



## EMC TEST REPORT For CE

Test Report No. : KES-E1-18T0434

Date of Issue : Aug. 01, 2018

Product name : 2M LENS Module

Model/Type No. : SLA-2M2800P

Variant Model : -

Applicant : Hanwha Techwin Co., Ltd.

Applicant Address : 6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si,  
Gyeonggi-do, 13488, KOREA

Manufacturer : 1. Hanwha Techwin (Tianjin) Co.,Ltd.  
2. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.  
3. D-TECH CO.,LTD.

Manufacturer Address : 1. No.11 Weiliu Rd, Micro-Electronic Industrial Park, TEDA, Tianjin,  
300385, People's Republic of China  
2. Lot O-2, Que Vo Industrial Zone extended area,  
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam  
3. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do,  
Korea (Suwon Industrial Complex)

Date of Receipt : Jul. 19, 2018

Test date : Jul. 19, 2018 ~ Jul. 24, 2018

Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dae Jung, Choi  
EMC Test Engineer

Reviewed by

Dong-Hun, Jang  
EMC Technical Manager

This test report is not related to KOLAS.

**KES Co., Ltd.**

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**REPORT REVISION HISTORY**

| Date          | Test Report No. | Revision History |
|---------------|-----------------|------------------|
| Aug. 01, 2018 | KES-E1-18T0434  | Issued           |
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## 1.0 General Product Description

### Main Specifications of EUT are:

|                           | <b>SLA-2M2800P</b>                                                             |
|---------------------------|--------------------------------------------------------------------------------|
| <b>Video</b>              |                                                                                |
| Imaging Device            | 1/2.8" 2M CMOS                                                                 |
| Total Pixels              | 1945(H) x 1109(V) 2.16M                                                        |
| Effective Pixels          | 1945(H) x 1097(V) 2.13M                                                        |
| Scanning System           | Progressive Scan                                                               |
| Min. Illumination         | Color : 0.055Lux(F2.0, 1/30sec, 30IRE)<br>B/W : 0.055Lux(F2.0, 1/30sec, 30IRE) |
| S / N Ratio               | 50dB                                                                           |
| Wide Dynamic Range        | 150dB                                                                          |
| Day & Night               | Electrical                                                                     |
| <b>Lens</b>               |                                                                                |
| Focal Length (Zoom Ratio) | 2.8mm                                                                          |
| Max. Aperture Ratio       | F2.0                                                                           |
| Angular Field of View     | H:107.4°, V:62.2°, D:122.0°                                                    |
| Lens Type                 | Fixed focal                                                                    |
| Mount Type                | M12 Lens module with main unit                                                 |
| <b>Pan/Tilt/Rotate</b>    |                                                                                |
| Pan / Tilt / Rotate Range | -90°~+90° / +26~+80° / -180°~+180°                                             |
| <b>Mechanical</b>         |                                                                                |
| Color / Material          | Black / Plastic                                                                |
| Dimension (WxHxD)         | Ø35.5 x 35.9 mm                                                                |
| Weight                    | 30g (0.07 lb)                                                                  |



## 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.

Voltage ☐ 230Vac ☐ 100 Vac ☐ 24 Vac ☐ 12 Vdc ☒ PoE

Frequency ☐ 50 Hz ☐ 60 Hz ☐ Hz

## 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 |
|----------------|--------------|---------------|------------------------------------|---------|
| 2M LENS Module | SLA-2M2800P  | -             | Hanwha Techwin (Tianjin) Co., Ltd. | EUT     |

## 1.5 Support Equipments

| Description    | Model Number     | Serial Number   | Manufacturer                               | Remarks |
|----------------|------------------|-----------------|--------------------------------------------|---------|
| NETWORK CAMERA | PNM-9320VQP      | -               | Hanwha Techwin (Tianjin) Co., Ltd.         | -       |
| PoE Injector   | PT-PSE109GBRO-AH | PT1824010157    | Dongguan PROCET Network Technology Co.,Ltd | -       |
| Notebook       | NT730U3E         | JJRE91CF200065A | Samsung Electronics Co., Ltd.              | -       |
| AC/DC Adaptor  | PA-1600-66       | AD-6019P        | LITEON                                     | -       |
| 2M LENS Module | SLA-2M2400P      | -               | Hanwha Techwin (Tianjin) Co., Ltd.         | 1EA     |
| 2M LENS Module | SLA-2M3600P      | -               | Hanwha Techwin (Tianjin) Co., Ltd.         | 1EA     |
| 2M LENS Module | SLA-2M6000P      | -               | Hanwha Techwin (Tianjin) Co., Ltd.         | 1 EA    |



## 1.6 External I/O Cabling

| Start                |             | END            |             | Cable Spec. |        |
|----------------------|-------------|----------------|-------------|-------------|--------|
| Description          | I/O Port    | Description    | I/O Port    | Length      | Shield |
| 2M LENS Module (EUT) | 40 PIN      | NETWORK CAMERA | 40 PIN      | -           | -      |
| NETWORK CAMERA       | 40 PIN      | 2M LENS Module | 40 PIN      | -           | -      |
|                      | 40 PIN      | 2M LENS Module | 40 PIN      | -           | -      |
|                      | 40 PIN      | 2M LENS Module | 40 PIN      | -           | -      |
|                      | RJ-45 (PoE) | PoE Injector   | RJ-45 (PoE) | 3.0         | U      |
| PoE Injector         | RJ-45 (LAN) | Notebook       | RJ-45 (LAN) | 3.0         | U      |

\* Unshielded=U, Shielded=S

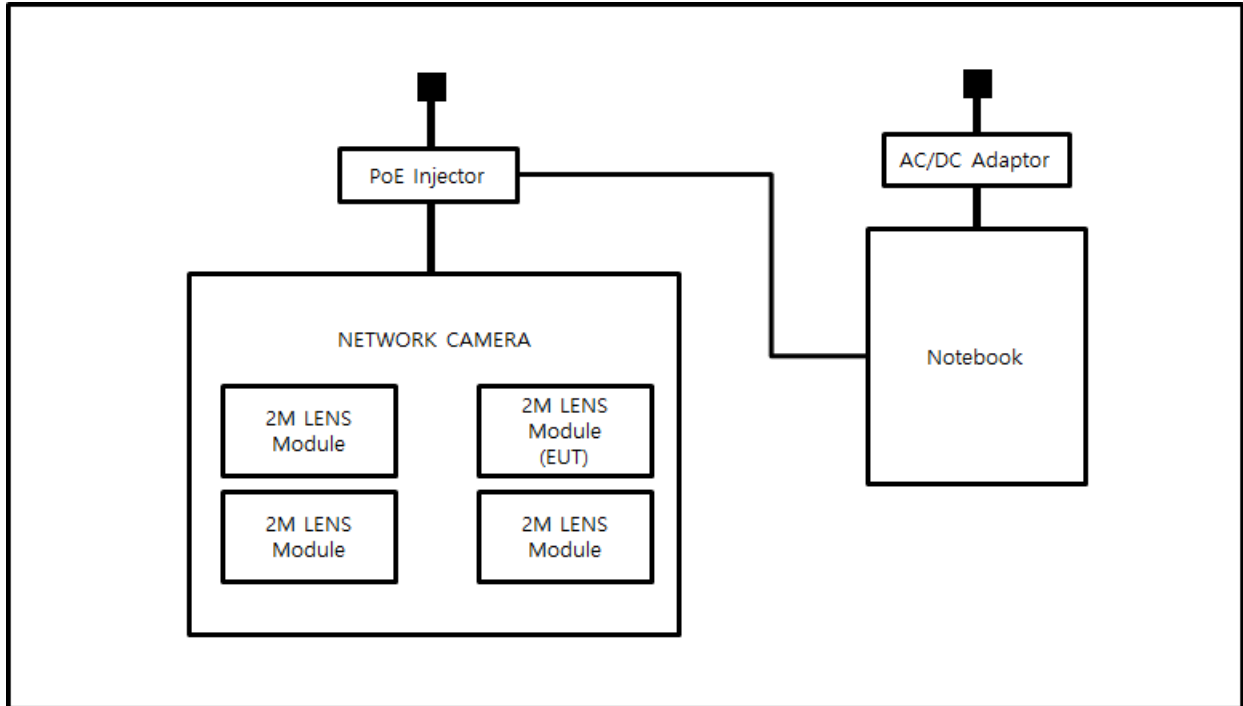
## 1.7 EUT Operating Mode(s)

| Test Mode | operating                   |
|-----------|-----------------------------|
| PoE       | E.U.T Monitoring, Ping Test |

| EUT Test operating S/W |         |                          |
|------------------------|---------|--------------------------|
| Name                   | Version | Manufacture Company      |
| WebViewer              | -       | Hanwha Techwin Co., Ltd. |

