TEST REPORT

Applicant:	MIC Optoelectronic Co., Ltd
Address:	2nd floor, Third Building, 97# AiNan Road, LongDong, BaoLong Street, LongGang District, Shenzhen, China
Manufacturer:	MIC Optoelectronic Co., Ltd
Address:	2nd floor, Third Building, 97# AiNan Road, LongDong, BaoLong Street, LongGang District, Shenzhen, China
EUT:	LED Street Light
Trade Mark:	MIC
Model Number:	MSL-F200 MSL-F25, MSL-F30, MSL-F50, MSL-F60, MSL-F80, MSL-F100, MSL-F120, MSL-F150, MSL-F180, MSL-F240, MSL-F300
Date of Receipt:	Nov. 14, 2023
Test Date:	Nov. 14, 2023 - Nov. 20, 2023
Date of Report:	Nov. 20, 2023
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Applicable Standards:	BS EN IEC 55015:2019+A11:2020 BS IEC 61000-3-2:2019+A1:2021, BS EN 61000-3-3:2013+A1:2019+A2:2021 BS EN 61547:2023 BS EN 61000-4-2:2009, BS EN IEC 61000-4-3:2020, BS EN 61000-4-4:2012, BS EN 61000-4-5:2014+A1:2017, BS EN 61000-4-6:2014/AC:2015, BS EN 61000-4-8:2010, BS EN IEC 61000-4-11:2020
Test Result:	Pass
Report Number:	DL-20231120023E

Prepared (Engineer):	HuiLian Xu
Reviewer (Supervisor):	Jack Bu
Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

TABLE OF CONTENT

1. VERSION

Version No.	Date	Description
00	Nov. 20, 2023	Original

2. TEST SUMMARY

EMC Emission				
Standard	Test Item	Limit	Result	Remark
BS EN 55015	Disturbance voltages (CE)	------	PASS	
	Radiated disturbance in 9kHz-30MHz (ME)	------	PASS	
	Radiated disturbance in 30MHz-1000MHz (RE)	------	PASS	
BS IEC 61000-3-2	Harmonic Current Emission	Class C	PASS	
BS EN 61000-3-3	Voltage Fluctuations & Flicker	------	PASS	
EMC Immunity				
Section BS EN 61547	Test Item	Performance Criteria	Result	Remark
BS EN 61000-4-2	Electrostatic Discharge	B	PASS	
BS EN IEC 61000-4-3	RF electromagnetic field	A	PASS	
BS EN 61000-4-4	Fast transients	B	PASS	
BS EN 61000-4-5	Surges	B	PASS	
BS EN 61000-4-6	Injected Current	A	PASS	
BS EN 61000-4-8	Power Frequency Magnetic Field	A	PASS	
BS EN IEC 61000-4-11	Volt. Interruptions Volt. Dips	B / C / C[NOTE (3)]	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) The power consumption of EUT is less than 75W and no Limits apply.

(3) Voltage dip: 100% reduction – Performance Criteria B

Voltage dip: 30% reduction – Performance Criteria C

Voltage Interruption: 100% Interruption – Performance Criteria C

(4) Test Facility: Shenzhen DL Testing Technology Co., Ltd.

Address: 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

3. GENERAL INFORMATION

3.1 Description of Device (EUT)

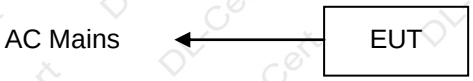
EUT:	LED Street Light
Trade Mark:	MIC
Model Number:	MSL-F200 MSL-F25, MSL-F30, MSL-F50, MSL-F60, MSL-F80, MSL-F100, MSL-F120, MSL-F150, MSL-F180, MSL-F240, MSL-F300
Test Model:	MSL-F200
Model difference:	The product's different for model number and appearance color.
Power Supply:	Input: 220-240V~ 1.1A 50/60Hz Output: 48V⎓ 3.45A
Working Frequency:	Below 108MHz

NOTE:
(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
(2) The EUT's all information provided by client.

3.2 Tested System Details

None.

3.3 Block Diagram of Test Set-up



3.4 Test Mode Description

Mode1. On Mode

3.5 Test Auxiliary Equipment

None.

3.6 Test Uncertainty

Conducted Emission Uncertainty : ±2.56dB

Radiated Emission Uncertainty : ±3.24dB

4. TEST INSTRUMENT USED

For Conducted Emission Test (843 Shielded Room)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
843 Shielded Room	ChengYu	843 Room	843	Sep. 20, 2022	Sep. 19, 2025
EMI Receiver	R&S	ESR	101421	Nov. 04, 2023	Nov. 03, 2024
LISN	R&S	ENV216	102417	Nov. 04, 2023	Nov. 03, 2024
Clamp	COM-POWER	CLA-050	431072	Nov. 04, 2023	Nov. 03, 2024
3-Loop Antenna	DAZE	ZN30401	13021	Nov. 04, 2023	Nov. 03, 2024
ISN T8	Schwarzbeck	NTFM 8158	101135	Nov. 04, 2023	Nov. 03, 2024
ISN T5	Schwarzbeck	NTFM 8158	101136	Nov. 04, 2023	Nov. 03, 2024
843 Cable 1#	ChengYu	CE Cable	001	Nov. 04, 2023	Nov. 03, 2024
843 Cable 1#	ChengYu	CE Cable	002	Nov. 04, 2023	Nov. 03, 2024

For Radiated Emission Test (966 chamber)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
966 chamber	ChengYu	966 Room	966	Nov. 06, 2023	Nov. 05, 2026
Spectrum Analyzer	Agilent	E4408B	MY50140780	Nov. 04, 2023	Nov. 03, 2024
EMI Receiver	R&S	ESRP7	101393	Nov. 04, 2023	Nov. 03, 2024
Amplifier	Schwarzbeck	BBV9743B	00153	Nov. 04, 2023	Nov. 03, 2024
Amplifier	EMEC	EM01G8GA	00270	Nov. 04, 2023	Nov. 03, 2024
Broadband Trilog Antenna	Schwarzbeck	VULB9162	00306	Nov. 04, 2023	Nov. 03, 2024
Horn Antenna	Schwarzbeck	BBHA9120D	02139	Nov. 04, 2023	Nov. 03, 2024
966 Cable 1#	ChengYu	966	004	Nov. 04, 2023	Nov. 03, 2024
966 Cable 2#	ChengYu	966	003	Nov. 04, 2023	Nov. 03, 2024

For Harmonic & Flicker Test (EMS --- site)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
Harmonics, Flicker & power Analyser	LAPLACE INSTRUMENTS	AC2000A	311370	Nov. 04, 2023	Nov. 03, 2024
AC Power Supply	MToni	HPF5010	633659	Nov. 04, 2023	Nov. 03, 2024

For Electrostatic Discharge Immunity Test (EMS --- site)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
ESD Tester	SCHLODER	SESD 230	17352	Nov. 04, 2023	Nov. 03, 2024

For RF Field Strength Susceptibility Test (Keyway --- site)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
Signal Generator	HP	8648A	3625U00573	Apr. 12, 2023	Apr. 11, 2024
Amplifier	A&R	500A100	17034	Apr. 12, 2023	Apr. 11, 2024
Amplifier	A&R	100W/1000M1	17028	Apr. 12, 2023	Apr. 11, 2024
Audio Analyzer (20Hz~1GHz)	Panasonic	2023B	202301/428	Apr. 12, 2023	Apr. 11, 2024
Isotropic Field Probe	A&R	FP2000	16755	Apr. 12, 2023	Apr. 11, 2024
Antenna	EMCO	3108	9507-2534	Apr. 12, 2023	Apr. 11, 2024
Log-periodic Antenna	A&R	AT1080	16812	Apr. 12, 2023	Apr. 11, 2024

For EFT /B, Surge, Voltage Dips Interruptions Test (EMS --- site)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
Transient Comprehensive Immunity Test System	Graphtec	HVIP16T+HCOMPACT 5	192501+192202	Nov. 04, 2023	Nov. 03, 2024
Coupling Clamp	HTEC	001	0001	Nov. 04, 2023	Nov. 03, 2024

For Injected Currents Susceptibility Test (EMS --- site)

Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
C/S Test System	LIONCEL	RIS-6091-85	0191101	Nov. 04, 2023	Nov. 03, 2024
CDN	LIONCEL	CDN-M2-16	0191001	Nov. 04, 2023	Nov. 03, 2024
CDN	LIONCEL	CDN-M3-16	0191002	Nov. 04, 2023	Nov. 03, 2024
Injection Clamp	Frankonia	EMCL-20	18101728-0108	Nov. 04, 2023	Nov. 03, 2024

For Magnetic Field Immunity Test (EMS --- site)

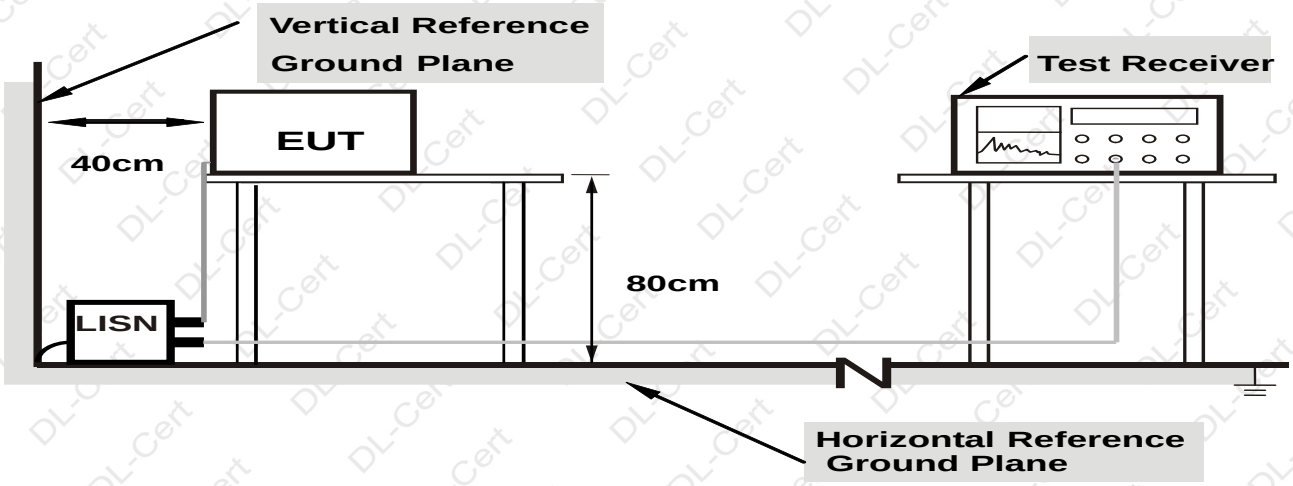
Equipment	Manufacturer	Model	Serial	Last Cal.	Next Cal.
Magnetic field Test System	LIONCEL	PMF-801C-C/ PMF-801C-T	190401	Nov. 04, 2023	Nov. 03, 2024

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0

5. DISTURBANCE VOLTAGES TEST

5.1 Block Diagram Of Test Setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

5.2 Test Standard and Limit

BS EN 55015

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0,009 to 0,05	110	--
0.05 to 0.15	90 to 80*	--
0.15~0.50	66 ~ 56*	55 ~ 46*
0.50~5.00	56	46
5.00~30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

5.3 EUT Configuration on Test

The following equipment's are installed on conducted emission test to meet BS EN 55015 requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

5.4 Operating Condition of EUT

5.4.1 Setup the EUT and simulators as shown in Section 5.1.

5.4.2 Turn on the power of all equipment.

5.4.3 Let the EUT work in test modes and test it.

5.5 Test Procedure

The EUT is put on the table and connected to the AC mains through a Artificial Mains Network (AMN) or ISN. This provided a 50ohm coupling impedance for the tested equipment. Both sides of AC line are checked to find out the maximum conducted emission levels according to the **BS EN 55015** regulations during conducted emission test.

