TEST REPORT

This laboratory is accredited by Radio Research Laboratory and National Voluntary Laboratory Accreditation Program.
The tests reported herein have been performed in accordance with its terms of accreditation.

Test Report No.	**:**	**LR500111904H**
Issue Date	**:**	**April 16, 2019**
Applied Standard	**:**	**FCC Part 15, Subpart B and ICES-003**
Trade Name	**:**	**Hanwha Techwin Co., Ltd.**
Equipment Name	**:**	**NETWORK CAMERA**
Model Name	**:**	**QND-8021**
Additional Model Name	**:**	**QND-8011**
Serial Number	**:**	**Identification**

Revision history

Revision	Date of issue	Test report No.	Description
0	16.04.2019	LR500111904H	Initial

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LTA Certification

Applicant / Manufacture

Company name	:	Hanwha Techwin Co., Ltd.
Address	:	6, Pangyo-ro 319 Beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, 13488, KOREA
Telephone / Facsimile	:	+82-70-7147-8753(http://hanhwa-security.com)

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)

Equipment Under Test (EUT)

Equipment Name	:	NETWORK CAMERA
Model name	:	QND-8021
Additional Model name	:	QND-8011 Additional Model is different only lens specification.
Serial number	:	Identification
Intended environment	:	Residential area
Date of receipt	:	April 04, 2019
EUT condition	:	Pre-production, not damaged
Test Mode	:	Play mode
Interface ports	:	LAN
Power rating	:	DC 48 V
Test Voltage	:	DC 48 V

Model Description

- NONE

Model Specification

- NONE

*** To be continued next page ***

LTA Certification –cont.-

Test Performed

Test started & completed	:	April 11, 2019
Location	:	LTA Co., Ltd.

Test Specification

Purpose of the test	:	Compliance test to the following standard
Applied standard	:	FCC Part 15, Subpart B and ICES-003
Classification	:	Class A
Deviations from Standard Test Method	:	N/A

Test Results

Measurement	Results*	Test method
Conducted disturbance	Not Applicable	ANSI C 63.4-2014
Radiated disturbance	Complies	ANSI C 63.4-2014

* : The compliance statement is based on nominal value only.

Modification performed by the lab.;

- N.A

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

Laboratory's Certificate

Report number	:	LR500111904H
Issue date	:	April 16, 2019

This test report is issued under the authority of:

Young Kyu Shin, Technical Manager

The test was supervised by:

Joo Hyung Cho, Test Engineer

The results in this report apply only to the sample(s) tested.

It is not allowed to copy this report even partly without the allowance of the test laboratory.

General information's

Purpose

This document is based on the Electromagnetic Interference (EMI) tests performed on the **"QND-8021"**. The measurements were performed according to the measurement procedure described in ANSI C 63.4-2014.The tests were carried out in order to confirm whether the electromagnetic emissions from the EUT(Equipment Under Test), are within the Class A limits defined in FCC Part 15, Subpart B- "Section 15.107- Conducted limits" and "Section 15.109-Radiated emission limits".

Test Performed

Company name	:	**LTA Co., Ltd (KR0049)**
Address	:	4, Songju-ro 236beon-gil, Yangji-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do, 17159, Korea
Telephone	:	+82-31-323-6008
Facsimile		+82-31-323-6010

Measurement uncertainty

Conducted disturbance	(0.15 to 30 MHz) :	±2.80 [dB] (k=2)	
Radiated disturbance	(30 to 1,000 MHz) :	H : ±4.84 [dB] (k=2)	V : ±5.00 [dB] (k=2)
	(1 GHz to 6 GHz) :	H : ±5.97 [dB] (k=2)	V : ±5.96 [dB] (k=2)
	(6 GHz to 18 GHz) :	H : ±6.20 [dB] (k=2)	V : ±6.20 [dB] (k=2)

The coverage factor k=2 yields approx. a 95% level of confidence for near-normal distribution typical of most measurement results.

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	2019-09-30	ECT accredited Lab.
RRA	KOREA	KR0049	-	EMC accredited Lab.
FCC	U.S.A	649054	Updating	FCC CAB
VCCI	JAPAN	C-4948, T-2416, R-4483(10 m), G-10847	2020-09-10 2020-09-10 2020-10-15 2022-06-13	VCCI registration
IC	CANADA	5799A-2	2019-06-15	IC filing
KOLAS	KOREA	NO.551	2021-08-20	KOLAS accredited Lab.

1- Brief Information

1-1 Test Summary

Parameter	Applied Standard	Status (note 1)
I. Emission		
Conducted disturbance	FCC Part 15.107 / ICES-003 Clause 6.1	NA
Radiated disturbance	FCC Part 15.109 / ICES-003 Clause 6.2	C
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable * The data in this test report are traceable to the national or international standards.		

Frequency range to be scanned:

0.15 MHz - 30 MHz as conducted measurement

30 MHz to 5th harmonic of the highest frequency or 40 GHz, whichever is lower as radiated measurement.

Bandwidth:

Measured by the CISPR quasi-peak function Bandwidth is 9 kHz in the frequency 0.15 MHz to 30 MHz and 120 kHz in the frequency 30 MHz to 1,000 MHz.

