FCC EVALUATION REPORT FOR CERTIFICATION

Applicant: OHSUNG ELECTRONICS CO., LTD.

#181 Gongdan-dong , Gumi-si, Gyeongbuk

Republic of Korea.

Attn : Mr. Hak-Ki Kim / General Manager

Date of Issue: Oct. 14, 2015

Order Number: GETEC-C1-15-469

Test Report Number: GETEC-E3-15-038

Test Site: GUMI UNIVERSITY EMC CENTER

FCC Registration Number: 269701

FCC ID. : OZ5URCTKP5500

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-5500**
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,

Seung Chul Lee, Senior Engineer
GUMI UNIVERSITY EMC CENTER

Reviewed by,

Jae-Hoon Jeong, Technical Manager
GUMI UNIVERSITY EMC CENTER

CONTENTS

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 1-dong, Gumi-si, Gyeongsangbuk-do, Republic of Korea
Manufacturer: OHSUNG ELECTRONICS CO.,LTD.
Manufacturer Address: #181, Gongdan 1-dong, Gumi-si, Gyeongsangbuk-do, Republic of Korea
Contact Person: Mr. Hak-Ki Kim / General Manager
Telephone Number: +82-54-468-7281 Fax Number: +82-54-461-8368

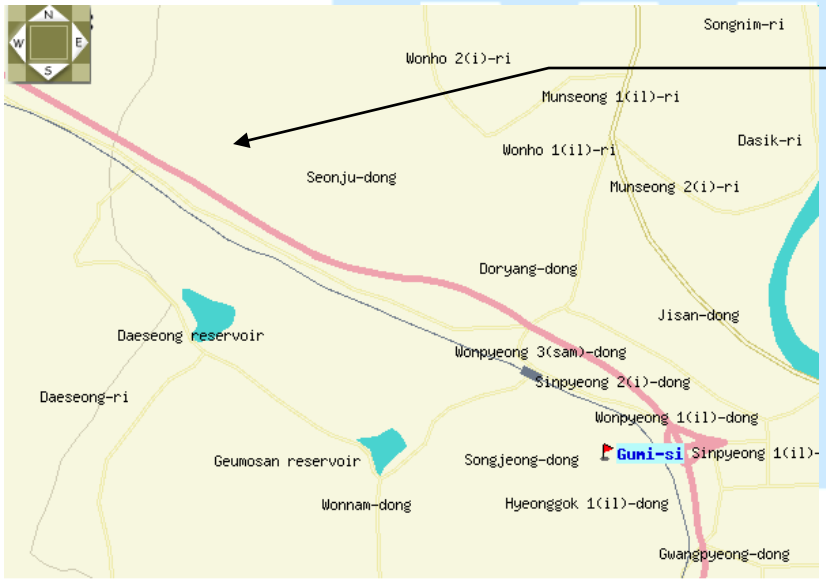
- **FCC ID** OZ5URCTKP5500
- **EUT Type** Network Keypad
- **Equipment Class** Class B computing device peripheral (JBP)
- **Model Name** TKP-5500
- **Trade Name** UNIVERSAL remote control
- **Serial Number** Prototype
- **Rule Part(s)** FCC Part 15 Subpart B
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2009)
- **Dates of Test** Oct. 02, 2015
- **Place of Test** **GUMI UNIVERSITY EMC CENTER**
(FCC Test Firm Registration Number: 269701)
37 Yaeun-ro, Gumi-si, Gyeongsangbuk-do, 730-711, Republic of Korea.
- **Test Report Number** GETEC-E3-15-038
- **Date of Issue** Oct. 14, 2015

- **GUMI UNIVERSITY EMC CENTER is an FCC Test Film registered (Reg. No. 269701) test facility has met all the requirements specified in Section 2.948 of the FCC rules.**
- **GUMI UNIVERSITY EMC CENTER has accredited as Conformity Assessment Body (CAB) notified by Radio Research Laboratories (Designation No.: KR0033) in compliance with ISO/IEC 17025. Therefore, Gumi UNIVERSITY EMC Center is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) under Parts 15 and 18 of the commissions Rules**

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 Keypad (Model Name: TKP-5500)**

