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EMC Test Report

Report Number	**ESTCCE2306-001**			
Applicant	Company Name	DOF Inc		
	Address	601, 602, 77 Seongsuil-ro, Seongdong-gu, Seoul, South korea		
	Contact Person	Lee Ju young		
	Factory Address	601, 602, 77 Seongsuil-ro, Seongdong-gu, Seoul, South korea		
Product	Product type	3D Scanner		
	Model	FREEDOM X5	Manufacturer	DOF Inc
	Serial No.	NONE	Country of origin	Korea
Other	Receipt Date	28-Apr-23	Receipt Number	ESTC-23-00675
	Issued Date	08-Jun-23	Tested Date	13-May-23 ~ 14-May-23
Test Result	Complied			
EMC Directive	2014/30/EU			

Standard	EMI Standard	EMS Standard
	EN 55032:2015+A11:2020 Class A EN IEC 61000-3-2:2019+A1:2021 EN 61000-3-3:2013+A1:2019+A2:2021	EN 55035:2017+A11:2020 EN 61000-4-2:2009 EN IEC 61000-4-3:2020 EN 61000-4-4:2012 EN 61000-4-5: 2014+A1:2017 EN 61000-4-6:2014+AC:2015 EN IEC 61000-4-11:2020

Tested by	Won Sang Lee / Test Engineer	(Signature)
Approved by	Kyong Kyu Sang / Technical Manager	(Signature)

ESTECH CO., LTD

140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, R. O. Korea
TEL : +82 31 6318037 FAX : +82 31 6318039

* Note
- This product has the same electrical circuit and is a simple derived model name series.(FREEDOM X3 , Marathon MT-5000, FREEDOM X9)
- This is certified that the above mentioned products have been tested for the sample provided by client.
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- This test report is not related to KOLAS accreditation.

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Contents

1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and tested in accordance with the measurement procedures as indicated in this report ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.
ESTECH Lab. assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Suite 1015 World Meridian II, 123 Gasan Digital 2-ro,
Geumcheon-gu, Seoul 153-759, R. O. Korea

EMC Test Lab. : 140-16, Eongmalli-ro, Majang-myeon, Icheon-si, Gyeonggi-do, R. O. Korea

1.3 Registration Information

Our Test lab has worked test lab system by ISO/IEC 17025:2017 and was registered, designated or certified by the followthe bodies

MSIT : Designated in accordance with the provisions of Radio Waves Act and
International Standard ISO/IEC 17025

FCC : Designated with registration number 659627 under APECTEL MRA
between the RRA and the FCC.

VCCI : Registrated in the scope of conducted and radiated measurement,
(R-20023,T-20023,G-20033 and C-20021)

1.4 Measurement Uncertainty Values

Test Items	Uncertainty(k = 2)
Radiated Emission (30 MHz to 1 GHz)	3.30 dB
Radiated Emission (1 GHz to 6 GHz)	4.86 dB
Conducted Emission (AC Mains)	2.80 dB
Discontinous Disturbance (AC Mains)	2.30 dB
Disturbance Power (30 MHz to 300 MHz)	3.75 dB
Conducted Emission (Telecommunication)	3.72 dB
Limits concerning harmonic current test	0.87%
Voltage Fluctuations & Flicker test	5.90%
Electrostatic Discharge test	Uncertainty = 5 % It has been demonstrated that the Electrostatic Discharge test meets the specified requirements in the standard with at least 95 % confidence.
Radiated Electromagnetic Fields test	4.78 dB
Electrical Fast Transients/Burst test	Uncertainty = 10 % It has been demonstrated that the Electrical Fast Transients/Burst test meets the specified requirements in the standard with at least 95 % confidence.
Surge Test	Uncertainty = 10 % It has been demonstrated that the Surge Test meets the specified requirements in the standard with at least 95 % confidence.
Conducted Immunity	1.86 dB
Voltage dips, short interruptions and voltage variations	Uncertainty = 5 % It has been demonstrated that the Voltage dip generator meets the specified requirements in the standard with at least 95 % confidence.

Decision rule:

The following rules were applied for the statements of conformity regarding whether or not to include the measurement uncertainty of the measuring equipment used in the decision-making according to the instruction of
“Reporting method for conformity of test results (EST-QP17-Q-I02)”.

■ Simple acceptance (Complied/Non-complied or Pass/Fail decision rules that do not taken measurement uncertainty into account) (w = 0)

☐ Complied/Non-complied or Pass/Fail decision rules considering measurement uncertainty as guard bands. (w = U) or,

☐ Provided by the client _____

2. Description of EUT

2.1 Summary of Equipment Under Test

EUT Name : 3D Scanner

Model Number : FREEDOM X5

Serial Number : NONE

Manufacturer : DOF Inc

Country of origin : Korea

Power Rating : Input : AC (100 - 240) V, (50 – 60) Hz, Output : DC 24 V, 2.5 A

Testing Voltage : AC 230 V, 50 Hz

Internal Clock : 8 MHz

2.2 General descriptions of EUT

- Rated voltage :
    1. Adaptor : Input 100-240V~, 50-60Hz / Output 24V, 2.5A
    2. Power input :
        1) DC 24V / MAX. 2.5A
- Power Consumption : 60W
- Communication standard : USB 3.0
- Precision : ≤ 20 ㎛

3. Measurement Condition

3.1 EUT Operation.

- The EUT was in the following operation mode during all testing.

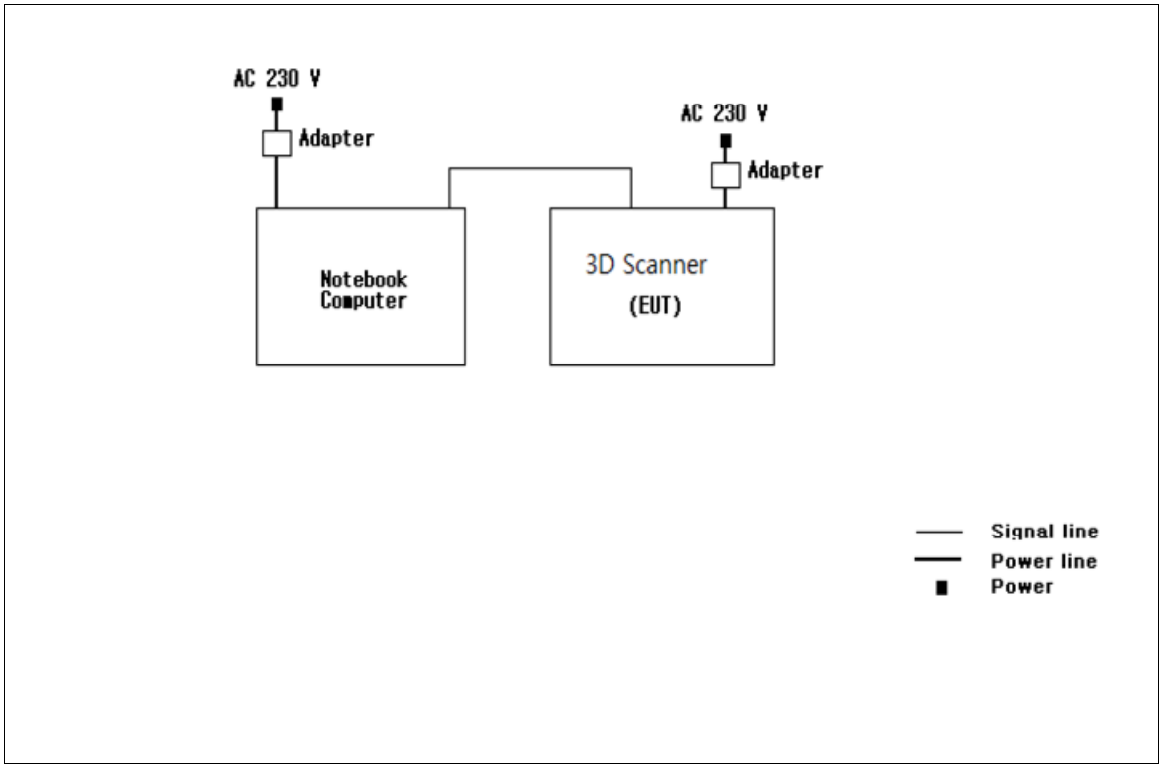
1. Test by connecting with a Notebook computer and continuously monitoring with the provided 3D scan program.

Start Equipment		End Equipment		Cable		Remark
Name	I/O port	Name	I/O port	Length(m)	Shielded	
3D Scanner	DC-IN	Adatper	-	1.4	Unshielded	
3D Scanner	USB	Notebook Computer	USB	1.0	Shielded	
Notebook Computer	DC-IN	Adapter	-	1.5	Shielded	

3.2 EUT Configurations

Equipment Name	Model Name	S/N	Manufacturer	Remark (CE ID)
3D Scanner	FREEDOM X5	NONE	DOF Inc	EUT
Adapter	JL2425	NONE	Doohyeon Electric	
Notebook Computer	TPN-Q266	5CD151F5HN	Tech-Fronf Computer Co., Ltd.	
Adapter	TPC-DA60	NONE	Delta	

3.3 Test Setup Configuration



4. Electromagnetic Interference Test

4.1 Measurement of radiated emission (Below 1 GHz)

In the range 30 MHz to 1 GHz Eelectric Field strength was measured in accordance with EN 55032:2015+A11:2020 Class A. The test setup was made according to EN 55032:2015+A11:2020 Class A on an 10 m Semi-Anechoic Chamber, which allows a 10 m distance measurement. The height of this table was 0.8 m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup..

