




TEST REPORT

<p>KCTL Inc. 28, Mosan-gil, Jeongnam-myeon, Hwasung-si, Gyeonggi-do, 18516, Korea TEL: 82 31 286 5881 FAX: 82 31 8059 1154 www.kctl.co.kr</p>	<p>Report No.: KR21-HEC0030 Page (1) of (60)</p>	
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1. Client

- Name : Maltani Corp.
- Address : 80, Eumbongmyeon-ro, Eumbong-myeon, Asan-si, Chungcheongnam-do, 31433 Korea, Republic of
- Date of Receipt : 2021-03-11

2. Use of Report : -

3. Name of Product / Model : CLEAN EDGE 1200 / S-RLP3040-50-C002

4. Manufacturer / Country of Origin : Maltani Corp. / Korea

5. Date of Test : 2021-04-01 - 2021-04-07

6. Location of Test : Permanent Testing Lab On Site Testing
 (Address: 28 Mosan-gil, Jeongnam-myeon, Hwaseong-si, Gyeonggi-do 18516 Republic of Korea)

7. Test method used : EN 55015:2013 +A1:2015
 EN 61547:2009
 EN IEC 61000-3-2:2019
 IEC 61000-3-2:2018
 EN 61000-3-3:2013/A1:2019
 IEC 61000-3-3:2013 /A1:2017

8. Test Result : Refer to the test result in the test report

Affirmation	Tested by	Technical Manager
	Name : Jeongwon Kim (Signature)	Name : Byungyeon Kim (Signature)

2021-04-07

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As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by KCTL Inc.

REPORT REVISION HISTORY

Date	Revision	Page No
2021-04-07	Originally issued	-

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General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

Statement not required by the standard or client used for type testing

The measurement uncertainty was not considered in accordance request of the client.

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1. Applicant information

Applicant: Maltani Corp.

Address: 80, Eumbongmyeon-ro, Eumbong-myeon, Asan-si, Chungcheongnam-do, 31433 Korea, Republic of

Telephone: +82-41-534-2151

Fax: +82-41-534-5822

E-mail: 76lmh@hanmail.net

Contact name: Moonhee Lee

Manufacturer: Maltani Corp.

Address: 80, Eumbongmyeon-ro, Eumbong-myeon, Asan-si, Chungcheongnam-do, 31433 Korea, Republic of

Telephone: +82-41-534-2151

Fax: +82-41-534-5822

E-mail: 76lmh@hanmail.net

Contact name: Moonhee Lee

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2. Laboratory information

Address

KCTL Inc. Hwasung Lab.

28, Mosan-gil, Jeongnam-myeon, Hwasung-si, Gyeonggi-do, 18516, Korea

Telephone Number: 82 31 286 5881

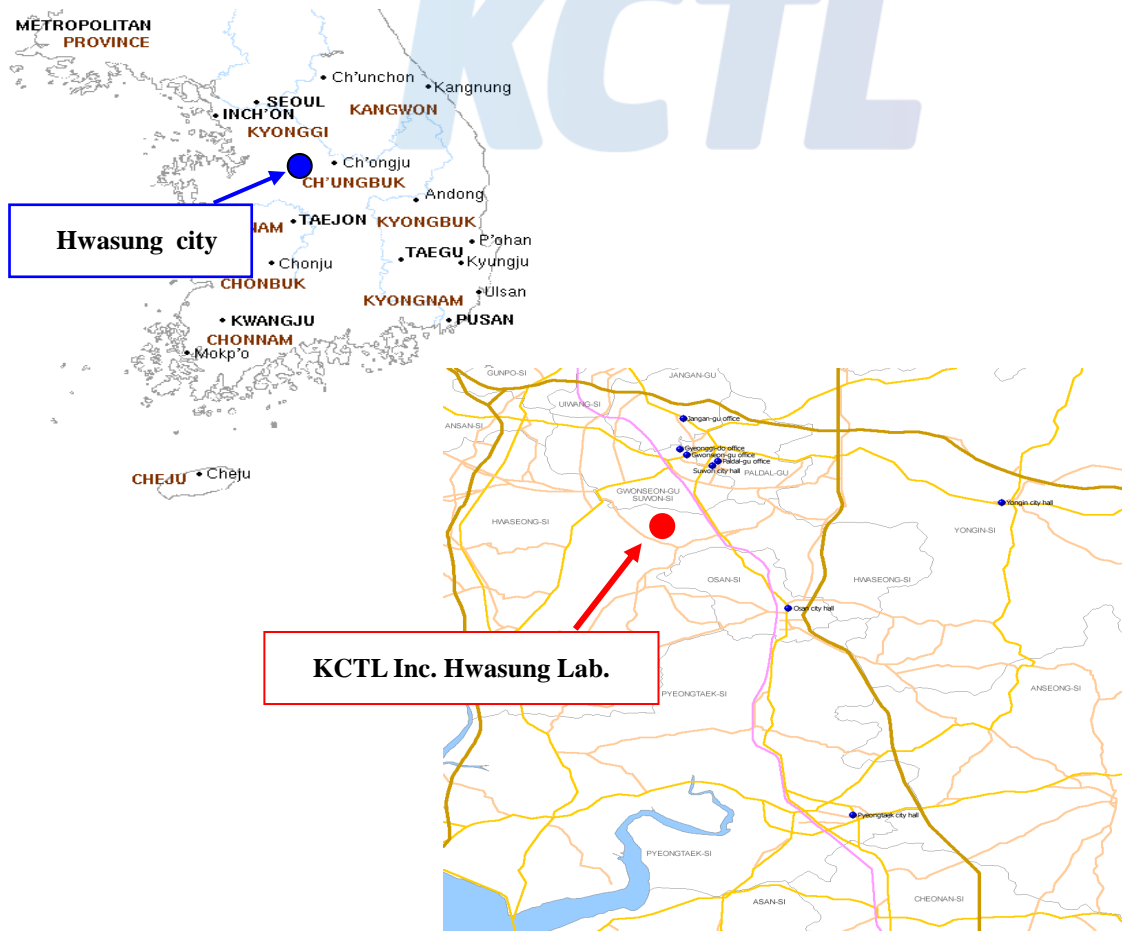
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FCC Site Designation No: KR0040

KOLAS NO.: KT231

VCCI NO.: 1980

SITE MAP



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3. Test system configuration

3.1 Operation environment

	Temperature	Humidity	Pressure
Shielded room(CE)	21.8 °C	40.5 % R.H.	-
Shielded room(RE)	19.2 °C	40.3 % R.H.	-
Chamber 10 m(RE)	21.5 °C	41.1 % R.H.	-
Shielded room(Harmonics)	21.8 °C	40.5 % R.H.	100.8 kPa
Shielded room(flickers)	21.8 °C	40.5 % R.H.	100.8 kPa
Shielded room(ESD)	22.3 °C	42.5 % R.H.	101.1 kPa
Chamber 3 m(RS)	21.1 °C	42.7 % R.H.	100.9 kPa
Shielded room(EFT / BURST)	21.8 °C	41.6 % R.H.	101.1 kPa
Shielded room(SURGE)	21.8 °C	41.6 % R.H.	101.1 kPa
Shielded room(CS)	21.8 °C	41.6 % R.H.	101.1 kPa
Shielded room(DIP)	21.8 °C	41.6 % R.H.	101.1 kPa

Test site

These testing items were performed following locations;

Test item	Test site
Disturbance Voltages	Shielded Room
Radiated Electromagnetic disturbance	Shielded Room
Radiated Emission	Chamber 10 m
Harmonics current, Voltage fluctuations and flickers	Shielded Room
Electrostatic discharge	Shielded Room
Radiated RF immunity	Chamber 3 m
Electric Fast Transient/BURST	Shielded Room
Surge	Shielded Room
Conducted RF immunity	Shielded Room
Voltage dip/interruption	Shielded Room

3.2 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_AMN (Confidence level about 95 %, $k = 2$)		
Shielded Room	9 kHz ~ 150 kHz : 2.0 dB	
	150 kHz ~ 30 MHz : 2.5 dB	
Radiated Emission measurement (Confidence level about 95 %, $k = 2$)		
10 m Chamber	30 MHz ~ 1 000 MHz	3 m : 4.9 dB
		10 m : 4.9 dB

3.3 Measurement Program

These test items were performed by software programs;

Test item	Measurement Program	Used
Disturbance Voltages	TEPTO-DV/AM V 4.1.0083 (tsj corporation)	☒
Radiated Electromagnetic disturbance	TEPTO-DV/AM V 4.1.0083 (tsj corporation)	☒
Radiated Emission	TEPTO-DV/RE V 3.1.0047 (tsj corporation)	☒
Radiated RF Immunity	TDK Conducted Immunity Lab _Ver. 11.25 (TDK)	☒
Conducted RF Immunity	TDK Conducted Immunity Lab _Ver. 10.98.0.1 (TDK)	☒
Harmonics and Flicker	NET.CONTROL Ver.3.0.5 (EM TEST)	☒
Electric Fast Transient/Burst Surge Transient/DIP	TEMA 3000 Ver 4.2.1 (EMC PARTNER)	☒

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4. Description of EUT

4.1 General information

Specifications	
Product	CLEAN EDGE 1200
Model	S-RLP3040-50-C002
Installation	T-BAR
Power	30 W + 40 W (2ch or 1ch) / General
Luminous Flux (lm)	5,880
CCT (K)	5,000
CRI (Ra)	≥ 80
Size (mm)	L1,194 x W294 x H24
Weight (kg)	4.2
Input Voltage (VAC/Hz)	AC 200-250 50/60

4.2 Product description

Type of product	CLEAN EDGE 1200
Model name (Basic)	S-RLP3040-50-C002
Model name (Variant)	S-RLP3040-40-C002, S-RLP3040-30-C002
Difference	The difference is CCT. S-RLP3040-40-C002 : 4 000 K S-RLP3040-30-C002 : 3 000 K
Serial no	-
Testing voltage	AC 230 V, 50 Hz
Input rating	AC (200-250) V, (50/60) Hz

4.3 Auxiliary equipments

Type	Model / Part #	S/N	Manufacturer
LIGHT METER	TES 1332	-	TES

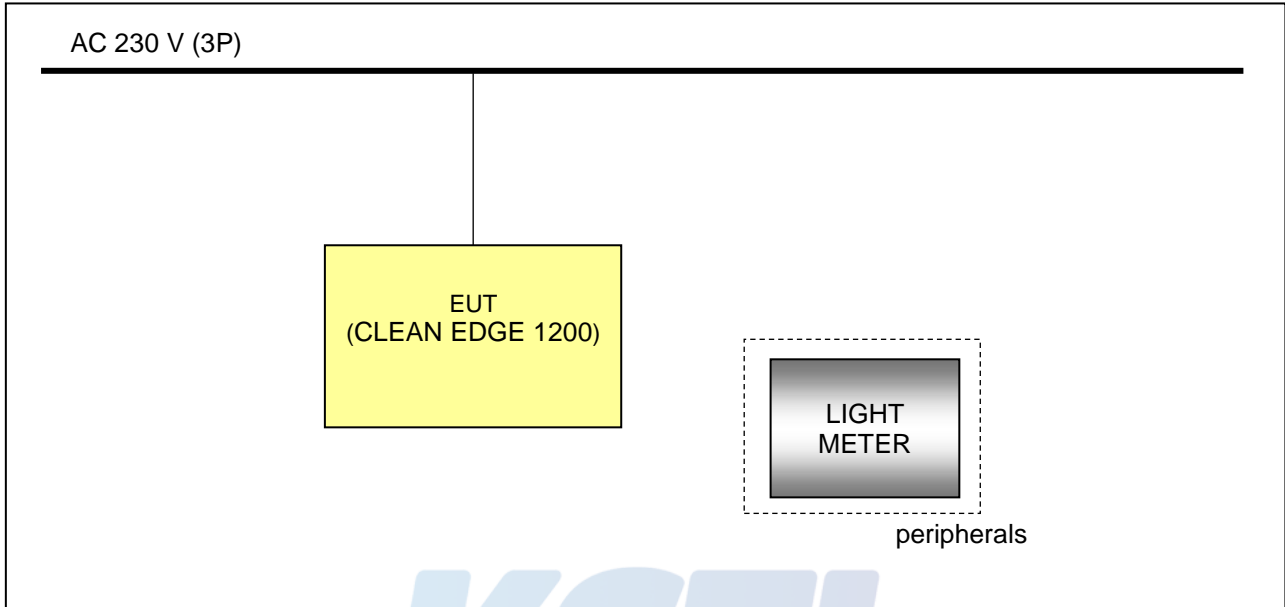
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4.4 Test configuration



	Start		End		Cable	
	Name	I/O port	Name	I/O port	Length (m)	Spec.
-	-	-	-	-	-	-

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4.5 Operating conditions

The EUT was configured as normal intended use.

