

FCC EVALUATION REPORT FOR CERTIFICATION

(Class II Permissive Change)

Manufacturer : OHSUNG ELECTRONICS CO., LTD

Date of Issue : October 7, 2005

#181 Gongdan-Dong, Gumi-City

Test Report S/N : GETEC-E3-05-068

Gyeongsangbuk-Do, Korea

Test Site : Gumi College EMC Center

Attn : Mr. Kwang-jae Ok / Manager

FCC ID

OZ5URCMX-3000

APPLICANT

OHSUNG ELECTRONICS CO., LTD

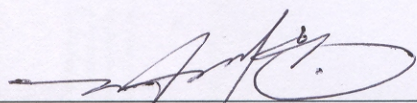
Rule Part(s)	: FCC Part 15 Subpart B
Equipment Class	: Computing Device Peripheral
Application Type	: Class II Permissive Change
EUT Type	: Remote Controller
Model No.	: MX-3000-N4
Class II Change(s)	: With alternate LCD Panel (UL0026OSTNA UDIA Co., Ltd.)

This equipment, with the Class II Permissive Change(s) listed above, has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003.

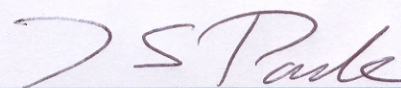
I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Reviewed by,



Jea-Hoon Jeong, Associate Engineer
GUMI College EMC center



Tae-Sig Park, Technical manager
GUMI College EMC center

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1. Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.

Responsible Party	: OHSUNG ELECTRONICS CO., LTD.
Contact Person	: Mr. Kwang-jae Ok / Manager
Manufacturer	: OHSUNG ELECTRONICS CO., LTD
	#181 Gongdan-Dong, Gumi-city, Gyeongsangbuk-do, Korea

- **FCC ID.** OZ5URCMX-3000
- **Application Type** Class II Permissive Change
- **EUT Type** Remote Controller
- **Power Source** AC 120V / 60Hz
DC 5V (Lithium Ion battery)
- **Model No.** MX-3000-N4
- **Rule Part(s)** FCC Part 15 Subpart B
- **Equipment Class** Computing device peripheral
- **Test Procedure(s)** ANSI C63.4 (2003)
- **Dates of Test** October 6, 2005
- **Place of Test** Gumi College EMC Center
- **Test Report No.** GETEC-E3-05-068
- **Class II Change(s)** **With alternate LCD Panel**
(UL0026OSTNA UDIA Co., Ltd.)

2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **OHSUNG ELECTRONICS CO., LTD. RF Transmitter Universal Remote Control (Model No.: MX-3000-N4)**

These measurement tests were conducted at **Gumi College EMC Center**.

The site address is 407, Bugok-Dong, Gumi-City, Gyeongsangbuk-Do, Korea

This test site is one of the highest point of Gumi 1 college at about 200 kilometers away from Seoul city and 40 kilometers away from Daegu city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 on October 19, 1992



Fig 1. The map above shows the Gumi College in vicinity area.

3. Test Conditions & EUT Information

3.1 Description of EUT

The Equipment Under Test (EUT) is the **OHSUNG ELECTRONICS CO., LTD. RF Transmitter Universal Remote Control (Model No.: MX-3000-N4)**

Test Mode	Download mode IR remote control mode
AC/DC Adapter	061-052000-UF (Xiang Fa Electronics Co., Ltd.) Input: 100 ~ 240Vac, 50 ~ 60Hz, 0.3A Output: 5Vdc, 2A
Cable(s)	2.1m AC/DC Adapter cable Connected to the EUT 1.2m USB cable Connected to the EUT and notebook PC

3.2 Support Equipment used

Notebook PC	COMPAQ E500 S/N: 1J1BFTBZ528G FCC ID: DoC
Serial mouse	LOGITECH M-S69 S/N: 334684-108 FCC ID: JNZ211443
Printer	Hewlett Packard 970CXI S/N: MY9B01F1FG FCC ID: DoC

4. Description of tests

4.1 Conducted Emission

The Line conducted emission test facility is inside a $4 \times 8 \times 2.5$ meter shielded enclosure.

