TEST REPORT

KES Co., Ltd.
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Tel : +82-31-425-6200, Fax : +82-31-341-3838

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. : TNM-C2822TDR

Variant Model : TNM-C2812TDR, TNM-C2712TDR, TNM-C2722TDR

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 Ward, Bac Ninh City, Bac Ninh Province, Vietnam
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea (Suwon Industrial Complex)

3. Date of Receipt : Mar. 25, 2025

4. Test date : Dec. 05, 2024 ~ Dec. 06, 2024

5. Date of Issue : Mar. 25, 2025

6. Test Results : In Compliance

Tested by

[이동윤]2025/03/25

Dong Yun, Lee
EMC Test Engineer
Tested by Jae Won, Lee
(Retired person)
Proxy signature : Dong Yun, Lee

Reviewed by

[최대중]2025/03/25

Dae Jung, 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
Dec. 18, 2024	KES-EM244284	Issued
Mar. 25, 2025	KES-EM244284-R1	Reissuance due to the addition of a derivative

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1.0 General Product Description

Main Specifications of EUT are:

Internal highest operating frequency : 1 008 MHz

Spec Display Name	Thermal	Visible
Video		
Imaging Device	Uncooled micro bolometer	1/2.8" CMOS (5MP)
Resolution	640x480, 320x240 (Original sensor resolution: 160x120)	2592x1944, 2560x1440, 1920x1080, 1280x960, 1280x720, 800x600, 800x448, 720x576, 720x480, 640x480, 640x360, 320x240
Max. Framerate	H.265/H.264: Max. 8fps	H.265/H.264: Max. 30fps/25fps
NETD	< 50mK	None
Pixel Size	12μm	None
Lens		
Focal Length (Zoom Ratio)	1.77mm fixed focal	4.46mm fixed focal
Max. Aperture Ratio	F1.1	F1.65
Angular Field of View	H: 57° / V: 44° / D: 71°	H: 69° / V: 50.9° / D: 88.8°
Focus Control	Fixed	Fixed
Pan / Tilt / Rotate		
Pan / Tilt / Rotate Range	0°~360° / 0°~70° / 0°~360°	
Operational		
Camera Title	Displayed up to 85 characters	
Direction Indicator	None	None
Day & Night	None	Auto
Backlight Compensation	None	BLC, WDR, SSDR
Wide Dynamic Range	None	WDR
Digital Noise Reduction	None	SSNR V
Digital Image Stabilization	None	Support
Defog	None	None
Motion Detection	8ea, polygonal zones	
Privacy Masking	6ea, rectangle zones	
Gain Control	None	Low / Middle / High
White Balance	None	ATW / AWC / Manual / Indoor / Outdoor
LDC	None	Support
Electronic Shutter Speed	None	Minimum / Maximum / Anti flicker(1/5~1/20,000sec)
Digital PTZ	None	None
Video Rotation	Flip, Mirror	
Analytics	Temperature detection, Temperature difference detection Analytics events - Motion detection, Tampering	Analytics events based on AI engine - Early fire detection Analytics events - Defocus detection, Tampering, Audio detection, Motion detection
Business Intelligence	None	None
Serial Interface	None	None
Alarm I/O	Input 1ea / Output 1ea	
Alarm Triggers	Analytics, Network disconnect, Alarm input, 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, Send message by HTTP/HTTPS/TCP) - Audio clip playback - MQTT: publication	
Audio In	Selectable(mic in/line in)	
Audio Out	Line out	
Light Type	White light	
Color Palettes	Whitehot, Sepia, Red, Custom	None
Radiometry		
Temperature detect range	Narrow: -10°C~140°C Wide: -10°C~450°C	None
Temperature accuracy	Narrow: Greater of ±5°C or 5% Wide: Greater of ±10°C or 10%	None

Temperature detection	2 Rectangle ROI zones	None
Additional	Spot temperature reading	None
Network		
Ethernet	Metal shielded RJ45 (10/100BASE-T)	
Video Compression	H.265/H.264: Main/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	WiseStreamⅡ	Manual(5ea area), WiseStreamⅡ
Video Quality Adjustment	H.264/H.265: Target bitrate level control MJPEG: Target bitrate level control	
Bitrate Control	H.264/H.265: CBR or VBR MJPEG: VBR	
Streaming	Unicast(6 users) / Multicast	
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	
Application Programming Interface	ONVIF Profile S/T SUNAPI(HTTP API)	
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 CA3)	
Secure Storage	Sdcard pratition encrypt	
Security Certificate	None	
General		
Webpage Language	English, French, German, Spanish, Italian, Simplified Chinese, Traditional Chinese, Korean, Russian, Japanese, Portuguese, Czech, Polish, Turkish, Dutch, Hungarian, Greek	
Web Viewer	None	
Edge Storage	Micro SD/SDHC/SDXC 1slots 512GB	
Memory	2GB RAM, 512MB Flash	
Environmental & Electrical		
Operating Temperature / Humidity	-30°C~+55°C(-22°F~+131°F) / 0~95% RH(non-condensing) * Start up should be done at above -10°C	
Storage Temperature / Humidity	-40°C~+60°C(-40°F to +140°F) / Less than 95% RH	
Certification	IP67	
Input Voltage	PoE(IEEE802.3af, Class3)	
Power Consumption	PoE: Max 10.8W, typical 6.2W	
Mechanical		
Color / Material	White / Aluminum	
RAL Code	RAL9003	
Product Dimensions / Weigl	Ø110x97mm, 650g	
Compatible Conduit hole / (	Conduit hole : None	
Hanging Mount (Dome)	SBP-120HMW	
Backbox	SBV-140BW	
Certifications & Standards		
Network	None	
EMC	FCC 47 CFR 15 Subpart B Class A ICES-3(A)/NMB-3(A) CE/UKCA - EN 55032 Class A, EN 50130-4, EN 61000-3-2, EN 61000-3-3 VCCI CISPR 32 Class A RCM AS/NZS CISPR 32 Class A	
Safety	UL 62368-1, CAN/CSA C22.2 NO. 62368-1 IEC/EN 62471	
Environment	IEC/EN 63000 IEC/EN 60529 IP67	
Video	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.

☒ PoE

1.2 Variant Model Differences

Addition of derivatives due to the difference in fixed lens and the rest of the same.
(Same as the base model, no changes in circuitry, appearance, or hardware.)

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK THERMAL CAMERA	TNM-C2822TDR	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Laptop	P95G001	9JM8HT2	DELL INC.	-
Laptop Adapter	HA65NM130	-	Chicony Power Technology (Suzhou)Co.,Ltd.	-
PoE Injector	PT-PSE109GBRO-AH	-	Dongguan PROCET Network Technology Co.,Ltd	-
Headset	K550	-	Britz®	-
Smartphone	-	-	SAMSUNG	-
Micro SD Card	-	-	SanDisk	16 GB
Alarm	-	-	-	-
Button Alarm	-	-	-	-

1.6 External I/O Cabling

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)	3.5	U
	Audio IN	Headset	Audio OUT	1.5	U
	Audio OUT		Audio IN	1.5	U
	Micro SD Card Slot	Micro SD Card	Micro SD Card Slot	-	-
	Alarm OUT	Alarm	Alarm IN	3.5	U
	Alarm IN	Button Alarm	Alarm OUT	3.5	U
PoE Injector	RJ-45(LAN)	Laptop	RJ-45(LAN)	2.0	U
Laptop	DC Jack	Laptop Adapter	DC Jack	1.6	U
Laptop	3.5 mm	Smartphone	3.5 mm	1.0	U

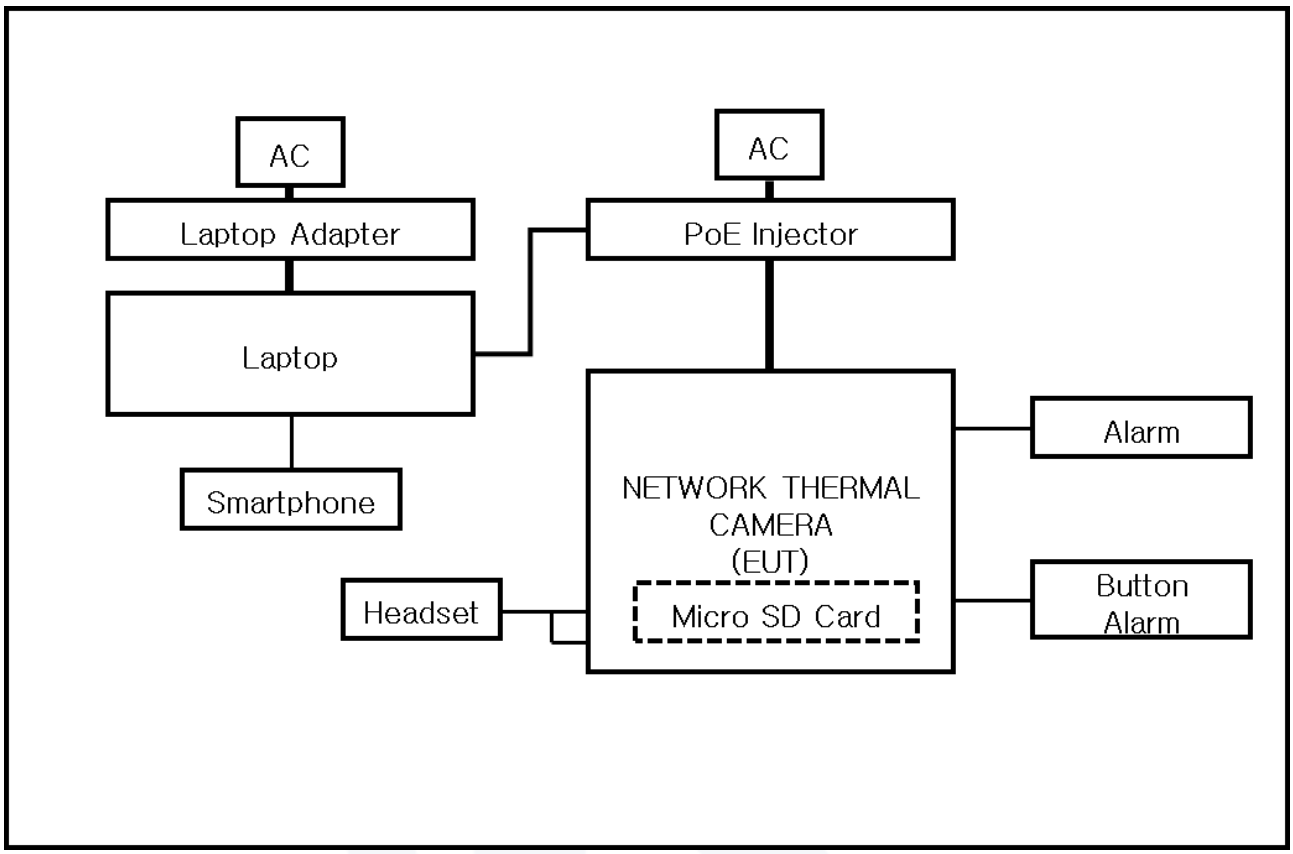
* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

Test mode	Normal operating
Operating	1. Connect to the web viewer and test while checking the video output of the test equipment. 2. Run the Ping Test to check whether the network of the test equipment is operating normally. 3. Confirm normal output from the headset by outputting 1 kHz Tone. 4. Activate the microphone in the web viewer to check if the microphone is in normal condition. 5. Check whether the recording file is saved on the Micro SD Card before/after the test. 6. Press the alarm button to confirm normal operation of the alarm.