Test mode	Normal operating
1	After powering on the EUT, it was tested while monitoring the LUX value of the EUT using LIGHT METER.



5. Summary of test results

5.1 Summary of EMI emission test results

Applied	Test items	Test method	Result
<input checked="" type="checkbox"/>	Disturbance Voltages	EN 55015:2013 +A1:2015	Pass
<input checked="" type="checkbox"/>	Radiated Electromagnetic disturbance	EN 55015:2013 +A1:2015	Pass
<input checked="" type="checkbox"/>	Harmonics Current Emissions	EN IEC 61000-3-2:2019	Pass
<input checked="" type="checkbox"/>	Voltage Fluctuations and Flickers	EN 61000-3-3:2013 +A1:2019	Pass

5.2 Summary of immunity test results

Applied	Test items	Test method	Result
EN 61547:2009			
<input checked="" type="checkbox"/>	Electrostatic Discharge	EN 61000-4-2:2009	Pass
<input checked="" type="checkbox"/>	Radiated Susceptibility	EN 61000-4-3:2006 +A2:2010	Pass
<input checked="" type="checkbox"/>	Electric Fast Transient/Burst	EN 61000-4-4:2012	Pass
<input checked="" type="checkbox"/>	Surge Transient	EN 61000-4-5:2014 +A1:2017	Pass
<input checked="" type="checkbox"/>	Conducted Susceptibility	EN 61000-4-6:2014	Pass
<input checked="" type="checkbox"/>	Voltage Dips and Interruptions	EN 61000-4-11:2004 +A1:2017	Pass

This product complies with the requirements of the EMC Directive 2014/30/EU

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5.3 Performance criteria

Performance criterion A:

During the test no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended. (The luminous intensity shall be deemed to be unchanged if the measured intensities do not deviate by more than 15 %.)

Performance criterion B:

During the test the luminous may change the any value. After the test the luminous intensity shall be restored to its initial value within 1 min. Regulating controls needs not function during the test, but after the test the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

Performance criterion C:

During and after the test change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30min, all functions shall return to normal if necessary by temporary interruption of the mains supply and/or operating the regulating control. Additional requirement for lighting equipment incorporating a starting device: After the test the lighting equipment is switch off. After half an hour it is switched on again. The lighting equipment shall start and operate as intended.

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6. Test results

6.1 Disturbance Voltages

Testing voltage	AC 230 V, 50 Hz		
Test facility	Shielded room		
Date	2021-04-01		
Temperature (°C)	21.8 °C	Humidity (% R.H.)	40.5 % R.H.
Remarks	Pass		

6.1.1 Limits of disturbance voltages measurement

 Mains terminals

Frequency	Limits dB(μ V) ^a	
	Quasi-peak	Average
9 kHz ~ 50 kHz	110	-
50 kHz ~ 150 kHz	90 ~ 80 ^b	-
150 kHz ~ 0.5 MHz	66 ~ 56 ^b	56 ~ 46 ^b
0.5 MHz ~ 5 MHz	56 ^c	46 ^c
5 MHz ~ 30 MHz	60	50

^a At the transition frequency, the lower limit applies.

^b The limit decreases linearly with the logarithm of the frequency in the ranges
50 kHz - 150 kHz and 150 kHz - 0.5 MHz

^c For electrode less lamps and luminaries, the limit in the frequency range of
2.51 MHz - 3.0 MHz is 73 dB(μ V) quasi-peak and 63 dB(μ V) average

 Load terminals

Frequency [MHz]	Limits dB(μ V) ^a	
	Quasi-peak	Average
0.15 ~ 0.5	80	70
0.5 ~ 30	74	64

^a At the transition frequency, the lower limit applies.

Control terminals

Frequency [MHz]	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.50	84 ~ 74	74 ~ 64
0.5 ~ 30	74	64

Note #1 The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz

Note #2 The voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which Presents a common mode(asymmetric mode) impedance of 15 Ω to the control terminal .

6.1.2 Measurement procedure

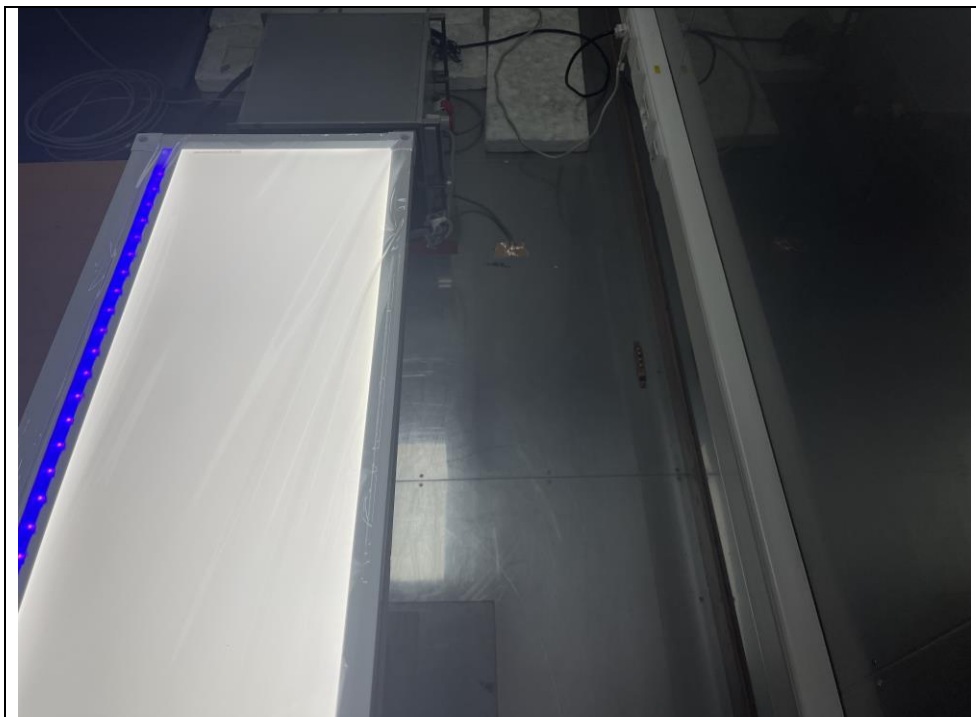
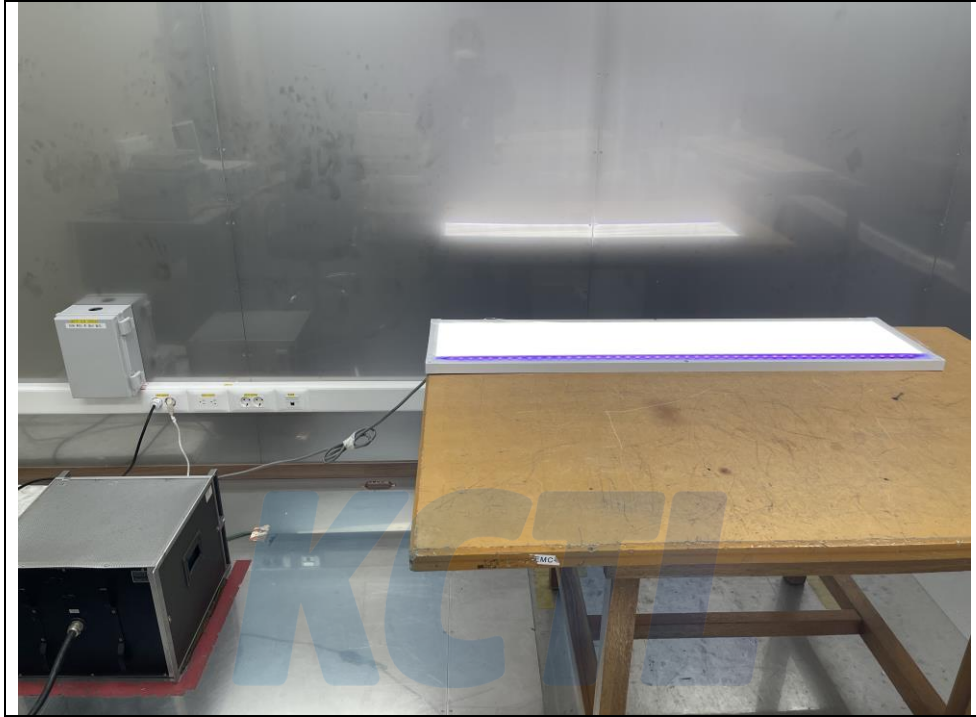
The measurements were performed in a shielded room. EUT was setup as shown in photograph and placed on a non-metallic table height of 0.8 m above the reference ground plane. The rear of table was located 0.4 m to the vertical conducted plane. EUT was power through the LISN, which was bonded to the ground plane. The LISN power was filtered. Each EUT power lead, except ground (safety) lead was individually connected through a LISN to input power source. EUT signal cables that hung closer than 0.4 m to the Horizontal metal ground 0.3 m ~ 0.4 m long. The power cord was bundles in the center. All peripheral equipment was powered from a sub LISN. The LISN and ISN were positioned 0.8 m from the EUT. Peak and Average detection were used in preliminary testing and Quasi-peak and Average detections were used at final measurement.

6.1.3 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Test Receiver	ESCI	100561	Rohde & Schwarz	2021-09-18	<input checked="" type="checkbox"/>
Artificial Mains Network	NSLK8128	8128144	Schwarzbeck	2021-06-19	<input checked="" type="checkbox"/>
LOCAL SWITCH MODULE	ESLSM9K2 00M	1810001	EMC SOLUTIONS	2021-09-17	<input checked="" type="checkbox"/>

