EMC Test Report

Client Name	:	Foshan kaicheng lightling co., ltd
Address	:	No. 16 Xingyexi Road, Shishan, Nanhai District, Foshan 52800 , China
Product Name	:	Solar Street light
Date	:	Jul. 02, 2020

Shenzhen Anbotek Compliance Laboratory Limited

Contents

TEST REPORT

Applicant	:	Foshan kaicheng lightling co., ltd
Manufacturer	:	Foshan kaicheng lightling co., ltd
Product Name	:	Solar Street light
Model No.	:	TR01-C, TR01-A, TR01-B
Trade Mark	:	N.A.
Rating(s)	:	Operating Voltage: 3.2V; Operating Current: 31.25A; Max power: 100W; Battery: 3.2V, 40 Ah
Test Standard(s)	:	**EN 55015: 2013+A1: 2015; EN 61547: 2009; (IEC 61000-4-2; IEC 61000-4-3)**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the EN 55015 and EN 61547 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt: Jun. 17, 2020

Date of Test: Jun. 17~28, 2020

Prepared By: Winnie Huang
(Engineer / Winnie Huang)

Reviewer: Well Wang
(Supervisor / Well Wang)

Approved & Authorized Signer: Tom Chen
(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Foshan kaicheng lightling co., ltd
Address	:	No. 16 Xingyexi Road, Shishan, Nanhai District, Foshan 52800 , China
Manufacturer	:	Foshan kaicheng lightling co., ltd
Address	:	No. 16 Xingyexi Road, Shishan, Nanhai District, Foshan 52800 , China
Factory	:	Foshan kaicheng lightling co., ltd
Address	:	No. 16 Xingyexi Road, Shishan, Nanhai District, Foshan 52800 , China

1.2. Description of Device (EUT)

Product Name	:	Solar Street light	
Model No.	:	TR01-C, TR01-A, TR01-B (Note: All samples are the same except the model number & appearance, so we prepare “TR01-C” for test only.)	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 3.2V via Solar Panel / DC 3.2V	
Test Sample No.	:	1-1-1	
Product Description	:	Adapter:	N/A
Remark: (1) For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual.			

1.3. Auxiliary Equipment Used During Test

N/A		

1.4. Description of Test Modes

Pretest Modes	Descriptions
Mode 1	Solar Charging
Mode 2	On

For Mode 1~ Mode 2 Block Diagram of Test Setup

EUT

1.5. Test Summary

Test Items	Test Modes	Status
Power Line Conducted Emission Test (9KHz To 30MHz)	/	N
Radiated Emission Test (30MHz To 1000MHz)	Mode 1 Mode 2	P
Magnetic Radiated Emission Test (9KHz To 30MHz)	Mode 2	P
Electrostatic Discharge immunity Test	Mode 1 Mode 2	P
RF Field Strength susceptibility Test	Mode 1 Mode 2	P
Electrical Fast Transient/Burst Immunity Test	/	N
Surge Immunity Test	/	N
Injected Currents Susceptibility Test	/	N
Voltage Dips and Interruptions Test	/	N
P) Indicates “PASS”. N) Indicates “Not applicable”		

1.6. Test Equipment List

Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 04, 2019	1 Year
2.	Pre-amplifier	Schwarzbeck	BBV-9745	9745-075	Nov. 04, 2019	1 Year
3.	Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	01109	Nov. 01, 2019	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	EMEC-3A1	N/A	N/A	N/A

Magnetic Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 04, 2019	1 Year
2.	Triple-Loop Antenna(2M)	EVERFINE	LLA-2	905003	Nov. 04, 2019	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 04, 2019	1 Year
4.	Software Name EZ-EMC	Ferrari Technology	ANB-03A	N/A	N/A	N/A

Electrostatic Discharge Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Simulators	emtest	ESD NX30.1	11891	Mar. 07, 2020	1 Year

R/S Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Signal Generator	Agilent	N5182A	MY48180656	Nov. 04, 2019	1 Year
2	Amplifier	Micotoop	MPA-80-1000-250	MPA1903096	Nov. 04, 2019	1 Year
3	Amplifier	Micotoop	MPA-1000-6000-100	MPA1903122	Nov. 04, 2019	1 Year
4	Log-Periodic Antenna	Schwarzbeck	VULP9118E	00992	Apr. 17, 2020	1 Year
5	Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 01, 2019	1 Year
6	Power Sensor	Agilent	E9301A	MY41498906	Nov. 04, 2019	1 Year
7	Power Sensor	Agilent	E9301A	MY41498088	Nov. 04, 2019	1 Year
8	Power Meter	Agilent	E4419B	GB40202909	Nov. 04, 2019	1 Year
9	Field Probe	ETS-Lindgren	HI-6006	00212747	Apr. 17, 2020	1 Year
10	software	EMtrace	EM 3	N/A	N/A	N/A

1.7. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, September 27, 2019.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A, March 07, 2019.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518128

1.8. EMS Performance Criteria

√ A: Normal performance within the specification limits
√ B: Temporary degradation or loss of function or performance which is self-recoverable
√ C: Temporary degradation or loss of function or performance which requires operator intervention or system reset
√ D: Degradation or loss of function which is not recoverable due to damage of equipment (components) or software, or loss of data

Note: The manufacturer's specification may define effects on the EUT which may be considered insignificant, and therefore acceptable.

This classification may be used as a guide in formulating performance criteria, by committees responsible for generic, product and product-family standards, or as a framework for the agreement on performance criteria between the manufacturer and the purchaser, for example where no suitable generic, product or product-family standard exists.

