



EMC TEST REPORT For CE

Test Report No. : KES-E1-16T0577-R3
Date of Issue : Aug. 12, 2019
Product name : NETWORK VIDEO RECORDER
Model/Type No. : QRN-810P
Variant Model : QRN-410P, QRN-810P1T, QRN-410P1T
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 : Nov, 01, 2016
Test date : Nov, 10, 2016 – Nov. 11, 2016
Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by


Young Suk Song
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.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

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

Test report No.:
KES-E1-16T0577-R3
Page (2) of (64)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Nov. 21, 2016	KES-E1-16T0577	Issued
Jun. 22, 2017	KES-E1-16T0577-R1	Changed manufacturer and Updated standards
May. 15, 2019	KES-E1-16T0577-R2	Adding Derived Models and Manufacturers
Aug. 12, 2019	KES-E1-16T0577-R3	Add Derivative Model

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

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



TABLE OF CONTENTS

1.0	General Product Description	4
1.1	Test Voltage & Frequency	6
1.2	Variant Model Differences.....	6
1.3	Device Modifications	6
1.4	Equipment Under Test.....	6
1.5	Support Equipments	7
1.6	External I/O Cabling	8
1.7	E.U.T Operating Mode(s).....	8
1.8	Configuration.....	9
1.9	Calibration Details of Equipment Used for Measurement.....	10
1.10	Test Facility	10
1.11	Laboratory Accreditations and Listings	10
2.0	Test Regulations.....	11
2.1	Conducted Emissions at Mains Power Ports.....	13
2.2	Conducted Emissions at Telecommunication Ports	14
2.3	Radiated Electric Field Emissions(Below 1 GHz)	15
2.4	Radiated Electric Field Emissions(Above 1 GHz).....	16
2.5	Harmonic Current Emissions.....	17
2.6	Voltage Fluctuations and Flicker	18
3.0	Criteria for compliance.....	19
3.1	Electrostatic Discharge.....	21
3.2	Radiated Electric Field Immunity	24
3.3	Electrical Fast Transients/Bursts	26
3.4	Surge Transients	28
3.5	Conducted Disturbance	31
3.6	Voltage Dips and Short Interruptions	34
APPENDIX A – TEST DATA.....		36
Conducted Emissions at Mains Power Ports.....		36
Conducted Emissions at Telecommunication Ports		38
Radiated Electric Field Emissions(Below 1 GHz)		41
Radiated Electric Field Emissions(Above 1 GHz).....		42
Harmonic Current Emissions and Voltage Fluctuations and Flicker		46
Test Setup Photos and Configuration		49
Conducted Voltage Emissions		49
Conducted Telecommunication Emissions		50
Radiated Electric Field Emissions(Below 1 GHz)		51
Radiated Electric Field Emissions(Above 1 GHz).....		52
Harmonic Current Emissions and Voltage Fluctuations and Flicker		53
Electrostatic Discharge		53
Radiated Electric Field Immunity		54
Electrical Fast Transients/Bursts		55
Surge Transients.....		56
Conducted Disturbance.....		57
Voltage Dips and Short Interruptions.....		58
EUT External Photographs		59
EUT Internal Photographs		60



1.0 General Product Description

Main Specifications of E.U.T are:

Model		QRN-810
Display		
Network Camera	Inputs	Max. 8CH
	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 / 2V / 3V / 4 / 6 / 8 / Auto Sequence [Web] 1 / 4 / 8 / Auto Sequence
	Performance	[Local Monitor] 8MP(60fps, only One Ch) 5MP(90fps), 3MP(120fps), 2MP(240fps), 720p(240fps), D1(240fps) [Web] 5MP(30fps), 3MP(60fps), 2MP(120fps), 720p(240fps), D1(240fps)
Performance		
Operating System	Embedded	Linux
Record	Compression	H.265, H.264, MJPEG
	Recording Bandwidth	Max. 100Mbps
	Resolution	CIF ~ 8MP
	Type	Manual, Schedule(Continuous/Event), Event (Pre/Post)
	Event Action	e-Mail, PTZ Preset, Alarm Out, Buzzer, Monitor Out
Search & Play	Playback Bandwidth	32Mbps (8CH simultaneously)
	Performance	Max. 3 Users (Remote 3)
	Mode	Date & Time(Calendar) Event Log list
	Simultaneous playback	Max. 8CH (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
Storage	Default Built-In	0TB ~ 8TB (dependent on region)
	Internal	2SATA
	Max.Capacity	8TB
Backup	File backup	BU/Exe(USB), JPG/AVI(Web, CMS)
	Function	Multi channel(Upto 8CH) Play, Date-Time/Title display
Sensor	I/O	4/3 (NO 2EA, NO/NC 1EA)
Audio	Input	8 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/v6
Security		User access Log, IP Filtering, 802.1x, Encryption,
OS		Supported OS : Windows 7, 8, 10, Mac OS X 10.8, 10.9, 10.10, 10.11
Web Browser	Non-plugin Webviewer Supported Browser: Google Chrome 47, MS Edge 20	
	Plug-in Webviewer Supported MS Explore 11, Mozilla Firefox 43, Apple Safari 9 * Mac OS X only	
Viewer Software	Type	SSM, Webviewer, Smart Viewer, wisenet Mobile
	CMS Support	Support SDK/CGI(SUNAPI)

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



KES Co., Ltd.

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

Test report No.:
KES-E1-16T0577-R3
Page (5) of (64)

Functions		
Camera Setup	Register	1) Auto mode 2) Manual mode
	Setup Items	IP address, Audio 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 Webname
Easy Configuration		Setup Wizard (Date/Time, Network, Auto Camera Configuration) P2P (TUTK)
Redundancy	Failover	N/A
	ARB	Yes
PTZ	Control	Via GUI, Webviewer, SPC-2000
	Preset	300 Presets (Camera)
Smart phone	Support Model	I-Phone, Android
	Protocol Support	RTP, RTSP, HTTP, CGI(SUNAPI)
	Control	Live(8ch) : Multi-Profile Support Playback(1ch) Event push
	Max. Remote Users	Search (3), Live Unicast (10), Multicast (20)
System Control	Control Applications	Mouse, Web, SPC-2000 (Controller), IR Remocon
Indicator/Interface		
Front	Indicator	Power Status LED 1EA Lan Status LED 1EA Record Status LED 1EA
Connectors	HDMI	1 EA - Support upto 4K (3840 x 2160)
	Audio	Out(1EA, RCA, Line)
	Ethernet	■ 1EA (WAN, 1Gbps) - WAN : Uplink to CMS
	Alarm	In(4EA, Terminal Block) Out(3EA, Terminal Block)
	USB	Front 2EA(USB2.0), Rear 1(USB3.0)
	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

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



1.1 Test Voltage & Frequency

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

Voltage ☐ 220 Vac ☒ 230 Vac ☐ 240 Vac ☐ 12 Vdc ☐ PoE
Frequency ☒ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

Variant Model	Difference
QRN-410P	No changes. just hardware circuits and that sales by place of management models.
QRN-810P1T	Add derivative model for vendor management
QRN-410P1T	Add derivative model for vendor management

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
NETWORK VIDEO RECORDER	QRN-810P	-	Hanwha Techwin(Tianjin) Co.,Ltd.	E.U.T
ADAPTOR	KPL-048F-VI	-	CHANNEL WELL TECHNOLOGY	
MOUSE	MOEIUOA,AA-SM2PCPB	-	Dongguan Primax Electronic & Telecommunication Products Ltd.	
REMOTE CONTROL	EP10-000331A	-	SAMSUNG	
HDD	WD20PURX	XCC4M1FNFXHP	West digital	

**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-E1-16T0577-R3
Page (7) of (64)

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
MONITOR 1	SMT-2232	C95V67VF900025B	Weihai Daewoo Electronics Co., Ltd.	-
MONITOR 2	I2269VWM	BEWD39A000147	L&T Display Technology(Fujian) LTD.	-
SPEAKER	SB-700Plus	-	WEMA INT	-
SPEAKER ADAPTOR	DZ036HL 180200K	-	KEERDA	-
NETWORK CAMERA	SND-E6031RP	-	SAMSUNG TECHWIN CO., LTD.	-
USB MEMORY	-	-	-	4 GB
Controller	SPC-1010	C50E67WD601003	SamSung Techwin Co.,Ltd.	-
Controller ADAPTOR	PA-120150SN	-	PERFECTPOWER CO., LTD.	-

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

1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
NETWORK VIDEO RECORDER (E.U.T)	HDMI	MONITOR 1	HDMI	1.4	S
	D-SUB	MONITOR 2	D-SUB	1.6	S
	AUDIO	SPEAKER	AUDIO	1.4	U
	USB 3.0	USB MEMORY	USB 3.0	-	-
	RJ-45	NETWORK CAMERA	RJ-45	3.0	U
	USB 2.0	MOUSE	USB 2.0	1.8	U
	2 PIN	Controller	2 PIN	3.0	U

* Unshielded=U, Shielded=S

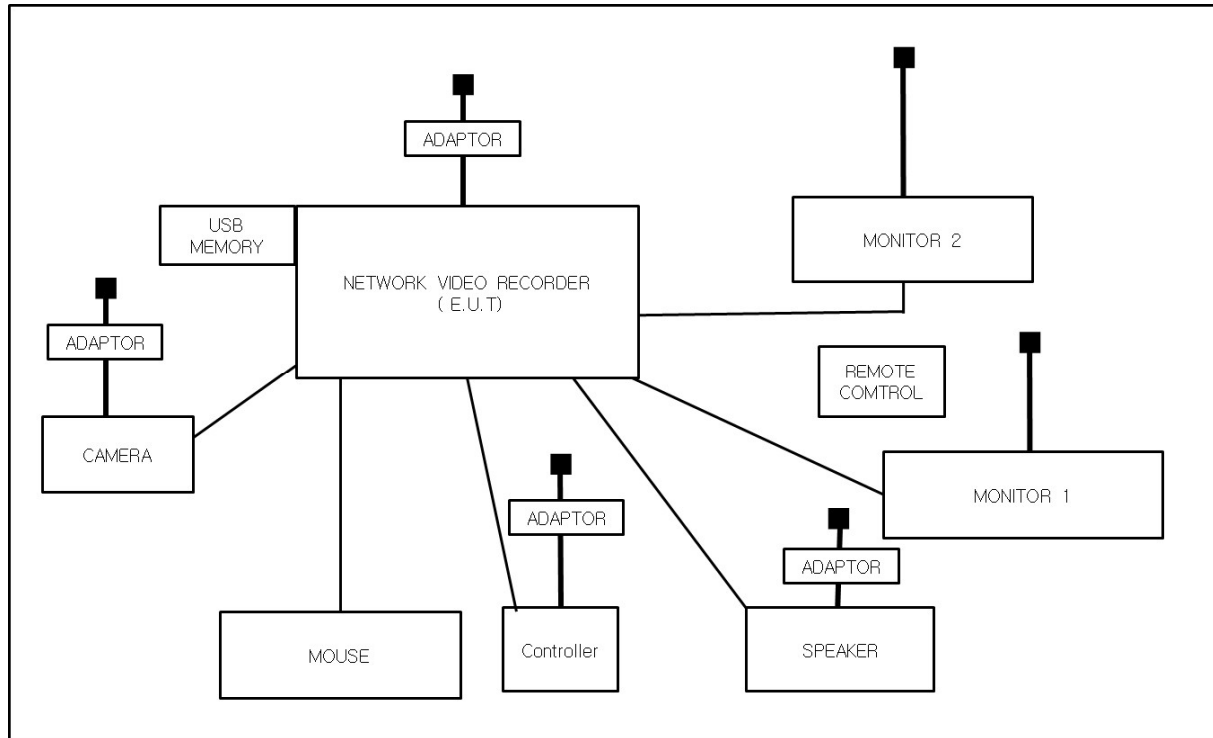
1.7 E.U.T Operating Mode(s)

Test mode	Normal operating
-	E.U.T Monitoring, 1 kHz

E.U.T Test operating S/W		
Name	Version	Manufacture Company
-	-	-

1.8 Configuration

■ AC Main
 □ DC Main



1.9 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.

