# EMC TEST REPORT

| | | |
|---|---|---|
| Test Report No. | : | KES-E1-19T0809-R2 |
| Date of Issue | : | Sep. 28, 2021 |
| Product name | : | Network Camera |
| Model/Type No. | : | PNB-A9001 |
| Variant Mode | : | PNB-A9001LP, PNB-A9001OP |
| 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 SECURITY VIETNAM CO.,LTD.<br>2. D-TECH CO.,LTD. |
| Manufacturer Address | : | 1. Lot O-2, Que Vo Industrial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam<br>2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea (Suwon Industrial Complex) |
| Equipment authorization | : | **Supplier's Declaration of Conformity** |
| Date of Receipt | : | Nov. 26, 2019 |
| Test date | : | Dec. 01, 2019 |
| Test Results | : | ☒ **In Compliance** ☐ **Not in Compliance** |

*Tested by*



Min Seong, Kim
EMC Test Engineer

*Reviewed by*



Dong-Hun, Jang
EMC Technical Manager

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

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# REPORT REVISION HISTORY

| Date | Test Report No. | Revision History |
|---|---|---|
| Dec. 18, 2019 | KES-E1-19T0809 | Issued |
| Dec. 09, 2020 | KES-E1-19T0809-R1 | Reissuance due to the addition of a derivative |
| Sep. 28, 2021 | KES-E1-19T0809-R2 | Re-issue due to Manufacturer deletion |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

***This report shall not be reproduced except in full, without the written approval of KES Co., Ltd. This document may 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.***

# TABLE OF CONTENTS

1.0 General Product Description ..... 4
1.1 Test Voltage & Frequency ..... 7
1.2 Variant Model Differences ..... 7
1.3 Device Modifications ..... 7
1.4 Equipment Under Test ..... 7
1.5 Support Equipments ..... 8
1.6 External I/O Cabling ..... 9
1.7 EUT Operating Mode(s) ..... 10
1.8 Configuration ..... 10
1.9 Remarks when standards applied ..... 11
1.10 Calibration Details of Equipment Used for Measurement ..... 11
1.11 Test Facility ..... 11
1.12 Laboratory Accreditations and Listings ..... 11
2.0 Test Regulations ..... 12
2.1 Conducted Emissions at Mains Power Ports ..... 14
2.2 Radiated Electric Field Emissions(Below 1 ㎓) ..... 15
2.3 Radiated Electric Field Emissions(Above 1 ㎓) ..... 16
APPENDIX A – TEST DATA ..... 17
Conducted Emissions at Mains Power Ports ..... 17
Radiated Electric Field Emissions(Below 1 ㎓) ..... 19
Radiated Electric Field Emissions(Above 1 ㎓) ..... 21
Test Setup Photos and Configuration ..... 22
Radiated Electric Field Emissions(Below 1 ㎓) ..... 23
Radiated Electric Field Emissions(Above 1 ㎓) ..... 24
EUT External Photographs ..... 25
EUT Internal Photographs ..... 26

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# 1.0 General Product Description

## Main Specifications of EUT are:

| Video | PNB-A9001 | |
|---|---|---|
| Imaging Device | 1/1.8" 8MP CMOS | |
| Effective Pixels | 3864(H) x 2180(V) | |
| NETD | None | |
| Pixel Size | None | |
| Min. Illumination | Color: 0.065Lux(F1.2, 1/30sec) | |
| Video Out | CVBS: 1.0 Vp-p / 75Ω composite, 720x480(N), 720x576(P) for installation<br>USB: Micro USB Type B, 1280x720 for installation | |
| **Lens** | | |
| Focal Length (Zoom Ratio) | None | |
| Max. Aperture Ratio | None | |
| Angular Field of View | None | |
| Min. Object Distance | None | |
| Focus Control | Simple focus | |
| Lens Type | DC auto iris, P iris, Manual, I-CS | |
| Mount Type | C mount, CS mount | |
| Optional Lens | None | |
| **Pan / Tilt / Rotate** | | |
| Pan / Tilt / Rotate Range | None | |
| Pan Range | None | |
| Pan Speed | None | |
| Tilt Range | None | |
| Tilt Speed | None | |
| Rotate Range | None | |
| Sequence | None | |
| Preset Accuracy | None | |
| Azimuth | None | |
| Auto Tracking | None | |
| **Operational** | | |
| IR Viewable Length | None | |
| Camera Title | Off / On (Up to 85 characters)<br>- W/W : English / Numeric / Special characters<br>- China : English / Numeric / Special / Chinese characters<br>- Common : Multi-line (Max. 5), Color (Grey / Green / Red / Blue / Black / White),<br>Auto scale by resolution | |
| Day & Night | Auto(ICR)/Color/BW/External/Schedule | |
| Backlight Compensation | BLC, WDR | |
| Wide Dynamic Range | 120dB | |
| Contrast Enhancement | SSDR (Off / On) | |
| Digital Noise Reduction | SSNRIII(2D+3D Noise Filter) (Off / On) | |
| Digital Image Stabilization | Support(built-in gyro sensor) | |
| Defog | None | |
| Motion Detection | 8ea, 8point Polygonal zones | |
| Privacy Masking | 32ea, polygonal zones<br>- Color : Gray, Green, Red, Blue, Black, White<br>- Mosaic | |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

| | | |
|---|---|---|
| Gain Control | Support | |
| White Balance | ATW / AWC / Manual / Indoor / Outdoor(include Mercury & Sodium) | |
| Contrast | Level adjustment | |
| LDC | Support | |
| Electronic Shutter Speed | Minimum / Maximum / Anti flicker (1/5~1/12,000sec) | |
| Digital PTZ | Support(Preset, Group) | |
| Video Rotation | Flip, Mirror, Hallway view(90˚/270˚) | |
| Analytics | Object detection(Person/Vehicle/Face/<br>License plate), Defocus detection, Directional detection, Motion detection, Digital auto tracking, Appear/Disappear, Enter/Exit, Loitering, Tampering, Virtual line, Audio detection, Sound classification,<br>Shock detection<br>**BestShot, Feature extraction** | |
| Business Intelligence | People counting, Queue management, Heatmap | |
| Serial Interface | RS-485(Samsung-T, Pelco-D/P, Panasonic, Bosch, AD, GE, Vicon, Honeywell) | |
| Alarm I/O | Input 1ea / Output 1ea / 12V Power (Max. 50mA) 1ea<br>- 2 configurable i/o ports | |
| Alarm Triggers | Analytics, Network disconnect, Alarm input | |
| Alarm Events | File upload via FTP and e-mail<br>Notification via e-mail<br>SD/SDHC/SDXC or NAS recording at event triggers<br>Alarm output<br>DPTZ Preset<br>Handover<br>Audio playback | |
| Audio In | Selectable(mic in/line in/Built in MIC)<br>Supply voltage: 2.5VDC(4mA), Input impedance: 2K Ohm | |
| Audio Out | Line out, Max.output level: 1Vrms | |
| IR Illuminator (Optional) | None | |
| Wiper | None | |
| Coaxial Protocol | None | |
| Video Transmission Distance | None | |
| **Radiometry** | | |
| Temperature detect range | None | |
| Temperature accuracy | None | |
| Temperature detection | None | |
| Additional | None | |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

