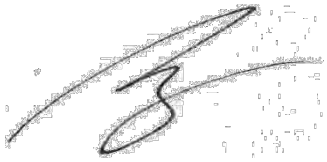
EMC TEST REPORT For CE

Test Report No.	:	KES-E1-19T0488
Date of Issue	:	Aug. 19, 2019
Product name	:	THERMAL CAMERA
Model/Type No.	:	TNO-3010T
Variant Model	:	TNO-3020T, TNO-3030T, TNO-3010TRA, TNO-3020TRA
Applicant	:	Hanwha Techwin Co., Ltd.
Applicant Address	:	6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488, KOREA
Manufacturer	:	1. HANWHA TECHWIN (TIANJIN) CO.,LTD. 2. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD. 3. D-TECH CO.,LTD.
Manufacturer Address	:	1. No.11 Weiliu Rd,Micro-Electronic Industrial Park, TEDA,Tianjin, 300385,People's Republic of China 2. Lot O-2, Que Vo Industrial Zone extended area, Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam 3. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do, Korea (Suwon Industrial Complex)
Date of Receipt	:	Aug. 09, 2019
Test date	:	Aug. 10, 2019 ~ Aug. 11, 2019
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by



Kang Hyeon, 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. 19, 2019	KES-E1-19T0488	Issued

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1.0 General Product Description

Main Specifications of EUT are:

	TNO-3010T
Video	
Imaging Device	Uncooled micro bolometer
Effective Pixels	None
NETD	< 60mK
Pixel Size	12 μm
Min. Illumination	None
Video Out	CVBS: 1.0 Vp-p / 75Ω composite, 720x480(N), 720x576(P) for installation USB: Micro USB Type B, 1280x720 for installation
Lens	
Max. Aperture Ratio	F1.0
Angular Field of View	H:92.0°, V:65.5°, D:125.7°
Min. Object Distance	0.3m(****ft)
Focus Control	Fixed
Operational	
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 ditection, 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

1.1 Test Voltage & Frequency

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

Voltage ☒ 230Vac ☐ 100 Vac ☐ 24 Vac ☒ 12 Vdc ☒ PoE

Frequency ☒ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

Add simple derived model for management model by sales department

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
THERMAL CAMERA	TNO-3010T	-	HANWHA TECHWIN(TIANJIN) CO., LTD	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	NT-R519	ZLT393BSB00204H	SAMSUNG	-
Notebook Adapter	ADP-60ZH D	-	DELTA ELECTRONICS, INC.	-
MIC	MP1000	-	-	-
Speaker	BR1000A Cuve Black 2	-	DONGGUAN EDIFIER TECHNOLOGY Co., Ltd	-
Button Alarm	-	-	-	-
Alarm	-	-	-	-
AC Adapter	DRL-246000AC	-	Dream TEK	-
PoE Adapter	PD-3001GC/AC	RD935608201696420 0	Power Dsine	-
Smart phone	A1303	-	APPLE .Inc	-

1.6 External I/O Cabling

■ AC 24 V

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
THERMAL CAMERA	RJ-45	Notebook	RJ-45	4.0	U
	Line in(2Pin)	MIC	2Pin	1.5	U
	Line Out(2Pin)	Speaker	2Pin	1.5	U
	Alarm in	Button Alarm	2Pin	4.0	U
	Alarm out	Alarm	2Pin	4.0	U
Notebook	MIC	Smart phone	Audio out	1.0	U

* Unshielded=U, Shielded=S

■ DC 12 V

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
THERMAL CAMERA	RJ-45	Notebook	RJ-45	4.0	U
	Line in(2Pin)	MIC	2Pin	1.5	U
	Line Out(2Pin)	Speaker	2Pin	1.5	U
	Alarm in	Button Alarm	2Pin	4.0	U
	Alarm out	Alarm	2Pin	4.0	U
Notebook	MIC	Smart phone	Audio out	1.0	U

* Unshielded=U, Shielded=S

■ PoE

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
THERMAL CAMERA	RJ-45	PoE Adapter	RJ-45	4.0	U
	Line in(2Pin)	MIC	2Pin	1.5	U
	Line Out(2Pin)	Speaker	2Pin	1.5	U
	Alarm in	Button Alarm	2Pin	4.0	U
	Alarm out	Alarm	2Pin	4.0	U
Notebook	MIC	Smart phone	Audio out	1.0	U
	RJ-45	PoE Adapter	RJ-45	4.0	U

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

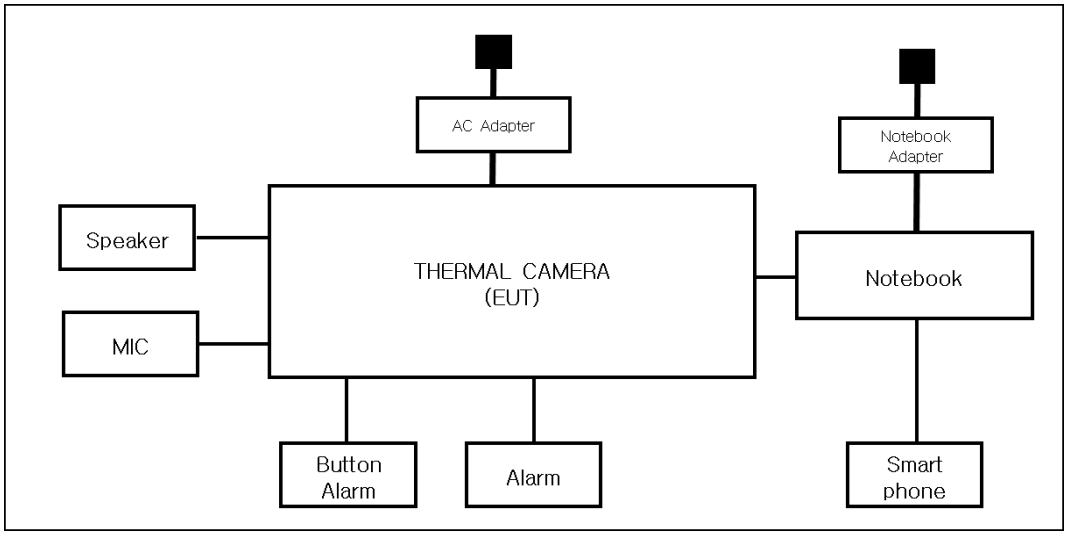
Test Mode	operating
AC24V DC12V PoE	EUT Monitoring, Ping Test

EUT Test operating S/W		
Name	**Version**	**Manufacture Company**
WebViewer	-	-

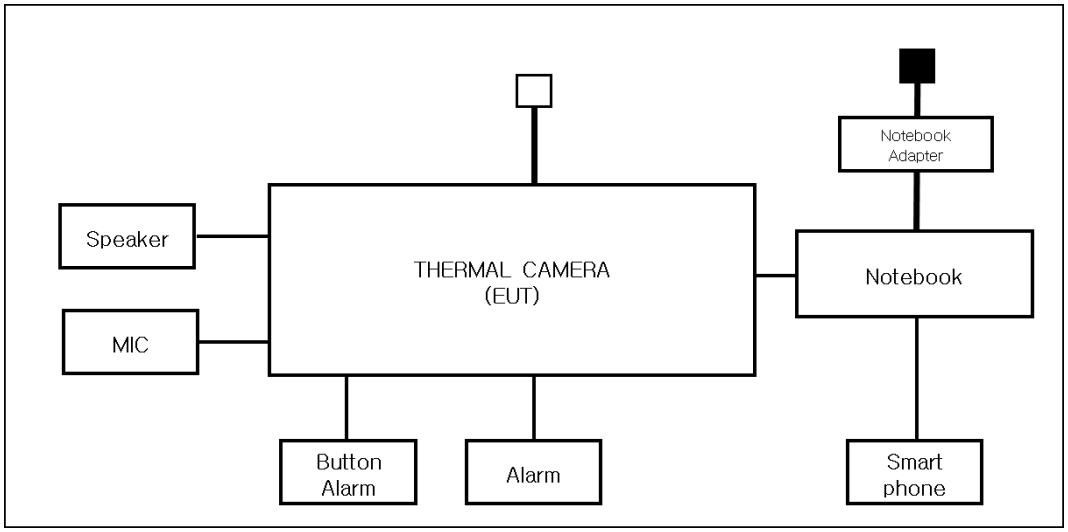
1.8 Configuration

■ AC Main
□ DC Main

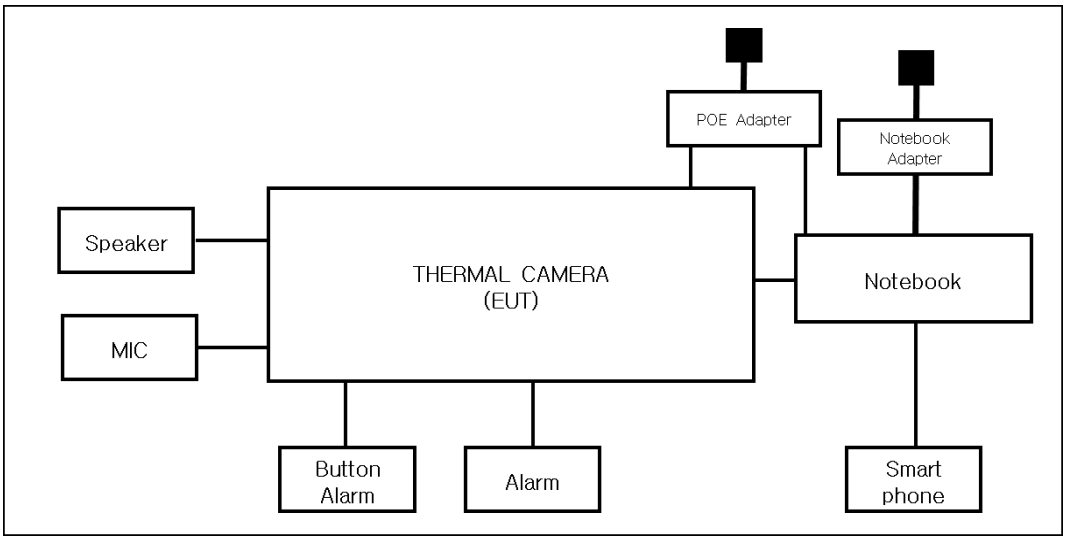
■ AC 24 V



■ DC 12 V



■ PoE



1.9 Remarks when standards applied

N/A

1.10 Calibration Details of Equipment Used for Measurement

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

1.11 Test Facility

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

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	**RRA**	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KR0100
International	**KOLAS**	EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KT489
USA	**FCC**	3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	KR0100
Canada	**ISED**	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	23298-1
JAPAN	**VCCI**	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	R-20056, C-20036, T-20040, G-20057
Europe	**TÜV SÜD**	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	CARAT 001633 0003

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: 2012/AC:2013	☒ 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		

☐ **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

2.1 Conducted Emissions at Mains Power Ports

Test Date
Aug. 10, 2019

Test Location
Electro wave Shieldroom #3

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	04, 22, 2020
☒	LISN	ENV216	R & S	101137	01, 25, 2020
☒	LISN	ENV216	R & S	101786	01, 25, 2020

Test Conditions
Temperature: 24,2 ℃
Relative Humidity: 51,9 % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.
The test has been tested using the AC / AC adaptor.(DC and PoE are not applicable.)

2.2 Conducted Emissions at Telecommunication Ports

Test Date
Aug. 10, 2019

Test Location
Electro wave Shieldroom #3

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	04, 22, 2020
☒	LISN	ENV216	R & S	101137	01, 25, 2020
☒	LISN	ENV216	R & S	101786	01, 25, 2020
☒	8-WIRE ISN CAT3	CAT3 8158	SCHWARZBECK	8158-0019	03, 19, 2020
☒	8-WIRE ISN CAT5	CAT5 8158	SCHWARZBECK	8158-0030	03, 19, 2020
☐	8-WIRE ISN CAT6	NTFM 8158	SCHWARZBECK	8158-0029	08, 13, 2020

Test Conditions
Temperature: 24,2 ℃
Relative Humidity: 51,9 % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.3 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Aug. 10, 2019

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, 09, 2020
☒	AMPLIFIER	SCU 01	R & S	100603	11, 26, 2019
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020
☒	ATTENUATOR	8491A	HP	32173	03, 11, 2020

Test Conditions
Temperature: 24,2 ℃
Relative Humidity: 51,9 % R.H.

Frequency Range of Measurement
30 ㎒ to 1 ㎓

Instrument Settings
IF Band Width: 120 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Aug. 10, 2019

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, 06, 2020
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	05, 27, 2020
☐	ATTENUATOR	8491A	HP	35496	03, 11, 2020
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 12, 2021

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,5 % R.H.

Frequency Range of Measurement
1 ㎓ to 6 ㎓

Instrument Settings
IF Band Width: 1 ㎒

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.5 Harmonic Current Emissions

Test Date
Aug. 11, 2019

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, 09, 2020
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % 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.
The test has been tested using the AC / AC adaptor.(DC and PoE are not applicable.)

2.6 Voltage Fluctuations and Flicker

Test Date
Aug. 11, 2019

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, 09, 2020
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % R.H.

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.
The test has been tested using the AC / AC adaptor.(DC and PoE are not applicable.)

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 dBμV.

