

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer : OH SUNG 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 12, 2009
Order Number: GETEC-C1-09-223
Test Report Number: GETEC-E3-09-128
Test Site: Gumi College EMC Center
FCC Registration Number: (100749, 443957)

FCC ID.: OZ5URCMRX1

Applicant: OH SUNG 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-1
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 / 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,



Hyoung Seop Kim, Associate Engineer
GUMI College EMC center



Tae-Sig Park, 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: OH SUNG Electronics Co., Ltd.

Applicant Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea.

Manufacturer: OH SUNG Electronics Co., Ltd.

Manufacturer Address: #181 Gongdan-dong, Gumi-si, Gyeongbuk, Republic of Korea.

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

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- **FCC ID.** OZ5URCMRX1
- **Equipment Class** Class B computing device peripheral (JBP)
- **EUT Type** Network Base Station
- **Model Name** MRX-1
- **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** November 04 ~ 09, 2009
- **Place of Test** **Gumi College EMC Center** (FCC Registration Number: 100749, 443957)
407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-09-128
- **Dates of Issue** November 12, 2009

EUT Type: Network Base Station

FCC ID.: OZ5URCMRX1



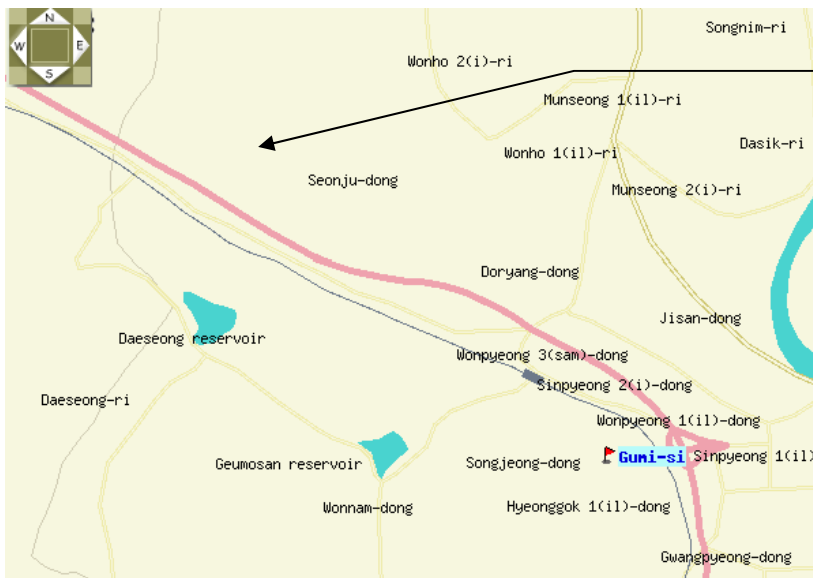
2. Introduction

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 **OH SUNG Electronics Co., Ltd. Network Base Station (Model Name: MRX-1)**

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 on October 19, 1992



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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 **OH SUNG Electronics Co., Ltd. Network Base Station (Model Name: MRX-1) FCC ID.: OZ5URCMRX1**

Maximum Frequency range : 25 MHz
Used AC/DC Adapter : HK-R112-A12(UNIVERSAL remote control)
Input: AC (100 - 240) V, (50 / 60) Hz, 0.5 A
Output: DC 12 V, 1.0 A

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.

RS-232: 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 x 120mm x28mm

Power: 12v External Power Supply



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
Notebook PC	SAMSUNG	NT-Q45	S/N: CNBA4300168AI00682D5800 FCC ID: DoC
RF Sensor	OH SUNG Electronics Co., Ltd.	RFX-250	S/N: N/A FCC ID: OZ5URCRFX250
Voltage power sensor	OH SUNG Electronics Co., Ltd.	VS-100	S/N: N/A FCC ID: DoC
RF transmitter	OH SUNG Electronics Co., Ltd.	RFTX-1	S/N: N/A FCC ID: OZ5URCRFTX1
Network base station	OH SUNG Electronics Co., Ltd.	MRX-1	S/N: N/A FCC ID: OZ5URCMRX1
Printer	Hewlett Packard	970CXI	S/N: MY9B01F1FG FCC ID: DoC
PS2 Mouse	LOGITECH	M-S69	S/N: 334684-108 FCC ID: JNZ211443

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



3.2.2 Used Cable(s)

Cable Name	Condition	Description
Adapter cable(Power cable)	Connected to the EUT and Adapter	1.91 m unshielded
RS232 cable	Connected to the EUT and Notebook PC	2.23 m shielded
IR output cable	Connected to the EUT and IR sensor	3.0 m unshielded
Ethernet (LAN) cable	Connected to the EUT and Notebook PC	1.0 m unshielded
Voltage power sensor cable	Connected to the EUT and VS-100	2.8 m unshielded
RFTX cable	Connected to the EUT and RFTX-1	3.5 m unshielded
RF input cable	Connected to the EUT and RFX-250	3.62 m unshielded
RF output cable	Connected to the EUT and MRX-1	1.8 m shielded
IR input cable	Connected to the EUT and MRX-1	3.0 m shielded

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)
 - Ethernet & RS232 communication mode
: Network connecting and notebook PC connecting mode.

 - RF/IR receiving & output mode
: Continuous IR sensor operating mode.

 - Relay switch operating mode
: Automatic ON/OFF operating mode via software.



