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<http://www.ltalab.com>

## EMC TEST REPORT

Dates of Tests: January 13 - 17, 2020

Test Report S/N: LR500122001T

Test Site : LTA Co., Ltd.

Model No.

**QRN-1620S**

APPLICANT

**Hanwha Techwin Co., Ltd.**

**Equipment Name** : NVR  
**Manufacturer** : Hanwha Techwin(Tianjin) Co., Ltd.  
**Model name** : QRN-1620S  
**Test Device Serial No.:** : Identification  
**Rule Part(s)** : AS/NZS CISPR 32:2015  
CISPR 32 Ed2.0

**Date of issue** : January 20, 2020

This test report is issued under the authority of:

Young Kyu Shin, Technical Manager

The test was supervised by:

Jun Hwan Park, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.



## Revision history

| Revision | Date of issue | Test report No. | Description |
|----------|---------------|-----------------|-------------|
| 0        | 20.01.2020    | LR500112001T    | Initial     |

**TABLE OF CONTENTS**

1. General information’s .....4

2. Information’s about test item .....5

3. Test Report .....8

4. Test Items .....9

    4-1 Conducted disturbance .....9

    4-2 Radiated disturbance .....15

APPENDIX A TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS.....20

APPENDIX B PHOTOGRAPHS .....22

## 1. General information's

### 1-1 Test Performed

Company name : **LTA Co., Ltd**  
 Address : 4, Songju-ro 236beon-gil, Yangji-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do, 17159, Korea  
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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the “General requirements for the competents of calibration and testing laboratory”.

### 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

| Agency | Country | Accreditation No. | Validity   | Reference             |
|--------|---------|-------------------|------------|-----------------------|
| NVLAP  | U.S.A   | 200723-0          | 2020-09-30 | ECT accredited Lab.   |
| RRA    | KOREA   | KR0049            | -          | EMC accredited Lab.   |
| FCC    | U.S.A   | 649054            | 2021-04-11 | FCC CAB               |
| VCCI   | JAPAN   | C-4948,           | 2020-09-10 | VCCI registration     |
|        |         | T-2416,           | 2020-09-10 |                       |
|        |         | R-4483(10 m),     | 2020-10-15 |                       |
|        |         | G-10847           | 2022-06-13 |                       |
| IC     | CANADA  | 5799A             | 2021-06-16 | IC filing             |
| KOLAS  | KOREA   | NO.KT551          | 2021-08-20 | KOLAS accredited Lab. |

## 2. Information's about test item

### 2-1 Client / Manufacturer

Company name : Hanwha Techwin Co., Ltd.  
Address : 6, Pangyo-ro 319beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do  
Telephone /Facsimile : +82-70-7147-8361 / -

### Factory #1

Company name : Hanwha Techwin(Tianjin) Co., Ltd.  
Address : No.11 Weiliu Rd, Micro-Electronic Industrial Park, TEDA, Tianjin, 300385, People's Republic of China

### Factory #2

Company name : HANWHA TECHWIN SECURITY VIETNAM CO.,LTD.  
Address : Lot O-2, Que Vo Industrial Zone extended area ,Nam Son commune, Bac Ninh city, Bac Ninh province, Vietnam

### Factory #3

Company name : D-TECH CO.,LTD.  
Address : 173-25, Saneop-ro, Gwonseon-gu, Suwon-si, Gyeonggi-do, Korea (Suwon Industrial Complex)

### 2-2 Equipment Under Test (EUT)

Class : A  
Category : NVR  
Model name : QRN-1620S  
Serial number : Identification  
Date of receipt : December 30, 2019  
EUT condition : Pre-production, not damaged  
Interface Ports : DC IN, GND, VIWER, HDMI, VGA, USB, PoE CAMERA, HDD, ALARM IN, ALARM OUT, AUDIO OUT  
Power rating : AC 240 V, 50 Hz

### 2-3 Modification

- NONE

### 2-4 Test conditions

Temp. / Humid. / Pressure : (21 - 22) °C / (36 - 38) % R.H.  
Tested Model : QRN-1620S  
Test mode : REC mode  
Test Voltage : AC 240 V, 50 Hz

**2-5 EUT**

| Equipment         | Model No. | Serial No. | Manufacturer                                                                                        |
|-------------------|-----------|------------|-----------------------------------------------------------------------------------------------------|
| NVR               | QRN-1620S | N/A        | Hanwha Techwin(Tianjin) Co., Ltd.<br>HANWHA TECHWIN SECURITY<br>VIETNAM CO.,LTD.<br>D-TECH CO.,LTD. |
| Mouse             | MOKJUO    | N/A        | Primax Electronics Ltd.                                                                             |
| Remote Controller | N/A       | N/A        | N/A                                                                                                 |

**2-6 Accessary**

| Equipment            | Model No.        | Serial No.       | Manufacturer                                    |
|----------------------|------------------|------------------|-------------------------------------------------|
| Notebook             | P56              | N/A              | HANSUNG                                         |
| Notebook Adapter     | A10-090P3A       | N/A              | Chicony                                         |
| Network Camera       | QNV-6032R        | N/A              | HANWHA TECHWIN(TIANJIN) CO., LTD                |
| Smart Phone          | IM-A900S         | N/A              | PANTECH                                         |
| Monitor #1           | 24MA53D          | N/A              | LG                                              |
| Monitor #1 Adapter   | A11-120P1A       | N/A              | Chicony                                         |
| Monitor #2           | 24BK550YW        | 902NTFA7P563     | LG                                              |
| IP Router #1         | X5007            | N/A              | IPTIME                                          |
| IP Router #1 Adapter | RS-AB02J00-K     | N/A              | Dongguan Jinhua Sheng Power Technology Co., Ltd |
| IP Router #2         | H608             | N/A              | IPTIME                                          |
| IP Router #2 Adapter | DCP015A050600K   | N/A              | ZIONCOM (VIETNAM) Co., LTD                      |
| Speaker              | N/A              | N/A              | N/A                                             |
| Door Sensor          | N/A              | N/A              | N/A                                             |
| Alarm                | DS-360           | N/A              | DMCALL                                          |
| USB Memory Stick     | Ultra Flair CZ73 | N/A              | SanDisk                                         |
| HDD                  | 771945           | WCC4MOLLX<br>NEJ | Western Digital                                 |