## 1.8 Configuration

■ AC Main  
□ DC Main



## 1.9 Remarks when standards applied

N/A

## 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. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2012

## 1.12 Laboratory Accreditations and Listings

| Country       | Agency  | Scope of Accreditation                                                                                                                                                                                        | Logo                                                                                                                      |
|---------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| KOREA         | RRA     | EMI (3 m & 10 m Semi-Aechoic Chamber ,<br>10 m Open Area and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS,<br>Magnetic, Dips and interruptions)                                                 | <br>KR0100                            |
| International | KOLAS   | EMI (3 m & 10 m Semi-Aechoic Chamber ,<br>and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS,<br>Magnetic, Dips and interruptions)                                                                | <br>KT489                            |
| USA           | FCC     | 3 m & 10 m Semi-Aechoic Chamber, 10 m<br>Open Area and Conducted test site to<br>perform FCC Part 15/18 measurements.                                                                                         | <br>KR0100                           |
| Canada        | ISED    | 3 m & 10 m Semi-Aechoic Chamber and<br>Conducted test site                                                                                                                                                    | <br>23298-1                          |
| JAPAN         | VCCI    | Mains Ports Conducted Interference<br>Measurement, Telecommunication Ports<br>Conducted Disturbance Measurement and<br>Radiation 10 meter site, Facility for<br>measuring radiated disturbance above 1<br>GHz | <br>R-4308, C-4798,<br>T-2311, G-914 |
| Europe        | TÜV SÜD | EMI (3 m & 10 m Semi-Aechoic Chamber ,<br>10 m Open Area and conducted test<br>site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS,<br>Magnetic, Dips and interruptions)                                              | <br>CARAT 17 07 01633<br>001         |

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## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1  
☐ Class A

☐ Group 2  
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547:2009

☒ EN 55032:2012/AC:2013

☒ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☐ EN 61326-1:2013



- 
- |                                                               |                                  |                                  |
|---------------------------------------------------------------|----------------------------------|----------------------------------|
| <input type="checkbox"/> <b>VCCI V-3 / 2015.04</b>            | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> <b>AS/NZS CISPR22:2009 +A1:2010</b>  | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> <b>47 CFR Part 15, Subpart B</b>     |                                  |                                  |
| <input type="checkbox"/> CISPR 22:2009 +A1:2010               | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2009                      |                                  |                                  |
| <input type="checkbox"/> <b>IC Regulation ICES-003 : 2016</b> |                                  |                                  |
| <input type="checkbox"/> CAN/CSA CISPR 22-10                  | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2014                      |                                  |                                  |
| <input type="checkbox"/> <b>RE- Directive 2014/53/EU</b>      |                                  |                                  |
| <input type="checkbox"/> EN 301 489-1 V1.9.2                  |                                  |                                  |
| <input type="checkbox"/> Equipment for fixed use              |                                  |                                  |
| <input type="checkbox"/> Equipment for vehicular use          |                                  |                                  |
| <input type="checkbox"/> Equipment for portable use           |                                  |                                  |
| <input type="checkbox"/> EN 301 489-3 V1.6.1                  |                                  |                                  |
| <input type="checkbox"/> EN 301 489-17 V2.2.1                 |                                  |                                  |
| <input type="checkbox"/> EN 60945:2002                        |                                  |                                  |



## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

Jul. 19, 2018

### 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        | 101781        | 04, 25, 2019 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 01, 05, 2019 |
| <input checked="" type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 04, 25, 2019 |
| <input checked="" type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 11, 27, 2018 |
| <input type="checkbox"/>            | LISN              | NNBM8124     | SCHWARZBECK  | 8124-1002     | 08, 07, 2018 |
| <input type="checkbox"/>            | LISN              | NNBM8124     | SCHWARZBECK  | 8124-1003     | 08, 07, 2018 |

### Test Conditions

Temperature: 23,9 °C  
Relative Humidity: 56,7 % 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 Conducted Emissions at Telecommunication Ports

### Test Date

N/A

### Test Location

Electro wave Shieldroom #6

### Test Equipment

| Used                     | Description       | Model Number | Manufacturer | Serial Number | Cal. Due     |
|--------------------------|-------------------|--------------|--------------|---------------|--------------|
| <input type="checkbox"/> | EMI Test S/W      | EMC32        | R & S        | 9.12.00       | -            |
| <input type="checkbox"/> | EMI TEST RECEIVER | ESR3         | R & S        | 101781        | 04, 25, 2019 |
| <input type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 01, 05, 2019 |
| <input type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 04, 25, 2019 |
| <input type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 11, 27, 2018 |
| <input type="checkbox"/> | 8-WIRE ISN CAT3,5 | ENY81        | R & S        | 100174        | 01, 07, 2019 |
| <input type="checkbox"/> | 8-WIRE ISN CAT6   | ENY81-CAT6   | R & S        | 101665        | 01, 07, 2019 |
| <input type="checkbox"/> | CDN               | CDNS502A     | TESEQ        | 40431         | 01, 05, 2019 |

### Test Conditions

Temperature:

°C

Relative Humidity:

% 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

N/A



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

### Test Date

Jul. 20, 2018

### 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        | 04, 11, 2019 |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 714           | 11, 28, 2018 |

### Test Conditions

Temperature: 23,6 °C  
Relative Humidity: 49,5 % 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.



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

### Test Date

Jul. 20, 2018

### Test Location

SEMI ANECHOIC CHAMBER #3

### 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          | ESR7         | R & S            | 101190        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | PREAMPLIFIER               | 8449B        | AGILENT          | 3008A01967    | 05, 31, 2019 |
| <input type="checkbox"/>            | ATTENUATOR                 | 8491A        | HP               | 35496         | 03, 21, 2019 |
| <input checked="" type="checkbox"/> | DOUBLE RIDGED HORN ANTENNA | SAS-571      | A.H.SYSTEM,INC   | 781           | 05, 02, 2019 |

### Test Conditions

Temperature: 23,3 °C  
Relative Humidity: 49,5 % 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.



## 2.5 Harmonic Current Emissions

### Test Date

Jul. 19, 2018

### Test Location

Electro wave Shieldroom #3

### Test Equipment

| Used                                | Description            | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W           | dpa.control  | EM TEST      | 5.4.11.0      | -            |
| <input checked="" type="checkbox"/> | DIGITAL POWER ANALYZER | DPA 500N     | EM TEST      | V1024106759   | 08, 09, 2018 |
| <input checked="" type="checkbox"/> | POWER SOURCE           | ACS 500N6    | EM TEST      | V1024106760   | -            |

### Test Conditions

Temperature: 24,0 °C  
Relative Humidity: 57,1 % R.H.

### Classification of Equipment for Harmonic Current Emissions

- ☒ Class A  
☐ Class B  
☐ Class C(Below 25 W)  
☐ Class C(Above 25 W)  
☐ Class D

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.



## 2.6 Voltage Fluctuations and Flicker

### Test Date

Jul. 19, 2018

### Test Location

Electro wave Shieldroom #3

### Test Equipment

| Used                                | Description            | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W           | dpa.control  | EM TEST      | 5.4.11.0      | -            |
| <input checked="" type="checkbox"/> | DIGITAL POWER ANALYZER | DPA 500N     | EM TEST      | V1024106759   | 08, 08, 2018 |
| <input checked="" type="checkbox"/> | POWER SOURCE           | ACS 500N6    | EM TEST      | V1024106760   | -            |

### Test Conditions

Temperature: 24,0 °C  
Relative Humidity: 57,1 % R.H.

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.

### 3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 Alarm systems-Part 4: Electromagnetic compatibility Product family  
standard: Immunity requirements for components of fire, intruder and social alarm systems

**The variety and the diversity of the apparatus within the scope of this document makes 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 by the manufacture and noted in the test**

**report, based on the following criteria:**

#### **Electrostatic discharge**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing that is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

#### **Radiated electromagnetic fields**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing which could be interpreted by associated equipment as a change, and no such

Flickering of indicators occurs at a field strength of 3 V/m.

For components of CCTV systems, where the picture is allowed at 10 V/m, providing.

(a) there is no permanent damage or change to EUT

(e.g. no corruption of memory or changes to programmable setting etc.)

(b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and

(c) there is no observable deterioration of the picture at 1 V/m.

---

**Fast transient burst / slow high energy voltage surge**

There shall be no damage, malfunction or change of status due to the conditioning.  
Flickering of an indicator during the application of discharge is permissible, providing  
That there is no residual is permissible, providing that there is no residual change in the EUT or  
any  
change in outputs, which could be interpreted by associated equipment as a change.

**Conducted RF immunity**

There shall be no damage, malfunction or change of status due to the conditioning.  
Flickering of an indicator during the application of discharge is permissible, providing  
That there is no residual is permissible, providing that there is no residual change in the EUT or  
any  
change in outputs, which could be interpreted by associated equipment as a change,  
and no such flickering of indicators oeuvres at  $U = 130 \text{ dB}\mu\text{V}$ .  
For component of CCTV systems, where the status is monitored by observing the TV picture,  
then deterioration of the picture is allowed at  $U = 140 \text{ dB}\mu\text{V}$ , providing:  
(a) there is no permanent damage or change to the EUT  
(e.g. no corruption of memory or changes to programmable settings etc.)  
(b) at  $U = 130 \text{ dB}\mu\text{V}$ , any deterioration of the picture is so minor that the system could  
still be used; and  
(c) there in no observable deterioration of the picture at  $U = 120 \text{ dB}\mu\text{V}$ .