Measured by the Peak function Bandwidth is 1 MHz in the frequency 1 GHz to 40 GHz.

A sample calculation:

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

Emission Level= meter reading + COR.F

1-2 Variant Model

- NONE

1-3 Test mode of the EUT

The tests have been conducted with the following operational mode(s) of the EUT.

Name of mode in the report

Play mode

1-4 Modification

- NONE

1-5 List of EUT and accessory

EUT				
Equipment Name	**Model Name**	**Serial No.**	**Manufacturer**	**Remarks**
NETWORK CAMERA	**QND-8021**	**ZMME70GM400003T**	**Hanwha Techwin (Tianjin) Co., Ltd.**	**–**
ACCESSORY				
Equipment Name	**Model Name**	**Serial No.**	**Manufacturer**	**Remarks**
Notebook	Lenovo G500	CD24530393	Lenovo	–
Notebook Adapter	ADLX65NCC3A	N/A	Lenovo	–
POE Injector	MPSE-4803E	N/A	MOA TELECOM	–

1-6 Cable List

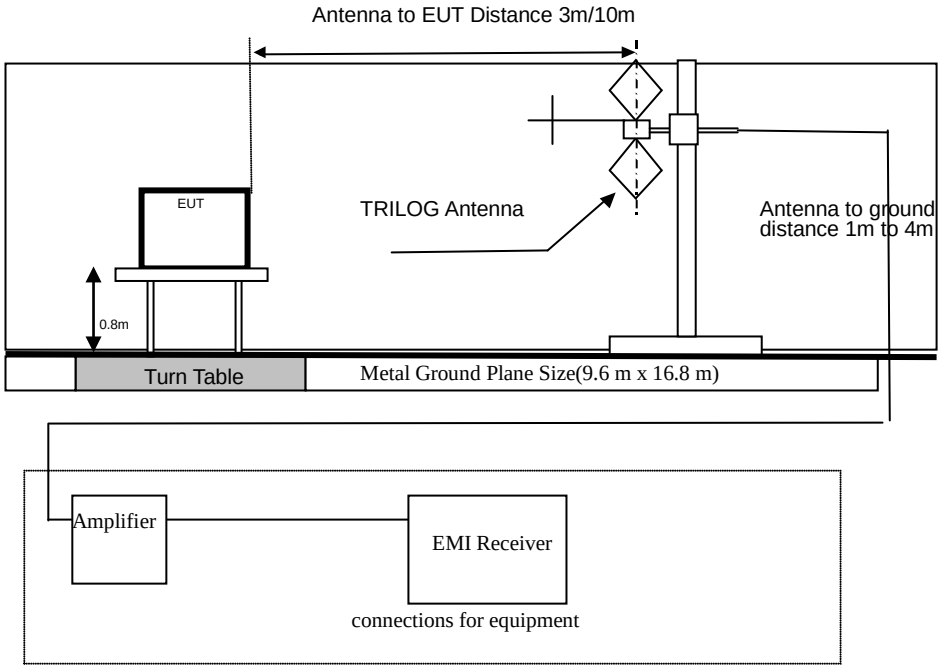
Cable List						
From		**To**		**Length**	**Shielding**	
Type	**I/O Port**	**Type**	**I/O Port**	**(m)**	**Cable**	**backshell**
EUT	LAN	POE Injection	LAN	3.0	NO	Plastic
POE Injection	LAN	Notebook	LAN	3.0	NO	Plastic
	AC IN	AC Power Source	3 Pin AC Line	1.4	NO	Plastic
Notebook	DC IN	Notebook Adapter	DC OUT	1.4	NO	Plastic
Notebook Adapter	AC IN	AC Power source	3 Pin AC Line	1.0	NO	Plastic

