

EMC TEST REPORT

Test Report No. : KES-EM-22T0882
Date of Issue : Nov. 04, 2022
Product name : DVR
Model/Type No. : ARD-1610
Variant Model : -
Applicant : Hanwha Techwin Co., Ltd.
Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
Manufacturer : 1. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.
2. D-TECH CO.,LTD.
Manufacturer Address : 1. Lot O-2, Que Vo Industrial Zone extended area,
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do,
Korea (Suwon Industrial Complex)
Equipment authorization : **Supplier's Declaration of Conformity**
Date of Receipt : Oct. 13, 2022
Test date : Oct. 25, 2022
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by



Seong Min, Jang
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

Report No.:

KES-EM-22T0882

Page (2) of (38)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Nov. 04, 2022	KES-EM-22T0882	Issued

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 kes@kes.co.kr



KES Co., Ltd.

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

Report No.:

KES-EM-22T0882

Page (3) of (38)

TABLE OF CONTENTS

1.0	General Product Description.....	4
1.1	Test Voltage & Frequency	11
1.2	Variant Model Differences	11
1.3	Device Modifications	11
1.4	Equipment Under Test.....	11
1.5	Support Equipments	12
1.6	External I/O Cabling	13
1.7	EUT Operating Mode(s)	15
1.8	Configuration.....	15
1.9	Remarks when standards applied	16
1.10	Calibration Details of Equipment Used for Measurement	16
1.11	Test Facility	16
1.12	Laboratory Accreditations and Listings	16
2.0	Test Regulations.....	17
2.1	Conducted Emissions at Mains Power Ports	18
2.2	Radiated Electric Field Emissions(Below 1 GHz)	20
2.3	Radiated Electric Field Emissions(Above 1 GHz)	22
APPENDIX A – TEST DATA.....		24
Conducted Emissions at Mains Power Ports.....		24
Radiated Electric Field Emissions(Below 1 GHz)		26
Radiated Electric Field Emissions(Above 1 GHz)		28
Test Setup Photos and Configuration		29
Conducted Emissions at Mains Power Ports.....		29
Radiated Electric Field Emissions(Below 1 GHz)		30
Radiated Electric Field Emissions(Above 1 GHz)		31
EUT External Photographs		32
EUT Internal Photographs		33

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

1.0 General Product Description

Main Specifications of EUT are:

		ARD-1610
Display		
Analog camera	Inputs	16CH(1Vp-p 75ohm, BNC)
	Signal Type	AHD(5MP, 4MP, 1080p, 720p) HDTVI(5MP, 4MP, 1080p, 720p) HDCVI(5MP, 4MP, 1080p, 720p) CVBS(NTSC/PAL)
Network camera	Inputs	Additional 2CH (Max. 18CH)
	Resolution	5MP ~ CIF
	Protocols	SUNAPI(Wisenet), ONVIF
Decoding	Local Display	None
	Multi Screen Display	None
	Resolution	None
Live	Local Display	1x HDMI, 1x VGA [Single Mode] - HDMI: 3840 x 2160, 2560x1440, 1920x1080, 1280x1024, 1280x720 [Dual Mode] Clone - HDMI: 1920x1080, 1280x1024, 1280x720 - VGA: 1920x1080, 1280x1024, 1280x720
	Multi Screen Display	[Local monitor] - Dynamic layout, Virtual channel view - up to ? division [Web] 1 / 4 / 9 / sequence

	Resolution	[Analog Camera(NTSC/PAL)] 5MP(5M Half 20fps/12fps) 4MP(4M Half 30fps/25fps) 2MP(2M Half 30fps/25fps) 1MP(1M Half 30fps/25fps) [Network Camera] - Typ. 2MP(120fps)
Performance		
Operating System	Embedded	Linux
Record	Compression	H.265, H.264, MJPEG
	Record Rate(Analog)	[Analog Camera(NTSC/PAL)](Main Stream)5MP(5M Half 20fps/12fps)4MP(4M Half 30fps/25fps)2MP(2M Half 30fps/25fps)1MP(1M Half 30fps/25fps)(Sub Stream)720p or higher : 640x368 full fps/CHSD signal : upto CIF 30/25fps/CH* The maximum recording frame rate depends on the frame rate of the input camera.
	Recording Bandwidth	Max. 100Mbps
	Resolution	5MP ~ CIF
	Mode	Manual, Schedule (Continuous/Event), Event(Pre/Post), Dual Track

	Event Trigger	Alarm Input Analog Camera : Video Loss, Motion Detection, Tampering Network Camera : Camera Event (Sensor, MD, Video analytics), VA event (Tampering, Enter / Exit, Passing, Virtual- line, (Dis)Appear, Face Detection, Audio detection), Defocus camera event, Dynamic camera event
	Event Action	E-mail, PTZ preset, Alarm out, Buzzer, Monitor out
Search & Play	Playback Bandwidth	Max. 32Mbps
	User	Max. 4 users (Set 1, Remote 3)
	Simultaneous playback	16CH(Local Monitor, CMS, Wisenet Mobile) 1Ch(Web)
	Fisheye Dewarping	WEB / CMS
	Mode	Date & Time (Calendar) / Event log list / Text search (POS), Back up, Motion, Smart search (Virtual Line w/ direction, Enter / Exit) * All Search Included Preview Function ARB search
	Resolution	5MP ~ CIF
	Playback Control	Fast Forward/Backward (x2,x4,x8,x16,x32,x64, x128, x256) Slow Forward/Backward (x1/2,x1/4,x1/8) ※Move one step up/down
Storage	Supported HDD	Up to 6TB
	HDD Slot	SATA 2ea(Max 12TB)
	External	None
	RAID	None
Backup	File backup	BU, EXE(Include Player), AVI(Webviewer only)
	Function	Max. 16 CH play, Date-time/title display
Network		

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

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		Wisenet DDNS
Transmission speed		[Analog Camera(NTSC/PAL)] (Main Stream) 5MP(5M Half 20fps/12fps) 4MP(4M Half 30fps/25fps) 2MP(2M Half 30fps/25fps) 1MP(1M Half 30fps/25fps) (Sub Stream) 720p or higher : 640x368 full fps/CH SD signal : upto CIF 30/25fps/CH * The maximum recording frame rate depends on the frame rate of the input camera.
Transmission Bandwidth		Max. 100Mbps
Transmission Bandwidth Wired(LAN)		None
Wireless	WiFi	None
	3G/LTE	None
Audio	Input/Output	1 Line in / 1 Line out
	Compression	G.711 (N/W Cam G.711, 726)
	Audio Communication	2-Way
		None
		IP address filtering, User access log, 802.1x Authentication, Encryption (ID/PW, Recording, Transmission, Backup) Device Certificate(Hanwha Techwin Root CA)
Web viewer	Supported OS	Windows 10, Mac OS 11 Big Sur and later

	Supported browser	Chrome v89 or above, Edge v89 or above, Safari v14.0.3 or above
Viewer Software		SSM, Webviewer, Wisenet Viewer, Wisenet mobileSupport SDK/CGI(SUNAPI) for integration to 3'rd party VMS
Functions		
Camera Setup	Register	Auto, Manual
	Item	None
PTZ	Control	Via GUI, Webviewer, SSM, Wisenet Viewer, Wisenet Mobile Viewer, System Controller
	Preset	300 presets
Smart phone	Support Model	iOS, Android
	Protocol Support	RTP, RTSP, HTTP, CGI(SUNAPI)
	Control	Live(16ch) : Multi-Profile Support Playback(4Ch Multi Playback, Max 2MP) Event push
	Max. Remote Users	Search(3), Live Unicast(10)
Redundancy	Failover	None
	ARB	Support
Easy configuration		Setup Wizard (Language Date/Time, Password, Network, Auto Camera Configuration), P2P (QR code)
Coaxial Control		CVBS(Pelco-C)/AHD/CVI/TVI
Interface		
Front	Indicator	LED(Status indicator) : Power(1), Record(1), Network(1)
Storage		None
Reset		Switch(1EA)

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



KES Co., Ltd.