**2-7 Cable List**

| From                    |                        | To                   |               | Length<br>(m) | Shielding |           |
|-------------------------|------------------------|----------------------|---------------|---------------|-----------|-----------|
| Type                    | I/O Port               | Type                 | I/O Port      |               | Cable     | backshell |
| EUT                     | AC IN                  | AC Power Source      | 3 Pin AC Line | 1.5           | NO        | Plastic   |
|                         | GND                    | GND                  | -             | 1.0           | NO        | -         |
|                         | VIWER                  | Notebook             | LAN           | 3.0           | YES       | Plastic   |
|                         | HDMI                   | Monitor #1           | HDMI          | 1.5           | YES       | Plastic   |
|                         | VGA                    | Monitor #2           | VGA           | 1.4           | YES       | Plastic   |
|                         | USB #1                 | USB Memory Stick     | -             | -             | -         | Metal     |
|                         | USB #2                 | Mouse                | -             | 1.0           | NO        | Plastic   |
|                         | HDD                    | HDD                  | -             | -             | -         | -         |
|                         | PoE CAMERA #1          | Network Camera       | PoE           | 3.0           | YES       | Plastic   |
|                         | PoE CAMERA #2<br>~ #8  | IP Router #1         | LAN           | 1.0           | YES       | Plastic   |
|                         | PoE CAMERA #9<br>~ #16 | IP Router #2         | LAN           | 1.0           | YES       | Plastic   |
|                         | ALARM IN #1 ~<br>#4    | Door Sensor          | ALARM OUT     | 3.0           | NO        | Plastic   |
|                         | ALARM OUT #1,<br>#2    | Alarm                | ALARM IN      | 3.0           | NO        | Plastic   |
|                         | AUDIO OUT              | Speaker              | AUDIO IN      | 1.0           | NO        | Plastic   |
| Network Camera          | AUDIO IN               | Smart Phone          | AUX           | 1.0           | NO        | Plastic   |
| Remote Controller       | DC IN                  | Battery              | DC OUT        | -             | -         | -         |
| Smart Phone             | DC IN                  | Battery              | DC OUT        | -             | -         | -         |
| Alarm                   | DC IN                  | Battery              | DC OUT        | -             | -         | -         |
| Monitor #1              | DC IN                  | Monitor #1 Adapter   | DC OUT        | 1.4           | NO        | Plastic   |
| Notebook                | DC IN                  | Notebook Adapter     | DC OUT        | 1.3           | NO        | Plastic   |
| IP Router #1            | DC IN                  | IP Router Adapter #1 | DC OUT        | 2.0           | NO        | Plastic   |
| IP Router #2            | DC IN                  | IP Router Adapter #2 | DC OUT        | 1.5           | NO        | Plastic   |
| Monitor #1<br>Adapter   | AC IN                  | AC Power Source      | 3 Pin AC Line | 1.5           | NO        | Plastic   |
| Monitor #2              | AC IN                  | AC Power Source      | 3 Pin AC Line | 1.5           | NO        | Plastic   |
| Notebook Adapter        | AC IN                  | AC Power Source      | 3 Pin AC Line | 1.0           | NO        | Plastic   |
| IP Router #1<br>Adapter | AC IN                  | AC Power Source      | 2 Pin AC Line | -             | -         | -         |
| IP Router #2<br>Adapter | AC IN                  | AC Power Source      | 2 Pin AC Line | -             | -         | -         |

### 3. Test Report

#### 3.1 Summary of tests

| Parameter             | Applied Standard    | Status |
|-----------------------|---------------------|--------|
| <b>I. Emission</b>    |                     |        |
| Conducted disturbance | AS/NZS CISPR32:2015 | C      |
| Radiated disturbance  | AS/NZS CISPR32:2015 | C      |

Note 1: C=Complies    NC=Not Complies    NT=Not Tested    NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

## 4. Test Items

### 4-1 Conducted disturbance

#### Definition:

The test assesses the ability of the EUT to limit its internal noise from being present on the AC mains Power In/Output/Telecommunication ports.

We were performed the test according to LTA procedure LTA-QI-04.

|                             |                       |
|-----------------------------|-----------------------|
| Test method                 | : AS/NZS CISPR32:2015 |
| Measurement Frequency range | : 150 kHz - 30 MHz    |
| Measurement RBW             | : 9 kHz               |
| Test mode                   | : REC mode            |
| Result                      | : <b>Complies</b>     |

#### Measurement Data:

- Refer to the Next page (Maximum emission configuration)

#### A sample calculation:

COR. F (correction factor)= LISN Insertion loss + Cable loss + Pulse Limiter Factor

Emission Level= meter reading + COR.F

#### Limits for conducted disturbance at the mains ports of class A ITE

| Frequency Range  | Quasi-peak | Average |
|------------------|------------|---------|
| (0.15 - 0.5) MHz | 79 dBuV    | 66 dBuV |
| (0.5 – 30) MHz   | 73 dBuV    | 60 dBuV |

Note: The limits will decrease with the frequency logarithmically within 0.15MHz to 0.5MHz

#### Limits for conducted disturbance at the mains ports of class B ITE

| Frequency Range  | Quasi-peak     | Average        |
|------------------|----------------|----------------|
| (0.15 – 0.5) MHz | (66 – 56) dBuV | (56 - 46) dBuV |
| (0.5 – 5) MHz    | 56 dBuV        | 46 dBuV        |
| (5 – 30) MHz     | 60 dBuV        | 50 dBuV        |

Note: The limits will decrease with the frequency logarithmically within 0.15 MHz to 0.5 MHz

**Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15 MHz to 30 MHz for class A equipment**

| Frequency Range  | Voltage limits |                | Current limits |                |
|------------------|----------------|----------------|----------------|----------------|
|                  | Quasi-peak     | Average        | Quasi-peak     | Average        |
| (0.15 - 0.5) MHz | (97 – 87) dBuV | (84 – 74) dBuV | (53 – 43) dBuV | (40 – 30) dBuV |
| (0.5 – 30) MHz   | 87 dBuV        | 74 dBuV        | 43 dBuV        | 30 dBuV        |

Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Note 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of  $150\Omega$  to the telecommunication port under test (conversion factor is  $20 \log_{10} 150/I = 44$  dB)

**Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15 MHz to 30 MHz for class B equipment**

| Frequency Range  | Voltage limits |                | Current limits |                |
|------------------|----------------|----------------|----------------|----------------|
|                  | Quasi-peak     | Average        | Quasi-peak     | Average        |
| (0.15 - 0.5) MHz | (84 – 74) dBuV | (74 – 64) dBuV | (40 – 30) dBuV | (30 – 20) dBuV |
| (0.5 – 30) MHz   | 74 dBuV        | 64 dBuV        | 30 dBuV        | 20 dBuV        |

Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Note 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of  $150\Omega$  to the telecommunication port under test (conversion factor is  $20 \log_{10} 150/I = 44$  dB)