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

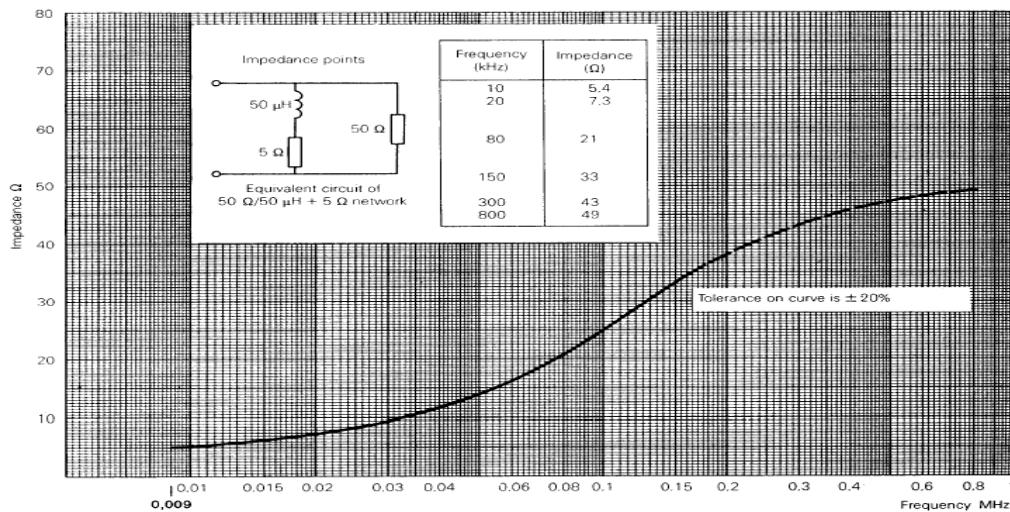


Fig 2. Impedance of LISN



4.3 Radiated Emission

The measurements were conducted in a 3 m anechoic chamber (FCC Registration No.: 443957) 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 noted for each frequency found.

The spectrum was scanned from 30 to 1000 MHz, using a biconical log antenna (Schwarzbeck, VULB9160).

Above 1 GHz, a horn antenna (Schwarzbeck, BBHA9120D / EMCO 3160) was used.

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 an 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 from 1 m to 4 m and stopped at the azimuth or height producing the maximum emission.

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

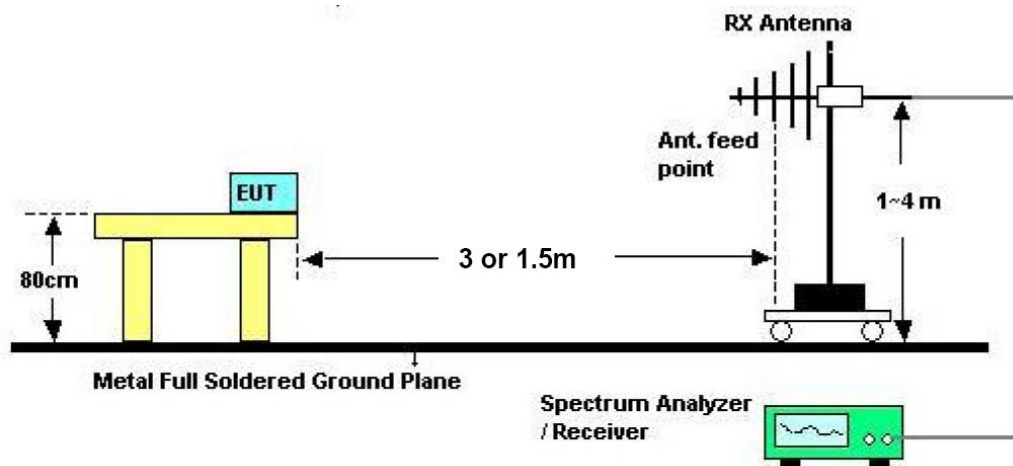


Fig 3. Dimensions of test site.



5. Conducted Emission

5.1 Operating Environment

Temperature : 25 °C
Relative Humidity : 52 % 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.

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) Class B	
	Quasi-Peak	Average
Freq. Range		
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. 13. 2009
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 12. 2009
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 12. 2009
■ - ISN T8	TESEQ. GmbH	ISN	24568	10. 16. 2010

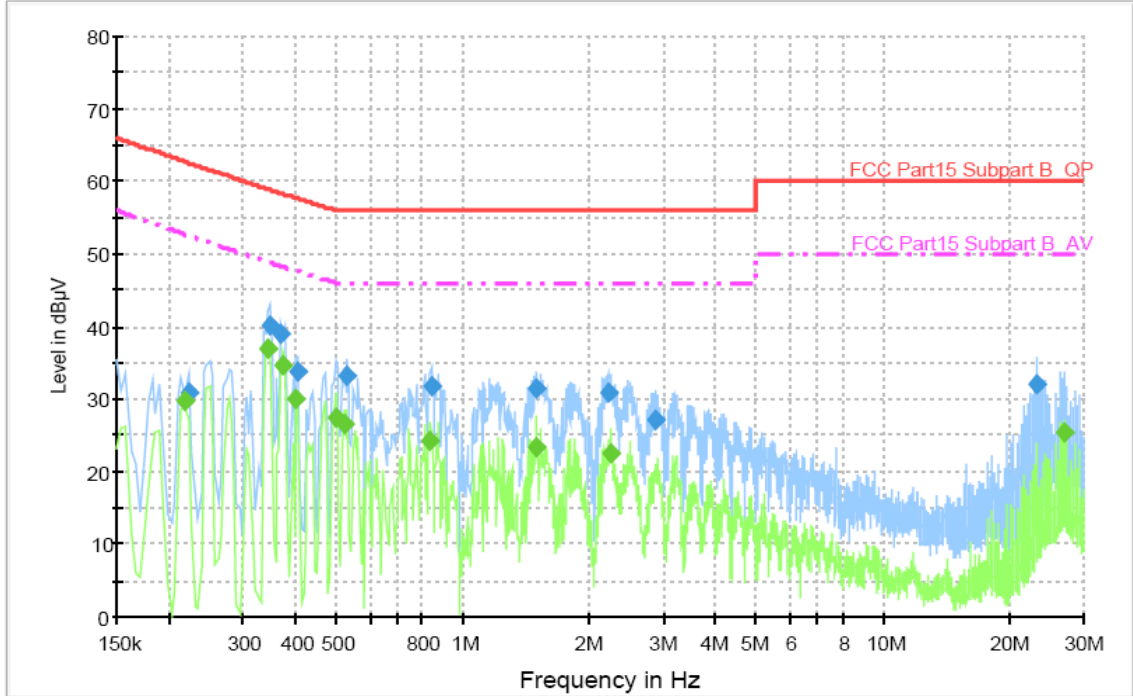
5.6 Test data for Conducted Emission

- Test Date : November 09, 2009
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz



◆ Operating Condition: Ethernet & RS232 communication mode

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
0.222000	30.9	1000.000	9.000	GND	L1	9.9	31.7	62.6	
0.346000	40.0	1000.000	9.000	GND	L1	10.0	18.9	58.9	
0.370000	39.1	1000.000	9.000	GND	L1	10.0	19.2	58.3	
0.406000	33.7	1000.000	9.000	GND	L1	10.0	23.9	57.6	
0.530000	33.2	1000.000	9.000	GND	L1	10.0	22.8	56.0	
0.842000	31.8	1000.000	9.000	GND	L1	10.0	24.2	56.0	
1.498000	31.3	1000.000	9.000	GND	L1	10.1	24.7	56.0	
2.210000	30.8	1000.000	9.000	GND	L1	10.1	25.2	56.0	
2.882000	27.3	1000.000	9.000	GND	L1	10.1	28.7	56.0	
23.130000	32.0	1000.000	9.000	GND	L1	11.0	28.0	60.0	

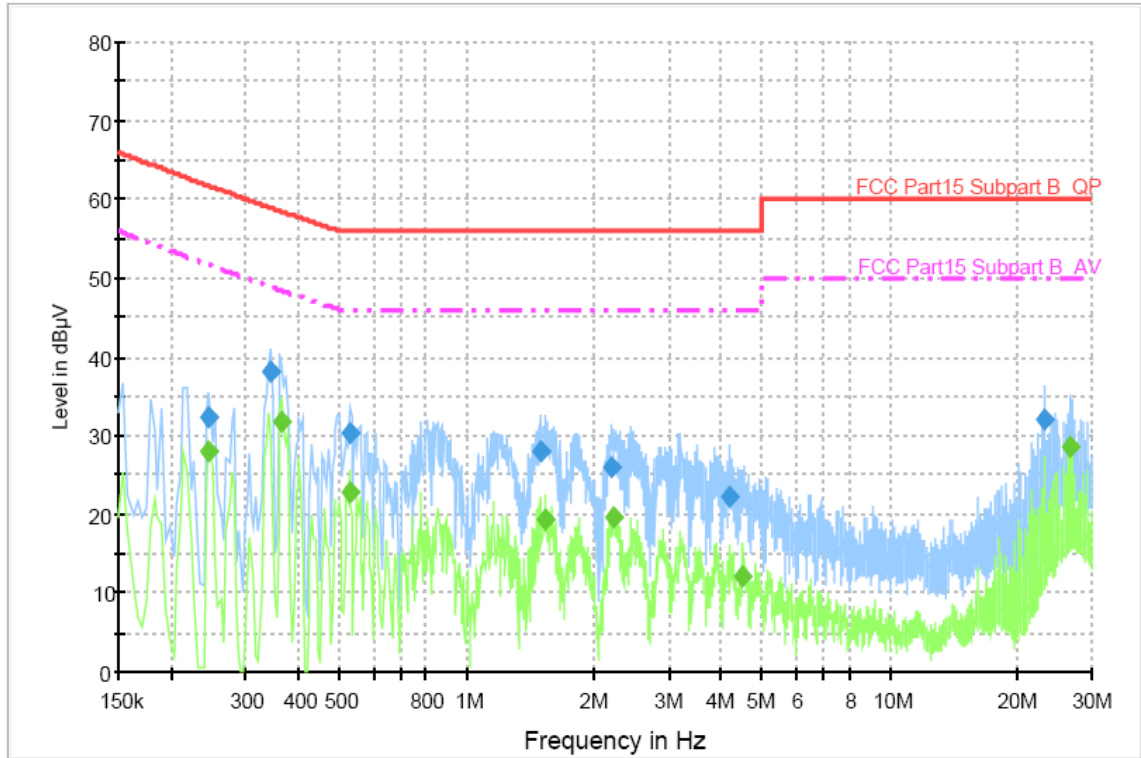
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.218000	29.9	1000.000	9.000	GND	L1	9.9	22.8	52.7	
0.342000	36.8	1000.000	9.000	GND	L1	10.0	12.1	48.9	
0.374000	34.7	1000.000	9.000	GND	L1	10.0	13.5	48.2	
0.402000	29.9	1000.000	9.000	GND	L1	10.0	17.8	47.7	
0.498000	27.6	1000.000	9.000	GND	L1	10.0	18.4	46.0	
0.522000	26.7	1000.000	9.000	GND	L1	10.0	19.3	46.0	
0.838000	24.2	1000.000	9.000	GND	L1	10.0	21.8	46.0	
1.498000	23.5	1000.000	9.000	GND	L1	10.1	22.5	46.0	
2.250000	22.5	1000.000	9.000	GND	L1	10.1	23.5	46.0	
27.158000	25.5	1000.000	9.000	GND	L1	11.0	24.5	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
0.246000	32.5	1000.000	9.000	GND	N	10.0	29.2	61.7	
0.342000	38.1	1000.000	9.000	GND	N	10.0	20.9	59.0	
0.526000	30.5	1000.000	9.000	GND	N	10.0	25.5	56.0	
1.494000	28.1	1000.000	9.000	GND	N	10.1	27.9	56.0	
2.190000	26.0	1000.000	9.000	GND	N	10.1	30.0	56.0	
4.178000	22.2	1000.000	9.000	GND	N	10.2	33.8	56.0	
23.130000	32.2	1000.000	9.000	GND	N	10.8	27.8	60.0	