2- Test Site Description

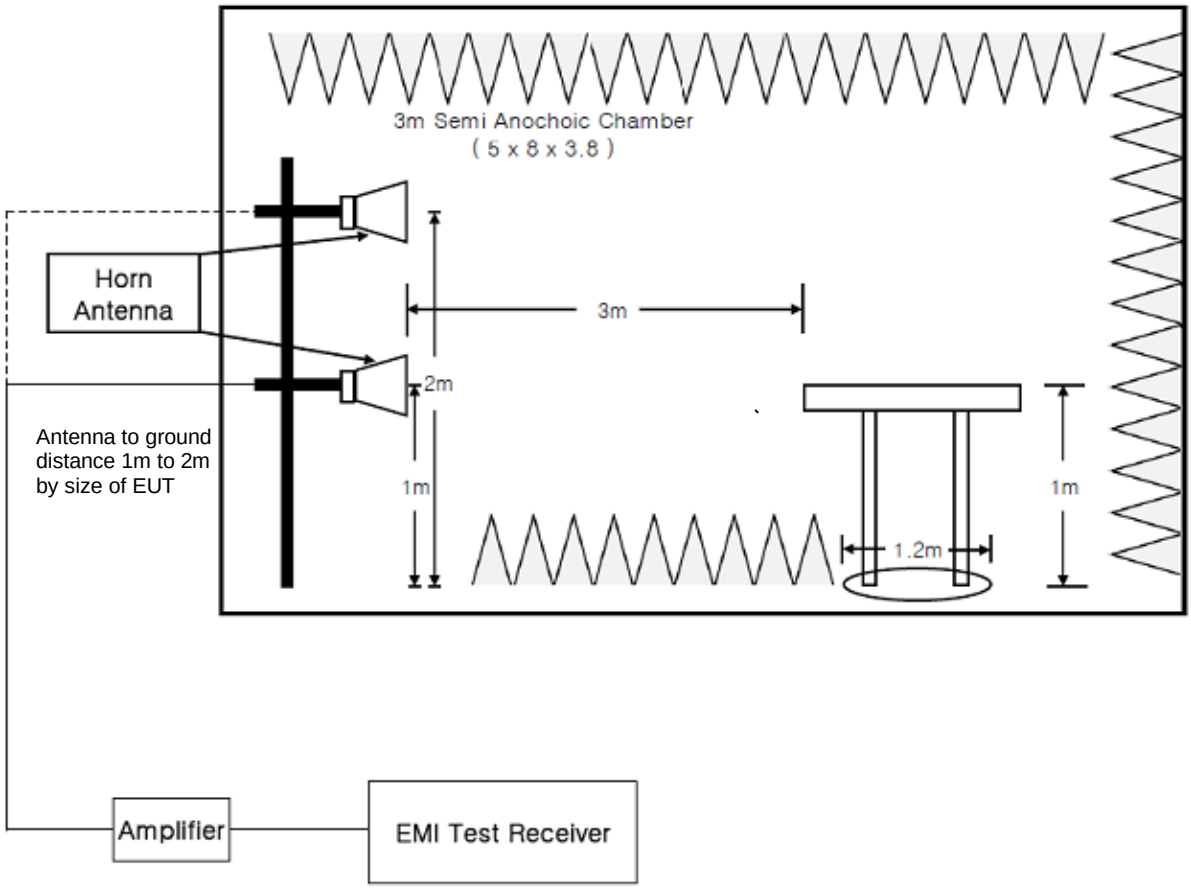
1-Facility

All the testing facilities are periodically serviced as a daily check for equipment and cables systems, an every 6 months facility check for the facilities and a monthly check and annual calibration for testing equipment according to ISO/IEC 17025. All the testing facilities are used as the same specifications shown below. There are descriptions both for radiated disturbance measurement and conducted disturbance measurement conformed by ANSI C 63.4-2014.
The NSA measurement of the 10 m chamber was performed on February 05, 2018 according to ANSI C 63.4:2014
The SVSWR measurement of the 10 m chamber was performed on February 03, 2018 according to ANSI C 63.4:2014

2-1 Radiated Disturbance Measurement – Below 1 GHz



2-2 Radiated Disturbance Measurement – Above 1GHz



3- Test Procedure

3-1 Radiated Disturbance Measurements – Below 1GHz

- Test site is met the requirements of ANSI C 63.4-2014 and the distance between the EUT and the antenna is adjusted 3 m/10 m.
- The turntable can be rotated 360 degrees.
- The antenna can be adjusted between 1m and 4m in height above the ground.
- The EUT is placed on the non-conducting table with 0.8 m height on the turntable.
- Measurements are carried out using a EMI test receiver with peak detectors (100 kHz bandwidth) and an EMI receiver with quasi-peak detectors (120 kHz bandwidth).
- Refer to the list of test equipment used for the test.
- TRILOG antenna are used as wideband antenna.
- The TRILOG antenna is used in the frequency range of 30 MHz to 1 000 MHz.
- A variable attenuator is used for verifying amplifier's linearity.
- Rotating the turntable and adjusting the height of the antenna are carried out by control buttons on the console.
- Refer to "Brief Information"(page 7-8) about details of the EUT and configuration of the cables.

- Measurement is carried out by a LTA operator as manual operation.

–searching for some of High disturbance frequency points than the other points with the following settings; bandwidth 100 kHz, frequency range 10 MHz between 30 MHz and 300 MHz and frequency range 50 MHz between 300 MHz and 1 GHz.

–searching the worst direction with the maximum level of the disturbance wave in rotating the turntable 360 degrees at each searched frequency point.

–setting the height of the antenna with the maximum level of the disturbance wave from 1m to 4m.

–reading the disturbance level by the EMI receiver with quasi-peak detectors (120 kHz bandwidth) according to ANSI C 63.4-2014.

–measuring to vertical and horizontal polarization.

–calculating the measurement result with the following formula or equation:

(Result = Reading +Cor.F (antenna factor + cable loss – PreAmp Gain)

(ex) = 50.6 dBμV/m + (11.08 dB(1/m) + 1.31 dB -27.32 dB)

= 35.67 dBμV/m

3-2 Radiated Disturbance Measurements – Above 1GHz

・Test site is met the requirements of ANSI C 63.4-2014 and the distance between the EUT and the antenna is adjusted 3 m.