**Voltage dip/interruption / Voltage variation**

There shall be no damage, malfunction or change of status due to the conditioning.  
Flickering of an indicator during the conditioning is permissible, providing that there is no  
residual  
change in the EUT or any change in outputs, which could be interpreted by associated  
equipment  
as a change. The EUT shall meet the acceptance criteria for the functional test, after the  
conditioning.

### 3.1 Electrostatic Discharge

#### Reference Standard

EN 61000-4-2:2009

#### Test Date

Jul. 24, 2018

#### Test Location

EMS-ESD: Electro wave Shieldroom #7

#### Test Equipment

| Used                                | Description   | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | ESD SIMULATOR | ESS-2000     | Noise Ken    | ESS01Z0454    | 10, 11, 2018 |
| <input checked="" type="checkbox"/> | HCP           | -            | KES          | -             | -            |
| <input checked="" type="checkbox"/> | VCP           | -            | KES          | -             | -            |

#### Test Conditions

Temperature: 23,5 °C  
Relative Humidity: 57,5 % R.H.  
Atmospheric Pressure: 100,1 kPa

#### Test Specifications

Discharge Factor:  $\geq 1$  s

Discharge Impedance: 330 ohm / 150 pF

Kind of Discharge: Air, Contact (direct and indirect)

Polarity: Positive and Negative

Number of Discharge: 10 at all locations for Air discharge  
10 at all locations for Contact discharge

|                    |                                                                                                                                                                                                 |                                                                                                                                                                                                                   |                                                                                                                                                                                             |                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discharge Voltage: | <b>Contact</b><br><input type="checkbox"/> 2 kV<br><input type="checkbox"/> 4 kV<br><input checked="" type="checkbox"/> 6 kV<br><input type="checkbox"/> 8 kV<br><input type="checkbox"/> 15 kV | <b>Air</b><br><input checked="" type="checkbox"/> 2 kV<br><input checked="" type="checkbox"/> 4 kV<br><input type="checkbox"/> 6 kV<br><input checked="" type="checkbox"/> 8 kV<br><input type="checkbox"/> 15 kV | <b>HCP</b><br><input type="checkbox"/> 2 kV<br><input type="checkbox"/> 4 kV<br><input checked="" type="checkbox"/> 6 kV<br><input type="checkbox"/> 8 kV<br><input type="checkbox"/> 15 kV | <b>VCP</b><br><input type="checkbox"/> 2 kV<br><input type="checkbox"/> 4 kV<br><input checked="" type="checkbox"/> 6 kV<br><input type="checkbox"/> 8 kV<br><input type="checkbox"/> 15 kV |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Notes: HCP: Horizontal coupling plane  
VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

**Location of Discharge:**

|         |
|---------|
| Air     |
| Contact |



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**Test Data****Indirect Discharge**

| No. | Test Point  | Discharge Method  | Observations | Remarks |
|-----|-------------|-------------------|--------------|---------|
| 1   | HCP Contact | Contact Discharge | Complied     | -       |
| 2   | VCP Contact | Contact Discharge | Complied     | -       |

**Direct Discharge**

| No. | Test Point | Discharge Method  | Observations | Remarks |
|-----|------------|-------------------|--------------|---------|
| 1   | Enclosure  | Contact Discharge | Complied     | -       |
| 2   | Enclosure  | Contact Discharge | Complied     | -       |

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria

**Remarks**

N/A

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## 3.2 Radiated Electric Field Immunity

### Reference Standard

EN 61000-4-3:2006 +A2:2010

### Test Date

Jul. 23, 2018

### Test Location

EMS-RS: ☐ SEMI ANECHOIC CHAMBER #2 ☒ SEMI ANECHOIC CHAMBER #3

### Test Equipment

| Used                                | Description                     | Model Number    | Manufacturer    | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------------|-----------------|-----------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W                    | EMC32           | R & S           | 10.10.02      | -            |
| <input checked="" type="checkbox"/> | SIGNAL GENERATOR                | SMB 100A        | R & S           | 177586        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | BROADBAND AMPLIFIER             | BBA100          | R & S           | 101239        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | BROADBAND AMPLIFIER             | 100S1G6M1       | AR              | 579931        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | POWER METER                     | NRP2            | R & S           | 103475        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | AVG POWER SENSOR                | NRP-Z91         | R & S           | 102526        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | AVG POWER SENSOR                | NRP-Z91         | R & S           | 102527        | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | STACKED DOUBLE LOG-PER- ANTENNA | STPL9128 E      | Schwarzbeck     | 9128ES-121    | -            |
| <input checked="" type="checkbox"/> | DIRECTIONAL COUPLER             | KYDC-D1070-DX40 | KY TELECOM      | KY150001      | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | DOUBLE RIDGED HORN ANTENNA      | SAS-571         | A.H.SYSTEM, INC | 781           | 05, 02, 2019 |

### Test Conditions

Temperature: 23,2 °C  
Relative Humidity: 50,3 % R.H.  
Atmospheric Pressure: 99,6 kPa



### Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Field Strength: ☐ 1 V/m ☐ 3 V/m  
☒ 10 V/m

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 1,4 GHz to 2,7 GHz  
☒ 80 MHz to 2,7 GHz

Modulation: ☒ AM, 80 %, 1 kHz sine wave  
☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

# of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

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**Test Data**

| Side Exposed | Observations |          |
|--------------|--------------|----------|
|              | Horizontal   | Vertical |
| Front        | Complied     | Complied |
| Right        | Complied     | Complied |
| Back         | Complied     | Complied |
| Left         | Complied     | Complied |

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria

**Remarks**

N/A

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### 3.3 Electrical Fast Transients/Bursts

#### Reference Standard

EN 61000-4-4:2012

#### Test Date

Jul. 24, 2018

#### Test Location

EMS-EFT: Electro wave Shieldroom #7

#### Test Equipment

| Used                                | Description               | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W              | iec.control  | EM TEST      | 5.4.7         | -            |
| <input checked="" type="checkbox"/> | ULTRA COMPACT SIMULATOR   | UCS 500N7    | EM TEST      | P1608172950   | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | MOTOR VARIAC              | MV2616       | EM TEST      | P1552169719   | 11, 27, 2018 |
| <input type="checkbox"/>            | CAPACITIVE COUPLING CLAMP | HFK          | EM TEST      | P1633183115   | 11, 27, 2018 |

#### Test Conditions

Temperature: 23,5 °C  
Relative Humidity: 57,5 % R.H.  
Atmospheric Pressure: 100,1 kPa

#### Test Specifications

|                                                              |                                                                        |                                              |
|--------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------|
| Pulse Amplitude & Polarity:<br>(AC Power Lines)              | <input type="checkbox"/> ± 1.0 kV<br><input type="checkbox"/> ± 4.0 kV | <input checked="" type="checkbox"/> ± 2.0 kV |
| Pulse Amplitude & Polarity:<br>(Other supply / Signal Lines) | <input type="checkbox"/> ± 0.5 kV<br><input type="checkbox"/> ± 2.0 kV | <input checked="" type="checkbox"/> ± 1.0 kV |
| Burst Period:                                                | <input checked="" type="checkbox"/> 300 ms                             | <input type="checkbox"/> 2 s                 |
| Repetition Rate:                                             | <input type="checkbox"/> 5 klz                                         | <input checked="" type="checkbox"/> 100 klz  |
| Duration of Test Voltage:                                    | <input checked="" type="checkbox"/> ≥ 1 min                            |                                              |
| Required Performance Criteria:                               | <input checked="" type="checkbox"/> Complied                           |                                              |

### Test Data

☒ Input a.c. power ports – Coupling/Decoupling Network used

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Burst (kV) | (-) Burst (kV) |
| L – N – PE          | Complied       | Complied       |

☐ Input d.c. power ports – Coupling/Decoupling Network used

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Burst (kV) | (-) Burst (kV) |
| -                   | -              | -              |

☐ Signal ports and telecommunication ports – Coupling Clamp used

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Burst (kV) | (-) Burst (kV) |
| -                   | -              | -              |

Note: “Blank” = Not performed

Observations:

Complied – No degradation of function

### Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

### Remarks

N/A



## 3.4 Surge Transients

### Reference Standard

EN 61000-4-5:2014

### Test Date

Jul. 24, 2018

### Test Location

EMS-Surge: Electro wave Shieldroom #7

### Test Equipment

| Used                                | Description             | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|-------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W            | iec.control  | EM TEST      | 5.4.7         | -            |
| <input checked="" type="checkbox"/> | ULTRA COMPACT SIMULATOR | UCS 500N7    | EM TEST      | P1608172950   | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | MOTOR VARIAC            | MV2616       | EM TEST      | P1552169719   | 11, 27, 2018 |
| <input type="checkbox"/>            | CDN                     | CNV 508N1    | EM TEST      | P1610176296   | 11, 28, 2018 |
| <input type="checkbox"/>            | CDN                     | CNV 504N7.3  | EM TEST      | P1744207079   | 12, 18, 2018 |

### Test Conditions

Temperature: 23,5 °C  
Relative Humidity: 57,5 % R.H.  
Atmospheric Pressure: 100,1 kPa



## Test Specifications

### AC Power Lines

Source Impedance: 12 ohm for common Mode and 2 ohm for differential Mode

Surge Amplitude : Common Mode  
☒ (0,5 / 1,0 / 2,0) kV  
Differential Mode  
☒ (0,5 / 1,0) kV

Number of Surges: ☒ 5 surges per angle

Angle: ☒ 0°, 90°, 180°, 270° (input a.c. power port)

Polarity: ☒ Positive & Negative

Repetition Rate: ☐ 1 surge per min ☒ 1 surge per 30 sec.

