



EMC TEST REPORT

Test Report No. : KES-EM-22T0737
Date of Issue : Aug 25, 2022
Product Name : NETWORK CAMERA
Model/Type No. : XNV-9083RZ
Variant Model : XNV-8083RZ
Applicant : Hanwha Techwin Co., Ltd.
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : 1. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.
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 (Suwon Industrial Complex)
Date of Receipt : Aug 01, 2022
Test Date : Aug 01, 2022 ~ Aug. 05, 2022
Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by

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EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

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

**KES Co., Ltd.**

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Aug 25, 2022	KES-EM-22T0737	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Video	
Imaging Device	1/1.8" progressive CMOS
Resolution	3840x2160, 3328x1872, 3072x1728, 2592x1944, 2688x1520, 1920x1080, 1600x1200, 1280x1024, 1280x960, 1280x720, 1024x768, 800x600, 800x448, 720x576, 720x480, 640x480, 640x360, 320x240.
Max. Framerate	H.265/H.264: Max. 30fps/25fps(60Hz/50Hz) MJPEG: Max. 15fps/12fps(60Hz/50Hz)
NETD	None
Pixel Size	None
Min. Illumination	Color: 0.03Lux(F1.3, 1/30sec, 30IRE) BW: 0.003Lux(F1.3, 1/30sec, 30IRE), 0Lux(IR LED on)
Video Out	None
Video Transmission Distance	None
Lens	
Focal Length (Zoom Ratio)	4.4~9.3mm(2.1x) motorized varifocal
Max. Aperture Ratio	F1.3(Wide) ~ F2.15(Tele)
Angular Field of View	H: 113°(Wide)~47°(Tele) V: 58°(Wide)~26°(Tele) D: 138°(Wide)~54°(Tele)
Min. Object Distance	0.5m(1.64ft)
Focus Control	Simple focus, Manual
Lens Type	P-iris(IR corrected)
Mount Type	None
Optional Lens	None
Pan / Tilt / Rotate	
Pan / Tilt / Rotate Range	Remote adjustment(Max. 200cycles) 0°~350° / 0°~85° / 0°~340°
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	Auto(ICR)
Backlight Compensation	BLC, HLC, WDR, SDR
Wide Dynamic Range	extremeWDR (120dB)
Digital Noise Reduction	WiseNR II (Based on AI engine), SSNR V
Digital Image Stabilization	Support
Defog	Support
Motion Detection	8ea, 8point Polygonal zones
Privacy Masking	32ea, 4point Quadrangle zones - Color : Gray, Green, Red, Blue, Black, White - Mosaic
Gain Control	Off / Max Gain / Manual
White Balance	ATW / Narrow ATW / AWC / Manual / Indoor / Outdoor
LDC	Support (Fill/stretch mode)
Electronic Shutter Speed	Minimum / Maximum / Prefer / Anti flicker (2~1/12,000sec) Auto Prefer shutter control(Based on AI engine)
Digital PTZ	Support(preset/group)
Video Rotation	Flip, Mirror, Hallway view(90°/270°)

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Analytics	Classified object type : Person/Face/Vehicle/License plate Attributes : Vehicle(Type:car/bus/truck/motorcycle/bicycle) Support DetectionShot Analytics events based on AI engine - Object detection, Virtual line(Crossing/Direction), Virtual area(Loitering/Intrusion/Enter/Exit) Analytics events - Defocus detection, Motion detection, Tampering, Fog detection, Virtual area(Appear/Disappear) * Audio detection, Sound classification(with NW I/O box SPM-4210)
Business Intelligence	None
Serial Interface	None
Alarm I/O	None
Alarm Triggers	Analytics, Network disconnect, App event, Time schedule * Alarm input(with NW I/O Box SPM-4210)
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(with NW I/O box SPM-4210) - Handover(PTZ preset, Send message by HTTP/HTTPS/TCP)
Audio In	None
Audio Out	None
IR Viewable Length	15m(49.21ft) 30m(98.43ft) based on scene
IR Illuminator (Optional)	None
Water Removal	None
Auto Tracking	None
Coaxial Protocol	None
Color Palettes	None
Radiometry	
Temperature Detect Range	None
Temperature Accuracy	None
Temperature Detection	None
Additional	None
Network	
Ethernet	Metal shielded RJ-45(10/100/1000BASE-T)
Video Compression	H.265/H.264: Main/High, MJPEG
Audio Compression	None
Smart Codec	Manual(5ea area), WiseStreamII, WiseStreamIII(Based on AI engine)
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(20 users) / Multicast Multiple streaming(Up to 10 profiles, 3 virtual channel support)
Protocol	IPv4, IPv6, TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL/TLS, DHCP, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, UPnP, Bonjour, LLDP, SRTP (TCP, UDP Unicast)
Security	TPM 2.0 (FIPS 140-2 level 2) HTTPS(SSL) Login Authentication Digest Login Authentication IP Address Filtering User access log 802.1X Authentication(EAP-TLS, EAP-LEAP, EAP-PEAP MSCHAPv2) Device Certificate(Hanwha Techwin Root CA, pre-installed) Secure by default certificate Secure OS/Boot/Storage, Verify firmware forgery
SIP support (VoIP, Peer-to-peer, SIP/P	None
Application Programming Interface	ONVIF Profile S/G/T/M SUNAPI(HTTP API) Wisenet open platform

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General	
Webpage Language	English, Korean, Chinese, French, Italian, Spanish, German, Japanese, Russian, Portuguese, Czech, Polish, Turkish, Dutch, Greek, Hungarian
Web Viewer	None
Edge Storage	Micro SD/SDHC/SDXC 2slot Max. 1TB (512GB * 2)
Memory	4GB RAM, 512MB Flash
Environmental & Electrical	
Operating Temperature / Humidity	-50°C ~ +55°C (-58°F ~ +131°F) +74°C (165°F) (Max) based on NEMA TS-2 (2.2.7) * Start up should be done at above -30°C 0~95%RH (non-condensing) Humidity control /w AIR vent
Storage Temperature / Humidity	-50°C ~ +60°C (-58°F ~ +140°F) / Less than 90% RH
Certification	IP66/IP67/IP6K9K, NEMA4X, IK10+
Input Voltage	PoE+ (IEEE802.3at, Class4)
Power Consumption	PoE+: Max 22.5W, typical 12.1W
Mechanical	
Color / Material	White / Aluminum Hard-coated dome bubble
RAL Code	RAL9003
Product Dimensions / Weight	Ø180x135mm (7.09x5.31"), 2000g (4.41 lb)
Compatible Conduit hole / Gangbox	19.1mm (3/4") (M25) single, double, 4" octagon, 4" square
Hanging Mount (Dome)	SBP-187HMW
Skin Cover (Dome)	None
Weather Cap (Dome)	include
Power Module	None
Backbox	None
Certifications & Standards	
Network	None
EMC	EN 50121-4 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 KS C 9832 Class A, KS C 9835
Safety	UL 62368-1, CAN/CSA C22.2 NO. 62368-1 IEC 62471
Environment	EN IEC 63000 IEC 60529 IP66/IP67, ISO 20653 IP6K9K, IEC 62262 IK10+ NEMA 250 type 4X
Video	None
DORI (EN62676-4 standard)	
Detect (25PPM/ 8PPF)	Wide: 51.7m (166.77ft) / Tele: 176.6m (579.49ft)
Observe (63PPM/ 19PPF)	Wide: 20.3m (66.71ft) / Tele: 70.7m (231.80ft)
Recognize (125PPM/ 38PPF)	Wide: 10.2m (33.35ft) / Tele: 35.3m (115.90ft)
Identify (250PPM/ 76PPF)	Wide: 5.1m (16.68ft) / Tele: 17.7m (57.95ft)

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1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage ☐ AC 230 V ☐ AC 100 V ☐ DC 24 V ☐ DC 12 V ☒ PoE

Frequency ☐ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

Added Derived model of difference in simple model name.
Basic model and electrical circuitry, structure and performance are the same.

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK CAMERA	XNV-9083RZ	-	HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.	EUT

1.5 System Configuration

Description	Model Number	Serial Number	Manufacturer	Remarks
-	-	-	-	-

1.6 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
PoE Adapter	PT-PSE109GBRO-AH	-	Dongguan PROCET Network Technology Co.,Ltd	-
Notebook	Latitude 5300	8C47BE45C060	DELL INC.	-
Notebook Adapter	HA65NM130	-	Chicony Power Technology(Suzhou)Co. ,Ltd.	-
Micro SD card	-	-	Sandisk	-



1.7 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK CAMERA (EUT)	Micro SD Card slot	Micro SD card	Micro SD Card slot	-	-
	RJ-45 (PoE)	PoE Adapter	RJ-45 (PoE)	3.0	S
PoE Adapter	RJ-45 (LAN)	Notebook	RJ-45 (LAN)	3.0	U
Notebook	DC Jack	Notebook Adapter	DC Jack	1.8	U

