

EMC TEST REPORT

Report No. : N2104R-0347

Model and/or type referene : TNO-6321E

Test item description : 2M 32x Network Camera

Trade Mark/Brand name : N/A

Additional model name : N/A

Manufacturer : Wonwoo Engineering Co.,Ltd

Test Device Serial No. : N/A

EMC Directive : Electromagnetic Compatibility Directive 2014/30/EU

Test Standards : EN 55032: 2015/+A11: 2020
EN 50130-4:2011 + A1: 2014
EN IEC 61000-3-2:2019
EN 61000-3-3:2013+A1:2019

Data of issue : April 08, 2021

Test result : **Complied**


2021.04.08

Tested by YOO Byeongkook
(+ signature) / Staff


2021. 04. 08

Reviewed by OH Seungjun
(+ signature) / Technical Manager

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.

This report is related to KS Q ISO/IEC 17025 and KOLAS.

Revision History

Rev. No.	Issued Report No.	Issued Date	Revisions	Effect Section
0	N2104R-0347	April 08, 2021	Origin report	All

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1. General information

1.1 Test Performed

RRA Designation No.: KR0157

KOLAS Accreditation No. : KT511

Laboratory : **NTREE Co., Ltd.**

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SITE MAP

1st laboratory



2nd laboratory



2. Information about test item

2.1 Applicant information

Company name : Hanwha Techwin Co., Ltd
Address : 6, Pangyo-ro 319beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Telephone / Facsimile : +82-70-7147-5383 / +82-31-8018-3717
Contact name : UG Shin
Manufacturer : Wonwoo Engineering Co.,Ltd
Factory Address : 81, Magokjungang6-ro, Gangseo-gu, Seoul, Republic of Korea

2.2 Equipment Under Test (EUT) description

Classification of installation : A
Test item particulars : 2M 32x Network Camera
Trademark : N/A
Model and/or type reference : TNO-6321E
Additional model name : N/A
Serial number : N/A
Date (s) of performance of tests: : March 22, 2021 to March 25, 2021
Date of receipt of test item : March 15, 2021
EUT condition : Pre-productions, not damaged
Interface Ports : AC IN, IO, LAN
EUT Power Source : AC 24 V, 6 A
Internal clock frequency : Above 108 MHz
Firmware version : -
Notice : N/A
Modification : N/A

2.3 Test conditions

Temp. / Humid. / Pressure	:	EMI : $+(20 \pm 1) ^\circ\text{C}$ / $49 - 52$ % RH
	:	EMS: $+(20 \pm 1) ^\circ\text{C}$ / $(43 - 49)$ % RH / (101.6 ± 0.3) kPa
Operating mode	:	Operating Mode
Test Voltage	:	AC 230 V / 50 Hz

2.4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
NOTEBOOK	NT300E4C	N/A	SAMSUNG
NOTEBOOK ADAPTER	CPA09-004A	N/A	N/A
ALARM	QL-Inductionbox	N/A	N/A
ALARM ADAPTER	SP1509A	N/A	Seung Bo Elecom Co.,Ltd.
ADAPTER	MKAC-66-243000K	N/A	ShenZhen MaCable Technology Co.,Ltd Dongguan Branch

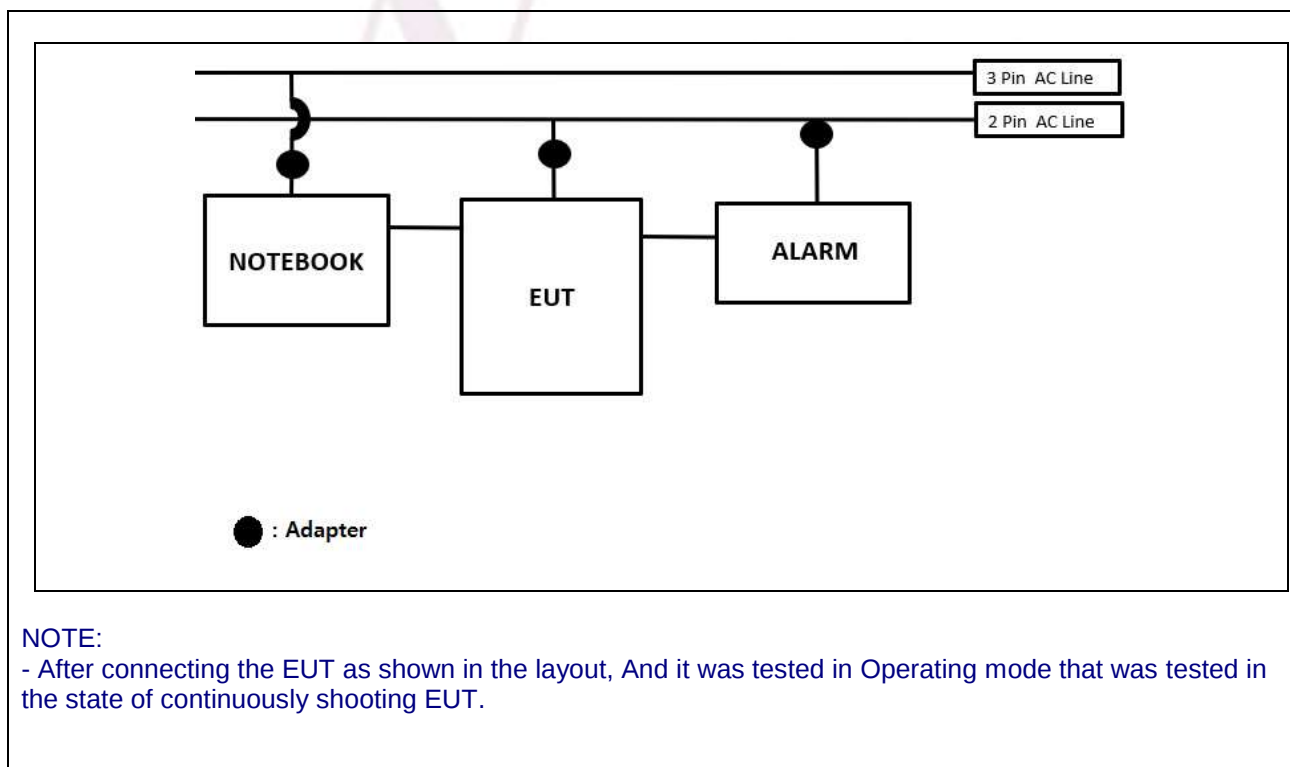
2.5 Variant Model

Model name	Remark
N/A	N/A

2.6 Cable List

Cable List				
Type	Length (m)	Shielding (Cable/backshell)	Remarks	
			From	to
EUT	1.2	NO / NO	AC IN	AC OUT
EUT	1.2	NO / NO	IO	IO
EUT	3.0	NO / NO	LAN	LAN
ALARM	1.2	NO / NO	DC IN	DC OUT
NOTEBOOK	1.2	NO / NO	DC IN	DC OUT
NOTEBOOK ADAPTER	1.5	NO / NO	AC IN	AC OUT
ALARM ADAPTER	-	- / -	AC IN	AC OUT
ADAPTER	1.5	NO / NO	AC IN	AC OUT

2.7 Block diagram of the EUT test



3. Test Report

3.1 Test Summary

3.1.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
☒	Requirements for radiated emissions	EN 55032: 2015/+A11: 2020	C
☐	Requirements for radiated emissions from FM receivers	EN 55032: 2015/+A11: 2020	N/A
☐	Requirements for outdoor units of home satellite receiving systems	EN 55032: 2015/+A11: 2020	N/A
☒	Requirements for conducted emissions from the AC mains power ports	EN 55032: 2015/+A11: 2020	C
☒	Requirements for asymmetric mode conducted emissions	EN 55032: 2015/+A11: 2020	C
☐	Requirements for conducted differential voltage emissions	EN 55032: 2015/+A11: 2020	N/A
☒	Harmonic Current emission	EN IEC 61000-3-2:2019	C
☒	Voltage fluctuations and flicker	EN 61000-3-3:2013+A1:2019	C

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3.1.2 Summary of EMS immunity test results

Applied	Test items	Test method	Result
EN 50130-4:2011+A1:2014			
☒	Electrostatic Discharge	EN 61000-4-2:2009	C
☒	RF Electromagnetic field (80 MHz to 2.7 GHz)	EN 61000-4-3:2006/A2:2010	C
☒	Fast Transients common mode	EN 61000-4-4:2004+A1 :2010	C
☒	Surge, line to line and line to ground	EN 61000-4-5:2006	C
☒	RF common mode (0.15 MHz to 100 MHz)	EN 61000-4-6:2009	C
☒	Voltage Dips and Interruptions	EN 61000-4-11:2004	C

Note 1: C=Complies N/A=Not Applicable F=Fail

Note 2: The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.
(The highest internal source of an EUT : ABOVE 108 MHz)

Note 3: The EUT was tested using LAN Cat.6e.

3.2 EMISSION

3.2.1 Requirements for radiated emissions

Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 55032: 2015/+A11: 2020
Measuring Distance	: Below 1 GHz - 10 m / Above 1 GHz - 3 m
Measurement Frequency range	: 30 MHz to 6 000 MHz
Measurement RBW	: Below 1 GHz – 120 kHz / Above 1 GHz – 1 MHz
Test mode	: Operating Mode
Result	: Complies

A sample calculation:

- C.F (correction factor)= Ant. Factor + Cable loss – (Amp. + 6 dB Att.) (Below 1 GHz)
- C.F (correction factor)= Ant. Factor + Cable loss – (Amp.) (Above 1 GHz)
- Emission Level= meter reading + C.F
- Sample calculation;

- Below 1 GHz

At Frequency: **181.029 MHz** Result = Reading + C.F. = **58.68+ (-28.8) = 29.88** [dBμV/m]

- Measurement Data's kept in NTREE Co., Ltd

- Above 1 GHz

At Frequency: **1600.000 MHz** Result = Reading + C.F. = **55.41+ (-15.0) = 40.41** [dBμV/m]

- Measurement Data's kept in NTREE Co., Ltd

Limit of below 1 GHz - CLASS A

Frequency Range (MHz)	Quasi-peak (dB(μV/m))	Distance (m)
30 to 230	40	10
230 to 1 000	47	

Limit of below 1 GHz - CLASS B

Frequency Range (MHz)	Quasi-peak (dB(μV/m))	Distance (m)
30 to 230	30	10
230 to 1 000	37	

Limit of above 1 GHz - CLASS A

Limit of above 1 GHz – Class A			
Frequency Range (MHz)	Average (dBμV/m)	Peak (dBμV/m)	Distance (m)
1 000 to 3 000	56	76	3
3 000 to 6 000	60	80	
NOTE:	The lower limit applies at the transition frequency.		

Limit of above 1 GHz - CLASS B

Frequency Range	Average (dBμV/m)	Peak (dBμV/m)	Distance (m)
1 000 to 3 000	50	70	3
3 000 to 6 000	54	74	
NOTE:	The lower limit applies at the transition frequency.		