The bandwidth of the test receiver (R&S Test Receiver ESR) is set at 10KHz.

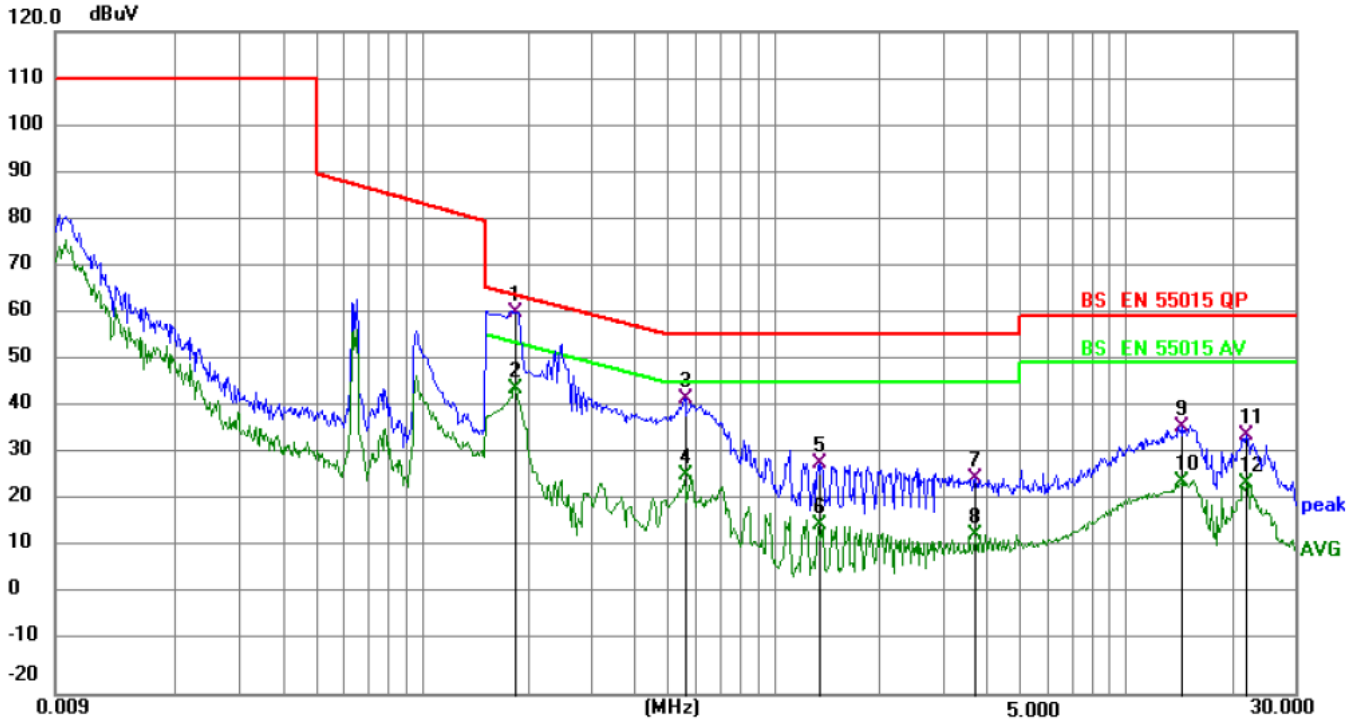
The frequency ranges from 150kHz to 30MHz is investigated.

5.6 Test Result

PASS

Please refer to the following page.

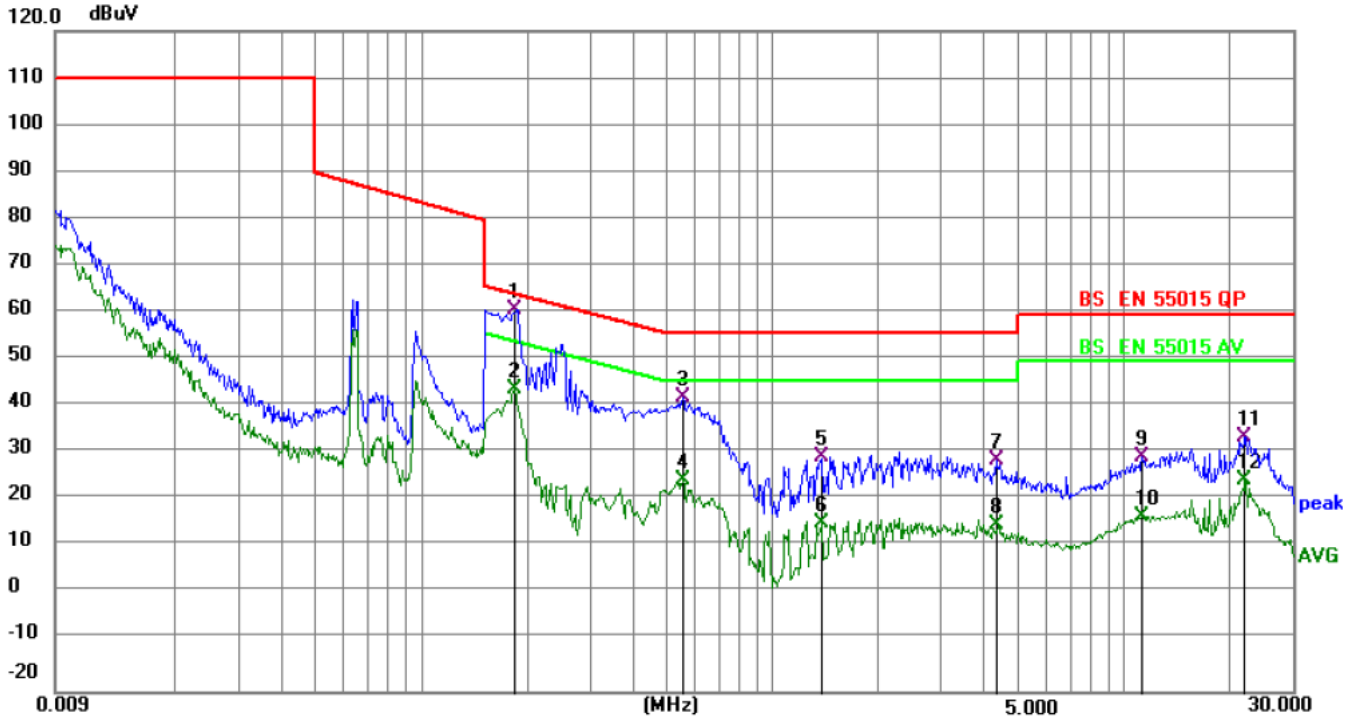
Disturbance Voltages Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Phase:	Line
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1 *	0.181400	50.88	9.90	60.78	64.42	-3.64	QP	P	
2	0.181400	34.72	9.90	44.62	54.42	-9.80	AVG	P	
3	0.555000	33.21	9.33	42.54	56.00	-13.46	QP	P	
4	0.555000	17.00	9.33	26.33	46.00	-19.67	AVG	P	
5	1.351400	19.44	9.54	28.98	56.00	-27.02	QP	P	
6	1.351400	6.44	9.54	15.98	46.00	-30.02	AVG	P	
7	3.709400	15.86	9.81	25.67	56.00	-30.33	QP	P	
8	3.709400	4.14	9.81	13.95	46.00	-32.05	AVG	P	
9	14.455500	26.47	10.23	36.70	60.00	-23.30	QP	P	
10	14.455500	14.77	10.23	25.00	50.00	-25.00	AVG	P	
11	21.803900	23.88	10.74	34.62	60.00	-25.38	QP	P	
12	21.803900	13.75	10.74	24.49	50.00	-25.51	AVG	P	

Remark:Correct Factor = Cable lose + LISN insertion loss;
Level = Reading + Correct factor;Margin = Level – Limit;

Disturbance Voltages Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Phase:	Neutral
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1

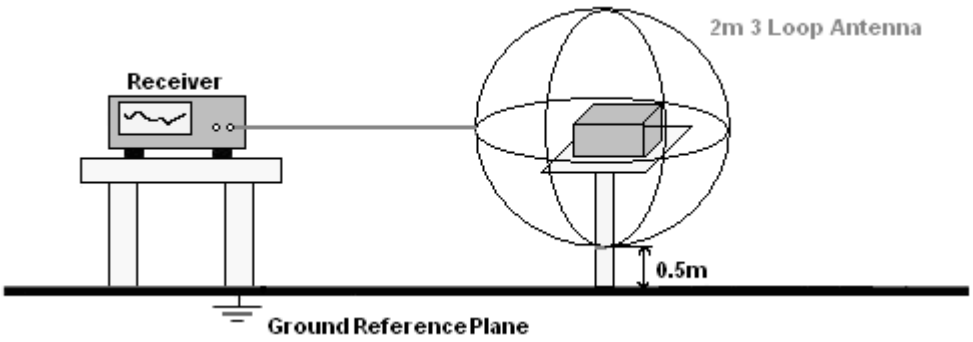


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1 *	0.181500	51.49	9.45	60.94	64.42	-3.48	QP	P	
2	0.181500	34.70	9.45	44.15	54.42	-10.27	AVG	P	
3	0.550500	33.15	9.38	42.53	56.00	-13.47	QP	P	
4	0.550500	15.67	9.38	25.05	46.00	-20.95	AVG	P	
5	1.369500	20.14	9.63	29.77	56.00	-26.23	QP	P	
6	1.369500	6.08	9.63	15.71	46.00	-30.29	AVG	P	
7	4.299000	19.08	10.04	29.12	56.00	-26.88	QP	P	
8	4.299000	5.57	10.04	15.61	46.00	-30.39	AVG	P	
9	11.170500	19.41	10.32	29.73	60.00	-30.27	QP	P	
10	11.170500	6.92	10.32	17.24	50.00	-32.76	AVG	P	
11	22.006500	23.41	10.79	34.20	60.00	-25.80	QP	P	
12	22.006500	14.10	10.79	24.89	50.00	-25.11	AVG	P	

Remark:Correct Factor = Cable lose + LISN insertion loss;
Level = Reading + Correct factor;Margin = Level – Limit;

6. RADIATED DISTURBANCE IN 9 KHZ TO 30 MHZTEST

6.1 Block Diagram of Test Setup



6.2 Test Standard and Limit

BS EN 55015

Frequency MHz	Limits dB(μA) 2m Loop Diameter
	Quasi-peak Level
0,009 to 0,07	88
0.07 to 0.15	88 ~ 58*
0.15~3.00	58 ~ 22*
3.00~30.00	22

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

6.3 EUT Configuration on Test

The following equipment's are installed on conducted emission test to meet BS EN 55015 requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

6.4 Operating Condition of EUT

6.4.1 Setup the EUT and simulators as shown in Section 6.1.

6.4.2 Turn on the power of all equipment.

6.4.3 Let the EUT work in test modes and test it.

6.5 Test Procedure

The EUT is put on the table and connected to the AC mains through a Artificial Mains Network (AMN) or ISN. This provided a 50ohm coupling impedance for the tested equipment. Both sides of AC line are checked to find out the maximum conducted emission levels according to the **BS EN 55015** regulations during conducted emission test.

The bandwidth of the test receiver (R&S Test Receiver ESR) is set at 10KHz.

