Test Report

1. Client

· Name :	WIZNET Co., Ltd.
· Address :	5F Humax Village, 216, Hwangsaeul-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

2. Use of Report :	CE DoC
3. Sample Description :	
· Model	W5100S-EVB-Pico
· Kind of Product	iEthernet Module
· Variant Model Name	-
4. Date of Receipt :	2023.08.23
5. Date of Test :	2023. 09. 12 ~ 2023. 09. 17
6. Test Method :	EN 55032:2015/A11:2020, CLASS A EN 55035:2017/A11:2020 EN 61000-3-2:2019/A1:2021 EN 61000-3-3:2013/A1:2019
7. Test Results :	Complied

This test report must not be reproduced or reproduced in any way.
The results shown in this test report are the results of testing the samples provided.
This test report is prepared according to the requirements of ISO / IEC 17025.

	Tested by	Technical Manager
Affirmation	DongYong, Lee (signature)	YONG MIN, PARK (signature)

10 18, 2023

EMC Labs Co., Ltd. (seal)

[Contents]

1. Revision history

Issued report No.	Version	Issued date	Revisions
KR0140-EC2310-001	Rev.00	October 18, 2023	Original

2. Test Regulation

▣ Emission : EN 55032:2015/A11:2020

▣ EN 55032 : 2015/A11:2020

☐ Class B Equipment ▣ Class A Equipment

▣ Generic

▣ EN 61000-3-2 : 2019/A1:2021

▣ EN 61000-3-3 : 2013/A1:2019

▣ Immunity : EN 55035:2017/A11:2020

▣ EN 61000-4-2 : 2009

▣ EN 61000-4-3 : 2006/A2:2010

▣ EN 61000-4-4 : 2012

▣ EN 61000-4-5 : 2006

▣ EN 61000-4-6 : 2009

☐ EN 61000-4-8 : 2010

▣ EN 61000-4-11 : 2004

3. Laboratory Information

Address

EMC Labs Co., Ltd.

Laboratory : 100, Jangjateo-ro, Hobeop-myeon, Icheon-si, Gyeonggi-do, 17396, Korea
Telephone Number : +82-31-637-8895
Facsimile Number : +82-505-116-8895

SITE MAP

4. Equipment Under Test

4.1 Product Specification

Test Voltage : AC 120 V / 60 Hz
EUT Highest operating frequency: 108 MHz

4.2 EUT Modification

- N/A

4.3 General Information

▣ Table-Top ☐ Floor – Standing

☐ Table-Top & Floor-Standing (Combination)

4.4 Configuration of the equipment under test

Equipment	Model	Manufacture	Serial No.
NOTE PC	82KD000UKR	LENOVO	-
Adapter	ADLX65CLGR2A	Lite-On Technology Corp.	-

Type	Description	Connection	Spec.	Length(m)
EUT	DC IN	NOTE PC	shield	0.8
	LAN	NOTE PC	Unshield	5.0

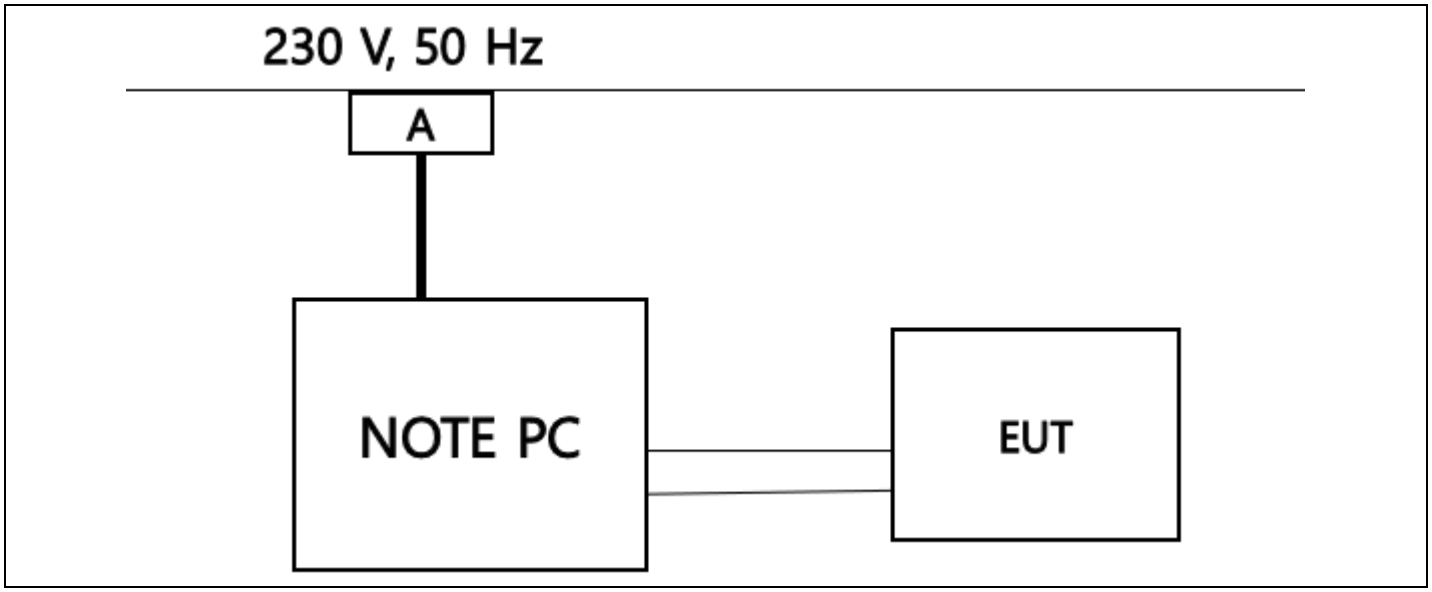
Display Observation Distance	1.2 m
The type of cable used to test the networking functionality	Cat.5 (Unshielded Cable)
Data rate when testing networking functionality	100 Mbps
The level selected during the audio output function test	-

4.5 Operating Conditions

The equipment under test was operated during the measurement under following

Test mode	Normal Operating
1	Connect the EUT to the NOTE PC and proceed with the test by checking operation through the 'AX1' program provided by the company.
*	* The electromagnetic wave conduction test (communication port) test was conducted using a program (IBM Exerciser – 100 Mbps).

4.6 The drawing of general test setup



5. Summary of Test Result

5.1 Summary of EMI emission test result

EN 55032 : 2015/A11:2020

Electromagnetic compatibility of multimedia equipment – Emission Requirements.

Test items		Result
Conducted Emission (Power Line)	EN55032:2015/A11:2020	Pass
Conducted Emission (Telecommunication Line)	EN55032:2015/A11:2020	Pass
Radiated Emission (Below 1GHz)	EN55032:2015/A11:2020	Pass
Radiated Emission (Above 1GHz)	EN55032:2015/A11:2020	Pass

EN 61000-3-2 : 2019/A1:2021

Limits for harmonic-current emissions (equipment input current up to including 16A per phase)

Test items	Test methods	Result
Harmonics	EN 61000-3-2 : 2019/A1:2021	Pass

EN 61000-3-3 : 2013/A1:2019

Limitation of voltage fluctuations and flicker in public low-voltage supply systems,

for equipment with rated current ≤ 16A per phase and not subject to conditional connection

Test items	Test methods	Result
Flicker	EN 61000-3-3: 2013/A1:2019	Pass

5.2 Summary of immunity test result

EN 55035:2017/A11:2020

Electromagnetic compatibility of multimedia equipment – Immunity Requirements.

Test items	Test methods	Result
Electrostatic discharge	EN 61000-4-2:2009	Pass
Electromagnetic field	EN 61000-4-3:2006/A2:2010	Pass
Electric fast transients	EN 61000-4-4:2012	Pass
Surge	EN 61000-4-5:2006	Pass
Conducted Immunity	EN 61000-4-6:2009	Pass
Magnetic field Immunity	EN 61000-4-8:2010	Not application
Voltage dip/interruption	EN 61000-4-11:2004	Pass

5.3 Performance criteria

Performance criterion A
The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion B
During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.
After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment 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), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion C
Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

6. Test Results

6.1 Conducted Emission

Environmental Conditions

Temperature	(22.3 ℃)
Humidity	(47 % R.H.)
Test Area	Conducted Room
Test date	2023.09.13

6.1.1 Limits of conducted emission measurement

* Class A equipment

Frequency range (㎒)	Coupling device (EN 55032 see table A.7)	Detector type / bandwidth	Class A limits (dB(㎶))
0.15 to 0.50	AMN	Quasi Peak / 9 kHz	79
0.50 to 30			73
0.15 to 0.50	AMN	Average / 9 kHz	66
0.50 to 30			60
* Apply across the entire frequency range.			

* Class B equipment

Frequency range (㎒)	Coupling device (EN 55032 see table A.7)	Detector type / bandwidth	Class B limits (dB(㎶))
0.15 to 0.50	AMN	Quasi Peak / 9 kHz	66 – 56
0.50 to 5			56
5 to 30			60
0.15 to 0.50	AMN	Average / 9 kHz	56 – 46
0.50 to 5			46
5 to 30			50
* Apply across the entire frequency range.			

6.1.2 Measurement procedure

Mains
The measurements were performed in a shielded room.
EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane.
The rear of table was located 0.4 m to the vertical conducted plane.
EUT was power through the LISN, which was bonded to the ground plane.
The LISN power was filtered. Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source.
All I.O cables are positioned to simulate typical actual usage according to the test standard.
Both lines of power cord, hot and neutral, were measured.

6.1.3 Used equipments

Equipment	Model	Manufacturer	Serial No.	Next Cal. Date	Used
MEASUREMENT SOFTWARE	EMC32 VER 10.60.15	Rohde&Schwarz	-	-	☒
Test Receiver	ESR7	Rohde&Schwarz	101616	2024.06.27	☒
※LISN	ENV216	Rohde&Schwarz	100409	2024.01.09	☒
LISN	3825-2	EMCO	8901-1458	2024.01.09	☒
PULSE LIMITER	EPL-30	lignex1	-	2024.01.09	☒