Used equipments – (Below 1 GHz)

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMI Test Receiver	ESR7	ROHDE & SCHWARZ	102035	2021.11.02
☒	Tri-Log Antenna	VULB9168	Schwarzbeck	721	2022.03.24
☒	Amplifier	TK-PA6S	TESTEK	120018	2021.11.02
☒	Attenuator	PE7047-6	Pasternack	#1	2022.03.24
☐	COMMON MODE ABSORPTION DEVICE	CMAD1614	Schwarzbeck	00095	2021.11.04

Used equipments – (Above 1 GHz)

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMI Test Receiver	ESR7	ROHDE & SCHWARZ	101302	2022.03.11
☒	Double Ridged Broadband Horn Antenna(KOLAS)	BBHA 9120D	Schwarzbeck	9120D-02083	2021.10.08
☒	Amplifier	TK-PA18S	TESTEK	160006-L	2022.03.12

Measurement Data:

- Refer to the Next page (Maximum emission configuration)

Below 1 GHz

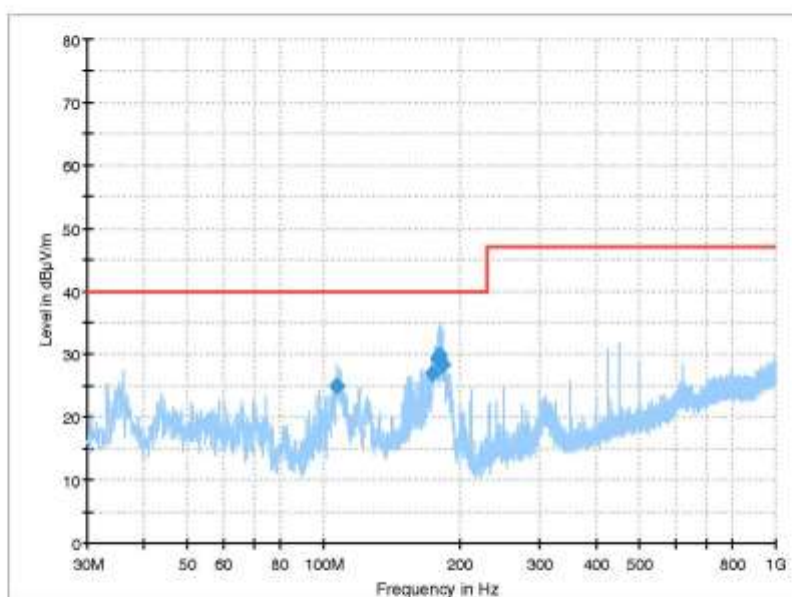
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2021-03-22

Test Report

Common Information

Test Description:	A2021-03153
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz / Temp 21 Humi 52
Operator Name:	YOO Byeongkook
Comment:	



Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
106.630000	25.01	40.00	14.99	2000.0	120.000	200.0	V	239.0	-31.2
173.657000	26.93	40.00	13.07	2000.0	120.000	400.0	H	32.0	-28.2
178.410000	29.10	40.00	10.90	2000.0	120.000	400.0	H	32.0	-28.5
179.477000	29.47	40.00	10.53	2000.0	120.000	400.0	H	32.0	-28.8
181.029000	29.89	40.00	10.12	2000.0	120.000	400.0	H	32.0	-28.8
182.678000	28.31	40.00	11.69	2000.0	120.000	400.0	H	32.0	-28.9

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Result(dBμV/m)= Reading(dBμV/m) + Antenna + cable Loss- Amp. + Attenuator

Above 1 GHz

-Horizontal

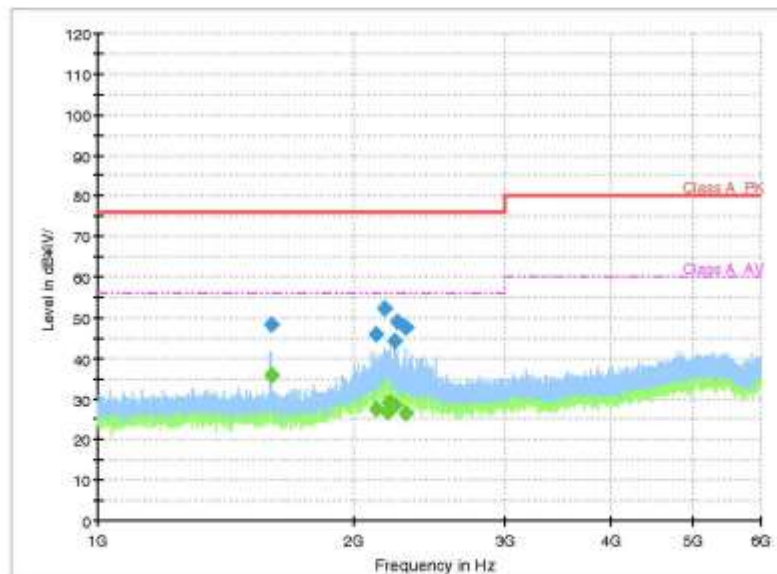
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2021-03-22

Test Report

Common Information

Test Description:	A2021-03153
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V, 50Hz / temp. 20 Humi. 49
Operator Name:	YOO Byeongkook
Comment:	



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1800.000000	48.38	---	76.00	27.64	1000.0	1000.000	100.0	H	208.0	-15.0
1800.000000	---	35.71	56.00	20.29	1000.0	1000.000	100.0	H	208.0	-15.0
2123.611111	45.96	---	76.00	30.04	1000.0	1000.000	100.0	H	137.0	-11.5
2123.611111	---	27.46	56.00	28.54	1000.0	1000.000	100.0	H	137.0	-11.5
2169.166667	52.20	---	76.00	23.80	1000.0	1000.000	100.0	H	243.0	-11.0
2188.055556	---	26.83	56.00	29.17	1000.0	1000.000	100.0	H	0.0	-11.0
2195.833333	---	29.08	56.00	26.92	1000.0	1000.000	100.0	H	261.0	-10.9
2229.166667	44.22	---	76.00	31.78	1000.0	1000.000	100.0	H	190.0	-11.1
2232.222222	---	28.56	56.00	27.44	1000.0	1000.000	100.0	H	243.0	-11.2
2250.555556	48.89	---	76.00	27.11	1000.0	1000.000	100.0	H	243.0	-11.3
2299.722222	---	26.57	56.00	29.43	1000.0	1000.000	100.0	H	243.0	-11.4
2299.722222	47.63	---	76.00	28.37	1000.0	1000.000	100.0	H	243.0	-11.4

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$$\text{Level[dB}\mu\text{V/m]} = \text{Read level[dB}\mu\text{V/m]} + \text{Factor[dB]}$$

-Vertical

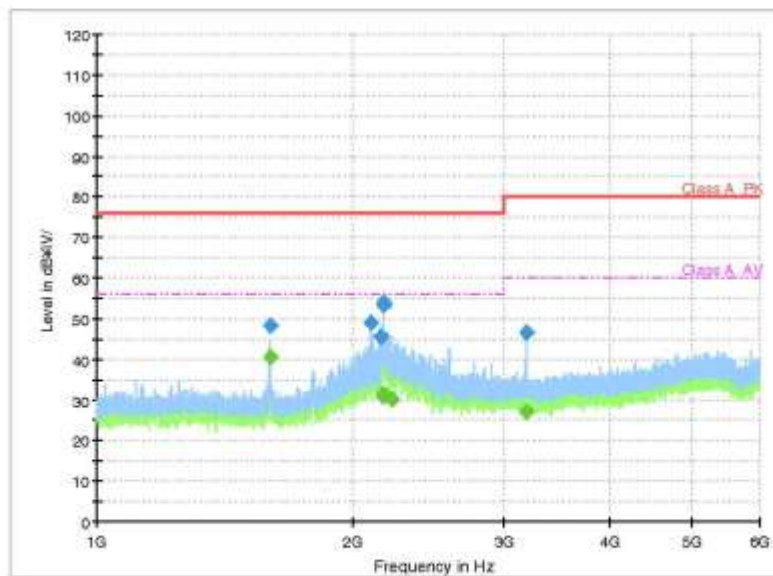
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2021-03-22

Test Report

Common Information

Test Description:	A2021-03153
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V, 50Hz / temp. 20 Humi. 49
Operator Name:	YOO Byeongkook
Comment:	



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mess. Time (ms)	Bandwidth h (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1600.000000	48.38	---	76.00	27.62	1000.0	1000.000	100.0	V	185.0	-15.0
1600.000000	---	40.41	56.00	15.59	1000.0	1000.000	100.0	V	185.0	-15.0
2100.555556	49.06	---	76.00	26.94	1000.0	1000.000	100.0	V	185.0	-11.9
2152.222222	45.42	---	76.00	30.58	1000.0	1000.000	100.0	V	167.0	-11.1
2172.222222	---	30.82	56.00	25.18	1000.0	1000.000	100.0	V	0.0	-11.0
2172.222222	53.93	---	76.00	22.07	1000.0	1000.000	100.0	V	0.0	-11.0
2173.611111	53.35	---	76.00	22.65	1000.0	1000.000	100.0	V	9.0	-11.0
2173.888889	---	31.26	56.00	24.74	1000.0	1000.000	100.0	V	9.0	-11.0
2175.000000	---	31.40	56.00	24.60	1000.0	1000.000	100.0	V	9.0	-11.0
2219.166667	---	30.11	56.00	25.89	1000.0	1000.000	100.0	V	0.0	-11.1
3197.777778	46.58	---	80.00	33.42	1000.0	1000.000	100.0	V	0.0	-9.8
3197.777778	---	27.08	60.00	32.92	1000.0	1000.000	100.0	V	0.0	-9.8

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$$\text{Level[dB}\mu\text{V/m]} = \text{Read level[dB}\mu\text{V/m]} + \text{Factor[dB]}$$

3.2.2 Requirements for radiated emissions from FM receivers

Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 55032: 2015/+A11: 2020
Measuring Distance	: ☐ 10 m / ☐ 3 m
Measurement Frequency range	: 30 MHz to 1 000 MHz
Measurement RBW	: 120 kHz
Test mode	: - mode
Result	: Not Applicable

A sample calculation:

- C.F (correction factor)= Ant. Factor + Cable loss – (Amp. + 10 dB Att.)

- Emission Level= meter reading + C.F

- Sample calculation ;

At Frequency : - Result = Reading + C.F. = -+ (-) = - [dB(μV/m)]

- Measurement Data's kept in NTREE Co., Ltd.

