



# TEST REPORT



Report No. : KES-EM240343  
Page 1 / 38

**KES Co., Ltd.**  
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## 1. Client

Applicant : Hanwha Vision Co., Ltd  
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

## 2. Sample Description

Product name : SIP MIC  
Model/Type No. : SPA-M2000  
Variant Model : -  
Manufacturer : Inter-M Corporation  
Manufacturer Address : 73, Hwahap-ro 1402beon-gil, Yangju-si, Gyeonggi-do, Republic of Korea

**3. Date of Receipt** : Jan. 25, 2024

**4. Test date** : Feb. 03, 2024 ~ Feb. 04, 2024

**5. Date of Issue** : Mar. 20, 2024

**6. Test Results** : In Compliance

*Tested by*

*Reviewed by*

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Seon Ho, Choi  
EMC Test Engineer

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Dong Hun, Jang  
EMC Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.



**REPORT REVISION HISTORY**

| Date          | Test Report No. | Revision History |
|---------------|-----------------|------------------|
| Mar. 20, 2024 | KES-EM240343    | Issued           |
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## TABLE OF CONTENTS

|                                                      |                                                            |    |
|------------------------------------------------------|------------------------------------------------------------|----|
| 1.0                                                  | General Product Description.....                           | 4  |
| 1.1                                                  | Test Voltage & Frequency .....                             | 5  |
| 1.2                                                  | Variant Model Differences .....                            | 5  |
| 1.3                                                  | Device Modifications .....                                 | 5  |
| 1.4                                                  | Equipment Under Test .....                                 | 5  |
| 1.5                                                  | Support Equipments .....                                   | 5  |
| 1.6                                                  | External I/O Cabling.....                                  | 6  |
| 1.7                                                  | EUT Operating Mode(s).....                                 | 7  |
| 1.8                                                  | Configuration.....                                         | 8  |
| 1.9                                                  | Remarks when standards applied .....                       | 9  |
| 1.10                                                 | Calibration Details of Equipment Used for Measurement..... | 9  |
| 1.11                                                 | Test Facility .....                                        | 9  |
| 1.12                                                 | Laboratory Accreditations and Listings .....               | 9  |
| 2.0                                                  | Test Regulations .....                                     | 10 |
| 2.1                                                  | Conducted Emissions at Mains Power Ports.....              | 11 |
| 2.2                                                  | Radiated Electric Field Emissions(Below 1 GHz).....        | 13 |
| 2.3                                                  | Radiated Electric Field Emissions(Above 1 GHz) .....       | 15 |
| APPENDIX A – TEST DATA .....                         |                                                            | 17 |
| Conducted Emissions at Mains Power Ports .....       |                                                            | 17 |
| Radiated Electric Field Emissions(Below 1 GHz) ..... |                                                            | 21 |
| Radiated Electric Field Emissions(Above 1 GHz).....  |                                                            | 25 |
| Test Setup Photos and Configuration.....             |                                                            | 27 |
| Conducted Emissions at Mains Power Ports .....       |                                                            | 27 |
| Radiated Electric Field Emissions(Below 1 GHz) ..... |                                                            | 29 |
| Radiated Electric Field Emissions(Above 1 GHz).....  |                                                            | 31 |
| EUT External Photographs.....                        |                                                            | 33 |
| EUT Internal Photographs.....                        |                                                            | 34 |



## 1.0 General Product Description

### Main Specifications of EUT are:

| Product                                 |                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                                    | SIP Microphone                                                                                                                                                                                                                                                                                          |
| Line Output                             |                                                                                                                                                                                                                                                                                                         |
| Output Level                            | None                                                                                                                                                                                                                                                                                                    |
| Frequency Response                      | None                                                                                                                                                                                                                                                                                                    |
| THD + N Ratio (AES17 LPF)               | None                                                                                                                                                                                                                                                                                                    |
| S/N Ratio (20kHz LPF, A-WTD)            | None                                                                                                                                                                                                                                                                                                    |
| Line Input                              |                                                                                                                                                                                                                                                                                                         |
| Maximum Input Level                     | -7dBV, Aux Input Volume Max                                                                                                                                                                                                                                                                             |
| Amplifier                               |                                                                                                                                                                                                                                                                                                         |
| Description                             | 1W/ 8Ω, Monitor Amp                                                                                                                                                                                                                                                                                     |
| Network                                 |                                                                                                                                                                                                                                                                                                         |
| Ethernet                                | 10/100 Base-T                                                                                                                                                                                                                                                                                           |
| Memory                                  |                                                                                                                                                                                                                                                                                                         |
| Internal Memory                         | None                                                                                                                                                                                                                                                                                                    |
| External Memory (Micro SD)              | None                                                                                                                                                                                                                                                                                                    |
| Contact                                 |                                                                                                                                                                                                                                                                                                         |
| Contact Input. Dry contact              | None                                                                                                                                                                                                                                                                                                    |
| Contact Output. Dry contact (NO)        | None                                                                                                                                                                                                                                                                                                    |
| General                                 |                                                                                                                                                                                                                                                                                                         |
| Operating Temperature                   | -10 ~ +40°C (+14°F ~ +104°F)                                                                                                                                                                                                                                                                            |
| Operating Humidity                      | 10~95% RH (Non-Condensing)                                                                                                                                                                                                                                                                              |
| IP code                                 | None                                                                                                                                                                                                                                                                                                    |
| Weight                                  | 1.3 Kg                                                                                                                                                                                                                                                                                                  |
| Size                                    | 200(W) x 73(H) x 206(D)mm                                                                                                                                                                                                                                                                               |
| Color                                   | Black                                                                                                                                                                                                                                                                                                   |
| Certificate                             | EMC : KS C 9832/9835, EN 55032/55035, FCC Part 15 Subpart B, ICES-003<br>Safety : UL 62368-1, CAN/CSA 62368-1                                                                                                                                                                                           |
| Power                                   |                                                                                                                                                                                                                                                                                                         |
| PoE                                     | PoE (IEEE 802.3 af type 1 Class 3)                                                                                                                                                                                                                                                                      |
| PoE+                                    | Max.12W, DC24V                                                                                                                                                                                                                                                                                          |
| Embedded MIC                            |                                                                                                                                                                                                                                                                                                         |
| Input Sensitivity                       | -50dBV ± 3dB (Mic Volume Max)                                                                                                                                                                                                                                                                           |
| Frequency Response                      | 100Hz ~ 6kHz                                                                                                                                                                                                                                                                                            |
| Audio                                   |                                                                                                                                                                                                                                                                                                         |
| Supported Audio Format                  | None                                                                                                                                                                                                                                                                                                    |
| Speaker                                 |                                                                                                                                                                                                                                                                                                         |
| Speaker Component                       | None                                                                                                                                                                                                                                                                                                    |
| Max. Sound Pressure Level (PoE)         | None                                                                                                                                                                                                                                                                                                    |
| Max. Sound Pressure Level (PoE+)        | None                                                                                                                                                                                                                                                                                                    |
| Frequency Range (-10dB)                 | None                                                                                                                                                                                                                                                                                                    |
| Sensitivity (1Watt)                     | None                                                                                                                                                                                                                                                                                                    |
| Coverage Pattern                        | None                                                                                                                                                                                                                                                                                                    |
| Network Protocol                        |                                                                                                                                                                                                                                                                                                         |
| Security                                | Password protection : admin,setup,user,guest<br>(sha-2, Digest authentication, User access log)<br>Digest authentication, User access log                                                                                                                                                               |
| Supported Protocols                     | IPv4, HTTP, SIP, mDNS, DNS, NTP, TCP, UDP, DHCP, ARP, ICMP                                                                                                                                                                                                                                              |
| System Integration                      |                                                                                                                                                                                                                                                                                                         |
| API (Application Programming Interface) | SUNAPI                                                                                                                                                                                                                                                                                                  |
| Multi-source Dynamic PA control         | None                                                                                                                                                                                                                                                                                                    |
| VoIP                                    | Tested with SIP clients such as Grandstream, Yealink, Cisco, MicroSIP softphone and PBX supplier such as Asterisk<br>Tested with SIP client such as Grandstream and PBX supplier such as Grandstream<br>Supported SIP features: DTMF (RFC2833)<br>Supported codecs: PCMU, PCMA, speex/8000, speex/16000 |
| TTS                                     | None                                                                                                                                                                                                                                                                                                    |
| Audio Monitoring                        | None                                                                                                                                                                                                                                                                                                    |
| Event & Preset                          | None                                                                                                                                                                                                                                                                                                    |
| Functional Monitoring                   | Connection verification, Built-in system logging                                                                                                                                                                                                                                                        |



## 1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

- ☒ AC 120 V, 60 Hz (AC/DC Adapter Input Power)
- ☒ AC 120 V, 60 Hz (PoE Adapter Input Power)

## 1.2 Variant Model Differences

Not applicable

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

| Description     | Model Number | Serial Number | Manufacturer                                 | Remarks |
|-----------------|--------------|---------------|----------------------------------------------|---------|
| SIP MIC         | SPA-M2000    | -             | Inter-M Corporation                          | EUT     |
| AC / DC Adapter | KPL-060M-VI  | -             | Channel Well Technology (Guangzhou) Co.,Ltd. | -       |

## 1.5 Support Equipments

| Description           | Model Number | Serial Number | Manufacturer                                   | Remarks |
|-----------------------|--------------|---------------|------------------------------------------------|---------|
| Speaker               | -            | -             | -                                              | -       |
| Notebook              | LG15U590     | -             | LG Electronics Co., Ltd.                       | -       |
| Notebook Adapter      | A13-040N3A   | -             | CHICONY POWER TECHNOLOGY (Chongqing) CO., LTD. | -       |
| PoE Switch            | GS728TPP     | 3AR3595700005 | NETGEAR®                                       | -       |
| Smart Phone           | SM-G991N     | -             | SAMSUNG                                        | -       |
| switching hub         | H508         | -             | IpTIME                                         | -       |
| switching hub Adapter | DWA05200K    | -             | Dongguan City Rongrun Industry Co.,Ltd         | -       |



## 1.6 External I/O Cabling

### ■ DC 24 V Mode

| Start         |            | END                   |            | Cable Spec. |        |
|---------------|------------|-----------------------|------------|-------------|--------|
| Description   | I/O Port   | Description           | I/O Port   | Length      | Shield |
| SIP MIC (EUT) | DC Jack    | AC / DC Adapter (EUT) | Line out   | 1.5         | U      |
|               | AUX IN     | Notebook              | 3.5 mm     | 1.0         | U      |
|               | -          | Smart Phone           | -          | -           | -      |
|               | RJ-45(LAN) | switching hub         | RJ-45(LAN) | 3.5         | U      |
| Poe Switch    | RJ-45(LAN) | switching hub         | RJ-45(LAN) | 1.5         | U      |
|               | RJ-45(PoE) | Speaker               | RJ-45(PoE) | 1.6         | U      |
|               | RJ-45(LAN) | Notebook              | RJ-45(LAN) | 1.2         | U      |
| Notebook      | DC Jack    | Notebook Adapter      | DC Jack    | 1.4         | U      |
| switching hub | DC Jack    | switching hub Adapter | DC Jack    | 1.2         | U      |