4.1.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	100916	29-Jun-23
Logbicon Antenna	VULB 9168	SCHWARZBECK	237	21-Mar-24
Turn Table	DT3000-2t	Innco System GmbH	N/A	N/A
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	N/A
Antenna Master & Turn table controller	CO3000-P	Innco System GmbH	CO3000/1138 /44661018/P	N/A

4.1.2 Environmental conditions

Section	Temperature (°C)	Humidity (% R.H.)
Radiated emission	23.1	55.2
Test Place	10 m Semi-Anechoic Chamber	

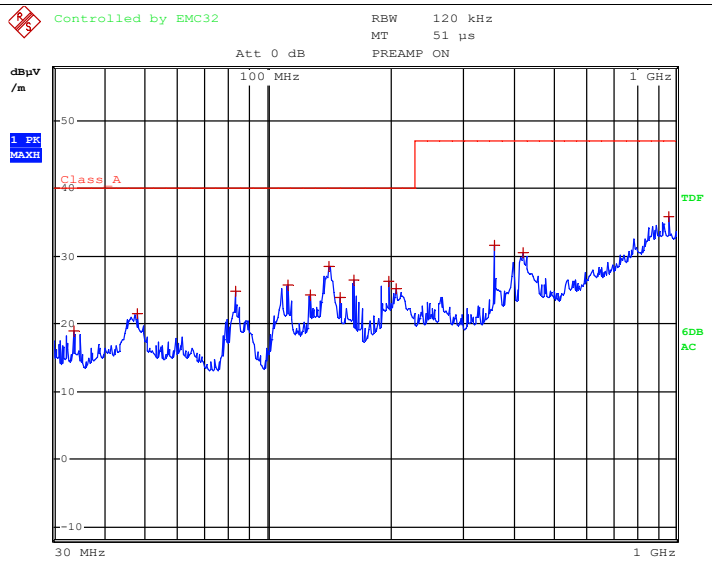
4.1.3 Test data

Test Date : 13-May-23

Frequency [MHz]	Reading [dBuV]	Position [V/H]	Height [m]	Correction Factor		Result Value [dBuV/m]		Margin [dB]
				Antenna [dB/m]	Cable etc. [dB]	Limit	Result	
46.90	21.64	V	1.0	13.51	0.98	40.00	36.13	3.87
53.00	19.10	V	1.0	13.58	1.01	40.00	33.69	6.31
62.10	16.04	V	1.0	12.97	1.05	40.00	30.06	9.94
85.30	23.03	V	1.0	8.28	1.21	40.00	32.52	7.48
112.60	21.77	V	1.0	9.80	1.46	40.00	33.03	6.97
152.00	20.77	V	1.0	13.10	1.64	40.00	35.51	4.49
Remark	H : Horizontal, V : Vertical Result Value = Reading + Antenna + Cable loss *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection.							

4.1.4 Test data graph

[Horizontal]



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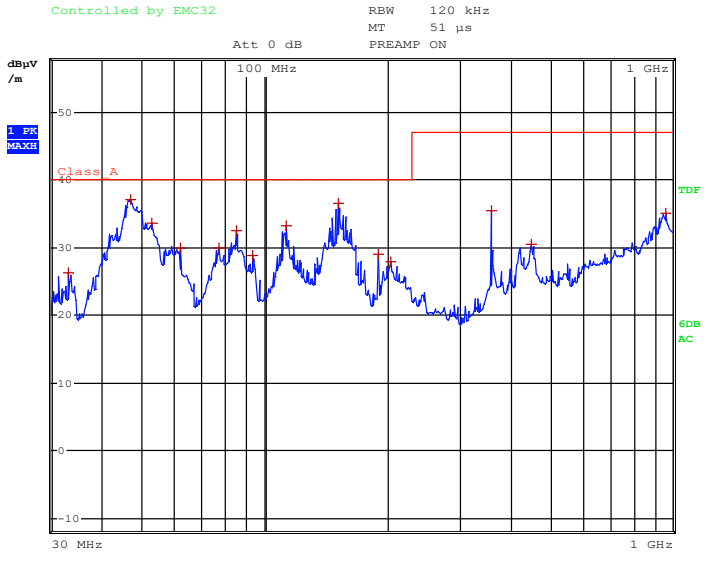
Date: 13.MAY.2023 09:16:10

[Vertical]



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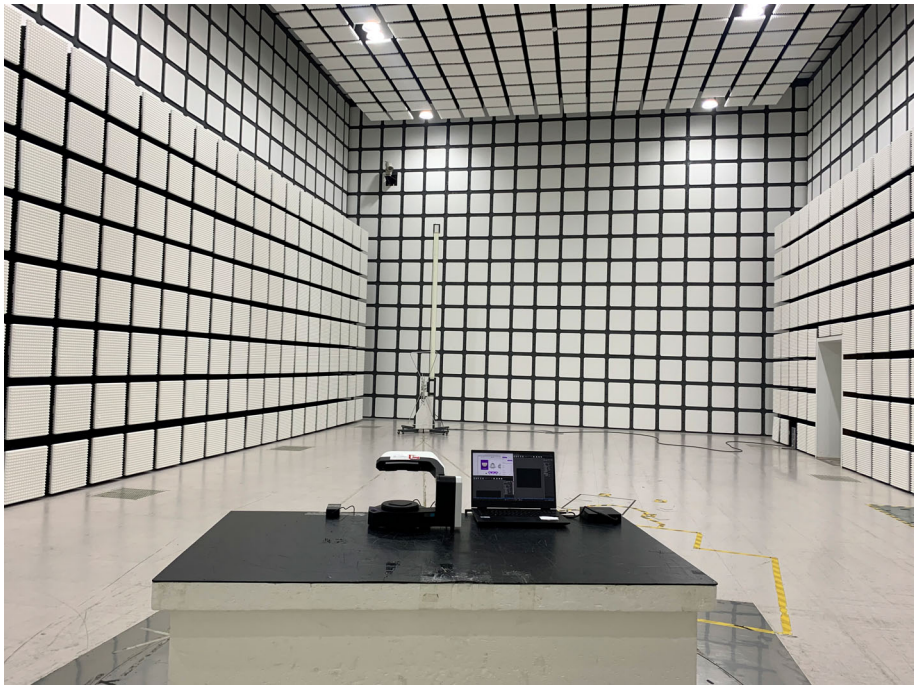
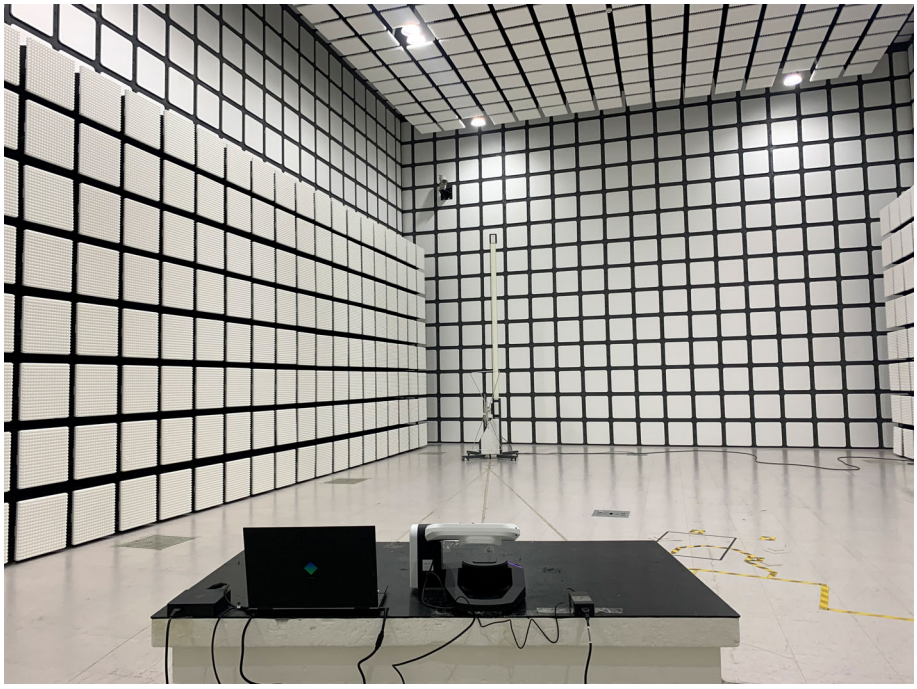
Date: 13.MAY.2023 09:03:55

4.1.5 Setup for Radiated Test (Below 1 GHz)

[Front]



[Rear]



4.2 Measurement of radiated emission (Above 1 GHz)

Above 1 GHz the radiated emission was measured in accordance with EN 55032:2015+A11:2020 Class A. The test setup was made according to EN 55032:2015+A11:2020 Class A on an 3 m Semi-Anechoic Chamber, which allows a 3 m distance measurement. The height of this table was 0.8 m. Themeasurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