Limit - CLASS B

Frequency Range (MHz)	Quasi-peak (dB(μV/m))		Distance (m)
	Fundamental	Harmonics	
30 to 230	50	42	10
230 to 300		42	
300 to 1 000		46	
30 to 230	60	52	3
230 to 300		52	
230 to 1 000		56	

Used equipment

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☐	-	-	-	-	-

Measurement Data:

- Refer to the Next page (Maximum emission configuration)

3.2.3 Requirements for outdoor units of home satellite receiving systems

Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 55032: 2015/+A11: 2020
Measuring Distance	: Below 1 GHz - 10 m / Above 1 GHz - 3 m
Measurement Frequency range	: 30 MHz to 6 000 MHz
Measurement RBW	: Below 1 GHz – 120 kHz / Above 1 GHz – 1 MHz
Test mode	: - mode
Result	: Not Applicable

A sample calculation:

- C.F (correction factor)= Ant. Factor + Cable loss – (Amp. + 6 dB Att.) (Below 1 GHz)
- C.F (correction factor)= Ant. Factor + Cable loss – (Amp.) (Above 1 GHz)
- Emission Level= meter reading + C.F
- Sample calculation:
- Below 1 GHz
 - At Frequency: - Result = Reading + C.F. = -+ (-) = - [dB μ V/m]
- Above 1 GHz
 - At Frequency: - Result = Reading + C.F. = -+ (-) = - [dB μ V/m]
- Measurement Data's kept in NTREE Co., Ltd.

Limit of Requirements for outdoor units of home satellite receiving systems

Frequency Range (MHz)	Measurement		Limits	Applicable to
	Distance (m)	Detector type /Bandwidth		
30 to 230	10	Quasi-peak / 120 kHz	30 dB(μV/m)	
230 to 1 000			37 dB(μV/m)	
1 000 to 2 500	3	Average / 1 MHz	50 dB(μV/m)	LO leakage and spurious radiated emissions from the EUT, in the region outside ±7° of the main beam axis.
2 500 to 18 000			64 dB(μV/m)	
1 000 to 18 000	3		37 dB(μV/m)	LO leakage from the EUT, in the region within ±7° of the main beam axis.
1 000 to 18 000	N/A		30 dBpW	
For details of the EUT configuration, see Annex H of EN 55032. For radiated emissions measurements at frequencies up to 1 GHz, the requirements defined in Table Limit of below 1 GHz - CLASS B at 3.2.1 shall be satisfied. Apply the appropriate limits across the entire frequency range.				

Used equipments – (Below 1 GHz)

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☐	-	-	-	-	-

Used equipments – (Above 1 GHz)

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☐	-	-	-	-	-

3.2.4 Requirements for conducted emissions from the AC mains power ports

Definition:

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

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 55032: 2015/+A11: 2020
Measurement Frequency range and RBW	: 150 kHz – 30 MHz : 9 kHz
Test mode	: Operating Mode
Result	: Complies

A sample calculation:

- C.F (correction factor)= LISN Insertion loss + Cable loss
- Emission Level= meter reading + C.FP
- Sample calculation;
- At Frequency: **12.136 600 MHz** Result = Reading + C.F. = **22.63+ (10.0) = 32.63** [dBμV/m]
☐ Quasi-peak, ☒ CISPR Average)
- Measurement Data's kept in NTREE Co., Ltd.

Limits for conducted emissions from the AC mains ports of class A equipment.

Applicable to AC mains power port		
Frequency Range(MHz)	Quasi-peak (dB(μV))	CISPR Average (dB(μV))
0.15 to 0.5	79	66
0.5 to 30	73	60
Apply across the entire frequency range.		

Limits for conducted emissions from the AC mains ports of class B equipment.

Applicable to AC mains power port		
Frequency Range (MHz)	Quasi-peak (dB(μV))	CISPR Average (dB(μV))
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50
Apply across the entire frequency range.		

Used equipment

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMI Test Receiver	ESR3	ROHDE & SCHWARZ	102019	2021.11.02
☒	Two-Line V-Network(MAIN)(KC,CE,FCC)	ENV216	ROHDE & SCHWARZ	102177	2022.03.11
☒	Two-Line V-Network(SUB)	ENV216	ROHDE & SCHWARZ	102026	2021.11.02

Measurement Data:

- (Maximum emission configuration)

- LINE

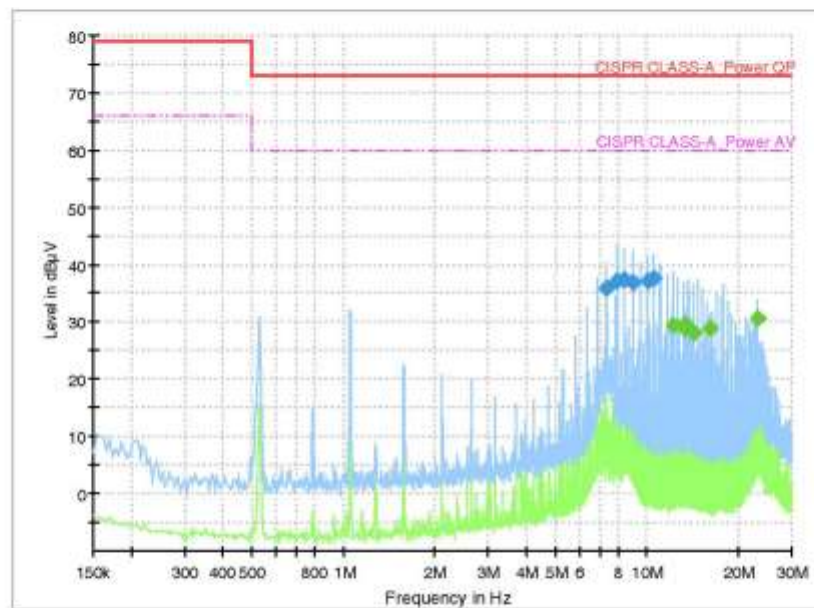
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2021-03-23

Test Report

Common Information

Test Description: A2021-03153
 Test Mode: Operating Mode
 Test Standard: EN 50130-4
 Environment Conditions: AC 230 V 50 Hz, Temp. 20 / Humi. 51
 Operator Name: YOO Byeongkook
 Comment: -



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
7.385350	35.80	---	73.00	37.20	5000.0	9.000	L1	9.9
7.916050	37.10	---	73.00	35.90	5000.0	9.000	L1	9.9
8.438850	37.28	---	73.00	35.72	5000.0	9.000	L1	9.9
8.969750	36.85	---	73.00	36.15	5000.0	9.000	L1	9.9
10.032000	37.24	---	73.00	35.76	5000.0	9.000	L1	9.9
10.556200	37.73	---	73.00	35.27	5000.0	9.000	L1	9.9
12.136600	---	28.26	60.00	30.74	5000.0	9.000	L1	10.0
13.356500	---	28.83	60.00	31.17	5000.0	9.000	L1	10.0
13.419000	---	29.66	60.00	30.34	5000.0	9.000	L1	10.0
14.214200	---	28.13	60.00	31.87	5000.0	9.000	L1	10.0
16.226300	---	28.86	60.00	31.14	5000.0	9.000	L1	10.0
23.130000	---	30.55	60.00	29.45	5000.0	9.000	L1	10.1

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- NEUTRAL

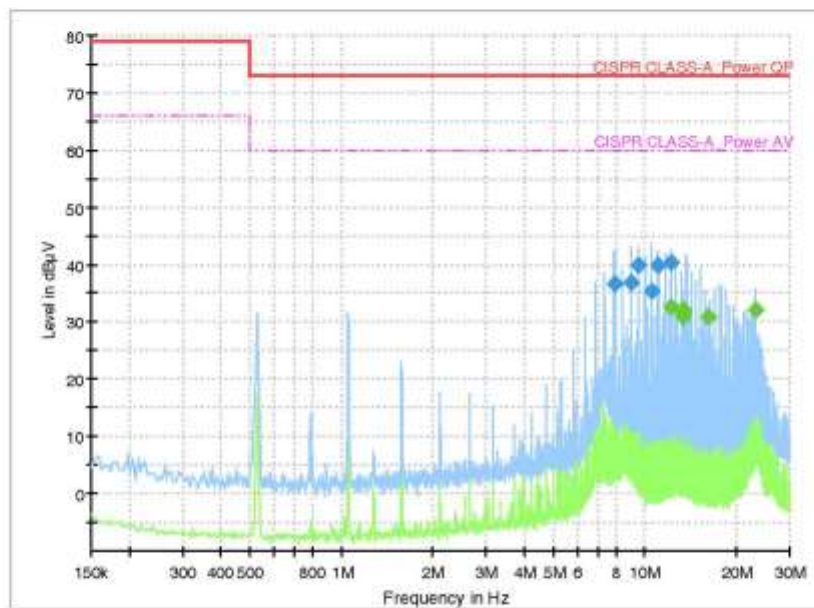
CE_N

2021-03-23

Test Report

Common Information

Test Description: A2021-03153
 Test Mode: Operating Mode
 Test Standard: EN 50130-4
 Environment Conditions: AC 230 V 50 Hz, Temp. 20 / Humi. 51
 Operator Name: YOO Byeongkook
 Comment: -



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
7.916150	36.52	---	73.00	36.48	5000.0	9.000	N	9.9
8.965650	36.88	---	73.00	36.12	5000.0	9.000	N	9.9
9.496850	39.78	---	73.00	33.22	5000.0	9.000	N	9.9
10.580300	35.32	---	73.00	37.68	5000.0	9.000	N	9.9
11.078900	39.97	---	73.00	33.03	5000.0	9.000	N	9.9
12.136800	---	32.63	60.00	27.37	5000.0	9.000	N	10.0
12.136800	40.27	---	73.00	32.73	5000.0	9.000	N	10.0
13.416900	---	30.97	60.00	29.03	5000.0	9.000	N	10.0
13.419000	---	32.24	60.00	27.76	5000.0	9.000	N	10.0
13.420500	---	31.53	60.00	28.47	5000.0	9.000	N	10.0
16.226300	---	30.91	60.00	29.09	5000.0	9.000	N	10.0
23.130000	---	32.14	60.00	27.86	5000.0	9.000	N	10.1

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3.2.5 Requirements for asymmetric mode conducted emissions

Definition:

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

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 55032: 2015/+A11: 2020
Measurement Frequency range and RBW	: 150 kHz – 30 MHz : 9 kHz
Test mode	: Operating mode
Result	: Complies

A sample calculation:

- C.F (correction factor)= AAN / CVP / Current Probe Insertion loss + Cable loss
- Emission Level= meter reading + C.F
- Sample calculation;
- At Frequency: **23.130 000 MHz** Result = Reading + C.F. = **40.68+ (9.9) = 50.58** [dB μ V/m]
☐ Quasi-peak, ☒ CISPR Average)
- Measurement Data's kept in NTREE Co., Ltd.

Limit of for asymmetric mode conducted emissions from Class A equipment.

1. Wired network ports					
2. Optical fiber port with metallic shield or tension members.					
3. Antenna ports					
Frequency Range (MHz)	Coupling device	Voltage limits		Current limit	
		Quasi-peak (dB(μV))	Average (dB(μV))	Quasi-peak (dB(μA))	Average (dB(μA))
0.15 to 0.5	AAN	97 to 87	84 to 74	N/A	
0.5 to 30		87	74		
0.15 to 0.5	CVP and current probe	97 to 87	84 to 74	53 to 43	40 to 30
0.5 to 30		87	74	40	30
0.15 to 0.5	current probe	N/A		53 to 43	40 to 30
0.5 to 30				40	30
The choice of coupling device and measurement procedure is defined in Annex C.					
AC mains ports that also have the function of a wired network port shall meet the limits given in Table					
limits for conducted emissions from the AC mains ports of class A equipment at 3.2.3.					
The measurement shall cover the entire frequency range.					
The application of the voltage and/or current limits is dependent on the measurement procedure used.					
Refer to Table C.1 for applicability.					
Testing is required at only one EUT supply voltage and frequency.					
Applicable to ports listed above and intended to connect to cables longer than 3 m.					