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

Report No.:

KES-EM-22T0882

Page (9) of (38)

HDD Key Lock		None
HDMI		1EA
VGA		1EA
BNC		16CH In / 1CH Out(Spot Output)
DP		None
DVI		None
e-SATA		None
Audio		Out(1EA, RCA, Line)
Ethernet		RJ-45(10/100 BASE-T)
Alarm		In 4EA, Out 1EA - Relay Out1(NO/NC/COM)
USB		2EA(Front/Rear USB2.0)
GPS		None
WiFi		None
Serial(Protocols)		RS-485 (Samsung-T/Pelco-D/Pelco-p) * for PTZ
Power inlet		1EA DC Input Jack
System		
Log	Log List	Max. 100,000 (System Log, Event Log each)
System Control		Mouse, Webviewer, System Controller(SPC-7000, SPC-6000, SPC-2000)
Power Management	Shutdown Delay	None
	Startup Delay	None
Language		English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese, Japanese, Thai, Vietnamese
Environmental		
		0°C to +40°C(+32°F to +104°F)
		20% ~ 85% RH
Certification		UL, CE, FCC, KC

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

**KES Co., Ltd.**

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

Report No.:

KES-EM-22T0882

Page (10) of (38)

Electrical		
		DC12V
		TBD
PoE Budget		None
Mechanical		
Color / Material		Black / Metal
Dimension (WxHxD)		370.0x 44.0 x 320mm(14.57" x 1.73" x 12.6")
Weight		TBD
Control Box		
Interface	Indicator	
	Emergency Button	
	Audio/Power Switch	
	Main I/O	
Mechanical	Color / Material	
	Dimension (WxHxD)	
	Weight	

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

1.1 Test Voltage & Frequency

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

☒ AC 120 V, 60 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
DVR	ARD-1610	-	HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.	EUT
Adapter	KPL-048F-VI	-	Channel Well Technology (Guangzhou) Co., Ltd.	-
Mouse	MOKJUO	21H07051	Primax Electronics Ltd.	-
HDD	SC HA500	-	Western Digital	-

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Laptop #1	LG15N54	503NZWY038929	LG	-
Laptop Adapter #1	PA-1900-14	OF2R263348701 7764	LITE-ON TECHNOLOGY COPORATION	-
Laptop #2	P95G001	9JM8HT2	DELL INC.	-
Laptop Adapter #2	HA65NM130	-	Chicony Power Technology(Suzhou)Co., Ltd.	-
Monitor 1	SMT-2232	C95V67VF90003 8B	Weihai Daewoo Electronics Co., Ltd.	-
Monitor 2	SMT-2233	ZC6U67VH50019 4D	Weihai Daewoo Electronics Co., Ltd.	-
Monitor 3	-	-	DELL. INC	-
Speaker	-	-	Britz	-
Controller	SPC-1010	C50E67WG10100 F	SamSung Techwin Co.,Ltd.	-
Controller Adapter	AP-12005A	-	A Power	-
Alarm	PRO-SL	-	SENSOR PRO	-
ButtonAlarm	-	-	-	-
Camera #1	SCD-6083RN	-	TB-eye Ltd.	-
Camera Adapter #1	KP-1220	-	Korea Power	-
Camera #2	HCV-6070R	-	HANWHA TECHWIN CO., LTD.	-
Camera Adapter #2	DAD12050DKA	-	DREAM ELECTRONICS.	-
USB Memory	-	-	SanDisk	-
NETWORK VIDEO ENCODER #1	SPE-410	-	HANWHA TECHWIN CO.,LTD.	-
NETWORK VIDEO ENCODER Adapter #1	2ACB022F	-	Channel Well Technology (Guangzhou) Co., Ltd.	-
NETWORK VIDEO ENCODER #2	SPE-410	-	HANWHA TECHWIN CO.,LTD.	-
NETWORK VIDEO ENCODER Adapter #2	2ACB022F	-	Channel Well Technology (Guangzhou) Co., Ltd.	-

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

1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
DVR (EUT)	DC Jack	Adapter (EUT)	DC Jack	1.4	U
	USB A-type	Mouse (EUT)	USB A-type	1.5	U
	BNC(SPOT)	Monitor #1	BNC	3.5	S
	VGA	Monitor #2	VGA	1.5	U
	HDMI	Monitor #3	HDMI	1.4	S
	AUDIO OUT	Speaker	AUDIO OUT	2.0	U
	RS-485	Controller	RS-485	3.2	U
	Alarm OUT	Alarm	Alarm IN	3.1	U
	Alarm IN	ButtonAlarm	Alarm OUT	3.2	U
	RJ-45	Laptop #1	RJ-45	3.0	U
	AUDIO IN	Laptop #1	AUDIO IN	1.5	U
	AUDIO IN	Laptop #1	AUDIO IN	1.5	U
	AUDIO IN	Laptop #2	AUDIO IN	1.5	U
	AUDIO IN	Laptop #2	AUDIO IN	1.5	U
	USB	USB Memory	USB	-	-
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #1	BNC	10.0	U

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

**KES Co., Ltd.**

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

Report No.:

KES-EM-22T0882

Page (14) of (38)

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
DVR (EUT)	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
	BNC (VIDEO IN)	NETWORK VIDEO ENCODER #2	BNC	10.0	U
Laptop #1	DC Jack	Laptop Adapter #1	DC Jack	1.4	S
Laptop #2	DC Jack	Laptop Adapter #2	DC Jack	1.4	S
Controller	DC Jack	Controller Adapter	DC Jack	1.4	S
Camera #1	DC Jack	Camera Adapter #1	DC Jack	1.4	S
	BNC	NETWORK VIDEO ENCODER #1	BNC	1.5	U
Camera #2	DC Jack	Camera Adapter #2	DC Jack	1.4	S
	BNC	NETWORK VIDEO ENCODER #2	BNC	1.5	U
NETWORK VIDEO ENCODER #1	2 Pin	NETWORK VIDEO ENCODER Adapter #1	2 Pin	2.0	U
NETWORK VIDEO ENCODER #2	2 Pin	NETWORK VIDEO ENCODER Adapter #2	2 Pin	2.0	U

