



## EMC TEST REPORT For RCM

Test Report No. : KES-E1-18T0637

Date of Issue : Nov. 16, 2018

Product name : Thermal Camera

Model/Type No. : TNO-4040TR

Variant Model : TNO-4030TR

Applicant : Hanwha Techwin Co., Ltd.

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

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

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

Date of Receipt : Nov. 06, 2018

Test date : Nov. 08, 2018

Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by

Kang Hyeon, Kim  
EMC Test Engineer

Reviewed by

Dong-Hun, Jang  
EMC Technical Manager

This test report is not related to KOLAS.

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## REPORT REVISION HISTORY

| Date          | Test Report No. | Revision History |
|---------------|-----------------|------------------|
| Nov. 16, 2018 | KES-E1-18T0637  | Issued           |
|               |                 |                  |
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## 1.0 General Product Description

Main Specifications of EUT are:

|                             |  |
|-----------------------------|--|
| <b>VIDEO</b>                |  |
| Imaging Device              | Uncooled microbolometer, Pixel size : 17 $\mu$ m   |
| Effective Pixels            | 640(H) x 480(V)  |
| NETD                        | <50mK  |
| Video Out                   | CVBS : 1.0Vpp / 75 $\Omega$ composite, 720 x 480(N), 720 x 576(P), for installation<br>USB : Micro USB type B, 1280 x 720, for installation  |
| <b>LENS</b>                 |  |
| Focal Length (Zoom Ratio)   | 19mm fixed   |
| Max. Aperture Ratio         | F1.0   |
| Angular Field of View       | H : 32° / V : 24.3° / D : 39.2°  |
| Min. Object Distance        | 11m (36.09ft)  |
| Focus Control               | Fixed  |
| Lens / Mount Type           | Board-in type  |
| <b>OPERATIONAL</b>          |  |
| Camera Title                | Off / On<br>- W/W : English / Numeric / Special characters<br>- China : English / Numeric / Special / Chinese characters<br>- Common : Multi-line (Max. 5), Color (Gray / Green / Red / Blue / Black / White),<br>Transparency, Auto scale by resolution |
| Motion Detection            | Off / On (8ea, 8point polygonal zones), Handover   |
| Privacy Masking             | Off / On (32ea, polygonal zones)<br>- Color : Gray / Green / Red / Blue / Black / White - Mosaic   |
| Flip / Mirror               | Off / On, Hallway : 90° / 270°   |
| Video & Audio Analytics     | Tampering, Loitering, Directional detection, Virtual line, Enter/Exit, (Dis) Appear,<br>Audio detection, Motion detection, Sound classification, Shock detection,<br>Temperature change detection  |
| Alarm I/O                   | Input 1ea / Output 2ea   |
| Digital Image Stabilization | Off / On (Built-in Gyro sensor)  |
| Alarm Triggers              | Alarm Input, Motion detection, Video & Audio analytics, Network disconnect   |
| Alarm Events                | File upload Via FTP, E-mail, Notification Via E-mail, Local storage (SD/SDHC/<br>SDXC) or NAS recording at event triggers, External output   |
| Pixel count                 | Support  |
| <b>NETWORK</b>              |  |
| Ethernet                    | RJ-45 (10/100 BASE-T)  |
| Video Compression Format    | H.265 / H.264 (MPEG-4 part 10/AVC) : Main / Baseline / High, MJPEG   |
| Resolution                  | 640 x 480, 640 x 360, 320 x 240  |
| Max. Framerate              | H.265 / H.264 : Max. 30fps at all resolutions, MJPEG : Max. 30fps  |
| WiseStreamII                | Support  |
| Video Quality Adjustment    | H.265 / H.264 / MJPEG : Target Bitrate Level Control   |
| Bitrate Control Method      | H.265 / H.264 : CBR or VBR, MJPEG : VBR  |
| Streaming Capability        | Multiple streaming (Up to 10 profiles)   |
| Audio In                    | Selectable (Mic in / Line in), Supply voltage : 2.5V DC (4mA),<br>Input impedance : approx. 2K Ohm   |
| Audio Out                   | Line out, Max output level : 1 Vrms  |
| Audio Compression Format    | G.711 u-law / G.726 selectable, G.726 (ADPCM) 8KHz, G.711 8KHz,<br>G.726 : 16Kbps, 24Kbps, 32Kbps, 40Kbps, AAC-LC : 48Kbps at 8 / 16 / 32 / 48KHz  |
| Audio Communication         | Bi-directional (2-Way)   |
| IP                          | IPv4, IPv6   |
| Protocol                    | TCP/IP, UDP/IP, RTP (UDP), RTP (TCP), RTCP/RTSP, NTP, HTTP, HTTPS, SSL/TLS,<br>DHCP, PPPoE, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3 (MIB-2), ARP, DNS, DDNS,<br>QoS, UPnP, Bonjour  |

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## 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 ☐ 240 Vac ☐ 100 Vac ☒ 24 Vac ☒ 12 Vdc ☒ PoE

Frequency ☐ 50 Hz ☐ 60 Hz ☐ Hz

## 1.2 Variant Model Differences

A derivative model to the classification of customers simple.

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

| Description    | Model Number | Serial Number | Manufacturer                      | Remarks |
|----------------|--------------|---------------|-----------------------------------|---------|
| Thermal Camera | TNO-4040TR   | -             | Hanwha Techwin (Tianjin) Co.,Ltd. | EUT     |

## 1.5 Support Equipments

| Description      | Model Number   | Serial Number | Manufacturer                               | Remarks |
|------------------|----------------|---------------|--|---------|
| PoE Adaptor      | PD-9601GR      | -             | Microsemi                                  | -       |
| Notebook         | ProBook4430s   | -             | HP   | -       |
| Notebook Adaptor | SeriesPPP0009H | -             | CHICONY POWER TECHNOLOGY (SUZHOU) CO.,LTD, | -       |
| Speaker          | BR1000A        | -             | DONGGUAN 1 TECHNOLOGY Co., Ltd             | -       |
| MIC              | MP1000         | -             | -  | -       |
| Alarm            | -              | -             | -  | -       |
| Button Alarm     | -              | -             | -  | -       |
| iPod             | A1367          | C3TDG2JGDCP9  | APPLE .Inc                                 | -       |
| Micro SD Card    | -              | -             | SanDisk                                    | 8 GB    |

## 1.6 External I/O Cabling

### ■ AC 24 V, DC 12 V MODE

| Start                |              | END           |              | Cable Spec. |        |
|----------------------|--------------|---------------|--------------|-------------|--------|
| Description          | I/O Port     | Description   | I/O Port     | Length      | Shield |
| Thermal Camera (EUT) | RJ-45        | Notebook      | RJ-45        | 3.0         | U      |
|                      | Thermal 2Pin | Speaker       | 3.5 mm       | 1.4         | U      |
|                      | Thermal 2Pin | MIC           | 3.5 mm       | 1.4         | U      |
|                      | Thermal 2Pin | Alarm         | Thermal 2Pin | 3.0         | U      |
|                      | Thermal 2Pin | Button Alarm  | Thermal 2Pin | 3.0         | U      |
|                      | SLOT         | Micro SD Card | SLOT         | -           | -      |
| Notebook             | 3.5 mm       | iPod          | 3.5 mm       | 0.8         | U      |

### ■ PoE MODE

| Start                |              | END           |              | Cable Spec. |        |
|----------------------|--------------|---------------|--------------|-------------|--------|
| Description          | I/O Port     | Description   | I/O Port     | Length      | Shield |
| Thermal Camera (EUT) | RJ-45 (PoE)  | PoE Adaptor   | RJ-45 (PoE)  | 3.0         | U      |
|                      | Thermal 2Pin | Speaker       | 3.5 mm       | 1.4         | U      |
|                      | Thermal 2Pin | MIC           | 3.5 mm       | 1.4         | U      |
|                      | Thermal 2Pin | Alarm         | Thermal 2Pin | 3.0         | U      |
|                      | Thermal 2Pin | Button Alarm  | Thermal 2Pin | 3.0         | U      |
|                      | SLOT         | Micro SD Card | SLOT         | -           | -      |
| Notebook             | RJ-45 (DATA) | PoE Adaptor   | RJ-45 (DATA) | 1.5         | U      |
|                      | 3.5 mm       | iPod          | 3.5 mm       | 0.8         | U      |