Required Performance Criteria: ☒ Complied

### Other supply / Signal Lines

Source Impedance: 42 ohm for common Mode

Surge Amplitude: Common Mode  
☐ (0,5 / 1,0) kV

Number of Surges: ☐ 5 Surges

Polarity: ☐ Positive & Negative

Repetition Rate: ☐ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☐ Complied

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**Test Data**

☒ Line to Line – Differential Mode

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Surge (kV) | (-) Surge (kV) |
| L – N               | Complied       | Complied       |

☒ Line to Earth – Common Mode

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Surge (kV) | (-) Surge (kV) |
| L – PE              | Complied       | Complied       |
| N – PE              | Complied       | Complied       |

**Signal Lines**

☐ Line to Earth – Common Mode

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Surge (kV) | (-) Surge (kV) |
| -                   | -              | -              |

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

**Remarks**

N/A

### 3.5 Conducted Disturbance

#### Reference Standard

EN 61000-4-6:2014

#### Test Date

Jul. 19, 2018

#### Test Location

EMS-CS: Electro wave Shieldroom #6

#### Test Equipment

| Used                                | Description               | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W              | icd.control  | EM TEST      | 5.3.11        | -            |
| <input checked="" type="checkbox"/> | CONTINUOUS WAVE SIMULATOR | CWS 500N1.4  | EM TEST      | P1602169880   | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | ATTENUATOR                | ATT 6/80     | EM TEST      | P1614178148   | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | CDN                       | CDN M016     | TESEQ        | 43694         | 11, 27, 2018 |
| <input type="checkbox"/>            | CDN                       | CDN M016     | TESEQ        | 43697         | 11, 27, 2018 |
| <input type="checkbox"/>            | CDN                       | CDN T800     | TESEQ        | 42800         | 11, 27, 2018 |
| <input type="checkbox"/>            | EM CLAMP                  | KEMZ 801A    | TESEQ        | 44099         | 11, 28, 2018 |

#### Test Conditions

Temperature: 23,9 °C  
Relative Humidity: 56,7 % R.H.  
Atmospheric Pressure: 100,1 kPa

#### Test Specifications

Frequency range: ☒ 150 kHz to 100 MHz ☐ 150 kHz to 80 MHz

Voltage Level: ☐ 1 Vrms ☐ 3 Vrms  
☒ 10 Vrms

Modulation: ☒ AM, 80 %, 1 kHz sine wave  
☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ Complied

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**Test Data**

☒ Input a.c. power ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| L – N -PE                            | CDN             | Complied     |

☐ Input d.c. power ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| -                                    | -               | -            |

☐ Signal ports and telecommunication ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| -                                    | -               | -            |

Notes: CDN = Coupling Decoupling Network  
"blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria

**Remarks**

N/A



### 3.6 Voltage Dips and Short Interruptions

#### Reference Standard

EN 61000-4-11:2004

#### Test Date

Jul. 24, 2018

#### Test Location

EMS-Voltage dip: Electro wave Shieldroom #7

#### Test Equipment

| Used                                | Description             | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|-------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W            | iec.control  | EM TEST      | 5.4.7         | -            |
| <input checked="" type="checkbox"/> | ULTRA COMPACT SIMULATOR | UCS 500N7    | EM TEST      | P1608172950   | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | MOTOR VARIAC            | MV2616       | EM TEST      | P1552169719   | 11, 27, 2018 |

#### Test Conditions

Temperature: 23,5 °C  
Relative Humidity: 57,5 % R.H.  
Atmospheric Pressure: 100,1 kPa

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**Test Specifications & Observations/Remarks**

(Test Voltage : 230 V (ac) )

| <u>Test Level</u>                             | <u>Duration [in period/ms (50 Hz)]</u>          | <u>Results</u>  |
|-----------------------------------------------|-------------------------------------------------|-----------------|
| <input checked="" type="checkbox"/> 20 % dip  | <input checked="" type="checkbox"/> 250 / 5 000 | <u>Complied</u> |
| <input checked="" type="checkbox"/> 30 % dip  | <input checked="" type="checkbox"/> 25 / 500    | <u>Complied</u> |
| <input checked="" type="checkbox"/> 60 % dip  | <input checked="" type="checkbox"/> 10 / 200    | <u>Complied</u> |
| <input checked="" type="checkbox"/> 100 % dip | <input checked="" type="checkbox"/> 250 / 5 000 | <u>Complied</u> |

- Voltage variations

|                                                 |                                                  |                 |
|-------------------------------------------------|--------------------------------------------------|-----------------|
| <input checked="" type="checkbox"/> Unom + 10 % | <input checked="" type="checkbox"/> 253.0 V (ac) | <u>Complied</u> |
| <input checked="" type="checkbox"/> Unom - 15 % | <input checked="" type="checkbox"/> 195.5 V (ac) | <u>Complied</u> |

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria  
☐ NOT APPLICABLE

**Remarks**

PASS Required Performance Criteria.

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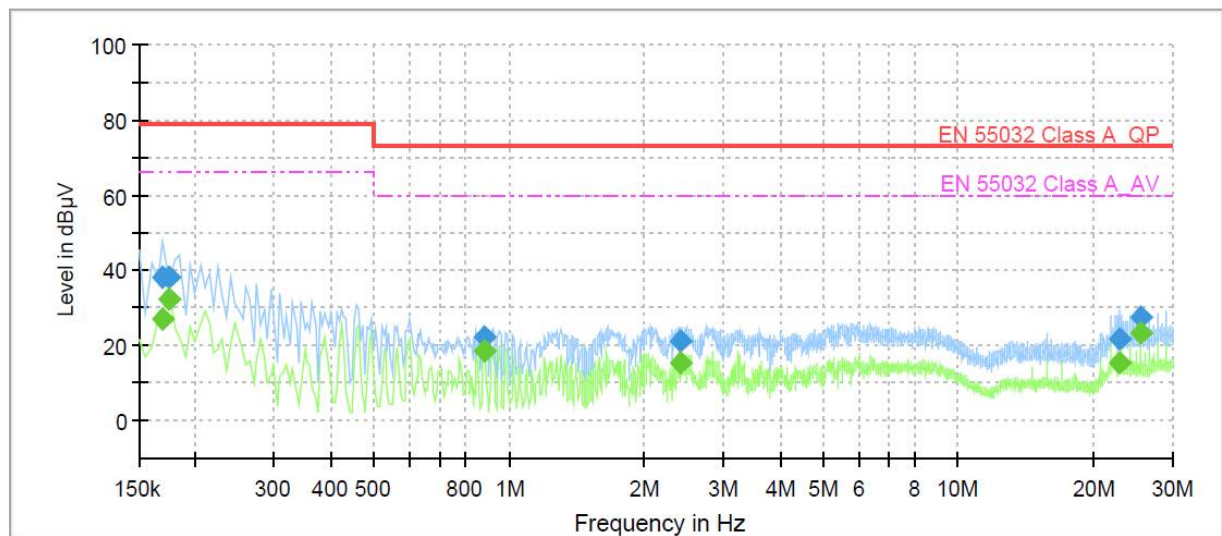
## APPENDIX A – TEST DATA

### Conducted Emissions at Mains Power Ports

[HOT]

#### Common Information

Test Description: Conducted Emission  
Model No.: SLA-2M2800P  
Mode: H  
Operator Name: KES



