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EMC TEST REPORT

Dates of Tests: December 20 - 25, 2019

Test Report S/N: LR500122001Q

Test Site : LTA Co., Ltd.

Model No.

QRN-420S

APPLICANT

Hanwha Techwin Co., Ltd.

Equipment Name : NVR
Manufacturer : Hanwha Techwin(Tianjin) Co., Ltd.
Model name : QRN-420S
Test Device Serial No.: : Identification
Rule Part(s) : AS/NZS CISPR 32:2015
CISPR 32 Ed2.0

Date of issue : January 13, 2020

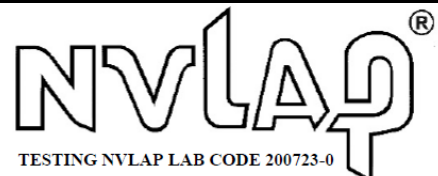
This test report is issued under the authority of:

The test was supervised by:

Young Kyu Shin, Technical Manager

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	13.01.2020	LR500122001Q	Initial

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1. General information's

1-1 Test Performed

Company name : **LTA Co., Ltd**
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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-420S
 Serial number : Identification
 Date of receipt : December 19, 2019
 EUT condition : Pre-production, not damaged
 Interface Ports : DC IN, GND, VIEWER, HDMI, USB, PoE CAMERA
 Power rating : DC 54 V

2-3 Modification

- NONE

2-4 Test conditions

Temp. / Humid. / Pressure : (22 - 24) °C / (41) % R.H.
 Tested Model : QRN-420S
 Test mode : REC mode
 Test Voltage : AC 240 V, 50 Hz

2-5 EUT

Equipment	Model No.	Serial No.	Manufacturer
NVR	QRN-420S	N/A	Hanwha Techwin(Tianjin) Co., Ltd. HANWHA TECHWIN SECURITY VIETNAM CO.,LTD. D-TECH CO.,LTD.
Mouse	MOKJUO	N/A	Primax Electronics Ltd.
Adapter	FSP065-DWAN3	N/A	Zhonghan Electronics (Shenzhen) Co., Ltd.
Remote Controller	N/A	N/A	N/A

2-6 Accessary

Equipment	Model No.	Serial No.	Manufacturer
Notebook	RV711	N/A	SAMSUNG
Notebook Adapter	CPA09-004A	N/A	Chicony
Network Camera	QNV-6032R	N/A	Hanwha Techwin(Tianjin) Co., Ltd.
Smart Phone	SM-G930L	N/A	SAMSUNG
Monitor	24MA53D	N/A	LG
Monitor Adapter	A11-120P1A	N/A	Chicony
IP Router	X5007	N/A	IPTIME
IP Router Adapter	RS-AB02J00-K	N/A	Dongguan Jinhua Sheng Power Technology Co., Ltd
USB Memory Stick	Ultra Flair CZ73	N/A	SanDisk
HDD	800055	N/A	WESTERN DIGITAL TECHNOLOGIES, INC.

2-7 Cable List

From		To		Length (m)	Shielding	
Type	I/O Port	Type	I/O Port		Cable	backshell
EUT	DC IN	Adapter	DC OUT	1.5	NO	Plastic
	GND	GND	-	1.0	NO	-
	VIEWER	Notebook	LAN	3.0	YES	Plastic
	HDMI	Notebook	HDMI	1.2	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 ~ #4	IP Router	LAN	1.0	YES	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	-	-	-
Monitor	DC IN	Monitor Adapter	DC OUT	1.4	NO	Plastic
Notebook	DC IN	Notebook Adapter	DC OUT	1.3	NO	Plastic
IP Router	DC IN	IP Router Adapter	DC OUT	1.5	NO	Plastic
Monitor Adapter	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 Adapter	AC IN	AC Power Source	2 Pin AC Line	2.0	NO	Plastic

3. Test Report

3.1 Summary of tests

Parameter	Applied Standard	Status
I. Emission		
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	: Complies

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 150Ω 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 150Ω 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-420S

