EMC TEST REPORT For VCCI

Test Report No.	:	KES-E1-17T0520
Date of Issue	:	Aug. 14, 2017
Product name	:	DVR
Model/Type No.	:	HRD-1641N
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	:	Jul. 10, 2017
Test date	:	Aug. 17, 2017 – Aug. 18, 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-E1-17T0520	Issued

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1.0 General Product Description

Main Specifications of EUT 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 ☐ 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-1641N	-	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

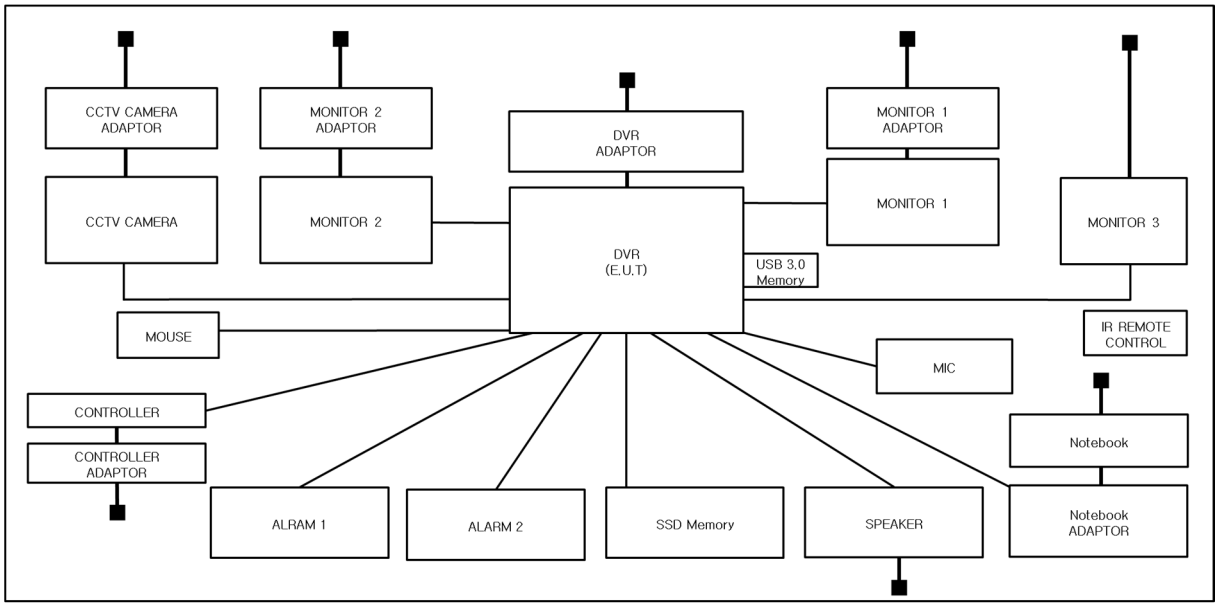
1.7 EUT Operating Mode(s)

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 and CISPR Publication 22.

1.12 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)	KOREA LABORATORY ACCREDITATION SCHEME KOLAS TESTING NO. 489

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☐ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010 ☐ Group 1 ☐ Class A ☐ Group 2 ☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547 :2009

☐ EN 55032:2015 ☐ Class A ☐ Class B

☐ EN 55024:2010 +A1:2015

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013

☒ **VCCI V-3 / 2015.04** ☒ Class A ☐ Class B

☐ **AS/NZS CISPR22:2009 +A1:2010** ☐ Class A ☐ Class B

☐ **47 CFR Part 15, Subpart B**

- ☐ CISPR 22:2009 +A1:2010 ☐ Class A ☐ Class B
- ☐ ANSI C63.4-2009

☐ **IC Regulation ICES-003 : 2016**

- ☐ CAN/CSA CISPR 22-10 ☐ Class A ☐ Class B
- ☐ ANSI C63.4-2014

☐ **RE– Directive 2014/53/EU**

☐ EN 301 489-1 V1.9.2

- ☐ Equipment for fixed use
- ☐ Equipment for vehicular use
- ☐ Equipment for portable use

☐ EN 301 489-3 V1.6.1

☐ EN 301 489-17 V2.2.1

☐ EN 60945:2002

2.1 Conducted Emissions Mains Power Ports

Test Date
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 %

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 #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
☒	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 #1 ☐ OPEN AREA TEST SITE #2

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☐	EMI Test S/W	-	-	-	-
☒	EMI TEST RECEIVER	ESVS10	R & S	826008/014	04, 18, 2018
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	04, 14, 2018

Test Conditions
Temperature: 32,1℃
Relative Humidity: 57,0 %

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.

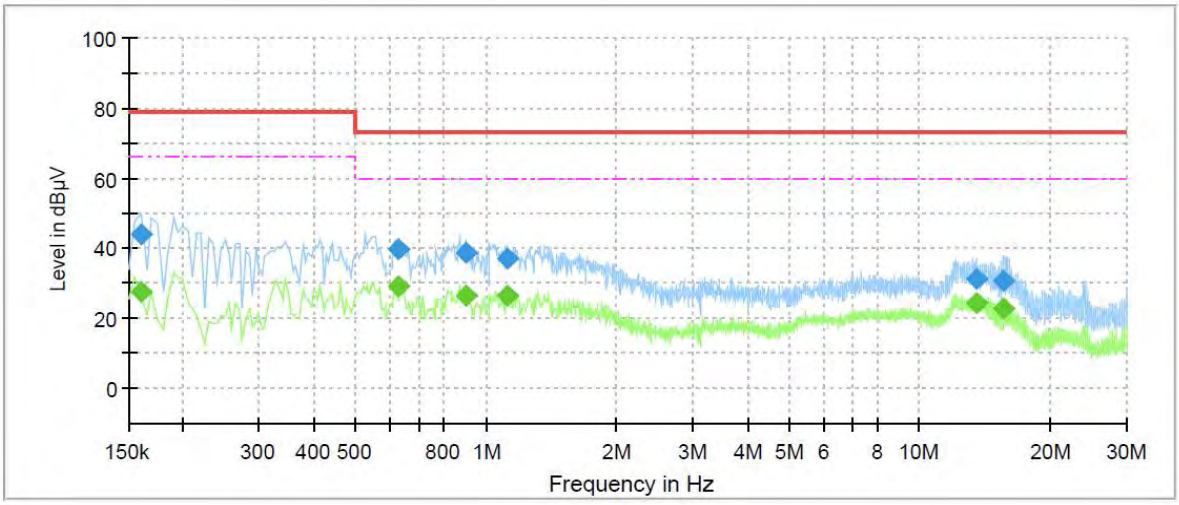
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

[HOT]