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

1.8 Configuration



1.9 Remarks when standards applied

It receives PoE power, and the PoE port is considered a wired network port.
Test items related to the power port are not applicable.

1.10 Calibration Details of Equipment Used for Measurement

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

1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, 12658, Korea, 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 0008

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

☒ **EMC – Regulations 2016**

☒ EN 55032:2015/A11:2020 ☒ Class A ☐ Class B

☒ EN 50130-4:2011/A1:2014

2.1 Conducted Emissions at Mains Power Ports

Test Date
N/A

Test Location
Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMI Test S/W	EMC32	R & S	9.12.00	-
☐	EMI TEST RECEIVER	ESR3	R & S	101783	11, 06, 2025
☐	LISN	ENV216	R & S	101787	01, 10, 2025
☐	LISN	ESH2-Z5	R & S	100450	11, 06, 2025
☐	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 06, 2025

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

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☐ PASS
☐ NOT PASS
☒ NOT APPLICABLE

Remarks
Refer to ‘Remarks when standards applied'.

2.2 Conducted Emissions at Telecommunication Ports

Test Date
Dec. 05, 2024

Test Location
Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	11, 06, 2025
☒	LISN	ENV216	R & S	101787	01, 10, 2025
☒	LISN	ESH2-Z5	R & S	100450	11, 06, 2025
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 06, 2025
☒	8-WIRE ISN CAT3,5	ENY81	R & S	100174	11, 12, 2025
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101666	03, 06, 2025

Test Conditions
Temperature: (22,3 ± 0,1) ℃
Relative Humidity: (45,9 ± 0,1) % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.3 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Dec. 05, 2024

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	02, 13, 2025
☒	AMPLIFIER	SCU 01	R & S	100603	11, 06, 2025
☒	BILOG ANTENNA	VULB 9168	SCHWARZBECK	9168-461	05, 09, 2266
☒	ATTENUATOR	6806.17.A	HUBER+SUHNER	-	02, 13, 2025

Test Conditions
Temperature: (22,2 ± 0,1) ℃
Relative Humidity: (45,9 ± 0,1) % R.H.

Frequency Range of Measurement
30 ㎒ to 1 ㎓

Instrument Settings
IF Band Width: 120 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Dec. 05, 2024

Test Location
SEMI ANECHOIC CHAMBER #5

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	ES10/RE	TOYO Corporation	2022.01.000	-
☒	EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	02, 13, 2025
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	11, 04, 2025
☒	PREAMPLIFIER	8449B	HP	3008A00538	04, 30, 2025
☒	ATTENUATOR	8491B	HP	23094	02, 13, 2025

Test Conditions
Temperature: (22,6 ± 0,1) ℃
Relative Humidity: (46,3 ± 0,1) % R.H.

Frequency Range of Measurement
1 ㎓ to 6 ㎓

Instrument Settings
IF Band Width: 1 ㎒

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
N/A

Test Location
Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMI Test S/W	net.control	EM TEST	2.1.4	-
☐	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	03, 28, 2025
☐	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: ℃
Relative Humidity: % 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

Remarks
Refer to ‘Remarks when standards applied'.

2.6 Voltage Fluctuations and Flicker

Test Date
N/A

Test Location
Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMI Test S/W	net.control	EM TEST	2.1.4	-
☐	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	03, 28, 2025
☐	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

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

Test Results
The requirements are:

☐ PASS
☐ NOT PASS
☒ NOT APPLICABLE

Remarks
Refer to ‘Remarks when standards applied'.

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 $dB\mu V$.

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 $dB\mu V$, 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 $dB\mu V$, 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 $dB\mu V$.

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

Test Date
Dec. 05, 2024

Test Location
EMS-ESD: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	01, 30, 2025
☒	HCP	-	KES	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: (22,3 ± 0,1) ℃
Relative Humidity: (45,9 ± 0,1) % R.H.
Atmospheric Pressure: (100,2 ± 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

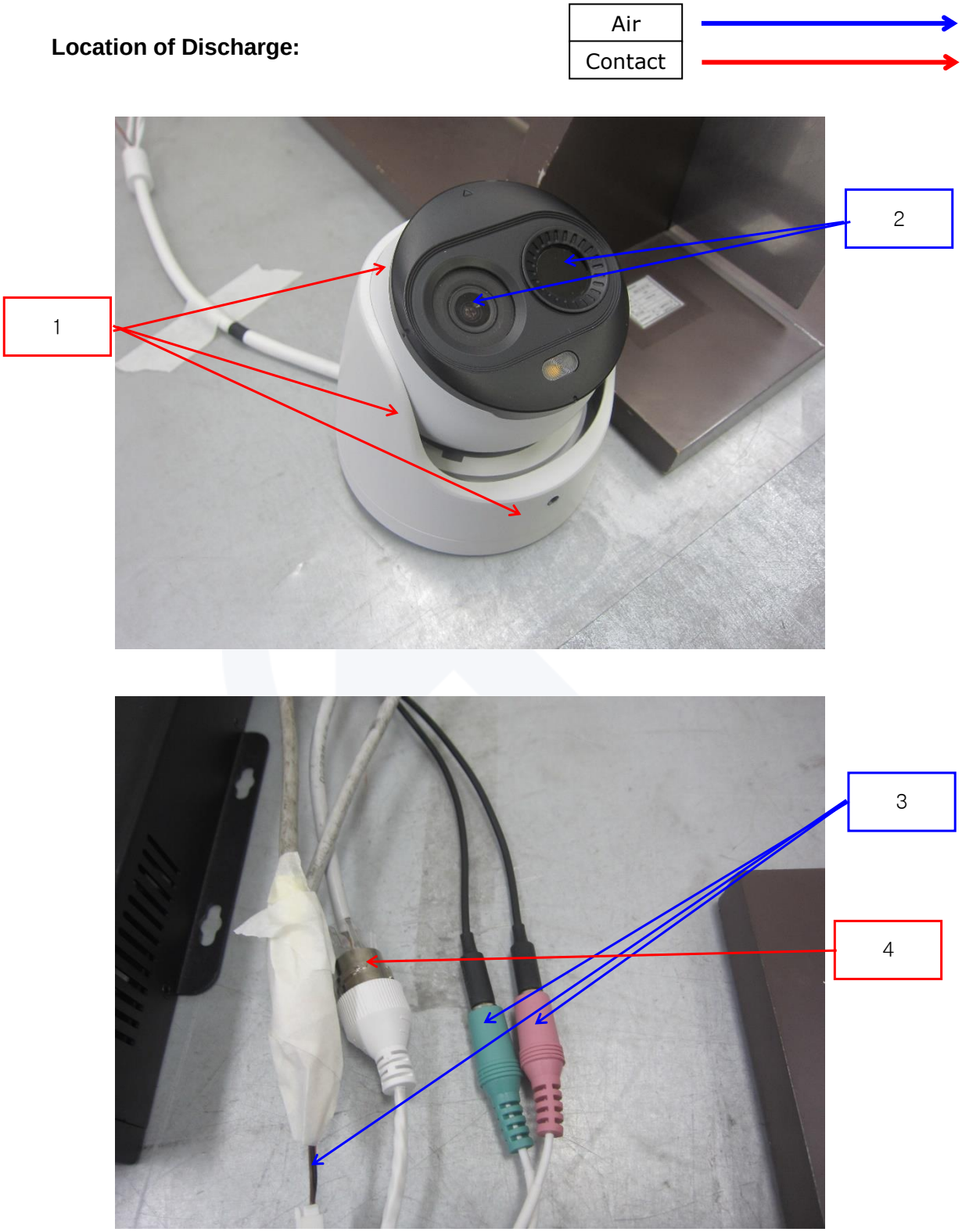
Discharge Voltage:

Contact	Air	HCP	VCP
☐ 2 kV	☒ 2 kV	☐ 2 kV	☐ 2 kV
☐ 4 kV	☒ 4 kV	☐ 4 kV	☐ 4 kV
☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

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

Required Performance Criteria: ☒ Complied

Location of Discharge:



Test Data

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	Contact Discharge	Complied	-
2	Camera Lens	Air Discharge	Complied	-
3	Around port 1	Air Discharge	Complied	-
4	Around 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

Test Date
Dec. 06, 2024

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	10.10.02	-
☒	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	07, 29, 2025
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
☒	POWER METER	E4419B	Agilent	GB40203000	02, 13, 2025
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY52170007	02, 13, 2025
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY41498669	02, 13, 2025
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 05, 2025

Test Conditions
Temperature: (22,1 ± 0,6) ℃
Relative Humidity: (46,1 ± 0,6) % R.H.
Atmospheric Pressure: (100,1 ± 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

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

Test Date
Dec. 06, 2024

Test Location
EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 06, 2025
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 07, 2025
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 06, 2025

Test Conditions

Temperature: (22,8 ± 0,1) ℃
Relative Humidity: (45,9 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) ㎪

