

Test Report Number:	FTS22KR-8204E	Total Page(s): 21
Applicant Name:	Zhongshan Yunduo Lighting Appliance Factory	
Applicant Address:	9th Floor, Building F, Electric Mall, No. 368 Dong'an North Road, Haizhou, Guzhen, Zhongshan City, Guangdong Province, China	
Trademark:	Yunduo	
Test item:	Solar bollard Light	
Model / Type Reference:	TC-2023, DC-3662, DC-3661, DC-3668, DC-3661Z, DC3662Z, DC - 3668Z, TC-238, TC-238Z, TC-404, TC-404Z, TC-11829, TC-11829Z, TC-11719, TC-234	
Date of Issue:	2022-11-22	
Testing Laboratory:	Guangdong Future Test Services Co., Ltd No.228, Min' an South Rd, Xiaolan Town, Zhongshan City, Guangdong Province, China	
Test Specification:	EN IEC 55015:2019+A11:2020 EN 61547:2009 EN IEC 61000-3-2:2019+A1:2021 EN 61000-3-3:2013+A1:2019	
Test Result:	Passed	
Compiled by:	Reviewed by:	
2022-11-22	Leo Xiao	<i>Leo Xiao</i>
2022-11-22	Gordon Xie	<i>Gordon Xie</i>
<i>Date</i>	<i>Name</i>	<i>Signature</i>
<i>Date</i>	<i>Name</i>	<i>Signature</i>
Remark:	N/A	
<p>The duplication of this report or parts of it and its use for advertising purposes is only allowed with permission of the testing laboratory. This report contains the result of the examination of the product sample submitted by the applicant. A general statement concerning the quality of the products from the series manufacture cannot be derived therefore.</p>		

Test Summary

6.1.1 Harmonics Current Emission on AC Mains

RESULT: Pass

6.1.2 Voltage Changes, Voltage Fluctuations and Flicker

RESULT: Pass

6.1.3 Radiated Electromagnetic in the Frequency Range 9 kHz to 30 MHz

RESULT: Pass

6.2.1 Radiated Disturbance

RESULT: Pass

7.2.1 Radio-frequency Electromagnetic Fields (RS)

RESULT: Pass

7.3.1 Electrostatic Discharges (ESD)

RESULT: Pass

Contents

1. General Remarks	4
1.1 Complementary Materials	4
2. Measurement Uncertainty	4
3. Test Sites.....	4
3.1 Test Facilities.....	4
3.2 List of Test and Measurement Instruments	4
4. General Product Information	5
4.1 Product Function and Intended Use.....	5
4.2 Ratings and System Details.....	5
4.3 Independent Operation Modes	6
4.4 Noise Generating and Noise Suppressing Parts	6
4.5 Submitted Documents	6
5. Test Set-up and Operation Modes	7
5.1 Principle of Configuration Selection	7
5.2 Physical Configuration for Testing	7
5.3 Test Operation and Test Software	7
5.4 Special Accessories and Auxiliary Equipment.....	7
5.5 Countermeasures to achieve EMC Compliance.....	7
6. Test Results Emission.....	8
6.1 Emission in the Frequency Range up to 30 MHz	8
6.1.1 Harmonics Current Emission on AC Mains.....	8
6.1.2 Voltage Changes, Voltage Fluctuations and Flicker.....	10
6.1.3 Radiated Electromagnetic in the Frequency Range 9 kHz to 30 MHz	11
6.2 Emission in the Frequency Range above 30 MHz	13
6.2.1 Radiated Disturbance.....	13
7. Test Results Immunity	15
7.1 Immunity requirements	15
7.2 Continuous Disturbances.....	16
7.2.1 Radio-frequency Electromagnetic Fields (RS)	16
7.3 Transient Disturbances.....	18
7.3.1 Electrostatic Discharges (ESD)	18
8. The photos of test setting	20

1. General Remarks

When applying the basic standards in this test report, please refer to the applied generic or product family standards for edition information:

For dated basic standards, only the edition cited applies. For undated basic standards, the latest edition (including any amendments) applies.

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test result.

Appendix 2: Photo of EUT

Appendix 3: List of Test and Measurement Equipment

2. Measurement Uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	3.26dB
Uncertainty for Disturbance Power test	3.28dB
Uncertainty for Radiation Emission test	3.14 dB (Polarize: V)
	3.16 dB (Polarize: H)

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

3. Test Sites

3.1 Test Facilities

A. Guangdong Future Test Services Co., Ltd

Add: No.228, Min' an South Rd, Xiaolan Town, Zhongshan City, Guangdong Province, China

B. Guangdong Tsaint Hi-tech Co., Ltd.

-1&1/F, Property 1, Area B, No.10, Lelin Road, Tongyi Industrial Park, Guzhen, Zhongshan, Guangdong, China

3.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Refer to attached Appendix 3.

4. General Product Information

Model list:

No.	Model	Input (dc)	Power(W)
1	TC-2023	3.7V	2
2	DC-3662	3.7V	2
3	DC-3661	3.7V	2
4	DC-3668	3.7V	2
5	DC-3661Z	3.7V	2
6	DC3662Z	3.7V	2
7	DC -3668Z	3.7V	2
8	TC-238	3.7V	2
9	TC-238Z	3.7V	2
10	TC-404	3.7V	2
11	TC-404Z	3.7V	2
12	TC-11829	3.7V	2
13	TC-11829Z	3.7V	2
14	TC-11719	3.7V	2
15	TC-234	3.7V	2

Model difference:

- All models consist mainly of LED, solar panel and circuit board, only the circuit board contains electronic control circuit
- All models use the same brand of circuit board, the circuit principle and layout of the circuit board is the same. The difference between all models is in appearance and color.
- All models have no dimming function and no wireless part

According to the above information, all tests were performed on following models

Model	EMC test item	Model name In appendix 1
TC-2023	RE, LOOP, ESD, RS	TC-2023

4.1 Product Function and Intended Use

Refer to Technical Documentation and User Manual

4.2 Ratings and System Details

Type designation:	Refer to section 4
Rated input:	Refer to section 4
Max. power:	Refer to section 4
Protection class:	Class III
Ports:	AC mains, control line(<3m), DC output line(<3m)
Cables:	Unshielded

Refer to the Technical Documentation for further information.

4.3 Independent Operation Modes

The basic operation modes are:

- A. Lighting Mode

Refer to the user manual for further information.

4.4 Noise Generating and Noise Suppressing Parts

Refer to the Technical Documentation for further information.

4.5 Submitted Documents

Difference Declaration

Circuit Diagram

PCB Layout

User Manual

Label

5. Test Set-up and Operation Modes

5.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

5.2 Physical Configuration for Testing

Refer to relative paragraphs of this test report.

