EMC TEST REPORT

Report No.	:	N2102R-1187
Model and/or type referene	:	TNU-6322ER
Test item description	:	2M 32x Network PTZ 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	:	February 25, 2021
Test result	:	Complied

2021. 02. 25

Tested by	YOO Byeongkook	Reviewed by	OH Seungjun
(+ signature)	/ Staff	(+ signature)	/ Technical Manager

2021. 02. 25

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.

>>TABLE OF CONTENTS<<

1. General information

1.1 Test Performed

RRA Designation No.: KR0157
KOLAS Accreditation No. : KT511

Laboratory	:	**NTREE Co., Ltd.**
1st laboratory	:	30,Pajangcheon-ro 44beon-gil,Jangan-gu, Suwon-si, Gyeonggi-do,
Address		16204, KOREA
Telephone	:	+82-31-893-1000
Facsimile	:	+82-31-893-0111
2nd laboratory	:	228-60, Saneop-ro 155beon-gil, Gwonseon-gu, Suwon-si, Gyeionggi-do,
Address		16648, KOREA
Telephone	:	+82-31-893-0999
Facsimile	:	+82-31-297-0444

SITE MAP

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 PTZ Camera
Trademark	:	N/A
Model and/or type reference	:	TNU-6322ER
Additional model name	:	N/A
Serial number	:	N/A
Date (s) of performance of tests:	:	February 08, 2021 to February 16, 2021
Date of receipt of test item	:	February 08, 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	:	-
Note	:	N/A
Modification	:	N/A

2.3 Test conditions

Temp. / Humid. / Pressure	:	EMI : +(20 ± 1) ℃ /48 - 50) % RH EMS: +(20 ± 2) ℃ /(41 - 49) % RH / (101.3 ± 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 1, 2	W&T-LP145W240600	N/A	W&T ELECTRONIC CO.,LTD

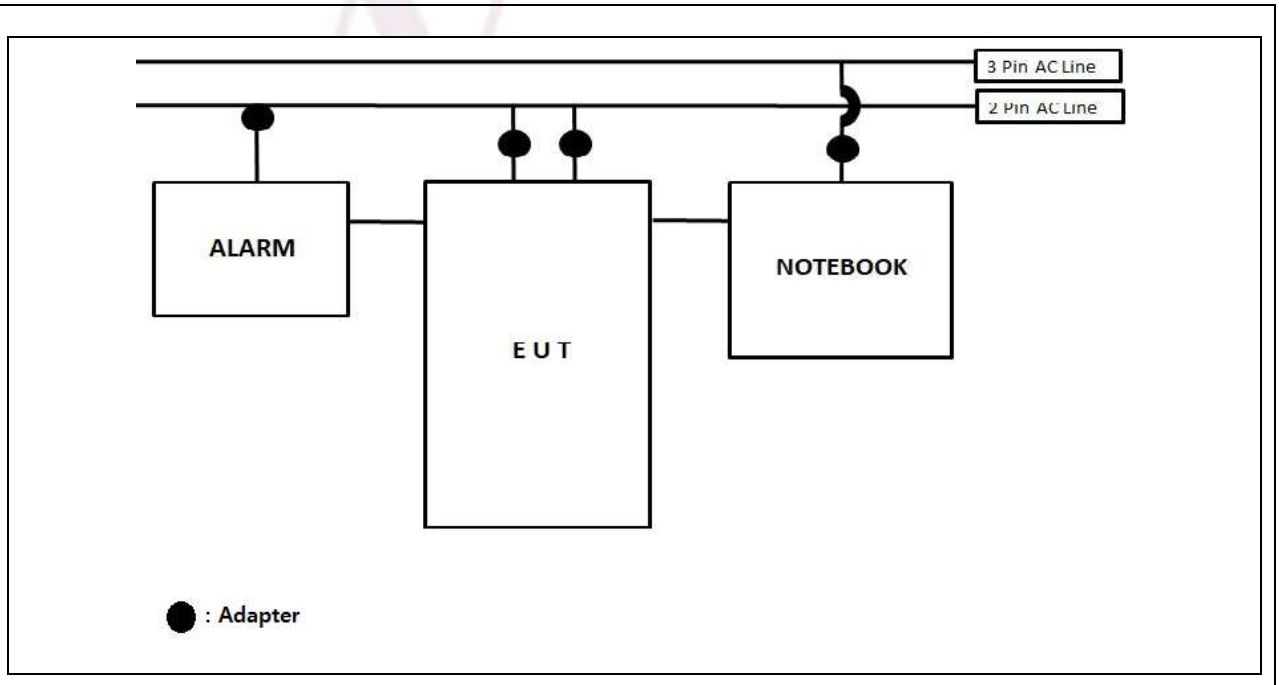
2.5 Variant Model

Model name	Remark
N/A	N/A

2.6 Cable List

Cable List				
Type	Length (m)	Shielding (Cable/backshell)	Remarks	
			From	to
EUT	1.5	NO / NO	AC IN	AC OUT
EUT	3.0	NO / NO	LAN	LAN
EUT	2.0	NO / NO	IO	IO
NOTEBOOK	1.2	NO / NO	DC IN	DC OUT
NOTEBOOK ADAPTER	1.5	NO / NO	AC IN	AC OUT
ALARM	1.2	NO / NO	DC IN	DC OUT
ALARM ADAPTER	-	- / -	AC IN	AC OUT
ADAPTER 1, 2	1.5	NO / NO	AC IN	AC OUT

2.7 Block diagram of the EUT test



NOTE:
- After connecting the EUT as shown in the layout, And it was tested in Operating mode that was tested in the state of continuously shooting EUT.

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**

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 ㎒ to 2.7 ㎓)	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 ㎒ to 100 ㎒)	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 adapter used in the device under test is a peripheral device.

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: **99.937 000** ㎒ Result = Reading + C.F. = **60.97**+ (**-32.4**) = **28.57** [dBµV/m]

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

- Above 1 GHz

At Frequency: **2101.944 444** ㎒ Result = Reading + C.F. = **56.17**+ (**-5.9**) = **50.27** [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

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	2021.03.13
☒	Double Ridged Broadband Horn Antenna(KOLAS)	BBHA 9120D	Schwarzbeck	9120D-1245	2021.03.23
☒	Amplifier	TK-PA18S	TESTEK	140002	2021.03.13

Measurement Data:

- Refer to the Next page (Maximum emission configuration)

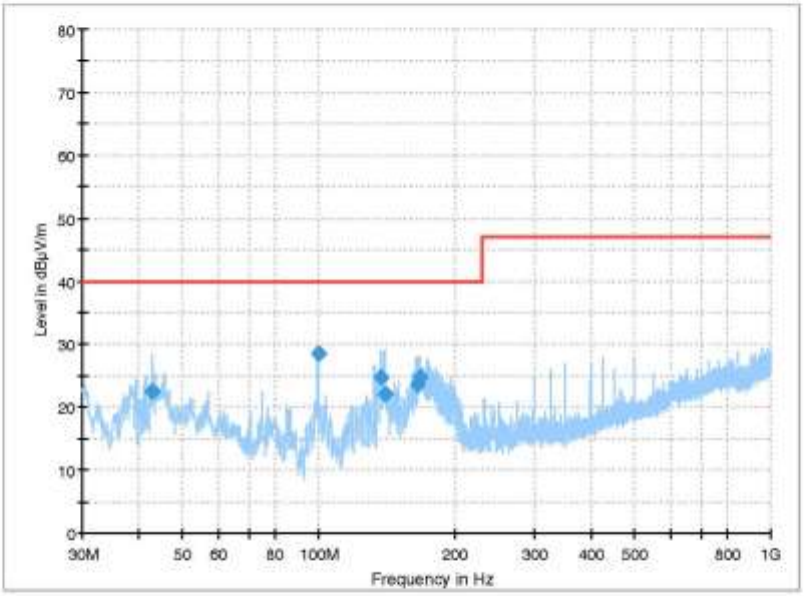
Below 1 GHz

RE 2021-02-08

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz / Temp 21 Humi 50
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)
42.901000	22.45	40.00	17.55	2000.0	120.000	100.0	V	359.0	-29.2
99.937000	28.57	40.00	11.43	2000.0	120.000	100.0	V	212.0	-32.4
137.185000	24.71	40.00	15.29	2000.0	120.000	100.0	V	0.0	-28.1
139.901000	22.09	40.00	17.91	2000.0	120.000	100.0	V	0.0	-27.8
164.539000	23.69	40.00	16.31	2000.0	120.000	100.0	V	212.0	-27.6
166.964000	24.75	40.00	15.25	2000.0	120.000	100.0	V	235.0	-27.8

1 / 1

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

Above 1 ㎓

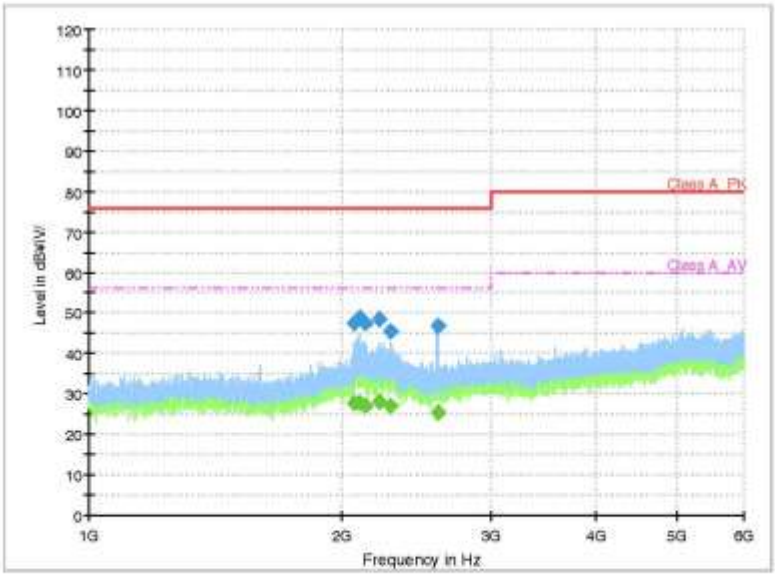
-Horizontal

HOR 2021-02-16

Test Report

Common Information

Test Description:	A2021-01595
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)
2070.277778	47.41	---	76.00	28.59	1000.0	1000.000	100.0	H	238.0	-6.4
2070.277778	---	27.73	56.00	28.27	1000.0	1000.000	100.0	H	238.0	-6.4
2101.944444	---	27.79	56.00	28.21	1000.0	1000.000	100.0	H	238.0	-5.9
2101.944444	48.70	---	76.00	27.30	1000.0	1000.000	100.0	H	238.0	-5.9
2129.166667	---	27.04	56.00	28.96	1000.0	1000.000	100.0	H	146.0	-5.9
2129.166667	47.48	---	76.00	28.52	1000.0	1000.000	100.0	H	146.0	-5.9
2212.222222	48.54	---	76.00	27.46	1000.0	1000.000	100.0	H	238.0	-5.1
2212.222222	---	28.04	56.00	27.96	1000.0	1000.000	100.0	H	238.0	-5.1
2283.333333	---	27.20	56.00	28.80	1000.0	1000.000	100.0	H	238.0	-5.0
2283.333333	45.37	---	76.00	30.63	1000.0	1000.000	100.0	H	238.0	-5.0
2597.222222	46.80	---	76.00	29.20	1000.0	1000.000	100.0	H	146.0	-5.3
2597.222222	---	25.54	56.00	30.46	1000.0	1000.000	100.0	H	146.0	-5.3

1 / 1

Level[dBµV/m] = Read level[dBµV/m] + Factor[dB]

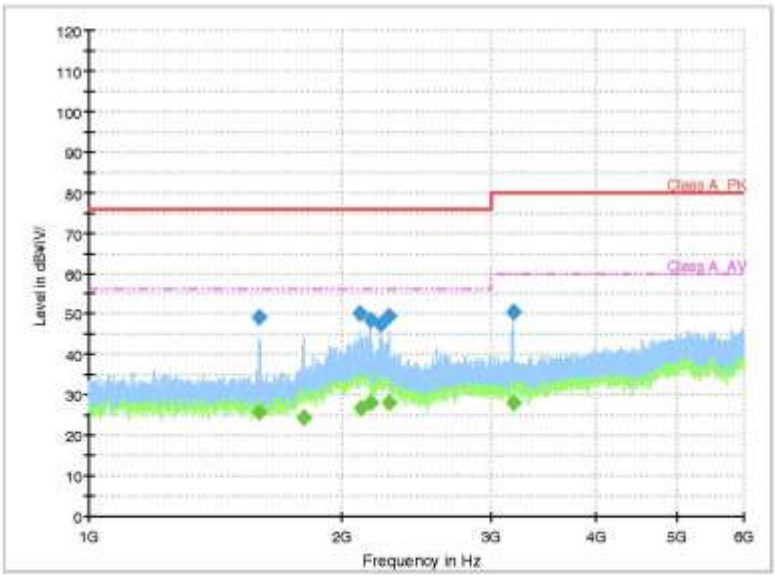
-Vertical

VER 2021-02-16

Test Report

Common Information

Test Description:	A2021-01595
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)
1595.000000	---	25.67	56.00	30.33	1000.0	1000.000	100.0	V	107.0	-11.4
1595.000000	49.28	---	76.00	26.72	1000.0	1000.000	100.0	V	107.0	-11.4
1798.055556	---	24.40	56.00	31.60	1000.0	1000.000	100.0	V	160.0	-9.2
2101.944444	50.27	---	76.00	25.73	1000.0	1000.000	100.0	V	214.0	-5.9
2105.277778	---	26.84	56.00	29.16	1000.0	1000.000	100.0	V	314.0	-5.9
2159.444444	48.40	---	76.00	27.60	1000.0	1000.000	100.0	V	160.0	-5.7
2159.444444	---	27.98	56.00	28.02	1000.0	1000.000	100.0	V	160.0	-5.7
2220.000000	47.55	---	76.00	28.45	1000.0	1000.000	100.0	V	196.0	-5.0
2271.944444	---	28.07	56.00	27.93	1000.0	1000.000	100.0	V	178.0	-4.9
2271.944444	49.41	---	76.00	26.59	1000.0	1000.000	100.0	V	178.0	-4.9
3195.000000	---	28.00	60.00	32.00	1000.0	1000.000	100.0	V	72.0	-2.6
3195.000000	50.50	---	80.00	29.50	1000.0	1000.000	100.0	V	72.0	-2.6