Limit of for asymmetric mode conducted emissions from Class B equipment.

1.	Wired network ports
2.	Optical fiber port with metallic shield or tension members.
3.	Broadcast receiver tuner ports
4.	Antenna ports

Frequency Range (MHz)	Coupling device	Voltage limits		Current limit	
		Quasi-peak (dB(μV))	Average (dB(μV))	Quasi-peak (dB(μA))	Average (dB(μA))
0.15 to 0.5	AAN	84 to 74	74 to 64	N/A	
0.5 to 30		74	64		
0.15 to 0.5	CVP and Current probe	84 to 74	74 to 64	40 to 30	30 to 20
0.5 to 30		74	64	30	20
0.15 to 0.5	Current probe	N/A		40 to 30	30 to 20
0.5 to 30				30	20

The choice of coupling device and measurement procedure is defined in Annex C.
Screened ports including TV broadcast receiver tuner ports are measured with a common-mode impedance of 150 Ω. This is typically accomplished with the screen terminated by 150 Ω to earth.
AC mains ports that also have the function of a wired network port shall meet the limits given in Table limits for conducted emissions from the AC mains ports of class B equipment at 3.2.3.
The measurement shall cover the entire frequency range.
The application of the voltage and/or current limits is dependent on the measurement procedure used.
Refer to Table C.1 for applicability.
Testing is required at only one EUT supply voltage and frequency.
Applicable to ports listed above and intended to connect to cables longer than 3 m.

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMI Test Receiver	ESR3	ROHDE & SCHWARZ	102019	2021.11.02
☒	Two-Line V-Network(MAIN)(KC,CE,FCC)	ENV216	ROHDE & SCHWARZ	102177	2022.03.11
☒	Two-Line V-Network(SUB)	ENV216	ROHDE & SCHWARZ	102026	2021.11.02
☒	Impedance Stabilization Network	ENY81	ROHDE & SCHWARZ	100227	2021.11.04
☐	Impedance Stabilization Network	ENY81-CA6	ROHDE & SCHWARZ	101731	2021.11.04
☐	CDN	CDN ST08A	TESEQ	36643	2022.03.11
☐	Current Probe	EZ-17	ROHDE & SCHWARZ	101003	2021.11.03

Measurement Data:

- (Maximum emission configuration)
- No other emissions were detected at a level greater than 20 dB below limit

- 10 Mbps

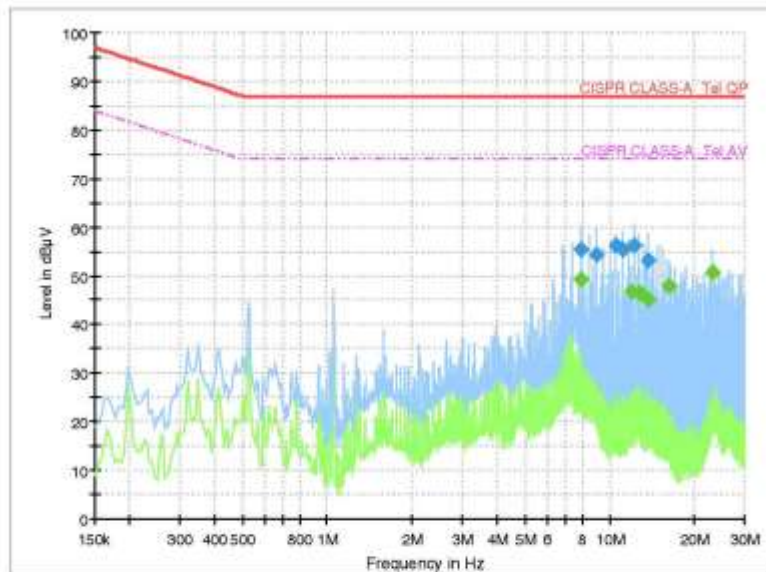
CE_TEL_10

2021-03-23

Test Report

Common Information

Test Description:	A2021-03153
Test Mode:	Operating Mode
Test Standard:	KN 32
Environment Conditions:	AC 230 V 50 Hz, Temp. 20 / Humi. 51
Operator Name:	YOO Byeongkook
Comment:	LAN - 10 Mbps



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
7.812150	55.46	—	87.00	31.54	1000.0	9.000	9.6
7.923950	—	49.36	74.00	24.64	1000.0	9.000	9.6
8.973750	54.21	—	87.00	32.79	1000.0	9.000	9.7
10.556200	56.13	—	87.00	30.87	1000.0	9.000	9.7
11.082900	55.52	—	87.00	31.48	1000.0	9.000	9.7
11.892500	—	46.76	74.00	27.24	1000.0	9.000	9.7
12.136500	56.21	—	87.00	30.79	1000.0	9.000	9.7
12.807500	—	46.52	74.00	27.48	1000.0	9.000	9.7
13.712500	—	44.99	74.00	29.01	1000.0	9.000	9.8
13.713000	53.18	—	87.00	33.82	1000.0	9.000	9.8
16.226300	—	47.90	74.00	26.10	1000.0	9.000	9.8
23.130000	—	50.58	74.00	23.42	1000.0	9.000	9.9

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- 100 Mbps

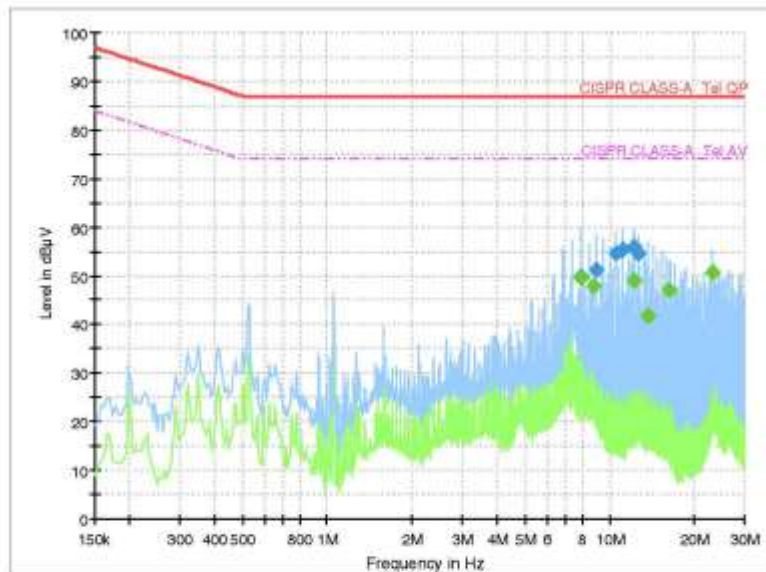
CE_TEL_100

2021-03-23

Test Report

Common Information

Test Description:	A2021-03153
Test Mode:	Operating Mode
Test Standard:	KN 32
Environment Conditions:	AC 230 V 50 Hz, Temp. 20 / Humi. 51
Operator Name:	YOO Byeongkook
Comment:	LAN - 100 Mbps



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
7.906250	49.97	—	87.00	37.03	1000.0	9.000	9.6
7.923950	—	49.56	74.00	24.44	1000.0	9.000	9.6
8.716050	—	48.02	74.00	25.98	1000.0	9.000	9.7
8.969750	51.14	—	87.00	35.86	1000.0	9.000	9.7
10.556100	54.51	—	87.00	32.49	1000.0	9.000	9.7
11.086900	55.52	—	87.00	31.48	1000.0	9.000	9.7
12.136800	55.91	—	87.00	31.09	1000.0	9.000	9.7
12.136900	—	48.90	74.00	25.10	1000.0	9.000	9.7
12.663200	54.61	—	87.00	32.39	1000.0	9.000	9.7
13.724500	—	41.72	74.00	32.28	1000.0	9.000	9.8
16.230300	—	47.16	74.00	26.84	1000.0	9.000	9.8
23.130000	—	50.57	74.00	23.43	1000.0	9.000	9.9

3.2.6 Requirements for conducted differential voltage emissions

Definition:

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

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 55032: 2015/+A11: 2020
Measurement Frequency range	: Below 1 GHz : 120 kHz (Quasi Peak)
and RBW(Detector)	Above 1 GHz : 1 MHz (Peak)
Test mode	: — mode
Result	: Not Applicable

A sample calculation:

- C.F (correction factor) = Matching pad + POWER SPLITTER/COMBINER + Cable loss
- Emission Level= meter reading + C.F
- Sample calculation;
- At Frequency: - Result = Reading + C.F. = -+ (-) = - [dBμV]
- Measurement Data's kept in NTREE Co., Ltd.

Limit of for conducted differential voltage emissions from Class B equipment.

Applicable to					
1. TV broadcast receiver tuner ports with an accessible connector					
2. RF modulator output ports					
3. FM broadcast receiver tuner ports with an accessible connector					
Frequency Range (MHz)	Coupling device	Class B limits dB(μV) 75 Ω			Applicability
		Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
30 to 950	For frequencies ≤1 GHz Quasi Peak/ 120 kHz	46	46	46	See ^a
950 to 2 150		46	54	54	
950 to 2 150		46	54	54	See ^b
30 to 300	For frequencies ≥1 GHz Peak/ 1 MHz	46	54	50	See ^c
300 to 1 000				52	
30 to 300		46	66	59	See ^d
300 to 1 000				52	
30 to 950		46	76	46	See ^e
950 to 2150			N/A	54	
a Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers. b Tuner units (not the LNB) for satellite signal reception. c Frequency modulation audio receivers and PC tuner cards. d Frequency modulation car radios. e Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports. Limits specified for the LO are for the RF modulator carrier signal and harmonics. The term ‘other’ refers to all emissions other than the fundamental and the harmonics of the LO. The measurement shall cover the entire frequency range. The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.					

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☐	EMI Receiver	ESR7	Rohde & Schwarz	101302	2022.03.11
☐	POWER SPLITTER/COMBINER	ZFRSC-42-S+	Mini-Circuits	SUU90901305	2022.03.11
☐	MATCHING PAD	UNMP-5075+	Mini-Circuits	VUU01601305	2022.03.11
☐	Impedance Matching Box	TIB-R1	TESTEC	150054-R	-
☐	color TV pattern generator	PM5418	PHILIPS	LO 634427	-
☐	All-Band Modulator	DTA-2115	DekTec	2115000354	-

Measurement Data:

- (Maximum emission configuration)



3.2.7 Harmonic Current (AC power input port)

Definition:

This part deals with the Limitation of harmonic currents injected into the public supply system.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method : **EN IEC 61000-3-2:2019**
 Test mode : Operating Mode
 Result : **Complies**

Measurement Data:

Uncertainty(HAR) = +/- 2.24 % (with a 95 % confidence level, k = 2)

“It has been demonstrated that the HAR generator meets the specified requirements in the standard with at least 95 % confidence.”