2. Radiated Emission Test

2.1. Test Standard and Limit

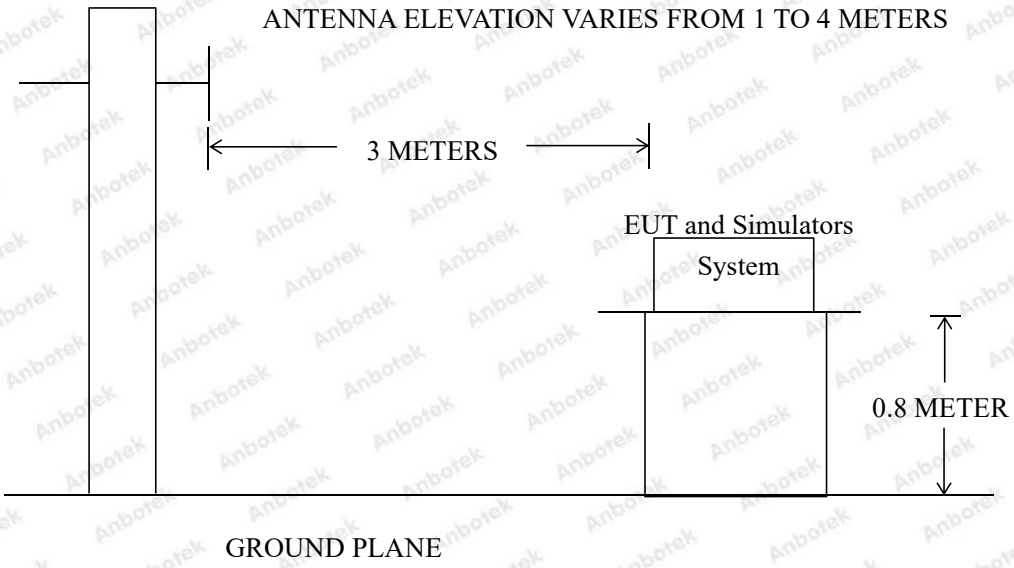
Test Standard	EN 55015

Radiated Emission Test Limit

Test Limit	Frequency (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
	30 ~ 230	3	40
	230 ~ 1000	3	47

Remark: (1) The smaller limit shall apply at the combination 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 EUT.

2.2. Test Setup



2.3. EUT Configuration on Measurement

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

2.4. Operating Condition of EUT

2.4.1. Setup the EUT as shown in Section 2.2.

2.4.2. Turn on the power of all equipments.

2.4.3. Let the EUT work in test mode and measure it.

2.5. Test Procedure

The EUT is placed on a turn table which is 0.8 meter high above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna is used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.

The EUT is tested in Chamber.

The test results are listed in Section 2.6.

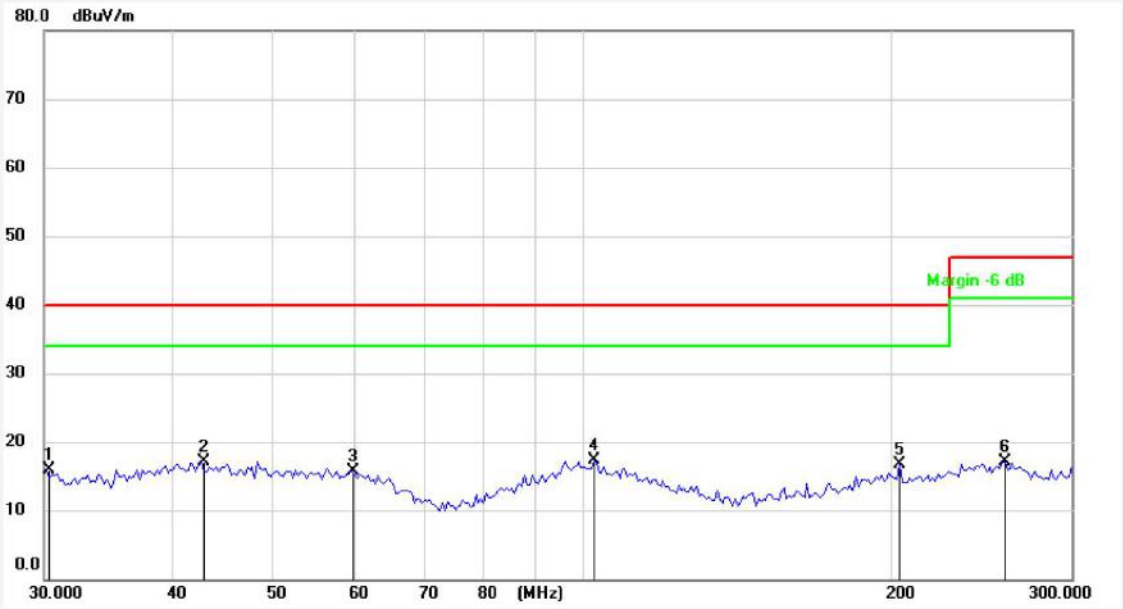
2.6. Test Results

PASS

The frequency range from 30MHz to 1000MHz is investigated.

The test curves are shown in the following pages.

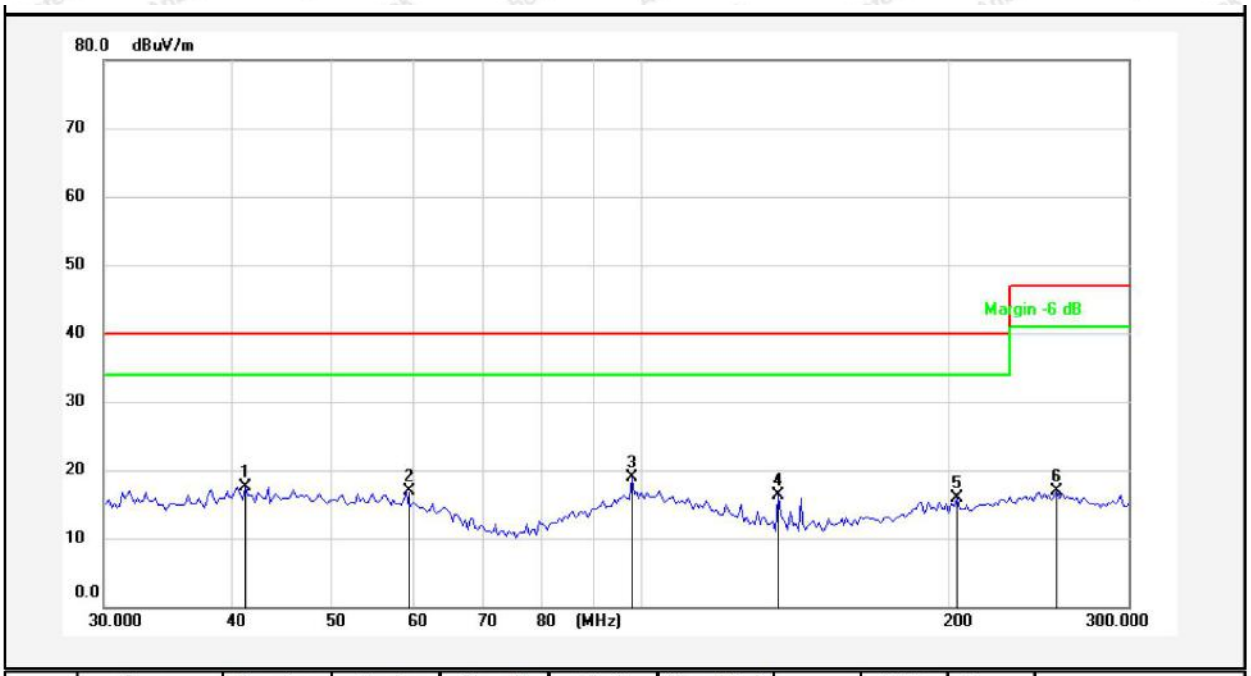
Test item:	**Radiation Test**	**Polarization:**	**Horizontal**
Standard:	**(RE)EN 55015**	**Power Source:**	**DC 3.2V via Solar Panel**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.8(℃)/57%RH**
Test Mode:	**Solar Charging**		



