

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer: OHSUNG ELECTRONICS CO., LTD.

Date of Issue: March 25, 2013

**#181 Gongdan-dong, Gumi-si, Gyeongbuk,
Republic of Korea**

Order Number: GETEC-C1-13-112

Attn: Mr. Hak-Ki Kim / General Manager

Test Report Number: GETEC-E3-13-029

Test Site: GUMI COLLEGE EMC CENTER

FCC Registration Number: (100749, 443957)

FCC ID. : OZ5URCMRX2

Applicant : OHSUNG ELECTRONICS CO., LTD.

Rule Part(s) : FCC Part 15 Subpart B
Equipment Class : Class B computing device peripheral (JBP)
EUT Type : Network Base Station
Type of Authority : Certification
Model Name : MRX-2
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 (2009) / Canadian standard ICES-003

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

**Soon-Hoon Jeong, Associate Engineer
GUMI COLLEGE EMC CENTER**

Jae-Hoon Jeong

**Jae-Hoon Jeong, Technical Manager
GUMI COLLEGE EMC CENTER**





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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. Hak-Ki Kim / General Manager

Tel. Number: +82-54-468- 7281 Fax Number: +82-54- 461- 8368

● FCC ID.	OZ5URCMRX2
● EUT Type	Network Base Station
● Model Name	MRX-2
● 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 (2009) / Canadian standard ICES-003
● Dates of Test	March 18, 2013
● Place of Test	GUMI COLLEGE EMC CENTER (FCC Registration Number: 100749, 443957) 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.
● Test Report Number	GETEC-E3-13-029
● Dates of Issue	March 25, 2013

EUT Type: Network Base Station

FCC ID.: OZ5URCMRX2





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 (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **OHSUNG ELECTRONICS CO., LTD. Network Base Station(Model Name: MRX-2)**

These measurement tests were conducted at **GUMI COLLEGE EMC CENTER**

The site address is 37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.

This test site is one of the highest point of Gumi 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 (2009)

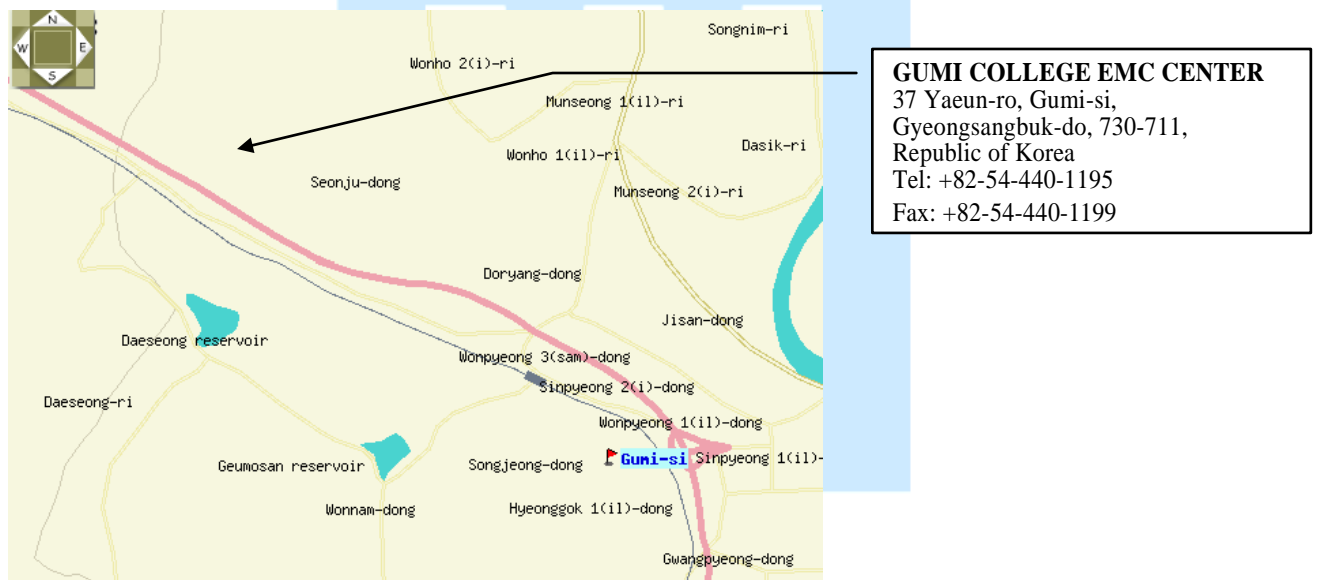


Fig 1. The map above shows the Gumi College in vicinity area.





