

FCC EVALUATION REPORT FOR CERTIFICATION

Applicant : OHSUNG ELECTRONICS CO., LTD.

#181 Gongdan-dong, Gumi-si, Gyeongbuk,

Republic of Korea

Attn: Mr. Kwang-Jae Ok / Team Leader of Q.C

Date of Issue : November 17, 2010

Order Number: GETEC-C1-10-182

Test Report Number: GETEC-E3-10-094

Test Site: Gumi College EMC Center

FCC Registration Number: (100749, 443957)

FCC ID.: OZ5URCMFS8

Applicant: OHSUNG ELECTRONICS CO., LTD.

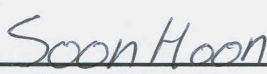
Rule Part(s) : FCC Part 15 Subpart B
Equipment Class : Class B computing device peripheral (JBP)
EUT Type : Switching Hub
Type of Authority : Certification
Model Name : MFS-8
Trade Name : UNIVERSAL Remote Control

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,



Soon-Hoon Jeong, Engineer
GUMI College EMC center



Jae-Hoon Jeong, Senior Engineer
GUMI College EMC center



CONTENTS

1. GENERAL INFORMATION	3
2. INTRODUCTION	4
3. PRODUCT INFORMATION	5
3.1 DESCRIPTION OF EUT.....	5
3.2 SUPPORT EQUIPMENT / CABLES USED	6
3.3 MODIFICATION ITEM(S).....	6
4. DESCRIPTION OF TESTS.....	7
4.1 TEST CONDITION.....	7
4.2 CONDUCTED EMISSION	8
4.3 RADIATED EMISSION.....	9
5. CONDUCTED EMISSION.....	10
5.1 OPERATING ENVIRONMENT	10
5.2 TEST SET-UP	10
5.3 MEASUREMENT UNCERTAINTY.....	10
5.4 LIMIT	11
5.5 TEST EQUIPMENT USED.....	11
5.6 TEST DATA FOR CONDUCTED EMISSION	11
6. RADIATED EMISSION	14
6.1 OPERATING ENVIRONMENT	14
6.2 TEST SET-UP	14
6.3 MEASUREMENT UNCERTAINTY.....	14
6.4 LIMIT	15
6.5 TEST EQUIPMENT USED.....	15
6.6 TEST DATA FOR RADIATED EMISSION.....	16
7. SAMPLE CALCULATIONS.....	17
7.1 EXAMPLE 1 :	17
7.2 EXAMPLE 2 :	17
8. RECOMMENDATION & CONCLUSION.....	18
APPENDIX A – ATTESTATION STATEMENT	
APPENDIX B – ID SAMPLE LABEL & LOCATION	
APPENDIX C – BLOCK DIAGRAM	
APPENDIX D – TEST SET-UP PHOTOGRAPHS	
APPENDIX E – EXTERNAL PHOTOGRAPHS	
APPENDIX F – INTERNAL PHOTOGRAPHS	
APPENDIX G – USER’S MANUAL	



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.

1. General Information

Applicant: OHSUNG ELECTRONICS CO., LTD.
Applicant Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea
Manufacturer: OHSUNG ELECTRONICS CO., LTD.
Manufacturer Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea
Contact Person: Mr. Kwang-Jae Ok / Team Leader of Q.C
Tel. Number: +82-54-468-0831 Fax Number: +82-54-461-8368

- **FCC ID.** OZ5URCMFS8
- **EUT Type** Switching Hub
- **Model Name** MFS-8
- **Trade Name** UNIVERSAL Remote Control
- **Serial Number** Prototype
- **Rule Part(s)** FCC Part 15 Subpart B
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2003)
- **Dates of Test** September 16 ~ 28, 2010
- **Place of Test** **Gumi College EMC Center** (FCC Registration Number: 100749, 443957)
407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-10-094
- **Dates of Issue** November 17, 2010