・The turntable can be rotated 360 degrees.

・The antenna can be adjusted between 1m and 4 m in height above the ground.

・The EUT is placed on the non-conducting table with 1 m height on the turntable.

・Measurements are carried out using a EMI test receiver with peak detectors (1 MHz bandwidth) and an EMI receiver with peak and average detectors(1 MHz bandwidth).

・Refer to the list of test equipment used for the test.

・HORN antenna are used as wideband antenna.

・The HORN antenna is used in the frequency range of 1 GHz to 18 GHz.

・A variable attenuator is used for verifying amplifier's linearity.

・Rotating the turntable and adjusting the height of the antenna are carried out by control buttons on the console.

・Refer to "Brief Information"(page 7-8) about details of the EUT and configuration of the cables.

・Measurement is carried out by a LTA operator as manual operation.

–searching the worst direction with the maximum level of the disturbance wave in rotating the turntable 360 degrees at each searched frequency point.

–setting the height of the antenna with the maximum level of the disturbance wave from 1 m to 4 m

–reading the disturbance level by the EMI receiver with peak and average detectors (1 MHz bandwidth) according to ANSI C 63.4-2014.

–measuring to vertical and horizontal polarization.

–calculating the measurement result with the following formula or equation:

(Result = Reading +Cor.F (antenna factor + cable loss – PreAmp Gain)

(ex) = 35.9 dBμV/m + (23.92 dB(1/m) + 7.01 dB - 38.33 dB)

= 28.5 dBμV/m

4- List of Equipment Used For the Tests

Radiated Emission – Below 1 GHz

	Item	Model Name	Manufacturer	Serial No.	Next Cal.	Interval
☒	EMI TEST Receiver	ESU	Rohde & Schwarz	100092	2019.09.06	1 year
☒	Amplifier (25 dB)	8447D	HP	2944A07684	2019.09.06	1 year
☒	BILOG Antenna	VULB9168	SCHWARZBECK	775	2020.04.12 (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	2019.09.06	1 year
☒	Amplifier	8449B	HP	3008A00671	2019.09.06	1 year
☒	HORN ANTENNA	3115	ETS	114105	2019.09.26 (RRA)	2 year
☒	TEST PROGRAM	e3 20181212a (V9)	AUDIX	-	-	-

5- EMISSION

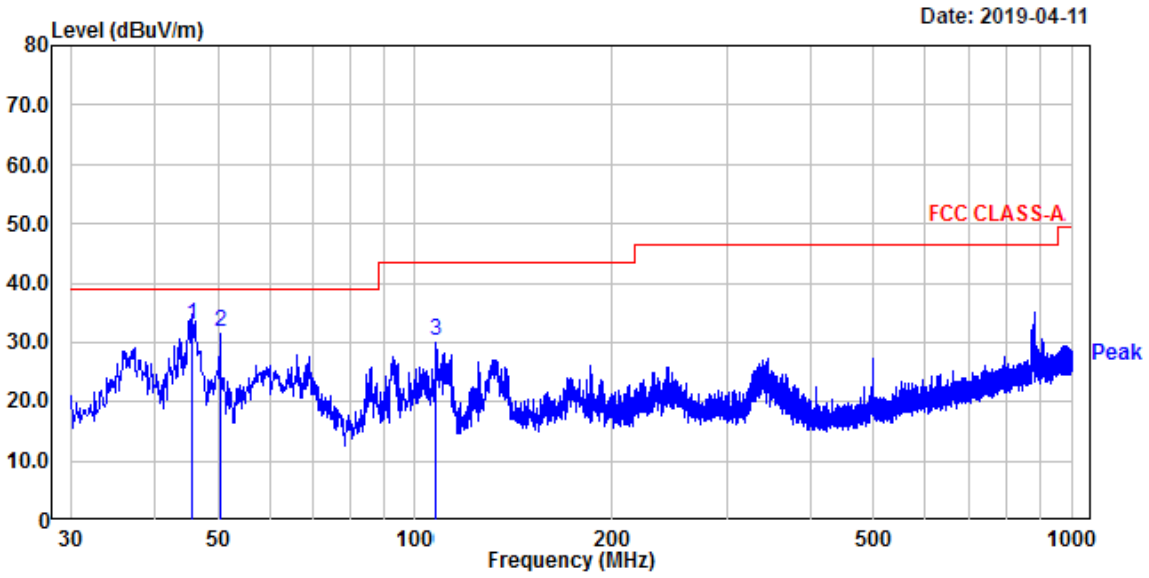
5-1 Radiated Disturbance Measurements

(Below 1GHz) / V

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: QND-8021 Temp/Humi: 23 / 36

Test Mode : Play mode Tested by: CHO J H



Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
45.61	48.59	-15.66	32.93	39.00	6.07	100	27	vertical
50.37	46.99	-15.42	31.57	39.00	7.43	110	106	vertical
107.99	42.68	-12.51	30.17	43.50	13.33	100	350	vertical

