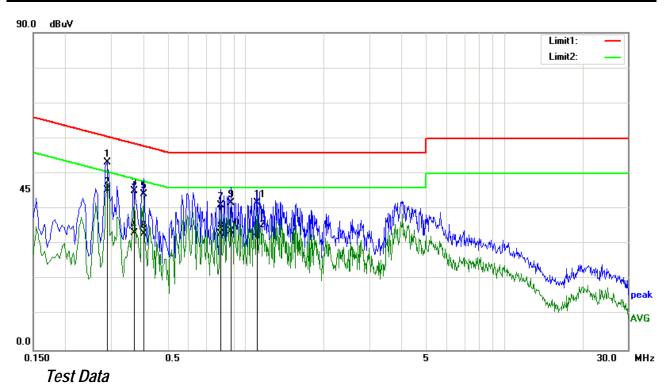
Phase Line Plot at 120Vac, 60Hz

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



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Test Mode: Normal Working Mod



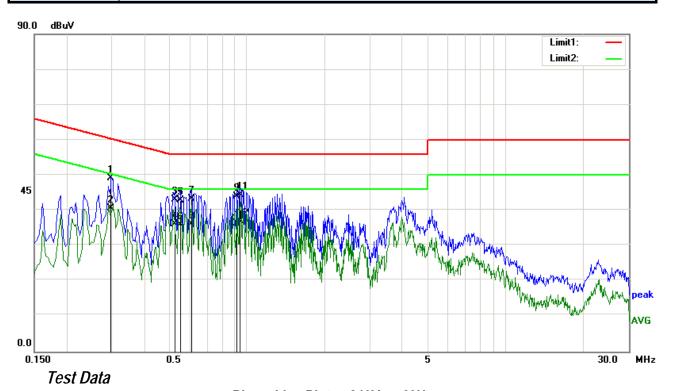
Phase Neutral Plot at 120Vac, 60Hz

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



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Test Mode : Normal Working Mode



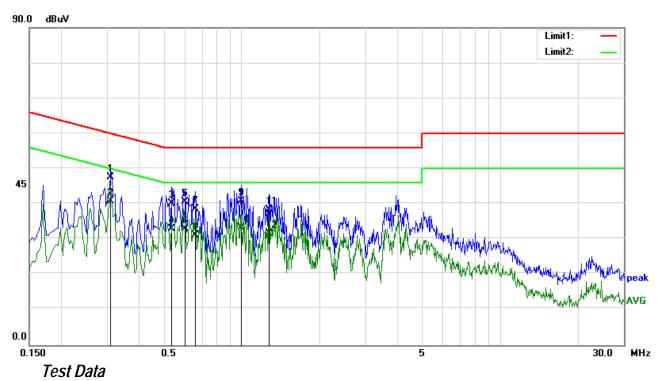
Phase Line Plot at 240Vac, 60Hz

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



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Test Mode : Normal Working Mode



Phase Neutral Plot at 240Vac, 60Hz

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



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6.2 Radiated Emissions

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

Requirement(s):

Remark

Spec	Requirement	Applicable				
	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)					
	Frequency range (MHz) Field Strength (µV/m)					
47.CED	30 – 88 88 – 216 150					
47CFR	216 – 960 200	\boxtimes				
§15.109	Above 960 500					
	Class A digital devices(10m)					
	Frequency range (MHz) Field Strength (µV/m)					
I	30 – 88 90					
I	88 – 216 150					
	216 – 960 210					
	Above 960 300					
Test Setup	Ground Plane Test Receiver The FIIT was switched on and allowed to warm up to its normal operating condition	-				
Procedure	 The EUT was switched on and allowed to warm up to its normal operating condition. 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: Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz resolution bandwidth respectively for each frequency measured. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. 					



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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 $(dB\mu V/m)$ = Receiver Reading Value

Detector= Peak Detector or Quasi Peak Detector

Ant_F=Antenna Factor

PA_G=Pre-Amplifier Gain

Cab_L=Cable Loss

Result $(dB\mu V/m)$ = Read ing Value + Corrected Value

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

Height (cm) = Height of Receiver antenna

Degree = Turn table degree

Calculation Formula:

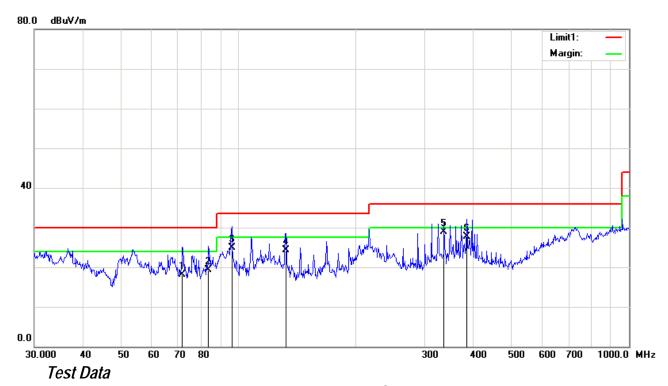
Margin (dB) = Result (dB μ V/m) – limit (dB μ V/m)



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Test Mode:	Normal Working Mode	
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(Below 1GHz)



Vertical Polarity Plot @10m

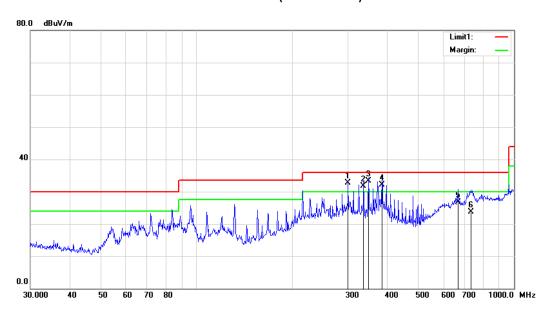
No.	Frequency	Reading	Detector	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degree
	(MHz)	(dBµV/m)		(dB/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	(cm)	(°)
1	71.8320	54.78	QP	9.88	47.91	1.44	18.19	30.00	-11.81	177	360
2	83.8156	57.41	QP	7.98	47.58	1.46	19.27	30.00	-10.73	200	239
3	96.0986	59.69	QP	10.28	46.66	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



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Test Mode:	Normal Working Mode	
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(Below 1GHz)



Test Data

Horizontal Polarity Plot @10m

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	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.



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Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted Emission	ns				
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	\boxtimes
Antenna (30MHz~6GHz)	JB6	A121411	10/31/2016	10/31/2017	\boxtimes
SIEMIC EZ_EMC Radiated Emissions software	Ver.ICP-03A1	N/A	N/A	N/A	



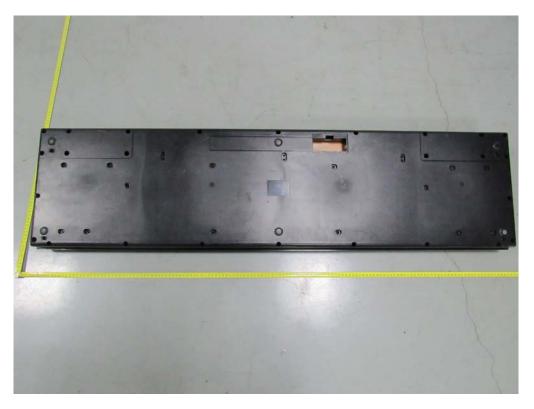
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Annex B. EUT And Test Setup Photographs

Annex B.i. Photograph EUT Internal Photo



Front View of EUT



Rear View of EUT



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Top View of EUT



Bottom View of EUT



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Left View of EUT



Right View of EUT



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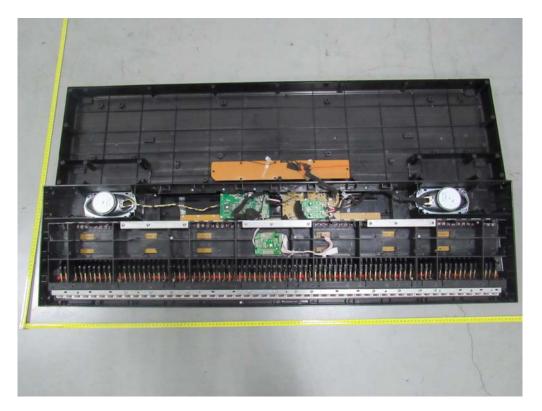


EUT – Port Front View



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Annex B.ii. Photograph EUT Internal Photo



