



## EMC TEST REPORT For CE

Test Report No. : KES-E1-18T0058  
Date of Issue : Jan. 09, 2018  
Product name : 2M LENS MODULE  
Model/Type No. : SLA-2M2800DP  
Variant Model : -  
Applicant : Hanwha Techwin Co., Ltd.  
Applicant Address : 1204, Changwon-daero, Seongsan-gu Changwon-si,  
Gyeongsangnam-do, Korea  
Manufacturer : Hanwha Techwin (Tianjin) Co., Ltd.  
Manufacturer Address : No.11 Weiliu Rd, Micro-Electronic Industrial Park, TEDA,  
Tianjin, 300385, People's Republic of China  
Date of Receipt : Dec. 21, 2017  
Test date : Jan. 05, 2018 ~ Jan. 08, 2018  
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Young Suk, Song  
EMC Test Engineer

Reviewed by

Dong-Hun, Jang  
EMC Technical Manager

This test report is not related to KOLAS.

**KES Co., Ltd.**

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-E1-18T0058  
Page (2) of (56)

---

**REPORT REVISION HISTORY**

| Date          | Test Report No. | Revision History |
|---------------|-----------------|------------------|
| Jan. 09, 2018 | KES-E1-18T0058  | Issued           |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |
|               |                 |                  |

***This report shall not be reproduced except in full, without the written approval of KES Co., Ltd. This document Jun be altered or revised by KES Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by KES Co., Ltd. will constitute fraud and shall nullify the document.***

---

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.



## TABLE OF CONTENTS

|                                                                       |                                                             |    |
|-----------------------------------------------------------------------|-------------------------------------------------------------|----|
| 1.0                                                                   | General Product Description .....                           | 4  |
| 1.1                                                                   | Test Voltage & Frequency .....                              | 5  |
| 1.2                                                                   | Variant Model Differences .....                             | 5  |
| 1.3                                                                   | Device Modifications .....                                  | 5  |
| 1.4                                                                   | Equipment Under Test .....                                  | 5  |
| 1.5                                                                   | Support Equipments .....                                    | 5  |
| 1.6                                                                   | External I/O Cabling .....                                  | 6  |
| 1.7                                                                   | E.U.T Operating Mode(s) .....                               | 6  |
| 1.8                                                                   | Configuration .....                                         | 7  |
| 1.9                                                                   | Remarks when standards applied .....                        | 8  |
| 1.10                                                                  | Calibration Details of Equipment Used for Measurement ..... | 8  |
| 1.11                                                                  | Test Facility .....                                         | 8  |
| 1.12                                                                  | Laboratory Accreditations and Listings .....                | 8  |
| 2.0                                                                   | Test Regulations .....                                      | 9  |
| 2.1                                                                   | Conducted Emissions at Mains Power Ports .....              | 11 |
| 2.2                                                                   | Conducted Emissions at Telecommunication Ports .....        | 12 |
| 2.3                                                                   | Radiated Electric Field Emissions(Below 1 GHz) .....        | 13 |
| 2.4                                                                   | Radiated Electric Field Emissions(Above 1 GHz) .....        | 14 |
| 2.5                                                                   | Harmonic Current Emissions .....                            | 15 |
| 2.6                                                                   | Voltage Fluctuations and Flicker .....                      | 16 |
| 3.0                                                                   | Criteria for compliance .....                               | 17 |
| 3.1                                                                   | Electrostatic Discharge .....                               | 19 |
| 3.2                                                                   | Radiated Electric Field Immunity .....                      | 22 |
| 3.3                                                                   | Electrical Fast Transients/Bursts .....                     | 25 |
| 3.4                                                                   | Surge Transients .....                                      | 27 |
| 3.5                                                                   | Conducted Disturbance .....                                 | 30 |
| 3.6                                                                   | Voltage Dips and Short Interruptions .....                  | 32 |
| APPENDIX A – TEST DATA .....                                          |                                                             | 34 |
| Conducted Emissions at Mains Power Ports .....                        |                                                             | 34 |
| Conducted Emissions at Telecommunication Ports .....                  |                                                             | 36 |
| Radiated Electric Field Emissions(Below 1 GHz) .....                  |                                                             | 38 |
| Radiated Electric Field Emissions(Above 1 GHz) .....                  |                                                             | 39 |
| Harmonic Current Emissions and Voltage Fluctuations and Flicker ..... |                                                             | 40 |
| Test Setup Photos and Configuration .....                             |                                                             | 43 |
| Conducted Voltage Emissions .....                                     |                                                             | 43 |
| Conducted Telecommunication Emissions .....                           |                                                             | 44 |
| Radiated Electric Field Emissions(Below 1 GHz) .....                  |                                                             | 45 |
| Radiated Electric Field Emissions(Above 1 GHz) .....                  |                                                             | 46 |
| Harmonic Current Emissions and Voltage Fluctuations and Flicker ..... |                                                             | 47 |
| Electrostatic Discharge .....                                         |                                                             | 48 |
| Radiated Electric Field Immunity .....                                |                                                             | 48 |
| Electrical Fast Transients/Bursts .....                               |                                                             | 49 |
| Surge Transients .....                                                |                                                             | 50 |
| Conducted Disturbance .....                                           |                                                             | 51 |
| Voltage Dips and Short Interruptions .....                            |                                                             | 52 |
| EUT External Photographs .....                                        |                                                             | 53 |
| EUT Internal Photographs .....                                        |                                                             | 54 |



## 1.0 General Product Description

### Main Specifications of E.U.T are:

| Video                     |                                                                                |
|---------------------------|--------------------------------------------------------------------------------|
| 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                                                                     |
| Lens                      |                                                                                |
| Focal Length (Zoom Ratio) | 2.8mm                                                                          |
| Max. Aperture Ratio       | F2.0                                                                           |
| Angular Field of View     | H:107.4°, V:62.2°, D:122.0°                                                    |
| Min. Object Distance      | -                                                                              |
| Focus Control             | -                                                                              |
| Lens Type                 | Fixed focal                                                                    |
| Mount Type                | M12 Lens module with main unit                                                 |
| Mechanical                |                                                                                |
| Color / Material          | Black / Plastic                                                                |
| Dimension (WxHxD)         | Ø35.5 x 27.9mm                                                                 |
| Weight                    | 27g                                                                            |