* Unshielded=U, Shielded=S

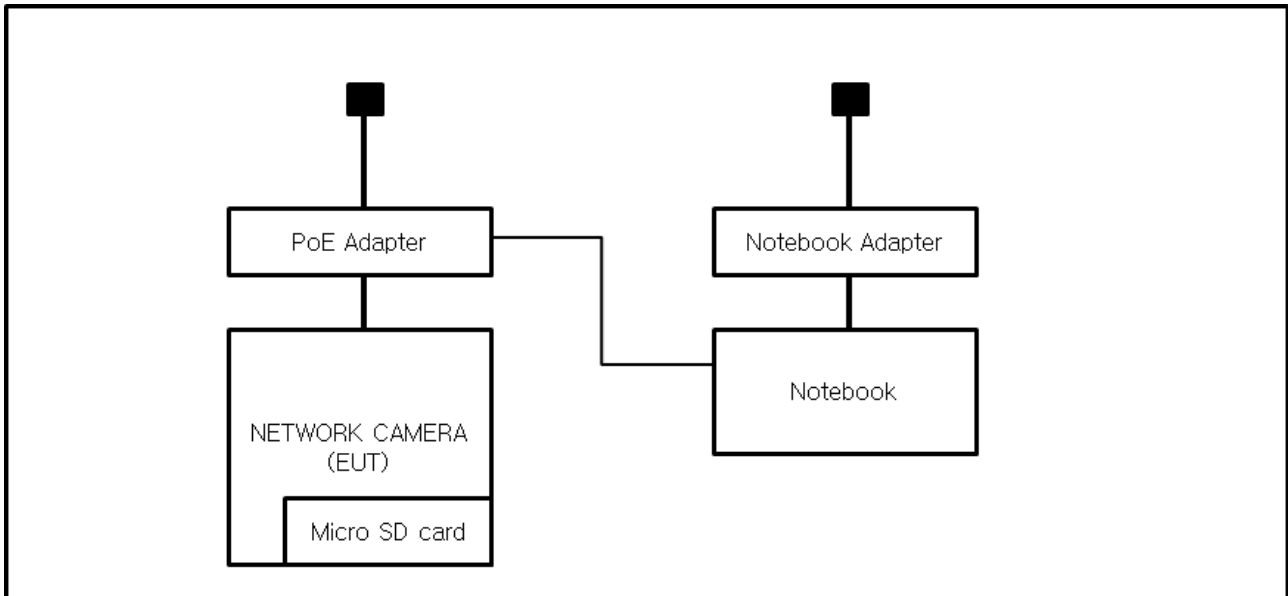
1.7 EUT Operating Mode(s)

Test mode	operating
Operating	Check the Normal Operation status. after testing, check if the recording is normally done on the Micro SD Card

EUT Test operating S/W - Vendor Offered Programs		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Techwin Co., Ltd.

1.8 Configuration

■ AC Main
□ DC Main



1.9 Remarks When Standards Applied

N/A

1.10 Calibration Details of Equipment Used for Measurement

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

1.11 Test Facility

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

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298
JAPAN	VCCI	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	 R-20056, C-20036, T-20040, G-20057
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

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2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014 / 30 / EU**

☒ EN 50121-4:2016

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013



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	Dec 28, 2022
☐	LISN	ENV216	R & S	101787	Dec 27, 2022
☐	LISN	ESH2-Z5	R & S	100450	Dec 27, 2022
☐	PULSE LIMITER	ESH3-Z2	R & S	101915	Dec 27, 2022

Test Conditions

Temperature: (±) °C

Relative Humidity: (±) % 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

It is not tested apply because it is powered by PoE.



2.2 Conducted Emissions at Telecommunication Ports

Test Date

Aug. 01, 2022

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	Dec 28, 2022
☒	LISN	ENV216	R & S	101787	Dec 27, 2022
☒	LISN	ESH2-Z5	R & S	100450	Dec 27, 2022
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	Dec 27, 2022
☐	8-WIRE ISN CAT3,5	ENY81	R & S	100174	Dec 28, 2022
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	Dec 28, 2022
☒	ISN	ISN S8	SCHWARZBECK	ISN-S8-0019	Mar 07, 2023

Test Conditions

Temperature: (24,3 ± 0,1) °C

Relative Humidity: (44,6 ± 0,1) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

2.3 Impulse Noise (click)

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	CLICK METER SOFTWARE CMS FOR DDA55	AFJ	4.19	-
☐	CLICK ANALYZER	DDA55+	AFJ INSTRUMENTS	14042211198	Mar 31, 2023
☐	LISN	ENV216	R & S	101787	Dec 27, 2022

Test Conditions

Temperature: (±) °C

Relative Humidity: (±) % 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

RemarksIt is not tested apply because it is powered by PoE.



2.4 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Aug. 01, 2022

Test Location

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	Mar 31, 2023
☒	AMPLIFIER	SCU 01	R & S	100603	Nov 24, 2022
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	Dec 08, 2022
☒	ATTENUATOR	8491A	HP	32173	Mar 08, 2023

Test Conditions

Temperature: (24,4 ± 0,1) °C

Relative Humidity: (45,6 ± 0,1) % 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.

2.5 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Aug. 02, 2022

Test Location

SEMI ANECHOIC CHAMBER #3

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	ESR7	R & S	101190	Aug 01, 2023
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	Apr 01, 2023
☐	ATTENUATOR	8491A	HP	35496	Mar 08, 2023
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	Mar 03, 2023

Test Conditions

Temperature: (24,6 ± 0,1) °C

Relative Humidity: (45,5 ± 0,1) % 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

RemarksSee Appendix A for test data.



2.6 Harmonic Current Emissions

Test Date

N/A

Test Location

Electro wave Shieldroom #3

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	Apr 06, 2023
☐	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (±) °C

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

It is not tested apply because it is powered by PoE.



2.7 Voltage Fluctuations and Flicker

Test Date

N/A

Test Location

Electro wave Shieldroom #3

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	Apr 06, 2023
☐	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (±) °C

Relative Humidity: (±) % R.H.

Test Results

The requirements are:

- ☐ PASS
☐ NOT PASS
☒ NOT APPLICABLE

Remarks

It is not tested apply because it is powered by PoE.

3.0 Criteria for Compliance

Criteria for compliance was based on the following guidelines:

General performance criteria

The general principles (performance criteria) for the evaluation of the immunity test results are the following.

Performance criterion A

The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.



3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Aug. 05, 2022

Test Location

EMS-ESD: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	Feb 24, 2023
☒	HCP	-	KES	-	-
☒	VCP	-	KES	-	-

Test Conditions

Temperature: (24,4 ± 0,1) °C
Relative Humidity: (45,3 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 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

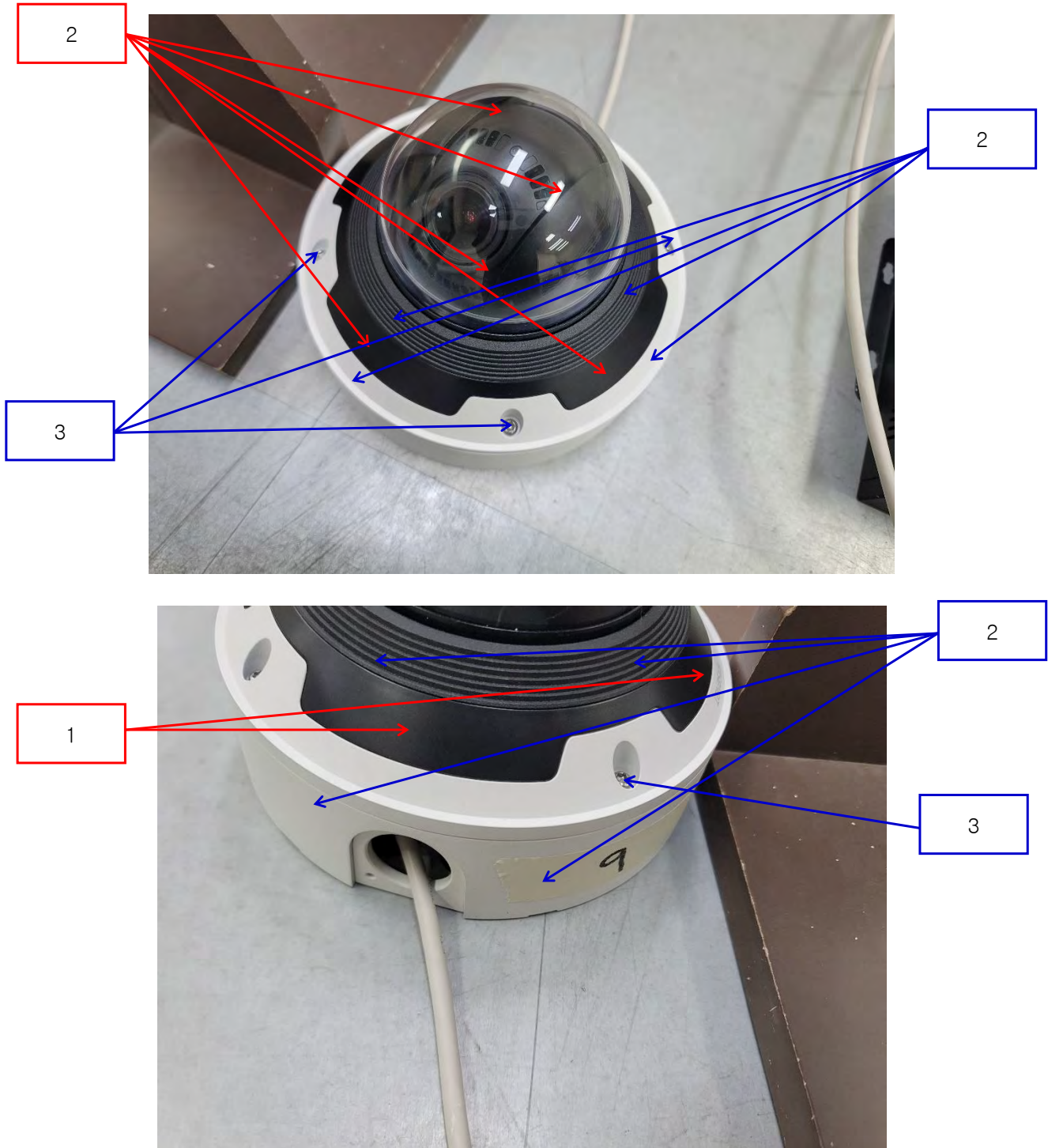
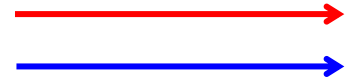
Notes: HCP: Horizontal Coupling Plane

VCP: Vertical Coupling Plane

Required Performance Criteria: ☒ B

Location of Discharge:

Air
Contact



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Test Data

Indirect Discharge

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure 1	Air Discharge	A	-
2	Enclosure 2	Contact Discharge	A	-
3	Screw	Contact Discharge	A	-

Note: "Blank" = Not performed

Observations:

- A – No response observed from E.U.T
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

RemarksPASS Required Performance Criteria.

