

**KES Co., Ltd.**

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Report No.:

KES-EM-22T0285-R1

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# EMC TEST REPORT

Test Report No. : KES-EM-22T0285-R1

Date of Issue : Feb. 24, 2023

Product name : DVR

Model/Type No. : HRX-1635

Variant Model : -

Applicant : Hanwha Vision Co., Ltd

Applicant Address : 6, Pangyo-ro 319Beon-gil, Bundang-gu, Seongnam-si,  
Gyeonggi-do, Republic of Korea

Manufacturer : 1. HANWHA VISION VIETNAM COMPANY LIMITED  
2. D-TECH CO.,LTD.

Manufacturer Address : 1. Lot O-2, Que Vo Industrial Zone extended area,  
Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam  
2. 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi- do,  
Korea (Suwon Industrial Complex)

Equipment authorization : **Supplier's Declaration of Conformity**

Date of Receipt : Mar. 02, 2022

Test date : Mar. 07, 2022 ~ Mar. 11, 2022

Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dong Hyun, Won  
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                                                     |
|---------------|-------------------|----------------------------------------------------------------------|
| Mar. 30, 2022 | KES-EM-22T0285    | Issued                                                               |
| Feb. 24, 2023 | KES-EM-22T0285-R1 | Change the Applicant and manufacturer at the request of the customer |
|               |                   |                                                                      |
|               |                   |                                                                      |
|               |                   |                                                                      |
|               |                   |                                                                      |
|               |                   |                                                                      |
|               |                   |                                                                      |
|               |                   |                                                                      |
|               |                   |                                                                      |

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## 1.0 General Product Description

### Main Specifications of EUT are:

| Display          |                       |                                                                                                                                                                                                                                                                                                      |
|------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analog camera    | Inputs                | 16CH(1Vp-p 75ohm, BNC)                                                                                                                                                                                                                                                                               |
|                  | Signal Type           | - AHD(8MP, 5MP, 4MP, 1080p, 720p)<br>- HDVI(8MP, 5MP, 4MP, 1080p, 720p)<br>- HDCVI(8MP, 5MP, 4MP, 1080p, 720p)<br>- NTSC/PAL                                                                                                                                                                         |
| Network camera   | Inputs                | 2CH (Up to 16CH)                                                                                                                                                                                                                                                                                     |
|                  | Resolution            | 8MP ~ CIF                                                                                                                                                                                                                                                                                            |
|                  | Protocols             | SUNAPI(Wisenet), ONVIF                                                                                                                                                                                                                                                                               |
| Live             | Local Display         | 1x HDMI, 1x VGA (Dual monitor)<br>HDMI: 3840 x 2160, 2560x1440, 1920x1080, 1280x1044,<br>1280x720 (Expand mode 1920x1080)<br>VGA: 1920x1080, 1280x1024, 1280x720 (Expand 1024*768)                                                                                                                   |
|                  | Multi Screen Display  | [Local monitor] Dynamic layout/Sequence,<br>[Web] 1 / 4 / 9 / sequence                                                                                                                                                                                                                               |
|                  | Resolution            | [Analog Camera(NTSC/PAL)]<br>- 8MP(15/12fps), 5MP(20/12fps), 4MP(30/25fps),<br>2MP(30/25fps), 1MP(30/25fps), 960H(or 720H)(30/25fps) *<br>per CH<br>[Network Camera]<br>- Typ. 2MP(480fps)                                                                                                           |
| Performance      |                       |                                                                                                                                                                                                                                                                                                      |
| Operating System | Embedded              | Linux                                                                                                                                                                                                                                                                                                |
| Record           | Compression           | H.265, H.264, MJPEG                                                                                                                                                                                                                                                                                  |
|                  | Record Rate(Analog)   | (Main Stream, NT/PAL) 8M 8/8fps, 5M 12/12fps, 4M<br>15/12fps, 2M 30/25fps, 720p 30/25fps, Under 960H<br>30/25fps/CH<br>(Sub Stream) 720p/CH or Higher : 640x360 Full fps, SD :<br>upto SD Full fps<br>* The maximum recording frame rate depends on the frame<br>rate of the input camera.           |
|                  | Recording Bandwidth   | Max. 128Mbps (H.265-1635)                                                                                                                                                                                                                                                                            |
|                  | Resolution            | 8MP ~ CIF                                                                                                                                                                                                                                                                                            |
|                  | Event Trigger         | Alarm Input<br>Analog Camera : Video Loss, Motion Detection, Tampering<br>Network Camera : Camera Event (Sensor, MD, Video<br>analytics), VA event (Tampering, Enter / Exit, Passing, Virtual-<br>line, (Dis)Appear, Face Detection, Audio detection), Defocus<br>camera event, Dynamic camera event |
|                  | Event Action          | E-mail, PTZ preset, Alarm out, Buzzer, Monitor out                                                                                                                                                                                                                                                   |
| Search & Play    | Playback Bandwidth    | Max. 32Mbps (16CH simultaneously)                                                                                                                                                                                                                                                                    |
|                  | User                  | Max. 4 users (Set 1, Remote 3)                                                                                                                                                                                                                                                                       |
|                  | Simultaneous playback | 16CH(Local Monitor), 16Ch (CMS),<br>4Ch (Wisenet Mobile), 1Ch(Web)                                                                                                                                                                                                                                   |
|                  | Fisheye Dewarping     | WEB / CMS                                                                                                                                                                                                                                                                                            |
|                  | Search Mode           | Date & Time (Calendar) / Event log list / Text search (POS),<br>Back up, Motion, Smart search (Virtual Line w/ direction,<br>Enter / Exit) * All Search Included Preview Function<br>ARB search                                                                                                      |
|                  | Resolution            | 8MP ~ CIF                                                                                                                                                                                                                                                                                            |
| Storage          | Supported HDD         | Up to 6TB                                                                                                                                                                                                                                                                                            |
|                  | HDD Slot              | SATA Bay(Max. 48TB)                                                                                                                                                                                                                                                                                  |
| Backup           | File backup           | BU, EXE(Include Player), AVI(Webviewer only)                                                                                                                                                                                                                                                         |
|                  | Function              | Max. 16 CH play, Date-time/title display                                                                                                                                                                                                                                                             |
| Network          |                       |                                                                                                                                                                                                                                                                                                      |
| Protocol         |                       | TCP/IP, UDP/IP, RTP (UDP), RTP (TCP), RTSP, NTP, HTTP,<br>DHCP (Server, Client), PPPoE, SMTP, ICMP, IGMP, ARP, DNS,<br>DDNS, uPnP, HTTPS, SNMP, ONVIF (Profile-S),<br>SUNAPI(Server, Client)                                                                                                         |
| DDNS             |                       | Wisenet DDNS                                                                                                                                                                                                                                                                                         |

