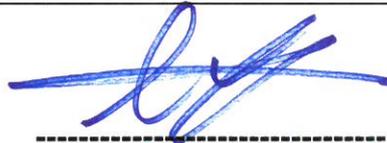


FCC TEST REPORT

Reference No. : G-44-2015-01005
Applicant : Sony Corporation
Equipment Under Test (EUT) :
 Product Name : Mobile Projector
 Model Name : MP-CL1
FCC Authorization Type : Certification
Applied Standards : FCC Part 15 Subpart B, Class B
 ANSI C63.4 : 2009
Date of Receipt : April 07, 2015
Date of Test : May 21, 2015 ~ May 22, 2015
Date of Issue : June 09, 2015
Test Results : Complied

Tested by

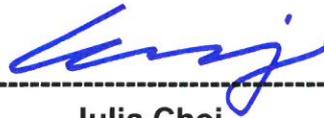
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Walter Lee

Reviewed by

:



Julia Choi

Remarks :

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The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full

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1. General Information

1.1 Client Information

Applicant : Sony Corporation
 Address : 1-7-1, Konan Minato-ku, Tokyo, 108-0075, Japan

Manufacturer : Sony Electronics of Korea Co., Ltd.
 Address : 76 Jayumuyeok 2-gil, Masanhoewon-Gu, Chanwon-Si, Gyeongsangnam-Do, Republic of Korea

1.2 Test Laboratory

Name and Address : SGS Korea Co., Ltd.
 - Giheung 1 Lab : 35, Giheungdanji-ro 121beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea
 - Giheung 2 Lab : 23, Giheungdanji-ro 24beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea

FCC Registration No. : 656853
 Phone : + 82 31 548 0711
 Fax : + 82 31 548 0719
 e-mail : Julia.choi@sgs.com

1.3 General Information of E.U.T.

Product Name	Mobile Projector
Model Name	MP-CL1
Serial No.	None
FCC ID	AK8MP-CL1
EMI Classification	Class B
Test Power	120 V~, 60 Hz
Internal Clock Freq	600 MHz (Wireless : 2.4 GHz or 5 GHz)

Wi-Fi standards supported	2.4 GHz	Transmission frequency (MHz)		2 402 MHz ~ 2 482 MHz	
		Receive Frequency (MHz)		2 402 MHz ~ 2 482 MHz	
	5 GHz	W52	CH	Frequency	
			36	5 170 MHz ~ 5 190 MHz	
			40	5 190 MHz ~ 5 210 MHz	
			44	5 210 MHz ~ 5 230 MHz	
		W53	48	5 230 MHz ~ 5 250 MHz	
			52	5 250 MHz ~ 5 270 MHz	
			56	5 270 MHz ~ 5 290 MHz	
			60	5 290 MHz ~ 5 310 MHz	
		W56	64	5 310 MHz ~ 5 330 MHz	
			100	5 490 MHz ~ 5 510 MHz	
			104	5 510 MHz ~ 5 530 MHz	
			108	5 530 MHz ~ 5 550 MHz	
			112	5 550 MHz ~ 5 570 MHz	
			116	5 570 MHz ~ 5 590 MHz	
		W58	120	5 590 MHz ~ 5 610 MHz	
124	5 610 MHz ~ 5 630 MHz				
149	5 735 MHz ~ 5 755 MHz				
153	5 755 MHz ~ 5 775 MHz				
		157	5 775 MHz ~ 5 795 MHz		
		161	5 795 MHz ~ 5 815 MHz		
Output resolution	1,920x720 p				
Audio output	HP Out (Φ3.5 Audio Jack)				
HDMI/MHL input	HDMI 1.4a/EDID, HDCP compatible				
Diagonal projection image size	40 inches at projection distance of 1.15 m				
Brightness	Average: 32 lumens/Maximum: 37 lumens (100% White)				
Color reproducibility	Full color (16,770,000 colors)				
Laser class	Class 3R Wavelength: 445 nm to 639 nm Beam divergence: 4.5 mrad. Pulse Frequency: 60 Hz Output : 206 mW				
Rated input	DC5 V/1.5 A				
Rated output	DC5 V/1.5 A, 1 port				
Maximum operating Freq.	5 GHz				
Port	Micro USB input, HDMI/MHL IN, HDM IN, AUDIO OUT, DC Output				
Function	Beam Project function by connecting with HDMI, MHL, Wi-Fi and battery pack				

1.4 Operating Modes and Conditions

Operating mode	Operating Condition
1)HDMI Mode	The EUT is connected by HDMI with laptop and it is outputting video and sound. Also The smart phone has been connected by USB port and it is charging battery.
2)MHL Mode	The EUT is connected by MHL with Tablet computers and it is outputting video and sound. Also The smart phone has been connected by USB port and it is charging battery.

1.4.1 Monitoring Method

- Checking the state of video and audio output and the state of charge about Smartphone

1.5 Auxiliary Equipments

Description	Model	Serial No.	Manufacturer
SMARTPHONE	SHW-M250L	R13B568159	SAMSUNG ELECTRONICS CO., LTD.
NOTEBOOK COMPUTER	SVE151G13P	-	Sony corporation
Tablet PC	SM-P601	RF1DA2XZZ3H	SAMSUNG ELECTRONICS CO., LTD.
AC Adaptor	CP-AD2	5832563	Sony corporation
HDTV Adapter	ET-H10FAU	RT2G311AS E	SAMSUNG ELECTRONICS CO., LTD.
EarPhone	-	-	-

Note: Auxiliary equipments are declared according to FCC procedure.