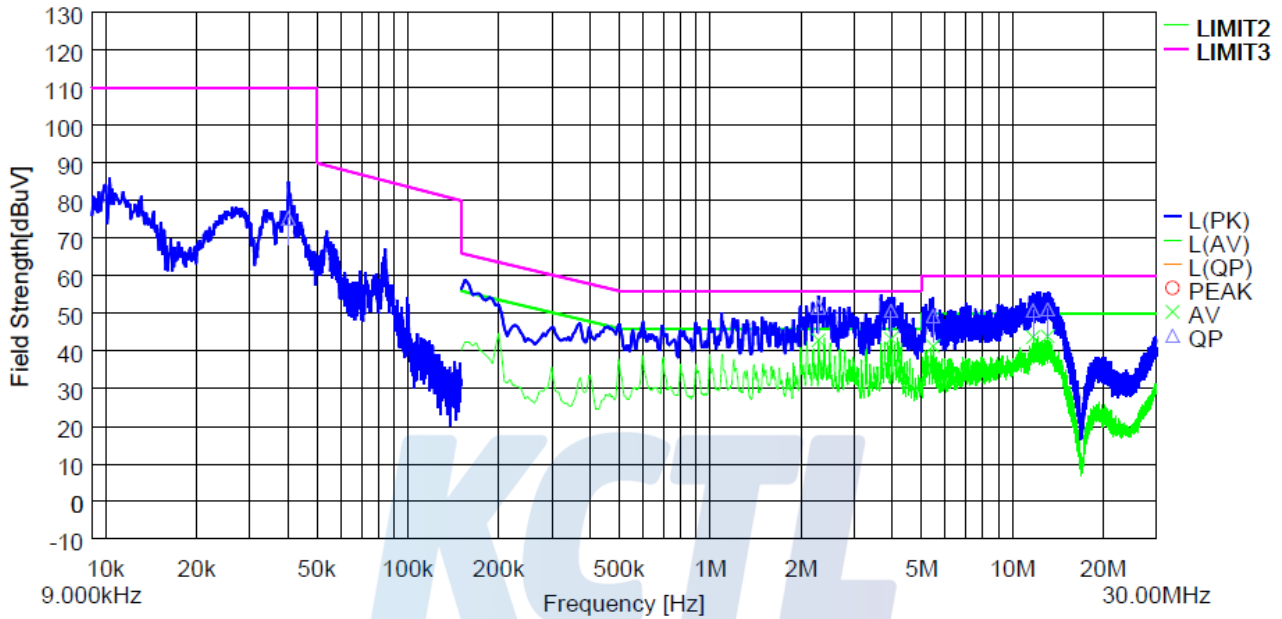
6.1.4 Photographs of test setup

Mains terminals



6.1.5 Disturbance Voltages measurement result

Mains terminals



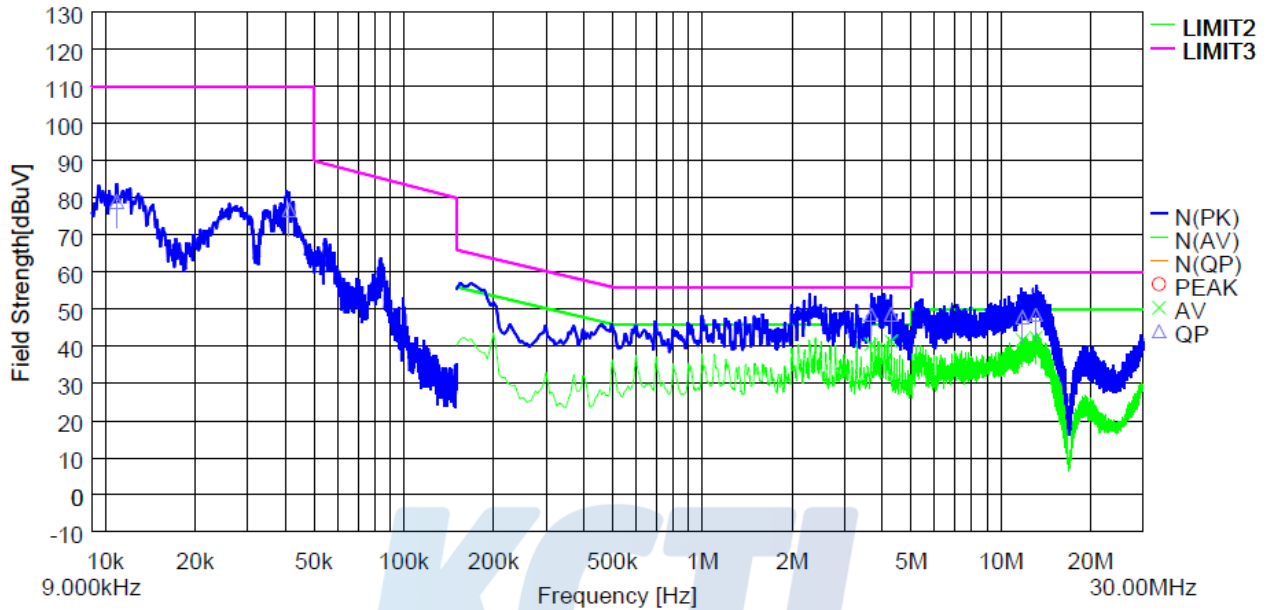
Freq.	Mode	Level			Factor			PEAK	CAV	QP	Limit			Margin		
		PEAK	CAV	QP	LISN	Loss	Gain				PEAK	CAV	QP	PEAK	CAV	QP
[MHz]		[dBuV]			[dB]			[dBuV]			[dBuV]			[dB]		
0.04020	L	---	---	64.92	0.22	10.17	0.00	---	---	75.31	---	---	10.00	---	---	34.69
2.28300	L	---	32.69	41.52	0.12	10.09	0.00	---	42.90	51.73	---	46.00	56.00	---	3.10	4.27
3.97050	L	---	32.97	40.40	0.15	10.12	0.00	---	43.24	50.67	---	46.00	56.00	---	2.76	5.33
5.46000	L	---	31.02	38.99	0.17	10.14	0.00	---	41.33	49.30	---	50.00	60.00	---	8.67	10.70
11.71000	L	---	33.22	40.29	0.29	10.23	0.00	---	43.73	50.80	---	50.00	60.00	---	6.27	9.20
13.10050	L	---	33.37	40.57	0.30	10.23	0.00	---	43.90	51.10	---	50.00	60.00	---	6.10	8.90

[L]

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Freq.	Mode	Level			Factor			PEAK	CAV	QP	Limit			Margin		
		PEAK	CAV	QP	LISN	Loss	Gain				PEAK	CAV	QP	PEAK	CAV	QP
[MHz]		[dBuV]			[dB]			[dBuV]			[dB]					
0.01090	N	---	---	66.48	0.74	11.87	0.00	---	---	79.10	---	---	10.00	---	---	30.90
0.04120	N	---	---	66.40	0.25	10.17	0.00	---	---	76.82	---	---	10.00	---	---	33.18
3.67800	N	---	30.29	38.28	0.15	10.11	0.00	---	40.55	48.54	---	46.00	56.00	---	5.45	7.46
4.29000	N	---	31.14	38.39	0.15	10.12	0.00	---	41.42	48.67	---	46.00	56.00	---	4.58	7.33
11.81800	N	---	31.19	37.35	0.29	10.23	0.00	---	41.70	47.86	---	50.00	60.00	---	8.30	12.14
13.11400	N	---	31.85	37.95	0.30	10.23	0.00	---	42.38	48.48	---	50.00	60.00	---	7.62	11.52

[N]

6.2 Radiated Electromagnetic disturbance

Testing voltage	AC 230 V, 50 Hz		
Test facility	Shielded room		
Date	2021-04-05		
Temperature (°C)	19.2 °C	Humidity (% R.H.)	40.3 % R.H.
Remarks	Pass		

6.2.1 Limits of radiated electromagnetic disturbance measurement

Frequency	Limits for loop diameter dB(μ A) ^a		
	2 m	3 m	4 m
9 kHz ~ 70 kHz	88	81	75
70 kHz ~ 150 kHz	88 ~ 58 ^b	81 ~ 51 ^b	75 ~ 45 ^b
150 kHz ~ 3.0 MHz	58 ~ 22 ^b	51 ~ 15 ^b	49 ~ 9 ^b
3.0 MHz ~ 30 MHz	22	15 ~ 16 ^c	9 ~ 12 ^c

^a At the transition frequency, the lower limit applies.

^b Decreasing linearly with the logarithm of the frequency. For electrode less lamps and luminaries, the limit in the frequency range of 2.2 MHz ~ 3.0 MHz is 58 dB(μ A) for 2 m, 51 dB(μ A) for 3 m, and 45 dB(μ A) for 4 m loop diameter.

^c Increasing linearly with the logarithm of the frequency.

$$\text{Margin(dB)} = \text{Limit(dB}(\mu\text{A)}) - \text{QuasiPeak(dB}(\mu\text{A)})$$

Note

Although the kind and length of the cable that described in section 5.3.3.3 have to be stated to apply "b", but we didn't go through above procedure because our customer asked us to do not fill them in.

6.2.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
EMI TEST RECEIVER	ESCS30	828985/023	Rohde & Schwarz	2021-09-18	<input checked="" type="checkbox"/>
Triple loop Antenna	HXYZ 9170	9170-231	Schwarzbeck	-	<input checked="" type="checkbox"/>

- Triple loop antenna is self-checked every year to ensure validity.

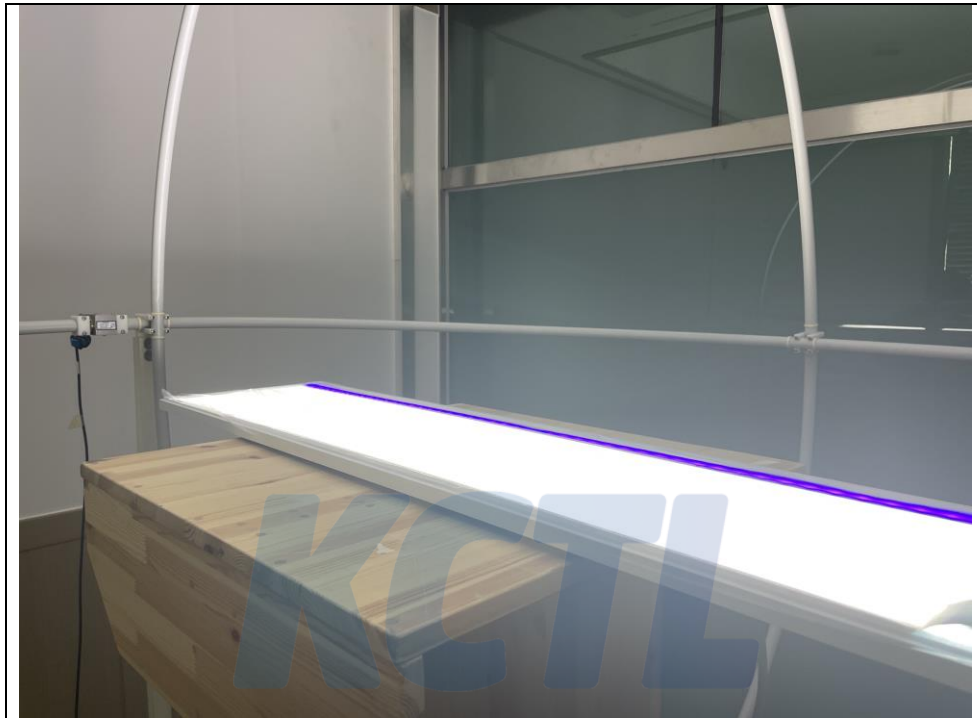
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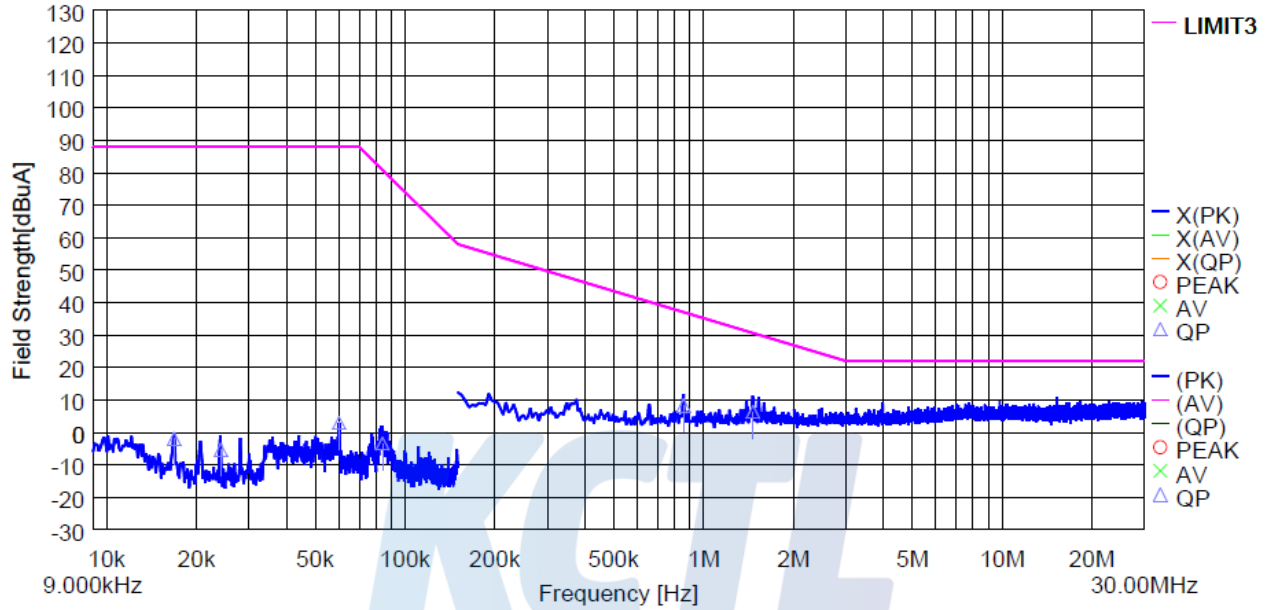


6.2.3 Photographs of test setup



6.2.4 Radiated Electromagnetic disturbance result

Graph and Data



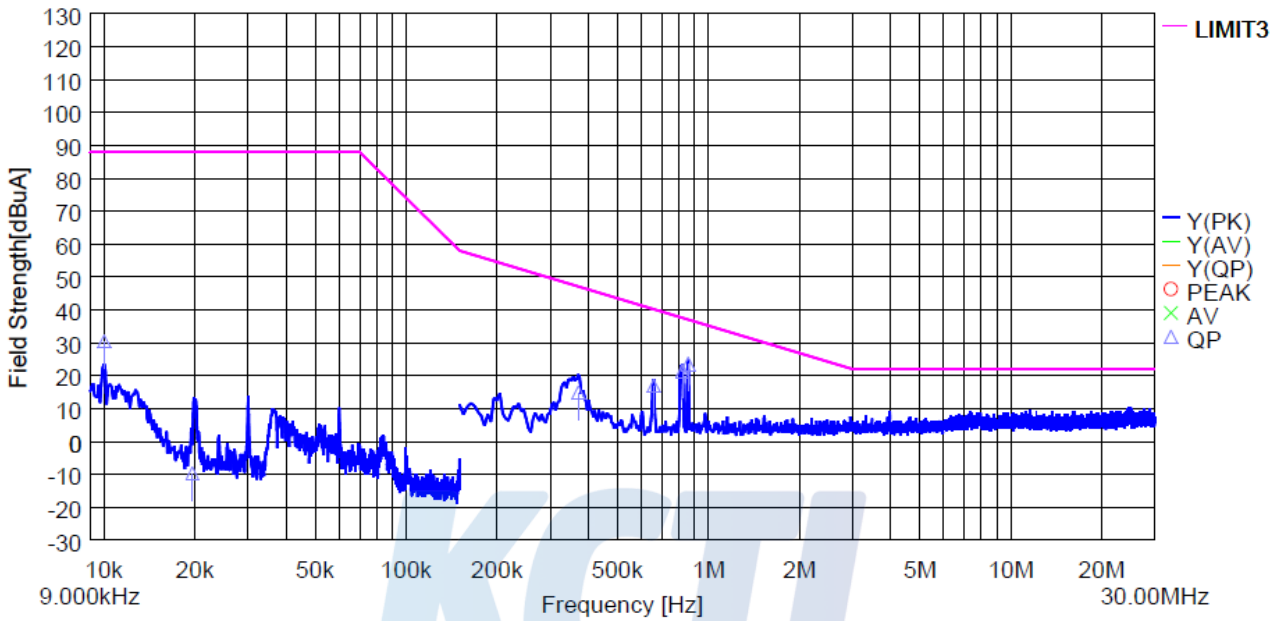
Freq.	Mode	Level			Factor			PEAK	CAV	QP	Limit			Margin		
		PEAK	CAV	QP	Ant.	Loss	Gain				PEAK	CAV	QP	PEAK	CAV	QP
[MHz]		[dBuV]			[dB]			[dBuA]			[dBuA]			[dB]		
0.01680	X	---	---	-1.98	0.00	0.02	0.00	---	---	-1.96	---	---	88.00	---	---	89.96
0.02410	X	---	---	-5.39	0.00	0.02	0.00	---	---	-5.37	---	---	88.00	---	---	93.37
0.06000	X	---	---	2.93	0.00	0.03	0.00	---	---	2.96	---	---	88.00	---	---	85.04
0.08390	X	---	---	-3.47	0.00	0.02	0.00	---	---	-3.45	---	---	80.87	---	---	84.32
0.85650	X	---	---	8.44	0.00	0.02	0.00	---	---	8.46	---	---	37.06	---	---	28.60
1.46400	X	---	---	6.29	0.00	0.06	0.00	---	---	6.35	---	---	30.62	---	---	24.27