## Conducted emissions (LINE)



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EUT /Model No. : QRN-1620S

Phase : Line

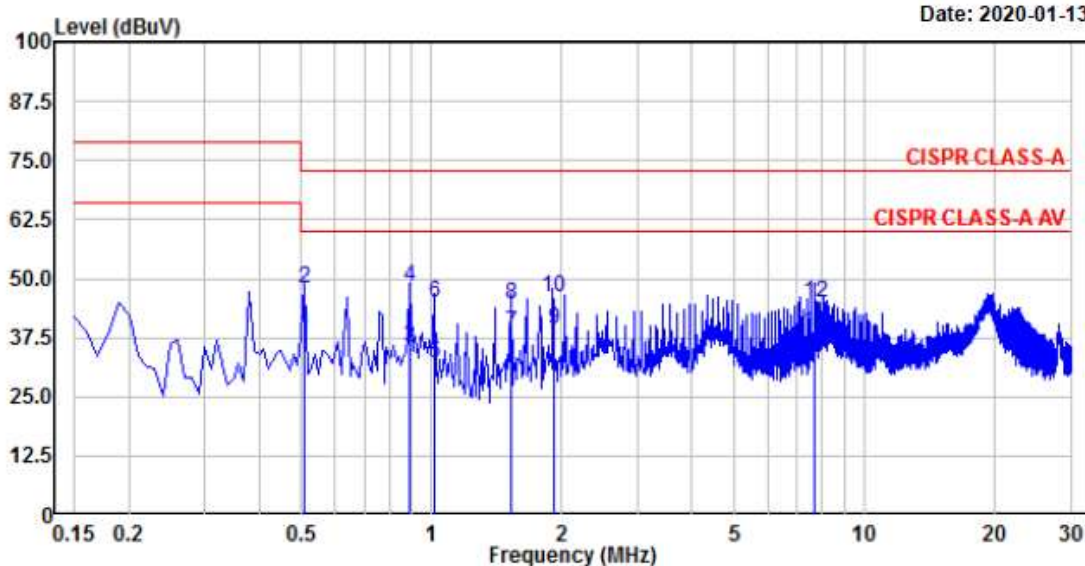
Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 21 'C / 36 % R.H.

Test Engineer : PARK J H

Date: 2020-01-13



| No. | Freq<br>MHz | RD<br>QP<br>dBuV | RD<br>AV<br>dBuV | C.F<br>dB | Result<br>QP<br>dBuV | Result<br>AV<br>dBuV | Limit<br>QP<br>dBuV | Limit<br>AV<br>dBuV | Margin<br>QP<br>dB | Margin<br>AV<br>dB | Phase |
|-----|-------------|------------------|------------------|-----------|----------------------|----------------------|---------------------|---------------------|--------------------|--------------------|-------|
| 2.  | 0.510       | 28.28            | 18.79            | 19.49     | 47.77                | 38.28                | 73.00               | 60.00               | 25.23              | 21.72              | Line  |
| 4.  | 0.892       | 28.63            | 16.04            | 19.53     | 48.16                | 35.57                | 73.00               | 60.00               | 24.84              | 24.43              | Line  |
| 6.  | 1.020       | 25.25            | 12.50            | 19.54     | 44.79                | 32.04                | 73.00               | 60.00               | 28.21              | 27.96              | Line  |
| 8.  | 1.530       | 24.80            | 18.78            | 19.56     | 44.36                | 38.34                | 73.00               | 60.00               | 28.64              | 21.66              | Line  |
| 10. | 1.912       | 26.50            | 19.72            | 19.56     | 46.06                | 39.28                | 73.00               | 60.00               | 26.94              | 20.72              | Line  |
| 12. | 7.649       | 25.05            | 18.79            | 19.79     | 44.84                | 38.58                | 73.00               | 60.00               | 28.16              | 21.42              | Line  |

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

## Conducted emissions (NEUTRAL)



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EUT /Model No. : QRN-1620S

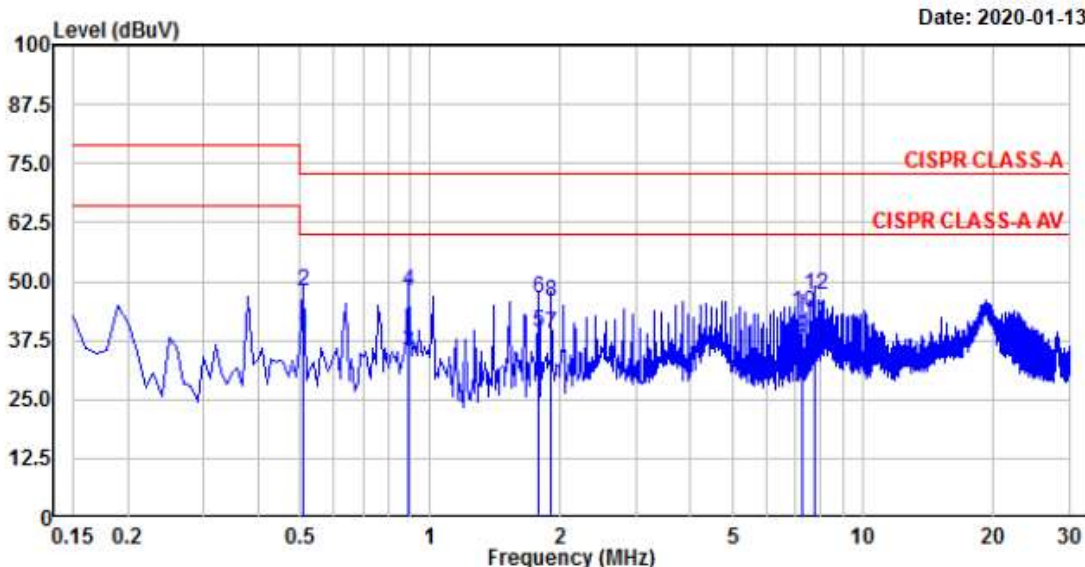
Phase : Neutral

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 21 'C / 36 % R.H.

Test Engineer : PARK J H



| No. | Freq<br>MHz | RD<br>QP<br>dBuV | RD<br>AV<br>dBuV | C.F<br>dB | Result<br>QP<br>dBuV | Result<br>AV<br>dBuV | Limit<br>QP<br>dBuV | Limit<br>AV<br>dBuV | Margin<br>QP<br>dB | Margin<br>AV<br>dB | Phase   |
|-----|-------------|------------------|------------------|-----------|----------------------|----------------------|---------------------|---------------------|--------------------|--------------------|---------|
| 2.  | 0.509       | 28.32            | 18.81            | 19.54     | 47.86                | 38.35                | 73.00               | 60.00               | 25.14              | 21.65              | neutral |
| 4.  | 0.890       | 28.17            | 15.64            | 19.57     | 47.74                | 35.21                | 73.00               | 60.00               | 25.26              | 24.79              | neutral |
| 6.  | 1.782       | 26.92            | 19.66            | 19.60     | 46.52                | 39.26                | 73.00               | 60.00               | 26.48              | 20.74              | neutral |
| 8.  | 1.910       | 26.20            | 19.11            | 19.60     | 45.80                | 38.71                | 73.00               | 60.00               | 27.20              | 21.29              | neutral |
| 10. | 7.262       | 23.65            | 18.25            | 19.80     | 43.45                | 38.05                | 73.00               | 60.00               | 29.55              | 21.95              | neutral |
| 12. | 7.769       | 27.25            | 21.68            | 19.85     | 47.10                | 41.53                | 73.00               | 60.00               | 25.90              | 18.47              | neutral |