5.3 Test Operation and Test Software

Refer to test setup in chapter 6 and chapter 7.

5.4 Special Accessories and Auxiliary Equipment

None.

5.5 Countermeasures to achieve EMC Compliance

No additional countermeasures to the submitted test sample(s) were employed to achieve compliance.

6. Test Results Emission

6.1 Emission in the Frequency Range up to 30 MHz

6.1.1 Harmonics Current Emission on AC Mains

RESULT:**Pass****Test Specification**

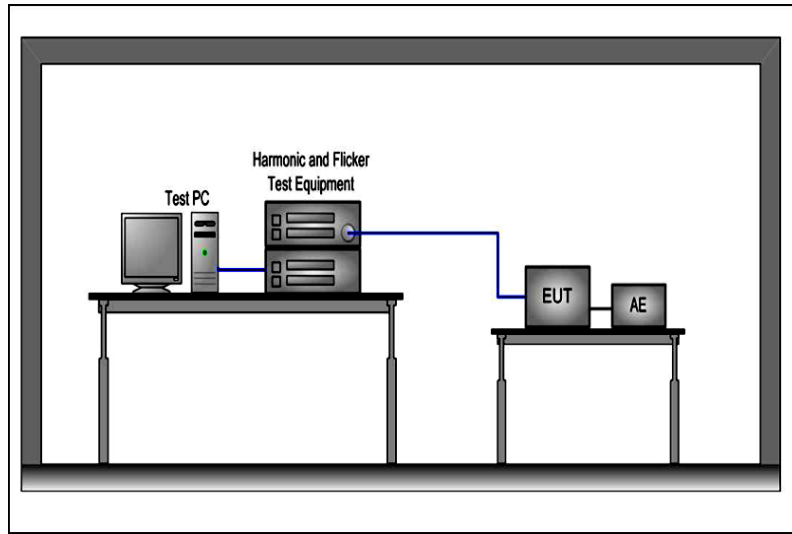
Basic standard	:	EN IEC 61000-3-2:2019+A1:2021
Measurement equipment requirement	:	IEC 61000-4-7
Measured harmonics	:	1 – 40
Equipment class	:	C
Limits	:	Clause 7.4

Test Setup

Date of testing	:	N/A
Input voltage	:	N/A
Operation mode	:	N/A
Test observation period	:	N/A
Temperature	:	N/A
Humidity	:	N/A
Air pressure	:	N/A

*) note: In the maximum power state, the THC value of the EUTs is also the maximum

Test Connection Diagram



There is no need for test to be performed on this product in accordance with EN IEC 61000-3-2:2019+A1:2021 Clause 1 Scope:

This part of IEC 61000 is applicable to electrical and electronic equipment having a rated input current up to and including 16 A per phase, and intended to be connected to public low-voltage distribution systems.

6.1.2 Voltage Changes, Voltage Fluctuations and Flicker

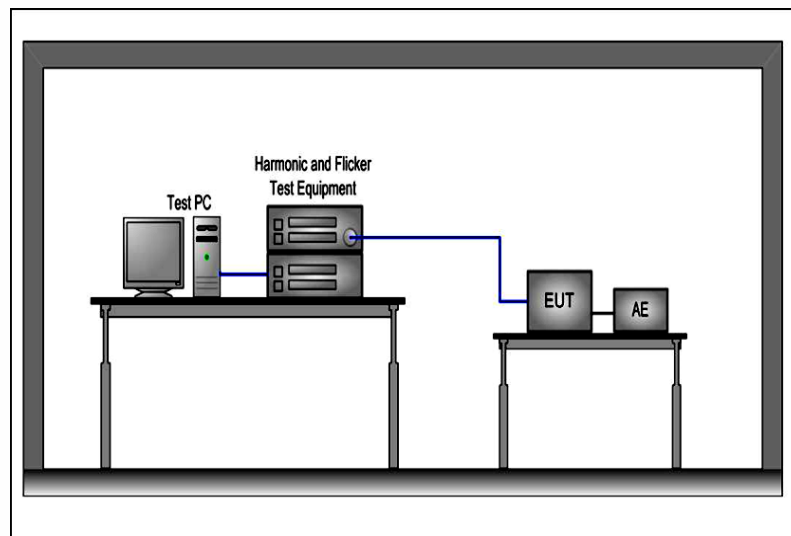
RESULT:

Pass

Test Specification

Basic standard	:	EN 61000-3-3:2013+A1:2019
Measurement equipment requirement	:	IEC 61000-4-15
Limits	:	EN 61000-3-3:2013+A1:2019, Clause 5

Test Connection Diagram



“Pst and Plt requirements shall not be applied to voltage changes caused by manual switching.

The limits shall not be applied to voltage changes associated with emergency switching or emergency interruptions.”

Please also refer to Annex A (Application of limits and type test conditions) for details in EN 61000-3-3:2013+A1:2019.

--No limits shall apply to lamps.

--Incandescent lamp luminaries with ratings less than or equal to 1 000 W and discharge lamp luminaries with ratings less than or equal to 600 W, are deemed to comply with the d_{max} limits in this standard and are not required to be tested.

--Ballasts are deemed to be part of luminaries and are not required to be tested.

6.1.3 Radiated Electromagnetic in the Frequency Range 9 kHz to 30 MHz

RESULT:

Pass

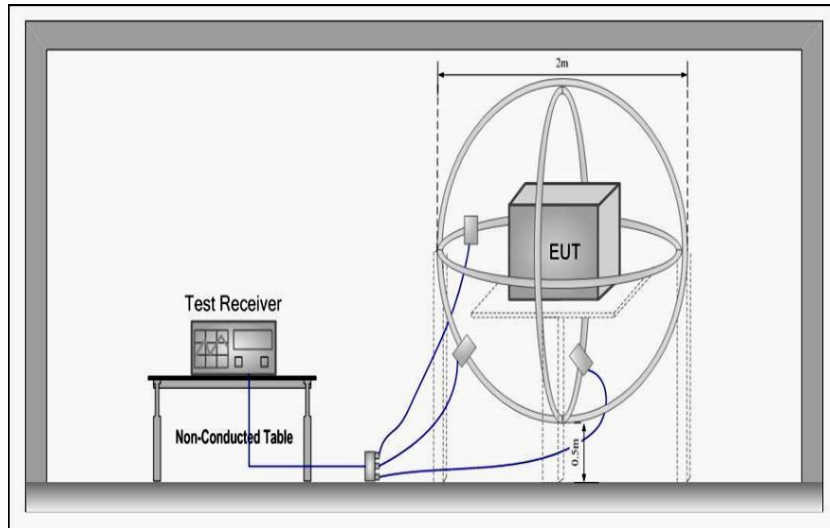
Test Specification

Test procedure	:	EN IEC 55015:2019+A11, Clause 8
Frequency range	:	9kHz-30MHz
Test site	:	Shielded Room
Limits	:	EN IEC 55015:2019+A11, Table 8

