

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: Jun. 03, 2016****Order Number: GETEC-C1-16-250****Test Report Number: GETEC-E3-16-027****Test Site: GUMI UNIVERSITY EMC CENTER****FCC Registration Number: 269701****FCC ID. : OZ5URCTKP7600****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-7600
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,

Sung-Min Moon, Engineer
GUMI UNIVERSITY EMC CENTER

Reviewed by,

Jae-Hoon Jeong, Technical Manager
GUMI UNIVERSITY 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 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	OZ5URCTKP7600
● EUT Type	Network Keypad
● Equipment Class	Class B computing device peripheral (JBP)
● Model Name	TKP-7600
● 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. 26, 2016 ~ May. 30, 2016
● 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-E3-16-027
● Date of Issue	Jun. 03, 2016



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-7600)**

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)

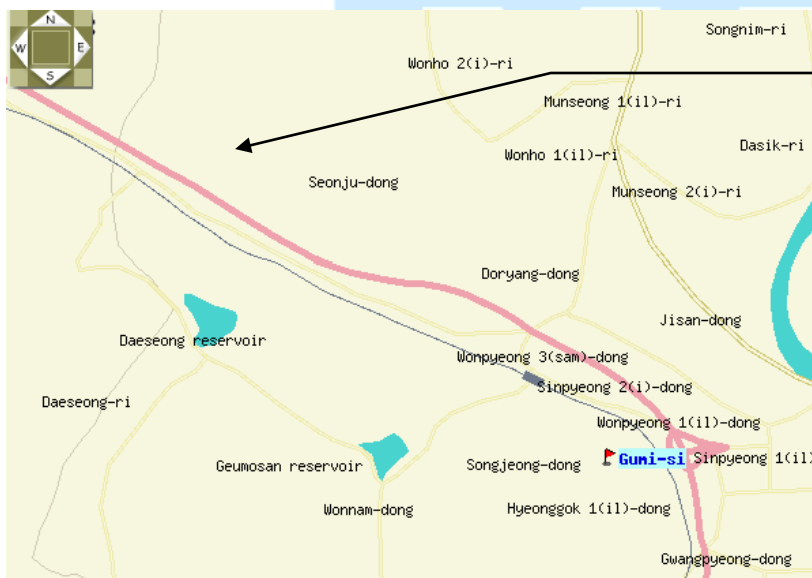


Fig 1. The map above shows the Gumi UNIVERSITY in vicinity area.



3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **OHSUNG Electronics Co.,Ltd.**
Network Keypad (Model Name: TKP-7600) FCC ID.: OZ5URCTKP7600

Type of product	Network Keypad
Model Name	TKP-7600
Power	DC 48 V (Standard PoE Injector or PoE switch(Purchased separately))
Microprocessor	Coretex-A9 dual 1 GHz
Memory	4 GB eMMC, 1 GB RAM
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	7 inch (1280 x800)
Weight	10.51 oz
Size	7.91" x 5.04" x 1.03"
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-7600	S/N: None FCC ID.: OZ5URCTKP7600
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 shielded

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.

