



## EMC TEST REPORT For CE

Test Report No. : KES-E1-19T0449-R1  
Date of Issue : Feb. 27, 2020  
Product name : Pentabrid DVR (Digital Video Recoder)  
Model/Type No. : HRX-820  
Variant Model : -  
Applicant : Hanwha Techwin Co., Ltd.  
Applicant Address : 6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si,  
Gyeonggi-do, 13488, KOREA  
Manufacturer : 1. HANWHA TECHWIN(TIANJIN) CO., LTD  
2. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.  
3. D-TECH CO.,LTD.  
Manufacturer Address : 1. No.11 Weiliu Rd, Micro-Electronic Industrial Park, TEDA, Tianjin,  
300385, People's Republic of China  
2. Lot O-2, Que Vo Industrial Zone extended area,  
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam  
3. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do,  
Korea (Suwon Industrial Complex)  
Date of Receipt : Jul. 25, 2019  
Test date : Jul. 31, 2019 ~ Aug. 05, 2019  
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Min Seong, Kim  
EMC Test Engineer

Reviewed by

Dong-Hun, Jang  
EMC Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.



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### REPORT REVISION HISTORY

| Date          | Test Report No.   | Revision History      |
|---------------|-------------------|-----------------------|
| Aug. 07, 2019 | KES-E1-19T0449    | Issued                |
| Feb. 27, 2020 | KES-E1-19T0449-R1 | Delete Model name 'P' |
|               |                   |                       |
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## 1.0 General Product Description

### Main Specifications of EUT are:

| Video            |                     |             |                                                                                                                                                                                                                                                                                                     |
|------------------|---------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Video Input      | Analog Camera       | Input       | 16CH, 1Vp-p 75ohm, BNC                                                                                                                                                                                                                                                                              |
|                  |                     | Signal Type | AHD(8MP, 5MP, 4MP, 1080p, 720p)<br>HDTVI(8MP, 5MP, 4MP, 1080p, 720p)<br>HDCVI(5MP, 4MP, 1080p, 720p)<br>CVBS (NTSC/PAL)                                                                                                                                                                             |
|                  | Network Camera      | Input       | 2CH (up to 10CH)                                                                                                                                                                                                                                                                                    |
|                  |                     | Resolution  | CIF ~ 8MP                                                                                                                                                                                                                                                                                           |
|                  |                     | Protocols   | SUNAPI(Wisenet), ONVIF                                                                                                                                                                                                                                                                              |
| Live             | Local Display       |             | 1x HDMI, 1x VGA dual monitor                                                                                                                                                                                                                                                                        |
| Operating System | Embedded            |             | Linux                                                                                                                                                                                                                                                                                               |
| Recording        | Compression         |             | H.265, H.264, MJPEG                                                                                                                                                                                                                                                                                 |
|                  | Record Rate(Analog) |             | - Analog Camera(NTSC/PAL)<br>(Main Stream) 8MP 8/8fps CH, 5M 12/12fps CH, 4M 15/12fps CH, 2M 30/25fps CH, 720p 30/25fps/CH, SD 30/25fps/CH<br>(Sub Stream) HD: 640x360 full fps/CH, SD: upto SD full fps/CH<br><br>*The maximum recording frame rate depends on the frame rate of the input camera. |
|                  | Mode                |             | Manual, Schedule (Continuous/Event), Event(Pre/Post), Dual Track                                                                                                                                                                                                                                    |
|                  | Event Trigger       |             | Alarm Input<br>Analog Camera<br>Video Loss, Motion Detection, Tampering<br>Network Camera<br>Camera Event (Sensor, MD, Video analytics),<br>VA event (Tampering, Enter / Exit, Passing, Virtual- line, (Dis)Appear, Face Detection, Audio detection), Defocus camera event                          |
|                  | Event Action        |             | E-mail, PTZ preset, Alarm out, Buzzer, Monitor out                                                                                                                                                                                                                                                  |
|                  | Overwrite modes     |             | Overwrite On/Off                                                                                                                                                                                                                                                                                    |

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|                              |                       |  |                                                                                                                                                                                     |
|------------------------------|-----------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Search &amp; Playback</b> | Performance           |  | Max. 4 users (Set 1, Remote 3)                                                                                                                                                      |
|                              | Resolution            |  | CIF ~ 8MP                                                                                                                                                                           |
|                              | Playback Control      |  | Fast Forward/Backward (x2,x4,x8,x16,x32,x64, x128, x256)<br>Slow Forward/Backward (x1/2,x1/4,x1/8)<br>※Move one step up/down                                                        |
|                              | Internal              |  | <b>Up to 2 SATA HDDs</b><br><b>Max. 6TB/HDD(TBD)</b>                                                                                                                                |
| <b>Storage</b>               | External              |  | USB(for Backup)                                                                                                                                                                     |
|                              | File Format           |  | BU(DVR Player), SEC(Set, Include Player), AVI(Webviewer only)                                                                                                                       |
| <b>NETWORK</b>               |                       |  |                                                                                                                                                                                     |
| Protocol support             |                       |  | TCP/IP, UDP/IP, RTP (UDP), RTP (TCP), RTSP, NTP, HTTP, DHCP (Server, Client), PPPoE, SMTP, ICMP, IGMP, ARP, DNS, DDNS, uPnP, HTTPS, SNMP, ONVIF (Profile-S), SUNAPI(Server, Client) |
| Max. Remote users            |                       |  | Search (3), Live Unicast (10), Multicast (20)                                                                                                                                       |
| Security                     |                       |  | IPv4/v6                                                                                                                                                                             |
| Security                     |                       |  | IP address filtering, User access log, 802.1x Authentication, Encryption (ID/PW, Recording, Transmission, Backup)                                                                   |
| OS                           |                       |  | Supported OS : Window XP (Service pack 2 or above), Vista, 7, 8, 10, Mac OS X (10.7 or above)                                                                                       |
| Web Browser                  |                       |  | Google Chrome 47 or above, MS Edge 20 or above, Safari 9 or above<br>*support Plug-in free Web                                                                                      |
| Viewer Software              |                       |  | SSM, Webviewer, SmartViewer, Wisenet Mobile Viewer                                                                                                                                  |
| CMS Support                  |                       |  | SDK/CGI(SUNAPI)                                                                                                                                                                     |
| <b>Function</b>              |                       |  |                                                                                                                                                                                     |
| Easy Configuration           |                       |  | Setup Wizard<br>(Language Date/Time, Password, Network, Auto Camera Configuration), P2P (QR code)                                                                                   |
| ARB (Auto Recovery Backup)   |                       |  | support                                                                                                                                                                             |
| PTZ                          | Control/Preset        |  | Via GUI & RS-485, Webviewer, SPC-7000 / 300 presets                                                                                                                                 |
| Smart phone                  | OS / Protocol support |  | Android , iOS, RTP, RTSP, HTTP, CGI(SUNAPI)                                                                                                                                         |
|                              | Control               |  | Live(8ch) : Multi-Profile Support<br>Playback(1ch, Max. 2MP)<br>Event push                                                                                                          |
| <b>System Control</b>        |                       |  | Mouse, IR Remocon, Web, SPC-7000                                                                                                                                                    |

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| INDICATOR / INTERFACE |                                |                                                                                                                                 |
|-----------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Front                 | Indicator                      | Power status LED 1ea, HDD Action LED 1ea, Alarm Status LED 1ea<br>Record status LED 1ea, Network Action LED 1ea, Backup LED 1ea |
| Monitors              | Mode                           |                                                                                                                                 |
|                       | HDMI                           | 1 HDMI (4K(3840 x 2160), 2K(2560 x 1440), 1920x1080, 1280x1024, 1280x720)                                                       |
|                       | VGA                            | 1 VGA (1920x1080, 1280x1024, 1280x720)                                                                                          |
|                       | Composite(Spot)                | BNC(1CH) ※ Included OSD On Screen, Single, Multi, Auto Change mode Support                                                      |
| Audio                 | Inputs/Output                  | 4CH line in / 1CH line out                                                                                                      |
|                       | Compression                    | G.711                                                                                                                           |
|                       | Sampling rate                  | 8KHz                                                                                                                            |
| Alarm                 | Inputs/Outputs                 | Terminal 8 Inputs (NO/NC) / Terminal 4 relay Outputs (NO/NC)<br>MAX DC18V, 2A, Typical DC12V, 2A                                |
| Ethernet              |                                | 1 RJ45 10/100/1000 Base-T                                                                                                       |
| USB                   |                                | 1 ports(USB 3.0, Rear), 1 ports(USB 2.0, Front) → 2 ports(USB 2.0, Front)                                                       |
| Serial                |                                | RS-485(Full Duplex) for PTZ, Samsung System Keyboard                                                                            |
| Coaxia Control        |                                | Support (CVBS and AHD/CVI/TVI)                                                                                                  |
| Reset                 |                                | Yes(Factory Reset, Alarm Reset)                                                                                                 |
| General               |                                |                                                                                                                                 |
| Electrical            | Input Voltage/Current          | DC12V Adaptor(100~250V AC ±10% , 50/60Hz)                                                                                       |
|                       | Power consumption              | (TBD) Max. W                                                                                                                    |
| Environmental         | Operating Temperature/Humidity | +0°C to +40°C (+32°F to +104°F) / 20% to 85% RH                                                                                 |
| Mechanical            | Color / Material               | Black / Metal                                                                                                                   |
|                       | Dimension (W x H x D)          | (TBD) W370.0x H44.0 x D320(14.57" x 1.73" x 12.6")                                                                              |
|                       | Weight (with hard disks)       | TBD kg                                                                                                                          |

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

Frequency ☒ 50 Hz ☐ 60 Hz ☐ Hz

## 1.2 Variant Model Differences

Not applicable

## 1.3 Device Modifications

Not applicable

## 1.4 Equipment Under Test

| Description                                  | Model Number         | Serial Number | Manufacturer                                 | Remarks |
|----------------------------------------------|----------------------|---------------|----------------------------------------------|---------|
| Pentabrid DVR<br>(Digital Video<br>Recorder) | HRX-820              | -             | HANWHA TECHWIN<br>(TIANJIN) CO., LTD         | EUT     |
| AC / DC Adapter                              | FSP060-DIBAN2        | -             | Zhonghan Electronics<br>(Shenzhen) Co., Ltd. | -       |
| Mouse                                        | MOKJUO               | -             | Primax Electronics Ltd.                      | -       |
| HDD                                          | WD40PUEX-<br>64N96Y0 | -             | Western Digital                              | 4 TB    |

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## 1.5 Support Equipments

| Description        | Model Number   | Serial Number   | Manufacturer                                   | Remarks |
|--------------------|----------------|-----------------|------------------------------------------------|---------|
| Camera             | SDC-79446BF    | -               | HANWHA TECHWIN (TIANJIN) CO., LTD              | -       |
| Camera Adapter     | FSP-060-DIBAN2 | -               | Zhonghan Electronics (Shenzhen) Co., Ltd.      | -       |
| Monitor 1          | SMT-2233       | ZC6U67VH500194D | Weiha Daewoo Electronics Co., Ltd.             | -       |
| Monitor 2          | SMT-2232       | C95V67VF900038B | Weiha Daewoo Electronics Co., Ltd.             | -       |
| Monitor 3          | SMT-2232       | C95V67VF900015Y | Weiha Daewoo Electronics Co., Ltd.             | -       |
| Notebook           | NT730U3E       | JJRE91CF200065A | Samsung Electronics                            | -       |
| Notebook Adapter   | PA-1600-66     | AD-6019P        | LITEON                                         | -       |
| Speaker            | BR10000A CUVE  | -               | BEIJING EDIFIER HI-TECH GROUP.                 | -       |
| MIC                | CMK-303        | -               | CAMAC                                          | -       |
| Controller         | SPC-1010       | C50E67WG10100F  | SamSung Techwin Co.,Ltd.                       | -       |
| Controller Adapter | RS-AB1000      | -               | Dongguan Jinhuasheng Power Technology Co.,Ltd. | -       |
| Alarm              | -              | -               | -                                              | -       |
| Button Alarm       | -              | -               | -                                              | -       |
| USB Memory         | -              | -               | SONY                                           | 16 GB   |