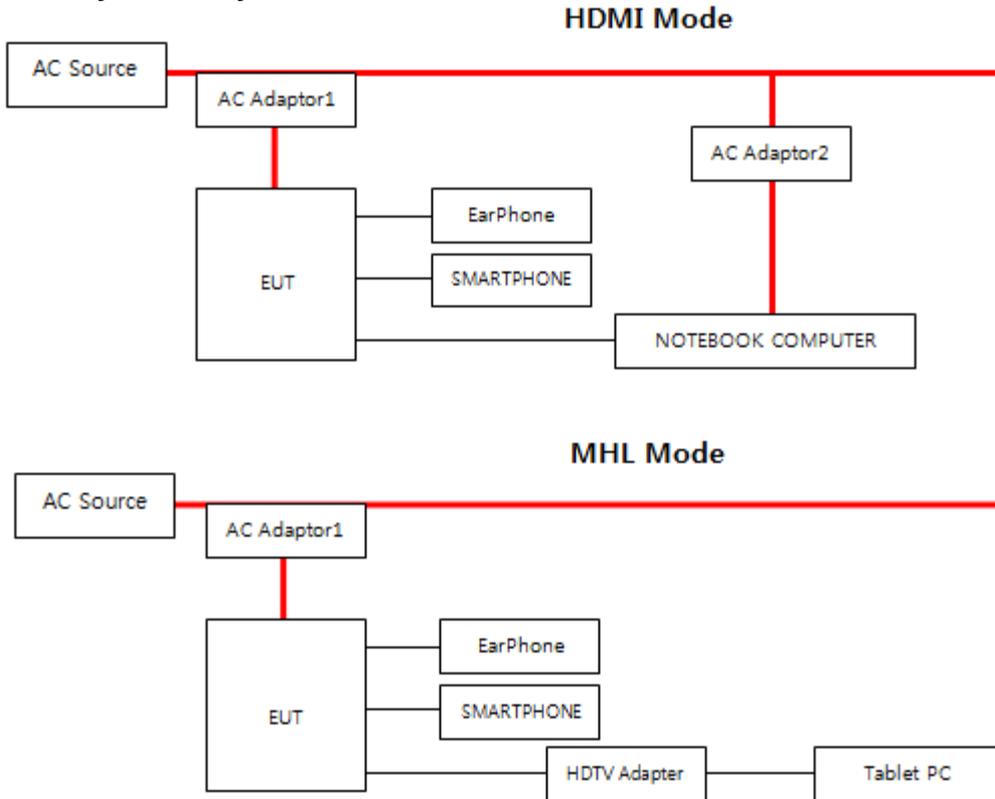
1.6 Cable List

Start		END		Cable Spec.		User core
Name	I/O Port	Name	I/O Port	Length	Shield	
[HDMI Mode]						
EUT	AUDIO OUT	EarPhone	-	1.8	Unshield	-
	HDMI/MHL IN	NOTEBOOK COMPUTER	HDMI OUT	1.7	Shield	-
	DC Output	SMARTPHONE	MINI HDMI	1.5	Shield	-
	Micro USB input	AC Adaptor1	USB	1.0	Shield	-
AC Adaptor1	AC IN	AC Source	-	-	Unshield	-
NOTEBOOK COMPUTER	DC IN	AC Adaptor2	DC OUT	1.5	Shield	-
AC Adaptor2	AC IN	AC Source	-	1.7	Unshield	-
[MHL Mode]						
EUT	AUDIO OUT	EarPhone	-	1.8	Unshield	-
	HDMI/MHL IN	HDTV Adapter	HDMI	1.7	Shield	-
	DC Output	SMARTPHONE	MINI USB	1.5	Shield	-
	Micro USB input	AC Adaptor1	USB	1.0	Shield	-
AC Adaptor1	AC IN	AC Source	-	-	Unshield	-
HDTV Adapter	MINI USB	Tablet PC	MINI USB	0.1	Unshield	-

1.7 System Configurations

Description	Model	Serial No.	Manufacturer
Main Board	MP-CL1	I-MP0-023-01	SONY
Sub Board	PJM-1102	0-335-717-08	-
Battery	US506071H 2	3064DQ107XA09B	SONY

1.8 Test System Layout



1.9 Modifications

There was no modified item during the test.

1.10 Applicable Standards for Testing

Standards	Status	Deviation
FCC Part 15 Subpart B Class B	Applicable	No Deviation

1.11 Summary of Test Results

Test Item	Standards	Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107	Complied
Radiated Emission	FCC Part 15 Subpart B Section 15.109	Complied

Note : Test methods of all test items are performed according to the basic standards in this table.