6.1.4 Test data

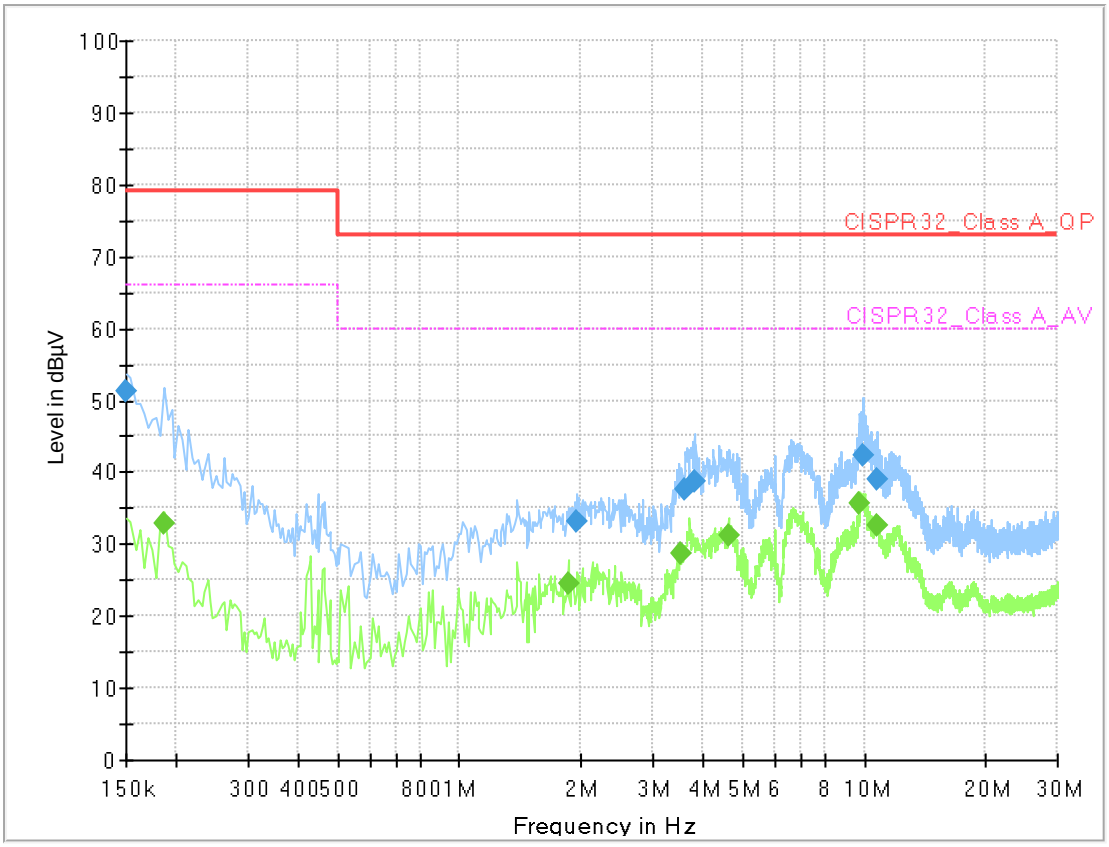
• Note. QP = Quasi-Peak, AV= Average

• Loss = LISN Loss + Cable Loss

• Measurement time : 1 s

6.1.5 Test Result

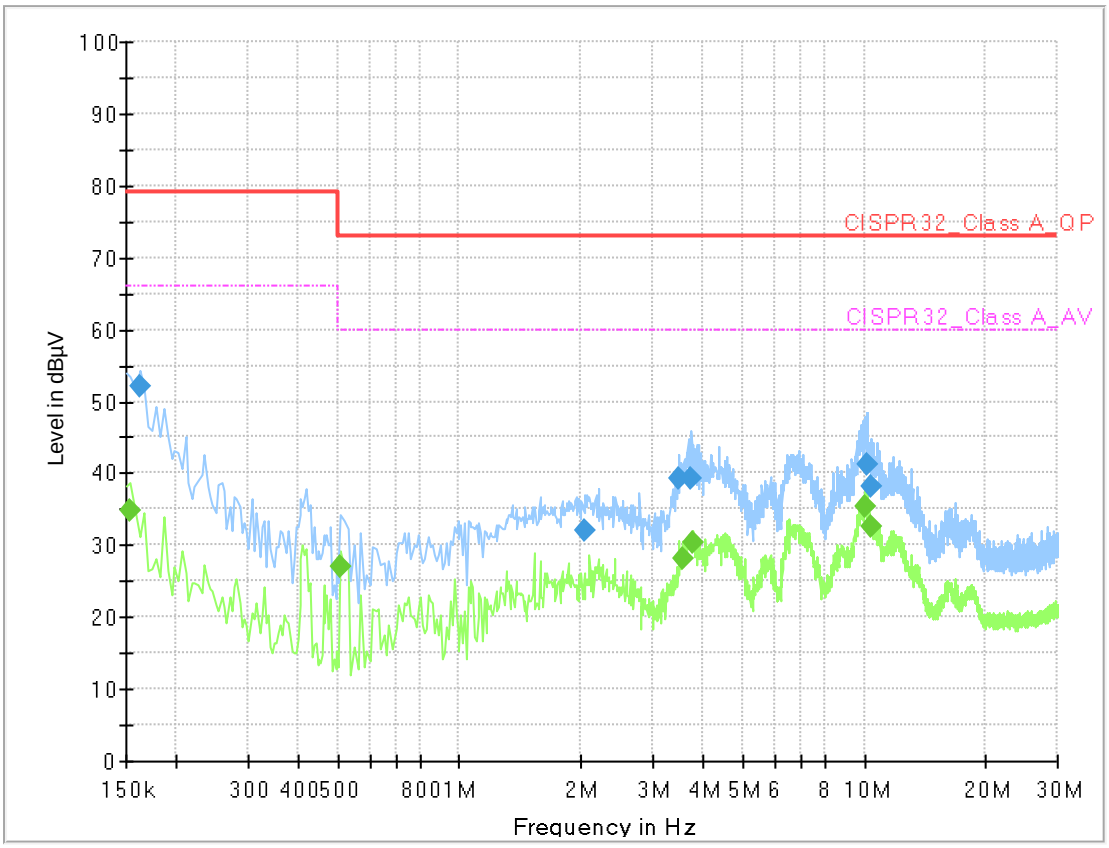
[HOT] - [Multi Tap]



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.150	51.29	---	79.00	27.71	9	L1	20.0
0.186	---	32.83	66.00	33.17	9	L1	19.9
1.860	---	24.62	60.00	35.38	9	L1	20.5
1.950	33.24	---	73.00	39.76	9	L1	20.5
3.540	---	28.55	60.00	31.45	9	L1	20.9
3.600	37.56	---	73.00	35.44	9	L1	20.9
3.800	38.79	---	73.00	34.21	9	L1	21.0
4.610	---	31.27	60.00	28.73	9	L1	21.3
9.760	---	35.52	60.00	24.48	9	L1	23.2
9.910	42.42	---	73.00	30.58	9	L1	23.2
10.710	38.95	---	73.00	34.05	9	L1	23.5
10.750	---	32.65	60.00	27.35	9	L1	23.5

[NEUTRAL] - [Multi Tap]



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.154	---	34.73	66.00	31.27	9	N	19.9
0.162	52.02	---	79.00	26.98	9	N	20.0
0.510	---	27.16	60.00	32.84	9	N	19.9
2.050	32.09	---	73.00	40.91	9	N	20.0
3.490	39.25	---	73.00	33.75	9	N	20.1
3.550	---	28.27	60.00	31.73	9	N	20.1
3.740	39.18	---	73.00	33.82	9	N	20.2
3.760	---	30.41	60.00	29.59	9	N	20.2
10.000	---	35.31	60.00	24.69	9	N	21.6
10.120	41.26	---	73.00	31.74	9	N	21.6
10.400	---	32.55	60.00	27.45	9	N	21.7
10.420	38.20	---	73.00	34.80	9	N	21.7

6.2 Conducted Emission(Telecommunications/network)

Environmental Conditions

Temperature	(22.3 ℃)
Humidity	(47 % R.H.)
Test Area	Conducted Room
Test date	2023.09.13

6.2.1 Measurement procedure

Telecommunications/network

All power was connected to the system through Artificial Mains Network (AMN). All tested telecommunications lines were connected to an Asymmetric Artificial Network (AAN) and conducted voltage measurements on telecommunications lines were made at the output of the AAN. Where an AAN was not appropriate or available measurements were made using a Capacitive Voltage Probe and Current probe.

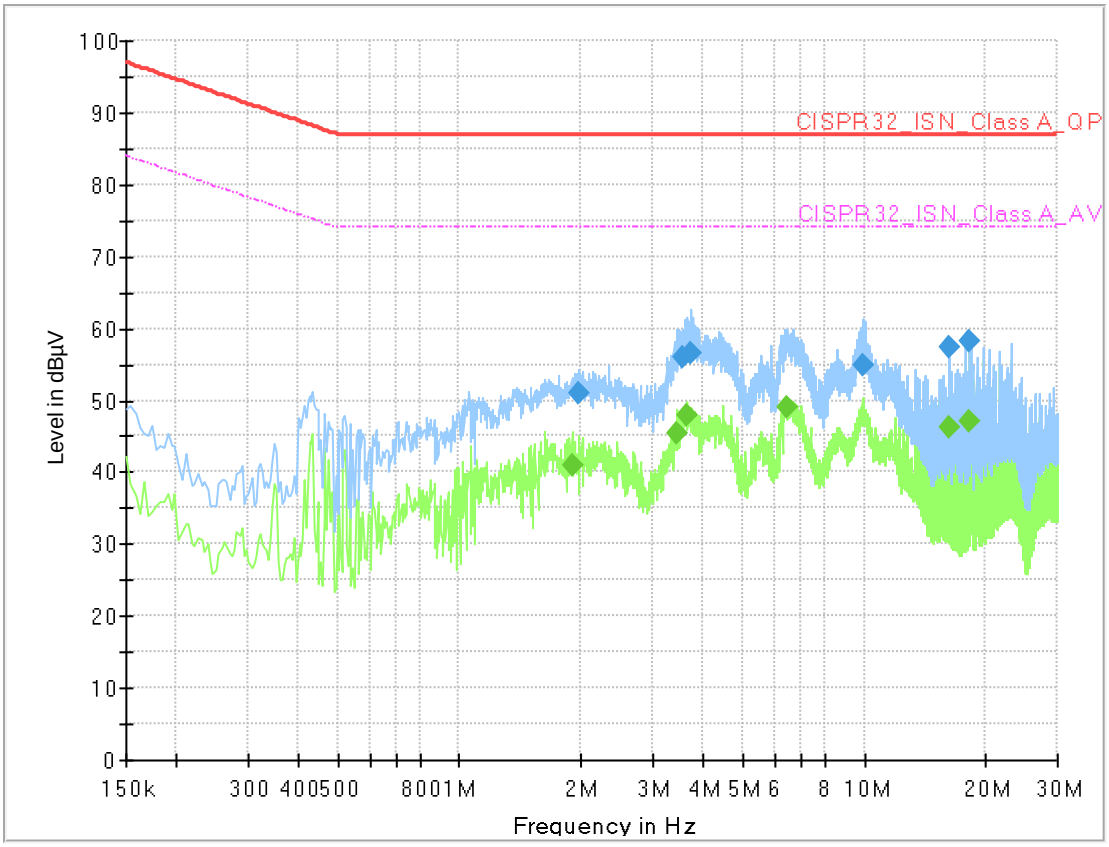
* For Ethernet interfaces, measurements are required at the highest data rate supported by the interface.

6.2.2 Used equipments

Equipment	Model	Manufacturer	Serial No.	Next Cal. Date	Used
MEASUREMENT SOFTWARE	EMC32 VER 10.60.15	Rohde&Schwarz	-	-	☒
Test Receiver	ESR7	Rohde&Schwarz	101616	2024.06.27	☒
※LISN	ENV216	Rohde&Schwarz	100409	2024.01.09	☒
LISN	3825-2	EMCO	8901-1458	2024.01.09	☒
ISN	CAT3 8158	SCHWARZBECK	CAT3-8158-0018	2024.03.14	☐
ISN	CAT5 8158	SCHWARZBECK	CAT5-8158-0033	2024.03.14	☒
ISN	CAT6 8158	SCHWARZBECK	8158-0033	2024.03.14	☐
ISN	ST08	TESEQ	41234	2024.06.27	☐
CDN	S1-75 BNC	EM TEST	P1408132027	2024.06.27	☐
RF Current Probe	F-65	FCC	292	2024.09.12	☐
PULSE LIMITER	EPL-30	lignex1	-	2024.01.09	☒

6.2.3 Test Result

[100 Mbps]



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Corr. (dB)
1.896	---	41.03	74.00	32.97	9	19.4
1.968	51.02	---	87.00	35.98	9	19.4
3.456	---	45.35	74.00	28.65	9	19.4
3.548	55.96	---	87.00	31.04	9	19.4
3.640	---	47.82	74.00	26.18	9	19.4
3.716	56.47	---	87.00	30.53	9	19.4
6.420	---	48.96	74.00	25.04	9	19.4
9.896	54.84	---	87.00	32.16	9	19.4
16.228	57.31	---	87.00	29.69	9	19.6
16.228	---	46.22	74.00	27.78	9	19.6
18.244	---	47.16	74.00	26.84	9	19.6
18.244	58.26	---	87.00	28.74	9	19.6

6.3 Radiated emission

Environmental Conditions

Temperature	(22.2 ℃) - Semi anechoic chamber (10m) (22.4 ℃) - Fully anechoic chamber(3m)
Humidity	(48 % R.H.) - Semi anechoic chamber (10m) (48 % R.H.) - Fully anechoic chamber(3m)
Test Area	Semi anechoic chamber (10m) – Below 1GHz Fully anechoic chamber(3m) – Above 1GHz
Test date	2023.09.12 - Semi anechoic chamber (10m) 2023.09.13 - Fully anechoic chamber(3m)

