

EMC TEST REPORT For RCM

Test Report No. : KES-E1-19T0491

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

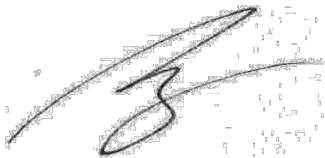
Manufacturer : 1. HANWHA TECHWIN(TIANJIN) CO., LTD.
2. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.
3. D-TECH CO.,LTD.

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. 12, 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.

**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

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KES-E1-19T0491
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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Aug. 19, 2019	KES-E1-19T0491	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 / 75 Ω 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 detection, Sound classification, Shock detection
Alarm I/O	Input 1ea / Output 2ea
Alarm Triggers	Analytics, Network disconnect, Alarm input
Alarm Events	File upload via FTP and e-mail Notification via e-mail SD/SDHC/SDXC or NAS recording at event triggers Alarm output Handover



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 ☒ 240 Vac ☐ 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	RD9356082016964 200	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

**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

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■ 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

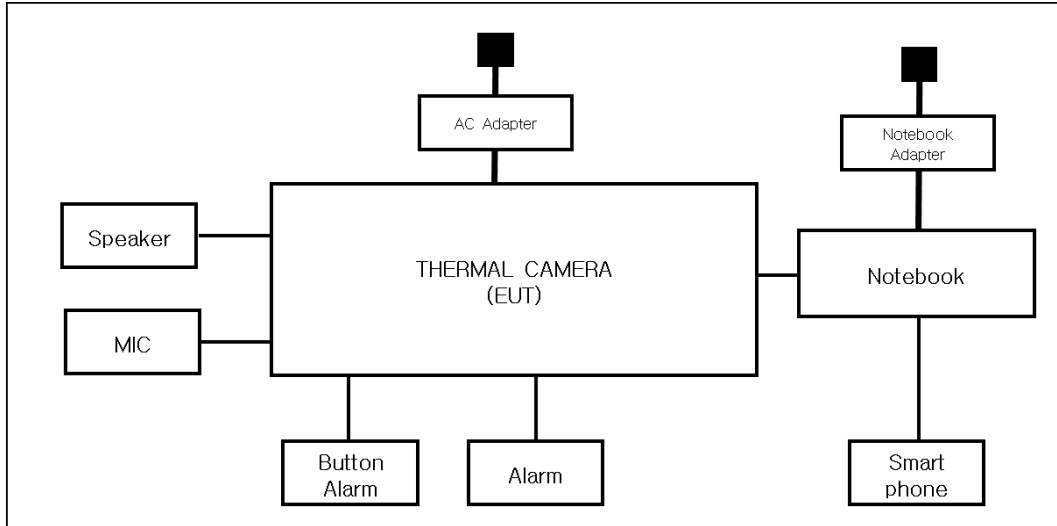
EUT Test operating S/W		
Name	Version	Manufacture Company
WebViewer	-	-

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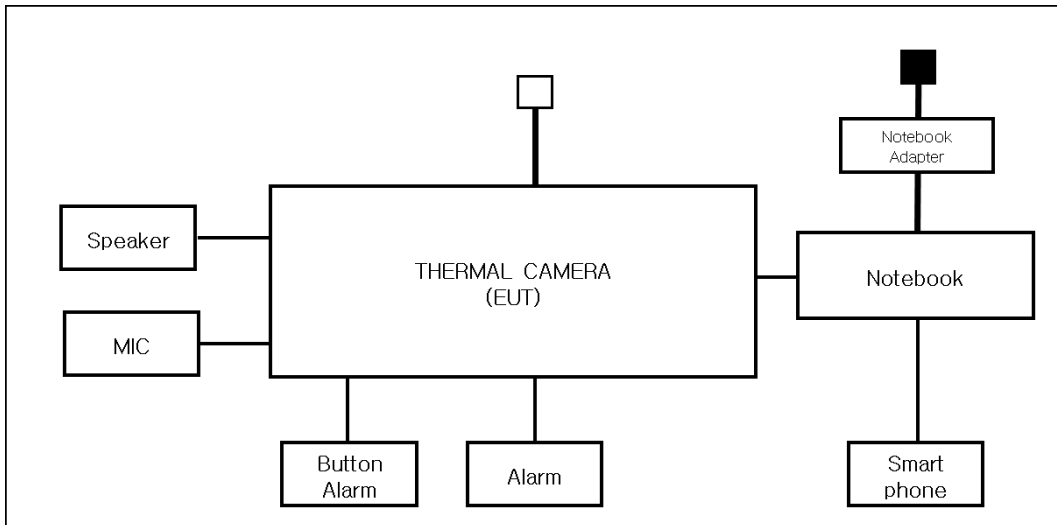
1.8 Configuration