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3.2 Radio-frequency Electromagnetic Field

Reference Standard

EN IEC 61000-4-3:2020

Test Date

Aug. 03, 2022

Test Location

EMS-RS: ☒ SEMI ANECHOIC CHAMBER #3 ☐ SEMI ANECHOIC CHAMBER #4(10 m)

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	Aug 01, 2023
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
☒	POWER METER	E4419B	Agilent	GB40203000	Mar 31, 2023
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY52170007	Apr 04, 2023
☒	AVERAGE POWER SENSOR	E9301A	Agilent	MY41498669	Apr 04, 2023
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM, INC	781	Mar 03, 2023

Test Conditions

Temperature: (24,9 ± 0,1) °C
Relative Humidity: (46,4 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) kPa



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Test Specifications

Antenna Polarization: Horizontal & Vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Frequency Range: ☒ 80 MHz to 800 MHz [10V/m]
[Field Strength] ☒ 800 MHz to 1 GHz [20 V/m]
☒ 1,4 GHz to 2,0 GHz [10 V/m]
☒ 2,0 GHz to 2,7 GHz [5 V/m]
☒ 5,1 GHz to 6,0 GHz [3 V/m]

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: ☒ A

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Test Data

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

Note: "Blank" = Not performed

Observations:

- A – No response observed from E.U.T
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

Remarks

PASS Required Performance Criteria.

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3.3 Fast Transients

Reference Standard

EN 61000-4-4:2012

Test Date

Aug. 04, 2022

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	Dec 03, 2022
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	Mar 31, 2023
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	Dec 03, 2022

Test Conditions

Temperature: (24,2 ± 0,1) °C
Relative Humidity: (45,4 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) kPa

Test Specifications

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

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

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☒ 5 klz ☐ 100 klz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ A

Test Data

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (kV)	(-) Burst (kV)
RJ-45 (PoE)	A	A

Note: “Blank” = Not performed

Observations:

- A – No response observed from E.U.T
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

Remarks

PASS Required Performance Criteria.
Any degradations of performance was not observed during in the test.

3.4 Surges

Reference Standard

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

Test Date

Aug. 04, 2022

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	Dec 03, 2022
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	Mar 31, 2023
☒	CDN	CNV 504N7.3	EM TEST	P1744207079	Dec 03, 2022

Test Conditions

Temperature: (24,2 ± 0,1) °C
Relative Humidity: (45,4 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) kPa



Test Specifications

Power Lines

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

Surge Amplitude : Common Mode
☐ (2,0) kV
Differential Mode
☐ (1,0) kV

Number of Surges: ☐ 5 surges per angle

Angle: ☐ 0°, 90°, 180°, 270° (input AC power port)

Polarity: ☐ Positive & Negative

Repetition Rate: ☐ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☐ B

DC POWER Lines

Source Impedance: 12 ohm (not isolated from earth) and 42 ohm (isolated from earth)

Surge Amplitude: Common Mode
☐ (2,0) kV
Differential Mode
☐ (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: ☒ B

Signal Lines

Source Impedance: 42 ohm
Surge Amplitude: Common Mode
☐ (2,0) kV
Differential Mode
☒ (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: ☒ B



Test Data

DC POWER Lines

☐ 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 Line – Differential Mode

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

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
RJ-45(PoE)	A	A

Note: "Blank" = Not performed

Observations:

- A – No response observed from E.U.T
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

Remarks

PASS Required Performance Criteria.

Any degradations of performance was not observed during the test.

3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Aug 01, 2022

Test Location

EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.12	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	Nov 24, 2022
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	Nov 24, 2022
☒	CDN	CDN M016	TESEQ	43694	Nov 24, 2022
☒	CDN	CDN M016	TESEQ	43697	Nov 24, 2022
☒	CDN	CDN ST08A	TESEQ	43886	Nov 24, 2022
☐	EM CLAMP	KEMZ 801A	TESEQ	44099	Nov 25, 2022

Test Conditions

Temperature: (24,3 ± 0,1) °C
Relative Humidity: (44,6 ± 0,1) % R.H.
Atmospheric Pressure: (100,0 ± 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

Frequency Step: ☒ 1 % step

Dwell Time: ☐ 1 s ☒ 3 s

Required Performance Criteria: ☒ A

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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	A

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

- A – No response observed from E.U.T
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

RemarksPASS Required Performance Criteria.Any degradations of performance was not observed during in the test.

3.6 Power Frequency Magnetic Field Immunity

Reference Standard

EN 61000-4-8:2010

Test Date

Aug 05, 2022

Test Location

EMS-Magnetic: 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	-
☒	EMS Test S/W	NET.CONTROL	EM TEST	1.2.11	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	Dec 03, 2022
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	Mar 31, 2023
☒	MAGNETIC FIELD COIL	MS 100N	EM TEST	P1536163691	Dec 07, 2022
☒	CURRENT TRANSFORMER	MC 26100 (100 A 교정)	EM TEST	P1550168963	Mar 31, 2023
☒	MULTIFUNCTION AC/DC POWER SOURCE	NETWAVE 7-400	EM TEST	P1614178393	Nov 25, 2022
☒	MAGNETICFIELD COIL	INA 703	Teseq AG	3006	Mar 31, 2023

Test Conditions

Temperature: (24,4 ± 0,1) °C
Relative Humidity: (45,3 ± 0,1) % R.H.
Atmospheric Pressure: (100,1 ± 0,0) kPa



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Test Specifications

Field Strength(Power Source): ☒ 100 A/m (ac)

☒ 300 A/m (dc)

Frequency (ac): ☒ 16.7 Hz ☒ 50 Hz ☐ 60 Hz

Frequency (dc): ☒ 0 Hz

Required Performance Criteria: ☒ A

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Test Data

☒ Immersion method

Coil orientation	Result
X	A
Y	A
Z	A

☐ Proximity method

Coil orientation	Result
X	-
Y	-
Z	-

- During the test, the Y/Z polarized was tested with proximity.

Note: "blank" = Not performed

Observations:

- A – No response observed from E.U.T
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

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

Remarks

PASS Required Performance Criteria.

Any degradations of performance was not observed during in the test.



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APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

N/A

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[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))

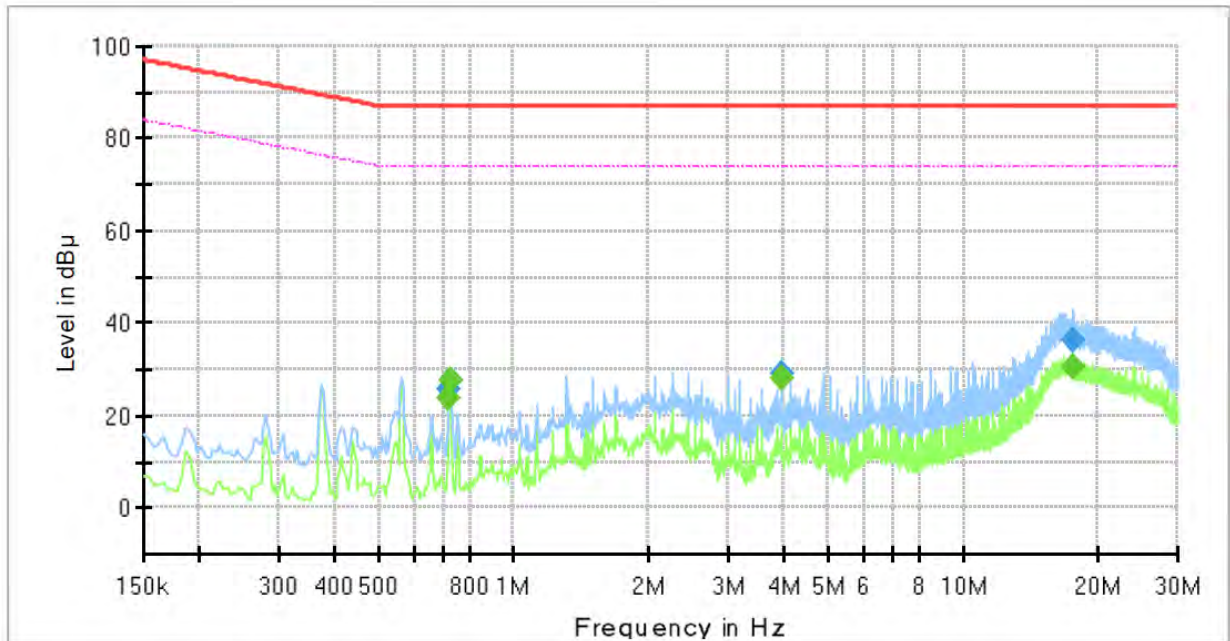
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Conducted Emissions at Telecommunication Ports

[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	XNV-9083RZ
Mode :	
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)
0.718000	---	23.73	74.00	50.27	1000.0	9.000	Single Line	19.8
0.718000	25.50	---	87.00	61.50	1000.0	9.000	Single Line	19.8
0.722000	---	27.48	74.00	46.52	1000.0	9.000	Single Line	19.8
0.722000	27.62	---	87.00	59.38	1000.0	9.000	Single Line	19.8
3.938000	---	28.07	74.00	45.93	1000.0	9.000	Single Line	19.8
3.938000	29.04	---	87.00	57.96	1000.0	9.000	Single Line	19.8
17.658000	---	30.44	74.00	43.56	1000.0	9.000	Single Line	20.0
17.658000	36.25	---	87.00	50.75	1000.0	9.000	Single Line	20.0

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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