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.1732	32.81	-16.81	16.00	40.00	-24.00	peak			
2	42.6208	32.71	-15.60	17.11	40.00	-22.89	peak			
3	59.5143	32.04	-16.38	15.66	40.00	-24.34	peak			
4	102.8303	33.23	-15.94	17.29	40.00	-22.71	peak			
5	203.9958	34.40	-17.67	16.73	40.00	-23.27	peak			
6	258.2981	33.23	-16.20	17.03	47.00	-29.97	peak			

Note: **Result=Reading+Factor Over Limit=Result-Limit**

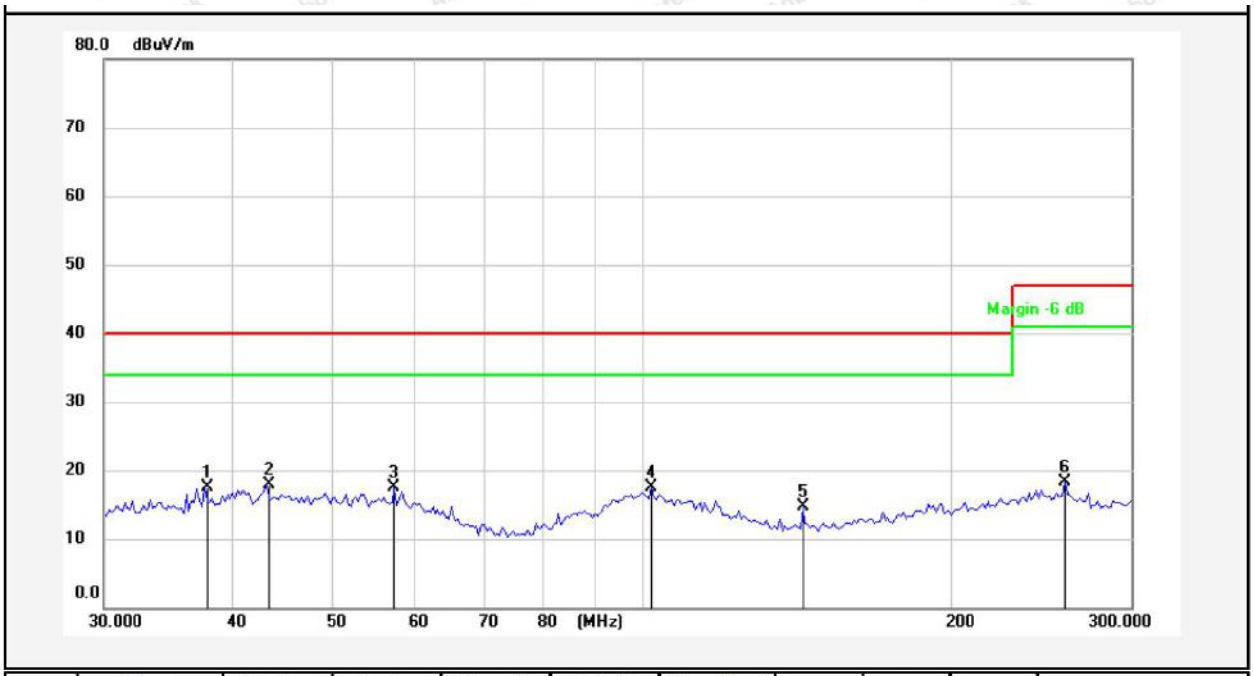
Test item:	**Radiation Test**	**Polarization:**	**Vertical**
Standard:	**(RE)EN 55015**	**Power Source:**	**DC 3.2V via Solar Panel**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.8(℃)/57%RH**
Test Mode:	**Solar Charging**		



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	41.1738	33.09	-15.58	17.51	40.00	-22.49	peak			
2	59.1727	33.23	-16.37	16.86	40.00	-23.14	peak			
3	98.2022	34.75	-15.82	18.93	40.00	-21.07	peak			
4	136.3393	36.58	-20.22	16.36	40.00	-23.64	peak			
5	203.9958	33.48	-17.67	15.81	40.00	-24.19	peak			
6	255.3414	33.04	-16.19	16.85	47.00	-30.15	peak			

Note: **Result=Reading+Factor Over Limit=Result-Limit**

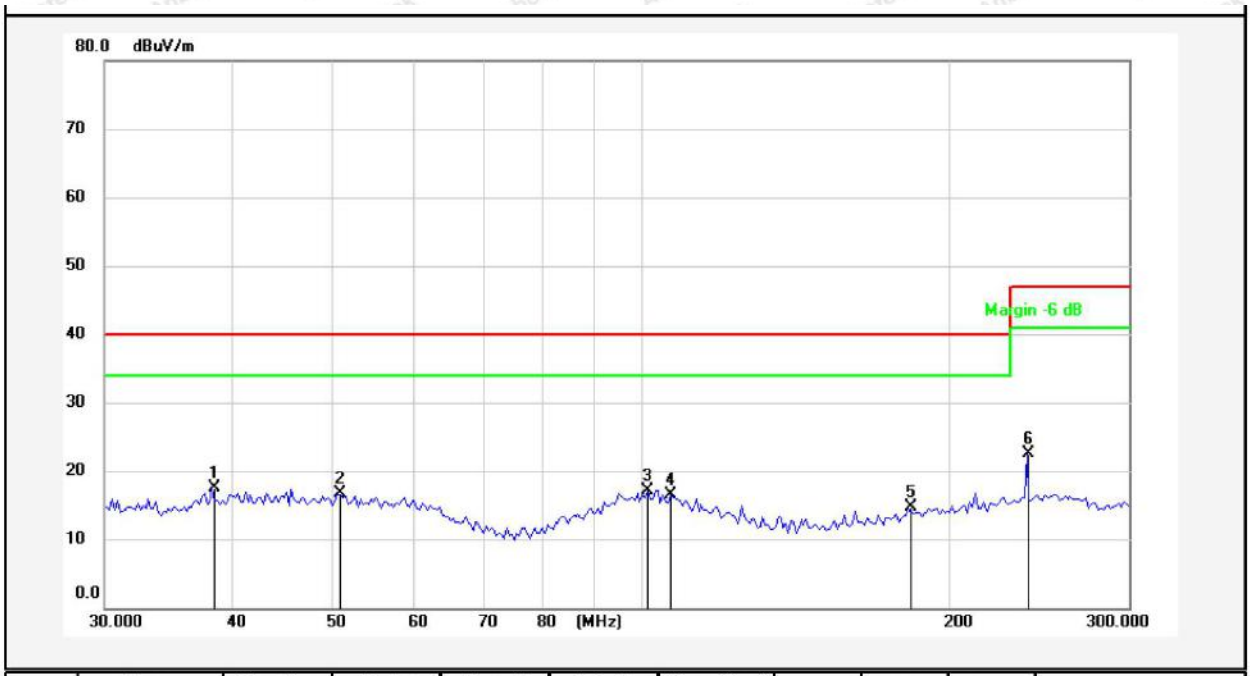
Test item:	**Radiation Test**	**Polarization:**	**Horizontal**
Standard:	**(RE)EN 55015**	**Power Source:**	**DC 3.2V**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.8(℃)/57%RH**
Test Mode:	**On**		



