

TEST REPORT



Report No. : KES-EM-23T0935

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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-C3020TRA

Variant Model : TNO-C3010TRA, TNO-C3030TRA

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. 19, 2023

4. Test date : Oct. 19, 2023 ~ Oct. 24, 2023

5. Date of Issue : Nov. 06, 2023

6. Test Results : In Compliance

Tested by

Min Seong, Kim
EMC Test Engineer

Reviewed by

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-23T0935	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Video	
Imaging Device	Uncooled micro bolometer
Resolution	768x576, 384x288(original)
Max. Framerate	H.265/H.264/MJPEG: Max. 30fps
NETD	< 30mK
Pixel Size	17 μ m
Min. Illumination	None
Video Out	USB: Micro USB Type B, 768x576 for installation
Video Transmission Distance	None
Lens	
Focal Length (Zoom Ratio)	6.6mm fixed focal
Max. Aperture Ratio	F1.0
Angular Field of View	H: 60° / V: 43.8° / D: 77.8° (iFoV: 2.6 mRad)
Min. Object Distance	1.3M
Focus Control	Fixed
Lens Type	None
Mount Type	None
Optional Lens	None
Pan / Tilt / Rotate	
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

Radiometry	
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)
Network	
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(5ea 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
Security	
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

General	
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
Environmental & Electrical	
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
Mechanical	
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
Certifications & Standards	
Network	None
EMC	TBD
Safety	TBD
Environment	TBD
Video	None
DORI (EN62676-4 standard)	
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

Fixed Lens Differences

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK THERMAL CAMERA	TNO-C3020TRA	-	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
Controller	DC Jack	Controller Adapter	Line-Out (DC Jack)	1.5	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

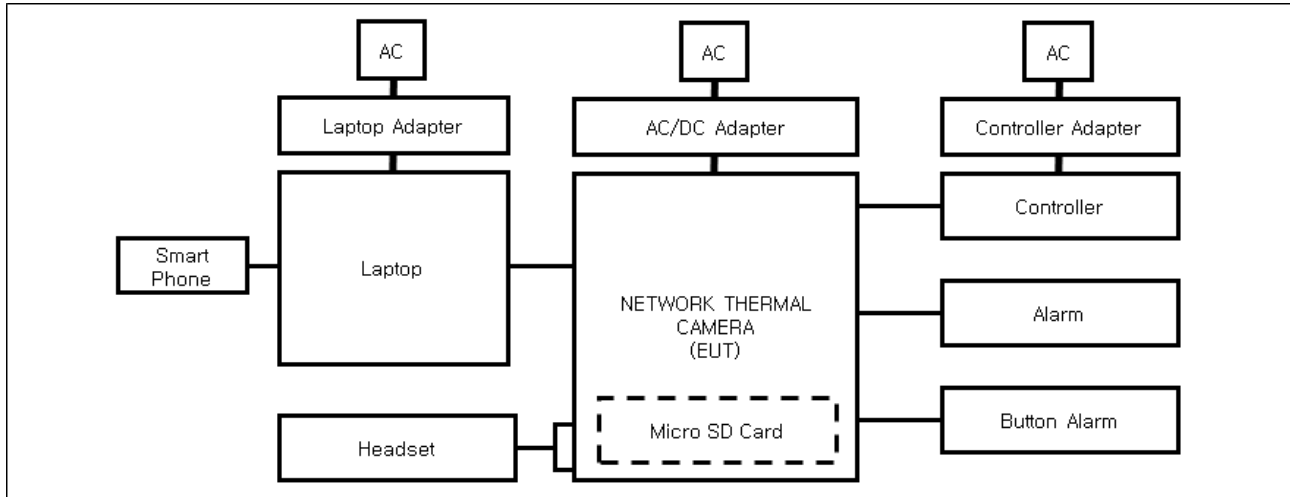
1.7 EUT Operating Mode(s)

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

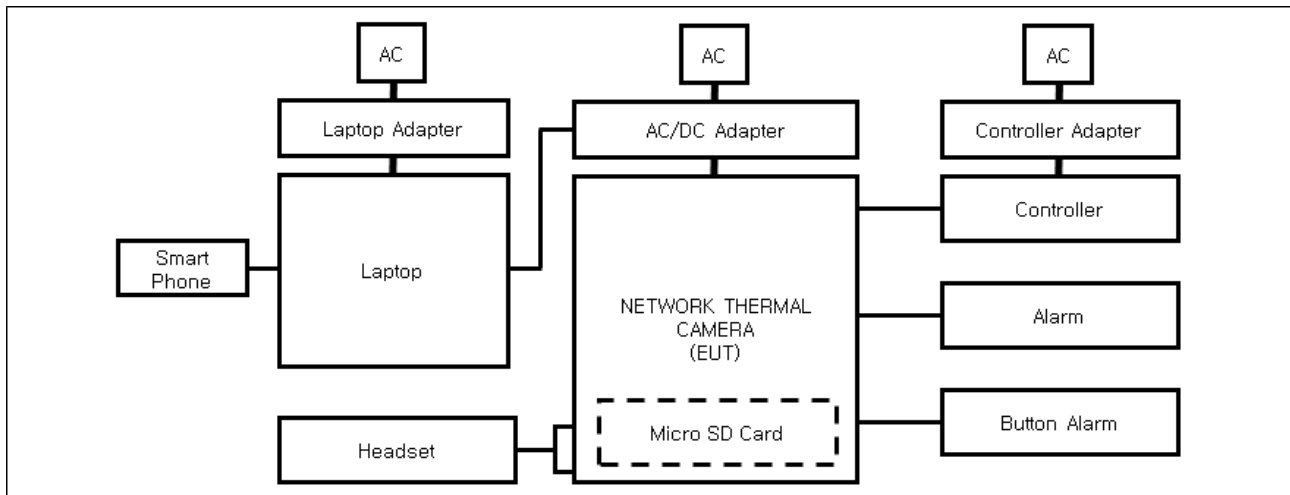
EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Vision Co., Ltd

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:

☒ **EMC – Directive 2014/30/EU**

☒ EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011/A1:2014

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☒ **EMC – Regulations 2016**

☒ EN 55032:2015/A11:2020

☒ Class A

☐ Class B

☒ EN 50130-4:2011/A1:2014

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

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

RemarksSee 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 type="checkbox"/>	8-WIRE ISN CAT3,5	ENY81	R & S	100174	11, 22, 2023
<input checked="" type="checkbox"/>	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	11, 22, 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.

- 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

RemarksSee 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.

2.5 Harmonic Current Emissions

Test Date

Oct. 19, 2023

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	net.control	EM TEST	2.1.4	-
<input checked="" type="checkbox"/>	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	03, 27, 2024
<input checked="" type="checkbox"/>	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,1 ± 0,1) °C

Relative Humidity: (44,9 ± 0,2) % R.H.

Classification of Equipment for Harmonic Current Emissions

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

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.6 Voltage Fluctuations and Flicker

Test Date

Oct. 19, 2023

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	net.control	EM TEST	2.1.4	-
<input checked="" type="checkbox"/>	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	03, 27, 2024
<input checked="" type="checkbox"/>	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,1 ± 0,1) °C

Relative Humidity: (44,9 ± 0,2) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011/A1 :2014 Alarm systems-Part 4: Electromagnetic compatibility Product family standard:

Immunity requirements for components of fire, intruder and social alarm systems

The variety and the diversity of the apparatus within the scope of this document makes it difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard, the apparatus

becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance by the manufacture and noted in the test report, based on the following criteria:

Electrostatic discharge

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

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

Radiated electromagnetic fields

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

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

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

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

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

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

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

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

Fast transient burst / slow high energy voltage surge

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

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Conducted RF immunity

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

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change, and no such flickering of indicators oeuvres at $U = 130 \text{ dB}\mu\text{V}$.

For component of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at $U = 140 \text{ dB}\mu\text{V}$, providing:

- (a) there is no permanent damage or change to the EUT
(e.g. no corruption of memory or changes to programmable settings etc.)
- (b) at $U = 130 \text{ dB}\mu\text{V}$, any deterioration of the picture is so minor that the system could still be used; and
- (c) there in no observable deterioration of the picture at $U = 120 \text{ dB}\mu\text{V}$.