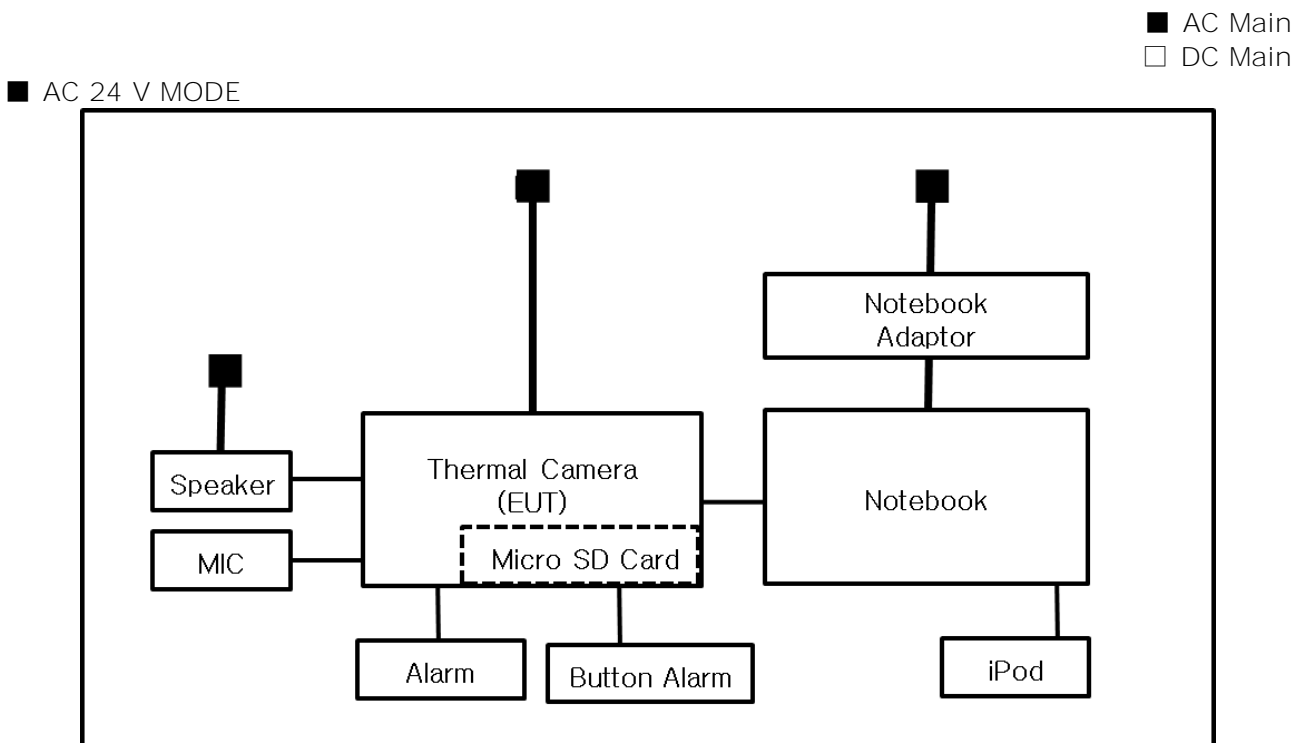
\* Unshielded=U, Shielded=S

## 1.7 EUT Operating Mode(s)

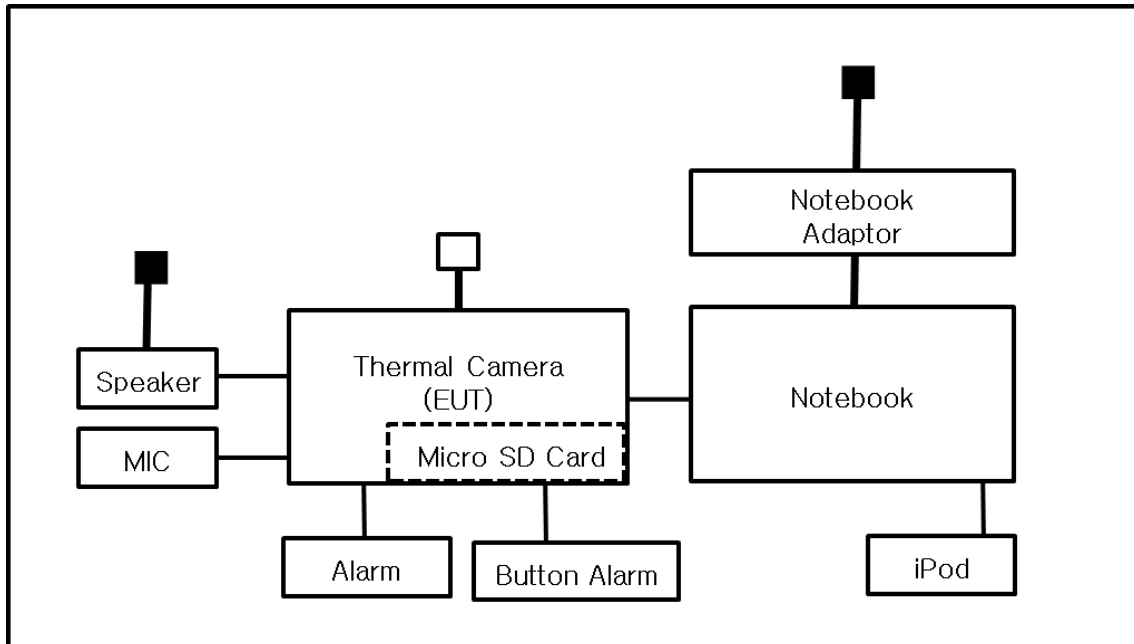
| Test mode                 | operating                 |
|---------------------------|---------------------------|
| AC 24 V<br>DC 12 V<br>PoE | EUT Monitoring, Ping Test |

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

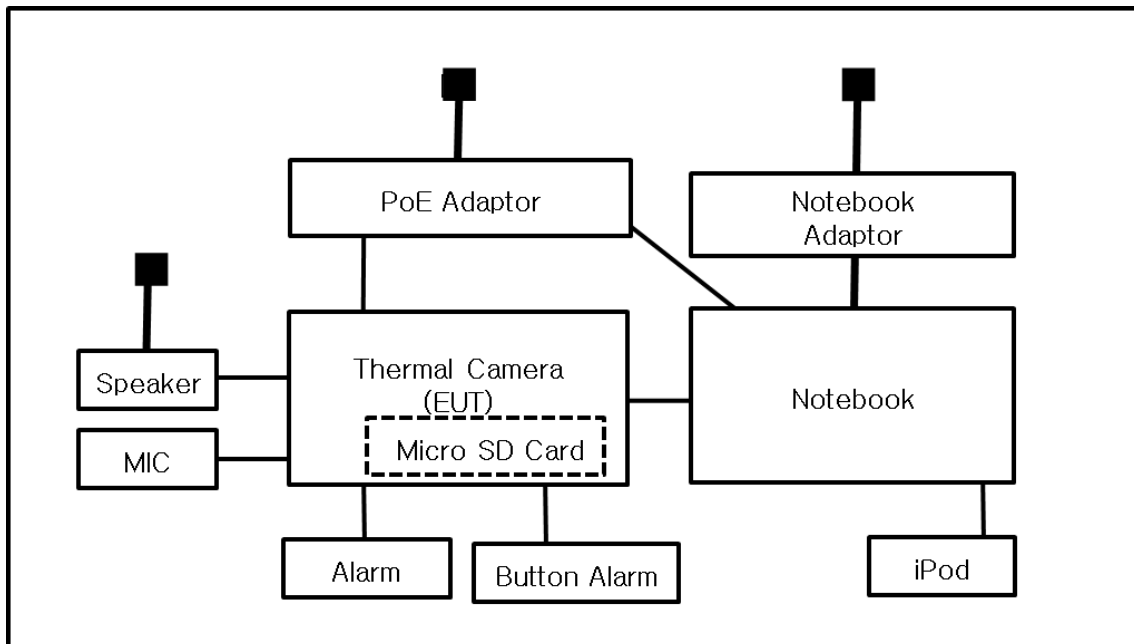
## 1.8 Configuration



■ DC 12 V MODE



■ PoE MODE





## 1.9 Remarks when standards applied

N/A

## 1.10 Calibration Details of Equipment Used for Measurement

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

## 1.11 Test Facility

The measurement facility is located at 473-21 Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4: 2014 and CISPR 16-1-4: 2012

## 1.12 Laboratory Accreditations and Listings

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

## 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 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



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- 
- |   |   |                                  |
|---|---|----------------------------------|
| <input type="checkbox"/> VCCI V-3 / 2015.04             | <input type="checkbox"/> Class A            | <input type="checkbox"/> Class B |
| <input checked="" type="checkbox"/> AS/NZS CISPR32:2015 | <input checked="" type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <br>  |   |                                  |
| <input type="checkbox"/> 47 CFR Part 15, Subpart 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"/> IC Regulation ICES-003 : 2016  |   |                                  |
| <input type="checkbox"/> CAN/CSA CISPR 22-10            | <input type="checkbox"/> Class A            | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2014                |   |                                  |
| <input type="checkbox"/> RE- Directive 2014/53/EU       |   |                                  |
| <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     |   |                                  |
| <input type="checkbox"/> EN 301 489-3 V1.6.1            |   |                                  |
| <input type="checkbox"/> EN 301 489-17 V2.2.1           |   |                                  |
| <input type="checkbox"/> EN 60945:2002                  |   |                                  |

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## 2.1 Conducted Emissions at Mains Power Ports

Test Date  
Nov. 08, 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, 25, 2019 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101137        | 01, 31, 2019 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101786        | 04, 25, 2019 |

### Test Conditions

Temperature: 22,4 °C  
Relative Humidity: 54,1 % 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.

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## 2.2 Conducted Emissions at Telecommunication Ports

Test Date  
Nov. 08, 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, 25, 2019 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101137        | 01, 31, 2019 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101786        | 04, 25, 2019 |
| <input checked="" type="checkbox"/> | 8-WIRE ISN CAT3   | CAT3 8158    | SCHWARZBECK  | 8158-0019     | 03, 22, 2019 |
| <input checked="" type="checkbox"/> | 8-WIRE ISN CAT5   | CAT5 8158    | SCHWARZBECK  | 8158-0030     | 03, 22, 2019 |

Test Conditions  
Temperature: 22,4 °C  
Relative Humidity: 54,1 % 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  
Nov. 08, 2018

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

Test Equipment

| Used                                | Description              | Model Number | Manufacturer     | Serial Number | Cal. Due     |
|-------------------------------------|--------------------------|--------------|------------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W             | EP5/RE       | TOYO Corporation | 6.0.0         | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER        | ESU26        | R & S            | 100551        | 04, 11, 2019 |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 27, 2018 |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 714           | 11, 28, 2018 |

Test Conditions  
Temperature: 21,4 °C  
Relative Humidity: 54,7 % 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  
Nov. 08, 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, 06, 2019 |
| <input checked="" type="checkbox"/> | PREAMPLIFIER               | 8449B        | AGILENT          | 3008A01967    | 05, 31, 2019 |
| <input type="checkbox"/>            | ATTENUATOR                 | 8491A        | HP               | 35496         | 03, 21, 2019 |
| <input checked="" type="checkbox"/> | DOUBLE RIDGED HORN ANTENNA | SAS-571      | A.H.SYSTEM, INC  | 781           | 05, 02, 2019 |

Test Conditions  
Temperature: 22,7 °C  
Relative Humidity: 54,0 % 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.



## APPENDIX A – TEST DATA

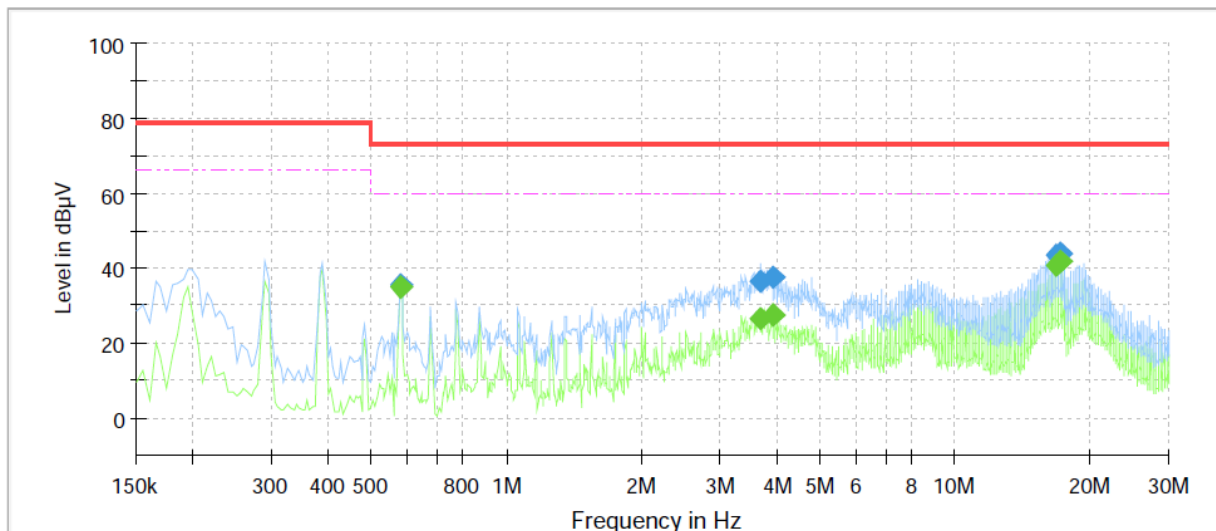
### Conducted Emissions at Mains Power Ports

#### ■ AC 24 V MODE

HOT LINE

### Common Information

Test Description: Conducted Emission  
Model No.: TNO-4040TR  
Mode: AC  
Operator Name: KES