The EUT was placed on a non-conducting 1.0 by 1.5 meter table, which is 0.8 meters in height and 0.4 meters away from the vertical wall of the shielded enclosure.

The EUT was powered from the Rohde & Schwarz LISN (ESH2-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH3-Z5). Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCS30).

The EMI test receiver was scanned from 150kHz to 30MHz with 20msec sweep time to determine the frequency producing the maximum EME from the EUT. The frequency producing the maximum level was re-examined using Quasi-Peak mode of the EMI test receiver.

The bandwidth of Quasi-peak mode was set to 9KHz. Each emission was maximized consistent with typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum diagram emission. Excess cable lengths were bundled at center with 30 – 40 centi-meters.

Each EME reported was calibrated using the R/S signal generator

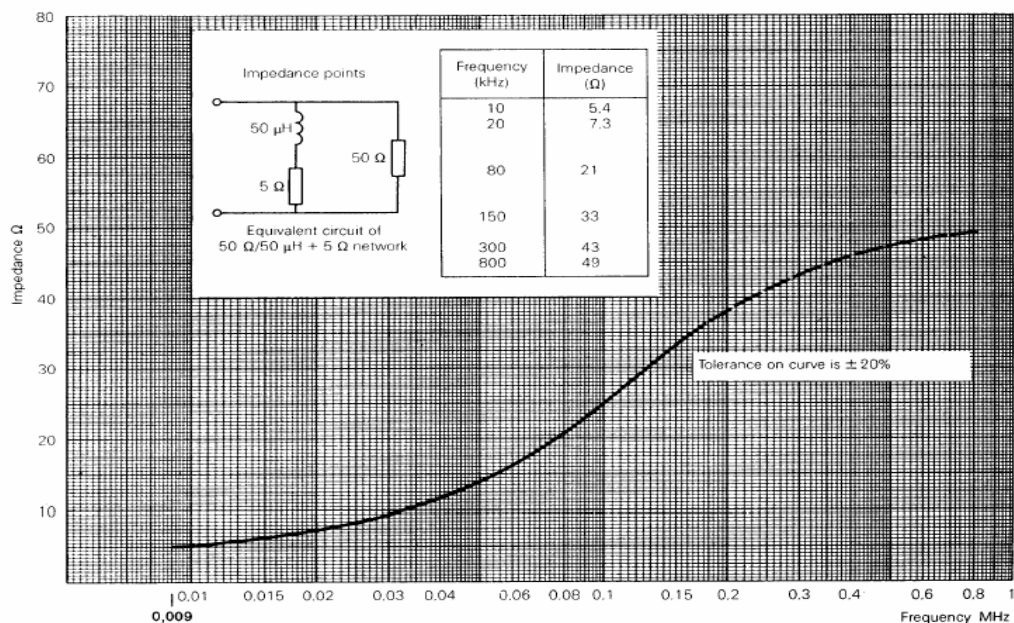


Fig 2. Impedance of LISN

4.2 Radiated Emission

Preliminary measurements were conducted 3m semi anechoic chamber using broadband antennas to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The technology configuration, mode of operation and turntable azimuth with respect to antenna was note for each frequency found.

The spectrum was scanned from 30 to 1000MHz using biconical antenna (R&S, HK116) and log-periodic antenna (R&S, HL223).

Above 1GHz, calibrated double ridged horn antennas(Schwarzbeck, BBHA 9120D) were used.

Final measurements were made outdoors at 3 m-test range using biconical antenna (R&S, HK116) , log-periodic antenna (R&S, HL223)and calibrated double ridged horn antennas(Schwarzbeck, BBHA 9120D).

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during pre-scan measurements was re-examined and investigated using EMI test receiver. (ESI)

The detector function was set to peak mode, the bandwidth of the receiver was set to 100KHz and 1MHz.

The EUT, support equipment and interconnecting cables were reconfigured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non-metallic 1.0×1.5 meter table.