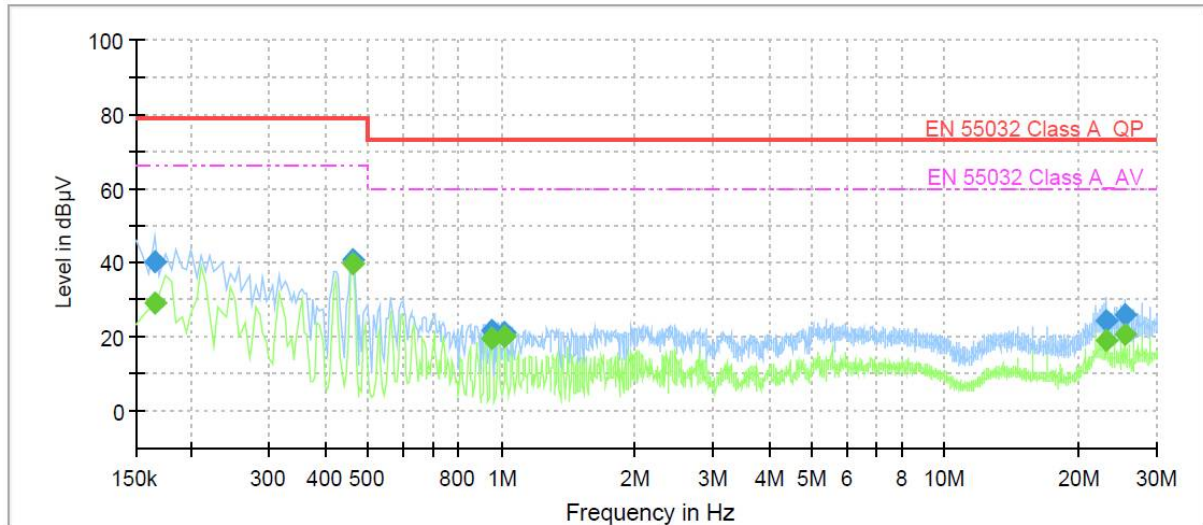
#### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.170000        | ---              | 27.23           | 66.00        | 38.77       | 1000.0          | 9.000           | L1   | 19.3       |
| 0.170000        | 37.91            | ---             | 79.00        | 41.09       | 1000.0          | 9.000           | L1   | 19.3       |
| 0.175000        | ---              | 32.12           | 66.00        | 33.88       | 1000.0          | 9.000           | L1   | 19.3       |
| 0.175000        | 38.06            | ---             | 79.00        | 40.94       | 1000.0          | 9.000           | L1   | 19.3       |
| 0.885000        | ---              | 18.52           | 60.00        | 41.48       | 1000.0          | 9.000           | L1   | 19.9       |
| 0.885000        | 22.15            | ---             | 73.00        | 50.85       | 1000.0          | 9.000           | L1   | 19.9       |
| 2.405000        | ---              | 15.47           | 60.00        | 44.53       | 1000.0          | 9.000           | L1   | 20.1       |
| 2.405000        | 21.36            | ---             | 73.00        | 51.64       | 1000.0          | 9.000           | L1   | 20.1       |
| 22.790000       | ---              | 15.61           | 60.00        | 44.39       | 1000.0          | 9.000           | L1   | 20.3       |
| 22.790000       | 21.50            | ---             | 73.00        | 51.50       | 1000.0          | 9.000           | L1   | 20.3       |
| 25.430000       | ---              | 23.09           | 60.00        | 36.91       | 1000.0          | 9.000           | L1   | 20.4       |
| 25.430000       | 27.38            | ---             | 73.00        | 45.62       | 1000.0          | 9.000           | L1   | 20.4       |

## [ NEUTRAL ]

### Common Information

Test Description: Conducted Emission  
Model No.: SLA-2M2800P  
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) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.165000        | ---              | 29.37           | 66.00        | 36.63       | 1000.0          | 9.000           | N    | 19.3       |
| 0.165000        | 40.47            | ---             | 79.00        | 38.53       | 1000.0          | 9.000           | N    | 19.3       |
| 0.460000        | ---              | 39.46           | 66.00        | 26.54       | 1000.0          | 9.000           | N    | 19.6       |
| 0.460000        | 40.53            | ---             | 79.00        | 38.47       | 1000.0          | 9.000           | N    | 19.6       |
| 0.950000        | ---              | 19.62           | 60.00        | 40.38       | 1000.0          | 9.000           | N    | 19.9       |
| 0.950000        | 21.72            | ---             | 73.00        | 51.28       | 1000.0          | 9.000           | N    | 19.9       |
| 1.020000        | ---              | 19.93           | 60.00        | 40.07       | 1000.0          | 9.000           | N    | 20.0       |
| 1.020000        | 21.44            | ---             | 73.00        | 51.56       | 1000.0          | 9.000           | N    | 20.0       |
| 23.000000       | ---              | 19.05           | 60.00        | 40.95       | 1000.0          | 9.000           | N    | 20.4       |
| 23.000000       | 24.17            | ---             | 73.00        | 48.83       | 1000.0          | 9.000           | N    | 20.4       |
| 25.430000       | ---              | 20.55           | 60.00        | 39.45       | 1000.0          | 9.000           | N    | 20.4       |
| 25.430000       | 26.17            | ---             | 73.00        | 46.83       | 1000.0          | 9.000           | N    | 20.4       |

#### ◆ 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))



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**Conducted Emissions at Telecommunication Ports**

**[10 Mbps]**

N/A

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**[1 000 Mbps]**

N/A

◆ 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 (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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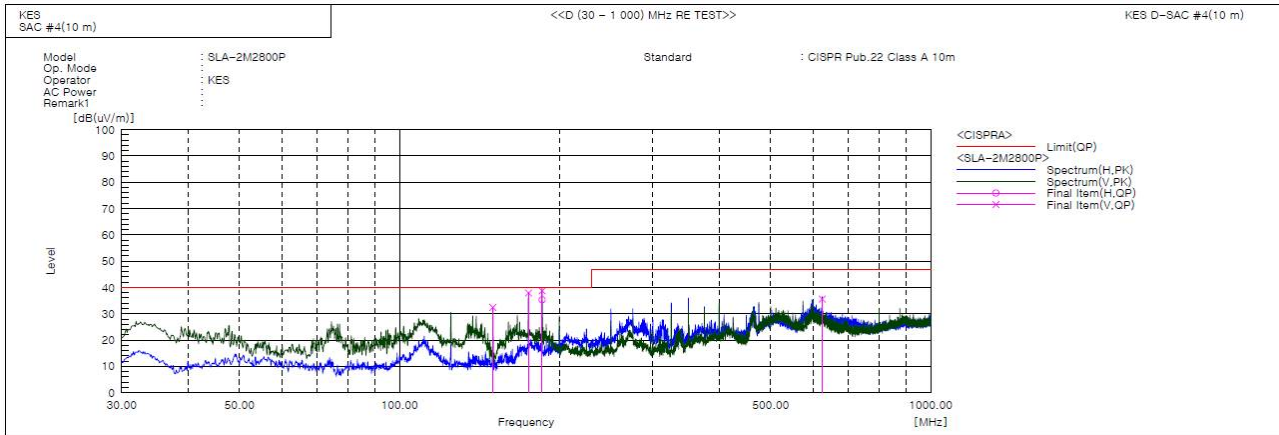
3701, 40, Simin-daero 365beon-gil,  
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea  
Tel: +82-31-425-6200 / Fax: +82-31-424-0450  
www.kes.co.kr

Test report No.:

KES-E1-18T0434

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



#### 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   | 149.918            | V   | 64.5                      | -32.1            | 32.4                       | 40.0                      | 7.6                  | 101.0          | 191.0          |        |
| 2   | 175.014            | V   | 68.8                      | -30.9            | 37.9                       | 40.0                      | 2.1                  | 102.0          | 175.0          |        |
| 3   | 185.569            | V   | 68.1                      | -29.4            | 38.7                       | 40.0                      | 1.3                  | 100.0          | 214.0          |        |
| 4   | 185.636            | H   | 64.7                      | -29.4            | 35.3                       | 40.0                      | 4.7                  | 397.0          | 150.0          |        |
| 5   | 624.979            | V   | 51.3                      | -15.7            | 35.6                       | 47.0                      | 11.4                 | 169.0          | 294.0          |        |

#### ◆ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)

Result(QP) [dB( $\mu$ V/m)] = (Reading(QP)[dB( $\mu$ V)] + c.f[dB(1/m)]

Margin(QP)[dB] = Limit[dB( $\mu$ V/m)] - Result(QP) [dB( $\mu$ V/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

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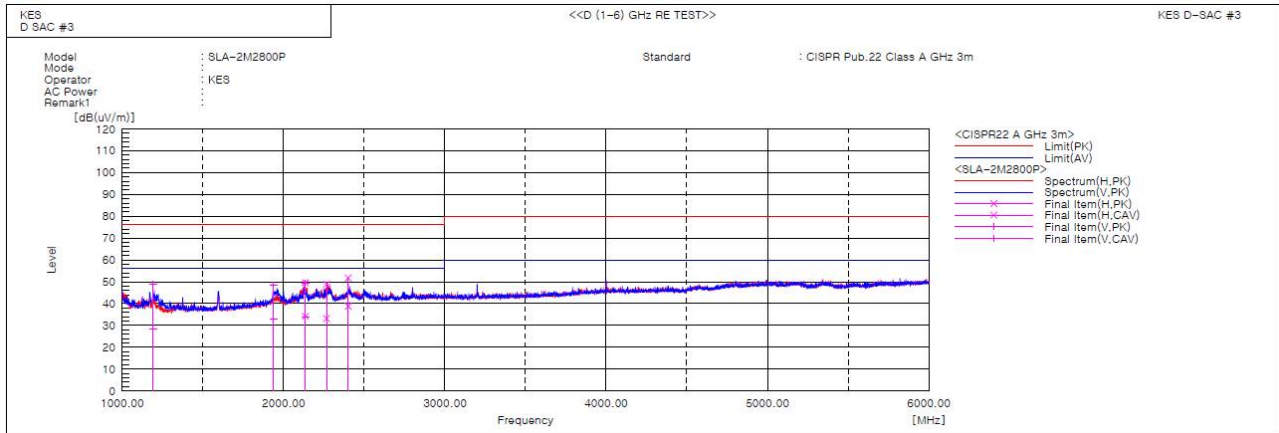
3701, 40, Simin-daero 365beon-gil,  
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea  
Tel: +82-31-425-6200 / Fax: +82-31-424-0450  
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KES-EI-18T0434