[X]

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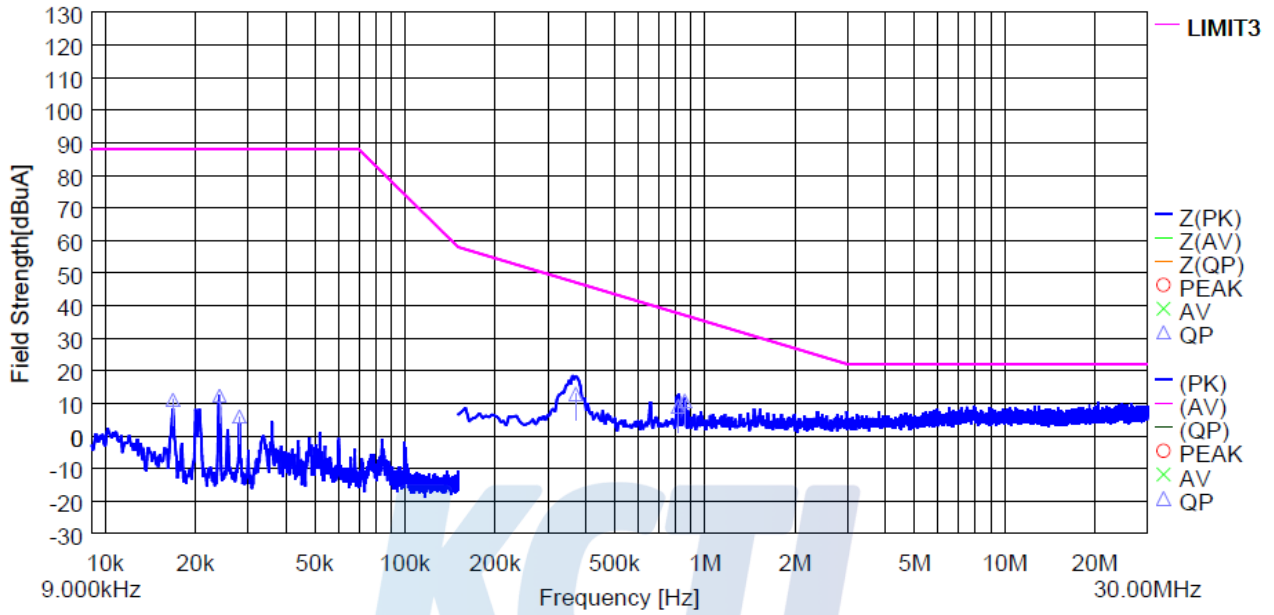
Freq.	Mode	Level			Factor			PEAK	CAV	QP	Limit			Margin		
		PEAK	CAV	QP	Ant.	Loss	Gain				PEAK	CAV	QP	PEAK	CAV	QP
[MHz]		[dBuV]			[dB]			[dBuA]			[dBuA]			[dB]		
0.01000	Y	---	---	30.35	0.00	0.04	0.00	---	---	30.39	---	---	88.00	---	---	57.61
0.01960	Y	---	---	-9.68	0.00	0.01	0.00	---	---	-9.67	---	---	88.00	---	---	97.67
0.37050	Y	---	---	14.80	0.00	0.05	0.00	---	---	14.85	---	---	47.13	---	---	32.28
0.65850	Y	---	---	16.88	0.00	0.02	0.00	---	---	16.90	---	---	40.22	---	---	23.32
0.82050	Y	---	---	21.47	0.00	0.02	0.00	---	---	21.49	---	---	37.58	---	---	16.09
0.85650	Y	---	---	23.51	0.00	0.02	0.00	---	---	23.53	---	---	37.06	---	---	13.53

[Y]

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Freq.	Mode	Level			Factor			PEAK	CAV	QP	Limit			Margin		
		PEAK	CAV	QP	Ant.	Loss	Gain				PEAK	CAV	QP	PEAK	CAV	QP
[MHz]		[dBuV]			[dB]			[dBuA]			[dBuA]			[dB]		
0.01680	Z	---	---	11.06	0.00	0.02	0.00	---	---	11.08	---	---	88.00	---	---	76.92
0.02400	Z	---	---	12.28	0.00	0.02	0.00	---	---	12.30	---	---	88.00	---	---	75.70
0.02800	Z	---	---	5.88	0.00	0.03	0.00	---	---	5.91	---	---	88.00	---	---	82.09
0.37050	Z	---	---	12.84	0.00	0.05	0.00	---	---	12.89	---	---	47.13	---	---	34.24
0.81600	Z	---	---	9.13	0.00	0.02	0.00	---	---	9.15	---	---	37.65	---	---	28.50
0.85650	Z	---	---	10.81	0.00	0.02	0.00	---	---	10.83	---	---	37.06	---	---	26.23

[Z]

6.3 Radiated Emissions

Testing voltage	AC 230 V, 50 Hz		
Test facility	10 m Chamber		
Test distance	10 m		
Date	2021-04-02		
Temperature (°C)	21.5 °C	Humidity (% R.H.)	41.1 % R.H.
Remarks	Pass		

6.3.1 Limits of radiated emissions measurement

Frequency [MHz]	Quasi-peak limits (dB(μ V/m))
30 ~ 230	30
230 ~ 300	37

At the transition frequency, the lower limit applies.

6.3.2 Measurement procedure

The test was done at a 10 m Chamber with a quasi-peak detector. EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane. Cables were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m 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

Equipment	Model no.	Serial no.	Makers	Next Cal. Date	Used
Test Receiver	ESCI	100561	Rohde & Schwarz	2021-09-18	<input checked="" type="checkbox"/>
BI-LOG Ant.	CBL6112D	55442	Teseq GmbH	2021-12-27	<input checked="" type="checkbox"/>
Amplifier	310N	185938	SONOMA	2021-12-29	<input checked="" type="checkbox"/>

6.3.4 Sample calculation

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follow:

$$\text{Result QP}[\text{dB}(\mu\text{V}/\text{m})] = \text{Reading QP}[\text{dB}(\mu\text{V})] + \text{C.Fac} [\text{dB}/\text{m}]$$

Result QP : The final measure

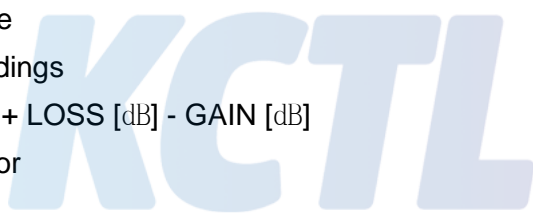
Reading QP : Instrument readings

$$\text{C.Fac} : \text{ANT FACTOR} [\text{dB}/\text{m}] + \text{LOSS} [\text{dB}] - \text{GAIN} [\text{dB}]$$

ANT FACTOR: Antenna Factor

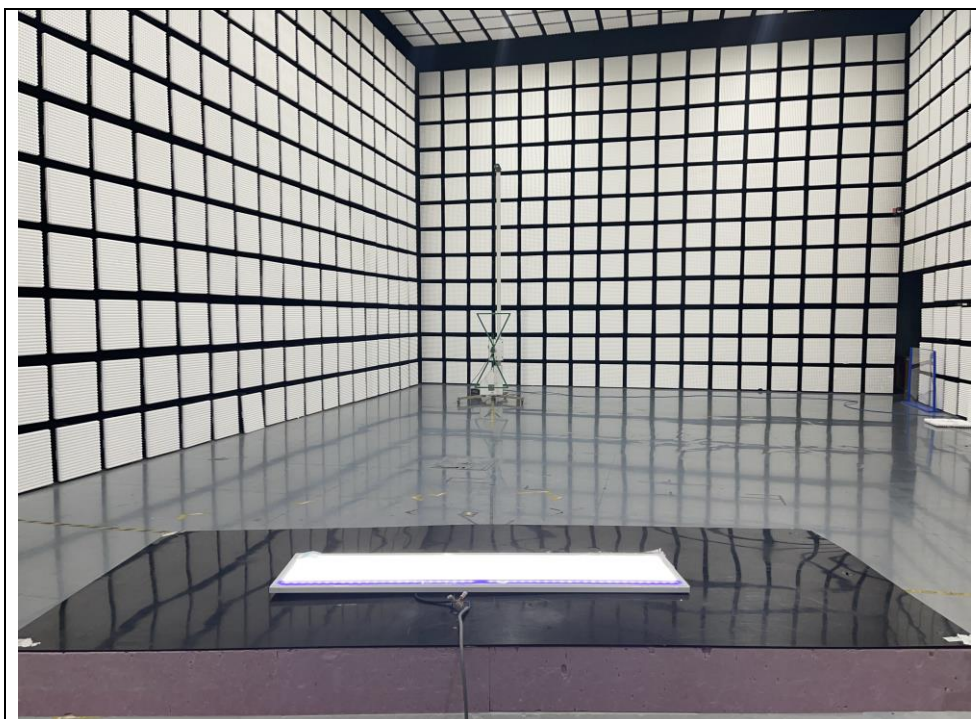
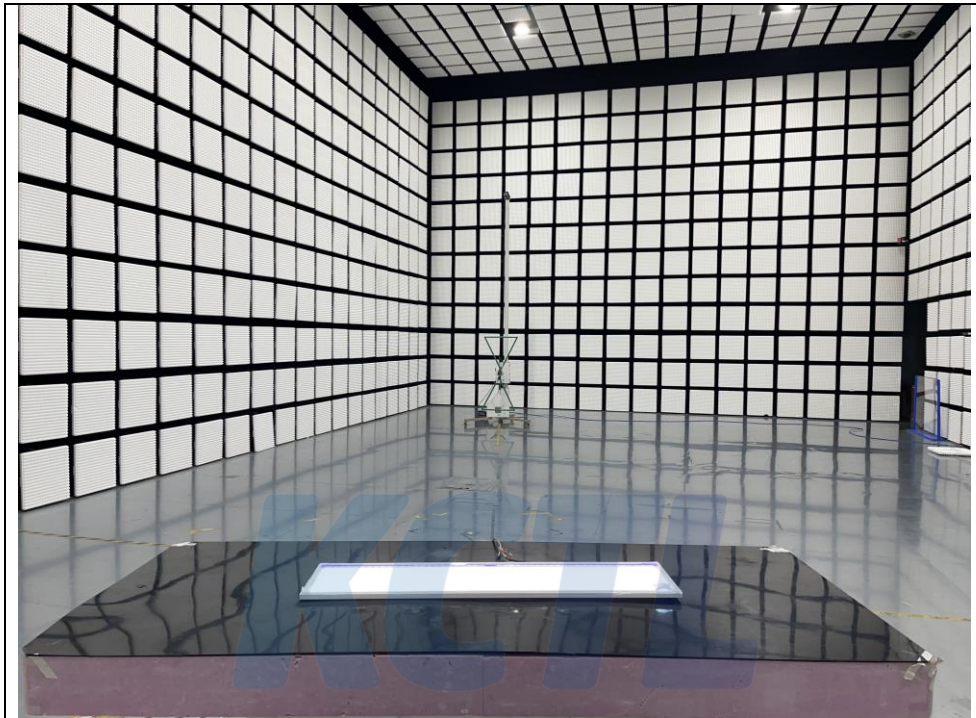
LOSS: Cable Loss