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|                        |                     |                                                                                                                                                                                                                                                                                                |
|------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmission speed     |                     | - 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>* The maximum recording frame rate depends on the frame rate of the input camera. |
| Transmission Bandwidth |                     | Max. 100Mbps                                                                                                                                                                                                                                                                                   |
| Audio                  | Input/Output        | 16 Uline in (RCA 4 Line, Option : Audio Extension Cable) / 1Line line out                                                                                                                                                                                                                      |
|                        | Compression         | G.711 (N/W Cam G.711, 726)                                                                                                                                                                                                                                                                     |
|                        | Audio Communication | 2-Way                                                                                                                                                                                                                                                                                          |
| Max Remote Users       |                     | Search(3), Live Unicast(10), Multicast(20)                                                                                                                                                                                                                                                     |
| Security               |                     | IP address filtering, User access log, 802.1x Authentication, Encryption (ID/PW, Recording, Transmission, Backup)<br>Device Certificate(Hanwha Techwin Root CA)                                                                                                                                |
| Web viewer             | Supported OS        | Windows 10, Mac OS 11 Big Sur and later                                                                                                                                                                                                                                                        |
|                        | Supported browser   | Chrome v99 / Edge v99 /Safari v14.0.3 Higher (2022/03)                                                                                                                                                                                                                                         |
| Viewer Software        |                     | SSM, Webviewer, SmartViewer, Wisenet Mobile Viewer, Wisenet Viewer<br>Support SDK/CGI(SUNAPI) for integration to 3rd party VMS                                                                                                                                                                 |
| <b>Functions</b>       |                     |                                                                                                                                                                                                                                                                                                |
| Camera Setup           | Register            | Auto, Manual                                                                                                                                                                                                                                                                                   |
|                        | Item                | None                                                                                                                                                                                                                                                                                           |
| PTZ                    | Control             | Via GUI, Webviewer, SSM, SmartViewer, Wisenet Mobile Viewer, System Controller                                                                                                                                                                                                                 |
|                        | Preset              | 300 presets                                                                                                                                                                                                                                                                                    |
| Smart phone            | Support Model       | iOS, Android                                                                                                                                                                                                                                                                                   |
|                        | Protocol Support    | RTP, RTSP, HTTP, CGI(SUNAPI)                                                                                                                                                                                                                                                                   |
|                        | Control             | Live(16ch) : Multi-Profile Support<br>Playback(4Ch Multi Playback, Max 2MP)<br>Event push                                                                                                                                                                                                      |
|                        | Max. Remote Users   | Search(3), Live Unicast(10)                                                                                                                                                                                                                                                                    |
| Easy configuration     |                     | Setup Wizard (Language Date/Time, Password, Network, Auto Camera Configuration), P2P (QR code)                                                                                                                                                                                                 |
| Coaxial Control        |                     | CVBS(Pelco-C)/AHD/CVI/TVI                                                                                                                                                                                                                                                                      |
| <b>Interface</b>       |                     |                                                                                                                                                                                                                                                                                                |
| Front                  | Indicator           | LED(Status Indicator) :<br>Power(1), HDD Action(1), Alarm(1), Record(1), Network(1), Backup(1)                                                                                                                                                                                                 |
| Reset                  |                     | Switch(1EA)                                                                                                                                                                                                                                                                                    |
| HDMI                   |                     | 1EA                                                                                                                                                                                                                                                                                            |
| VGA                    |                     | 1EA                                                                                                                                                                                                                                                                                            |
| BNC                    |                     | 16CH In / 1CH Out(Spot Output)                                                                                                                                                                                                                                                                 |
| Ethernet               |                     | RJ-45(10/100/1000BASE-T)                                                                                                                                                                                                                                                                       |
| Alarm                  |                     | In 16EA, Out 4EA<br>- Relay Out1(NO/NC/COM)<br>- Relay Out2~4(NO/COM)                                                                                                                                                                                                                          |
| USB                    |                     | 2EA(Front USB2.0, Rear USB 3.0))                                                                                                                                                                                                                                                               |
| Serial(Protocols)      |                     | RS-485/422 (Samsung-T/Pelco-D/Pelco-p) * for PTZ                                                                                                                                                                                                                                               |
| Power inlet            |                     | 1EA AC ( AC100~240V)                                                                                                                                                                                                                                                                           |
| <b>System</b>          |                     |                                                                                                                                                                                                                                                                                                |
| Log                    | Log List            | Max. 100,000 (System Log, Event Log each), (HRX-1632)                                                                                                                                                                                                                                          |
| System Control         |                     | Mouse, Webviewer, System Controller(SPC-7000, SPC-6000, SPC-2000)                                                                                                                                                                                                                              |
| Language               |                     | English, French, German, Italian, Spanish, Russian, Turkish, Polish, Dutch, Swedish, Czech, Portuguese, Danish, Rumanian, Serbian, Croatian, Hungarian, Greek, Norwegian, Finnish, Korean, Chinese, Japanese, Thai                                                                             |
| <b>Environmental</b>   |                     |                                                                                                                                                                                                                                                                                                |
| Operating Temperature  |                     | 0°C to +40°C(+32°F to +104°F)                                                                                                                                                                                                                                                                  |
| Operating Humidity     |                     | 20% ~ 85% RH                                                                                                                                                                                                                                                                                   |

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|                   |  |                                             |
|-------------------|--|---------------------------------------------|
| Certification     |  | UL, CE, FCC, KC, UKCA                       |
| Electrical        |  |                                             |
| Power Input       |  | 100~240 VAC±10%, 50/60 Hz                   |
| Power Consumption |  | Max. 200W (6T HDD 8ea)                      |
| PoE Budget        |  | None                                        |
| Mechanical        |  |                                             |
| Color / Material  |  | Black / Metal                               |
| Dimension (WxHxD) |  | 440 x 88 x 384.8mm(17.32" x 3.46" x 15.15") |
| Weight            |  | Approx. 5.7Kg (4TB HDD 1ea)                 |

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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.

☒ AC 120 V, 60 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         | HRX-1635     | -             | HANWHA VISION<br>VIETNAM COMPANY<br>LIMITED | EUT     |
| Mouse       | MOKJUO       | -             | Primax Electronics Ltd.                     | -       |
| HDD         | ST2000VX012  | WFM30EFP      | SEAGATE                                     | 2 TB    |

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## 1.5 Support Equipments

| Description                     | Model Number    | Serial Number     | Manufacturer                                  | Remarks |
|---------------------------------|-----------------|-------------------|-----------------------------------------------|---------|
| Notebook                        | P98F004         | 21599158359       | DELL INC.                                     | -       |
| Notebook Adapter                | LA240PM190      | -                 | LITE-ON TECHNOLOGY (CHANGZHOU)CO.,LTD.        | -       |
| Monitor 1                       | SMT-2232        | C95V67VF90002 5B  | WeiHai Daewoo Electronics Co., Ltd.           | -       |
| Monitor 2                       | SMT-2232        | C95V67VF90003 8B  | WeiHai Daewoo Electronics Co., Ltd.           | -       |
| Monitor 3                       | DELL E2222H DVT | 8221TCM10D001 03X | DELL INC.                                     | -       |
| Speaker                         | E5              | -                 | PreSonus®                                     | -       |
| Controller                      | SPC-1010        | C50E67WG10100 F   | SamSung Techwin Co.,Ltd.                      | -       |
| Controller Adapter              | -               | -                 | -                                             | -       |
| Alarm                           | PRO-SL          | -                 | SENSOR PRO                                    | -       |
| ButtonAlarm                     | -               | -                 | -                                             | -       |
| Camera 1                        | SCD-6083RN      | -                 | TB-eye Ltd.                                   | -       |
| Camera 1 Adapter                | KP-1220         | JH10099-15001     | KEPCO                                         | -       |
| Camera 2                        | HCV-6070R       | -                 | HANWHA VISION VIETNAM COMPANY LIMITED         | -       |
| Camera 2 Adapter                | DAD12050DKA     | KTLSA10022-8001   | Dream Electronics Inc.                        | -       |
| NETWORK VIDEO ENCODER 1         | SPE-410         | -                 | HANWHA VISION VIETNAM COMPANY LIMITED         | -       |
| NETWORK VIDEO ENCODER 1 Adapter | 2ACB022F        | -                 | Channel Well Technology (Guangzhou) Co., Ltd. | -       |
| NETWORK VIDEO ENCODER 2         | SPE-410         | -                 | HANWHA VISION VIETNAM COMPANY LIMITED         | -       |
| NETWORK VIDEO ENCODER 2 Adapter | 2ACB022F        | -                 | Channel Well Technology (Guangzhou) Co., Ltd. | -       |
| USB Memory                      | -               | -                 | NOVOMATIC                                     | -       |

