



EMC TEST REPORT For CE

Test Report No. : KES-EM-21T0323
Date of Issue : May. 03, 2021
Product name : NETWORK CAMERA
Model/Type No. : TNO-7180R
Variant Model : -
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 : Apr. 12, 2021
Test date : Apr. 17, 2021 ~ Apr. 19, 2021
Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by

In Han, Kang
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.

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Report No.:
KES-EM-21T0323
Page (2) of (90)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
May. 03, 2021	KES-EM-21T0323	Issued

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TABLE OF CONTENTS

1.0	General Product Description	4
1.1	Test Voltage & Frequency	7
1.2	Variant Model Differences.....	7
1.3	Device Modifications	7
1.4	Equipment Under Test.....	7
1.5	Support Equipments	8
1.6	External I/O Cabling	9
1.7	EUT Operating Mode(s)	10
1.8	Configuration.....	11
1.9	Remarks when standards applied	12
1.10	Calibration Details of Equipment Used for Measurement	12
1.11	Test Facility	12
1.12	Laboratory Accreditations and Listings	13
2.0	Test Regulations.....	14
2.1	Conducted Emissions at Mains Power Ports	16
2.2	Conducted Emissions at Telecommunication Ports	17
2.3	Radiated Electric Field Emissions(Below 1 GHz)	18
2.4	Radiated Electric Field Emissions(Above 1 GHz)	19
2.5	Harmonic Current Emissions	20
2.6	Voltage Fluctuations and Flicker	21
3.0	Criteria for compliance	22
3.1	Electrostatic Discharge.....	24
3.2	Radiated Electric Field Immunity	31
3.3	Electrical Fast Transients/Bursts	34
3.4	Surge Transients	37
3.5	Conducted Disturbance	41
3.6	Voltage Dips and Short Interruptions	45
APPENDIX A – TEST DATA.....		48
Conducted Emissions at Mains Power Ports.....		48
Conducted Emissions at Telecommunication Ports		52
Radiated Electric Field Emissions(Below 1 GHz)		54
Radiated Electric Field Emissions(Above 1 GHz)		56
Harmonic Current Emissions and Voltage Fluctuations and Flicker		58
Test Setup Photos and Configuration		63
Conducted Emissions at Mains Power Ports.....		63
Conducted Emissions at Telecommunication Ports		65
Radiated Electric Field Emissions(Below 1 GHz)		67
Radiated Electric Field Emissions(Above 1 GHz)		69
Harmonic Current Emissions and Voltage Fluctuations and Flicker		71
Electrostatic Discharge		72
Radiated Electric Field Immunity		73
Electrical Fast Transients/Bursts		74
Surge Transients.....		75
Conducted Disturbance.....		76
Voltage Dips and Short Interruptions.....		77
EUT External Photographs.....		78
EUT Internal Photographs		79



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Report No.:
KES-EM-21T0323
Page (4) of (90)

1.0 General Product Description

Main Specifications of EUT are:

Video	
Imaging Device	1/1.8" 3MP CMOS
Effective Pixels	2048(H)x1536(V)
Min. Illumination	0.1 Lux (1/30, gain 48dB)
Video Out	CVBS: 1.0 Vp-p / 75Ω composite, 720x480(N), 720x576(P) for installation USB: Micro USB Type B, 1280x720 for installation
Lens	
Focal Length (Zoom Ratio)	6.8~120mm(18x) motorized varifocal
Max. Aperture Ratio	F1.6(Wide)~F4.13(Tele)
Angular Field of View	H: 58.5°(Wide)~3.7°(Tele)/V: 35.0°(Wide)~2.1°(Tele)
Min. Object Distance	2m
Focus Control	Simple focus, Focus save
Lens Type	DC auto iris
Mount Type	Borad in type
Operational	
IR Viewable Length	50m
License plate capture	vehicel speed : up to 250km/h, lane coverage : up to 2 lane
Camera Title	Displayed up to 85 characters
Day & Night	Auto(ICR)
Backlight Compensation	BLC, SSDR
Wide Dynamic Range	미지원
Digital Noise Reduction	SSNRV
Digital Image Stabilization	미지원 - 변경점 진행
Defog	미지원 - 변경점 진행
Motion Detection	8ea, polygonal zones
Privacy Masking	6ea, Rectangle zones - Color: Grey/Green/Red/Blue/Black/White(AI 카메라 사양 연동)
Gain Control	Support
White Balance	ATW / AWC / Manual / Indoor / Outdoor
LDC	Support
Electronic Shutter Speed	Minimum / Maximum / Anti flicker (2 ~ 1/20,000sec) / Double shutter mode
Digital PTZ	
Video Rotation	Flip, Mirror
Analytics	Defocus detection, Directional detection, Fog detection, Face detection, Motion detection, Digital auto tracking, Appear/Disappear, Enter/Exit, Loitering, Tampering, Virtual line, Audio detection
Business Intelligence	None
Serial Interface	RS-485/422(Samsung-T, Pelco-D/P, Panasonic, Bosch, AD, GE, Vicon, Honeywell)
Alarm I/O	Configurable 4 Port
Alarm Triggers	Analytics, Network disconnect, Alarm input
Alarm Events	File upload via FTP and e-mail Notification via e-mail SD/SDHC/SDXC or NAS recording at event triggers Alarm output
Audio In	Selectable(mic in/line in) Supply voltage: 2.5VDC(4mA), Input impedance: 2K Ohm
Audio Out	Line out, Max.output level: 1Vrms
IR Illuminator (Optional)	

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Report No.:
KES-EM-21T0323
Page (5) of (90)

Network	
Ethernet	RJ-45(10/100/1000BASE-T)
Video Compression	H.265/H.264: Main/Baseline/High, MJPEG
Resolution	3M 2048x1536, 1920x1080, 1280x1024, 1280x960, 1280x720, 1024x768, 800x600, 800x448, 720x576, 720x480, 640x480, 640x360, 320x240 2M 1920x1080, 1280x1024, 1280x960, 1280x720, 1024x768, 800x600, 800x448, 720x576, 720x480, 640x480, 640x360, 320x240
Max. Framerate	H.265/H.264: Max. 60fps/50fps(60Hz/50Hz) MJPEG: Max. 30fps/25fps(60Hz/50Hz)
Smart Codec	Manual(Sea area), WiseStream II
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)
Audio Compression(TBD)	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
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, PIM-SM, UPnP, Bonjour, LLDP, SRTSP
Security	HTTPS(SSL) Login Authentication Digest Login Authentication IP Address Filtering User access log 802.1X Authentication(EAP-TLS, EAP-LEAP) Device Certificate(Hanwha Techwin root CA) Secure boot TPM
Edge Storage	Micro SD/SDHC/SDXC 1slot (256GB)
Application Programming Interface	ONVIF Profile S/G/T SUNAPI(HTTP API) Wisenet open platform v3.60
Webpage Language	English, Korean, Chinese, French, Italian, Spanish, German, Japanese, Russian, Swedish, Portuguese, Czech, Polish, Turkish, Dutch, Hungarian, Greek
Web Viewer	Supported OS: Windows 7, 8.1, 10, Mac OS X 10.10, 10.11, 10.12 Recommended Browser: Google Chrome Supported Browser: MS Explore11, MS Edge, Mozilla Firefox(Window 64bit only), Apple Safari(Mac OS X only)
Memory	2048MB RAM, 256MB Flash

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Report No.:
KES-EM-21T0323
Page (6) of (90)

Environmental	
Operating Temperature / Humidity	Normal : -40°C~+55°(-40°F ~ +131°F) / Intermittent : -40°C~+60°C(-40°F ~ +140°F) Maximum Temperature based on NEMA-TS 2(2.2.7) : +74°C(+165°F) Less than 95% RH(Non-condensing)
Storage Temperature / Humidity	-50°C~+60°C / Less than 95% RH(Non-dondensing)
Certification	IP66, IK10, NEMA 4X, NEMA TS 2(2.2.8, 2.2.9)
Electrical	
Input Voltage	HPoE, 12VDC
Power Consumption	Max 48W
Mechanical	
Color / Material	White
RAL Code	RAL9003
Product dimensions / weight	W186.9 x D293.7 x H259.3 (mm) / 4.8kg

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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.

☒ AC 230 V, 50 Hz ☐ PoE

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK CAMERA	TNO-7180R	-	HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.	EUT
Fiber PoE Injector	PT-PSE109GBRO- AH-S	-	Dongguan PROCET Network Technology Co.,Ltd	EUT

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Report No.:
KES-EM-21T0323
Page (8) of (90)

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC/DC Adapter	2ACB022F	-	Channel Well Technology(Guangzhou) Co., Ltd.	-
Notebook	P95G001	8KM8HT2	Wistron Infocom (Chengdu) Company Limited	-
Notebook Adapter	LA65NS2-01	-	LITE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.	-
Alarm	-	-	-	-
Button alarm	-	-	-	-
Smartphone	A1586	-	APPLE .Inc	-
MIC	MP1000	-	-	-
Speaker	BR1000A Cuve Black 2	-	DONGGUAN EDIFIER TECHNOLOGY Co., Ltd	-
Micro SD Card	-	-	SanDisk	16 GB

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Report No.:
KES-EM-21T0323
Page (9) of (90)

1.6 External I/O Cabling

■ DC Mode

Start		END		Cable Spec.	
Description	I / O Port	Description	I / O Port	Length	Shield
NETWORK CAMERA (EUT)	RJ-45	Notebook	RJ-45	3.0	S
	Alarm OUT	Alarm	Alarm IN	3.0	U
	Alarm IN	Button alarm	Alarm OUT	3.0	U
	Audio IN	MIC	Audio IN	1.4	U
	Audio OUT	Speaker	Audio OUT	1.4	U
	SLOT	Micro SD Card	SLOT	-	-
Notebook	3.5 mm	Smartphone	3.5 mm	0.5	U

* Unshielded=U, Shielded=S

■ PoE Mode

Start		END		Cable Spec.	
Description	I / O Port	Description	I / O Port	Length	Shield
NETWORK CAMERA (EUT)	RJ-45 (PoE)	Fiber PoE Injector (EUT)	RJ-45 (PoE)	2.5	S
	Alarm OUT	Alarm	Alarm IN	3.0	U
	Alarm IN	Button alarm	Alarm OUT	3.0	U
	Audio IN	MIC	Audio IN	1.4	U
	Audio OUT	Speaker	Audio OUT	1.4	U
	SLOT	Micro SD Card	SLOT	-	-
Notebook	RJ-45 (LAN)	Fiber PoE Injector (EUT)	RJ-45 (LAN)	3.0	S
	3.5 mm	Smartphone	3.5 mm	0.5	U

* Unshielded=U, Shielded=S

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Report No.:
KES-EM-21T0323
Page (10) of (90)

1.7 EUT Operating Mode(s)

■ DC/ PoE Mode

Test Mode	operating
Operation	the test was conducted while checking the camera video output from the laptop and making sure that they operate normally while performing a ping test.

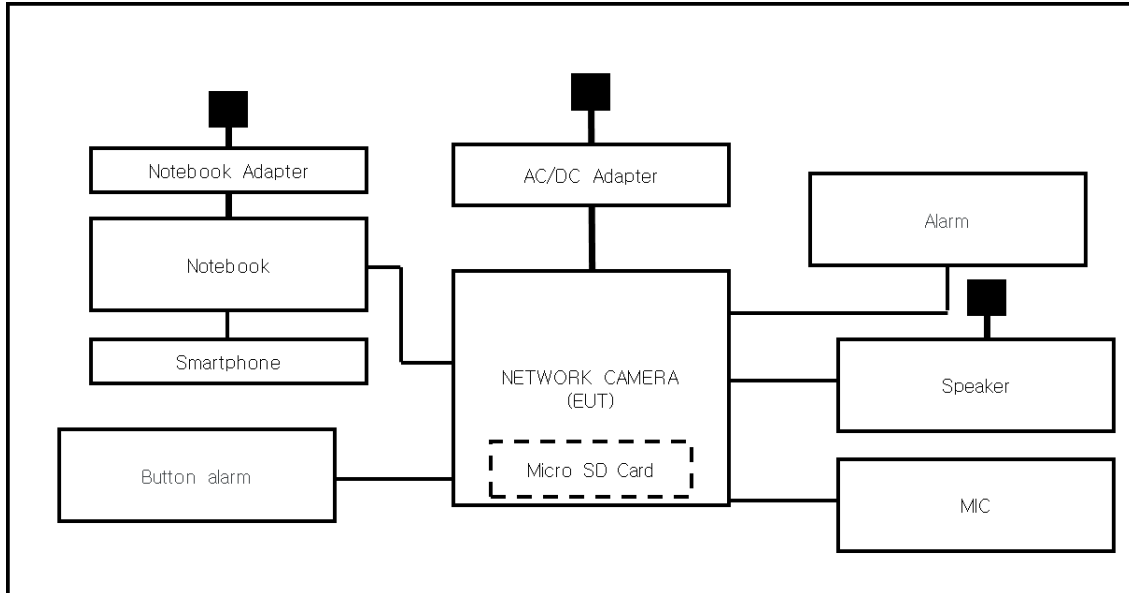
EUT Test operating S / W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Techwin Co., Ltd.

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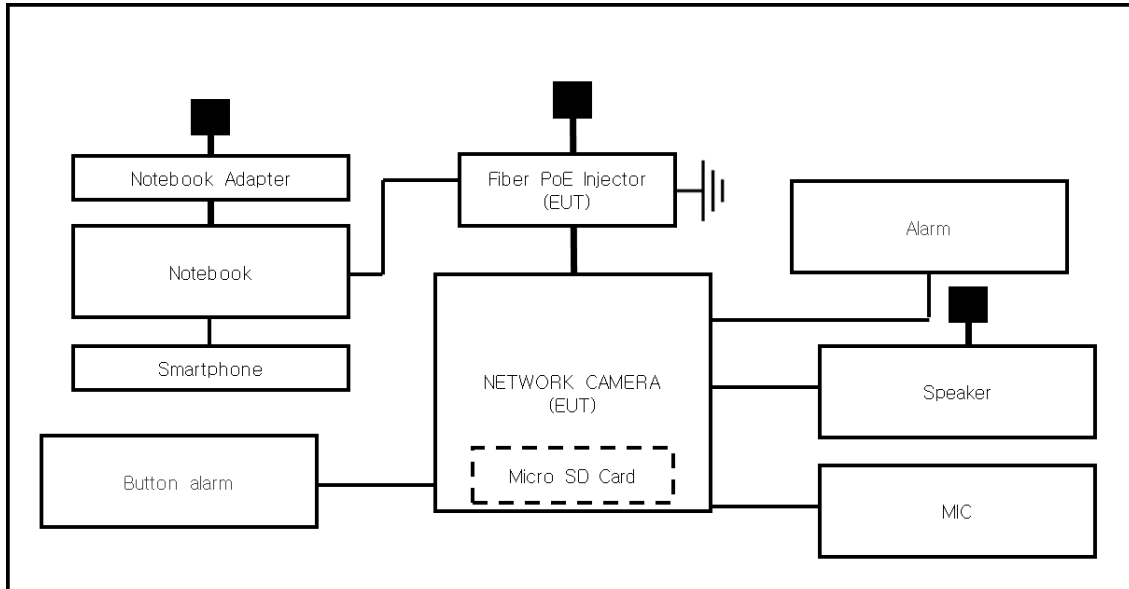
1.8 Configuration

■ AC Main
 □ DC Main

■ DC Mode



■ PoE Mode



1.9 Remarks when standards applied

USB Port and VIDEO 2 PIN Port are for administrator use and are excluded from testing.



