

# DECLARATION OF CONFORMITY

We; Hanwha Techwin Co., Ltd.

DECLARE UNDER OUR SOLE RESPONSIBILITY THAT THE PRODUCT;

**Report No:** KES-E1-17T0190

**Type of  
equipment:** DVR

**Model Name:** HRD-1642P

**Variant Model:** -

**Applicant:** Hanwha Techwin Co., Ltd.

**Address:** 1204, Changwon-daero, Seongsan-gu,  
Chang-won-si, Gyeongsangnam-do, Korea

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

**Address:** No.11 Weiliu Rd, Micro-Electronic  
Industrial Park, TEDA, Tianjin,  
300385, people's Republic of China

**Test standards :** AS/NZS CISPR22:2009+A1:2010

**Classification:** C-Tick

The above equipment was tested by EMC compliance Testing Laboratory for with the requirements of C-tick Rules and Regulations. The results of testing in this report apply to the product / system which was tested only.

**Mar. 02, 2017**  
(Date of issue)

(Name and signature of authorized person)



# EMC TEST REPORT For C-TICK

Test Report No. : KES-E1-17T0190  
Date of Issue : Mar, 02, 2017  
Product name : DVR  
Model/Type No. : HRD-1642P  
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, 13, 2017  
Test date : Feb, 20, 2017  
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Young Suk, Song  
EMC Test Engineer

Reviewed by

Dong-Hun, Jang  
EMC Technical Manager

**KES Co., Ltd.**

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Test report No.:  
KES-E1-17T0190  
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**REPORT REVISION HISTORY**

| Date          | Test Report No. | Revision History |
|---------------|-----------------|------------------|
| Mar, 02, 2017 | KES-E1-17T0190  | Issued           |
|               |                 |                  |
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## 1.0 General Product Description

### Main Specifications of EUT are:

| HRD-1642           |                                               |                                                                                                                                                                                                                                |
|--------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Video              | Inputs                                        | 16channel 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                                    | 480fps, 400fps                                                                                                                                                                                                                 |
|                    | Resolution                                    | 2560x1440, 1920 x 1080, 1280 x 720, 960 x 480, 704 x 480 / 960 x 576, 704 x 576                                                                                                                                                |
|                    | Multi Screen display                          | 1/4/7/9/13/16/18A/PIP/Sequence                                                                                                                                                                                                 |
| Performance        |                                               |                                                                                                                                                                                                                                |
| Operating System   | Embedded                                      | Linux                                                                                                                                                                                                                          |
| Recording          | Compression                                   | H.264, Wisestream                                                                                                                                                                                                              |
|                    |                                               | NTSC : Up to 240fps@4MP / PAL : Up to 200fps@4MP                                                                                                                                                                               |
|                    |                                               | -                                                                                                                                                                                                                              |
|                    | Record Rate(Analog)                           | 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 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 8 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(SD Signal only), 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)                                                                                                                                                                                         |
|                    | Simultaneous playback                         | Step Forward/Backward * Backward Play with I-frame Only                                                                                                                                                                        |
| Network(IPv4)      |                                               | 16CH(Local Monitor, CMS)                                                                                                                                                                                                       |
|                    | Transmission speed                            | Record(Main) Stream) 4MP : 15fps/CH, 1080p/720p/WD1/4CIF/CIF : 30fps/CH(N), 25fps/CH(P)                                                                                                                                        |
|                    | Transmission Bandwidth                        | Fast Forward/Backward (x2,x4,x8,x16,x32,x64) * Backward Play with I-frame Only,                                                                                                                                                |
|                    | Bandwidth control                             | Slow Forward/Backward (x1/2,x1/4,x1/8)                                                                                                                                                                                         |
|                    | Stream                                        | Step Forward/Backward * Backward Play with I-frame Only                                                                                                                                                                        |
|                    | Remote users Maximum                          | 16CH(Local Monitor, CMS)                                                                                                                                                                                                       |
|                    | Protocol support                              | Record Stream and Network Stream Selectable (at monitoring Viewer)                                                                                                                                                             |
|                    |                                               | Search(3)/Live Unicast(10)/Live Multicast(20)                                                                                                                                                                                  |
|                    | Web Browser                                   | TCP/IP,DHCP,PPPoE,SMTP,NTP,HTTP,DDNS,RTP,RTSP,SNMP,(SUNAPI 2017.07)                                                                                                                                                            |
|                    | Viewer Software                               | Windows OS : Internet Explorer 8, 9, 10, Firefox 3.8 or higher, Chrome 12 or higher                                                                                                                                            |
| Smart phone        |                                               | Mac OS : Safari 5 or higher, Firefox 3.8 or higher                                                                                                                                                                             |
|                    | Platform                                      | SSM, Webviewer, SmartViewer, iPOLiS mobile viewer, WiseNet Mobile (~7. 2017)                                                                                                                                                   |
|                    | Protocol support                              | Android, iOS                                                                                                                                                                                                                   |
|                    | Control                                       | RTP, RTSP, HTTP,CGI(SUNAPI 2017.07)                                                                                                                                                                                            |
| Storage            | Internal                                      | Live(8ch) : Multi-Profile Support                                                                                                                                                                                              |
|                    | External (e-SATA Interface)                   | Playback(1ch)                                                                                                                                                                                                                  |
|                    | File Format (Back-up)                         | Remote users Maximum                                                                                                                                                                                                           |
| Security           | Search (3), Live Unicast (10), Multicast (20) | Search (3), Live Unicast (10), Multicast (20)                                                                                                                                                                                  |
|                    | Internal                                      | Up to 8 SATA HDDs (0~8TB HDD)                                                                                                                                                                                                  |
| Easy Configuration | External (e-SATA Interface)                   | e-SATA, USB(for Backup)                                                                                                                                                                                                        |
|                    | File Format (Back-up)                         | BU(DVR Player), SEC(Include Player), AVI                                                                                                                                                                                       |
| Interface          | Password Protection                           | 1 Admin, 10 Group, 10 User per 1 Group                                                                                                                                                                                         |
|                    | Data Authentication                           | Watermark                                                                                                                                                                                                                      |
| Monitors           | Easy Configuration                            | P2P (TUTK) (~7. 2017)                                                                                                                                                                                                          |
|                    | 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                                                                                                                                                                          |
| Audio              | Loop Outputs                                  | -                                                                                                                                                                                                                              |
|                    | Inputs/Output                                 | 16CH line in (Built in 4CH, Option : Audio Extension Cable)/ 1CH line out                                                                                                                                                      |
|                    | Compression                                   | G.711                                                                                                                                                                                                                          |
| Alarm              | Sampling rate                                 | 8KHz                                                                                                                                                                                                                           |
|                    | Inputs/Outputs                                | Terminal 16 Inputs (NO/NC) / Terminal 4 relay Outputs (NO/NC), Rating : 30V DC/2A, 250V AC/0.25A                                                                                                                               |
| Connections        | Remote notification                           | Notification via e-mail                                                                                                                                                                                                        |
|                    | Ethernet                                      | 1 RJ45 10/100/1000 Base-T                                                                                                                                                                                                      |
|                    | Serial interface                              | RS-485(Full Duplex) for PTZ, Samsung System Keyboard                                                                                                                                                                           |
|                    | USB                                           | 1 ports(USB 3.0, Rear), 1 ports(USB 2.0, Front)                                                                                                                                                                                |
|                    | e-SATA                                        | 2 External SATA ports                                                                                                                                                                                                          |
|                    | Application Support                           | Mouse, Remote Controller,SPC-2000/7000 (RS-485 protocol)TBD                                                                                                                                                                    |
|                    | 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)<br>AHD : ACP(AHD Coax Protocol)                                                                                                                                                                 |
| General            |                                               |                                                                                                                                                                                                                                |
| Electrical         | Input Voltage/Current                         | 100 ~ 240 VAC ±10%; 50/60 Hz                                                                                                                                                                                                   |
|                    | Power consumption                             | smpps 250w                                                                                                                                                                                                                     |
| 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)                         | W440 x H88 x D384.8(17.32" x 3.46" x 15.14")                                                                                                                                                                                   |
|                    | Weight (with hard disks)                      | 5.885kg                                                                                                                                                                                                                        |
| Language           |                                               | English, French, German, Spanish, Italian, Russian, Polish, Czech, Turkish, Netherlands                                                                                                                                        |
|                    | GUI                                           | 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 |

