

FCC EVALUATION REPORT FOR CERTIFICATION

Applicant: Ohsung Electronics Co.,Ltd.**#181 Gongdan-Dong, Gumi-Si,****Gyeongsangbuk-Do, South Korea.****Attn : Hak-Ki Kim / General Manager****Date of Issue: Apr. 26, 2017****Order Number: GETEC-C1-17-184****Test Report Number: GETEC-E3-17-015****Test Site: GUMI UNIVERSITY EMC CENTER****FCC Registration Number: 269701****FCC ID. : OZ5URCTKP5600****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-5600
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 (2014) / 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,

Hyun Kim, Senior Engineer
GUMI UNIVERSITY EMC CENTER

Reviewed by,

Jae-Hoon Jeong, Technical Manager
GUMI UNIVERSITY EMC CENTER



CONTENTS

| | |
|--|----|
| 1. GENERAL INFORMATION | 3 |
| 2. INTRODUCTION | 4 |
| 3. PRODUCT INFORMATION | 5 |
| 3.1 DESCRIPTION OF EUT..... | 5 |
| 3.2 SUPPORT EQUIPMENT / CABLES USED | 6 |
| 3.3 MODIFICATION ITEM(S) | 6 |
| 4. DESCRIPTION OF TESTS..... | 7 |
| 4.1 TEST CONDITION..... | 7 |
| 4.2 CONDUCTED EMISSION | 8 |
| 4.3 RADIATED EMISSION..... | 9 |
| 5. CONDUCTED EMISSION..... | 10 |
| 5.1 OPERATING ENVIRONMENT | 10 |
| 5.2 TEST SET-UP | 10 |
| 5.3 MEASUREMENT UNCERTAINTY..... | 10 |
| 5.4 LIMIT | 11 |
| 5.5 TEST EQUIPMENT USED..... | 11 |
| 5.6 TEST DATA FOR CONDUCTED EMISSION | 11 |
| 6. RADIATED EMISSION | 14 |
| 6.1 OPERATING ENVIRONMENT | 14 |
| 6.2 TEST SET-UP | 14 |
| 6.3 MEASUREMENT UNCERTAINTY..... | 14 |
| 6.4 LIMIT | 15 |
| 6.5 TEST EQUIPMENT USED..... | 16 |
| 6.6 TEST DATA FOR RADIATED EMISSION | 16 |
| 7. SAMPLE CALCULATIONS..... | 21 |
| 7.1 EXAMPLE 1 : | 21 |
| 7.2 EXAMPLE 2 : | 21 |
| 8. RECOMMENDATION & CONCLUSION..... | 22 |
| APPENDIX A – ATESTSTATION STATEMENT | |
| APPENDIX B – ID SAMPLE LABEL & LOCATION | |
| APPENDIX C – BLOCK DIAGRAM | |
| APPENDIX D – TEST SET-UP PHOTOGRAPHS | |
| APPENDIX E – EXTERNAL PHOTOGRAPHS | |
| APPENDIX F – INTERNAL PHOTOGRAPHS | |
| APPENDIX G – USER’S MANUAL | |



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, Gyeongsangbuk-Do, South Korea

Manufacturer: Ohsung Electronics Co., Ltd.

Manufacturer Address: #181 Gongdan-Dong, Gumi-Si, Gyeongsangbuk-Do, South Korea

Contact Person: Hak-Ki Kim / General Manager

Telephone Number: +82-54-468-7281 **Fax Number:** +82-54-461-8368

| | |
|-----------------------------|---|
| ● FCC ID | OZ5URCTKP5600 |
| ● EUT Type | Network Keypad |
| ● Equipment Class | Class B computing device peripheral (JBP) |
| ● Model Name | TKP-5600 |
| ● 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 (2014) |
| ● Dates of Test | Mar. 21, 2017 ~ Mar. 30, 2017 |
| ● 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-E3-17-015 |
| ● Date of Issue | Apr. 26, 2017 |



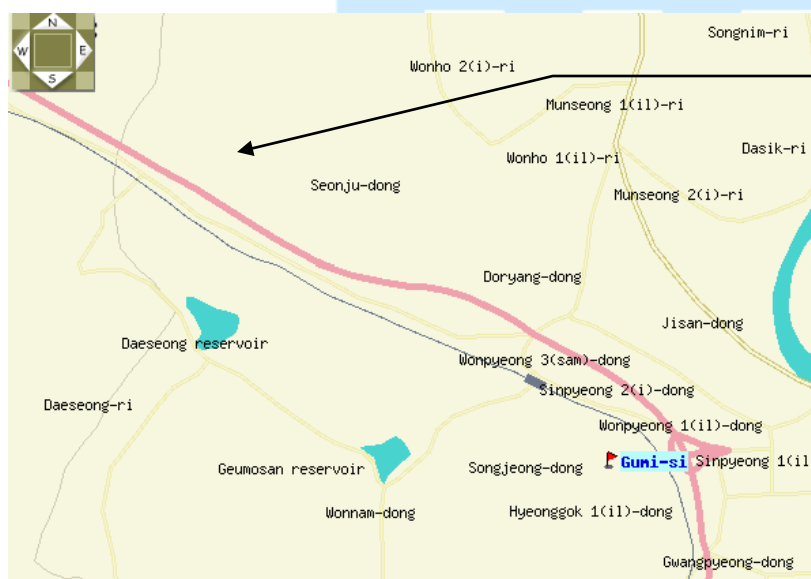
2. Introduction

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 C63.4-2014) was used in determining radiated and conducted emissions emanating from **Ohsung Electronics Co.,Ltd. Network Keypad (Model Name: TKP-5600)**

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 (2014)



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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-5600) FCC ID.: OZ5URCTKP5600

Microprocessor: Cortex-A9 dual 1GHz
Memory: 4GB eMMC, 1GB 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: 5 inch (960x540)
Weight: 6.28 oz
Size: 3.15"(L) x 5.62"(H) x 0.96"(D)
Power: Standard PoE Injector or PoE Switch (Purchased separately)



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-5600 | S/N: None FCC ID.: OZ5URCTKP5600 |
| 8-Port Gigabit Desktop/Rackmount Switch with 8-Port PoE | TP-LINK Technologies Co.,Ltd. | TL-SG1008PE | S/N: 2166308000074 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 8-Port Gigabit Desktop /RackmountSwitch with 8-Port PoE | 1.80 m shielded |