## 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-2M2800DP | -             | Hanwha Techwin (Tianjin) Co.,Ltd | E.U.T   |

## 1.5 Support Equipments

| Description      | Model Number | Serial Number   | Manufacturer                     | Remarks |
|------------------|--------------|-----------------|----------------------------------|---------|
| PoE Adaptor      | GS728TPP     | -               | NETGEAR, INC.                    | -       |
| Notebook         | NT730U3E     | JJRE91CF200065A | Samsung Electronics Co., Ltd.    | -       |
| Notebook Adaptor | PA-1600-66   | AD-6019P        | Li Shin Co., Ltd.                | -       |
| Network Camera   | PNM-7000VD   | -               | Hanwha Techwin (Tianjin) Co.,Ltd | -       |
| LENS MODULE      | SLA-2M6000D  | -               | Hanwha Techwin (Tianjin) Co.,Ltd | -       |



## 1.6 External I/O Cabling

| Start                  |              | END            |              | Cable Spec. |        |
|------------------------|--------------|----------------|--------------|-------------|--------|
| Description            | I/O Port     | Description    | I/O Port     | Length      | Shield |
| 2M LENS MODULE (E.U.T) | LENS Out     | Network Camera | LENS In      | -           | -      |
| Network Camera         | RJ-45 (PoE)  | PoE Adaptor    | RJ-45 (PoE)  | 3.0         | U      |
|                        | LENS In      | LENS MODULE    | LENS Out     | -           | -      |
| PoE Adaptor            | RJ-45 (Data) | Notebook       | RJ-45 (Data) | 3.0         | U      |

\* Unshielded=U, Shielded=S

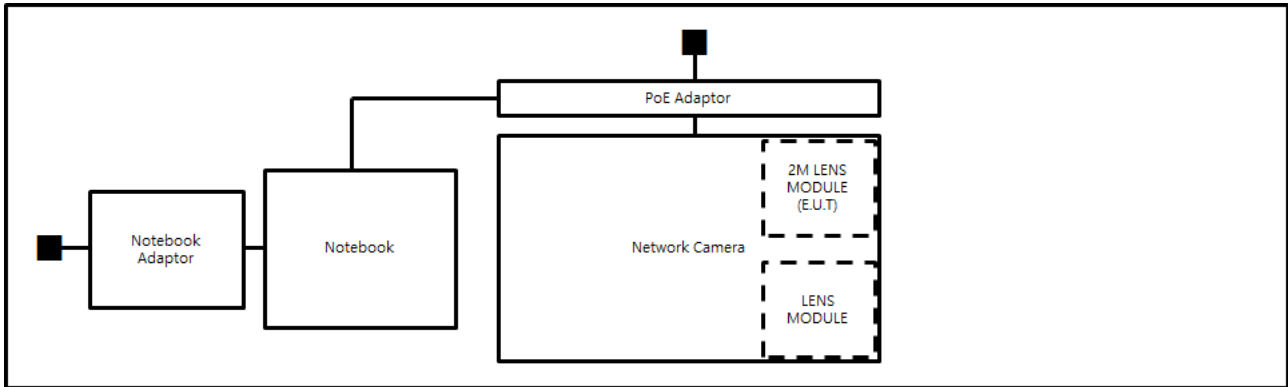
## 1.7 E.U.T Operating Mode(s)

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

| E.U.T 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 and CISPR Publication 32.

## 1.12 Laboratory Accreditations and Listings

| Country       | Agency | Scope of Accreditation                                                                                                                                                                                 | Logo                                                                                                                      |
|---------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| USA           | FCC    | 3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.                                                                                                       |                                       |
| JAPAN         | VCCI   | Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz         | <br>R-4308, C-4798,<br>T-2311, G-914 |
| KOREA         | MSIP   | EMI (10 meter Open Area Test Site and two conducted sites)<br>Radio(3 & 10 meter Open Area Test Sites and one conducted site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>KR0100                           |
| Canada        | IC     | 3 & 10 meter Open Area Test Sites and one conducted site                                                                                                                                               | <br>4769B-1                          |
| Europe        | CE     | EMI (10 meter Open Area Test Site and two conducted sites)<br>Radio(3 & 10 meter Open Area Test Sites and one conducted site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) |                                      |
| International | KOLAS  | EMI (10 meter Open Area Test Site and two conducted sites)<br>Radio(3 & 10 meter Open Area Test Sites and one conducted site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) |                                      |

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## 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                      |                                  |                                  |
| <br><input type="checkbox"/> <b>RE- Directive 2014/53/EU</b>  |                                  |                                  |
| <br><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           |                                  |                                  |
| <br><input type="checkbox"/> EN 301 489-3 V1.6.1              |                                  |                                  |
| <br><input type="checkbox"/> EN 301 489-17 V2.2.1             |                                  |                                  |
| <br><input type="checkbox"/> EN 60945:2002                    |                                  |                                  |



## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

N/A

### Test Location

Electro wave Shieldroom

### 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        | 101783        | 04, 27, 2018 |
| <input type="checkbox"/> | LISN              | ENV216       | R & S        | 101137        | 02, 03, 2018 |
| <input type="checkbox"/> | LISN              | ENV216       | R & S        | 101786        | 04, 27, 2018 |
| <input type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101914        | 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:

°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

## 2.2 Conducted Emissions at Telecommunication Ports

**Test Date**

Jan. 05, 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      | EMC32        | R & S        | 9.12.00       | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER | ESR3         | R & S        | 101783        | 04, 27, 2018 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101137        | 02, 03, 2018 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101786        | 04, 27, 2018 |
| <input checked="" type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101914        | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | 8-WIRE ISN CAT3   | CAT3 8158    | SCHWARZBECK  | 8158-0019     | 03, 29, 2018 |
| <input checked="" type="checkbox"/> | 8-WIRE ISN CAT5   | CAT5 8158    | SCHWARZBECK  | 8158-0030     | 03, 29, 2018 |
| <input type="checkbox"/>            | 8-WIRE ISN CAT6   | NTFM 8158    | SCHWARZBECK  | 8158-0029     | 08, 10, 2018 |
| <input type="checkbox"/>            | ISN               | ISN S8       | SCHWARZBECK  | ISN-S8-0019   | 05, 12, 2018 |

**Test Conditions**

Temperature: 24,1 °C  
Relative Humidity: 42,9 % 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.