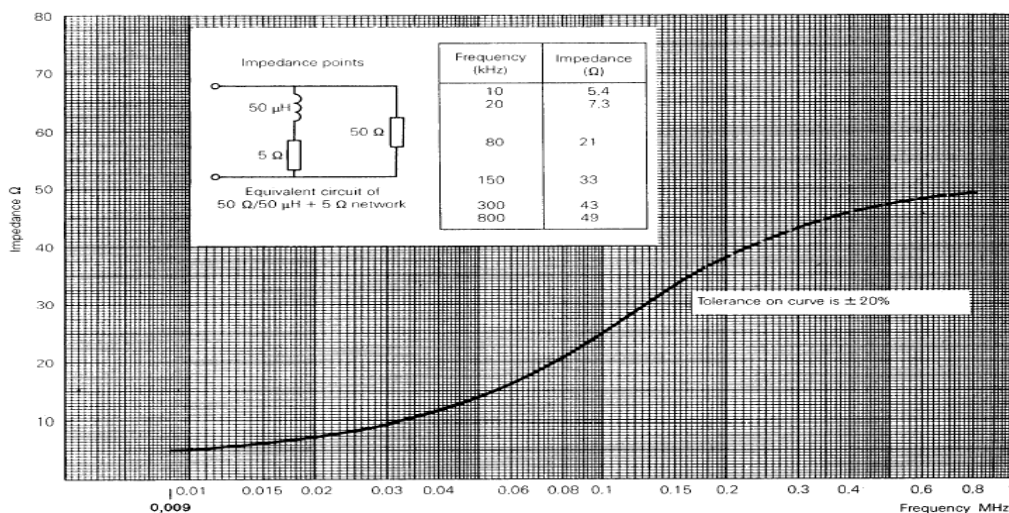


Fig 2. Impedance of LISN



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.

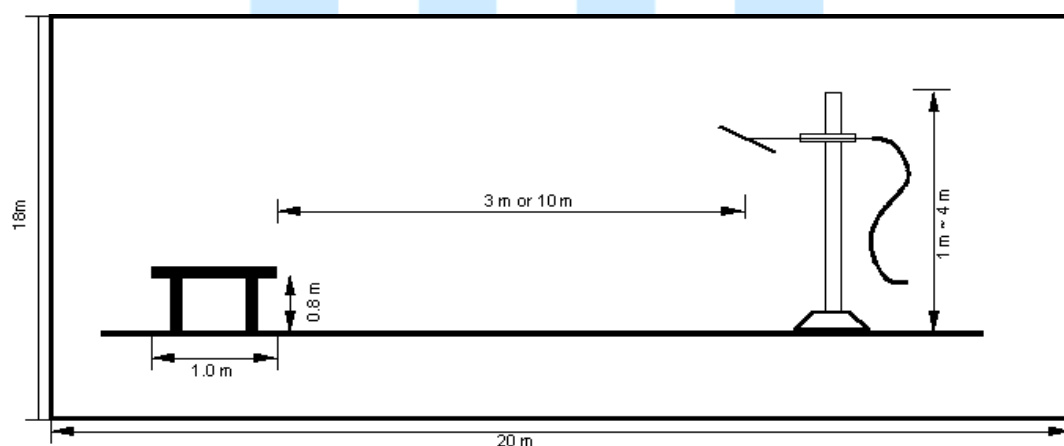


Fig 3. Dimensions of test site (Below 1 GHz)

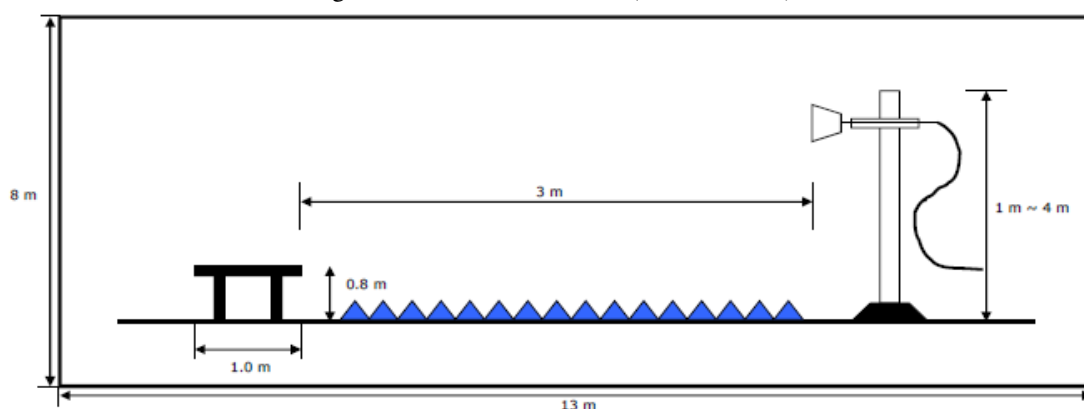


Fig 4. Dimensions of test site (Above 1 GHz)



5. Conducted Emission

5.1 Operating Environment

Temperature : 24.8 °C
Relative Humidity : 47.3 % 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 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)	3.94 dB	Confidence level of approximately 95 % ($k = 2$)
Conducted emission (150 kHz ~ 30 MHz)	3.43 dB	Confidence level of approximately 95 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