4.2.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Antenna Mast	MA4640-XP-ET	Innco System GmbH	N/A	N/A
Antenna Master & Turn table controller	CO3000	Innco System GmbH	CO3000/931 /38240516/L	N/A
Turn Table	DT1500-S	Innco System GmbH	N/A	N/A
Horn Antenna	BBHA9120D	SCHWARZBECK	469	8-Nov-23
AMPLIFIER	8449B	HP	3008A00581	29-Jun-23
Test Receiver	ESU	Rohde & Schwarz	100529	29-Jun-23

4.2.2 Environmental conditions

Section	Temperature (°C)	Humidity (% R.H.)
Radiated electromagnetic Disturbance	23.3	55.3
Test Place	3 m Semi-Anechoic Chamber	

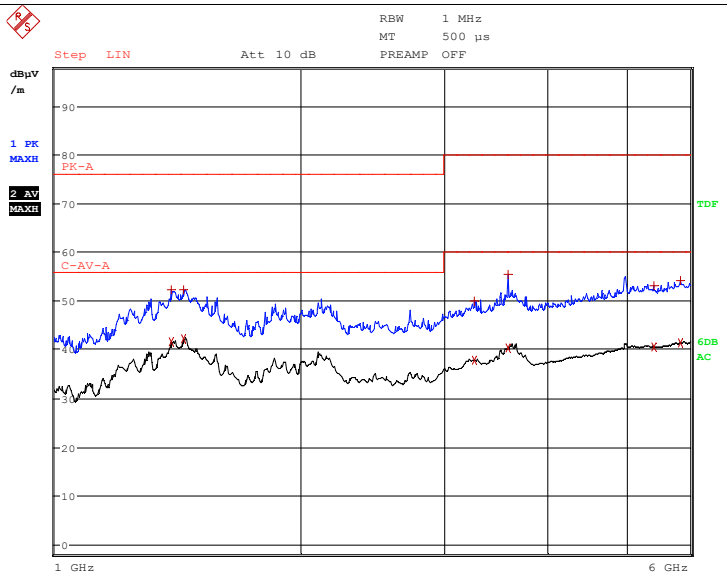
4.2.3 Test data

Test Date : 13-May-23

Frequency [MHz]	Reading [dBuV]	Position [V/H]	Height [m]	Correction Factor		Result Value [dBuV/m]		Margin [dB]
				Antenna [dB/m]	Cable etc. [dB]	Limit	Result	
Peak								
1440.00	57.30	H	1.0	25.54	-30.55	76.00	52.29	23.71
1440.00	56.89	V	1.0	25.54	-30.55	76.00	51.88	24.12
5388.00	48.11	H	1.0	31.80	-26.68	80.00	53.23	26.77
5388.00	51.59	V	1.0	31.80	-26.68	80.00	56.71	23.29
5842.00	46.27	H	1.0	32.42	-26.49	80.00	52.20	27.80
5842.00	51.26	V	1.0	32.42	-26.49	80.00	57.19	22.81
Cispr Average								
1440.00	47.29	H	1.0	25.54	-30.55	56.00	42.28	13.72
1440.00	46.02	V	1.0	25.54	-30.55	56.00	41.01	14.99
5388.00	35.50	H	1.0	31.80	-26.68	60.00	40.62	19.38
5388.00	36.80	V	1.0	31.80	-26.68	60.00	41.92	18.08
5842.00	35.47	H	1.0	32.42	-26.49	60.00	41.40	18.60
5842.00	36.44	V	1.0	32.42	-26.49	60.00	42.37	17.63
Remark	H : Horizontal, V : Vertical *Reading = receiver reading + Amplifier Gain *CL = Cable Loss-Amplifier Gain							

4.2.4 Test Data Graphs

[Horizontal]



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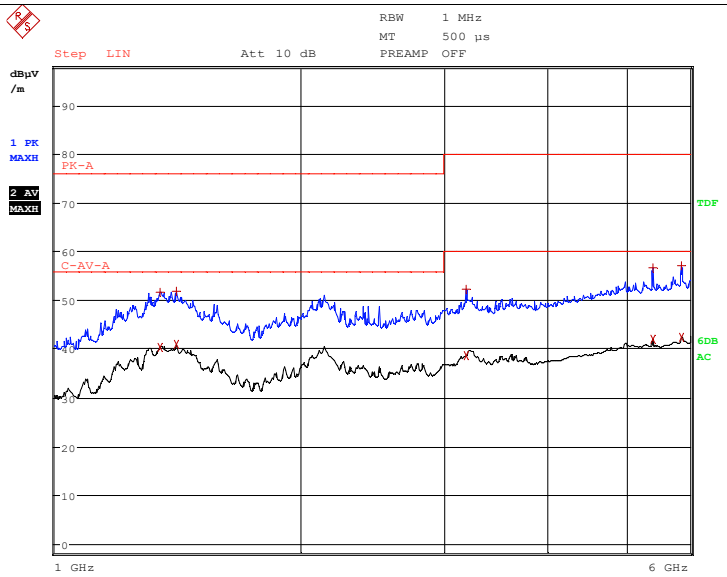
Date: 13.MAY.2023 11:15:50

[Vertical]



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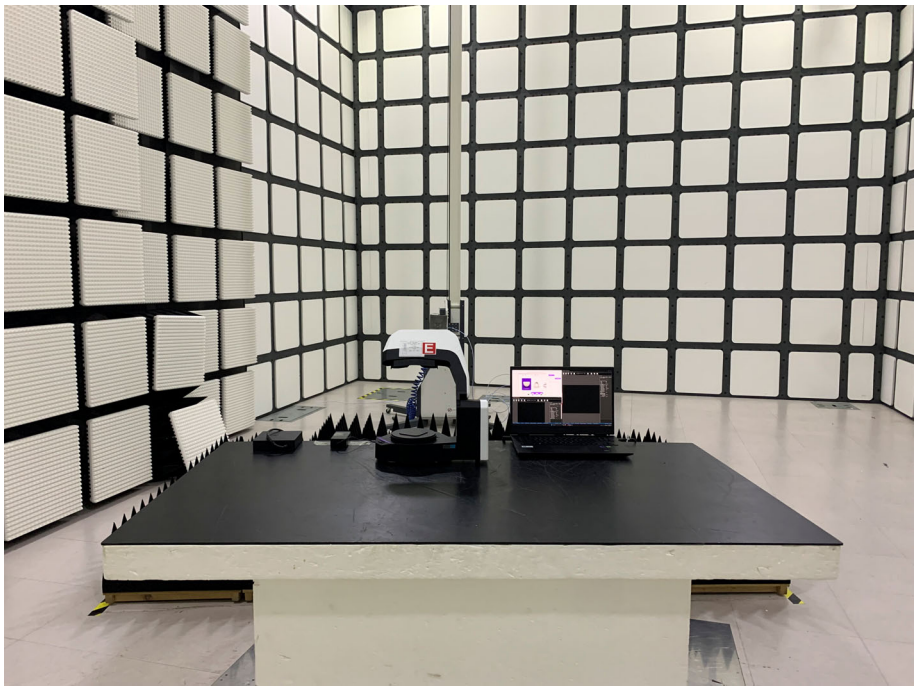
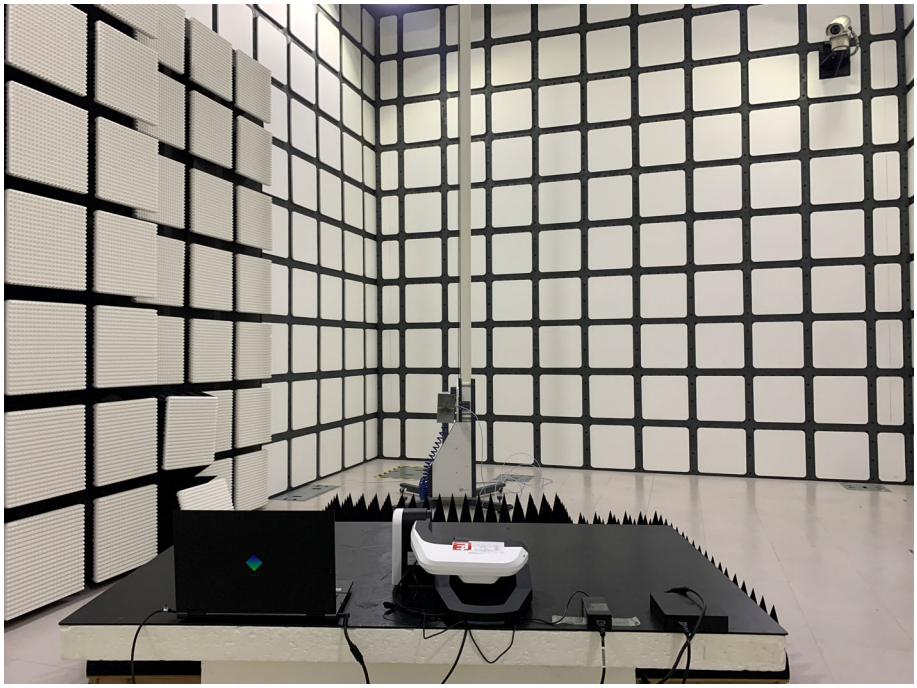
Date: 13.MAY.2023 11:03:42

4.2.5 Setup for Radiated Test (Above 1 GHz)

[Front]



[Rear]



4.3 Conducted emission test

The continuous disturbance voltage of AC Mains was measured in accordance to EN 55032:2015+A11:2020 Class A. The test setup was made according to EN55032:2015+A11:2020 Class A in a shielded Room. The EUT was placed on a non-conductive table at least 0.8 m above the ground plane. A grounded vertical referenceplane was positioned in a distance of 0.4 m from the EUT. The distance from the EUT to other metal surfaceswas at least 0.8 m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0 m. The test receiver with Quasi peak detector.