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## 1.6 External I/O Cabling

| Start                                                 |           | END          |           | Cable Spec. |        |
|-------------------------------------------------------|-----------|--------------|-----------|-------------|--------|
| Description                                           | I/O Port  | Description  | I/O Port  | Length      | Shield |
| Pentabrid DVR<br>(Digital Video<br>Recorder)<br>(EUT) | VIDEO IN  | Camera       | BNC       | 10.0        | U      |
|                                                       | HDMI      | Monitor 1    | HDMI      | 1.5         | S      |
|                                                       | VGA OUT   | Monitor 2    | D-SUB     | 1.5         | S      |
|                                                       | SPOT      | Monitor 3    | BNC       | 3.0         | S      |
|                                                       | NETWORK   | Notebook     | RJ-45     | 3.0         | U      |
|                                                       | AUDIO OUT | Speaker      | RCA       | 1.6         | U      |
|                                                       | AUDIO IN  | MIC          | RCA       | 1.6         | U      |
|                                                       | RS-485    | Controller   | RS-485    | 10.0        | U      |
|                                                       | Alarm Out | Alarm        | Alarm In  | 10.0        | U      |
|                                                       | Alarm In  | Button Alarm | Alarm Out | 10.0        | U      |
|                                                       | USB 2.0   | Mouse        | USB       | 1.3         | U      |
|                                                       | USB 3.0   | USB Memory   | USB       | -           | -      |

\* Unshielded=U, Shielded=S

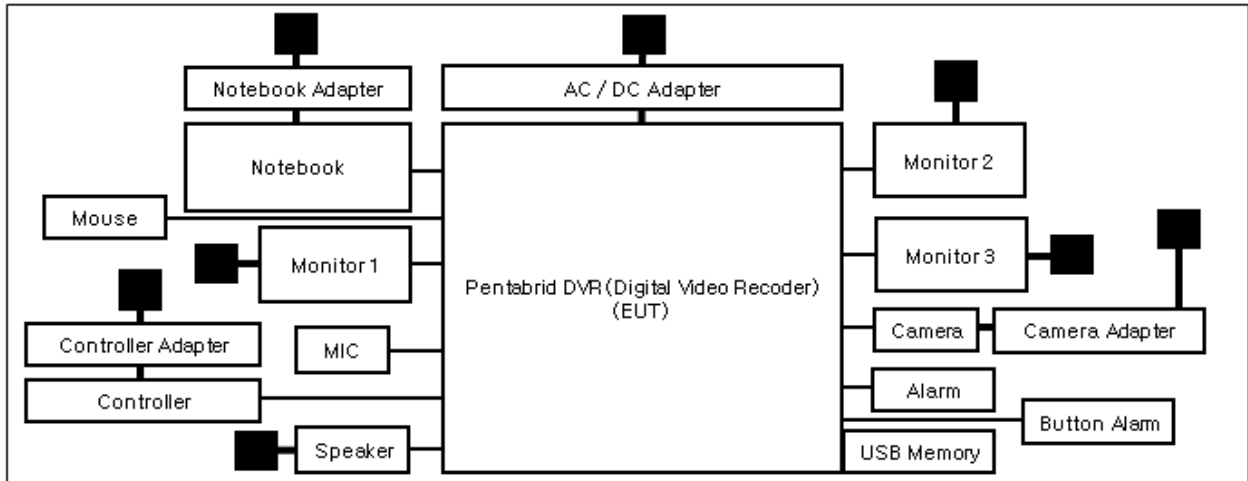
## 1.7 EUT Operating Mode(s)

| Test Mode | operating                 |
|-----------|---------------------------|
| OP        | EUT Monitoring, Ping Test |

| EUT Test operating S/W |         |                          |
|------------------------|---------|--------------------------|
| Name                   | Version | Manufacture Company      |
| WebViewer              | -       | Hanwha Techwin Co., Ltd. |

## 1.8 Configuration

■ AC Main  
 □ DC Main



## 1.9 Remarks when standards applied

N/A

## 1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

## 1.11 Test Facility

The measurement facility is located at 473-21 Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2012

## 1.12 Laboratory Accreditations and Listings

| Country       | Agency         | Scope of Accreditation                                                                                                                                                                         | Logo                                                                                                                           |
|---------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| KOREA         | <b>RRA</b>     | EMI (3 m & 10 m Semi-Anechoic Chamber ,<br>10 m Open Area and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS,<br>Magnetic, Dips and interruptions)                                 | <br>KR0100                                 |
| International | <b>KOLAS</b>   | EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS,<br>Magnetic, Dips and interruptions)                                                   | <br>KT489                                 |
| USA           | <b>FCC</b>     | 3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.                                                                               | <br>KR0100                                |
| Canada        | <b>ISED</b>    | 3 m & 10 m Semi-Anechoic Chamber and Conducted test site                                                                                                                                       | <br>23298-1                               |
| JAPAN         | <b>VCCI</b>    | 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-20056, C-20036,<br>T-20040, G-20057 |
| Europe        | <b>TÜV SÜD</b> | EMI (3 m & 10 m Semi-Anechoic Chamber , 10 m Open Area and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS,<br>Magnetic, Dips and interruptions)                                    | <br>CARAT 001633 0003                     |

## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1  
☐ Class A

☐ Group 2  
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 61547:2009

☒ EN 55032: 2012/AC:2013

☒ Class A

☐ Class B

☐ EN 55024:2010 +A1:2015

☒ EN 50130-4:2011+A1:2014

☒ EN 61000-3-2:2014

☒ EN 61000-3-3:2013

☐ EN 61326-1:2013



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- |                                                               |                                  |                                  |
|---------------------------------------------------------------|----------------------------------|----------------------------------|
| <input type="checkbox"/> <b>VCCI-CISPR 32:2016</b>            | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> <b>AS/NZS CISPR32:2015</b>           | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <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 C63.4-2014                      |                                  |                                  |
| <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                      |                                  |                                  |
| <input type="checkbox"/> <b>RE- Directive 2014/53/EU</b>      |                                  |                                  |
| <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           |                                  |                                  |
| <input type="checkbox"/> EN 301 489-3 V1.6.1                  |                                  |                                  |
| <input type="checkbox"/> EN 301 489-17 V2.2.1                 |                                  |                                  |
| <input type="checkbox"/> EN 60945:2002                        |                                  |                                  |

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## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

Jul. 31, 2019

### Test Location

Electro wave Shieldroom #6

### Test Equipment

| Used                                | Description       | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|-------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W      | EMC32        | R & S        | 9.12.00       | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER | ESR3         | R & S        | 101781        | 04, 22, 2020 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 01, 04, 2020 |
| <input checked="" type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 04, 22, 2020 |
| <input checked="" type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 11, 26, 2019 |

### Test Conditions

Temperature: 23,8 °C  
Relative Humidity: 53,4 % R.H.

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.

## 2.2 Conducted Emissions at Telecommunication Ports

### Test Date

Jul. 31, 2019

### Test Location

Electro wave Shieldroom #6

### Test Equipment

| Used                                | Description       | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|-------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W      | EMC32        | R & S        | 9.12.00       | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER | ESR3         | R & S        | 101781        | 04, 22, 2020 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 01, 04, 2020 |
| <input checked="" type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 04, 22, 2020 |
| <input checked="" type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 11, 26, 2019 |
| <input type="checkbox"/>            | 8-WIRE ISN CAT3,5 | ENY81        | R & S        | 100174        | 01, 07, 2020 |
| <input checked="" type="checkbox"/> | 8-WIRE ISN CAT6   | ENY81-CAT6   | R & S        | 101665        | 01, 07, 2020 |

### Test Conditions

Temperature: 23,8 °C  
Relative Humidity: 53,4 % R.H.

### Frequency Range of Measurement

150 kHz to 30 MHz

### Instrument Settings

IF Band Width: 9 kHz

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.

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

**Test Date**

Jul. 31, 2019

**Test Location**☐ OPEN AREA TEST SITE #2 ☒ SEMI ANECHOIC CHAMBER #4(10m)**Test Equipment**

| Used                                | Description              | Model Number | Manufacturer     | Serial Number | Cal. Due     |
|-------------------------------------|--------------------------|--------------|------------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W             | EP5/RE       | TOYO Corporation | 6.0.0         | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER        | ESU26        | R & S            | 100551        | 04, 09, 2020 |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 26, 2019 |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 715           | 11, 29, 2020 |
| <input checked="" type="checkbox"/> | ATTENUATOR               | 8491A        | HP               | 32173         | 03, 11, 2020 |

**Test Conditions**

Temperature: 23,8 °C  
Relative Humidity: 54,1 % R.H.

**Frequency Range of Measurement**

30 MHz to 1 GHz

**Instrument Settings**

IF Band Width: 120 kHz

**Test Results**

The requirements are:

☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

**Remarks**See Appendix A for test data.

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

### Test Date

Aug. 01, 2019

### Test Location

SEMI ANECHOIC CHAMBER #3

### Test Equipment

| Used                                | Description                | Model Number | Manufacturer     | Serial Number | Cal. Due     |
|-------------------------------------|----------------------------|--------------|------------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W               | EP5/RE       | TOYO Corporation | 6.0.0         | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER          | ESR7         | R & S            | 101190        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | PREAMPLIFIER               | 8449B        | AGILENT          | 3008A01967    | 05, 27, 2020 |
| <input type="checkbox"/>            | ATTENUATOR                 | 8491A        | HP               | 35496         | 03, 11, 2020 |
| <input checked="" type="checkbox"/> | DOUBLE RIDGED HORN ANTENNA | SAS-571      | A.H.SYSTEM,INC   | 781           | 03, 12, 2021 |

### Test Conditions

Temperature: 23,5 °C  
Relative Humidity: 53,4 % R.H.

### Frequency Range of Measurement

1 GHz to 6 GHz

### Instrument Settings

IF Band Width: 1 MHz

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.



## 2.5 Harmonic Current Emissions

### Test Date

Aug. 01, 2019

### Test Location

Electro wave Shieldroom #3

### Test Equipment

| Used                                | Description            | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W           | net.control  | EM TEST      | 2.1.4         | -            |
| <input checked="" type="checkbox"/> | DIGITAL POWER ANALYZER | DPA 500N     | EM TEST      | V1024106759   | 04, 09, 2020 |
| <input checked="" type="checkbox"/> | POWER SOURCE           | ACS 500N6    | EM TEST      | V1024106760   | -            |

### Test Conditions

Temperature: 24,9 °C  
Relative Humidity: 53,2 % R.H.

### Classification of Equipment for Harmonic Current Emissions

- ☒ Class A  
☐ Class B  
☐ Class C(Below 25 W)  
☐ Class C(Above 25 W)  
☐ Class D

### Test Results

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

### Remarks

See Appendix A for test data.