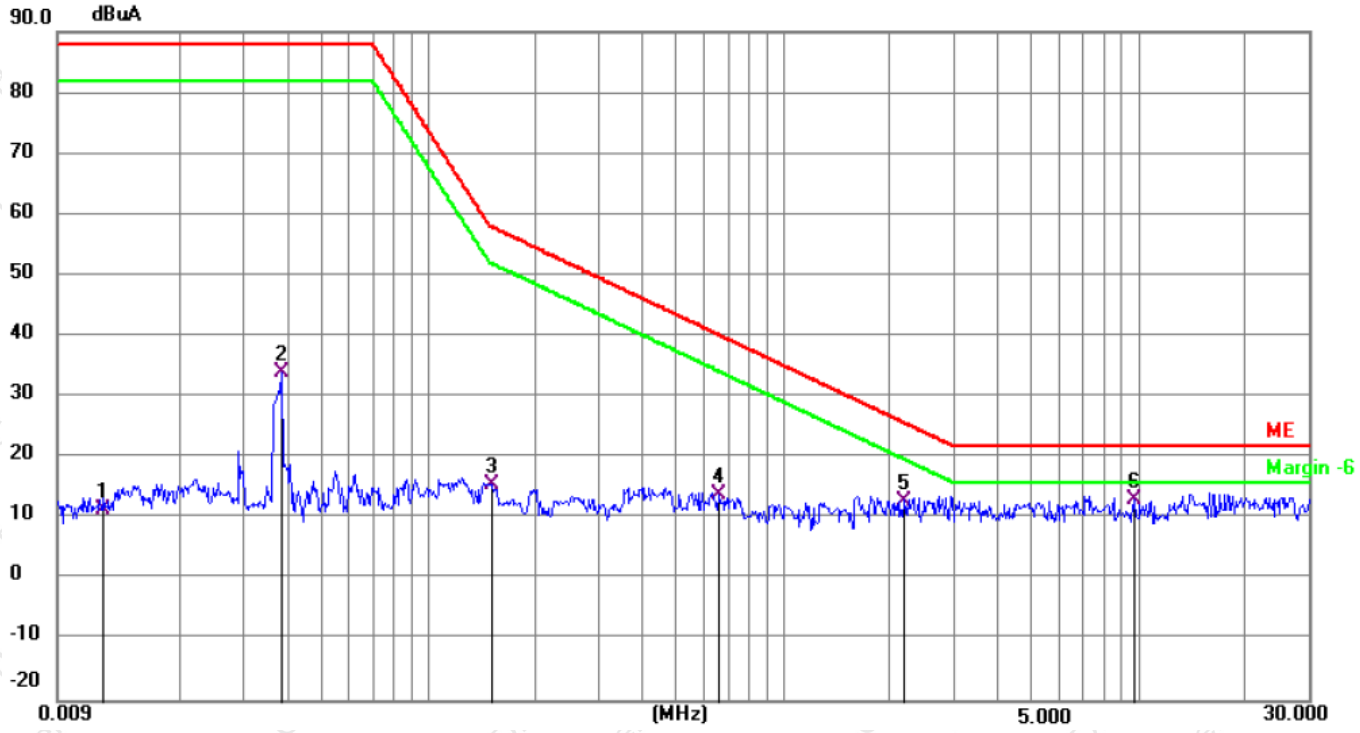
The frequency range from 9kHz to 30MHz is investigated.

6.6 Test Result

PASS

Please refer to the following page.

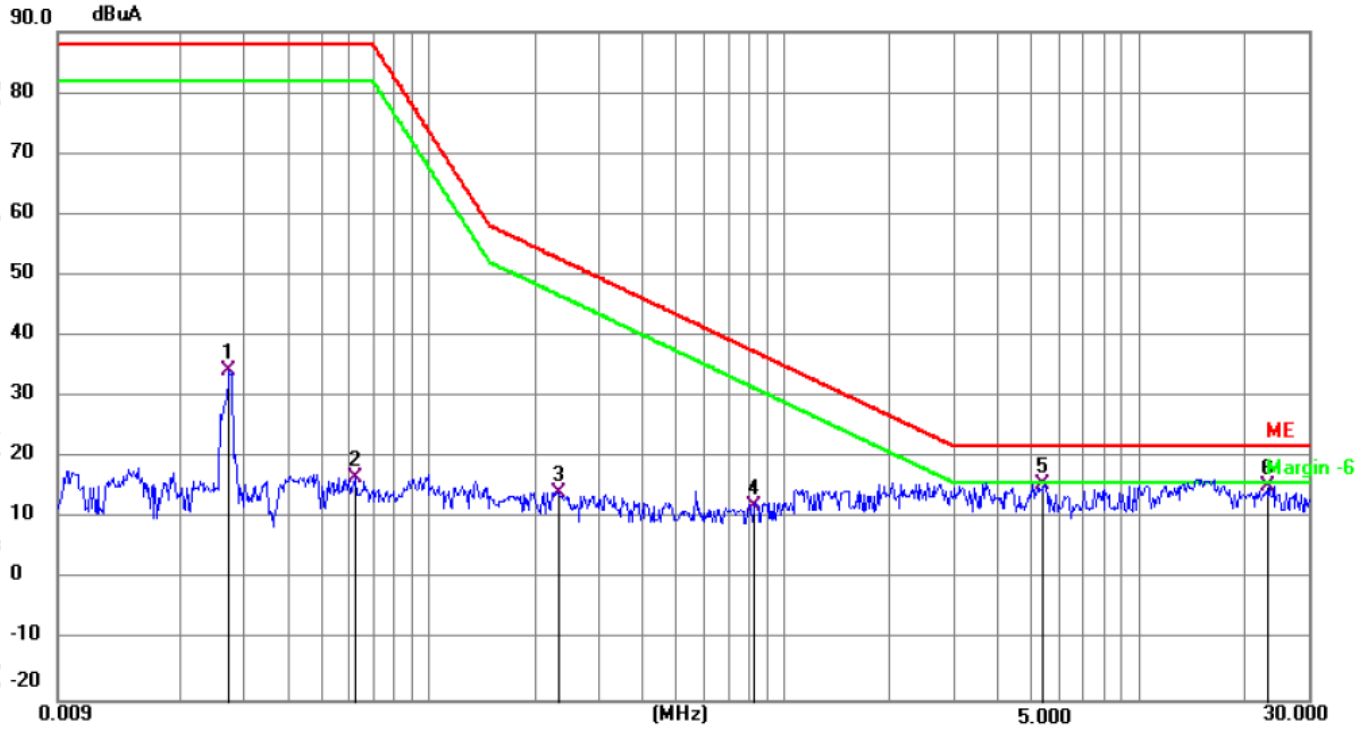
Radiated disturbance (9KHz-30MHz) Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Polarization:	X
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1



No.	Frequency (MHz)	Reading (dBuA)	Factor (dB)	Level (dBuA)	Limit (dBuA)	Margin (dB)	Detector	P/F	Remark
1	0.012000	-38.50	50.00	11.50	88.00	-76.50	QP	P	
2	0.038600	-22.65	56.56	33.91	88.00	-54.09	QP	P	
3	0.150200	-14.41	30.00	15.59	57.98	-42.39	QP	P	
4	0.658200	-16.09	30.00	13.91	40.23	-26.32	QP	P	
5	2.170500	-17.00	30.00	13.00	25.89	-12.89	QP	P	
6 *	9.753000	-16.95	30.00	13.05	22.00	-8.95	QP	P	

Remark:Correct Factor = Cable lose + LISN insertion loss;
Level = Reading + Correct factor;Margin = Level – Limit;

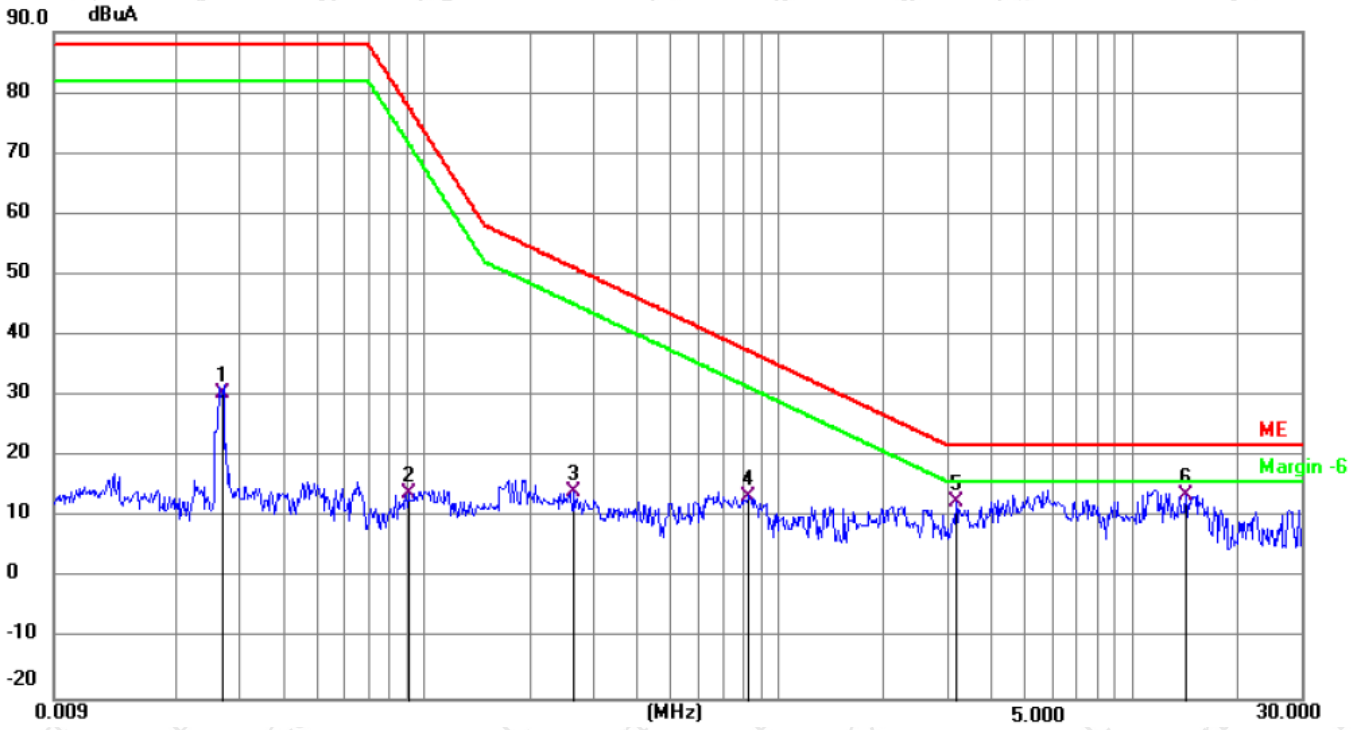
Radiated disturbance (9KHz-30MHz) Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Polarization:	Y
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1



No.	Frequency (MHz)	Reading (dBuA)	Factor (dB)	Level (dBuA)	Limit (dBuA)	Margin (dB)	Detector	P/F	Remark
1	0.027400	-23.90	58.19	34.29	88.00	-53.71	QP	P	
2	0.062500	-36.46	53.09	16.63	88.00	-71.37	QP	P	
3	0.232600	-15.81	30.00	14.19	52.73	-38.54	QP	P	
4	0.829500	-17.95	30.00	12.05	37.45	-25.40	QP	P	
5 *	5.374500	-14.28	30.00	15.72	22.00	-6.28	QP	P	
6	23.310800	-14.61	30.00	15.39	22.00	-6.61	QP	P	

Remark:Correct Factor = Cable lose + LISN insertion loss;
Level = Reading + Correct factor;Margin = Level – Limit;

Radiated disturbance (9KHz-30MHz) Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Polarization:	Z
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1