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 16-1-4:2019

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	 23298-1
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	TÜ V SÜ D	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

2.0 Test Regulations

The emissions tests were performed according to following regulations:

- ☒ EMC – Directive 2014/30/EU
 - ☐ EN 61000-6-3:2011
 - ☐ EN 61000-6-1:2007
 - ☐ EN 61000-6-4:2007 +A1:2011
 - ☐ EN 61000-6-2:2005
 - ☐ EN 55011:2007 +A1:2010
 - ☐ EN 55014-1:2006 +A2:2011
 - ☐ EN 55014-2:1997 +A2:2008
 - ☐ EN 55015:2013
 - ☐ EN 61547:2009
 - ☒ EN 55032:2012/AC:2013
 - ☒ EN 50130-4:2011
 - ☒ EN 61000-3-2:2014
 - ☒ EN 61000-3-3:2013
 - ☐ EN 61326-1:2013
 - ☒ EMC – Regulations 2016/1091
 - ☒ BS EN 55032:2015
 - ☒ BS EN 55035:2017
 - ☒ BS EN 61000-3-2:2014
 - ☒ BS EN 61000-3-3:2013
- ☐ Group 1
☐ Class A
- ☐ Group 2
☐ Class B
- ☒ Class A ☐ Class B

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Report No.:
KES-EM-21T0323
Page (15) of (90)

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- | | | |
|---|----------------------------------|----------------------------------|
| ☐ VCCI-CISPR 32:2016 | ☐ Class A | ☐ Class B |
| ☐ AS/NZS CISPR32:2015 | ☐ Class A | ☐ Class B |
| ☐ 47 CFR Part 15, Subpart B | | |
| ☐ CISPR 22:2009 +A1:2010 | ☐ Class A | ☐ Class B |
| ☐ ANSI C63.4-2017 | ☐ Class A | ☐ Class B |
| ☐ IC Regulation ICES-003 Issue 7 | | |
| ☐ CAN/CSA CISPR 32:17 | ☐ Class A | ☐ Class B |
| ☐ ANSI C63.4-2017 | ☐ Class A | ☐ Class B |
|
☐ RE- Directive 2014/53/EU | | |
|
☐ EN 301 489-1 V1.9.2 | | |
| ☐ Equipment for fixed use | | |
| ☐ Equipment for vehicular use | | |
| ☐ Equipment for portable use | | |
|
☐ EN 301 489-3 V1.6.1 | | |
|
☐ EN 301 489-17 V2.2.1 | | |
|
☐ EN 60945:2002 | | |

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Report No.:
KES-EM-21T0323
Page (16) of (90)

2.1 Conducted Emissions at Mains Power Ports

Test Date
Apr. 17, 2021

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	01, 15, 2022
☒	LISN	ENV216	R & S	101787	12, 29, 2021
☒	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021

Test Conditions

Temperature: (23,5 ± 0,1) °C
Relative Humidity: (45,7 ± 0,2) % R.H.

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

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Report No.:
KES-EM-21T0323
Page (17) of (90)

2.2 Conducted Emissions at Telecommunication Ports

Test Date
Apr. 17, 2021

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	01, 15, 2022
☒	LISN	ENV216	R & S	101787	12, 29, 2021
☒	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021
☐	8-WIRE ISN CAT3,5	ENY81	R & S	100174	12, 30, 2021
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	12, 30, 2021
☒	ISN	ISN S8	SCHWARZBECK	ISN-S8-0019	03, 10, 2022

Test Conditions

Temperature: (23,5 ± 0,1) °C
Relative Humidity: (45,7 ± 0,2) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

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Report No.:
KES-EM-21T0323
Page (18) of (90)

2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date
Apr. 17, 2021

Test Location
☐ OPEN AREA TEST SITE #2 ☒ 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	04, 01, 2022
☒	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2021
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
☒	ATTENUATOR	8491A	HP	32173	03, 10, 2022

Test Conditions

Temperature: (23,2 ± 0,1) °C
Relative Humidity: (46,0 ± 0,3) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

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Report No.:
KES-EM-21T0323
Page (19) of (90)

2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date
Apr. 17, 2021

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	08, 05, 2021
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 07, 2022
☐	ATTENUATOR	8491A	HP	35496	03, 10, 2022
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 11, 2022

Test Conditions

Temperature: (24,0 ± 0,1) °C
Relative Humidity: (46,0 ± 0,2) % 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.

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2.5 Harmonic Current Emissions

Test Date
Apr. 17, 2021

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	04, 06, 2022
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,9 ± 0,1) °C
Relative Humidity: (45,8 ± 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

Remarks

See Appendix A for test data.



2.6 Voltage Fluctuations and Flicker

Test Date
Apr. 17, 2021

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	04, 06, 2022
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,9 ± 0,1) °C
Relative Humidity: (45,8 ± 0,2) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 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
Apr. 18, 2021

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	02, 01, 2022
☒	HCP	-	KES	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions

Temperature: (23,7 ± 0,2) °C
Relative Humidity: (45,9 ± 0,3) % R.H.
Atmospheric Pressure: (100,0 ± 0,1) 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

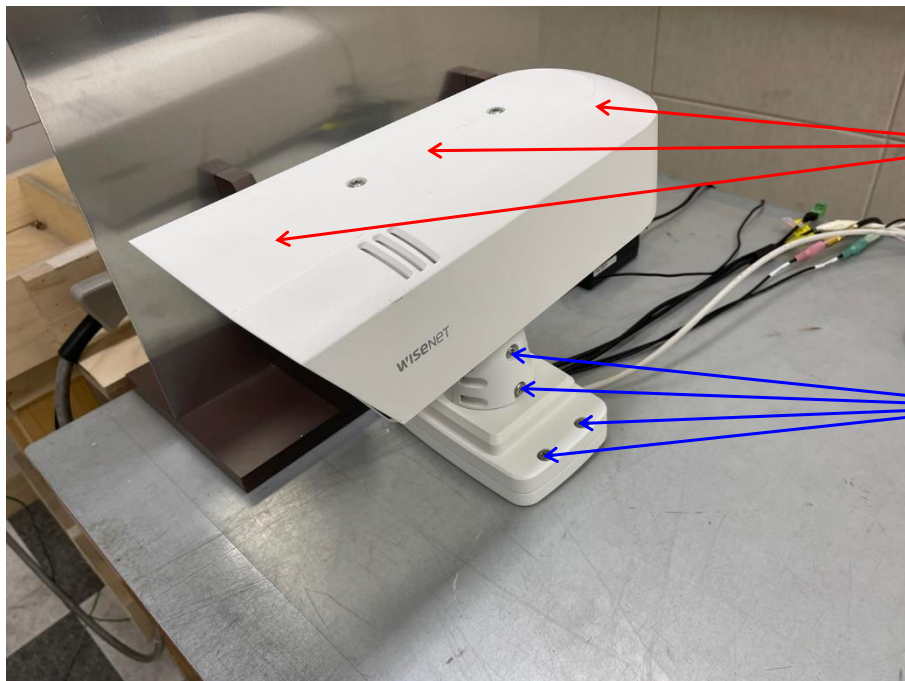
Required Performance Criteria: ☒ Complied

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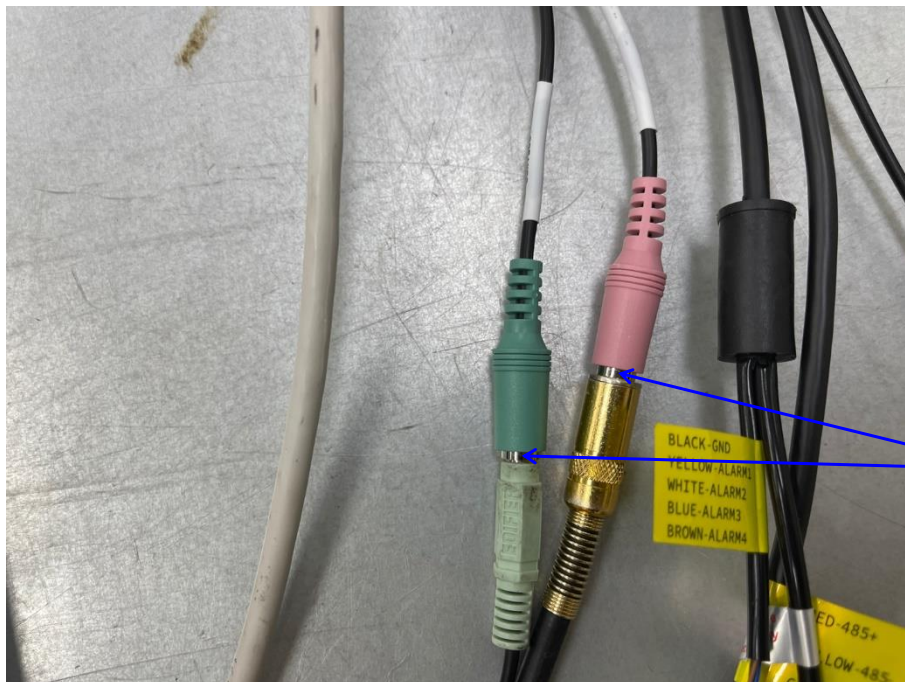
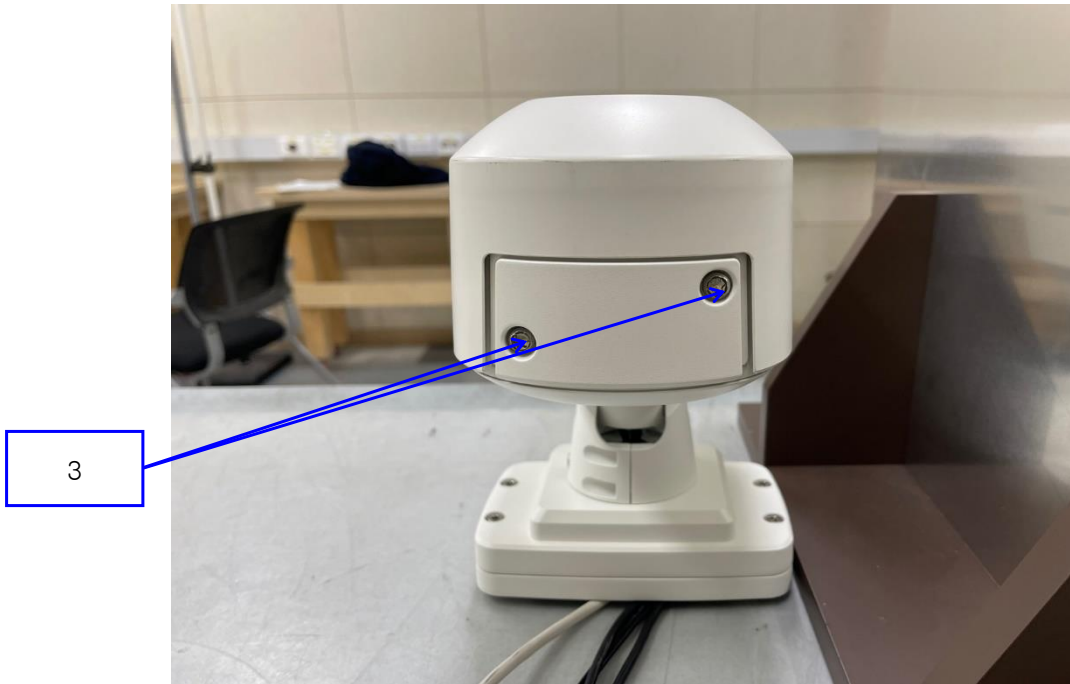
Location of Discharge:

■ DC Mode

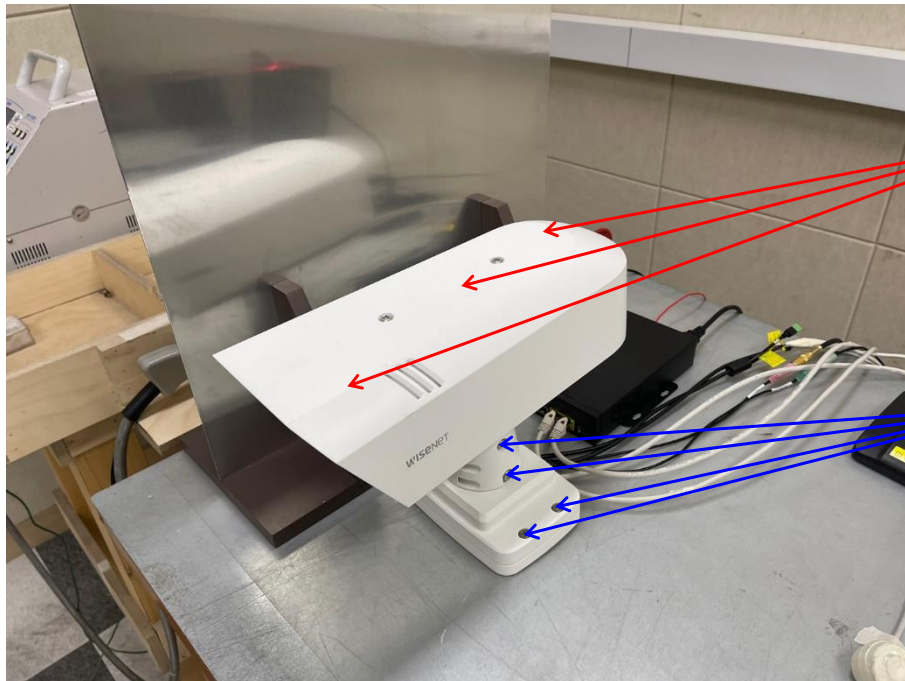
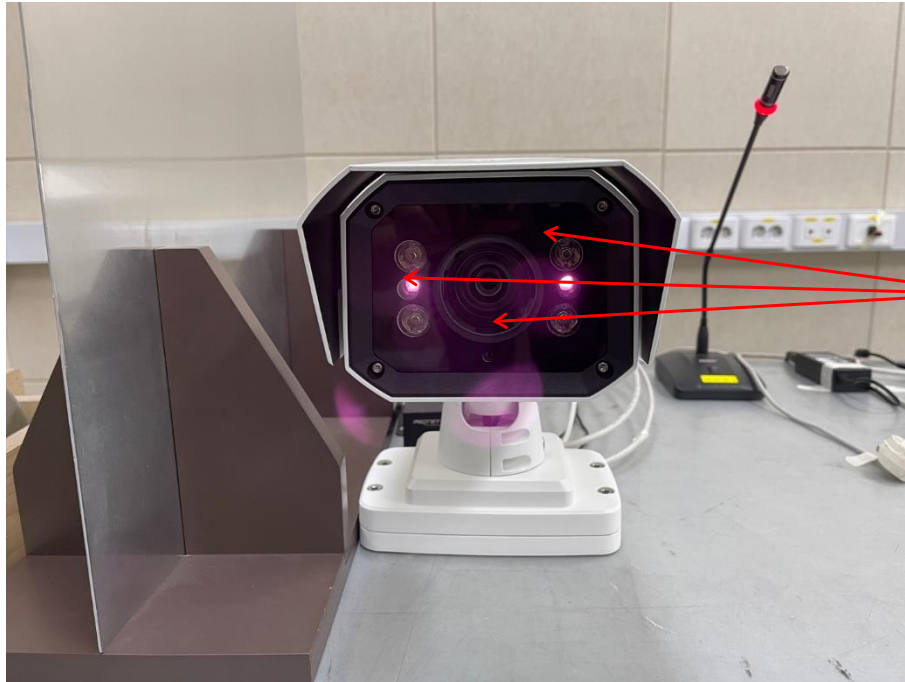
Air
Contact