3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **OHSUNG ELECTRONICS CO., LTD.**
Network Base Station (Model Name: MRX-2) FCC ID.: OZ5URCMRX2

- Equipment : Network Base Station
- Model Name : MRX-2
- Serial Number : Prototype
- Network : One 10/100 Ethernet port
- Relay : One relay configurable to be No, NC or Momentary
- Sensor : One sensor supports Video or Voltage sensing via URC sensors.
- RS232 : Two RS-232 ports support TX, RX and GND two way communication via URC cables.
- IR : Six adjustable IR ports enable the included URC emitters to control IR devices
Note: 6th IR Output requires the included sleeved emitter(identified by a pink connector), since it can optionally be used to connect an RFTX-1
- Weight : 8.4 oz.
- Size : 248 mm × 120 mm × 28 mm
- Power : 12 V External Power Supply
 - AC/DC Adaptor
 - Model name : HK-R112-A12
 - Manufacture: HON KWANG ELECTRONIC CO., LTD.
 - Rating : Input AC 100 ~ 240 V , 50-60 Hz, 0.5 A
 - Output DC 12 V, 1.0 A
- Clock Frequency : 50 MHz





3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
Notebook computer	COMPAQ	N620C	S/N: CNU33509W8 FCC ID.: DoC
RF Sensor	OHSUNG ELECTRONICS CO., LTD	FRX-250	S/N: None. FCC ID.: DoC
Remote controller	OHSUNG ELECTRONICS CO., LTD	MX-900	S/N: None. FCC ID.: OZ5URCMX900
Voltage power sensor	OHSUNG ELECTRONICS CO., LTD	VS-100	S/N: None. FCC ID: DoC
Network Base Station	OHSUNG ELECTRONICS CO., LTD	MRX-2	S/N: None. FCC ID.: None.

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.
Adaptor	HON KWANG ELECTRONIC CO., LTD.	HK-R112-A12	S/N: None. FCC ID.: N/A





3.2.3 Used Cable(s)

Cable Name	Condition	Description
Power cable(Multi-tap)	Connected to the EUT(Adaptor) and power supply	1.20 m unshielded
DC in cable	Connected to the EUT(Main) and EUT(Adaptor)	1.80 m unshielded
Ethernet cable	Connected to the EUT(Main) and Network	10.00 m unshielded
RS-232 cable	Connected to the EUT(Main) and notebook computer	1.80 m Shielded with a ferrite core
Sensor in cable	Connected to the EUT(Main) and Voltage power sensor	1.90 m unshielded
IR in cable	Connected to the EUT(Main) and Remote controller	1.00 m unshielded
IR output sensor cable	Connected to the EUT(Main) and IR Emitter(6EA)	2.90 m unshielded
RF in cable	Connected to the EUT(Main) and voltage power sensor	3.60 m unshielded
RF out cable	Connected to the EUT(Main) and Network base station	3.60 m unshielded

3.3 Modification Item(s)

- None





4. Description of tests

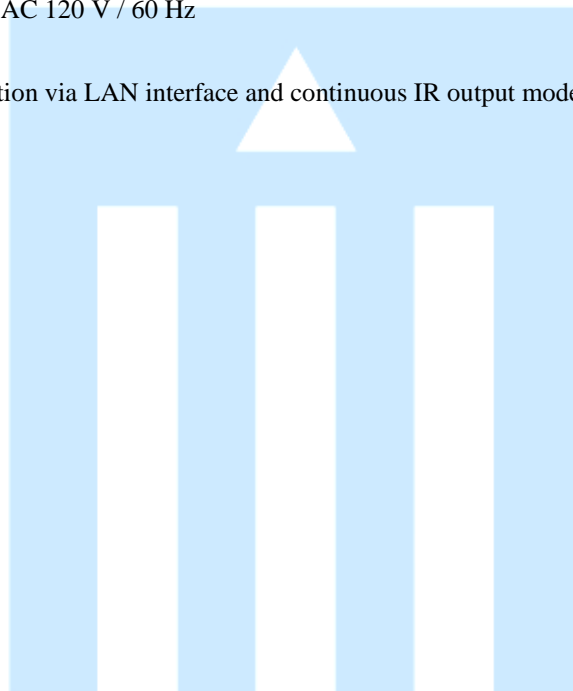
4.1 Test Condition

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.