Common Information

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



Final_Result

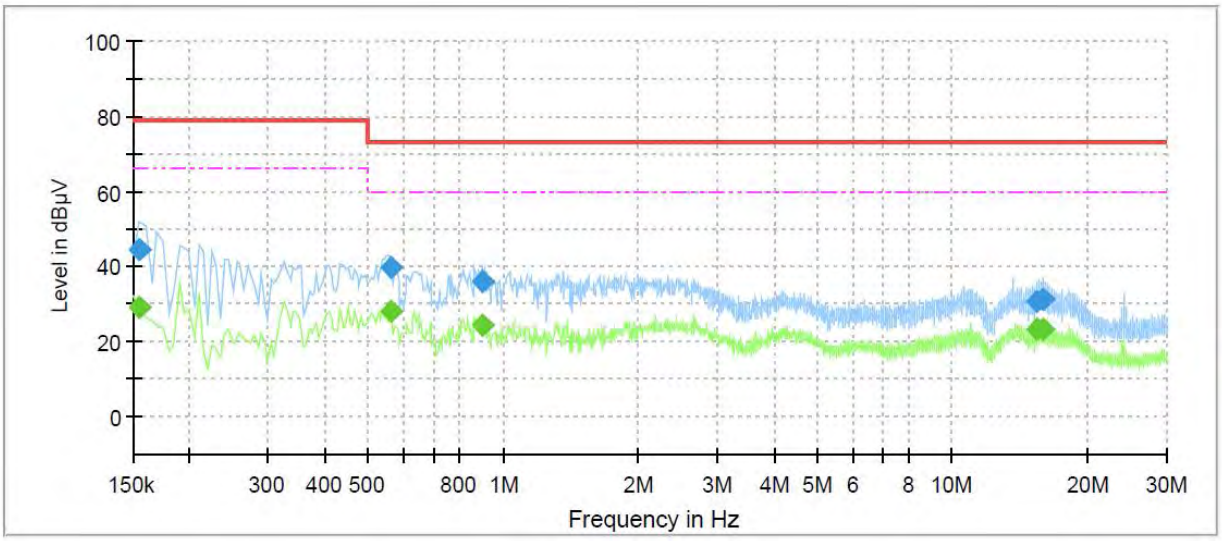
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.160000	---	27.61	66.00	38.39	1000.0	9.000	L1	19.4
0.160000	43.93	---	79.00	35.07	1000.0	9.000	L1	19.4
0.630000	---	29.25	60.00	30.75	1000.0	9.000	L1	19.6
0.630000	39.60	---	73.00	33.40	1000.0	9.000	L1	19.6
0.895000	---	26.68	60.00	33.32	1000.0	9.000	L1	19.8
0.895000	38.64	---	73.00	34.36	1000.0	9.000	L1	19.8
1.125000	---	26.39	60.00	33.61	1000.0	9.000	L1	19.8
1.125000	37.14	---	73.00	35.86	1000.0	9.000	L1	19.8
13.545000	---	24.55	60.00	35.45	1000.0	9.000	L1	19.8
13.545000	31.00	---	73.00	42.00	1000.0	9.000	L1	19.8
15.540000	---	22.83	60.00	37.17	1000.0	9.000	L1	20.0
15.540000	30.75	---	73.00	42.25	1000.0	9.000	L1	20.0

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

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	HRD-1641N
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)
0.155000	---	29.17	66.00	36.83	1000.0	9.000	N	19.4
0.155000	44.45	---	79.00	34.55	1000.0	9.000	N	19.4
0.565000	---	28.03	60.00	31.97	1000.0	9.000	N	19.6
0.565000	39.55	---	73.00	33.45	1000.0	9.000	N	19.6
0.895000	---	24.20	60.00	35.80	1000.0	9.000	N	19.8
0.895000	36.19	---	73.00	36.81	1000.0	9.000	N	19.8
15.355000	---	23.22	60.00	36.78	1000.0	9.000	N	20.0
15.355000	30.75	---	73.00	42.25	1000.0	9.000	N	20.0
15.980000	---	23.37	60.00	36.63	1000.0	9.000	N	20.0
15.980000	31.19	---	73.00	41.81	1000.0	9.000	N	20.0

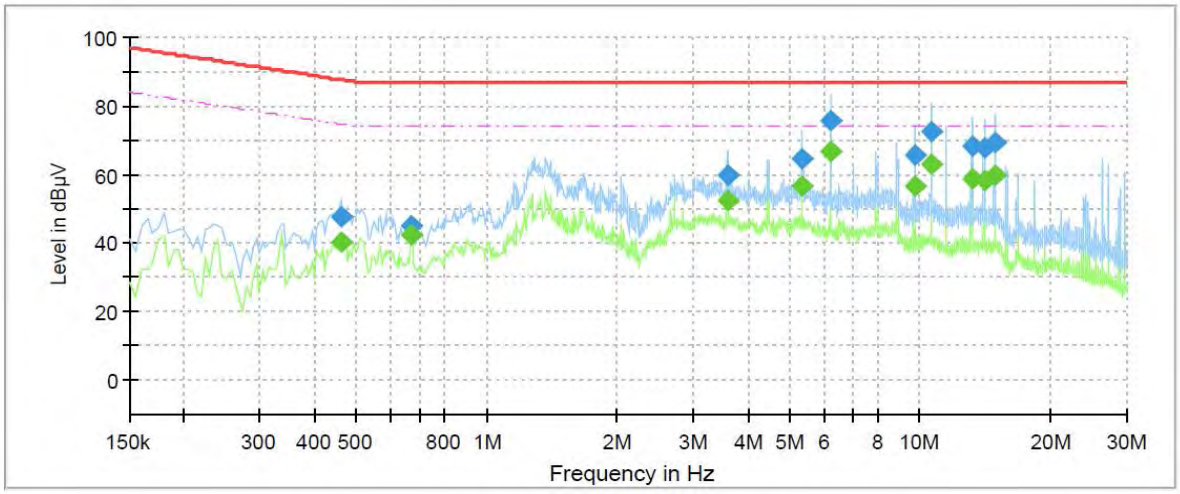
♦ Calculation
QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]
QuasiPeak / CAverage : The Final Value
Reading Value : Not shown in the table.
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

Conducted Emissions at Telecommunication Ports

[10 Mbps]