EMISSION

2.1 Test Results

Test Items	Standards	Test Results
Conducted Emission	FCC Part 15 Subpart B Section 15.107	Complied
Radiated Emission	FCC Part 15 Subpart B Section 15.109	Complied

2.2 Test Method and Limits

2.2.1 Test Method

Test Items	Measuring Frequency Range	RBW	Measuring Distance
Conducted Emission	0.15 MHz ~ 30 MHz	9 kHz	-
Radiated Emission	30 MHz ~ 1 GHz	120 kHz	10 m & 3 m
	Above 1 GHz	1 MHz	3 m

Note : 10 m method of radiated emission measurement is only applied to Class A equipment over the frequency range of 30 MHz ~ 1 GHz. Except this, 3 m method is applied to Class B equipment over the frequency range of 30 MHz ~ 1 GHz and Class A and Class B equipment above 1 GHz.

2.2.2 Test Limits

-Conducted Emission Limits

Frequency Range	Limits (dB(μ V))		Class
	Quasi-peak	Average	
0.15 MHz ~ 0.5 MHz	79	66	Class A
0.5 MHz ~ 30 MHz	73	60	
0.15 MHz ~ 0.5 MHz	66 to 56	56 to 46	Class B
0.5 MHz ~ 5 MHz	56	46	
5 MHz ~ 30 MHz	60	50	

Note : The lower limit shall apply at the transition frequencies. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

-Radiated Emission Limits below 1 GHz

Frequency Range	Limits (dB(μ V/m))		Class
	Quasi-peak		
30 MHz ~ 88 MHz	39.1		Class A (10 m method)
88 MHz ~ 216 MHz	43.5		
216 MHz ~ 960 MHz	46.4		
960 MHz ~ 1 GHz	49.5		
30 MHz ~ 88 MHz	40.0		Class B (3 m method)
88 MHz ~ 216 MHz	43.5		
216 MHz ~ 960 MHz	46.0		
960 MHz ~ 1 GHz	54.0		

-Radiated Emission Limits above 1 GHz (3m method)

Frequency Range	Limits (dB(μ V/m))		Class
	Average	Peak	
Above 1 GHz	59.5	79.5	Class A
Above 1 GHz	54.0	74.0	Class B

Note : The limits of class A equipment is extrapolated using an extrapolation factor of 20 dB/decade because it was measured at 3m distance not 10m distance.

2.3 Conducted Emission

The initial preliminary exploratory scans were performed over the measuring frequency range (0.15 MHz to 30 MHz) using a max hold mode incorporating a Peak detector and Average detector and using the software of EMC32 (Version V8.50 from R&S). The final test data was measured using a Quasi-Peak detector and CISPR Average detector.

2.3.1 Test Equipments

Equipment	Model	Manufacturer	S/N	Cal. Due Date
EMI TEST RECEIVER	ESR7	R&S	101179	2015.11.06
2-LINE V-NETWORK	ENV216	R&S	101180	2016.04.03
ARTIFICIAL MAIN NETWORK	ESH2-Z5	R&S	100303	2016.01.08
PULSE LIMITER	ESH3-Z2	R&S	100283	2015.11.17
Shield Room	-	SY CORPORATION	-	-

2.3.2 Test Site

Shield Room in Giheung 1 Laboratory

2.3.3 Environment Conditions

Temperature : (Minimum 23.4, Maximum 23.5) °C
 Humidity : (Minimum 35.7, Maximum 35.8) % R.H.
 Atmospheric Pressure : (100.3) kPa

Test Date: May 21, 2015

2.3.4 Test Results

[Test mode : HDMI]

Freq. (MHz)	Line	Level (dB μ V)		LISN (dB)	CL (dB)	Pulse Limiter (dB)	Result (dB μ V)		Limit (dB μ V)		Margin (dB)	
		Q/P	A/V				Q/P	A/V	Q/P	A/V	Q/P	A/V
0.19	N	26.34	16.71	9.77	0.00	9.83	45.94	36.31	64.04	54.04	18.10	17.73
0.28	N	27.19	16.34	9.66	0.00	9.83	46.68	35.83	60.82	50.82	14.14	14.99
0.37	N	24.31	13.55	9.80	0.00	9.83	43.94	33.18	58.50	48.50	14.56	15.32
0.77	N	29.88	14.92	9.73	0.00	9.84	49.45	34.49	56.00	46.00	6.55	11.51
1.16	N	28.76	15.29	9.70	0.02	9.84	48.32	34.85	56.00	46.00	7.68	11.15
1.64	N	30.23	17.71	9.60	0.06	9.84	49.73	37.21	56.00	46.00	6.27	8.79
0.19	H	24.88	18.05	9.77	0.00	9.83	44.48	37.65	64.04	54.04	19.56	16.39
0.28	H	24.04	15.90	9.66	0.00	9.83	43.53	35.39	60.82	50.82	17.29	15.43
0.37	H	21.19	13.56	9.80	0.00	9.83	40.82	33.19	58.50	48.50	17.68	15.31
0.37	H	24.51	16.15	9.80	0.00	9.83	44.14	35.78	58.50	48.50	14.36	12.72
0.77	H	23.17	13.36	9.73	0.00	9.84	42.74	32.93	56.00	46.00	13.26	13.07
1.21	H	25.73	16.90	9.70	0.02	9.84	45.29	36.46	56.00	46.00	10.71	9.54
1.65	H	22.58	16.44	9.60	0.07	9.84	42.09	35.95	56.00	46.00	13.91	10.05

2.4 Radiated Emission

The initial preliminary exploratory scans were performed over the measuring frequency range using a max hold mode incorporating a Peak detector and using the software of EMC32 (Version V9.15 from R&S). The test data was measured using a Quasi-Peak detector below 1 GHz.

Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency.

2.4.1 Test Equipments

Equipment	Model	Manufacturer	S/N	Cal. Due Date
EMI TEST RECEIVER	ESC17	R&S	100778	2015.08.27
BILOG ANTENNA	CBL6112D	TESEQ	25233	2015.07.19
Double Ridged Horn Antenna	HF906	R&S	100564	2015.09.05
AMPLIFIER	8447D	HP	1726A01265	2015.09.18
AMPLIFIER	SCU-18	R&S	10070	2016.04.02
10m SEMI-ANECHOIC CHAMBER	-	SY CORPORATION	-	-

Note : The Antenna calibration period is 2 years, but the other equipment calibration period are 1 year.

2.4.2 Test Site

10m SEMI-ANECHOIC CHAMBER in Giheung 1 Laboratory

2.4.3 Environment Conditions

① Below 1 GHz (10 m method)

Temperature : (Minimum 22.7, Maximum 22.8) °C

Humidity : (Minimum 33.2, Maximum 33.3) % R.H.

Atmospheric Pressure : (100.1) kPa

Test Date: May 22, 2015

② Above 1 GHz (3 m method)

Temperature : (Minimum 22.5, Maximum 22.6) °C

Humidity : (Minimum 34.5, Maximum 34.6) % R.H.

Atmospheric Pressure : (100.1) kPa

Test Date: May 22, 2015

2.4.4 Test Results

① Below 1 GHz

[Test mode : HDMI]

Freq. (MHz)	Level (dB μ V)	Pol. (H/V)	A (°)	H (cm)	AF (dB)	CL (dB)	Amp. (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
99.72	45.01	V	154	211	10.15	1.30	26.99	29.47	43.50	14.03
143.98	49.15	H	39	316	10.78	1.42	27.04	34.31	43.50	9.19
148.46	47.33	H	146	361	10.55	1.44	27.05	32.27	43.50	11.23
206.18	48.17	V	280	264	9.42	1.72	27.06	32.25	43.50	11.25
279.05	48.30	H	317	227	13.20	1.96	26.55	36.91	46.00	9.09
279.41	42.74	V	231	111	13.21	1.96	26.54	31.37	46.00	14.63
593.93	43.18	H	34	378	19.44	2.98	27.30	38.30	46.00	7.70
624.00	44.35	H	136	364	19.60	3.02	27.30	39.67	46.00	6.33
781.14	40.84	V	241	343	20.86	3.34	27.06	37.98	46.00	8.02
797.63	40.20	H	341	256	21.06	3.39	27.01	37.64	46.00	8.36

[Test mode : MHL]

Freq. (MHz)	Level (dB μ V)	Pol. (H/V)	A (°)	H (cm)	AF (dB)	CL (dB)	Amp. (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30.85	39.06	V	81	341	16.69	0.70	26.99	29.46	40.00	10.54
42.85	42.72	V	121	318	10.29	0.80	26.87	26.94	40.00	13.06
120.21	37.54	H	337	207	10.95	1.30	27.02	22.77	43.50	20.73
143.98	46.61	H	96	230	10.78	1.42	27.04	31.77	43.50	11.73
222.79	43.60	V	203	309	10.62	1.79	26.94	29.07	46.00	16.93
296.99	37.75	H	108	249	13.58	1.99	26.42	26.90	46.00	19.10
371.20	36.86	H	138	345	15.61	2.21	26.61	28.07	46.00	17.93
594.06	33.34	V	85	259	19.44	2.98	27.30	28.46	46.00	17.54
742.59	33.99	V	211	236	20.39	3.23	27.17	30.44	46.00	15.56
881.05	30.25	H	250	147	21.89	3.56	26.59	29.11	46.00	16.89

Measurement Uncertainty (Horizontal) : 5.48 dB (The confidential level is about 95%, k=2)

Measurement Uncertainty (Vertical) : 5.64 dB (The confidential level is about 95%, k=2)

- Note :
- AF = Antenna Factor
 - CL = Cable Loss
 - AG = Amplifier Gain
 - POL H = Horizontal
 - POL V = Vertical
 - A : Angle
 - H : Height
 - Margin = Limit – F/S
 - Result = Level + AF + CL – AG

Ex) In case

Freq ; 100 MHz, level ; 30 dB(μ V/m), AF ; 10 dB/m, CL ; 4 dB, AG ; 25 dB

$$\begin{aligned} \text{Result} &= \text{Level} + \text{AF} + \text{CL} - \text{AG} \\ &= 30 + 10 + 4 - 25 = 19 \end{aligned}$$

$$\begin{aligned} \text{Margin} &= \text{Limit} - \text{Result} \\ &= 43.5 - 19 \\ &= 24.5 \end{aligned}$$

② Above 1 GHz

[Test mode : HDMI]