6.3.1 Limits of radiated emission measurement

*Limits below 1GHz

* Class A equipment

Frequency range (㎒)	Measurement		Class A limits (dB(㎶/m))
	Distance (m)	Detector type/ bandwidth	OATS/SAC
30 to 230	10	Quasi Peak / 120 kHz	40
230 to 1 000			47
30 to 230	3		50
230 to 1 000			57

* Class B equipment

Frequency range (㎒)	Measurement		Class B limits (dB(㎶/m))
	Distance (m)	Detector type/ bandwidth	OATS/SAC
30 to 230	10	Quasi Peak / 120 kHz	30
230 to 1 000			37
30 to 230	3		40
230 to 1 000			47

*Limits above 1GHz

* Class A equipment

Frequency range (㎒)	Measurement		Class A limits (dB(μV/m))
	Distance (m)	Detector type/ bandwidth	FSOATS
1 to 3	3	Average / 1 MHz	56
3 to 6			60
1 to 3		Peak / 1 MHz	76
3 to 6			80

* Class B equipment

Frequency range (㎒)	Measurement		Class B limits (dB(μV/m))
	Distance (m)	Detector type/ bandwidth	FSOATS
1 to 3	3	Average / 1 MHz	50
3 to 6			54
1 to 3		Peak / 1 MHz	70
3 to 6			74

6.3.2 Measurement procedure

Mains

A test was performed at 3m & 10m distance in a semi-anechoic chamber for searching correct frequency.
The final test was done at a 10m/3m semi-anechoic chamber with a quasi-peak detector peak detector & average detector.
EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.
Cables were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.
Cables connected to EUT were fixed to cause maximum emission.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.
The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.3.3 Used equipments

* Below 1GHz

Equipment	Model no	Manufacturer	Serial no.	Next cal. date	Used
MEASUREMENT SOFTWARE	EMC32 VER 10.60.15	Rohde&Schwarz	-	-	☐
Spectrum Analyzer	E4401B	HP.Agilent	US39440387	2024.06.27	☒
EMI TEST RECEIVER	ESVS10	ROHDE&SCHWARZ	846285/004	2024.06.27	☒
Controllers	CO3000-4port	Innco Systems GmbHRE	CO3000/ 1060/ 42111117/P	-	☒
Antenna Masts	MA4640/800-XP-ET	Innco Systems GmbHRE	-	-	☒
Turn tables	DS3000-S-1t	Innco Systems GmbHRE	-	-	☒
AMPLIFIER	PO-LS960	PANOPTICS	PL181004	2024.06.27	☒
Bi-Log Ant	VULB9168	Schwarzbeck	902	2023.11.30	☒

* Above 1GHz

Equipment	Model no	Manufacturer	Serial no.	Next cal. date	Used
MEASUREMENT SOFTWARE	EMC32 VER 10.60.15	Rohde&Schwarz	-	-	☒
EMI TEST RECEIVER	ESW44	Rohde&Schwarz	101952	2024.03.14	☒
Controllers	CO3000-4port	Innco Systems GmbHRE	CO3000/ 1061/ 42111117/P	-	☒
Antenna Masts	MA4640/800-XP-ET	Innco Systems GmbHRE	-	-	☒
Turn tables	DS2000-S-1t	Innco Systems GmbHRE	-	-	☒
Horn ANT	BBHA9120D	Schwarzbeck	974	2023.11.29	☒
AMPLIFIER	TK-PA18H	TESTEK	220104-L	2024.03.14	☒

6.3.4 Test data

* Receiving Antenna Mode : Horizontal, Vertical
* Note : Total Reading = Test Receiver meter,
Reading = Correction(Antenna factor + Cable factor - Amp Gain)
Pol.= Polarization → H = Horizontal, V = Vertical

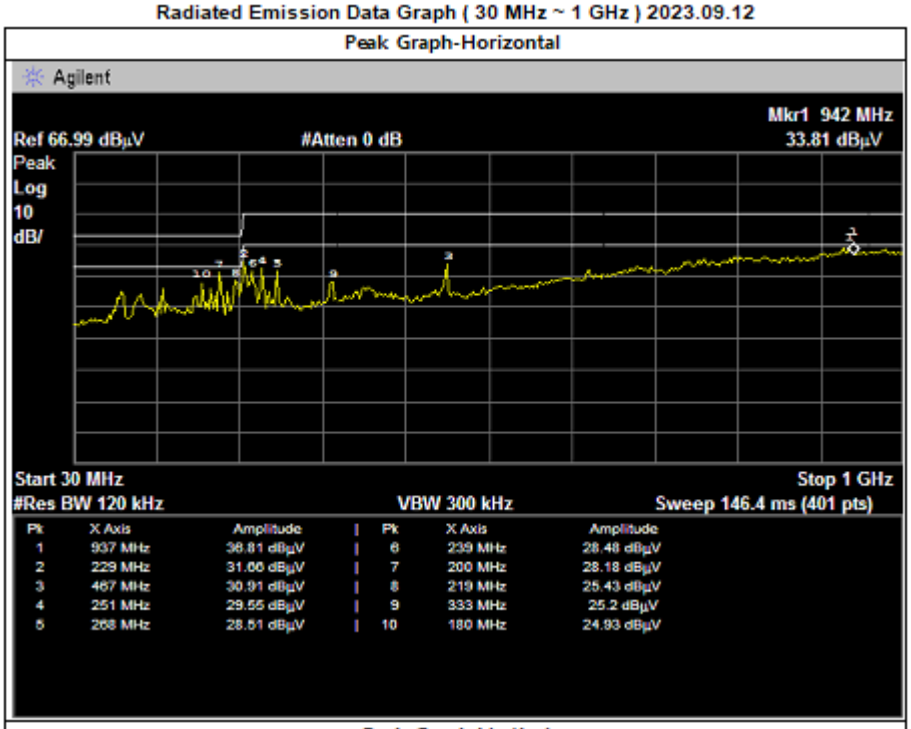
Result [dB(㎶/m)] = Total reading [dB(㎶)] + AF [dB/m] + CL [dB] - AG [dB]

6.3.5 Test Result

[Below 1GHz]

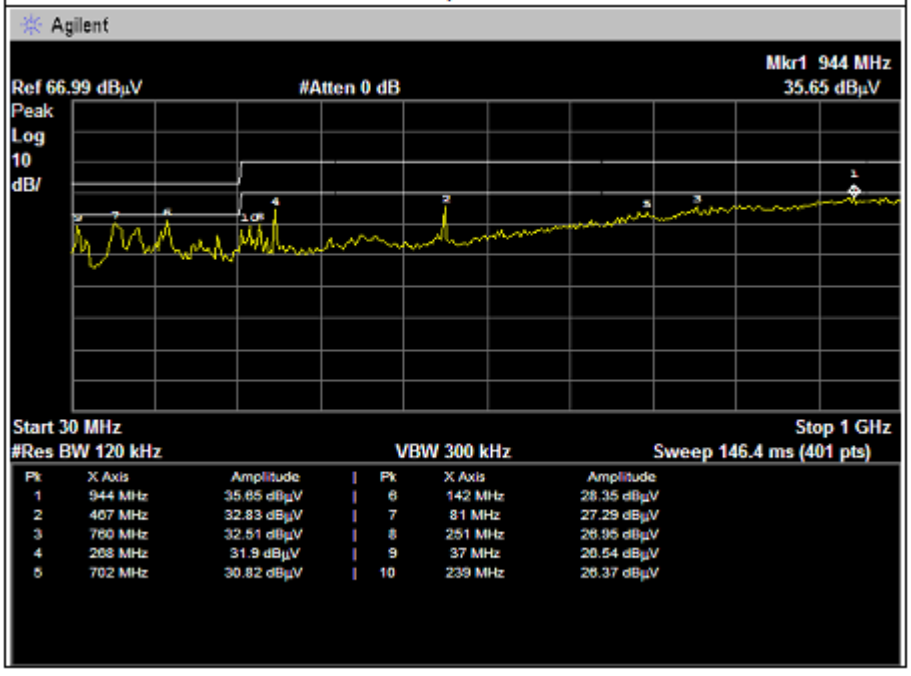
Radiated Emission Data Graph (30 MHz ~ 1 GHz) 2023.09.12

Peak Graph-Horizontal



Pk	X Axis	Amplitude	Pk	X Axis	Amplitude
1	937 MHz	38.81 dBµV	6	239 MHz	28.48 dBµV
2	229 MHz	31.66 dBµV	7	200 MHz	28.18 dBµV
3	467 MHz	30.91 dBµV	8	219 MHz	25.43 dBµV
4	251 MHz	29.55 dBµV	9	333 MHz	25.2 dBµV
5	268 MHz	28.51 dBµV	10	180 MHz	24.93 dBµV

Peak Graph-Vertical



Pk	X Axis	Amplitude	Pk	X Axis	Amplitude
1	944 MHz	35.65 dBµV	6	142 MHz	28.35 dBµV
2	467 MHz	32.83 dBµV	7	81 MHz	27.29 dBµV
3	760 MHz	32.51 dBµV	8	251 MHz	26.95 dBµV
4	268 MHz	31.9 dBµV	9	37 MHz	26.54 dBµV
5	702 MHz	30.82 dBµV	10	239 MHz	26.37 dBµV

*10m Chamber Scan Data

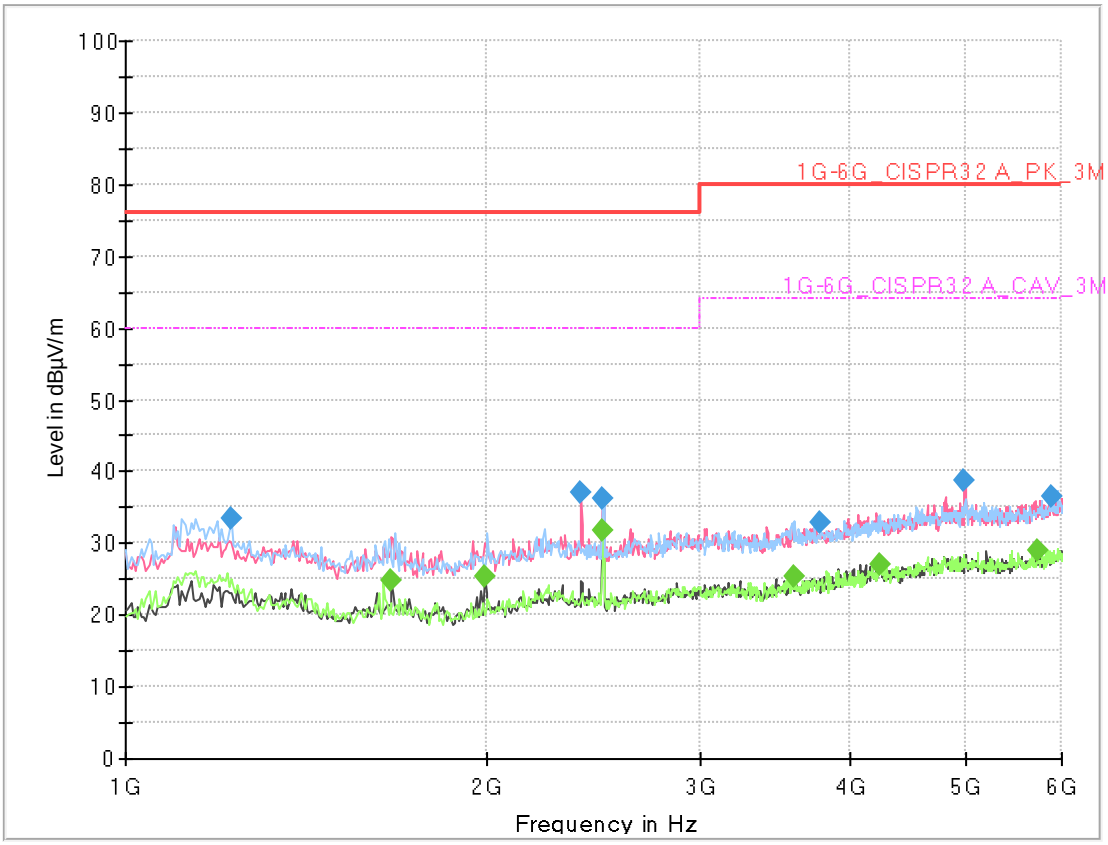
제품명 : iEthernet Module
모델명 : W5500-EVB-Pico
제조사 : WIZNET Co., Ltd

