

FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer: OHSUNG ELECTRONICS CO., LTD.

Date of Issue: May 21, 2012

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

Order Number: GETEC-C1-12-155

Republic of Korea

Test Report Number: GETEC-E3-12-054

Attn.: Mr. Hak-Ki Kim / General Manager

Test Site: GUMI COLLEGE EMC CENTER

FCC Registration Number: (100749, 443957)

FCC ID. : OZ5URCTKP2000N

Applicant : OHSUNG 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 : TKP-2000N
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

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,



Soon-Hoon Jeong, Associate Engineer
GUMI COLLEGE EMC CENTER



Jae-Hoon Jeong, Senior Engineer
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: +82-54-468-0831 Fax Number: +82-54-461-8368

- **FCC ID.** OZ5URCTKP2000N
- **Equipment Class** Class B computing device peripheral (JBP)
- **EUT Type** Network Keypad
- **Model Name** TKP-2000N
- **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** May 9 ~ 18, 2012
- **Place of Test** **GUMI COLLEGE EMC CENTER** (FCC Registration No.: 100749, 443957)
407, Bugok-Dong, Gumi-City, Gyungbok, 730-711, Republic of Korea
- **Test Report Number** GETEC-E3-12-054
- **Dates of Issue** May 21, 2012

EUT Type: Network Keypad

FCC ID.: OZ5URCTKP2000N



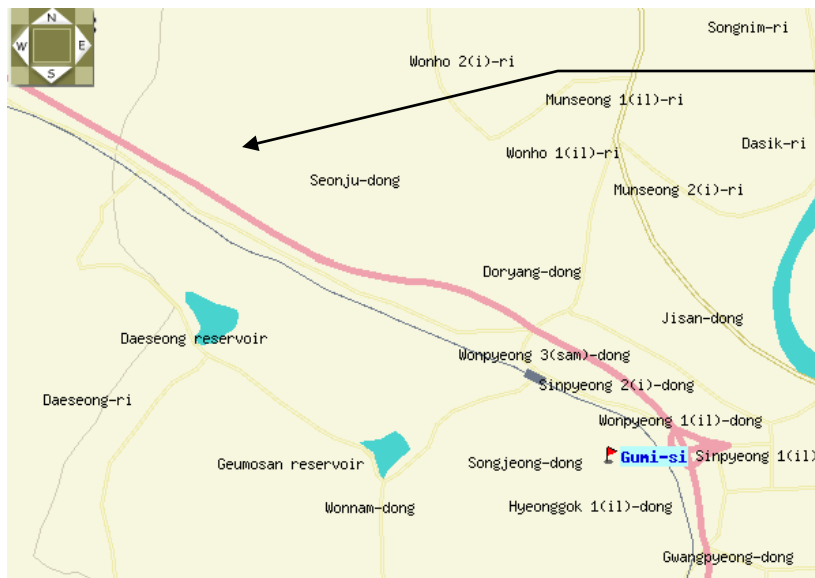
2. Introduction

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. Network Keypad (Model Name: TKP-2000N) FCC ID.: OZ5URCTKP2000N**

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

The site address is 407, Bugok-Dong, Gumi-City, Gyungbok, 730-711, Republic of 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 FCC §2.948 according to ANSI C63.4 (2009)



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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 **OHSUNG ELECTRONICS CO., LTD. Network Keypad (Model Name: TKP-2000N) FCC ID.: OZ5URCTKP2000N**

- **Microprocessor** : 400 MHz RISC
- **Memory** : 128 MB Flash
- **Devices** : Supports up to 255 devices
- **Pages** : Supports up to 255 pages on each device
- **Macro capability** : Up to 255b steps
- **Network** : One 10/100 Ethernet port (PoE)
- **LCD** : 3.5 inch (320 × 240)
- **Power** : Standard PoE Injector or PoE Switch (Purchased separately)
- **Max. Frequency** : 133 MHz

3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
Switching Hub	OHSUNG ELECTRONICS CO., LTD.	MFSP0F-8	S/N: None. FCC ID: OZ5URCMFSP0E8