1 / 1

Level[dBµV/m] = Read level[dBµV/m] + 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.
☐	EMI Test Receiver	ESR7	ROHDE & SCHWARZ	102035	2021.11.02
☐	Tri-Log Antenna(KOLAS)	VULB9168	Schwarzbeck	721	2022.03.24
☐	Amplifier	TK-PA6S	TESTEK	120018	2021.11.02
☐	Attenuator	PE7047-6	Pasternack	#1	2022.03.24

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. = **-**+ (**-**) = **-** [dBμV/m]
- Above 1 GHz

  At Frequency: **-** Result = Reading + C.F. = **-**+ (**-**) = **-** [dBμV/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.
☐	EMI Test Receiver	ESR7	ROHDE & SCHWARZ	102035	2021.11.02
☐	Tri-Log Antenna(KOLAS)	VULB9168	Schwarzbeck	721	2022.03.24
☐	Amplifier	TK-PA6S	TESTEK	120018	2021.11.02
☐	Attenuator	PE7047-6	Pasternack	#1	2022.03.24

Used equipments – (Above 1 GHz)

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☐	EMI Test Receiver	ESR7	ROHDE & SCHWARZ	101302	2021.03.13
☐	Double Ridged Broadband Horn Antenna(KOLAS)	BBHA 9120D	Schwarzbeck	9120D-1245	2021.03.23
☐	Amplifier	TK-PA18S	TESTEK	140002	2021.03.13

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: **27.6325** ㎒ Result = Reading + C.F. = **25.78**+ (**10.1**) = **35.88** [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	2021.03.13
☒	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

Measurement Data:

- (Maximum emission configuration)

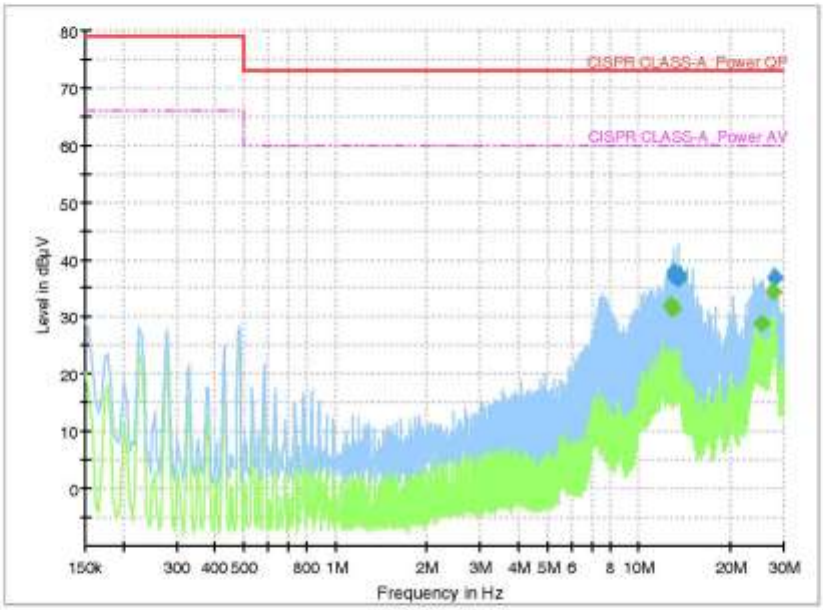
- LINE_Power #1

CE_L_POWER 1 2021-02-09

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz, Temp. 19 / Humi. 48
Operator Name	YOO Byeongkook
Comment:	POWER 1



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
12.756200	---	31.82	60.00	28.18	5000.0	9.000	L1	10.0
12.806500	---	32.08	60.00	27.92	5000.0	9.000	L1	10.0
12.958000	---	31.43	60.00	28.57	5000.0	9.000	L1	10.0
13.004400	37.19	---	73.00	35.81	5000.0	9.000	L1	10.0
13.005900	38.00	---	73.00	35.00	5000.0	9.000	L1	10.0
13.006900	37.87	---	73.00	35.13	5000.0	9.000	L1	10.0
13.557100	37.27	---	73.00	35.73	5000.0	9.000	L1	10.0
13.557500	36.75	---	73.00	36.25	5000.0	9.000	L1	10.0
25.366000	---	28.81	60.00	31.19	5000.0	9.000	L1	10.1
27.806000	---	34.33	60.00	25.67	5000.0	9.000	L1	10.1
27.860000	---	34.31	60.00	25.69	5000.0	9.000	L1	10.1
27.906000	36.90	---	73.00	36.10	5000.0	9.000	L1	10.1

1 / 1

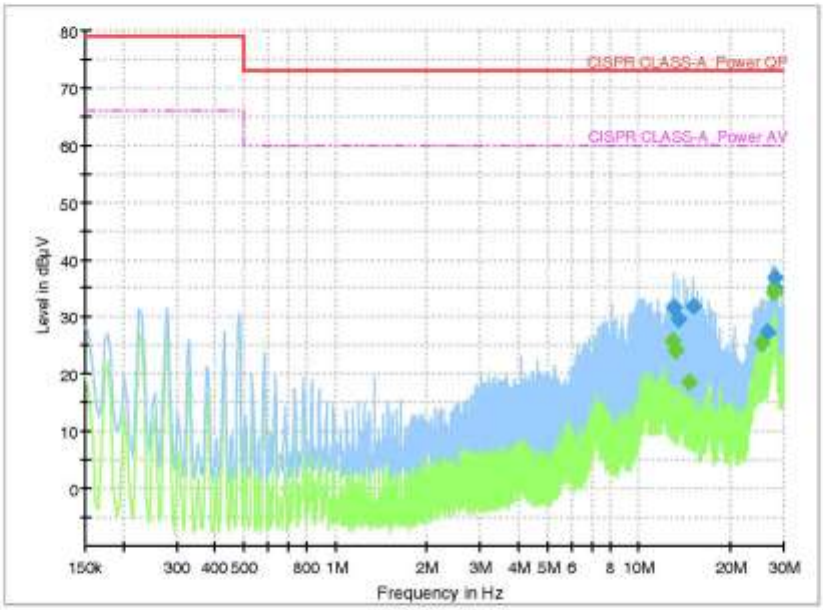
- **NEUTRAL_Power #1**

CE_N_POWER 1 2021-02-09

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz, Temp. 19 / Humi. 48
Operator Name	YOO Byeongkook
Comment:	POWER 1



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
12.862800	---	25.94	60.00	34.06	5000.0	9.000	N	10.0
13.006800	31.51	---	73.00	41.49	5000.0	9.000	N	10.0
13.261100	---	24.16	60.00	35.84	5000.0	9.000	N	10.0
13.553100	29.70	---	73.00	43.30	5000.0	9.000	N	10.0
14.683600	---	18.47	60.00	41.53	5000.0	9.000	N	10.0
15.082900	31.91	---	73.00	41.09	5000.0	9.000	N	10.0
25.377500	---	25.44	60.00	34.56	5000.0	9.000	N	10.1
26.573500	27.38	---	73.00	45.62	5000.0	9.000	N	10.1
27.718500	---	34.43	60.00	25.57	5000.0	9.000	N	10.1
27.927500	35.23	---	73.00	37.77	5000.0	9.000	N	10.1
27.966500	36.97	---	73.00	36.03	5000.0	9.000	N	10.1
28.021500	---	34.39	60.00	25.61	5000.0	9.000	N	10.1

1 / 1

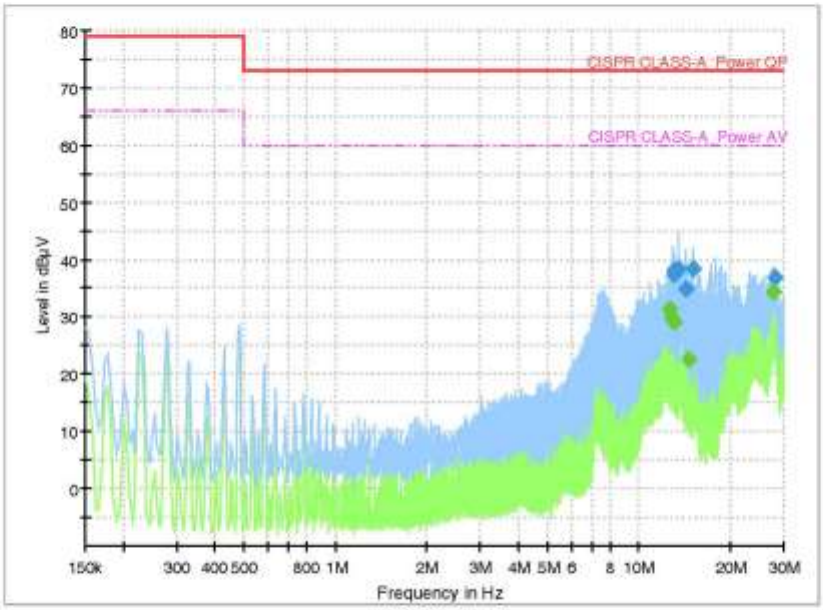
- LINE_Power #2

CE_L_POWER 2 2021-02-09

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz, Temp. 19 / Humi. 48
Operator Name	YOO Byeongkook
Comment:	POWER 2



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
12.664700	---	31.25	60.00	28.75	5000.0	9.000	L1	10.0
12.811900	---	29.86	60.00	30.14	5000.0	9.000	L1	10.0
13.006800	38.06	---	73.00	34.94	5000.0	9.000	L1	10.0
13.008400	37.37	---	73.00	35.63	5000.0	9.000	L1	10.0
13.112600	---	29.10	60.00	30.90	5000.0	9.000	L1	10.0
13.557100	38.46	---	73.00	34.54	5000.0	9.000	L1	10.0
14.349300	34.75	---	73.00	38.25	5000.0	9.000	L1	10.0
14.582900	---	22.64	60.00	37.36	5000.0	9.000	L1	10.0
15.020500	36.37	---	73.00	34.63	5000.0	9.000	L1	10.0
27.631000	---	34.26	60.00	25.74	5000.0	9.000	L1	10.1
27.781000	---	34.45	60.00	25.55	5000.0	9.000	L1	10.1
27.931000	36.93	---	73.00	36.07	5000.0	9.000	L1	10.2

1 / 1

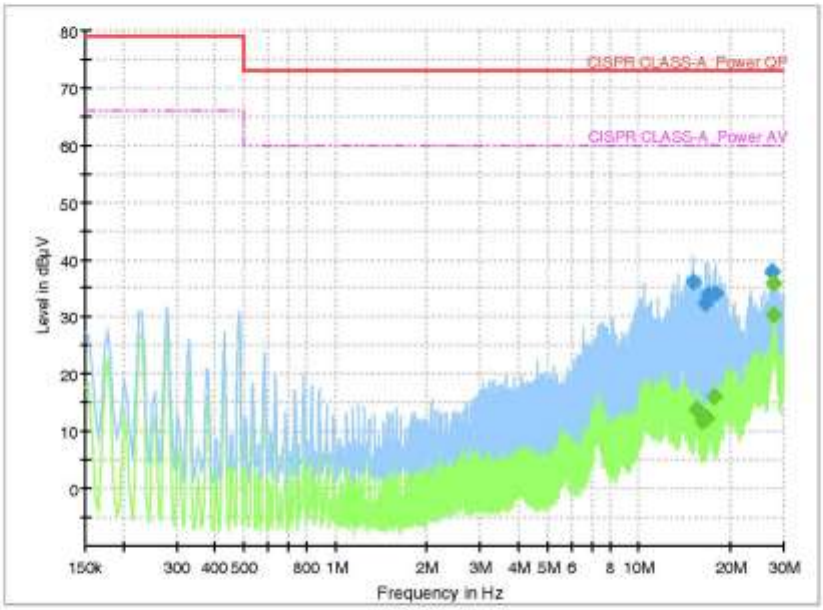
- **NEUTRAL_Power #2**

CE_N_POWER 2 2021-02-09

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz, Temp. 19 / Humi. 48
Operator Name	YOO Byeongkook
Comment:	POWER 2



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
15.020500	36.03	---	73.00	36.97	5000.0	9.000	N	10.0
15.022900	36.18	---	73.00	36.82	5000.0	9.000	N	10.0
15.484900	---	13.73	60.00	46.27	5000.0	9.000	N	10.0
16.137800	---	11.85	60.00	48.15	5000.0	9.000	N	10.0
16.546300	32.49	---	73.00	40.51	5000.0	9.000	N	10.0
16.673300	---	12.29	60.00	47.71	5000.0	9.000	N	10.0
16.975600	33.82	---	73.00	39.18	5000.0	9.000	N	10.0
17.622200	---	16.12	60.00	43.88	5000.0	9.000	N	10.0
17.830200	34.23	---	73.00	38.77	5000.0	9.000	N	10.0
27.537000	37.90	---	73.00	35.10	5000.0	9.000	N	10.1
27.632500	---	35.88	60.00	24.12	5000.0	9.000	N	10.1
27.778500	---	30.47	60.00	29.53	5000.0	9.000	N	10.1