5.4 Limit

RFI Conducted	FCC Limit(dBμV) 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

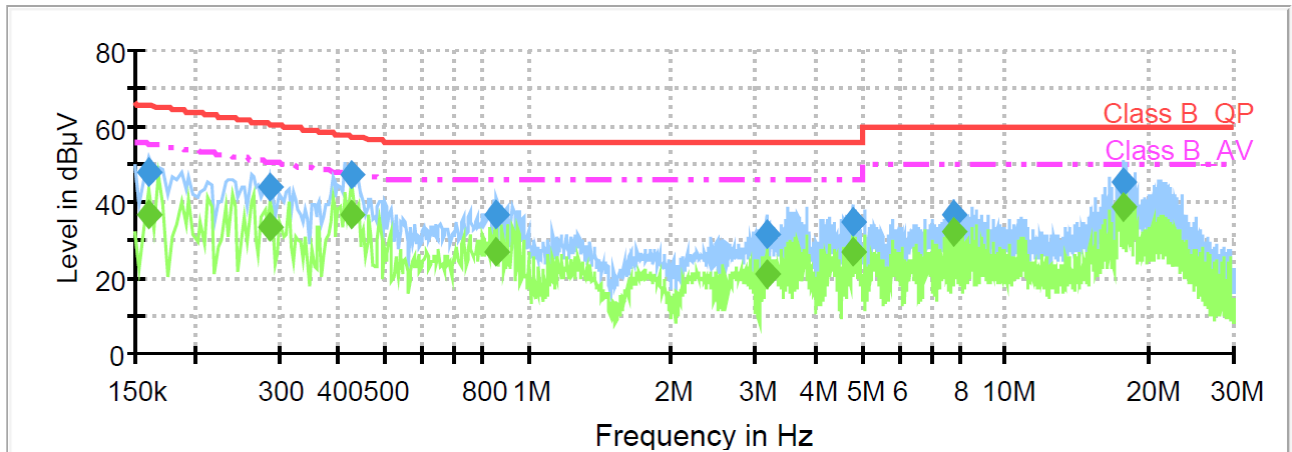
Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ - ESCI	Rohde & Schwarz	EMI Test Receiver	100237	Apr. 18, 2017
■ - ENV216	Rohde & Schwarz	LISN	100173	Apr. 19, 2017
□ - ENV216	Rohde & Schwarz	LISN	100172	Apr. 19, 2017
□ - ENY81-CA6	Rohde & Schwarz	ISN	101573	Jul. 02, 2016
□ - ISN T8	TESEQ.GmbH	ISN	24568	Apr. 22, 2017
■ - EMC 32	Rohde & Schwarz	Software	Ver.8.53	N/A

5.6 Test data for Conducted Emission

- Test Date : May. 30, 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
0.161194	47.8	100.0	9.000	Off	N	9.7	17.6	65.4	
0.288056	43.8	100.0	9.000	Off	N	9.7	16.8	60.6	
0.426113	47.3	100.0	9.000	Off	N	9.7	10.0	57.3	
0.858938	36.9	100.0	9.000	Off	N	9.7	19.1	56.0	
3.146194	31.4	100.0	9.000	Off	L1	9.8	24.6	56.0	
4.769288	34.9	100.0	9.000	Off	N	9.8	21.1	56.0	
7.750556	36.4	100.0	9.000	Off	L1	9.9	23.6	60.0	
17.757769	45.3	100.0	9.000	Off	L1	10.1	14.7	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.161194	36.5	100.0	9.000	Off	N	9.7	18.9	55.4	
0.288056	33.6	100.0	9.000	Off	N	9.7	17.0	50.6	
0.426113	36.6	100.0	9.000	Off	N	9.7	10.7	47.3	
0.858938	26.7	100.0	9.000	Off	N	9.7	19.3	46.0	
3.146194	21.2	100.0	9.000	Off	L1	9.8	24.8	46.0	
4.769288	26.9	100.0	9.000	Off	N	9.8	19.1	46.0	
7.750556	31.9	100.0	9.000	Off	L1	9.9	18.1	50.0	
17.757769	38.9	100.0	9.000	Off	L1	10.1	11.1	50.0	

< Fig 5. Graph of continuous disturbance >



6. Radiated Emission

6.1 Operating Environment

Temperature : 21.0 °C
Relative Humidity : 43.6 % 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”.

