EMC TEST REPORT For CE

Test Report No.	:	KES-E1-17T0518-R2
Date of Issue	:	Oct. 04, 2018
Product name	:	DVR
Model/Type No.	:	HRD-1641P
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 (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	:	Jul. 10, 2017
Test date	:	Aug. 04, 2017 – Aug. 08, 2017
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Jin Bae, Lee
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KOLAS.

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Aug. 14, 2017	KES-E1-17T0518	Issued
Sep. 07, 2018	KES-E1-17T0518-R1	Update Applicant and Manufacturer Address
Oct. 04, 2018	KES-E1-17T0518-R2	Reissue due to model name change

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1.0 General Product Description

Main Specifications of E.U.T are:

HRD-1641		
Video	Inputs	16channel BNC : AHD(2MP, 4MP), HDTVI(Only 2MP), HDCVI(Only 2MP), NTSC/PAL
	Resolution	2560x1440, 1920 x 1080, 960 x 480, 704 x 480 / 960 x 576, 704 x 576
Live	Frame rate	480fps , 400fps
	Resolution	2560x1440, 1920 x 1080, 960 x 480, 704 x 480 / 960 x 576, 704 x 576
	Multi Screen display	1/4/7/9/13/16/16A/PIP/Sequence
Performance		
Operating System	Embedded	Linux
Recording	Compression	H.264, Wisestream
	Record Rate(Analog)	NTSC : Up to 240fps@4MP / PAL : Up to 200fps@4MP NTSC : Up to 480fps@1920 x 1080 / PAL : Up to 400fps@1920 x 1080 NTSC: Up to 480fps @ 1280 x 720, 928x480, 704X480, 704X240, 352X240 PAL: Up to 400fps @ 1280 x 720, 928x576, 704x576, 704x288, 352x288
	Mode	Manual, Schedule (Continuous/Event), Event(Pre/Post), Time lapse (1~30 fps(N), 1~25fps(P))
	Event	Video Loss, Motion(Level 1~10), Alarm, Tampering(Level Low,Medium, High)
	Overwrite modes	Continuous
	Pre-alarm	Up to 30 sec (5,10,20,30 Sec)
	Post-Alarm	Up to 6 hour (5,10,20,30 sec,1,3,5,10,20 min,1,2,3,4,5,6 hour)
Search & Playback	Search mode	Date/time, Event, Back up, Motion (※ All Search Included Preview Function)
	Playback function	Fast Forward/Backward (x2,x4,x8,x16,x32,x64,) ※Backward Play with I-frame Only, Slow Forward/Backward (x1/2,x1/4,x1/8) Step Forward/Backward ※ Backward Play with I-frame Only
	Simultaneous playback	16CH(Local Monitor, CMS)
Network(IPv4)	Transmission speed	Record(Main) Stream) 4MP : 15fps/CH, 1080p/720p/WD1/4CIF/2CIF/CIF : 30fps/CH(N), 25fps/CH(P) Network(Sub) Stream) WD1/4CIF : 12fps/CH, 2CIF/CIF/QVGA/QCUF : 30fps/CH(N), 25fps/CH(P)
	Transmission Bandwidth	Up to 64Mbps
	Bandwidth control	Selectable
	Stream	Record Stream and Network Stream Selectable (at monitoring Viewer)
	Remote users Maximum	Search(3)/Live Unicast(10)/Live Multicast(20)
	Protocol support	TCP/IP,DHCP,PPPoE,SMTP,NTP,HTTP,DDNS,RTP,RTSP,SNMP
	Web Browser	Windows OS : Internet Explorer 8, 9, 10, Firefox 3.6 or higher, Chrome 12 or higher Mac OS : Safari 5 or higher, Firefox 3.6 or higher
	Viewer Software	SSM, Webviewer, SmartViewer, iPOLiS mobile viewer
Smart phone	Platform	Android , iOS
	Protocol support	RTP, RTSP, HTTP,
	Control	Live(8ch) : Multi-Profile Support Playback(1ch)
	Remote users Maximum	Search (3), Live Unicast (10), Multicast (20)
Storage	Internal	Up to 2 SATA HDDs (0~6TB HDD)
	External (e-SATA Interface)	e-SATA, USB(for Backup)
	File Format (Back-up)	BU(DVR Player), SEC(Include Player), AVI
Security	Password Protection	1 Admin, 10 Group , 10 User per 1 Group
	Data Authentication	Watermark
Easy Configuration	Easy Configuration	N/A
Interface		
Monitors	VGA	1 VGA (1920x1080, 1280x1024, 1280x720)
	HDMI	1 HDMI (4K(3840 x 2160), 2K(2560 x 1440), 1920x1080, 1280x1024, 1280x720)
	Composite(Spot)	BNC(1CH) ※ Included OSD On Screen, Multi mode Support
	Loop Outputs	N/A
Audio	Inputs/Output	4CH line in / 1CH line out
	Compression	G.711
	Sampling rate	8KHz
Alarm	Inputs/Outputs	Terminal 16 Inputs (NO/NC) / Terminal 4 relay Outputs (NO/NC), Rating : 30V DC/2A, 250V AC/0.25A
	Remote notification	Notification via e-mail
Connections	Ethernet	1 RJ45 10/100/1000 Base-T
	Serial interface	RS-485(Half Duplex) for PTZ, Samsung System Keyboard
	USB	1 ports(USB 3.0, Rear), 2 ports(USB 2.0, Front)
	e-SATA	1 External SATA ports
	Application Supoort	Mouse, IR Remocon
	Protocol support(RS-485)	Samsung-E/Samsung-T/Pelco-D/Pelco-p/Panasonic/ Phillips/ AD/ DIAMOND/ ERNA/ KALATEL/ VCL TP/VICON/ ELMO/GE
	Protocol support(Coaxial)	NTSC/PAL : Pelco-C (Coaxitron) AHD : ACP(AHD Coax Protocol)
General		
Electrical	Input Voltage/Current	DC12V Adaptor(100~250V AC ±10% , 50/60Hz)
	Power consumption	Max. 52W
Environmental	Operating Temperature/Humidity	+0°C to +40°C (+32°F to +104°F) / 20% to 85% RH
Mechanical	Dimension (W x H x D)	W370.0x H44.0 xD320(14.57" x 1.73" x12.6")
	Weight (no hard disks)	Approx. 2.328kg
Lauguage	GUI	English, French, German, Spanish, Italian, Russian, Polish, Czech, Turkish, Netherlands Portuguese, Swedish, Danish, Rumania, Serbia, Croatia, Hungary, Greek, Finnish, Norwegian, Korean, Japanese, Chinese(Traditional), Thai , Chinese(Simplified)(25 Language) * For Korean Model : Korean
	Web Browser	English, French, German, Spanish, Italian, Russian, Polish, Czech, Turkish, Netherlands Portuguese, Swedish, Danish, Rumania, Serbia, Croatia, Hungary, Greek, Finnish, Norwegian, Korean, Japanese, Chinese(Traditional), Thai , Chinese(Simplified)(25 Language) * For Korean Model : Korean

1.1 Test Voltage & Frequency

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

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

Frequency ☒ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
DVR	HRD-1641P	-	Hanwha Techwin (Tianjin) Co.,Ltd	E.U.T
DVR ADAPTOR	FSP060-DIBAN2	H00000212	Zhonghan Electronics (Shenzhen) Co., Ltd.	-
HDD	WD40PURX-64N960	WCC7K5PX74R4	WD	4 TB
IR REMOTE CONTROL	EP10-000331A	-	-	-
MOUSE	MOKJUO	-	Primax Electronics Ltd.	-

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
MONITOR 1	LT23C350	009MHYCH106388P	SAMSUNG	-
MONITOR 1 ADAPTOR	A4514_DSM	CN07BN4400721ASE 38GCOY0XS	Samsung Electro-Mechanics Co.,Ltd	-
MONITOR 2	S24E370DL	0NTWHTPH200179Y	SAMSUNG	-
MONITOR 2 ADAPTOR	A3514_FPN	CN07BN4400832ASK 28GCTR235 R.D	POWERNET Technologies Crop.	-
MONITOR 3	SMT-2232	C95V67VF900038B	Weihai Daewoo Electronics Co., Ltd.	-
CCTV CAMERA	SDH-C74041-CAM	-	SMASUNG	-
CCTV CAMERA ADAPTOR	FSP060-DIBAN2	H00000195	Zhonghan Electronics (Shenzhen) Co., Ltd.	
CONTROLLER	SPC-1010	C50E67WG10100F	SamSung Techwin Co.,Ltd	-
CONTROLLER ADAPTOR	RS-AB1000	-	Dongguan Jinhuasheng Power Technology Co.,Ltd	-
SPEAKER	BR10000A CUVE	-	BEIJING EDIFIER HI-TECH GROUP.	-
MIC	CMK-303	-	CAMAC	-
ALARM 1	-	-	-	-
ALARM 2	-	-	-	-
USB 3.0 Memory	-	-	-	16 GB
Notebook	X56K	HN11N5151FJ0045W	HANSUNG	-
Notebook ADAPTOR	A12-120P1A	F180271552011758	CHICONY POWER TECHNOLOGY CO.,LTD.	-
SSD Memory	SSD320	B12734-0373	Transcend	64 GB

1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
DVR (E.U.T)	D-SUB	MONITOR 1	D-SUB	1.4	S
	HDMI	MONITOR 2	HDMI	1.4	S
	BNC	MONITOR 3	BNC	2.5	S
	BNC	CCTV CAMERA	BNC	10.0	S
	2 Pin	CONTROLLER	2 Pin	3.2	U
	Audio Out	SPEAKER	Audio Out	1.2	U
	Audio IN	MIC	Audio IN	1.2	U
	3 Pin	ALARM 1	3 Pin	3.2	U
	3 Pin	ALARM 2	3 Pin	3.6	U
	USB 3.0	USB 3.0 Memory	USB 3.0	-	-
	RJ-45	Notebook	RJ-45	5.2	U
	e-SATA	SSD Memory	e-SATA	0.5	U
	USB 2.0	MOUSE	USB 2.0	1.5	U

* Unshielded=U, Shielded=S

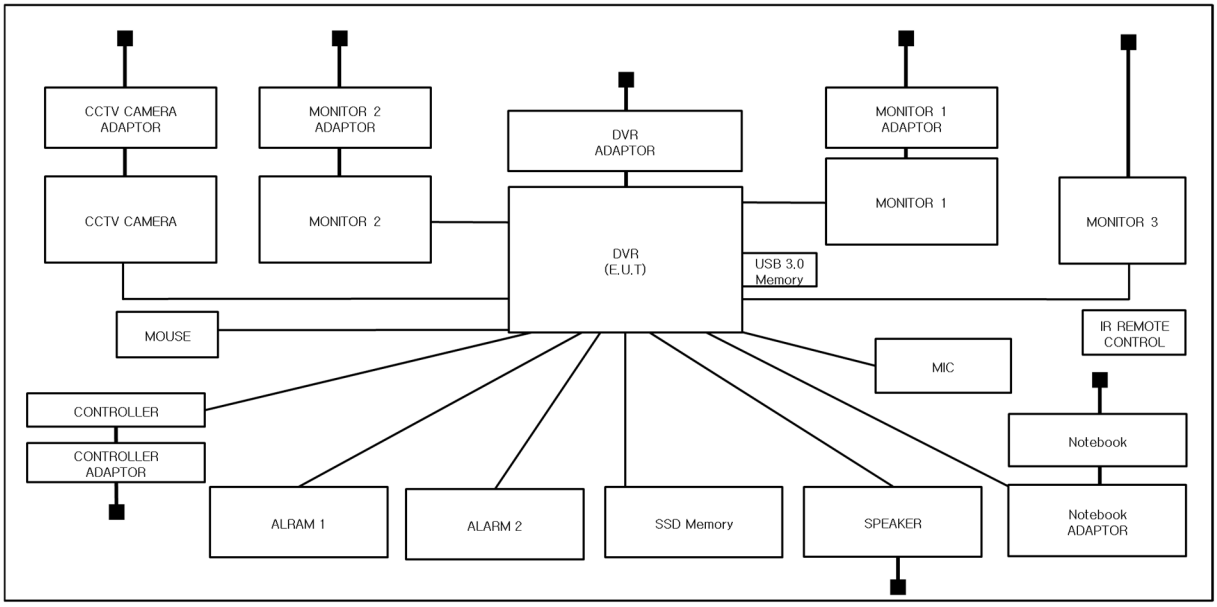
1.7 E.U.T Operating Mode(s)

operating
1. Check the output of the camera images on the monitor 2. Check the video output of the camera via the laptop and ping test.