\* Unshielded=U, Shielded=S

### ■ PoE Mode

| Start         |            | END              |            | Cable Spec. |        |
|---------------|------------|------------------|------------|-------------|--------|
| Description   | I/O Port   | Description      | I/O Port   | Length      | Shield |
| SIP MIC (EUT) | AUX IN     | Notebook         | 3.5 mm     | 1.0         | U      |
|               | -          | Smart Phone      | -          | -           | -      |
|               | RJ-45(PoE) | PoE Switch       | RJ-45(PoE) | 3.5         | U      |
| Poe Switch    | RJ-45(PoE) | Speaker          | RJ-45(PoE) | 1.6         | U      |
|               | RJ-45(LAN) | Notebook         | RJ-45(LAN) | 1.2         | U      |
| Notebook      | DC Jack    | Notebook Adapter | DC Jack    | 1.4         | U      |

\* Unshielded=U, Shielded=S



## 1.7 EUT Operating Mode(s)

### ■ DC 24 V Mode, PoE Mode

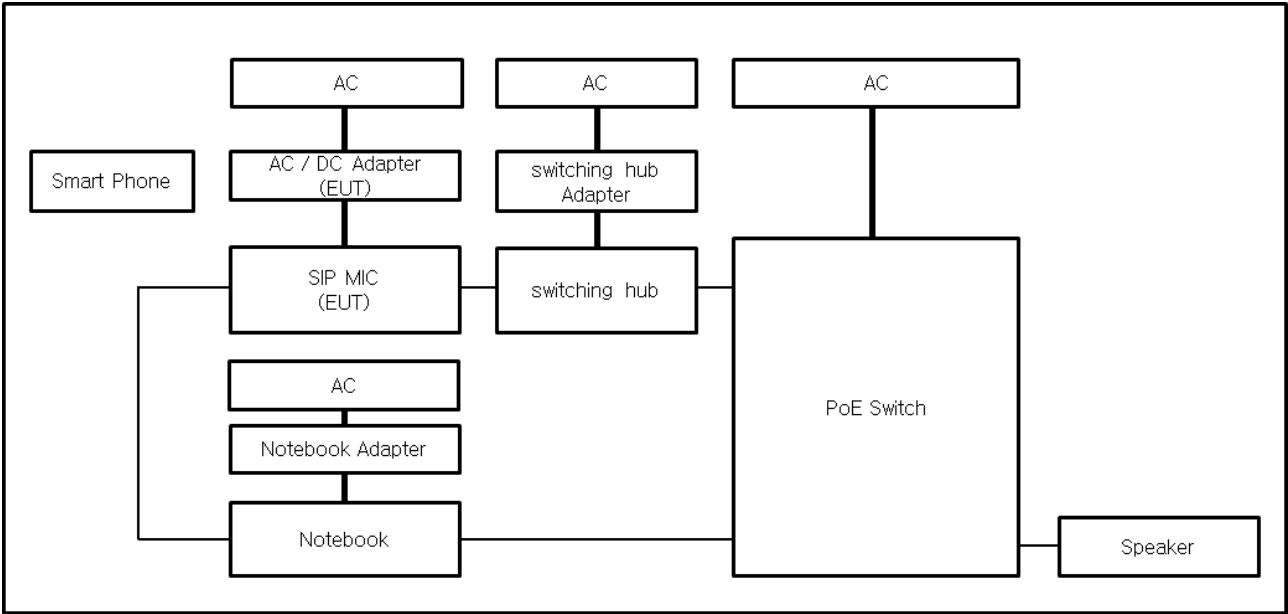
| Test mode | operating                                                                                                                                                                                      |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating | The test was performed by running Pingtest on a laptop to check whether the test equipment was connected properly and whether 1 kHz tone was output to the speaker through the test equipment. |

| EUT Test operating S/W |         |                     |
|------------------------|---------|---------------------|
| Name                   | Version | Manufacture Company |
| -                      | -       | -                   |

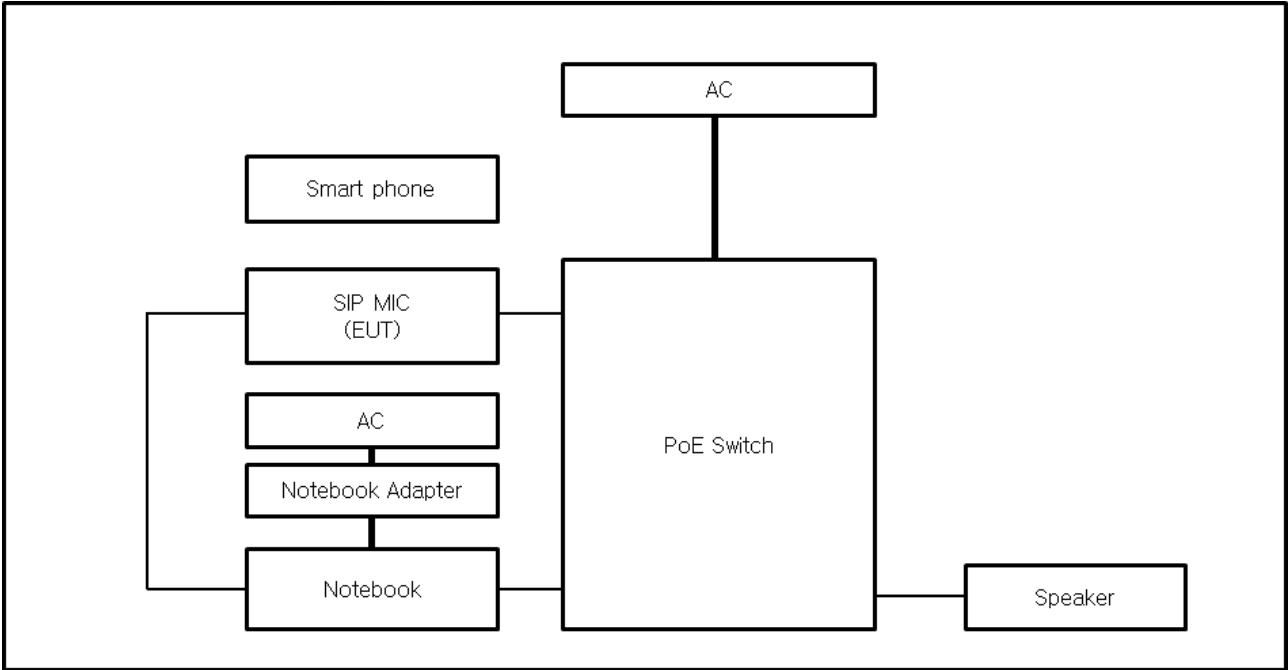


# 1.8 Configuration

## ■ DC 24 V Mode



## ■ PoE Mode







## 1.9 Remarks when standards applied

In PoE mode, the LAN port is regarded as a wired communication network port and power-related ports are not tested.

## 1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

## 1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

## 1.12 Laboratory Accreditations and Listings

| Country       | Agency  | Scope of Accreditation                                                                                                                  | Logo                                                                                                                           |
|---------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| KOREA         | RRA     | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>KR0100                                  |
| International | KOLAS   | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>KT489                                  |
| USA           | FCC     | 3 m & 10 m Semi-Anechoic Chamber<br>Conducted test site to perform FCC Part 15/18 measurements.                                         | <br>KR0100                                |
| Canada        | ISED    | 3 m & 10 m Semi-Anechoic Chamber and Conducted test site                                                                                | <br>23298                                 |
| JAPAN         | VCCI    | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)                                                                          | <br>C-20136, T-20137,<br>R-20181, G-20176 |
| Europe        | TÜV SÜD | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>CARAT 001633 0004                     |



## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **47 CFR Part 15, Subpart B**

☐ CISPR 22:2009 +A1:2010

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B

☒ **IC Regulation ICES-003 Issue 7**

☐ CAN/CSA-CISPR 32:17

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B





## 2.1 Conducted Emissions at Mains Power Ports

**Test Date**

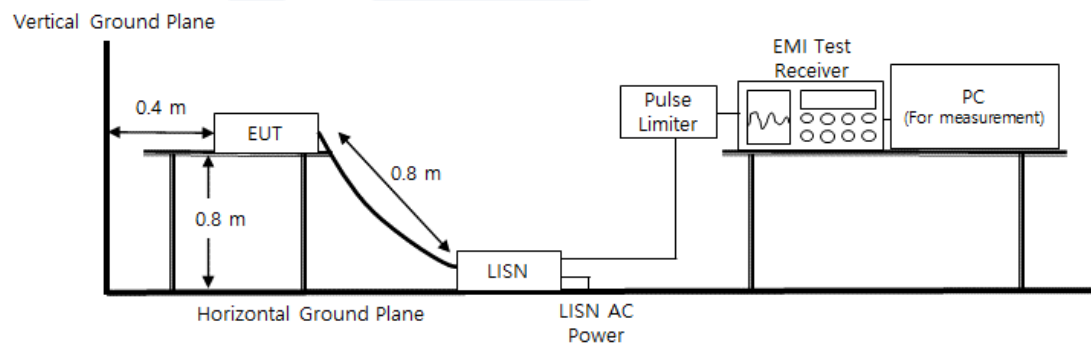
Feb. 03, 2024

**Test Location**

Electro wave Shieldroom #6

**Test Equipment**

| Used                                | Description       | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|-------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W      | EMC32        | R & S        | 9.12.00       | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER | ESR3         | R & S        | 101783        | 11, 08, 2024 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 11, 08, 2024 |
| <input checked="" type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 11, 08, 2024 |
| <input checked="" type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 11, 08, 2024 |

**Diagram of test setup**



### Test Conditions

Temperature: (21,8 ± 0,2) °C  
Relative Humidity: (45,9 ± 0,3) % R.H.

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

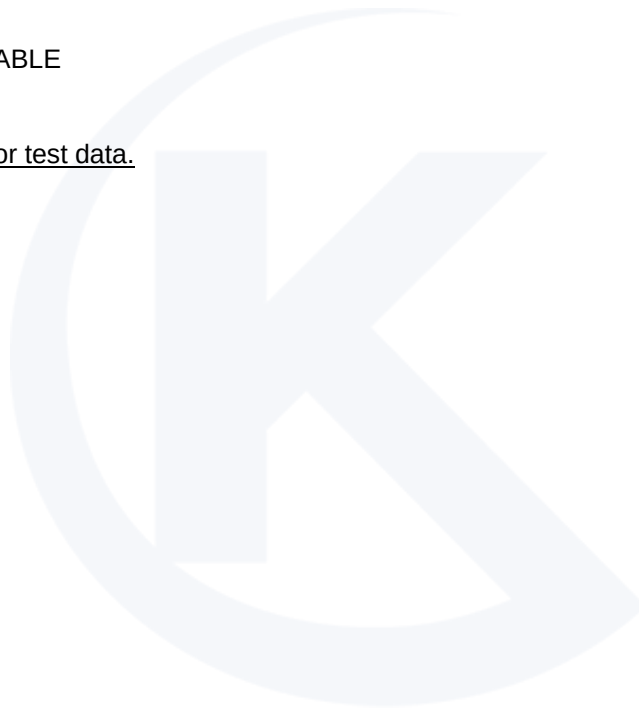
### Test Results

The requirements are:

- ☒ PASS
- ☐ NOT PASS
- ☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.