4.3.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
LISN	NNLK8121	SCHWARZBECK	#695	29-Jun-23
Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	102772	29-Jun-23
TEST RECEIVER	ESPI	ROHDE & SCHWARZ	100005	29-Jun-23
LISN	ENV216	ROHDE & SCHWARZ	101231	29-Jun-23

4.3.2 Environmental conditions

Section	Temperature (°C)	Humidity (% R.H.)
Conducted emission	23.0	55.2
Test Place	Shielded Room	

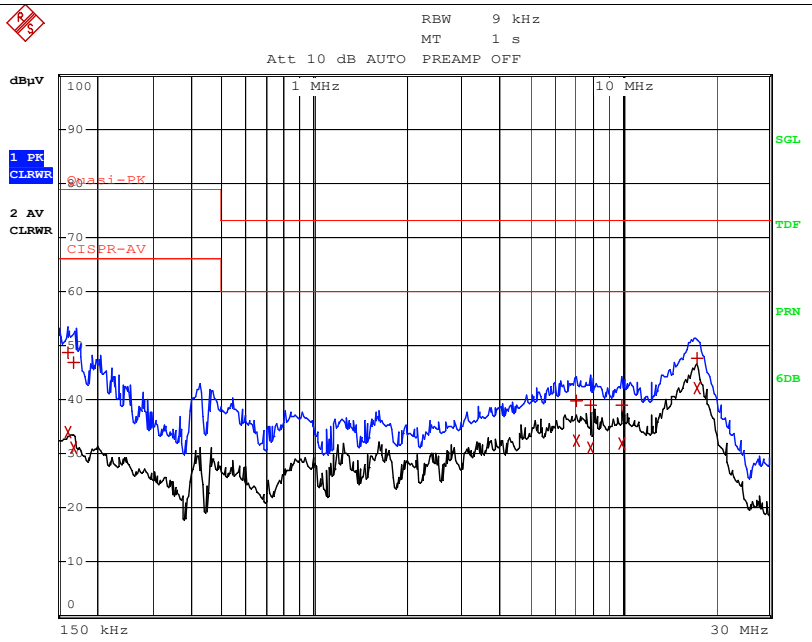
4.3.3 Test data

Test Date : 13-May-23

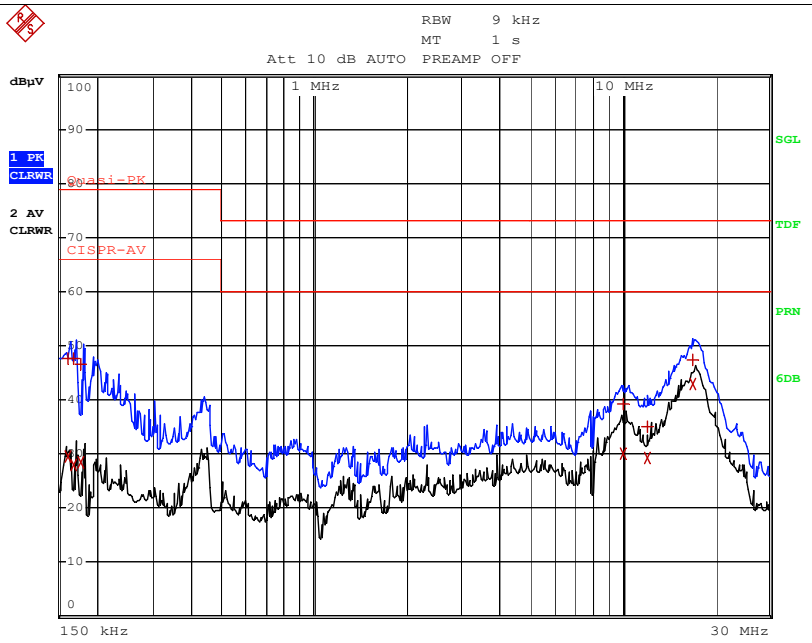
Frequency (MHz)	Correction Factor (dB)		Line (H/N)	Quasi-peak Value (dBuV)				Average Value (dBuV)			
	LISN	Cable etc.		Limit	Reading	Result	Margin	Limit	Reading	Result	Margin
0.16	0.06	0.15	H	79.00	48.62	48.83	30.17	66.00	34.10	34.31	31.69
0.17	0.04	0.15	N	79.00	47.60	47.79	31.21	66.00	27.95	28.14	37.86
0.18	0.04	0.14	N	79.00	46.54	46.72	32.28	66.00	28.40	28.58	37.42
7.09	0.13	0.28	H	73.00	39.75	40.16	32.84	60.00	32.53	32.94	27.06
10.06	0.18	0.32	N	73.00	39.22	39.72	33.28	60.00	30.11	30.61	29.39
16.96	0.30	0.40	N	73.00	47.31	48.01	24.99	60.00	42.89	43.59	16.41
Remark	H = Hot Line, N = Neutral Line Correction factor=LISN factor + Cable loss										

4.3.4 Test Data Graphs

[HOT LINE]

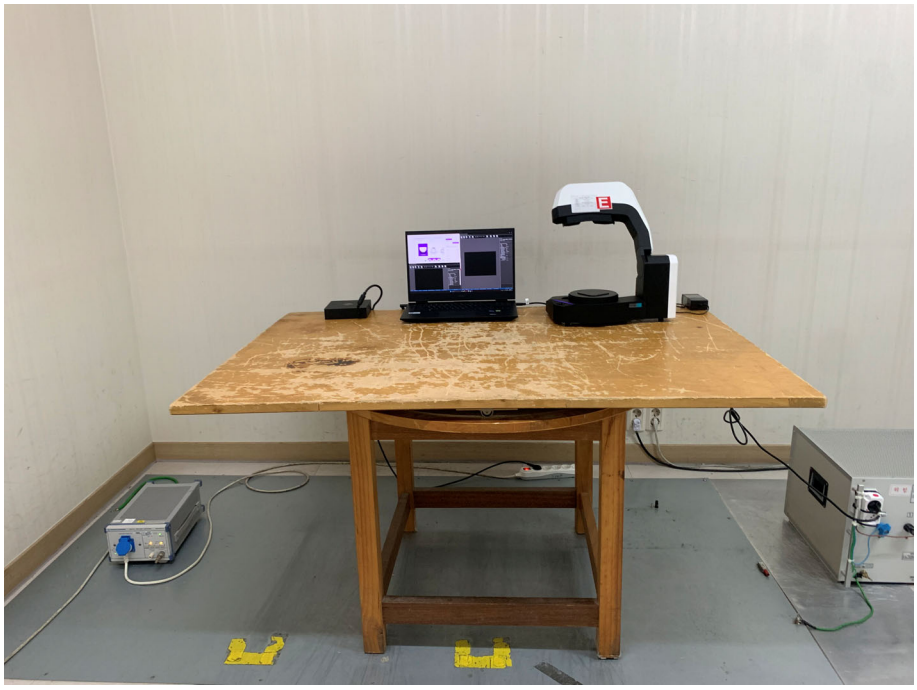


[NEUTRAL LINE]



4.3.5 Setup for Conducted Test : 0.15 MHz ~ 30 MHz

[Front]



[Rear]

4.4 Limits concerning harmonic current test

The harmonics on AC Mains in the frequency from 0 kHz to 2 kHz were measured in accordance to EN IEC 61000-3-2:2019+A1:2021 The objective of this standard is to set limits for harmonic emissions of equipment within its scope, so that, with due allowance for the emissions from other equipment, compliance with the limits ensures that harmonic disturbance do not exceed the compatibility levels defined in EN IEC 61000-3-2:2019+A1:2021.For the purpose of harmonic current limitation, equipment is classified as follows.

Class A : - Balanced three-phase equipment
- Household appliances excluding equipment identified as Class D
- Tools excluding portable tools
- Dimmers for incandescent lamps
- Audio equipment.

Equipment not specified in one of the three other classes shall be considered as Class A equipment

Class B : - Portable tools
- Arc welding equipment which is not professional equipment.

Class C : - Lighting equipment.

Class D : Equipment having a specified power 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).

