

FCC REPORT

Applicant: NLU Products, L.L.C.

Address of Applicant: 2801 N Thanksgiving Way #300, Lehi, UT 84043 USA

Equipment Under Test (EUT)

Product Name: Lantern

Model No.: Boulder

Trade mark: Lander

FCC ID: 2ALQR-BLDCTT20

Applicable standards: FCC CFR Title 47 Part 15 Subpart B

Date of sample receipt: 30 Nov., 2020

Date of Test: 01 Dec., to 09 Dec., 2020

Date of report issued: 30 Dec., 2020

Test Result: PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	10 Dec., 2020	Original
01	30 Dec., 2020	Update section 5.2

Tested by:

*YT Yang***Test Engineer**

Date:

30 Dec., 2020

Reviewed by:

*Winner Zhang***Project Engineer**

Date:

30 Dec., 2020

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4 Test Summary

Test Item	Section in CFR 47	Result
Conducted Emission	Part 15.107	Pass
Radiated Emission	Part 15.109	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: The EUT not applicable of the test item.		
Test Method:	ANSI C63.4:2014	

5 General Information

5.1 Client Information

Applicant:	NLU Products, L.L.C.
Address:	2801 N Thanksgiving Way #300, Lehi, UT 84043 USA
Manufacturer:	NLU Products, L.L.C.
Address:	2801 N Thanksgiving Way #300, Lehi, UT 84043 USA
Factory:	CTT Co., Ltd
Address:	Building 2 of Industrial park, No. 197, Xinhua Blvd, Tongqiao town, Zhongkai High-tech zone, Huizhou, Guangdong, China 516032.

5.2 General Description of E.U.T.

Product Name:	Lantern
Model No.:	Boulder
Type-C:	Charge-In : DC5 V, 3.0 A; DC9 V, 2.0 A; DC12 V, 1.5 A Charge-Out: DC5 V, 3.0 A; DC9 V, 2.0 A; DC12 V, 1.5 A
Type-A:	Charge-Out: DC 5V, 2.4 A DC 5V, 1 A
Power supply: (Wireless charging)	Input: 5V, 3A / 9V, 2A /12V, 1.5A Output: 5W, 7.5W
Power supply:	Lithium-ion rechargeable battery DC3.63V, each 3350mAh * 4 total 13400mAh
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

5.3 Test Mode and test samples plans

Operating mode	Detail description
Discharging + Working mode	Keep the EUT in Discharging + Wireless charging work + Turn on the light mode(Port A)
Discharging + Working mode	Keep the EUT in Discharging + Wireless charging work + Turn on the light mode(Port C)
Charging + Working mode	Keep the EUT in Charging + Wireless charging work + Turn on the light mode(Port A)
Charging + Working mode	Keep the EUT in Charging + Wireless charging work +Turn on the light mode(Port C)

The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

5.4 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±1.60 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±3.12 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.32 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.16 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±3.20 dB (k=2)

5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
Skytek	Wireless charging match load	/	/	/
Apple	Adapter	A1695	N/A	N/A

5.6 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.

5.7 Description of Cable Used

Cable Type	Description	Length	From	To
Detached USB Cable	Shielding	0.3m	EUT	Adapter

5.8 Additions to, deviations, or exclusions from the method

No

5.9 Laboratory Facility

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

- **FCC - Designation No.: CN1211**
JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.
- **ISED – CAB identifier.: CN0021**
The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.
- **A2LA - Registration No.: 4346.01**
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.10 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.
 Address: No.110~116, Building B, Jinyuan Business Building, Xixiang Road,
 Bao'an District, Shenzhen, Guangdong, China
 Tel: +86-755-23118282, Fax: +86-755-23116366
 Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

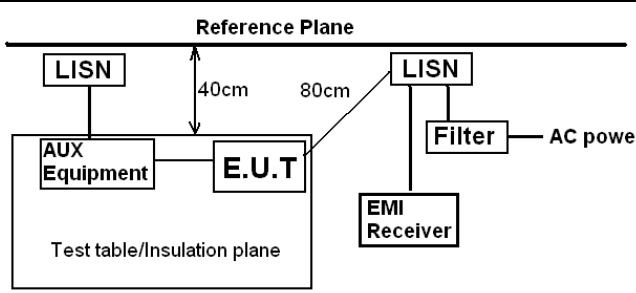
5.11 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2020	07-21-2021
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-07-2020	03-06-2021
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-07-2020	03-06-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-07-2020	03-06-2021
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2020	06-21-2021
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-18-2020	11-17-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2020	03-06-2021
Pre-amplifier	CD	PAP-1G18	11804	03-07-2020	03-06-2021
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-05-2020	03-04-2021
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-18-2020	11-17-2021
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-05-2020	03-04-2021
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2020	03-06-2021
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2020	03-06-2021
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2020	03-06-2021