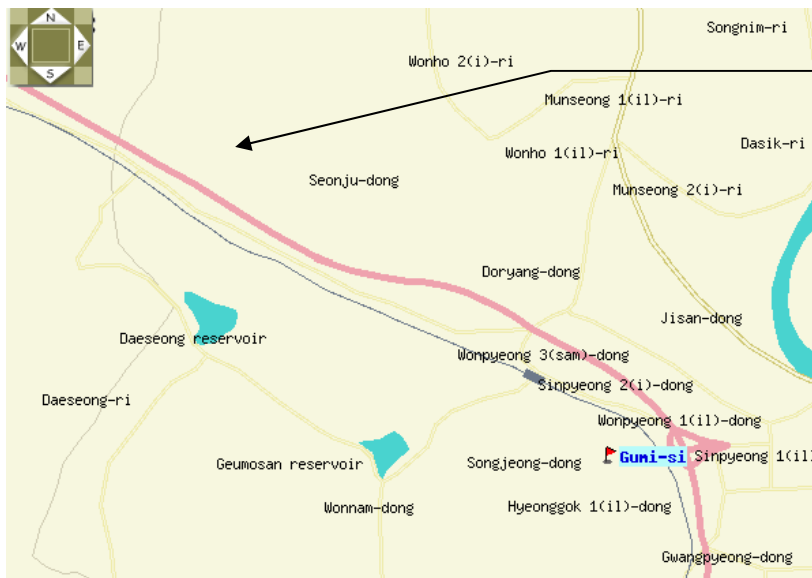
2. Introduction

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 9 kHz to 40 GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **OHSUNG ELECTRONICS CO., LTD. Switching Hub (Model Name: MFS-8)**

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

The site address is 407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.

This test site is one of the highest point of Gumi 1 college at about 200 km away from Seoul city and 40 km 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 (2003)



GUMI COLLEGE EMC CENTER
407, Bugok-dong, Gumi-si,
Gyeongbuk 730-711, Korea.
Tel: +82-54-440-1195
Fax: +82-54-440-1199

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



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **OHSUNG ELECTRONICS CO., LTD. Switching Hub (Model Name: MFS-8) FCC ID.: OZ5URCMFS8**

- Microprocessor : 55 MHz RISC
- Memory : 4 Megabits of Serial Flash, 512 KB Flash, 128 KB SRAM
- Network : Switching – Eight 10/100 Ethernet ports
LAN – One 10/100 Ethernet port
- Power Supply : 12 V External Power Supply
- Size : 1.5” (H) × 9.8” (W) × 4.9” (D)
- Weight : 0.35 kg
- Maximum Frequency Range : 25 MHz



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
Notebook PC	Hewlett Packard	NX6120	S/N: CNU5150Y65 FCC ID.: DoC
PS2 mouse	SAMSUNG	SMH-2100UB	S/N: TAKZ502639N FCC ID.: N/A

See “Appendix D – Test Setup Photographs” for actual system test set-up

3.2.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
AC/DC adapter ^{*1)}	UNIVERSAL Remote Control	HK-R112-A12	S/N: 0810KG FCC ID.: N/A

1) Input ratings: AC (100 – 240) V~, (50 / 60) Hz, 0.5 A / Output ratings: DC 12 V, 1 A

3.2.3 Used Cable(s)

Cable Name	Condition	Description
Power cable	Connected to the adapter	1.80 m unshielded
DC power cable	Connected to the EUT and adapter	2.90 m shielded
WAN cable	Connected to the EUT and network	10.00 m unshielded
LAN cable	Connected to the EUT and notebook PC	3.00 m 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 : AC 120 V / 60 Hz
- Test Mode(s): Continuous files download mode via internet



4.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Registration No.: 100749)

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

The EUT is 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 150 kHz to 30 MHz with 20 ms 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 9 kHz. 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 cm ~ 40 cm.

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

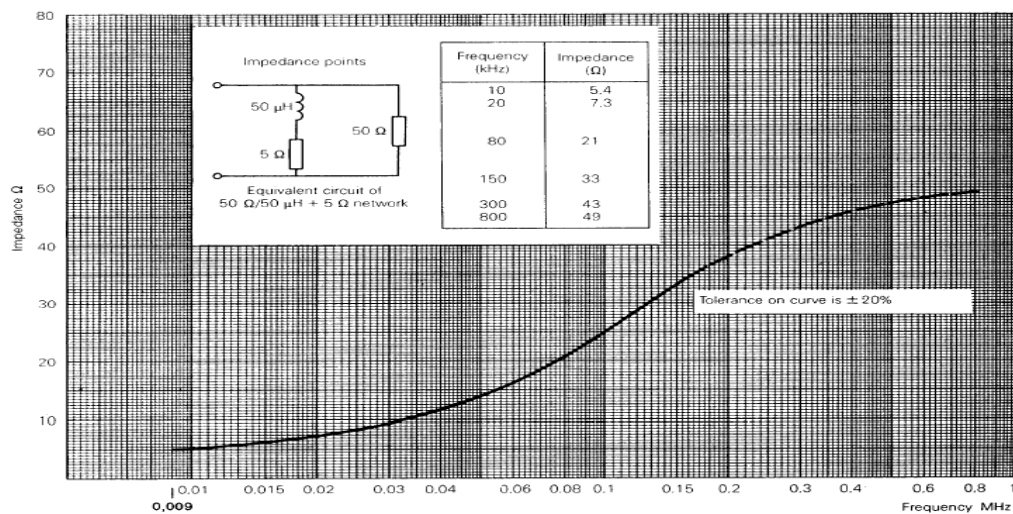


Fig 2. Impedance of LISN



4.3 Radiated Emission

Preliminary measurements were conducted 3 m 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.

