



EMC TEST REPORT For VCCI

Test Report No. : KES-E1-18T0248

Date of Issue : Apr. 08, 2018

Product name : NVR

Model/Type No. : QRN-1610S

Variant Model : -

Applicant : Hanwha Teschwin 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)

Equipment authorization : ☐ Declaration of Conformity
☒ Verification
☐ Certification

Date of Receipt : Mar. 27, 2018

Test date : Apr. 05, 2018

Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by

Young Jun, Jo
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KOLAS.

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



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

Test report No.:
KES-E1-18T0248
Page (2) of (35)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Apr. 08, 2018	KES-E1-18T0248	Issued

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

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



TABLE OF CONTENTS

1.0	General Product Description.....	4
1.1	Test Voltage & Frequency	8
1.2	Variant Model Differences.....	8
1.3	Device Modifications	8
1.4	Equipment Under Test.....	8
1.5	Support Equipments	9
1.6	External I/O Cabling	10
1.7	EUT Operating Mode(s)	10
1.8	Configuration.....	11
1.9	Remarks when standards applied	12
1.10	Calibration Details of Equipment Used for Measurement.....	12
1.11	Test Facility	12
1.12	Laboratory Accreditations and Listings	12
2.0	Test Regulations.....	13
2.1	Conducted Emissions Mains Power Ports.....	15
2.2	Conducted Emissions at Telecommunication Ports.....	16
2.3	Radiated Electric Field Emissions(Below 1 GHz)	17
2.4	Radiated Electric Field Emissions(Above 1 GHz)	18
APPENDIX A – TEST DATA.....		19
Conducted Emissions at Mains Power Ports.....		19
Conducted Emissions at Telecommunication Ports		21
Radiated Electric Field Emissions(Below 1 GHz)		25
Radiated Electric Field Emissions(Above 1 GHz).....		26
Test Setup Photos and Configuration		27
Conducted Voltage Emissions		27
Conducted Telecommunication Emissions		28
Radiated Electric Field Emissions(Below 1 GHz)		30
Radiated Electric Field Emissions(Above 1 GHz).....		31
EUT External Photographs.....		32
EUT Internal Photographs		33

1.0 General Product Description

Main Specifications of EUT are:

Key Features		[Q Series 16ch Network Video Recorder with PoE Switch] • Up to 16ch 8megapixel supported • H.265, H.264, MJPEG codec supported • WiseStream support • 128Mbps network camera recording • Plug & play by 16 PoE ports • Max. 2HDDs supported • HDMI / VGA local monitor • P2P service(QR code connect) support
Display		
Network Camera	Inputs	Max. 16ch
	Resolution	CIF ~ 8MP
	Fish-Eye Dewarping	N/A (process on Web / CMS)
	Protocols	Samsung, ONVIF
Live	Local Display	1x HDMI / 1x VGA
	Multi-Channel Display	[Local Monitor] 1 / 2H / 2V / 3V / 4 / 6 / 8 / 9 / 13 / 16 / Auto Sequence [Web] 1 / 4 / 9 / 16 / Auto Sequence
	Performance	[Local Monitor] 8MP(60fps) 5MP(90fps), 3MP(120fps), 2MP(240fps), 720p(480fps), D1(480fps)
Performance		
Operating System	Embedded	Linux
Record	Compression	H.265, H.264, MJPEG
	Recording Bandwidth	Max. 128Mbps
	Resolution	CIF ~ 8MP
	Type	Manual, Schedule(Continuous/Event), Event (Pre/Post)
	Event Trigger	- Alarm Input(4) - Video Loss - Camera event (Sensor, MD, Video analytics, Defocus)
	Event Action	e-Mail, PTZ Preset, Alarm Out, Buzzer, Monitor Out
Search & Play	Playback Bandwidth	32Mbps (16ch simultaneously)
	Performance	Max. 3 Users (Local 1, Remote 3)

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

**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

Test report No.:

KES-EI-18T0248

Page (5) of (35)

	Mode	Date & Time(Calendar) Event Log list Text Search(POS) ARB Search Smart Search - Virtual Line w/ direction, Enter/Exit
	Simultaneous playback	Max. 16ch (Local, Network)
	Resolution	CIF ~ 8MP
	Fish-Eye Dewarping	N/A (processed on Web / CMS)
	Playback Control	Fast/Slow Forward / Backward, Move one step Up / Down
	Default Built-In	0 ~ 6TB
Storage	Internal	2(Max.12TB)
Backup	File backup	BU/Exe(USB), JPG/AVI(Web, CMS)
	Function	Multi channel(Upto 16ch) Play, Date-Time/Title display
Sensor	I/O	4/2 (NO 1EA, NO/NC 1EA)
Audio	Input	16 ch (network)
	Compression	G.711, G.726, AAC(16/48KHz)
	Audio Communication	2-Way
Network		
Protocol		TCP/IP, UDP/IP, RTP (UDP), RTP (TCP), RTSP, NTP, HTTP, DHCP (Server, Client), PPPoE, SMTP, ICMP, IGMP, ARP, DNS, DDNS, uPnP, HTTPS, SNMP, ONVIF (Profile-S), SUNAPI(Server, Client)
DDNS		Hanwha Security DDNS
Transmission Bandwidth		128Mbps
Max Remote Users		Search (3), Live Unicast (10), Multicast (20)
IP Version		IPv4/IPv6
Security		User access Log, IP Filtering, 802.1x, Encryption
Language	GUI	English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese(Simplified), Japanese, Thai

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.



	Web	English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese(Simplified), Japanese, Thai
OS		Windows 7, 8, 10, Mac OS X 10.9. 10.10. 10.11
Web Browser		- Plug-in free web viewer : Google Chrome 47, MS Edge 20 - Plug-in Webviewer : MS Explorer 11, Apple Safari 9(Mac OS X only)
Viewer Software	Type	SSM, Webviewer, Smart Viewer, Wisenet Mobile
	CMS Support	Support SDK/CGI(SUNAPI)
Functions		
Camera Setup	Register	PnP, Manual
	Setup Items	IP address, Add profile edit, Bitrate, Compression, GOP, Quality, Camera MD setup Camera video setup (Simple focus, Brightness/Contrast, Flip/Mirror, IRIS, WDR, D&N, SSNR, Shutter, SSDR, DIS), Fisheye Dewarping(web), Hallway View Setup, Camera Webpage
Camera Control	PoE	1) Monitor PoE Power consumption 2) On/Off Control for each PoE camera 3) Remote Reset for each PoE camera
Easy Configuration		Setup Wizard (Date/Time, Network, Auto Camera Configuration) P2P (QR code)
ARB		Yes
PTZ	Control	Via GUI, Webviewer, 300 preset
Smart phone	Support Model	I-Phone, Android
	Protocol Support	RTP, RTSP, HTTP, CGI(SUNAPI)
	Control	Live(16ch) : Multi-Profile Support Playback(1ch) Event push
	Max. Remote Users	Search (3), Live Unicast (10), Multicast (20)
System Control		Mouse, Web, IR Remocon
Indicator/Interface		
Front	Indicator	LED (Status indicator) : 6ea HDD action 1, Alarm 1, Power 1, Record 1, Backup 1, Network1