■ AC Main
 □ DC Main

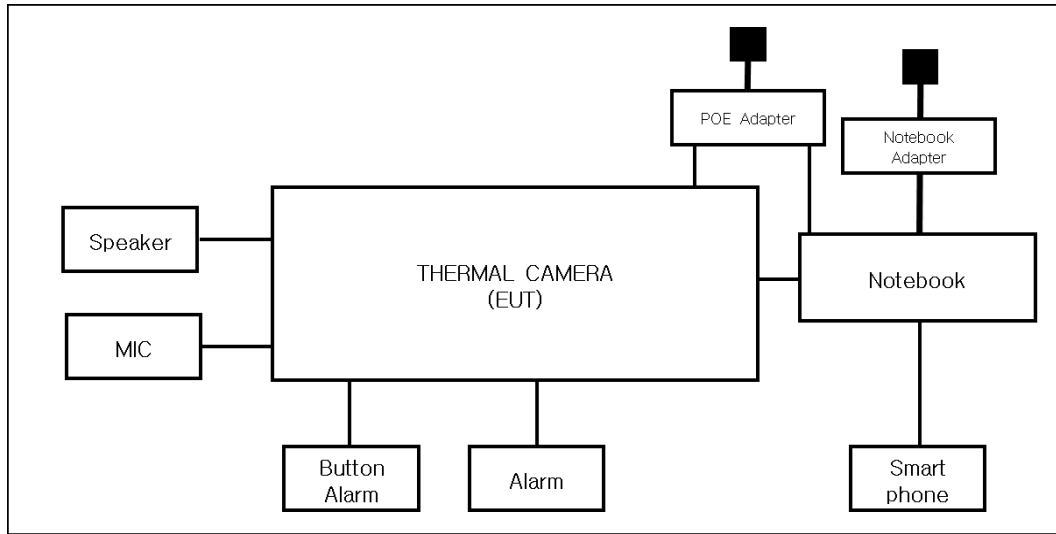
■ AC 24 V



■ 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, Yeosu-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2012

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298-1
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 55032:2015

☐ Class A

☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ 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 C63.4-2009 | | |
|
 | | |
| ☐ 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. 12, 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 ConditionsTemperature: 23,7 °C
Relative Humidity: 54,0 % 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.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. 12, 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 ConditionsTemperature: 23,7 °C
Relative Humidity: 54,0 % 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.

2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Aug. 12, 2019

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

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	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: 23,9 °C

Relative Humidity: 54,1 % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Aug. 12, 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, 2019
☒	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 ConditionsTemperature: 23,9 °C
Relative Humidity: 54,1 % R.H.**Frequency Range of Measurement**

1 GHz to 6 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

APPENDIX A – TEST DATA

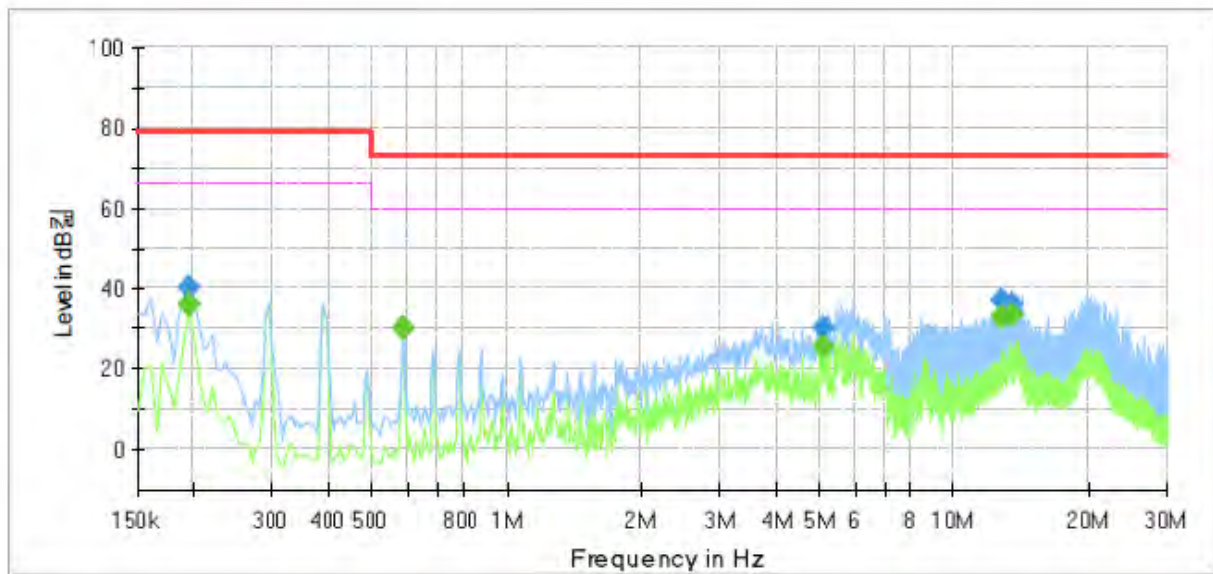
Conducted Emissions at Mains Power Ports