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	37.5510	33.79	-16.20	17.59	40.00	-22.41	peak			
2	43.1143	33.57	-15.60	17.97	40.00	-22.03	peak			
3	57.4938	33.75	-16.26	17.49	40.00	-22.51	peak			
4	102.2401	33.36	-15.88	17.48	40.00	-22.52	peak			
5	143.5890	35.10	-20.43	14.67	40.00	-25.33	peak			
6	258.2981	34.55	-16.20	18.35	47.00	-28.65	peak			

Note: Result=Reading+Factor Over Limit=Result-Limit

Test item:	**Radiation Test**	**Polarization:**	**Vertical**
Standard:	**(RE)EN 55015**	**Power Source:**	**DC 3.2V**
Distance:	**3m**	**Temp.(℃)/Hum.(%RH):**	**23.8(℃)/57%RH**
Test Mode:	**On**		



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	38.2051	33.49	-16.03	17.46	40.00	-22.54	peak			
2	50.6549	32.74	-15.95	16.79	40.00	-23.21	peak			
3	101.6532	32.95	-15.83	17.12	40.00	-22.88	peak			
4	107.0585	32.74	-16.30	16.44	40.00	-23.56	peak			
5	182.8611	33.16	-18.53	14.63	40.00	-25.37	peak			
6	238.2985	38.72	-16.28	22.44	47.00	-24.56	peak			

Note: Result=Reading+Factor Over Limit=Result-Limit

3. Magnetic Radiated Emission Test

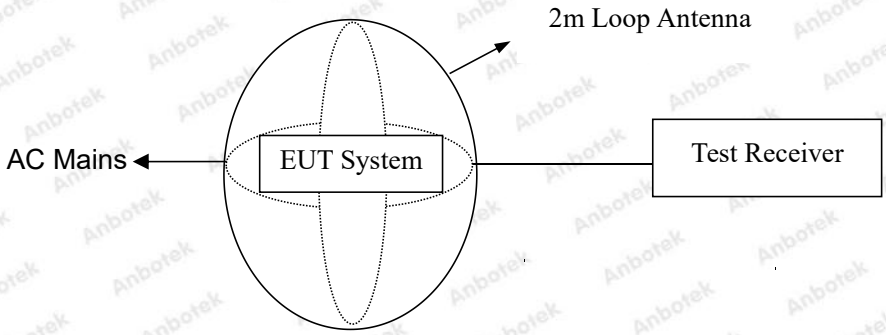
3.1. Test Standard and Limit

Test Standard	EN 55015

Limits for Magnetic Radiated Emission

Test Limit	Frequency	Limits for loop diameter (dBμA)
		2m
	9KHz ~ 70KHz	88
	70KHz ~ 150KHz	88 ~ 58*
	150KHz ~ 3.0MHz	58 ~ 22*
	3.0MHz ~ 30MHz	22
Remark: (1) At the transition frequency the lower limit applies. (2) * decreasing linearly with logarithm of the frequency.		

3.2. Test Setup



3.3. EUT Configuration on Measurement

The following equipments are installed on Magnetic Radiated emission Measurement to meet EN 55015 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

3.4. Operating Condition of EUT

3.4.1. Setup the EUT as shown in Section 3.2.

3.4.2. Turn on the power of all equipments.

3.4.3. Let the EUT work in test mode and measure it.

3.5. Test Procedure

The EUT is placed on a wood table in the center of a loop antenna. The induced current in the loop antenna is measured by means of a current probe and the test receiver. Three field components are checked by means of a coaxial switch.

The frequency range from 9KHz to 30MHz is investigated. The receiver is measured with the quasi-peak detector. For frequency band 9KHz to 150KHz, the bandwidth of the test receiver (ESCI) is set at 200Hz. For frequency band 150KHz to 30MHz, the bandwidth is set at 9KHz.

All the test results are listed in Section 3.6.

3.6. Test Results

PASS

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

The test curves are shown in the following pages.

