

# TEST REPORT



Report No. : KES-EM-23T0945

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**KES Co., Ltd.**

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## 1. Client

Applicant : Hanwha Vision Co., Ltd

Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do,  
Republic of Korea

## 2. Sample Description

Product name : NETWORK THERMAL CAMERA

Model/Type No. : TNO-C3032TRA

Variant Model : TNO-C3012TRA, TNO-C3022TRA

Manufacturer : 1. HANWHA VISION VIETNAM COMPANY LIMITED  
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  
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea

3. Date of Receipt : Oct. 16, 2023

4. Test date : Oct. 20, 2023 ~ Oct. 22, 2023

5. Date of Issue : Nov. 06, 2023

6. Test Results : In Compliance

Tested by

Reviewed by

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Min Seong, Kim  
EMC Test Engineer

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Seong Min, Choi  
EMC Technical Manager

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

**REPORT REVISION HISTORY**

Date	Test Report No.	Revision History
Nov. 06, 2023	KES-EM-23T0945	Issued

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## 1.0 General Product Description

Main Specifications of EUT are:

<b>Video</b>	
Imaging Device	Uncooled micro bolometer
Resolution	768x576, 384x288(original)
Max. Framerate	H.265/H.264/MJPEG: Max. 8fps
NETD	< 30mK
Pixel Size	17 $\mu$ m
Min. Illumination	None
Video Out	USB: Micro USB Type B, 768x576 for installation
Video Transmission Distance	None
<b>Lens</b>	
Focal Length (Zoom Ratio)	9.7mm fixed focal
Max. Aperture Ratio	F1.0
Angular Field of View	H: 37.9° / V: 28.7° / D: 46.7° (iFoV: 1.8 mRad )
Min. Object Distance	2.8M
Focus Control	Fixed
Lens Type	None
Mount Type	None
Optional Lens	None
<b>Pan / Tilt / Rotate</b>	
Pan / Tilt / Rotate Range	0°~350° / 0°~90° / 0°~350°
Pan Range	None
Pan Speed	None
Tilt Range	None
Tilt Speed	None
Rotate Range	None
Sequence	None
Preset Accuracy	None

Operational	
Camera Title	Displayed up to 85 characters
Direction Indicator	None
Day & Night	None
Backlight Compensation	None
Wide Dynamic Range	None
Digital Noise Reduction	None
Digital Image Stabilization	None
Defog	None
Motion Detection	8ea, 8point polygonal zones
Privacy Masking	6ea, Rectangle zones - color : Grey, Black, White
Gain Control	None
White Balance	None
LDC	None
Electronic Shutter Speed	None
Digital PTZ	None
Video Rotation	Flip, Mirror, Hallway view(90°/270°)
Analytics	Classified object type: Person/Vehicle Support BestShot Analytics events based on AI engine - WiseMD, Object detection, Virtual line*(Crossing/Direction), Virtual area*(Loitering/Intrusion/Enter/Exit) Analytics events - Motion detection, Tampering, Audio detection, Sound classification, Shock detection, Virtual area(Appear/Disappear)
Business Intelligence	Support (Temperature Analysis)
Serial Interface	RS-485
Alarm I/O	2 configurable I/O ports
Alarm Triggers	Analytics, Network disconnect, Alarm input, Time schedule, MQTT subscription
Alarm Events	When alarm trigger occurred - File upload(image): e-mail/FTP - Notification: e-mail - Recording: SD/SDHC/SDXC or NAS recording at event triggers - Alarm output - Handover: PTZ preset - MQTT: publication
Audio Streaming	None
Audio In	Selectable(mic in/line in)
Audio Out	Line out
IR Viewable Length	None
IR Illuminator (Optional)	None
IR Radiation angle	None
IR LED	None
IR Wavelength	None
IR Operation	None
Water Removal	None
Auto Tracking	None
Coaxial Protocol	None
Color Palettes	Whitehot, Blackhot, Rainbow, Rainbow2, Sepia, Red, Iron, Custom, Hybrid palettes

<b>Radiometry</b>	
Temperature Detect Range	-40°C~550°C(-40°F~1022°F)
Temperature Accuracy	below 150°C: up to $\pm 2^{\circ}\text{C}$ Above 150°C: up to $\pm 20\%$ * based on measurements in a room temperature environment.
Temperature Detection	10 Polygonal ROI zones, whole FoV area
Additional	Hybrid palettes, Spot temperature reading (ROI condition monitoring: Above/ Below/ Increase/ Decrease)
<b>Network</b>	
Ethernet	Metal shielded RJ-45(10/100/1000BASE-T)
Video Compression	H.265/H.264: Main/Baseline/High, MJPEG
Audio Compression	G.711 u-law / G.726 Selectable G.726(ADPCM) 8KHz, G.711 8KHz G.726: 16Kbps, 24Kbps, 32Kbps, 40Kbps AAC-LC: 48Kbps at 16KHz
Smart Codec	Manual(Sea area), WiseStreamII, WiseStreamIII(Based on AI engine)
Video Quality Adjustment	None
Bitrate Control	H.264/H.265: CBR or VBR MJPEG: VBR
Streaming	Unicast(20 users) / Multicast Multiple streaming(Up to 10 profiles)
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, CDP, SRTP (TCP, UDP Unicast), MQTT
Security	None
Application Programming Interface	ONVIF Profile S/G/T/M SUNAPI(HTTP API) Wisenet open platform
<b>Security</b>	
OS / Firmware Protect	Secure boot, Signed firmware, Firmware encryption
User authentication	Digest Authentication, Prevent brute-force attack
Network authentication	802.1X Authentication(EAP-TLS, EAP-LEAP, EAP-PEAP MSCHAPv2)
Secure Communication	HTTPS, SRTP, WSS(Websocket secure)
Access Control	Access control based on IP address
Data Protect	Authentication information encryption, ZIP compression encryption
Audit	User Access/System/Event log management
Device ID	Device Certificate(Hanwha Private Root CA)
Secure Storage	TPM(Trusted platform module), SDcard partition encrypt
Security Certificate	TPM with FIPS 140-2 level 2

<b>General</b>	
Webpage Language	English, Korean, Chinese, French, Italian, Spanish, German, Japanese, Russian, Portuguese, Czech, Polish, Turkish, Dutch, Hungarian, Greek
Web Viewer	None
Edge Storage	Micro SD/SDHC/SDXC 1slot Max. 1TB
Memory	2GB RAM, 512MB Flash
<b>Environmental &amp; Electrical</b>	
Operating Temperature / Humidity	-40°C~+60°C(-40°F~+140°F) / 0~95% RH(non-condensing)
Storage Temperature / Humidity	-50°C~+60°C(-58°F~+140°F) / Less than 95% RH
Certification	IP66, IK10, NEMA4X
Input Voltage	PoE(IEEE802.3af, Class3), 12VDC
Power Consumption	PoE: Max 10.8W, typical 9W 12VDC: Max 9.4W, typical 7.7W
<b>Mechanical</b>	
Color / Material	White / Aluminum + PC
RAL Code	RAL9003
Product Dimensions / Weight	ø93.8x233.5mm(ø3.69x9.19"), 1700g(3.75 lb)
Compatible Conduit hole / Gang	SBO-147BA(Sold seperately) / single, double, 4" octagon, 4" square
Hanging Mount (Dome)	TBD
Skin Cover	TBD
Skin Cover (Dome)	TBD
Weather Cap (Dome)	TBD
Power Module	TBD
Backbox	Include
<b>Certifications &amp; Standards</b>	
Network	None
EMC	TBD
Safety	TBD
Environment	TBD
Video	None
<b>DORI (EN62676-4 standard)</b>	
Detect (25PPM/ 8PPF)	(None)
Observe (63PPM/ 19PPF)	(None)
Recognize (125PPM/ 38PPF)	(None)
Identify (250PPM/ 76PPF)	(None)