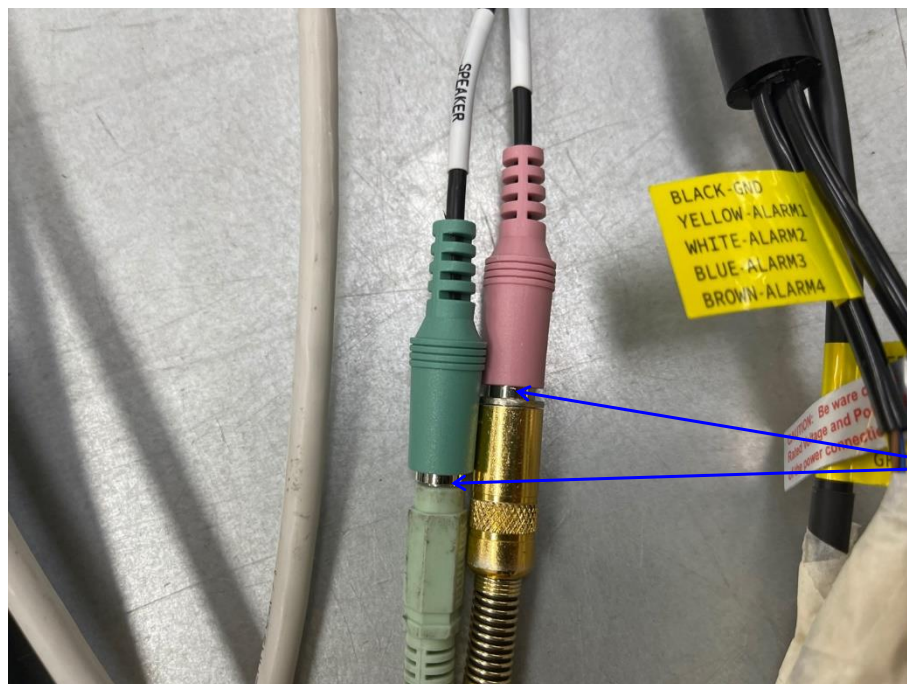
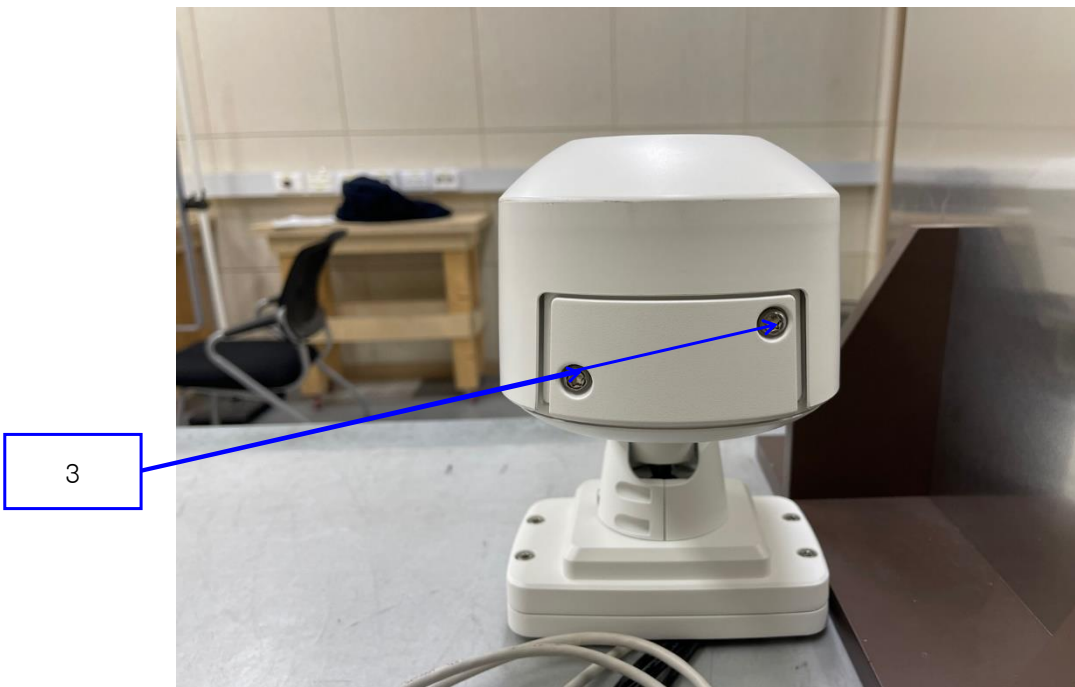
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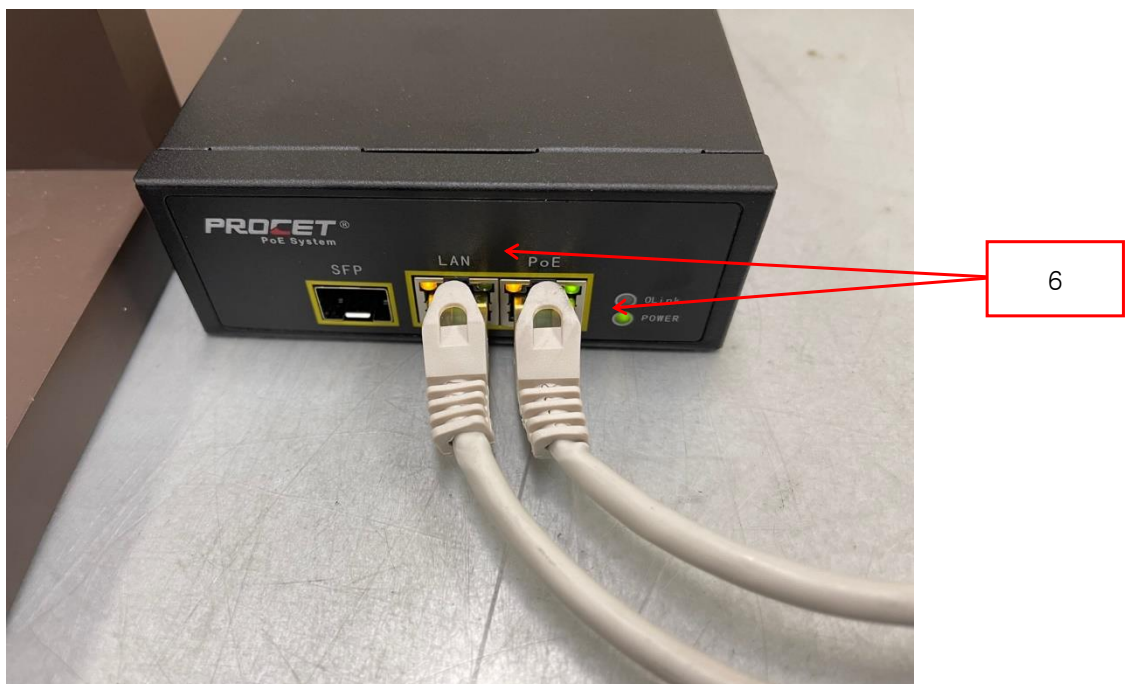
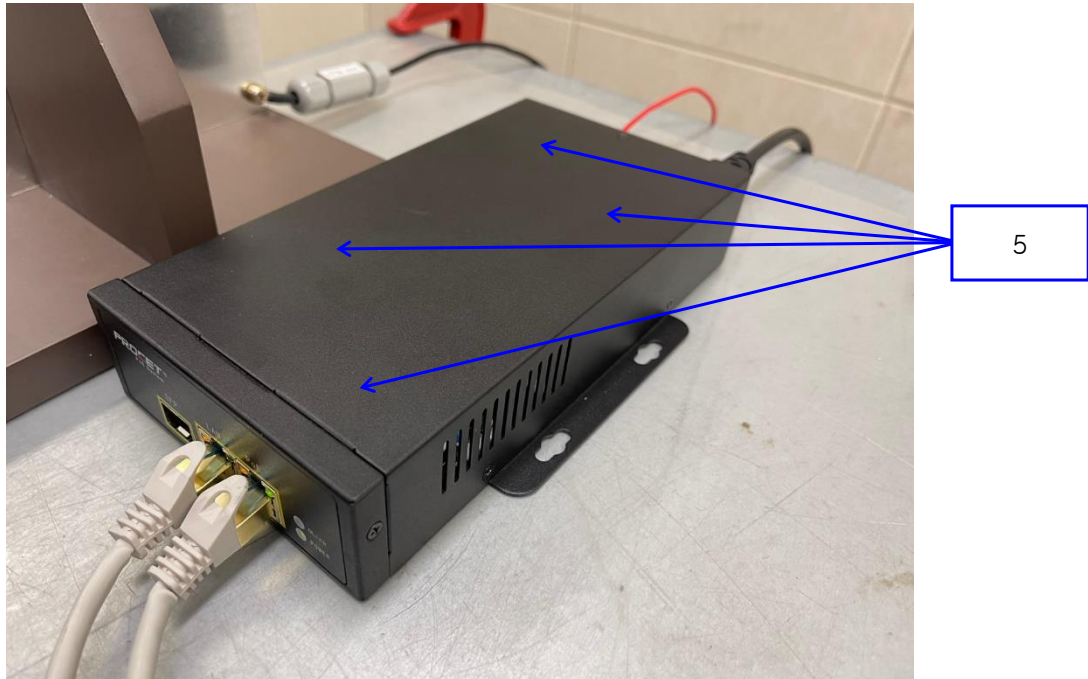


■ PoE Mode



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Report No.:
KES-EM-21T0323
Page (30) of (90)

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	Lens	Air Discharge	Complied	-
2	Enclosure	Air Discharge	Complied	-
3	Screw	Contact Discharge	Complied	-
4	Port	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	Lens	Air Discharge	Complied	-
2	Enclosure	Air Discharge	Complied	-
3	Screw	Contact Discharge	Complied	-
4	Port	Contact Discharge	Complied	-
5	PoE Enclosure	Contact Discharge	Complied	-
5	Around Port	Air 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

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Report No.:
KES-EM-21T0323
Page (31) of (90)

3.2 Radiated Electric Field Immunity

Reference Standard
EN 61000-4-3:2006 +A2:2010

Test Date
Apr. 19, 2021

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	9.12.00	-
☒	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 05, 2021
☒	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
☒	POWER METER	E4419B	Agilent	GB40203000	04, 01, 2022
☒	CW POWER SENSOR	E4412A	Agilent	US38488240	04, 01, 2022
☒	CW POWER SENSOR	E4412A	Agilent	MY41501662	04, 01, 2022
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM, INC	781	03, 11, 2022

Test Conditions

Temperature: (23,9 ± 0,1) °C
Relative Humidity: (46,2 ± 0,3) % R.H.
Atmospheric Pressure: (100,3 ± 0,1) kPa

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Report No.:
KES-EM-21T0323
Page (32) of (90)

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

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Report No.:
KES-EM-21T0323
Page (33) of (90)

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

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3.3 Electrical Fast Transients / Bursts

Reference Standard
EN 61000-4-4:2012

Test Date
Apr. 18, 2021

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	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 26, 2021

Test Conditions

Temperature: (23,7 ± 0,2) °C
Relative Humidity: (45,9 ± 0,3) % R.H.
Atmospheric Pressure: (100,0 ± 0,1) kPa

Test Specifications

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

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

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☐ 5 kHz ☒ 100 kHz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ Complied

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Report No.:
KES-EM-21T0323
Page (35) of (90)

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
PE	-	-
L – N	Complied	Complied
L – PE	-	-
N – PE	-	-
L – N – PE	-	-

☐ 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
Alarm IN	Complied	Complied
Alarm OUT	Complied	Complied

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■ PoE Mode

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

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

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Report No.:
KES-EM-21T0323
Page (37) of (90)

3.4 Surge Transients

Reference Standard
EN 61000-4-5:2014

Test Date
Apr. 18, 2021

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	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021
☒	CDN	CNV 508N1	EM TEST	P1610176296	11, 27, 2021

Test Conditions

Temperature: (23,7 ± 0,2) °C
Relative Humidity: (45,9 ± 0,3) % R.H.
Atmospheric Pressure: (100,0 ± 0,1) kPa

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Report No.:
KES-EM-21T0323
Page (38) of (90)

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

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Report No.:
KES-EM-21T0323
Page (39) of (90)

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

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Report No.:
KES-EM-21T0323
Page (40) of (90)

■ PoE 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)
L – PE	Complied	Complied
N – PE	Complied	Complied

Signal Lines☒ **Line to Earth – Common Mode**

Mode of Application	Coupling Method	Observations	
		(+) Surge (kV)	(-) Surge (kV)
RJ-45 (LAN)	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
☐ NOT APPLICABLE

Remarks

PASS Required Performance Criteria



3.5 Conducted Disturbance

Reference Standard
EN 61000-4-6:2014

Test Date
Apr. 19, 2021

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	5.3.11	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 25, 2021
☒	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 25, 2021
☒	CDN	CDN M016	TESEQ	43694	11, 25, 2021
☒	CDN	CDN M016	TESEQ	43697	11, 25, 2021
☒	CDN	CDN ST08A	TESEQ	43886	11, 25, 2021
☒	EM CLAMP	KEMZ 801A	TESEQ	44099	11, 26, 2021

Test Conditions

Temperature: (23,5 ± 0,1) °C
Relative Humidity: (45,6 ± 0,2) % R.H.
Atmospheric Pressure: (100,2 ± 0,0) kPa



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Report No.:
KES-EM-21T0323
Page (42) of (90)

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

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Report No.:
KES-EM-21T0323
Page (43) of (90)

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
Alarm IN	Clamp	Complied
Alarm OUT	Clamp	Complied

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Report No.:
KES-EM-21T0323
Page (44) of (90)

■ PoE Mode☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L - N - PE	-	-

☐ 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 (LAN)	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 61000-4-11:2004

Test Date
Apr. 18, 2021

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	5.4.7	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
☒	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021

Test Conditions

Temperature: (23,7 ± 0,2) °C
Relative Humidity: (45,9 ± 0,3) % R.H.
Atmospheric Pressure: (100,0 ± 0,1) kPa

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Report No.:
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Page (46) of (90)

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>
☒ 20 % dip	☒ 250 / 5 000	<u>Complied</u>
☒ 30 % dip	☒ 25 / 500	<u>Complied</u>
☒ 60 % dip	☒ 10 / 200	<u>Complied</u>
☒ 100 % dip	☒ 250 / 5 000	<u>Degradation</u>

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 195.5 V (ac)	<u>Complied</u>

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Report No.:
KES-EM-21T0323
Page (47) of (90)

■ PoE Mode**- Voltage Dips and Short Interruptions**

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

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 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(100%, 250cycle), EUT was turned off but after the test, it was recovered by no operator's intervention.