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

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	**RRA**	EMI (3 m & 10 m Semi-Aechoic 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-Aechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	KT489
USA	**FCC**	3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	KR0100
Canada	**ISED**	3 m & 10 m Semi-Aechoic 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-Aechoic 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
Aug. 04, 2017

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	04, 27, 2018
☒	LISN	ENV216	R & S	101137	02, 03, 2018
☒	LISN	ENV216	R & S	101786	04, 27, 2018
☒	PULSE LIMITER	ESH3-Z2	R & S	101914	12, 13, 2017

Test Conditions
Temperature: 23,5 ℃
Relative Humidity: 45,1 %

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Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.2 Conducted Emissions at Telecommunication Ports

Test Date
Aug. 04, 2017

Test Location
Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101783	04, 27, 2018
☒	LISN	ENV216	R & S	101137	02, 03, 2018
☒	LISN	ENV216	R & S	101786	04, 27, 2018
☒	PULSE LIMITER	ESH3-Z2	R & S	101914	12, 13, 2017
☒	8-WIRE ISN CAT3	CAT3 8158	SCHWARZBECK	8158-0019	03, 29, 2018
☒	8-WIRE ISN CAT5	CAT5 8158	SCHWARZBECK	8158-0030	03, 29, 2018
☒	ISN	ISN S8	SCHWARZBECK	ISN-S8-0019	05, 12, 2018

Test Conditions
Temperature: 23,5 ℃
Relative Humidity: 45,1 %

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.3 Radiated Electric Field Emissions(Below 1 ㎓)

Test Date
Aug. 05, 2017

Test Location
☐ OPEN AREA TEST SITE #2 ☒ SAC #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 18, 2018
☒	AMPLIFIER	SCU 01	R & S	100603	12, 13, 2017
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	716	11, 28, 2018

Test Conditions
Temperature: 24,1 ℃
Relative Humidity: 54,9 %

Frequency Range of Measurement
30 ㎒ to 1 ㎓

Instrument Settings
IF Band Width: 120 ㎑

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.4 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Aug. 05, 2017

Test Location
SEMI ANECHOIC CHAMBER #2

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	e3	AUDIX	8.083b	-
☒	EMI TEST RECEIVER	ESU26	R & S	100552	04, 19, 2018
☒	PREAMPLIFIER	8449B	AGILENT	3008A01729	05, 31, 2018
☒	LOG-PERIODIC ANTENNA	STLP 9149	SCHWARZBECK	9149-255	05, 17, 2018

Test Conditions
Temperature: 23,7 ℃
Relative Humidity: 42,3 %

Frequency Range of Measurement
1 ㎓ to 6 ㎓

Instrument Settings
IF Band Width: 1 ㎒

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.5 Harmonic Current Emissions

Test Date
Aug. 06, 2017

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	dpa.control	EM TEST	5.4.11.0	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	08, 08, 2017
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	08, 08, 2017

Test Conditions
Temperature: 22,9 ℃
Relative Humidity: 41,6 %

Classification of Equipment for Harmonic Current Emissions
☒ Class A
☐ Class B
☐ Class C(Below 25 W)
☐ Class C(Above 25 W)
☐ Class D

Test Results
The requirements are:

☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks
See Appendix A for test data.

2.6 Voltage Fluctuations and Flicker

Test Date
Aug. 06, 2017

Test Location
Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	dpa.control	EM TEST	5.4.11.0	-
☒	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	08, 08, 2017
☒	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	08, 08, 2017

Test Conditions
Temperature: 22,9 ℃
Relative Humidity: 41,6 %

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 $dB\mu V$.

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 $dB\mu V$, 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 $dB\mu V$, 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 $dB\mu V$.

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
Aug. 06, 2017

Test Location
EMS-ESD: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMS Test S/W	-	-	-	-
☒	ESD SIMULATOR	ESS-2000	Noise Ken	ESS05X4620	02, 24, 2018
☒	HCP	-	Noise Ken	-	-
☒	VCP	-	Noise Ken	-	-

Test Conditions

Temperature:	22,9 ℃
Relative Humidity:	41,6 %
Atmospheric Pressure:	99,3 kPa

Test Specifications

Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

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

Polarity: Positive and Negative

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

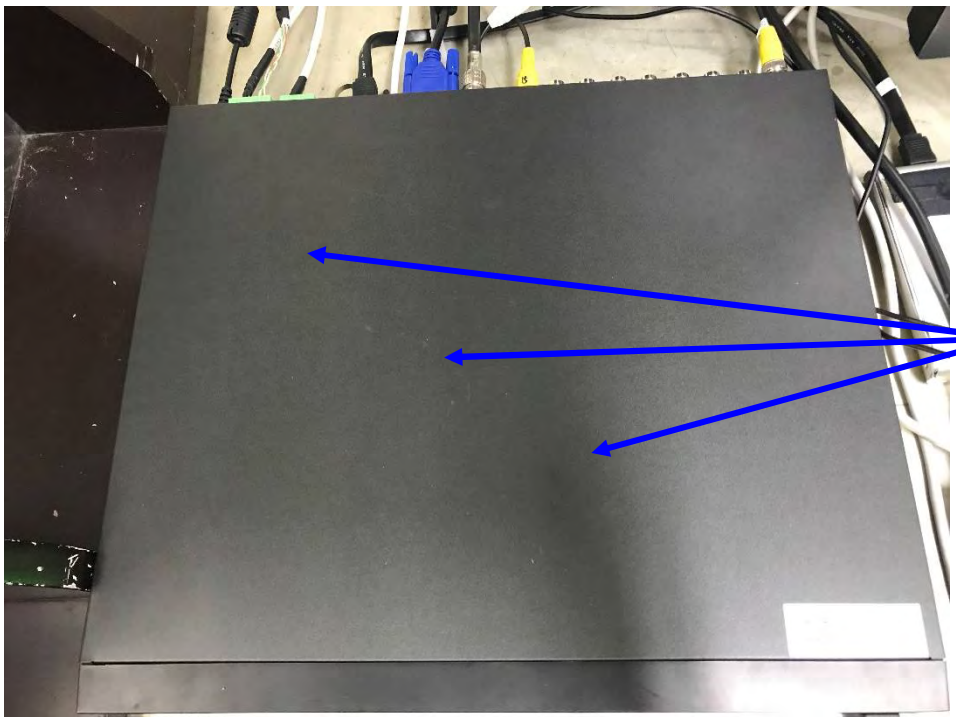
Discharge Voltage:	Contact	Air	HCP	VCP
	☐ 2 kV	☒ 2 kV	☐ 2 kV	☐ 2 kV
	☐ 4 kV	☒ 4 kV	☐ 4 kV	☐ 4 kV
	☒ 6 kV	☐ 6 kV	☒ 6 kV	☒ 6 kV
	☐ 8 kV	☒ 8 kV	☐ 8 kV	☐ 8 kV
	☐ 15 kV	☐ 15 kV	☐ 15 kV	☐ 15 kV

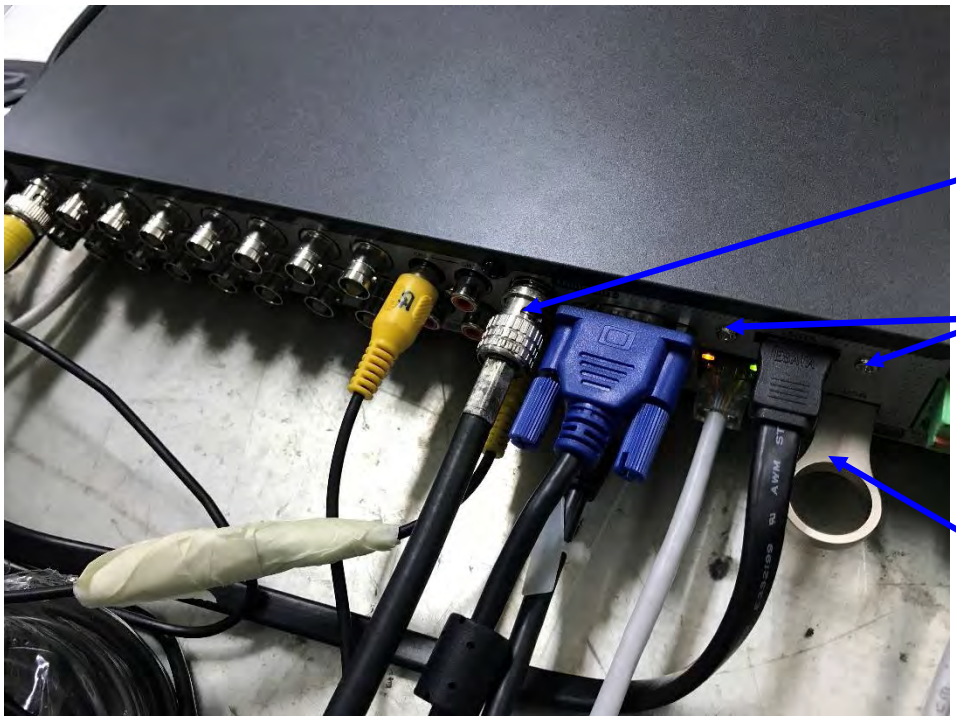
Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

Required Performance Criteria: ☒ Complied

Location of Discharge:

Air
Contact





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	Sarface	Contact Discharge	Complied	-
2	Screw	Contact Discharge	Complied	-
3	UBS 3.0 MEMORY	Contact Discharge	Complied	-
4	BNC Port	Contact Discharge	Complied	-

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria.

3.2 Radiated Electric Field Immunity

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

Test Date
Aug. 06, 2017

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

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	EMC32	R & S	-	-
☒	SIGNAL GENERATOR	SMB 100A	R & S	177586	08, 08, 2017
☒	BROADBAND AMPLIFIER	BBA100	R & S	101239	08, 08, 2017
☒	BROADBAND AMPLIFIER	100S1G6M1	AR	579931	08, 08, 2017
☒	POWER METER	NRP2	R & S	103475	08, 08, 2017
☒	AVG POWER SENSOR	NRP-Z91	R & S	102526	08, 08, 2017
☒	AVG POWER SENSOR	NRP-Z91	R & S	102527	08, 08, 2017
☒	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
☒	MICROPHONE	MP201	BSWA	520963	11, 11, 2017
☒	SOUND ACOUSTIC TESTER	TST-1000	TESTEK	150045	11, 08, 2017

Test Conditions

Temperature: 24,9 ℃
Relative Humidity: 52,2 %
Atmospheric Pressure: 98,6 kPa

Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

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

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

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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

# of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

Test Data

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

Note: "Blank" = Not performed

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria.

3.3 Electrical Fast Transients/Bursts

Reference Standard
EN 61000-4-4:2012

Test Date
Aug. 08, 2017

Test Location
EMS-EFT: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.3.9	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N5T	EM TEST	P1317117973	02, 08, 2018
☒	MOTOR VARIAC	MV2616	EM TEST	V0936105123	02, 08, 2018
☒	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	070925	06, 26, 2018

Test Conditions

Temperature:	23,3 ℃
Relative Humidity:	40,8 %
Atmospheric Pressure:	98,4 ㎪

Test Specifications

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

Test Data

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Observations	
	(+) Burst (㎸)	(-) Burst (㎸)
BNC (CCTV CAMERA)	Complied	Complied
2 PIN (CONTROLLER)	Complied	Complied
3 PIN (ALARM 1,2)	Complied	Complied
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
Aug. 08, 2017

Test Location
EMS-Surge: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.3.9	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N5T	EM TEST	P1317117973	02, 08, 2018
☒	MOTOR VARIAC	MV2616	EM TEST	V0936105123	02, 08, 2018
☒	CDN	CNV 508T5	EM TEST	P1549168422	04, 26, 2018

Test Conditions
Temperature: 23,3 ℃
Relative Humidity: 40,8 %
Atmospheric Pressure: 98.4 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 (㎸)	(-) Surge (㎸)
L – N	Complied	Complied
L – PE	Complied	Complied
N - PE	Complied	Complied

☐ Line to Earth – Common Mode

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

Signal Lines

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (㎸)	(-) Surge (㎸)
BNC (CCTV CAMERA)	Complied	Complied
2 PIN (CONTROLLER)	Complied	Complied
3 PIN (ALARM 1,2)	Complied	Complied
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
Aug. 08, 2017

Test Location
EMS-CS: Electro wave Shieldroom #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	icd.control	EM TEST	5.3.7	-
☒	CONTINUOUS WAVE SIMULATOR	CWS 500N1	EM TEST	V0936105119	08, 08, 2017
☒	ATTENUATOR	ATT6	EM TEST	1208-34	08, 08, 2017
☒	CDN	CDN-M2/M3N	EM TEST	0909-06	08, 08, 2017
☒	CDN	CDN T8RJ45	EM TEST	0909-09	08, 08, 2017
☒	EM INJECTION CLAMP	EM 101	Liithi	35943	02, 03, 2018
☒	MICROPHONE	MP201	BSWA	520963	11, 11, 2017
☒	SOUND ACOUSTIC TESTER	TST-1000	TESTEK	150045	11, 08, 2017

Test Conditions
Temperature: 23,3 ℃
Relative Humidity: 40,8 %
Atmospheric Pressure: 98,4 kPa

Test Specifications

Frequency range:	☒ 150 ㎑ to 100 ㎒	☐ 150 ㎑ to 80 ㎒
Voltage Level:	☐ 1 Vrms ☒ 10 Vrms	☐ 3 Vrms
Modulation:	☒ AM, 80 %, 1 ㎑ sine wave ☒ PM, 1 ㎐ (0,5 s ON : 0,5 s OFF)	
Frequency step:	☒ 1 % step	
Dwell Time:	☒ 1 s	☐ 3 s
Required Performance Criteria:	☒ Complied	

Test Data

☒ 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
BNC (CCTV CAMERA)	Complied	Complied
2 PIN (CONTROLLER)	Complied	Complied
3 PIN (ALARM 1,2)	Complied	Complied
RJ-45	Complied	Complied

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

Observations:
Complied – No degradation of function

Test Results

☒ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria

Remarks

PASS Required Performance Criteria.