## 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.

☒ DC 12 V      ☒ PoE

## 1.2 Variant Model Differences

Addition of a simple derivative model due to the difference in fixed lenses

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK THERMAL CAMERA	TNO-C3032TRA	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT

## 1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC/DC Adapter	2ACB022F	-	ChAnnel Well Technology (Guangzhou) Co.,Ltd.	-
PoE INJECTOR	PD-9501GR/AC	-	CHANGZHOU WUJIN HONGGUANG RADIO CO, LTD.	-
Laptop	P95G001	9JM8HT2	DELL INC.	-
Laptop Adapter	HA65NM130	-	Chicony Power Technology(Suzhou)Co.,Ltd	-
Controller	SPC-1010	C50E67WG10100F	SamSung Techwin Co.,Ltd.	-
Controller Adapter	A260-120300W-KR1	-	Dongguan Aohai Technology Co., Ltd.	-
Alarm	PRO-SL	-	SENSOR PRO	-
Button Alarm	-	-	-	-
Headset	K550	-	Britz®	-
Micro SD Card	-	-	SanDisk	32 GB
Smart Phone	SM-N950N	R39JB0C3FB	SamSung	-



## 1.6 External I/O Cabling

■ DC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK THERMAL CAMERA (EUT)	DC Jack (2 Pin)	AC/DC Adapter	Line-Out (2 Pin)	1.0	U
	RJ-45	Laptop	RJ-45	4.0	U
	RS-485 (2 Pin)	Controller	RS-485(2 Pin)	3.5	U
	Alarm Out (2 Pin)	Alarm	Line-Out (2 Pin)	3.5	U
	Alarm In (2 Pin)	Button Alarm	Line-Out (2 Pin)	3.5	U
	Audio Out (3.5 mm)	Headset	Line-Out (3.5 mm)	1.6	U
	Audio In (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	Micro SD Slot	Micro SD Card	Micro SD Slot	-	-
Laptop	DC Jack	Laptop Adapter	Line-Out (DC Jack)	2.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

\* Unshielded=U, Shielded=S

## ■ PoE Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK THERMAL CAMERA (EUT)	RJ-45 (PoE)	PoE INJECTOR	RJ-45 (PoE)	4.0	U
	RS-485 (2 Pin)	Controller	RS-485(2 Pin)	3.5	U
	Alarm Out (2 Pin)	Alarm	Line-Out (2 Pin)	3.5	U
	Alarm In (2 Pin)	Button Alarm	Line-Out (2 Pin)	3.5	U
	Audio Out (3.5 mm)	Headset	Line-Out (3.5 mm)	1.6	U
	Audio In (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	Micro SD Slot	Micro SD Card	Micro SD Slot	-	-
PoE INJECTOR	RJ-45 (Data)	Laptop	RJ-45	3.0	U
Laptop	DC Jack	Laptop Adapter	Line-Out (DC Jack)	2.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U
Controller	DC Jack	Controller Adapter	Line-Out (DC Jack)	1.5	U

\* Unshielded=U, Shielded=S

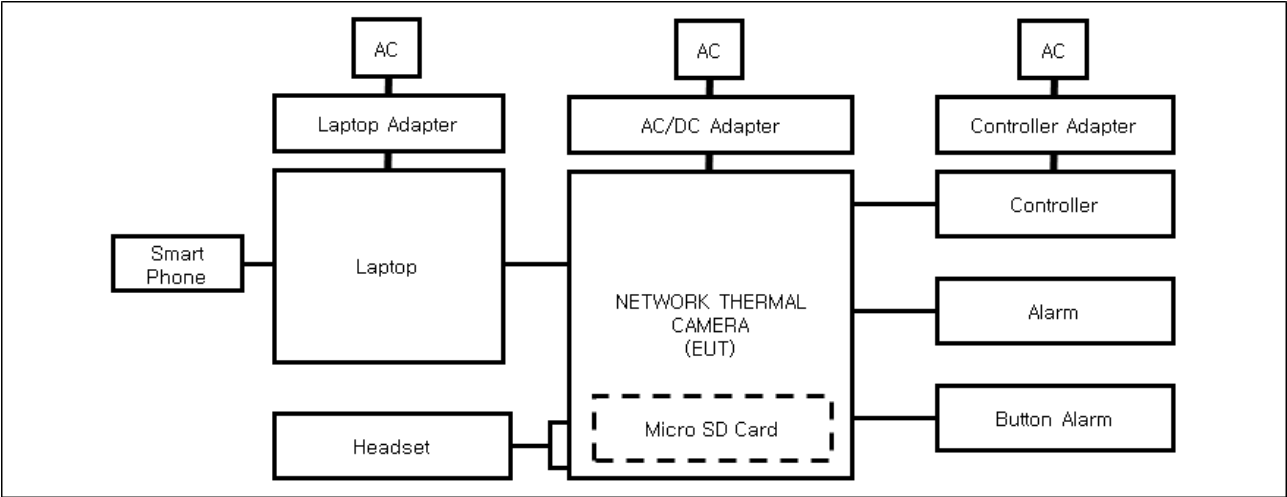
## 1.7 EUT Operating Mode(s)

Test mode	operating
Operating	<ul style="list-style-type: none"> <li>- Connect to the web viewer on your laptop and check if the video from the cameras are displayed normally.</li> <li>- Network ping test on the laptop</li> <li>- Check camera operation through controller</li> <li>- Check alarm function</li> <li>- Check audio output of 1 kHz tone from headset</li> <li>- Check the storage device for the recorded screen after the test.</li> </ul>

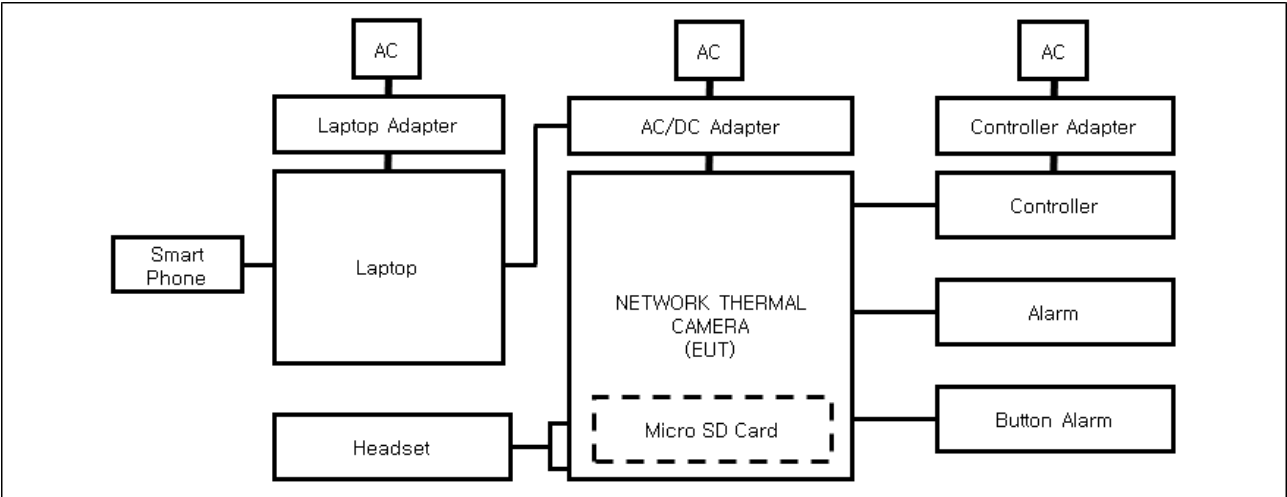
EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Vision Co., Ltd

1.8 Configuration

■ DC Mode



■ PoE Mode



## 1.9 Remarks when standards applied

The USB (Micro 5 Pin) port is an administrator port and was excluded from the test.