The turntable containing the test sample was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission. Each EME reported was calibrated using the R/S signal generator

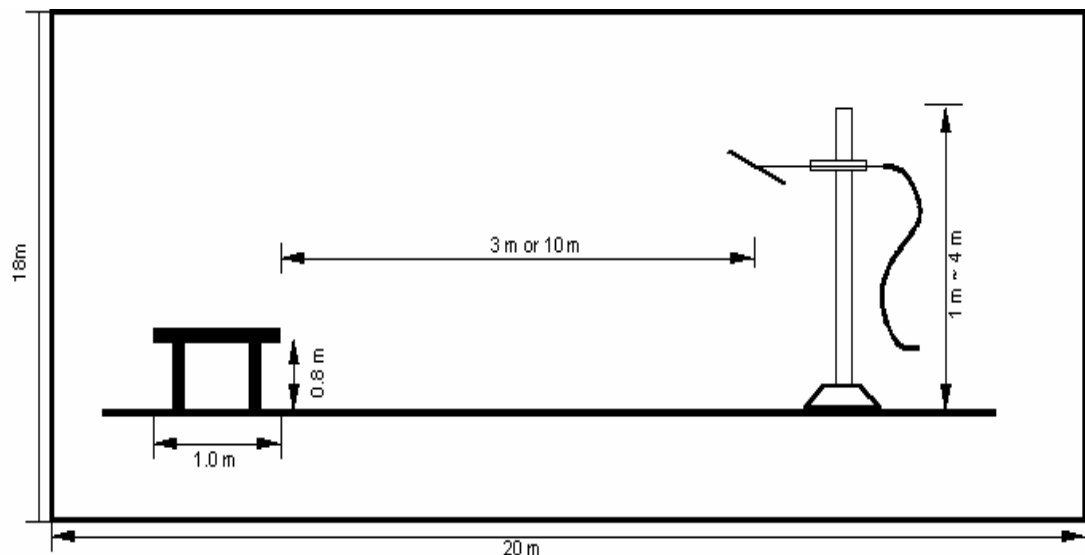


Fig 3. Dimensions of Open Site Test Area

5. Conducted emission

5.1 Operating environment

Temperature : 22 °C
Relative humidity : 52 %

5.2 Test set-up

The conducted emission measurements were performed in the shielded room.

The EUT was placed on wooden table, 0.8m heights above the floor, 0.4m from the reference ground plane (GRP) wall and 0.8m from AMN.

AMN is bonded on horizontal reference ground plane.

The ground plane, which was electrically bonded to the shield room, ground system and all power lines entering the shield room, was filtered.

5.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO "Guide to the expression of uncertainty in measurement".

The measurement uncertainty was given with a confidence of 95%.

Contribution	Probability Distribution	Uncertainty (±dB)	
		Power Port	Communication port
Receiver specification	Rectangular	0.50	0.50
LISN coupling specification	Rectangular	1.50	
ISN coupling specification	Rectangular		1.50
Mismatch			
LISN VRC : $\Gamma_{l=}$ 0.20	U-shaped	0.05	0.05
ISN VRC : $\Gamma_{l=}$ 0.20		-0.05	-0.05
ATT VRC(IN) : $\Gamma_{g=}$ 0.03			
Uncertainty limits $20\log(1 \pm \Gamma_l \Gamma_g)$			
Mismatch			
Receiver VRC : $\Gamma_{l=}$ 0.09	U-shaped	0.09	0.09
ATT VRC : $\Gamma_{g=}$ 0.11		-0.09	-0.09
Uncertainty limits $20\log(1 \pm \Gamma_l \Gamma_g)$			
System repeatability	Std Deviation	0.11	0.11
Cable and input attenuator calibration	Normal (k=2)	0.04	0.04
Repeatability of EUT			
Combined standard uncertainty $U_c(y)$	Normal	0.92	0.92
		-0.92	-0.92
Extended uncertainty U	Normal (k=2)	1.85	1.85
		-1.85	-1.85

5.4 Limit

RFI Conducted	FCC Limit(dB) Class B	
Freq. Range	Quasi-Peak	Average
150kHz – 0.5MHz	66 – 56*	56 – 46*
0.5MHz – 5MHz	56	46
5MHz – 30MHz	60	50
*Limits decreases linearly with the logarithm of frequency.		