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

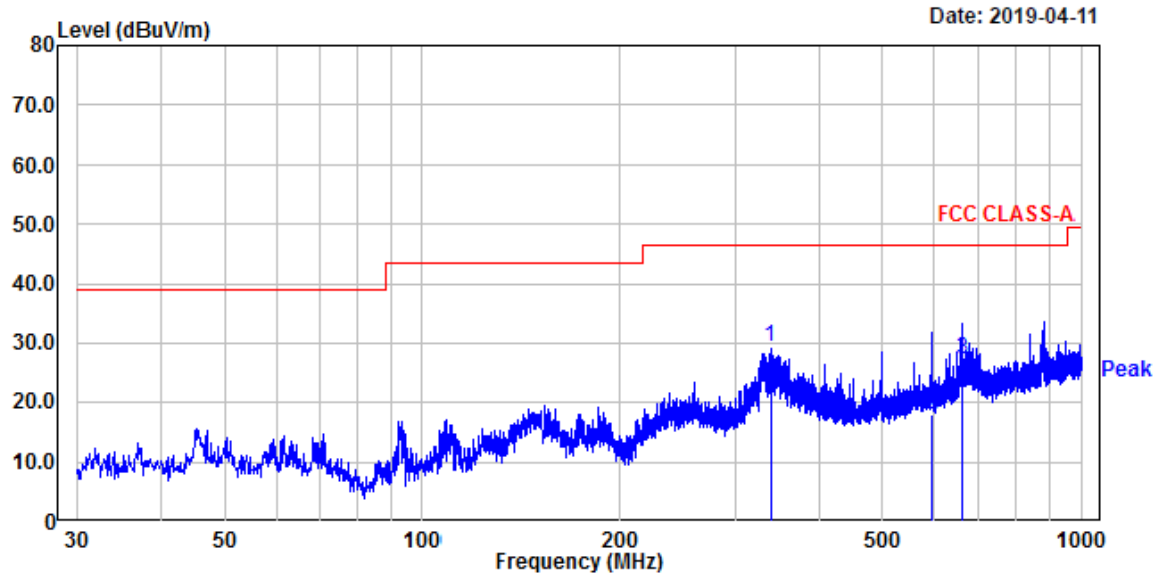
-Continue

(Below 1 GHz) / H

4, Songjuro 236Beon-gil, yanggi-myeon,
Yongin-si, Gyeonggi-do, Korea
Tel : +82-31-3236008,9
Fax : +82-31-3236010
www.ltalab.com

EUT/Model No.: QND-8021 Temp/Humi: 23 / 36

Test Mode : Play mode Tested by: CHO J H



Freq	Reading	C.F	Result QP	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	deg	
337.00	38.50	-9.14	29.36	46.40	17.04	400	135	horizontal
594.56	21.28	-3.49	17.79	46.40	28.61	390	236	horizontal
660.06	29.55	-2.44	27.11	46.40	19.29	400	56	horizontal

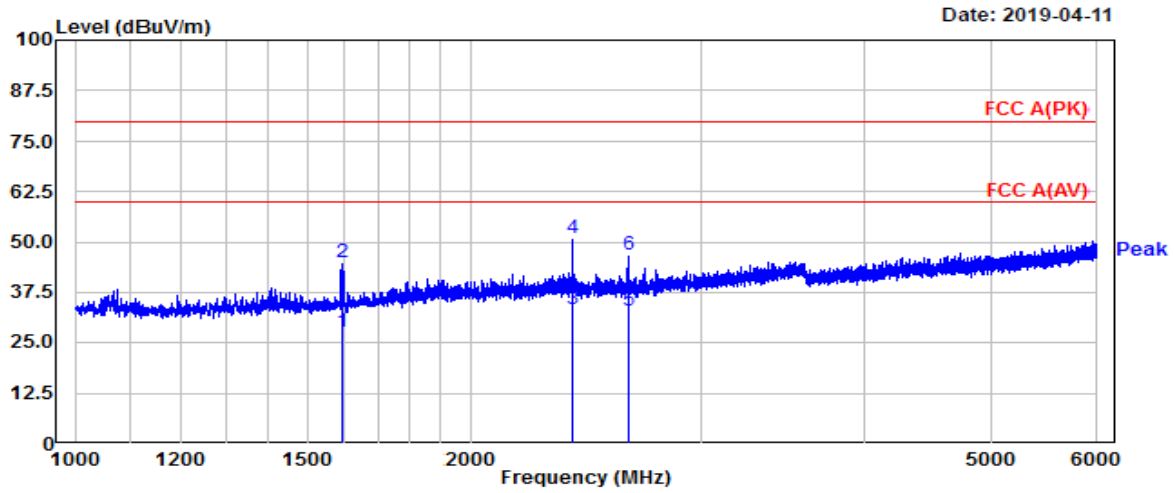
Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

-Continue

(Above 1 GHz)