Voltage dip/interruption / Voltage variation

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

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

3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Oct. 22, 2023

Test Location

EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	01, 31, 2024
<input checked="" type="checkbox"/>	HCP	-	KES	-	-
<input checked="" type="checkbox"/>	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: (23,0 ± 0,1) °C
 Relative Humidity: (46,6 ± 0,1) % R.H.
 Atmospheric Pressure: (99,9 ± 0,0) kPa

Test Specifications

Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

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

Polarity: Positive and Negative

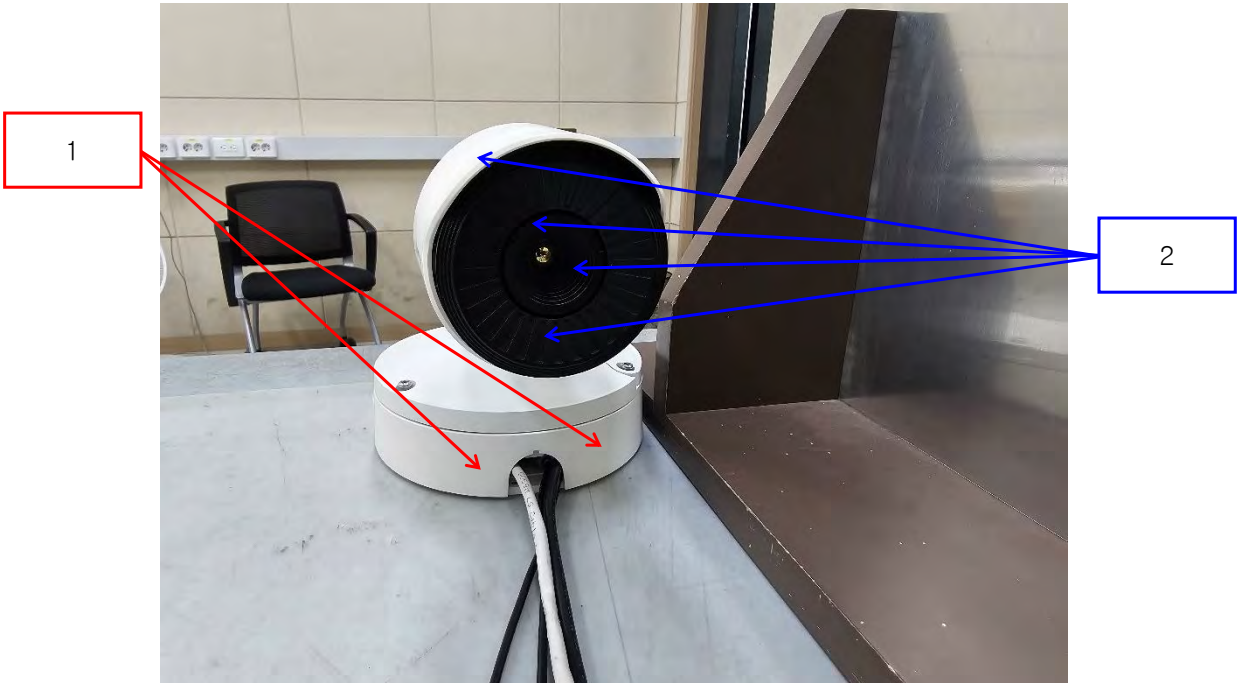
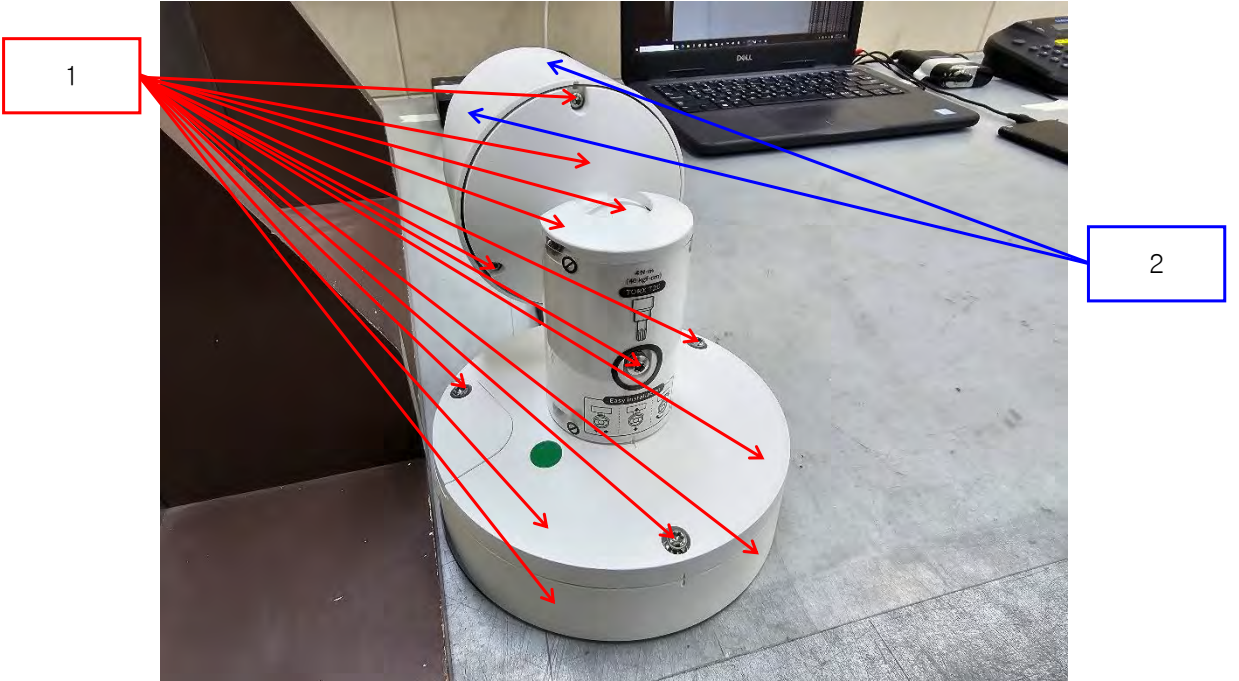
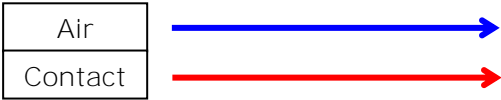
Number of Discharge: 10 at all locations for Air discharge
 10 at all locations for Contact discharge

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

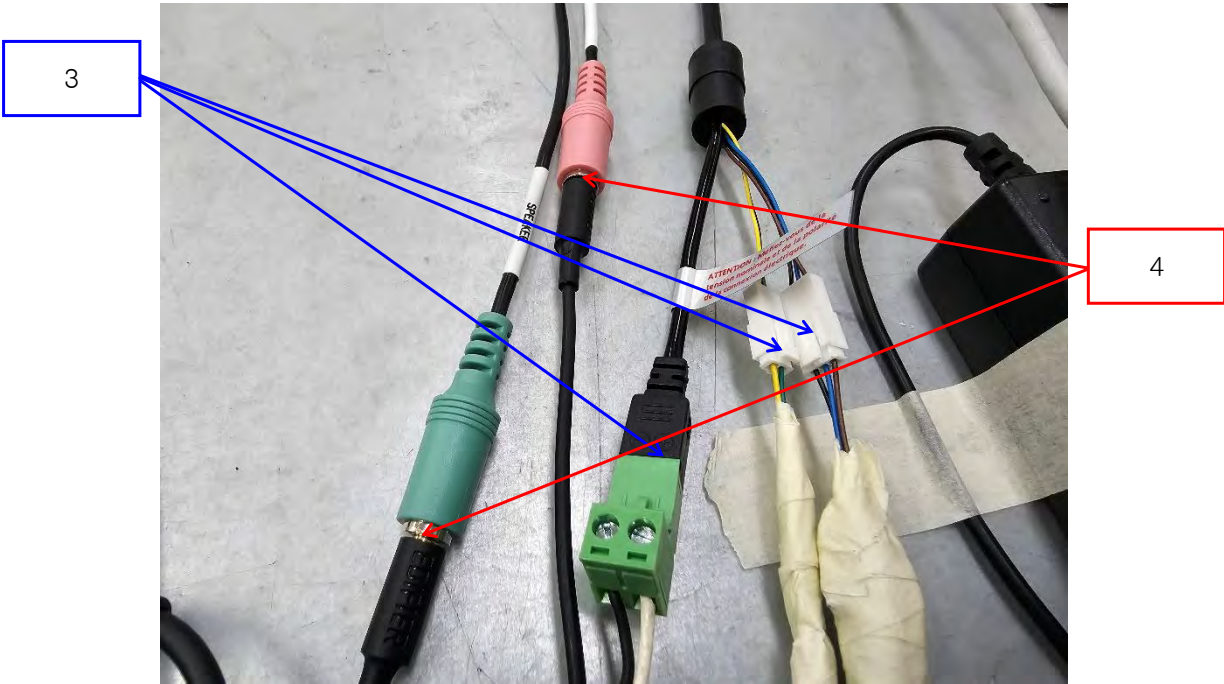
Notes: HCP: Horizontal coupling plane
 VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