4.4.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Test System	PHF555	HAEFELY	080419-11	30-Jun-23
Harmonic & Flicker Test System	DPA 550N	EM Test AG	V1033107193	5-Jul-23

4.4.2 Environmental Conditions

Section	Temperature (°C)	Humidity (% R.H.)
Harmonic test	23.2	55.2

4.4.3 Test data

Test Date : 14-May-23

Test Report

Report Number :	00675-ha
Test Standard :	IEC 61000-3-2 (Ed5-1) - Class A (230V - 50Hz)
Test Date :	5/14/2023 11:03:10 AM

Result

E.U.T. :	PASS	Source :	PASS

Climatic Conditions

Temperature :	23.2 °C	Pressure :	101.3 kPa	Humidity :	55.2 %

Software

Name :	net.control	Version :	3.2.3.0

Measures & Analysis

Measure Window :	10 periods	Voltage Range :	500 V
Refresh Interval :	2 s	Current Range :	50 A
Sampling Rate :	6.4 kS/s		
Scaled Window :	Rectangular		
According :	IEC 61000-3-2 (Edition 5.1) Limits for harmonic current emissions (equipment input current < 16 A per phase)		

Measure Results

Standard Specific Results for IEC 61000-3-2 (Edition 5.1)

Standard Group:	Industry
Standard Name:	IEC 61000-3-2 (Edition 5.1) Limits for harmonic current emissions (equipment input current < 16 A per phase)
Device Under Test:	PASS
Power Source:	PASS
Connection Type:	L - N
Main Line:	230 V, 50 Hz
Classification:	Class A
Appli. of Limits:	less than or equal to 150 % (Without POHC Enhancement)

Check Harmonics 2..40	
First detected harmonic order > 150 %	
Line 1:	None
Harmonics orders > 150 %	
Line 1:	None
Harmonics orders with average > 100 %	
Line 1:	None

Measured values	
Fundamental Current	
Line 1:	0.098 A
Active input Power	
Line 1:	21.244 W *
Circuit power factor	
Line 1:	0.432 *

** Absolute value.*

Current Test Result

Average and Maximum harmonic current results									
Hn	Average				Maximum				Harmonic Result
	Ieff [A]	of Limit [%]	Limit [A]	Result	Ieff [A]	of Limit [%]	Limit [A]	Result	
1	0.086				0.098				
2	0.002	0.173	1.080	n/a	0.002	0.150	1.620	n/a	PASS
3	0.078	3.384	2.300	PASS	0.090	2.604	3.450	PASS	PASS
4	0.002	0.538	0.430	n/a	0.003	0.486	0.645	n/a	PASS
5	0.073	6.435	1.140	PASS	0.084	4.931	1.710	PASS	PASS
6	0.002	0.759	0.300	n/a	0.003	0.670	0.450	n/a	PASS
7	0.068	8.778	0.770	PASS	0.077	6.676	1.155	PASS	PASS
8	0.002	0.832	0.230	n/a	0.003	0.757	0.345	n/a	PASS
9	0.062	15.563	0.400	PASS	0.070	11.688	0.600	PASS	PASS
10	0.002	0.978	0.184	n/a	0.002	0.881	0.276	n/a	PASS
11	0.055	16.626	0.330	PASS	0.061	12.302	0.495	PASS	PASS
12	0.002	1.033	0.153	n/a	0.002	0.942	0.230	n/a	PASS
13	0.046	22.015	0.210	PASS	0.050	15.991	0.315	PASS	PASS
14	0.001	1.101	0.131	n/a	0.002	0.973	0.197	n/a	PASS
15	0.038	25.036	0.150	PASS	0.040	17.803	0.225	PASS	PASS
16	0.001	1.117	0.115	n/a	0.002	0.982	0.173	n/a	PASS
17	0.029	22.226	0.132	PASS	0.031	15.373	0.199	PASS	PASS
18	0.001	1.257	0.102	n/a	0.002	1.039	0.153	n/a	PASS
19	0.022	18.670	0.118	PASS	0.022	12.651	0.178	PASS	PASS
20	0.001	1.209	0.092	n/a	0.001	1.079	0.138	n/a	PASS
21	0.016	14.635	0.107	PASS	0.016	10.263	0.161	PASS	PASS
22	0.001	1.307	0.084	n/a	0.001	1.099	0.125	n/a	PASS
23	0.011	10.801	0.098	PASS	0.011	7.790	0.147	PASS	PASS
24	0.001	1.341	0.077	n/a	0.001	1.135	0.115	n/a	PASS
25	0.007	8.159	0.090	PASS	0.008	5.696	0.135	PASS	PASS
26	0.001	1.429	0.071	n/a	0.001	1.213	0.106	n/a	PASS
27	0.006	7.547	0.083	PASS	0.008	6.319	0.125	PASS	PASS
28	0.001	1.484	0.066	n/a	0.001	1.215	0.099	n/a	PASS
29	0.007	8.452	0.078	PASS	0.009	7.409	0.116	PASS	PASS
30	0.001	1.535	0.061	n/a	0.001	1.293	0.092	n/a	PASS
31	0.007	9.701	0.073	PASS	0.009	8.140	0.109	PASS	PASS
32	0.001	1.652	0.058	n/a	0.001	1.326	0.086	n/a	PASS
33	0.007	10.441	0.068	PASS	0.008	8.147	0.102	PASS	PASS
34	0.001	1.582	0.054	n/a	0.001	1.283	0.081	n/a	PASS
35	0.007	10.374	0.064	PASS	0.007	7.620	0.096	PASS	PASS
36	0.001	1.633	0.051	n/a	0.001	1.316	0.077	n/a	PASS
37	0.006	9.480	0.061	PASS	0.006	6.549	0.091	PASS	PASS
38	0.001	1.679	0.048	n/a	0.001	1.319	0.073	n/a	PASS
39	0.005	8.070	0.058	n/a	0.005	5.639	0.087	n/a	PASS
40	0.001	1.732	0.046	n/a	0.001	1.359	0.069	n/a	PASS

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Voltage Source Verification

Harmonic voltage results				
Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	229.888	99.951		
2	0.017	0.008	0.200	PASS
3	0.034	0.015	0.900	PASS
4	0.010	0.004	0.200	PASS
5	0.021	0.009	0.400	PASS
6	0.012	0.005	0.200	PASS
7	0.012	0.005	0.300	PASS
8	0.007	0.003	0.200	PASS
9	0.008	0.004	0.200	PASS
10	0.009	0.004	0.200	PASS
11	0.009	0.004	0.100	PASS
12	0.015	0.007	0.100	PASS
13	0.010	0.004	0.100	PASS
14	0.009	0.004	0.100	PASS
15	0.015	0.007	0.100	PASS
16	0.012	0.005	0.100	PASS
17	0.009	0.004	0.100	PASS
18	0.006	0.002	0.100	PASS
19	0.007	0.003	0.100	PASS
20	0.008	0.004	0.100	PASS
21	0.016	0.007	0.100	PASS
22	0.015	0.007	0.100	PASS
23	0.014	0.006	0.100	PASS
24	0.014	0.006	0.100	PASS
25	0.009	0.004	0.100	PASS
26	0.009	0.004	0.100	PASS
27	0.011	0.005	0.100	PASS
28	0.011	0.005	0.100	PASS
29	0.009	0.004	0.100	PASS
30	0.013	0.005	0.100	PASS
31	0.009	0.004	0.100	PASS
32	0.010	0.004	0.100	PASS
33	0.009	0.004	0.100	PASS
34	0.010	0.004	0.100	PASS
35	0.009	0.004	0.100	PASS
36	0.022	0.010	0.100	PASS
37	0.013	0.006	0.100	PASS
38	0.012	0.005	0.100	PASS
39	0.009	0.004	0.100	PASS
40	0.008	0.003	0.100	PASS

4.4.4 Setup Figure

4.5 Limits Concerning Voltage Fluctuations & Flicker test

The voltage fluctuations on AC mains in the frequency range from 0 kHz to 2 kHz were measured inaccordance to EN 61000-3-3:2013+A1:2019+A2:2021

4.5.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Test System	PHF555	HAEFELY	080419-11	30-Jun-23
Harmonic & Flicker Test System	DPA 550N	EM Test AG	V1033107193	5-Jul-23

4.5.2 Environmental Conditions

Section	Temperature (°C)	Humidity (% R.H.)
Flicker test	23.2	55.2

4.5.3 Test data

Test Date : 14-May-23

Test Report

Report Number :	00675-FL
Test Standard :	IEC 61000-3-3 (Ed3-2) - General Test conditions (230V - 50Hz)
Test Date :	5/14/2023 1:58:49 PM

Result

E.U.T. :	Test passed

Climatic Conditions

Temperature :	23.2 °C	Pressure :	101.3 kPa	Humidity :	55.2 %

Software

Name :	net.control	Version :	3.2.3.0

Flicker Results

Standard Specific Results for IEC 61000-3-3 (Edition 3.2)

Standard Group:	Industry
Standard Name:	IEC 61000-3-3 (Edition 3.2) Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection
Test Condition:	General Test Conditions
Analysis Status:	PASS

Flicker Measurements Settings

Main Line:	230V, 50Hz
Flicker Meter:	230V / 50Hz
Flicker Impedance:	Zref
Observation Time:	12 × 10 min
Measurements:	12

Flicker Measurements

	P_{st}	Max P_{st}	Max d_c	Max d_{max}	Max T_{max}
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