Final Measurement Detector 2

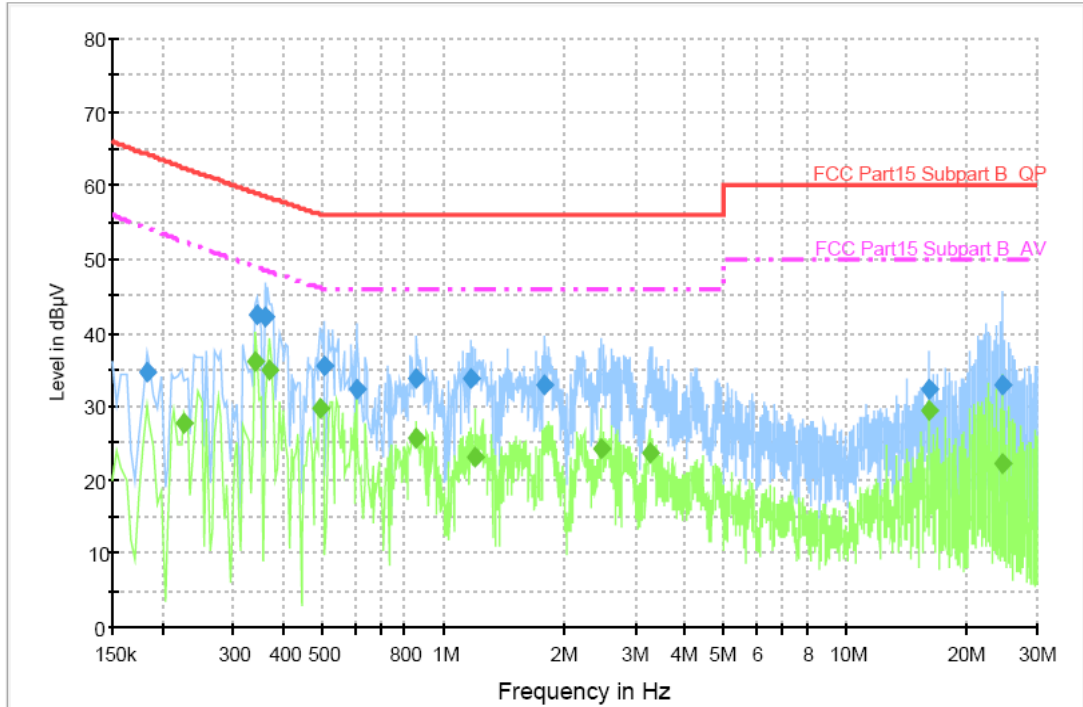
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.246000	28.0	1000.000	9.000	GND	N	10.0	23.7	51.7	
0.366000	31.9	1000.000	9.000	GND	N	10.0	16.5	48.4	
0.526000	22.8	1000.000	9.000	GND	N	10.0	23.2	46.0	
1.530000	19.4	1000.000	9.000	GND	N	10.1	26.6	46.0	
2.214000	19.6	1000.000	9.000	GND	N	10.1	26.4	46.0	
4.502000	12.2	1000.000	9.000	GND	N	10.2	33.8	46.0	
26.610000	28.5	1000.000	9.000	GND	N	10.8	21.5	50.0	

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



◆ Operating Condition: RF/IR receiving & output mode

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
0.182000	34.6	1000.000	9.000	GND	L1	9.9	29.7	64.3	
0.342000	42.4	1000.000	9.000	GND	L1	10.0	16.6	59.0	
0.358000	42.2	1000.000	9.000	GND	L1	10.0	16.4	58.6	
0.502000	35.4	1000.000	9.000	GND	L1	10.0	20.6	56.0	
0.606000	32.3	1000.000	9.000	GND	L1	10.0	23.7	56.0	
0.858000	33.9	1000.000	9.000	GND	L1	10.0	22.1	56.0	
1.170000	33.7	1000.000	9.000	GND	L1	10.0	22.3	56.0	
1.790000	32.9	1000.000	9.000	GND	L1	10.1	23.1	56.0	
16.166000	32.4	1000.000	9.000	GND	L1	10.7	27.6	60.0	
24.650000	33.0	1000.000	9.000	GND	L1	11.0	27.0	60.0	