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 dBμV, 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 dBμV, 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 dBμV.

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
Aug. 11, 2019

Test Location
EMS-ESD: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS05X4620	02, 22, 2020
☒	HCP	-	Noise Ken	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % R.H.
Atmospheric Pressure: 99,7 kPa

Test Specifications
Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

Kind of Discharge: Air, Contact (direct and indirect)

Polarity: Positive and Negative

Number of Discharge: 10 at all locations for Air discharge
10 at all locations for Contact discharge

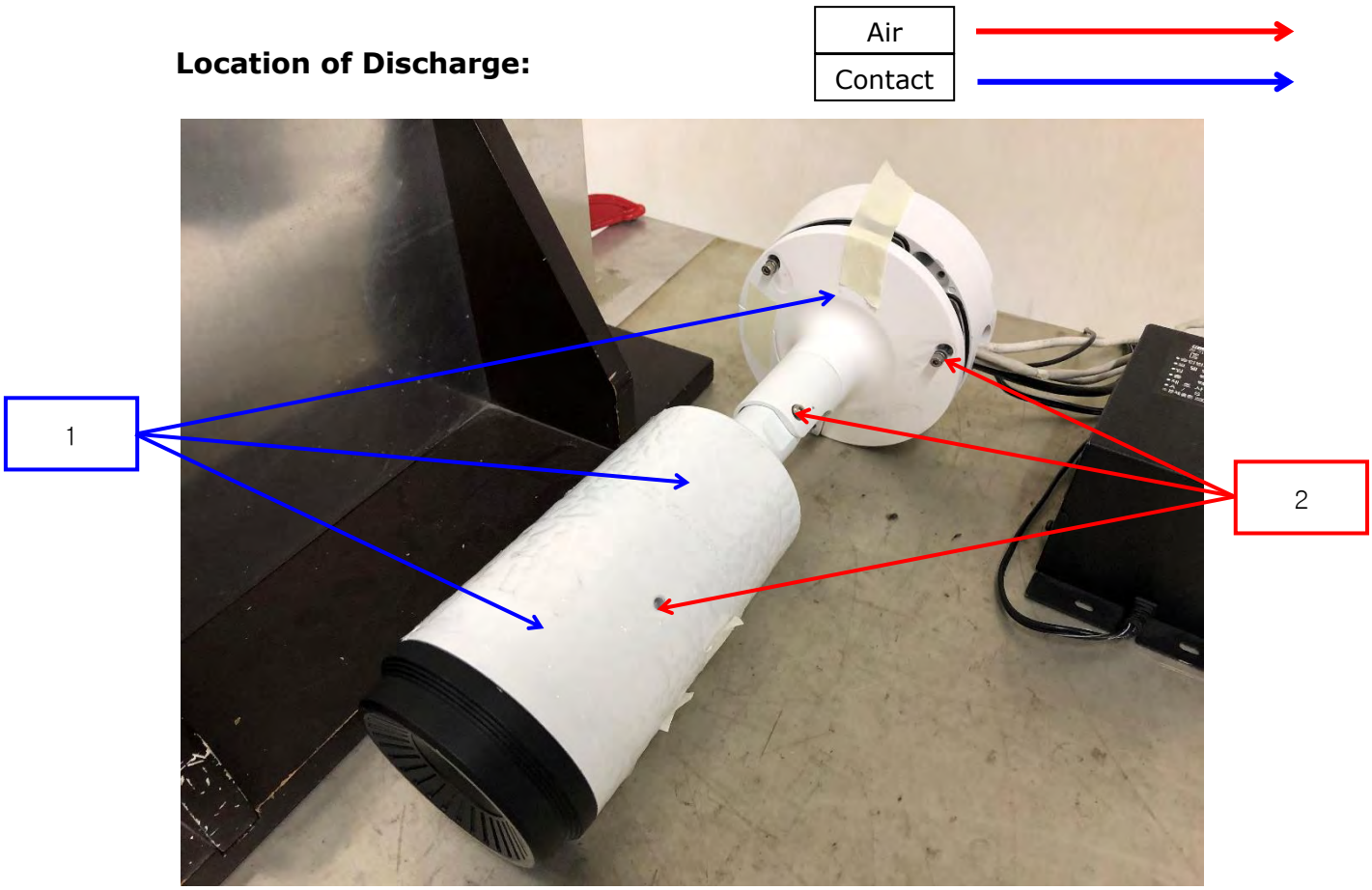
Discharge Voltage:

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

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

Required Performance Criteria: ☒ Complied

Location of Discharge:



Test Data

■ AC 24 V

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	Air Discharge	Complied	-
2	Screw	Contact Discharge	Complied	-

■ DC 12 V

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	Air Discharge	Complied	-
2	Screw	Contact Discharge	Complied	-

■ PoE

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	Air Discharge	Complied	-
2	Screw	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.2 Radiated Electric Field Immunity

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

Test Date
Aug. 11, 2019

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	10.10.02	-
☒	SIGNAL GENERATOR	SMB 100A	R & S	177586	08, 06, 2020
☒	BROADBAND AMPLIFIER	BBA100	R & S	101239	08, 06, 2020
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 06, 2020
☒	POWER METER	NRP2	R & S	103475	08, 06, 2020
☒	AVG POWER SENSOR	NRP-Z91	R & S	102526	08, 06, 2020
☒	AVG POWER SENSOR	NRP-Z91	R & S	102527	08, 06, 2020
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	DIRECTIONAL COUPLER	KYDC-D1070-DX40	KY TELECOM	KY150001	08, 06, 2020
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	03, 12, 2021

Test Conditions
Temperature: 24,1 ℃
Relative Humidity: 53,0 % R.H.
Atmospheric Pressure: 99,6 kPa

Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

Field Strength: ☐ 1 V/m ☐ 3 V/m
☒ 10 V/m

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 1,4 GHz to 2,7 GHz
☒ 80 MHz to 2,7 GHz

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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

# of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

Test Data

■ AC 24 V

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

■ DC 12 V

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

■ PoE

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
Aug. 11, 2019

Test Location
EMS-EFT: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	AMETEK CTS	7.1.2	-
☒	ULTRA COMPACT SIMULATOR	UCS 500 N5	EM TEST	V0936105120	06, 24, 2020
☒	MOTOR VARIAC	MV2616	EM TEST	V0936105123	06, 24, 2020
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	070925	06, 24, 2020

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % R.H.
Atmospheric Pressure: 99,7 ㎪

Test Specifications

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

Test Data

■ AC 24 V

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

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

■ DC 12 V

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

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

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

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
L1	Complied	Complied
L2	Complied	Complied
PE	-	-
L1 - L2	Complied	Complied
L1 – PE	-	-
L2 - PE	-	-
L1 – L2 - PE	-	-

☒ Signal ports and telecommunication ports – Coupling Clamp used

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

■ PoE

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

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

Note: "Blank" = Not performed
Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.4 Surge Transients

Reference Standard
EN 61000-4-5:2014

Test Date
Aug. 11, 2019

Test Location
EMS-Surge: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	AMETEK CTS	7.1.2	-
☒	ULTRA COMPACT SIMULATOR	UCS 500 N5	EM TEST	V0936105120	06, 24, 2020
☒	MOTOR VARIAC	MV2616	EM TEST	V0936105123	06, 24, 2020
☐	CDN	CNV 508N1	EM TEST	P1551168979	04, 22, 2020

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % R.H.
Atmospheric Pressure: 99,7 kPa

Test Specifications

AC Power Lines

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

Surge Amplitude : Common Mode
☐ (0,5 / 1,0 / 2,0) kV
Differential Mode
☒ (0,5 / 1,0) kV

Number of Surges: ☒ 5 surges per angle

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

Polarity: ☒ Positive & Negative

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

Required Performance Criteria: ☒ Complied

Other supply / Signal Lines

Source Impedance: 42 ohm for common Mode

Surge Amplitude: Common Mode
☐ (0,5 / 1,0) kV

Number of Surges: ☐ 5 Surges

Polarity: ☐ Positive & Negative

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

Required Performance Criteria: ☐ Complied

Test Data

■ AC 24 V

☒ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

Signal Lines

☐ Line to Earth – Common Mode

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

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
Other supply/signal lines : No test is required because it is not permitted to connect cables > 30 m long.

3.5 Conducted Disturbance

Reference Standard
EN 61000-4-6:2014

Test Date
Aug. 11, 2019

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	5.3.7	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1	EM TEST	V0936105119	06, 24, 2020
☒	ATTENUATOR	ATT6	EM TEST	1208-34	06, 24, 2020
☒	CDN	CDN-M2/M3N	EM TEST	0909-06	06, 24, 2020
☒	CDN	CDN T8RJ45	EM TEST	0909-09	06, 24, 2020
☒	EM INJECTION CLAMP	EM 101	Liithi	35943	01, 24, 2020

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % R.H.
Atmospheric Pressure: 99,7 kPa

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

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

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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ Complied

Test Data

■ AC 24 V

☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L – N	CDN	Complied

☐ Input d.c. power ports

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

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied
Alarm In	Clamp	Complied
Alarm Out	Clamp	Complied

■ DC 12 V

☐ Input a.c. power ports

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

☒ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L1 – L2	CDN	Complied

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	CDN	Complied
Alarm In	Clamp	Complied
Alarm Out	Clamp	Complied

■ PoE

☐ 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
Alarm In	Clamp	Complied
Alarm Out	Clamp	Complied

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

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria

3.6 Voltage Dips and Short Interruptions

Reference Standard
EN 61000-4-11:2004

Test Date
Aug. 11, 2019

Test Location
EMS-Voltage dip: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	AMETEK CTS	7.1.2	-
☒	ULTRA COMPACT SIMULATOR	UCS 500 N5	EM TEST	V0936105120	06, 24, 2020
☒	MOTOR VARIAC	MV2616	EM TEST	V0936105123	06, 24, 2020

Test Conditions
Temperature: 24,0 ℃
Relative Humidity: 52,7 % R.H.
Atmospheric Pressure: 99,7 kPa

Test Specifications & Observations/Remarks

■ AC 24 V

- Voltage Dips and Short Interruptions

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

- Voltage variations

☒ Unom + 10 %	☒ 253.0 V (ac)	Complied
☒ Unom - 15 %	☒ 195.5 V (ac)	Complied

Observations:
Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria
The test has been tested using the AC / AC adaptor.

APPENDIX A – TEST DATA

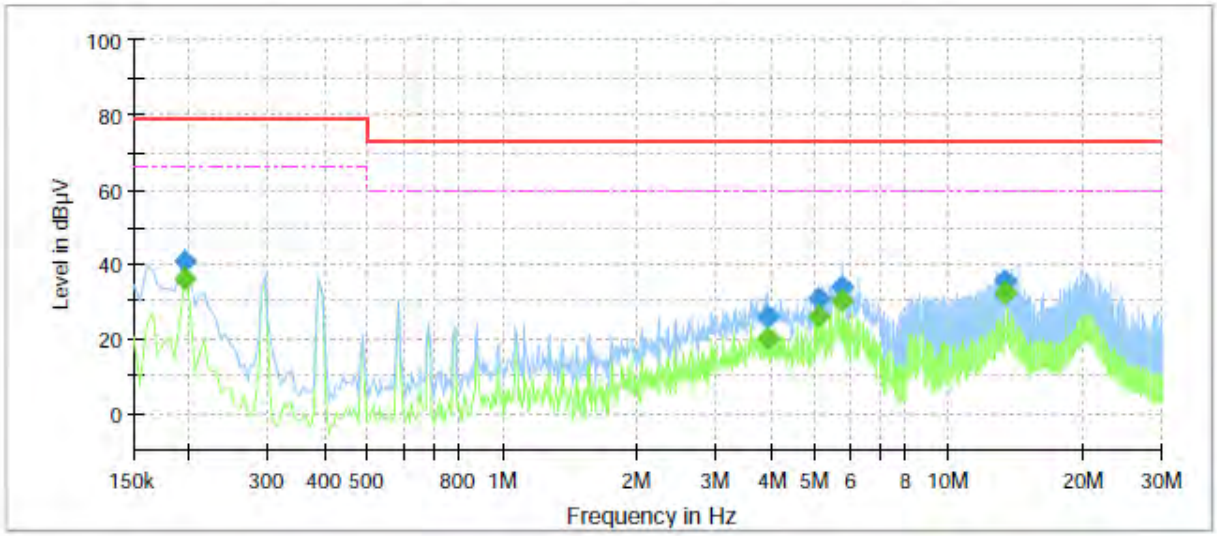
Conducted Emissions at Mains Power Ports

■ AC 24 V

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3010T
Mode	CE
Operator Name:	KES



