

Shenzhen BALUN Technology Co., Ltd.



FOR

smart projector

ISSUED TO Optoma Corporation

12F., No. 213, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City, Taiwan 231



Xia long Tested by: Xia Long (Engineer) May . 08.201) Date

Wei Yanguan

(Chief Engineer)

Date for Date

Report No.:

BL-SZ16C0086-401

EUT Name: smart projector **LDMLSSZ** Model Name:

Brand Name: Optoma

Test Standard: 47 CFR Part 15 Subpart B

FCC ID: 2ABRC-LDMLSSZ

Test Conclusion: Pass

Test Date:

Dec. 12, 2016 ~ Feb. 28, 2017

Date of Issue: Mar. 08, 2017

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Revision History

Version

Issue Date

Revisions Content

Rev. 01

Mar. 08, 2017

Initial Issue

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.	
A ddroop	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi	
Address	Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China	
Phone Number	+86 755 6685 0100	

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.		
A ddroop	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi		
Address	Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China		
	The laboratory has been listed by Industry Canada to perform		
	electromagnetic emission measurements. The recognition numbers		
	of test site are 11524A-1.		
Approditation	The laboratory has been listed by US Federal Communications		
Accreditation	Commission to perform electromagnetic emission measurements.		
Certificate	The recognition numbers of test site are 832625.		
	The laboratory is a testing organization accredited by China National		
	Accreditation Service for Conformity Assessment (CNAS) according		
	to ISO/IEC 17025. The accreditation certificate number is L6791.		
	All measurement facilities used to collect the measurement data are		
Description	located at Block B, FL 1, Baisha Science and Technology Park, Shahe		
Description	Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R.		
	China 518055		

1.3 Laboratory Condition

Ambient Temperature	20°C~25°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v6.3.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.



2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Applicant Optoma Corporation		
A ddraga	12F., No. 213, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City,		
Address	Taiwan 231		

2.2 Manufacturer Information

Manufacturer	Guizhou CVIM Technology Co., Ltd	
Addross	4th Floor, 5th R&D Building, Zunyi Software Park, Xiazi Town, Xinpu	
Address	New District, Zunyi, Guizhou	

2.3 Factory Information

Factory	Huizhou Goldenchip Electronics Co., Ltd			
Addroso	Factory workshop, No.12, Songyang Road, Zhongkai High-tech			
Address	Zone, Huizhou City, Guangdong			

2.4 General Description for Equipment under Test (EUT)

EUT Name	smart projector	
Model Name Under Test	LDMLSSZ	
Series Model Name	LDMLSSZ, IntelliGo S1, ML330	
Description of Model	Above basic model name and additional model name are totally the	
name differentiation	same configuration including circuit, PCB layout, electrical part and	
	outlook, and only differ in model name.	
Hardware Version	TDB	
Software Version	TDB	
Dimensions (Approx.)	N/A	
Weight (Approx.)	N/A	
The Highest Speed of	NI/A	
Processor	N/A	
Network and Wireless	Bluetooth, WIFI	
connectivity	Didetootii, vvii i	



2.5 Ancillary Equipment

Ancillary Equipment 1	Adapter		
	Brand Name	Huntkey	
	Model No.	HKA03619021-8C	
	Serial No.	N/A	
	Rated Input	100-240 V~, 50/60 Hz, 1000 mA	
	Rated Output 19 V=, 2100 mA		
Ancillary Equipment 2	HDMI Cable		
	Length	1.2 m	
Ancillary Equipment 3	AV Cable		
	Length 0.18 m		
Ancillary Equipment 4	Remote Control		

2.6 Technical Information

Note: Not Application.