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## Radiated Electric Field Emissions(Above 1 GHz)



### Final Result

| No. | Frequency [MHz] | (P) | Reading PK [dB(uV)] | Reading CAV [dB(uV)] | c.f [dB(1/m)] | Result PK [dB(uV/m)] | Result CAV [dB(uV/m)] | Limit PK [dB(uV/m)] | Limit AV [dB(uV/m)] | Margin PK [dB] | Margin CAV [dB] | Height [cm] | Angle [deg] | Remark |
|-----|-----------------|-----|---------------------|----------------------|---------------|----------------------|-----------------------|---------------------|---------------------|----------------|-----------------|-------------|-------------|--------|
| 1   | 1191.781        | V   | 54.8                | 34.6                 | -6.1          | 48.7                 | 28.5                  | 76.0                | 56.0                | 27.3           | 27.5            | 100.0       | 2.5         |        |
| 2   | 1938.004        | V   | 49.5                | 34.0                 | -1.0          | 48.5                 | 33.0                  | 76.0                | 56.0                | 27.5           | 23.0            | 100.0       | 354.4       |        |
| 3   | 2135.099        | H   | 49.4                | 34.1                 | 0.1           | 49.5                 | 34.2                  | 76.0                | 56.0                | 26.5           | 21.8            | 100.0       | 236.4       |        |
| 4   | 2136.338        | V   | 49.4                | 33.9                 | 0.1           | 49.5                 | 34.0                  | 76.0                | 56.0                | 26.5           | 22.0            | 100.0       | 88.8        |        |
| 5   | 2266.302        | H   | 48.1                | 32.3                 | 0.8           | 48.9                 | 33.1                  | 76.0                | 56.0                | 27.1           | 22.9            | 100.0       | 329.1       |        |
| 6   | 2400.480        | H   | 50.5                | 37.5                 | 1.3           | 51.8                 | 38.8                  | 76.0                | 56.0                | 24.2           | 17.2            | 100.0       | 302.8       |        |

### ◆ 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

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**Harmonic Current Emissions and Voltage Fluctuations and Flicker****Average harmonic current results**

| Hn | I <sub>eff</sub> [A] | % of Limit | Limit [A] | Result |
|----|----------------------|------------|-----------|--------|
| 1  | 118.779E-3           |            |           |        |
| 2  | 2.763E-3             |            |           | PASS   |
| 3  | 110.351E-3           | 4.798      | 2.30      | PASS   |
| 4  | 4.348E-3             |            |           | PASS   |
| 5  | 106.187E-3           | 9.315      | 1.14      | PASS   |
| 6  | 3.415E-3             |            |           | PASS   |
| 7  | 100.345E-3           | 13.032     | 770.00E-3 | PASS   |
| 8  | 3.621E-3             |            |           | PASS   |
| 9  | 92.181E-3            | 23.045     | 400.00E-3 | PASS   |
| 10 | 4.103E-3             |            |           | PASS   |
| 11 | 83.584E-3            | 25.328     | 330.00E-3 | PASS   |
| 12 | 3.104E-3             |            |           | PASS   |
| 13 | 74.176E-3            | 35.322     | 210.00E-3 | PASS   |
| 14 | 2.629E-3             |            |           | PASS   |
| 15 | 63.770E-3            | 42.513     | 150.00E-3 | PASS   |
| 16 | 2.087E-3             |            |           | PASS   |
| 17 | 53.310E-3            | 40.280     | 132.35E-3 | PASS   |
| 18 | 1.820E-3             |            |           | PASS   |
| 19 | 42.755E-3            | 36.105     | 118.42E-3 | PASS   |
| 20 | 1.486E-3             |            |           | PASS   |
| 21 | 32.832E-3            | 20.430     | 160.71E-3 | PASS   |
| 22 | 971.041E-6           |            |           | PASS   |
| 23 | 24.405E-3            | 16.631     | 146.74E-3 | PASS   |
| 24 | 840.681E-6           |            |           | PASS   |
| 25 | 16.819E-3            | 12.459     | 135.00E-3 | PASS   |
| 26 | 720.561E-6           |            |           | PASS   |
| 27 | 10.212E-3            | 8.170      | 124.99E-3 | PASS   |
| 28 | 790.890E-6           |            |           | PASS   |
| 29 | 5.402E-3             | 4.642      | 116.39E-3 | PASS   |
| 30 | 698.495E-6           |            |           | PASS   |
| 31 | 2.562E-3             |            |           | PASS   |
| 32 | 600.526E-6           |            |           | PASS   |
| 33 | 2.793E-3             |            |           | PASS   |
| 34 | 693.398E-6           |            |           | PASS   |
| 35 | 4.273E-3             |            |           | PASS   |
| 36 | 641.377E-6           |            |           | PASS   |
| 37 | 4.860E-3             |            |           | PASS   |
| 38 | 726.086E-6           |            |           | PASS   |
| 39 | 4.664E-3             |            |           | PASS   |
| 40 | 707.266E-6           |            |           | PASS   |

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.



## Test Data - Harmonics (continued)

**Maximum harmonic current results**

| Hn | I <sub>eff</sub> [A] | % of Limit | Limit [A] | Result |
|----|----------------------|------------|-----------|--------|
| 1  | 118.957E-3           |            |           |        |
| 2  | 3.180E-3             |            |           | PASS   |
| 3  | 110.541E-3           | 3.204      | 3.45      | PASS   |
| 4  | 4.842E-3             |            |           | PASS   |
| 5  | 106.386E-3           | 6.221      | 1.71      | PASS   |
| 6  | 3.833E-3             |            |           | PASS   |
| 7  | 100.494E-3           | 8.701      | 1.15      | PASS   |
| 8  | 4.047E-3             |            |           | PASS   |
| 9  | 92.352E-3            | 15.392     | 600.00E-3 | PASS   |
| 10 | 4.554E-3             |            |           | PASS   |
| 11 | 83.796E-3            | 16.928     | 495.00E-3 | PASS   |
| 12 | 3.532E-3             |            |           | PASS   |
| 13 | 74.371E-3            | 23.610     | 315.00E-3 | PASS   |
| 14 | 3.055E-3             |            |           | PASS   |
| 15 | 63.998E-3            | 28.443     | 225.00E-3 | PASS   |
| 16 | 2.433E-3             |            |           | PASS   |
| 17 | 53.476E-3            | 26.937     | 198.52E-3 | PASS   |
| 18 | 2.091E-3             |            |           | PASS   |
| 19 | 42.975E-3            | 24.194     | 177.63E-3 | PASS   |
| 20 | 1.753E-3             |            |           | PASS   |
| 21 | 33.035E-3            | 20.555     | 160.71E-3 | PASS   |
| 22 | 1.190E-3             |            |           | PASS   |
| 23 | 24.671E-3            | 16.812     | 146.74E-3 | PASS   |
| 24 | 947.851E-6           |            |           | PASS   |
| 25 | 16.997E-3            | 12.591     | 135.00E-3 | PASS   |
| 26 | 855.378E-6           |            |           | PASS   |
| 27 | 10.336E-3            | 8.269      | 124.99E-3 | PASS   |
| 28 | 938.570E-6           |            |           | PASS   |
| 29 | 5.504E-3             | 4.729      | 116.39E-3 | PASS   |
| 30 | 784.041E-6           |            |           | PASS   |
| 31 | 2.661E-3             |            |           | PASS   |
| 32 | 663.406E-6           |            |           | PASS   |
| 33 | 2.894E-3             |            |           | PASS   |
| 34 | 772.069E-6           |            |           | PASS   |
| 35 | 4.374E-3             |            |           | PASS   |
| 36 | 704.055E-6           |            |           | PASS   |
| 37 | 4.998E-3             |            |           | PASS   |
| 38 | 824.267E-6           |            |           | PASS   |
| 39 | 4.780E-3             |            |           | PASS   |
| 40 | 790.833E-6           |            |           | PASS   |

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.