■ AC 24 V

HOT LINE

Common Information

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



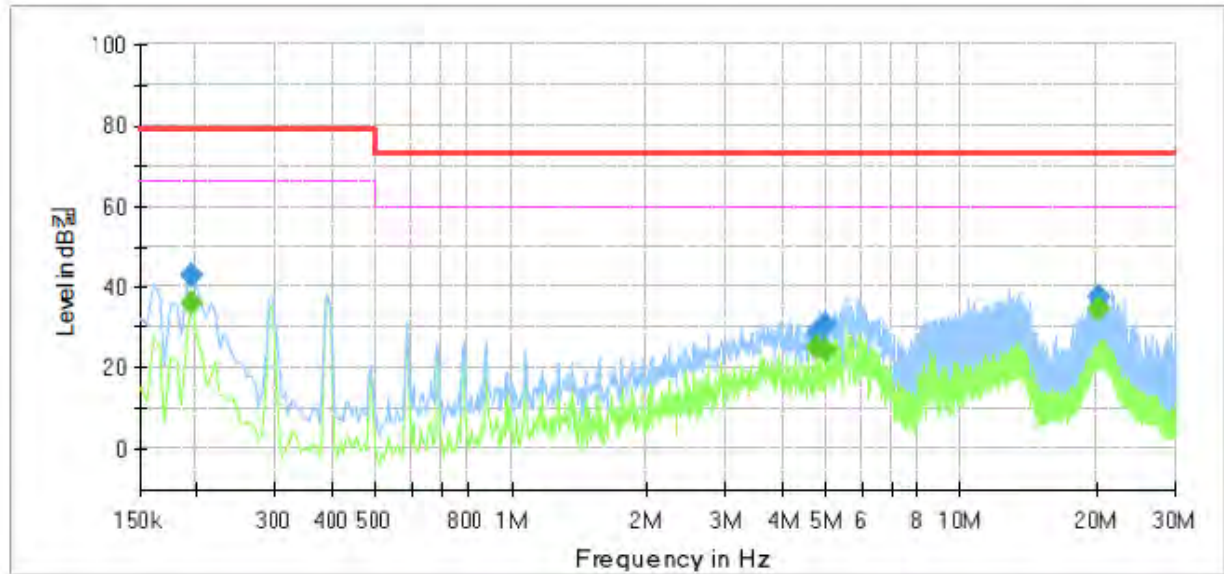
Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.195000	---	35.89	66.00	30.11	1000.0	9.000	L1	10.0
0.195000	40.17	---	79.00	38.83	1000.0	9.000	L1	10.0
0.585000	---	30.27	60.00	29.73	1000.0	9.000	L1	11.2
0.585000	30.30	---	73.00	42.70	1000.0	9.000	L1	11.2
5.085000	---	25.69	60.00	34.31	1000.0	9.000	L1	10.0
5.085000	30.44	---	73.00	42.56	1000.0	9.000	L1	10.0
12.810000	---	32.91	60.00	27.09	1000.0	9.000	L1	10.5
12.810000	37.03	---	73.00	35.97	1000.0	9.000	L1	10.5
13.495000	---	33.18	60.00	26.82	1000.0	9.000	L1	10.6
13.495000	35.95	---	73.00	37.05	1000.0	9.000	L1	10.6

NEUTRAL LINE

Common Information

Test Description:	Conducted Emission
Model No.:	TNO-3010T
Mode	RCM
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	---	36.13	66.00	29.87	1000.0	9.000	N	10.0
0.195000	42.69	---	79.00	36.31	1000.0	9.000	N	10.0
4.790000	---	24.64	60.00	35.36	1000.0	9.000	N	10.0
4.790000	28.83	---	73.00	44.17	1000.0	9.000	N	10.0
4.990000	---	24.60	60.00	35.40	1000.0	9.000	N	10.0
4.990000	30.50	---	73.00	42.50	1000.0	9.000	N	10.0
20.260000	---	34.18	60.00	25.82	1000.0	9.000	N	10.8
20.260000	37.83	---	73.00	35.17	1000.0	9.000	N	10.8

◆ 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:

Model No.:

Mode

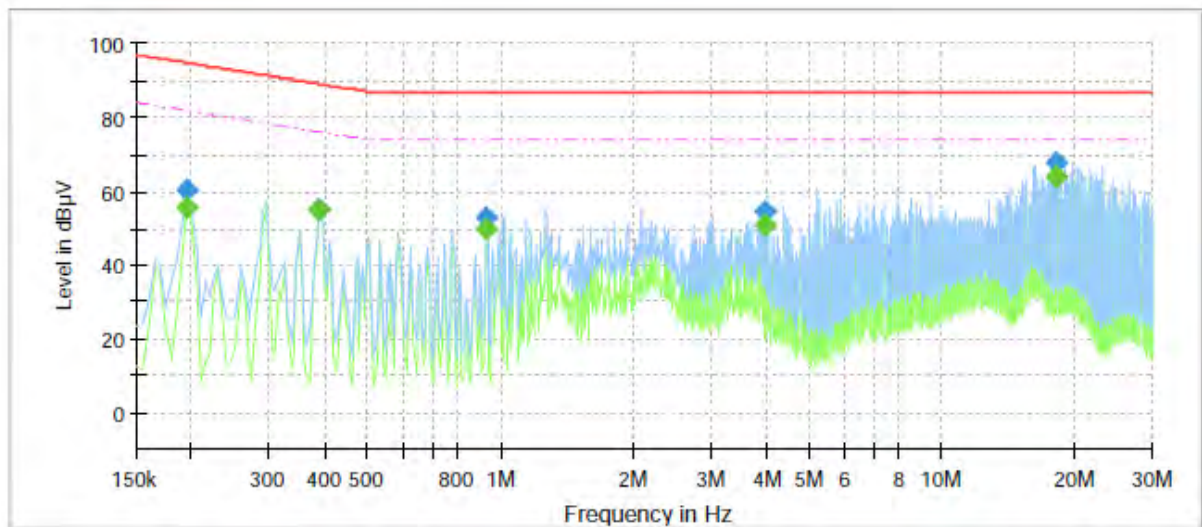
Operator Name:

Telecommunication Emission

TNO-3010T

AC 10

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

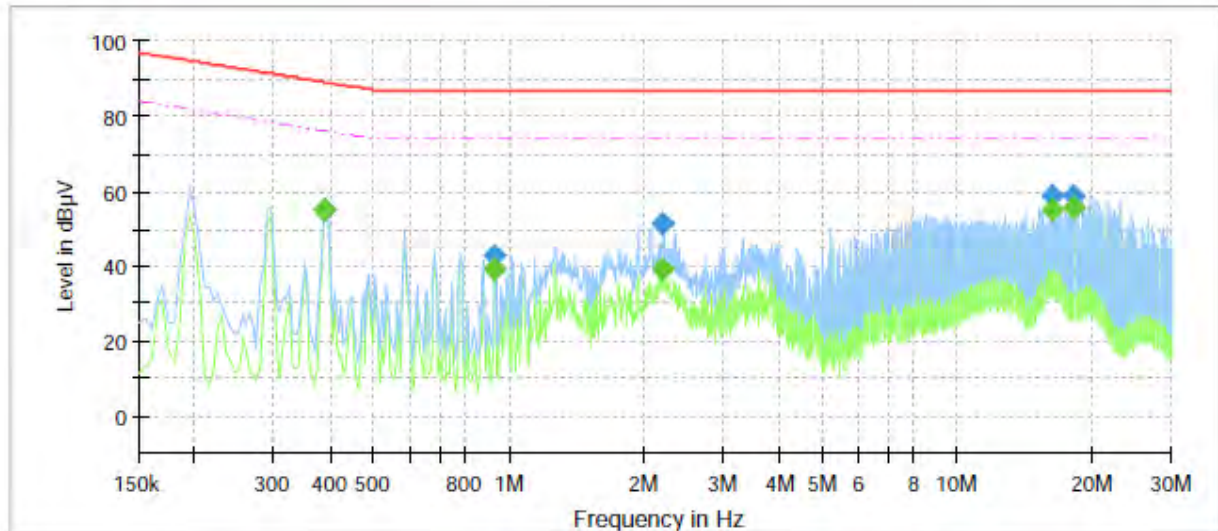
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[100 Mbps] Common Information

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



Final Result

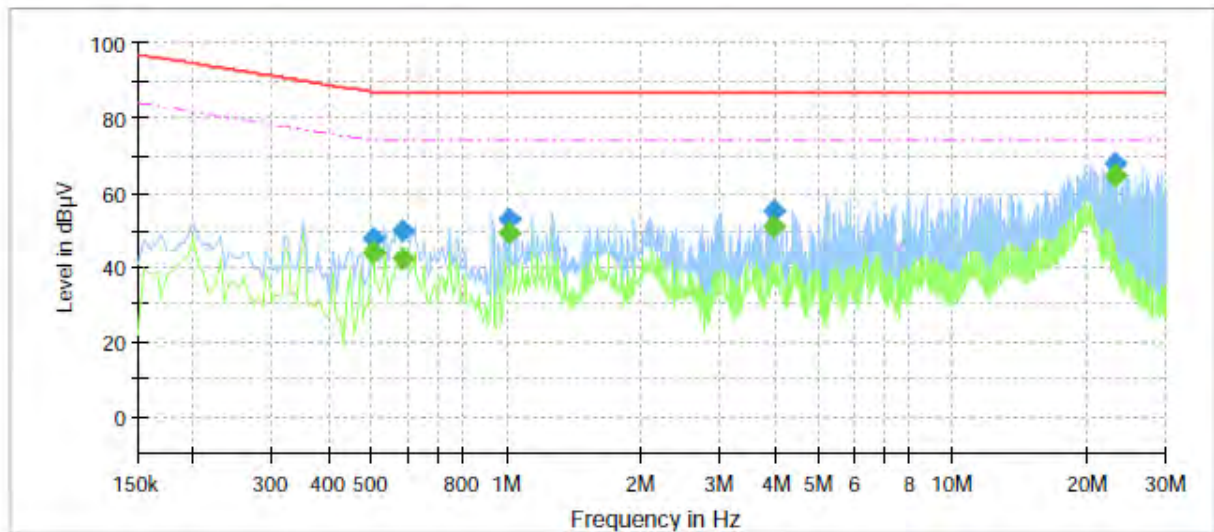
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.390000	---	55.00	76.06	21.06	1000.0	9.000	Single Line	10.6
0.390000	55.12	---	89.06	33.94	1000.0	9.000	Single Line	10.6
0.930000	---	39.30	74.00	34.70	1000.0	9.000	Single Line	11.2
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