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 % ($k = 2$)

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

The listed uncertainties are the worst case uncertainty for the entire range of measurement. please note that the uncertainty values are provided for informational purposes only are not used in determining the PASS/FAIL results



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

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

Frequency (MHz)	CISPR Class B Peak Limit @ 3 m dB μ V/m	CISPR Class B Average Limit@ 3 m dB μ V/m
> 1 000	70.0	50.0



6.5 Test Equipment used

Model Name	Manufacturer	Description	Serial Number	Due to Calibration
□ - ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	Apr. 18, 2017
■ - ESR7	Rohde & Schwarz	EMI Test Receiver	101382	Apr. 18, 2017
■ - VULB9160	Schwarzbeck	Broad Band Test Antenna	3193	Mar. 28, 2018
■ - BBHA9120D	Schwarzbeck	Horn ANT	207	Mar. 16, 2017
□ - MCU066	matur GmbH	Position Controller	1390306	N/A
□ - TT2.5SI	matur GmbH	Turntable	1390307	N/A
□ - AM 4.0	matur GmbH	Antenna Mast	1390308	N/A
■ - CO3000	Innco system GmbH	Position Controller	1390306	N/A
■ - DT3000	Innco system GmbH	Turntable	1390307	N/A
■ - MA4000-EP	Innco system GmbH	Antenna Mast	1390308	N/A
■ - AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	Jan. 05, 2017
■ - 87405A	Agilent	Preamplifier	MY39500777	Jan. 05, 2017
■ - EMC 32	Rohde & Schwarz	Software	Ver.9.26.01	N/A

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.