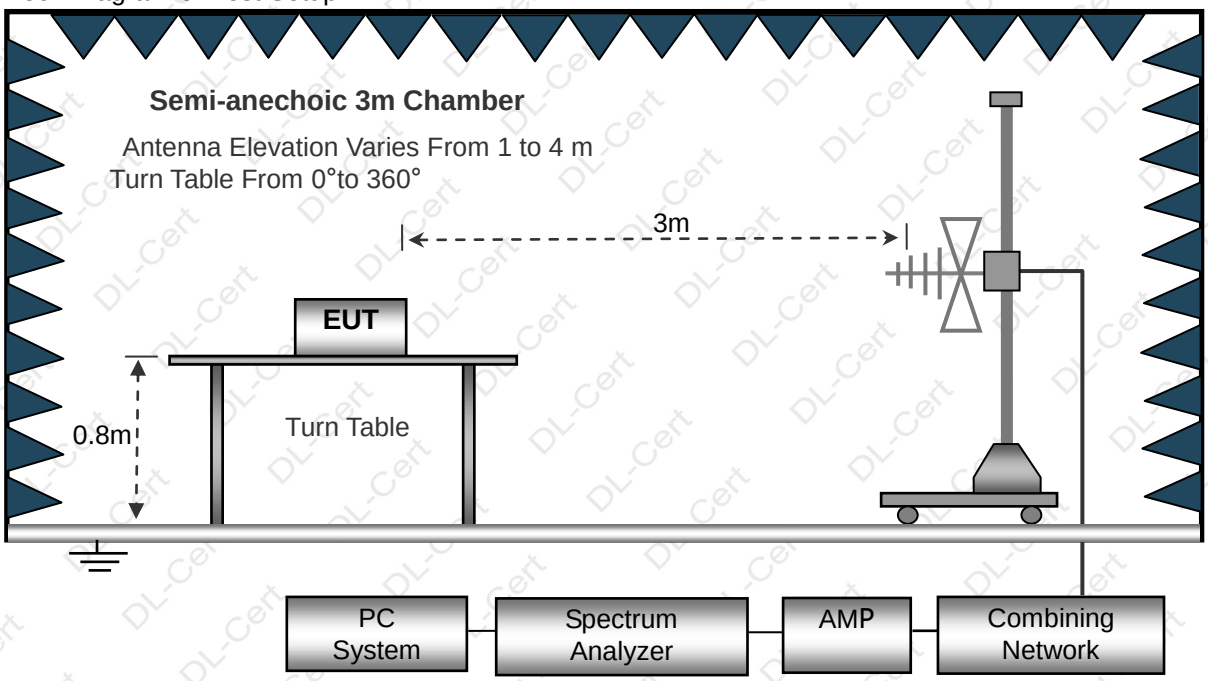


No.	Frequency (MHz)	Reading (dBuA)	Factor (dB)	Level (dBuA)	Limit (dBuA)	Margin (dB)	Detector	P/F	Remark
1	0.026900	-27.78	58.26	30.48	88.00	-57.52	QP	P	
2	0.090700	-41.31	55.32	14.01	77.80	-63.79	QP	P	
3	0.267000	-15.83	30.00	14.17	51.07	-36.90	QP	P	
4	0.829500	-16.45	30.00	13.55	37.45	-23.90	QP	P	
5	3.183100	-17.30	30.00	12.70	22.00	-9.30	QP	P	
6 *	14.167600	-16.18	30.00	13.82	22.00	-8.18	QP	P	

Remark:Correct Factor = Cable lose + LISN insertion loss;
Level = Reading + Correct factor;Margin = Level – Limit;

7. RADIATED DISTURBANCE IN 30MHZ TO 1000 MHZTEST

7.1 Block Diagram of Test Setup



7.2 Test Standard and Limit

BS EN 55015

Frequency (MHz)	Quasi-peak limits at 3m dB(μV/m)
30-230	40
230-1000	47

Remark:

(1) The smaller limit shall apply at the cross point between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instrument, antenna and the closed point of any part of the device or system.

7.3 EUT Configuration on Test

The BS EN 55015 regulations test method must be used to find the maximum emission during radiated emission test.

The configuration of EUT is the same as used in conducted emission test.

Please refer to Section 5.3.

7.4 Operating Condition of EUT

Same as conducted emission test, which is listed in Section 5.4 except the test set up replaced as Section 6.2.

7.5 Test Procedure

1) The radiated emissions test was conducted in a semi-anechoic chamber.

2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

3) Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT.

4) The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. Measurements were performed for both horizontal and vertical antenna polarization.

5) The bandwidth setting on the field strength meter (R&S Test Receiver ESCI) is set at 120KHz.

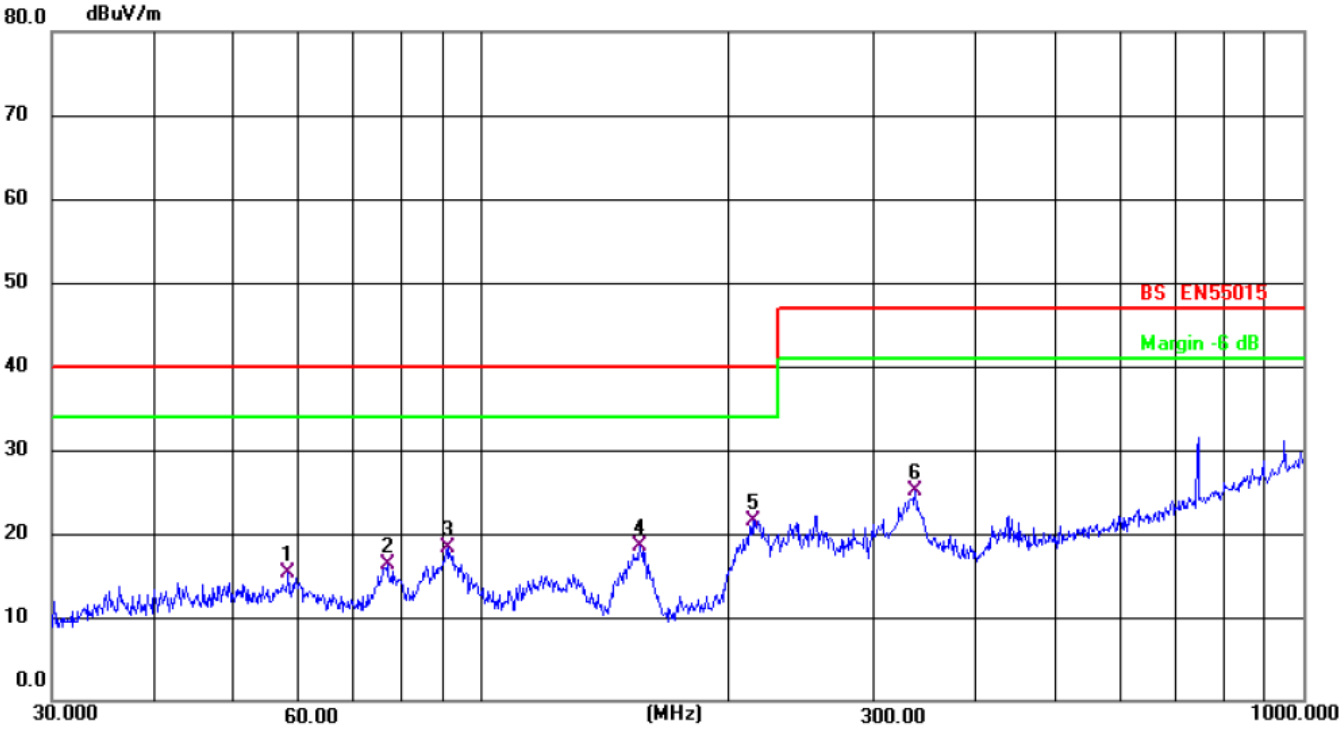
6) The frequency range from 30MHz to 1000MHz is checked.

7.6 Test Result

PASS

Please refer to the following page.

Radiated Disturbance (30MHz-1000MHz) Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Polarization:	Horizontal
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1



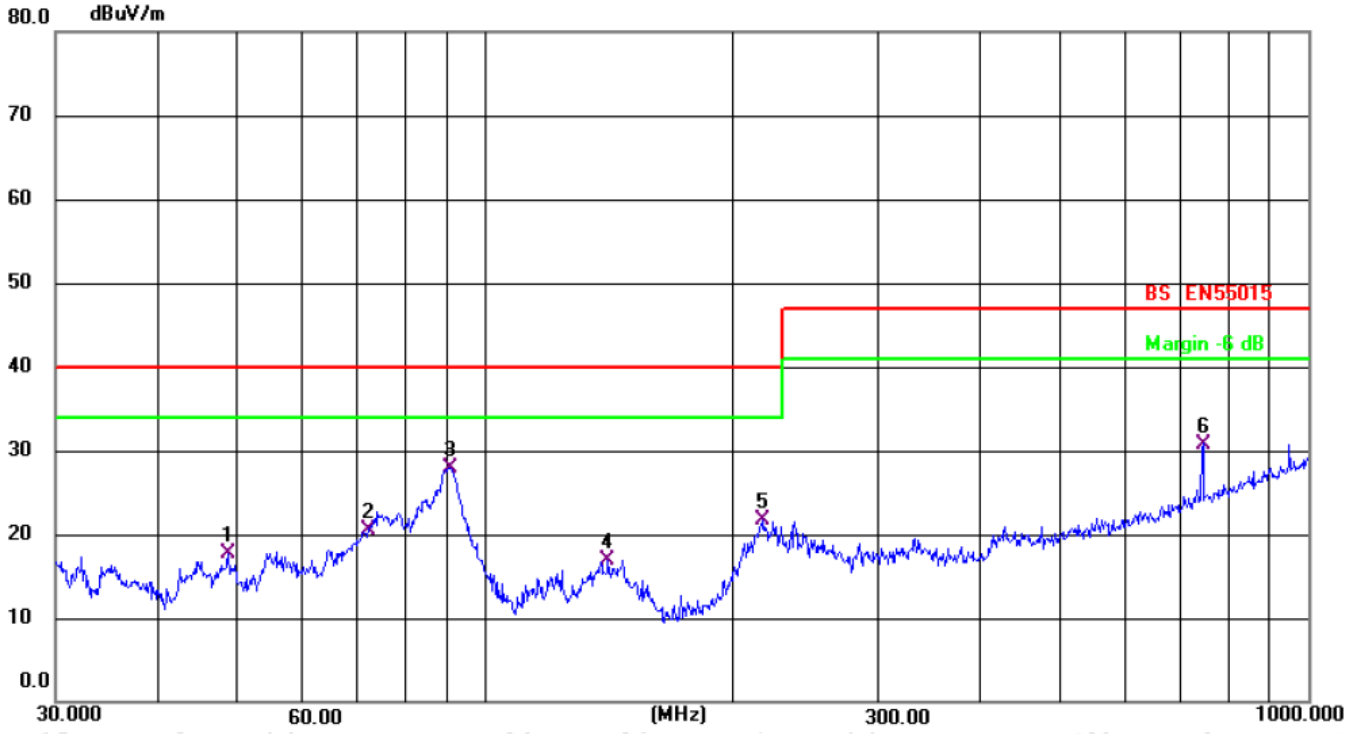
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		58.2030	28.17	-12.79	15.38	40.00	-24.62	QP
2		76.7808	33.07	-16.85	16.22	40.00	-23.78	QP
3		91.1746	35.17	-16.95	18.22	40.00	-21.78	QP
4		155.9101	35.94	-17.47	18.47	40.00	-21.53	QP
5	*	213.7634	35.69	-14.19	21.50	40.00	-18.50	QP
6		337.2155	35.88	-10.81	25.07	47.00	-21.93	QP

Remark:

Correct Factor=Cable loss+Antenna factor-Preamplifier

Measurement Level = Reading Level + Correct Factor; Margin = Measurement Level- Limit;

Radiated Disturbance (30MHz-1000MHz) Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Pressure:	1009hPa	Polarization:	Vertical
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		48.6719	31.01	-13.29	17.72	40.00	-22.28	QP
2		72.0843	36.38	-15.84	20.54	40.00	-19.46	QP
3	*	90.5374	44.94	-16.98	27.96	40.00	-12.04	QP
4		140.8351	34.30	-17.44	16.86	40.00	-23.14	QP
5		217.5443	35.75	-14.03	21.72	40.00	-18.28	QP
6		744.8661	33.95	-3.15	30.80	47.00	-16.20	QP

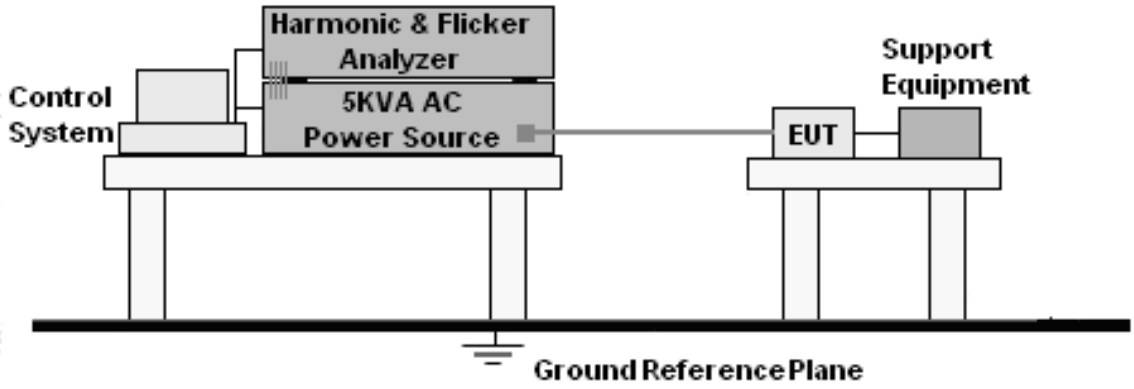
Remark:

Correct Factor=Cable loss+Antenna factor-Preamplifier

Measurement Level = Reading Level + Correct Factor; Margin = Measurement Level- Limit;

8. HARMONIC CURRENT EMISSION TEST

8.1 Block Diagram of Test Setup



8.2 Test Standard

BS IEC 61000-3-2

8.3 Operating Condition of EUT

Setup the EUT as shown in Section 8.1.