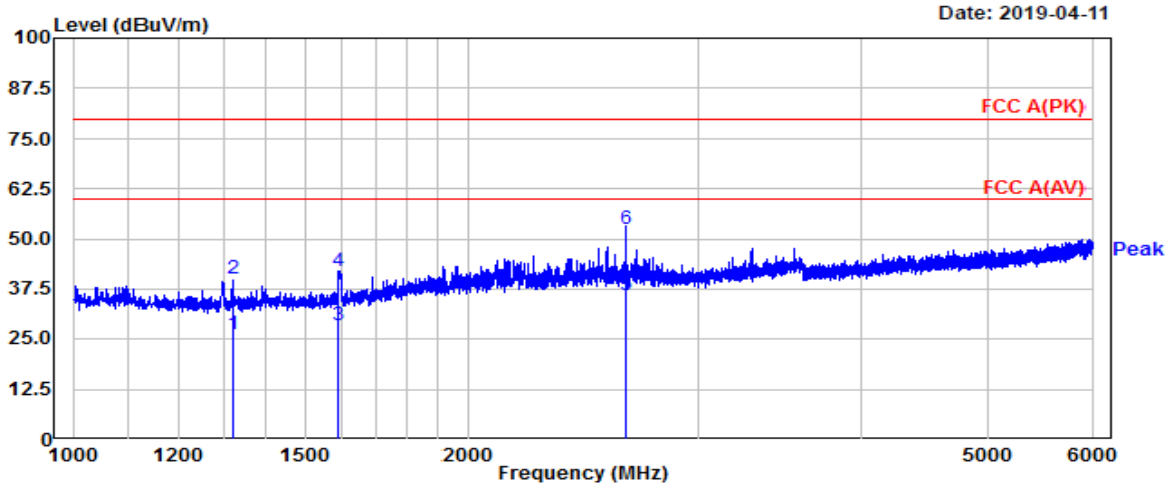
EUT/Model No.: QND-8021 Temp/Humi: 23 / 36

Test Mode : Play mode Tested by: CHO J H



EUT/Model No.: QND-8021 Temp/Humi: 23 / 36

Test Mode : Play mode Tested by: CHO J H



Manufacture : Hanwha Techwin (Tianjin) Co., Ltd.
Model : QND-8021
TEST mode : Play mode

Test Date	Temp.: [℃]	Humidity: [%]	Distance (m)
2019-04-11	23	36	3.8

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 Hor/Ver
1596.3	35.6	32.6	-3.10	32.52	29.45	80.0	60.0	47.48	30.55	100	337	H
2391.3	34.1	33.7	1.78	35.91	35.43	80.0	60.0	44.09	24.57	100	302	H
2642.5	33.0	32.2	2.88	35.88	35.03	80.0	60.0	44.12	24.97	100	278	H
1320.7	47.4	33.3	-5.19	42.16	28.06	80.0	60.0	37.84	31.94	100	242	V
1593.8	47.2	33.5	-3.13	44.03	30.33	80.0	60.0	35.97	29.67	100	229	V
2640.7	51.5	34.9	2.87	54.32	37.72	80.0	60.0	25.68	22.28	100	337	V