3.6 Voltage Dips and Short Interruptions

Reference Standard
EN 61000-4-11:2004

Test Date
Aug. 08, 2017

Test Location
EMS-Voltage dip: Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMS Test S/W	iec.control	EM TEST	5.3.9	-
☒	ULTRA COMPACT SIMULATOR	UCS 500N5T	EM TEST	P1317117973	02, 08, 2018
☒	MOTOR VARIAC	MV2616	EM TEST	V0936105123	02, 08, 2018

Test Conditions

Temperature:	23,3 ℃
Relative Humidity:	40,8 %
Atmospheric Pressure:	98,4 kPa

Test Specifications & Observations/Remarks

(Test Voltage : 230 V (ac))

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

- Voltage cariations

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

Observations:
Complied – No degradation of function

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

Remarks
PASS Required Performance Criteria.

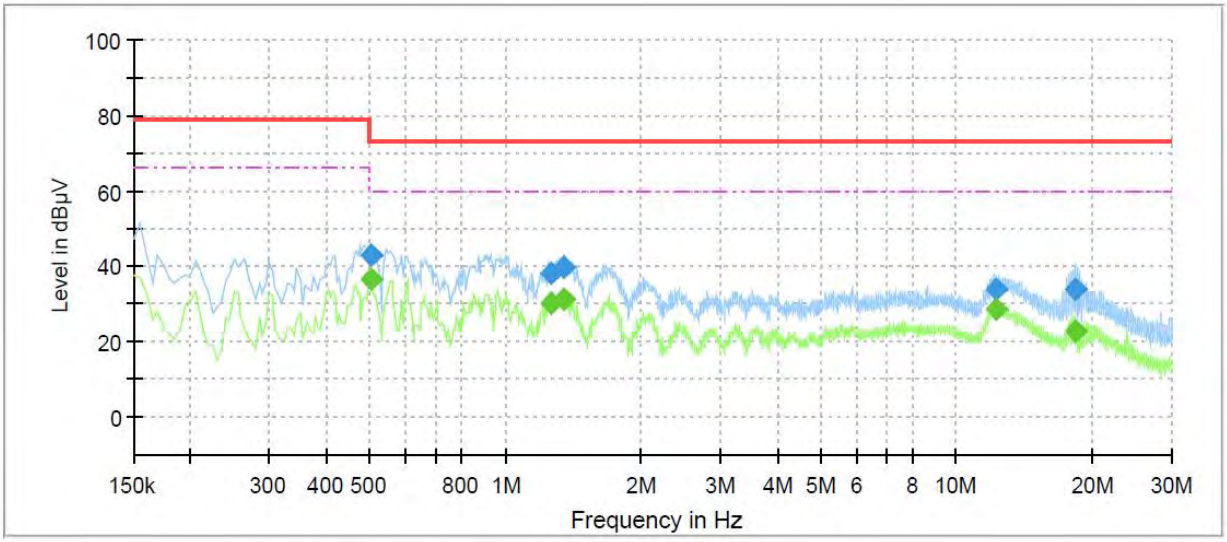
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	HRD-1641P
Mode	H
Operator Name:	KES



Final_Result

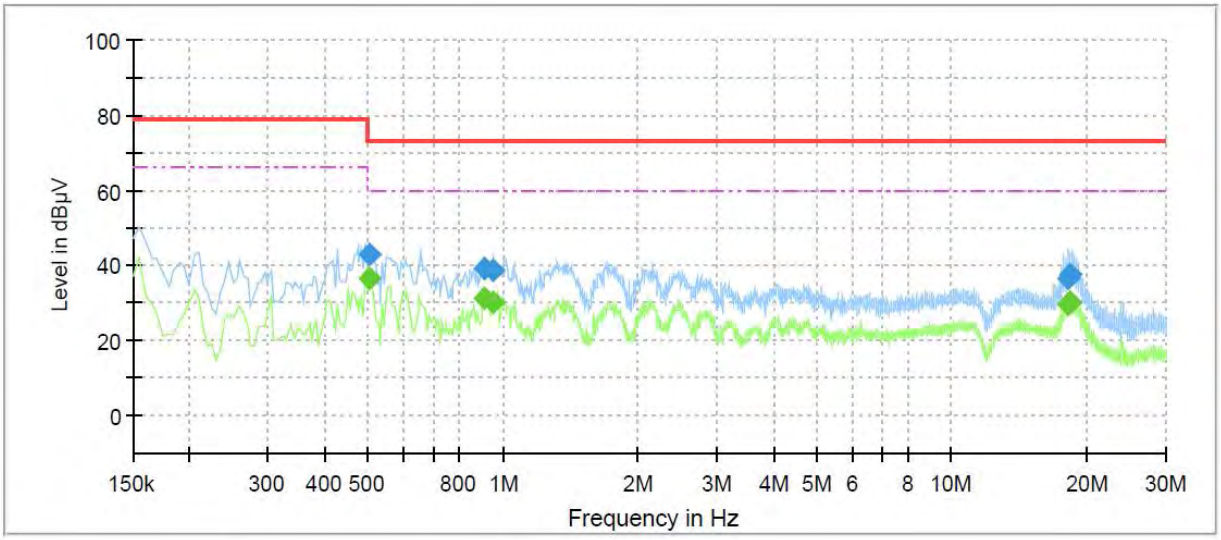
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.505000	---	36.47	60.00	23.53	1000.0	9.000	L1	19.6
0.505000	43.05	---	73.00	29.95	1000.0	9.000	L1	19.6
1.265000	---	30.33	60.00	29.67	1000.0	9.000	L1	19.9
1.265000	38.19	---	73.00	34.81	1000.0	9.000	L1	19.9
1.355000	---	31.50	60.00	28.50	1000.0	9.000	L1	19.9
1.355000	39.47	---	73.00	33.53	1000.0	9.000	L1	19.9
12.280000	---	28.59	60.00	31.41	1000.0	9.000	L1	19.8
12.280000	33.68	---	73.00	39.32	1000.0	9.000	L1	19.8
18.385000	---	22.63	60.00	37.37	1000.0	9.000	L1	20.2
18.385000	33.70	---	73.00	39.30	1000.0	9.000	L1	20.2

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

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	HRD-1641P
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)
0.505000	---	36.31	60.00	23.69	1000.0	9.000	N	19.6
0.505000	43.06	---	73.00	29.94	1000.0	9.000	N	19.6
0.910000	---	31.30	60.00	28.70	1000.0	9.000	N	19.8
0.910000	39.06	---	73.00	33.94	1000.0	9.000	N	19.8
0.955000	---	30.32	60.00	29.68	1000.0	9.000	N	19.8
0.955000	38.62	---	73.00	34.38	1000.0	9.000	N	19.8
18.125000	---	29.46	60.00	30.54	1000.0	9.000	N	20.1
18.125000	36.77	---	73.00	36.23	1000.0	9.000	N	20.1
18.400000	---	30.00	60.00	30.00	1000.0	9.000	N	20.1
18.400000	37.48	---	73.00	35.52	1000.0	9.000	N	20.1

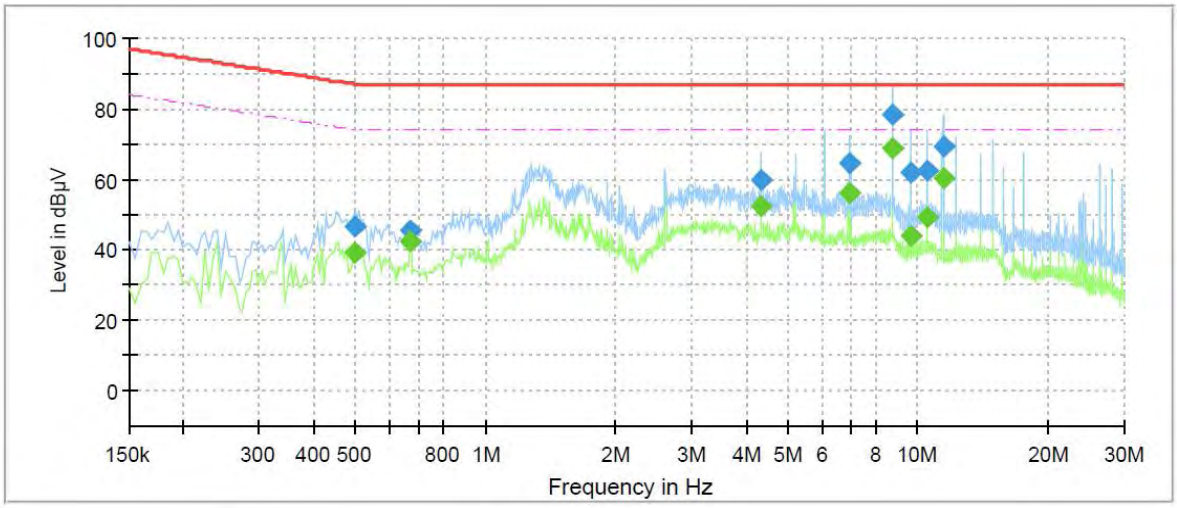
♦ Calculation
QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]
QuasiPeak / CAverage : The Final Value
Reading Value : Not shown in the table.
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

Conducted Emissions at Telecommunication Ports

[10 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	HRD-1641P
Mode	10 Mbps
Operator Name:	KES