3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title	
1	FCC 47 CFR Part 15 Subpart B (10-1-15 Edition)	Unintentional Radiators	
2	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	

3.2 Verdict

	No.	Description	FCC Rule	Test Verdict	Result
	1	Radiated Emission	15.109	Pass	Annex A .1
ſ	2	Conducted Emission, AC Ports	15.107	Pass	Annex A .2

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	3.23 dB
Radiated emissions (30 MHz-1 GHz)	4.30 dB
Radiated emissions (1 GHz-18 GHz)	4.81 dB
Radiated emissions (18 GHz-40 GHz)	5.71 dB



4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment	Selected Values During Tests				
Parameter	Temperature	Voltage	Relative Humidity	Ambient Pressure	
Normal Temperature,					
Normal Voltage	23°C~26°C	AC 120 V/60 Hz	50%-55%	100 to 102 kPa	
(NTNV)					

4.2 Test Equipment List

	Radiated Emission Test For Frequency Below 1 GHz									
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use				
EMI Receiver	ROHDE&SCHW ARZ	ESRP	101036	2016.07.05	2017.07.04	\boxtimes				
Test Antenna- Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2016.07.19	2018.07.18	\boxtimes				
Test Antenna- Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21					
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60 *7.35m	N/A	2016.08.09	2018.08.08	\boxtimes				

	Radiated Emission Test For Frequency Above 1 GHz									
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use				
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2016.09.09	2017.09.08	\boxtimes				
Test Antenna- Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21					
Test Antenna- Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21	\boxtimes				
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.24	2019.02.23	\boxtimes				

Conducted disturbance Test								
Description	Description Manufacturer Model Serial No. Cal. Date Cal. Due							
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2016.07.05	2017.07.04	\boxtimes		
LISN	SCHWARZBECK	NSLK 8127	8127-687	2016.07.05	2017.07.04	\boxtimes		
Shielded	ChangNing	CN-130701	130703	N/A	N/A	\boxtimes		
Enclosure	Changiang	CIN-130701	130703	IN/A	IN/A			



4.3 Test Enclosure list

Description	Manufacturer	Model	Serial No.	Length	Description	Use
PC	Dell	015K3N	N/A	N/A	Special Handled	
Laptop	Lenovo	E31-80	N/A	N/A	N/A	\boxtimes
Printer	HP	DESKJET 1000	N/A	N/A	N/A	
Keyboard	Logitech	Y-BP62a	N/A	N/A	N/A	
Mouse	Logitech	M100	N/A	N/A	N/A	\boxtimes
USB Disk	Kingston	N/A	N/A	N/A	N/A	\boxtimes
TF Card	Kingston	N/A	N/A	N/A	N/A	\boxtimes
VGA Cable	N/A	N/A	N/A	1.5 m	Shielded with core	
HDMI Cable	N/A	N/A	N/A	1.5 m	Shielded with core	
DVI Cable	N/A	N/A	N/A	1.5 m	Shielded with core	
Coaxial video cable	N/A	N/A	N/A	2.0 m	Shielded with core	
iPhone	Apple	A1586	N/A	N/A	N/A	
Phone	MI	M4	N/A	N/A	N/A	
Bluetooth Earphone	SAMSUNG	Gear Circle	N/A	N/A	N/A	\boxtimes
GPS/GLONAS S Vector signal generator	R&S	N5172B EXG	N/A	N/A	N/A	
WIFI Router	TP-LINK	TL-WDR7500	N/A	N/A	N/A	\boxtimes
Earphone	N/A	OPPO	N/A	1.1 m	N/A	\boxtimes
Car Battery	Camel	55530	N/A	N/A	12 V/55 Ah	
Artificial load	N/A	N/A	N/A	N/A	2.5 Ω/100 W	
Artificial load	N/A	N/A	N/A	N/A	5 Ω/100 W	
Electronic Load	ITECH	IT8511	N/A	N/A	N/A	
USB Cable	N/A	N/A	N/A	1.5 m	Shielded with core	
DC Power Supply	ITECH	IT6863A	60001401068 7210006	N/A	N/A	
LCD Monitor	SAMSUNG	UA32C4000P	N/A	N/A	N/A	
LCD Monitor	Dell	U241HB	N/A	N/A	N/A	
RJ45 Cable	N/A	N/A	N/A	1.5 m	Shielded with core	\boxtimes