Test Setup

Date of testing	:	Refer to Appendix 1
Input voltage	:	Refer to Appendix 1
Operation mode	:	A
Test configuration	:	Table-top (2m loop)
Temperature	:	Refer to Appendix 1
Humidity	:	Refer to Appendix 1
Air pressure	:	Refer to Appendix 1

Test Connection Diagram



Test Connection Diagram

Test Result

Measurement uncertainty: 2.54dB (k=2, σ = 95%)

Horizontal component of disturbance is measured by A1 and A2 antennas of LAS, while vertical component of disturbance is measured by A3 antenna of LAS.

Disturbances other than those mentioned are small or not detectable.

For measurement results, please refer to the attached appendix 1.

6.2 Emission in the Frequency Range above 30 MHz

6.2.1 Radiated Disturbance

RESULT:

Pass

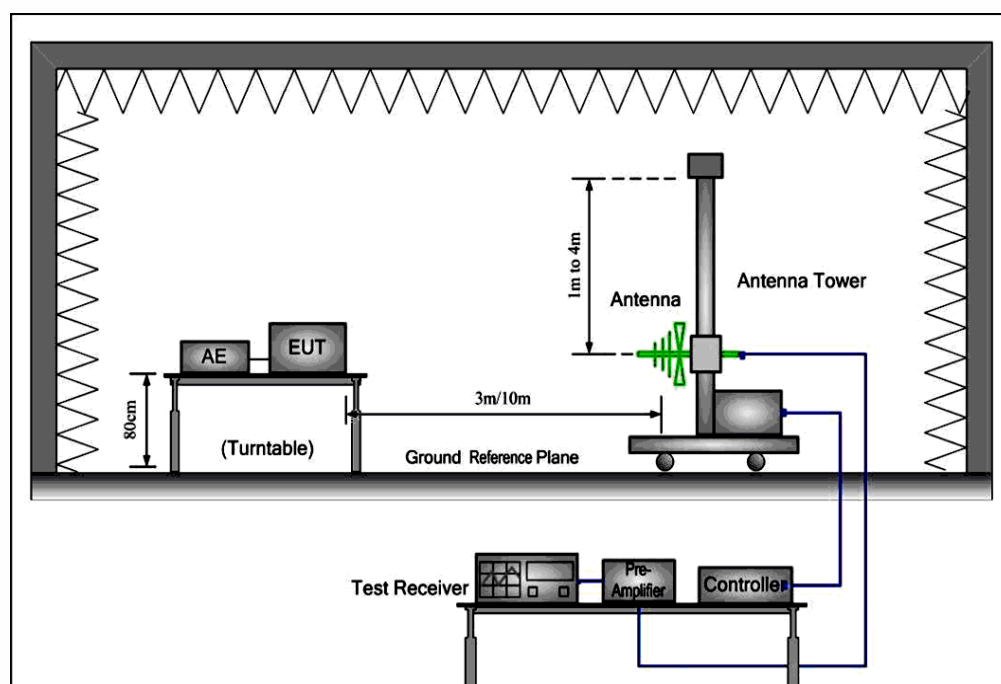
Test Specification

Test procedure	:	EN IEC 55015:2019+A11, Clause 9
Ports	:	Enclosure
Frequency range	:	30MHz-1000MHz
Test site	:	SAC
Limits	:	EN IEC 55015:2019+A11, Table 10

Test Setup

Date of testing	:	Refer to the appendix 1
Input voltage	:	Refer to the appendix 1
Operation mode	:	A (worst mode)
Test configuration	:	Tabletop
Temperature	:	Refer to the appendix 1
Humidity	:	Refer to the appendix 1
Air pressure	:	Refer to the appendix 1

Test Connection Diagram



Test Result

Measurement uncertainty: 3.16dB (k=2, σ = 95%)

Disturbances other than those mentioned are small or not detectable.

For test results, please refer to the attached appendix 1. The test data in Appendix 1 are the worst EUTs results after testing in illuminated mode.

7. Test Results Immunity

7.1 Immunity requirements

According to EN 61547:2009, the appliance shall fulfil the requirements of:

Radio-frequency Electromagnetic Field Amplitude Modulated (RS) Criterion A

Electrostatic Discharge (ESD)

Criterion B

7.2 Continuous Disturbances

7.2.1 Radio-frequency Electromagnetic Fields (RS)

RESULT:

Pass

Test Specification

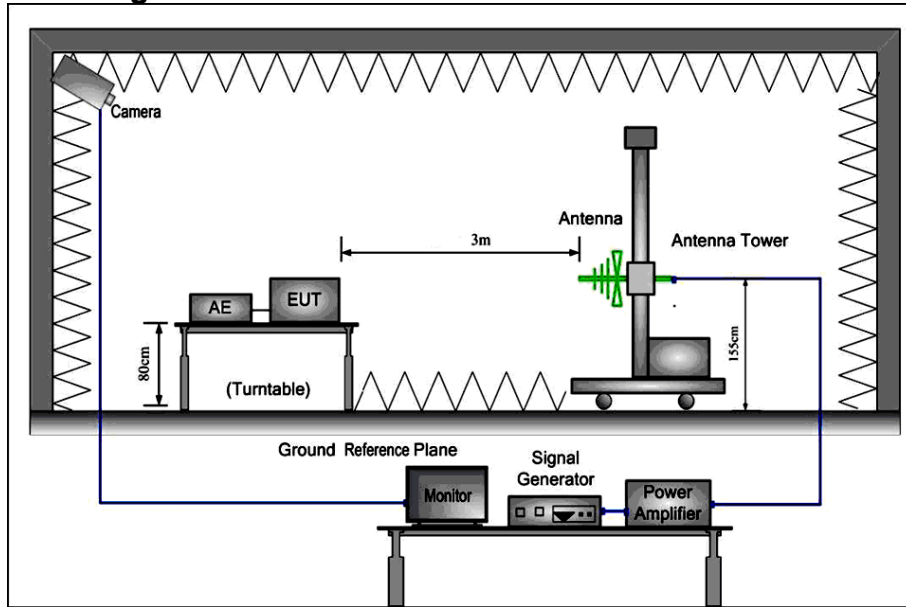
Test Specification

Family standard	: EN 61547:2009
Basic standard	: IEC 61000-4-3
Test level	: 3 V/m
Frequency range	: 80MHz to 1000MHz
Modulation	: 1 kHz sine-wave, 80% AM
Sweep mode	: Automatic
Sweep step	: 1%
Dwell time	: ≥1Sec
Performance criterion	: A

Test Setup

Date of testing	: 19 Nov, 2022
Input voltage	: DC 3.7V
Operation mode	: A
Temperature	: 24°C
Humidity	: 55%
Air pressure	: 101kPA

Test Connection Diagram



Test Result

Table 2: Immunity against Radio-frequency Electromagnetic Fields (RS)

Side of the equipment under test	Frequency (MHz)	Antenna polarization (Vertical/Horizontal)	Result	Remark
Front	80 -1000	V and H	Pass	A
Rear		V and H	Pass	A
Right		V and H	Pass	A
Left		V and H	Pass	A

*) Remark: No degradation was observed during and after the tests.