### Final Result

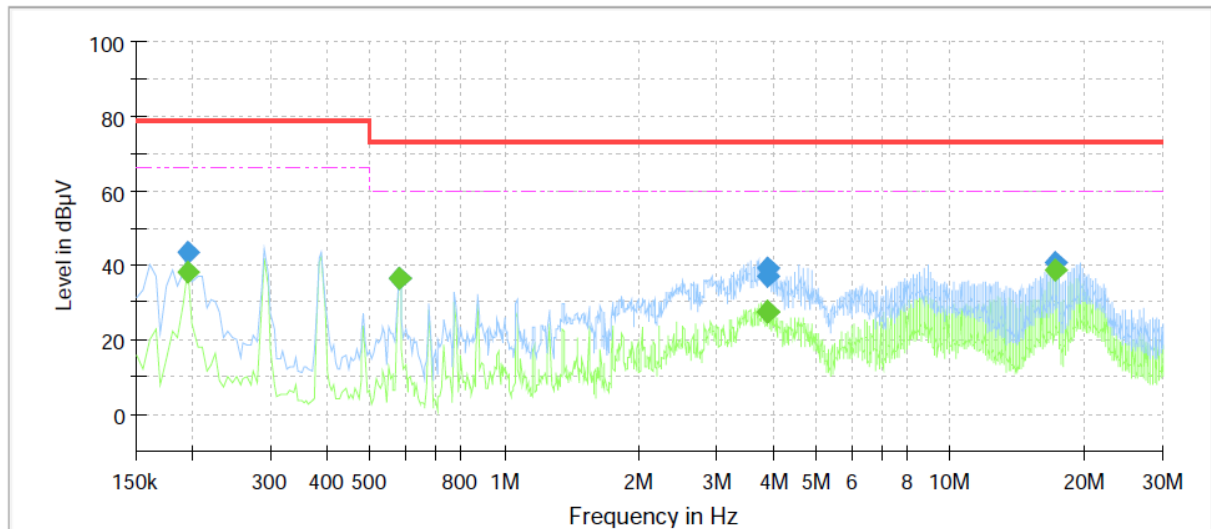
| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.580000        | ---              | 35.08           | 60.00        | 24.92       | 1000.0          | 9.000           | L1   | 9.8        |
| 0.580000        | 35.25            | ---             | 73.00        | 37.75       | 1000.0          | 9.000           | L1   | 9.8        |
| 3.680000        | ---              | 26.72           | 60.00        | 33.28       | 1000.0          | 9.000           | L1   | 10.1       |
| 3.680000        | 36.71            | ---             | 73.00        | 36.29       | 1000.0          | 9.000           | L1   | 10.1       |
| 3.925000        | ---              | 27.53           | 60.00        | 32.47       | 1000.0          | 9.000           | L1   | 10.1       |
| 3.925000        | 37.50            | ---             | 73.00        | 35.50       | 1000.0          | 9.000           | L1   | 10.1       |
| 16.875000       | ---              | 40.87           | 60.00        | 19.13       | 1000.0          | 9.000           | L1   | 10.3       |
| 16.875000       | 43.20            | ---             | 73.00        | 29.80       | 1000.0          | 9.000           | L1   | 10.3       |
| 17.265000       | ---              | 41.74           | 60.00        | 18.26       | 1000.0          | 9.000           | L1   | 10.3       |
| 17.265000       | 43.97            | ---             | 73.00        | 29.03       | 1000.0          | 9.000           | L1   | 10.3       |



## NEUTRAL LINE

## Common Information

|                   |                    |
|-------------------|--------------------|
| Test Description: | Conducted Emission |
| Model No.:        | TNO-4040TR         |
| Mode              | AC                 |
| Operator Name:    | KES                |



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.195000        | ---              | 38.06           | 66.00        | 27.94       | 1000.0          | 9.000           | N    | 9.7        |
| 0.195000        | 43.60            | ---             | 79.00        | 35.40       | 1000.0          | 9.000           | N    | 9.7        |
| 0.580000        | ---              | 36.30           | 60.00        | 23.70       | 1000.0          | 9.000           | N    | 9.8        |
| 0.580000        | 36.44            | ---             | 73.00        | 36.56       | 1000.0          | 9.000           | N    | 9.8        |
| 3.875000        | ---              | 27.77           | 60.00        | 32.23       | 1000.0          | 9.000           | N    | 10.1       |
| 3.875000        | 37.31            | ---             | 73.00        | 35.69       | 1000.0          | 9.000           | N    | 10.1       |
| 3.910000        | ---              | 27.65           | 60.00        | 32.35       | 1000.0          | 9.000           | N    | 10.1       |
| 3.910000        | 39.09            | ---             | 73.00        | 33.91       | 1000.0          | 9.000           | N    | 10.1       |
| 17.165000       | ---              | 38.44           | 60.00        | 21.56       | 1000.0          | 9.000           | N    | 10.2       |
| 17.165000       | 40.52            | ---             | 73.00        | 32.48       | 1000.0          | 9.000           | N    | 10.2       |

### ◆ Calculation

$$\text{QuasiPeak [dBμV]} / \text{CAverage [dBμV]} = \text{Reading Value [dBμV]} + \text{Corr. [dB]}$$

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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



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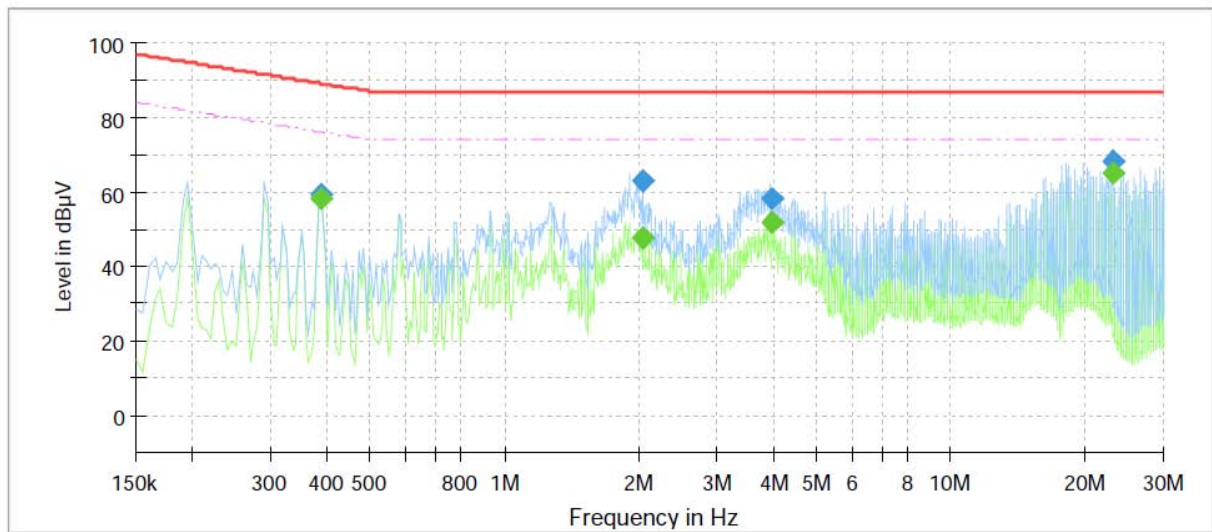
### Conducted Emissions at Telecommunication Ports

#### ■ AC 24 V MODE

[10 Mbps]

### Common Information

Test Description: Telecommunication Emission  
Model No.: TNO-4040TR  
Mode: AC 10  
Operator Name: KES



### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.390000        | ---              | 58.15           | 76.06        | 17.91       | 1000.0          | 9.000           | Single Line | 10.1       |
| 0.390000        | 59.30            | ---             | 89.06        | 29.76       | 1000.0          | 9.000           | Single Line | 10.1       |
| 2.040000        | ---              | 47.79           | 74.00        | 26.21       | 1000.0          | 9.000           | Single Line | 10.3       |
| 2.040000        | 62.86            | ---             | 87.00        | 24.14       | 1000.0          | 9.000           | Single Line | 10.3       |
| 3.955000        | ---              | 52.05           | 74.00        | 21.95       | 1000.0          | 9.000           | Single Line | 10.2       |
| 3.955000        | 58.03            | ---             | 87.00        | 28.97       | 1000.0          | 9.000           | Single Line | 10.2       |
| 23.130000       | ---              | 64.87           | 74.00        | 9.13        | 1000.0          | 9.000           | Single Line | 10.1       |
| 23.130000       | 68.30            | ---             | 87.00        | 18.70       | 1000.0          | 9.000           | Single Line | 10.1       |

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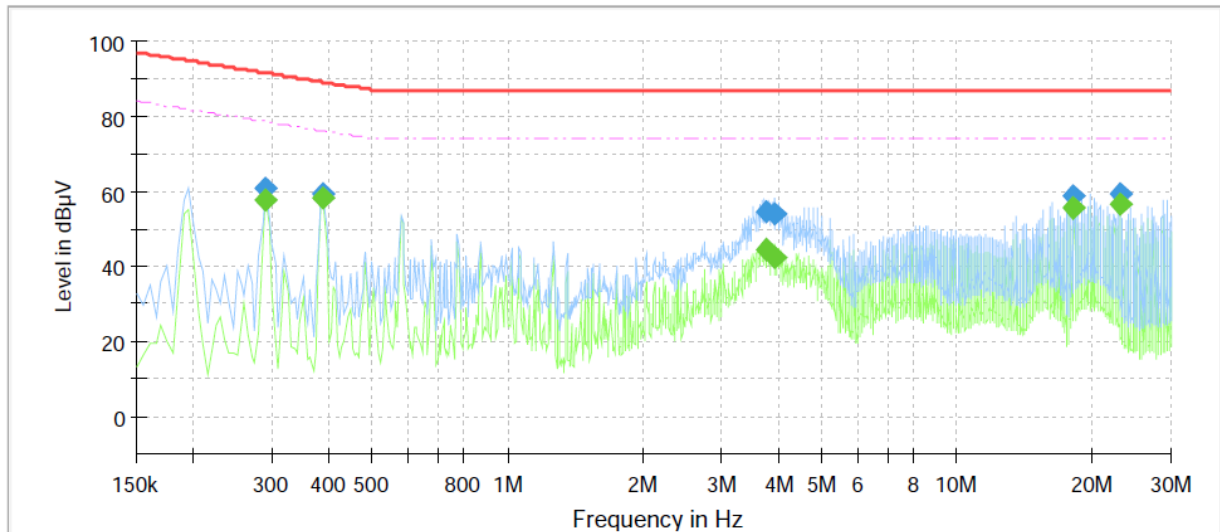
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[100 Mbps]

## Common Information

Test Description: Telecommunication Emission  
Model No.: TNO-4040TR  
Mode: AC 100  
Operator Name: KES



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.290000        | ---              | 57.48           | 78.52        | 21.04       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.290000        | 60.76            | ---             | 91.52        | 30.76       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.390000        | ---              | 58.06           | 76.06        | 18.00       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.390000        | 59.13            | ---             | 89.06        | 29.93       | 1000.0          | 9.000           | Single Line | 9.6        |
| 3.775000        | ---              | 44.25           | 74.00        | 29.75       | 1000.0          | 9.000           | Single Line | 9.7        |
| 3.775000        | 54.28            | ---             | 87.00        | 32.72       | 1000.0          | 9.000           | Single Line | 9.7        |
| 3.915000        | ---              | 42.27           | 74.00        | 31.73       | 1000.0          | 9.000           | Single Line | 9.7        |
| 3.915000        | 54.08            | ---             | 87.00        | 32.92       | 1000.0          | 9.000           | Single Line | 9.7        |
| 18.245000       | ---              | 55.40           | 74.00        | 18.60       | 1000.0          | 9.000           | Single Line | 9.7        |
| 18.245000       | 58.66            | ---             | 87.00        | 28.34       | 1000.0          | 9.000           | Single Line | 9.7        |
| 23.130000       | ---              | 56.53           | 74.00        | 17.47       | 1000.0          | 9.000           | Single Line | 9.6        |
| 23.130000       | 59.46            | ---             | 87.00        | 27.54       | 1000.0          | 9.000           | Single Line | 9.6        |