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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>(EUT) | USB 2.0   | Mouse<br>(EUT)             | USB       | 1.5         | U      |
|              | RJ-45     | Notebook                   | RJ-45     | -           | S      |
|              | AUDIO IN  | Notebook                   | 3.5 mm    | 1.6         | U      |
|              | AUDIO IN  | Notebook                   | 3.5 mm    | 1.6         | U      |
|              | SPOT      | Monitor 1                  | BNC       | 3.5         | S      |
|              | D-SUB     | Monitor 2                  | D-SUB     | 1.8         | S      |
|              | HDMI      | Monitor 3                  | HDMI      | 2.0         | S      |
|              | AUDIO OUT | Speaker                    | RCA       | 2.8         | U      |
|              | RS-485    | Controller                 | RS-485    | 4.0         | U      |
|              | Alarm OUT | Alarm                      | Alarm IN  | 3.0         | U      |
|              | Alarm IN  | ButtonAlarm                | Alarm OUT | 3.0         | U      |
|              | BNC       | NETWORK VIDEO<br>ENCODER 1 | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       | NETWORK VIDEO<br>ENCODER 2 | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |
|              | BNC       |                            | BNC       | 10.0        | U      |

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| Start                   |          | END                             |          | Cable Spec. |        |
|-------------------------|----------|---------------------------------|----------|-------------|--------|
| Description             | I/O Port | Description                     | I/O Port | Length      | Shield |
| DVR (EUT)               | BNC      | NETWORK VIDEO ENCODER 2         | BNC      | 10.0        | U      |
|                         | USB 3.0  | USB Memory                      | USB      | -           | -      |
| NETWORK VIDEO ENCODER 1 | BNC      | Camera 1                        | BNC      | 1.6         | U      |
| NETWORK VIDEO ENCODER 2 | BNC      | Camera 2                        | BNC      | 1.5         | U      |
| Notebook                | DC Jack  | Notebook Adapter                | DC Jack  | 2.2         | S      |
| Controller              | DC Jack  | Controller Adapter              | DC Jack  | 1.8         | U      |
| NETWORK VIDEO ENCODER 1 | 2 Pin    | NETWORK VIDEO ENCODER 1 Adapter | 2 Pin    | 2.0         | U      |
| NETWORK VIDEO ENCODER 2 | 2 Pin    | NETWORK VIDEO ENCODER 2 Adapter | 2 Pin    | 2.0         | U      |
| Camera 1                | 2 Pin    | Camera 1 Adapter                | 2 Pin    | 1.8         | U      |
| Camera 2                | 2 Pin    | Camera 2 Adapter                | 2 Pin    | 2.0         | U      |

\* Unshielded=U, Shielded=S

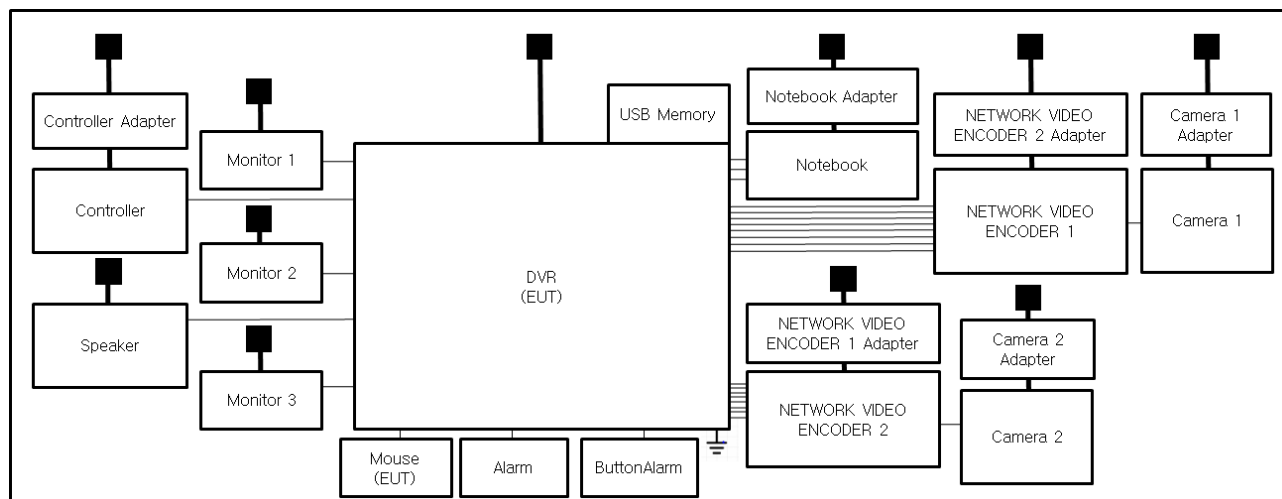
## 1.7 EUT Operating Mode(s)

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

| EUT Test operating S/W |         |                        |
|------------------------|---------|------------------------|
| Name                   | Version | Manufacture Company    |
| Web Viewer             | -       | Hanwha Vision 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, Republic of. The sites are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-4:2019

## 1.12 Laboratory Accreditations and Listings

| Country       | Agency  | Scope of Accreditation                                                                                                                  | Logo                                                                                                                           |
|---------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| KOREA         | RRA     | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>KR0100                                  |
| International | KOLAS   | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>KT489                                 |
| USA           | FCC     | 3 m & 10 m Semi-Anechoic Chamber<br>Conducted test site to perform FCC Part 15/18 measurements.                                         | <br>KR0100                                |
| Canada        | ISED    | 3 m & 10 m Semi-Anechoic Chamber and Conducted test site                                                                                | <br>23298                                 |
| JAPAN         | VCCI    | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)                                                                          | <br>C-20136, T-20137,<br>R-20181, G-20176 |
| Europe        | TÜV SÜD | EMI (3 m & 10 m Semi-Anechoic Chamber and conducted test site)<br>EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions) | <br>CARAT 001633 0004                     |

## 2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ **47 CFR Part 15, Subpart B**

☐ CISPR 22:2009 +A1:2010

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B

☒ **IC Regulation ICES-003 Issue 7**

☐ CAN/CSA-CISPR 32:17

☐ Class A

☐ Class B

☒ ANSI C63.4a-2017

☒ Class A

☐ Class B



## 2.1 Conducted Emissions at Mains Power Ports

### Test Date

Mar. 07, 2022

### 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        | 101783        | 12, 28, 2022 |
| <input checked="" type="checkbox"/> | LISN              | ENV216       | R & S        | 101787        | 12, 27, 2022 |
| <input checked="" type="checkbox"/> | LISN              | ESH2-Z5      | R & S        | 100450        | 12, 27, 2022 |
| <input checked="" type="checkbox"/> | PULSE LIMITER     | ESH3-Z2      | R & S        | 101915        | 12, 27, 2022 |

### Test Conditions

Temperature: (23,4 ± 0,1) °C

Relative Humidity: (43,5 ± 0,1) % 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 Radiated Electric Field Emissions(Below 1 GHz)

### Test Date

Mar. 07, 2022

### 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, 01, 2022 |
| <input checked="" type="checkbox"/> | AMPLIFIER                | SCU 01       | R & S            | 100603        | 11, 24, 2022 |
| <input checked="" type="checkbox"/> | TRILOG-BROADBAND ANTENNA | VULB9163     | Schwarzbeck      | 715           | 12, 08, 2022 |
| <input checked="" type="checkbox"/> | ATTENUATOR               | 8491A        | HP               | 32173         | 03, 08, 2023 |

### Test Conditions

Temperature: (23,7 ± 0,2) °C

Relative Humidity: (43,7 ± 0,1) % 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.