1 / 1

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: **0.481 950** ㎒ Result = Reading + C.F. = **41.92**+ (**9.6**) = **51.52** [dBμV/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	2021.03.13
☒	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	2021.03.13
☐	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

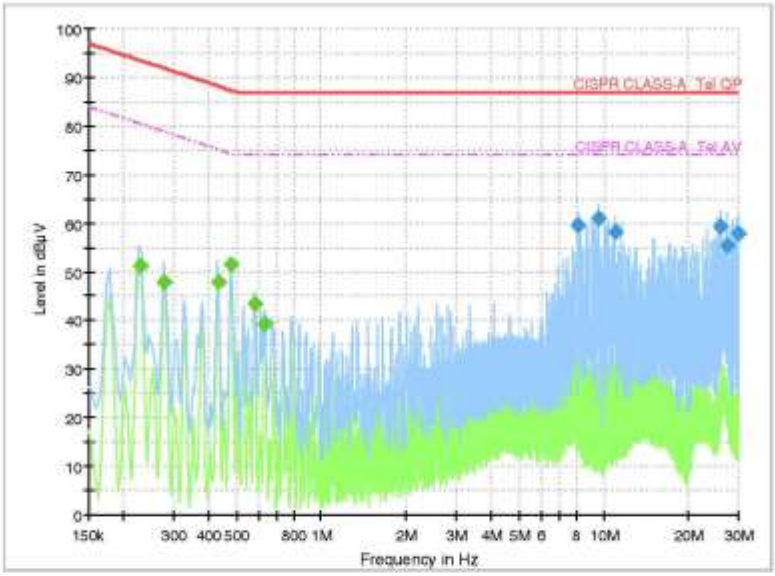
- 10 Mbps

CE_TEL_10 2021-02-09

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz, Temp. 19 / Humi. 48
Operator Name	YOO Byeongkook
Comment:	LAN - 10 Mbps



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.228350	---	51.31	80.51	29.20	1000.0	9.000	9.8
0.279050	---	47.90	78.84	30.94	1000.0	9.000	9.7
0.431250	---	47.89	75.23	27.34	1000.0	9.000	9.6
0.481950	---	51.52	74.31	22.79	1000.0	9.000	9.6
0.579450	---	43.48	74.00	30.52	1000.0	9.000	9.6
0.630250	---	39.15	74.00	34.85	1000.0	9.000	9.6
8.122950	59.48	---	87.00	27.52	1000.0	9.000	9.6
9.586350	61.11	---	87.00	25.89	1000.0	9.000	9.6
10.993200	58.29	---	87.00	28.71	1000.0	9.000	9.6
26.015000	59.32	---	87.00	27.68	1000.0	9.000	10.0
27.417500	55.32	---	87.00	31.68	1000.0	9.000	10.1
29.982500	57.81	---	87.00	29.19	1000.0	9.000	10.2

1 / 1

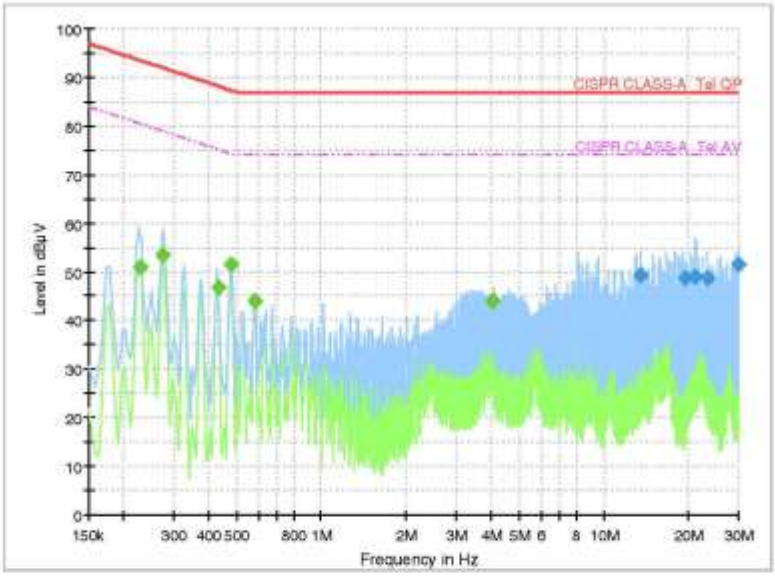
- 100 Mbps

CE_TEL_100 2021-02-09

Test Report

Common Information

Test Description:	A2021-01595
Test Mode:	Operating Mode
Test Standard:	EN 50130-4
Environment Conditions:	AC 230 V 50 Hz, Temp. 19 / Humi. 48
Operator Name	YOO Byeongkook
Comment:	LAN - 100 Mbps



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)
0.228350	---	51.09	80.51	29.42	1000.0	9.000	9.8
0.275150	---	53.53	78.96	25.43	1000.0	9.000	9.7
0.431250	---	46.67	75.23	28.55	1000.0	9.000	9.6
0.481950	---	51.48	74.31	22.83	1000.0	9.000	9.6
0.583450	---	44.01	74.00	29.99	1000.0	9.000	9.6
4.040550	---	44.03	74.00	29.97	1000.0	9.000	9.5
13.557100	49.41	---	87.00	37.59	1000.0	9.000	9.7
19.355700	48.70	---	87.00	38.30	1000.0	9.000	9.8
21.006500	49.11	---	87.00	37.89	1000.0	9.000	9.9
21.007000	48.96	---	87.00	38.04	1000.0	9.000	9.9
23.329000	48.71	---	87.00	38.29	1000.0	9.000	9.9
29.982500	51.47	---	87.00	35.53	1000.0	9.000	10.2

1 / 1

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.

<table>
<tr><td colspan="6">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</td></tr>
<tr><td rowspan="2">Frequency Range (MHz)</td><td rowspan="2">Coupling device</td><td colspan="3">Class B limits dB(µV) 75 Ω</td><td rowspan="2">Applicability</td></tr>
<tr><td>Other</td><td>Local Oscillator Fundamental</td><td>Local Oscillator Harmonics</td></tr>
<tr><td>30 to 950</td><td rowspan="10">For frequencies ≤1 GHz Quasi Peak/ 120 kHz

For frequencies ≥1 GHz Peak/ 1 MHz</td><td>46</td><td>46</td><td>46</td><td rowspan="2">See [a]</td></tr>
<tr><td>950 to 2 150</td><td>46</td><td>54</td><td>54</td></tr>
<tr><td>950 to 2 150</td><td>46</td><td>54</td><td>54</td><td>See [b]</td></tr>
<tr><td>30 to 300</td><td rowspan="2">46</td><td rowspan="2">54</td><td>50</td><td rowspan="2">See [c]</td></tr>
<tr><td>300 to 1 000</td><td>52</td></tr>
<tr><td>30 to 300</td><td rowspan="2">46</td><td rowspan="2">66</td><td>59</td><td rowspan="2">See [d]</td></tr>
<tr><td>300 to 1 000</td><td>52</td></tr>
<tr><td>30 to 950</td><td rowspan="2">46</td><td>76</td><td>46</td><td rowspan="2">See [e]</td></tr>
<tr><td>950 to 2150</td><td>N/A</td><td>54</td></tr>
<tr><td colspan="6">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.</td></tr>
</table>

Used equipments:

Used	Equipment	Model name	Manufacturer	Serial No.	Next Cal.
☐	EMI Receiver	ESR7	Rohde & Schwarz	101302	2021.03.13
☐	POWER SPLITTER/COMBINER	ZFRSC-42-S+	Mini-Circuits	SUU90901305	2021.03.13
☐	MATCHING PAD	UNMP-5075+	Mini-Circuits	VUU01601305	2021.03.13
☐	Impedance Matching Box	TIB-R1	TESTEC	150054-R	-
☐	color TV pattern generator	PM5418	PHILIPS	LO 634427	-
☐	All-Band Modulrator	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:

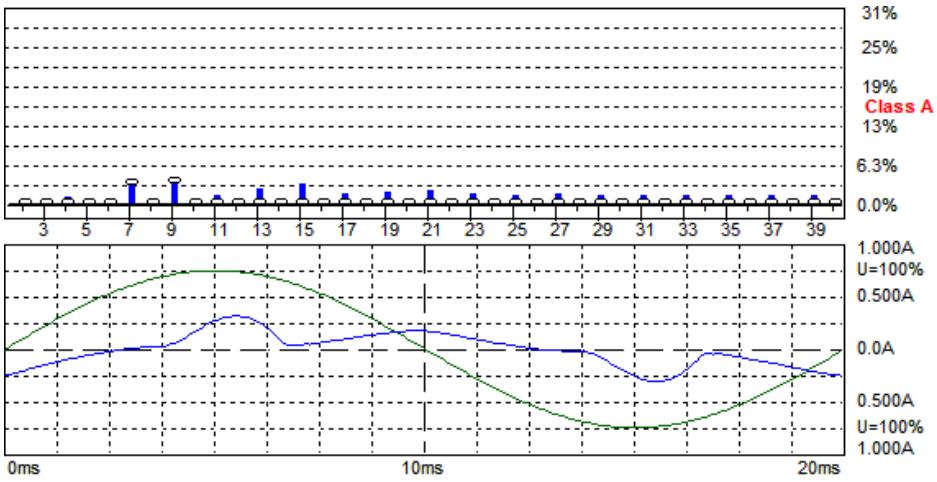
Uncertainty(HAR) = +/- 2.24 % (with a 95 % confidence level, k = 2)

"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.
☒	HAR1000 System	HAR1000-1P	EMC PARTNER	HAR1000-1P 230V-0212	2021.08.03

[Power #1]



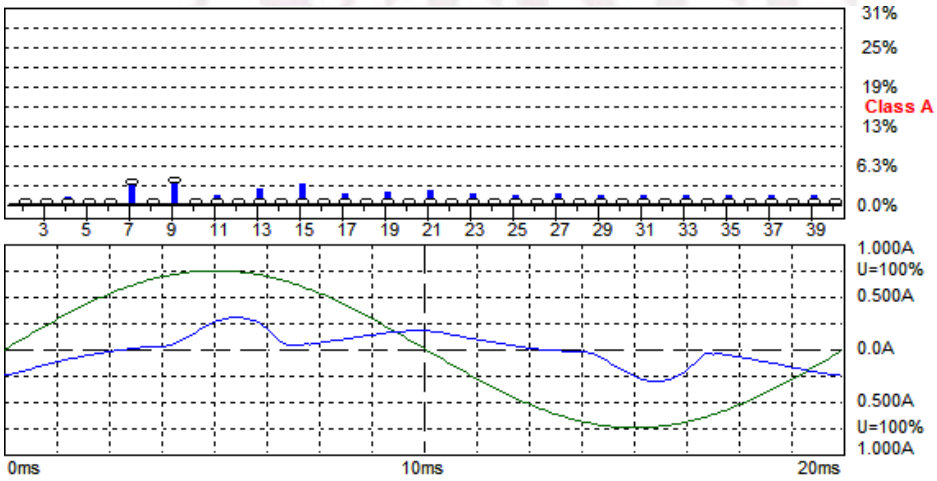
Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2) 2021-02-09 오후 1:02

Urms =	230.9	V	P =	20.74	W	THC =	0.079	A	Range: 1 A
Irms =	0.154	A	pf =	0.582					V-nom: 230 V
									TestTime: 5 min (100%)

A2021-01595 **Test completed, Result: PASSED**

HAR-1000 EMC-Partner

[Power #2]



Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2) 2021-02-09 오후 1:19

Urms =	230.9	V	P =	20.71	W	THC =	0.079	A	Range: 1 A
Irms =	0.154	A	pf =	0.581					V-nom: 230 V
									TestTime: 5 min (100%)

A2021-01595 **Test completed, Result: PASSED**

HAR-1000 EMC-Partner

[Power #1]

Operator	YOO Byeongkook
Unit	A2021-01595
Serial Number	N/A
Remarks	

Urms =	230.9V	Freq =	50.065	Range:	1 A
Irms =	0.154A	Ipk =	0.314A	cf =	2.038
P =	20.74W	S =	35.63VA	pf =	0.582
THDi =	59.8 %	THDu =	0.10 %	Class A	

Test - Time : 5min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Imax [A]	Limit [A]	Status
1	50	0.1328	0.1328	0.1331		
2	100	0.0101	0.0101	0.0103	1.0800	
3	150	0.0522	0.0521	0.0522	2.3000	
4	200	0.0000	0.0035	0.0035	0.4300	
5	250	0.0513	0.0512	0.0514	1.1400	
6	300	0.0000	0.0014	0.0014	0.3000	
7	350	0.0238	0.0237	0.0239	0.7700	
8	400	0.0000	0.0015	0.0015	0.2300	
9	450	0.0143	0.0143	0.0143	0.4000	
10	500	0.0000	0.0005	0.0005	0.1840	
11	550	0.0000	0.0037	0.0037	0.3300	
12	600	0.0000	0.0001	0.0001	0.1533	
13	650	0.0000	0.0048	0.0048	0.2100	
14	700	0.0000	0.0002	0.0002	0.1314	