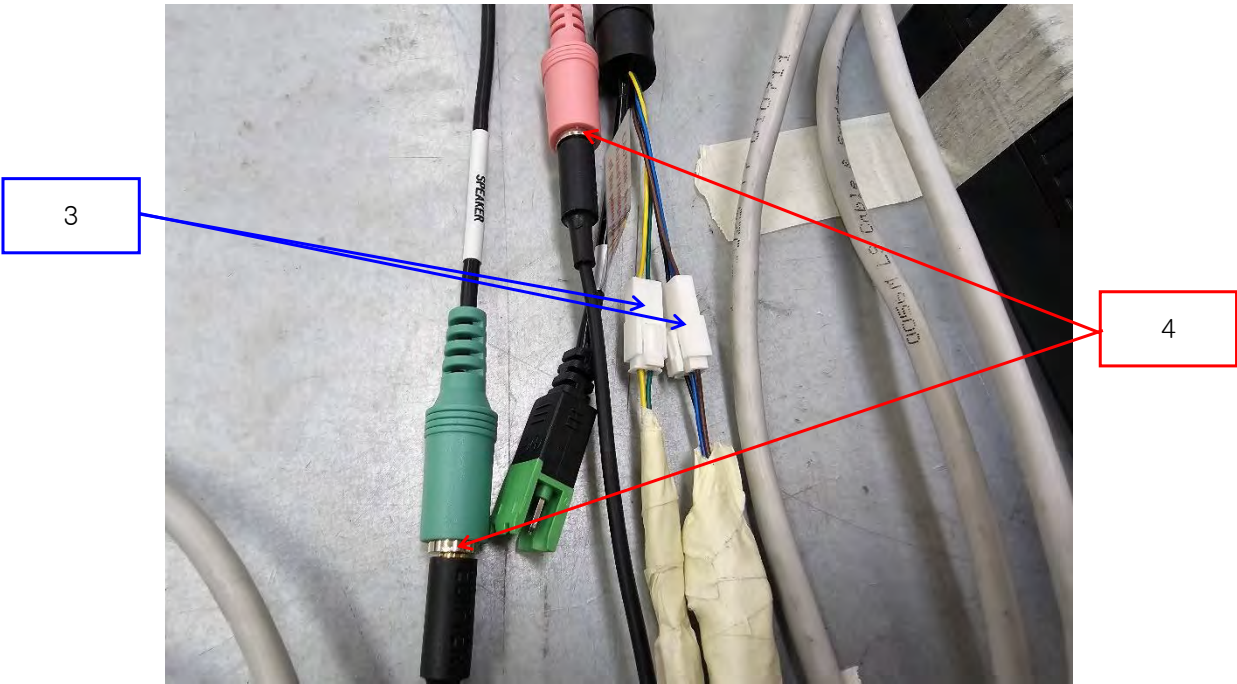
Location of Discharge:



■ DC Mode



■ PoE Mode



Test Data**■ DC Mode**

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure 1	Contact Discharge	Complied	-
2	Enclosure 2, Lens	Air Discharge	Complied	-
3	Port 1	Air Discharge	Complied	-
4	Port 2	Contact Discharge	Complied	-

■ PoE Mode**Indirect Discharge**

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure 1	Contact Discharge	Complied	-
2	Enclosure 2, Lens	Air Discharge	Complied	-
3	Port 1	Air Discharge	Complied	-
4	Port 2	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria

3.2 Radiated Electric Field Immunity

Reference Standard

EN IEC 61000-4-3:2020

Test Date

Oct. 20, 2023 / Oct. 21, 2023

Test Location

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	EMC32	R & S	10.10.02	-
<input checked="" type="checkbox"/>	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	07, 31, 2024
<input checked="" type="checkbox"/>	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
<input checked="" type="checkbox"/>	POWER METER	E4419B	Agilent	GB40203000	03, 21, 2024
<input checked="" type="checkbox"/>	AVERAGE POWER SENSOR	E9301A	Agilent	MY52170007	03, 21, 2024
<input checked="" type="checkbox"/>	AVERAGE POWER SENSOR	E9301A	Agilent	MY41498669	03, 21, 2024
<input checked="" type="checkbox"/>	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
<input checked="" type="checkbox"/>	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 06, 2024

Test Conditions

Test Date:	Oct. 20, 2023	Oct. 21, 2023
Temperature:	(22,8 ± 0,1) °C	(22,5 ± 0,1) °C
Relative Humidity:	(45,0 ± 0,2) % R.H.	(46,9 ± 0,3) % R.H.
Atmospheric Pressure:	(100,1 ± 0,0) kPa	(100,5 ± 0,0) kPa

Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

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

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

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

Frequency step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

Test Data

■ DC Mode

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

■ PoE Mode

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

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria

3.3 Electrical Fast Transients/Bursts

Reference Standard

EN 61000-4-4:2012

Test Date

Oct. 22, 2023

Test Location

EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 28, 2023
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 29, 2023
<input checked="" type="checkbox"/>	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 28, 2023

Test Conditions

Temperature: (22,7 ± 0,1) °C
 Relative Humidity: (47,2 ± 0,2) % R.H.
 Atmospheric Pressure: (99,9 ± 0,0) kPa

Test Specifications

Pulse Amplitude & Polarity:
 (AC Power Lines) ☐ ± 1.0 kV ☒ ± 2.0 kV
☐ ± 4.0 kV

Pulse Amplitude & Polarity:
 (Other supply / Signal Lines) ☐ ± 0.5 kV ☒ ± 1.0 kV
☐ ± 2.0 kV

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☐ 5 klz ☒ 100 klz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ Complied

Test Data

■ DC Mode

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45	Complied	Complied
RS-485 (2 Pin)	Complied	Complied
Alarm Out (2 Pin)	Complied	Complied
Alarm In (2 Pin)	Complied	Complied

☒ PoE Mode

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45	Complied	Complied
RS-485 (2 Pin)	Complied	Complied
Alarm Out (2 Pin)	Complied	Complied
Alarm In (2 Pin)	Complied	Complied

Note: “Blank” = Not performed

Observations:

Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.4 Surge Transients

Reference Standard

EN 61000-4-5:2014/A1:2017

Test Date

Oct. 21, 2023

Test Location

EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 28, 2023
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 29, 2023
<input checked="" type="checkbox"/>	CDN	CNV 508N1	EM TEST	P1610176296	11, 29, 2023

Test Conditions

Temperature: (22,6 ± 0,2) °C
Relative Humidity: (47,4 ± 0,3) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) kPa

Test Specifications**AC Power Lines**

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

Surge Amplitude :
Common Mode
☐ (0,5 / 1,0 / 2,0) kV
Differential Mode
☒ (0,5 / 1,0) kVNumber of Surges: ☒ 5 surges per angleAngle: ☒ 0°, 90°, 180°, 270° (input a.c. power port)Polarity: ☒ Positive & NegativeRepetition Rate: ☐ 1 surge per min ☒ 1 surge per 30 sec.Required Performance Criteria: ☒ Complied**Other supply / Signal Lines**

Source Impedance: 42 ohm for common Mode

Surge Amplitude:
Common Mode
☒ (0,5 / 1,0) kVNumber of Surges: ☒ 5 SurgesPolarity: ☒ Positive & NegativeRepetition Rate: ☐ 1 surge per min ☒ 1 surge per 30 sec.Required Performance Criteria: ☒ Complied

Test Data

■ DC Mode

☒ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

Signal Lines☒ Line to Earth – Common Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45	CDN	Complied	Complied
	LINE	Complied	Complied

■ PoE Mode

☐ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

Signal Lines☒ Line to Earth – Common Mode

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45 (PoE)	CDN	Complied	Complied
	LINE	Complied	Complied

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**PASS Required Performance Criteria

3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Oct. 23, 2023 / Oct. 24, 2023

Test Location

EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	icd.control	EM TEST	5.3.12	-
<input checked="" type="checkbox"/>	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 10, 2023
<input checked="" type="checkbox"/>	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 10, 2023
<input checked="" type="checkbox"/>	CDN	CDN M016	TESEQ	43694	11, 10, 2023
<input checked="" type="checkbox"/>	CDN	CDN M016	TESEQ	43697	11, 10, 2023
<input checked="" type="checkbox"/>	CDN	CDN T8RJ45	EM TEST	0909-09	07, 31, 2024
<input checked="" type="checkbox"/>	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 14, 2023

Test Conditions

Test Date:	Oct. 23, 2023	Oct. 24, 2023
Temperature:	(23,0 ± 0,1) °C	(22,7 ± 0,3) °C
Relative Humidity:	(46,5 ± 0,3) % R.H.	(46,3 ± 0,5) % R.H.
Atmospheric Pressure:	(100,0 ± 0,0) kPa	(100,1 ± 0,0) kPa

Test Specifications

Frequency range:

☒ 150 kHz to 100 MHz

☐ 150 kHz to 80 MHz

Voltage Level:

☐ 1 Vrms

☐ 3 Vrms

☒ 10 Vrms

Modulation:

☒ AM, 80 %, 1 kHz sine wave

☒ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step:

☒ 1 % step

Dwell Time:

☐ 1 s

☒ 3 s

Required Performance Criteria:

☒ Complied

Test Data**■ DC Mode**☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L – N	CDN	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied
RS-485 (2 Pin)	Clamp	Complied
Alarm Out (2 Pin)	Clamp	Complied
Alarm In (2 Pin)	Clamp	Complied

■ PoE Mode☐ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	-	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied
RS-485 (2 Pin)	Clamp	Complied
Alarm Out (2 Pin)	Clamp	Complied
Alarm In (2 Pin)	Clamp	Complied

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

Observations:

Complied – No degradation of function

Test Results☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria**Remarks**

- PASS Required Performance Criteria

- Tested by decoupling the laptop RJ-45 cable

3.6 Voltage Dips and Short Interruptions

Reference Standard

EN IEC 61000-4-11:2020

Test Date

Oct. 21, 2023

Test Location

EMS-Voltage dip: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.8	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 29, 2023
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 29, 2023

Test Conditions

Temperature: (22,9 ± 0,1) °C
Relative Humidity: (46,8 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) kPa

Test Specifications & Observations/Remarks

■ DC Mode

- Voltage Dips and Short Interruptions

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

- Voltage variations

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

Observations:

Complied – No degradation of function

Degradation - See "Remarks "

Test Results

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

Remarks

During the test, EUT was turned off but after the test, it was recovered without operator's intervention.