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

3.2.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: - FCC ID.: -

3.2.3 Used Cable(s)

Cable Name	Condition	Description
LAN cable	Connected to the EUT and switching hub	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 (DC 48 V supplied fed from the POE(Power Over Ethernet) port)
- Test Mode(s): Connected to the Network via switching hub



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

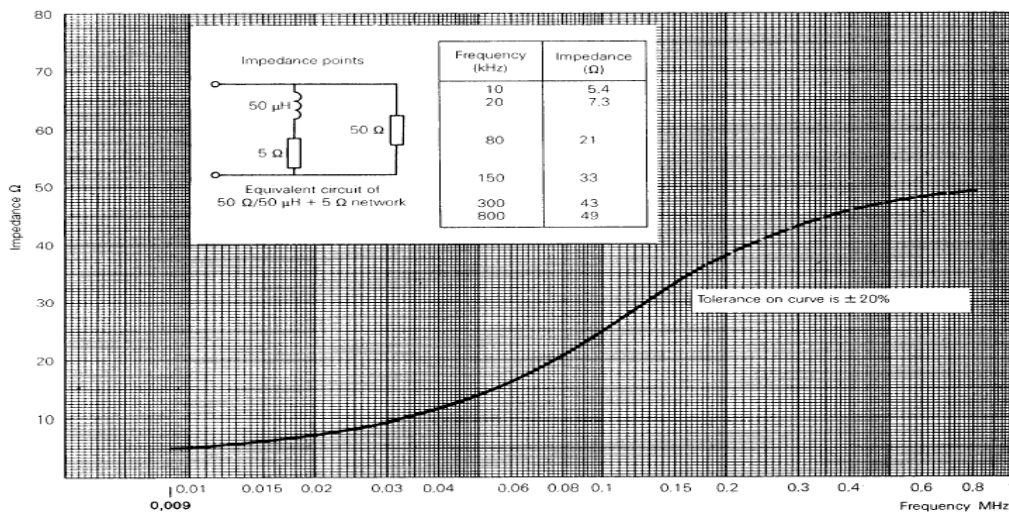


Fig 2. Impedance of LISN



4.3 Radiated Emission

Measurements (below 1 GHz) were made at Open area test site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 m. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then 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, where applicable.

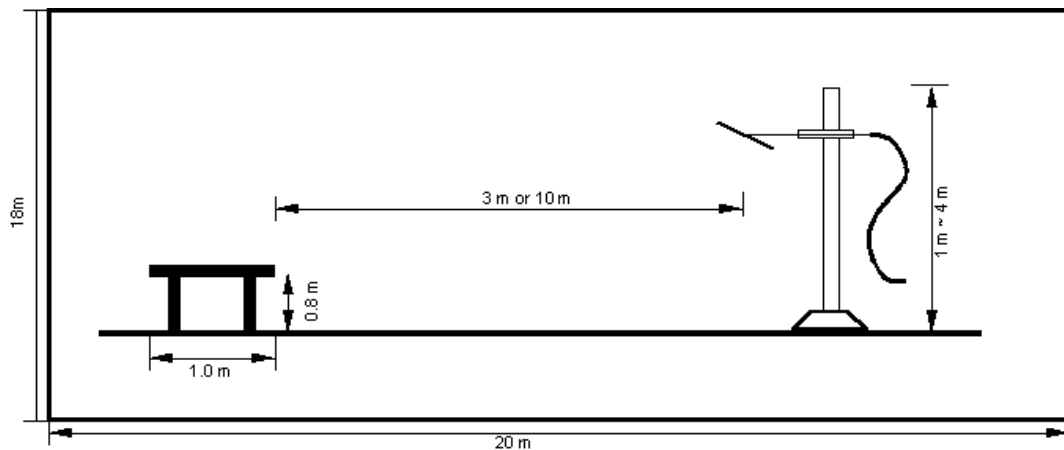


Fig 3. Dimensions of test site

The measurements (above 1 GHz) were made 3 m distance test site that complies to CISPR 16-1-4 (2007). In order to meet SVSWR Limit (Within 6 dB), the bottom side of test site was installed with absorbers. 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. The measurements were conducted with Average and Peak value.

