



# EMC TEST REPORT For CE

Test Report No. : KES-E1-17T0214-R1  
Date of Issue : Oct, 23, 2017  
Product name : DVR  
Model/Type No. : HRD-442P  
Variant Model : -  
Applicant : Hanwha Techwin Co., Ltd.  
Applicant Address : 1204, Changwon-daero, Seongsan-gu, Changwon-si,  
Gyeongsangnam-do, Korea  
Manufacturer : Hanwha Techwin (Tianjin) Co., Ltd.  
Manufacturer Address : No.11 Weiliu Rd, Micro-Electronic Industrial Park, TEDA, Tianjin,  
300385, people's Republic of China  
Date of Receipt : Feb, 21, 2017  
Test date : Mar, 10, 2017 – Mar, 14, 2017  
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

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EMC Test Engineer

Reviewed by

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**REPORT REVISION HISTORY**

Date	Test Report No.	Revision History
Mar, 15, 2017	KES-E1-17T0214	Issued
Oct. 23, 2017	KES-E1-17T0214-R1	Standard Revision

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## 1.0 General Product Description

### Main Specifications of E.U.T are:

item		Details
Video	Input	4channel BNC : AHD(~4MP), TVI(~2MP), CVI(~2MP), NTSC/PAL
	Resolution	2560x1440, 1920 x 1080, 1280 x 720, 960 x 480, 704 x 480 / 960 x 576, 704 x 576
Live	Frame rate	120fps, 100fps
	Resolution	2560x1440, 1920 x 1080, 1280 x 720, 960 x 480, 704 x 480 / 960 x 576, 704 x 576
	Multi Screen display	1/4/PIIP/Sequence
Performance		
Operating System	Embedded	Linux
Recording	Compression	H.264, Wisestream
	Record Rate	NTSC : Up to 60fps@4MP / PAL : Up to 50fps@4MP NTSC : Up to 120fps@1920 x 1080 / PAL : Up to 100fps@1920 x 1080 NTSC : Up to 120fps @ 1280 x 720, 928x480, 704x480, 704x240, 352x240 PAL : Up to 100fps @ 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 Input(16), 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, POS, 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	4CH(Local Monitor, CMS)
Network (IPv4)	Transmission speed	Record(Main) Stream) 4MP : 15fps/CH, 3MP : 10fps/CH, 1080p/720p/WD1/4CIF/ CIF : 30fps/CH(N), 25fps/CH(P) Network(Sub) Stream) WD1/4CIF : 12fps/CH, 2CIF/QCIF/QVGA/QCIF : 30fps/CH(N).
	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, DNS, RTP, RTSP, SNMP, SUNAPI
	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
Smart phone	Viewer Software	SSM, Webviewer, SmartViewer, iPOLIS mobile viewer, WiseNet Mobile (–Apr. 2017)
	Platform	Android, ios
	Protocol support	RTP, RTSP, HTTP, CGI(SUNAPI)
	Control	Live(8ch) : Multi-Profile Support Playback(1ch) Event push
	Remote users Maximum	Search (3), Live Unicast (10), Multicast (20)
Storage	Internal	Up to 2 SATA HDDs (0~8TB HDD)
	External (E-SATA Interface)	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		P2P (TUTK)



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Interface		
Monitors	VGA	1 VGA (1920x1080, 1280x1024, 1280x720)
	Composite(Spot)	BNC(1CH) ※ Included OSD On Screen, Multi mode Support
	Loop Outputs	-
Audio	Inputs/Output	4CH line in / 1CH line out
	Compression	G.711
	Sampling rate	8KHz
Alarm	Inputs/Outputs	Terminal 4 Inputs (NO/NC) / Terminal 1 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(Full Duplex) for PTZ, Samsung System Keyboard
	USB	2 ports(Front)
	e-SATA	-
	Application Support	Mouse, IR Remote, SPC-2000 (RS-485 protocol)
	Protocol support(RS-485)	Samsung-E/Samsung-T/Pelco-D/Pelco-p/Panasonic/ Phillips/ AD/ DIAMOND/ ERNA/ KALATEL/ VCL TP/MICON/ 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	-
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)	TBD W370.0x H 44.0 x D 320(14.57" x 1.73" x 12.6")
	Weight (With hard disks)	TBD Approx. 2.68Kg(5.91lb)
Language	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 , Taiwanese(25 Language)
	Web Browser	English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese(Simplified), Japanese, Thai (23 Language)

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## 1.1 Test Voltage & Frequency

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

Voltage ☒ 230 Vac ☐ 100 Vac ☐ 24 Vac ☐ 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-442P	-	Hanwha Techwin Co., Ltd.	E.U.T
AC / DC Adaptor	FSP040-RHAN2	-	Zhonghan Electronics(Shenzhen) Co., Ltd.	-
Mouse1	MOEIUOA	PMX-MMOEIUA(B)	PRIMAX ELECTRONICS LTD.	-
Remote Controller	EP10-000331A	-	Samsung Techwin (Sta)	-
HDD	WD10PURX	WCC4J7TS2NSC	WD Purple	2 TB



## 1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Notebook	X56K	HN11N5151FJ0045W	HANSUNG	-
Notebook Adaptor	A12-120P1A	F180271552011758	CHICONY POWER TECHNOLOGY CO.,LTD.	-
MONITOR1	SMT-2232	C95V67VF900015Y	Weihai Daewoo Electronics Co., Ltd.	-
MONITOR2	LT23C350	009MHYCH106388P	Samsung Electro-Mechanics Co.,Ltd	-
MONITOR2 Adaptor	A4514_DSM	CN07BN4400721ASE3 8GCOY0XS	Samsung Electro-Mechanics Co.,Ltd	-
MONITOR3	HSTND-7041-L	6CM6020YQQ	HP Inc.	-
CAMERA x 4	SDC-8440BC	-	Hanwha Techwin (Tianjin) Co.,Ltd	-
CAMERA AC / DC Adaptor	EO-1210	-	EO Electronics	-
I Phone	A1530	-	APPLE	-
Speaker	BR-100A	-	Britz International Co., Ltd.	-
MIC	CMK-303	-	CAMAC	-
Mouse2	SMB-400	0DJM010118	SEJIN ELECTRON INC.	-
2.0 USB Memory	-	-	SanDisk	64 GB
Alarm1	-	-	-	-
Alarm2	-	-	-	-



## 1.6 External I/O Cabling

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
DVR (E.U.T)	RJ-45	Notebook	RJ-45	3.0	U
	BNC	MONITOR1	BNC	3.0	S
	HDMI	MONITOR2	HDMI	1.5	S
	D-SUB	MONITOR3	D-SUB	1.5	S
	BNC x 4	CAMERA x 4	BNC x 4	10.0	S
	RCA	Speaker	RCA	1.4	U
	RCA	MIC	RCA	1.2	U
	USB	2.0 USB Memory	USB	-	U
	2 Pin	Alarm1	2 Pin	3.5	U
	2 Pin	Alarm2	2 Pin	3.5	U
	USB	Mouse1	USB	1.5	U
	RS 232	Mouse2	RS 232	1.2	U
	-	Remote Controller	-	-	-
Notebook	3.5 mm	I Phone	3.5 mm	1.0	U

\* Unshielded=U, Shielded=S

## 1.7 E.U.T Operating Mode(s)

operating
E.U.T Monitoring, Ping test

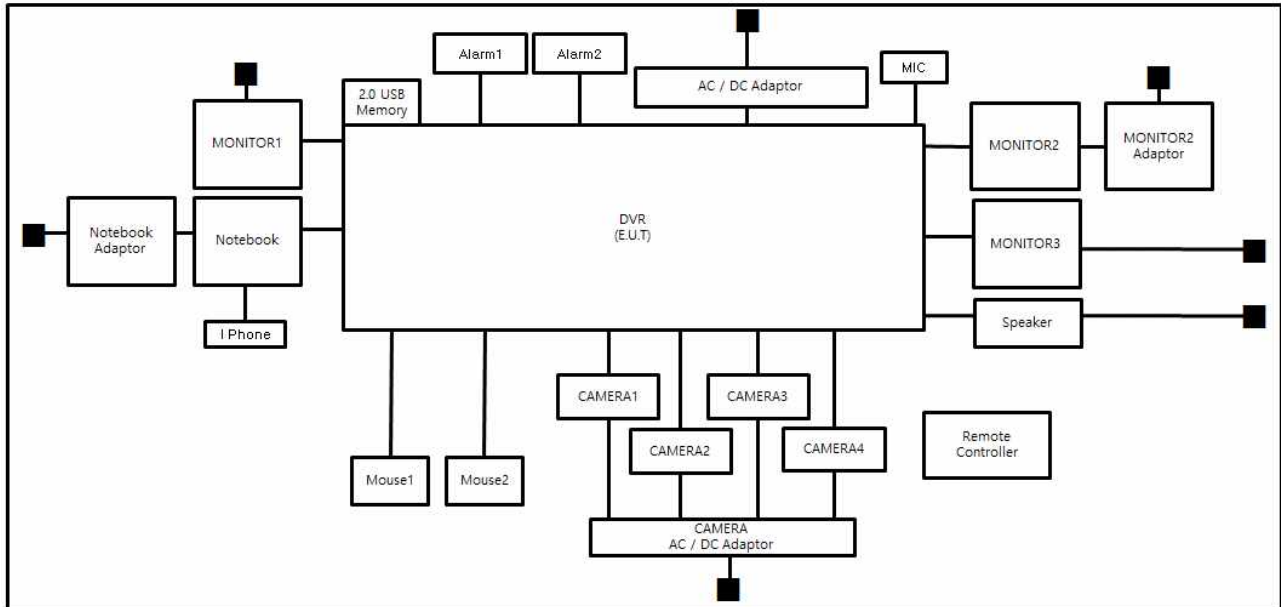
E.U.T Test operating S/W		
Name	Version	Manufacture Company
WebViewer	-	Hanwha Techwin Co., Ltd.