APPENDIX A – TEST DATA

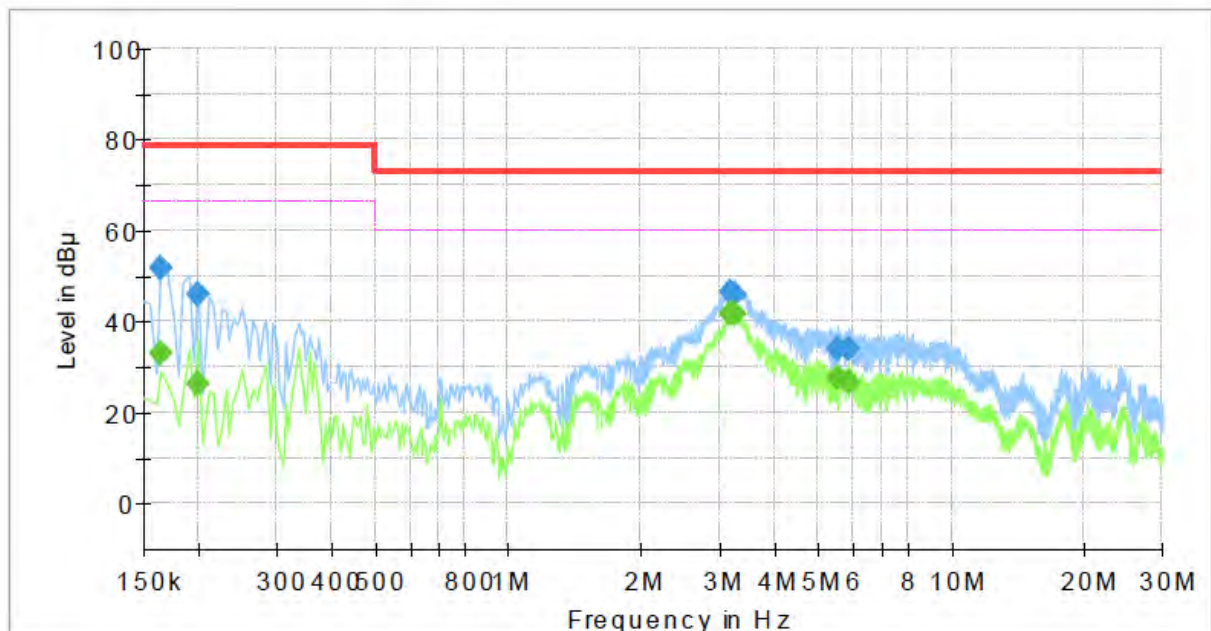
Conducted Emissions at Mains Power Ports

■ DC Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-C3020TRA
Phase:	L1
Mode:	DC
Operator Name:	KES



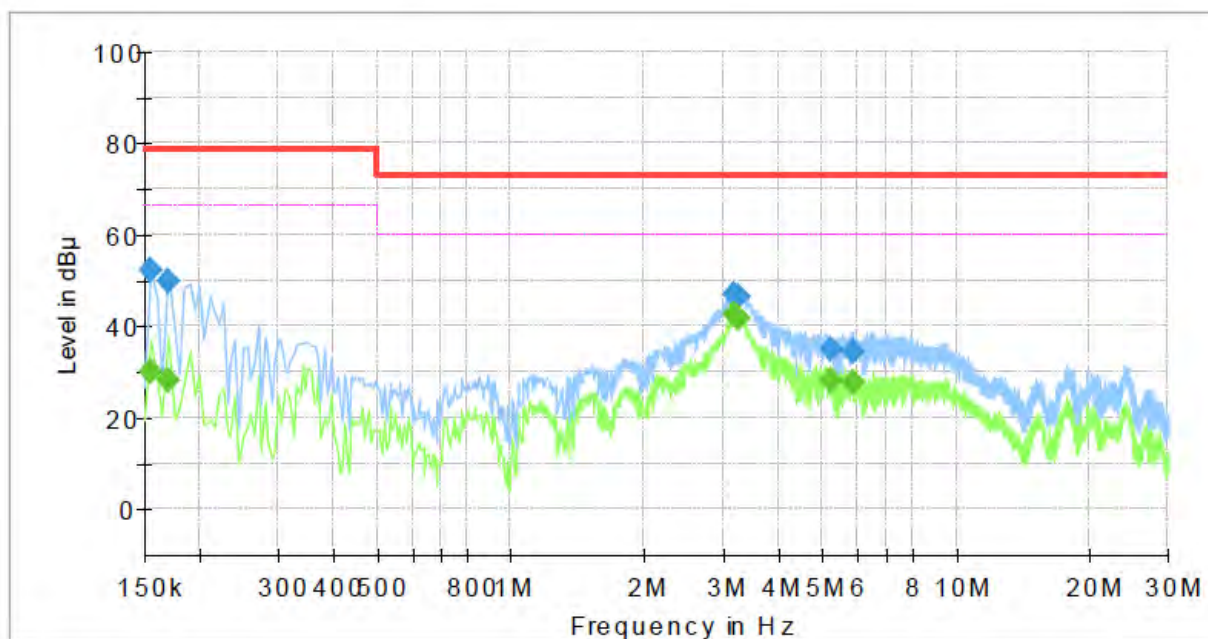
Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.165000	---	32.97	66.00	33.03	1000.0	9.000	L1	19.4
0.165000	51.76	---	79.00	27.24	1000.0	9.000	L1	19.4
0.200000	---	26.04	66.00	39.96	1000.0	9.000	L1	19.4
0.200000	46.09	---	79.00	32.91	1000.0	9.000	L1	19.4
3.195000	---	41.67	60.00	18.33	1000.0	9.000	L1	19.6
3.195000	46.30	---	73.00	26.70	1000.0	9.000	L1	19.6
3.250000	---	41.45	60.00	18.55	1000.0	9.000	L1	19.6
3.250000	46.09	---	73.00	26.91	1000.0	9.000	L1	19.6
5.580000	---	27.40	60.00	32.60	1000.0	9.000	L1	19.8
5.580000	33.92	---	73.00	39.08	1000.0	9.000	L1	19.8
5.860000	---	26.90	60.00	33.10	1000.0	9.000	L1	19.8
5.860000	33.89	---	73.00	39.11	1000.0	9.000	L1	19.8

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-C3020TRA
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)
0.155000	---	30.20	66.00	35.80	1000.0	9.000	N	19.4
0.155000	52.15	---	79.00	26.85	1000.0	9.000	N	19.4
0.170000	---	28.30	66.00	37.70	1000.0	9.000	N	19.4
0.170000	49.80	---	79.00	29.20	1000.0	9.000	N	19.4
3.165000	---	42.35	60.00	17.65	1000.0	9.000	N	19.6
3.165000	46.76	---	73.00	26.24	1000.0	9.000	N	19.6
3.255000	---	41.53	60.00	18.47	1000.0	9.000	N	19.6
3.255000	46.22	---	73.00	26.78	1000.0	9.000	N	19.6
5.220000	---	28.22	60.00	31.78	1000.0	9.000	N	19.8
5.220000	34.63	---	73.00	38.37	1000.0	9.000	N	19.8
5.870000	---	27.74	60.00	32.26	1000.0	9.000	N	19.8
5.870000	34.46	---	73.00	38.54	1000.0	9.000	N	19.8

◆ 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))