APPENDIX A – TEST DATA

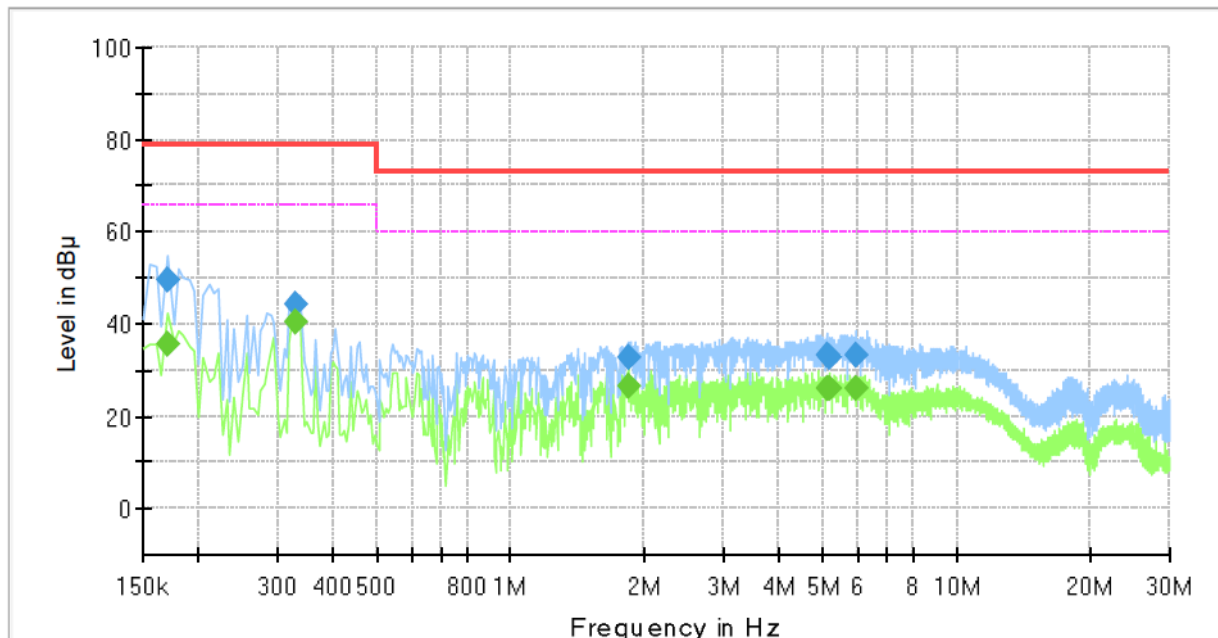
Conducted Emissions at Mains Power Ports

■ DC Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-7180R
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)
0.170000	---	35.59	66.00	30.41	1000.0	9.000	L1	19.4
0.170000	49.75	---	79.00	29.25	1000.0	9.000	L1	19.4
0.330000	---	40.33	66.00	25.67	1000.0	9.000	L1	19.5
0.330000	44.13	---	79.00	34.87	1000.0	9.000	L1	19.5
1.830000	---	26.66	60.00	33.34	1000.0	9.000	L1	20.3
1.830000	32.69	---	73.00	40.31	1000.0	9.000	L1	20.3
5.105000	---	26.22	60.00	33.78	1000.0	9.000	L1	19.6
5.105000	33.09	---	73.00	39.91	1000.0	9.000	L1	19.6
5.195000	---	26.11	60.00	33.89	1000.0	9.000	L1	19.6
5.195000	32.78	---	73.00	40.22	1000.0	9.000	L1	19.6
5.950000	---	26.16	60.00	33.84	1000.0	9.000	L1	19.5
5.950000	33.35	---	73.00	39.65	1000.0	9.000	L1	19.5

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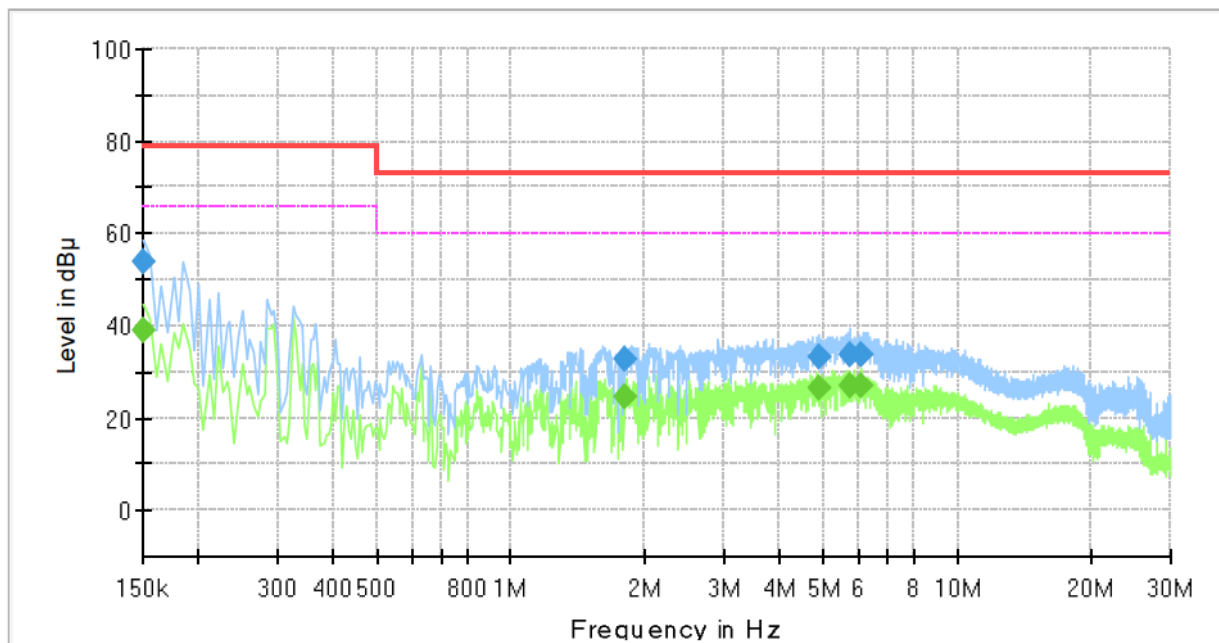
3701, 40, Simin-daero 365beon-gil,
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Report No.:
KES-EM-21T0323
Page (49) of (90)

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-7180R
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)
0.150000	---	38.92	66.00	27.08	1000.0	9.000	N	19.4
0.150000	54.06	---	79.00	24.94	1000.0	9.000	N	19.4
1.795000	---	24.55	60.00	35.45	1000.0	9.000	N	20.3
1.795000	32.84	---	73.00	40.16	1000.0	9.000	N	20.3
4.890000	---	26.74	60.00	33.26	1000.0	9.000	N	19.7
4.890000	33.18	---	73.00	39.82	1000.0	9.000	N	19.7
5.765000	---	27.03	60.00	32.97	1000.0	9.000	N	19.5
5.765000	33.63	---	73.00	39.37	1000.0	9.000	N	19.5
6.120000	---	27.09	60.00	32.91	1000.0	9.000	N	19.5
6.120000	33.86	---	73.00	39.14	1000.0	9.000	N	19.5

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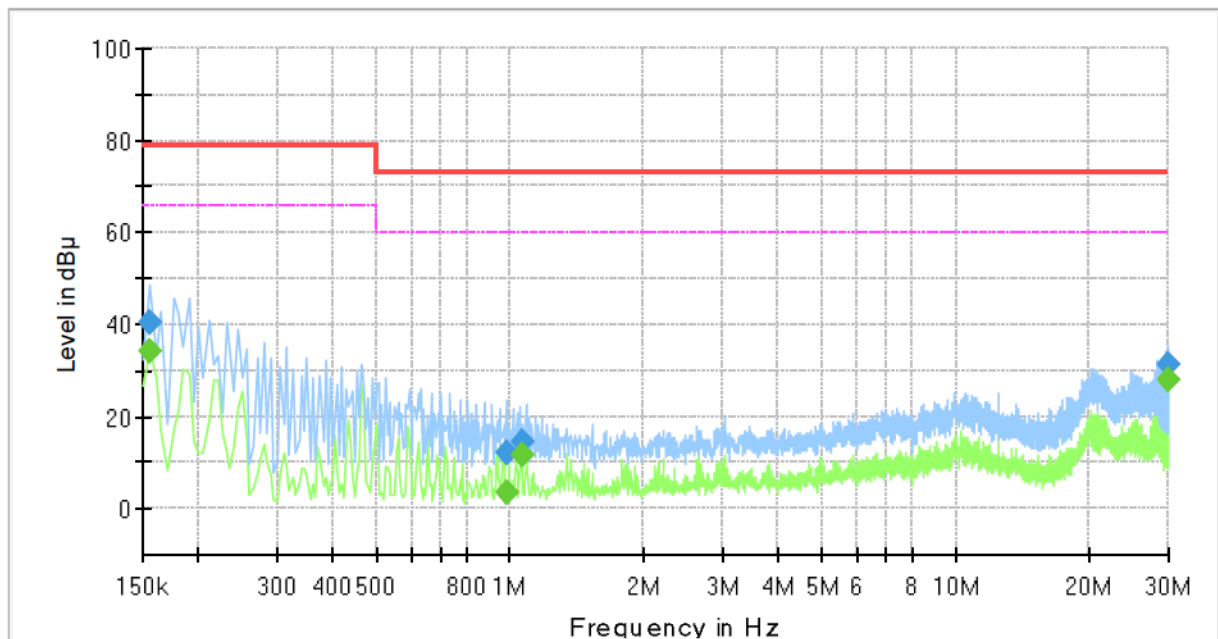
Report No.:
KES-EM-21T0323
Page (50) of (90)

■ PoE Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-7180R
Phase:	L1
Mode:	PoE
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	---	34.03	66.00	31.97	1000.0	9.000	L1	19.4
0.155000	40.63	---	79.00	38.37	1000.0	9.000	L1	19.4
0.980000	---	3.39	60.00	56.61	1000.0	9.000	L1	20.0
0.980000	12.26	---	73.00	60.74	1000.0	9.000	L1	20.0
1.060000	---	11.45	60.00	48.55	1000.0	9.000	L1	20.1
1.060000	14.36	---	73.00	58.64	1000.0	9.000	L1	20.1
29.925000	---	27.83	60.00	32.17	1000.0	9.000	L1	20.4
29.925000	31.23	---	73.00	41.77	1000.0	9.000	L1	20.4

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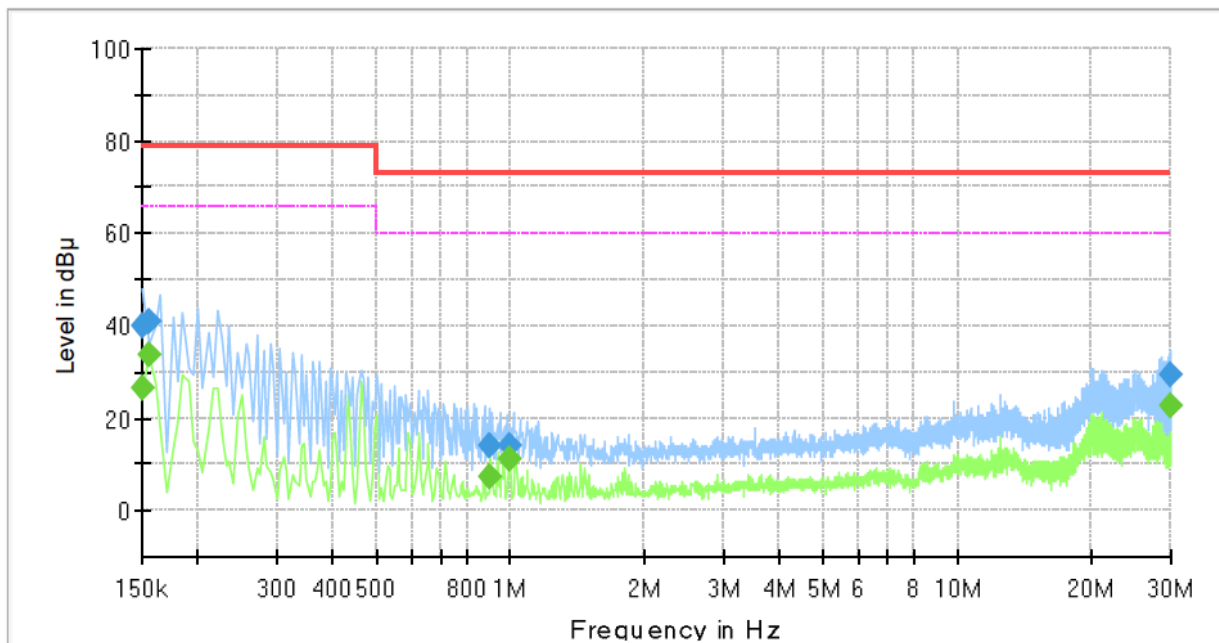
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Report No.:
KES-EM-21T0323
Page (51) of (90)

[NEUTRAL]

Common Information

Test Description: Conducted Emission
Model No.: TNO-7180R
Phase: N
Mode: PoE
Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	---	26.31	66.00	39.69	1000.0	9.000	N	19.4
0.150000	39.94	---	79.00	39.06	1000.0	9.000	N	19.4
0.155000	---	33.63	66.00	32.37	1000.0	9.000	N	19.4
0.155000	40.85	---	79.00	38.15	1000.0	9.000	N	19.4
0.895000	---	7.21	60.00	52.79	1000.0	9.000	N	20.1
0.895000	13.80	---	73.00	59.20	1000.0	9.000	N	20.1
0.995000	---	11.20	60.00	48.80	1000.0	9.000	N	20.0
0.995000	14.00	---	73.00	59.00	1000.0	9.000	N	20.0
29.925000	---	22.81	60.00	37.19	1000.0	9.000	N	20.4
29.925000	29.53	---	73.00	43.47	1000.0	9.000	N	20.4

◆ 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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Report No.:
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Page (52) of (90)

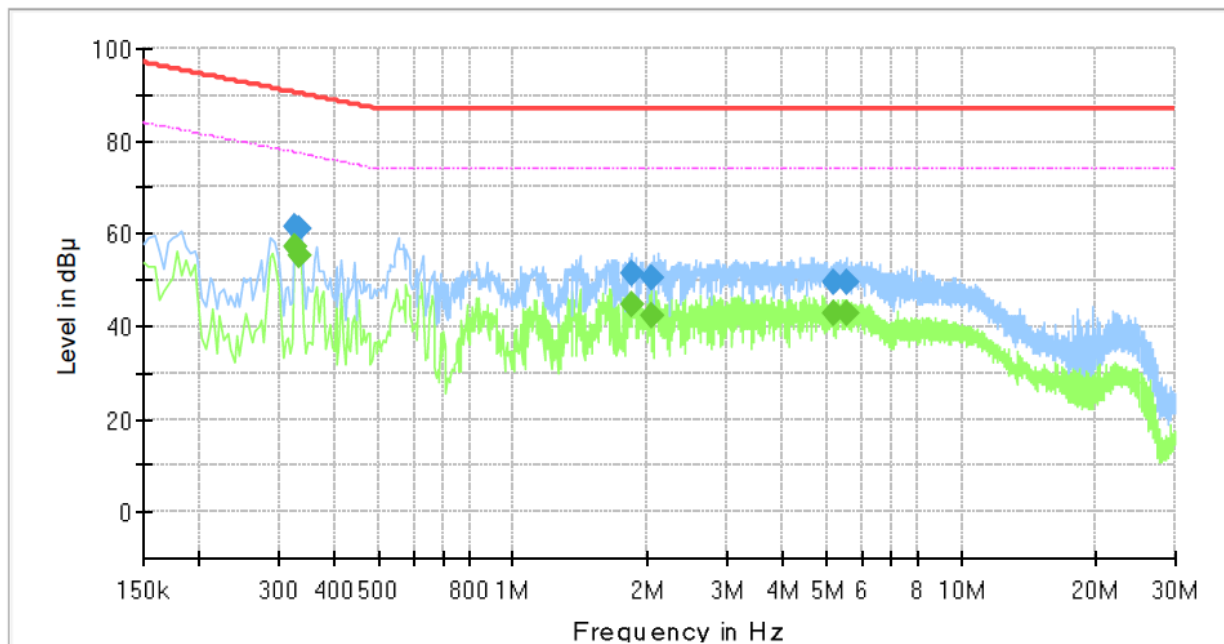
Conducted Emissions at Telecommunication Ports

■ DC Mode

[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-7180R
Mode :	DC
Speed :	1000 Mbps
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.326000	---	57.33	77.55	20.22	1000.0	9.000	Single Line	19.5
0.326000	61.40	---	90.55	29.15	1000.0	9.000	Single Line	19.5
0.334000	---	55.24	77.35	22.11	1000.0	9.000	Single Line	19.5
0.334000	60.95	---	90.35	29.40	1000.0	9.000	Single Line	19.5
1.842000	---	44.74	74.00	29.26	1000.0	9.000	Single Line	20.1
1.842000	51.54	---	87.00	35.46	1000.0	9.000	Single Line	20.1
2.030000	---	42.19	74.00	31.81	1000.0	9.000	Single Line	20.2
2.030000	50.69	---	87.00	36.31	1000.0	9.000	Single Line	20.2
5.174000	---	43.03	74.00	30.97	1000.0	9.000	Single Line	19.5
5.174000	49.67	---	87.00	37.33	1000.0	9.000	Single Line	19.5
5.570000	---	42.86	74.00	31.14	1000.0	9.000	Single Line	19.4
5.570000	49.47	---	87.00	37.53	1000.0	9.000	Single Line	19.4