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-05-2020	03-04-2021
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-05-2020	03-04-2021
LISN	CHASE	MN2050D	1447	03-05-2020	03-04-2021
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	06-18-2020	06-17-2021
Cable	HP	10503A	N/A	03-05-2020	03-04-2021
EMI Test Software	AUDIX	E3	Version: 6.110919b		

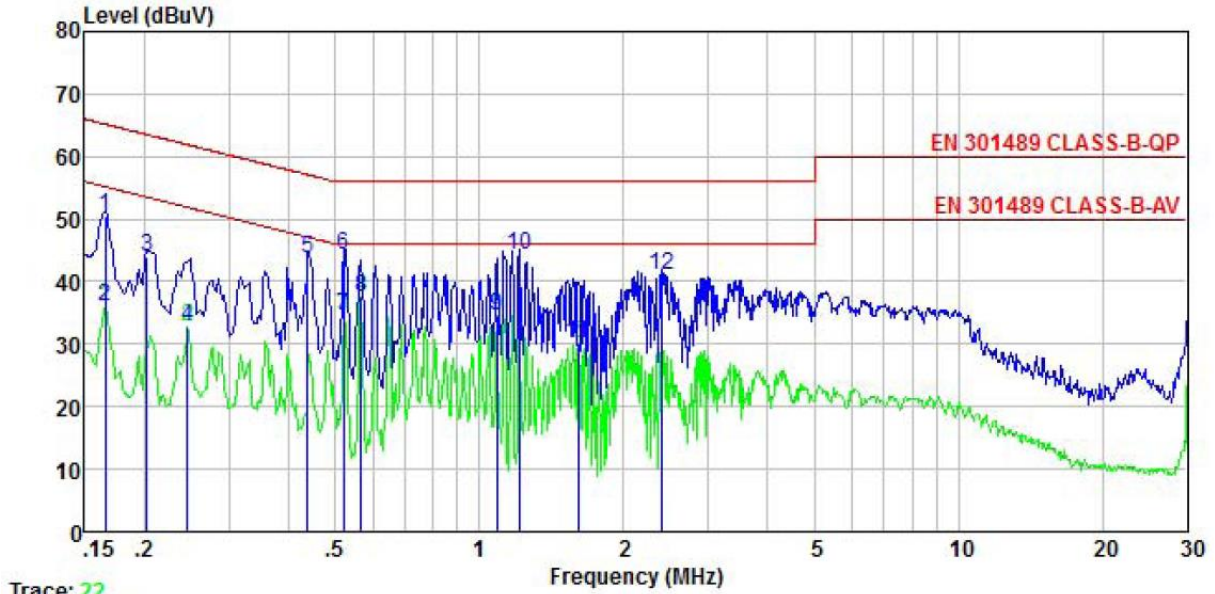
6 Test results and Measurement Data

6.1 Conducted Emission

Test Requirement:	FCC Part 15 B Section 15.107		
Test Frequency Range:	150kHz to 30MHz		
Class / Severity:	Class B		
Receiver setup:	RBW=9kHz, VBW=30kHz		
Limit:	Frequency range (MHz)	Limit (dB μ V)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	0.5-30	60	50
* Decreases with the logarithm of the frequency.			
Test setup:	 <p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>		
Test procedure	<ol style="list-style-type: none"> 1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4(latest version) on conducted measurement. 		
Test Instruments:	Refer to section 5.11 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement data:

Product name:	Lantern	Product model:	Boulder
Test by:	YT	Test mode:	Working mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5°C Humi: 55%