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

## Conducted emissions (TEL\_100 M) / PoE CAMERA



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EUT /Model No. : QRN-1620S

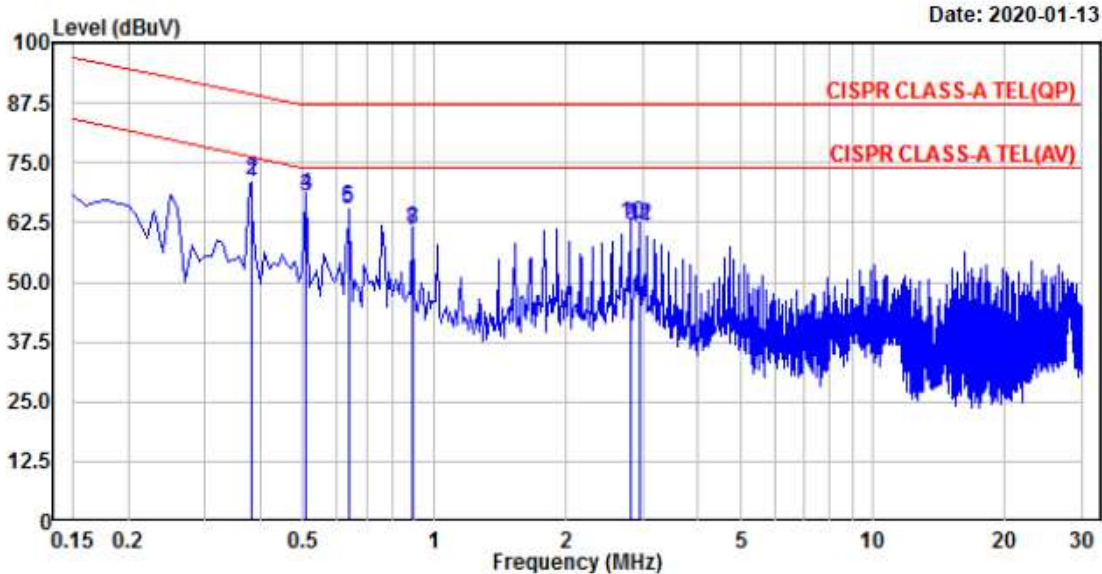
Phase : TEL\_100M(PoE CAMERA)

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 21 °C / 36 % R.H.

Test Engineer : PARK J H



| No. | Freq<br>MHz | RD<br>QP<br>dBuV | RD<br>AV<br>dBuV | C.F<br>dB | Result<br>QP<br>dBuV | Result<br>AV<br>dBuV | Limit<br>QP<br>dBuV | Limit<br>AV<br>dBuV | Margin<br>QP<br>dB | Margin<br>AV<br>dB | Phase |
|-----|-------------|------------------|------------------|-----------|----------------------|----------------------|---------------------|---------------------|--------------------|--------------------|-------|
| 2.  | 0.382       | 51.67            | 51.18            | 19.60     | 71.27                | 70.78                | 89.24               | 76.24               | 17.97              | 5.46               | Line  |
| 4.  | 0.509       | 48.85            | 48.37            | 19.55     | 68.40                | 67.92                | 87.00               | 74.00               | 18.60              | 6.08               | Line  |
| 6.  | 0.636       | 46.10            | 45.65            | 19.52     | 65.62                | 65.17                | 87.00               | 74.00               | 21.38              | 8.83               | Line  |
| 8.  | 0.891       | 41.64            | 41.24            | 19.49     | 61.13                | 60.73                | 87.00               | 74.00               | 25.87              | 13.27              | Line  |
| 10. | 2.801       | 42.94            | 42.33            | 19.41     | 62.35                | 61.74                | 87.00               | 74.00               | 24.65              | 12.26              | Line  |
| 12. | 2.929       | 42.55            | 41.96            | 19.41     | 61.96                | 61.37                | 87.00               | 74.00               | 25.04              | 12.63              | Line  |

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

## Conducted emissions (TEL\_1000 M) / VIEWER



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EUT /Model No. : QRN-1620S

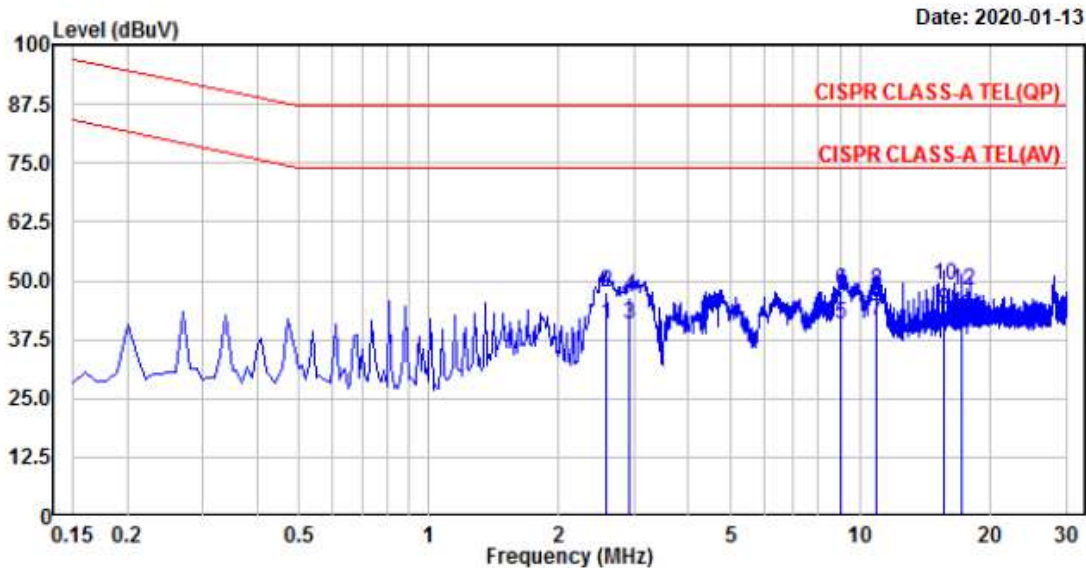
Phase : TEL\_1000M(VIEWER)

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 21 'C / 36 % R.H.

Test Engineer : PARK J H



| No. | Freq<br>MHz | RD<br>QP<br>dBuV | RD<br>AV<br>dBuV | C.F<br>dB | Result<br>QP<br>dBuV | Result<br>AV<br>dBuV | Limit<br>QP<br>dBuV | Limit<br>AV<br>dBuV | Margin<br>QP<br>dB | Margin<br>AV<br>dB | Phase |
|-----|-------------|------------------|------------------|-----------|----------------------|----------------------|---------------------|---------------------|--------------------|--------------------|-------|
| 2.  | 2.570       | 28.28            | 21.54            | 19.35     | 47.63                | 40.89                | 87.00               | 74.00               | 39.37              | 33.11              | Line  |
| 4.  | 2.903       | 26.95            | 21.49            | 19.35     | 46.30                | 40.84                | 87.00               | 74.00               | 40.70              | 33.16              | Line  |
| 6.  | 9.040       | 28.32            | 21.22            | 19.51     | 47.83                | 40.73                | 87.00               | 74.00               | 39.17              | 33.27              | Line  |
| 8.  | 10.940      | 28.32            | 22.00            | 19.55     | 47.87                | 41.55                | 87.00               | 74.00               | 39.13              | 32.45              | Line  |
| 10. | 15.661      | 29.30            | 24.18            | 19.65     | 48.95                | 43.83                | 87.00               | 74.00               | 38.05              | 30.17              | Line  |
| 12. | 17.164      | 28.27            | 23.29            | 19.68     | 47.95                | 42.97                | 87.00               | 74.00               | 39.05              | 31.03              | Line  |