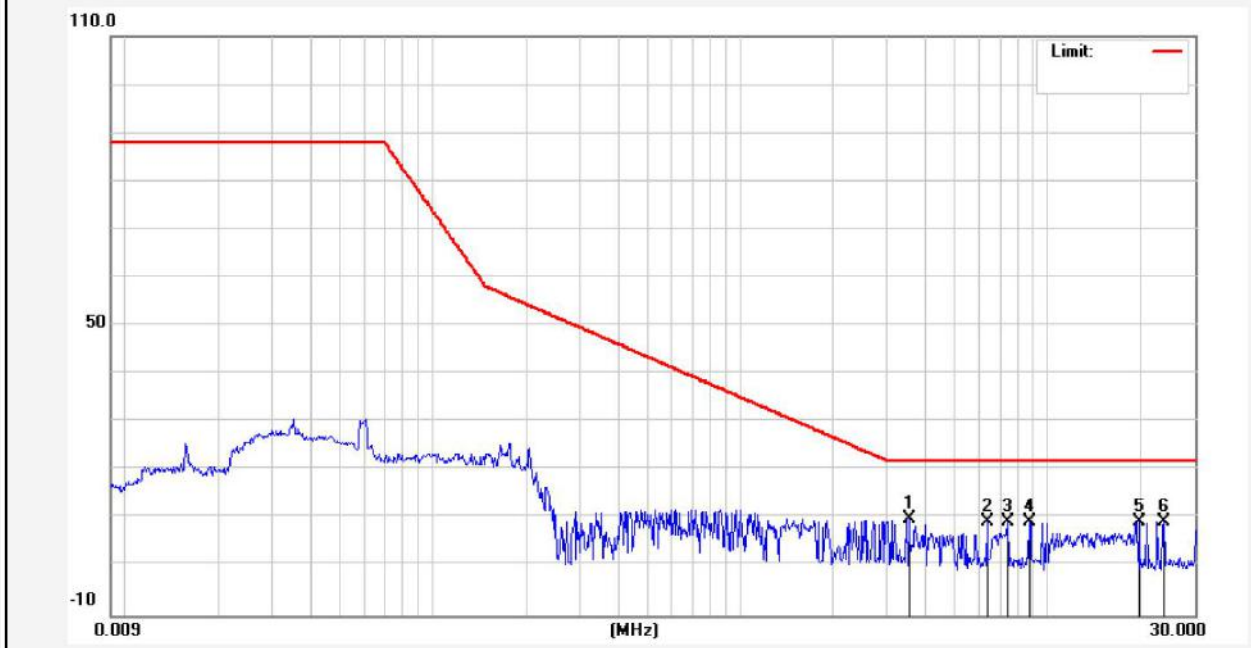
Magnetic Radiated Emission Test

Test Site: 1# Shielded Room

Test Specification: DC 3.2V

Comment: X

Temp.: 21.2℃ Hum.: 60%



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Over Limit (dB)	Detector	Remark
1	3.5419	9.96	0.03	9.99	22.00	-12.01	QP	
2	6.3258	9.29	0.07	9.36	22.00	-12.64	QP	
3	7.4020	9.24	0.07	9.31	22.00	-12.69	QP	
4	8.6940	9.27	0.04	9.31	22.00	-12.69	QP	
5	19.7500	9.35	0.02	9.37	22.00	-12.63	QP	
6	23.8460	9.35	0.02	9.37	22.00	-12.63	QP	

Note: Result=Reading+Factor Over Limit=Result-Limit

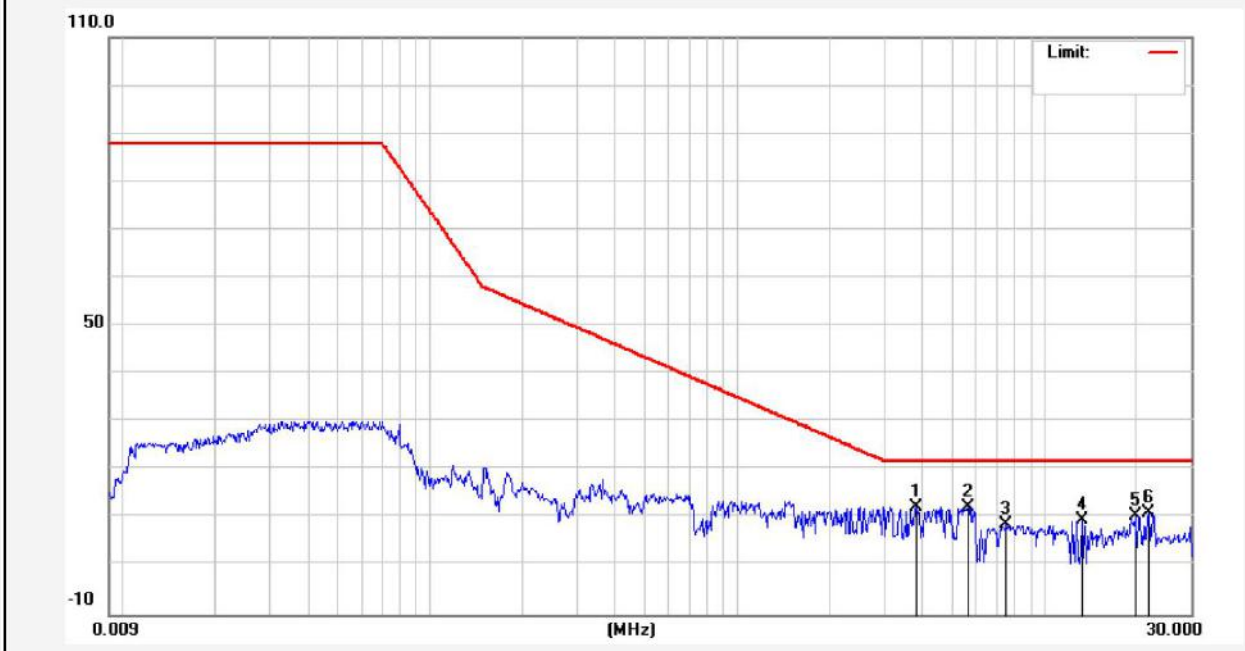
Magnetic Radiated Emission Test

Test Site: 1# Shielded Room

Test Specification: DC 3.2V

Comment: Y

Temp.: 21.2℃ Hum.: 60%



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Over Limit (dB)	Detector	Remark
1	3.8380	12.39	0.03	12.42	22.00	-9.58	QP	
2	5.6420	12.29	0.05	12.34	22.00	-9.66	QP	
3	7.4980	8.58	0.07	8.65	22.00	-13.35	QP	
4	13.2940	9.50	0.02	9.52	22.00	-12.48	QP	
5	19.7099	10.62	0.02	10.64	22.00	-11.36	QP	
6	21.8978	11.24	0.02	11.26	22.00	-10.74	QP	