Turn on the power of all equipment.

Let the EUT work in test mode and test it.

8.4 Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test the harmonic current level.

8.5 Test Results

PASS

Please refer to the following page.

EUT: LED Street Light **Operator:**

Test category: IEC/EN 61000-3-2:2019+A1:2021 Class C>25W **Model/Type:MSL-F200**

Measurement standard: IEC 61000-4-7 Ed2:1:2009 **Serial number:**

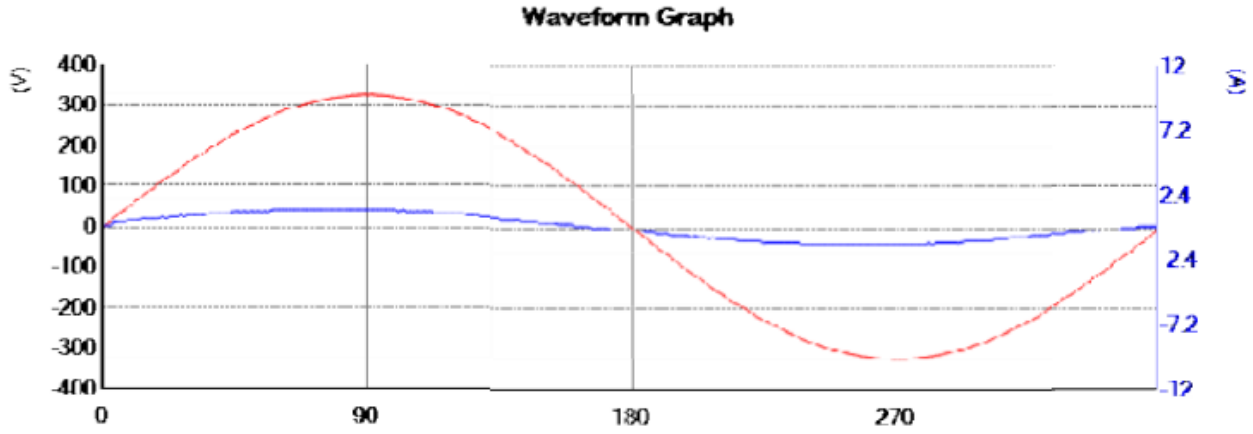
Test date:2023-11-17 **Start time: 16:18:44** **End time: 16:21:22**

Test duration (sec):150

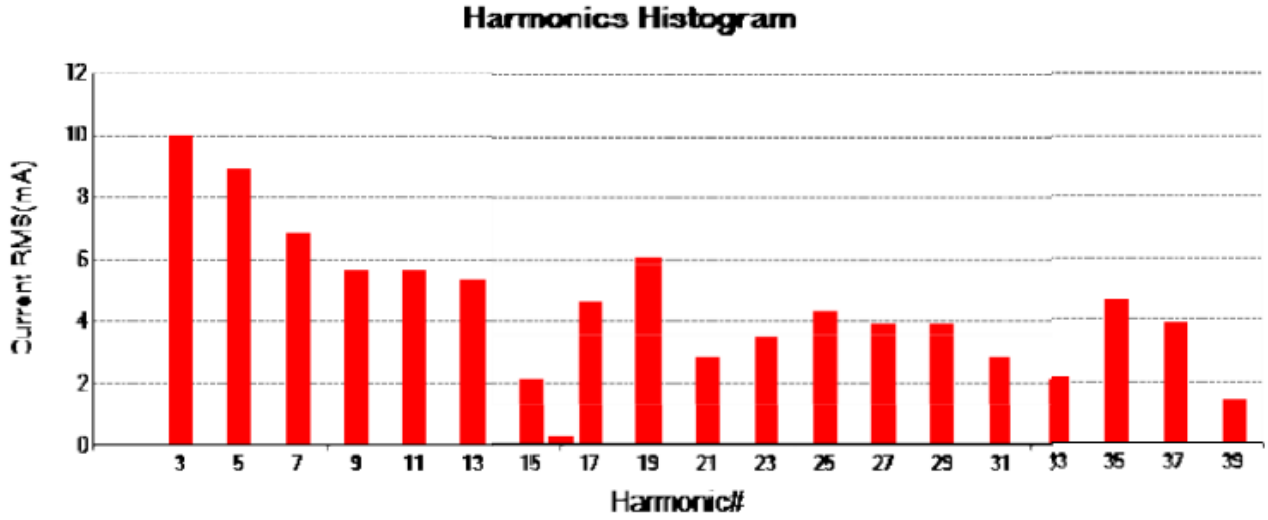
Describe:

Test Result: pass **Source qualification(Power Off Load):** Idle - Pass

Current & voltage waveforms



Harmonics and Class C limit line (>25W)



EUT: LED Street Light **Operator:**

Test category: IEC/EN 61000-3-2:2019+A1:2021 Class C>25W **Model/Type: MSL-F200**

Measurement standard: IEC 61000-4-7 Ed2:1:2009 **Serial number:**

Test date:2023-11-17 **Start time: 16:18:44** **End time: 16:21:22**

Test duration (sec):150

Describe:

Test Result: pass **Source qualification(Power Off Load): Idle - Pass**

THC(mA): 22.700 **I - THD(%): 2.6** **POHC(mA):11.500** **POHC Limit(mA):82.849**

Parameter values during test:

V_RMS (Volts): 230.0 **Frequency(Hz): 50.0**

I_RMS(A): 0.9 **Crest Factor: 1.413**

Power (Watts): 197.0 **Power Factor: 0.980**

Harm#	Harms(filtered) (mA)	Limit (mA)	Harms(avg) (mA)	100%Limit	Harms(max) (mA)	150%Limit	Status
I_Fund	873.300						
2	0.000	17.466	0.400	2.290	0.700	2.672	Pass
3	10.000	235.791	10.200	4.326	10.400	2.940	Pass
4	0.000	-	0.200	-	0.300	-	N/A
5	8.900	87.330	9.000	10.306	8.900	6.794	Pass
6	0.000	-	0.200	-	0.300	-	N/A
7	6.800	61.131	6.900	11.287	7.100	7.743	Pass
8	0.000	-	0.200	-	0.300	-	N/A
9	5.700	43.665	5.600	12.825	5.700	8.703	Pass
10	0.000	-	0.100	-	0.300	-	N/A
11	5.700	26.199	5.600	21.375	5.700	14.504	Pass
12	0.000	-	0.100	-	0.000	-	N/A
13	5.300	26.199	5.600	21.375	5.700	14.504	Pass
14	0.000	-	0.000	-	0.000	-	N/A
15	2.100	26.199	2.000	7.634	2.100	5.344	Pass
16	0.300	-	0.200	-	0.300	-	N/A
17	4.600	26.199	4.900	18.703	5.000	12.723	Pass
18	0.000	-	0.100	-	0.300	-	N/A
19	6.100	26.199	6.300	24.047	6.400	16.286	Pass
20	0.000	-	0.100	-	0.300	-	N/A
21	2.800	26.199	2.900	11.069	2.800	7.125	Pass
22	0.000	-	0.000	-	0.000	-	N/A
23	3.500	26.199	3.600	13.741	3.900	9.924	Pass
24	0.000	-	0.100	-	0.300	-	N/A
25	4.300	26.199	4.500	17.176	4.600	11.705	Pass
26	0.000	-	0.000	-	0.000	-	N/A
27	3.900	26.199	4.100	15.649	4.300	10.942	Pass
28	0.000	-	0.000	-	0.000	-	N/A
29	3.900	26.199	4.000	15.268	3.900	9.924	Pass
30	0.000	-	0.100	-	0.000	-	N/A
31	2.800	26.199	3.000	11.451	3.200	8.143	Pass
32	0.000	-	0.100	-	0.300	-	N/A
33	2.100	26.199	2.100	8.016	2.100	5.344	Pass
34	0.000	-	0.100	-	0.300	-	N/A
35	4.600	26.199	4.700	17.940	4.600	11.705	Pass
36	0.000	-	0.100	-	0.300	-	N/A
37	3.900	26.199	3.800	14.504	3.900	9.924	Pass
38	0.000	-	0.000	-	0.000	-	N/A
39	1.400	26.199	1.500	5.725	1.400	3.562	Pass
40	0.000	-	0.100	-	0.300	-	N/A

Note: All harmonics are below the minimum limits and are ignored.

9. VOLTAGE FLUCTUATIONS & FLICKER TEST

9.1 Block Diagram of Test Setup

Same as Section 8.1.

9.2 Test Standard

BS EN 61000-3-3

9.3 Operating Condition of EUT

Same as Section 8.3. The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test the harmonic current level.

Flicker Test Limit

Test items	Limits
Pst	1.0
dc	3.3%
Tmax	4.0%
dt	Not exceed 3.3% for 500ms

9.4 Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test the harmonic current level.