## 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, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

## 1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber 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 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
JAPAN	VCCI	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)	 C-20136, T-20137, R-20181, G-20176
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **AS/NZS CISPR 32:2015 AMD 1:2020**

☒ Class A

☐ Class B

## 2.1 Conducted Emissions at Mains Power Ports

**Test Date**

Oct. 22, 2023

**Test Location**

Electro wave Shieldroom #6

**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	11, 10, 2023
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 10, 2023

**Test Conditions**

Temperature: (22,3 ± 0,2) °C

Relative Humidity: (47,5 ± 0,3) % R.H.

**Frequency Range of Measurement**

150 kHz to 30 MHz

**Instrument Settings**

IF Band Width: 9 kHz

**Test Results**

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

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

## 2.2 Conducted Emissions at Telecommunication Ports

**Test Date**

Oct. 22, 2023

**Test Location**

Electro wave Shieldroom #6

**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	11, 11, 2023
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	11, 10, 2023
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	11, 10, 2023
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 10, 2023
<input checked="" type="checkbox"/>	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	11, 22, 2023
<input type="checkbox"/>	CDN	CDNS502A	TESEQ	40431	11, 10, 2023

**Test Conditions**

Temperature: (22,3 ± 0,2) °C

Relative Humidity: (47,4 ± 0,3) % 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.- For Ethernet interfaces, measurements are required at the highest data rate supported by the interface.

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

**Test Date**

Oct. 20, 2023

**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	03, 21, 2024
<input checked="" type="checkbox"/>	AMPLIFIER	SCU 01	R & S	100603	11, 10, 2023
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 17, 2024
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	32173	03, 03, 2024

**Test Conditions**

Temperature: (22,7 ± 0,1) °C

Relative Humidity: (45,1 ± 0,3) % 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**

Oct. 20, 2023

**Test Location**

SEMI ANECHOIC CHAMBER #5

**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	ES10/RE	TOYO Corporation	2022.01.000	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	03, 21, 2024
<input checked="" type="checkbox"/>	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	11, 08, 2023
<input checked="" type="checkbox"/>	PREAMPLIFIER	8449B	HP	3008A00538	05, 31, 2024
<input checked="" type="checkbox"/>	ATTENUATOR	8491B	HP	23094	03, 21, 2024

**Test Conditions**

Temperature: (23,0 ± 0,2) °C

Relative Humidity: (45,0 ± 0,4) % 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.  
- The Average of the test data is the cispr average result.

## APPENDIX A – TEST DATA

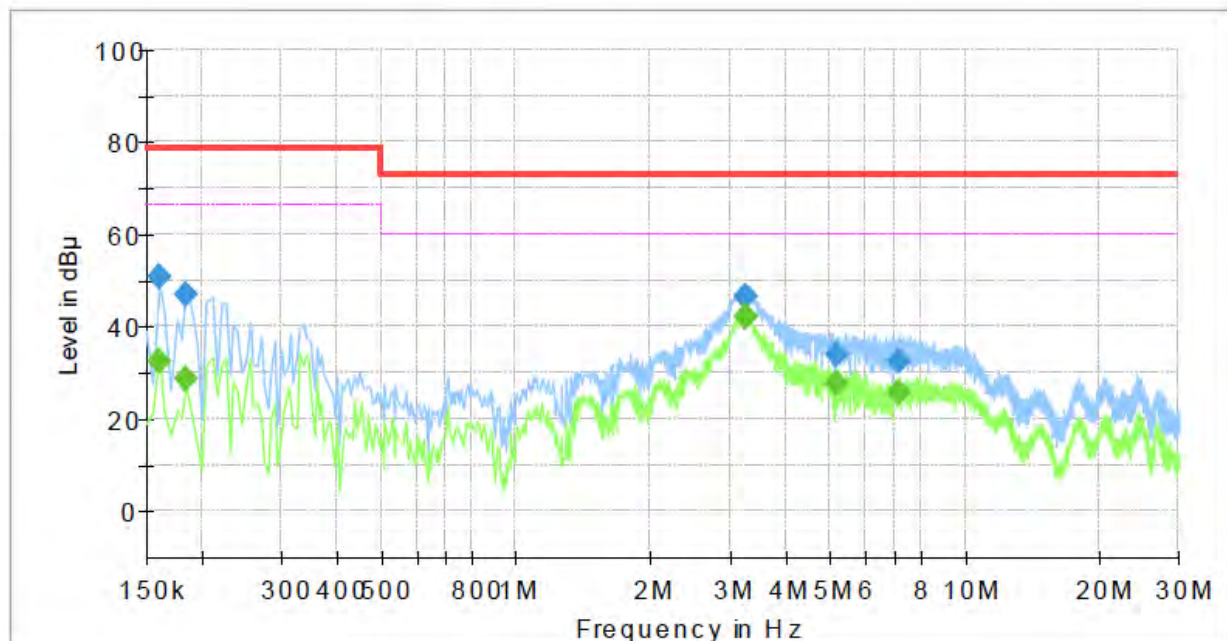
### Conducted Emissions at Mains Power Ports

■ DC Mode

HOT LINE

### Common Information

Test Description: Conducted Emission  
 Model No.: TNO-C3032TRA  
 Phase: L1  
 Mode: DC  
 Operator Name: KES



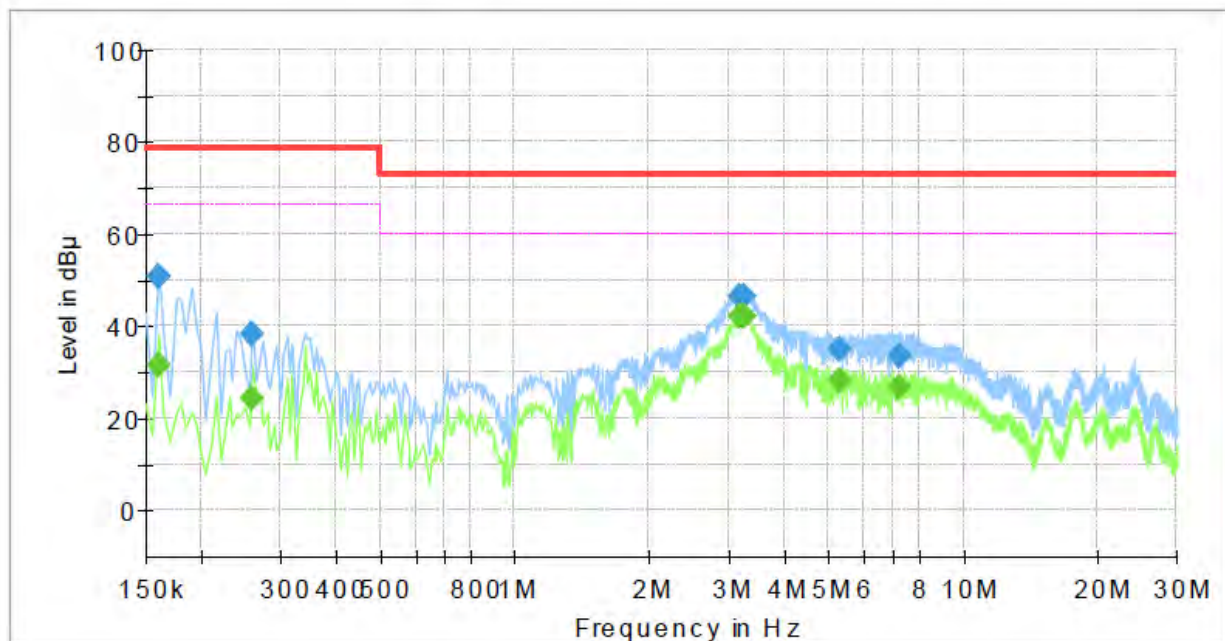
### Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	32.47	66.00	33.53	1000.0	9.000	L1	19.4
0.160000	50.90	---	79.00	28.10	1000.0	9.000	L1	19.4
0.185000	---	28.66	66.00	37.34	1000.0	9.000	L1	19.4
0.185000	47.10	---	79.00	31.90	1000.0	9.000	L1	19.4
3.255000	---	42.14	60.00	17.86	1000.0	9.000	L1	19.6
3.255000	46.47	---	73.00	26.53	1000.0	9.000	L1	19.6
3.260000	---	42.17	60.00	17.83	1000.0	9.000	L1	19.6
3.260000	46.54	---	73.00	26.46	1000.0	9.000	L1	19.6
5.200000	---	27.81	60.00	32.19	1000.0	9.000	L1	19.8
5.200000	34.13	---	73.00	38.87	1000.0	9.000	L1	19.8
7.120000	---	25.76	60.00	34.24	1000.0	9.000	L1	19.9
7.120000	32.59	---	73.00	40.41	1000.0	9.000	L1	19.9

