

EMC TEST REPORT For RCM

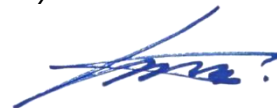
Test Report No. : KES-EM-22T0684-R1
Date of Issue : Feb. 24, 2023
Product name : Thermal Camera
Model/Type No. : TNO-4040TR
Variant Model : TNO-4030TR, TNO-L4030TR
Applicant : Hanwha Vision Co., Ltd
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
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 : Jul. 21, 2022
Test date : Jul. 24, 2022 ~ Jul. 25, 2022
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by



Min-Seong, 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.



REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Aug. 08, 2022	KES-EM-22T0684	Issued
Feb. 24, 2023	KES-EM-22T0684-R1	Change the Applicant and manufacturer at the request of the customer.

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.

TABLE OF CONTENTS

1.0	General Product Description.....	4
1.1	Test Voltage & Frequency	6
1.2	Variant Model Differences	6
1.3	Device Modifications	6
1.4	Equipment Under Test.....	6
1.5	Support Equipments	7
1.6	External I/O Cabling	8
1.7	EUT Operating Mode(s)	11
1.8	Configuration.....	12
1.9	Remarks when standards applied	14
1.10	Calibration Details of Equipment Used for Measurement	14
1.11	Test Facility	14
1.12	Laboratory Accreditations and Listings	15
2.0	Test Regulations.....	16
2.1	Conducted Emissions at Mains Power Ports	17
2.2	Conducted Emissions at Telecommunication Ports.....	18
2.3	Radiated Electric Field Emissions(Below 1 GHz)	19
2.4	Radiated Electric Field Emissions(Above 1 GHz)	20
APPENDIX A – TEST DATA.....		21
Conducted Emissions at Mains Power Ports.....		21
Conducted Emissions at Telecommunication Ports		25
Radiated Electric Field Emissions(Below 1 GHz)		28
Radiated Electric Field Emissions(Above 1 GHz).....		31
Test Setup Photos and Configuration		34
Conducted Emissions at Mains Power Ports.....		34
Conducted Emissions at Telecommunication Ports		35
Radiated Electric Field Emissions(Below 1 GHz)		37
Radiated Electric Field Emissions(Above 1 GHz).....		39
EUT External Photographs		41
EUT Internal Photographs		42



1.0 General Product Description

Main Specifications of EUT are:

	TNO-4030TR	TNO-4040TR	TNO-4041TR
VIDEO			
Imaging Device	Uncooled micro bolometer		
Effective Pixels	None		
NETD	< 50mK		
Pixel Size	17μm		
Min. Illumination	None		
LENS			
Focal Length (Zoom Ratio)	13mm fixed focal	19mm fixed focal	
Max. Aperture Ratio	F1.0		
Angular Field of View	H : 48.6° / V : 36.4 / D : 61.6°	H : 32° / V : 24.3° / D : 39.2°	
Min. Object Distance	5m (16.40ft)	11m (36.09ft)	
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°)		Flip, Mirror
Analytics	Directional detection, Motion detection, Appear/Disappear, Enter/Exit, Loitering, Tampering, Virtual line, Audio detection, Temperature dtection, Sound classification, Shock detection		
Serial Interface	-		RS-485 (Samsung-T, Pelco-D/P, Panasonic, Bosch, AD, GE, Vicon, Honeywell)
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		
RADIOMETRY			
Temperature detect range	-20°C~130°C (-4°F~266°F)		
Temperature accuracy	±5°C(≤100°C), ±20%(>100°C)		
Temperature detection	3ea rectangular		
Additional	Hybrid palettes, Spot temperature reading		
NETWORK			
Ethernet	RJ-45 (10/100BASE-T)		
Video Compression	H.265/H.264: Main/Baseline/High, MJPEG		
Resolution	640 x 480, 640 x 360, 320 x 240		
Max. Framerate	H.265/H.264 : Max. 30fps/25fps (60Hz/50Hz) MJPEG : Max. 30fps/25fps (60Hz/50Hz)		
Smart Codec	Manual (5ea area), WiseStream II		

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-22T0684-R1

Page (5) of (50)

	TNO-4030TR	TNO-4040TR	TNO-4041TR
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	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		
Security	HTTPS (SSL) login authentication Digest login authentication IP address filtering User access log 802.1X authentication (EAP-TLS, EAP-LEAP)		
Edge Storage	Micro SD/SDHC/SDXC 1slot 256GB		
Application Programming Interface	ONVIF Profile S/G/T SUNAPI (HTTP API) Wisenet open platform		
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 Explorer11, MS Edge, Mozilla Firefox (Windows 64bit only), Apple Safari (Mac OS X only)		
Memory	1024MB RAM, 256MB Flash		
ENVIRONMENTAL			
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, IK10, NEMA4X		
ELECTRICAL			
Input Voltage	PoE (IEEE802.3af, Class3), 24VAC, 12VDC		
Power Consumption	PoE : Max. 10W, typical 8.6W 12VDC : Max. 9W, typical 7.5W 24VAC : Max. 10.5W, typical 8.9W		
MECHANICAL			
Color / Material	White / Aluminium		
RAL Code	RAL9003		
Product dimensions / weight	Φ101.97x401.8mm (4.01x15.82") / 3,124g (6.89lb)		Φ101.97x309mm (4.01x12.17") / 2,452g (5.41lb)

* The latest product information / specification can be found at hanwha-security.co.uk

* Design and specifications are subject to change without notice.

* Wisenet is the proprietary brand of Hanwha Techwin.

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-22T0684-R1

Page (6) of (50)

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 240 V, 50 Hz ☒ PoE

1.2 Variant Model Differences

A derivative model to the classification of customers simple.

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
Thermal Camera	TNO-4040TR	-	HANWHA VISION VIETNAM COMPANY LIMITED	EUT

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



1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC/AC Adapter	-	-	-	-
AC/DC Adapter	2ACB022F	-	ChAnnel Well Technology (Guangzhou) Co.,Ltd.	-
PoE Adapter	MA-INJ-4	-	CHANGZHOU WUJIN HONGGUANG RADIO CO, LTD.	-
Notebook	Latitude 5300	8C47BE45C060	DELL INC.	-
Notebook Adapter	HA65NM130	-	Chicony Power Technology(Suzhou)Co., Ltd.	-
Micro SD Card	-	-	SanDisk	32 GB
Headset	K550	-	Britz®	-
Alarm	PRO-SL	-	SENSOR PRO	-
Button Alarm	-	-	-	-
Smart Phone	SM-N950N	R39JB0C3FB	SAMSUNG	-

1.6 External I/O Cabling

■ AC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Thermal Camera (EUT)	2 Pin	AC/AC Adapter	Line-Out (2 Pin)	1.0	U
	RJ-45	Notebook	RJ-45	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
	MIC (3.5 mm)	Headset	XLR	2.0	U
	Speaker (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	2 Pin	Alarm	Line-Out (2 Pin)	3.0	U
	2 Pin	Button Alarm	Line-Out (2 Pin)	3.0	U
Notebook	DC Jack	Notebook Adapter	Line-Out (DC Jack)	1.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S

**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-22T0684-R1

Page (9) of (50)

■ DC Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Thermal Camera (EUT)	2 Pin	AC/DC Adapter	Line-Out (2 Pin)	1.0	U
	RJ-45	Notebook	RJ-45	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
	MIC (3.5 mm)	Headset	XLR	2.0	U
	Speaker (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	2 Pin	Alarm	Line-Out (2 Pin)	3.0	U
	2 Pin	Button Alarm	Line-Out (2 Pin)	3.0	U
Notebook	DC Jack	Notebook Adapter	Line-Out (DC Jack)	1.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S

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

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
Thermal Camera (EUT)	RJ-45 (PoE)	PoE Adapter	RJ-45 (PoE)	3.0	U
	SLOT	Micro SD Card	SLOT	-	-
	MIC (3.5 mm)	Headset	XLR	2.0	U
	Speaker (3.5 mm)		Line-Out (3.5 mm)	1.6	U
	2 Pin	Alarm	Line-Out (2 Pin)	3.0	U
	2 Pin	Button Alarm	Line-Out (2 Pin)	3.0	U
Notebook	RJ-45	PoE Adapter	RJ-45 (DATA)	1.0	U
	DC Jack	Notebook Adapter	Line-Out (DC Jack)	1.0	U
	3.5 mm	Smart Phone	3.5 mm	1.0	U

* Unshielded=U, Shielded=S

**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-22T0684-R1

Page (11) of (50)

1.7 EUT Operating Mode(s)

Test Mode	operating
Operation	<ul style="list-style-type: none">- By connecting to the Web Viewer, checking the video output of EUT and performing a ping test, it was confirmed that the network function is operating normally.- After the test, the Micro SD Card was checked to see if it was recorded normally.

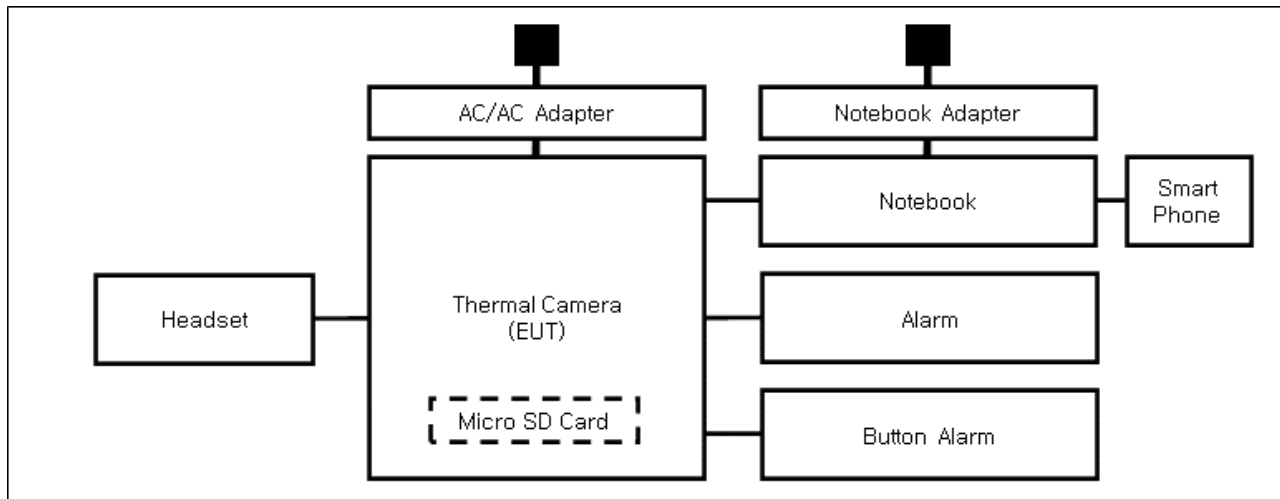
EUT Test operating S/W		
Name	Version	Manufacture Company
Web Viewer	-	Hanwha Vision Co., Ltd