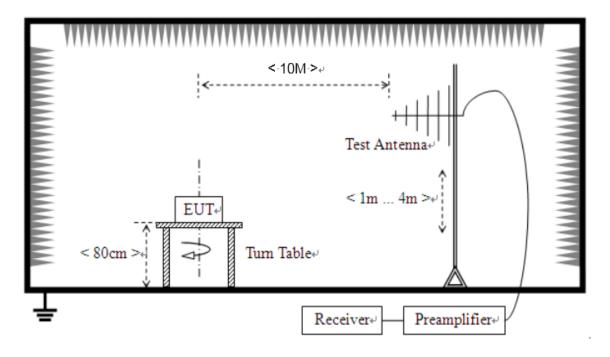
4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	The HDMI Input Test Mode EUT + Adapter + Laptop + Mouse + Earphone + RJ45 Cable + HDMI Cable + Remote Control + TF Card + USB Disk + BT Link + WIFI Link
TC02	The USB Input Test Mode EUT + Adapter + Laptop + Mouse + Earphone + RJ45 Cable + Remote Control + TF Card + USB Disk + BT Link + WIFI Link
TC03	The AV Input Test Mode EUT + Adapter + Laptop + Mouse + Earphone + RJ45 Cable + AV Cable + Remote Control + TF Card + USB Disk + BT Link + WIFI Link
TC04	The TF Card Input Test Mode EUT + Adapter + Laptop + Mouse + Earphone + RJ45 Cable + Remote Control + TF Card + USB Disk + BT Link + WIFI Link



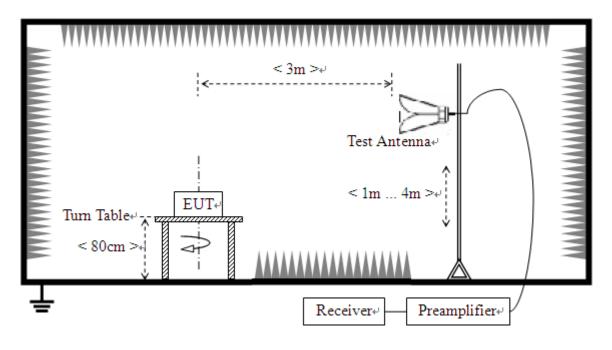
4.5 Test Setups

Test Setup 1



(For Radiated Emission Test (30 MHz-1 GHz))

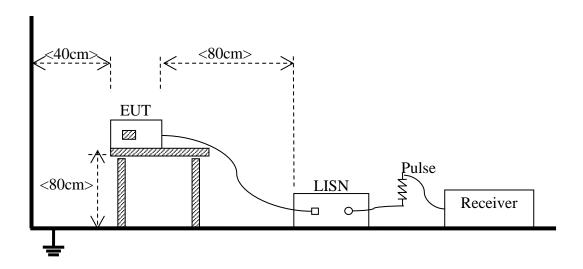
Test Setup 2



(For Radiated Emission Test (above 1 GHz))



Test Setup 3



(For Conducted Emission, AC Ports Test)



4.6 Test Conditions

Test Case	Test Conditions		
	Test Env.	NTNV	
Radiated Emission	Test Setup	Test Setup 1&2	
	Test Configuration	TC01~TC04 Note	
Conducted Emission, AC Ports	Test Env.	NTNV	
	Test Setup	Test Setup 3	
	Test Configuration	TC01~TC04 Note	

Note: Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report. The HDMI Input Test Mode is the worst mode in this report.



5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class B	(at 10 m)	Class A (at 10 m)		
	Field Strength Field Strength		Field Strength	Field Strength	
(IVIFIZ)	(μV/m)	(dBµV/m)	(μV/m)	(dBµV/m)	
30 - 88	100	30	90	39	
88 - 216	150	33.5	150	43.5	
216 - 960	200	36	210	46.4	
Above 960	500	44	300	49.5	

NOTE:

- 1) Field Strength ($dB\mu V/m$) = 20*log [Field Strength ($\mu V/m$)].
- 2) In the emission tables above, the tighter limit applies at the band edges.

5.1.1.2 Test Setup

Refer to 4.5 section (test setups1 to test setups2) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.



