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EMC TEST REPORT

For

BAREBONES LIVING

Forest Lantern

Model No.: LIV-261-Bronze, LIV-262-Red

Prepared for	:	BAREBONES LIVING
Address	:	1215 East Wilmington Avenue, Suite 140, Salt Lake City, Utah, USA
Prepared by	:	EMTEK (NINGBO) CO., LTD.
Address	:	1/F ., Building 4, No. 1177, Lingyun Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang, China
		Tel: +86-574-27907998 Fax: +86-574-27721538

Report Number	:	EN170614005E
Date of Test	:	June 14, 2017 to June 21, 2017
Date of Report	:	June 23, 2017

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Test Report Description Page

TEST REPORT DESCRIPTION

Applicant	:	BAREBONES LIVING
Manufacturer	:	ZHEJIANG HUANGYAN YUANQIAO ARTS & CRAFTS FACTORY
Trademark	:	Barebones Living
EUT	:	Forest Lantern
Model No.	:	LIV-261-Bronze, LIV-262-Red
Power Supply	:	DC 3.7V, 4.4A, 16.28W

Measurement Procedure Used:

EN 55015:2013+A1:2015,
EN 61547:2009
(IEC 61000-4-2:2008, IEC 61000-4-3:2010, IEC 61000-4-4:2012,
IEC 61000-4-5:2014, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004)

The device described above is tested by EMTEK (NINGBO) CO., LTD. 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 EMTEK (NINGBO) CO., LTD. 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 EN55015 and EN61547 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (NINGBO) CO., LTD.

Date of Test : June 14, 2017 to June 21, 2017

Prepared by : Sophia
(Engineer)

Reviewer : Kuki
(Quality Manager)

Approved & Authorized Signer : Tony Wei
(Manager)

EMTEK (NINGBO) CO., LTD. TESTING

Modified History

Version	Report No.	Revision date	Summary
Ver.1.0	EN170614005E	\	Original Report

1. SUMMARY OF TEST RESULT

EMISSION			
Description of test item	Standard	Limits	Results
Conducted disturbance at mains terminals	EN 55015:2013+A1:2015	Table 2a	N/A
Magnetic Emission	EN 55015:2013+A1:2015	Table 3a	Pass
Radiated Disturbance	EN 55015:2013+A1:2015	Table 3b	Pass
Harmonics	EN 61000-3-2:2014	Class C	N/A
Voltage fluctuation and flicker	EN 61000-3-3:2013	Section 5	N/A
Immunity(EN 61547:2009)			
Description of test item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2010	A	Pass
EFT/B Immunity	IEC 61000-4-4:2012	B	N/A
Surge Immunity	IEC 61000-4-5:2014	C	N/A
Conducted RF Immunity	IEC 61000-4-6:2013	A	N/A
Power frequency magnetic field	IEC 61000-4-8:2009	A	N/A
Voltage dips and interruptions, 100% reduction	IEC 61000-4-11:2004	B	N/A
Voltage dips and interruptions, 30% reduction		C	N/A
Note: N/A is an abbreviation for Not Applicable.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	Forest Lantern
Model Number	:	LIV-261-Bronze, LIV-262-Red (Note: All the models are the same except the colour. We prepare LIV-261-Bronze for EMC test.)
Test Voltage	:	DC 3.7V
Applicant	:	BAREBONES LIVING
Address	:	1215 East Wilmington Avenue, Suite 140, Salt Lake City, Utah, USA
Manufacturer	:	ZHEJIANG HUANGYAN YUANQIAO ARTS & CRAFTS FACTORY
Address	:	No.47 Yuandian Road, Yuanqiao Town, Huangyan, Taizhou
Date of Receiver	:	June 14, 2017
Date of Test	:	June 14, 2017 to June 21, 2017

2.2. Description of Test Facility

Site Description

EMC Lab. : Accredited by CNAS, 2016.12.20
The certificate is valid until 2023.1.20
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005)
The Certificate Registration Number is L6666.

Accredited by FCC, Valid until 2017/07/12
The Certificate Registration Number is 463622.

Accredited by Industry Canada, November 14, 2016
The Certificate Registration Number is 46405-9469.

Name of Firm : EMTEK (NINGBO) CO., LTD.

Site Location : 1F Building 4, 1177#, Lingyun Road, National Hi-Tech Zone, Ningbo, Zhejiang, China

2.3. Support Device

N/A

2.4. Measurement Uncertainty

Magnetic Emission Uncertainty	:	2.6dB
Radiated Emission Uncertainty (3m Chamber)	:	3.44 (Polarize: H) (30MHz-1000MHz) 3.78 (Polarize: V) (30MHz-1000MHz)

3. MEASURING DEVICE AND TEST EQUIPMENT

3.1. For Magnetic Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	101108	July 17, 2016	1 Year
2.	Van Veen Loop Antenna	AFJ Instruments	VVL1530	SC0CIZ	July 17, 2016	1 Year

3.2. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	Rohde & Schwarz	ESCI	101107	July 17, 2016	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	101107	July 17, 2016	1 Year
3.	Pre-Amplifier	CD	PAP-0203	22015	July 17, 2016	1 Year
4.	Bilog Antenna	Schwarzbeck	VULB9163	9163-467	July 16, 2016	1 Year
5.	Cable	Huber + Suhner	CBL3-NN-0.5M	101216-21405 00-2	July 17, 2016	1 Year
6.	Cable	Huber + Suhner	CBL3-NN-3.0M	101216-21430 00-2	July 17, 2016	1 Year
7.	Cable	Huber + Suhner	CBL3-NN-9.0M	101216-21490 00	July 17, 2016	1 Year

3.3. For Electrostatic Discharge Immunity Test

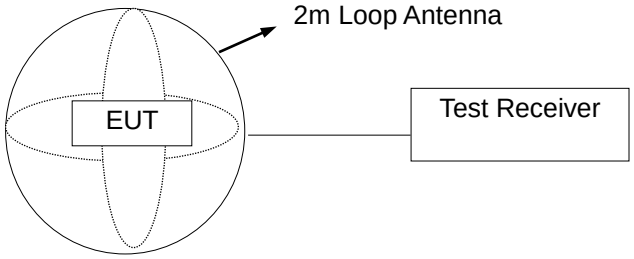
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	SCHAFFNER	NSG 432	1285	July 17, 2016	1 Year