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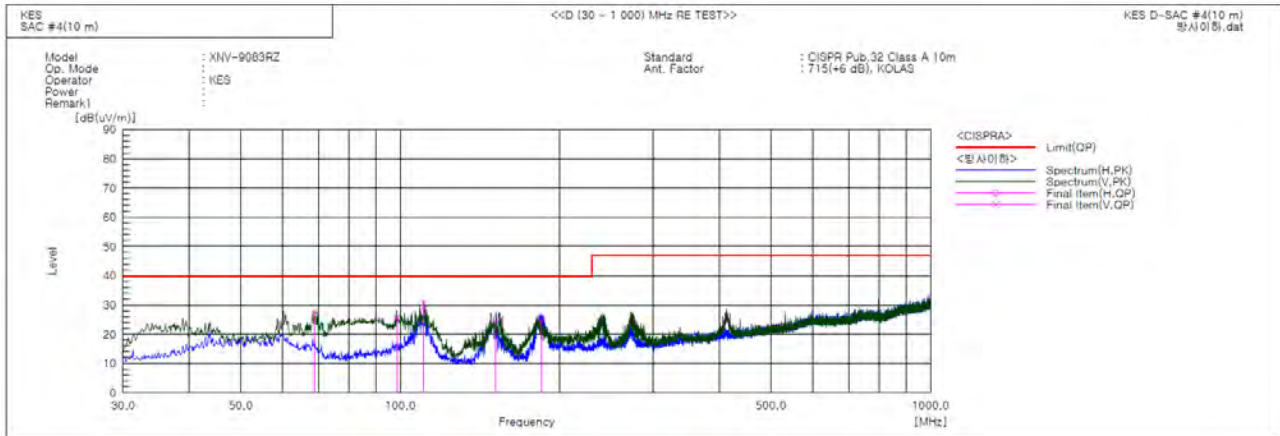
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Impulse Noise (click)

N/A

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Radiated Electric Field Emissions(Below 1 GHz)



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	68.921	V	52.0	-24.5	27.5	40.0	12.5	109.0	234.0	
2	98.506	V	48.3	-22.7	25.6	40.0	14.4	145.0	271.0	
3	110.753	V	53.1	-22.4	30.7	40.0	9.3	115.0	252.0	
4	110.755	H	50.3	-22.4	27.9	40.0	12.1	400.0	162.0	
5	151.493	H	50.5	-25.2	25.3	40.0	14.7	399.0	51.0	
6	184.473	H	48.4	-23.0	25.4	40.0	14.6	388.0	217.0	

◆ Calculation – SAC #4(10 m)

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

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

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

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



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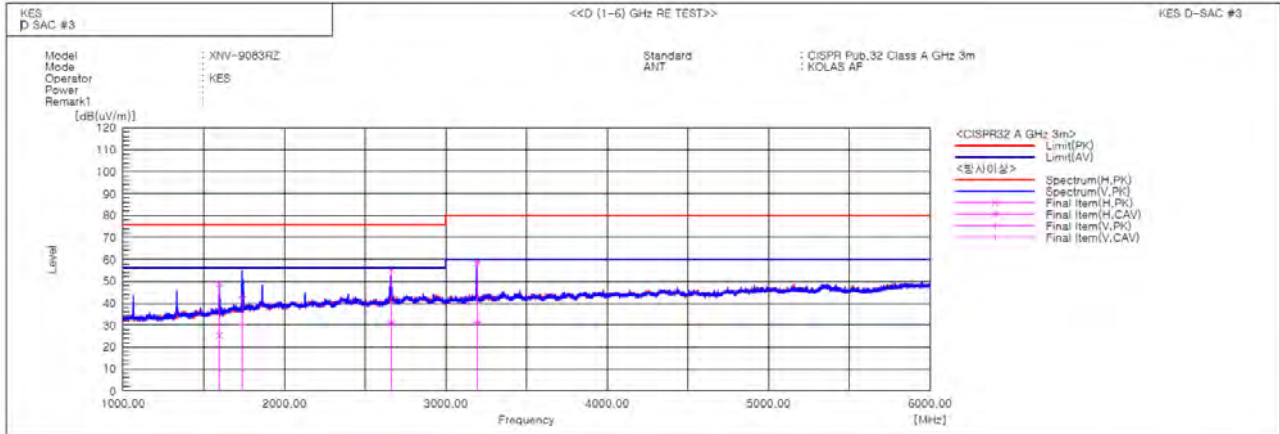
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Radiated Electric Field Emissions(Above 1 GHz)



Final Result

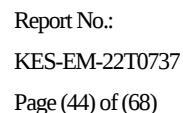
No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1596.832	H	53.8	30.2	-5.0	48.8	25.2	76.0	56.0	27.2	30.8	100.0	2.7	
2	1738.395	V	45.7	33.2	-3.0	42.7	30.2	76.0	56.0	33.3	25.8	100.0	143.3	
3	2660.390	V	54.5	29.6	1.3	55.8	30.9	76.0	56.0	20.2	25.1	100.0	57.8	
4	2660.943	H	54.2	29.7	1.3	55.5	31.0	76.0	56.0	20.5	25.0	100.0	1.1	
5	3193.489	H	55.2	28.5	3.1	58.3	31.6	80.0	60.0	21.7	28.4	100.0	62.6	
6	3193.758	V	55.4	28.2	3.1	58.5	31.3	80.0	60.0	21.5	28.7	100.0	29.6	

◆ Calculation

Over Limit [dB] = (Read Level[dB μ V] + Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line[dB μ V]

Over Limit : Margin, Read Level : Reading value, Ant Factor : ANT Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

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www.kes.co.kr

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Test Data - Voltage Fluctuations

Maximum Flicker results

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

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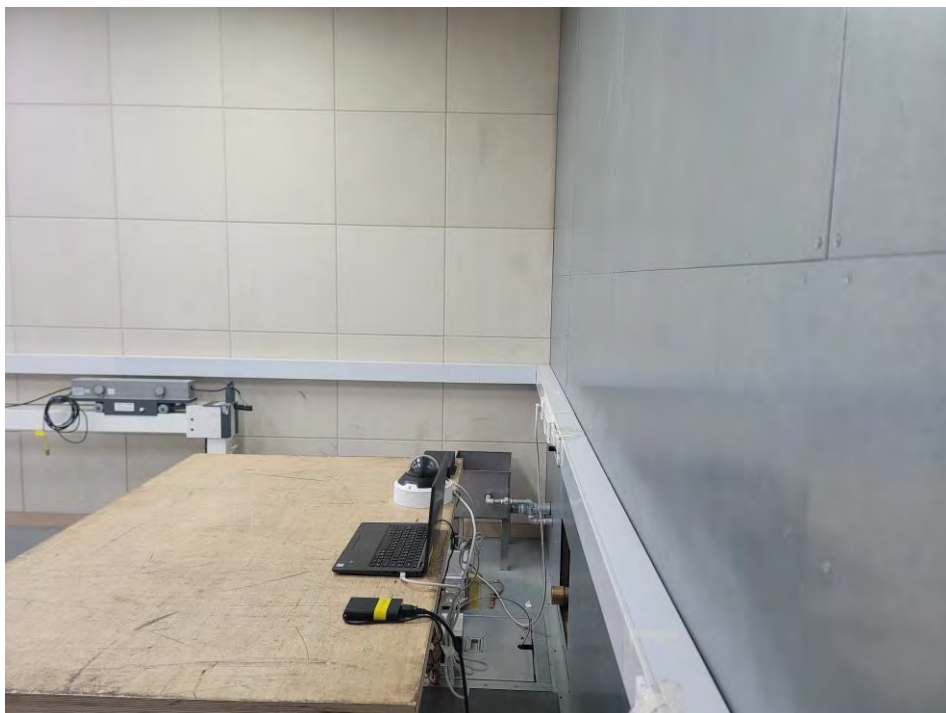
Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

N/A

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Conducted Emissions at Telecommunication Ports



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Impulse Noise (click)

N/A

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Radiated Electric Field Emissions(Below 1 GHz)



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Radiated Electric Field Emissions(Above 1 GHz)



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Harmonic Current Emissions and Voltage Fluctuations and Flicker

N/A

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Electrostatic Discharge



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Radio-frequency Electromagnetic Field