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## 1.8 Configuration

■ AC Main  
□ DC Main







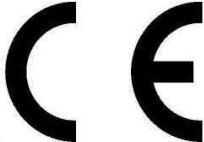

## 1.9 Calibration Details of Equipment Used for Measurement

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 and CISPR Publication 22.

## 1.11 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	
JAPAN	VCCI	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	 R-4308, C-4798, T-2311, G-914
KOREA	MSIP	EMI (10 meter Open Area Test Site and two conducted sites) Radio(3 & 10 meter Open Area Test Sites and one conducted site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
Canada	IC	3 & 10 meter Open Area Test Sites and one conducted site	 4769B-1
Europe	CE	EMI (10 meter Open Area Test Site and two conducted sites) Radio(3 & 10 meter Open Area Test Sites and one conducted site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	
International	KOLAS	EMI (10 meter Open Area Test Site and two conducted sites) Radio(3 & 10 meter Open Area Test Sites and one conducted site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	



## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1  
☐ Class A

☐ Group 2  
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547:2009

☒ EN 55032:2012

☒ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☒ EN 50130-4:2011

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☐ EN 61326-1:2013



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☐ **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

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## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

Mar, 13, 2017

### Test Location

Electro wave Shieldroom

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR3	R & S	101783	05, 03, 2017
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101137	02, 03, 2018
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101786	05, 02, 2017
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101914	12, 13, 2017
<input checked="" type="checkbox"/>	Shield Room #3	-	SEMITEC	-	-
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-

### Test Conditions

Temperature: 21,3 °C

Relative Humidity: 32,8 %

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.

## 2.2 Conducted Emissions at Telecommunication Ports

### Test Date

Mar, 13, 2017

### Test Location

Electro wave Shieldroom

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test Receiver	ESR3	R & S	101783	05, 03, 2017
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101137	02, 03, 2018
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101786	05, 02, 2017
<input checked="" type="checkbox"/>	8-Wire ISN CAT3	CAT3 8158	Schwarzbeck Mess	8158-0019	04, 01, 2017
<input checked="" type="checkbox"/>	8-Wire ISN CAT5	CAT5 8158	Schwarzbeck Mess	8158-0030	04, 01, 2017
<input checked="" type="checkbox"/>	8-Wire ISN CAT6	NTFM 8158	Schwarzbeck Mess	8158-0029	08, 11, 2017
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101914	12, 13, 2017
<input checked="" type="checkbox"/>	Shield Room #3	-	SEMITEC	-	-
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-

### Test Conditions

Temperature: 21,3 °C  
Relative Humidity: 32,8 %

### 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

Mar, 10, 2017

### Test Location

☐ Open Area Test Site #1

☒ Open Area Test Site #2

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESVS10	Rohde & Schwarz	826008/014	04, 18, 2017
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	714	11, 28, 2018
<input checked="" type="checkbox"/>	Open Area Test Site 2	-	KES	-	-
<input checked="" type="checkbox"/>	Antenna Mast	-	DAIL EMC	-	-
<input checked="" type="checkbox"/>	Turn Table	-	DAIL EMC	-	-
<input checked="" type="checkbox"/>	EMI Test S/W	-	-	-	-

### Test Conditions

Temperature: 9,8 °C

Relative Humidity: 36,0 %

### 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

### Remarks

See Appendix A for test data.



## 2.4 Radiated Electric Field Emissions(Above 1 GHz)

### Test Date

Mar, 10, 2017

### Test Location

Semi Anechoic Chamber #2

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	Log-Periodic Antenna	STLP 9149	SCHWARZBECK	9149-255	05, 17, 2018
<input checked="" type="checkbox"/>	EMI Test Receiver	ESU26	R & S	100552	04, 24, 2017
<input checked="" type="checkbox"/>	Broadband Coaxial Preamplifier	BBV 9718	Schwarzbeck Mess - Elektronik	9718-246	10, 14, 2017
<input checked="" type="checkbox"/>	Semi Anechoic Chamber #2	-	SEMITEC	-	-
<input checked="" type="checkbox"/>	Antenna Mast	-	AUDIX	-	-
<input checked="" type="checkbox"/>	Turn Table	-	AUDIX	-	-
<input checked="" type="checkbox"/>	EMI Test S/W	e3	AUDIX	8.083b	-

### Test Conditions

Temperature: 20,6 °C

Relative Humidity: 36,1 %

### 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

Mar, 10, 2017

### Test Location

Electro wave Shieldroom

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	AC Source	ACS 500 N	EM TEST	V1024106760	08, 08, 2017
<input checked="" type="checkbox"/>	Digital Power Analyzer	DPA 500 N	EM TEST	V1024106759	08, 08, 2017
<input checked="" type="checkbox"/>	EMI Test S/W	dpa.control	EM TEST AG	5.4.8.0	-

### Test Conditions

Temperature: 20,6 °C

Relative Humidity: 36,1 %

### 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

Mar, 10, 2017

### Test Location

Electro wave Shieldroom

### Test Equipment

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

### Test Conditions

Temperature: 20,6 °C

Relative Humidity: 36,1 %

### 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

Mar, 13, 2017

### Test Location

EMS-ESD: Electro wave Shieldroom

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	ESD SIMULATOR	ESS-2000	Noise Ken	ESS05X4620	02, 24, 2018
<input checked="" type="checkbox"/>	HCP	-	Noise Ken	-	-
<input checked="" type="checkbox"/>	VCP	-	Noise Ken	-	-
<input checked="" type="checkbox"/>	EMS Test S/W	-	-	-	-

### Test Conditions

Temperature: 21,3 °C  
Relative Humidity: 32,8 %  
Atmospheric Pressure: 100,2 kPa

### Test Specifications

Discharge Factor:  $\geq 1$  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

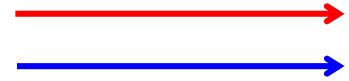
Discharge Voltage:	<b>Contact</b> <input type="checkbox"/> 2 kV <input type="checkbox"/> 4 kV <input checked="" type="checkbox"/> 6 kV <input type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV	<b>Air</b> <input checked="" type="checkbox"/> 2 kV <input checked="" type="checkbox"/> 4 kV <input type="checkbox"/> 6 kV <input checked="" type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV	<b>HCP</b> <input type="checkbox"/> 2 kV <input type="checkbox"/> 4 kV <input checked="" type="checkbox"/> 6 kV <input type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV	<b>VCP</b> <input type="checkbox"/> 2 kV <input type="checkbox"/> 4 kV <input checked="" type="checkbox"/> 6 kV <input type="checkbox"/> 8 kV <input type="checkbox"/> 15 kV
--------------------	---	---	---	---

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

Required Performance Criteria: ☒ Complied

**Location of Discharge:**

Air
Contact



1

3



2

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**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	Screw	Contact Discharge	Complied	-
3	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.

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## 3.2 Radiated Electric Field Immunity

### Reference Standard

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

### Test Date

Mar, 13, 2017

### Test Location

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

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	SIGNAL GENERATOR	ESG-3000A	HP	US37040210	11, 01, 207
<input checked="" type="checkbox"/>	AMPLIFIER	ITA0300-200	Infinitech	-	11, 01, 207
<input checked="" type="checkbox"/>	AMPLIFIER	ITA0750-200	Infinitech	-	11, 01, 207
<input checked="" type="checkbox"/>	AMPLIFIER	ITA1500-100	Infinitech	-	11, 01, 207
<input checked="" type="checkbox"/>	AMPLIFIER	ITA2500-100	Infinitech	-	11, 01, 207
<input checked="" type="checkbox"/>	GPB INTERFACE CONTROL	SYSTEM CONTROL UNIT	Infinitech	-	-
<input checked="" type="checkbox"/>	POWER SUPPLY	SYSTEM POWER SUPPLY	Infinitech	-	-
<input checked="" type="checkbox"/>	POWER METER	E4419B	Agilent	MY45101506	06, 27, 2017
<input checked="" type="checkbox"/>	AVERAGE POWER SENSOR	E9301A	Agilent	-	06, 27, 2017
<input checked="" type="checkbox"/>	AVERAGE POWER SENSOR	E9301A	Agilent	MY41495698	11, 17, 2017
<input checked="" type="checkbox"/>	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 D	SCHWARZBECK	9128D038	-
<input checked="" type="checkbox"/>	SEMI ANECHOIC CHAMBER #2	-	SEMITEC	-	-
<input checked="" type="checkbox"/>	EMS Test S/W	KTI_RS2012	KOREA TECHNOLOGY INSTITUTE CO., LTD	2.1.1	-



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### Test Conditions

Temperature: 21,3 °C  
Relative Humidity: 32,8 %  
Atmospheric Pressure: 100,2 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

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**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.

