



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (1) of (99)

EMC TEST REPORT For CE

Test Report No. : KES-EM-21T0250-R1
Date of Issue : Feb. 24, 2023
Product name : NETWORK THERMAL CAMERA
Model/Type No. : TNO-3050T
Variant Model : TNO-3040T
Applicant : Hanwha Vision Co., Ltd
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : 1. HANWHA VISION VIETNAM COMPANY LIMITED
2. D-TECH CO.,LTD.
Manufacturer Address : 1. Lot O-2, Que Vo Industrial Zone extended area,
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do,
Korea (Suwon Industrial Complex)
Date of Receipt : Mar. 22, 2021
Test date : Mar. 27, 2021 ~ Apr. 07, 2021
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Hyo Jin, Kim
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.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0250-R1
Page (2) of (99)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Apr. 16, 2021	KES-EM-21T0250	Issued
Feb. 24, 2023	KES-EM-21T0250-R1	- Change the Applicant and manufacturer at the request of the customer. - Update Test Regulation at customer request.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd. This document may be altered or revised by KES Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by KES Co., Ltd. will constitute fraud and shall nullify the document.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

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.....	10
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	12
2.0	Test Regulations.....	13
2.1	Conducted Emissions at Mains Power Ports	15
2.2	Conducted Emissions at Telecommunication Ports	16
2.3	Radiated Electric Field Emissions(Below 1 GHz)	17
2.4	Radiated Electric Field Emissions(Above 1 GHz)	18
2.5	Harmonic Current Emissions	19
2.6	Voltage Fluctuations and Flicker	20
3.0	Criteria for compliance.....	21
3.1	Electrostatic Discharge.....	23
3.2	Radiated Electric Field Immunity	32
3.3	Electrical Fast Transients/Bursts	35
3.4	Surge Transients	39
3.5	Conducted Disturbance	43
3.6	Voltage Dips and Short Interruptions	47
APPENDIX A – TEST DATA.....		50
Conducted Emissions at Mains Power Ports.....		50
Conducted Emissions at Telecommunication Ports		54
Radiated Electric Field Emissions(Below 1 GHz)		57
Radiated Electric Field Emissions(Above 1 GHz).....		60
Harmonic Current Emissions and Voltage Fluctuations and Flicker		63
Test Setup Photos and Configuration		68
Conducted Emissions at Mains Power Ports.....		68
Conducted Emissions at Telecommunication Ports		70
Radiated Electric Field Emissions(Below 1 GHz)		73
Radiated Electric Field Emissions(Above 1 GHz).....		76
Harmonic Current Emissions and Voltage Fluctuations and Flicker		79
Electrostatic Discharge		80
Radiated Electric Field Immunity		82
Electrical Fast Transients/Bursts		84
Surge Transients.....		86
Conducted Disturbance.....		88
Voltage Dips and Short Interruptions.....		90
EUT External Photographs		91
EUT Internal Photographs		92

1.0 General Product Description

Main Specifications of EUT are:

Video	
Imaging Device	Uncooled micro bolometer
Resolution	320x240
Max. Framerate	H.265/H.264: Max. 30fps/25fps(60Hz/50Hz) MJPEG: Max. 30fps/25fps(60Hz/50Hz)
NETD	< 60mK
Pixel Size	12 μ m
Video Out	CVBS: 1.0 Vp-p / 75 Ω composite, 720x480(N), 720x576(P) for installation USB: Micro USB Type B, 1280x720 for installation
Lens	
Focal Length (Zoom Ratio)	35mm fixed focal
Max. Aperture Ratio	F1.0
Angular Field of View	H: 6.3°, V: 4.7°, D: 7.8°
Min. Object Distance	51m
Focus Control	Fixed
Operational	
Camera Title	Displayed up to 85 characters
Digital Image Stabilization	Support(built-in gyro sensor)
Motion Detection	8ea, 8point polygonal zones
Privacy Masking	32ea, polygonal zones - Color: Grey/Green/Red/Blue/Black/White - Mosaic
Video Rotation	Flip, Mirror, Hallway view(90°/270°)
Analytics	Directional detection, Motion detection, Appear/Disappear, Enter/Exit, Loitering, Tampering, Virtual line, Audio detection, Temperature detection, Sound classification, Shock detection
Alarm I/O	Input 1ea / Output 2ea
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 Handover
Audio In	Selectable(mic in/line in) Supply voltage: 2.5VDC(4mA), Input impedance: 2K Ohm
Audio Out	Line out, Max.output level: 1Vrms
Color palettes	Whitehot, Blackhot, Rainbow, Rainbow2, Sepia, Red, Iron, Custom
Network	
Ethernet	RJ-45(10/100BASE-T)
Video Compression	H.265/H.264: Main/Baseline/High, MJPEG
Audio Compression	G.711 u-law / G.726 Selectable G.726(ADPCM) 8KHz, G.711 8KHz G.726: 16Kbps, 24Kbps, 32Kbps, 40Kbps AAC-LC: 48Kbps at 16KHz
Smart Codec	Manual(5ea area), WiseStreamII
Bitrate Control	H.264/H.265: CBR or VBR MJPEG: VBR
Streaming	Unicast(20 users) / Multicast Multiple streaming(Up to 10 profiles)
Protocol	IPv4, IPv6, TCP/IP, UDP/IP, RTP(UDP), RTP(TCP), RTCP, RTSP, NTP, HTTP, HTTPS, SSL/TLS, DHCP, FTP, SMTP, ICMP, IGMP, SNMPv1/v2c/v3(MIB-2), ARP, DNS, DDNS, QoS, 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)
Application Programming Interface	ONVIF Profile S/G/T SUNAPI(HTTP API)

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact kes@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (6) of (99)

	Wisenet open platform
General	
Webpage Language	English, French, Italian, Spanish, German, Japanese, Russian, Swedish, Portuguese, Czech, Polish, Turkish, Dutch, Hungarian, Greek
Edge Storage	Micro SD/SDHC/SDXC 1slot 256GB
Memory	1024MB RAM, 256MB Flash
Environmental & Electrical	
Operating Temperature / Humidity	-40°C ~ +60°C (-40°F ~ +140°F) / Less than 90% RH
Storage Temperature / Humidity	-50°C ~ +60°C (-58°F ~ +140°F) / Less than 90% RH
Certification	IP66, NEMA4X
Input Voltage	PoE(IEEE802.3af, Class3), 24VAC, 12VDC
Power Consumption	PoE: Max. 8.7W, typical 7.5W 12VDC: Max. 7.8W, typical 6.7W 24VAC: Max. 9.2W, typical 8.0W
Mechanical	
Color / Material	White / Aluminum
RAL Code	RAL9003
Product dimensions / weight	Φ147.51x375.3mm(58.07x147.76") / 3124g(6.89 lb)

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



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

Addition of derivative models for place of sale management

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK THERMAL CAMERA	TNO-3050T	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC Adapter	DRL-246000AC	-	Dream Electronics Co., Ltd.	-
DC Adapter	FSP060-DIBAN2	-	FSP GROUP INC.	-
PoE Adapter	PT-PSE109GBRO-AH	-	Dongguan PROCET Network Technology Co.,Ltd	-
Notebook	LG15N54	410NZGK015231	LG Electronics Co., Ltd.	-
Notebook Adapter	ADP-90WH B	84ZW19F1663	DELTA ELECTRONICS(JIANGSU) LTD.	-
Speaker	BR1000A Cuve Black 2	-	DONGGUAN EDIFIER TECHNOLOGY Co., Ltd	-
MIC	MP1000	-	-	-
Alarm	-	-	-	-
Button Alarm	-	-	-	-
Smartphone	A1586	-	APPLE .Inc	-
Micro SD Card	-	-	SanDisk	4 GB

1.6 External I/O Cabling

■ DC / AC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK THERMAL CAMERA (EUT)	RJ-45	Notebook	RJ-45	3.0	U
	Audio Out	Speaker	3.5 mm	1.4	U
	Audio In	MIC	3.5 mm	1.4	U
	Alarm Out	Alarm	Alarm In	2.8	U
	Alarm In	Button Alarm	Alarm Out	2.6	U
	Micro SD Slot	Micro SD Card	Micro SD 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 THERMAL CAMERA (EUT)	RJ-45	PoE Adapter	RJ-45	3.0	U
	Audio Out	Speaker	3.5 mm	1.4	U
	Audio In	MIC	3.5 mm	1.4	U
	Alarm Out	Alarm	Alarm In	2.8	U
	Alarm In	Button Alarm	Alarm Out	2.6	U
	Micro SD Slot	Micro SD Card	Micro SD Slot	-	-
Notebook	RJ-45	PoE Adapter	RJ-45	3.0	U
	3.5 mm	Smartphone	3.5 mm	0.5	U

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

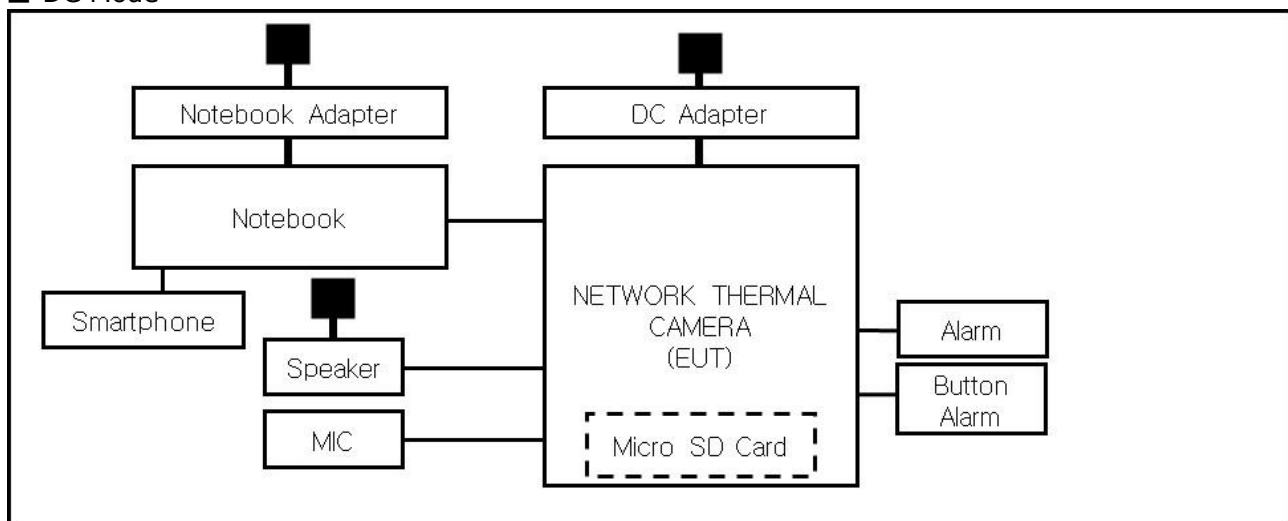
Test Mode	operating
DC Mode, AC Mode, PoE Mode	After placing the test equipment and peripheral devices as shown in the layout below, the tests were conducted while checking the 1KHz output from the smartphone, the camera video output from the notebook and verifying that they were operating normally while PING TEST.

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

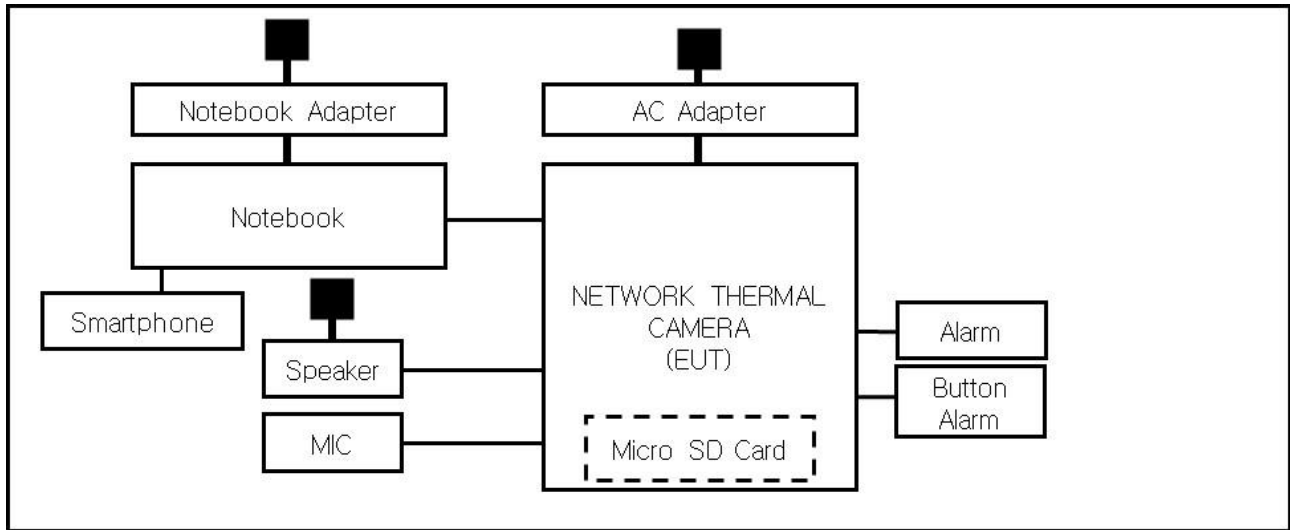
1.8 Configuration

■ AC Main
 □ DC Main

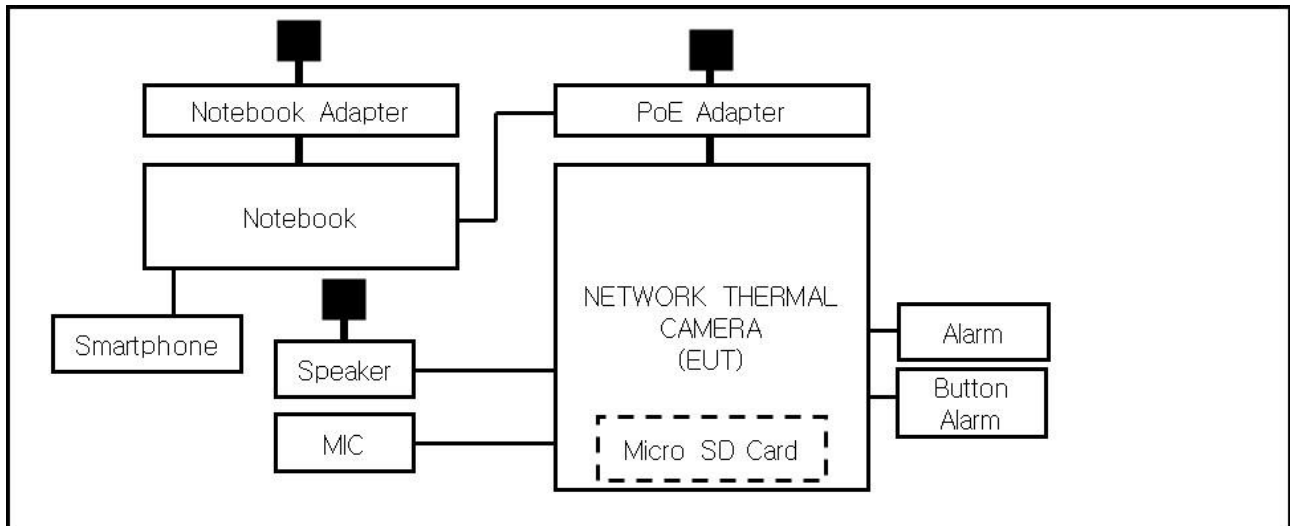
■ DC Mode



■ AC Mode



■ PoE Mode



1.9 Remarks when standards applied

The USB port and VIDEO port are excluded for testing as the Firmware update.

1.10 Calibration Details of Equipment Used for Measurement

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

1.11 Test Facility

The measurement facility is located at 473-21, Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298
JAPAN	VCCI	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)	 C-20136, T-20137, R-20181, G-20176
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014/30/EU**

☐ EN 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

☐ Group 1
☐ Class A

☐ Group 2
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547:2009

☒ EN 55032:2015/A11 :2020

☒ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☒ 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/A11:2020

☒ BS EN 50130-4:2011

☒ BS EN 61000-3-2:2014

☒ BS EN 61000-3-3:2013



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (14) of (99)

-
- | | | |
|---|----------------------------------|----------------------------------|
| ☐ 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 C63.4-2014 | | |
| ☐ IC Regulation ICES-003 : 2016 | | |
| ☐ CAN/CSA CISPR 22-10 | ☐ Class A | ☐ Class B |
| ☐ ANSI C63.4-2014 | | |
| ☐ 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 | | |

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

2.1 Conducted Emissions at Mains Power Ports

Test Date

Apr. 02, 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: (23,8 ± 0,2) °C

Relative Humidity: (45,0 ± 0,4) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date

Apr. 02, 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
☐	CDN	CDNS502A	TESEQ	40431	12, 29, 2021

Test Conditions

Temperature: (23,8 ± 0,2) °C
Relative Humidity: (45,0 ± 0,4) % 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 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Mar. 29, 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: (24,3 ± 0,3) °C

Relative Humidity: (44,7 ± 0,2) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Mar. 28, 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 ± 0,2) °C

Relative Humidity: (45,1 ± 0,3) % 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.