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

**Test Date**

Jan. 05, 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, 18, 2018 |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 716           | 11, 28, 2018 |

**Test Conditions**Temperature: 23,9 °C  
Relative Humidity: 40,8 % 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

Jan. 06, 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, 2018 |
| <input type="checkbox"/>            | ATTENUATOR                 | 8491A        | HP               | 32173         | 03, 24, 2018 |
| <input checked="" type="checkbox"/> | DOUBLE RIDGED HORN ANTENNA | SAS-571      | A.H.SYSTEM,INC   | 781           | 05, 02, 2019 |

### Test Conditions

Temperature: 23,9 °C  
Relative Humidity: 42,1 % 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.





### 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

Jan. 07, 2018

### Test Location

EMS-ESD: Electro wave Shieldroom #3

### Test Equipment

| Used                                | Description   | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | ESD SIMULATOR | ESS-2000     | Noise Ken    | ESS05X4620    | 02, 24, 2018 |
| <input checked="" type="checkbox"/> | HCP           | -            | Noise Ken    | -             | -            |
| <input checked="" type="checkbox"/> | VCP           | -            | Noise Ken    | -             | -            |

### Test Conditions

Temperature: 23,8 °C  
Relative Humidity: 42,5 % R.H.  
Atmospheric Pressure: 100,8 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

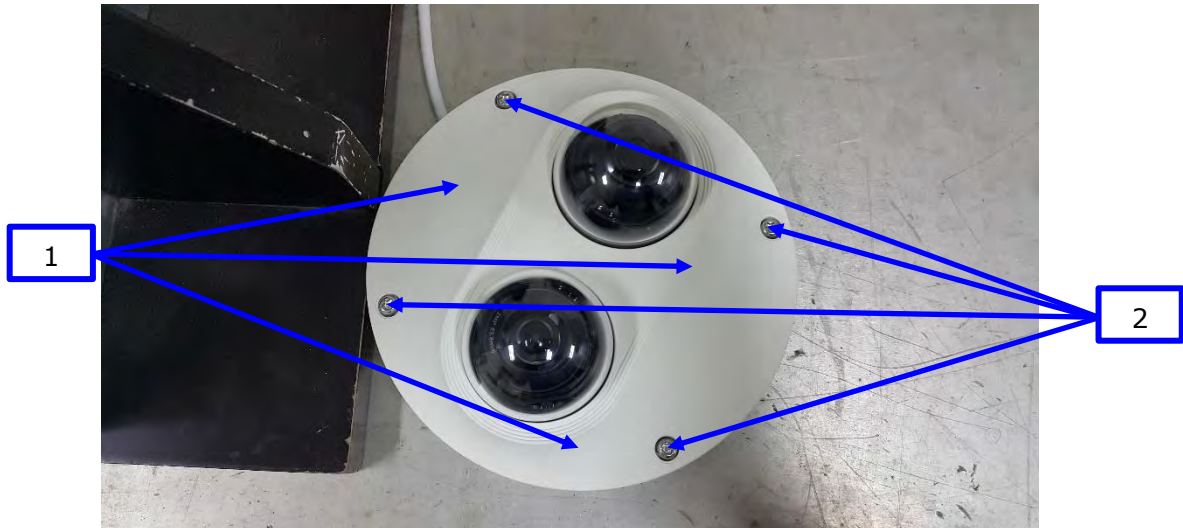
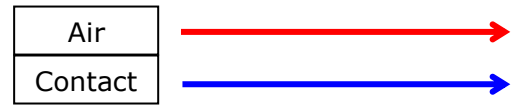
Number of Discharge: 10 at all locations for Air discharge  
10 at all locations for Contact discharge

|                    |                                                                                                                                                                                                 |                                                                                                                                                                                                                   |                                                                                                                                                                                             |                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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:**



**KES Co., Ltd.**

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-E1-18T0058  
Page (21) of (56)

**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   | Surface    | Contact Discharge | Complied     | -       |
| 2   | Screw      | 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**

PASS Required Performance Criteria.

## 3.2 Radiated Electric Field Immunity

### Reference Standard

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

### Test Date

Jan. 06, 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: 23,9 °C  
Relative Humidity: 42,1 % R.H.  
Atmospheric Pressure: 101,2 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

**KES Co., Ltd.**

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-E1-18T0058  
Page (24) of (56)

**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**

PASS Required Performance Criteria.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

### 3.3 Electrical Fast Transients/Bursts

#### Reference Standard

EN 61000-4-4:2012

#### Test Date

Jan. 08, 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 checked="" type="checkbox"/> | CAPACITIVE COUPLING CLAMP | HFK          | EM TEST      | P1633183115   | 11, 27, 2018 |

#### Test Conditions

Temperature: 24,2 °C  
Relative Humidity: 40,8 % R.H.  
Atmospheric Pressure: 101,1 kPa

#### Test Specifications

|                                                              |                                                                        |                                              |
|--------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------|
| Pulse Amplitude & Polarity:<br>(AC Power Lines)              | <input type="checkbox"/> ± 1.0 kV<br><input type="checkbox"/> ± 4.0 kV | <input 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 kHz                                         | <input checked="" type="checkbox"/> 100 kHz  |
| 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) |
| -                   | -              | -              |

☐ 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) |
| RJ-45 (PoE)         | Complied       | Complied       |

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

## Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

## Remarks

PASS Required Performance Criteria.