5.1.2 Conducted Emission

5.1.2.1 Test Limit

Frequency range (MHz)	Cla	ass A
	Quasi-peak	Average
	(dBµV)	(dBµV)
0.15 - 0.50	79	66
0.50 - 30	73	60

	Cla	iss B
Frequency range (MHz)	Quasi-peak	Average
	(dBµV)	(dBµV)
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 0.50 MHz.

5.1.2.2 Test Setup

Refer to 4.5 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides $50 \Omega/50 \mu H$ of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.1.2.4 Test Result

Please refer to ANNEX A.2.



ANNEX A TEST RESULTS

A.1 Radiated Emission

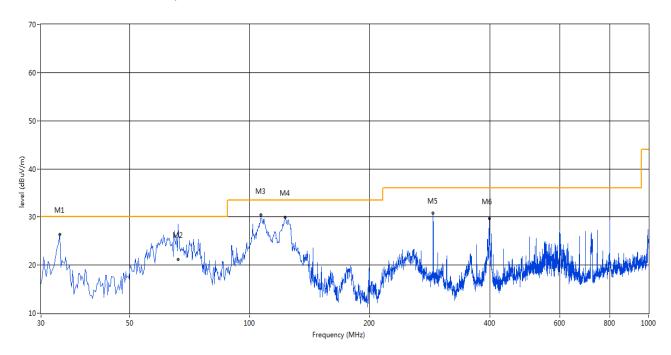
Note 1: The symbol of "--" in the table which means not application.

Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Test Data and Plots

The HDMI Input Test Mode

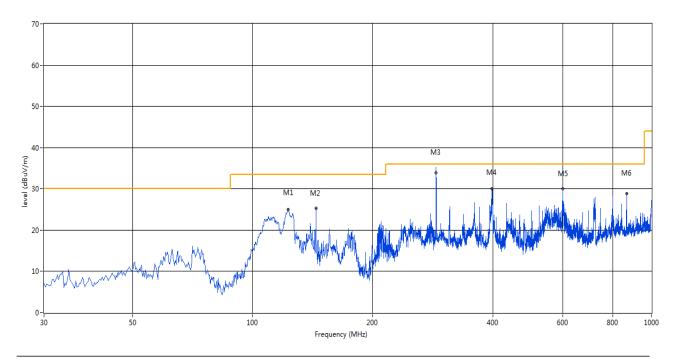
A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency	Results	Factor (dB)	Limit	Margin	Detector	Table	Height	ANT	Verdict
	(MHz)	(dBuV/m)		(dBuV/m)	(dB)		(o)	(cm)		
1	33.394	26.40	-16.67	30.0	3.60	Peak	0.00	300	Vertical	Pass
2	65.752	25.60	-16.64	30.0	4.40	Peak	230.00	372.00	Vertical	N/A
2*	65.752	21.13	-16.64	30.0	8.87	QP	230.00	372.00	Vertical	Pass
3	106.611	30.42	-15.85	33.5	3.08	Peak	340.00	100	Vertical	Pass
4	122.854	29.96	-18.54	33.5	3.54	Peak	65.00	200	Vertical	Pass
5	288.440	30.76	-13.66	36.0	5.24	Peak	161.00	400	Vertical	Pass
6	398.508	29.61	-10.79	36.0	6.39	Peak	161.00	400	Vertical	Pass