Final_Result

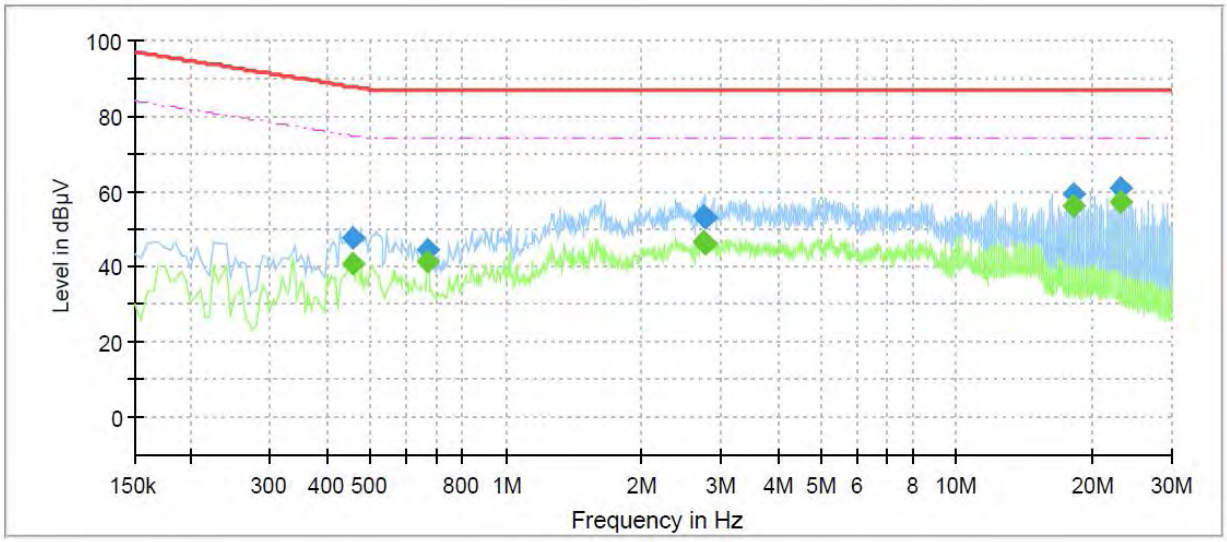
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.500000	46.42	---	87.00	40.58	1000.0	9.000	Single Line	19.9
0.500000	---	39.25	74.00	34.75	1000.0	9.000	Single Line	19.9
0.670000	45.42	---	87.00	41.58	1000.0	9.000	Single Line	19.9
0.670000	---	42.50	74.00	31.50	1000.0	9.000	Single Line	19.9
4.350000	59.64	---	87.00	27.36	1000.0	9.000	Single Line	20.0
4.350000	---	52.14	74.00	21.86	1000.0	9.000	Single Line	20.0
6.955000	64.65	---	87.00	22.35	1000.0	9.000	Single Line	19.8
6.955000	---	56.22	74.00	17.78	1000.0	9.000	Single Line	19.8
8.750000	---	68.85	74.00	5.15	1000.0	9.000	Single Line	19.8
8.750000	78.14	---	87.00	8.86	1000.0	9.000	Single Line	19.8
9.610000	---	43.76	74.00	30.24	1000.0	9.000	Single Line	19.8
9.610000	62.08	---	87.00	24.92	1000.0	9.000	Single Line	19.8
10.495000	---	49.19	74.00	24.81	1000.0	9.000	Single Line	19.8
10.495000	62.61	---	87.00	24.39	1000.0	9.000	Single Line	19.8
11.410000	---	60.11	74.00	13.89	1000.0	9.000	Single Line	19.8
11.410000	69.40	---	87.00	17.60	1000.0	9.000	Single Line	19.8

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

[100 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	HRD-1641P
Mode	100 Mbps
Operator Name:	KES



Final_Result

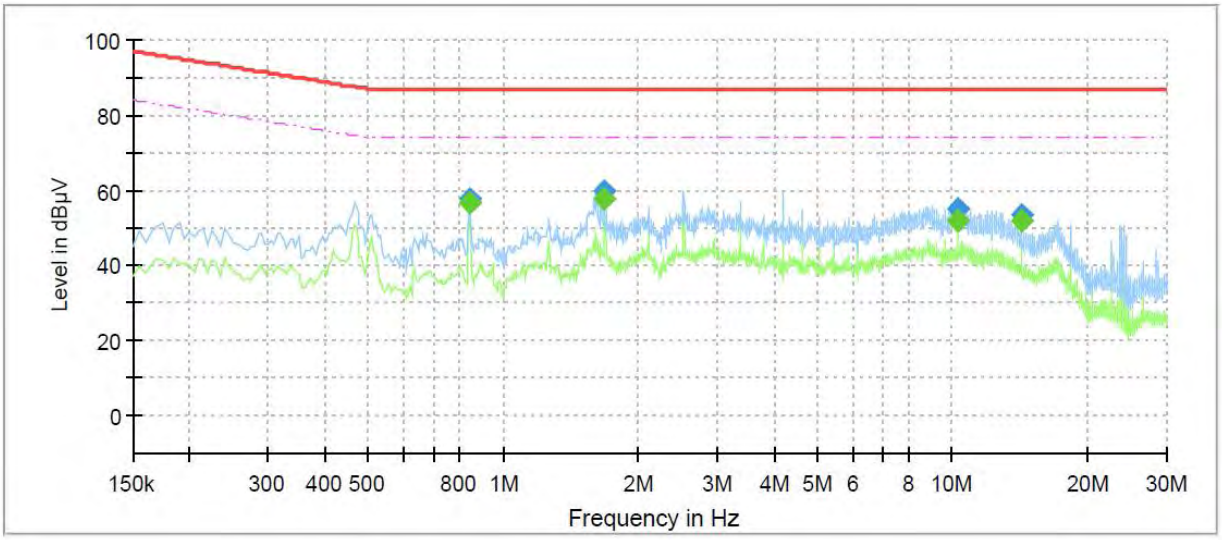
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.455000	---	40.82	74.78	33.96	1000.0	9.000	Single Line	19.4
0.455000	47.76	---	87.78	40.02	1000.0	9.000	Single Line	19.4
0.670000	---	41.53	74.00	32.47	1000.0	9.000	Single Line	19.4
0.670000	44.54	---	87.00	42.46	1000.0	9.000	Single Line	19.4
2.755000	---	46.50	74.00	27.50	1000.0	9.000	Single Line	19.5
2.755000	53.27	---	87.00	33.73	1000.0	9.000	Single Line	19.5
2.780000	---	46.13	74.00	27.87	1000.0	9.000	Single Line	19.5
2.780000	53.02	---	87.00	33.98	1000.0	9.000	Single Line	19.5
18.245000	---	55.97	74.00	18.03	1000.0	9.000	Single Line	19.5
18.245000	59.31	---	87.00	27.69	1000.0	9.000	Single Line	19.5
23.130000	---	57.13	74.00	16.87	1000.0	9.000	Single Line	19.4
23.130000	60.89	---	87.00	26.11	1000.0	9.000	Single Line	19.4

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

[1 000 Mbps]

Common Information

Test Description:	Telecommunication Emission
Model No.:	HRD-1641P
Mode	1 000 Mbps
Operator Name:	KES

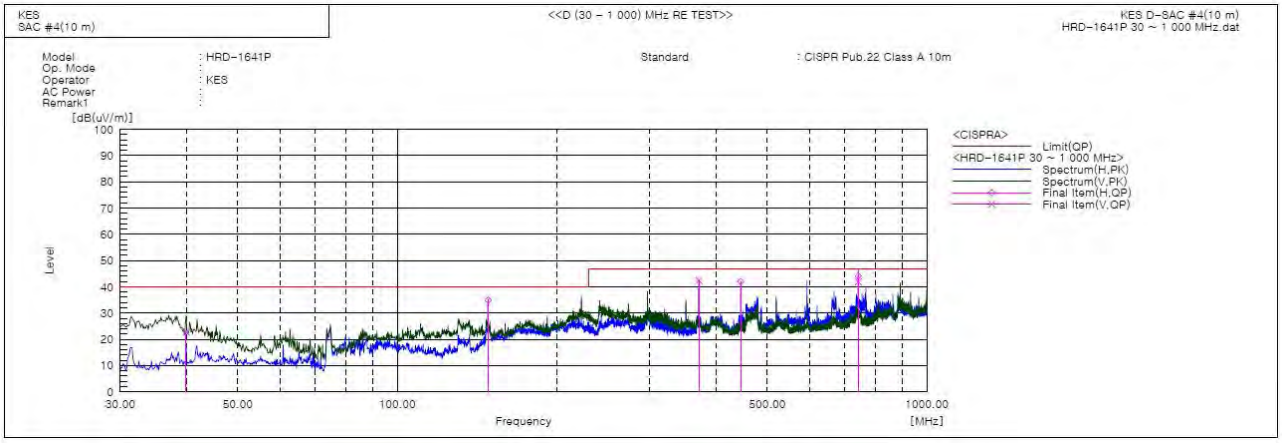


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.840000	---	56.58	74.00	17.42	1000.0	9.000	Single Line	19.6
0.840000	57.84	---	87.00	29.16	1000.0	9.000	Single Line	19.6
1.680000	---	57.71	74.00	16.29	1000.0	9.000	Single Line	19.8
1.680000	59.65	---	87.00	27.35	1000.0	9.000	Single Line	19.8
10.240000	---	51.93	74.00	22.07	1000.0	9.000	Single Line	19.6
10.240000	55.04	---	87.00	31.96	1000.0	9.000	Single Line	19.6
14.335000	---	51.93	74.00	22.07	1000.0	9.000	Single Line	19.9
14.335000	53.56	---	87.00	33.44	1000.0	9.000	Single Line	19.9

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

Radiated Electric Field Emissions(Below 1 ㎓)



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	39.943	V	52.2	-29.4	22.8	40.0	17.2	100.0	54.0	
2	148.461	H	66.3	-31.4	34.9	40.0	5.1	363.0	15.0	
3	371.198	V	63.6	-21.2	42.4	47.0	4.6	100.0	33.0	
4	445.524	H	61.1	-19.1	42.0	47.0	5.0	108.0	102.0	
5	742.504	H	57.2	-13.1	44.1	47.0	2.9	173.0	358.0	
6	742.504	V	55.0	-13.1	41.9	47.0	5.1	100.0	358.0	

♦ Calculation – SAC #4(10 m)

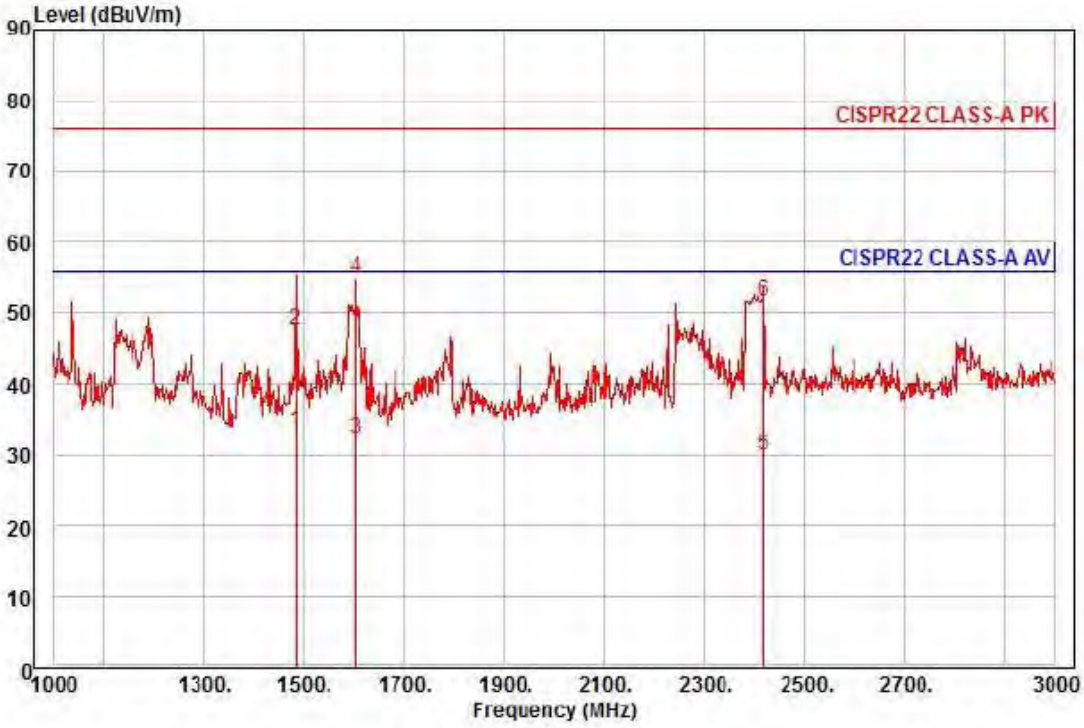
Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)]

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 ㎓)