**KES Co., Ltd.**

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

**Test Date**

Mar. 08, 2022

**Test Location**

SEMI ANECHOIC CHAMBER #5

**Test Equipment**

| Used                                | Description       | Model Number | Manufacturer     | Serial Number | Cal. Due     |
|-------------------------------------|-------------------|--------------|------------------|---------------|--------------|
| <input checked="" type="checkbox"/> | EMI Test S/W      | EP5/RE       | TOYO Corporation | 6.0.120       | -            |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER | ESU26        | Rohde & Schwarz  | 100552        | 04, 01, 2022 |
| <input checked="" type="checkbox"/> | HORN ANTENNA      | BBHA 9120D   | SCHWARZBECK      | 9120D-1802    | 12, 16, 2022 |
| <input checked="" type="checkbox"/> | PREAMPLIFIER      | 8449B        | HP               | 3008A00538    | 06, 21, 2022 |

**Test Conditions**

Temperature: (23,2 ± 0,2) °C

Relative Humidity: (43,1 ± 0,1) % R.H.

**Frequency Range of Measurement**

1 GHz to 5 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.

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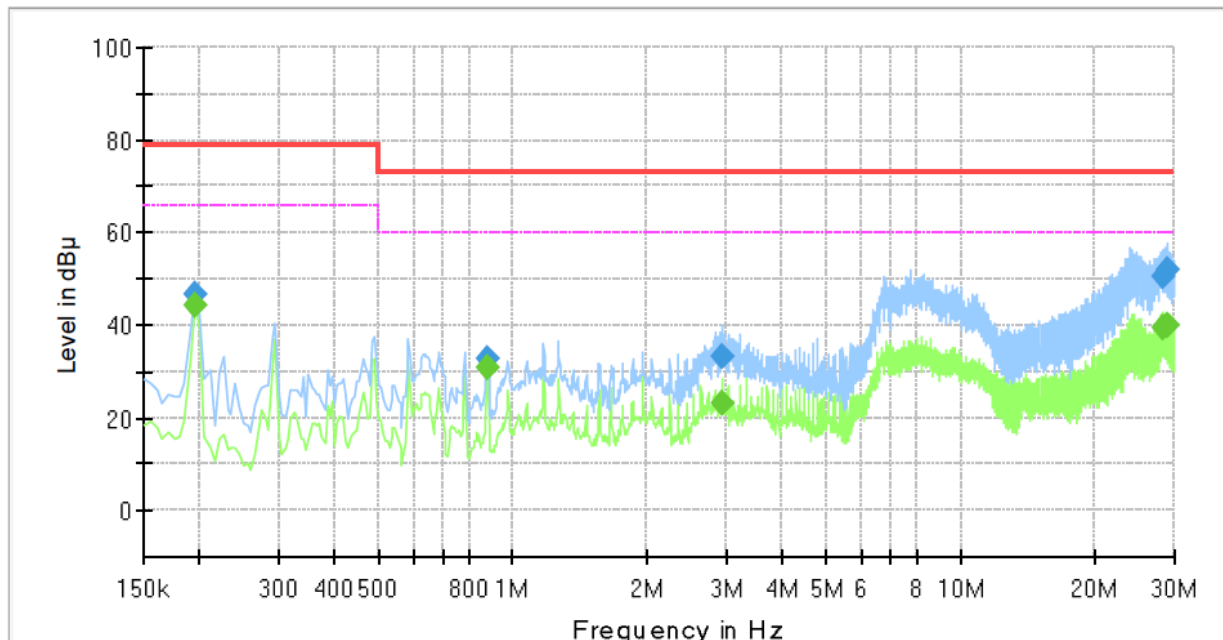
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## APPENDIX A – TEST DATA

### Conducted Emissions at Mains Power Ports HOT LINE

#### Common Information

|                   |                    |
|-------------------|--------------------|
| Test Description: | Conducted Emission |
| Model No.:        | HRX-1635           |
| 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) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.195000        | ---              | 44.07           | 66.00        | 21.93       | 1000.0          | 9.000           | L1   | 19.4       |
| 0.195000        | 46.62            | ---             | 79.00        | 32.38       | 1000.0          | 9.000           | L1   | 19.4       |
| 0.880000        | ---              | 31.00           | 60.00        | 29.00       | 1000.0          | 9.000           | L1   | 20.1       |
| 0.880000        | 32.74            | ---             | 73.00        | 40.26       | 1000.0          | 9.000           | L1   | 20.1       |
| 2.945000        | ---              | 23.34           | 60.00        | 36.66       | 1000.0          | 9.000           | L1   | 20.2       |
| 2.945000        | 33.26            | ---             | 73.00        | 39.74       | 1000.0          | 9.000           | L1   | 20.2       |
| 28.280000       | ---              | 39.60           | 60.00        | 20.40       | 1000.0          | 9.000           | L1   | 20.3       |
| 28.280000       | 50.64            | ---             | 73.00        | 22.36       | 1000.0          | 9.000           | L1   | 20.3       |
| 28.850000       | ---              | 39.81           | 60.00        | 20.19       | 1000.0          | 9.000           | L1   | 20.3       |
| 28.850000       | 51.76            | ---             | 73.00        | 21.24       | 1000.0          | 9.000           | L1   | 20.3       |

**NEUTRAL LINE****Common Information**

Test Description:

Model No.:

Phase:

Mode:

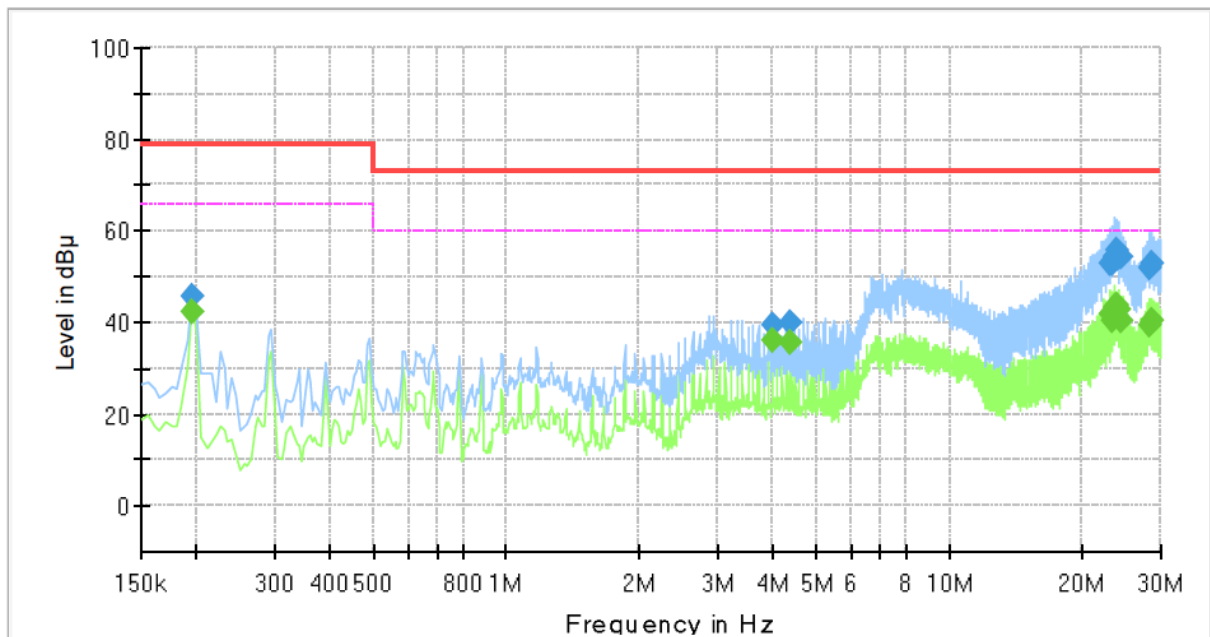
Operator Name:

Conducted Emission

HRX-1635

N

KES



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Report No.:

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## Final Result

| Frequency<br>(MHz) | QuasiPeak<br>(dBμV) | CAverage<br>(dBμV) | Limit<br>(dBμV) | Margin<br>(dB) | Meas.<br>Time<br>(ms) | Bandwidth<br>(kHz) | Line | Corr.<br>(dB) |
|--------------------|---------------------|--------------------|-----------------|----------------|-----------------------|--------------------|------|---------------|
| 0.195000           | 45.64               | ---                | 79.00           | 33.36          | 1000.0                | 9.000              | N    | 19.4          |
| 0.195000           | ---                 | 42.19              | 66.00           | 23.81          | 1000.0                | 9.000              | N    | 19.4          |
| 4.000000           | 39.44               | ---                | 73.00           | 33.56          | 1000.0                | 9.000              | N    | 19.9          |
| 4.000000           | ---                 | 35.94              | 60.00           | 24.06          | 1000.0                | 9.000              | N    | 19.9          |
| 4.390000           | 39.72               | ---                | 73.00           | 33.28          | 1000.0                | 9.000              | N    | 19.8          |
| 4.390000           | ---                 | 35.76              | 60.00           | 24.24          | 1000.0                | 9.000              | N    | 19.8          |
| 23.020000          | 53.09               | ---                | 73.00           | 19.91          | 1000.0                | 9.000              | N    | 20.1          |
| 23.020000          | ---                 | 41.78              | 60.00           | 18.22          | 1000.0                | 9.000              | N    | 20.1          |
| 23.340000          | 52.78               | ---                | 73.00           | 20.22          | 1000.0                | 9.000              | N    | 20.1          |
| 23.340000          | ---                 | 40.43              | 60.00           | 19.57          | 1000.0                | 9.000              | N    | 20.1          |
| 23.510000          | ---                 | 43.03              | 60.00           | 16.97          | 1000.0                | 9.000              | N    | 20.1          |
| 23.510000          | 54.30               | ---                | 73.00           | 18.70          | 1000.0                | 9.000              | N    | 20.1          |
| 23.610000          | ---                 | 43.21              | 60.00           | 16.79          | 1000.0                | 9.000              | N    | 20.1          |
| 23.610000          | 54.30               | ---                | 73.00           | 18.70          | 1000.0                | 9.000              | N    | 20.1          |
| 23.990000          | ---                 | 43.65              | 60.00           | 16.35          | 1000.0                | 9.000              | N    | 20.1          |
| 23.990000          | 55.76               | ---                | 73.00           | 17.24          | 1000.0                | 9.000              | N    | 20.1          |
| 24.190000          | ---                 | 42.96              | 60.00           | 17.04          | 1000.0                | 9.000              | N    | 20.1          |
| 24.190000          | 54.44               | ---                | 73.00           | 18.56          | 1000.0                | 9.000              | N    | 20.1          |
| 24.405000          | ---                 | 40.33              | 60.00           | 19.67          | 1000.0                | 9.000              | N    | 20.1          |
| 24.405000          | 54.45               | ---                | 73.00           | 18.55          | 1000.0                | 9.000              | N    | 20.1          |
| 28.435000          | ---                 | 39.60              | 60.00           | 20.40          | 1000.0                | 9.000              | N    | 20.3          |
| 28.435000          | 51.80               | ---                | 73.00           | 21.20          | 1000.0                | 9.000              | N    | 20.3          |
| 28.710000          | ---                 | 40.52              | 60.00           | 19.48          | 1000.0                | 9.000              | N    | 20.3          |
| 28.710000          | 53.13               | ---                | 73.00           | 19.87          | 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.

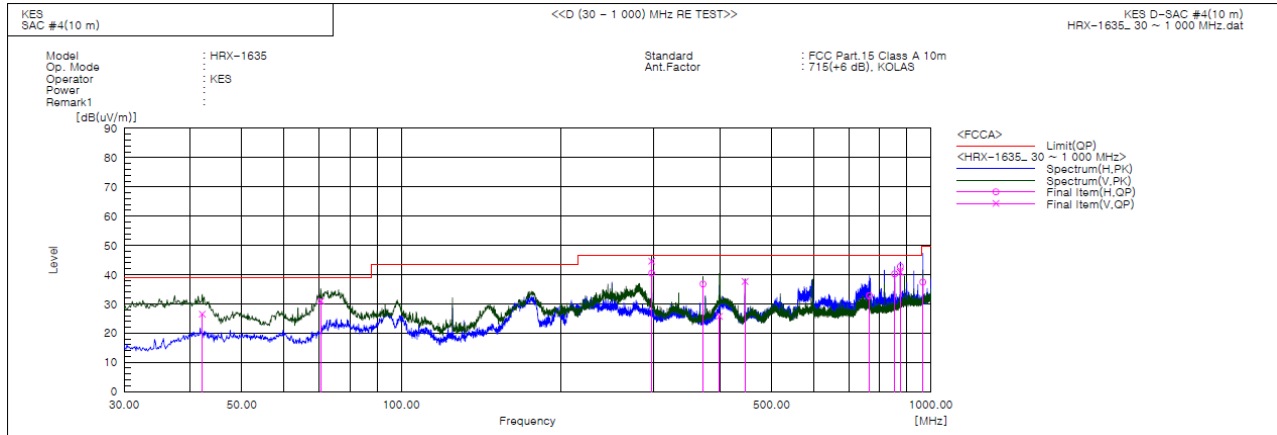
Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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## Radiated Electric Field Emissions(Below 1 GHz)

- 47 CFR Part 15, Subpart B



### Final Result

| No. | Frequency<br>[MHz] | (P) | Reading<br>QP<br>[dB(uV)] | c.f<br>[dB(1/m)] | Result<br>QP<br>[dB(uV/m)] | Limit<br>QP<br>[dB(uV/m)] | Margin<br>QP<br>[dB] | Height<br>[cm] | Angle<br>[deg] | Remark |
|-----|--------------------|-----|---------------------------|------------------|----------------------------|---------------------------|----------------------|----------------|----------------|--------|
| 1   | 42.125             | V   | 48.4                      | -21.9            | 26.5                       | 39.0                      | 12.5                 | 150.0          | 233.0          |        |
| 2   | 70.498             | V   | 56.1                      | -25.1            | 31.0                       | 39.0                      | 8.0                  | 148.0          | 101.0          |        |
| 3   | 296.993            | H   | 58.6                      | -18.1            | 40.5                       | 46.5                      | 6.0                  | 400.0          | 206.0          |        |
| 4   | 297.012            | V   | 62.7                      | -18.1            | 44.6                       | 46.5                      | 1.9                  | 100.0          | 177.0          |        |
| 5   | 371.319            | H   | 51.7                      | -14.9            | 36.8                       | 46.5                      | 9.7                  | 269.0          | 187.0          |        |
| 6   | 398.721            | V   | 40.0                      | -14.2            | 25.8                       | 46.5                      | 20.7                 | 156.0          | 66.0           |        |
| 7   | 445.524            | V   | 50.9                      | -13.2            | 37.7                       | 46.5                      | 8.8                  | 112.0          | 196.0          |        |
| 8   | 765.381            | H   | 39.3                      | -6.5             | 32.8                       | 46.5                      | 13.7                 | 298.0          | 9.0            |        |
| 9   | 853.894            | H   | 45.6                      | -5.4             | 40.2                       | 46.5                      | 6.3                  | 400.0          | 29.0           |        |
| 10  | 874.991            | V   | 45.4                      | -4.6             | 40.8                       | 46.5                      | 5.7                  | 108.0          | 215.0          |        |
| 11  | 875.113            | H   | 47.4                      | -4.6             | 42.8                       | 46.5                      | 3.7                  | 392.0          | 32.0           |        |
| 12  | 965.237            | H   | 40.8                      | -3.4             | 37.4                       | 49.5                      | 12.1                 | 385.0          | 2.0            |        |