3.4. For RF Strength Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	signal generator	Agilent	N5181A	MY50145187	May 20, 2017	1 Year
2.	RF Power Meter. Dual Channel	BOONTON	4232A	10539	May 21, 2017	1 Year
3.	50ohm Diode Power Sensor	BOONTON	51011EMC	34236/34238	May 21, 2017	1 Year
4.	Field Strength Meter	DARE	RSS1006A	10I00037SO 22	May 21, 2017	1 Year
5.	50ohm Diode Power Sensor	Boonton	51011EMC	36164	May 21, 2017	1 Year
6.	Power Amplifier	MILMEGA	80RF1000-1 75	1059345	May 20, 2017	1 Year
7.	Power Amplifier	MILMEGA	AS0102-55	1018770	May 20, 2017	1 Year
8.	Power Amplifier	MILMEGA	AS1860-50	1059346	May 20, 2017	1 Year
9.	Log.-Per. Antenna	SCHWARZBECK	VULP 9118E	811	May 21, 2017	1 Year
10.	Broad-Band Horn Antenna	Schwarzbeck	STLP 9149	9149-227	May 21, 2017	1 Year
11.	Multi-function interface system	DARE	CTR1009B	12I00250SN O72	N/A	N/A
12.	Automatic switch group	DARE	RSW1004A	N/A	N/A	N/A

4. MAGNETIC FIELD EMISSION MEASUREMENT

4.1. Block Diagram of Test Setup



(EUT: Forest Lantern)

4.2. Measurement Standard

EN 55015:2013+A1:2015

4.3. Measurement Limits

Frequency	Limits for loop diameter (dBμA)
	2m
9KHz ~ 70KHz	88
70KHz ~ 150KHz	88 ~ 58*
150KHz ~ 3.0MHz	58 ~ 22*
3.0MHz ~ 30MHz	22

1. At the transition frequency the lower limit applies.
2. * Decreasing linearly with logarithm of the frequency.

4.4. EUT Configuration on Measurement

The following equipments are installed on Magnetic Emission Measurement to meet EN55015 requirements and operating in a manner which tends to maximize its emission characteristics in a normal application.

EUT : Forest Lantern
Model Number : LIV-261-Bronze

4.5. Operating Condition of EUT

4.5.1. Turn on the power.

4.5.2. After that, let the EUT work in test mode (ON) and measure it.

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

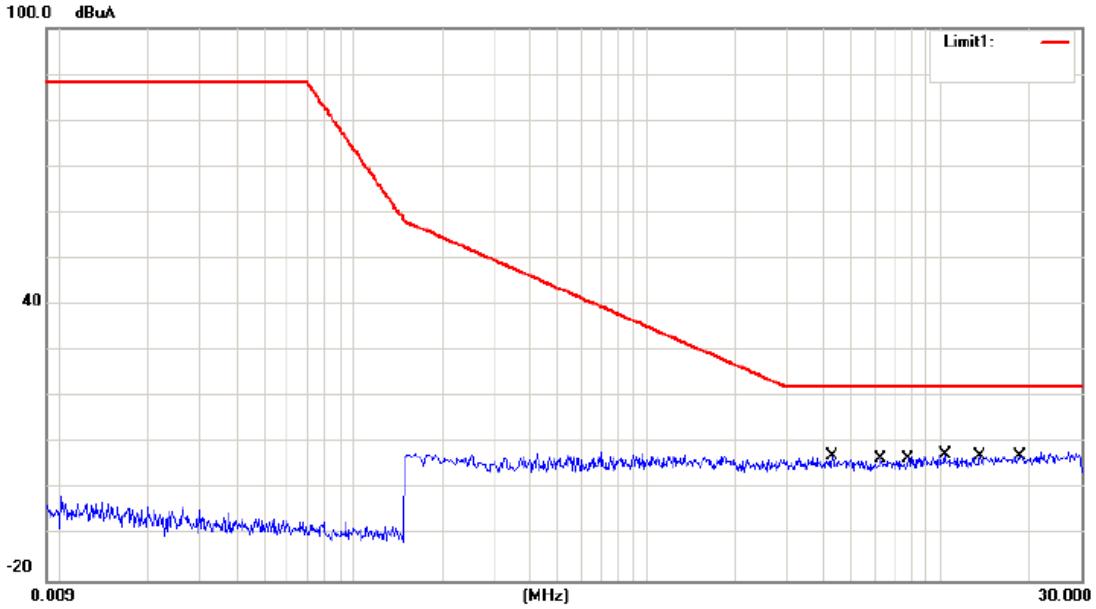
The frequency range from 9 KHz to 30MHz is investigated. All the test results are listed in Section 4.7.

4.7. Test Results

PASS.

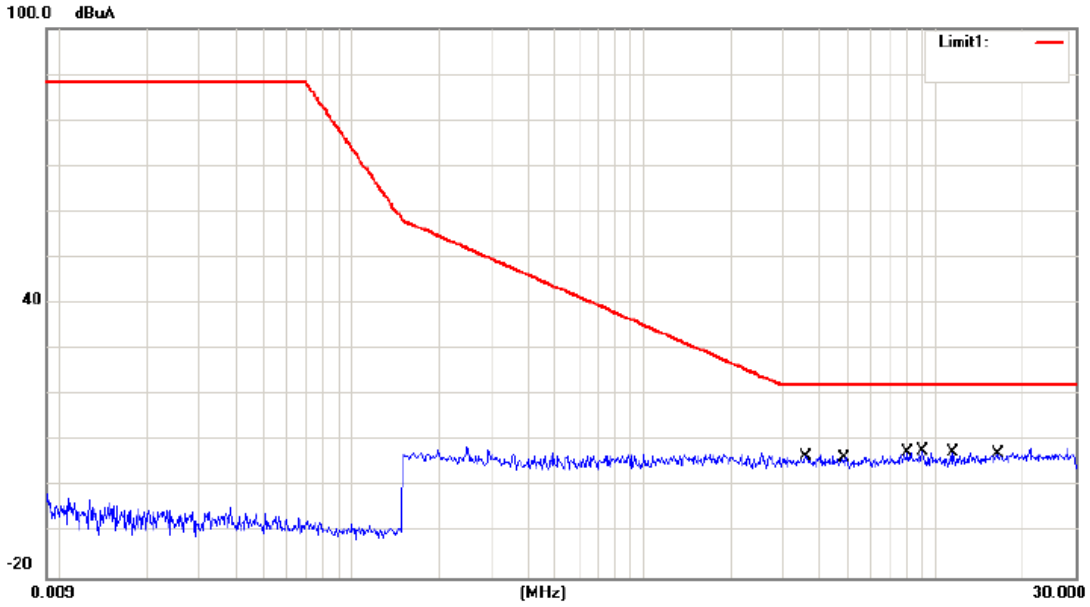
Please see the attached pages.