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	Precision Power Analyzer	LMG671	ZES ZIMMER	3572008	2021.12.21
☒	IEC VOLTAGE DIPS MODULE with POWER SOURCE	EPTS-75A-3 3150AFX- 4AGC	FACIFIC	20009 126224916	2021.12.15

Test Settings

Test

Measuring Standard	IEC 61000-4-7:2002 + A1:2008
Limits	IEC 61000-3-2:2018 (Table 1)
Test conditions	IEC 61000-3-2:2018, App. B.10 Information technology equipment (ITE)
Test Date	23.03.2021
Test Time	07:46:44
Measurement Duration	00:02:30
EUT Classification	Class A
EUT / Measurement Setup	
Power Supply	
Nominal Voltage	230V
Nominal Frequency	50Hz

EUT Details

Brand	Hanwha Techwin Co., Ltd
Model	A2021-03153

Laboratory Details

Name	
Address	

Test Equipment

Power Meter

Manufacturer	ZES ZIMMER Electronic Systems GmbH
Model	LMG671
Serial Number	03572008
Software Version	3.031-R63116
NI controlled by LMG, SN:	
Analysis Software	ZES ZIMMER LMG600 Control 3.031-R63116

Additional Measurands - Informative

Additional Measurands

$U_{rms, L1}$	230.134 V	$U_{pp, L1}$	649.896 V	$U_{dc, L1}$	-26.0824 mV
$U_{ct, L1}$	1.41223	$I_{rms, L1}$	55.2985 mA	$I_{pp, L1}$	236.145 mA
$I_{dc, L1}$	95.5649 μ A	$I_{ct, L1}$	2.14189	P_{L1}	7.46437 W
Q_{L1}	10.3071 var	S_{L1}	12.7261 VA	PF_{L1}	0.58654
$f_{cycle, L1}$	50.0 Hz				

Result Overview

Test Name	Test Result	Limit Usage	Info
Supply Voltage	OK		50.00 Hz (50.00 Hz ± 0.5%)
Frequency Test (61000-4-7) [L1]			
Supply peak voltage test (61000-4-7) [L1]	OK		
Positive peak test	OK		All positive peak values within the allowed range
Negative peak test	OK		All negative peak values within the allowed range
Supply peak position test (61000-4-7) [L1]	OK		All peak values within the allowed range
Supply Voltage Harmonic Distortion Test (61000-4-7) [L1]	OK		
Voltage Distortion H2	OK	2.8%	0.01% < 0.20%
Voltage Distortion H3	OK	33.0%	0.30% < 0.90%
Voltage Distortion H4	OK	2.8%	0.01% < 0.20%
Voltage Distortion H5	OK	3.8%	0.02% < 0.40%
Voltage Distortion H6	OK	3.5%	0.01% < 0.20%
Voltage Distortion H7	OK	3.8%	0.01% < 0.30%
Voltage Distortion H8	OK	1.5%	0.00% < 0.20%
Voltage Distortion H9	OK	2.7%	0.01% < 0.20%
Voltage Distortion H10	OK	2.4%	0.00% < 0.20%
Voltage Distortion H11	OK	9.6%	0.01% < 0.10%
Voltage Distortion H12	OK	6.1%	0.01% < 0.10%
Voltage Distortion H13	OK	6.8%	0.01% < 0.10%
Voltage Distortion H14	OK	4.5%	0.00% < 0.10%
Voltage Distortion H15	OK	4.5%	0.00% < 0.10%
Voltage Distortion H16	OK	3.8%	0.00% < 0.10%
Voltage Distortion H17	OK	5.4%	0.01% < 0.10%
Voltage Distortion H18	OK	2.0%	0.00% < 0.10%
Voltage Distortion H19	OK	5.2%	0.01% < 0.10%
Voltage Distortion H20	OK	3.8%	0.00% < 0.10%
Voltage Distortion H21	OK	2.2%	0.00% < 0.10%
Voltage Distortion H22	OK	2.7%	0.00% < 0.10%
Voltage Distortion H23	OK	3.2%	0.00% < 0.10%
Voltage Distortion H24	OK	4.7%	0.00% < 0.10%
Voltage Distortion H25	OK	2.8%	0.00% < 0.10%
Voltage Distortion H26	OK	3.0%	0.00% < 0.10%
Voltage Distortion H27	OK	4.3%	0.00% < 0.10%
Voltage Distortion H28	OK	3.3%	0.00% < 0.10%
Voltage Distortion H29	OK	4.8%	0.00% < 0.10%
Voltage Distortion H30	OK	2.4%	0.00% < 0.10%
Voltage Distortion H31	OK	4.4%	0.00% < 0.10%
Voltage Distortion H32	OK	3.4%	0.00% < 0.10%
Voltage Distortion H33	OK	2.1%	0.00% < 0.10%
Voltage Distortion H34	OK	2.2%	0.00% < 0.10%
Voltage Distortion H35	OK	3.1%	0.00% < 0.10%
Voltage Distortion H36	OK	3.0%	0.00% < 0.10%
Voltage Distortion H37	OK	2.4%	0.00% < 0.10%
Voltage Distortion H38	OK	1.7%	0.00% < 0.10%
Voltage Distortion H39	OK	1.4%	0.00% < 0.10%
Voltage Distortion H40	OK	2.1%	0.00% < 0.10%
Frequency groups up to 9kHz (61000-4-7) [L1]	OK		
Table 1 Harmonic Current Test (61000-3-2) [L1]	OK		
Harmonic Current Test 100%	OK		
100% Test H2	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H3	OK	0.7%	Limit met (0.017 A ≤

100% Test H4	OK		2.300 A) No test required (0.000 A ≤ 0.005 A)
100% Test H5	OK	1.5%	Limit met (0.017 A ≤ 1.140 A)
100% Test H6	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H7	OK	1.3%	Limit met (0.010 A ≤ 0.770 A)
100% Test H8	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H9	OK	1.6%	Limit met (0.006 A ≤ 0.400 A)
100% Test H10	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H11	OK		No test required (0.002 A ≤ 0.005 A)
100% Test H12	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H13	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H14	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H15	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H16	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H17	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H18	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H19	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H20	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H21	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H22	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H23	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H24	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H25	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H26	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H27	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H28	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H29	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H30	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H31	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H32	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H33	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H34	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H35	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H36	OK		No test required (0.000 A

			≤ 0.005 A)
100% Test H37	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H38	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H39	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H40	OK		No test required (0.000 A ≤ 0.005 A)
Harmonic Current Test 150%	OK		
150% Test H2	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H3	OK	0.5%	Limit met (0.017 A ≤ 3.450 A)
150% Test H4	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H5	OK	1.0%	Limit met (0.017 A ≤ 1.710 A)
150% Test H6	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H7	OK	0.9%	Limit met (0.010 A ≤ 1.155 A)
150% Test H8	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H9	OK	1.0%	Limit met (0.006 A ≤ 0.600 A)
150% Test H10	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H11	OK		No test required (0.002 A ≤ 0.005 A)
150% Test H12	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H13	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H14	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H15	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H16	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H17	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H18	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H19	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H20	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H21	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H22	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H23	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H24	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H25	OK		No test required (0.001 A ≤ 0.005 A)
150% Test H26	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H27	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H28	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H29	OK		No test required (0.000 A

			≤ 0.005 A)
150% Test H30	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H31	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H32	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H33	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H34	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H35	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H36	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H37	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H38	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H39	OK		No test required (0.000 A ≤ 0.005 A)
150% Test H40	OK		No test required (0.000 A ≤ 0.005 A)
Harmonic Current Test 200%	OK		
200% Test H2	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H3	OK	0.4%	Limit met (0.017 A ≤ 4.600 A)
200% Test H4	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H5	OK	0.8%	Limit met (0.017 A ≤ 2.280 A)
200% Test H6	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H7	OK	0.7%	Limit met (0.010 A ≤ 1.540 A)
200% Test H8	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H9	OK	0.8%	Limit met (0.006 A ≤ 0.800 A)
200% Test H10	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H11	OK		No test required (0.002 A ≤ 0.005 A)
200% Test H12	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H13	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H14	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H15	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H16	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H17	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H18	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H19	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H20	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H21	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H22	OK		No test required (0.000 A

			≤ 0.005 A)
200% Test H23	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H24	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H25	OK		No test required (0.001 A ≤ 0.005 A)
200% Test H26	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H27	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H28	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H29	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H30	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H31	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H32	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H33	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H34	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H35	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H36	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H37	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H38	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H39	OK		No test required (0.000 A ≤ 0.005 A)
200% Test H40	OK		No test required (0.000 A ≤ 0.005 A)
POHC Test	OK	0.5%	POHC Limit met (0.001 A ≤ 0.251 A)
100% Test H2	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H3	OK	0.7%	Limit met (0.017 A ≤ 2.300 A)
100% Test H4	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H5	OK	1.5%	Limit met (0.017 A ≤ 1.140 A)
100% Test H6	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H7	OK	1.3%	Limit met (0.010 A ≤ 0.770 A)
100% Test H8	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H9	OK	1.6%	Limit met (0.006 A ≤ 0.400 A)
100% Test H10	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H11	OK		No test required (0.002 A ≤ 0.005 A)
100% Test H12	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H13	OK		No test required (0.001 A ≤ 0.005 A)
100% Test H14	OK		No test required (0.000 A ≤ 0.005 A)
100% Test H15	OK		No test required (0.001 A

		≤ 0.005 A)
100% Test H16	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H17	OK	No test required (0.001 A ≤ 0.005 A)
100% Test H18	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H19	OK	No test required (0.001 A ≤ 0.005 A)
100% Test H20	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H21	OK	No test required (0.001 A ≤ 0.005 A)
100% Test H22	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H23	OK	No test required (0.001 A ≤ 0.005 A)
100% Test H24	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H25	OK	No test required (0.001 A ≤ 0.005 A)
100% Test H26	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H27	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H28	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H29	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H30	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H31	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H32	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H33	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H34	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H35	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H36	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H37	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H38	OK	No test required (0.000 A ≤ 0.005 A)
150% Test H39	OK	No test required (0.000 A ≤ 0.005 A)
100% Test H40	OK	No test required (0.000 A ≤ 0.005 A)

3.2.8 Voltage Variation and Flicking (AC power input port)

Definition:

This section is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 61000-3-3:2013+A1:2019
Test mode	: Operating Mode
Result	: Complies

Measurement Data:

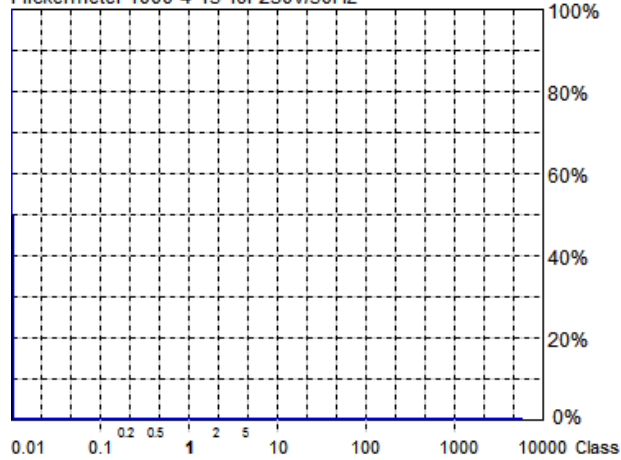
Uncertainty(HAR) = +/- 2.24 % (with a 95 % confidence level, k = 2)

“It has been demonstrated that the HAR generator meets the specified requirements in the standard with at least 95 % confidence.”

