

# EMC TEST REPORT

|   |                             |  |
|---|-----------------------------|--|
| <b>KOSTEC CO., Ltd.</b><br>28(175-20, Annyeong-dong) 406-gil sejaro,<br>Hwaseong-si, Gyeonggi-do, Korea<br>Tel:031-222-4251, Fax:031-222-4252 | Report No. : KST-CEE-220031 |  <b>KOSTEC Co., Ltd.</b><br><a href="http://www.kostec.org">http://www.kostec.org</a> |
|---|-----------------------------|--|

**1. Applicant**

- Name : KG AUTO Co.,Ltd.
- Address : 45, Sojeongsandan 4-ro, Sojeong-myeon, Sejong-si, Republic of Korea

**2. Test Item**

- Product Name: Sign Tower(Indicating Tower)
- Model Name: KG-SFB-V2-5L

**3. Manufacturer**

- Name : KG AUTO Co.,Ltd.
- Address : 45, Sojeongsandan 4-ro, Sojeong-myeon, Sejong-si, Republic of Korea

**4. Date of Test :** Jul. 07, 2022 to Jul. 09, 2022

**5. Test Method Used :**

EN IEC 61000-6-4:2019  
 Electromagnetic compatibility (EMC)-Part 6-4:Generic standards -Emissionstandard for industrial environments  
 EN IEC 61000-6-2:2019  
 Electromagnetic compatibility (EMC)-Part 6-2:Generic standards - Immunityfor industrial environments  
 EN 61000-3-3 : 2013/A2:2021  
 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations  
 And flicker in public low-voltage supply systems, for equipment with rated current < = 16 A per phase  
 and not subject to conditional connection

**6. Test Result :** Pass

**7. Note:** None

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.  
 This test report is not related to KOLAS accreditation.

|             |  |   |
|-------------|--|---|
| Affirmation | Tested by<br>Name : Eun-Su, Choi (Signature) | Technical Manager<br>Name : Chang-Ho, Lee (Signature) |
|-------------|--|---|

2022 . 07 . 13 .

**KOSTEC Co., Ltd.**

## Revision History of Test Report

| Rev. | Revisions     | Effect page | Reviewed      | Date         |
|------|---------------|-------------|---------------|--------------|
| -    | Initial issue | All         | Chang-Ho, Lee | Jul. 13 2022 |

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## 1. General Information

### 1.1 Information of EUT

|                         |                              |
|-------------------------|------------------------------|
| Product Name            | Sign Tower(Indicating Tower) |
| Model Name              | KG-SFB-V2-5L                 |
| Serial No.              | None                         |
| Type of Sample Tested   | Pre-production               |
| Supplied Power for Test | AC 230 V / 50 Hz             |
| Port                    | AC In                        |
| Ground                  | Without-ground               |

**This information was provided by the customer**

|  |  |                                     |
|--|--|-------------------------------------|
| Clock used                                 | Below 108 MHz  |                                     |
| High Frequency Used                        | Below 108 MHz  |                                     |
| Model differences                          |  |                                     |
| Model name                                 | Difference   | Tested (checked)                    |
| KG-SFB-V2-5L                               | Basic Model<br>(the basic model that was fully tested) | <input checked="" type="checkbox"/> |
| KG-S-V2-5L,<br>KG-SF-V2-5L,<br>KG-SB-V2-5L | Variant Models   | -                                   |

### 1.2 Applicants Information

|                |   |
|----------------|---|
| Applicant      | KG AUTO Co.,Ltd.  |
| Address        | 45, Sojeongsandan 4-ro, Sojeong-myeon, Sejong-si, Republic of Korea |
| Telephone No.  | +82-44-715-7650   |
| Facsimile No.  | +82-44-715-7651   |
| Contact person | KIM KYUNG-HUN (69progress@kgauto.co.kr)                             |

## 2. Information of Testing Laboratory

### Test laboratory and address

KOSTEC Co., Ltd.

28(175-20,Annyeong-dong)406-gil sejaro, Hwaseong-si Gyeonggi-do, Korea

Telephone Number: 82-31-222-4251

Facsimile Number: 82-31-222-4252

### Registration information

KOLAS No.: KT232

RRA(National Radio Research Agency): KR0041

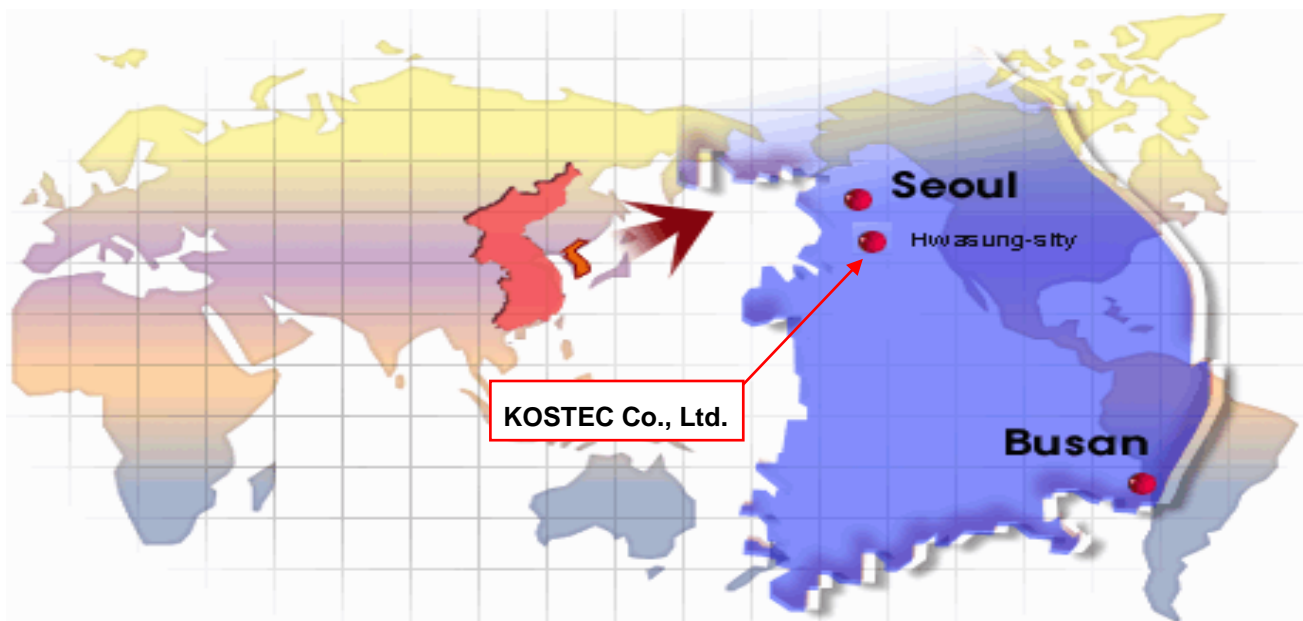
FCC Designation No.: KR0041

IC Designation No.: KR0041

VCCI Membership No. : 2005

VCCI Registration No. of EMI site: R-14202 / C-14685 / G-10834 / T-12225

### Route Map of Measurement Facility



### 3. Test System Configuration

#### 3.1 Operation Environment

| Test Items   | Test date | Temp (°C) | Humidity (%R.H.) | Pressure (kPa) |
|--|-----------|-----------|------------------|----------------|
| <b>Emission</b>  |           |           |                  |                |
| Conducted Emission                                       | Jul. 08   | 23        | 56               | -              |
| Radiated Emission (Below 1 GHz)                          | Jul. 07   | 21        | 53               |                |
| Radiated Emission (Above 1 GHz)                          | Jul. 08   | 19        | 50               |                |
| Harmonics Current  | -         | -         | -                |                |
| Flicker  | Jul. 09   | 28        | 46               |                |
| <b>Immunity</b>  |           |           |                  |                |
| Electro Static Discharge                                 | Jul. 07   | 22        | 42               | 100.1          |
| Radio Frequency Electromagnetic Fields                   | Jul. 07   | 18        | 56               | -              |
| Electric Fast Transient                                  | Jul. 07   | 28        | 46               | -              |
| Surge  | Jul. 07   | 28        | 46               | -              |
| Conducted Immunity                                       | Jul. 07   | 28        | 46               | -              |
| Magnetic Field Susceptibility                            | -         | -         | -                | -              |
| Voltage Dips, Short Interruptions and Voltage Variations | Jul. 07   | 28        | 46               | -              |

### 3.2 Measurement Uncertainty

| Test Items   | $k_p$ | Expanded Uncertainty   | Note |
|--|-------|--|------|
| <b>Emission</b>  |       |  |      |
| Conducted Emission (AC Main Power Ports)                 | 2     | ±3.44 dB   | -    |
| Conducted Emission (Asymmetric mode)                     | 2     | ±3.44 dB   | -    |
| Conducted Emission (Differential voltage)                | 2     | ±0.96 dB   | -    |
| Radiated Emission (Below 1 GHz)                          | 2     | ±4.26 dB   | -    |
| Radiated Emission (Above 1 GHz)                          | 2     | ±3.68 dB   | -    |
| Radiated Emission (FM receivers)                         | 2     | ±4.26 dB   | -    |
| <b>Immunity</b>  |       |  |      |
| Electro Static Discharge                                 | 2     | 5 %  | -    |
| Radio Frequency Electromagnetic Fields                   | 2     | The calibration procedure : 1.78 dB<br>The Level Setting : 2.16 dB | -    |
| Electric Fast Transient                                  | 2     | ±10 %  | -    |
| Surge  | 2     | ±10 %  | -    |
| Conducted Immunity                                       | 2     | ±2.34 %  | -    |
| Magnetic Field Susceptibility                            | 2     | ±5 %   | -    |
| Voltage Dips, Short Interruptions and Voltage Variations | 2     | ±5 %   | -    |

### 3.3 Sample calculation

#### Conducted Emission

The field strength is calculated by adding the LISN factor, cable loss from the measured reading. The sample calculation is as follows:

FS = MR + Factor  
 MR = Meter Reading  
 Factor = Ant. Factor, Cable Loss, etc

If MR is 30 dB, LISN Factor 1 dB, CL 1 dB  
 The result (MR) is 30 + 1 + 1 = 32 dB $\mu$ V

## 4. Condition and Procedure for Test activities

### 4.1 Configuration of EUT

| Description                              | Model or Part No.   | Serial No.  | Manufacturer            |
|--|---------------------|-------------|-------------------------|
| <b>Sign Tower<br/>(Indicating Tower)</b> | <b>KG-SFB-V2-5L</b> | <b>None</b> | <b>KG AUTO Co.,Ltd.</b> |

### 4.2 Used Peripherals

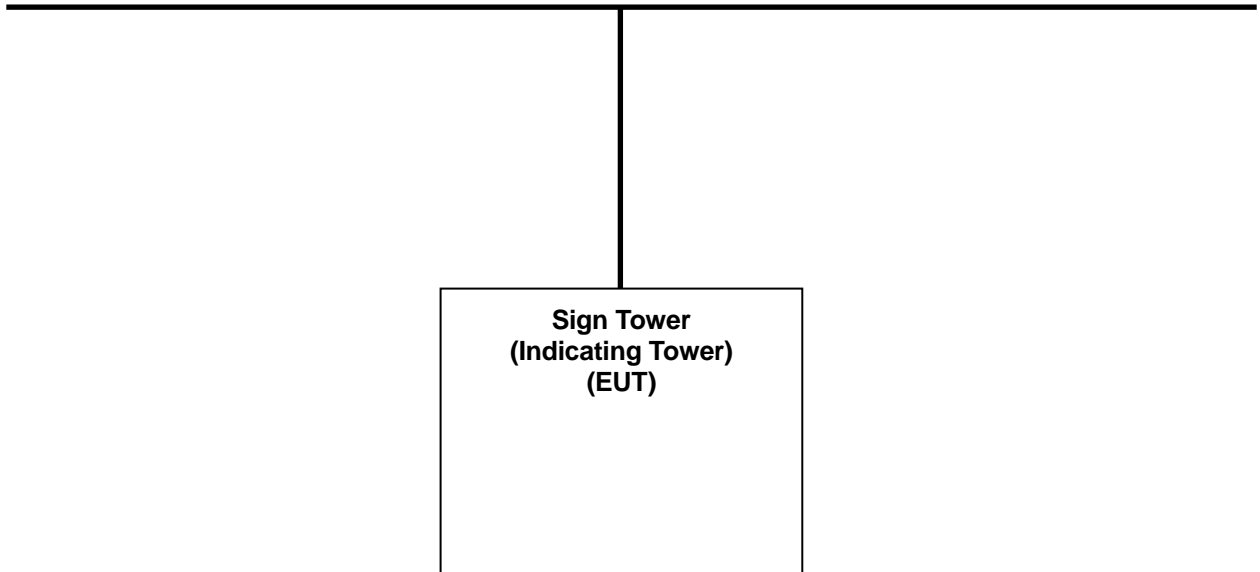
| Description | Model or Part No. | Serial No. | Manufacturer |
|-------------|-------------------|------------|--------------|
| -           | -                 | -          | -            |