측정일 : 2023.09.12
모 드 : Operation

A

Frequency [MHz]	Total Reading [dBμV/m]	Pol.	Height [m]	angle [°]	Quasi-Peak [dBμV/m]	Correction			Limits [dBμV/m]	Result [dBμV/m]	Margin [dB]
						Antenna [dB/m]	Cable [dB]	Amp Gain [dB]			
141.66	49.80	V	1.1	160	(21.68)	13.00	5.82	40.50	40	28.12	11.88
200.95	51.90	H	3.9	30	(23.82)	10.10	6.90	40.82	40	28.08	11.92
229.05	54.80	H	4.0	200	(23.21)	10.36	7.31	40.88	40	31.59	8.41
467.13	46.90	V	1.0	90	(14.18)	17.16	11.04	42.37	47	32.72	14.28
760.37	37.60	V	1.1	270	(5.07)	22.20	14.56	41.83	47	32.53	14.47
937.48	39.20	H	4.0	0	(2.39)	23.80	16.34	42.54	47	36.81	10.19

[Above 1GHz]



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1225.00	33.55	---	76	42.45	1000	100	H	168	-16.0
1665.00	---	24.92	60	35.08	1000	100	V	101	-15.7
1990.00	---	25.29	60	34.71	1000	100	V	96	-14.3
2390.00	37.08	---	76	38.92	1000	100	V	308	-12.2
2495.00	36.22	---	76	39.78	1000	100	V	0	-12.0
2495.00	---	31.83	60	28.17	1000	100	H	124	-12.0
3590.00	---	25.45	64	38.55	1000	100	V	265	-8.2
3780.00	32.79	---	80	47.21	1000	100	V	272	-7.5
4235.00	---	27.09	64	36.91	1000	100	V	359	-5.5
4985.00	38.77	---	80	41.23	1000	100	V	191	-1.4
5740.00	---	28.89	64	35.11	1000	100	V	286	1.1
5880.00	36.49	---	80	43.51	1000	100	V	21	1.6

6.4 Electrostatic Discharge

Environmental Conditions

Temperature	(22.3 ℃)
Humidity	(47 % R.H.)
Atmosphere pressure	(100.2 ㎪)
Test Area	EMC Test Room
Test date	2023.09.16

6.4.1 Measurement procedure

A ground reference plane was located on the floor, and connected to earth via a low impedance connection.
The return cable of the ESD generator was connected to the reference plane. In case of floor standing equipment, EUT was placed on the reference plane on 0.1 m of insulating Support.
In case of table top equipment, EUT was placed on a wooden table 0.8m above the reference grounded floor.
A horizontal coupling plane(HCP) was placed on the table, and Connected to the reference plane via a 470 resistor located in each end (0.5mm insulating support between EUT and HCP).

In both cases a vertical coupling plane(VCP) OF 0.5 X 0.5m was located 10cm from the EUT′s sides.

The VCP was connected to the reference plane in the same matter as the HCP.

6.4.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. Date	Used
ESD SIMULATOR	PESD1610	HAEFELY	H810682	2024.07.11	☐
ESD SIMULATOR	ESS-B3011	NOISEKEN	ESS1796831	2024.07.18	☒

6.4.3 Test Data

Test Specification : EN 61000-4-2:2009

Kind of Discharges
☒ Contact Discharge
☒ Air Discharge
☒ HCP / VCP (Indirect Discharge)

Discharge Voltages
☒ Contact Discharge : ± 4 kV
☒ Air Discharge : ± 2 / 4 / 8 kV
☒ HCP / VCP : ± 4 kV

Discharge Impedance
☒ 330 Ω/150pF ☐ 2KΩ/330pF

Number Of Discharge

☒ Number of discharges per point, for each voltage and polarity
: 20 (Interval between discharges : ≥ 1s)

Test point (Please refer to attached photograph.)

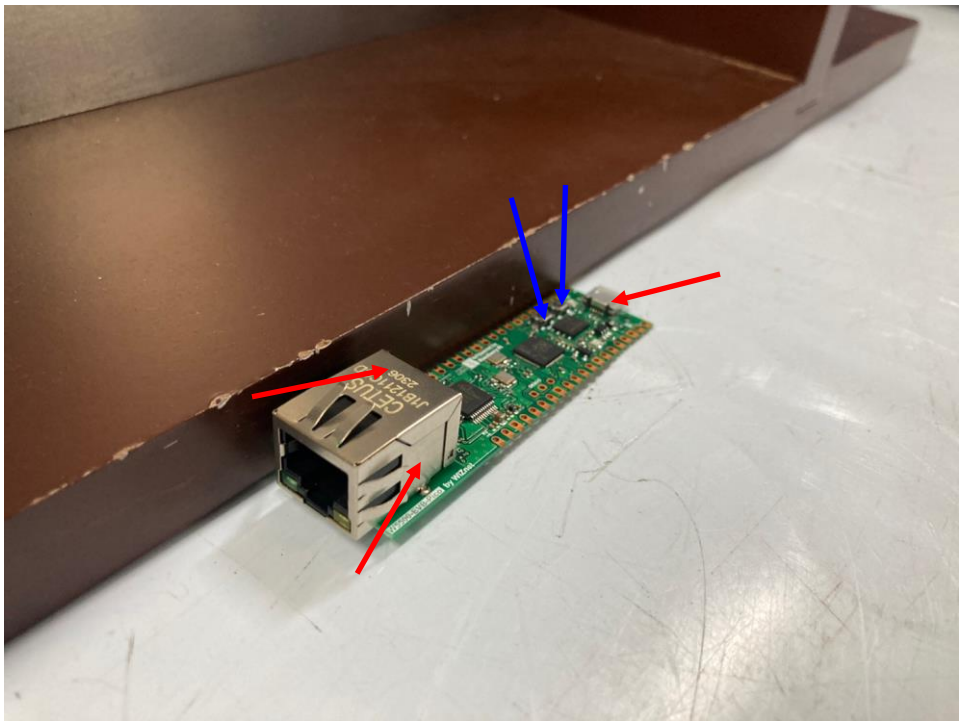
Test Results
☒ Complied ☐ Not complied

Comment :

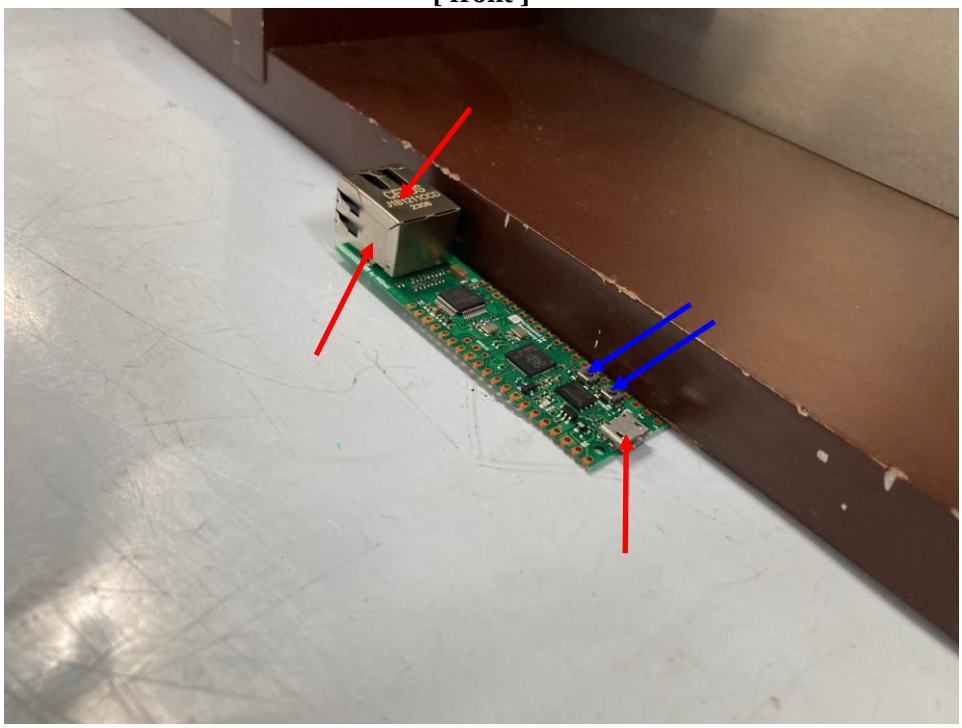
- There was no change of operation status during above testing.

Electrostatic Discharge (Test Point)

Air discharge →
Contact discharge →



[front]



[rear]

Indirect Discharge

	Test Point	Kind of Discharge	Performance Criteria	Result	Remark
Indirect	HCP	Contact	B	A	
	VCP			A	

Direct Discharge

Direct	Lan, Dc In Port	Contact	B	A	
	-	Air		-	
	Button	Air (non discharge)		A	

6.5 Radio Frequency Electromagnetic Fields

Environmental Conditions

Temperature	(22.4 ℃)
Humidity	(48 % R.H.)
Test Area	RS Chamber
Test date	2023.09.15

6.5.1 Measurement procedure

The test was performed at 3m full anechoic chamber.
For floor standing equipment, the EUT was standing on the floor.
For tabletop equipment, the EUT was located on a wooden table 0.8m above the floor.
The EUT was tested all sides, horizontal and vertical polarization.
The field uniformity was calibrated for 3V/m.

6.5.2 Used equipments

Equipment	Model no.	Manufacturer	Serial no.	Next Cal. date	Used
RADIATED SUSCEPTIBILITY SOFTWARE	I2 20180112 (v5)	Audix	-	-	☒
Signal Generator	8665B	HP	3315A00341	2023.12.14	☒
Amplifier	150W1000M2	AR	0331745	-	☒
Amplifier	ITRS-1030A50	Infinitech	20121000001	-	☒
Amplifier	ES3060BP60	SUNGSAN	SA1031-OPT1-0002	-	☒
Power Meter	E4419B	AGILENT	MY41291980	2024.05.10	☒
Power Head Sensor	E9301A	AGILENT	US39212396	2024.05.10	☒
Power Head Sensor	E9301A	AGILENT	US39210340	2024.05.10	☒
Directional Coupler	DC6180A	AR	0331175	2024.05.10	☒
Coaxial Directional Coupler	M2001-2801	-	M2001-0001	2024.09.12	☒
Antenna	3142D	ETS LINDGREN	00102179	-	☒
RADIATED SUSCEPTIBILITY SOFTWARE	I2 190813a (v5)	Audix	-	-	☐
Amplifier	ESU210BP300	Sungsan	SA8015-0001	-	☐
Amplifier	ES1060BP100	Sungsan	SA8016-0001	-	☐
Directional Coupler	DCU210P300-40	Sungsan	DC1001-0003	2024.09.12	☐
Directional Coupler	DCU1060P100-40	Sungsan	DC0034-0002	2024.09.12	☐
Rack & Switch Control Box	-	Sungsan	-	-	☐
Log Periodic Antenna	VULP9118E	Schwarzbeck	1015	-	☐
Log Periodic Antenna	STLP9149	Schwarzbeck	677	-	☐
Power meter	E4419B	Agilent	GB43312904	2024.05.10	☐
Power sensor	8481A	Agilent	2702A58374	2024.09.12	☐
Power sensor	8481A	Agilent	1926A28196	2024.09.12	☐
Signal Generator	APSIN6010HC	Anapico	111-433600410-1298	2024.09.12	☐
Audio Acoustic Tester	TST-1000	TESTEK	230104-A	2024.02.16	☐
Impedance Box	TIB-R1	TESTEK	230106-R	-	☐
Field Probe	FL7006	AR	0344233	2024.01.16	☐
Field Monitor	FM7004	AR	0330923	-	☐
Laser Probe Interface	FI7000	AR	0344349	-	☐

6.5.3 Test Data

Test Specification : EN 61000-4-3:2006/A2:2010

Frequency Range

☒ 80MHz – 1000MHz ☐ 1400 MHz – 2000MHz ☐ 2000 MHz – 2700 MHz ☐ 80MHz – 2500MHz

☒ 1.8 GHz, 2.6GHz, 3.5GHz, 5GHz (Spot Frequency)

Test level

☐ 1V/m ☒ 3V/m ☐ 10V/m

Modulation

☒ AM : 1kHz, 80%
☐ PM :

Frequency step

☒ log 1% step ☐ log 3% step ☐ log 5% step

Dwell Time

☐ 3 s ☐ 2 s ☒ 1 s

Test point

☒ Front (Horizontal / Vertical)
☒ Rear (Horizontal / Vertical)
☒ Left (Horizontal / Vertical)
☒ Right (Horizontal / Vertical)

Audio output function

☐ Possible ☐ Impossible

Test Results

☒ Complied ☐ Not complied

Comment :

- There was no change of operation status during above testing. .