2.5 Harmonic Current Emissions

Test Date

Apr. 07, 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, 2021
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,3 ± 0,1) °C

Relative Humidity: (46,2 ± 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. 07, 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, 2021
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,3 ± 0,3) °C

Relative Humidity: (46,2 ± 0,3) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 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. 05, 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: (24,0 ± 0,1) °C
Relative Humidity: (45,9 ± 0,2) % R.H.
Atmospheric Pressure: (100,0 ± 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 ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV	Air ☒ 2 kV ☒ 4 kV ☐ 6 kV ☒ 8 kV ☐ 15 kV	HCP ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV	VCP ☐ 2 kV ☐ 4 kV ☒ 6 kV ☐ 8 kV ☐ 15 kV
--------------------	---	---	---	---

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

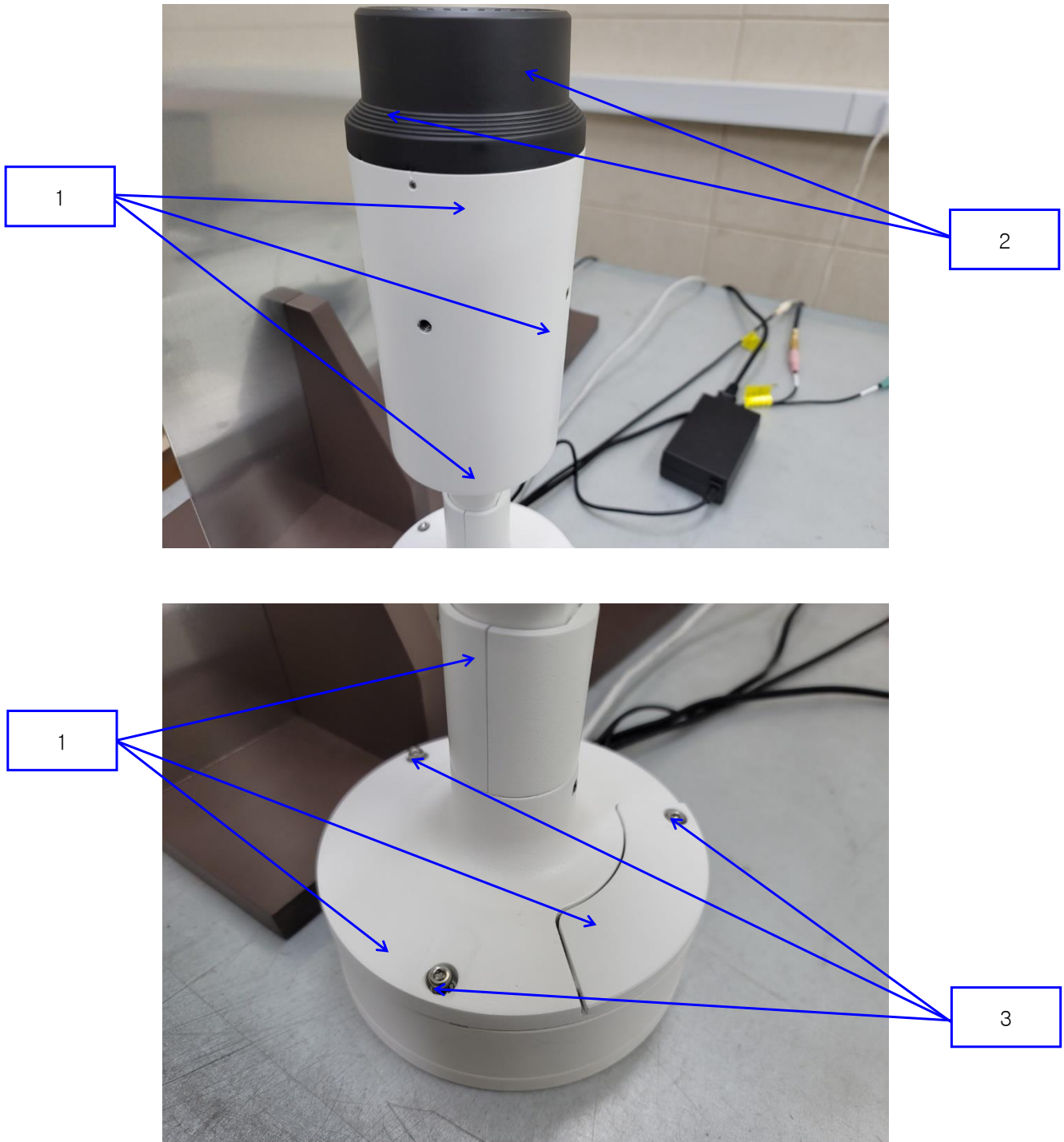
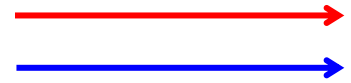
Required Performance Criteria: ☒ Complied

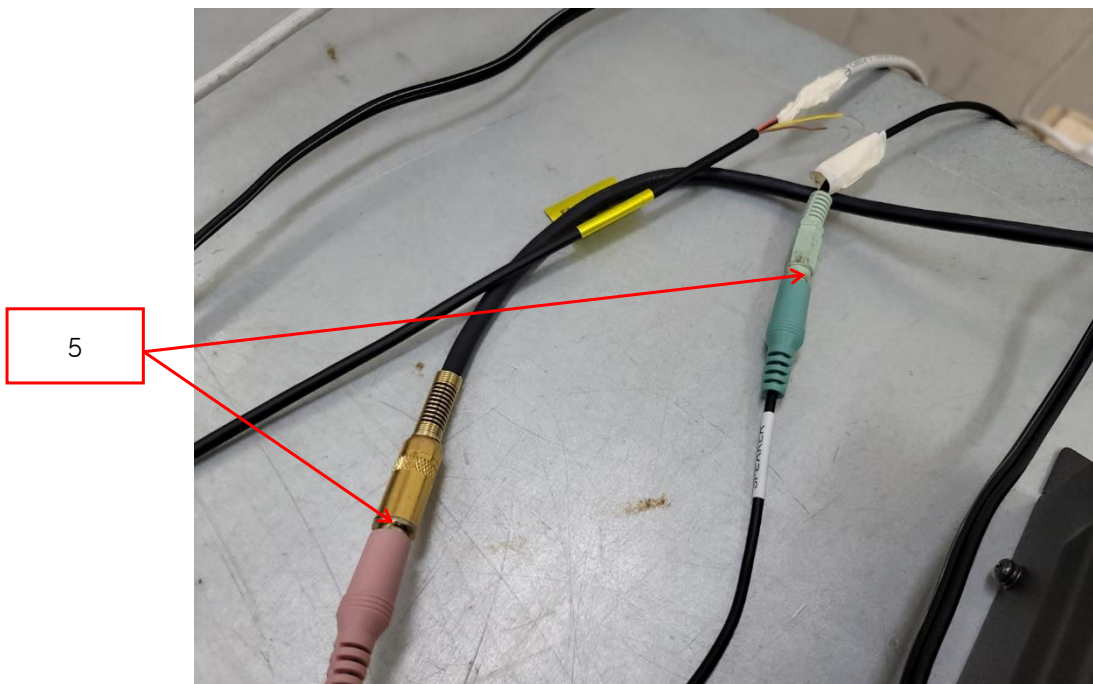
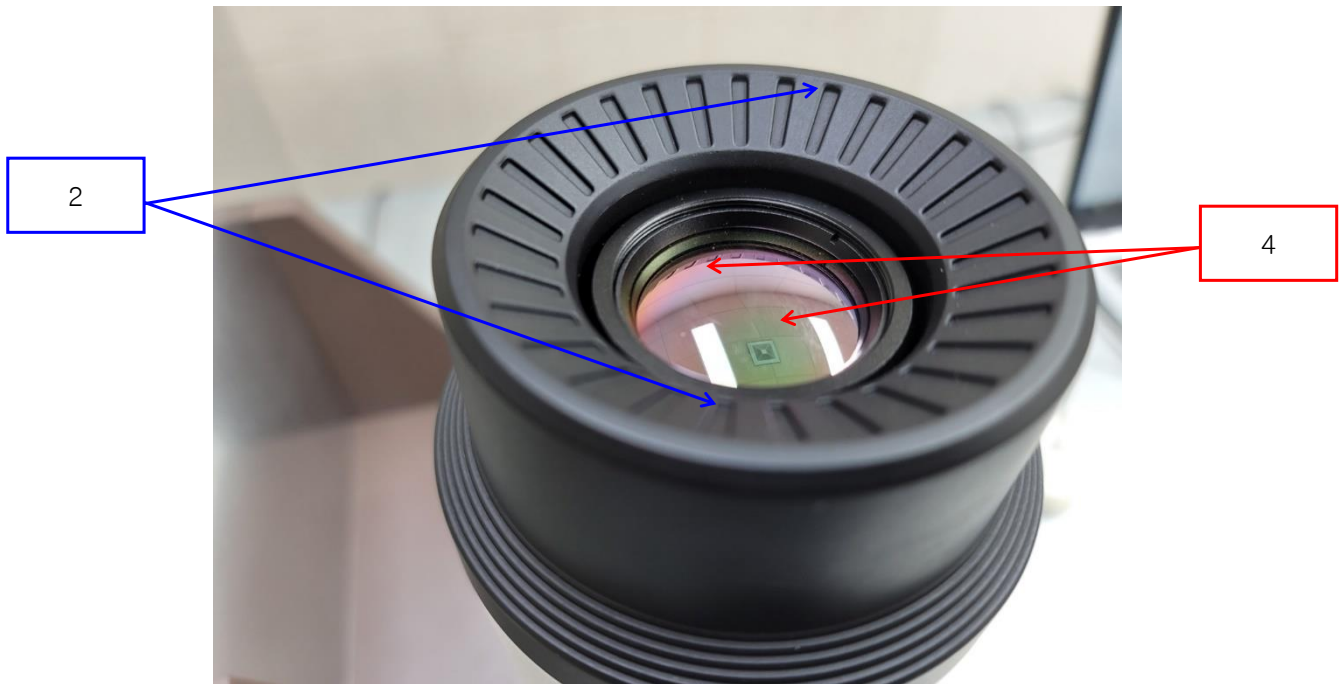
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Location of Discharge:

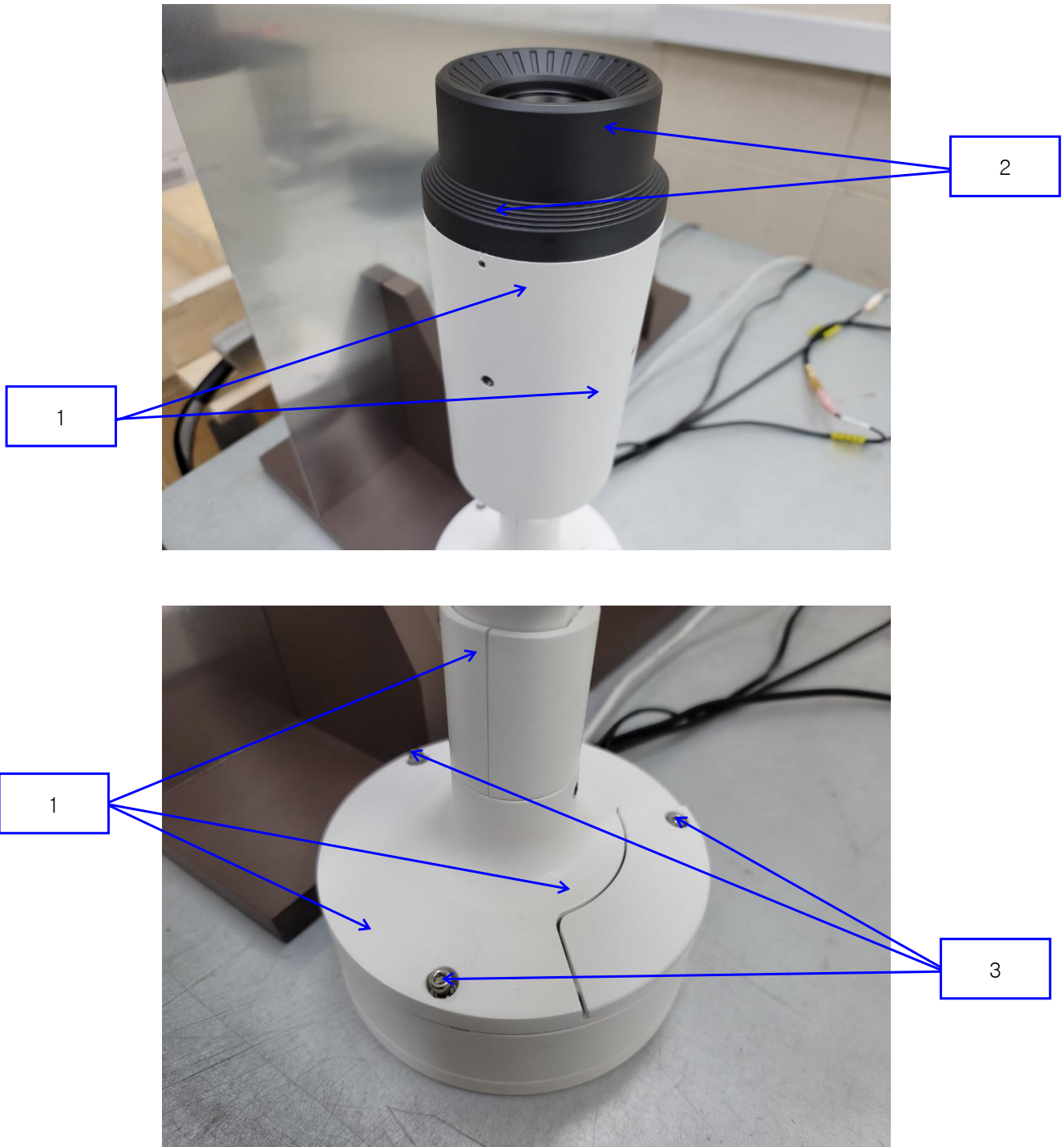
■ DC Mode

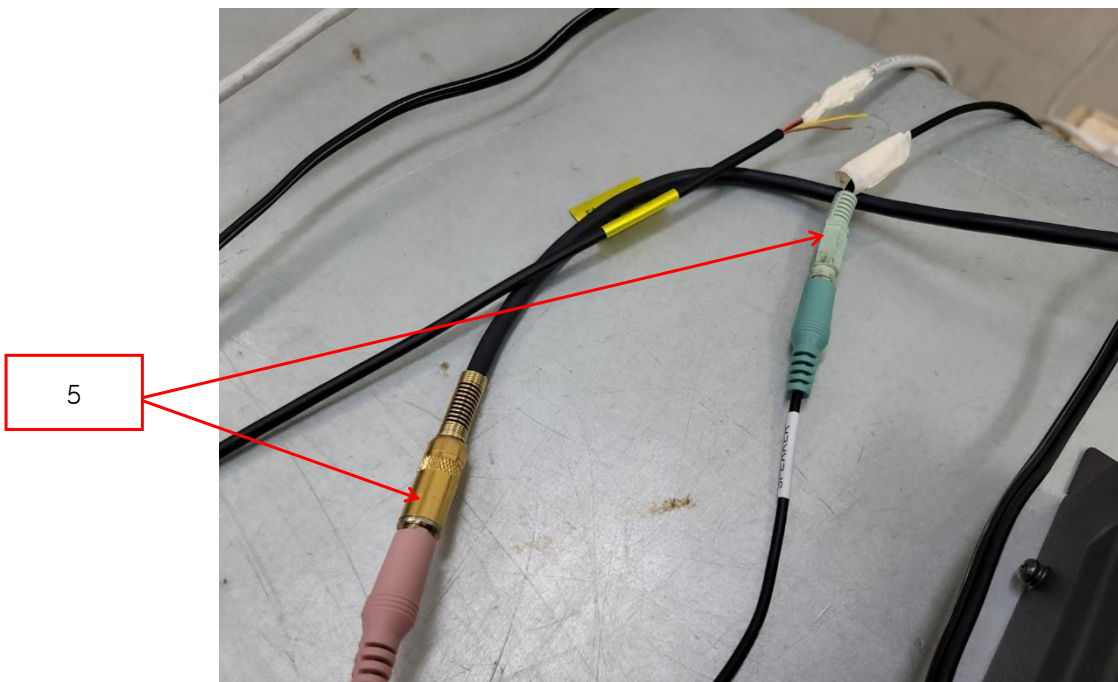
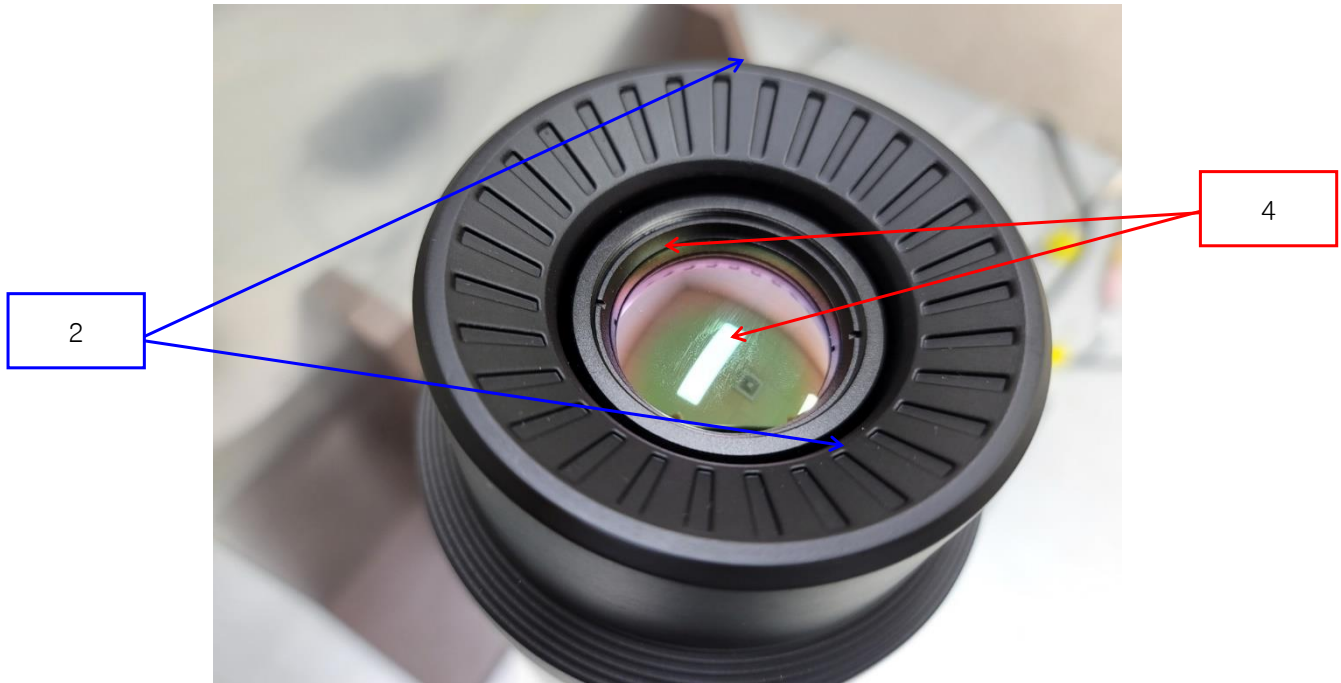
Air
Contact



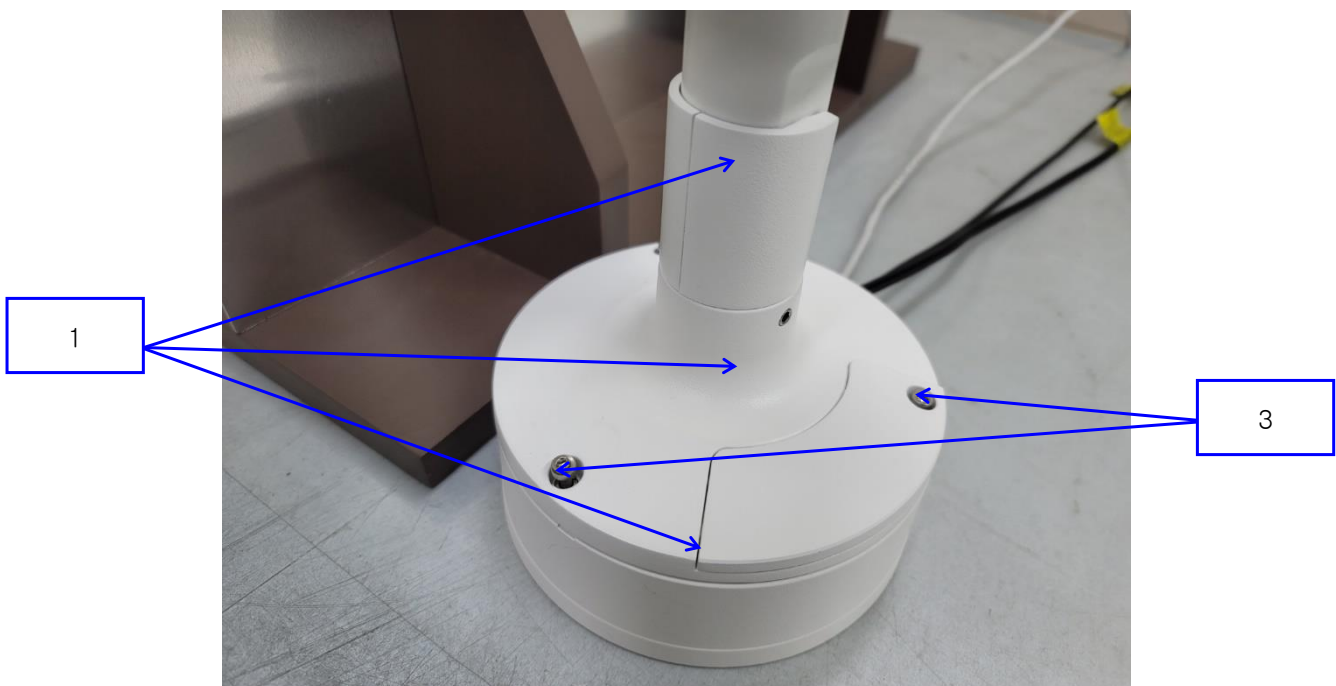
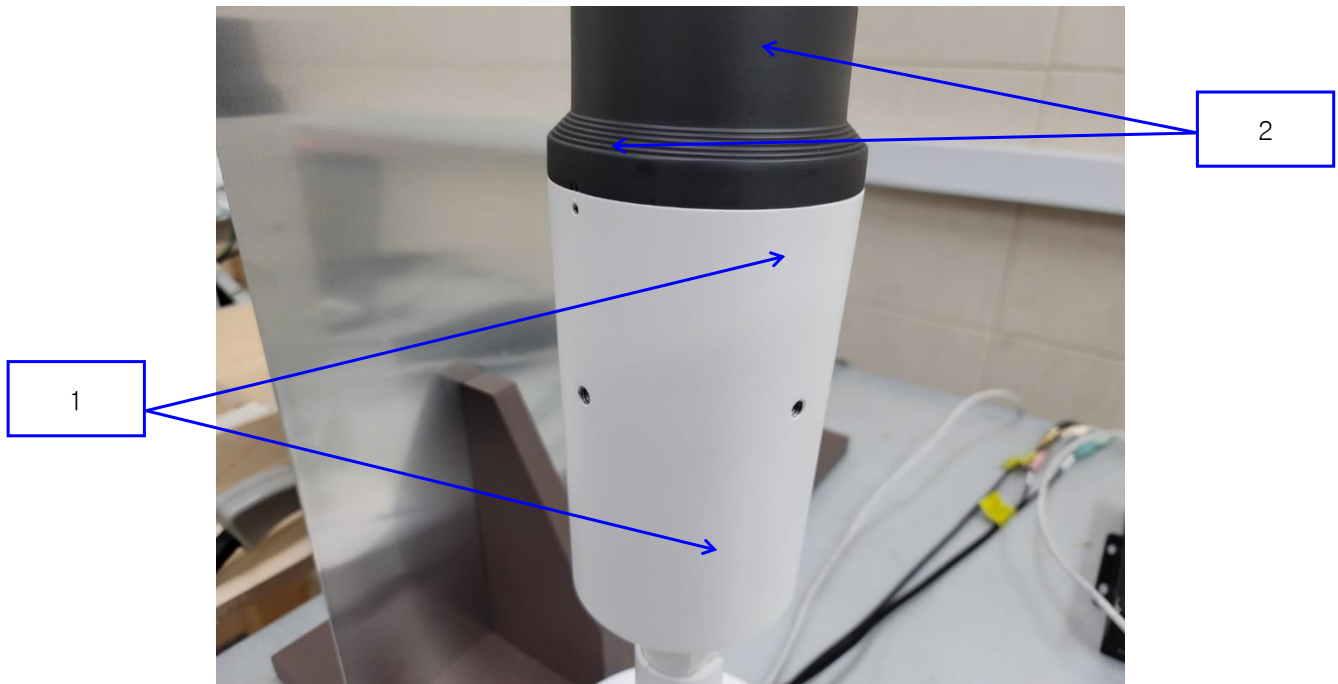