**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

Test report No.:

KES-EI-18T0248

Page (7) of (35)

Connectors	VGA	1EA(1920x1080, 1280x720)
	HDMI	1 EA (3840 x 2160, 1920x1080, 1280x720)
	Audio	Out(1EA, RCA, Line)
	Ethernet	■ 16EA (PoE, 100Mbps) ■ 1EA (WAN, 1Gbps) - WAN : Uplink to CMS
	Alarm	In(4EA, Terminal Block) Out(2EA, Terminal Block)
	USB	Front 1EA(USB2.0), Rear 1(USB3.0)
	Ext. Storage	N/A
	Serial	N/A
	Reset	Switch(1EA)
	Power Cord	Included
System		
Log	Log List	Max. 20000 (System Log, Event Log each)
Environmental		
Operating Temperature / Humidity		+0°C to +40°C(+32°F to +104°F)
Humidity		20% ~ 85% RH
Electrical		
Power Input		100 to 240 VAC ±10%
Power Consumption		TBD (MAX. 99W(338BTU, 8TB HDD x 2ea))
PoE Budget		MAX. 100W
Mechanical		
Color / Material		Black / Metal
Dimension (WxHxD)		W370.0 x H44.0 x D320 mm(1U)
Weight		TBD
Accessories		
IR Remocon		Yes
Mouse		Yes

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.



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 ☐ 230 Vac ☒ 100 Vac ☐ 24 Vac ☐ 5 Vdc ☐ PoE

Frequency ☐ 50 Hz ☒ 60 Hz ☐ Hz

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NVR	QRN-1610S	-	Hanwha Techwin (Tianjin) Co.,Ltd.	EUT
Mouse	YTOP589	-	-	-
Remote Controller	-	-	SAMSUNG	-
HDD	ST2000VM003	-	SEAGATE	2TB

**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

Test report No.:
KES-EI-18T0248
Page (9) of (35)

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	LG15N54	410NZET022292	LG Electronics Co., Ltd.	-
Notebook AC/DC Adapter	DA-1900-08	9700591703	Dongguang Lite Power 2nd Plant	-
Monitor1	SMT-2232	C95V67VF900025B	Weihai Daewoo Electronics Co., Ltd.	-
Monitor2	HSTND-7041-L	6CM6020YQQ	HP Inc.	-
Camera	SND-L6013P	-	HANWHA TECHWIN CO.,LTD.	-
USB Memory	-	-	-	4 GB
Speaker	BR10000A CUVE	-	BEIJING EDIFIER HI- TECH GROUP.	-
Alarm1	SIP-1201DD D0	-	SAMSUNG TECHWIN CO., LTD.	-
Alarm2	-	-	-	-

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.



1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NVR (EUT)	RJ45	Notebook	RJ45	3.5	U
	HDMI	Monitor1	HDMI	1.2	S
	D-SUB	Monitor1	D-SUB	1.3	U
	RJ45	Camera	RJ45	5.0	S
	USB	USB Memory	USB	-	-
	USB	Mouse	USB	1.0	U
	RCA	Speaker	RCA	1.6	U
	2 PIN	Alarm1	2 PIN	3.5	U
	2 PIN	Alarm2	2 PIN	3.5	U
	IR	Remote Controller	IR	-	-

* Unshielded=U, Shielded=S

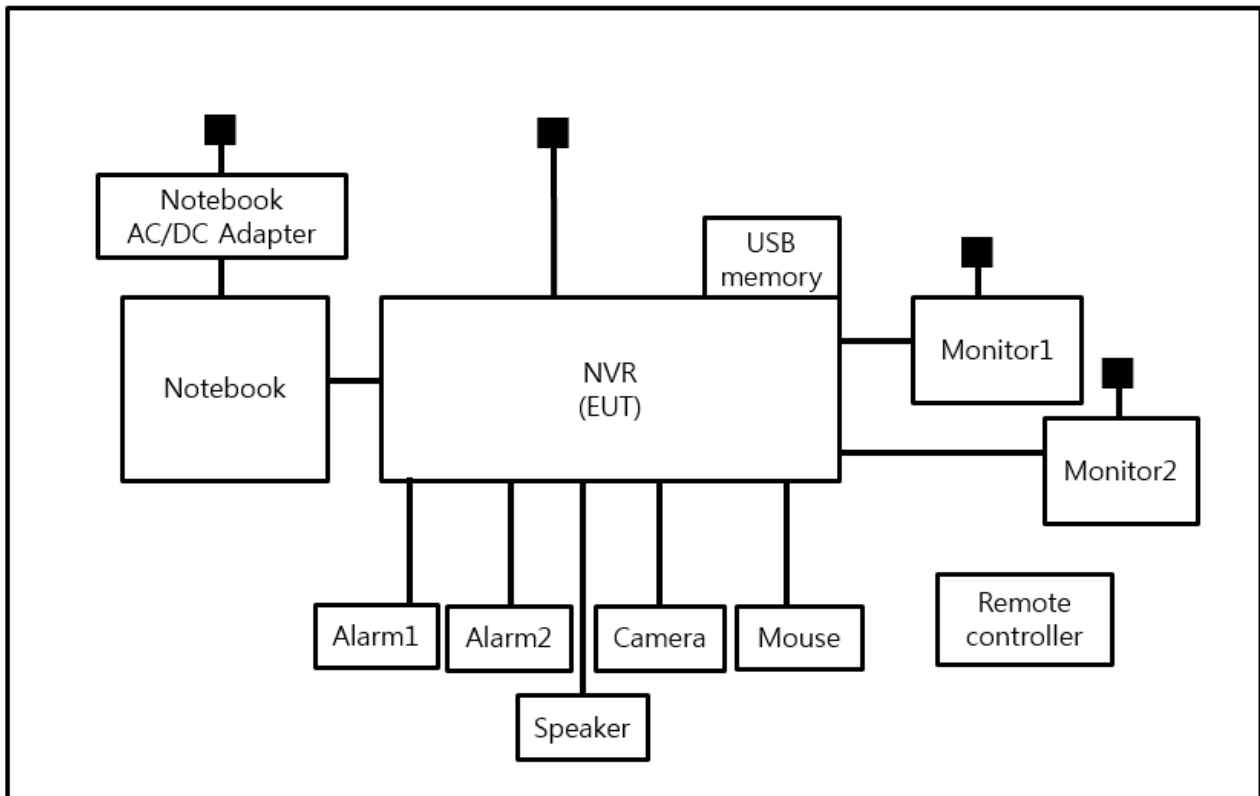
1.7 EUT Operating Mode(s)

Test mode	operating
POE	EUT Monitoring, Ping Test

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

1.8 Configuration

■ AC Main
□ DC Main



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.