Test Specifications

Pulse Amplitude & Polarity: (AC Power Lines)	☐ ± 1.0 ㎸	☐ ± 2.0 ㎸
	☐ ± 4.0 ㎸	
Pulse Amplitude & Polarity: (Other supply / Signal Lines)	☐ ± 0.5 ㎸	☒ ± 1.0 ㎸
	☐ ± 2.0 ㎸	
Burst Period:	☒ 300 ㎳	☐ 2 s
Repetition Rate:	☐ 5 ㎑	☒ 100 ㎑
Duration of Test Voltage:	☒ ≥ 1 min	
Required Performance Criteria:	☒ Complied	

Test Data

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
RJ-45(PoE)	Complied	Complied
Alarm IN	Complied	Complied
Alarm OUT	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

Test Date
Dec. 06, 2024

Test Location
EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 07, 2025
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 07, 2025
☒	CDN	CNV 508N1	EM TEST	P1610176296	11, 08, 2025

Test Conditions

Temperature: (22,8 ± 0,6) ℃
Relative Humidity: (45,9 ± 0,6) % 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) kV
Number of Surges:	☐ 5 surges per angle
Angle:	☐ 0°, 90°, 180°, 270° (input a.c. power port)
Polarity:	☐ Positive & Negative
Repetition Rate:	☐ 1 surge per min ☐ 1 surge per 30 sec.
Required Performance Criteria:	☐ Complied

Other supply / Signal Lines

Source Impedance:	42 ohm for common Mode
Surge Amplitude:	Common Mode ☒ (0,5 / 1,0) kV
Number of Surges:	☒ 5 Surges
Polarity:	☒ Positive & Negative
Repetition Rate:	☒ 1 surge per min ☐ 1 surge per 30 sec.
Required Performance Criteria:	☒ Complied

Test Data

☐ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

Signal Lines

☒ Line to Earth – Common Mode

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

Test Date
Dec. 06, 2024

Test Location
EMS-CS: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	7.2.0	-
☒	TEST SYSTEM FOR CONDUCTED AND RADIATED	NSG4070	TESEQ	65585	11, 18, 2025
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 06, 2025
☒	CDN	CDN M016	TESEQ	43694	11, 07, 2025
☒	CDN	CDN M016	TESEQ	43697	11, 07, 2025
☒	CDN	CDN T8RJ45	EM TEST	0909-09	07, 29, 2025
☒	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 08, 2025

Test Conditions

Temperature: (22,9 ± 0,6) ℃
Relative Humidity: (46,2 ± 0,6) % R.H.
Atmospheric Pressure: (100,0 ± 0,0) ㎪

Test Specifications

Frequency range: ☒ 150 ㎑ to 100 ㎒ ☐ 150 ㎑ to 80 ㎒

Voltage Level: ☐ 1 Vrms ☐ 3 Vrms
☒ 10 Vrms

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

Frequency step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

Required Performance Criteria: ☒ Complied

Test Data

☐ 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(PoE)	CDN	Complied
Alarm IN	Clamp	Complied
Alarm OUT	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

3.6 Voltage Dips and Short Interruptions

Reference Standard
EN IEC 61000-4-11

Test Date
N/A

Test Location
EMS-Voltage dip: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMS Test S/W	iec.control	EM TEST	5.4.8	-
☐	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 07, 2025
☐	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 07, 2025

Test Conditions

Temperature: ℃
Relative Humidity: % R.H.
Atmospheric Pressure: kPa

Test Specifications & Observations/Remarks

- Voltage Dips and Short Interruptions

Test Level	Duration [in period/ms (50 ㎐)]	Results
☐ 20 % dip	☐ 250 / 5 000	N/A
☐ 30 % dip	☐ 25 / 500	N/A
☐ 60 % dip	☐ 10 / 200	N/A
☐ 100 % dip	☐ 250 / 5 000	N/A

- Voltage variations

☐ Unom + 10 %	☐ 253.0 V (ac)	N/A
☐ Unom - 15 %	☐ 195.5 V (ac)	N/A

Observations:
Complied – No degradation of function
Degradation - See "Remarks "

Test Results

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

Remarks

Refer to ‘Remarks when standards applied'

APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

N/A

[NEUTRAL]

N/A

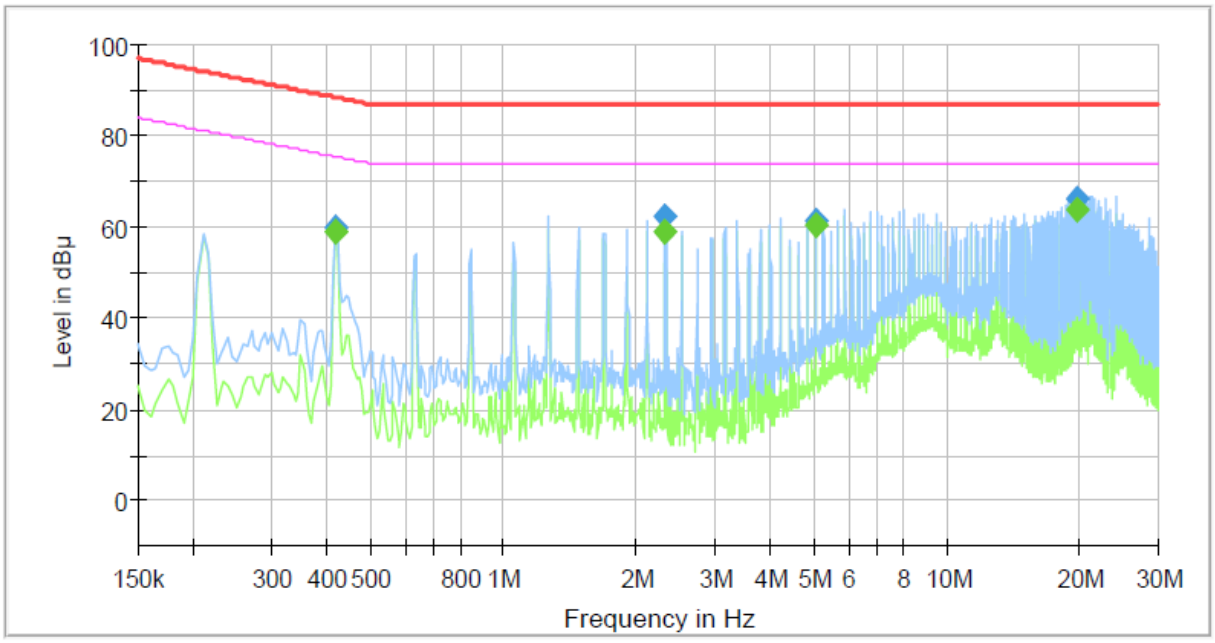
♦ Calculation
QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]
QuasiPeak / CAverage : The Final Value
Reading Value : Not shown in the table.
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

Conducted Emissions at Telecommunication Ports

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Job No.:	KES-EM244284
Mode :	TEL 100 Mbps
Speed :	
Operator Name:	KES

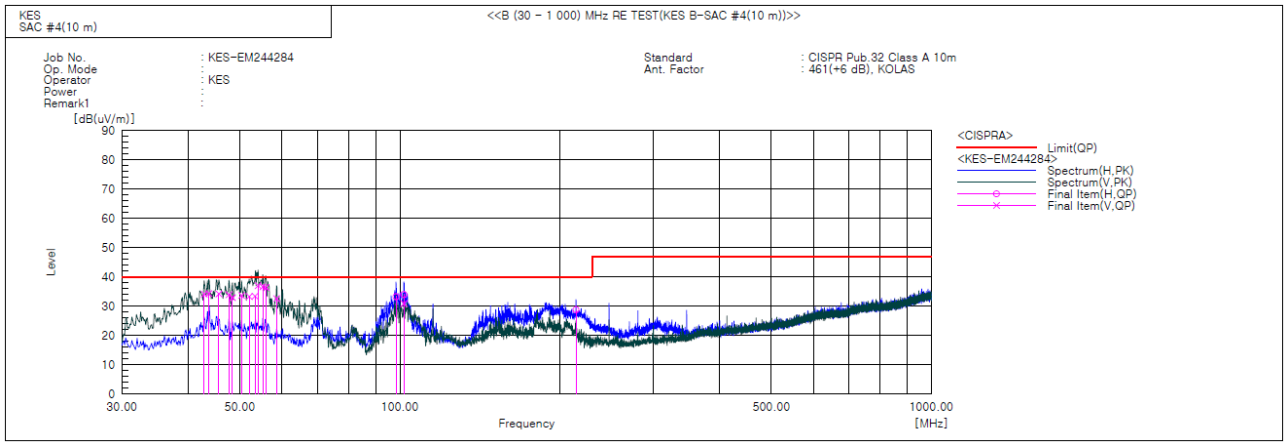


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.420000	---	59.05	75.45	16.40	1000.0	9.000	Single Line	19.6
0.420000	59.72	---	88.45	28.73	1000.0	9.000	Single Line	19.6
2.320000	---	59.18	74.00	14.82	1000.0	9.000	Single Line	19.5
2.320000	62.31	---	87.00	24.69	1000.0	9.000	Single Line	19.5
5.060000	---	60.48	74.00	13.52	1000.0	9.000	Single Line	19.6
5.060000	61.49	---	87.00	25.51	1000.0	9.000	Single Line	19.6
19.615000	---	64.01	74.00	9.99	1000.0	9.000	Single Line	19.9
19.615000	66.44	---	87.00	20.56	1000.0	9.000	Single Line	19.9

♦ 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 ㎓)