## 3.4 Surge Transients

### Reference Standard

EN 61000-4-5:2014

### Test Date

Jan. 08, 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 checked="" 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: 24,2 °C  
Relative Humidity: 40,8 % R.H.  
Atmospheric Pressure: 101,1 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

**KES Co., Ltd.**

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-E1-18T0058  
Page (29) of (56)

**Test Data**

☐ Line to Earth – Common Mode

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

**Signal Lines**

☒ Line to Earth – Common Mode

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Surge (kV) | (-) Surge (kV) |
| RJ-45 (PoE)         | Complied       | Complied       |

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

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

**Remarks**

PASS Required Performance Criteria.

## 3.5 Conducted Disturbance

### Reference Standard

EN 61000-4-6:2014

### Test Date

Jan. 07, 2018

### Test Location

EMS-CS: Electro wave Shieldroom #3

### Test Equipment

| Used                                | Description               | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W              | icd.control  | EM TEST      | 5.3.7         | -            |
| <input checked="" type="checkbox"/> | CONTINUOUS WAVE SIMULATOR | CWS 500N1    | EM TEST      | V0936105119   | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | ATTENUATOR                | ATT6         | EM TEST      | 1208-34       | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | CDN                       | CDN-M2/M3N   | EM TEST      | 0909-06       | 08, 07, 2018 |
| <input checked="" type="checkbox"/> | CDN                       | CDN T8RJ45   | EM TEST      | 0909-09       | 08, 07, 2018 |
| <input type="checkbox"/>            | EM INJECTION CLAMP        | EM 101       | Liithi       | 35943         | 02, 03, 2018 |

### Test Conditions

Temperature: 23,8 °C  
Relative Humidity: 42,5 % R.H.  
Atmospheric Pressure: 100,8 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

**KES Co., Ltd.**

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-EI-18T0058  
Page (31) of (56)

**Test Data**

☐ Input a.c. power ports

| Coupling Location<br>(Line Stressed) | Coupling Method                                                 | Observations |
|--------------------------------------|-----------------------------------------------------------------|--------------|
| -                                    | CDN ( <input type="checkbox"/> M2, <input type="checkbox"/> M3) | -            |

☐ Input d.c. power ports

| Coupling Location<br>(Line Stressed) | Coupling Method                                                 | Observations |
|--------------------------------------|-----------------------------------------------------------------|--------------|
| -                                    | CDN ( <input type="checkbox"/> M2, <input type="checkbox"/> M3) | -            |

☒ Signal ports and telecommunication ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| RJ-45 (PoE)                          | CDN T8RJ45      | Complied     |

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**

PASS Required Performance Criteria.



### 3.6 Voltage Dips and Short Interruptions

#### Reference Standard

EN 61000-4-11:2004

#### Test Date

N/A

#### Test Location

EMS-Voltage dip: Electro wave Shieldroom #7

#### Test Equipment

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

#### Test Conditions

Temperature:

°C

Relative Humidity:

% R.H.

Atmospheric Pressure:

kPa



## Test Specifications & Observations/Remarks

(Test Voltage : V)

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

- Voltage variations

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

Observations:

Complied – No degradation of function

### Test Results

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

### Remarks

N/A



---

## **APPENDIX A – TEST DATA**

### **Conducted Emissions at Mains Power Ports**

**[HOT]**

N/A



**KES Co., Ltd.**

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-E1-18T0058  
Page (35) of (56)

---

**[ NEUTRAL ]**

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 (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

---

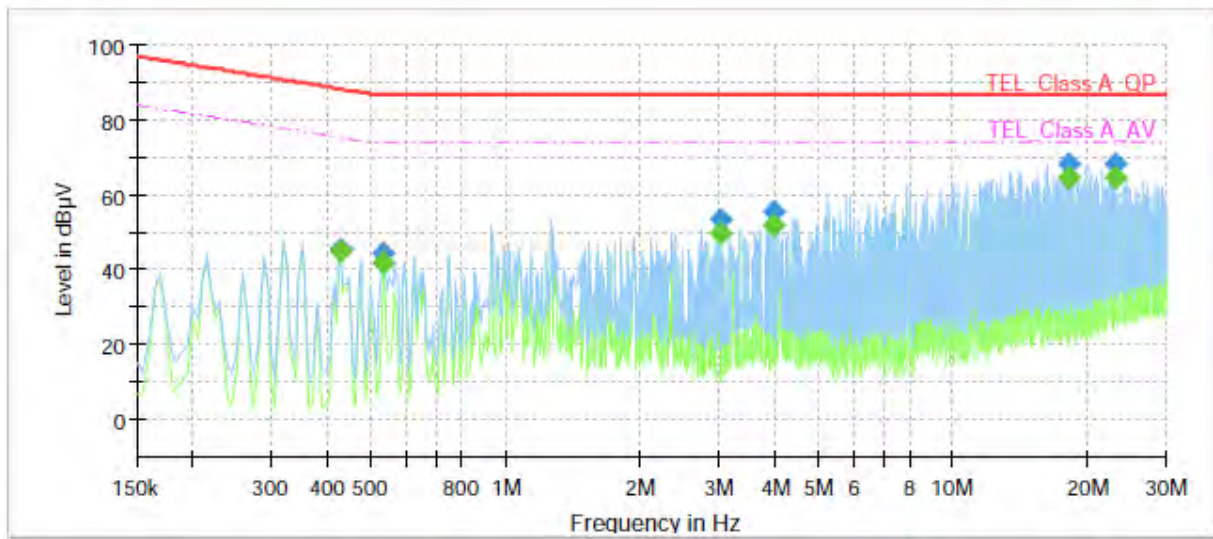
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Conducted Emissions at Telecommunication Ports

[10 Mbps]