## NEUTRAL LINE

**Common Information**

Test Description:	Conducted Emission
Model No.:	TNO-C3032TRA
Phase:	N
Mode:	DC
Operator Name:	KES

**Final Result**

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	31.65	66.00	34.35	1000.0	9.000	N	19.4
0.160000	50.91	---	79.00	28.09	1000.0	9.000	N	19.4
0.260000	---	24.10	66.00	41.90	1000.0	9.000	N	19.4
0.260000	38.17	---	79.00	40.83	1000.0	9.000	N	19.4
3.190000	---	41.92	60.00	18.08	1000.0	9.000	N	19.6
3.190000	46.55	---	73.00	26.45	1000.0	9.000	N	19.6
3.235000	---	42.17	60.00	17.83	1000.0	9.000	N	19.6
3.235000	46.66	---	73.00	26.34	1000.0	9.000	N	19.6
5.325000	---	28.17	60.00	31.83	1000.0	9.000	N	19.8
5.325000	34.66	---	73.00	38.34	1000.0	9.000	N	19.8
7.210000	---	26.83	60.00	33.17	1000.0	9.000	N	19.9
7.210000	33.44	---	73.00	39.56	1000.0	9.000	N	19.9

## ◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

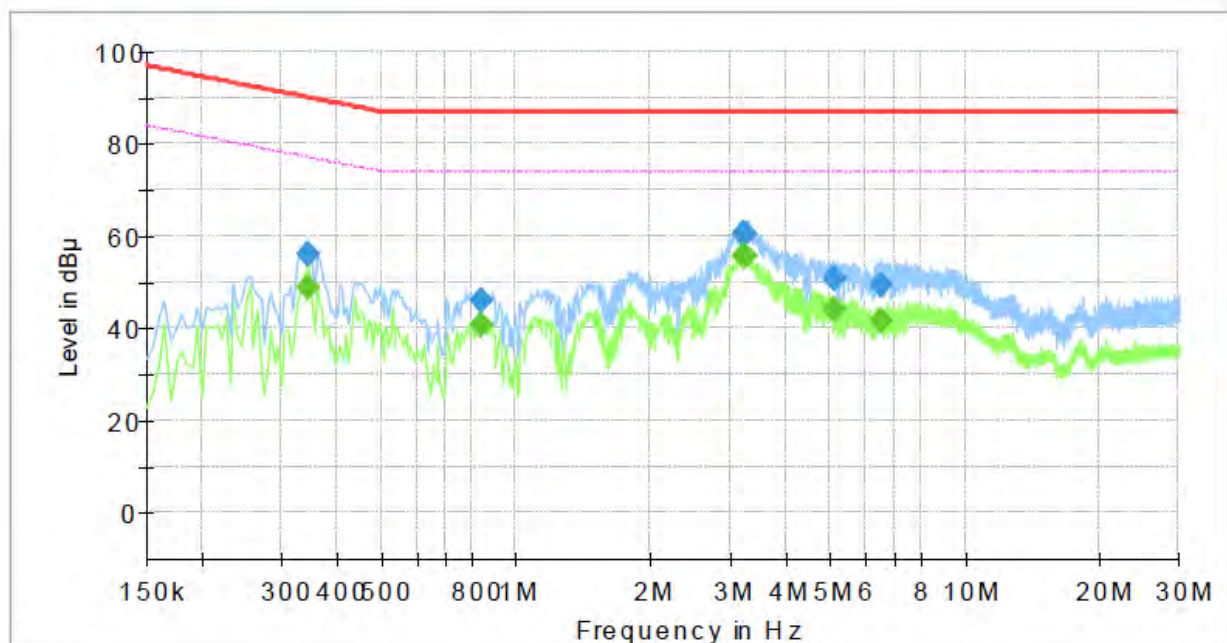
**Conducted Emissions at Telecommunication Ports**

■ DC Mode

[1 000 Mbps]

**Common Information**

Test Description:	Telecommunication Emission
Model No.:	TNO-C3032TRA
Mode :	DC
Speed :	1 000 Mbps
Operator Name:	KES

**Final Result**

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.345000	---	48.72	77.08	28.36	1000.0	9.000	Single Line	19.5
0.345000	56.07	---	90.08	34.01	1000.0	9.000	Single Line	19.5
0.840000	---	40.62	74.00	33.38	1000.0	9.000	Single Line	19.4
0.840000	45.96	---	87.00	41.04	1000.0	9.000	Single Line	19.4
3.215000	---	55.70	74.00	18.30	1000.0	9.000	Single Line	19.4
3.215000	60.61	---	87.00	26.39	1000.0	9.000	Single Line	19.4
3.255000	---	55.76	74.00	18.24	1000.0	9.000	Single Line	19.4
3.255000	60.66	---	87.00	26.34	1000.0	9.000	Single Line	19.4
5.145000	---	43.89	74.00	30.11	1000.0	9.000	Single Line	19.5
5.145000	50.66	---	87.00	36.34	1000.0	9.000	Single Line	19.5
6.520000	---	41.42	74.00	32.58	1000.0	9.000	Single Line	19.5
6.520000	49.23	---	87.00	37.77	1000.0	9.000	Single Line	19.5