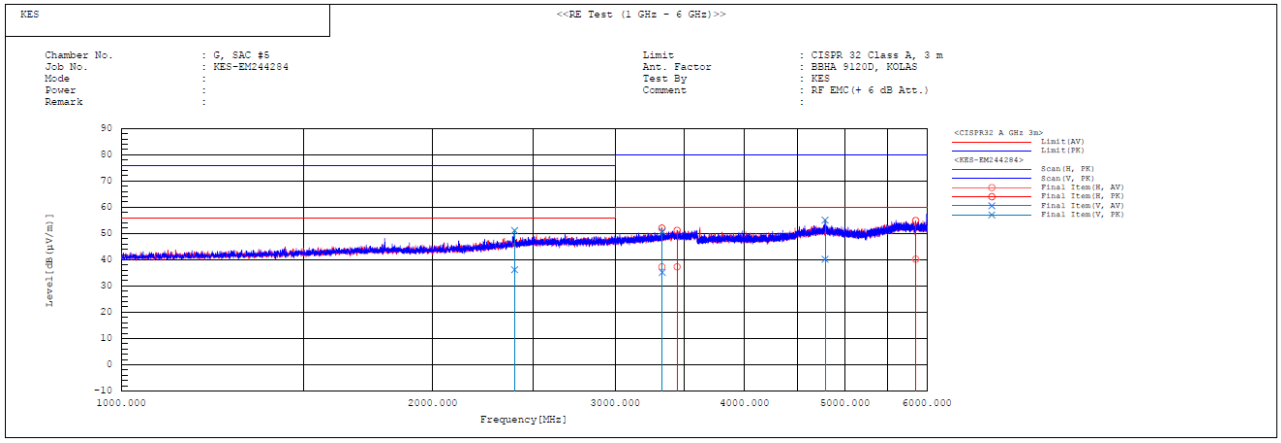


Final Result

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	42.853	V	55.8	-21.7	34.1	40.0	5.9	112.0	74.0	
2	43.701	V	55.9	-21.6	34.3	40.0	5.7	109.0	217.0	
3	45.641	V	55.6	-21.4	34.2	40.0	5.8	114.0	228.0	
4	47.703	V	55.1	-21.2	33.9	40.0	6.1	142.0	239.0	
5	48.430	V	54.0	-21.1	32.9	40.0	7.1	146.0	89.0	
6	50.370	V	54.8	-21.1	33.7	40.0	6.3	149.0	82.0	
7	52.068	V	54.3	-21.0	33.3	40.0	6.7	102.0	55.0	
8	53.401	V	54.5	-21.1	33.4	40.0	6.6	109.0	134.0	
9	54.129	V	58.1	-21.1	37.0	40.0	3.0	107.0	48.0	
10	55.220	V	57.8	-21.2	36.6	40.0	3.4	114.0	122.0	
11	55.948	V	57.6	-21.2	36.4	40.0	3.6	146.0	97.0	
12	58.615	V	54.0	-21.4	32.6	40.0	7.4	112.0	115.0	
13	98.385	H	58.5	-25.3	33.2	40.0	6.8	195.0	87.0	
14	101.780	V	55.6	-24.7	30.9	40.0	9.1	397.0	325.0	
15	101.780	H	58.7	-24.7	34.0	40.0	6.0	399.0	79.0	
16	214.421	H	50.4	-21.6	28.8	40.0	11.2	199.0	295.0	

♦ Calculation
Result(QP) [dB(㎶/m)] = (Reading(QP)[dB(㎶)] + c.f[dB(1/m)]
Margin(QP)[dB] = Limit[dB(㎶/m)] - Result(QP) [dB(㎶/m)]
Reading(QP) : Reading value, Result(QP) : Reading value + Factor value
Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

Radiated Electric Field Emissions(Above 1 ㎓)



Final Result

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	2399.257	V	31.8	46.7	4.4	36.2	51.1	56.0	76.0	19.8	24.9	100.0	242.2	
2	3329.107	H	30.6	45.3	6.7	37.3	52.0	60.0	80.0	22.7	28.0	100.0	358.3	
3	3331.350	V	28.4	44.1	6.7	35.1	50.8	60.0	80.0	24.9	29.2	100.0	288.6	
4	3442.259	H	30.4	44.3	6.9	37.3	51.2	60.0	80.0	22.7	28.8	100.0	44.8	
5	4785.108	V	28.9	43.8	11.3	40.2	55.1	60.0	80.0	19.8	24.9	100.0	152.7	
6	5852.347	H	26.3	41.0	13.9	40.2	54.9	60.0	80.0	19.8	25.1	100.0	112.5	

♦ Calculation
Result(PK/CAV) [dB(㎶/m)] = (Reading(PK/CAV)[dB(㎶)] + c.f[dB(1/m)]
Margin(PK/CAV)[dB] = Limit[dB(㎶/m)] - Result(PK/CAV) [dB(㎶/m)]
Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value
Limit(PK/CAV) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

Harmonic Current Emissions and Voltage Fluctuations and Flicker

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
		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	Ieff [A]	% of Limit	Limit [A]	Result
		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

Maximum Flicker results

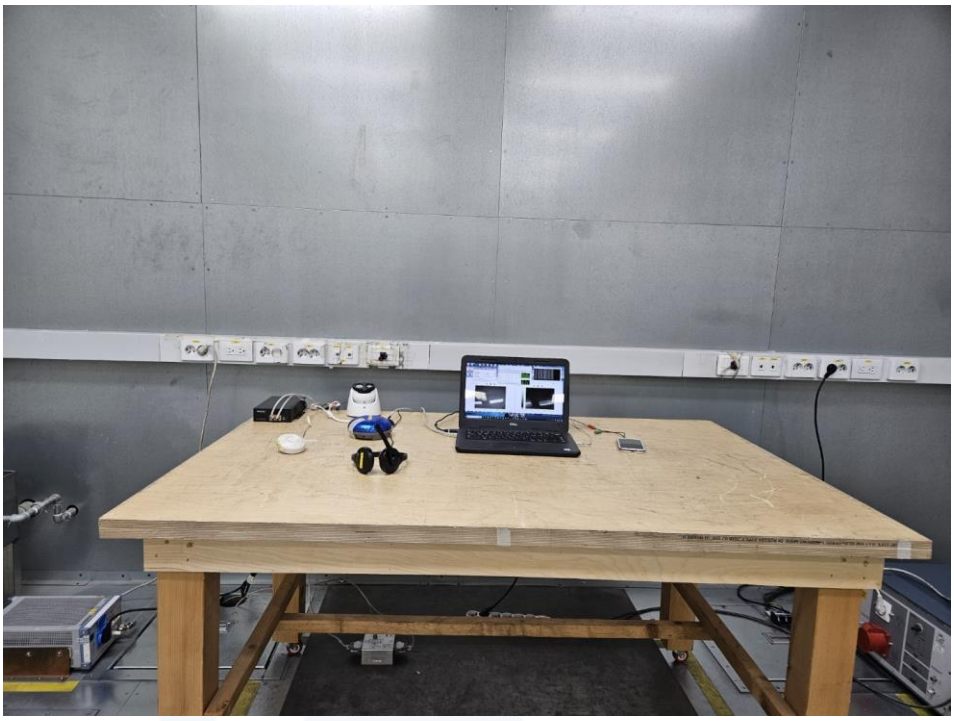
Flicker Measurements					
	Plt	**Max Pst**	**Max Dc**	**Max Dmax**	**Max Tmax**
Line 1:	N/A				
Limits:					
Results:					

Test Setup Photos and Configuration

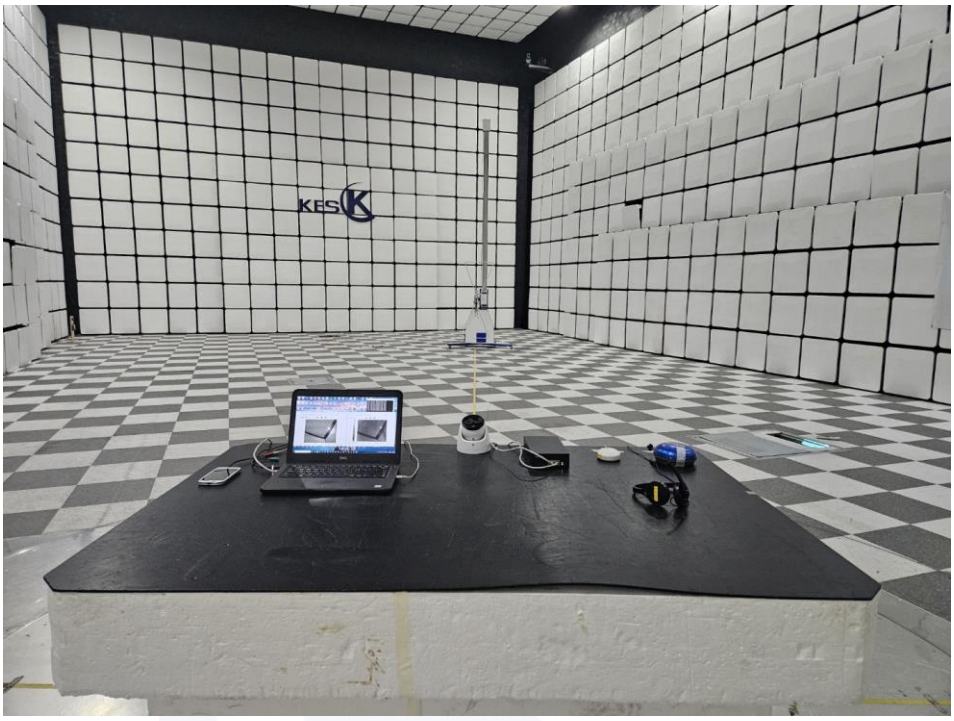
Conducted Emissions at Mains Power Ports

