

EMC TEST REPORT

Sample : LED SOLAR STREETLIGHT

Trade Mark : V-TAC

Main Model : VT-20201ST

Additional Model : VT-30301ST, VT-40401ST

Report No. : UNIA23011003ER-11

Prepared for

V-TAC EXPORTS LTD

FLAT/RM D-2, 7F, WING CHEONG COMMERCIAL BLDG, 19-25 JERVOIS
STREET, SHEUNG WAN, HONGKONG

Prepared by

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TEST RESULT CERTIFICATION

Applicant: V-TAC EXPORTS LTD
Address: FLAT/RM D-2, 7F, WING CHEONG COMMERCIAL BLDG, 19-25
JERVOIS STREET, SHEUNG WAN, HONGKONG
Manufacturer: V-TAC EXPORTS LTD
Address: FLAT/RM D-2, 7F, WING CHEONG COMMERCIAL BLDG, 19-25
JERVOIS STREET, SHEUNG WAN, HONGKONG

Product description

Product: LED SOLAR STREETLIGHT
Trade Mark.....: V-TAC
Model Name: VT-20201ST, VT-30301ST, VT-40401ST

Standards: EN IEC 55015:2019+A11:2020
EN 61547:2009

Date of Test

Date (s) of performance of tests: Jan.10,2023 ~ Jan.13,2023
Date of Issue.....: Jan.16,2023
Test Result.....: Pass

Prepared by:

kahn.yang

Kahn Yang/Editor



Reviewer:

Kelly Cheng/Supervisor



Approved & Authorized Signer:

Liuze/Manager

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1 TEST SUMMARY

1.1 TEST RESULTS

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Class	Result	Remark
EN IEC 55015:2019+A11:2020	Conducted Emission	Class B	N/A	--
	Radiated Emission	Class B	PASS	--
EN IEC 61000-3-2:2019 +A1:2021	Harmonic Current Emission	--	N/A	--
EN 61000-3-3:2013 +A2:2021+AC:2022-01	Voltage Fluctuations & Flicker	--	N/A	--
EMC Immunity				
Section EN 61547:2009	Test Item	Performance Criteria	Result	Remark
EN 61000-4-2:2009	Electrostatic Discharge	B	PASS	--
EN IEC 61000-4-3:2020	RF Electromagnetic Field	A	PASS	--
EN 61000-4-4:2012	Fast Transients	B	N/A	--
EN 61000-4-5:2014 +A1:2017	Surges	B	N/A	--
EN 61000-4-6:2014 +AC:2015	Injected Current	A	N/A	--
EN 61000-4-8:2010	Power Frequency Magnetic Field	A	N/A	--
EN IEC 61000-4-11:2020+AC: 2020-06	Volt. Interruptions Volt. Dips	B / C	N/A	NOTE (2)

Note:

- (1) "N/A" denotes test is not applicable in this test Report.
- (2) Voltage Dip: 100% reduction – Performance Criteria B
Voltage Dip: 30% reduction – Performance Criteria C
- (3) For client's request and manual description, the test will not be executed.
- (4) "--" means "no" in this test report.

1.2 TEST LOCATION

Test Laboratory : Shenzhen United Testing Technology Co.,Ltd.
 Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95%.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	CISPR 16-4-2	9kHz ~ 150kHz	2.96	--
		150kHz ~ 30MHz	2.44	--

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	CISPR 16-4-2	9kHz ~ 30MHz	2.50	--
		30MHz ~ 1000MHz	4.80	--
		1000MHz ~ 6000MHz	4.13	--

1.4 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35 °C
Relative Humidity:	30~60 %
Air Pressure:	950~1050 hPa

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

The following information of EUT submitted and identified by applicant:

Product:	LED SOLAR STREETLIGHT
Trade Mark:	V-TAC
Main Model:	VT-20201ST
Additional Model:	VT-30301ST, VT-40401ST
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: VT-20201ST.
Power Source:	DC 3.2V by battery
Product Description:	The EUT is a LED SOLAR STREETLIGHT. Based on the application, features, or specification exhibited in User's Manual, more details of EUT technical specification, please refer to the User's Manual.

I/O Port Information (Applicable Not Applicable)

I/O Port Type	Number
/	/

2.2 DESCRIPTION OF THE TEST MODES

No.	Test mode description	Worst
1	Lighting on	--

Note: Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

2.3 DESCRIPTION OF TEST SETUP



Note: The EUT tested system was configured as upper figure, unless otherwise a special operating condition is specified in the following during the testing.