3.3 Modification Item(s)

- None



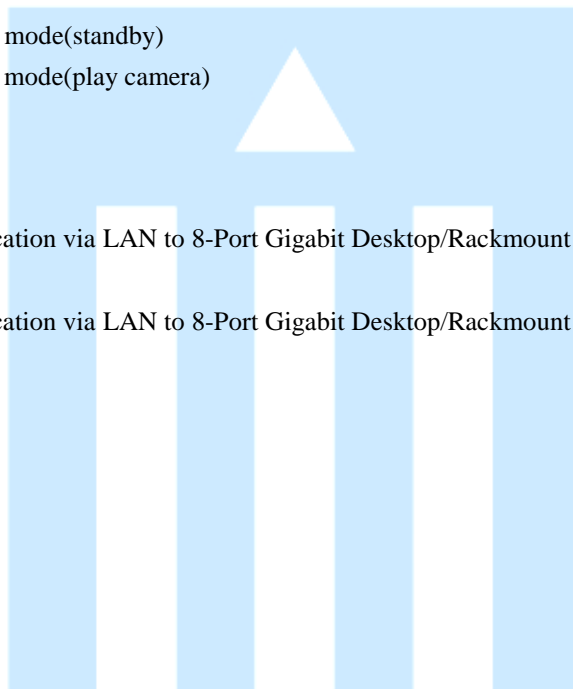
4. Description of tests

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 test conditions of the noted test mode(s) in this test report are;

- Test Voltage / Frequency : AC 120 V / 60 Hz
- Test Mode(s)
 - . Network communication mode(standby)
 - . Network communication mode(play camera)
- Operating test pattern
 - . Conducted Emission:
The EUT was communication via LAN to 8-Port Gigabit Desktop/Rackmount Switch with 8-Port PoE
 - . Radiated Emission:
The EUT was communication via LAN to 8-Port Gigabit Desktop/Rackmount Switch with 8-Port PoE





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.

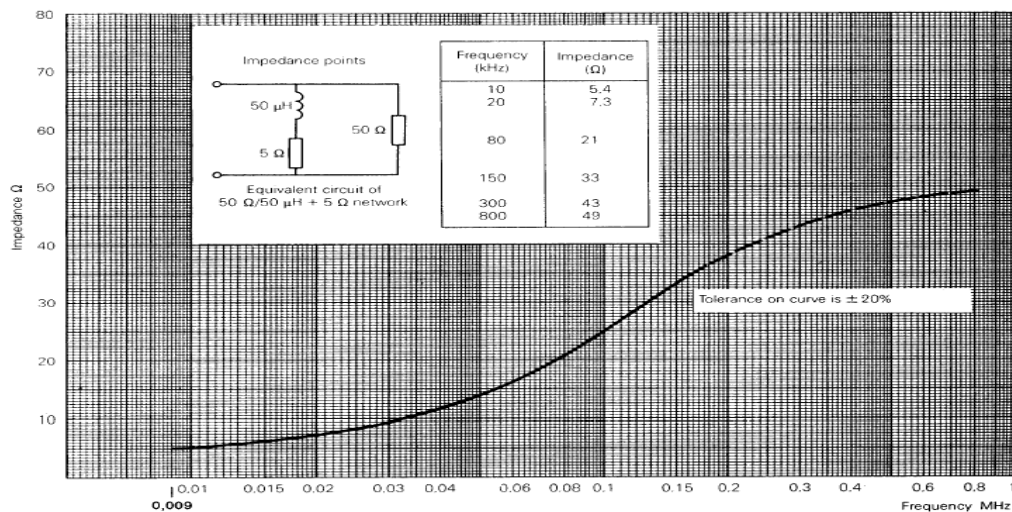


Fig 2. Impedance of LISN



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.

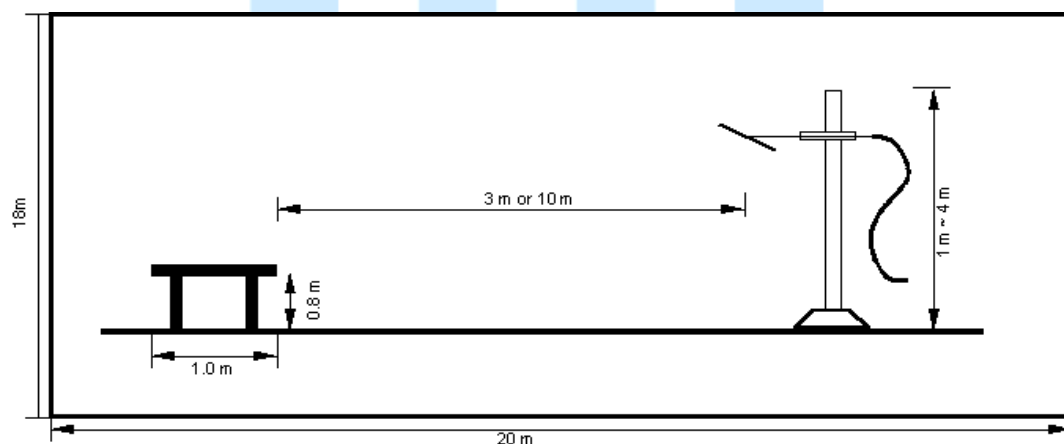


Fig 3. Dimensions of test site (Below 1 GHz)