15	750	0.0000	0.0045	0.0045	0.1500
16	800	0.0000	0.0001	0.0001	0.1150
17	850	0.0000	0.0021	0.0021	0.1324
18	900	0.0000	0.0001	0.0001	0.1022
19	950	0.0000	0.0020	0.0020	0.1184
20	1000	0.0000	0.0001	0.0001	0.0920
21	1050	0.0000	0.0020	0.0020	0.1071
22	1100	0.0000	0.0001	0.0001	0.0836
23	1150	0.0000	0.0015	0.0015	0.0978
24	1200	0.0000	0.0001	0.0001	0.0767
25	1250	0.0000	0.0011	0.0012	0.0900
26	1300	0.0000	0.0001	0.0001	0.0708
27	1350	0.0000	0.0012	0.0012	0.0833
28	1400	0.0000	0.0001	0.0001	0.0657
29	1450	0.0000	0.0010	0.0010	0.0776
30	1500	0.0000	0.0000	0.0001	0.0613
31	1550	0.0000	0.0008	0.0008	0.0726
32	1600	0.0000	0.0001	0.0001	0.0575
33	1650	0.0000	0.0008	0.0008	0.0682
34	1700	0.0000	0.0001	0.0001	0.0541
35	1750	0.0000	0.0007	0.0008	0.0643
36	1800	0.0000	0.0001	0.0001	0.0511
37	1850	0.0000	0.0007	0.0007	0.0608
38	1900	0.0000	0.0001	0.0001	0.0484
39	1950	0.0000	0.0006	0.0006	0.0577
40	2000	0.0000	0.0001	0.0001	0.0460

[Power #2]

Operator	YOO Byeongkook
Unit	A2021-01595
Serial Number	N/A
Remarks	

Urms =	230.9V	Freq =	50.065	Range:	1 A
Irms =	0.154A	Ipk =	0.313A	cf =	2.032
P =	20.71W	S =	35.63VA	pf =	0.581
THDi =	59.8 %	THDu =	0.10 %	Class A	

Test - Time : 5min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Imax [A]	Limit [A]	Status
1	50	0.1323	0.1326	0.1326		
2	100	0.0100	0.0099	0.0101	1.0800	
3	150	0.0519	0.0519	0.0520	2.3000	
4	200	0.0000	0.0034	0.0035	0.4300	
5	250	0.0511	0.0511	0.0511	1.1400	
6	300	0.0000	0.0014	0.0014	0.3000	
7	350	0.0237	0.0237	0.0237	0.7700	
8	400	0.0000	0.0015	0.0015	0.2300	
9	450	0.0142	0.0142	0.0142	0.4000	
10	500	0.0000	0.0005	0.0005	0.1840	
11	550	0.0000	0.0037	0.0037	0.3300	
12	600	0.0000	0.0001	0.0001	0.1533	
13	650	0.0000	0.0048	0.0048	0.2100	
14	700	0.0000	0.0002	0.0002	0.1314	
15	750	0.0000	0.0045	0.0045	0.1500	

16	800	0.0000	0.0001	0.0001	0.1150
17	850	0.0000	0.0021	0.0021	0.1324
18	900	0.0000	0.0001	0.0001	0.1022
19	950	0.0000	0.0020	0.0020	0.1184
20	1000	0.0000	0.0001	0.0001	0.0920
21	1050	0.0000	0.0020	0.0020	0.1071
22	1100	0.0000	0.0001	0.0001	0.0836
23	1150	0.0000	0.0015	0.0015	0.0978
24	1200	0.0000	0.0001	0.0001	0.0767
25	1250	0.0000	0.0011	0.0012	0.0900
26	1300	0.0000	0.0001	0.0001	0.0708
27	1350	0.0000	0.0012	0.0012	0.0833
28	1400	0.0000	0.0001	0.0001	0.0657
29	1450	0.0000	0.0010	0.0010	0.0776
30	1500	0.0000	0.0000	0.0001	0.0613
31	1550	0.0000	0.0008	0.0008	0.0726
32	1600	0.0000	0.0001	0.0001	0.0575
33	1650	0.0000	0.0008	0.0008	0.0682
34	1700	0.0000	0.0000	0.0001	0.0541
35	1750	0.0000	0.0007	0.0008	0.0643
36	1800	0.0000	0.0000	0.0001	0.0511
37	1850	0.0000	0.0007	0.0007	0.0608
38	1900	0.0000	0.0000	0.0001	0.0484
39	1950	0.0000	0.0006	0.0006	0.0577
40	2000	0.0000	0.0001	0.0001	0.0460

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:

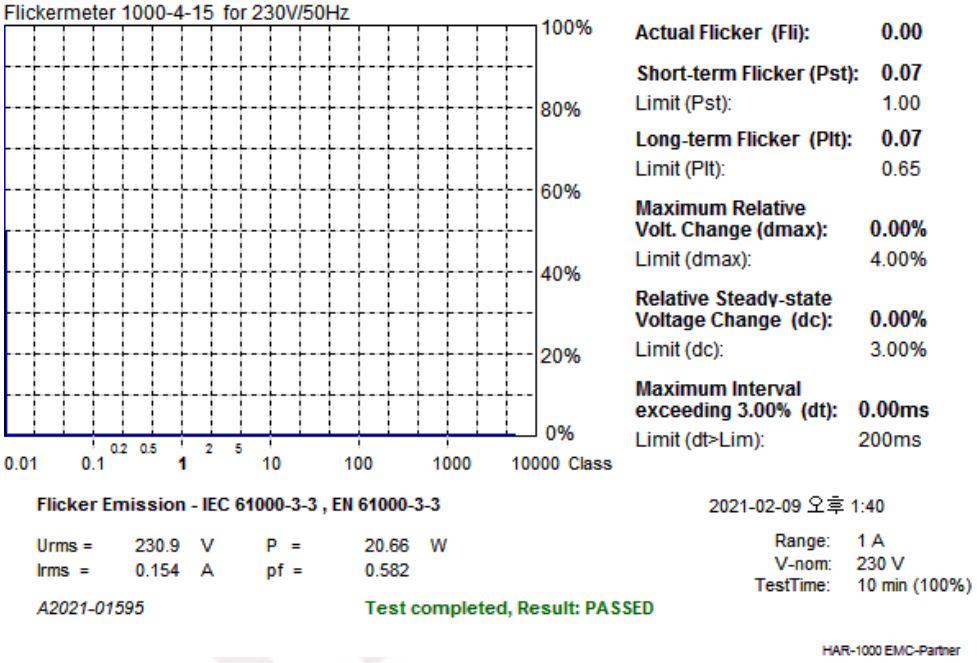
Uncertainty(HAR) = +/- 2.24 % (with a 95 % confidence level, k = 2)

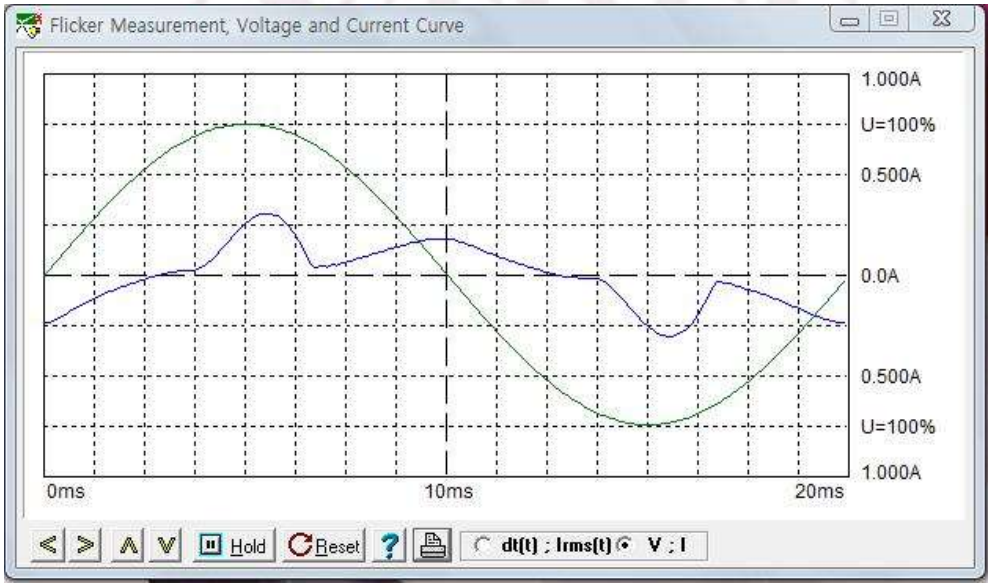
“It has been demonstrated that the HAR generator meets the specified requirements in the standard with at least 95 % confidence.”

Used equipments:

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

[Power #1]


Flickermeter 1000-4-15 for 230V/50Hz
100%
80%
60%
40%
20%
0%
0.01
0.1
0.2
0.5
1
2
5
10
100
1000
10000 Class
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
2021-02-09 오후 1:40
Urms = 230.9 V
Irms = 0.154 A
P = 20.66 W
pf = 0.582
Range: 1 A
V-nom: 230 V
TestTime: 10 min (100%)
A2021-01595
Test completed, Result: PASSED
HAR-1000 EMC-Partner


Flicker Measurement, Voltage and Current Curve
1.000A
U=100%
0.500A
0.0A
0.500A
U=100%
1.000A
0ms
10ms
20ms
Hold
Reset
dt(t) ; Irms(t)
V ; I

[Power #1]

Operator	YOO Byeongkook
Unit	A2021-01595
Serial Number	N/A
Remarks	

Urms =	230.9V	Freq =	50.065	Range:	1 A
Irms =	0.154A	Ipk =	0.311A	cf =	2.019
P =	20.66W	S =	35.51VA	pf =	0.582

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

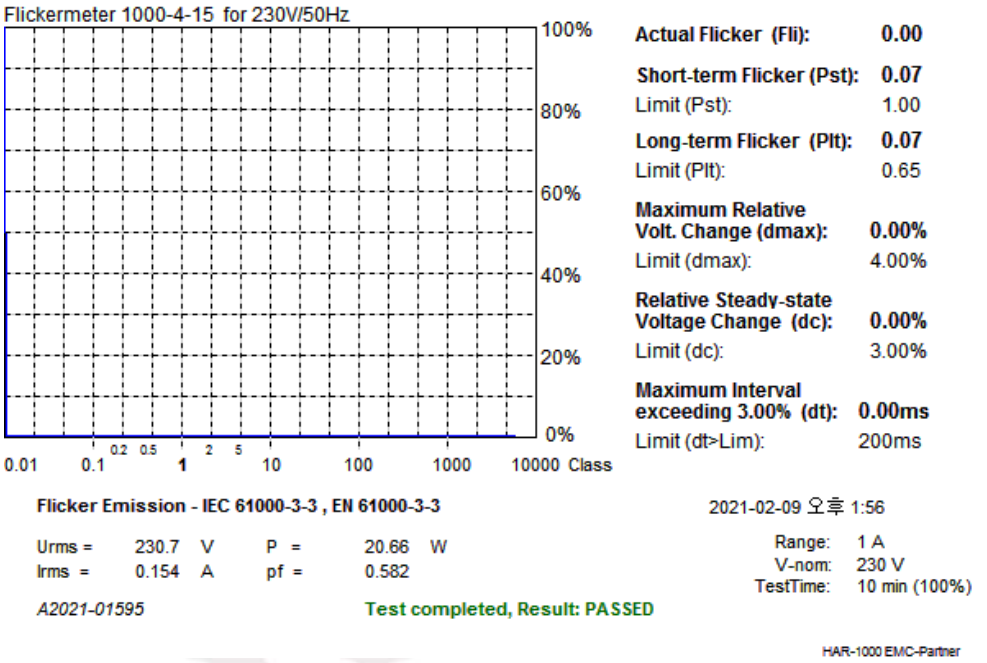
LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

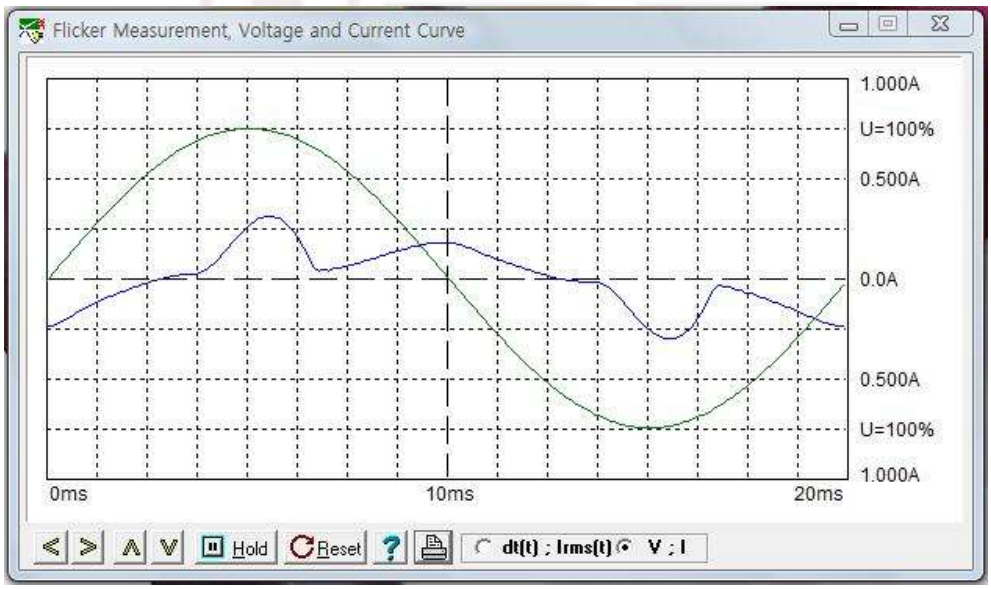
Limits :	Plt :	0.65	Pst :	1.00	
		dmax :	4.00 %	dc :	3.00 %
		dtLim:	3.00 %	dt>Lim:	200ms

Test completed, Result: PASSED

	dmax
	[%]
1	0.000

[Power #2]


Flickermeter 1000-4-15 for 230V/50Hz
100%
80%
60%
40%
20%
0%
0.01
0.1
1
10
100
1000
10000 Class
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
2021-02-09 오후 1:56
Urms = 230.7 V
Irms = 0.154 A
P = 20.66 W
pf = 0.582
Range: 1 A
V-nom: 230 V
TestTime: 10 min (100%)
A2021-01595
Test completed, Result: PASSED
HAR-1000 EMC-Partner


Flicker Measurement, Voltage and Current Curve
1.000A
U=100%
0.500A
0.0A
0.500A
U=100%
1.000A
0ms
10ms
20ms
Hold
Reset
dt(t) ; Irms(t)
V ; I

[Power #2]

Operator	YOO Byeongkook
Unit	A2021-01595
Serial Number	N/A
Remarks	

Urms =	230.7V	Freq =	50.065	Range:	1 A
Irms =	0.154A	Ipk =	0.311A	cf =	2.022
P =	20.66W	S =	35.48VA	pf =	0.582

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	:	19 ℃ / 41 % R.H. / 101.3 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	2021.03.17

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.