These measurement tests were conducted at **GUMI UNIVERSITY 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 UNIVERSITY 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)



GUMI UNIVERSITY EMC CENTER
37 Yaeun-ro, Gumi-si,
Gyeongsangbuk-do, 730-711,
Republic of Korea
Tel: +82-54-440-1195
Fax: +82-54-440-1199

Fig 1. The map above shows the Gumi UNIVERSITY 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-5500) FCC ID.: OZ5URCTKP5500

Type of product	Network Keypad
Model Name	TKP-5500
Power	DC 48 V (Standard PoE Injector or PoE switch(Purchased separately))
Microprocessor	190 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 255 steps
Network	One 10/100 Ethernet port (PoE)
LCD	3.5 inch (320 x 240)
Weight	9.84 oz
Size	5.75” x 4.7” x 1.8”
Maximum Clock frequency	400 MHz

3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID.
Network Keypad	OHSUNG ELECTRONICS CO.,LTD.	TKP-5500	S/N: None FCC ID.: OZ5URCTKP5500
PoE Switching Hub	OHSUNG ELECTRONICS CO.,LTD.	MFSPOE-8	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.
-	-	-	-

3.2.3 Used Cable(s)

Cable Name	Condition	Description
LAN cable	Connected to the EUT and MFSPOE-8[1)]	10.00 m Unshielded

1) MFSPOE-8: PoE Switching Hub

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 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 mode

- Operating test pattern
  -. Conducted Emission: The EUT was communication via LAN port to MFSPOE-8
  -. Radiated Emission: The EUT was communication via LAN port to MFSPOE-8

4.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Test Film Registration No.: 269701)
The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.4 m in height and 0.8 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.

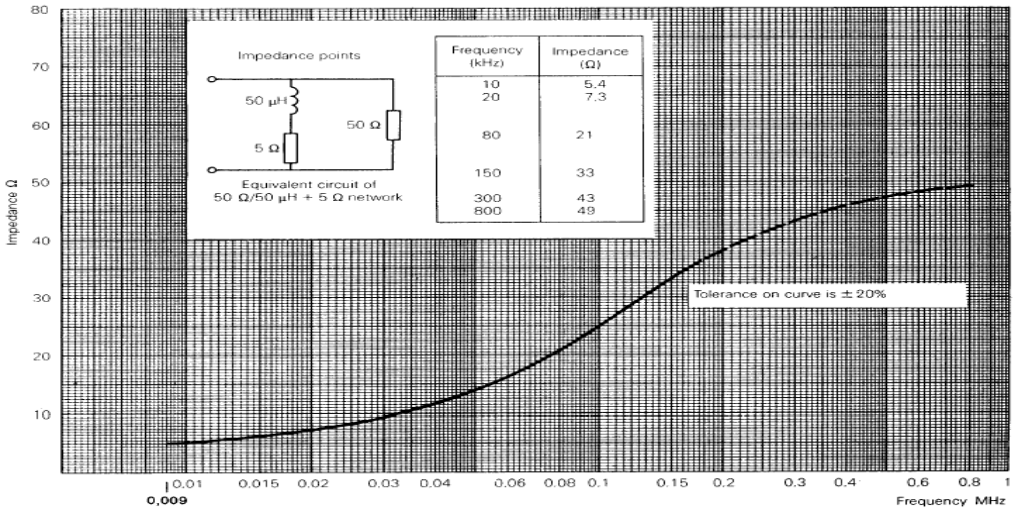


Fig 2. Impedance of LISN

4.3 Radiated Emission

Exploratory Radiated measurements were conducted at the 3 m or 10 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 1 GHz were made at 3 m or 10 m Chamber (FCC Test Firm Registration No.: 269701) or Open area test site (FCC Test Firm Registration No.: 269701) that complies with CISPR 16/ANSI C63.4.
Above 1 GHz final measurements were conducted at the 3m Chamber (FCC Test Firm 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.