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## 2.6 Voltage Fluctuations and Flicker

**Test Date**

Aug. 01, 2019

**Test Location**

Electro wave Shieldroom #3

**Test Equipment**

| Used                                | Description            | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W           | net.control  | EM TEST      | 2.1.4         | -            |
| <input checked="" type="checkbox"/> | DIGITAL POWER ANALYZER | DPA 500N     | EM TEST      | V1024106759   | 04, 09, 2020 |
| <input checked="" type="checkbox"/> | POWER SOURCE           | ACS 500N6    | EM TEST      | V1024106760   | -            |

**Test Conditions**

Temperature: 24,9 °C  
Relative Humidity: 53,2 % R.H.

**Test Results**

The requirements are:

- ☒ PASS  
☐ NOT PASS  
☐ NOT APPLICABLE

**Remarks**See Appendix A for test data.

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### **3.0 Criteria for compliance**

Criteria for compliance was based on the following guidelines:

EN 50130-4:2011+A1 :2014 Alarm systems-Part 4: Electromagnetic compatibility Product family standard: Immunity requirements for components of fire, intruder and social alarm systems

**The variety and the diversity of the apparatus within the scope of this document makes it**

**difficult to define precise criteria for the evaluation of the immunity test results.**

**If as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe then the apparatus shall be deemed to have failed the test.**

**A functional description and a definition of performance by the manufacture and noted in the test**

**report, based on the following criteria:**

#### **Electrostatic discharge**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing that is no residual change in the EUT or any change in outputs, which could be interpreted by associated equipment as a change.

#### **Radiated electromagnetic fields**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing which could be interpreted by associated equipment as a change, and no such

Flickering of indicators occurs at a field strength of 3 V/m.

For components of CCTV systems, where the picture is allowed at 10 V/m, providing.

(a) there is no permanent damage or change to EUT

(e.g. no corruption of memory or changes to programmable setting etc.)

(b) at 3 V/m, any deterioration of the picture is so minor that the system could still be used; and

(c) there is no observable deterioration of the picture at 1 V/m.



---

### **Fast transient burst / slow high energy voltage surge**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any

change in outputs, which could be interpreted by associated equipment as a change.

### **Conducted RF immunity**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the application of discharge is permissible, providing

That there is no residual is permissible, providing that there is no residual change in the EUT or any

change in outputs, which could be interpreted by associated equipment as a change,

and no such flickering of indicators oeuvres at  $U = 130 \text{ dB}\mu\text{V}$ .

For component of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at  $U = 140 \text{ dB}\mu\text{V}$ , providing:

(a) there is no permanent damage or change to the EUT

(e.g. no corruption of memory or changes to programmable settings etc.)

(b) at  $U = 130 \text{ dB}\mu\text{V}$ , any deterioration of the picture is so minor that the system could still be used; and

(c) there in no observable deterioration of the picture at  $U = 120 \text{ dB}\mu\text{V}$ .

### **Voltage dip/interruption / Voltage variation**

There shall be no damage, malfunction or change of status due to the conditioning.

Flickering of an indicator during the conditioning is permissible, providing that there is no residual

change in the EUT or any change in outputs, which could be interpreted by associated equipment

as a change. The EUT shall meet the acceptance criteria for the functional test, after the conditioning.

## 3.1 Electrostatic Discharge

### Reference Standard

EN 61000-4-2:2009

### Test Date

Aug. 05, 2019

### Test Location

EMS-ESD: Electro wave Shieldroom #7

### Test Equipment

| Used                                | Description   | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | ESD SIMULATOR | ESS-2000     | Noise Ken    | ESS01Z0454    | 10, 11, 2019 |
| <input checked="" type="checkbox"/> | HCP           | -            | KES          | -             | -            |
| <input checked="" type="checkbox"/> | VCP           | -            | KES          | -             | -            |

### Test Conditions

Temperature: 26,1 °C  
Relative Humidity: 54,2 % R.H.  
Atmospheric Pressure: 99,8 kPa

### Test Specifications

Discharge Factor:  $\geq 1$  s

Discharge Impedance: 330 ohm / 150 pF

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

Polarity: Positive and Negative

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

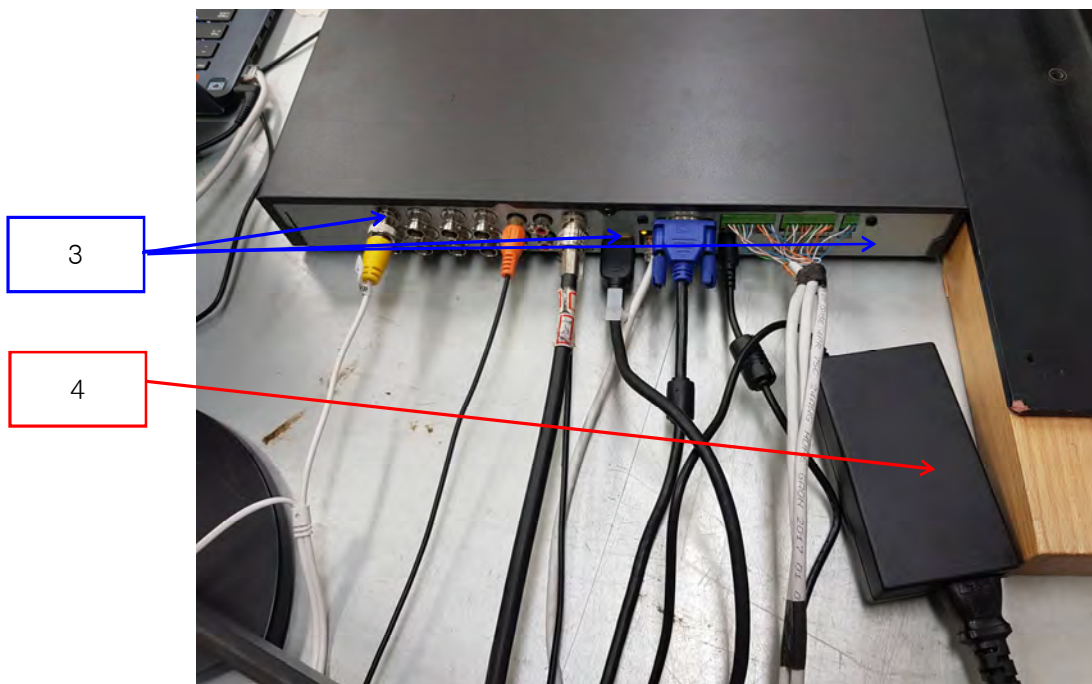
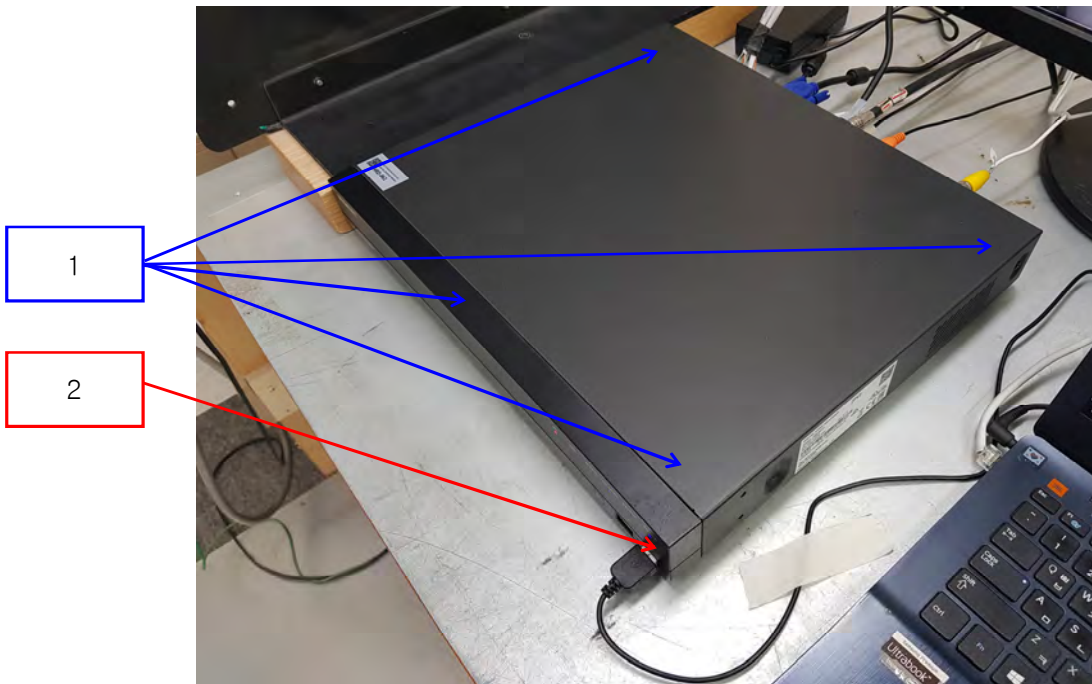
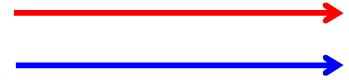
|                    |                                                                                                                                                                                                 |                                                                                    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

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

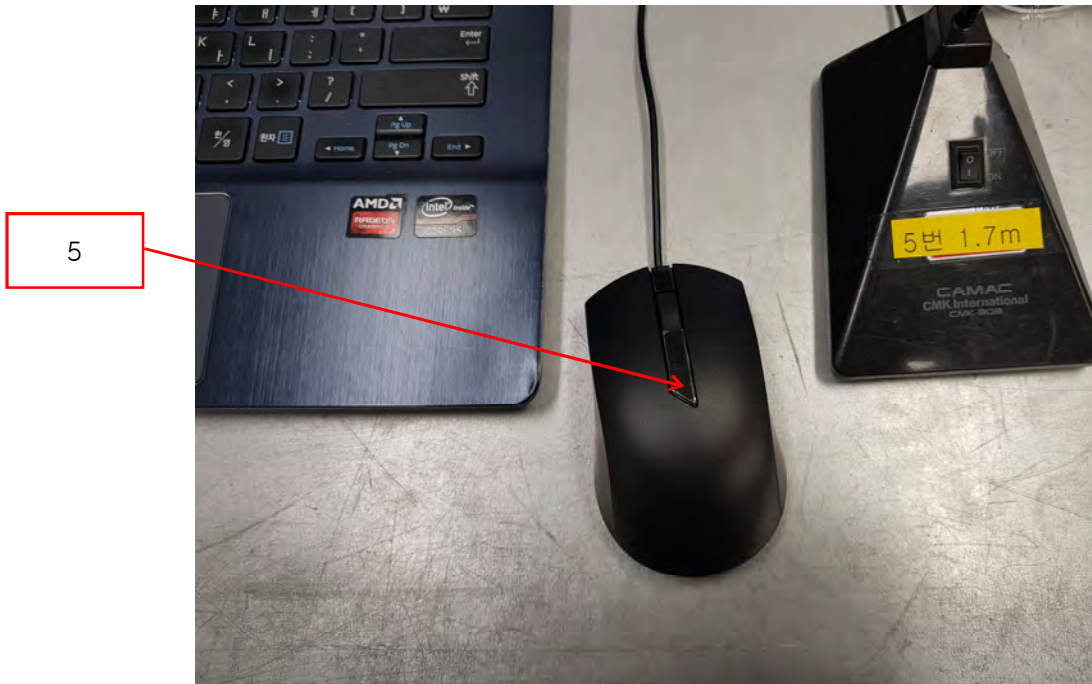
Required Performance Criteria: ☒ Complied