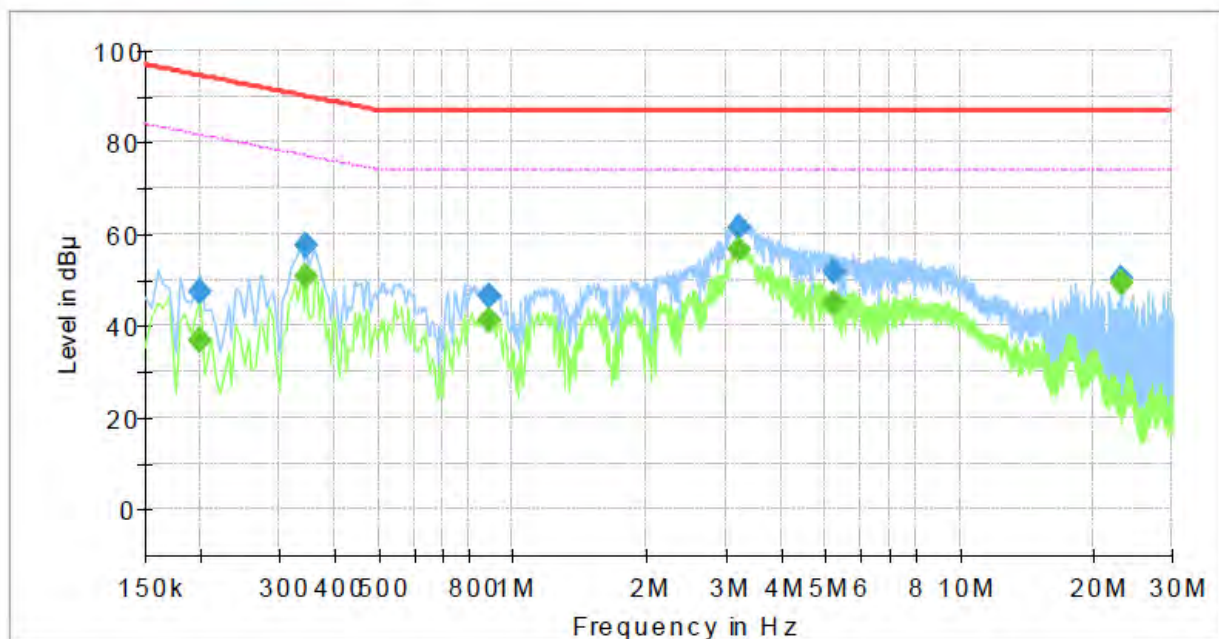
Conducted Emissions at Telecommunication Ports

■ DC Mode

[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-C3020TRA
Mode :	DC
Speed :	1 000 Mbps
Operator Name:	KES

**Final Result**

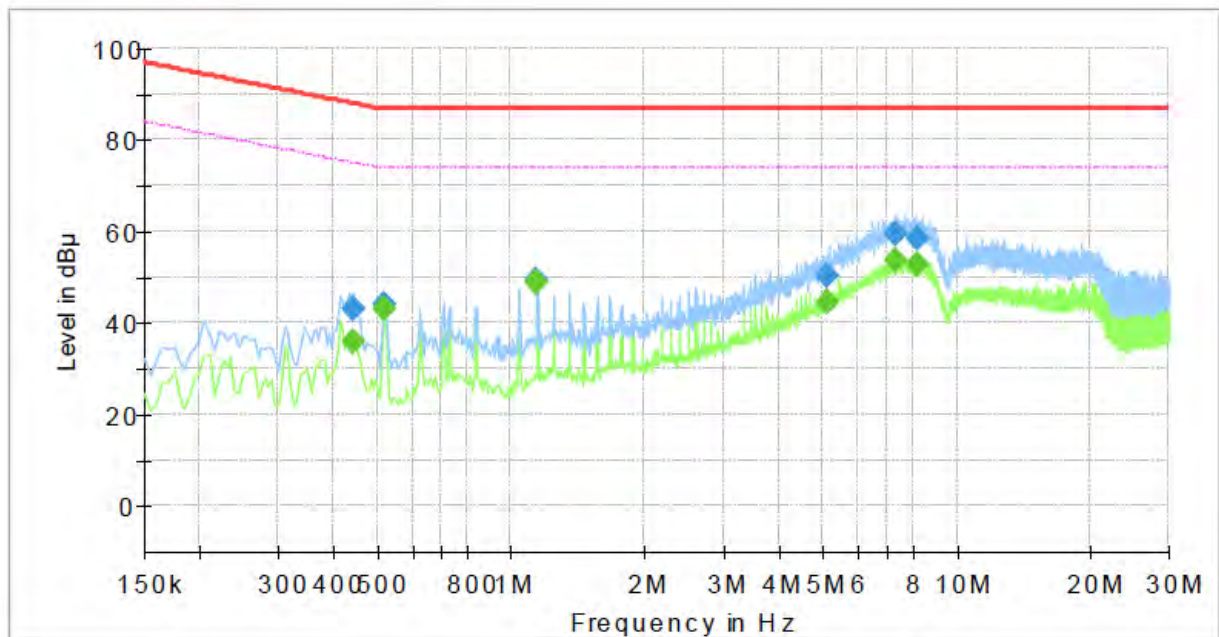
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.200000	---	36.91	81.61	44.70	1000.0	9.000	Single Line	19.6
0.200000	47.35	---	94.61	47.26	1000.0	9.000	Single Line	19.6
0.345000	---	50.55	77.08	26.53	1000.0	9.000	Single Line	19.5
0.345000	57.37	---	90.08	32.71	1000.0	9.000	Single Line	19.5
0.890000	---	41.10	74.00	32.90	1000.0	9.000	Single Line	19.3
0.890000	46.58	---	87.00	40.42	1000.0	9.000	Single Line	19.3
3.225000	---	56.68	74.00	17.32	1000.0	9.000	Single Line	19.4
3.225000	61.54	---	87.00	25.46	1000.0	9.000	Single Line	19.4
5.275000	---	45.11	74.00	28.89	1000.0	9.000	Single Line	19.5
5.275000	51.76	---	87.00	35.24	1000.0	9.000	Single Line	19.5
23.130000	---	49.37	74.00	24.63	1000.0	9.000	Single Line	19.9
23.130000	50.31	---	87.00	36.69	1000.0	9.000	Single Line	19.9

■ PoE Mode

[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-C3020TRA
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)
0.445000	---	35.96	74.97	39.01	1000.0	9.000	Single Line	19.4
0.445000	43.22	---	87.97	44.75	1000.0	9.000	Single Line	19.4
0.520000	---	43.02	74.00	30.98	1000.0	9.000	Single Line	19.4
0.520000	43.86	---	87.00	43.14	1000.0	9.000	Single Line	19.4
1.145000	---	48.70	74.00	25.30	1000.0	9.000	Single Line	19.3
1.145000	49.42	---	87.00	37.58	1000.0	9.000	Single Line	19.3
5.125000	---	44.64	74.00	29.36	1000.0	9.000	Single Line	19.5
5.125000	50.44	---	87.00	36.56	1000.0	9.000	Single Line	19.5
7.295000	---	53.55	74.00	20.45	1000.0	9.000	Single Line	19.6
7.295000	59.32	---	87.00	27.68	1000.0	9.000	Single Line	19.6
8.170000	---	52.61	74.00	21.39	1000.0	9.000	Single Line	19.6
8.170000	58.61	---	87.00	28.39	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))

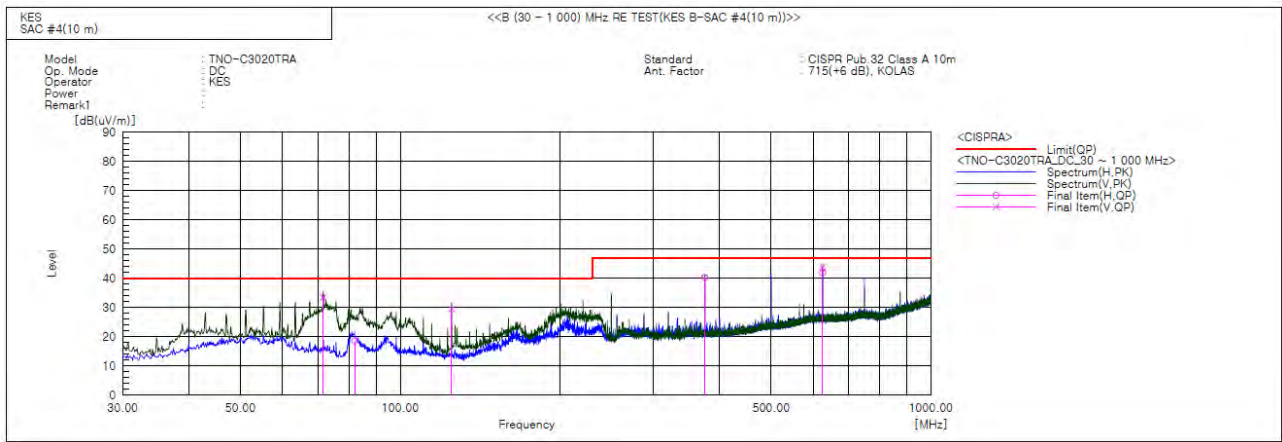
KES-QP16-F01(00-23-01-01)

KES Co., Ltd.