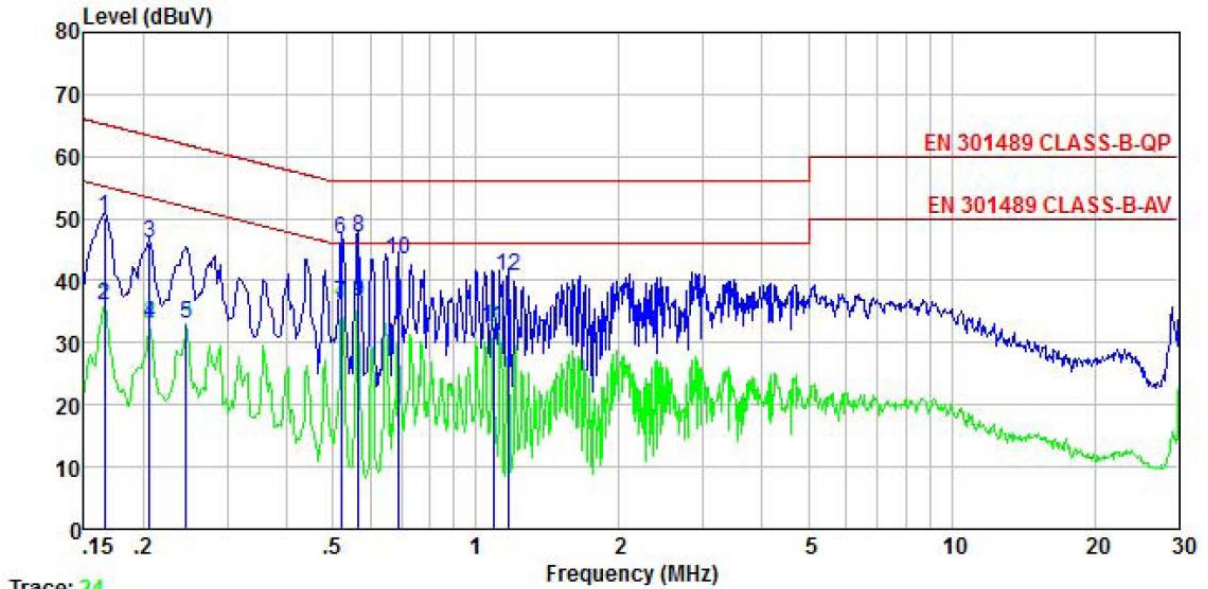


	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.166	40.38	-0.58	-0.09	10.77	50.48	65.16	-14.68	QP
2	0.166	26.03	-0.58	-0.09	10.77	36.13	55.16	-19.03	Average
3	0.202	33.90	-0.59	-0.16	10.76	43.91	63.54	-19.63	QP
4	0.246	22.72	-0.57	-0.21	10.75	32.69	51.91	-19.22	Average
5	0.437	33.43	-0.46	0.11	10.74	43.82	57.11	-13.29	QP
6	0.521	34.18	-0.44	-0.36	10.76	44.14	56.00	-11.86	QP
7	0.521	24.56	-0.44	-0.36	10.76	34.52	46.00	-11.48	Average
8	0.567	27.64	-0.47	-0.37	10.76	37.56	46.00	-8.44	Average
9	1.088	23.87	-0.61	0.37	10.88	34.51	46.00	-11.49	Average
10	1.216	33.67	-0.59	0.24	10.90	44.22	56.00	-11.78	QP
11	1.610	19.93	-0.54	-0.07	10.93	30.25	46.00	-15.75	Average
12	2.409	30.72	-0.47	-0.27	10.94	40.92	56.00	-15.08	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

Product name:	Lantern	Product model:	Boulder
Test by:	YT	Test mode:	Working mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5°C Humi: 55%



Trace: 24

	Freq	Read Level	LISN Factor	Aux Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.166	39.97	-0.68	0.01	10.77	50.07	65.16	-15.09	QP
2	0.166	25.79	-0.68	0.01	10.77	35.89	55.16	-19.27	Average
3	0.206	35.92	-0.67	0.00	10.76	46.01	63.36	-17.35	QP
4	0.206	23.07	-0.67	0.00	10.76	33.16	53.36	-20.20	Average
5	0.246	22.99	-0.67	0.01	10.75	33.08	51.91	-18.83	Average
6	0.521	36.44	-0.65	0.03	10.76	46.58	56.00	-9.42	QP
7	0.521	26.07	-0.65	0.03	10.76	36.21	46.00	-9.79	Average
8	0.567	36.79	-0.65	0.03	10.76	46.93	56.00	-9.07	QP
9	0.567	26.59	-0.65	0.03	10.76	36.73	46.00	-9.27	Average
10	0.690	33.31	-0.64	0.04	10.77	43.48	56.00	-12.52	QP
11	1.088	22.24	-0.68	0.09	10.88	32.53	46.00	-13.47	Average
12	1.166	30.56	-0.69	0.10	10.89	40.86	56.00	-15.14	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