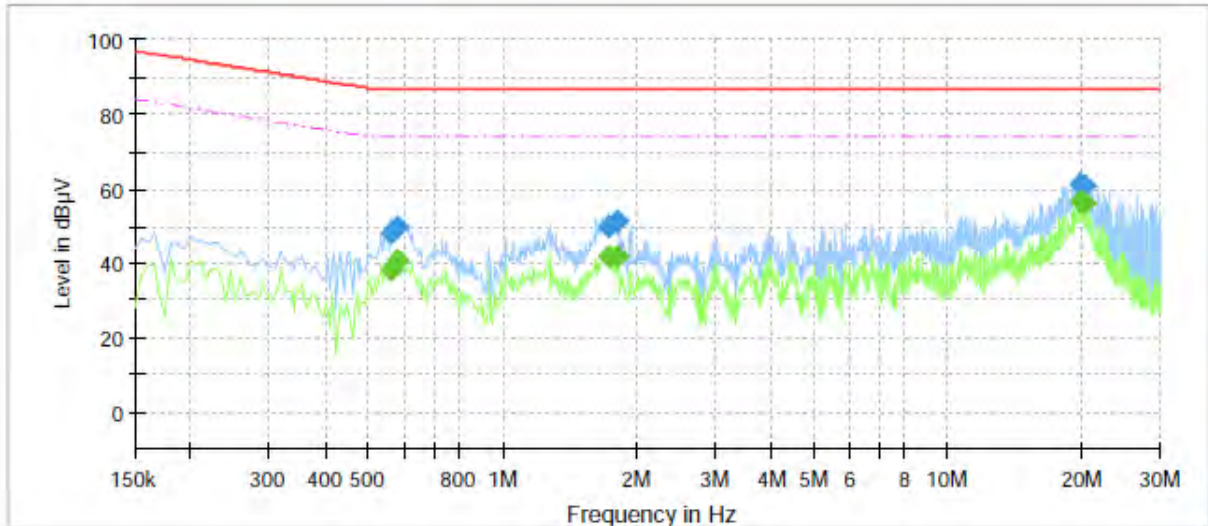


Final Result

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

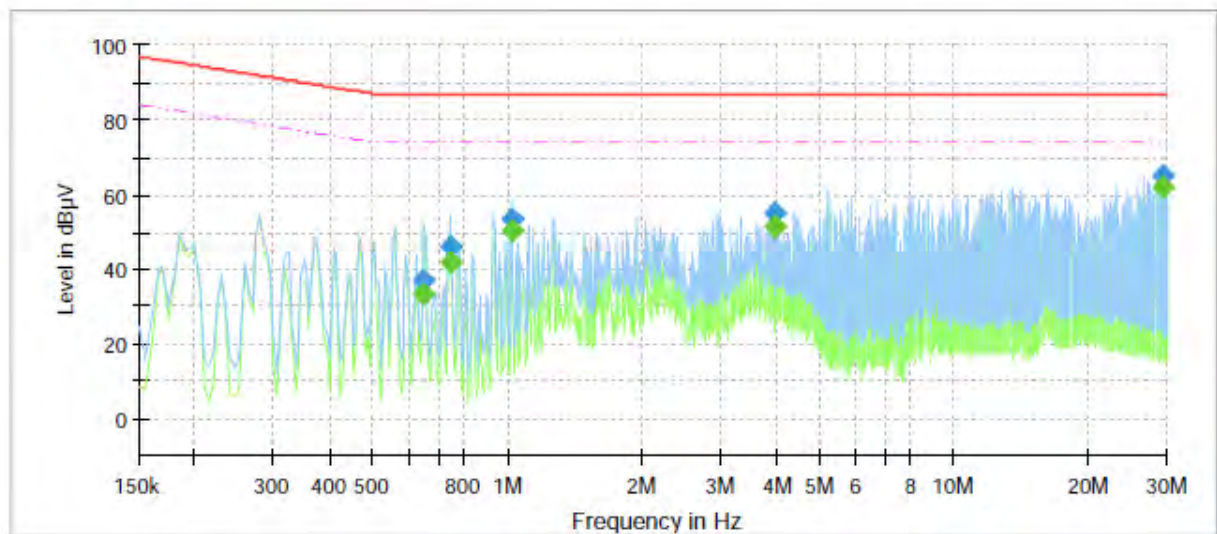
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.565000	---	38.11	74.00	35.89	1000.0	9.000	Single Line	11.0
0.565000	48.20	---	87.00	38.80	1000.0	9.000	Single Line	11.0
0.580000	---	40.97	74.00	33.03	1000.0	9.000	Single Line	11.0
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

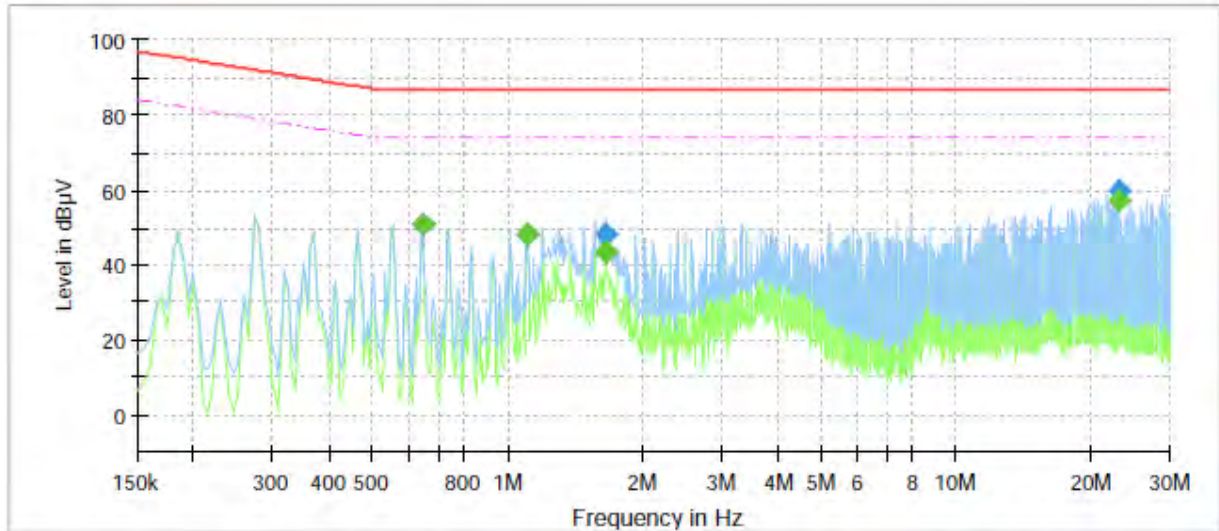


Final Result

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

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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