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

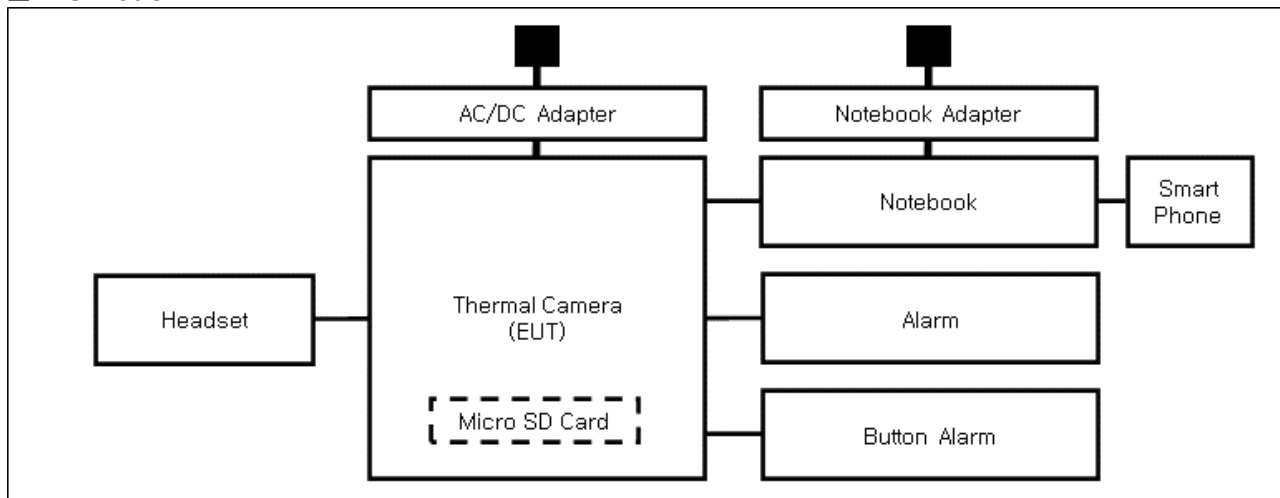
1.8 Configuration

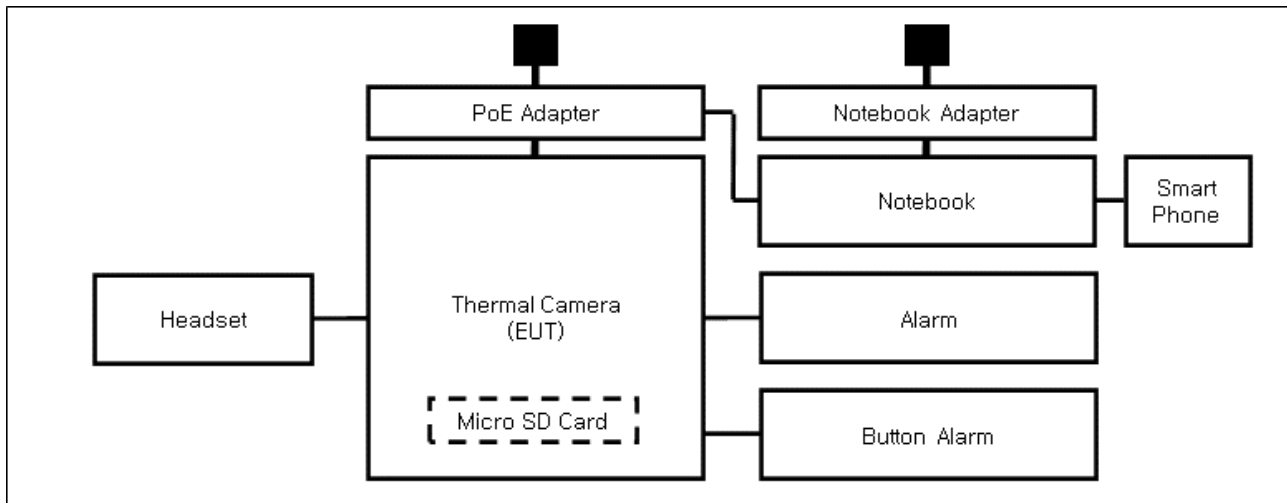
■ AC Main
 □ DC Main

■ AC Mode



■ DC Mode



■ PoE Mode

1.9 Remarks when standards applied

- VIDEO port and USB port were excluded from testing because it is the management port.
- PoE port is considered to be wired network port, so power-related test items are excluded.







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



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-22T0684-R1

Page (16) of (50)

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **AS/NZS CISPR 32:2015 AMD 1:2020**

☒ Class A

☐ Class B

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

Jul. 24, 2022

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	12, 28, 2022
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 27, 2022
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 27, 2022
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 27, 2022

Test Conditions

Temperature: (24,5 ± 0,2) °C

Relative Humidity: (45,2 ± 0,3) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date

Jul. 24, 2022

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	12, 28, 2022
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 27, 2022
<input checked="" type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 27, 2022
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 27, 2022
<input checked="" type="checkbox"/>	8-WIRE ISN CAT3,5	ENY81	R & S	100174	12, 28, 2022
<input type="checkbox"/>	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	12, 28, 2022

Test Conditions

Temperature: (24,5 ± 0,2) °C

Relative Humidity: (45,2 ± 0,3) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

- See Appendix A for test data.
- For Ethernet interfaces, measurements are required at the highest data rate supported by the interface.

2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Jul. 24, 2022

Test Location

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	R & S	100551	03, 31, 2023
<input checked="" type="checkbox"/>	AMPLIFIER	SCU 01	R & S	100603	11, 24, 2022
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	32173	03, 08, 2023

Test Conditions

Temperature: (25,0 ± 0,2) °C
Relative Humidity: (45,3 ± 0,4) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Jul. 25, 2022

Test Location

SEMI ANECHOIC CHAMBER #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR7	R & S	101190	08, 03, 2022
<input checked="" type="checkbox"/>	PREAMPLIFIER	8449B	AGILENT	3008A01967	04, 01, 2023
<input checked="" type="checkbox"/>	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 03, 2023

Test Conditions

Temperature: (24,7 ± 0,2) °C

Relative Humidity: (44,8 ± 0,5) % 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.

APPENDIX A – TEST DATA

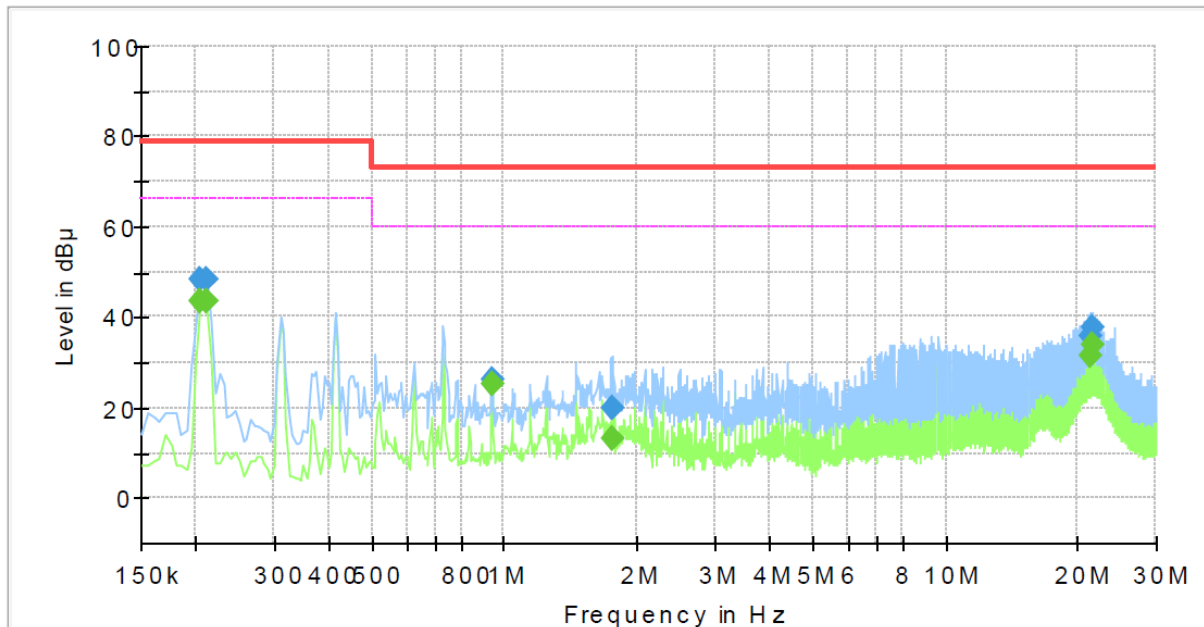
Conducted Emissions at Mains Power Ports

■ AC Mode

HOT LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-4040TR
Phase:	L1
Mode:	AC
Operator Name:	KES



Final_Result

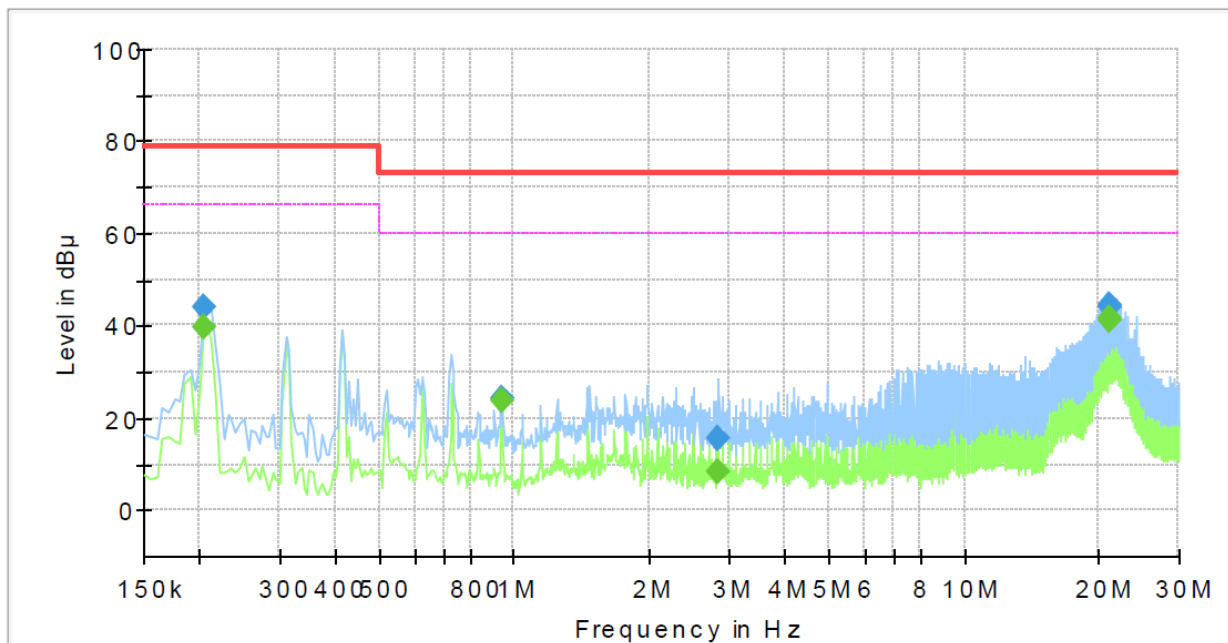
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.205000	---	43.63	66.00	22.37	1000.0	9.000	L1	19.4
0.205000	48.30	---	79.00	30.70	1000.0	9.000	L1	19.4
0.210000	---	43.78	66.00	22.22	1000.0	9.000	L1	19.4
0.210000	48.47	---	79.00	30.53	1000.0	9.000	L1	19.4
0.935000	---	25.14	60.00	34.86	1000.0	9.000	L1	20.1
0.935000	26.11	---	73.00	46.89	1000.0	9.000	L1	20.1
1.750000	---	13.01	60.00	46.99	1000.0	9.000	L1	20.3
1.750000	19.97	---	73.00	53.03	1000.0	9.000	L1	20.3
21.375000	---	31.61	60.00	28.39	1000.0	9.000	L1	20.1
21.375000	36.02	---	73.00	36.98	1000.0	9.000	L1	20.1
21.480000	---	33.72	60.00	26.28	1000.0	9.000	L1	20.1
21.480000	37.77	---	73.00	35.23	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 LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-4040TR
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)
0.205000	---	39.57	66.00	26.43	1000.0	9.000	N	19.4
0.205000	43.88	---	79.00	35.12	1000.0	9.000	N	19.4
0.935000	---	23.61	60.00	36.39	1000.0	9.000	N	20.1
0.935000	24.31	---	73.00	48.69	1000.0	9.000	N	20.1
2.845000	---	8.46	60.00	51.54	1000.0	9.000	N	20.2
2.845000	15.77	---	73.00	57.23	1000.0	9.000	N	20.2
21.075000	---	41.16	60.00	18.84	1000.0	9.000	N	20.2
21.075000	44.08	---	73.00	28.92	1000.0	9.000	N	20.2
21.180000	---	41.61	60.00	18.39	1000.0	9.000	N	20.2
21.180000	44.53	---	73.00	28.47	1000.0	9.000	N	20.2

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.