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 and CISPR Publication 22.

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	
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-4308, C-4798, T-2311, G-914
KOREA	RRA	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
Canada	IC	3 m & 10 m Semi-Aechoic Chamber and Conducted test site	 4769B-1
Europe	CE	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	
International	KOLAS	EMI (3 m & 10 m Semi-Aechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☐ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1
☐ Class A

☐ Group 2
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547 :2009

☐ EN 55032:2015

☐ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013



-
- | | | |
|---|---|----------------------------------|
| ☒ VCCI V-3 / 2015.04 | ☒ Class A | ☐ Class B |
| ☐ AS/NZS CISPR22:2009 +A1:2010 | ☐ 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 Mains Power Ports

Test Date

Apr. 05, 2018

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 27, 2018
☒	LISN	ENV216	R & S	101787	01, 05, 2019
☒	LISN	ESH2-Z5	R & S	100450	04, 27, 2018
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 27, 2018
☐	LISN	NNBM8124	SCHWARZBECK	8124-1002	08, 07, 2018
☐	LISN	NNBM8124	SCHWARZBECK	8124-1003	08, 07, 2018

Test Conditions

Temperature: 23,2 °C
Relative Humidity: 42,0 % 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

Remarks

See Appendix A for test data.



2.2 Conducted Emissions at Telecommunication Ports

Test Date

Apr. 05, 2018

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 27, 2018
☒	LISN	ENV216	R & S	101787	01, 05, 2019
☒	LISN	ESH2-Z5	R & S	100450	04, 27, 2018
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 27, 2018
☒	8-WIRE ISN CAT3,5	ENY81	R & S	100174	01, 07, 2019
☐	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	01, 07, 2019
☒	ISN	ISN S8	SCHWARZBECK	ISN-S8-0019	05, 12, 2018
☐	CDN	CDNS502A	TESEQ	40431	01, 05, 2019

Test Conditions

Temperature: 23,2 °C
Relative Humidity: 42,0 % 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

Remarks

See Appendix A for test data.



2.3 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Apr. 05, 2018

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, 18, 2018
☒	AMPLIFIER	SCU 01	R & S	100603	11, 27, 2018
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	714	11, 28, 2018

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 48,4 % 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

Apr. 05, 2018

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, 07, 2018
☒	PREAMPLIFIER	8449B	AGILENT	3008A01967	05, 31, 2018
☐	ATTENUATOR	8491A	HP	35496	03, 21, 2019
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	05, 02, 2019

Test Conditions

Temperature: 20,0 °C

Relative Humidity: 48,6 % 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

HOT LINE

Common Information

Test Description:

Conducted Emission

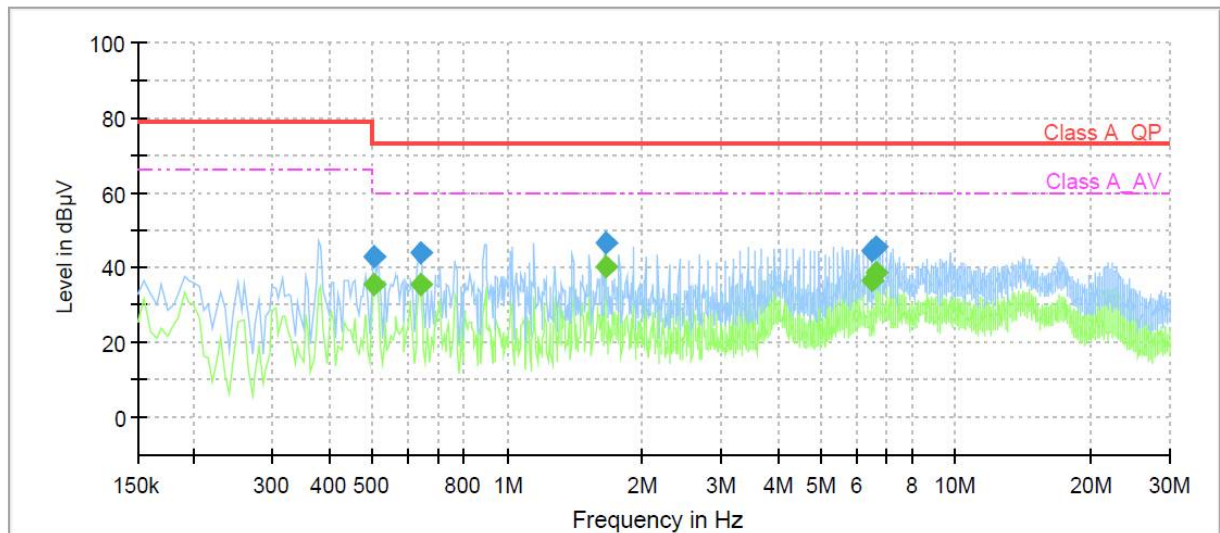
Model No.:

QRN-1610S

Mode

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	---	35.57	60.00	24.43	1000.0	9.000	L1	19.6
0.505000	42.84	---	73.00	30.16	1000.0	9.000	L1	19.6
0.640000	---	35.51	60.00	24.49	1000.0	9.000	L1	19.7
0.640000	44.02	---	73.00	28.98	1000.0	9.000	L1	19.7
1.655000	---	40.23	60.00	19.77	1000.0	9.000	L1	20.1
1.655000	46.42	---	73.00	26.58	1000.0	9.000	L1	20.1
6.495000	---	36.71	60.00	23.29	1000.0	9.000	L1	19.6
6.495000	44.64	---	73.00	28.36	1000.0	9.000	L1	19.6
6.625000	---	38.65	60.00	21.35	1000.0	9.000	L1	19.6
6.625000	45.63	---	73.00	27.37	1000.0	9.000	L1	19.6



KES Co., Ltd.