### Common Information

|                   |                            |
|-------------------|----------------------------|
| Test Description: | Telecommunication Emission |
| Model No.:        | SLA-2M2800DP               |
| Mode              | PoE_10 Mbps                |
| Operator Name:    | KES                        |



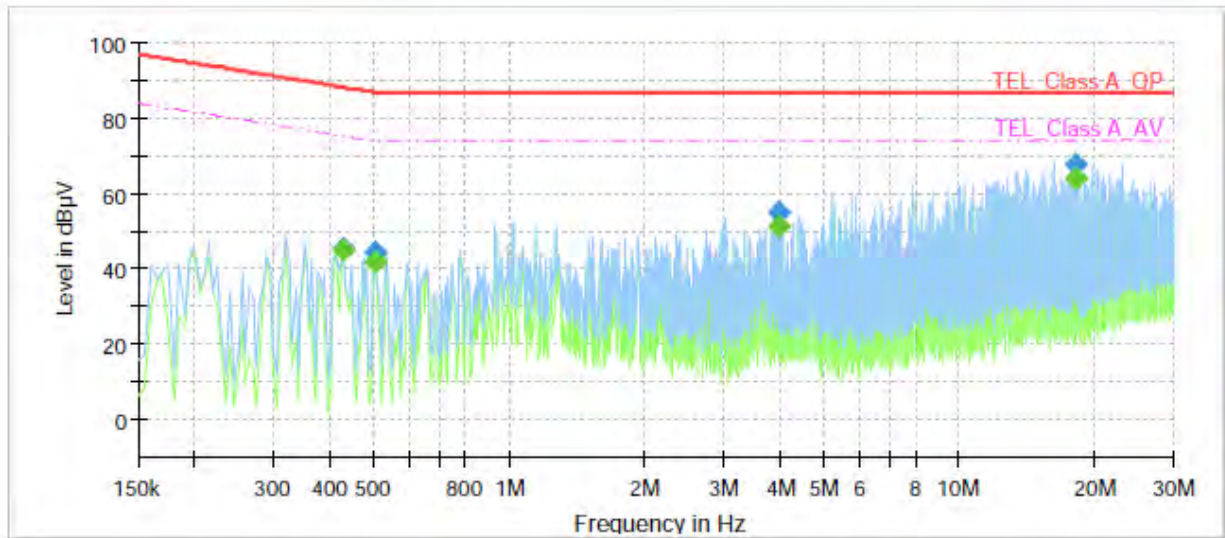
### Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.430000        | ---              | 45.26           | 75.25        | 29.99       | 1000.0          | 9.000           | Single Line | 19.9       |
| 0.430000        | 45.27            | ---             | 88.25        | 42.98       | 1000.0          | 9.000           | Single Line | 19.9       |
| 0.535000        | ---              | 41.66           | 74.00        | 32.34       | 1000.0          | 9.000           | Single Line | 19.9       |
| 0.535000        | 44.47            | ---             | 87.00        | 42.53       | 1000.0          | 9.000           | Single Line | 19.9       |
| 3.040000        | ---              | 49.88           | 74.00        | 24.12       | 1000.0          | 9.000           | Single Line | 20.0       |
| 3.040000        | 53.38            | ---             | 87.00        | 33.62       | 1000.0          | 9.000           | Single Line | 20.0       |
| 3.955000        | ---              | 51.99           | 74.00        | 22.01       | 1000.0          | 9.000           | Single Line | 20.0       |
| 3.955000        | 55.52            | ---             | 87.00        | 31.48       | 1000.0          | 9.000           | Single Line | 20.0       |
| 18.245000       | ---              | 64.81           | 74.00        | 9.19        | 1000.0          | 9.000           | Single Line | 20.0       |
| 18.245000       | 68.40            | ---             | 87.00        | 18.60       | 1000.0          | 9.000           | Single Line | 20.0       |
| 23.130000       | ---              | 64.60           | 74.00        | 9.40        | 1000.0          | 9.000           | Single Line | 19.9       |
| 23.130000       | 68.11            | ---             | 87.00        | 18.89       | 1000.0          | 9.000           | Single Line | 19.9       |

## [100 Mbps]

### Common Information

|                   |                            |
|-------------------|----------------------------|
| Test Description: | Telecommunication Emission |
| Model No.:        | SLA-2M2800DP               |
| Mode              | PoE_100 Mbps               |
| Operator Name:    | KES                        |



### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.430000        | ---              | 44.90           | 75.25        | 30.35       | 1000.0          | 9.000           | Single Line | 19.4       |
| 0.430000        | 45.47            | ---             | 88.25        | 42.78       | 1000.0          | 9.000           | Single Line | 19.4       |
| 0.505000        | ---              | 41.58           | 74.00        | 32.42       | 1000.0          | 9.000           | Single Line | 19.4       |
| 0.505000        | 44.56            | ---             | 87.00        | 42.44       | 1000.0          | 9.000           | Single Line | 19.4       |
| 3.955000        | ---              | 51.10           | 74.00        | 22.90       | 1000.0          | 9.000           | Single Line | 19.5       |
| 3.955000        | 54.94            | ---             | 87.00        | 32.06       | 1000.0          | 9.000           | Single Line | 19.5       |
| 18.245000       | ---              | 64.08           | 74.00        | 9.92        | 1000.0          | 9.000           | Single Line | 19.5       |
| 18.245000       | 67.84            | ---             | 87.00        | 19.16       | 1000.0          | 9.000           | Single Line | 19.5       |