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KES-E1-18T0434  
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### Test Data - Voltage Fluctuations

## Maximum Flicker results

|          | <b>EUT values</b> | <b>Limit</b> | <b>Result</b> |
|----------|-------------------|--------------|---------------|
| Pst      | 0.028             | 1.00         | PASS          |
| Plt      | 0.028             | 0.65         | PASS          |
| dc [%]   | 0.000             | 3.30         | PASS          |
| dmax [%] | 0.078             | 4.00         | PASS          |
| Tmax [s] | 0.000             | 0.50         | PASS          |

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## Test Setup Photos and Configuration

### Conducted Voltage Emissions



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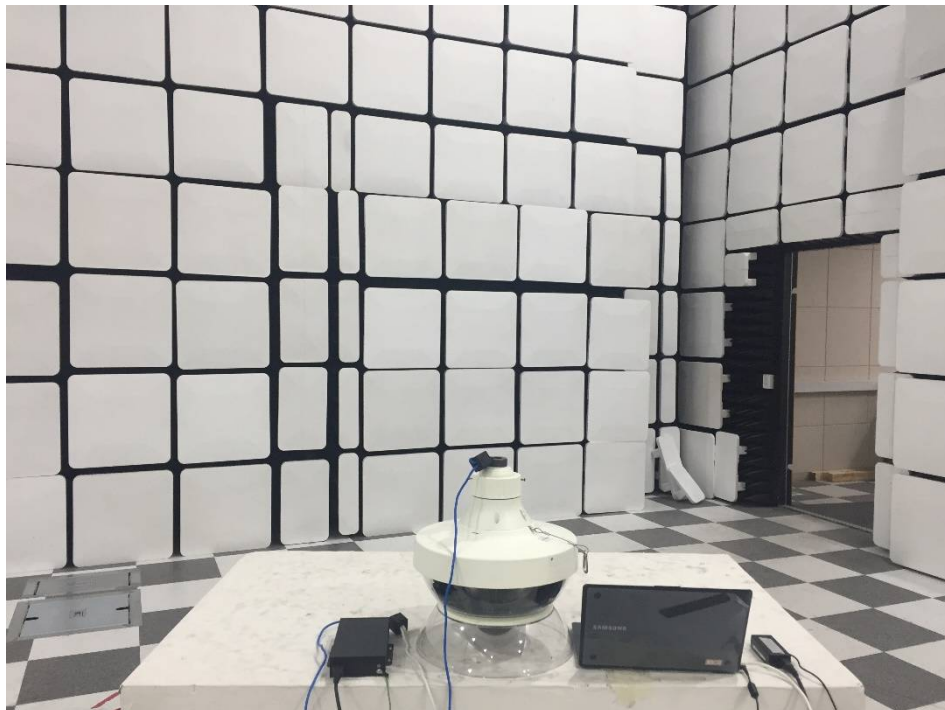
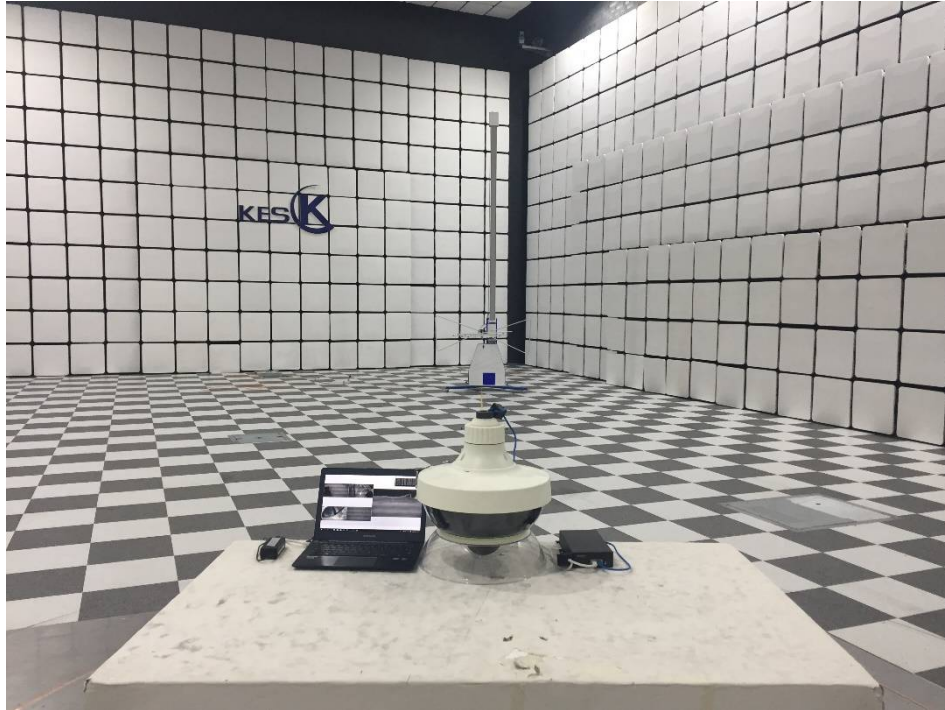
## Conducted Telecommunication Emissions

N/A

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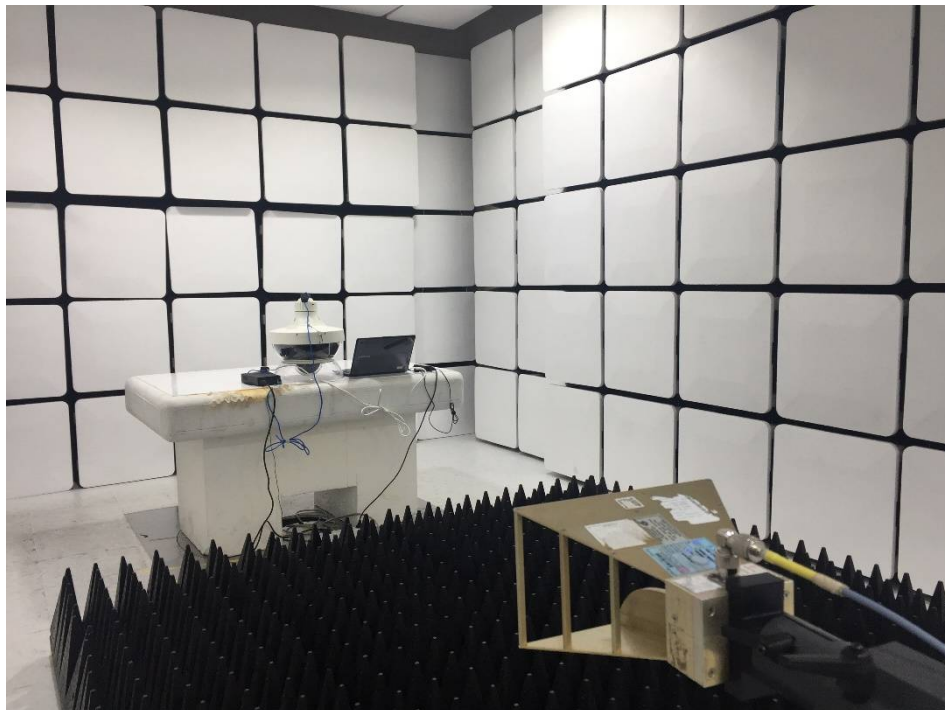
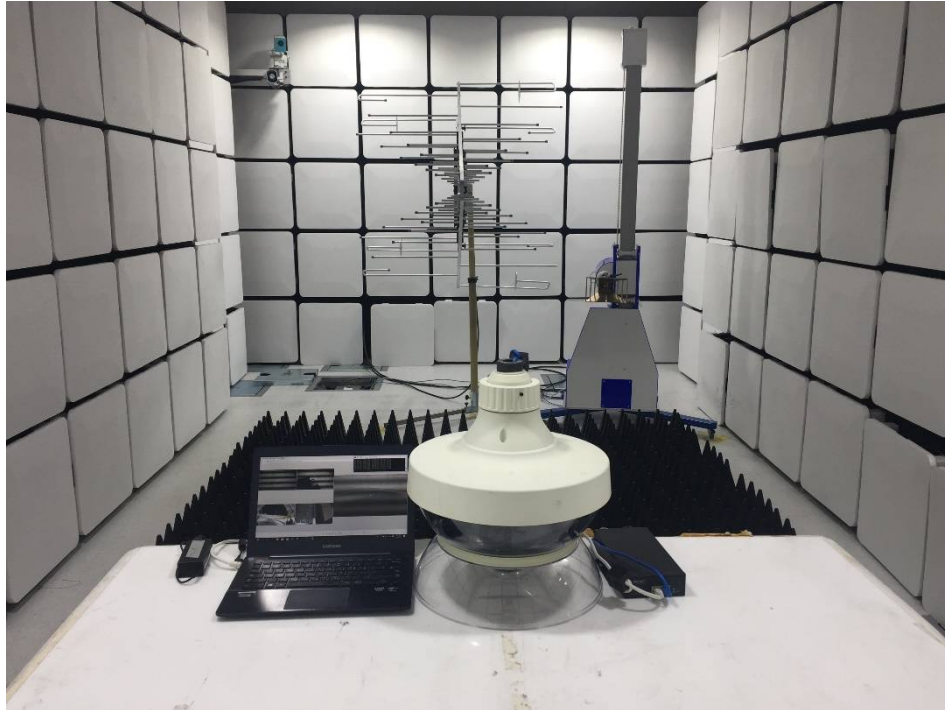
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## Radiated Electric Field Emissions(Below 1 GHz)



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## Radiated Electric Field Emissions(Above 1 GHz)



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## Harmonic Current Emissions and Voltage Fluctuations and Flicker