## Location of Discharge:

|         |
|---------|
| Air     |
| Contact |



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**Test Data**

## Indirect Discharge

| No. | Test Point  | Discharge Method  | Observations | Remarks |
|-----|-------------|-------------------|--------------|---------|
| 1   | HCP Contact | Contact Discharge | Complied     | -       |
| 2   | VCP Contact | Contact Discharge | Complied     | -       |

## Direct Discharge

| No. | Test Point     | Discharge Method  | Observations | Remarks |
|-----|----------------|-------------------|--------------|---------|
| 1   | Enclosure      | Contact Discharge | Complied     | -       |
| 2   | Front USB Port | Air Discharge     | Complied     | -       |
| 3   | Back Panel     | Air Discharge     | Complied     | -       |
| 4   | AC/DC Adapter  | Air Discharge     | Complied     | -       |
| 5   | Mouse          | Air Discharge     | Complied     | -       |

Note: "Blank" = Not performed

## Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria

**Remarks**PASS Required Performance Criteria

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## 3.2 Radiated Electric Field Immunity

**Reference Standard**

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

**Test Date**

Aug. 03, 2019

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

| Used                                | Description                     | Model Number    | Manufacturer   | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------------|-----------------|----------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W                    | EMC32           | R & S          | 10.10.02      | -            |
| <input checked="" type="checkbox"/> | SIGNAL GENERATOR                | SMB 100A        | R & S          | 177586        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | BROADBAND AMPLIFIER             | BBA100          | R & S          | 101239        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | BROADBAND AMPLIFIER             | 100S1G6M1       | AR             | 579931        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | POWER METER                     | NRP2            | R & S          | 103475        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | AVG POWER SENSOR                | NRP-Z91         | R & S          | 102526        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | AVG POWER SENSOR                | NRP-Z91         | R & S          | 102527        | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | STACKED DOUBLE LOG-PER- ANTENNA | STPL9128 E      | Schwarzbeck    | 9128ES-121    | -            |
| <input checked="" type="checkbox"/> | DIRECTIONAL COUPLER             | KYDC-D1070-DX40 | KY TELECOM     | KY150001      | 08, 06, 2020 |
| <input checked="" type="checkbox"/> | DOUBLE RIDGED HORN ANTENNA      | SAS-571         | A.H.SYSTEM,INC | 781           | 03, 12, 2021 |

**Test Conditions**

Temperature: 23,2 °C  
Relative Humidity: 53,5 % R.H.  
Atmospheric Pressure: 100,0 kPa

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### Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☒ 3 m

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

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

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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

# of Sides Radiated: ☒ 4

Required Performance Criteria: ☒ Complied

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**Test Data**

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

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria

**Remarks**

PASS Required Performance Criteria

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### 3.3 Electrical Fast Transients/Bursts

#### Reference Standard

EN 61000-4-4:2012

#### Test Date

Aug. 05, 2019

#### Test Location

EMS-EFT: Electro wave Shieldroom #7

#### Test Equipment

| Used                                | Description               | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W              | iec.control  | EM TEST      | 5.4.7         | -            |
| <input checked="" type="checkbox"/> | ULTRA COMPACT SIMULATOR   | UCS 500N7    | EM TEST      | P1608172950   | 11, 27, 2019 |
| <input checked="" type="checkbox"/> | MOTOR VARIAC              | MV2616       | EM TEST      | P1552169719   | 11, 27, 2019 |
| <input checked="" type="checkbox"/> | CAPACITIVE COUPLING CLAMP | HFK          | EM TEST      | P1633183115   | 11, 26, 2019 |

#### Test Conditions

Temperature: 26,1 °C  
Relative Humidity: 54,2 % R.H.  
Atmospheric Pressure: 99,8 kPa

#### Test Specifications

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

Pulse Amplitude & Polarity:  
(Other supply / Signal Lines) ☐ ± 0.5 kV ☒ ± 1.0 kV  
☐ ± 2.0 kV

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☐ 5 klz ☒ 100 klz

Duration of Test Voltage: ☒ ≥ 1 min

Required Performance Criteria: ☒ Complied

## Test Data

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

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

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

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

☒ Signal ports and telecommunication ports – Coupling Clamp used

| Mode of Application | Observations   |                |
|---------------------|----------------|----------------|
|                     | (+) Burst (kV) | (-) Burst (kV) |
| NETWORK             | Complied       | Complied       |
| VIDEO IN            | Complied       | Complied       |
| SPOT                | Complied       | Complied       |
| RS-485              | Complied       | Complied       |
| Alarm Cable         | Complied       | Complied       |
| Button Alarm Cable  | Complied       | Complied       |

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

## Test Results

☒ PASS Required Performance Criteria

☐ NOT PASS Required Performance Criteria

## Remarks

PASS Required Performance Criteria



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### 3.4 Surge Transients

#### Reference Standard

EN 61000-4-5:2014

#### Test Date

Aug. 05, 2019

#### Test Location

EMS-Surge: Electro wave Shieldroom #7

#### Test Equipment

| Used                                | Description               | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W              | iec.control  | EM TEST      | 5.4.7         | -            |
| <input checked="" type="checkbox"/> | ULTRA COMPACT SIMULATOR   | UCS 500N7    | EM TEST      | P1608172950   | 11, 27, 2019 |
| <input checked="" type="checkbox"/> | MOTOR VARIAC              | MV2616       | EM TEST      | P1552169719   | 11, 27, 2019 |
| <input type="checkbox"/>            | CAPACITIVE COUPLING CLAMP | HFK          | EM TEST      | P1633183115   | 11, 26, 2019 |

#### Test Conditions

Temperature: 26,1 °C  
Relative Humidity: 54,2 % R.H.  
Atmospheric Pressure: 99,8 kPa

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### Test Specifications

#### AC Power Lines

Source Impedance: 12 ohm for common Mode and 2 ohm for differential Mode

Surge Amplitude :

Common Mode

☒ (0,5 / 1,0 / 2,0) kV

Differential Mode

☒ (0,5 / 1,0) kV

Number of Surges:

☒ 5 surges per angle

Angle:

☒ 0°, 90°, 180°, 270° (input a.c. power port)

Polarity:

☒ Positive & Negative

Repetition Rate:

☐ 1 surge per min ☒ 1 surge per 30 sec.

Required Performance Criteria: ☒ Complied

#### Other supply / Signal Lines

Source Impedance:

42 ohm for common Mode

Surge Amplitude:

Common Mode

☐ (0,5 / 1,0) kV

Number of Surges:

☐ 5 Surges

Polarity:

☐ Positive & Negative

Repetition Rate:

☐ 1 surge per min ☐ 1 surge per 30 sec.

Required Performance Criteria: ☐ Complied

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**Test Data**☒ Line to Line – Differential Mode

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

☒ Line to Earth – Common Mode

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

**Signal Lines**☐ Line to Earth – Common Mode

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

Note: "Blank" = Not performed

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria  
☐ NOT APPLICABLE

**Remarks**PASS Required Performance CriteriaOther supply/signal lines : No test is required because it is not permitted to connect cables > 30 m long.

### 3.5 Conducted Disturbance

#### Reference Standard

EN 61000-4-6:2014

#### Test Date

Aug. 04, 2019

#### Test Location

EMS-CS: Electro wave Shieldroom #6

#### Test Equipment

| Used                                | Description               | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|---------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W              | icd.control  | EM TEST      | 5.3.11        | -            |
| <input checked="" type="checkbox"/> | CONTINUOUS WAVE SIMULATOR | CWS 500N1.4  | EM TEST      | P1602169880   | 11, 26, 2019 |
| <input checked="" type="checkbox"/> | ATTENUATOR                | ATT 6/80     | EM TEST      | P1614178148   | 11, 26, 2019 |
| <input checked="" type="checkbox"/> | CDN                       | CDN M016     | TESEQ        | 43694         | 11, 26, 2019 |
| <input checked="" type="checkbox"/> | CDN                       | CDN M016     | TESEQ        | 43697         | 11, 26, 2019 |
| <input checked="" type="checkbox"/> | CDN                       | CDN T800     | TESEQ        | 42800         | 11, 26, 2019 |
| <input checked="" type="checkbox"/> | EM CLAMP                  | KEMZ 801A    | TESEQ        | 44099         | 11, 27, 2019 |

#### Test Conditions

Temperature: 24,4 °C  
Relative Humidity: 53,8 % R.H.  
Atmospheric Pressure: 100,1 kPa

#### Test Specifications

Frequency range: ☒ 150 kHz to 100 MHz ☐ 150 kHz to 80 MHz

Voltage Level: ☐ 1 Vrms ☐ 3 Vrms  
☒ 10 Vrms

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

Frequency step: ☒ 1 % step

Dwell Time: ☒ 1 s ☐ 3 s

Required Performance Criteria: ☒ Complied

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**Test Data**☒ Input a.c. power ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| L – N – PE                           | CDN             | Complied     |

☐ Input d.c. power ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| -                                    | -               | -            |

☒ Signal ports and telecommunication ports

| Coupling Location<br>(Line Stressed) | Coupling Method | Observations |
|--------------------------------------|-----------------|--------------|
| NETWORK                              | CDN             | Complied     |
| VIDEO IN                             | Clamp           | Complied     |
| SPOT                                 | Clamp           | Complied     |
| RS-485                               | Clamp           | Complied     |
| Alarm Cable                          | Clamp           | Complied     |
| Button Alarm Cable                   | Clamp           | Complied     |

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

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria

**Remarks**PASS Required Performance Criteria

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### 3.6 Voltage Dips and Short Interruptions

**Reference Standard**

EN 61000-4-11:2004

**Test Date**

Aug. 05, 2019

**Test Location**

EMS-Voltage dip: Electro wave Shieldroom #7

**Test Equipment**

| Used                                | Description             | Model Number | Manufacturer | Serial Number | Cal. Due     |
|-------------------------------------|-------------------------|--------------|--------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMS Test S/W            | iec.control  | EM TEST      | 5.4.7         | -            |
| <input checked="" type="checkbox"/> | ULTRA COMPACT SIMULATOR | UCS 500N7    | EM TEST      | P1608172950   | 11, 27, 2019 |
| <input checked="" type="checkbox"/> | MOTOR VARIAC            | MV2616       | EM TEST      | P1552169719   | 11, 27, 2019 |

**Test Conditions**

Temperature: 26,1 °C  
Relative Humidity: 54,2 % R.H.  
Atmospheric Pressure: 99,8 kPa

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**Test Specifications & Observations/Remarks****- Voltage Dips and Short Interruptions**

| <u>Test Level</u>                             | <u>Duration [in period/ms (50 Hz)]</u>          | <u>Results</u>  |
|-----------------------------------------------|-------------------------------------------------|-----------------|
| <input checked="" type="checkbox"/> 20 % dip  | <input checked="" type="checkbox"/> 250 / 5 000 | <u>Complied</u> |
| <input checked="" type="checkbox"/> 30 % dip  | <input checked="" type="checkbox"/> 25 / 500    | <u>Complied</u> |
| <input checked="" type="checkbox"/> 60 % dip  | <input checked="" type="checkbox"/> 10 / 200    | <u>Complied</u> |
| <input checked="" type="checkbox"/> 100 % dip | <input checked="" type="checkbox"/> 250 / 5 000 | <u>Complied</u> |

**- Voltage variations**

|                                                 |                                                  |                 |
|-------------------------------------------------|--------------------------------------------------|-----------------|
| <input checked="" type="checkbox"/> Unom + 10 % | <input checked="" type="checkbox"/> 253.0 V (ac) | <u>Complied</u> |
| <input checked="" type="checkbox"/> Unom - 15 % | <input checked="" type="checkbox"/> 195.5 V (ac) | <u>Complied</u> |