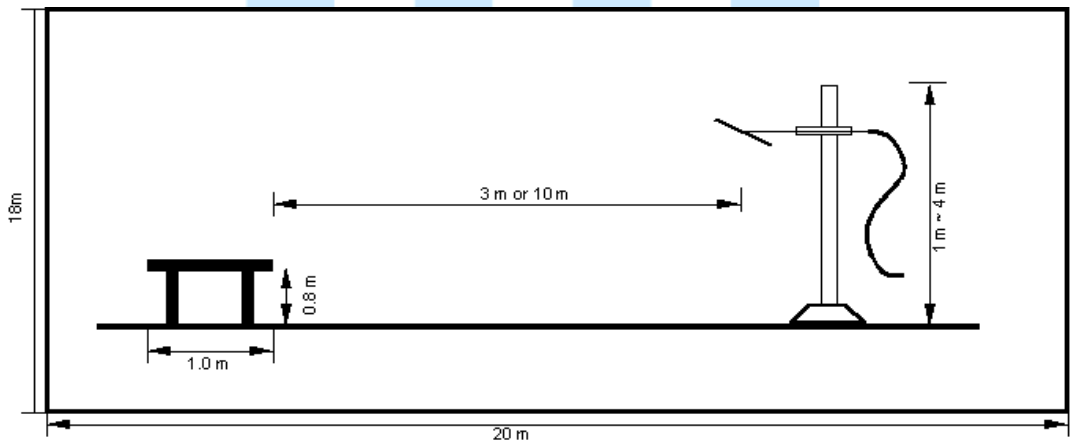


Fig 3. Dimensions of test site (Below 1 GHz)

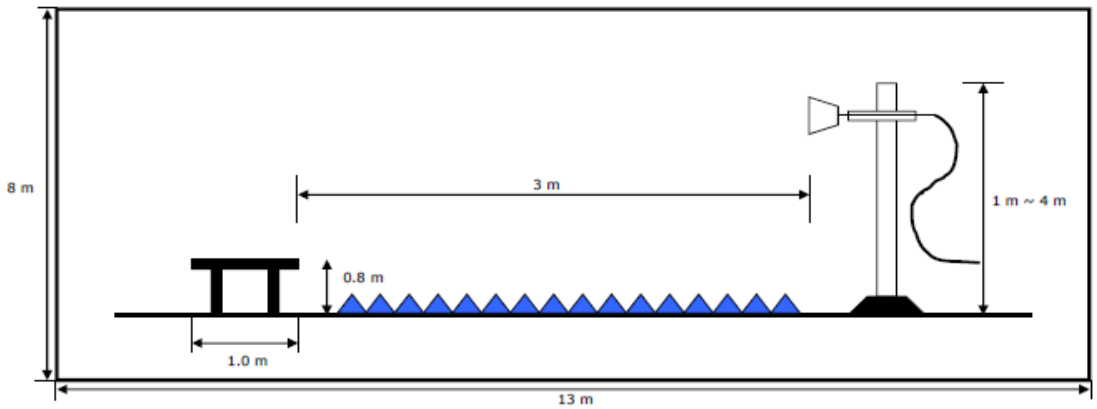


Fig 4. Dimensions of test site (Above 1 GHz)

5. Conducted Emission

5.1 Operating Environment

Temperature : 23.9 ℃
Relative Humidity : 33.5 % R.H.

5.2 Test Set-up

The conducted emission measurements were performed in the shielded room.
The EUT was placed on wooden table, 0.4 m heights above the floor, 0.8 m from the reference ground plan e (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 enter ing 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)	3.94 dB	Confidence level of approximately 95 % (k = 2)
Conducted emission (150 kHz ~ 30 MHz)	3.43 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.		