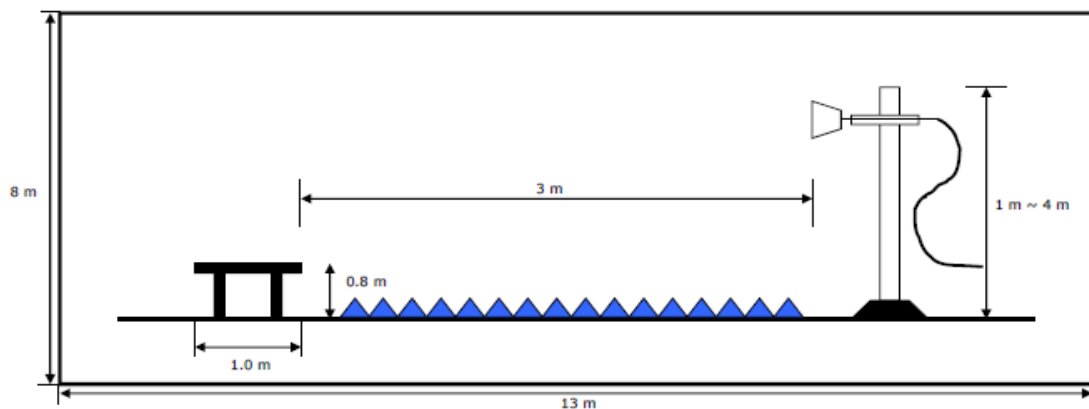


Fig 4. Dimensions of test site (Above 1 GHz)



5. Conducted Emission

5.1 Operating Environment

Temperature : 23.8 °C
Relative Humidity : 36.1 % 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) | 3.85 dB | Confidence level of approximately 95 % ($k = 2$) |
| Conducted emission (150 kHz ~ 30 MHz) | 3.32 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

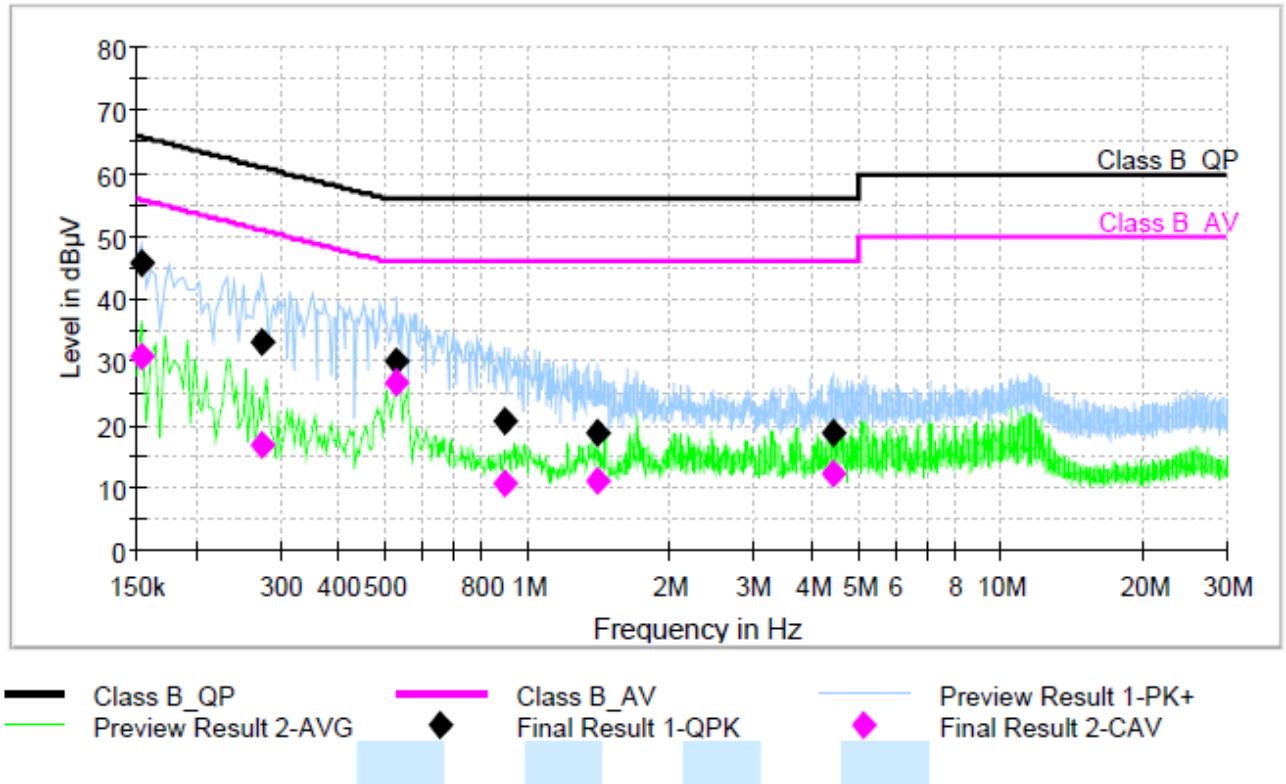
| Model Name | Manufacturer | Description | Serial Number | Due to Calibration |
|------------|-----------------|-------------------|---------------|--------------------|
| ■ - ESCI | Rohde & Schwarz | EMI Test Receiver | 100237 | Apr. 18, 2017 |
| ■ - ENV216 | Rohde & Schwarz | LISN | 100172 | Apr. 19, 2017 |
| □ - ENV216 | Rohde & Schwarz | LISN | 100173 | Apr. 19, 2017 |
| □ - ISN T8 | TESEQ.GmbH | ISN | 24568 | Apr. 22, 2017 |
| ■ - ST 08 | TESEQ.GmbH | ISN | 42870 | Jun. 09, 2017 |
| ■ - EMC 32 | Rohde & Schwarz | Software | Ver 8.53 | N/A |

5.6 Test data for Conducted Emission

- Test Date : Mar. 30, 2017
- Resolution Bandwidth : 9 kHz
- Frequency Range : 0.15 MHz ~ 30 MHz
- Line : L1: Live, N: Neutral



- Operating condition: Network communication mode(standby)



Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.153731 | 45.5 | 200.0 | 9.000 | Off | L1 | 9.6 | 20.3 | 65.8 | |
| 0.276863 | 33.0 | 200.0 | 9.000 | Off | N | 9.6 | 27.9 | 60.9 | |
| 0.530588 | 30.2 | 200.0 | 9.000 | Off | L1 | 9.7 | 25.8 | 56.0 | |
| 0.892519 | 20.7 | 200.0 | 9.000 | Off | L1 | 9.7 | 35.3 | 56.0 | |
| 1.403700 | 18.7 | 200.0 | 9.000 | Off | N | 9.7 | 37.3 | 56.0 | |
| 4.433475 | 18.6 | 200.0 | 9.000 | Off | L1 | 9.8 | 37.4 | 56.0 | |