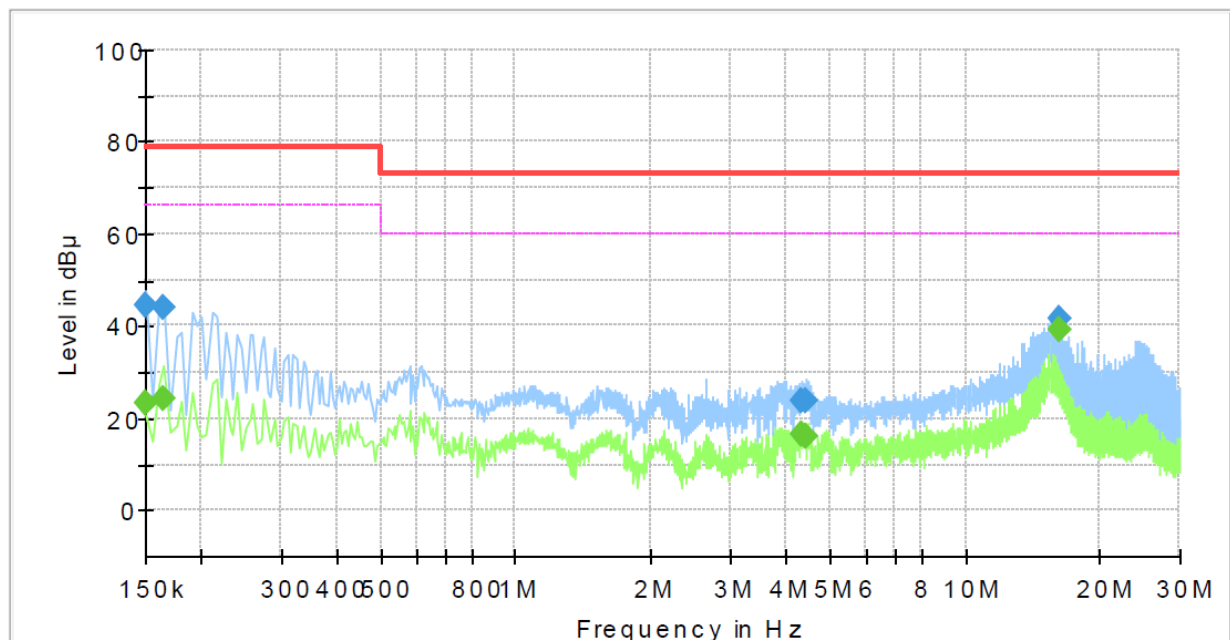
The authenticity of the test report, contact kes@kes.co.kr

■ DC Mode

HOT LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-4040TR
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)
0.150000	---	23.42	66.00	42.58	1000.0	9.000	L1	19.4
0.150000	44.33	---	79.00	34.67	1000.0	9.000	L1	19.4
0.165000	---	24.48	66.00	41.52	1000.0	9.000	L1	19.4
0.165000	43.93	---	79.00	35.07	1000.0	9.000	L1	19.4
4.320000	---	16.42	60.00	43.58	1000.0	9.000	L1	19.8
4.320000	23.74	---	73.00	49.26	1000.0	9.000	L1	19.8
4.420000	---	16.05	60.00	43.95	1000.0	9.000	L1	19.8
4.420000	23.61	---	73.00	49.39	1000.0	9.000	L1	19.8
16.230000	---	39.03	60.00	20.97	1000.0	9.000	L1	19.9
16.230000	41.56	---	73.00	31.44	1000.0	9.000	L1	19.9

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

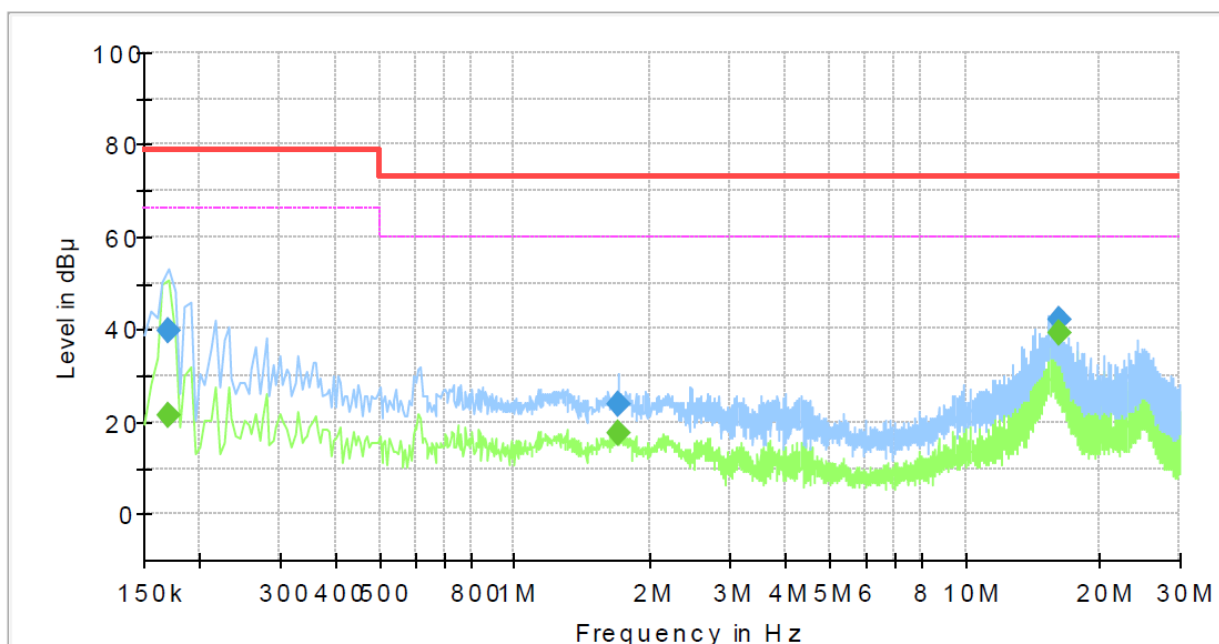
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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

NEUTRAL LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-4040TR
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)
0.170000	---	21.22	66.00	44.78	1000.0	9.000	N	19.4
0.170000	39.85	---	79.00	39.15	1000.0	9.000	N	19.4
1.695000	---	17.45	60.00	42.55	1000.0	9.000	N	20.3
1.695000	23.74	---	73.00	49.26	1000.0	9.000	N	20.3
16.230000	---	39.39	60.00	20.61	1000.0	9.000	N	19.9
16.230000	42.02	---	73.00	30.98	1000.0	9.000	N	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 (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

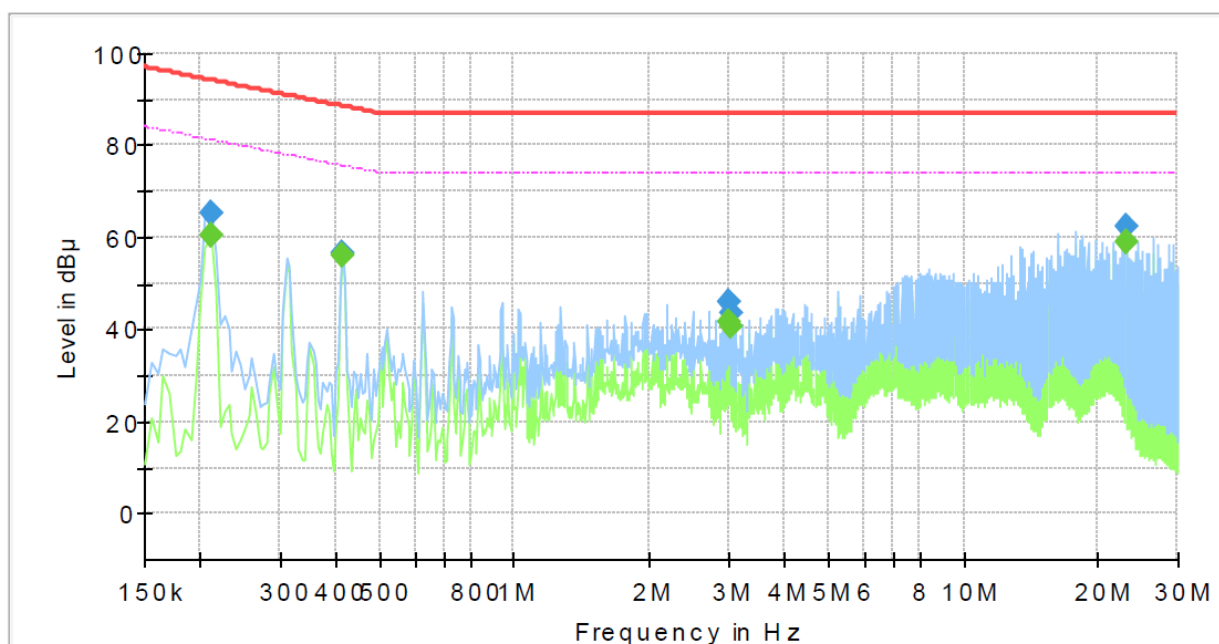
Conducted Emissions at Telecommunication Ports

■ AC Mode

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-4040TR
Mode :	AC
Speed :	100 Mbps
Operator Name:	KES