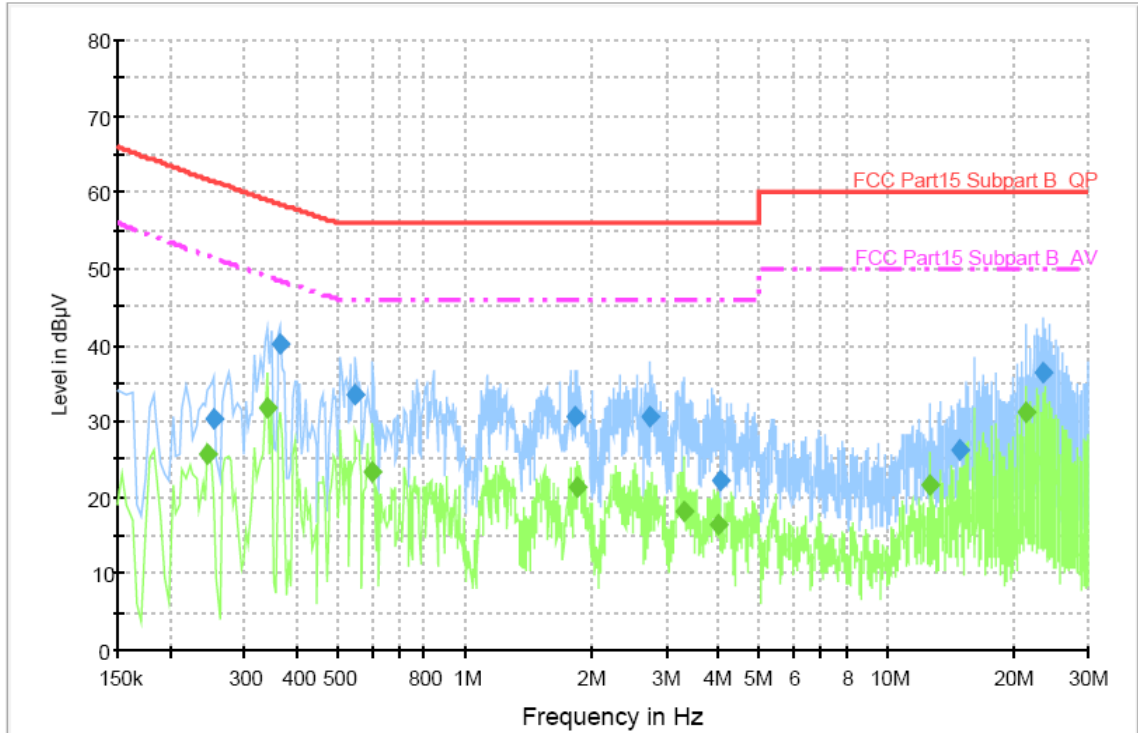
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.226000	27.7	1000.000	9.000	GND	L1	9.9	24.7	52.4	
0.338000	36.0	1000.000	9.000	GND	L1	10.0	13.0	49.0	
0.370000	35.1	1000.000	9.000	GND	L1	10.0	13.2	48.3	
0.494000	29.8	1000.000	9.000	GND	L1	10.0	16.3	46.1	
0.854000	25.8	1000.000	9.000	GND	L1	10.0	20.2	46.0	
1.198000	23.1	1000.000	9.000	GND	L1	10.0	22.9	46.0	
2.474000	24.3	1000.000	9.000	GND	L1	10.1	21.7	46.0	
3.250000	23.5	1000.000	9.000	GND	L1	10.1	22.5	46.0	
16.226000	29.5	1000.000	9.000	GND	L1	10.7	20.5	50.0	
24.650000	22.3	1000.000	9.000	GND	L1	11.0	27.7	50.0	

< Fig 6. 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
0.254000	30.4	1000.000	9.000	GND	N	10.0	31.0	61.4	
0.366000	40.2	1000.000	9.000	GND	N	10.0	18.2	58.4	
0.550000	33.5	1000.000	9.000	GND	N	10.0	22.5	56.0	
1.818000	30.5	1000.000	9.000	GND	N	10.1	25.5	56.0	
2.746000	30.5	1000.000	9.000	GND	N	10.1	25.5	56.0	
4.030000	22.2	1000.000	9.000	GND	N	10.2	33.8	56.0	
14.822000	26.3	1000.000	9.000	GND	N	10.6	33.7	60.0	
23.614000	36.3	1000.000	9.000	GND	N	10.8	23.7	60.0	

Final Measurement Detector 2

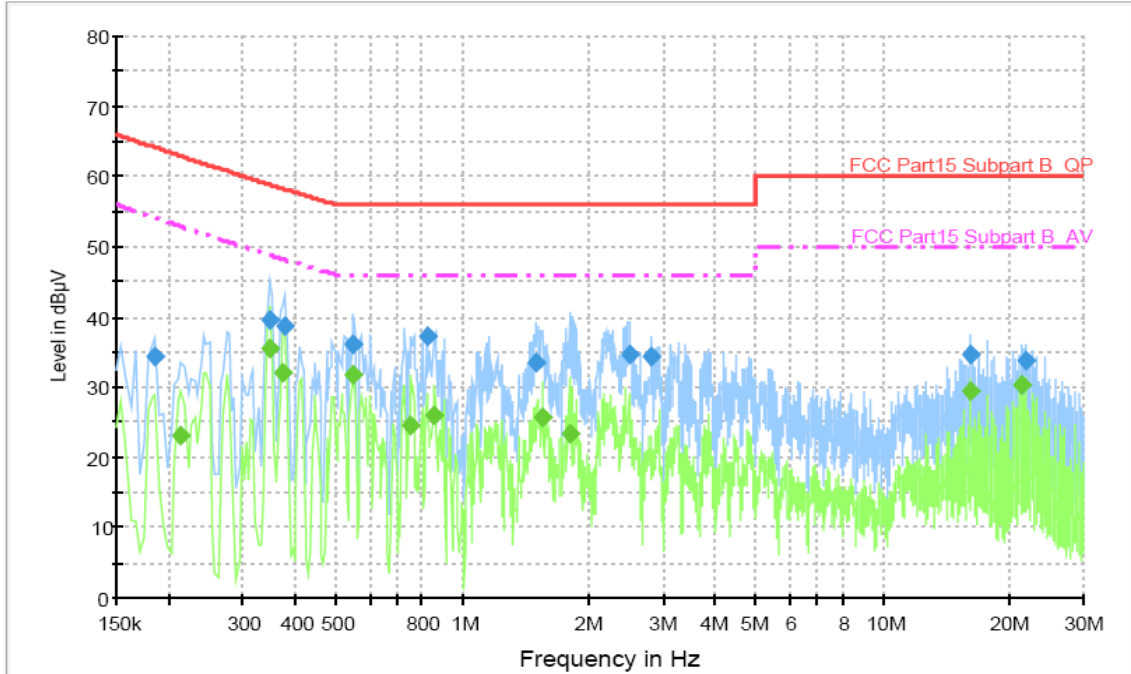
Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.246000	25.6	1000.000	9.000	GND	N	10.0	26.1	51.7	
0.338000	31.7	1000.000	9.000	GND	N	10.0	17.3	49.0	
0.602000	23.3	1000.000	9.000	GND	N	10.0	22.7	46.0	
1.850000	21.4	1000.000	9.000	GND	N	10.1	24.6	46.0	
3.298000	18.3	1000.000	9.000	GND	N	10.1	27.7	46.0	
3.986000	16.4	1000.000	9.000	GND	N	10.2	29.6	46.0	
12.666000	21.6	1000.000	9.000	GND	N	10.4	28.4	50.0	
21.438000	31.2	1000.000	9.000	GND	N	10.8	18.8	50.0	

