

TEST REPORT

Report Number	181200079SEL-EMC2(R1)
Applicant Name/Address	UNIANA Co., Ltd. 377, Mokdongdong-ro, Yang Chon-Gu, Seoul, Korea (07983)
Test Sample Description	
- Product	GAME MACHINE
- Model and/or Brand name	BALL RUNNER
- Variant model name.....	-
- Manufacturer Name / Address ..	UNIANA Co., Ltd. 377, Mokdongdong-ro, Yang Chon-Gu, Seoul, Korea (07983)
- Rating(s)	AC 120 V, (50/60) Hz
Receipt of sample(s)	27 Dec. 2018
Date of Test	21 Jan. 2019 ~ 22 Jan. 2019
Test Method(s)	FCC Part 15 Subpart B
Test Results & Uncertainty	See EMC Results Conclusion
Issue date	13 Mar. 2019

Note 1: The results shown in this test report refer only to the sample(s) tested.
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Note 3: This laboratory is not accredited for the test results marked as *.

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Intertek ETL SEMKO Korea Ltd.

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- Change History

Revision 1	7, 10 pages	Modified of Test Setup and Procedure.
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SECTION 2 EMC RESULTS CONCLUSION (WITH JUSTIFICATION)

We tested the GAME MACHINE, Model: BALL RUNNER, to determine if it was in compliance with the relevant US standards as marked on the test report.

We found that the unit met the requirement of FCC Part 15 Subpart B standards when tested as received.

Test Items	Applied Standards	Results			
		Comply	Not Comply	N/A	See Note
Disturbance Voltage	FCC Part 15 Subpart B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Radiated disturbance (Below 1 GHz)	FCC Part 15 Subpart B	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Radiated disturbance (Above 1 GHz)	FCC Part 15 Subpart B	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note 1) When determining the test conclusion, the Measurement Uncertainty of test has been considered.

Measurement Uncertainty

Disturbance Voltage	$U = 3.40$ [dB] (Confidence level approximately 95 %, $k = 2$)
Radiated Emissions	Horizontal : $U = 3.90$ [dB] Vertical : $U = 4.70$ [dB] (Confidence level approximately 95 %, $k = 2$)



SECTION 3 TEST ENVIRONMENT AND CONDITIONS

Test Environment

Test Item	Test Site	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)	Pressure (kPa)
Disturbance Voltage	Shielded Room #2	01-22	21.1 ± 1.0	42.0 ± 1.0	-
Radiated disturbance (Below 1 GHz)	10 m chamber	01-21	21.7 ± 1.0	41.1 ± 1.0	-
Radiated disturbance (Above 1 GHz)	10 m chamber	-	-	-	-