#### ◆ 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))

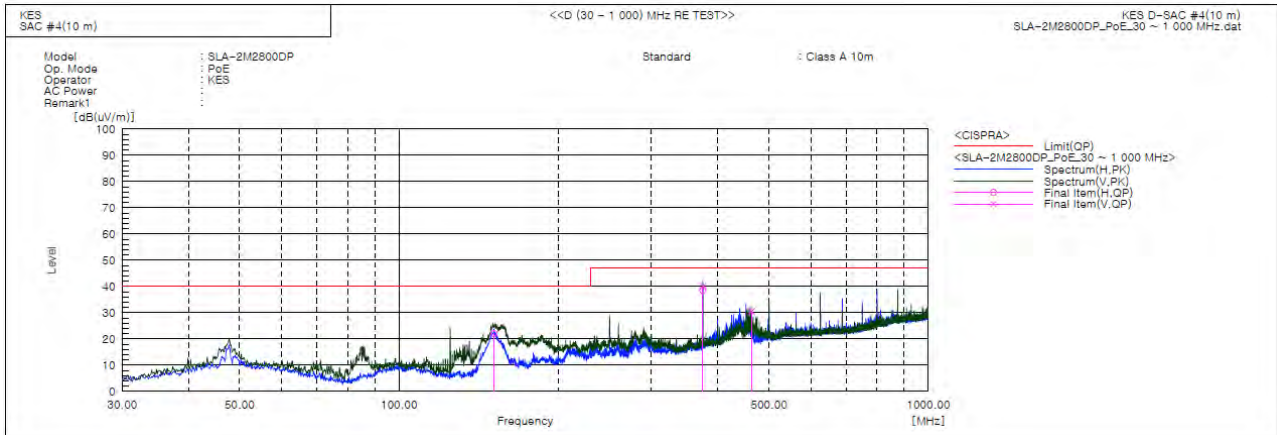


## KES Co., Ltd.

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-E1-18T0058  
Page (38) of (56)

### 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   | 151.302            | H   | 53.4                      | -31.4            | 22.0                       | 40.0                      | 18.0                 | 400.0          | 160.0          |        |
| 2   | 374.893            | H   | 59.9                      | -21.3            | 38.6                       | 47.0                      | 8.4                  | 367.0          | 128.0          |        |
| 3   | 375.031            | V   | 61.4                      | -21.3            | 40.1                       | 47.0                      | 6.9                  | 100.0          | 209.0          |        |
| 4   | 462.984            | V   | 49.3                      | -18.8            | 30.5                       | 47.0                      | 16.5                 | 100.0          | 237.0          |        |

#### ◆ 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

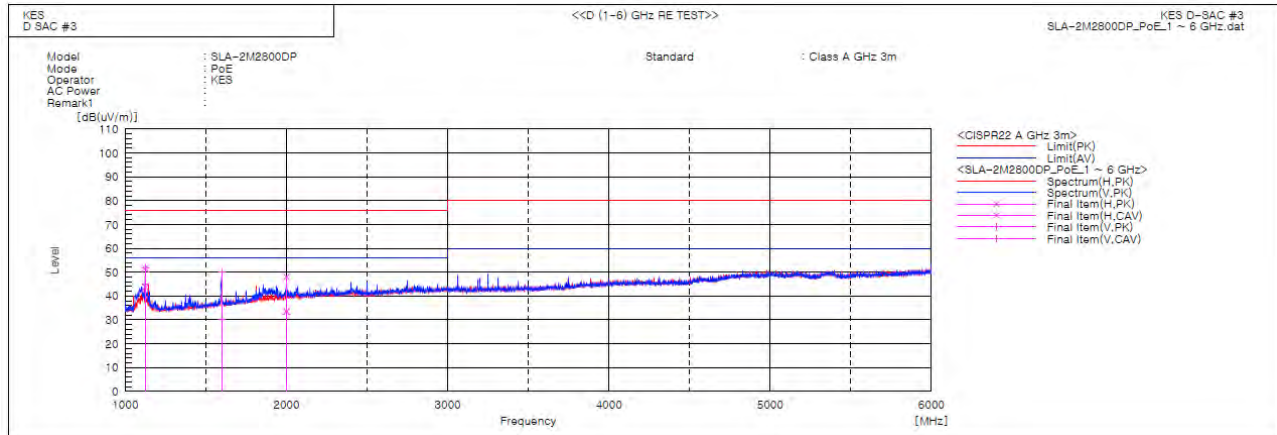


## KES Co., Ltd.

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-E1-18T0058  
Page (39) of (56)

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



#### Final Result

| No. | Frequency<br>[MHz] | (P) | Reading<br>PK<br>[dB(uV)] | Reading<br>CAV<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>PK<br>[dB(uV/m)] | Result<br>CAV<br>[dB(uV/m)] | Limit<br>PK<br>[dB(uV/m)] | Limit<br>AV<br>[dB(uV/m)] | Margin<br>PK<br>[dB] | Margin<br>CAV<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|----------------------------|------------------|----------------------------|-----------------------------|---------------------------|---------------------------|----------------------|-----------------------|----------------|----------------|--------|
| 1   | 1124.850           | H   | 60.6                      | 52.8                       | -9.1             | 51.5                       | 43.7                        | 76.0                      | 56.0                      | 24.5                 | 12.3                  | 101.0          | 28.0           |        |
| 2   | 1125.060           | V   | 61.0                      | 54.3                       | -9.1             | 51.9                       | 45.2                        | 76.0                      | 56.0                      | 24.1                 | 10.8                  | 101.0          | 349.4          |        |
| 3   | 1600.010           | V   | 55.1                      | 35.6                       | -5.2             | 49.9                       | 30.4                        | 76.0                      | 56.0                      | 26.1                 | 25.6                  | 101.0          | 349.3          |        |
| 4   | 1999.900           | H   | 49.7                      | 35.2                       | -1.7             | 48.0                       | 33.5                        | 76.0                      | 56.0                      | 28.0                 | 22.5                  | 101.0          | 172.6          |        |

#### ◆ Calculation

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

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





**KES Co., Ltd.**

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-E1-18T0058  
Page (42) of (56)

**Test Data - Voltage Fluctuations****Maximum Flicker results**

|          | EUT values | Limit | Result |
|----------|------------|-------|--------|
| Pst      | N/A        |       |        |
| Plt      |            |       |        |
| dc [%]   |            |       |        |
| dmax [%] |            |       |        |
| Tmax [s] |            |       |        |

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.