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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 ☒ 240 Vac ☐ 100 Vac ☐ 24ac ☐ 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-1642P    | -             | Hanwha Techwin (Tianjin) Co.,Ltd | E.U.T   |
| Mouse 1                | MOEIUOA      | PMX-MMOEIUA   | PRIMAX ELECTRONICS LTD.          | -       |
| Remote Controller      | EP10-000329A | -             | Samsung Techwin (Sta)            | -       |
| HDD                    | WD10PURX     | WCC4J7TS2NSC  | WD Purple                        | 1TB     |
| Switching Power Supply | FSP250-50GUB | -             | FSP                              | -       |

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## 1.5 Support Equipments

| Description               | Model Number | Serial Number                  | Manufacturer                            | Remarks |
|---------------------------|--------------|--------------------------------|-----------------------------------------|---------|
| MONITOR 1                 | W2261VT      | 005NDCRDV451                   | LG Electronics NanJing Display Co., Ltd | -       |
| MONITOR 2                 | S24E370DL    | 0NTWHTPH200179Y                | Samsung Electronics Co., Ltd            | -       |
| MONITOR 2 Adaptor         | A3514_FPN    | CN07BN4400832ASK2 8GCTR235 R.D | POWERNET Technologies Crop.             | -       |
| MONITOR 3                 | SMT-2232     | C95V67VF900025B                | Weihai Daewoo Electronics Co., Ltd.     | -       |
| Notebook                  | X56K         | HN11N5151FJ0045W               | HANSUNG                                 | -       |
| Notebook Adaptor          | A12-120P1A   | F180271552011758               | CHICONY POWER TECHNOLOGY CO.,LTD.       | -       |
| CAMERA                    | SDC-8440BC   | -                              | Hanwha Techwin (Tianjin) Co.,Ltd        | -       |
| CAMERA AC/ DC Adapter     | EO-1210      | -                              | EO Electronics                          | -       |
| Speaker                   | BR-100A      | -                              | Britz International Co., Ltd.           | -       |
| Microphone 1              | CMK-303      | -                              | CAMAC                                   | -       |
| Microphone 2              | CMK-303      | -                              | CAMAC                                   | -       |
| Mouse 2                   | SMB-400      | 0DJM010118                     | SEJIN ELECTRON INC.                     | -       |
| External hard disk drives | MDY-US2528   | -                              | Q-DRIVER                                | -       |
| Alarm 1                   | -            | -                              | -                                       | -       |
| Alarm 2                   | -            | -                              | -                                       | -       |

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## 1.6 External I/O Cabling

| Start          |           | END                       |           | Cable Spec. |        |
|----------------|-----------|---------------------------|-----------|-------------|--------|
| Description    | I/O Port  | Description               | I/O Port  | Length      | Shield |
| DVR<br>(E.U.T) | RJ 45     | Notebook                  | RJ 45     | 3.0         | U      |
|                | D-SUB     | MONITOR 1                 | D-SUB     | 1.5         | S      |
|                | HDMI      | MONITOR 2                 | HDMI      | 1.5         | S      |
|                | BNC       | MONITOR 3                 | BNC       | 3.0         | S      |
|                | BNC       | CAMERA                    | BNC       | 10          | S      |
|                | Audio out | Speaker                   | Audio in  | 1.4         | U      |
|                | Audio in  | Microphone 1              | Audio out | 1.2         | U      |
|                | Audio in  | Microphone 2              | Audio out | 1.7         | U      |
|                | USB       | Mouse 1                   | USB       | 1.2         | U      |
|                | RS 232    | Mouse 2                   | RS 232    | 1.4         | U      |
|                | e sata    | External hard disk drives | e sata    | 0.15        | U      |
|                | 2 Pin     | Alarm 1                   | 2 Pin     | 3.0         | U      |
|                | 2 Pin     | Alarm 2                   | 2 Pin     | 3.0         | U      |

\* Unshielded=U, Shielded=S

## 1.7 EUT Operating Mode(s)

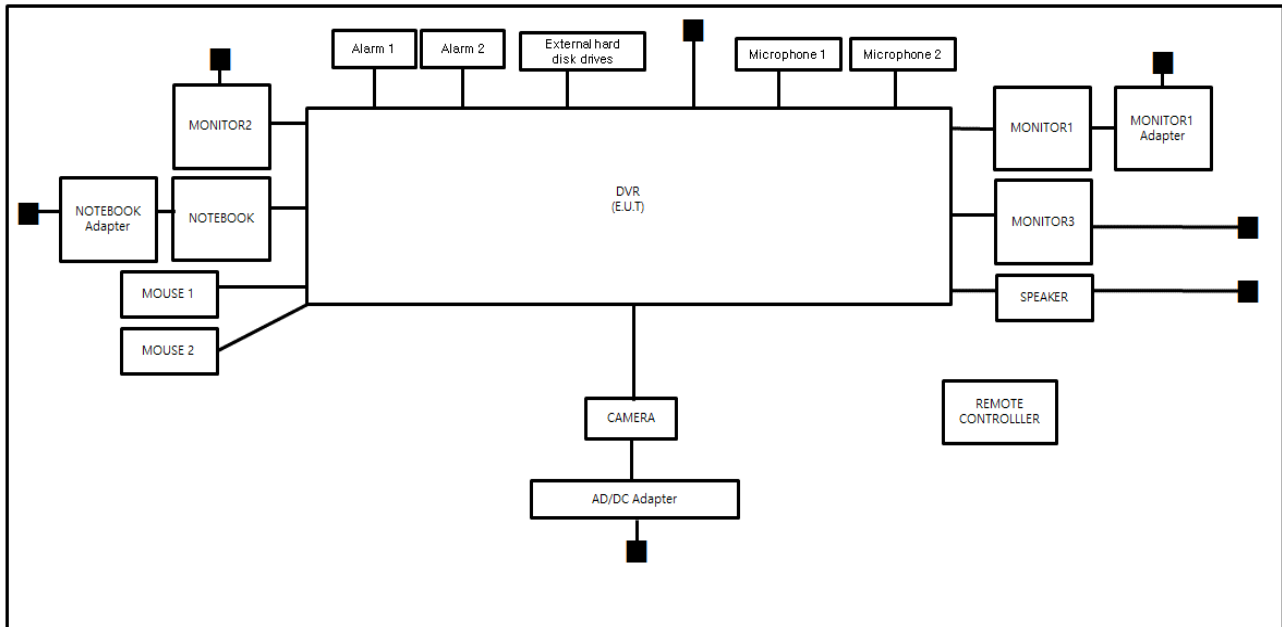
| Test mode | operating        |
|-----------|------------------|
| AC 230 V  | E.U.T Monitoring |

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

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## 1.8 Configuration

■ AC Main  
□ DC Main



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## 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         | <br>R-4308, C-4798,<br>T-2311, G-914 |
| KOREA         | MSIP   | EMI (10 meter Open Area Test Site and two conducted sites)<br>Radio(3 & 10 meter Open Area Test Sites and one conducted site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>KR0100                          |
| Canada        | IC     | 3 & 10 meter Open Area Test Sites and one conducted site                                                                                                                                               | <br>4769B-1                         |
| Europe        | CE     | EMI (10 meter Open Area Test Site and two conducted sites)<br>Radio(3 & 10 meter Open Area Test Sites and one conducted site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) |                                     |
| International | KOLAS  | EMI (10 meter Open Area Test Site and two conducted sites)<br>Radio(3 & 10 meter Open Area Test Sites and one conducted site)<br>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 55032:2012