Freq. (MHz)	Level (dB(μV))	Pol. (H/V)	A (°)	H (cm)	AF (dB/m)	CL (dB)	AG (dB)	Result dB(μV/m)	Limit dB(μV/m)	Margin (dB)
Peak Detector										
1500.00	68.91	H	204	100	25.53	6.60	43.95	57.09	74.00	16.91
1572.50	60.19	H	318	100	25.85	6.77	43.99	48.82	74.00	25.18
1785.00	62.05	H	149	100	26.80	7.28	43.91	52.22	74.00	21.78
1792.50	59.91	V	32	100	26.83	7.30	43.90	50.14	74.00	23.86
2395.00	55.04	V	118	100	28.15	9.38	44.10	48.47	74.00	25.53
2492.50	57.31	H	225	100	28.25	9.77	44.15	51.18	74.00	22.82
2493.75	59.26	V	73	100	28.25	9.78	44.15	53.14	74.00	20.86
3000.00	53.77	H	239	100	29.65	9.80	44.10	49.12	74.00	24.88
3000.00	56.63	V	175	100	29.65	9.80	44.10	51.98	74.00	22.02
Average Detector										
1500.00	43.60	H	204	100	25.53	6.60	43.95	31.78	54.00	22.22
1572.50	36.43	H	318	100	25.85	6.77	43.99	25.06	54.00	28.94
1785.00	37.32	H	149	100	26.80	7.28	43.91	27.49	54.00	26.51
1792.50	33.39	V	32	100	26.83	7.30	43.90	23.62	54.00	30.38
2395.00	34.92	V	118	100	28.15	9.38	44.10	28.35	54.00	25.65
2492.50	35.71	H	225	100	28.25	9.77	44.15	29.58	54.00	24.42
2493.75	33.45	V	73	100	28.25	9.78	44.15	27.33	54.00	26.67
3000.00	47.22	H	239	100	29.65	9.80	44.10	42.57	54.00	11.43
3000.00	45.92	V	175	100	29.65	9.80	44.10	41.27	54.00	12.73

Test mode : MHL

Freq. (MHz)	Level (dB(μV))	Pol. (H/V)	A (°)	H (cm)	AF (dB/m)	CL (dB)	AG (dB)	Result dB(μV/m)	Limit dB(μV/m)	Margin (dB)
Peak Detector										
1039.38	54.14	H	95	100	23.44	5.49	43.98	39.09	70.00	30.91
1113.75	55.15	H	244	100	23.78	5.67	43.94	40.66	70.00	29.34
1113.75	56.82	V	141	100	23.78	5.67	43.94	42.33	70.00	27.67
1336.25	50.69	H	47	100	24.79	6.21	43.90	37.79	70.00	32.21
1336.25	50.20	V	195	100	24.79	6.21	43.90	37.30	70.00	32.70
2003.75	48.16	V	101	100	27.75	7.82	44.20	39.53	70.00	30.47
Average Detector										
1039.38	44.39	H	95	100	23.44	5.49	43.98	29.34	50.00	20.66
1113.75	42.70	H	244	100	23.78	5.67	43.94	28.21	50.00	21.79
1113.75	44.02	V	141	100	23.78	5.67	43.94	29.53	50.00	20.47
1336.25	43.91	H	47	100	24.79	6.21	43.90	31.01	50.00	18.99
1336.25	44.11	V	195	100	24.79	6.21	43.90	31.21	50.00	18.79
2003.75	38.40	V	101	100	27.75	7.82	44.20	29.77	50.00	20.23

Measurement Uncertainty (Horizontal) : 5.88 dB (The confidential level is about 95%, k=2)

Measurement Uncertainty (Vertical) : 4.50 dB (The confidential level is about 95%, k=2)

Note 1:

• AF = Antenna Factor • CL = Cable Loss • Amp = Amplifier Gain

• POL H = Horizontal

• POL V = Vertical

• A : Angle

• H : Height

• Margin = Limit – Result

• Result = Level + AF + CL – Amp

Ex) In case

Freq ; 100 MHz, level ; 30 dB(μV/m), AF ; 10 dB/m, CL ; 4 dB, AG ; 25 dB

Result = Level + AF + CL – AG

$$= 30 + 10 + 4 - 25 = 19$$

Margin = Limit – Result

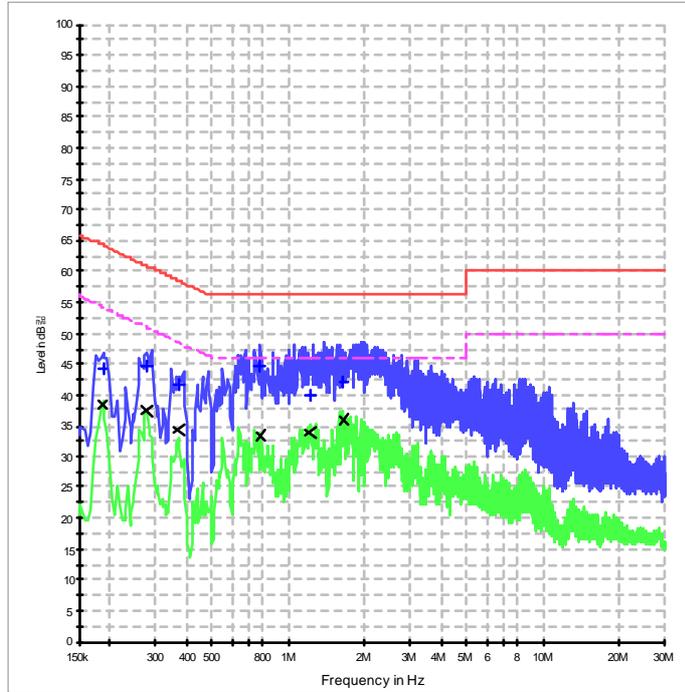
$$= 43.5 - 19 = 24.5$$

See Appendix B (Radiated Emission)