2.2 Radiated Electric Field Emissions(Below 1 GHz)

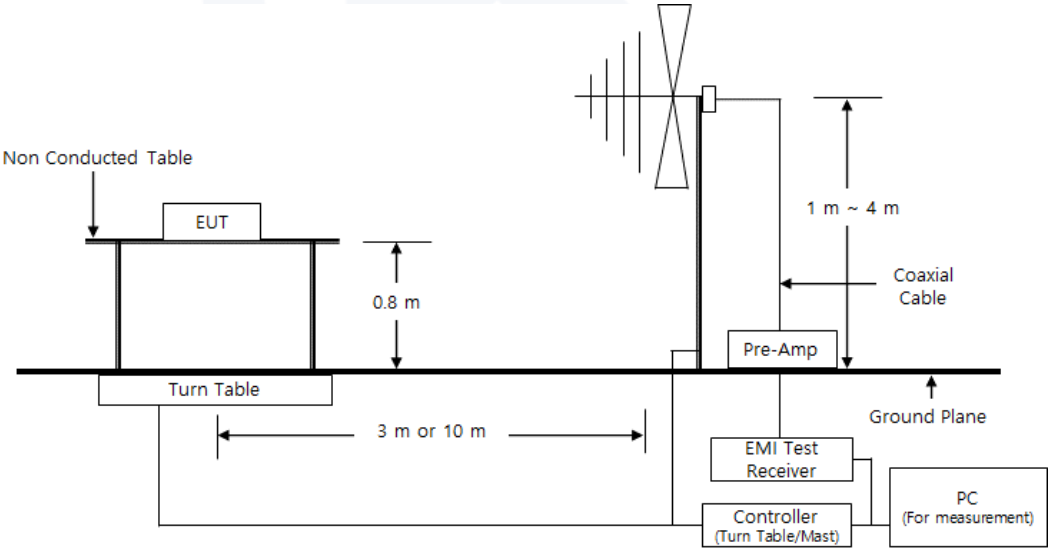
Test Date  
Feb. 04, 2024

Test Location  
☐ OPEN AREA TEST SITE #2      ☒ SEMI ANECHOIC CHAMBER #4(10m)

Test Equipment

| Used                                | Description              | Model Number | Manufacturer     | Serial Number | Cal. Due     |
|-------------------------------------|--------------------------|--------------|------------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W             | EP5/RE       | TOYO Corporation | 6.0.0         | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER        | ESU26        | R & S            | 100551        | 03, 21, 2024 |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 08, 2024 |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 715           | 11, 17, 2024 |
| <input checked="" type="checkbox"/> | ATTENUATOR               | 8491A        | HP               | 32173         | 03, 03, 2024 |

Diagram of test setup





### Test Conditions

Temperature:  $(22,4 \pm 0,2) ^\circ\text{C}$   
Relative Humidity:  $(46,1 \pm 0,5) \% \text{ R.H.}$

### Frequency Range of Measurement

30 MHz to 1 GHz

### Instrument Settings

IF Band Width: 120 kHz

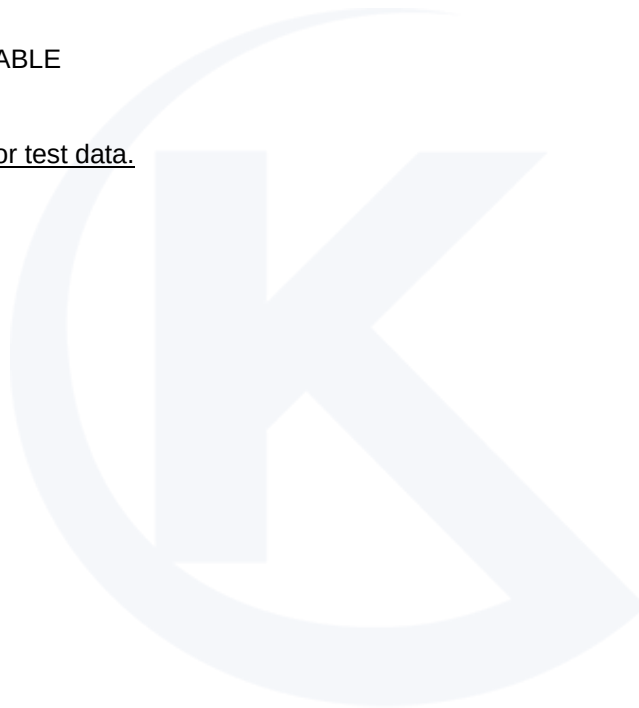
### Test Results

The requirements are:

- ☒ PASS
- ☐ NOT PASS
- ☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.





## 2.3 Radiated Electric Field Emissions(Above 1 GHz)

**Test Date**

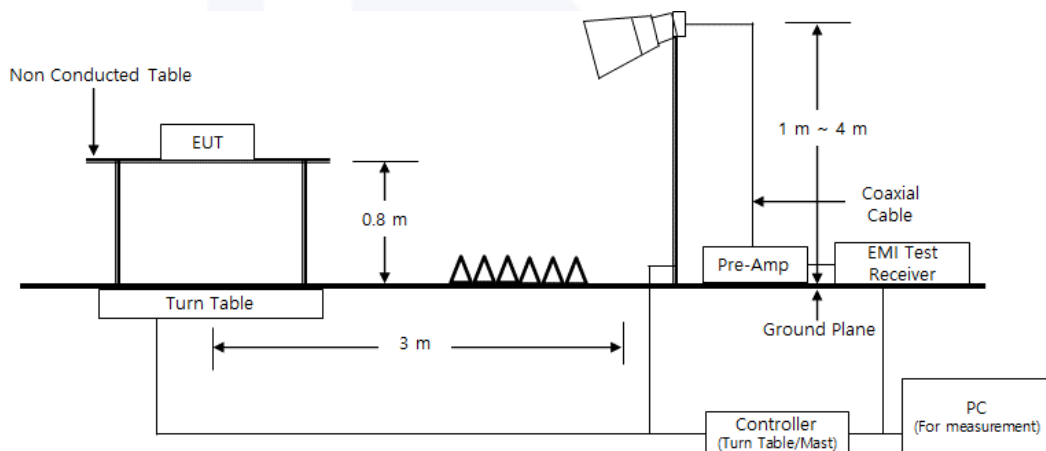
Feb. 04, 2024

**Test Location**

SEMI ANECHOIC CHAMBER #5

**Test Equipment**

| Used                                | Description       | Model Number | Manufacturer     | Serial Number | Cal. Due     |
|-------------------------------------|-------------------|--------------|------------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W      | ES10/RE      | TOYO Corporation | 2022.01.000   | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER | ESU26        | Rohde & Schwarz  | 100552        | 03, 21, 2024 |
| <input checked="" type="checkbox"/> | HORN ANTENNA      | BBHA 9120D   | SCHWARZBECK      | 9120D-1802    | 11, 03, 2024 |
| <input checked="" type="checkbox"/> | PREAMPLIFIER      | 8449B        | HP               | 3008A00538    | 05, 31, 2024 |
| <input checked="" type="checkbox"/> | ATTENUATOR        | 8491B        | HP               | 23094         | 03, 21, 2024 |

**Diagram of test setup**



### Test Conditions

Temperature: (22,7 ± 0,2) °C  
Relative Humidity: (46,3 ± 0,3) % R.H.

### Frequency Range of Measurement

1 GHz to 6 GHz

### Instrument Settings

IF Band Width: 1 MHz

### Test Results

The requirements are:

- ☒ PASS
- ☐ NOT PASS
- ☐ NOT APPLICABLE

### Remarks

- See Appendix A for test data.
- The Average of the test data is the cispr average result.





## APPENDIX A – TEST DATA

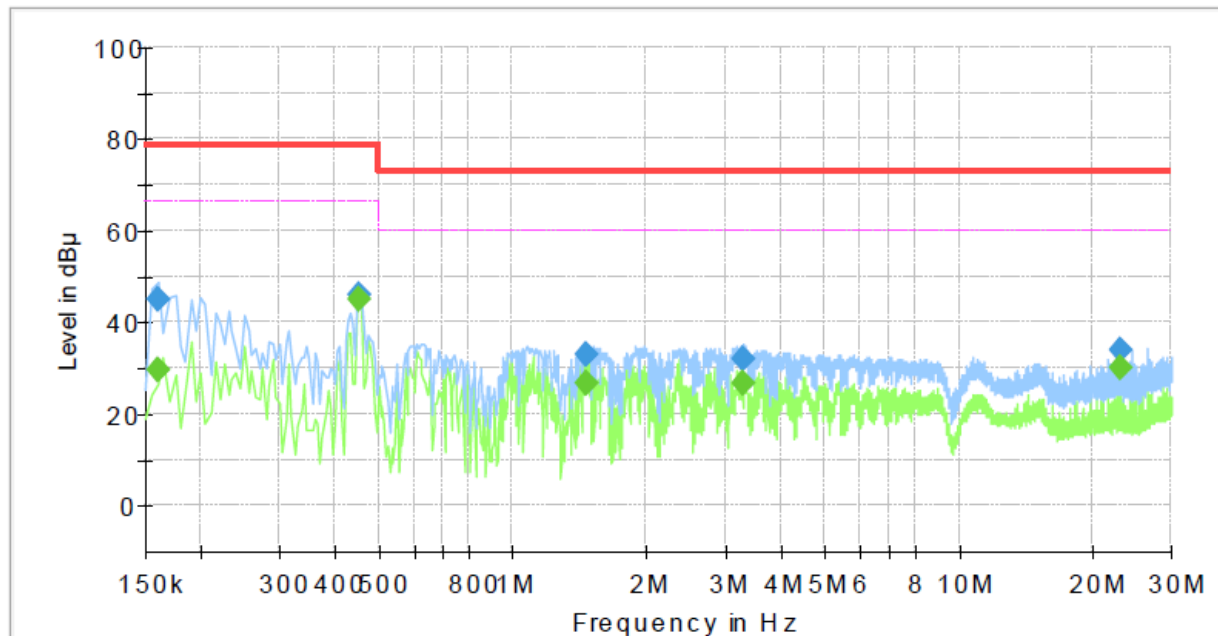
### Conducted Emissions at Mains Power Ports

■ DC 24 V Mode

HOT LINE

### Common Information

Test Description: Conducted Emission  
Model No.: SPA-M2000  
Phase: DC 24 V  
Mode: H  
Operator Name: KES