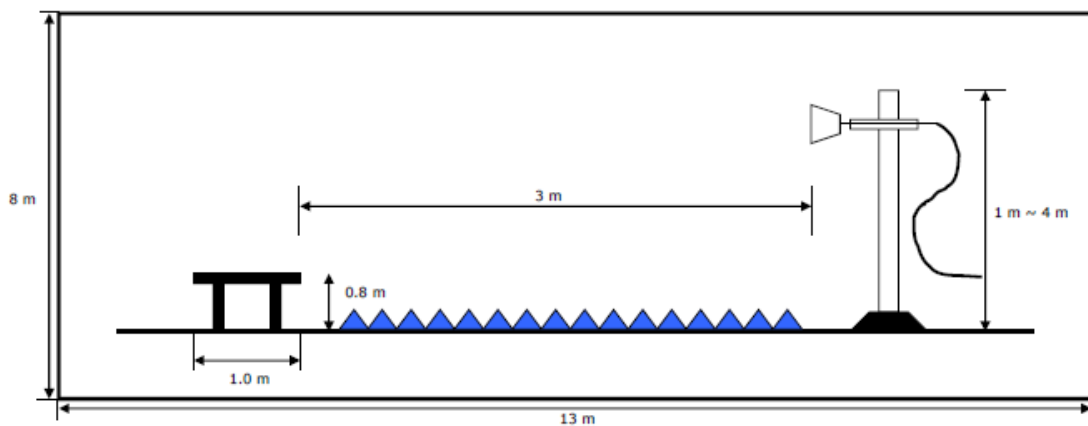


Fig 4. Dimensions of test site



5. Conducted Emission

5.1 Operating Environment

Temperature : 24.0 °C
Relative Humidity : 37.0 % 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

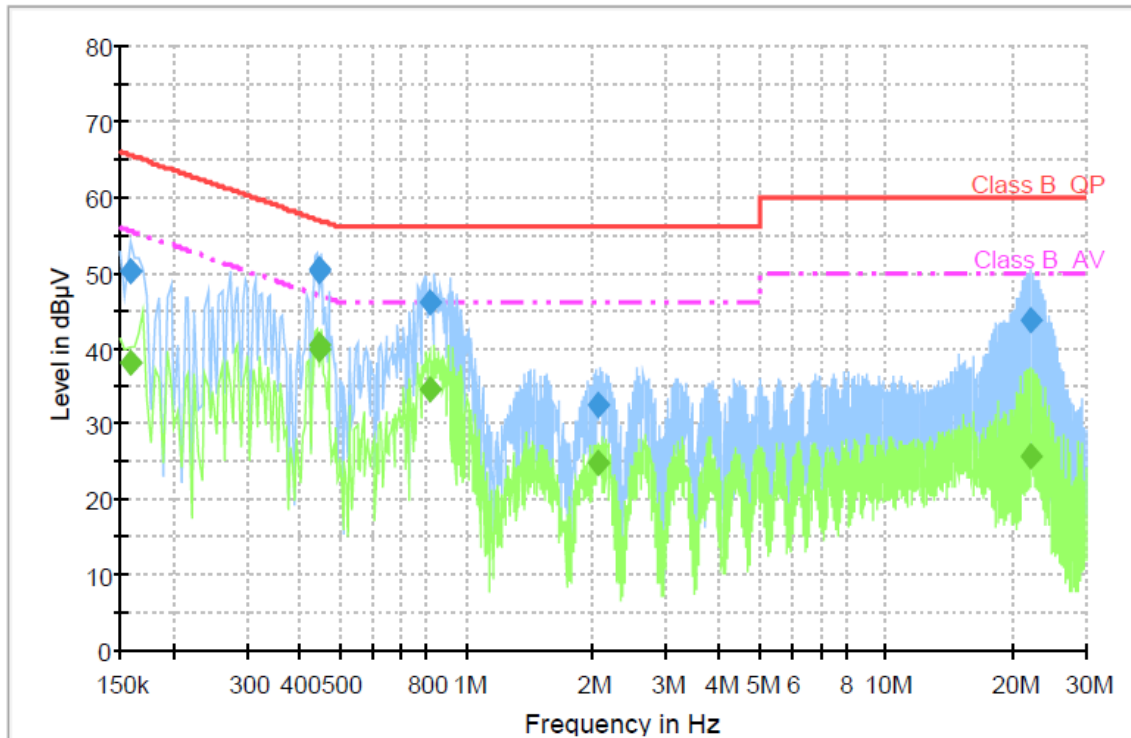
*Limits decreases linearly with the logarithm of frequency.