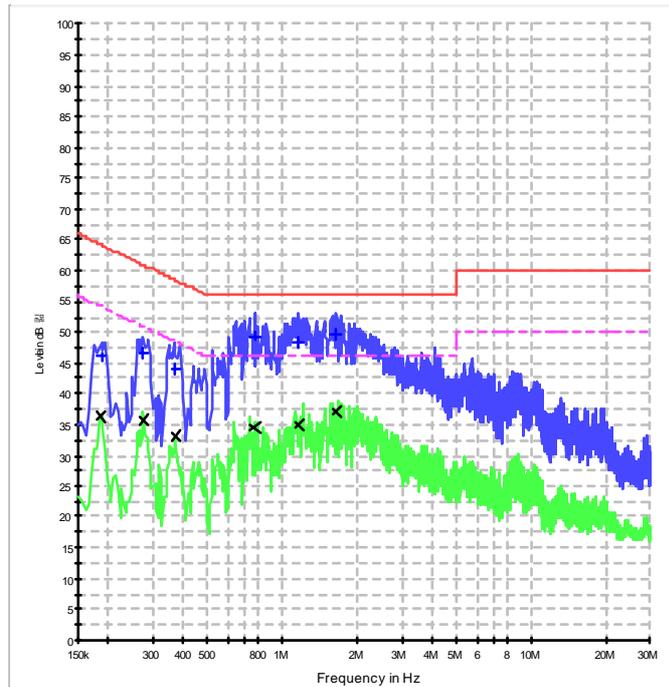
Appendix A : Conducted Emission

[Test mode : HDMI]

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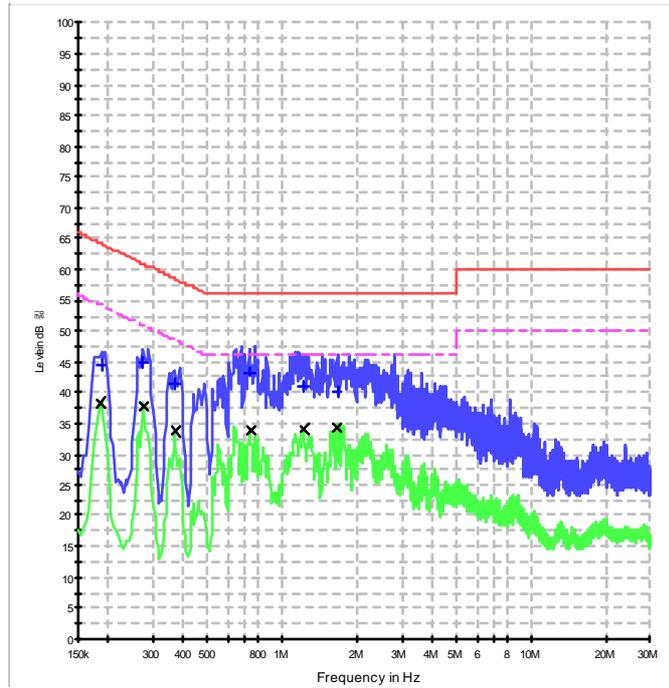


N

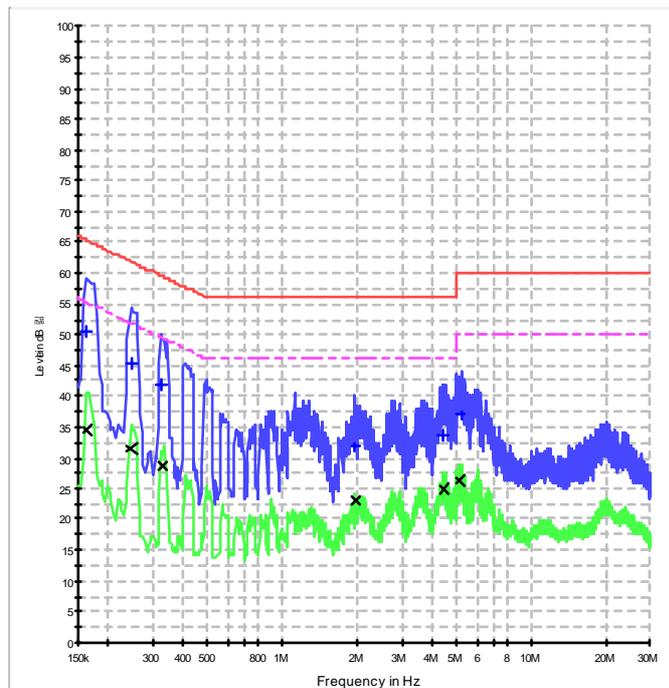


[Test mode : MHL]