| | | |
|---|---|---|
| **Network** | | |
| Ethernet | RJ-45(10/100/1000BASE-T) | |
| Video Compression | H.265/H.264: Main/High, MJPEG | |
| Resolution | 3840x2160, 3072x1728, 2592x1944, 2688x1520, 2560x1440, 2048x1536, 1920x1080, 1600x1200, 1280x1024,1280x960, 1280x720, 1024x768,<br>800 x 600, 800 x 448,<br>720 x 576, 720x480,<br>640x480, 640x360 | |
| Max. Framerate | H.265/H.264: Max. 30fps/25fps(60Hz/50Hz)<br>MJPEG: Max. 15fps/12fps(60Hz/50Hz) | |
| Smart Codec | Manual(5ea area), WiseStream II | |
| Video Quality Adjustment | H.264/H.265: Target bitrate level control<br>MJPEG: Quality level control | |
| Bitrate Control | H.264/H.265: CBR or VBR<br>MJPEG: VBR | |
| Streaming | Unicast(20 users) / Multicast<br>Multiple streaming(Up to 3 profiles) | |
| Audio Compression | G.711 u-law /G.726 Selectable<br>G.726(ADPCM) 8KHz, G.711 8KHz<br>G.726: 16Kbps, 24Kbps, 32Kbps, 40Kbps<br>AAC-LC: 48Kbps at 16KHz | |
| Protocol | IPv4, IPv6, TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP,RTSP, NTP, HTTP, HTTPS, SSL/TLS, DHCP, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, UPnP, Bonjour, LLDP, SRTP (TCP, UDP Unicast) | |
| Security | HTTPS(SSL) Login Authentication<br>Digest Login Authentication<br>IP Address Filtering<br>User access log<br>802.1X Authentication(EAP-TLS, EAP-LEAP)<br>Device Certificate(Hanwha Techwin Root CA) | |
| Edge Storage | Micro SD/SDHC/SDXC 2slot 각 256GB Total 512GB | |
| Application Programming Interface | ONVIF Profile S/G/T<br>SUNAPI(HTTP API)<br>Wisenet open platform | |
| Webpage Language | English, Korean, Chinese, French, Italian, Spanish, German, Japanese, Russian, Swedish,, Portuguese, Czech, Polish, Turkish, Dutch, Hungarian, Greek | |
| Web Viewer | Supported OS: Windows 8.1, 10, Mac OS X 10.10, 10.11, 10.12<br>Recommended Browser: Google Chrome<br>Supported Browser: MS Explore11, MS Edge, Mozilla Firefox(Window 64bit only), Apple Safari(Mac OS X only) | |
| Memory | 4096MB RAM, 512MB Flash | |
| **Environmental** | | |
| Operating Temperature / Humidity | -10°C ~ +55°C(+14°F ~ +131°F) / Less than 90% RH | |
| Storage Temperature / Humidity | -50°C ~ +60°C(-58°F ~ +140°F) / Less than 90% RH | |
| Certification | None | |
| **Electrical** | | |
| Input Voltage | PoE+(IEEE802.3at), 12VDC | |
| Power Consumption | PoE+: Max 19.50W, typical 15.00W<br>12VDC: Max 16.50W, typical 12.00W | |
| **Mechanical** | | |
| Color / Material | Body: Black / Aluminum | |
| RAL Code | None | |
| Product dimensions / weight | 73.1x66.6x147.8mm, Weight : 0.70Kg (1.54lb) | |
| Conduit hole | | |
| Hanging mount(Dome) | | |
| Skin cover(Dome) | | |
| Weather cap(Dome) | | |
| Power module | | |
| Backbox | | |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

## 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 ☐ 230 Vac ☐ 120 Vac ☐ 24 Vac ☒ 12 Vdc ☒ PoE

Frequency ☐ 50 Hz ☐ 60 Hz ☐ Hz

## 1.2 Variant Model Differences

Addition of derivative model for distributiom route classification

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

| Description | Model Number | Serial Number | Manufacturer | Remarks |
|---|---|---|---|---|
| Network Camera | PNB-A9001 | - | HANWHA TECHWIN SECURITY VIETNAM CO.,LTD. | EUT |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

## 1.5 Support Equipments

| Description | Model Number | Serial Number | Manufacturer | Remarks |
|---|---|---|---|---|
| PoE+ Adapter | GS728TPP | - | NETGEAR | - |
| Lens | M118VG1250IR | - | TAMRON | - |
| Notebook | P95G001 | 8KM8HT2 | Wistron Infocom (Chengdu) Company Limited | - |
| Notebook Adapter | LA65NS2-01 | - | LITE-ON TECHNOLOGY(CHANG ZHOU)CO.,LTD. | - |
| Controller | SPC-1010 | C50E67WG10100F | SamSung Techwin Co.,Ltd. | - |
| Controller Adapter | RS-AB1000 | - | Dongguan Jinhuasheng Power Technology Co.,Ltd. | - |
| Speaker | BR1000A Cuve Black 2 | - | DONGGUAN EDIFIER TECHNOLOGY Co., Ltd | - |
| MIC | MP1000 | - | - | - |
| Alarm | SIP-1201DD D0 | - | SAMSUNG TECHWIN CO., LTD. | - |
| Button Alarm | - | - | - | - |
| Smart Phone | LG-SU760 | 108KPQJ0186212 | LG Electronics Co.,Ltd. | - |
| Micro SD Card | - | - | SanDisk | 8 GB |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

## 1.6 External I/O Cabling

■ DC 12 V Mode

| Start | | END | | Cable Spec. | |
|---|---|---|---|---|---|
| **Description** | **I/O Port** | **Description** | **I/O Port** | **Length** | **Shield** |
| Network Camera (EUT) | IRIS | Lens | IRIS | 0.2 | U |
| | NETWORK | Notebook | RJ-45 | 3.0 | U |
| | RS-485 | Controller | RS-485 | 3.0 | U |
| | Audio Out | Speaker | 3.5 ㎜ | 1.4 | U |
| | Audio In | MIC | XLR | 1.4 | U |
| | Alarm Out | Alarm | Alarm In | 3.0 | U |
| | Alarm In | Button Alarm | Alarm Out | 3.0 | U |
| | SLOT | Micro SD Card | SLOT | - | - |
| Notebook | 3.5 ㎜ | Smart Phone | 3.5 ㎜ | 1.0 | U |