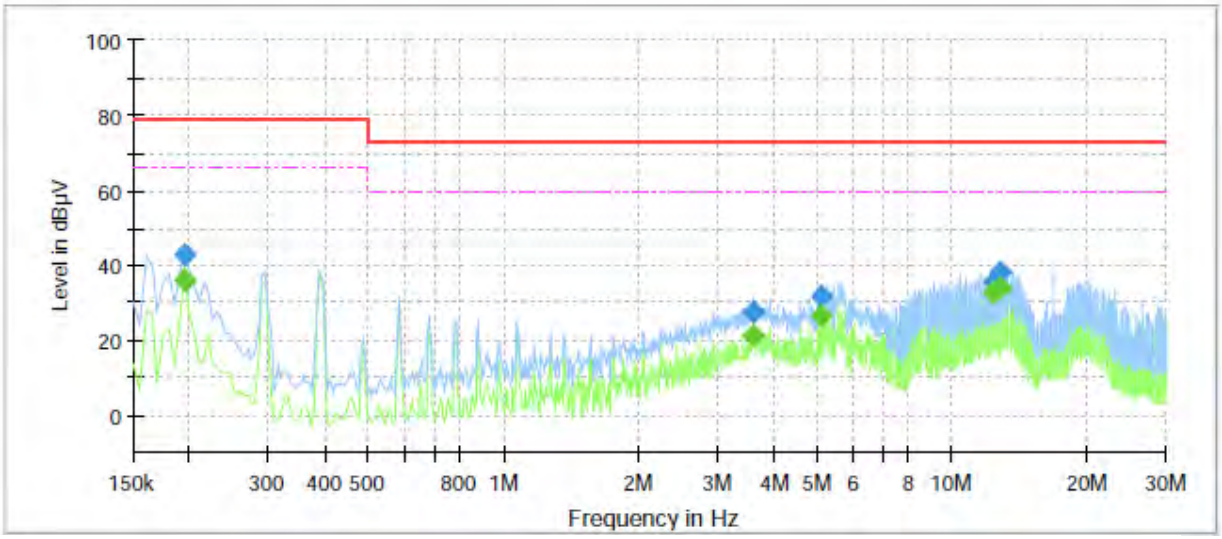
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.195000	---	35.92	66.00	30.08	1000.0	9.000	L1	10.0
0.195000	40.55	---	79.00	38.45	1000.0	9.000	L1	10.0
3.915000	---	19.88	60.00	40.12	1000.0	9.000	L1	10.1
3.915000	25.86	---	73.00	47.14	1000.0	9.000	L1	10.1
5.085000	---	25.72	60.00	34.28	1000.0	9.000	L1	10.0
5.085000	30.73	---	73.00	42.27	1000.0	9.000	L1	10.0
5.770000	---	30.02	60.00	29.98	1000.0	9.000	L1	10.3
5.770000	33.97	---	73.00	39.03	1000.0	9.000	L1	10.3
13.300000	---	32.22	60.00	27.78	1000.0	9.000	L1	10.5
13.300000	35.33	---	73.00	37.67	1000.0	9.000	L1	10.5

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3010T
Mode	CE
Operator Name:	KES



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.195000	---	36.24	66.00	29.76	1000.0	9.000	N	10.0
0.195000	42.93	---	79.00	36.07	1000.0	9.000	N	10.0
3.600000	---	21.33	60.00	38.67	1000.0	9.000	N	10.2
3.600000	27.71	---	73.00	45.29	1000.0	9.000	N	10.2
5.085000	---	26.39	60.00	33.61	1000.0	9.000	N	10.0
5.085000	31.63	---	73.00	41.37	1000.0	9.000	N	10.0
12.320000	---	32.62	60.00	27.38	1000.0	9.000	N	10.4
12.320000	35.41	---	73.00	37.59	1000.0	9.000	N	10.4
12.810000	---	33.94	60.00	26.06	1000.0	9.000	N	10.5
12.810000	38.16	---	73.00	34.84	1000.0	9.000	N	10.5

♦ 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))

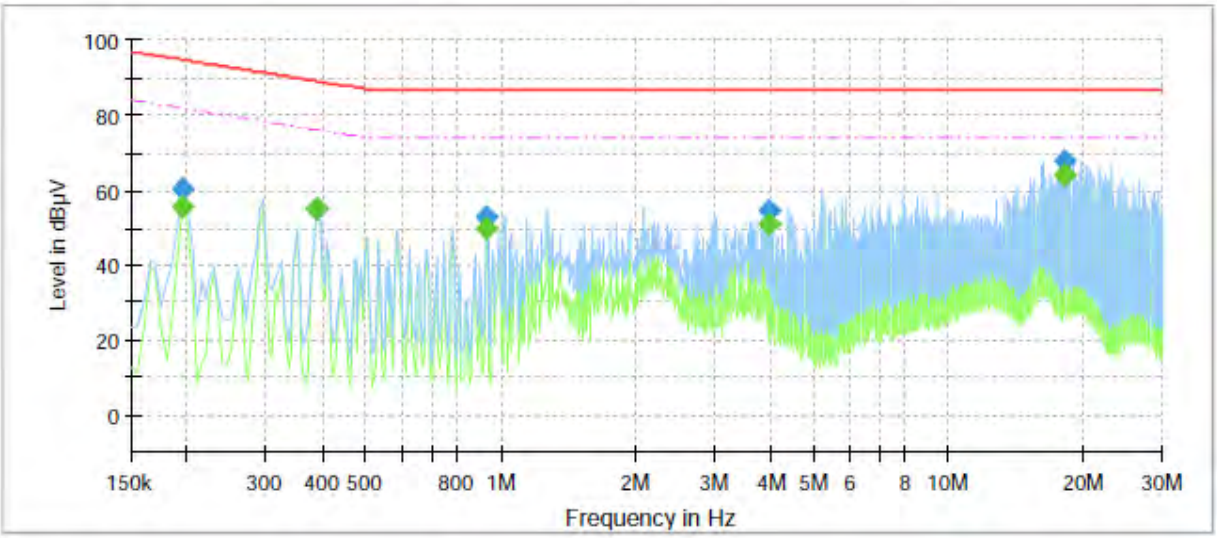
Conducted Emissions at Telecommunication Ports

■ AC 24 V

[10 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3010T
Mode	CE 10
Operator Name:	KES



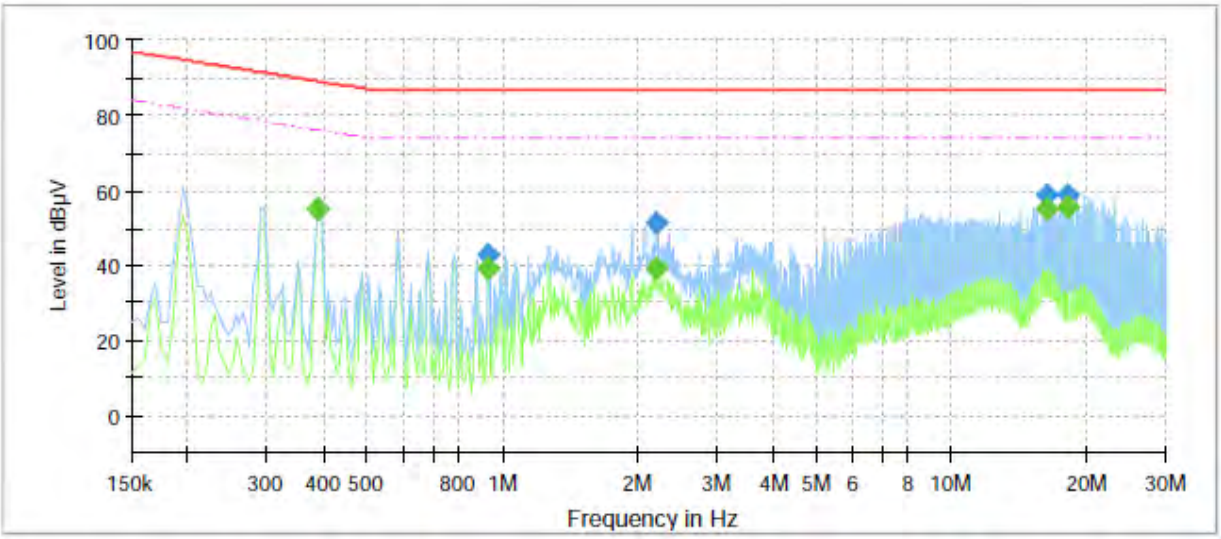
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.195000	---	55.84	81.82	25.98	1000.0	9.000	Single Line	10.5
0.195000	60.52	---	94.82	34.30	1000.0	9.000	Single Line	10.5
0.390000	---	55.08	76.06	20.98	1000.0	9.000	Single Line	11.1
0.390000	55.22	---	89.06	33.84	1000.0	9.000	Single Line	11.1
0.930000	---	49.63	74.00	24.37	1000.0	9.000	Single Line	11.6
0.930000	53.11	---	87.00	33.89	1000.0	9.000	Single Line	11.6
3.955000	---	50.89	74.00	23.11	1000.0	9.000	Single Line	10.2
3.955000	54.51	---	87.00	32.49	1000.0	9.000	Single Line	10.2
18.240000	---	64.14	74.00	9.86	1000.0	9.000	Single Line	10.8
18.240000	67.53	---	87.00	19.47	1000.0	9.000	Single Line	10.8

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3010T
Mode	CE 100
Operator Name:	KES



Final_Result

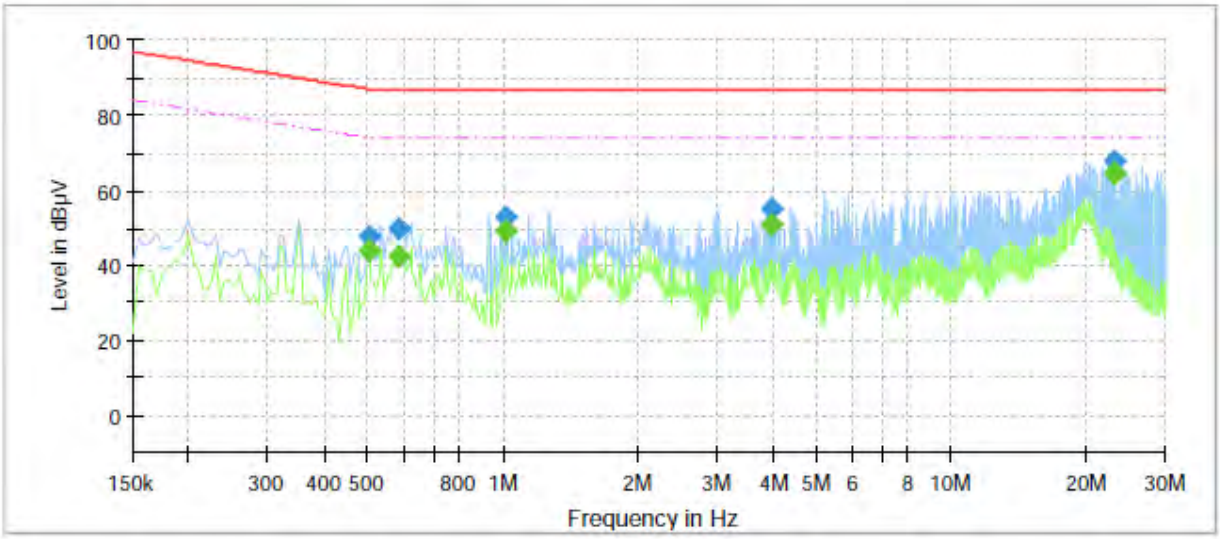
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.390000	---	55.00	76.06	21.06	1000.0	9.000	Single Line	10.6
0.390000	55.12	---	89.06	33.94	1000.0	9.000	Single Line	10.6
0.930000	---	39.30	74.00	34.70	1000.0	9.000	Single Line	11.2
0.930000	42.70	---	87.00	44.30	1000.0	9.000	Single Line	11.2
2.215000	---	39.36	74.00	34.64	1000.0	9.000	Single Line	9.5
2.215000	51.32	---	87.00	35.68	1000.0	9.000	Single Line	9.5
16.230000	---	54.93	74.00	19.07	1000.0	9.000	Single Line	10.2
16.230000	58.68	---	87.00	28.32	1000.0	9.000	Single Line	10.2
18.240000	---	55.82	74.00	18.18	1000.0	9.000	Single Line	10.2
18.240000	59.01	---	87.00	27.99	1000.0	9.000	Single Line	10.2

■ DC 12 V

[10 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3010T
Mode	DC 10
Operator Name:	KES