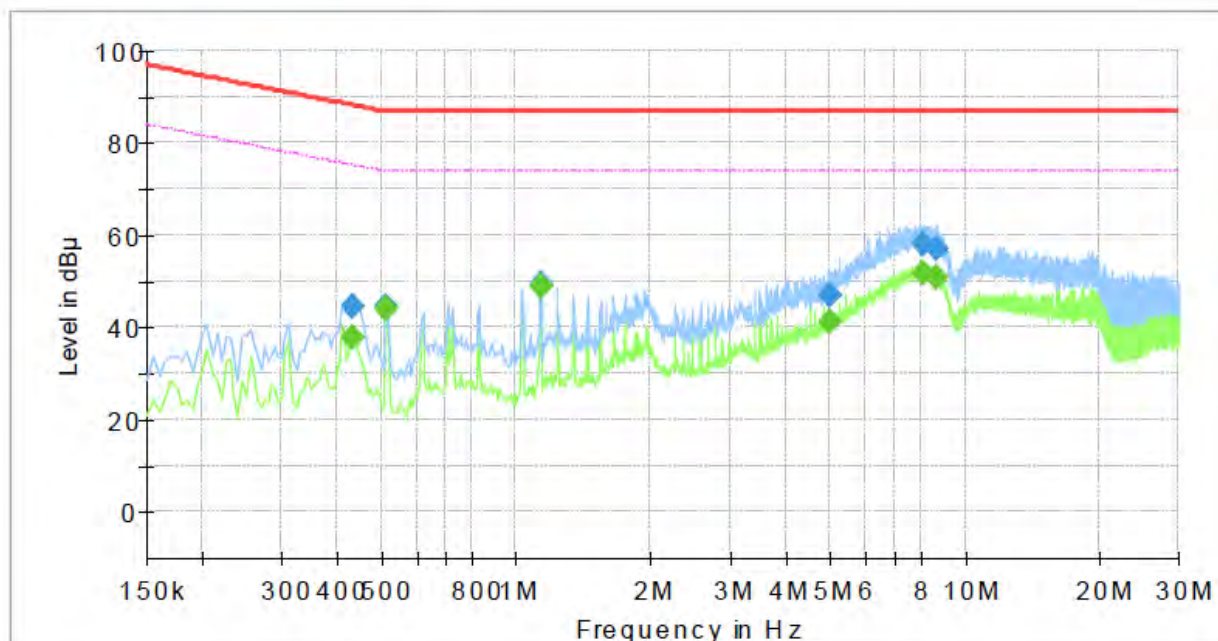


■ PoE Mode

[1 000 Mbps]

## Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-C3032TRA
Mode :	PoE
Speed :	1 000 Mbps
Operator Name:	KES



## Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.435000	---	37.61	75.16	37.55	1000.0	9.000	Single Line	19.4
0.435000	44.38	---	88.16	43.78	1000.0	9.000	Single Line	19.4
0.515000	---	44.04	74.00	29.96	1000.0	9.000	Single Line	19.4
0.515000	44.67	---	87.00	42.33	1000.0	9.000	Single Line	19.4
1.135000	---	48.62	74.00	25.38	1000.0	9.000	Single Line	19.3
1.135000	49.35	---	87.00	37.65	1000.0	9.000	Single Line	19.3
5.020000	---	41.25	74.00	32.75	1000.0	9.000	Single Line	19.5
5.020000	47.06	---	87.00	39.94	1000.0	9.000	Single Line	19.5
8.075000	---	51.87	74.00	22.13	1000.0	9.000	Single Line	19.6
8.075000	57.81	---	87.00	29.19	1000.0	9.000	Single Line	19.6
8.670000	---	50.91	74.00	23.09	1000.0	9.000	Single Line	19.6
8.670000	56.86	---	87.00	30.14	1000.0	9.000	Single Line	19.6

### ♦ Calculation

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

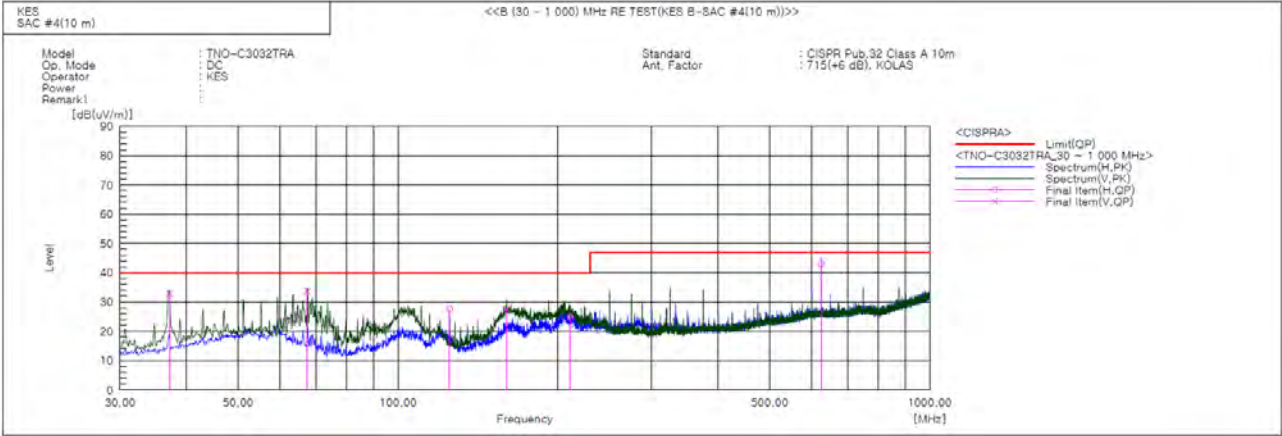
QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

Radiated Electric Field Emissions(Below 1 GHz)

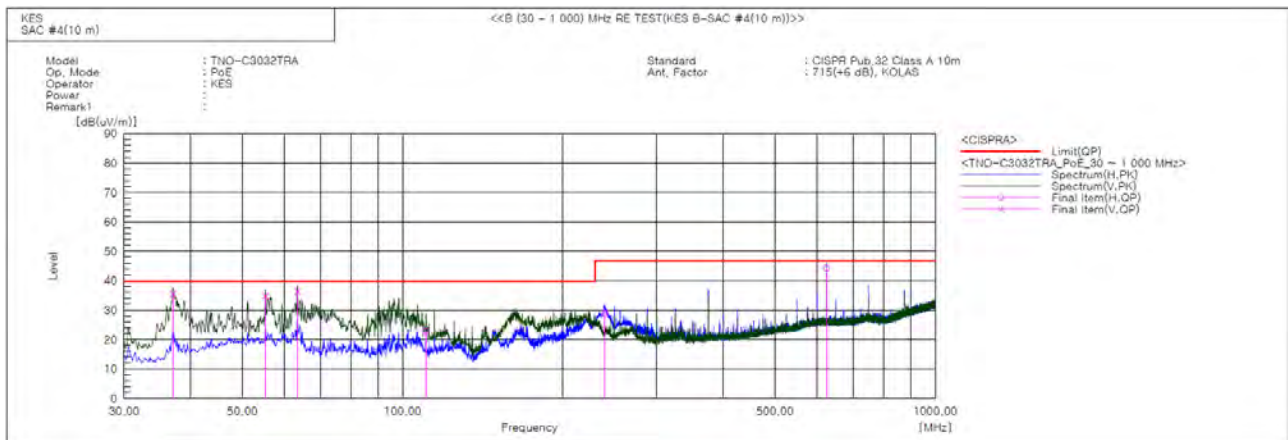
DC Mode



Final Result

No.	Frequency	(P)	Reading	c.f	Result	Limit	Margin	Height	Angle	Remark
	[MHz]		QP		QP	QP	QP			
			[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]	
1	37.154	V	56.4	-23.3	33.1	40.0	6.9	100.0	275.0	
2	67.466	V	57.3	-23.6	33.7	40.0	6.3	146.0	72.0	
3	124.939	H	51.9	-24.3	27.6	40.0	12.4	400.0	181.0	
4	159.980	V	52.3	-24.7	27.6	40.0	12.4	100.0	230.0	
5	210.905	H	44.9	-20.1	24.8	40.0	15.2	400.0	84.0	
6	624.974	H	50.7	-7.6	43.1	47.0	3.9	241.0	321.0	

# **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	37.033	V	58.9	-23.4	35.5	40.0	4.5	100.0	118.0	
2	55.220	V	55.5	-20.7	34.8	40.0	5.2	105.0	140.0	
3	63.465	V	58.7	-22.4	36.3	40.0	3.7	100.0	70.0	
4	110.510	H	45.3	-22.6	22.7	40.0	17.3	400.0	293.0	
5	239.641	H	47.8	-19.0	28.8	47.0	18.2	400.0	55.0	
6	624.974	H	51.9	-7.6	44.3	47.0	2.7	247.0	165.0	