1.10 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

1.11 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-4308, C-4798, T-2311, G-914
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 17 07 01633 001

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 +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 at Mains Power Ports

Test Date

Nov, 10, 2016

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test Receiver	ESR3	R & S	101783	05, 03, 2017
☒	LISN	ENV216	R & S	101137	02, 04, 2017
☒	LISN	ENV216	R & S	101786	05, 02, 2017
☒	Electro wave Shieldroom	-	SEMITEC	-	-
☒	EMI Test S/W	EMC32	R&S	9.12.00	-

Test Conditions

Temperature: 18,9 °C

Relative Humidity: 40,9 %

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

RemarksSee Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date

Nov, 10, 2016

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test Receiver	ESR3	R&S	101783	05, 03, 2017
☒	LISN	ENV216	R&S	101137	02, 04, 2017
☒	LISN	ENV216	R&S	101786	05, 02, 2017
☒	8-Wire ISN CAT3	CAT3 8158	Schwarzbeck Mess	8158-0019	04, 01, 2017
☒	8-Wire ISN CAT5	CAT5 8158	Schwarzbeck Mess	8158-0030	04, 01, 2017
☒	8-Wire ISN CAT6	NTFM 8158	Schwarzbeck Mess	8158-0029	08, 11, 2017
☒	Electro wave Shieldroom	-	SEMITEC	-	-
☒	EMI Test S/W	EMC32	R&S	9.12.00	-

Test Conditions

Temperature: 18,9 °C

Relative Humidity: 40,9 %

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

Nov, 10, 2016

Test Location☐ Open Area Test Site #1 ☒ Open Area Test Site #2**Test Equipment**

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI TEST Receiver	ESR3	R&S	101781	05, 03, 2017
☒	Trilog-Broadband ANT	VULB 9163	Schwarzbeck	9163-713	05, 15, 2017
☒	Open Area Test Site	-	KES	-	-
☒	Antenna Mast	-	DAEIL EMC	-	-
☒	Turn Table	-	DAEIL EMC	-	-
☒	EMI Test S/W	-	-	-	-

Test Conditions

Temperature: 10,9 °C

Relative Humidity: 53,0 %

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

Nov, 10, 2016

Test Location

Semi Anechoic Chamber #2

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM,INC	781	05, 07, 2017
☒	EMI Test Receiver	ESU26	R&S	100552	04, 24, 2017
☒	Broadband Coaxial Preamplifier	BBV 9718	Schwarzbeck Mess - Elektronik	9718-246	10, 14, 2017
☒	Semi Anechoic Chamber #2	-	SEMITEC	-	-
☒	Antenna Mast	-	AUDIX	-	-
☒	Turn Table	-	AUDIX	-	-
☒	EMI Test S/W	e3	AUDIX	8.083b	-

Test Conditions

Temperature: 18,9 °C

Relative Humidity: 40,9 %

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.

2.5 Harmonic Current Emissions

Test Date

Nov, 10, 2016

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	AC Source	ACS 500 N	EM TEST	V1024106760	08, 08, 2017
☒	Digital Power Analyzer	DPA 500 N	EM TEST	V1024106759	08, 08, 2017
☒	EMI Test S/W	dpa.control	EM TEST AG	5.4.8.0	-

Test Conditions

Temperature: 18,9 °C

Relative Humidity: 40,9 %

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

RemarksSee Appendix A for test data.



2.6 Voltage Fluctuations and Flicker

Test Date

Nov, 10, 2016

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	AC Source	ACS 500 N	EM test	V1024106760	08, 08, 2017
☒	Digital Power Analyzer	DPA 500 N	EM test	V1024106759	08, 08, 2017
☒	EMI Test S/W	dpa.control	EM TEST AG	5.4.8.0	-

Test Conditions

Temperature: 18,9 °C

Relative Humidity: 40,9 %

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011 +A1:2014 Alarm systems-Part 4: Electromagnetic compatibility Product family standard: Immunity requirements for components of fire, intruder and social alarm systems

The variety and the diversity of the apparatus within the scope of this document makes it difficult to define precise criteria for the evaluation of the immunity test results.

If as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance by the manufacture and noted in the test report, based on the following criteria:

Electrostatic discharge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing that is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Radiated electromagnetic fields

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing which could be interpreted by associated equipment as a change, and no such

Flickering of indicators occurs at a field strength of 3 V/m.

For components of CCTV systems, where the picture is allowed at 10 V/m, providing.

(a) there is no permanent damage or change to EUT

(e.g. no corruption of memory or changes to programmable setting etc.)

(b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and

(c) there is no observable deterioration of the picture at 1 V/m.

Fast transient burst / slow high energy voltage surge

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

Conducted RF immunity

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change,
and no such flickering of indicators oeuvres at $U = 130 \text{ dB}\mu\text{V}$.

For component of CCTV systems, where the status is monitored by observing the TV picture,
then deterioration of the picture is allowed at $U = 140 \text{ dB}\mu\text{V}$, providing:

- (a) there is no permanent damage or change to the EUT
(e.g. no corruption of memory or changes to programmable settings etc.)
- (b) at $U = 130 \text{ dB}\mu\text{V}$, any deterioration of the picture is so minor that the system could still be used; and
- (c) there in no observable deterioration of the picture at $U = 120 \text{ dB}\mu\text{V}$.

Voltage dip/interruption / Voltage variation

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the conditioning is permissible, providing that there is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change. The EUT shall meet the acceptance criteria for the functional test, after the conditioning.

3.1 Electrostatic Discharge

Reference Standard

EN 61000-4-2:2009

Test Date

Nov, 11, 2016

Test Location

EMS-ESD: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS05X4620	02, 24, 2017
☒	HCP	-	Noise Ken	-	-
☒	VCP	-	Noise Ken	-	-
☒	EMS Test S/W	N/A	N/A	N/A	-

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 42,9 %
Atmospheric Pressure: 100,5 kPa

Test Specifications

Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

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

Polarity: Positive and Negative

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

Discharge Voltage:

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

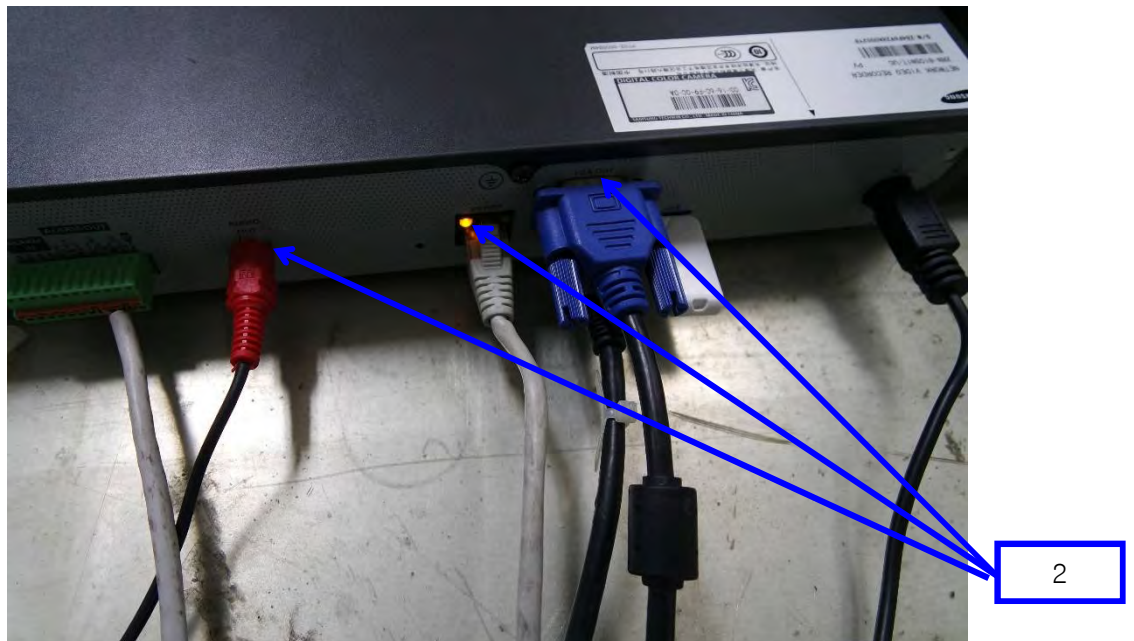
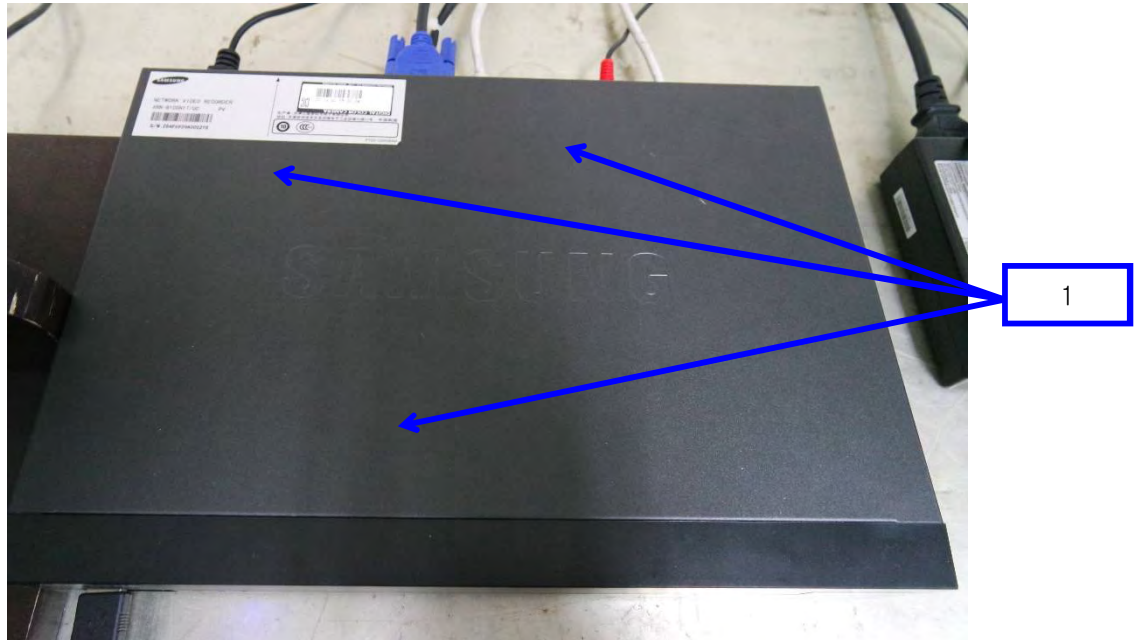
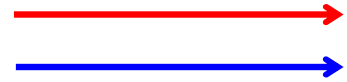
Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

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

Location of Discharge:

Air
Contact



**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-E1-16T0577-R3
Page (23) of (64)

Test Data**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	Surface	Contact Discharge	Complied	-
2	Ports	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

Nov, 11, 2016

Test Location

EMS-RS: ☐ Semi Anechoic Chamber #1 ☒ Semi Anechoic Chamber #2

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 08, 2017
☒	BROADBAND AMPLIFIER	BBA100	Rohde & Schwarz	101239	08, 08, 2017
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 08, 2017
☒	POWER METER	NRP2	Rohde & Schwarz	103475	08, 08, 2017
☒	AVG POWER SENSOR	NRP-Z91	Rohde & Schwarz	102526	08, 08, 2017
☒	AVG POWER SENSOR	NRP-Z91	Rohde & Schwarz	102527	08, 08, 2017
☒	Stacked Log.-Per.Antenna	STLP 9128 D	Schwarzbeck	9128D038	-
☒	DIRECTIONAL COUPLER	KYDC-D1070-DX40	Kytelecom Co., Ltd.	KY150001	08, 08, 2017
☒	Semi Anechoic Chamber #2	-	SEMITEC	-	-
☒	EMS Test S/W	EMC32	R&S	9.12.00	-

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 42,9 %
Atmospheric Pressure: 100,5 kPa

**KES Co., Ltd.**

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

Test report No.:
KES-E1-16T0577-R3
Page (25) of (64)

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

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

Nov, 11, 2016

Test Location

EMS-EFT: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	Ultra Compact Simulator	UCS 500 N5	EM TEST	V0936105120	06, 27, 2017
☒	Capacitive Coupling Clamp	HFK	EM TEST	070925	06, 27, 2017
☒	Motor Variac	MV2616	EM TEST	V0936105123	06, 27, 2017
☒	EMS Test S/W	iec.control	EM TEST AG	5.0.9.0	-

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 42,9 %
Atmospheric Pressure: 100,5 kPa

Test Specifications

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

**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-E1-16T0577-R3
Page (27) of (64)

Test Data

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

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

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

Nov, 11, 2016

Test Location

EMS-Surge: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	Ultra Compact Simulator	UCS 500 N5	EM TEST	V0936105120	06, 27, 2017
☒	Motor Variac	MV2616	EM TEST	V0936105123	06, 27, 2017
☐	CDN	CNV 504N	EM TEST	V0936105121	06, 27, 2017
☒	CDN	CNV 508T5	EM TEST	P1549168422	04, 27, 2017
☒	EMS Test S/W	iec.control	EM TEST AG	5.0.9.0	-

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 42,9 %
Atmospheric Pressure: 100,5 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

☒ Line to Line – Differential Mode

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

☐ Line to Earth – Common Mode

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

Signal Lines

☒ Line to Earth – Common Mode

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

Note: “Blank” = Not performed

Observations:

Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria.