Final measurements were made 3 m chamber (FCC registration No.: 443957) and/or 10 m OATS (FCC registration No.: 100749).

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. The detector function was set to CISPR quasi-peak mode average mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency or type of signal.

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 0.8 m high non-metallic 1.0 m × 1.5 m 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

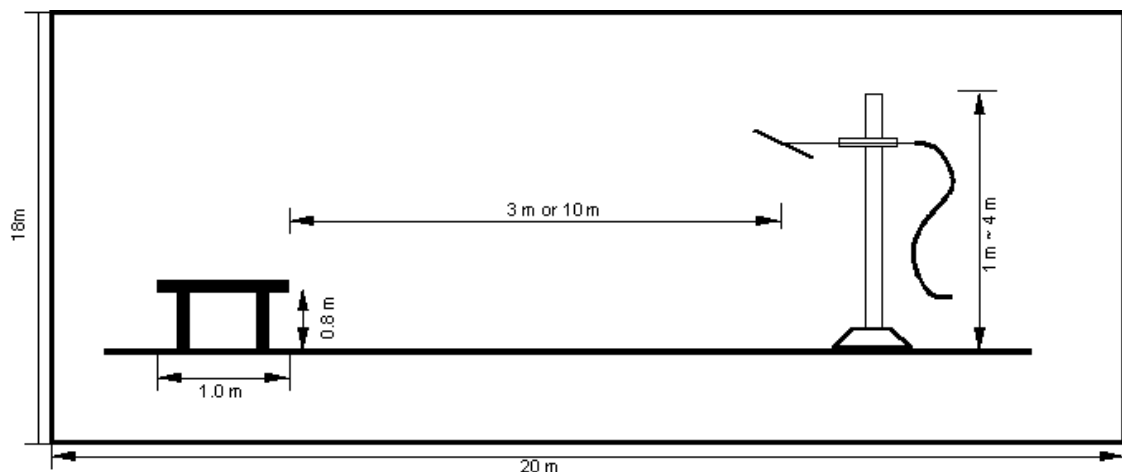


Fig 3. Dimensions of test site.



5. Conducted Emission

5.1 Operating Environment

Temperature : 25 °C
Relative Humidity : 47 % R.H.

5.2 Test Set-up

The conducted emission measurements were performed in the shielded room.

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

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, were 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 %.

Test Items	Uncertainty	Remark
Conducted emission (9 kHz ~ 150 kHz)	± 2.69 dB	Confidence levels of 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	± 4.16 dB	Confidence levels of 95 % ($k = 2$)



5.4 Limit

RFI Conducted	FCC Limit(dB μ V/m) Class B	
	Quasi-Peak	Average
150 kHz ~ 0.5 MHz	66 ~ 56*	56 ~ 46*
0.5 MHz ~ 5 MHz	56	46
5 MHz ~ 30 MHz	60	50

*Limits decreases linearly with the logarithm of frequency.