Common Information

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



Final_Result

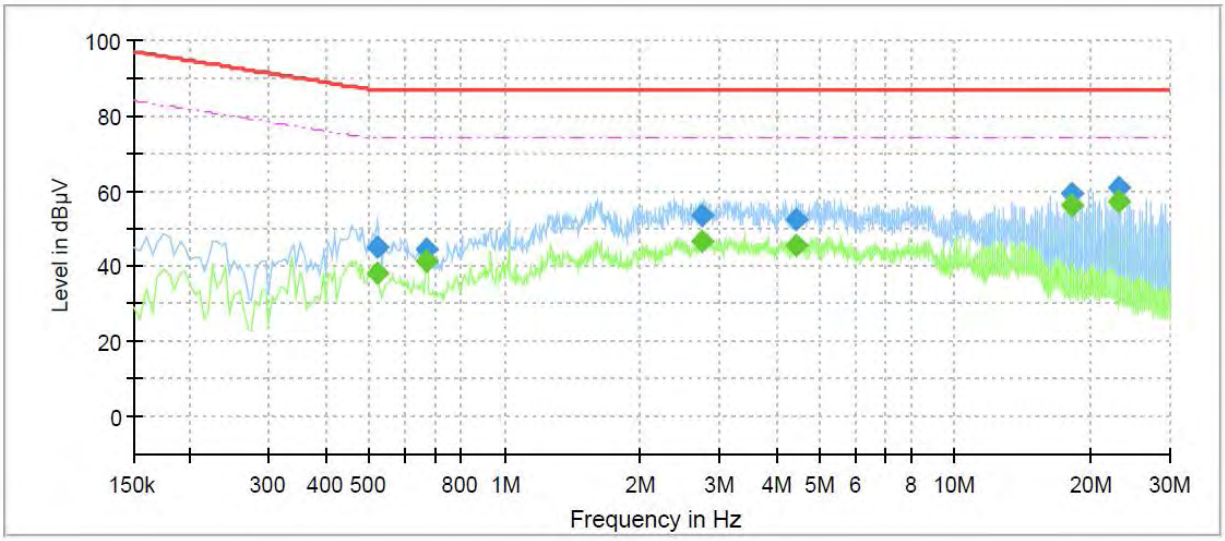
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.460000	47.53	---	87.69	40.16	1000.0	9.000	Single Line	19.9
0.460000	---	40.34	74.69	34.35	1000.0	9.000	Single Line	19.9
0.670000	45.14	---	87.00	41.86	1000.0	9.000	Single Line	19.9
0.670000	---	42.40	74.00	31.60	1000.0	9.000	Single Line	19.9
3.585000	59.74	---	87.00	27.26	1000.0	9.000	Single Line	20.0
3.585000	---	52.41	74.00	21.59	1000.0	9.000	Single Line	20.0
5.325000	---	56.71	74.00	17.29	1000.0	9.000	Single Line	19.9
5.325000	64.77	---	87.00	22.23	1000.0	9.000	Single Line	19.9
6.250000	---	66.61	74.00	7.39	1000.0	9.000	Single Line	19.9
6.250000	75.55	---	87.00	11.45	1000.0	9.000	Single Line	19.9
9.730000	---	56.48	74.00	17.52	1000.0	9.000	Single Line	19.8
9.730000	65.53	---	87.00	21.47	1000.0	9.000	Single Line	19.8
10.600000	---	62.89	74.00	11.11	1000.0	9.000	Single Line	19.8
10.600000	72.35	---	87.00	14.65	1000.0	9.000	Single Line	19.8
13.150000	---	58.76	74.00	15.24	1000.0	9.000	Single Line	19.9
13.150000	68.18	---	87.00	18.82	1000.0	9.000	Single Line	19.9
14.075000	---	58.22	74.00	15.78	1000.0	9.000	Single Line	19.9
14.075000	67.58	---	87.00	19.42	1000.0	9.000	Single Line	19.9
14.945000	---	59.70	74.00	14.30	1000.0	9.000	Single Line	20.0
14.945000	69.10	---	87.00	17.90	1000.0	9.000	Single Line	20.0

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

[100 Mbps]

Common Information

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



Final_Result

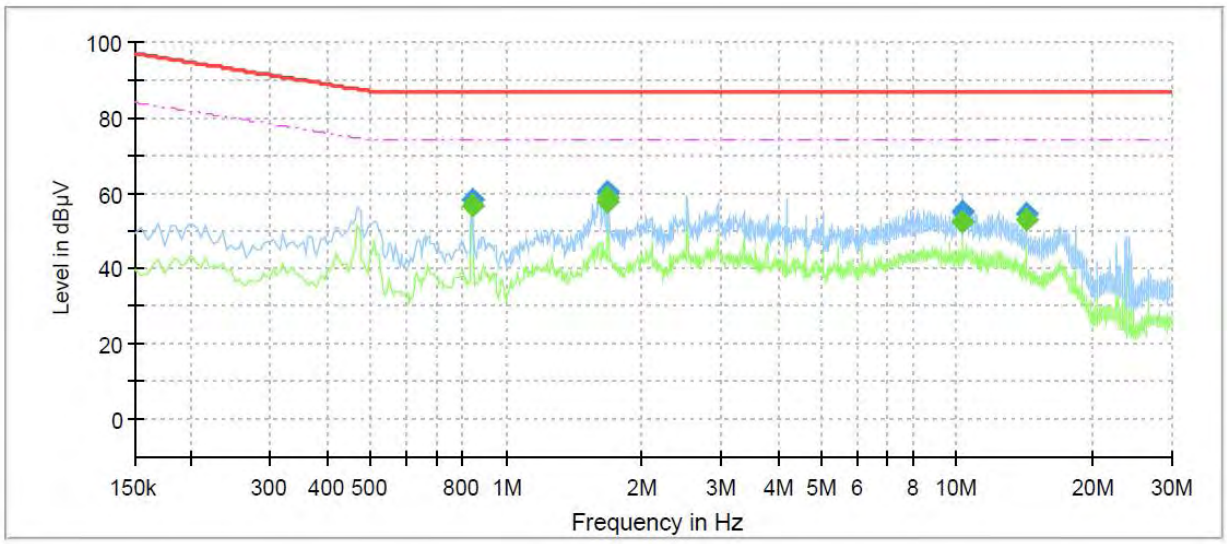
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.520000	---	37.94	74.00	36.06	1000.0	9.000	Single Line	19.4
0.520000	44.99	---	87.00	42.01	1000.0	9.000	Single Line	19.4
0.670000	---	41.55	74.00	32.45	1000.0	9.000	Single Line	19.4
0.670000	44.39	---	87.00	42.61	1000.0	9.000	Single Line	19.4
2.755000	---	46.64	74.00	27.36	1000.0	9.000	Single Line	19.5
2.755000	53.43	---	87.00	33.57	1000.0	9.000	Single Line	19.5
4.440000	---	45.43	74.00	28.57	1000.0	9.000	Single Line	19.5
4.440000	52.58	---	87.00	34.42	1000.0	9.000	Single Line	19.5
18.245000	---	55.98	74.00	18.02	1000.0	9.000	Single Line	19.5
18.245000	59.32	---	87.00	27.68	1000.0	9.000	Single Line	19.5
23.130000	---	57.11	74.00	16.89	1000.0	9.000	Single Line	19.4
23.130000	60.88	---	87.00	26.12	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-1641N
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	---	56.82	74.00	17.18	1000.0	9.000	Single Line	19.6
0.840000	58.14	---	87.00	28.86	1000.0	9.000	Single Line	19.6
1.680000	---	58.56	74.00	15.44	1000.0	9.000	Single Line	19.8
1.680000	60.53	---	87.00	26.47	1000.0	9.000	Single Line	19.8
1.685000	---	57.51	74.00	16.49	1000.0	9.000	Single Line	19.8
1.685000	59.70	---	87.00	27.30	1000.0	9.000	Single Line	19.8
10.240000	---	52.42	74.00	21.58	1000.0	9.000	Single Line	19.6
10.240000	55.24	---	87.00	31.76	1000.0	9.000	Single Line	19.6
14.335000	---	53.04	74.00	20.96	1000.0	9.000	Single Line	19.9
14.335000	54.45	---	87.00	32.55	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))