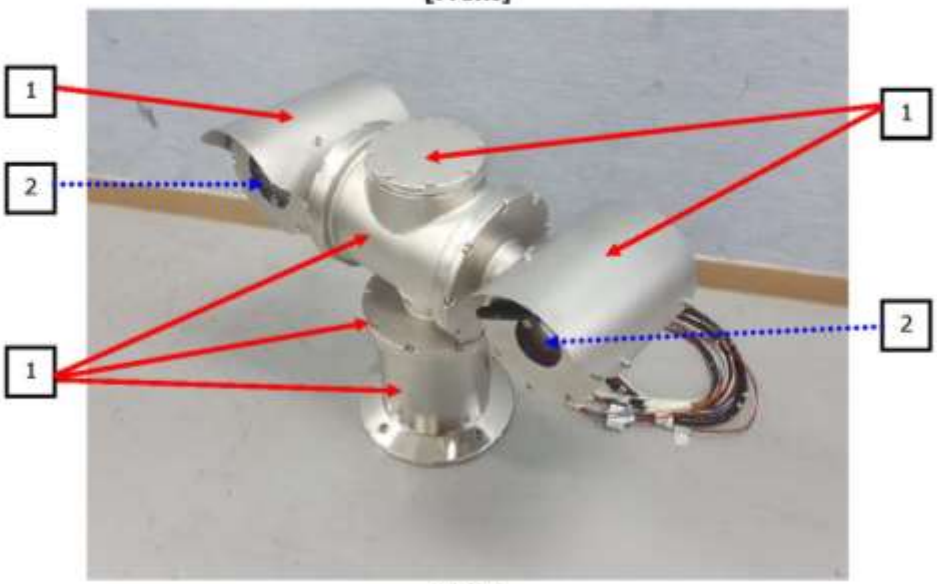
2. Direct Discharge

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

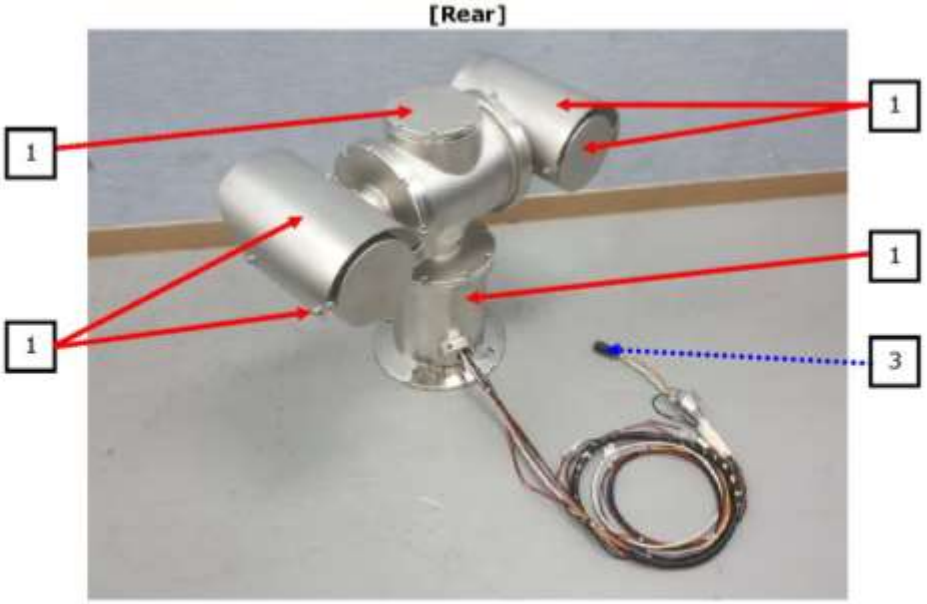
[Test point] Air Discharge(A)

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 ㎒ to 2.7 ㎓
Test level	:	10 V/m (r.m.s) (unmodulated)
Duty cycle	:	80 % AM, 1 ㎑, sinusoidal
		Pulse modulation : 1 ㎐ (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	N5181A	Agilent technologies	MY50145570	2021.03.13
☒	Log. - Per. Antenna	STLP9128DS	Schwarzbeck	9128DS 052	-
☒	Double Ridged Broadband Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1245	2021.03.23
☒	RF power meter	N1914A	Agilent technologies	MY54100025	2021.03.13
☒	RF Power Amplifiers	250W1000B	AR	0456836	-
☒	RF Power Amplifiers	50S1G6	AR	0433927	-
☒	Directional coupler	DC6180A	AR	0433802	2021.03.13
☒	Directional coupler	DC7200	AR	0433902	2021.03.13
☒	Average Power Sensor	E9304A	Agilent technologies	MY54110001	2021.03.13
☒	Average Power Sensor	E9304A	Agilent technologies	MY54110004	2021.03.13

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 / Other supply lines	: ☐ ± 0.5, 1.0 kV
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)	± 1.0 kV	A	No reaction recognized.
	Line(L) to ground(PE)	± 2.0 kV	-	-
	Line(N) to ground(PE)	± 2.0 kV	-	-
90°	Line(L) to line(N)	± 1.0 kV	A	No reaction recognized.
	Line(L) to ground(PE)	± 2.0 kV	-	-
	Line(N) to ground(PE)	± 2.0 kV	-	-
180°	Line(L) to line(N)	± 1.0 kV	A	No reaction recognized.
	Line(L) to ground(PE)	± 2.0 kV	-	-
	Line(N) to ground(PE)	± 2.0 kV	-	-
270°	Line(L) to line(N)	± 1.0 kV	A	No reaction recognized.
	Line(L) to ground(PE)	± 2.0 kV	-	-
	Line(N) to ground(PE)	± 2.0 kV	-	-

- DC Power port

Line	Level	Result	Remark
-	± - kV	-	-

- Signal port

Port	Level	Result	Remark
-	± - 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 ㎒ to 100 ㎒
Test level	:	140 dBμV (r.m.s) (unmodulated)
		10 V (Modulated)
Amplitude Modulation	:	80 % AM, 1 ㎑, sinusoidal
Pulse Modulation	:	1 ㎐ (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	2021.03.13
☒	POWER SENSOR	RPR2006C	DARE	15I00037SNO55	2021.03.13
☒	POWER SENSOR	RPR2006C	DARE	15I00037SNO56	2021.03.13
☒	CDN	CDN M016	TESEQ	44553	2021.11.02
☐	CDN	CDN T2	EM TEST	P1348126361	2021.03.13
☐	CDN	CDN S501A	TESEQ	44479	2021.11.02
☐	CDN	CDN S751A	TESEQ	44734	2021.11.02
☐	CDN	CDN S8 RJ45	EM TEST	P1345125806	2021.03.13
☐	CDN	CDN T8 RJ45	EM TEST	P1343125197	2021.03.13
☒	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 dBμV) , 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 dBμV), 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 1V/m(U_0 = 120 dBμV).

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.

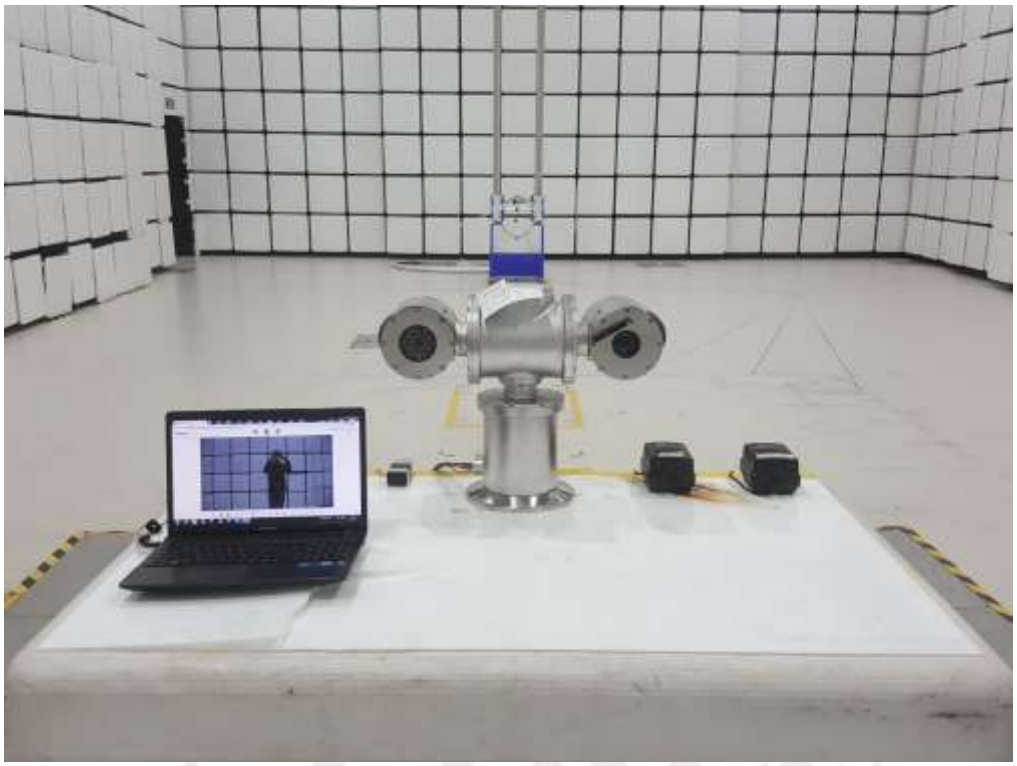
Conducted emission measurement (with a 95 % confidence level , *k* = 2)		
Shielded Room(#1)	9 kHz to 30 MHz:	2.0 dB
Radiated Emission measurement (with a 95 % confidence level , *k* = 2)		
10 m Chamber	30 MHz: to 1 000 MHz:	4.2 dB
3 m Chamber(#1)	1 000 MHz: to 6 000 MHz:	5.0 dB

Attachment III

PHOTOGRAPHS

Radiated disturbances (Maximum emission configuration) – Below 1GHz

[Front]



[Rear]

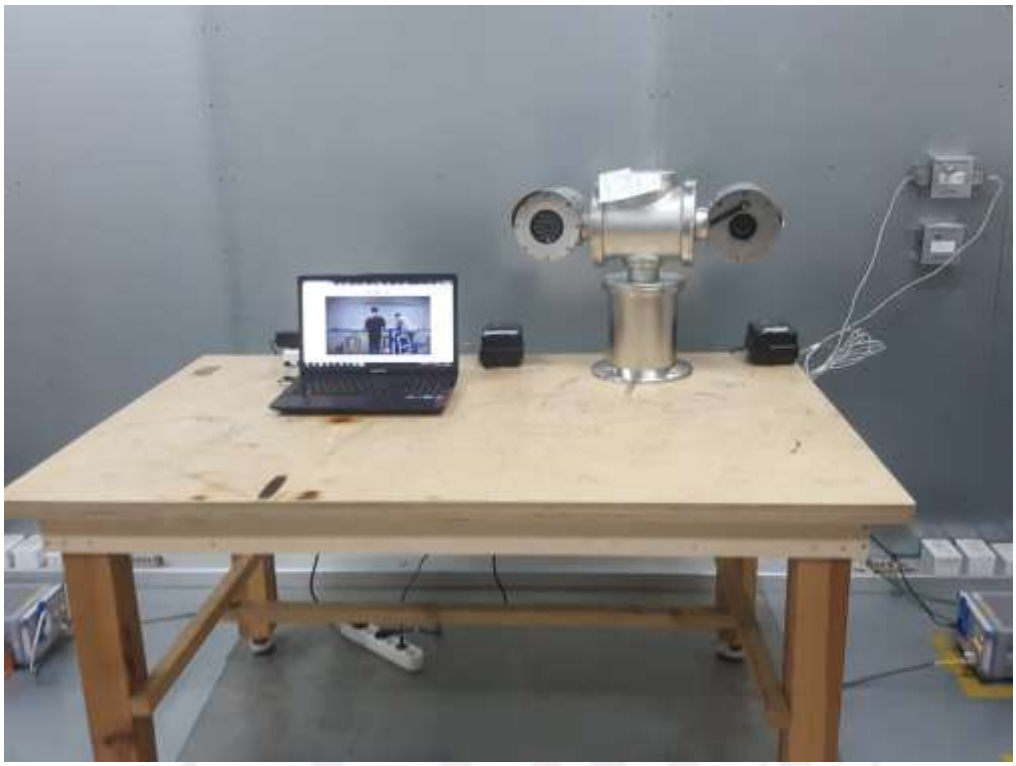
Radiated disturbances (Maximum emission configuration) – Above 1GHz