9.5 Test Results

Flicker Test Data			
Temperature:	24.5℃	Relative Humidity:	54%
Test Voltage:	AC 230V/50Hz	Test Mode:	Mode 1

Voltage Fluctuation	Limit	Value
Relative Voltage Change Characteristic Tmax (dc > 3%)	500ms	0ms
Maximum Relative Voltage Change dmax	4%	0.00
	6%	/
	7%	/
Relative Steady-state Voltage Change dc	3.3%	0.00

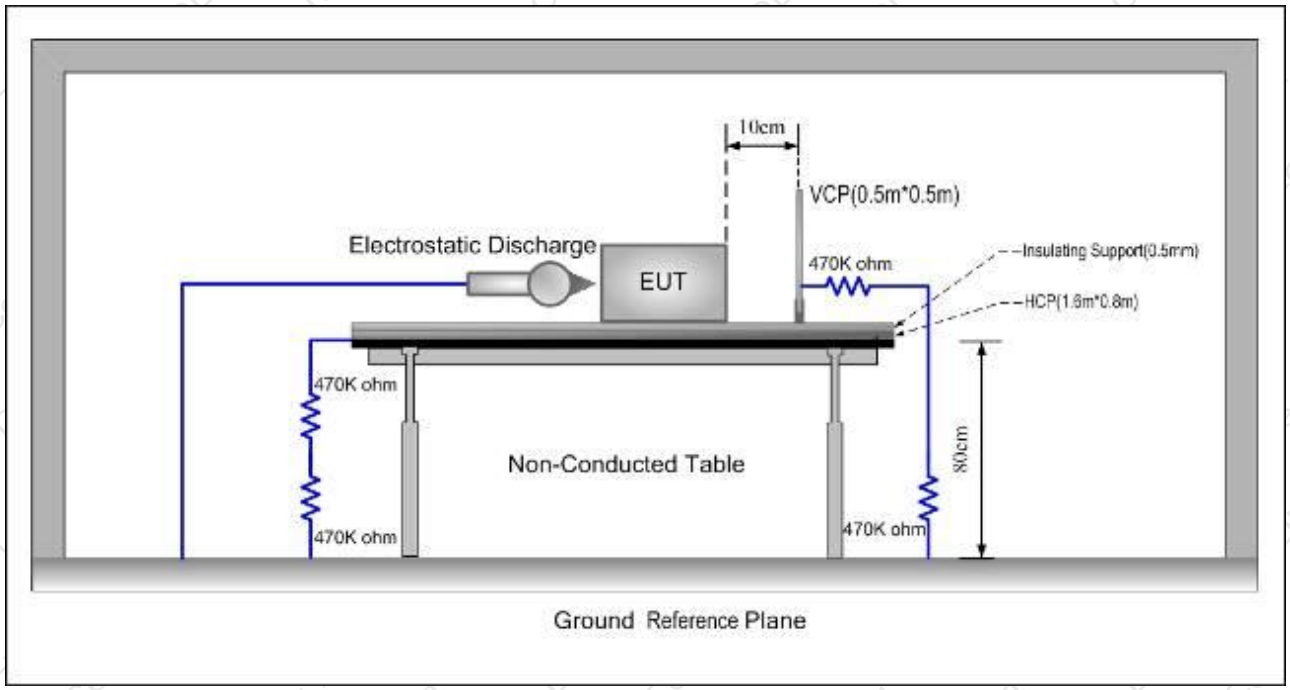
Flicker	Limit	Value
Short-term Flicker Indicator Pst	1.0	0.063
Long-term Flicker Indicator Plt	0.65	/

10. IMMUNITY TEST OF GENERAL THE PERFORMANCE CRITERIA

Product Standard	BS EN 61547
CRITERION A	During the test, no change of the lumimous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.
CRITERION B	During the test the luminous intensity may change to any value. After the test the luminous intensity shall be restored to its initial value within 1 min. Regulating controls need 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.
CRITERION C	During and after the test any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, 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 switched off. After half an hour it is switched on again. The lighting equipment shall start and operate as intended.

11. ELECTROSTATIC DISCHARGE IMMUNITY TEST

11.1 Block Diagram of Test Setup



11.2 Test Standard

BS EN 61547, BS EN 61000-4-2

11.3 Severity Levels and Performance Criterion

Severity Level: 3 / Air Discharge: ±8KV

Level: 2 / Contact Discharge: ±4KV

Performance criterion: B

11.4 Test Procedure

a. Electrostatic discharges were applied only to those points and surfaces of the Product that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the Product.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the Product as fast as possible (without causing mechanical damage) to touch the Product. After each discharge, the ESD generator was removed from the Product and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

g. At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the Product. The ESD generator was positioned vertically at a distance of 0.1 meters from the Product with the discharge electrode touching the HCP.

h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the Product were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the Product.

11.5 Test Results

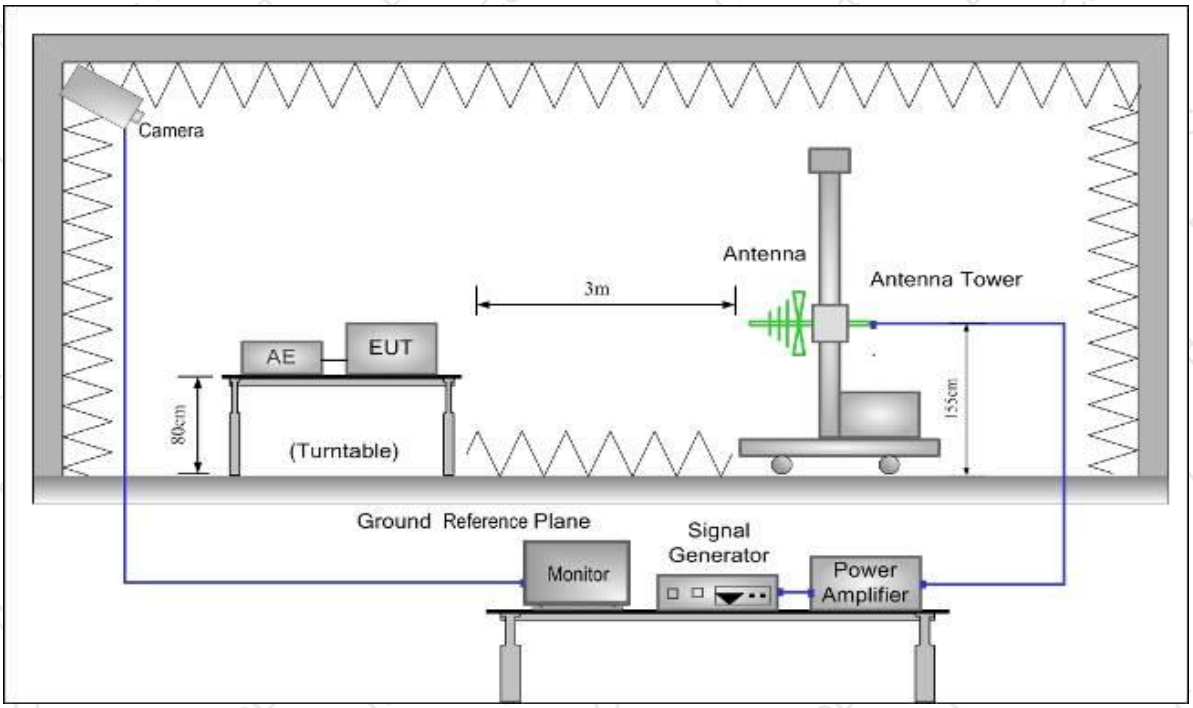
PASS

Please refer to the following page.

Electrostatic Discharge Test Data					
Temperature:	25.1℃		Humidity:	55%	
Power Supply:	AC 230V/50Hz		Test Mode:	Mode 1	
Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Required Level	Result
Contact Discharge	Conductive Surfaces	2, 4	10	B	Pass
	Indirect Discharge HCP	2, 4	10	B	Pass
	Indirect Discharge VCP	2, 4	10	B	Pass
Air Discharge	Slots, Apertures, and Insulating Surfaces	2, 4, 8	10	B	Pass
Note: N/A					

12. RF FIELD STRENGTH SUSCEPTIBILITY TEST

12.1 Block Diagram of Test Setup



12.2 Test Standard

BS EN 61547, BS EN IEC 61000-4-3

12.3 Severity Levels and Performance Criterion

Severity Level 2, 3V / m

Performance criterion: A

12.4 Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.

All the scanning conditions are as follows:

Condition of Test	Remarks
Fielded Strength	3 V/m (Severity Level 2)
Radiated Signal	Modulated
Scanning Frequency	80 – 1000 MHz
Dwell time of radiated	0.0015 decade/s
Waiting Time	1 Sec.

12.5 Test Results

PASS

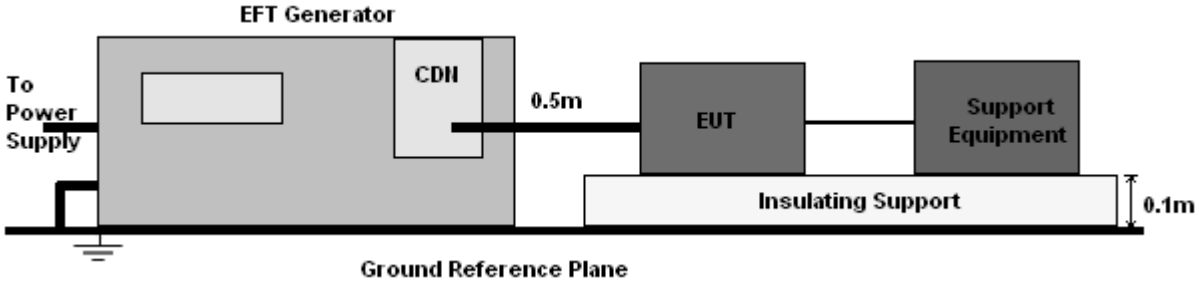
Please refer to the following page.

R/S Test Data				
Temperature:	25.1℃	Humidity:	55%	
Power Supply:	AC 230V/50Hz	Test Mode:	Mode 1	
Criterion:	A	Steps	1 %	
Frequency (MHz)	Position	Field Strength (V/m)	Required Level	Result
80 – 1000	Front, Right, Back, Left	3	A	Pass
Note: N/A				

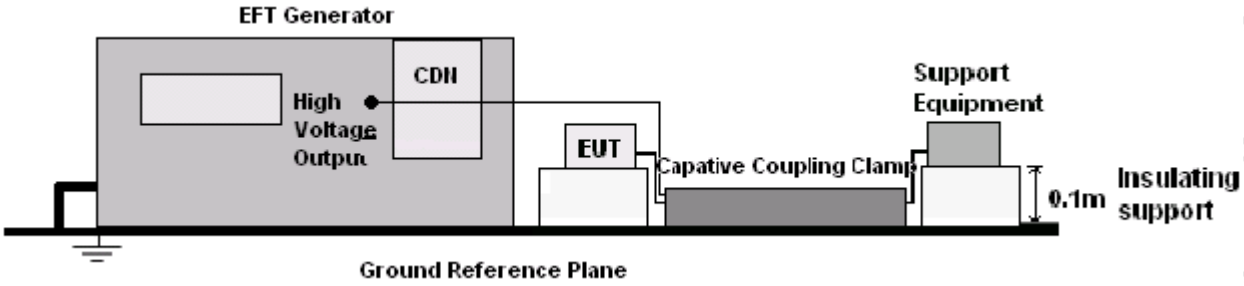
13. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

13.1 Block Diagram of EUT Test Setup

For input a.c. / d.c. power port:



For signal lines and control lines:



13.2 Test Standard

BS EN 61547, BS EN 61000-4-4

13.3 Severity Levels and Performance Criterion

Severity Level 2 at 1KV, Pulse Rise time & Duration: 5 nS / 50 nS

Performance criterion: B

13.4 Test Procedure

EUT shall be placed 0.8m high above the ground reference plane which is a min.1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m

For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.

13.5 Test Results

PASS

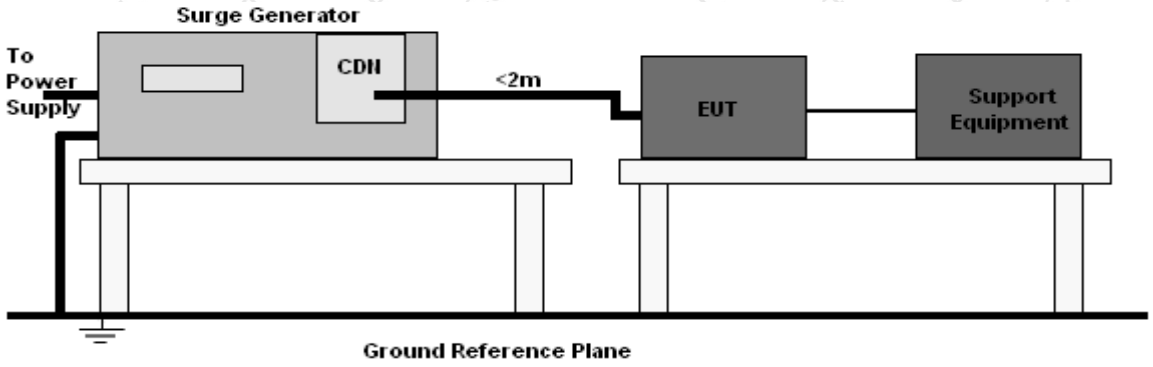
Please refer to the following page.