### Final Result

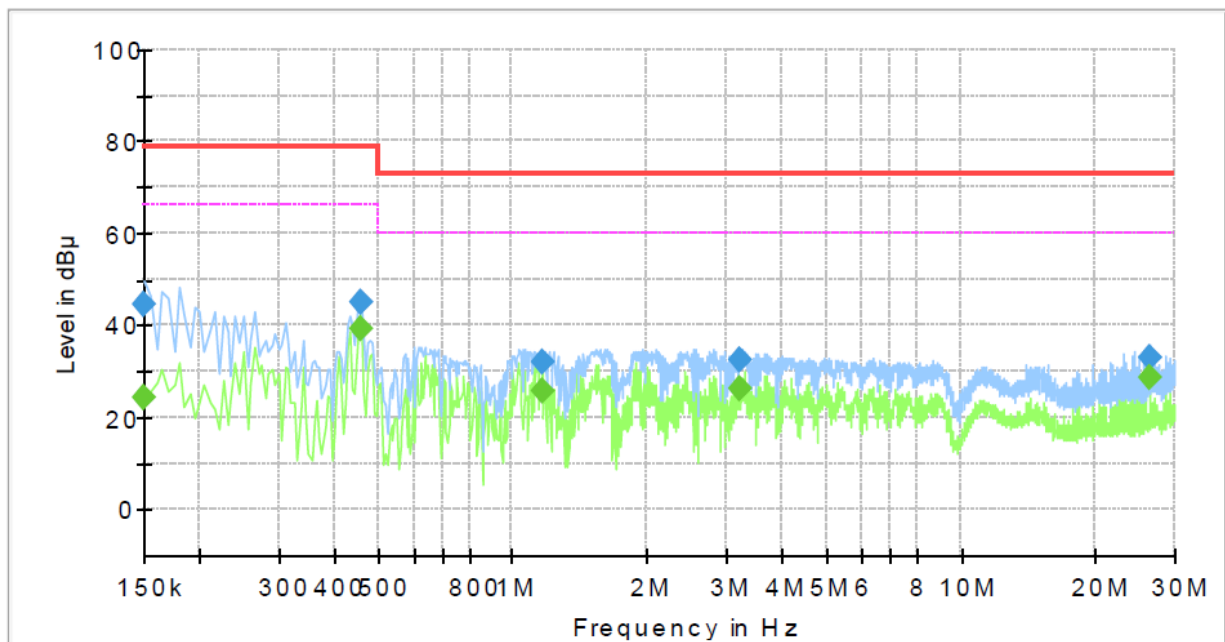
| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.160000        | ---              | 29.56           | 66.00        | 36.44       | 1000.0          | 9.000           | L1   | 19.4       |
| 0.160000        | 45.03            | ---             | 79.00        | 33.97       | 1000.0          | 9.000           | L1   | 19.4       |
| 0.455000        | ---              | 44.94           | 66.00        | 21.06       | 1000.0          | 9.000           | L1   | 19.5       |
| 0.455000        | 45.93            | ---             | 79.00        | 33.07       | 1000.0          | 9.000           | L1   | 19.5       |
| 1.470000        | ---              | 26.57           | 60.00        | 33.43       | 1000.0          | 9.000           | L1   | 19.5       |
| 1.470000        | 32.87            | ---             | 73.00        | 40.13       | 1000.0          | 9.000           | L1   | 19.5       |
| 3.285000        | ---              | 26.44           | 60.00        | 33.56       | 1000.0          | 9.000           | L1   | 19.6       |
| 3.285000        | 32.18            | ---             | 73.00        | 40.82       | 1000.0          | 9.000           | L1   | 19.6       |
| 23.130000       | ---              | 29.97           | 60.00        | 30.03       | 1000.0          | 9.000           | L1   | 20.3       |
| 23.130000       | 34.07            | ---             | 73.00        | 38.93       | 1000.0          | 9.000           | L1   | 20.3       |



## NEUTRAL LINE

**Common Information**

Test Description: Conducted Emission  
Model No.: SPA-M2000  
Phase: DC 24 V  
Mode: N  
Operator Name: KES

**Final Result**

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.150000        | ---              | 24.32           | 66.00        | 41.68       | 1000.0          | 9.000           | N    | 19.3       |
| 0.150000        | 44.63            | ---             | 79.00        | 34.37       | 1000.0          | 9.000           | N    | 19.3       |
| 0.460000        | ---              | 39.31           | 66.00        | 26.69       | 1000.0          | 9.000           | N    | 19.4       |
| 0.460000        | 44.80            | ---             | 79.00        | 34.20       | 1000.0          | 9.000           | N    | 19.4       |
| 1.160000        | ---              | 25.83           | 60.00        | 34.17       | 1000.0          | 9.000           | N    | 19.5       |
| 1.160000        | 32.05            | ---             | 73.00        | 40.95       | 1000.0          | 9.000           | N    | 19.5       |
| 3.205000        | ---              | 26.29           | 60.00        | 33.71       | 1000.0          | 9.000           | N    | 19.6       |
| 3.205000        | 32.29            | ---             | 73.00        | 40.71       | 1000.0          | 9.000           | N    | 19.6       |
| 26.610000       | ---              | 28.49           | 60.00        | 31.51       | 1000.0          | 9.000           | N    | 20.4       |
| 26.610000       | 32.78            | ---             | 73.00        | 40.22       | 1000.0          | 9.000           | N    | 20.4       |



■ PoE Mode

HOT LINE

## Common Information

Test Description:

Model No.:

Phase:

Mode:

Operator Name:

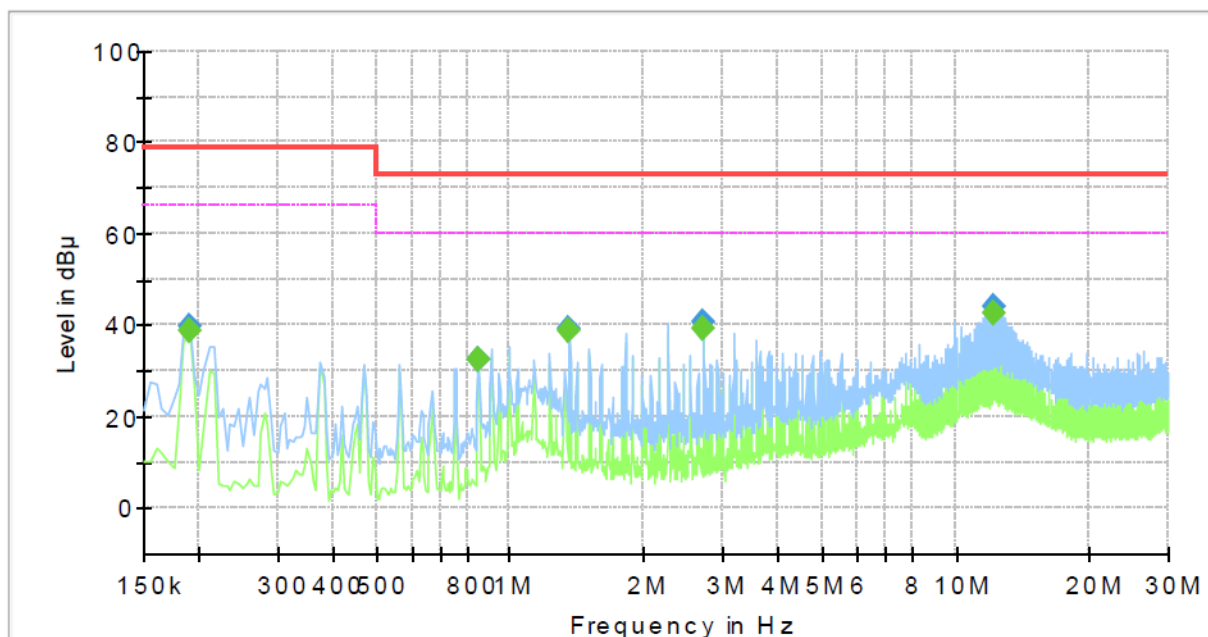
Conducted Emission

SPA-M2000

PoE

H

KES



## Final Result

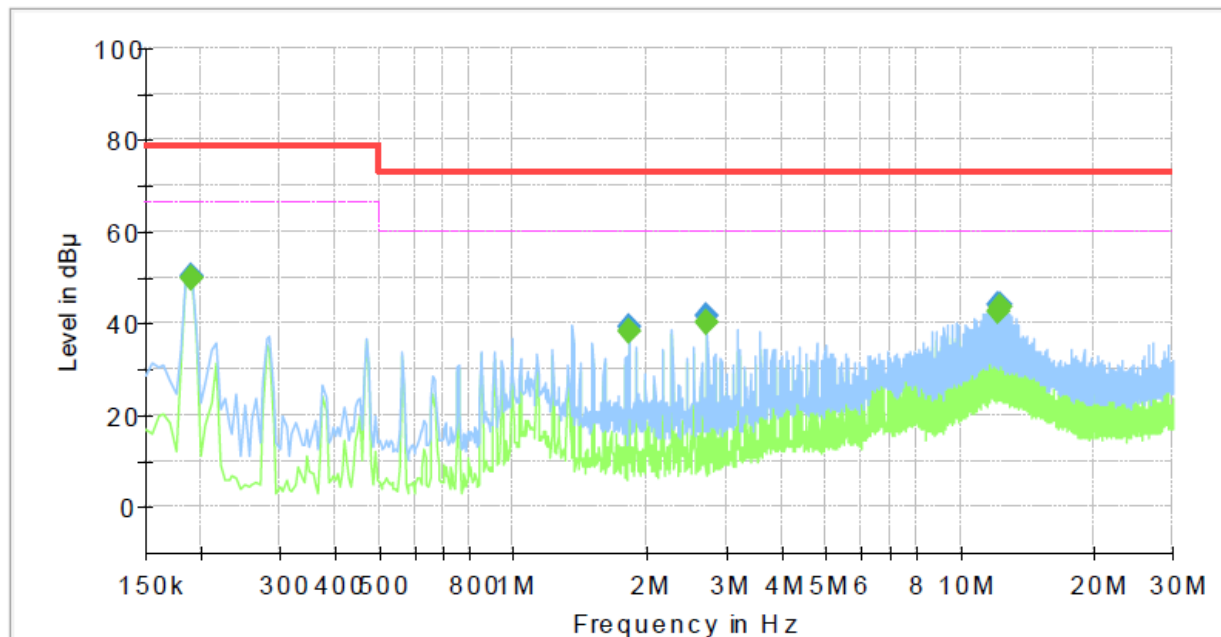
| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.190000        | ---              | 38.75           | 66.00        | 27.25       | 1000.0          | 9.000           | L1   | 19.4       |
| 0.190000        | 39.88            | ---             | 79.00        | 39.12       | 1000.0          | 9.000           | L1   | 19.4       |
| 0.845000        | ---              | 32.54           | 60.00        | 27.46       | 1000.0          | 9.000           | L1   | 19.5       |
| 0.845000        | 32.55            | ---             | 73.00        | 40.45       | 1000.0          | 9.000           | L1   | 19.5       |
| 1.360000        | ---              | 38.95           | 60.00        | 21.05       | 1000.0          | 9.000           | L1   | 19.5       |
| 1.360000        | 39.22            | ---             | 73.00        | 33.78       | 1000.0          | 9.000           | L1   | 19.5       |
| 2.720000        | ---              | 39.20           | 60.00        | 20.80       | 1000.0          | 9.000           | L1   | 19.6       |
| 2.720000        | 40.61            | ---             | 73.00        | 32.39       | 1000.0          | 9.000           | L1   | 19.6       |
| 12.135000       | ---              | 42.67           | 60.00        | 17.33       | 1000.0          | 9.000           | L1   | 20.0       |
| 12.135000       | 44.12            | ---             | 73.00        | 28.88       | 1000.0          | 9.000           | L1   | 20.0       |



## NEUTRAL LINE

**Common Information**

Test Description: Conducted Emission  
Model No.: SPA-M2000  
Phase: PoE  
Mode: N  
Operator Name: KES

**Final Result**

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.190000        | ---              | 50.05           | 66.00        | 15.95       | 1000.0          | 9.000           | N    | 19.4       |
| 0.190000        | 50.37            | ---             | 79.00        | 28.63       | 1000.0          | 9.000           | N    | 19.4       |
| 1.815000        | ---              | 38.20           | 60.00        | 21.80       | 1000.0          | 9.000           | N    | 19.6       |
| 1.815000        | 39.12            | ---             | 73.00        | 33.88       | 1000.0          | 9.000           | N    | 19.6       |
| 2.720000        | ---              | 40.01           | 60.00        | 19.99       | 1000.0          | 9.000           | N    | 19.6       |
| 2.720000        | 41.66            | ---             | 73.00        | 31.34       | 1000.0          | 9.000           | N    | 19.6       |
| 12.135000       | ---              | 42.73           | 60.00        | 17.27       | 1000.0          | 9.000           | N    | 20.0       |
| 12.135000       | 44.06            | ---             | 73.00        | 28.94       | 1000.0          | 9.000           | N    | 20.0       |
| 12.325000       | ---              | 43.39           | 60.00        | 16.61       | 1000.0          | 9.000           | N    | 20.0       |
| 12.325000       | 44.12            | ---             | 73.00        | 28.88       | 1000.0          | 9.000           | N    | 20.0       |

## ◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

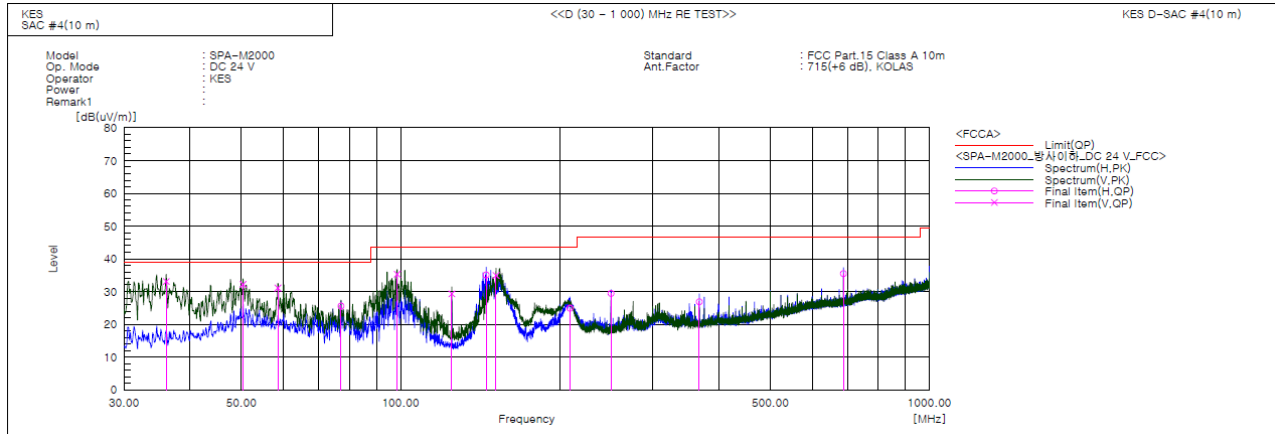
Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

**Radiated Electric Field Emissions(Below 1 GHz)**

- 47 CFR Part 15, Subpart B

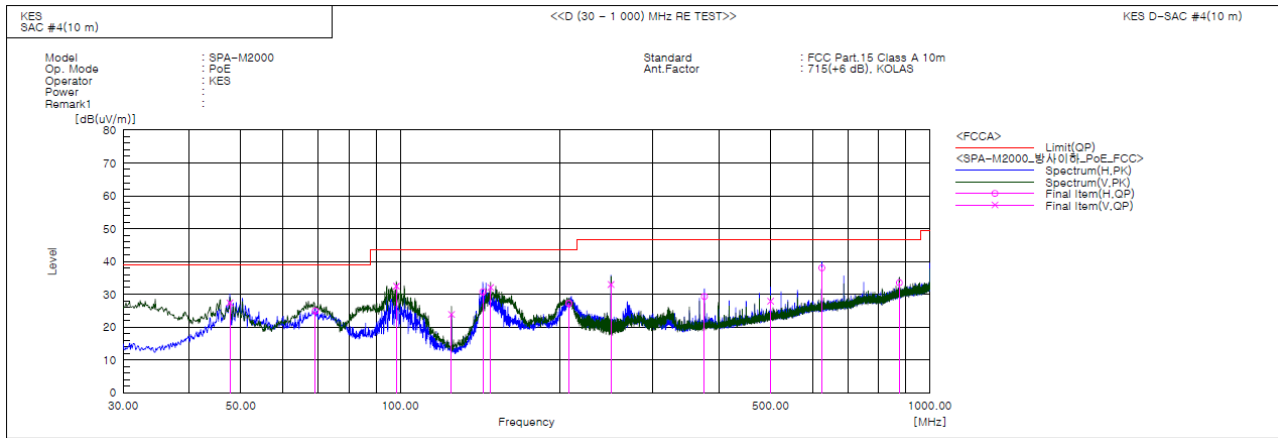
■ DC 24 V Mode

**Final Result**

| No. | Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>QP<br>[dB(uV/m)] | Limit<br>QP<br>[dB(uV/m)] | Margin<br>QP<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|------------------|----------------------------|---------------------------|----------------------|----------------|----------------|--------|
| 1   | 36.063             | V   | 57.6                      | -24.5            | 33.1                       | 39.0                      | 5.9                  | 106.0          | 92.0           |        |
| 2   | 50.370             | V   | 53.3                      | -21.1            | 32.2                       | 39.0                      | 6.8                  | 198.0          | 262.0          |        |
| 3   | 58.615             | V   | 53.0                      | -21.9            | 31.1                       | 39.0                      | 7.9                  | 100.0          | 255.0          |        |
| 4   | 77.166             | H   | 53.0                      | -27.4            | 25.6                       | 39.0                      | 13.4                 | 400.0          | 187.0          |        |
| 5   | 98.506             | V   | 57.7                      | -22.4            | 35.3                       | 43.5                      | 8.2                  | 100.0          | 159.0          |        |
| 6   | 124.939            | V   | 53.9                      | -24.6            | 29.3                       | 43.5                      | 14.2                 | 100.0          | 240.0          |        |
| 7   | 145.188            | H   | 60.3                      | -25.2            | 35.1                       | 43.5                      | 8.4                  | 399.0          | 179.0          |        |
| 8   | 151.493            | V   | 60.0                      | -25.1            | 34.9                       | 43.5                      | 8.6                  | 113.0          | 229.0          |        |
| 9   | 208.965            | H   | 45.0                      | -20.1            | 24.9                       | 43.5                      | 18.6                 | 400.0          | 157.0          |        |
| 10  | 249.948            | H   | 48.2                      | -18.8            | 29.4                       | 46.5                      | 17.1                 | 400.0          | 237.0          |        |
| 11  | 367.196            | H   | 41.4                      | -14.5            | 26.9                       | 46.5                      | 19.6                 | 304.0          | 353.0          |        |
| 12  | 687.539            | H   | 42.3                      | -6.8             | 35.5                       | 46.5                      | 11.0                 | 309.0          | 250.0          |        |



## ■ PoE Mode



## Final Result

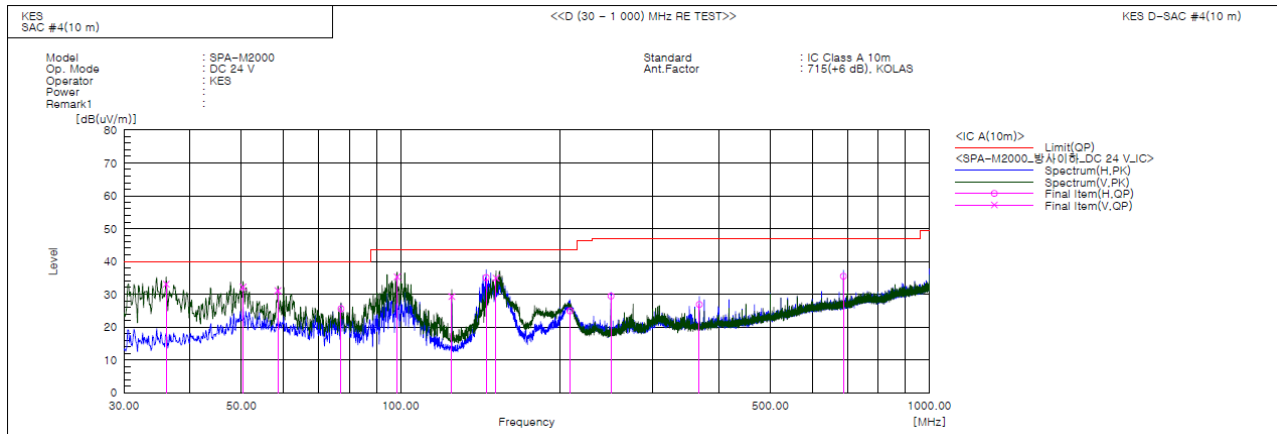
| No. | Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>QP<br>[dB(uV/m)] | Limit<br>QP<br>[dB(uV/m)] | Margin<br>QP<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|------------------|----------------------------|---------------------------|----------------------|----------------|----------------|--------|
| 1   | 47.703             | V   | 48.6                      | -21.2            | 27.4                       | 39.0                      | 11.6                 | 100.0          | 304.0          |        |
| 2   | 69.164             | H   | 49.6                      | -24.7            | 24.9                       | 39.0                      | 14.1                 | 352.0          | 44.0           |        |
| 3   | 98.385             | V   | 54.9                      | -22.4            | 32.5                       | 43.5                      | 11.0                 | 105.0          | 160.0          |        |
| 4   | 124.939            | V   | 48.5                      | -24.6            | 23.9                       | 43.5                      | 19.6                 | 100.0          | 338.0          |        |
| 5   | 143.248            | H   | 55.9                      | -25.2            | 30.7                       | 43.5                      | 12.8                 | 400.0          | 172.0          |        |
| 6   | 148.098            | V   | 57.3                      | -25.2            | 32.1                       | 43.5                      | 11.4                 | 100.0          | 127.0          |        |
| 7   | 208.116            | H   | 47.4                      | -20.2            | 27.2                       | 43.5                      | 16.3                 | 400.0          | 330.0          |        |
| 8   | 249.948            | V   | 51.8                      | -18.8            | 33.0                       | 46.5                      | 13.5                 | 196.0          | 30.0           |        |
| 9   | 375.078            | H   | 43.7                      | -14.4            | 29.3                       | 46.5                      | 17.2                 | 308.0          | 190.0          |        |
| 10  | 500.086            | V   | 39.0                      | -11.1            | 27.9                       | 46.5                      | 18.6                 | 117.0          | 180.0          |        |
| 11  | 625.095            | H   | 45.6                      | -7.6             | 38.0                       | 46.5                      | 8.5                  | 391.0          | 210.0          |        |
| 12  | 875.113            | H   | 36.9                      | -3.4             | 33.5                       | 46.5                      | 13.0                 | 306.0          | 206.0          |        |