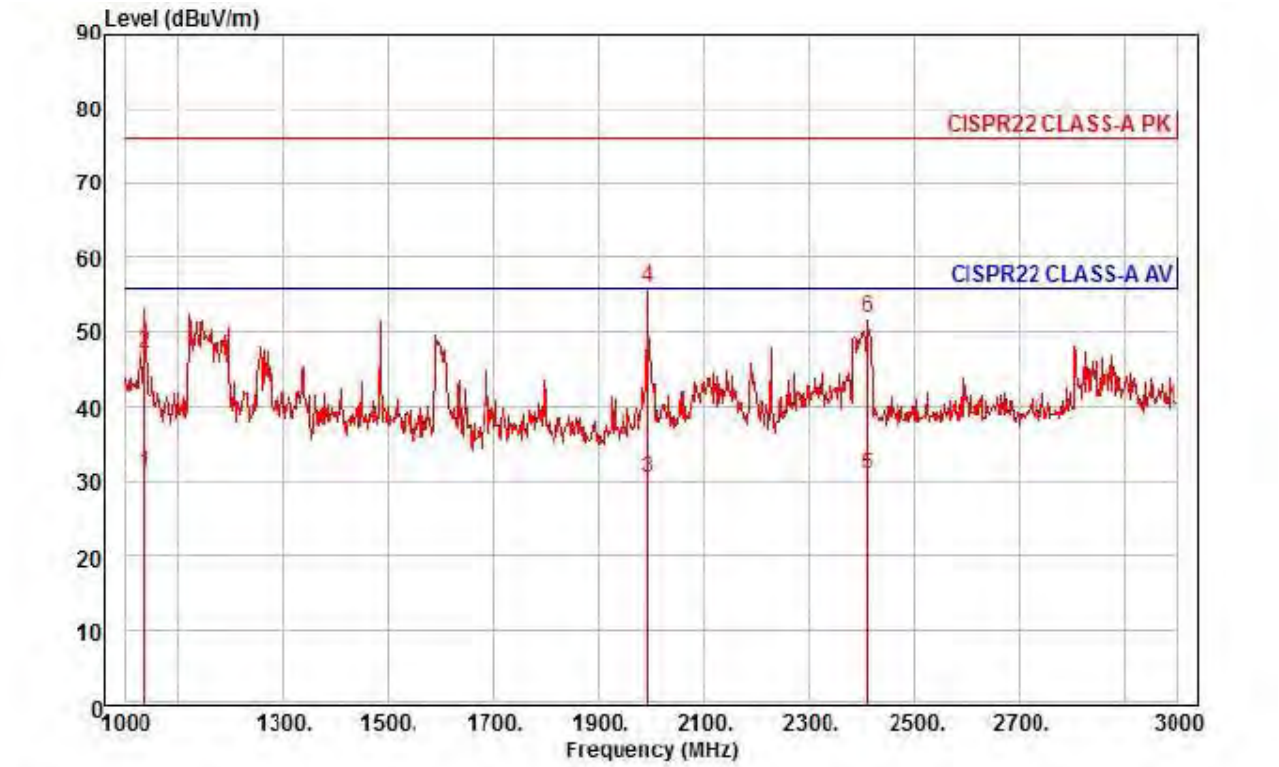
Site : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) horizontal
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : HRD-1641P
Mode :
Memo :

	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 av	1484.00	36.86	23.97	8.17	35.63	50	56.00	-22.63	horizontal	Average
2	1484.00	51.10	23.97	8.17	35.63	50	76.00	-28.39	horizontal	Peak
3	1604.00	34.96	24.43	8.52	35.52	321	56.00	-23.61	horizontal	Average
4 pp	1604.00	57.46	24.43	8.52	35.52	321	76.00	-21.11	horizontal	Peak
5	2418.00	27.22	27.28	10.64	35.33	42	56.00	-26.19	horizontal	Average
6	2418.00	49.13	27.28	10.64	35.33	42	76.00	-24.28	horizontal	Peak

♦ Calculation

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

Over Limit : Marjin, Read Level : Reading value, Ant Factor : ANT Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor



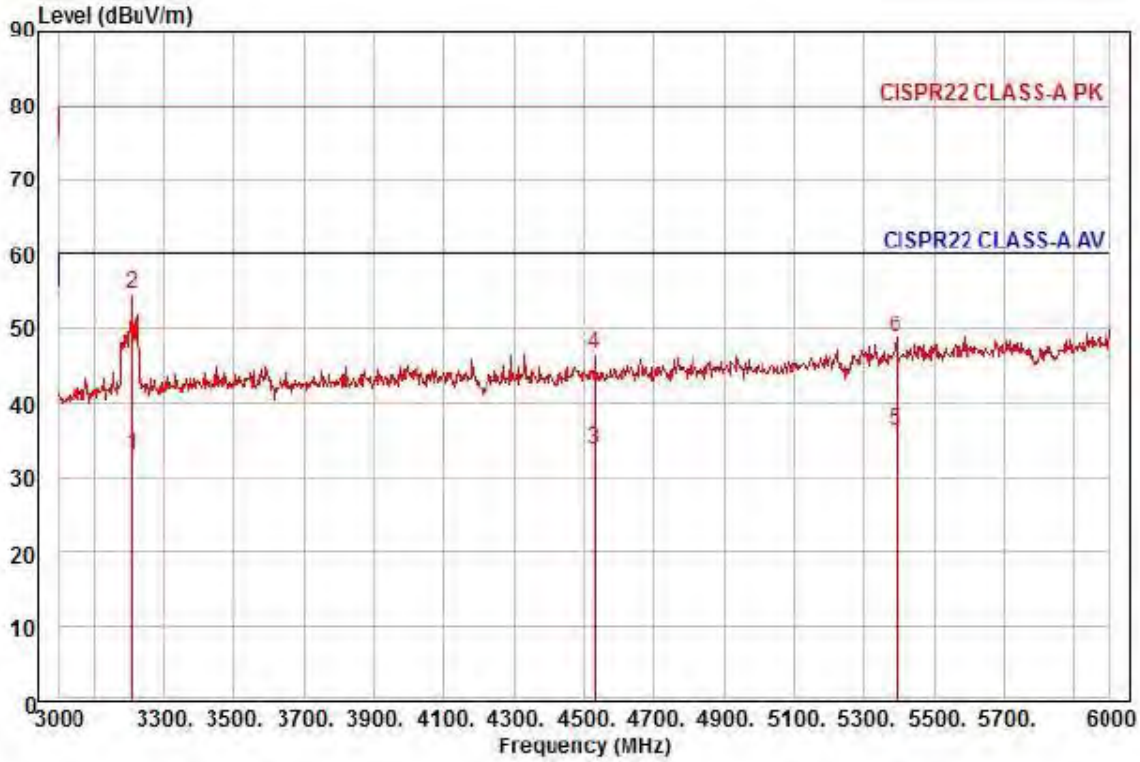
Site : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) vertical
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : HRD-1641P
Mode :
Memo :

	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 av	1038.00	37.73	22.62	6.76	36.03	275	56.00	-24.92	vertical	Average
2	1038.00	53.64	22.62	6.76	36.03	275	76.00	-29.01	vertical	Peak
3	1994.00	30.07	25.99	9.63	35.18	360	56.00	-25.49	vertical	Average
4 pp	1994.00	55.38	25.99	9.63	35.18	360	76.00	-20.18	vertical	Peak
5	2412.00	28.44	27.26	10.62	35.33	343	56.00	-25.01	vertical	Average
6	2412.00	49.55	27.26	10.62	35.33	343	76.00	-23.90	vertical	Peak

♦ Calculation

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

Over Limit : Marjin, Read Level : Reading value, Ant Factor : ANT Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor



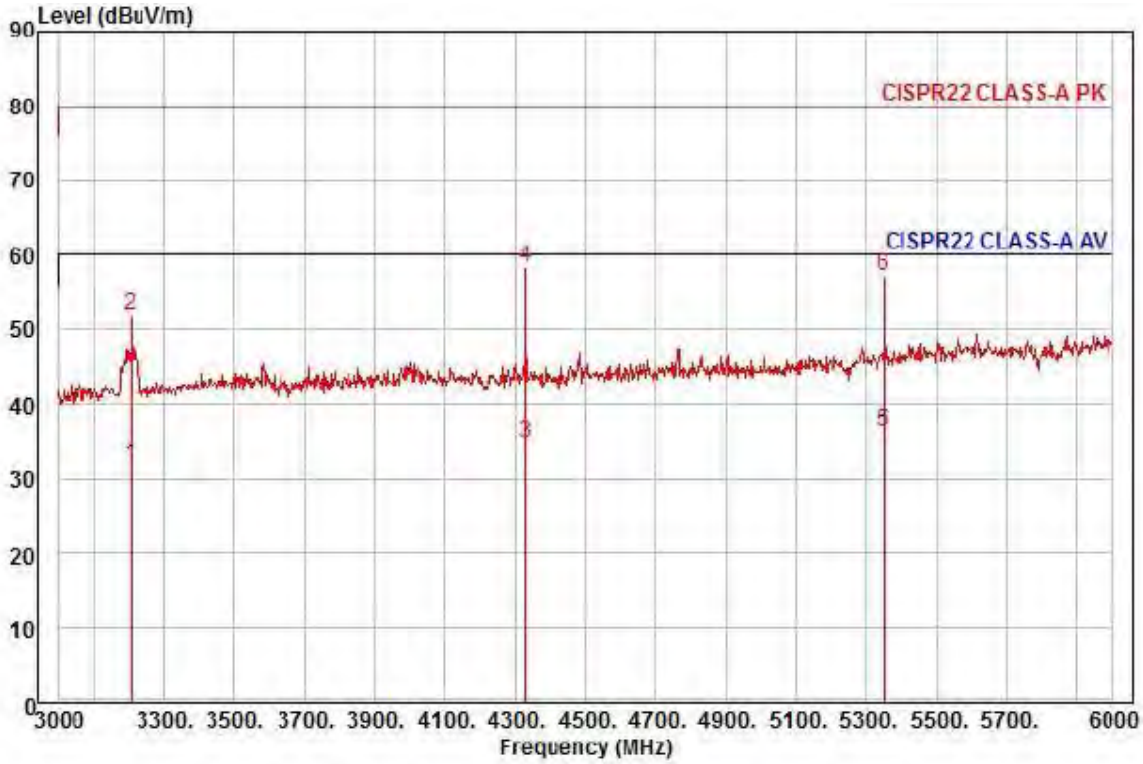

```
Site      : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) horizontal
          : RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project   :
Model     : HRD-1641P
Mode      :
Memo      :
```

	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	3207.00	25.53	30.32	12.68	35.50	333	60.00	-26.97	horizontal	Average
2 pk	3207.00	47.26	30.32	12.68	35.50	333	80.00	-25.24	horizontal	Peak
3	4530.00	21.80	32.42	15.01	35.47	162	60.00	-26.24	horizontal	Average
4	4530.00	34.75	32.42	15.01	35.47	162	80.00	-33.29	horizontal	Peak
5 pp	5391.00	20.63	34.94	16.44	35.65	194	60.00	-23.64	horizontal	Average
6	5391.00	33.09	34.94	16.44	35.65	194	80.00	-31.18	horizontal	Peak

♦ Calculation

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

Over Limit : Marjin, Read Level : Reading value, Ant Factor : ANT Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor



Site : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) vertical
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : HRD-1641P
Mode :
Memo :

	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	3204.00	24.35	30.32	12.67	35.50	50	60.00	-28.16	vertical	Average
2	3204.00	44.61	30.32	12.67	35.50	50	80.00	-27.90	vertical	Peak
3	4329.00	23.17	32.41	14.66	35.40	340	60.00	-25.16	vertical	Average
4 pp	4329.00	46.79	32.41	14.66	35.40	340	80.00	-21.54	vertical	Peak
5 av	5349.00	20.86	34.78	16.35	35.65	75	60.00	-23.66	vertical	Average
6	5349.00	41.76	34.78	16.35	35.65	75	80.00	-22.76	vertical	Peak

♦ Calculation

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

Over Limit : Marjin, Read Level : Reading value, Ant Factor : ANT Factor,
Cable Loss : Cable loss, Preamp Factor : Preamp Factor

Harmonic Current Emissions and Voltage Fluctuations and Flicker

Average harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	79.065E-3			
2	2.710E-3			PASS
3	73.765E-3	3.207	2.30	PASS
4	3.774E-3			PASS
5	71.932E-3	6.310	1.14	PASS
6	4.147E-3			PASS
7	70.567E-3	9.165	770.00E-3	PASS
8	3.212E-3			PASS
9	68.871E-3	17.218	400.00E-3	PASS
10	3.374E-3			PASS
11	66.039E-3	20.012	330.00E-3	PASS
12	3.462E-3			PASS
13	62.617E-3	29.818	210.00E-3	PASS
14	3.290E-3			PASS
15	59.009E-3	39.340	150.00E-3	PASS
16	3.031E-3			PASS
17	55.226E-3	41.727	132.35E-3	PASS
18	3.094E-3			PASS
19	51.188E-3	43.226	118.42E-3	PASS
20	3.039E-3			PASS
21	46.821E-3	29.134	160.71E-3	PASS
22	2.898E-3			PASS
23	42.542E-3	28.990	146.74E-3	PASS
24	2.642E-3			PASS
25	38.118E-3	28.236	135.00E-3	PASS
26	2.467E-3			PASS
27	33.658E-3	26.928	124.99E-3	PASS
28	2.377E-3			PASS
29	29.282E-3	25.159	116.39E-3	PASS
30	2.166E-3			PASS
31	25.055E-3	23.013	108.87E-3	PASS
32	1.966E-3			PASS
33	21.104E-3	20.635	102.27E-3	PASS
34	1.768E-3			PASS
35	17.314E-3	17.954	96.44E-3	PASS
36	1.497E-3			PASS
37	13.757E-3	15.082	91.21E-3	PASS
38	1.346E-3			PASS
39	10.649E-3	12.306	86.53E-3	PASS
40	1.225E-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.