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	HAR1000 System	HAR1000-1P	EMC PARTNER	HAR1000-1P 230V-0212	2021.08.03

Flickermeter 1000-4-15 for 230V/50Hz



Actual Flicker (Fli): 0.00
 Short-term Flicker (Pst): 0.07
 Limit (Pst): 1.00
 Long-term Flicker (Plt): 0.07
 Limit (Plt): 0.65
 Maximum Relative Volt. Change (dmax): 0.00%
 Limit (dmax): 4.00%
 Relative Steady-state Voltage Change (dc): 0.00%
 Limit (dc): 3.00%
 Maximum Interval exceeding 3.00% (dt): 0.00ms
 Limit (dt>Lim): 200ms

Flicker Emission - IEC 61000-3-3, EN 61000-3-3

2021-03-23 오후 4:15

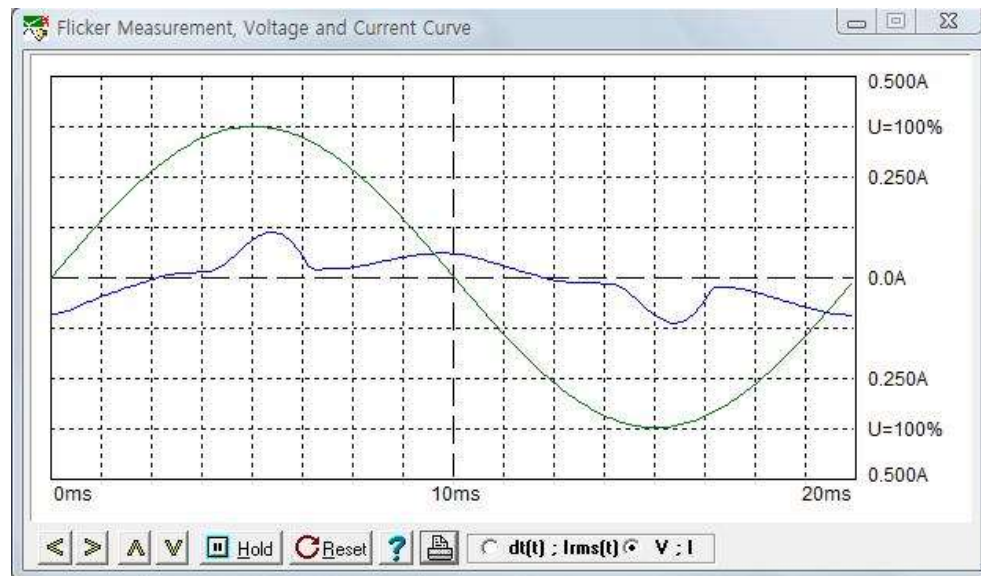
Urms = 230.9 V P = 7.780 W
 Irms = 0.057 A pf = 0.595

Range: 0.5 A
 V-nom: 230 V
 TestTime: 10 min (100%)

A2021-03153

Test completed, Result: PASSED

HAR-1000 EMC-Partner



Operator YOO Byeongkook

Unit A2021-03153

Serial Number N/A

Remarks

Urms = 230.9V Freq = 50.052 Range: 0.5 A

Irms = 0.057A Ipk = 0.119A cf = 2.099

P = 7.780W S = 13.08VA pf = 0.595

Test - Time : 1 x 10min = 10min (100 %)

LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

Limits : Plt : 0.65 Pst : 1.00

dmax : 4.00 % dc : 3.00 %

dtLim: 3.00 % dt>Lim: 200ms

Test completed, Result: PASSED

dmax

[%]

1 0.000

3.3 IMMUNITY

3.3.1 Electrostatic Discharge

Definition:

The test assesses the ability of the EUT to operate as intended in the event of an electrostatic discharge.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 61000-4-2:2009
Temperature / Humidity / Pressure	: 20 °C / 43 % R.H. / 101.8 kPa
Discharge Impedance	: (330 ±10%) Ω / (150 ±10%) pF
Type of Discharge (air discharge)	: ± 2, 4, 8 kV
Type of Discharge (contact discharge)	: ± 6 kV
Number of discharges at each point	: 20 of each polarity
Discharge Repetition on Rate	: 1 / sec
Test mode	: Operating Mode
Performance Criteria	: B (Refer to the attachment I)
Result	: Complies

Measurement Data:

- Uncertainty (ESD) = +/- 5 % (with a 95 % confidence level, k = 2)

“It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least 95 % confidence.”

Used equipments

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	ESD Simulator	ESD 30N	EM TEST	P1315117206	2022.03.15

ESD Test Point and Result:**1. Indirect Discharge**

No.	Position	Kind of Discharge	Results	Remarks
1	HCP	Contact	A	No reaction recognized.
2	VCP	Contact	A	No reaction recognized.

2. Direct Discharge

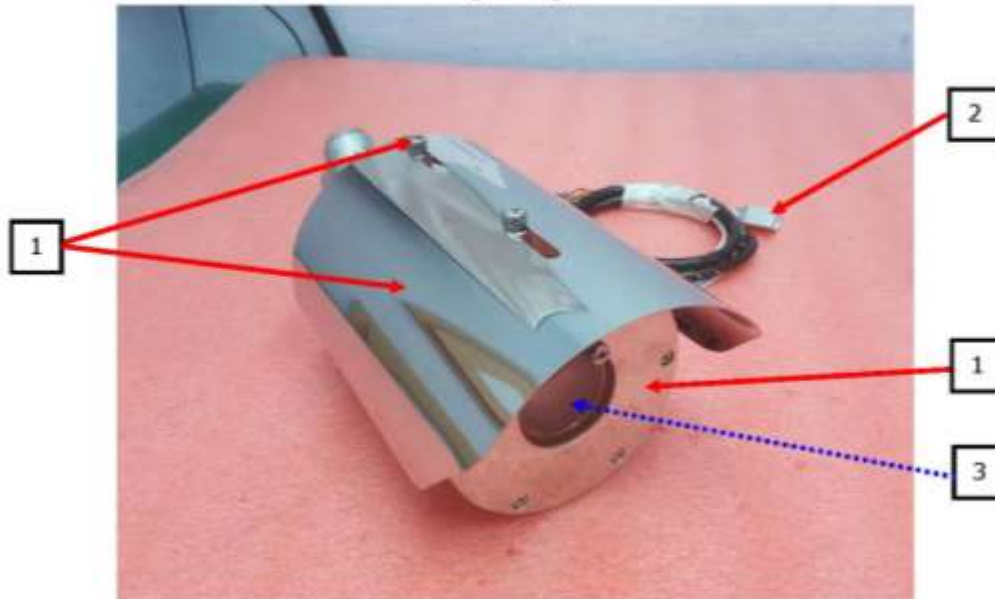
No.	Position	Kind of Discharge	Result	Remarks
1	ENCLOSURE	Contact	A	No reaction recognized.
2	LAN	Contact	A	No reaction recognized.
3	LENS	Air	A	No reaction recognized.

N
T
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E
E

[Test point] Air Discharge(A)
Contact Discharge(C)



[Front]



[Rear]



3.3.2 RF Electromagnetic Field

Definition:

The test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic field disturbance.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 61000-4-3:2006/A2:2010
Frequency range and Test level	: 80 MHz to 2.7 GHz
Test level	: 10 V/m (r.m.s) (unmodulated)
Duty cycle	: 80 % AM, 1 kHz, sinusoidal Pulse modulation : 1 Hz (0.5 s ON : 0.5 s OFF)
Rep. frequency	: 1 % of fundamental
Test mode	: Operating Mode
Performance Criteria	: A (Refer to the attachment I)
Result	: Complies

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	SIGNAL GENERATOR(RadiCentre)	CTR1009B	DARE	-	2022.02.18
☒	LOG-PER Antenna	VULP 9118 E	Schwarzbeck	1005	-
☒	RadiField(ANT 1 ~ 6 GHz)	RFS2006B	DARE	RFS6B-1901003	-
☒	POWER AMPLIFIER	MT400	PRANA	1812-2438	-
☒	Dual Directional Coupler	C3908-714	WERLATONE	118241	2022.02.18
☒	POWER SENSOR	RPR2006C	DARE	RPR6C-1901015	2022.02.18
☒	POWER SENSOR	RPR2006C	DARE	RPR6C-1901016	2022.02.18

Measurement Data:

- Uncertainty = +/- 1.6 dB (with a 95 % confidence level, k = 2.28)

"It has been demonstrated that the RS generator meets the specified requirements in the standard with at least 95 % confidence."

Port	Test mode	Result		Remark
		Horizontal	Vertical	
Enclosure	Operating Mode	A	A	No reaction recognized.

3.3.3 Electrical Fast Transients common mode

Definition:

The test assesses the ability of the EUT to operate as intended in the event of Electrical Fast Transients presence on one of the input/output ports.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method : EN 61000-4-4:2004/A1:2010
Signal line length : ☒ Above 3 m, ☐ Below 3 m
Test level : ☒ ± 1.0 kV (Signal port, DC power input port)
: ☒ ± 2.0 kV (AC power input port)
Polarity : Negative/ positive
Repetition frequency : 100 kHz Tr/Th = 5 / 50 ns
Test mode : Operating Mode
Performance Criteria : B (Refer to the attachment I)
Result : **Complies**

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMC IMMUNITY TEST SYSTEM(SURGE,BURST,DIP)	IMU3000	EMC PARTNER	F5-S6-T6-D-V-1504	2021.11.03
☐	CDN(1.25/50, 10/700)	CDN UTP ED3	EMC PARTNER	ED3-1516	2021.11.03
☒	Capacitive coupling clamp	CN-EFT1000	EMC PARTNER	1651	2021.11.03

Measurement Data:

- Uncertainty = +/- 10 % (with a 95 % confidence level, k = 2)

"It has been demonstrated that the EFT/Burst generator meets the specified requirements in the standard with at least 95 % confidence."

- Power port

Line	Test level	Result	Remarks
L – N	± 2.0 kV	A	No reaction recognized.
L – N – PE	± 2.0 kV	—	—
Positive - Negative	± 1.0 kV	—	—

- Signal line port

Line	Test level	Result	Remarks
LAN	± 1 kV	A	No reaction recognized.