6.6 Electric Fast Transient/BURST

Environmental Conditions

Temperature	(22.4 ℃)
Humidity	(48 % R.H.)
Test Area	EMC Test Room
Test date	2023.09.15

6.6.1 Measurement procedure

A ground reference plane was located on the floor.
EFT generator was connected to reference ground plane via low impedance connection.
For floor standing equipment, EUT was placed on a 0.1 m wooden table.
For tabletop equipment, EUT was placed on a wooden table(0.1m) above the reference plane.
Test generator and coupling/decoupling network was placed on, and bounded to, the ground reference plane.
When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces, except the ground reference plane beneath the coupling clamp, Shall be 0.5 m.

6.6.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. date	Used
IMMUNITY TEST SOFTWARE	IEC.CONTROL VER 9.2.2	AMETEK CTS GmbH	-	-	☒
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2024.05.10	☒
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	☒
CAPACITIVE COUPLING CLAMP	CCL	EM Test	P1745207364	2024.05.10	☒

6.6.3 Used equipments

Test Specification : EN 61000-4-4:2012

Location of Coupling (AC cable Length : 0.5m)
☒ Power ☒ Signal Lines ☐ Telecommunication line

Test level
☒ Power : 1 kV
☒ Signal Line : 0.5 kV
☐ Tel. line :

Burst frequency : 5 kHz, 5/50 ns

Coupling Time : > 60 s

Test Results
☒ Complied ☐ Not complied

Coupling Point (AC main)	Polarity	Levels (kV)	Results (criterion)
L-N	±	1 (kV)	A

Coupling Point (Clamp)	Polarity	Levels (kV)	Results (criterion)
LAN Cable	±	0.5 (kV)	A

Comment :

- There was no change of operation status during above testing.

6.7 Surge

Environmental Conditions

Temperature	(22.3 ℃)
Humidity	(47 % R.H.)
Test Area	EMC Test Room
Test date	2023.09.15

6.7.1 Measurement procedure

A ground reference plane was located on the floor.
SURGE generator was connected to reference ground plane via low impedance connection.
For floor standing equipment, EUT was placed on a 0.8 m wooden table.
For tabletop equipment, EUT was placed on a wooden table(0.8m) above the reference plane.
The following additional pulses are required only if the EUT has an earth connection or if the EUT is earthed via any AE.

6.7.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. date	Used
IMMUNITY TEST SOFTWARE	IEC.CONTROL VER 9.2.2	AMETEK CTS GmbH	-	-	☒
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2024.05.10	☒
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	☒
CDN	CNV 508N1	EM Test	P1742204935	2024.06.27	☐
CDN	CNV 508T5	EM Test	P1742204981	2024.06.27	☐

6.7.3 Test data

Test Specification : EN 61000-4-5:2006

Location of Coupling (AC cable Length : 1.2 m)
☒ AC Power ☐ Signal Lines ☐ Telecommunication line

Test level
☒ Power ☒ Line to Line : ±0.5/1 kV ☒ Line to Ground : ±0.5/1/2 kV
☐ Signal Line :
☐ Tel. line :

Surge Pulse Shape : Tr / Th = 1.2 / 50

Test mode
- AC Power : L-N-PE
-Signal Line :

Coupling Impedance
☒ 18uF : Line to Line ☒ 10 Ω+9uF : Line to Ground ☐ 40Ω+0.1uF ☐ 18uF : Tel line
☐ 40Ω+0.5uF

Coupling Time : > 1 min

Number of Surge : 5

Angle : ☐0 ☒90 ☐180 ☒270

Test Results

☒ Complied ☐ Not complied

Coupling Point (AC)	Polarity	Levels (kV)	Results (criterion)
L-N	±	0.5/1 (kV)	A

Comment :

- There was no change of operation status during above testing.

6.8 Conducted Immunity

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Environmental Conditions

Temperature	(22.3 ℃)
Humidity	(47 % R.H.)
Test Area	EMC Test Room
Test date	2023.09.17

6.8.1 Measurement procedure

A ground reference plane was located on the floor.
The EUT was isolated 0.1 m isolating support.
The ground plane was connected to floor reference ground plane via low impedance connection.
This test were Performed using CDN for mains, clamp for signal and injection probe.

6.8.2 Used equipments

Equipment	Model no.	Manufacturer	Serial no.	Next Cal. date	Used
Conducted Susceptibility software	ICD.CONTROL VER 6.1.3	AMETEK CTS GmbH	-	-	☒
CS GENERATOR	NSG 4070	TESEQ	48185	2024.01.09	☒
Attenuator (6dB)	ATN 6150	TESEQ	17091901	2024.06.27	☒
CDN	M016	TESEQ	49312	2024.06.27	☒
EM Injection Clamp	F-2031-23MM	FCC	091219	2024.05.10	☒
CDN	F-801-M3-16A	FCC	091282	2024.05.10	☒
CDN	ISN ST08	TESEQ	41234	2024.06.27	☐
CDN	CDN S1-75 BNC	TESEQ	P1408132027	2024.06.27	☐
Decoupling Network	F-2031-DCN-23MM	FCC	091221	-	☐
Audio Acoustic Tester	TST-1000	TESTEK	150068-A	2023.11.07	☐
Impedance Box	TIB-R1	TESTEK	150059-R	-	☐

6.8.3 Test Data

Test Specification : EN 61000-4-6:2009

Frequency Range

Frequency (MHz)	Voltage Level (r.m.s.) (V)
0.15 to 10	3
10 to 30	3 to 1
30 to 80	1

Location of Coupling (AC cable Length : 0.3 m)
☒ Power ☒ Signal Lines ☐Telecommunication line

Modulation
☒ AM : 1kHz, 80%
☐ PM : 1Hz (0.5 s ON : 0.5 s OFF)

Frequency step
☒ log 1% step ☐ log 3% step ☐ log 5% step

Dwell Time
☐ 3 s ☐ 2 s ☒ 1 s

Audio output function
☐ Possible ☐ Impossible

Test Results
☒ Complied ☐ Not complied

Coupling Point (AC)	Coupling Method	Results (criterion)
POWER	CDN (M2)	A

Coupling Point (Signal)	Coupling Method	Results (criterion)
LAN Cable #1~#6	EM Injection Clamp	A

Comment :

- There was no change of operation status during above testing.

6.9 Magnetic field Immunity

Environmental Conditions

Temperature	(℃)
Humidity	(% R.H.)
Test Area	EMC Test Room
Test date	

6.9.1 Measurement procedure

The test was performed on a ground reference plane (GRP) on a 0.1m wooden table.
The EUT was isolated 10 cm isolating support.
The ground plane was connected to floor reference ground plane via low impedance connection.
The test generator was placed 3m distance from the induction coil. The generator was connected reference ground plane.
Preliminary verification of equipment performances was carried out prior to applying the test magnetic field. The field was applied to the EUT horizontal, vertical polarization.

6.9.2 Used equipments

Equipment	Model No.	Manufacturer	Serial No.	Next Cal. date	Used
IMMUNITY TEST SOFTWARE	IEC.CONTROL VER 9.2.2	AMETEK CTS GmbH	-	-	☐
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2024.05.10	☐
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	☐
Current transformer	MC 2630	EM Test	P1730202035	2024.06.27	☐
Magnetic field coil	MS 100N	EM Test	P1738203462	2024.06.27	☐

6.9.3 Test data

Test specification : EN 61000-4-8:2010

Magnetic field strength : ☐ 1A/m ☐ 3A/m ☐ 30A/m

Frequency : ☐ 50Hz ☐ 60Hz

Polarization : ☐ Horizontal ☐ Vertical

Coupling time : 60s≥

Positions	Test level	Results (criterion)
X	A/m	-
Y	A/m	-
Z	A/m	-

Comment :

- Not Applicable.

6.10 Dips and Interruptions

Environmental Conditions

Temperature	(22.4 ℃)
Humidity	(48 % R.H.)
Test Area	EMC Test Room
Test date	2023.09.15

6.10.1 Measurement procedure

The dips/interruption test is only applicable to AC mains.
The dips/interruptions were applied at zero crossing.

6.10.2 Used equipments

Equipment	Model no.	Manufacturer	Serial no.	Next Cal. date	Used
IMMUNITY TEST SOFTWARE	IEC.CONTROL VER 9.2.2	AMETEK CTS GmbH	-	-	☒
MULTIFUNCTIONAL TEST GENERATOR	compact NX5	EM Test	P1725200197	2024.05.10	☒
Motorized Variac	variac NX1-260-16	EM Test	P1745207277	-	☒

6.10.3 Test data

Test specification : EN 61000-4-11:2004

Normal Voltage / Frequency :

- ☐ 115Vac / 50Hz
- ☐ 100Vac / 50Hz
- ☐ 100Vac / 60Hz
- ☐ Dips (40%)
- ☒ Dips (70%)
- ☒ Dips (> 95%)
- ☒ Interruption (> 95%)
- ☒ 230Vac / 50Hz
- ☐ 240Vac / 60Hz
- ☐ 240Vac / 50Hz

Event time :

- ☒ 25P
- ☒ 0.5P
- ☒ 250P
- ☐ 1P
- ☐ 10P
- ☐ 12P
- ☐ 300P
- ☐ 30P
- ☐ 50P

Phase

- ☒ 0
- ☐ 180

Test results

☒ Complied ☐ Not complied

Test Level (%UT)	Dip / Int. (%UT)	Duration / Period	Results (criterion)
0%	100%	0.5 Period	A
70%	30%	25 Period	A
0%	100%	250 Period	C

Comment :

- A : There was no change of operation status during above testing.(0.5, 25 Period)

- C : The EUT power is turen off whe applied, But it works nomally wwhen the EUT is restarted after application . (250 Period)

6.11 Harmonics

Environmental Conditions

Temperature	(22.1 ℃)
Humidity	(48 % R.H.)
Test Area	EMC Test Room
Test date	2023.09.14

6.11.1 Measurement procedure

The equipment is supplied in series with shunt(s) Rm or current transformer(s) from a source having the same nominal voltage and frequency as the rated supply voltage and frequency of the equipment.
Measurements shall be made under normal load, or conditions for adequate heat discharge, and under normal operating conditions.

User′s operation controls or automatic programmers shall be set to produce the maximum harmonic component, for each successive harmonic component in turn. For the purpose of harmonic current limitation, equipment is classified as follows :

Class A : Equipment not specified in one of the three other Classes shall be considered as Class A equipment.
- Balanced three-phase equipment;
- Household appliances excluding equipment identified as Class D;
- Tools excluding portable tools;
- Dimmers for incandescent lamps;
- Audio equipment.