3.5 Conducted Disturbance

Reference Standard

EN 61000-4-6:2014

Test Date

Nov, 11, 2016

Test Location

EMS-CS: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	Continuous Wave Generator	CWS 500N1	EM TEST	V0936105119	08, 08, 2017
☒	6 dB Attenuator	ATT6	EM TEST	1208-34	08, 08, 2017
☒	CDN	CDN-M2/M3N	EM TEST	0909-06	08, 08, 2017
☐	CDN	CDN-T2-RJ11	EM TEST	0909-07	08, 08, 2017
☐	CDN	CDN-T4	EM TEST	0909-08	08, 08, 2017
☐	CDN	CDN-T8RJ45	EM TEST	0909-09	08, 08, 2017
☐	CDN	CDN-AF2	EM TEST	0909-10	08, 08, 2017
☐	CDN	CDN-AF4	EM TEST	0909-11	08, 08, 2017
☒	EM Injection Clamp	EM 101	Liithi	35943	02, 04, 2017
☒	EMS Test S/W	icd.control	EM TEST AG	5.3.7	

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 42,9 %
Atmospheric Pressure: 100,5 kPa



KES Co., Ltd.

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

Test report No.:
KES-E1-16T0577-R3
Page (32) of (64)

Test Specifications

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

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

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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ Complied

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

Test Data☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L - N - PE	CDN (☐ M2, ☒ M3)	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
-	CDN (☐ M2, ☐ M3)	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	EM Injection 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

Nov, 11, 2016

Test Location

EMS-Voltage dip: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	Ultra Compact Simulator	UCS 500 N5	EM TEST	V0936105120	06, 27, 2017
☒	Motor Variac	MV2616	EM TEST	V0936105123	06, 27, 2017
☒	EMS Test S/W	iec.control	EM TEST AG	5.0.9.0	-

Test Conditions

Temperature: 19,7 °C
Relative Humidity: 42,9 %
Atmospheric Pressure: 100,5 kPa

**KES Co., Ltd.**

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

Test report No.:
KES-E1-16T0577-R3
Page (35) of (64)

Test Specifications & Observations/Remarks

(Test Voltage : 50 Hz)

<u>Test Level</u>	<u>Duration [in period/ms (50 Hz)]</u>	<u>Results</u>
☒ 20 % dip	☒ 250 /5000	<u>Complied</u>
☒ 30 % dip	☒ 25 /500	<u>Complied</u>
☒ 60 % dip	☒ 10 /200	<u>Complied</u>
☒ 100 % dip	☒ 250 /5000	<u>Complied</u>

- Voltage variations

☒ Unom + 10 %	☒ 253 V (ac)	<u>Complied</u>
☒ Unom - 15 %	☒ 195.5 V (ac)	<u>Complied</u>

Observations:
Complied – No degradation of function

Test Results

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

Remarks

PASS Required Performance Criteria.

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

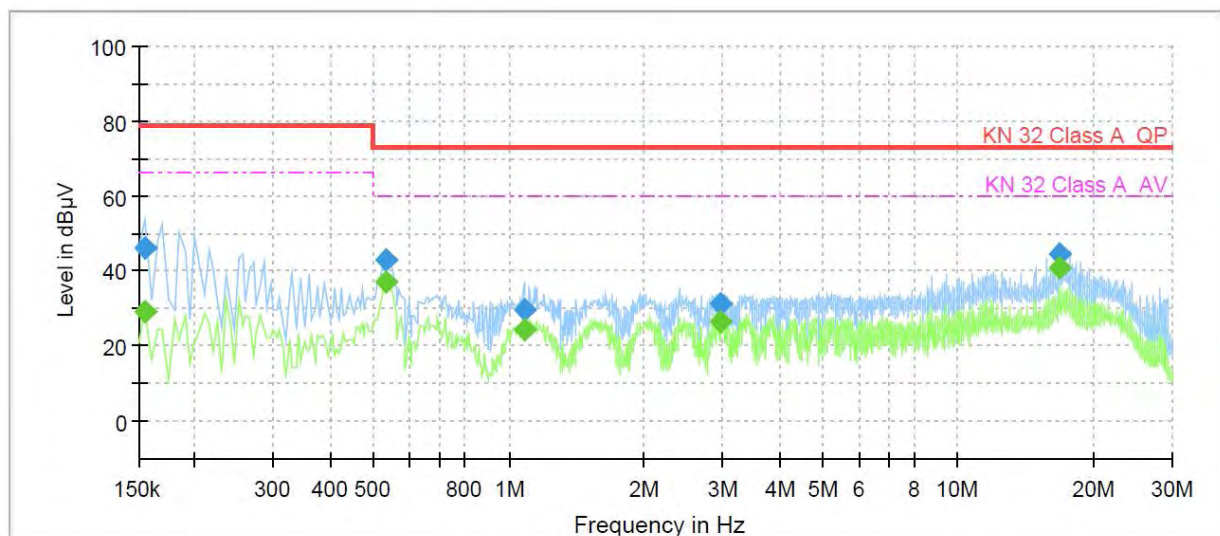
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

Test Description: Conducted Emission
Model No.: QRN-810P
Mode
Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.155000	---	28.88	66.00	37.12	1000.0	9.000	L1	9.7
0.155000	45.99	---	79.00	33.01	1000.0	9.000	L1	9.7
0.530000	---	37.23	60.00	22.77	1000.0	9.000	L1	9.8
0.530000	43.12	---	73.00	29.88	1000.0	9.000	L1	9.8
1.080000	---	24.43	60.00	35.57	1000.0	9.000	L1	9.9
1.080000	29.71	---	73.00	43.29	1000.0	9.000	L1	9.9
2.950000	---	26.33	60.00	33.67	1000.0	9.000	L1	10.1
2.950000	31.10	---	73.00	41.90	1000.0	9.000	L1	10.1
16.745000	---	40.52	60.00	19.48	1000.0	9.000	L1	10.0
16.745000	44.57	---	73.00	28.43	1000.0	9.000	L1	10.0

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

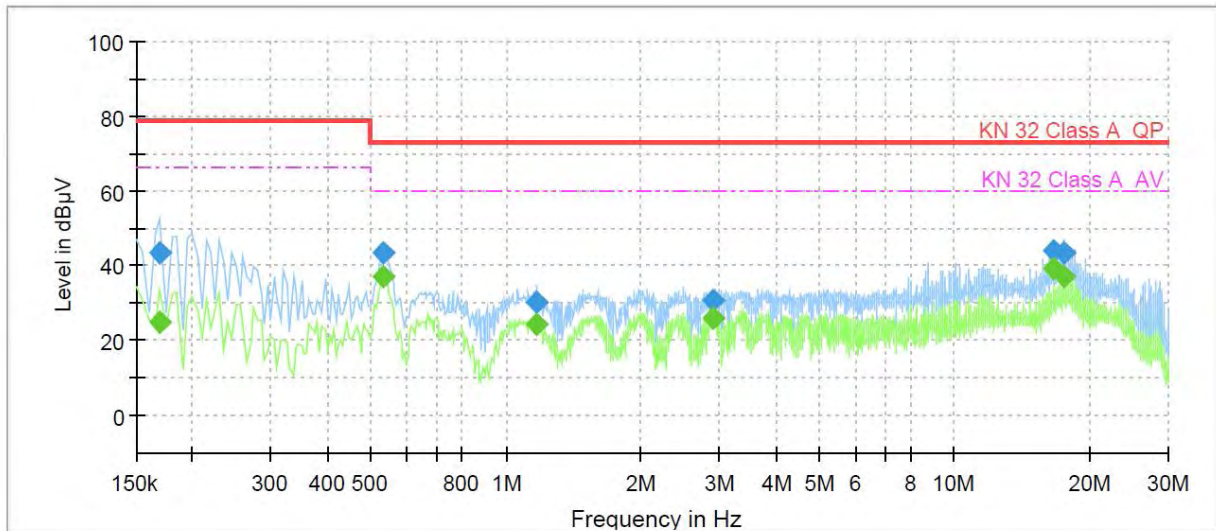
Corr. : Correction values (LISN FACTOR+ Cable Loss)

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

[NEUTRAL]

Common Information

Test Description: Conducted Emission
Model No.: QRN-810P
Mode
Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.170000	---	25.09	66.00	40.91	1000.0	9.000	N	9.7
0.170000	43.65	---	79.00	35.35	1000.0	9.000	N	9.7
0.535000	---	37.08	60.00	22.92	1000.0	9.000	N	9.8
0.535000	43.39	---	73.00	29.61	1000.0	9.000	N	9.8
1.170000	---	24.36	60.00	35.64	1000.0	9.000	N	9.9
1.170000	30.18	---	73.00	42.82	1000.0	9.000	N	9.9
2.905000	---	25.80	60.00	34.20	1000.0	9.000	N	10.0
2.905000	30.68	---	73.00	42.32	1000.0	9.000	N	10.0
16.660000	---	39.35	60.00	20.65	1000.0	9.000	N	10.0
16.660000	44.11	---	73.00	28.89	1000.0	9.000	N	10.0
17.610000	---	37.22	60.00	22.78	1000.0	9.000	N	10.0
17.610000	43.59	---	73.00	29.41	1000.0	9.000	N	10.0

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

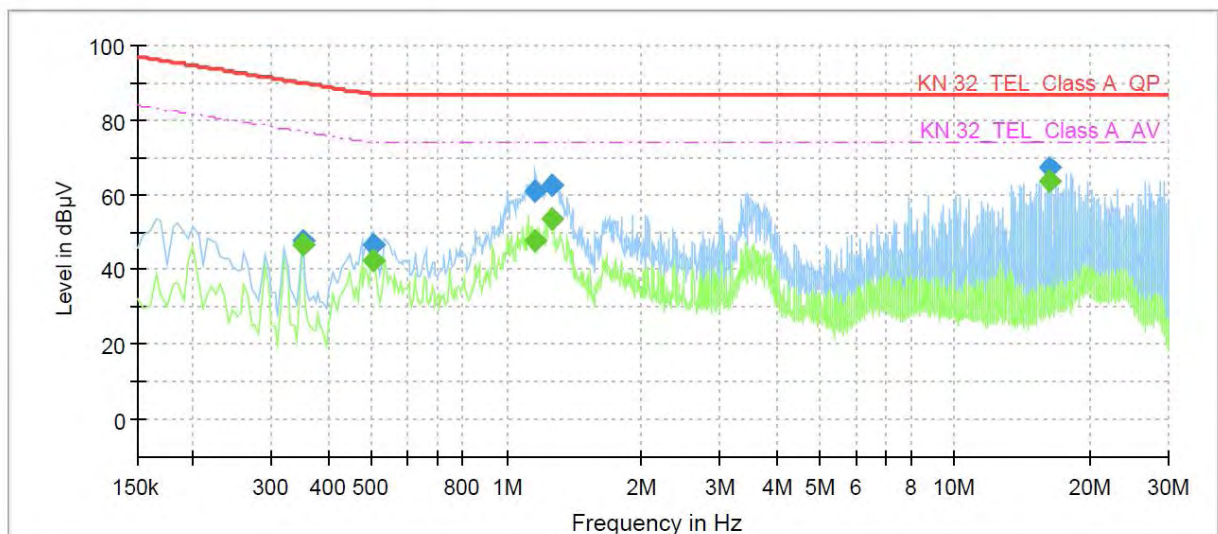
Corr. : Correction values (LISN FACTOR+ Cable Loss)