Remarks: C.F (Correction Factor) = Insertion loss + Cable loss + Pulse Limiter

## 4-2 Radiated disturbance

### Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.  
We were performed the test according to LTA procedure LTA-QI-04.

|                             |                                              |
|-----------------------------|----------------------------------------------|
| Test method                 | : AS/NZS CISPR32:2013                        |
| Measuring Distance          | : 10 m for below 1 GHz / 3 m for above 1 GHz |
| Measurement Frequency range | : 30 MHz – 6 000 MHz                         |
| Measurement RBW             | : 120 kHz @ 10 m / 1 MHz @ 3 m               |
| Test mode                   | : REC mode                                   |
| Result                      | : <b>Complies</b>                            |

### Measurement Data:

- Refer to the Next page (Maximum emission configuration)
- The highest internal source of an EUT is higher than 108 MHz, the measurement shall only be made up to 6 GHz.  
(The highest internal source of an EUT : 1.8 GHz)

### A sample calculation:

COR. F (correction factor)= Antenna factor + Cable loss- Amp.gain- Distance correction

Emission Level= meter reading + COR.F

**Limit of 10 m for below 1 GHz**

## CLASS A

| Frequency Range   | Quasi-peak |
|-------------------|------------|
| (30 – 230) MHz    | 40 dBuV/m  |
| (230 – 1 000) MHz | 47 dBuV/m  |

## CLASS B

| Frequency Range   | Quasi-peak |
|-------------------|------------|
| (30 – 230) MHz    | 30 dBuV/m  |
| (230 – 1 000) MHz | 37 dBuV/m  |

**Limit of 3m for above 1 GHz**

## CLASS A

| Frequency Range     | Average Limit @ 3m<br>(dB $\mu$ V/m)                 | Peak limit @ 3m<br>(dB $\mu$ V/m) |
|---------------------|------------------------------------------------------|-----------------------------------|
| (1 000 – 3 000) MHz | 56                                                   | 76                                |
| (3 000 – 6 000) MHz | 60                                                   | 80                                |
| NOTE:               | The lower limit applies at the transition frequency. |                                   |

## CLASS B

| Frequency Range     | Average Limit @ 3m<br>(dB $\mu$ V/m)                 | Peak limit @ 3m<br>(dB $\mu$ V/m) |
|---------------------|------------------------------------------------------|-----------------------------------|
| (1 000 – 3 000) MHz | 50                                                   | 70                                |
| (3 000 – 6 000) MHz | 54                                                   | 74                                |
| NOTE:               | The lower limit applies at the transition frequency. |                                   |

## Radiated Emission (Below 1 GHz) / V



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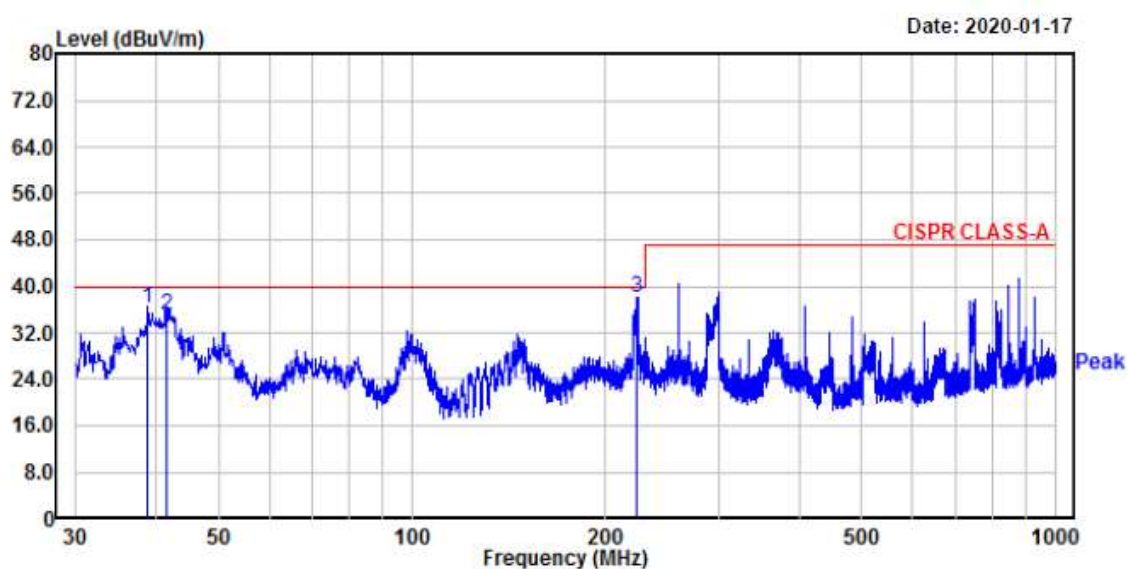
EUT/Model No.: QRN-1620S

Temp/Humi: 22 'C / 38 % R.H.

Test Mode : REC mode

Tested by: PARJ J H

Power : 240 V / 50 Hz



| No. | Freq<br>MHz | Reading<br>dBμV | C.F<br>dB | Result<br>QP<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB | Height<br>cm | Angle<br>deg | Polarity |
|-----|-------------|-----------------|-----------|------------------------|-----------------|--------------|--------------|--------------|----------|
| 1.  | 38.85       | 50.16           | -13.93    | 36.23                  | 40.00           | 3.77         | 194          | 360          | vertical |
| 2.  | 41.52       | 48.54           | -13.62    | 34.92                  | 40.00           | 5.08         | 400          | 93           | vertical |
| 3.  | 223.76      | 52.95           | -14.84    | 38.11                  | 40.00           | 1.89         | 100          | 193          | vertical |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

## Radiated Emission (Below 1 GHz) / H



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www.ltalab.com

EUT/Model No.: QRN-1620S

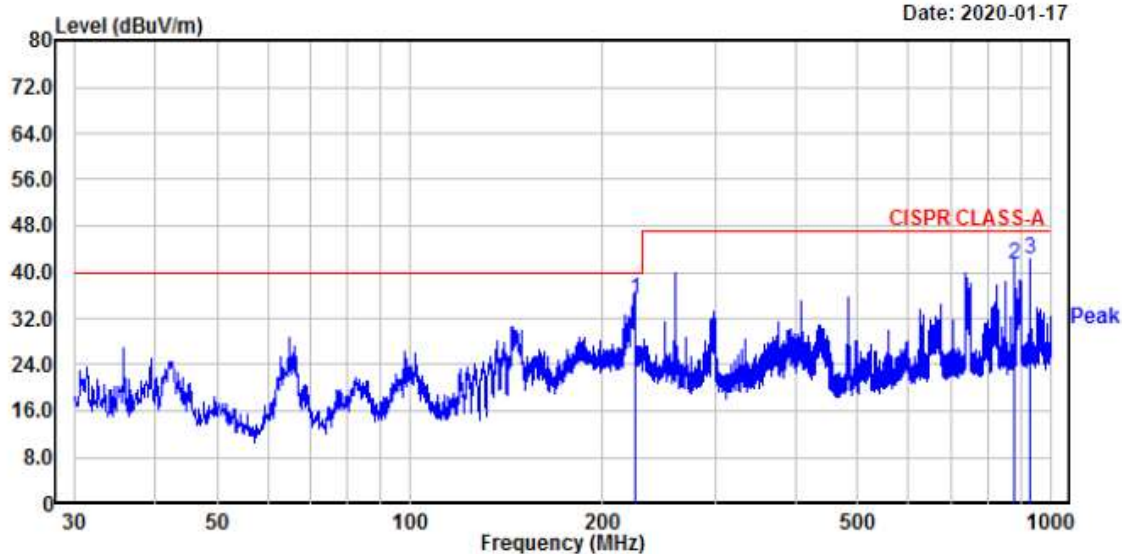
Temp/Humi: 22 'C / 38 % R.H.