Fast Transients

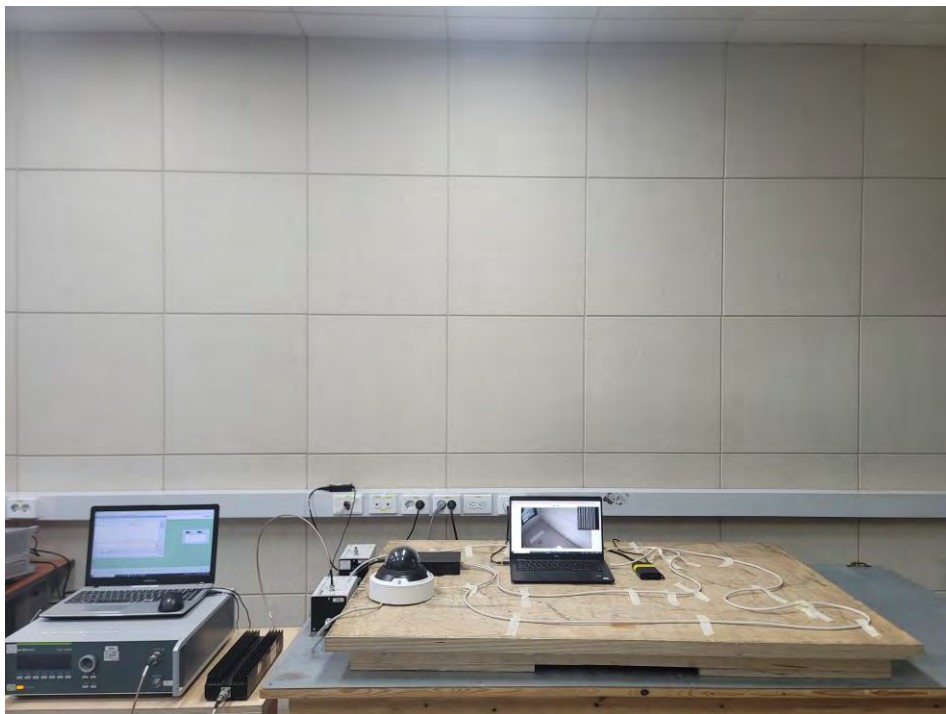


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Surges



Conducted Disturbance



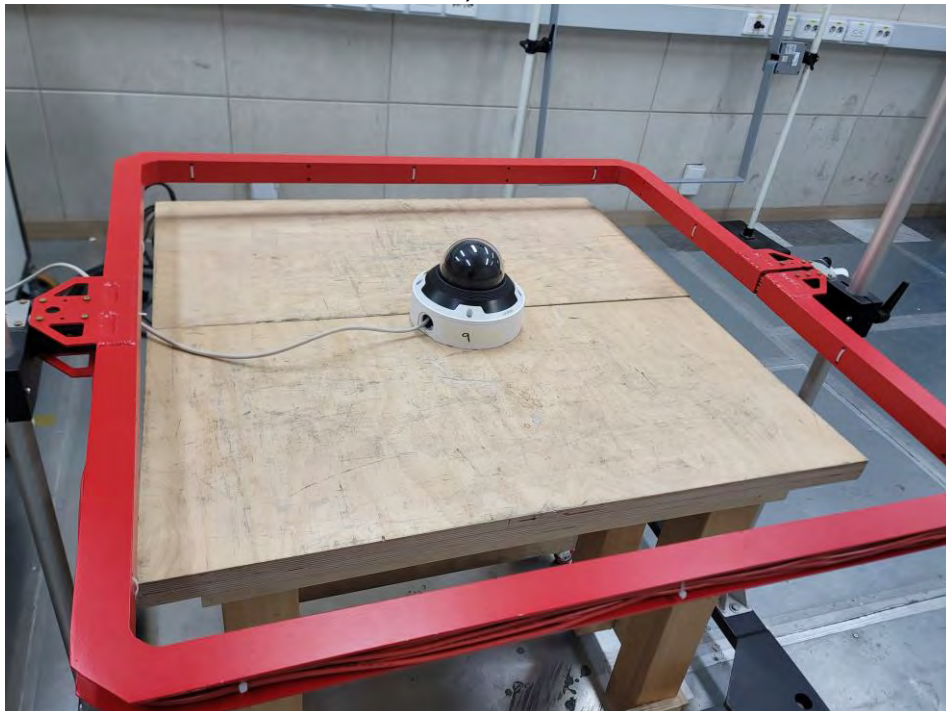
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Power Frequency Magnetic Field Immunity

16.7, 50 Hz (AC), 100 A/m



0 Hz (DC), 300 A/m



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EUT External Photographs

(Top)



(Bottom)



EUT Internal Layout Photographs

(Top View)



EUT Internal View – Board 1

(Top)



(Bottom)



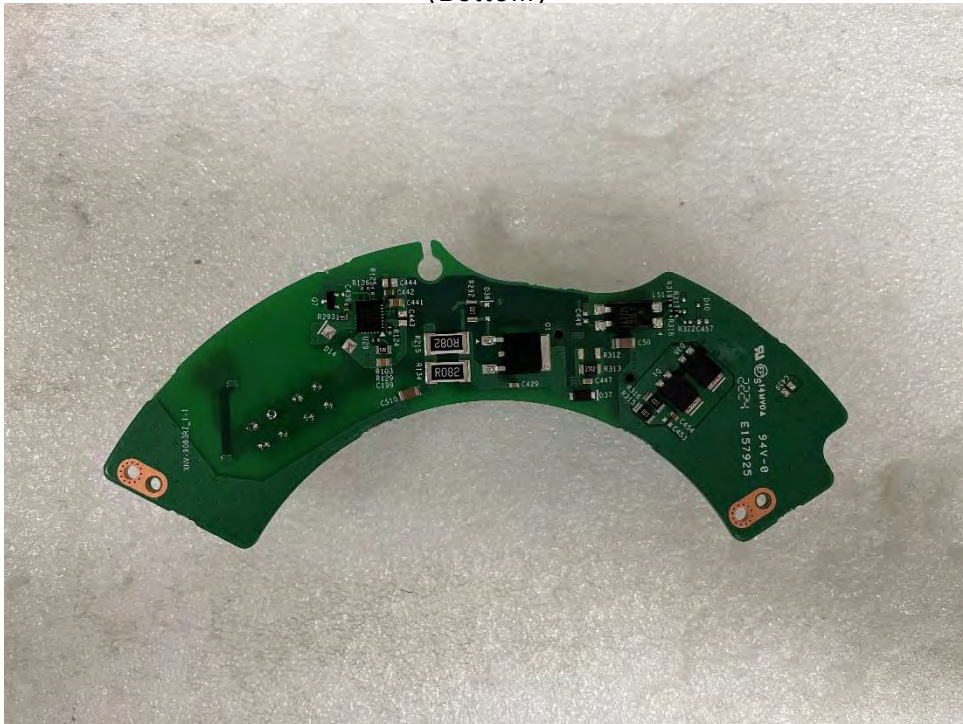
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EUT Internal View – Board 2

(Top)



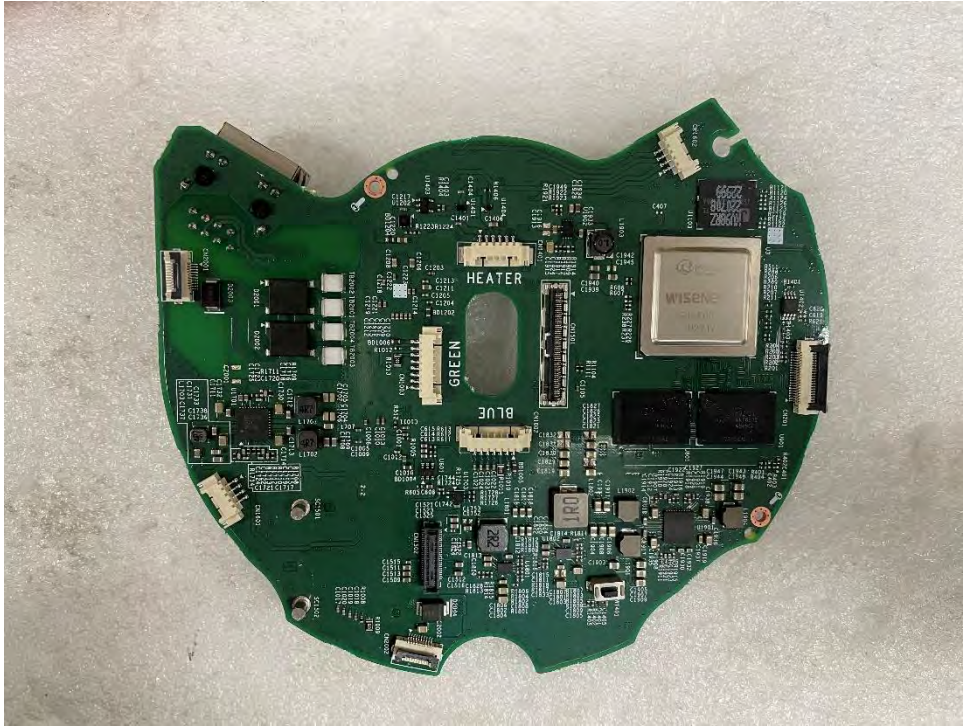
(Bottom)



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EUT Internal View – Board 3

(Top)



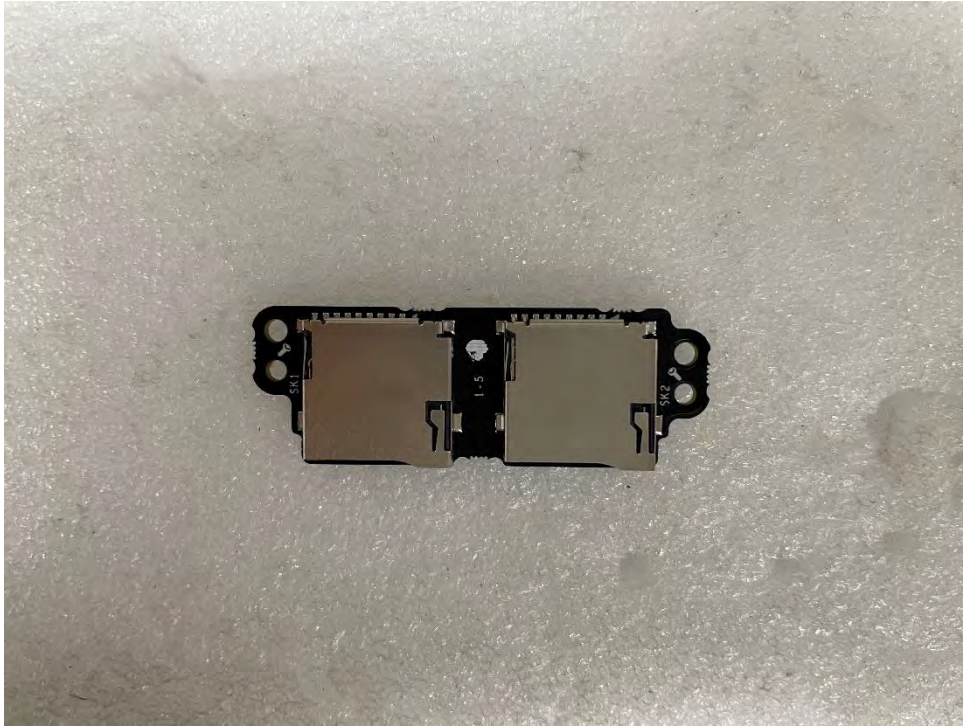
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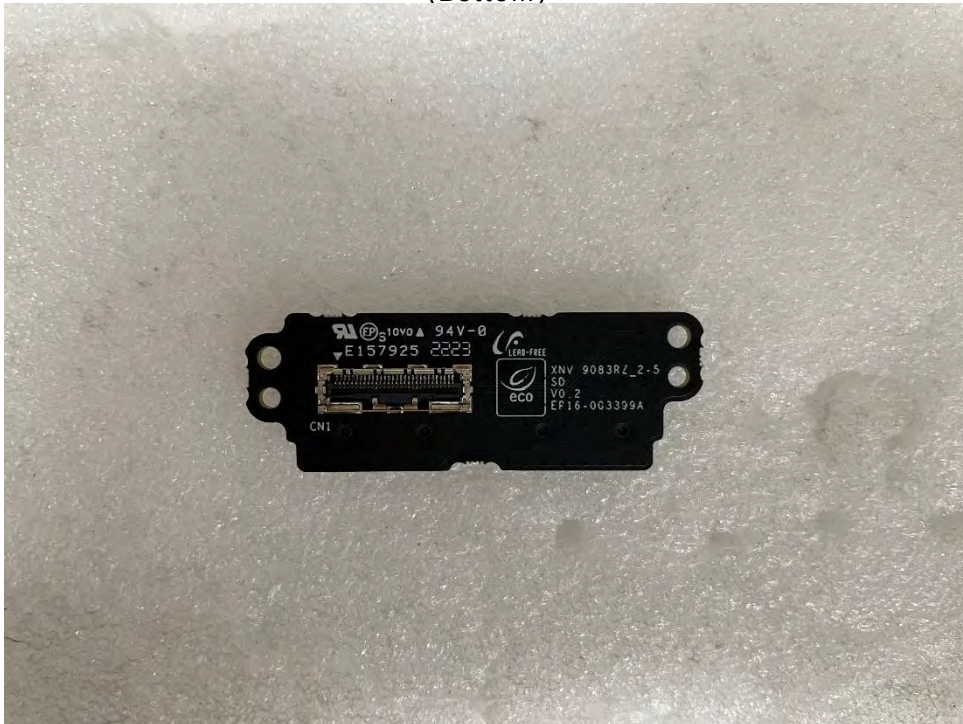
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EUT Internal View – Board 4