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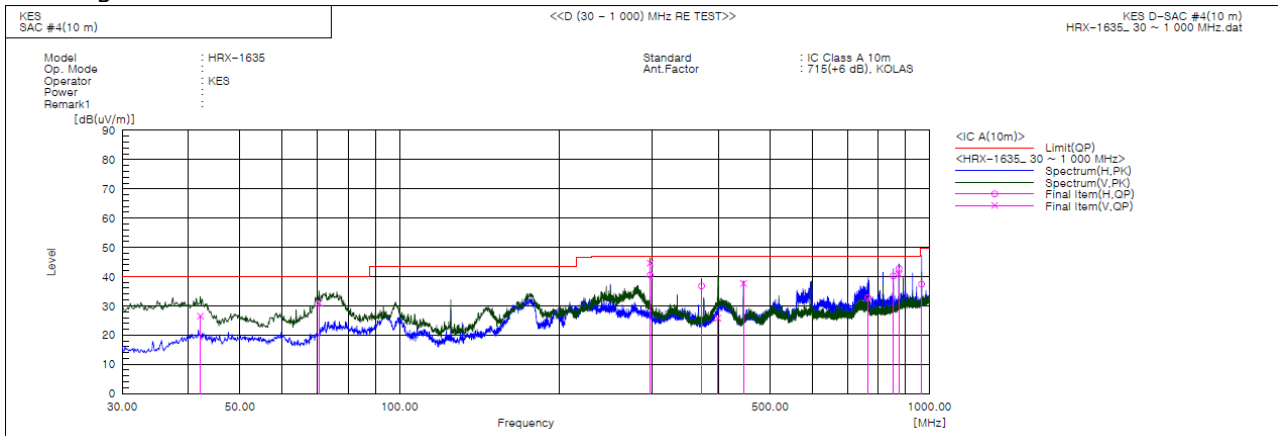
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Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea  
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## - IC Regulation ICES-003 Issue 7



### 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   | 42.125          | V   | 48.4                | -21.9         | 26.5                 | 40.0                | 13.5           | 150.0       | 233.0       |        |
| 2   | 70.498          | V   | 56.1                | -25.1         | 31.0                 | 40.0                | 9.0            | 148.0       | 101.0       |        |
| 3   | 296.993         | H   | 58.6                | -18.1         | 40.5                 | 47.0                | 6.5            | 400.0       | 206.0       |        |
| 4   | 297.012         | V   | 62.7                | -18.1         | 44.6                 | 47.0                | 2.4            | 100.0       | 177.0       |        |
| 5   | 371.319         | H   | 51.7                | -14.9         | 36.8                 | 47.0                | 10.2           | 269.0       | 187.0       |        |
| 6   | 398.721         | V   | 40.0                | -14.2         | 25.8                 | 47.0                | 21.2           | 156.0       | 66.0        |        |
| 7   | 445.524         | V   | 50.9                | -13.2         | 37.7                 | 47.0                | 9.3            | 112.0       | 196.0       |        |
| 8   | 765.381         | H   | 39.3                | -6.5          | 32.8                 | 47.0                | 14.2           | 298.0       | 9.0         |        |
| 9   | 853.894         | H   | 45.6                | -5.4          | 40.2                 | 47.0                | 6.8            | 400.0       | 29.0        |        |
| 10  | 874.991         | V   | 45.4                | -4.6          | 40.8                 | 47.0                | 6.2            | 108.0       | 215.0       |        |
| 11  | 875.113         | H   | 47.4                | -4.6          | 42.8                 | 47.0                | 4.2            | 392.0       | 32.0        |        |
| 12  | 965.237         | H   | 40.8                | -3.4          | 37.4                 | 49.5                | 12.1           | 385.0       | 2.0         |        |

### ◆ Calculation - SAC #4(10 m)

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

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

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

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

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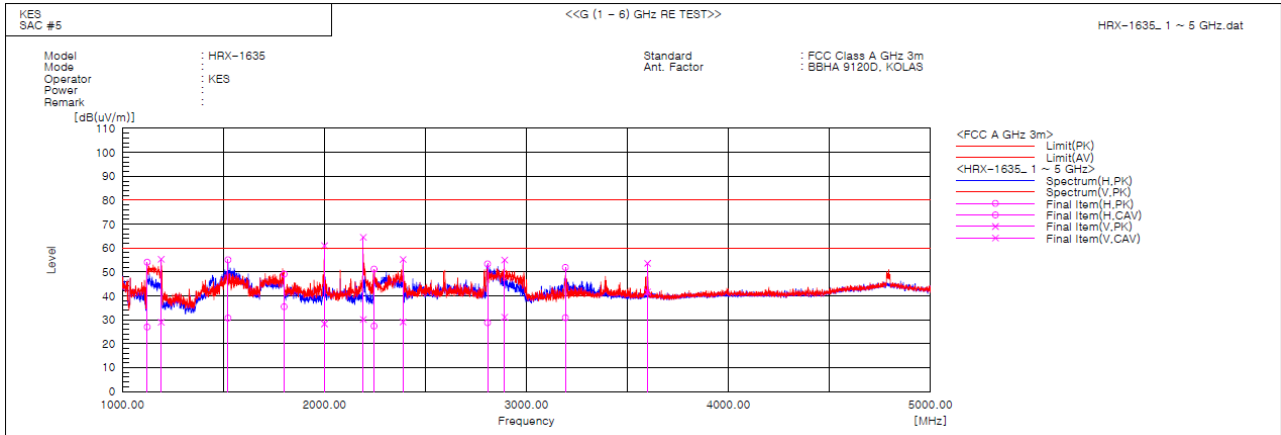
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### Radiated Electric Field Emissions(Above 1 GHz)