Test Mode : REC mode

Tested by: PARJ J H

Power : 240 V / 50 Hz

Date: 2020-01-17



| No. | Freq<br>MHz | Reading<br>dBμV | C.F<br>dB | Result<br>QP<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB | Height<br>cm | Angle<br>deg | Polarity   |
|-----|-------------|-----------------|-----------|------------------------|-----------------|--------------|--------------|--------------|------------|
| 1.  | 224.73      | 50.15           | -14.87    | 35.28                  | 40.00           | 4.72         | 400          | 268          | horizontal |
| 2.  | 874.99      | 41.15           | 0.26      | 41.41                  | 47.00           | 5.59         | 100          | 358          | horizontal |
| 3.  | 928.22      | 40.96           | 1.25      | 42.21                  | 47.00           | 4.79         | 100          | 116          | horizontal |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

## Radiated Emission

(Above 1 GHz) / V

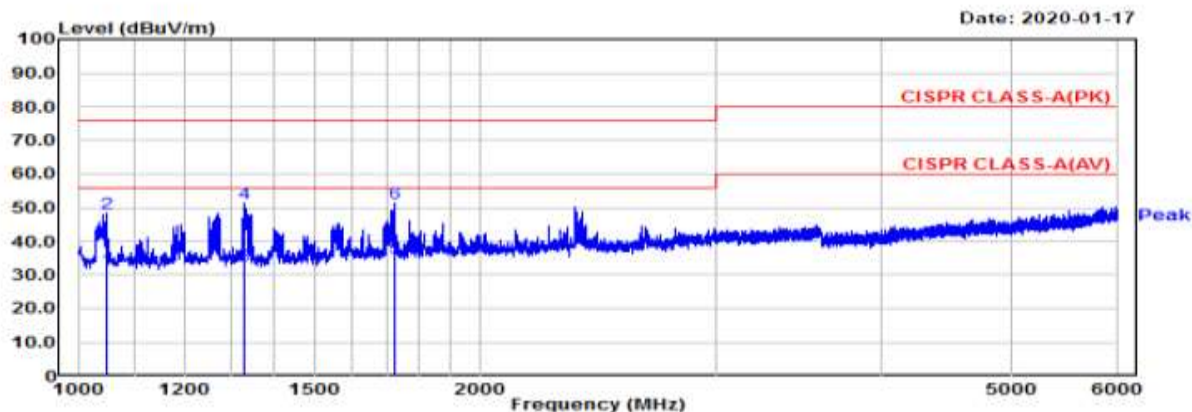
EUT/Model No.: QRN-1620S

Temp/Humi: 22 °C / 38 % R.H.

Test Mode : REC mode

Tested by: PARJ J H

Power : 240 V / 50 Hz



(Above 1 GHz) / H

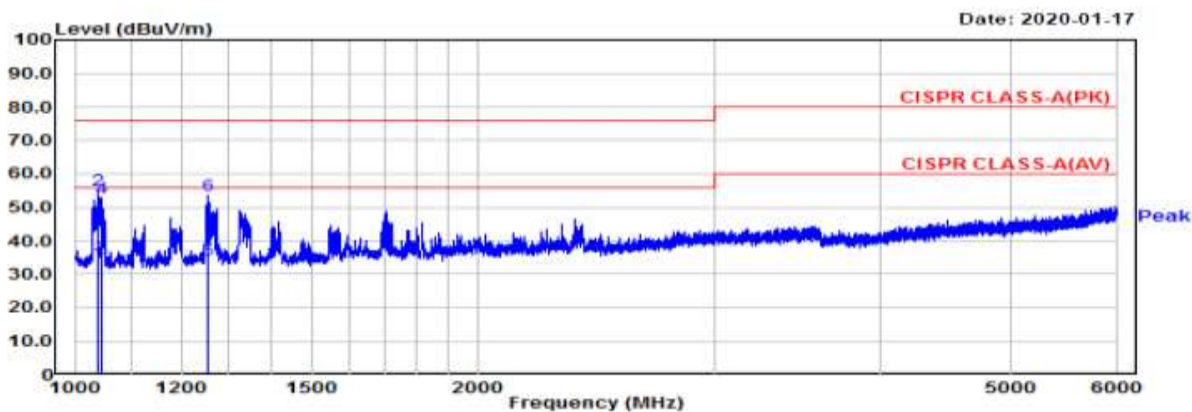
EUT/Model No.: QRN-1620S

Temp/Humi: 22 °C / 38 % R.H.

Test Mode : REC mode

Tested by: PARJ J H

Power : 240 V / 50 Hz



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

Test Date

Temp.: Humidity Distance

Model : QRN-1620S

2020-01-17

22.00

38.00

3.8

TEST mode : REC mode

| Frequency | Reading(PK) | Reading(AV) | C.F   | Result(PK) | Result(AV) | Limit(PK) | Limit(AV) | Margin(PK) | Margin(AV) | Height | Angle | Polarity |
|-----------|-------------|-------------|-------|------------|------------|-----------|-----------|------------|------------|--------|-------|----------|
| MHz       | dBuV        | dBuV        | dB    | dBuV/m     | dBuV/m     | dBuV/m    | dBuV/m    | dB         | dB         | cm     | deg   | H/V      |
| 1039.38   | 43.63       | 43.63       | -8.01 | 35.62      | 35.62      | 76.00     | 56.00     | 40.38      | 20.38      | 100    | 161   | H        |
| 1046.88   | 44.55       | 44.55       | -7.95 | 36.60      | 36.60      | 76.00     | 56.00     | 39.40      | 19.40      | 100    | 251   | H        |
| 1254.38   | 42.30       | 42.30       | -6.07 | 36.23      | 36.23      | 76.00     | 56.00     | 39.77      | 19.77      | 100    | 158   | H        |
| 1049.38   | 58.24       | 41.57       | -7.94 | 50.30      | 33.63      | 76.00     | 56.00     | 25.70      | 22.37      | 100    | 99    | V        |
| 1331.25   | 58.82       | 40.46       | -5.41 | 53.41      | 35.05      | 76.00     | 56.00     | 22.59      | 20.95      | 100    | 76    | V        |
| 1721.88   | 56.98       | 40.90       | -3.58 | 53.40      | 37.32      | 76.00     | 56.00     | 22.60      | 18.68      | 100    | 41    | V        |

**APPENDIX A**

**TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS**

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment are identified by the Test Laboratory.