SECTION 4 EUT INFORMATION

Equipment Under Test (EUT): GAME MACHINE

Model: BALL RUNNER

Variant Model: -

Serial No.: -

Rated Voltage: AC 120 V, (50/60) Hz

Maximum clock frequency: 16 MHz



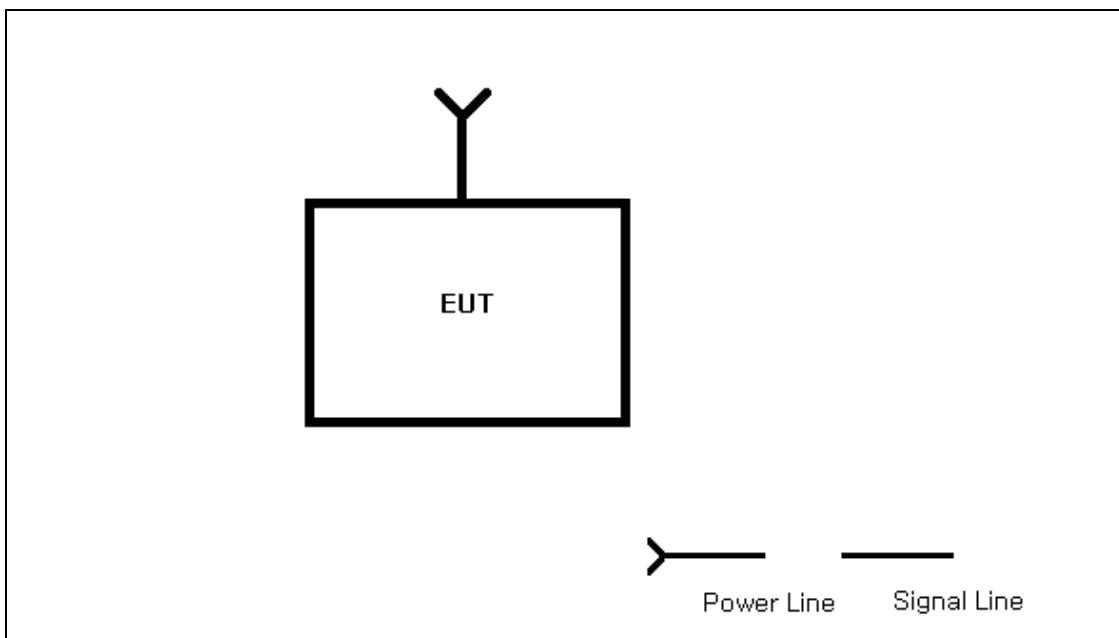
SECTION 5 TEST CONFIGURATION, OPERATION MODE AND SET-UP

Equipment	Model No.	Serial No.	Manufacturer	Connect type	CABLE Length (m)	Shield
GAME MACHINE	BALL RUNNER	-	UNIANA Co., Ltd.	AC IN	2.0	Unshielded

Test Operation Mode

Mode: Operating Mode

Test Setup





SECTION 6 EMISSION

Radiated disturbance test

Test Method and Summary

Test standard: FCC Part 15 Subpart B

Used Test Equipment

Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC001	EMI Test Receiver	R & S	ESU40	100478	2020.01.03	1Y
EMC002	EMI Test Receiver	R & S	ESU26	100590	2020.01.04	1Y
EMC025	Biconilog (Type7)	ETS-Lindgren	3142E	00203547	2019.11.02	2Y
EMC027	Biconilog (Type7)	ETS-Lindgren	3142E	00201450	2019.11.02	2Y
EMC075	AMP	R & S	SCU-08	100737	2020.01.04	1Y
EMC076	AMP	R & S	SCU-08	100738	2020.01.04	1Y

Operating Environment

Test Voltage: AC 120 V, 60 Hz

Test Setup and Procedure

The tabletop EUT along with its peripherals were placed on a non-conducted table with a height of 0.8 m in height table above the reference ground plane.

The floor-standing EUT is not typically installed with its base in direct electrical contact with, or connected to, a metal floor or grid, the EUT shall not be placed in direct electrical contact with the test site (or turntable) reference ground plane. If necessary to prevent direct metallic contact of the EUT and the reference ground plane, insulating material (up to 12 mm thick) shall be placed under the EUT.

Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 m to 4 m above the reference ground plane continuously to determine associated with higher emission levels and record them.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For measurements above 1 GHz, place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal.

The final measurement antenna elevation shall be that which maximizes the emissions.



Limits

- The test frequency range of Radiated Disturbance measurements are listed below.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1 000
108 – 500	2 000
500 – 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

(1) Limit for Radiated Emission below 1 000 MHz

Frequency range (MHz)	Class A Equipment (10 m distance) Quasi-peak (dB μ V/m)	Class B Equipment (3 m distance) Quasi-peak (dB μ V/m)
30 to 88	39.0	40
88 to 216	43.5	43.5
216 to 960	46.4	46
960 to 1 000	49.5	54

Note 1) The lower limit shall apply at the transition frequency.

Note 2) Additional provisions may be required for cases where interference occurs.

Note 3) According to 15.109(g), as an alternative to the radiated emission limit shown above, digital devices may be shown to comply with the standards (CISPR), Pub. 22 shown as below.