7.3 Transient Disturbances

7.3.1 Electrostatic Discharges (ESD)

RESULT:

Pass

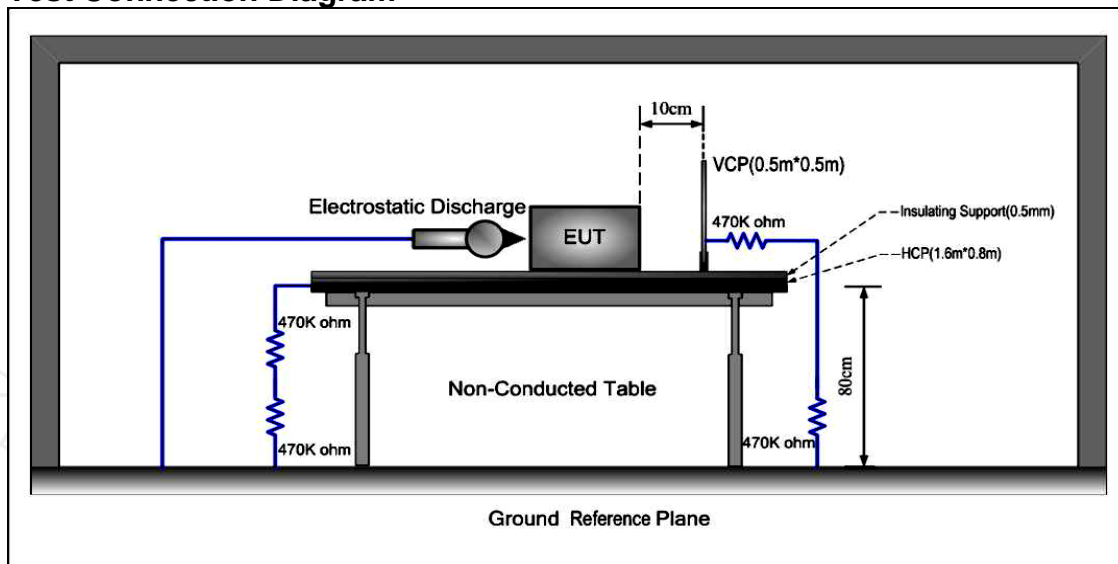
Test Specification

Family standard	: EN 61547:2009
Basic standard	: IEC 61000-4-2
Charge voltage	: ±4kV (contact, VCP, HCP) ±2kV, ±4kV, ±8kV (air discharge)
Number of discharges	: > 10
Polarity	: Positive / Negative
Performance criterion	: B

Test Setup

Date of testing	: 19 Nov, 2022
Input voltage	: DC 3.7V
Operation mode	: A
Temperature	: 24°C
Humidity	: 55%
Air pressure	: 101kPA

Test Connection Diagram



Test Result

Table 3: Electrostatic Discharge

Direct discharges			
Air discharges Discharge location	Air discharge voltage (kV)	Polarity	Remark
Refer to Photograph of ESD setup	2, 4, 8	+/-	Applied, *)
Non-conductive parts	2, 4, 8	+/-	Applied, *)
Contact discharges Discharge location	Contact discharge voltage (kV)	Polarity	Remark
Refer to Photograph of ESD setup	4	+/-	N/A
Conductive parts	4	+/-	N/A
Indirect discharges			
Contact discharges Discharge location	Contact discharge voltage (kV)	Polarity	Remark
HCP	4	+/-	Applied, *)
VCP	4	+/-	Applied, *)

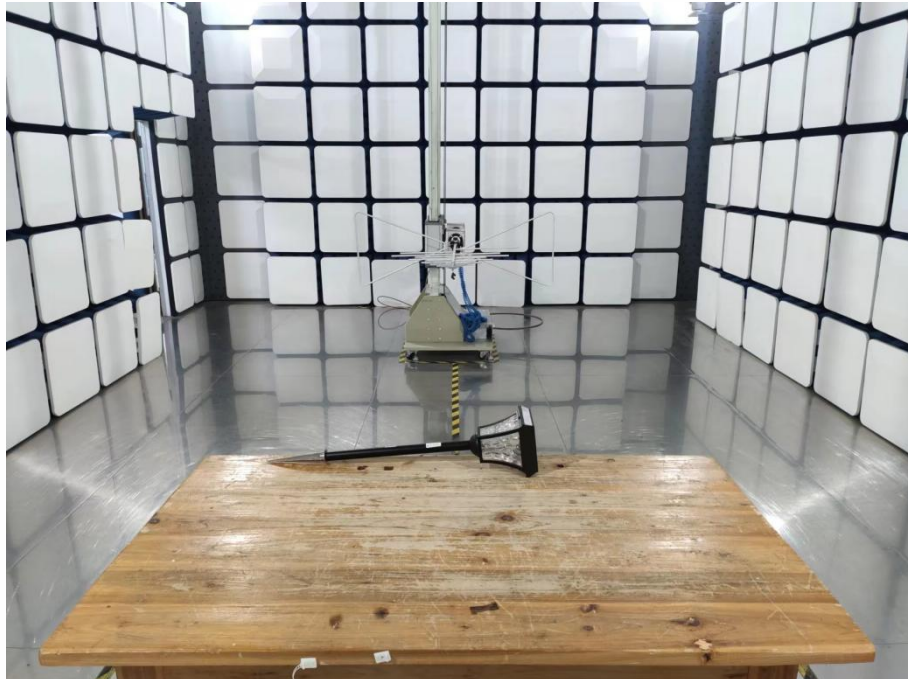
*) Remark: No degradation was found.