Final_Result

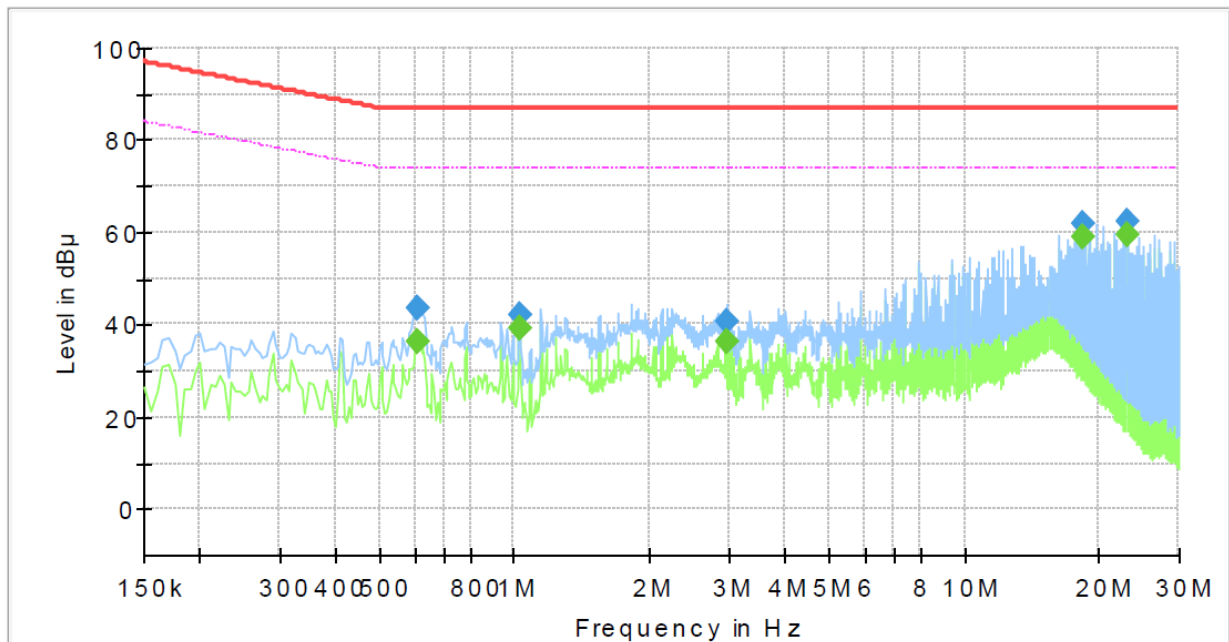
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.210000	---	60.45	81.21	20.76	1000.0	9.000	Single Line	19.7
0.210000	65.13	---	94.21	29.08	1000.0	9.000	Single Line	19.7
0.415000	---	56.12	75.55	19.43	1000.0	9.000	Single Line	19.7
0.415000	56.62	---	88.55	31.93	1000.0	9.000	Single Line	19.7
3.010000	---	41.82	74.00	32.18	1000.0	9.000	Single Line	20.0
3.010000	45.84	---	87.00	41.16	1000.0	9.000	Single Line	20.0
3.040000	---	40.74	74.00	33.26	1000.0	9.000	Single Line	20.0
3.040000	43.65	---	87.00	43.35	1000.0	9.000	Single Line	20.0
23.130000	---	58.86	74.00	15.14	1000.0	9.000	Single Line	20.1
23.130000	62.20	---	87.00	24.80	1000.0	9.000	Single Line	20.1

■ DC Mode

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-4040TR
Mode :	DC
Speed :	100 Mbps
Operator Name:	KES

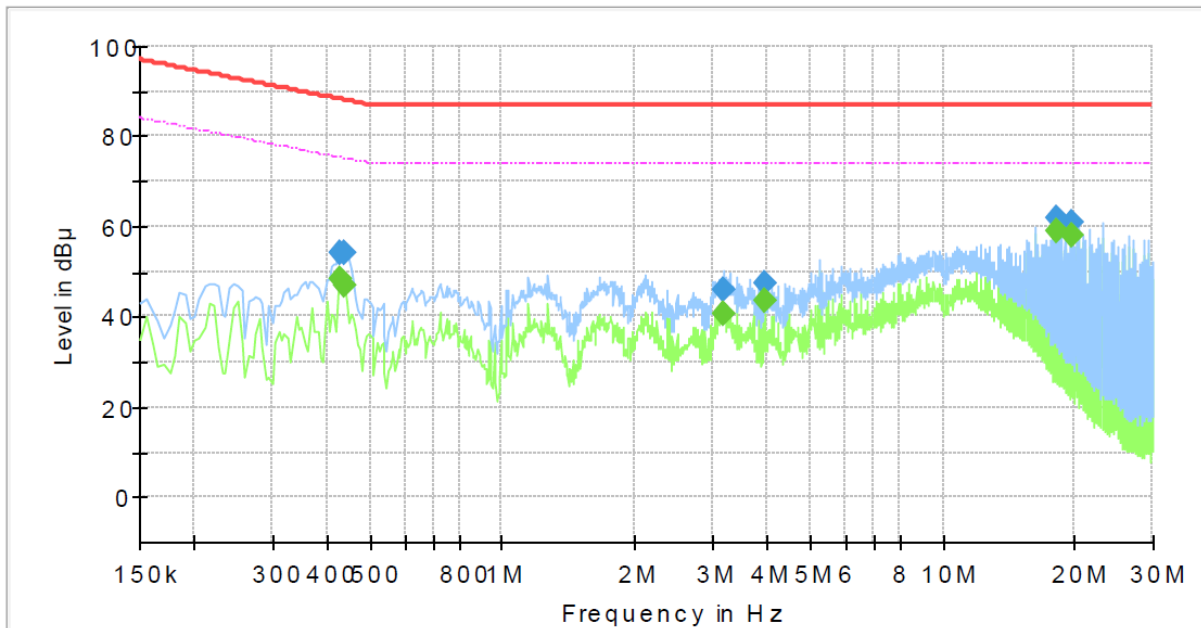


Final_Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.610000	---	36.50	74.00	37.50	1000.0	9.000	Single Line	19.8
0.610000	43.65	---	87.00	43.35	1000.0	9.000	Single Line	19.8
1.025000	---	39.19	74.00	34.81	1000.0	9.000	Single Line	20.0
1.025000	42.01	---	87.00	44.99	1000.0	9.000	Single Line	20.0
2.975000	---	36.29	74.00	37.71	1000.0	9.000	Single Line	20.0
2.975000	40.87	---	87.00	46.13	1000.0	9.000	Single Line	20.0
18.305000	---	58.90	74.00	15.10	1000.0	9.000	Single Line	19.8
18.305000	61.71	---	87.00	25.29	1000.0	9.000	Single Line	19.8
23.130000	---	59.53	74.00	14.47	1000.0	9.000	Single Line	20.1
23.130000	62.57	---	87.00	24.43	1000.0	9.000	Single Line	20.1

PoE Mode
[100 Mbps]
Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-4040TR
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)
0.430000	---	48.29	75.25	26.96	1000.0	9.000	Single Line	19.7
0.430000	54.21	---	88.25	34.04	1000.0	9.000	Single Line	19.7
0.440000	---	46.88	75.06	28.18	1000.0	9.000	Single Line	19.7
0.440000	54.22	---	88.06	33.84	1000.0	9.000	Single Line	19.7
3.190000	---	40.54	74.00	33.46	1000.0	9.000	Single Line	20.0
3.190000	46.16	---	87.00	40.84	1000.0	9.000	Single Line	20.0
3.955000	---	43.77	74.00	30.23	1000.0	9.000	Single Line	19.7
3.955000	47.20	---	87.00	39.80	1000.0	9.000	Single Line	19.7
18.245000	---	58.93	74.00	15.07	1000.0	9.000	Single Line	19.8
18.245000	61.67	---	87.00	25.33	1000.0	9.000	Single Line	19.8
19.710000	---	58.04	74.00	15.96	1000.0	9.000	Single Line	20.0
19.710000	60.89	---	87.00	26.11	1000.0	9.000	Single Line	20.0

◆ Calculation

$$\text{QuasiPeak [dBuV]} / \text{CAverage [dBuV]} = \text{Reading Value [dBuV]} + \text{Corr. [dB]}$$

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

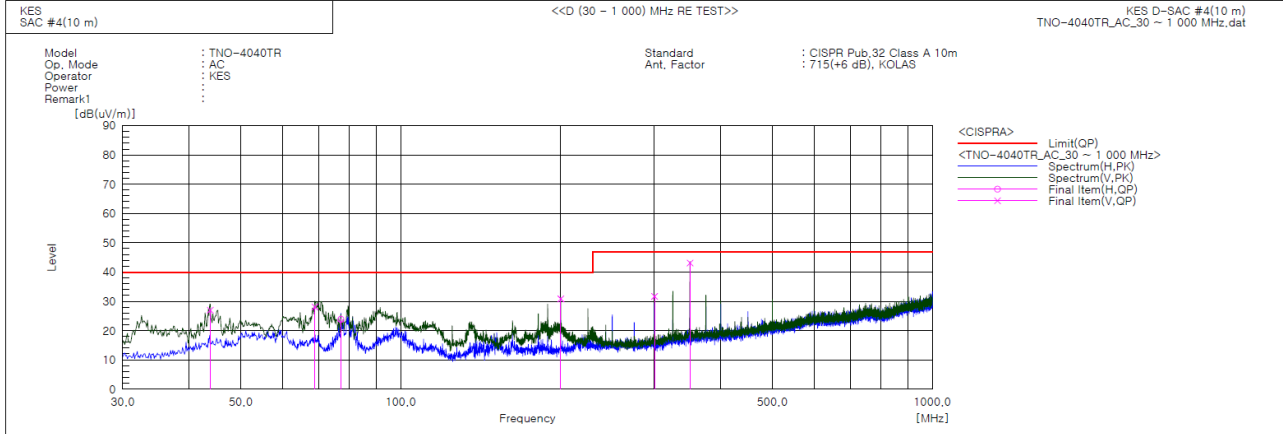
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

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

Radiated Electric Field Emissions(Below 1 GHz)

■ AC Mode

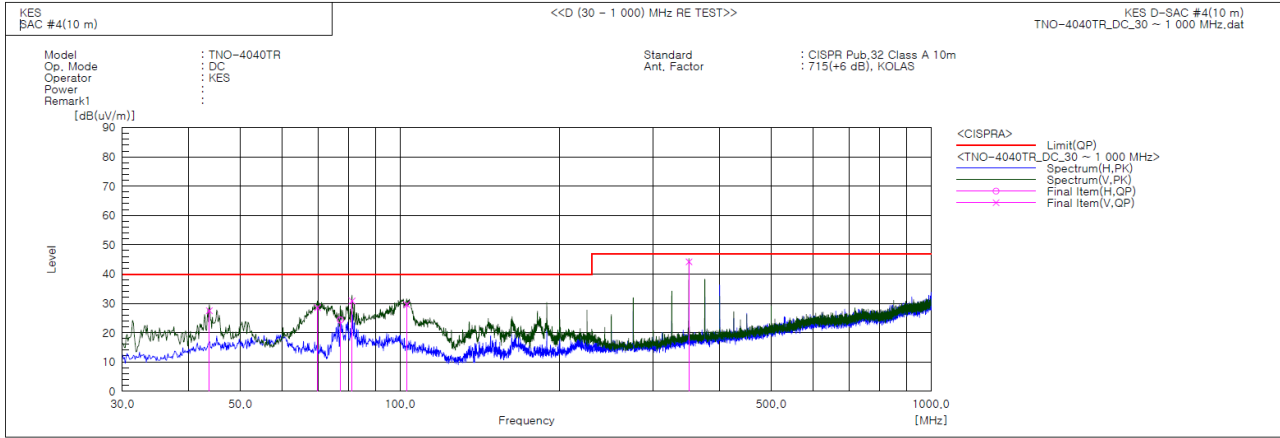


Final Result

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	43.823	V	48.6	-21.6	27.0	40.0	13.0	116.0	110.0	
2	68.921	V	52.6	-24.5	28.1	40.0	11.9	132.0	207.0	
3	77.166	H	51.3	-27.4	23.9	40.0	16.1	375.0	62.0	
4	199.993	V	51.9	-21.0	30.9	40.0	9.1	100.0	200.0	
5	300.024	V	49.7	-18.0	31.7	47.0	15.3	100.0	37.0	
6	349.979	V	58.4	-15.3	43.1	47.0	3.9	100.0	1.0	