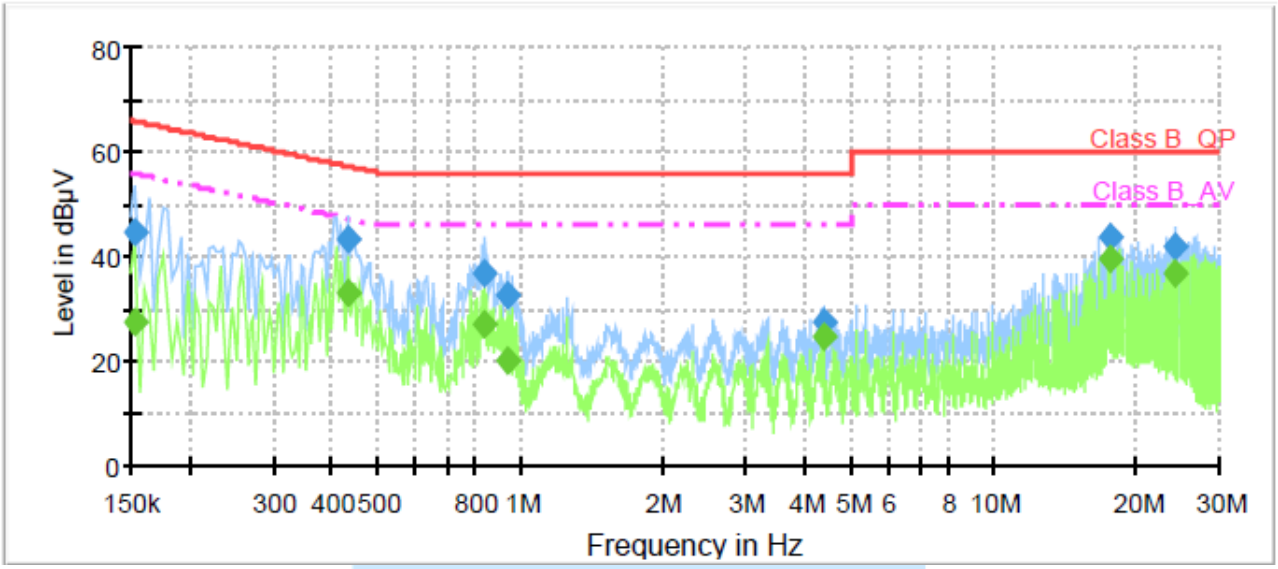
5.5 Test Equipment used

	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESCI	Rohde & Schwarz	EMI Test Receiver	100237	Apr. 23, 2016
■ -	ENV216	Rohde & Schwarz	LISN	100173	Apr. 23, 2016
☐ -	ENV216	Rohde & Schwarz	LISN	100172	Apr. 23, 2016
☐ -	ENY81-CA6	Rohde & Schwarz	ISN	101573	Jul. 02, 2016
☐ -	ISN T8	TESEQ.GmbH	ISN	24568	May. 27, 2016

5.6 Test data for Conducted Emission

-. Test Date : Oct. 02, 2016
-. Resolution Bandwidth : 9 kHz
-. Frequency Range : 0.15 MHz ~ 30 MHz
-. Line : L1: Live, N: Neutral

▪ Operating condition: Communication mode



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153731	44.8	100.0	9.000	Off	L1	9.7	21.0	65.8	
0.429844	43.4	100.0	9.000	Off	L1	9.7	13.9	57.3	
0.840281	36.7	100.0	9.000	Off	L1	9.7	19.3	56.0	
0.933563	32.4	100.0	9.000	Off	N	9.7	23.6	56.0	
4.358850	27.5	100.0	9.000	Off	N	9.8	28.5	56.0	
17.686875	43.8	100.0	9.000	Off	L1	10.1	16.2	60.0	
24.350888	41.9	100.0	9.000	Off	N	10.2	18.1	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.153731	27.6	100.0	9.000	Off	L1	9.7	28.2	55.8	
0.429844	33.1	100.0	9.000	Off	L1	9.7	14.2	47.3	
0.840281	26.8	100.0	9.000	Off	L1	9.7	19.2	46.0	
0.933563	20.0	100.0	9.000	Off	N	9.7	26.0	46.0	
4.358850	24.6	100.0	9.000	Off	N	9.8	21.4	46.0	
17.686875	39.7	100.0	9.000	Off	L1	10.1	10.3	50.0	
24.350888	36.7	100.0	9.000	Off	N	10.2	13.3	50.0	

< Fig 5. Graph of continuous disturbance >

6. Radiated Emission

6.1 Operating Environment

Temperature : 20.4 ℃
Relative Humidity : 47.5 % R.H.