5.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 05. 2012
■ - ESH3-Z5	Rohde & Schwarz	LISN	838979/020	12. 07. 2012
■ - ESH2-Z5	Rohde & Schwarz	LISN	829991/009	12. 07. 2012
■ - ENY81-CA6	Rohde & Schwarz	ISN	101573	10. 19. 2012

5.6 Test data for Conducted Emission

- Test Date : May 16, 2012
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz
- Line : L1: Live, N: Neutral



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.158000	50.3	1000.0	9.000	GND	L1	10.1	15.3	65.6	
0.448000	50.5	1000.0	9.000	GND	L1	10.1	6.4	56.9	
0.448000	50.3	1000.0	9.000	GND	L1	10.1	6.6	56.9	
0.824000	46.0	1000.0	9.000	GND	N	10.1	10.0	56.0	
2.072000	32.4	1000.0	9.000	GND	L1	10.2	23.6	56.0	
22.144000	43.6	1000.0	9.000	GND	N	10.3	16.4	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.158000	38.0	1000.0	9.000	GND	L1	10.1	17.5	55.6	
0.448000	39.9	1000.0	9.000	GND	L1	10.1	7.0	46.9	
0.448000	40.3	1000.0	9.000	GND	L1	10.1	6.6	46.9	
0.824000	34.5	1000.0	9.000	GND	N	10.1	11.5	46.0	
2.072000	24.7	1000.0	9.000	GND	L1	10.2	21.3	46.0	
22.144000	25.6	1000.0	9.000	GND	N	10.3	24.4	50.0	

< Fig 5. Conducted emission result >



6. Radiated Emission

6.1 Operating Environment

Temperature : 19.0 °C
Relative Humidity : 64.0 % R.H.

6.2 Test Set-up

A preliminary scan with peak mode was performed in the semi anechoic chamber and found frequency for test site. The formal radiated emission was measured at 10 m distance open area test site and 3 m distance 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(Open Area Test Site)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 10 m, Vertical)	± 3.96 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (30 MHz ~ 300 MHz, 10 m, Horizontal)	± 3.44 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Vertical)	± 3.74 dB	Confidence level of approximately 95 % ($k = 2$)
Radiated emission (300 MHz ~ 1 000 MHz, 10 m, Horizontal)	± 3.88 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
■ - ESCS30	Rohde & Schwarz	EMI Test Receiver	839809/003	12. 05. 2012
■ - HK116	Rohde & Schwarz	Biconical Antenna	826861/018	01. 29. 2014
■ - HL223	Rohde & Schwarz	Log Periodic Antenna	829228/011	01. 29. 2014
■ - HD100	HD GmbH	Position Controller	100/692/01	N/A
■ - DS415S	HD GmbH	Turntable	415/657/01	N/A
■ - MA240	HD GmbH	Antenna Mast	240/565/01	N/A
■ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 05. 2012
■ - BBHA9120D	Schwarzbeck	Horn Antenna	597	01. 23. 2013
■ - 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. 2012