* Unshielded=U, Shielded=S

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

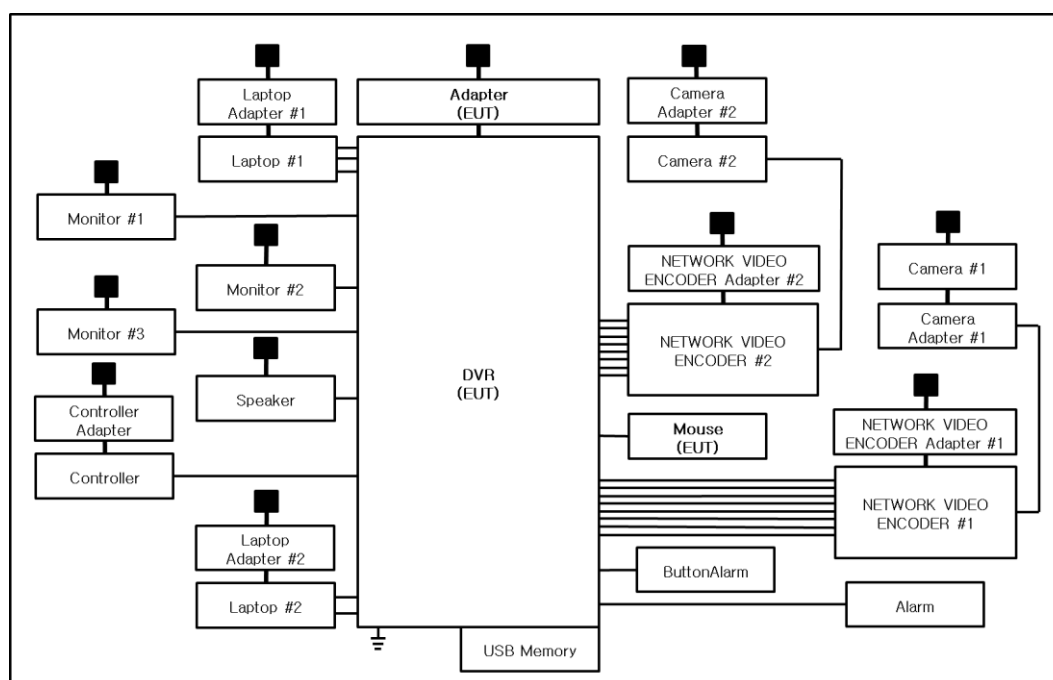
1.7 EUT Operating Mode(s)

Test Mode	operating
Operation	EUT Monitoring, Ping Test

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

1.8 Configuration

■ AC Main
 □ DC Main



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, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber , 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
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 0004

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **47 CFR Part 15, Subpart B**

☐ CISPR 22:2009 +A1:2010

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B

☒ **IC Regulation ICES-003 Issue 7**

☐ CAN/CSA-CISPR 32:17

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B

2.1 Conducted Emissions at Mains Power Ports

Test Date

Oct. 25, 2022

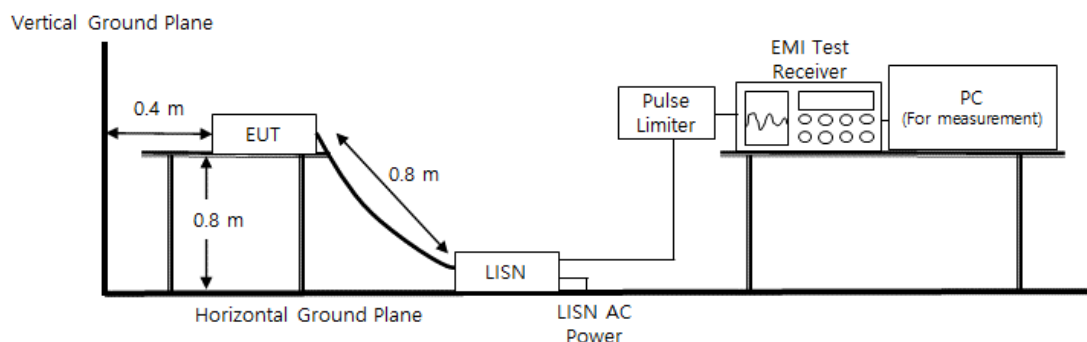
Test Location

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	101783	12, 28, 2022
☒	LISN	ENV216	R & S	101787	12, 27, 2022
☒	LISN	ESH2-Z5	R & S	100450	12, 27, 2022
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 27, 2022

Diagram of test setup





KES Co., Ltd.

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

Report No.:

KES-EM-22T0882

Page (19) of (38)

Test Conditions

Temperature: (23,0 ± 0,2) °C

Relative Humidity: (47,0 ± 0,1) % 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.

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

2.2 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Oct. 25, 2022

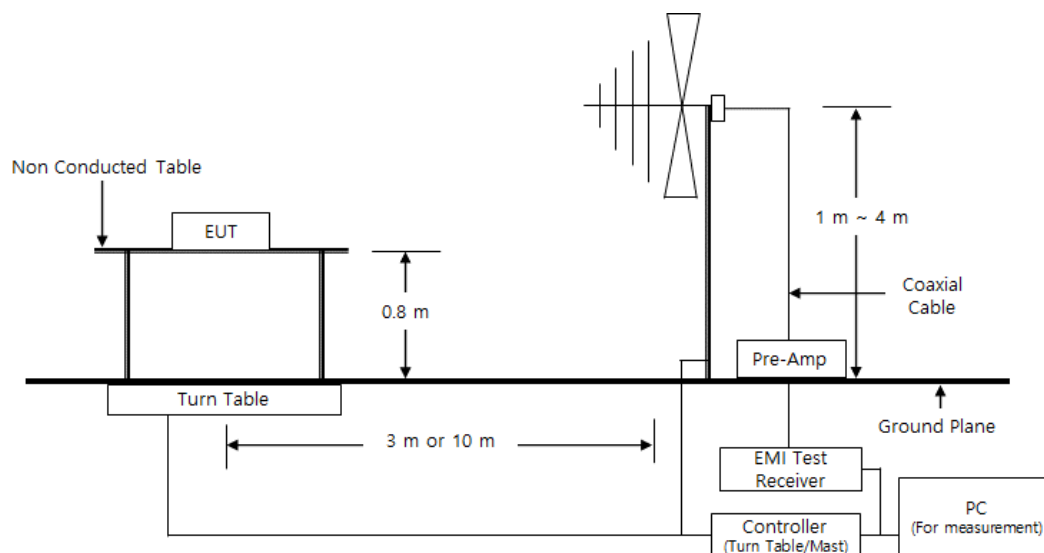
Test Location

☐ 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	03, 31, 2023
☒	AMPLIFIER	SCU 01	R & S	100603	11, 24, 2022
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
☒	ATTENUATOR	8491A	HP	32173	03, 08, 2023

Diagram of test setup



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



KES Co., Ltd.

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

Report No.:
KES-EM-22T0882
Page (21) of (38)

Test Conditions

Temperature: $(22,5 \pm 0,1) ^\circ\text{C}$
Relative Humidity: $(47,0 \pm 0,1) \% \text{ R.H.}$

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.

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

2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Oct. 25, 2022

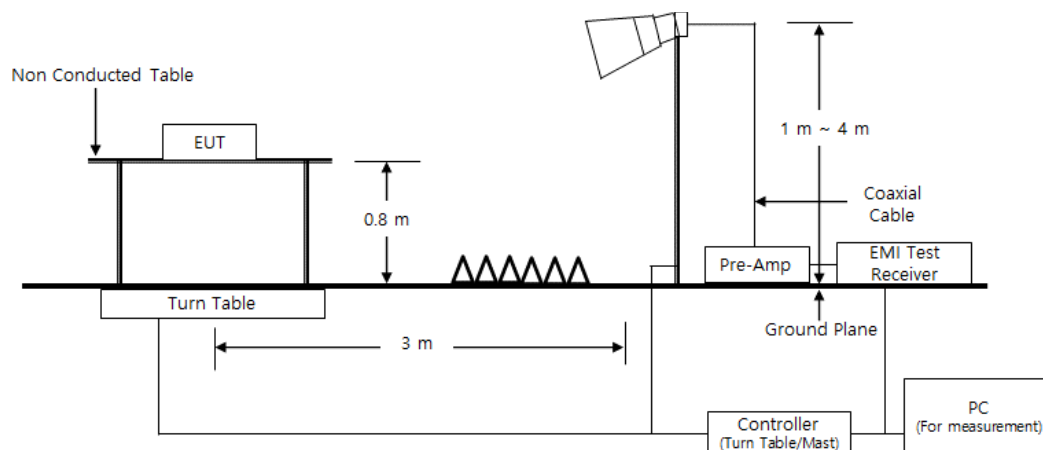
Test Location

SEMI ANECHOIC CHAMBER #5

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	ES10/RE	TOYO Corporation	2022.01.000	-
☒	EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	03, 31, 2023
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	12, 16, 2022
☒	PREAMPLIFIER	8449B	HP	3008A00538	06, 02, 2023
☒	ATTENUATOR	8491B	HP	23094	04, 21, 2023

Diagram of test setup



Test Conditions

Temperature: (22,3 ± 0,1) °C
Relative Humidity: (47,6 ± 0,2) % R.H.