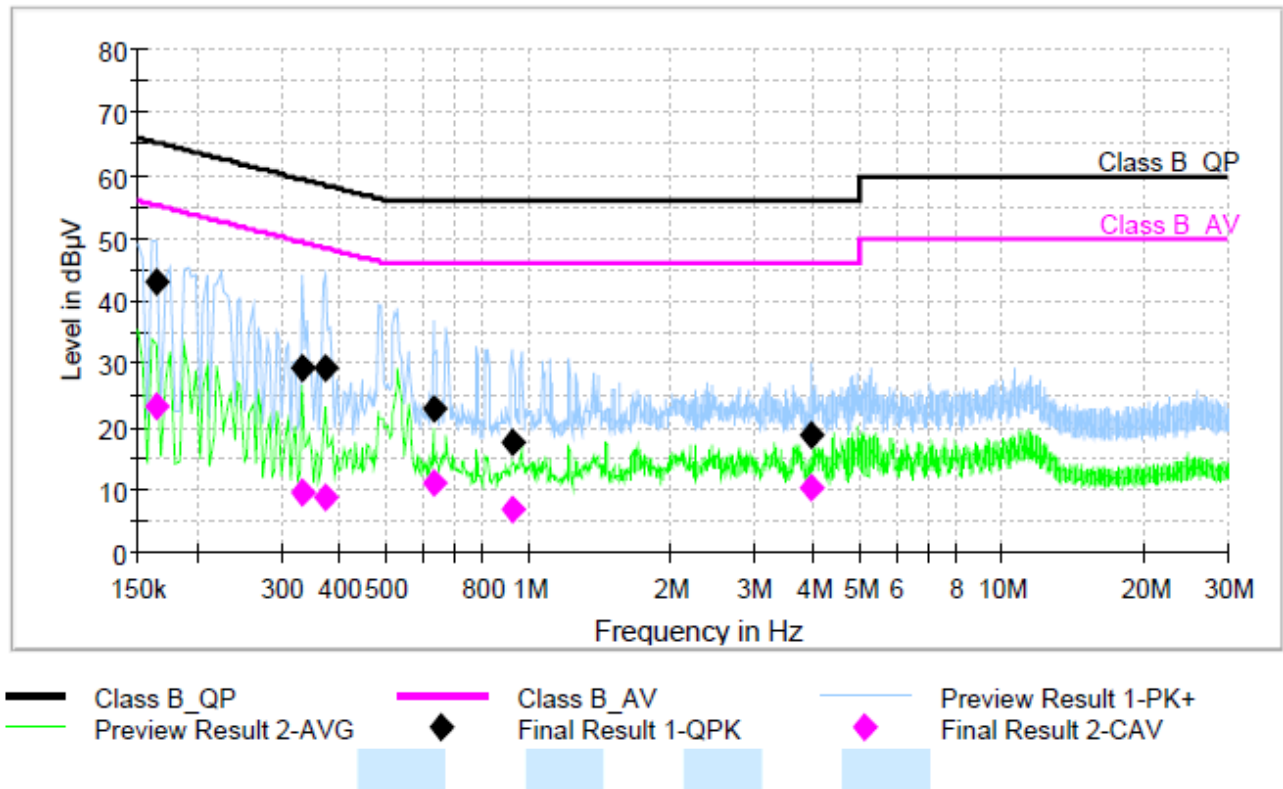
Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.153731 | 31.0 | 200.0 | 9.000 | Off | L1 | 9.6 | 24.8 | 55.8 | |
| 0.276863 | 16.9 | 200.0 | 9.000 | Off | N | 9.6 | 34.0 | 50.9 | |
| 0.530588 | 26.8 | 200.0 | 9.000 | Off | L1 | 9.7 | 19.2 | 46.0 | |
| 0.892519 | 10.7 | 200.0 | 9.000 | Off | L1 | 9.7 | 35.3 | 46.0 | |
| 1.403700 | 11.2 | 200.0 | 9.000 | Off | N | 9.7 | 34.8 | 46.0 | |
| 4.433475 | 12.1 | 200.0 | 9.000 | Off | L1 | 9.8 | 33.9 | 46.0 | |

< Fig 5. Graph of continuous disturbance >



- Operating condition: Network communication mode(play camera)



Final Result 1

| Frequency (MHz) | QuasiPeak (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|------------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.164925 | 42.9 | 200.0 | 9.000 | Off | L1 | 9.6 | 22.3 | 65.2 | |
| 0.332831 | 29.2 | 200.0 | 9.000 | Off | L1 | 9.6 | 30.2 | 59.4 | |
| 0.373875 | 29.3 | 200.0 | 9.000 | Off | L1 | 9.6 | 29.1 | 58.4 | |
| 0.631331 | 22.9 | 200.0 | 9.000 | Off | L1 | 9.7 | 33.1 | 56.0 | |
| 0.926100 | 17.7 | 200.0 | 9.000 | Off | N | 9.7 | 38.3 | 56.0 | |
| 3.974531 | 18.7 | 200.0 | 9.000 | Off | N | 9.8 | 37.3 | 56.0 | |

Final Result 2

| Frequency (MHz) | CAverage (dBμV) | Meas. Time (ms) | Bandwidth (kHz) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) | Comment |
|-----------------|-----------------|-----------------|-----------------|--------|------|------------|-------------|--------------|---------|
| 0.164925 | 23.1 | 200.0 | 9.000 | Off | L1 | 9.6 | 32.1 | 55.2 | |
| 0.332831 | 9.6 | 200.0 | 9.000 | Off | L1 | 9.6 | 39.8 | 49.4 | |
| 0.373875 | 8.8 | 200.0 | 9.000 | Off | L1 | 9.6 | 39.6 | 48.4 | |
| 0.631331 | 11.2 | 200.0 | 9.000 | Off | L1 | 9.7 | 34.8 | 46.0 | |
| 0.926100 | 6.8 | 200.0 | 9.000 | Off | N | 9.7 | 39.2 | 46.0 | |
| 3.974531 | 10.5 | 200.0 | 9.000 | Off | N | 9.8 | 35.5 | 46.0 | |