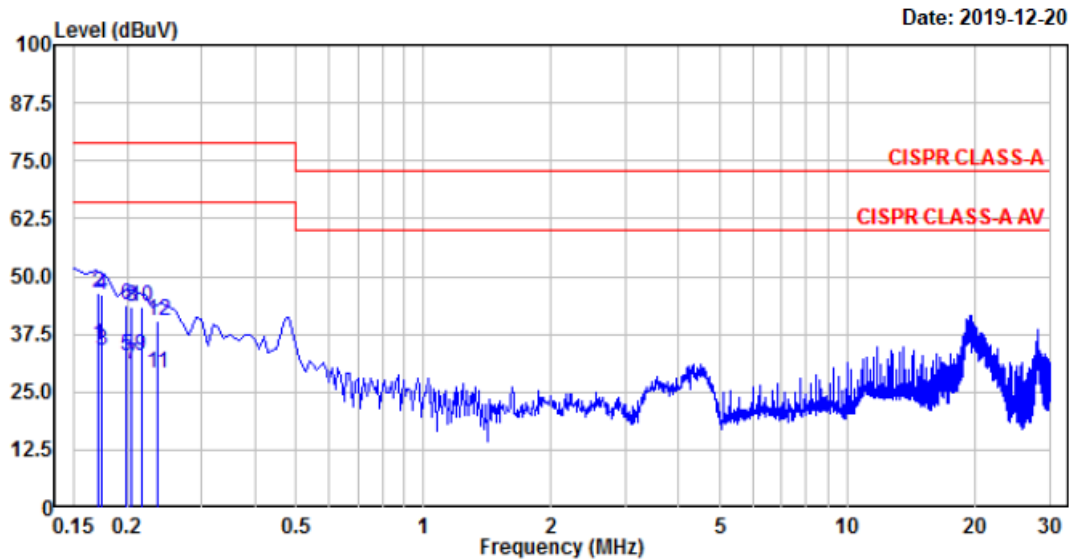
Phase : Line

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 24 °C / 41 % R.H.

Test Engineer : PARK J H



No.	Freq MHz	RD QP dBuV	RD AV dBuV	C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB	Phase
2.	0.172	26.82	15.70	19.43	46.25	35.13	79.00	66.00	32.75	30.87	Line
4.	0.175	26.59	14.37	19.43	46.02	33.80	79.00	66.00	32.98	32.20	Line
6.	0.199	24.34	13.22	19.44	43.78	32.66	79.00	66.00	35.22	33.34	Line
8.	0.205	23.96	11.41	19.44	43.40	30.85	79.00	66.00	35.60	35.15	Line
10.	0.216	23.93	13.37	19.44	43.37	32.81	79.00	66.00	35.63	33.19	Line
12.	0.236	20.94	9.54	19.44	40.38	28.98	79.00	66.00	38.62	37.02	Line

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

Conducted emissions (NEUTRAL)



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EUT /Model No. : QRN-420S

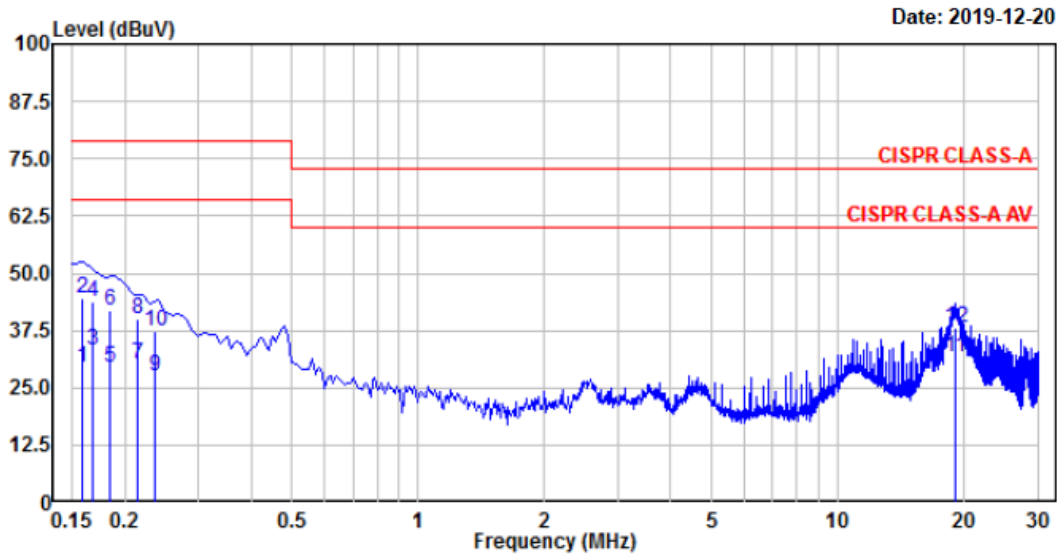
Phase : Neutral

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 24 'C / 41 % R.H.

Test Engineer : PARK J H



No.	Freq MHz	RD QP dBuV	RD AV dBuV	C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB	Phase
2.	0.159	25.10	9.97	19.49	44.59	29.46	79.00	66.00	34.41	36.54	neutral
4.	0.167	24.46	13.54	19.49	43.95	33.03	79.00	66.00	35.05	32.97	neutral
6.	0.185	22.26	10.13	19.49	41.75	29.62	79.00	66.00	37.25	36.38	neutral
8.	0.215	20.52	10.69	19.49	40.01	30.18	79.00	66.00	38.99	35.82	neutral
10.	0.237	17.74	7.89	19.49	37.23	27.38	79.00	66.00	41.77	38.62	neutral
12.	19.043	18.06	11.78	19.95	38.01	31.73	73.00	60.00	34.99	28.27	neutral