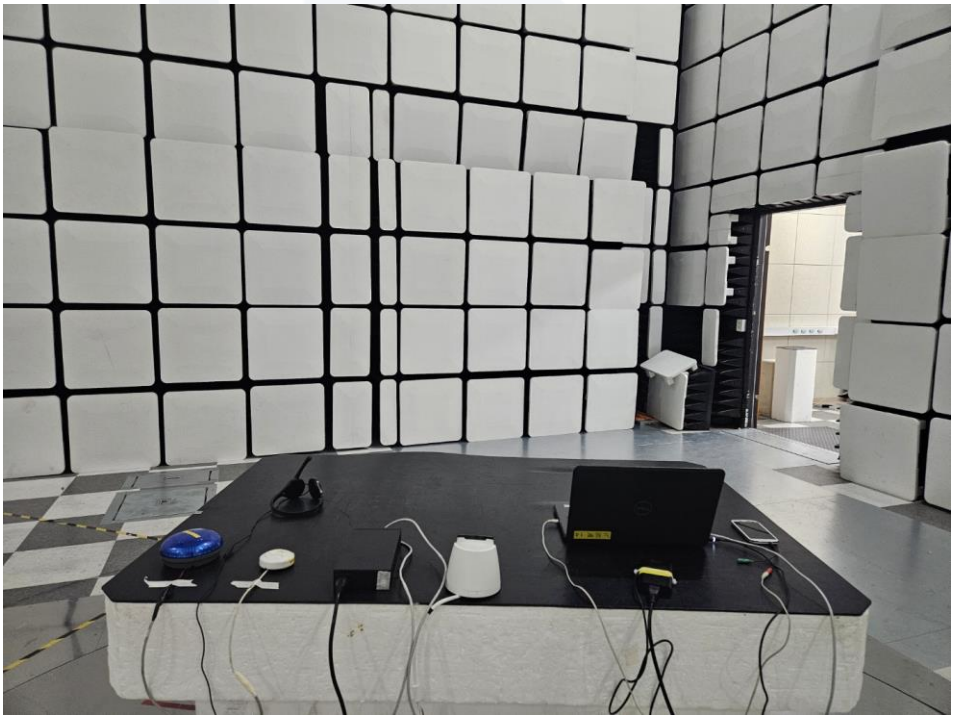
N/A

Conducted Emissions at Telecommunication Ports

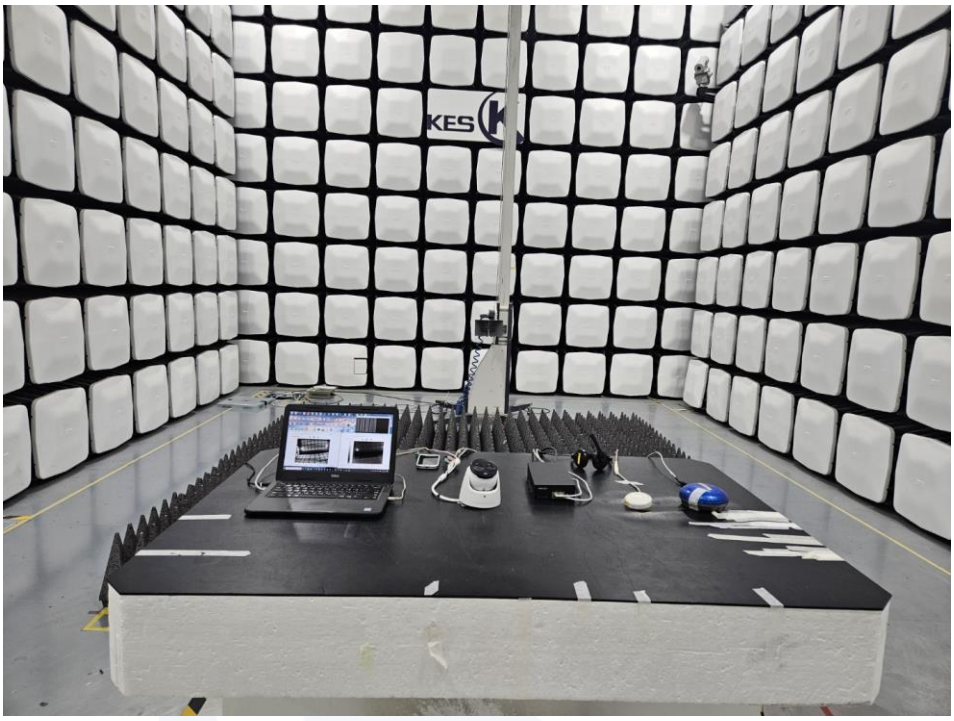


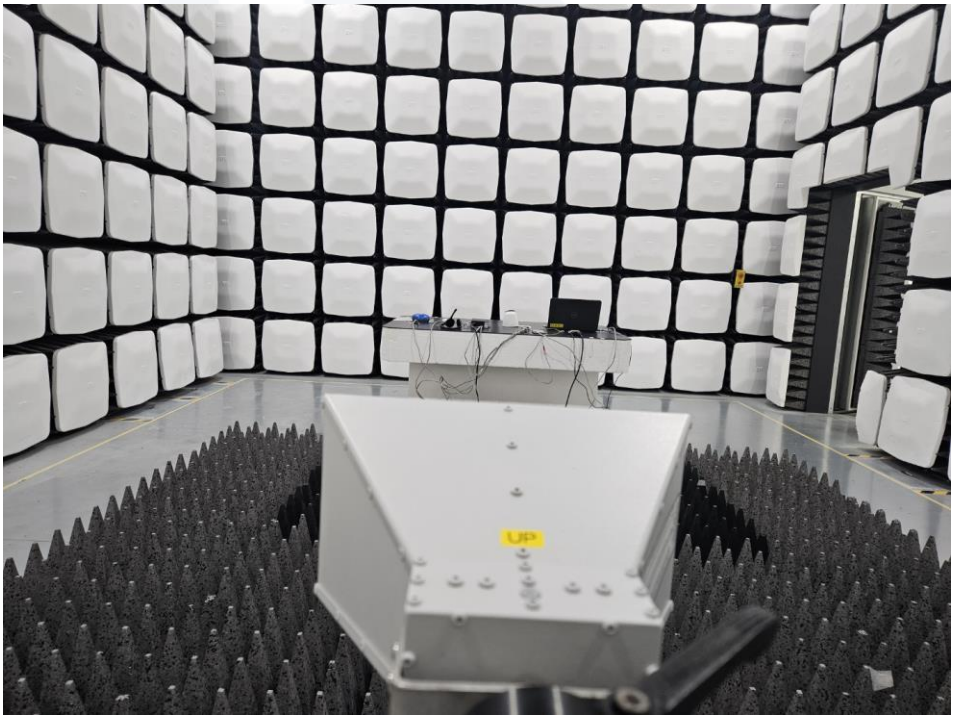
Radiated Electric Field Emissions(Below 1 ㎓)





Radiated Electric Field Emissions(Above 1 ㎓)

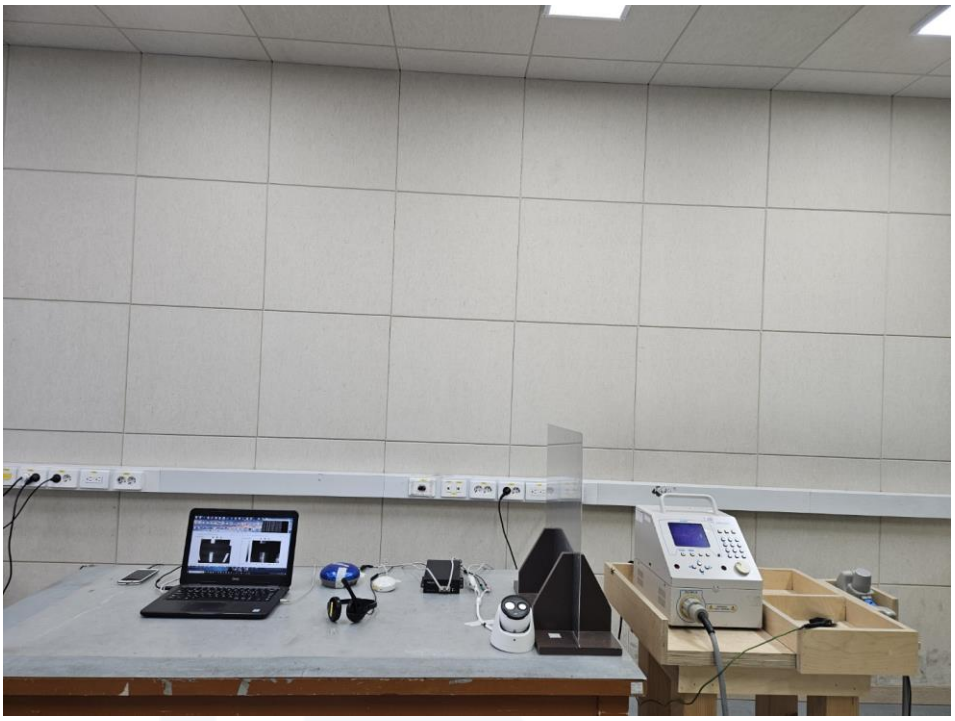




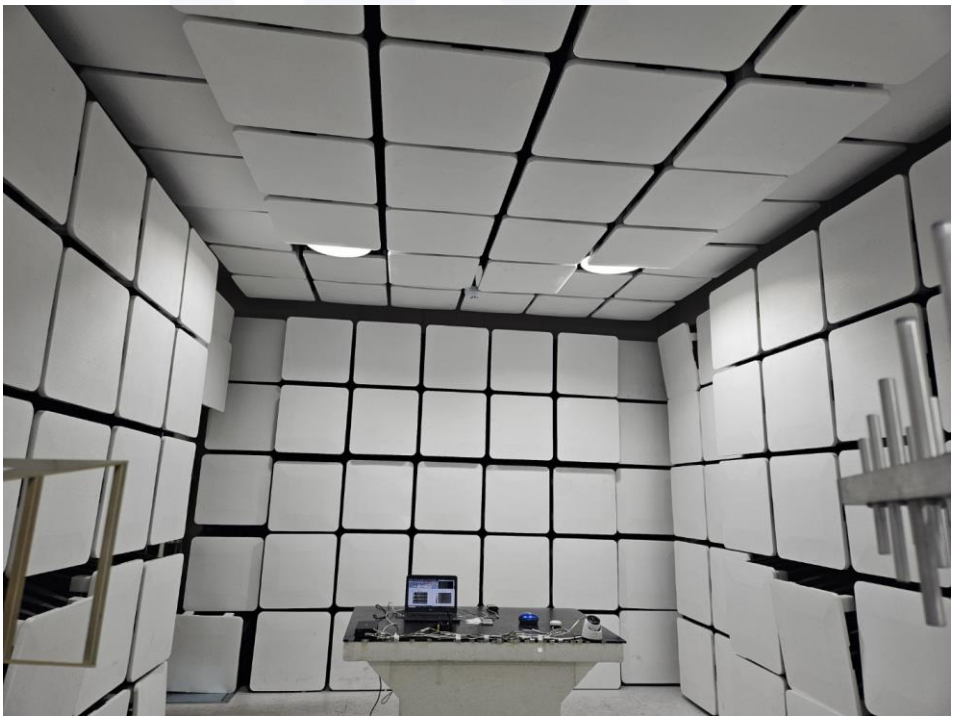
Harmonic Current Emissions and Voltage Fluctuations and Flicker

