

FCC EVALUATION REPORT FOR CERTIFICATION

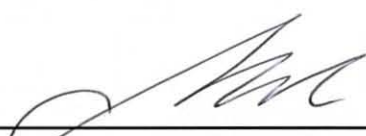
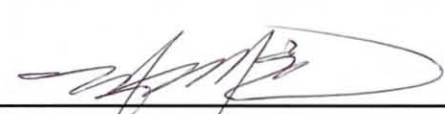
FCC Class B (Class II Permissive Change)

Manufacturer : OHSUNG ELECTRONICS CO., LTD.**Date of Issue : March 18, 2015****#181 Gongdan-dong , Gumi-si, Gyeongbuk****Order Number: GETEC-C1-15-090****Republic of Korea.****Test Report Number: GETEC-E3-15-006****Attn : Mr. Hak-Ki Kim / General Manager****Test Site: GUMI COLLEGE EMC CENTER****FCC Registration Number: 269701****FCC ID. : OZ5URCMRF260****Applicant : OHSUNG ELECTRONICS CO., LTD.**

Rule Part(s)	: FCC Part 15 Subpart B
Equipment Class	: Communications Receiver used with Part 15 Transmitter (CYY)
EUT Type	: Base Station
Type of Authority	: Certification
Model Name	: MRF-260, MRF-260DBL
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 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,**
**Seung-Chul Lee, Senior Engineer
GUMI COLLEGE EMC CENTER**
**Jae-Hoon Jeong, Technical Manager
GUMI COLLEGE EMC CENTER**

GETEC-QP-28-007 (Rev.01)

EMC CENTER

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It is not allowed to copy this report even partly without the approval of 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

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- **FCC ID.** OZ5URCMRF260
- **Equipment Class** Communications Receiver used with Part 15 Transmitter (CYY)
- **EUT Type** Base Station
- **Model Name** MRF-260, MRF-260DBL
- **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)
- **Dates of Test** March 05, 2015
- **Place of Test** **GUMI COLLEGE EMC CENTER**
(FCC Registration No.:269701)
407, Bugok-dong, Gumi-city, Gyeongsangbuk-do, Korea.
- **Test Report Number** GETEC-E3-15-006
- **Dates of Issue** March 18, 2015
- **Class II Change(s)** Changed Main Board



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.**

Base Station (Model Name: MRF-260, MRF-260DBL)

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

The site address is 407, Bugok-dong, Gumi-city, 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)