Test Data - Harmonics (continued)

Maximum harmonic current results

Hn	Ieff [A]	% of Limit	Limit [A]	Result
1	79.769E-3			
2	3.247E-3			PASS
3	74.483E-3	2.159	3.45	PASS
4	4.262E-3			PASS
5	73.370E-3	4.291	1.71	PASS
6	5.097E-3	1.133	450.00E-3	PASS
7	71.252E-3	6.169	1.15	PASS
8	3.625E-3			PASS
9	69.556E-3	11.593	600.00E-3	PASS
10	3.921E-3			PASS
11	66.685E-3	13.472	495.00E-3	PASS
12	4.163E-3			PASS
13	63.186E-3	20.059	315.00E-3	PASS
14	4.043E-3			PASS
15	59.637E-3	26.505	225.00E-3	PASS
16	3.724E-3			PASS
17	55.778E-3	28.096	198.52E-3	PASS
18	3.677E-3			PASS
19	51.717E-3	29.115	177.63E-3	PASS
20	3.458E-3			PASS
21	47.159E-3	29.344	160.71E-3	PASS
22	3.323E-3			PASS
23	42.796E-3	29.164	146.74E-3	PASS
24	3.197E-3			PASS
25	38.317E-3	28.383	135.00E-3	PASS
26	2.897E-3			PASS
27	33.863E-3	27.091	124.99E-3	PASS
28	2.852E-3			PASS
29	29.413E-3	25.273	116.39E-3	PASS
30	2.507E-3			PASS
31	25.214E-3	23.159	108.87E-3	PASS
32	2.264E-3			PASS
33	21.508E-3	21.031	102.27E-3	PASS
34	2.060E-3			PASS
35	17.470E-3	18.116	96.44E-3	PASS
36	1.733E-3			PASS
37	13.876E-3	15.212	91.21E-3	PASS
38	1.528E-3			PASS
39	11.027E-3	12.743	86.53E-3	PASS
40	1.375E-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.

Test Data - Voltage Fluctuations

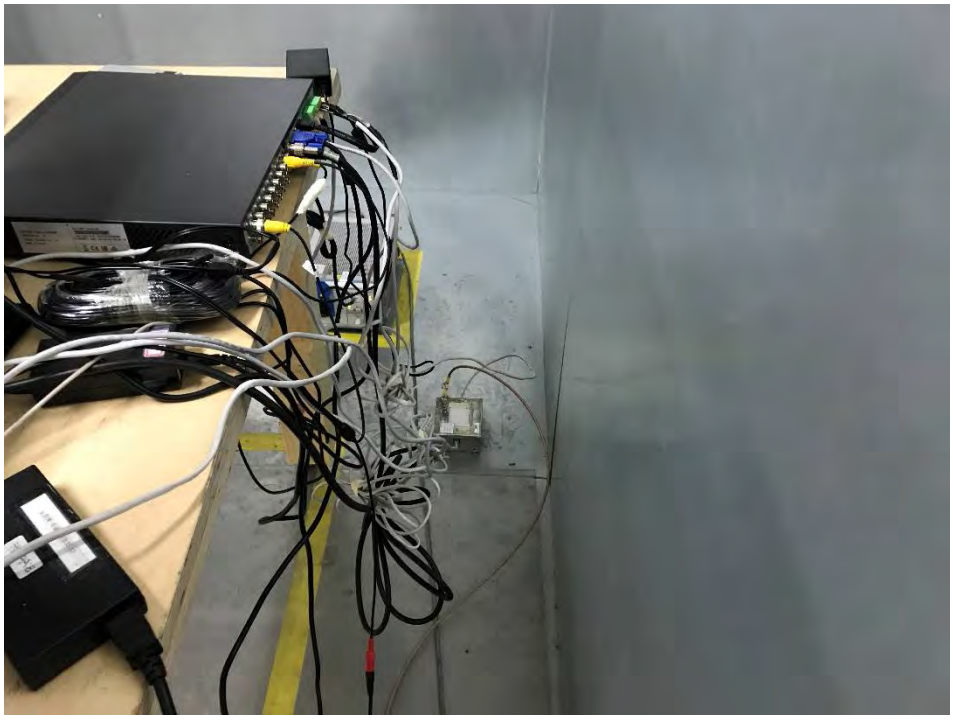
Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.034	4.00	PASS
Tmax [s]	0.000	0.50	PASS

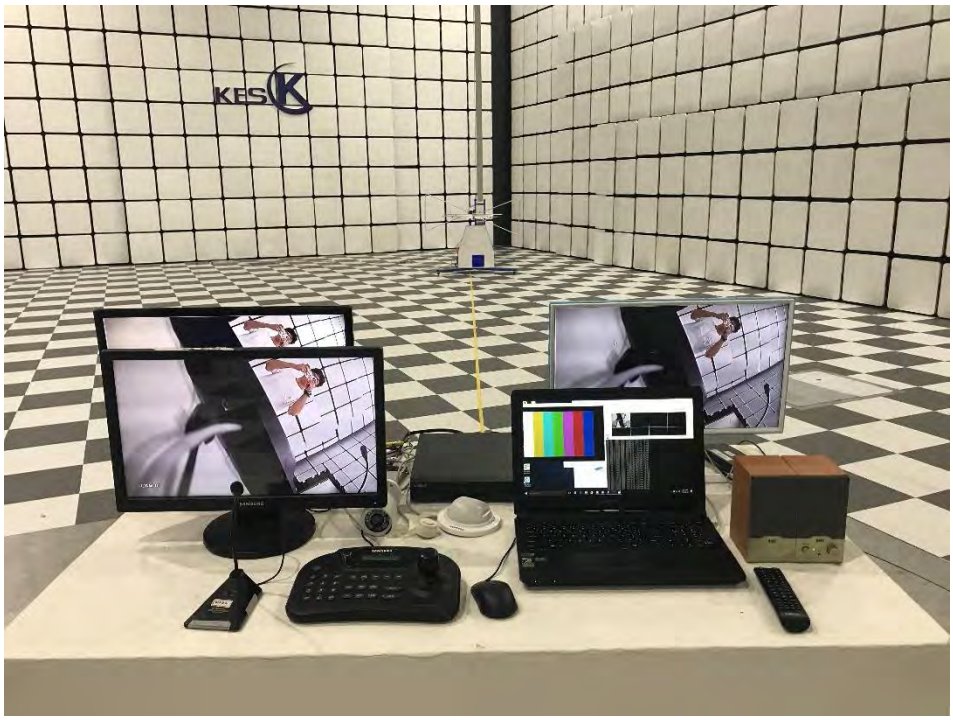
Test Setup Photos and Configuration

Conducted Voltage Emissions

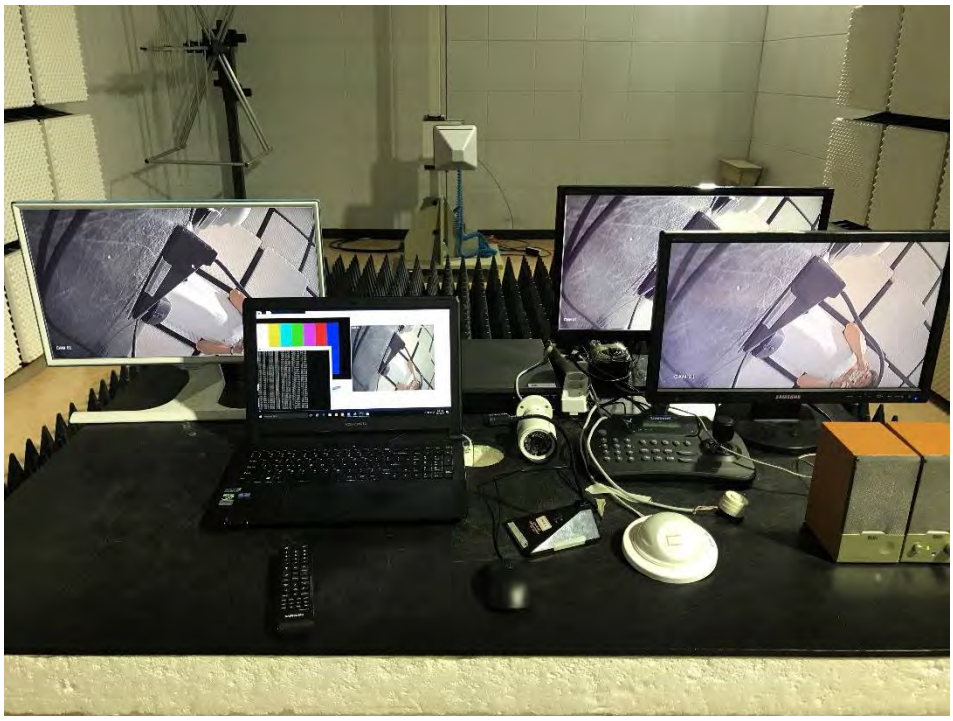
Conducted Telecommunication Emissions

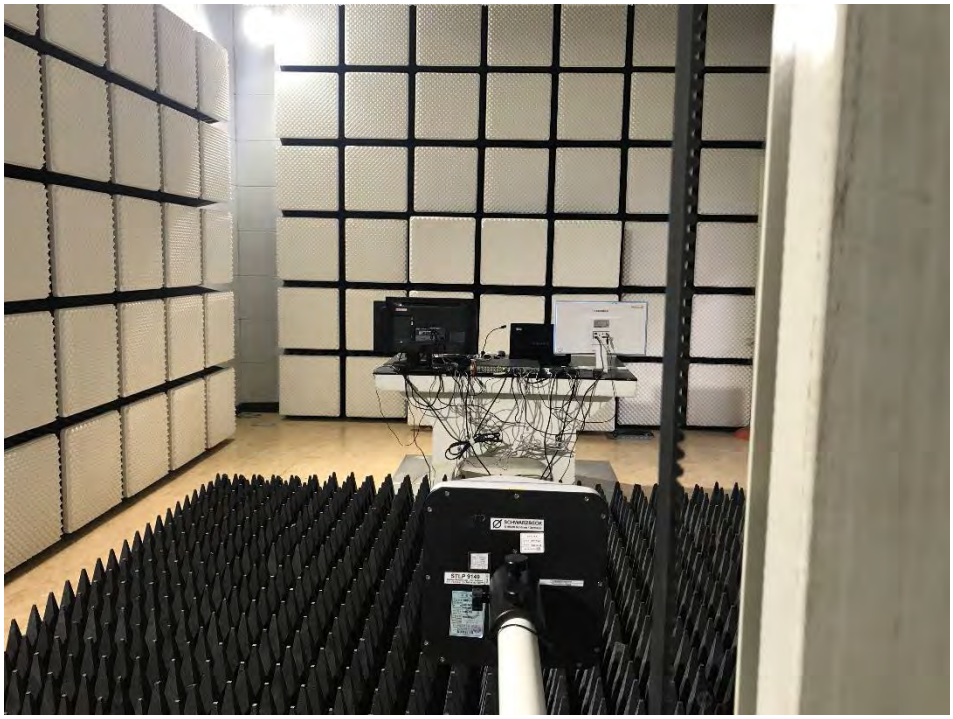


Radiated Electric Field Emissions(Below 1 ㎓)