N/A

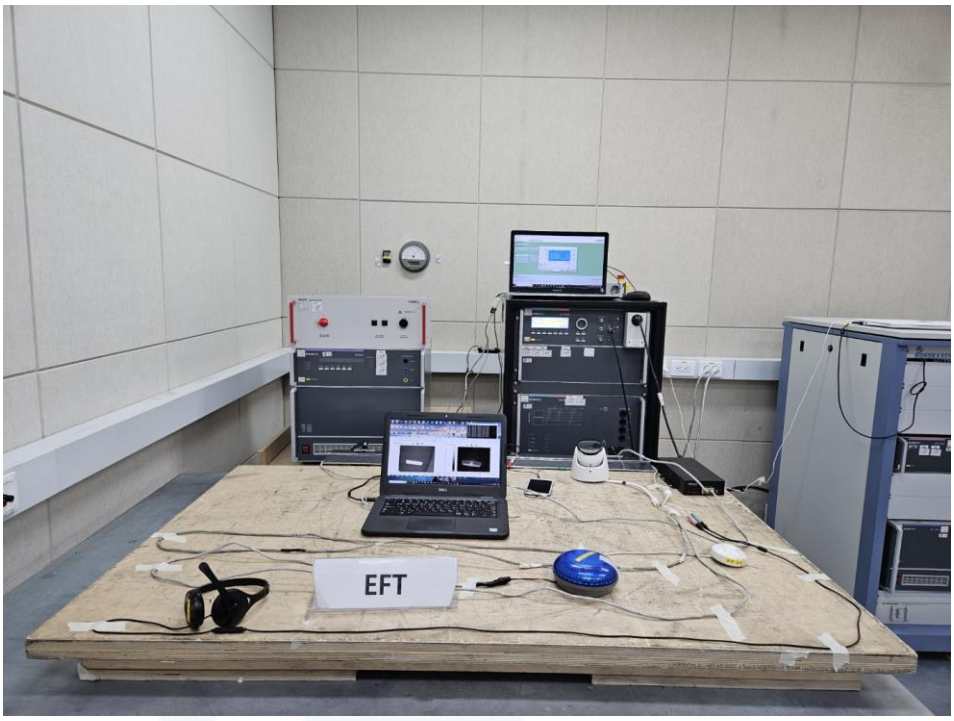
Electrostatic Discharge



Radiated Electric Field Immunity

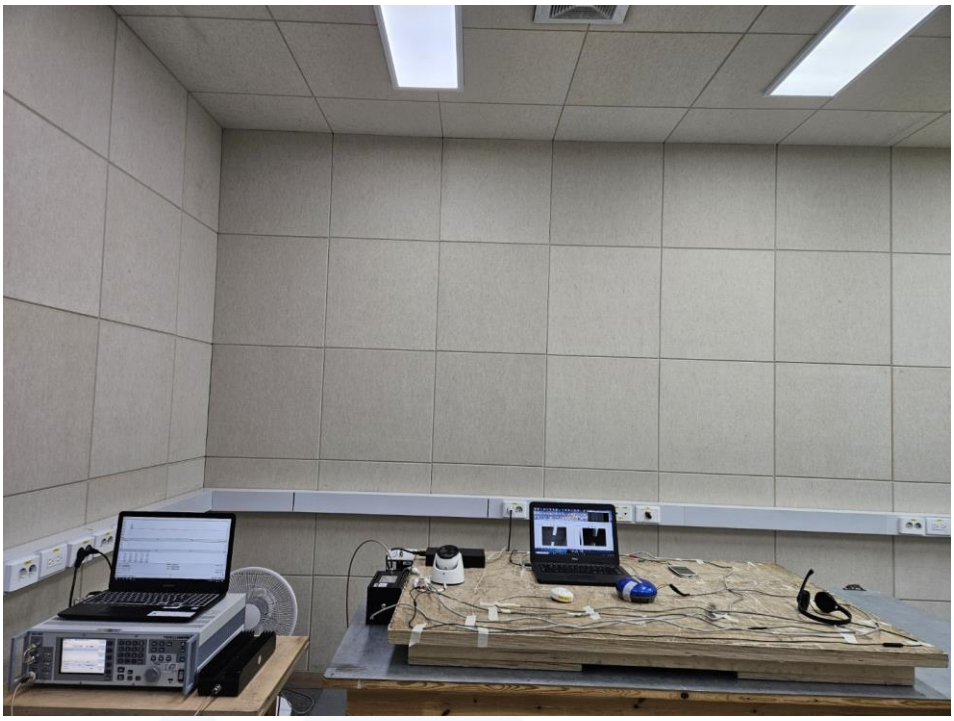


Electrical Fast Transients/Bursts



Surge Transients

Conducted Disturbance



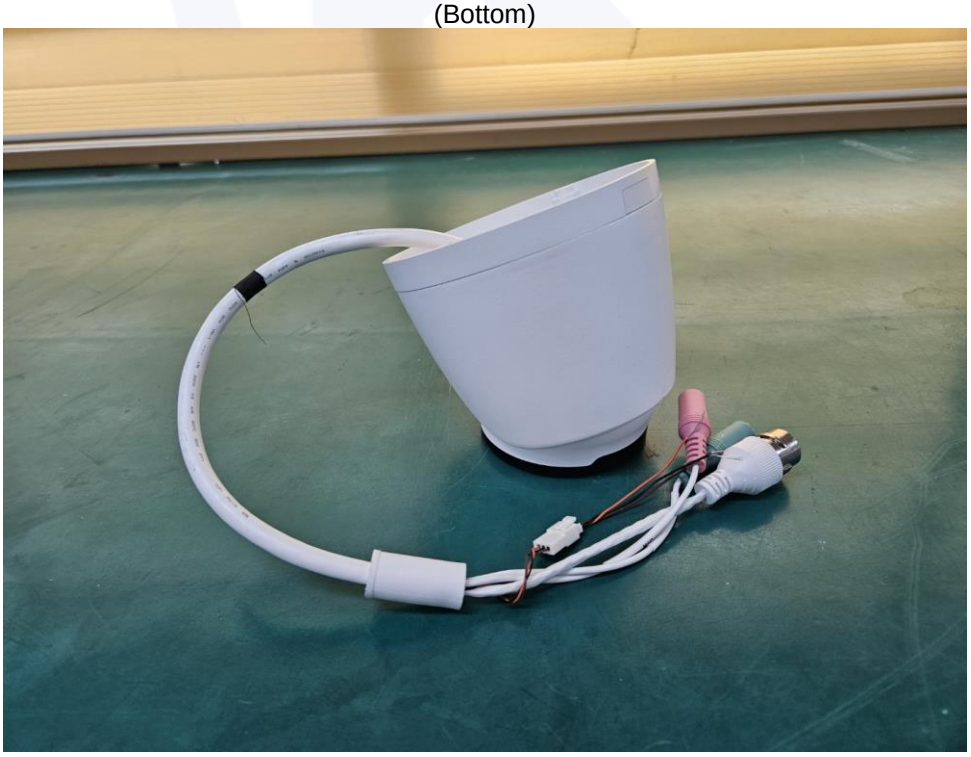
Voltage Dips and Short Interruptions

N/A

EUT External Photographs

(Top)

(Bottom)

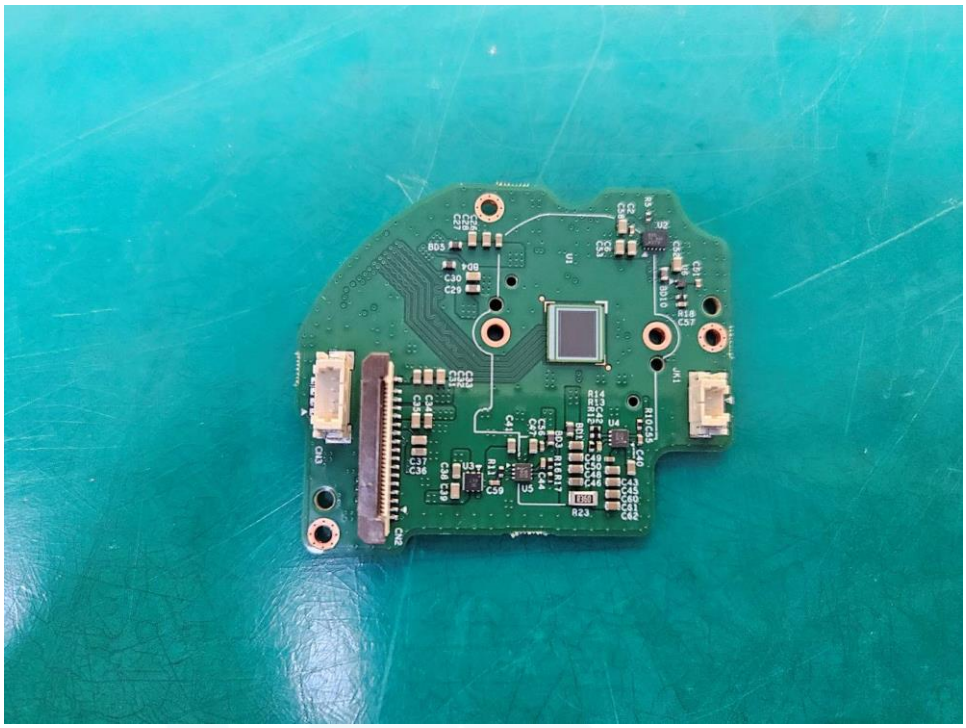


EUT Internal Photographs

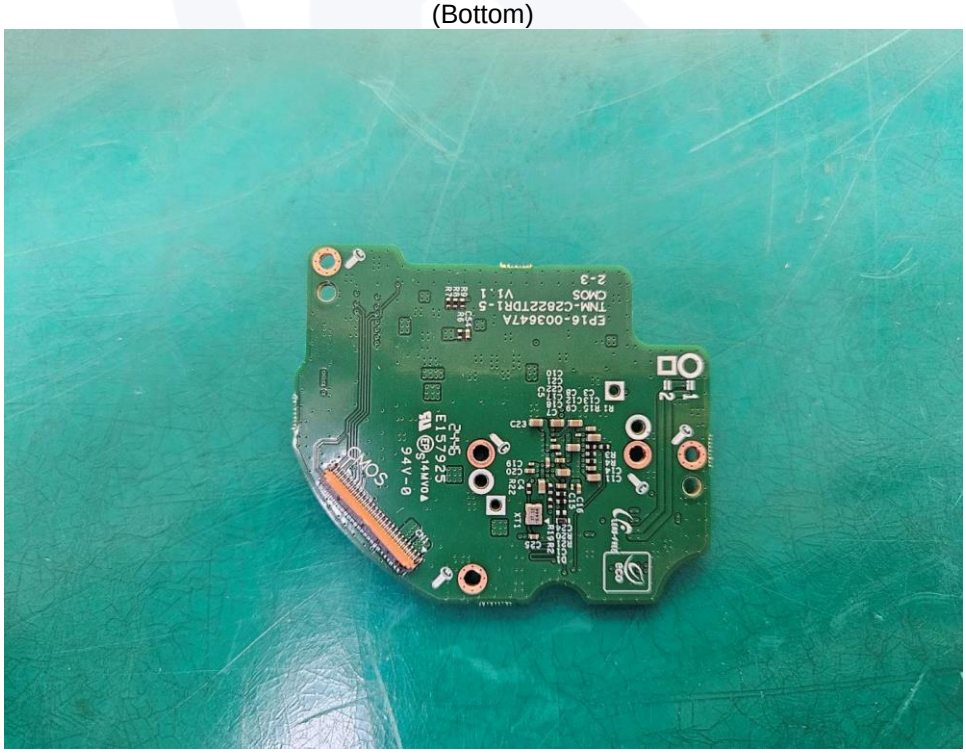
(Internal View)