2.4 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Power Cable Length	Note
E-1	LED SOLAR STREETLIGHT	V-TAC	VT-20201ST	--	EUT

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2023.09.27
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2024.02.26
4	PREAMP	HP	8449B	3008A00160	2023.09.22
5	PREAMP	HP	8447D	2944A07999	2023.05.17
6	EMI Test Receiver	Rohde&Schwarz	ESR3	101891	2023.09.22
7	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2023.09.22
8	Active Loop Antenna	Com-Power	AL-310R	10160009	2023.07.25
9	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2023.05.23
10	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2023.09.27
11	Loop Antenna	Beijing daze Technology	ZN30401	13015	2023.09.22
12	EM Clamp	Schwarzbeck	MDS21	03350	2023.09.27
Electrostatic Discharge Test					
1	ESD Generator	EVERFINE	EMS61000-2A	P185811CA837112 1	2023.09.23
RS Test					
1	Power Meter	Agilent	E4419B	QB4331226	2023.10.10
2	Power Sensor	Agilent	8481A	MY41092622	2023.10.10
3	Power Sensor	Agilent	8481A	US37296783	2023.10.10
4	Signal Generator	Agilent	N5182A	MY46240556	2023.10.10
5	Power Amplifier	MICOTOP	MPA-80-1000-250	1711489	2023.10.10
6	Power Amplifier	MICOTOP	MPA-1000-3000-7 5	1711488	2023.10.10
7	Power Amplifier	MICOTOP	MPA-3000-6000-5 0	MPA1706275	2023.10.10
8	Bilog Antenna	TESEQ	CBL6111D	34678	2023.10.10
9	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2023.05.23

3 RADIATED EMISSIONS MEASUREMENT

3.1 RADIATION EMISSION LIMIT

Frequency (MHz)	⊠2m	□3m	□4m
	dB(μA)	dB(μA)	dB(μA)
0.009~0.07	88	81	75
0.07~0.15	88 - 58 *	81 - 51 *	75 - 45 *
0.15~3.0	58 - 22 *	51 - 15 *	45 - 9 *
3.0~30.0	22	15 - 16 *	9 - 12 *

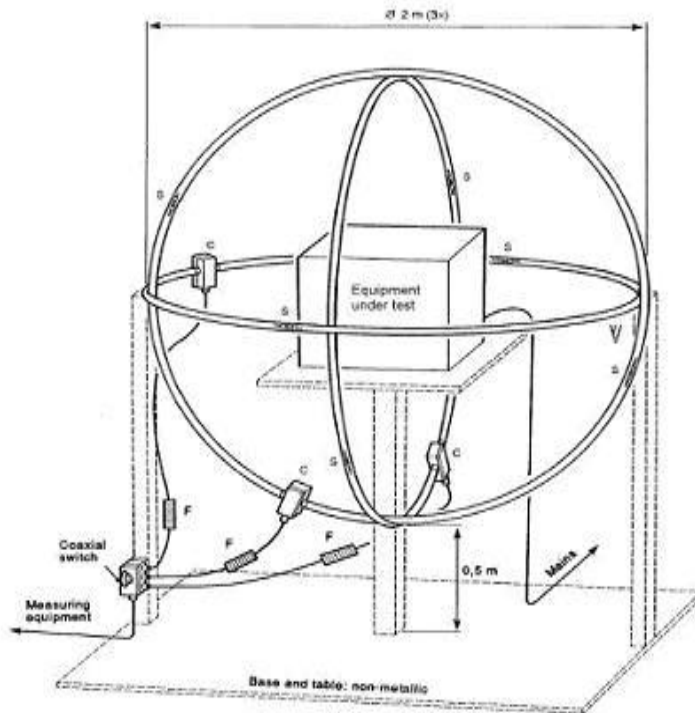
Frequency (MHz)	10m	3m
	dBuV/m	dBuV/m
30~230	30	40
230~1000	37	47

Note:

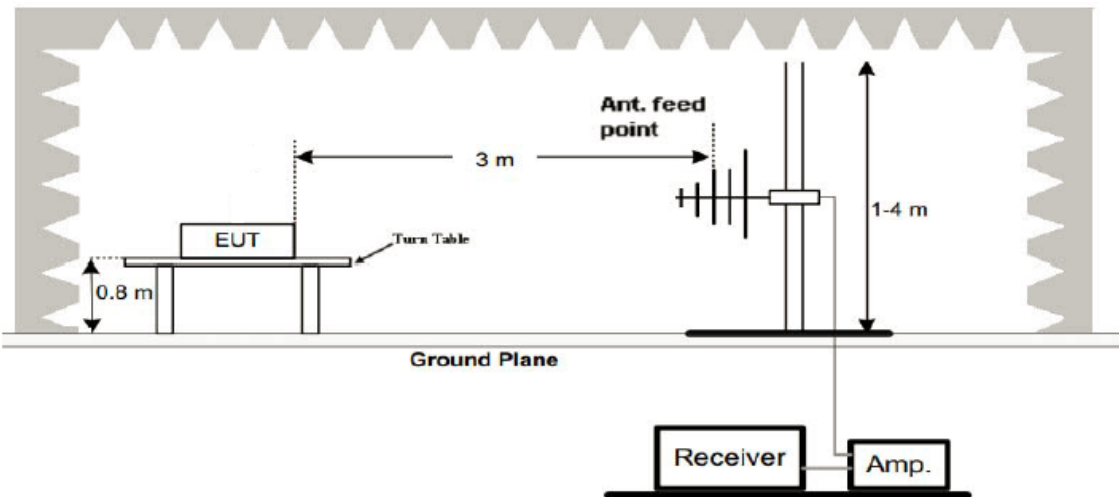
1. The limit for radiated test was performed according to as following: CISPR 15.
2. The tighter limit applies at the band edges.
2. Emission level (dBuV/m) = 20log Emission level (uV/m).