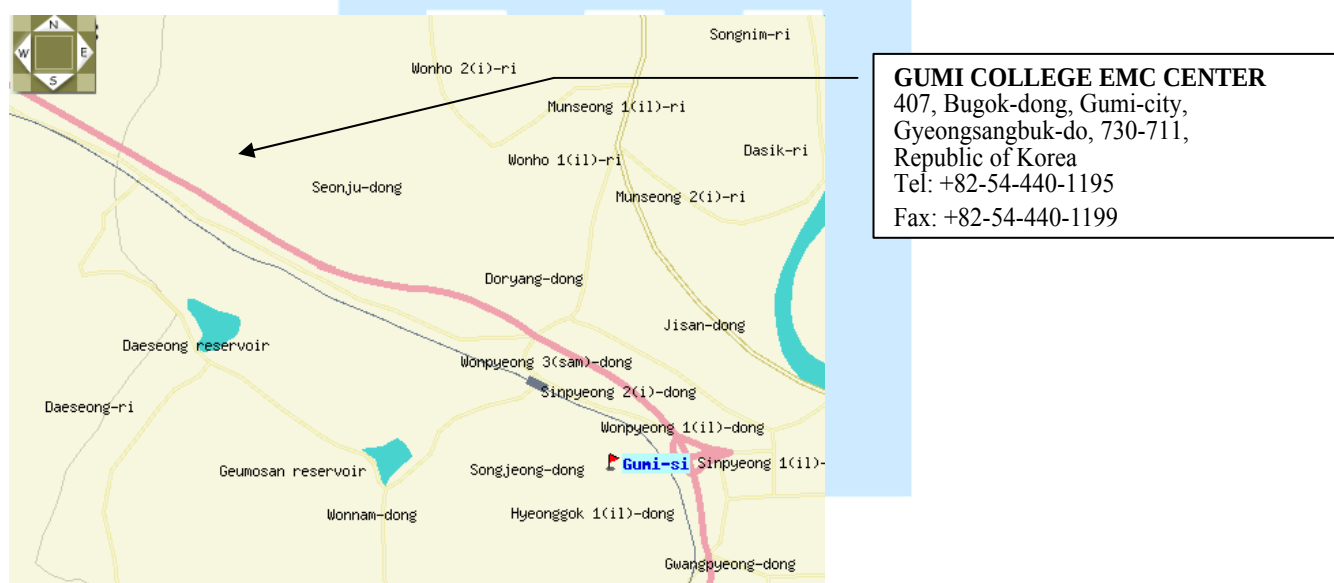


Fig 1. The map above shows the Gumi College in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **OHSUNG Electronics Co., Ltd.**

Base Station (Model Name: MRF-260, MRF-260DBL) FCC ID.: OZ5URCMRF260

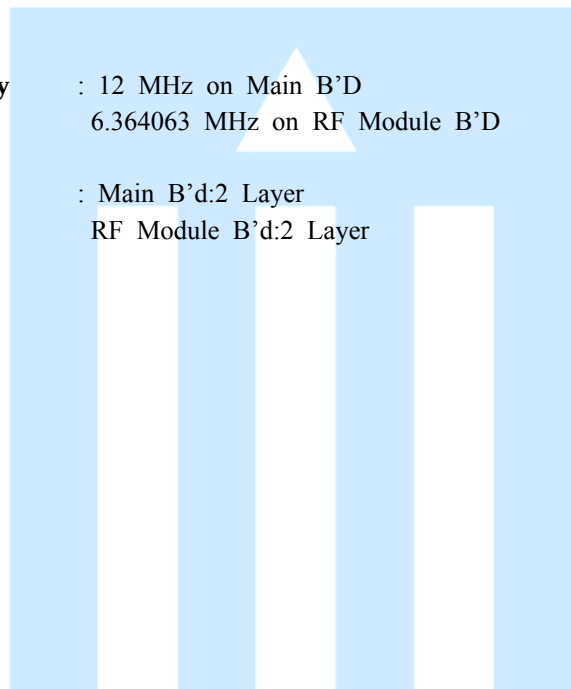
This EUT can receive RF signal from RF transmitter and, convert to IR signal and transmit it.

RF Receiving Frequency : 418MHz

External Connector : DC in, IR output

Crystal, Clock Frequency : 12 MHz on Main B'D
6.364063 MHz on RF Module B'D

Number of Layer : Main B'd:2 Layer
RF Module B'd:2 Layer



EUT Type: Base Station

FCC ID.: OZ5URCMRF260





3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
RF Transmitter	OH SUNG Electronics Inc	MX-890	S/N: N/A FCC ID: OZ5URCMX890

See “Appendix C– 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⁾	MEILE Group Ltd	MLF-A006090030E0061	S/N : None. FCC ID.: None.

- 1) Rating: Input(AC 100 ~ 240) V, (50/60)) Hz, Max 0.18A. Output(DC 9 V, 0.3 A)

3.2.3 Used Cable(s)

Cable Name	Condition	Description
Adapter cable	Connected to the EUT and power	1.8 m unshielded
IR sensor cable	Connected to the EUT and IR sensor	3.2 m unshielded