■ PoE Mode

| Start | | END | | Cable Spec. | |
|---|---|---|---|---|---|
| **Description** | **I/O Port** | **Description** | **I/O Port** | **Length** | **Shield** |
| Network Camera (EUT) | IRIS | Lens | IRIS | 0.2 | U |
| | NETWORK | PoE+ Adapter | RJ-45 | 3.0 | U |
| | RS-485 | Controller | RS-485 | 3.0 | U |
| | Audio Out | Speaker | 3.5 ㎜ | 1.4 | U |
| | Audio In | MIC | XLR | 1.4 | U |
| | Alarm Out | Alarm | Alarm In | 3.0 | U |
| | Alarm In | Button Alarm | Alarm Out | 3.0 | U |
| | SLOT | Micro SD Card | SLOT | - | - |
| Notebook | 3.5 ㎜ | Smart Phone | 3.5 ㎜ | 1.0 | U |
| | RJ-45 | PoE+ Adapter | RJ-45 | 2.0 | U |

* Unshielded=U, Shielded=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.
The authenticity of the test report, contact shchoi@kes.co.kr

## 1.7 EUT Operating Mode(s)

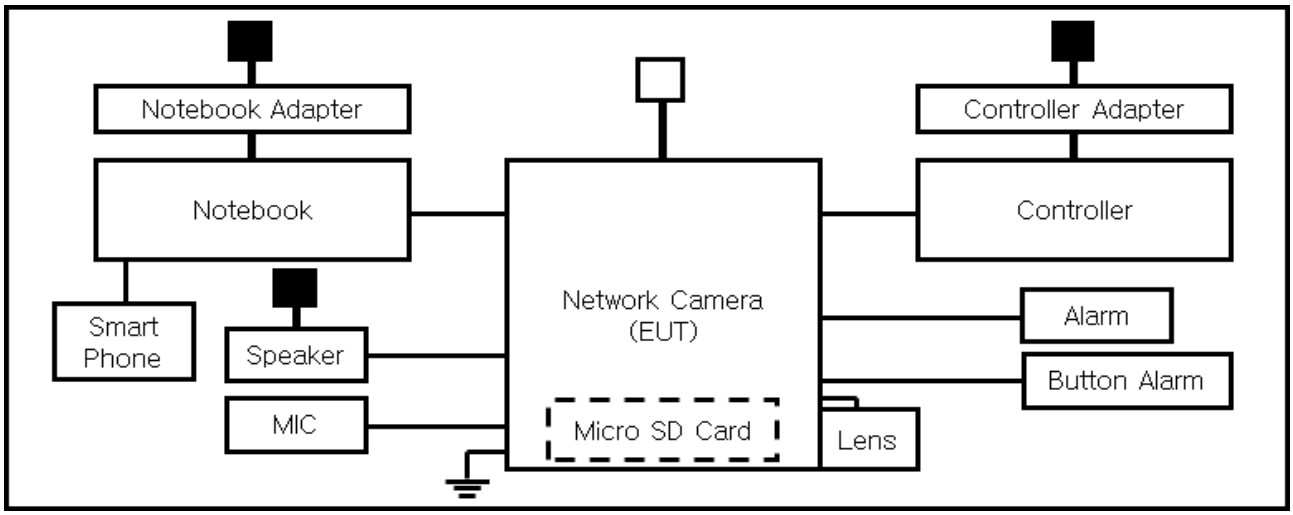
| Test mode | operating |
|---|---|
| DC 12 V,<br>PoE | Monitoring EUT Using Web Viewer, Ping Test |

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

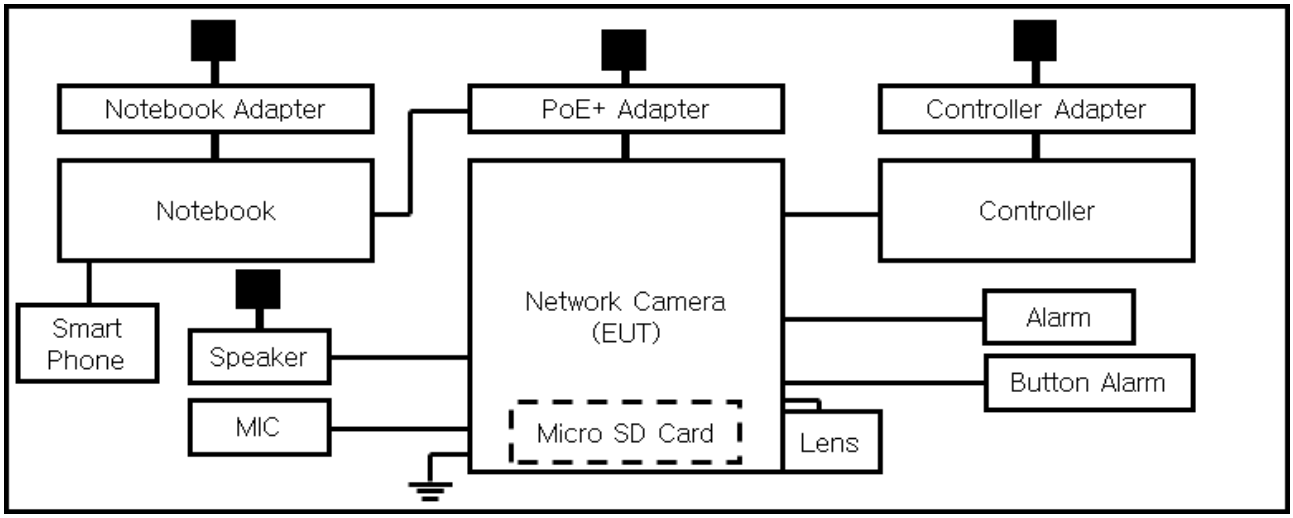
## 1.8 Configuration

■ AC Main
□ DC Main

■ DC 12 V Mode




■ PoE Mode




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.
The authenticity of the test report, contact shchoi@kes.co.kr

## 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, Yeoju-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-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | KR0100 |
| International | **KOLAS** | EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | KT489 |
| USA | **FCC** | 3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements. | KR0100 |
| Canada | **ISED** | 3 m & 10 m Semi-Anechoic Chamber and Conducted test site | 23298-1 |
| 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 | R-20056, C-20036, T-20040, G-20057 |
| Europe | **TÜV SÜD** | EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | CARAT 001633 0004 |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# 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 ☐ Group 2
☐ Class A ☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 55032:2015 ☐ Class A ☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013

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.
The authenticity of the test report, contact shchoi@kes.co.kr

| | | |
|---|---|---|
| ☐ **VCCI-CISPR 32:2016** | ☐ Class A | ☐ Class B |
| ☐ **AS/NZS CISPR32:2015** | ☐ Class A | ☐ Class B |
| ☒ **47 CFR Part 15, Subpart B** | | |
| ☐ CISPR 22:2009 +A1:2010 | ☐ Class A | ☐ Class B |
| ☒ ANSI C63.4-2014 | ☒ Class A | ☐ Class B |
| ☒ **IC Regulation ICES-003 : 2016** | | |
| ☐ CAN/CSA CISPR 22-10 | ☐ Class A | ☐ Class B |
| ☒ ANSI C63.4-2014 | ☒ Class A | ☐ Class B |

