



## ***FCC EVALUATION REPORT FOR CERTIFICATION***

**Manufacturer : OHSUNG ELECTRONICS CO., LTD**  
**#181 Gongdan-Dong, Gumi-City,**  
**Gyeongsangbuk-Do, Korea**  
**Attn : Mr. Kwang-jae Ok / Team Leader Q.C**

**Date of Issue : November 24, 2006**  
**Test Report No. : GETEC-E3-06-067**  
**Test Site : Gumi College EMC Center**  
**(Registration No.: 100749)**

**FCC ID.**

**OZ5URCMSC400**

**APPLICANT**

**OHSUNG ELECTRONICS CO., LTD**

**Rule Part(s) : FCC Part 15 Subpart B**  
**Equipment Class : Class B computing device peripheral (JBP)**  
**EUT Type : Master system controller**  
**Type of Authority : Certification**  
**Model No. : MSC-400**  
**Trade name : URC**

**This equipment has been shown to be in 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 vest 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,**

**Dong-Hun Kang, Associate Engineer**  
**GUMI College EMC center**

**Tae-Sig Park, Technical Manger**  
**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.*

**Applicant: OHSUNG ELECTRONICS CO., LTD.**

**Applicant Address: #181 Gongdan-Dong, Gumi-city, Gyeongsangbuk-do, Korea**

**Manufacturer: OHSUNG ELECTRONICS CO., LTD.**

**Manufacturer Address: #181 Gongdan-Dong, Gumi-city, Gyeongsangbuk-do, Korea**

**Contact Person: Mr. Kwang-jae Ok / Team Leader Q.C**

**Tel. & Fax No.: Tel No.: +82-54-468-7284**

- **FCC ID.** OZ5URCMSC400
- **EUT Type** Master system controller
- **Model No.** MSC-400
- **Rule Part(s)** FCC Part 15 Subpart B
- **Test Procedure(s)** ANSI C63.4 (2003)
- **FCC Procedure** Certification
- **Dates of Test** November 09, 2006
- **Place of Test** **Gumi College EMC Center** ( FCC Registration No.: 100749)  
407, Bugok-Dong, Gumi-si, Gyeongsangbuk-Do, Korea
- **Test Report No.** GETEC-E3-06-067
- **Dates of Issue** November 21, 2006

## 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. Master system controller (Model No.:MSC-400)**

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.**  
**Master system controller (Model No.: MSC-400)**

*MSC-400 Master system controller can include IR(Infrared controlled devices), RS-232(Serial controlled devices),  
And Relay and voltage controlled devices (such as lights, drapes, curtains and blinds).*

<b>Power Supply</b>	AC120V / 60Hz
<b>AC/DC Adapter</b>	EA1050E-120 (EDACPOWER ELEC.) Input: 100-240V 50/60Hz 1.8A Output: DC12V 3.5A
<b>Microprocessor</b>	Advanced ARM7TDMI
<b>Memory</b>	32 Megabytes of SDRAM and 64 Megabytes NAND Flash Memory
<b>Learning Capability</b>	Standard Frequencies (15kHz to 460kHz)
<b>RF Range (Radio Frequency)</b>	50 to 100 feet, depending upon the environment
<b>Weight</b>	77.6 oz.
<b>Size</b>	17.25" * 8.5" * 2.5"

### 3.2 Support Equipment / Cables used

#### 3.2.1 Used Support Equipment

Description	Manufacturer	Model No.	S/N & FCC ID
Notebook PC	COMPAQ	Nx9000	S/N: CNF333128L FCC ID: CRVSA-02T1-75
RF remote controller	OHSUNG Electronics	TX-1000	S/N: Prototype FCC ID: OZ5URCTX1000
Relay	OHSUNG Electronics	N/A	S/N: Prototype FCC ID: N/A
IR sensor	OHSUNG Electronics	N/A	S/N: Prototype FCC ID: N/A

*See "Appendix E – Test Setup Photographs" for actual system test set-up*

#### 3.2.2 Used Cable(s)

Cable No.	Condition	Description
Adapter Cable	Connected to the Adapter	1.9m Unshielded with ferrite core
USB Cable	Connected to the EUT and Notebook PC	1.8m Shielded
RS232 cable	Connected to the EUT and Notebook PC	1.8m Shielded
Video or voltage sensor cable	Connected to the EUT	1.8m Unshielded
IR programmable Output cable	Connected to the EUT and IR sensor	3.0m Unshielded
RF in cable	Connected to the EUT and RF remote controller	1.8m Unshielded
RF out cable	Connected to the EUT and relay	0.5m Unshielded

### 3.3 Modification Item(s)

-. None

## 4. Description of tests

### 4.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used.

The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.