3.3.4 Surge

Definition:

The test assesses the ability of the EUT to operate as intended in the event of surge presence on the AC main power input ports.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method : EN 61000-4-5:2006

Polarity pulses : 0°, 90°, 180°, 270°

Test level

AC Power port	: ☒ ± 0.5, 1.0 kV (Line to Line)
	: ☐ ± 0.5, 1.0, 2.0 kV (Line to Ground)
Signal lines /	: ☐ ± 0.5, 1.0 kV
Other supply lines	

Wave shape : 1.2 / 50 µs pulse

Number of surges : 5 (at each phase)

Test mode : Operating mode

Performance Criteria : B (Refer to the attachment I)

Result : **Complies**

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMC IMMUNITY TEST SYSTEM(SURGE,BURST,DIP)	IMU3000	EMC PARTNER	F5-S6-T6-D-V-1504	2021.11.03
☐	CDN(1.25/50, 10/700)	CDN UTP ED3	EMC PARTNER	ED3-1516	2021.11.03

Measurement Data:

- Uncertainty = +/- 10 % (with a 95 % confidence level, k = 2)

"It has been demonstrated that the Surge generator meets the specified requirements in the standard with at least 95 % confidence."

- AC Power port

Phase	Line	Level	Result	Remark
0°	Line(L) to line(N)	$\pm 1.0 \text{ kV}$	A	No reaction recognized.
	Line(L) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
	Line(N) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
90°	Line(L) to line(N)	$\pm 1.0 \text{ kV}$	A	No reaction recognized.
	Line(L) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
	Line(N) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
180°	Line(L) to line(N)	$\pm 1.0 \text{ kV}$	A	No reaction recognized.
	Line(L) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
	Line(N) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
270°	Line(L) to line(N)	$\pm 1.0 \text{ kV}$	A	No reaction recognized.
	Line(L) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-
	Line(N) to ground(PE)	$\pm 2.0 \text{ kV}$	-	-

- DC Power port

Line	Level	Result	Remark
-	$\pm - \text{ kV}$	-	-

- Signal port

Port	Level	Result	Remark
-	$\pm - \text{ kV}$	-	-

3.3.5 RF current common mode

Definition:

The test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic disturbance on the input/output ports.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 61000-4-6:2009
Frequency range	: 0.15 MHz to 100 MHz
Test level	: 140 dBμV (r.m.s) (unmodulated) 10 V (Modulated)
Amplitude Modulation	: 80 % AM, 1 kHz, sinusoidal
Pulse Modulation	: 1 Hz (0.5 s ON : 0.5 s OFF)
Step size	: 1 % of fundamental.
Test mode	: Operating Mode
Performance Criteria	: A (Refer to the attachment I)
Result	: Complies

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	POWER AMPLIFIER	RPA2575A	DARE	17I00022SNO03	-
☒	SIGNAL GENERATOR	CTR1004B	DARE	17I00026SNO34	2022.03.12
☒	POWER SENSOR	RPR2006C	DARE	15I00037SNO55	2022.03.12
☒	POWER SENSOR	RPR2006C	DARE	15I00037SNO56	2022.03.12
☒	CDN	CDN M016	TESEQ	44553	2021.11.02
☐	CDN	CDN T2	EM TEST	P1348126361	2022.03.12
☐	CDN	CDN S501A	TESEQ	44479	2021.11.02
☐	CDN	CDN S751A	TESEQ	44734	2021.11.02
☐	CDN	CDN S8 RJ45	EM TEST	P1345125806	2022.03.12
☐	CDN	CDN T8 RJ45	EM TEST	P1343125197	2022.03.12
☒	RF INJECTION CLAMP	KEMZ801A	TESEQ	44985	2021.11.04

Measurement Data:

- Uncertainty = +/-1.25 dB (with a 95 % confidence level, k = 2)

- AC / DC POWER port

Port	Mode	Result	Remarks
AC Power	Operating mode	A	No reaction recognized

- Signal port

Signal Line	Mode	Result	Remarks
LAN	Operating mode	A	No reaction recognized

3.3.6 Voltage dips and interruptions

Definition:

The test assesses the ability of the EUT to operate as intended in the event of voltage dips and interruptions present on the AC mains power input ports.

The tests were performed according to the NT-QP-014 procedure of the NTREE Co., Ltd.

Test method	: EN 61000-4-11:2004
Voltage drop and Interruption	: 40 % for duration of 10 period 70 % for duration of 25 period 0 %, 80 % for duration of 250 period
Ut	: -
Test mode	: Operating mode
Performance Criteria	: B, B, B, C (Refer to the attachment I)
Result	: Complies

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☒	EMC IMMUNITY TEST SYSTEM(SURGE,BURST,DIP)	IMU3000	EMC PARTNER	F5-S6-T6-D-V-1504	2021.11.03

Measurement Data:

- Uncertainty = +/- 5 % (with a 95 % confidence level, k = 2)

"It has been demonstrated that the Voltage dips generator meets the specified requirements in the standard with at least 95 % confidence."

- Test result is same both 240 V / 50 Hz and 100 V / 50 Hz.

Test Level %Ut	Voltage droop and interruptions %Ut	Duration of Reduction (period)	Result	Remarks
80	20	250	A	No reaction recognized
70	30	25	A	
40	60	10	A	
0	100	250	B	EUT was powered off during the test, but self-recovered after completion of the test

APPENDIX

Attachment I PERFORMANCE CRITERIA

Performance criterion A

The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

Criteria of Radiated electromagnetic fields and Conducted disturbances induced by electromagnetic fields are given in the following contents.

For components of CCTV systems, where the status is monitored by observing the TV picture, then deterioration of the picture is allowed at 10 V/m ($U_0 = 140 \text{ dB}\mu\text{V}$) , providing

- a) there is no permanent damage or change to the EUT (e.g. no corruption of memory or changes to programmable settings, etc)
- b) at 3 V/m ($U_0 = 130 \text{ dB}\mu\text{V}$), any deterioration of the picture is so minor that the system could still be used, and
- c) there is no observable deterioration of the picture at 1 V/m ($U_0 = 120 \text{ dB}\mu\text{V}$).

Attachment II

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC.

The factors contributing to uncertainties are test receiver, cable loss, antenna factor calibration, Antenna directivity, antenna factor variation with height, antenna phase center variation, antenna frequency interpolation, measurement distance variation, site imperfection, mismatch, and system repeatability. Based on CISPR 16-4-2, the measurement uncertainty level with a 95 % confidence level was applied.

Conducted emission measurement (with a 95 % confidence level , $k = 2$)		
Shielded Room(#1)	9 kHz to 30 MHz:	2.0 dB
Radiated Emission measurement (with a 95 % confidence level , $k = 2$)		
10 m Chamber	30 MHz: to 1 000 MHz:	4.2 dB
3 m Chamber(#1)	1 000 MHz: to 6 000 MHz:	5.0 dB

Attachment III

PHOTOGRAPHS

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E

Radiated disturbances (Maximum emission configuration) – Below 1GHz

[Front]

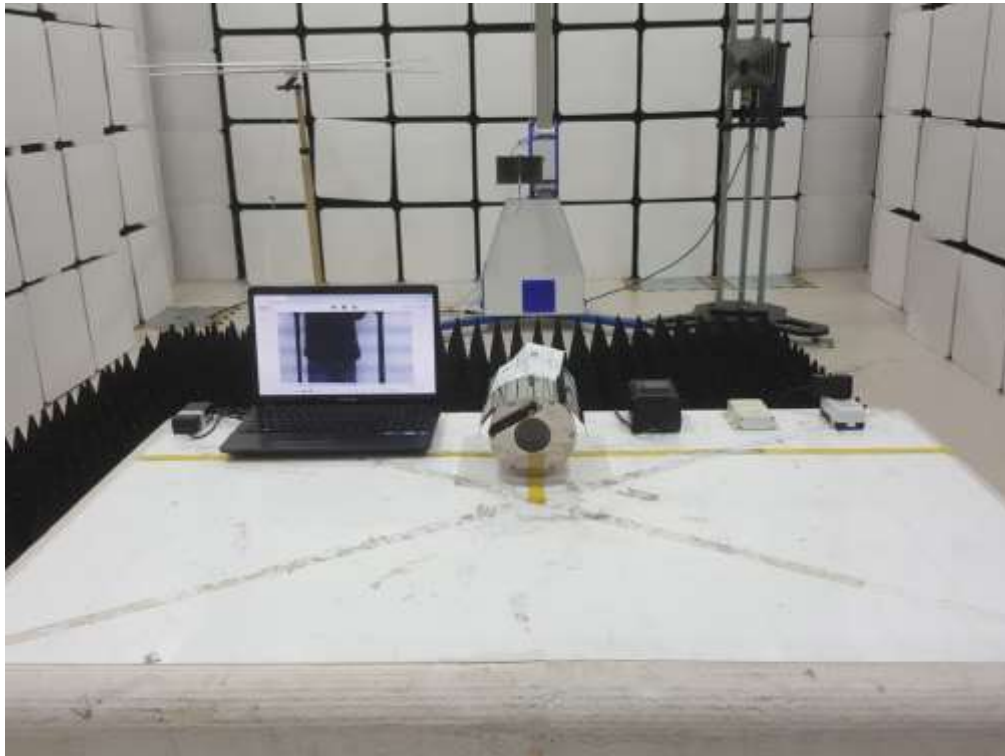


[Rear]



Radiated disturbances (Maximum emission configuration) – Above 1GHz

[Front]



[Rear]



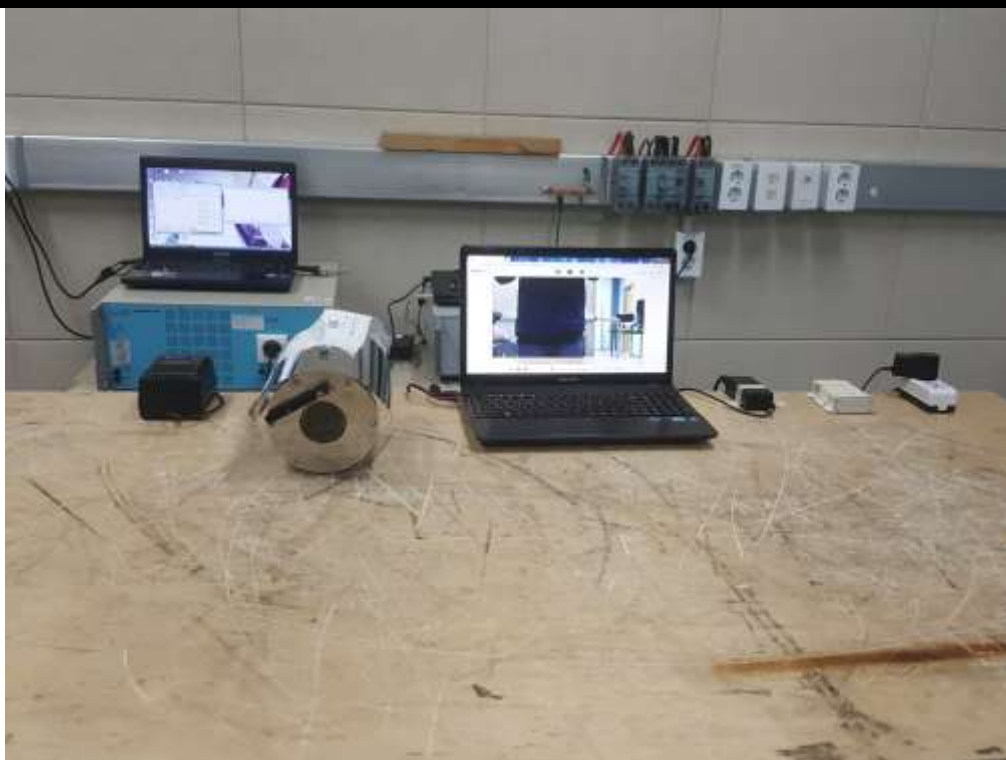
Disturbance Voltage at the mains terminals (Maximum emission configuration)**[Front]****[Rear]**