8. The photos of test setting

Radiated electromagnetic disturbances:



Radiated Emission:



Electrostatic Discharges (ESD):

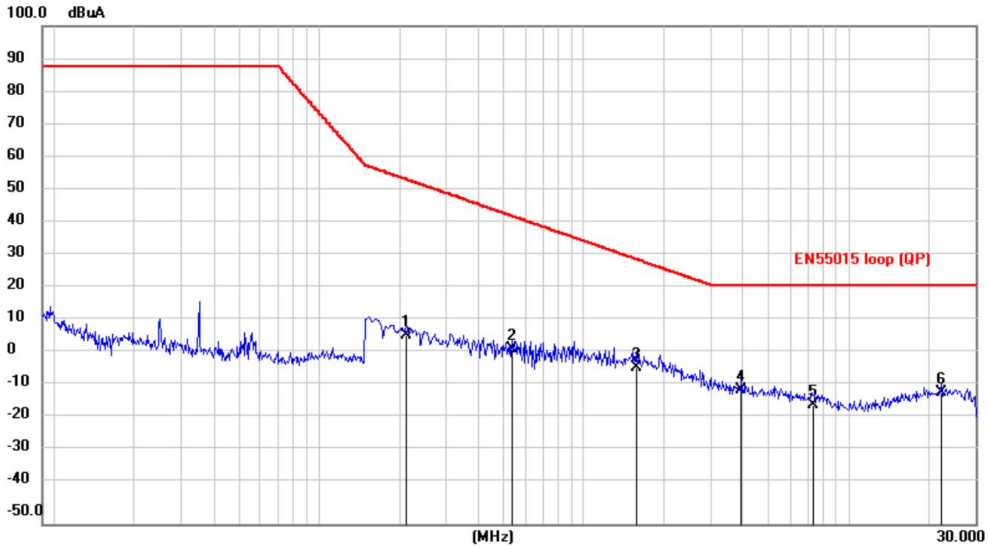




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Conducted Emission Measurement

File : FTS22KP-8204 Data : #1 Date : 2022/11/15 Time : 3:37:49



Site LAB	Phase: X	Temperature: 26
Limit: EN55015 loop (QP)	Power: DC 3.7V	Humidity: 60 %
EUT: Solar bollard Light		
M/N: TC-2023		
Mode: Lighting mode		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuA	Correct Factor dB	Measure- ment dBuA	Limit dBuA	Over dB	Detector	Comment
1		0.2140	-15.26	22.04	6.78	53.73	-46.95	QP	
2		0.5340	-15.94	18.75	2.81	42.74	-39.93	QP	
3		1.5780	-21.15	18.26	-2.89	29.72	-32.61	QP	
4	*	3.9340	-28.73	19.02	-9.71	22.00	-31.71	QP	
5		7.3500	-31.02	16.94	-14.08	22.00	-36.08	QP	
6		22.3340	-29.97	19.48	-10.49	22.00	-32.49	QP	

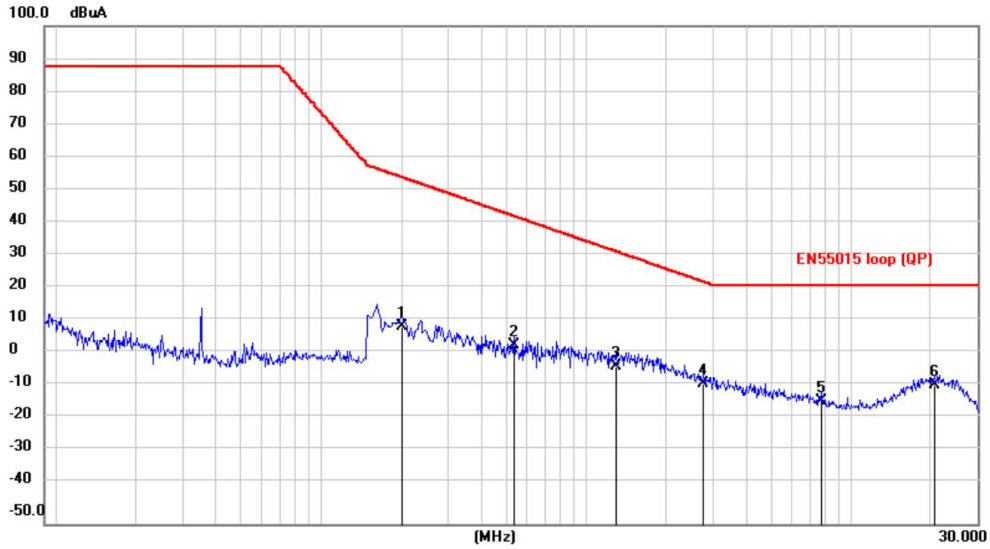
*:Maximum data x:Over limit !:over margin (Reference Only)



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Conducted Emission Measurement

File : FTS22KP-8204 Data : #2 Date : 2022/11/15 Time : 3:45:34



Site: LAB Phase: **Y** Temperature: 26
 Limit: EN55015 loop (QP) Power: DC 3.7V Humidity: 60 %
 EUT: Solar bollard Light
 M/N: TC-2023
 Mode: Lighting mode
 Note:

No. Mk.	Freq. MHz	Reading Level dBuA	Correct Factor dB	Measurement dBuA	Limit dBuA	Over dB	Detector	Comment
1	0.2020	-13.81	23.26	9.45	54.42	-44.97	QP	
2	0.5340	-15.21	18.90	3.69	42.74	-39.05	QP	
3	1.3020	-20.71	18.07	-2.64	32.03	-34.67	QP	
4	2.7740	-26.50	18.65	-7.85	22.94	-30.79	QP	
5	7.7180	-29.44	16.40	-13.04	22.00	-35.04	QP	
6 *	20.7979	-31.35	23.17	-8.18	22.00	-30.18	QP	

*:Maximum data x:Over limit !:over margin

(Reference Only)