Frequency Range of Measurement

1 GHz to 5 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.
- The Average of the test data is the cispr average result.

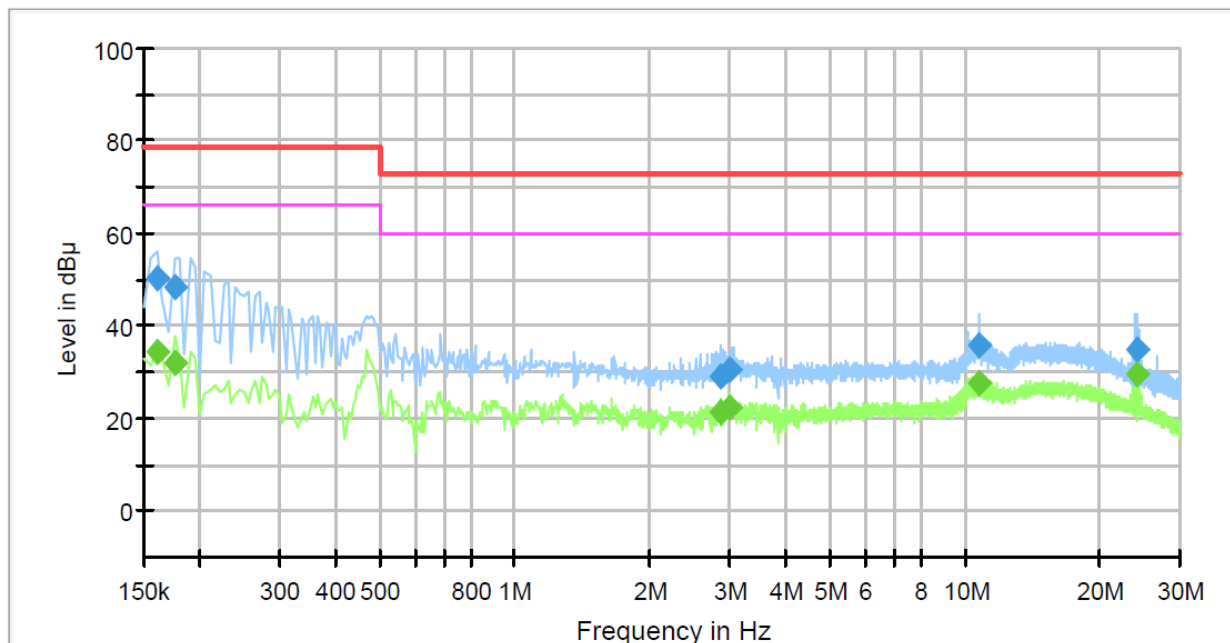
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

Test Description: Conducted Emission
 Model No.: ARD-1610
 Phase:
 Mode: L1
 Operator Name: KES



Final Result

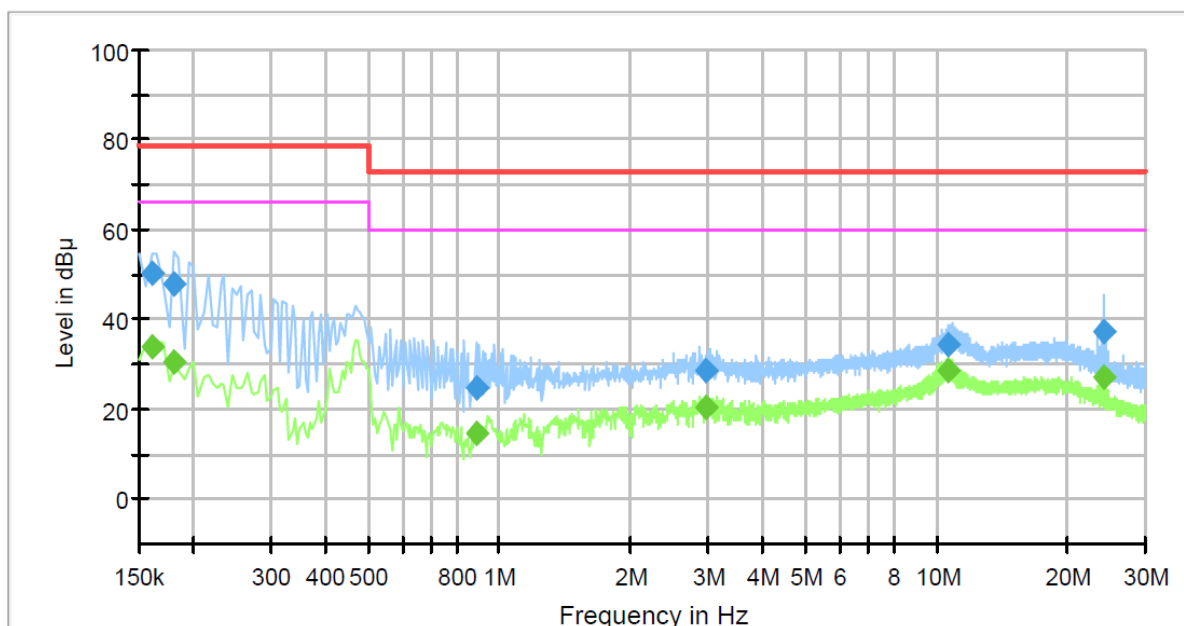
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	34.53	66.00	31.47	1000.0	9.000	L1	19.4
0.160000	50.19	---	79.00	28.81	1000.0	9.000	L1	19.4
0.175000	---	32.15	66.00	33.85	1000.0	9.000	L1	19.4
0.175000	48.53	---	79.00	30.47	1000.0	9.000	L1	19.4
2.865000	---	21.36	60.00	38.64	1000.0	9.000	L1	20.2
2.865000	28.89	---	73.00	44.11	1000.0	9.000	L1	20.2
3.010000	---	22.25	60.00	37.75	1000.0	9.000	L1	20.1
3.010000	30.49	---	73.00	42.51	1000.0	9.000	L1	20.1
10.800000	---	27.68	60.00	32.32	1000.0	9.000	L1	19.9
10.800000	35.99	---	73.00	37.01	1000.0	9.000	L1	19.9
24.115000	---	29.63	60.00	30.37	1000.0	9.000	L1	20.1
24.115000	35.03	---	73.00	37.97	1000.0	9.000	L1	20.1