### 4.3 Used cables

| Cable Type | Shield | Length<br>(m) | Ferrite | Connector | Connection<br>Point 1 | Connection<br>Point 2 |
|------------|--------|---------------|---------|-----------|-----------------------|-----------------------|
| AC In      | No     | 2.0           | No      | Line      | EUT                   | AC Outlet             |



#### 4.4 EUT Test Configuration



#### 4.5 Operating conditions

After setting, the EUT was tested with short the port of the EUT, observed the operation status through the LED

## 5. Summary of Test Results

### 5.1 Modification to the EUT

-

### 5.2 Standards & results

| Basic Standards  | Test Item   | Result      |
|------------------|---|-------------|
| EN IEC 61000-6-4 | Conducted & Radiated Emissions  | <b>PASS</b> |
| EN 61000-3-2     | Limits for harmonics current emissions  | <b>N/A</b>  |
| EN 61000-3-3     | Limitation of voltage changes, voltage fluctuations and flicker in low-voltage supply systems | <b>PASS</b> |
| EN 61000-4-2     | Electrostatic discharge immunity test   | <b>PASS</b> |
| EN 61000-4-3     | Radiated, radio-frequency, electromagnetic field immunity test                                | <b>PASS</b> |
| EN 61000-4-4     | Electrical fast transient/burst   | <b>PASS</b> |
| EN 61000-4-5     | Surge   | <b>PASS</b> |
| EN 61000-4-6     | Conducted disturbances, induced by radio-frequency fields                                     | <b>PASS</b> |
| EN 61000-4-8     | Power frequency magnetic field immunity test  | <b>N/A</b>  |
| EN 61000-4-11    | Voltage dips, short interruptions and voltage variations                                      | <b>PASS</b> |

Note 1) N/A mean is Not Applicable.

Note 2) Decision rule: The statement of conformity in this report was judged according to the specification limits of the standard without considering uncertainty.

### 5.3 Performance criteria

The variety and the diversity of the apparatus within the scope of this document make it difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard the apparatus becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test. A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria:

**Performance criterion A:** The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

**Performance criterion B:** The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

**Performance criterion C:** Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operating of the controls.

## 6. Test Result

### 6.1 Conducted emission

#### 6.1.1 Measurement procedure

##### Mains

The measurements were performed in a shielded room. The EUT was placed 0.4 m from vertical metal reference of plane at the least 2 m by 2 m, was kept at least 0.8 m from any other metal surface. EUT was placed on a non-metallic table 0.8 m above horizontal metal reference plane. And EUT was placed 0.4 m from vertical ground plane. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source. Both lines of power cord, live and neutral, were measured.

#### 6.1.2 Used equipment

| Equipment     | Model No.       | Serial No.                  | Manufacturer    | Next cal date | Used |
|---------------|-----------------|-----------------------------|-----------------|---------------|------|
| Test receiver | ESCS30          | 100111                      | Rohde & Schwarz | 2023. 01. 17  | ●    |
| EMI RECEIVER  | ER-30           | L0910A010                   | LIG             | 2022. 08. 30  | -    |
| Pulse Limiter | ESH3-Z2         | 100097                      | Rohde & Schwarz | 2023. 01. 17  | ●    |
| Pulse Limiter | ESH3-Z2         | 100022                      | Rohde & Schwarz | 2023. 01. 17  | -    |
| LISN          | ESH3-Z5         | 100147                      | Rohde & Schwarz | 2023. 01. 17  | ●    |
| LISN          | ESH2-Z5         | 100044                      | Rohde & Schwarz | 2023. 01. 18  | ●    |
| LISN          | ESH2-Z5         | 100060                      | Rohde & Schwarz | 2023. 01. 18  | -    |
| LISN          | 3825/2          | 9402-2163                   | EMCO            | 2023. 01. 18  | -    |
| DTV MODULATOR | TVB599A         | 23.53.20.15.09.<br>00.00.23 | TELEVIEW        | 2023. 01. 19  | -    |
| Test Program  | ESxS-K1 Ver2.2  | None                        | Rohde & Schwarz | -             | ●    |
| Test Program  | ETS2008 Ver2.40 | None                        | LIG             | -             | -    |

6.1.3 Test data

**AC Mains**

**< Class A >**

| Freq. [MHz] | Factor [dB] |            | POL | QP             |                  |                 |             | CISPR-AV       |                  |                 |             |
|-------------|-------------|------------|-----|----------------|------------------|-----------------|-------------|----------------|------------------|-----------------|-------------|
|             | LISN        | CABLE +P/L |     | Limit [dB(μV)] | Reading [dB(μV)] | Result [dB(μV)] | Margin [dB] | Limit [dB(μV)] | Reading [dB(μV)] | Result [dB(μV)] | Margin [dB] |
| 0.162       | 0.16        | 9.89       | L   | 79.00          | 31.57            | 31.73           | 47.27       | 66.00          | 13.70            | 13.86           | 52.14       |
| 0.400       | 0.13        | 9.92       | N   | 79.00          | 28.88            | 29.01           | 49.99       | 66.00          | 13.50            | 13.63           | 52.37       |
| 0.701       | 0.14        | 9.94       | N   | 73.00          | 31.79            | 31.93           | 41.07       | 60.00          | 29.20            | 29.34           | 30.66       |
| 1.123       | 0.16        | 9.97       | L   | 73.00          | 15.07            | 15.23           | 57.77       | 60.00          | 7.70             | 7.86            | 52.14       |
| 1.318       | 0.15        | 9.99       | N   | 73.00          | 12.82            | 12.97           | 60.03       | 60.00          | 12.00            | 12.15           | 47.85       |
| 1.459       | 0.17        | 10.00      | L   | 73.00          | 12.68            | 12.85           | 60.15       | 60.00          | 7.00             | 7.17            | 52.83       |
| 1.486       | 0.15        | 10.00      | N   | 73.00          | 12.81            | 12.96           | 60.04       | 60.00          | 12.00            | 12.15           | 47.85       |
| 2.716       | 0.18        | 10.07      | N   | 73.00          | 11.59            | 11.77           | 61.23       | 60.00          | 12.10            | 12.28           | 47.72       |
| 3.673       | 0.23        | 10.11      | L   | 73.00          | 23.00            | 23.23           | 49.77       | 60.00          | 9.20             | 9.43            | 50.57       |
| 3.802       | 0.21        | 10.11      | N   | 73.00          | 12.84            | 13.05           | 59.95       | 60.00          | 12.30            | 12.51           | 47.49       |
| 13.232      | 0.58        | 10.32      | L   | 73.00          | 11.60            | 12.18           | 60.82       | 60.00          | 7.00             | 7.58            | 52.42       |

- \* LISN: LISN insertion Loss, Cable: Cable Loss, P/L: pulse limiter factor
- \* L: Line. Live, N: Line. Neutral
- \* Reading: test receiver reading value (with cable loss & pulse limiter factor)
- \* Result = LISN + Reading

**Telecommunication port (RJ-45)**

| Freq. [MHz] | Factor [dB] |            | QP             |                  |                 |             | CISPR AV       |                  |                 |             |
|-------------|-------------|------------|----------------|------------------|-----------------|-------------|----------------|------------------|-----------------|-------------|
|             | ISN         | CABLE +P/L | Limit [dB(μV)] | Reading [dB(μV)] | Result [dB(μV)] | Margin [dB] | Limit [dB(μV)] | Reading [dB(μV)] | Result [dB(μV)] | Margin [dB] |
| -           | -           | -          | -              | -                | -               | -           | -              | -                | -               | -           |

- \* ISN : ISN insertion Loss, Cable: Cable loss, P/L : Pulse limiter factor
- \* Reading : Test receiver reading value
- \* Result = ISN + Cable + P/L + Reading

6.1.4 Conducted disturbance test graph

AC Mains

Line. Live

Kostec Co.,Ltd

08 Jul 2022 11:03

Conducted Emission

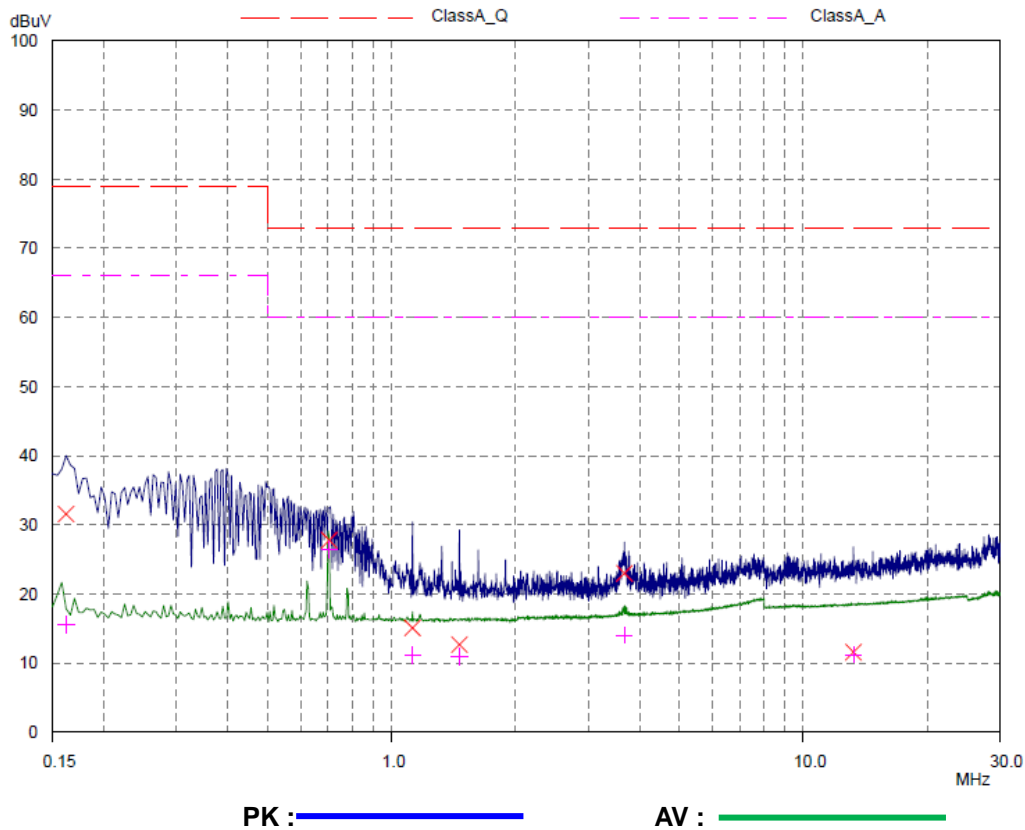
EUT: KST-PO-22-0071  
 Manuf:  
 Op Cond: AC 220 V 60 Hz  
 Operator: E.S.CHOI  
 Test Spec: KC  
 Comment: LIVE  
 Normal  
 Result File: 0071\_L.dat : New Measurement

Scan Settings (1 Range)

| Frequencies |       |           | Receiver Settings |          |        |       |        |       |
|-------------|-------|-----------|-------------------|----------|--------|-------|--------|-------|
| Start       | Stop  | Step      | IF BW             | Detector | M-Time | Atten | Preamp | OpRge |
| 150kHz      | 30MHz | 3.9063kHz | 9kHz              | PK+AV    | 10msec | 15 dB | OFF    | 60dB  |

| Transducer | No. | Start | Stop  | Name |
|------------|-----|-------|-------|------|
|            | 11  | 9kHz  | 30MHz | MAIN |

Final Measurement: Detectors: X QP / + AV  
 Meas Time: 1sec  
 Peaks: 25  
 Acc Margin: 50 dB





