

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-C1-09-215
Test Report Number: GETEC-E3-09-130
Test Site: Gumi College EMC Center
FCC Registration Number: (100749, 443957)

FCC ID.: OZ5URCKP4000

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 Keypad
Type of Authority	: Certification
Model Name	: KP-4000
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.

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- **FCC ID.** OZ5URCKP4000
- **Equipment Class** Class B computing device peripheral (JBP)
- **EUT Type** Network Keypad
- **Model Name** KP-4000
- **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-E3-09-130
- **Dates of Issue** November 12, 2009

EUT Type: Network Keypad

FCC ID.: OZ5URCKP4000



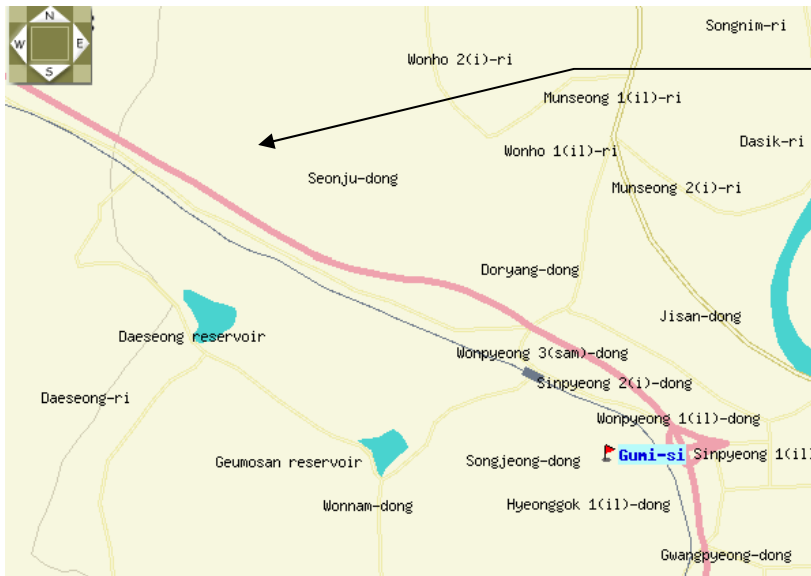
2. Introduction

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 Keypad (Model Name: KP-4000)**

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 Keypad (Model Name: KP-4000) FCC ID.: OZ5URCKP4000**

Maximum Frequency range : 25 MHz

Microprocessor: 190MHz RISC

Memory: 64 Megabytes of RAM (for User Configuration)

Devices: Supports up to 255 Devices

Pages: Supports up to 255 Pages on each Device

Macro Capability: Up to 255 steps each, however nesting is allowed

Network: One 10/100 Ethernet port

Weight: 9.84 oz.

Size: 5.75" x 4.7" x 1.8"

Power : DC12V, 1A or Use PoE Power



3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
RF Remote controller	OH SUNG Electronics Co., Ltd.	RFTX-1	S/N: N/A FCC ID: OZ5URCRFTX1
Used AC/DC Adapter	Suzhou Li Shin Electronics Co., Ltd.	LSE0107A1240	S/N:A30837111228 FCC ID:N/A

Note) The EUT hasn't a AC/DC power supply unit. However, the EUT has a possibility it could be connected into the low voltage public supply system with a AC/DC Adapter. Therefore, we did EMI measurement with above described AC/DC Adapter

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

3.2.2 Used Cable(s)

Cable Name	Condition	Description
DC Power cable	Connected to the EUT and AC/DC Adapter	1.0 m unshielded
LAN cable	Connected to the EUT and Network	10.0 m unshielded
Power cable	Connected to the Adapter and power	1.8 m unshielded
IR out cable	Connected to the EUT and RFTX-1	3.5 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 : AC 120 V / 60 Hz

- Test Mode(s)
 - IR continuous transmitting & Network connecting 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).