Observations:

Complied – No degradation of function

**Test Results**

- ☒ PASS Required Performance Criteria  
☐ NOT PASS Required Performance Criteria  
☐ NOT APPLICABLE

**Remarks**PASS Required Performance Criteria

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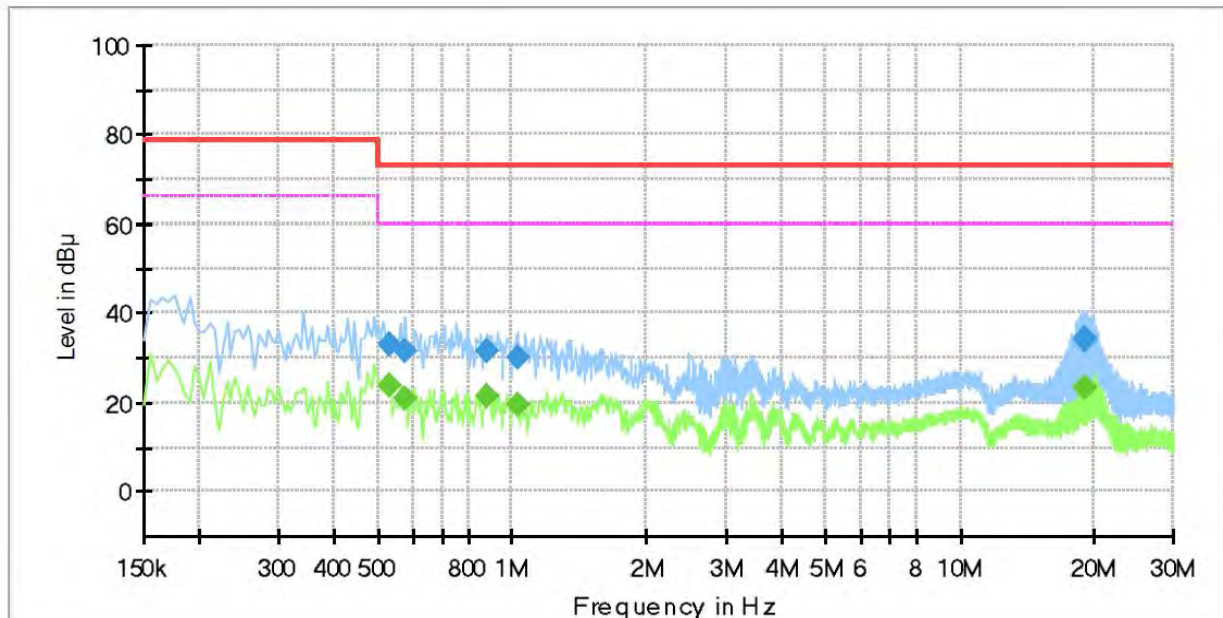
## APPENDIX A – TEST DATA

### Conducted Emissions at Mains Power Ports

[HOT]

#### Common Information

|                   |                    |
|-------------------|--------------------|
| Test Description: | Conducted Emission |
| Model No.:        | HRX-820P           |
| Phase:            |                    |
| Mode:             | H                  |
| Operator Name:    | KES                |



#### Final Result

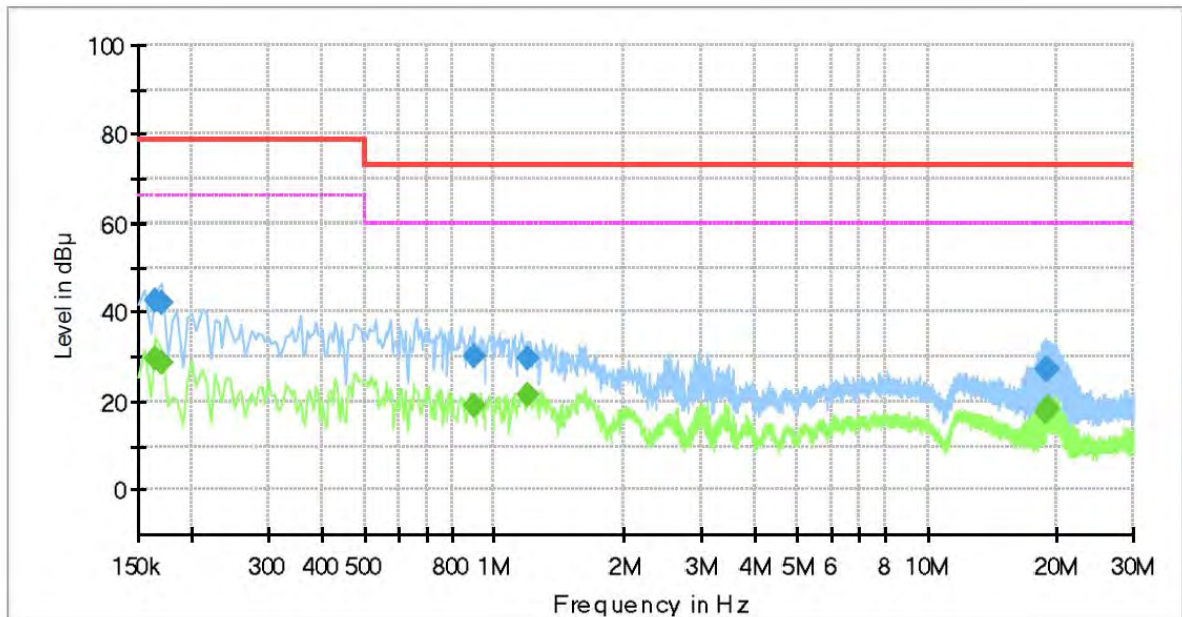
| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.530000        | ---              | 23.75           | 60.00        | 36.25       | 1000.0          | 9.000           | L1   | 19.9       |
| 0.530000        | 33.04            | ---             | 73.00        | 39.96       | 1000.0          | 9.000           | L1   | 19.9       |
| 0.575000        | ---              | 20.70           | 60.00        | 39.30       | 1000.0          | 9.000           | L1   | 19.9       |
| 0.575000        | 31.68            | ---             | 73.00        | 41.32       | 1000.0          | 9.000           | L1   | 19.9       |
| 0.880000        | ---              | 21.33           | 60.00        | 38.67       | 1000.0          | 9.000           | L1   | 20.3       |
| 0.880000        | 31.34            | ---             | 73.00        | 41.66       | 1000.0          | 9.000           | L1   | 20.3       |
| 1.025000        | ---              | 19.31           | 60.00        | 40.69       | 1000.0          | 9.000           | L1   | 20.4       |
| 1.025000        | 30.03            | ---             | 73.00        | 42.97       | 1000.0          | 9.000           | L1   | 20.4       |
| 19.010000       | ---              | 23.30           | 60.00        | 36.70       | 1000.0          | 9.000           | L1   | 20.3       |
| 19.010000       | 34.01            | ---             | 73.00        | 38.99       | 1000.0          | 9.000           | L1   | 20.3       |
| 19.110000       | ---              | 23.31           | 60.00        | 36.69       | 1000.0          | 9.000           | L1   | 20.3       |
| 19.110000       | 34.18            | ---             | 73.00        | 38.82       | 1000.0          | 9.000           | L1   | 20.3       |

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## [ NEUTRAL ]

### Common Information

Test Description: Conducted Emission  
 Model No.: HRX-820P  
 Phase:  
 Mode: N  
 Operator Name: KES



### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.165000        | ---              | 29.66           | 66.00        | 36.34       | 1000.0          | 9.000           | N    | 19.5       |
| 0.165000        | 42.62            | ---             | 79.00        | 36.38       | 1000.0          | 9.000           | N    | 19.5       |
| 0.170000        | ---              | 28.80           | 66.00        | 37.20       | 1000.0          | 9.000           | N    | 19.5       |
| 0.170000        | 42.17            | ---             | 79.00        | 36.83       | 1000.0          | 9.000           | N    | 19.5       |
| 0.895000        | ---              | 18.81           | 60.00        | 41.19       | 1000.0          | 9.000           | N    | 20.3       |
| 0.895000        | 30.05            | ---             | 73.00        | 42.95       | 1000.0          | 9.000           | N    | 20.3       |
| 1.200000        | ---              | 21.36           | 60.00        | 38.64       | 1000.0          | 9.000           | N    | 20.4       |
| 1.200000        | 29.77            | ---             | 73.00        | 43.23       | 1000.0          | 9.000           | N    | 20.4       |
| 18.760000       | ---              | 17.67           | 60.00        | 42.33       | 1000.0          | 9.000           | N    | 20.3       |
| 18.760000       | 26.91            | ---             | 73.00        | 46.09       | 1000.0          | 9.000           | N    | 20.3       |
| 19.055000       | ---              | 18.39           | 60.00        | 41.61       | 1000.0          | 9.000           | N    | 20.3       |
| 19.055000       | 27.05            | ---             | 73.00        | 45.95       | 1000.0          | 9.000           | N    | 20.3       |

#### ◆ 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))

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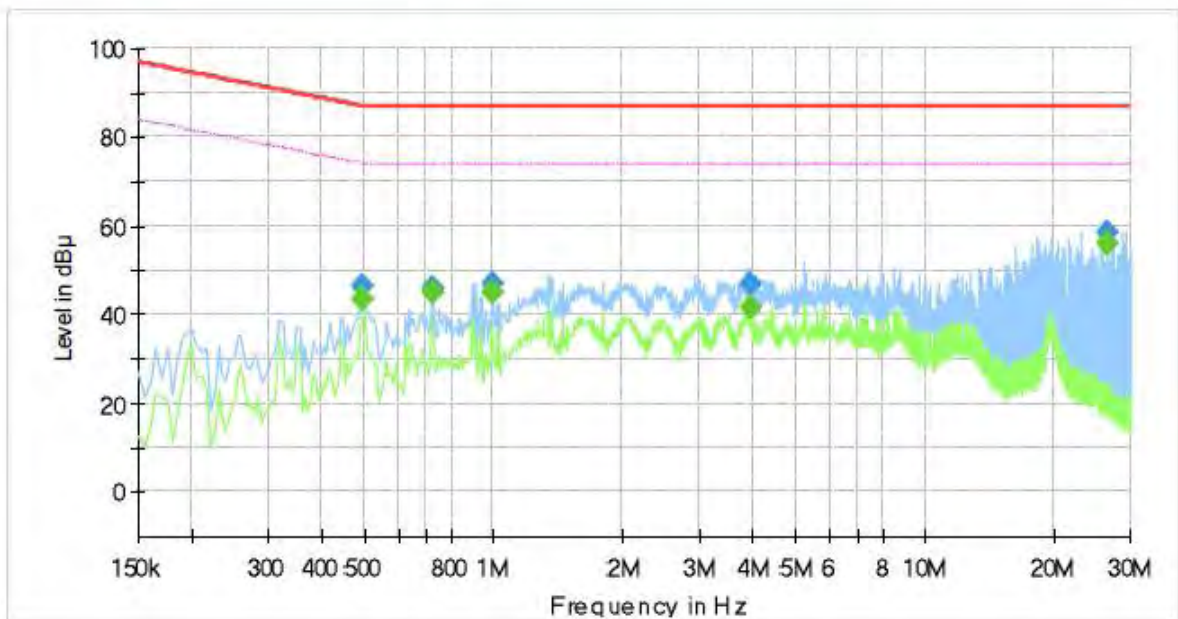
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## Conducted Emissions at Telecommunication Ports