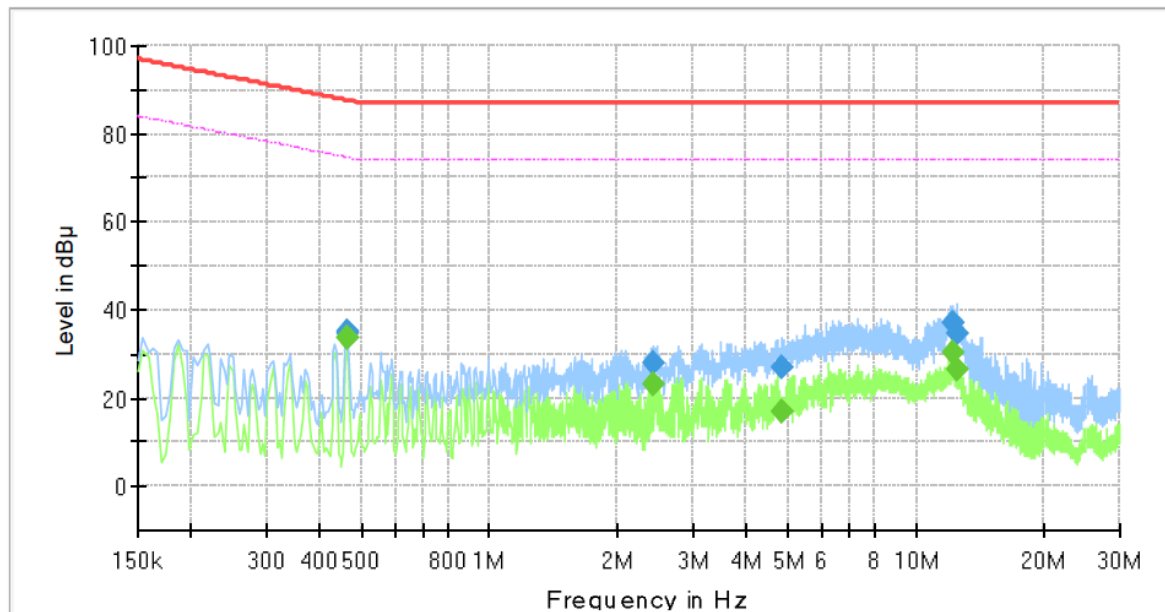
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PoE Mode

[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-7180R
Mode :	PoE(LAN)
Speed :	1000 Mbps
Operator Name:	KES


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.462000	---	33.66	74.66	41.00	1000.0	9.000	Single Line	19.6
0.462000	35.22	---	87.66	52.44	1000.0	9.000	Single Line	19.6
0.466000	---	33.55	74.58	41.03	1000.0	9.000	Single Line	19.6
0.466000	34.47	---	87.58	53.11	1000.0	9.000	Single Line	19.6
2.418000	---	23.08	74.00	50.92	1000.0	9.000	Single Line	20.1
2.418000	27.98	---	87.00	59.02	1000.0	9.000	Single Line	20.1
4.850000	---	16.97	74.00	57.03	1000.0	9.000	Single Line	19.5
4.850000	26.93	---	87.00	60.07	1000.0	9.000	Single Line	19.5
12.198000	---	30.37	74.00	43.63	1000.0	9.000	Single Line	19.9
12.198000	37.04	---	87.00	49.96	1000.0	9.000	Single Line	19.9
12.438000	---	26.45	74.00	47.55	1000.0	9.000	Single Line	19.9
12.438000	34.81	---	87.00	52.19	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))

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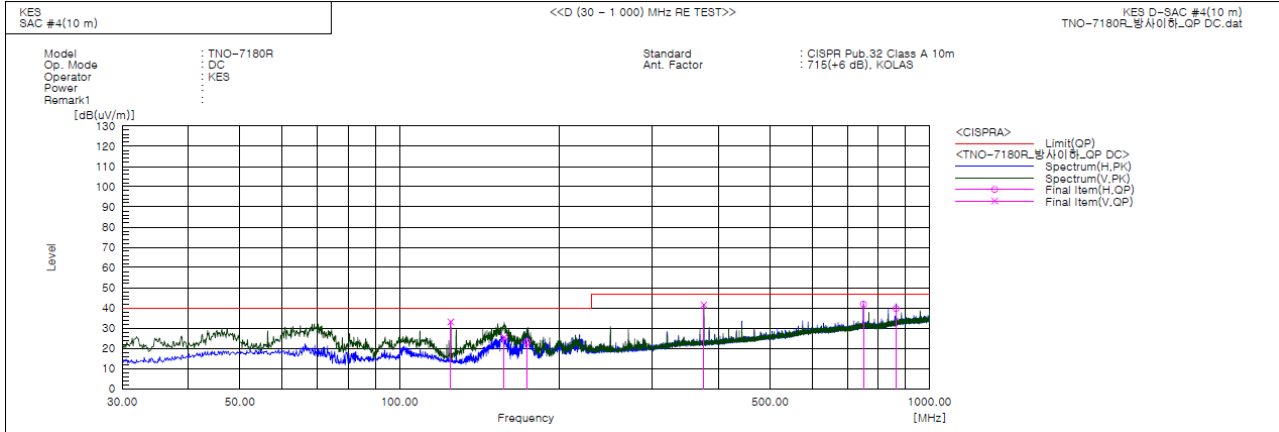
Report No.:

KES-EM-21T0323

Page (54) of (90)

Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	124.939	V	57.9	-24.8	33.1	40.0	6.9	117.0	132.0	
2	157.676	V	50.1	-24.6	25.5	40.0	14.5	106.0	243.0	
3	174.045	H	47.0	-23.8	23.2	40.0	16.8	398.0	226.0	
4	374.956	V	56.4	-14.8	41.6	47.0	5.4	103.0	219.0	
5	749.983	H	47.5	-5.7	41.8	47.0	5.2	195.0	287.0	
6	864.079	H	44.3	-4.6	39.7	47.0	7.3	191.0	90.0	

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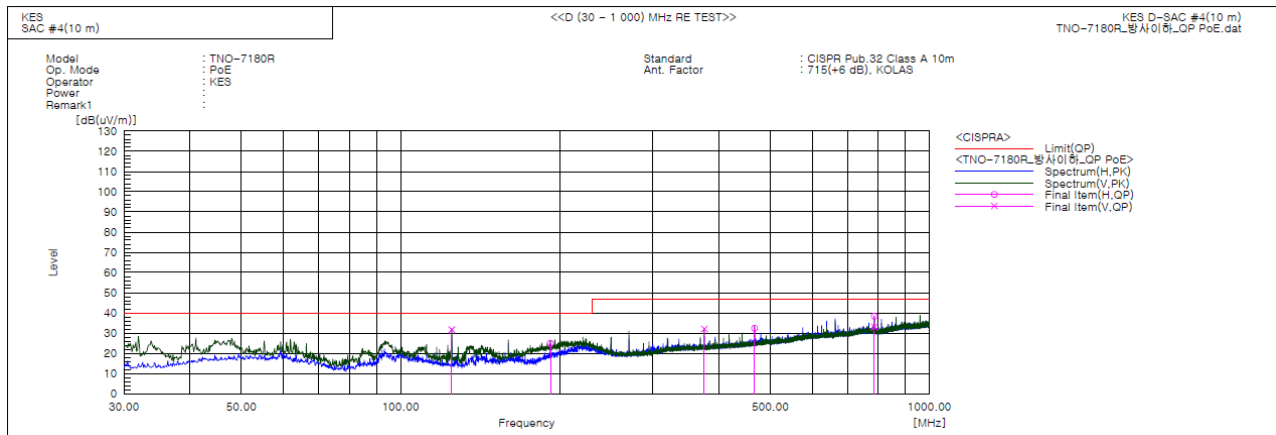


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Report No.:
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Page (55) of (90)

PoE Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	124.939	V	56.5	-24.8	31.7	40.0	8.3	104.0	11.0	
2	191.990	H	46.6	-21.7	24.9	40.0	15.1	377.0	90.0	
3	375.078	V	46.9	-14.8	32.1	47.0	14.9	111.0	276.0	
4	466.985	H	45.0	-12.6	32.4	47.0	14.6	278.0	81.0	
5	786.479	V	39.4	-6.2	33.2	47.0	13.8	102.0	6.0	
6	786.479	H	44.5	-6.2	38.3	47.0	8.7	157.0	358.0	

◆ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)

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

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

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

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

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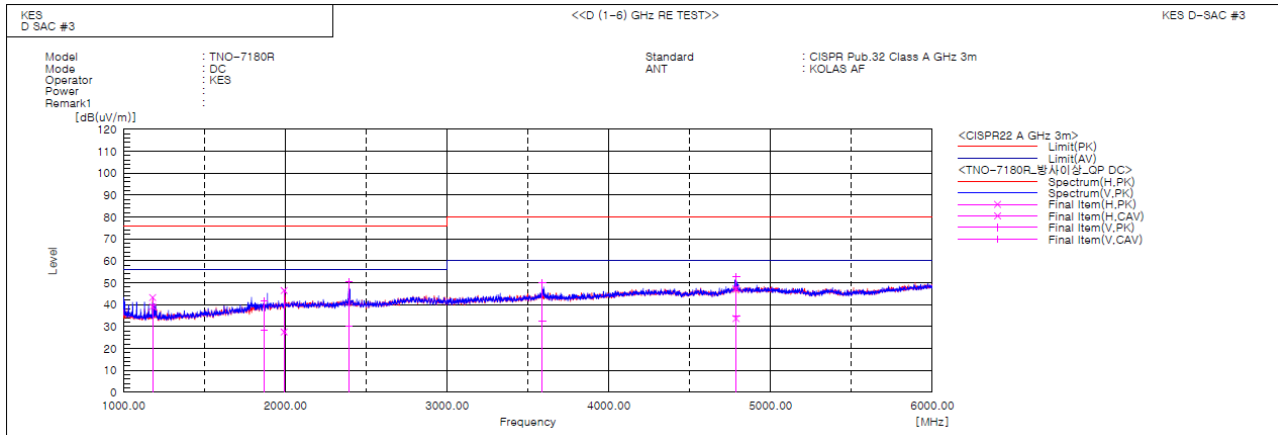
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Report No.:
KES-EM-21T0323
Page (56) of (90)

Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1179.650	H	51.8	47.6	-8.5	43.3	39.1	76.0	56.0	32.7	16.9	100.0	4.6	
2	1867.844	V	43.7	30.1	-2.0	41.7	28.1	76.0	56.0	34.3	27.9	100.0	195.6	
3	1992.371	H	47.4	28.4	-0.9	46.5	27.5	76.0	56.0	29.5	28.5	100.0	344.3	
4	2394.680	V	50.4	30.1	0.2	50.6	30.3	76.0	56.0	25.4	25.7	100.0	25.4	
5	3589.122	V	45.7	28.3	4.2	49.9	32.5	80.0	60.0	30.1	27.5	100.0	295.1	
6	4786.701	H	38.8	25.2	8.5	47.3	33.7	80.0	60.0	32.7	26.3	100.0	280.7	
7	4788.868	V	44.3	26.1	8.5	52.8	34.6	80.0	60.0	27.2	25.4	100.0	28.5	

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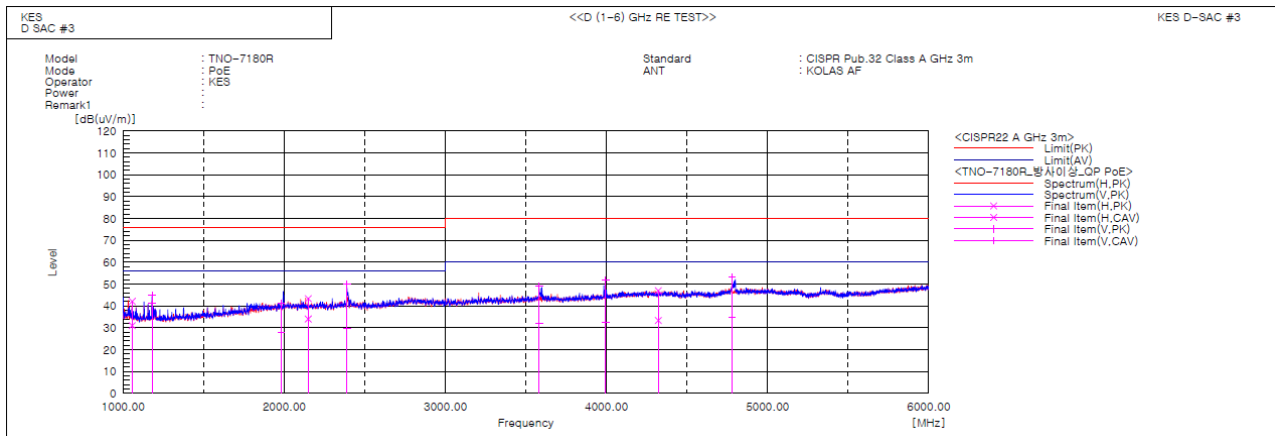


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Report No.:
KES-EM-21T0323
Page (57) of (90)

PoE Mode



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1056.415	H	51.2	40.1	-9.1	42.1	31.0	76.0	56.0	33.9	25.0	100.0	342.1	
2	1179.540	V	53.3	49.6	-8.5	44.8	41.1	76.0	56.0	31.2	14.9	100.0	0.5	
3	1980.613	V	42.3	29.0	-0.9	41.4	28.1	76.0	56.0	34.6	27.9	100.0	359.7	
4	2148.857	H	44.0	34.7	-0.6	43.4	34.1	76.0	56.0	32.6	21.9	100.0	217.2	
5	2390.590	V	49.6	29.6	0.2	49.8	29.8	76.0	56.0	26.2	26.2	100.0	24.6	
6	3583.573	V	45.0	27.8	4.2	49.2	32.0	80.0	60.0	30.8	28.0	100.0	254.9	
7	3994.318	V	46.1	26.9	5.6	51.7	32.5	80.0	60.0	28.3	27.5	100.0	186.5	
8	4322.146	H	40.0	26.4	7.0	47.0	33.4	80.0	60.0	33.0	26.6	100.0	117.4	
9	4780.794	V	44.7	26.5	8.4	53.1	34.9	80.0	60.0	26.9	25.1	100.0	24.4	

◆ Calculation

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

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

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

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

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Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.086			
2	0.002	0.157	1.080	n/a
3	0.078	3.398	2.300	PASS
4	0.002	0.433	0.430	n/a
5	0.077	6.736	1.140	PASS
6	0.002	0.604	0.300	n/a
7	0.073	9.493	0.770	PASS
8	0.002	0.769	0.230	n/a
9	0.066	16.504	0.400	PASS
10	0.001	0.813	0.184	n/a
11	0.059	18.001	0.330	PASS
12	0.002	0.982	0.153	n/a
13	0.052	24.984	0.210	PASS
14	0.002	1.169	0.131	n/a
15	0.045	30.105	0.150	PASS
16	0.002	1.336	0.115	n/a
17	0.038	28.701	0.132	PASS
18	0.002	1.522	0.102	n/a
19	0.031	26.597	0.118	PASS
20	0.002	1.708	0.092	n/a
21	0.026	16.118	0.161	PASS
22	0.002	1.869	0.084	n/a
23	0.021	14.339	0.147	PASS
24	0.002	1.983	0.077	n/a
25	0.018	13.185	0.135	PASS
26	0.002	2.136	0.071	n/a
27	0.016	12.621	0.125	PASS
28	0.001	2.134	0.066	n/a
29	0.015	13.033	0.116	PASS
30	0.001	2.402	0.061	n/a
31	0.015	13.500	0.109	PASS
32	0.001	2.466	0.058	n/a
33	0.014	14.089	0.102	PASS
34	0.001	2.624	0.054	n/a
35	0.014	14.421	0.096	PASS
36	0.001	2.694	0.051	n/a
37	0.013	14.172	0.091	PASS
38	0.001	2.669	0.048	n/a
39	0.012	13.591	0.087	PASS
40	0.001	2.886	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	0.086			
2	0.003	0.197	1.620	n/a
3	0.079	2.295	3.450	PASS
4	0.003	0.479	0.645	n/a
5	0.077	4.518	1.710	PASS
6	0.003	0.663	0.450	n/a
7	0.073	6.360	1.155	PASS
8	0.003	0.861	0.345	n/a
9	0.066	11.063	0.600	PASS
10	0.002	0.838	0.276	n/a
11	0.060	12.062	0.495	PASS
12	0.002	1.071	0.230	n/a
13	0.053	16.719	0.315	PASS
14	0.002	1.264	0.197	n/a
15	0.045	20.154	0.225	PASS
16	0.002	1.449	0.173	n/a
17	0.038	19.272	0.199	PASS
18	0.003	1.695	0.153	n/a
19	0.032	17.890	0.178	PASS
20	0.003	1.850	0.138	n/a
21	0.026	16.315	0.161	PASS
22	0.003	2.120	0.125	n/a
23	0.021	14.544	0.147	PASS
24	0.003	2.209	0.115	n/a
25	0.018	13.405	0.135	PASS
26	0.002	2.339	0.106	n/a
27	0.016	12.845	0.125	PASS
28	0.002	2.325	0.099	n/a
29	0.015	13.268	0.116	PASS
30	0.002	2.661	0.092	n/a
31	0.015	13.747	0.109	PASS
32	0.002	2.721	0.086	n/a
33	0.015	14.357	0.102	PASS
34	0.002	2.823	0.081	n/a
35	0.014	14.700	0.096	PASS
36	0.002	3.014	0.077	n/a
37	0.013	14.522	0.091	PASS
38	0.002	2.901	0.073	n/a
39	0.012	14.018	0.087	PASS
40	0.002	3.162	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.