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

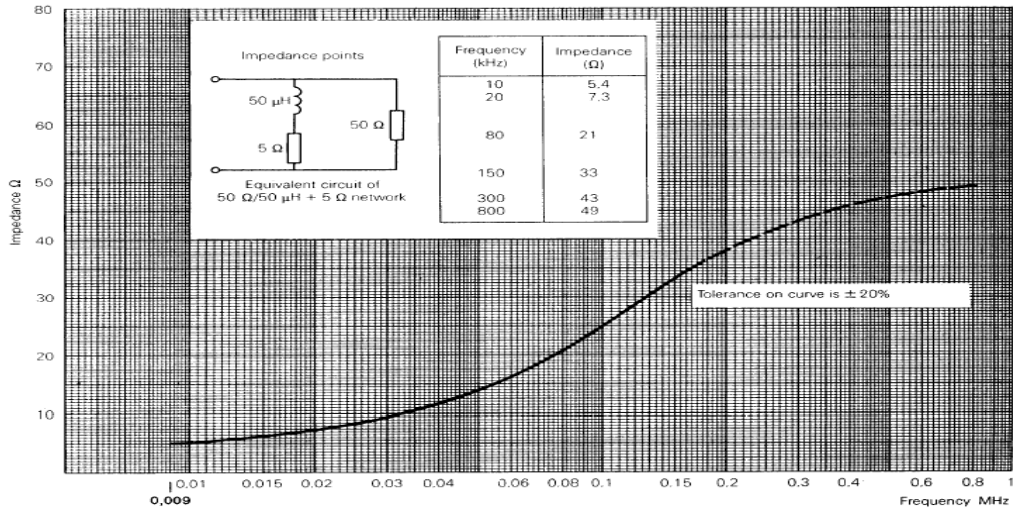


Fig 2. Impedance of LISN



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

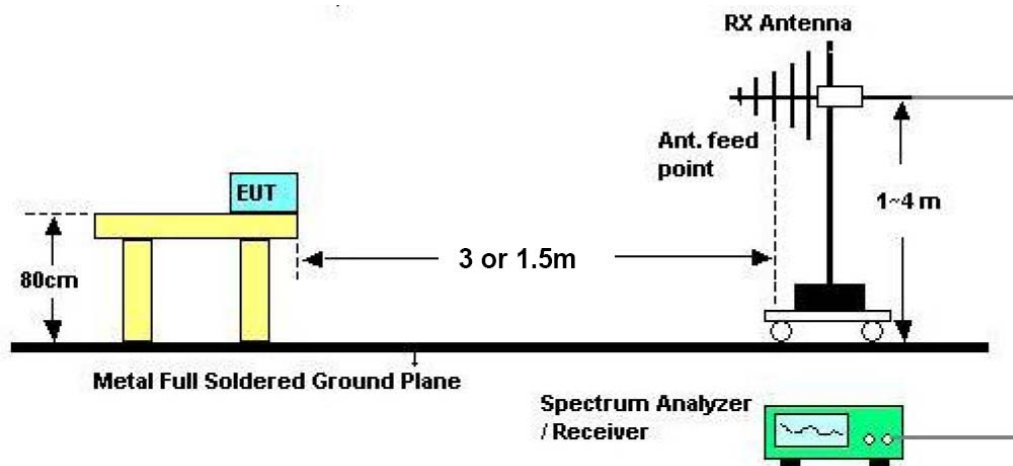


Fig 3. Dimensions of test site.