☐ **RE– Directive 2014/53/EU**

☐ EN 301 489-1 V1.9.2

- ☐ Equipment for fixed use
- ☐ Equipment for vehicular use
- ☐ Equipment for portable use

☐ EN 301 489-3 V1.6.1

☐ EN 301 489-17 V2.2.1

☐ EN 60945:2002

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# 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 |
|---|---|---|---|---|---|
| ☐ | EMI Test S/W | EMC32 | R & S | 9.12.00 | - |
| ☐ | EMI TEST RECEIVER | ESR3 | R & S | 101781 | 04, 22, 2020 |
| ☐ | LISN | ENV216 | R & S | 101787 | 01, 04, 2020 |
| ☐ | LISN | ESH2-Z5 | R & S | 100450 | 04, 22, 2020 |
| ☐ | PULSE LIMITER | ESH3-Z2 | R & S | 101915 | 11, 25, 2020 |

**Test Conditions**
Temperature: ℃
Relative Humidity: % R.H.

**Frequency Range of Measurement**
150 ㎑ to 30 ㎒

**Instrument Settings**
IF Band Width: 9 ㎑

**Test Results**
The requirements are:

☐ PASS
☐ NOT PASS
☒ NOT APPLICABLE

**Remarks**
It is not tested apply because it is powered by DC and PoE.

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# 2.2 Radiated Electric Field Emissions(Below 1 ㎓)

**Test Date**
Dec. 01, 2019

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

**Test Equipment**

| Used | Description | Model Number | Manufacturer | Serial Number | Cal. Due |
|---|---|---|---|---|---|
| ☒ | EMI Test S/W | EP5/RE | TOYO Corporation | 6.0.0 | - |
| ☒ | EMI TEST RECEIVER | ESU26 | R & S | 100551 | 04, 09, 2020 |
| ☒ | AMPLIFIER | SCU 01 | R & S | 100603 | 11, 25, 2020 |
| ☒ | TRILOG-BROADBAND ANTENNA | VULB9163 | Schwarzbeck | 715 | 11, 29, 2020 |
| ☒ | ATTENUATOR | 8491A | HP | 32173 | 03, 11, 2020 |

**Test Conditions**
Temperature: 22,1 ℃
Relative Humidity: 51,7 % R.H.

**Frequency Range of Measurement**
30 ㎒ to 1 ㎓

**Instrument Settings**
IF Band Width: 120 ㎑

**Test Results**
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

**Remarks**
See Appendix A for test data.

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# 2.3 Radiated Electric Field Emissions(Above 1 ㎓)

**Test Date**
Dec. 01, 2019

**Test Location**
SEMI ANECHOIC CHAMBER #4(10 m)

**Test Equipment**

| Used | Description | Model Number | Manufacturer | Serial Number | Cal. Due |
|---|---|---|---|---|---|
| ☒ | EMI Test S/W | EP5/RE | TOYO Corporation | 6.0.0 | - |
| ☒ | EMI TEST RECEIVER | ESU26 | R & S | 100551 | 04, 09, 2020 |
| ☒ | PREAMPLIFIER | 8449B | AGILENT | 3008A01742 | 01, 08, 2020 |
| ☐ | ATTENUATOR | 8491A | HP | 35496 | 03, 11, 2020 |
| ☒ | HORN ANTENNA | BBHA 9120D | SCHWARZBECK | 9120D-1802 | 03, 12, 2020 |

**Test Conditions**
Temperature: 22,1 ℃
Relative Humidity: 51,7 % R.H.

**Frequency Range of Measurement**
1 ㎓ to 5 ㎓

**Instrument Settings**
IF Band Width: 1 ㎒

**Test Results**
The requirements are:
☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

**Remarks**
See Appendix A for test data.

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# APPENDIX A – TEST DATA

## Conducted Emissions at Mains Power Ports

HOT LINE

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.
The authenticity of the test report, contact shchoi@kes.co.kr

NEUTRAL LINE

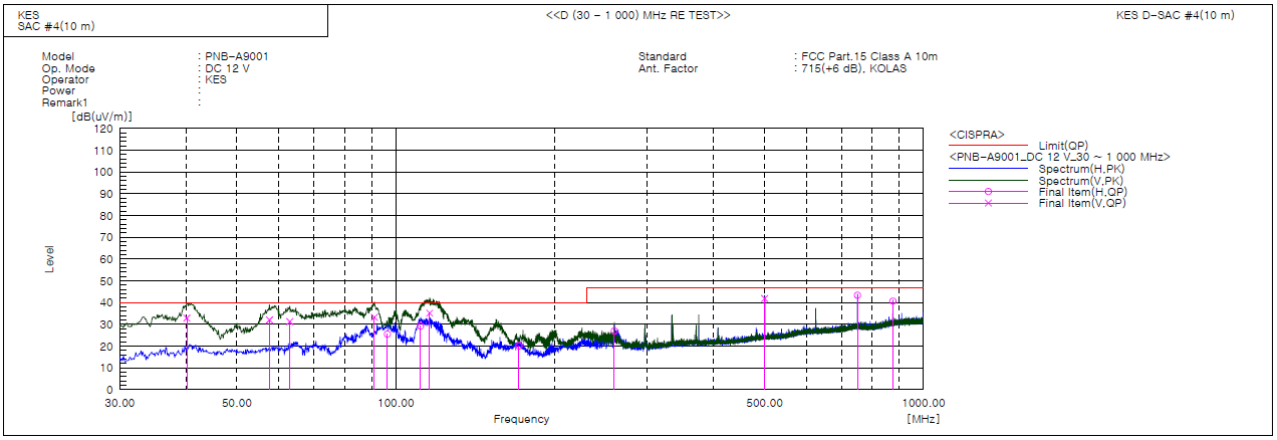
N/A

◆ 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.
The authenticity of the test report, contact shchoi@kes.co.kr