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

Radiated Electric Field Emissions(Below 1 GHz)

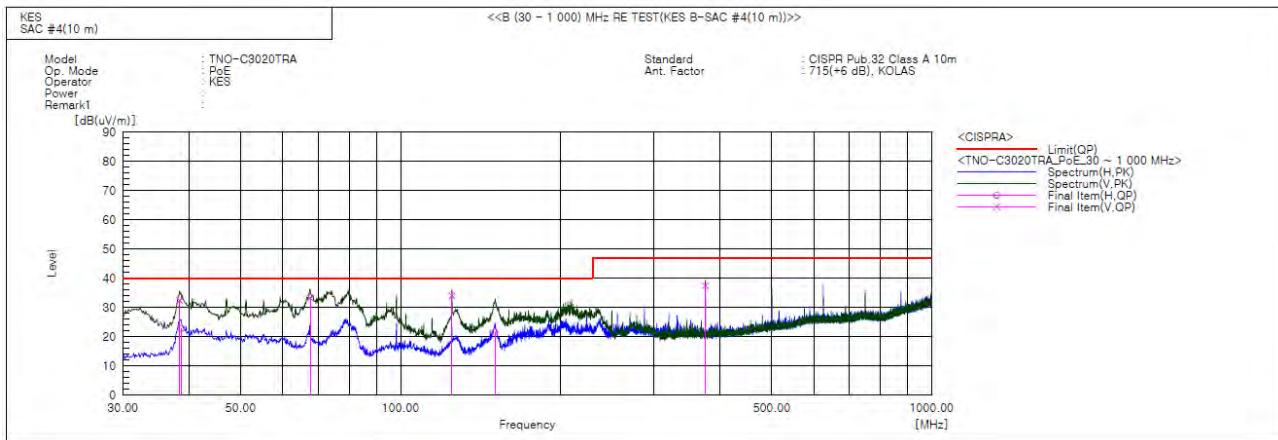
DC Mode



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	71.589	V	58.6	-25.1	33.5	40.0	6.5	124.0	95.0	
2	82.016	H	45.5	-27.0	18.5	40.0	21.5	335.0	185.0	
3	124.939	V	53.8	-24.3	29.5	40.0	10.5	142.0	353.0	
4	374.956	H	54.2	-14.0	40.2	47.0	6.8	400.0	245.0	
5	624.974	V	51.3	-7.6	43.7	47.0	3.3	100.0	325.0	
6	625.095	H	49.4	-7.6	41.8	47.0	5.2	400.0	91.0	

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	38.366	V	55.3	-22.9	32.4	40.0	7.6	134.0	86.0	
2	38.609	H	45.6	-22.8	22.8	40.0	17.2	400.0	98.0	
3	67.588	V	56.8	-23.6	33.2	40.0	6.8	100.0	120.0	
4	124.939	V	58.3	-24.3	34.0	40.0	6.0	125.0	179.0	
5	150.523	H	46.4	-24.9	21.5	40.0	18.5	400.0	184.0	
6	374.956	V	51.4	-14.0	37.4	47.0	9.6	100.0	314.0	

Calculation

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

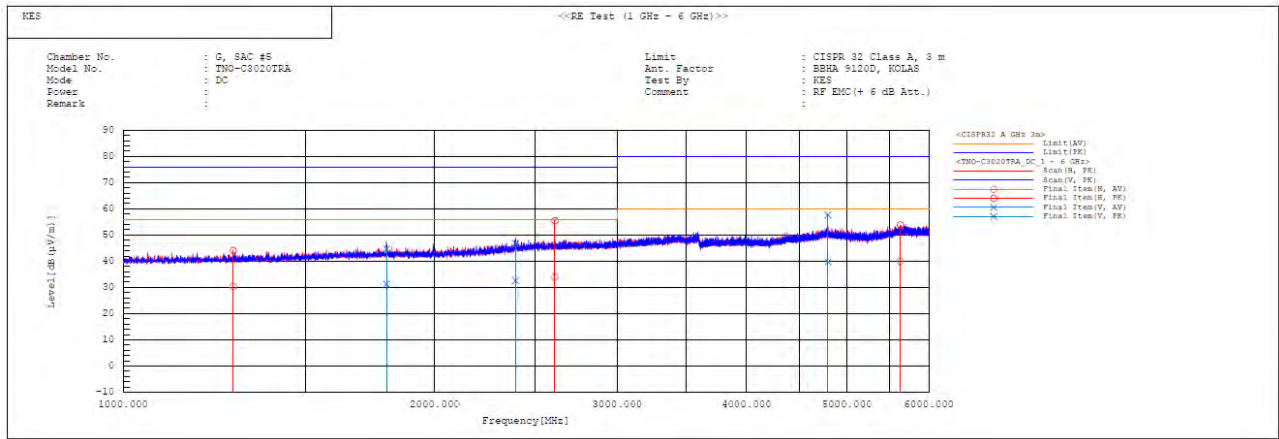
Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

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

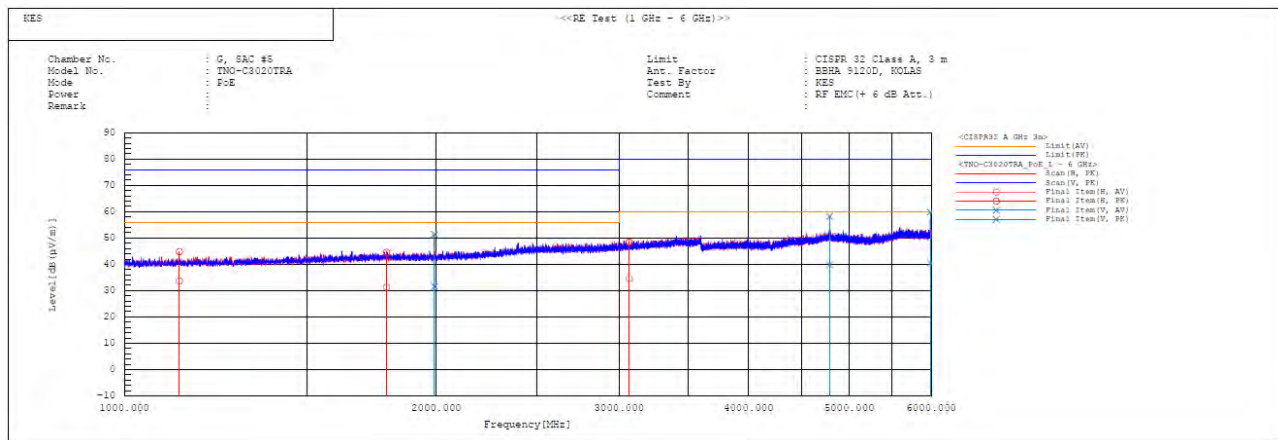
Radiated Electric Field Emissions(Above 1 GHz)

DC Mode



Final Result														
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	1277.981	H	30.8	44.4	-0.4	30.4	44.0	56.0	76.0	25.6	32.0	100.0	150.4	
2	1796.306	V	29.3	42.8	1.9	31.2	44.7	56.0	76.0	24.8	31.3	100.0	151.8	
3	2392.936	V	29.3	42.4	4.3	32.6	46.7	56.0	76.0	23.4	29.3	100.0	262.9	
4	2612.770	H	29.9	50.3	5.1	34.0	55.4	56.0	76.0	22.0	20.6	100.0	276.2	
5	4793.917	V	29.3	46.2	11.4	39.7	57.6	60.0	80.0	20.3	22.4	100.0	0.7	
6	5633.236	H	26.8	40.6	13.2	40.0	53.8	60.0	80.0	20.0	26.2	100.0	83.6	

PoE Mode



Calculation

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

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

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

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

Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.035			
2	0.002	0.149	1.080	n/a
3	0.028	1.204	2.300	PASS
4	0.002	0.431	0.430	n/a
5	0.028	2.479	1.140	PASS
6	0.001	0.490	0.300	n/a
7	0.028	3.664	0.770	PASS
8	0.001	0.622	0.230	n/a
9	0.027	6.628	0.400	PASS
10	0.001	0.807	0.184	n/a
11	0.025	7.696	0.330	PASS
12	0.001	0.929	0.153	n/a
13	0.024	11.571	0.210	PASS
14	0.002	1.156	0.131	n/a
15	0.023	15.272	0.150	PASS
16	0.001	1.162	0.115	n/a
17	0.022	16.315	0.132	PASS
18	0.001	1.290	0.102	n/a
19	0.020	16.968	0.118	PASS
20	0.001	1.396	0.092	n/a
21	0.019	11.555	0.161	PASS
22	0.001	1.480	0.084	n/a
23	0.017	11.543	0.147	PASS
24	0.001	1.654	0.077	n/a
25	0.015	11.401	0.135	PASS
26	0.001	1.628	0.071	n/a
27	0.014	11.106	0.125	PASS
28	0.001	1.859	0.066	n/a
29	0.012	10.426	0.116	PASS
30	0.001	1.760	0.061	n/a
31	0.011	9.896	0.109	PASS
32	0.001	1.850	0.058	n/a
33	0.009	8.995	0.102	PASS
34	0.001	1.942	0.054	n/a
35	0.008	8.040	0.096	PASS
36	0.001	1.968	0.051	n/a
37	0.007	7.304	0.091	PASS
38	0.001	2.198	0.048	n/a
39	0.005	6.041	0.087	PASS
40	0.001	2.103	0.046	n/a

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

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.

Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.038			
2	0.002	0.139	1.620	n/a
3	0.031	0.913	3.450	PASS
4	0.002	0.362	0.645	n/a
5	0.032	1.863	1.710	PASS
6	0.002	0.373	0.450	n/a
7	0.032	2.748	1.155	PASS
8	0.002	0.466	0.345	n/a
9	0.030	4.962	0.600	PASS
10	0.002	0.623	0.276	n/a
11	0.028	5.736	0.495	PASS
12	0.002	0.710	0.230	n/a
13	0.027	8.517	0.315	PASS
14	0.002	0.891	0.197	n/a
15	0.025	11.184	0.225	PASS
16	0.002	0.883	0.173	n/a
17	0.024	11.900	0.199	PASS
18	0.002	1.004	0.153	n/a
19	0.022	12.296	0.178	PASS
20	0.001	1.076	0.138	n/a
21	0.020	12.401	0.161	PASS
22	0.001	1.173	0.125	n/a
23	0.018	12.247	0.147	PASS
24	0.002	1.339	0.115	n/a
25	0.016	12.005	0.135	PASS
26	0.001	1.331	0.106	n/a
27	0.014	11.571	0.125	PASS
28	0.001	1.521	0.099	n/a
29	0.012	10.695	0.116	PASS
30	0.001	1.384	0.092	n/a
31	0.011	10.056	0.109	PASS
32	0.001	1.459	0.086	n/a
33	0.009	9.126	0.102	PASS
34	0.001	1.515	0.081	n/a
35	0.008	8.131	0.096	PASS
36	0.001	1.532	0.077	n/a
37	0.007	7.427	0.091	PASS
38	0.001	1.674	0.073	n/a
39	0.005	6.301	0.087	PASS
40	0.001	1.553	0.069	n/a

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

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.

Test Data - Voltage Fluctuations

■ DC Mode

Maximum Flicker results

Flicker Measurements					
	Plt	Max Pst	Max Dc	Max Dmax	Max Tmax
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ DC Mode

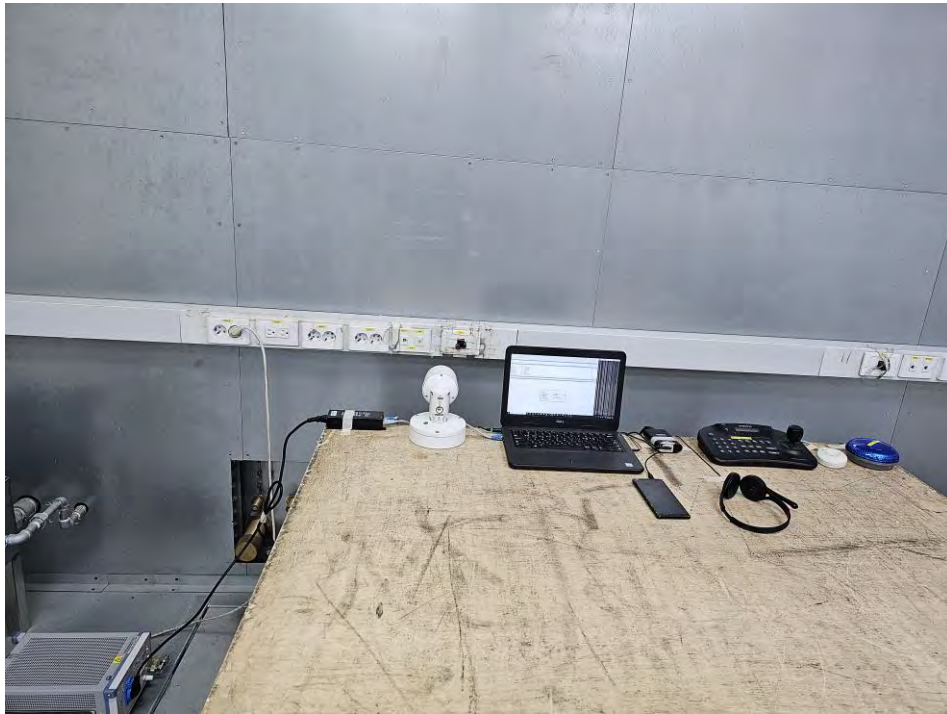


Conducted Emissions at Telecommunication Ports

■ DC Mode



■ PoE Mode

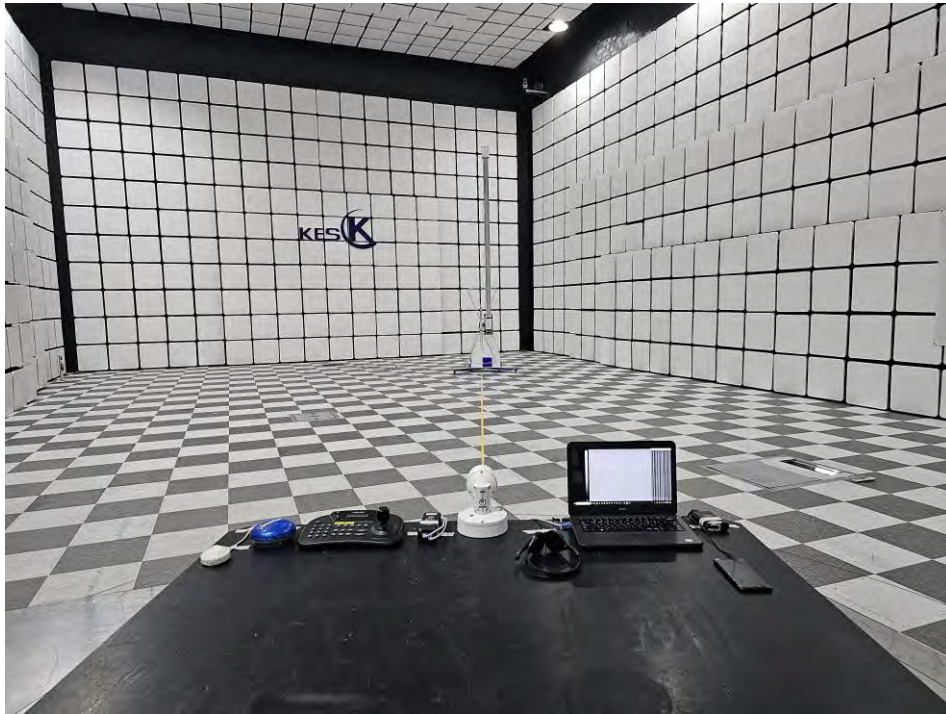


Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



■ PoE Mode

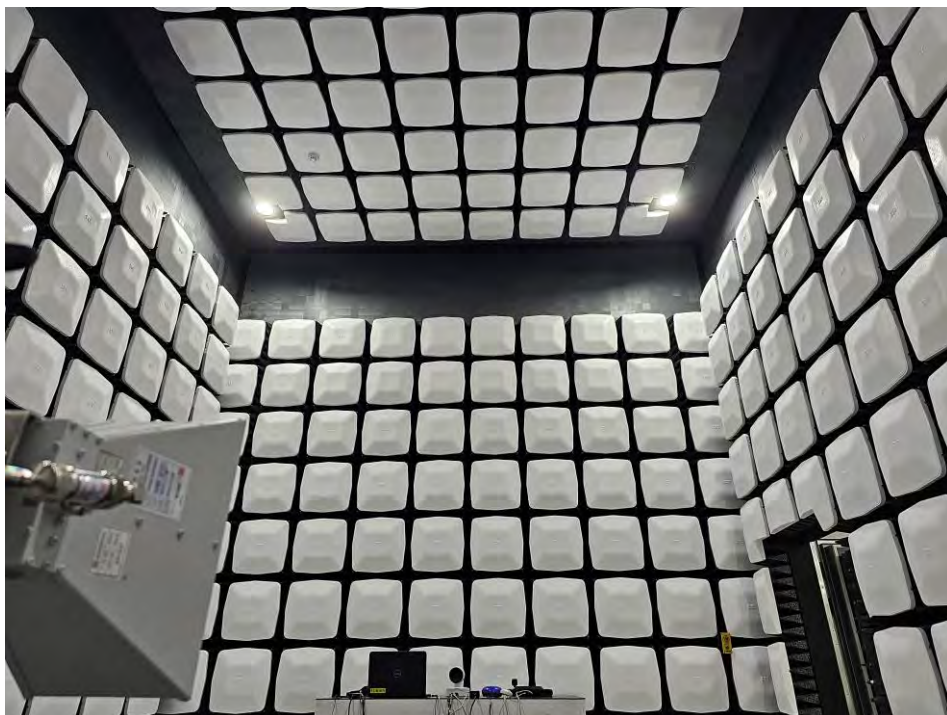


Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode



■ PoE Mode



Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode



Electrostatic Discharge

■ DC Mode



■ PoE Mode



Radiated Electric Field Immunity

■ DC Mode



Electrical Fast Transients/Bursts

■ DC Mode



■ PoE Mode



Surge Transients

■ DC Mode



■ PoE Mode



Conducted Disturbance

■ DC Mode



■ PoE Mode



Voltage Dips and Short Interruptions

■ DC Mode



EUT External Photographs

(Top)



(Bottom)



EUT Internal Photographs

(Internal View)



EUT Internal View – IR Board

(Top)