Test Data:



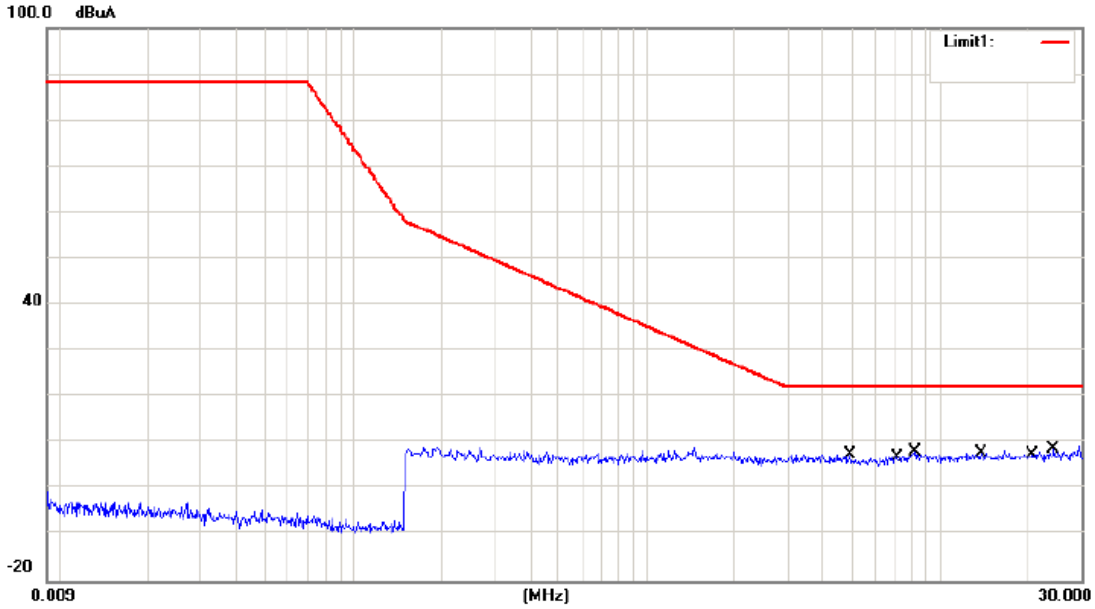
Site site #1 Phase: LOOP X Temperature: 25
Limit: (ME)EN55015 Power: DC 3.7V Humidity: 52 %
Mode: ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	Comment
1		4.2540	6.80	0.46	7.26	22.00	-14.74	QP	
2		6.2200	6.10	0.48	6.58	22.00	-15.42	QP	
3		7.7200	6.00	0.49	6.49	22.00	-15.51	QP	
4	*	10.3560	7.00	0.50	7.50	22.00	-14.50	QP	
5		13.6320	6.50	0.53	7.03	22.00	-14.97	QP	
6		18.5880	6.40	0.57	6.97	22.00	-15.03	QP	



Site site #1 Phase: LOOP Y Temperature: 25
Limit: (ME)EN55015 Power: DC 3.7V Humidity: 52 %
Mode: ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	Comment
1		3.6020	6.10	0.45	6.55	22.00	-15.45	QP	
2		4.8420	5.90	0.47	6.37	22.00	-15.63	QP	
3		8.0120	7.00	0.49	7.49	22.00	-14.51	QP	
4	*	8.9760	7.20	0.49	7.69	22.00	-14.31	QP	
5		11.3520	6.90	0.51	7.41	22.00	-14.59	QP	
6		16.2480	6.60	0.55	7.15	22.00	-14.85	QP	



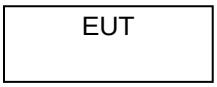
Site site #1 Phase: LOOP Z Temperature: 25
Limit: (ME)EN55015 Power: DC 3.7V Humidity: 52 %
Mode: ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	Comment
1		4.9420	7.10	0.47	7.57	22.00	-14.43	QP	
2		7.1240	6.50	0.48	6.98	22.00	-15.02	QP	
3		8.1680	7.40	0.49	7.89	22.00	-14.11	QP	
4		13.7400	7.30	0.53	7.83	22.00	-14.17	QP	
5		20.4440	6.90	0.58	7.48	22.00	-14.52	QP	
6	*	24.1160	7.90	0.60	8.50	22.00	-13.50	QP	

5. RADIATED EMISSION MEASUREMENT

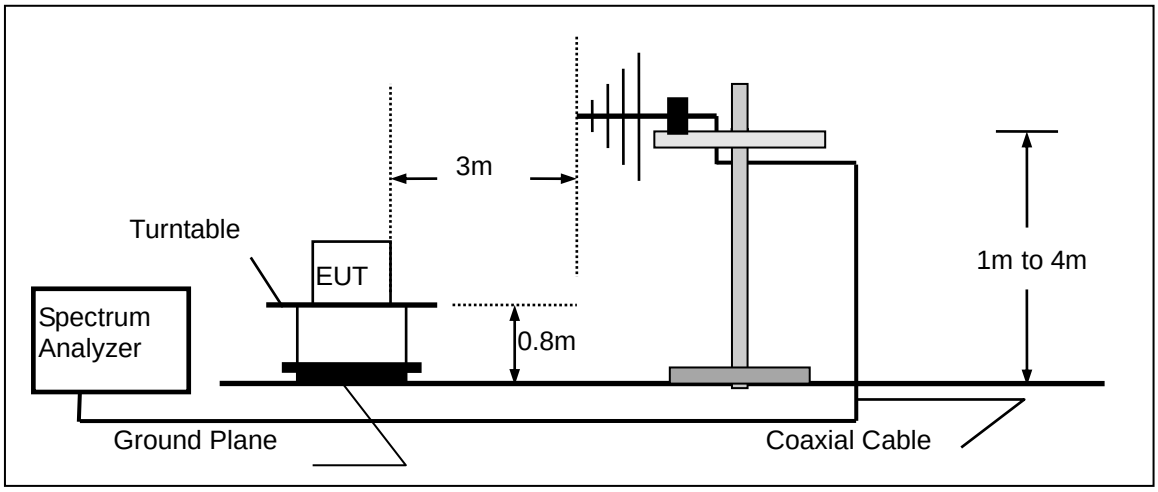
5.1. Block Diagram of Test

5.1.1. Block diagram of connection between the EUT and simulators.



(EUT: Forest Lantern)

5.1.2. Block diagram of test setup (In chamber)



(EUT: Forest Lantern)

5.2. Measuring Standard

EN 55015:2013+A1:2015

5.3. Radiated Emission Limits

All emanations from a device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
30 ~ 230	3	40
230 ~ 300	3	47

Note: (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.