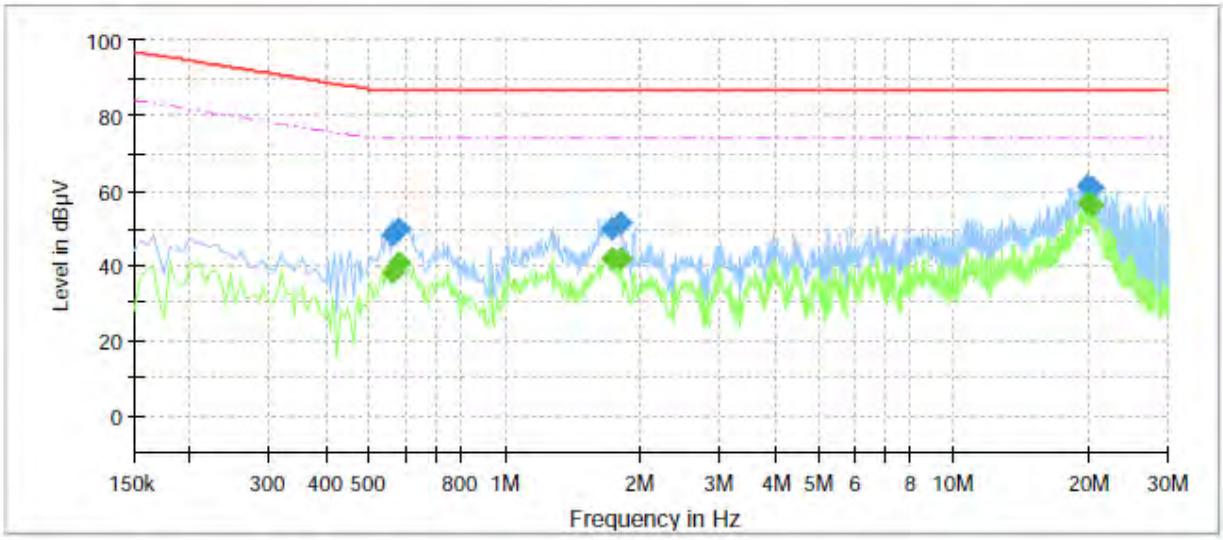
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.505000	---	43.71	74.00	30.29	1000.0	9.000	Single Line	11.3
0.505000	47.86	---	87.00	39.14	1000.0	9.000	Single Line	11.3
0.590000	---	42.35	74.00	31.65	1000.0	9.000	Single Line	11.5
0.590000	49.64	---	87.00	37.36	1000.0	9.000	Single Line	11.5
1.020000	---	49.28	74.00	24.72	1000.0	9.000	Single Line	11.5
1.020000	53.03	---	87.00	33.97	1000.0	9.000	Single Line	11.5
3.955000	---	51.05	74.00	22.95	1000.0	9.000	Single Line	10.2
3.955000	54.88	---	87.00	32.12	1000.0	9.000	Single Line	10.2
23.125000	---	64.48	74.00	9.52	1000.0	9.000	Single Line	10.9
23.125000	67.74	---	87.00	19.26	1000.0	9.000	Single Line	10.9

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3010T
Mode	DC 100
Operator Name:	KES



Final_Result

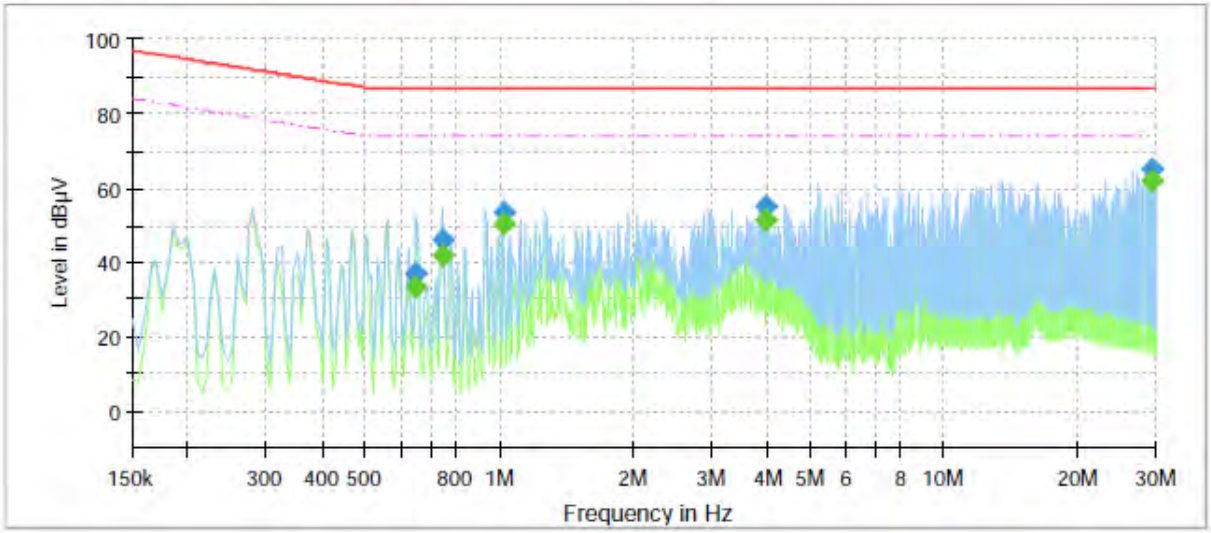
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.565000	---	38.11	74.00	35.89	1000.0	9.000	Single Line	11.0
0.565000	48.20	---	87.00	38.80	1000.0	9.000	Single Line	11.0
0.580000	---	40.97	74.00	33.03	1000.0	9.000	Single Line	11.0
0.580000	49.53	---	87.00	37.47	1000.0	9.000	Single Line	11.0
1.740000	---	42.03	74.00	31.97	1000.0	9.000	Single Line	9.7
1.740000	49.71	---	87.00	37.29	1000.0	9.000	Single Line	9.7
1.810000	---	41.74	74.00	32.26	1000.0	9.000	Single Line	9.6
1.810000	51.36	---	87.00	35.64	1000.0	9.000	Single Line	9.6
19.710000	---	56.64	74.00	17.36	1000.0	9.000	Single Line	10.3
19.710000	61.51	---	87.00	25.49	1000.0	9.000	Single Line	10.3
20.260000	---	56.33	74.00	17.67	1000.0	9.000	Single Line	10.3
20.260000	61.06	---	87.00	25.94	1000.0	9.000	Single Line	10.3

■ PoE

[10 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3010T
Mode	POE 10
Operator Name:	KES



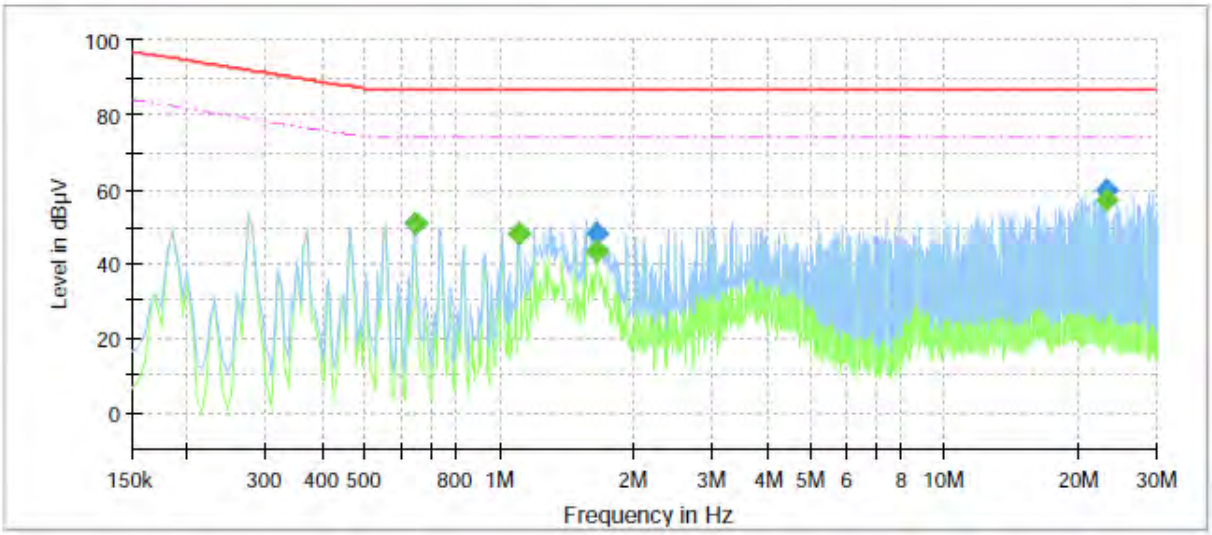
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.650000	---	33.56	74.00	40.44	1000.0	9.000	Single Line	11.6
0.650000	37.04	---	87.00	49.96	1000.0	9.000	Single Line	11.6
0.745000	---	41.82	74.00	32.18	1000.0	9.000	Single Line	11.7
0.745000	46.12	---	87.00	40.88	1000.0	9.000	Single Line	11.7
1.025000	---	50.25	74.00	23.75	1000.0	9.000	Single Line	11.5
1.025000	53.67	---	87.00	33.33	1000.0	9.000	Single Line	11.5
3.955000	---	51.57	74.00	22.43	1000.0	9.000	Single Line	10.2
3.955000	55.22	---	87.00	31.78	1000.0	9.000	Single Line	10.2
29.235000	---	61.81	74.00	12.19	1000.0	9.000	Single Line	11.2
29.235000	65.24	---	87.00	21.76	1000.0	9.000	Single Line	11.2

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	TNO-3010T
Mode	POE 100
Operator Name:	KES



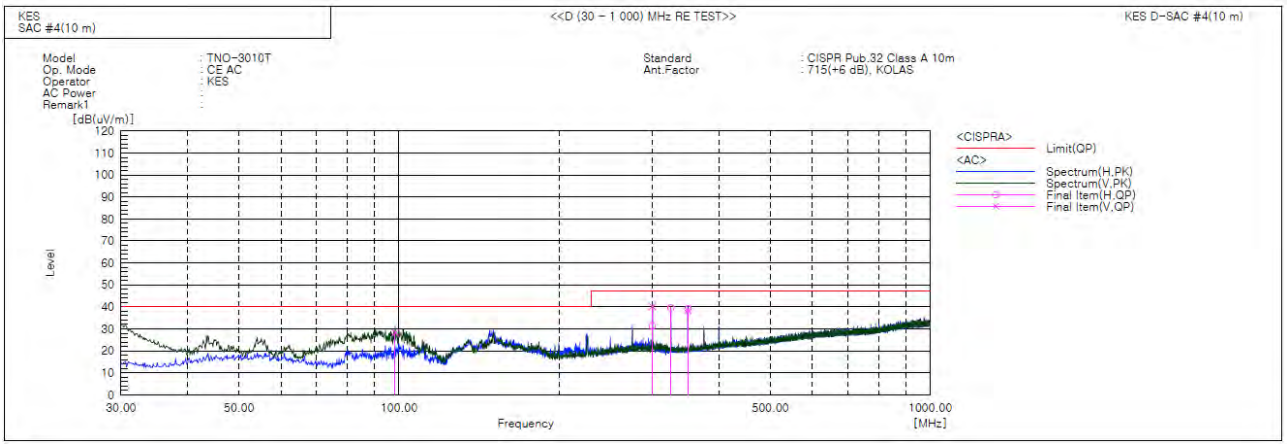
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.645000	---	50.80	74.00	23.20	1000.0	9.000	Single Line	11.1
0.645000	50.78	---	87.00	36.22	1000.0	9.000	Single Line	11.1
1.105000	---	47.93	74.00	26.07	1000.0	9.000	Single Line	10.8
1.105000	48.16	---	87.00	38.84	1000.0	9.000	Single Line	10.8
1.660000	---	43.43	74.00	30.57	1000.0	9.000	Single Line	9.8
1.660000	48.22	---	87.00	38.78	1000.0	9.000	Single Line	9.8
23.125000	---	56.97	74.00	17.03	1000.0	9.000	Single Line	10.4
23.125000	59.60	---	87.00	27.40	1000.0	9.000	Single Line	10.4

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

Radiated Electric Field Emissions(Below 1 ㎓)

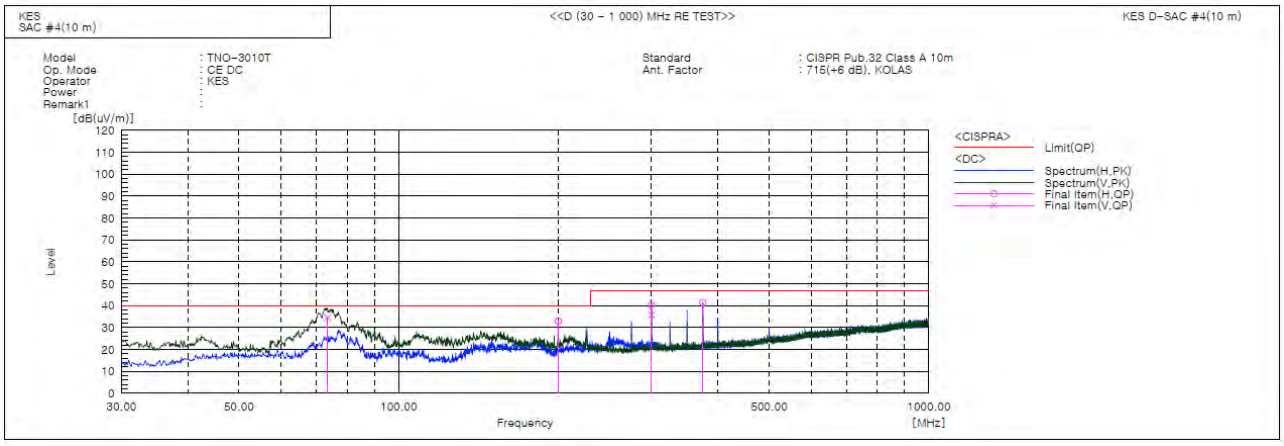
■ AC 24 V



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	98.385	V	50.2	-22.0	28.2	40.0	11.8	150.0	184.0	
2	299.903	H	49.6	-18.3	31.3	47.0	15.7	200.0	238.0	
3	300.024	V	58.4	-18.3	40.1	47.0	6.9	100.0	336.0	
4	325.001	H	57.0	-17.5	39.5	47.0	7.5	200.0	246.0	
5	349.979	H	55.7	-16.6	39.1	47.0	7.9	200.0	301.0	
6	349.979	V	54.9	-16.6	38.3	47.0	8.7	100.0	208.0	