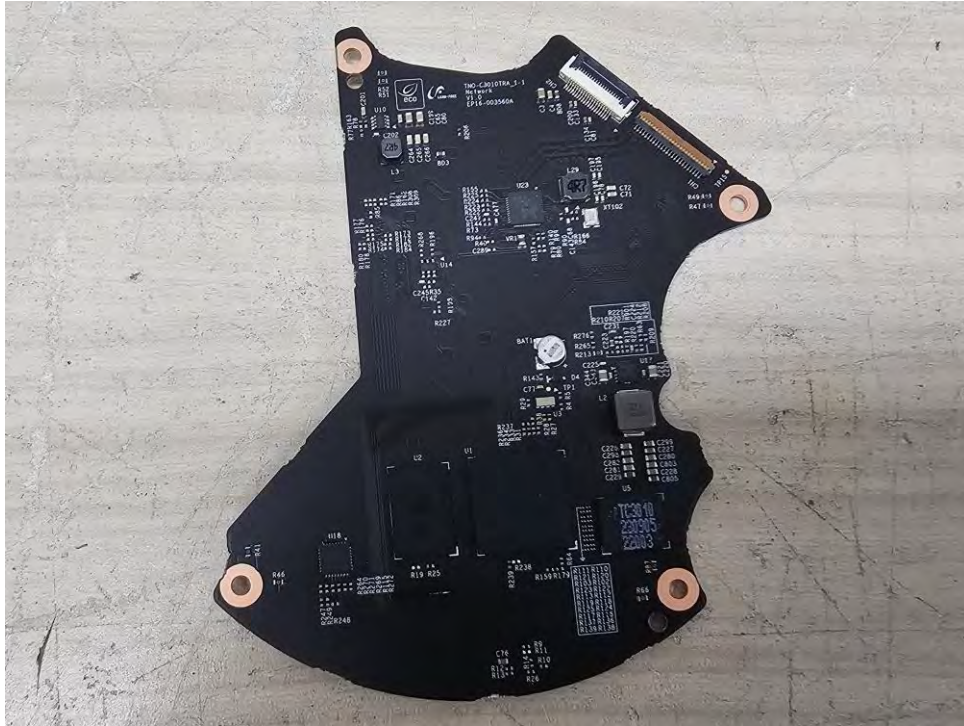


(Bottom)

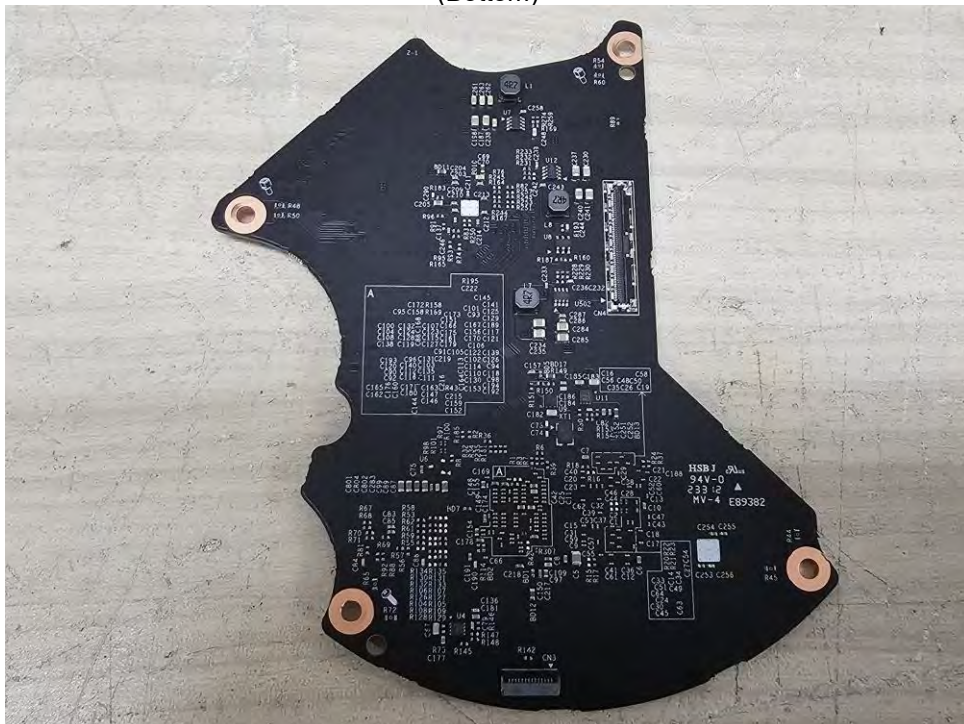


EUT Internal View – Network Board

(Top)

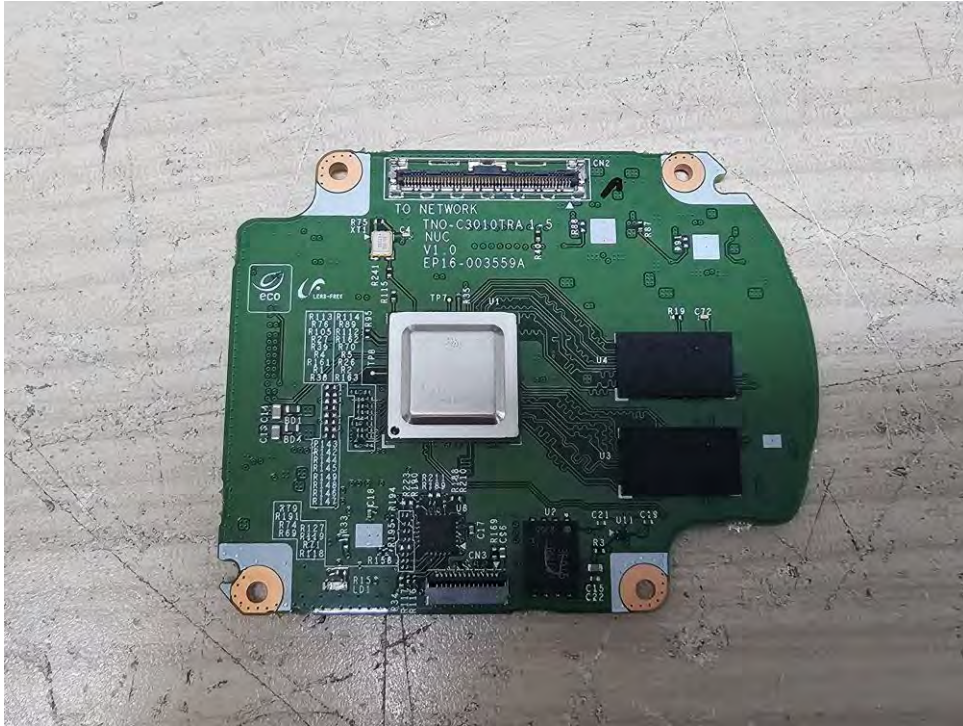


(Bottom)

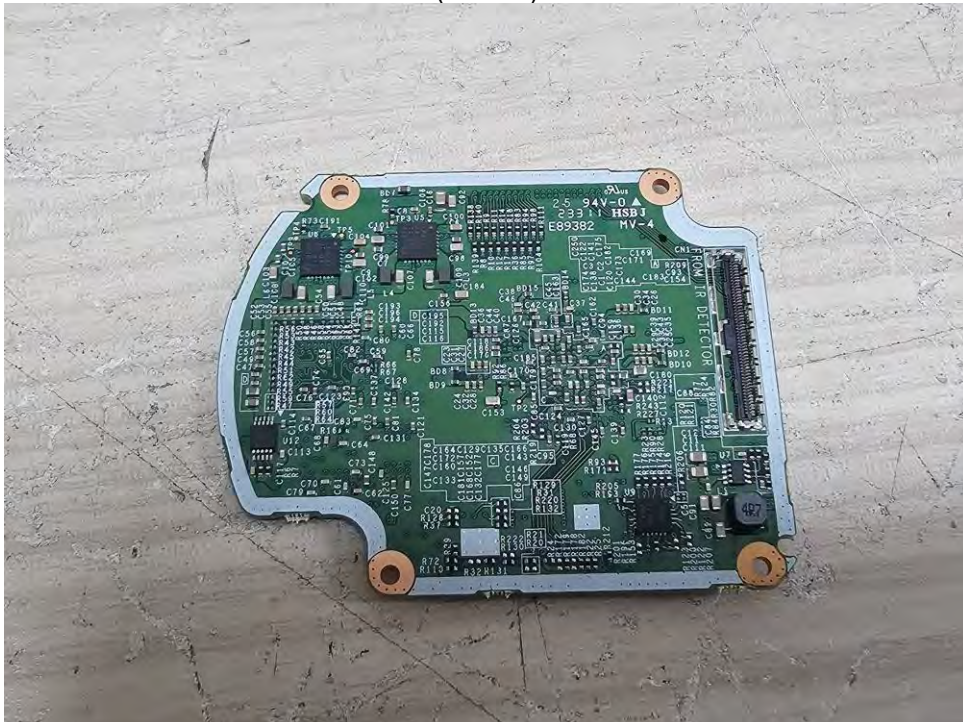


EUT Internal View – NUC Board

(Top)



(Bottom)



EUT Internal View – Power Board

(Top)



(Bottom)



EUT Internal View – Lens

(Top)



(Bottom)



Label and Location



<p><u>NETWORK THERMAL CAMERA</u></p> <p>Model No : TNO-C3020TRA</p> <p>Manufacturer : HANWHA VISION VIETNAM COMPANY LIMITED</p> <p>Made in Vietnam</p>	<p>UK CA</p> <p>CE</p>
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