☐ Class A

☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013



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- |                                                                          |                                             |                                  |
|--------------------------------------------------------------------------|---------------------------------------------|----------------------------------|
| <input type="checkbox"/> <b>VCCI V-3 / 2015.04</b>                       | <input type="checkbox"/> Class A            | <input type="checkbox"/> Class B |
| <input checked="" type="checkbox"/> <b>AS/NZS CISPR22:2009 + A1:2010</b> | <input checked="" type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> <b>47 CFR Part 15, Subpart B</b>                |                                             |                                  |
| <input type="checkbox"/> CISPR 22:2009 +A1:2010                          | <input type="checkbox"/> Class A            | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2009                                 |                                             |                                  |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> <b>IC Regulation ICES-003 : 2016</b>            |                                             |                                  |
| <input type="checkbox"/> CAN/CSA CISPR 22-10                             | <input type="checkbox"/> Class A            | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2014                                 |                                             |                                  |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> <b>RE- Directive 2014/53/EU</b>                 |                                             |                                  |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> EN 301 489-1 V1.9.2                             |                                             |                                  |
| <input type="checkbox"/> Equipment for fixed use                         |                                             |                                  |
| <input type="checkbox"/> Equipment for vehicular use                     |                                             |                                  |
| <input type="checkbox"/> Equipment for portable use                      |                                             |                                  |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> EN 301 489-3 V1.6.1                             |                                             |                                  |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> EN 301 489-17 V2.2.1                            |                                             |                                  |
| <br>                                                                     |                                             |                                  |
| <input type="checkbox"/> EN 60945:2002                                   |                                             |                                  |

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## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

Feb, 20, 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: 20,9 °C  
Relative Humidity: 40,4 %

### 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**

Feb, 20, 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 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: 20,9 °C

Relative Humidity: 40,4 %

**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.

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## 2.3 Radiated Electric Field Emissions(Below 1 GHz)

### Test Date

Feb, 20, 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    | ESR3         | R & S        | 101781        | 05, 03, 2017 |
| <input checked="" type="checkbox"/> | Trilog-Broadband ANT | VULB 9163    | Schwarzbeck  | 715           | 04, 14, 2018 |
| <input checked="" type="checkbox"/> | OATS                 | -            | KES          | -             | -            |
| <input checked="" type="checkbox"/> | Antenna Mast         | -            | DAEIL EMC    | -             | -            |
| <input checked="" type="checkbox"/> | Turn Table           | -            | DAEIL EMC    | -             | -            |
| <input checked="" type="checkbox"/> | EMI Test S/W         | -            | -            | -             | -            |

### Test Conditions

Temperature: 2,1 °C  
Relative Humidity: 42,0 %

### 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**

Feb, 20, 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: 20,9 °C

Relative Humidity: 40,4 %

**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.

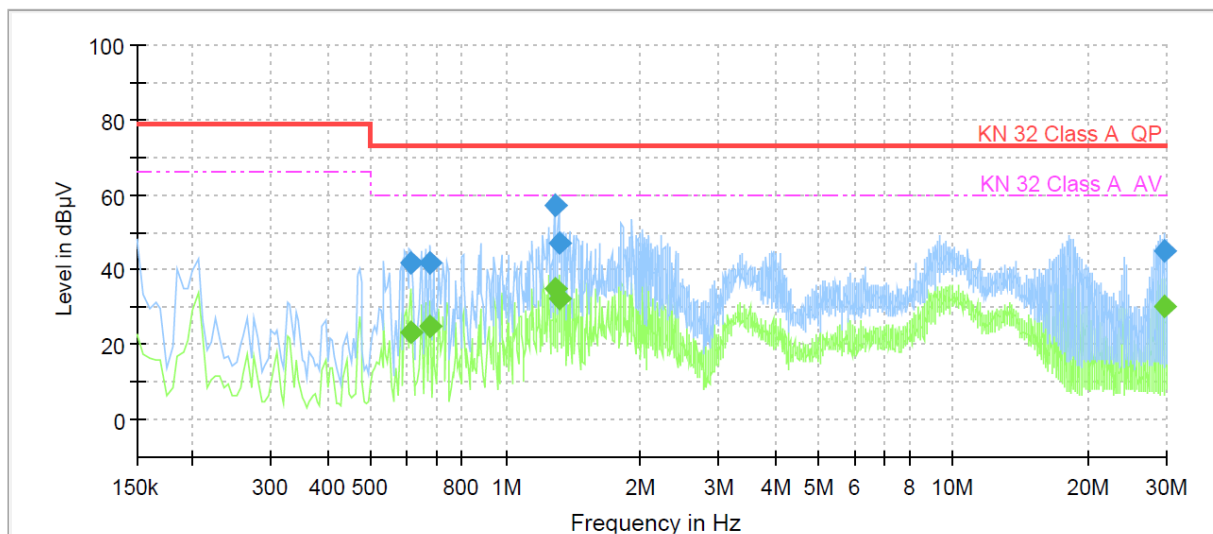
## APPENDIX A – TEST DATA

### Conducted Emissions at Mains Power Ports

[HOT]

#### Common Information

Test Description: Conducted Emission  
Model No.: HRD-1642P  
Mode  
Operator Name: KES



#### Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.615000        | ---              | 23.48           | 60.00        | 36.52       | 1000.0          | 9.000           | L1   | 20.4       |
| 0.615000        | 41.73            | ---             | 73.00        | 31.27       | 1000.0          | 9.000           | L1   | 20.4       |
| 0.680000        | ---              | 25.03           | 60.00        | 34.97       | 1000.0          | 9.000           | L1   | 20.4       |
| 0.680000        | 42.07            | ---             | 73.00        | 30.93       | 1000.0          | 9.000           | L1   | 20.4       |
| 1.285000        | ---              | 34.79           | 60.00        | 25.21       | 1000.0          | 9.000           | L1   | 20.0       |
| 1.285000        | 57.17            | ---             | 73.00        | 15.83       | 1000.0          | 9.000           | L1   | 20.0       |
| 1.315000        | ---              | 32.35           | 60.00        | 27.65       | 1000.0          | 9.000           | L1   | 20.0       |
| 1.315000        | 47.28            | ---             | 73.00        | 25.72       | 1000.0          | 9.000           | L1   | 20.0       |
| 29.665000       | ---              | 30.20           | 60.00        | 29.80       | 1000.0          | 9.000           | L1   | 20.3       |
| 29.665000       | 45.14            | ---             | 73.00        | 27.86       | 1000.0          | 9.000           | L1   | 20.3       |

#### ◆ Calculation

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

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

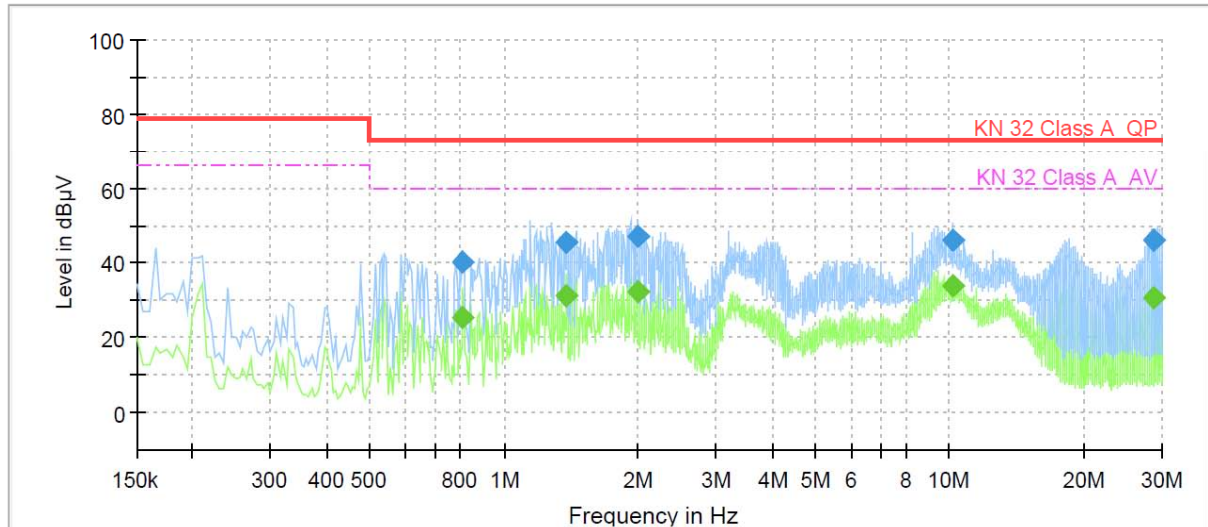
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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[NEUTRAL]

## Common Information

Test Description: Conducted Emission  
Model No.: HRD-1642P  
Mode  
Operator Name: KES



## Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.810000        | ---              | 25.44           | 60.00        | 34.56       | 1000.0          | 9.000           | N    | 20.3       |
| 0.810000        | 40.14            | ---             | 73.00        | 32.86       | 1000.0          | 9.000           | N    | 20.3       |
| 1.385000        | ---              | 31.34           | 60.00        | 28.66       | 1000.0          | 9.000           | N    | 20.0       |
| 1.385000        | 45.63            | ---             | 73.00        | 27.37       | 1000.0          | 9.000           | N    | 20.0       |
| 1.990000        | ---              | 32.35           | 60.00        | 27.65       | 1000.0          | 9.000           | N    | 19.8       |
| 1.990000        | 47.29            | ---             | 73.00        | 25.71       | 1000.0          | 9.000           | N    | 19.8       |
| 10.160000       | ---              | 33.73           | 60.00        | 26.27       | 1000.0          | 9.000           | N    | 19.9       |
| 10.160000       | 46.05            | ---             | 73.00        | 26.95       | 1000.0          | 9.000           | N    | 19.9       |
| 28.740000       | ---              | 30.77           | 60.00        | 29.23       | 1000.0          | 9.000           | N    | 20.3       |
| 28.740000       | 45.92            | ---             | 73.00        | 27.08       | 1000.0          | 9.000           | N    | 20.3       |

### ◆ 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))

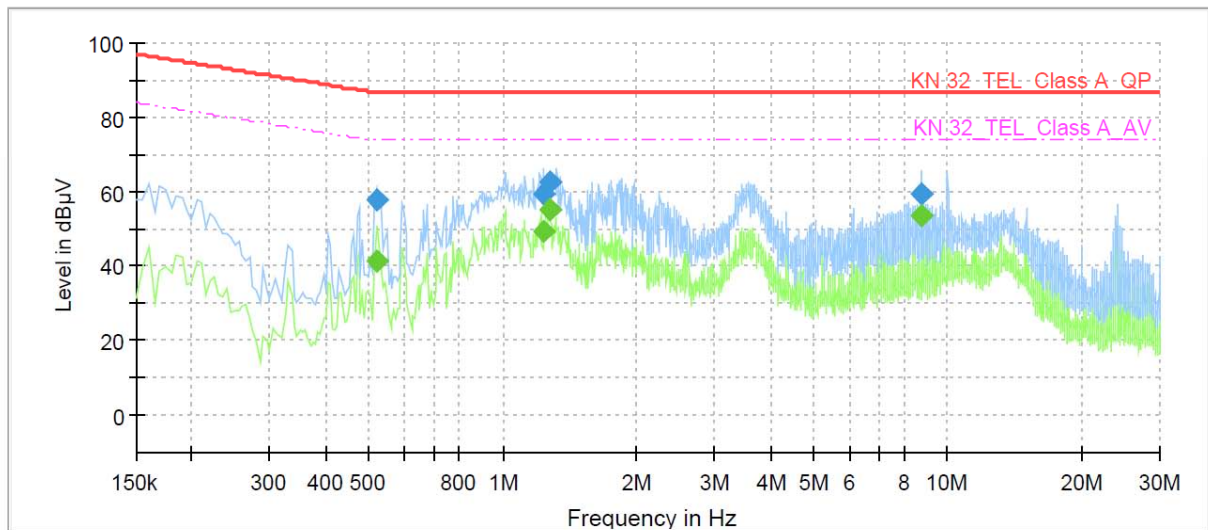
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## Conducted Emissions at Telecommunication Ports

[10 Mbps]

### Common Information

Test Description: Telecommunication Emission  
Model No.: HRD-1642P  
Mode  
Operator Name: KES



### Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.520000        | ---              | 41.24           | 74.00        | 32.76       | 1000.0          | 9.000           | Single Line | 20.8       |
| 0.520000        | 57.95            | ---             | 87.00        | 29.05       | 1000.0          | 9.000           | Single Line | 20.8       |
| 1.235000        | ---              | 49.07           | 74.00        | 24.93       | 1000.0          | 9.000           | Single Line | 20.2       |
| 1.235000        | 59.46            | ---             | 87.00        | 27.54       | 1000.0          | 9.000           | Single Line | 20.2       |
| 1.270000        | ---              | 54.93           | 74.00        | 19.07       | 1000.0          | 9.000           | Single Line | 20.2       |
| 1.270000        | 62.66            | ---             | 87.00        | 24.34       | 1000.0          | 9.000           | Single Line | 20.2       |
| 8.750000        | ---              | 53.70           | 74.00        | 20.30       | 1000.0          | 9.000           | Single Line | 19.9       |
| 8.750000        | 59.34            | ---             | 87.00        | 27.66       | 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.

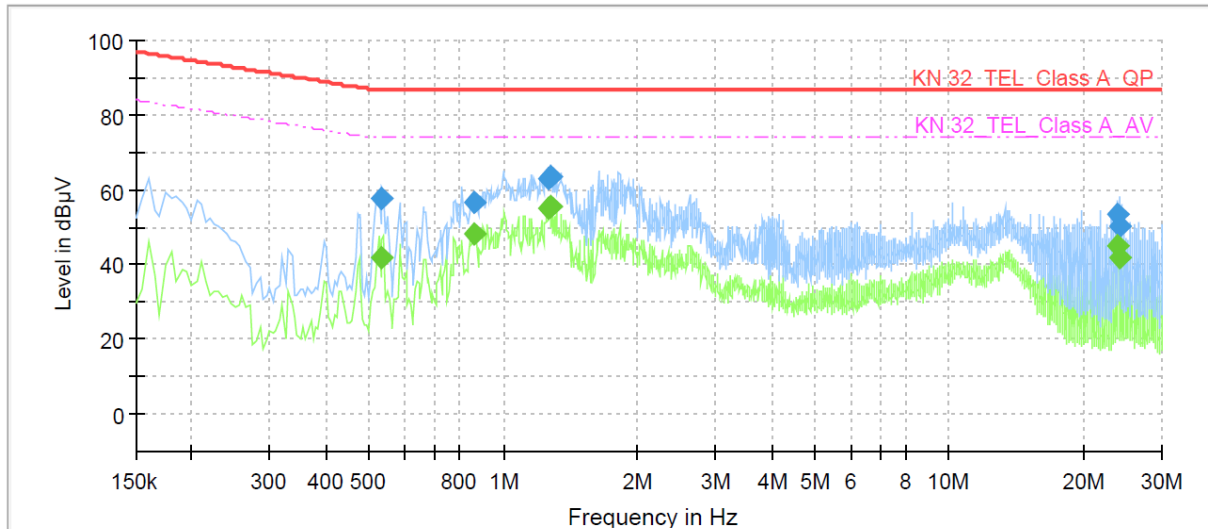
Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))



[100 Mbps]

## Common Information

Test Description: Telecommunication Emission  
Model No.: HRD-1642P  
Mode  
Operator Name: KES



## Final Result

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.535000        | ---              | 42.03           | 74.00        | 31.97       | 1000.0          | 9.000           | Single Line | 20.3       |
| 0.535000        | 57.69            | ---             | 87.00        | 29.31       | 1000.0          | 9.000           | Single Line | 20.3       |
| 0.860000        | ---              | 48.24           | 74.00        | 25.76       | 1000.0          | 9.000           | Single Line | 20.0       |
| 0.860000        | 56.76            | ---             | 87.00        | 30.24       | 1000.0          | 9.000           | Single Line | 20.0       |
| 1.265000        | ---              | 55.29           | 74.00        | 18.71       | 1000.0          | 9.000           | Single Line | 19.7       |
| 1.265000        | 63.02            | ---             | 87.00        | 23.98       | 1000.0          | 9.000           | Single Line | 19.7       |
| 1.270000        | ---              | 55.69           | 74.00        | 18.31       | 1000.0          | 9.000           | Single Line | 19.7       |
| 1.270000        | 63.32            | ---             | 87.00        | 23.68       | 1000.0          | 9.000           | Single Line | 19.7       |
| 23.980000       | ---              | 44.79           | 74.00        | 29.21       | 1000.0          | 9.000           | Single Line | 19.6       |
| 23.980000       | 53.42            | ---             | 87.00        | 33.58       | 1000.0          | 9.000           | Single Line | 19.6       |
| 24.150000       | ---              | 41.78           | 74.00        | 32.22       | 1000.0          | 9.000           | Single Line | 19.6       |
| 24.150000       | 50.10            | ---             | 87.00        | 36.90       | 1000.0          | 9.000           | Single Line | 19.6       |