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

Conducted emissions (TEL_100 M) / PoE



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EUT /Model No. : QRN-420S

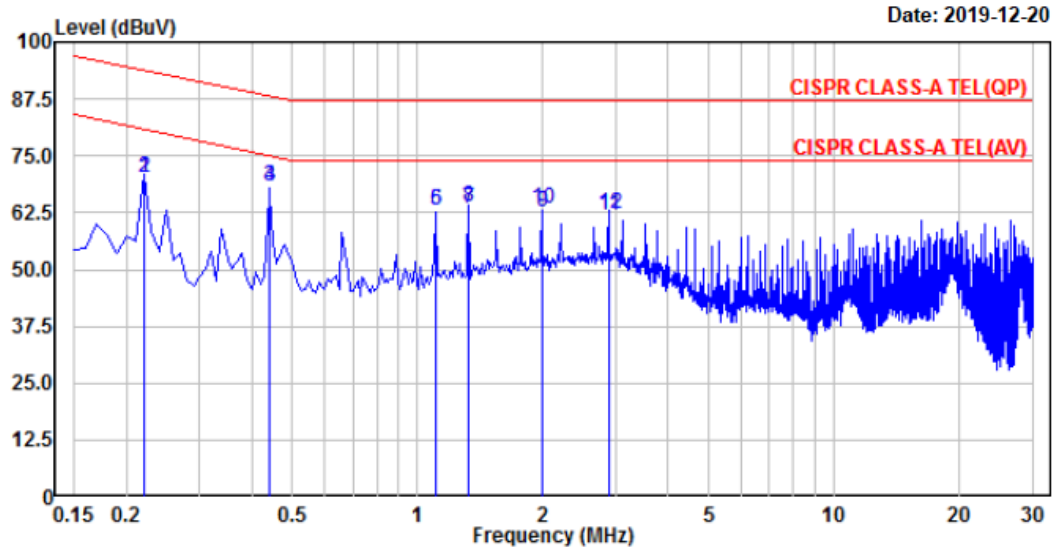
Phase : TEL_100M(PoE)

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 24 'C / 41 % R.H.

Test Engineer : PARK J H



No.	Freq MHz	RD QP dBuV	RD AV dBuV	C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB	Phase
2.	0.221	50.61	50.35	19.72	70.33	70.07	93.77	80.77	23.44	10.70	Line
4.	0.443	48.70	48.60	19.53	68.23	68.13	88.01	75.01	19.78	6.88	Line
6.	1.107	43.74	43.57	19.42	63.16	62.99	87.00	74.00	23.84	11.01	Line
8.	1.328	44.23	44.04	19.41	63.64	63.45	87.00	74.00	23.36	10.55	Line
10.	1.993	43.86	43.37	19.39	63.25	62.76	87.00	74.00	23.75	11.24	Line
12.	2.878	43.08	42.36	19.37	62.45	61.73	87.00	74.00	24.55	12.27	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-420S

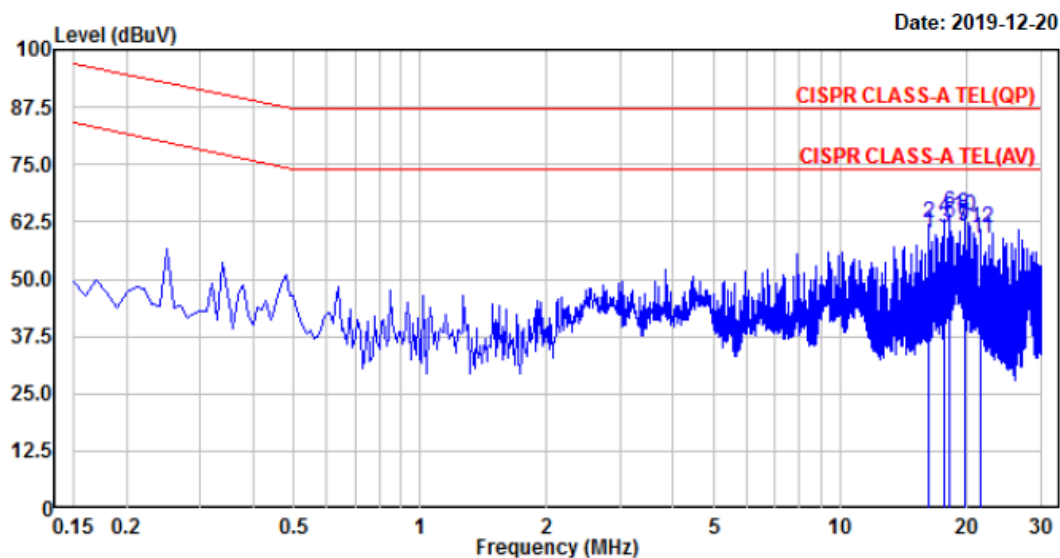
Phase : TEL_1000M(Viewer)

Test Mode : REC mode

Test Power : 240 V / 50 Hz

Temp./ Humi. : 24 'C / 41 % R.H.