5.4. EUT Configuration on Test

The EN55015 regulations test method must be used to find the maximum emission during radiated emission measurement.

5.5. Operating Condition of EUT

5.5.1. Turn on the power.

5.5.2. After that, let the EUT work in test mode (ON) and measure it.

5.6. Test Procedure

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna that 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 (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver (ESCI) is set at 120kHz.
The frequency range from 30MHz to 300MHz is investigated.

5.7. Measuring Results

PASS.

Please see the attached pages.

Test Data:

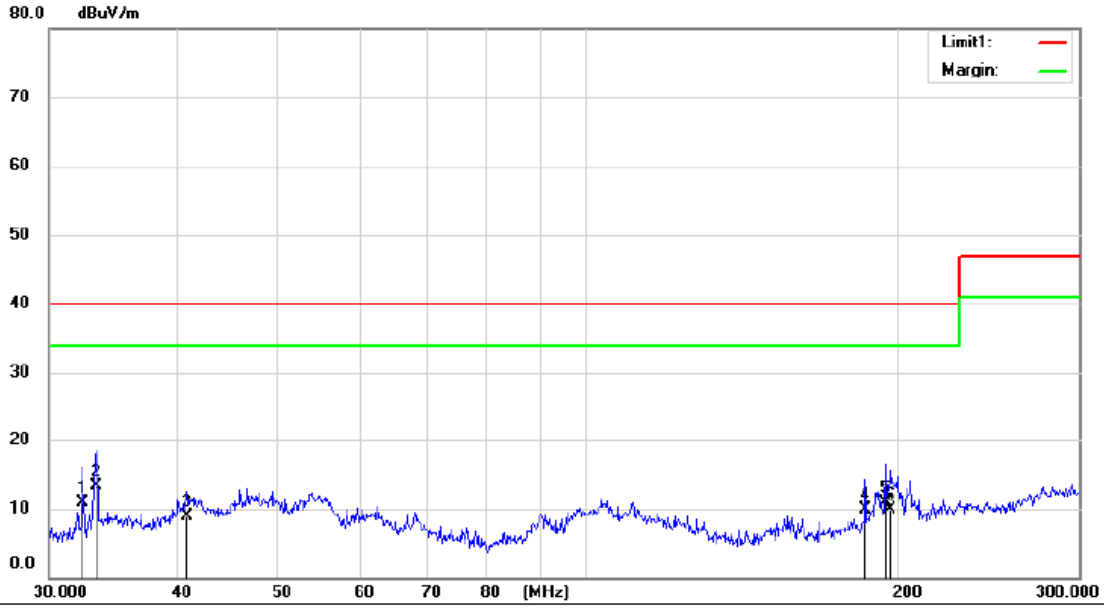
Site site #1 Polarization: *Vertical* Temperature: 20 C

Limit: (RE)EN55015 Power: DC3.7V Humidity: 52 %

Mode:ON

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		154.5686	46.09	-25.49	20.60	40.00	-19.40	QP			
2	*	156.3584	46.65	-25.55	21.10	40.00	-18.90	QP			
3		157.4422	45.55	-25.55	20.00	40.00	-20.00	QP			
4		192.8063	42.51	-21.91	20.60	40.00	-19.40	QP			
5		198.6650	42.33	-22.33	20.00	40.00	-20.00	QP			
6		200.0420	42.48	-22.58	19.90	40.00	-20.10	QP			



Site site #1 Polarization: *Horizontal* Temperature: 20 C
Limit: (RE)EN55015 Power: DC3.7V Humidity: 52 %
Mode:ON
Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		32.2940	34.13	-23.13	11.00	40.00	-29.00	QP			
2	*	33.3520	36.04	-22.64	13.40	40.00	-26.60	QP			
3		40.8433	29.50	-20.50	9.00	40.00	-31.00	QP			
4		186.2607	33.40	-23.40	10.00	40.00	-30.00	QP			
5		194.5903	32.72	-21.72	11.00	40.00	-29.00	QP			
6		196.8436	32.01	-22.01	10.00	40.00	-30.00	QP			

6. IMMUNITY PERFORMANCE CRITERIA DESCRIPTION

A functional description of performance criteria, during or as a consequence of the immunity testing, shall be provided by the manufacturer and noted in the test report.

The performance of lighting equipment shall be assessed by monitoring:
— The luminous intensity of the luminaire or of the lamp(s);
— The functioning of the control in case of equipment which includes a regulating control or concerns the regulating control itself;
— The functioning of the starting device, if any.

The following performance criteria apply to lighting equipment:
Performance 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.

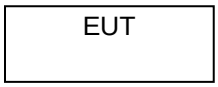
Performance criterion B:
During the test the luminous intensity may change to any value. After the test the luminous intensity shall be restored to its initial value within 1 min.
Regulating controls need not function during the test, but after the test the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

Performance 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.

7. ELECTROSTATIC DISCHARGE IMMUNITY TEST

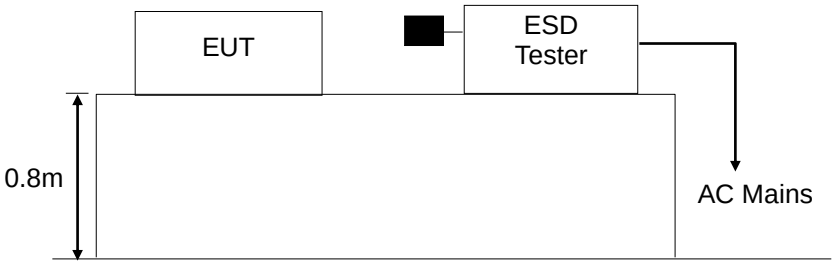
7.1. Block Diagram of Test Setup

7.1.1. Block diagram of connection between the EUT and simulators.



(EUT: Forest Lantern)

7.1.2. Block diagram of ESD test setup



(EUT: Forest Lantern)

7.2. Test Standard

EN 61547:2009
(IEC 61000-4-2:2008 Severity Level: 3 / Air Discharge: ±8KV
Level: 2 / Contact Discharge: ±4KV)

7.3. Severity Levels and Performance Criterion

7.3.1. Severity 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

7.3.2. Performance criterion: B

7.4. Operating Condition of EUT

7.4.1.Turn on the power.

7.4.2.After that, let the EUT work in test mode (ON) and measure it.