Report No. : KES-EM240343

- IC Regulation ICES-003 Issue 7

■ DC 24 V Mode



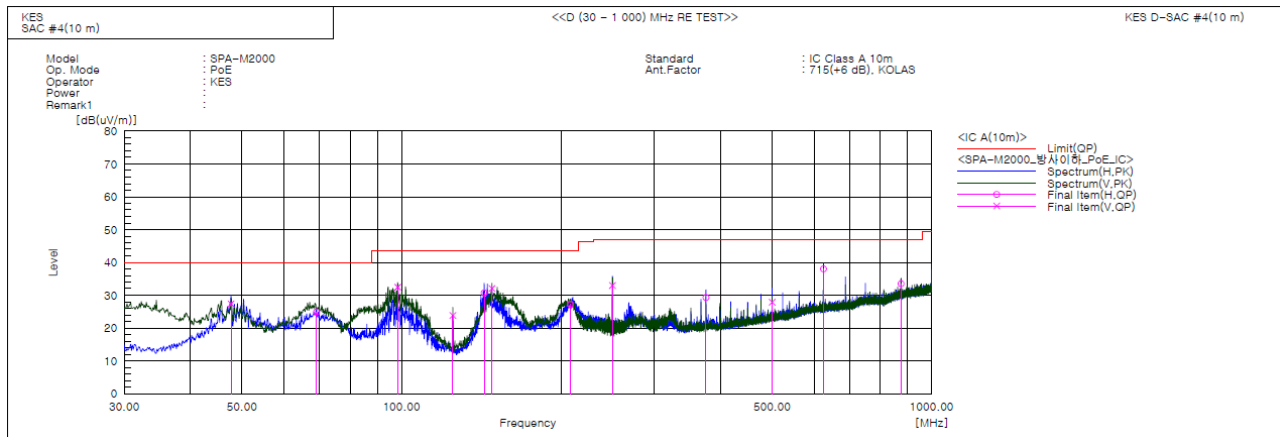
## Final Result

| No. | Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>QP<br>[dB(uV/m)] | Limit<br>QP<br>[dB(uV/m)] | Margin<br>QP<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|------------------|----------------------------|---------------------------|----------------------|----------------|----------------|--------|
| 1   | 36.063             | V   | 57.6                      | -24.5            | 33.1                       | 40.0                      | 6.9                  | 106.0          | 92.0           |        |
| 2   | 50.370             | V   | 53.3                      | -21.1            | 32.2                       | 40.0                      | 7.8                  | 198.0          | 262.0          |        |
| 3   | 58.615             | V   | 53.0                      | -21.9            | 31.1                       | 40.0                      | 8.9                  | 100.0          | 255.0          |        |
| 4   | 77.166             | H   | 53.0                      | -27.4            | 25.6                       | 40.0                      | 14.4                 | 400.0          | 187.0          |        |
| 5   | 98.506             | V   | 57.7                      | -22.4            | 35.3                       | 43.5                      | 8.2                  | 100.0          | 159.0          |        |
| 6   | 124.939            | V   | 53.9                      | -24.6            | 29.3                       | 43.5                      | 14.2                 | 100.0          | 240.0          |        |
| 7   | 145.188            | H   | 60.3                      | -25.2            | 35.1                       | 43.5                      | 8.4                  | 399.0          | 179.0          |        |
| 8   | 151.493            | V   | 60.0                      | -25.1            | 34.9                       | 43.5                      | 8.6                  | 113.0          | 229.0          |        |
| 9   | 208.965            | H   | 45.0                      | -20.1            | 24.9                       | 43.5                      | 18.6                 | 400.0          | 157.0          |        |
| 10  | 249.948            | H   | 48.2                      | -18.8            | 29.4                       | 47.0                      | 17.6                 | 400.0          | 237.0          |        |
| 11  | 367.196            | H   | 41.4                      | -14.5            | 26.9                       | 47.0                      | 20.1                 | 304.0          | 353.0          |        |
| 12  | 687.539            | H   | 42.3                      | -6.8             | 35.5                       | 47.0                      | 11.5                 | 309.0          | 250.0          |        |





## ■ PoE Mode



## Final Result

| No. | Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dB(μV)] | c.f<br>[dB(1/m)] | Result<br>QP<br>[dB(μV/m)] | Limit<br>QP<br>[dB(μV/m)] | Margin<br>QP<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|------------------|----------------------------|---------------------------|----------------------|----------------|----------------|--------|
| 1   | 47.703             | V   | 48.6                      | -21.2            | 27.4                       | 40.0                      | 12.6                 | 100.0          | 304.0          |        |
| 2   | 69.164             | H   | 49.6                      | -24.7            | 24.9                       | 40.0                      | 15.1                 | 352.0          | 44.0           |        |
| 3   | 98.385             | V   | 54.9                      | -22.4            | 32.5                       | 43.5                      | 11.0                 | 105.0          | 160.0          |        |
| 4   | 124.939            | V   | 48.5                      | -24.6            | 23.9                       | 43.5                      | 19.6                 | 100.0          | 338.0          |        |
| 5   | 143.248            | H   | 55.9                      | -25.2            | 30.7                       | 43.5                      | 12.8                 | 400.0          | 172.0          |        |
| 6   | 148.098            | V   | 57.3                      | -25.2            | 32.1                       | 43.5                      | 11.4                 | 100.0          | 127.0          |        |
| 7   | 208.116            | H   | 47.4                      | -20.2            | 27.2                       | 43.5                      | 16.3                 | 400.0          | 330.0          |        |
| 8   | 249.948            | V   | 51.8                      | -18.8            | 33.0                       | 47.0                      | 14.0                 | 196.0          | 30.0           |        |
| 9   | 375.078            | H   | 43.7                      | -14.4            | 29.3                       | 47.0                      | 17.7                 | 308.0          | 190.0          |        |
| 10  | 500.086            | V   | 39.0                      | -11.1            | 27.9                       | 47.0                      | 19.1                 | 117.0          | 180.0          |        |
| 11  | 625.095            | H   | 45.6                      | -7.6             | 38.0                       | 47.0                      | 9.0                  | 391.0          | 210.0          |        |
| 12  | 875.113            | H   | 36.9                      | -3.4             | 33.5                       | 47.0                      | 13.5                 | 306.0          | 206.0          |        |

## ◆ Calculation

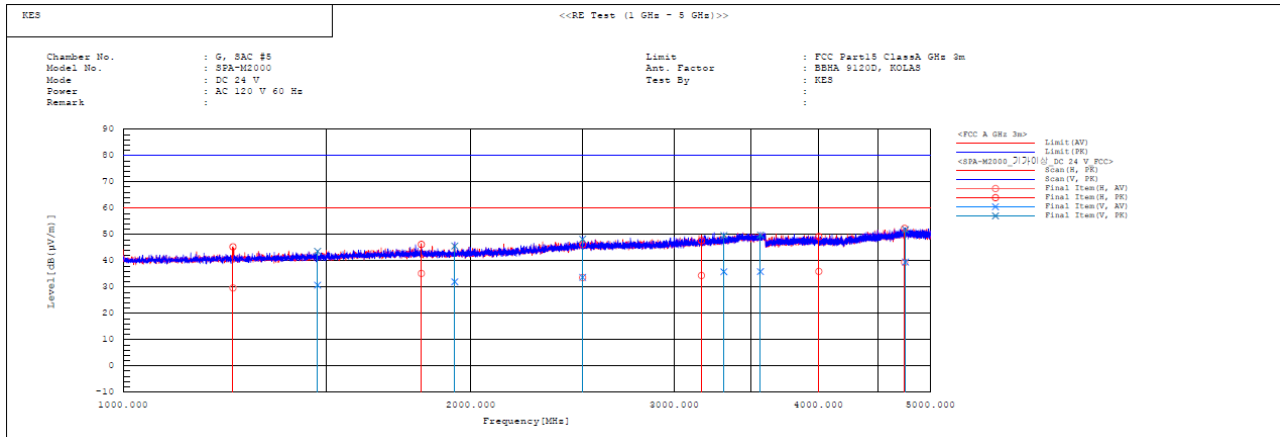
Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

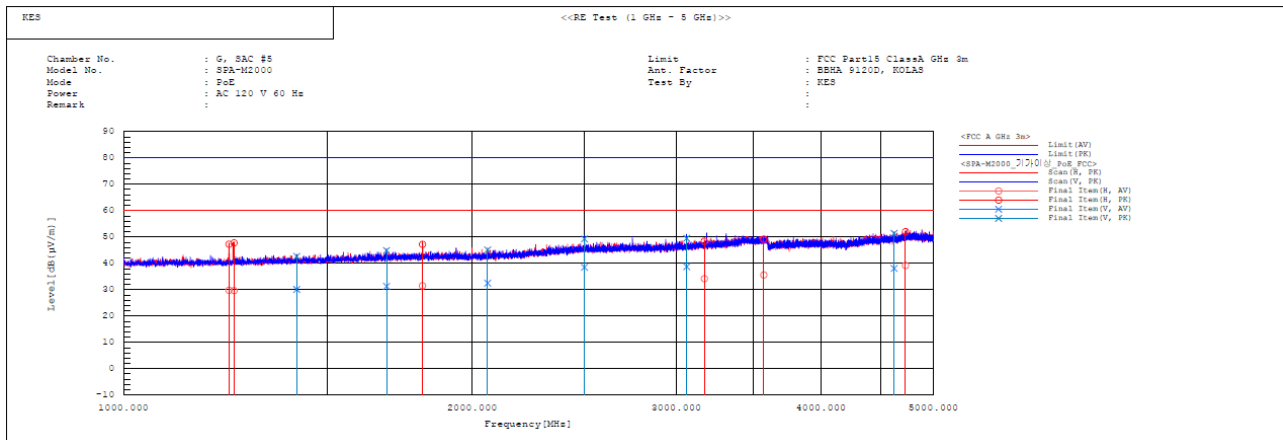


**Radiated Electric Field Emissions(Above 1 GHz)****DC 24 V Mode****Final Result**

| No. | Frequency [MHz] | Pol | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c.f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit AV [dB(μV/m)] | Limit PK [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [deg] | Remark |
|-----|-----------------|-----|---------------------|---------------------|---------------|----------------------|----------------------|---------------------|---------------------|----------------|----------------|-------------|-------------|--------|
| 1   | 1245.185        | H   | 30.4                | 46.0                | -0.7          | 29.7                 | 45.3                 | 60.0                | 80.0                | 30.3           | 34.7           | 400.0       | 254.8       |        |
| 2   | 1474.109        | V   | 30.3                | 43.2                | 0.4           | 30.7                 | 43.6                 | 60.0                | 80.0                | 29.3           | 36.4           | 100.0       | 112.0       |        |
| 3   | 1812.306        | H   | 33.3                | 44.3                | 1.9           | 35.2                 | 46.2                 | 60.0                | 80.0                | 24.8           | 33.8           | 400.0       | 0.6         |        |
| 4   | 1937.285        | V   | 29.7                | 43.3                | 2.3           | 32.0                 | 45.6                 | 60.0                | 80.0                | 28.0           | 34.4           | 103.0       | 27.7        |        |
| 5   | 2499.697        | H   | 29.0                | 41.6                | 4.6           | 33.6                 | 46.2                 | 60.0                | 80.0                | 26.4           | 33.8           | 396.0       | 95.2        |        |
| 6   | 2500.085        | V   | 29.1                | 43.6                | 4.6           | 33.7                 | 48.2                 | 60.0                | 80.0                | 26.3           | 31.8           | 100.0       | 150.1       |        |
| 7   | 3168.102        | H   | 27.9                | 41.2                | 6.5           | 34.4                 | 47.7                 | 60.0                | 80.0                | 25.6           | 32.3           | 390.0       | 0.6         |        |
| 8   | 3312.403        | V   | 29.1                | 42.9                | 6.7           | 35.8                 | 49.6                 | 60.0                | 80.0                | 24.2           | 30.4           | 189.0       | 13.0        |        |
| 9   | 3562.896        | V   | 28.9                | 42.8                | 7.0           | 35.9                 | 49.8                 | 60.0                | 80.0                | 24.1           | 30.2           | 100.0       | 257.1       |        |
| 10  | 4002.775        | H   | 27.7                | 40.9                | 8.3           | 36.0                 | 49.2                 | 60.0                | 80.0                | 24.0           | 30.8           | 302.0       | 167.6       |        |
| 11  | 4748.899        | H   | 28.1                | 41.0                | 11.3          | 39.4                 | 52.3                 | 60.0                | 80.0                | 20.6           | 27.7           | 400.0       | 35.4        |        |
| 12  | 4756.465        | V   | 28.2                | 40.5                | 11.3          | 39.5                 | 51.8                 | 60.0                | 80.0                | 20.5           | 28.2           | 199.0       | 61.4        |        |