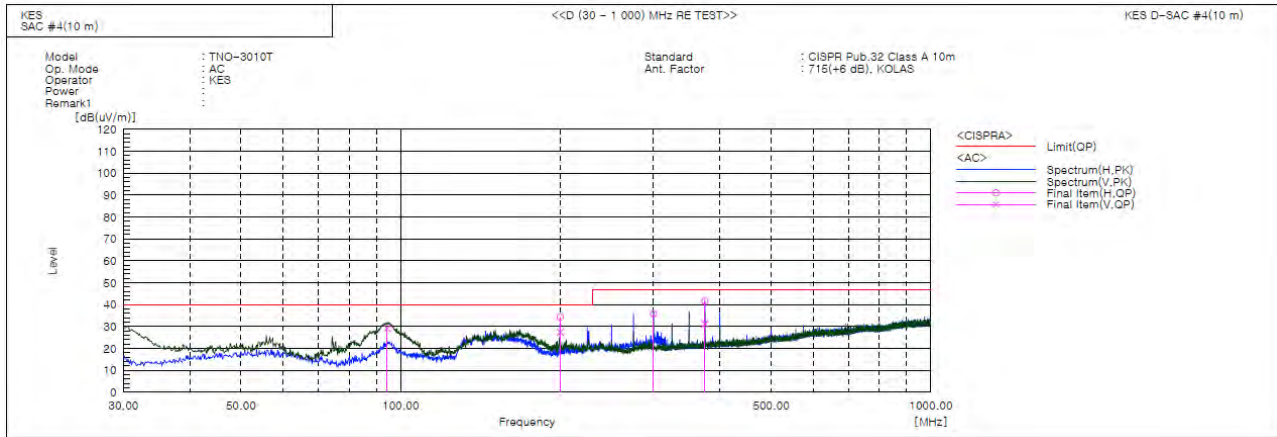
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Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
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Radiated Electric Field Emissions(Below 1 GHz)

■ 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	94.384	V	52.7	-23.5	29.2	40.0	10.8	400.0	348.0	
2	199.993	H	56.2	-21.8	34.4	40.0	5.6	400.0	234.0	
3	199.993	V	49.3	-21.8	27.5	40.0	12.5	100.0	173.0	
4	300.024	H	54.5	-18.6	35.9	47.0	11.1	200.0	208.0	
5	374.956	H	57.3	-15.7	41.6	47.0	5.4	200.0	168.0	
6	374.956	V	46.9	-15.7	31.2	47.0	15.8	100.0	69.0	

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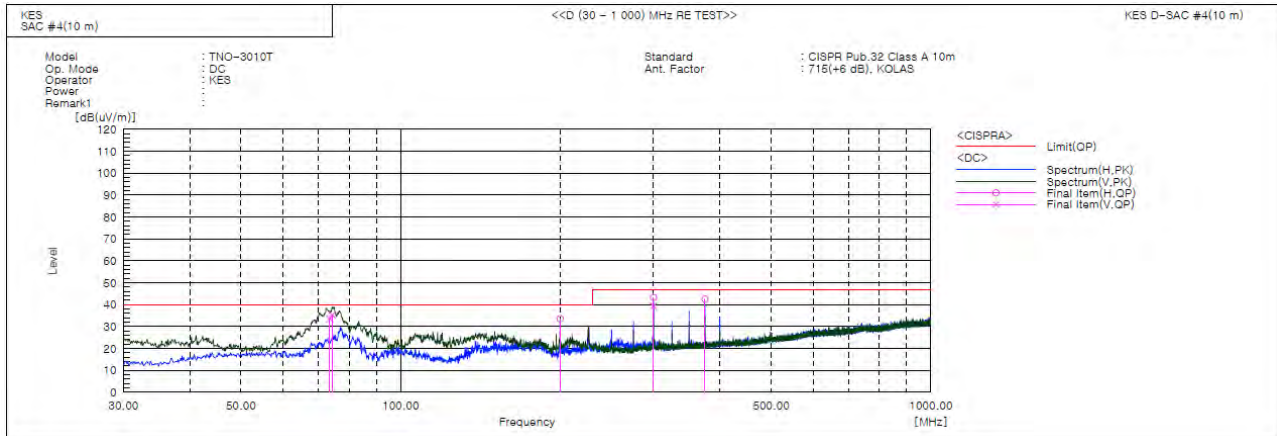


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Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
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■ DC 12 V



Final Result

No.	Frequency	(P)	Reading	c.f	Result	Limit	Margin	Height	Angle	Remark
	[MHz]		QP		QP	QP	QP			
			[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]	
1	73.491	V	59.7	-26.2	33.5	40.0	6.5	141.0	217.0	
2	74.301	V	61.8	-26.5	35.3	40.0	4.7	227.0	245.0	
3	199.991	H	55.4	-21.8	33.6	40.0	6.4	381.0	71.0	
4	299.984	H	61.9	-18.6	43.3	47.0	3.7	291.0	221.0	
5	299.985	V	57.9	-18.6	39.3	47.0	7.7	100.0	150.0	
6	374.962	H	58.3	-15.7	42.6	47.0	4.4	249.0	177.0	