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

NEUTRAL LINE

Common Information

Test Description:	Conducted Emission
Model No.:	ARD-1610
Phase:	
Mode:	N
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	33.94	66.00	32.06	1000.0	9.000	N	19.4
0.160000	50.53	---	79.00	28.47	1000.0	9.000	N	19.4
0.180000	---	30.44	66.00	35.56	1000.0	9.000	N	19.4
0.180000	48.05	---	79.00	30.95	1000.0	9.000	N	19.4
0.885000	---	14.54	60.00	45.46	1000.0	9.000	N	20.1
0.885000	24.82	---	73.00	48.18	1000.0	9.000	N	20.1
2.975000	---	20.30	60.00	39.70	1000.0	9.000	N	20.2
2.975000	28.41	---	73.00	44.59	1000.0	9.000	N	20.2
10.635000	---	28.77	60.00	31.23	1000.0	9.000	N	19.9
10.635000	34.50	---	73.00	38.50	1000.0	9.000	N	19.9
24.215000	---	27.35	60.00	32.65	1000.0	9.000	N	20.2
24.215000	37.13	---	73.00	35.87	1000.0	9.000	N	20.2

◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

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

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

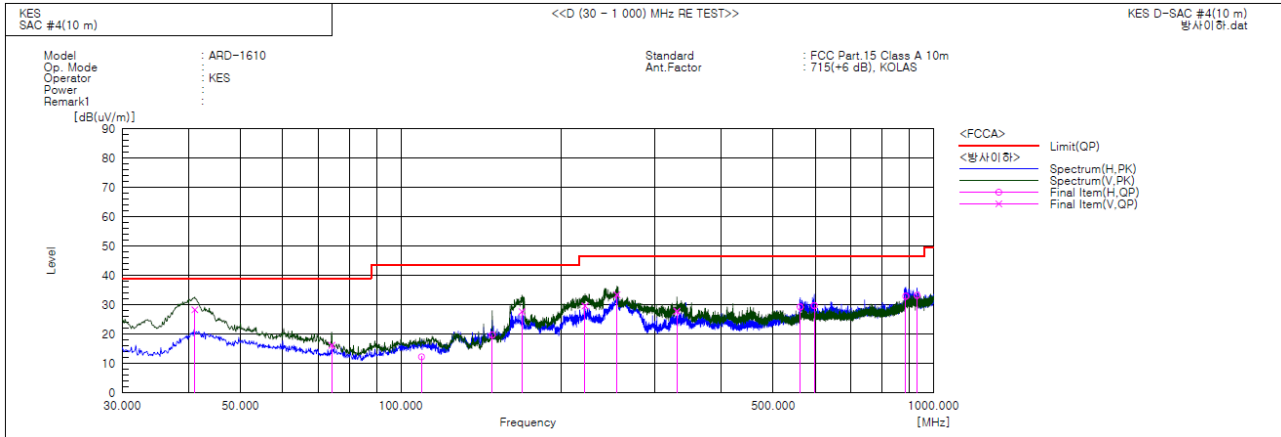
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

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



Radiated Electric Field Emissions(Below 1 GHz)

- 47 CFR Part 15, Subpart B

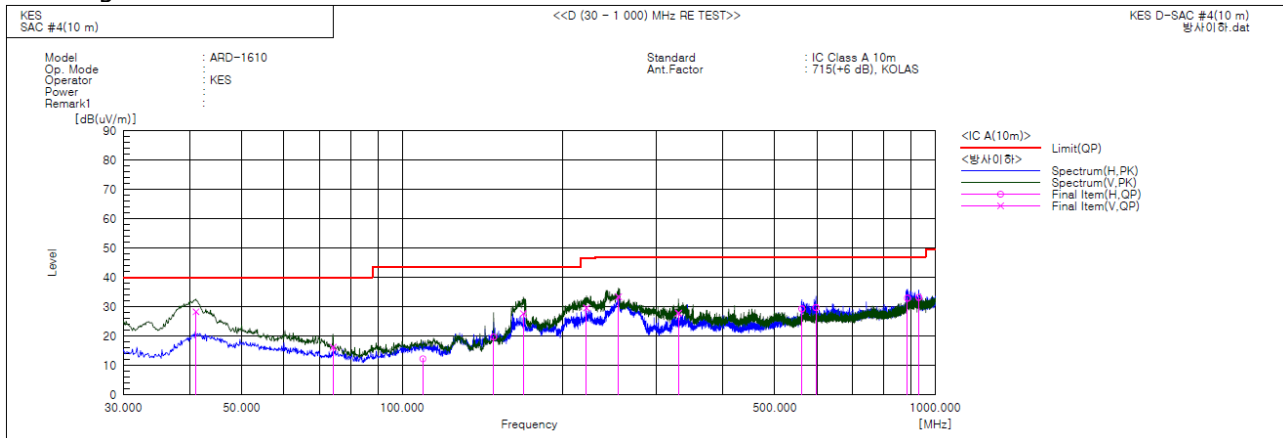


Final Result

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	41.034	V	50.3	-22.0	28.3	39.0	10.7	113.0	275.0	
2	74.256	V	42.6	-26.4	16.2	39.0	22.8	110.0	168.0	
3	109.419	H	34.5	-22.2	12.3	43.5	31.2	384.0	166.0	
4	148.461	H	44.8	-25.1	19.7	43.5	23.8	380.0	178.0	
5	168.831	V	51.8	-24.1	27.7	43.5	15.8	121.0	23.0	
6	221.623	V	49.7	-20.1	29.6	46.5	16.9	100.0	171.0	
7	254.555	V	52.3	-18.9	33.4	46.5	13.1	113.0	12.0	
8	329.851	V	43.6	-15.8	27.8	46.5	18.7	100.0	358.0	
9	562.045	H	38.8	-9.5	29.3	46.5	17.2	376.0	311.0	
10	597.563	H	37.9	-8.2	29.7	46.5	16.8	386.0	318.0	
11	887.116	H	36.7	-3.8	32.9	46.5	13.6	400.0	337.0	
12	931.251	H	36.5	-3.3	33.2	46.5	13.3	400.0	14.0	

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

- IC Regulation ICES-003 Issue 7



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	41.034	V	50.3	-22.0	28.3	40.0	11.7	113.0	275.0	
2	74.256	V	42.6	-26.4	16.2	40.0	23.8	110.0	168.0	
3	109.419	H	34.5	-22.2	12.3	43.5	31.2	384.0	166.0	
4	148.461	H	44.8	-25.1	19.7	43.5	23.8	380.0	178.0	
5	168.831	V	51.8	-24.1	27.7	43.5	15.8	121.0	23.0	
6	221.623	V	49.7	-20.1	29.6	46.4	16.8	100.0	171.0	
7	254.555	V	52.3	-18.9	33.4	47.0	13.6	113.0	12.0	
8	329.851	V	43.6	-15.8	27.8	47.0	19.2	100.0	358.0	
9	562.045	H	38.8	-9.5	29.3	47.0	17.7	376.0	311.0	
10	597.563	H	37.9	-8.2	29.7	47.0	17.3	386.0	318.0	
11	887.116	H	36.7	-3.8	32.9	47.0	14.1	400.0	337.0	
12	931.251	H	36.5	-3.3	33.2	47.0	13.8	400.0	14.0	

◆ Calculation - SAC #4(10 m)