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

DC Mode

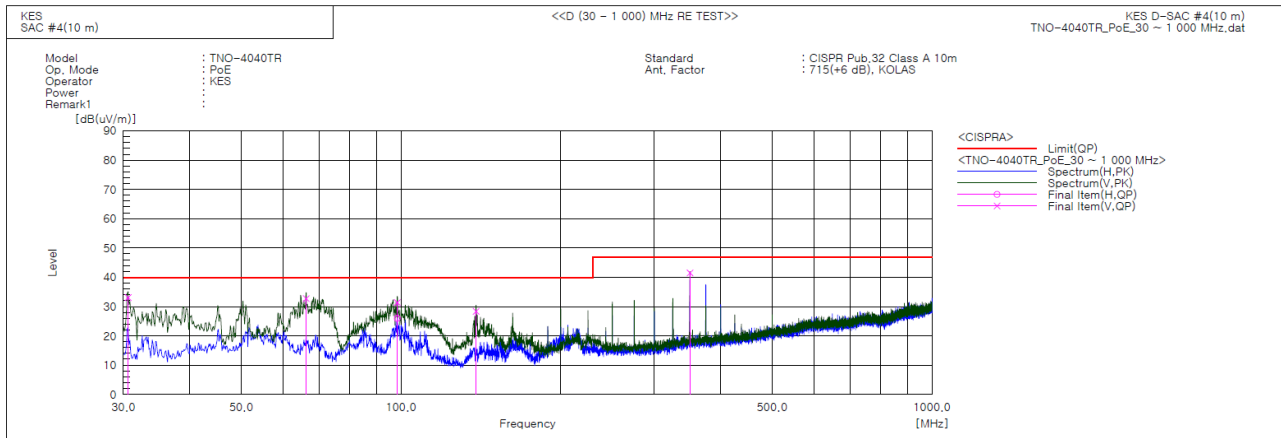


Final Result

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	43.701	V	49.1	-21.6	27.5	40.0	12.5	100.0	11.1	
2	69.891	V	53.3	-24.8	28.5	40.0	11.5	100.0	158.1	
3	77.166	H	51.7	-27.4	24.3	40.0	15.7	400.0	355.9	
4	81.168	V	58.4	-27.6	30.8	40.0	9.2	150.0	263.5	
5	102.871	V	52.1	-22.5	29.6	40.0	10.4	150.0	172.1	
6	349.979	V	59.5	-15.3	44.2	47.0	2.8	100.0	6.1	

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

■ PoE Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	30.606	V	58.3	-25.2	33.1	40.0	6.9	105.0	286.0	
2	66.254	V	56.3	-23.6	32.7	40.0	7.3	113.0	109.0	
3	98.385	V	54.1	-22.7	31.4	40.0	8.6	132.0	0.0	
4	98.385	H	48.7	-22.7	26.0	40.0	14.0	400.0	170.0	
5	138.398	V	53.9	-25.5	28.4	40.0	11.6	109.0	198.0	
6	349.979	V	56.8	-15.3	41.5	47.0	5.5	100.0	162.0	

◆ Calculation

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

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

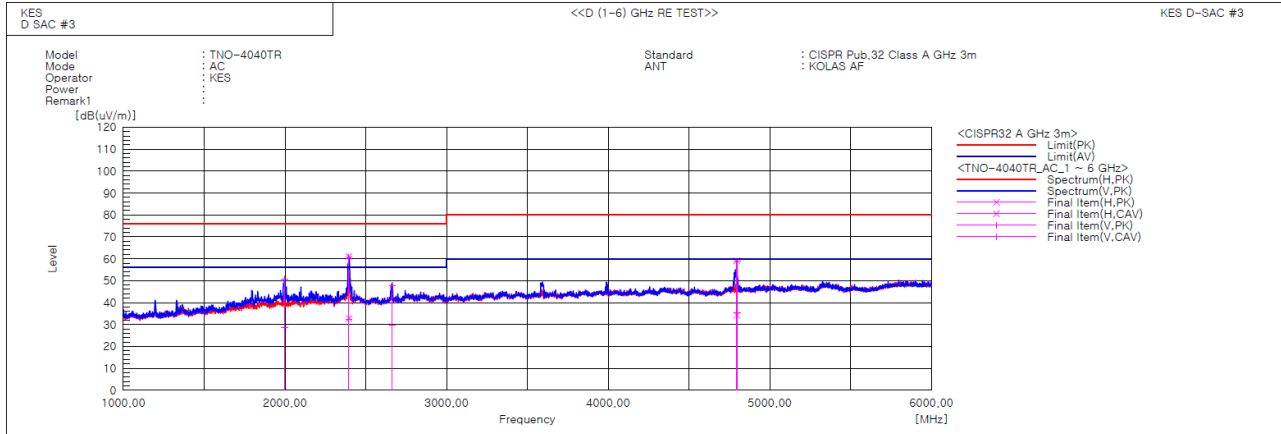
Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

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



Radiated Electric Field Emissions(Above 1 GHz)

■ AC Mode



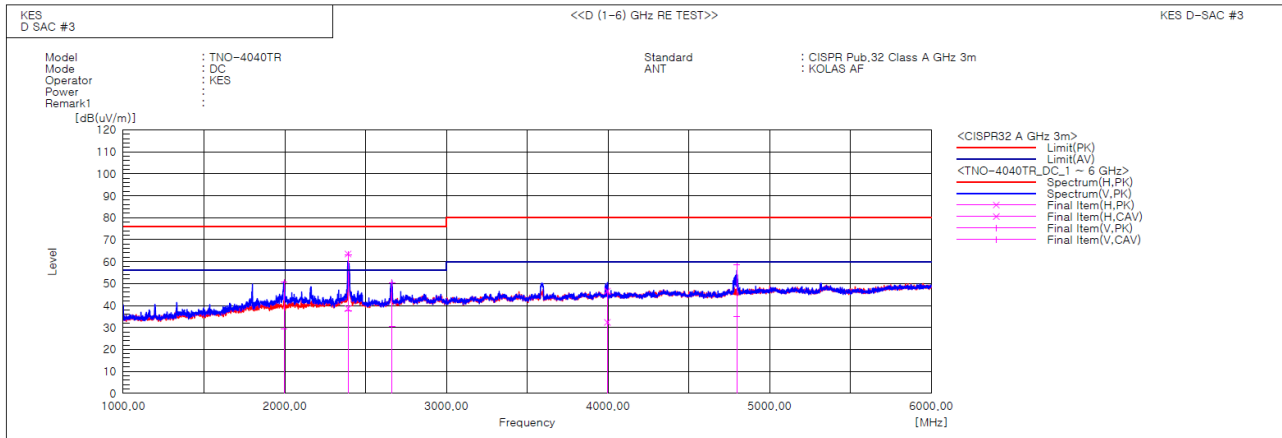
Final Result

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	1996.092	V	51.8	29.7	-1.0	50.8	28.7	76.0	56.0	25.2	27.3	100.0	47.9	
2	2394.841	H	59.9	31.6	1.2	61.1	32.8	76.0	56.0	14.9	23.2	100.0	262.4	
3	2395.100	V	59.5	31.1	1.2	60.7	32.3	76.0	56.0	15.3	23.7	100.0	60.9	
4	2664.311	V	46.3	28.4	1.3	47.6	29.7	76.0	56.0	28.4	26.3	100.0	11.4	
5	4795.331	H	51.5	26.7	7.6	59.1	34.3	80.0	60.0	20.9	25.7	100.0	126.7	
6	4797.450	V	51.2	27.8	7.6	58.8	35.4	80.0	60.0	21.2	24.6	100.0	4.2	

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



DC Mode

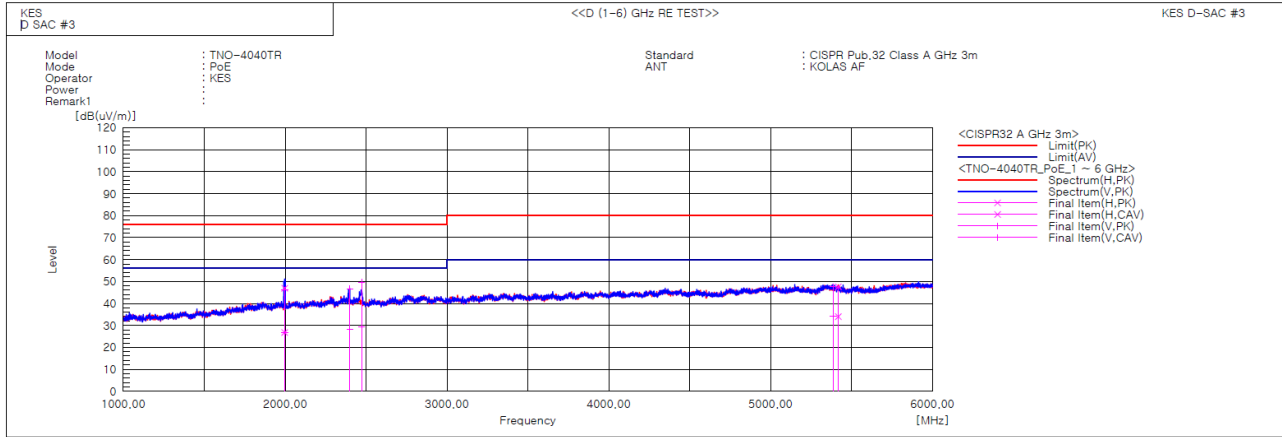


Final Result

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	1995.153	V	51.6	30.3	-1.1	50.5	29.2	76.0	56.0	25.5	26.8	100.0	34.7	
2	2390.760	H	62.3	37.4	1.2	63.5	38.6	76.0	56.0	12.5	17.4	100.0	262.5	
3	2391.520	V	61.9	36.5	1.2	63.1	37.7	76.0	56.0	12.9	18.3	100.0	335.1	
4	2663.236	V	49.1	29.2	1.3	50.4	30.5	76.0	56.0	25.6	25.5	100.0	354.0	
5	3995.313	H	40.8	26.5	5.8	46.6	32.3	80.0	60.0	33.4	27.7	100.0	259.6	
6	4797.071	V	51.0	27.2	7.6	58.6	34.8	80.0	60.0	21.4	25.2	100.0	357.6	

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(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	1996.031	H	47.9	27.8	-1.0	46.9	26.8	76.0	56.0	29.1	29.2	100.0	195.1	
2	1997.731	V	47.1	27.7	-1.0	46.1	26.7	76.0	56.0	29.9	29.3	100.0	151.7	
3	2399.800	V	45.5	27.0	1.2	46.7	28.2	76.0	56.0	29.3	27.8	100.0	11.8	
4	2472.270	V	48.6	28.2	1.1	49.7	29.3	76.0	56.0	26.3	26.7	100.0	7.7	
5	5386.258	V	38.0	24.6	9.5	47.5	34.1	80.0	60.0	32.5	25.9	100.0	234.9	
6	5418.585	H	38.1	24.5	9.5	47.6	34.0	80.0	60.0	32.4	26.0	100.0	158.8	