Test Engineer : PARK J H



No.	Freq MHz	RD QP dBuV	RD AV dBuV	C.F dB	Result QP dBuV	Result AV dBuV	Limit QP dBuV	Limit AV dBuV	Margin QP dB	Margin AV dB	Phase
2.	16.228	42.91	40.58	19.50	62.41	60.08	87.00	74.00	24.59	13.92	Line
4.	17.693	43.77	41.66	19.51	63.28	61.17	87.00	74.00	23.72	12.83	Line
6.	18.242	45.00	42.91	19.52	64.52	62.43	87.00	74.00	22.48	11.57	Line
8.	19.708	44.60	42.16	19.55	64.15	61.71	87.00	74.00	22.85	12.29	Line
10.	19.709	44.10	42.07	19.55	63.65	61.62	87.00	74.00	23.35	12.38	Line
12.	21.662	41.70	39.16	19.58	61.28	58.74	87.00	74.00	25.72	15.26	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	: Complies

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 (dB μ V/m)	Peak limit @ 3m (dB μ 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 (dB μ V/m)	Peak limit @ 3m (dB μ 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-420S

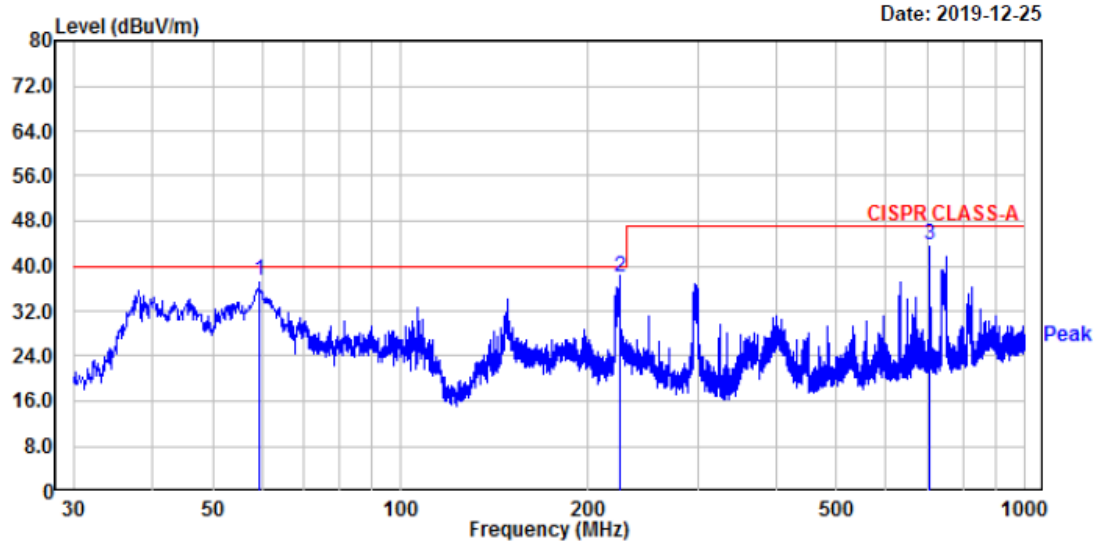
Temp/Humi: 22 'C / 41 % R.H.

Test Mode : REC mode

Tested by: PARK J H

Power : 240 V / 50 Hz

Date: 2019-12-25



No.	Freq MHz	Reading dBuV	C.F dB	Result QP dBuV/m	Limit dBuV/m	Margin dB	Height cm	Angle deg	Polarity
1.	59.46	51.17	-13.86	37.31	40.00	2.69	218	0	vertical
2.	224.61	53.26	-15.24	38.02	40.00	1.98	100	248	vertical
3.	705.36	46.82	-3.02	43.80	47.00	3.20	218	0	vertical

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

Radiated Emission (Below 1 GHz) / H



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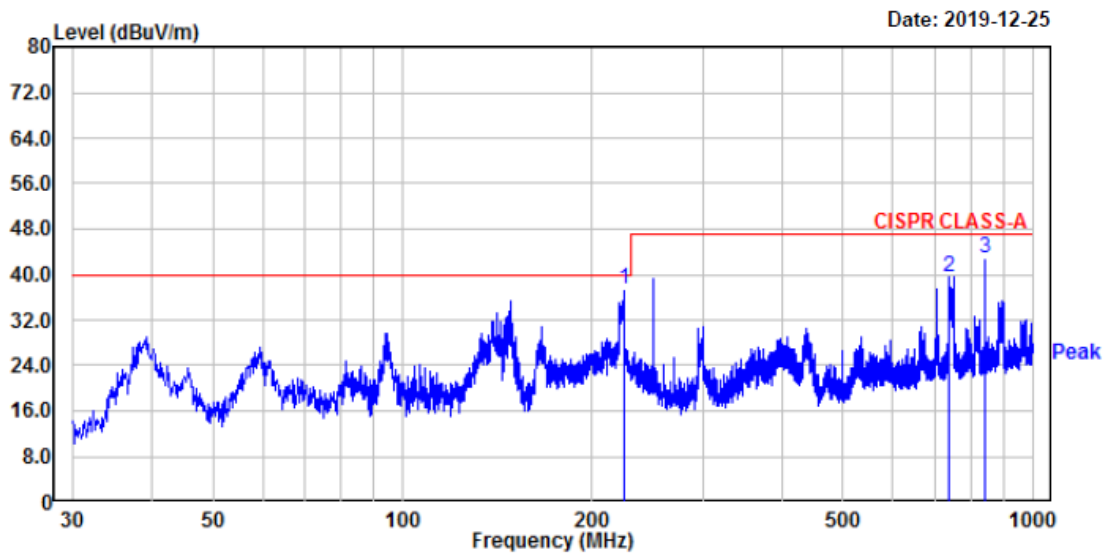
EUT/Model No.: QRN-420S