3.2 TEST SETUP

1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency Above 30MHz



3.3 TEST PROCEDURE

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.
6. For the actual test configuration, please refer to the related Item EUT Test Photos.

3.4 TEST RESULT

PASS

Below 30MHz Test Results:

Note: The peak value is too low against the limit, so the test data is not record.

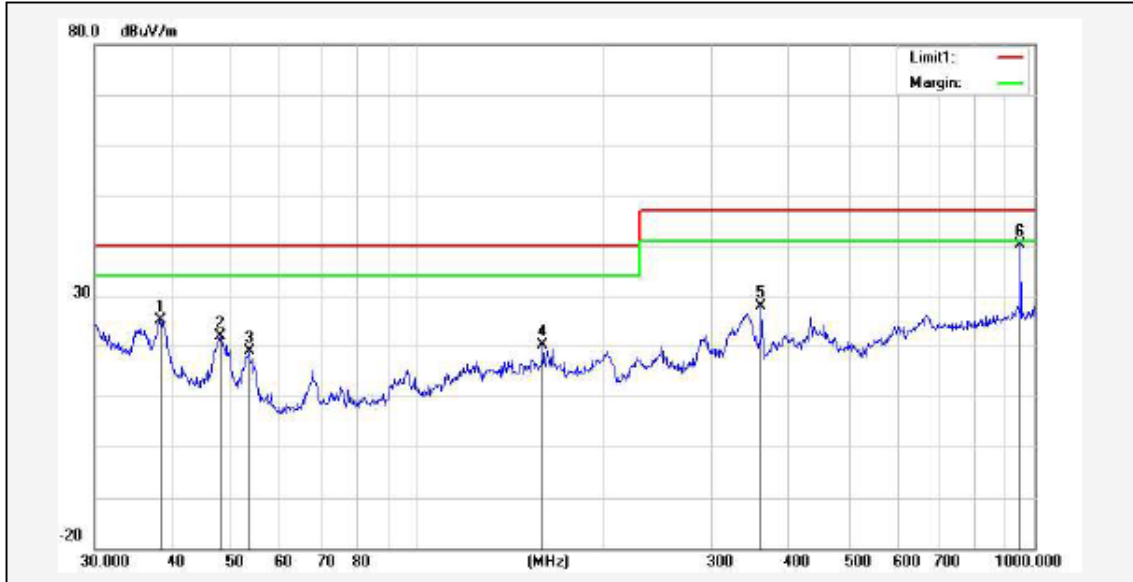
Above 30MHz Test Results:

Temperature:	24°C	Relative Humidity:	48%
Test Voltage:	DC 3.2V	Pressure:	1010hPa
Test Mode:	Mode 1	Polarization:	Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	30.1054	30.56	-7.18	23.38	40.00	-16.62			peak
2	35.4993	34.15	-11.29	22.86	40.00	-17.14			peak
3	159.7844	34.66	-16.64	18.02	40.00	-21.98			peak
4	293.0842	42.34	-14.72	27.62	47.00	-19.38			peak
5	341.9786	47.96	-14.23	33.73	47.00	-13.27			peak
6*	948.7610	39.65	-5.20	34.45	47.00	-12.55			peak

Temperature:	24°C	Relative Humidity:	48%
Test Voltage:	DC 3.2V	Pressure:	1010hPa
Test Mode:	Mode 1	Polarization:	Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	38.3462	38.87	-13.66	25.21	40.00	-14.79			peak
2	47.9940	41.25	-19.41	21.84	40.00	-18.16			peak
3	53.3180	39.80	-20.82	18.98	40.00	-21.02			peak
4	159.7844	36.77	-16.64	20.13	40.00	-19.87			peak
5	360.4476	41.72	-13.92	27.80	47.00	-19.20			peak
6*	948.7610	45.29	-5.20	40.09	47.00	-6.91			peak

Remark: 1. Result = Reading Level+ Factor, Margin= Result – Limit
 Factor=Ant. Factor + Cable Loss – Pre-amplifier