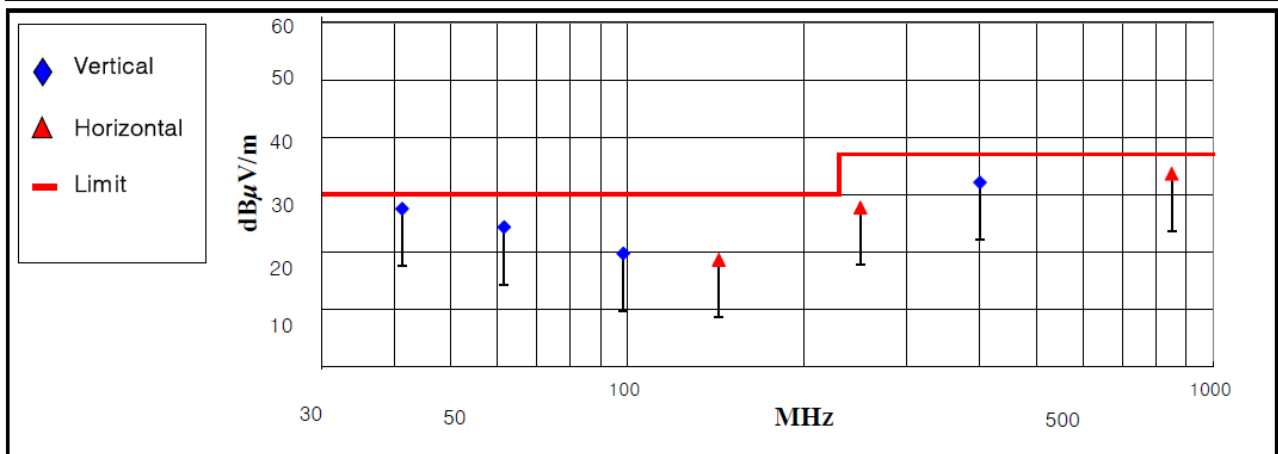


6.6 Test data for Radiated Emission

- Test Date : May 9 ~ 18, 2012
- Measurement Distance : 10 m / 3 m
- Note : The highest frequency of the internal source of the EUT is between 108 MHz and 500 MHz (133 MHz). The measurement was made up to 2 000 MHz.
- Measurement