### Line. Neutral

Kostec Co.,Ltd

08 Jul 2022 11:16

#### Conducted Emission

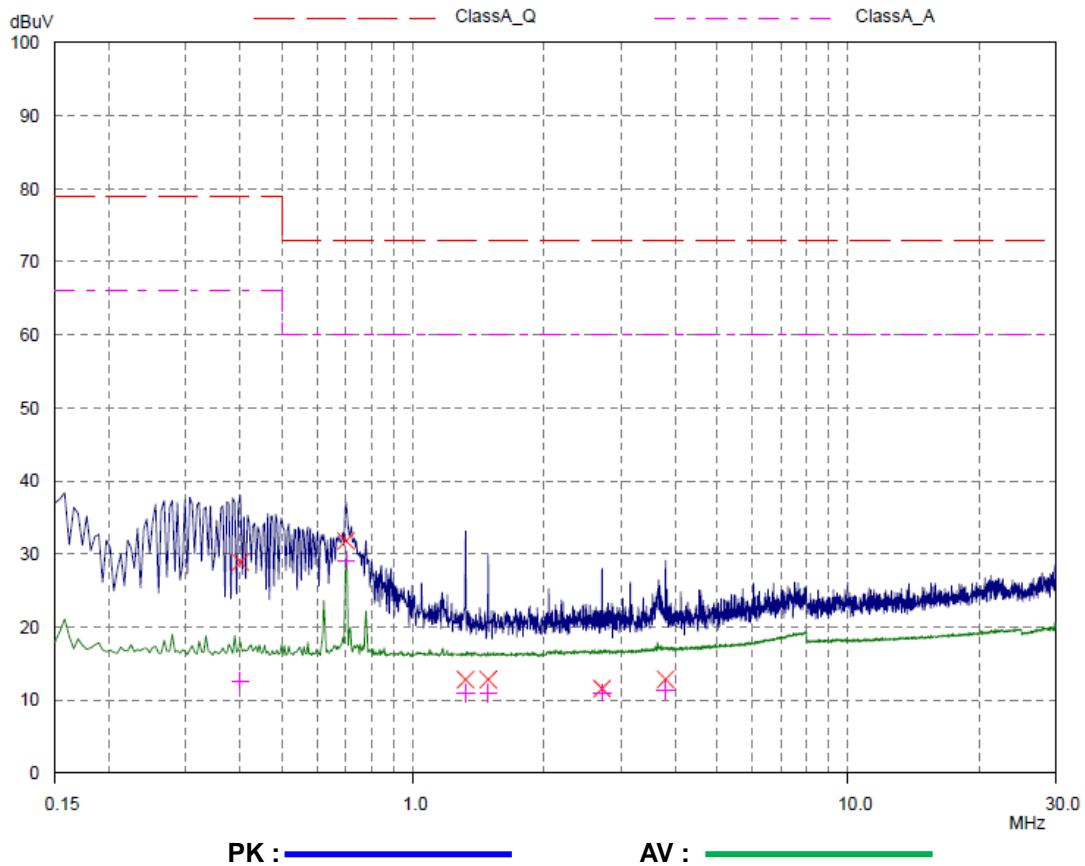
EUT: KST-PO-22-0071  
 Manuf:  
 Op Cond: AC 220 V 60 Hz  
 Operator: E.S.CHOI  
 Test Spec: KC  
 Comment: NEUTRAL  
 Normal  
 Result File: 0071\_N.dat : New Measurement

| Scan Settings |       |           |       | Receiver Settings |        |       |        |       |
|---------------|-------|-----------|-------|-------------------|--------|-------|--------|-------|
| Frequencies   |       | Step      | IF BW | Detector          | M-Time | Atten | Preamp | OpRge |
| Start         | Stop  |           |       |                   |        |       |        |       |
| 150kHz        | 30MHz | 3.9063kHz | 9kHz  | PK+AV             | 10msec | 15 dB | OFF    | 60dB  |

| Transducer | No. | Start | Stop  | Name |
|------------|-----|-------|-------|------|
|            | 11  | 9kHz  | 30MHz | MAIN |

Final Measurement: Detectors: X QP / + AV  
 Meas Time: 1sec  
 Peaks: 25  
 Acc Margin: 50 dB



## 6.2 Radiated Emission

### 6.2.1 Measurement procedure

A pretest was performed at 10 m distances in a semi-anechoic chamber for searching correct frequency. The final test was done at a 10 m area test site with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

### 6.2.2 Used equipment

#### 10 m Semi-Anechoic chamber (Below 1 GHz)

| Equipment         | Model No. | Serial No.                  | Manufacturer       | Next cal date | Used |
|-------------------|-----------|-----------------------------|--------------------|---------------|------|
| Test Receiver     | ESCI7     | 100823                      | R&S                | 2023. 01. 17  | ●    |
| Test Receiver     | ESPI      | 100488                      | Rohde & Schwarz    | 2023. 01. 17  | -    |
| Biconilog Antenna | 3142B     | 1745                        | EMCO               | 2024. 04. 27  | ●    |
| Biconilog Antenna | 3142B     | 9910-1432                   | EMCO               | 2024. 04. 08  | -    |
| AMPLIFIER         | TK-PA6S   | 120009                      | TESTEK             | 2023. 01. 17  | -    |
| AMPLIFIER         | TK-PA01S  | 220109-L                    | TESTEK             | 2023. 04. 29  | ●    |
| Antenna Master    | MA4000-EP | None                        | Innco systems GmbH | -             | ●    |
| Turn Table        | None      | None                        | Innco systems GmbH | -             | ●    |
| DTV MODULATOR     | TVB599A   | 23.53.20.15.09<br>.00.00.23 | TELEVIEW           | 2023. 01. 19  | -    |

#### 3 m Semi-Anechoic chamber (Above 1 GHz)

| Equipment              | Model No. | Serial No.                  | Manufacturer                   | Next cal date | Used |
|------------------------|-----------|-----------------------------|--------------------------------|---------------|------|
| Test Receiver          | ESCI7     | 100823                      | Rohde & Schwarz                | 2022. 08. 30  | -    |
| Test Receiver          | ESI       | 837514/004                  | Rohde & Schwarz                | 2023. 01. 17  | -    |
| Test Receiver          | ESCI7     | 100969                      | Rohde & Schwarz                | 2023. 01. 17  | ●    |
| Horn Antenna           | 3115      | 2996                        | EMCO                           | 2023. 02. 10  | -    |
| Horn Antenna           | 3115      | 9605-4834                   | EMCO                           | 2023. 03. 02  | ●    |
| Broadband Horn Antenna | BBHA 9170 | 743                         | SCHWARZBECK<br>MESS-ELEKTRONIK | 2023. 01. 21  | -    |
| Antenna Master         | AT13      | None                        | AUDIX                          | -             | ●    |
| Turn Table             | None      | None                        | AUDIX                          | -             | ●    |
| Antenna Master         | MA4000-EP | None                        | Innco systems GmbH             | -             | -    |
| Turn Table             | None      | None                        | Innco systems GmbH             | -             | -    |
| AMPLIFIER              | TK-PA6S   | 120009                      | TESTEK                         | 2023. 01. 17  | -    |
| AMPLIFIER              | 8449B     | 3008A02577                  | Agilent                        | 2023. 01. 17  | -    |
| AMPLIFIER              | 8449B     | 3008A00149                  | H.P                            | 2022. 08. 31  | ●    |
| DTV MODULATOR          | TVB599A   | 23.53.20.15.09<br>.00.00.23 | TELEVIEW                       | 2023. 01. 19  | -    |

### 6.2.3 Test Data

a) Below 1 GHz

**< Class A >**

| Freq. [MHz] | Reading [dB(μV)] | POL | H [m] | Factor      |            |           | Limit [dB(μV/m)] | Result [dB(μV/m)] | Margin [dB] |
|-------------|------------------|-----|-------|-------------|------------|-----------|------------------|-------------------|-------------|
|             |                  |     |       | ANT. [dB/m] | CABLE [dB] | AMP. [dB] |                  |                   |             |
| 36.30       | 5.09             | V   | 1.0   | 19.71       | 1.22       | 51.95     | 40.00            | 5.09              | 34.91       |
| 40.99       | 14.11            | V   | 1.0   | 17.18       | 1.26       | 51.94     | 40.00            | 14.11             | 25.89       |
| 45.51       | 11.07            | V   | 1.0   | 15.47       | 1.35       | 51.93     | 40.00            | 11.07             | 28.93       |
| 68.60       | 2.61             | V   | 1.0   | 12.49       | 1.67       | 51.88     | 40.00            | 2.61              | 37.39       |
| 331.71      | 13.53            | H   | 4.0   | 20.63       | 4.10       | 52.15     | 47.00            | 13.53             | 33.47       |
| 549.74      | 21.40            | H   | 4.0   | 25.59       | 5.33       | 53.24     | 47.00            | 21.40             | 25.60       |

\* Result & Reading : Test receiver reading value (Included ANT., CABLE and AMP. factor)

\* POL = Antenna Polarization / H = Antenna Height \* Receiving Antenna Mode : Horizontal, Vertical

\* ANT. = Antenna factor / CABLE = used Cable loss / AMP.: Gain of the Amplifier

b) Above 1 GHz

**< Class A >**

| Freq. [GHz] | Reading       |                  | POL | H [m] | Factor      |            |           |               | Peak             |                   |             | CISPR Average    |                   |             |
|-------------|---------------|------------------|-----|-------|-------------|------------|-----------|---------------|------------------|-------------------|-------------|------------------|-------------------|-------------|
|             | Peak [dB(μV)] | Average [dB(μV)] |     |       | ANT. [dB/m] | CABLE [dB] | AMP. [dB] | Distance [dB] | Limit [dB(μV/m)] | Result [dB(μV/m)] | Margin [dB] | Limit [dB(μV/m)] | Result [dB(μV/m)] | Margin [dB] |
| 3.193       | 42.96         | 30.49            | H   | 1.0   | 31.00       | 3.32       | 34.20     | 0.56          | 80.00            | 43.52             | 36.48       | 60.00            | 31.05             | 28.95       |

\* Result = Reading + Distance

\* Reading : Test receiver reading value (Included ANT., CABLE and AMP. factor)

\* POL = Antenna Polarization / H = Antenna Height \* Receiving Antenna Mode : Horizontal, Vertical

\* ANT. = antenna factor / CABLE = used cable loss / AMP.: Gain of the Amplifier /

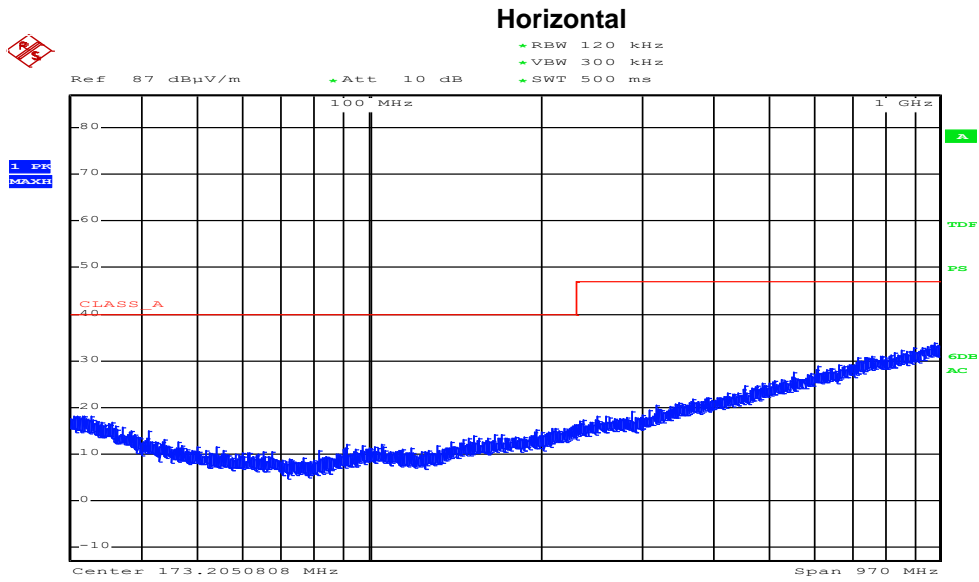
Distance : Distance compensation value

※ Except for the above data, the emission levels were very low, so that the other data are not reported.  
(See Radiated Emission Graph)