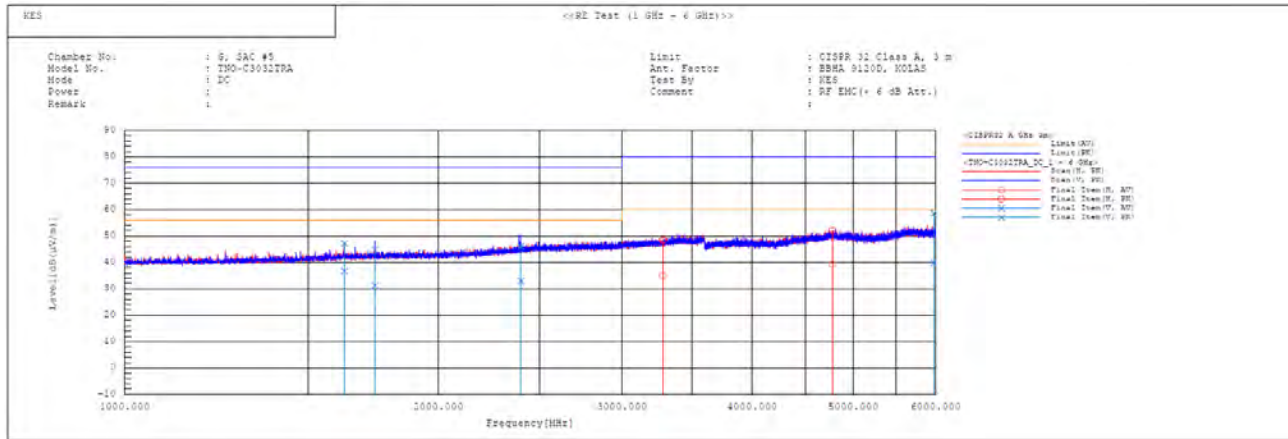
## **Calculation**

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

**Radiated Electric Field Emissions(Above 1 GHz)****■ DC Mode**

No.	Frequency [MHz]	Pol	Reading AV [dB(μV)]	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result AV [dB(μV/m)]	Result PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]	Remark
1	1625.008	V	35.5	46.0	1.2	36.7	47.2	56.0	76.0	19.3	28.8	100.0	129.9	
2	1738.185	V	29.6	43.1	1.7	31.3	44.8	56.0	76.0	24.7	31.2	100.0	214.1	
3	2399.326	V	28.6	41.7	4.3	32.9	46.0	56.0	76.0	23.1	30.0	100.0	134.4	
4	3282.256	H	28.4	41.8	6.6	35.0	48.4	60.0	80.0	25.0	31.6	100.0	32.6	
5	4772.788	H	27.9	40.8	11.3	39.2	52.1	60.0	80.0	20.8	27.9	100.0	0.0	
6	5976.497	V	25.9	44.7	13.9	39.8	58.6	60.0	80.0	20.2	21.4	100.0	0.0	



RES Test (1 GHz ~ 6 GHz)

Chamber No.	: G, SAC #5	Limit	: CISPR 32 Class 2, 3 m
Model No.	: TMO-C3032TRA	Ant. Factor	: BNA 9120D, NOLAS
Mode	: PoE	Test By	: NES
Power	:	Comment	: RF EMC (4 # dB Att.)
Remark	:		:

Level [dBm/Hz]

Frequency [MHz]

Legend:

- Limit (AV)
- Limit (PE)
- TMO-C3032TRA\_PoE\_4 = 6 dBm
- Mean (AV, PE)
- Final Term (AV)
- Final Term (PE)
- Final Term (AV)
- Final Term (PE)

No.	Frequency	Pol	Reading AV	Reading PK	c.f	Result AV	Result PK	Limit AV	Limit PK	Margin AV	Margin PK	Height	Angle	Remark
	[MHz]		[dB(μV)]	[dB(μV)]	[dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB(μV/m)]	[dB]	[dB]	[cm]	[deg]	
1	1249.991	V	37.2	46.6	-0.5	36.7	46.1	56.0	76.0	19.3	29.9	100.0	183.0	
2	1624.989	H	31.2	44.2	1.2	32.4	45.4	56.0	76.0	23.6	30.6	100.0	35.3	
3	1874.996	V	34.1	44.3	2.2	36.3	46.5	56.0	76.0	19.7	29.5	100.0	109.9	
4	3190.212	H	27.6	41.1	6.5	34.1	47.6	60.0	80.0	25.9	32.4	100.0	186.7	
5	5740.983	V	27.2	40.7	13.3	40.5	54.0	60.0	80.0	19.5	26.0	100.0	32.1	
6	5741.071	H	27.2	40.0	13.3	40.5	53.3	60.0	80.0	19.5	26.7	100.0	181.3	

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

## Test Setup Photos and Configuration

### Conducted Emissions at Mains Power Ports

■ DC Mode



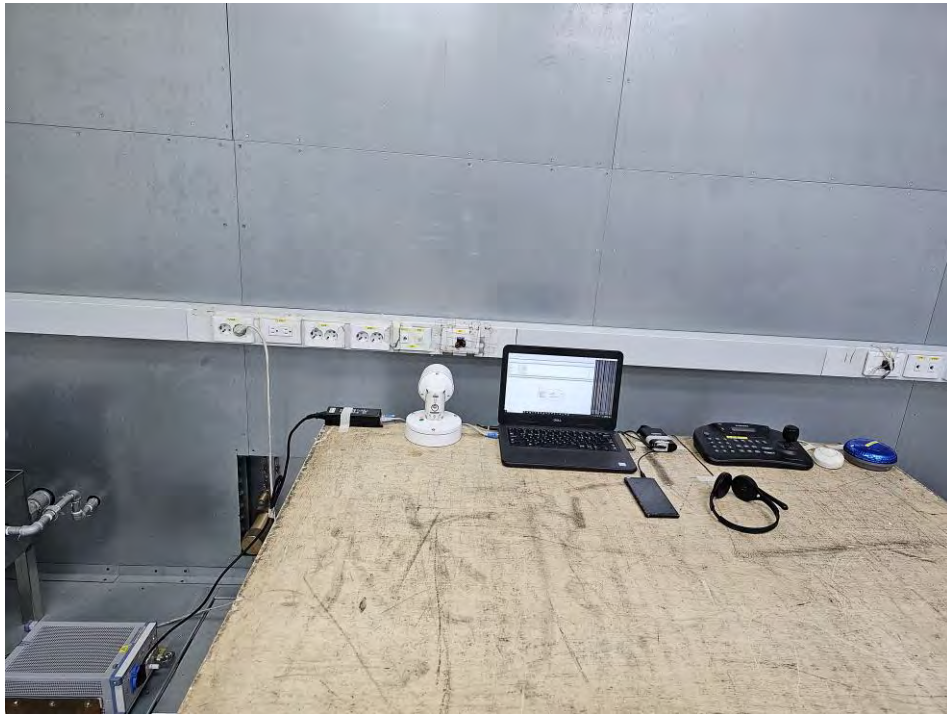
## Conducted Emissions at Telecommunication Ports