6.2 Radiated Emission

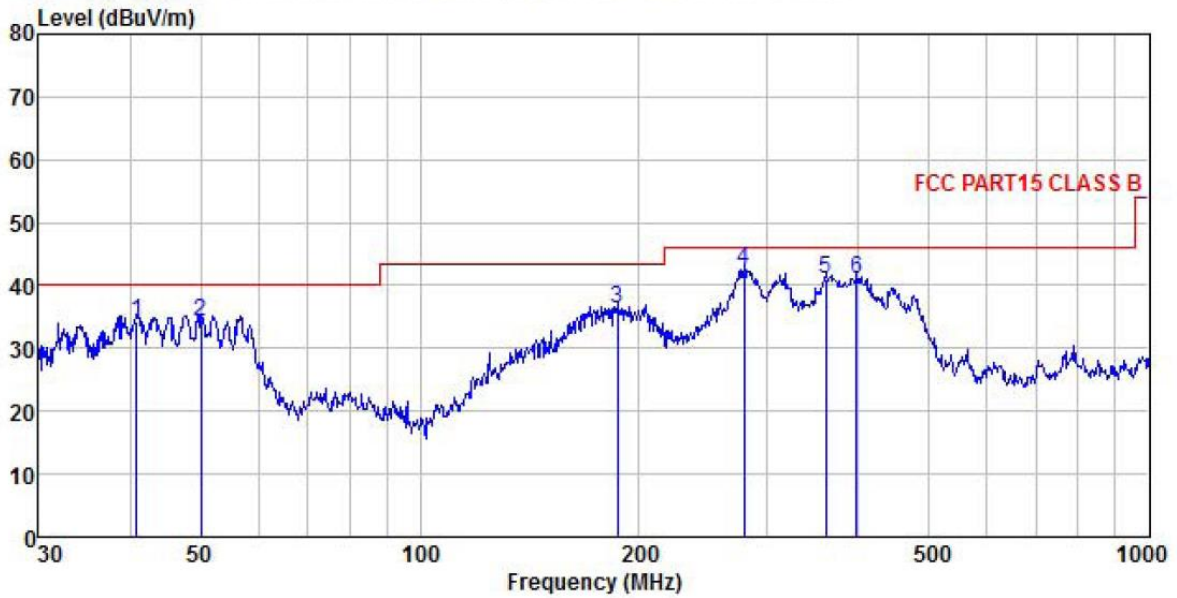
Test Requirement:	FCC Part 15 B Section 15.109				
Test Frequency Range:	30MHz to 6000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency	Limit (dBuV/m @3m)		Remark	
	30MHz-88MHz	40.0		Quasi-peak Value	
	88MHz-216MHz	43.5		Quasi-peak Value	
	216MHz-960MHz	46.0		Quasi-peak Value	
	Above 1GHz	54.0		Average Value	
74.0		Peak Value			
Test setup:	Below 1GHz				
Test setup:	Above 1GHz				
Test Procedure:	<ol style="list-style-type: none"> 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. 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 antenna height is varied from one meter to four 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. 				

	<p>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.</p> <p>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</p> <p>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</p>
Test Instruments:	Refer to section 5.11 for details
Test mode:	Refer to section 5.3 for details
Test results:	Passed
Remark:	All of the observed value above 6GHz ware the niose floor , which were no recorded

Measurement Data:

Below 1GHz:

Product Name:	Lantern	Product Model:	Boulder Boulder
Test By:	YT	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24°C Huni: 57%