3.3 Modification Item(s)

- None



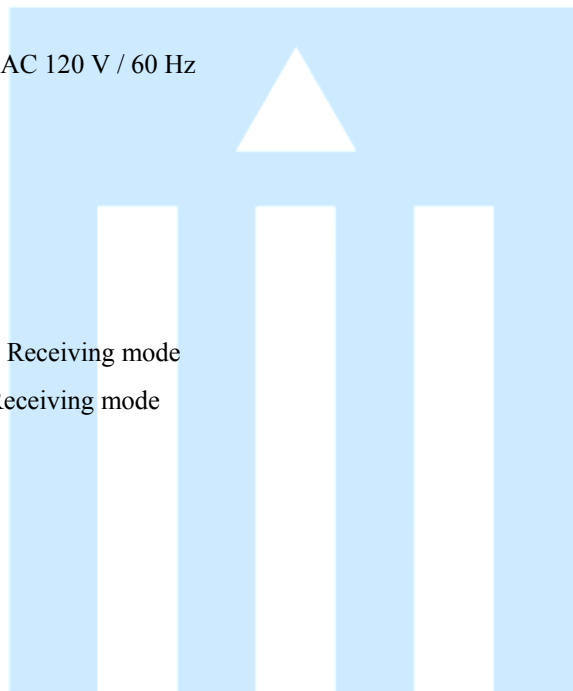
4. Description of tests

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)
 - . RF receiving mode
- Operating test pattern
 - . Conducted Emission: RF Receiving mode
 - . Radiated Emission: RF Receiving 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.: 269701)

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 (ENV216) and the support equipment is powered from the Rohde & Schwarz LISN (ENV216). 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, ESCI).

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.

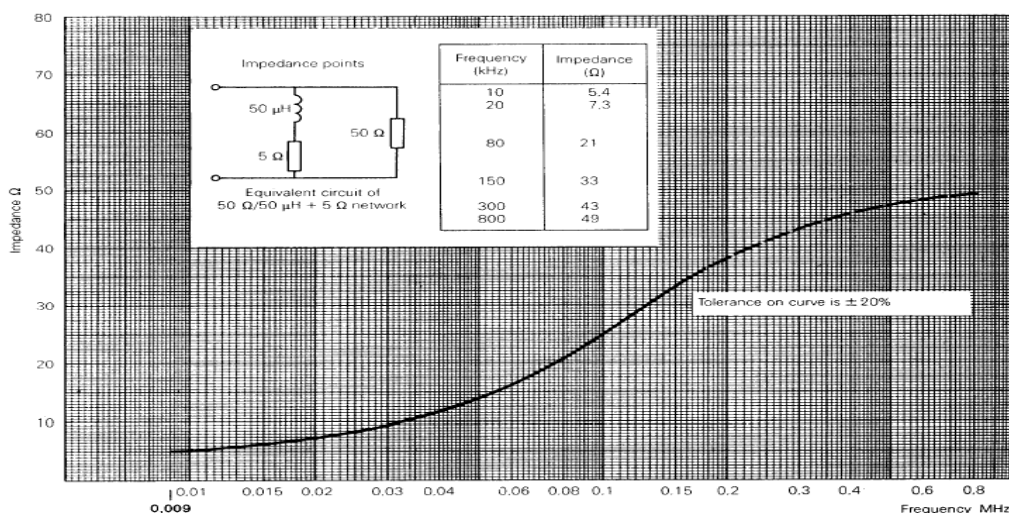


Fig 2. Impedance of LISN



4.3 Radiated Emission

Exploratory Radiated measurements were conducted at the 3 m 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 3 m Chamber (FCC Registration No.: 269701) or Open area test site (FCC Registration No.: 269701) that complies with CISPR 16/ANSI C63.4.

Above 1 GHz final measurements were conducted at the 3m Chamber (FCC Registration No.: 269701) only.

For measurements above 1GHz, the bottom side of 3 m 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 1 GHz) and Peak & Average mode (Above 1 GHz).

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.