Note 4) Result (dB μ V/m) = Reading (dB μ V) + Corr. (Ant. Factor (dB/m) + Cable Loss (dB) – Amp. Gain (dB))

Result: QuasiPeak, Reading: Receiver reading value, Corr.: Correction Factor

Margin = Limit – Result

Frequency range (MHz)	Class A Equipment (10 m distance) Quasi-peak (dB μ V/m)	Class B Equipment (10 m distance) Quasi-peak (dB μ V/m)
30 to 230	40	30
230 to 1 000	47	37

(2) Limits for Radiated Emission above 1 000 MHz at a measuring distance of 3 m

Frequency (GHz)	Class A Equipment Peak (dB μ V/m)	Class A Equipment Average (dB μ V/m)	Class B Equipment Peak (dB μ V/m)	Class B Equipment Average (dB μ V/m)
1 to 40	80	60	74	54

Note 1) Result (dB μ V/m) = Reading (dB μ V) + Corr. (Ant. Factor (dB/m) + Cable Loss (dB) – Amp. Gain (dB))

Result: Final value, Reading: Receiver reading value, Corr.: Correction Factor

Margin = Limit – Result

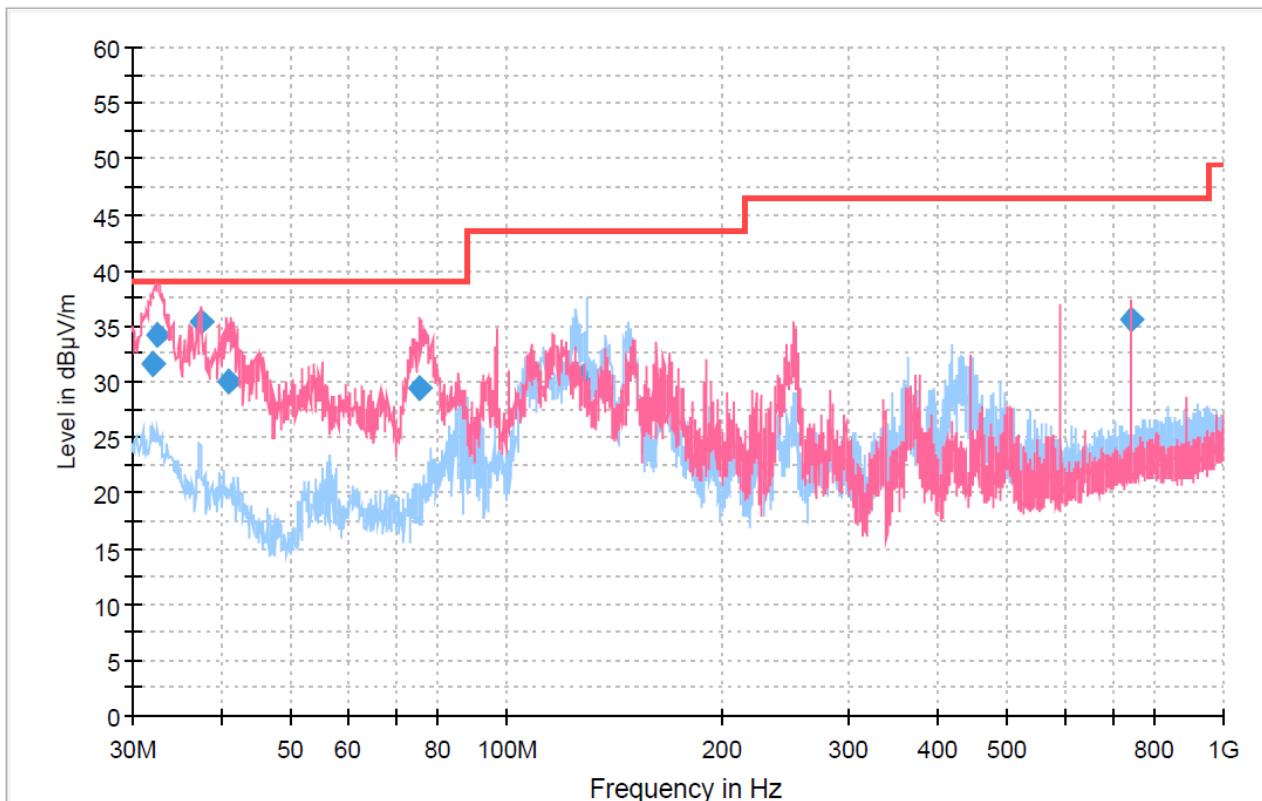
Note 2) If measured at a distance other than 3 m, apply the following formula to compensate the measured value.