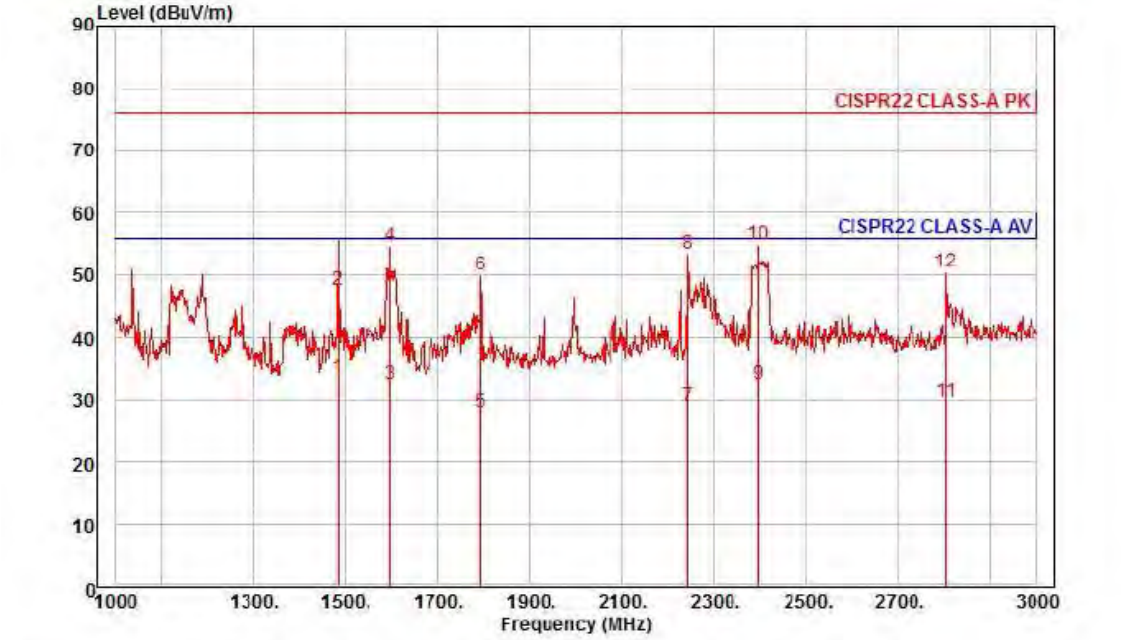
Radiated Electric Field Emissions(Below 1 ㎓)

Frequency	Amplitude	ANT Polar. (H/V)	ANT. Height	Correction Factor		Corrected Amplitude	Applicable Limit	Margin
[㎒]	[dB㎶]		[m]	ANT. [dB/m]	Cable [dB]	[dB㎶/m]	[dB㎶/m]	[dB]
148.39	23.30	H	4.00	8.16	2.78	34.24	40.00	5.76
148.44	22.20	V	1.00	8.17	2.78	33.15	40.00	6.85
297.06	19.00	H	3.81	13.35	4.08	36.43	47.00	10.57
371.13	21.20	H	3.90	14.94	4.39	40.53	47.00	6.47
371.23	21.60	V	1.25	14.95	4.40	40.95	47.00	6.05
445.19	16.40	V	3.10	16.35	5.07	37.82	47.00	9.18

* H : Horizontal, V : Vertical

♦ Calculation
Corrected Amplitude [㏈uV] = Amplitude[㏈uV] + Correction Factor [㏈]
Corrected Amplitude : The Final Value, Amplitude : Reading Value,
Correction Factor : ANT FACTOR + Cable loss

Radiated Electric Field Emissions(Above 1 ㎓)



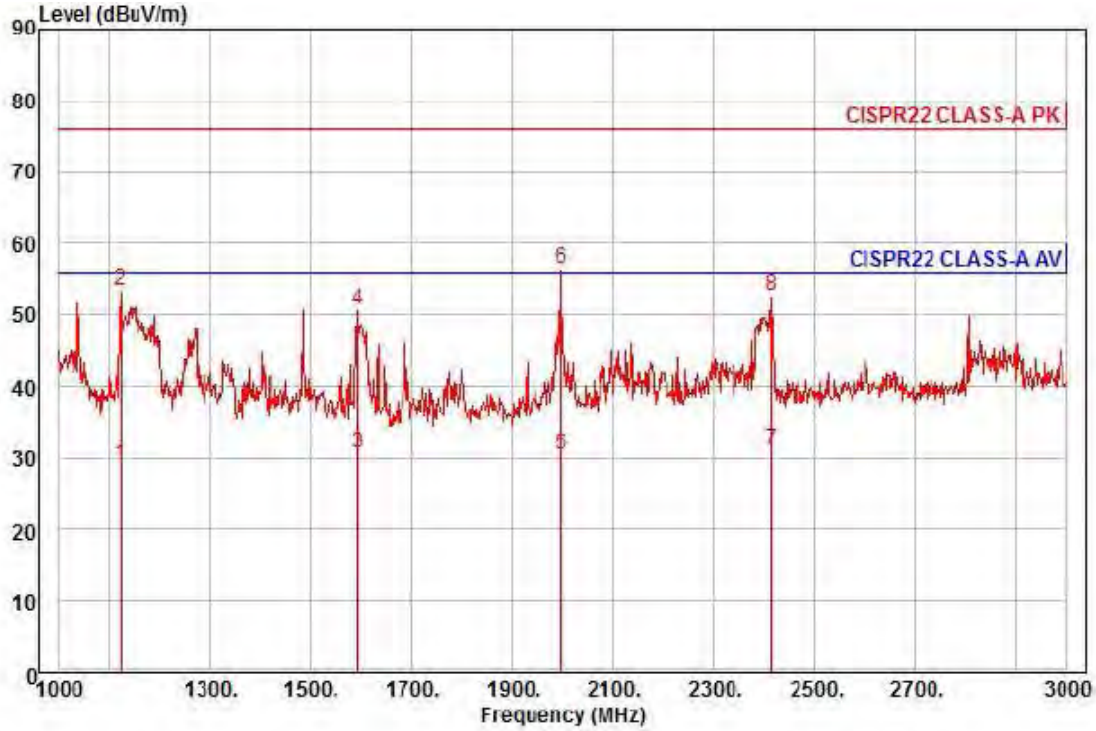
Site : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) horizontal
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : HRD-1641N
Mode :
Memo :