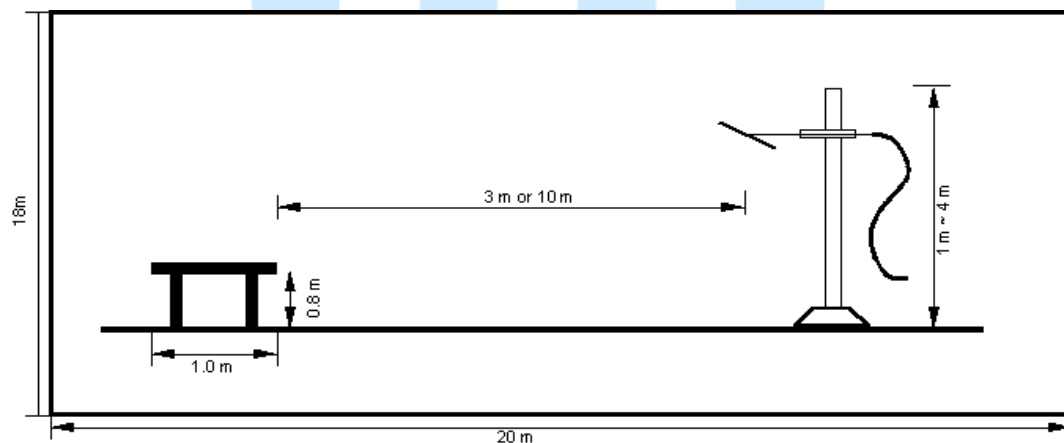


Fig 3. Dimensions of test site (Below 1 GHz)

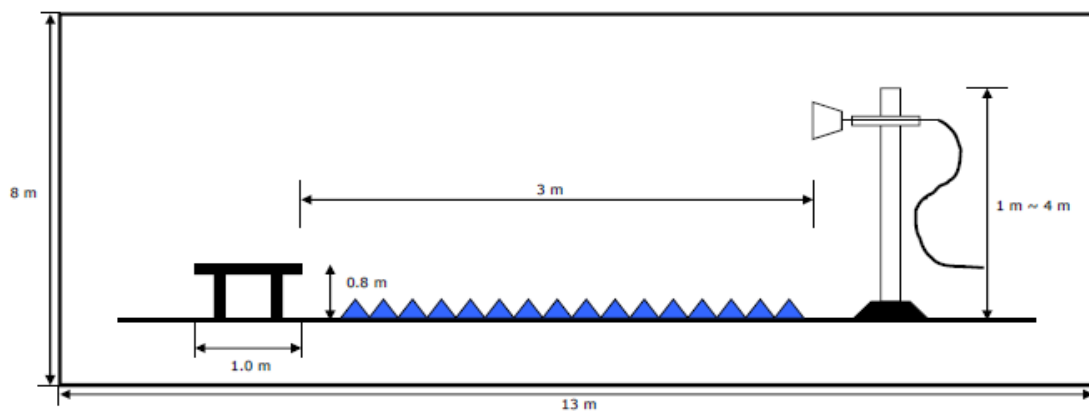


Fig 4. Dimensions of test site (Above 1 GHz)

EUT Type: Base Station

FCC ID.: OZ5URCMRF260





5. Conducted Emission

5.1 Operating Environment

Temperature : 21.8 °C
Relative Humidity : 43.9 % 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)	± 3.89 dB	Confidence level of approximately 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	± 3.37 dB	Confidence level of approximately 95 % ($k = 2$)



5.4 Limit

RFI Conducted	FCC Limit(dBμV/m) Class B	
Freq. Range	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