■ DC Mode



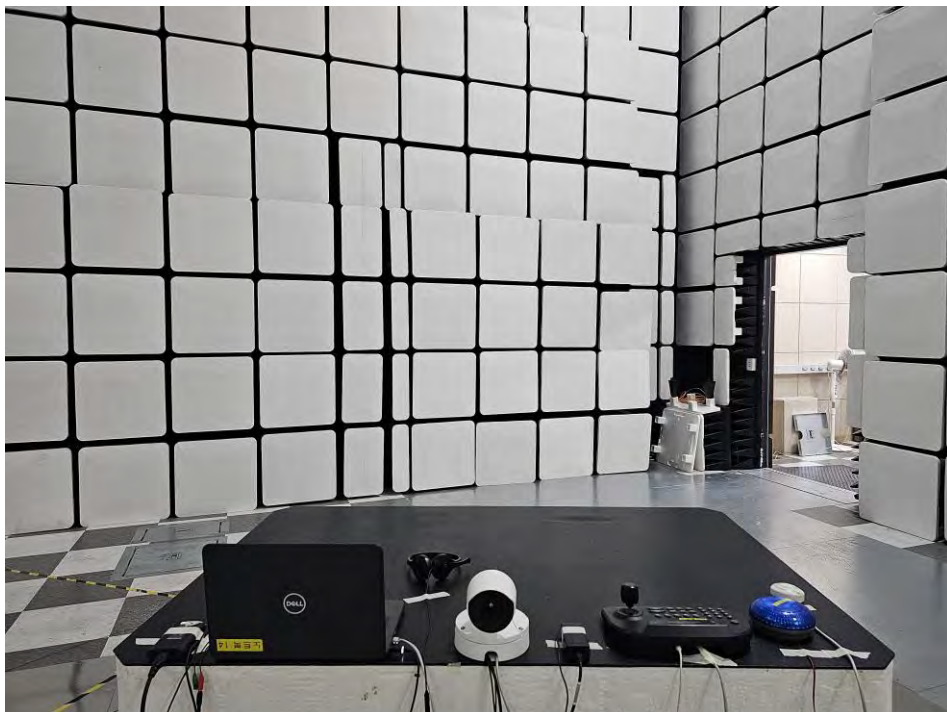


■ PoE Mode



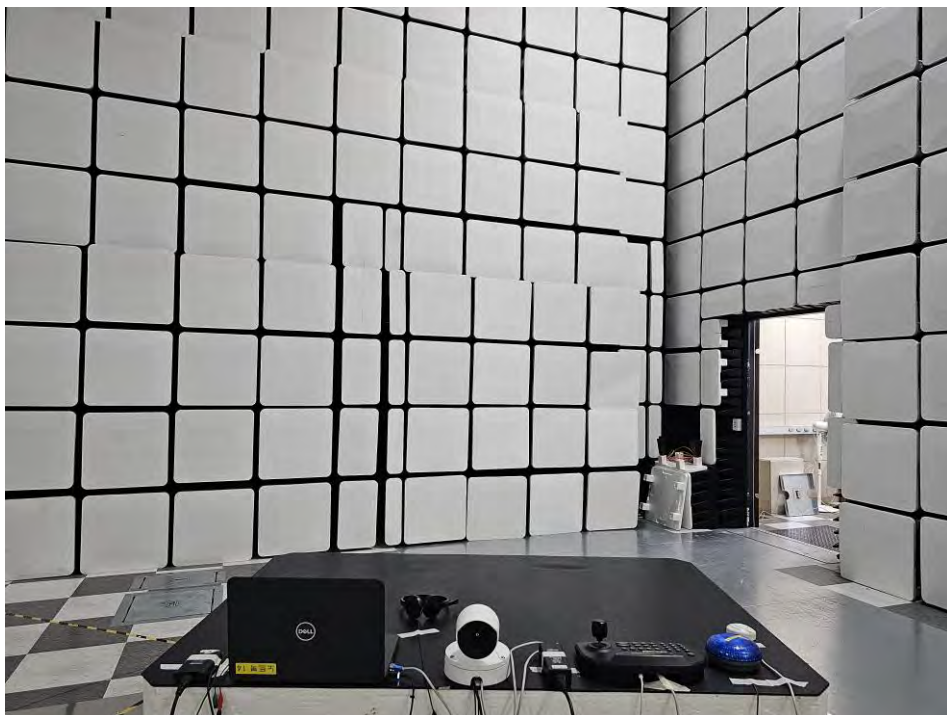
## Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode





■ PoE Mode



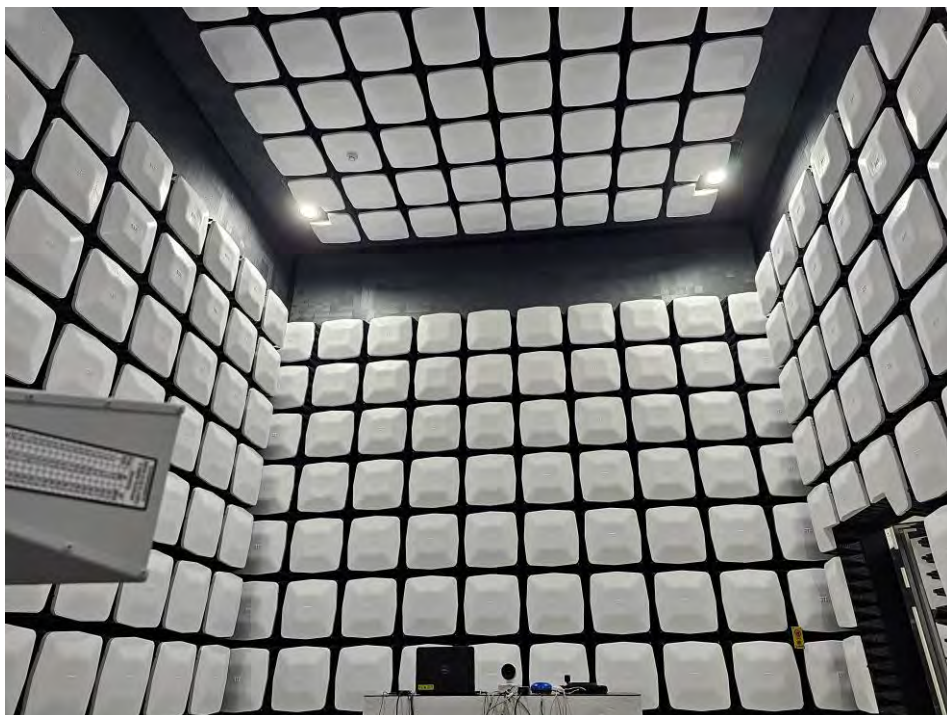
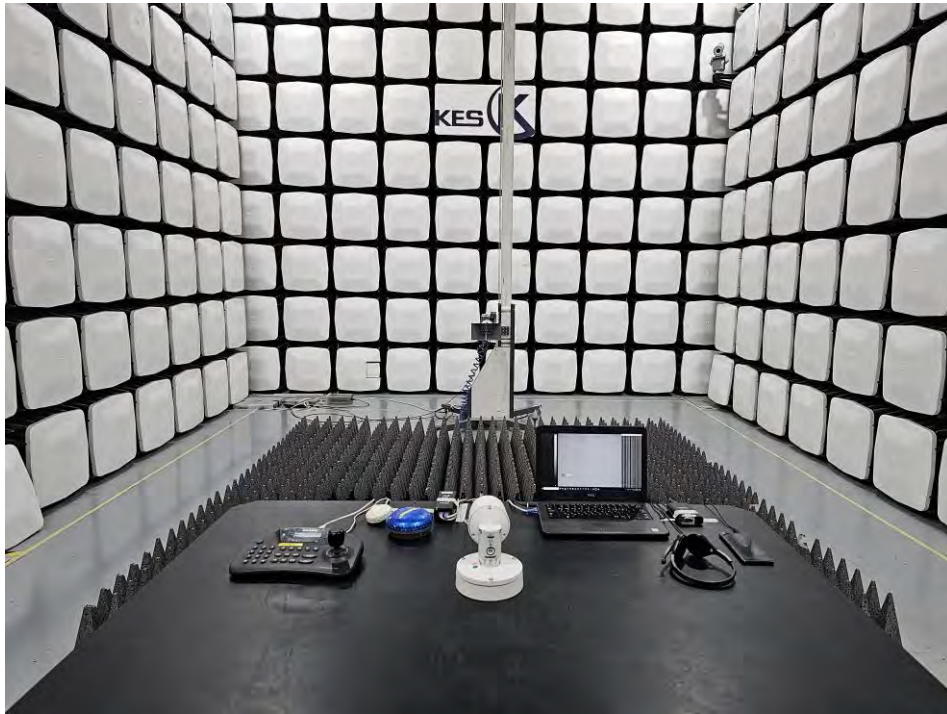
## Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode





■ PoE Mode





EUT External Photographs

(Top)



(Bottom)



## EUT Internal Photographs

(Internal View)



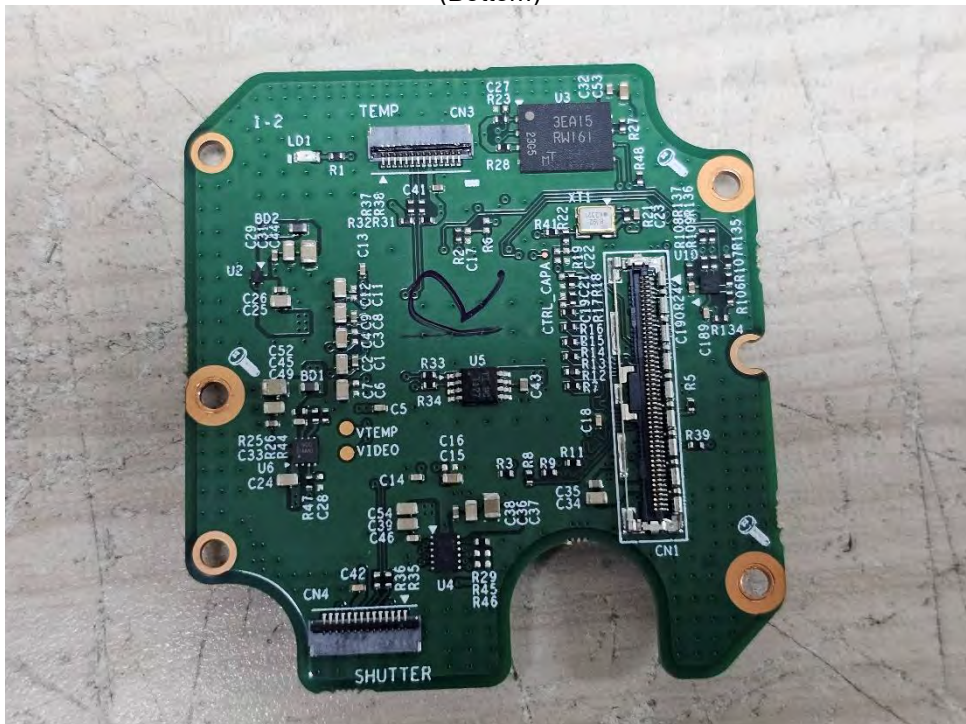


## EUT Internal View – IR Board

(Top)



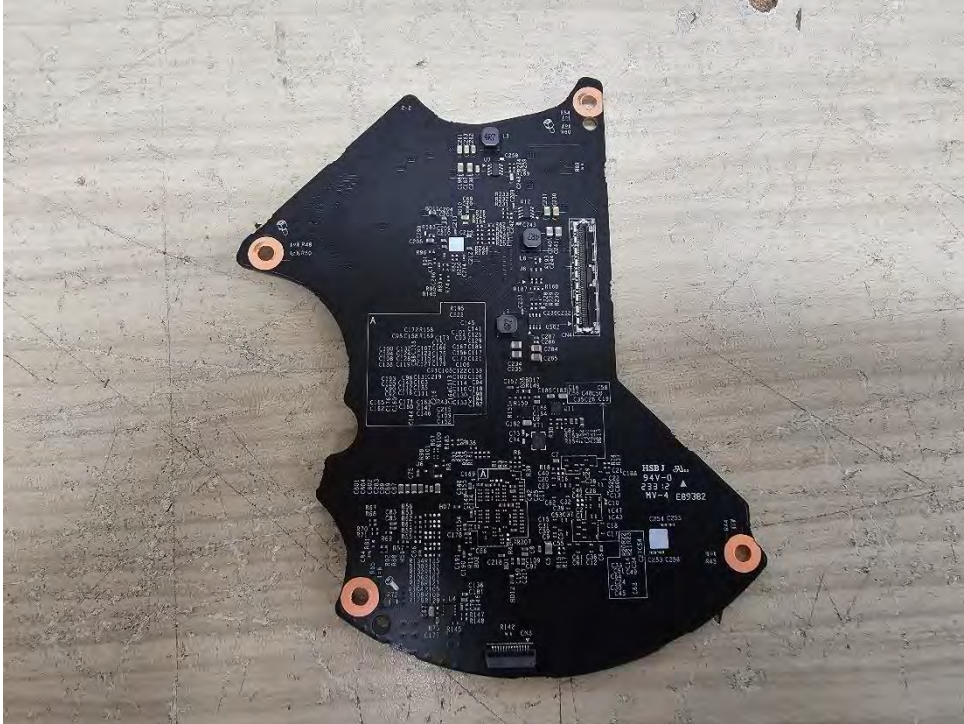
(Bottom)



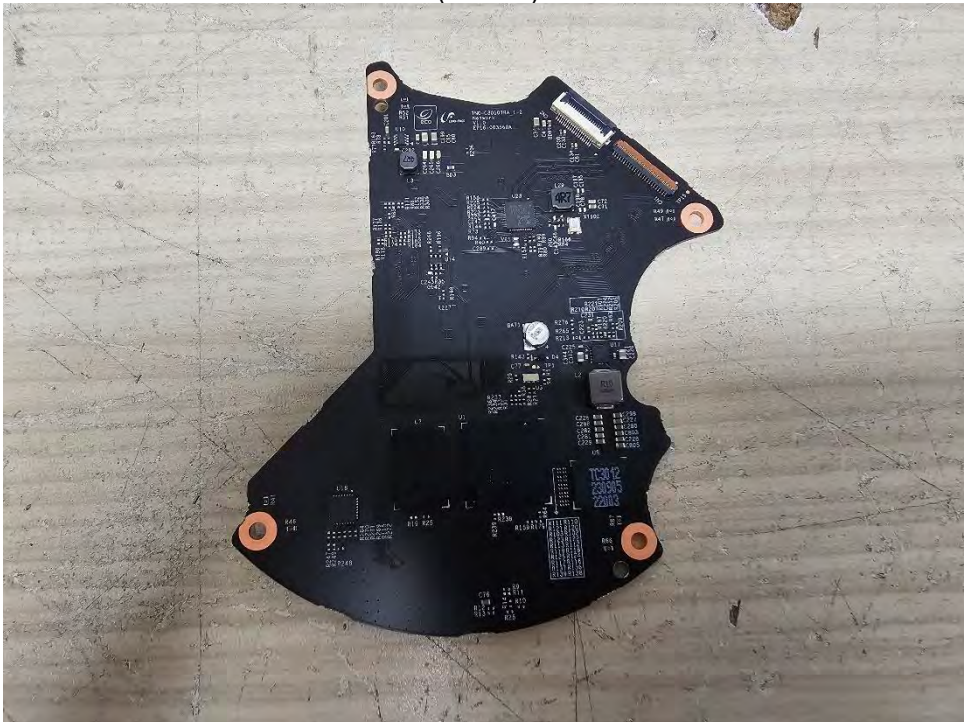


## EUT Internal View – Network Board

(Top)



(Bottom)





(Top)





## EUT Internal View – Power Board

(Top)



(Bottom)





## EUT Internal View – Lens

(Top)



(Bottom)