7.5. Test Procedure

7.5.1.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.

7.5.2.Contact Discharge:

All the procedure shall be same as Section 7.5.1. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

7.5.3.Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

7.5.4.Indirect discharge for vertical coupling plane

At least 10 singles discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 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.

7.6. Test Results

PASS

Please refer to the following pages

Electrostatic Discharge Test Result

Standard: ☒ IEC 61000-4-2	Result: ☒PASS /☐ FAIL

Applicant : BAREBONES LIVING
EUT : Forest Lantern
M/N : LIV-261-Bronze
Input Voltage : DC 3.7V
Air discharge : ± 8.0KV
Contact discharge : ± 4.0KV
Test Mode : ON

Test Date : June 16, 2017
Temperature : 25℃
Humidity : 55%
Criterion : B
Test Engineer : YANG

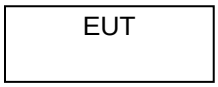
Location	**Kind** A-Air Discharge C-Contact Discharge	**Result**
HCP	C	A
VCP	C	A
Conducted Enclosure	C	A
Non-Conducted Enclosure	A	A
Button	A	A
All slots of the EUT	A	A
/	/	/

Note:

8. RF FIELD STRENGTH SUSCEPTIBILITY TEST

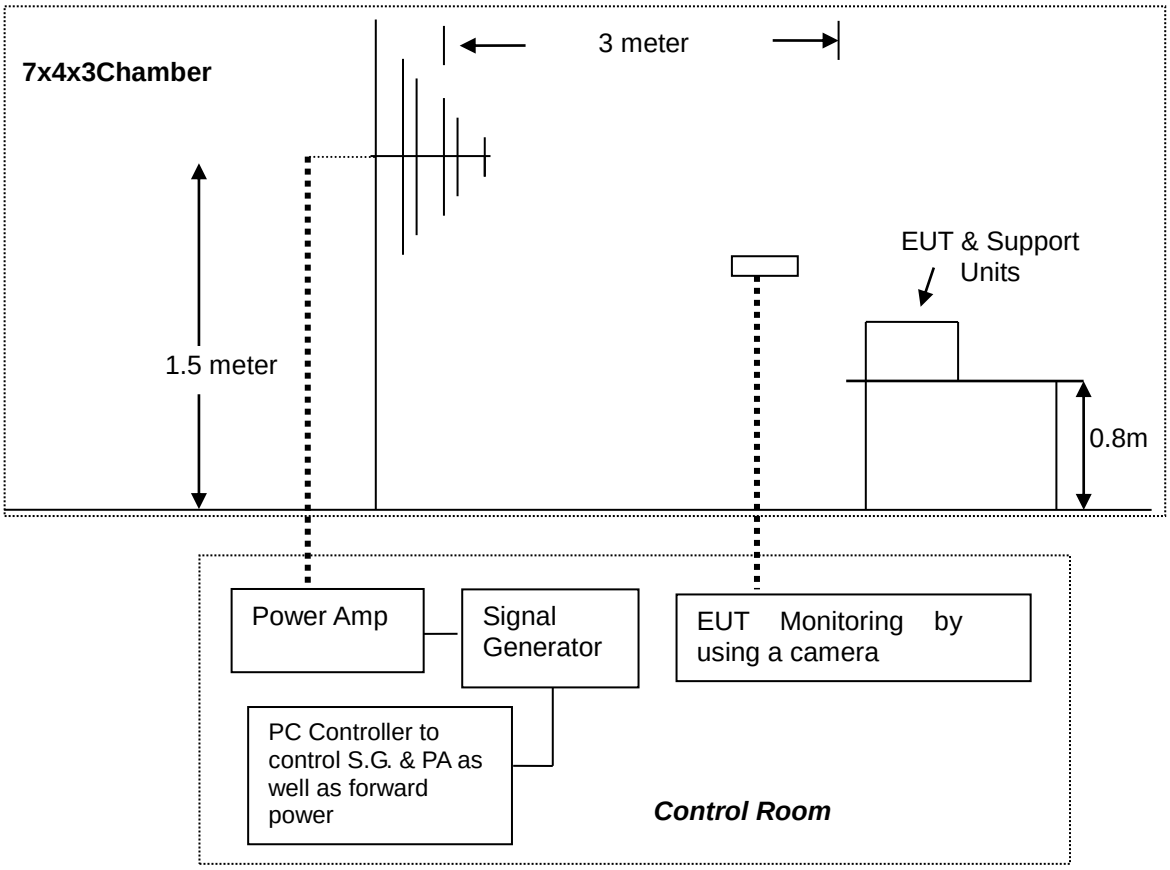
8.1. Block Diagram of Test

8.1.1. Block diagram of connection between the EUT and simulators.



(EUT: Forest Lantern)

8.1.2. Block diagram of RS test setup



(EUT: Forest Lantern)

8.2. Test Standard

EN 61547:2009 (IEC 61000-4-3:2010, Severity Level: 2, 3V / m)

8.3. Severity Levels and Performance Criterion

8.3.1.Severity Levels

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

8.3.2.Performance Criterion: A

8.4. Operating Condition of EUT

8.4.1.Turn on the power.

8.4.2.After that, let the EUT work in test mode (ON) and measure it.

8.5. Test Procedure

The EUT are placed on a table that is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna that is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna is set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.
In order to judge the EUT performance, a CCD camera is used to monitor it.

All the scanning conditions are as following:

	Condition of Test	Remark
1.	Fielded Strength	3V/m (Severity Level 2)
2.	Radiated Signal	Modulated
3.	Scanning Frequency	80-1000MHz
4.	Sweep time of radiated	0.0015 Decade/s
5.	Dwell Time	1 Sec.

8.6. Test Results

PASS.

Please refer to the following page.