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

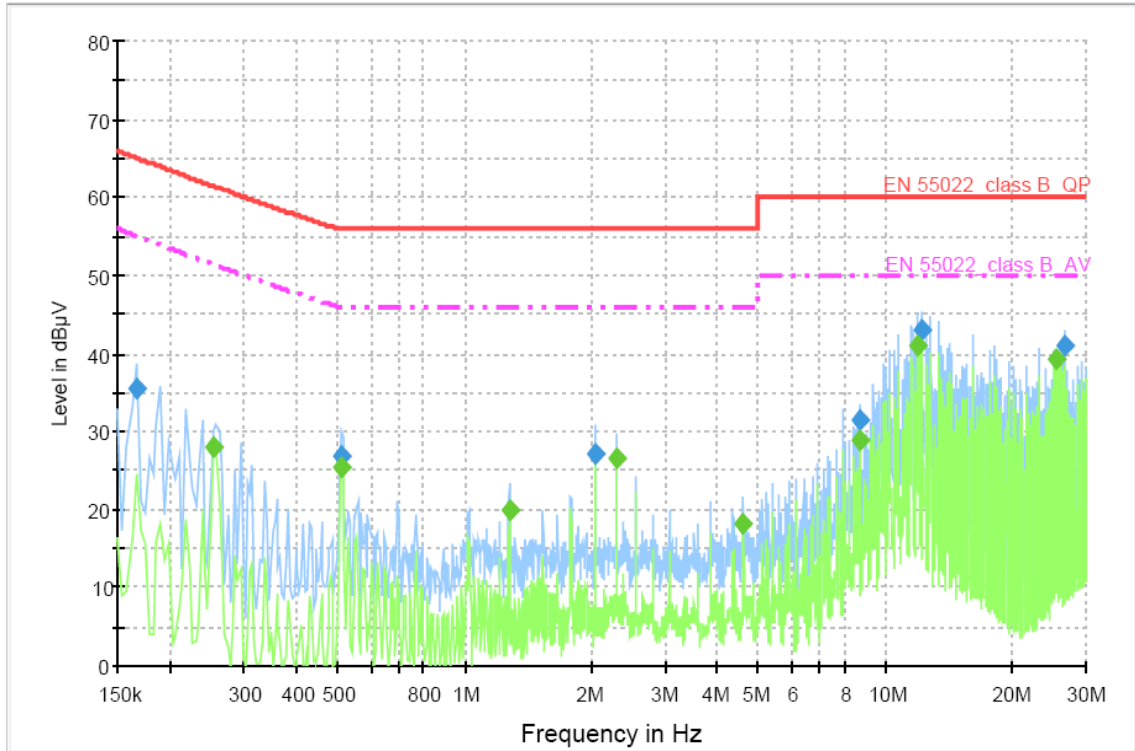
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI test receiver	839809/003	12. 13. 2009
□ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 12. 2009
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 12. 2009
□ - ISN T8	TESEQ. GmbH	ISN	24568	10. 16. 2010

5.6 Test data for Conducted Emission

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



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
0.166000	35.5	1000.000	9.000	GND	L1	9.9	29.6	65.1	
0.510000	26.8	1000.000	9.000	GND	L1	10.0	29.2	56.0	
2.046000	27.2	1000.000	9.000	GND	L1	10.1	28.8	56.0	
8.718000	31.4	1000.000	9.000	GND	L1	10.3	28.6	60.0	
12.198000	43.0	1000.000	9.000	GND	L1	10.4	17.0	60.0	
26.606000	41.0	1000.000	9.000	GND	L1	11.0	19.0	60.0	