< Fig 6. Graph of continuous disturbance >



6. Radiated Emission

6.1 Operating Environment

Temperature : 17.7 °C
Relative Humidity : 39.2 % 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) | 4.78 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal) | 4.77 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical) | 5.06 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal) | 5.03 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m) | 5.42 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (1 000 MHz ~ 18 000 MHz, 3 m) | 5.64 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) | 4.36 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal) | 4.37 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical) | 4.49 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal) | 4.47 dB | Confidence level of approximately 95 % ($k = 2$) |
| Radiated emission (1 000 MHz ~ 6 000 MHz, 3 m) | 5.27 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 |
|---|-------------------|-------------------------|---------------|--------------------|
| <input type="checkbox"/> - ESIB26 | Rohde & Schwarz | EMI Test Receiver | 830482/010 | Apr. 18, 2017 |
| <input checked="" type="checkbox"/> - ESU40 | Rohde & Schwarz | EMI Test Receiver | 100266 | Jul. 20, 2017 |
| <input type="checkbox"/> - ESR7 | Rohde & Schwarz | EMI Test Receiver | 101382 | Apr. 18, 2017 |
| <input type="checkbox"/> - VULB9160 | Schwarzbeck | Broad Band Test Antenna | 3099 | Aug. 03, 2017 |
| <input checked="" type="checkbox"/> - BBHA9120D | Schwarzbeck | Horn ANT | 207 | Oct. 13, 2017 |
| <input checked="" type="checkbox"/> - MCU066 | maturo GmbH | Position Controller | 1390306 | N/A |
| <input checked="" type="checkbox"/> - TT2.5SI | maturo GmbH | Turntable | 1390307 | N/A |
| <input checked="" type="checkbox"/> - AM 4.0 | maturo GmbH | Antenna Mast | 1390308 | N/A |
| <input type="checkbox"/> - BBHA9120D | Schwarzbeck | Horn ANT | 597 | May. 13, 2017 |
| <input type="checkbox"/> - CO3000 | Innco system GmbH | Position Controller | 1390306 | N/A |
| <input type="checkbox"/> - DT3000 | Innco system GmbH | Turntable | 1390307 | N/A |
| <input type="checkbox"/> - MA4000-EP | Innco system GmbH | Antenna Mast | 1390308 | N/A |
| <input type="checkbox"/> - MA4640-XP-ET | Innco system GmbH | Antenna Mast | MA4640/558 | N/A |
| <input checked="" type="checkbox"/> - AFS 44 00101800-25-10P-44 | MITEQ | Preamplifier | 1258943 | Dec. 06, 2017 |
| <input type="checkbox"/> - 87405A | Agilent | Preamplifier | MY39500777 | Dec. 06, 2017 |
| <input checked="" type="checkbox"/> - EMC 32 | Rohde & Schwarz | Software | Ver.9.15 | N/A |

6.6 Test data for Radiated Emission

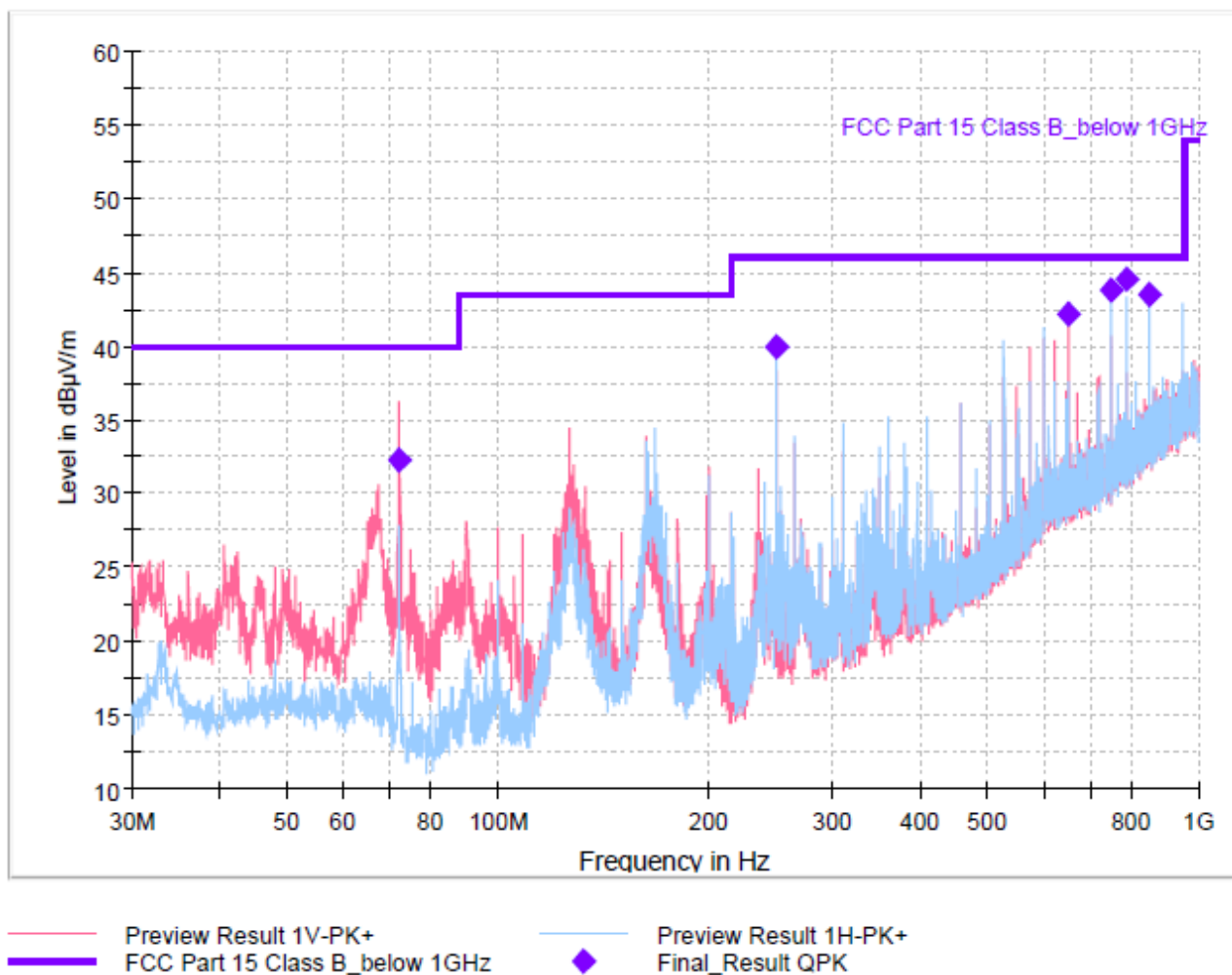
- Test Date : Mar. 21 ,2017
 - Measurement Distance : 3 m
 - Note : The EUT was tested made up 6 GHz, because, it was required from the client.
 - Measurement

| | | |
|----------------------|----------------|----------------|
| 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: Network communication mode(standby)