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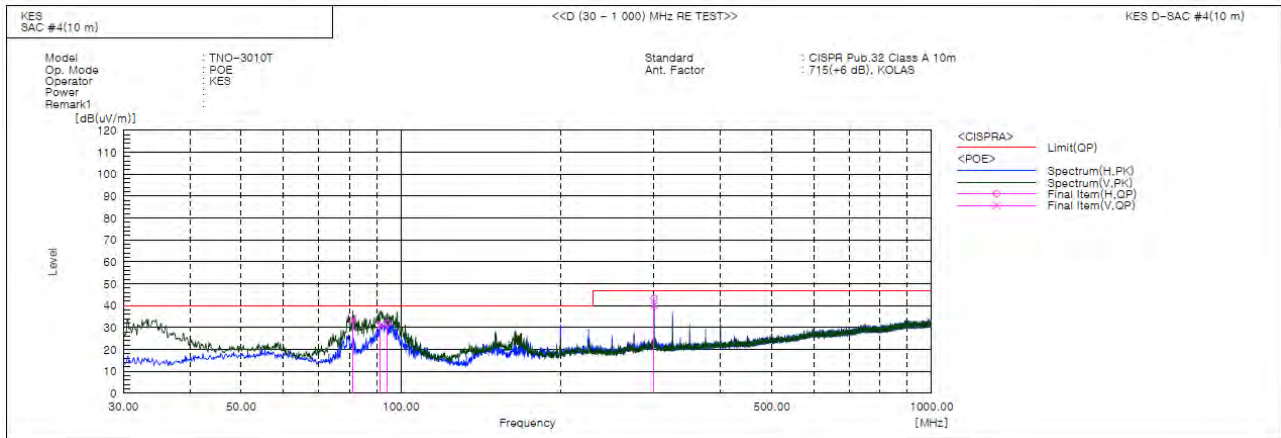


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■ PoE



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	81.168	V	61.1	-27.4	33.7	40.0	6.3	150.0	230.0	
2	91.474	V	55.7	-24.4	31.3	40.0	8.7	150.0	222.0	
3	94.384	H	55.4	-23.5	31.9	40.0	8.1	400.0	80.0	
4	300.024	H	62.0	-18.6	43.4	47.0	3.6	200.0	247.0	
5	300.024	V	58.8	-18.6	40.2	47.0	6.8	100.0	176.0	

◆ 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



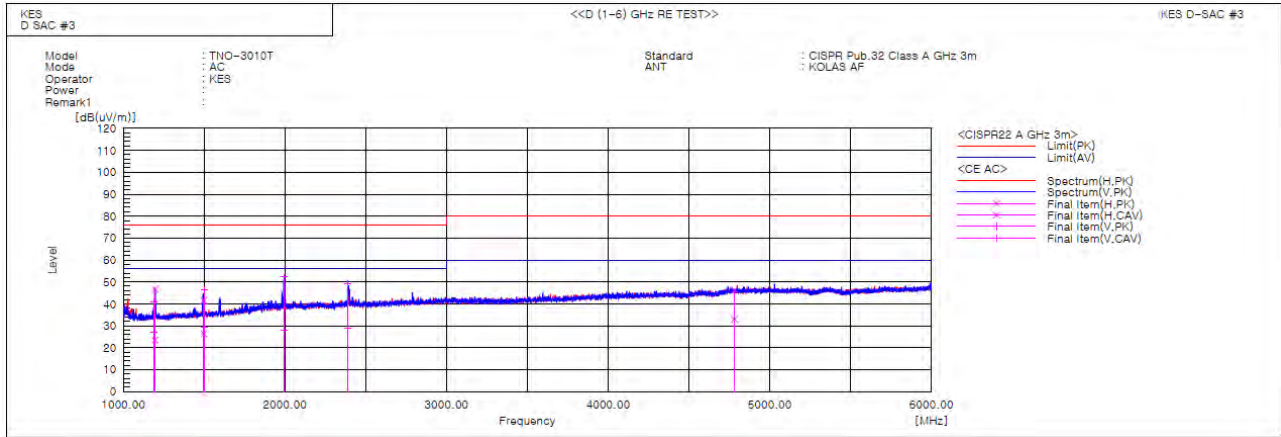
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Radiated Electric Field Emissions(Above 1 GHz)

■ 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	

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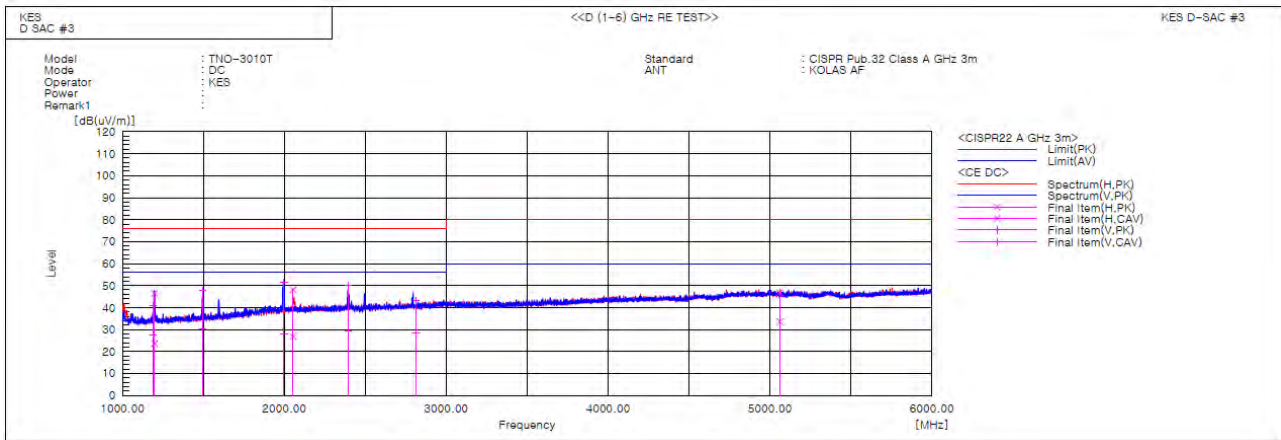
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■ DC 12 V