---

## **Test Setup Photos and Configuration**

### **Conducted Voltage Emissions**

N/A

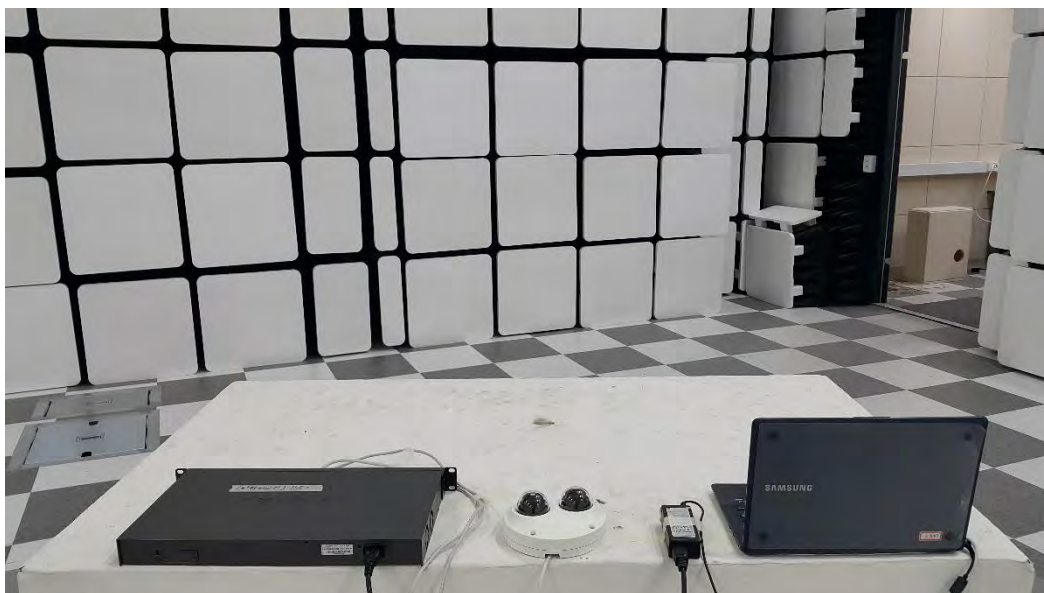
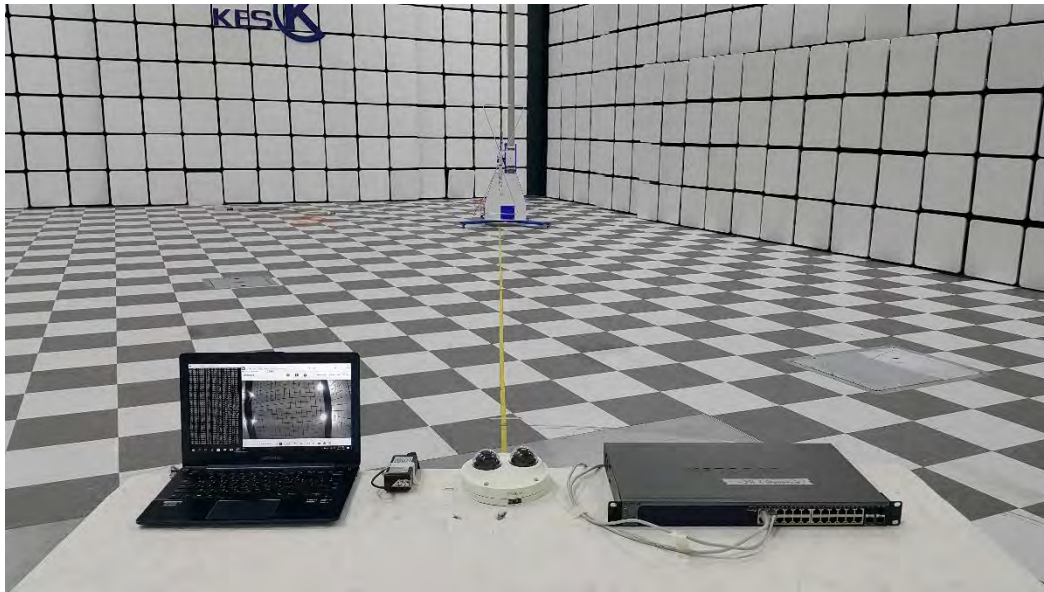
N/A

## Conducted Telecommunication Emissions



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Radiated Electric Field Emissions(Below 1 GHz)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Radiated Electric Field Emissions(Above 1 GHz)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.



**KES Co., Ltd.**

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-E1-18T0058  
Page (47) of (56)

---

## **Harmonic Current Emissions and Voltage Fluctuations and Flicker**

N/A

---

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Electrostatic Discharge



## Radiated Electric Field Immunity



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Electrical Fast Transients/Bursts



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Surge Transients



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Conducted Disturbance



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.



**KES Co., Ltd.**

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-E1-18T0058  
Page (52) of (56)

---

## **Voltage Dips and Short Interruptions**

N/A

---

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## EUT External Photographs

(Top)