Conducted Emissions at Telecommunication Ports

[10 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	QRN-810P
Mode	10M
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.350000	---	46.69	76.96	30.27	1000.0	9.000	Single Line	10.1
0.350000	47.86	---	89.96	42.10	1000.0	9.000	Single Line	10.1
0.505000	---	42.35	74.00	31.65	1000.0	9.000	Single Line	10.1
0.505000	46.52	---	87.00	40.48	1000.0	9.000	Single Line	10.1
1.160000	---	47.73	74.00	26.27	1000.0	9.000	Single Line	10.1
1.160000	60.67	---	87.00	26.33	1000.0	9.000	Single Line	10.1
1.260000	---	53.61	74.00	20.39	1000.0	9.000	Single Line	10.1
1.260000	62.54	---	87.00	24.46	1000.0	9.000	Single Line	10.1
16.230000	---	63.69	74.00	10.31	1000.0	9.000	Single Line	10.0
16.230000	67.05	---	87.00	19.95	1000.0	9.000	Single Line	10.0

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

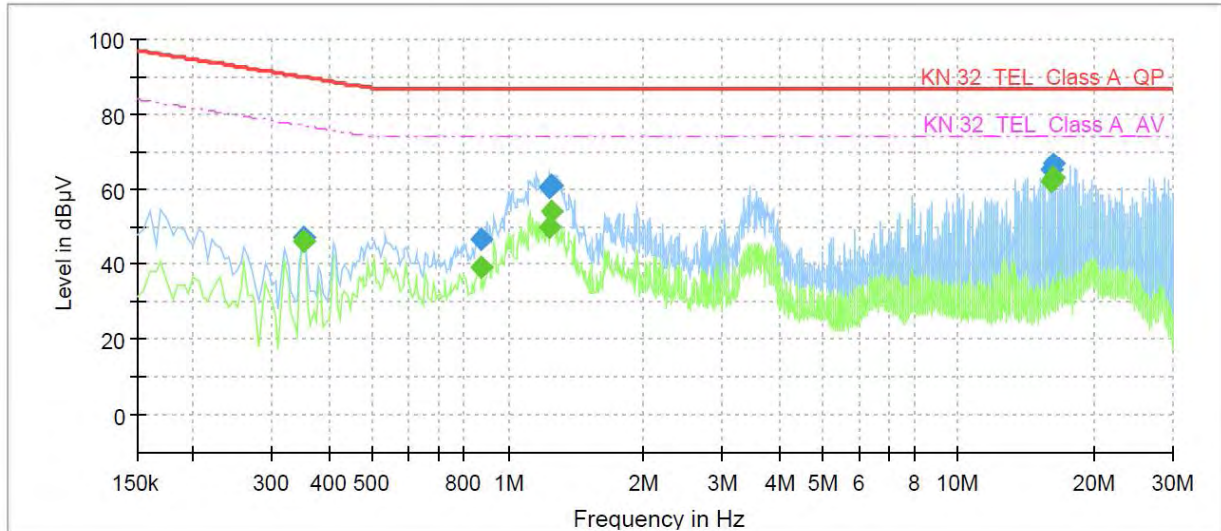
Reading Value : Not shown in the table.

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

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	QRN-810P
Mode	100M
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.350000	---	45.87	76.96	31.09	1000.0	9.000	Single Line	9.6
0.350000	47.18	---	89.96	42.78	1000.0	9.000	Single Line	9.6
0.870000	---	39.24	74.00	34.76	1000.0	9.000	Single Line	9.6
0.870000	46.59	---	87.00	40.41	1000.0	9.000	Single Line	9.6
1.240000	---	49.58	74.00	24.42	1000.0	9.000	Single Line	9.6
1.240000	60.10	---	87.00	26.90	1000.0	9.000	Single Line	9.6
1.250000	---	53.91	74.00	20.09	1000.0	9.000	Single Line	9.6
1.250000	60.96	---	87.00	26.04	1000.0	9.000	Single Line	9.6
16.165000	---	61.93	74.00	12.07	1000.0	9.000	Single Line	9.5
16.165000	65.22	---	87.00	21.78	1000.0	9.000	Single Line	9.5
16.230000	---	63.14	74.00	10.86	1000.0	9.000	Single Line	9.5
16.230000	66.51	---	87.00	20.49	1000.0	9.000	Single Line	9.5

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

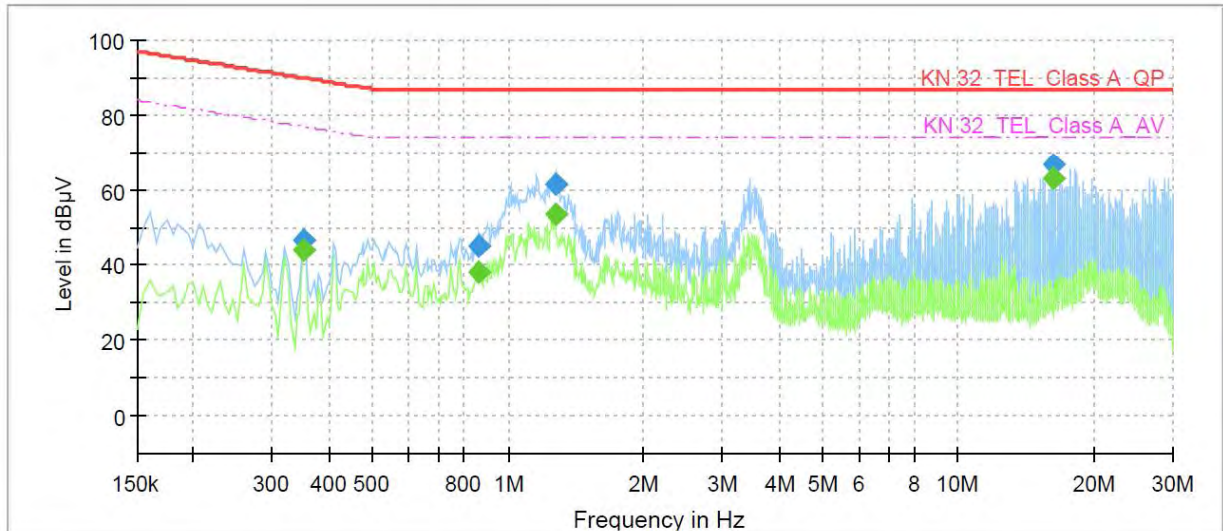
Reading Value : Not shown in the table.

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

[1000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	QRN-810P
Mode	1000M
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.350000	---	44.03	76.96	32.93	1000.0	9.000	Single Line	9.5
0.350000	46.44	---	89.96	43.52	1000.0	9.000	Single Line	9.5
0.865000	---	37.91	74.00	36.09	1000.0	9.000	Single Line	9.5
0.865000	45.06	---	87.00	41.94	1000.0	9.000	Single Line	9.5
1.270000	---	53.42	74.00	20.58	1000.0	9.000	Single Line	9.5
1.270000	61.48	---	87.00	25.52	1000.0	9.000	Single Line	9.5
16.230000	---	63.18	74.00	10.82	1000.0	9.000	Single Line	9.4
16.230000	66.51	---	87.00	20.49	1000.0	9.000	Single Line	9.4

◆ 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)



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-E1-16T0577-R3
Page (41) of (64)

Radiated Electric Field Emissions(Below 1 GHz)

Frequency	Amplitude	ANT	ANT. Height	Correction Factor		Corrected Amplitude	Applicable Limit	Margin [dB]
[MHz]	[dB μ V]	Polar. (H/V)	[m]	ANT. [dB/m]	Cable [dB]	[dB μ V/m]	[dB μ V/m]	
156.17	11.58	V	2.14	8.42	3.65	23.65	40.00	16.35
212.21	17.25	H	2.33	11.57	4.26	33.08	40.00	6.92
276.28	13.58	H	1.25	12.92	4.95	31.45	47.00	15.55
284.08	13.25	V	2.37	13.07	5.01	31.33	47.00	15.67
341.29	12.01	V	1.25	14.34	5.55	31.90	47.00	15.10
350.08	12.08	H	2.01	14.54	5.64	32.26	47.00	14.74
371.34	14.98	V	1.95	15.04	5.87	35.89	47.00	11.11
400.50	11.99	H	3.01	15.71	6.18	33.88	47.00	13.12

* H : Horizontal, V : Vertical

◆ Calculation

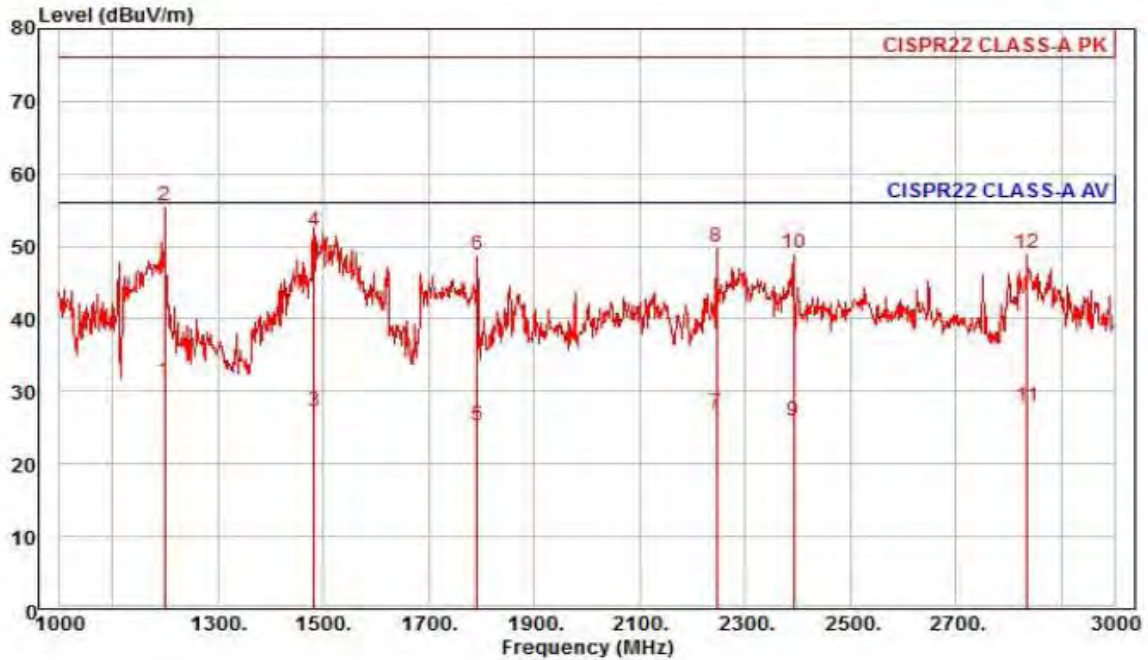
Corrected Amplitude [dB μ V] = Amplitude[dB μ V] + Correction Factor [dB]

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

Radiated Electric Field Emissions(Above 1 GHz)



Site : chamber
Condition: CISPR22 CLASS-A PK 3m HORN781(2015.05.07) horizontal
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : QRN-810P
Mode :
Memo : 1 - 3 GHz