Disturbance Voltage at the mains terminals (Maximum emission configuration)_ISN**[Front]****[Rear]**

Harmonic



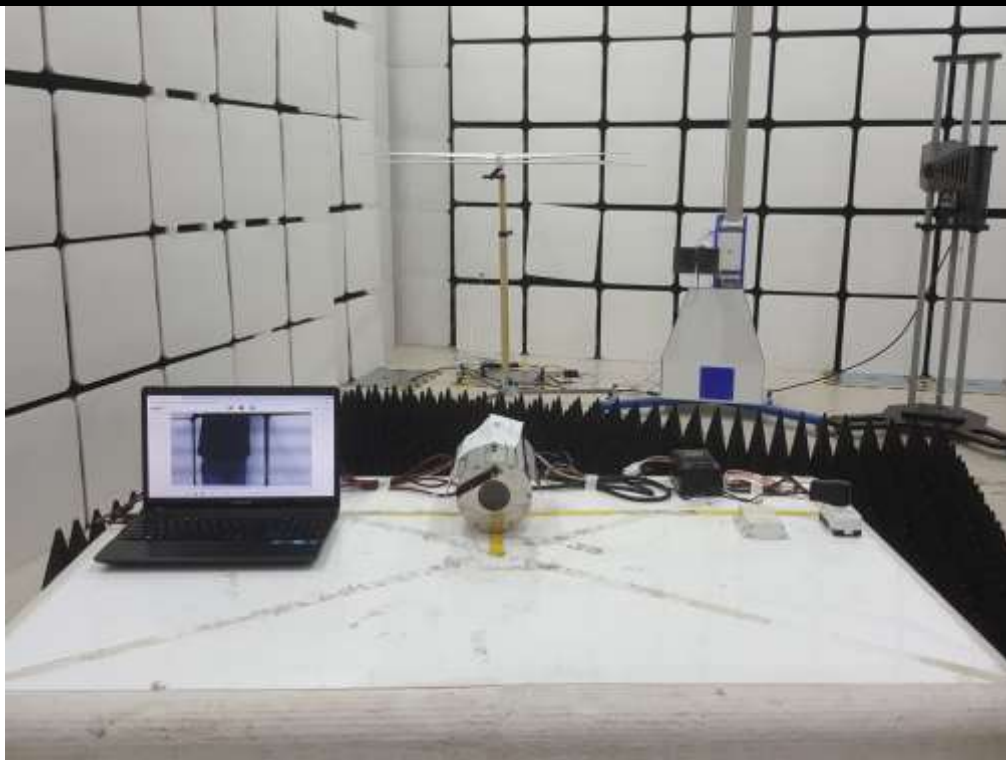
Flicker



Electromagnetic Discharge



RF Electromagnetic Field



Fast Transients common mode



Fast Transients common mode_Clamp



Surge



RF current common mode



RF current common mode_Clamp



Voltage dips and interruption



EUT Photo

Front of EUT



Rear of EUT



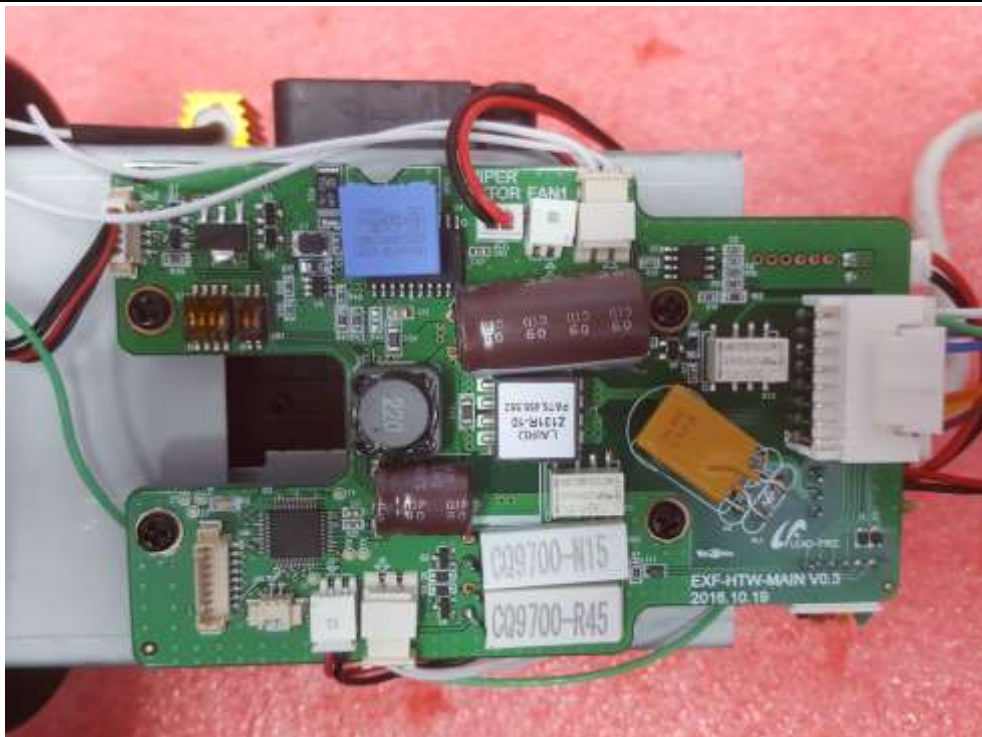
Position of LABEL



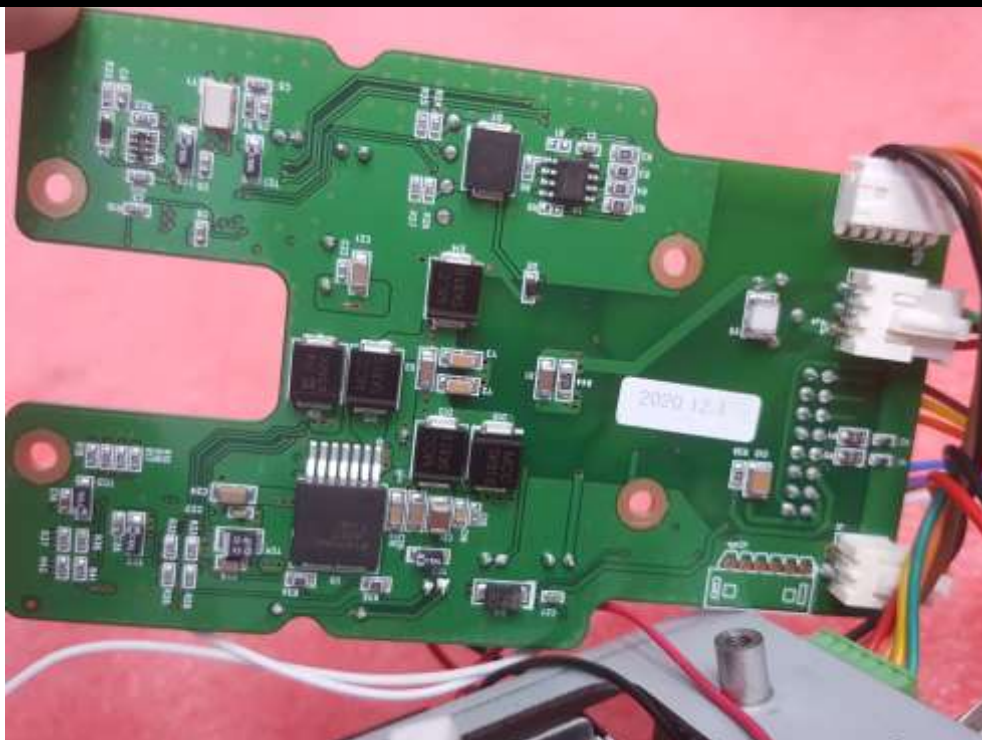
Internal of EUT



Top of MAIN BOARD



Bottom of MAIN BOARD



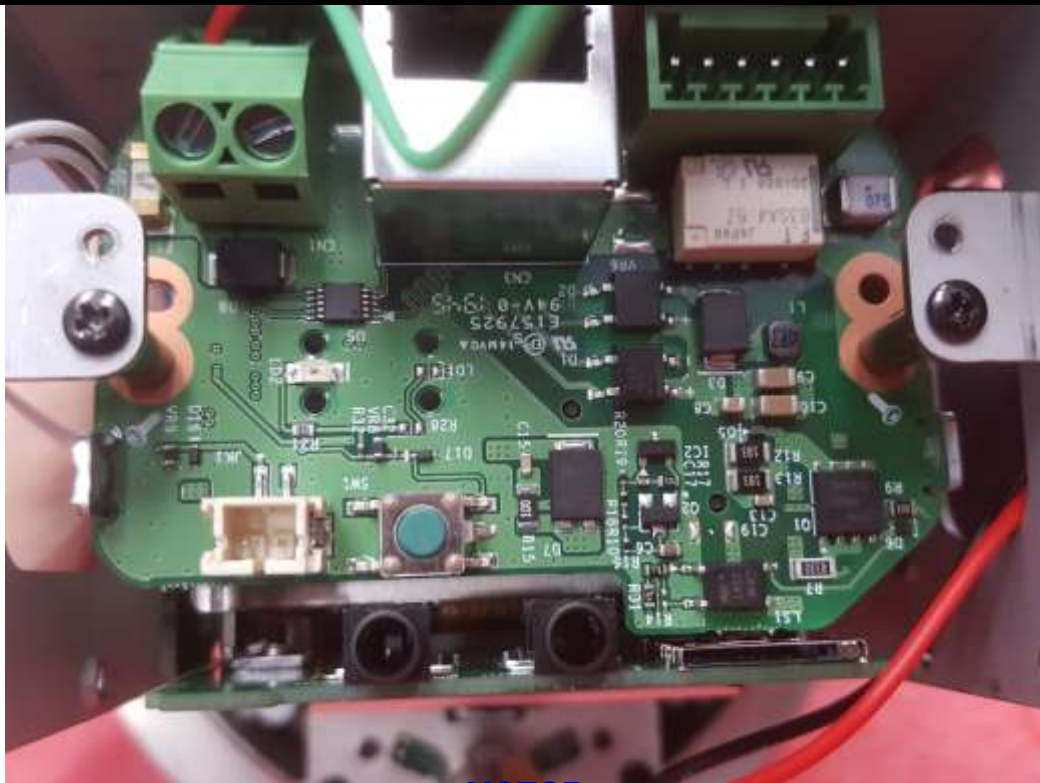
Top of CAM



Bottom of CAM



SUB BOARD



MOTOR