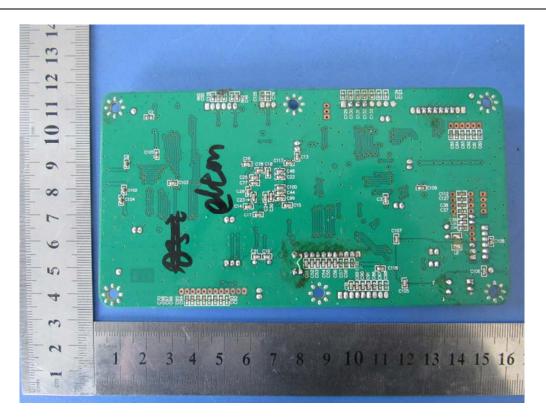
EUT Uncover - Front View



EUT PCBA - Front View



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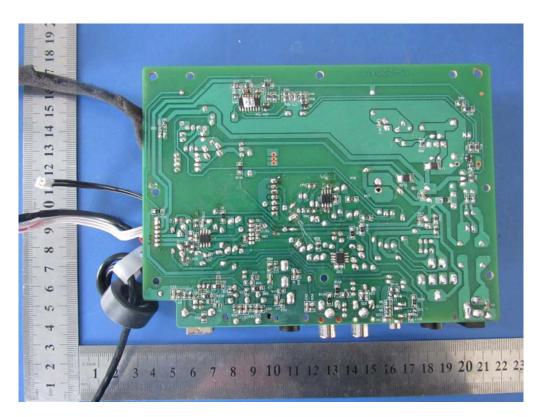
EUT PCBA 1 – Rear View



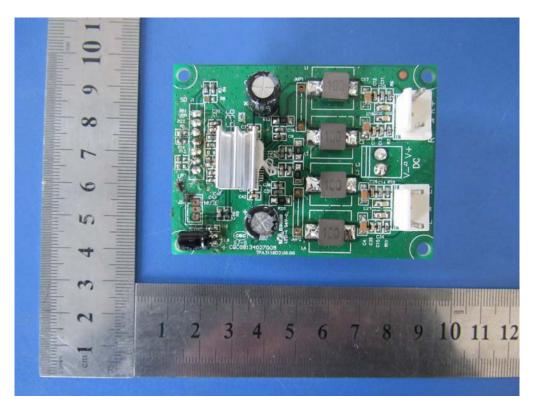
EUT PCBA 2 – Front View



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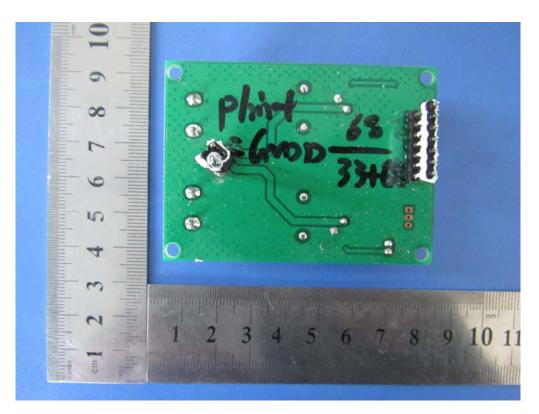
EUT PCBA 2 - Rear View



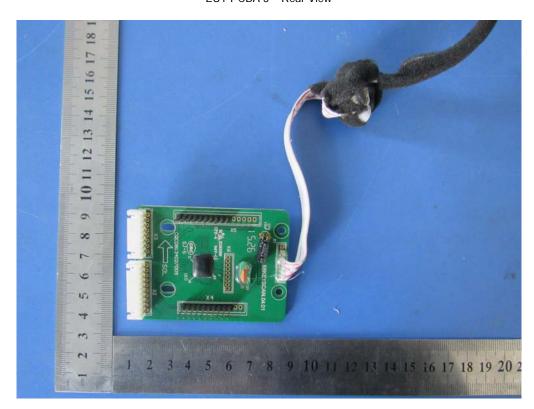
EUT PCBA 3 – Front View



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EUT PCBA 3 – Rear View



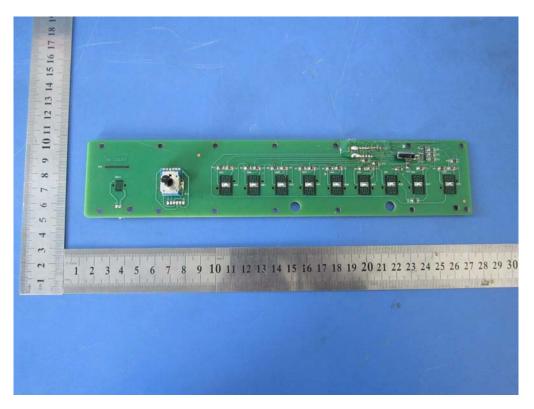
EUT PCBA 4 – Front View



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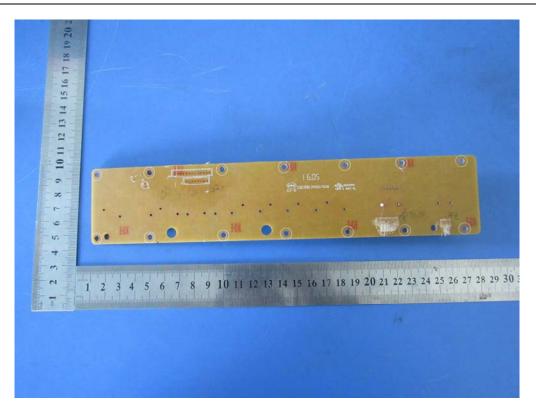
EUT PCBA 4 - Rear View