[100 Mbps]

### Common Information

|                   |                            |
|-------------------|----------------------------|
| Test Description: | Telecommunication Emission |
| Model No.:        | HRX-820P                   |
| Mode :            | 1 000 Mbps                 |
| Speed :           |                            |
| Operator Name:    | KES                        |



### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | CAverage (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line        | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|-------------|------------|
| 0.495000        | ---              | 43.47           | 74.08        | 30.61       | 1000.0          | 9.000           | Single Line | 19.9       |
| 0.495000        | 46.46            | ---             | 87.08        | 40.62       | 1000.0          | 9.000           | Single Line | 19.9       |
| 0.720000        | ---              | 44.92           | 74.00        | 29.08       | 1000.0          | 9.000           | Single Line | 20.1       |
| 0.720000        | 45.90            | ---             | 87.00        | 41.10       | 1000.0          | 9.000           | Single Line | 20.1       |
| 0.995000        | ---              | 45.07           | 74.00        | 28.93       | 1000.0          | 9.000           | Single Line | 20.3       |
| 0.995000        | 46.90            | ---             | 87.00        | 40.10       | 1000.0          | 9.000           | Single Line | 20.3       |
| 3.955000        | ---              | 41.83           | 74.00        | 32.17       | 1000.0          | 9.000           | Single Line | 19.6       |
| 3.955000        | 46.96            | ---             | 87.00        | 40.04       | 1000.0          | 9.000           | Single Line | 19.6       |
| 26.485000       | ---              | 55.97           | 74.00        | 18.03       | 1000.0          | 9.000           | Single Line | 20.6       |
| 26.485000       | 58.64            | ---             | 87.00        | 28.36       | 1000.0          | 9.000           | Single Line | 20.6       |

#### ◆ 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))

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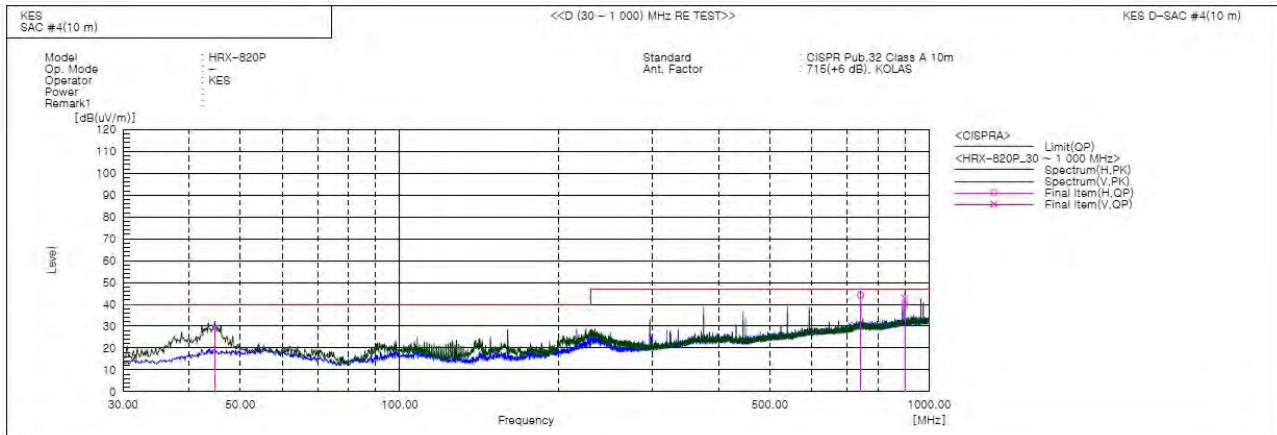
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### Radiated Electric Field Emissions(Below 1 GHz)



#### Final Result

| No. | Frequency [MHz] | (P) | Reading QP [dB(uV)] | c.f [dB(1/m)] | Result QP [dB(uV/m)] | Limit QP [dB(uV/m)] | Margin QP [dB] | Height [cm] | Angle [deg] | Remark |
|-----|-----------------|-----|---------------------|---------------|----------------------|---------------------|----------------|-------------|-------------|--------|
| 1   | 44.793          | V   | 51.1                | -21.9         | 29.2                 | 40.0                | 10.8           | 271.0       | 303.0       |        |
| 2   | 742.465         | H   | 51.6                | -7.4          | 44.2                 | 47.0                | 2.8            | 217.0       | 155.0       |        |
| 3   | 899.959         | V   | 48.5                | -5.7          | 42.8                 | 47.0                | 4.2            | 100.0       | 185.0       |        |
| 4   | 899.969         | H   | 45.3                | -5.7          | 39.6                 | 47.0                | 7.4            | 211.0       | 333.0       |        |

#### ◆ Calculation – SEMI ANECHOIC CHAMBER #4(10 m)

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

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

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

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



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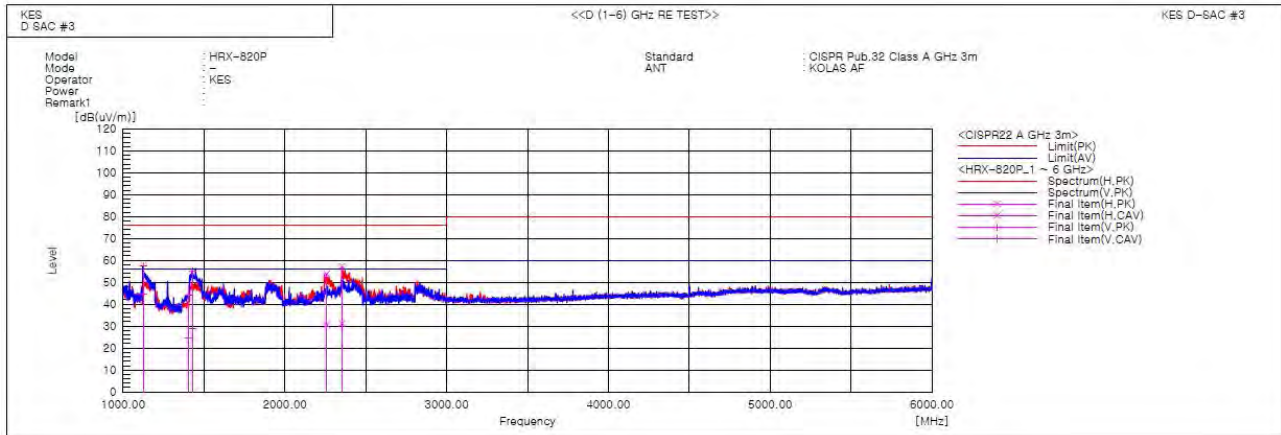
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### Radiated Electric Field Emissions(Above 1 GHz)



#### Final Result

| No. | Frequency<br>[MHz] | (P) | Reading<br>PK<br>[dB(uV)] | Reading<br>CAV<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>PK<br>[dB(uV/m)] | Result<br>CAV<br>[dB(uV/m)] | Limit<br>PK<br>[dB(uV/m)] | Limit<br>AV<br>[dB(uV/m)] | Margin<br>PK<br>[dB] | Margin<br>CAV<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|----------------------------|------------------|----------------------------|-----------------------------|---------------------------|---------------------------|----------------------|-----------------------|----------------|----------------|--------|
| 1   | 1124.979           | V   | 66.5                      | 53.4                       | -8.9             | 57.6                       | 44.5                        | 76.0                      | 56.0                      | 18.4                 | 11.5                  | 100.0          | 32.3           |        |
| 2   | 1404.715           | V   | 51.3                      | 31.7                       | -7.1             | 44.2                       | 24.6                        | 76.0                      | 56.0                      | 31.8                 | 31.4                  | 100.0          | 139.7          |        |
| 3   | 1431.283           | V   | 62.2                      | 36.0                       | -7.0             | 55.2                       | 29.0                        | 76.0                      | 56.0                      | 20.8                 | 27.0                  | 100.0          | 144.0          |        |
| 4   | 2257.687           | H   | 55.0                      | 31.8                       | -1.2             | 53.8                       | 30.6                        | 76.0                      | 56.0                      | 22.2                 | 25.4                  | 100.0          | 67.5           |        |
| 5   | 2351.200           | H   | 58.2                      | 32.0                       | -0.8             | 57.4                       | 31.2                        | 76.0                      | 56.0                      | 18.6                 | 24.8                  | 100.0          | 93.4           |        |

#### ◆ Calculation

Result(PK/CAV) [dB( $\mu$ V/m)] = (Reading(PK/CAV)[dB( $\mu$ V)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB( $\mu$ V/m)] - Result(PK/CAV) [dB( $\mu$ V/m)]

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

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

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## Harmonic Current Emissions and Voltage Fluctuations and Flicker

### Average harmonic current results

| Hn | I <sub>eff</sub> [A] | % of Limit | Limit [A] | Result |
|----|----------------------|------------|-----------|--------|
| 1  | 0.063                |            |           |        |
| 2  | 0.004                | 0.336      | 1.080     | n/a    |
| 3  | 0.056                | 2.446      | 2.300     | PASS   |
| 4  | 0.003                | 0.626      | 0.430     | n/a    |
| 5  | 0.055                | 4.814      | 1.140     | PASS   |
| 6  | 0.004                | 1.355      | 0.300     | n/a    |
| 7  | 0.054                | 6.951      | 0.770     | PASS   |
| 8  | 0.003                | 1.333      | 0.230     | n/a    |
| 9  | 0.053                | 13.188     | 0.400     | PASS   |
| 10 | 0.003                | 1.481      | 0.184     | n/a    |
| 11 | 0.051                | 15.486     | 0.330     | PASS   |
| 12 | 0.003                | 1.842      | 0.153     | n/a    |
| 13 | 0.049                | 23.169     | 0.210     | PASS   |
| 14 | 0.003                | 2.115      | 0.131     | n/a    |
| 15 | 0.046                | 30.492     | 0.150     | PASS   |
| 16 | 0.003                | 2.282      | 0.115     | n/a    |
| 17 | 0.043                | 32.414     | 0.132     | PASS   |
| 18 | 0.003                | 2.552      | 0.102     | n/a    |
| 19 | 0.040                | 33.959     | 0.118     | PASS   |
| 20 | 0.002                | 2.641      | 0.092     | n/a    |
| 21 | 0.037                | 23.060     | 0.161     | PASS   |
| 22 | 0.003                | 3.034      | 0.084     | n/a    |
| 23 | 0.034                | 23.295     | 0.147     | PASS   |
| 24 | 0.002                | 3.046      | 0.077     | n/a    |
| 25 | 0.031                | 22.943     | 0.135     | PASS   |
| 26 | 0.002                | 2.875      | 0.071     | n/a    |
| 27 | 0.028                | 22.212     | 0.125     | PASS   |
| 28 | 0.002                | 3.071      | 0.066     | n/a    |
| 29 | 0.025                | 21.299     | 0.116     | PASS   |
| 30 | 0.002                | 2.813      | 0.061     | n/a    |
| 31 | 0.022                | 19.763     | 0.109     | PASS   |
| 32 | 0.002                | 2.806      | 0.058     | n/a    |
| 33 | 0.019                | 18.153     | 0.102     | PASS   |
| 34 | 0.001                | 2.702      | 0.054     | n/a    |
| 35 | 0.016                | 16.290     | 0.096     | PASS   |
| 36 | 0.001                | 2.281      | 0.051     | n/a    |
| 37 | 0.013                | 13.975     | 0.091     | PASS   |
| 38 | 0.001                | 2.383      | 0.048     | n/a    |
| 39 | 0.010                | 12.014     | 0.087     | PASS   |
| 40 | 0.001                | 1.940      | 0.046     | n/a    |

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.