< Fig 7. Conducted emission result (Neutral line)>



◆ Operating Condition: Relay switch operating mode

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
0.186000	34.4	1000.000	9.000	GND	L1	9.9	29.7	64.1	
0.346000	39.6	1000.000	9.000	GND	L1	10.0	19.3	58.9	
0.378000	38.7	1000.000	9.000	GND	L1	10.0	19.5	58.2	
0.550000	36.2	1000.000	9.000	GND	L1	10.0	19.8	56.0	
0.822000	37.1	1000.000	9.000	GND	L1	10.0	18.9	56.0	
1.498000	33.6	1000.000	9.000	GND	L1	10.1	22.4	56.0	
2.486000	34.6	1000.000	9.000	GND	L1	10.1	21.4	56.0	
2.822000	34.2	1000.000	9.000	GND	L1	10.1	21.8	56.0	
16.230000	34.5	1000.000	9.000	GND	L1	10.7	25.5	60.0	
21.998000	33.8	1000.000	9.000	GND	L1	10.9	26.2	60.0	

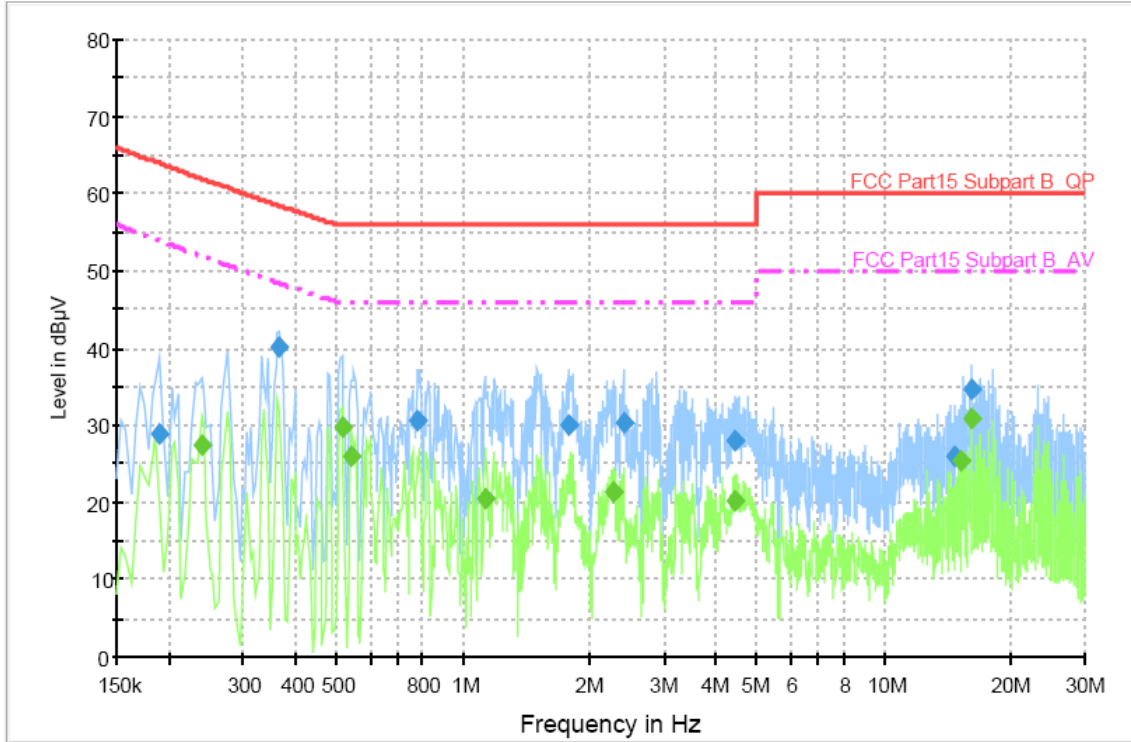
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.214000	23.1	1000.000	9.000	GND	L1	9.9	29.7	52.8	
0.346000	35.6	1000.000	9.000	GND	L1	10.0	13.3	48.9	
0.374000	31.9	1000.000	9.000	GND	L1	10.0	16.3	48.2	
0.550000	31.9	1000.000	9.000	GND	L1	10.0	14.1	46.0	
0.754000	24.7	1000.000	9.000	GND	L1	10.0	21.3	46.0	
0.858000	25.9	1000.000	9.000	GND	L1	10.0	20.1	46.0	
1.546000	25.7	1000.000	9.000	GND	L1	10.1	20.3	46.0	
1.794000	23.5	1000.000	9.000	GND	L1	10.1	22.5	46.0	
16.226000	29.4	1000.000	9.000	GND	L1	10.7	20.6	50.0	
21.442000	30.3	1000.000	9.000	GND	L1	10.9	19.7	50.0	