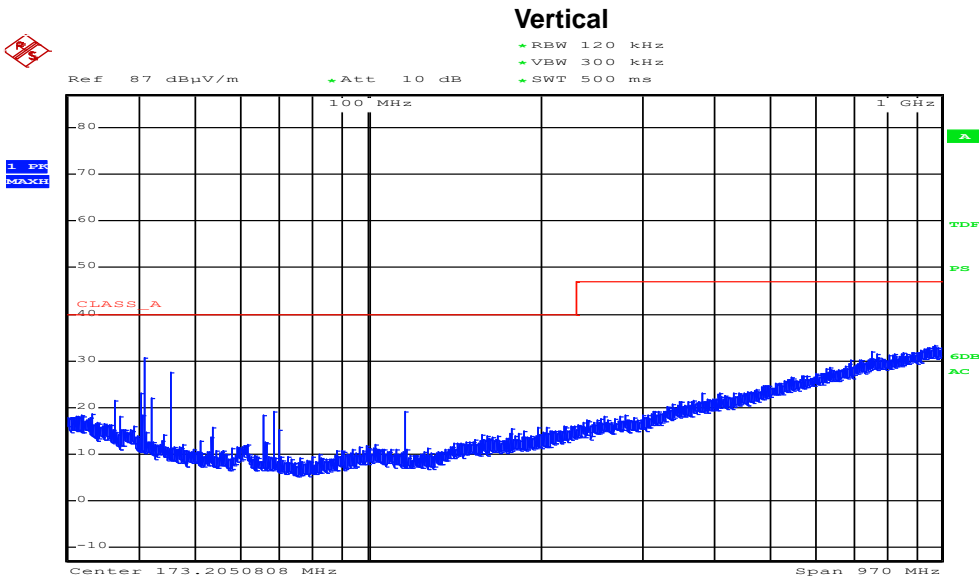


### 6.2.4 Radiated emission test graph

a) Below 1 GHz

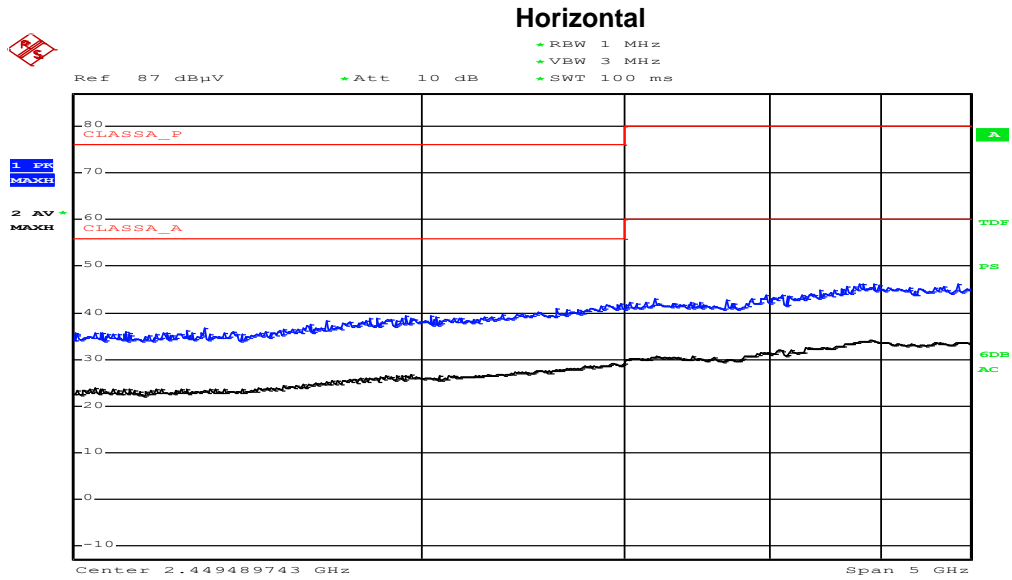


Date: 7.JUL.2022 19:42:48

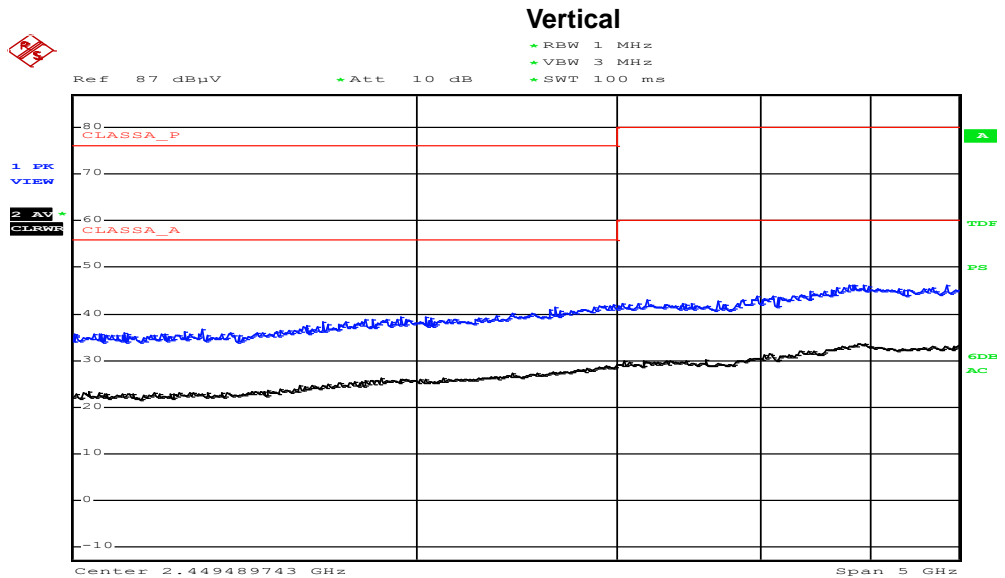


Date: 7.JUL.2022 19:33:33

b) Above 1 GHz



Date: 8.JUL.2022 06:33:51



Date: 8.JUL.2022 06:39:33

## 6.3 Electro Static Discharge

### 6.3.1 Measurement procedure

A ground reference plane was located on the floor, and connected to earth via a low impedance connection. The return cable of the ESD generator was connected to the reference plane. In case of floor standing equipment, EUT was placed on the reference plane on 10 cm of insulating Support. In case of tabletop equipment, EUT was placed on a wooden table 0.8 m above the reference grounded floor.

A horizontal coupling plane (HCP) was placed on the table, and Connected to the reference plane via a 470 k $\Omega$  resistor located in each end (0.5 mm insulating support between EUT and HCP). In both cases a vertical coupling plane (VCP) of 0.5 X 0.5 m was located 10 cm from the EUT's sides. The VCP was connected to the reference plane in the same matter as the HCP.

### 6.3.2 Used equipment

| Equipment                         | Model No.  | Serial No.                  | Manufacturer | Next cal date | Used |
|-----------------------------------|------------|-----------------------------|--------------|---------------|------|
| Electrostatic Discharge Simulator | ESS-2000   | ESS0432654                  | NOISEKEN     | 2023. 01. 20  | ●    |
| ESD Simulator                     | ESS-B3011A | ESS17Z7382                  | NOISEKEN     | 2023. 02. 10  | -    |
| HCP                               | -          | -                           | -            | -             | ●    |
| VCP                               | -          | -                           | -            | -             | ●    |
| DTV MODULATOR                     | TVB599A    | 23.53.20.15.09.0<br>0.00.23 | TELEVIEW     | 2023. 01. 19  | -    |

### 6.3.3 Test data

Test specifications

Test specification : EN 61000-4-2

Criteria required : B

Kind of discharges

- Contact discharge
- Air discharge
- HCP
- VCP

Discharge voltages

- Contact discharge :  $\pm 4$  kV
- Air discharge :  $\pm 2$  kV,  $\pm 4$  kV,  $\pm 8$  kV

Discharge impedance

- 330  $\Omega$  / 150 pF
- 2 k $\Omega$  / 330 pF

Number of discharge

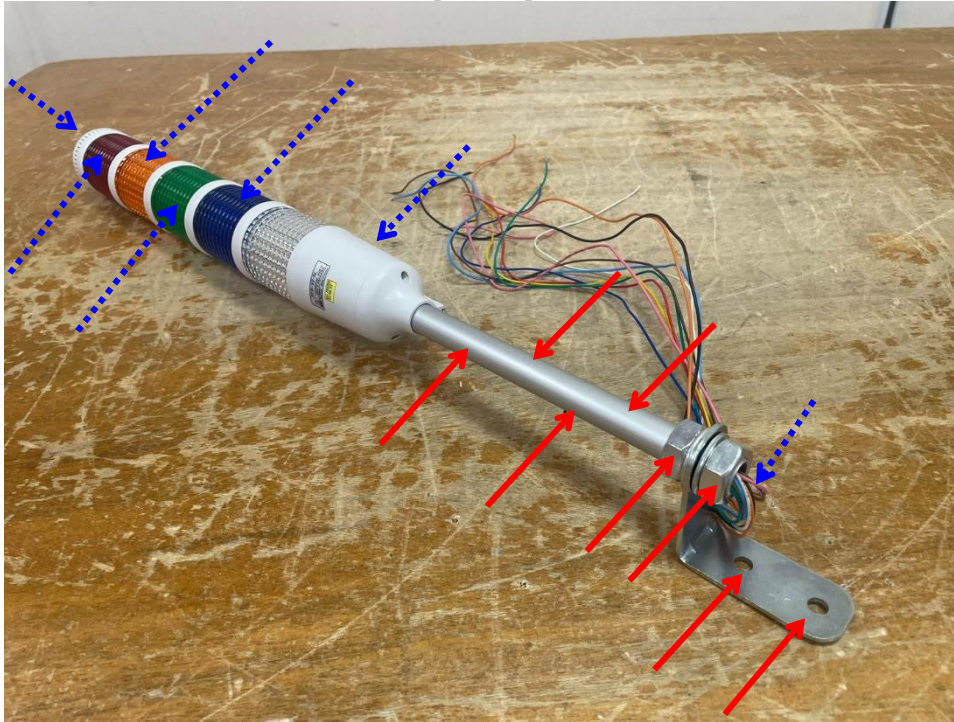
- $\geq 50$  ( + : 25, - : 25) at all test point for each point

**Test point**

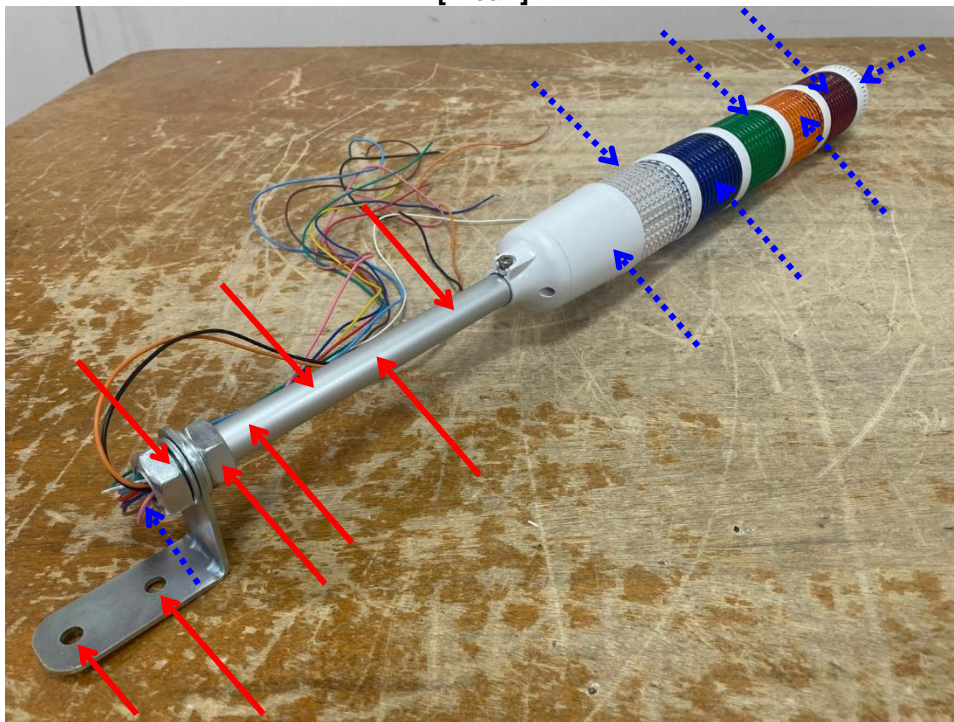
- Air discharge <----->

- Contact discharge <----->

[ Front ]



[ Rear ]



**Table**

| Test point                           | Test level [kV] | Air/ Contact | Polarity (+ / -) | Result |
|--------------------------------------|-----------------|--------------|------------------|--------|
| * HCP/VCP                            | 4               | Contact      | + / -            | A      |
| Front, Rear, Top, Left, Right (Case) | 2, 4, 8         | Air          | + / -            | A      |
| Bottom (Chassis)                     | 4               | Contact      | + / -            | A      |
| Bolt                                 | 4               | Contact      | + / -            | A      |

\* Indirect contact discharges were applied to the HCP and VCP.

Test results

Pass : [ A ]                       Fail

Comment : There was no change of operation status during above testing.

## 6.4 Radio frequency Electromagnetic Fields

### 6.4.1 Measurement procedure

The test was performed at 3 m full anechoic chamber.  
 For floor standing equipment, the EUT was standing on the floor, isolated from the ferrite core.  
 For tabletop equipment, the EUT was located on a wooden table 0.8 m above the floor.  
 The EUT was tested all sides, horizontal and vertical polarization.  
 The field uniformity was calibrated for 3 V/m, 10 V/m.