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

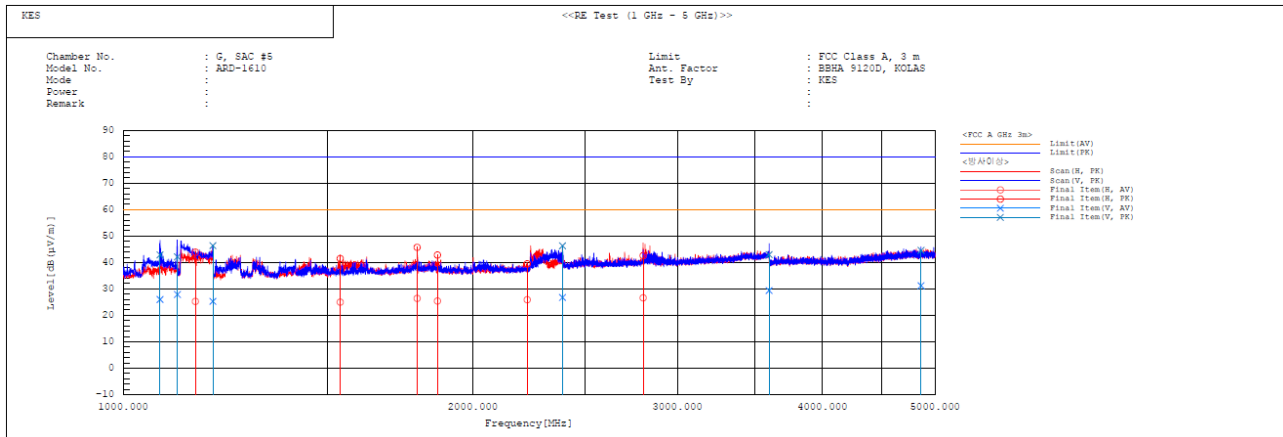
Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

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

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



Radiated Electric Field Emissions(Above 1 GHz)



Final Result

No.	Frequency [MHz]	Pol	Reading AV [dB(μV)]	Reading PK [dB(μV)]	c.f [dB(1/m)]	Result AV [dB(μV/m)]	Result PK [dB(μV/m)]	Limit AV [dB(μV/m)]	Limit PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]	Remark
1	1076.130	V	34.3	51.2	-8.3	26.0	42.9	60.0	80.0	34.0	37.1	133.0	200.6	
2	1113.813	V	36.0	50.2	-8.1	27.9	42.1	60.0	80.0	32.1	37.9	110.0	143.8	
3	1154.191	H	33.2	51.8	-7.9	25.3	43.9	60.0	80.0	34.7	36.1	376.0	331.3	
4	1194.963	V	32.9	54.0	-7.6	25.3	46.4	60.0	80.0	34.7	33.6	100.0	356.7	
5	1537.813	H	31.2	47.7	-6.2	25.0	41.5	60.0	80.0	35.0	38.5	386.0	48.2	
6	1791.419	H	31.5	50.8	-5.1	26.4	45.7	60.0	80.0	33.6	34.3	390.0	53.2	
7	1865.263	H	30.2	47.6	-4.8	25.4	42.8	60.0	80.0	34.6	37.2	385.0	28.0	
8	2227.913	H	29.6	43.2	-3.7	25.9	39.5	60.0	80.0	34.1	40.5	379.0	0.2	
9	2389.841	V	29.8	49.3	-3.0	26.8	46.3	60.0	80.0	33.2	33.7	143.0	37.6	
10	2804.002	H	28.3	44.3	-1.7	26.6	42.6	60.0	80.0	33.4	37.4	385.0	58.8	
11	3599.816	V	29.7	43.3	-0.3	29.4	43.0	60.0	80.0	30.6	37.0	113.0	162.8	
12	4863.813	V	27.3	40.7	3.9	31.2	44.6	60.0	80.0	28.8	35.4	142.0	332.4	

◆ Calculation

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

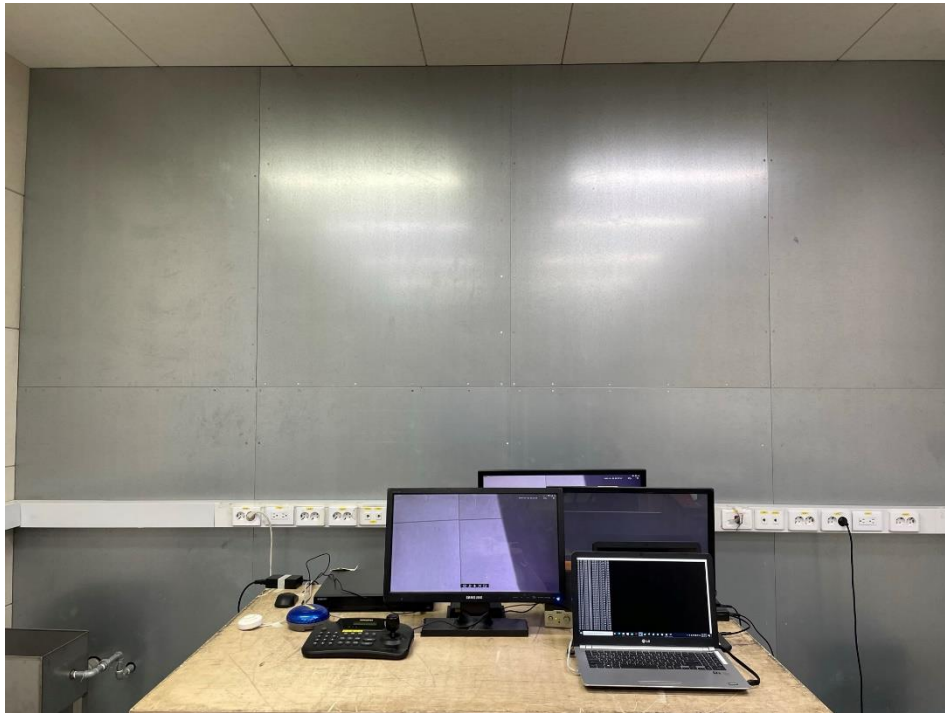
Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/m)]

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

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

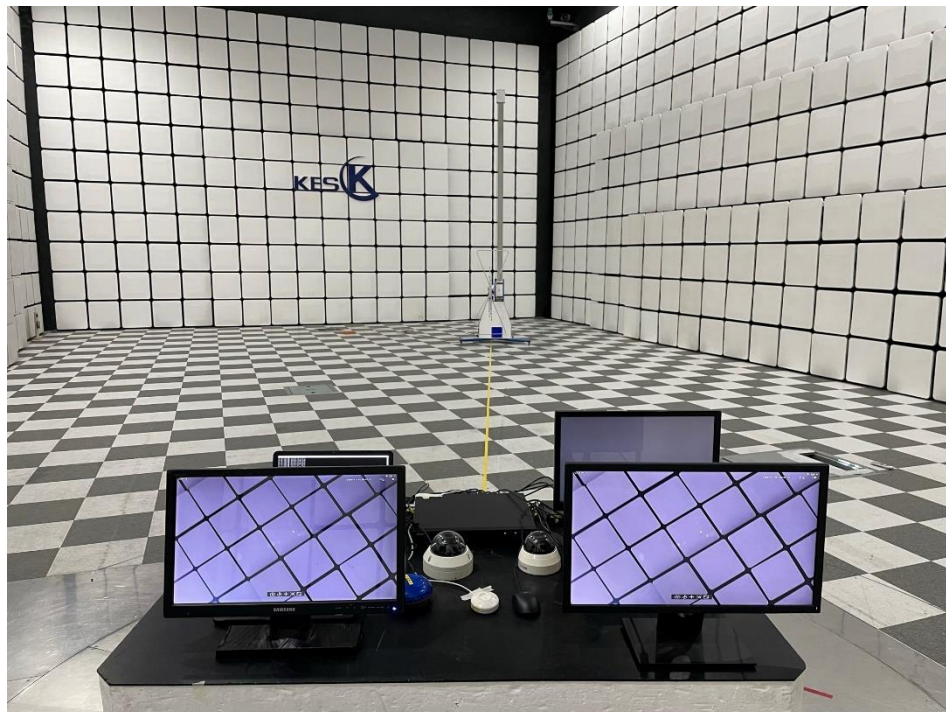
Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports



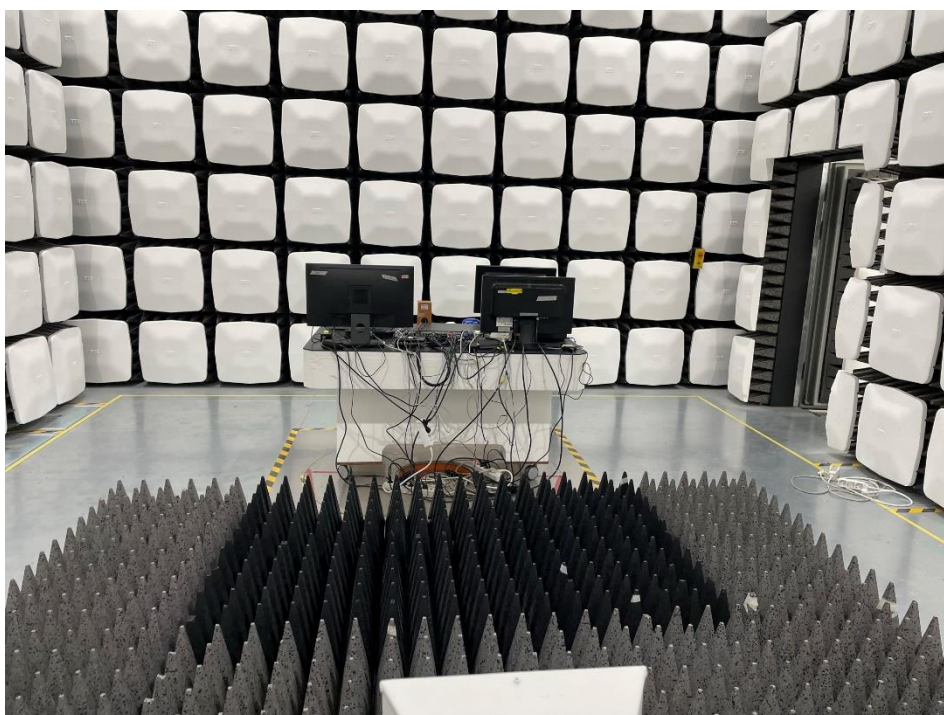
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact kes@kes.co.kr

Radiated Electric Field Emissions(Below 1 GHz)



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

Radiated Electric Field Emissions(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 kes@kes.co.kr

EUT External Photographs

(Top)



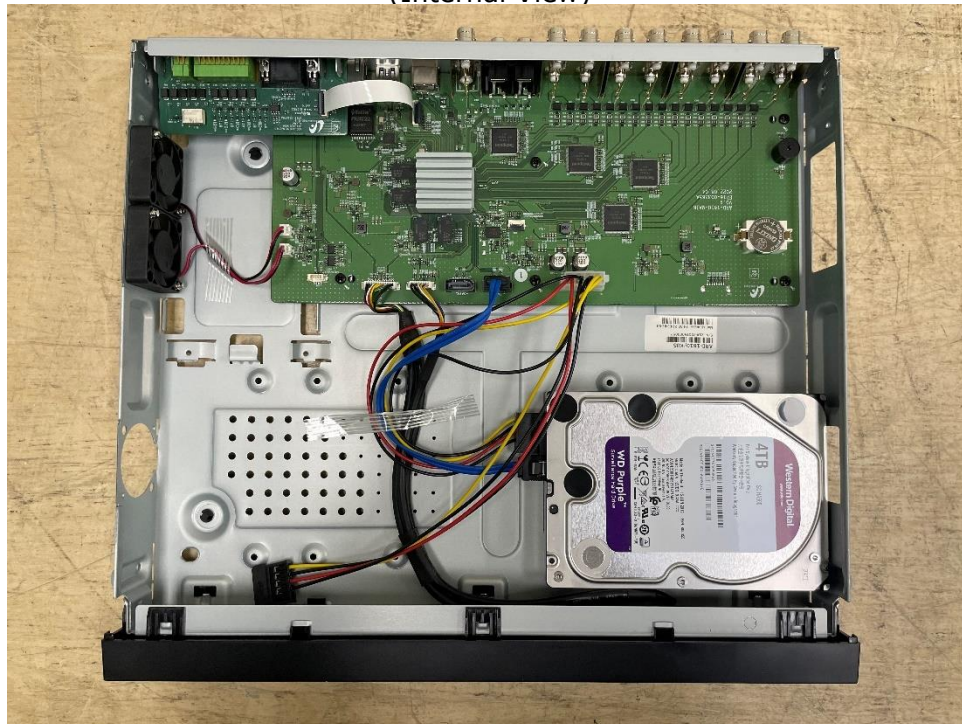
(Bottom)



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

EUT Internal Photographs

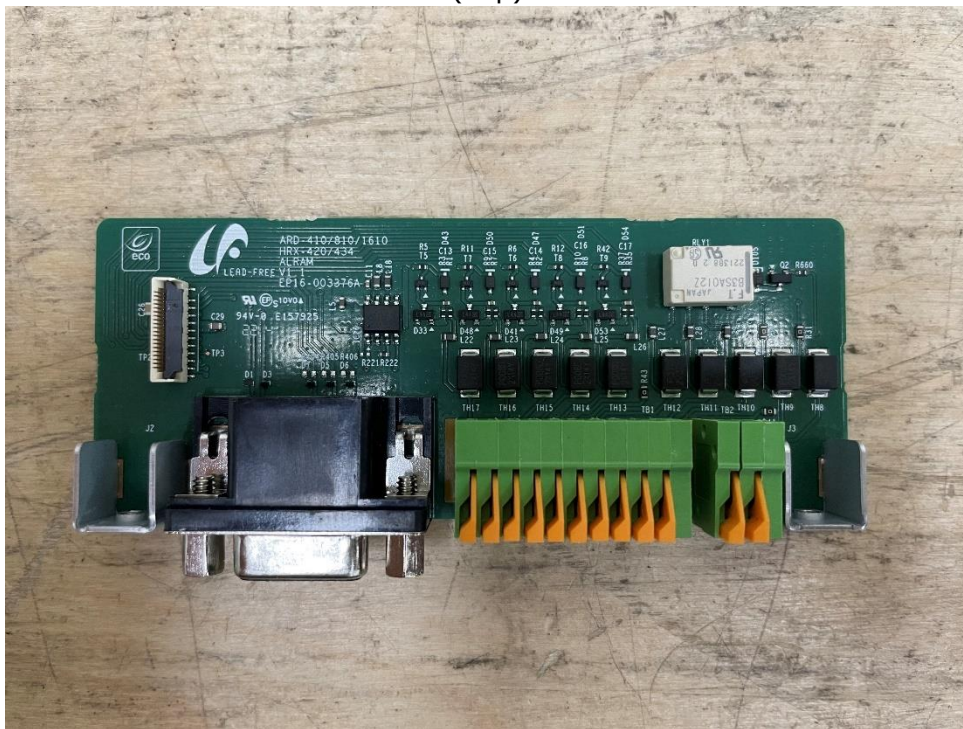
(Internal View)