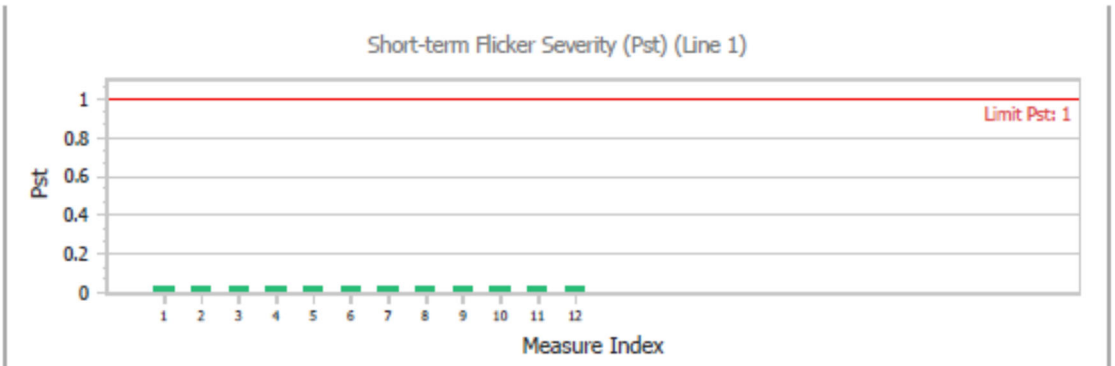
Flicker Individual Measurements

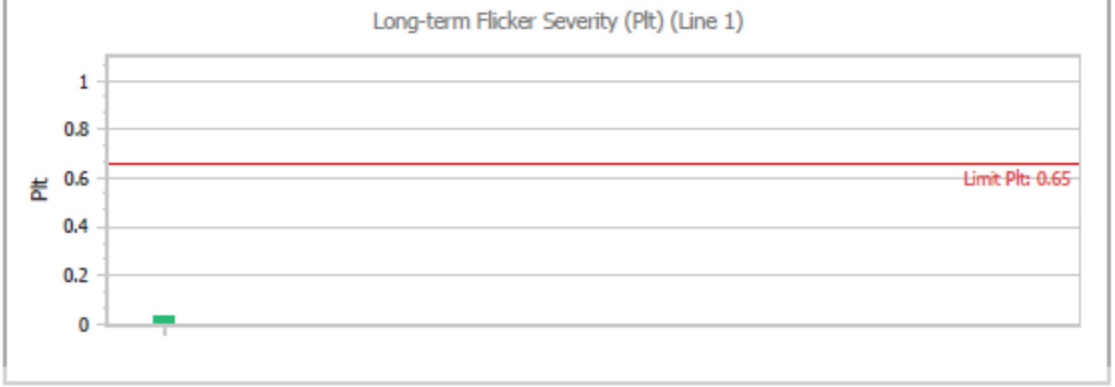
Measurement	P_{st} [ ]			d_c [%]			d_{max} [%]			T_{max} [s]		
	Value	Limit	Result	Value	Limit	Result	Value	Limit	Result	Value	Limit	Result
#1	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#2	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#3	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#4	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#5	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#6	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#7	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#8	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#9	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#10	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#11	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS
#12	0.03	1.00	PASS	0.00	3.30	PASS	< 0.2	4.00	PASS	0.00	0.50	PASS

Pst Data

Flicker (Line 1)

Meas. No.	P0,1	P1s	P3s	P10s	P50s	Pst	dc [%]	dmax [%]	Tmax [s]
1	0	0	0	0.001	0.005	0.028	0	0.04	0
2	0	0	0	0.001	0.005	0.028	0	0.035	0
3	0	0	0	0.001	0.005	0.028	0	0.031	0
4	0	0	0	0.001	0.005	0.028	0	0.029	0
5	0	0	0	0.001	0.005	0.028	0	0.037	0
6	0	0	0	0.001	0.005	0.028	0	0.031	0
7	0	0	0	0.001	0.005	0.028	0	0.033	0
8	0	0	0	0.001	0.005	0.028	0	0.033	0
9	0	0	0	0.001	0.005	0.028	0	0.031	0
10	0	0	0	0.001	0.005	0.028	0	0.035	0
11	0	0	0	0.001	0.005	0.028	0	0.032	0
12	0	0	0	0.001	0.005	0.028	0	0.034	0





4.5.4 Setup Figure

5. Electromagnetic Susceptibility Test

5.1 Electrostatic Discharge test

5.1.1 Test Standard

- Standard : EN 61000-4-2:2009
- Performance appraisal standard : B
- Energy storage capacitance : 150 pF (±10%)
- Discharge resistance : 330 Ω (±10%)
- Charging resistance : 50 MΩ (50 MΩ ~ 100 MΩ)
- Tolerance of the output voltage indication : ±5 %
- Polarity of the output voltage : Positive(+) and Negative(-)
- Holding time : at least 5 s
- Discharge, Mode of operation : Single discharge
- Interval discharge time : At least 1 s
- Repetition time(each polarity) : 10 for discharges.

5.1.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
ELECTROSTATIC DISCHARGE SIMULATOR	ESS-2002	NOISE KEN	ESS0452848	8-Nov-23

5.1.3 Environmental Conditions

Temperature (°C)	Humidity (% R.H.)	Pressure (kPa)
23.2	55.2	100.3

5.1.4 Test data

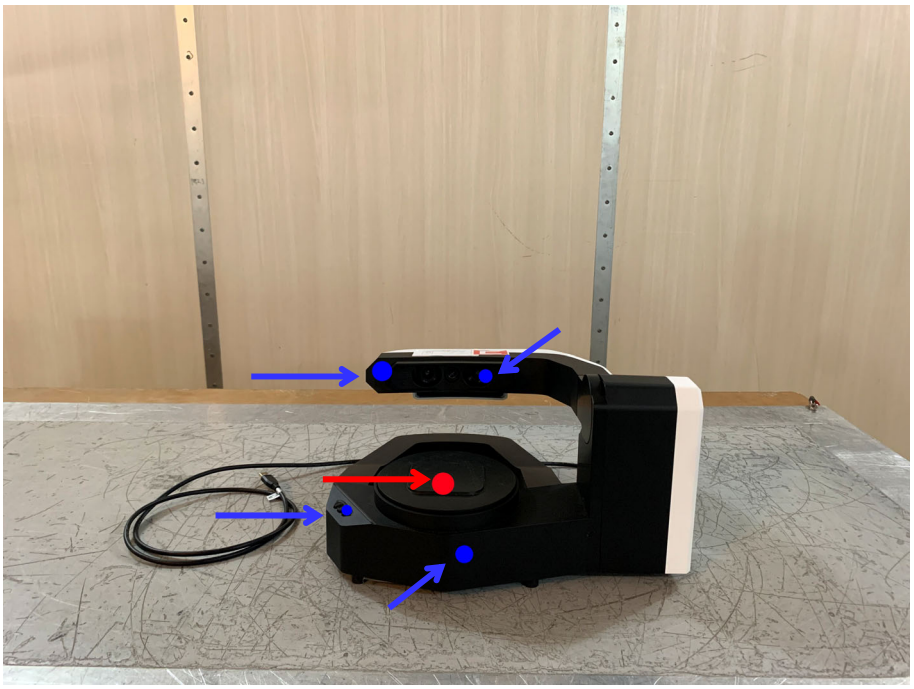
Test Date : 13-May-23

Test Method	No.	Position	Discharge method	Criterion	Result	Remark
Indirect	Horizontal coupling plane		Contact discharge	B	A	
	Vertical coupling plane			B	A	
Direct	1	The front top camera part	Air discharge	B	A	
	2	The front top cover part	Air discharge	B	A	
	3	The front bottom button part	Air discharge	B	A	
	4	The front bottom cover part	Air discharge	B	A	
	5	The front turn table part	Contact discharge	B	A	
	6	The rear top cover part	Air discharge	B	A	
	7	The rear DC-IN part	Air discharge	B	A	
	8	The rear usb cable port part	Air discharge	B	A	
	9	The rear bottom cover part	Air discharge	B	A	
	10	The left top cover part	Air discharge	B	A	
	11	The left bottom cover part	Air discharge	B	A	
	12	The right top cover part	Air discharge	B	A	
	13	The right bottom cover part	Air discharge	B	A	