### 6.4.2 Used equipment

| Equipment                                     | Model No.                           | Serial No.              | Manufacturer                | Next cal date | Used |
|---|-------------------------------------|-------------------------|-----------------------------|---------------|------|
| ESG Analog Signal Generator                   | E4428C                              | MY49070323              | Agilent                     | 2023. 01. 17  | ●    |
| Power Meter                                   | NRVD                                | 100401                  | Rohde & Schwarz             | 2023. 01. 18  | ●    |
| Power Sensor                                  | NRV-Z4                              | 100536                  | Rohde & Schwarz             | 2023. 01. 18  | ●    |
| Power Sensor                                  | NRV-Z4                              | 100537                  | Rohde & Schwarz             | 2023. 01. 18  | ●    |
| Directional coupler                           | DC6080                              | 303256                  | Amplifier Research          | -             | ●    |
| BI-DIRECTIONAL COUPLER                        | ZGDC35-93HP+                        | 0294                    | Mini-Circuits               | -             | ●    |
| System Interface                              | SI-300                              | 120898                  | EMC Automation              | -             | ●    |
| RF Amplifier                                  | 150W1000                            | 303048                  | Amplifire Reserch           | -             | ●    |
| RF Amplifier                                  | BLMA 1060-60/50D                    | 118344                  | BONN Elektronik             | -             | ●    |
| Biconilog Antenna                             | 3142B                               | 9910-1432               | ETS-Lindgren                | -             | -    |
| Ultra broadband Antenna                       | HL562                               | 100076                  | Rohde & Schwarz             | -             | ●    |
| Microwave Log. -Per. Antenna                  | STLP9149                            | 9149-117                | SCHWARZBECK MESS-ELECTRONIK | -             | ●    |
| Test Program                                  | TDK Radiated Immunity Lab (V 4.125) | None                    | TDK                         | -             | ●    |
| 15 MHz FUNCTION/ARBHITRARY WAVEFORM GENERATOR | 33120A                              | US36038310              | H.P.                        | 2023. 01. 18  | -    |
| Audio Analyzer                                | 1121                                | 14401                   | BOONTON ELECTRONICS CORP.   | 2023. 01. 18  | -    |
| Telephone Analyzer                            | DD-5601CID                          | 520007186               | CREDIX                      | 2023. 01. 18  | -    |
| FILTER  | 3202                                | 6506                    | KROHN-HITE CORP             | 2023. 01. 18  | -    |
| Measuring Amplifier Box                       | 2609                                | 1365937                 | Bruel & Kjaer               | -             | -    |
| AMP BOX                                       | AWM-01                              | 082207                  | TDK                         | -             | -    |
| TIME WAVE                                     | DSP-599zx                           | 36789                   | TIME WAVE                   | -             | -    |
| TIME WAVE                                     | DSP-599zx                           | 36790                   | TIME WAVE                   | -             | -    |
| DYNAMIC SIGNAL ANALYZER                       | 35670A                              | MY42507678              | Agilent                     | 2023. 01. 18  | -    |
| Sound Calibrator                              | 4231                                | 2588802                 | Bruel & Kjaer               | 2023. 01. 19  | -    |
| Impedance Box                                 | TIB-R1                              | 150035                  | TESTEK                      | -             | -    |
| DTV MODULATOR                                 | TVB599A                             | 23.53.20.15.09.00.00.23 | TELEVIEW                    | 2023. 01. 19  | -    |

### 6.4.3 Test data

Test specifications

Test Specification : EN 61000-4-3

Criteria required : A

Frequency range

80 MHz – 1000 MHz                       1.4 GHz – 6 GHz

Test level

1 V/m                       3 V/m                       10 V/m

Modulation

AM : 1 kHz, 80 %                       PM : 200 Hz, 50 % duty cycle

Frequency step

log 1 % step                       log 3 % step                       log 5 % step

Dwell time

3 s                       2 s                       1 s

Test point

Front                       Rear                       Left                       Right

Test results

Pass : [ A ]                       Fail

**Table .Result for Radio frequency electromagnetic fields**

| Frequency range   | Level [V/m] | Antenna | Positions | Result |
|-------------------|-------------|---------|-----------|--------|
| 80 MHz – 1000 MHz | 10          | H / V   | Front     | A      |
|                   |             |         | Left      | A      |
|                   |             |         | Right     | A      |
|                   |             |         | Rear      | A      |
| 1.4 GHz – 6 GHz   | 3           |         | Front     | A      |
|                   |             |         | Left      | A      |
|                   |             |         | Right     | A      |
|                   |             |         | Rear      | A      |

Comment : There was no change of operation status during above testing.



## 6.5 Electric Fast Transient

### 6.5.1 Measurement procedure

A ground reference plane was located on the floor.  
EFT generator was connected to reference ground plane via low impedance connection.  
For floor standing equipment, EUT was placed on a 0.1 m wooden table.  
For tabletop equipment, EUT was placed on a wooden table(0.8 m) above the reference plane.

### 6.5.2 Used equipment

| Equipment                    | Model No. | Serial No.                  | Manufacturer    | Next cal date | Used |
|------------------------------|-----------|-----------------------------|-----------------|---------------|------|
| EMC IMMUNITY TEST SYSTEM     | CCS 600   | ES0801622                   | 3ctest          | 2022. 08. 31  | -    |
| Capacitive Coupling Clamp    | HFK       | None                        | EM TEST         | 2023. 01. 17  | -    |
| COMPACT IMMUNITY TEST SYSTEM | AXOS 5    | 181806                      | HAEFELY TEST AG | 2023. 01. 17  | ●    |
| Capacitive Coupling Clamp    | IP4B      | 181968                      | HAEFELY TEST AG | 2023. 01. 17  | -    |
| DTV MODULATOR                | TVB599A   | 23.53.20.15.09<br>.00.00.23 | TELEVIEW        | 2023. 01. 19  | -    |

### 6.5.3 Test data

Test specifications

Test Specification: EN 61000-4-4

Criteria required: B

Coupling

AC mains     Signal     Telecommunication line     DC mains

Test level

AC mains : ±2 kV     DC mains : ±2 kV     Signal : ±1 kV

Test mode

- AC main:

L + N     L + PE     N + PE     L + N + PE

- DC main:

DC(+) + DC(-)

- Signal : -

Burst frequency: 5 kHz, 5/50 ns

Coupling time: ≥ 60 sec

Test results

Pass : [ A ]     Fail

Comment : There was no change of operation status during above testing.



## 6.6 Surge

### 6.6.1 Measurement procedure

A ground reference plane was located on the floor.  
 SURGE generator was connected to reference ground plane via low impedance connection.  
 For floor standing equipment, EUT was placed on a 0.1 m wooden table.  
 For tabletop equipment, EUT was placed on a wooden table(0.8 m) above the reference plane.

### 6.6.2 Used equipment

| Equipment                    | Model No.  | Serial No.                  | Manufacturer    | Next cal date | Used |
|------------------------------|------------|-----------------------------|-----------------|---------------|------|
| CDN                          | CNV 508 S1 | 1001-05                     | EM TEST         | -             | -    |
| CDN                          | CNV 508 S2 | 1001-06                     | EM TEST         | -             | -    |
| Surge Generator              | TSS 500M4  | 1201-04                     | EM TEST         | 2022. 08. 31  | -    |
| EMC IMMUNITY TEST SYSTEM     | CCS 600    | ES0801622                   | 3ctest          | 2022. 08. 31  | -    |
| COMPACT IMMUNITY TEST SYSTEM | AXOS 5     | 181806                      | HAEFELY TEST AG | 2023. 01. 17  | ●    |
| DTV MODULATOR                | TVB599A    | 23.53.20.15.<br>09.00.00.23 | TELEVIEW        | 2023. 01. 19  | -    |

### 6.6.3 Test data

Test specifications

Test specification: EN 61000-4-5

Criteria required: B

Coupling

AC mains     Signal     Telecommunication line     DC mains

Test level

AC mains :  $\pm 0.5$  kV, 1 kV     DC mains :  $\pm 0.5$  kV  
 Signal :  $\pm 1$  kV     Telecommunication line :  $\pm 2$  kV

Test mode

L + N     L + PE     N + PE     L + N + PE

Coupling impedance

$40 \Omega + 0.5 \mu\text{F}$       $40 \Omega$       $10 \Omega + 9 \mu\text{F}$       $18 \mu\text{F}$

Coupling time : > 5 sec

Number of surge: 5

Phase :  $0 \sim 360^\circ / 90^\circ$  Step

Test results

Pass: [ A ]     Fail

Comment : There was no change of operation status during above testing.

## 6.7 Conducted Immunity

### 6.7.1 Measurement procedure

A ground reference plane was located on the floor.

For tabletop equipment, the test was performed on a ground reference plane on a 0.8 m wooden table. The EUT was isolated 0.1 m isolating support. The ground plane was connected to floor reference ground plane via low impedance connection. For floor standing equipment, EUT was placed on a 0.1 m wooden table. This test were Performed using CDN for mains, clamp for signal. and injection probe.

### 6.7.2 Used equipment

| Equipment                                       | Model No.                            | Serial No.                  | Manufacturer                       | Next cal date | Used |
|---|--------------------------------------|-----------------------------|------------------------------------|---------------|------|
| Attenuator                                      | ATT 6/75                             | 1001-22                     | EM TEST                            | 2023. 01. 17  | -    |
| TEST SYSTEM FOR CONDUCTED AND RADIATED IMMUNITY | NSG 4070                             | 540130                      | TESEQ                              | 2023. 01. 17  | ●    |
| Attenuator                                      | DAM-12W                              | None                        | FRANKONIA EMV-Mess-System GmbH     | 2023. 01. 17  | ●    |
| CDN   | CDN-M2/32A                           | 510010550005                | EM TEST                            | 2023. 01. 17  | ●    |
| CDN   | CDN-M3/32A                           | 510010320014                | EM TEST                            | 2023. 01. 17  | -    |
| CDN   | CDN-M5/32A                           | 5100102S0003                | EM TEST                            | 2023. 01. 17  | -    |
| CDN   | CDN-T2                               | 0302-02                     | EM TEST                            | 2023. 01. 17  | -    |
| EM clamp  | EM101                                | 35611                       | Luthi Elektronik-Feinmechank AG    | 2023. 01. 19  | -    |
| EM INJECTION CLAMP                              | F-2031-32mm                          | 401                         | FISCHER CUSTOM COMMUNICATIONS      | 2023 .02. 07  | -    |
| CDN   | FCC-801-T8                           | 9961                        | FISCHER CUSTOM COMMUNICATIONS INC. | 2023. 01. 17  | -    |
| CDN   | FCC-801-M2-25A                       | 9977                        | FISCHER CUSTOM COMMUNICATIONS INC. | 2023. 01. 17  | -    |
| CDN   | FCC-801-M3-25A                       | 99136                       | FISCHER CUSTOM COMMUNICATIONS INC. | 2023. 01. 17  | -    |
| SIGNAL Generator                                | 8648C                                | 3847U02501                  | H.P.                               | 2023. 01. 17  | -    |
| Power Amplifier                                 | 275LC-CE                             | 8008-1                      | KALMUS                             | -             | -    |
| Test Program                                    | TDK Conducted Immunity Lab (V 4.124) | None                        | TDK                                | -             | -    |
| 15 MHz FUNCTION/ARBITRARY WAVEFORM GENERATOR    | 33120A                               | US36038310                  | H.P.                               | 2023. 01. 18  | -    |
| Audio Analyzer                                  | 1121                                 | 14401                       | BOONTON ELECTRONICS CORP.          | 2023. 01. 18  | -    |
| Telephone Analyzer                              | DD-5601CID                           | 520007186                   | CREDIX                             | 2023. 01. 18  | -    |
| FILTER  | 3202                                 | 6506                        | KROHN-HITE CORP                    | 2023. 01. 18  | -    |
| Measuring Amplifier Box                         | 2609                                 | 1365937                     | Bruel & Kjaer                      | -             | -    |
| AMP BOX   | AWM-01                               | 082207                      | TDK                                | -             | -    |
| TIME WAVE                                       | DSP-599zx                            | 36789                       | TIME WAVE                          | -             | -    |
| TIME WAVE                                       | DSP-599zx                            | 36790                       | TIME WAVE                          | -             | -    |
| DYNAMIC SIGNAL ANALYZER                         | 35670A                               | MY42507678                  | Agilent                            | 2023. 01. 18  | -    |
| Sound Calibrator                                | 4231                                 | 2588802                     | Bruel & Kjaer                      | 2023. 01. 19  | -    |
| Impedance Box                                   | TIB-R1                               | 150035                      | TESTEK                             | -             | -    |
| DTV MODULATOR                                   | TVB599A                              | 23.53.20.15.09.0<br>0.00.23 | TELEVIEW                           | 2023. 01. 19  | -    |

### 6.7.3 Test data

#### Test specifications

Test specification: EN 61000-4-6

Criteria required: A

#### Frequency range

150 kHz – 80 MHz       150 kHz – 230 MHz       150 kHz – 500 MHz

#### Coupling

AC main : CDN-M2/32A

DC main : -

Signal : -

#### Test level

1 V       3 V       10 V

#### Modulation

AM: 1 kHz, 80 %       PM: 1 Hz, 50 % duty cycle

#### Frequency step

Log 1 % step       log 3 % step       log 5 % step

#### Dwell time

3 s       2 s       1 s

#### Test results

Pass: [ A ]       Fail

Comment : There was no change of operation status during above testing.