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### 3.3 Electrical Fast Transients/Bursts

#### Reference Standard

EN 61000-4-4:2012

#### Test Date

Mar, 14, 2017

#### Test Location

EMS-EFT: Electro wave Shieldroom

#### Test Equipment

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

#### Test Conditions

Temperature: 19,2 °C  
Relative Humidity: 34,1 %  
Atmospheric Pressure: 100,2 kPa

#### Test Specifications

Pulse Amplitude & Polarity:  
(AC Power Lines) ☐ ± 1.0 kV ☒ ± 2.0 kV  
☐ ± 4.0 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



## 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
BNCx4	Complied	Complied
Alarm 1 (2Pin)	Complied	Complied
Alarm 2 (2Pin)	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

Mar, 14, 2017

#### Test Location

EMS-Surge: Electro wave Shieldroom

#### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500 N5	EM TEST	V0936105120	06, 27, 2017
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	V0936105123	06, 27, 2017
<input checked="" type="checkbox"/>	CDN	CNV 508N1	EM TEST	P1551168979	04, 27, 2017
<input type="checkbox"/>	CDN	CNV 508T5	EM TEST	P1549168422	04, 27, 2017
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.0.9.0	-

#### Test Conditions

Temperature: 19,2 °C  
Relative Humidity: 34,1 %  
Atmospheric Pressure: 100,2 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

### Power Lines

☒ Line to Line – Differential Mode

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

☒ Line to Earth – Common Mode

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

### Signal Lines

☒ Line to Earth – Common Mode

Mode of Application	Observations	
	(+) Surge (kV)	(-) Surge (kV)
RJ-45	Complied	Complied
BNCx4	Complied	Complied
Alarm 1 (2Pin)	Complied	Complied
Alarm 2 (2Pin)	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

Mar, 14, 2017

### Test Location

EMS-CS: Electro wave Shieldroom

### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	Continuous Wave Generator	CWS 500N1	EM TEST	V0936105119	08, 08, 2017
<input checked="" type="checkbox"/>	6 dB Attenuator	ATT6	EM TEST	1208-34	08, 08, 2017
<input checked="" type="checkbox"/>	CDN	CDN-M2/M3N	EM TEST	0909-06	08, 08, 2017
<input type="checkbox"/>	CDN	CDN-T2-RJ11	EM TEST	0909-07	08, 08, 2017
<input type="checkbox"/>	CDN	CDN-T4	EM TEST	0909-08	08, 08, 2017
<input type="checkbox"/>	CDN	CDN-T8RJ45	EM TEST	0909-09	08, 08, 2017
<input type="checkbox"/>	CDN	CDN-AF2	EM TEST	0909-10	08, 08, 2017
<input type="checkbox"/>	CDN	CDN-AF4	EM TEST	0909-11	08, 08, 2017
<input checked="" type="checkbox"/>	EM Injection Clamp	EM 101	Liithi	35943	02, 03, 2018
<input checked="" type="checkbox"/>	EMS Test S/W	icd.control	EM TEST	5.3.7	-

### Test Conditions

Temperature: 19,2 °C  
Relative Humidity: 34,1 %  
Atmospheric Pressure: 100,2 kPa



## 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

## Test Data

☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L – N – PE	CDN ( <input type="checkbox"/> M2, <input checked="" type="checkbox"/> M3)	Complied

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Observations
L1 – L2	CDN ( <input type="checkbox"/> M2, <input type="checkbox"/> M3)	-

☒ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Observations
RJ-45	EM Injection Clamp	Complied
BNCx4	EM Injection Clamp	Complied
Alarm 1 (2Pin)	EM Injection Clamp	Complied
Alarm 2 (2Pin)	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

Mar, 14, 2017

#### Test Location

EMS-Voltage dip: Electro wave Shieldroom

#### Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	Ultra Compact Simulator	UCS 500 N5	EM TEST	V0936105120	06, 27, 2017
<input checked="" type="checkbox"/>	Motor Variac	MV2616	EM TEST	V0936105123	06, 27, 2017
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.0.9.0	-

#### Test Conditions

Temperature: 19,2 °C  
Relative Humidity: 34,1 %  
Atmospheric Pressure: 100,2 kPa

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**Test Specifications & Observations/Remarks**

(Test Voltage : 230 V)

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

- Voltage variations

<input checked="" type="checkbox"/> Unom + 10 %	<input checked="" type="checkbox"/> 253.0 V (ac)	<u>Complied</u>
<input checked="" type="checkbox"/> Unom - 15 %	<input checked="" type="checkbox"/> 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

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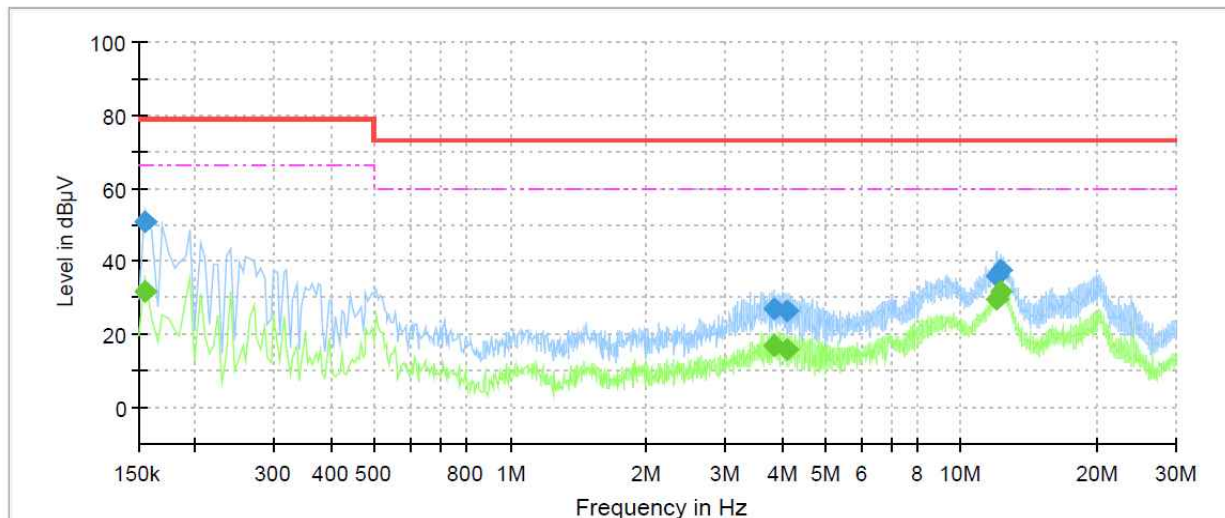
## APPENDIX A – TEST DATA

### Conducted Emissions at Mains Power Ports

[HOT]

### Common Information

Test Description: Conducted Emission  
Model No.: HRD-442P  
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)
0.155000	---	31.94	66.00	34.06	1000.0	9.000	L1	21.0
0.155000	50.84	---	79.00	28.16	1000.0	9.000	L1	21.0
3.835000	---	16.79	60.00	43.21	1000.0	9.000	L1	19.7
3.835000	27.06	---	73.00	45.94	1000.0	9.000	L1	19.7
4.125000	---	16.13	60.00	43.87	1000.0	9.000	L1	19.7
4.125000	26.29	---	73.00	46.71	1000.0	9.000	L1	19.7
12.045000	---	29.75	60.00	30.25	1000.0	9.000	L1	19.9
12.045000	36.08	---	73.00	36.92	1000.0	9.000	L1	19.9
12.270000	---	31.81	60.00	28.19	1000.0	9.000	L1	20.0
12.270000	37.54	---	73.00	35.46	1000.0	9.000	L1	20.0

#### ◆ Calculation

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

QuasiPeak / CAverage : The Final Value

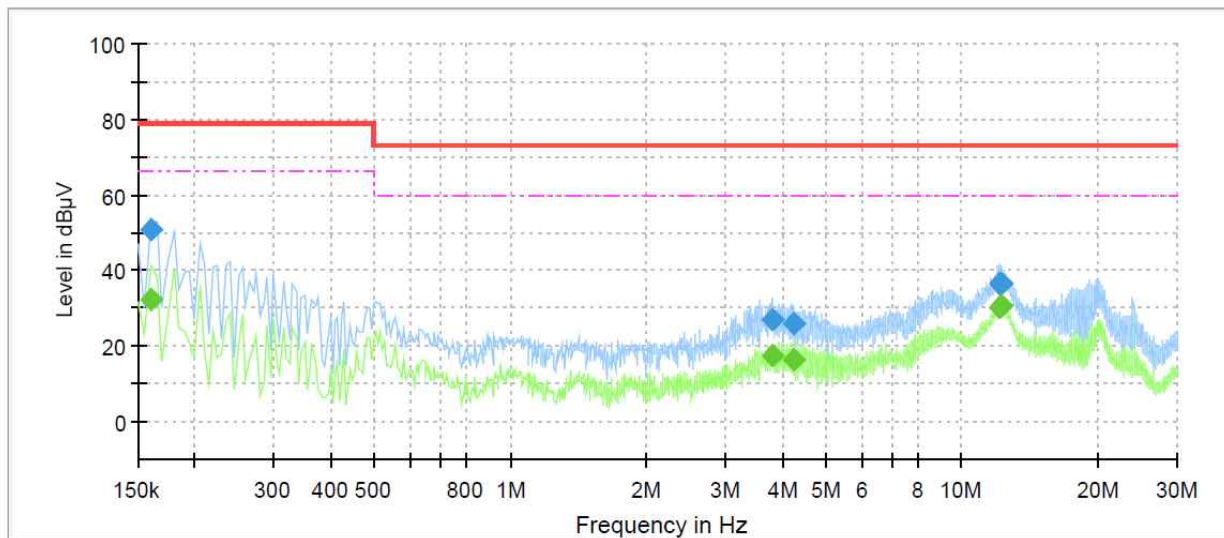
Reading Value : Not shown in the table.