GAIN: Amplifier Gain



6.3.5 Photographs of test setup

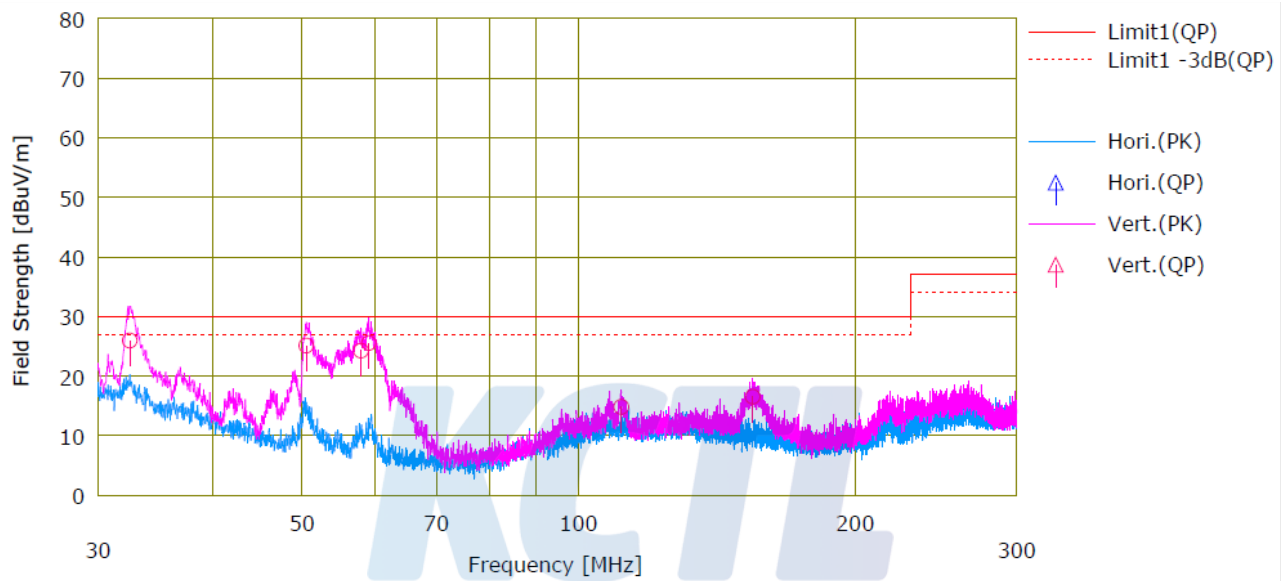
30 MHz - 300 MHz



6.3.6 Radiated emissions measurement result

Graph and Data

30 MHz - 300 MHz



No.	Freq. [MHz]	Leading	C.Fac	Result	Limit	Margin	Pola.	Height [cm]	Angle [deg]	Ant. Type	Comment
		<QP> [dBuV]		<QP> dBuV/m	<QP> dBuV/m	<QP> [dB]					
1	32.501	33.68	-7.76	25.92	30.00	4.08	Vert.	214	46	BI LO	
2	50.586	42.10	-16.99	25.11	30.00	4.89	Vert.	122	2	BI LO	
3	58.031	43.01	-18.78	24.23	30.00	5.77	Vert.	109	274	BI LO	
4	59.160	44.38	-18.85	25.53	30.00	4.47	Vert.	154	225	BI LO	
5	111.354	28.12	-13.30	14.82	30.00	15.18	Vert.	176	30	BI LO	
6	154.875	30.74	-14.22	16.52	30.00	13.48	Vert.	245	355	BI LO	

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6.4 Harmonics

Testing voltage	AC 230 V, 50 Hz				
Test facility	Shield Room				
Date	2021-04-01				
Temperature(°C)	21.8 °C	Humidity (% R.H.)	40.5 % R.H	Pressure (kPa)	100.8 kPa
Remarks	Pass				

6.4.1 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.

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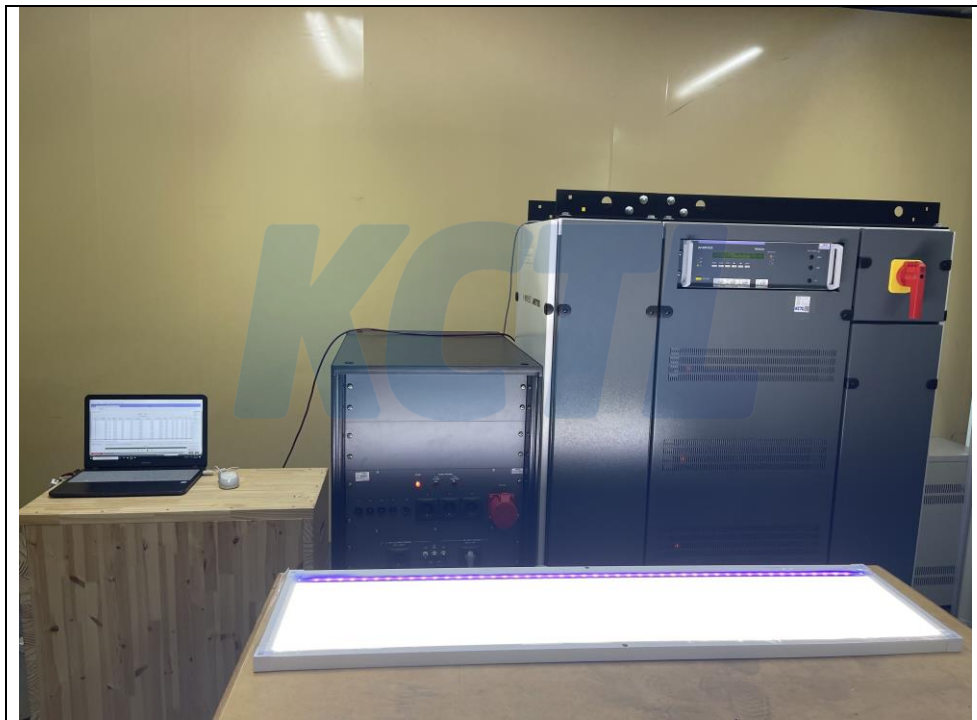
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6.4.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
AC/DC Power Source	Netwave 30.5	P2020240957	EM TEST	2021-07-02	<input checked="" type="checkbox"/>
DPA 503N	DPA 503N	P2014240512	EM TEST	2021-07-02	<input checked="" type="checkbox"/>

6.4.3 Photographs of test setup



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6.4.4 Measurement result

Test Report			
Report Number :	KP21-01572		
Test Standard :	IEC 61000-3-2 (Edition 5) Limits for harmonic current emissions (equipment input current < 16 A per phase)		
Tester :	KIM JEONG WON		
Test Date :	4/1/2021 3:23:55 PM		
Result			
E.U.T. :	PASS	Source :	PASS
Software			
Name :	net.control	Version :	3.0.5.0
Measures & Analysis			
Measure Window :	10 periods	Voltage Range :	500 V
Refresh Interval :	2 s	Current Range :	200 A
Sampling Rate :	6.4 kS/s		
Scaled Window :	Rectangular		
Accordinging :	IEC 61000-3-2 (Edition 5) Limits for harmonic current emissions (equipment input current < 16 A per phase)		
Measure Results			
Standard Specific Results for IEC 61000-3-2 (Edition 5)			
Standard Group:	Industry		
Standard Name:	IEC 61000-3-2 (Edition 5) Limits for harmonic current emissions (equipment input current < 16 A per phase)		
Device Under Test:	PASS		
Power Source:	PASS		
Connection Type:	L - N		
Classification:	Class C (Rated power > 25 W, Table 2)		
Appli. of Limits:	less than or equal to 150 % (Without POHC Enhancement)		
Check Harmonics 2..40			
<i>First detected harmonic order > 150 %</i>			
Line 1:	None		

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<i>Harmonics orders > 150 %</i>									
Line 1:		None							
<i>Harmonics orders with average > 100 %</i>									
Line 1:		None							
Measured values									
<i>Fundamental Current</i>									
Line 1:		1.552 A							
<i>Active input Power</i>									
Line 1:		345.156 W *							
<i>Circuit power factor</i>									
Line 1:		0.963 *							
* Absolute value.									
Current Test Result									
Average and Maximum harmonic current results									
Hn	Average				Maximum				Harmonic Result
	I _{eff} [%]	of Limit [%]	Limit [%]	Result	I _{eff} [%]	of Limit [%]	Limit [%]	Result	
1	99.974				100.003				
2	0.112	5.603	2.000	n/a	0.127	4.228	3.000	n/a	n/a
3	6.737	23.313	28.899	PASS	6.753	15.579	43.348	PASS	PASS
4	0.091				0.103				
5	4.214	42.139	10.000	PASS	4.233	28.218	15.000	PASS	PASS
6	0.081				0.089				
7	4.751	67.876	7.000	PASS	4.767	45.395	10.500	PASS	PASS
8	0.075				0.085				
9	1.932	38.644	5.000	PASS	1.941	25.878	7.500	PASS	PASS
10	0.073				0.080				
11	1.560	52.014	3.000	PASS	1.573	34.958	4.500	PASS	PASS
12	0.071				0.078				
13	1.251	41.701	3.000	PASS	1.262	28.053	4.500	PASS	PASS
14	0.074				0.081				
15	0.728	24.262	3.000	PASS	0.738	16.410	4.500	PASS	PASS
16	0.071				0.077				
17	0.357	11.892	3.000	n/a	0.367	8.164	4.500	n/a	n/a
18	0.071				0.080				
19	0.417	13.899	3.000	n/a	0.427	9.483	4.500	n/a	n/a
20	0.069				0.078				

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21	0.606	20.209	3.000	PASS	0.616	13.684	4.500	PASS	PASS
22	0.071				0.080				
23	0.801	26.708	3.000	PASS	0.812	18.044	4.500	PASS	PASS
24	0.074				0.081				
25	0.577	19.238	3.000	n/a	0.589	13.081	4.500	n/a	n/a
26	0.074				0.084				
27	0.345	11.492	3.000	n/a	0.356	7.920	4.500	n/a	n/a
28	0.070				0.078				
29	0.390	13.010	3.000	n/a	0.402	8.931	4.500	n/a	n/a
30	0.070				0.078				
31	0.319	10.634	3.000	n/a	0.331	7.358	4.500	n/a	n/a
32	0.072				0.082				
33	0.120	4.003	3.000	n/a	0.128	2.854	4.500	n/a	n/a
34	0.071				0.080				
35	0.293	9.763	3.000	n/a	0.302	6.703	4.500	n/a	n/a
36	0.076				0.084				
37	0.327	10.907	3.000	n/a	0.338	7.507	4.500	n/a	n/a
38	0.080				0.089				
39	0.116	3.861	3.000	n/a	0.125	2.776	4.500	n/a	n/a
40	0.078				0.088				

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	229.780	99.904		
2	0.191	0.083	0.200	PASS
3	0.059	0.026	0.900	PASS
4	0.076	0.033	0.200	PASS
5	0.059	0.026	0.400	PASS
6	0.049	0.021	0.200	PASS
7	0.053	0.023	0.300	PASS
8	0.037	0.016	0.200	PASS
9	0.049	0.021	0.200	PASS
10	0.031	0.013	0.200	PASS
11	0.039	0.017	0.100	PASS
12	0.026	0.011	0.100	PASS
13	0.027	0.012	0.100	PASS
14	0.022	0.009	0.100	PASS

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15	0.021	0.009	0.100	PASS
16	0.019	0.008	0.100	PASS
17	0.015	0.006	0.100	PASS
18	0.017	0.008	0.100	PASS
19	0.017	0.008	0.100	PASS
20	0.018	0.008	0.100	PASS
21	0.015	0.007	0.100	PASS
22	0.022	0.009	0.100	PASS
23	0.020	0.009	0.100	PASS
24	0.023	0.010	0.100	PASS
25	0.015	0.007	0.100	PASS
26	0.019	0.008	0.100	PASS
27	0.014	0.006	0.100	PASS
28	0.014	0.006	0.100	PASS
29	0.014	0.006	0.100	PASS
30	0.009	0.004	0.100	PASS
31	0.018	0.008	0.100	PASS
32	0.008	0.004	0.100	PASS
33	0.013	0.006	0.100	PASS
34	0.010	0.004	0.100	PASS
35	0.017	0.008	0.100	PASS
36	0.014	0.006	0.100	PASS
37	0.011	0.005	0.100	PASS
38	0.014	0.006	0.100	PASS
39	0.013	0.006	0.100	PASS
40	0.011	0.005	0.100	PASS

6.5 Voltage Fluctuations and Flickers

Testing voltage	AC 230 V, 50 Hz				
Test facility	Shield Room				
Date	2021-04-01				
Temperature(°C)	21.8 °C	Humidity (% R.H.)	40.5 % R.H	Pressure (kPa)	100.8 kPa
Remarks	Pass				

6.5.1 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.

$$P_{lt} = 2 \text{ h}$$

$$P_{st} = 10 \text{ min}$$

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.