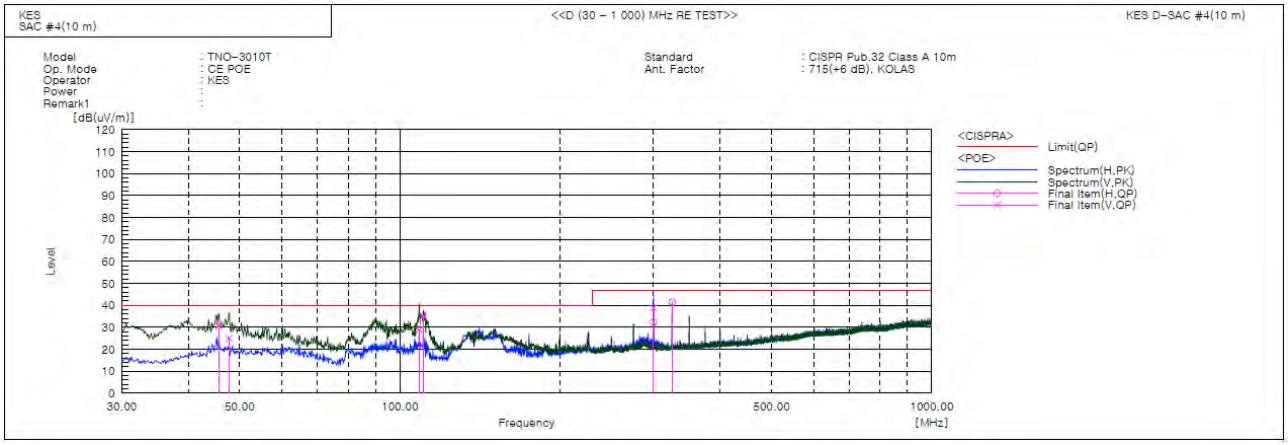
■ DC 12 V



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	73.408	V	60.8	-26.2	34.6	40.0	5.4	150.0	279.0	
2	199.993	H	54.8	-21.8	33.0	40.0	7.0	400.0	96.0	
3	300.024	H	58.9	-18.6	40.3	47.0	6.7	200.0	217.0	
4	300.024	V	54.4	-18.6	35.8	47.0	11.2	100.0	135.0	
5	374.956	H	57.1	-15.7	41.4	47.0	5.6	200.0	169.0	

■ PoE



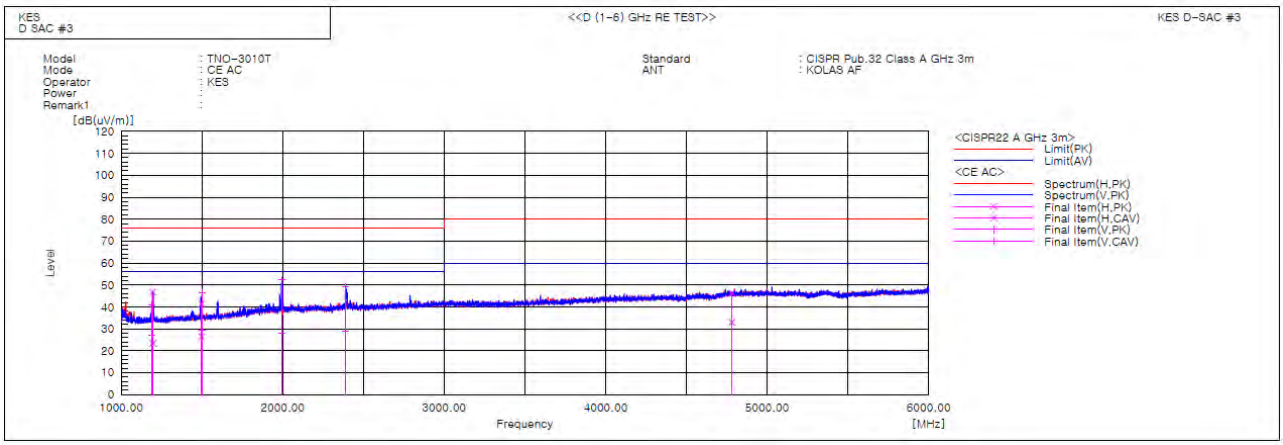
Final Result

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	45.641	V	52.4	-21.8	30.6	40.0	9.4	100.0	52.0	
2	47.703	V	46.6	-21.5	25.1	40.0	14.9	150.0	194.0	
3	108.691	V	51.4	-22.5	28.9	40.0	11.1	100.0	88.0	
4	110.753	V	57.8	-22.7	35.1	40.0	4.9	100.0	80.0	
5	300.024	H	51.0	-18.6	32.4	47.0	14.6	200.0	87.0	
6	300.024	V	57.4	-18.6	38.8	47.0	8.2	100.0	32.0	
7	325.001	H	58.7	-17.2	41.5	47.0	5.5	400.0	253.0	

♦ 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

Radiated Electric Field Emissions(Above 1 ㎓)

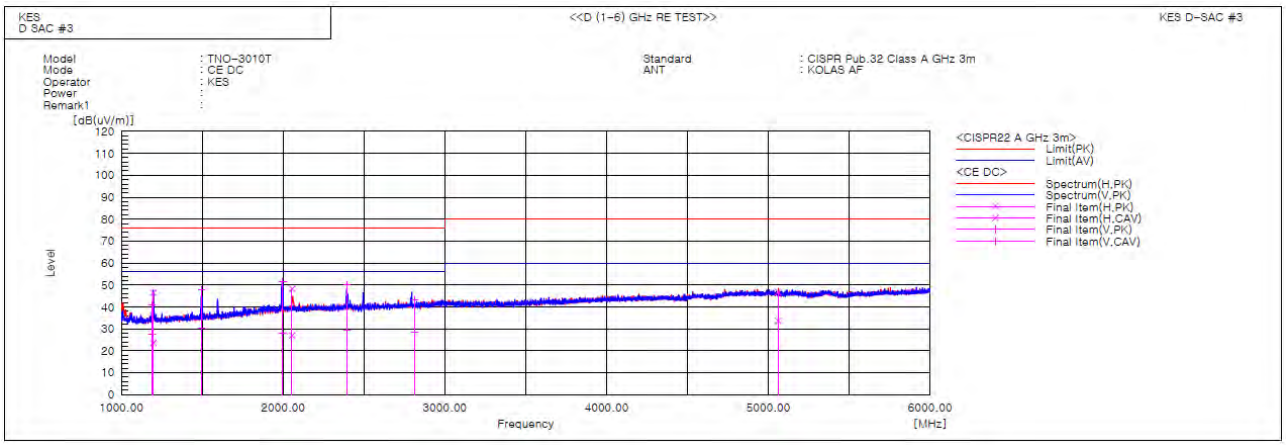
■ AC 24 V



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	1188.021	V	49.4	35.4	-8.6	40.8	26.8	76.0	56.0	35.2	29.2	100.0	286.1	
2	1195.780	H	55.3	31.9	-8.5	46.8	23.4	76.0	56.0	29.2	32.6	100.0	350.7	
3	1496.260	H	48.1	33.0	-6.6	41.5	26.4	76.0	56.0	34.5	29.6	100.0	310.4	
4	1498.400	V	52.9	36.0	-6.5	46.4	29.5	76.0	56.0	29.6	26.5	100.0	298.6	
5	1994.250	V	54.1	30.0	-1.9	52.2	28.1	76.0	56.0	23.8	27.9	100.0	339.7	
6	2390.151	V	49.8	29.3	-0.6	49.2	28.7	76.0	56.0	26.8	27.3	100.0	315.1	
7	4780.684	H	39.0	25.6	7.4	46.4	33.0	80.0	60.0	33.6	27.0	100.0	140.4	

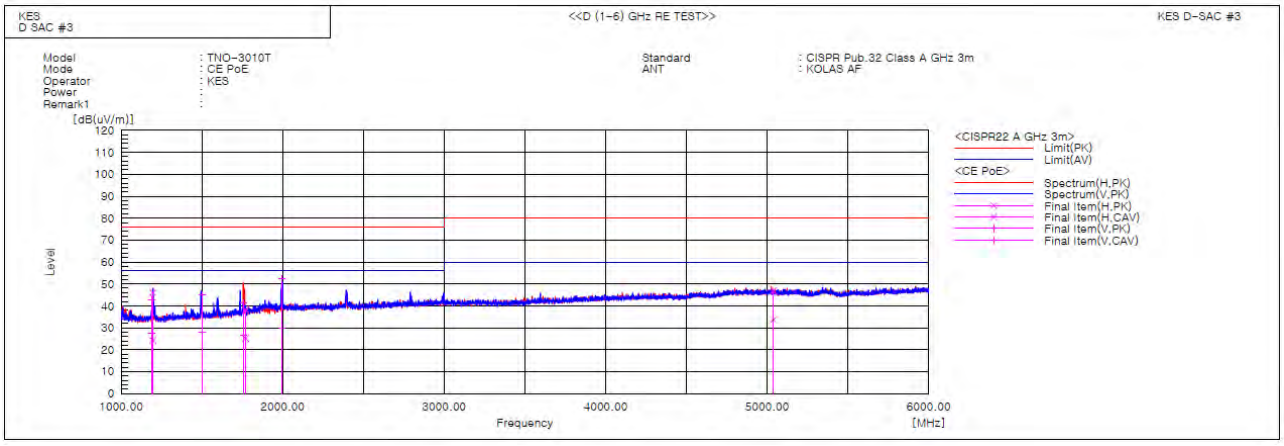
■ DC 12 V



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	1187.392	V	49.6	36.0	-8.6	41.0	27.4	76.0	56.0	35.0	28.6	100.0	290.4	
2	1197.440	H	54.9	32.1	-8.5	46.4	23.6	76.0	56.0	29.6	32.4	100.0	348.9	
3	1494.720	V	54.3	36.7	-6.6	47.7	30.1	76.0	56.0	28.3	25.9	100.0	307.5	
4	1997.129	V	53.5	29.8	-1.9	51.6	27.9	76.0	56.0	24.4	28.1	100.0	335.4	
5	2053.901	H	49.9	28.6	-1.7	48.2	26.9	76.0	56.0	27.8	29.1	100.0	2.6	
6	2392.730	V	50.5	29.8	-0.6	49.9	29.2	76.0	56.0	26.1	26.8	100.0	270.2	
7	2813.257	V	42.2	27.7	0.8	43.0	28.5	76.0	56.0	33.0	27.5	100.0	320.2	
8	5060.121	H	38.5	25.4	8.2	46.7	33.6	80.0	60.0	33.3	26.4	100.0	74.8	

■ PoE



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	1187.732	V	51.3	36.2	-8.6	42.7	27.6	76.0	56.0	33.3	28.4	100.0	287.0	
2	1195.801	H	54.6	32.7	-8.5	46.1	24.2	76.0	56.0	29.9	31.8	100.0	347.7	
3	1499.859	V	51.6	34.5	-6.5	45.1	28.0	76.0	56.0	30.9	28.0	100.0	302.3	
4	1756.176	V	45.5	30.5	-4.0	41.5	26.5	76.0	56.0	34.5	29.5	100.0	219.7	
5	1770.477	H	42.0	29.0	-3.8	38.2	25.2	76.0	56.0	37.8	30.8	100.0	3.3	
6	1993.221	V	54.4	31.7	-1.9	52.5	29.8	76.0	56.0	23.5	26.2	100.0	326.9	
7	5037.948	H	38.7	25.5	8.2	46.9	33.7	80.0	60.0	33.1	26.3	100.0	326.9	

♦ 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

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	0.179			
2	0.001	0.125	1.080	n/a
3	0.061	2.644	2.300	PASS
4	0.001	0.214	0.430	n/a
5	0.034	2.977	1.140	PASS
6	0.001	0.213	0.300	n/a
7	0.015	1.955	0.770	PASS
8	0.001	0.338	0.230	n/a
9	0.012	2.894	0.400	PASS
10	0.001	0.350	0.184	n/a
11	0.004	1.232	0.330	n/a
12	0.001	0.385	0.153	n/a
13	0.002	0.839	0.210	n/a
14	0.001	0.448	0.131	n/a
15	0.002	1.165	0.150	n/a
16	0.001	0.564	0.115	n/a
17	0.003	1.946	0.132	n/a
18	0.001	0.579	0.102	n/a
19	0.002	1.396	0.118	n/a
20	0.001	0.710	0.092	n/a
21	0.001	0.747	0.161	n/a
22	0.001	0.727	0.084	n/a
23	0.001	0.814	0.147	n/a
24	0.001	0.758	0.077	n/a
25	0.001	0.613	0.135	n/a
26	0.001	0.811	0.071	n/a
27	0.001	0.660	0.125	n/a
28	0.001	0.877	0.066	n/a
29	0.001	0.736	0.116	n/a
30	0.001	1.023	0.061	n/a
31	0.001	0.588	0.109	n/a
32	0.001	1.063	0.058	n/a
33	0.001	0.724	0.102	n/a
34	0.001	1.264	0.054	n/a
35	0.001	0.690	0.096	n/a
36	0.001	1.160	0.051	n/a
37	0.001	1.150	0.091	n/a
38	0.001	1.394	0.048	n/a
39	0.001	0.775	0.087	n/a
40	0.001	1.456	0.046	n/a

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.

Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	0.179			
2	0.002	0.100	1.620	n/a
3	0.061	1.768	3.450	PASS
4	0.001	0.164	0.645	n/a
5	0.034	2.003	1.710	PASS
6	0.001	0.201	0.450	n/a
7	0.015	1.312	1.155	PASS
8	0.001	0.257	0.345	n/a
9	0.012	1.966	0.600	PASS
10	0.001	0.294	0.276	n/a
11	0.004	0.865	0.495	n/a
12	0.001	0.300	0.230	n/a
13	0.002	0.630	0.315	n/a
14	0.001	0.340	0.197	n/a
15	0.002	0.847	0.225	n/a
16	0.001	0.417	0.173	n/a
17	0.003	1.350	0.199	n/a
18	0.001	0.515	0.153	n/a
19	0.002	0.979	0.178	n/a
20	0.001	0.530	0.138	n/a
21	0.001	0.807	0.161	n/a
22	0.001	0.536	0.125	n/a
23	0.001	0.876	0.147	n/a
24	0.001	0.569	0.115	n/a
25	0.001	0.775	0.135	n/a
26	0.001	0.616	0.106	n/a
27	0.001	0.722	0.125	n/a
28	0.001	0.766	0.099	n/a
29	0.001	0.821	0.116	n/a
30	0.001	0.783	0.092	n/a
31	0.001	0.675	0.109	n/a
32	0.001	0.907	0.086	n/a
33	0.001	0.888	0.102	n/a
34	0.001	0.937	0.081	n/a
35	0.001	0.771	0.096	n/a
36	0.001	0.877	0.077	n/a
37	0.001	1.276	0.091	n/a
38	0.001	1.291	0.073	n/a
39	0.001	0.880	0.087	n/a
40	0.001	1.108	0.069	n/a

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.

Test Data - Voltage Fluctuations

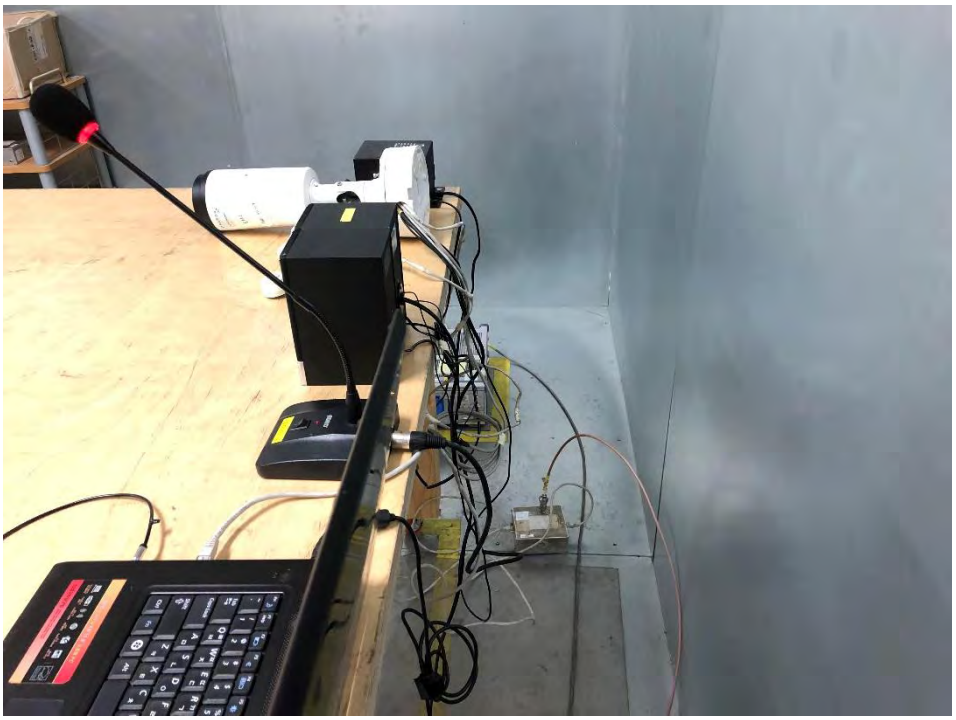
Maximum Flicker results

Flicker Measurements					
	Plt	**Max Pst**	**Max Dc**	**Max Dmax**	**Max Tmax**
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	*No Limit*	0.4	*No Limit*	*No Limit*	*No Limit*
Results:		PASS			

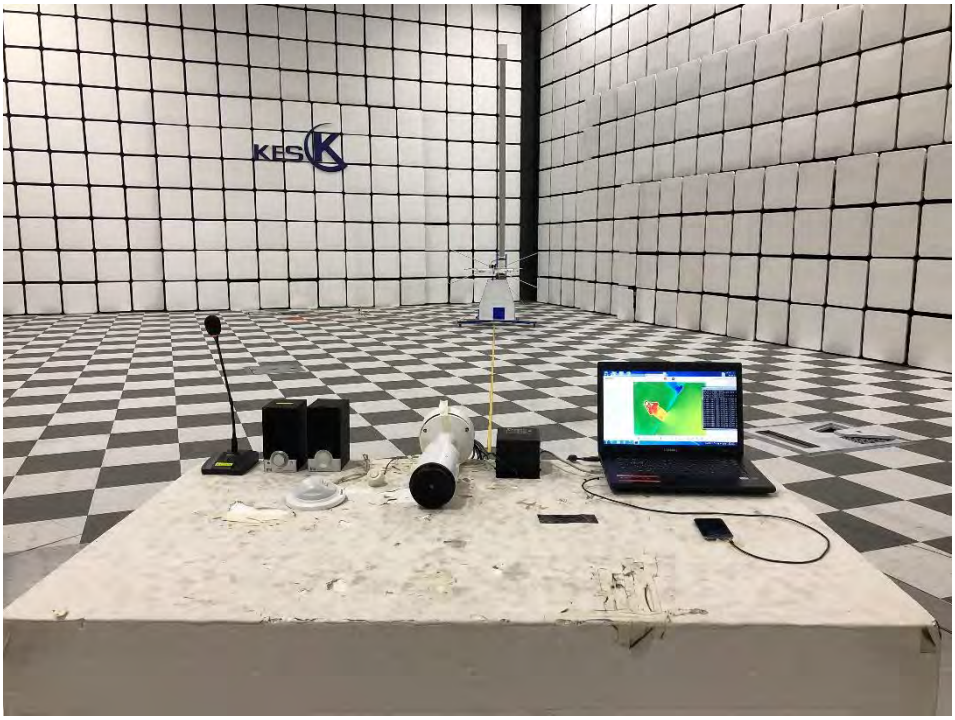
Test Setup Photos and Configuration

Conducted Voltage Emissions

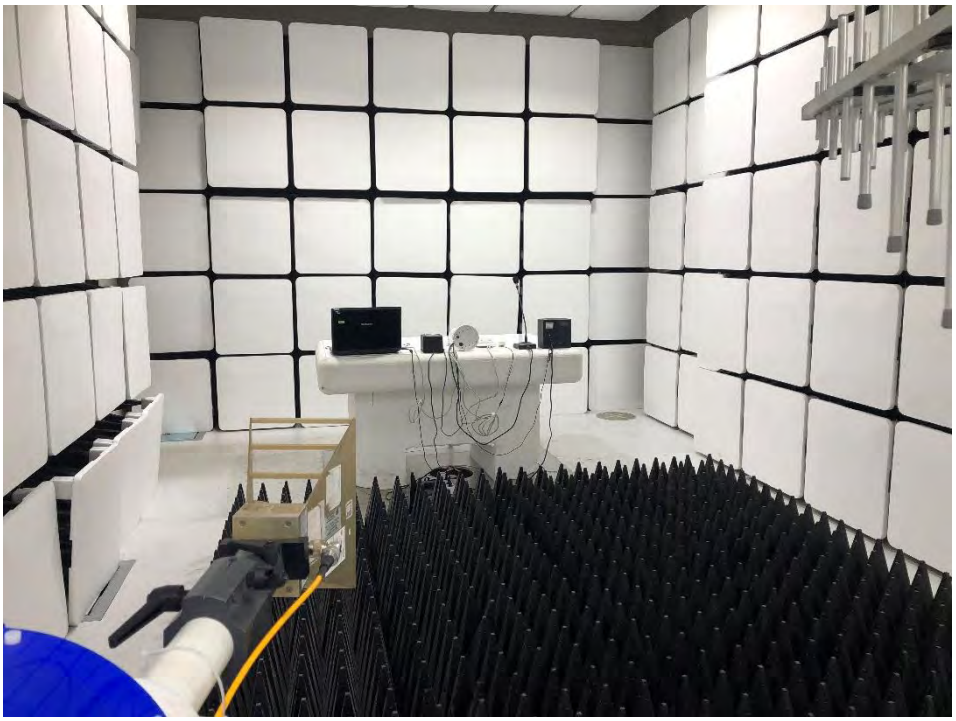
Conducted Telecommunication Emissions



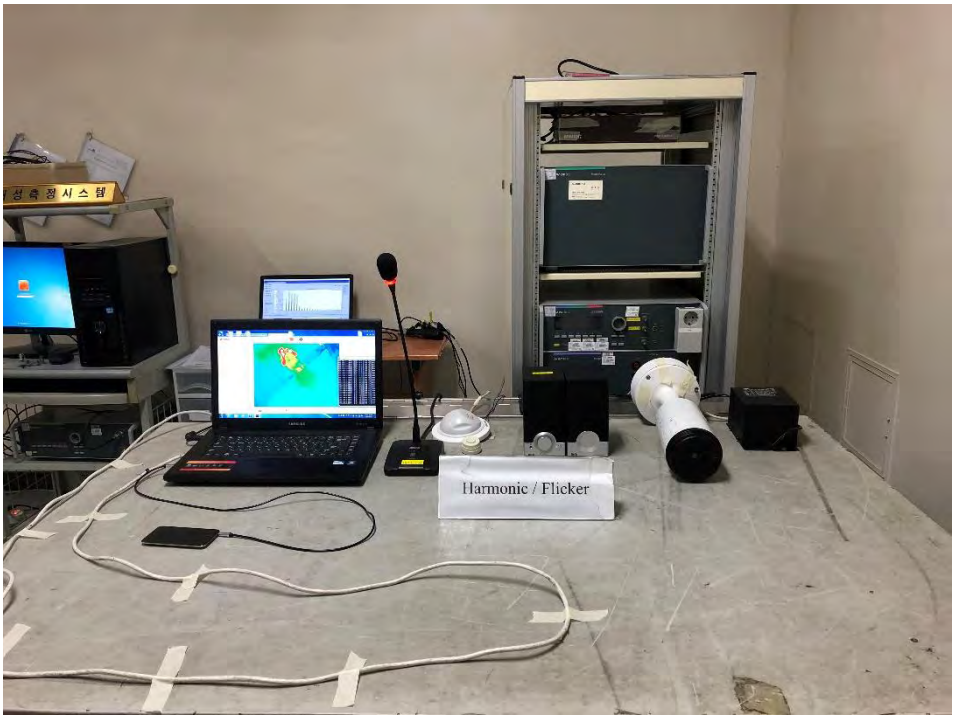
Radiated Electric Field Emissions(Below 1 ㎓)



Radiated Electric Field Emissions(Above 1 ㎓)