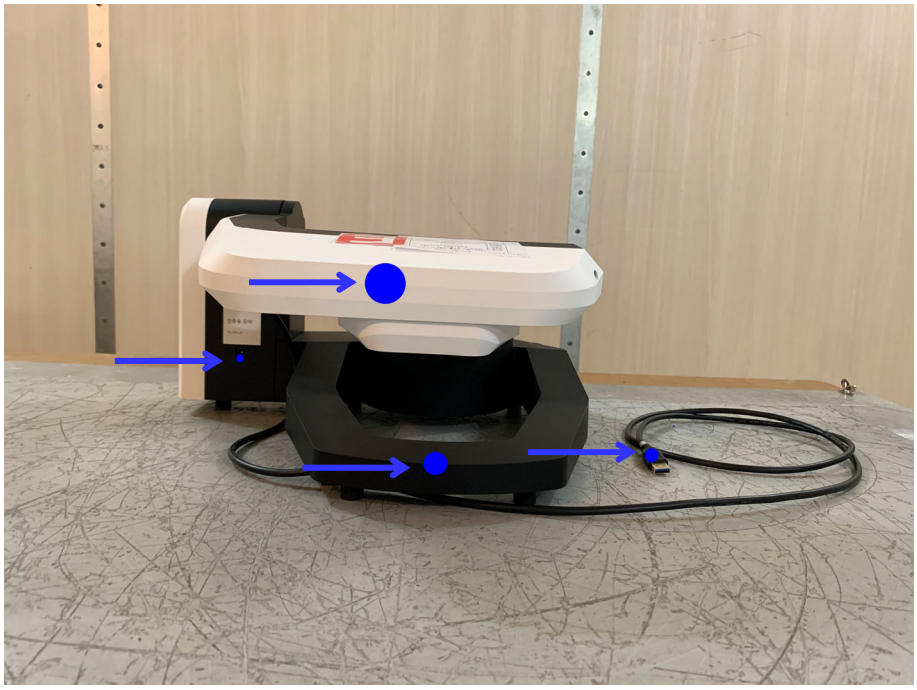
5.1.5 Test Point

Air dischrge	→
Contact dischrge	→

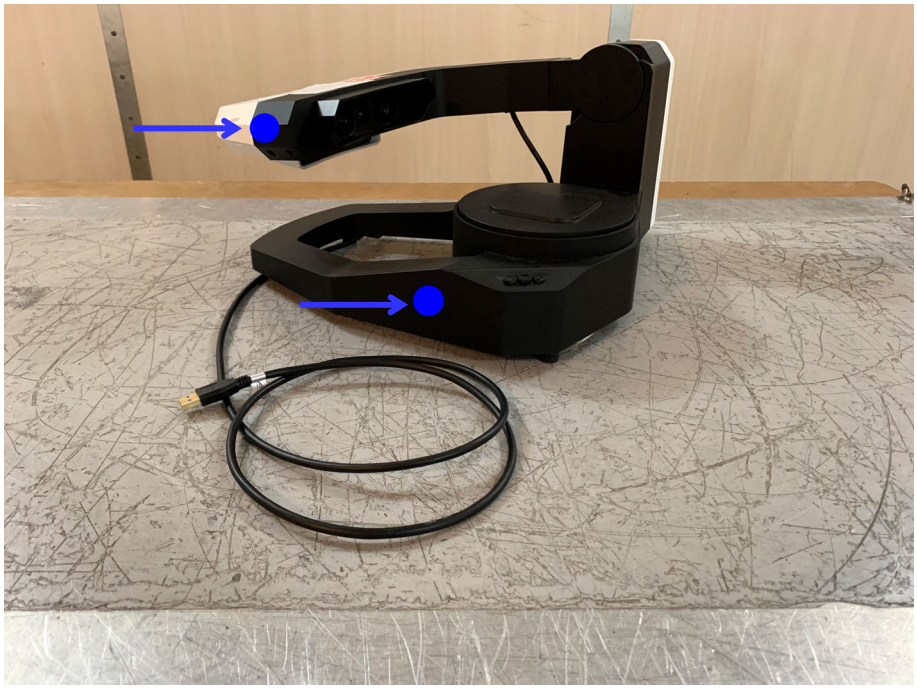
[Position – Front side]



[Position – Rear side]



[Position – Left side]



[Position – Right side]

5.1.6 Setup Figure

5.2 Radiated Electromagnetic Fields test

5.2.1 Test Standard

- Standard : EN IEC 61000-4-3:2020
- Criterion standard : A
- Frequency Range : 80 MHz ~ 1 000 MHz / Spot Frequencys : (1 800, 2 600, 3 500, 5 000) MHz ± 1 %
- Test Angle : 0°, 90°, 180°, 270°
- Sweep Capability : 1.5×10^{-3} decade/s
- Step Size : 1 % of Fundamental
- Antenna Polarity : Horizontally/Vertically
- Measurement Distance : 3 m
- Modulation : AM 80 % with 1 kHz sine wave
- Dwell time : 3 s
- Field Strength: 3 V/m

-During continuous RF disturbance testing, additional spot frequency tests are required for equipment with a primary function of telephony. The additional spot frequencies are: 80 MHz; 120 MHz; 160 MHz; 230 MHz; 434 MHz; 460 MHz; 600 MHz; 863 MHz and 900 MHz(±1 %)

5.2.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
POWER AMPLIFIER	MT400	PRANA	1601-1800	N/A
TEST System (SIGNAL GENERATOR)	RGN6000B	DARE	15I00075SNO01	30-Jun-23
TEST System (RADIFIELD Amplifier)	RFS1006B	DARE	15I00045SNO16	N/A
Hybrid Log Periodic Antenna	LPDA-0803	TDK	130243	N/A

5.2.3 Environmental Conditions

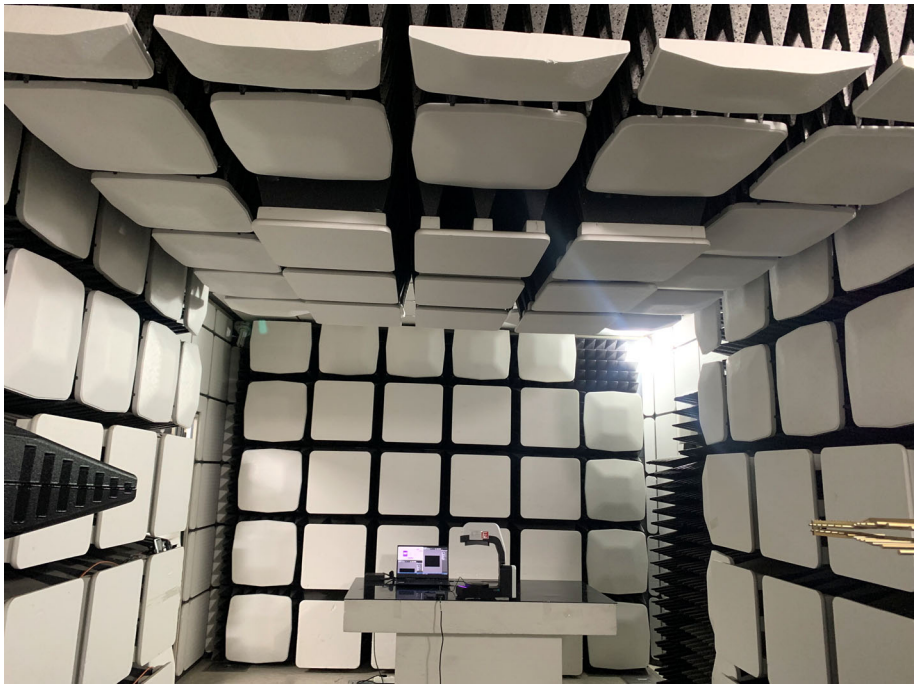
Temperature (°C)	Humidity (% R.H.)
23.1	55.1

5.2.4 Test data

Test Date : 13-May-23

Range of Frequency (MHz)	Position	Polarity	Electromagnetic Intensity (V/m)	Criterion	Result
80 MHz ~ 1 GHz	Front side	H	3	A	A
		V	3	A	A
	Right side	H	3	A	A
		V	3	A	A
	Left side	H	3	A	A
		V	3	A	A
	Rear side	H	3	A	A
		V	3	A	A
Reference		H : Horizontality, V : Verticality			
Spot of Frequency (GHz)	Position	Polarity	Electromagnetic Intensity (V/m)	Criterion	Result
(1.8, 2.6, 3.5, 5.0) GHz ± 1 %	Front side	H	3	A	A
		V	3	A	A
	Right side	H	3	A	A
		V	3	A	A
	Left side	H	3	A	A
		V	3	A	A
	Rear side	H	3	A	A
		V	3	A	A
Reference		H : Horizontality, V : Verticality			

5.2.5 Setup Figure



5.3 Electrical Fast Transients/Burst test

5.3.1 Test Standard

- Standard : EN 61000-4-4:2012
- Performance appraisal standard : B
- Test voltage : AC power : ±1 kV , DC port : ±0.5 kV(more than 3 m only),
  Analogue/digital port : ±0.5 kV
- Polarity : Positive(+), Negative(-)
- Repetition Frequency : 5 kHz
- Duration Time : 60 s

5.3.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
EMC IMMUNITY TESTER	IMU4000 F-S-D-V	EMC PARTNER	IMU400F-S-D-V1517	28-Nov-23
-	-	-	-	-

5.3.3 Environmental Conditions

Temperature (°C)	Humidity (% R.H.)
23.0	55.2

5.3.4 Test data

Test Date : 13-May-23

Tested Point		Test Voltage	Duration Time (s)	Criterion	Result	Remark
Input AC	L1 - L2 - PE	±1 kV	60 s	B	A	
Reference						

5.3.5 Setup Figure

5.4 Surge test

5.4.1 Test Standard

- Standard : EN 61000-4-5:2014+A1:2017
- Performance appraisal standard : B
- Test voltage AC : line to earth : ±2 kV with (1.2/50) μs , line to line : ±1 kV with (1.2/50) μs
- DC network power port(Line to Reference ground) : ±0.5 kV with (1.2/50) μs
- Analogue/digital port(Line to ground , Unshield Symmetrical) : ±(1 & 4) kV with (10/700) μs
  for Primary protection / ±1 kV and (10/700) μs for No Primary protection
- Coaxial or shielded port(shield to ground) : ±0.5 kV with (1.2/50) μs
- Polarity : Positive(+), Negative(-)
- Repetition rate:max 1/min.
- Five positive & negative pulses line-to-neutral at 90° and 270° phase

5.4.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
EMC IMMUNITY TESTER	IMU4000 F-S-D-V	EMC PARTNER	IMU400F-S-D-V1517	28-Nov-23