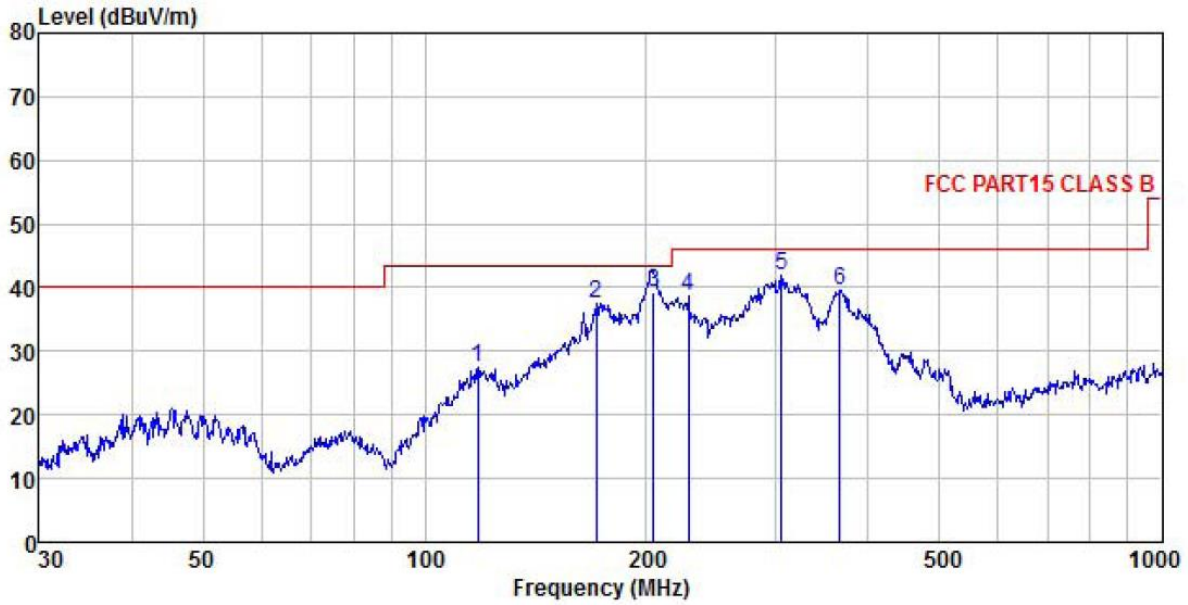


	ReadAntenna	Cable	Aux	Preamp	Level	Limit	Over	Remark	
Freq	Level	Factor	Loss	Factor	Factor	Line	Limit		
MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	40.845	51.10	12.82	0.36	0.00	29.89	34.39	40.00	-5.61 QP
2	50.057	50.60	13.20	0.38	0.00	29.82	34.36	40.00	-5.64 QP
3	186.441	47.23	17.26	0.69	0.00	28.93	36.25	43.50	-7.25 QP
4	278.067	51.40	18.62	0.84	0.00	28.49	42.37	46.00	-3.63 QP
5	360.448	49.94	18.86	0.94	0.00	28.61	41.13	46.00	-4.87 QP
6	397.633	49.59	19.08	0.99	0.00	28.77	40.89	46.00	-5.11 QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. The Aux Factor is a notch filter switch box loss, this item is not used.

Product Name:	Lantern	Product Model:	Boulder
Test By:	YT	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24℃ Humi: 57%



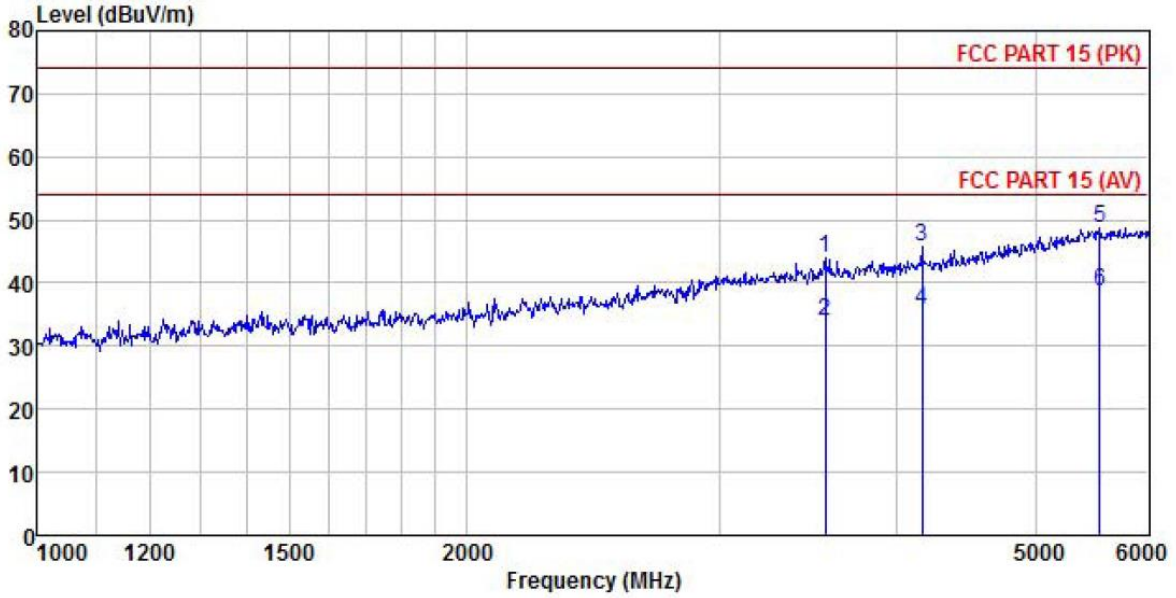
	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	118.186	45.75	10.53	0.57	0.00	29.40	27.45	43.50	-16.05	QP
2	170.793	49.35	16.54	0.66	0.00	29.04	37.51	43.50	-5.99	QP
3	204.238	49.10	18.32	0.72	0.00	28.80	39.34	43.50	-4.16	QP
4	227.691	48.02	18.42	0.75	0.00	28.66	38.53	46.00	-7.47	QP
5	304.610	50.83	18.71	0.87	0.00	28.46	41.95	46.00	-4.05	QP
6	365.539	48.43	18.89	0.95	0.00	28.63	39.64	46.00	-6.36	QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. The Aux Factor is a notch filter switch box loss, this item is not used.