Test Data - Harmonics (continued)

**Maximum harmonic current results**

| Hn | I <sub>eff</sub> [A] | % of Limit | Limit [A] | Result |
|----|----------------------|------------|-----------|--------|
| 1  | 0.063                |            |           |        |
| 2  | 0.004                | 0.275      | 1.620     | n/a    |
| 3  | 0.057                | 1.642      | 3.450     | PASS   |
| 4  | 0.003                | 0.524      | 0.645     | n/a    |
| 5  | 0.055                | 3.241      | 1.710     | PASS   |
| 6  | 0.005                | 1.086      | 0.450     | n/a    |
| 7  | 0.054                | 4.691      | 1.155     | PASS   |
| 8  | 0.004                | 1.086      | 0.345     | n/a    |
| 9  | 0.053                | 8.855      | 0.600     | PASS   |
| 10 | 0.003                | 1.229      | 0.276     | n/a    |
| 11 | 0.051                | 10.396     | 0.495     | PASS   |
| 12 | 0.003                | 1.515      | 0.230     | n/a    |
| 13 | 0.049                | 15.580     | 0.315     | PASS   |
| 14 | 0.003                | 1.741      | 0.197     | n/a    |
| 15 | 0.046                | 20.452     | 0.225     | PASS   |
| 16 | 0.003                | 1.890      | 0.173     | n/a    |
| 17 | 0.043                | 21.884     | 0.199     | PASS   |
| 18 | 0.003                | 2.118      | 0.153     | n/a    |
| 19 | 0.040                | 22.780     | 0.178     | PASS   |
| 20 | 0.003                | 2.126      | 0.138     | n/a    |
| 21 | 0.037                | 23.217     | 0.161     | PASS   |
| 22 | 0.003                | 2.430      | 0.125     | n/a    |
| 23 | 0.034                | 23.473     | 0.147     | PASS   |
| 24 | 0.003                | 2.477      | 0.115     | n/a    |
| 25 | 0.031                | 23.091     | 0.135     | PASS   |
| 26 | 0.002                | 2.348      | 0.106     | n/a    |
| 27 | 0.028                | 22.361     | 0.125     | PASS   |
| 28 | 0.002                | 2.527      | 0.099     | n/a    |
| 29 | 0.025                | 21.440     | 0.116     | PASS   |
| 30 | 0.002                | 2.296      | 0.092     | n/a    |
| 31 | 0.022                | 19.884     | 0.109     | PASS   |
| 32 | 0.002                | 2.358      | 0.086     | n/a    |
| 33 | 0.019                | 18.271     | 0.102     | PASS   |
| 34 | 0.002                | 2.205      | 0.081     | n/a    |
| 35 | 0.016                | 16.443     | 0.096     | PASS   |
| 36 | 0.001                | 1.893      | 0.077     | n/a    |
| 37 | 0.013                | 14.169     | 0.091     | PASS   |
| 38 | 0.001                | 1.951      | 0.073     | n/a    |
| 39 | 0.010                | 12.132     | 0.087     | PASS   |
| 40 | 0.001                | 1.584      | 0.069     | n/a    |

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.



## KES Co., Ltd.

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www.kes.co.kr

Report No.:  
KES-E1-19T0449-R1  
Page (45) of (59)

### Test Data - Voltage Fluctuations

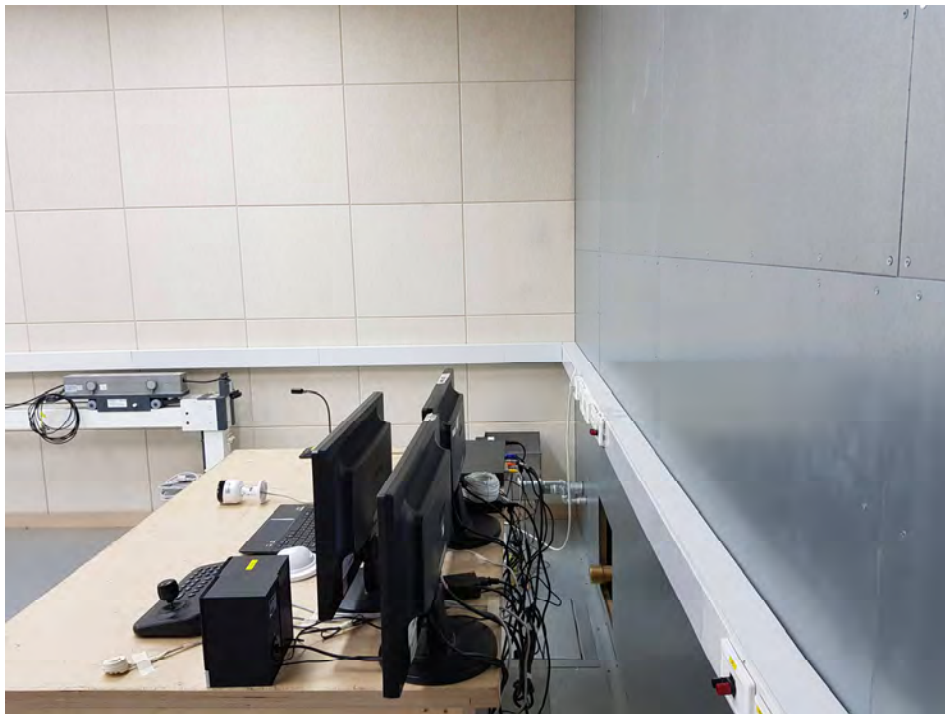
## Maximum Flicker results

| Flicker Measurements |       |         |        |          |          |
|----------------------|-------|---------|--------|----------|----------|
|                      | Plt   | Max Pst | Max Dc | Max Dmax | Max Tmax |
| Line 1:              | 0.028 | 0.028   | 0      | < 0.2    | 0        |
| Limits:              | 0.65  | 1       | 3.3    | 4        | 0.5      |
| Results:             | PASS  | PASS    | PASS   | PASS     | PASS     |

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

## Test Setup Photos and Configuration

### Conducted Voltage Emissions



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## Conducted Telecommunication Emissions



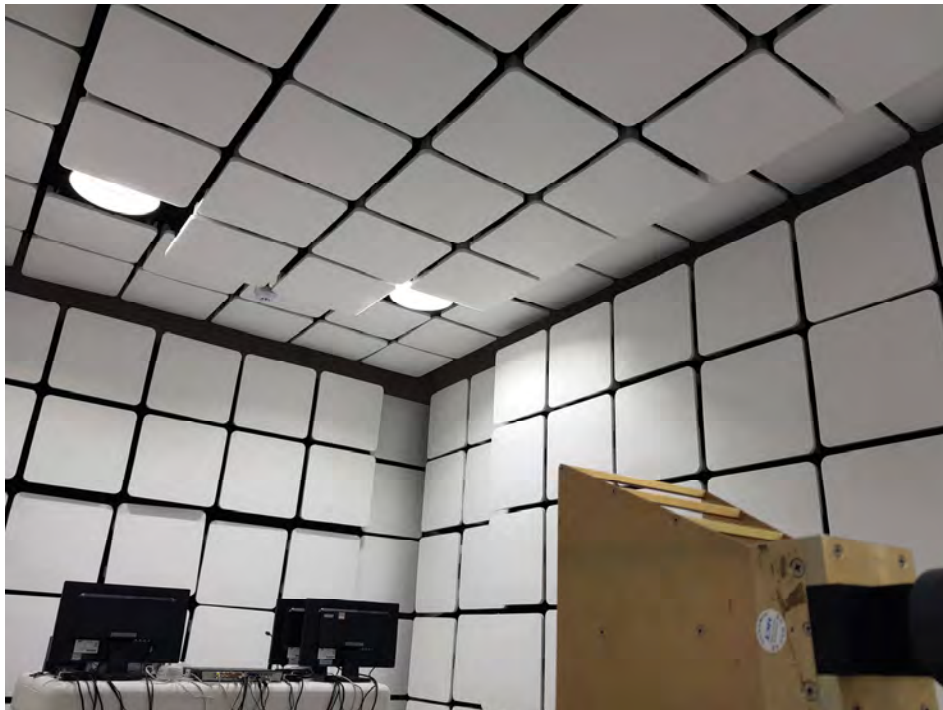
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## Radiated Electric Field Emissions(Below 1 GHz)



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## Radiated Electric Field Emissions(Above 1 GHz)



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## Harmonic Current Emissions and Voltage Fluctuations and Flicker



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## Electrostatic Discharge



## Radiated Electric Field Immunity



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## Electrical Fast Transients/Bursts



## Surge Transients



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## Conducted Disturbance



## Voltage Dips and Short Interruptions



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## EUT External Photographs

(Top)



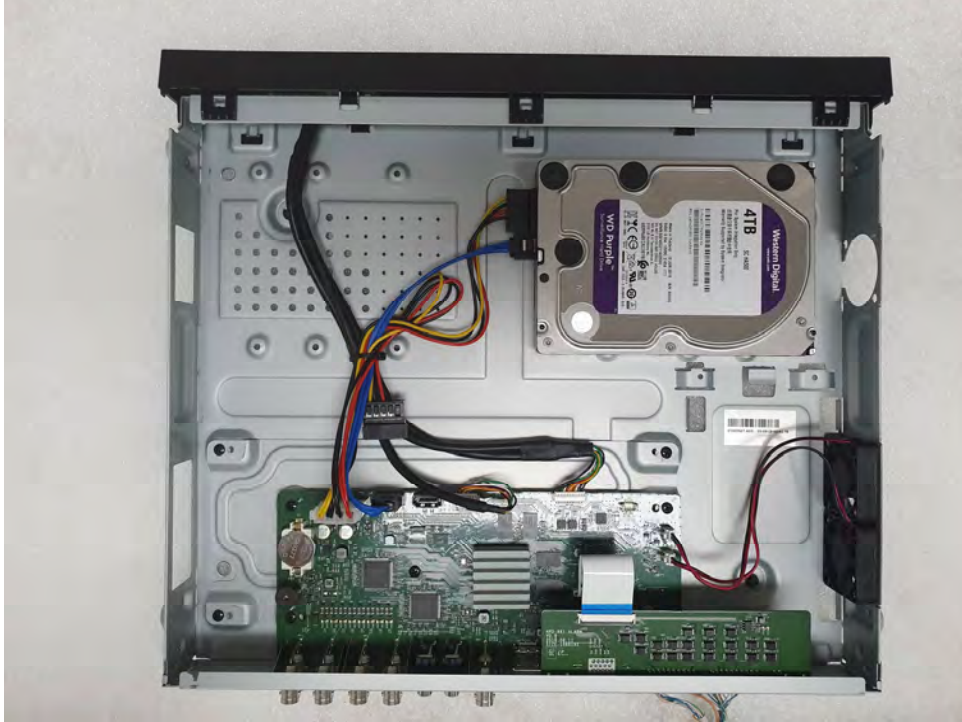
(Bottom)



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## EUT Internal Photographs

(Internal View)