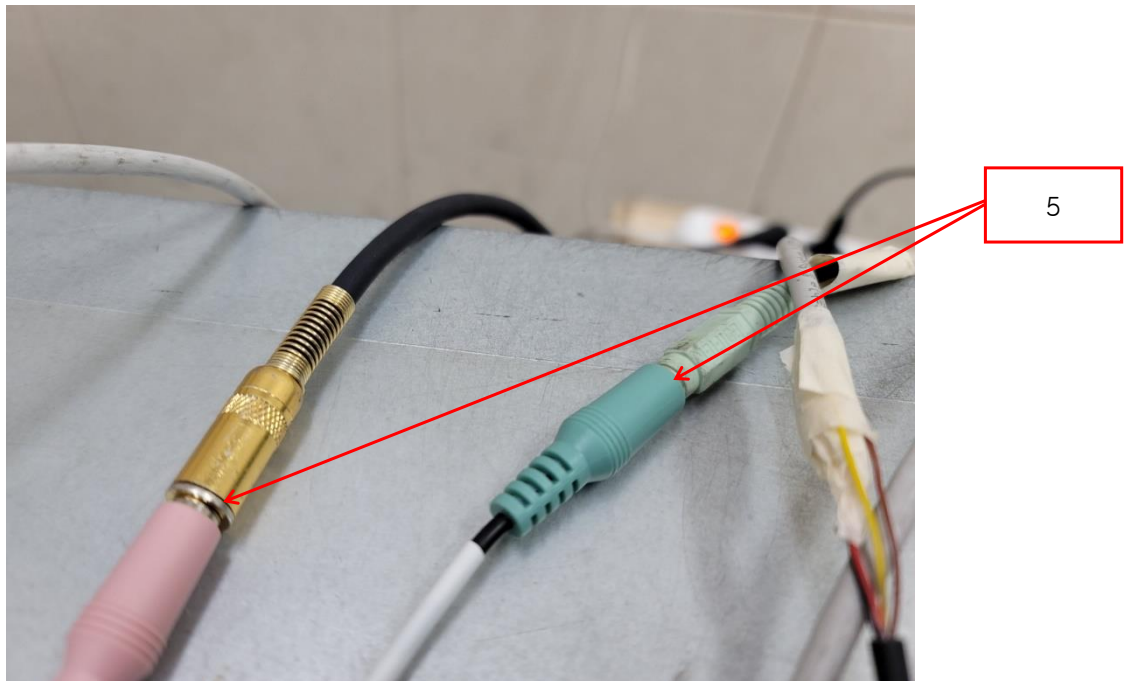
■ AC Mode





■ PoE Mode





**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (30) of (99)

Test Data

■ DC Mode

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

Direct Discharge

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

■ AC Mode

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

Direct Discharge

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (31) of (99)

■ PoE Mode

Indirect Discharge

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

Direct Discharge

No.	Test Point	Discharge Method	Observations	Remarks
1	Enclosure 1	Contact Discharge	Complied	-
2	Enclosure 2	Contact Discharge	Complied	-
3	Screw	Contact Discharge	Complied	-
4	Lens	Air Discharge	Complied	-
5	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

RemarksPASS Required Performance Criteria

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

3.2 Radiated Electric Field Immunity

Reference Standard

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

Test Date

Mar. 27, 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: (23,7 ± 0,4) °C
Relative Humidity: (45,6 ± 0,5) % R.H.
Atmospheric Pressure: (100,9 ± 0,0) kPa



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (33) of (99)

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Test Data

■ DC Mode

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

■ AC Mode

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

■ PoE Mode

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

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria

3.3 Electrical Fast Transients/Bursts

Reference Standard

EN 61000-4-4:2012

Test Date

Apr. 04, 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: (23,9 ± 0,3) °C
Relative Humidity: (46,2 ± 0,4) % R.H.
Atmospheric Pressure: (99,8 ± 0,0) kPa

Test Specifications

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

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

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☐ 5 kHz ☒ 100 kHz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ Complied

Test Data

■ DC Mode

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

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

■ AC 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

☒ PoE Mode

☐ 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)
-	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

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

Note: “Blank” = Not performed

Observations:

Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.4 Surge Transients

Reference Standard

EN 61000-4-5:2014

Test Date

Apr. 04, 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: (23,9 ± 0,4) °C
Relative Humidity: (46,2 ± 0,2) % R.H.
Atmospheric Pressure: (99,8 ± 0,0) kPa



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (40) of (99)

Test Specifications

AC Power Lines

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

Surge Amplitude :

Common Mode

☒ (0,5 / 1,0 / 2,0) kV

Differential Mode

☒ (0,5 / 1,0) kV

Number of Surges:

☒ 5 surges per angle

Angle:

☒ 0°, 90°, 180°, 270° (input a.c. power port)

Polarity:

☒ Positive & Negative

Repetition Rate:

☐ 1 surge per min ☒ 1 surge per 30 sec.

Required Performance Criteria: ☒ Complied

Other supply / Signal Lines

Source Impedance:

42 ohm for common Mode

Surge Amplitude:

Common Mode

☒ (0,5 / 1,0) kV

Number of Surges:

☒ 5 Surges

Polarity:

☒ Positive & Negative

Repetition Rate:

☐ 1 surge per min ☒ 1 surge per 30 sec.

Required Performance Criteria: ☒ Complied

Test Data

■ 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)
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	CDN	Complied	Complied
	LINE	Complied	Complied

■ AC 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	-	-
N – PE	-	-

Signal Lines

☒ Line to Earth – Common Mode

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

☒ PoE Mode

☐ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

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

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

Mar. 03, 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 T800	TESEQ	42800	11, 25, 2021

Test Conditions

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



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (44) of (99)

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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

Test Data

■ DC Mode

☒ Input a.c. power ports

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

■ AC 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

■ PoE Mode

☐ Input a.c. power ports

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

☐ Input d.c. power ports

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

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied

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. 04, 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: (23,9 ± 0,3) °C
Relative Humidity: (46,2 ± 0,2) % R.H.
Atmospheric Pressure: (99,8 ± 0,0) kPa



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (48) of (99)

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>

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0250-R1
Page (49) of (99)

■ AC 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

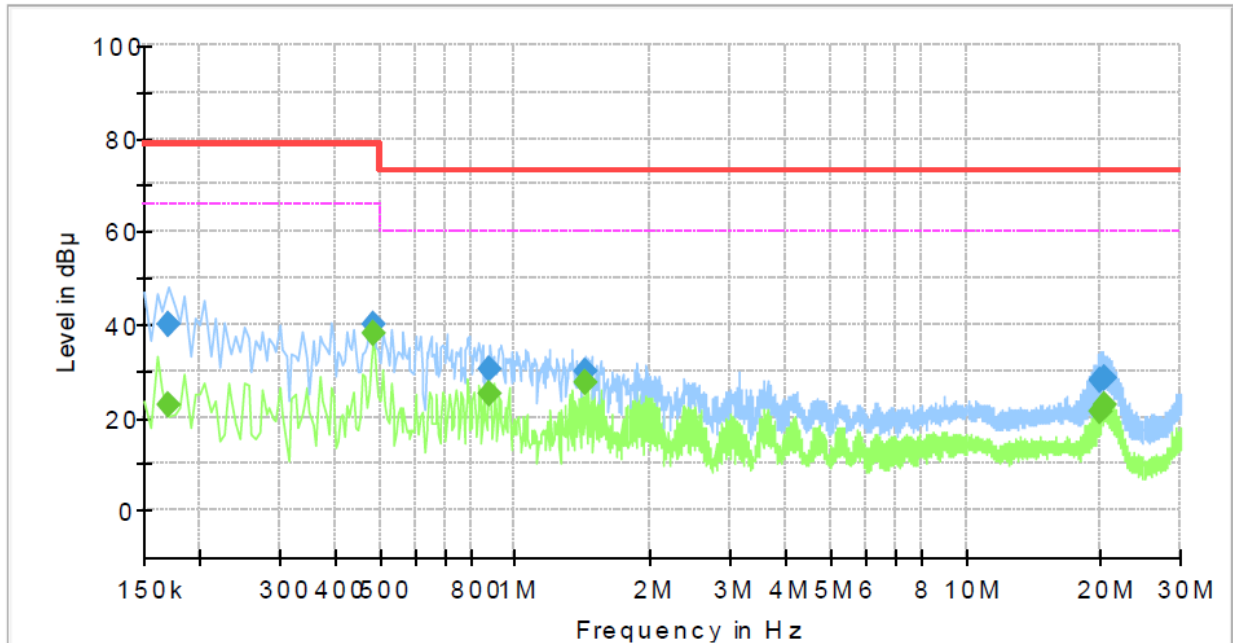
Conducted Emissions at Mains Power Ports

■ DC Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3050T
Phase:	L1
Mode:	DC
Operator Name:	KES



Final Result

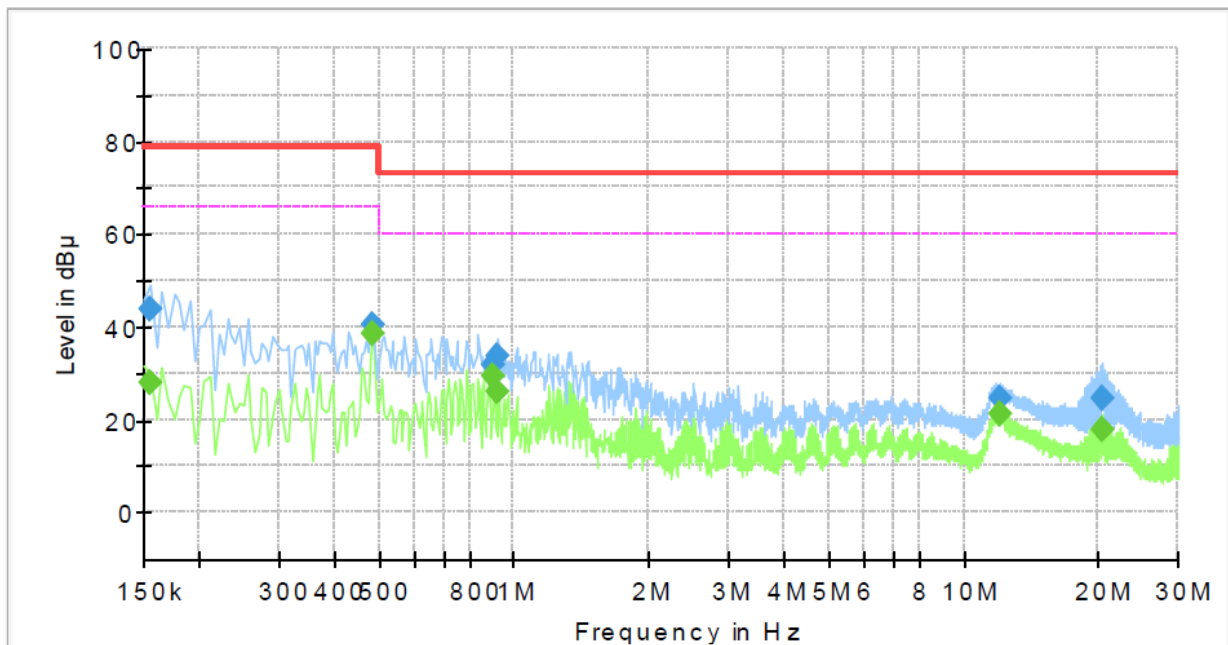
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.170000	---	22.68	66.00	43.32	1000.0	9.000	L1	19.4
0.170000	39.95	---	79.00	39.05	1000.0	9.000	L1	19.4
0.485000	---	38.26	66.00	27.74	1000.0	9.000	L1	19.7
0.485000	39.92	---	79.00	39.08	1000.0	9.000	L1	19.7
0.880000	---	25.17	60.00	34.83	1000.0	9.000	L1	20.0
0.880000	30.56	---	73.00	42.44	1000.0	9.000	L1	20.0
1.430000	---	27.29	60.00	32.71	1000.0	9.000	L1	20.1
1.430000	29.65	---	73.00	43.35	1000.0	9.000	L1	20.1
19.880000	---	21.07	60.00	38.93	1000.0	9.000	L1	20.1
19.880000	27.87	---	73.00	45.13	1000.0	9.000	L1	20.1
20.265000	---	22.57	60.00	37.43	1000.0	9.000	L1	20.1
20.265000	28.59	---	73.00	44.41	1000.0	9.000	L1	20.1

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact kes@kes.co.kr

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3050T
Phase:	N
Mode:	DC
Operator Name:	KES



Final Result

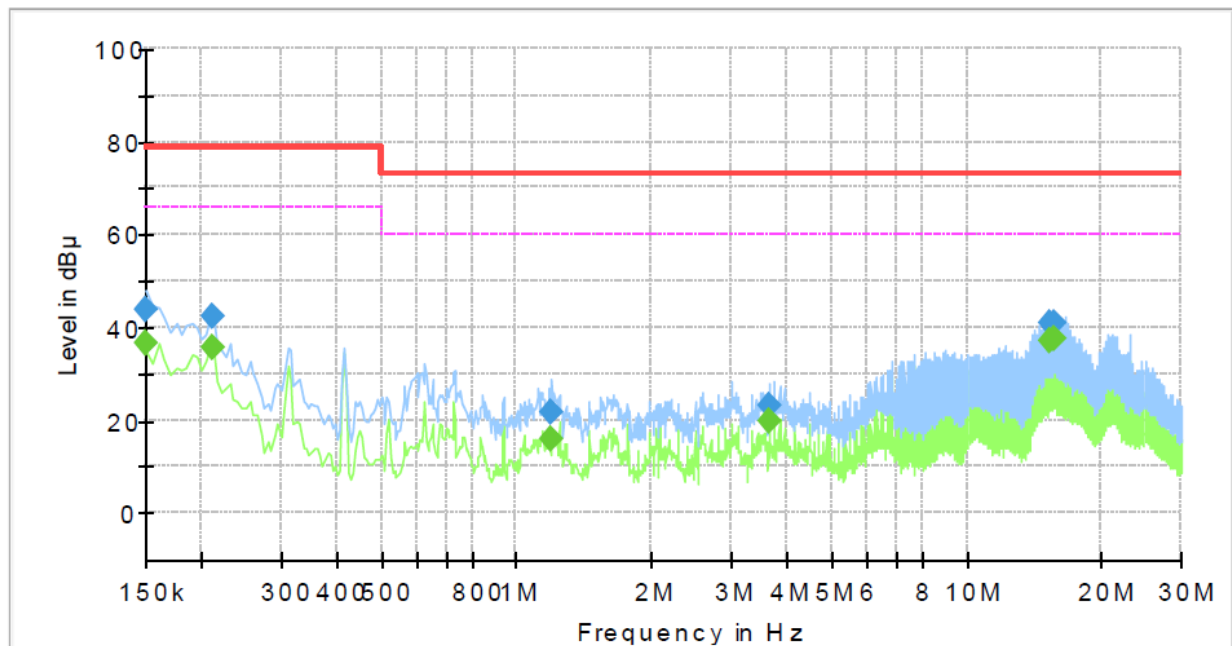
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.155000	---	27.99	66.00	38.01	1000.0	9.000	N	19.4
0.155000	43.72	---	79.00	35.28	1000.0	9.000	N	19.4
0.485000	---	38.72	66.00	27.28	1000.0	9.000	N	19.7
0.485000	40.35	---	79.00	38.65	1000.0	9.000	N	19.7
0.900000	---	29.43	60.00	30.57	1000.0	9.000	N	20.0
0.900000	31.90	---	73.00	41.10	1000.0	9.000	N	20.0
0.920000	---	26.23	60.00	33.77	1000.0	9.000	N	20.0
0.920000	33.54	---	73.00	39.46	1000.0	9.000	N	20.0
12.095000	---	21.40	60.00	38.60	1000.0	9.000	N	20.0
12.095000	24.64	---	73.00	48.36	1000.0	9.000	N	20.0
20.280000	---	17.92	60.00	42.08	1000.0	9.000	N	20.1
20.280000	24.70	---	73.00	48.30	1000.0	9.000	N	20.1

■ AC Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3050T
Phase:	L1
Mode:	AC
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	---	36.72	66.00	29.28	1000.0	9.000	L1	19.4
0.150000	43.98	---	79.00	35.02	1000.0	9.000	L1	19.4
0.210000	---	35.58	66.00	30.42	1000.0	9.000	L1	19.4
0.210000	42.12	---	79.00	36.88	1000.0	9.000	L1	19.4
1.200000	---	15.77	60.00	44.23	1000.0	9.000	L1	20.0
1.200000	21.82	---	73.00	51.18	1000.0	9.000	L1	20.0
3.630000	---	19.60	60.00	40.40	1000.0	9.000	L1	19.9
3.630000	23.25	---	73.00	49.75	1000.0	9.000	L1	19.9
15.350000	---	36.90	60.00	23.10	1000.0	9.000	L1	19.9
15.350000	40.71	---	73.00	32.29	1000.0	9.000	L1	19.9
15.660000	---	37.69	60.00	22.31	1000.0	9.000	L1	19.9
15.660000	40.72	---	73.00	32.28	1000.0	9.000	L1	19.9