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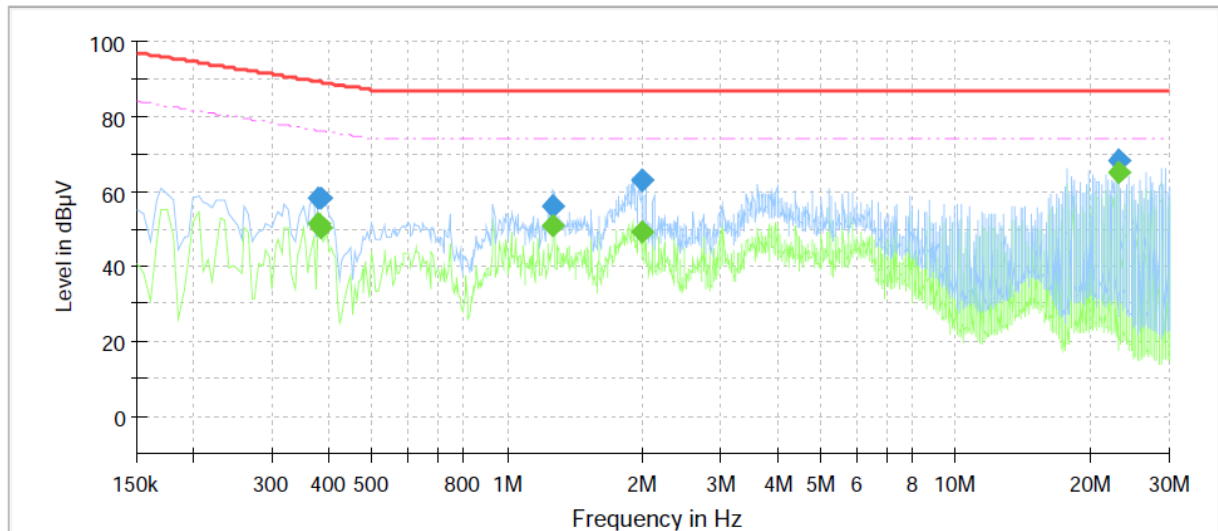
Test report No.:  
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### ■ DC 12 V MODE

[10 Mbps]

## Common Information

Test Description: Telecommunication Emission  
Model No.: TNO-4040TR  
Mode: DC 10  
Operator Name: KES



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.380000        | ---              | 51.27           | 76.28        | 25.01       | 1000.0          | 9.000           | Single Line | 10.1       |
| 0.380000        | 58.27            | ---             | 89.28        | 31.01       | 1000.0          | 9.000           | Single Line | 10.1       |
| 0.385000        | ---              | 50.13           | 76.17        | 26.04       | 1000.0          | 9.000           | Single Line | 10.1       |
| 0.385000        | 58.05            | ---             | 89.17        | 31.12       | 1000.0          | 9.000           | Single Line | 10.1       |
| 1.265000        | ---              | 50.82           | 74.00        | 23.18       | 1000.0          | 9.000           | Single Line | 10.3       |
| 1.265000        | 55.86            | ---             | 87.00        | 31.14       | 1000.0          | 9.000           | Single Line | 10.3       |
| 1.995000        | ---              | 49.47           | 74.00        | 24.53       | 1000.0          | 9.000           | Single Line | 10.3       |
| 1.995000        | 63.15            | ---             | 87.00        | 23.85       | 1000.0          | 9.000           | Single Line | 10.3       |
| 23.130000       | ---              | 64.87           | 74.00        | 9.13        | 1000.0          | 9.000           | Single Line | 10.1       |
| 23.130000       | 68.32            | ---             | 87.00        | 18.68       | 1000.0          | 9.000           | Single Line | 10.1       |

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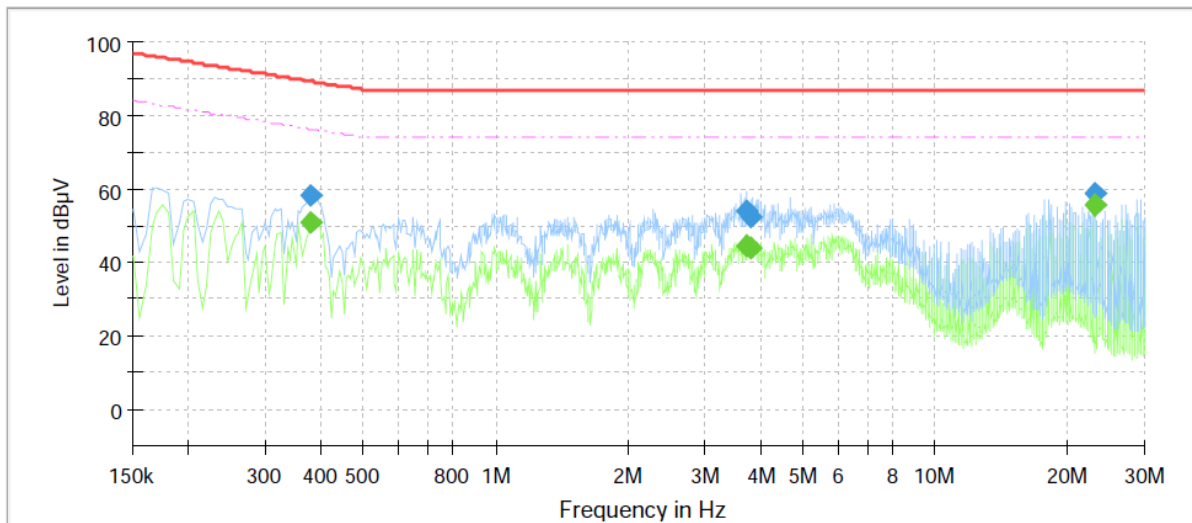
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[100 Mbps]

### Common Information

Test Description: Telecommunication Emission  
Model No.: TNO-4040TR  
Mode: DC 100  
Operator Name: KES



### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.380000        | ---              | 50.87           | 76.28        | 25.41       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.380000        | 57.96            | ---             | 89.28        | 31.32       | 1000.0          | 9.000           | Single Line | 9.6        |
| 3.710000        | ---              | 44.35           | 74.00        | 29.65       | 1000.0          | 9.000           | Single Line | 9.7        |
| 3.710000        | 53.99            | ---             | 87.00        | 33.01       | 1000.0          | 9.000           | Single Line | 9.7        |
| 3.820000        | ---              | 43.85           | 74.00        | 30.15       | 1000.0          | 9.000           | Single Line | 9.7        |
| 3.820000        | 52.29            | ---             | 87.00        | 34.71       | 1000.0          | 9.000           | Single Line | 9.7        |
| 23.130000       | ---              | 55.45           | 74.00        | 18.55       | 1000.0          | 9.000           | Single Line | 9.6        |
| 23.130000       | 59.01            | ---             | 87.00        | 27.99       | 1000.0          | 9.000           | Single Line | 9.6        |

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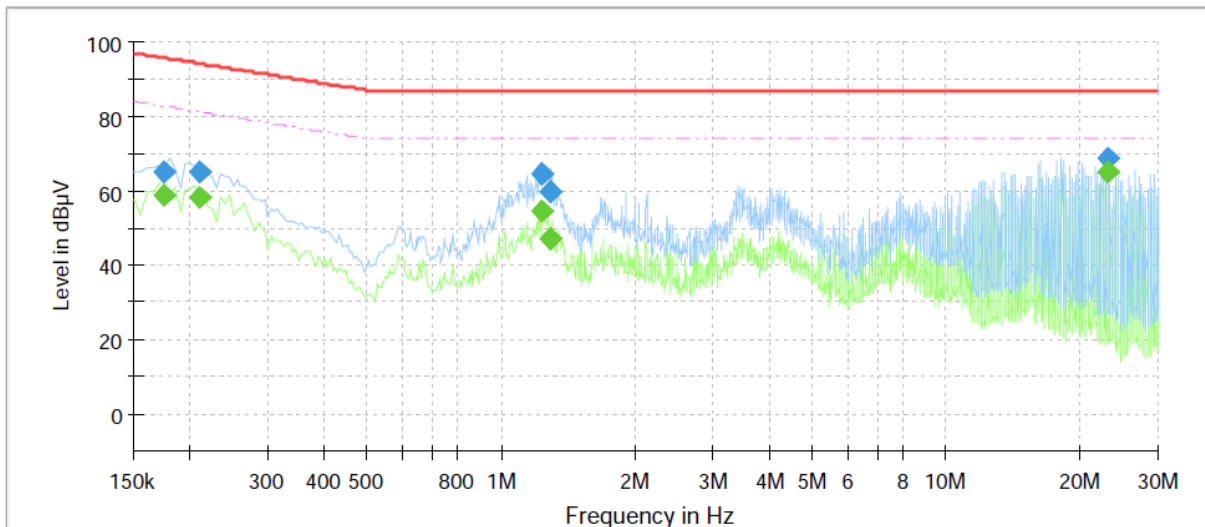


■ PoE MODE

[10 Mbps]

## Common Information

|                   |                            |
|-------------------|----------------------------|
| Test Description: | Telecommunication Emission |
| Model No.:        | TNO-4040TR                 |
| Mode              | PoE 10                     |
| Operator Name:    | KES                        |



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.175000        | ---              | 58.82           | 82.72        | 23.90       | 1000.0          | 9.000           | Single Line | 10.2       |
| 0.175000        | 65.03            | ---             | 95.72        | 30.69       | 1000.0          | 9.000           | Single Line | 10.2       |
| 0.210000        | ---              | 58.19           | 81.21        | 23.02       | 1000.0          | 9.000           | Single Line | 10.2       |
| 0.210000        | 65.11            | ---             | 94.21        | 29.10       | 1000.0          | 9.000           | Single Line | 10.2       |
| 1.240000        | ---              | 54.36           | 74.00        | 19.64       | 1000.0          | 9.000           | Single Line | 10.3       |
| 1.240000        | 64.37            | ---             | 87.00        | 22.63       | 1000.0          | 9.000           | Single Line | 10.3       |
| 1.285000        | ---              | 46.86           | 74.00        | 27.14       | 1000.0          | 9.000           | Single Line | 10.3       |
| 1.285000        | 59.77            | ---             | 87.00        | 27.23       | 1000.0          | 9.000           | Single Line | 10.3       |
| 23.130000       | ---              | 65.33           | 74.00        | 8.67        | 1000.0          | 9.000           | Single Line | 10.1       |
| 23.130000       | 68.88            | ---             | 87.00        | 18.12       | 1000.0          | 9.000           | Single Line | 10.1       |