The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency : AC120V / 60Hz
- Test Mode(s)
  - . PC communication mode via RS-232 with an software which controlled IR, Relay and etc.

#### 4.2 Conducted Emission

The Line conducted emission test facility is inside a 4×8×2.5 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

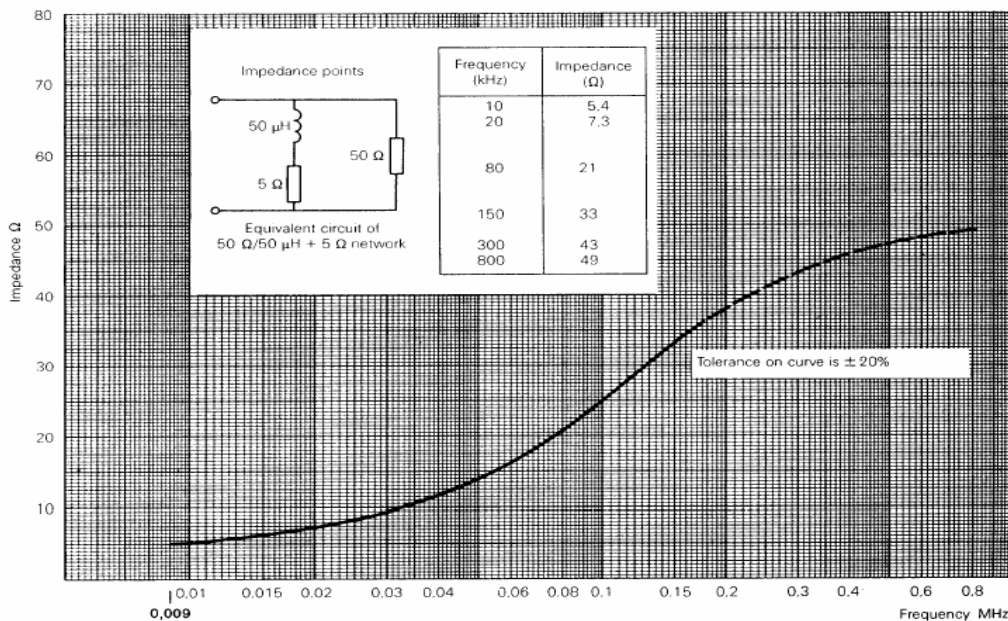


Fig 2. Impedance of LISN



### 4.3 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 120kHz 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