[Front]

[Rear]

Disturbance Voltage at the mains terminals (Maximum emission configuration)

[Front]



[Rear]

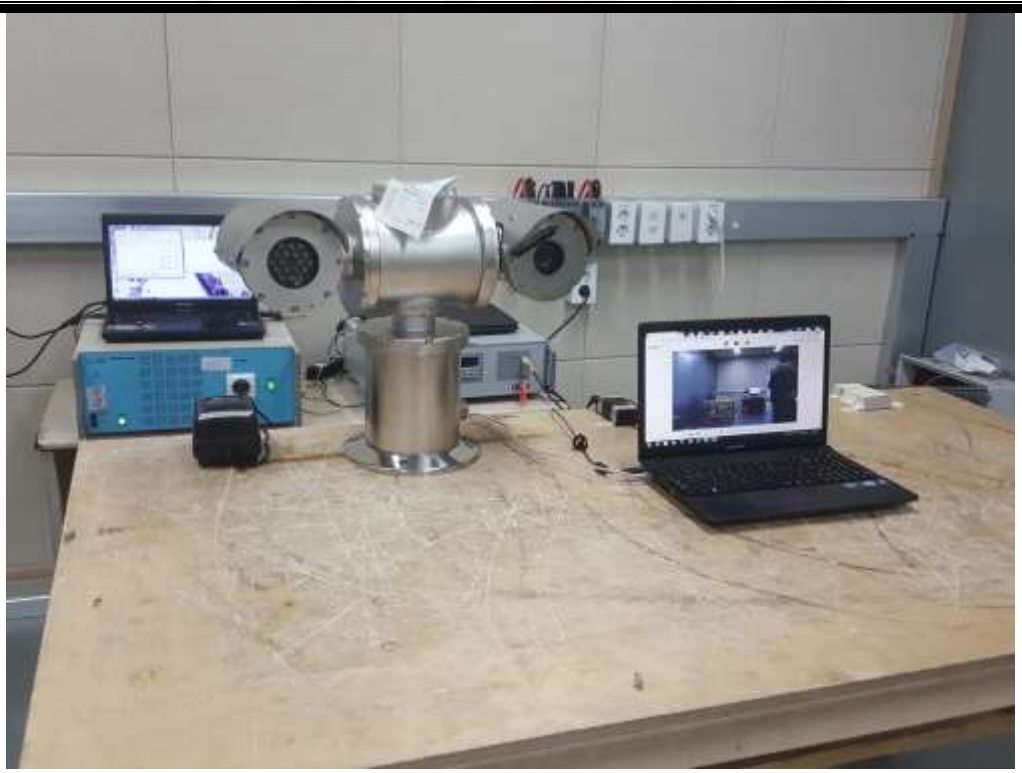
Disturbance Voltage at the mains terminals (Maximum emission configuration)_ISN

[Front]

[Rear]