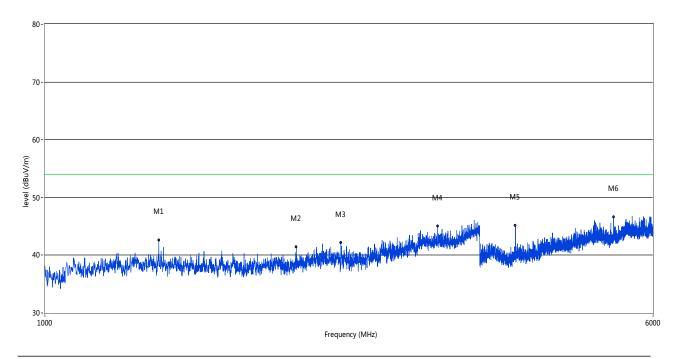
A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency	Results	Factor (dB)	Limit	Margin	Detector	Table	Height	ANT	Verdict
	(MHz)	(dBuV/m)		(dBuV/m)	(dB)		(o)	(cm)		
1	122.612	24.98	-18.46	33.5	8.52	Peak	22.00	400	Horizontal	Pass
2	144.189	25.31	-19.57	33.5	8.19	Peak	128.00	400	Horizontal	Pass
3	288.631	35.17	-13.66	36.0	0.83	Peak	152.00	380.00	Horizontal	N/A
3*	288.631	33.94	-13.66	36.0	2.06	QP	152.00	380.00	Horizontal	Pass
4	398.023	30.02	-10.74	36.0	5.98	Peak	82.00	100	Horizontal	Pass
5	599.975	30.09	-6.86	36.0	5.91	Peak	0.00	200	Horizontal	Pass
6	865.689	28.83	-2.94	36.0	7.17	Peak	191.00	100	Horizontal	Pass



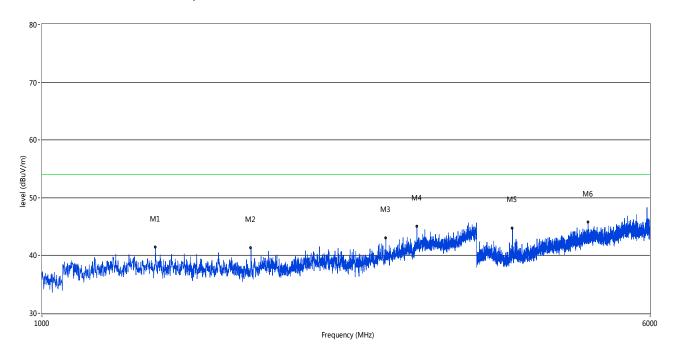
A.1.3 Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency	Results	Factor (dB)	Limit	Margin	Detector	Table	Height	ANT	Verdict
	(MHz)	(dBuV/m)		(dBuV/m)	(dB)		(o)	(cm)		
1	1398.450	42.62	-2.81	74.0	31.38	Peak	1.80	100	Vertical	Pass
2	2097.200	41.39	0.45	74.0	32.61	Peak	145.10	100	Vertical	Pass
3	2391.000	42.18	0.30	74.0	31.82	Peak	98.80	100	Vertical	Pass
4	3180.750	45.03	4.83	74.0	28.97	Peak	98.80	100	Vertical	Pass
5	3999.600	45.07	8.64	74.0	28.93	Peak	151.30	100	Vertical	Pass
6	5341.800	46.57	11.80	74.0	27.43	Peak	343.40	100	Vertical	Pass



A.1.4 Test Antenna Horizontal, 1 GHz – 6 GHz



No.	Frequency	Results	Factor	Limit	Margin	Detector	Table	Height	ANT	Verdict
	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dB)		(o)	(cm)		
1	1397.800	41.38	-2.93	74.0	32.62	Peak	353.20	100	Horizontal	Pass
2	1851.500	41.28	-0.12	74.0	32.72	Peak	353.20	100	Horizontal	Pass
3	2754.350	43.02	3.34	74.0	30.98	Peak	151.50	100	Horizontal	Pass
4	3018.250	45.03	4.58	74.0	28.97	Peak	344.10	100	Horizontal	Pass
5	3999.600	44.74	8.64	74.0	29.26	Peak	0.00	100	Horizontal	Pass
6	4998.600	45.70	11.07	74.0	28.30	Peak	287.10	100	Horizontal	Pass