The test conditions of the noted test mode(s) in this test report are;

- Test Voltage / Frequency : AC 120 V / 60 Hz
- Test Mode(s): Communication via LAN interface and continuous IR output mode





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).

Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and Average mode.

The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

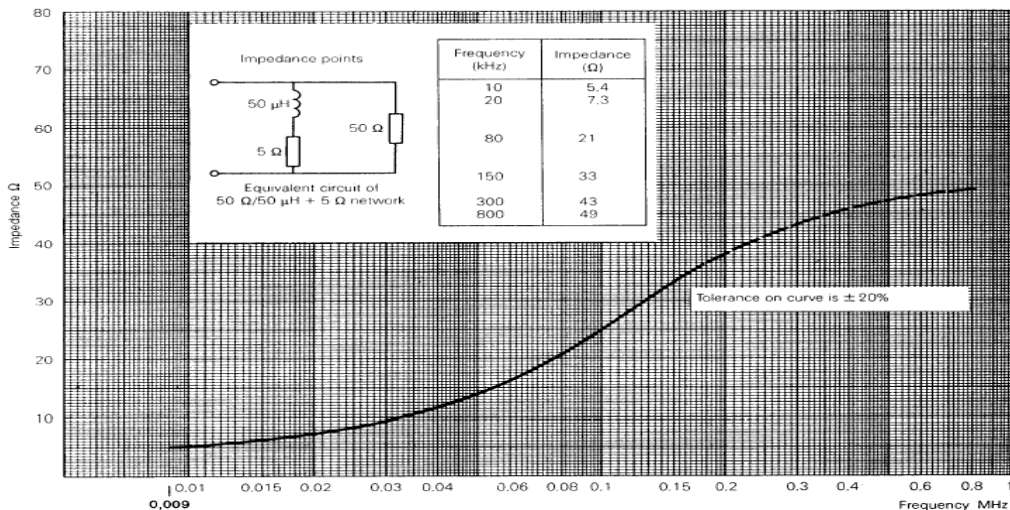


Fig 2. Impedance of LISN





4.3 Radiated Emission

Exploratory Radiated measurements were conducted at the 3m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements of below 1GHz were made at 3m Chamber (FCC Registration No.: 443957) or Open area test site (FCC Registration No.: 100749) that complies with CISPR 16/ANSI C63.4.

Above 1GHz final measurements were conducted at the 3m Chamber (FCC Registration No.: 443957) only.

For measurements above 1GHz, the bottom side of 3m chamber was installed with absorbers in order to meet SVSWR Limit.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1GHz) and Peak & Average mode (Above 1GHz).

The measurements were performed by rotating the EUT 360° and adjusting the receive antenna height from 1.0 m to 4.0 m. All frequencies were investigated in both horizontal and vertical antenna polarity.

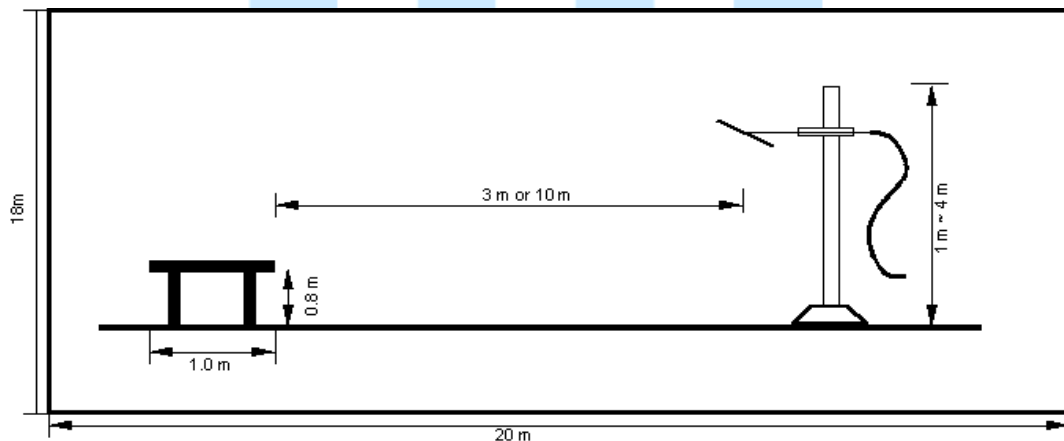


Fig 3. Dimensions of test site (Below 1GHz)