Em = Edm + 20*log(d/3) (d: Measured distance)

Em: Result of measured distance correction, Edm: Measured value

Test Data

[Below 1 GHz]

**Final Result**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
31.999844	31.61	39.00	7.39	100.0	V	259.0	-21.9
32.584739	34.12	39.00	4.88	100.0	V	274.0	-22.2
37.321302	35.39	39.00	3.61	100.0	V	202.0	-24.7
40.775000	29.97	39.00	9.03	250.0	V	218.0	-26.5
75.505989	29.41	39.00	9.59	151.0	V	176.0	-28.8
129.218125	30.86	43.50	12.64	400.0	H	173.0	-26.2
742.228177	35.48	46.50	11.02	199.0	V	104.0	-10.1



Disturbance Voltage Test

Test Method and Summary

Test standard : FCC Part 15 Subpart B

Used Test Equipment

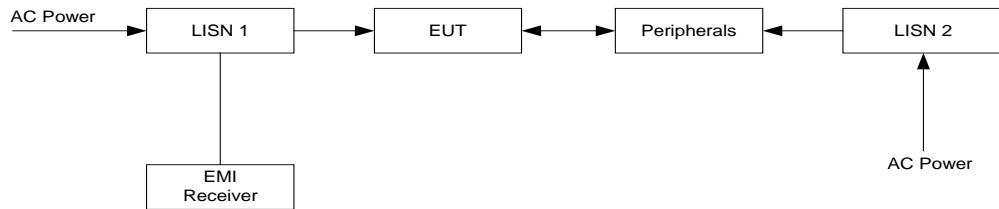
Control No.	Equipment	Manufacturer	Model No.	Serial No.	Next Cal.	Cal Int.
EMC004	EMI Test Receiver	R & S	ESR7	101560	2020.01.02	1Y
EMC007	Two-Line V-Network	R & S	ENV216	101982	2019.10.31	1Y

Operating Environment

Test Voltage: AC 120 V, 60 Hz

Test Setup and Procedure

Disturbance Voltage Test at Mains Terminal:



The tabletop EUT along with its peripherals were placed on a 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 m space from a vertical reference plane.

The floor-standing EUT is not typically installed with its base in direct electrical contact with, or connected to, a metal floor or grid, the EUT shall not be placed in direct electrical contact with the test site reference ground plane. If necessary to prevent direct metallic contact of the EUT and the reference ground plane, insulating material (up to 12 mm thick) shall be placed under the EUT.

The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 characteristic coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

Limits

Frequency range (MHz)	Limits dB(µV)			
	Quasi-peak		Average	
Class A	Class B	Class A	Class B	
0.15 to 0.50	79	66 to 56	66	56 to 46
0.50 to 5		56		46
5 to 30	73	60	60	50

Note 1) The lower limit shall apply at the transition frequencies.

Note 2) The limit decreases linearly with the logarithm of the frequency in the range (0.15 ~ 0.5) MHz.

Note 3) Result (dB μ V) = Reading (dB μ V) + Corr. (Insertion Loss (dB) + Cable Loss (dB))