5.5 Test Equipment used

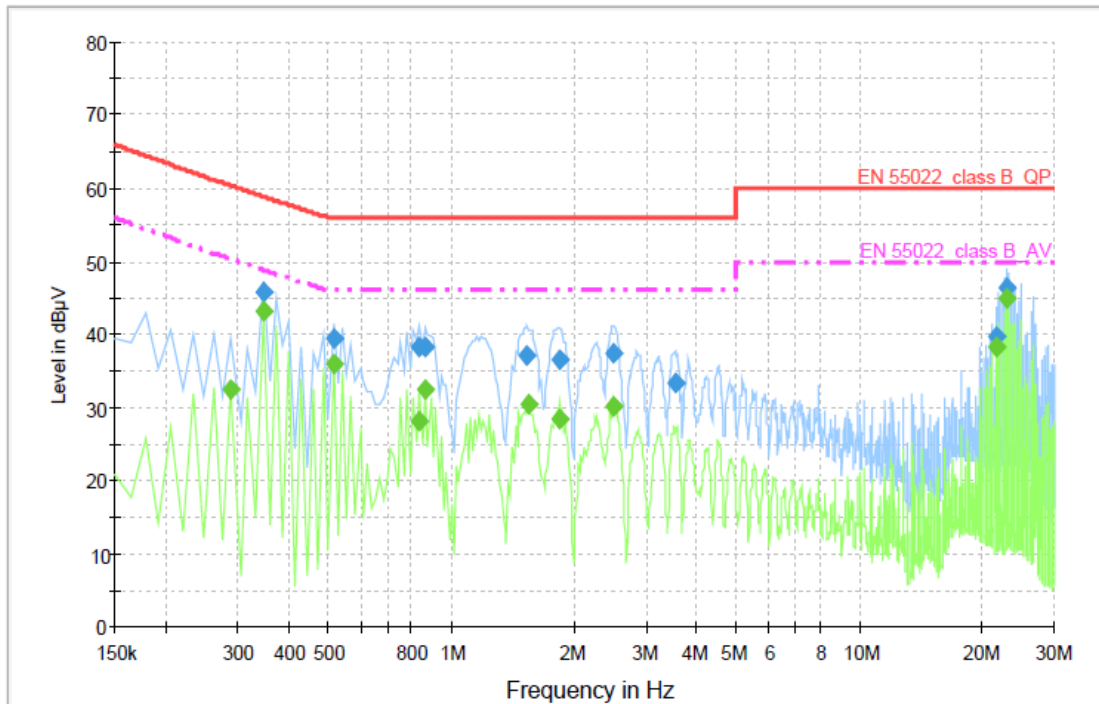
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 10. 2010
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 10. 2010
□ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 10. 2010
□ - ISN T8	TESEQ. GmbH	Impedance Network	24568	10. 16. 2010

5.6 Test data for Conducted Emission

- Test Date : September 28, 2010
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz



Voltage with 4-Line-LISN_L1



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.346000	45.7	1000.000	9.000	GND	L1	10.0	13.2	58.9	
0.514000	39.4	1000.000	9.000	GND	L1	10.0	16.6	56.0	
0.836000	38.3	1000.000	9.000	GND	L1	10.0	17.7	56.0	
0.864000	38.2	1000.000	9.000	GND	L1	10.0	17.8	56.0	
1.536000	37.0	1000.000	9.000	GND	L1	10.1	19.0	56.0	
1.844000	36.6	1000.000	9.000	GND	L1	10.1	19.4	56.0	
2.502000	37.3	1000.000	9.000	GND	L1	10.1	18.7	56.0	
3.538000	33.4	1000.000	9.000	GND	L1	10.2	22.6	56.0	
21.668000	39.8	1000.000	9.000	GND	L1	11.1	20.2	60.0	
23.068000	46.5	1000.000	9.000	GND	L1	11.2	13.5	60.0	