Calculation

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

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

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

Conducted Emissions at Telecommunication Ports

■ DC Mode



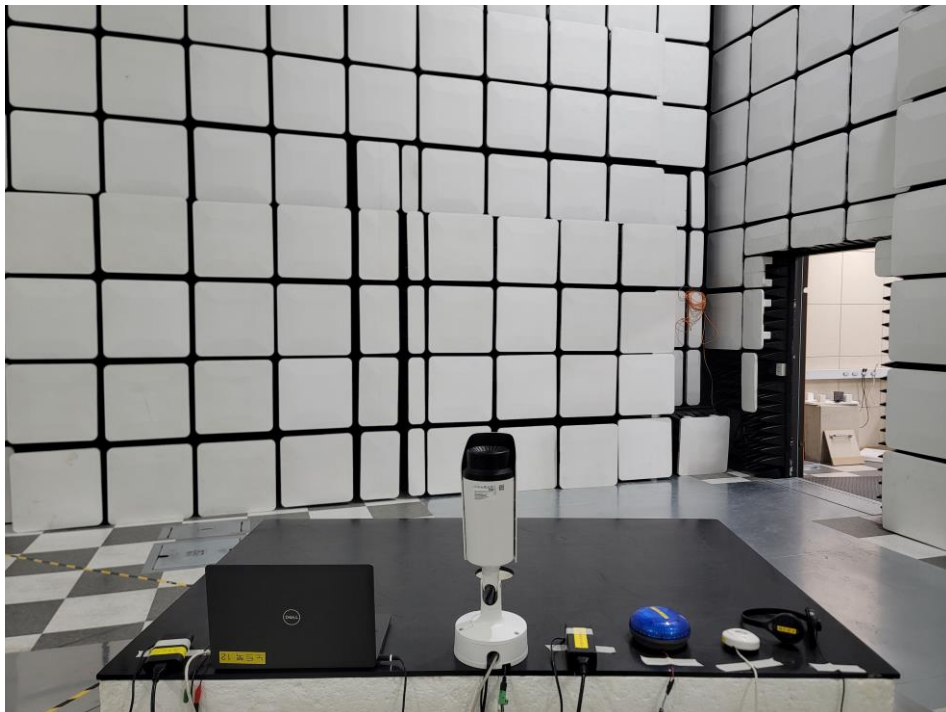
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



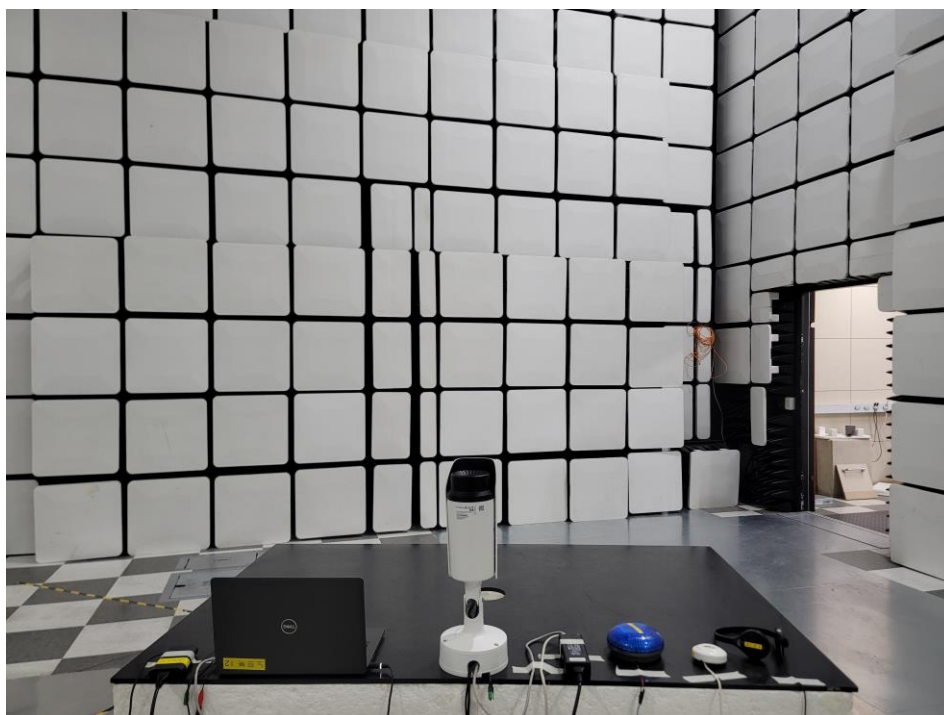
Radiated Electric Field Emissions(Below 1 GHz)

■ DC Mode



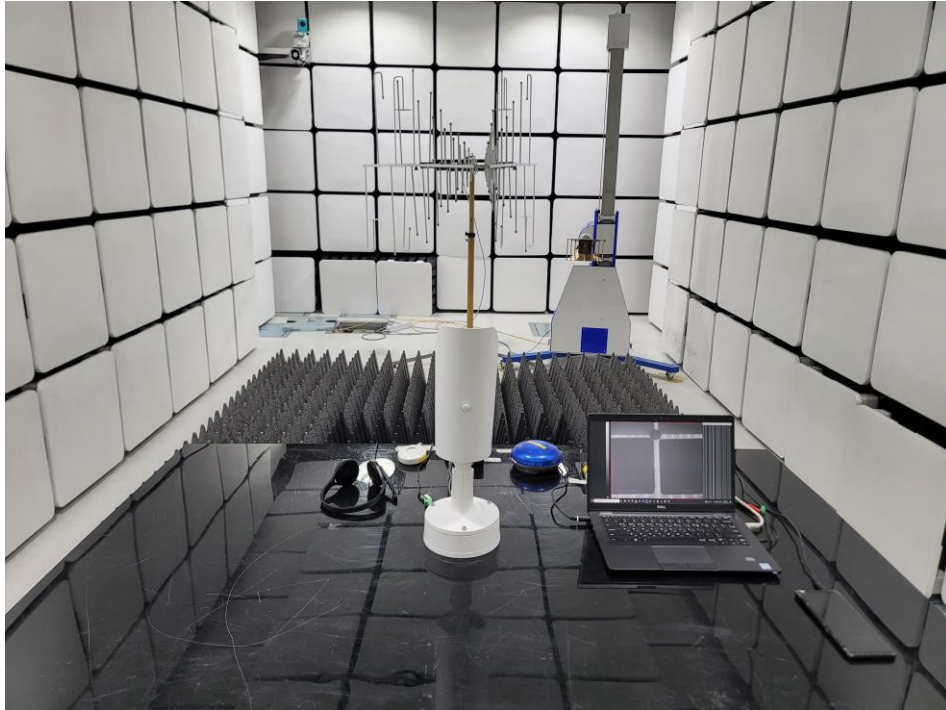
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

■ PoE Mode



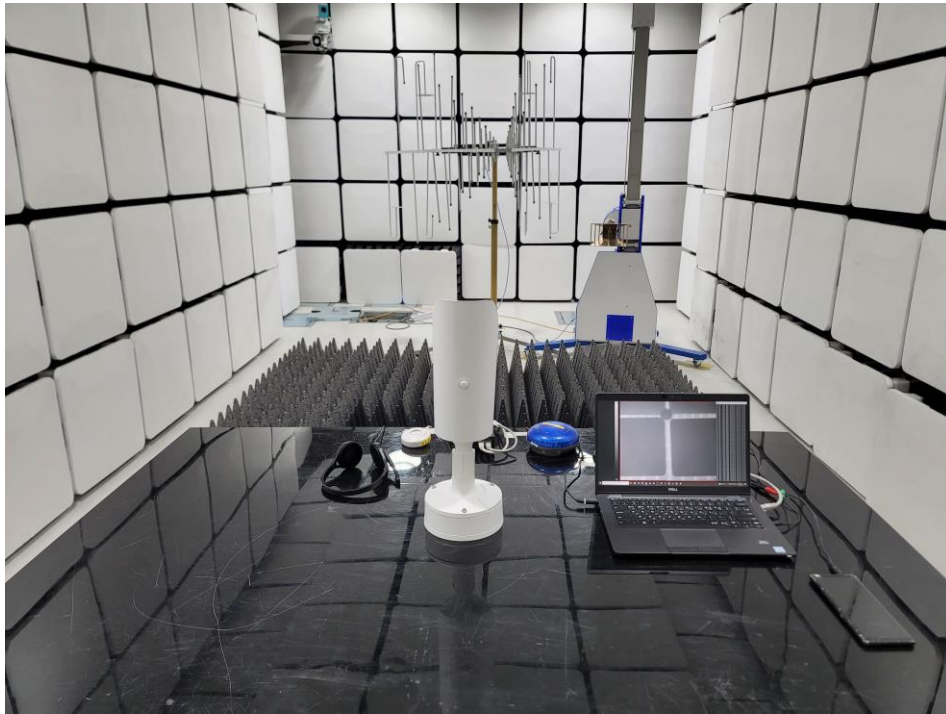
Radiated Electric Field Emissions(Above 1 GHz)

■ 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

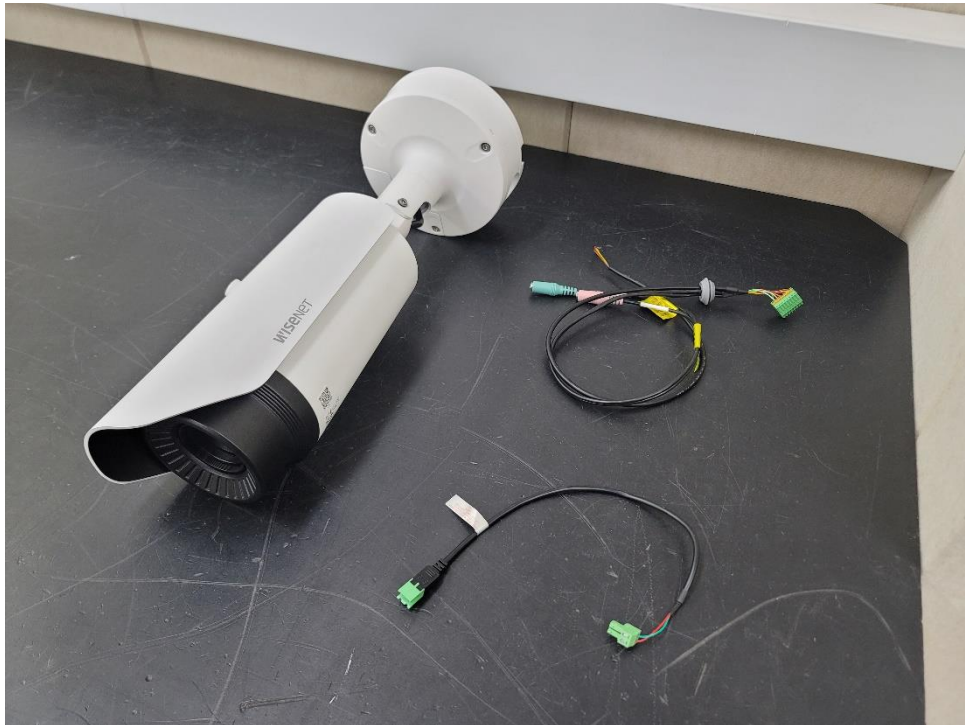
■ PoE Mode



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

EUT External Photographs

(Top)