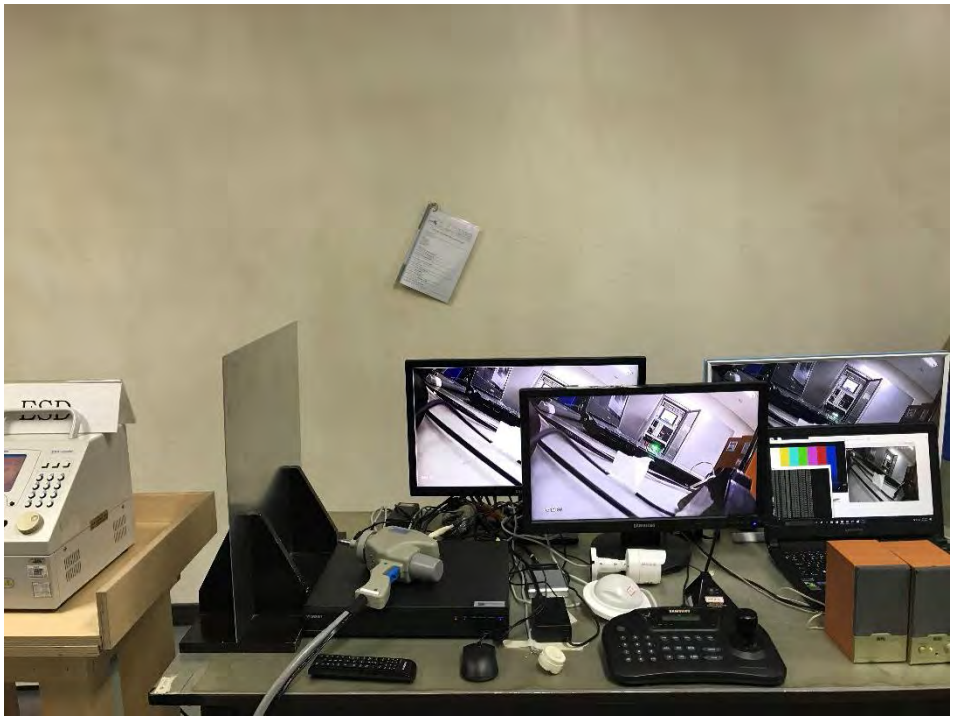
Radiated Electric Field Emissions(Above 1 ㎓)



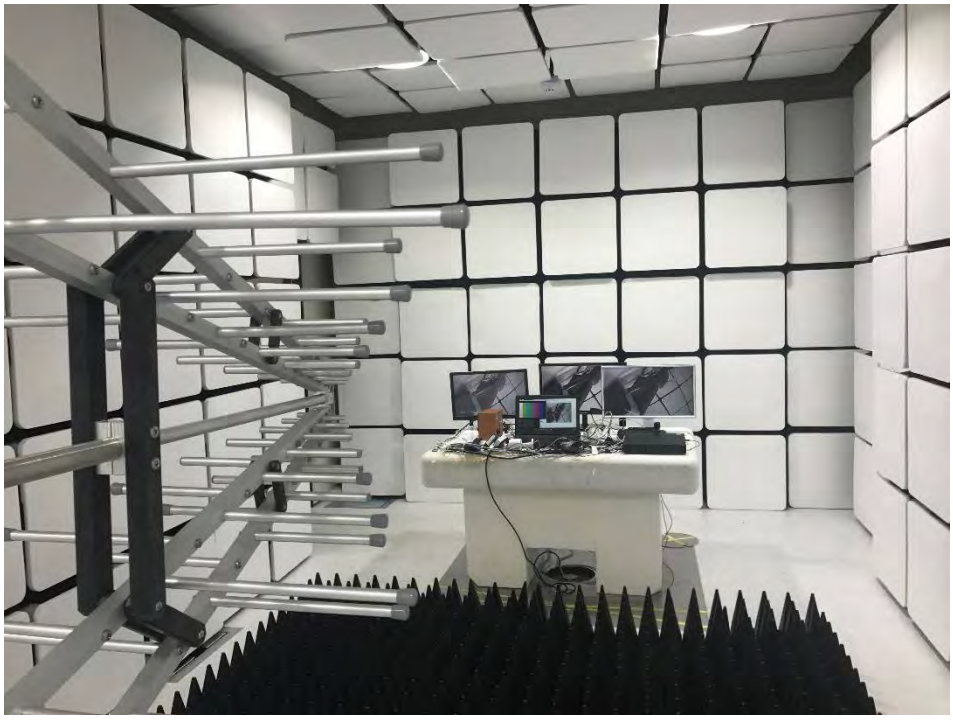


Harmonic Current Emissions and Voltage Fluctuations and Flicker

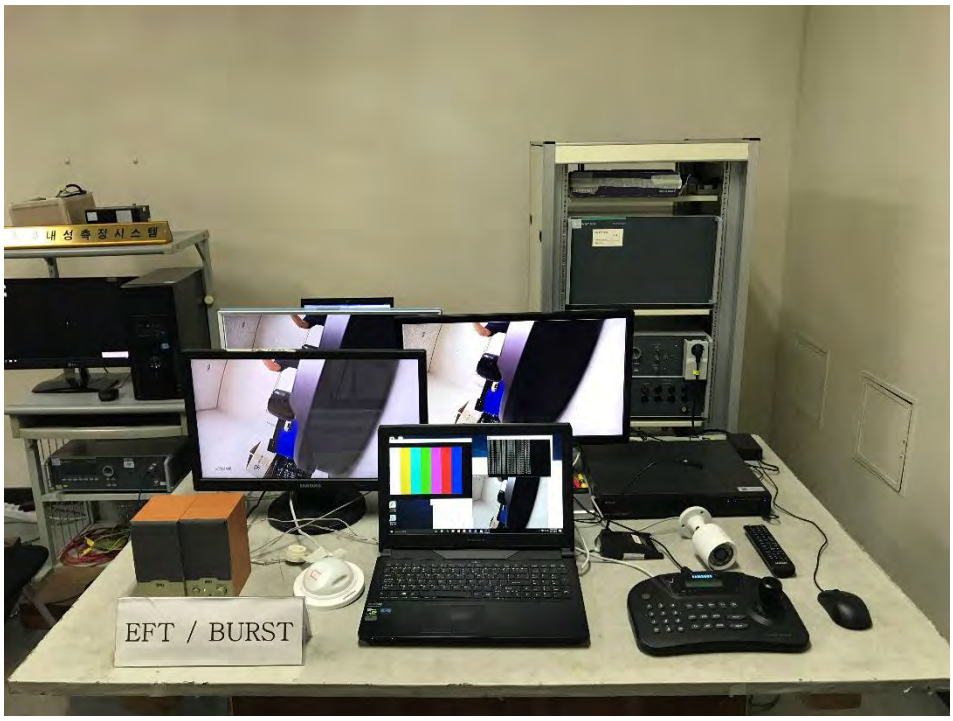
Electrostatic Discharge



Radiated Electric Field Immunity



Electrical Fast Transients/Bursts



Surge Transients

Conducted Disturbance

Voltage Dips and Short Interruptions

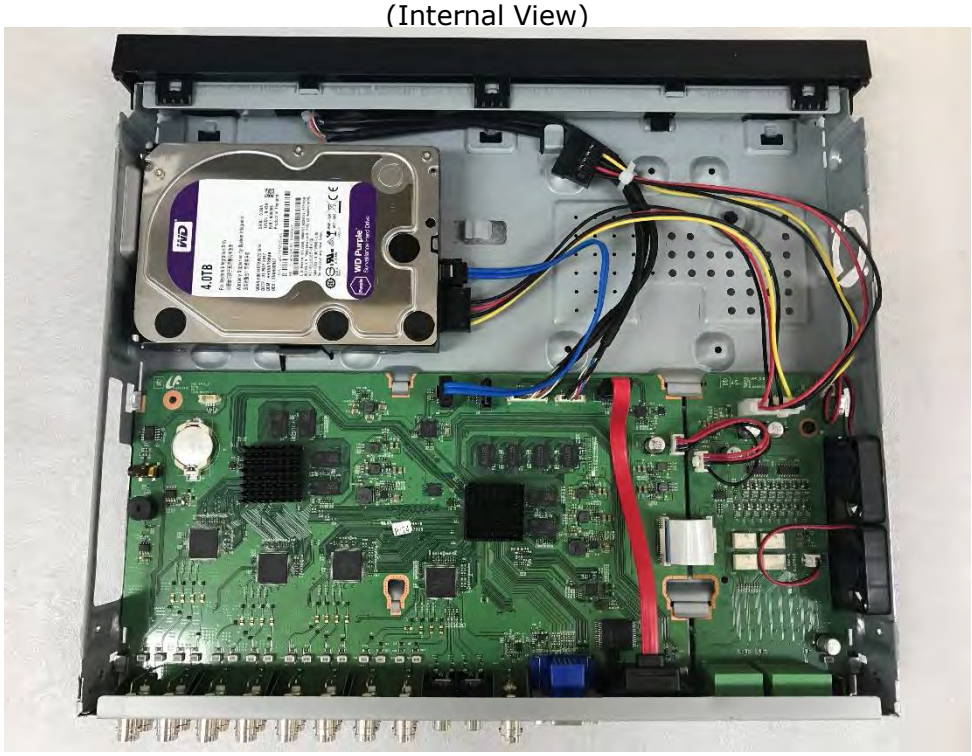
EUT External Photographs

(Top)

(Bottom)

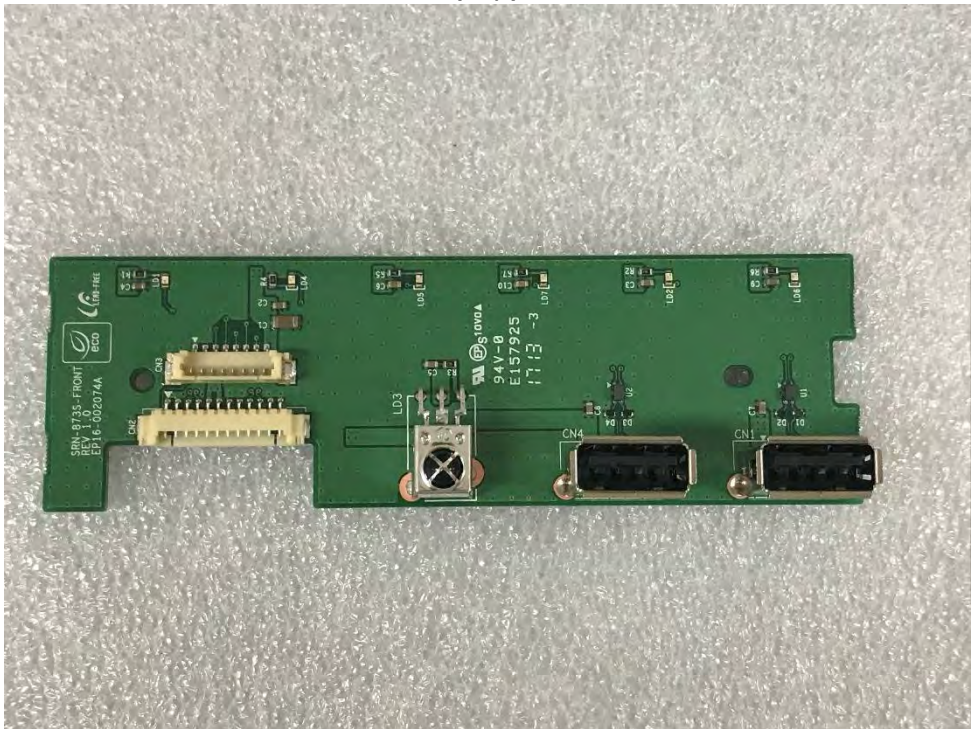
EUT Internal Photographs

(Internal View)

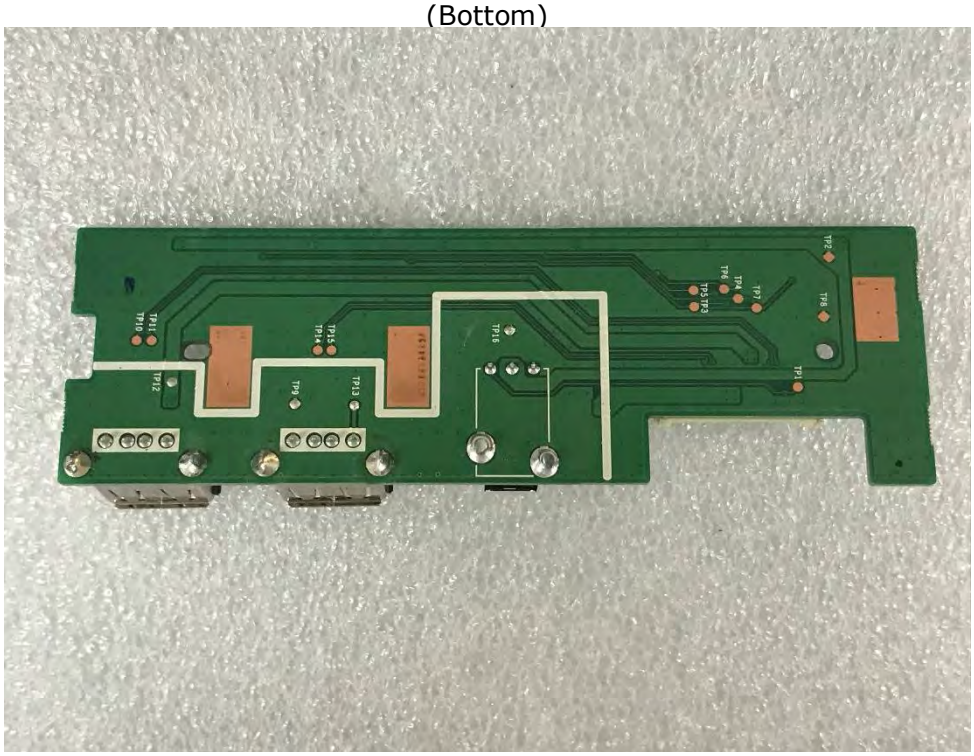


EUT Internal View – Board 1

(Top)