## ■ PoE Mode



## Final Result

| No. | Frequency [MHz] | Pol | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c.f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit AV [dB(μV/m)] | Limit PK [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [deg] | Remark |
|-----|-----------------|-----|---------------------|---------------------|---------------|----------------------|----------------------|---------------------|---------------------|----------------|----------------|-------------|-------------|--------|
| 1   | 1233.650        | H   | 30.5                | 48.0                | -0.7          | 29.8                 | 47.3                 | 60.0                | 80.0                | 30.2           | 32.7           | 305.0       | 294.1       |        |
| 2   | 1246.058        | H   | 30.4                | 48.5                | -0.7          | 29.7                 | 47.8                 | 60.0                | 80.0                | 30.3           | 32.2           | 400.0       | 294.1       |        |
| 3   | 1411.675        | V   | 29.9                | 42.4                | 0.2           | 30.1                 | 42.6                 | 60.0                | 80.0                | 29.9           | 37.4           | 100.0       | 37.5        |        |
| 4   | 1686.857        | V   | 29.9                | 43.5                | 1.4           | 31.3                 | 44.9                 | 60.0                | 80.0                | 28.7           | 35.1           | 105.0       | 133.5       |        |
| 5   | 1812.201        | H   | 29.6                | 45.3                | 1.9           | 31.5                 | 47.2                 | 60.0                | 80.0                | 28.5           | 32.8           | 400.0       | 296.6       |        |
| 6   | 2062.430        | V   | 29.7                | 42.3                | 2.8           | 32.5                 | 45.1                 | 60.0                | 80.0                | 27.5           | 34.9           | 108.0       | 312.8       |        |
| 7   | 2500.360        | V   | 33.9                | 44.7                | 4.6           | 38.5                 | 49.3                 | 60.0                | 80.0                | 21.5           | 30.7           | 198.0       | 182.9       |        |
| 8   | 3062.663        | V   | 32.4                | 43.2                | 6.3           | 38.7                 | 49.5                 | 60.0                | 80.0                | 21.3           | 30.5           | 100.0       | 166.8       |        |
| 9   | 3172.482        | H   | 27.7                | 41.9                | 6.5           | 34.2                 | 48.4                 | 60.0                | 80.0                | 25.8           | 31.6           | 390.0       | 113.1       |        |
| 10  | 3570.250        | H   | 28.5                | 42.1                | 7.1           | 35.6                 | 49.2                 | 60.0                | 80.0                | 24.4           | 30.8           | 358.0       | 166.7       |        |
| 11  | 4625.795        | V   | 27.5                | 40.8                | 10.6          | 38.1                 | 51.4                 | 60.0                | 80.0                | 21.9           | 28.6           | 109.0       | 61.5        |        |
| 12  | 4730.450        | H   | 28.0                | 40.8                | 11.2          | 39.2                 | 52.0                 | 60.0                | 80.0                | 20.8           | 28.0           | 301.0       | 45.8        |        |

## ◆ Calculation

Result(PK/CAV) [dB(μV/m)] = (Reading(PK/CAV)[dB(μV)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/m)]

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value



## Test Setup Photos and Configuration

### Conducted Emissions at Mains Power Ports

■ DC 24 V Mode





■ PoE Mode

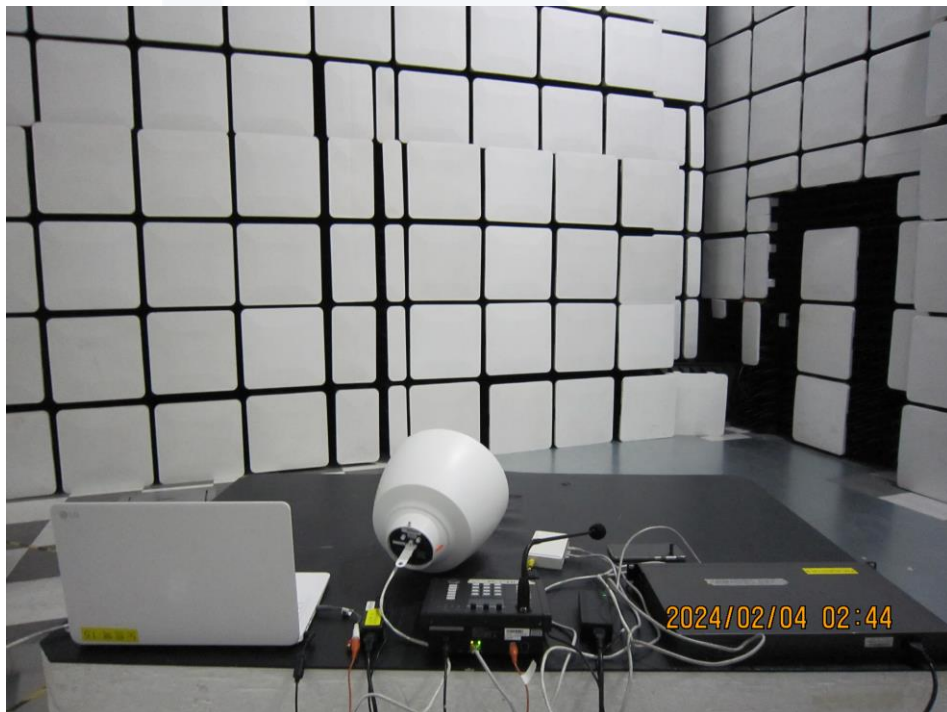
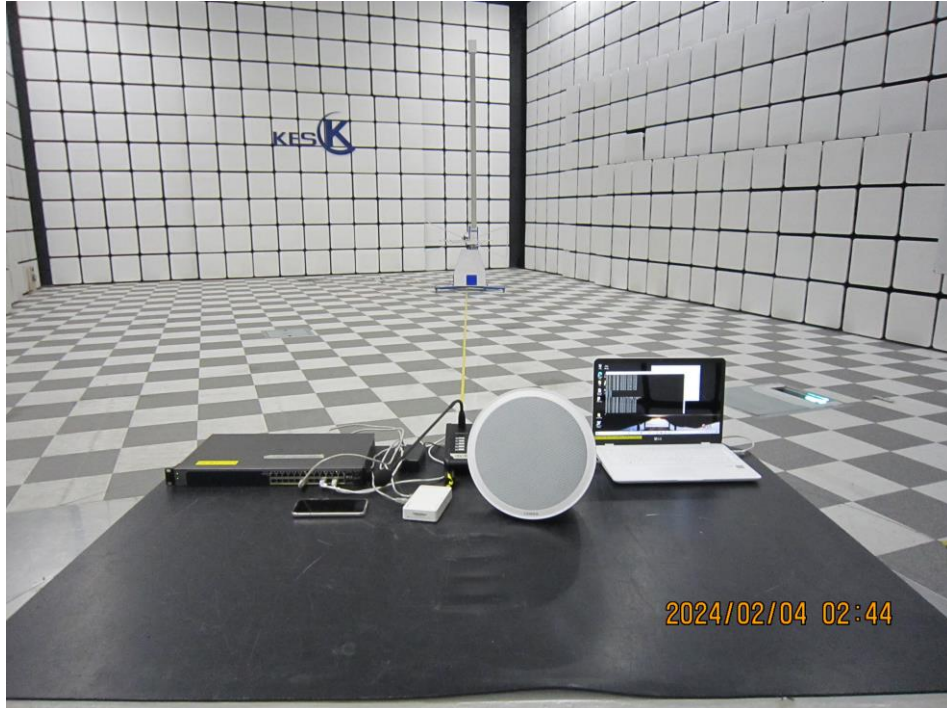






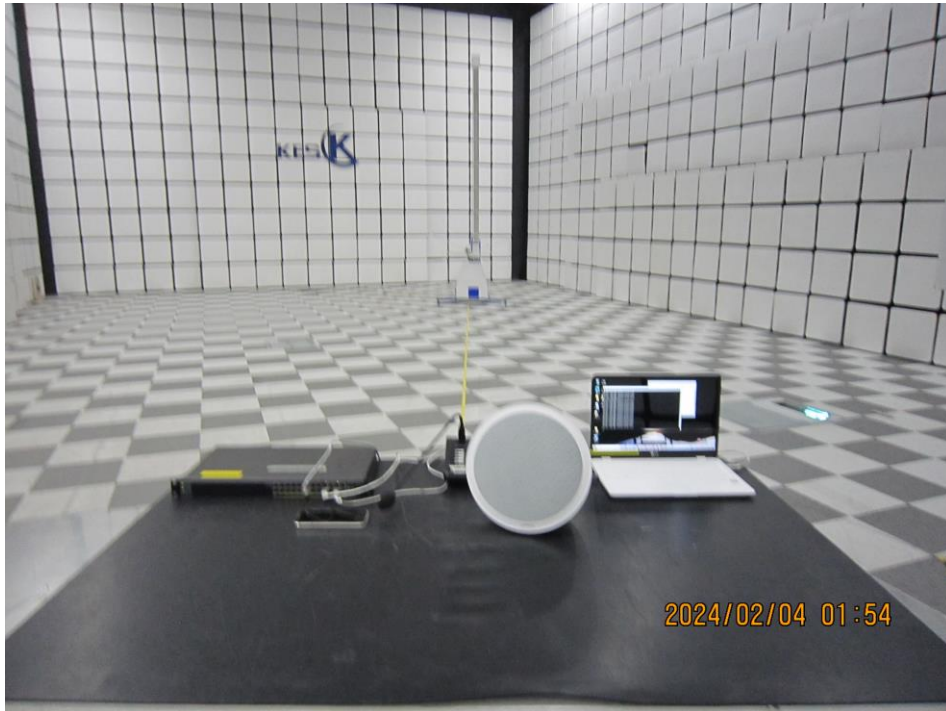
## Radiated Electric Field Emissions(Below 1 GHz)

■ DC 24 V Mode





■ PoE Mode





## Radiated Electric Field Emissions(Above 1 GHz)

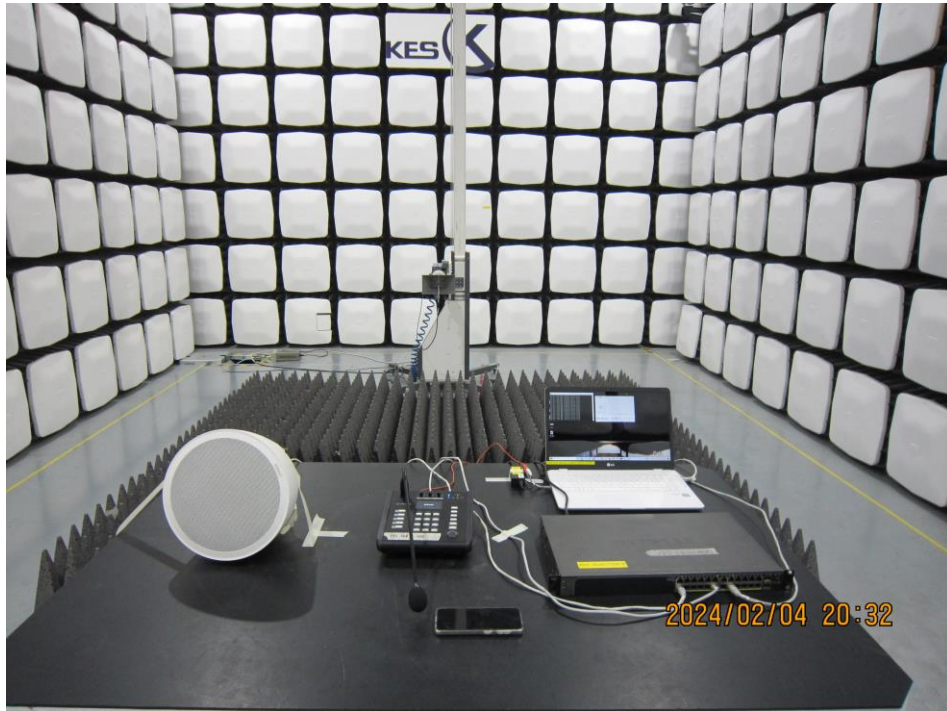
■ DC 24 V Mode







■ PoE Mode







## EUT External Photographs

(Top)