(The test was carried out at: EMTEK (SHENZHEN) CO., LTD)

RF Field Strength Susceptibility Test Results

Standard: ☒ IEC 61000-4-3	Result: ☒PASS /☐ FAIL

Applicant : BAREBONES LIVING

EUT : Forest Lantern

M/N : LIV-261-Bronze

Field Strength : 3 V/m

Input Voltage : DC 3.7V

Test Mode : ON

Test Engineer : YH

Test Date : June 21, 2017

Temperature : 25℃

Humidity : 55%

Criterion : A

Frequency Range : 80 MHz to1000MHz

Modulation:	☐ None		☐ Pulse		☒ AM 1KHz 80%	
	Frequency Rang 1: 80~ 1000MHz		Frequency Rang 2: N/A		Frequency Rang 3: N/A	
	Steps: 1%		Steps: 1%		Steps: 1%	
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
Front	A	A	/	/	/	/
Right	A	A	/	/	/	/
Rear	A	A	/	/	/	/
Left	A	A	/	/	/	/

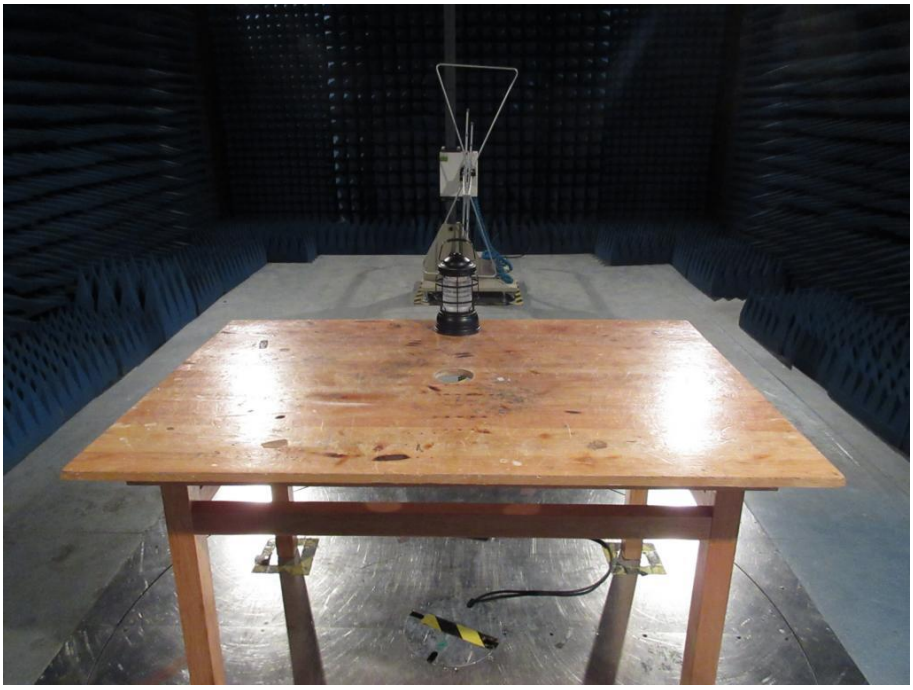
Test Equipment:
1. Signal Generator: Agilent;N5181A
2. Power Amplifier: MILMEGA; 80RF1000-175;
   MILMEGA;AS0102-55;
   MILMEGA;AS1860-50
3. Log. - Per. Antenna: SCHWARZBECK: VULP 9118E
   Broad-Band Horn Antenna: SCHWARZBECK; STLP 9149
4. RF Power Meter. Field Monitor: DARE;RSS1006A

Note:

9. PHOTOGRAPH OF TEST

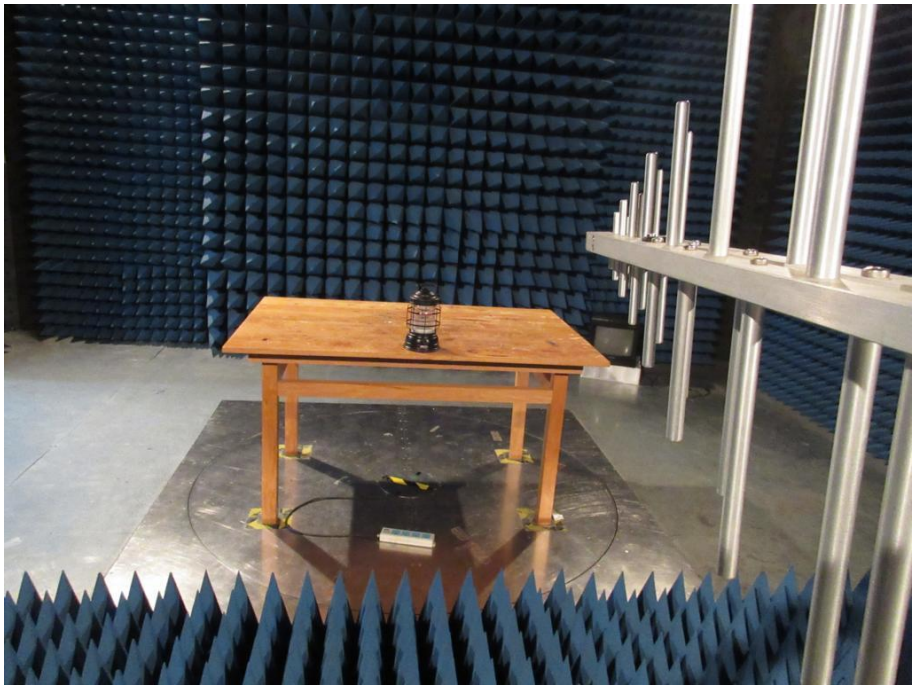
9.1. Photo of Magnetic field Emission Measurement

9.2. Photo of Radiation Emission Measurement



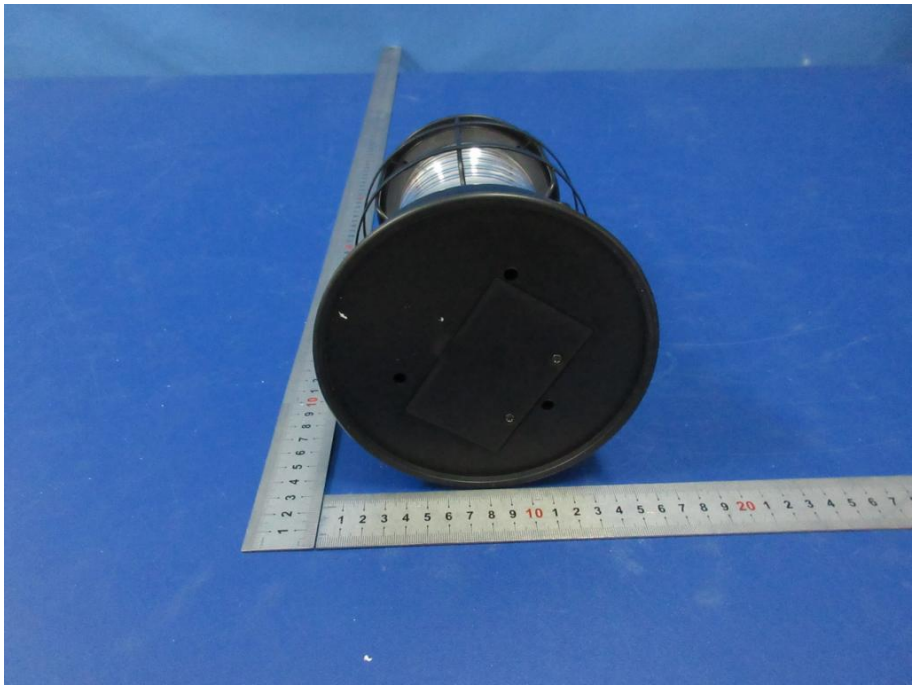
9.3. Photo of Electrostatic Discharge Test