Above 1GHz:

Product Name:	Lantern	Product Model:	Boulder
Test By:	YT	Test mode:	Working mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Vertical
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24°C Humi: 57%

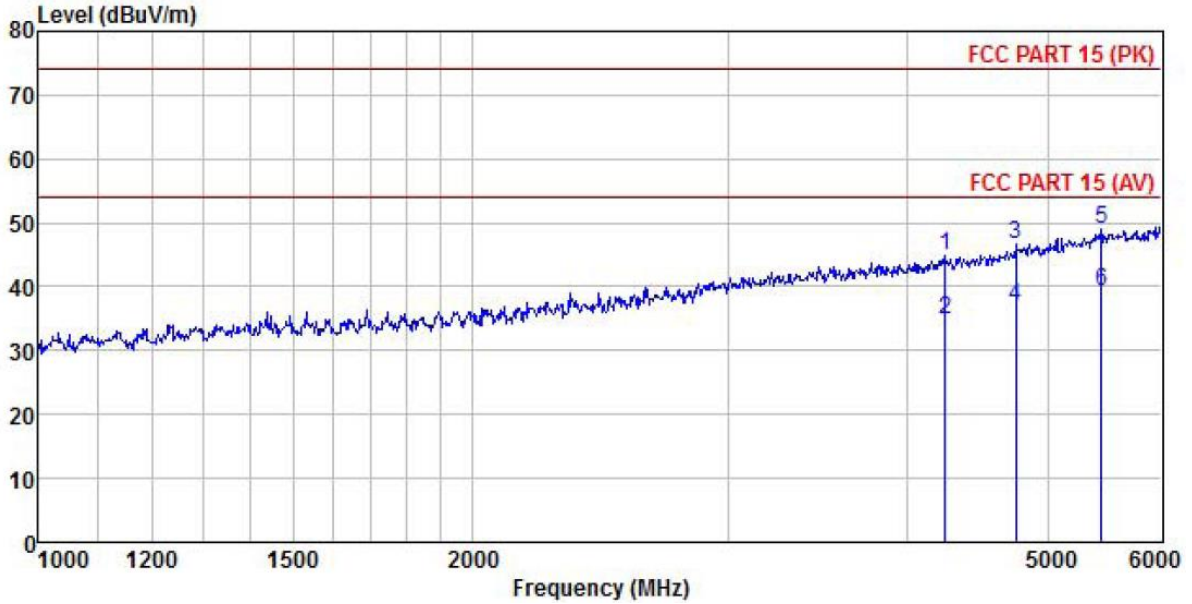


	Read Freq	Antenna Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit	Over	Remark
	MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	3562.126	49.09	28.79	5.37	2.20	41.51	43.94	74.00	-30.06	Peak
2	3562.126	39.11	28.79	5.37	2.20	41.51	33.96	54.00	-20.04	Average
3	4163.019	49.98	29.56	5.89	2.26	41.81	45.88	74.00	-28.12	Peak
4	4163.019	39.88	29.56	5.89	2.26	41.81	35.78	54.00	-18.22	Average
5	5545.141	48.40	32.32	7.02	2.66	41.81	48.59	74.00	-25.41	Peak
6	5545.141	38.45	32.32	7.02	2.66	41.81	38.64	54.00	-15.36	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	Lantern	Product Model:	Boulder
Test By:	YT	Test mode:	Working mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 120/60Hz	Environment:	Temp: 24°C Huni: 57%