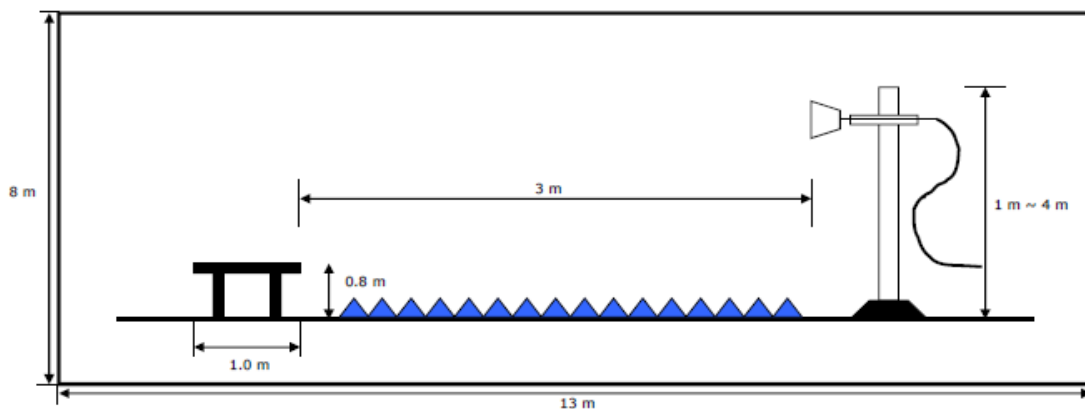


Fig 4. Dimensions of test site (Above 1GHz)





5. Conducted Emission

5.1 Operating Environment

Temperature : 22.0 °C
Relative Humidity : 42.0 % 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)	± 2.74 dB	Confidence level of approximately 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	± 4.25 dB	Confidence level of approximately 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	05. 22. 2013
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	05. 23. 2013
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	05. 23. 2013
■ - ISN T8	TESEQ. GmbH	ISN	24568	07. 04. 2013