EFT Test Data			
Temperature:	24.5℃	Humidity:	53%
Power Supply :	AC 230V/50Hz	Test Mode:	Mode 1

Coupling Line	Test Voltage (kV)	Performance Criterion	Result
L	±0.5, 1	B	PASS
N	±0.5, 1	B	PASS
L-N	±0.5, 1	B	PASS

14. SURGE TEST

14.1 Block Diagram of EUT Test Setup



14.2 Test Standard

BS EN 61547, BS EN61000-4-5

14.3 Severity Levels and Performance Criterion

Severity Level: Line to Line, Level 2 at 1KV;

Severity Level: Line to Earth, Level 3 at 2KV.

Performance criterion: B

14.4 Test Procedure

1) Set up the EUT and test generator as shown on section 14.1

2) For line-to-line coupling mode, provide a 1KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.

4) Different phase angles are done individually.

5) Repeat procedure 2) to 4) except the open-circuit test voltage change from 1KV to 2KV for line to earth coupling mode test.

6) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

14.5 Test Result

PASS

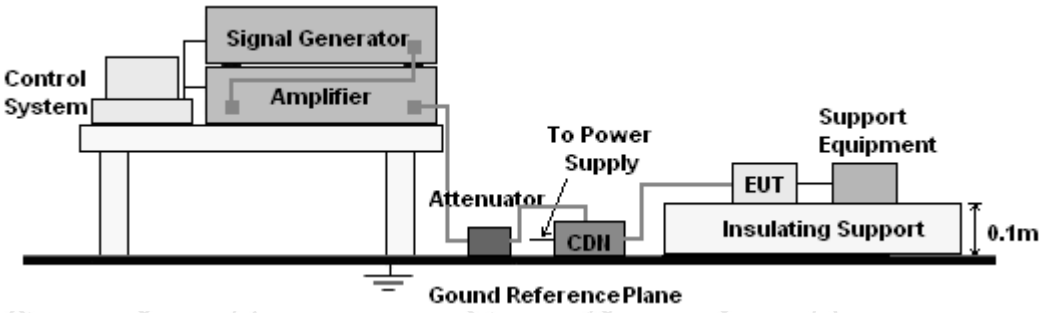
Please refer to the following page.

Surge Test Data						
Temperature:	24.5℃		Humidity:	53%		
Power Supply :	AC 230V/50Hz		Test Mode:	Mode 1		
Location	Polarity	Phase Angle	No of Pulse	Pulse Voltage (KV)	Performance Criterion	Result
L-N	+	90	5	0.5,1	B	Pass
L-N	-	270	5	0.5,1	B	Pass
Note: N/A						

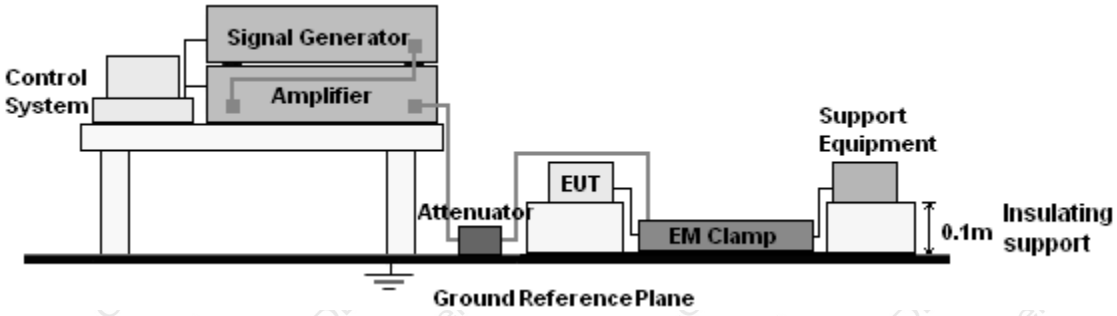
15. INJECTED CURRENTS SUSCEPTIBILITY TEST

15.1 Block Diagram of EUT Test Setup

For input a.c. / d.c. power port:



For signal lines and control lines:



15.2 Test Standard

BS EN 61547, BS EN61000-4-6

15.3 Severity Levels and Performance Criterion

Severity Level 2: 3V(rms), 150KHz ～ 80MHz/230MHz

Performance criterion: A

15.4 Test Procedure

1) Set up the EUT, CDN and test generator as shown on section 15.1

2) Let EUT work in test mode and measure.

3) The EUT and supporting equipments are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane at above 0.1-0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).

4) The disturbance signal described below is injected to EUT through CDN.

5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.

6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave

7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency

value.

8) Recording the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

15.5 Test Result

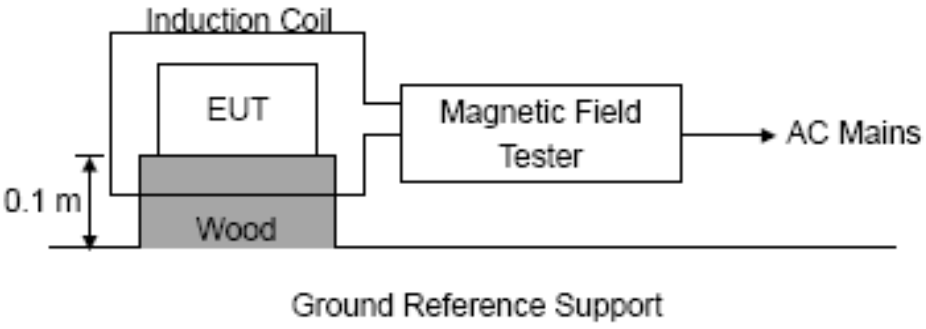
PASS

Please refer to the following page.

CS Test Data						
Temperature:		24.5℃		Humidity:	53%	
Power Supply :		AC 230V/50Hz		Test Mode:	Mode 1	
Frequency Range (MHz)	Injected Position	Strength	Modulation Signal	Freq. Step	Performance Criterion	Result
0.15～80	AC Line	3V(rms), Unmodulated	AM 80%, 1kHz sine wave	1%	A	Pass
0.15～80	DC Line, Signal Line	3V(rms), Unmodulated	AM 80%, 1kHz sine wave	1%	/	/
Note: N/A						

16. MAGNETIC FIELD IMMUNITY TEST

16.1 Block Diagram of EUT Test Setup



16.2 Test Standard

BS EN 61547, BS EN61000-4-8

16.3 Severity Levels and Performance Criterion

Severity Level 2: 3A/m

Performance criterion: A

16.4 Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m) and shown in Section 16.1. The induction coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

16.5 Test Result

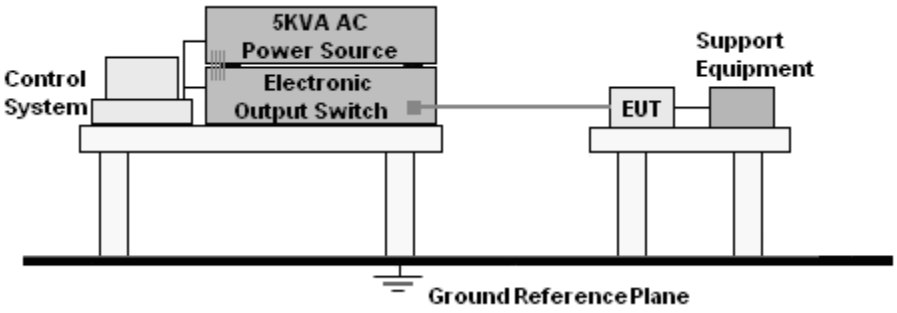
PASS

Please refer to the following page.

MS Test Data					
Temperature:	24.5℃		Humidity:	53%	
Power Supply :	AC 230V/50Hz		Test Mode:	Mode 1	
Test specification	Units	Duration	Coil Orientation	Performance Criterion	Result
3	A/m	5 Min	X	A	PASS
			Y	A	PASS
			Z	A	PASS
Note: N/A					

17. VOLTAGE DIPS AND INTERRUPTIONS TEST

17.1 Block Diagram of EUT Test Setup



17.2 Test Standard

BS EN 61547, BS EN IEC 61000-4-11

17.3 Severity Levels and Performance Criterion

Input and Output AC Power Ports.

☑ Voltage Dips.

☑ Voltage Interruptions.

Environmental Phenomena	Test Specification	Units	Phase Angle	Performance Criterion
Voltage Dips	70 10	% Reduction period	0°, 180°	C
Voltage Interruptions	0 0.5	% Reduction period	0°, 180°	B

17.4 Test Procedure

1) Set up the EUT and test generator as shown on section 17.1

2) The interruption is introduced at selected phase angles with specified duration. There is a 3mins minimum interval between each test event.

3) After each test a full functional check is performed before the next test.

4) Repeat procedures 2 & 3 for voltage dips, only the level and duration is changed.

5) Record any degradation of performance.

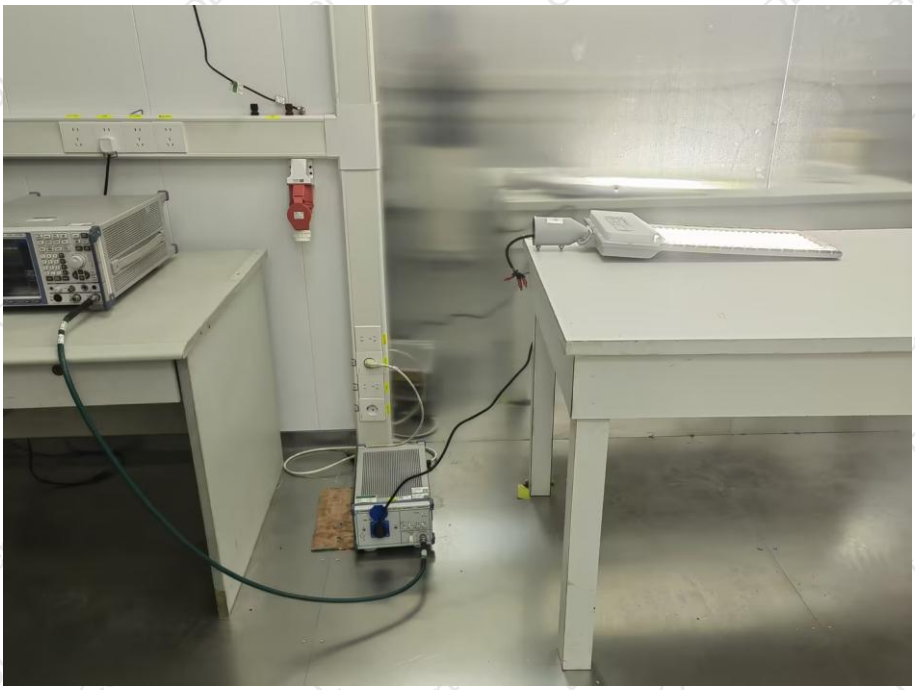
17.5 Test Result

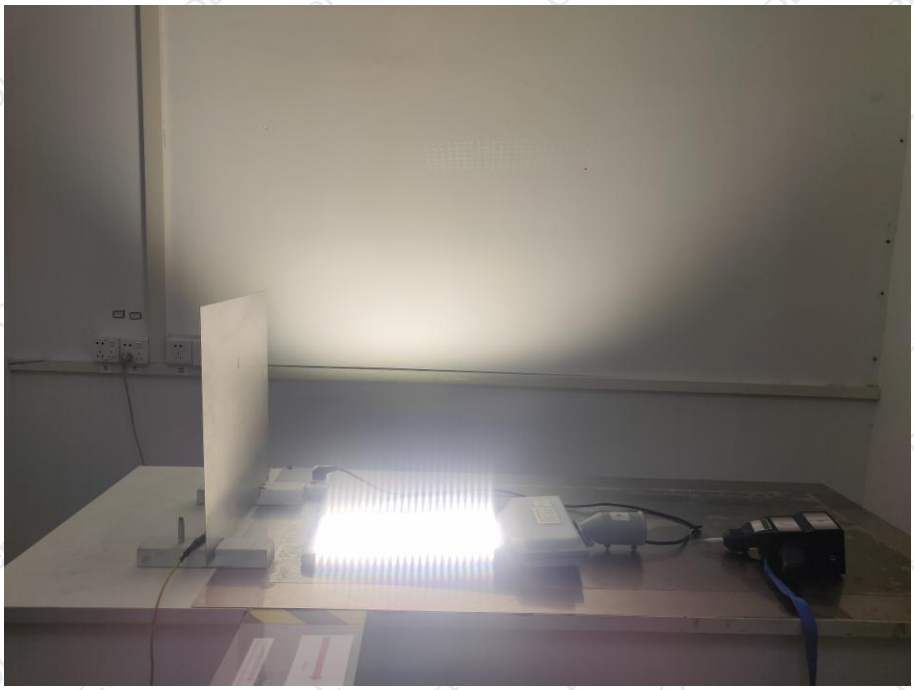
PASS

Please refer to the following page.