< Fig 8. 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
0.190000	28.7	1000.000	9.000	GND	N	9.9	35.2	63.9	
0.366000	40.2	1000.000	9.000	GND	N	10.0	18.2	58.4	
0.778000	30.6	1000.000	9.000	GND	N	10.0	25.4	56.0	
1.782000	30.0	1000.000	9.000	GND	N	10.1	26.0	56.0	
2.398000	30.3	1000.000	9.000	GND	N	10.1	25.7	56.0	
4.406000	28.0	1000.000	9.000	GND	N	10.2	28.0	56.0	
14.762000	25.9	1000.000	9.000	GND	N	10.6	34.1	60.0	
16.166000	34.8	1000.000	9.000	GND	N	10.6	25.2	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.238000	27.5	1000.000	9.000	GND	N	10.0	24.4	51.9	
0.514000	29.8	1000.000	9.000	GND	N	10.0	16.2	46.0	
0.542000	26.0	1000.000	9.000	GND	N	10.0	20.0	46.0	
1.130000	20.4	1000.000	9.000	GND	N	10.0	25.6	46.0	
2.278000	21.4	1000.000	9.000	GND	N	10.1	24.6	46.0	
4.418000	20.3	1000.000	9.000	GND	N	10.2	25.7	46.0	
15.250000	25.4	1000.000	9.000	GND	N	10.6	24.6	50.0	
16.166000	30.8	1000.000	9.000	GND	N	10.6	19.2	50.0	

< Fig 9. Conducted emission result (Neutral line)>



6. Radiated Emission

6.1 Operating Environment

Temperature : 20 °C
Relative Humidity : 46 % R.H.

6.2 Test Set-up

The formal radiated emission was measured at 3 m distance semi 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	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3m, Vertical)	± 3.54 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 3m, Horizontal)	± 3.49 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 3m, Vertical)	± 3.70 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 3m, Horizontal)	± 3.61 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 10m, Vertical)	± 3.21 dB	Confidence levels of 95 % (k=2)
Radiated emission (30 MHz ~ 300 MHz, 10m, Horizontal)	± 3.32 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 10m, Vertical)	± 3.63 dB	Confidence levels of 95 % (k=2)
Radiated emission (300 MHz ~ 1 000 MHz, 10m, Horizontal)	± 3.69 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
■ - ESI	Rohde & Schwarz	EMI test receiver	830482/010	12. 14. 2009
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3193	12. 11. 2009
■ - MCU066	matur GmbH	MCU066	1390306	N/A
■ - TT2.5SI	matur GmbH	Turntable	1390307	N/A
■ - AM 4.0	matur GmbH	Antenna Mast	1390308	N/A

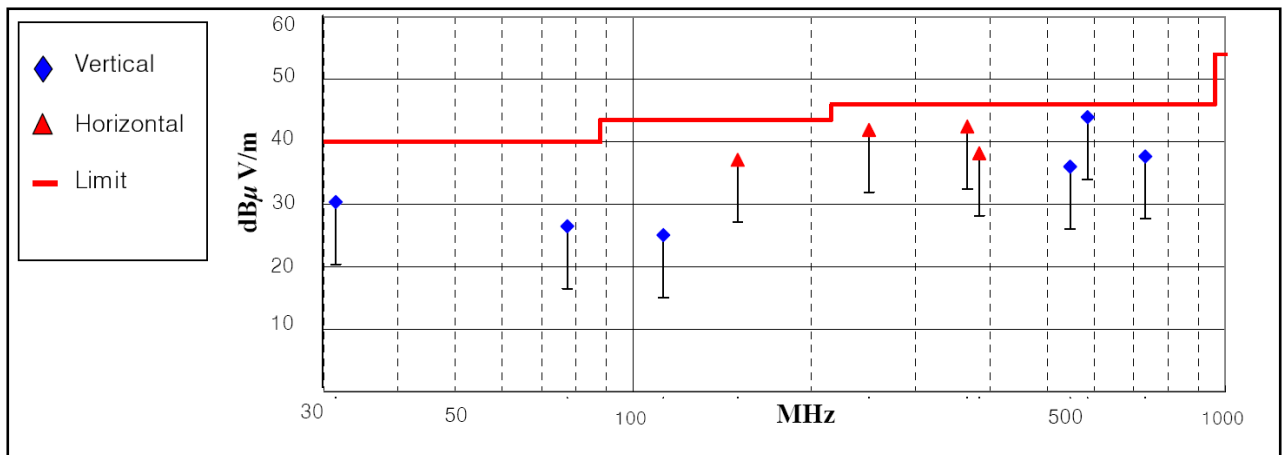


6.6 Test data for Radiated Emission

- Test Date : November 04, 2009
- 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 (25 MHz)
 The measurement was made up to 1 000 MHz

◆ Operating Condition: Ethernet & RS232 communication mode

Frequency (MHz)	Measurement Level				Limit (dB μ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dB μ V)	Factor(dB/m)	Loss(dB)	(dB μ V/m)					
31.45	18.35	10.98	1.03	30.36	40.00	9.64	V	100	186
77.36	16.45	8.30	1.75	26.50	40.00	13.50	V	107	16
112.45	12.95	10.38	1.76	25.09	43.50	18.41	V	100	72
150.00	22.34	12.65	2.15	37.14	43.50	6.36	H	220	214
250.03	27.97	11.17	2.76	41.90	46.00	4.10	H	169	173
366.40	25.12	14.13	3.23	42.48	46.00	3.52	H	100	212
384.00	20.39	14.48	3.30	38.17	46.00	7.83	H	108	276
546.60	14.41	17.83	3.80	36.04	46.00	9.96	V	100	183
585.29	21.12	18.84	4.03	43.99	46.00	2.01	V	108	71
732.89	11.97	20.93	4.77	37.67	46.00	8.33	V	100	124