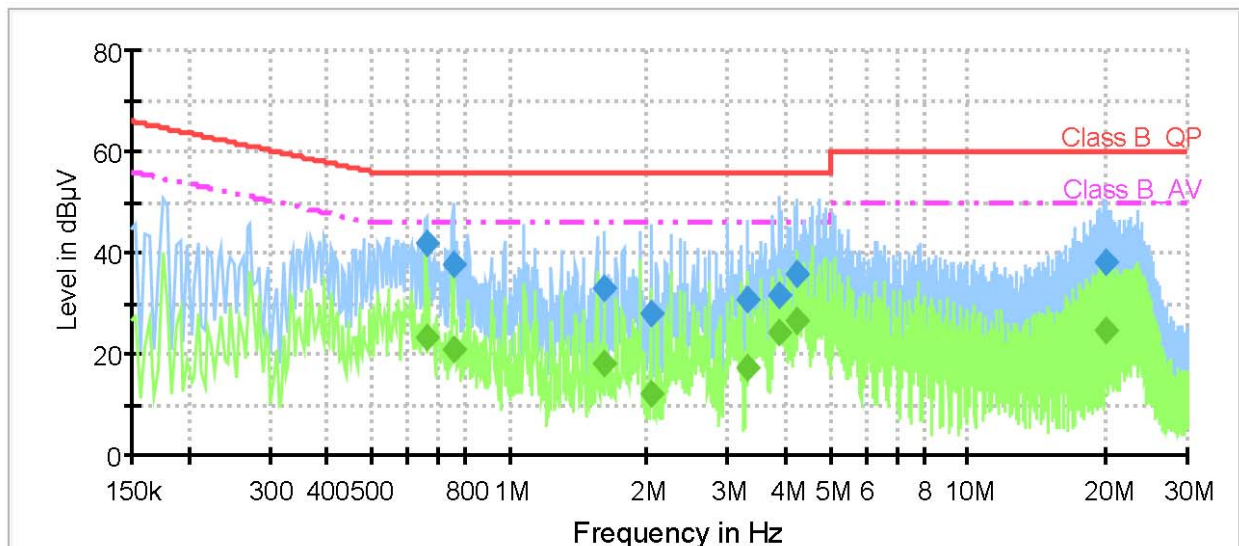
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCI	Rohde & Schwarz	EMI Test Receiver	100237	04. 30. 2015
■ - ENV216	Rohde & Schwarz	LISN	100173	04. 30. 2015
□ - ENV216	Rohde & Schwarz	LISN	100172	04. 30. 2015
□ - ISN T8	TESEQ.GmbH	ISN	24568	07. 10. 2014

5.6 Test data for Conducted Emission

- Test Date : March 05, 2015
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz
- Line : L1: Live, N: Neutral



- Operating condition: RF Receiving mode



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.661181	41.9	100.0	9.000	Off	L1	9.7	14.1	56.0	
0.754463	37.7	100.0	9.000	Off	N	9.7	18.3	56.0	
1.612650	33.1	100.0	9.000	Off	L1	9.8	22.9	56.0	
2.034281	27.8	100.0	9.000	Off	N	9.8	28.2	56.0	
3.310369	30.9	100.0	9.000	Off	N	9.8	25.1	56.0	
3.873788	31.5	100.0	9.000	Off	N	9.8	24.5	56.0	
4.254375	35.9	100.0	9.000	Off	L1	9.8	20.1	56.0	
19.921894	38.2	100.0	9.000	Off	L1	10.2	21.8	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.661181	23.4	100.0	9.000	Off	L1	9.7	22.6	46.0	
0.754463	20.9	100.0	9.000	Off	N	9.7	25.1	46.0	
1.612650	18.2	100.0	9.000	Off	L1	9.8	27.8	46.0	
2.034281	12.1	100.0	9.000	Off	N	9.8	33.9	46.0	
3.310369	17.1	100.0	9.000	Off	N	9.8	28.9	46.0	
3.873788	24.4	100.0	9.000	Off	N	9.8	21.6	46.0	
4.254375	26.4	100.0	9.000	Off	L1	9.8	19.6	46.0	
19.921894	24.7	100.0	9.000	Off	L1	10.2	25.3	50.0	

< Fig 5. Conducted emission result >



6. Radiated Emission

6.1 Operating Environment

Temperature : 18.8 °C
Relative Humidity : 26.9 % 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)	± 4.47 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 4.46 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 4.74 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 4.70 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m)	± 5.28 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (6 000 MHz ~ 18 000 MHz, 3 m)	± 5.37 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	04. 29. 2015
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3193	03. 25. 2016
□ - BBHA9120D	Schwarzbeck	Horn ANT	207	03. 06. 2016
■ - 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	01. 13. 2016