Temp/Humi: 22 'C / 41 % R.H.

Test Mode : REC mode

Tested by: PARK J H

Power : 240 V / 50 Hz



No.	Freq MHz	Reading dBuV	C.F dB	Result QP dBuV/m	Limit dBuV/m	Margin dB	Height cm	Angle deg	Polarity
1.	224.12	52.56	-15.22	37.34	40.00	2.66	400	35	horizontal
2.	736.52	41.90	-2.30	39.60	47.00	7.40	100	198	horizontal
3.	839.71	43.99	-0.99	43.00	47.00	4.00	400	256	horizontal

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

Radiated Emission

(Above 1 GHz) / V

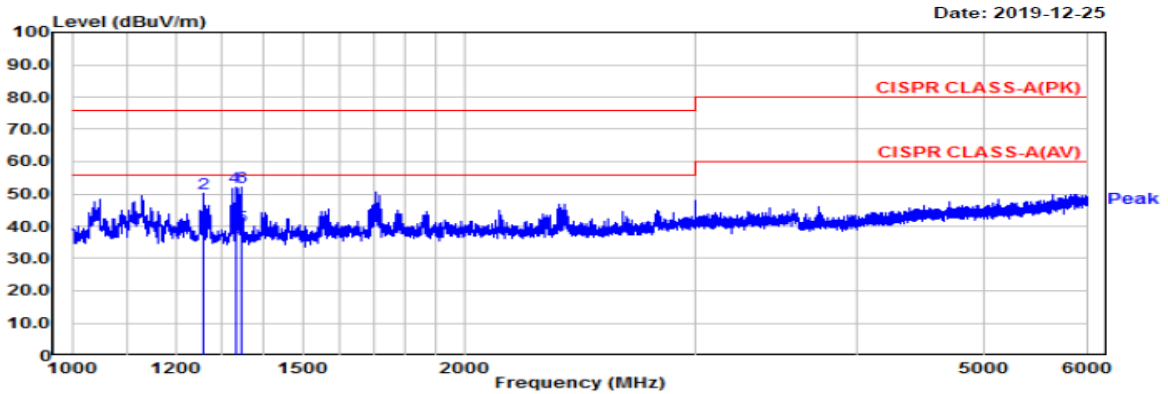
EUT/Model No.: QRN-420S

Temp/Humi: 22 °C / 41 % R.H.

Test Mode : REC mode

Tested by: PARK J H

Power : 240 V / 50 Hz



(Above 1 GHz) / H

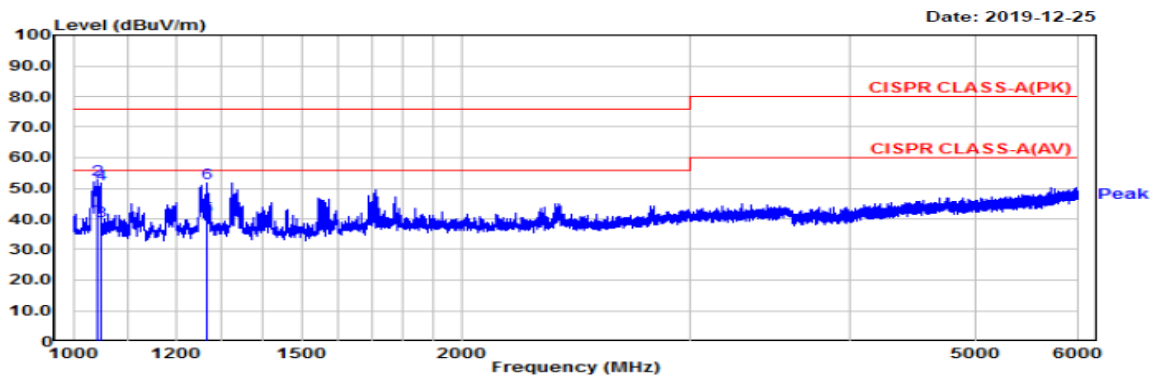
EUT/Model No.: QRN-420S

Temp/Humi: 22 °C / 41 % R.H.