4 EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/SERVRITY LEVEL/CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform Criteria
ESD EN 61000-4-2	8kV air discharge 4kV contact discharge	Direct Mode	B
	4kV HCP discharge 4kV VCP discharge	Indirect Mode	B
RS EN 61000-4-3	80 MHz to 1000 MHz, 1000Hz, 80%,AM modulated	Enclosure	A

4.2 GENERAL PERFORMANCE CRITERIA

According to EN 61547 standard, the general performance criteria as following:

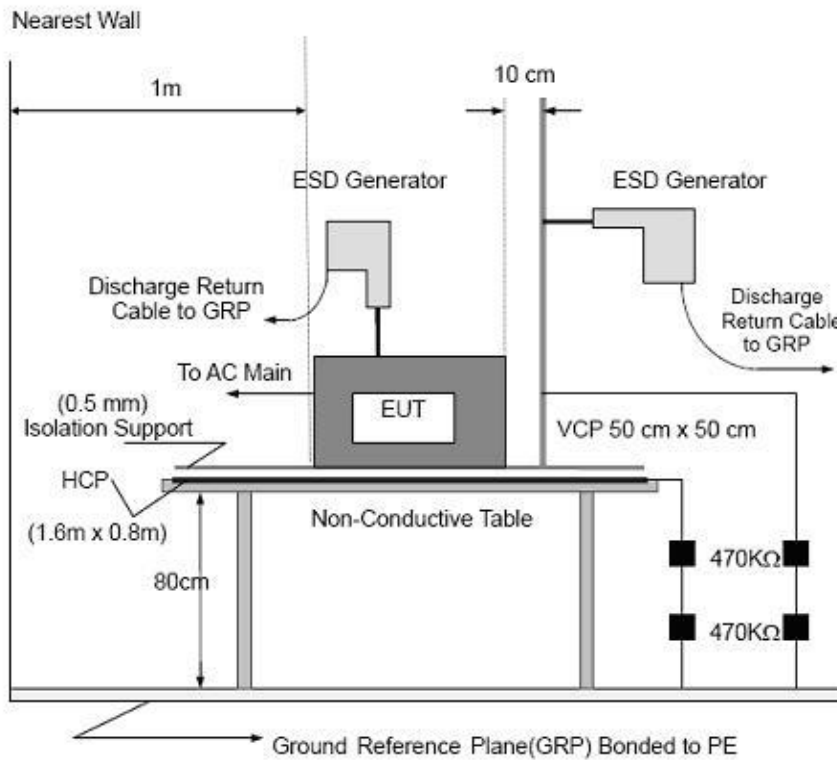
Criterion A	During the test, no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.
Criterion B	During the test, the luminous intensity may change to any value. After the test, the luminous intensity shall be restored to its 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.

5 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

5.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance:	B
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV (Direct) Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.2 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 0.8-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1 meter thickness. The GRP was consisted of a sheet of aluminum that is at least 0.25mm thick, and extended at least 0.5 meters from the EUT on all sides.

5.3 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manners:

1. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

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

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 EUT.

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

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

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

2. Air discharges at insulation surfaces of the EUT.

It was at least ten single discharges with positive and negative at the same selected point.

5.4 TEST RESULT

Temperature:	22°C	Relative Humidity:	48%
Test Voltage:	DC 3.2V	Pressure:	1010hPa
Test Mode:	Mode 1		

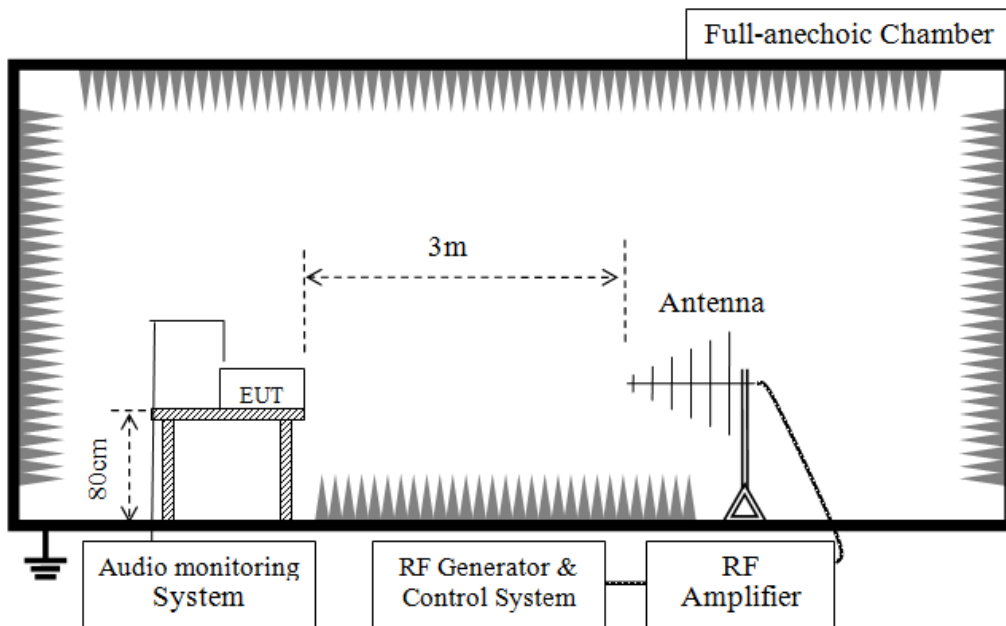
Voltage	Coupling	Test Performance	Performance Result	Result (Pass/Fail)
±4kV	Contact Discharge	No function loss	A	Pass
±4kV	Indirect Discharge HCP (Front)	No function loss	A	Pass
±4kV	Indirect Discharge HCP (Left)	No function loss	A	Pass
±4kV	Indirect Discharge HCP (Back)	No function loss	A	Pass
±4kV	Indirect Discharge HCP (Right)	No function loss	A	Pass
±4kV	Indirect Discharge VCP (Front)	No function loss	A	Pass
±4kV	Indirect Discharge VCP (Left)	No function loss	A	Pass
±4kV	Indirect Discharge VCP (Back)	No function loss	A	Pass
±4kV	Indirect Discharge VCP (Right)	No function loss	A	Pass
±8kV	Air Discharge	No function loss	A	Pass