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

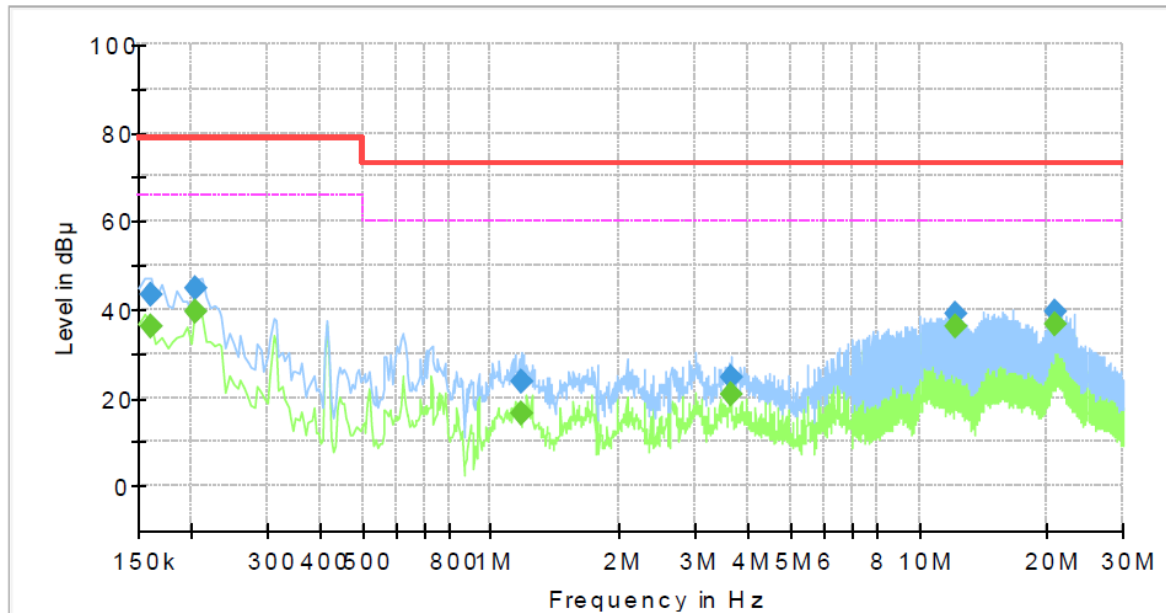
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3050T
Phase:	N
Mode:	AC
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	35.95	66.00	30.05	1000.0	9.000	N	19.4
0.160000	43.24	---	79.00	35.76	1000.0	9.000	N	19.4
0.205000	---	39.66	66.00	26.34	1000.0	9.000	N	19.4
0.205000	44.91	---	79.00	34.09	1000.0	9.000	N	19.4
1.175000	---	16.49	60.00	43.51	1000.0	9.000	N	20.0
1.175000	23.61	---	73.00	49.39	1000.0	9.000	N	20.0
3.630000	---	20.80	60.00	39.20	1000.0	9.000	N	19.9
3.630000	24.75	---	73.00	48.25	1000.0	9.000	N	19.9
12.135000	---	35.89	60.00	24.11	1000.0	9.000	N	20.0
12.135000	39.05	---	73.00	33.95	1000.0	9.000	N	20.0
20.950000	---	36.53	60.00	23.47	1000.0	9.000	N	20.2
20.950000	39.67	---	73.00	33.33	1000.0	9.000	N	20.2

◆ 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))

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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

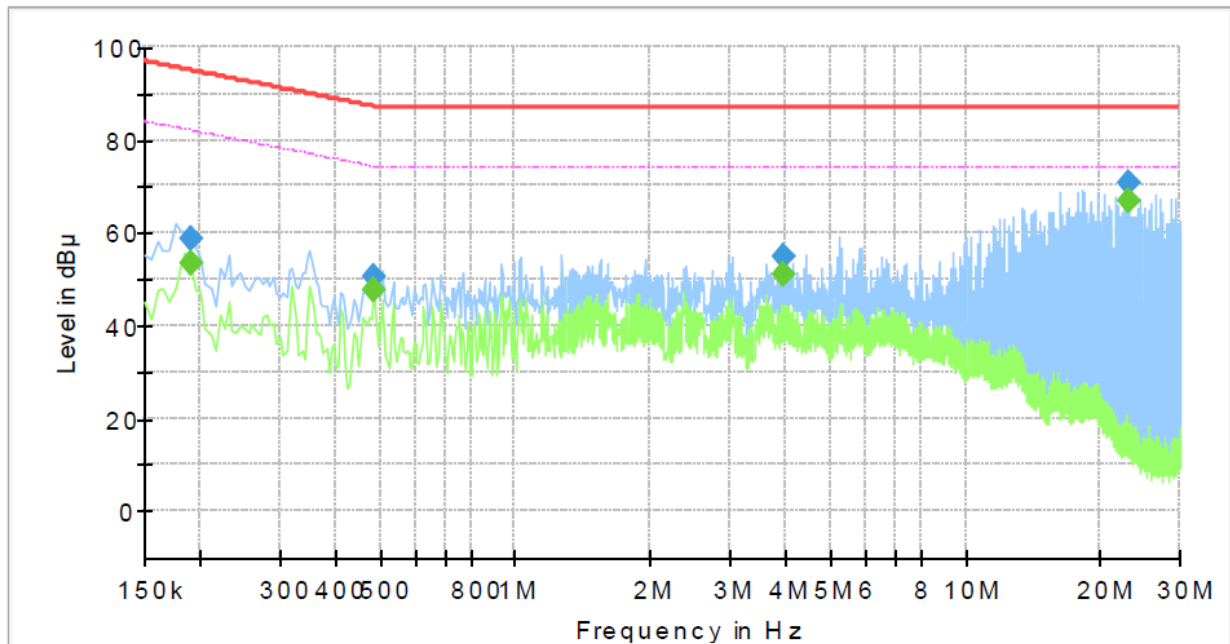
Conducted Emissions at Telecommunication Ports

■ DC Mode

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3050T
Mode :	DC
Speed :	100 Mbps
Operator Name:	KES



Final_Result

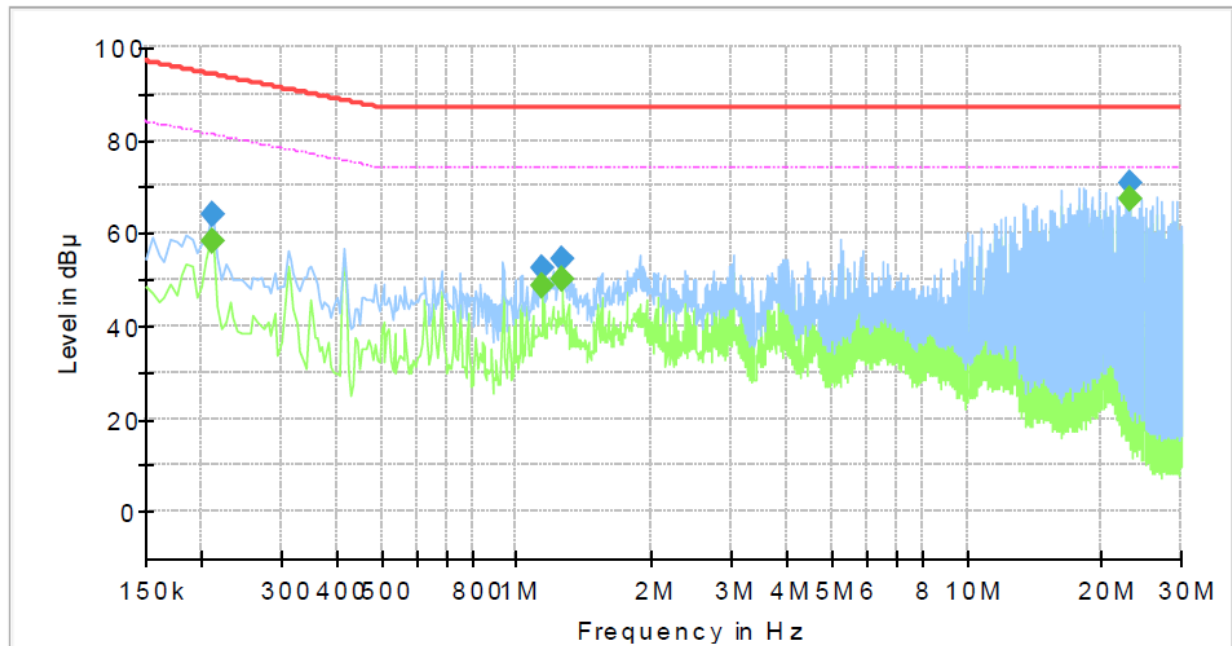
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.190000	---	53.60	82.04	28.44	1000.0	9.000	Single Line	19.8
0.190000	58.63	---	95.04	36.41	1000.0	9.000	Single Line	19.8
0.485000	---	47.76	74.25	26.49	1000.0	9.000	Single Line	19.8
0.485000	50.58	---	87.25	36.67	1000.0	9.000	Single Line	19.8
3.955000	---	50.88	74.00	23.12	1000.0	9.000	Single Line	19.7
3.955000	54.92	---	87.00	32.08	1000.0	9.000	Single Line	19.7
23.130000	---	66.96	74.00	7.04	1000.0	9.000	Single Line	20.1
23.130000	70.66	---	87.00	16.34	1000.0	9.000	Single Line	20.1

■ AC Mode

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3050T
Mode :	AC
Speed :	100 Mbps
Operator Name:	KES



Final Result

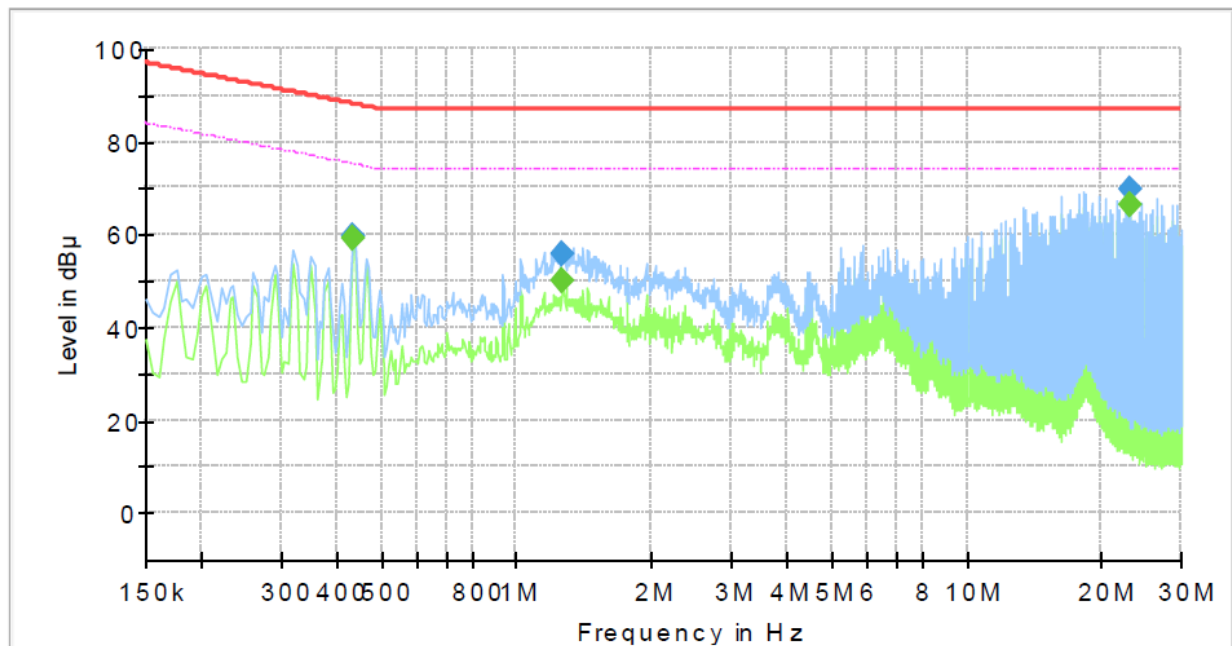
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.210000	---	58.41	81.21	22.80	1000.0	9.000	Single Line	19.7
0.210000	63.79	---	94.21	30.42	1000.0	9.000	Single Line	19.7
1.145000	---	48.55	74.00	25.45	1000.0	9.000	Single Line	20.0
1.145000	52.56	---	87.00	34.44	1000.0	9.000	Single Line	20.0
1.265000	---	49.88	74.00	24.12	1000.0	9.000	Single Line	20.0
1.265000	54.14	---	87.00	32.86	1000.0	9.000	Single Line	20.0
23.130000	---	67.24	74.00	6.76	1000.0	9.000	Single Line	20.1
23.130000	70.52	---	87.00	16.48	1000.0	9.000	Single Line	20.1

■ PoE Mode

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3050T
Mode :	PoE
Speed :	100 Mbps
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.435000	---	59.04	75.16	16.12	1000.0	9.000	Single Line	19.7
0.435000	59.77	---	88.16	28.39	1000.0	9.000	Single Line	19.7
1.265000	---	50.17	74.00	23.83	1000.0	9.000	Single Line	20.0
1.265000	55.70	---	87.00	31.30	1000.0	9.000	Single Line	20.0
23.130000	---	66.37	74.00	7.63	1000.0	9.000	Single Line	20.1
23.130000	69.89	---	87.00	17.11	1000.0	9.000	Single Line	20.1

◆ Calculation

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

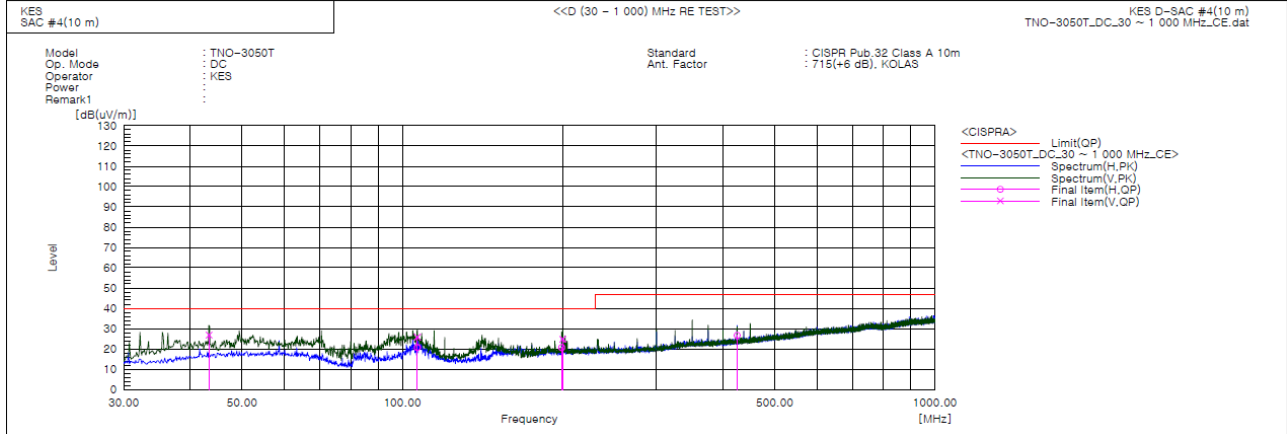
QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



Final Result

No.	Frequency [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	43.351	V	48.5	-21.7	26.8	40.0	13.2	132.0	339.0	
2	106.656	V	48.2	-22.4	25.8	40.0	14.2	125.0	280.0	
3	106.661	H	43.1	-22.4	20.7	40.0	19.3	363.0	177.0	
4	199.173	H	41.5	-20.8	20.7	40.0	19.3	351.0	202.0	
5	199.893	V	45.6	-20.8	24.8	40.0	15.2	155.0	228.0	
6	425.073	H	40.4	-13.7	26.7	47.0	20.3	392.0	222.0	



KES Co., Ltd.

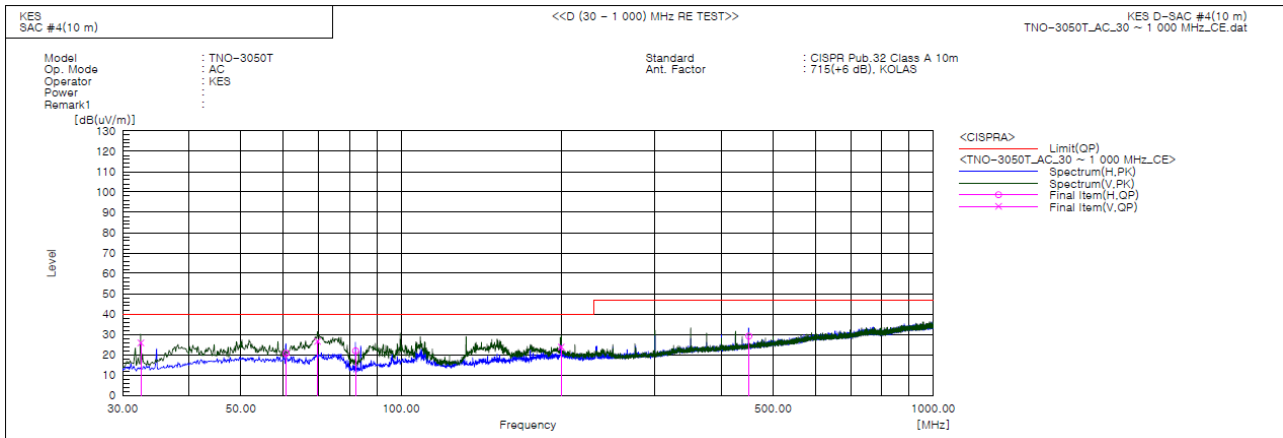
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (58) of (99)

■ AC Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	32.443	V	50.9	-25.1	25.8	40.0	14.2	131.0	162.0	
2	60.831	H	42.8	-22.1	20.7	40.0	19.3	351.0	122.0	
3	69.646	V	51.3	-24.7	26.6	40.0	13.4	136.0	118.0	
4	82.171	H	49.2	-27.3	21.9	40.0	18.1	351.0	293.0	
5	199.893	V	44.6	-20.8	23.8	40.0	16.2	141.0	219.0	
6	450.041	H	42.2	-13.1	29.1	47.0	17.9	356.0	137.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



KES Co., Ltd.