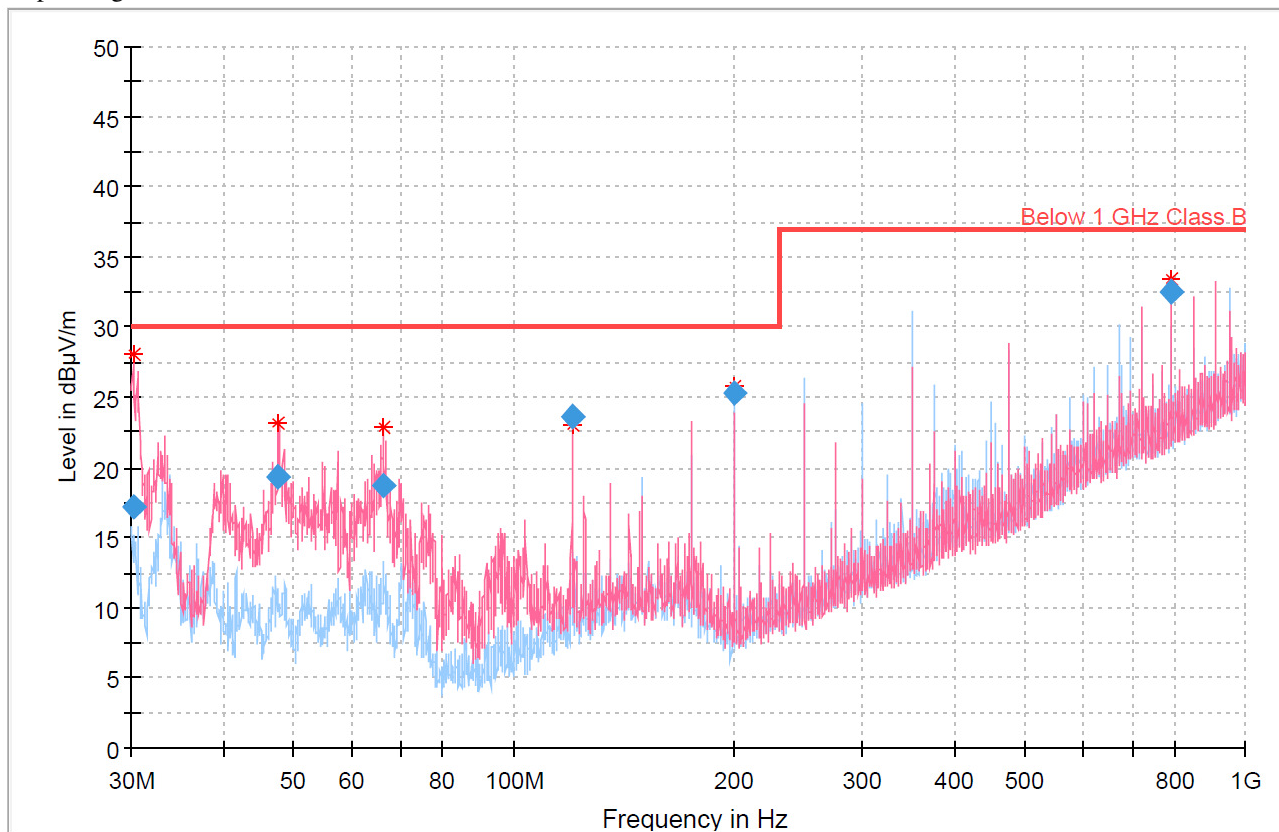
- Measurement

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

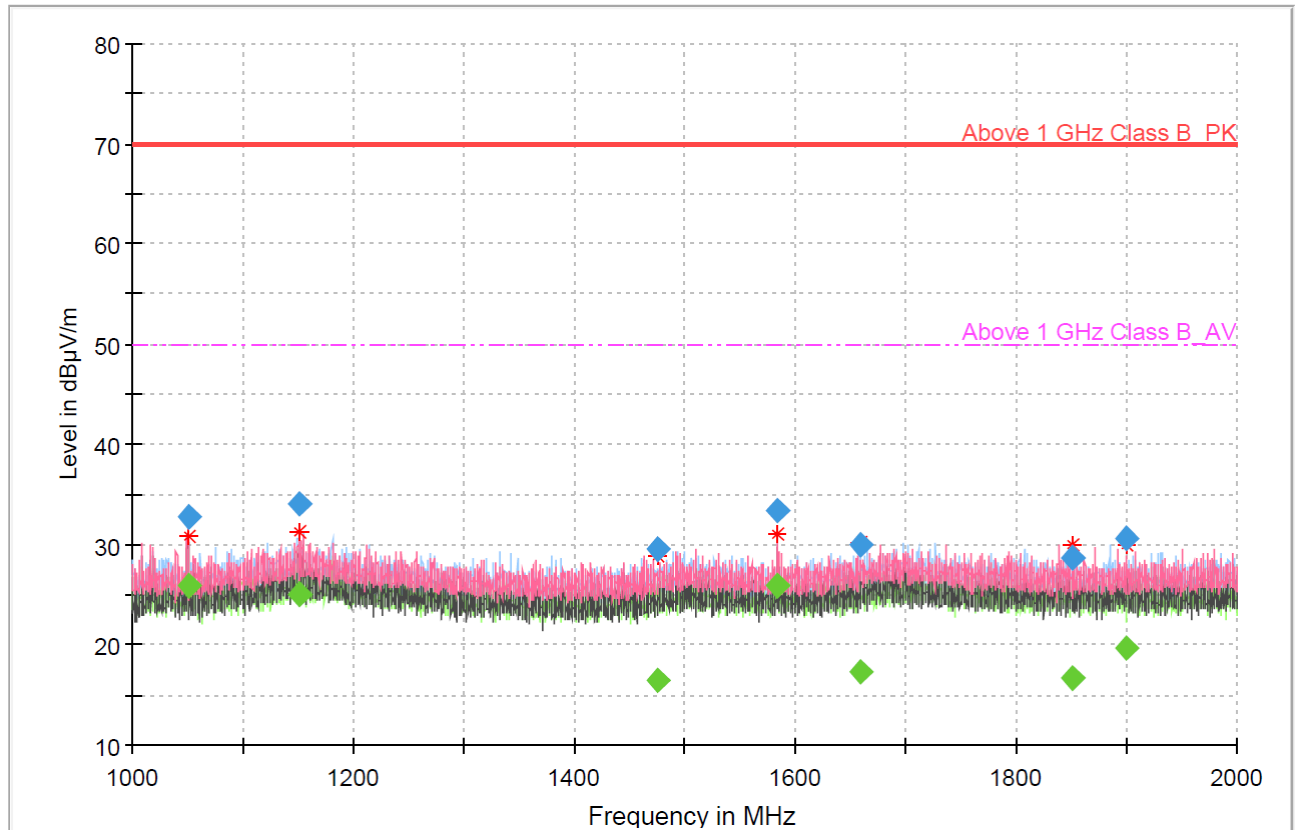
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Corr. (dB)
30.176	17.20	30.00	12.80	100.0	120.000	104.8	V	-13.4
47.489	19.30	30.00	10.70	100.0	120.000	99.9	V	-11.6
66.404	18.72	30.00	11.28	100.0	120.000	193.8	V	-12.5
120.023	23.55	30.00	6.45	100.0	120.000	111.7	V	-11.6
200.001	25.25	30.00	4.75	100.0	120.000	373.0	H	-12.6
792.004	32.46	37.00	4.54	100.0	120.000	194.8	V	2.3