5.5 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Calibrated Date
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 17. 2004
■ - ESH3-Z5	Rohde & Schwarz	Artificial mains network	838979/020	12. 17. 2004
■ - ESH2-Z5	Rohde & Schwarz	Artificial mains network	829991/009	12. 17. 2004

5.5 Test data for conducted emission**5.5.1 Download mode**

- Test Date : October 6, 2005
- Resolution bandwidth : 9kHz
- Frequency range : 0.15MHz ~ 30MHz
- AC Power Source : AC 120V, 60Hz / 5VDC (Lithium-ion Battery)

Frequency (MHz)	Line	Quasi-Peak (dBuV)		Margin (dB)	Average (dBuV)		Margin (dB)
		Emission level	limits		Emission level	limits	
0.180	H	43.99	64.49	20.50	32.49	54.49	22.00
0.345	H	26.26	59.08	32.82	17.66	49.08	31.42
0.410	H	28.39	57.65	29.25	17.29	47.65	30.35
0.710	N	19.00	56.00	37.00	12.40	46.00	33.60
1.090	H	31.00	56.00	25.00	16.20	46.00	29.80
1.840	H	26.04	56.00	29.96	15.24	46.00	30.76
2.580	H	30.26	56.00	25.74	11.56	46.00	34.44
8.840	H	25.42	60.00	34.58	18.82	50.00	31.18

Comment: Pol: H(Live), N(Neut)

5.5.2 IR remote control mode

- Test Date : October 6, 2005
- Resolution bandwidth : 9kHz
- Frequency range : 0.15MHz ~ 30MHz
- AC Power Source : AC 120V, 60Hz / 5VDC (Lithium-ion Battery)

Frequency (MHz)	Line	Quasi-Peak (dBuV)		Margin (dB)	Average (dBuV)		Margin (dB)
		Emission level	limits		Emission level	limits	
0.180	H	44.29	64.49	20.20	33.09	54.49	21.40
0.400	H	32.20	57.85	25.65	18.60	47.85	29.25
1.095	H	34.50	56.00	21.50	18.50	46.00	27.50
1.835	H	33.35	56.00	22.65	20.65	46.00	25.35
2.540	H	29.35	56.00	26.65	12.65	46.00	33.35
7.500	H	25.02	60.00	34.98	13.02	50.00	36.98

Comment: Pol: H(Live), N(Neut)

6. Radiated emission test

6.1 Operating environment

Temperature : 31 °C
Relative humidity : 42 %

6.2 Test set-up

A preliminary scan with peak mode was performed in the semi anechoic chamber and found frequency for open area test site.

The formal radiated emission was measured at 3m-distance open area test site.

The EUT was placed on a non-conductive turntable approximately 0.8 meters above the ground plane.

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 and 4.0 meters in order to determine the maximum emission levels.

This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

6.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.

The measurement uncertainty was given with a confidence of 95%.

Contribution	Probability Distribution	Uncertainty (dB)			
		Biconical Ant.		Log-periodic Ant.	
		3m	10m	3m	10m
Ambient signal					
Antenna factor calibration	Normal (k=2)	0.50	0.50	0.50	0.50
Receiver specification	Rectangular	0.50	0.50	0.50	0.50
Antenna directivity	Rectangular	0.25	0.00	1.50	0.25
Antenna phase center variation	Rectangular	0.00	0.00	1.00	0.20
Antenna factor frequency interpolation	Rectangular	0.25	0.25	0.25	0.25
Measure distance variation	Rectangular	0.60	0.40	0.60	0.40
Site imperfections	Rectangular	1.46	-2.32	2.26	2.94
Mismatch					
Receiver VRC : $\Gamma_I = 0.09$	U-shaped	0.33	0.33	0.33	0.33
Antenna VRC : $\Gamma_g = 0.43$ (Bi) 0.23 (Lp)		-0.35	-0.35	-0.18	-0.18
Uncertainty limits $20\log(1 \pm \Gamma_I \Gamma_g)$					
System repeatability	Std Deviation	0.18	0.18	0.17	0.17
Cable loss calibration	Normal (k=2)	0.05	0.05	0.05	0.05
Combined standard uncertainty $U_c(y)$	Normal	1.05	1.45	1.78	1.80
		-1.05	-1.45	-1.77	-1.78
Extended uncertainty U	Normal (k=2)	2.11	2.90	3.55	3.59
		-2.11	-2.90	-3.53	-3.57