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

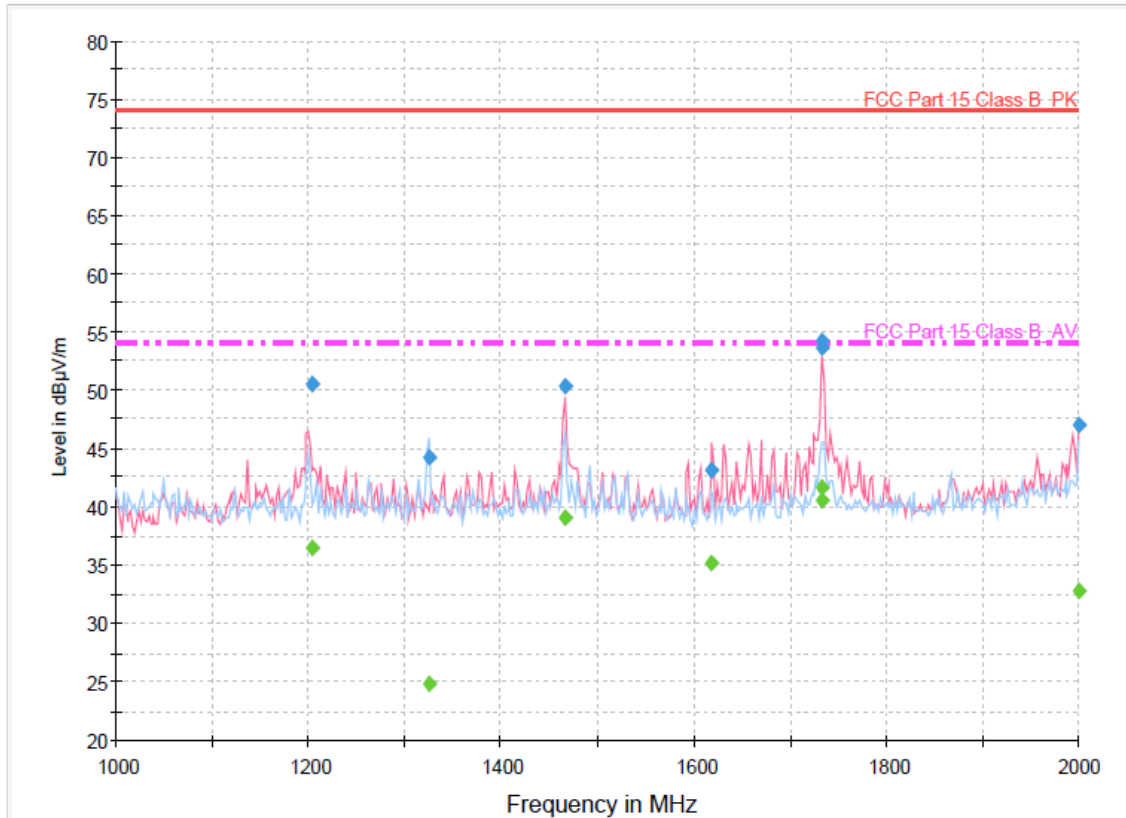
Frequency (MHz)	Measurement Level				Limit (dB μ V/m)	Margin (dB)	Positioning System		
	Reading	Antenna	Cable	Test Result			Pol. (H/V)	Height (cm)	Angle (°)
	Value(dB μ V)	Factor(dB/m)	Loss(dB)	(dB μ V/m)					
41.27	15.80	10.55	1.15	27.50	30.00	2.50	V	100	145
61.63	14.62	7.84	1.84	24.30	30.00	5.70	V	100	357
98.45	8.11	9.10	2.49	19.70	30.00	10.30	V	132	332
143.31	3.64	11.87	3.09	18.60	30.00	11.40	H	215	253
250.01	8.39	15.05	4.26	27.70	37.00	9.30	H	100	225
400.03	10.29	16.16	5.65	32.10	37.00	4.90	V	136	156
849.99	3.65	21.42	8.53	33.60	37.00	3.40	H	100	177



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



- Blue marker: Peak detector mode, Green marker: Average detector mode



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1203.400802	50.6	1000.0	1000.000	146.0	V	163.0	-13.5	23.4	74.0
1324.449299	44.2	1000.0	1000.000	147.0	H	250.0	-12.9	29.8	74.0
1466.733868	50.3	1000.0	1000.000	199.0	V	0.0	-12.7	23.7	74.0
1619.038477	43.2	1000.0	1000.000	100.0	V	194.0	-12.2	30.8	74.0
1733.282966	53.8	1000.0	1000.000	100.0	V	181.0	-11.9	20.2	74.0
1733.666934	54.3	1000.0	1000.000	100.0	V	173.0	-11.9	19.7	74.0
1999.800000	47.0	1000.0	1000.000	136.0	V	-11.0	-11.3	27.0	74.0

Final Result 2

Frequency (MHz)	CAverage (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1203.400802	36.5	1000.0	1000.000	146.0	V	163.0	-13.5	17.5	54.0
1324.449299	24.7	1000.0	1000.000	147.0	H	250.0	-12.9	29.3	54.0
1466.733868	39.1	1000.0	1000.000	199.0	V	0.0	-12.7	14.9	54.0
1619.038477	35.2	1000.0	1000.000	100.0	V	194.0	-12.2	18.8	54.0
1733.282966	41.6	1000.0	1000.000	100.0	V	181.0	-11.9	12.4	54.0
1733.666934	40.6	1000.0	1000.000	100.0	V	173.0	-11.9	13.4	54.0
1999.800000	32.7	1000.0	1000.000	136.0	V	-11.0	-11.3	21.3	54.0

< Fig 7. Radiated emission result (1 000 MHz ~ 2 000 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 Keypad (Model Name: TKP-2000N)** was complies with §15.107 and 15.109 of the FCC Rules.

- The end -