# Radiated Electric Field Emissions(Below 1 ㎓)

■ DC 12 V Mode

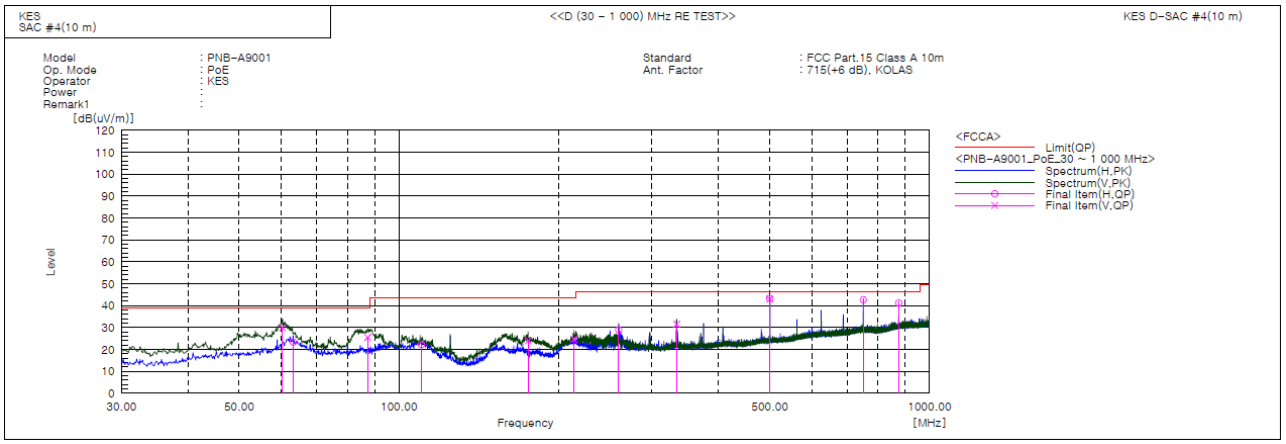



Final Result

| No. | Frequency [MHz] | (P) | Reading QP [dB(uV)] | c.f [dB(1/m)] | Result QP [dB(uV/m)] | Limit QP [dB(uV/m)] | Margin QP [dB] | Height [cm] | Angle [deg] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 40.185 | V | 55.7 | -22.8 | 32.9 | 39.0 | 6.1 | 135.0 | 258.0 | |
| 2 | 57.645 | V | 54.0 | -22.0 | 32.0 | 39.0 | 7.0 | 100.0 | 278.0 | |
| 3 | 62.980 | V | 54.3 | -23.0 | 31.3 | 39.0 | 7.7 | 100.0 | 254.0 | |
| 4 | 91.110 | V | 57.7 | -24.4 | 33.3 | 43.5 | 10.2 | 139.0 | 128.0 | |
| 5 | 96.445 | H | 48.4 | -22.9 | 25.5 | 40.0 | 14.5 | 400.0 | 154.0 | |
| 6 | 111.480 | H | 51.9 | -22.7 | 29.2 | 40.0 | 10.8 | 378.0 | 290.0 | |
| 7 | 115.966 | V | 58.5 | -23.3 | 35.2 | 43.5 | 8.3 | 100.0 | 293.0 | |
| 8 | 171.135 | H | 44.5 | -24.4 | 20.1 | 40.0 | 19.9 | 362.0 | 190.0 | |
| 9 | 259.526 | H | 46.9 | -19.9 | 27.0 | 47.0 | 20.0 | 400.0 | 83.0 | |
| 10 | 499.965 | V | 54.6 | -12.7 | 41.9 | 46.5 | 4.6 | 281.0 | 330.0 | |
| 11 | 749.983 | H | 50.7 | -7.3 | 43.4 | 46.5 | 3.1 | 232.0 | 225.0 | |
| 12 | 875.113 | H | 46.7 | -6.0 | 40.7 | 47.0 | 6.3 | 340.0 | 308.0 | |

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.
The authenticity of the test report, contact shchoi@kes.co.kr

■ PoE Mode




Final Result

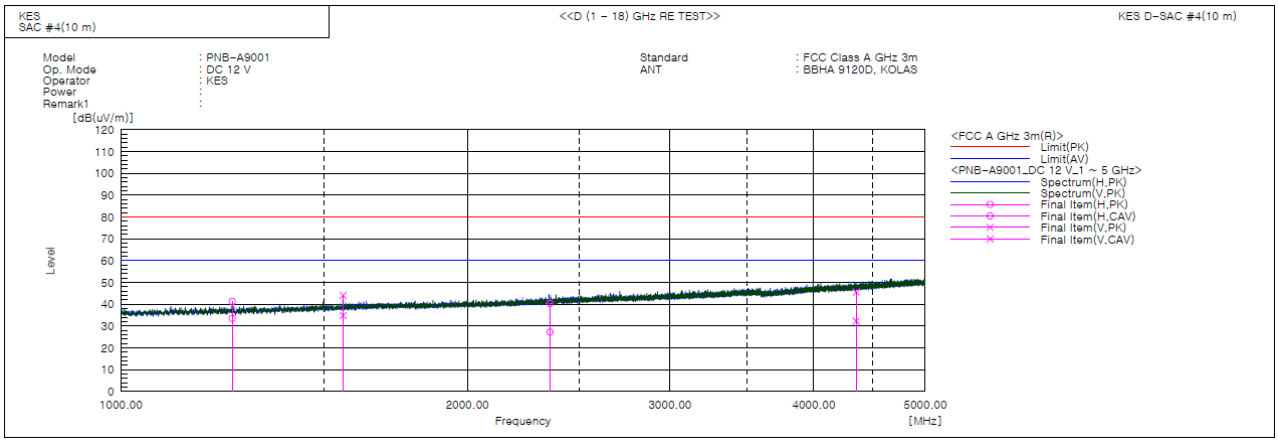
| No. | Frequency [MHz] | (P) | Reading QP [dB(uV)] | c.f [dB(1/m)] | Result QP [dB(uV/m)] | Limit QP [dB(uV/m)] | Margin QP [dB] | Height [cm] | Angle [deg] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 60.313 | V | 52.4 | -22.4 | 30.0 | 39.0 | 9.0 | 100.0 | 312.0 | |
| 2 | 63.223 | H | 46.4 | -23.0 | 23.4 | 39.0 | 15.6 | 262.0 | 94.0 | |
| 3 | 87.351 | V | 51.0 | -25.5 | 25.5 | 39.0 | 13.5 | 138.0 | 235.0 | |
| 4 | 110.268 | H | 44.8 | -22.6 | 22.2 | 43.5 | 21.3 | 400.0 | 270.0 | |
| 5 | 175.258 | V | 48.1 | -24.1 | 24.0 | 43.5 | 19.5 | 115.0 | 153.0 | |
| 6 | 213.815 | V | 45.5 | -20.8 | 24.7 | 43.5 | 18.8 | 143.0 | 346.0 | |
| 7 | 259.526 | H | 48.9 | -19.9 | 29.0 | 46.5 | 17.5 | 385.0 | 51.0 | |
| 8 | 333.731 | V | 48.4 | -16.8 | 31.6 | 46.5 | 14.9 | 400.0 | 20.0 | |
| 9 | 499.976 | H | 56.0 | -12.7 | 43.3 | 46.5 | 3.2 | 283.0 | 285.0 | |
| 10 | 499.990 | V | 55.7 | -12.7 | 43.0 | 46.5 | 3.5 | 184.0 | 335.0 | |
| 11 | 750.104 | H | 50.0 | -7.3 | 42.7 | 46.5 | 3.8 | 232.0 | 213.0 | |
| 12 | 875.113 | H | 47.2 | -6.0 | 41.2 | 46.5 | 5.3 | 312.0 | 316.0 | |

♦ Calculation – SAC #4(10 m)
Result(QP) [dB(㎶/m)] = (Reading(QP)[dB(㎶)] + c.f[dB(1/m)]
Margin(QP)[dB] = Limit[dB(㎶/m)] - Result(QP) [dB(㎶/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

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.
The authenticity of the test report, contact shchoi@kes.co.kr