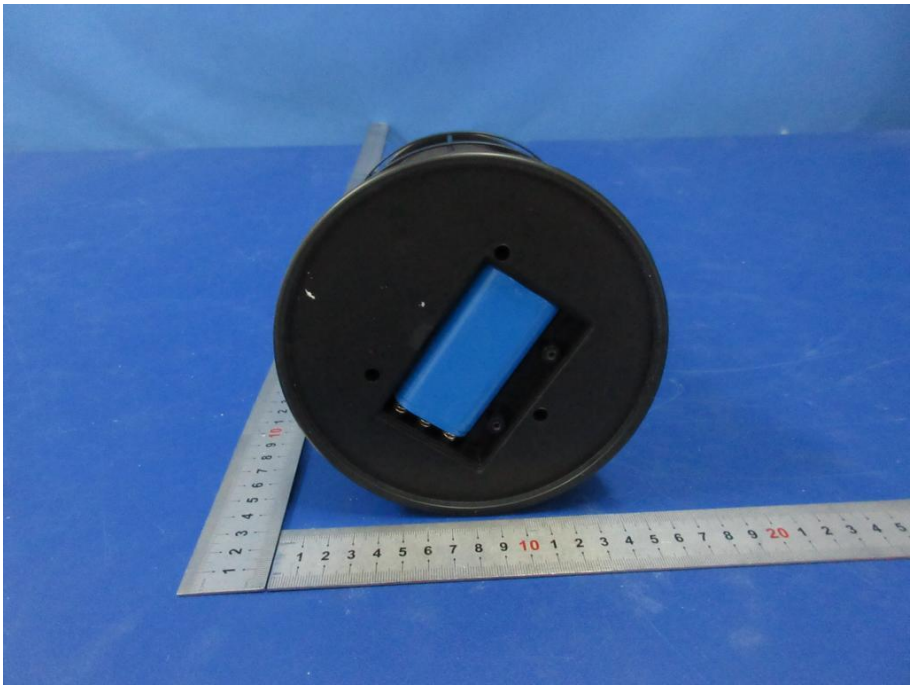
9.4. Photo of RF Field Strength Susceptibility Test

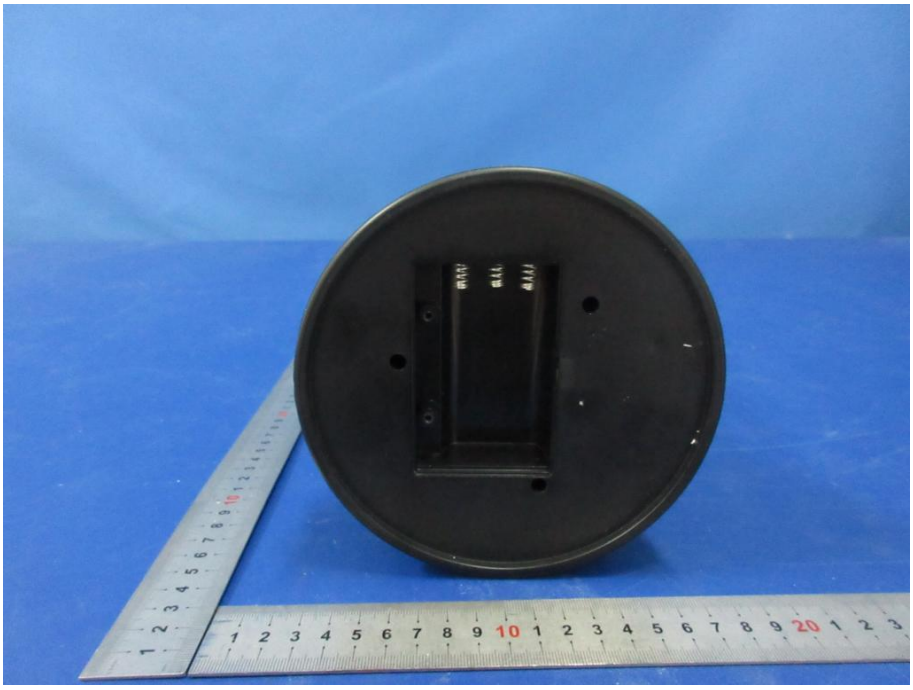


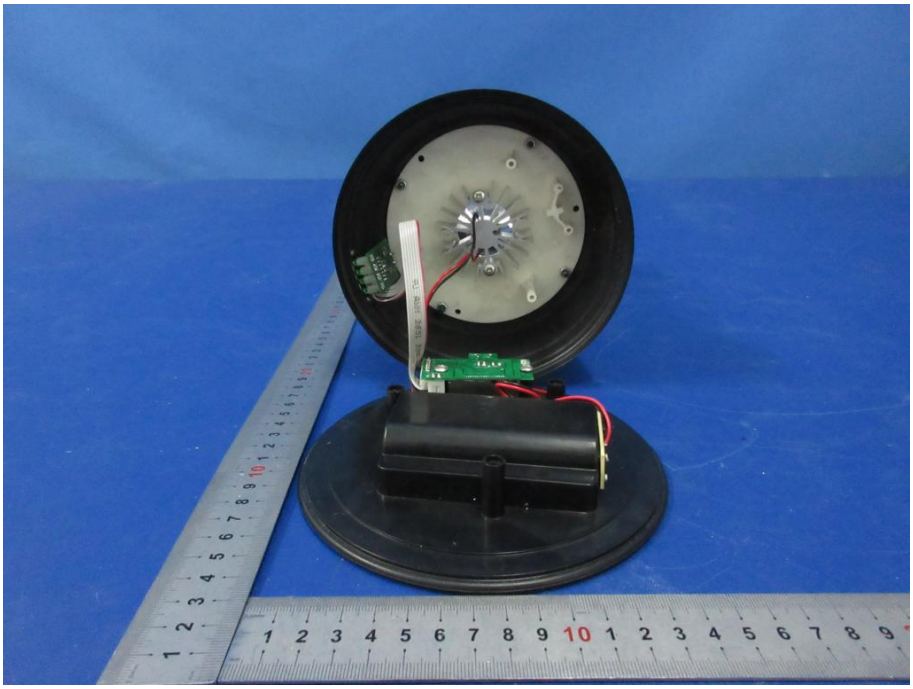
APPENDIX I
(Photos of EUT)