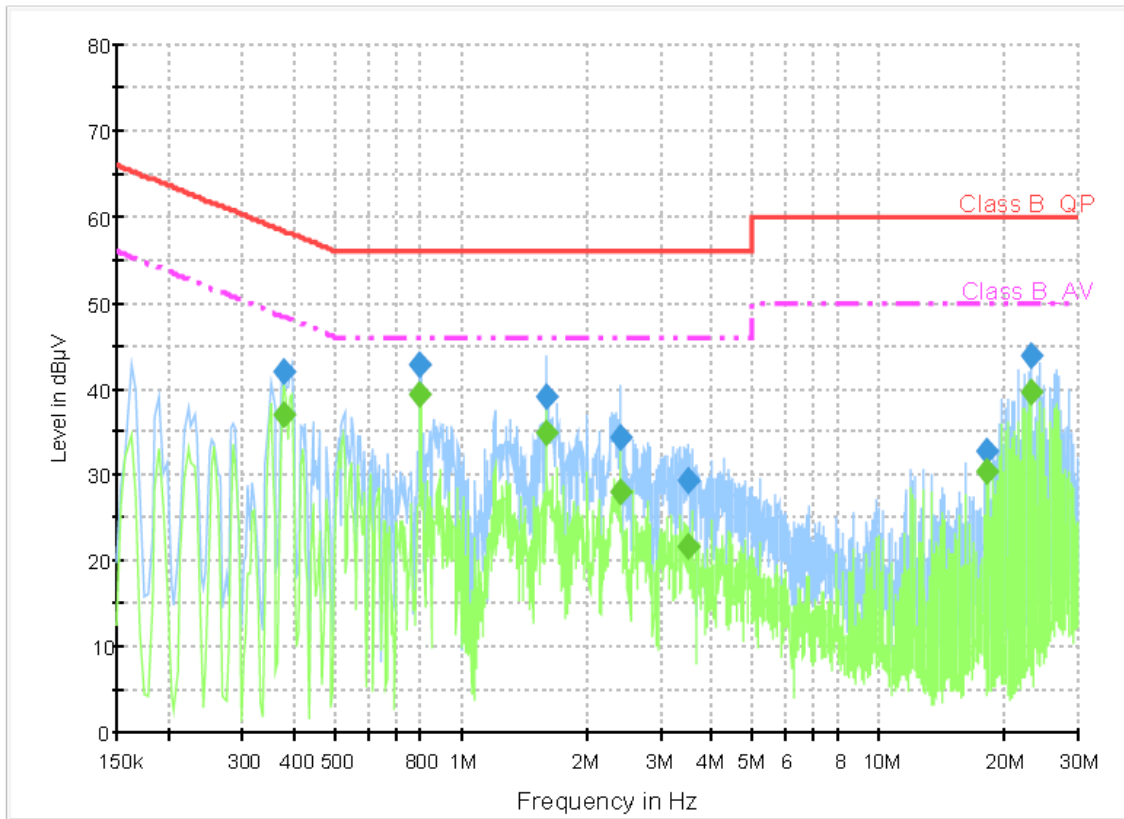
5.6 Test data for Conducted Emission

- Test Date : March 14, 2013
 - Resolution Bandwidth : 9 kHz
 - Frequency Range : 0.15 MHz ~ 30 MHz
 - Line : L1: Live, N: Neutral





- Operating condition: Communication via LAN interface and continuous IR output mode



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.376000	42.1	1000.0	9.000	GND	N	10.1	16.3	58.4	
0.800000	42.7	1000.0	9.000	GND	L1	10.1	13.3	56.0	
1.600000	39.1	1000.0	9.000	GND	N	10.1	16.9	56.0	
2.408000	34.4	1000.0	9.000	GND	N	10.1	21.6	56.0	
3.500000	29.2	1000.0	9.000	GND	N	10.1	26.8	56.0	
18.244000	32.8	1000.0	9.000	GND	N	10.4	27.2	60.0	
23.128000	43.9	1000.0	9.000	GND	N	10.6	16.1	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.376000	37.1	1000.0	9.000	GND	N	10.1	11.3	48.4	
0.800000	39.4	1000.0	9.000	GND	L1	10.1	6.6	46.0	
1.600000	35.0	1000.0	9.000	GND	N	10.1	11.0	46.0	
2.408000	28.0	1000.0	9.000	GND	N	10.1	18.0	46.0	
3.500000	21.6	1000.0	9.000	GND	N	10.1	24.4	46.0	
18.244000	30.2	1000.0	9.000	GND	N	10.4	19.8	50.0	
23.128000	39.7	1000.0	9.000	GND	N	10.6	10.3	50.0	

< Fig 5. Conducted emission result >





6. Radiated Emission

6.1 Operating Environment

Temperature : 23.0 °C
Relative Humidity : 42.0 % 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)	± 4.35 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 4.29 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 4.43 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 4.21 dB	Confidence level of approximately 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	05. 23. 2013
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3193	03. 15. 2014
■ - BBHA9120D	Schwarzbeck	Horn Antenna	207	01. 29. 2014
■ - MCU066	matur GmbH	Position Controller	1390306	N/A
■ - TT2.5SI	matur GmbH	Turntable	1390307	N/A
■ - AM 4.0	matur GmbH	Antenna Mast	1390308	N/A
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2013

6.6 Test data for Radiated Emission

- Test Date : March 13, 2013
- Measurement Distance : 3 m
- Note : The highest frequency of the internal source of the EUT is less than 108 MHz (50 MHz). The measurement was made up to 1 000 MHz

- Measurement

Frequency range	30 MHz ~ 1 GHz	Above 1 GHz
Detector mode	Quasi peak	Peak / Average
Resolution bandwidth	120 kHz	1 MHz