## 6.8 Magnetic Field Susceptibility

### 6.8.1 Test Procedure

The Magnetic field to which equipment is subjected may influence the reliable operation of equipment and systems.

The following tests are intended to demonstrate the immunity of equipment when subjected to power frequency magnetic fields related to the specific location and installation condition of the equipment (e.g. proximity of equipment to the disturbance source).

The power frequency magnetic field is generated by power frequency current in conductors or, more seldom, from other devices (e.g. leakage of transformers) in the proximity of equipment.

As for the influence of nearby conductors, one should differentiate between :

- the current under normal operating conditions, which produces a steady magnetic field, with a comparatively small magnitude;
- the current under fault conditions which can produce comparatively high magnetic fields but of short duration, until the protection devices operate (a few milliseconds with fuses, a few seconds for protection relays).

The test with short duration magnetic field related to fault conditions, requires test levels that differ from those for steady state conditions; the highest value apply mainly to equipment to be installed in exposed places of electrical plants.

|                     |                           |
|---------------------|---------------------------|
| Frequency range     | 50 Hz                     |
| Field level         | 3 A/m                     |
| Duration            | 60 seconds each axis      |
| Axis of orientation | X-axis, Y-axis and Z-axis |

### 6.8.2 Used equipment

| Equipment                         | Model No.   | Serial No. | Manufacturer | Next cal date | Used |
|-----------------------------------|-------------|------------|--------------|---------------|------|
| Current transformer               | MC2630      | D5101      | EM TEST      | 2022. 09. 01  | -    |
| Magnetic Field coil               | MS100       | 0401-16    | EM TEST      | -             | -    |
| Motorized Variac                  | MV2616      | 1101-03    | EM TEST      | -             | -    |
| SLIDE-AC                          | None        | None       | None         | -             | -    |
| CLAMP-ON GROUND RESISTANCE TESTER | 5601        | 10080105K  | PROVA        | 2022. 09. 02  | -    |
| Ultra Compact Generator           | UCS 500 M6A | 0401-15    | EM Test      | -             | -    |

### 6.8.3 Test data

Test specifications

Test specification : EN 61000-4-8

Criteria required : A

Test Point

Power

Pulse

Damped Oscillatory

Axis of Orientation

X

Y

Z

Test level

1 A/m

3 A/m

10 A/m

Comment : This test does not apply, because EUT does not contain components susceptible to magnetic fields.

## 6.9 Voltage Dips, Short Interruptions and Voltage Variations

### 6.9.1 Test Procedure

The EUT shall be connected to the test generator with the shortest power supply cable specified by the EUT manufacturer. If no cable length is specified, it shall be the shortest possible length suitable to the application of the EUT. Tests on 3-Phase EUT must be accomplished by using 3 sets of equipment mutually synchronized.

Type designation of the EUT.

- Information on possible connections (plugs, terminals, etc.) and corresponding cables and peripherals,
- Input power of equipment to be tested,
- Representative operational modes of the EUT for the test,
- Performance criteria used and defined in the technical specifications.

If the actual operating signal sources are not available to the EUT, they may be simulated.

Voltage Dips and Short Interruptions

- The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 seconds minimum (between each test event). Each representative mode of operation shall be tested.

Voltage Variations

- The EUT is tested to each of the specified voltage variations. Three times at 10 second intervals for the most representative modes of operations.

### 6.9.2 Used equipments

| Equipment                        | Model No.             | Serial No.                  | Manufacturer    | Next cal date | Used |
|----------------------------------|-----------------------|-----------------------------|-----------------|---------------|------|
| COMPACT IMMUNITY TEST SYSTEM     | DIP 116               | 181640                      | HAEFELY TEST AG | 2023. 01. 17  | ●    |
| COMPACT IMMUNITY TEST SYSTEM     | AXOS 5                | 181806                      | HAEFELY TEST AG | 2023. 01. 17  | ●    |
| EMC IMMUNITY TEST SYSTEM         | CCS 600               | ES0801622                   | 3ctest          | 2022. 08. 31  | -    |
| VOLTAGE VARIATION                | VMT 2216SV            | ES0471605                   | 3ctest          | 2022. 08. 31  | -    |
| MULTIFUNCTION AC/DC POWER SOURCE | NETWAVE 30-400        | P1826221268                 | EM TEST         | 2022. 08. 30  | -    |
| Test Program                     | Net.control (V.2.1.6) | EM TEST                     | EM TEST         | -             | -    |
| DTV MODULATOR                    | TVB599A               | 23.53.20.15.09<br>.00.00.23 | TELEVIEW        | 2023. 01. 19  | -    |

### 6.9.3 Test data

Test specifications

Test specification: EN 61000-4-11

Criteria required: B, C, C, C

Overshoot/undershoot

Less than 5 % of the change in voltage

voltage rise and fall time

1  $\mu$ s – 5  $\mu$ s

Phase shifting

0°       180°       360°

Phase relationship of voltage dips and interruptions with the power frequency

Less than + 5°       Less than + 10°

Test Voltage

100 V       220 V       230 V       240 V

Test Frequency

50 Hz       60 Hz

### 6.9.4 Test Result

| Phenomena    | Reduction | Period |       | Criteria | Result |
|--------------|-----------|--------|-------|----------|--------|
|              |           | 50 Hz  | 60 Hz |          |        |
| Voltage Dip  | 100 %     | 1      | 1     | B        | A      |
| Voltage Dip  | 60 %      | 10     | 12    | C        | A      |
| Voltage Dip  | 30 %      | 25     | 30    | C        | A      |
| Interruption | 100 %     | 250    | 300   | C        | C      |

Comment : During the level 100 % with 250 Period test; EUT shut off the power after then EUT return to normal condition by operator.

## 6.10 Harmonics Current

### 6.10.1 Test Procedure

EUT was connected to the Power Analyzer system. Measurements were conducted on all active phases, for harmonics 1-40 th of the mains frequency (50 Hz or 60 Hz). A pure AC main was supplied to the system from two power supply units. The units supply an AC main, free of harmonics or distortion of any kind. An overview of the harmonic emission is presented as numeric.

### 6.10.2 Used equipment

| Equipment                        | Model No.              | Serial No.  | Manufacturer | Next cal date | Used |
|----------------------------------|------------------------|-------------|--------------|---------------|------|
| Harmonics & Flicker Analyzer     | DPA 500                | 0701-05     | EM TEST      | 2023. 01. 19  | -    |
| AC source                        | ACS 500                | 0102-02     | EM TEST      | -             | -    |
| Test Program                     | dpa.control (V5.4.9.0) | None        | EM TEST      | -             | -    |
| MULTIFUNCTION AC/DC POWER SOURCE | NETWAVE 30-400         | P1826221268 | EM TEST      | 2022. 08. 30  | -    |
| THREE-PHASE FLICKER IMPEDANCE    | AIF 503N32.1           | P1826221539 | EM TEST      | 2023. 05. 19  | -    |
| DIGITAL POWER ANALYZER           | DPA 503N               | P1743206206 | EM TEST      | 2022. 11. 19  | -    |
| Test Program                     | net.control (V2.1.1)   | None        | EM TEST      | -             | -    |

### 5.9.3 Test Result

This test don't apply to EUT because EUT's power rating is less than 75 W.



## 6.11 Flicker

### 6.11.1 Test Procedure

EUT was connected to the Power Analyzer system. Measurements were conducted to obtain the desired flicker parameters. The measuring time depends on which parameters are to be measured:

- ◆ 2 hours for Long Time Flicker assessment (Plt)
- ◆ 10 minutes for Short Time Flicker assessment (Pst)
- ◆ 1-10 minutes for Dmax, Dc and Dt assessment (depending on EUT switch-rate)

A pure AC main was supplied to the system from two power supply units. The units supply an AC main, free of harmonics, fluctuations or distortion of any kind. Defined impedance was located between the supply unit and the EUT.

A measurement table and a graphic presentation of the “Worst Case” probability function of Short Time Flicker during this session (if measured) are presented in the report.

Instrumentation used during this session:

### 6.11.2 Used equipment

| Equipment                        | Model No.              | Serial No.  | Manufacturer | Next cal date | Used |
|----------------------------------|------------------------|-------------|--------------|---------------|------|
| Harmonics & Flicker Analyzer     | DPA 500                | 0701-05     | EM TEST      | 2023. 01. 19  | -    |
| AC source                        | ACS 500                | 0102-02     | EM TEST      | -             | -    |
| Test Program                     | dpa.control (V5.4.9.0) | None        | EM TEST      | -             | -    |
| MULTIFUNCTION AC/DC POWER SOURCE | NETWAVE 30-400         | P1826221268 | EM TEST      | 2022. 08. 30  | ●    |
| THREE-PHASE FLICKER IMPEDANCE    | AIF 503N32.1           | P1826221539 | EM TEST      | 2023. 05. 19  | ●    |
| DIGITAL POWER ANALYZER           | DPA 503N               | P1743206206 | EM TEST      | 2022. 11. 19  | ●    |
| Test Program                     | net.control (V2.1.1)   | None        | EM TEST      | -             | ●    |

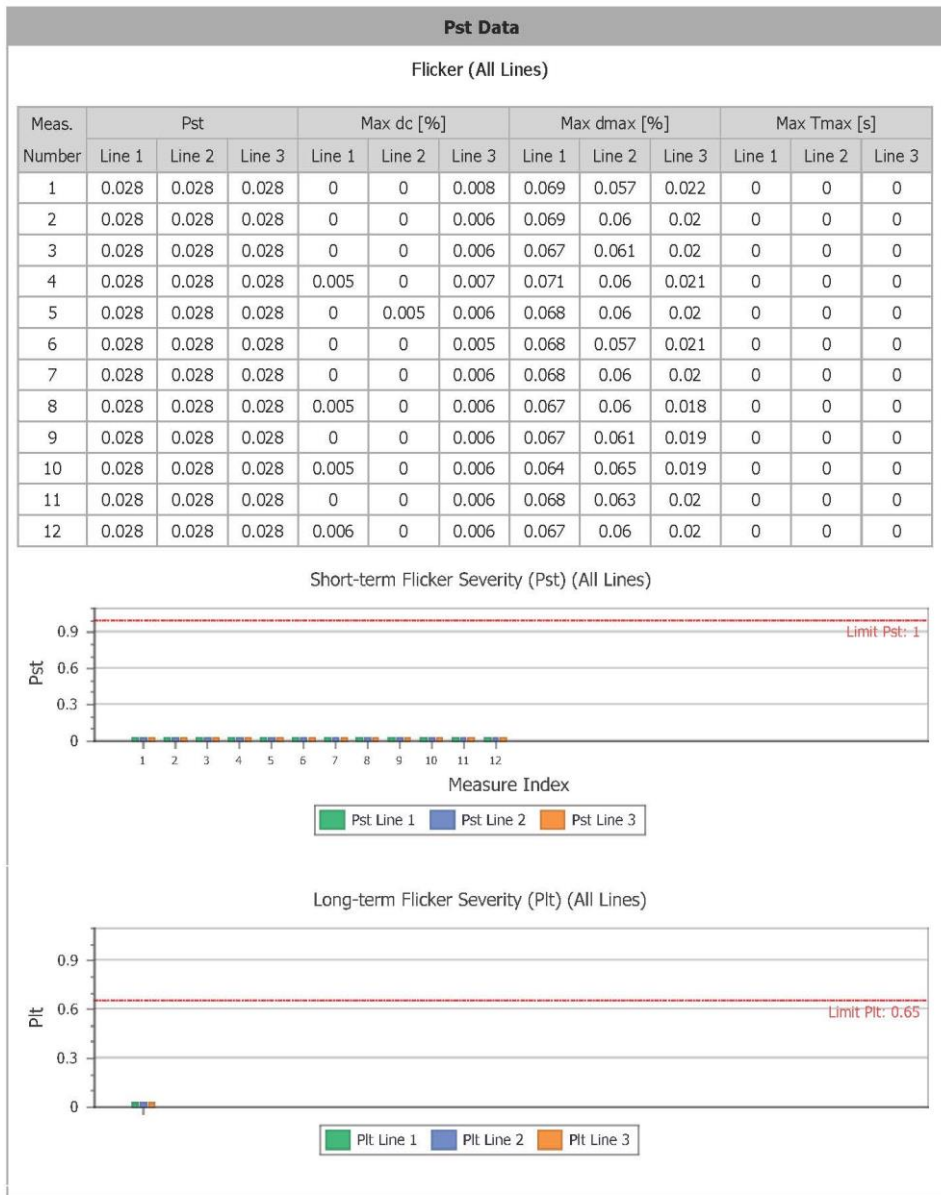
### 6.11.3 Test Result

| <b>Test Report</b> |   |
|--------------------|---|
| Report Number :    | PO-22-0071  |
| Test Standard :    | IEC 61000-3-3 (Edition 3)<br>Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16$ A per phase and not subject to conditional connection |
| Tester :           | E.S.CHOI  |
| Company :          | Kostec Co., Ltd.  |
| Test Date :        | 7/9/2022 2:59:34 PM   |