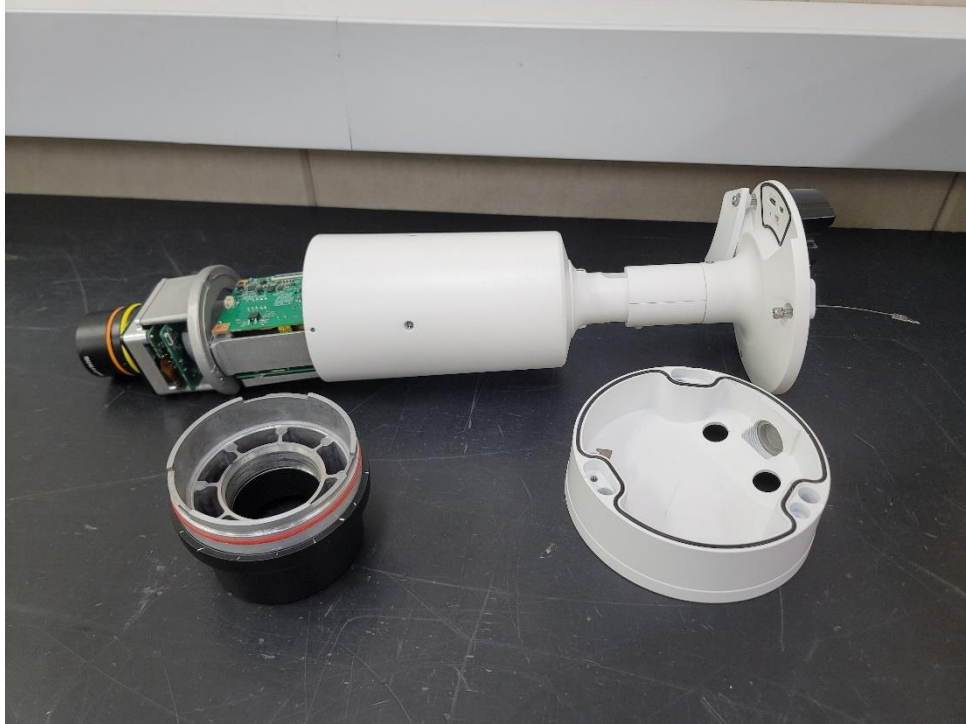
(Bottom)



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 – NUC Board

(Top)



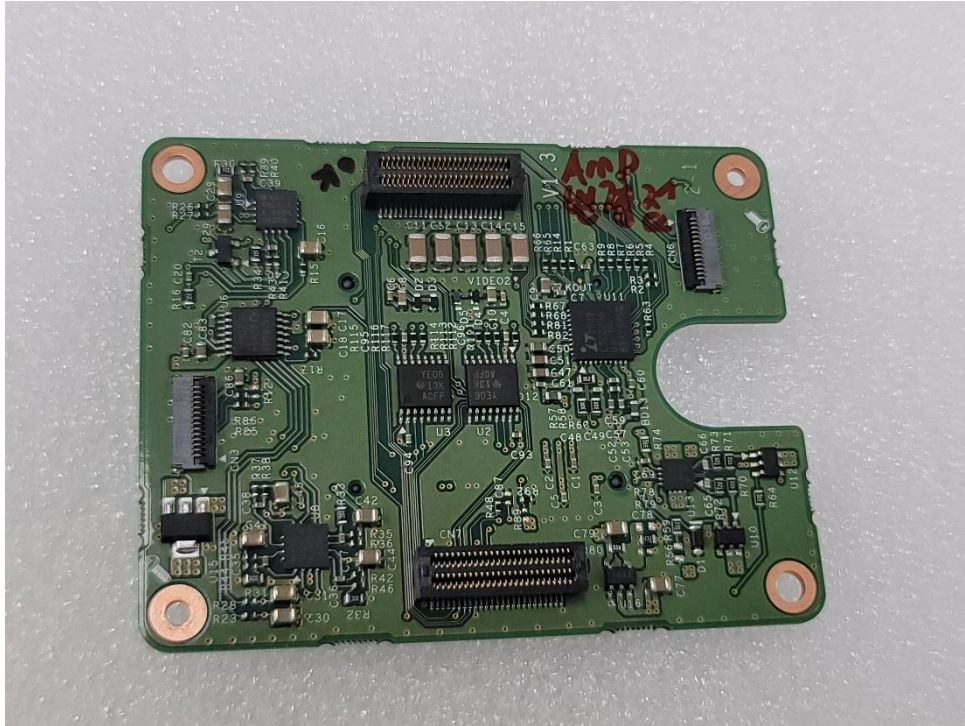
(Bottom)



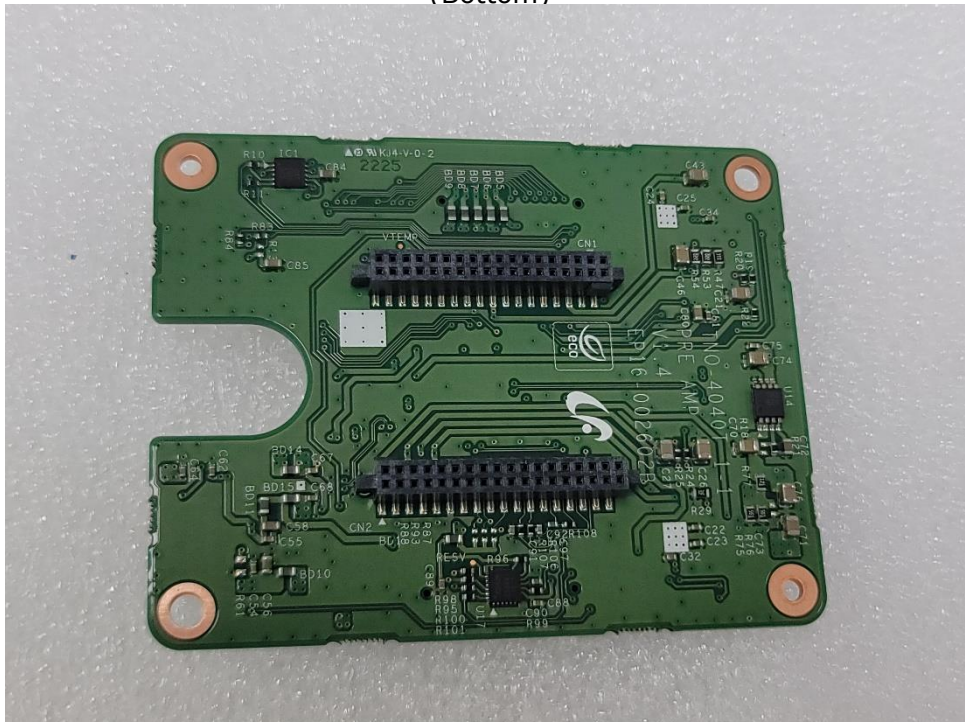
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – PRE AMP Board

(Top)



(Bottom)



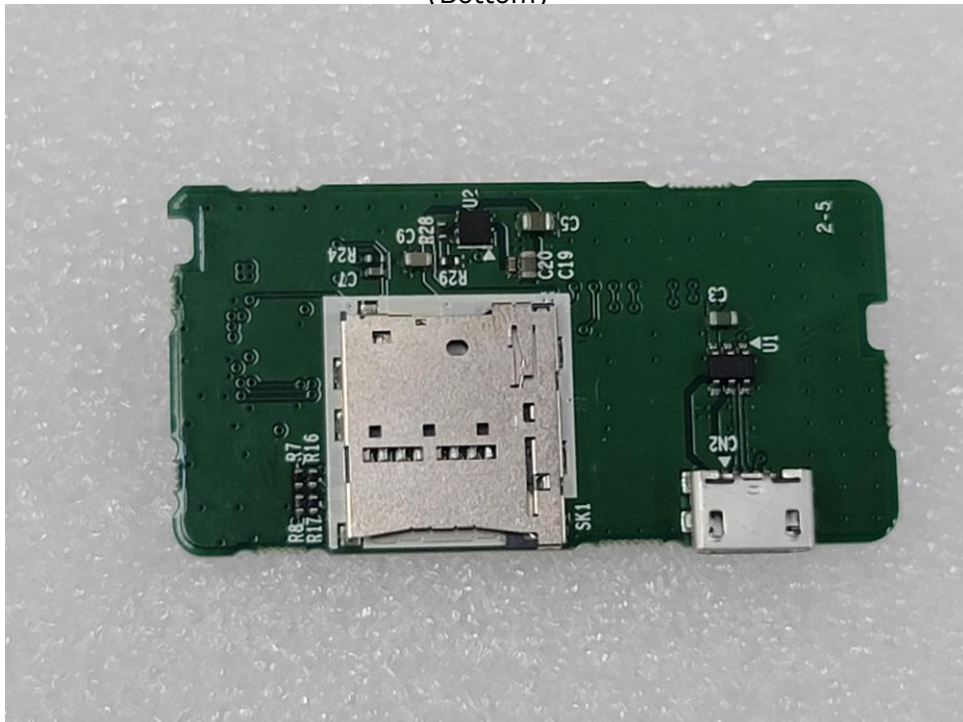
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – SD Card Board

(Top)



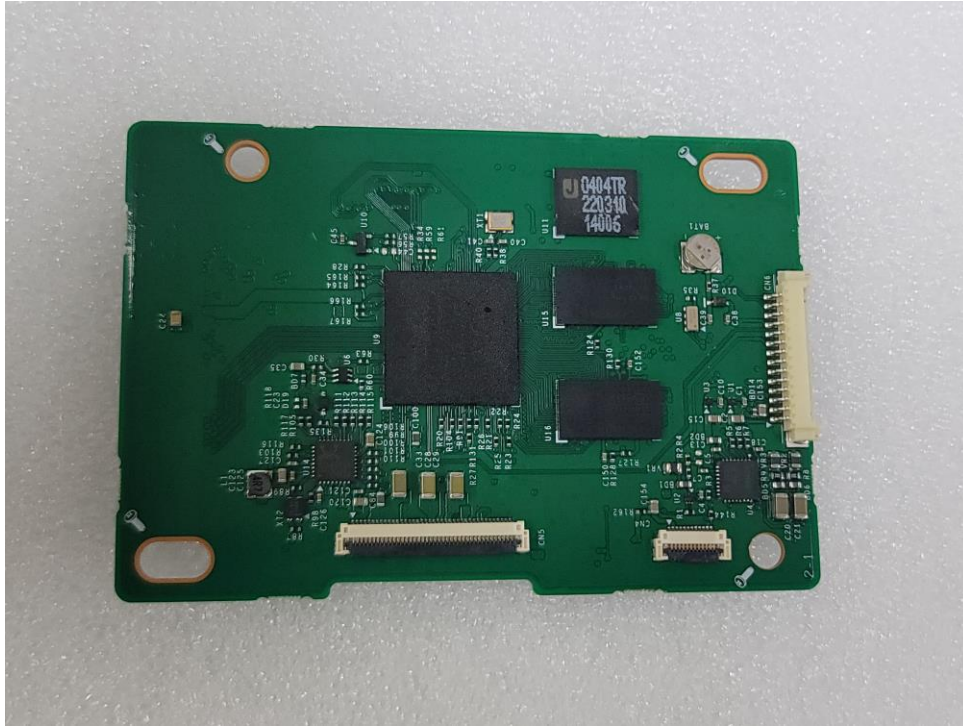
(Bottom)