■ PoE Mode

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.102			
2	0.003	0.251	1.080	n/a
3	0.093	4.034	2.300	PASS
4	0.004	0.972	0.430	n/a
5	0.089	7.820	1.140	PASS
6	0.003	1.080	0.300	n/a
7	0.084	10.949	0.770	PASS
8	0.003	1.288	0.230	n/a
9	0.078	19.455	0.400	PASS
10	0.004	2.037	0.184	n/a
11	0.070	21.358	0.330	PASS
12	0.003	1.992	0.153	n/a
13	0.063	29.772	0.210	PASS
14	0.002	1.693	0.131	n/a
15	0.054	35.978	0.150	PASS
16	0.002	1.606	0.115	n/a
17	0.045	34.224	0.132	PASS
18	0.002	1.653	0.102	n/a
19	0.037	30.837	0.118	PASS
20	0.001	1.405	0.092	n/a
21	0.028	17.467	0.161	PASS
22	0.001	1.093	0.084	n/a
23	0.021	14.216	0.147	PASS
24	0.001	1.062	0.077	n/a
25	0.014	10.641	0.135	PASS
26	0.001	1.051	0.071	n/a
27	0.009	6.997	0.125	PASS
28	0.001	1.265	0.066	n/a
29	0.004	3.858	0.116	n/a
30	0.001	1.228	0.061	n/a
31	0.002	1.598	0.109	n/a
32	0.001	1.175	0.058	n/a
33	0.002	2.167	0.102	n/a
34	0.001	1.217	0.054	n/a
35	0.004	3.709	0.096	n/a
36	0.001	1.245	0.051	n/a
37	0.004	4.687	0.091	n/a
38	0.001	1.376	0.048	n/a
39	0.004	4.822	0.087	n/a
40	0.001	1.373	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	0.102			
2	0.006	0.352	1.620	PASS
3	0.093	2.694	3.450	PASS
4	0.006	0.918	0.645	PASS
5	0.089	5.230	1.710	PASS
6	0.005	1.152	0.450	PASS
7	0.085	7.317	1.155	PASS
8	0.005	1.394	0.345	n/a
9	0.078	13.015	0.600	PASS
10	0.005	1.913	0.276	PASS
11	0.071	14.319	0.495	PASS
12	0.004	1.876	0.230	n/a
13	0.063	19.926	0.315	PASS
14	0.003	1.736	0.197	n/a
15	0.055	24.264	0.225	PASS
16	0.003	1.610	0.173	n/a
17	0.046	22.950	0.199	PASS
18	0.002	1.599	0.153	n/a
19	0.037	20.748	0.178	PASS
20	0.002	1.459	0.138	n/a
21	0.028	17.716	0.161	PASS
22	0.002	1.351	0.125	n/a
23	0.021	14.645	0.147	PASS
24	0.001	1.105	0.115	n/a
25	0.015	10.870	0.135	PASS
26	0.001	0.964	0.106	n/a
27	0.009	7.136	0.125	PASS
28	0.001	1.118	0.099	n/a
29	0.005	4.254	0.116	n/a
30	0.001	0.990	0.092	n/a
31	0.002	1.893	0.109	n/a
32	0.001	0.933	0.086	n/a
33	0.002	2.389	0.102	n/a
34	0.001	1.022	0.081	n/a
35	0.004	3.916	0.096	n/a
36	0.001	1.030	0.077	n/a
37	0.005	5.221	0.091	n/a
38	0.001	1.127	0.073	n/a
39	0.004	5.022	0.087	n/a
40	0.001	1.052	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.

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Report No.:
KES-EM-21T0323
Page (62) of (90)

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

■ PoE 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

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Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ DC Mode



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■ PoE Mode



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Conducted Emissions at Telecommunication Ports

■ DC Mode



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Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



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■ PoE Mode

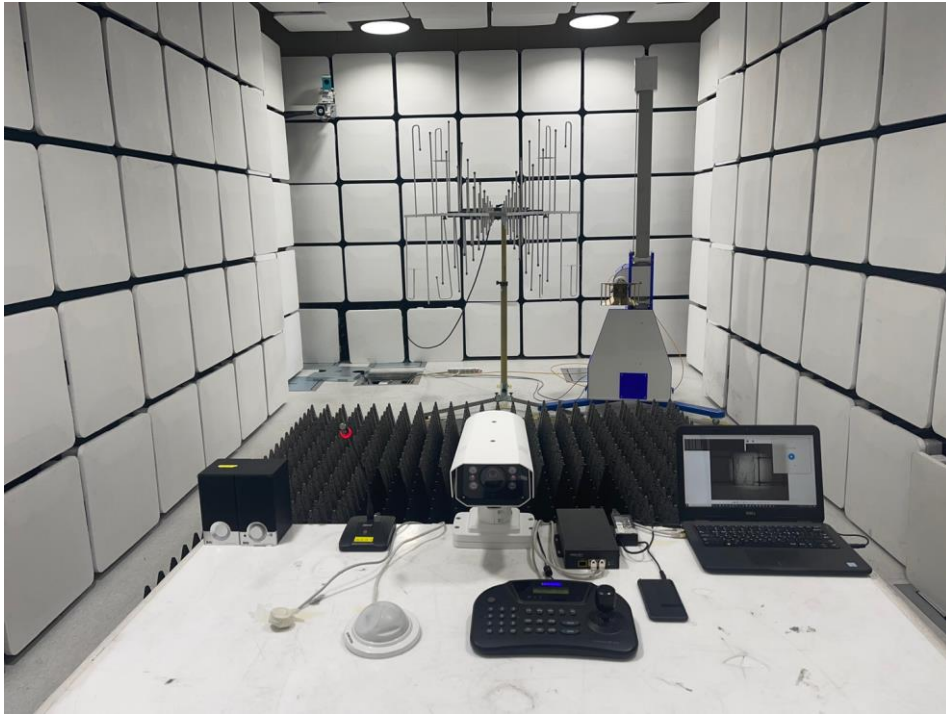
Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode



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■ PoE Mode



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Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode



■ PoE Mode



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Electrostatic Discharge

■ DC Mode



■ PoE Mode



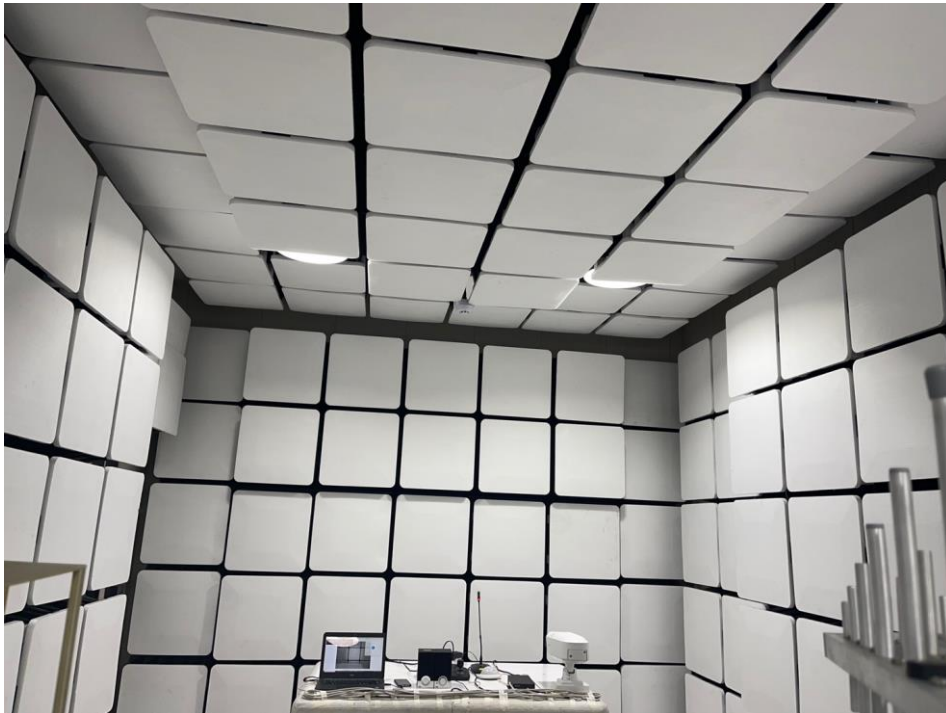
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Radiated Electric Field Immunity

■ DC Mode



■ PoE Mode



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Electrical Fast Transients/Bursts

■ DC Mode



■ PoE Mode



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Surge Transients

■ DC Mode



■ PoE Mode



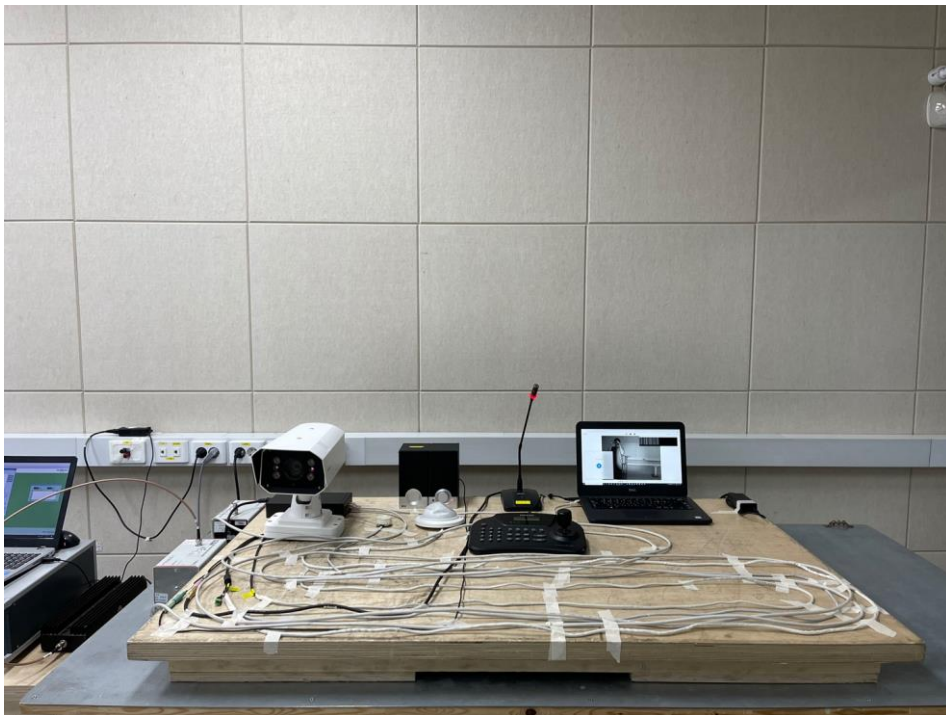
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Conducted Disturbance

■ DC Mode



■ PoE Mode



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Voltage Dips and Short Interruptions

■ DC Mode



■ PoE Mode



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EUT External Photographs

(Top)



(Bottom)



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EUT Internal Photographs

(Internal View)



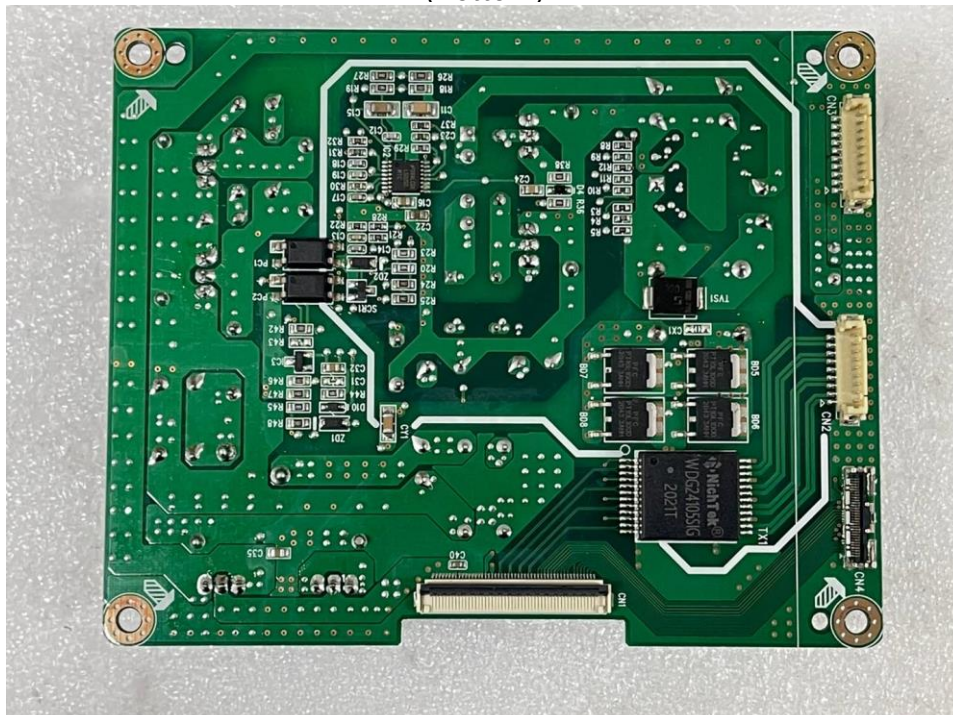
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EUT Internal View – Board 1

(Top)