H



N

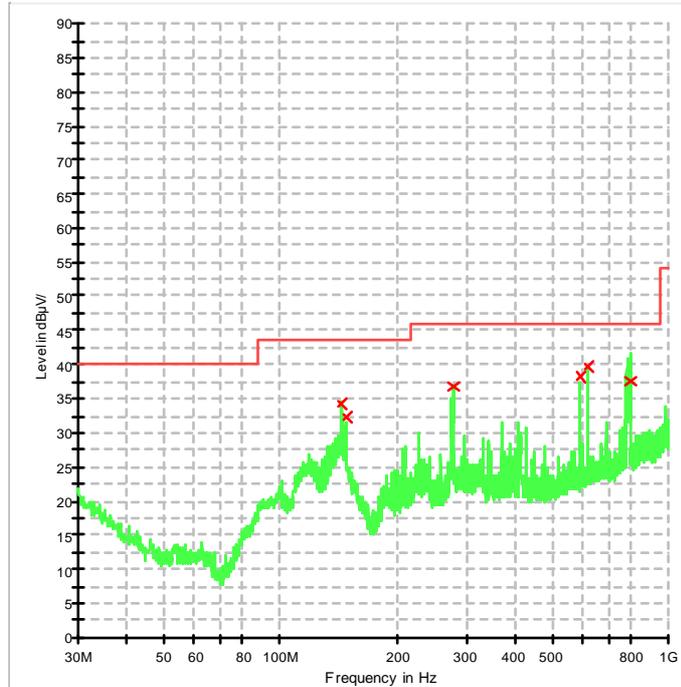


Appendix B : Radiated Emission

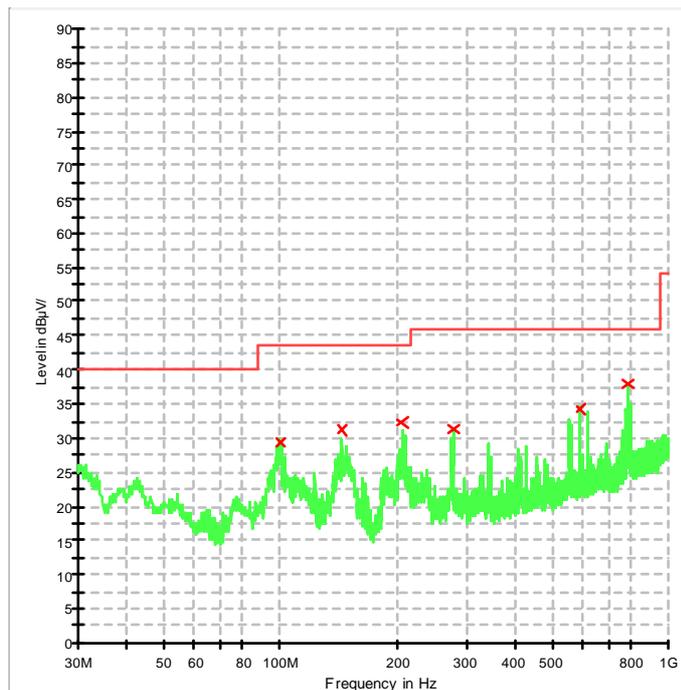
① Below 1 GHz

[Test mode : HDMI]