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 – Board 1

(Top)



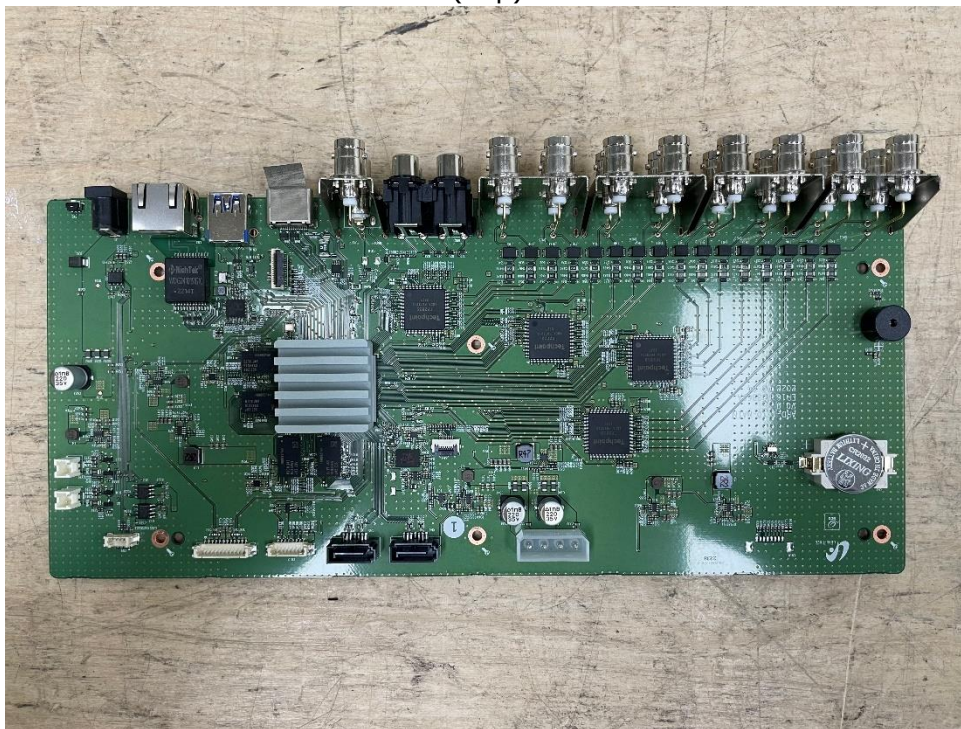
(Bottom)



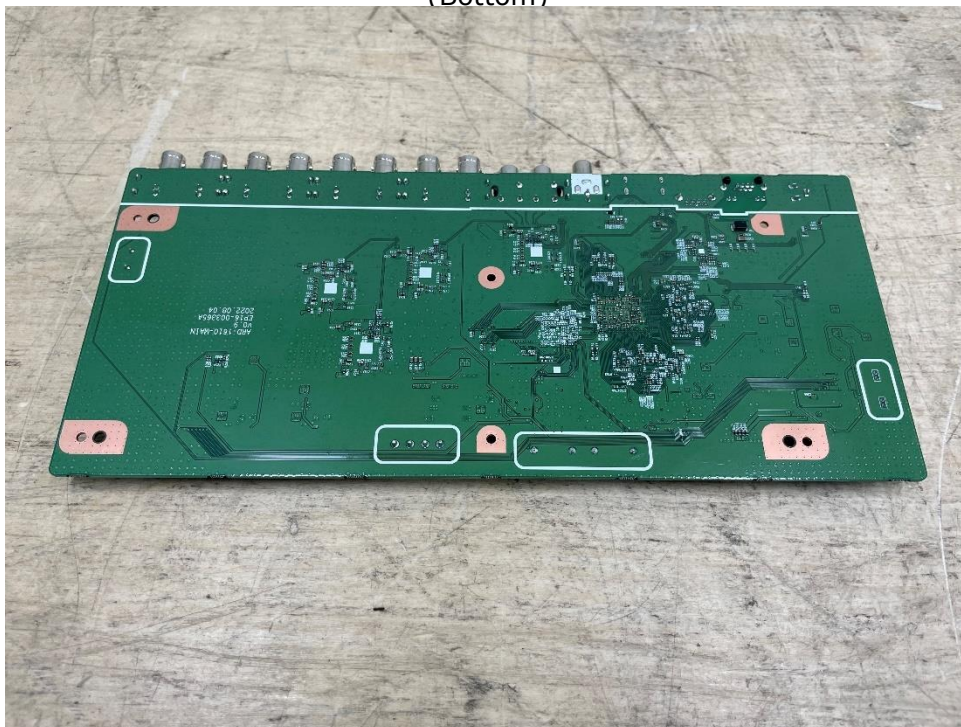
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact shchoi@kes.co.kr

EUT Internal View – Board 2

(Top)



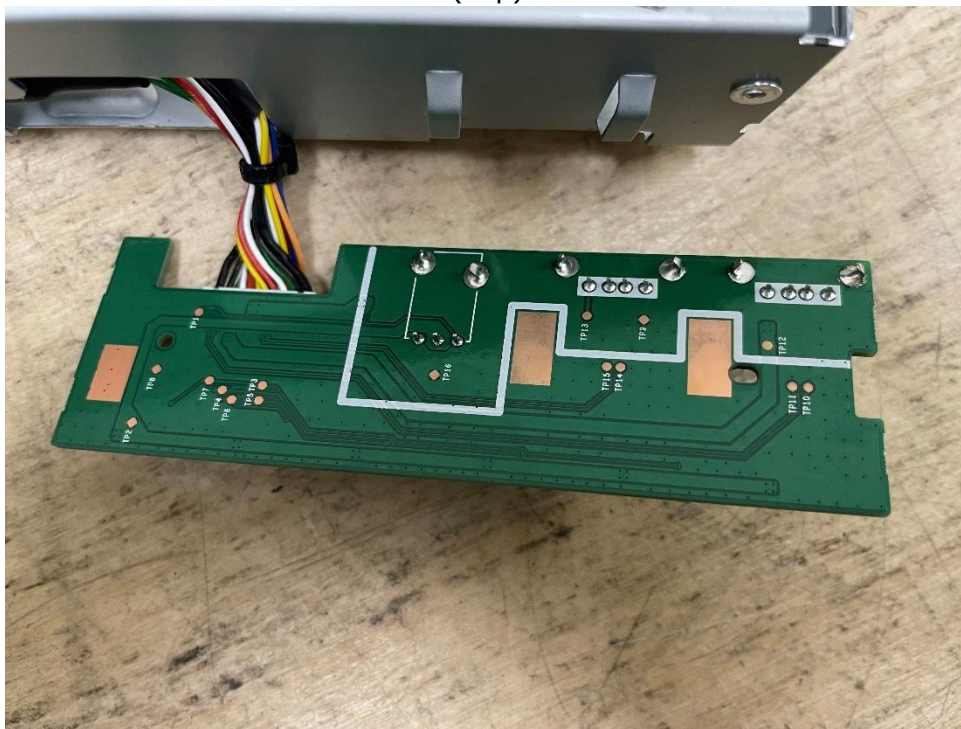
(Bottom)



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

EUT Internal View – Board 3

(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 – HDD

(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 Photographs

FCC Label



Hanwha Techwin Co., Ltd.

ARD-1610

IC Label

CAN ICES-003(A) / NMB-003(A)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:
(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.