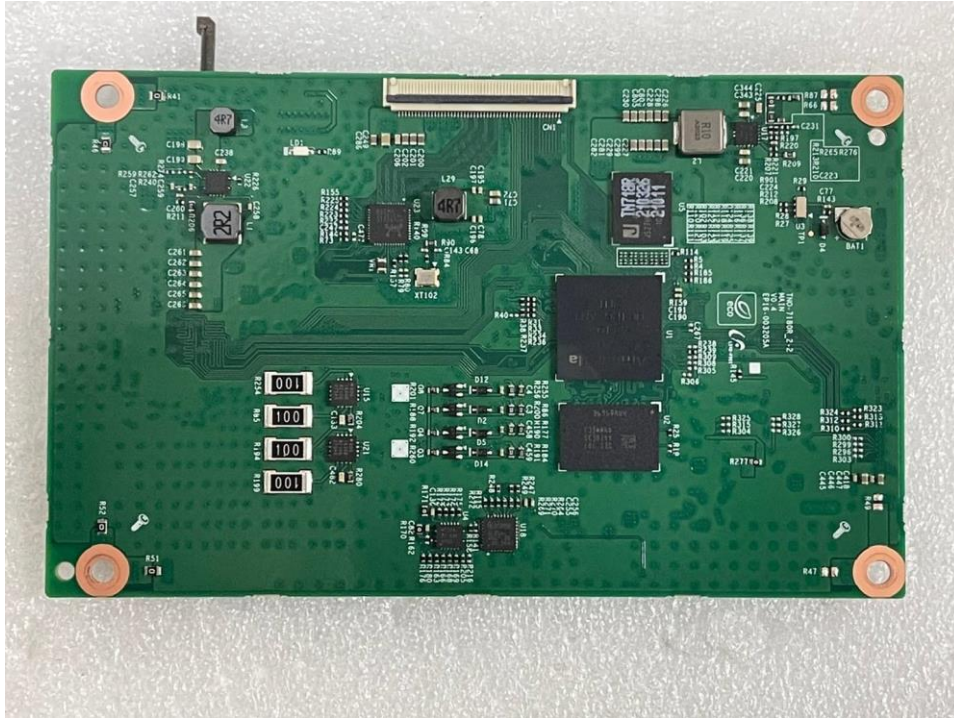
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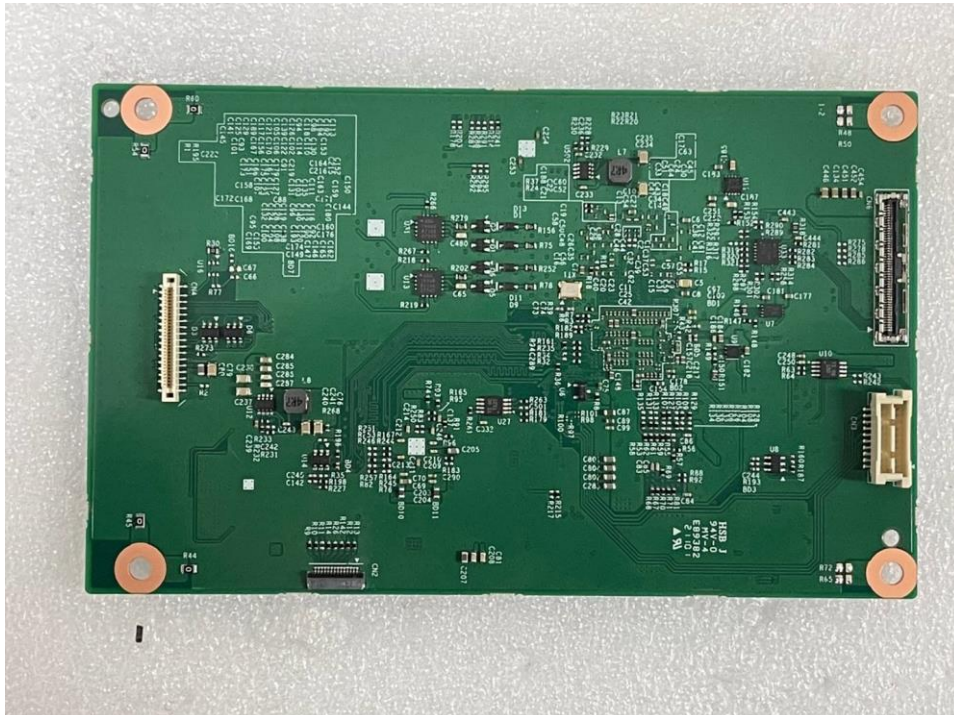
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EUT Internal View – Board 2

(Top)



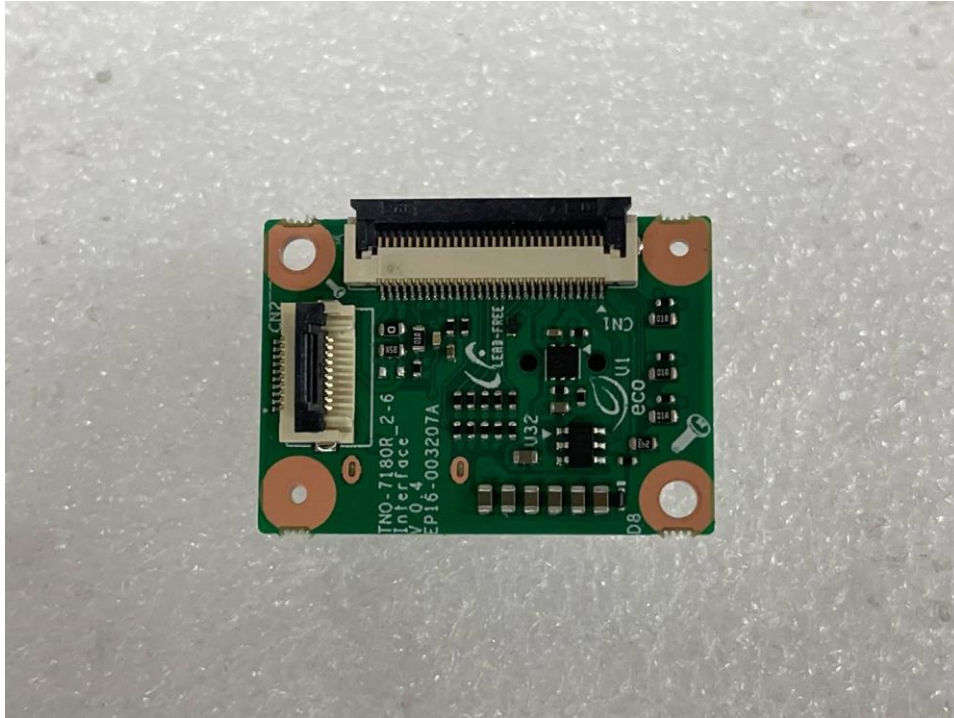
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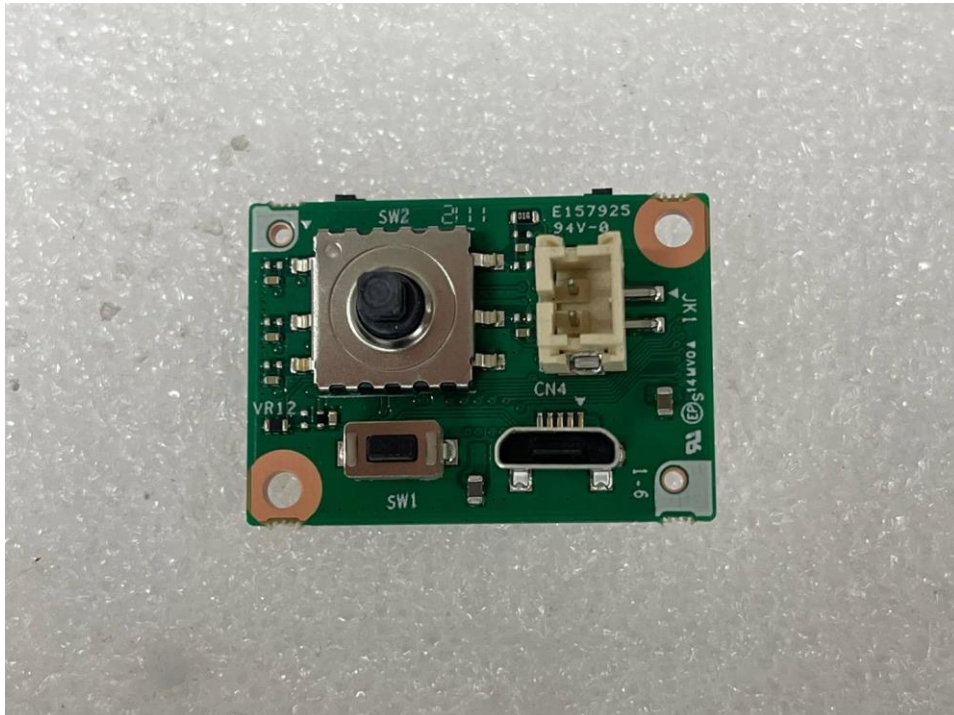
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EUT Internal View – Board 3

(Top)

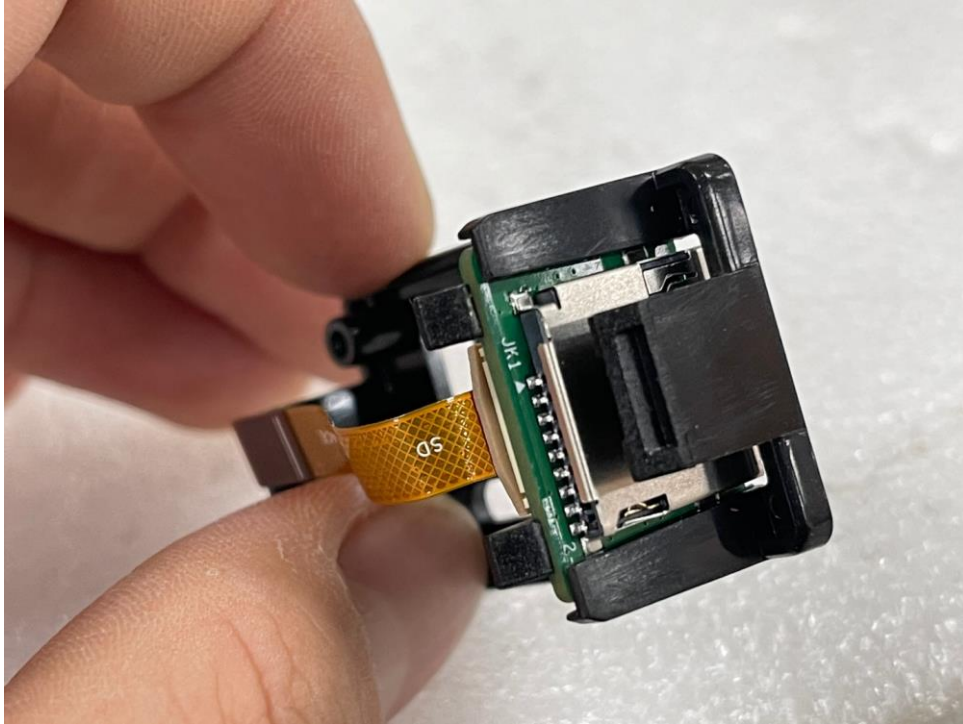


(Bottom)



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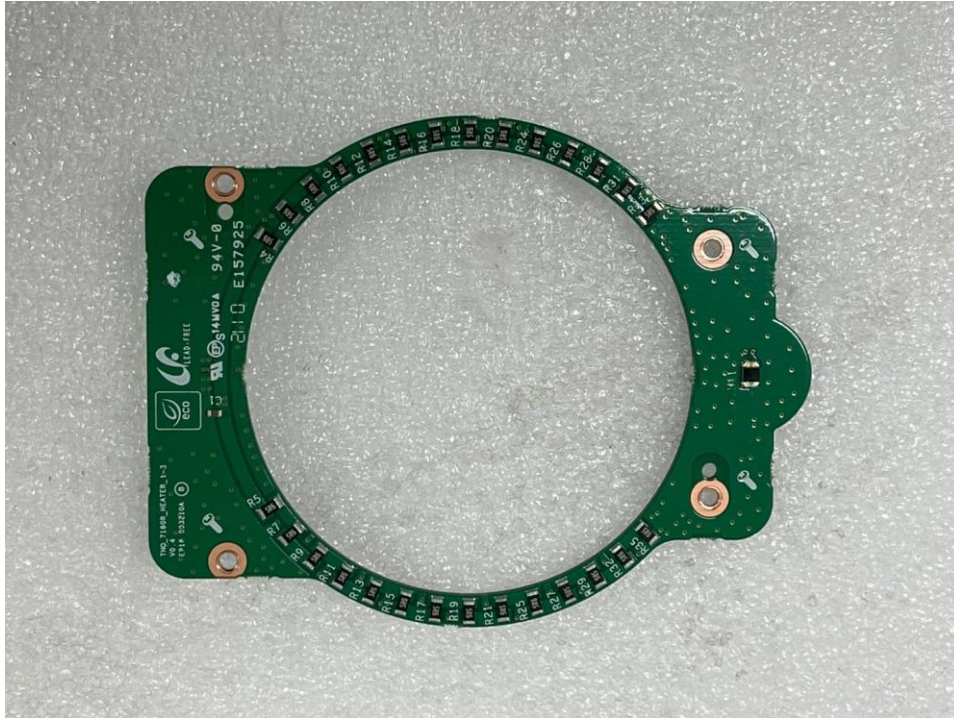
EUT Internal View – Board 4



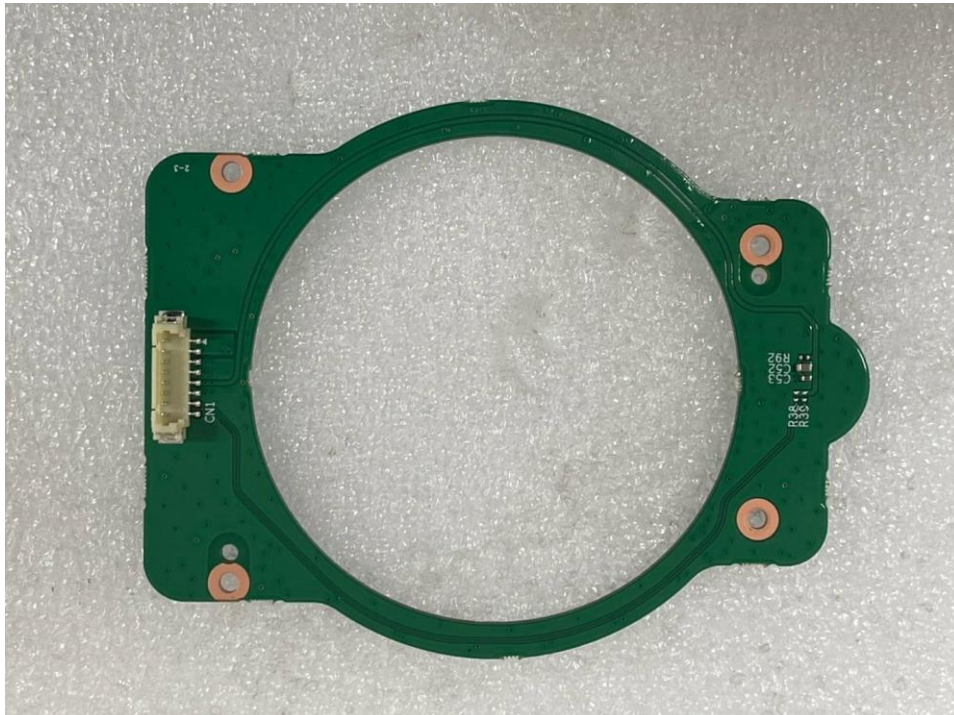
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EUT Internal View – Board 5

(Top)

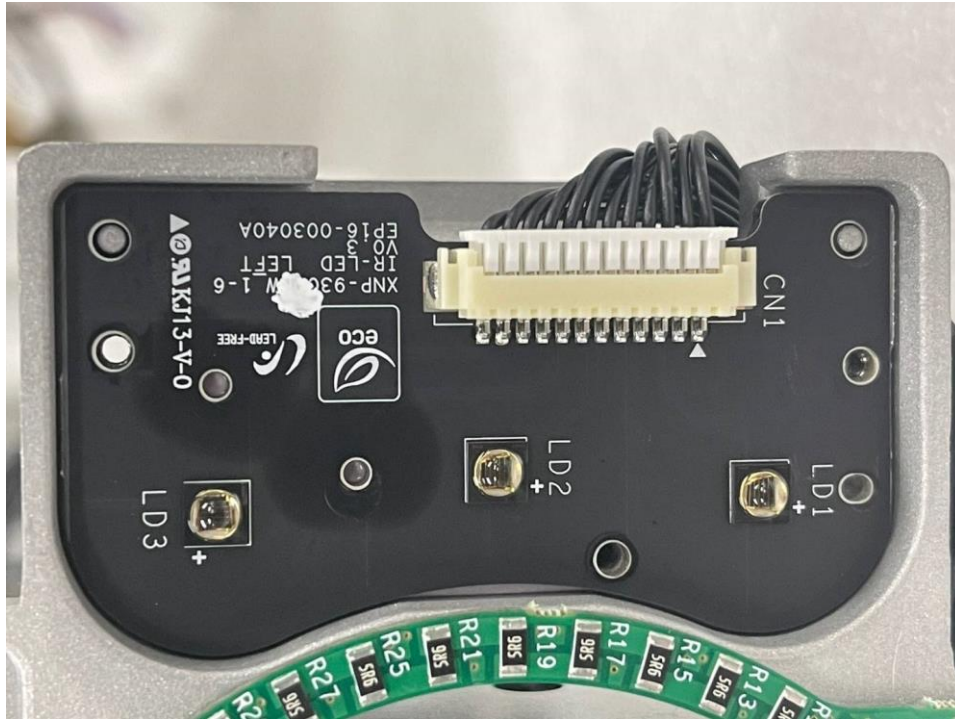


(Bottom)