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## Electrostatic Discharge

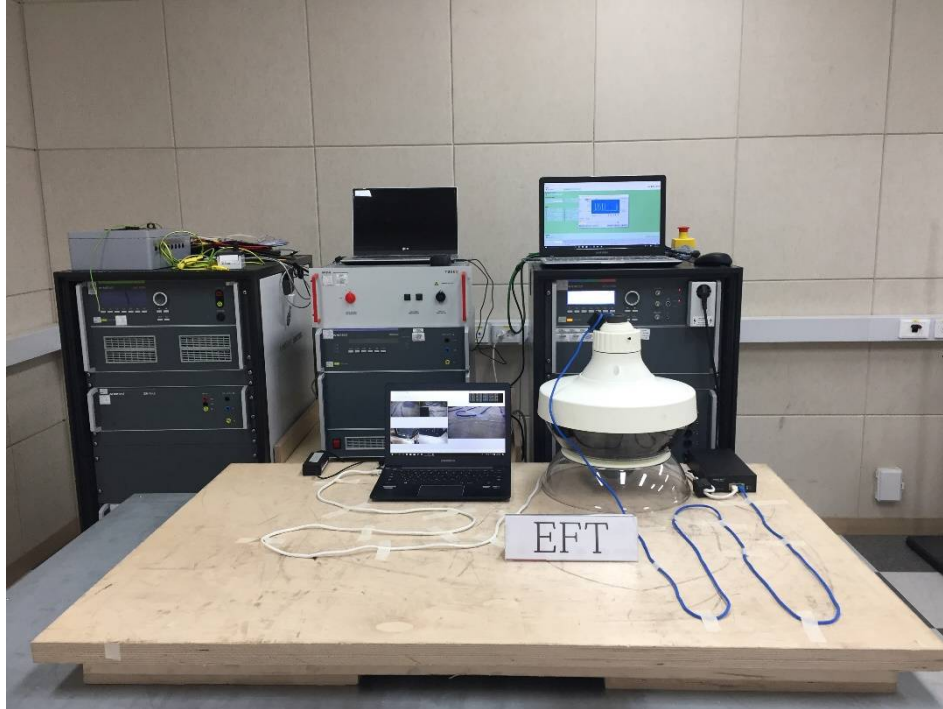


## Radiated Electric Field Immunity

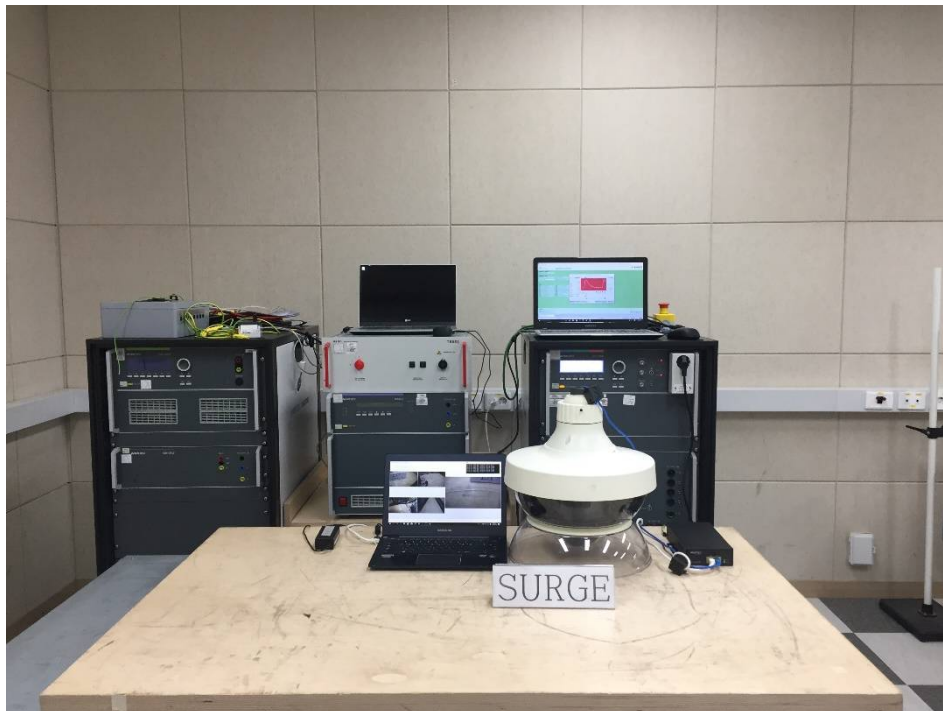


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## Electrical Fast Transients/Bursts

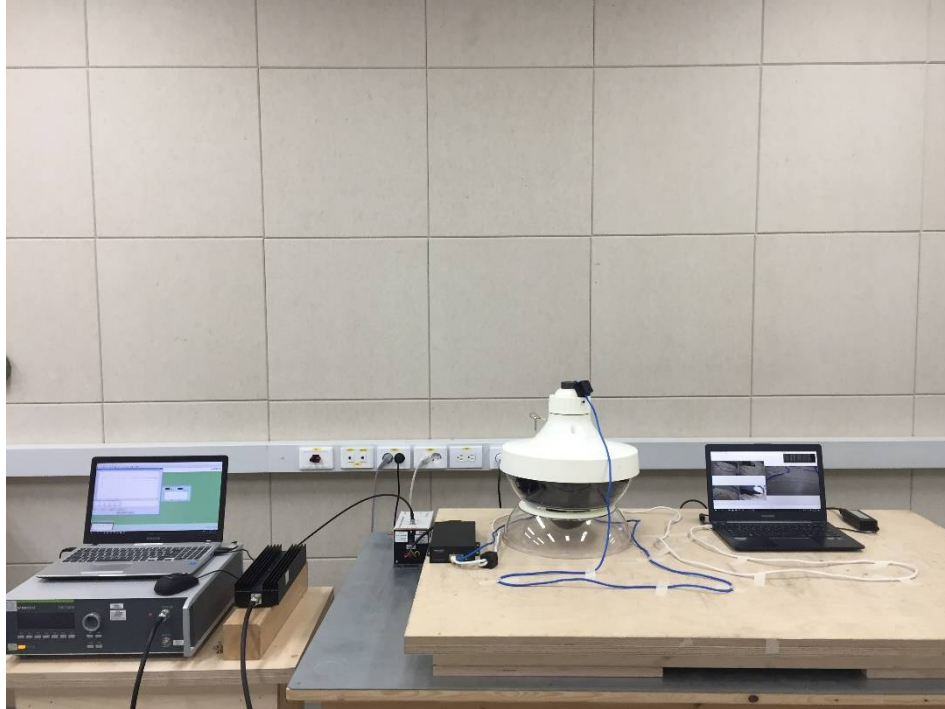


## Surge Transients



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## Conducted Disturbance



## Voltage Dips and Short Interruptions



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## EUT External Photographs

(Top)



(Bottom)



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## EUT Internal Photographs

(Internal View)

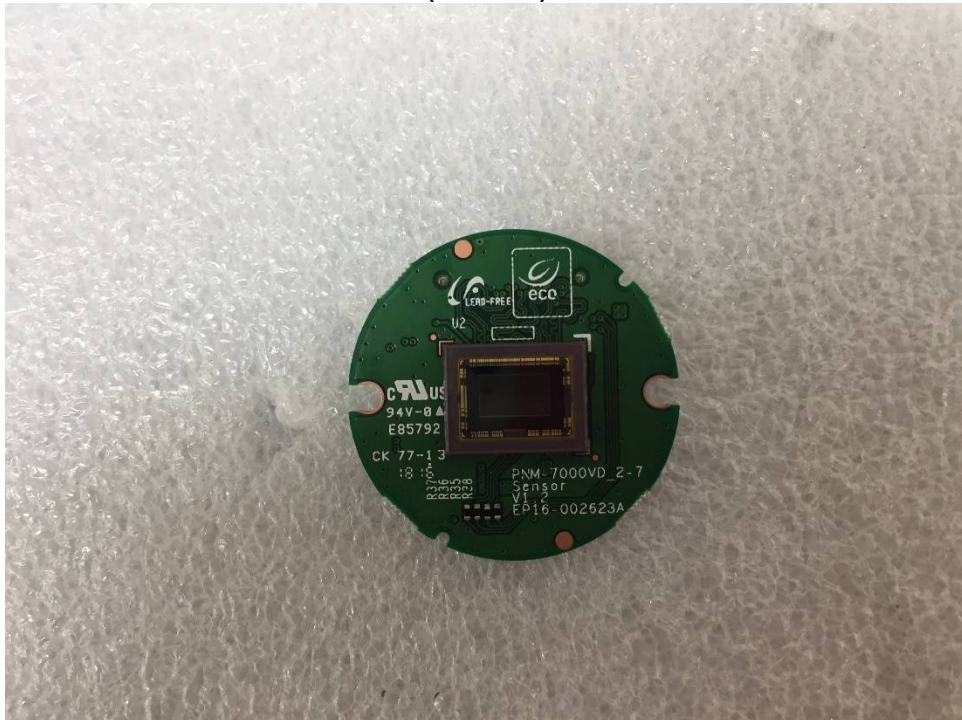


## EUT Internal View – Main Board

(Top)



(Bottom)



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## EUT Internal View – LENS

(Top)



(Bottom)



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## Label and Location



### **2M LENS Module**

Model No : SLA-2M2800P

Manufacturer : Hanwha Techwin (Tianjin) Co.,Ltd.

Made in China