Harmonic

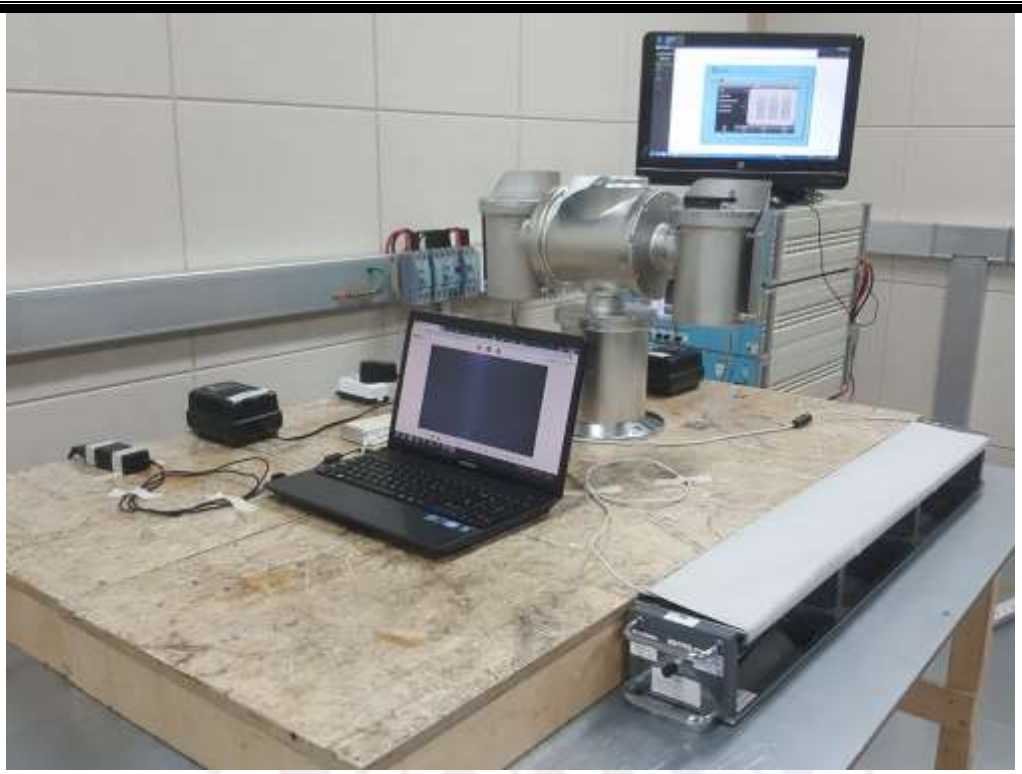
Flicker



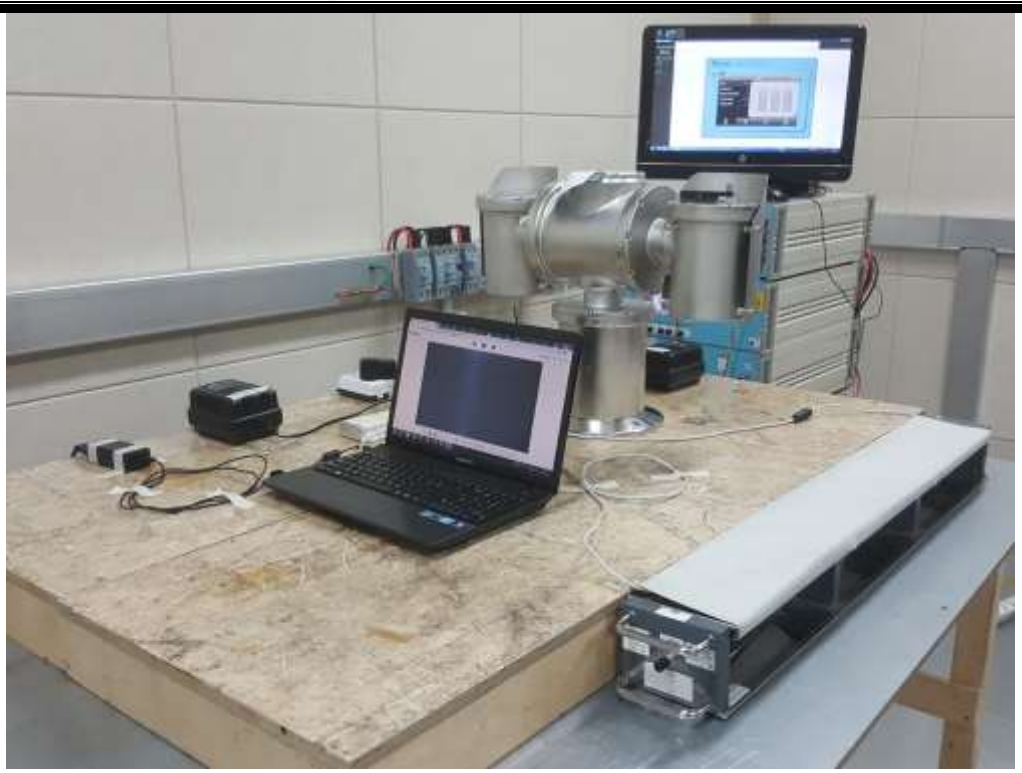
Electromagnetic Discharge

RF Electromagnetic Field

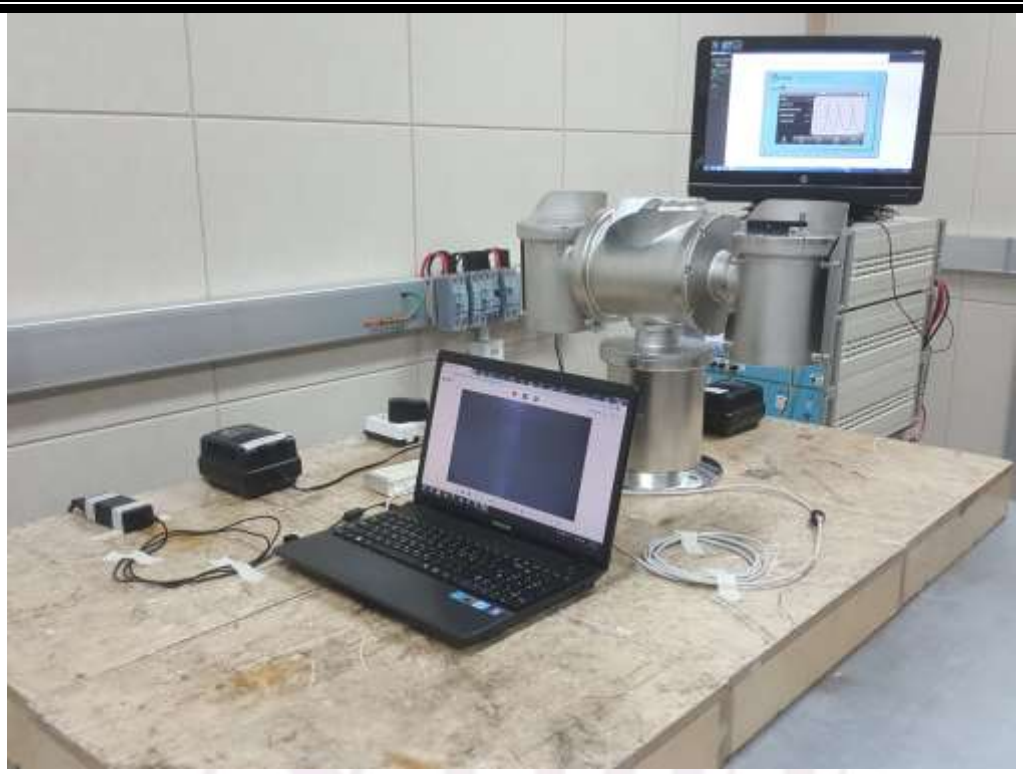
Fast Transients common mode



Fast Transients common mode_Clamp

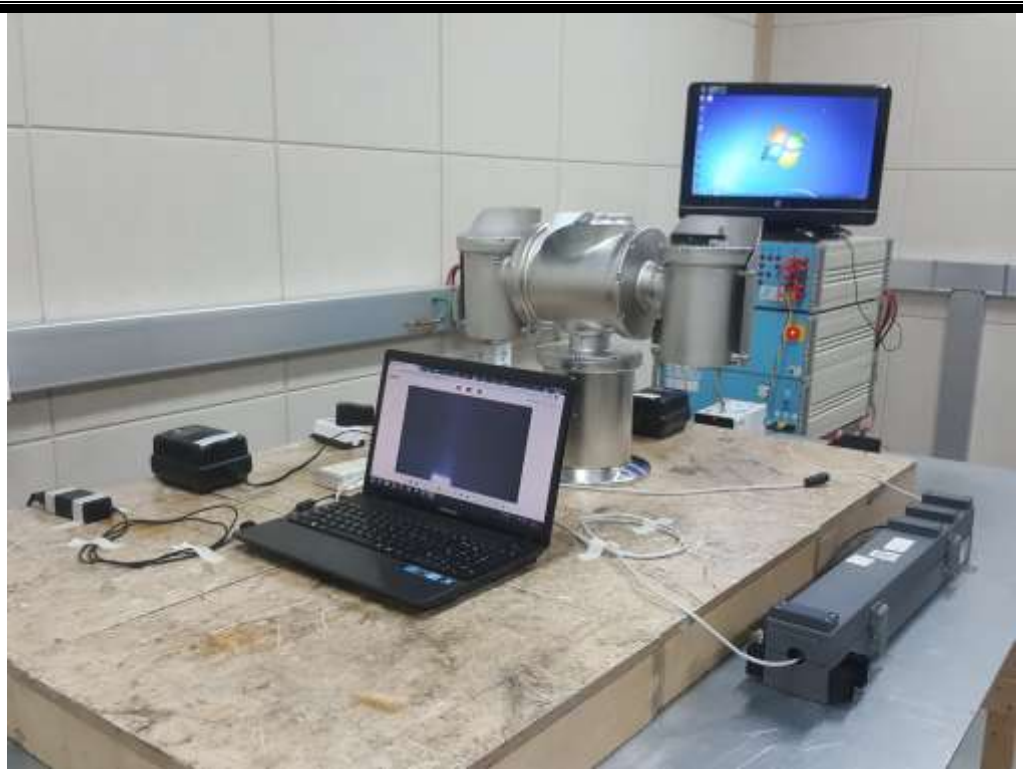


Surge

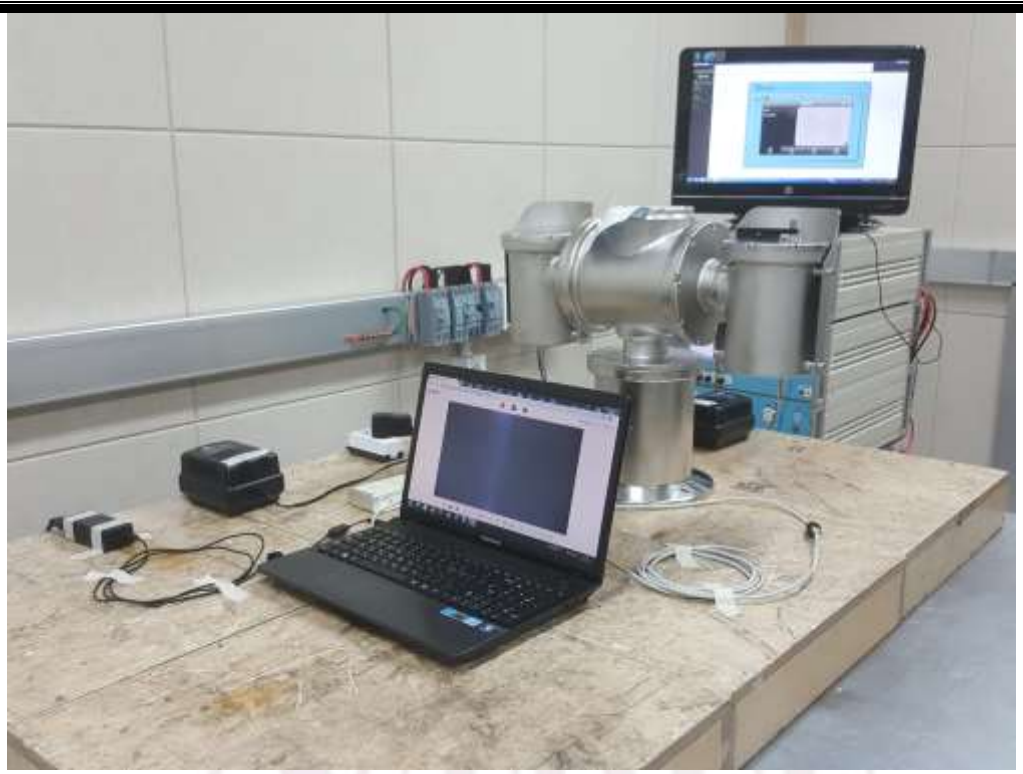


RF current common mode

RF current common mode_Clamp



Voltage dips and interruption



EUT Photo

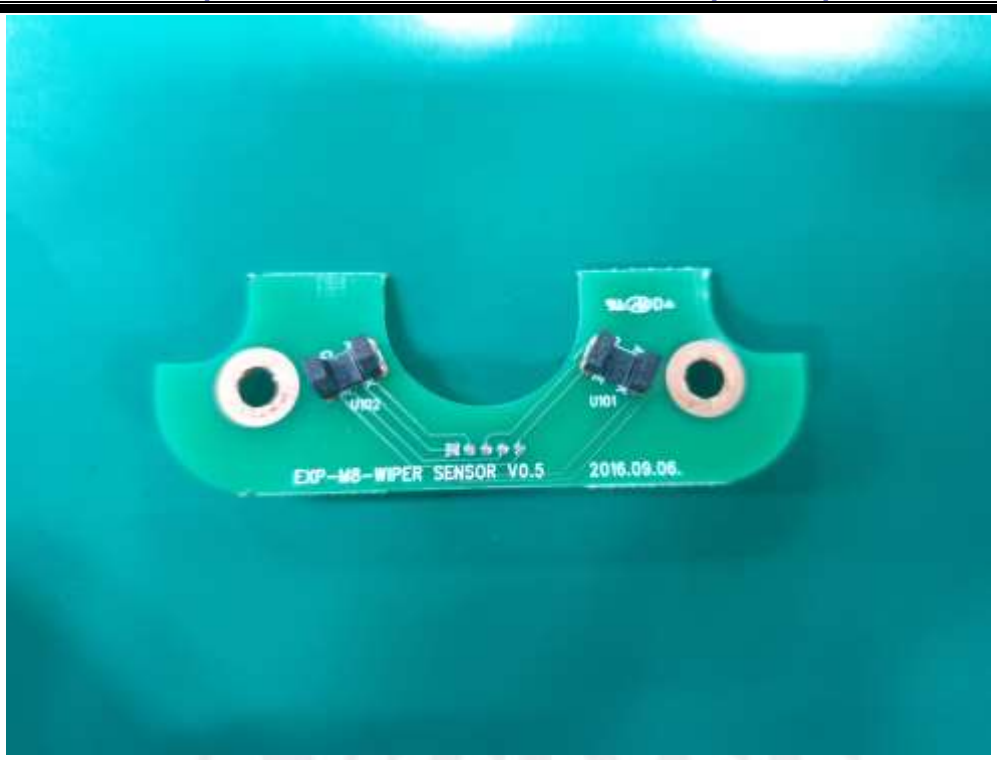
Front of EUT

Rear of EUT

Position of LABEL

Internal of EUT

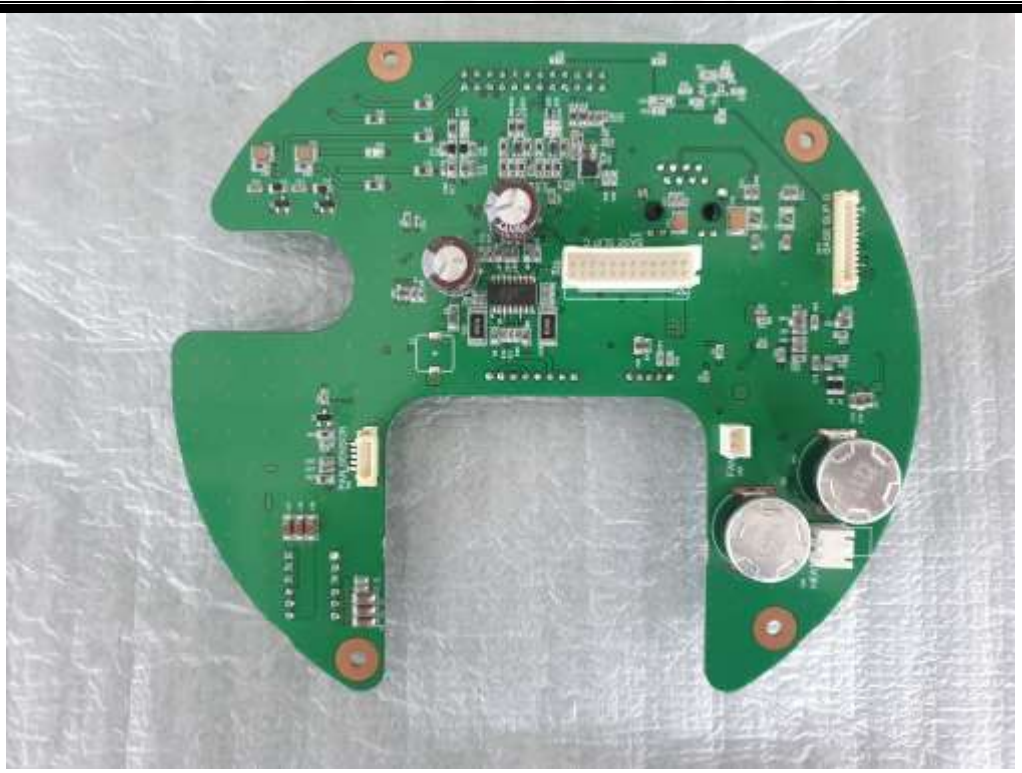
Top of EXP-M8-WIPERSENSOR V05(160906)



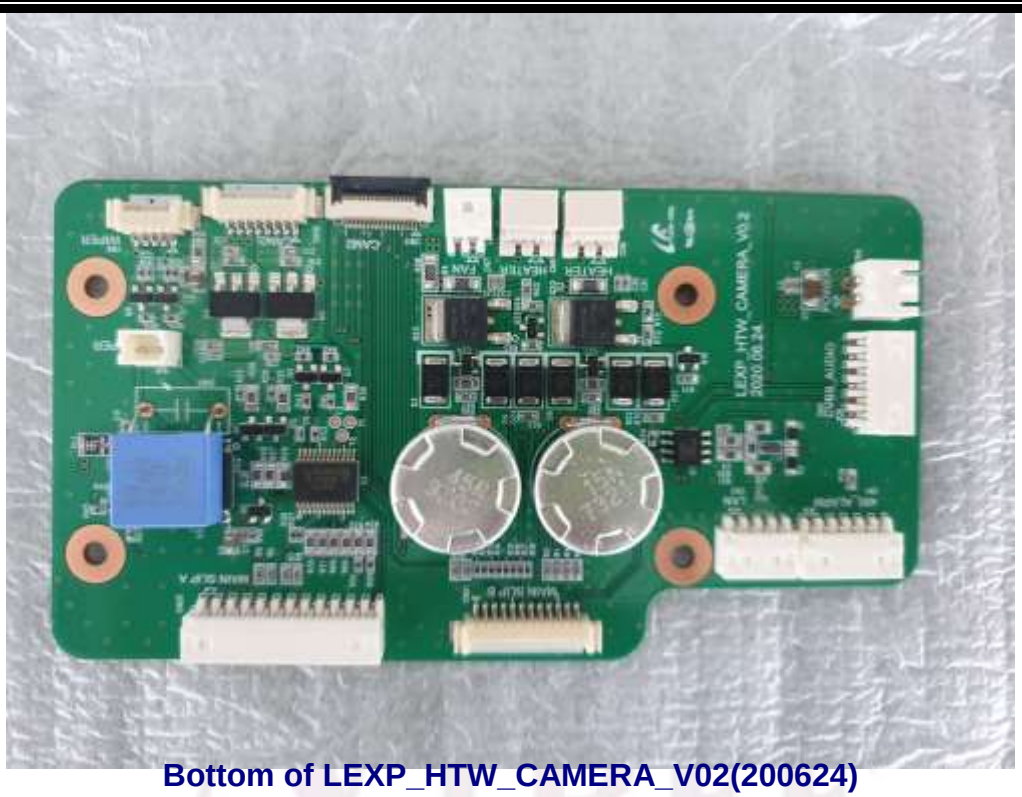
Bottom of EXP-M8-WIPERSENSOR V05(160906)

Top of LEXP_BASE_V03(201013)

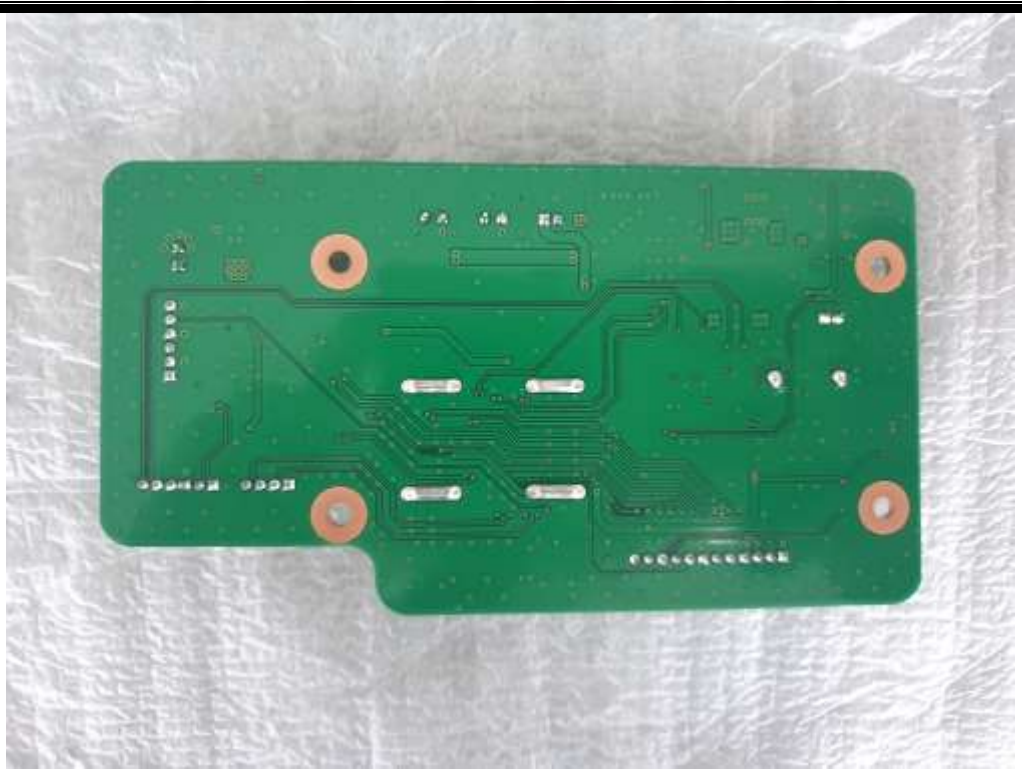
Bottom of LEXP_BASE_V03(201013)



Top of LEXP_HTW_CAMERA_V02(200624)