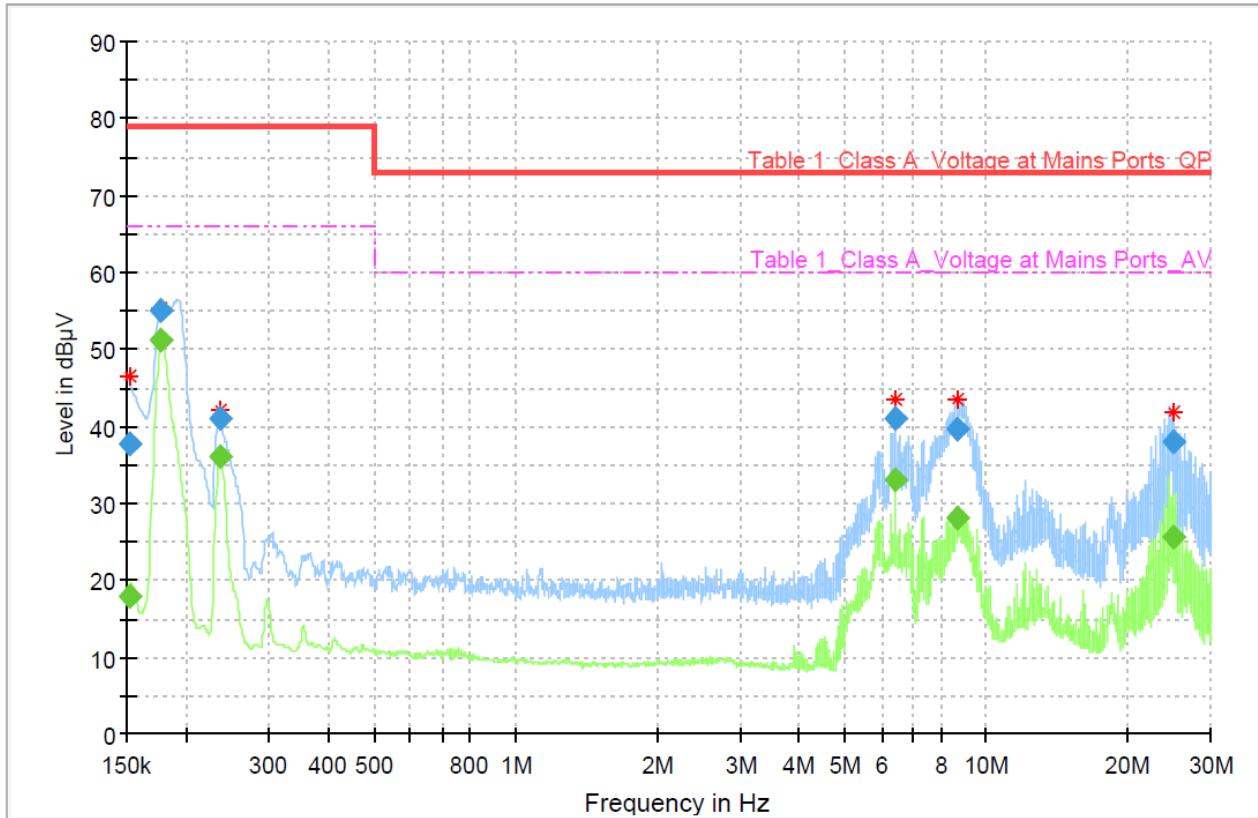
Result: QuasiPeak/CAverage, Reading: Receiver reading value, Corr.: Correction Factor

Margin = Limit – Result



Test Data

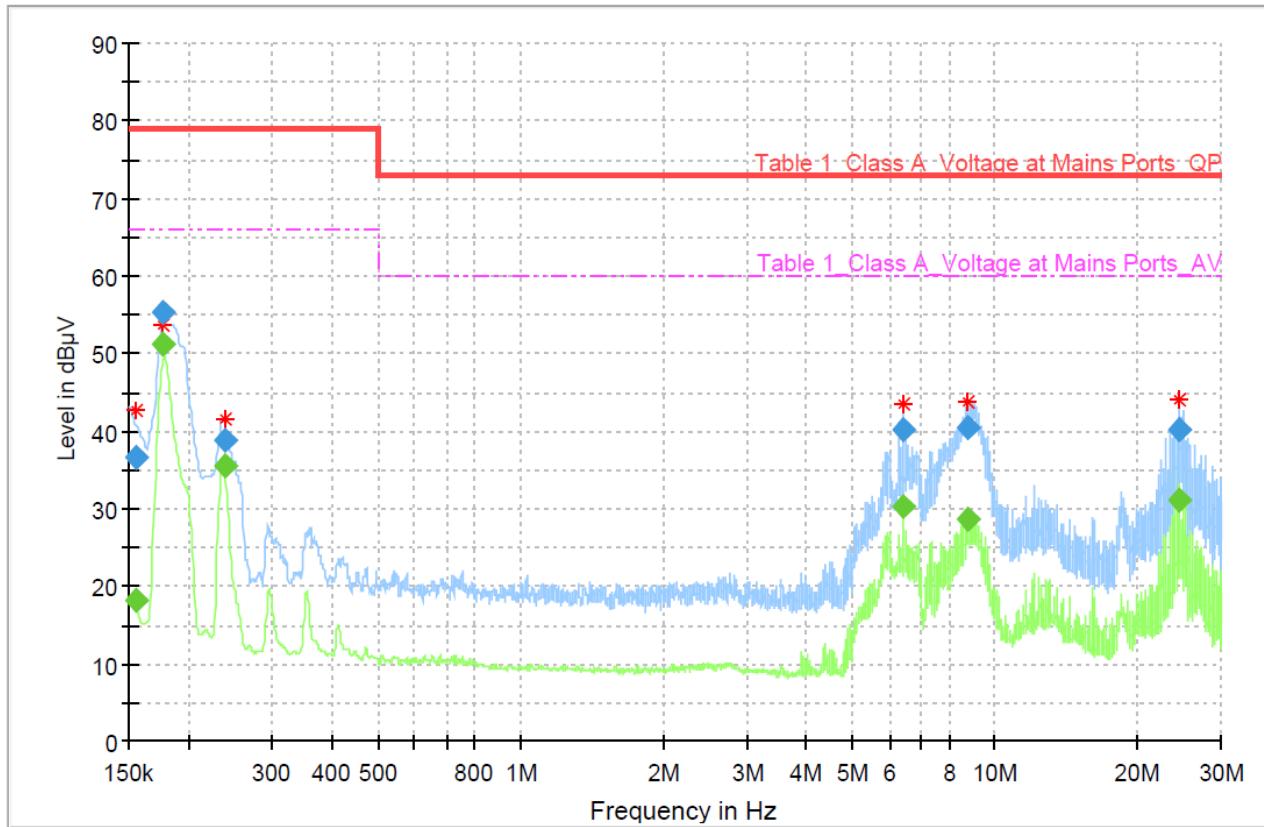
[Live]