6.2 Test Set-up

A preliminary and final measurement was at 3 m & 10 m anechoic chamber.
The EUT was placed on a non-conductive turntable approximately 1.0 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(3 m Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	4.66 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	4.65 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	4.91 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	4.88 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m)	5.32 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (1 000 MHz ~ 18 000 MHz, 3 m)	5.45 dB	Confidence level of approximately 95 % (k = 2)
Test Items(10 m Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	3.98 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	3.49 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	3.96 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	3.78 dB	Confidence level of approximately 95 % (k = 2)
Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m)	5.46 dB	Confidence level of approximately 95 % (k = 2)

6.4 Limit

Frequency (MHz)	FCC Limit @ 3 m. dBµV/m	CISPR Limit @ 10 m. dBµV/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

Frequency (MHz)	FCC Class B Peak Limit @ 3 m dBµV/m	FCC Class B Average Limit@ 3 m dBµV/m
> 1 000	74.0	54.0

6.5 Test Equipment used

	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	Apr. 23, 2016
□ -	VULB9160	Schwarzbeck	Broad Band Test Antenna	3193	Mar. 25 2016
■ -	BBHA9120D	Schwarzbeck	Horn ANT	207	Mar. 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	Jan. 13 2016

6.6 Test data for Radiated Emission

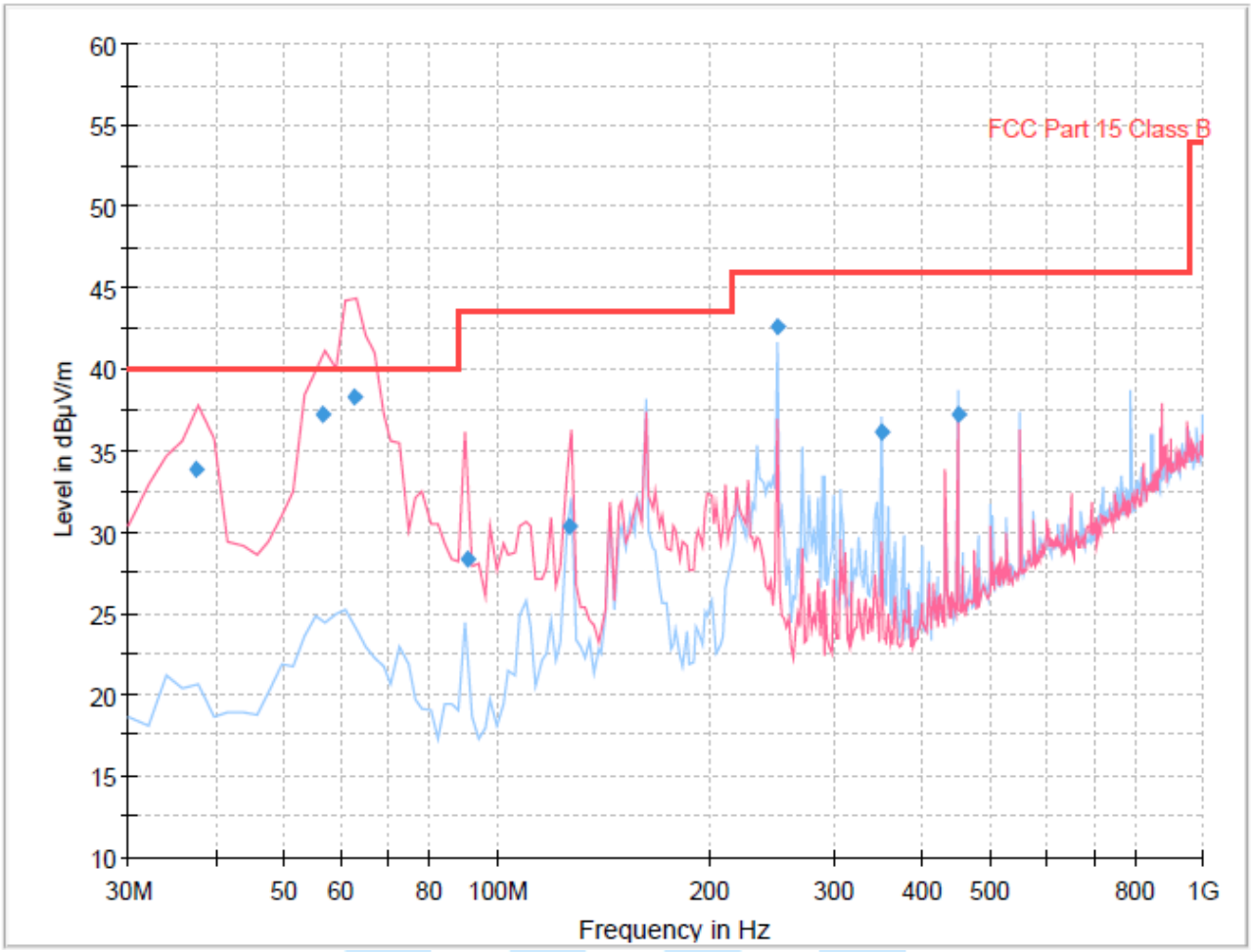
-. Test Date : Oct. 02 2015
-. Measurement Distance : 3 m, 10 m
-. Note : The highest frequency of the internal source of the EUT is between 108 MHz and 500 MHz(400 MHz). The measurement was made up to 2 000 MHz.