File : FTS22KP-8204Data :#2

Page: 1

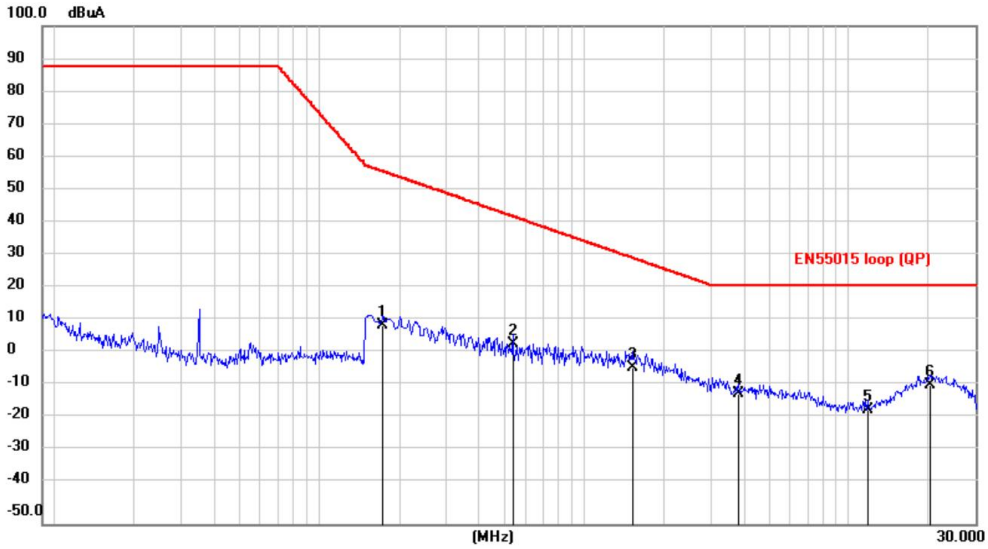
Engineer Signature:



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Conducted Emission Measurement

File : FTS22KP-8204 Data : #3 Date : 2022/11/15 Time : 3:52:51



Site LAB Phase: **Z** Temperature: 26
 Limit: EN55015 loop (QP) Power: DC 3.7V Humidity: 60 %
 EUT: Solar bollard Light
 M/N: TC-2023
 Mode: Lighting mode
 Note:

No. Mk.	Freq. MHz	Reading Level dBuA	Correct Factor dB	Measurement dBuA	Limit dBuA	Over dB	Detector	Comment
1	0.1740	-14.47	24.32	9.85	56.22	-46.37	QP	
2	0.5380	-14.41	18.78	4.37	42.65	-38.28	QP	
3	1.5220	-21.11	18.13	-2.98	30.15	-33.13	QP	
4	3.8340	-29.37	18.66	-10.71	22.00	-32.71	QP	
5	11.7140	-32.64	17.08	-15.56	22.00	-37.56	QP	
6 *	20.2220	-32.13	23.87	-8.26	22.00	-30.26	QP	

*:Maximum data x:Over limit !:over margin

(Reference Only)

File : FTS22KP-8204Data :#3

Page: 1

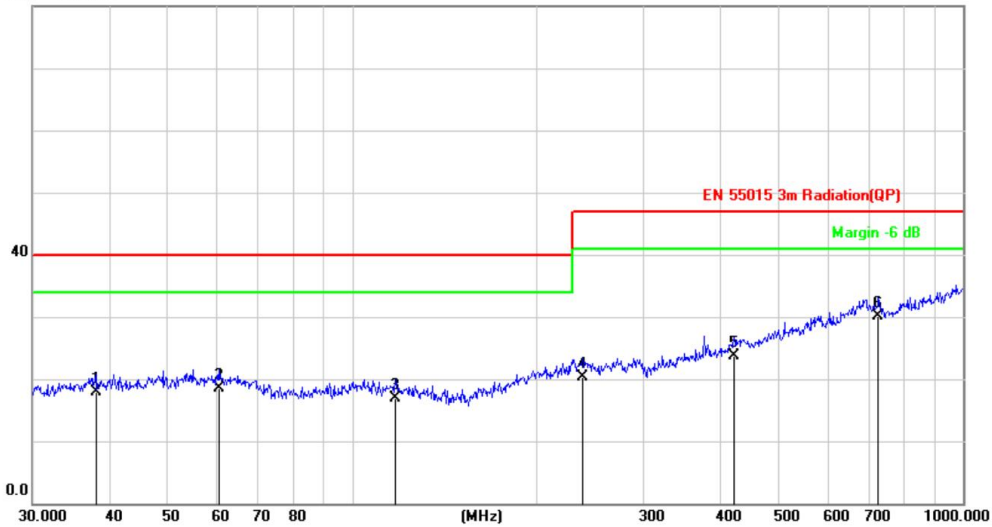
Engineer Signature:



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Radiated Emission Measurement

File : FTS22KP-8204 Data : #1 Date: 2022/11/14 Time: 22:28:18
 80.0 dBuV/m



Site LAB Polarization: **Horizontal** Temperature: 22
 Limit: EN 55015 3m Radiation(QP) Power: DC 3.7V Humidity: 52 %
 EUT: Solar bollard Light Distance:
 M/N: TC-2023
 Mode: Lighting mode
 Note:

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV/m	Limit dB/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	38.0782	4.99	13.00	17.99	40.00	-22.01	QP	100	131	
2	60.4919	5.02	13.49	18.51	40.00	-21.49	QP	200	352	
3	117.7724	5.55	11.31	16.86	40.00	-23.14	QP	200	147	
4	238.3102	6.38	13.91	20.29	47.00	-26.71	QP	100	32	
5	422.0577	5.85	17.86	23.71	47.00	-23.29	QP	100	192	
6 *	726.8052	7.44	22.70	30.14	47.00	-16.86	QP	200	352	

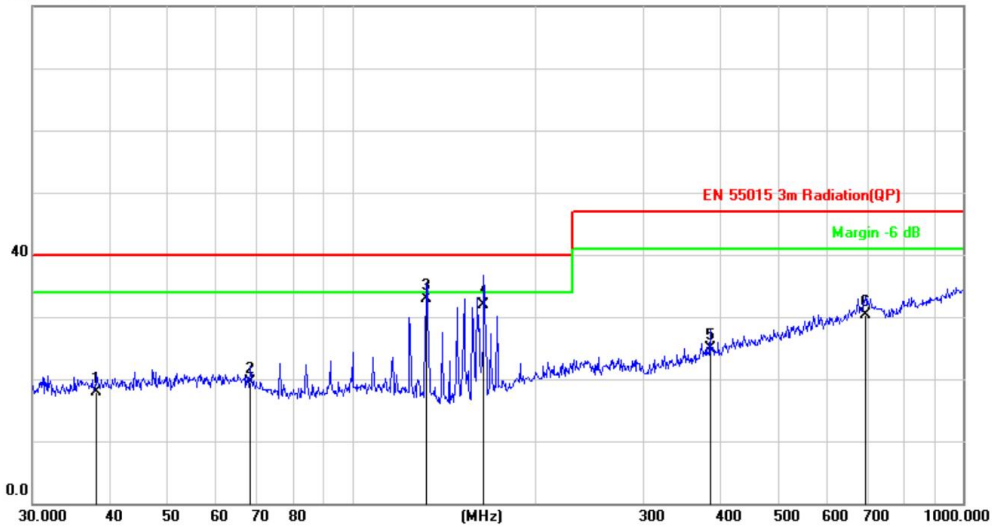
*:Maximum data x:Over limit !:over margin (Reference Only)