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	

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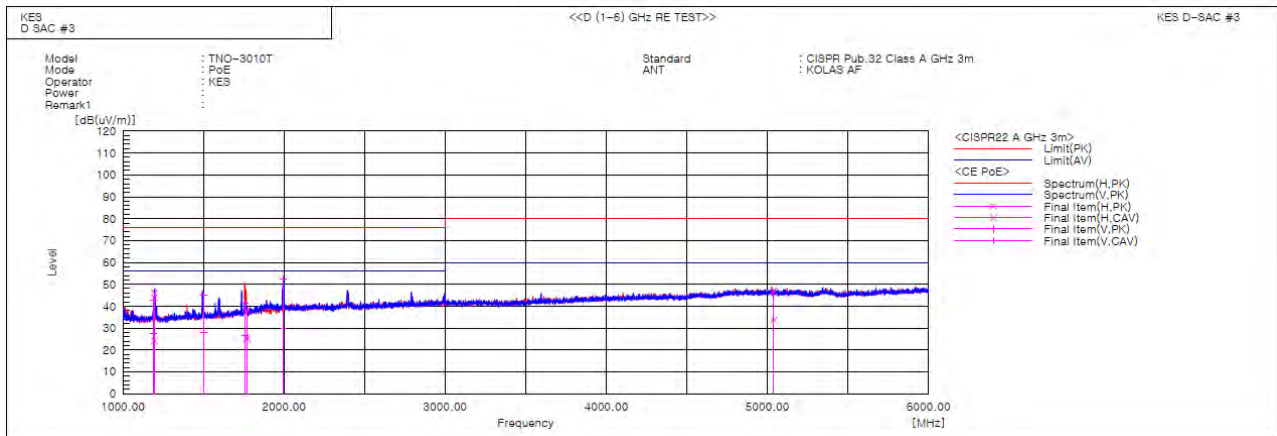
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■ PoE



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(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

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Test Setup Photos and Configuration

Conducted Voltage Emissions



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Conducted Telecommunication Emissions



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Radiated Electric Field Emissions(Below 1 GHz)



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Radiated Electric Field Emissions(Above 1 GHz)



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EUT External Photographs

(Top)



(Bottom)



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EUT Internal Photographs

(Internal View)



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EUT Internal View – Board 1

(Top)



(Bottom)



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EUT Internal View – Board 2

(Top)



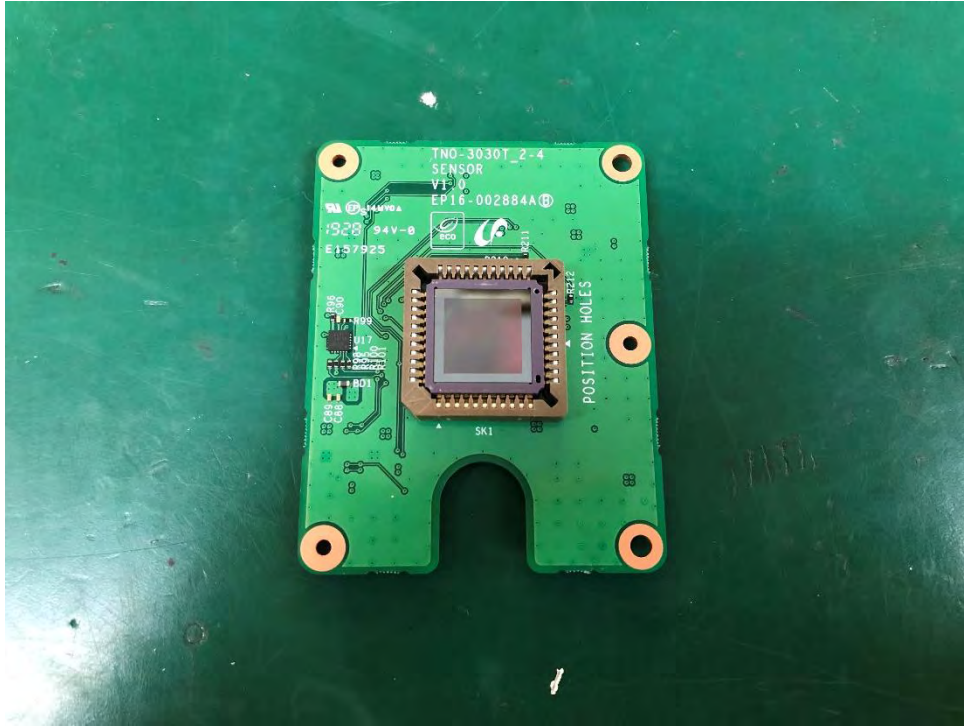
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EUT Internal View – Board 3

(Top)



(Bottom)



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EUT Internal View – Board 4

(Top)



(Bottom)



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EUT Internal View – Board 5

(Top)



(Bottom)



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