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

[NEUTRAL]

## Common Information

Test Description: Conducted Emission  
Model No.: HRD-442P  
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	---	32.25	66.00	33.75	1000.0	9.000	N	21.0
0.160000	51.07	---	79.00	27.93	1000.0	9.000	N	21.0
3.785000	---	17.37	60.00	42.63	1000.0	9.000	N	19.7
3.785000	27.03	---	73.00	45.97	1000.0	9.000	N	19.7
4.235000	---	16.34	60.00	43.66	1000.0	9.000	N	19.7
4.235000	25.91	---	73.00	47.09	1000.0	9.000	N	19.7
12.140000	---	30.19	60.00	29.81	1000.0	9.000	N	20.0
12.140000	36.40	---	73.00	36.60	1000.0	9.000	N	20.0
12.295000	---	30.70	60.00	29.30	1000.0	9.000	N	20.0
12.295000	36.59	---	73.00	36.41	1000.0	9.000	N	20.0

### ◆ 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 + Pulse Limiter FACTOR))

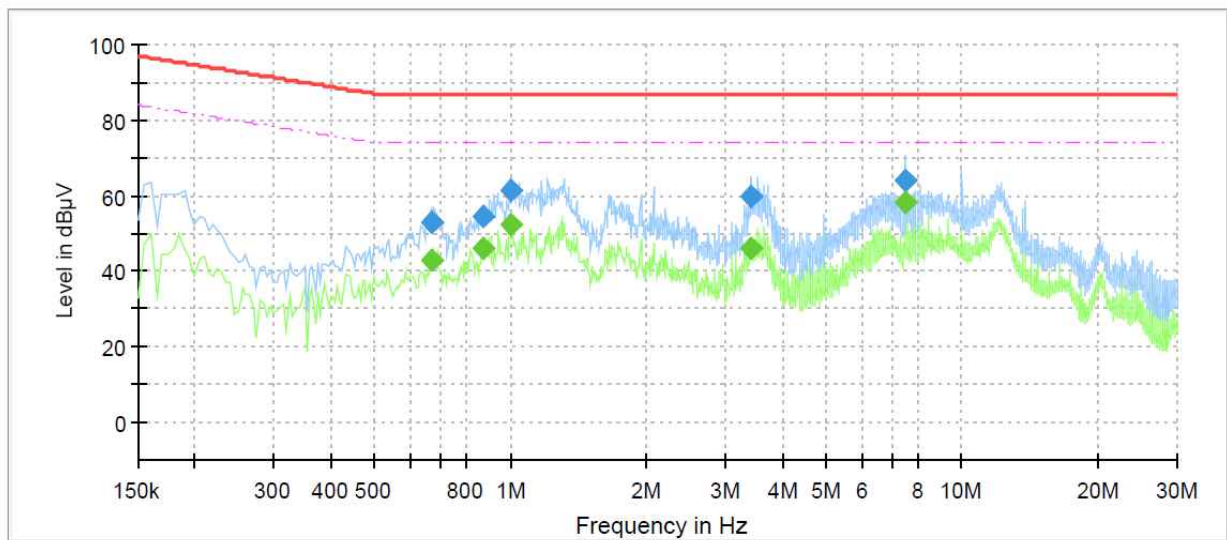


## Conducted Emissions at Telecommunication Ports

[10 Mbps]

### Common Information

Test Description: Telecommunication Emission  
Model No.: HRD-442P  
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)
0.670000	---	42.72	74.00	31.28	1000.0	9.000	Single Line	20.6
0.670000	52.96	---	87.00	34.04	1000.0	9.000	Single Line	20.6
0.875000	---	46.26	74.00	27.74	1000.0	9.000	Single Line	20.5
0.875000	54.28	---	87.00	32.72	1000.0	9.000	Single Line	20.5
1.000000	---	52.60	74.00	21.40	1000.0	9.000	Single Line	20.4
1.000000	61.16	---	87.00	25.84	1000.0	9.000	Single Line	20.4
3.430000	---	46.24	74.00	27.76	1000.0	9.000	Single Line	19.8
3.430000	60.07	---	87.00	26.93	1000.0	9.000	Single Line	19.8
7.500000	---	58.46	74.00	15.54	1000.0	9.000	Single Line	19.9
7.500000	64.29	---	87.00	22.71	1000.0	9.000	Single Line	19.9

#### ◆ 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 + Pulse Limiter FACTOR))

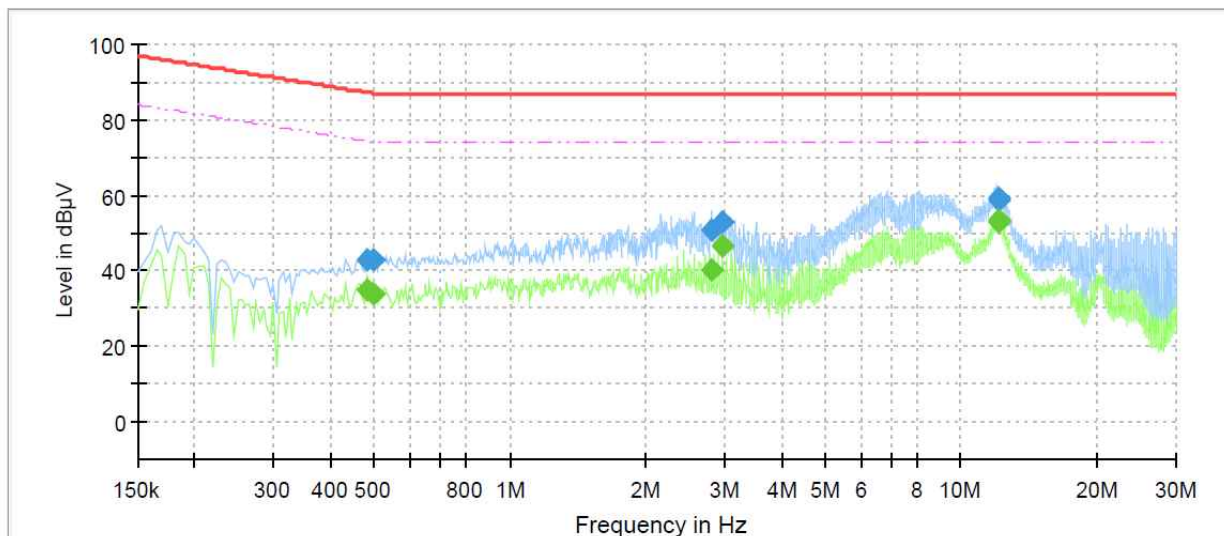
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**[100 Mbps]**

## Common Information

Test Description: Telecommunication Emission  
Model No.: HRD-442P  
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)
0.485000	---	35.14	74.25	39.11	1000.0	9.000	Single Line	20.4
0.485000	42.71	---	87.25	44.54	1000.0	9.000	Single Line	20.4
0.500000	---	33.98	74.00	40.02	1000.0	9.000	Single Line	20.4
0.500000	42.95	---	87.00	44.05	1000.0	9.000	Single Line	20.4
2.795000	---	40.04	74.00	33.96	1000.0	9.000	Single Line	19.4
2.795000	50.71	---	87.00	36.29	1000.0	9.000	Single Line	19.4
2.970000	---	46.64	74.00	27.36	1000.0	9.000	Single Line	19.3
2.970000	52.71	---	87.00	34.29	1000.0	9.000	Single Line	19.3
12.070000	---	53.30	74.00	20.70	1000.0	9.000	Single Line	19.5
12.070000	59.30	---	87.00	27.70	1000.0	9.000	Single Line	19.5
12.100000	---	53.14	74.00	20.86	1000.0	9.000	Single Line	19.5
12.100000	58.81	---	87.00	28.19	1000.0	9.000	Single Line	19.5

### ◆ 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 + Pulse Limiter FACTOR))

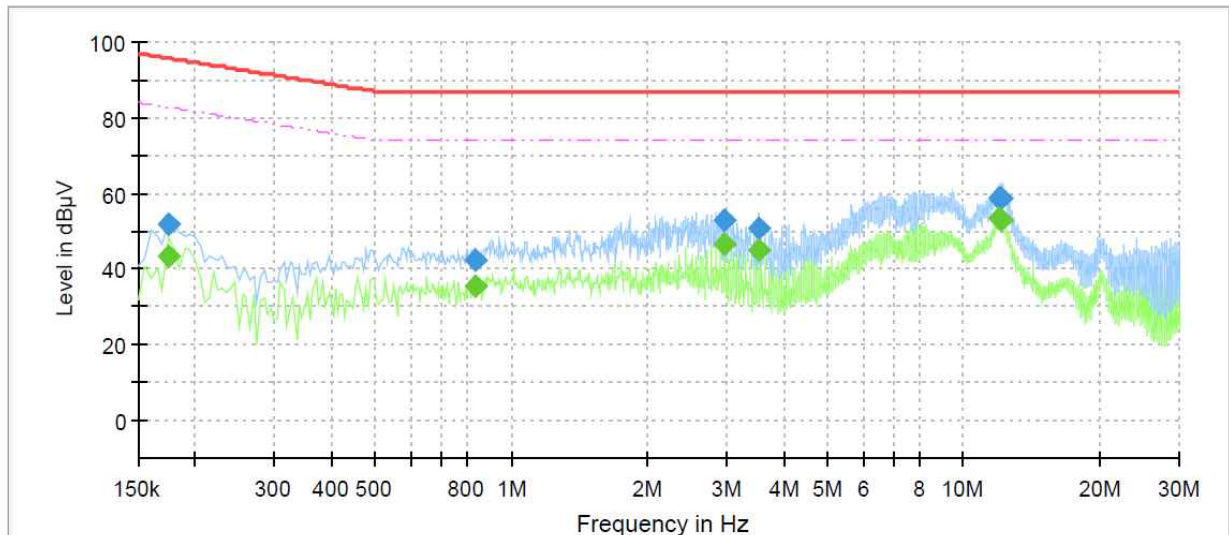
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## [1 000 Mbps]