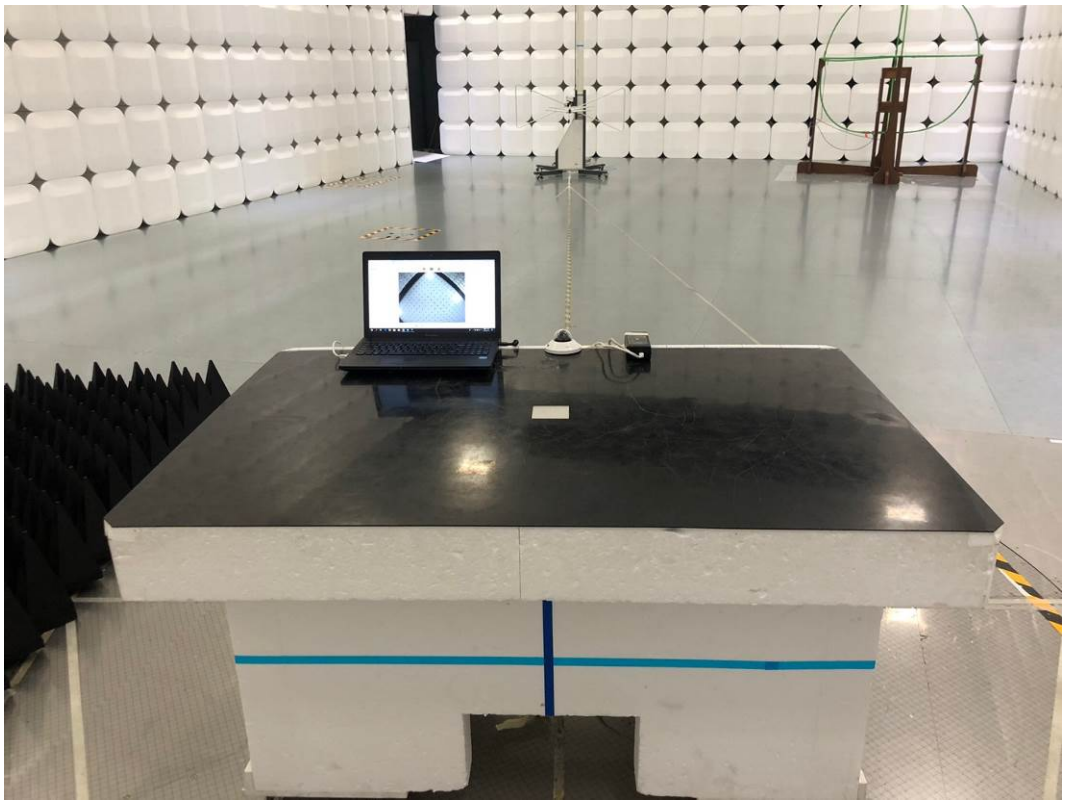
Conclusions

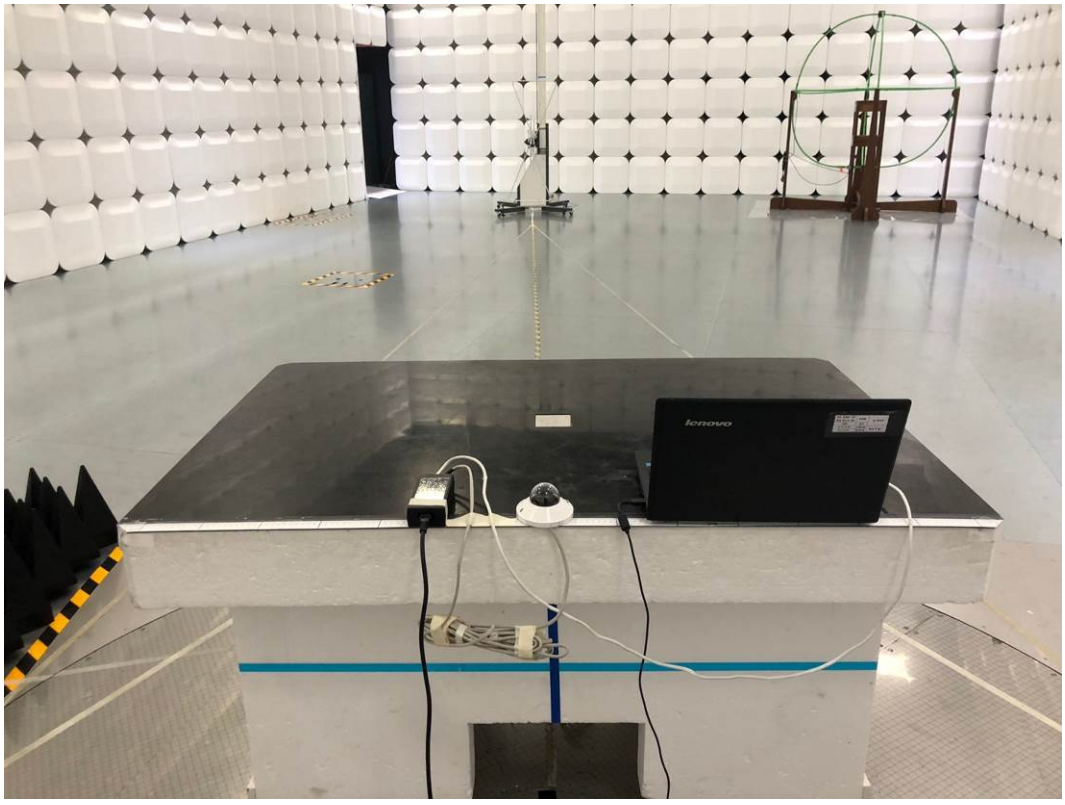
Product models **"QND-8021"** meets all of the Class A requirements of the FCC Part 15, Subpart B. Limits of radio disturbance characteristics of ITE).
(Refer to Test Specification and Test Results in the "LTA certification", page 3 and 4)

- The highest internal source of an EUT is higher than 108 MHz, the measurement shall be made up to 6 GHz.
(The highest internal source of an EUT : 1 GHz)