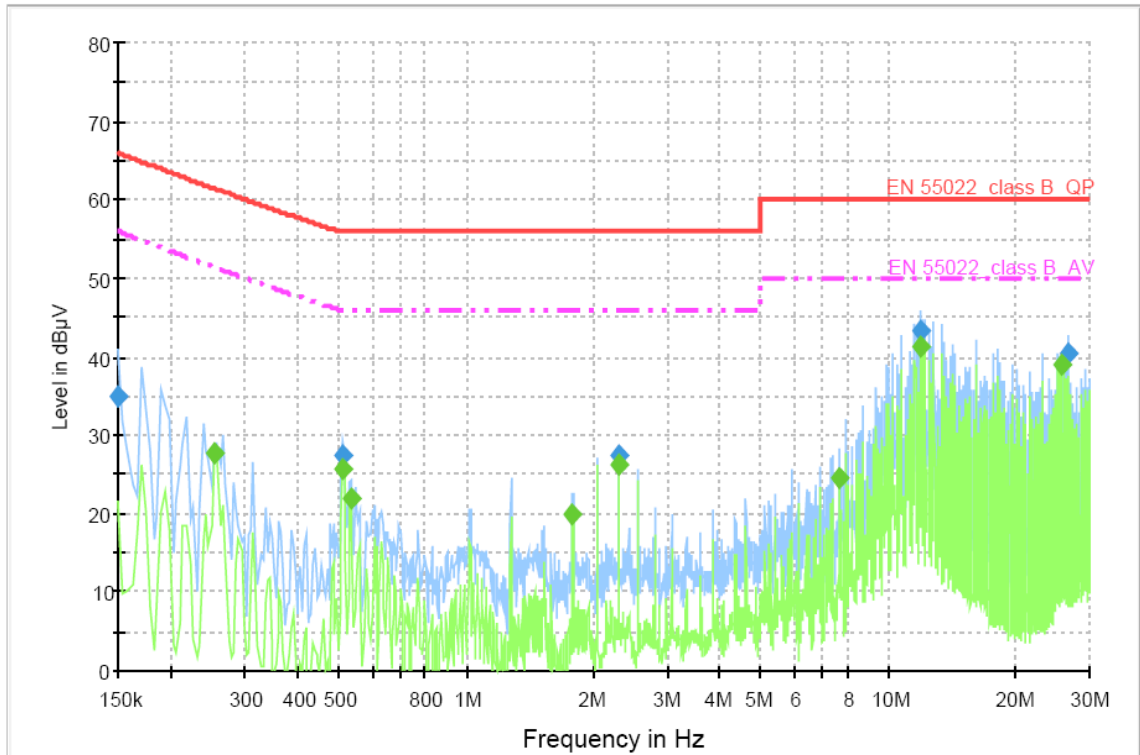
Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.254000	27.9	1000.000	9.000	GND	L1	10.0	23.5	51.4	
0.510000	25.4	1000.000	9.000	GND	L1	10.0	20.6	46.0	
1.278000	20.0	1000.000	9.000	GND	L1	10.0	26.0	46.0	
2.302000	26.5	1000.000	9.000	GND	L1	10.1	19.5	46.0	
4.606000	18.3	1000.000	9.000	GND	L1	10.2	27.7	46.0	
8.718000	28.8	1000.000	9.000	GND	L1	10.3	21.2	50.0	
11.890000	41.0	1000.000	9.000	GND	L1	10.4	9.0	50.0	
25.582000	39.2	1000.000	9.000	GND	L1	11.0	10.8	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
0.150000	34.9	1000.000	9.000	GND	N	9.9	31.1	66.0	
0.510000	27.4	1000.000	9.000	GND	N	10.0	28.6	56.0	
2.302000	27.5	1000.000	9.000	GND	N	10.1	28.5	56.0	
11.890000	43.4	1000.000	9.000	GND	N	10.4	16.6	60.0	
26.606000	40.3	1000.000	9.000	GND	N	10.8	19.7	60.0	

Final Measurement Detector 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.254000	27.7	1000.000	9.000	GND	N	10.0	23.7	51.4	
0.510000	25.7	1000.000	9.000	GND	N	10.0	20.3	46.0	
0.534000	21.8	1000.000	9.000	GND	N	10.0	24.2	46.0	
1.790000	19.9	1000.000	9.000	GND	N	10.1	26.1	46.0	
2.302000	26.2	1000.000	9.000	GND	N	10.1	19.8	46.0	
7.674000	24.6	1000.000	9.000	GND	N	10.3	25.4	50.0	
11.890000	41.2	1000.000	9.000	GND	N	10.4	8.8	50.0	
25.838000	38.9	1000.000	9.000	GND	N	10.8	11.1	50.0	