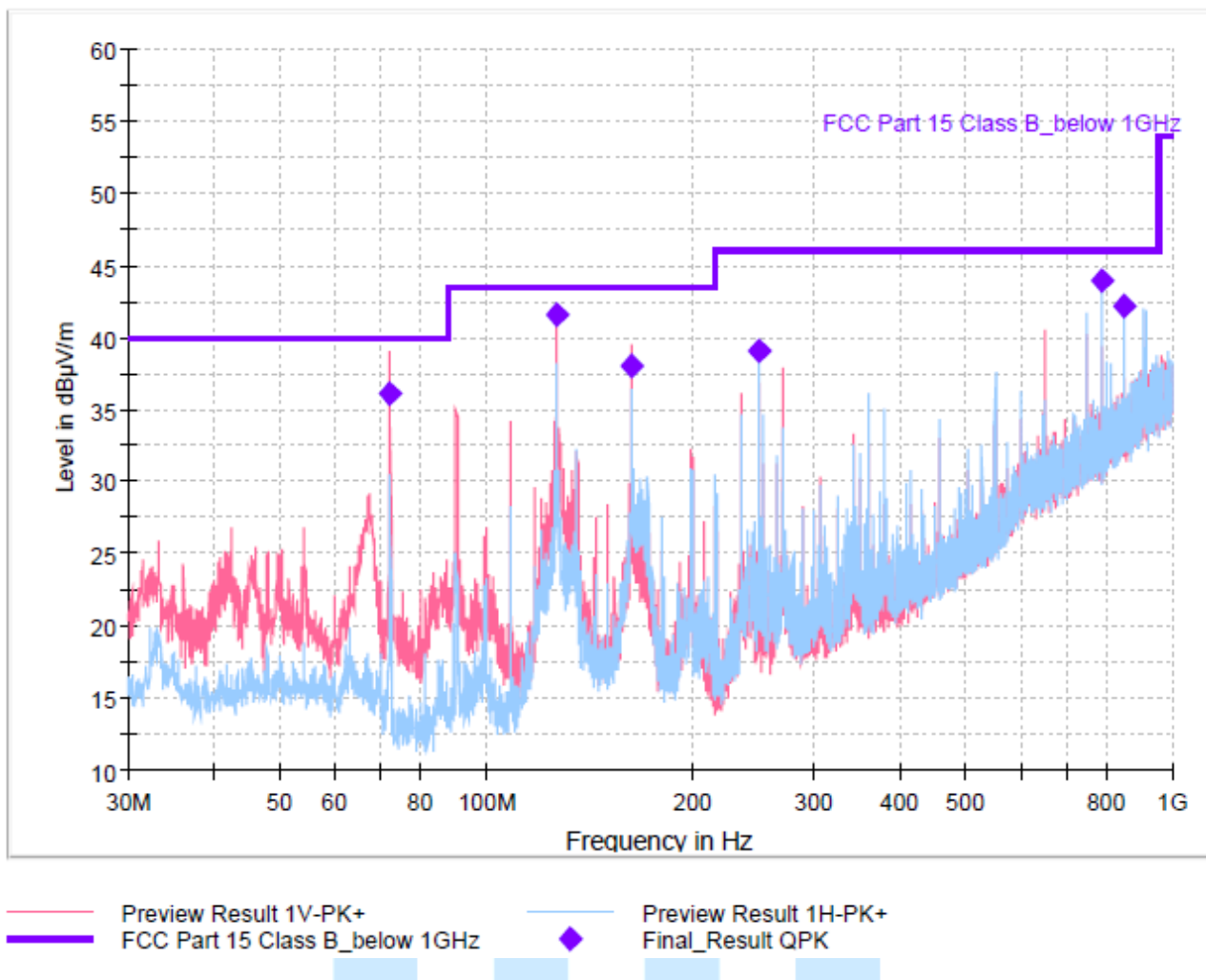
Final Result

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 72.376875 | 32.34 | 40.00 | 7.66 | 1000.0 | 120.000 | 125.0 | V | 272.0 | 11.2 |
| 250.008125 | 39.93 | 46.00 | 6.07 | 1000.0 | 120.000 | 181.0 | H | 104.0 | 15.1 |
| 650.011875 | 42.20 | 46.00 | 3.80 | 1000.0 | 120.000 | 100.0 | V | 43.0 | 26.9 |
| 750.003125 | 43.76 | 46.00 | 2.24 | 1000.0 | 120.000 | 225.0 | H | 183.0 | 28.6 |
| 791.976250 | 44.57 | 46.00 | 1.33 | 1000.0 | 120.000 | 185.0 | H | 21.0 | 29.3 |
| 850.013750 | 43.55 | 46.00 | 2.45 | 1000.0 | 120.000 | 113.0 | H | 178.0 | 30.6 |

< Fig 7. Radiated emission result (30 MHz ~ 1 000 MHz) >



- Operating condition: Network communication mode(play camera)