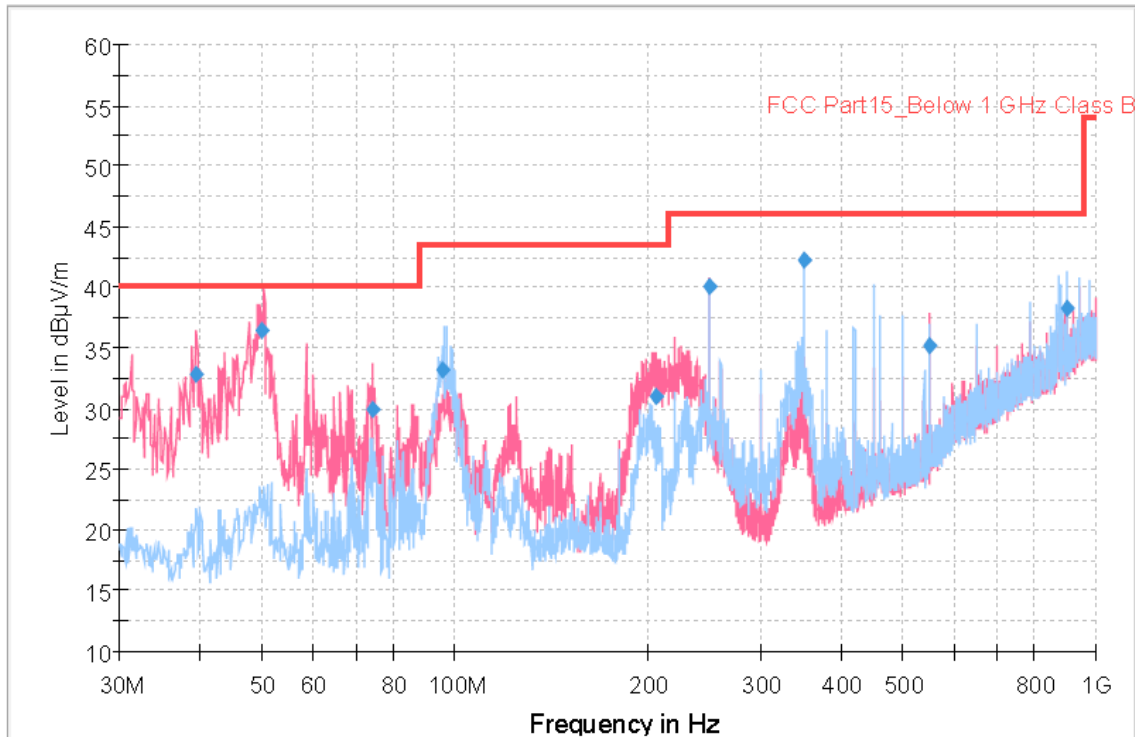
EUT Type: Network Base Station

FCC ID.: OZ5URCMRX2





- Operating condition: Communication via LAN interface and continuous IR output mode



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.457500	32.9	1000.0	120.000	100.0	V	56.0	12.5	7.1	40.0
49.770000	36.4	1000.0	120.000	100.0	V	261.0	13.1	3.6	40.0
74.578750	30.0	1000.0	120.000	100.0	V	214.0	10.0	10.0	40.0
95.485000	33.2	1000.0	120.000	200.0	H	178.0	9.8	10.3	43.5
205.468750	31.0	1000.0	120.000	100.0	V	351.0	10.9	12.5	43.5
249.987500	40.1	1000.0	120.000	150.0	V	265.0	13.0	5.9	46.0
349.978750	42.3	1000.0	120.000	100.0	H	136.0	16.2	3.7	46.0
550.001250	35.2	1000.0	120.000	100.0	V	262.0	20.8	10.8	46.0
899.848750	38.3	1000.0	120.000	113.0	H	277.0	27.0	7.7	46.0

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





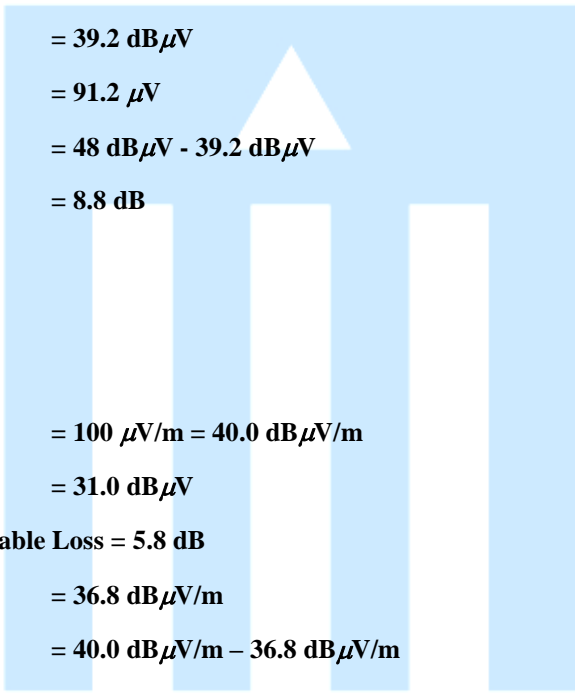
7. Sample Calculations

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

7.1 Example 1 :

■ 20.3 MHz

Class B Limit	= 250 μV = 48 dBμV
Reading	= 39.2 dBμV
10^{(39.2dB$\mu\text{V}/20$})	= 91.2 μV
Margin	= 48 dBμV - 39.2 dBμV
	= 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 dBμV
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.. Network Base Station(Model Name: MRX-2)** was complies with §15.107 and 15.109 of the FCC Rules.

- The end -