< 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)
1050.000	32.84	---	70.00	37.16	100.0	1000.000	215.2	V	7.0	-12.4
1050.000	---	25.83	50.00	24.17	100.0	1000.000	215.2	V	7.0	-12.4
1150.000	33.95	---	70.00	36.05	100.0	1000.000	224.9	H	140.0	-12.0
1150.000	---	24.94	50.00	25.06	100.0	1000.000	224.9	H	140.0	-12.0
1475.500	29.58	---	70.00	40.42	100.0	1000.000	125.0	V	235.0	-10.9
1475.500	---	16.46	50.00	33.54	100.0	1000.000	125.0	V	235.0	-10.9
1583.900	---	25.78	50.00	24.22	100.0	1000.000	175.0	H	164.0	-10.4
1583.900	33.41	---	70.00	36.59	100.0	1000.000	175.0	H	164.0	-10.4
1660.000	---	17.22	50.00	32.78	100.0	1000.000	125.0	H	267.0	-10.0
1660.000	29.91	---	70.00	40.09	100.0	1000.000	125.0	H	267.0	-10.0
1850.200	---	16.68	50.00	33.32	100.0	1000.000	130.2	V	204.0	-9.0
1850.200	28.66	---	70.00	41.34	100.0	1000.000	130.2	V	204.0	-9.0
1900.900	30.59	---	70.00	39.41	100.0	1000.000	121.9	H	164.0	-8.7
1900.900	---	19.70	50.00	30.30	100.0	1000.000	121.9	H	164.0	-8.7

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



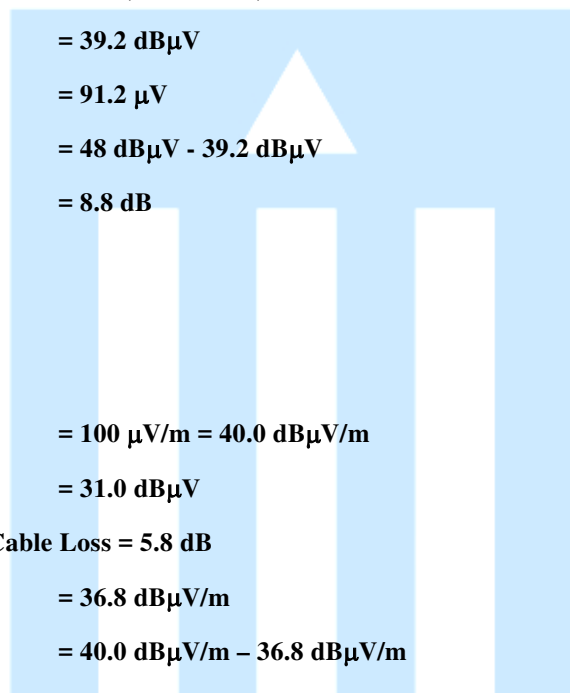
11. Sample Calculations

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

11.1 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



11.2 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



12. Recommendation & Conclusion

The data collected shows that the **OHSUNG ELECTRONICS CO.,LTD.**
Network Keypad (Model Name: TKP-7600) was complies with §15.107, 15.109 of the FCC Rules.

- The end -