DIPS Test Data				
Temperature:	24.5℃	Humidity:	53%	
Power Supply :	AC 230V/50Hz	Test Mode:	Mode 1	
Environmental Phenomena	Test Specification	Units	Performance Criterion	Result
Voltage Dips	70 10	% Reduction period	C	Pass
Voltage Interruptions	0 0.5	% Reduction period	B	Pass

18. SETUP PHOTOGRAPHS

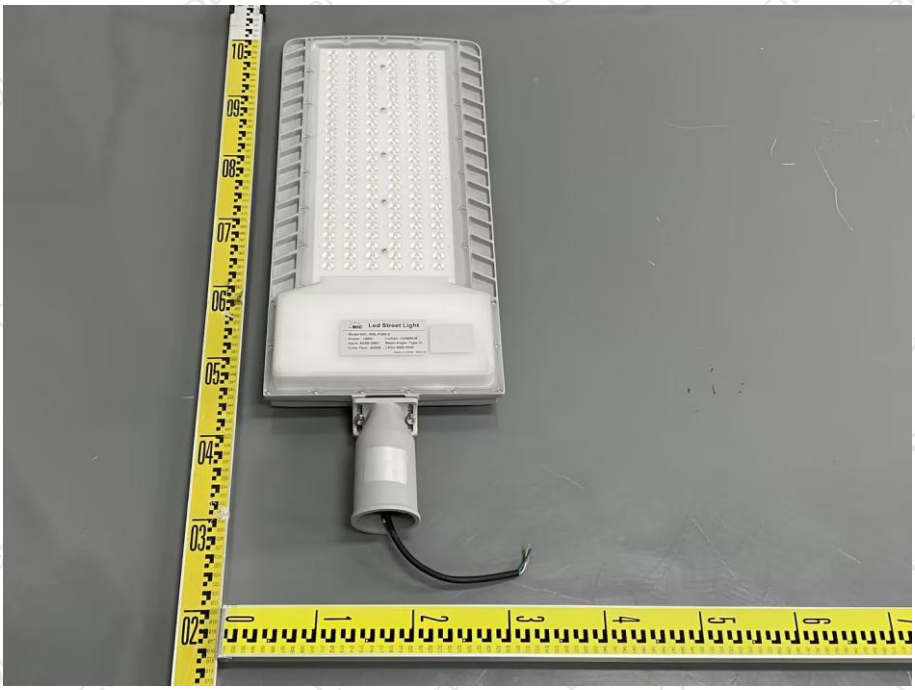


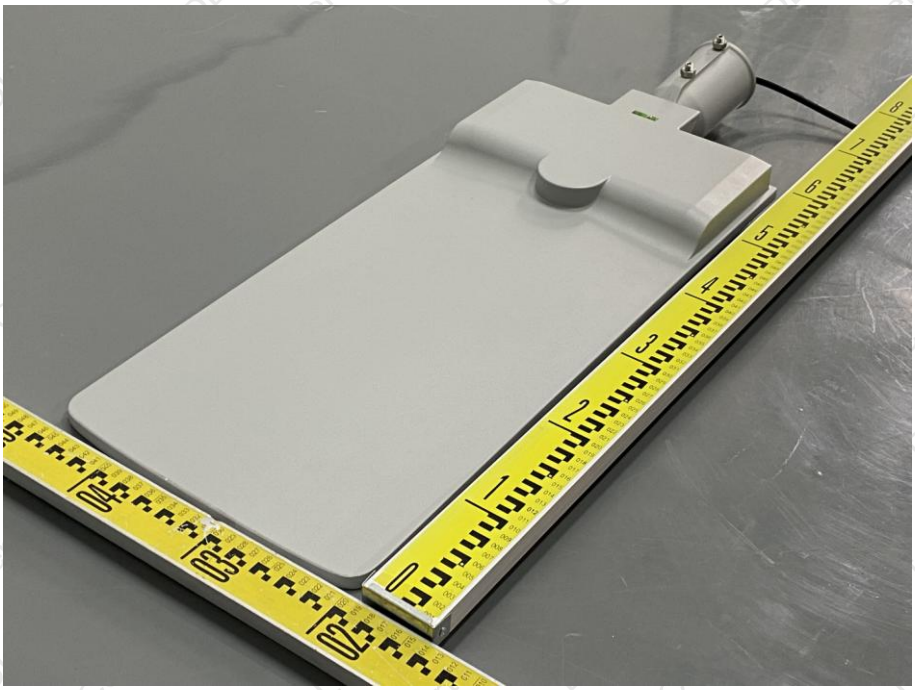


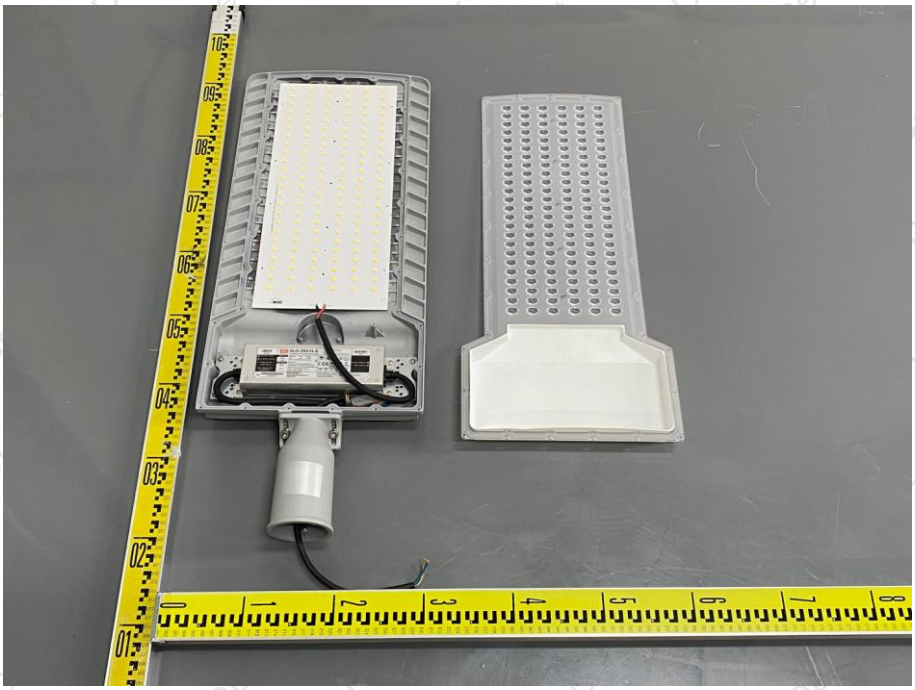

LAPLACE INSTRUMENTS LTD

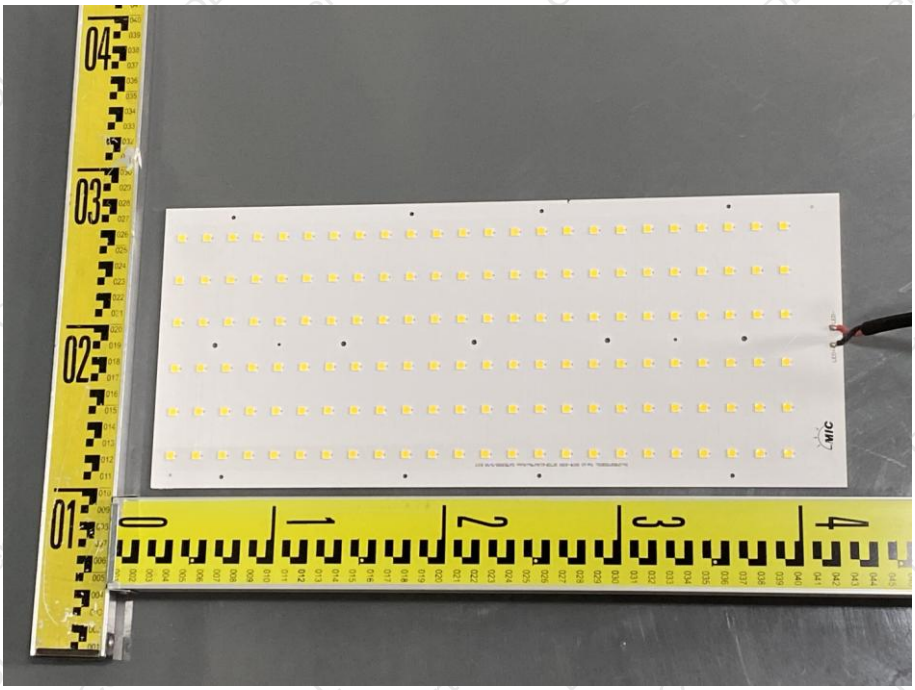

HTEC
HCOMPACT

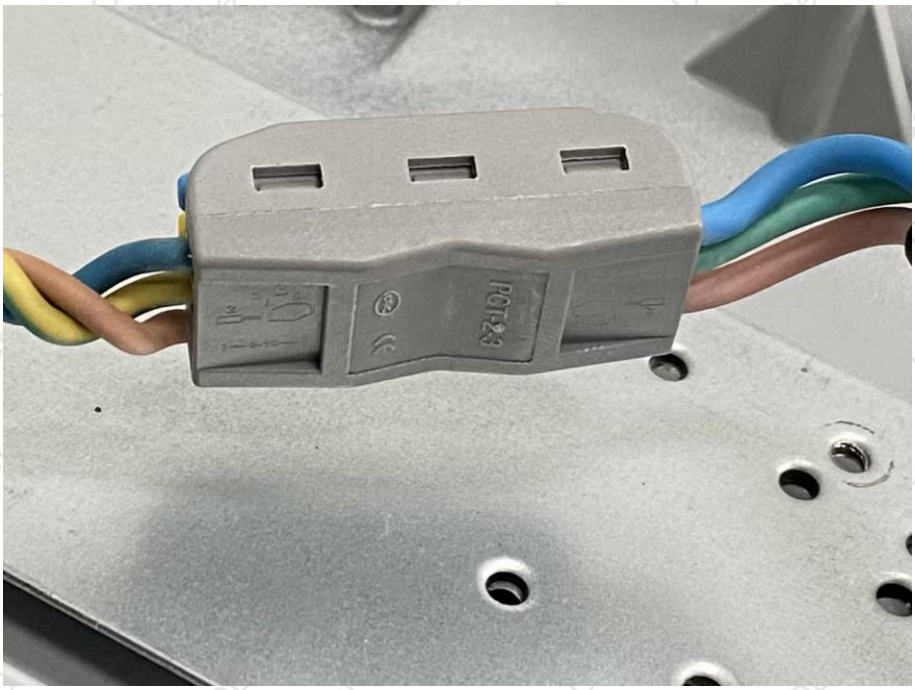
19. EUT PHOTOGRAPHS











※※※※※ END OF REPORT ※※※※※