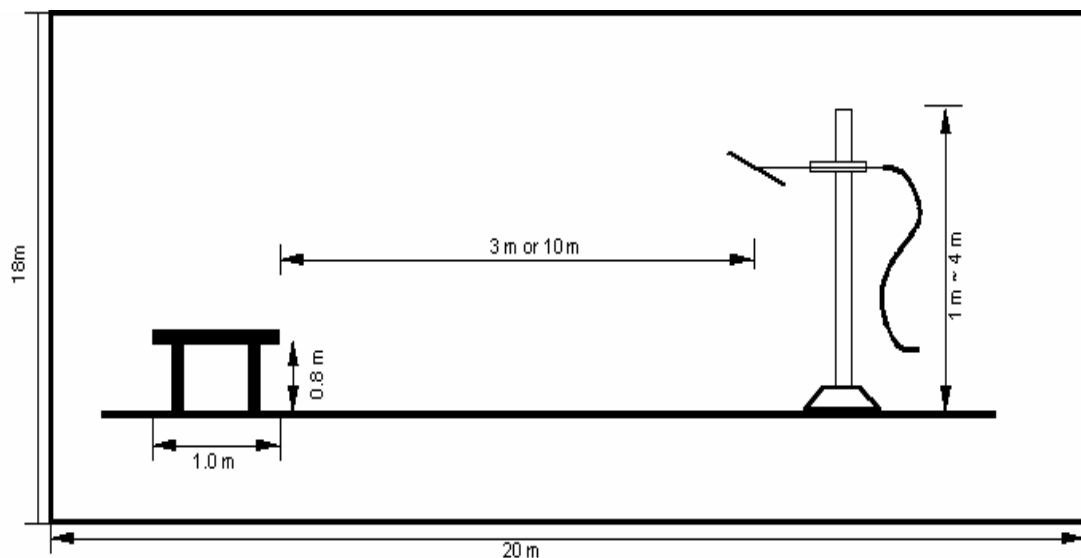


Fig 2. Dimensions of Open Site Test Area

## 5. Conducted emission

### 5.1 Operating environment

Temperature : 22 °C  
Relative humidity : 43 %

### 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 ( $\pm$ 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	U-shaped		
LISN VRC : $\Gamma_{l=}$ 0.20		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	U-shaped		
Receiver VRC : $\Gamma_{l=}$ 0.09		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	0.55	0.55
Cable and input attenuator calibration	Normal (k=2)	0.08	0.08
Repeatability of EUT			
Combined standard uncertainty $U_c(y)$	Normal	1.07 -1.07	1.07 -1.07
Extended uncertainty U	Normal (k=2)	2.15 -2.15	2.15 -2.15

**5.4 Limit**

RFI Conducted	FCC Limit(dB) Class B	
	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	Due to calibration
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 14. 2006
■ - ESH3-Z5	Rohde & Schwarz	Artificial mains network	838979/020	12. 16. 2006
■ - ESH2-Z5	Rohde & Schwarz	Artificial mains network	829991/009	12. 16. 2006

### 5.6 Test data for conducted emission

- Test Date : November 9, 2006
- Resolution bandwidth : 9kHz
- Frequency range : 0.15MHz ~ 30MHz
- AC Power Source : AC120V / 60Hz

Frequency (MHz)	Insertion Loss	Cable Loss	Pol.	Quasi-Peak[dBuV]			Average[dBuV]			Margin[dBuV]	
				Limit	Reading	Result	Limit	Reading	Result	Quasi	Average
0.175	0.09	-0.19	N	64.72	49.5	49.41	54.72	38.9	38.81	15.31	15.91
0.235	0.11	-0.21	N	62.27	43.1	43.00	52.27	33.5	33.40	19.27	18.87
0.295	0.11	-0.18	N	60.38	44.0	43.94	50.38	37.6	37.54	16.45	12.85
0.470	0.14	-0.16	L1	56.51	35.8	35.78	46.51	33.8	33.78	20.73	12.73
0.650	0.13	-0.23	N	56.00	34.0	33.90	46.00	31.4	31.30	22.10	14.70
0.765	0.15	-0.23	L1	56.00	37.6	37.52	46.00	36.4	36.32	18.48	9.68
0.825	0.15	-0.23	L1	56.00	37.6	37.52	46.00	36.3	36.22	18.48	9.78
1.940	0.19	-0.31	L1	56.00	33.3	33.17	46.00	31.1	30.97	22.83	15.03
3.000	0.22	-0.14	L1	56.00	40.2	40.28	46.00	33.8	33.88	15.72	12.12
6.800	0.33	-0.11	L1	60.00	36.4	36.63	50.00	29.4	29.63	23.37	20.37
12.810	0.51	0.05	L1	60.00	31.2	31.76	50.00	30.8	31.36	28.24	18.64

Comment: Pol: L1(Live), N(Neut)

## 6. Radiated emission

### 6.1 Operating environment

Temperature : 19°C  
Relative humidity : 38 %

### 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/10m-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	-2.00	-2.40	2.50	2.40
Mismatch					
Receiver VRC : $\Gamma_l = 0.09$	U-shaped	0.33	0.33	0.18	0.18
Antenna VRC : $\Gamma_g = 0.43$ (Bi) 0.23 (Lp)		-0.35	-0.35	-0.18	-0.18
Uncertainty limits $20\log(1 \pm \Gamma_l \Gamma_g)$					
System repeatability	Std Deviation	0.82	0.82	0.79	0.79
Cable loss calibration	Normal (k=2)	0.09	0.09	0.09	0.09
Combined standard uncertainty $U_c(y)$	Normal	1.54	1.70	2.03	1.68
		-1.54	-1.70	-2.03	-1.68
Extended uncertainty U	Normal (k=2)	3.09	3.39	4.05	3.36
		-3.09	-3.40	-4.05	-3.36