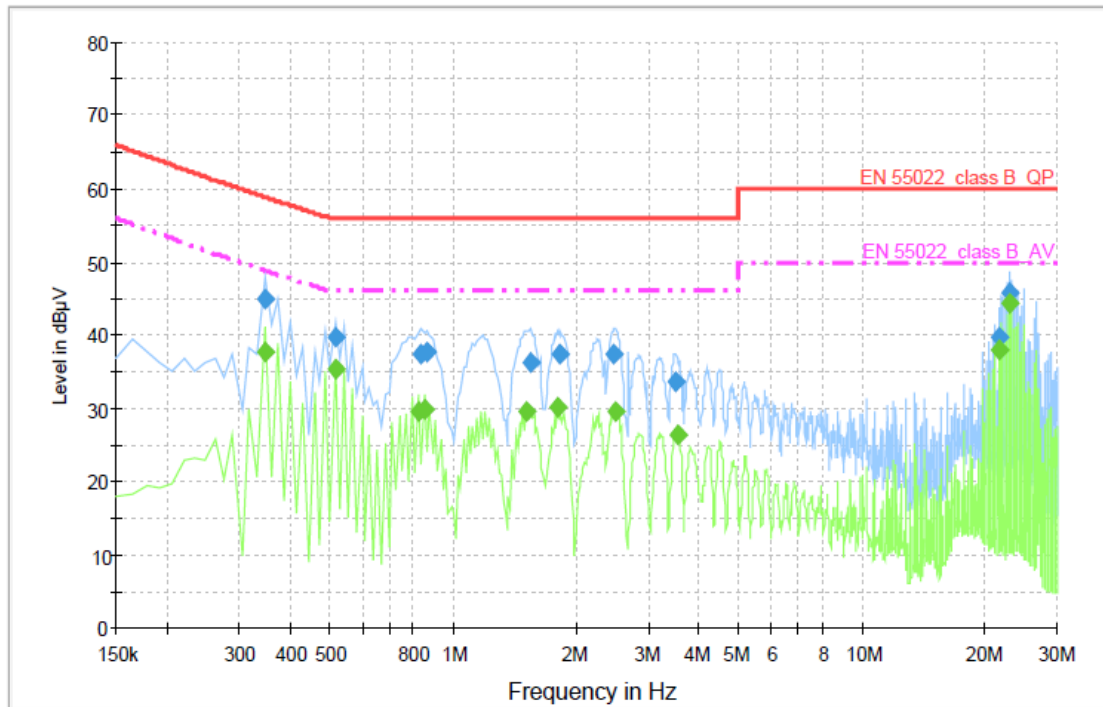
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.290000	32.6	1000.000	9.000	GND	L1	10.0	17.7	50.3	
0.346000	43.1	1000.000	9.000	GND	L1	10.0	5.8	48.9	
0.514000	36.0	1000.000	9.000	GND	L1	10.0	10.0	46.0	
0.836000	28.1	1000.000	9.000	GND	L1	10.0	17.9	46.0	
0.864000	32.6	1000.000	9.000	GND	L1	10.0	13.4	46.0	
1.550000	30.5	1000.000	9.000	GND	L1	10.1	15.5	46.0	
1.844000	28.5	1000.000	9.000	GND	L1	10.1	17.5	46.0	
2.502000	30.2	1000.000	9.000	GND	L1	10.1	15.8	46.0	
21.668000	38.3	1000.000	9.000	GND	L1	11.1	11.7	50.0	
23.068000	44.9	1000.000	9.000	GND	L1	11.2	5.1	50.0	

< Fig 4. Conducted emission result (Live line) >



Voltage with 4-Line-LISN_N



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.346000	45.0	1000.000	9.000	GND	N	10.0	13.9	58.9	
0.514000	39.6	1000.000	9.000	GND	N	10.0	16.4	56.0	
0.836000	37.4	1000.000	9.000	GND	N	10.0	18.6	56.0	
0.864000	37.6	1000.000	9.000	GND	N	10.0	18.4	56.0	
1.550000	36.2	1000.000	9.000	GND	N	10.1	19.8	56.0	
1.830000	37.4	1000.000	9.000	GND	N	10.1	18.6	56.0	
2.474000	37.4	1000.000	9.000	GND	N	10.1	18.6	56.0	
3.496000	33.7	1000.000	9.000	GND	N	10.1	22.3	56.0	
21.668000	39.7	1000.000	9.000	GND	N	10.8	20.3	60.0	
23.068000	45.9	1000.000	9.000	GND	N	10.8	14.1	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.346000	37.6	1000.000	9.000	GND	N	10.0	11.3	48.9	
0.514000	35.4	1000.000	9.000	GND	N	10.0	10.6	46.0	
0.822000	29.7	1000.000	9.000	GND	N	10.0	16.3	46.0	
0.850000	29.9	1000.000	9.000	GND	N	10.0	16.1	46.0	
1.508000	29.7	1000.000	9.000	GND	N	10.1	16.3	46.0	
1.802000	30.0	1000.000	9.000	GND	N	10.1	16.0	46.0	
2.502000	29.7	1000.000	9.000	GND	N	10.1	16.3	46.0	
3.538000	26.5	1000.000	9.000	GND	N	10.2	19.5	46.0	
21.668000	38.1	1000.000	9.000	GND	N	10.8	11.9	50.0	
23.068000	44.4	1000.000	9.000	GND	N	10.8	5.6	50.0	

< Fig 5. Conducted emission result (Neutral line) >



6. Radiated Emission

6.1 Operating Environment

Temperature : 25 °C
Relative Humidity : 44 % R.H.

6.2 Test Set-up

A preliminary and final measurement was at 3 m anechoic chamber.

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

The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m 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 %.