### Common Information

Test Description:	Telecommunication Emission
Model No.:	HRD-442P
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)
0.175000	---	43.45	82.72	39.27	1000.0	9.000	Single Line	20.9
0.175000	52.03	---	95.72	43.69	1000.0	9.000	Single Line	20.9
0.830000	---	35.60	74.00	38.40	1000.0	9.000	Single Line	19.9
0.830000	42.48	---	87.00	44.52	1000.0	9.000	Single Line	19.9
2.970000	---	46.77	74.00	27.23	1000.0	9.000	Single Line	19.3
2.970000	52.74	---	87.00	34.26	1000.0	9.000	Single Line	19.3
3.510000	---	45.02	74.00	28.98	1000.0	9.000	Single Line	19.3
3.510000	50.97	---	87.00	36.03	1000.0	9.000	Single Line	19.3
11.955000	---	53.35	74.00	20.65	1000.0	9.000	Single Line	19.5
11.955000	58.73	---	87.00	28.27	1000.0	9.000	Single Line	19.5
12.120000	---	53.09	74.00	20.91	1000.0	9.000	Single Line	19.5
12.120000	58.93	---	87.00	28.07	1000.0	9.000	Single Line	19.5

#### ◆ 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 + Pulse Limiter FACTOR))



## Radiated Electric Field Emissions(Below 1 GHz)

Frequency	Amplitude	ANT	ANT. Height	Correction Factor		Corrected Amplitude	Applicable Limit	Margin
[MHz]	[dB $\mu$ V]	Polar. (H/V)	[m]	ANT. [dB/m]	Cable [dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]
252.36	14.20	H	3.98	12.53	3.71	30.44	47.00	16.56
371.65	13.70	V	1.01	14.99	4.40	33.09	47.00	13.91
500.00	15.70	H	4.00	17.35	5.20	38.25	47.00	8.75
592.84	12.30	V	1.02	19.18	5.83	37.31	47.00	9.69
625.69	11.40	V	1.00	19.40	5.94	36.74	47.00	10.26
742.68	10.90	H	3.99	20.23	6.67	37.80	47.00	9.20

\* H : Horizontal, V : Vertical

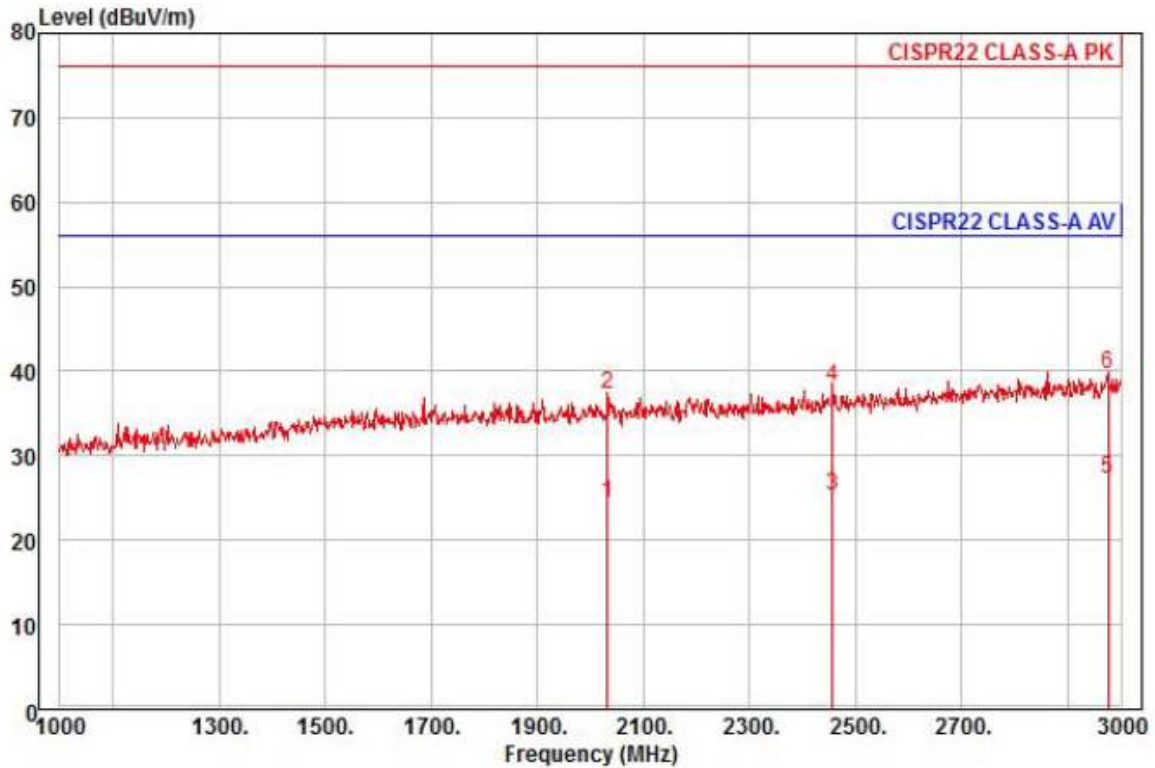
### ◆ Calculation

Corrected Amplitude [dB $\mu$ V] = Amplitude[dBuV] + Correction Factor [dB]

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

Correction Factor : ANT FACTOR + Cable loss

## Radiated Electric Field Emissions(Above 1 GHz)



Site : chamber

Condition: CISPR22 CLASS-A PK 3m STLP9149(9149-255,2016-05-17) horizontal  
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto

Project :

Model : HRD-442P

Mode :

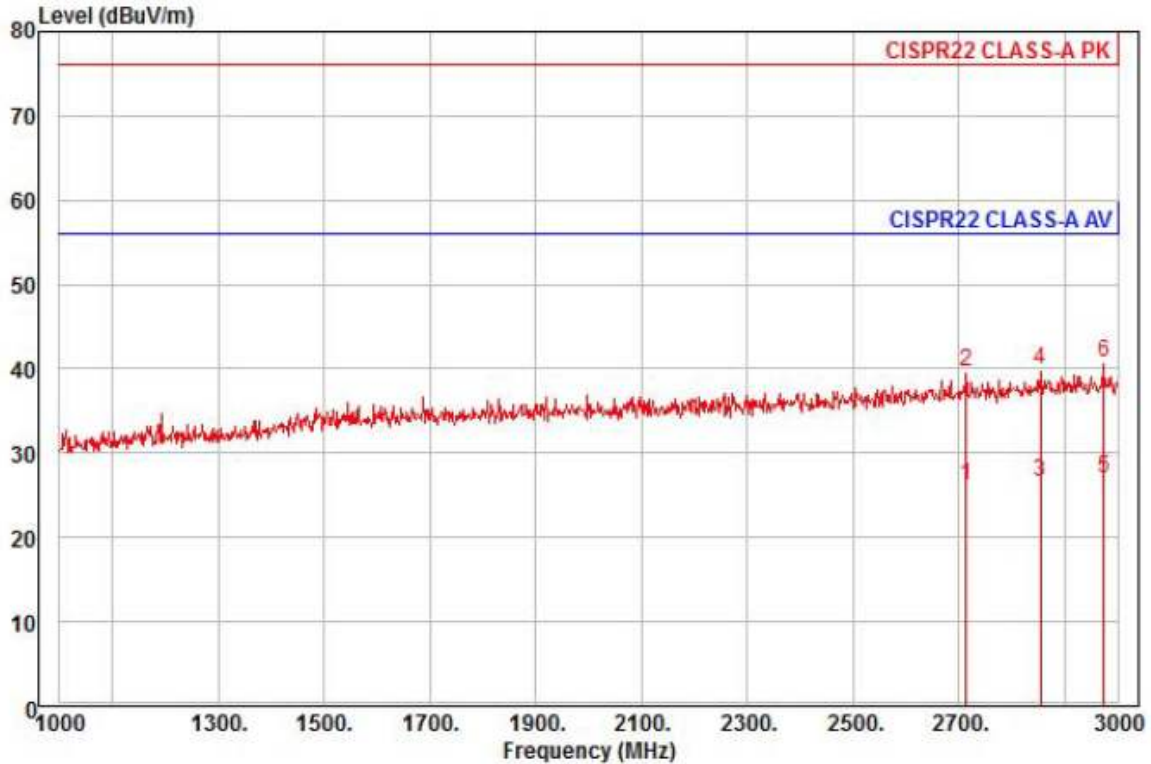
Memo : 1 ~ 3 GHz

	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	2032.00	28.60	25.73	9.41	39.41	12	56.00	-31.67	horizontal Average
2	2032.00	41.64	25.73	9.41	39.41	12	76.00	-38.63	horizontal Peak
3	2456.00	26.86	27.40	10.44	39.48	136	56.00	-30.78	horizontal Average
4	2456.00	39.84	27.40	10.44	39.48	136	76.00	-37.80	horizontal Peak
5 pp	2976.00	25.94	29.68	11.64	40.08	27	56.00	-28.82	horizontal Average
6 pk	2976.00	38.40	29.68	11.64	40.08	27	76.00	-36.36	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



Site : chamber  
Condition: CISPR22 CLASS-A PK 3m STLP9149(9149-255,2016-05-17) vertical  
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto  
Project :  
Model : HRD-442P  
Mode :  
Memo : 1 ~ 3 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	2714.00	26.49	28.52	11.02	39.78	161	56.00	-29.75	vertical	Average
2	2714.00	39.87	28.52	11.02	39.78	161	76.00	-36.37	vertical	Peak
3	2854.00	26.13	29.14	11.36	39.94	26	56.00	-29.31	vertical	Average
4	2854.00	39.40	29.14	11.36	39.94	26	76.00	-36.04	vertical	Peak
5 pp	2974.00	25.89	29.67	11.64	40.08	359	56.00	-28.88	vertical	Average
6 pk	2974.00	39.61	29.67	11.64	40.08	359	76.00	-35.16	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