6 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

6.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Required Performance:	A
Frequency Range:	80 MHz ~1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.55 m
Dwell Time:	1.5×10^{-3} decade/s

6.2 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

6.3 TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition need as following manners:

- 1.The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- 2.The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- 3.The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

6.4 TEST RESULT

Temperature:	22°C	Relative Humidity:	48%
Test Voltage:	DC 3.2V	Pressure:	1010hPa
Test Mode:	Mode 1		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Performance Result	Result (Pass/Fail)
80~1000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	A	PASS
			Rear		
			Left		
			Right		

Note: "A" stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

- 1) N/A - denotes test is not applicable in this test report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

7 PHOTO OF EUT

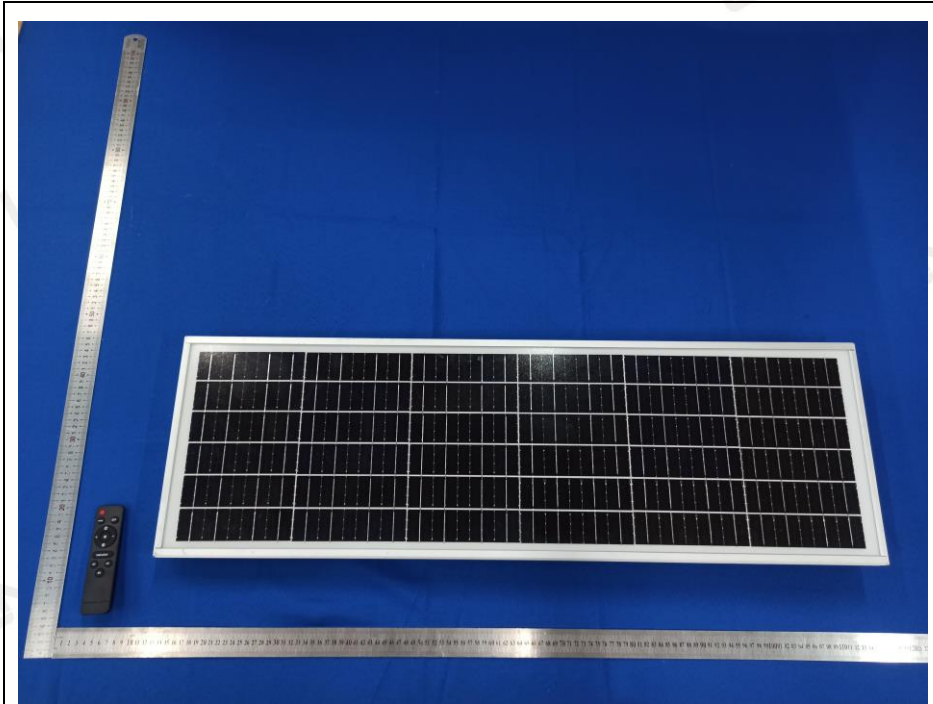


PHOTO 01



PHOTO 02



PHOTO 03

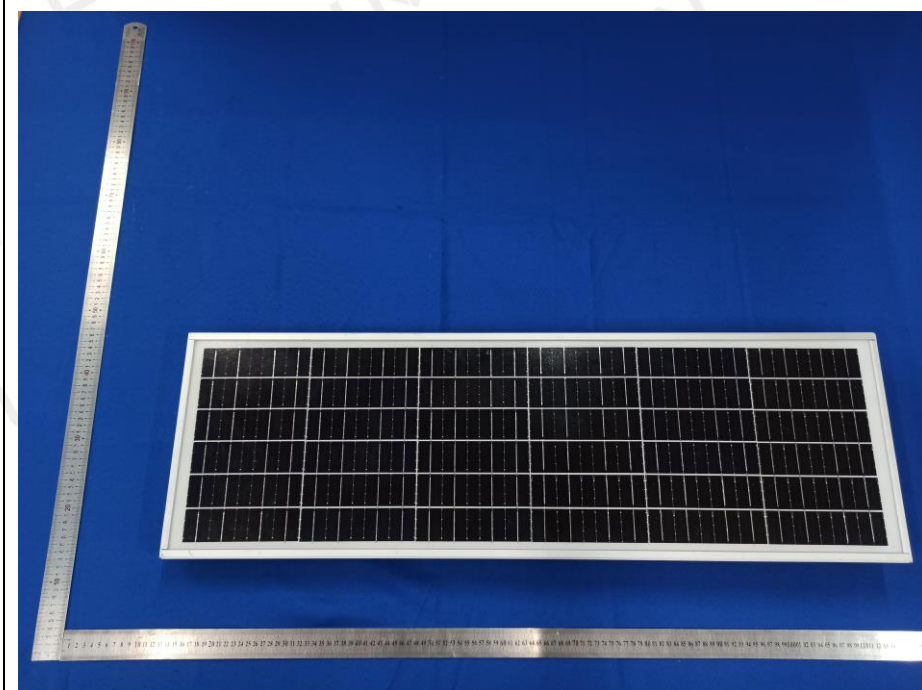


PHOTO 04

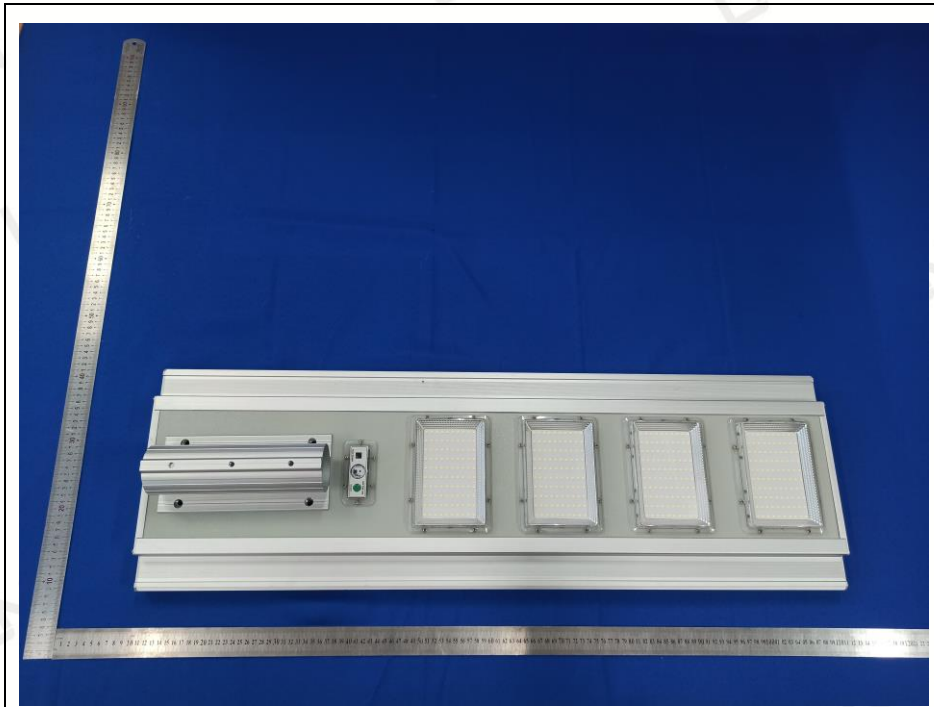


PHOTO 05



PHOTO 06

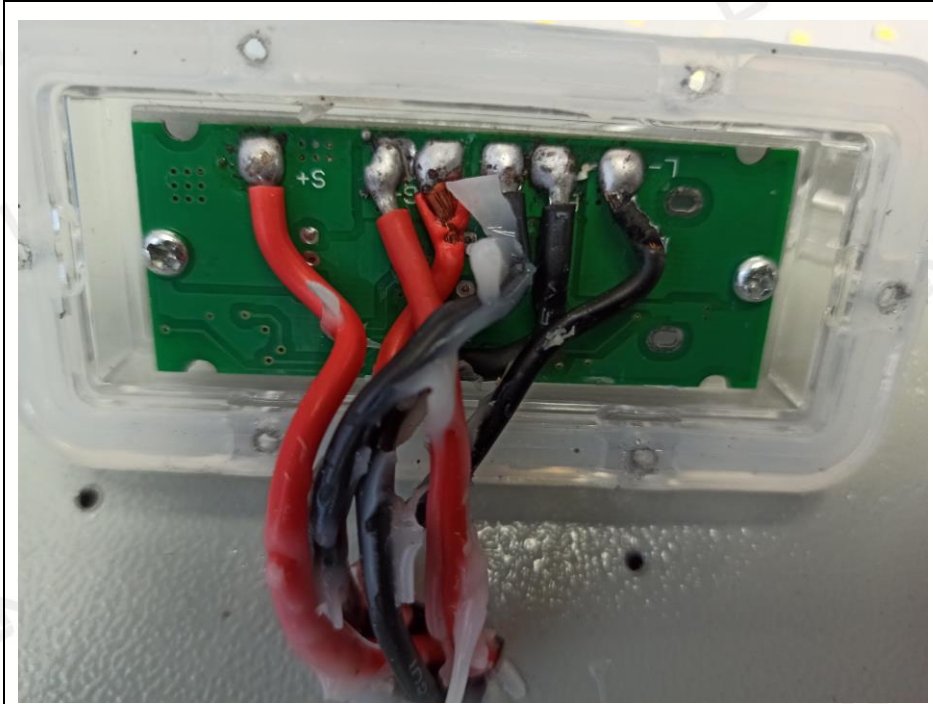


PHOTO 07

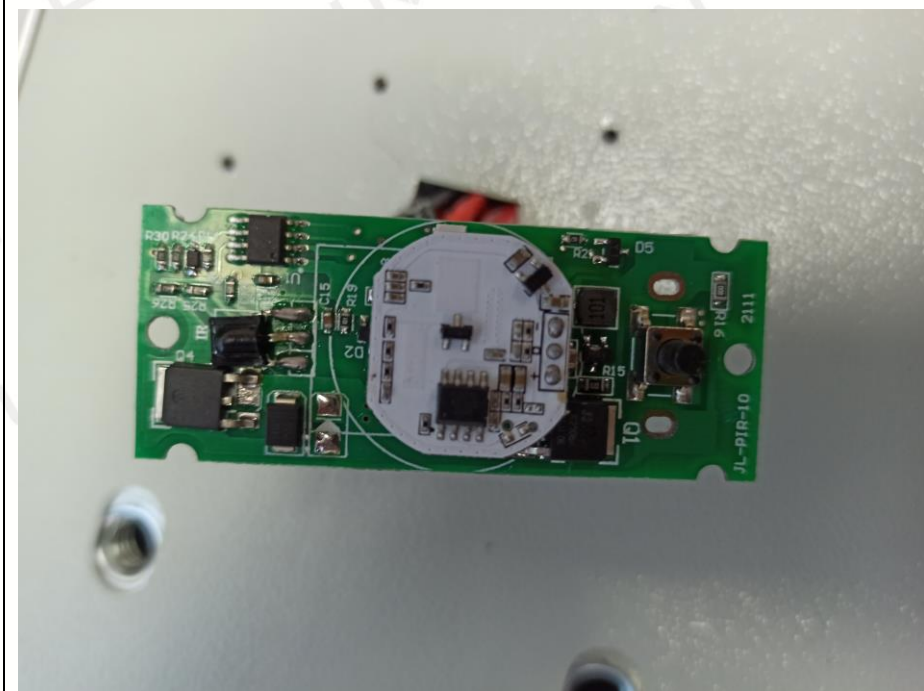


PHOTO 08

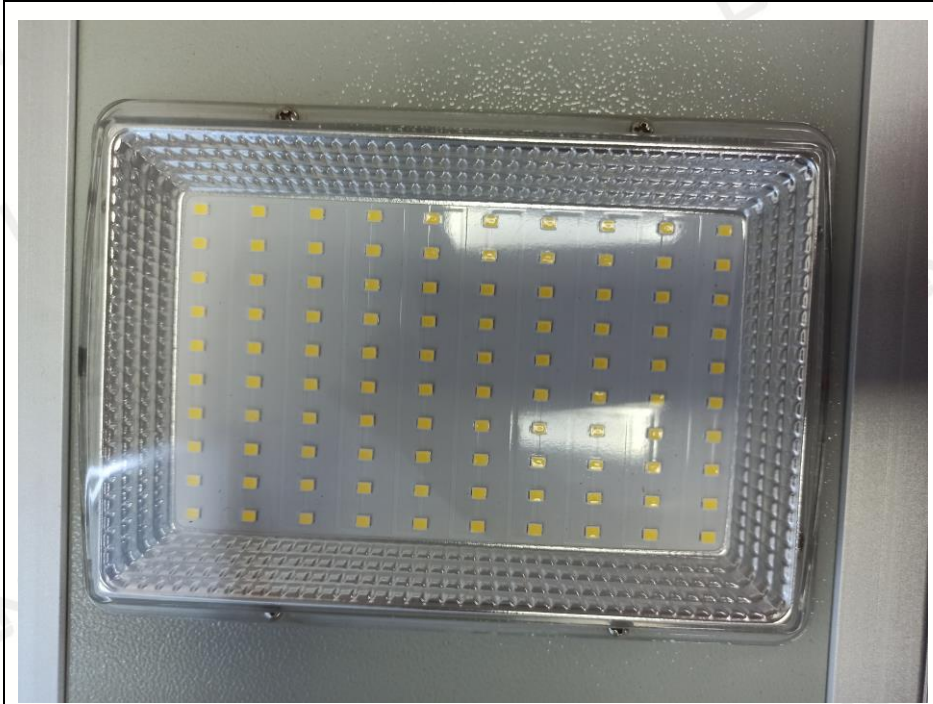


PHOTO 09

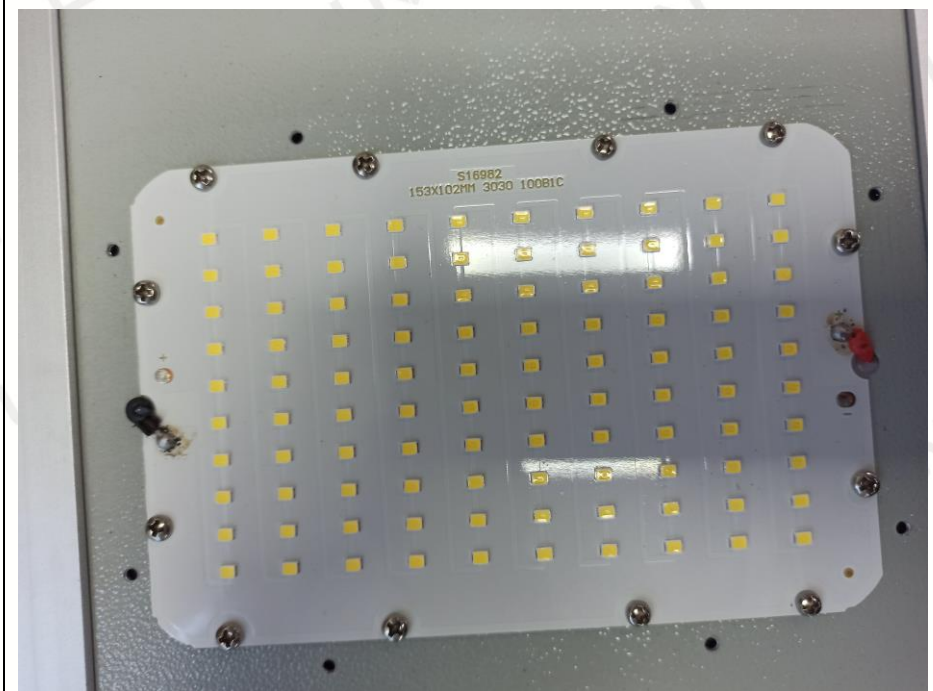


PHOTO 10



PHOTO 11



PHOTO 12



8 PHOTO OF TEST



PHOTO 01



PHOTO 02



End of Report

Statement

- 1.This report must have the signature of the authorized signatory and the special seal of the report, otherwise it will be considered invalid.If there is no anti-counterfeiting electronic seal of the laboratory in the report in PDF format or it is displayed as "x", the report is invalid.