### ◆ 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.<br>(H/V) | [m]         | ANT.<br>[dB/m]    | Cable<br>[dB] | [dB $\mu$ V/m]      | [dB $\mu$ V/m]   | [dB]   |
| 152.36    | 11.23        | V               | 2.36        | 8.28              | 3.05          | 22.56               | 40.00            | 17.44  |
| 254.37    | 14.25        | H               | 1.25        | 12.62             | 4.19          | 31.06               | 47.00            | 15.94  |
| 321.25    | 11.69        | H               | 2.33        | 13.86             | 4.74          | 30.29               | 47.00            | 16.71  |
| 372.55    | 14.58        | V               | 1.52        | 14.97             | 5.09          | 34.64               | 47.00            | 12.36  |
| 374.97    | 13.02        | H               | 2.95        | 15.03             | 5.11          | 33.16               | 47.00            | 13.84  |
| 518.37    | 14.58        | H               | 1.25        | 17.66             | 6.28          | 38.52               | 47.00            | 8.48   |
| 594.26    | 15.36        | V               | 3.01        | 19.16             | 6.79          | 41.31               | 47.00            | 5.69   |
| 667.59    | 10.25        | V               | 1.22        | 19.56             | 7.33          | 37.14               | 47.00            | 9.86   |

\* H : Horizontal, V : Vertical

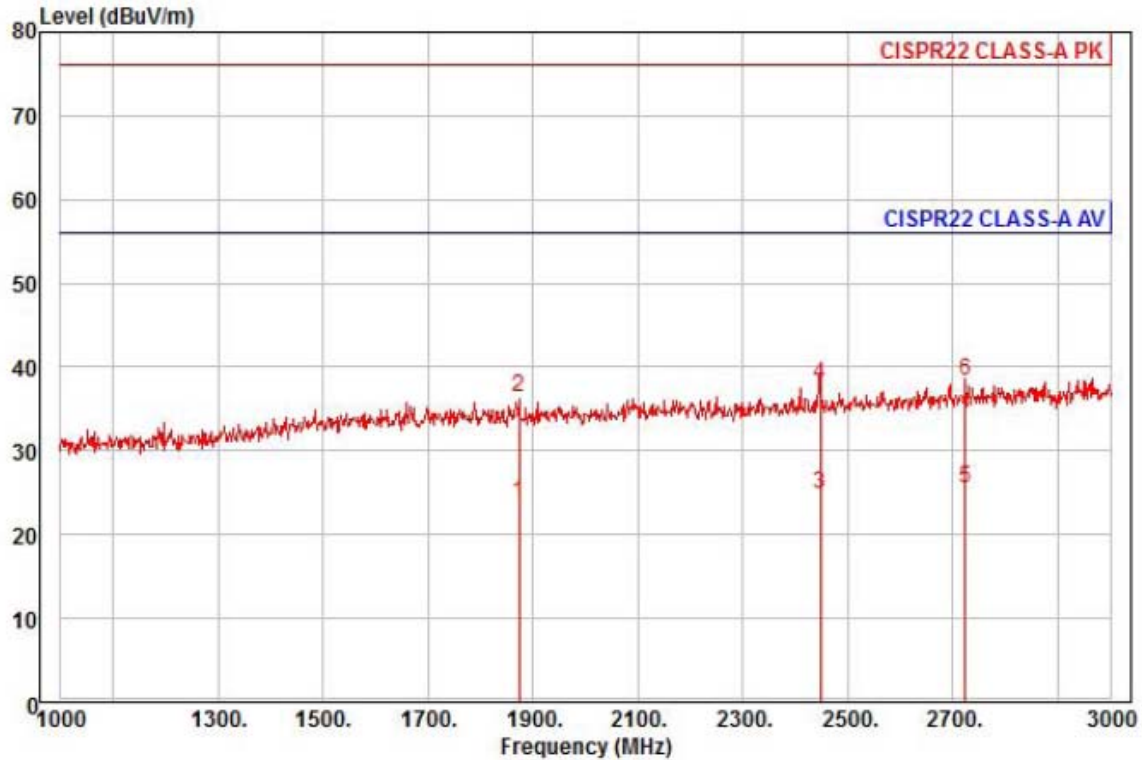
## ◆ Calculation

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-1642P  
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    | 1874.00 | 28.90      | 25.15      | 9.02       | 39.35         | 248  | 56.00      | -32.28     | horizontal | Average |
| 2    | 1874.00 | 41.49      | 25.15      | 9.02       | 39.35         | 248  | 76.00      | -39.69     | horizontal | Peak    |
| 3    | 2448.00 | 26.51      | 27.37      | 10.42      | 39.48         | 25   | 56.00      | -31.18     | horizontal | Average |
| 4    | 2448.00 | 39.72      | 27.37      | 10.42      | 39.48         | 25   | 76.00      | -37.97     | horizontal | Peak    |
| 5 pp | 2724.00 | 25.72      | 28.56      | 11.05      | 39.79         | 157  | 56.00      | -30.46     | horizontal | Average |
| 6 pk | 2724.00 | 38.62      | 28.56      | 11.05      | 39.79         | 157  | 76.00      | -37.56     | 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

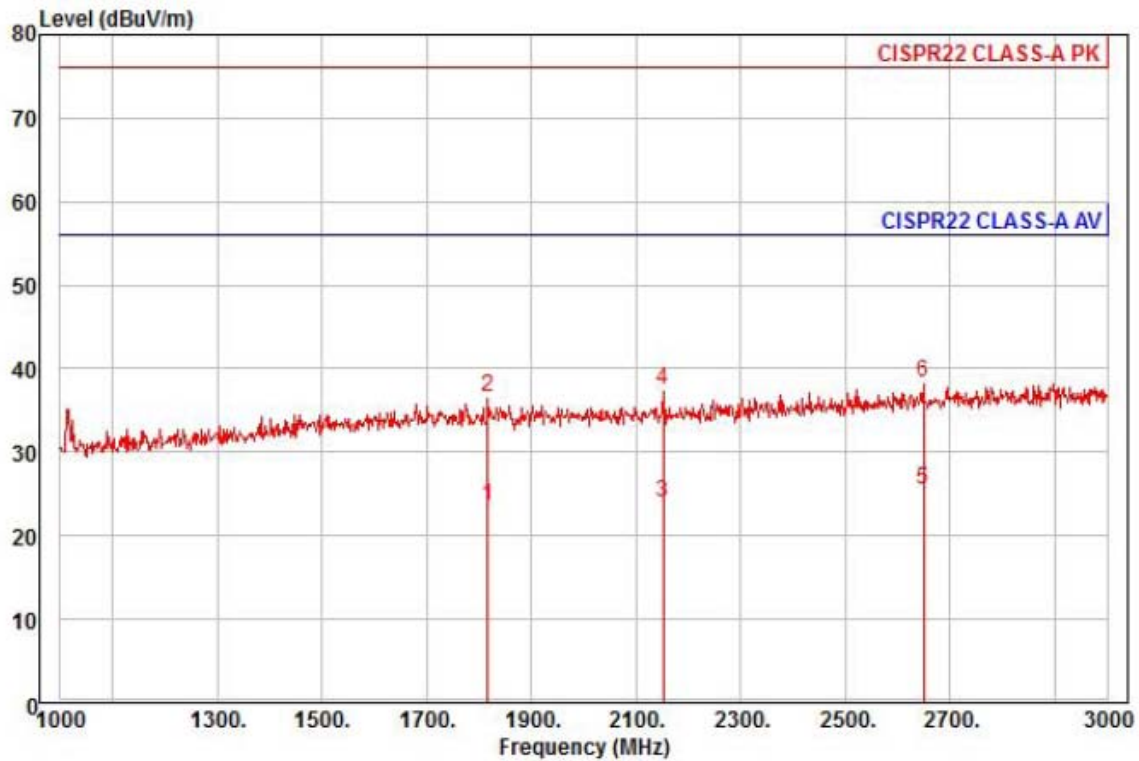
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Test report No.:  
KES-E1-17T0190  
Page (22) of (35)