**6.4 Limit**

Frequency (MHz)	FCC Limit @ 3m. dB $\mu$ V/m	CISPR Limit @ 10m. dB $\mu$ 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

**6.5 Test equipment used**

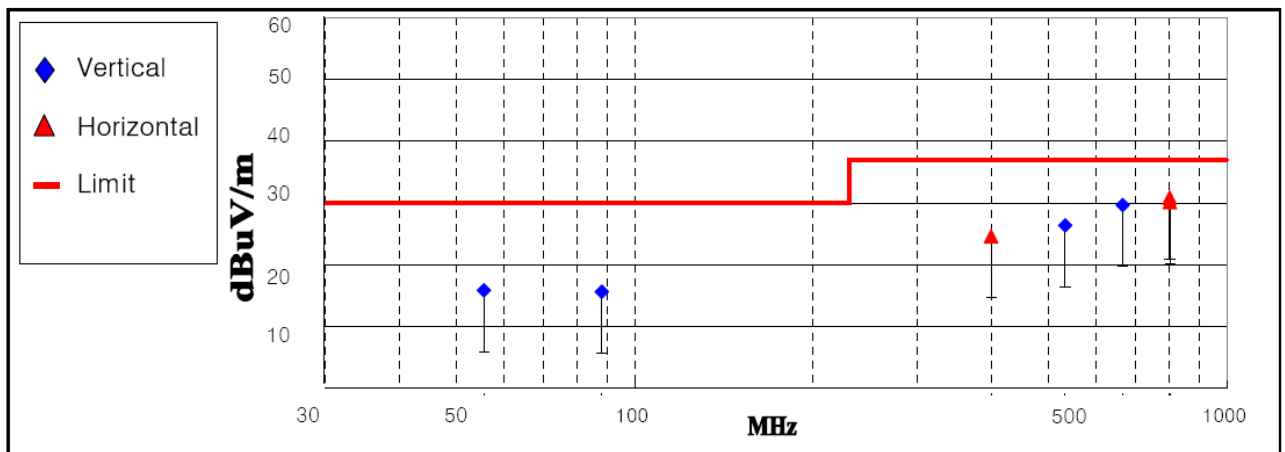
Model Number	Manufacturer	Description	Serial Number	Due to calibration
■ - ESI	Rohde & Schwarz	EMI test receiver	830482/010	12. 2. 2006
■ - HK116	Rohde & Schwarz	Biconical antenna	826861/018	12. 2. 2006
■ - HL223	Rohde & Schwarz	Log-periodic antenna	829228/011	12. 2. 2006
■ - BBHA 9120D	Schwarzbeck	Double ridged broadband 207 horn antenna		11. 26. 2006
■ - 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 Radiated emission test data**

- Test Date : November 9, 2006
- Resolution bandwidth : 120kHz
- Frequency range : 30MHz ~ 1000MHz
- Measurement distance : 10m

◆ Detector mode: Quasi- peak detector mode

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)
55.58	5.2	8.59	2.06	15.8	30.0	14.2	V	125	180
87.94	4.5	8.55	2.56	15.6	30.0	14.4	V	180	190
399.45	2.8	15.70	6.09	24.6	37.0	12.4	H	300	325
532.80	1.5	18.00	6.86	26.4	37.0	10.6	V	205	280
666.36	2.1	19.91	7.64	29.7	37.0	7.3	V	210	10
799.95	1.2	21.17	8.50	30.9	37.0	6.1	H	228	175
800.91	0.4	21.19	8.51	30.1	37.0	6.9	H	354	225



< Fig 4. Radiated emission result >

## 7. Recommendation & conclusion

The data collected shows that the Gumi College EMC Center.

**OHSUNG ELECTRONICS CO., LTD. Master system controller (Model No.: MSC-400)** was complies with § 15.107 and §15.109 of the FCC Rules.