6.6 Test data for Radiated Emission

- Test Date : March 05, 2015
- Measurement Distance : 3 m
- Note : The highest frequency of the internal source of the EUT is above 1 000 MHz (12 MHz) therefore, 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

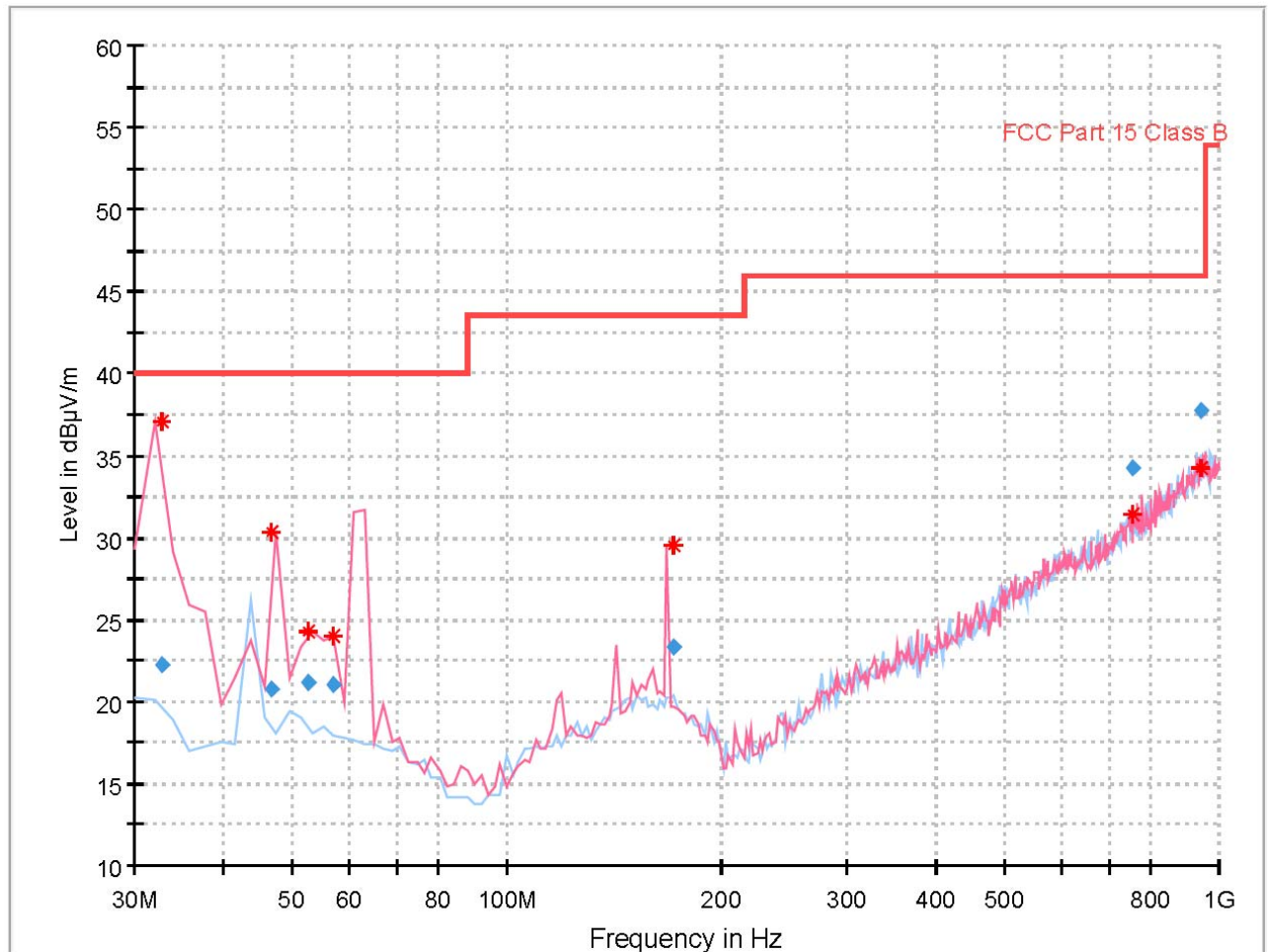
EUT Type: Base Station

FCC ID.: OZ5URCMRF260





- Operating condition: RF Receiving mode



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.705388	22.26	40.00	17.74	1000.0	120.000	107.0	V	330.0	13.1
46.587490	20.77	40.00	19.23	1000.0	120.000	114.0	V	146.0	14.3
52.473653	21.19	40.00	18.81	1000.0	120.000	121.0	V	226.0	14.4
56.863929	21.08	40.00	18.92	1000.0	120.000	125.0	V	200.0	14.2
170.855532	23.38	43.50	20.12	1000.0	120.000	112.0	V	92.0	15.5