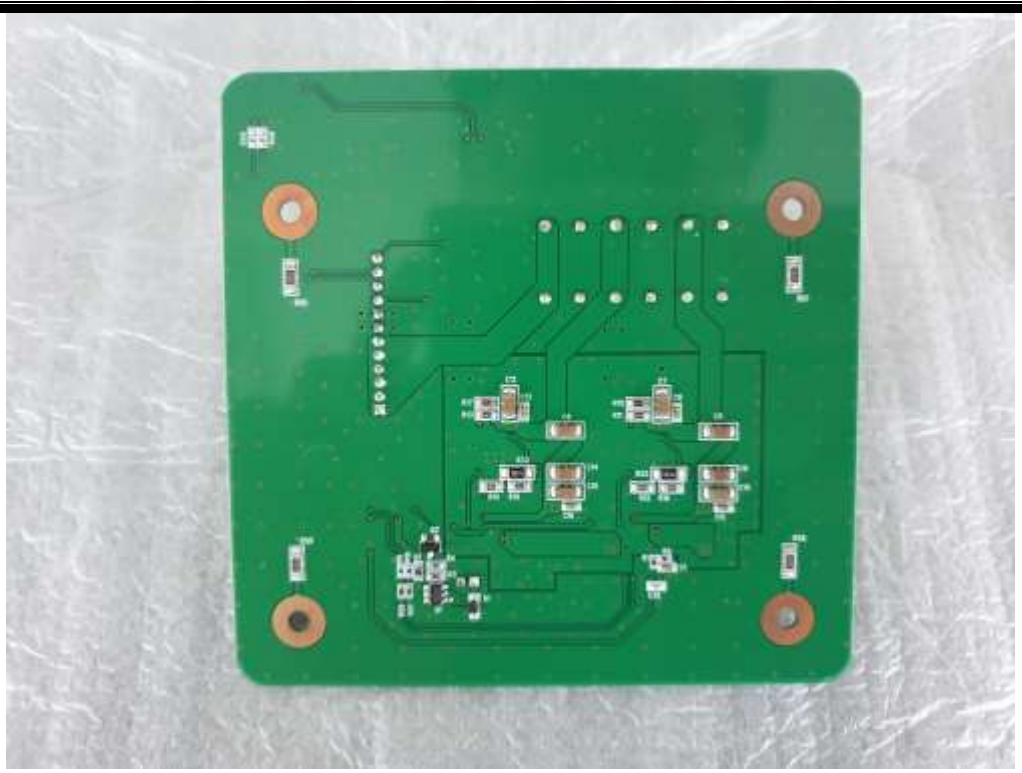


Bottom of LEXP_HTW_CAMERA_V02(200624)



Top of LEXP_IR_CTRL_V04(201105)

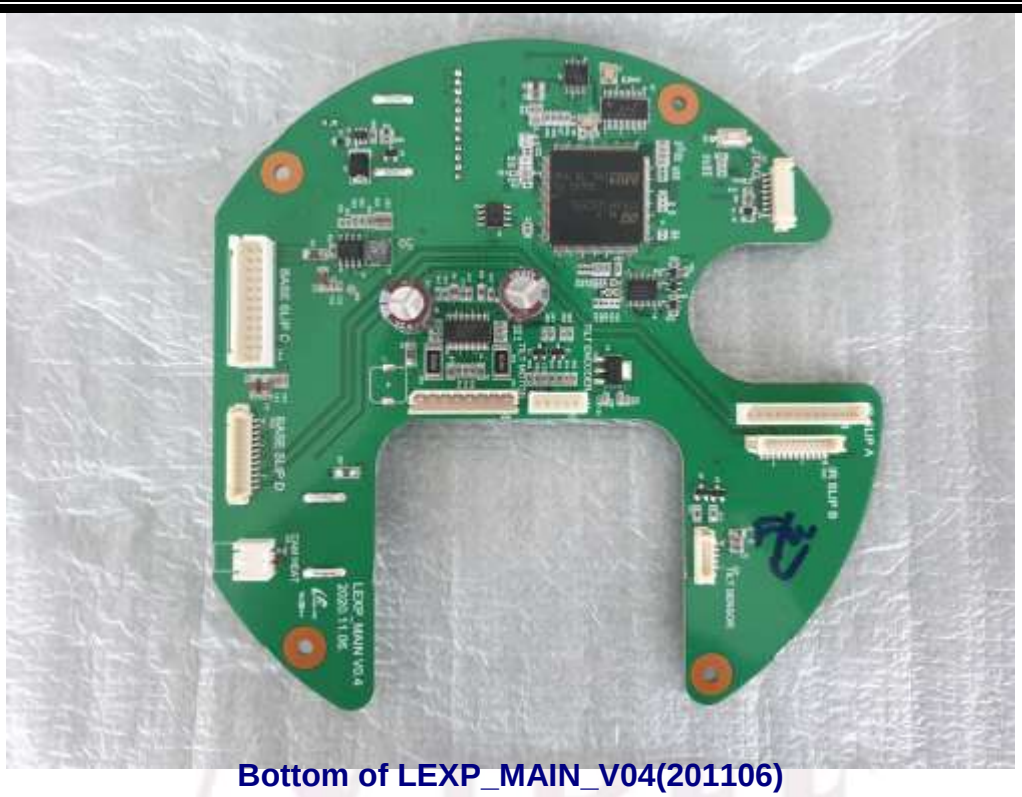
Bottom of LEXP_IR_CTRL_V04(201105)



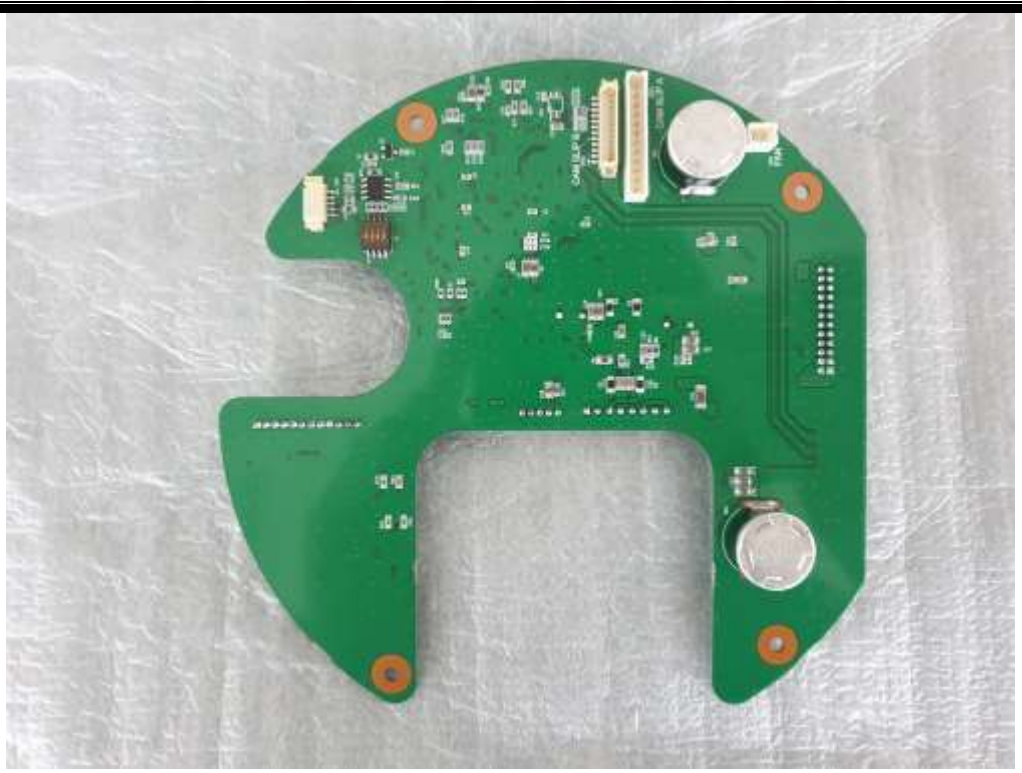
Top of LEXP_IR_LED_V03(201027)_METAL

Bottom of LEXP_IR_LED_V03(201027)_METAL

Top of LEXP_MAIN_V04(201106)



Bottom of LEXP_MAIN_V04(201106)



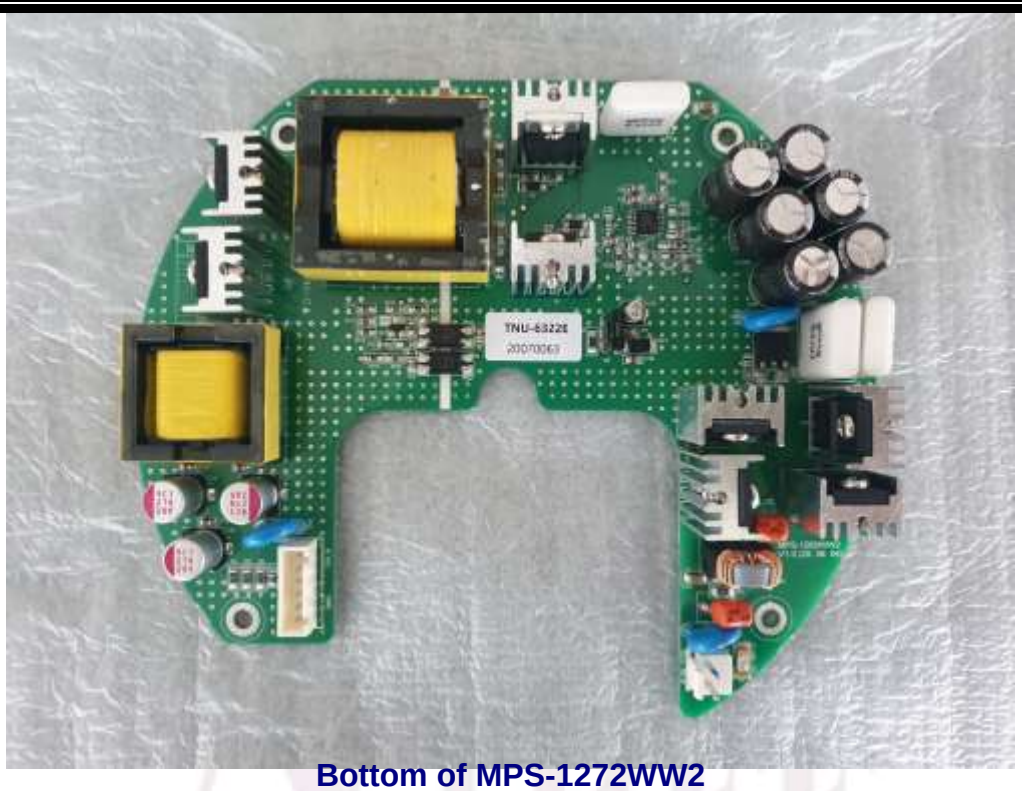
Top of LEXP_PAN_SENSOR_V01(200324)

Bottom of LEXP_PAN_SENSOR_V01(200324)

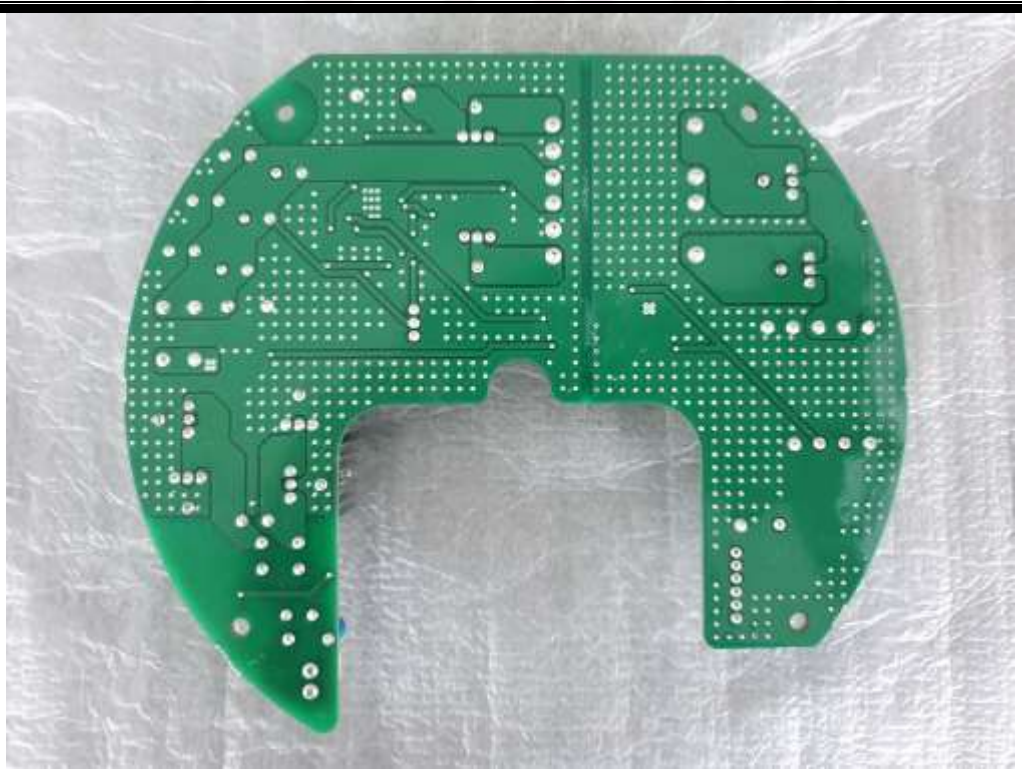
Top of LEXP_TILT_SENSOR_V01(200324)

Bottom of LEXP_TILT_SENSOR_V01(200324)

Top of MPS-1272WW2



Bottom of MPS-1272WW2



CAMERA