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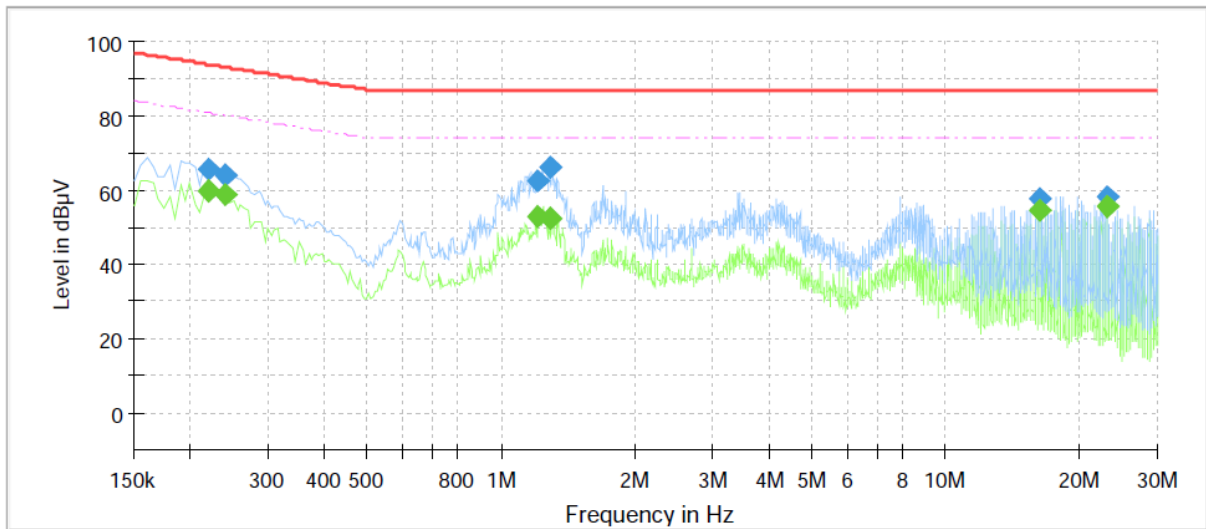
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[100 Mbps]

### Common Information

Test Description: Telecommunication Emission  
Model No.: TNO-4040TR  
Mode: PoE 100  
Operator Name: KES



### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.220000        | ---              | 59.95           | 80.82        | 20.87       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.220000        | 65.59            | ---             | 93.82        | 28.23       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.240000        | ---              | 58.57           | 80.10        | 21.53       | 1000.0          | 9.000           | Single Line | 9.6        |
| 0.240000        | 63.84            | ---             | 93.10        | 29.26       | 1000.0          | 9.000           | Single Line | 9.6        |
| 1.215000        | ---              | 53.15           | 74.00        | 20.85       | 1000.0          | 9.000           | Single Line | 9.8        |
| 1.215000        | 62.46            | ---             | 87.00        | 24.54       | 1000.0          | 9.000           | Single Line | 9.8        |
| 1.295000        | ---              | 52.49           | 74.00        | 21.51       | 1000.0          | 9.000           | Single Line | 9.8        |
| 1.295000        | 65.89            | ---             | 87.00        | 21.11       | 1000.0          | 9.000           | Single Line | 9.8        |
| 16.230000       | ---              | 54.46           | 74.00        | 19.54       | 1000.0          | 9.000           | Single Line | 9.7        |
| 16.230000       | 57.67            | ---             | 87.00        | 29.33       | 1000.0          | 9.000           | Single Line | 9.7        |
| 23.130000       | ---              | 55.46           | 74.00        | 18.54       | 1000.0          | 9.000           | Single Line | 9.6        |
| 23.130000       | 58.21            | ---             | 87.00        | 28.79       | 1000.0          | 9.000           | Single Line | 9.6        |

#### ◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

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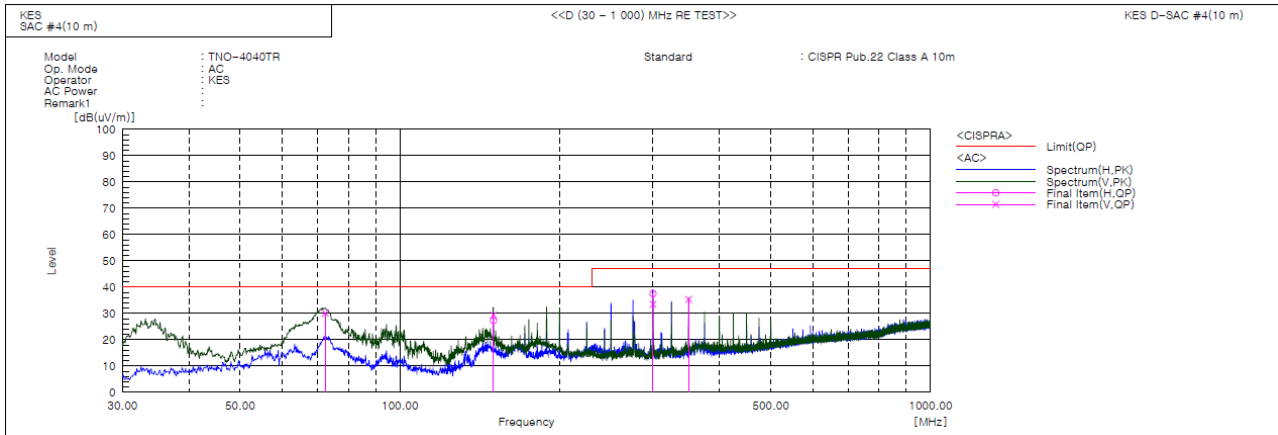
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### Radiated Electric Field Emissions(Below 1 GHz)

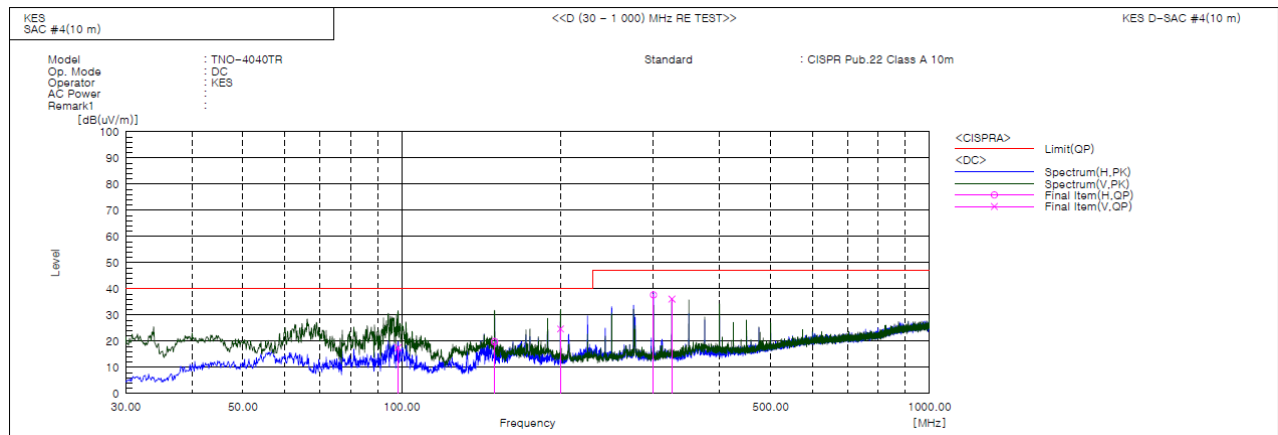
#### ■ AC 24 V MODE



#### 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   | 72.316          | V   | 63.2                | -33.1         | 30.1                 | 40.0                | 9.9            | 100.0       | 214.0       |        |
| 2   | 150.038         | H   | 59.4                | -32.1         | 27.3                 | 40.0                | 12.7           | 400.0       | 124.0       |        |
| 3   | 150.038         | V   | 61.5                | -32.1         | 29.4                 | 40.0                | 10.6           | 100.0       | 111.0       |        |
| 4   | 300.024         | H   | 62.3                | -24.8         | 37.5                 | 47.0                | 9.5            | 400.0       | 139.0       |        |
| 5   | 300.024         | V   | 58.3                | -24.8         | 33.5                 | 47.0                | 13.5           | 100.0       | 91.0        |        |
| 6   | 349.979         | V   | 58.5                | -23.2         | 35.3                 | 47.0                | 11.7           | 100.0       | 87.0        |        |

#### ■ 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   | 98.385          | V   | 46.6                | -29.1         | 17.5                 | 40.0                | 22.5           | 100.0       | 273.0       |        |
| 2   | 149.916         | H   | 51.9                | -32.1         | 19.8                 | 40.0                | 20.2           | 400.0       | 119.0       |        |
| 3   | 199.993         | V   | 52.2                | -27.5         | 24.7                 | 40.0                | 15.3           | 100.0       | 36.0        |        |
| 4   | 300.024         | H   | 62.5                | -24.8         | 37.7                 | 47.0                | 9.3            | 400.0       | 131.0       |        |
| 5   | 325.001         | V   | 60.2                | -24.1         | 36.1                 | 47.0                | 10.9           | 100.0       | 147.0       |        |

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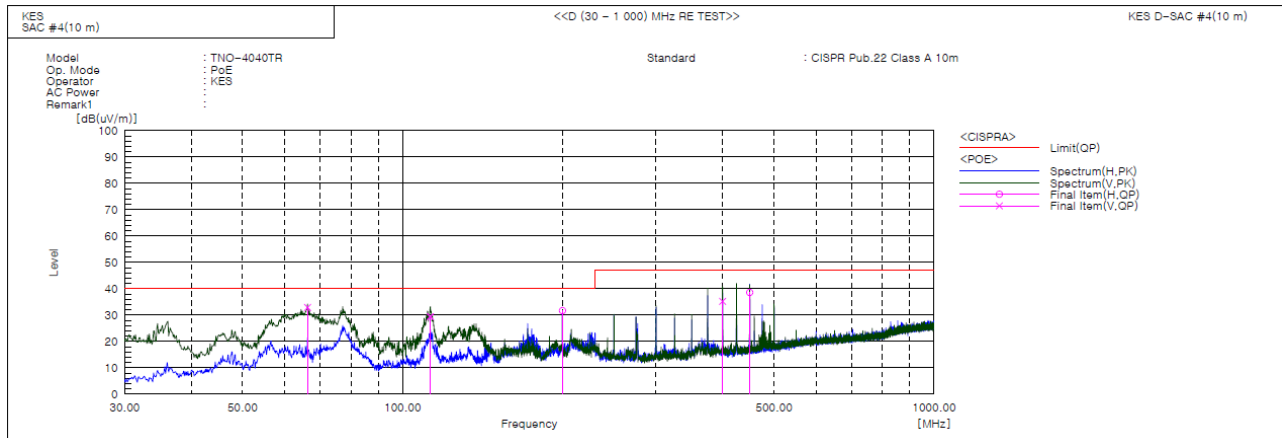


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### ■ PoE MODE



### 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   | 66.254          | V   | 64.2                | -31.3         | 32.9                 | 40.0                | 7.1            | 100.0       | 244.0       |        |
| 2   | 112.814         | V   | 59.7                | -30.3         | 29.4                 | 40.0                | 10.6           | 100.0       | 113.0       |        |
| 3   | 199.993         | H   | 59.2                | -27.5         | 31.7                 | 40.0                | 8.3            | 400.0       | 267.0       |        |
| 4   | 400.055         | V   | 56.6                | -21.4         | 35.2                 | 47.0                | 11.8           | 100.0       | 26.0        |        |
| 5   | 450.010         | H   | 58.8                | -20.2         | 38.6                 | 47.0                | 8.4            | 400.0       | 282.0       |        |