Harmonic Current Emissions and Voltage Fluctuations and Flicker



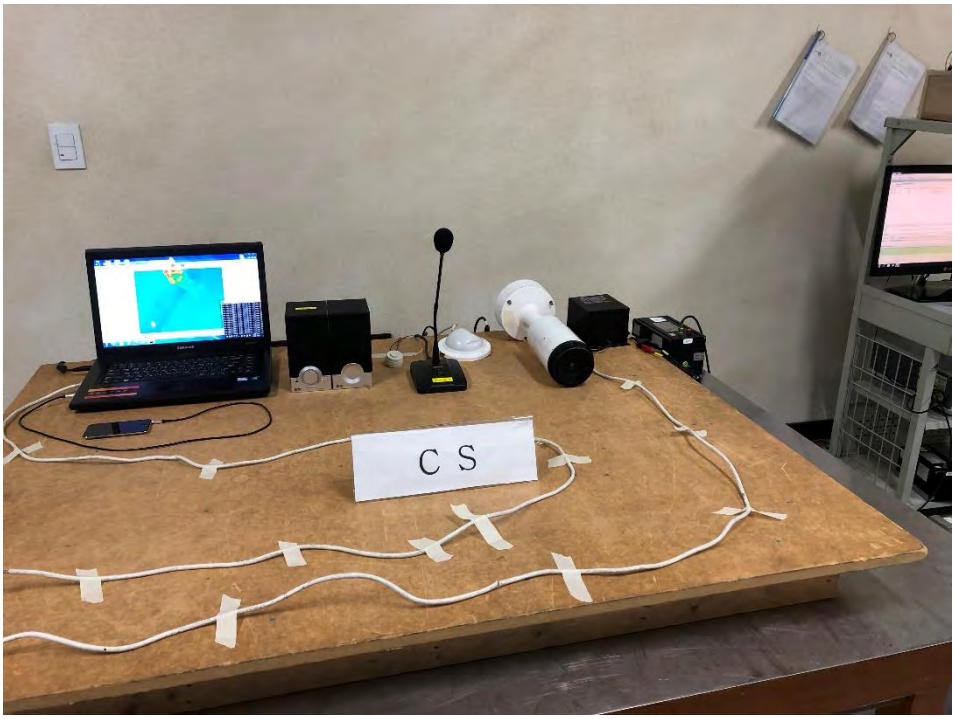
Electrostatic Discharge

Radiated Electric Field Immunity

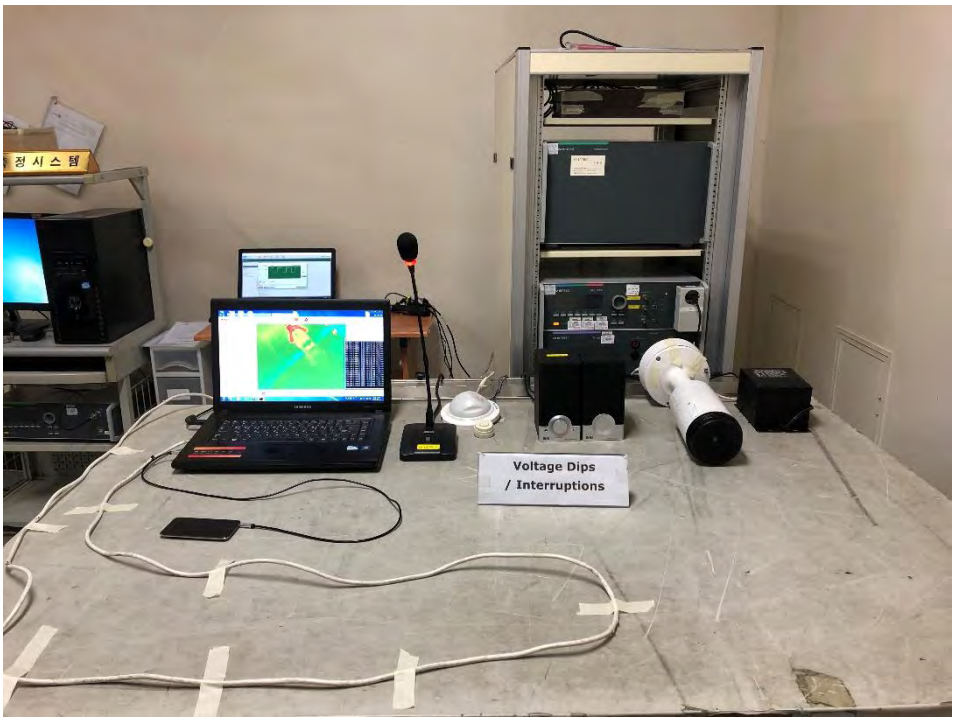
Electrical Fast Transients/Bursts

Surge Transients

Conducted Disturbance



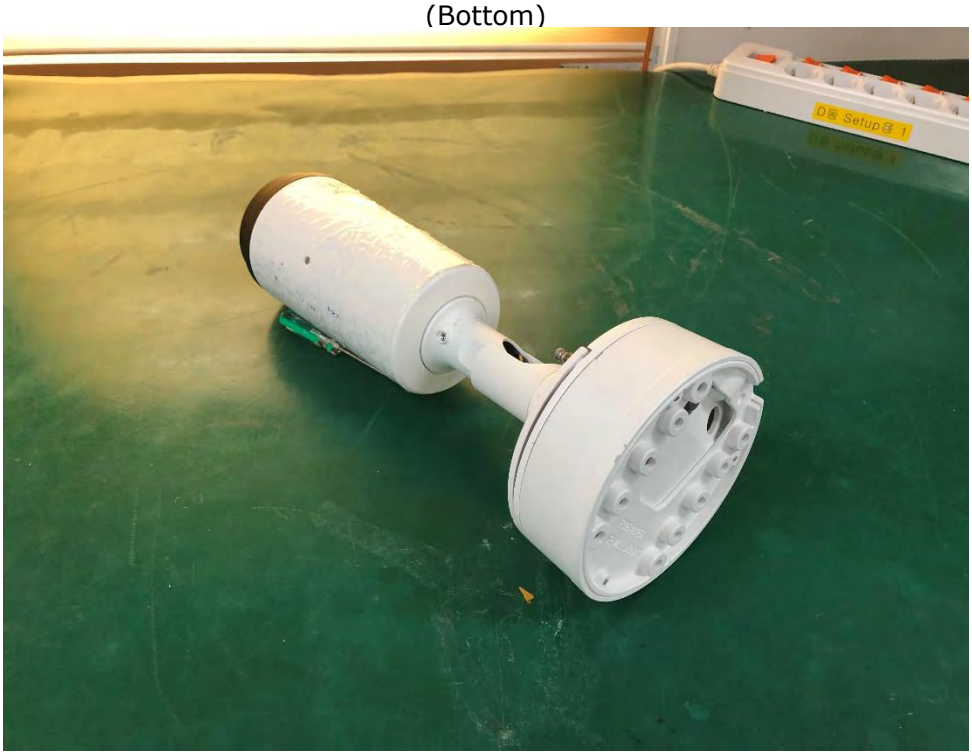
Voltage Dips and Short Interruptions



EUT External Photographs

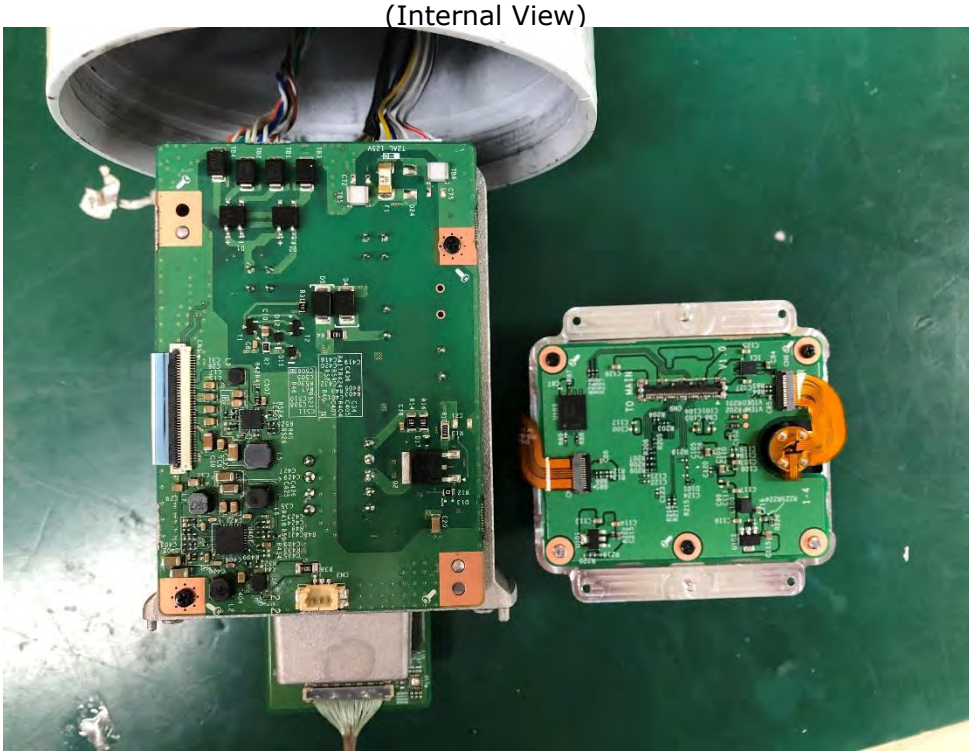
(Top)

(Bottom)



EUT Internal Photographs

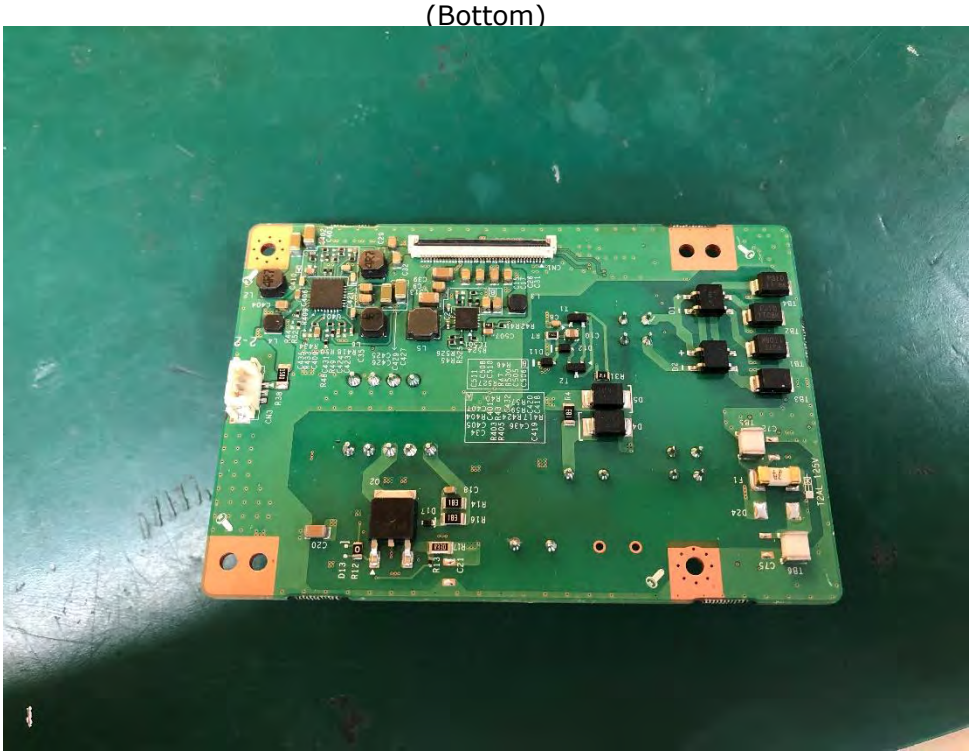
(Internal View)



EUT Internal View – Board 1

(Top)

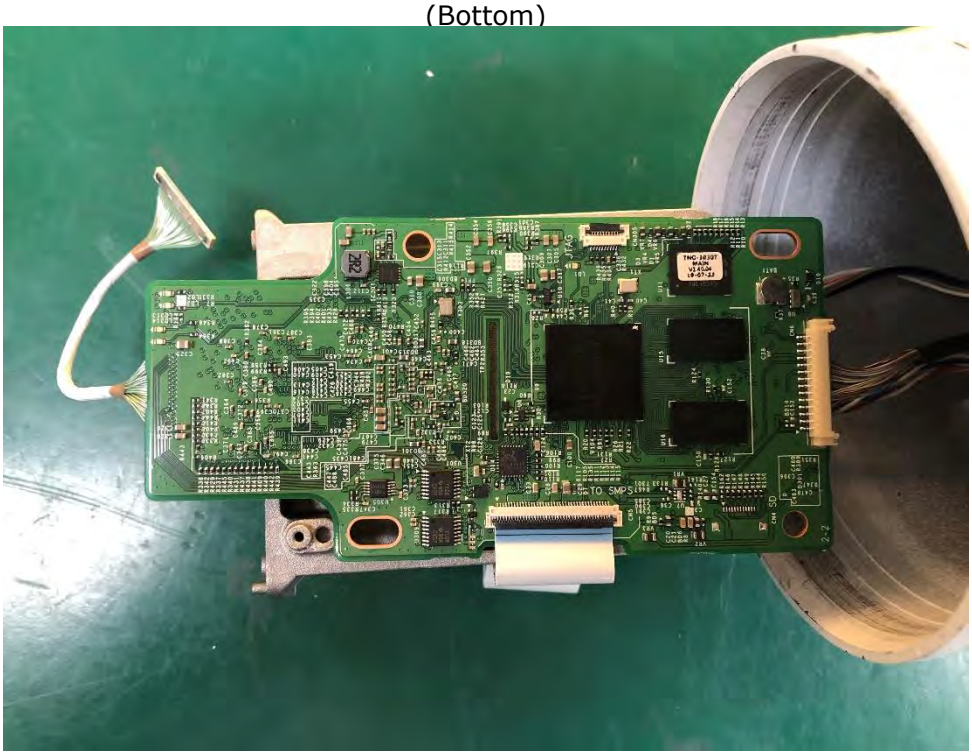
(Bottom)