6.5.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
AC/DC Power Source	Netwave 30.5	P2020240957	EM TEST	2021-07-02	<input checked="" type="checkbox"/>
DPA 503N	DPA 503N	P2014240512	EM TEST	2021-07-02	<input checked="" type="checkbox"/>

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6.5.3 Photographs of test setup



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6.5.4 Measurement result

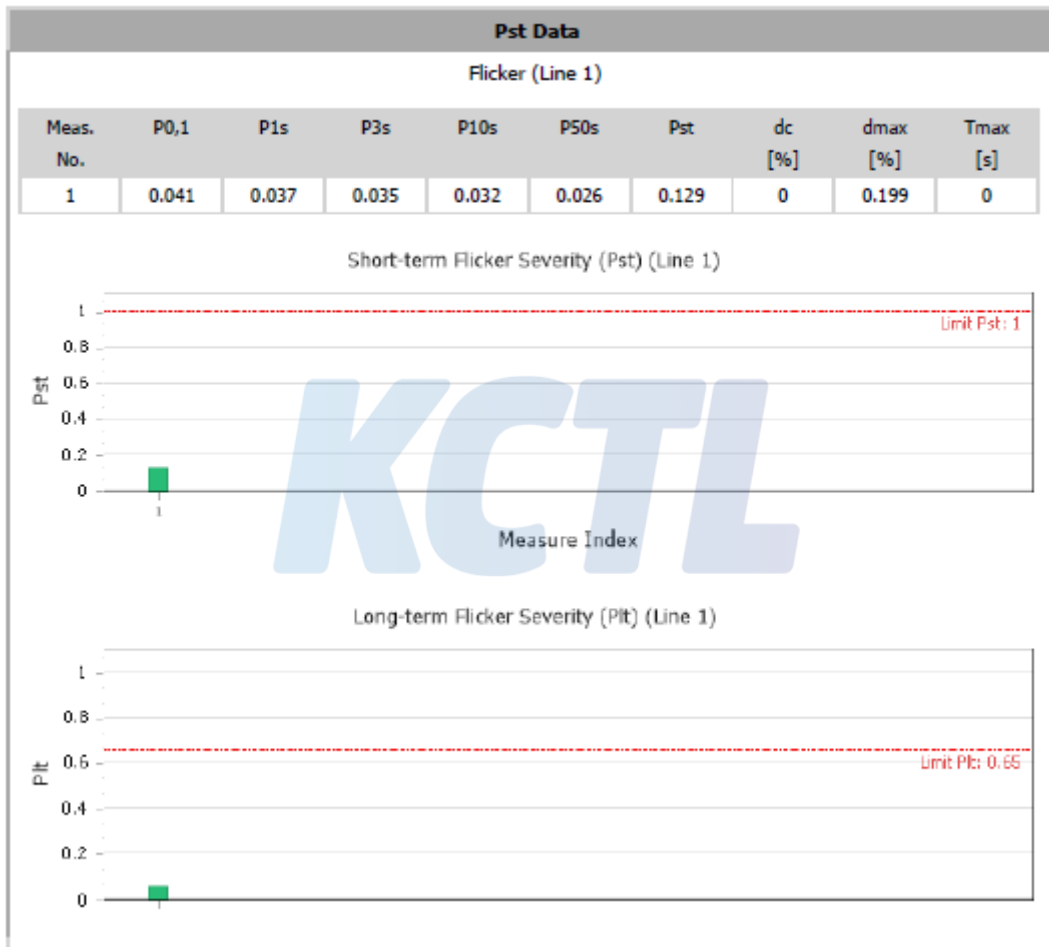
Test Report					
Report Number :	KP21-01572				
Test Standard :	IEC 61000-3-3 (Edition 3) Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection				
Tester :	KIM JEONG WON				
Test Date :	4/1/2021 2:46:35 PM				
Result					
E.U.T. :	Test passed				
Software					
Name :	net.control				
Version :	3.0.5.0				
Flicker Results					
Standard Specific Results for IEC 61000-3-3 (Edition 3)					
Standard Group:	Industry				
Standard Name:	IEC 61000-3-3 (Edition 3) 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:	1 x 10 min				
Measurements done:	1				
Flicker Measurements					
	P _{It}	Max P _{It}	Max D _c	Max D _{max}	Max T _{max}
Line 1:	0.056	0.129	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

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6.6 Electrostatic Discharge

Test level	<input checked="" type="checkbox"/> Contact: ± 4 kV <input checked="" type="checkbox"/> Air: ± 2 kV, ± 4 kV, ± 8 kV <input checked="" type="checkbox"/> HCP: ± 4 kV <input checked="" type="checkbox"/> VCP: ± 4 kV				
Discharge impedance	330 Ω / 150 pF				
Number of discharge (Each polarity)	<input checked="" type="checkbox"/> Contact: 10 <input checked="" type="checkbox"/> Air: 10 <input checked="" type="checkbox"/> HCP / VCP: 10				
Interval between discharges	1 s				
Testing voltage	AC 230 V, 50 Hz				
Test facility	Shielded room				
Date	2021-04-07				
Temperature(°C)	22.3 °C	Humidity (% R.H.)	42.5 % R.H.	Pressure (kPa)	101.1 kPa
Remarks	Pass - A: There was no change of operation status during above testing.				

6.6.1 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 0.8 m above the reference grounded floor. A horizontal coupling plane (HCP) was placed on the table, and Connected to the reference plane via a 470 kΩ resistor located in each end (0.5 mm insulating support between EUT and HCP). In both cases a vertical coupling plane(VCP) OF 0.5 X 0.5 m was located 0.1 m from the EUT's sides. The VCP was connected to the reference plane in the same matter as the HCP.

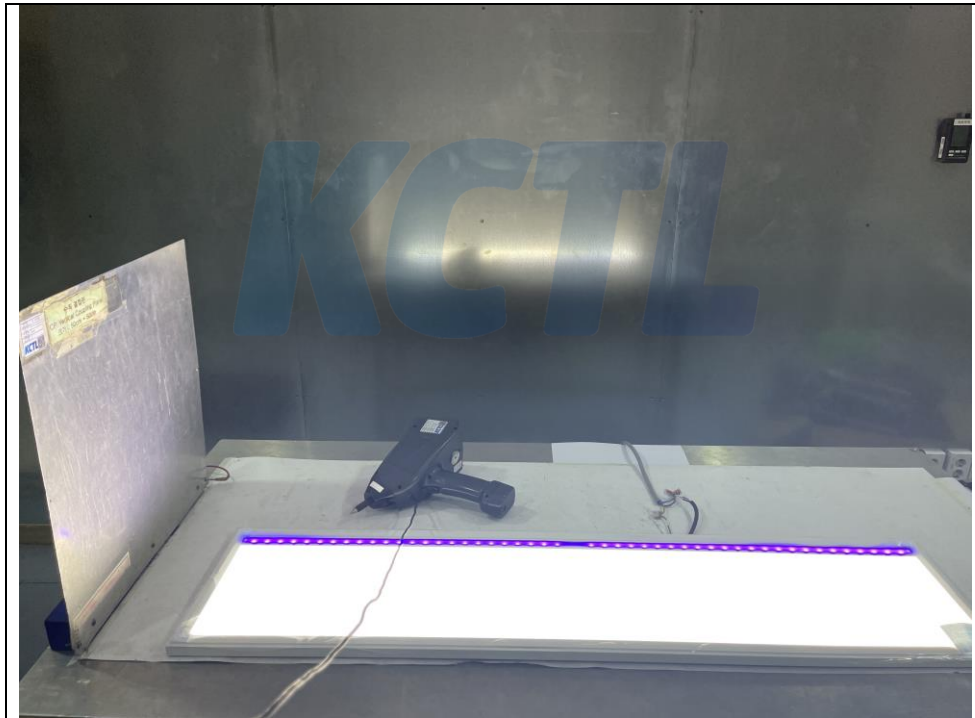
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KCTL**6.6.2 Used equipments**

Equipment	Model No.	Serial No.	Makers	Next Cal. Date	Used
ESD SIMULATOR	ONYX30	179461	HAEFELY	2022-02-23	<input checked="" type="checkbox"/>
HCP	-	-	-	-	<input checked="" type="checkbox"/>
VCP	-	-	-	-	<input checked="" type="checkbox"/>

6.6.3 Photographs of test setup

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6.6.4 Measurement result
Electrostatic Discharge (Test Point)

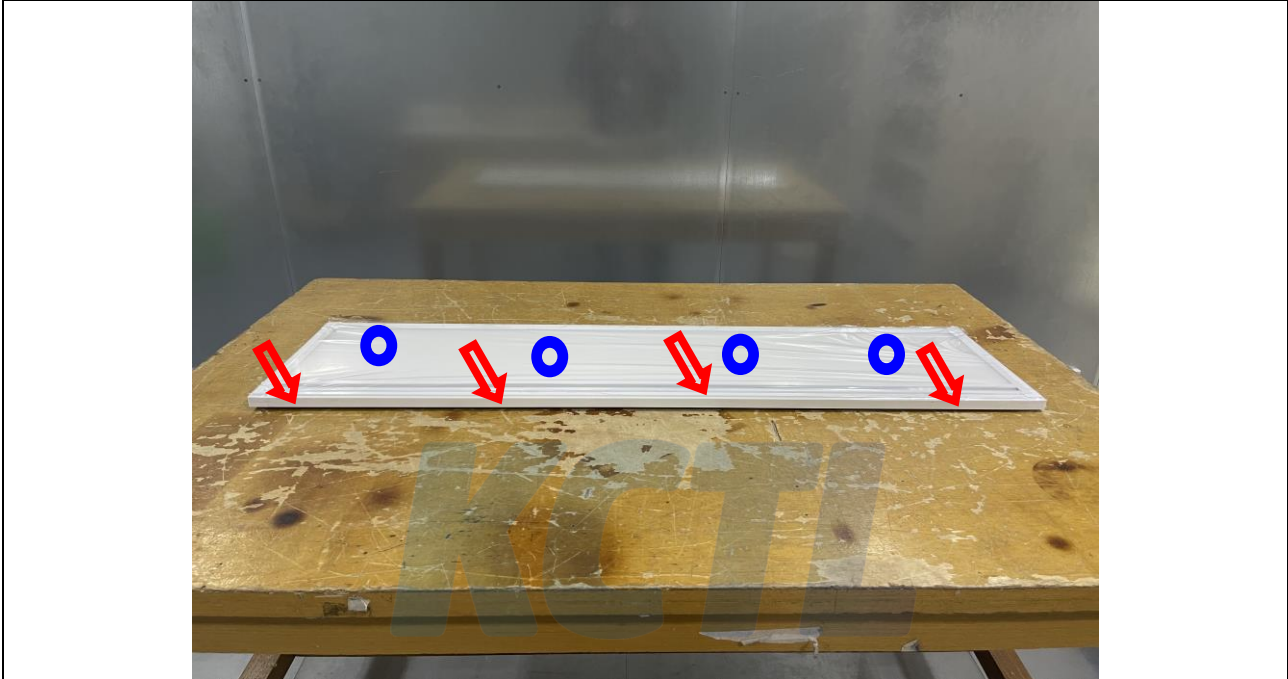
Air discharge



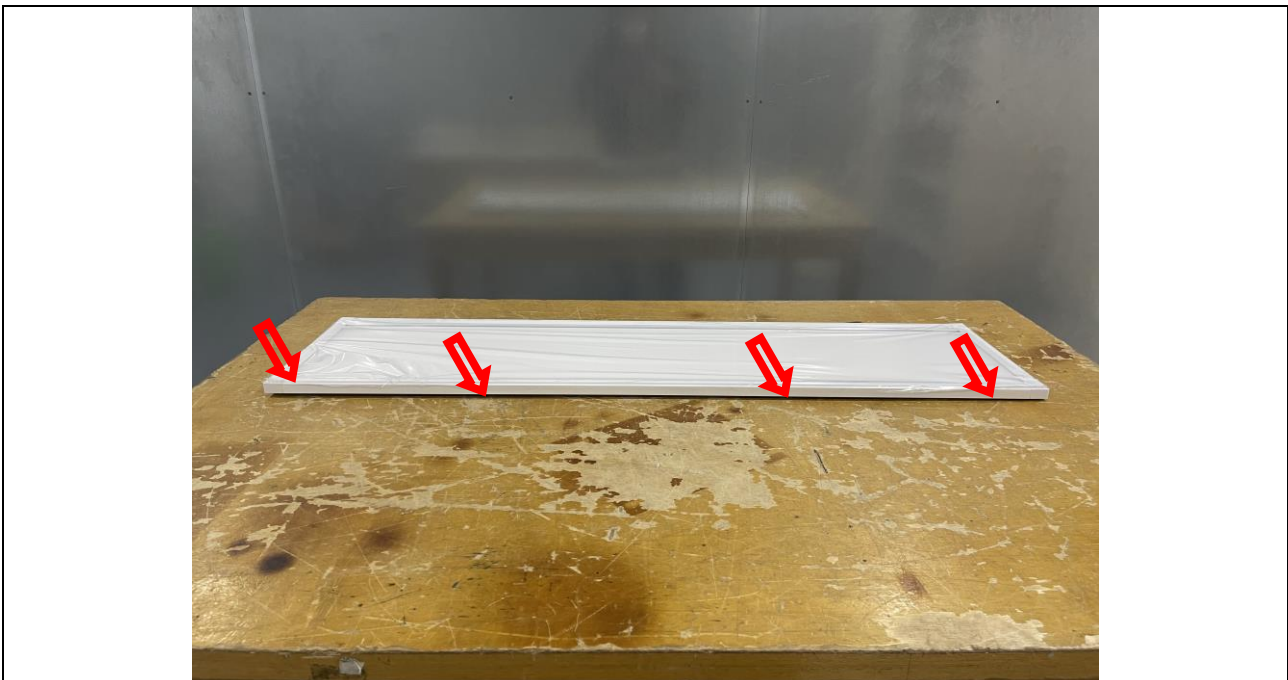
Contact discharge



[Front]