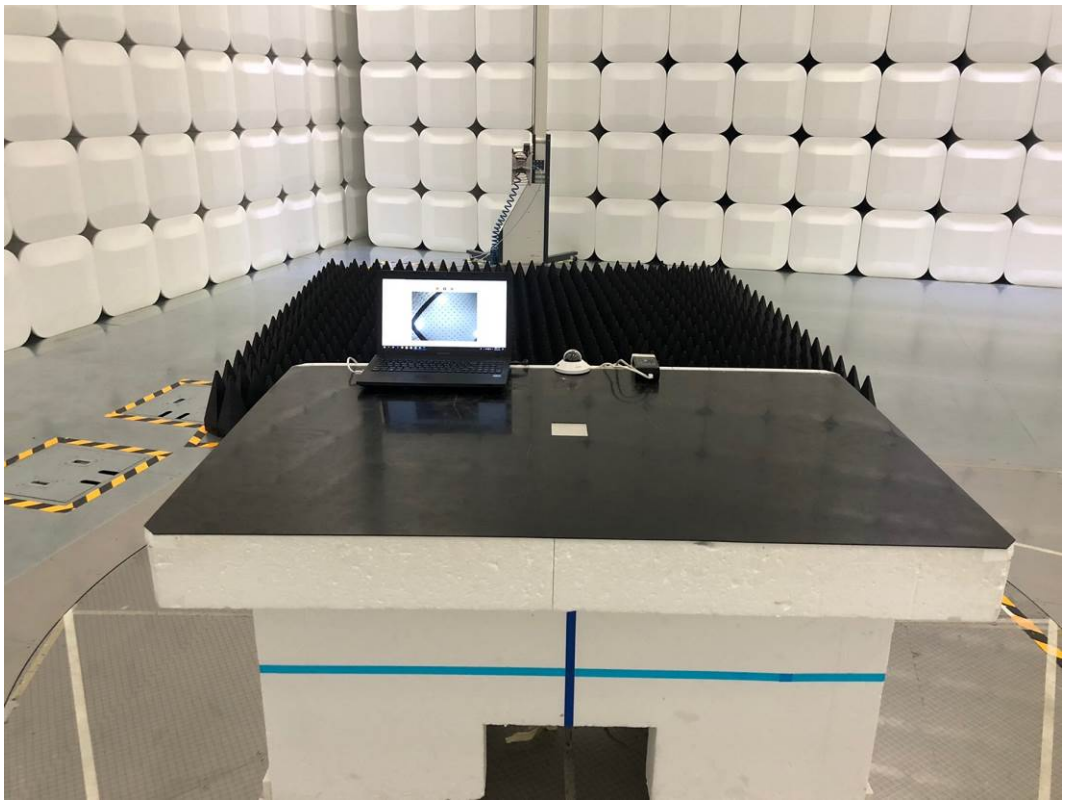
Photograph of the measurements

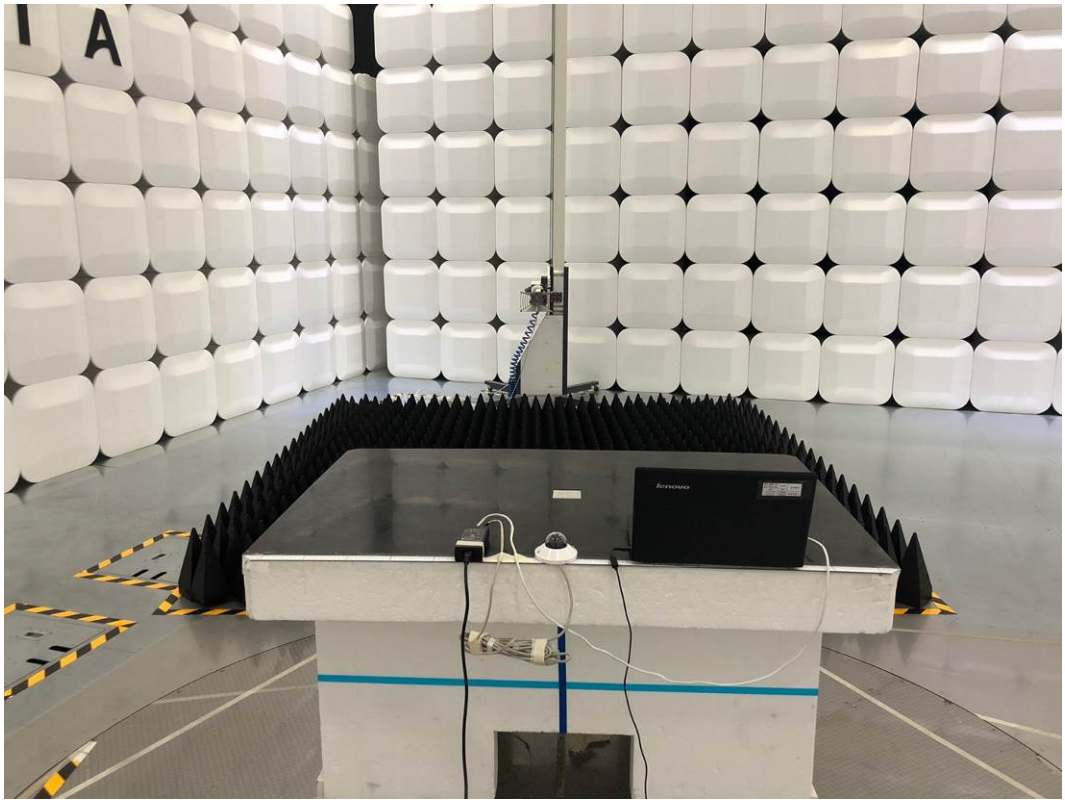
Photograph of the Radiated Disturbance Measurements (Below 1GHz)





Photograph of the Radiated Disturbance Measurements (Above 1GHz)





Photograph of the EUT

Photograph of the Equipment Under Test

Photograph of the Equipment Under Test