| <b>Result</b> |             |
|---------------|-------------|
| E.U.T. :      | Test passed |

| Flicker Results   |   |                     |                    |                      |                      |
|---|---|---------------------|--------------------|----------------------|----------------------|
| Standard Specific Results for IEC 61000-3-3 (Edition 3) |   |                     |                    |                      |                      |
| Standard Group:   | Industry  |                     |                    |                      |                      |
| Standard Name:  | IEC 61000-3-3 (Edition 3)<br>Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16$ A per phase and not subject to conditional connection |                     |                    |                      |                      |
| Test Condition:   | General Test Conditions   |                     |                    |                      |                      |
| Analysis Status:  | PASS  |                     |                    |                      |                      |
| Flicker Measurements Settings                           |   |                     |                    |                      |                      |
| Main line:  | 230V, 50Hz  |                     |                    |                      |                      |
| Flicker Meter:  | 230V / 50Hz   |                     |                    |                      |                      |
| Flicker Impedance:                                      | Zref  |                     |                    |                      |                      |
| Observation Time:                                       | 12 x 10 min   |                     |                    |                      |                      |
| Measurements performed:                                 | 12  |                     |                    |                      |                      |
| Flicker Measurements                                    |   |                     |                    |                      |                      |
|   | P <sub>It</sub>   | Max P <sub>st</sub> | Max D <sub>c</sub> | Max D <sub>max</sub> | Max T <sub>max</sub> |
| Line 1:   | 0.028   | 0.028               | 0.006              | < 0.2                | 0                    |
| Line 2:   | 0.028   | 0.028               | 0.005              | < 0.2                | 0                    |
| Line 3:   | 0.028   | 0.028               | 0.008              | < 0.2                | 0                    |
| Limits:   | 0.65  | 1                   | 3.3                | 4                    | 0.5                  |
| Results:  | PASS  | PASS                | PASS               | PASS                 | PASS                 |