Final Result

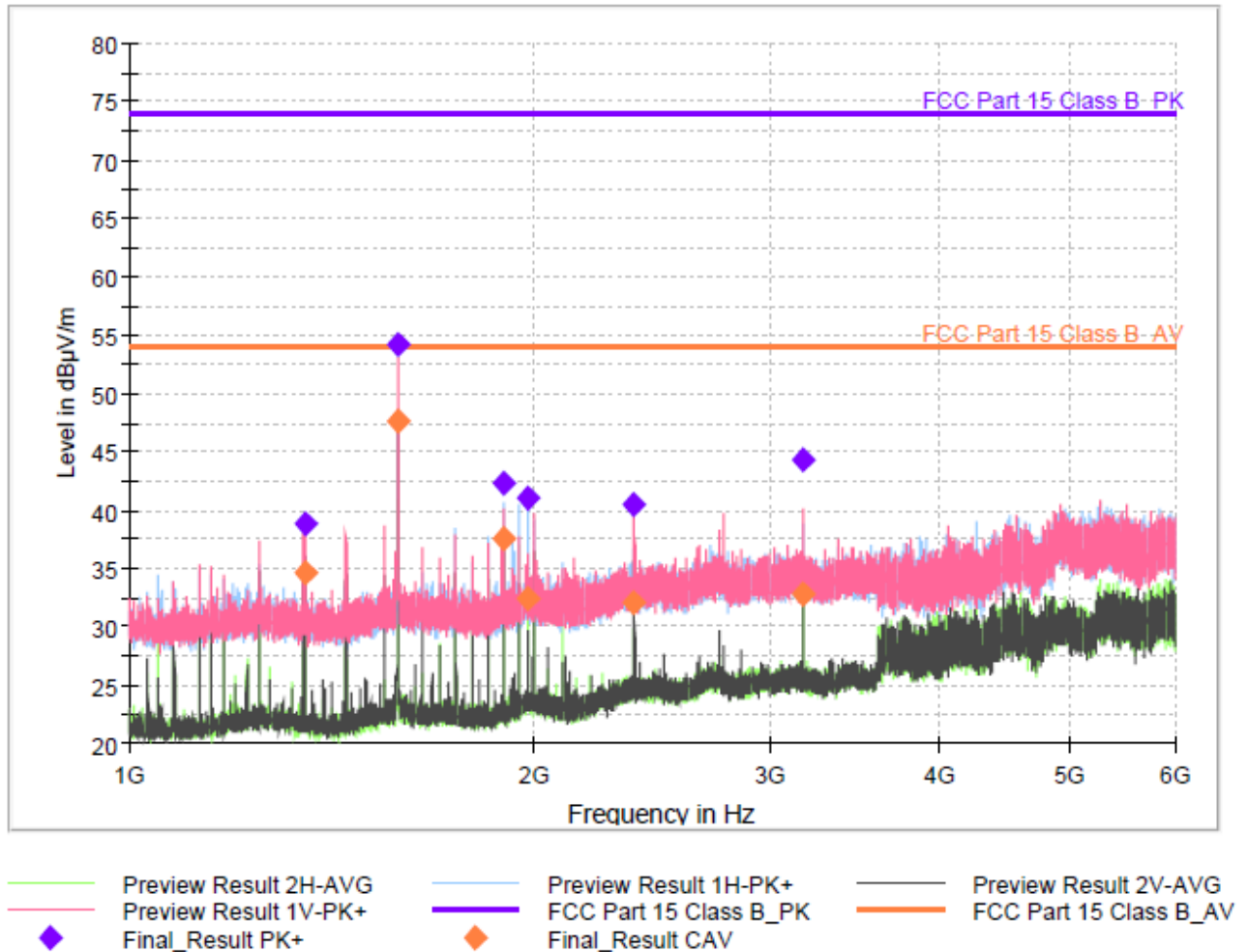
| Frequency (MHz) | QuasiPeak (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------------|----------------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 72.376875 | 36.08 | 40.00 | 3.92 | 1000.0 | 120.000 | 188.0 | V | 0.0 | 11.2 |
| 126.676250 | 41.49 | 43.50 | 2.01 | 1000.0 | 120.000 | 125.0 | V | 14.0 | 13.7 |
| 162.850000 | 38.03 | 43.50 | 5.47 | 1000.0 | 120.000 | 109.0 | V | 6.0 | 15.2 |
| 250.008125 | 39.02 | 46.00 | 6.98 | 1000.0 | 120.000 | 175.0 | H | 109.0 | 15.1 |
| 792.016250 | 43.85 | 46.00 | 2.15 | 1000.0 | 120.000 | 100.0 | H | 44.0 | 29.3 |
| 850.013750 | 42.10 | 46.00 | 3.90 | 1000.0 | 120.000 | 120.0 | H | 150.0 | 30.6 |

< Fig 8. Radiated emission result (30 MHz ~ 1 000 MHz) >



-. 1 GHz ~ 6 GHz

▪ Operating condition: Network communication mode(standby)