Class B : Portable tools; Arc welding equipment which is not professional equipment.
Class C : Lighting equipment.
Class D : Equipment having a specified power according to 6.2.2 less than or equal to 600 w, of the following types:
- Personal computers and personal computer monitors;
- Television receivers.
- refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

6.11.2 Used equipments

Equipment	Model no.	Manufacturer.	Serial no.	Next Cal. date	Used
PROGRAMMABLE AC POWER SOURCE	N4A06	Newtons4th Ltd.	91J-13186	2023.12.21	☒
Precision Power Analyzer	PPA5511	Newtons4th Ltd	162-05556	2023.12.14	☒
Impedance Network	IMP161	Newtons4th Ltd	91G-13185	2024.12.21	☒

6.11.3 Test data

- Refer to attached test data

Test results

☒ Complied ☐ Not complied

[HARMONICS]

14th September 2023 - 13:05:38	Ph:1 Page 1/3	IECSoft v2_7
N4L	IEC61000-3-2:2019+AMD1:2021 Fluctuating Harmonics	EMCLabs

Instrument Details	
Instrument Model	PPA5511
Serial Number	162-05556
Firmware Version	2.185
N4L Calibration Date	14th December 2023
Instrument Version	Standard
Source Details	
Source Model	N4A06
Source Serial	91J-13186
Source Frequency	50.000Hz
Source Voltage RMS	230.000V
Source Settling Time	10.0 s
Test Settings	
Class	Class A
Mode	Measured
Equipment Under Test	
Brand	N/A
Model	N/A
Serial	N/A
Impedance Network ID	N/A

Test Conditions		
	User Entered	Measured
Rated Voltage	N/A	227.675V
Rated Current	N/A	7.357mA
Rated Frequency	N/A	50.000Hz
Rated Power	N/A	18.048mW

Additional Test Information	
Measured Power Factor	0.0129
Max Current THD	3.816k%
Average THC	29.556mA
Max Power	135.531mW
Max F.Current	2.339mA
Average F.Current	1.377mA
Minimum Current	100A
Additional Test Details	
Operator	N/A
Lab Name	N/A
Location	N/A
Notes	
Signature	

Results	Test - N/A. Invalid DUT

6.12 Flicker

Environmental Conditions

Temperature	(22.1 ℃)
Humidity	(48 % R.H.)
Test Area	EMC Test Room
Test date	2023.09.14

6.12.1 Measurement procedure

EUT was connected to the power analyzer system.
Measurement was performed to obtain the desired flicker parameters.
The measuring time depends on which parameters are to be measured.
P_{lt} = 2 h
P_{st} = 10 min
Controls and automatic programs shall be set to produce the most unfavorable sequence of voltage changes, using only those combinations of controls and programs are mentioned by the manufacturer in the instruction manual.

6.12.2 Used equipments

Equipment	Model no.	Manufacturer.	Serial no.	Next Cal. date	Used
PROGRAMMABLE AC POWER SOURCE	N4A06	Newtons4th Ltd.	91J-13186	2023.12.21	☒
Precision Power Analyzer	PPA5511	Newtons4th Ltd	162-05556	2023.12.14	☒
Impedance Network	IMP161	Newtons4th Ltd	91G-13185	2024.12.21	☒

6.12.3 Test data

- Refer to attached test data

Test results

☒ Complied ☐ Not complied

[Flicker]

14th September 2023 - 15:12:32	Ph:1 Page 1/3	IECSoft v2_7

IEC61000-3-3:2013+AMD1:2019

Flickermeter

Instrument Details	
Instrument Model	PPA5511
Serial Number	162-05556
Firmware Version	2.185
N4L Calibration Date	14th December 2023
Instrument Version	Standard
Source Details	
Source Model	N4A06
Source Serial	91J-13186
Source Frequency	50.000Hz
Source Voltage RMS	230.000V
Test Settings	
Class	Voltage
Mode	Normal (4.0%)
Minimum Current	10A
PST	10 minutes
PLT	12 PSTs
Equipment Under Test	
Brand	N/A
Model	N/A
Serial	N/A
Impedance Network ID	N/A

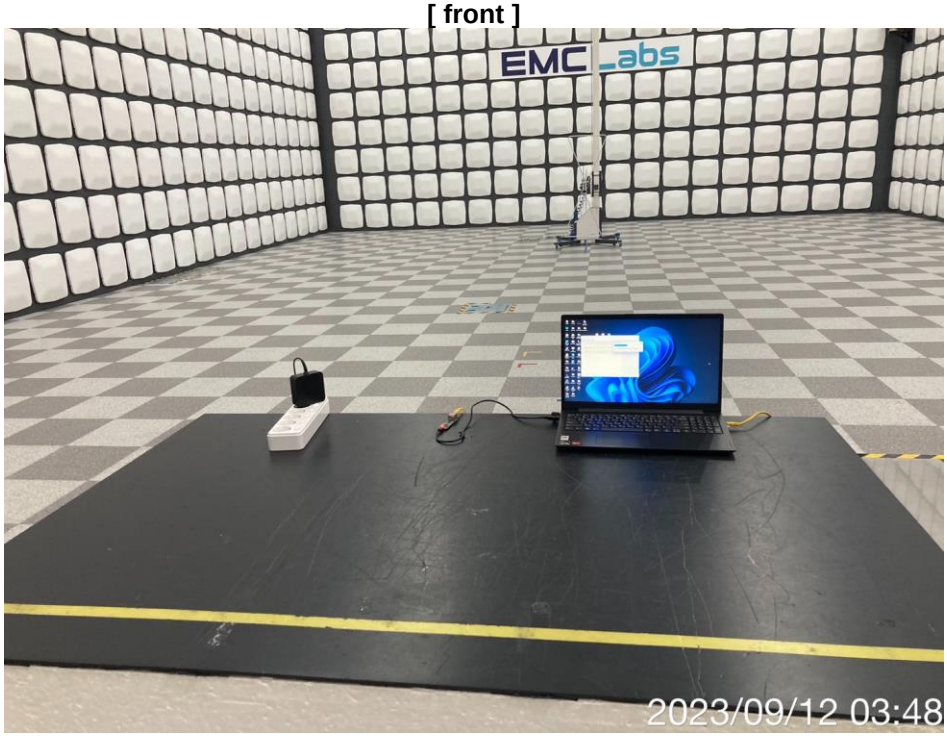
Test Conditions		
	User Entered	Measured
Rated Voltage	N/A	227.634V
Rated Current	N/A	N/A
Rated Frequency	N/A	50.000Hz
Rated Power	N/A	N/A
D max	0.0674% (Limit: 4.0%)	
T max	0.0000 s (Limit: 0.5 s)	
DC max	0.0061% (Limit: 3.3%)	
Additional Test Details		
Operator	N/A	
Lab Name	N/A	
Location	N/A	
Notes		
Signature		

Results	Phase1: INVALID - PASS

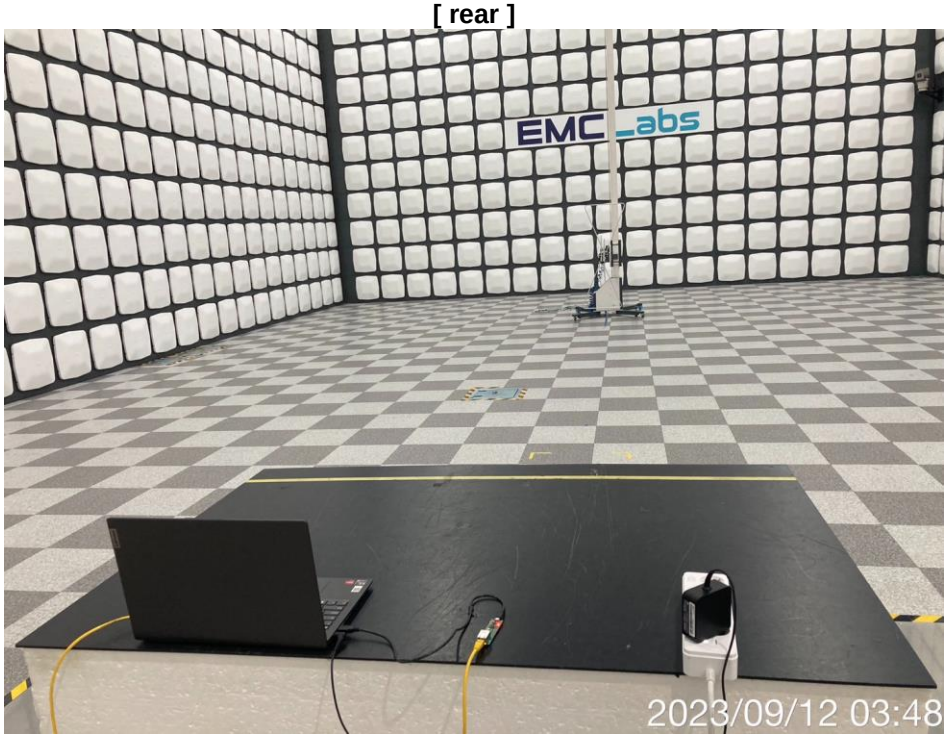
7. Test Photographs

Radiated Emission (Below 1GHz)

[front]

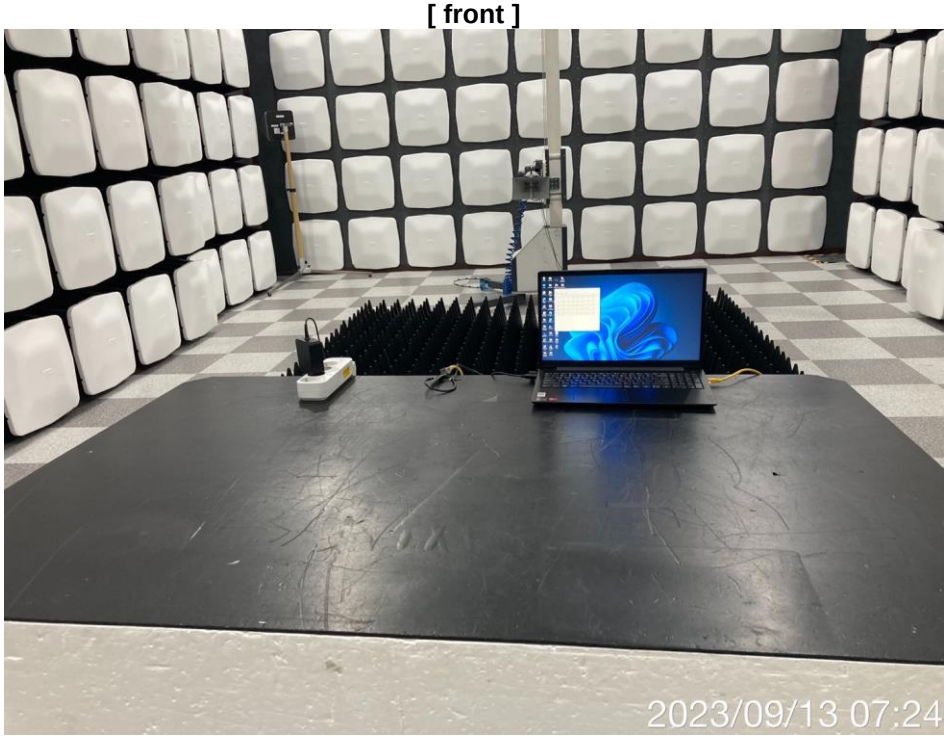


[rear]