	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	37.07	23.97	8.17	35.63	49	56.00	-22.42	horizontal	Average
2	1484.00	51.18	23.97	8.17	35.63	49	76.00	-28.31	horizontal	Peak
3	1598.00	35.32	24.41	8.50	35.53	325	56.00	-23.30	horizontal	Average
4	1598.00	57.39	24.41	8.50	35.53	325	76.00	-21.23	horizontal	Peak
5	1792.00	29.07	25.18	9.07	35.36	57	56.00	-28.04	horizontal	Average
6	1792.00	51.23	25.18	9.07	35.36	57	76.00	-25.88	horizontal	Peak
7	2244.00	27.31	26.75	10.23	35.27	57	56.00	-26.98	horizontal	Average
8	2244.00	51.79	26.75	10.23	35.27	57	76.00	-22.50	horizontal	Peak
9	2398.00	30.09	27.22	10.59	35.33	336	56.00	-23.43	horizontal	Average
10 pp	2398.00	52.47	27.22	10.59	35.33	336	76.00	-21.05	horizontal	Peak
11	2804.00	24.68	28.87	11.62	35.48	55	56.00	-26.31	horizontal	Average
12	2804.00	45.45	28.87	11.62	35.48	55	76.00	-25.54	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



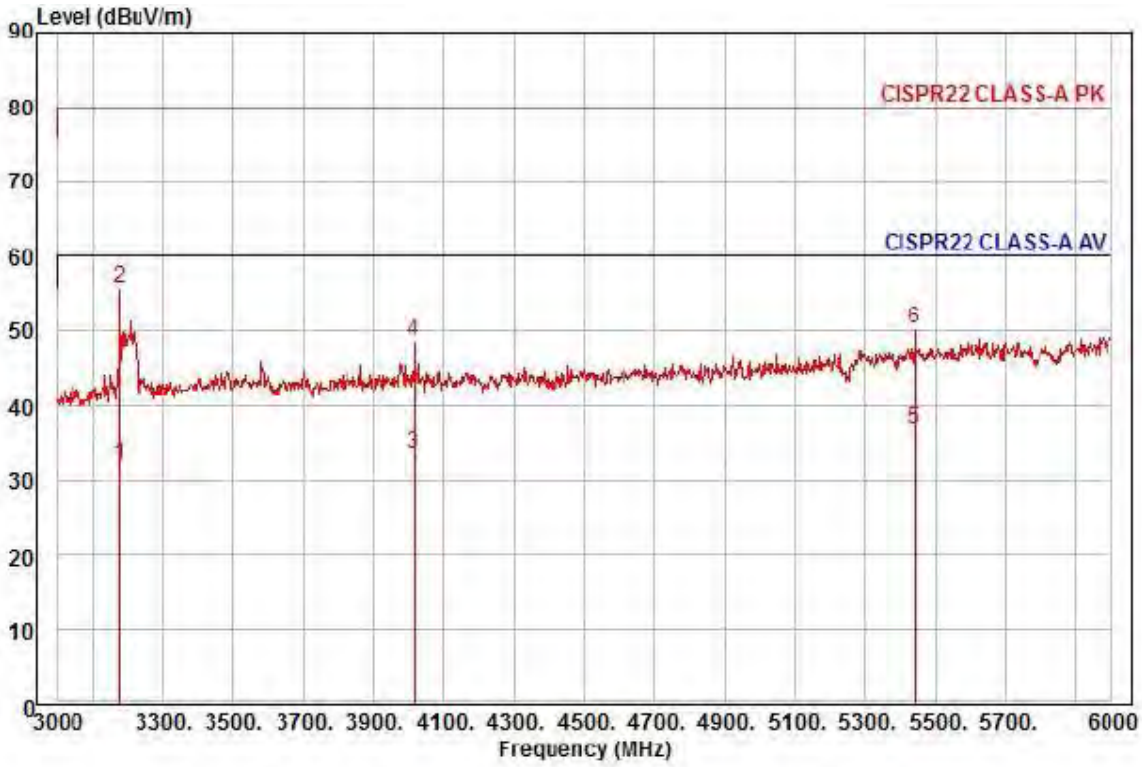
Site : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) vertical
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : HRD-1641N
Mode :
Memo :

	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	1122.00	34.98	22.87	7.03	35.95	187	56.00	-27.07	vertical	Average
2	1122.00	59.46	22.87	7.03	35.95	187	76.00	-22.59	vertical	Peak
3	1594.00	33.41	24.39	8.49	35.53	312	56.00	-25.24	vertical	Average
4	1594.00	53.42	24.39	8.49	35.53	312	76.00	-25.23	vertical	Peak
5	1998.00	30.04	26.00	9.64	35.17	1	56.00	-25.49	vertical	Average
6 pp	1998.00	55.87	26.00	9.64	35.17	1	76.00	-19.66	vertical	Peak
7 av	2414.00	28.55	27.27	10.63	35.33	341	56.00	-24.88	vertical	Average
8	2414.00	50.10	27.27	10.63	35.33	341	76.00	-23.33	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



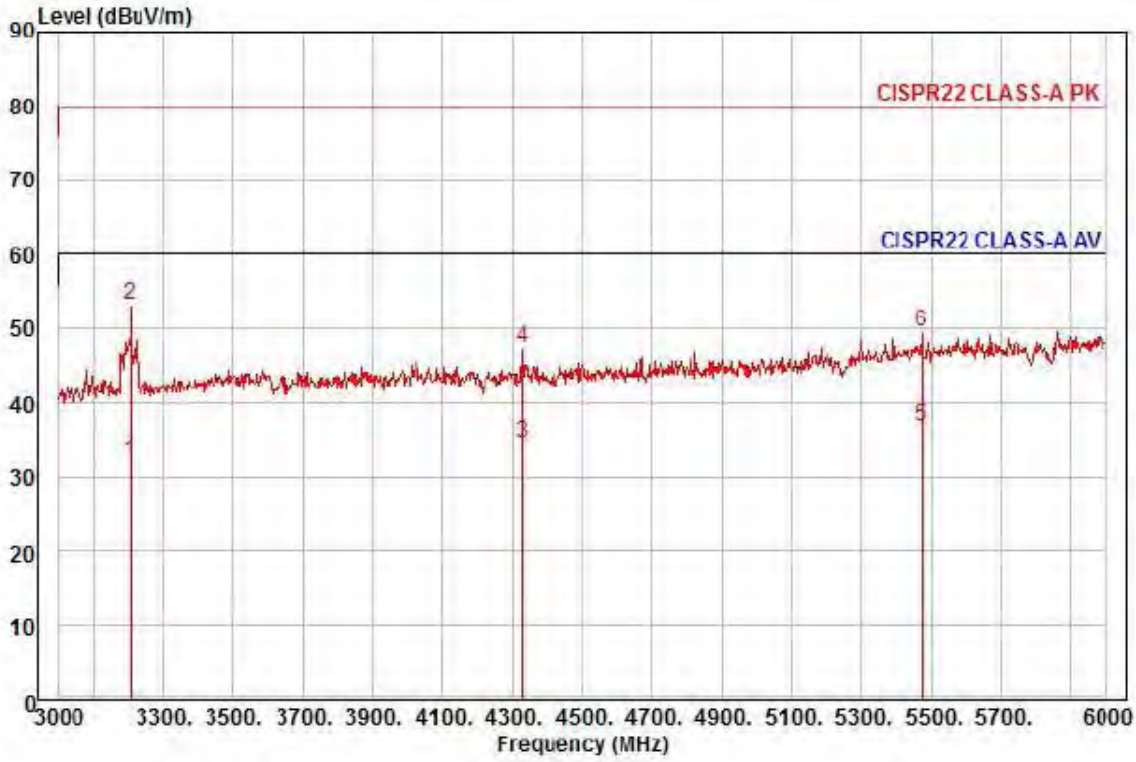
Site : chamber
Condition: CISPR22 CLASS-A PK 3m STLP9149(RRA CAL 2017-05-18) horizontal
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto
Project :
Model : HRD-1641N
Mode :
Memo :