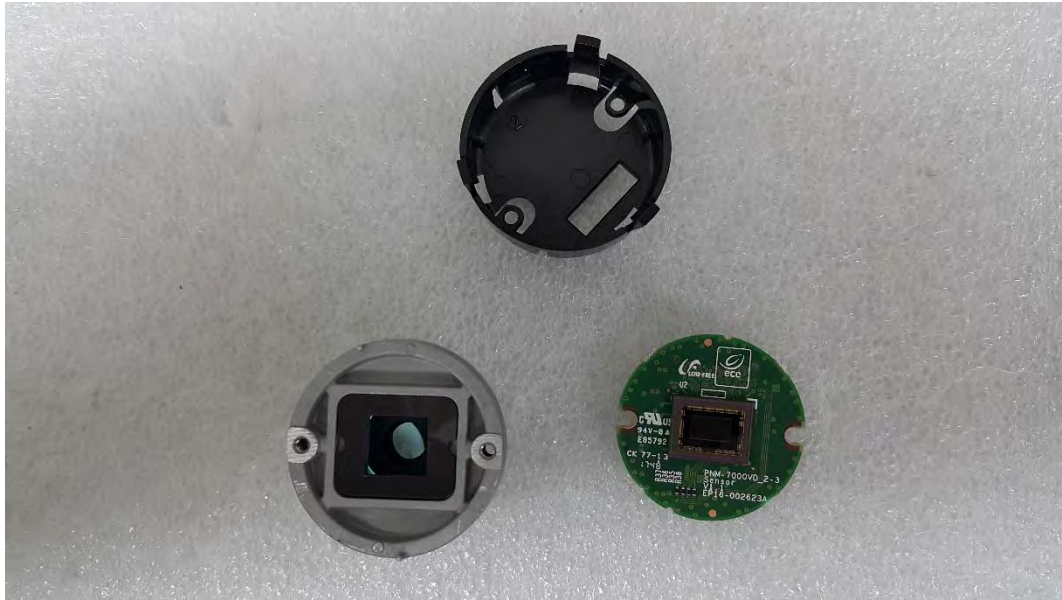


(Bottom)



## EUT Internal Photographs

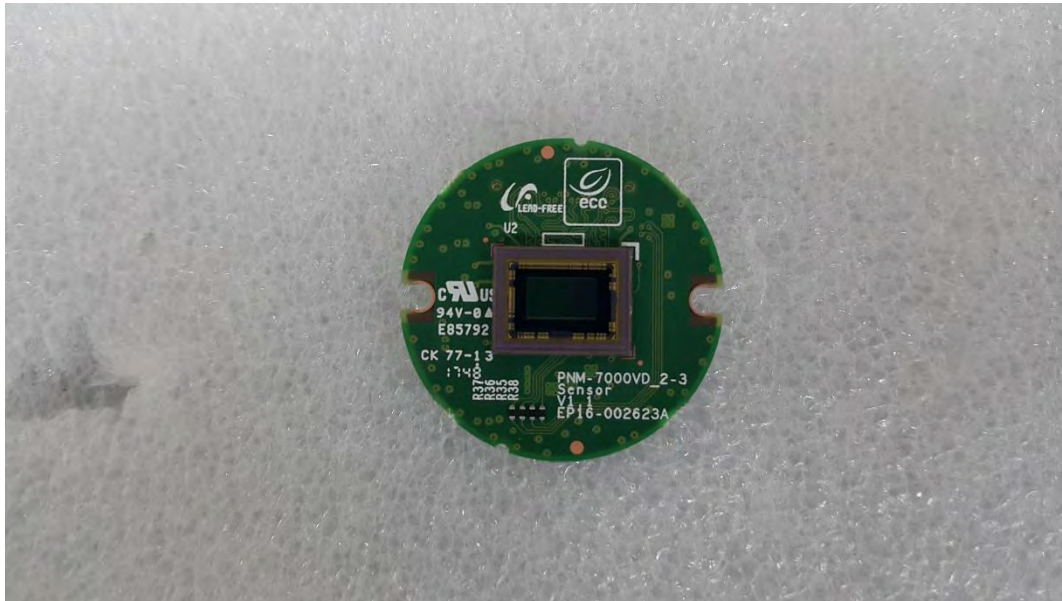
(Internal View)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## EUT Internal View – CCD board

(Top)

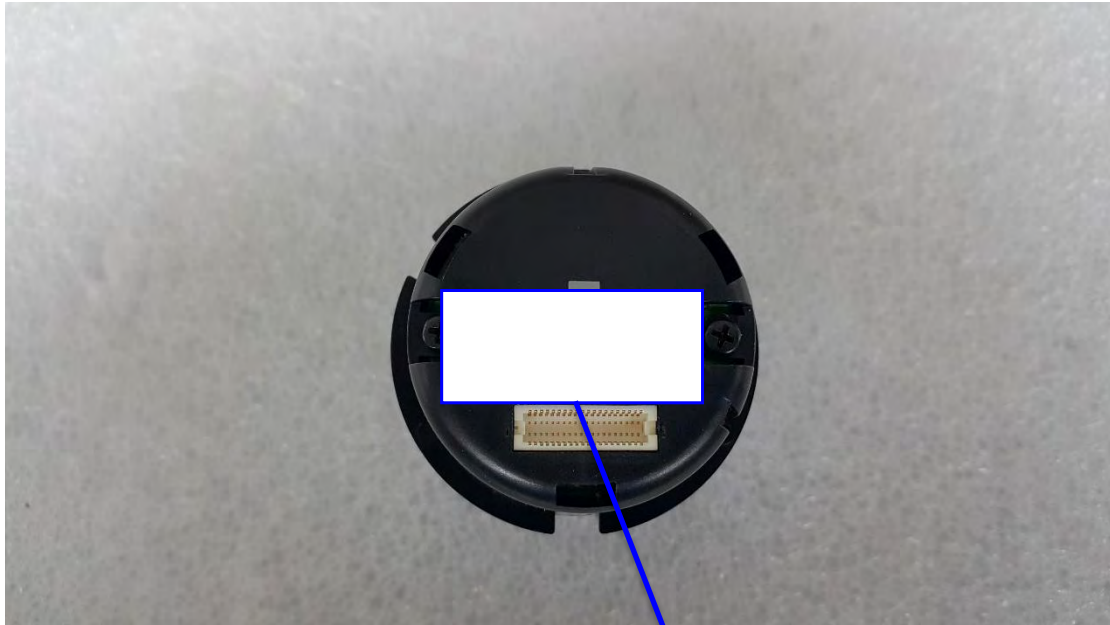


(Bottom)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.  
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

## Label and Location



### **2M LENS MODULE**

Model No : SLA-2M2800DP

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

Made in China