5.4.3 Environmental Conditions

Temperature (°C)	Humidity (% R.H.)
23.0	55.2

5.4.4 Test data

Test Date : 13-May-23

Tested Point		Test Voltage	Criterion	Result	Remark
Input AC	L1 - L2	±1 kV	B	A	
	L1 – PE	±2 kV	B	A	
	L2 - PE	±2 kV	B	A	
Reference	L1: Line, L2: Neutral, PE: Protective earth (Ground)				

5.4.5 Setup Figure

5.5 Conducted Immunity test

5.5.1 Test Standard

- Standard : EN 61000-4-6:2014+AC:2015
- Performance appraisal standard : A
- Frequency Range : (0.15 to 80) MHz
- Test Voltage : 3.0 V at (0.15 to 10) MHz , (3.0 to 1.0) V at (10 to 30) MHz , 1.0 V at (30 to 80) MHz
- Modulation : AM 80 % with 1 kHz sine wave
- Dwell time : 3 s
- Sweep Capability : 1.5×10^{-3} decade/s
- Step Size : 1 % of Fundamental
- During continuous RF disturbance testing, additional spot frequency tests are required for equipment with a primary function of telephony. The additional spot frequencies are:
0.2 MHz, 1 MHz, 7.1 MHz, 13.56 MHz, 21 MHz, 27.12 MHz and 40.68 MHz(±1 %)

5.5.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Continuous Wave Simulator	CWS 500N	EM TEST	P1548168222	30-Nov-23
Coupling/Decoupling Network	CDN M016	Teseq GmbH	27445	30-Jun-23
ATTENUATOR	50FH-006-300-2	AMPLIFIER RESEARCH	NONE	29-Jun-23
-	-	-	-	-

5.5.3 Environmental Conditions

Temperature (°C)	Humidity (% R.H.)
23.1	55.2

5.5.4 Test data

Test Date : 13-May-23

Tested point	Freq [MHz]	Level [V]	Criterion	Result	Remark
AC Main (M3)	0.15 to 10	3.0	A	A	
	10 to 30	3.0 to 1.0	A	A	
	30 to 80	1.0	A	A	
Reference					

5.5.5 Setup Figure

5.6 Power Frequency Magnetic Field Immunity - N/A

5.6.1 Test Standard

- Standard : EN 61000-4-8:2010
- Performance appraisal standard and test level 1 A/m : A
- Axis of Orientation : X, Y Z axis
- Test frequency : (50 or 60) Hz

5.6.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Magnetic field test system	MFS 100	HAEFELY	154006	29-Nov-23

5.6.3 Environmental Conditions

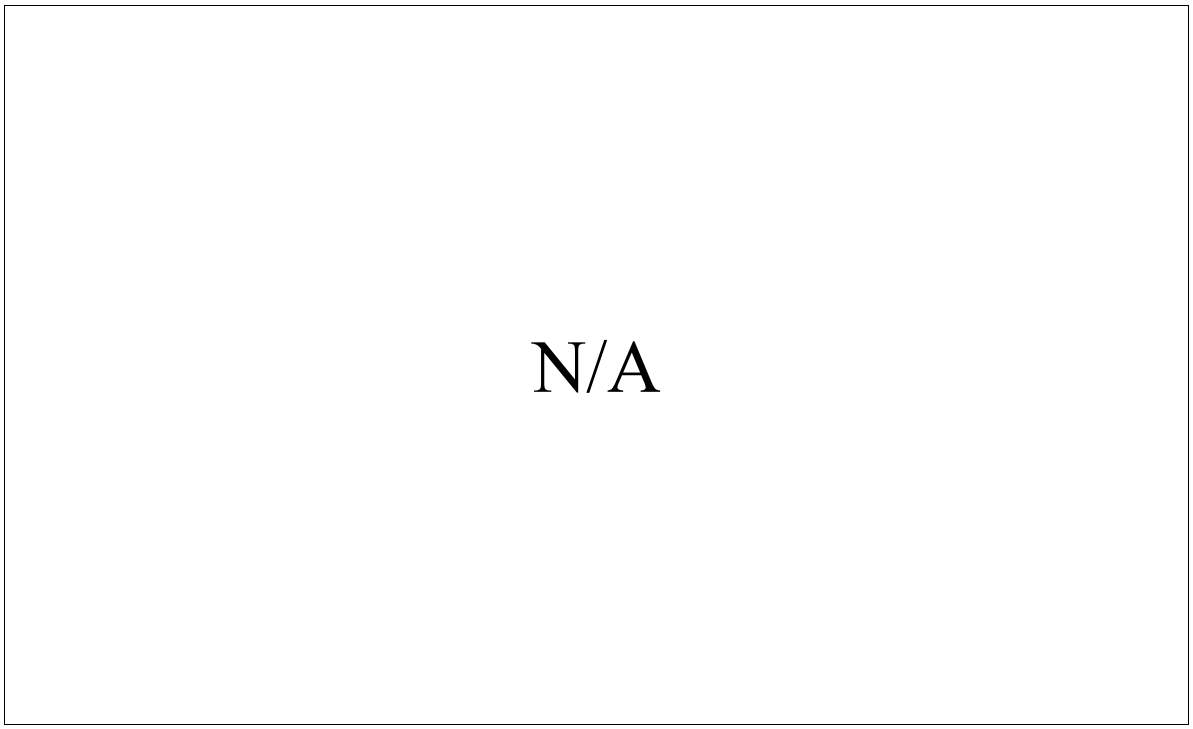
Temperature (°C)	Humidity (% R.H.)
-	-

5.6.4 Test data

Test Date :

Test Point	Freq. range [Hz]	Axis	TestLevel [A/m]	Criterion	Result
Enclosure	50/60 Hz	X	1	A	-
Enclosure	50/60 Hz	Y	1	A	-
Enclosure	50/60 Hz	Z	1	A	-
Remark	The EUT is not affected by magnetic field , so testing is not required.				

5.6.5 Setup Figure



5.7 Voltage Dips and Interruptions test

5.7.1 Test Standard

- Standard : EN IEC 61000-4-11:2020
- Performance appraisal standard and Voltage Reduction
  >95 % 250 cycles : C , >95 % 0.5 cycles : B, 30 % 25 cycles : C
- Number of pulses : 3 at each level
- Recovery time between pulses : 10 s
- Test angles : 0°,90° ,270°

5.7.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
EMC IMMUNITY TESTER	IMU4000 F-S-D-V	EMC PARTNER	IMU400F-S-D-V1517	28-Nov-23
DIP SIMULATOR (VARIAC)	VAR-EXT1000	EMC PARTNER	VAR-EXT1000-1580	28-Nov-23

5.7.3 Environmental Conditions

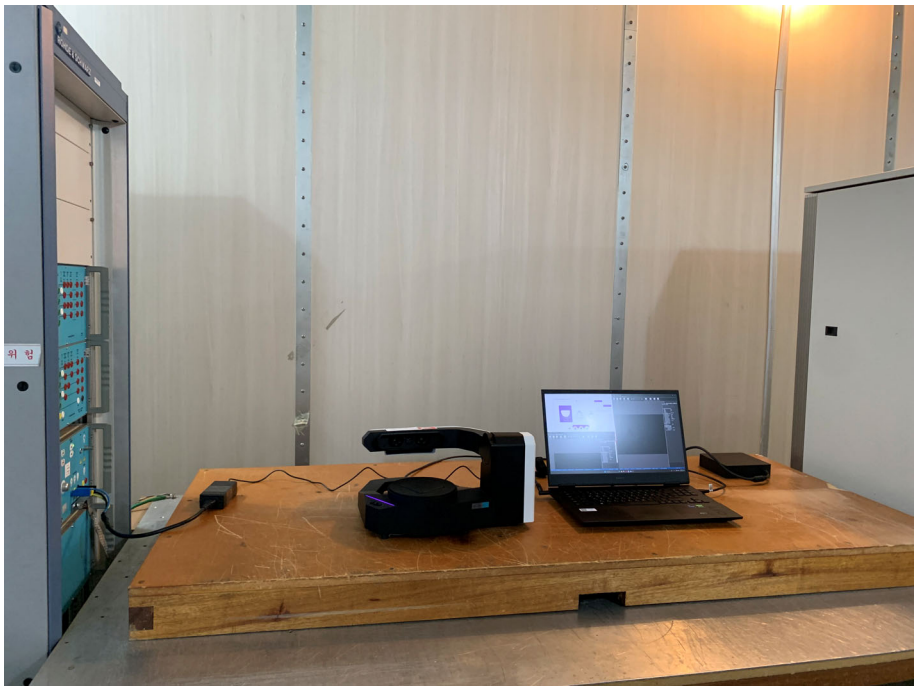
Temperature (°C)	Humidity (% R.H.)
23.0	55.2

5.7.4 Test data

Test Date : 13-May-23

Test Level	Duration Cycles	criteria	Result	Remark
> 95 %	0.5	B	A	
30 %	25	C	A	
> 95 %	250	C	C	*Power Reset
Reference	Changes to occur at 0 degree crossover point of the voltage waveform. If the EUT does not demonstrate compliance when tested with 0 degree switching, the test shall be repeated with the switching occurring at both 90 degrees and 270 degrees.			

5.7.5 Setup Figure



6. EUT Photographs

[Front]

[Rear]

[Inside]