Test Mode : REC mode

Tested by: PARK J H

Power : 240 V / 50 Hz



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

Test Date

Temp.: [°C]	Humidity : [%]	Distance (m)
22.00	41.00	3.80

Model : QRN-420S

2019-12-25

TEST mode : REC mode

Frequency MHz	Reading(PK) dBuV	Reading(AV) dBuV	C.F dB	Result(PK) dBuV/m	Result(AV) dBuV/m	Limit(PK) dBuV/m	Limit(AV) dBuV/m	Margin(PK) dB	Margin(AV) dB	Height cm	Angle deg	Polarity H/V
1041.25	50.14	50.14	-7.65	42.49	42.49	76.00	56.00	33.51	13.51	100	145	H
1048.13	48.80	48.80	-7.60	41.20	41.20	76.00	56.00	34.80	14.80	100	149	H
1268.75	48.39	48.39	-5.52	42.87	42.87	76.00	56.00	33.13	13.13	100	137	H
1258.13	57.87	45.83	-5.59	52.28	40.24	76.00	56.00	23.72	15.76	100	112	V
1331.88	58.97	43.26	-4.91	54.06	38.35	76.00	56.00	21.94	17.65	100	121	V
1345.00	58.80	46.93	-4.75	54.05	42.18	76.00	56.00	21.95	13.82	100	158	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
☒	EMI TEST Receiver	ESR	Rohde & Schwarz	101499	2020.07.04	1 year
☒	Pulse Limiter	ESH3-Z2	Rohde & Schwarz	100710	2020.03.16	1 year
☒	ISN	ISN T800	TESEQ	27109	2020.09.09	1 year
☒	ISN	ENY81-CA6	Rohde & Schwarz	101565	2020.09.09	1 year
☐	ISN	ISN S8	Schwarzbeck	79	2020.09.06	1 year
☐	CURRENT PROBE	EZ-17	Rohde & Schwarz	100508	2020.09.09	1 year
☐	CDN	TSCDN-C1-BNC-75	F.C.C	07004	2020.05.23	1 year
☐	LISN	ESH3-Z6	Rohde & Schwarz	100378	2020.09.05	1 year
☐	LISN	ESH3-Z6	Rohde & Schwarz	101468	2020.09.05	1 year
☒	LISN(main)	ENV216	Rohde & Schwarz	101222	2020.09.06	1 year
☒	LISN(sub)	LT32C/10	AFJ	32031518210	2020.09.05	1 year
☒	TEST PROGRAM	e3_ce 20181212a (V9)	AUDIX	-	-	-