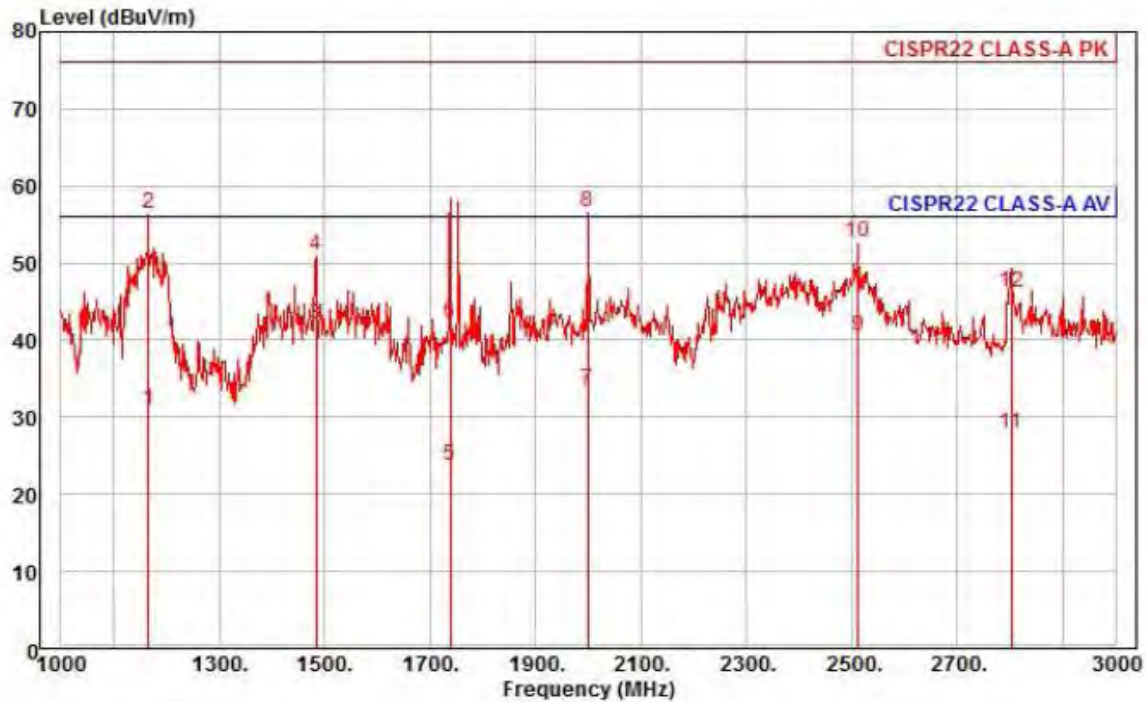
		Read	Ant	Cable	Preamp	TPos	Limit	Over		
	Freq	Level	Factor	Loss	Factor		Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	deg	dBuV/m	dB		
1	av	1200.00	39.16	24.70	7.14	39.61	152	56.00	-24.61	horizontal Average
2	pp	1200.00	63.35	24.70	7.14	39.61	152	76.00	-20.42	horizontal Peak
3		1482.00	32.74	25.82	7.96	39.17	61	56.00	-28.65	horizontal Average
4		1482.00	57.50	25.82	7.96	39.17	61	76.00	-23.89	horizontal Peak
5		1792.00	28.80	27.05	8.81	39.31	41	56.00	-30.65	horizontal Average
6		1792.00	52.21	27.05	8.81	39.31	41	76.00	-27.24	horizontal Peak
7		2246.00	28.09	28.48	9.92	39.42	63	56.00	-28.93	horizontal Average
8		2246.00	50.83	28.48	9.92	39.42	63	76.00	-26.19	horizontal Peak
9		2392.00	26.33	28.84	10.30	39.42	69	56.00	-29.95	horizontal Average
10		2392.00	49.30	28.84	10.30	39.42	69	76.00	-26.98	horizontal Peak
11		2836.00	26.68	29.93	11.32	39.92	63	56.00	-27.99	horizontal Average
12		2836.00	47.79	29.93	11.32	39.92	63	76.00	-26.88	horizontal Peak

◆ Calculation

Over Limit [dB] = (Read Level[dBuV] + Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line[dBuV]

Over Limit : Margin Value, Read Level : Reading Value, Ant Factor : Ant Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

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



Site : chamber
Condition: CISPR22 CLASS-A PK 3m HORN781(2015.05.07) vertical
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : QRN-810P
Mode :
Memo : 1 ~ 3 GHz

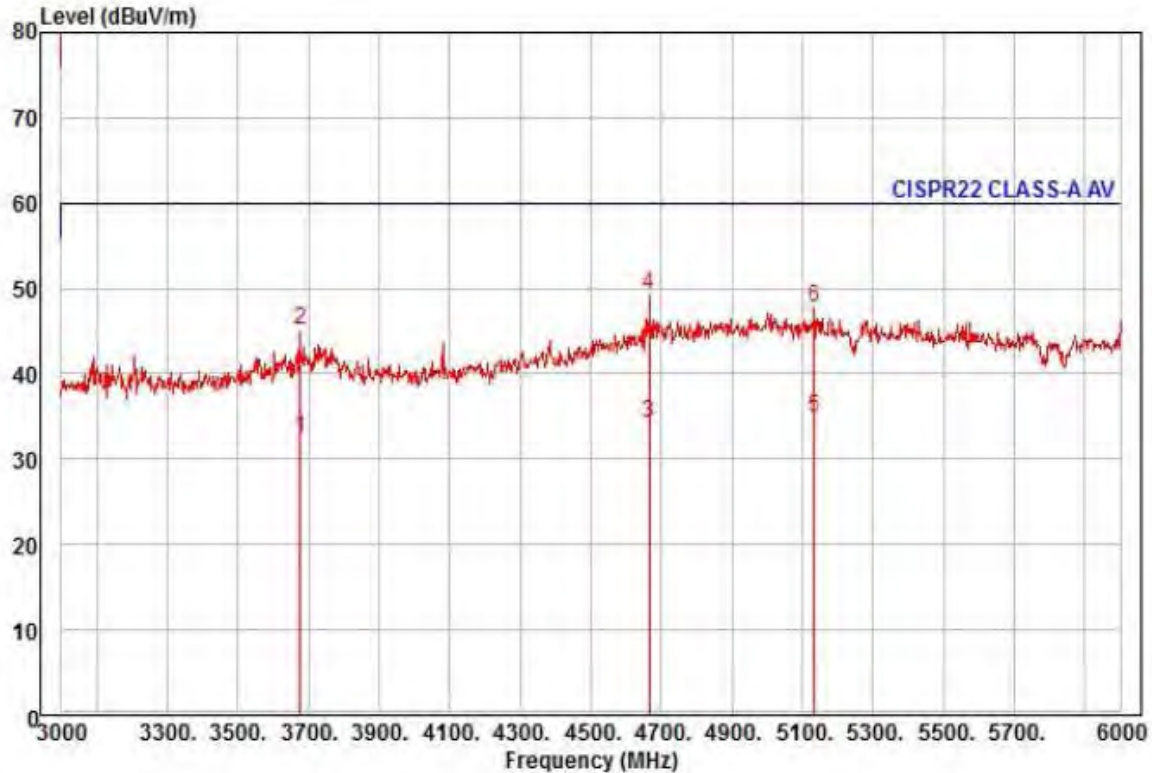
	Read Freq	Ant Level	Ant Factor	Cable Loss	Preamp Factor	TPos	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	deg	dBuV/m	dB		
1	1166.00	39.03	24.57	7.03	39.69	18	56.00	-25.06	vertical	Average
2	1166.00	64.58	24.57	7.03	39.69	18	76.00	-19.51	vertical	Peak
3 pp	1484.00	47.52	25.83	7.97	39.17	349	56.00	-13.85	vertical	Average
4	1484.00	56.34	25.83	7.97	39.17	349	76.00	-25.03	vertical	Peak
5	1738.00	27.44	26.84	8.67	39.29	70	56.00	-32.34	vertical	Average
6	1738.00	46.10	26.84	8.67	39.29	70	76.00	-33.68	vertical	Peak
7	2000.00	35.83	27.88	9.34	39.41	124	56.00	-22.36	vertical	Average
8 pk	2000.00	58.79	27.88	9.34	39.41	124	76.00	-19.40	vertical	Peak
9	2512.00	40.42	29.13	10.56	39.55	205	56.00	-15.44	vertical	Average
10	2512.00	52.50	29.13	10.56	39.55	205	76.00	-23.36	vertical	Peak
11	2802.00	26.65	29.84	11.24	39.88	200	56.00	-28.15	vertical	Average
12	2802.00	45.10	29.84	11.24	39.88	200	76.00	-29.70	vertical	Peak

◆ Calculation

Over Limit [dB] = (Read Level[dBuV] + Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line[dBuV]

Over Limit : Margin Value, Read Level : Reading Value, Ant Factor : Ant Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

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



Site : chamber
Condition: CISPR22 CLASS-A PK 3m HORN781(2015.05.07) horizontal
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : QRN-810P
Mode :
Memo : 3 - 6 GHz

	Freq	Read Level	Ant Factor	Cable Loss	Preamp Factor	TPos	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	deg	dBuV/m	dB		
1	3678.00	28.79	31.47	12.95	40.82	253	60.00	-27.61	horizontal	Average
2	3678.00	41.61	31.47	12.95	40.82	253	80.00	-34.79	horizontal	Peak
3	4665.00	24.27	35.81	14.80	40.60	129	60.00	-25.72	horizontal	Average
4 pk	4665.00	39.20	35.81	14.80	40.60	129	80.00	-30.79	horizontal	Peak
5 pp	5133.00	22.41	37.45	15.58	40.49	260	60.00	-25.05	horizontal	Average
6	5133.00	35.10	37.45	15.58	40.49	260	80.00	-32.36	horizontal	Peak

◆ Calculation

Over Limit [dB] = (Read Level[dBuV] + Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line[dBuV]

Over Limit : Margin Value, Read Level : Reading Value, Ant Factor : Ant Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

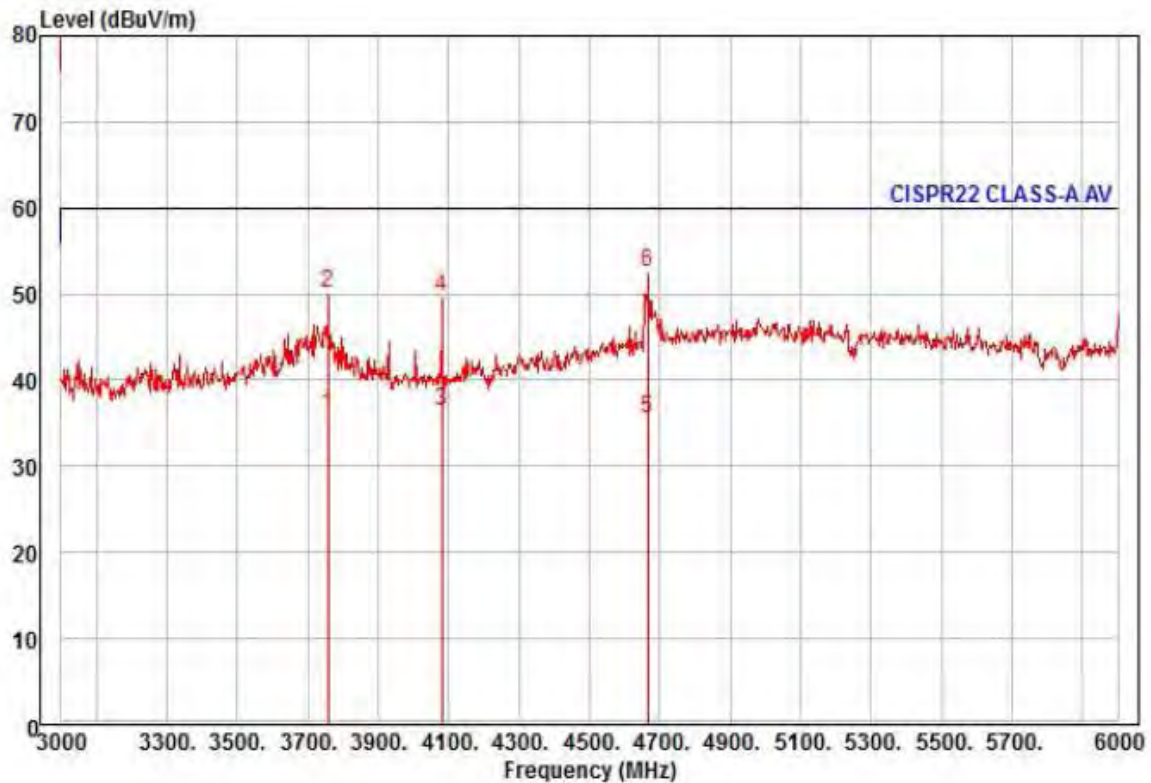
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

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

Test report No.:
KES-E1-16T0577-R3
Page (45) of (64)



Site : chamber
Condition: CISPR22 CLASS-A PK 3m HORN781(2015.05.07) vertical
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : QRN-810P
Mode :
Memo : 3 - 6 GHz

	Read	Ant	Cable	Preamp	TPos	Limit	Over		
Freq	Level	Factor	Loss	Factor		Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	deg	dBuV/m	dB		
1	3759.00	31.95	31.61	13.10	40.79	168	60.00	-24.13	vertical
2	3759.00	46.24	31.61	13.10	40.79	168	80.00	-29.84	vertical
3 pp	4080.00	30.85	32.47	13.72	40.71	162	60.00	-23.67	vertical
4	4080.00	44.31	32.47	13.72	40.71	162	80.00	-30.21	vertical
5	4665.00	25.44	35.81	14.80	40.60	133	60.00	-24.55	vertical
6 pk	4665.00	42.52	35.81	14.80	40.60	133	80.00	-27.47	vertical