## 7. Test Setup and EUT Photographs

Conducted Emission (Front)\_AC Mains



Conducted Emission (Rear)\_AC Mains



Conducted Emission (Front)\_Telecommunication port

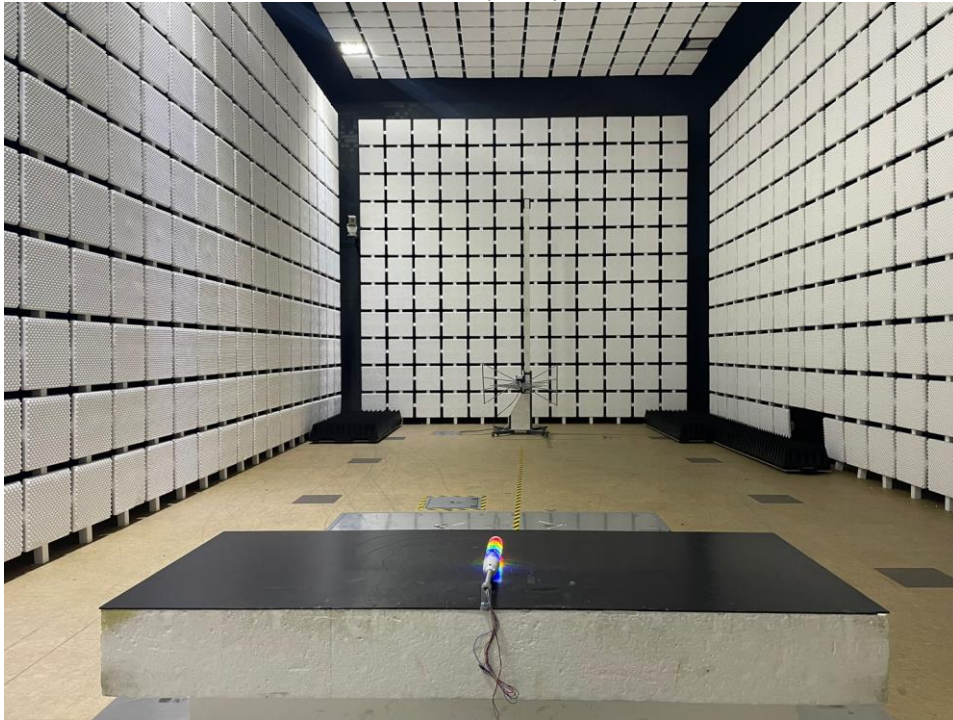
N/A

Conducted Emission (Rear)\_Telecommunication port

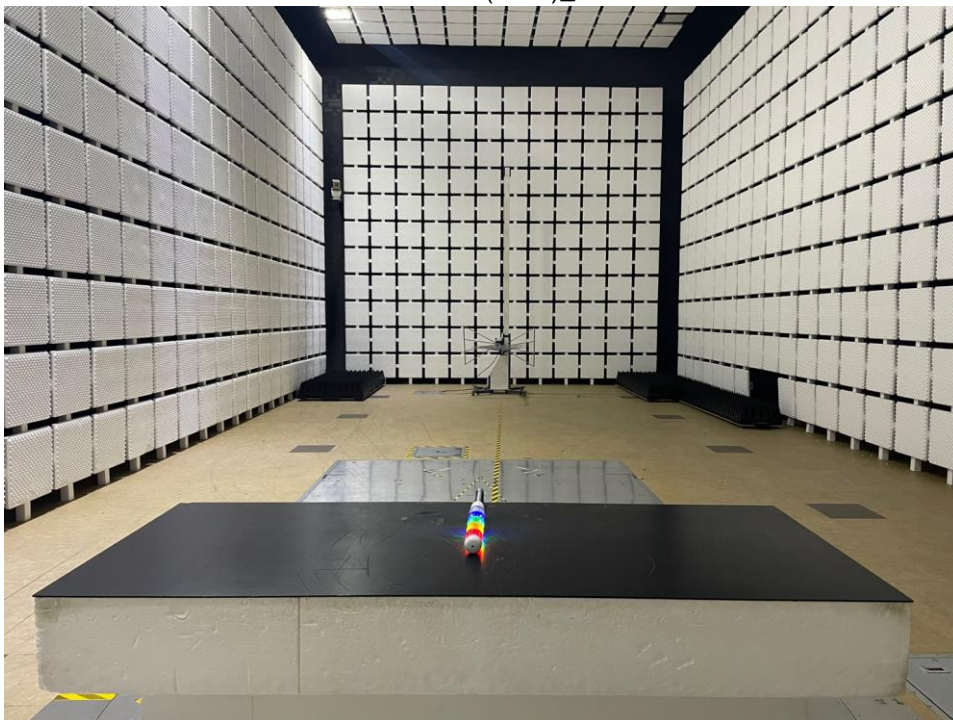
N/A



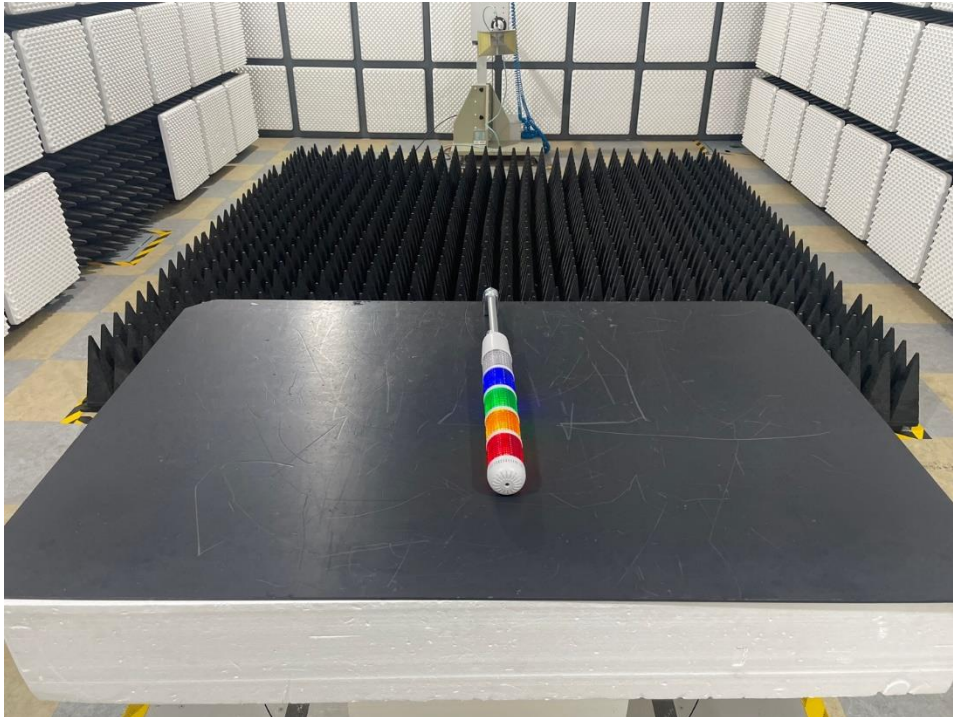
Radiated Emission (Front) \_Below 1 GHz



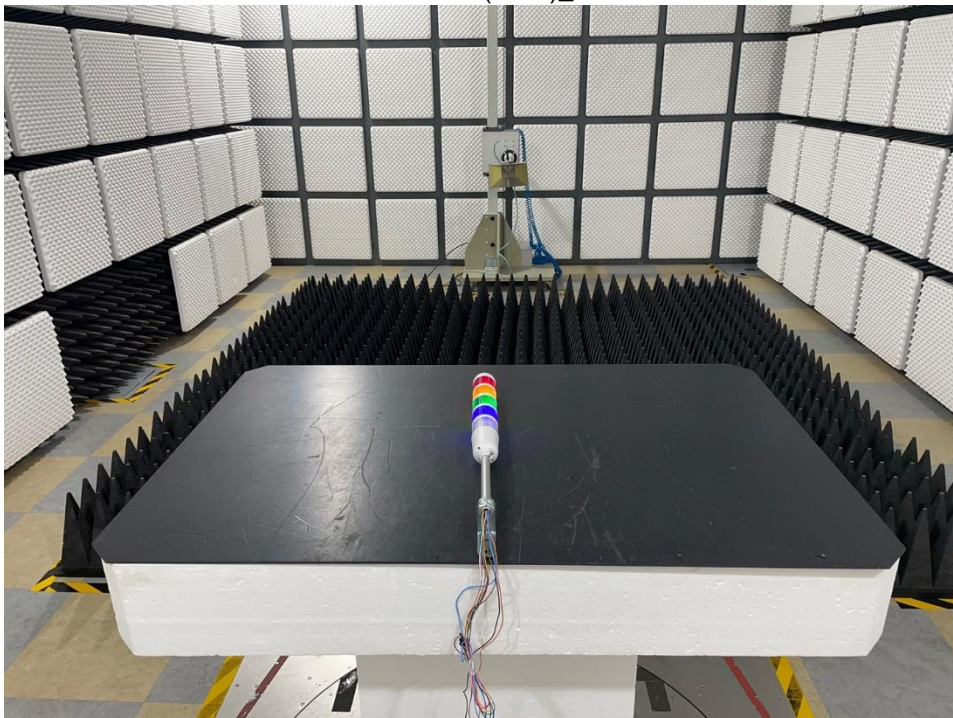
Radiated Emission (Rear) \_Below 1 GHz



Radiated Emission (Front)\_Above 1 GHz

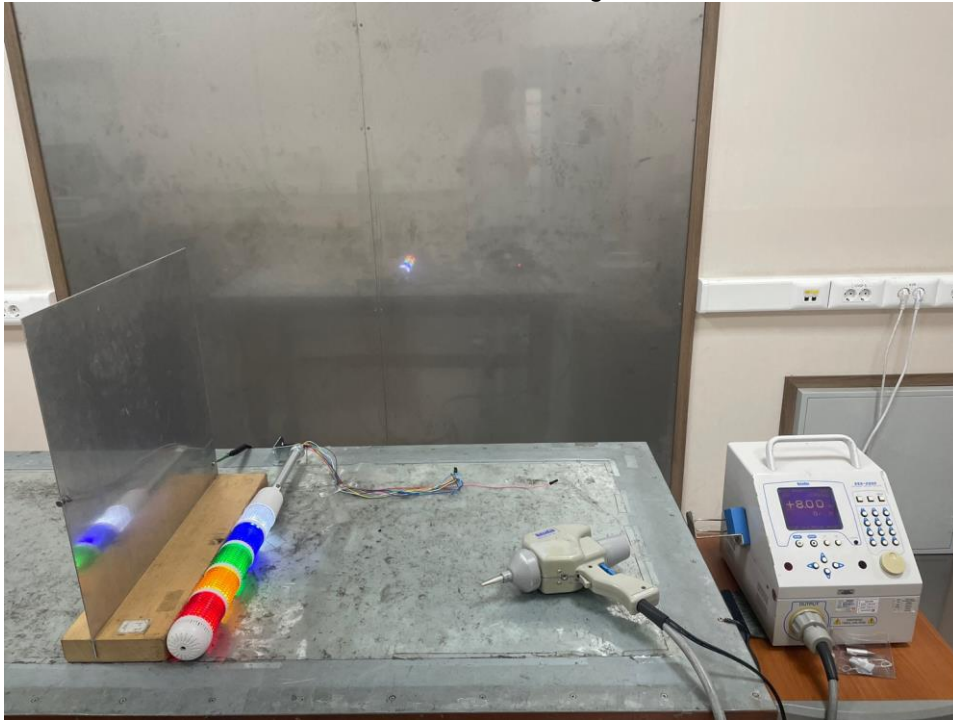


Radiated Emission (Rear)\_Above 1 GHz





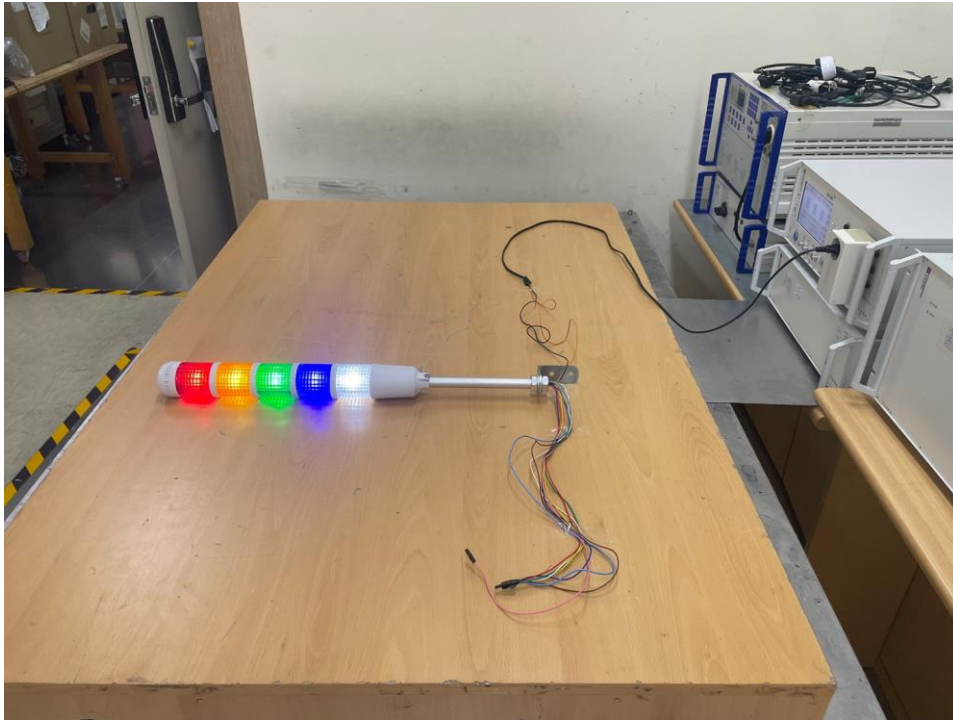
Electrostatic Discharge



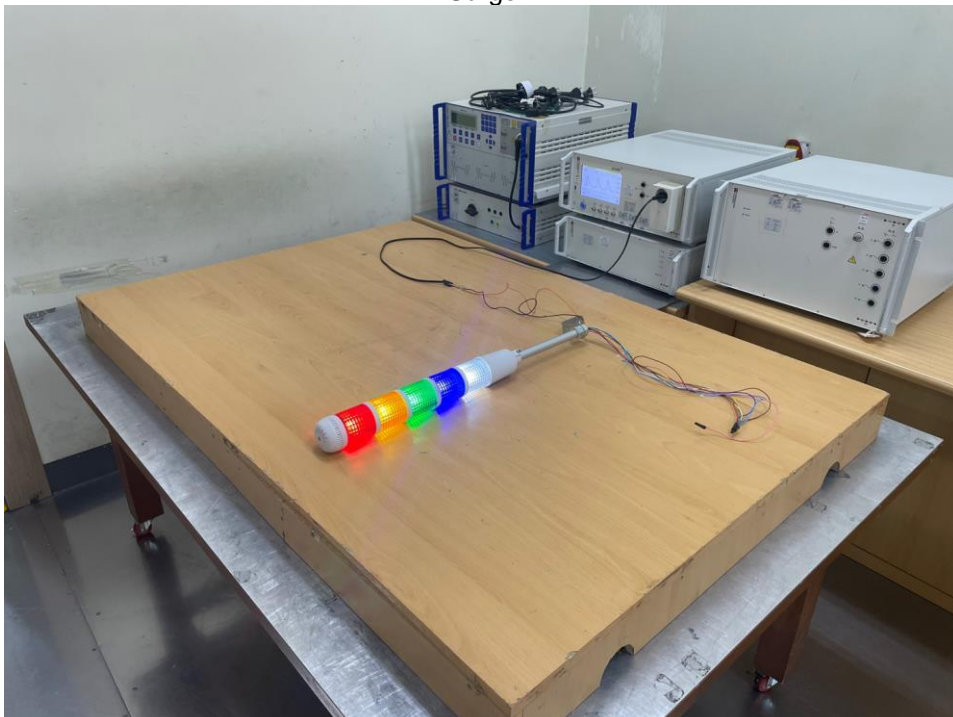
Electromagnetic Field Immunity



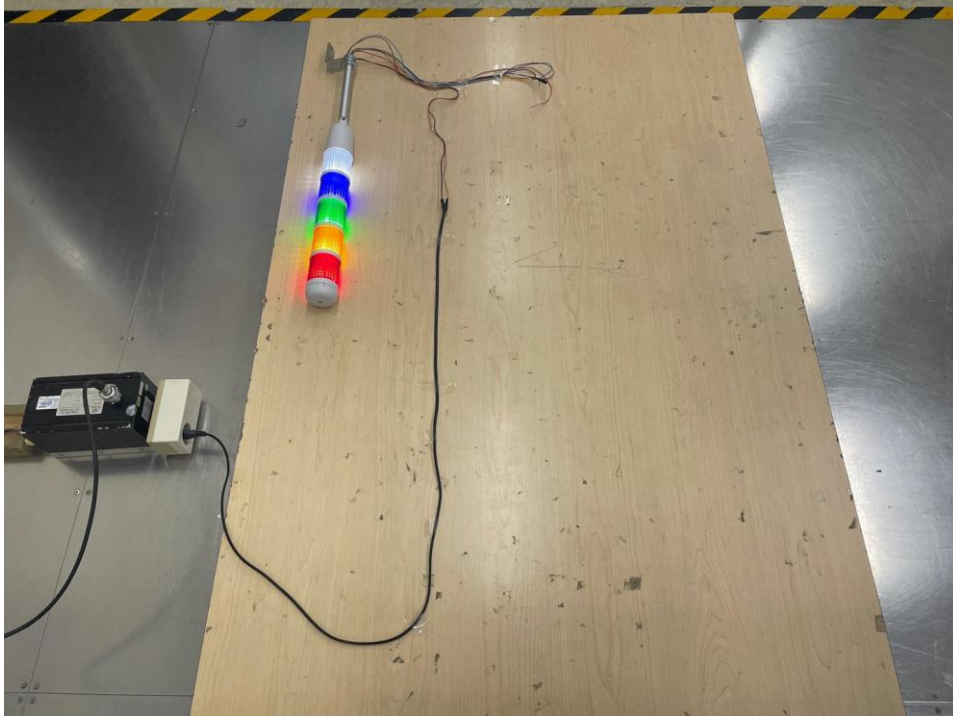
Electrical Fast Transient / Burst



Surge



Conducted Immunity



Magnetic Field Susceptibility

N/A



Voltage Dips & Interruption



Harmonics

N/A

Flicker



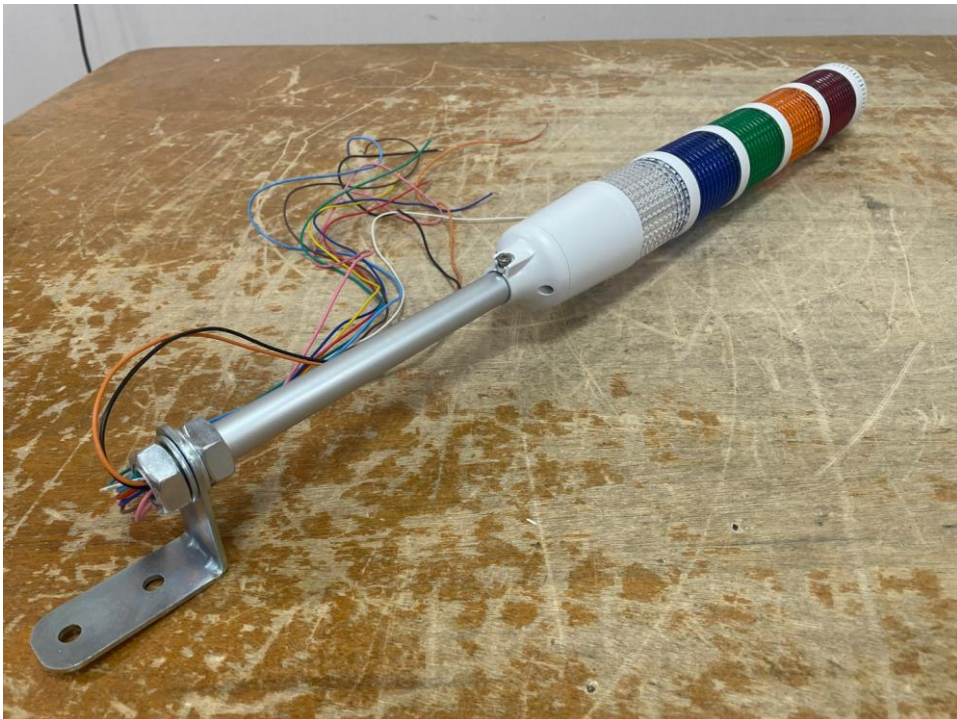
**Blank**

# EUT

Front

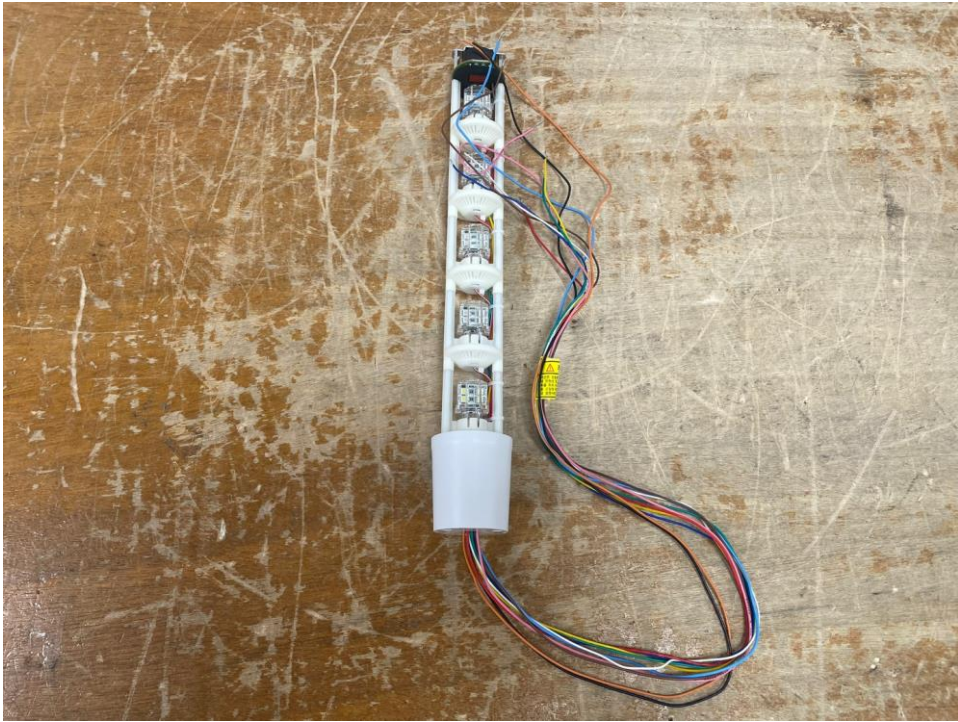


Rear





Inside



Port