	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	3177.00	24.68	30.24	12.60	35.51	336	60.00	-27.99	horizontal	Average
2 pk	3177.00	48.26	30.24	12.60	35.51	336	80.00	-24.41	horizontal	Peak
3	4014.00	22.31	32.50	14.09	35.28	316	60.00	-26.38	horizontal	Average
4	4014.00	37.37	32.50	14.09	35.28	316	80.00	-31.32	horizontal	Peak
5 qp	5442.00	20.76	35.14	16.52	35.66	44	60.00	-23.24	horizontal	Average
6	5442.00	34.26	35.14	16.52	35.66	44	80.00	-29.74	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-1641N
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	24.68	30.32	12.67	35.50	0	60.00	-27.83	vertical	Average
2 pk	3204.00	45.70	30.32	12.67	35.50	0	80.00	-26.81	vertical	Peak
3	4329.00	22.79	32.41	14.66	35.40	334	60.00	-25.54	vertical	Average
4	4329.00	35.74	32.41	14.66	35.40	334	80.00	-32.59	vertical	Peak
5 pp	5475.00	20.70	35.27	16.57	35.66	224	60.00	-23.12	vertical	Average
6	5475.00	33.47	35.27	16.57	35.66	224	80.00	-30.35	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

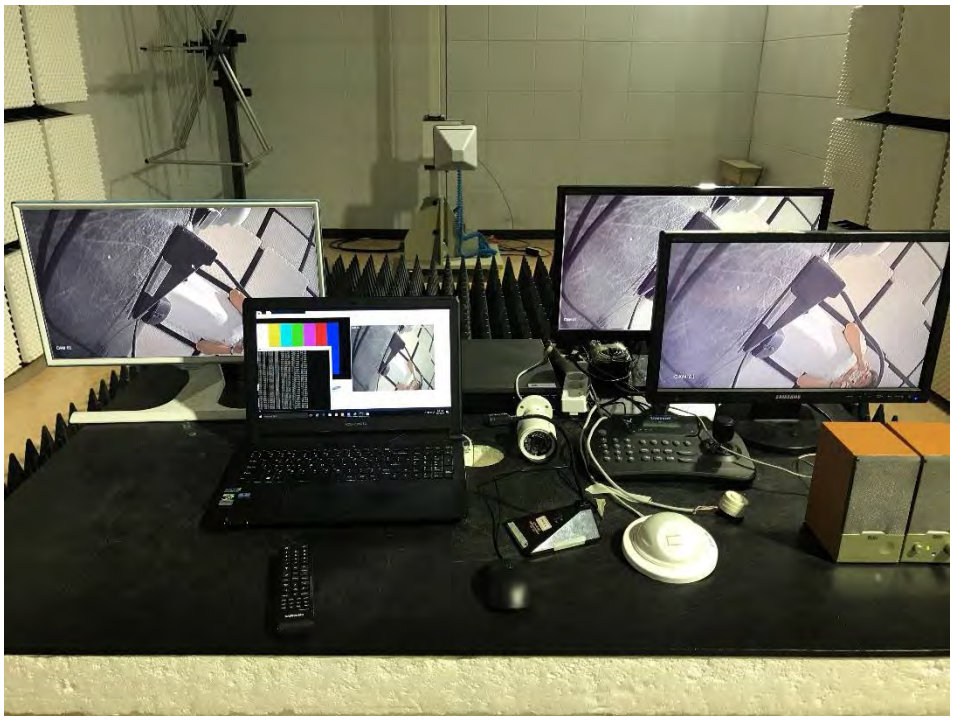
Test Setup Photos and Configuration

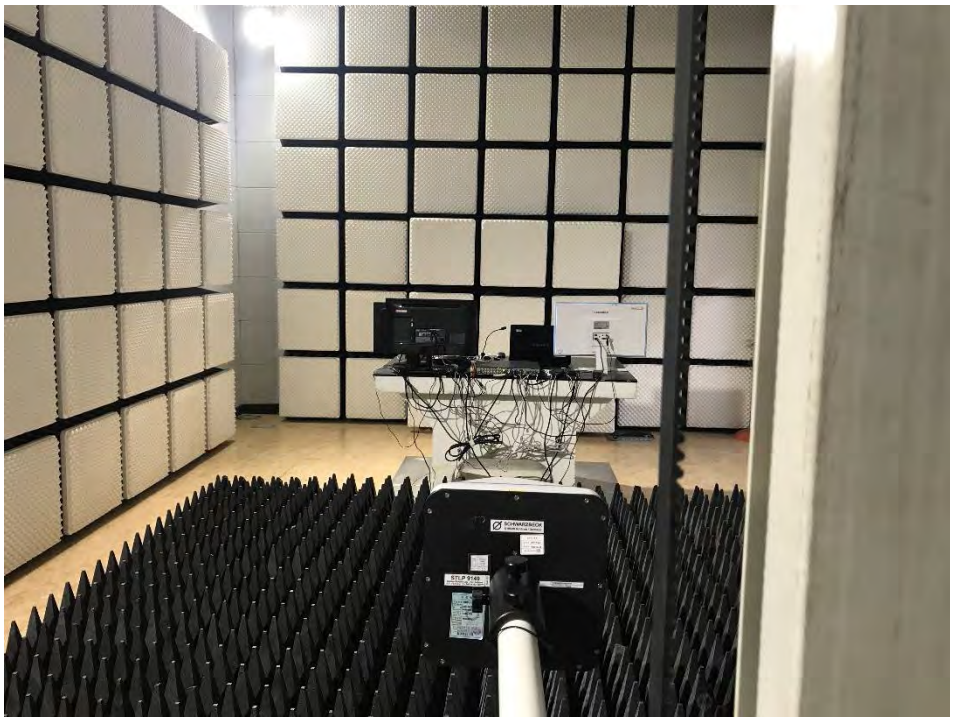
Conducted Voltage Emissions

Conducted Telecommunication Emissions

Radiated Electric Field Emissions(Below 1 ㎓)

Radiated Electric Field Emissions(Above 1 ㎓)