# Radiated Electric Field Emissions(Above 1 ㎓)

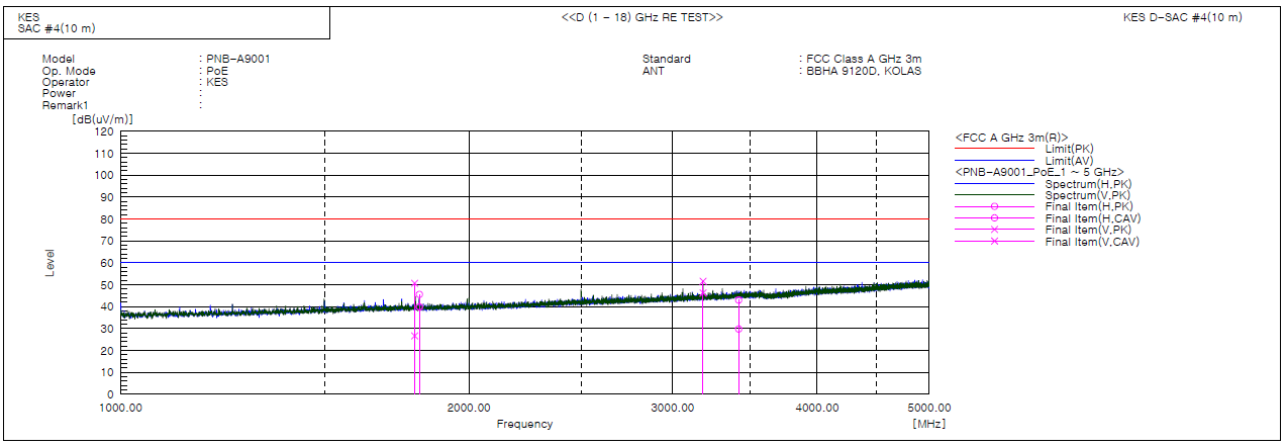
## ■ DC 12 V Mode




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 | 1249.760 | H | 45.8 | 38.0 | -4.5 | 41.3 | 33.5 | 80.0 | 60.0 | 38.7 | 26.5 | 335.0 | 341.0 | |
| 2 | 1559.755 | V | 46.6 | 37.4 | -2.5 | 44.1 | 34.9 | 80.0 | 60.0 | 35.9 | 25.1 | 100.0 | 57.0 | |
| 3 | 2359.800 | H | 39.2 | 26.1 | 1.2 | 40.4 | 27.3 | 80.0 | 60.0 | 39.6 | 32.7 | 318.0 | 314.0 | |
| 4 | 4354.680 | V | 36.6 | 23.3 | 9.0 | 45.6 | 32.3 | 80.0 | 60.0 | 34.4 | 27.7 | 143.0 | 0.0 | |

## ■ PoE Mode




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 | 1795.380 | V | 52.1 | 28.1 | -1.4 | 50.7 | 26.7 | 80.0 | 60.0 | 29.3 | 33.3 | 132.0 | 258.0 | |
| 2 | 1812.600 | H | 46.9 | 41.2 | -1.3 | 45.6 | 39.9 | 80.0 | 60.0 | 34.4 | 20.1 | 358.0 | 221.0 | |
| 3 | 3187.650 | V | 47.3 | 42.0 | 4.3 | 51.6 | 46.3 | 80.0 | 60.0 | 28.4 | 13.7 | 131.0 | 264.0 | |
| 4 | 3421.565 | H | 37.9 | 24.7 | 5.1 | 43.0 | 29.8 | 80.0 | 60.0 | 37.0 | 30.2 | 369.0 | 275.0 | |

♦ Calculation

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

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

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.
The authenticity of the test report, contact shchoi@kes.co.kr

## Test Setup Photos and Configuration

# Conducted Emissions at Mains Power Ports

N/A

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.
The authenticity of the test report, contact shchoi@kes.co.kr

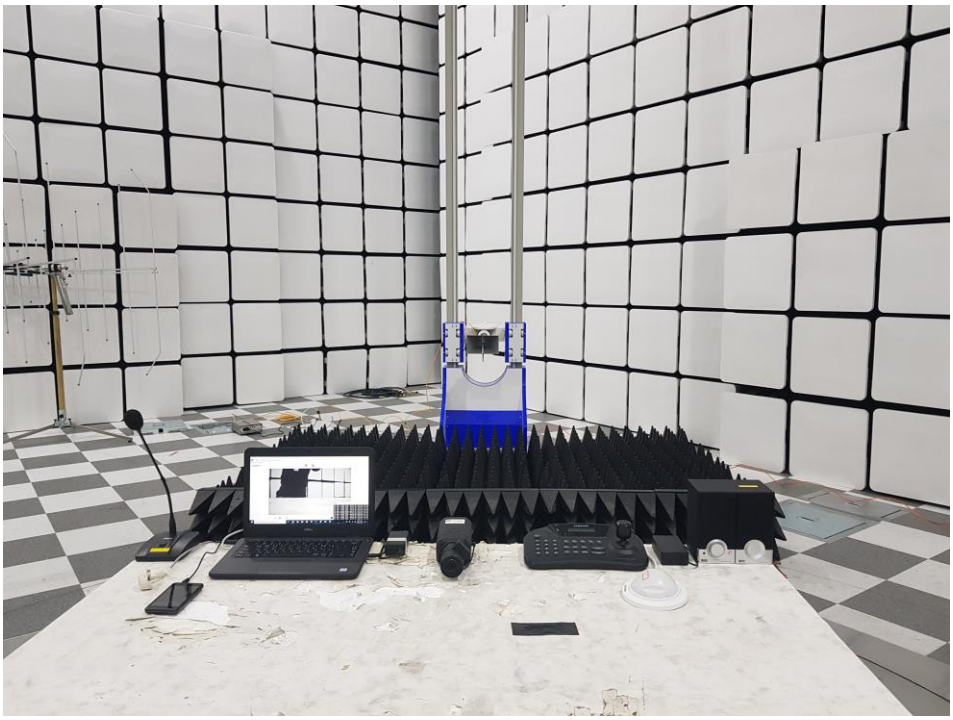
## Radiated Electric Field Emissions(Below 1 ㎓)





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.
The authenticity of the test report, contact shchoi@kes.co.kr

## Radiated Electric Field Emissions(Above 1 ㎓)





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.
The authenticity of the test report, contact shchoi@kes.co.kr

# EUT External Photographs

(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.
The authenticity of the test report, contact shchoi@kes.co.kr