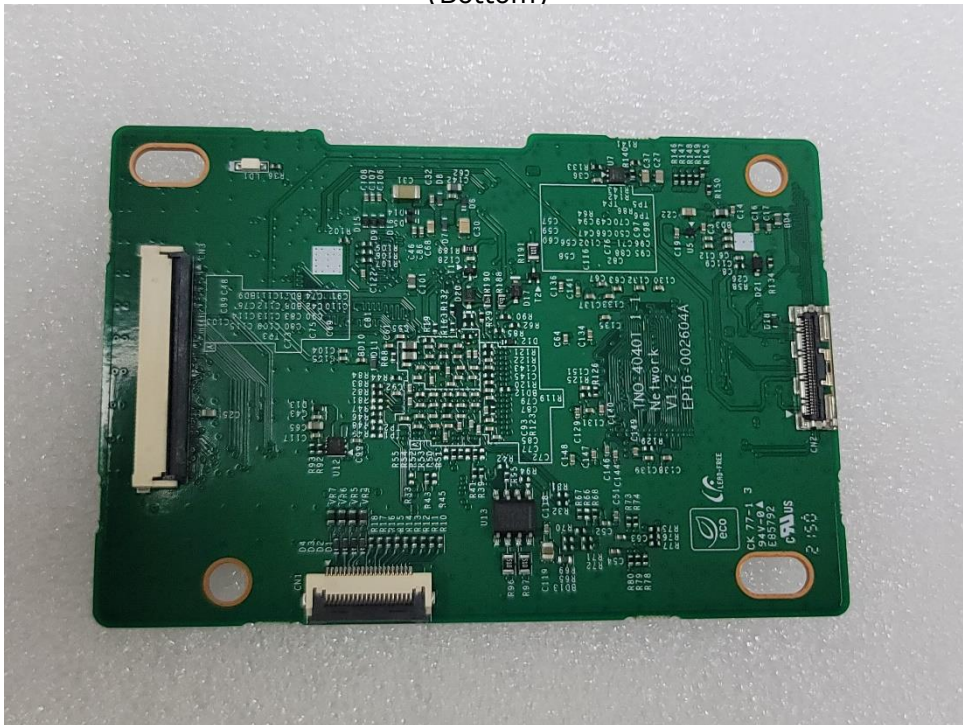
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Network Board

(Top)



(Bottom)



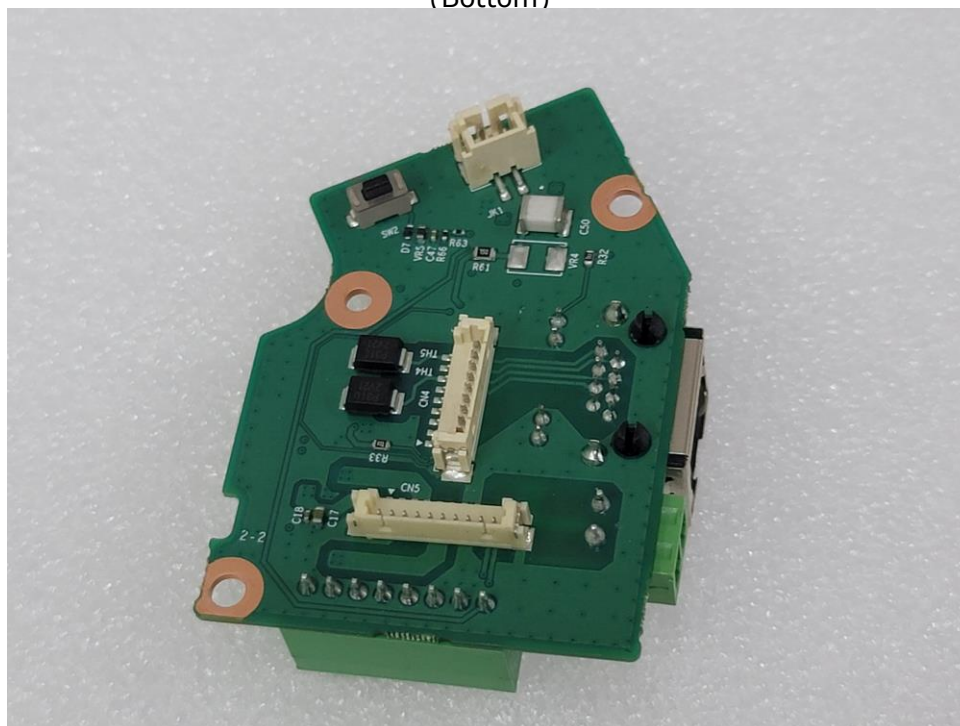
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Interface Board

(Top)



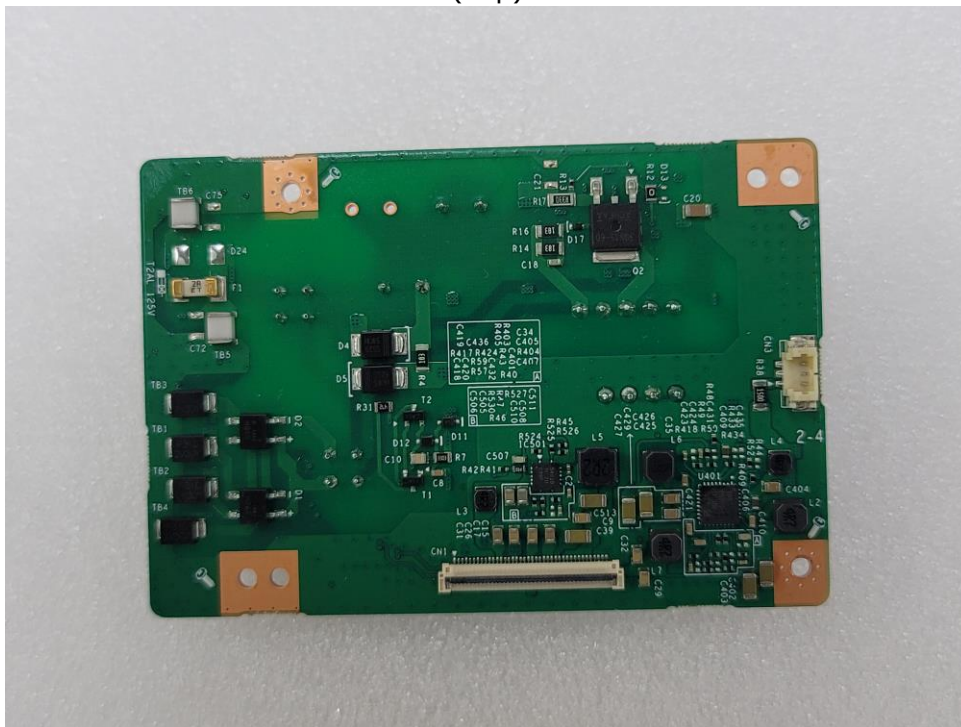
(Bottom)



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 – Power Board

(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)



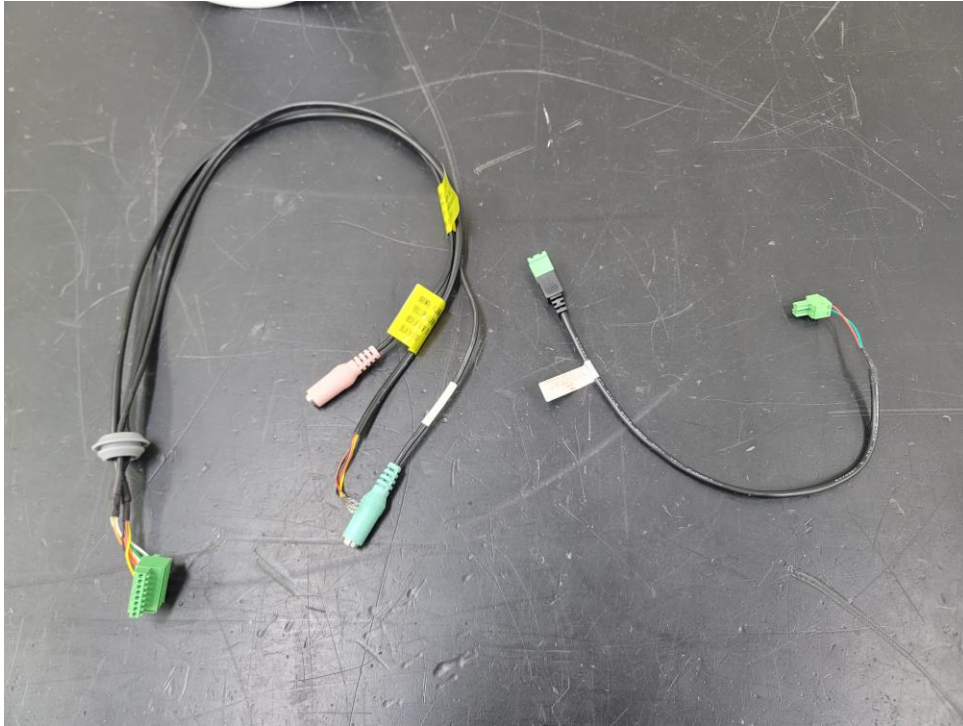
(Bottom)



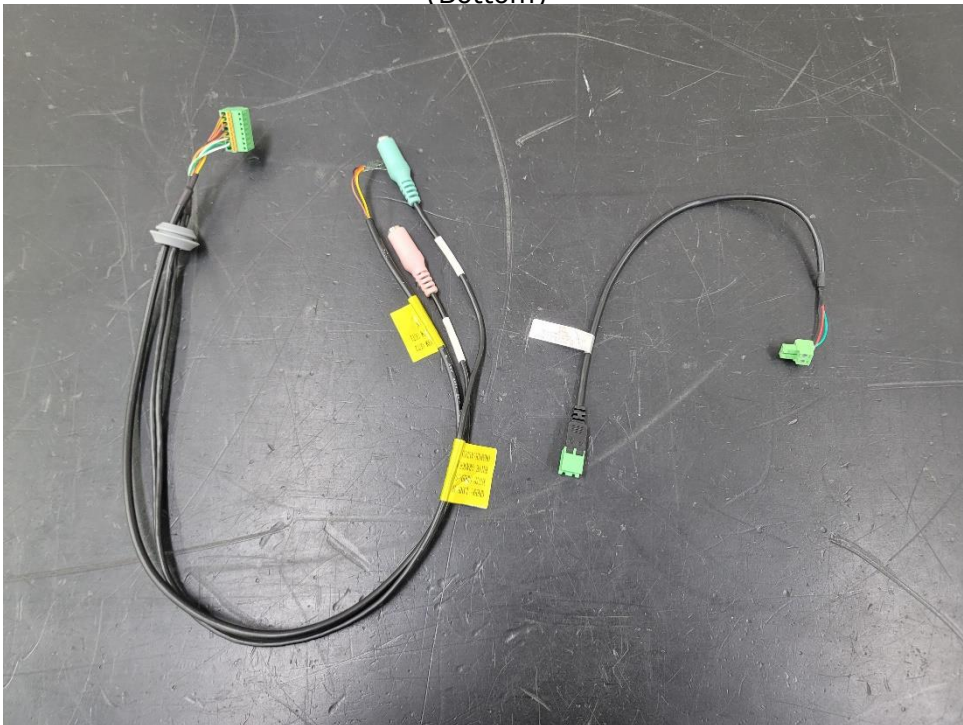
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

EUT Internal View – Cable

(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