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Radiated Emission Measurement

File : FTS22KP-8204 Data : #2 Date: 2022/11/14 Time: 22:30:58
 80.0 dBuV/m



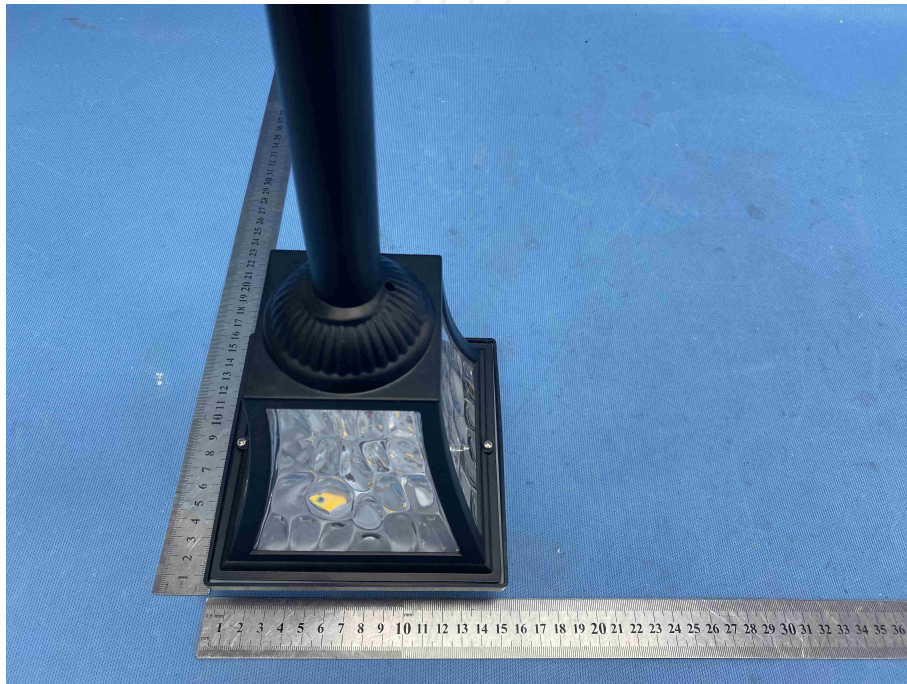
Site LAB Polarization: **Vertical** Temperature: 22
 Limit: EN 55015 3m Radiation(QP) Power: DC 3.7V Humidity: 52 %
 EUT: Solar bollard Light Distance:
 M/N: TC-2023
 Mode: Lighting mode
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	cm	degree	Comment
1		38.2120	4.95	13.01	17.96	40.00	-22.04	QP	100	101
2		68.1512	6.80	12.74	19.54	40.00	-20.46	QP	200	138
3	*	132.4900	22.86	10.12	32.98	40.00	-7.02	QP	100	169
4		164.4560	21.56	10.44	32.00	40.00	-8.00	QP	100	352
5		385.2805	8.18	16.67	24.85	47.00	-22.15	QP	100	139
6		691.9867	7.71	22.61	30.32	47.00	-16.68	QP	200	221

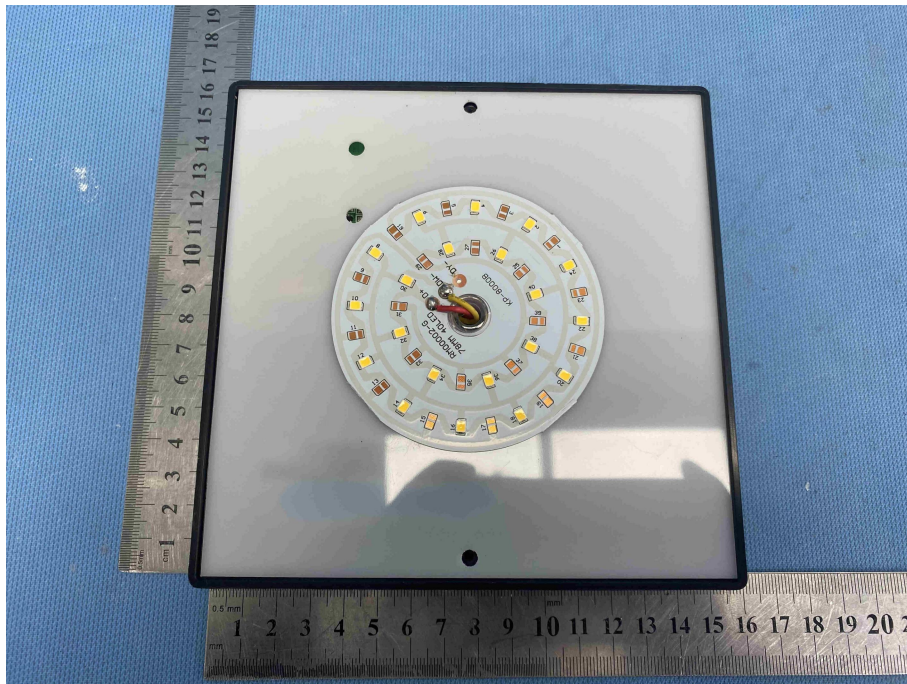
*:Maximum data x:Over limit !:over margin <Reference Only