- 2.This report shall not be modified, added or deleted without authorization.
- 3.The results of this report are only valid for the EUT provided by Applicant to our laboratory for inspection (That is,EUT received by our laboratory.Without special explanation, it refers to the samples presented in the report " PHOTO OF EUT ").
- 4.If there is any objection to the test data and conclusions of this report, please submit it in writing within 10 working days after the date of issuance of the report.
- 5.Without the written consent of the laboratory, this report shall not be copied (except for full copy), nor shall it be used as publicity materials or advertising.
- 6.The cover of the report is for decoration only, not included in the body of the report.
- 7.The paper report issued by our laboratory has the same effect as the electronic report. In case of any difference between the two, the electronic report shall prevail.
- 8.The Chinese and English reports issued by our laboratory have the same effect. In case of any difference in understanding, the Chinese version shall prevail.
- 9.Please provide the complete report documents issued by our laboratory when inquiring the report.
- 10.For cases where compliance is determined based on test values, when relevant specifications, standards, documents, and customers have no relevant requirements and no other special instructions, the test report issued by this laboratory is carried out in full value and adopts ILAC-G8:09 /2019 "Simple Acceptance Rule" for judgment.
- 11.In the People's Republic of China, when there is no CMA Accredited Symbol in this report, the report is only for scientific research, teaching or internal quality control activities.