# EUT Internal Photographs

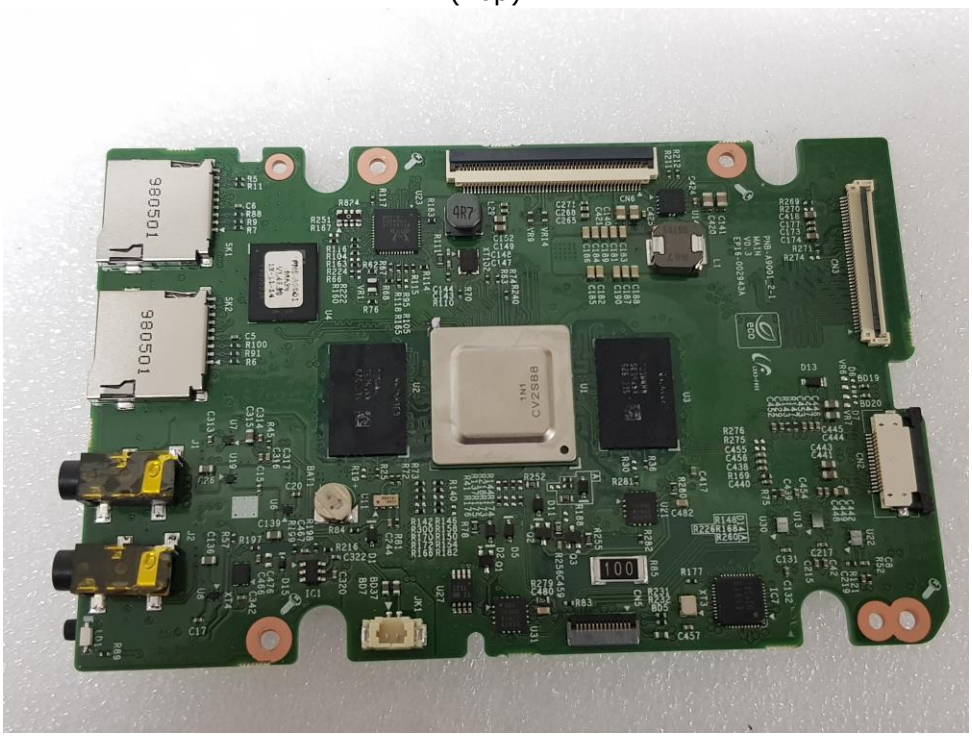
(Internal View)



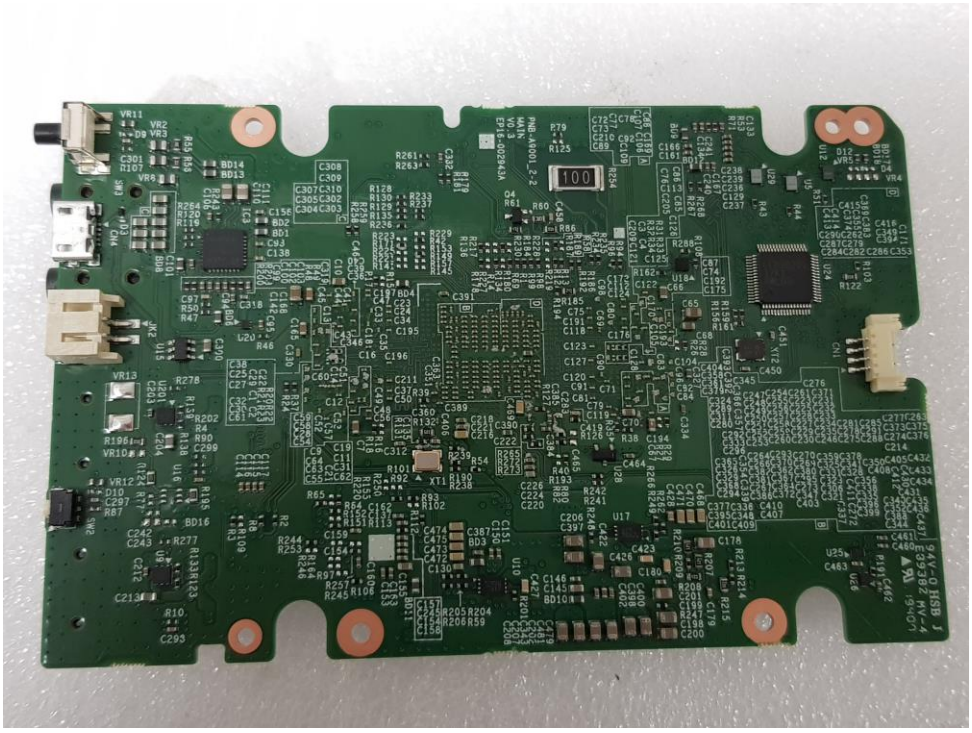
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

# EUT Internal View – Main Board

(Top)



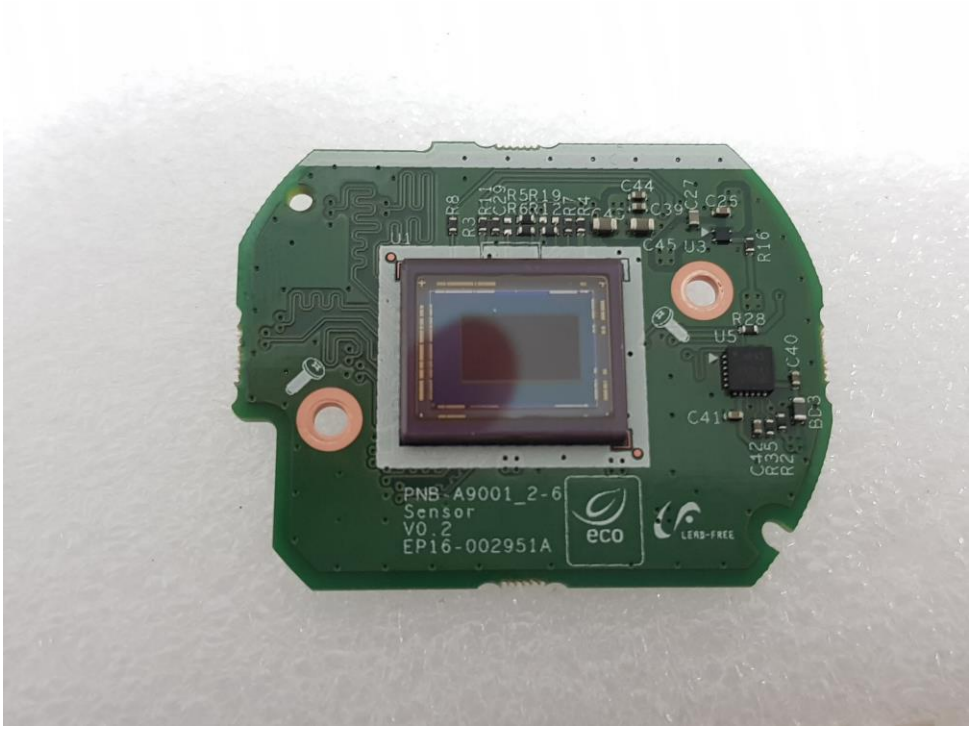
(Bottom)