◆ Calculation

Over Limit [dB] = (Read Level[dBuV] + Ant Factor[dB/m] + Cable Loss [dB] - Preamp Factor [dB]) - Limit Line[dBuV]

Over Limit : Margin Value, Read Level : Reading Value, Ant Factor : Ant Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

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

**Harmonic Current Emissions and Voltage Fluctuations and Flicker*****Average harmonic current results***

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	41.368E-3			
2	4.403E-3			PASS
3	31.995E-3	1.030	3.10	PASS
4	3.505E-3			PASS
5	31.561E-3	2.051	1.54	PASS
6	4.586E-3			PASS
7	31.111E-3	2.993	1.04	PASS
8	3.863E-3			PASS
9	30.403E-3	5.630	540.00E-3	PASS
10	3.175E-3			PASS
11	29.603E-3	6.645	445.50E-3	PASS
12	3.288E-3			PASS
13	28.601E-3	10.088	283.50E-3	PASS
14	3.427E-3			PASS
15	27.405E-3	13.534	202.50E-3	PASS
16	3.288E-3			PASS
17	26.328E-3	14.735	178.67E-3	PASS
18	3.193E-3			PASS
19	25.028E-3	15.656	159.87E-3	PASS
20	2.968E-3			PASS
21	23.331E-3	16.130	144.64E-3	PASS
22	2.785E-3			PASS
23	22.066E-3	16.708	132.07E-3	PASS
24	2.604E-3			PASS
25	20.522E-3	16.890	121.50E-3	PASS
26	2.362E-3			PASS
27	18.776E-3	16.690	112.50E-3	PASS
28	2.288E-3			PASS
29	17.375E-3	16.588	104.75E-3	PASS
30	2.004E-3			PASS
31	15.697E-3	16.020	97.98E-3	PASS
32	1.755E-3			PASS
33	14.073E-3	15.290	92.04E-3	PASS
34	1.689E-3			PASS
35	12.679E-3	14.608	86.79E-3	PASS
36	1.340E-3			PASS
37	11.021E-3	13.426	82.09E-3	PASS
38	1.195E-3			PASS
39	9.690E-3	12.441	77.88E-3	PASS
40	1.064E-3			PASS

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.

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

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

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



Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	43.021E-3			
2	5.104E-3	0.158	3.24	PASS
3	34.533E-3	0.500	6.90	PASS
4	4.719E-3			PASS
5	33.810E-3	0.989	3.42	PASS
6	5.391E-3	0.599	900.00E-3	PASS
7	33.182E-3	1.436	2.31	PASS
8	4.393E-3			PASS
9	32.816E-3	2.735	1.20	PASS
10	4.702E-3			PASS
11	31.961E-3	3.228	990.00E-3	PASS
12	4.150E-3			PASS
13	30.787E-3	4.887	630.00E-3	PASS
14	3.893E-3			PASS
15	29.186E-3	6.486	450.00E-3	PASS
16	3.723E-3			PASS
17	27.877E-3	7.021	397.05E-3	PASS
18	3.659E-3			PASS
19	26.546E-3	7.472	355.26E-3	PASS
20	3.372E-3			PASS
21	24.769E-3	7.706	321.42E-3	PASS
22	3.225E-3			PASS
23	23.350E-3	7.956	293.49E-3	PASS
24	3.004E-3			PASS
25	21.650E-3	8.019	270.00E-3	PASS
26	2.711E-3			PASS
27	19.780E-3	7.912	249.99E-3	PASS
28	2.690E-3			PASS
29	18.319E-3	7.870	232.77E-3	PASS
30	2.363E-3			PASS
31	16.416E-3	7.539	217.74E-3	PASS
32	2.057E-3			PASS
33	14.790E-3	7.231	204.54E-3	PASS
34	2.001E-3			PASS
35	13.261E-3	6.876	192.87E-3	PASS
36	1.610E-3			PASS
37	11.331E-3	6.211	182.43E-3	PASS
38	1.437E-3			PASS
39	9.952E-3	5.750	173.07E-3	PASS
40	1.316E-3			PASS

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.

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

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

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

**KES Co., Ltd.**

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

Test report No.:
KES-E1-16T0577-R3
Page (48) of (64)

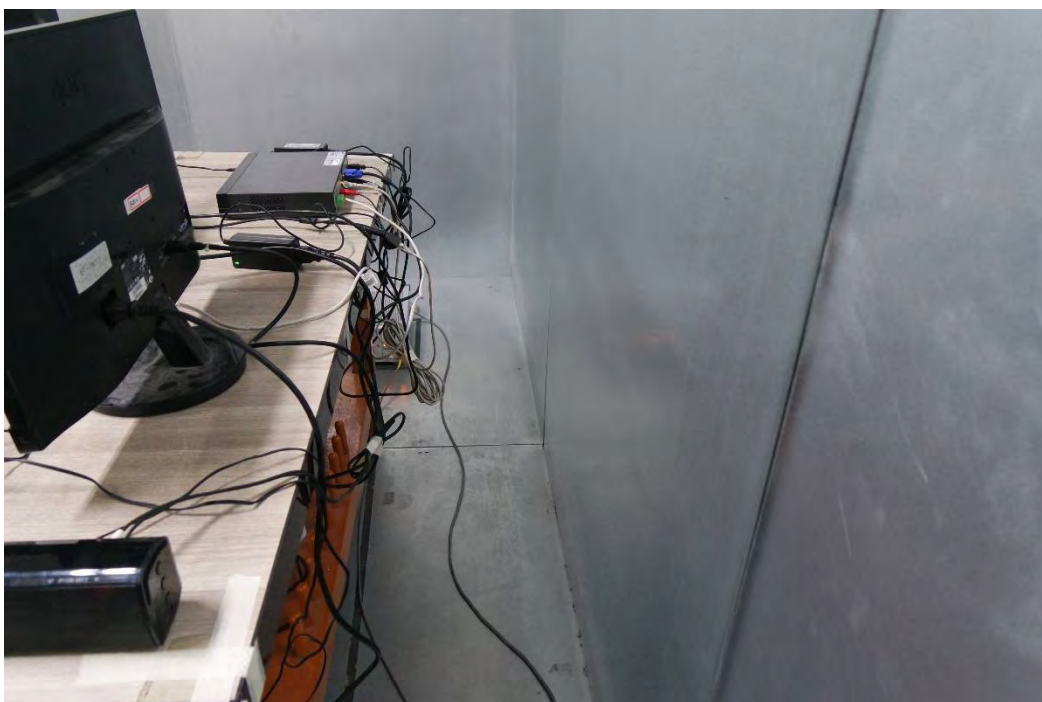
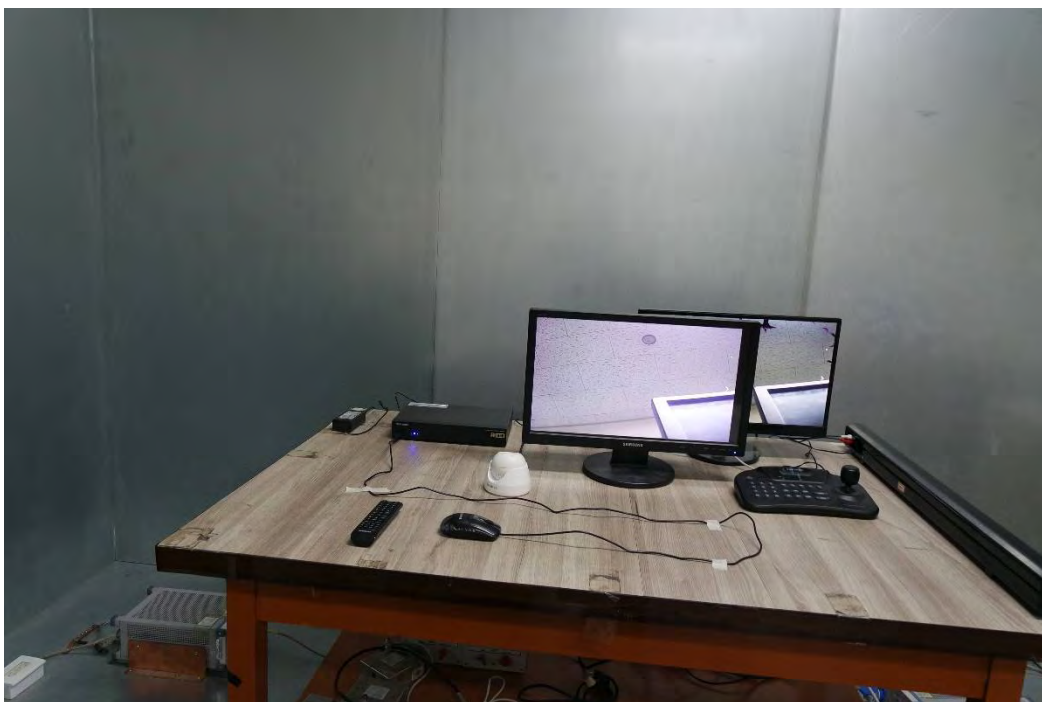
Test Data - Voltage Fluctuations**Maximum Flicker results**

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.035	4.00	PASS
Tmax [s]	0.000	0.50	PASS