Final Result

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.151399	---	17.95	66.00	48.05	L1	ON	9.8
0.151399	37.75	---	79.00	41.26	L1	ON	9.8
0.177111	---	51.12	66.00	14.88	L1	ON	10.0
0.177111	55.07	---	79.00	23.93	L1	ON	10.0
0.235722	---	36.04	66.00	29.96	L1	ON	9.8
0.235722	40.91	---	79.00	38.09	L1	ON	9.8
6.426638	---	33.10	60.00	26.90	L1	ON	9.8
6.426638	41.08	---	73.00	31.92	L1	ON	9.8
8.691737	---	27.98	60.00	32.02	L1	ON	9.9
8.691737	39.55	---	73.00	33.45	L1	ON	9.9
24.884087	---	25.71	60.00	34.29	L1	ON	10.0
24.884087	38.12	---	73.00	34.88	L1	ON	10.0

[Neutral]



Final Result

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.154321	---	18.04	66.00	47.96	N	ON	9.9
0.154321	36.60	---	79.00	42.40	N	ON	9.9
0.176824	---	51.16	66.00	14.84	N	ON	10.1
0.176824	55.41	---	79.00	23.59	N	ON	10.1
0.239016	---	35.39	66.00	30.61	N	ON	9.8
0.239016	38.94	---	79.00	40.06	N	ON	9.8
6.426364	---	30.40	60.00	29.60	N	ON	9.8
6.426364	40.07	---	73.00	32.93	N	ON	9.8
8.782077	---	28.63	60.00	31.37	N	ON	9.9
8.782077	40.37	---	73.00	32.63	N	ON	9.9
24.480828	---	31.03	60.00	28.97	N	ON	10.1
24.480828	40.18	---	73.00	32.82	N	ON	10.1