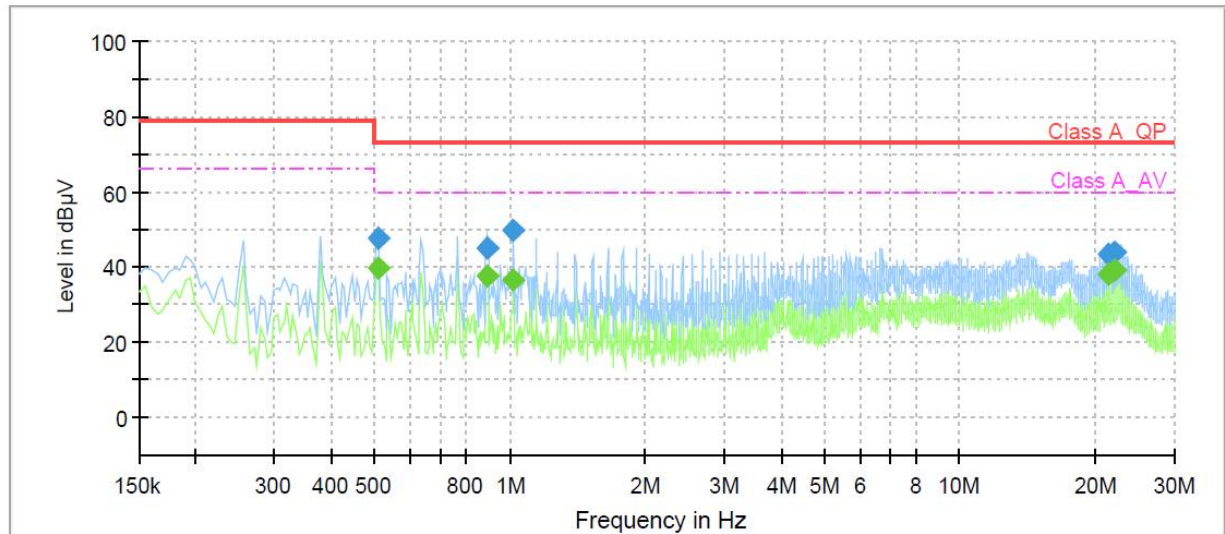
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Test report No.:
KES-E1-18T0248
Page (20) of (35)

NEUTRAL LINE

Common Information

Test Description: Conducted Emission
Model No.: QRN-1610S
Mode
Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.510000	---	39.85	60.00	20.15	1000.0	9.000	N	19.6
0.510000	47.81	---	73.00	25.19	1000.0	9.000	N	19.6
0.890000	---	37.41	60.00	22.59	1000.0	9.000	N	19.9
0.890000	45.16	---	73.00	27.84	1000.0	9.000	N	19.9
1.020000	---	36.37	60.00	23.63	1000.0	9.000	N	20.0
1.020000	49.70	---	73.00	23.30	1000.0	9.000	N	20.0
21.395000	---	38.28	60.00	21.72	1000.0	9.000	N	20.4
21.395000	43.41	---	73.00	29.59	1000.0	9.000	N	20.4
22.000000	---	39.31	60.00	20.69	1000.0	9.000	N	20.4
22.000000	43.94	---	73.00	29.06	1000.0	9.000	N	20.4

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

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



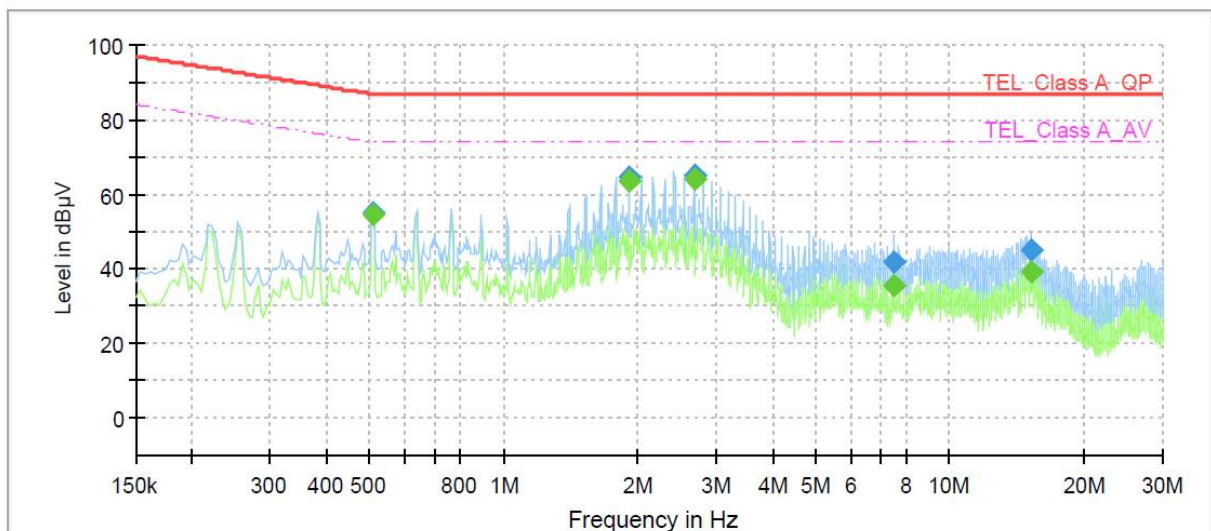
Conducted Emissions at Telecommunication Ports

■ POE Mode

[10 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: QRN-1610S
Mode: PoE 10 Mbps
Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.510000	---	54.62	74.00	19.38	1000.0	9.000	Single Line	19.6
0.510000	55.22	---	87.00	31.78	1000.0	9.000	Single Line	19.6
1.910000	---	63.66	74.00	10.34	1000.0	9.000	Single Line	20.0
1.910000	64.34	---	87.00	22.66	1000.0	9.000	Single Line	20.0
2.674000	---	64.28	74.00	9.72	1000.0	9.000	Single Line	20.0
2.674000	65.19	---	87.00	21.81	1000.0	9.000	Single Line	20.0
7.498000	---	35.63	74.00	38.37	1000.0	9.000	Single Line	19.6
7.498000	41.62	---	87.00	45.38	1000.0	9.000	Single Line	19.6
15.174000	---	39.26	74.00	34.74	1000.0	9.000	Single Line	20.0
15.174000	45.21	---	87.00	41.79	1000.0	9.000	Single Line	20.0



KES Co., Ltd.

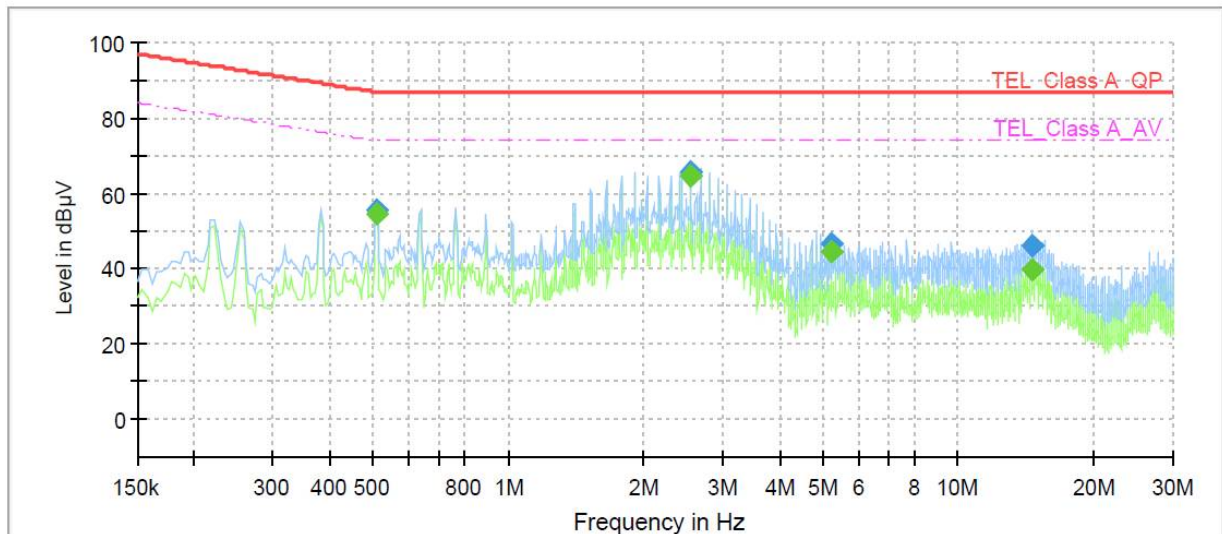
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Test report No.:
KES-E1-18T0248
Page (22) of (35)