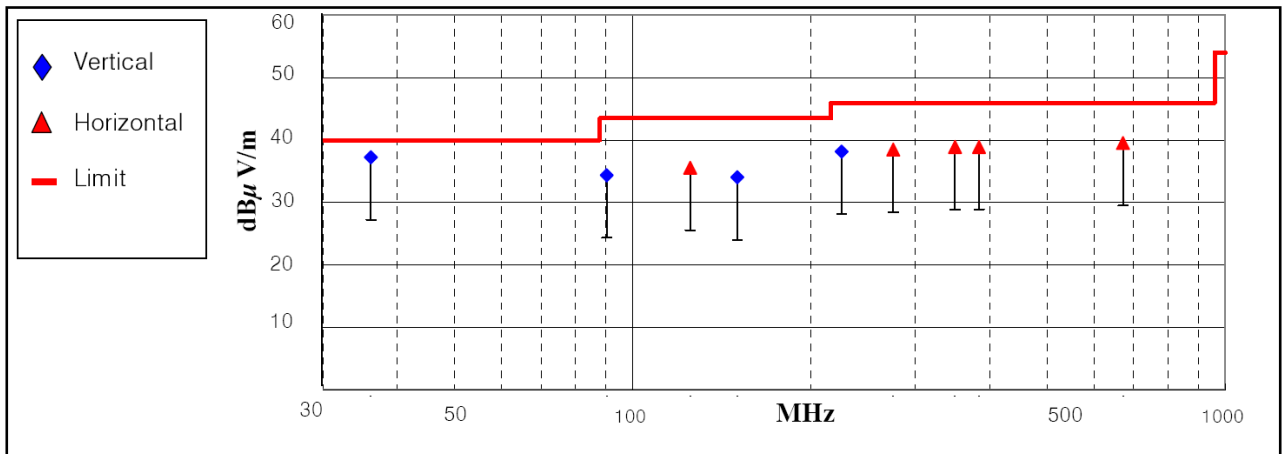


< Fig 10. Radiated emission result (30 MHz ~ 1 000 MHz)>



◆ Operating Condition: RF/IR receiving & output mode

Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)					
36.14	25.09	11.02	1.13	37.24	40.00	2.76	V	100	283
90.35	24.76	7.83	1.81	34.40	43.50	9.10	V	149	10
124.98	22.24	11.54	1.78	35.56	43.50	7.94	H	247	18
150.00	19.26	12.65	2.15	34.06	43.50	9.44	V	100	0
225.00	25.32	10.26	2.59	38.17	46.00	7.83	V	100	269
274.99	23.67	11.95	2.88	38.50	46.00	7.50	H	129	68
349.99	21.94	13.80	3.16	38.90	46.00	7.10	H	131	309
384.00	21.13	14.48	3.30	38.91	46.00	7.09	H	203	274
671.95	15.35	19.69	4.50	39.54	46.00	6.46	H	185	0

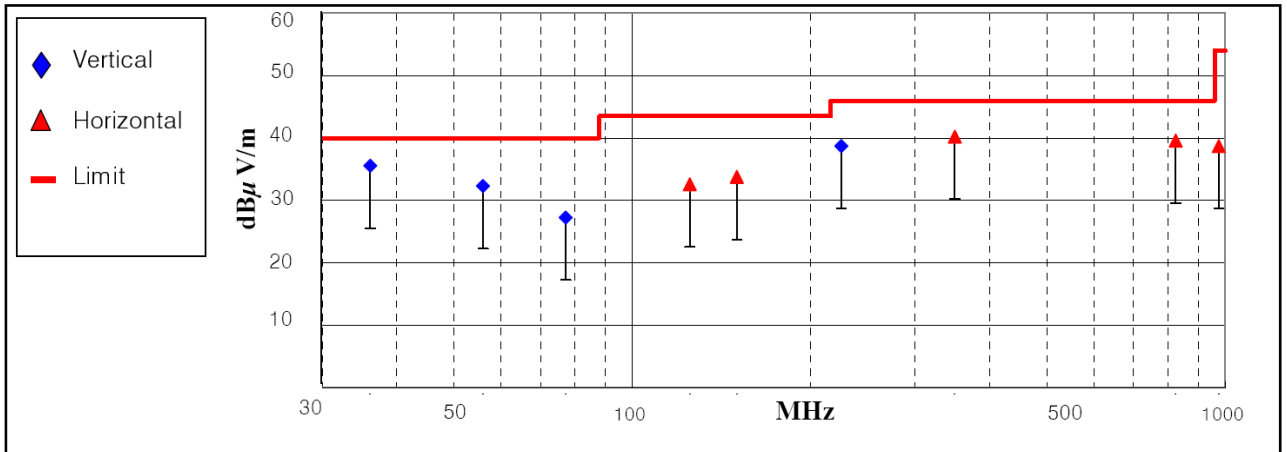


< Fig 11. Radiated emission result (30 MHz ~ 1 000 MHz)>



◆ Operating Condition: Relay switch operating mode

Frequency (MHz)	Measurement Level				Limit (dBμ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dBμ V)	Factor(dB/m)	Loss(dB)	(dBμ V/m)					
36.15	23.42	11.02	1.13	35.57	40.00	4.43	V	100	231
56.02	19.10	11.77	1.47	32.34	40.00	7.66	V	100	251
77.23	17.17	8.33	1.75	27.25	40.00	12.75	V	100	347
124.97	19.27	11.54	1.78	32.59	43.50	10.91	H	251	11
150.00	18.97	12.65	2.15	33.77	43.50	9.73	H	248	0
225.00	25.86	10.26	2.59	38.71	46.00	7.29	V	100	214
349.96	23.27	13.80	3.16	40.23	46.00	5.77	H	108	269
824.95	12.55	21.90	5.16	39.61	46.00	6.39	H	124	180
974.93	9.63	23.45	5.66	38.74	54.00	15.26	H	187	210



< Fig 12. 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 **OH SUNG Electronics Co., Ltd. Network Base Station (Model Name: MRX-1)** was complies with §15.107 and 15.109 of the FCC Rules.