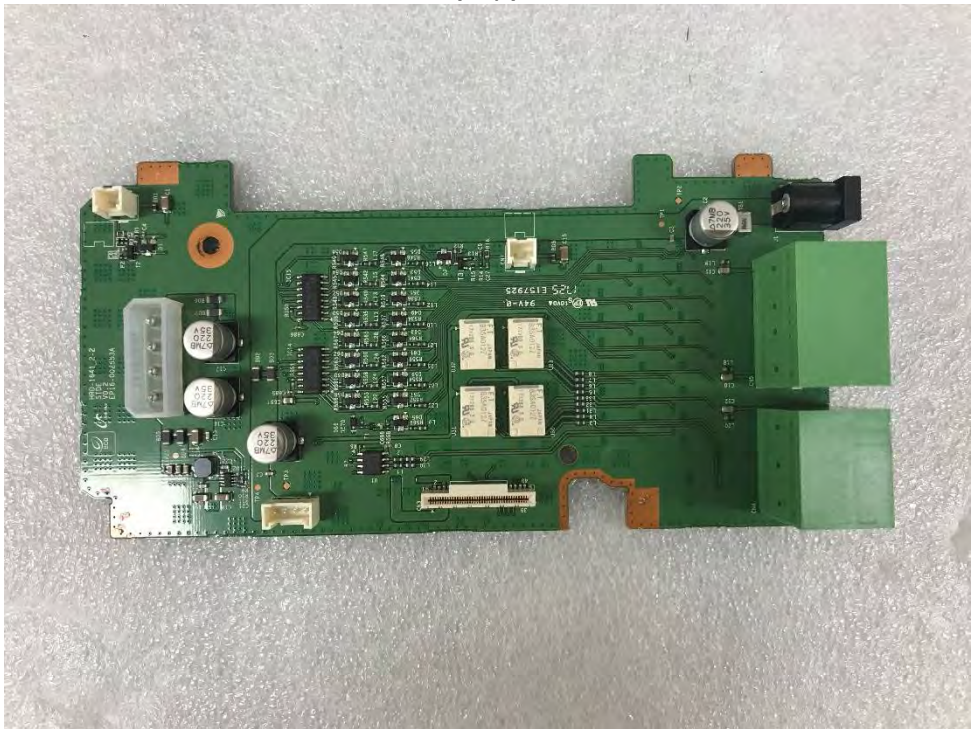


(Bottom)

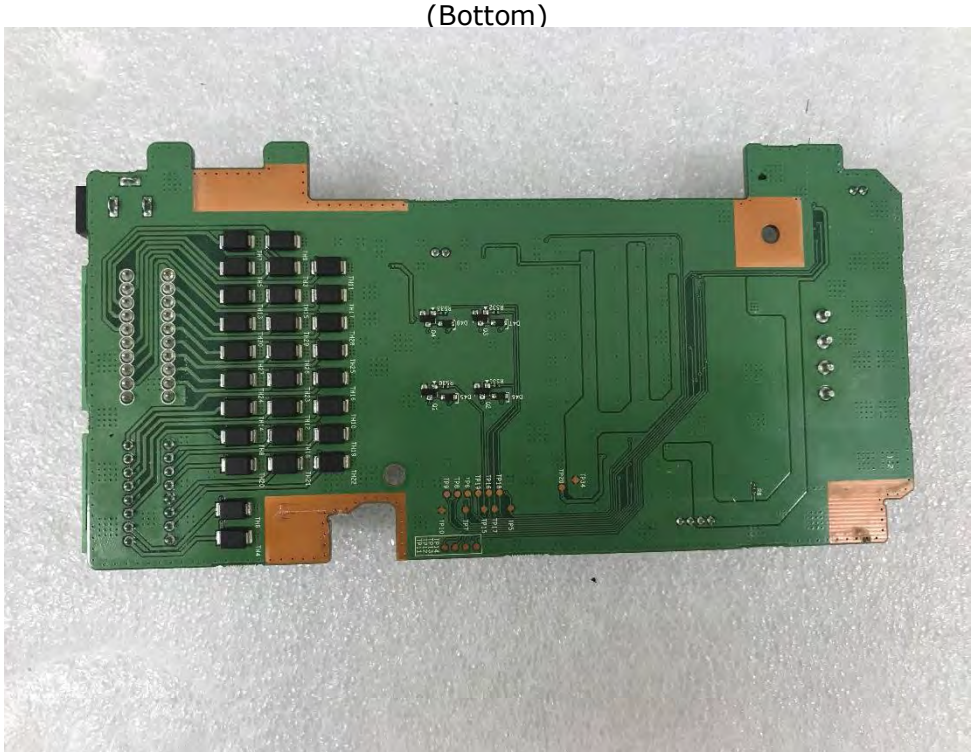


EUT Internal View – Board 2

(Top)

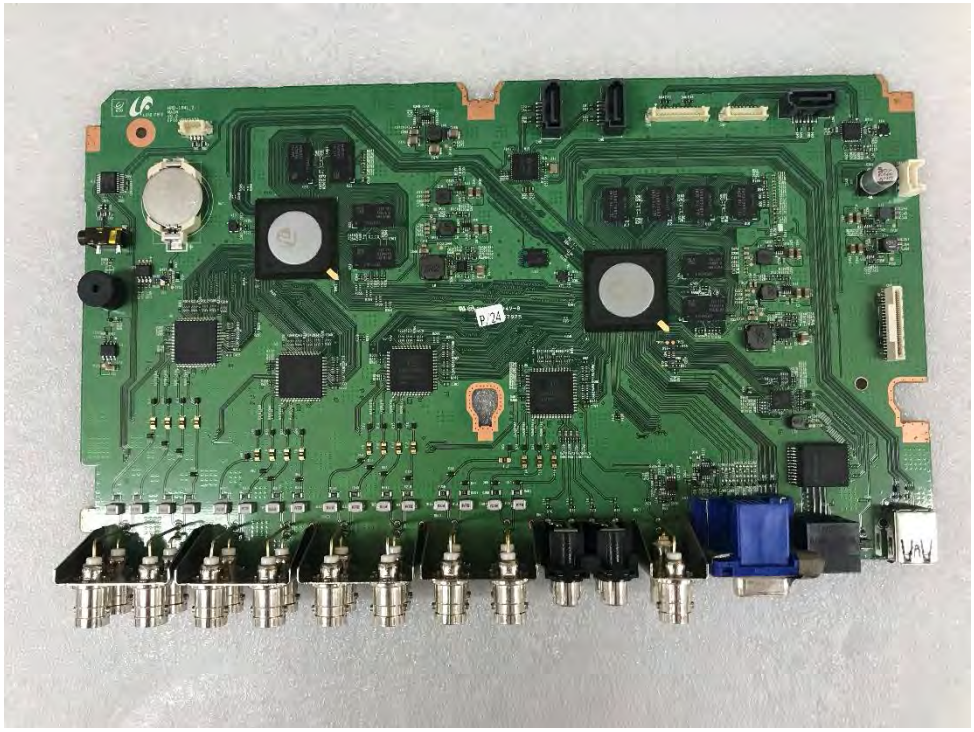


(Bottom)

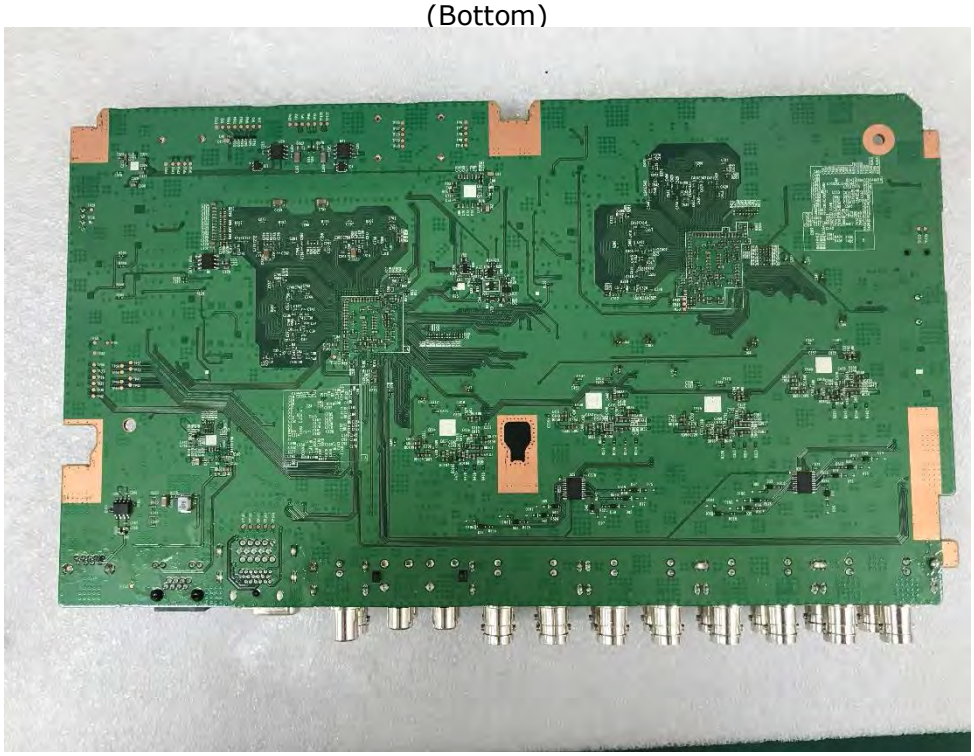


EUT Internal View – Board 3

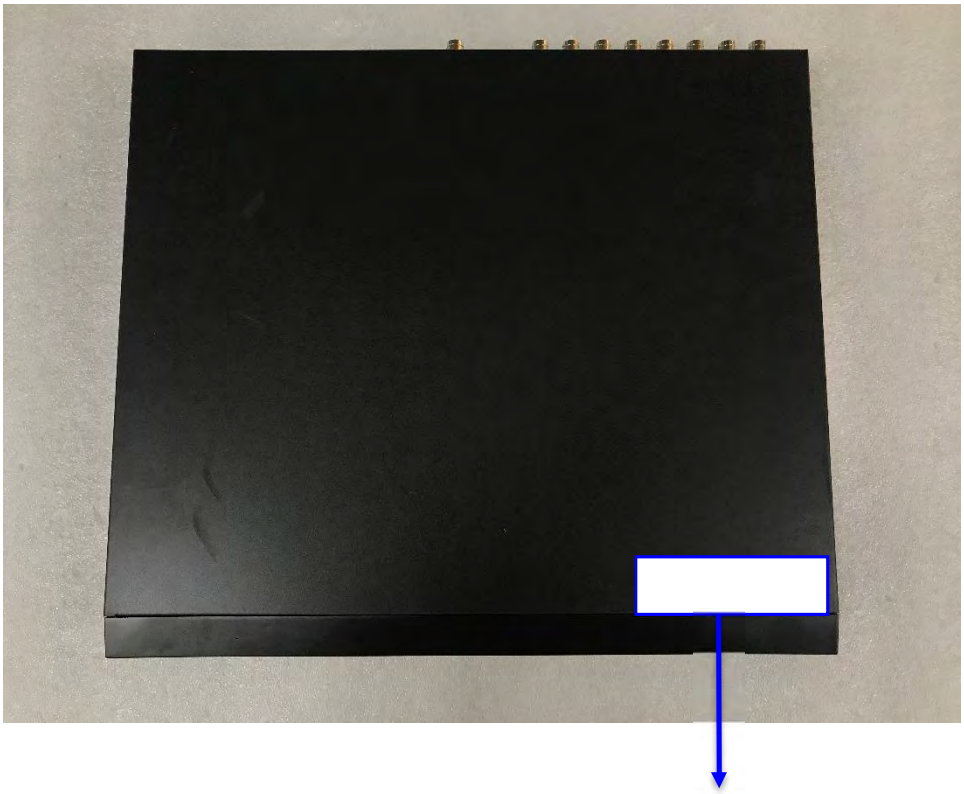
(Top)



(Bottom)



Label and Location



DVR

Model No : HRD-1641P

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

Made in China