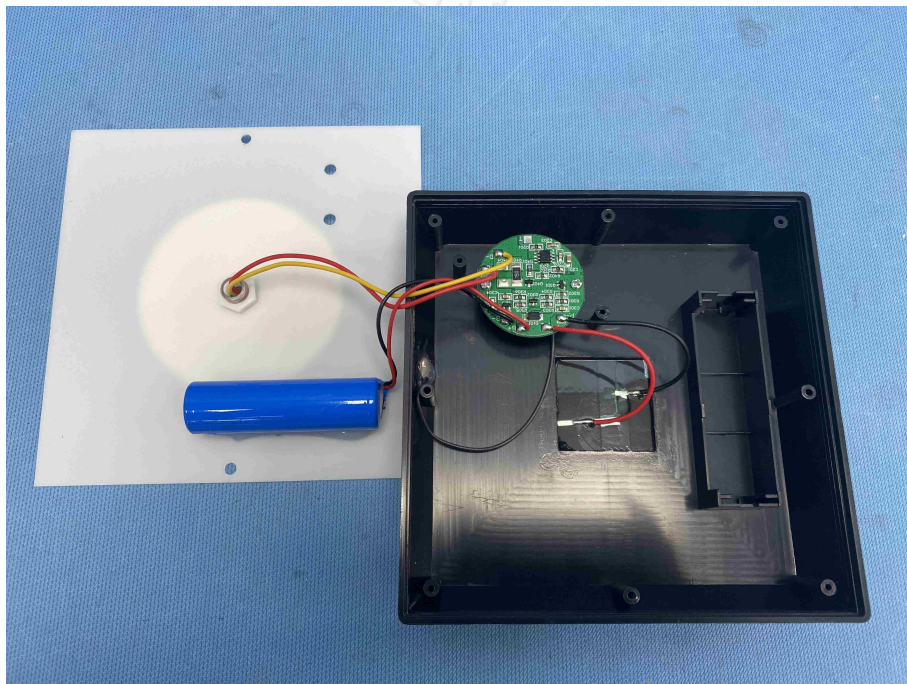
Picture 1



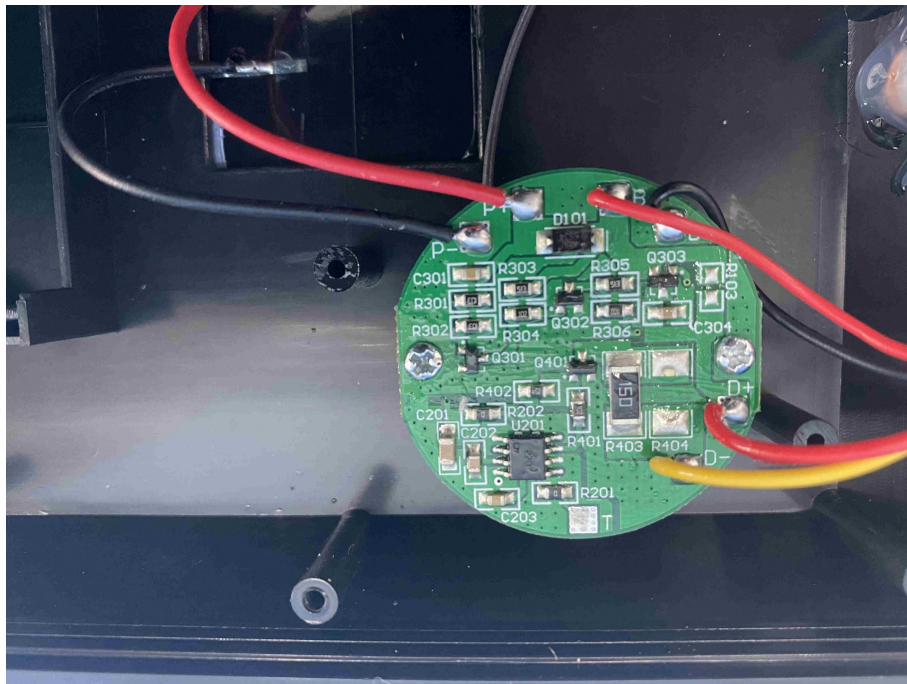
Picture 2



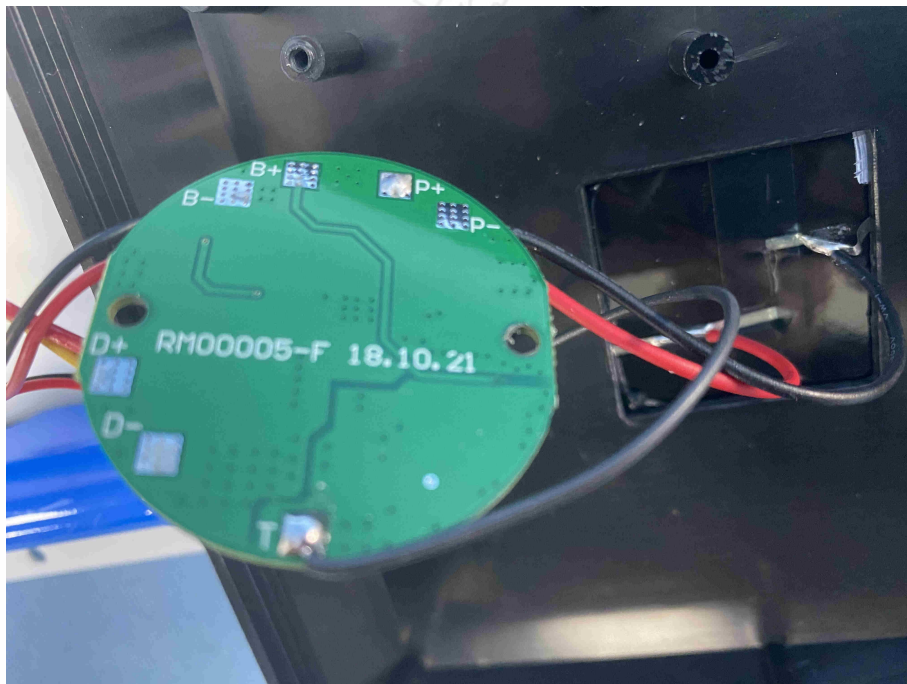
Picture 3



Picture 4



Picture 5



Picture 6

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Magnetic Radiation ☒				
Equipment	Manufacturer	Model No.	Serial No.	Cal Until
EMI Test Receiver	R&S	ESIB7	100082	28 Jul, 2023
Triple Loop Antenna	Laplace	RF300	9186	25 Feb, 2023
Radiated Emission (30MHz – 1000MHz) ☒				
Equipment	Manufacturer	Model No.	Serial No.	Cal Until
EMI Test Receiver	R&S	ESR7	101653	28 Jul, 2023
Broadband TRILOG Antenna	SCHWARZBEC K	VULB 9162	214	25 Feb, 2025
3m Semi-anechoic	YiHeng Electronics	9.0mx6.6mx6.7 m	N/A	31 Jul, 2024
RF Cable	FTS	FTS-235	/	28 Jul, 2023

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Radio-frequency electromagnetic fields ☒				
Equipment	Manufacturer	Model No.	Serial No.	Cal Until
Power Meter	Boonton	4242	17199	05 Jan, 2023
Field intensity meter	Narda	EP 600	711WX8088 0	09 Jan, 2023
Antenna	Schwarzbeck	VUSLP 9111E	00037	09 Jan, 2023
Horn antenna	Schwarzbeck	BBHA 9120D	02005	09 Jan, 2023
Power Amplifier	HTEC	MPA-1000- 6000-100	MPA200722 6	05 Jan, 2023
Power Amplifier	HTEC	HRF0810-250	MPA181033 5	05 Jan, 2023
Signal Generator	Keysight	N5181A	ATO-57097	05 Jan, 2023

-----End of test report-----