(Top)



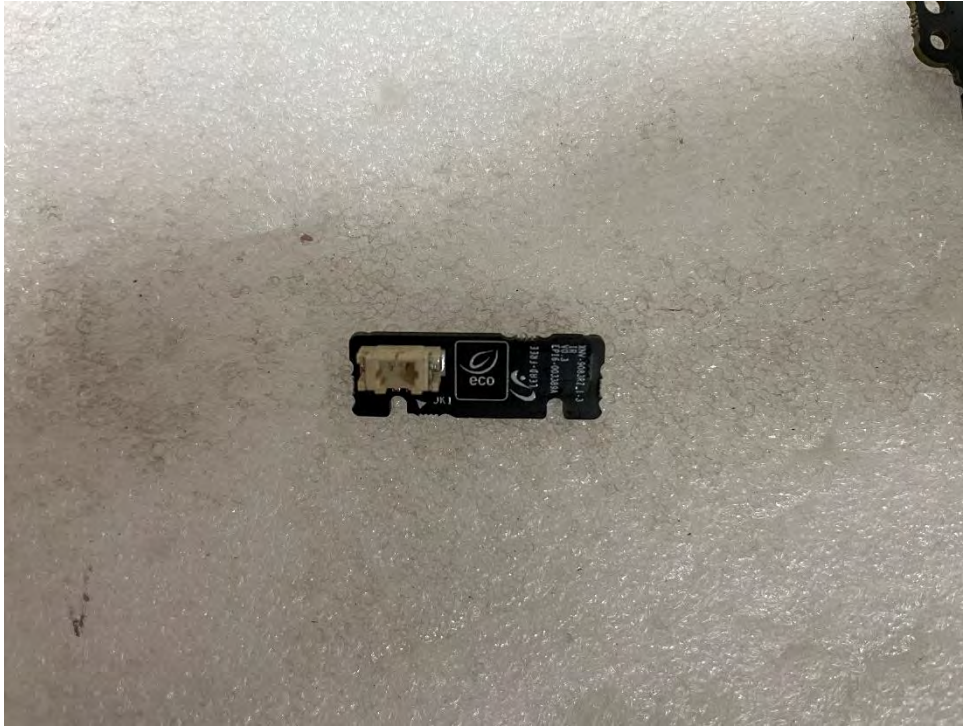
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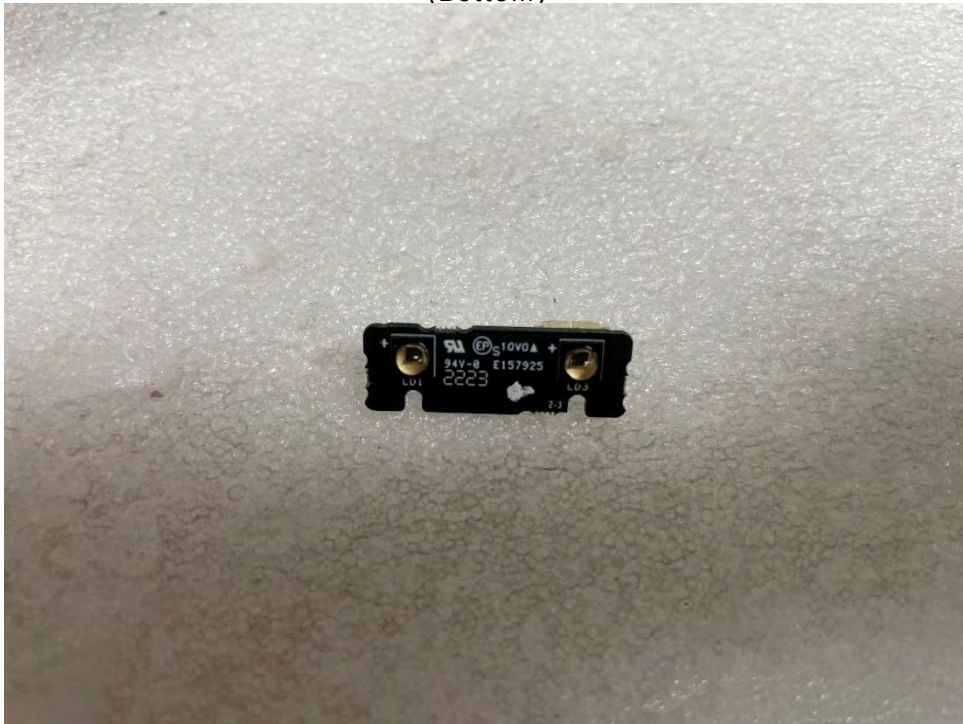
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EUT Internal View – Board 5

(Top)



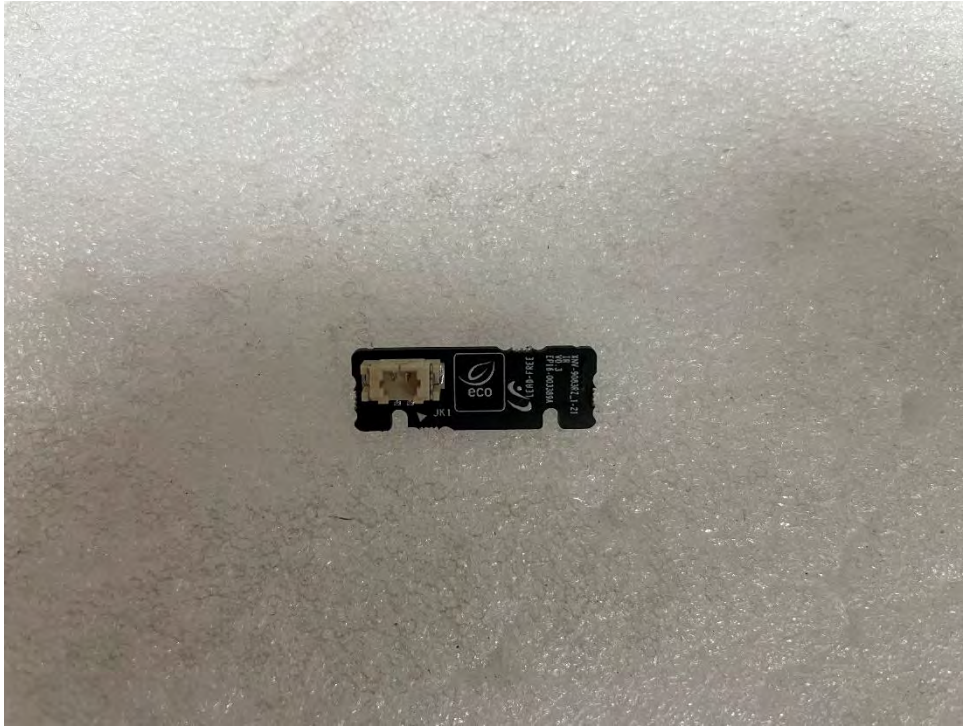
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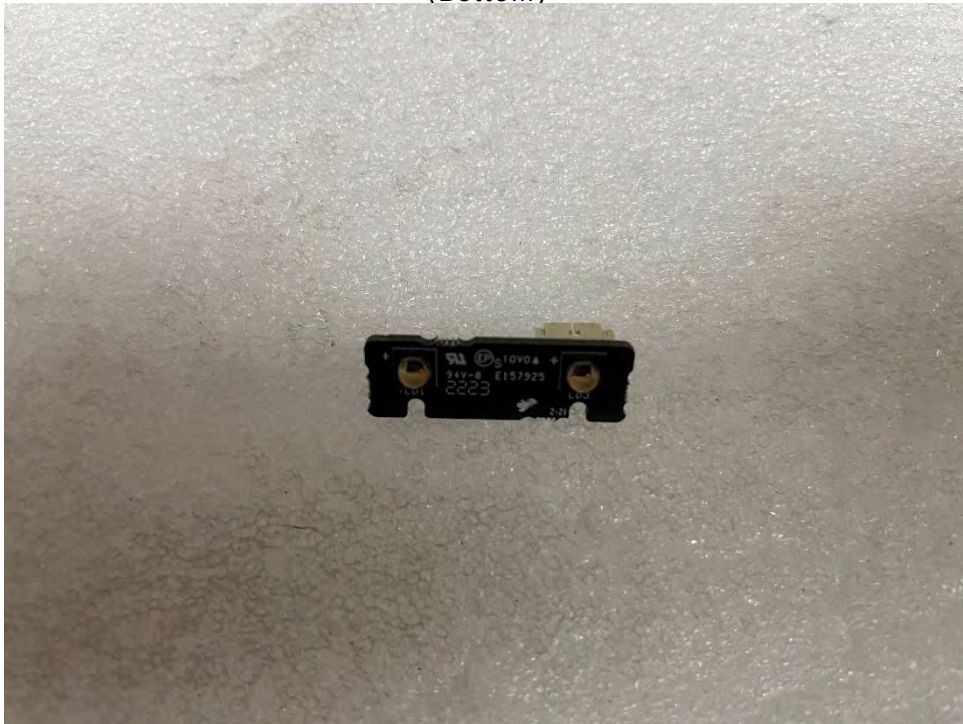
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EUT Internal View – Board 6