### ◆ Calculation

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

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

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

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

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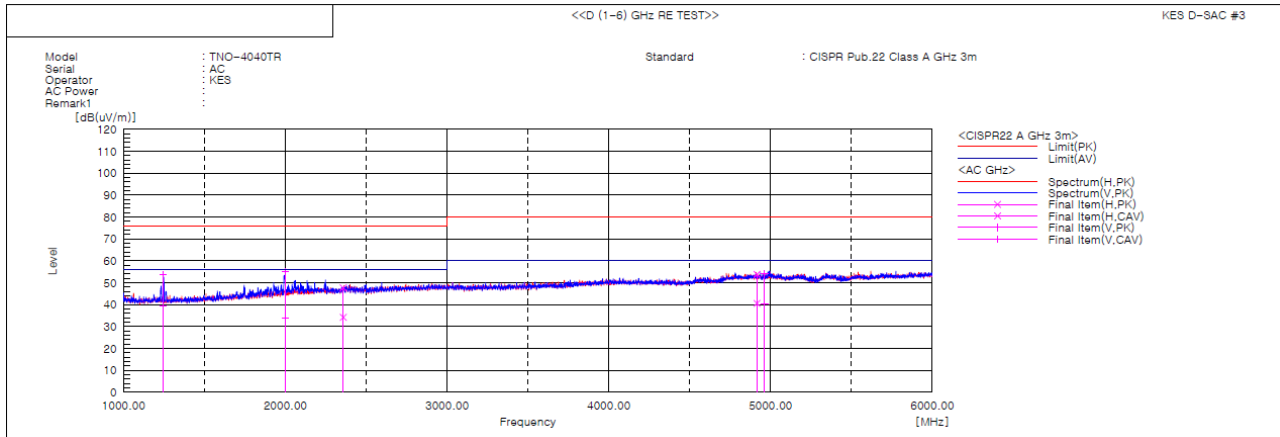
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### Radiated Electric Field Emissions(Above 1 GHz)

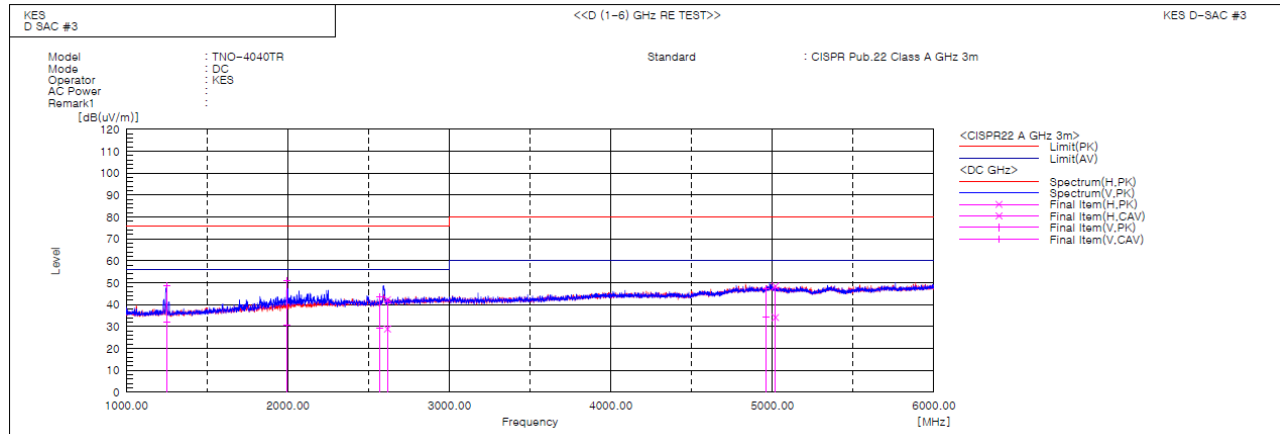
#### ■ AC 24 V MODE



#### 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   | 1246.710        | V   | 54.6                | 40.4                 | -1.0          | 53.6                 | 39.4                  | 76.0                | 56.0                | 22.4           | 16.6            | 100.0       | 210.0       |        |
| 2   | 1999.189        | V   | 51.0                | 30.0                 | 3.9           | 54.9                 | 33.9                  | 76.0                | 56.0                | 21.1           | 22.1            | 100.0       | 2.5         |        |
| 3   | 2358.444        | H   | 42.2                | 28.8                 | 5.5           | 47.7                 | 34.3                  | 76.0                | 56.0                | 28.3           | 21.7            | 100.0       | 299.1       |        |
| 4   | 4916.399        | H   | 39.6                | 26.3                 | 14.3          | 53.9                 | 40.6                  | 80.0                | 60.0                | 26.1           | 19.4            | 100.0       | 342.2       |        |
| 5   | 4963.524        | V   | 39.6                | 25.9                 | 14.4          | 54.0                 | 40.3                  | 80.0                | 60.0                | 26.0           | 19.7            | 100.0       | 271.2       |        |

#### ■ 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   | 1249.810        | V   | 55.5                | 39.2                 | -7.0          | 48.5                 | 32.2                  | 76.0                | 56.0                | 27.5           | 23.8            | 100.0       | 220.4       |        |
| 2   | 1992.850        | V   | 53.1                | 32.8                 | -2.1          | 51.0                 | 30.7                  | 76.0                | 56.0                | 25.0           | 25.3            | 100.0       | 18.9        |        |
| 3   | 2568.834        | V   | 43.3                | 29.0                 | 0.2           | 43.5                 | 29.2                  | 76.0                | 56.0                | 32.5           | 26.8            | 100.0       | 303.0       |        |
| 4   | 2616.796        | H   | 41.9                | 28.5                 | 0.4           | 42.3                 | 28.9                  | 76.0                | 56.0                | 33.7           | 27.1            | 100.0       | 234.4       |        |
| 5   | 4959.825        | V   | 38.9                | 25.8                 | 8.4           | 47.3                 | 34.2                  | 80.0                | 60.0                | 32.7           | 25.8            | 100.0       | 97.6        |        |
| 6   | 5018.945        | H   | 40.0                | 25.8                 | 8.4           | 48.4                 | 34.2                  | 80.0                | 60.0                | 31.6           | 25.8            | 100.0       | 122.2       |        |

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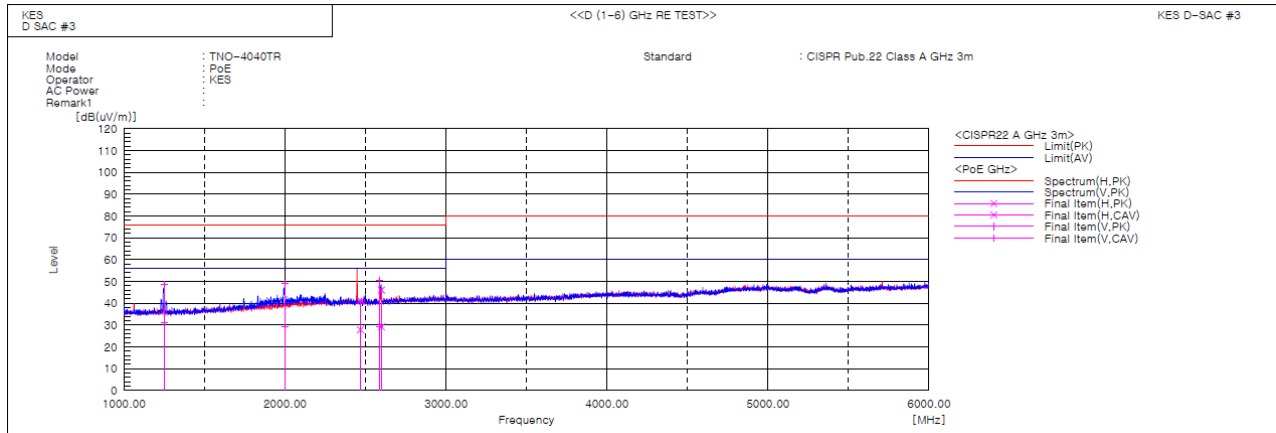


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### ■ PoE MODE



#### 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   | 1249.919        | V   | 55.6                | 38.4                 | -7.0          | 48.6                 | 31.4                  | 76.0                | 56.0                | 27.4           | 24.6            | 100.0       | 221.3       |        |
| 2   | 1999.069        | V   | 51.3                | 31.3                 | -2.1          | 49.2                 | 29.2                  | 76.0                | 56.0                | 26.8           | 26.8            | 100.0       | 3.2         |        |
| 3   | 2469.296        | H   | 41.3                | 28.0                 | -0.1          | 41.2                 | 27.9                  | 76.0                | 56.0                | 34.8           | 28.1            | 100.0       | 273.8       |        |
| 4   | 2598.859        | H   | 45.8                | 28.9                 | 0.3           | 46.1                 | 29.2                  | 76.0                | 56.0                | 29.9           | 26.8            | 100.0       | 227.3       |        |
| 5   | 2588.132        | V   | 50.4                | 29.0                 | 0.3           | 50.7                 | 29.3                  | 76.0                | 56.0                | 25.3           | 26.7            | 100.0       | 62.8        |        |

### ◆ 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

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## Test Setup Photos and Configuration

### Conducted Voltage Emissions



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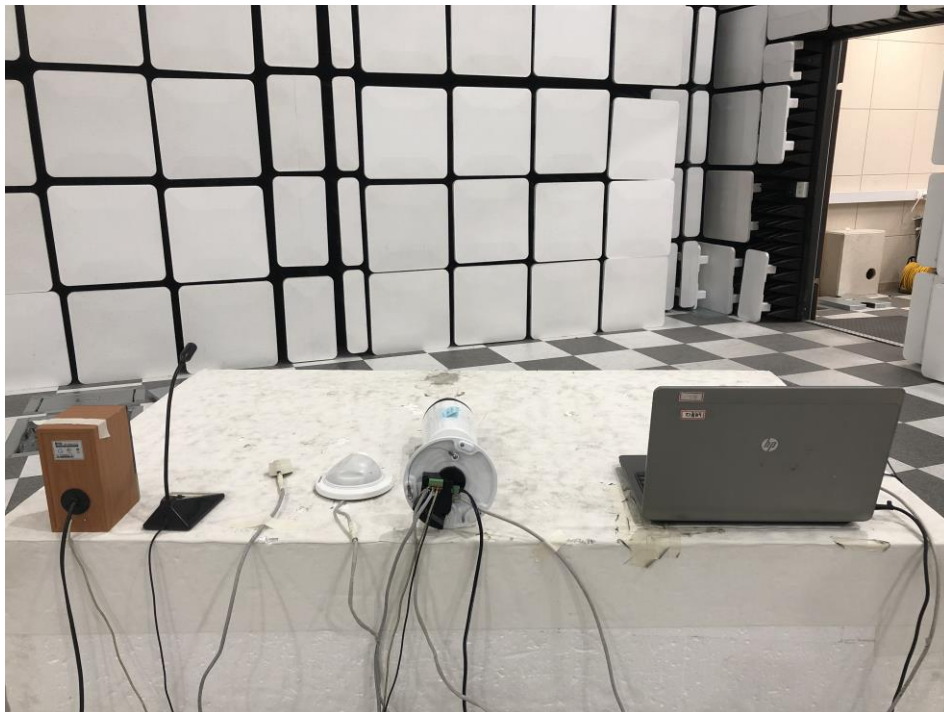
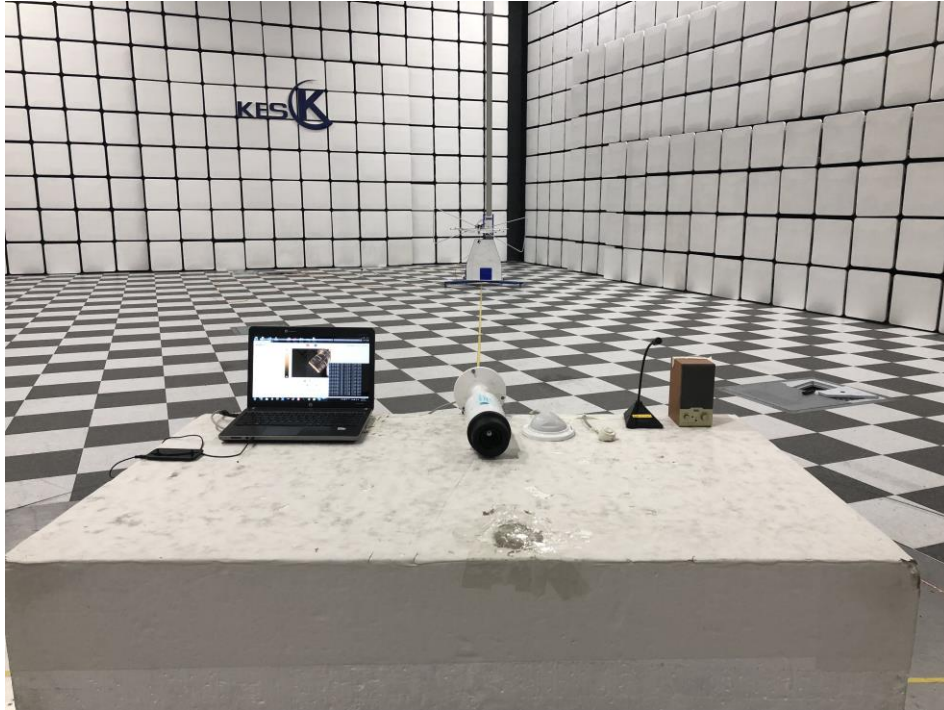
## Conducted Telecommunication Emissions