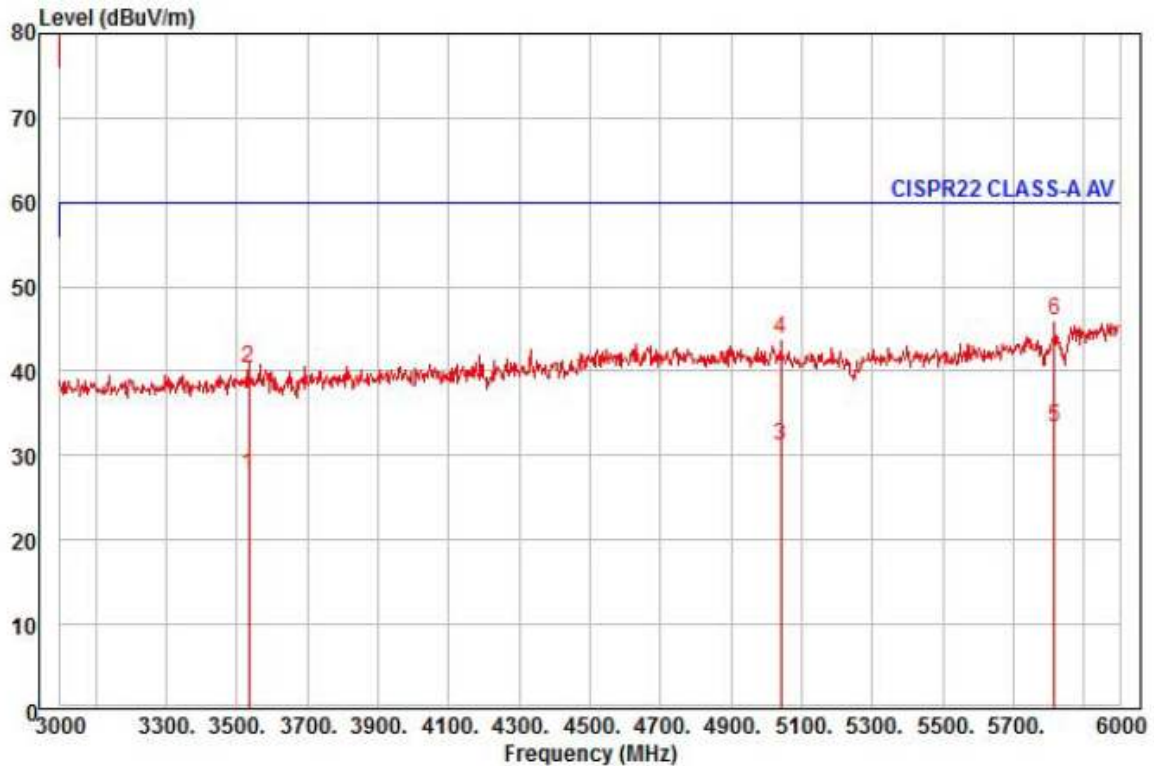
## KES Co., Ltd.

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Test report No.:

KES-E1-17T0214-R1

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Site : chamber  
Condition: CISPR22 CLASS-A PK 3m STLP9149(9149-255,2016-05-17) horizontal  
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto  
Project :  
Model : HRD-442P  
Mode :  
Memo : 3 ~ 6 GHz

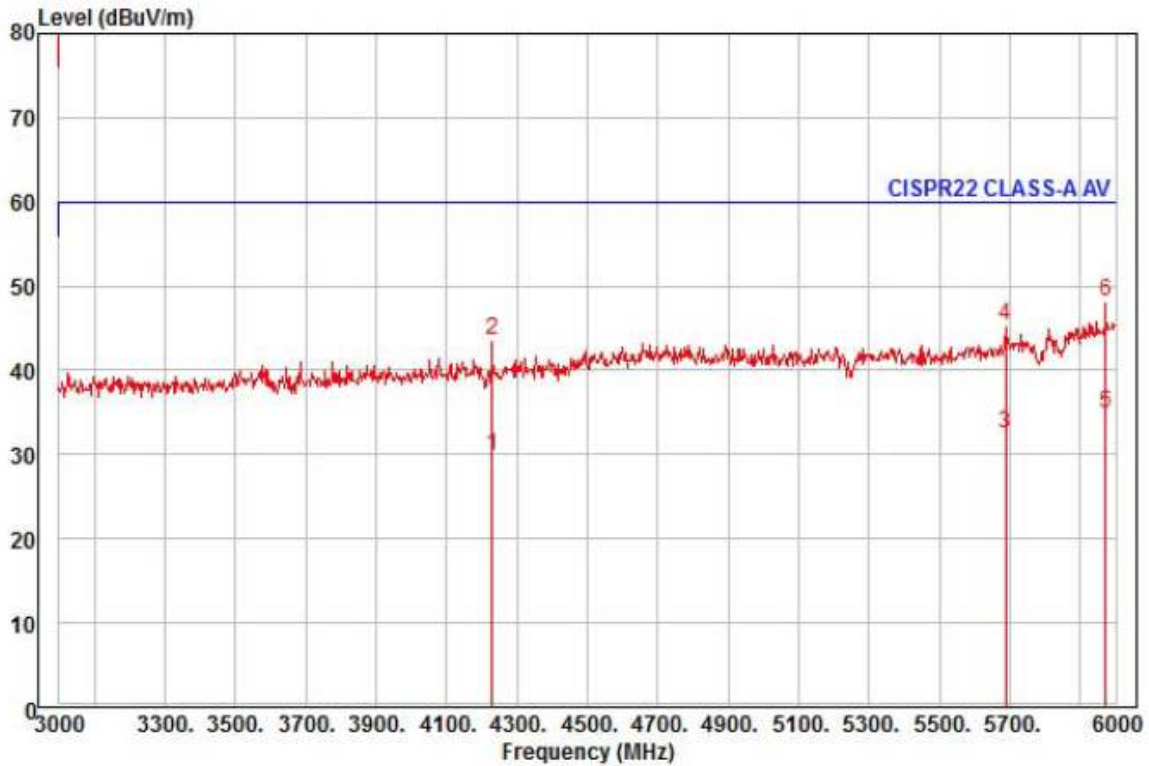
	Freq	Read Level	Ant Factor	Cable Loss	Preamp Factor	TPos	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	deg	dBuV/m	dB		
1	3534.00	25.47	30.36	12.69	40.87	30	60.00	-32.35	horizontal	Average
2	3534.00	38.15	30.36	12.69	40.87	30	80.00	-39.67	horizontal	Peak
3	5040.00	22.93	33.25	15.39	40.34	245	60.00	-28.77	horizontal	Average
4	5040.00	35.45	33.25	15.39	40.34	245	80.00	-36.25	horizontal	Peak
5 pp	5817.00	21.88	35.45	16.73	40.68	320	60.00	-26.62	horizontal	Average
6 pk	5817.00	34.57	35.45	16.73	40.68	320	80.00	-33.93	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

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Site : chamber  
Condition: CISPR22 CLASS-A PK 3m STLP9149(9149-255,2016-05-17) vertical  
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto  
Project :  
Model : HRD-442P  
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	4230.00	24.58	32.04	13.99	40.73	157	60.00	-30.12	vertical	Average
2	4230.00	38.40	32.04	13.99	40.73	157	80.00	-36.30	vertical	Peak
3	5688.00	22.24	34.67	16.50	40.85	165	60.00	-27.44	vertical	Average
4	5688.00	34.92	34.67	16.50	40.85	165	80.00	-34.76	vertical	Peak
5 pp	5973.00	22.02	36.39	17.02	40.47	196	60.00	-25.04	vertical	Average
6 pk	5973.00	35.29	36.39	17.02	40.47	196	80.00	-31.77	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

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

Hn	I <sub>eff</sub> [A]	% of Limit	Limit [A]	Result
1	40.887E-3			
2	3.311E-3			PASS
3	35.282E-3	1.534	2.30	PASS
4	4.234E-3			PASS
5	35.088E-3	3.078	1.14	PASS
6	2.383E-3			PASS
7	34.578E-3	4.491	770.00E-3	PASS
8	2.473E-3			PASS
9	33.627E-3	8.407	400.00E-3	PASS
10	2.982E-3			PASS
11	32.635E-3	9.889	330.00E-3	PASS
12	2.969E-3			PASS
13	31.385E-3	14.945	210.00E-3	PASS
14	2.872E-3			PASS
15	29.872E-3	19.914	150.00E-3	PASS
16	2.681E-3			PASS
17	28.581E-3	21.595	132.35E-3	PASS
18	2.600E-3			PASS
19	27.109E-3	22.892	118.42E-3	PASS
20	2.590E-3			PASS
21	25.263E-3	15.720	160.71E-3	PASS
22	2.286E-3			PASS
23	23.672E-3	16.132	146.74E-3	PASS
24	2.210E-3			PASS
25	21.896E-3	16.219	135.00E-3	PASS
26	2.199E-3			PASS
27	19.957E-3	15.966	124.99E-3	PASS
28	1.893E-3			PASS
29	18.169E-3	15.611	116.39E-3	PASS
30	1.795E-3			PASS
31	16.292E-3	14.965	108.87E-3	PASS
32	1.590E-3			PASS
33	14.556E-3	14.233	102.27E-3	PASS
34	1.331E-3			PASS
35	12.744E-3	13.215	96.44E-3	PASS
36	1.186E-3			PASS
37	10.968E-3	12.024	91.21E-3	PASS
38	841.716E-6			PASS
39	9.560E-3	11.047	86.53E-3	PASS
40	798.461E-6			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	I <sub>eff</sub> [A]	% of Limit	Limit [A]	Result
1	41.084E-3			
2	3.829E-3			PASS
3	35.671E-3	1.034	3.45	PASS
4	4.691E-3			PASS
5	35.308E-3	2.065	1.71	PASS
6	2.784E-3			PASS
7	34.844E-3	3.017	1.15	PASS
8	2.940E-3			PASS
9	33.879E-3	5.646	600.00E-3	PASS
10	3.376E-3			PASS
11	32.780E-3	6.622	495.00E-3	PASS
12	3.378E-3			PASS
13	31.494E-3	9.998	315.00E-3	PASS
14	3.302E-3			PASS
15	29.987E-3	13.328	225.00E-3	PASS
16	3.083E-3			PASS
17	28.699E-3	14.456	198.52E-3	PASS
18	2.998E-3			PASS
19	27.189E-3	15.306	177.63E-3	PASS
20	3.032E-3			PASS
21	25.353E-3	15.776	160.71E-3	PASS
22	2.662E-3			PASS
23	23.805E-3	16.222	146.74E-3	PASS
24	2.655E-3			PASS
25	22.047E-3	16.331	135.00E-3	PASS
26	2.590E-3			PASS
27	20.144E-3	16.116	124.99E-3	PASS
28	2.267E-3			PASS
29	18.335E-3	15.754	116.39E-3	PASS
30	2.162E-3			PASS
31	16.485E-3	15.142	108.87E-3	PASS
32	1.943E-3			PASS
33	14.666E-3	14.341	102.27E-3	PASS
34	1.704E-3			PASS
35	12.859E-3	13.334	96.44E-3	PASS
36	1.498E-3			PASS
37	11.094E-3	12.163	91.21E-3	PASS
38	1.158E-3			PASS
39	9.659E-3	11.162	86.53E-3	PASS
40	1.056E-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.