Note: Result=Reading+Factor Over Limit=Result-Limit

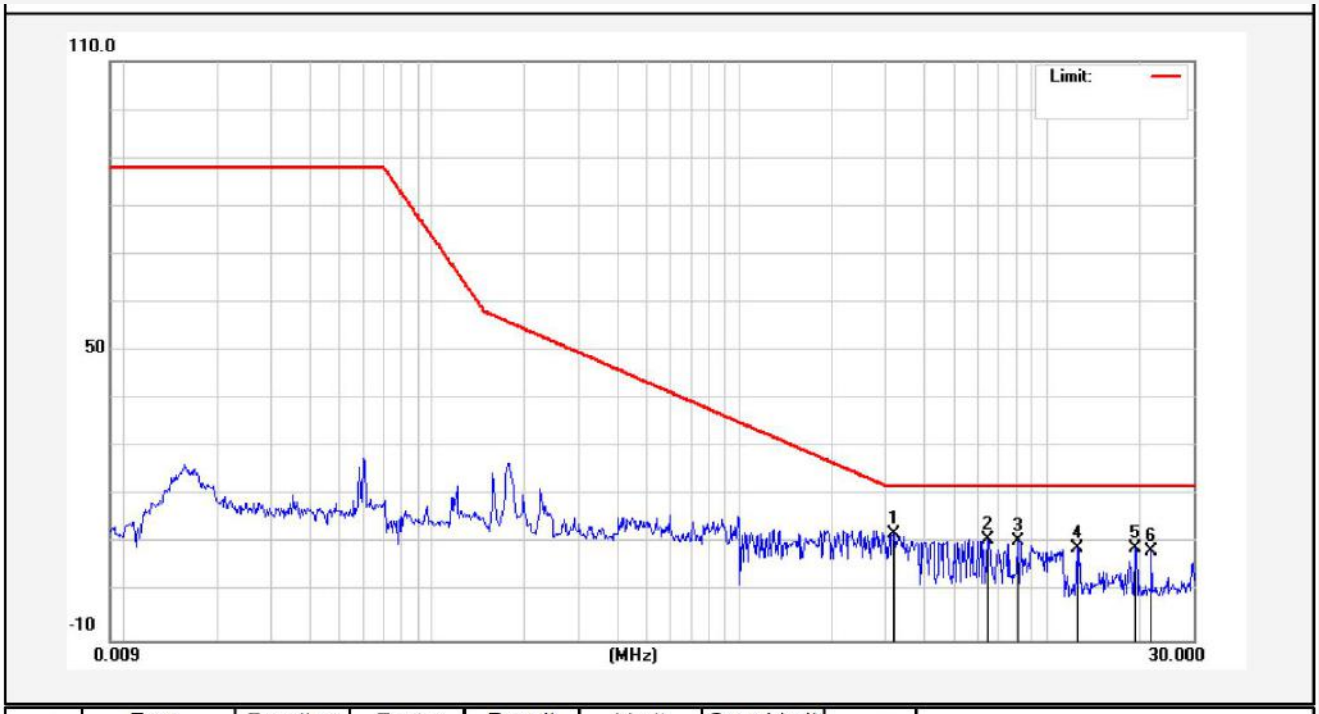
Magnetic Radiated Emission Test

Test Site: 1# Shielded Room

Test Specification: DC 3.2V

Comment: Z

Temp.: 21.2℃ Hum.: 60%



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit (dBuA)	Over Limit (dB)	Detector	Remark
1	3.1899	11.96	0.02	11.98	22.00	-10.02	QP	
2	6.4580	10.71	0.07	10.78	22.00	-11.22	QP	
3	8.0739	10.62	0.05	10.67	22.00	-11.33	QP	
4	12.5579	9.02	0.02	9.04	22.00	-12.96	QP	
5	19.3978	9.06	0.02	9.08	22.00	-12.92	QP	
6	22.0180	8.57	0.02	8.59	22.00	-13.41	QP	

Note: Result=Reading+Factor Over Limit=Result-Limit

4. Electrostatic Discharge Immunity Test

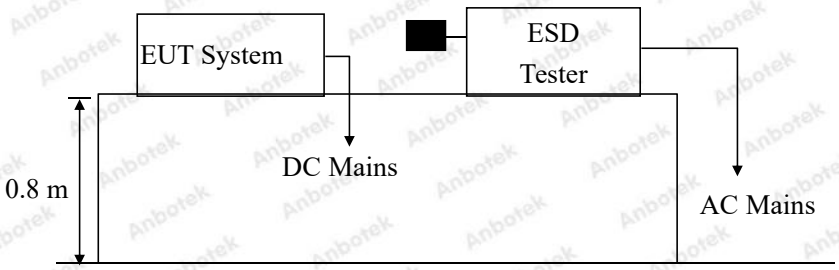
4.1. Test Standard and Level

Test Standard:	EN 61547 (IEC 61000-4-2)
Performance Criterion:	B
Severity Level: 3 / Air Discharge: ±8kV, Level: 2 / Contact Discharge: ±4kV	

Test Level

Level	Test Voltage Contact Discharge (kV)	Test Voltage Air Discharge (kV)
1.	±2	±2
2.	±4	±4
3.	±6	±8
4.	±8	±15
X	Special	Special

4.2. Test Setup



4.3. EUT Configuration on Measurement

The following equipments are installed on Electrostatic Discharge immunity Measurement to meet EN 61547 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

4.4. Operating Condition of EUT

4.4.1. Setup the EUT as shown on Section 4.2.

4.4.2. Turn on the power of all equipments.

4.4.3. After that, let the EUT work in test mode measure it.

4.5. Test Procedure

4.5.1. Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

4.5.2. Contact Discharge:

All the procedure shall be same as Section 4.5.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

4.5.3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

4.5.4. Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m × 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

4.6. Test Results

PASS

Please refer to the following page.

Electrostatic Discharge Test Results

Air discharge :	±8.0kV	Temperature :	23.6℃
Contact discharge :	±4.0kV	Humidity :	48%
Power Supply :	DC 3.2V via Solar Panel / DC 3.2V	Expert conclusion :	A
Test Result :	☒ Pass ☐ Fail		
# For each point positive 10 times and negative 10 times discharge			

Location		**Kind** A-Air Discharge C-Contact Discharge	**Result**
Screw	4 points	C	☑ A ☐ B ☐ C ☐ D
Light	4 points	A	☑ A ☐ B ☐ C ☐ D
Slot	4 points	A	☑ A ☐ B ☐ C ☐ D
HCP	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the front	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the rear	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the left	4 points	C	☑ A ☐ B ☐ C ☐ D
VCP of the right	4 points	C	☑ A ☐ B ☐ C ☐ D

Remark: Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).