Radiated Emission – Below 1 GHz

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

Radiated Emission – Above 1 GHz

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

APPENDIX B

PHOTOGRAPHS

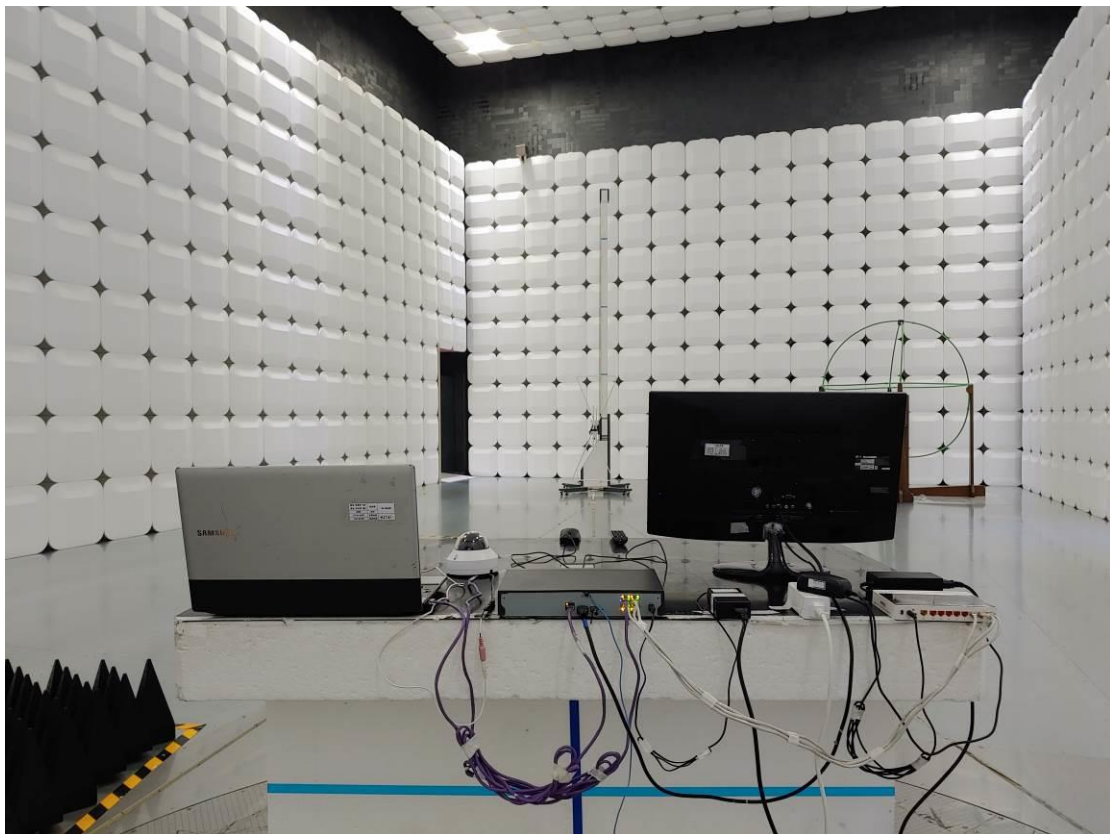
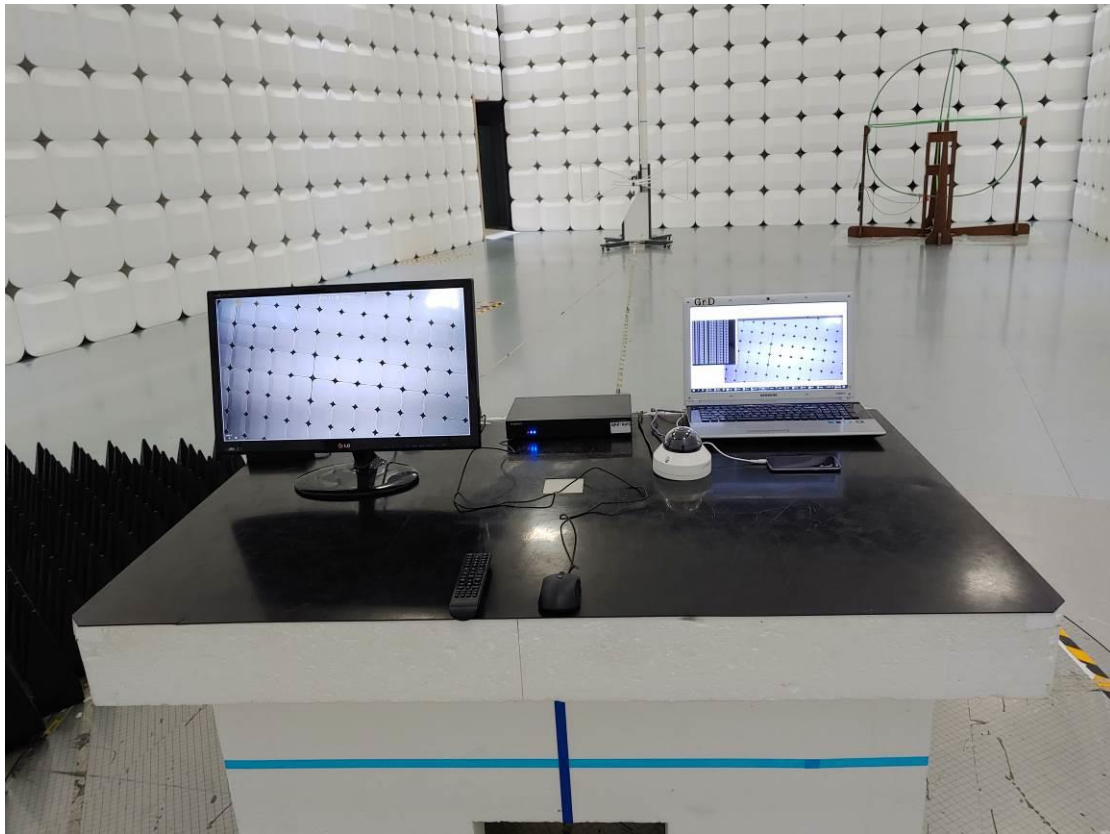
Conducted disturbance