#### ◆ Calculation

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

Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/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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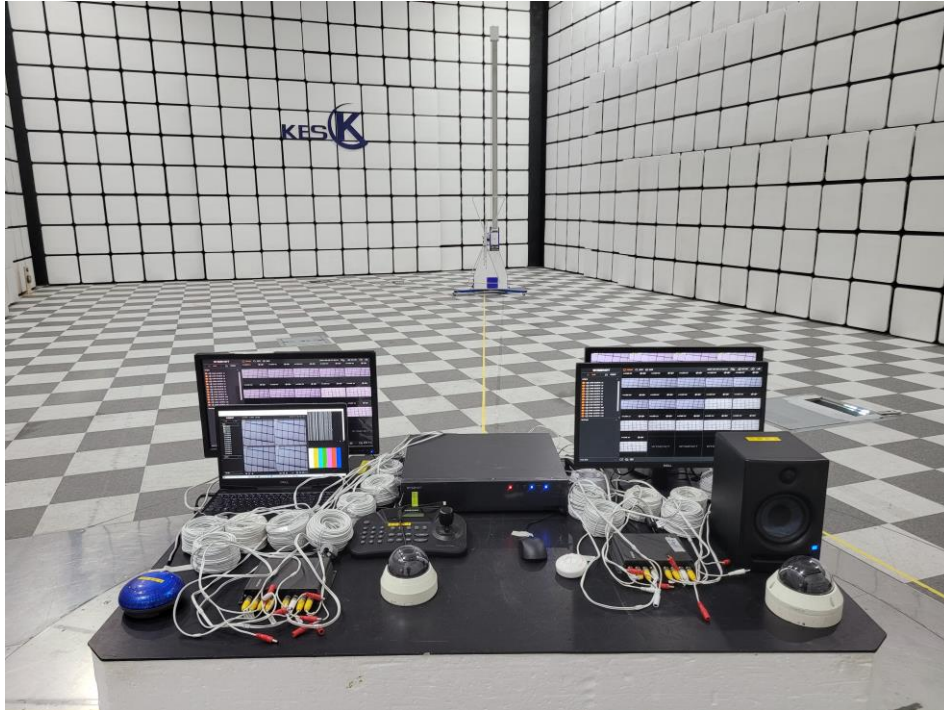
## Test Setup Photos and Configuration

### Conducted Emissions at Mains Power Ports



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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)



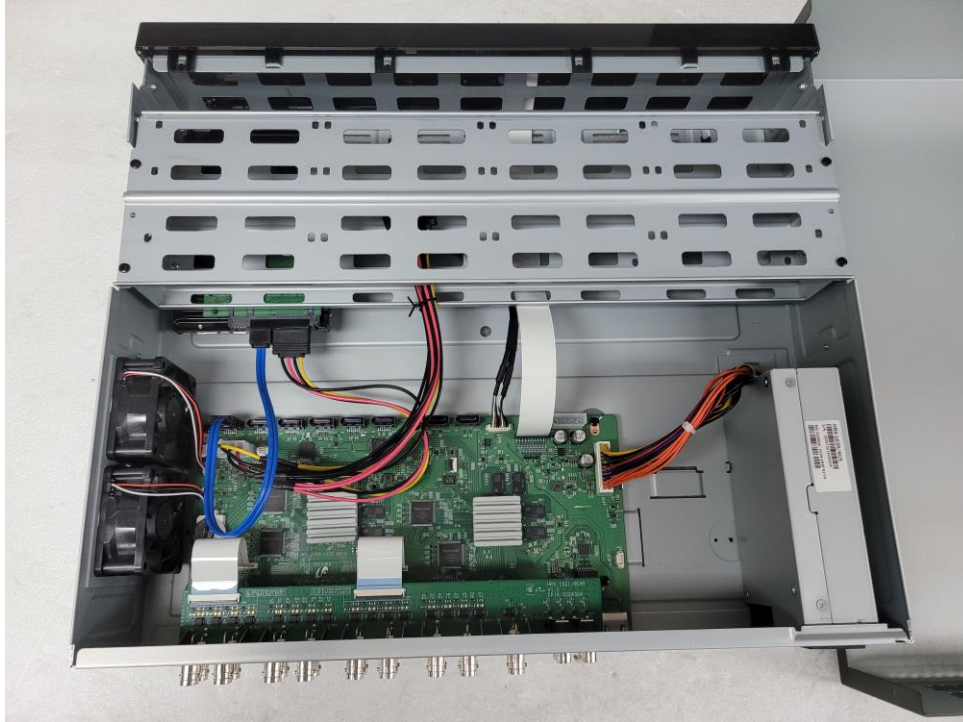
(Bottom)



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## **EUT Internal Photographs**

(Internal View)



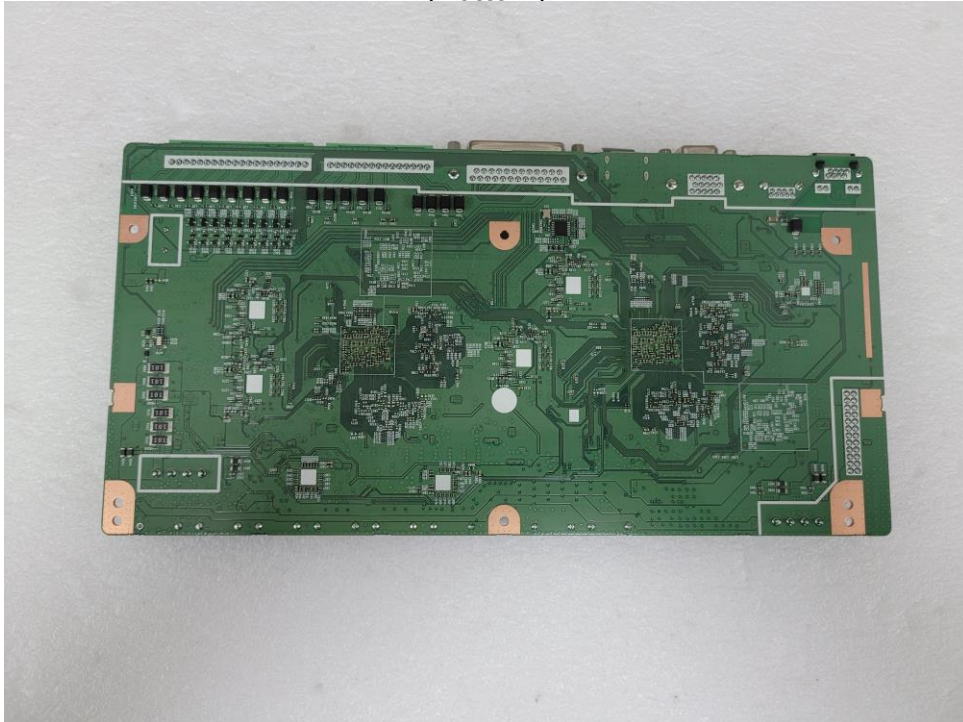
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## EUT Internal View – Main Board

(Top)



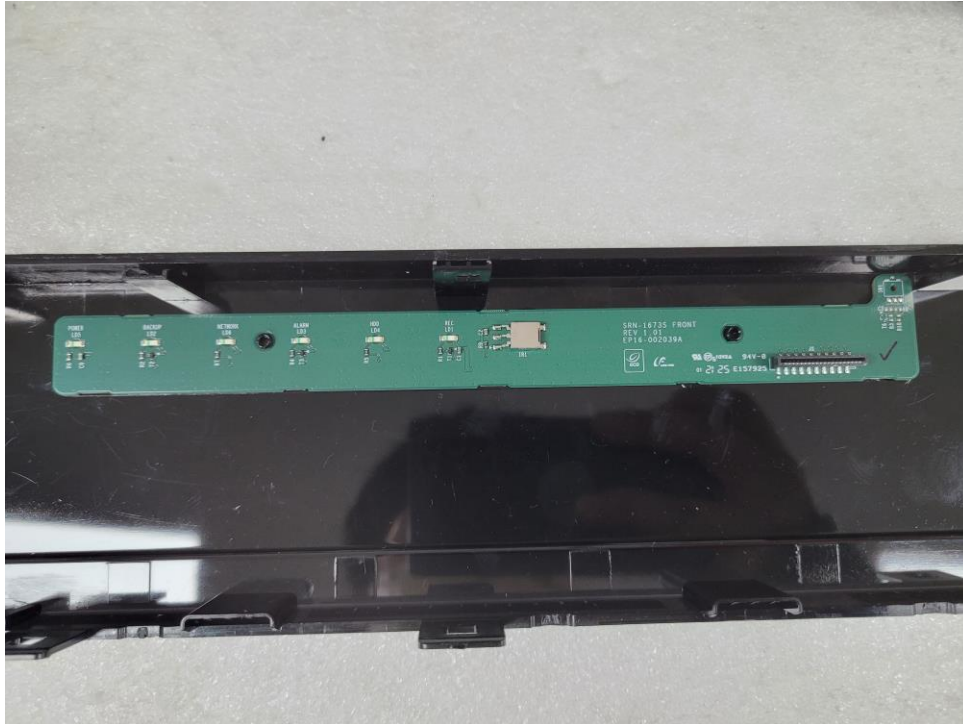
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## EUT Internal View – LED Board