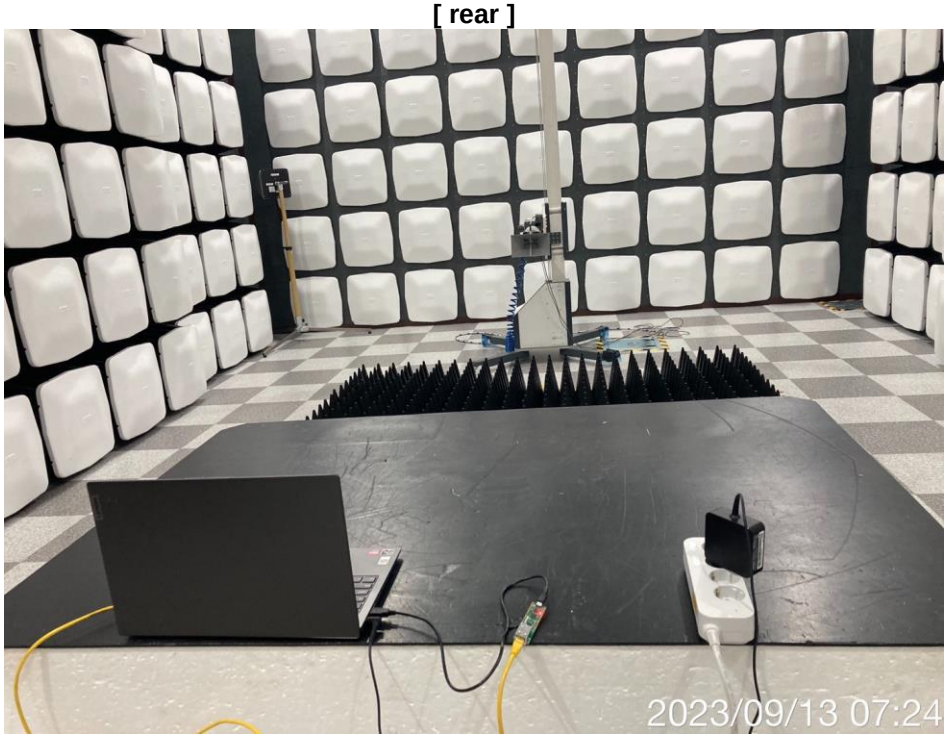


Radiated Emission (Above 1GHz)

[front]



[rear]



Conducted Emission (Main Power)

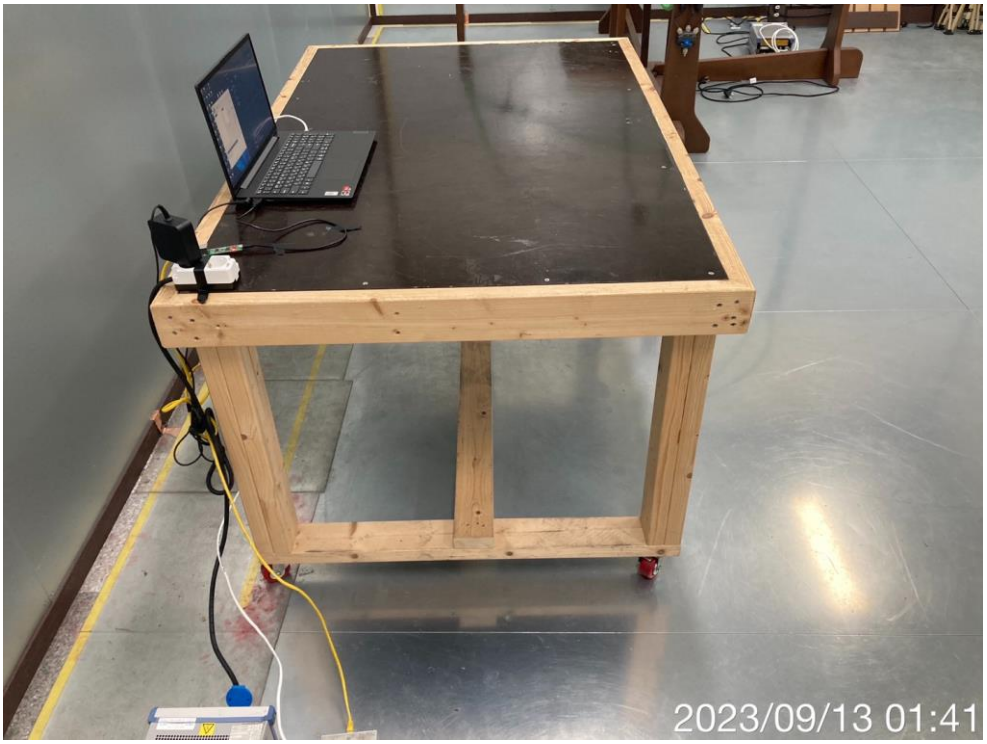
[front]

[rear]

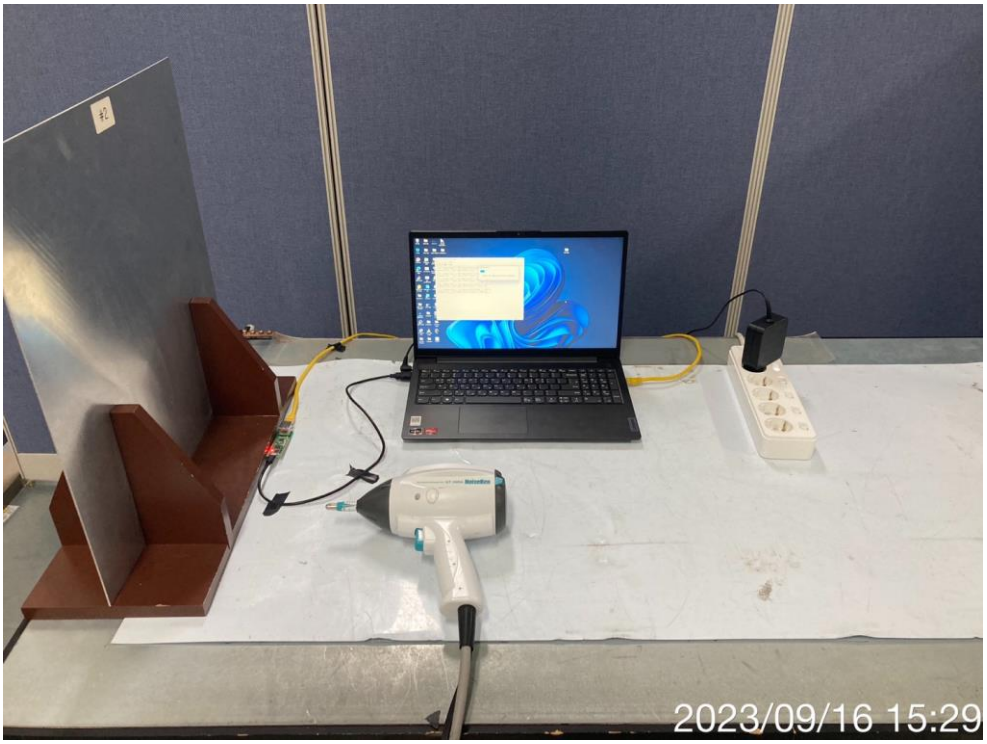
Conducted Emission (Telecommunications Power)

[Front]

[Rear]



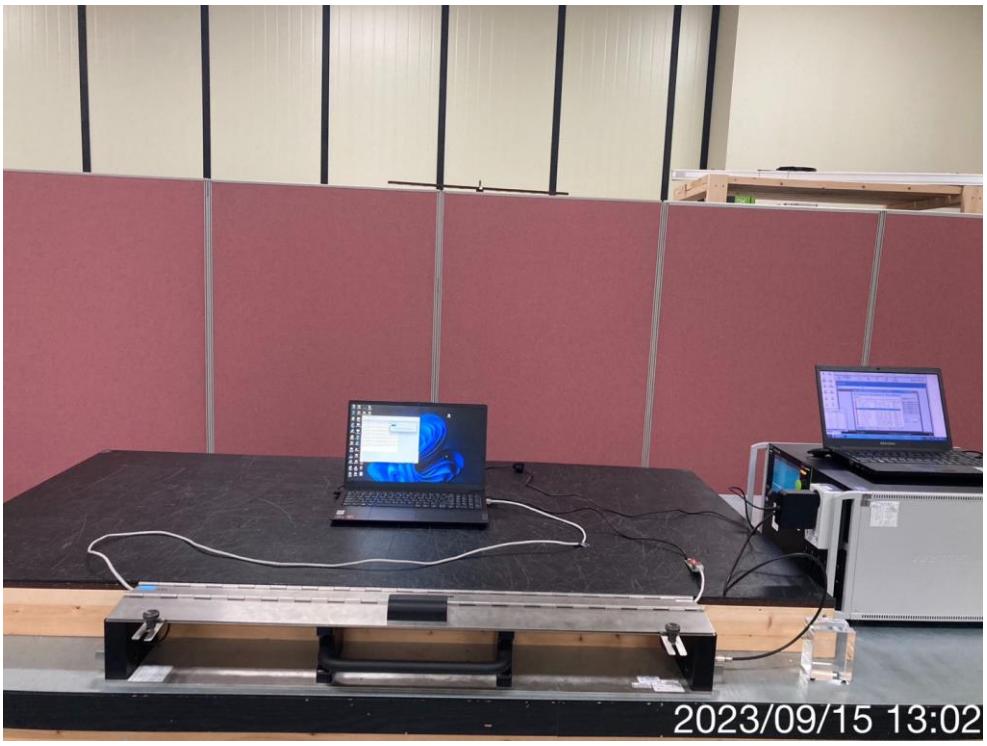
Electrostatic Discharge



Radio frequency electromagnetic field

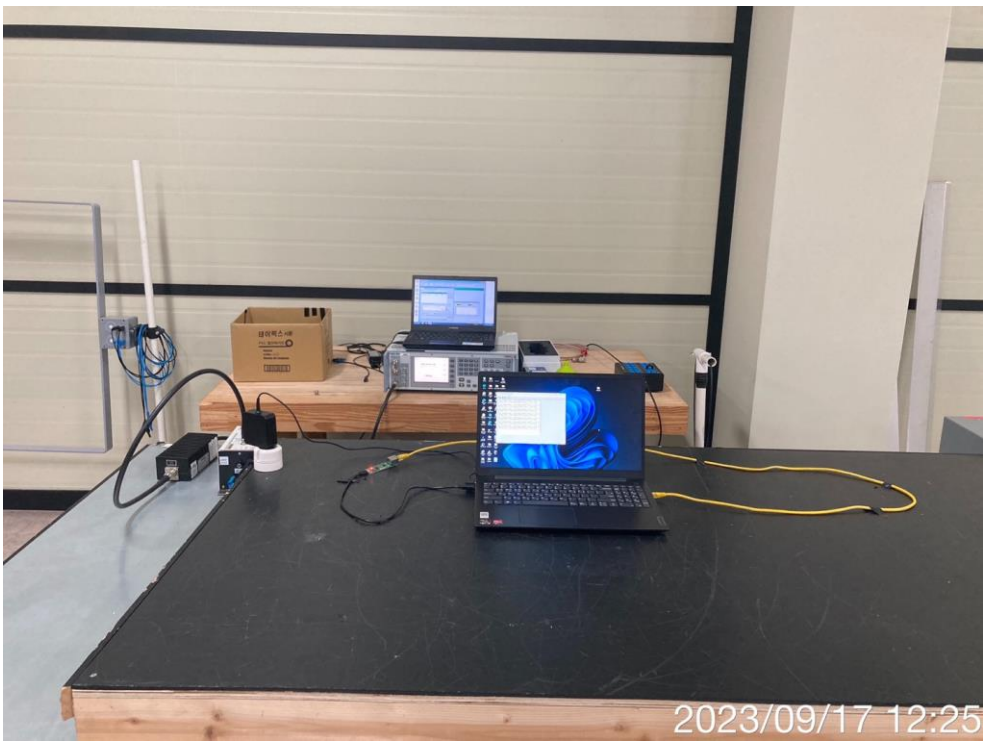
[80 ㎒ to 1 ㎓, Spot Frequency]