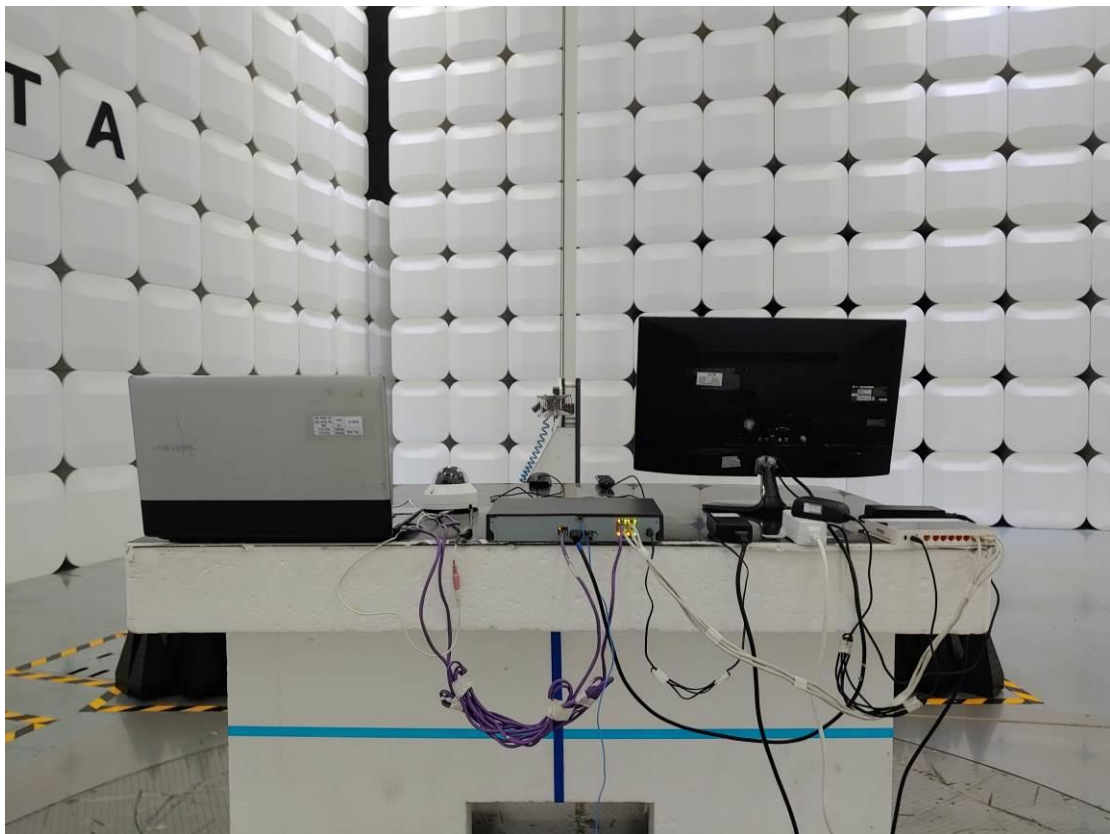
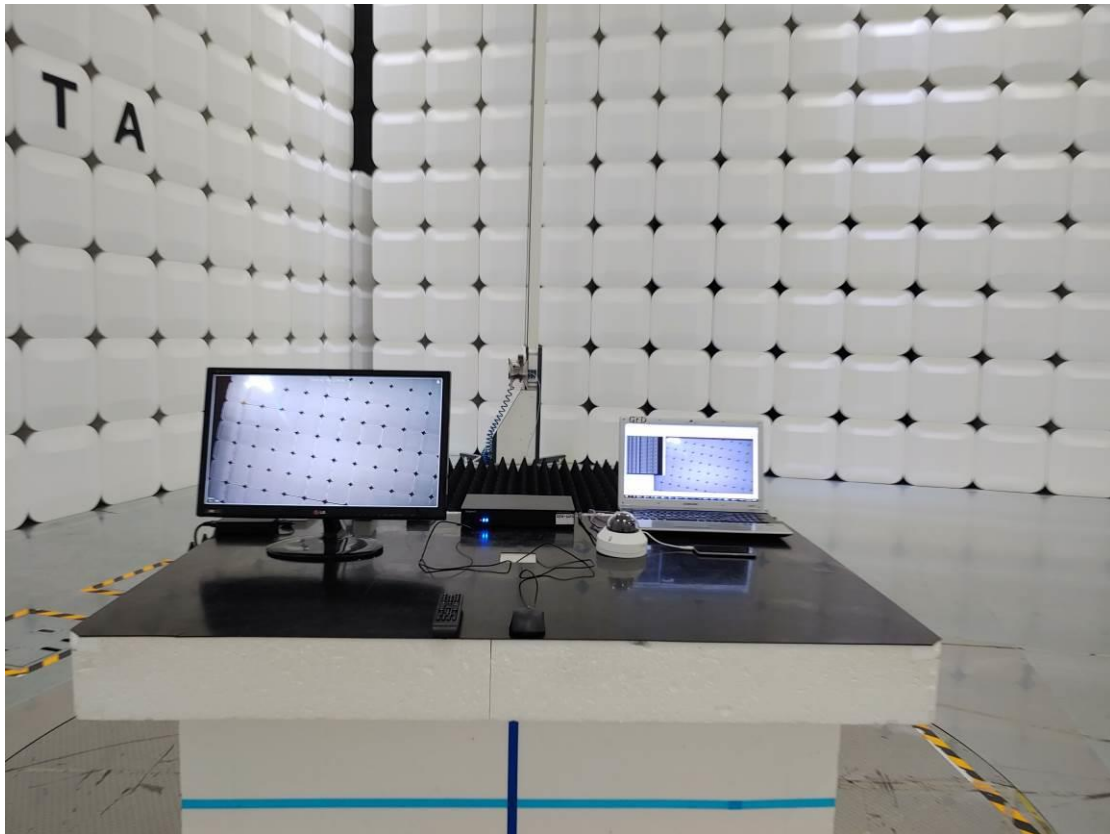
Conducted disturbance (TEL)



Radiated disturbance - Below 1 GHz



Radiated disturbance - Above 1 GHz



EUT



EUT