5. RF Field Strength Susceptibility Test

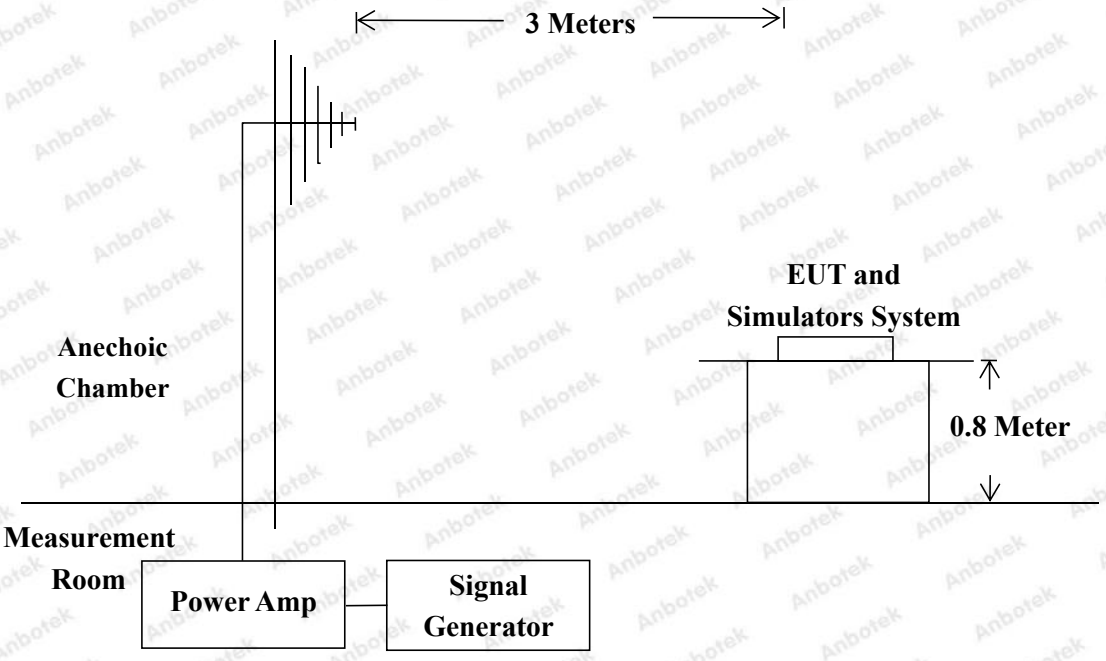
5.1. Test Standard and Level

Test Standard:	EN 61547 (IEC 61000-4-3)
Required Performance:	A
Frequency Range:	80MHz to 1000MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 0.5s

Test Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

5.2. Test Setup



5.3. EUT Configuration on Measurement

The following equipments are installed on RF Field Strength susceptibility Measurement to meet EN 61547 requirements 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 as shown on Section 5.2.

5.4.2. Turn on the power of all equipments.

5.4.3. After that, let the EUT work in test mode measure it.

5.5. 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.

1) The field strength level was 3V/m.
2) The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
3) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond, but shall in no case be less than 0.5s.
4) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.6. Measuring Results

PASS

Please refer to the following page.

RF Field Strength Susceptibility Test Results

Field Strength :	3V/m	Temperature :	23.6℃
Expert conclusion :	A	Humidity :	48%
Power Supply :	DC 3.2V via Solar Panel / DC 3.2V	Test Result :	☒ Pass ☐ Fail
Dwell Time:	1s		

Frequency Range (MHz)	Antenna Polarity	R.F. Field Strength	Azimuth	Result
80~1000	H / V	3 V/m (rms)	Front	☑ A ☐ B ☐ C ☐ D
			Rear	
			Left	
			Right	