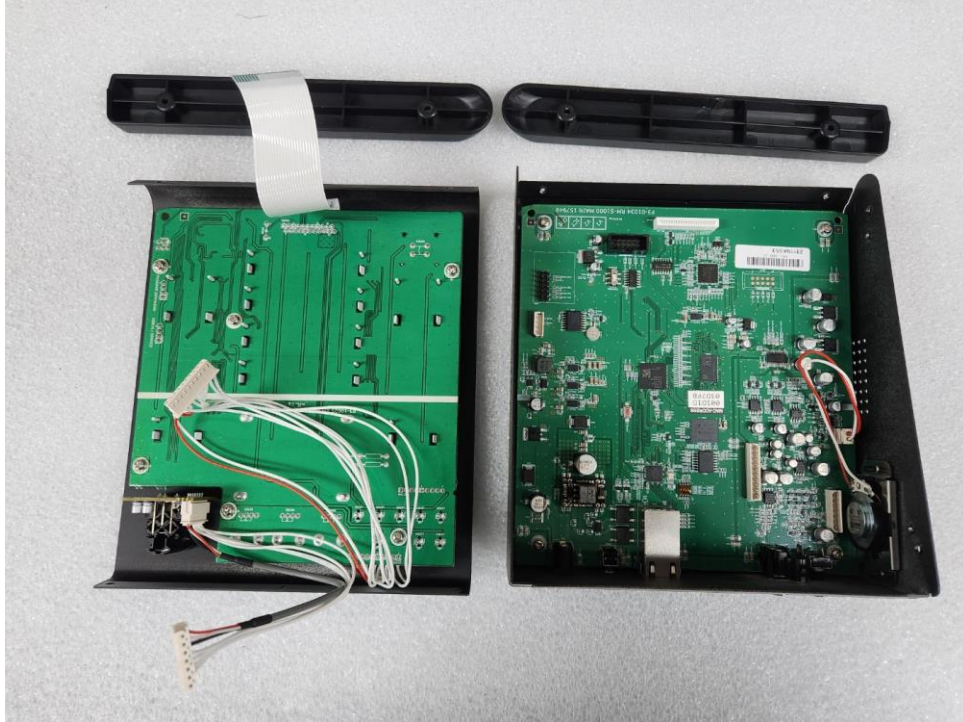
(Bottom)





## EUT Internal Photographs

(Internal View)



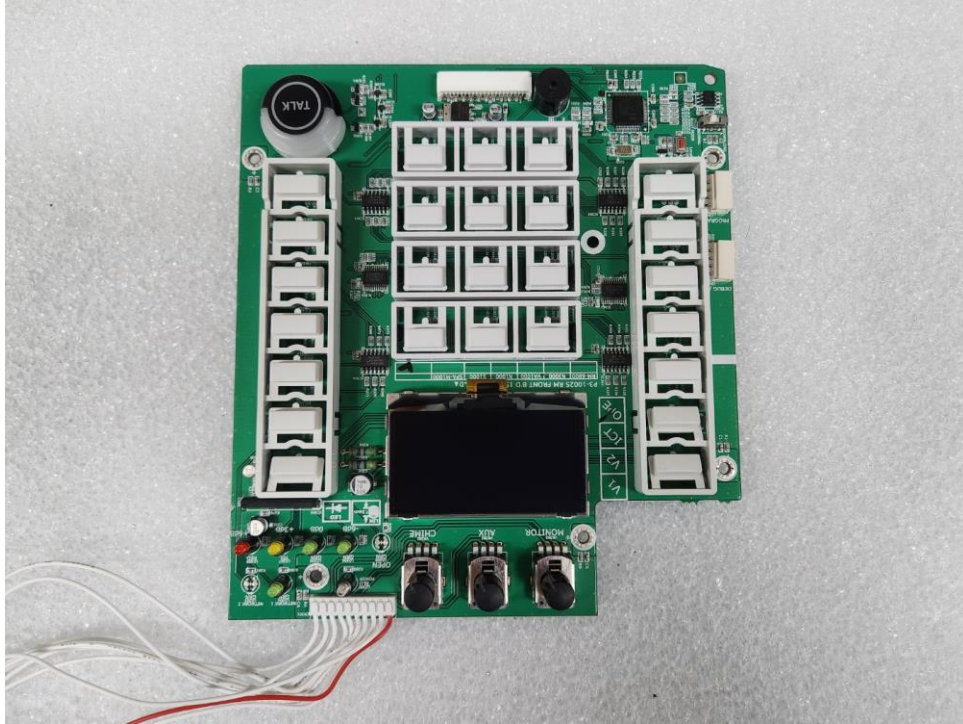




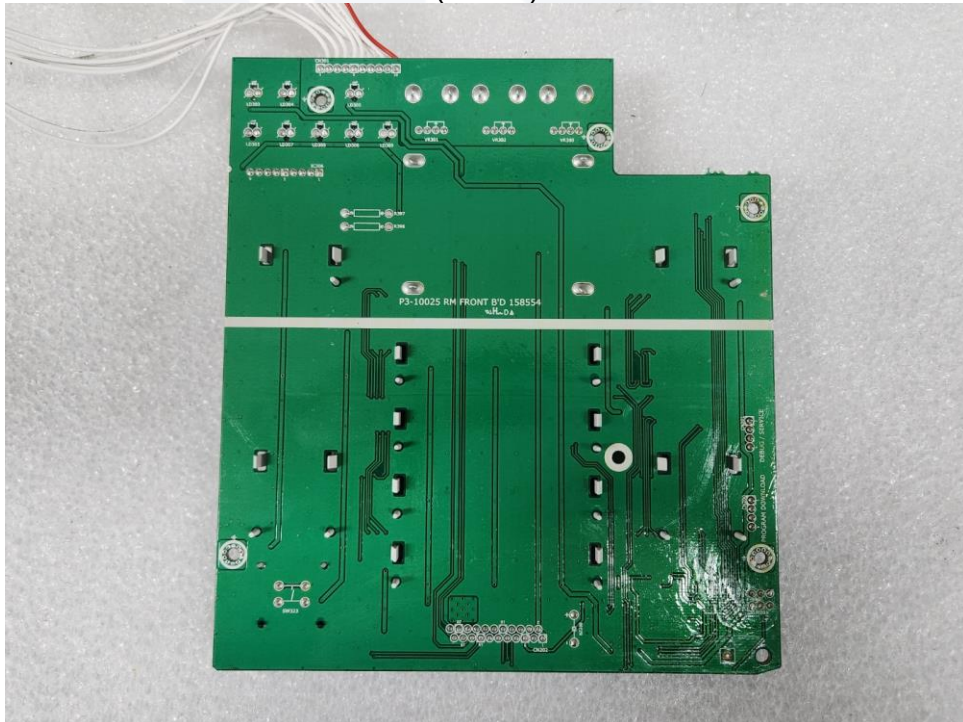


## EUT Internal View – Board 2

(Top)



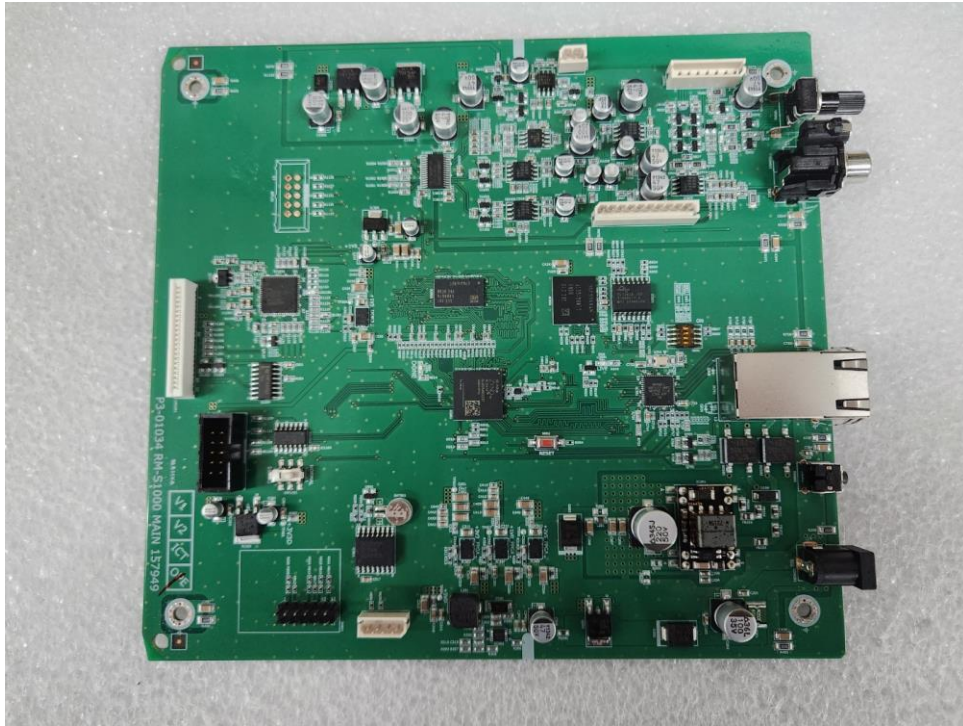
(Bottom)



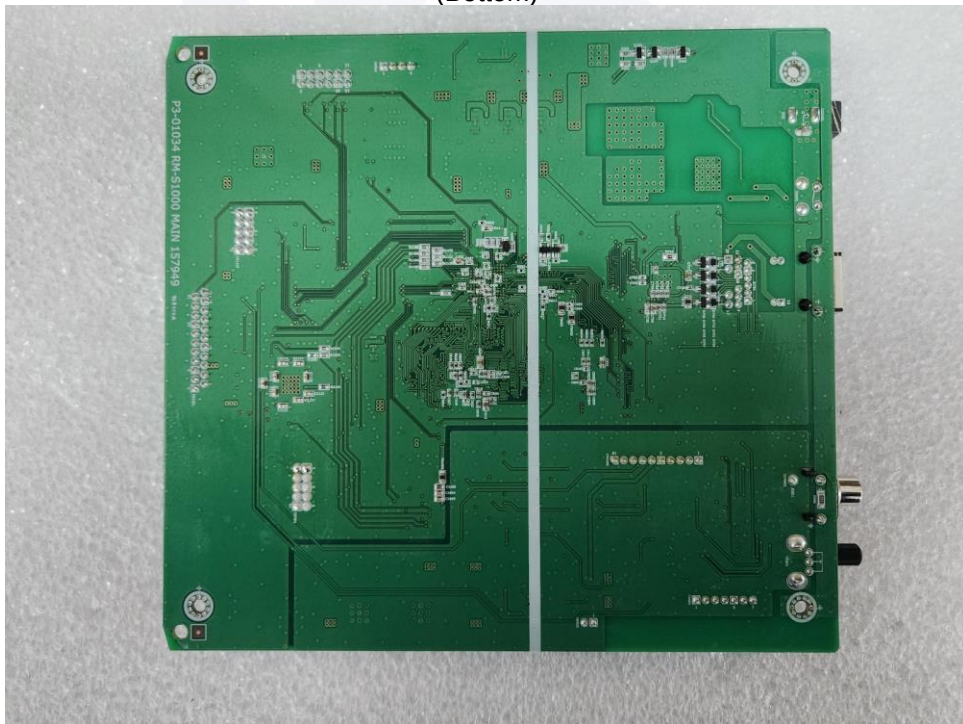


### EUT Internal View – Board 3

(Top)



(Bottom)





### Label Photographs

#### FCC Label



SIP MIC

SPA-M2000

#### IC Label

### CAN ICES-003(A) / NMB-003(A)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:  
(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.