(Top)

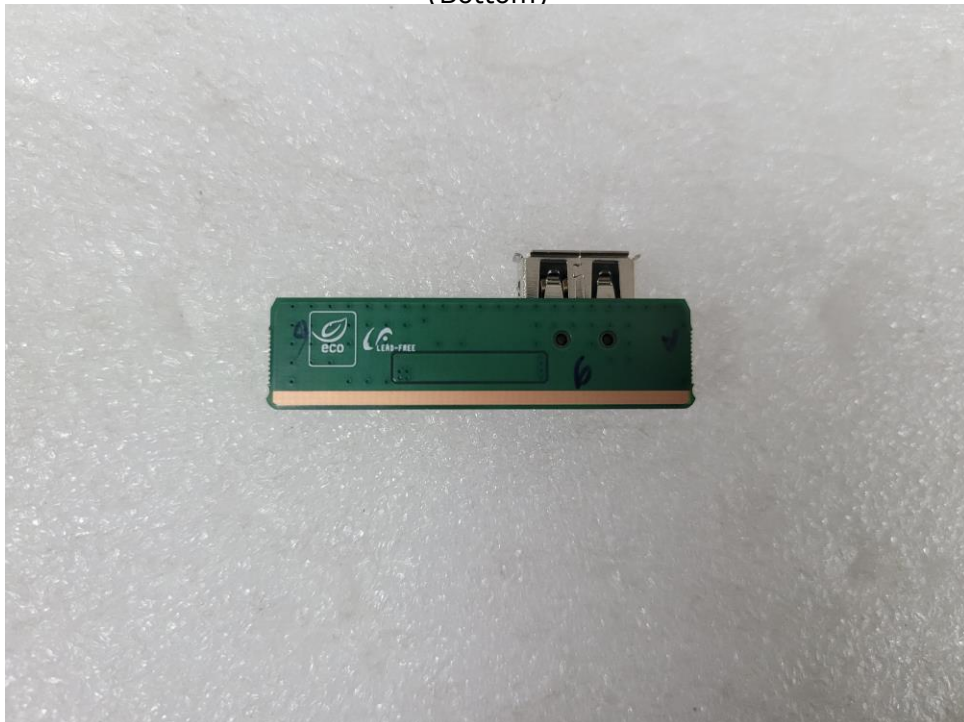


## EUT Internal View – USB Port Board

(Top)



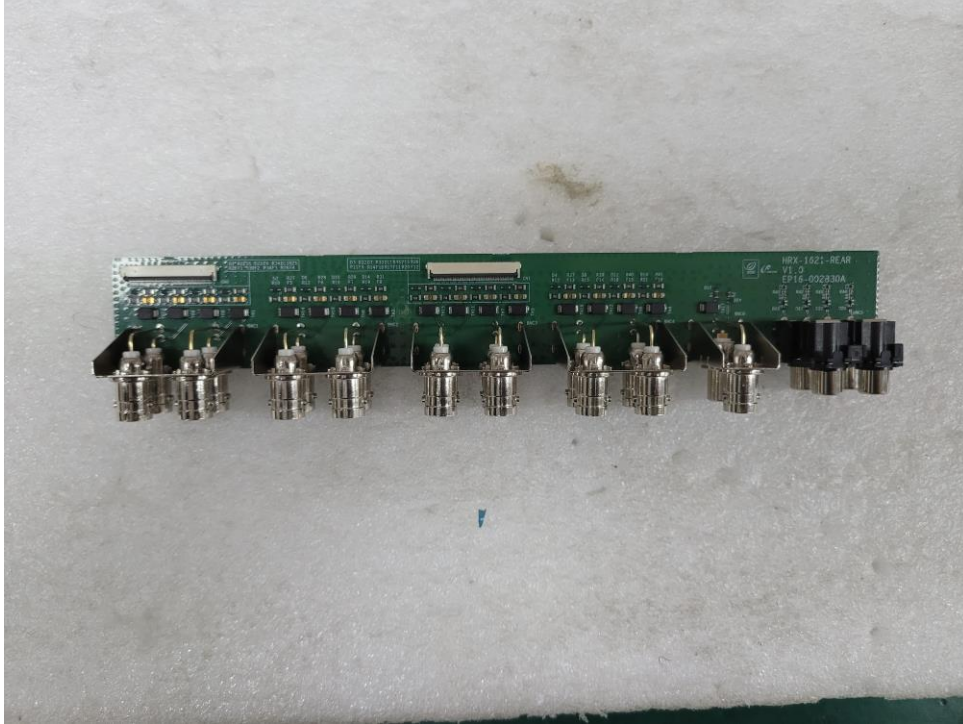
(Bottom)



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**EUT Internal View – Port Board**

(Top)

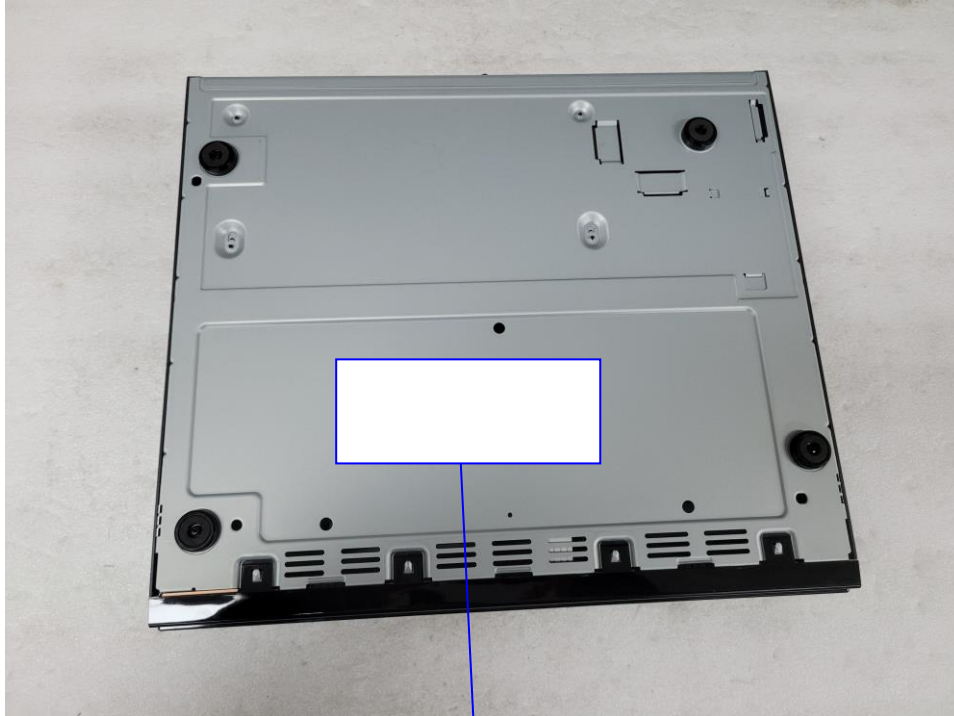


(Bottom)



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## Label Photographs



CAN ICES-3(A) / NMB-3(A)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.