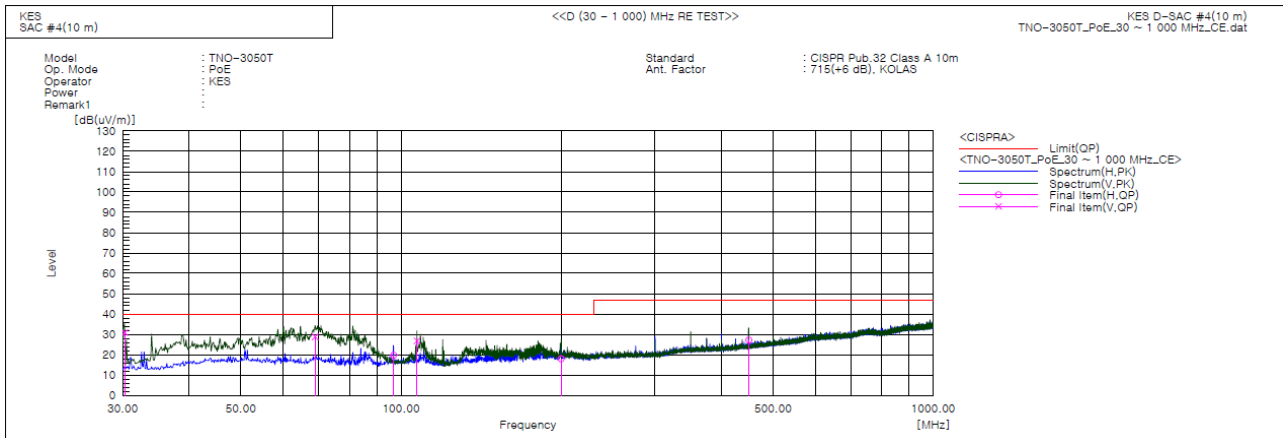
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (59) of (99)

PoE Mode



Final Result

No.	Frequency	(P)	Reading	c.f	Result	Limit	Margin	Height	Angle	Remark
	[MHz]		QP [dB(uV)]	[dB(1/m)]	QP [dB(uV/m)]	QP [dB(uV/m)]	QP [dB]	[cm]	[deg]	
1	30.273	V	56.2	-25.3	30.9	40.0	9.1	113.0	15.0	
2	68.954	V	53.3	-24.5	28.8	40.0	11.2	132.0	81.0	
3	96.834	H	42.9	-23.1	19.8	40.0	20.2	351.0	199.0	
4	107.141	V	49.2	-22.4	26.8	40.0	13.2	141.0	106.0	
5	199.893	H	38.7	-20.8	17.9	40.0	22.1	381.0	245.0	
6	450.045	H	40.3	-13.1	27.2	47.0	19.8	392.0	172.0	

◆ 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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

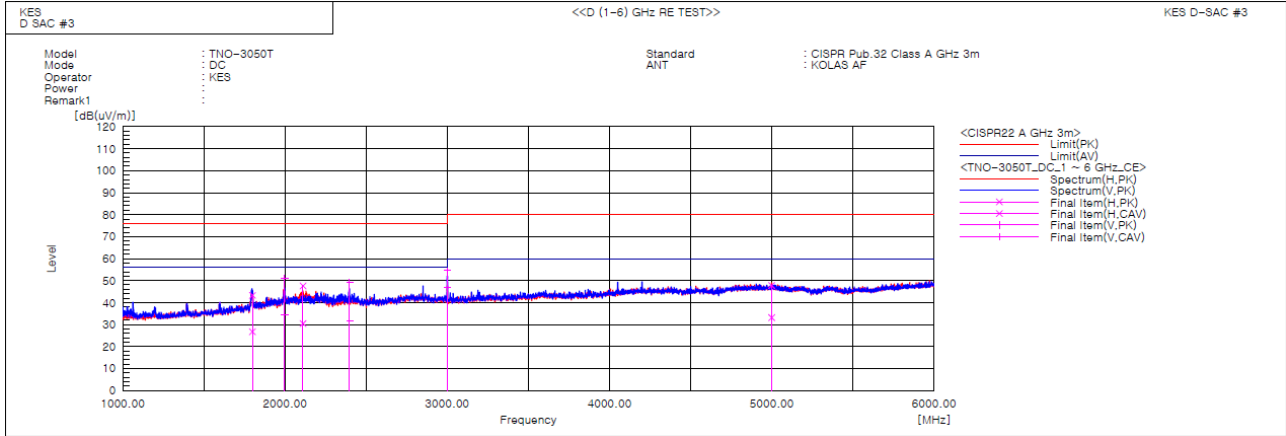
Report No.:

KES-EM-21T0250-R1

Page (60) of (99)

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	1799.121	H	46.3	29.7	-3.0	43.3	26.7	76.0	56.0	32.7	29.3	100.0	221.9	
2	1997.251	V	52.2	35.5	-1.0	51.2	34.5	76.0	56.0	24.8	21.5	100.0	195.1	
3	2110.331	H	48.3	31.2	-0.7	47.6	30.5	76.0	56.0	28.4	25.5	100.0	166.8	
4	2397.412	V	49.1	31.6	0.1	49.2	31.7	76.0	56.0	26.8	24.3	100.0	229.9	
5	3000.092	V	53.3	45.1	1.6	54.9	46.7	80.0	60.0	25.1	13.3	100.0	155.9	
6	4999.221	H	38.9	24.3	8.9	47.8	33.2	80.0	60.0	32.2	26.8	100.0	118.2	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr



KES Co., Ltd.

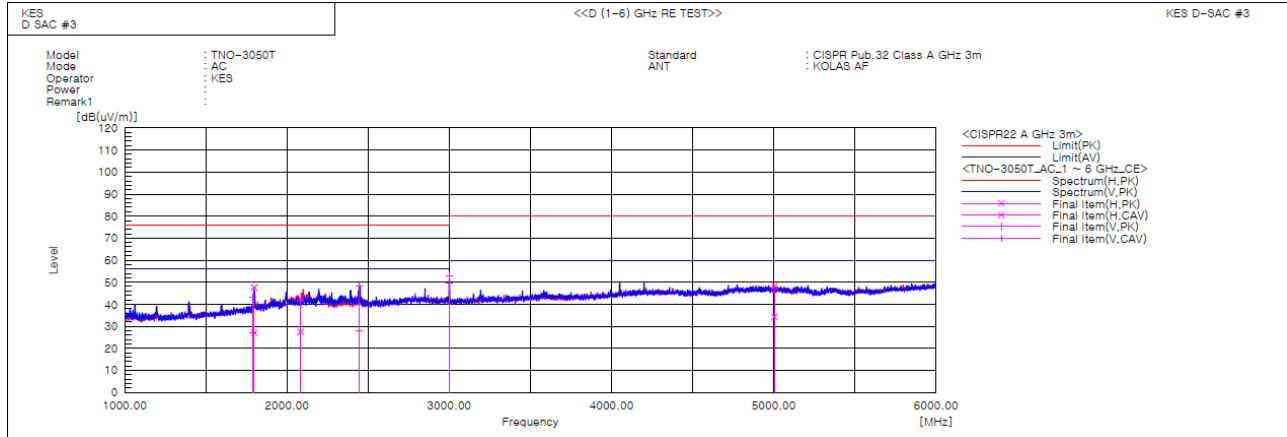
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (61) of (99)

AC Mode

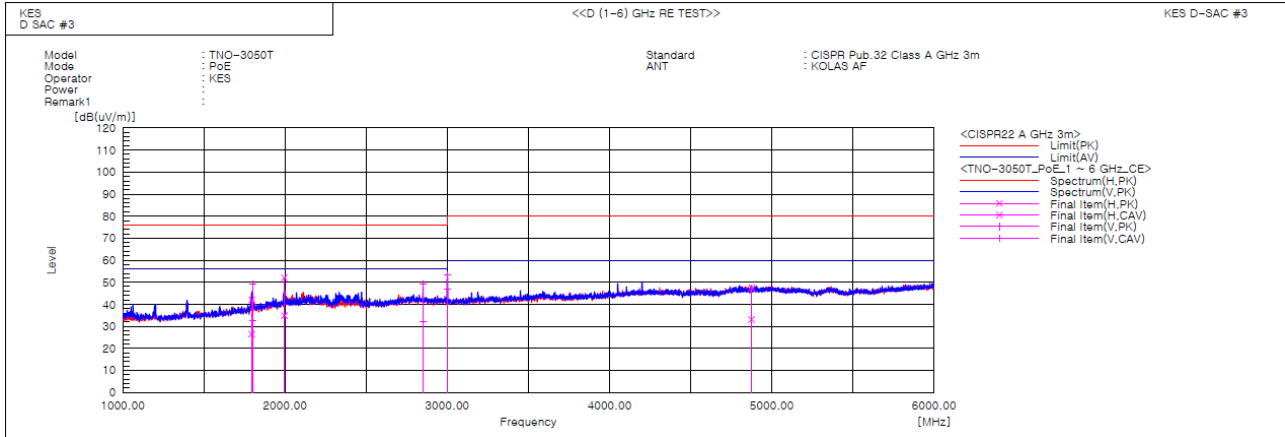


Final Result

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	1787.652	V	46.4	30.4	-3.2	43.2	27.2	76.0	56.0	32.8	28.8	100.0	190.0	
2	1797.361	H	50.6	30.0	-3.0	47.6	27.0	76.0	56.0	28.4	29.0	100.0	120.5	
3	2082.953	H	43.4	28.2	-0.7	42.7	27.5	76.0	56.0	33.3	28.5	100.0	141.4	
4	2443.621	V	48.3	28.0	0.1	48.4	28.1	76.0	56.0	27.6	27.9	100.0	35.6	
5	2999.970	V	51.2	47.8	1.6	52.8	49.4	76.0	56.0	23.2	6.6	100.0	165.3	
6	5003.019	H	39.3	25.4	8.9	48.2	34.3	80.0	60.0	31.8	25.7	100.0	357.3	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(μV)]	Reading CAV [dB(μV)]	c.f [dB(1/m)]	Result PK [dB(μV/m)]	Result CAV [dB(μV/m)]	Limit PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1794.211	H	45.1	29.6	-3.1	42.0	26.5	76.0	56.0	34.0	29.5	100.0	125.8	
2	1799.121	V	52.1	35.5	-3.0	49.1	32.5	76.0	56.0	26.9	23.5	100.0	177.0	
3	1995.312	H	53.1	35.9	-1.0	52.1	34.9	76.0	56.0	23.9	21.1	100.0	226.6	
4	2850.312	V	47.1	29.9	2.2	49.3	32.1	76.0	56.0	26.7	23.9	100.0	286.1	
5	3000.081	V	51.6	45.5	1.6	53.2	47.1	80.0	60.0	26.8	12.9	100.0	156.0	
6	4875.211	H	38.9	24.5	8.6	47.5	33.1	80.0	60.0	32.5	26.9	100.0	357.6	

◆ Calculation

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

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

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

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

Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.039			
2	0.003	0.316	1.080	n/a
3	0.030	1.323	2.300	PASS
4	0.003	0.739	0.430	n/a
5	0.030	2.593	1.140	PASS
6	0.004	1.477	0.300	n/a
7	0.029	3.787	0.770	PASS
8	0.003	1.336	0.230	n/a
9	0.029	7.272	0.400	PASS
10	0.003	1.414	0.184	n/a
11	0.028	8.582	0.330	PASS
12	0.003	1.813	0.153	n/a
13	0.027	12.950	0.210	PASS
14	0.003	2.328	0.131	n/a
15	0.026	17.270	0.150	PASS
16	0.003	2.654	0.115	n/a
17	0.025	18.638	0.132	PASS
18	0.003	2.903	0.102	n/a
19	0.024	19.878	0.118	PASS
20	0.003	2.928	0.092	n/a
21	0.022	13.679	0.161	PASS
22	0.003	3.179	0.084	n/a
23	0.021	14.158	0.147	PASS
24	0.003	3.326	0.077	n/a
25	0.019	14.357	0.135	PASS
26	0.002	3.198	0.071	n/a
27	0.018	14.285	0.125	PASS
28	0.002	3.394	0.066	n/a
29	0.017	14.189	0.116	PASS
30	0.002	3.161	0.061	n/a
31	0.015	13.658	0.109	PASS
32	0.002	3.016	0.058	n/a
33	0.013	13.147	0.102	PASS
34	0.002	3.070	0.054	n/a
35	0.012	12.622	0.096	PASS
36	0.001	2.499	0.051	n/a
37	0.011	11.568	0.091	PASS
38	0.001	2.517	0.048	n/a
39	0.009	10.764	0.087	PASS
40	0.001	2.115	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	0.039			
2	0.004	0.247	1.620	n/a
3	0.031	0.898	3.450	PASS
4	0.004	0.566	0.645	n/a
5	0.030	1.763	1.710	PASS
6	0.005	1.121	0.450	PASS
7	0.030	2.573	1.155	PASS
8	0.004	1.022	0.345	n/a
9	0.030	4.942	0.600	PASS
10	0.003	1.098	0.276	n/a
11	0.029	5.816	0.495	PASS
12	0.003	1.389	0.230	n/a
13	0.028	8.797	0.315	PASS
14	0.004	1.780	0.197	n/a
15	0.026	11.714	0.225	PASS
16	0.003	2.011	0.173	n/a
17	0.025	12.652	0.199	PASS
18	0.003	2.205	0.153	n/a
19	0.024	13.447	0.178	PASS
20	0.003	2.222	0.138	n/a
21	0.022	13.875	0.161	PASS
22	0.003	2.426	0.125	n/a
23	0.021	14.385	0.147	PASS
24	0.003	2.521	0.115	n/a
25	0.020	14.597	0.135	PASS
26	0.003	2.423	0.106	n/a
27	0.018	14.516	0.125	PASS
28	0.003	2.572	0.099	n/a
29	0.017	14.392	0.116	PASS
30	0.002	2.384	0.092	n/a
31	0.015	13.773	0.109	PASS
32	0.002	2.258	0.086	n/a
33	0.014	13.330	0.102	PASS
34	0.002	2.321	0.081	n/a
35	0.012	12.739	0.096	PASS
36	0.001	1.952	0.077	n/a
37	0.011	11.733	0.091	PASS
38	0.001	1.951	0.073	n/a
39	0.009	10.903	0.087	PASS
40	0.001	1.666	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.

■ AC Mode

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	0.244			
2	0.002	0.197	1.080	n/a
3	0.064	2.778	2.300	PASS
4	0.002	0.349	0.430	n/a
5	0.026	2.285	1.140	PASS
6	0.001	0.242	0.300	n/a
7	0.014	1.866	0.770	PASS
8	0.001	0.364	0.230	n/a
9	0.012	2.995	0.400	PASS
10	0.001	0.497	0.184	n/a
11	0.005	1.638	0.330	PASS
12	0.001	0.473	0.153	n/a
13	0.002	1.110	0.210	n/a
14	0.001	0.662	0.131	n/a
15	0.002	1.406	0.150	n/a
16	0.001	0.569	0.115	n/a
17	0.002	1.805	0.132	n/a
18	0.001	0.630	0.102	n/a
19	0.002	1.748	0.118	n/a
20	0.001	0.798	0.092	n/a
21	0.001	0.849	0.161	n/a
22	0.001	0.772	0.084	n/a
23	0.001	0.759	0.147	n/a
24	0.001	0.990	0.077	n/a
25	0.001	0.762	0.135	n/a
26	0.001	1.071	0.071	n/a
27	0.001	0.908	0.125	n/a
28	0.001	0.942	0.066	n/a
29	0.001	0.689	0.116	n/a
30	0.001	1.083	0.061	n/a
31	0.001	0.657	0.109	n/a
32	0.001	1.741	0.058	n/a
33	0.001	0.782	0.102	n/a
34	0.001	1.500	0.054	n/a
35	0.001	0.733	0.096	n/a
36	0.001	1.372	0.051	n/a
37	0.001	0.902	0.091	n/a
38	0.001	2.106	0.048	n/a
39	0.001	0.892	0.087	n/a
40	0.001	1.515	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	0.245			
2	0.002	0.148	1.620	n/a
3	0.064	1.865	3.450	PASS
4	0.002	0.309	0.645	n/a
5	0.026	1.543	1.710	PASS
6	0.001	0.179	0.450	n/a
7	0.015	1.325	1.155	PASS
8	0.001	0.283	0.345	n/a
9	0.012	2.033	0.600	PASS
10	0.001	0.441	0.276	n/a
11	0.006	1.121	0.495	PASS
12	0.001	0.359	0.230	n/a
13	0.003	0.800	0.315	n/a
14	0.001	0.651	0.197	n/a
15	0.002	1.043	0.225	n/a
16	0.001	0.428	0.173	n/a
17	0.003	1.278	0.199	n/a
18	0.001	0.488	0.153	n/a
19	0.002	1.294	0.178	n/a
20	0.001	0.592	0.138	n/a
21	0.002	0.992	0.161	n/a
22	0.001	0.601	0.125	n/a
23	0.001	0.878	0.147	n/a
24	0.001	0.776	0.115	n/a
25	0.001	1.023	0.135	n/a
26	0.001	0.932	0.106	n/a
27	0.001	1.068	0.125	n/a
28	0.001	0.692	0.099	n/a
29	0.001	0.796	0.116	n/a
30	0.001	0.845	0.092	n/a
31	0.001	0.930	0.109	n/a
32	0.001	1.309	0.086	n/a
33	0.001	0.871	0.102	n/a
34	0.001	1.247	0.081	n/a
35	0.001	0.936	0.096	n/a
36	0.001	1.255	0.077	n/a
37	0.001	1.007	0.091	n/a
38	0.001	1.734	0.073	n/a
39	0.001	1.234	0.087	n/a
40	0.001	1.213	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.

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0250-R1

Page (67) of (99)

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

■ AC 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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ DC Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ AC Mode



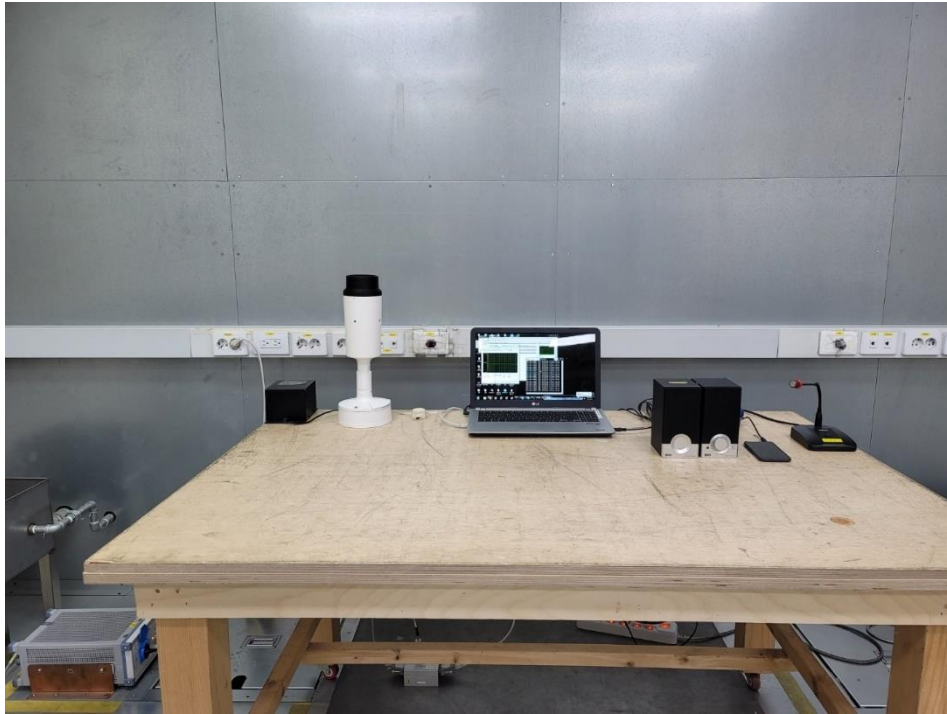
Conducted Emissions at Telecommunication Ports

■ DC Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ AC Mode



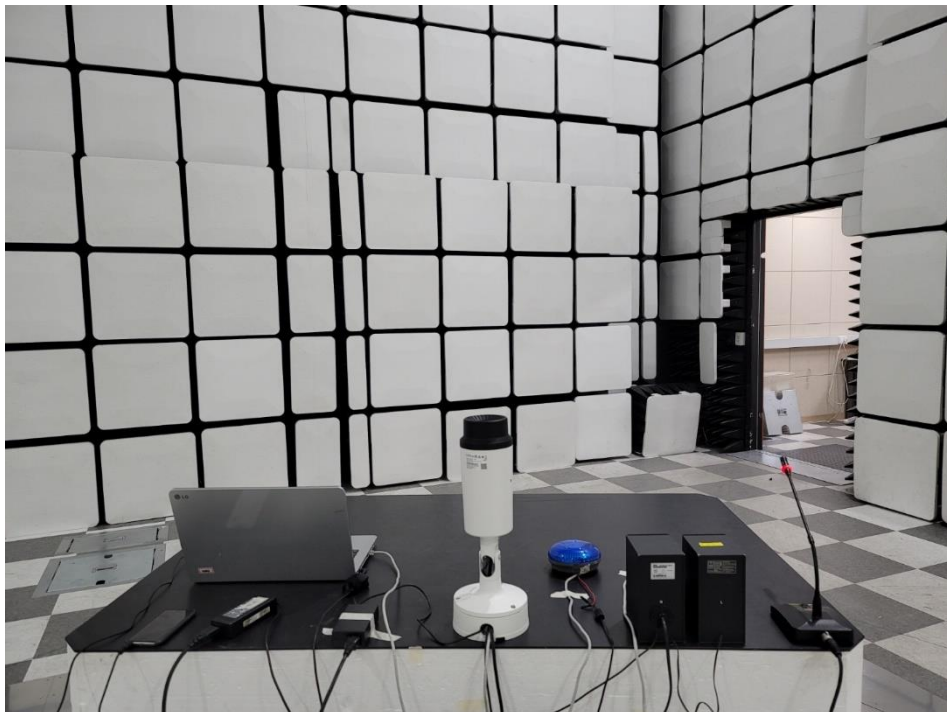
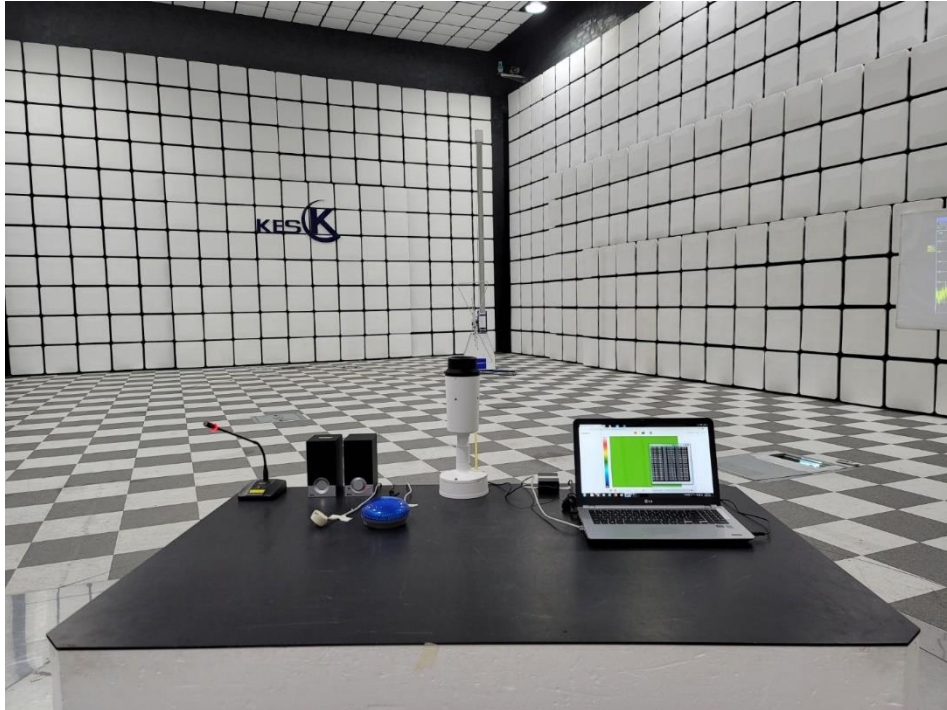
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