6.4 Limit

Frequency (MHz)	FCC Limit @ 3m. dB μ V/m	CISPR Limit @ 10m. dB μ V/m
30 – 88	40.0	30.0
88 – 216	43.5	30.0
216 – 230	46.0	30.0
230 – 960	46.0	37.0
960 – 1000	54.0	37.0
> 1000	54.0	No Specified limit

6.5 Test equipment used

Model Number	Manufacturer	Description	Serial Number	Calibrated Date
■ - ESI	Rohde & Schwarz	EMI test receiver	830482/010	12. 17. 2004
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 17. 2004
■ - HK116	Rohde & Schwarz	Biconical antenna	826861/018	11. 19. 2004
■ - HL223	Rohde & Schwarz	Log-periodic antenna	829228/011	11. 19. 2004
■ - HD100	HD GmbH	Position Controller	100/692/01	NCR
■ - DS415S	HD GmbH	Turntable	415/657/01	NCR
■ - MA240	HD GmbH	Antenna Mast	240/565/01	NCR

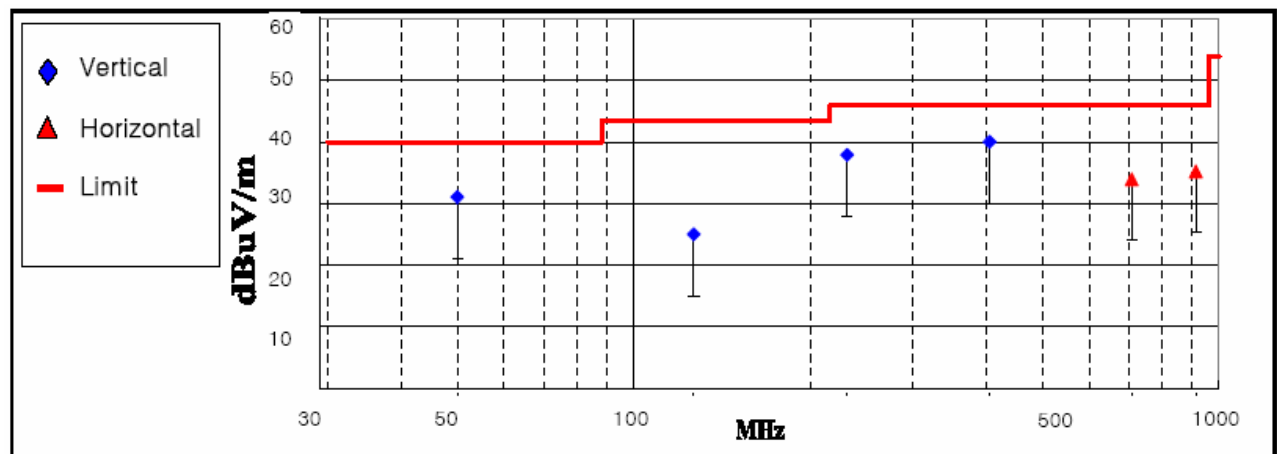
6.6 Test data for radiated emission

6.6.1 IR remote control mode

- Test Date : October 6, 2005
- Measuring Distance : 3m
- Spectrum resolution bandwidth (6dB) : 120kHz
- Detector mode : Quasi-peak detector mode
- Power Source : AC 120V, 60Hz / 5VDC (Lithium-ion Battery)