Test Items(Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 4.32 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 4.21 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 3.96 dB	Confidence levels of 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.97 dB	Confidence levels of 95 % ($k = 2$)



6.4 Limit

Frequency (MHz)	FCC Limit @ 3 m. dB μ V/m	CISPR Limit @ 10 m. 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 ~ 1 000	54.0	37.0
> 1 000	54.0	No Specified limit

6.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 11. 2010
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3193	03. 15. 2012
■ - BBHA9120D	Schwarzbeck	Horn Antenna	207	12. 22. 2011
■ - MCU066	maturo GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ - AM 4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2010

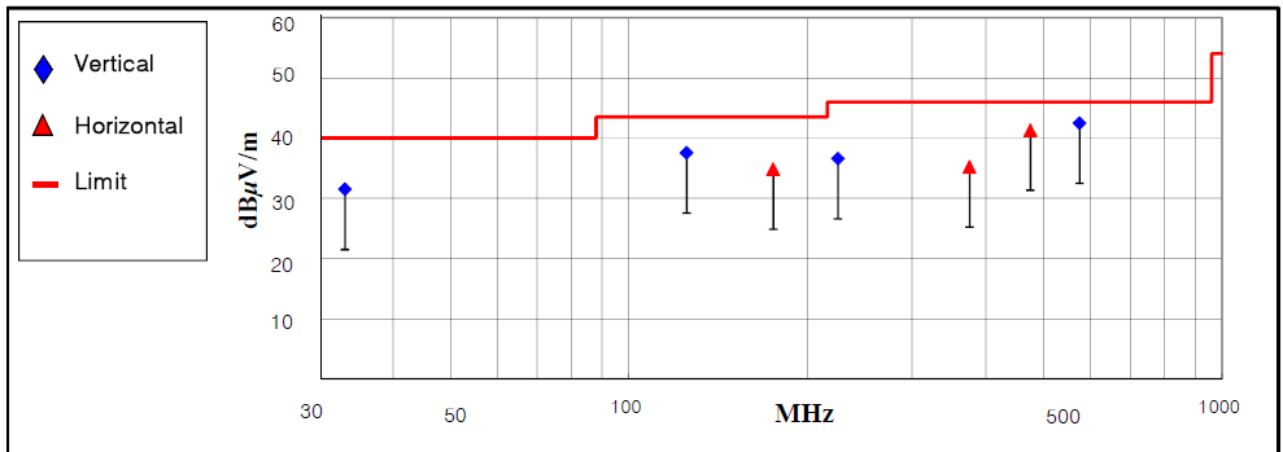


6.6 Test data for Radiated Emission

- Test Date : September 16, 2010
- Resolution Bandwidth : 120 kHz
- Frequency Range : 30 MHz ~ 1 000 MHz
- Measurement Distance : 3 m
- Note : The highest frequency of the internal source of the EUT is less than 108 MHz
 The measurement was made up to 1 000 MHz

◆ Detector mode: Quasi-Peak detector mode

Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading Value (dBμ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Test Result (dBμ V/m)			Pol. (H/V)	Height (cm)	Angle (°)
33.18	19.98	10.54	0.98	31.50	40.00	8.50	V	100	165
125.00	23.96	11.70	1.89	37.55	43.50	5.95	V	105	263
175.01	21.47	11.15	2.24	34.86	43.50	8.64	H	197	142
225.00	23.98	10.06	2.56	36.60	46.00	9.40	V	100	211
375.00	16.48	15.41	3.35	35.24	46.00	10.76	H	117	125
475.02	20.60	16.98	3.76	41.34	46.00	4.66	H	100	183
575.02	19.37	18.97	4.16	42.50	46.00	3.50	V	109	85



< Fig 6. Radiated emission result (30 MHz ~ 1 000 MHz) >



7. Sample Calculations

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \text{ Log}_{10}(\mu\text{V}/\text{m}) \\ \text{dB}\mu\text{V} &= \text{dBm} + 107 \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

7.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dB μV
Reading	= 39.2 dB μV
$10^{(39.2\text{dB}\mu\text{V}/20)}$	= 91.2 μV
Margin	= 48 dB μV - 39.2 dB μV = 8.8 dB

7.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 $\mu\text{V}/\text{m}$ = 40.0 dB $\mu\text{V}/\text{m}$
Reading	= 31.0 dB μV
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dB $\mu\text{V}/\text{m}$
Margin	= 40.0 dB $\mu\text{V}/\text{m}$ - 36.8 dB $\mu\text{V}/\text{m}$ = 3.2 dB



8. Recommendation & Conclusion

The data collected shows that the **OHSUNG ELECTRONICS CO., LTD. Switching Hub (Model Name: MFS-8)** was complies with §15.107 and 15.109 of the FCC Rules.