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www.kes.co.kr

Test report No.:

KES-E1-17T0214-R1

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## Test Data - Voltage Fluctuations

**Maximum Flicker results**

	<b>EUT values</b>	<b>Limit</b>	<b>Result</b>
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.000	3.30	PASS
dmax [%]	0.046	4.00	PASS
Tmax [s]	0.000	0.50	PASS

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## Test Setup Photos and Configuration

### Conducted Voltage Emissions



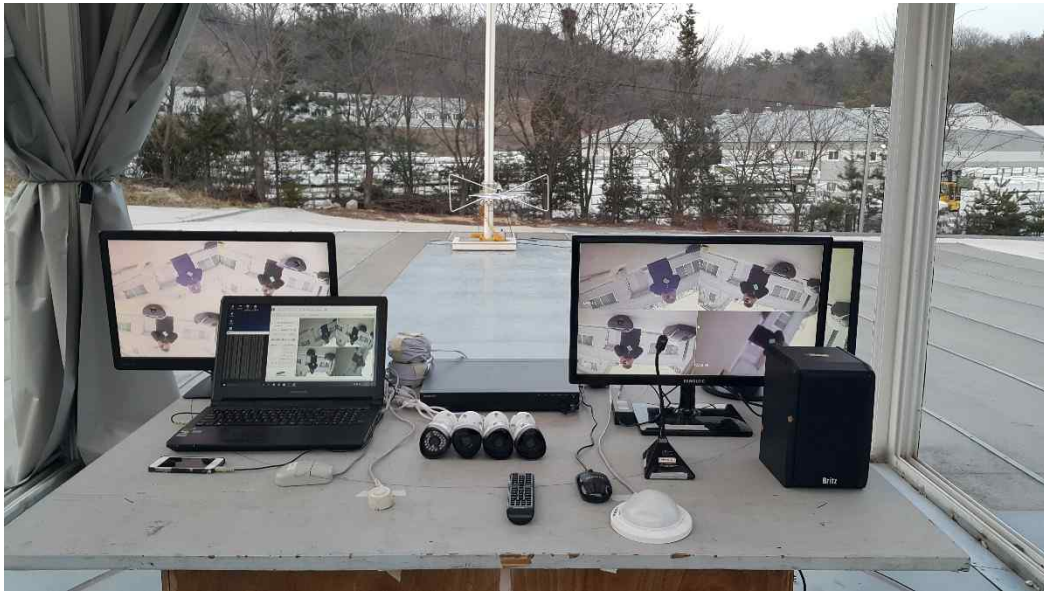
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## Conducted Telecommunication Emissions



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## Radiated Electric Field Emissions(Below 1 GHz)



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## Radiated Electric Field Emissions(Above 1 GHz)



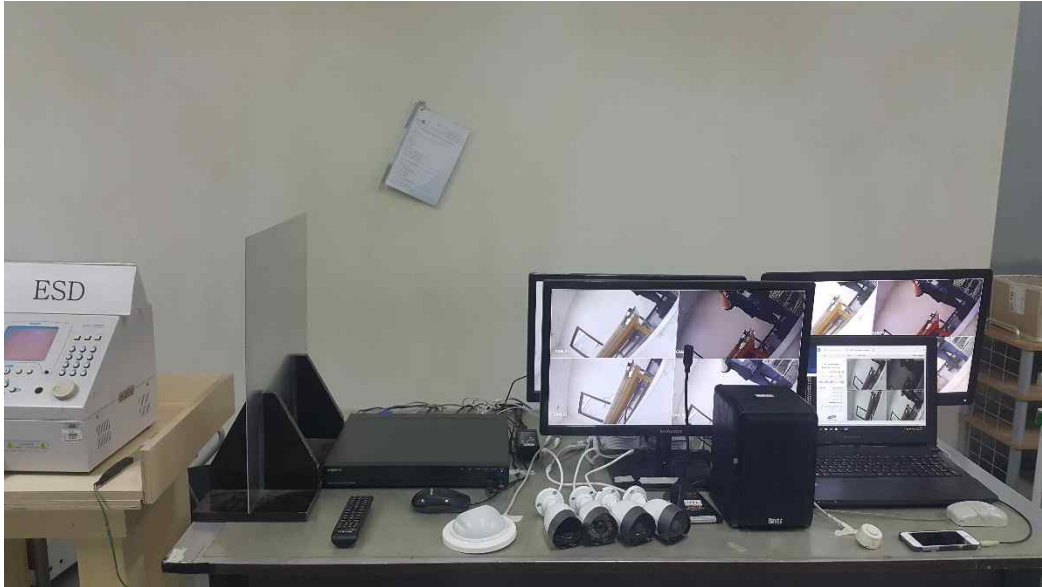
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## Harmonic Current Emissions and Voltage Fluctuations and Flicker

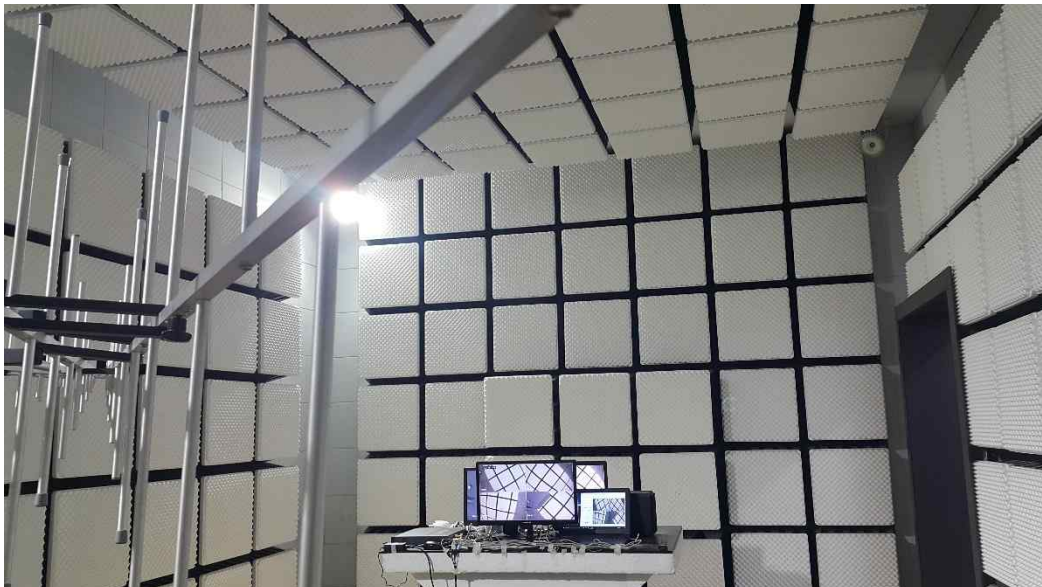


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## Electrostatic Discharge



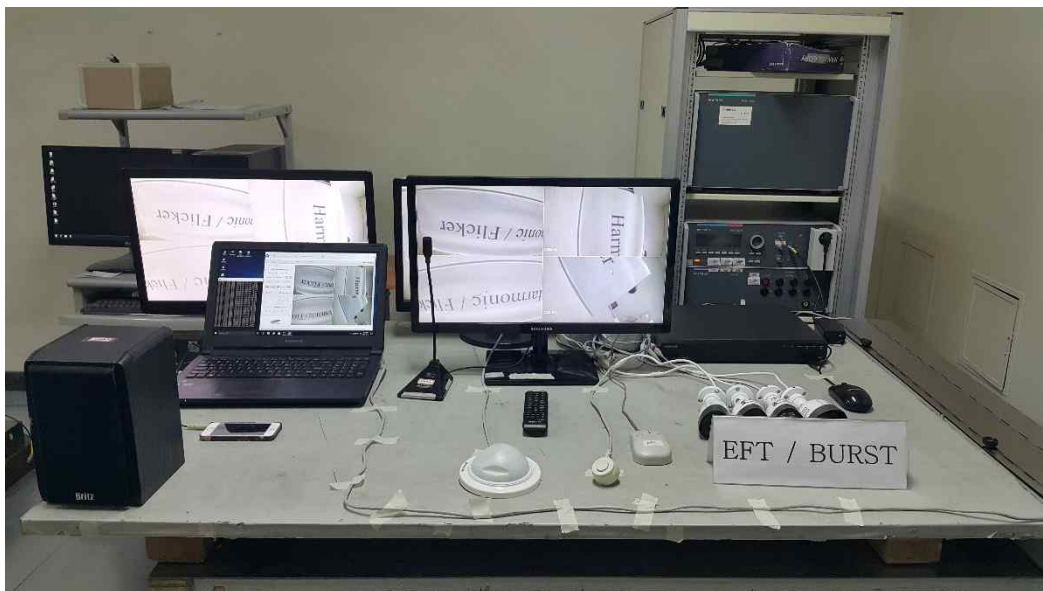
## Radiated Electric Field Immunity



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## Electrical Fast Transients/Bursts