EUT Internal View – Board 2

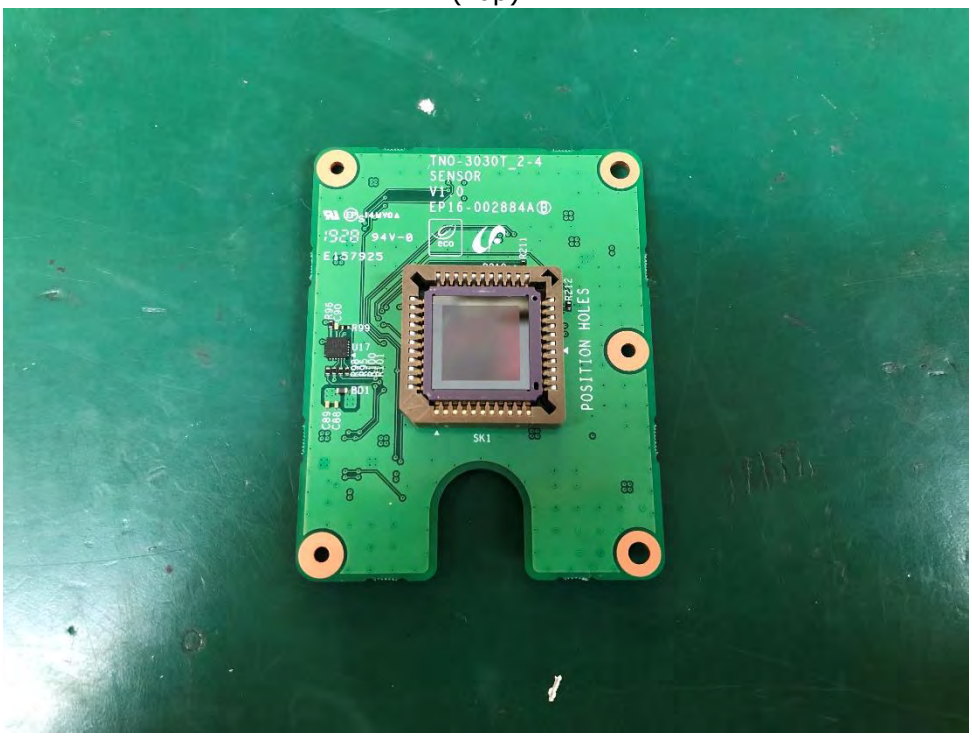
(Top)

(Bottom)

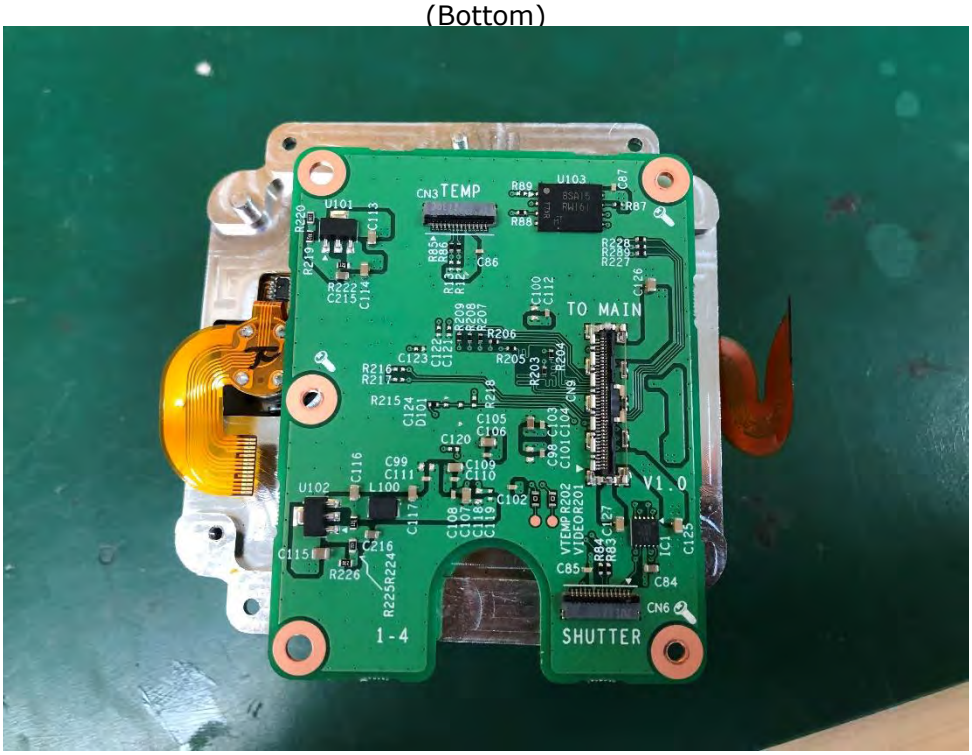


EUT Internal View – Board 3

(Top)

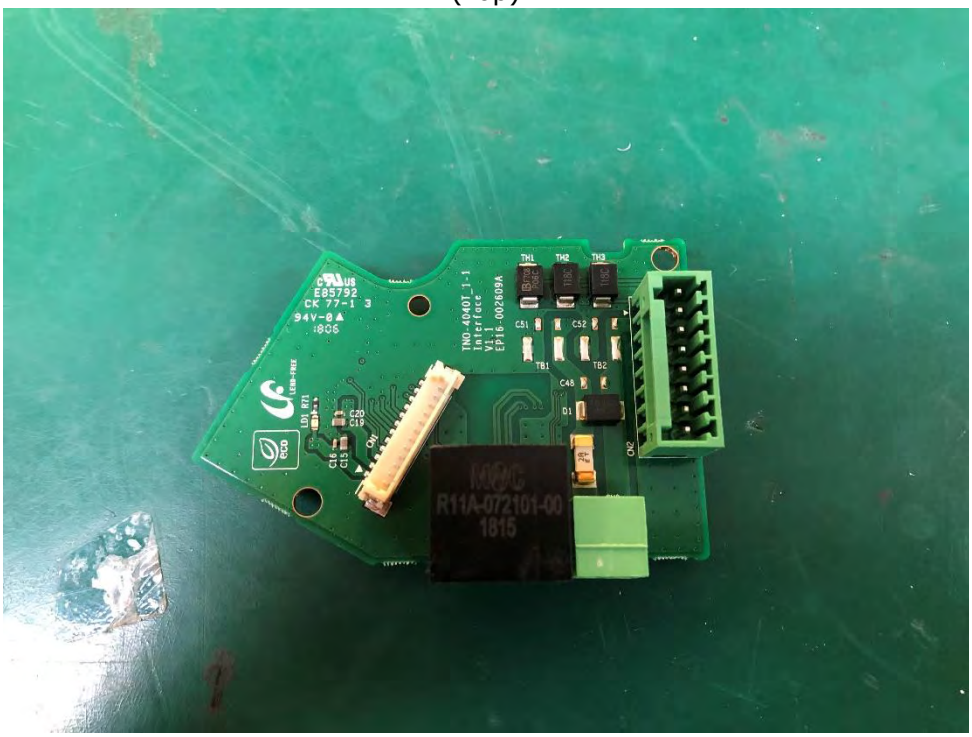


(Bottom)

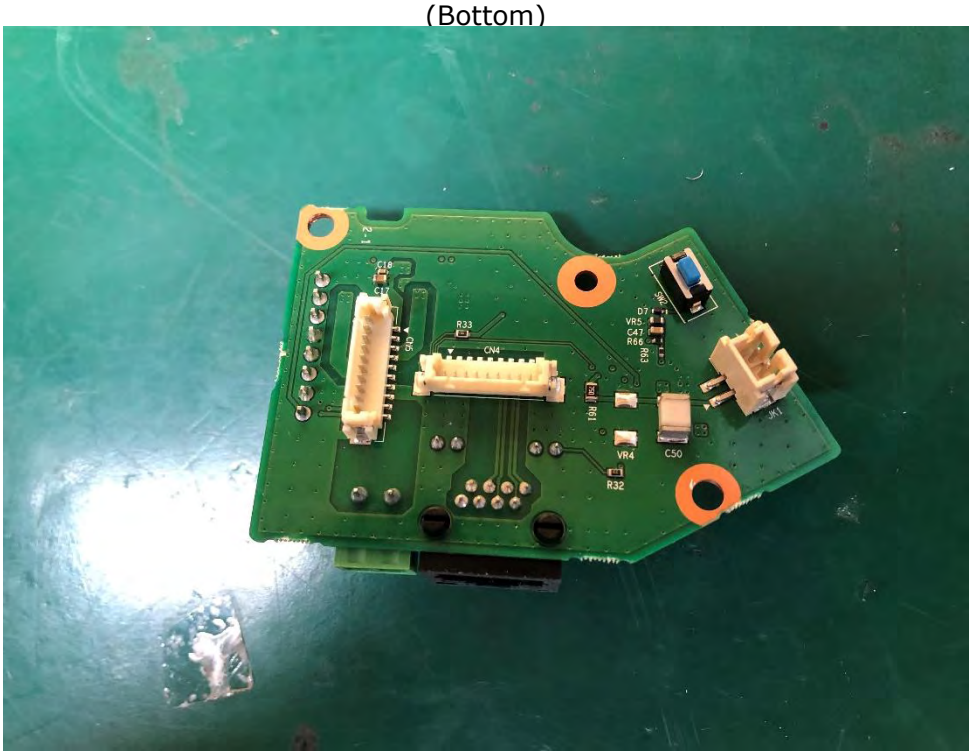


EUT Internal View – Board 4

(Top)



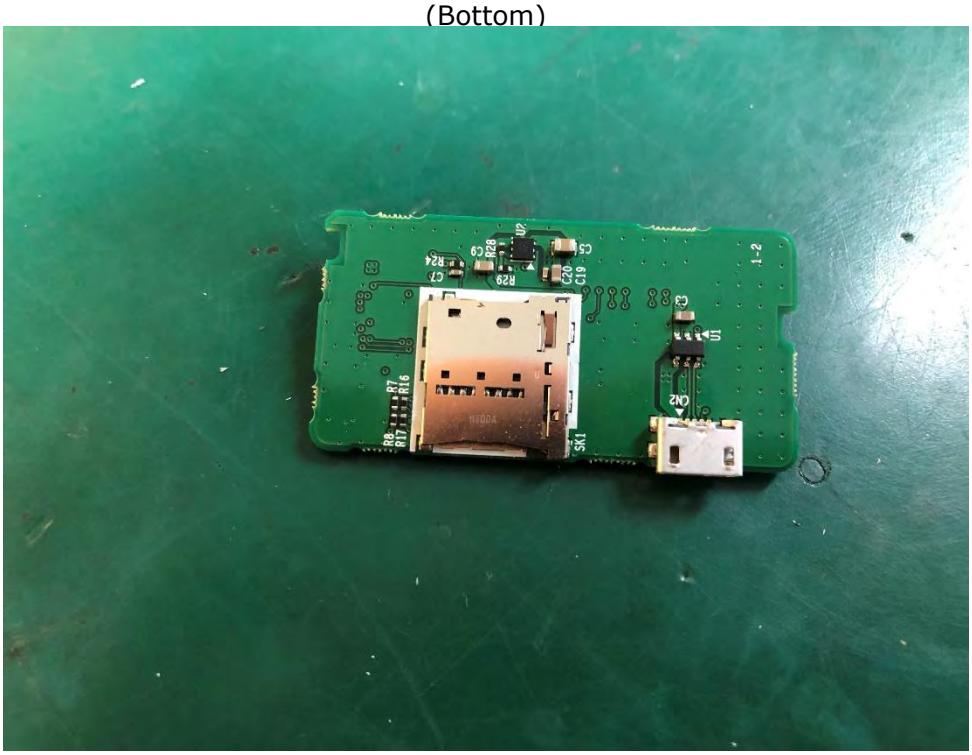
(Bottom)



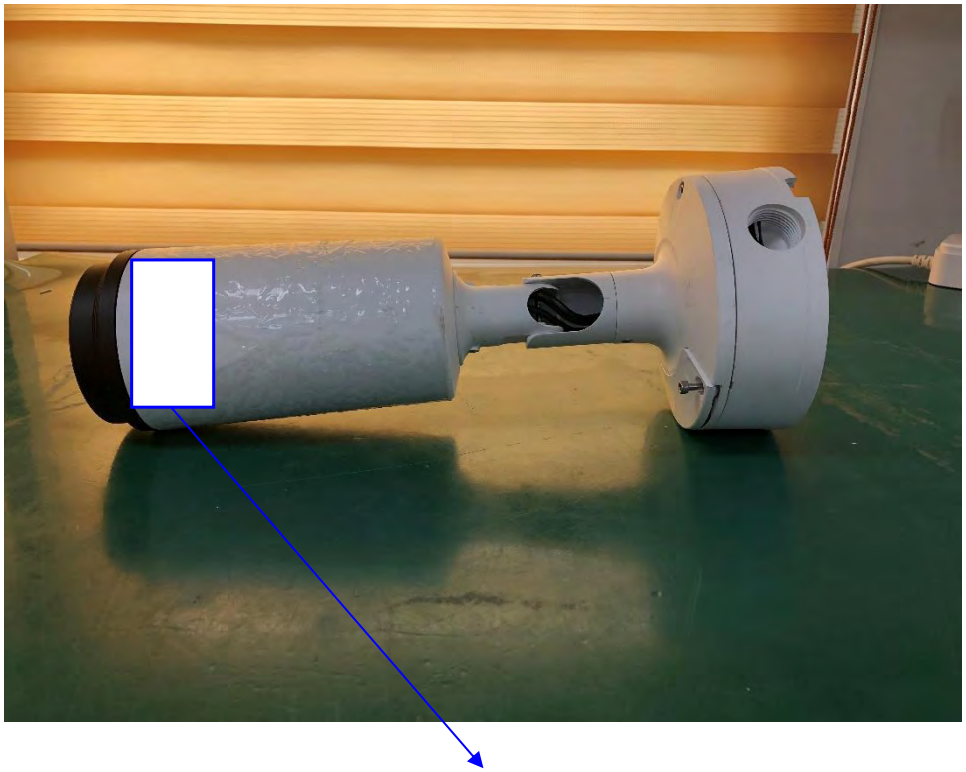
EUT Internal View – Board 5

(Top)

(Bottom)



Label and Location



THERMAL CAMERA

Model No : TNO-3010T

Manufacturer : HANWHA TECHWIN (TIANJIN) CO.,LTD.

Made in China