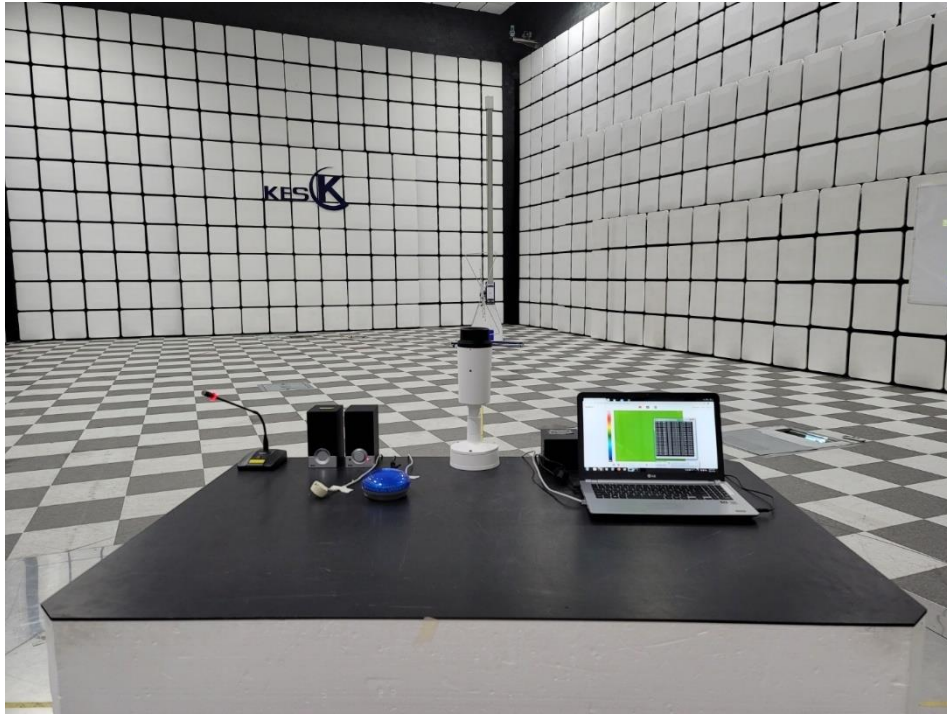
Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



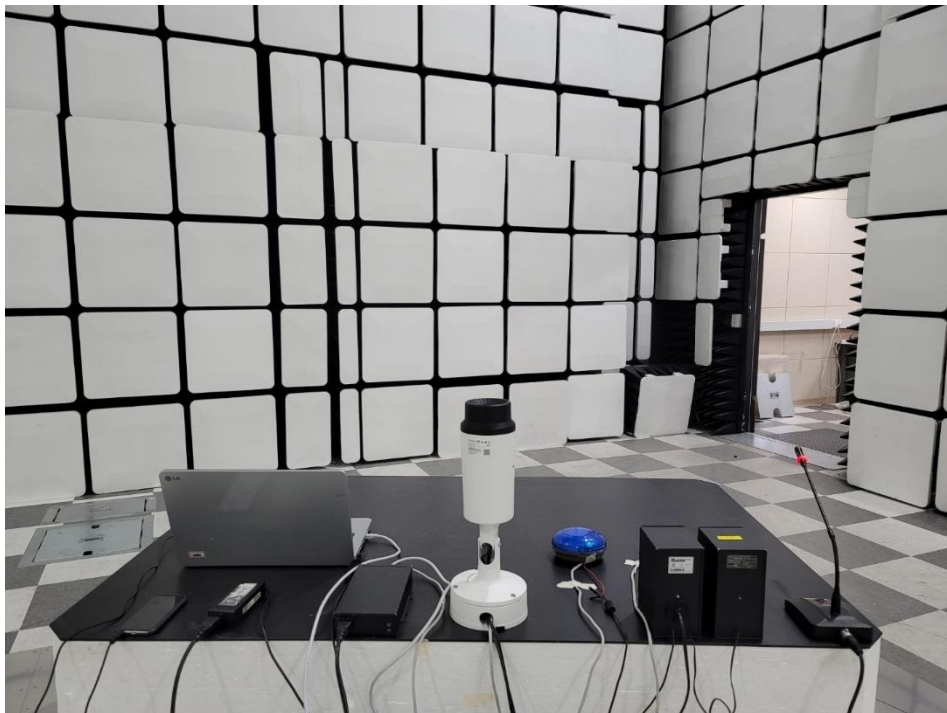
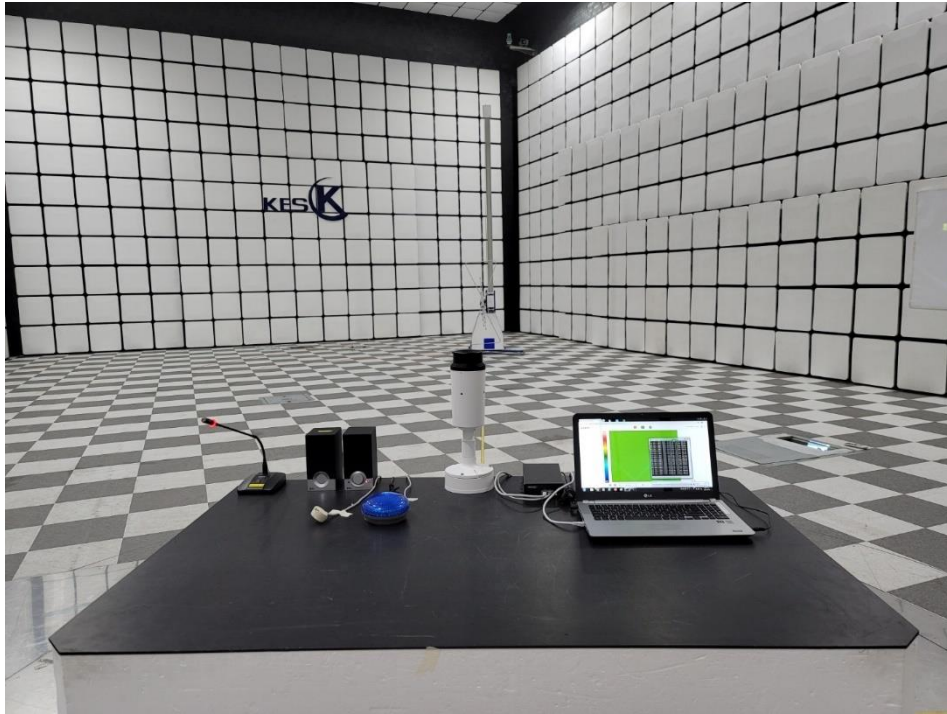
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ AC Mode



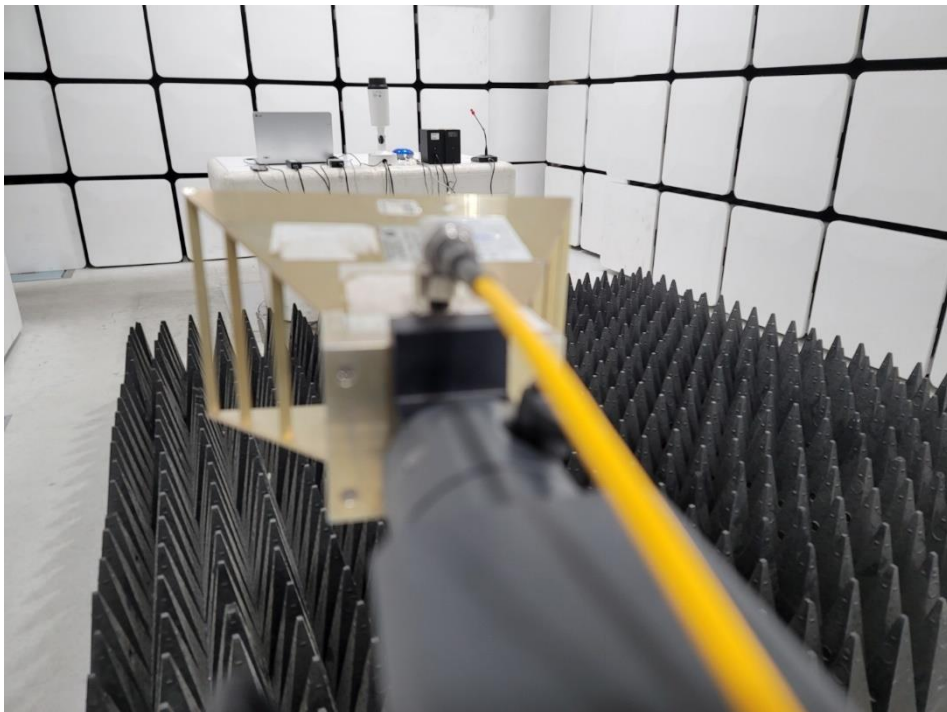
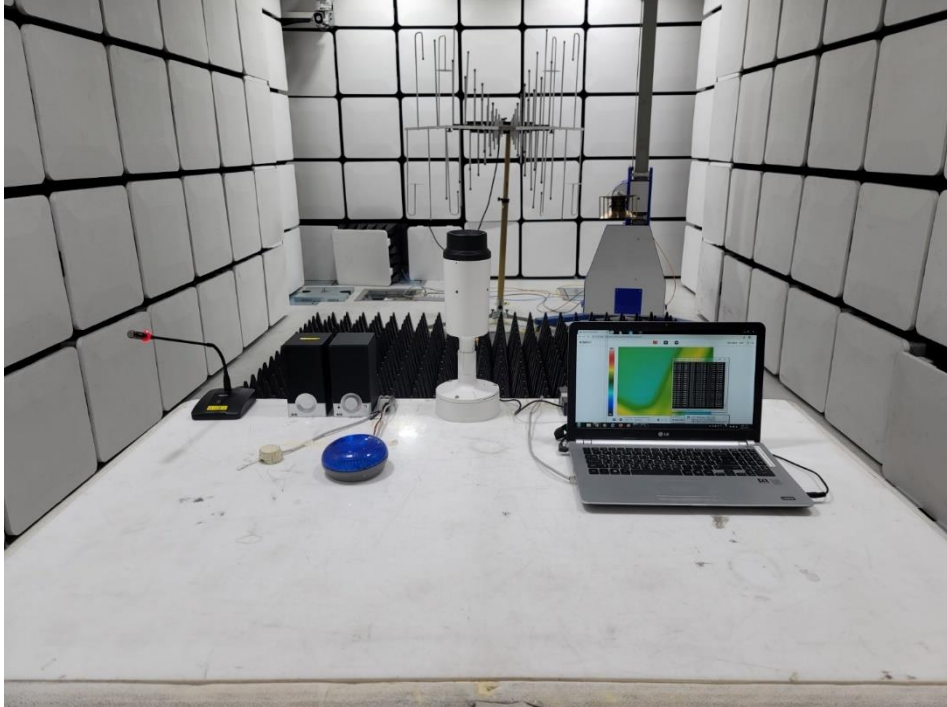
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



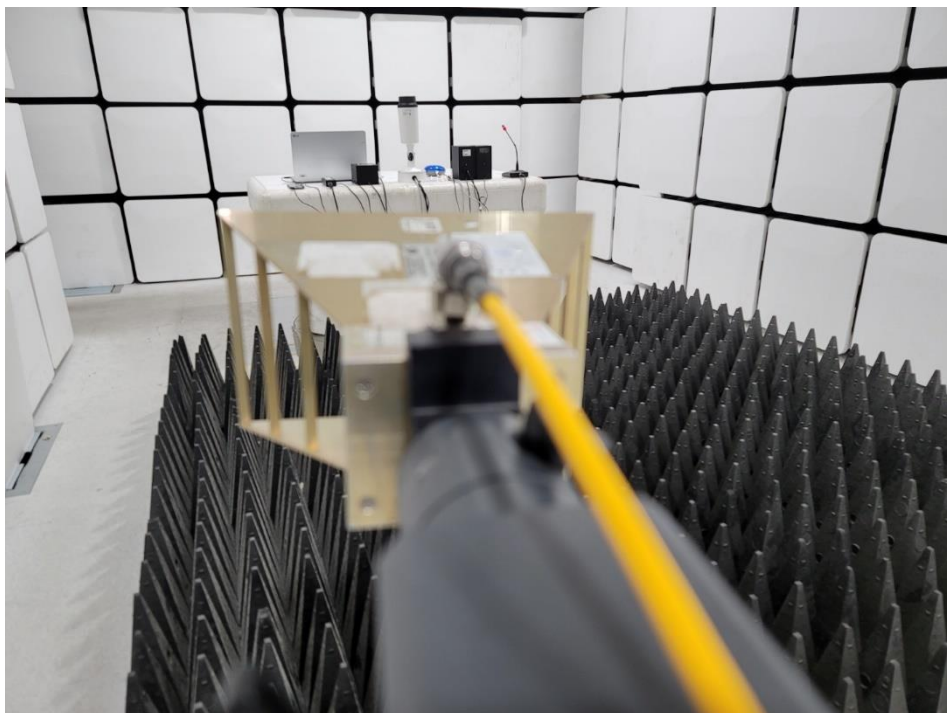
Radiated Electric Field Emissions(Above 1 GHz)

■ DC Mode



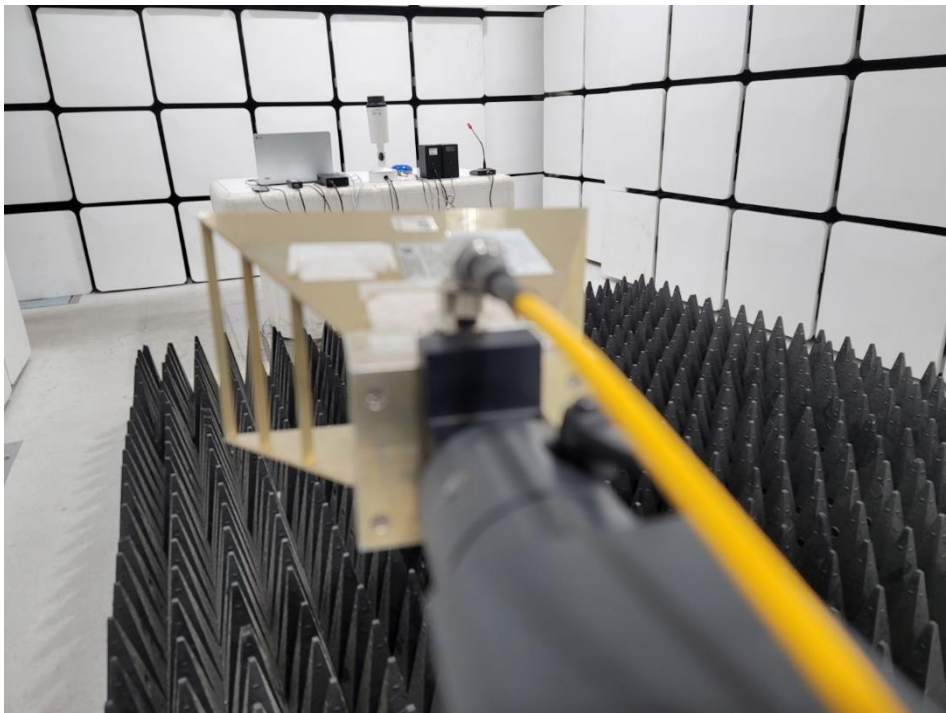
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ AC Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ DC Mode



■ AC Mode



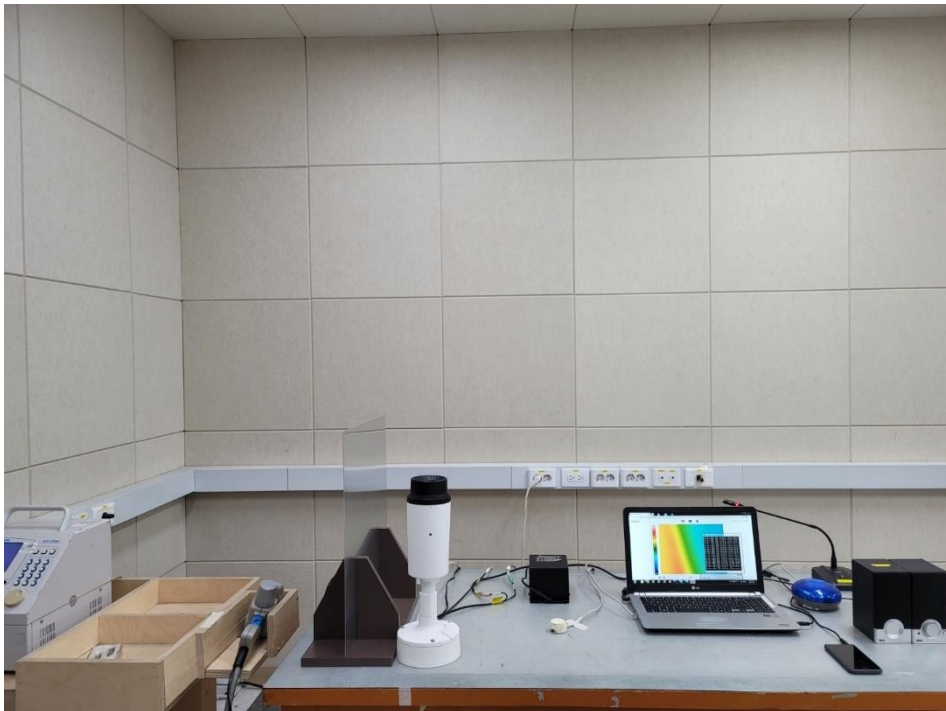
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Electrostatic Discharge