[Rear]



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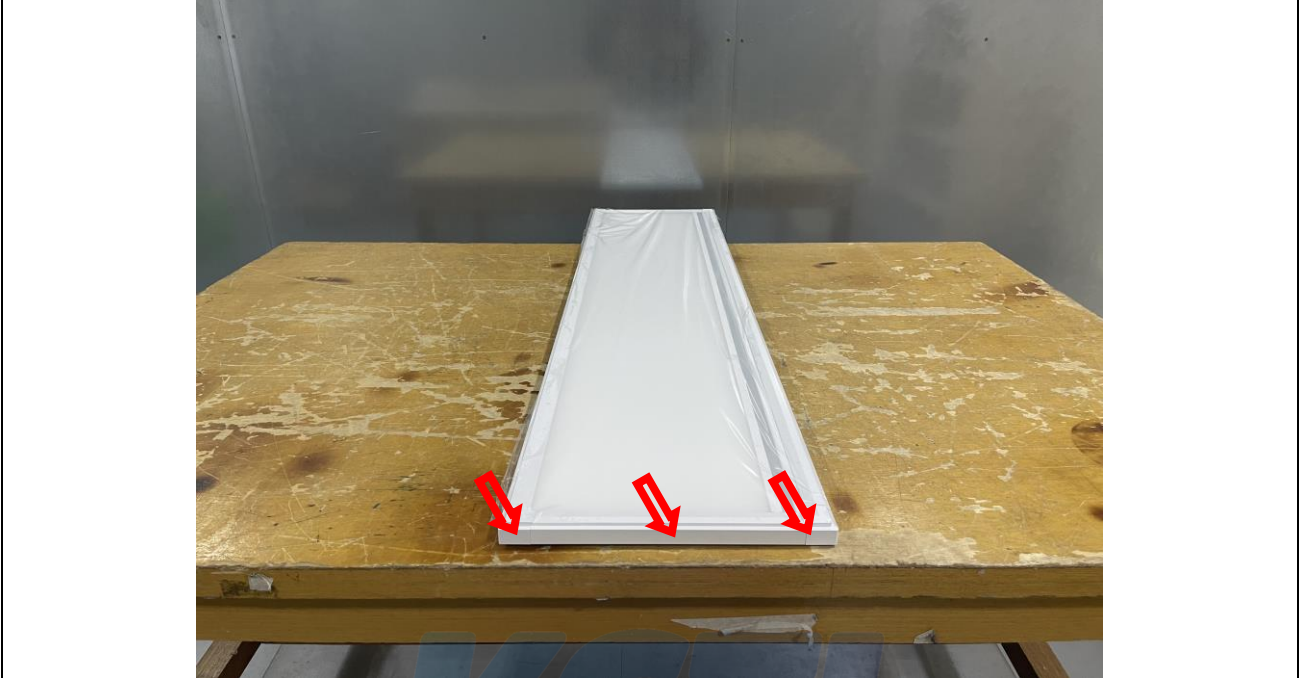
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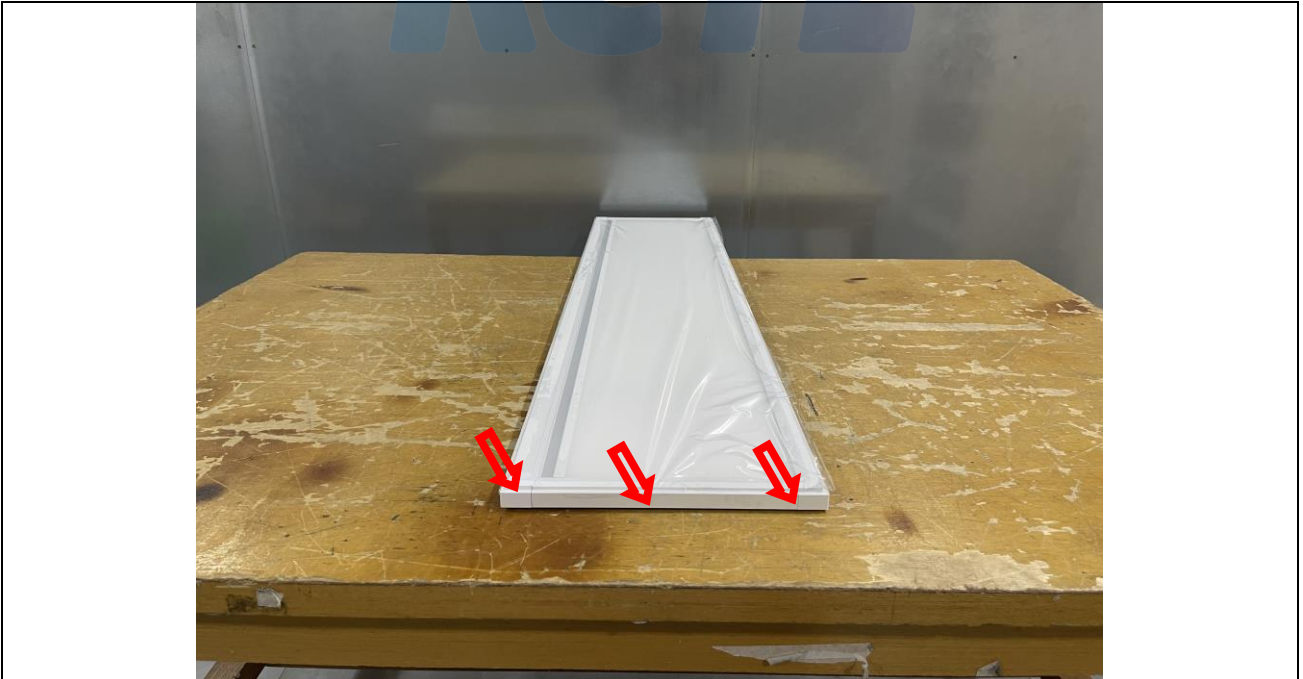
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[Left]



[Right]



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**HCP/VCP discharge**

Location(EUT)	Applied level (\pm)	Result
HCP (All 4 sides)	± 4 kV	A
VCP (All 4 sides)	± 4 kV	A

Contact discharge

Location(EUT)	Applied level (\pm)	Result
Front	± 4 kV	A
Rear	± 4 kV	A
Left	± 4 kV	A
Right	± 4 kV	A

Air discharge

Location(EUT)	Applied level (\pm)	Result
Front	± 2 kV, ± 4 kV, ± 8 kV	A
Rear	± 2 kV, ± 4 kV, ± 8 kV	-
Left	± 2 kV, ± 4 kV, ± 8 kV	-
Right	± 2 kV, ± 4 kV, ± 8 kV	-

Lux Meter

Before	After
248 Lux	250 Lux

6.7 Radiated Susceptibility

Tested frequency	80 MHz ~ 1 GHz				
Test level & Modulation	3 V/m, 80 % Amplitude Modulation (1 kHz)				
Frequency Step	1 % step				
Dwell time	1 s				
Distance	3 m from EUT to tip of antenna				
Testing Voltage	AC 230 V, 50 Hz				
Test facility	Fully anechoic chamber (3 m)				
Date	2021-04-05				
Temperature(°C)	21.1 °C	Humidity (% R.H.)	42.7 % R.H.	Pressure (kPa)	100.9 kPa
Remarks	Pass - A: There was no change of operation status during above testing.				

6.7.1 Measurement procedure

The test was performed at 3 m 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 0.8 m above the floor.

The EUT was tested all sides, horizontal and vertical polarization.

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6.7.2 Used equipments

Equipment	Model no.	Makers	Serial no.	Next Cal. date	Used
ESG VECTOR SIGNAL GENERATOR	E4438C	AGILENT	MY42080689	2021-09-17	<input checked="" type="checkbox"/>
Power Meter	NRVD	ROHDE&SCHWARZ	101176	2021-12-30	<input checked="" type="checkbox"/>
Power Sensor	NRV-Z51	ROHDE&SCHWARZ	100921	2021-12-30	<input checked="" type="checkbox"/>
Power Sensor	NRV-Z51	ROHDE&SCHWARZ	100922	2021-12-30	<input checked="" type="checkbox"/>
Power Amplifier	250W1000A	Amplifier Research	0330410	-	<input checked="" type="checkbox"/>
BiConiLog Antenna	3142E	ETS-LINDGREN	00224673	-	<input checked="" type="checkbox"/>
Directional Coupler	DC6180A	Amplifier Research	0352757	2022-02-18	<input checked="" type="checkbox"/>
RF RELAY MATRIX	RFM-S3A3C1LR	TSJ	04339	-	<input checked="" type="checkbox"/>

6.7.3 Photographs of test setup



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6.7.4 Measurement result

Location(EUT)	Antenna polarization	Result
Front side	Horizontal	A
	Vertical	A
Rear side	Horizontal	A
	Vertical	A
Left side	Horizontal	A
	Vertical	A
Right side	Horizontal	A
	Vertical	A

Lux Meter

Location(EUT)	Antenna polarization	Before	After
Front side	Horizontal	246 Lux	246 Lux
	Vertical	237 Lux	246 Lux
Rear side	Horizontal	241 Lux	252 Lux
	Vertical	236 Lux	237 Lux
Left side	Horizontal	239 Lux	241 Lux
	Vertical	241 Lux	248 Lux
Right side	Horizontal	240 Lux	247 Lux
	Vertical	240 Lux	237 Lux

6.8 Electric Fast Transient/Burst

Coupling	<input checked="" type="checkbox"/> AC main <input type="checkbox"/> DC Line <input type="checkbox"/> Control: Clamp <input type="checkbox"/> Telecommunication: Clamp				
Test level	<input checked="" type="checkbox"/> AC main: ± 1 kV Peak <input type="checkbox"/> DC Line: ± 0.5 kV Peak <input type="checkbox"/> Control: ± 0.5 kV Peak <input type="checkbox"/> Telecommunication: ± 0.5 kV Peak				
Repetition frequency	5 kHz, Tr/Th = 5 / 50 ns				
Coupling time (Minimum)	120 s				
Testing voltage	AC 230 V, 50 Hz				
Test facility	Shielded room				
Date	2021-04-07				
Temperature(°C)	21.8 °C	Humidity (% R.H.)	41.6 % R.H.	Pressure (kPa)	101.1 kPa
Remarks	Pass - A: There was no change of operation status during above testing.				

6.8.1 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 0.1 m above the ground 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.

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6.8.2 Used equipments

Equipment	Model no.	Makers	Serial no.	Next Cal. Date	Used
EMC IMMUNITY TESTER	IMU3000	EMC PARTNER	105684-2076	2021-06-23	<input checked="" type="checkbox"/>

6.8.3 Photographs of test setup

AC Main



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6.8.4 Measurement result

AC main

Coupling point	(+)	(-)	Result
L	+ 1 kV	- 1 kV	A
N	+ 1 kV	- 1 kV	A
PE	+ 1 kV	- 1 kV	A
L – N	+ 1 kV	- 1 kV	A
L – PE	+ 1 kV	- 1 kV	A
N – PE	+ 1 kV	- 1 kV	A
L – N – PE	+ 1 kV	- 1 kV	A

DC Line

Coupling point	(+)	(-)	Result
-	-	-	-

Telecommunication

Coupling point	(+)	(-)	Result
-	-	-	-

Lux Meter

Before	After
236 Lux	241 Lux

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6.9 Surge Transient

Coupling	<input checked="" type="checkbox"/> AC main: Direct <input type="checkbox"/> Control: Direct / CDN				
Test level	<input type="checkbox"/> AC main: <input type="checkbox"/> Differential mode: ± 0.5 kV (Below 25 W) <input type="checkbox"/> Common mode: ± 0.5 kV, ± 1 kV				
	<input checked="" type="checkbox"/> AC main: <input checked="" type="checkbox"/> Differential mode: ± 0.5 kV, ± 1 kV (Above 25 W) <input checked="" type="checkbox"/> Common mode: ± 0.5 kV, ± 1 kV, ± 2 kV <input type="checkbox"/> Control: ± 0.5 kV, ± 1 kV				
Coupling Impedance	<input checked="" type="checkbox"/> Differential mode: $18 \mu\text{F}$ <input type="checkbox"/> $40 \Omega + 0.5 \mu\text{F}$		<input checked="" type="checkbox"/> Common mode: $10 \Omega + 9 \mu\text{F}$ <input type="checkbox"/> Direct		
Surge pulse shape	Tr/Th = $1.2 / 50 \mu\text{s}$				
Angles	$90^\circ, 270^\circ$				
Number of surge	5				
Coupling time	30 s				
Testing Voltage	AC 230 V, 50 Hz				
Test facility	Shielded room				
Date	2021-04-07				
Temperature($^\circ\text{C}$)	21.8 $^\circ\text{C}$	Humidity (% R.H.)	41.6 % R.H.	Pressure (kPa)	101.1 kPa
Remarks	Pass - A: There was no change of operation status during above testing.				