-. Measurement

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

-. 30 MHz ~ 1 GHz

▪ Operating condition: Communication mode



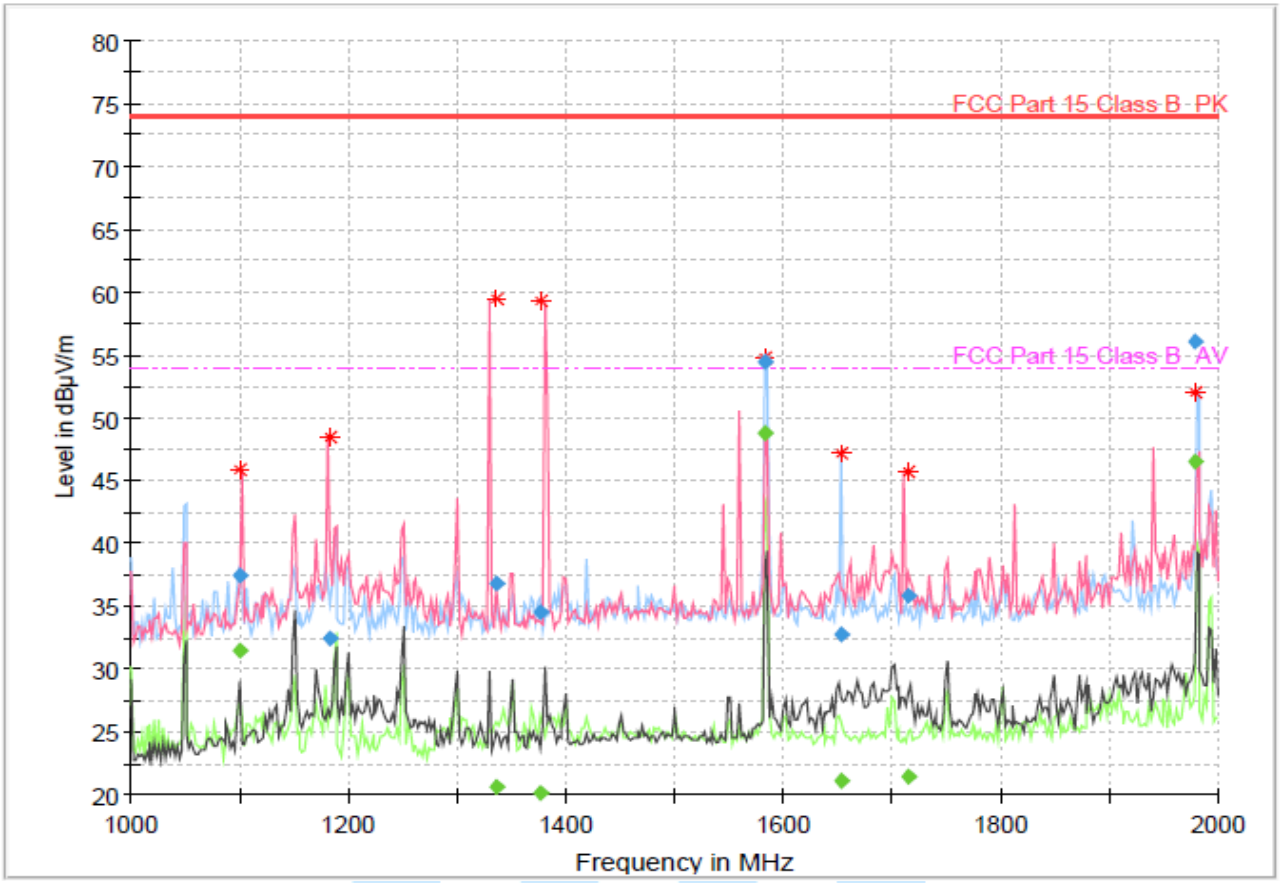
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
37.375551	33.80	40.00	6.20	1000.0	120.000	109.0	V	138.0	13.5
56.654429	37.17	40.00	2.83	1000.0	120.000	107.0	V	324.0	14.2
62.766092	38.28	40.00	1.72	1000.0	120.000	100.0	V	11.0	13.8
90.460521	28.33	43.50	15.17	1000.0	120.000	225.0	V	185.0	9.7
126.634389	30.29	43.50	13.21	1000.0	120.000	111.0	V	140.0	14.3
249.979319	42.56	46.00	3.44	1000.0	120.000	125.0	H	78.0	15.2
349.981483	36.15	46.00	9.85	1000.0	120.000	106.0	H	74.0	18.5
449.999760	37.23	46.00	8.77	1000.0	120.000	106.0	H	276.0	20.5