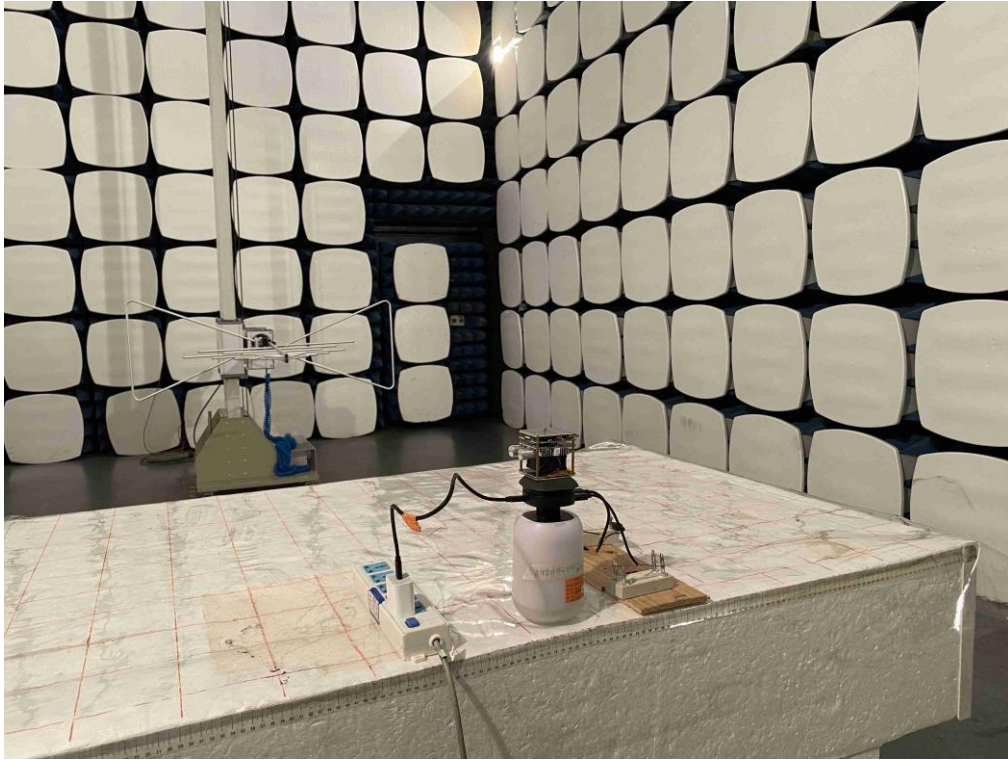
	ReadAntenna	Cable	Aux	Preamp	Level	Limit	Over	Remark
Freq	Level	Factor	Loss	Factor	Factor	Line	Limit	
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
1	4245.883	48.89	29.70	5.95	2.28	41.84	44.98	74.00 -29.02 Peak
2	4245.883	38.79	29.70	5.95	2.28	41.84	34.88	54.00 -19.12 Average
3	4753.260	49.24	30.66	6.35	2.43	41.90	46.78	74.00 -27.22 Peak
4	4753.260	39.32	30.66	6.35	2.43	41.90	36.86	54.00 -17.14 Average
5	5446.670	49.10	32.17	6.95	2.64	41.85	49.01	74.00 -24.99 Peak
6	5446.670	39.21	32.17	6.95	2.64	41.85	39.12	54.00 -14.88 Average

Remark:

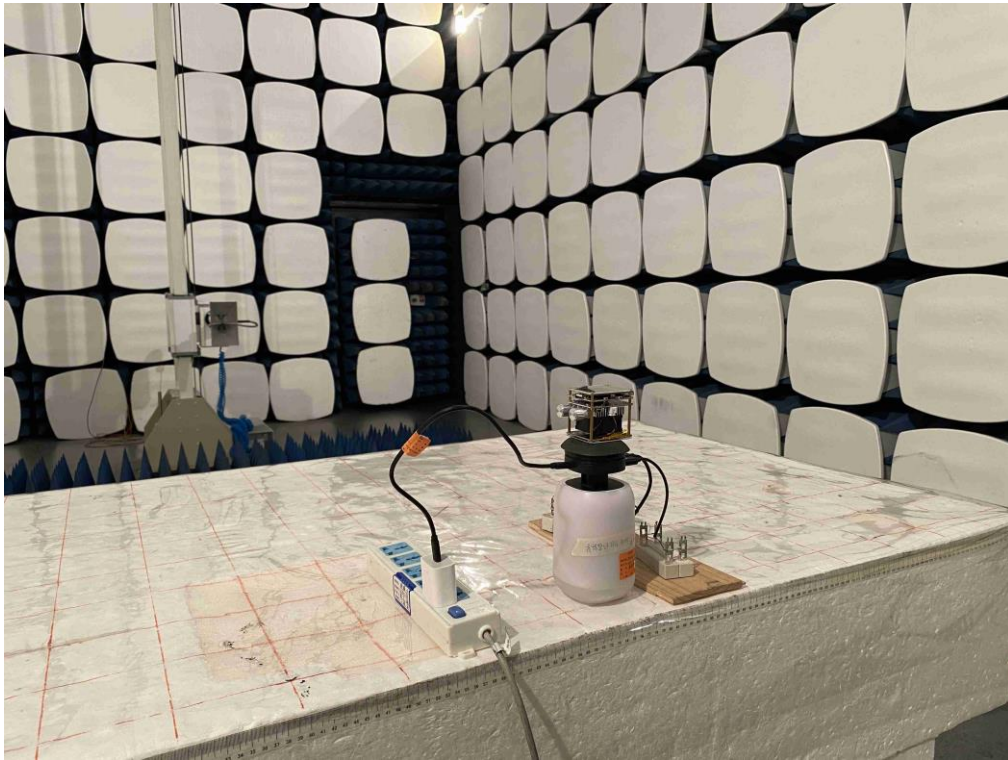
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

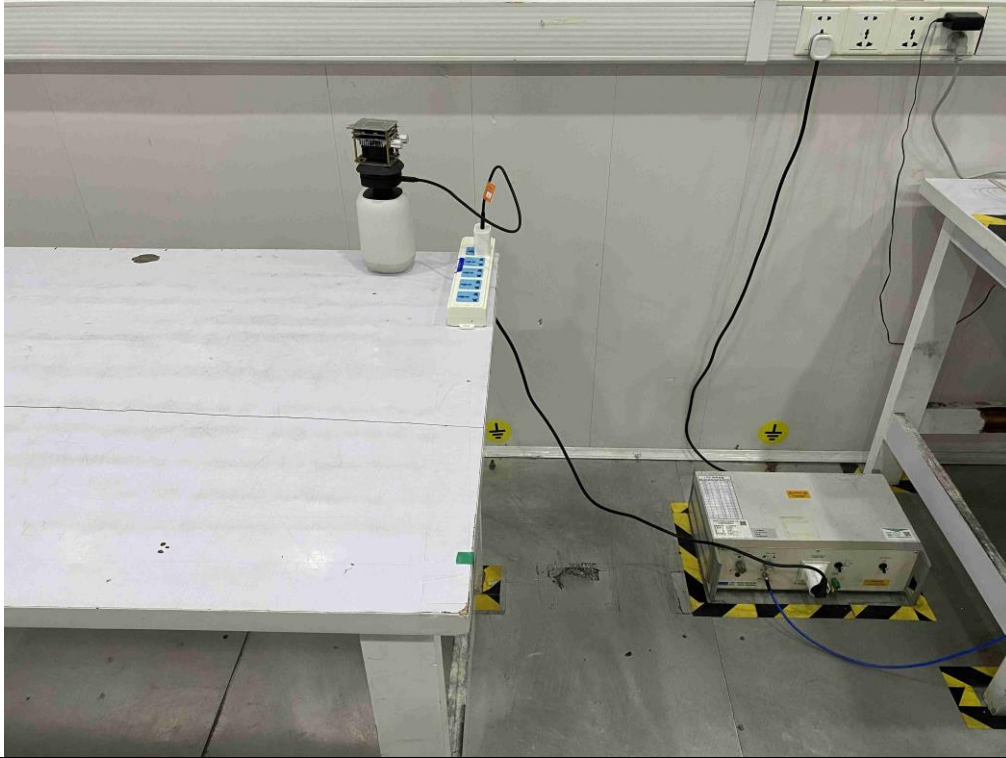
7 Test Setup Photo

Radiated Emission
Below 1GHz



Above 1GHz



Conducted Emission

8 EUT Constructional Details

Reference to the test report No.: JYTSZE201102601.

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