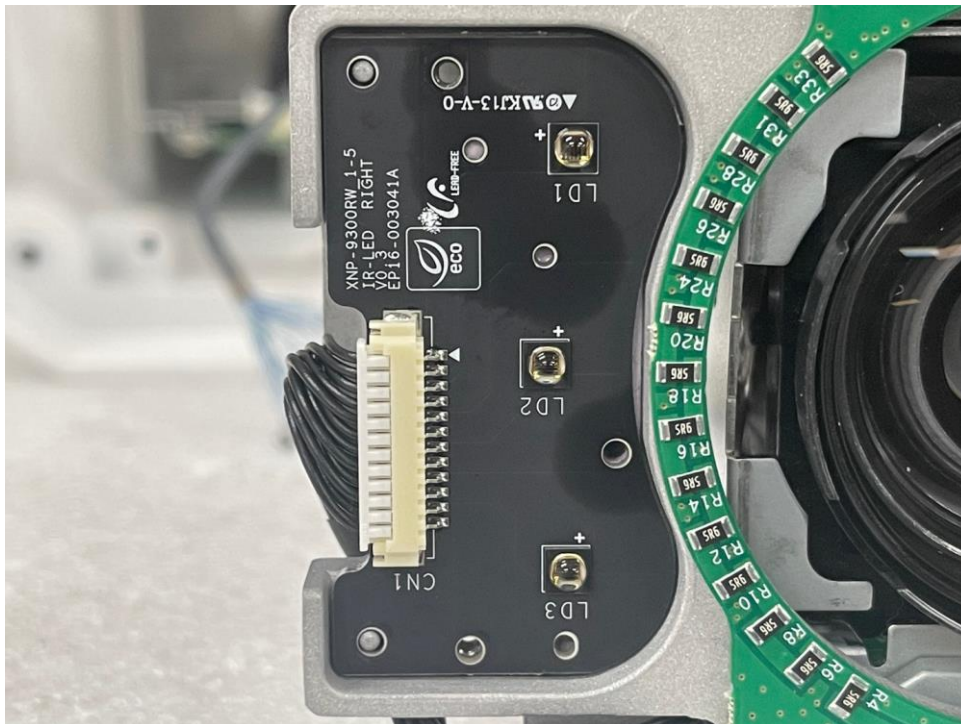


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EUT Internal View – Board 6



EUT Internal View – Board 7



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EUT Internal View – Board 8

(Top)



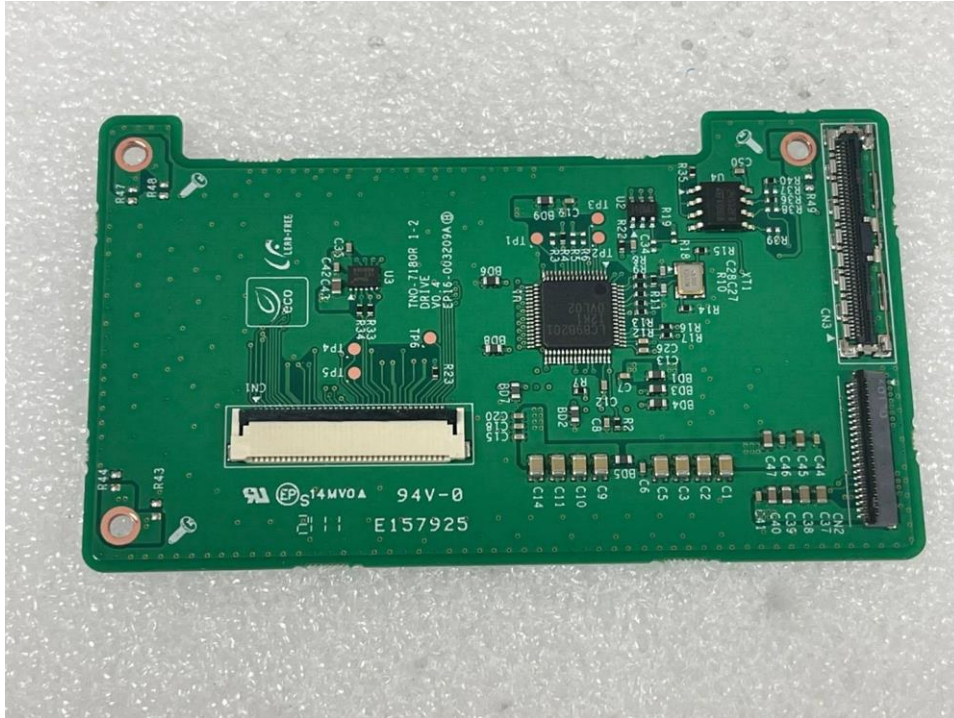
(Bottom)



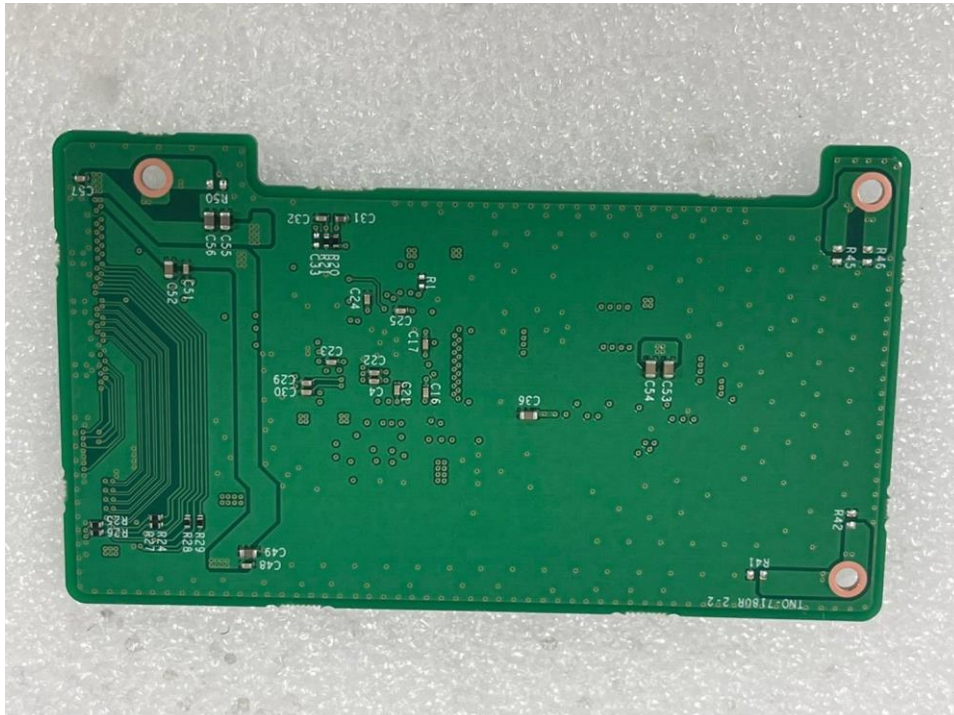
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The authenticity of the test report, contact shchoi@kes.co.kr

EUT Internal View – Board 9

(Top)



(Bottom)



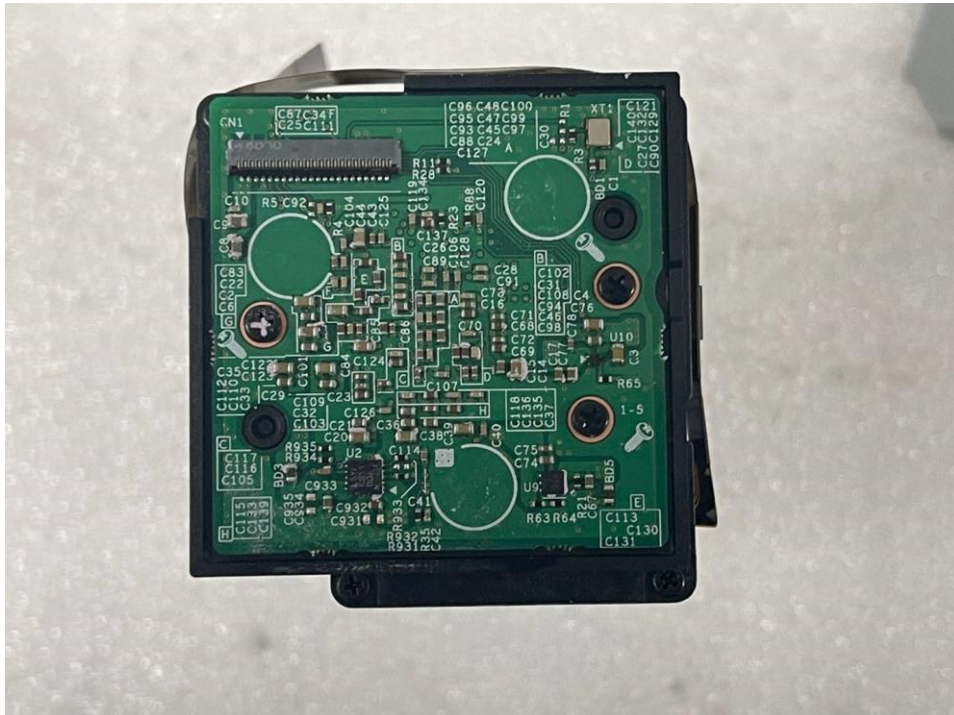
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EUT Internal View – Board 10

(Top)



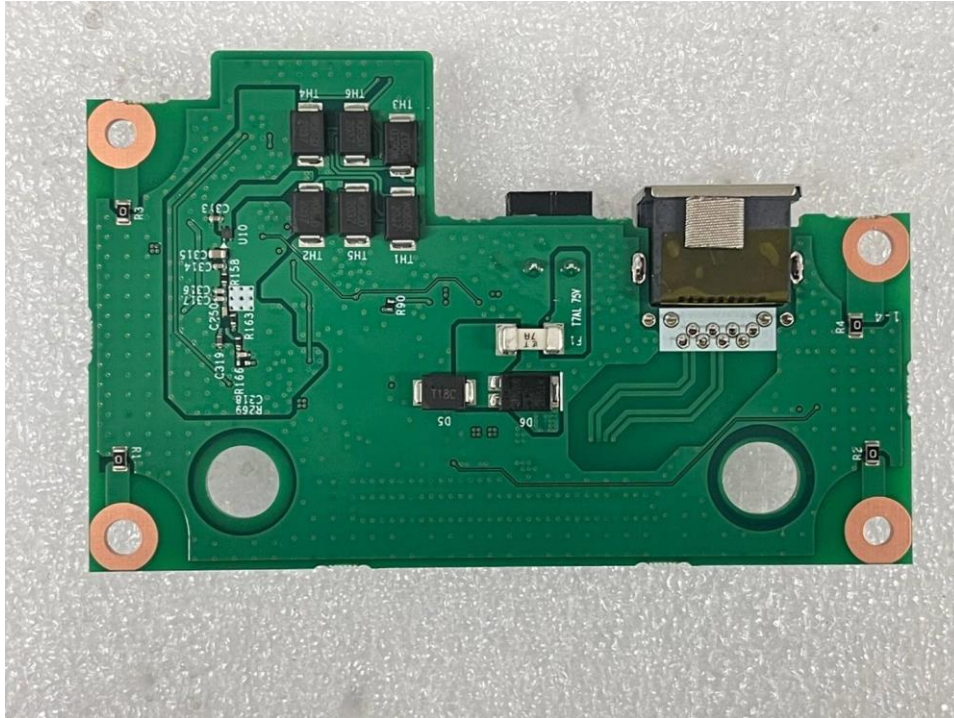
(Bottom)



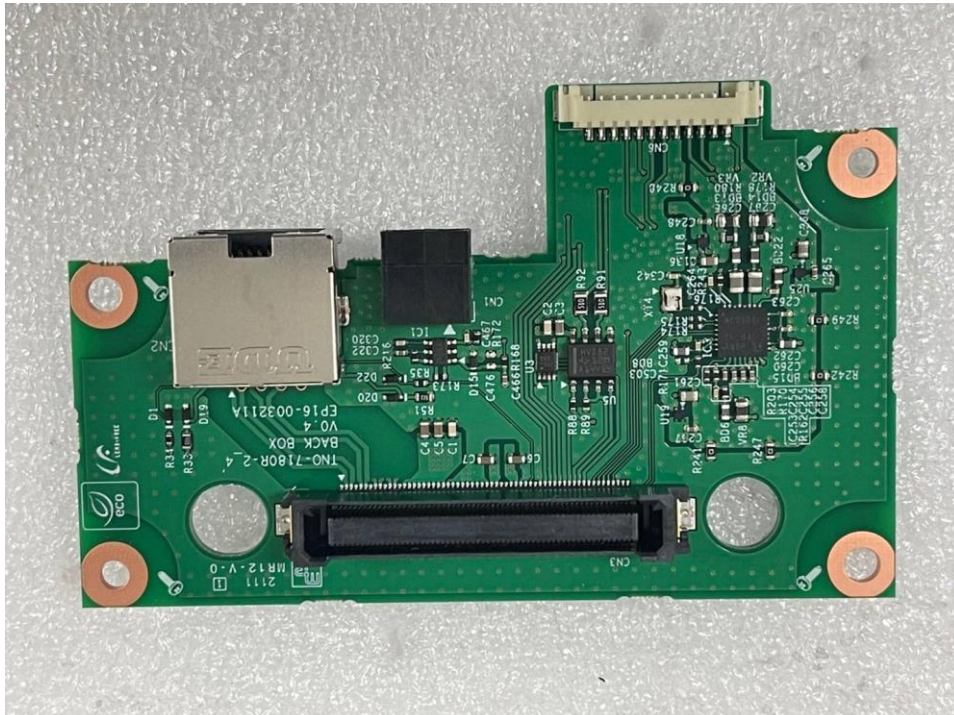
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EUT Internal View – Board 11

(Top)

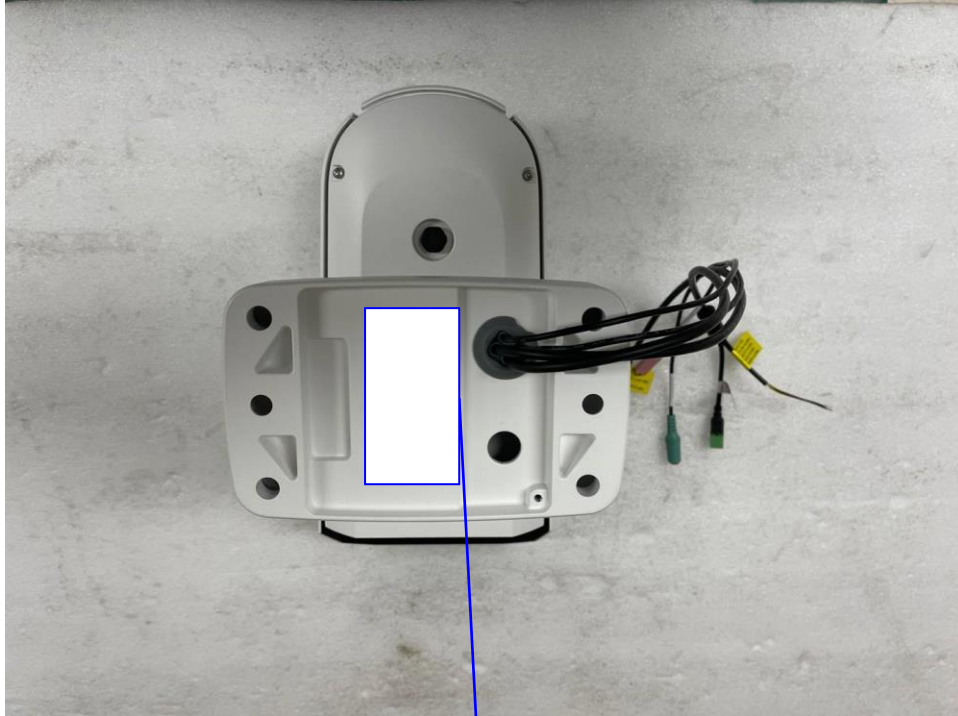


(Bottom)



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Label and Location



NETWORK CAMERA

Model No : TNO-7180R

Manufacturer : HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.

Made in Vietnam