EUT Internal View – Board 1

(Top)

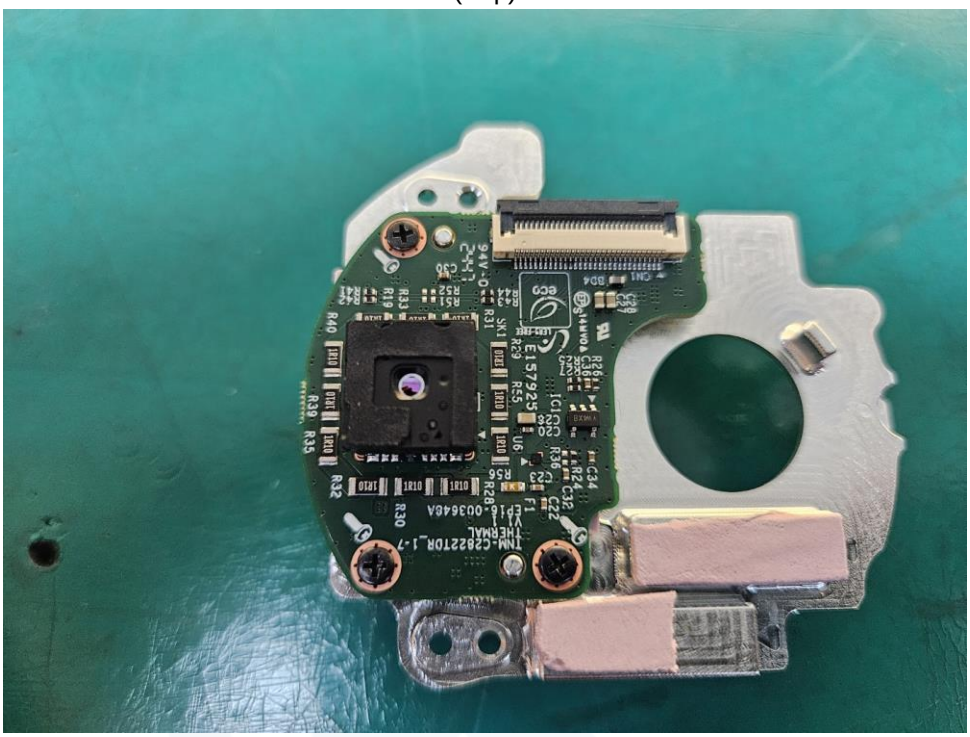


(Bottom)

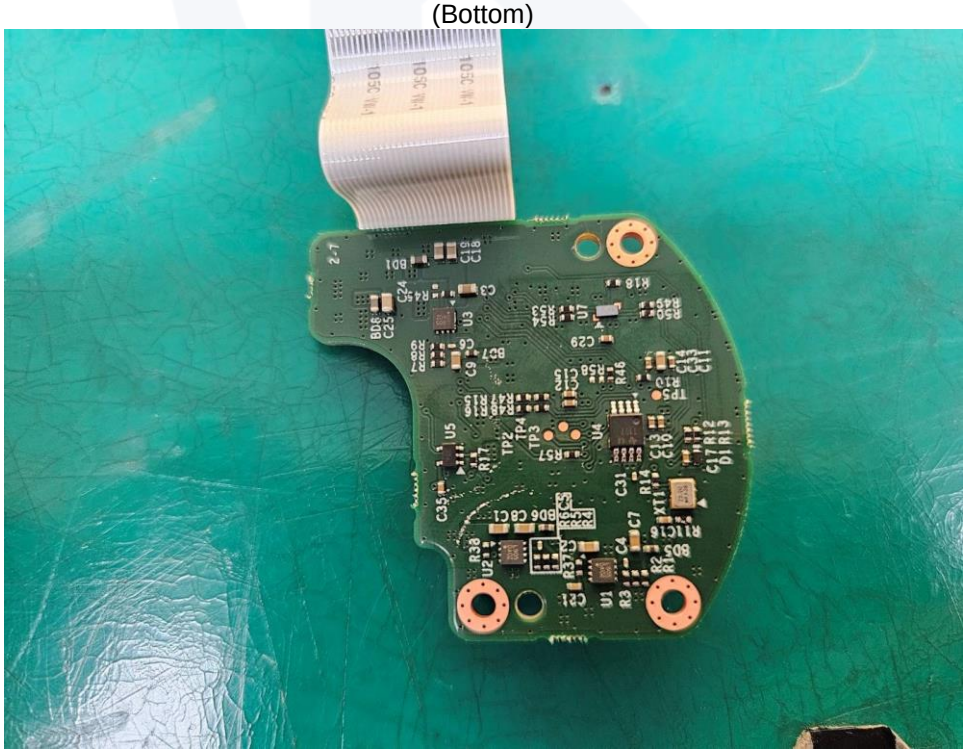


EUT Internal View – Board 2

(Top)

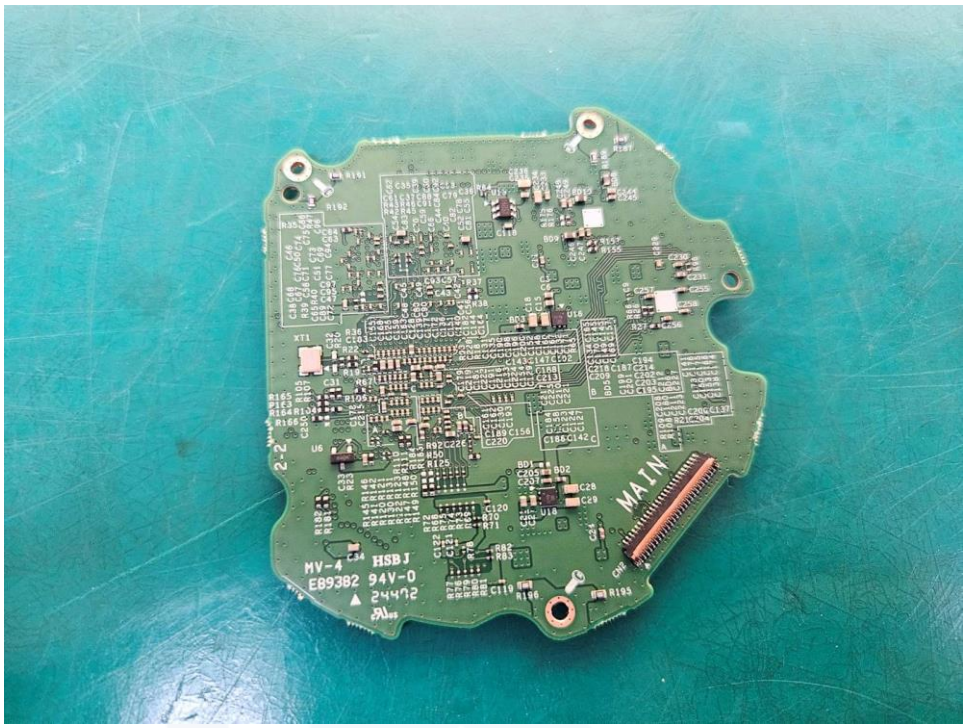


(Bottom)

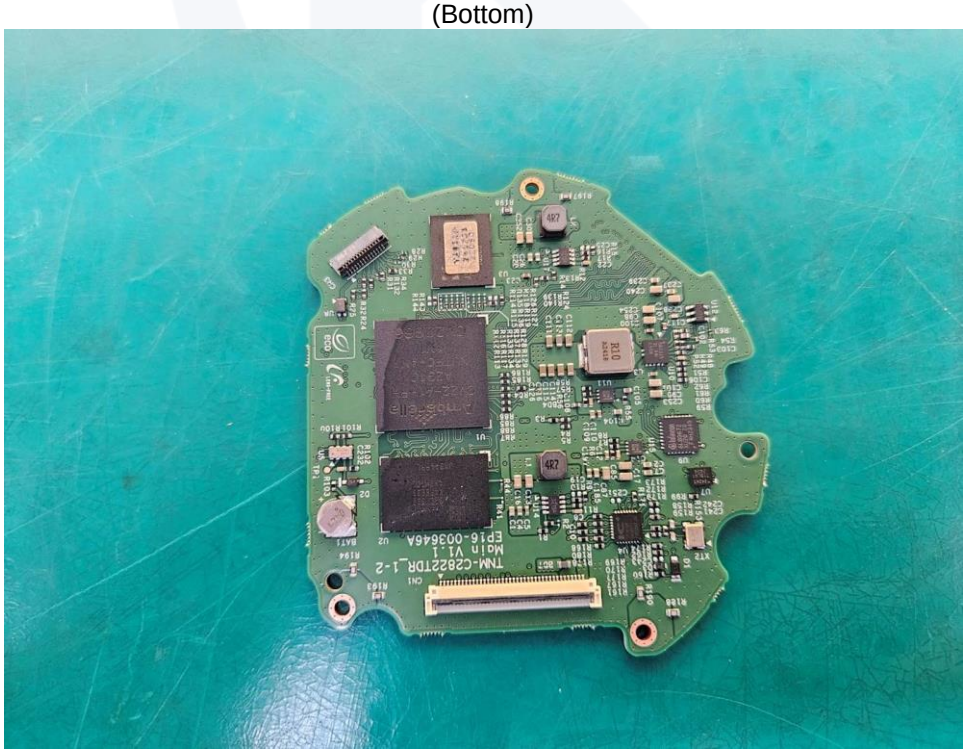


EUT Internal View – Board 3

(Top)