< Fig 5. 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

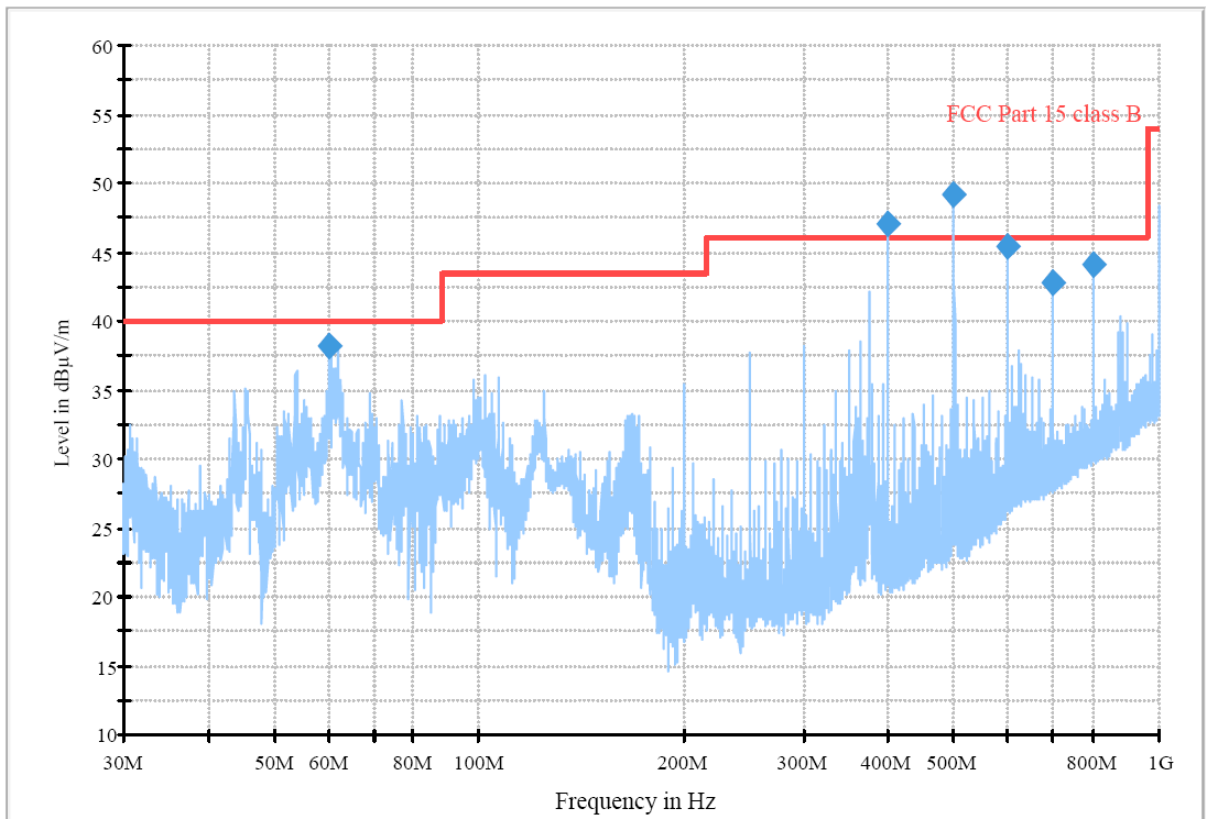
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESI	Rohde & Schwarz	EMI test receiver	830482/010	12. 14. 2009
■ - VULB9160	Schwarzbeck	Broadband Test Antenna	3193	12. 11. 2009
■ - MCU066	maturu GmbH	MCU066	1390306	N/A
■ - TT2.5SI	maturu GmbH	Turntable	1390307	N/A
■ - AM 4.0	maturu 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

FCC_ESIB_Direct_RE with Scans



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Quasi-peak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
60.200000	38.2	34.91	100.0	V	128.0	13.4	5.09	40.00
400.000000	47.1	43.76	100.0	H	285.0	19.8	2.24	46.00
500.000000	49.1	42.52	100.0	V	157.0	22.5	3.48	46.00
600.000000	45.4	41.96	100.0	V	193.0	25.9	4.04	46.00
700.050000	42.9	36.74	200.0	V	0.0	27.7	9.06	46.00
799.950000	44.1	40.72	104.0	H	140.0	29.7	5.28	46.00

< 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 **OH SUNG Electronics Co., Ltd. Network Keypad (Model Name: KP-4000)** was complies with §15.107 and 15.109 of the FCC Rules.