[100 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: QRN-1610S
Mode: PoE 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)
0.510000	---	54.77	74.00	19.23	1000.0	9.000	Single Line	19.6
0.510000	55.38	---	87.00	31.62	1000.0	9.000	Single Line	19.6
2.546000	---	64.58	74.00	9.42	1000.0	9.000	Single Line	20.0
2.546000	65.69	---	87.00	21.31	1000.0	9.000	Single Line	20.0
5.222000	---	44.72	74.00	29.28	1000.0	9.000	Single Line	19.6
5.222000	46.48	---	87.00	40.52	1000.0	9.000	Single Line	19.6
14.514000	---	39.88	74.00	34.12	1000.0	9.000	Single Line	20.0
14.514000	46.16	---	87.00	40.84	1000.0	9.000	Single Line	20.0

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.

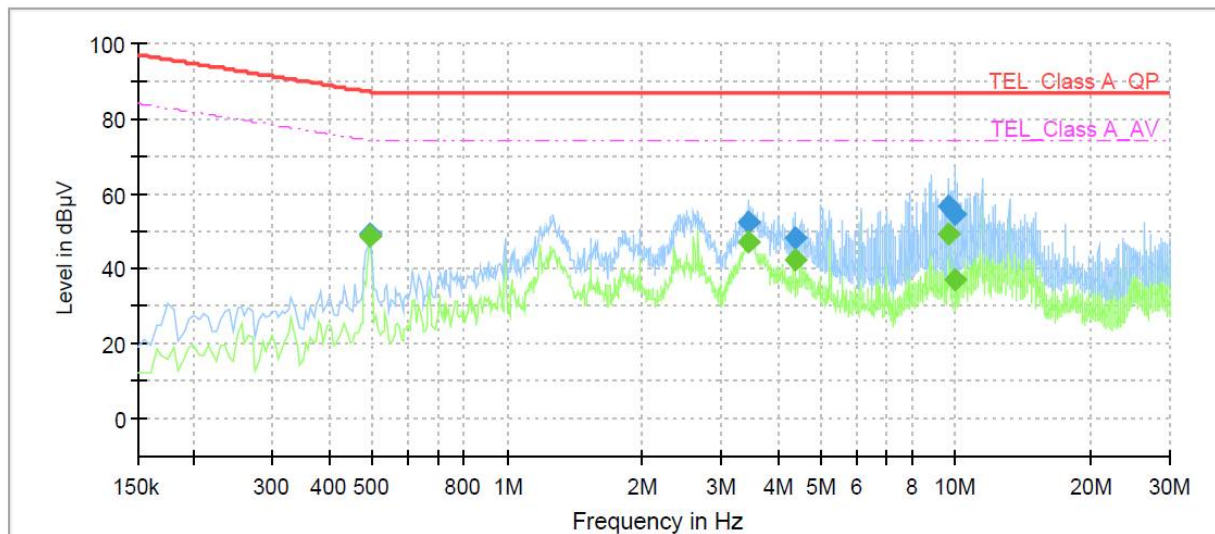


■ LAN Mode

[10 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: QRN-1610S
Mode: LAN 10 Mbps
Operator Name: KES



Final Result

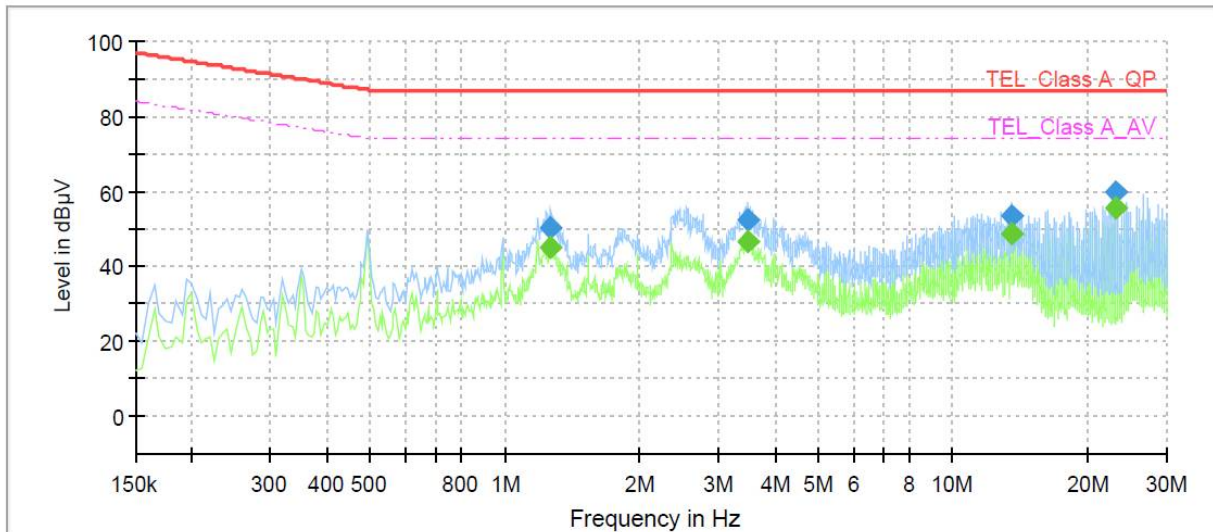
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.495000	---	48.70	74.08	25.38	1000.0	9.000	Single Line	19.5
0.495000	49.08	---	87.08	38.00	1000.0	9.000	Single Line	19.5
3.455000	---	47.15	74.00	26.85	1000.0	9.000	Single Line	19.6
3.455000	52.42	---	87.00	34.58	1000.0	9.000	Single Line	19.6
4.400000	---	42.36	74.00	31.64	1000.0	9.000	Single Line	19.4
4.400000	48.29	---	87.00	38.71	1000.0	9.000	Single Line	19.4
9.675000	---	49.48	74.00	24.52	1000.0	9.000	Single Line	19.6
9.675000	56.56	---	87.00	30.44	1000.0	9.000	Single Line	19.6
9.980000	---	37.19	74.00	36.81	1000.0	9.000	Single Line	19.6
9.980000	54.72	---	87.00	32.28	1000.0	9.000	Single Line	19.6