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

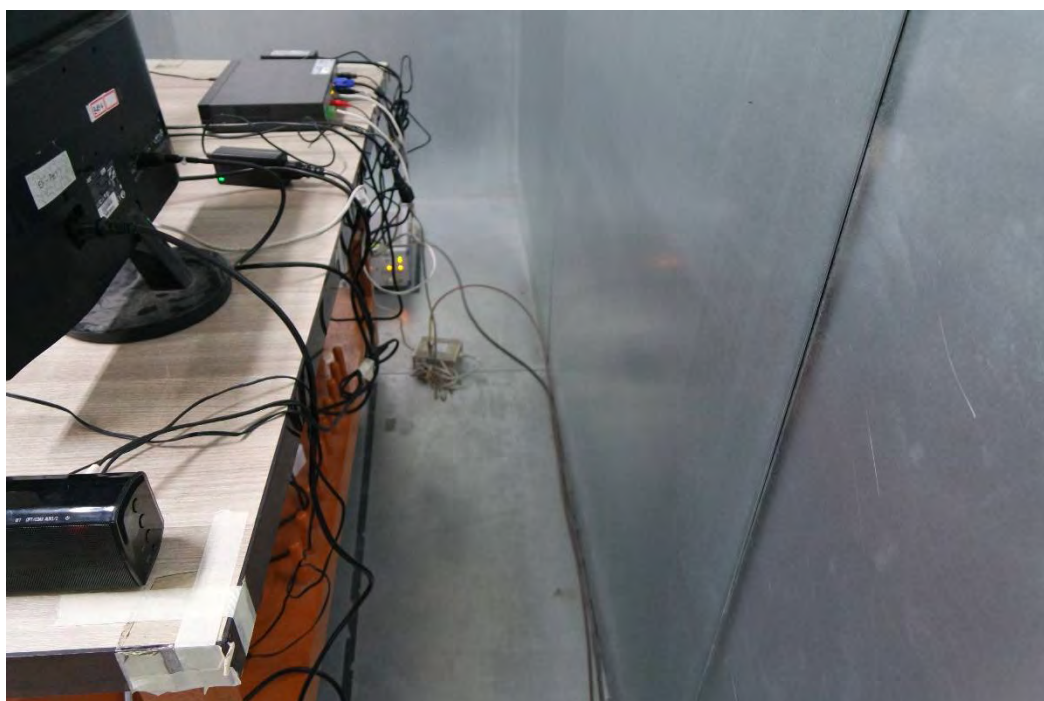
Test Setup Photos and Configuration

Conducted Voltage Emissions



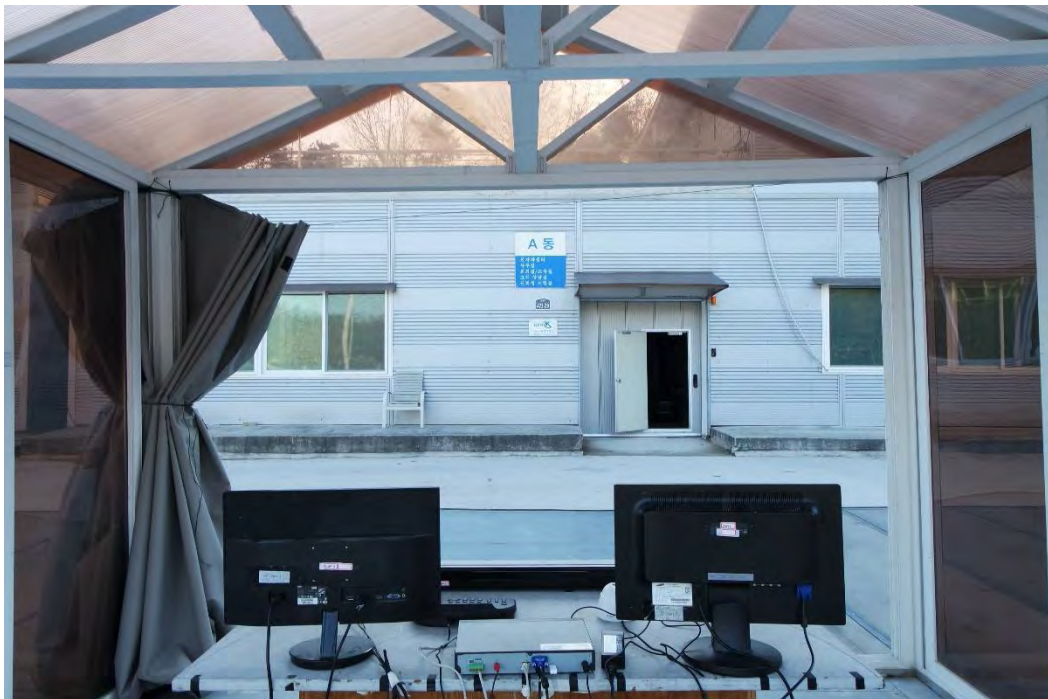
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Conducted Telecommunication Emissions



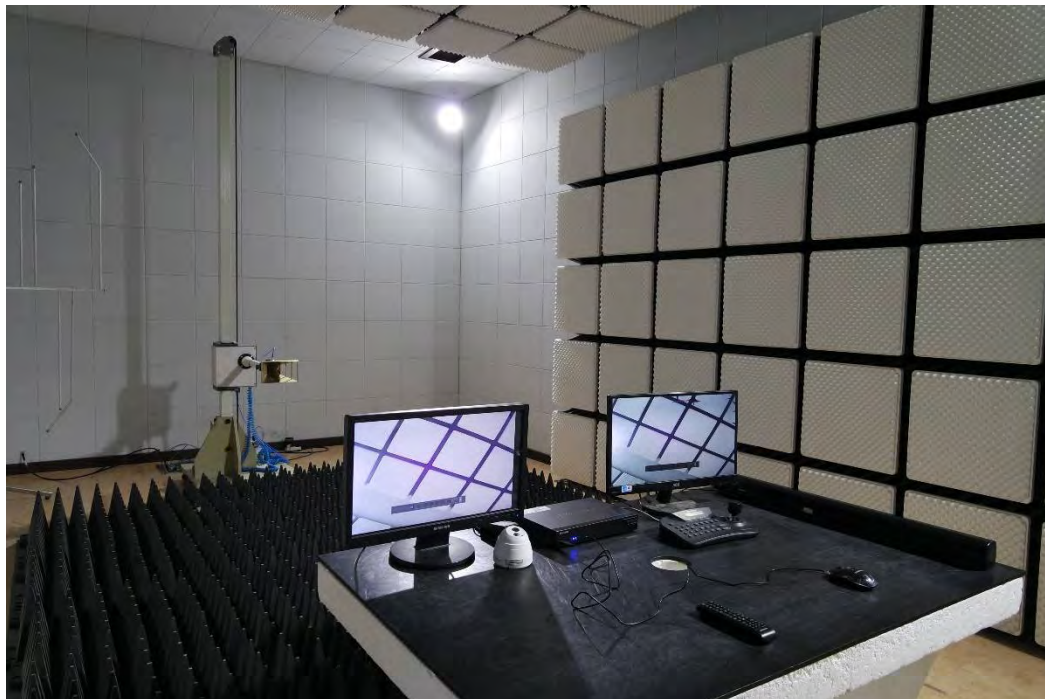
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

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

Radiated Electric Field Emissions(Above 1 GHz)

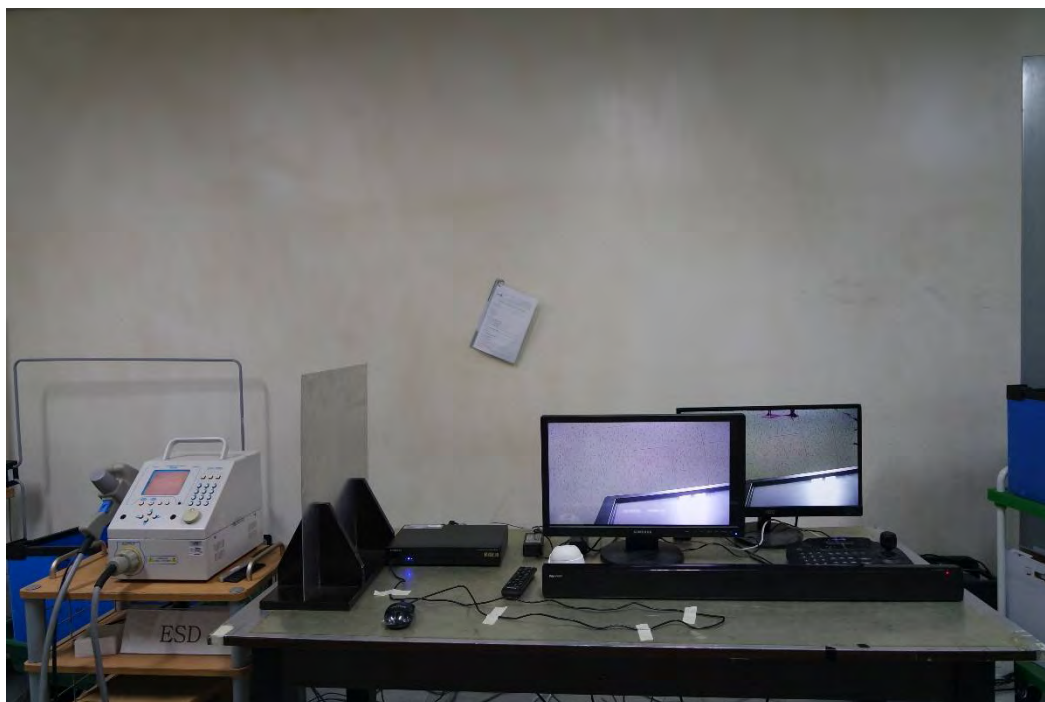


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Harmonic Current Emissions and Voltage Fluctuations and Flicker



Electrostatic Discharge



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

Radiated Electric Field Immunity



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

Electrical Fast Transients/Bursts



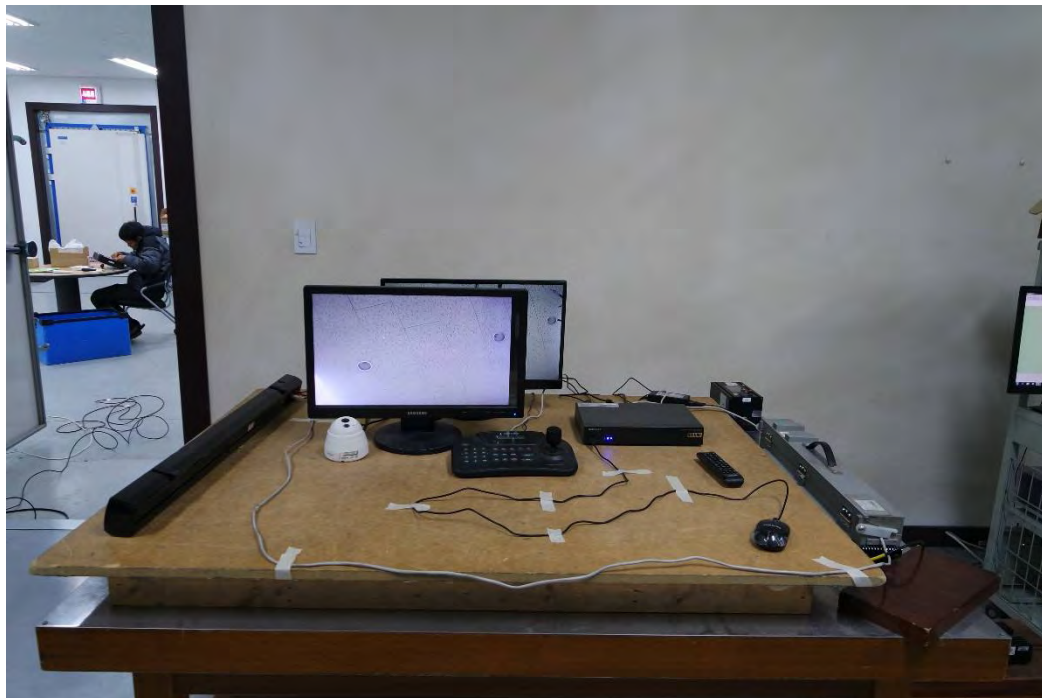
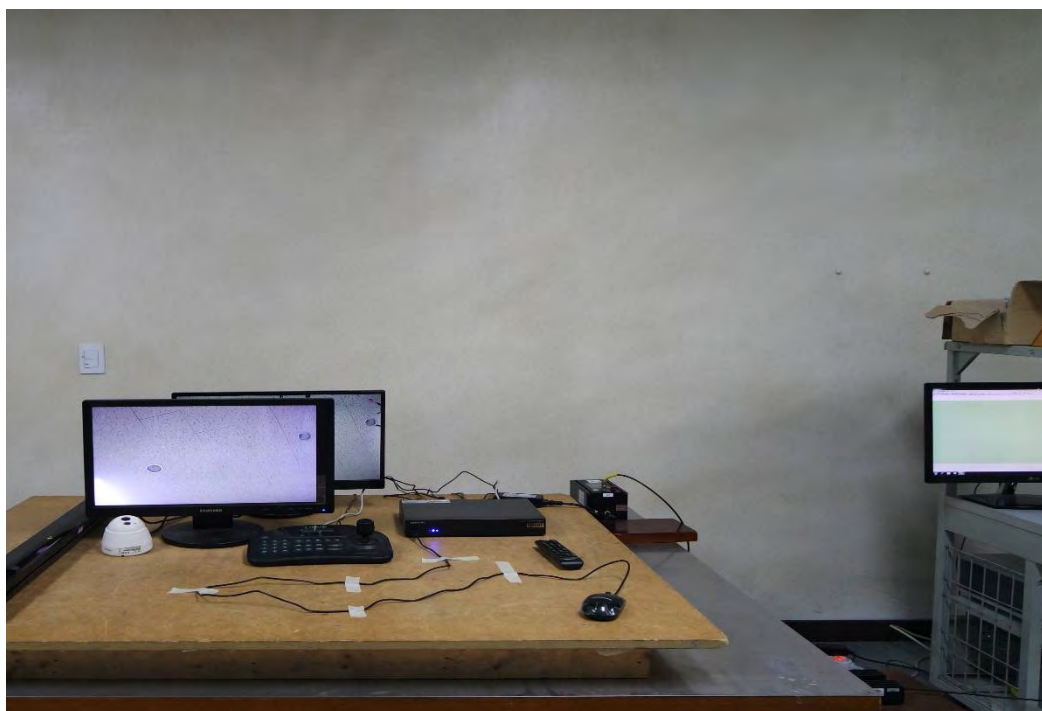
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Surge Transients



N/A

Conducted Disturbance



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

Voltage Dips and Short Interruptions



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

EUT External Photographs

(Top)



(Bottom)