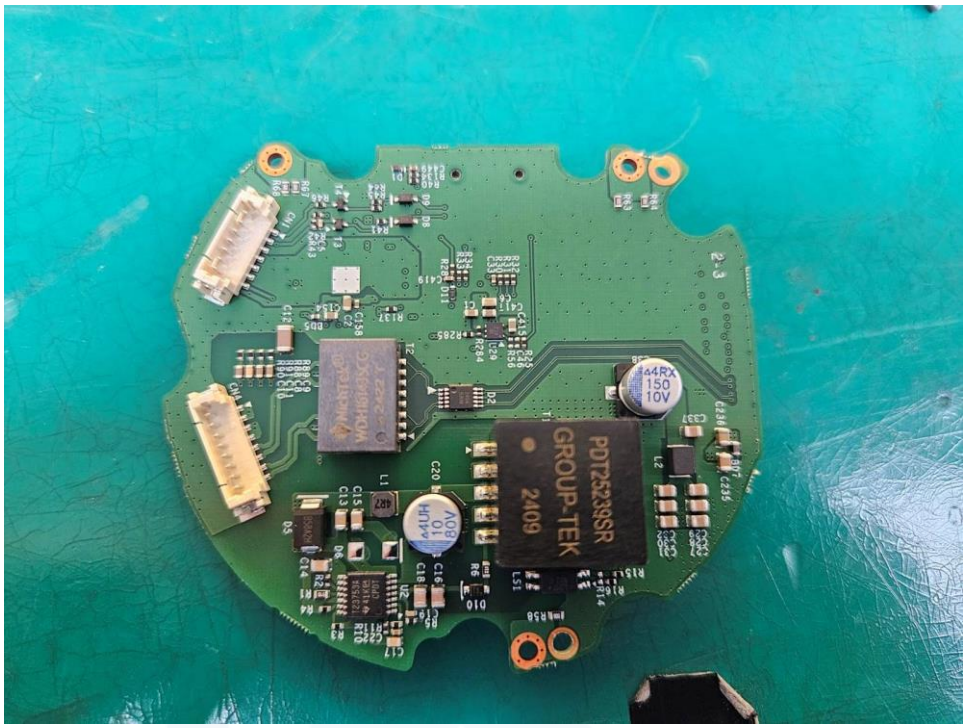


(Bottom)

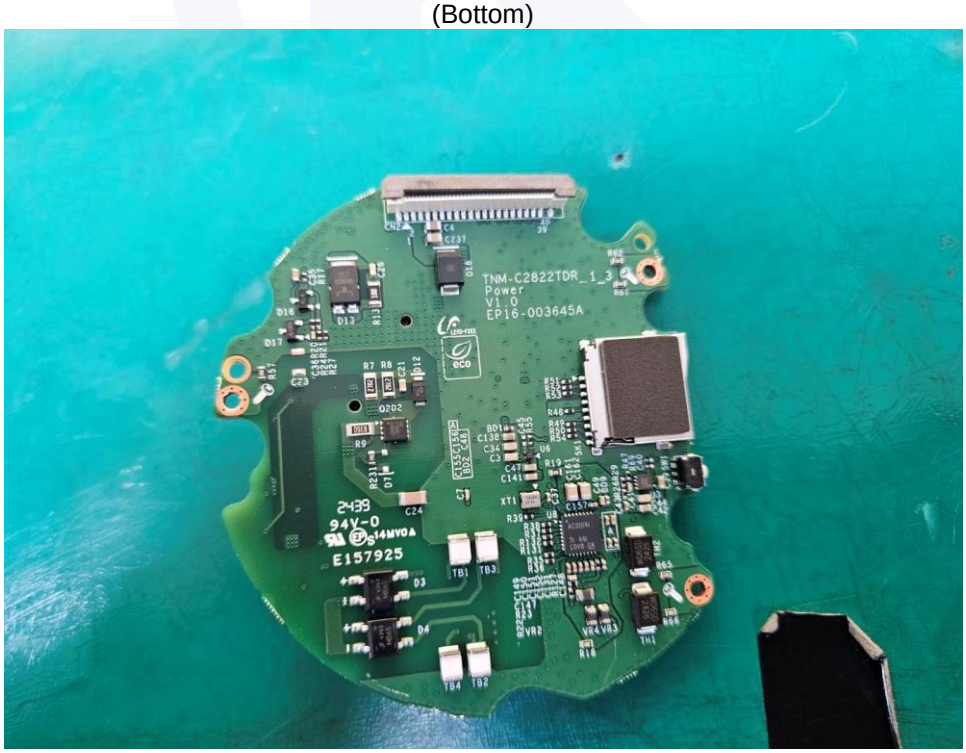


EUT Internal View – Board 4

(Top)



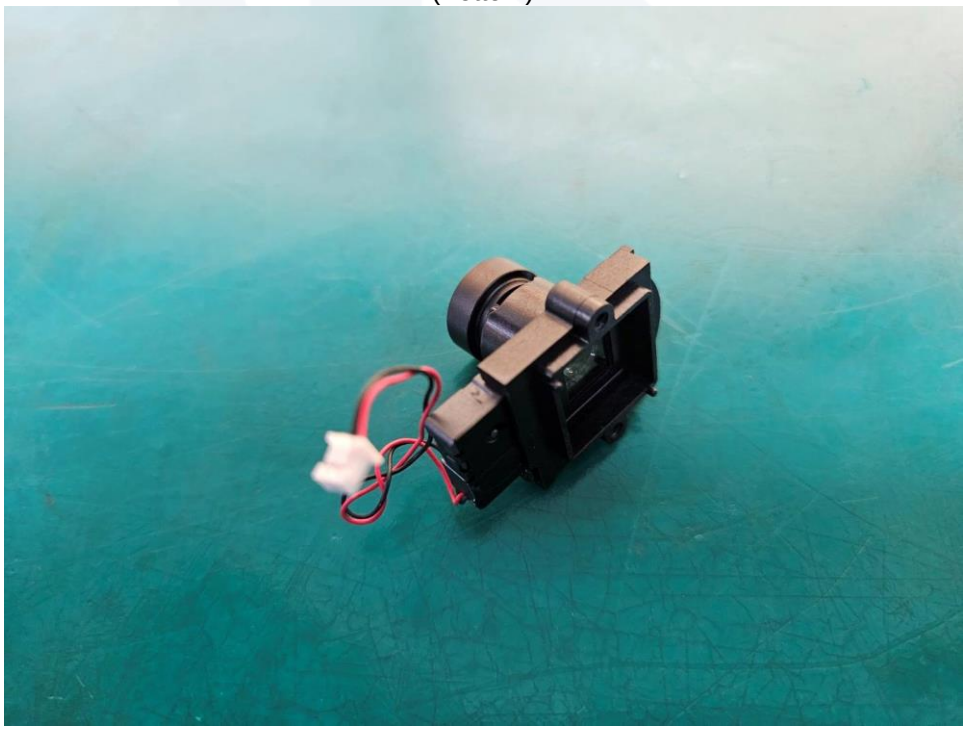
(Bottom)



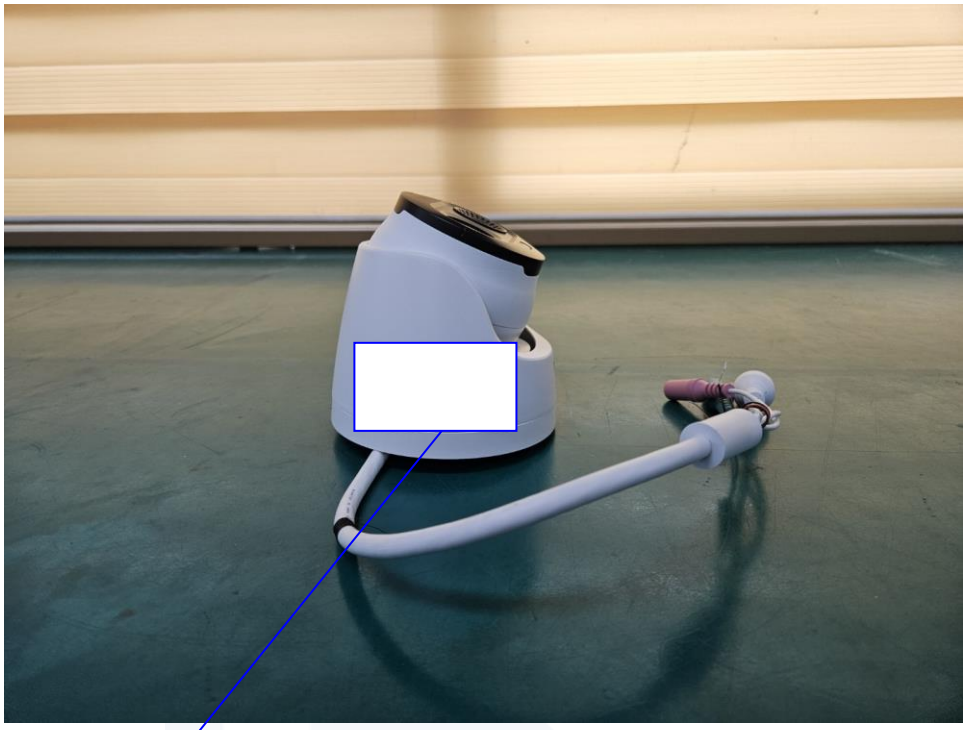
EUT Internal View – Camera Lens

(Top)

(Bottom)



Label and Location



NETWORK THERMAL CAMERA

Model No : TNM-C2822TDR

Manufacturer : HANWHA VISION VIETNAM COMPANY LIMITED

Made in Vietnam

The End.