[100 Mbps]

Common Information

Test Description: Telecommunication Emission
Model No.: QRN-1610S
Mode: LAN 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)
1.265000	---	44.79	74.00	29.21	1000.0	9.000	Single Line	19.7
1.265000	50.55	---	87.00	36.45	1000.0	9.000	Single Line	19.7
3.485000	---	46.80	74.00	27.20	1000.0	9.000	Single Line	19.5
3.485000	52.17	---	87.00	34.83	1000.0	9.000	Single Line	19.5
13.480000	---	48.94	74.00	25.06	1000.0	9.000	Single Line	19.7
13.480000	53.26	---	87.00	33.74	1000.0	9.000	Single Line	19.7
23.130000	---	55.54	74.00	18.46	1000.0	9.000	Single Line	20.1
23.130000	59.70	---	87.00	27.30	1000.0	9.000	Single Line	20.1

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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



KES Co., Ltd.

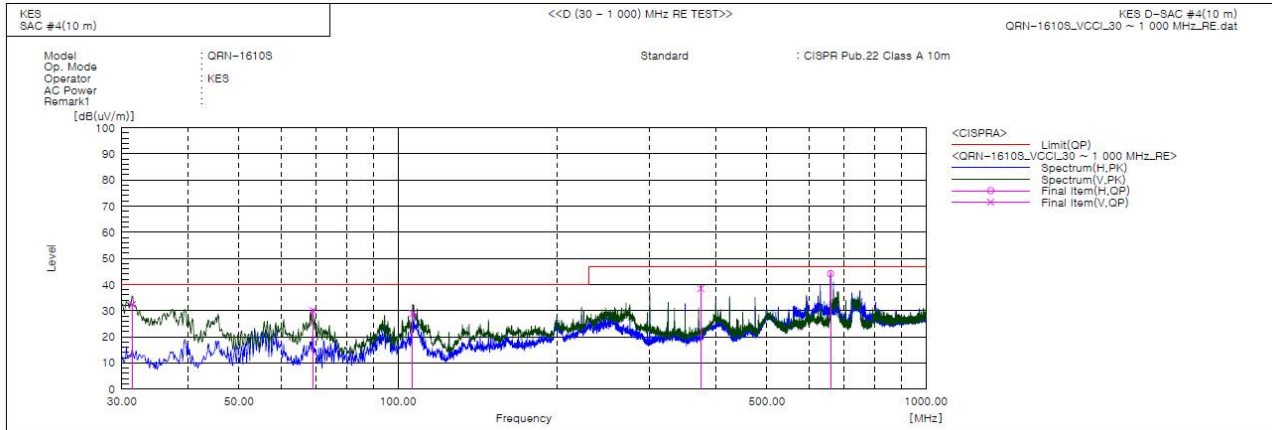
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Test report No.:

KES-E1-18T0248

Page (25) of (35)

Radiated Electric Field Emissions(Below 1 GHz)



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	31.405	V	65.1	-32.8	32.3	40.0	7.7	102.0	237.0	
2	69.010	V	62.2	-32.1	30.1	40.0	9.9	100.0	84.0	
3	106.611	V	58.3	-29.4	28.9	40.0	11.1	178.0	245.0	
4	374.953	V	60.7	-22.3	38.4	47.0	8.6	256.0	167.0	
5	660.009	H	59.4	-15.3	44.1	47.0	2.9	209.0	321.0	

◆ Calculation

Corrected Amplitude [dBuV] = Amplitude[dBuV] + Correction Factor [dB]

Corrected Amplitude : The Final Value, Amplitude : Reading Value,

Correction Factor : ANT FACTOR + Cable loss

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.



KES Co., Ltd.

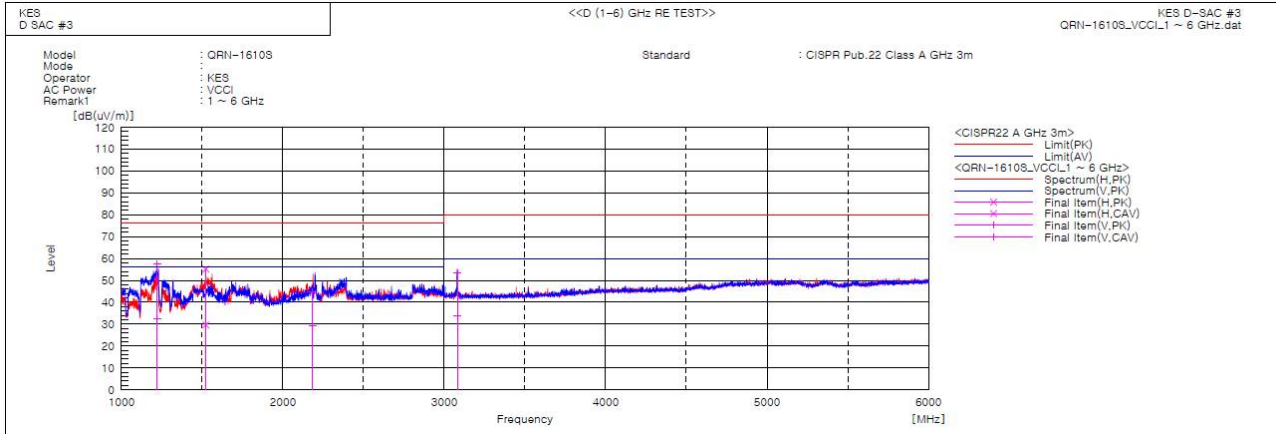
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Test report No.:

KES-EI-18T0248

Page (26) of (35)

Radiated Electric Field Emissions(Above 1 GHz)



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	1222.671	V	65.7	40.8	-8.2	57.5	32.6	76.0	56.0	18.5	23.4	100.0	41.7	
2	1522.823	H	60.8	35.3	-5.7	55.1	29.6	76.0	56.0	20.9	26.4	100.0	62.7	
3	2185.643	V	45.4	29.9	-0.5	44.9	29.4	76.0	56.0	31.1	26.6	100.0	130.9	
4	3080.930	V	50.3	30.9	2.9	53.2	33.8	80.0	60.0	26.8	26.2	100.0	296.8	

◆ 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

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.

Test Setup Photos and Configuration

Conducted Voltage Emissions



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.