6.9.1 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 & table top equipment, EUT was placed on a wooden table.

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6.9.2 Used equipments

Equipment	Model no.	Makers	Serial no.	Next Cal. Date	Used
EMC IMMUNITY TESTER	IMU3000	EMC PARTNER	105684-2076	2021-06-23	<input checked="" type="checkbox"/>

6.9.3 Photographs of test setup



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6.9.4 Measurement result

AC main

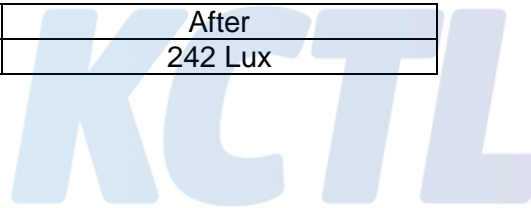
Coupling point	(+)	(-)	Result
L-N	+ 0.5 kV, + 1 kV	- 0.5 kV, - 1 kV	A
L-PE	+ 0.5 kV, + 1 kV, + 2 kV	- 0.5 kV, - 1 kV, - 2 kV	A
N-PE	+ 0.5 kV, + 1 kV, + 2 kV	- 0.5 kV, - 1 kV, - 2 kV	A

Control

Coupling point	(+)	(-)	Result
-	-	-	-

Lux Meter

Before	After
240 Lux	242 Lux



6.10 Conducted Susceptibility

Tested frequency & Test level	0.15 MHz ~ 80 MHz (3 V)				
Modulation	80 % Amplitude Modulation (1 kHz)				
Frequency Step	1 % step				
Dwell time	1 s				
Coupling method	<input checked="" type="checkbox"/> AC main: CDN(M3) <input type="checkbox"/> DC Line: CDN(M2) <input type="checkbox"/> Telecommunication: Clamp				
Testing Voltage	AC 230 V, 50 Hz				
Test facility	Shielded room				
Date	2021-04-07				
Temperature(°C)	21.8 °C	Humidity (% R.H.)	41.6 % R.H.	Pressure (kPa)	101.1 kPa
Remarks	Pass - A: There was no change of operation status during above testing.				

6.10.1 Measurement procedure

A ground reference plane was located on the floor.

The test was performed on a ground reference plane on a 0.1 m wooden table. This test were Performed using CDN for mains, clamp for signal and injection probe. The frequency range was swept from 0.15 MHz to 80 MHz. This frequency range was Modulated with 1 kHz sine wave at 80 %.

The signal generators provided the modulated frequency at a 1 % step size.

The power and all network cable, I/O cables longer than 3 m length were tested.

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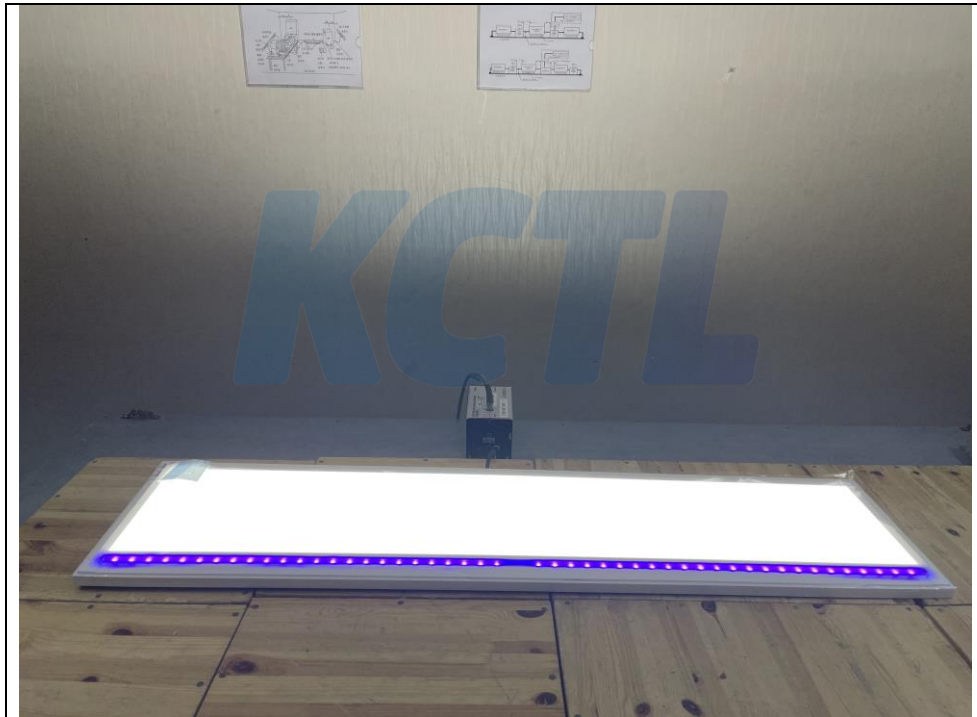
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6.10.2 Used equipments

Equipment	Model no.	Makers	Serial no.	Next Cal. date	Used
Conducted Immunity Test System	CIT-10/75	Frankonia EMV-Mess-Systeme GmbH	102C31213	2021-12-29	<input checked="" type="checkbox"/>
Coupling/Decoupling Network	CDN M016	Teseq GmbH	47899	2021-09-17	<input checked="" type="checkbox"/>

6.10.3 Photographs of test setup



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6.10.4 Measurement result

AC main

Coupling point	Coupling method	Result
Power	CDN (M016)	A

DC Line

Coupling point	Coupling method	Result
-	-	-

Telecommunication

Coupling point	Coupling method	Result
-	-	-

Lux Meter

Before	After
239 Lux	247 Lux

6.11 Voltage Dips and Interruptions

Number of dips	3 T				
Duration	10 s				
Phase	Zero crossing				
Testing Voltage	AC 200 V, AC 250 V, 50 Hz				
Test facility	Shielded room				
Date	2021-04-07				
Temperature(°C)	21.8 °C	Humidity (% R.H.)	41.6 % R.H.	Pressure (kPa)	101.1 kPa
Remarks	Pass				

6.11.1 Measurement procedure

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

6.11.2 Used equipments

Equipment	Model no.	Makers	Serial no.	Next Cal. date	Used
EMC IMMUNITY TESTER	IMU3000	EMC PARTNER	105684-2076	2021-06-23	<input checked="" type="checkbox"/>
EMC IMMUNITY TESTER	VAR-EXT1000	EMC PARTNER	VAR-EXT1000-1603	2021-06-22	<input checked="" type="checkbox"/>

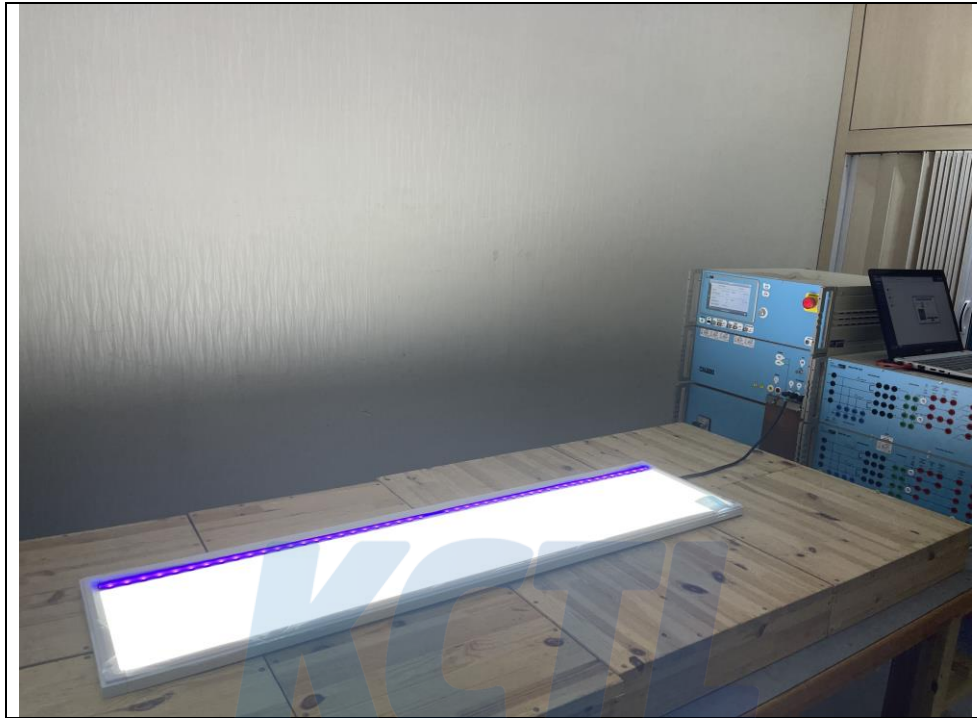
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6.11.3 Photographs of test setup



6.11.4 Measurement result

AC 200 V, AC 250 V, 50 Hz

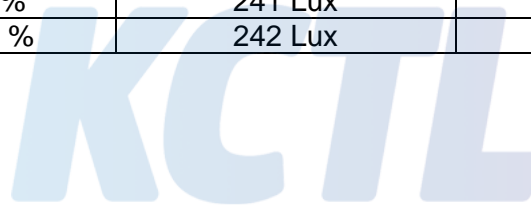
Test Level (%UT)	Dip/Int. (%UT)	Duration /Period	Angle (°)	Count number	Result
70 %	30 %	10 Period	0	3T	A
0 %	100 %	0.5 Period	0 / 180	3T	A

Comment:

A: There was no change of operation status during above testing.

Lux Meter

Test Level	Dip/Int.	Before	After
70 %	30 %	241 Lux	248 Lux
0 %	100 %	242 Lux	245 Lux



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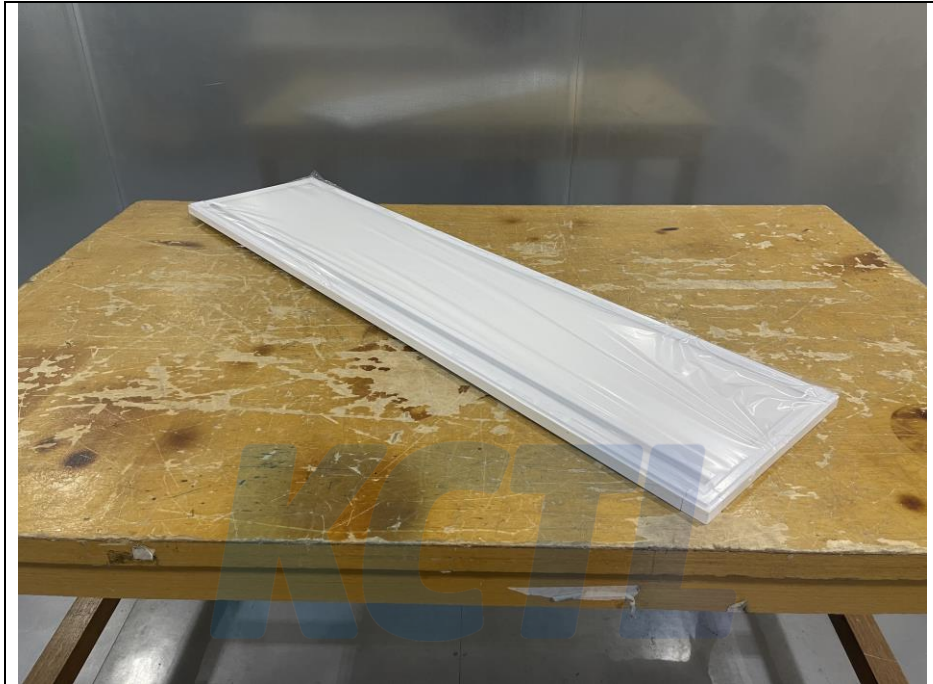
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7. EUT photographs

Front View



Rear View



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Inside