#### Conducted Disturbance Measurements

|                                     | Item              | Model Name           | Manufacturer    | Serial No.  | Next Cal.  | Interval |
|-------------------------------------|-------------------|----------------------|-----------------|-------------|------------|----------|
| <input checked="" type="checkbox"/> | EMI TEST Receiver | ESR                  | Rohde & Schwarz | 101499      | 2020.07.04 | 1 year   |
| <input checked="" type="checkbox"/> | Pulse Limiter     | ESH3-Z2              | Rohde & Schwarz | 100710      | 2020.03.16 | 1 year   |
| <input checked="" type="checkbox"/> | ISN               | ISN T800             | TESEQ           | 27109       | 2020.09.09 | 1 year   |
| <input checked="" type="checkbox"/> | ISN               | ENY81-CA6            | Rohde & Schwarz | 101565      | 2020.09.09 | 1 year   |
| <input type="checkbox"/>            | ISN               | ISN S8               | Schwarzbeck     | 79          | 2020.09.06 | 1 year   |
| <input type="checkbox"/>            | CURRENT PROBE     | EZ-17                | Rohde & Schwarz | 100508      | 2020.09.09 | 1 year   |
| <input type="checkbox"/>            | CDN               | TSCDN-C1-BNC-75      | F.C.C           | 07004       | 2020.05.23 | 1 year   |
| <input type="checkbox"/>            | LISN              | ESH3-Z6              | Rohde & Schwarz | 100378      | 2020.09.05 | 1 year   |
| <input type="checkbox"/>            | LISN              | ESH3-Z6              | Rohde & Schwarz | 101468      | 2020.09.05 | 1 year   |
| <input checked="" type="checkbox"/> | LISN(main)        | ENV216               | Rohde & Schwarz | 101222      | 2020.09.06 | 1 year   |
| <input checked="" type="checkbox"/> | LISN(sub)         | LT32C/10             | AFJ             | 32031518210 | 2020.09.05 | 1 year   |
| <input checked="" type="checkbox"/> | TEST PROGRAM      | e3_ce 20181212a (V9) | AUDIX           | -           | -          | -        |

#### Radiated Emission – Below 1 GHz

|                                     | Item              | Model Name        | Manufacturer    | Serial No. | Next Cal.          | Interval |
|-------------------------------------|-------------------|-------------------|-----------------|------------|--------------------|----------|
| <input checked="" type="checkbox"/> | EMI TEST Receiver | ESU               | Rohde & Schwarz | 100092     | 2020.09.05         | 1 year   |
| <input checked="" type="checkbox"/> | Amplifier (25 dB) | 8447D             | HP              | 2944A07684 | 2020.03.16         | 1 year   |
| <input checked="" type="checkbox"/> | BILOG Antenna     | VULB 9168         | SCHWARZBECK     | 775        | 2021.03.26 (KOLAS) | 2 year   |
| <input type="checkbox"/>            | BILOG Antenna     | VULB 9168         | SCHWARZBECK     | 775        | 2021.11.12 (RRA)   | 2 year   |
| <input checked="" type="checkbox"/> | TEST PROGRAM      | e3 20181212a (V9) | AUDIX           | -          | -                  | -        |

#### Radiated Emission – Above 1 GHz

|                                     | Item              | Model Name        | Manufacturer    | Serial No. | Next Cal.          | Interval |
|-------------------------------------|-------------------|-------------------|-----------------|------------|--------------------|----------|
| <input checked="" type="checkbox"/> | EMI TEST Receiver | ESU               | Rohde & Schwarz | 100092     | 2020.09.05         | 1 year   |
| <input checked="" type="checkbox"/> | Amplifier         | 8449B             | HP              | 3008A00671 | 2020.09.05         | 1 year   |
| <input type="checkbox"/>            | Amplifier         | PAM-840A          | COM-POWER       | 461314     | 2020.03.18         | 1 year   |
| <input type="checkbox"/>            | HORN ANTENNA      | 3116B             | ETS             | 133350     | 2020.05.10         | 2 year   |
| <input type="checkbox"/>            | HORN ANTENNA      | 3116B             | ETS             | 81109      | 2020.05.10         | 2 year   |
| <input checked="" type="checkbox"/> | HORN ANTENNA      | 3115              | ETS             | 114105     | 2021.09.17 (KOLAS) | 2 year   |
| <input type="checkbox"/>            | HORN ANTENNA      | 3115              | ETS             | 114105     | 2021.11.11 (RRA)   | 2 year   |
| <input checked="" type="checkbox"/> | TEST PROGRAM      | e3 20181212a (V9) | AUDIX           | -          | -                  | -        |

**APPENDIX B**

**PHOTOGRAPHS**

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## Conducted disturbance

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## Conducted disturbance (TEL)