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

EUT Internal Photographs

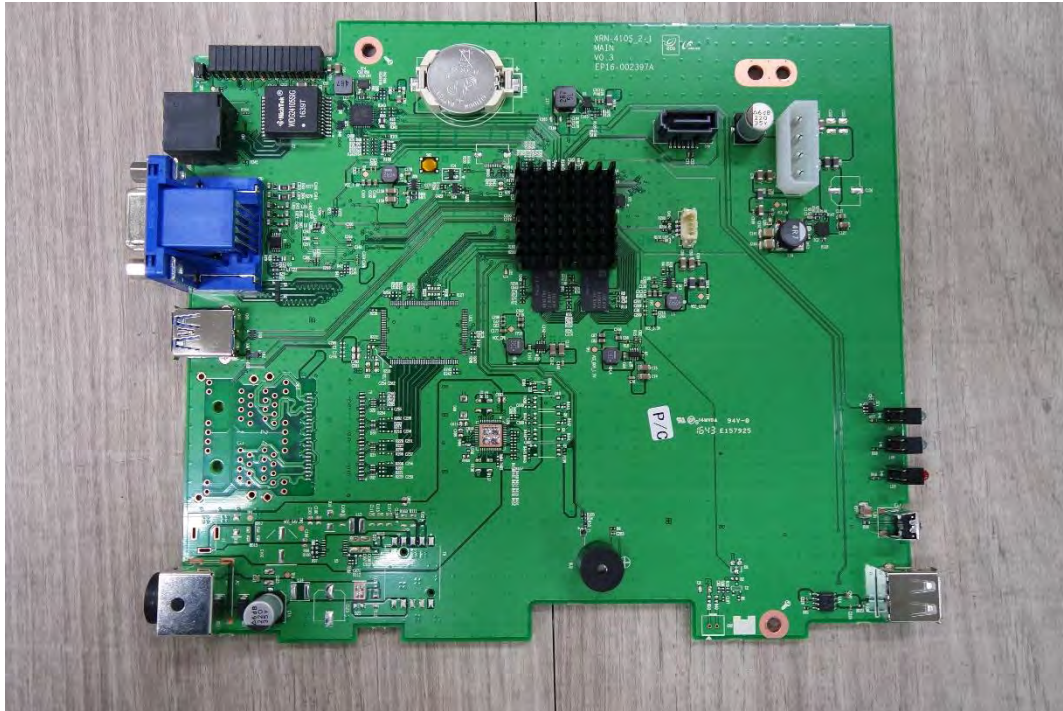
(Internal View)



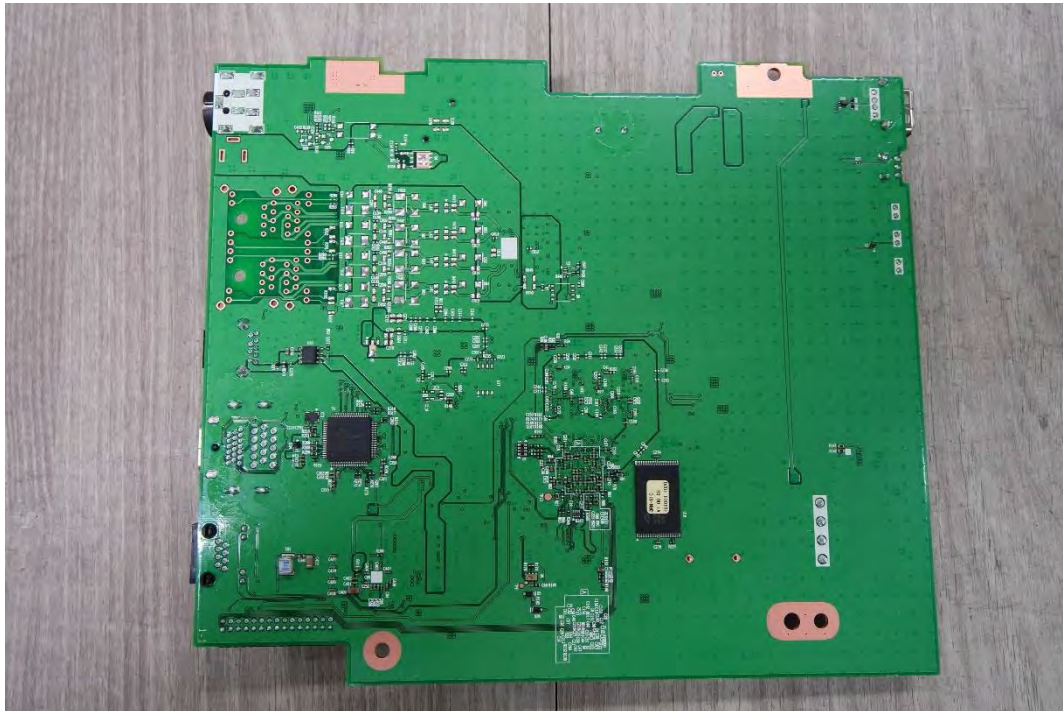
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

EUT Internal View – Main Board

(Top)



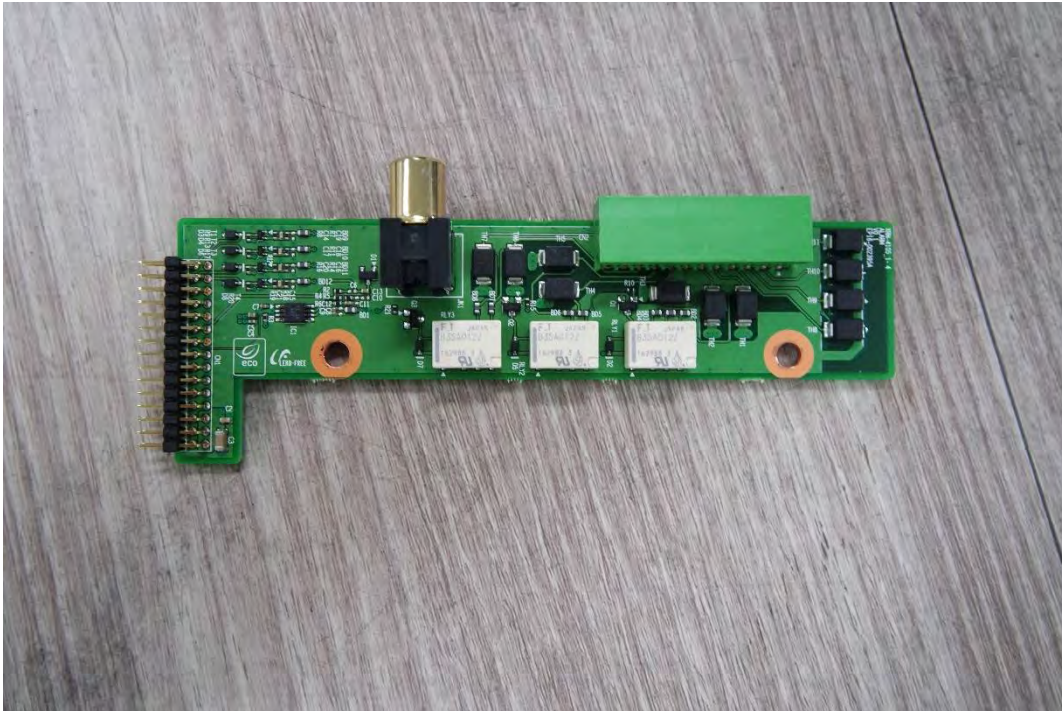
(Bottom)



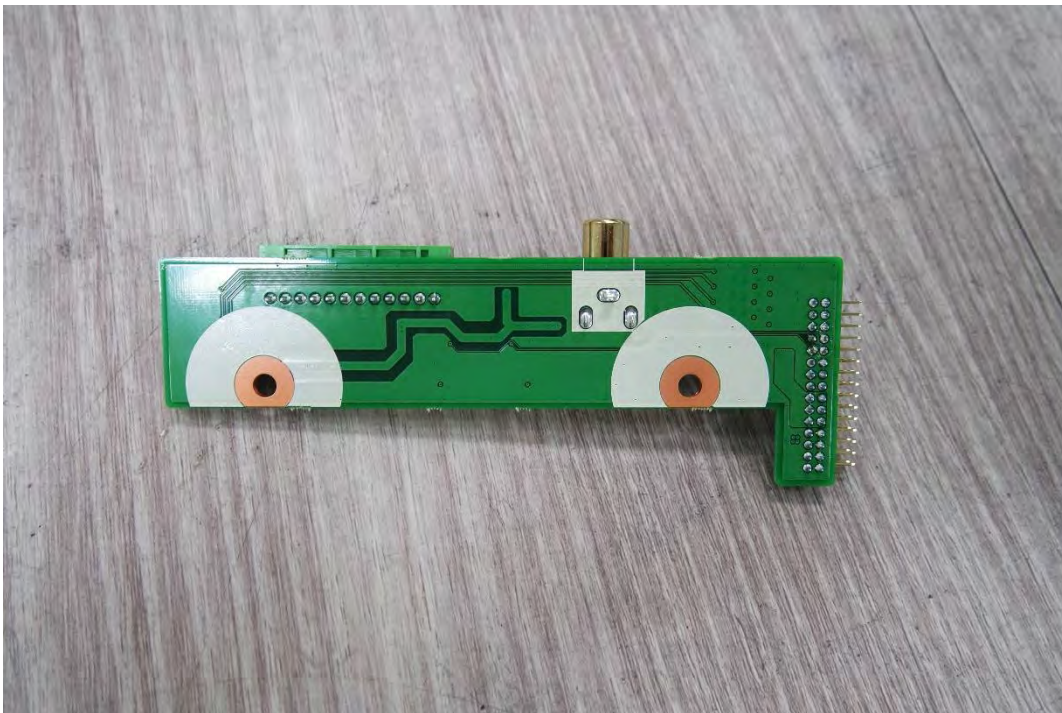
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

EUT Internal View – Sub Board

(Top)



(Bottom)



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

EUT Internal View – Hard

(Top)

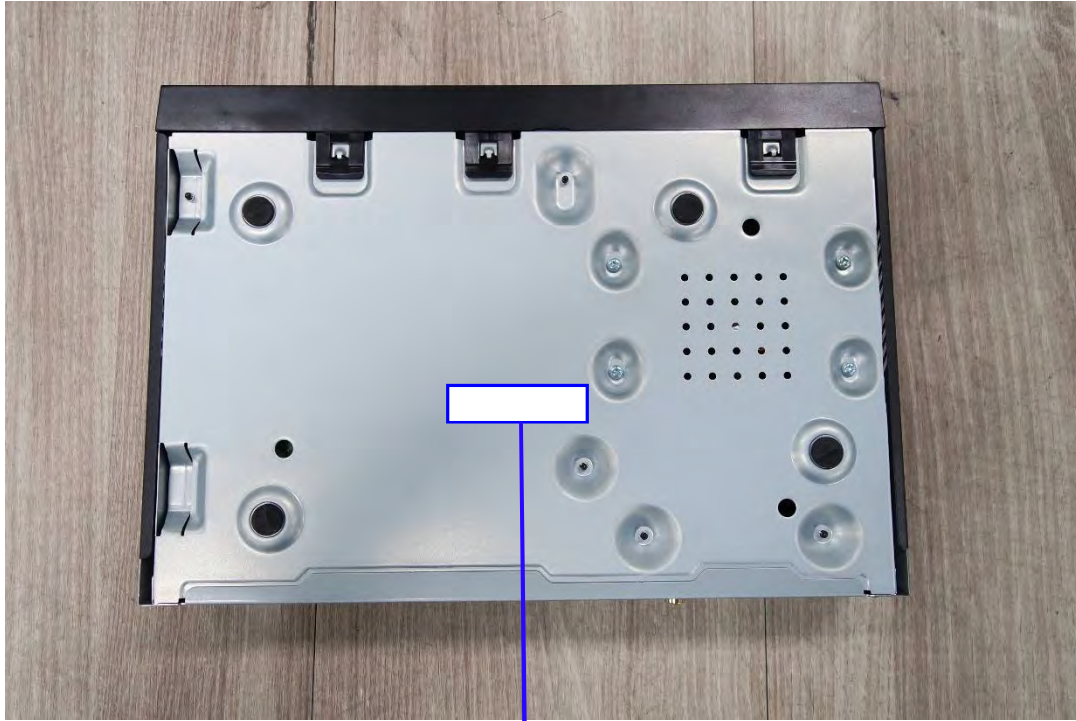


(Bottom)



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

Label and Location



NETWORK VIDEO RECORDER

Model No : QRN-810P

Manufacturer : Hanwha Techwin (Tianjin) Co.,Ltd.

Made in China