Electric Fast Transient, Surge, DIP/INT

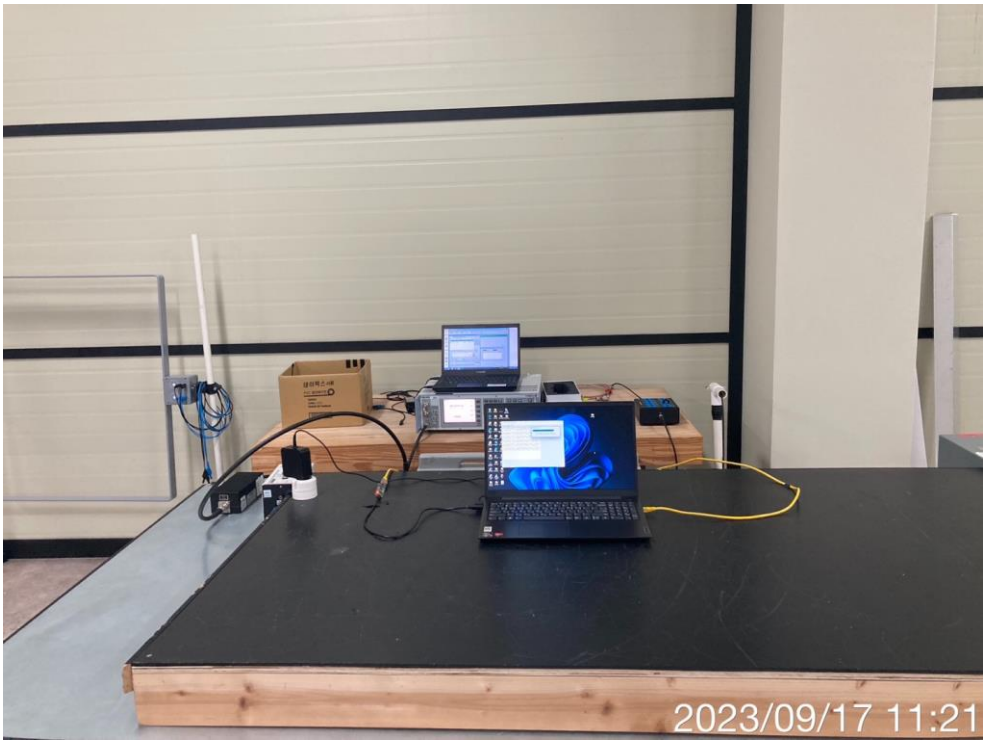


Conducted Immunity

[POWER PORT]



[DATA PORT]



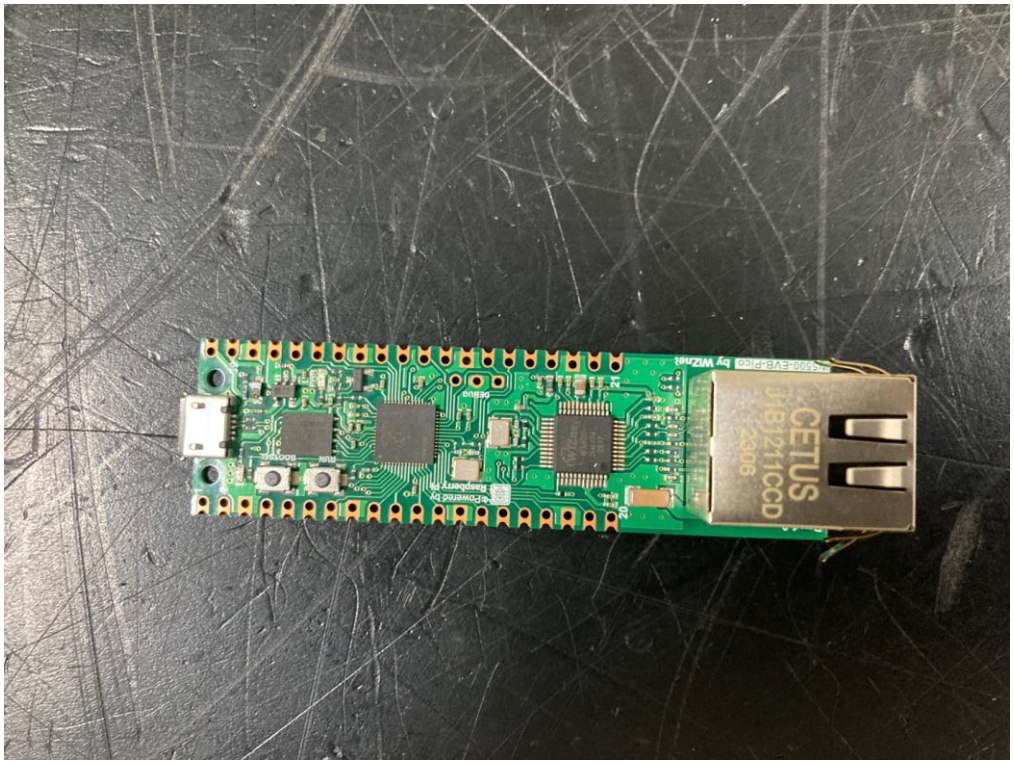
Magnetic field Immunity

N/A

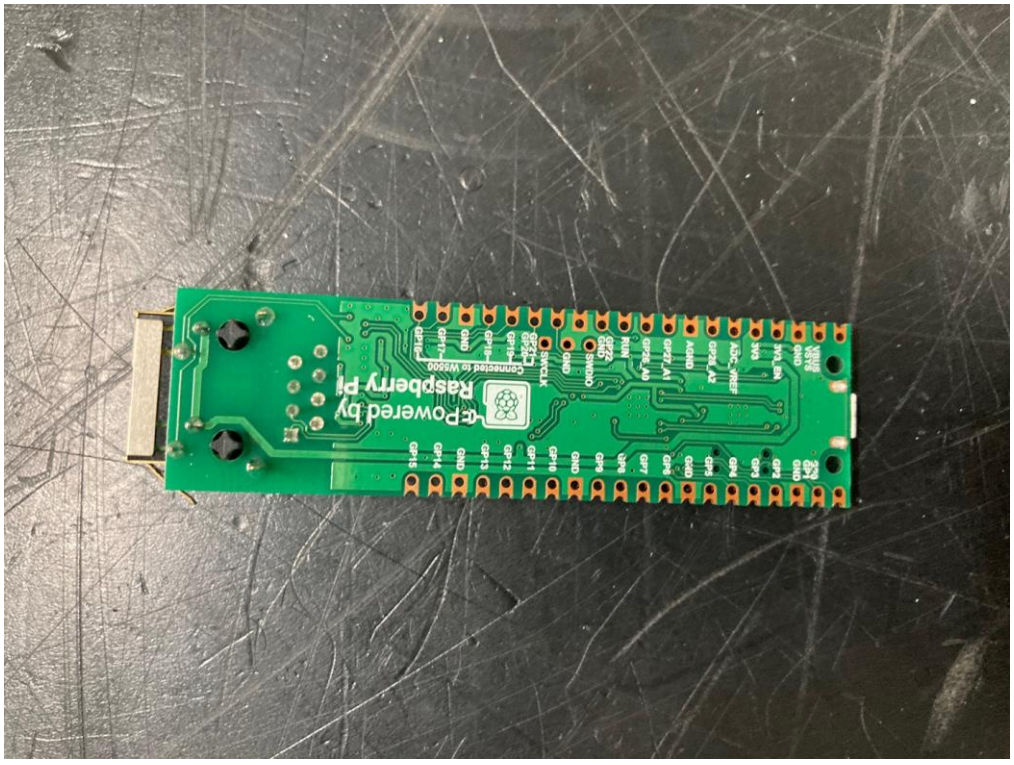
Harmonics & Flicker

8. E.U.T. Photographs

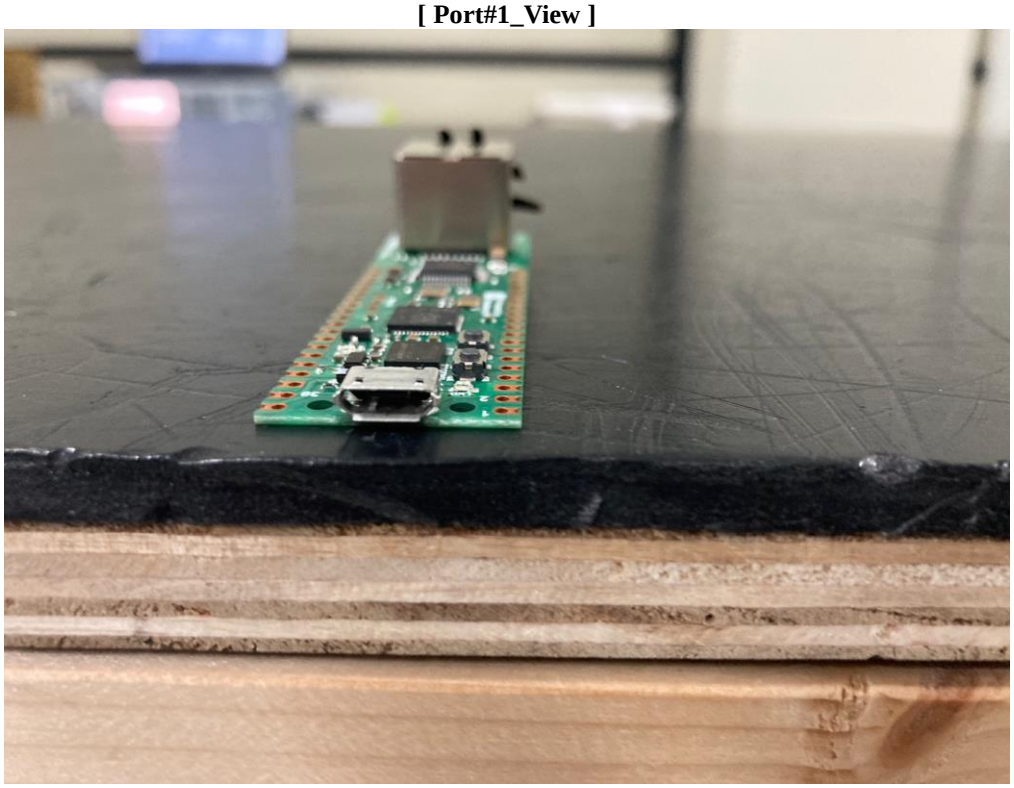
[Front View]



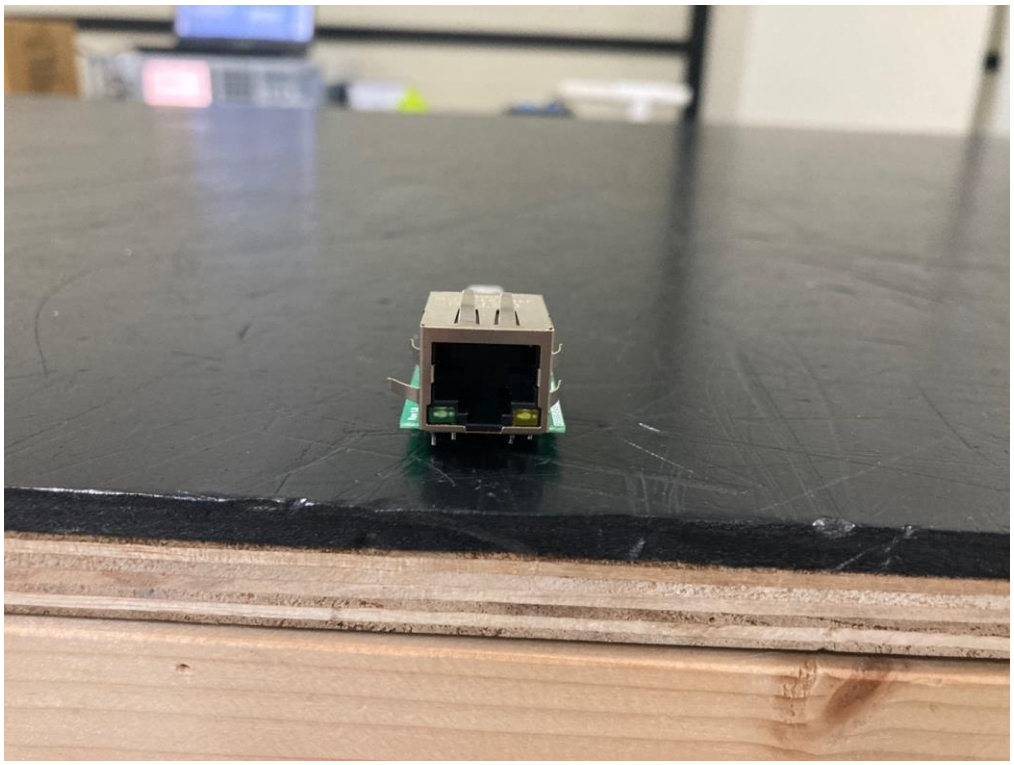
[Rear View]



[Port#1_View]



[Port#2_View]



-THE END-