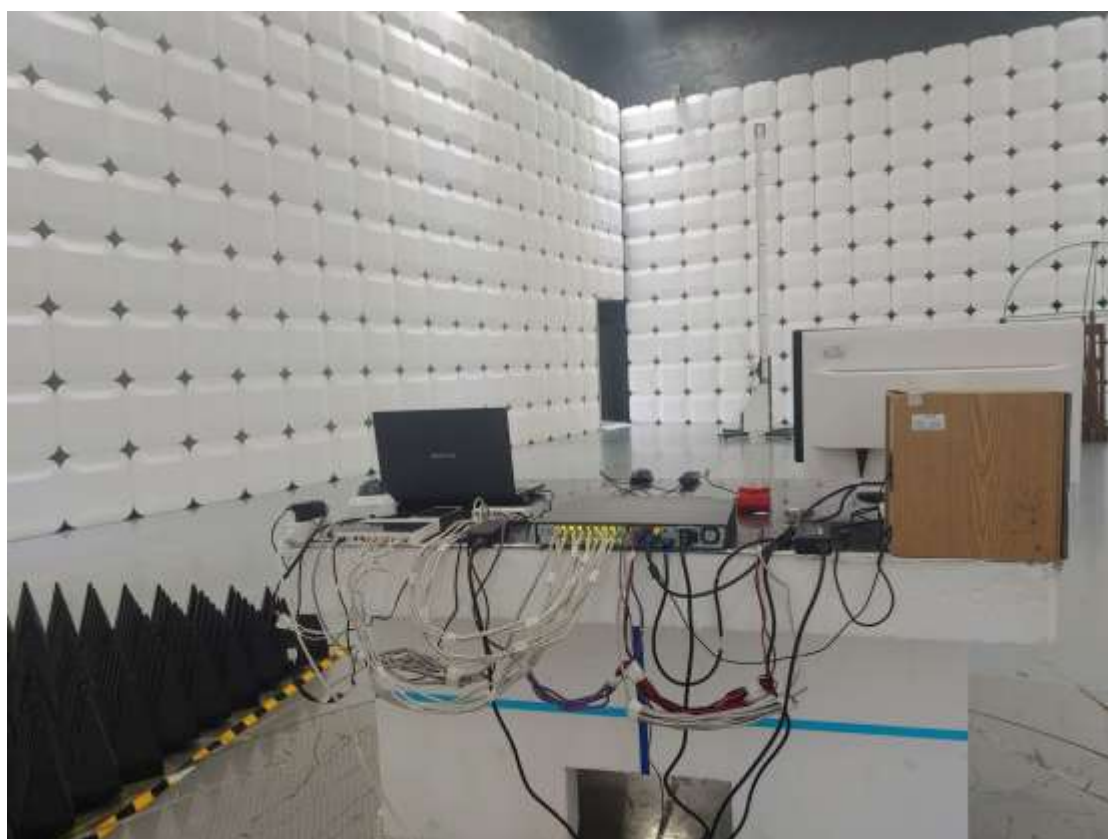
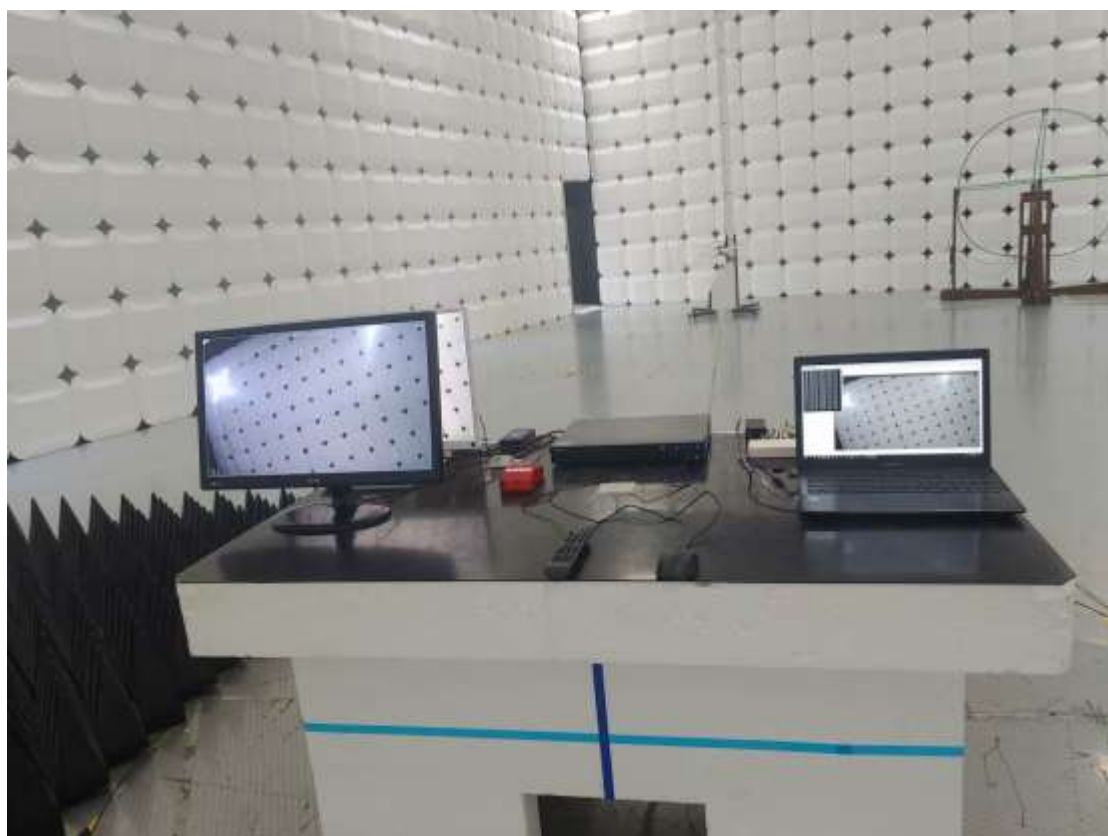
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## Radiated disturbance - Below 1 GHz

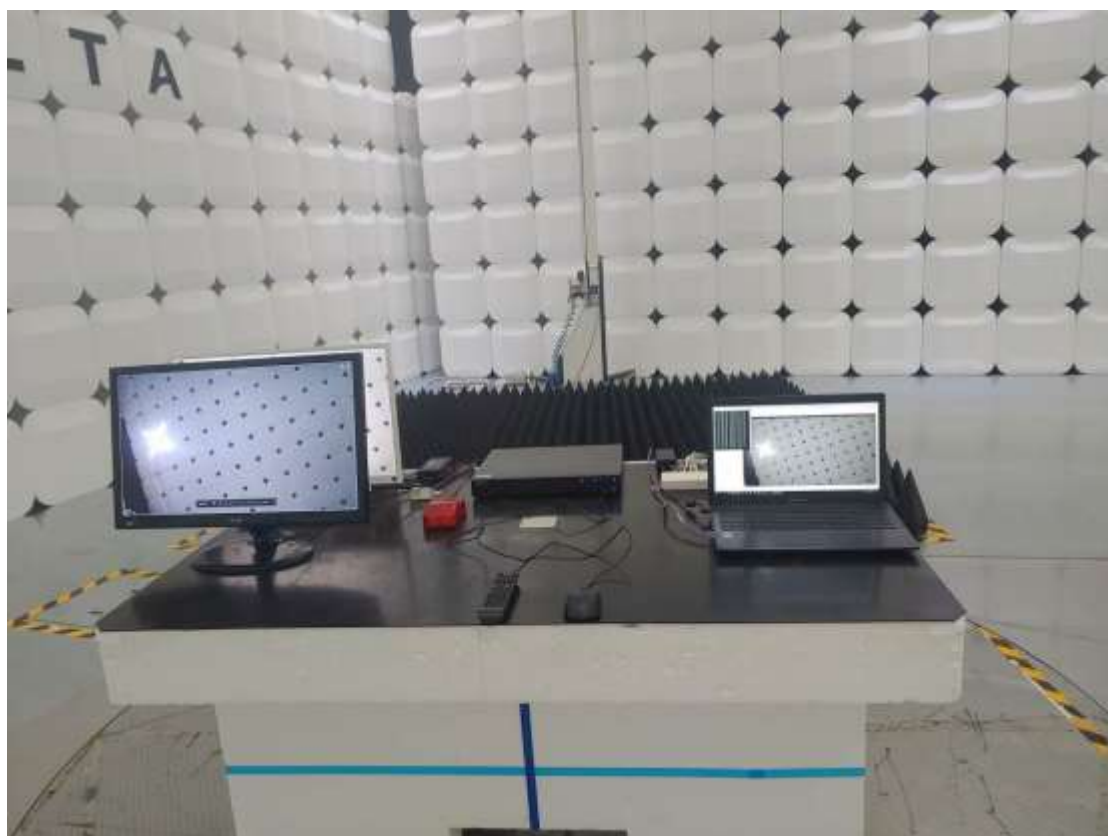
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**Radiated disturbance - Above 1 GHz**

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EUT

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## EUT

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