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## Surge Transients



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## Conducted Disturbance



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## Voltage Dips and Short Interruptions



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## EUT External Photographs

(Top)



(Bottom)



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## EUT Internal Photographs

(Internal View)

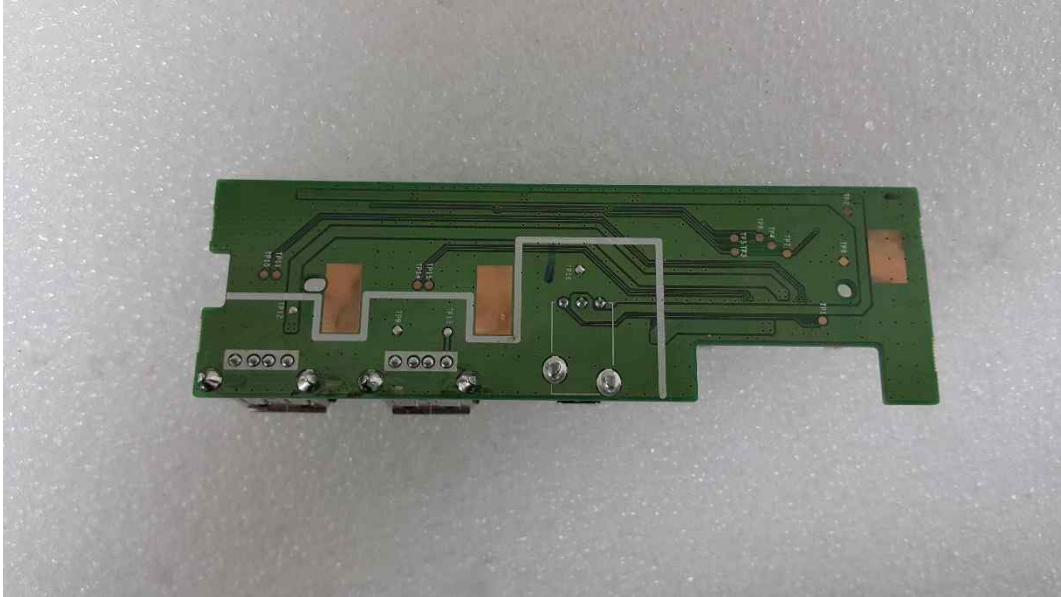


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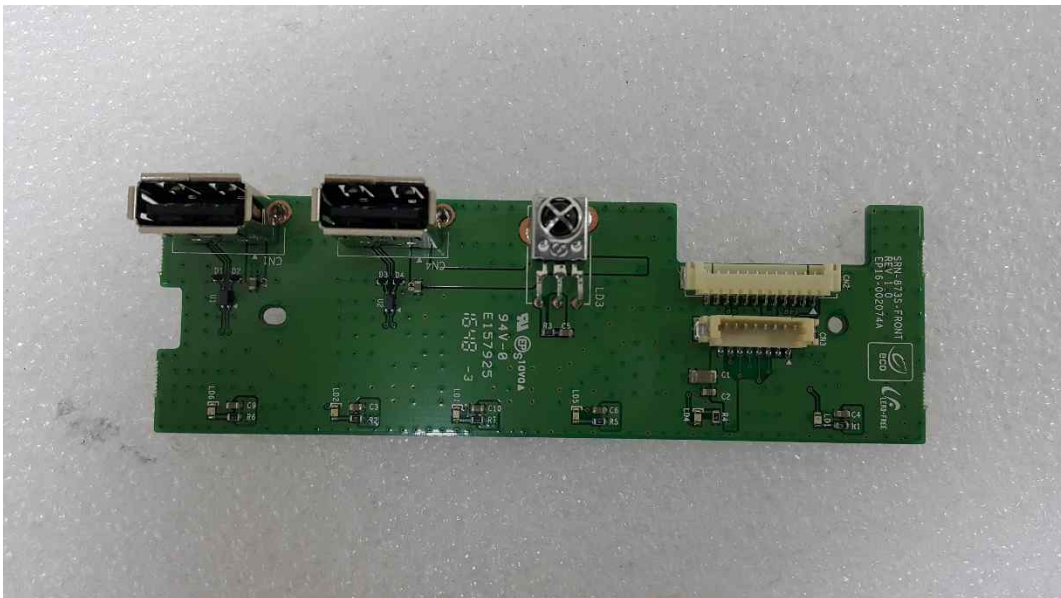


## EUT Internal View – Board 1

(Top)



(Bottom)



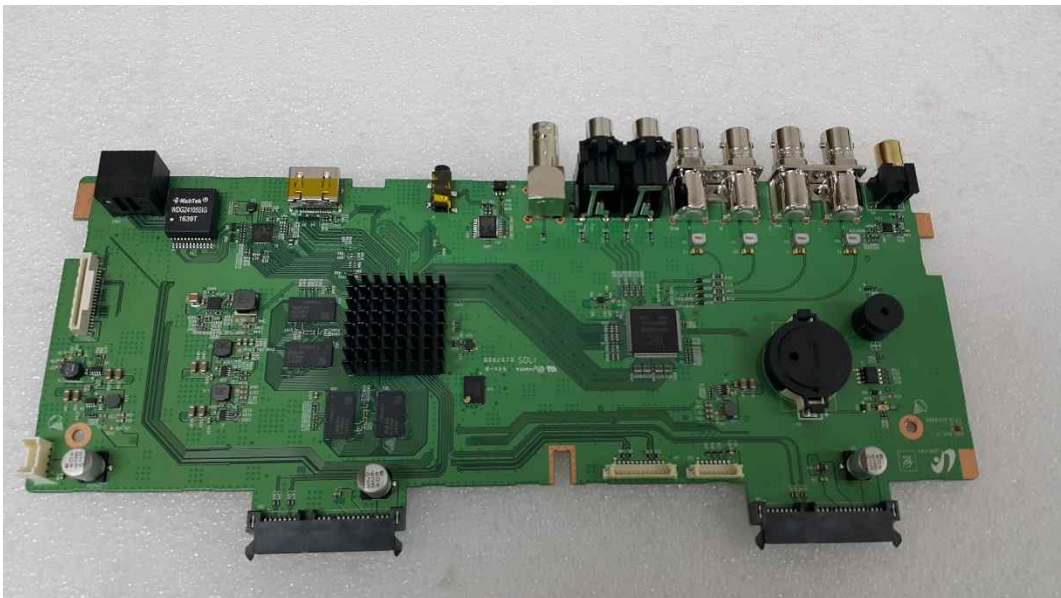
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## EUT Internal View – Board 2

(Top)



(Bottom)

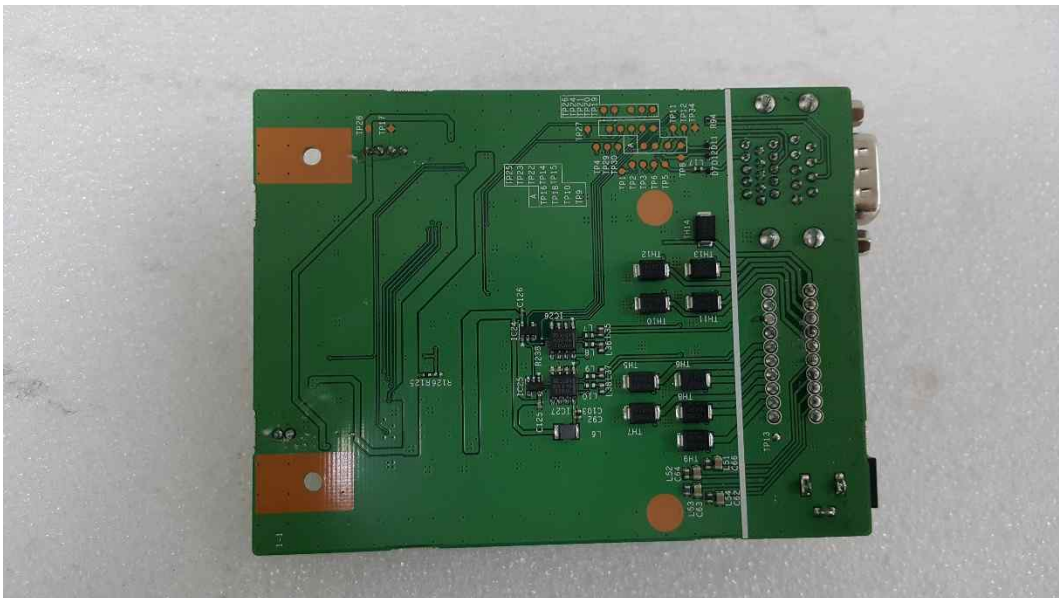


## EUT Internal View – Board 3

(Top)



(Bottom)



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## Label and Location



### **DVR**

Model No : HRD-442P

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

Made in of China