757.316701	34.29	46.00	11.71	1000.0	120.000	125.0	H	158.0	25.8
940.338765	37.79	46.00	8.21	1000.0	120.000	218.0	V	58.0	28.6

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



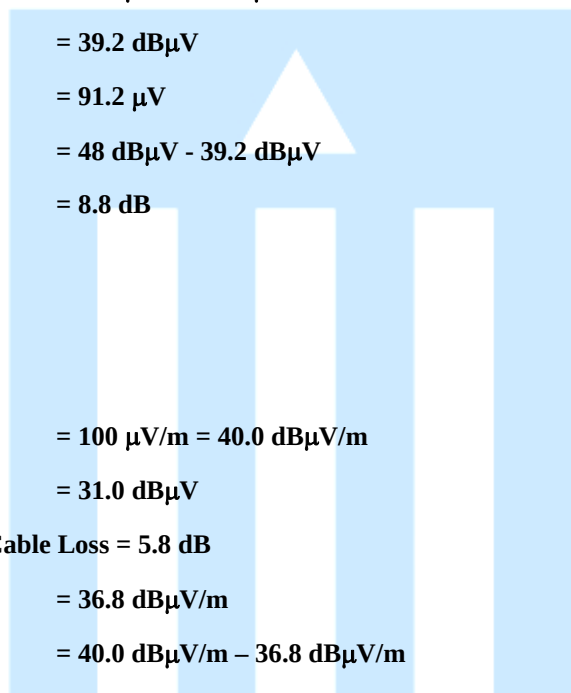
7. Sample Calculations

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

7.1 Example 1 :

■ 20.3 MHz

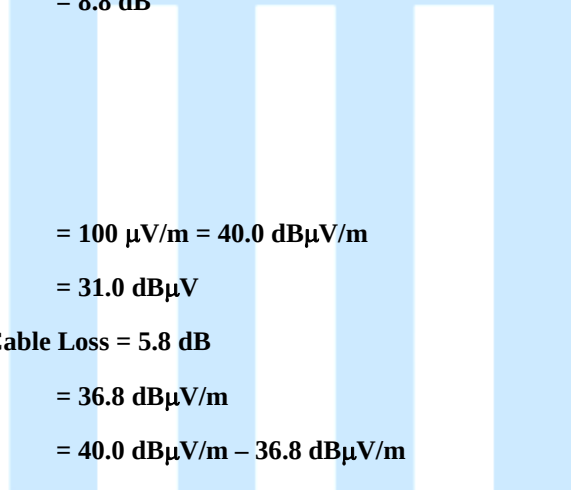
Class B Limit = 250 μV = 48 dB μV
Reading = 39.2 dB μV
 $10^{(39.2\text{dB}\mu\text{V}/20)}$ = 91.2 μV
Margin = 48 dB μV - 39.2 dB μV
= 8.8 dB



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.**

Base Station (Model Name: MRF-260, MRF-260DBL) was complies with §15.107 and 15.109 of the FCC Rules.

- The end -