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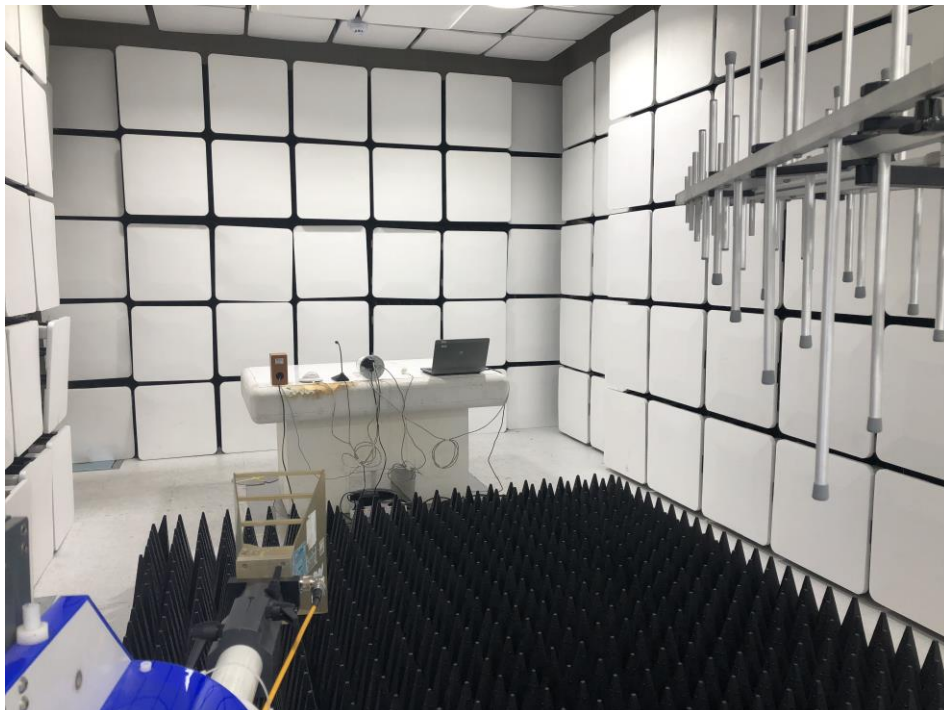


## Radiated Electric Field Emissions(Below 1 GHz)



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## Radiated Electric Field Emissions(Above 1 GHz)



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## EUT External Photographs

(Top)



(Bottom)

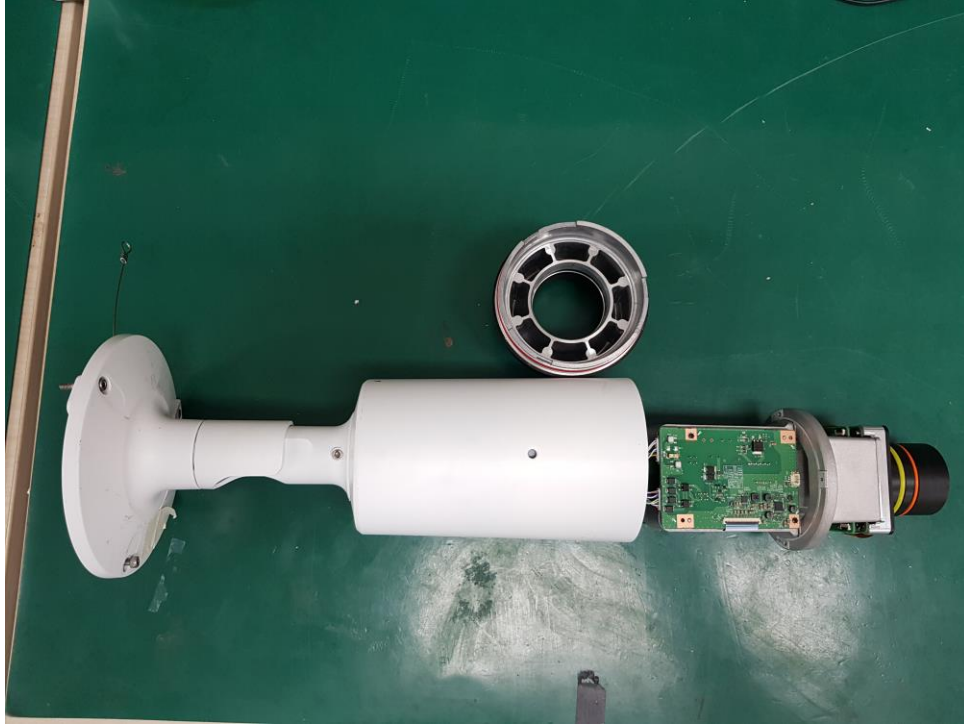


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## EUT Internal Photographs

(Internal View)



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## EUT Internal View – Interface Board (Top)



(Bottom)

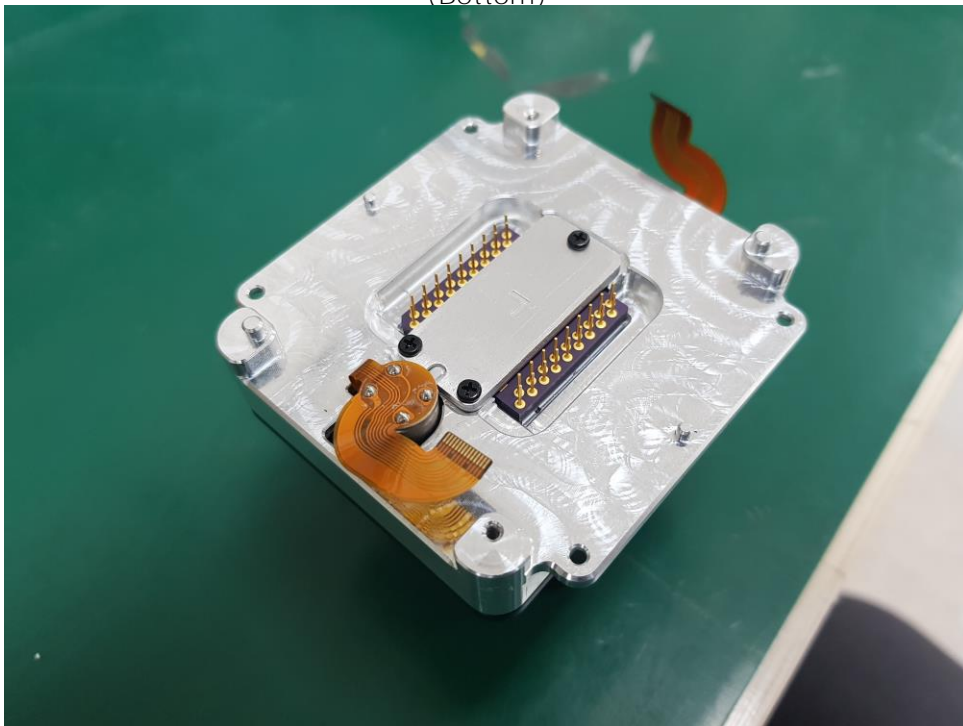


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EUT Internal View – Lens  
(Top)



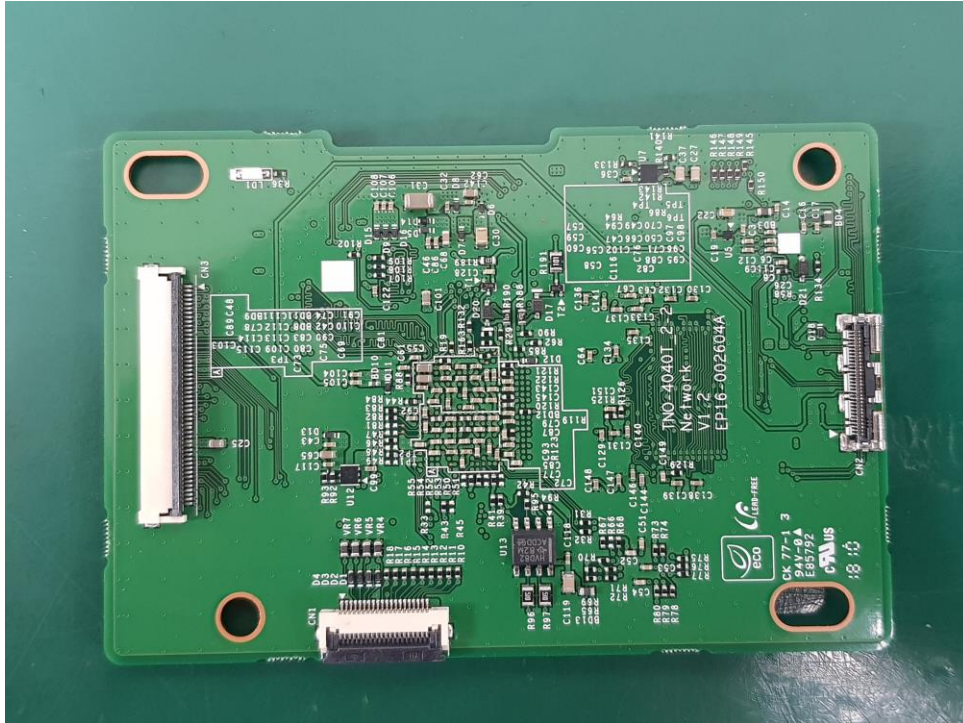
(Bottom)