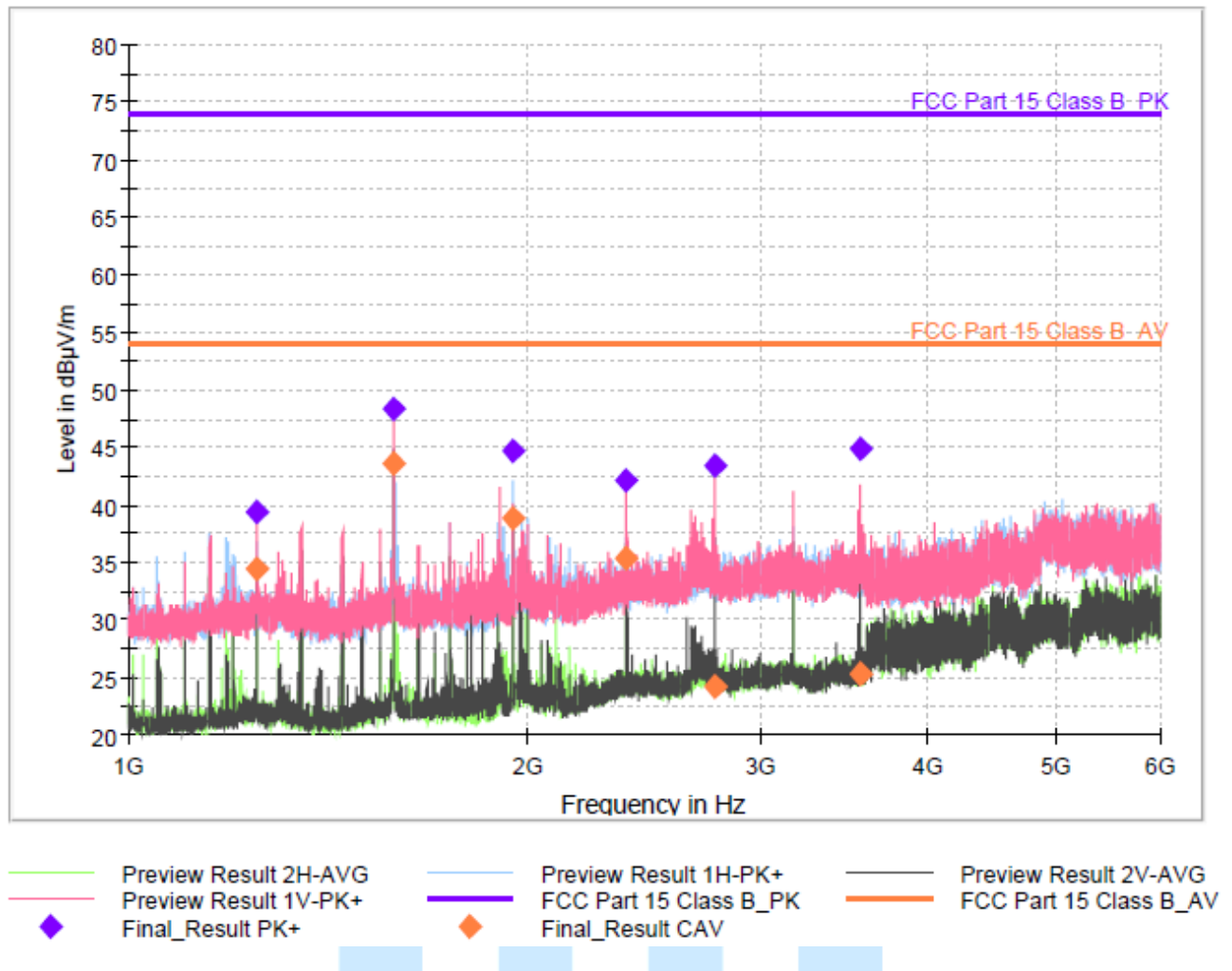
Final Result

| 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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1350.200 | --- | 34.71 | 54.00 | 19.29 | 1000.0 | 1000.000 | 100.0 | V | 350.0 | -13.1 |
| 1350.200 | 38.81 | --- | 74.00 | 35.19 | 1000.0 | 1000.000 | 100.0 | V | 350.0 | -13.1 |
| 1584.033 | 54.23 | --- | 74.00 | 19.77 | 1000.0 | 1000.000 | 100.0 | V | 39.0 | -12.7 |
| 1584.033 | --- | 47.60 | 54.00 | 6.40 | 1000.0 | 1000.000 | 100.0 | V | 39.0 | -12.7 |
| 1900.200 | --- | 37.57 | 54.00 | 16.43 | 1000.0 | 1000.000 | 125.0 | H | 210.0 | -12.0 |
| 1900.200 | 42.40 | --- | 74.00 | 31.60 | 1000.0 | 1000.000 | 125.0 | H | 210.0 | -12.0 |
| 1979.867 | --- | 32.51 | 54.00 | 21.49 | 1000.0 | 1000.000 | 109.0 | H | 203.0 | -11.9 |
| 1979.867 | 40.98 | --- | 74.00 | 33.02 | 1000.0 | 1000.000 | 109.0 | H | 203.0 | -11.9 |
| 2376.033 | 40.48 | --- | 74.00 | 33.52 | 1000.0 | 1000.000 | 100.0 | V | 9.0 | -10.4 |
| 2376.033 | --- | 32.13 | 54.00 | 21.87 | 1000.0 | 1000.000 | 100.0 | V | 9.0 | -10.4 |
| 3167.867 | --- | 32.77 | 54.00 | 21.23 | 1000.0 | 1000.000 | 121.0 | V | 153.0 | -8.8 |
| 3167.867 | 44.36 | --- | 74.00 | 29.64 | 1000.0 | 1000.000 | 121.0 | V | 153.0 | -8.8 |

< Fig 9. Radiated emission result (1 000 MHz ~6 000 MHz) >



- Operating condition: Network communication mode(play camera)



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) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 1250.033 | --- | 34.40 | 54.00 | 19.60 | 1000.0 | 1000.000 | 106.0 | V | -16.0 | -13.4 |
| 1250.033 | 39.47 | --- | 74.00 | 34.53 | 1000.0 | 1000.000 | 106.0 | V | -16.0 | -13.4 |
| 1584.033 | --- | 43.57 | 54.00 | 10.43 | 1000.0 | 1000.000 | 106.0 | V | 72.0 | -12.7 |
| 1584.033 | 48.37 | --- | 74.00 | 25.63 | 1000.0 | 1000.000 | 106.0 | V | 72.0 | -12.7 |
| 1949.800 | --- | 38.81 | 54.00 | 15.19 | 1000.0 | 1000.000 | 125.0 | H | 208.0 | -11.9 |
| 1949.800 | 44.65 | --- | 74.00 | 29.35 | 1000.0 | 1000.000 | 125.0 | H | 208.0 | -11.9 |
| 2376.033 | --- | 35.32 | 54.00 | 18.68 | 1000.0 | 1000.000 | 106.0 | V | 278.0 | -10.4 |
| 2376.033 | 42.22 | --- | 74.00 | 31.78 | 1000.0 | 1000.000 | 106.0 | V | 278.0 | -10.4 |
| 2771.967 | --- | 24.24 | 54.00 | 29.76 | 1000.0 | 1000.000 | 114.0 | V | 141.0 | -9.3 |
| 2771.967 | 43.44 | --- | 74.00 | 30.56 | 1000.0 | 1000.000 | 114.0 | V | 141.0 | -9.3 |
| 3563.900 | --- | 25.32 | 54.00 | 28.68 | 1000.0 | 1000.000 | 114.0 | V | 110.0 | -8.3 |
| 3563.900 | 44.85 | --- | 74.00 | 29.15 | 1000.0 | 1000.000 | 114.0 | V | 110.0 | -8.3 |

< Fig 10. Radiated emission result (1 000 MHz ~6 000 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 **Ohsung Electronics Co.,Ltd.**
Network Keypad (Model Name: TKP-5600) was complies with §15.107, 15.109 of the FCC Rules.

- The end -