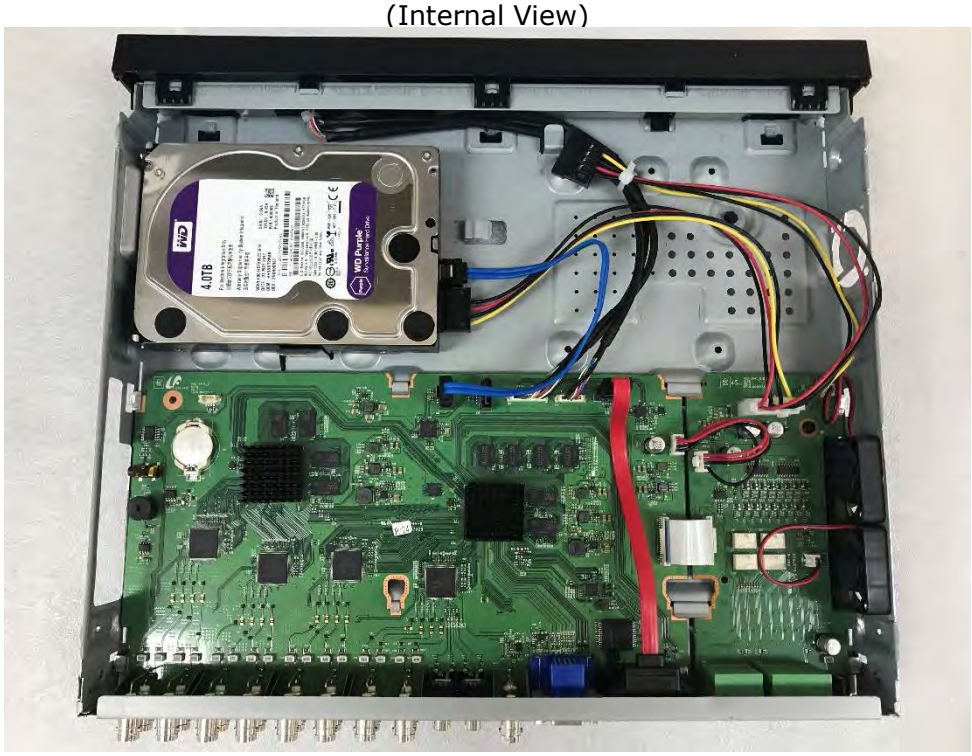
EUT External Photographs

(Top)

(Bottom)

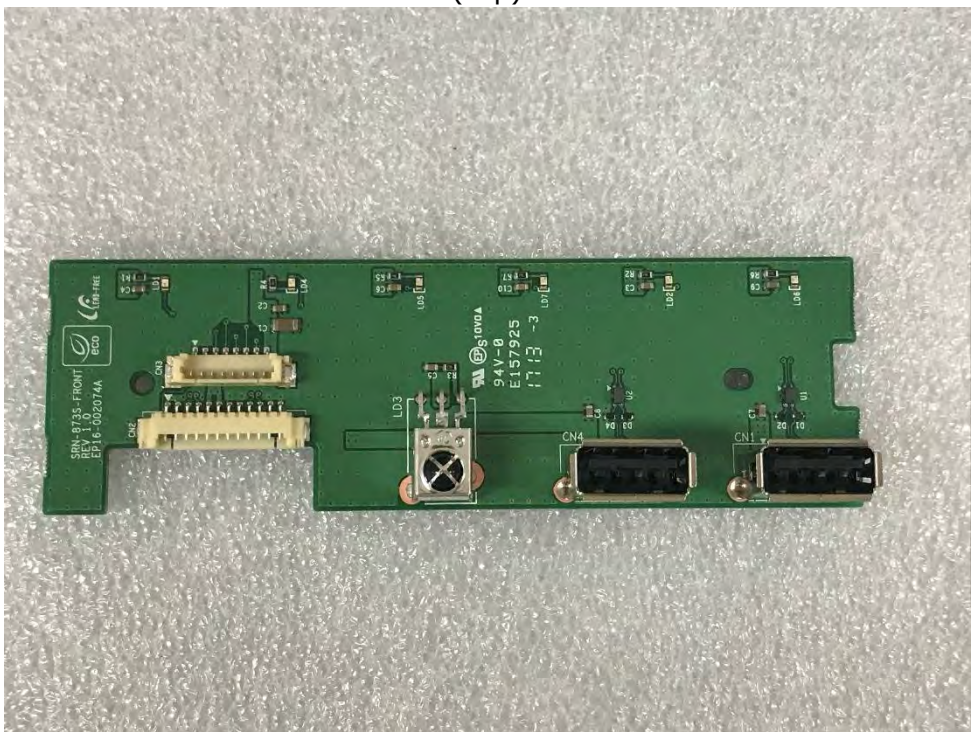
EUT Internal Photographs

(Internal View)

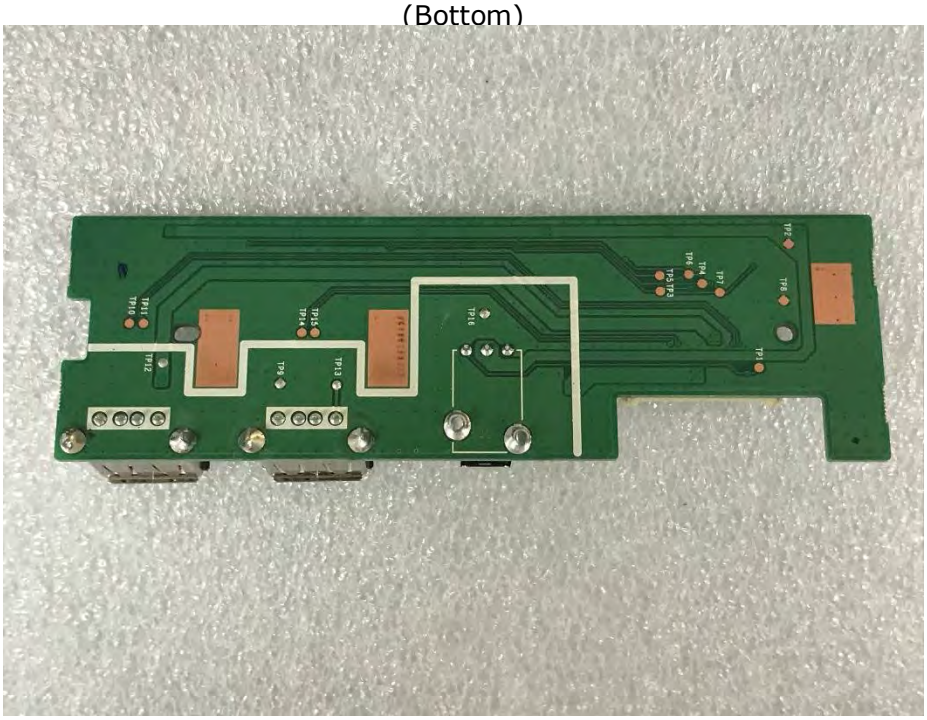


EUT Internal View – Board 1

(Top)