H

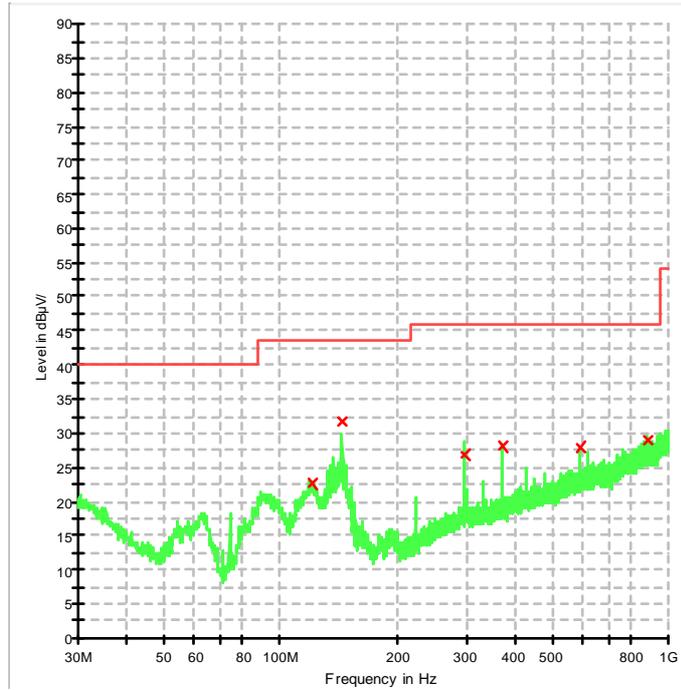


V

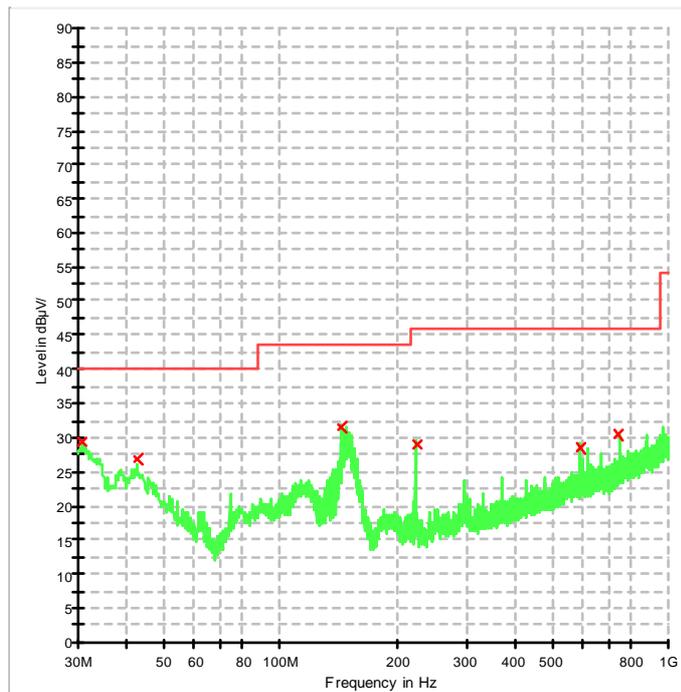


[Test mode : MHL]

H



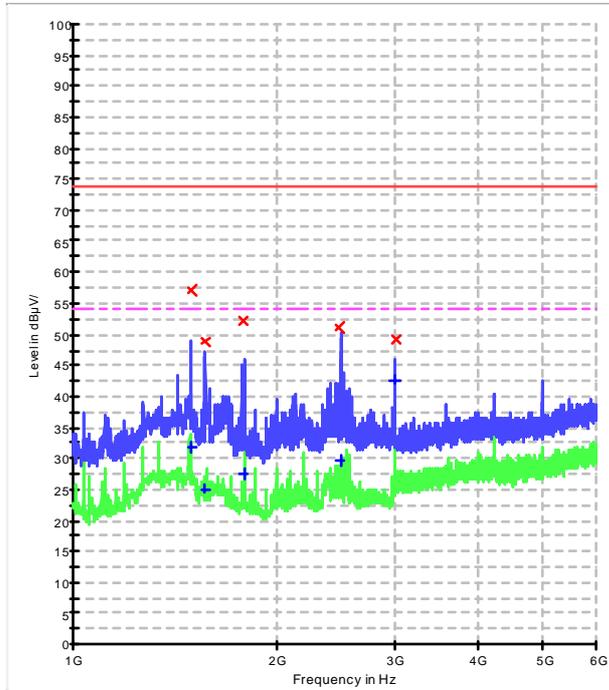
V



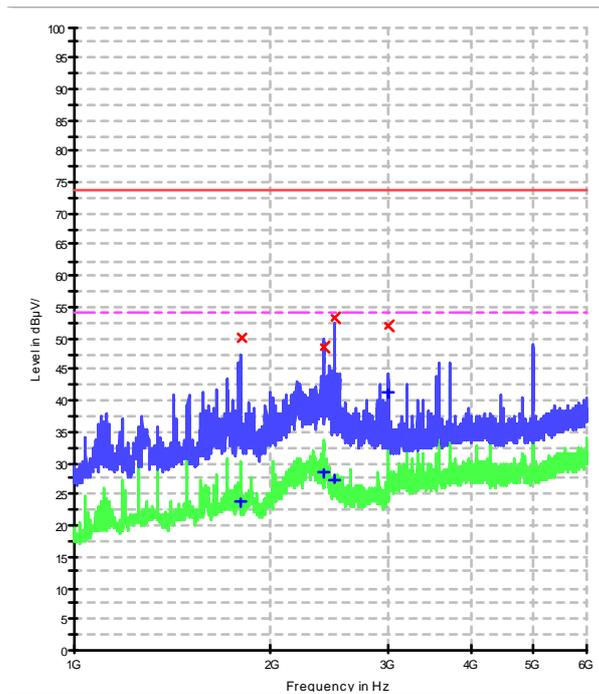
② Above 1 GHz

[Test mode : HDMI]

H

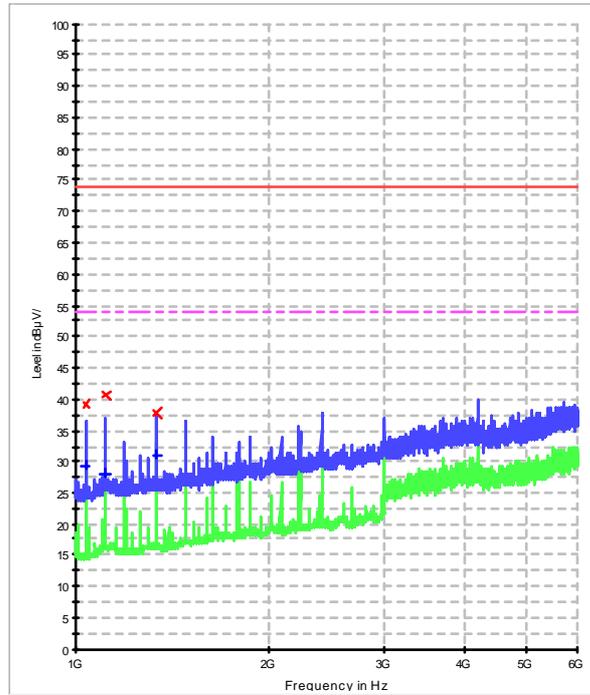


V



[Test mode : MHL]

H



V