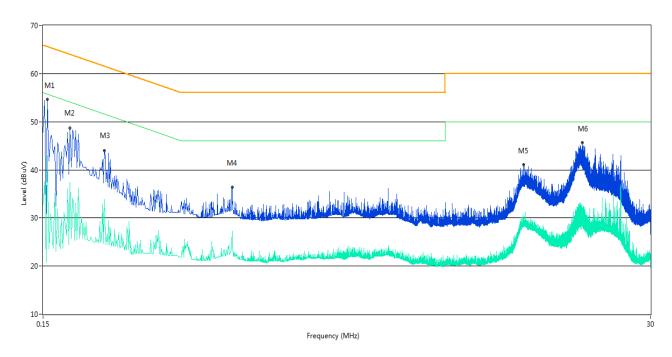


A.2 Conducted Emission

Test Data and Plots

The HDMI Input Test Mode

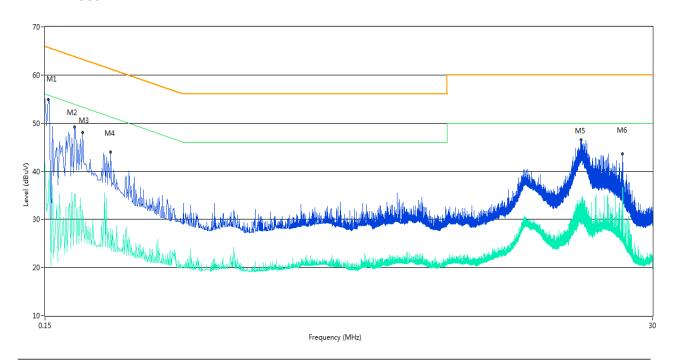
A.2.1 L Phase



No.	Frequency	Results	Factor (dB)	Limit	Margin	Detector	Line	Verdict
	(MHz)	(dBuV)		(dBuV)	(dB)			
1	0.156	54.7	11.00	65.7	11.00	Peak	L Line	Pass
1**	0.156	43.0	11.00	55.7	12.70	AV	L Line	Pass
2	0.190	48.7	11.00	64.0	15.30	Peak	L Line	Pass
2**	0.190	37.5	11.00	54.0	16.50	AV	L Line	Pass
3	0.256	43.9	11.00	61.6	17.70	Peak	L Line	Pass
3**	0.256	33.8	11.00	51.6	17.80	AV	L Line	Pass
4	0.780	36.4	11.00	56.0	19.60	Peak	L Line	Pass
4**	0.780	27.2	11.00	46.0	18.80	AV	L Line	Pass
5	9.934	41.1	11.00	60.0	18.90	Peak	L Line	Pass
5**	9.934	28.0	11.00	50.0	22.00	AV	L Line	Pass
6	16.532	45.7	11.00	60.0	14.30	Peak	L Line	Pass
6**	16.532	28.3	11.00	50.0	21.70	AV	L Line	Pass



A.2.2 N Phase



No.	Frequency	Results	Factor (dB)	Limit	Margin	Detector	Line	Verdict
	(MHz)	(dBuV)		(dBuV)	(dB)			
1	0.154	54.9	11.00	65.8	10.90	Peak	N Line	Pass
1**	0.154	33.7	11.00	55.8	22.10	AV	N Line	Pass
2	0.194	49.2	11.00	63.9	14.70	Peak	N Line	Pass
2**	0.194	35.3	11.00	53.9	18.60	AV	N Line	Pass
3	0.208	48.0	11.00	63.3	15.30	Peak	N Line	Pass
3**	0.208	31.9	11.00	53.3	21.40	AV	N Line	Pass
4	0.266	43.9	11.00	61.2	17.30	Peak	N Line	Pass
4**	0.266	28.1	11.00	51.2	23.10	AV	N Line	Pass
5	16.100	46.5	11.00	60.0	13.50	Peak	N Line	Pass
5**	16.100	32.1	11.00	50.0	17.90	AV	N Line	Pass
6	23.126	43.6	11.00	60.0	16.40	Peak	N Line	Pass
6**	23.126	36.8	11.00	50.0	13.20	AV	N Line	Pass



ANNEX B TEST SETUP PHOTOS

Please refer the document "BL-SZ16C0086-AE.PDF".

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document "BL-SZ16C0086-AW.PDF".

ANNEX D EUT INTERNAL PHOTOS

Please refer the document "BL-SZ16C0086-AI.PDF".

--END OF REPORT--