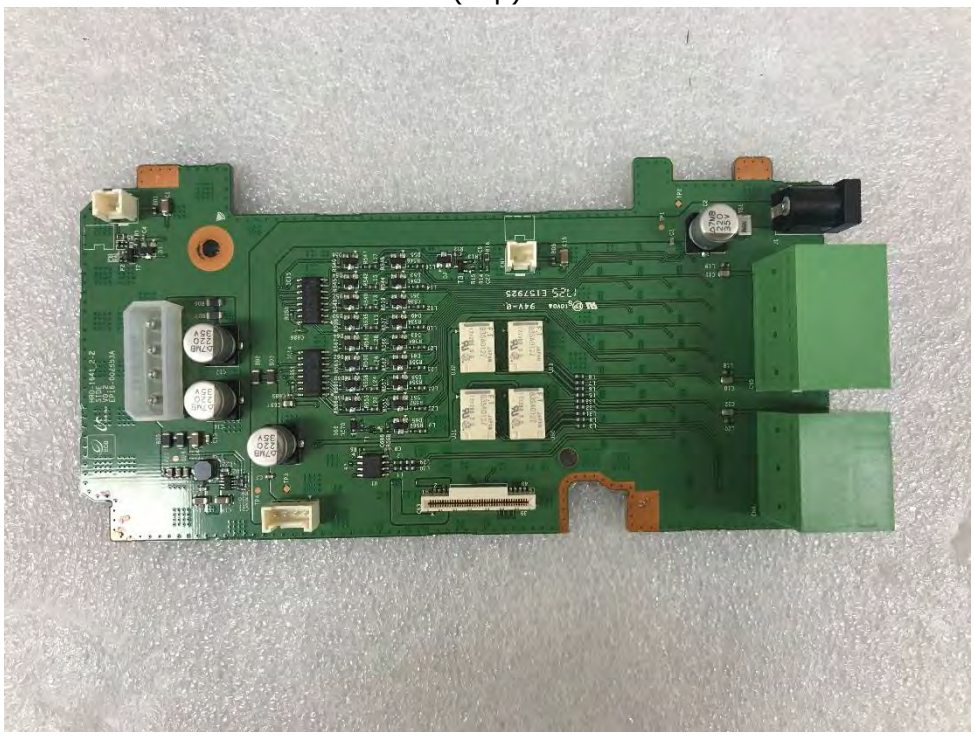


(Bottom)



EUT Internal View – Board 2

(Top)



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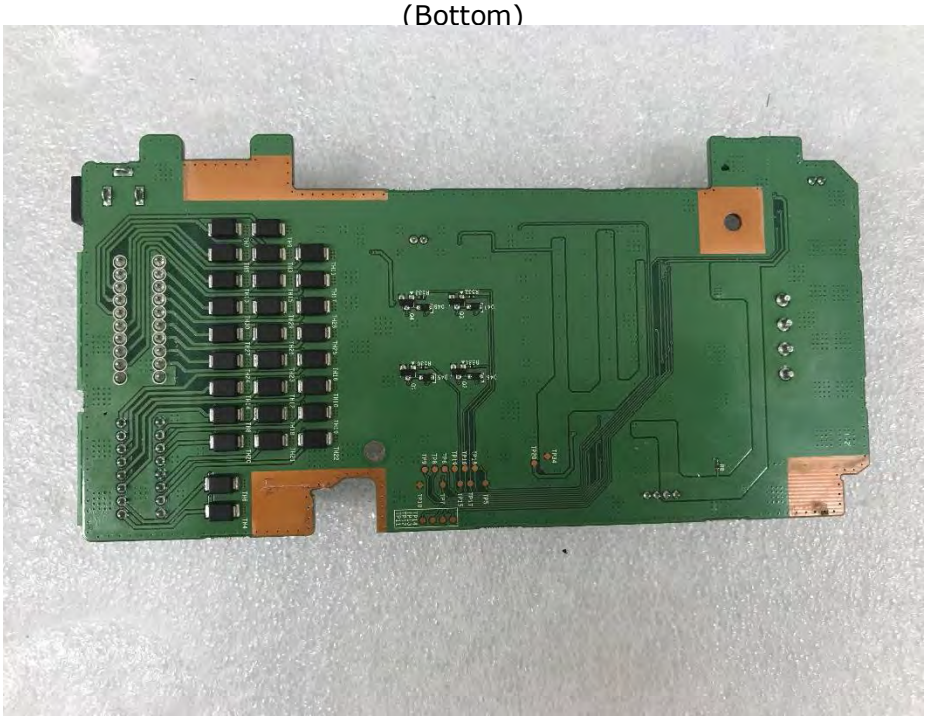
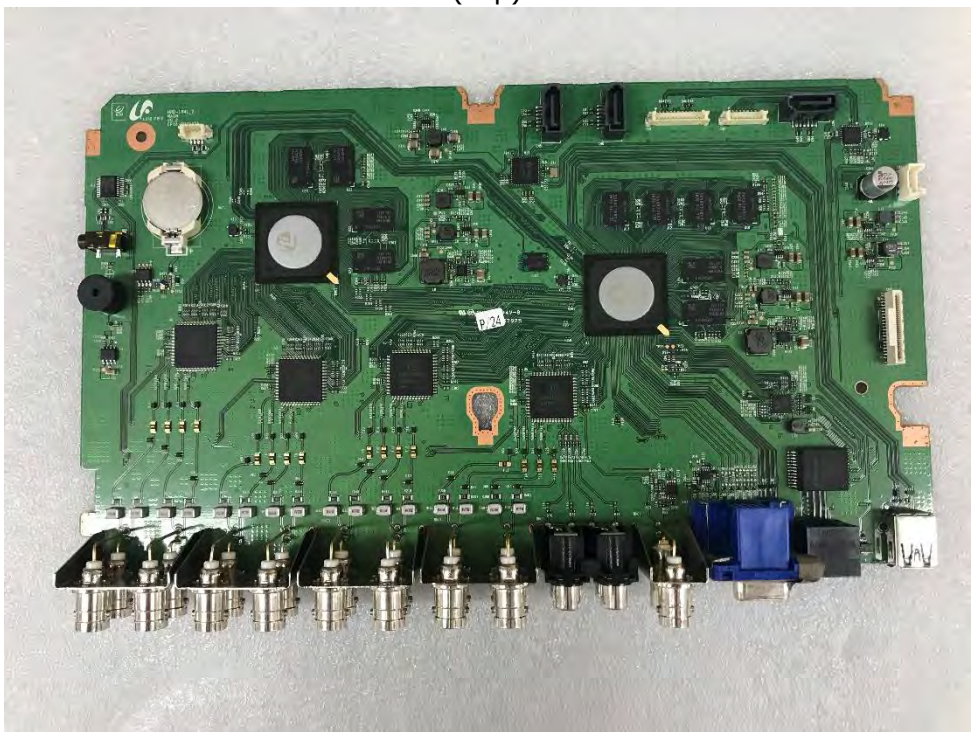


EUT Internal View – Board 3

(Top)



(Bottom)