(Top)



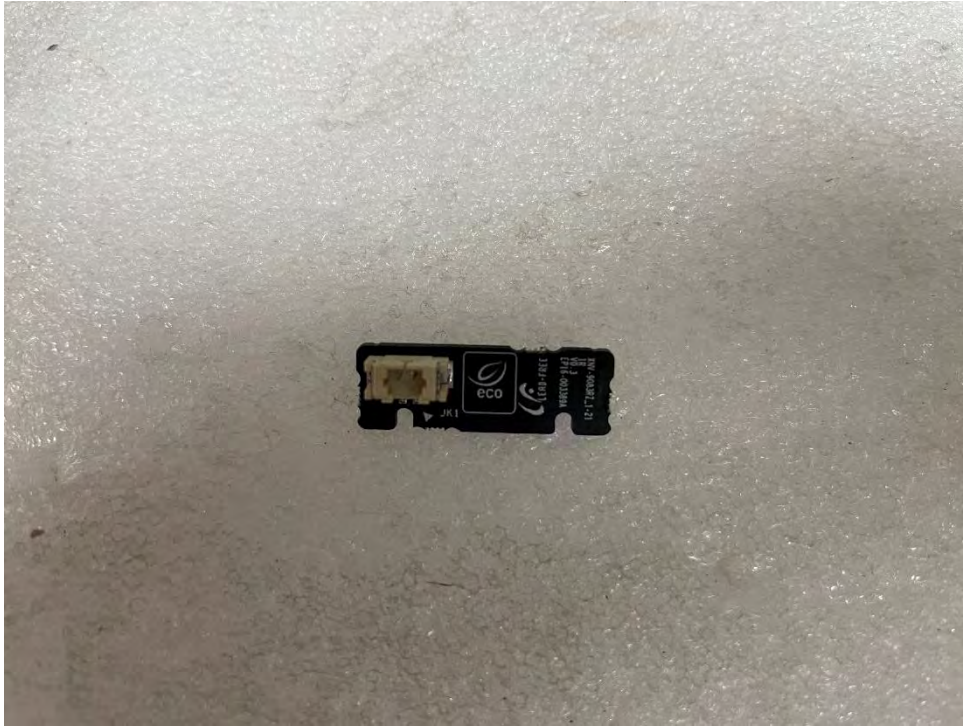
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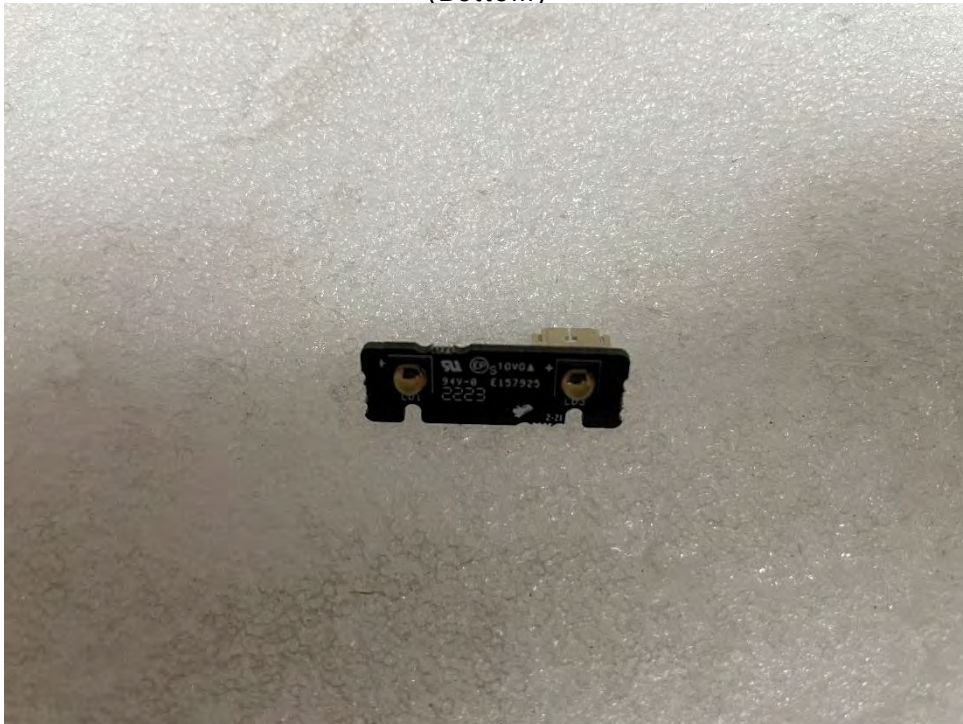
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EUT Internal View – Board 7

(Top)



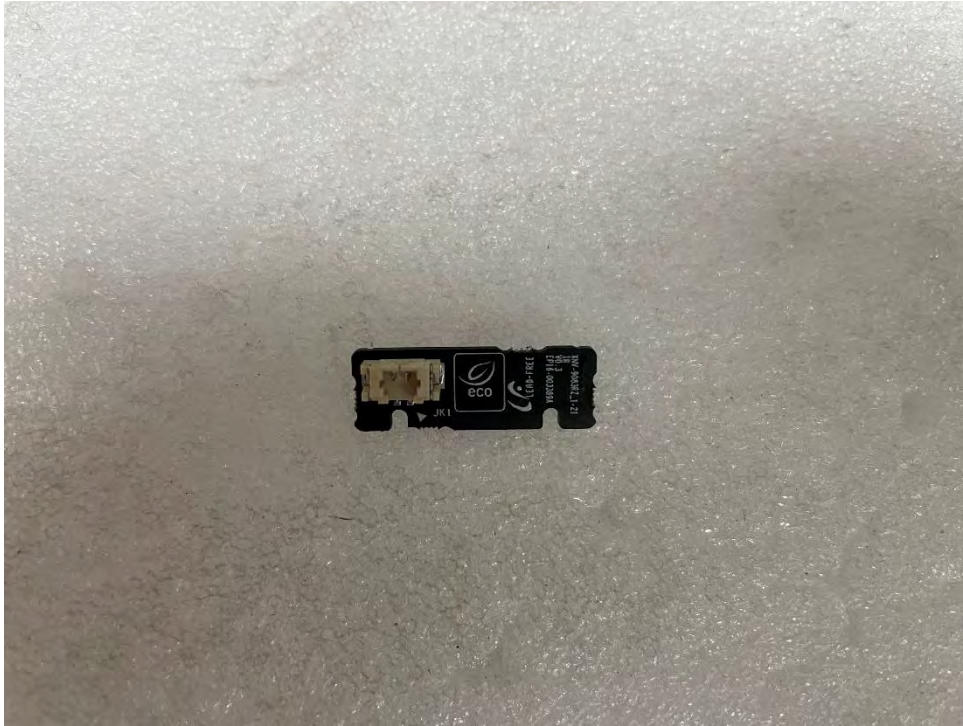
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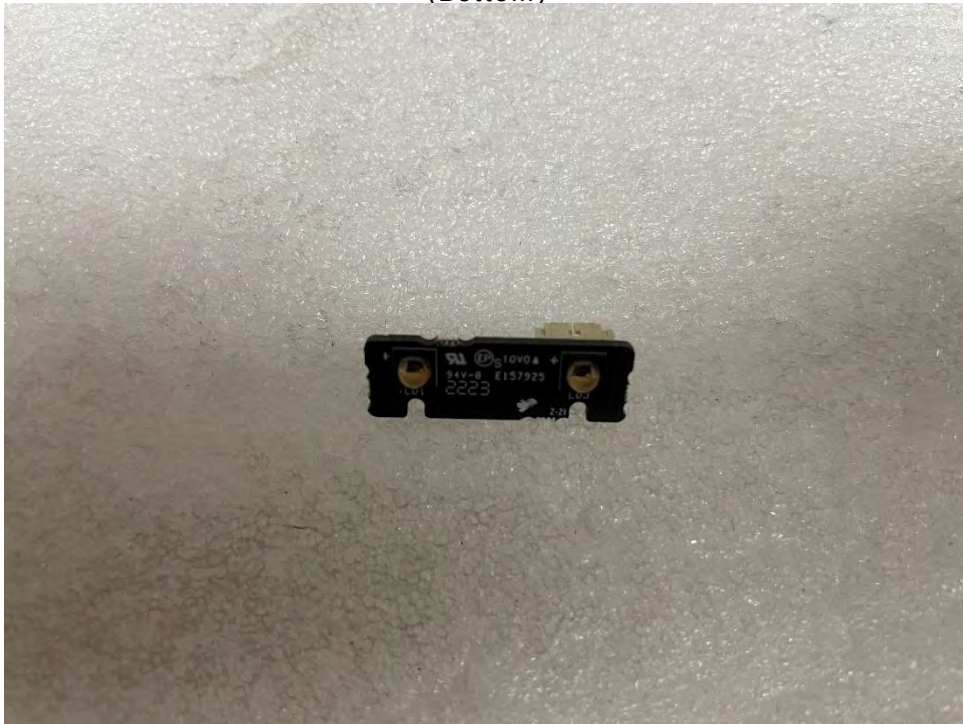
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EUT Internal View – Board 8