■ DC Mode



■ AC Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode

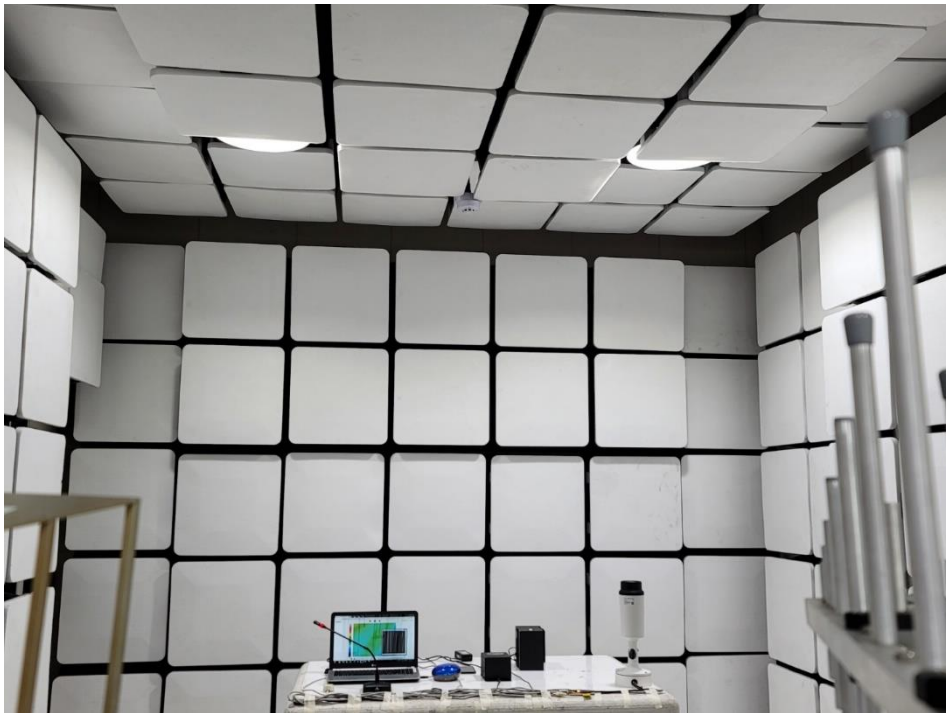


Radiated Electric Field Immunity

■ DC Mode



■ AC Mode



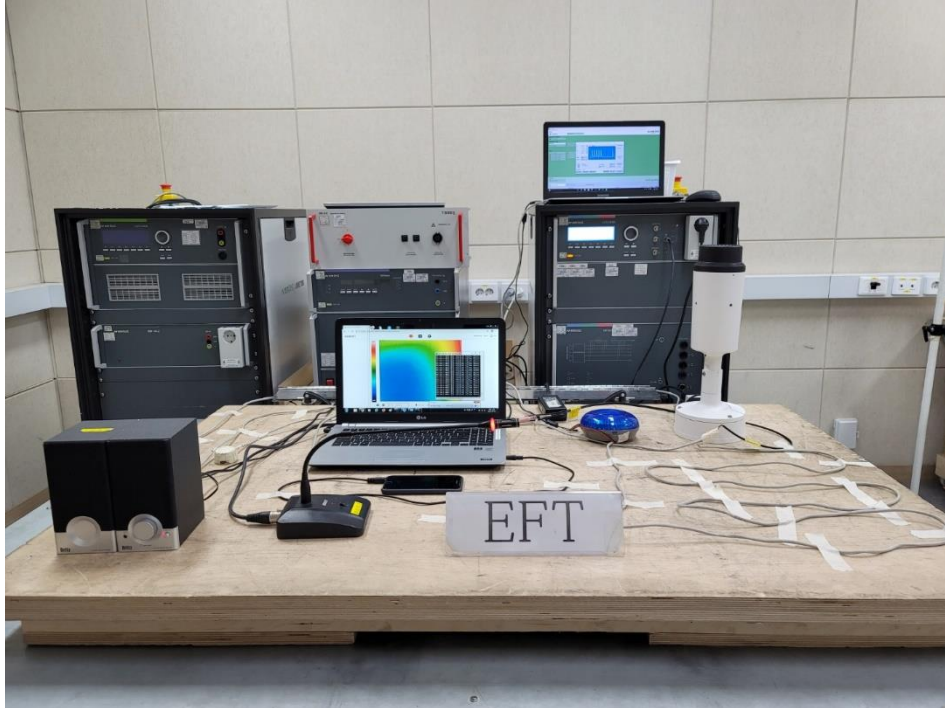
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode

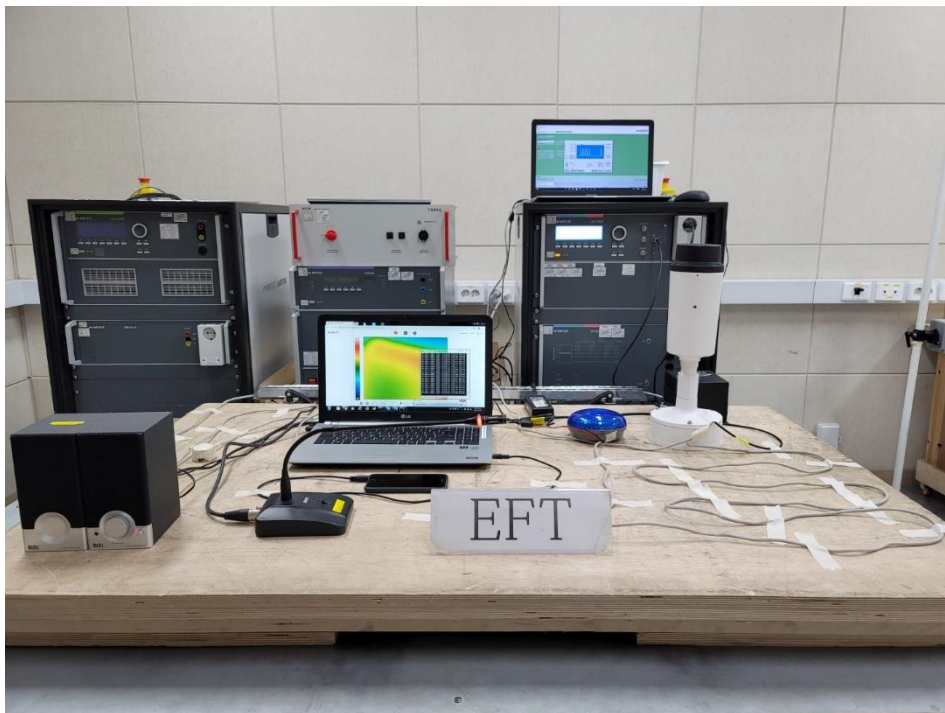


Electrical Fast Transients/Bursts

■ DC Mode

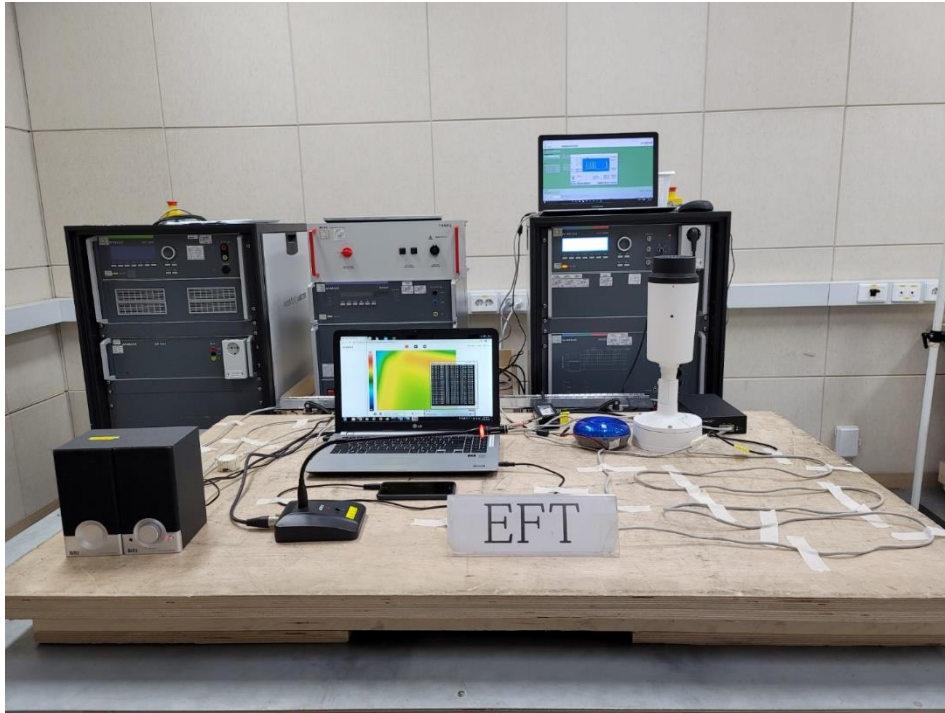


■ AC Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



Surge Transients

■ DC Mode

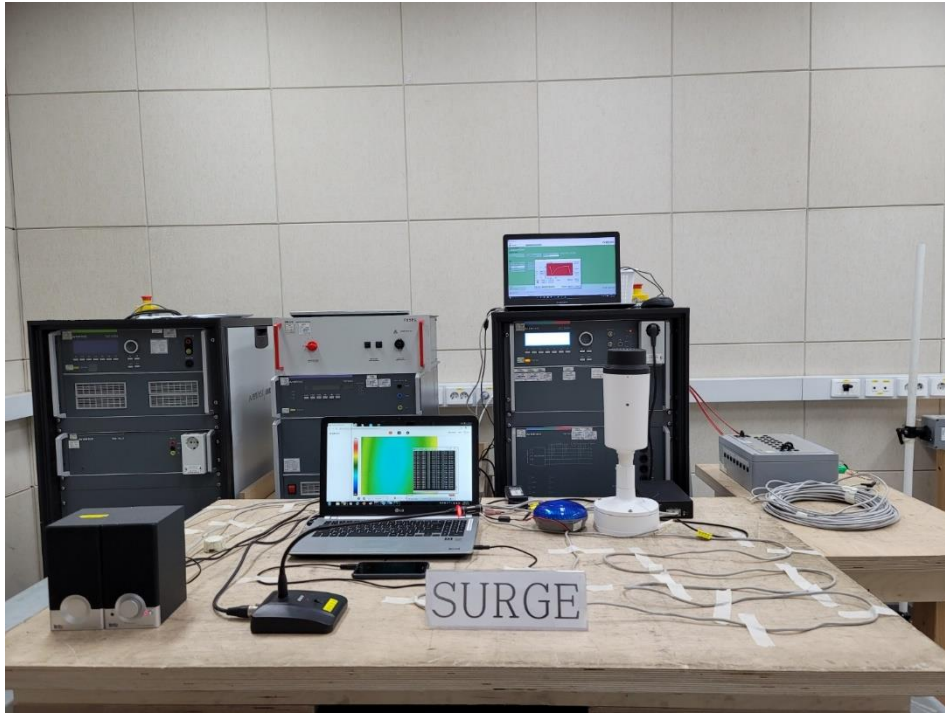


■ AC Mode



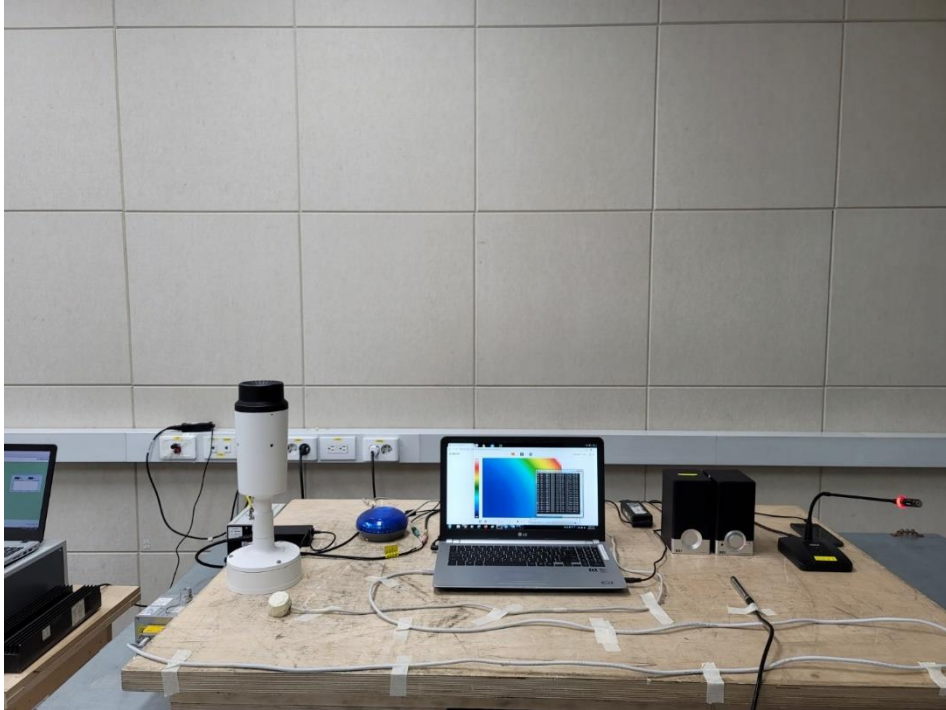
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode

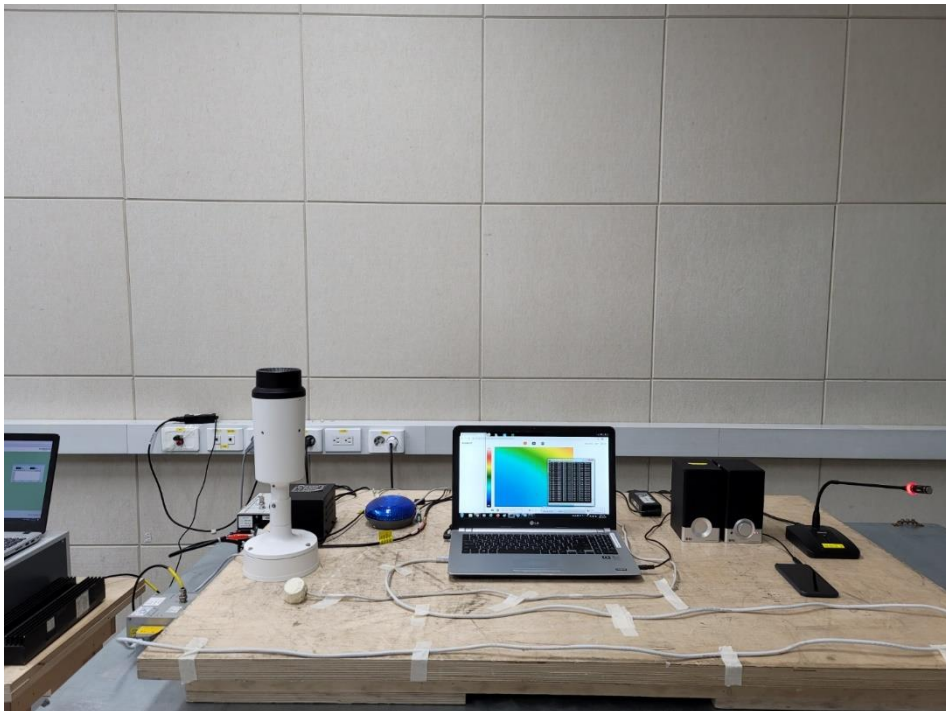


Conducted Disturbance

■ DC Mode



■ AC Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



Voltage Dips and Short Interruptions

■ DC Mode



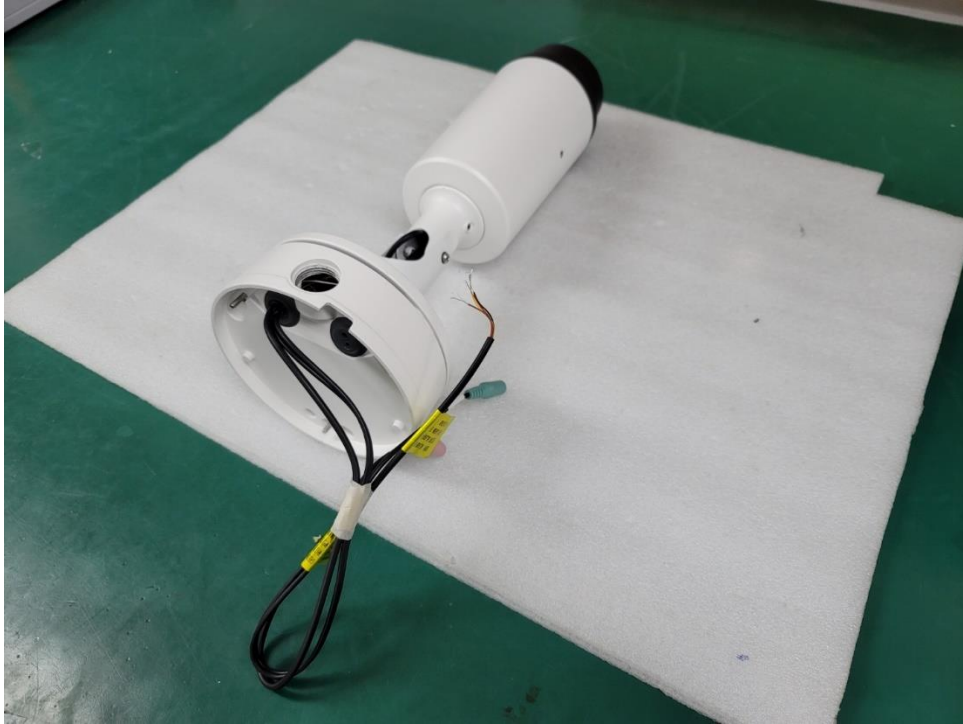
■ AC Mode



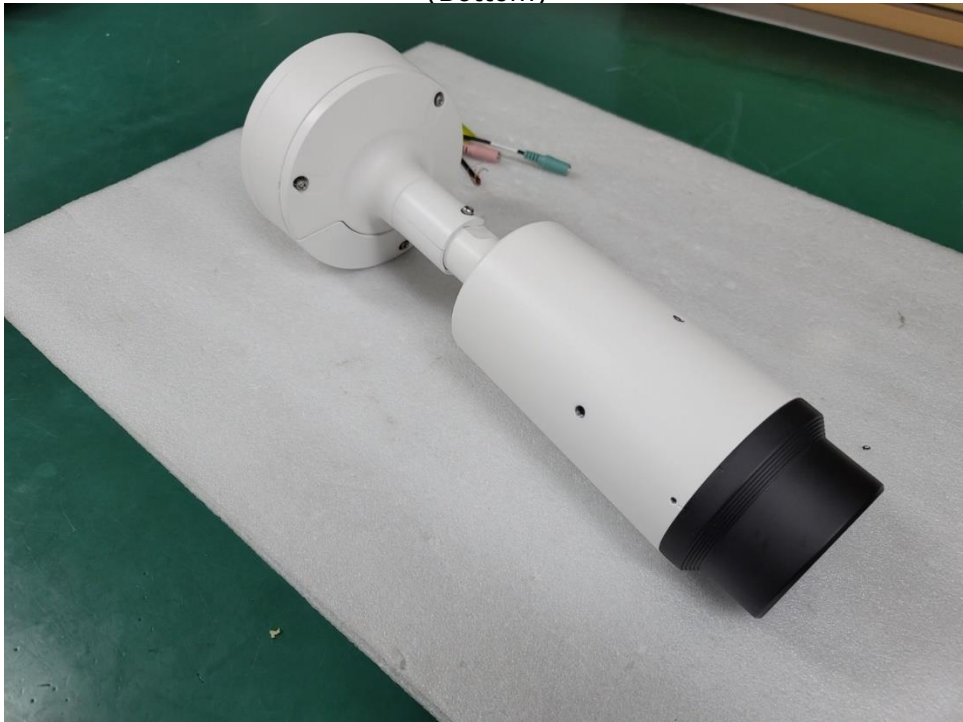
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT External Photographs

(Top)