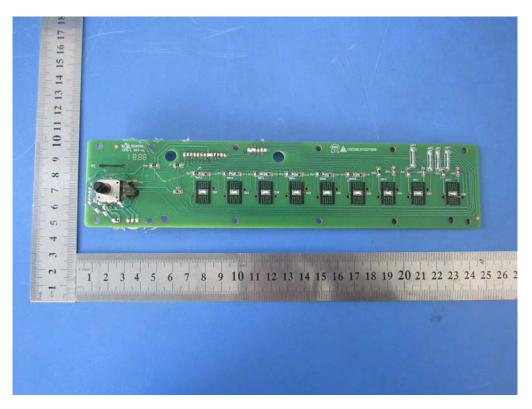
EUT PCBA 5 – Front View



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EUT PCBA 5 - Rear View



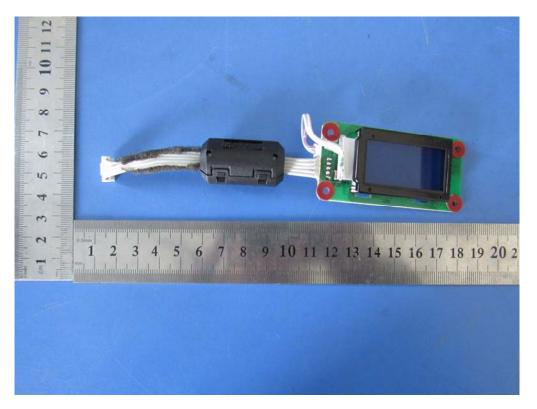
EUT PCBA 6 - Front View



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EUT PCBA 6 - Rear View



EUT PCBA 7 - Front View



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EUT PCBA 7 - Rear View



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Annex B.iii. Photograph Test Setup Photo



Conducted Emissions Setup Front View



Conducted Emissions Setup Side View



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Radiated Emissions Setup Below 1GHz Front View



Radiated Emissions Setup Below 1GHz Rear View

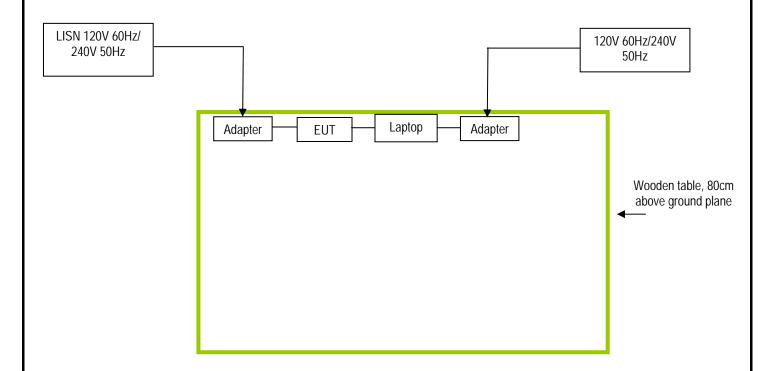


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Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

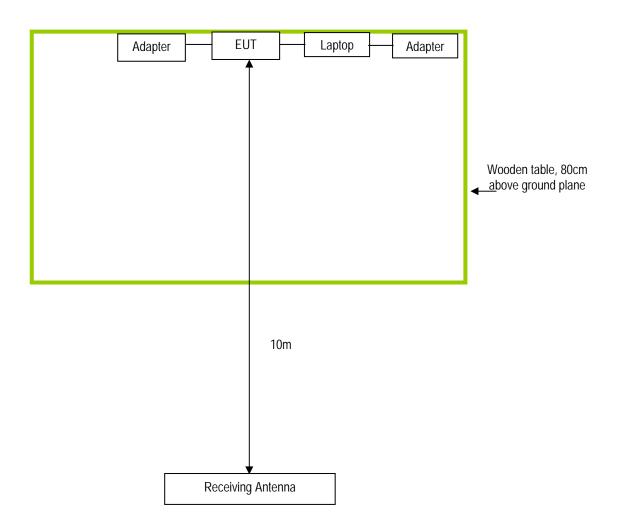
Block Configuration Diagram for Conducted Emissions





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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	Serial No
SAMSUNG	Laptop	905S3Q	NP905S3G-K06CN



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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