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-1642P  
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    | 1816.00 | 29.07  | 24.94 | 8.87   | 39.32 | 360    | 56.00 | -32.44    | vertical |
| 2    | 1816.00 | 42.11  | 24.94 | 8.87   | 39.32 | 360    | 76.00 | -39.40    | vertical |
| 3    | 2152.00 | 27.53  | 26.20 | 9.69   | 39.41 | 256    | 56.00 | -31.99    | vertical |
| 4    | 2152.00 | 40.91  | 26.20 | 9.69   | 39.41 | 256    | 76.00 | -38.61    | vertical |
| 5 pp | 2650.00 | 26.05  | 28.24 | 10.86  | 39.71 | 261    | 56.00 | -30.56    | vertical |
| 6 pk | 2650.00 | 39.02  | 28.24 | 10.86  | 39.71 | 261    | 76.00 | -37.59    | vertical |

## ◆ Calculation

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

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

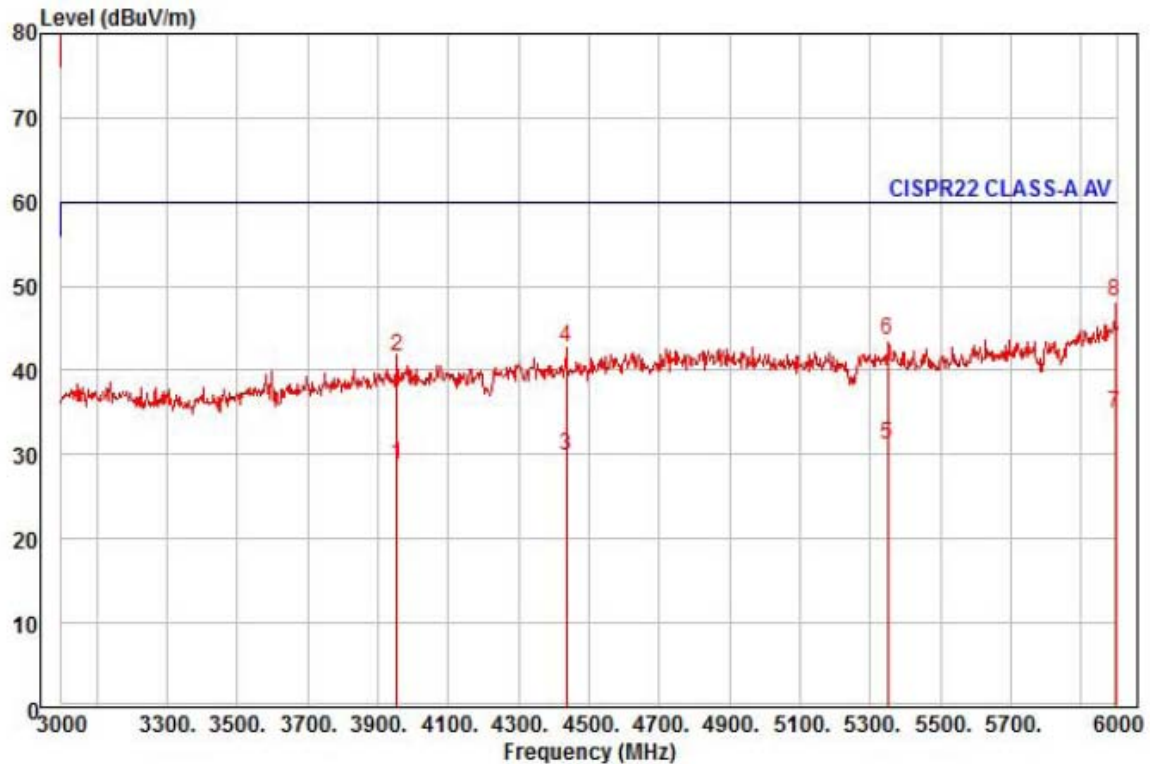
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Test report No.:  
KES-E1-17T0190  
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Site : chamber  
Condition: CISPR22 CLASS-A PK 3m STLP9149(9149-255,2016-05-17) horizontal  
: RBW:1000.000kHz VBW:1000.000kHz SWT:Auto  
Project :  
Model : HRD-1642P  
Mode :  
Memo : 3 ~ 6 GHz

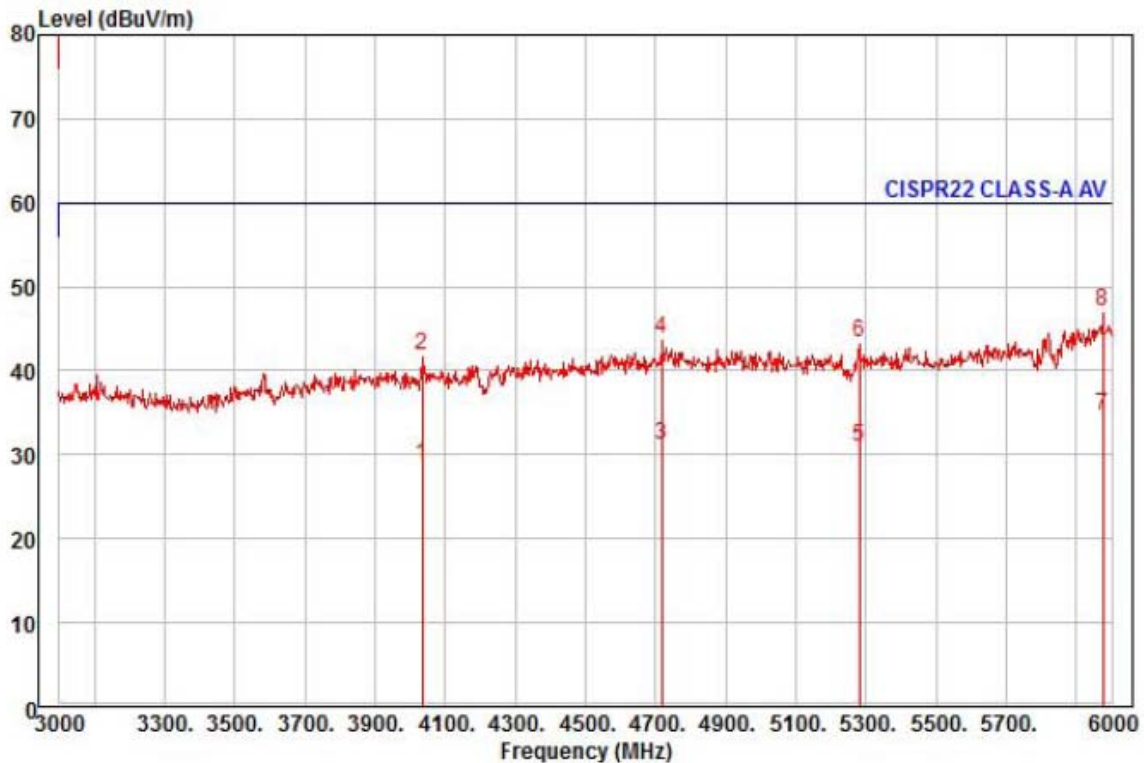
|      | Freq    | Read Level | Ant Factor | Cable Loss | Preamp Factor | TPos | Limit Line | Over Limit | Pol/Phase  | Remark  |
|------|---------|------------|------------|------------|---------------|------|------------|------------|------------|---------|
|      | MHz     | dBuV       | dB/m       | dB         | dB            | deg  | dBuV/m     | dB         |            |         |
| 1    | 3954.00 | 24.69      | 31.29      | 13.48      | 40.72         | 91   | 60.00      | -31.26     | horizontal | Average |
| 2    | 3954.00 | 37.64      | 31.29      | 13.48      | 40.72         | 91   | 80.00      | -38.31     | horizontal | Peak    |
| 3    | 4437.00 | 23.58      | 32.62      | 14.34      | 40.76         | 262  | 60.00      | -30.22     | horizontal | Average |
| 4    | 4437.00 | 36.63      | 32.62      | 14.34      | 40.76         | 262  | 80.00      | -37.17     | horizontal | Peak    |
| 5    | 5349.00 | 22.62      | 33.45      | 15.95      | 40.85         | 175  | 60.00      | -28.83     | horizontal | Average |
| 6    | 5349.00 | 34.99      | 33.45      | 15.95      | 40.85         | 175  | 80.00      | -36.46     | horizontal | Peak    |
| 7 pp | 5997.00 | 21.68      | 36.53      | 17.07      | 40.43         | 301  | 60.00      | -25.15     | horizontal | Average |
| 8 pk | 5997.00 | 35.00      | 36.53      | 17.07      | 40.43         | 301  | 80.00      | -31.83     | 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-1642P  
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    | 4035.00 | 24.35      | 31.49      | 13.63      | 40.70         | 305  | 60.00      | -31.23     | vertical  | Average |
| 2    | 4035.00 | 37.41      | 31.49      | 13.63      | 40.70         | 305  | 80.00      | -38.17     | vertical  | Peak    |
| 3    | 4719.00 | 23.74      | 32.99      | 14.92      | 40.55         | 302  | 60.00      | -28.90     | vertical  | Average |
| 4    | 4719.00 | 36.53      | 32.99      | 14.92      | 40.55         | 302  | 80.00      | -36.11     | vertical  | Peak    |
| 5    | 5280.00 | 22.36      | 33.40      | 15.84      | 40.73         | 349  | 60.00      | -29.13     | vertical  | Average |
| 6    | 5280.00 | 34.80      | 33.40      | 15.84      | 40.73         | 349  | 80.00      | -36.69     | vertical  | Peak    |
| 7 pp | 5976.00 | 21.70      | 36.41      | 17.03      | 40.46         | 61   | 60.00      | -25.32     | vertical  | Average |
| 8 pk | 5976.00 | 34.20      | 36.41      | 17.03      | 40.46         | 61   | 80.00      | -32.82     | 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