Conducted Telecommunication Emissions

- PoE



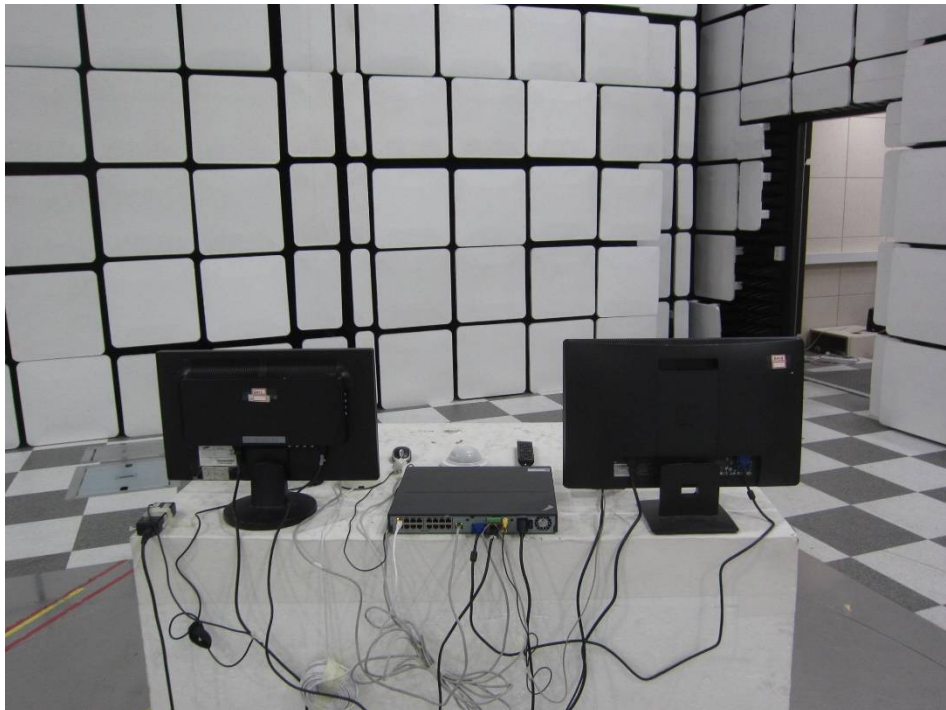
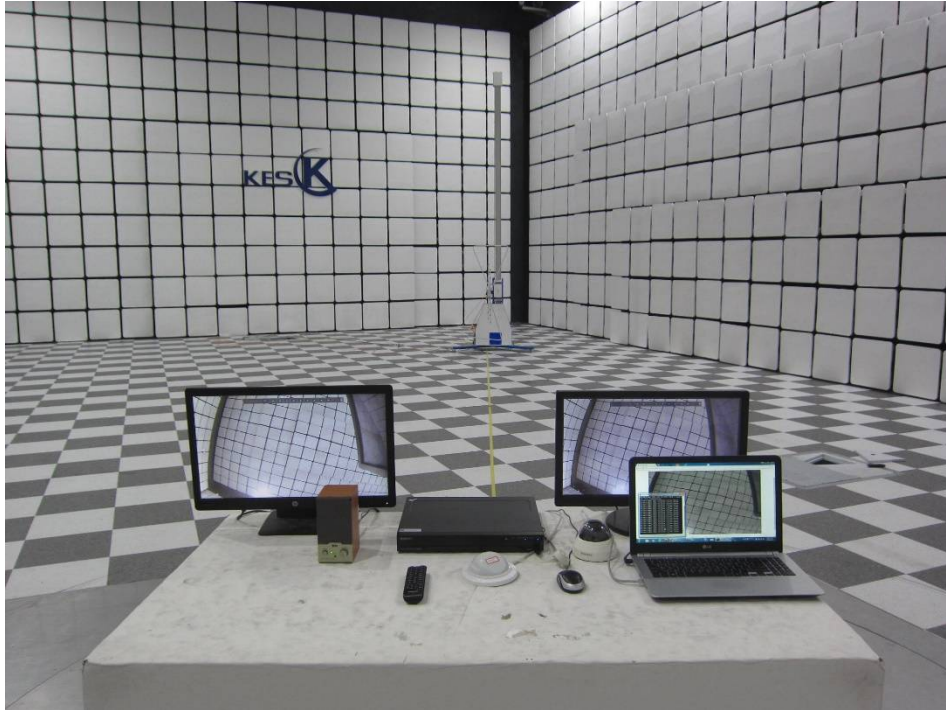
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

- LAN



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.

adiated Electric Field Emissions(Below 1 GHz)



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.

Radiated Electric Field Emissions(Above 1 GHz)



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.

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.

EUT Internal Photographs

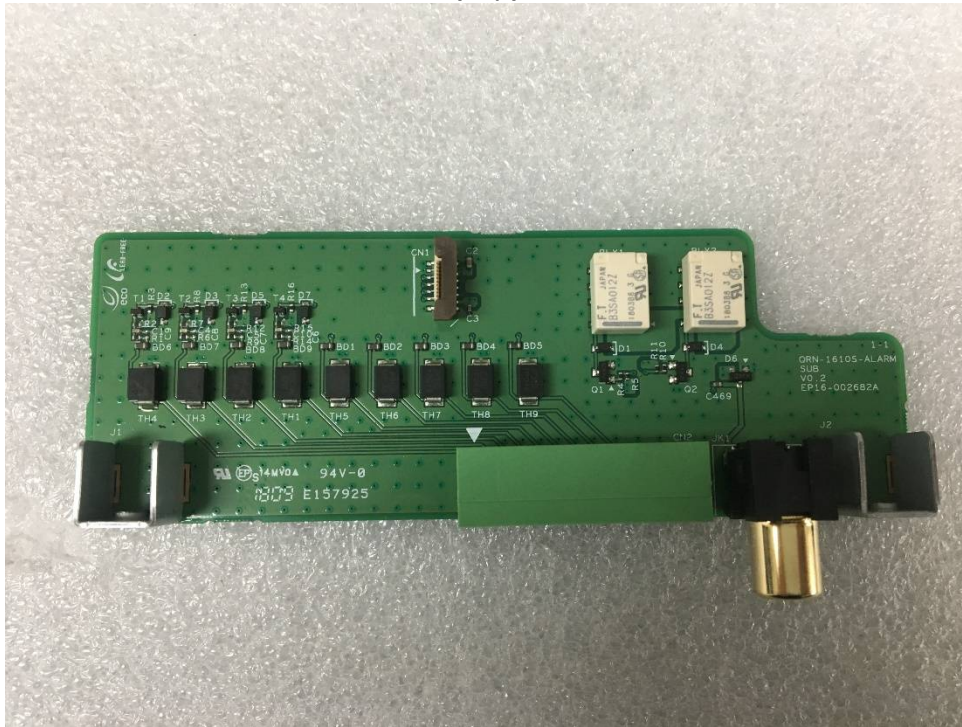
(Internal View)