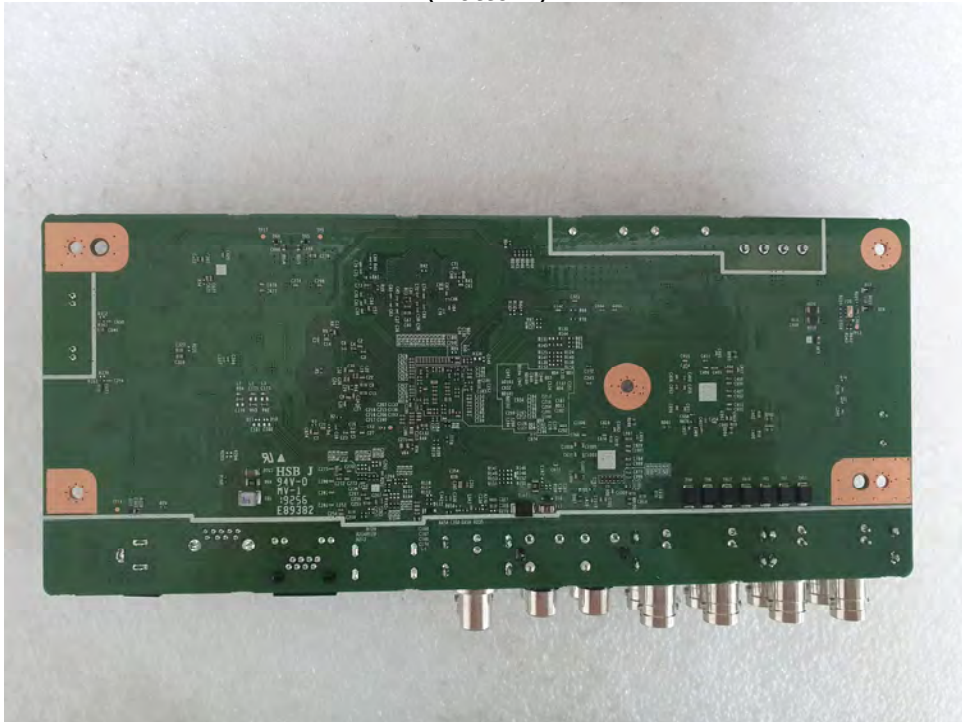
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## EUT Internal View – Main Board

(Top)



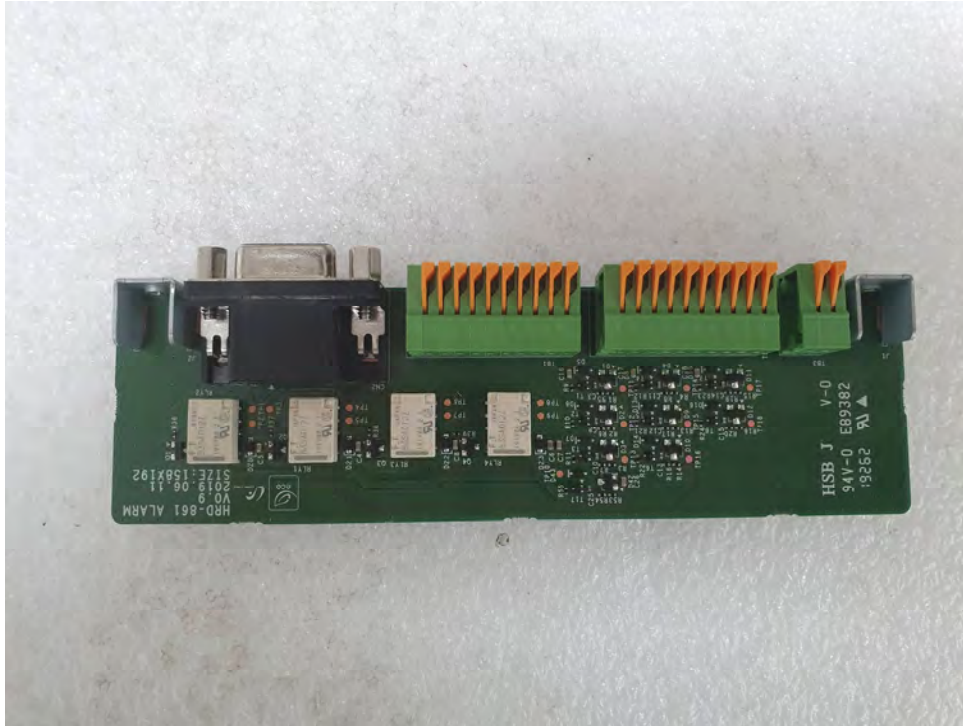
(Bottom)



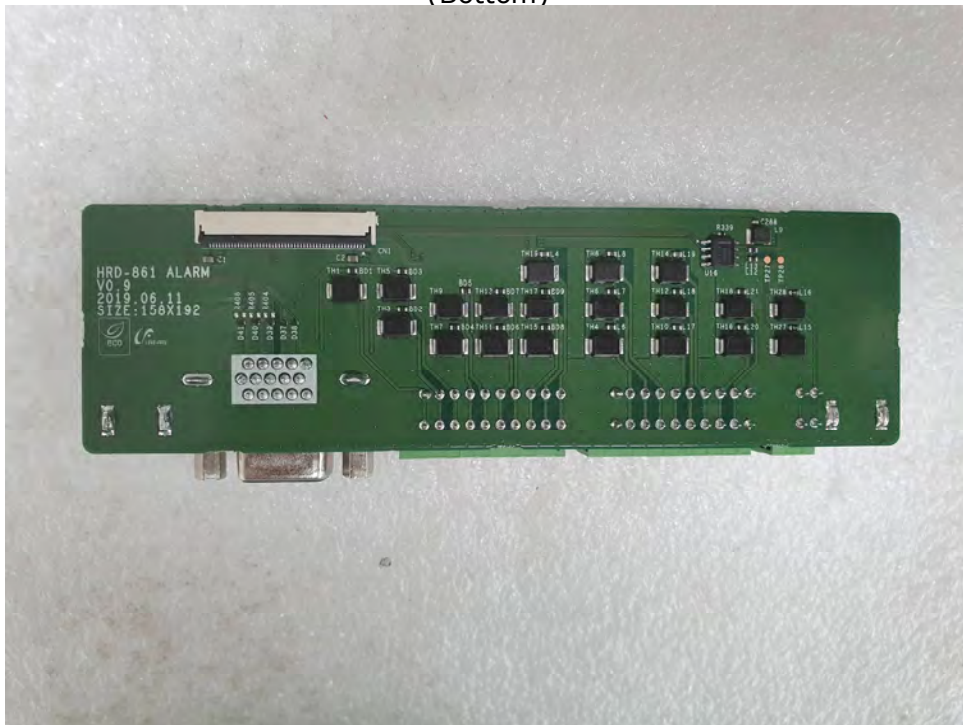
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## EUT Internal View – Sub Board 1

(Top)



(Bottom)



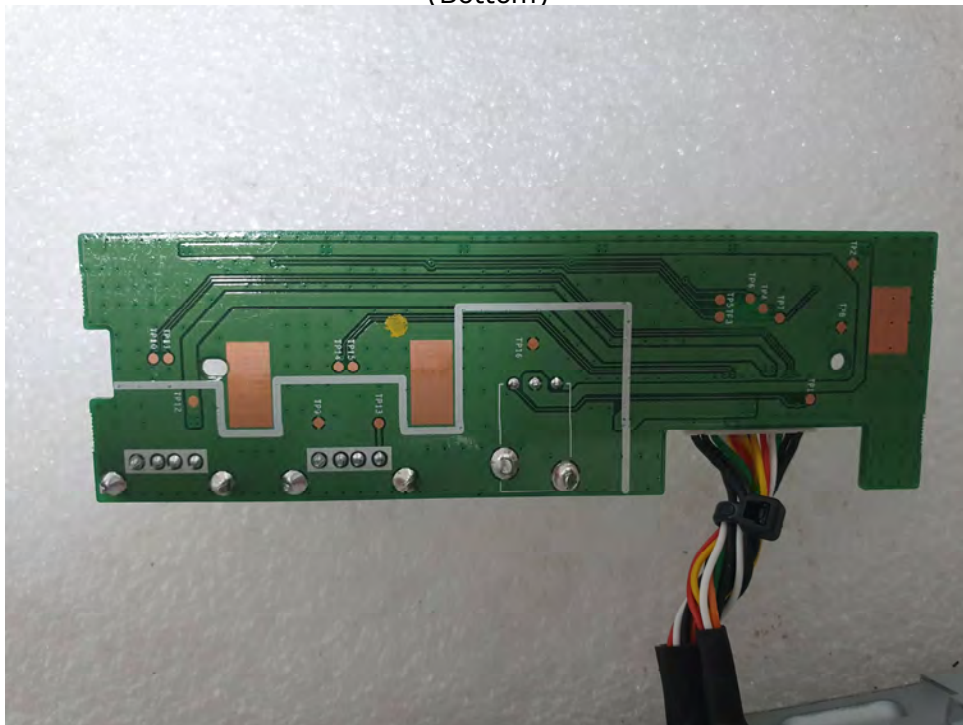
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## EUT Internal View – Sub Board 2

(Top)

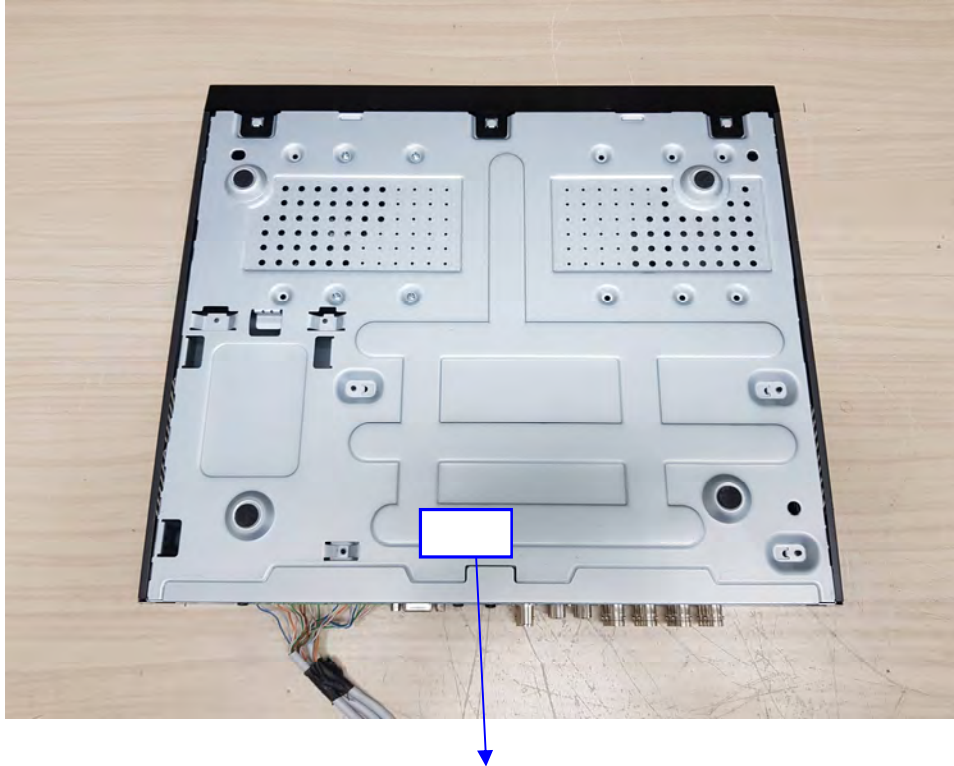


(Bottom)



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## Label and Location



### **Pentabrid DVR (Digital Video Recorder)**

Model No : HRX-820

Manufacturer : HANWHA TECHWIN(TIANJIN) CO., LTD

Made in China