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

-. 1 GHz ~ 2 GHz

▪ Operating condition: Communication mode



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1100.004409	---	31.50	54.00	22.50	1000.0	1000.000	106.0	V	30.0	-13.3
1100.004409	37.53	---	74.00	36.47	1000.0	1000.000	106.0	V	30.0	-13.3
1183.760721	32.40	---	74.00	41.60	1000.0	1000.000	200.0	V	210.0	-13.0
1183.760721	---	19.37	54.00	34.63	1000.0	1000.000	200.0	V	210.0	-13.0
1335.661323	36.76	---	74.00	37.24	1000.0	1000.000	125.0	V	207.0	-12.1
1335.661323	---	20.72	54.00	33.28	1000.0	1000.000	125.0	V	207.0	-12.1
1376.961523	34.48	---	74.00	39.52	1000.0	1000.000	125.0	V	196.0	-12.0
1376.961523	---	20.12	54.00	33.88	1000.0	1000.000	125.0	V	196.0	-12.0
1583.770341	---	48.81	54.00	5.19	1000.0	1000.000	100.0	H	196.0	-11.5
1583.770341	54.50	---	74.00	19.50	1000.0	1000.000	100.0	H	196.0	-11.5
1653.506613	---	21.13	54.00	32.87	1000.0	1000.000	175.0	H	65.0	-11.3
1653.506613	32.71	---	74.00	41.29	1000.0	1000.000	175.0	H	65.0	-11.3
1715.622846	---	21.39	54.00	32.61	1000.0	1000.000	164.0	V	196.0	-11.1
1715.622846	35.88	---	74.00	38.12	1000.0	1000.000	164.0	V	196.0	-11.1
1979.763928	56.10	---	74.00	17.90	1000.0	1000.000	109.0	H	222.0	-10.4
1979.763928	---	46.50	54.00	7.50	1000.0	1000.000	109.0	H	222.0	-10.4

< Fig 7. Radiated emission result (1 000 MHz ~ 2 000 MHz) >

11. Sample Calculations

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

11.1 Example 1 :

■ 20.3 MHz

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

11.2 Example 2 :

■ 66.7 MHz

Class B Limit	= 100 µV/m = 40.0 dBµV/m
Reading	= 31.0 dBµV
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dBµV/m
Margin	= 40.0 dBµV/m – 36.8 dBµV/m
	= 3.2 dB

12. Recommendation & Conclusion

The data collected shows that the **OHSUNG ELECTRONICS CO.,LTD. Network Keypad (Model Name: TKP-5500)** was complies with §15.107, 15.109 and 15.111 of the FCC Rules.

- The end -