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiated Emission Test

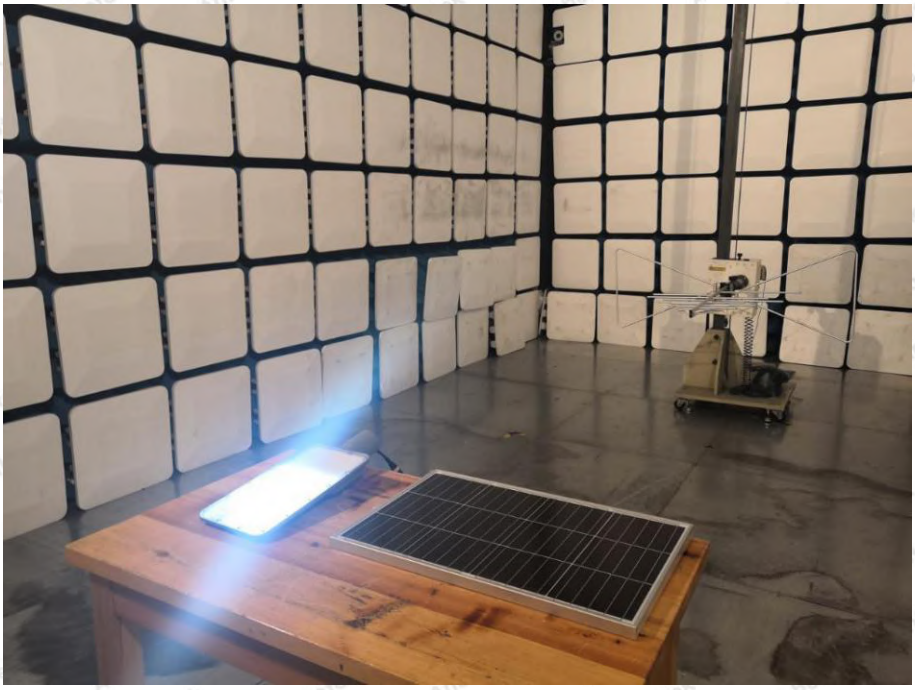


Photo of Magnetic Radiated Emission Test

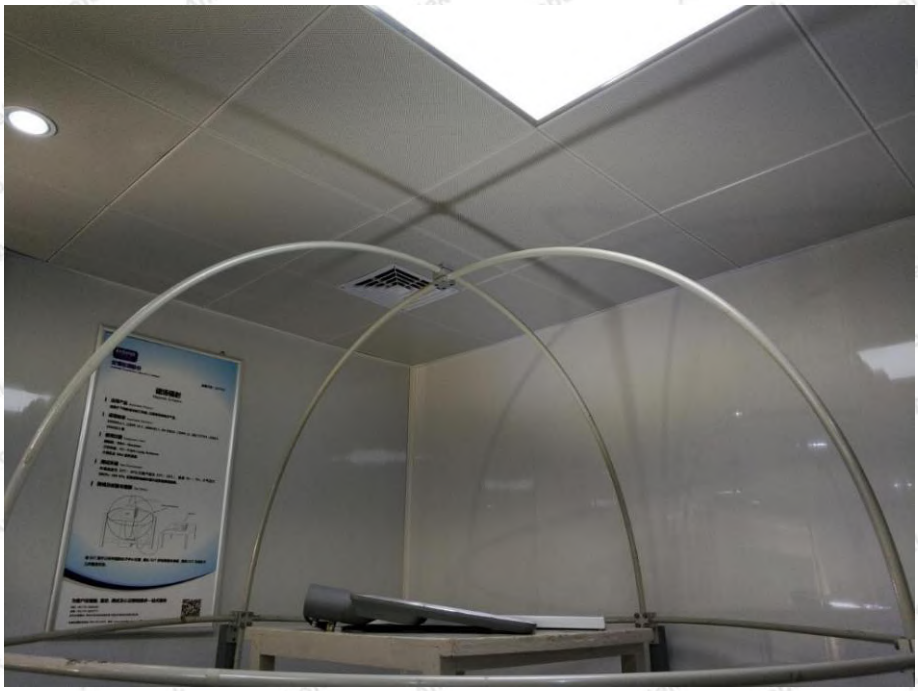


Photo of Electrostatic Discharge Immunity Test

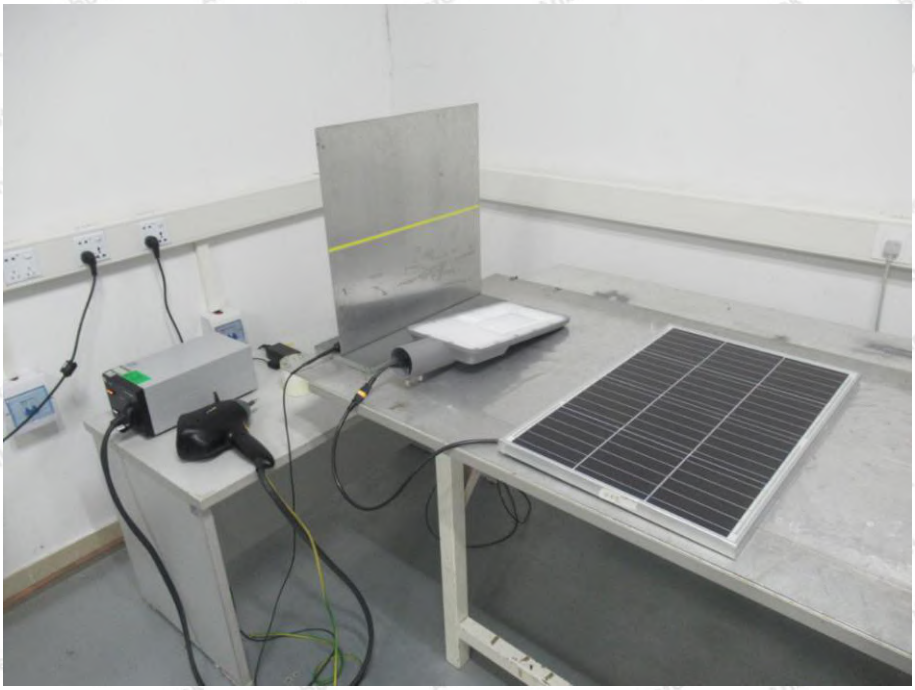
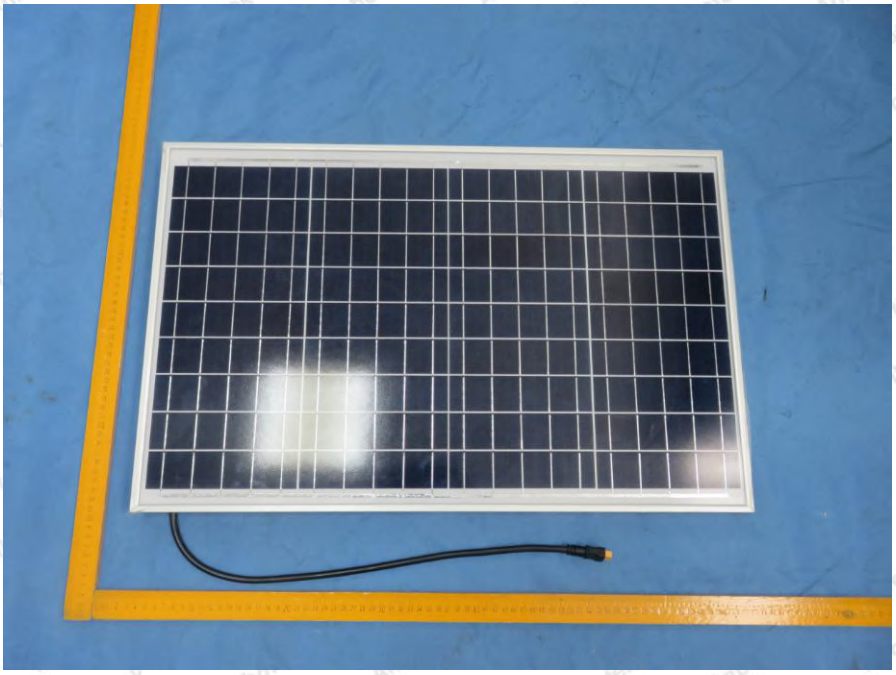
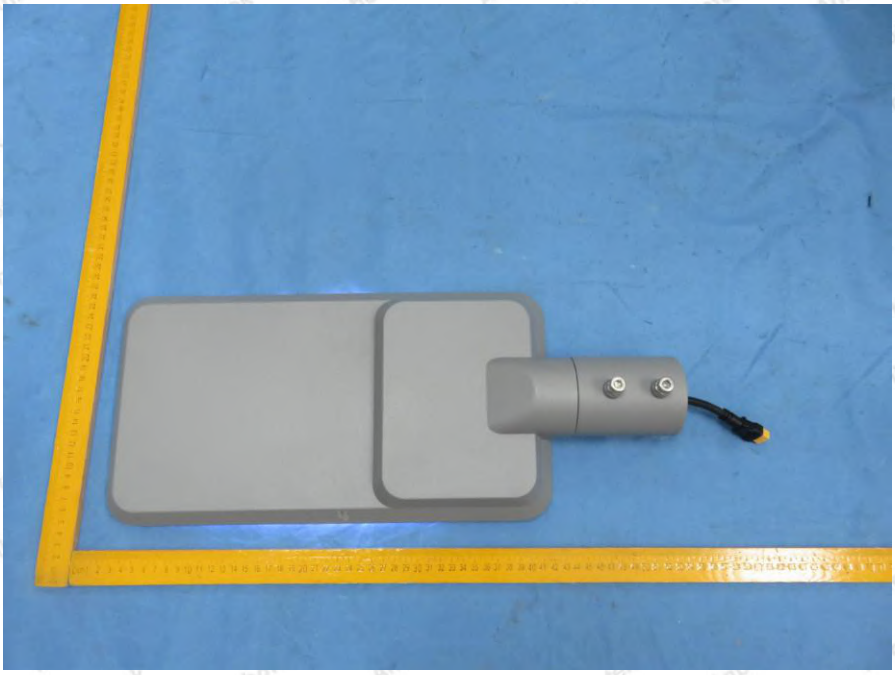


Photo of RF Field Strength susceptibility Test

APPENDIX II -- Photo documentation






SUN 32650
3.2V/40Ah
2020-04-22

CE Label

1. The CE conformity marking must consist of the initials ‘CE’ taking the following form:
   If the CE marking is reduced or enlarged, the proportions given in the above graduated drawing must be respected.
2. The CE marking must have a height of at least 5 mm except where this is not possible on account of the nature of the apparatus.
3. The CE marking must be affixed to the product or to its data plate. Additionally it must be affixed to the packaging, if any, and to the accompanying documents.
4. The CE marking must be affixed visibly, legibly and indelibly.
   It must have the same height as the initials ‘CE’.

---------- End of Report ----------