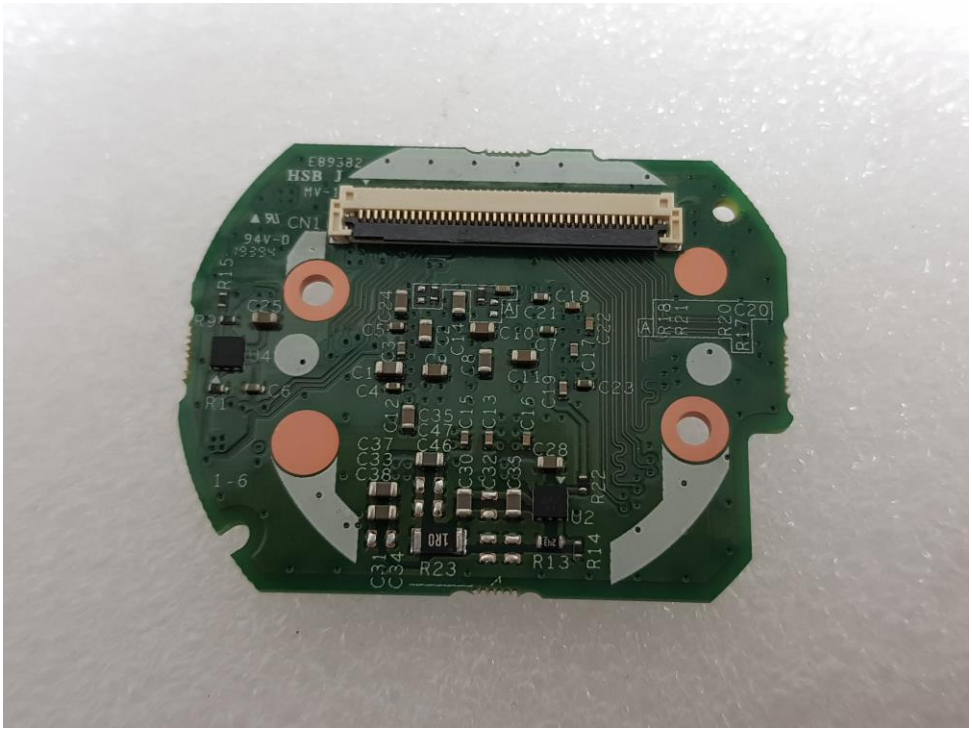
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

# EUT Internal View – SENSOR Board

(Top)




(Bottom)



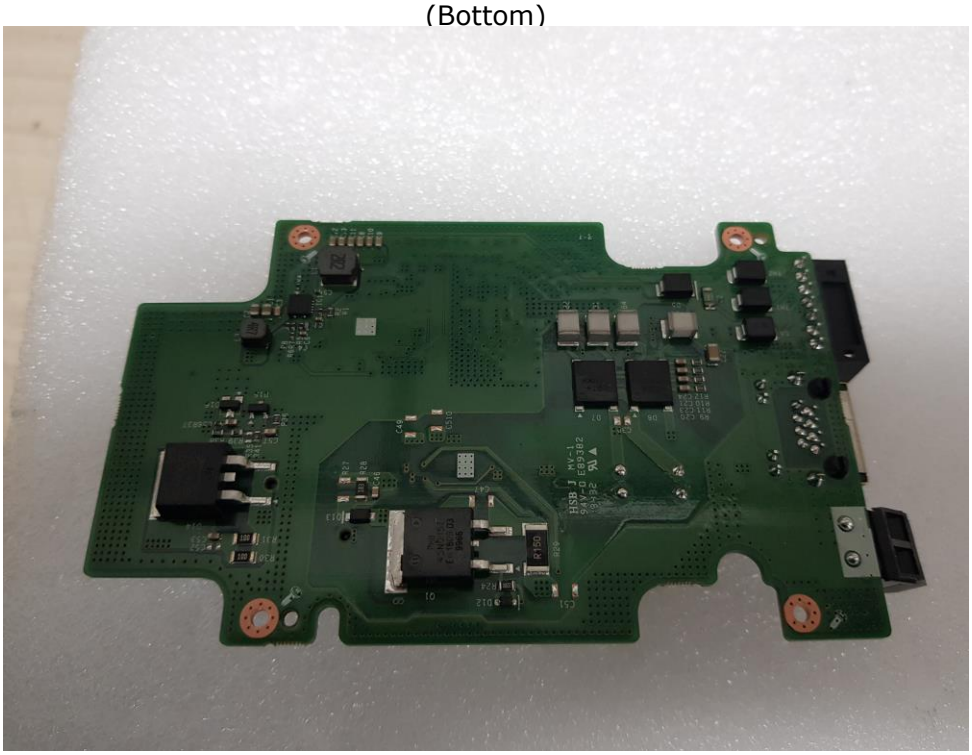

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

# EUT Internal View – POWER Board

(Top)

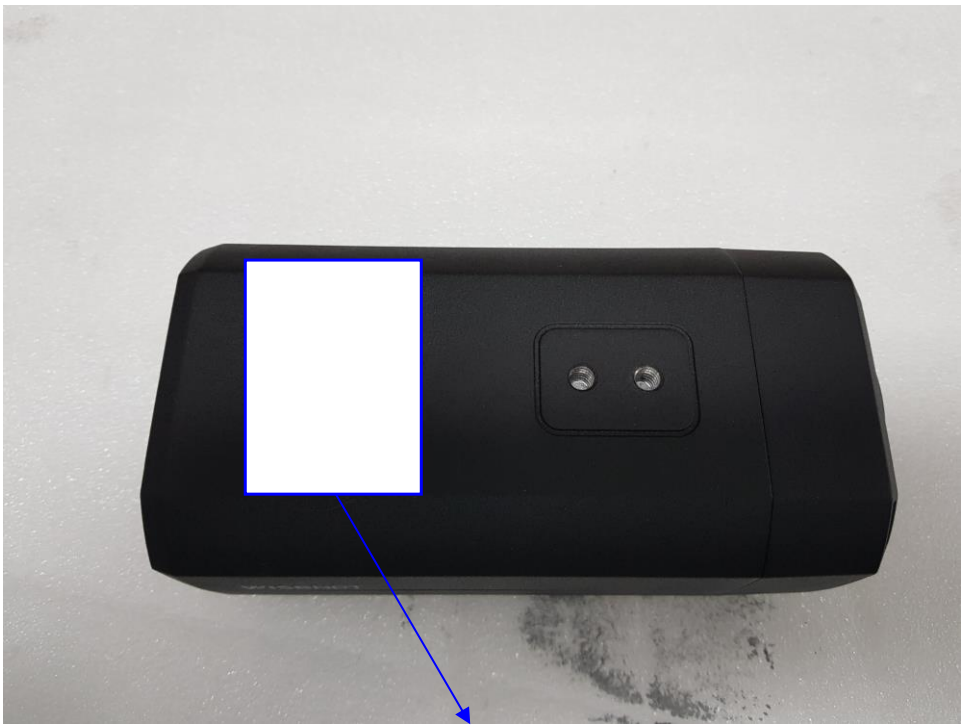


(Bottom)



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.
The authenticity of the test report, contact shchoi@kes.co.kr

# Label Photographs



CAN ICES-3(A) / NMB-3(A)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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.
The authenticity of the test report, contact shchoi@kes.co.kr