Frequency (MHz)	Measurement Level				Limit (dBuV/m)	Margin (dBuV/m)	Positioning System		
	Reading Value(dBuV)	Antenna Factor(dB)	Cable Loss(dB)	Test Result (dBuV/m)			Pol. (H/V)	Height (cm)	Angle (deg)
49.89	19.9	9.20	2.00	31.1	40.0	8.9	V	102	175
126.56	10.6	11.40	3.01	25.0	43.5	18.5	V	132	33
231.41	18.5	15.15	4.28	37.9	46.0	8.1	V	140	212
405.71	18.1	15.84	6.13	40.1	46.0	5.9	V	125	167
709.62	5.6	20.43	7.96	34.0	46.0	12.0	H	345	20
912.85	3.6	22.47	9.19	35.3	46.0	10.7	H	378	178

Note: "H": Horizontal, "V": Vertical



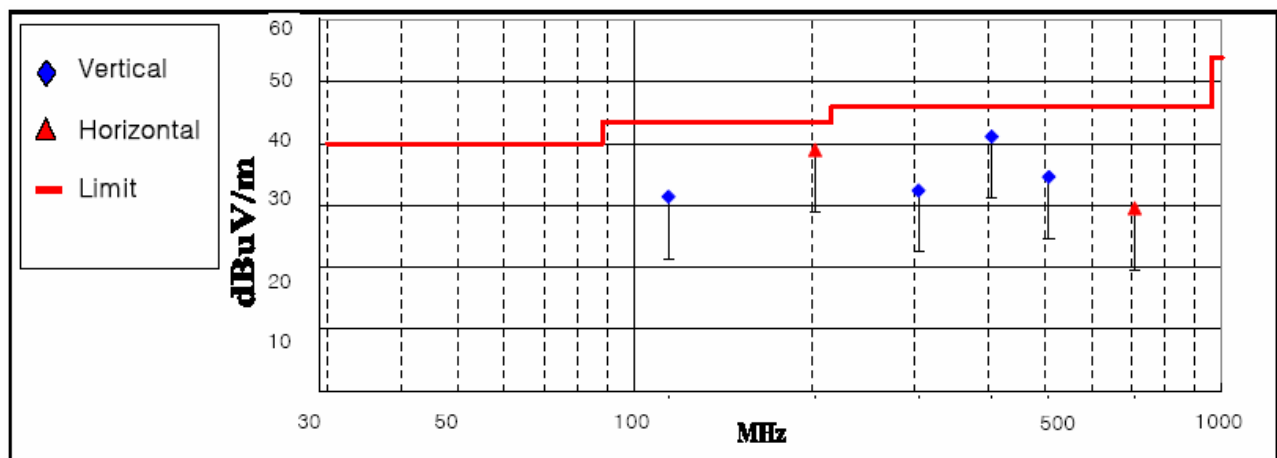
< Fig 4. Radiated emission result >

6.6.2 Download mode

- Test Date : October 6, 2005
- Measuring Distance : 3m
- Spectrum resolution bandwidth (6dB) : 120kHz
- Detector mode : Quasi-peak detector mode
- Power Source : AC 120V, 60Hz / 5VDC (Lithium-ion Battery)

Frequency (MHz)	Measurement Level				Limit (dBuV/m)	Margin (dBuV/m)	Positioning System		
	Reading Value(dBuV)	Antenna Factor(dB)	Cable Loss(dB)	Test Result (dBuV/m)			Pol. (H/V)	Height (cm)	Angle (deg)
114.08	17.9	10.66	2.84	31.4	43.5	12.1	V	102	277
202.83	21.3	13.75	3.93	39.0	43.5	4.5	H	385	165
304.24	14.3	13.03	5.14	32.5	46.0	13.5	V	165	30
405.62	19.2	15.84	6.13	41.2	46.0	4.8	V	147	210
507.11	10.4	17.59	6.66	34.6	46.0	11.4	V	130	177
709.76	1.2	20.44	7.96	29.6	46.0	16.4	H	314	165

Note: "H": Horizontal, "V": Vertical



< Fig 5. Radiated emission result >

7. Recommendation & conclusion

The data collected shows that the Gumi College EMC Center.

OHSUNG ELECTRONICS CO., LTD. RF Transmitter Universal Remote Control (Model No.: MX-3000-N4)
was complies with §15.107 and §15.109 of the FCC Rules.