(Top)



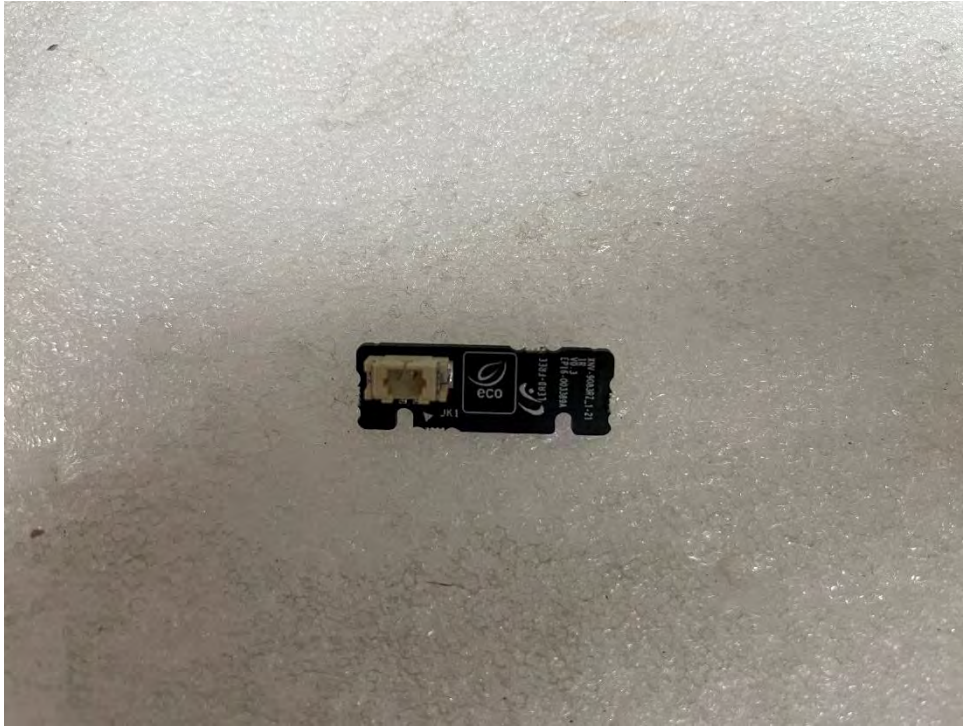
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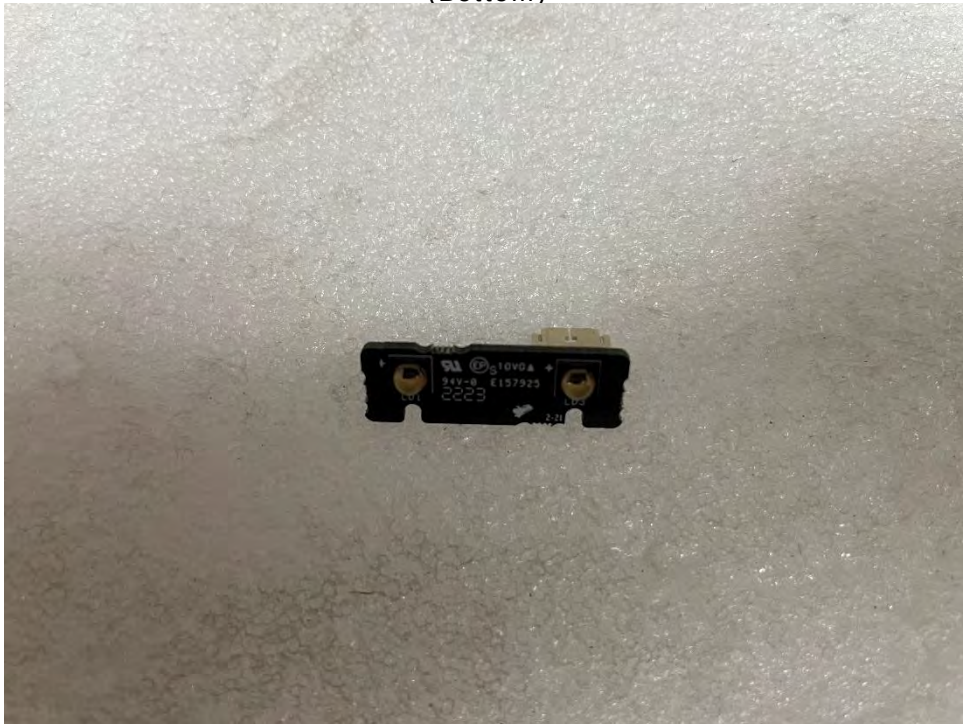
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EUT Internal View – Board 9

(Top)



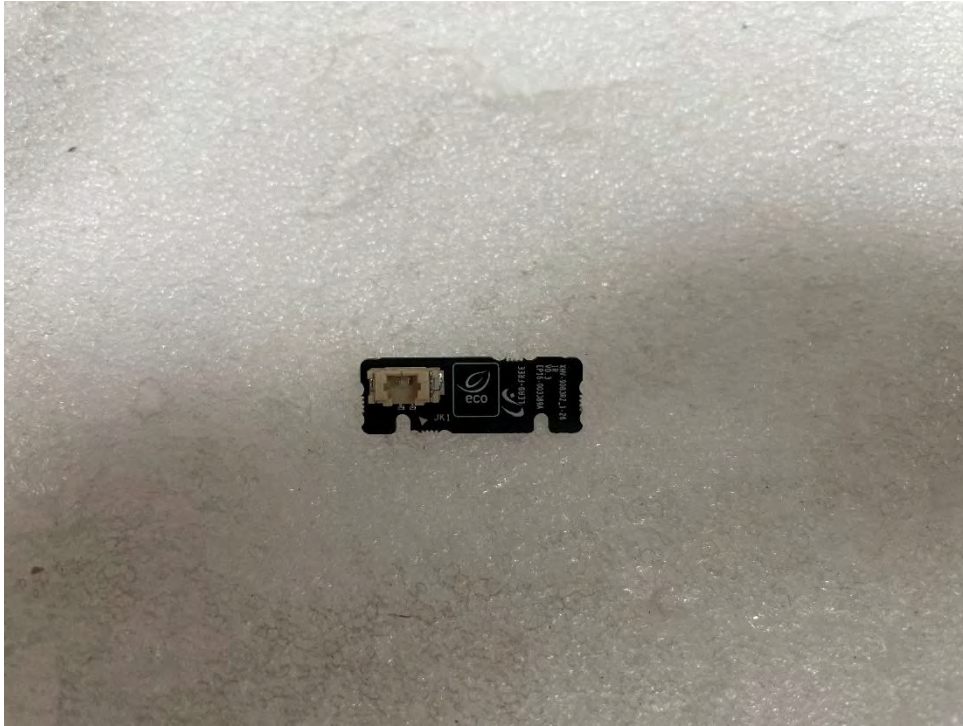
(Bottom)



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EUT Internal View – Board 10

(Top)



(Bottom)



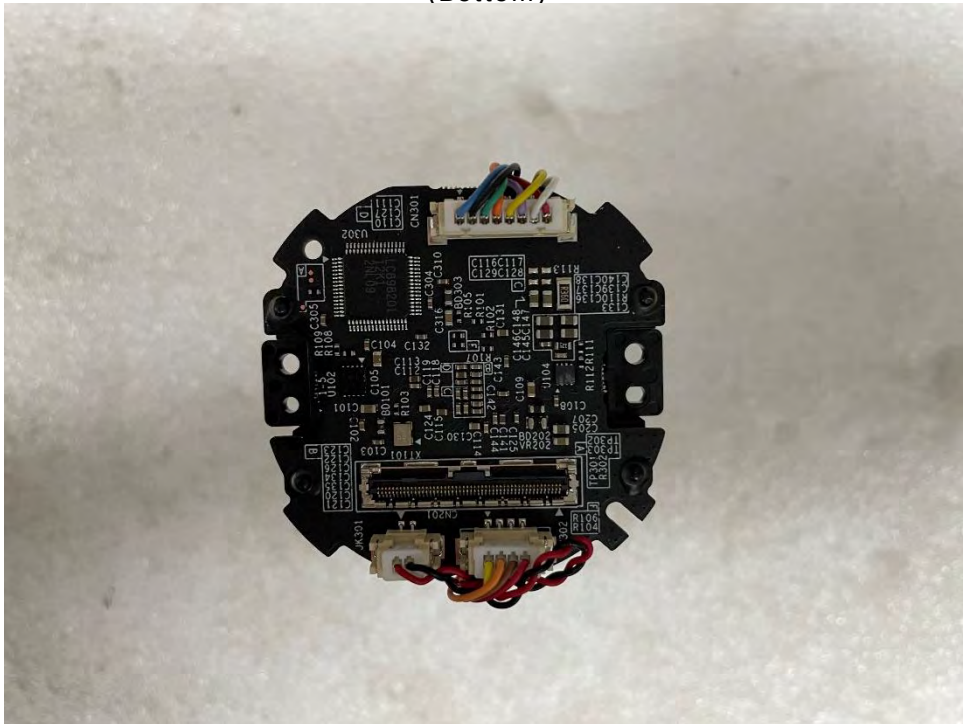
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EUT Internal View – Camera

(Top)



(Bottom)



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