## 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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## EUT External Photographs

(Top)



(Bottom)



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## EUT Internal Photographs

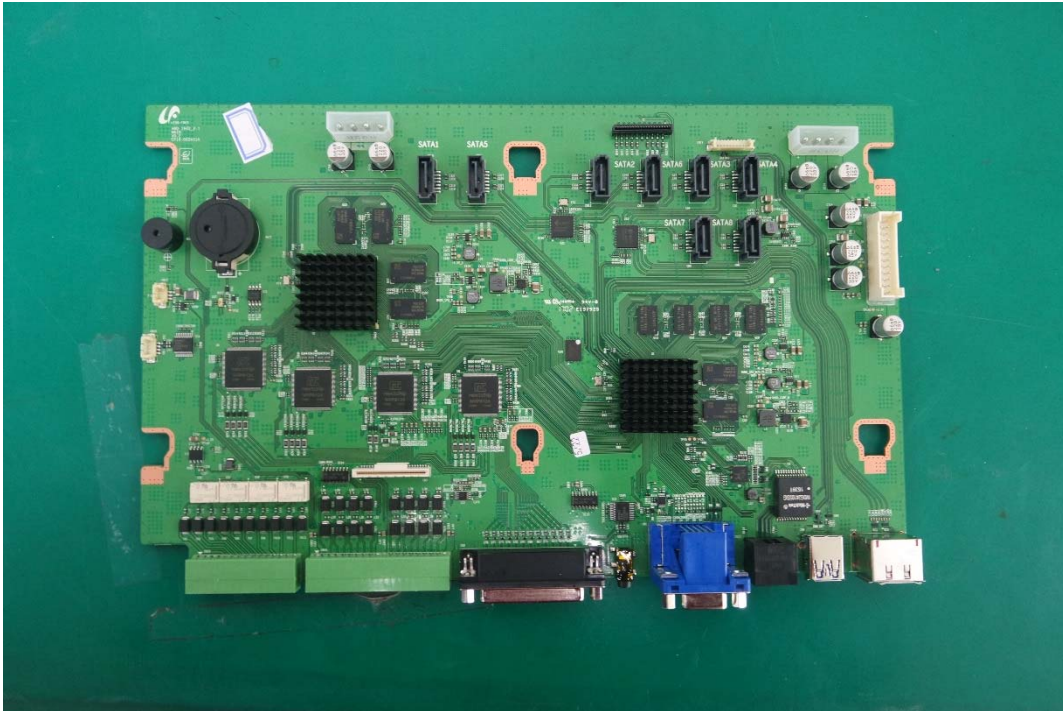
(Internal View)



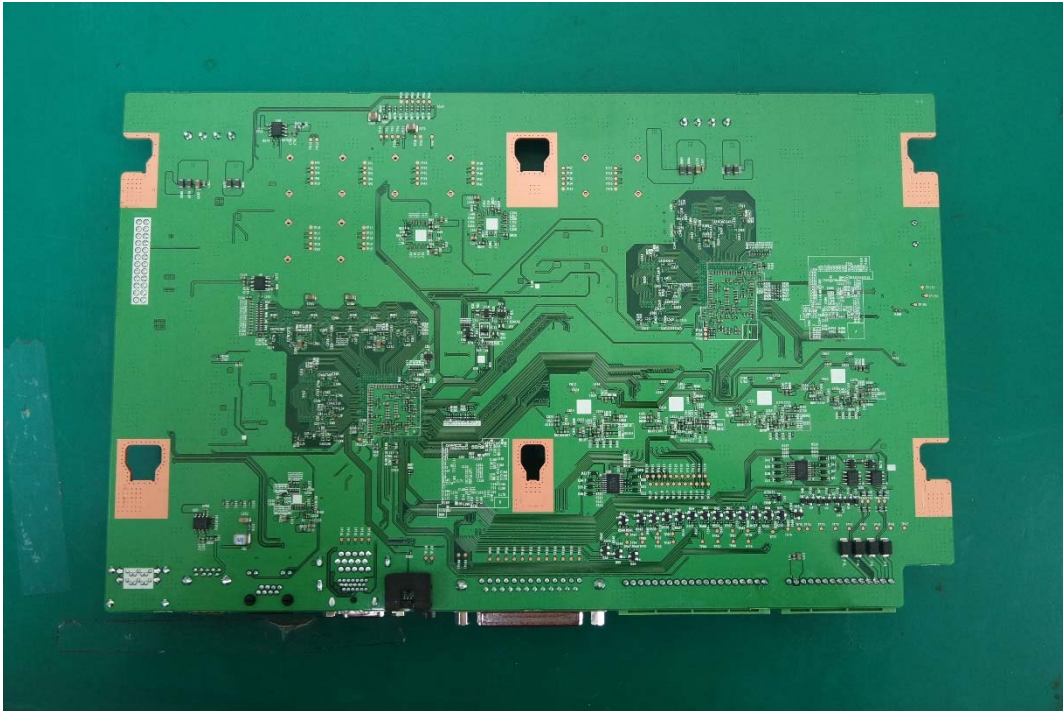
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## EUT Internal View – Main Board

(Top)



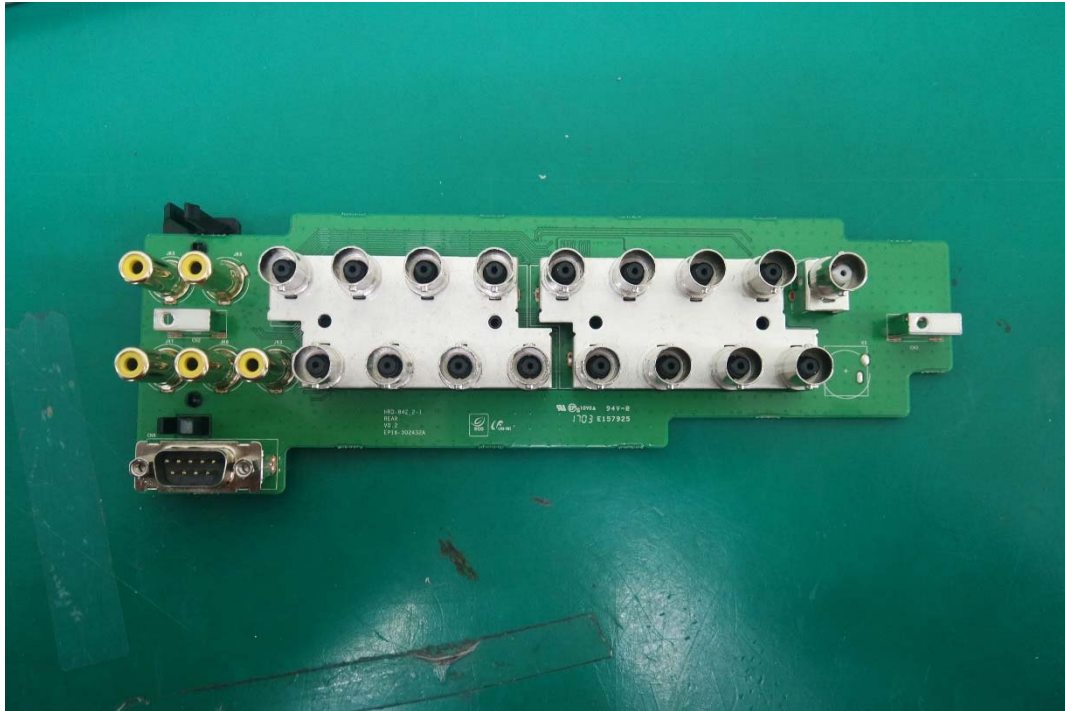
(Bottom)