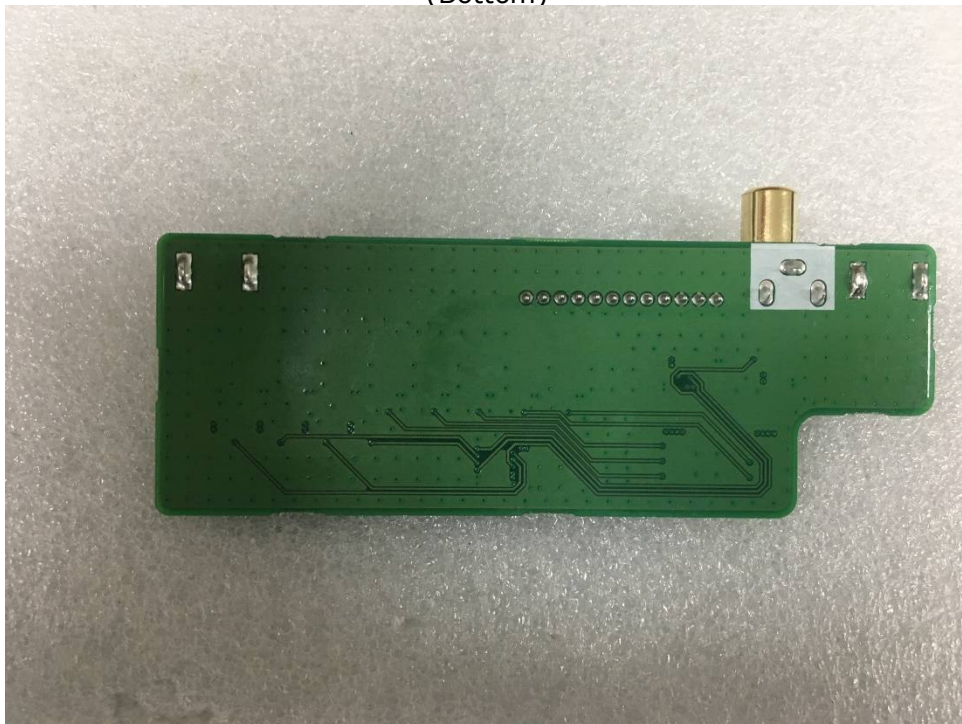
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

EUT Internal View – board 1

(Top)



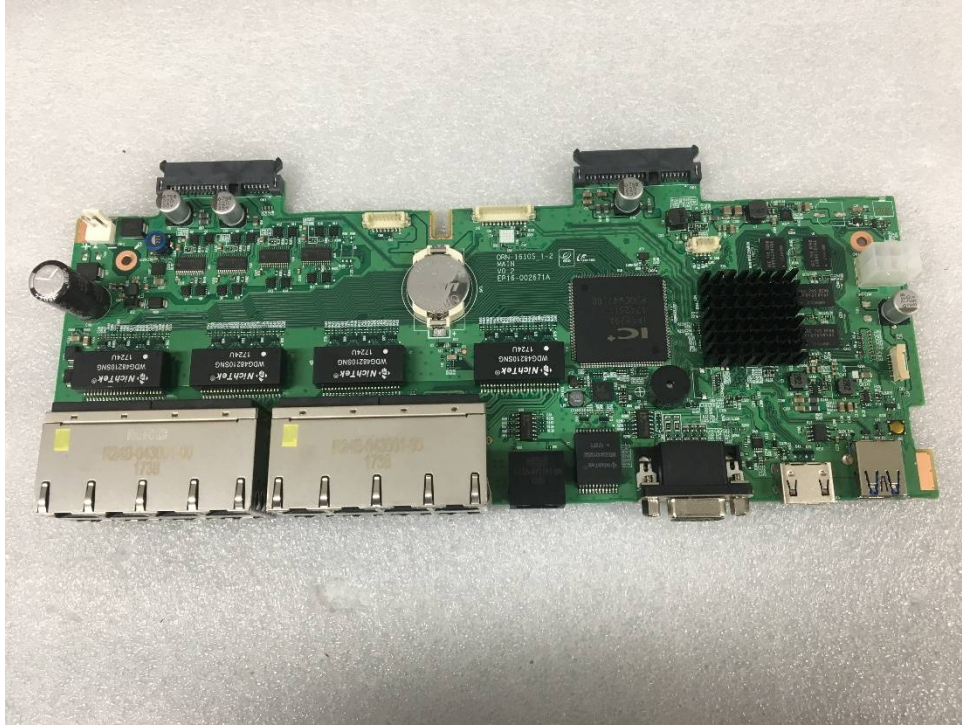
(Bottom)



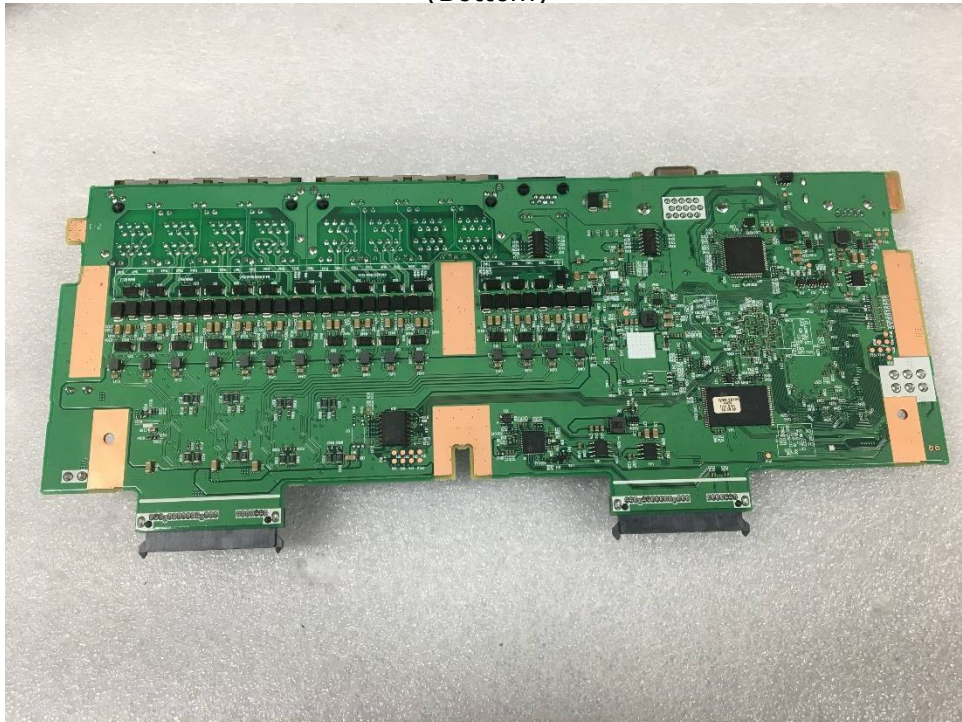
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

EUT Internal View – board 2

(Top)



(Bottom)



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