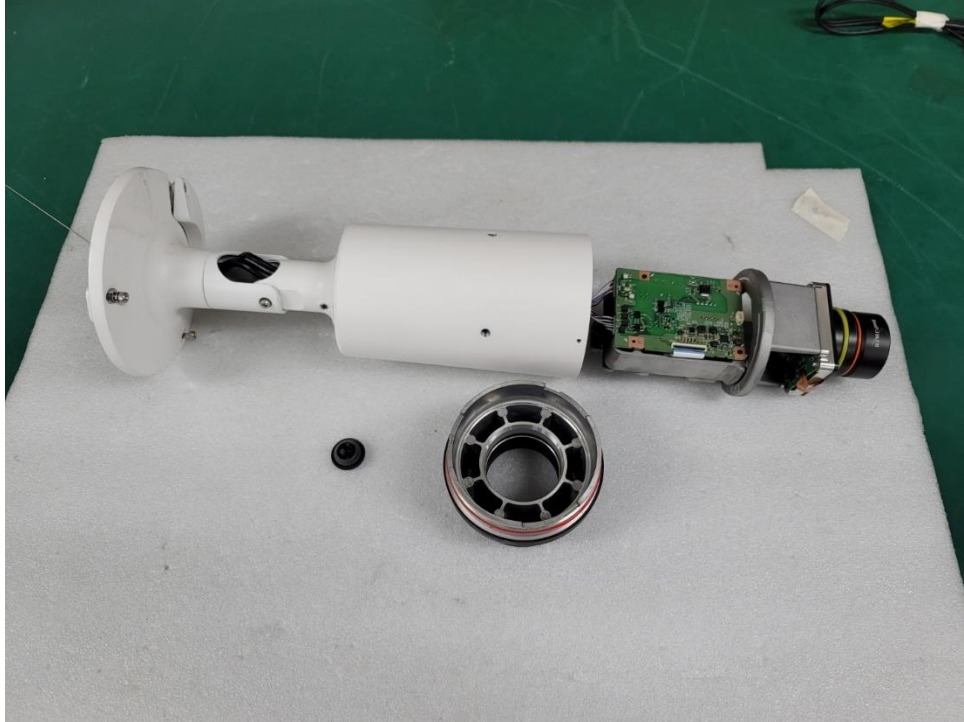
(Bottom)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal Photographs

(Internal View)

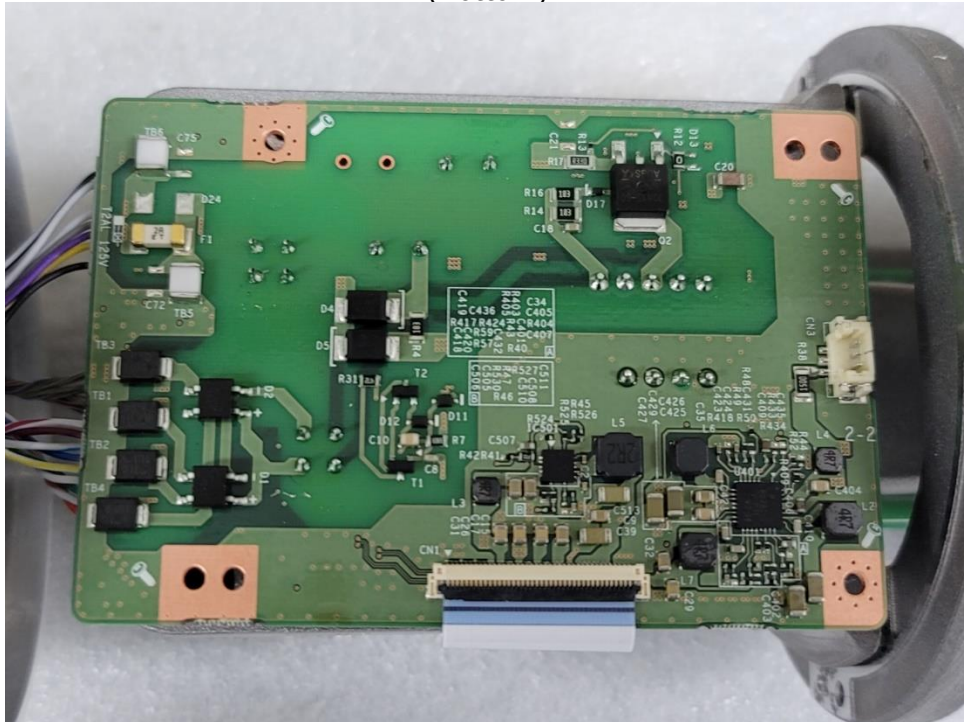


EUT Internal View – Board 1

(Top)



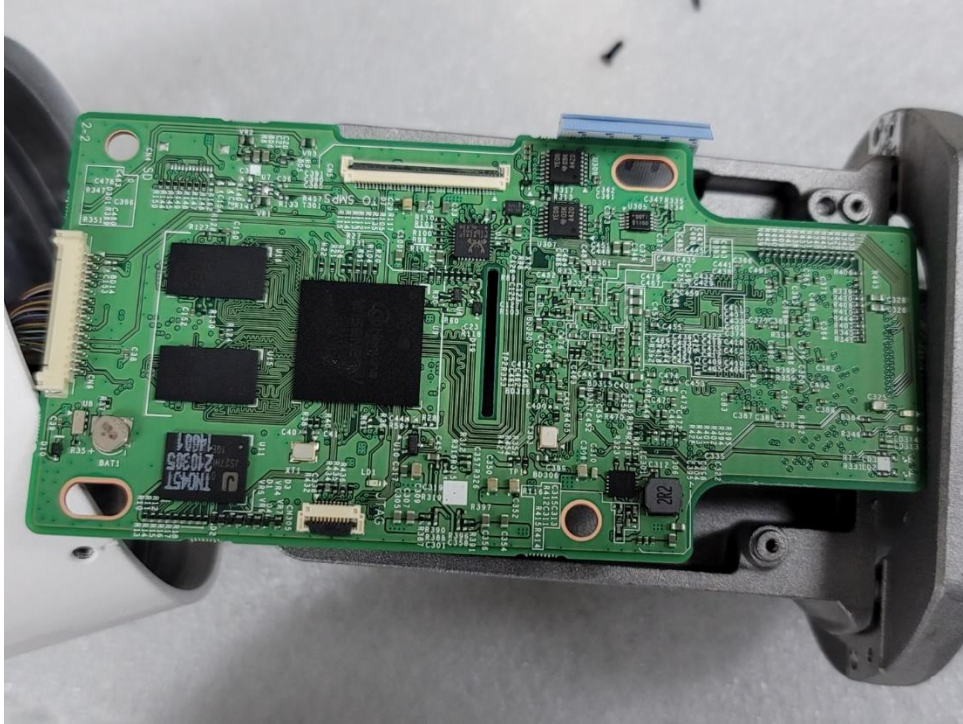
(Bottom)



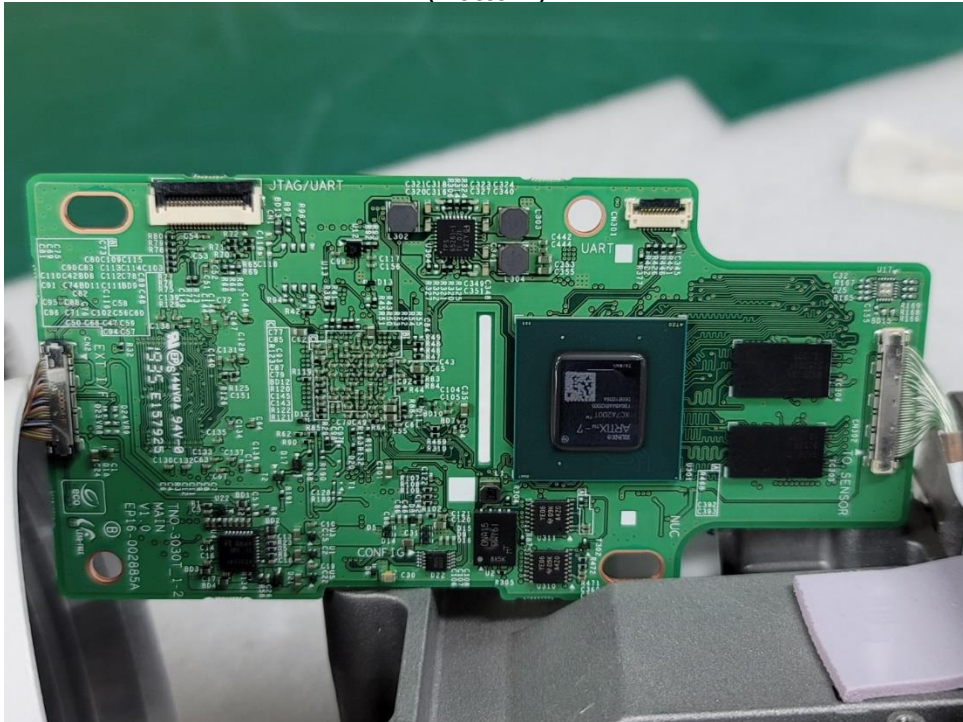
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Board 2

(Top)



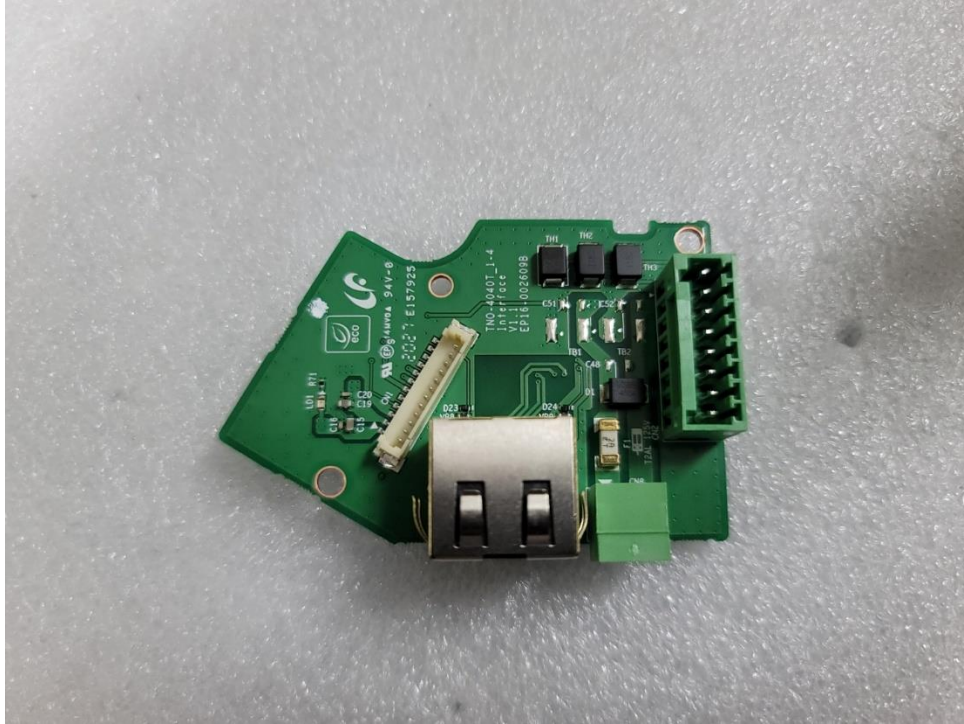
(Bottom)



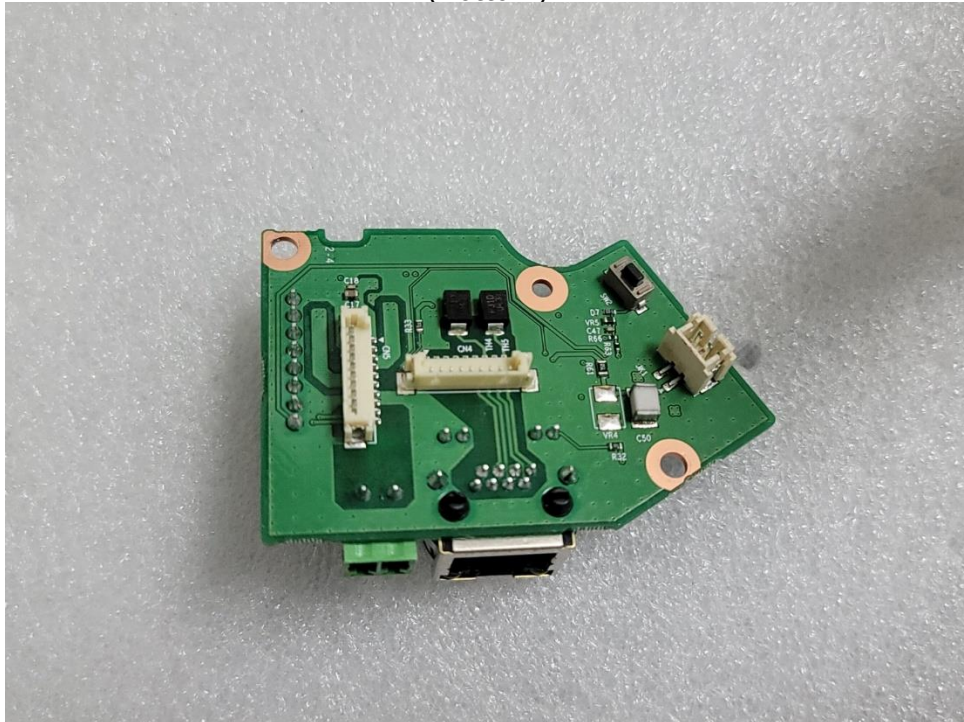
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Board 4

(Top)



(Bottom)



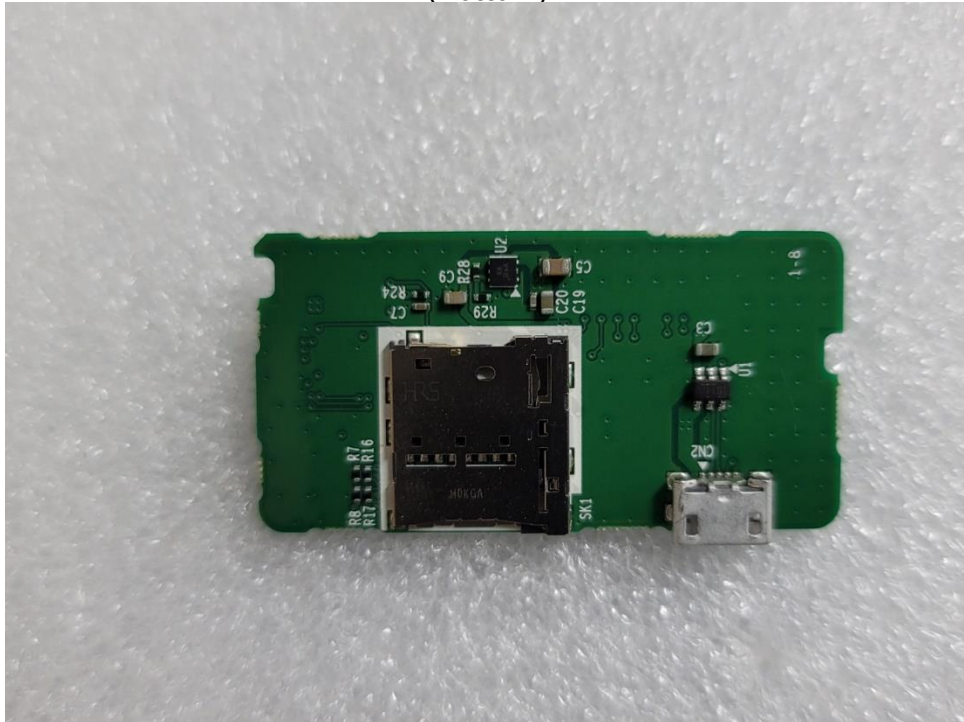
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Board 5

(Top)



(Bottom)



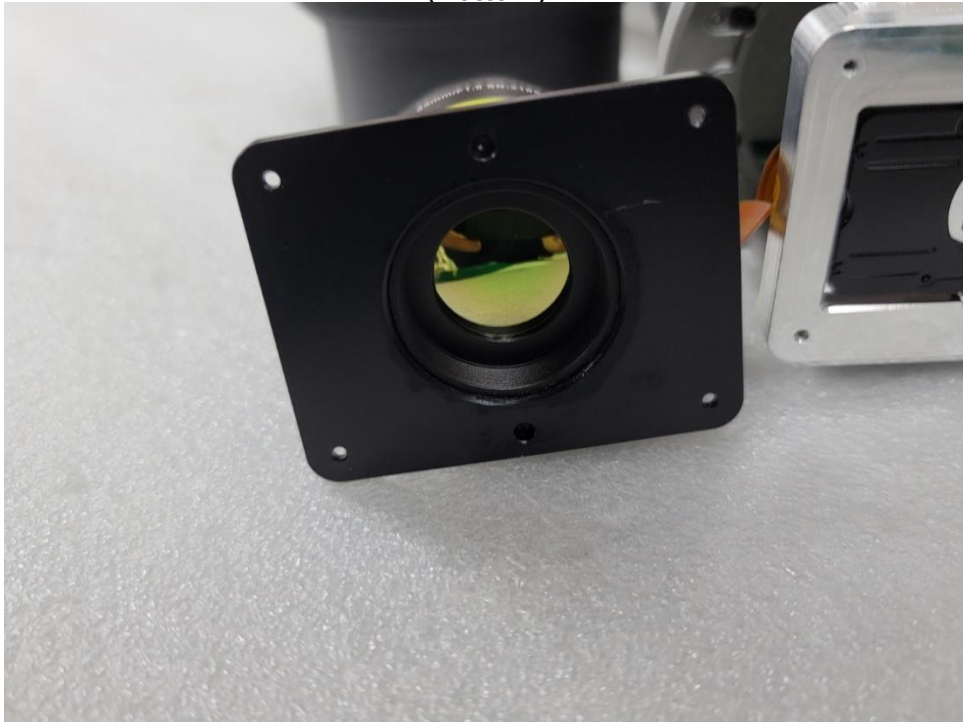
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Lens

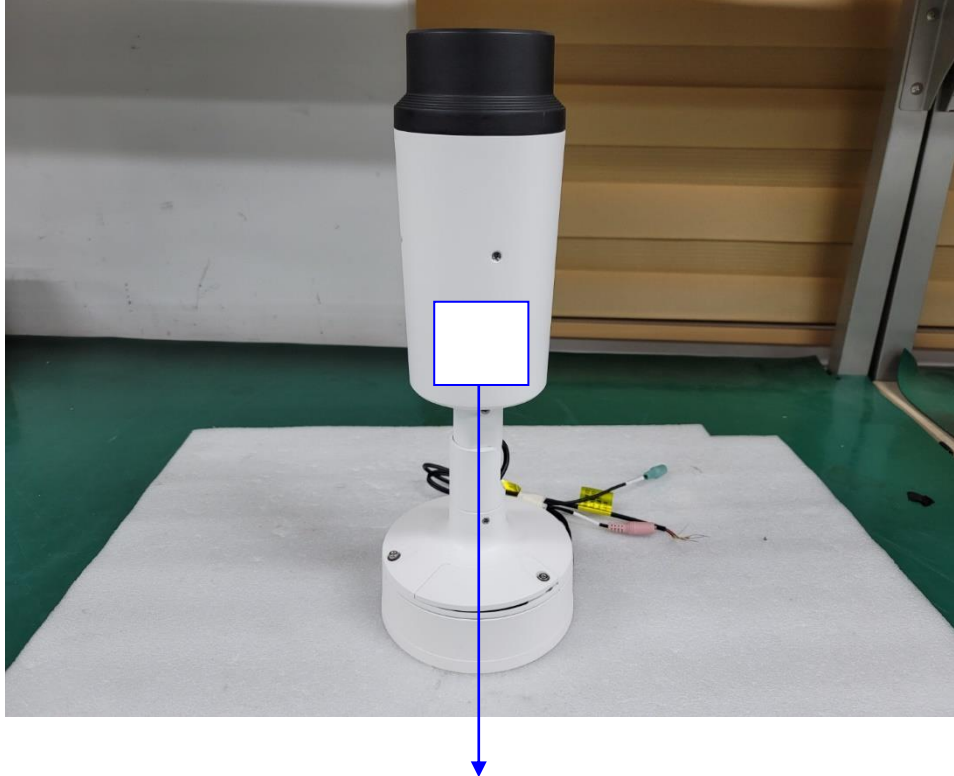
(Top)



(Bottom)



Label and Location



NETWORK THERMAL CAMERA

Model No : TNO-3050T

Manufacturer : HANWHA VISION VIETNAM COMPANY LIMITED

Made in Vietnam