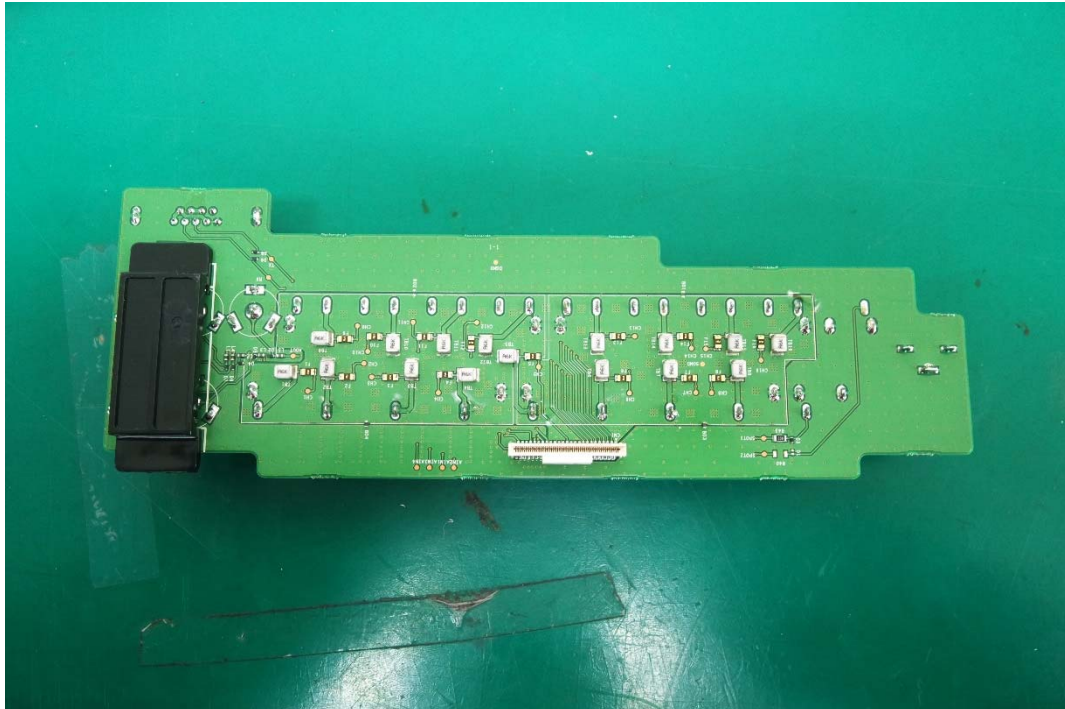
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## EUT Internal View – Sub Board 1

(Top)



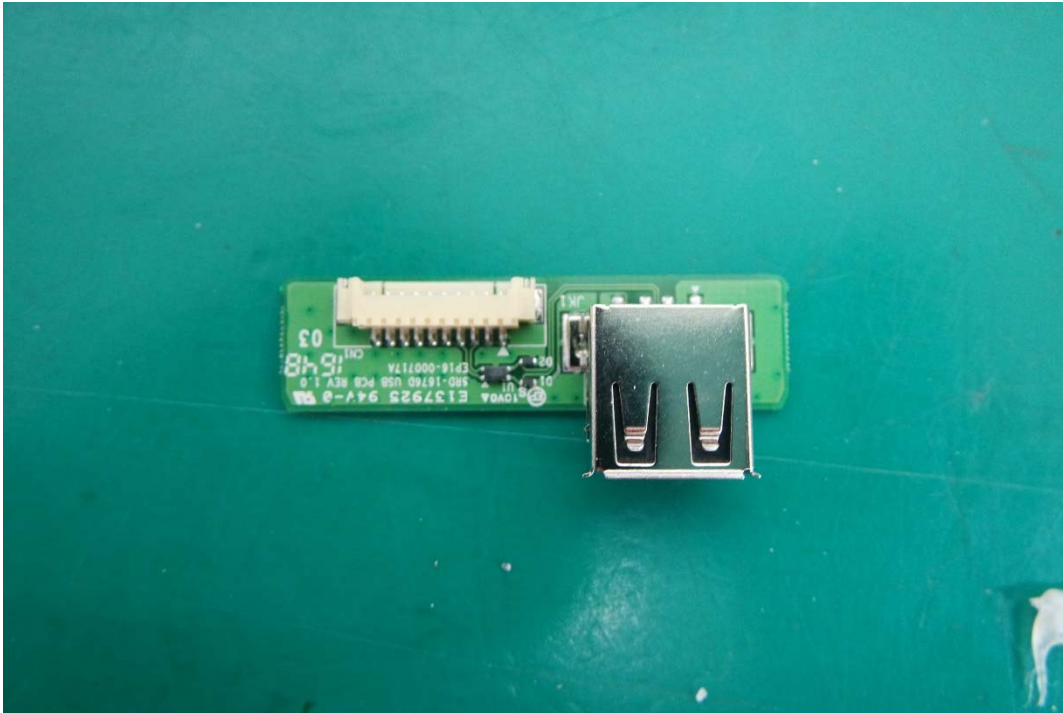
(Bottom)



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## EUT Internal View – Sub Board 2

(Top)



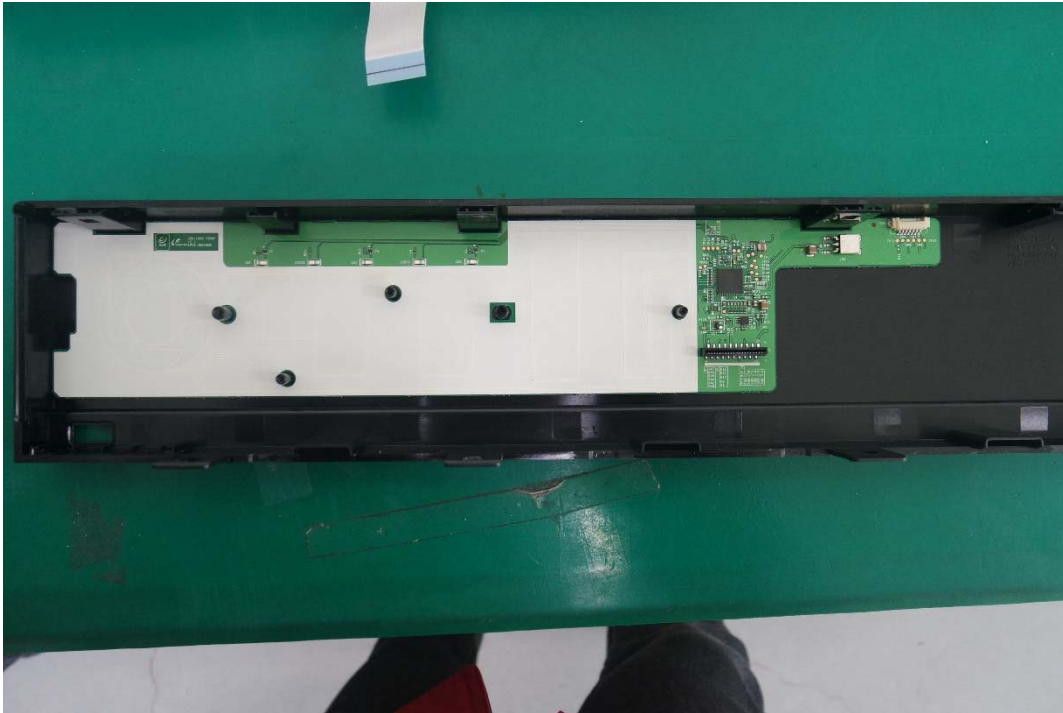
(Bottom)



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## EUT Internal View – Sub Board 3

(Top)



(Bottom)

N/A

## EUT Internal View – HDD

(Top)



(Bottom)



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