SECTION 7 APPENDIX I

Photographs of Test Configurations



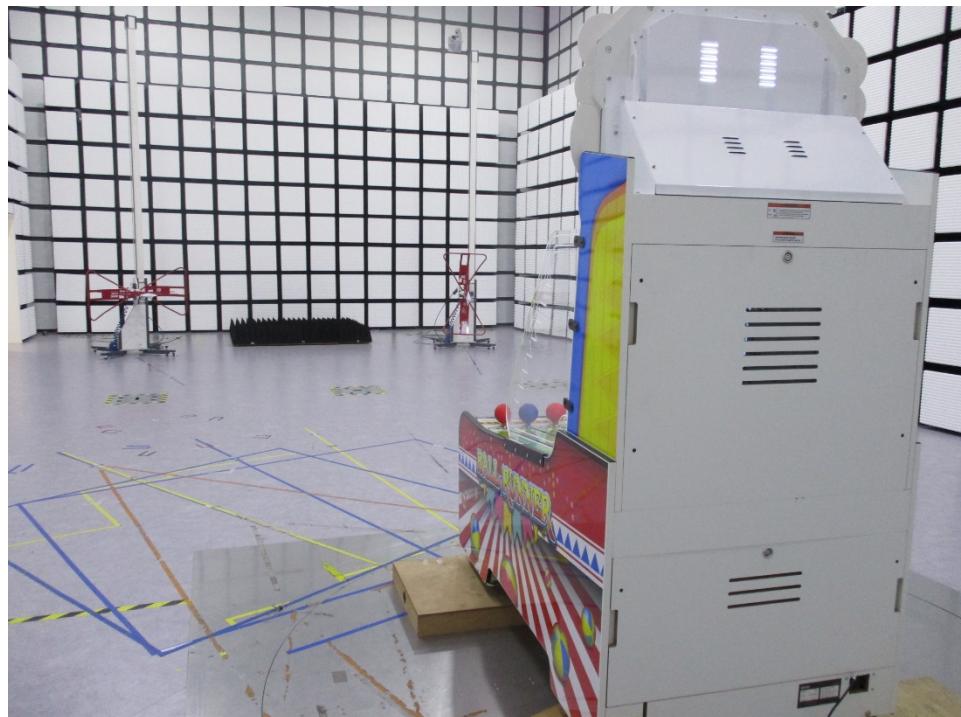
Disturbance Voltage Test



Disturbance Voltage Test



Radiated disturbance



Radiated disturbance

SECTION 8 APPENDIX II

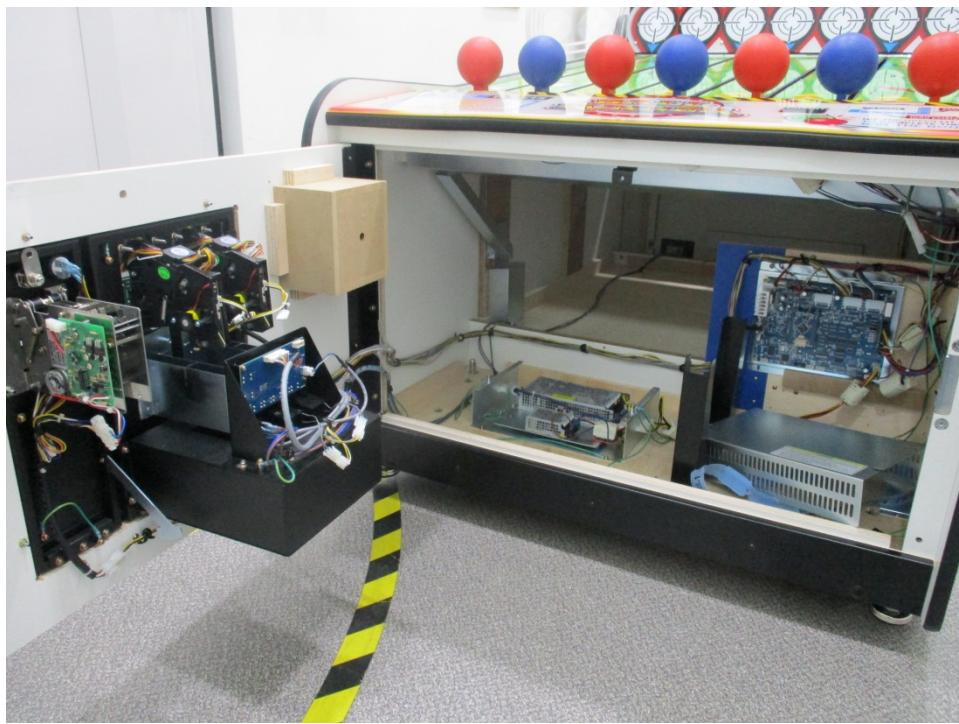
Photographs of EUT



Front



Rear



Inside 1



Inside 2

- E N D -