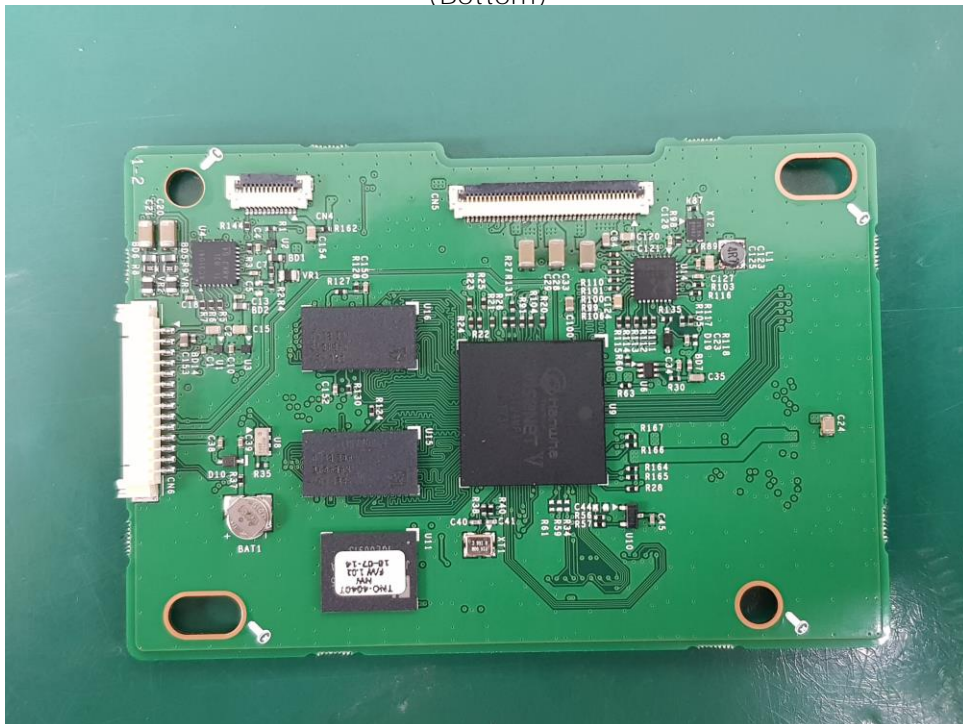
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## EUT Internal View – Network Board (Top)



## (Bottom)



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EUT Internal View – NUC Board  
(Top)



(Bottom)



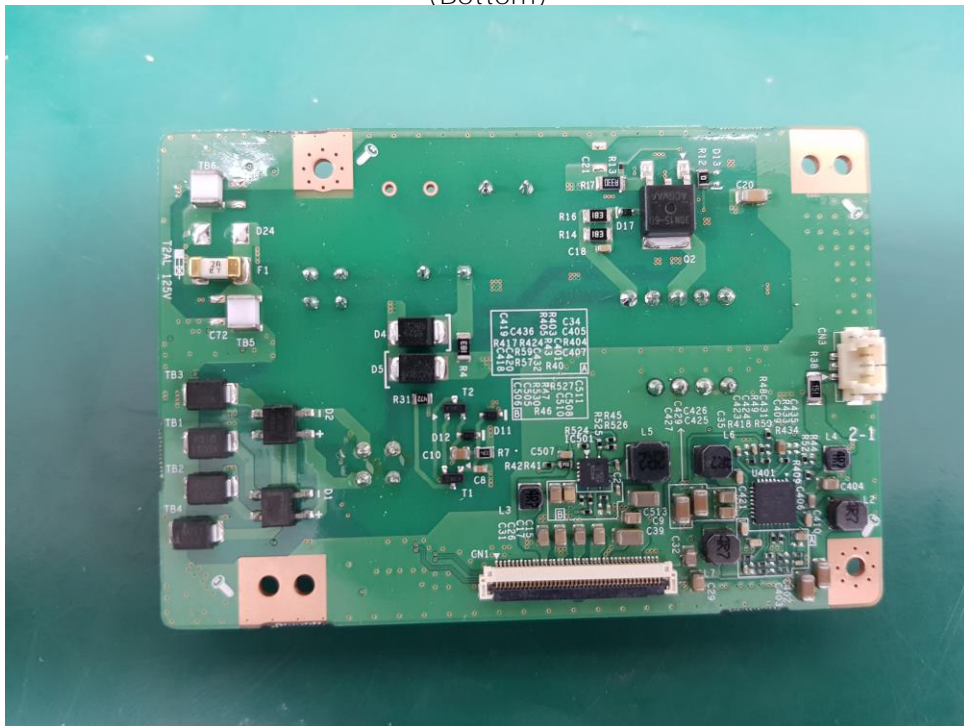
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## EUT Internal View – Power Board (Top)

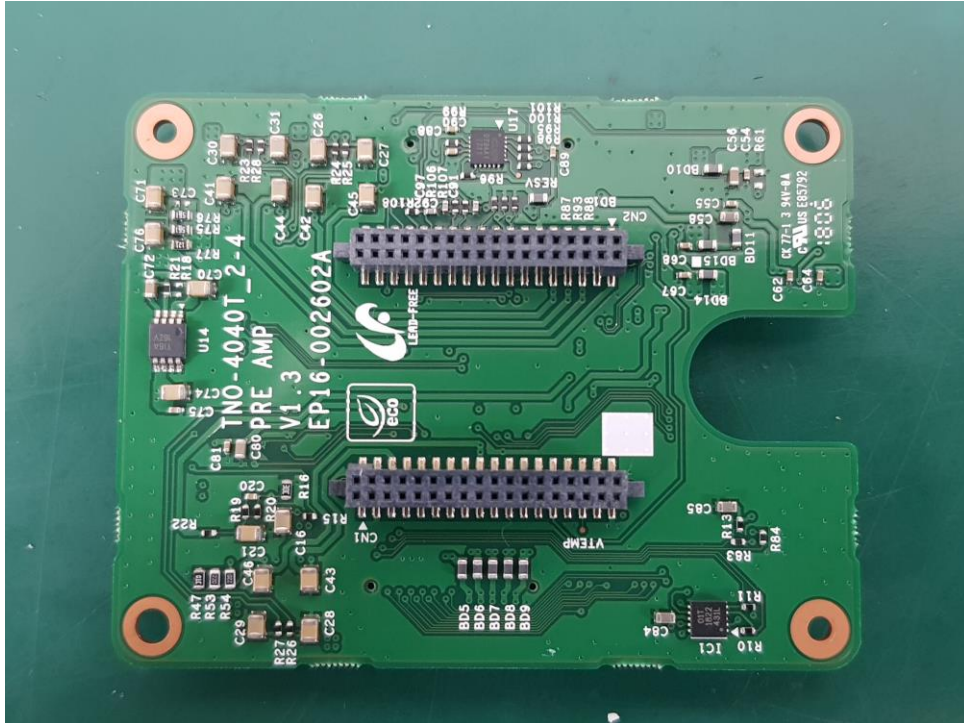


## (Bottom)

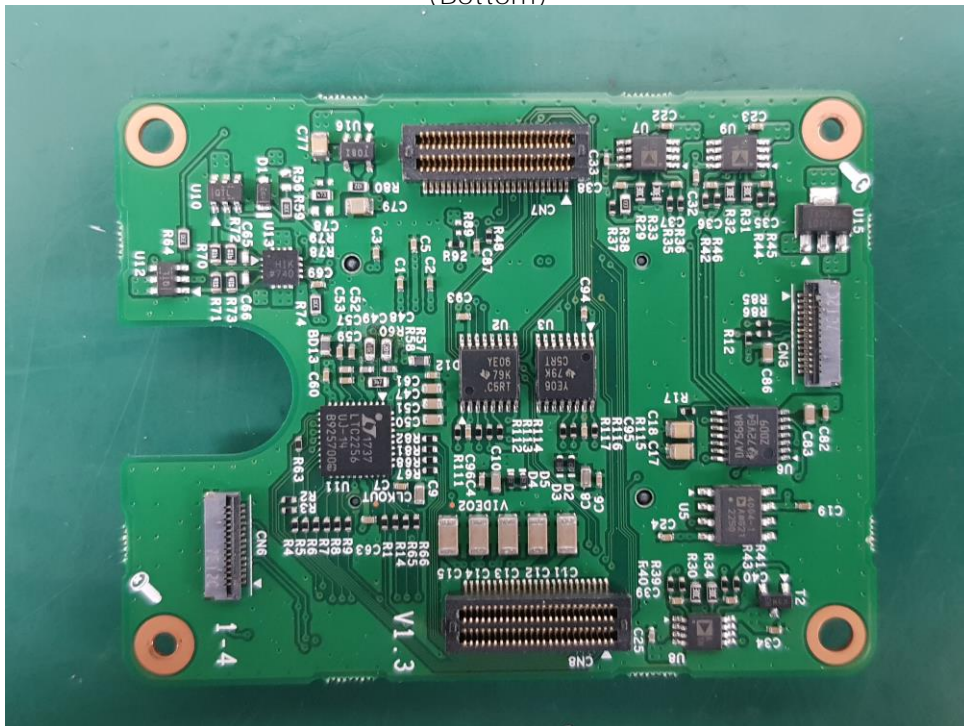


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## EUT Internal View – PRE AMP Board (Top)



(Bottom)



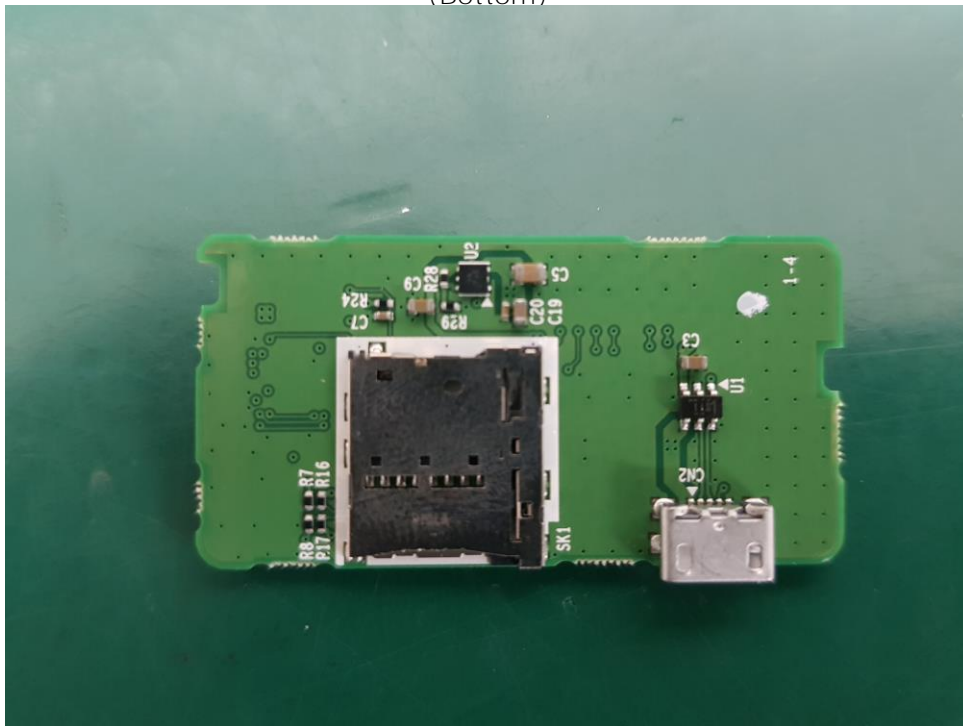
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## EUT Internal View – SD Card Board (Top)



(Bottom)



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