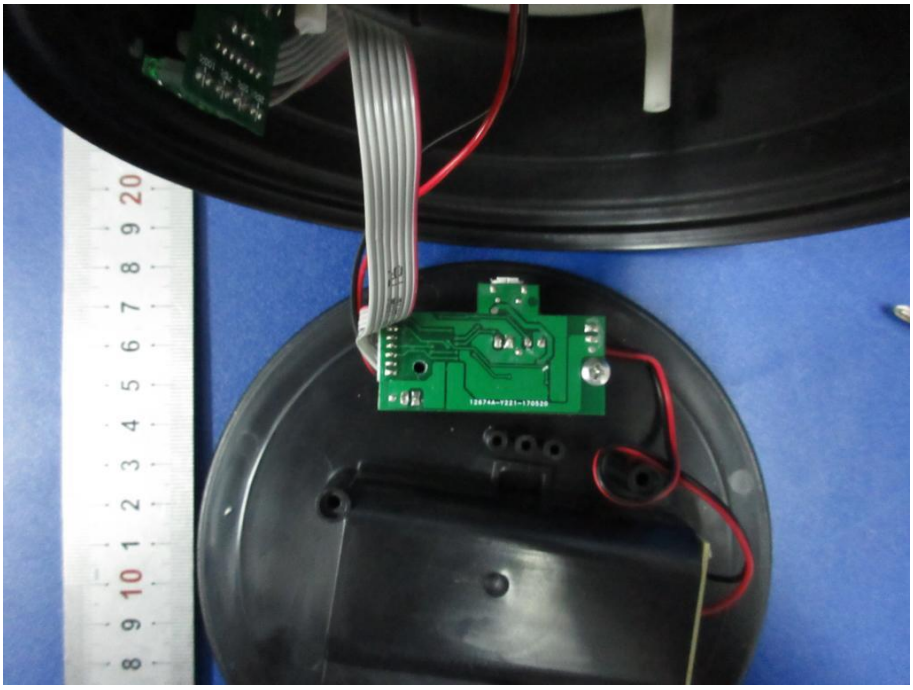
LIV-261-Bronze

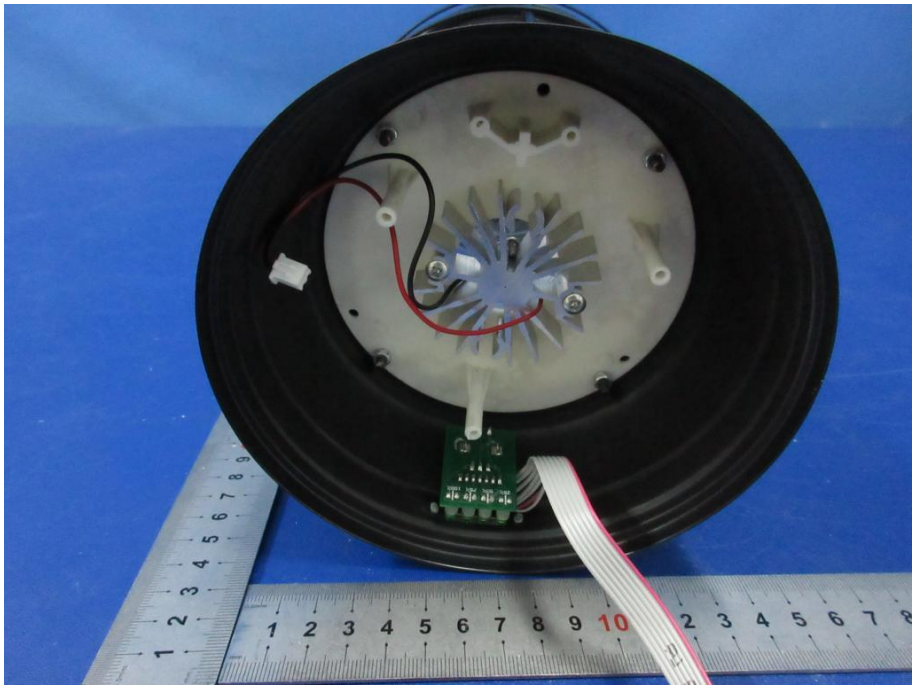


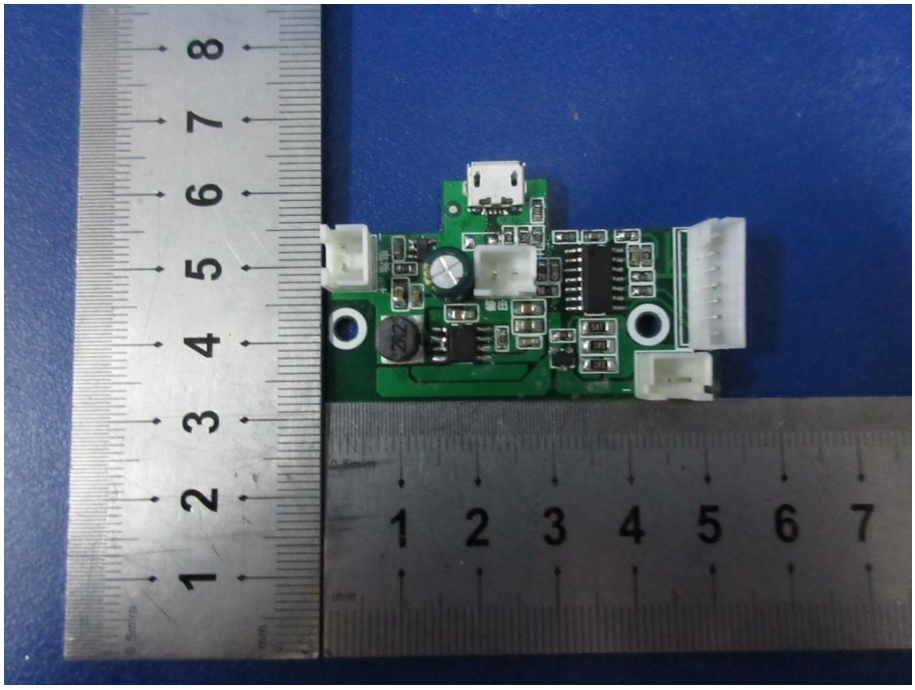


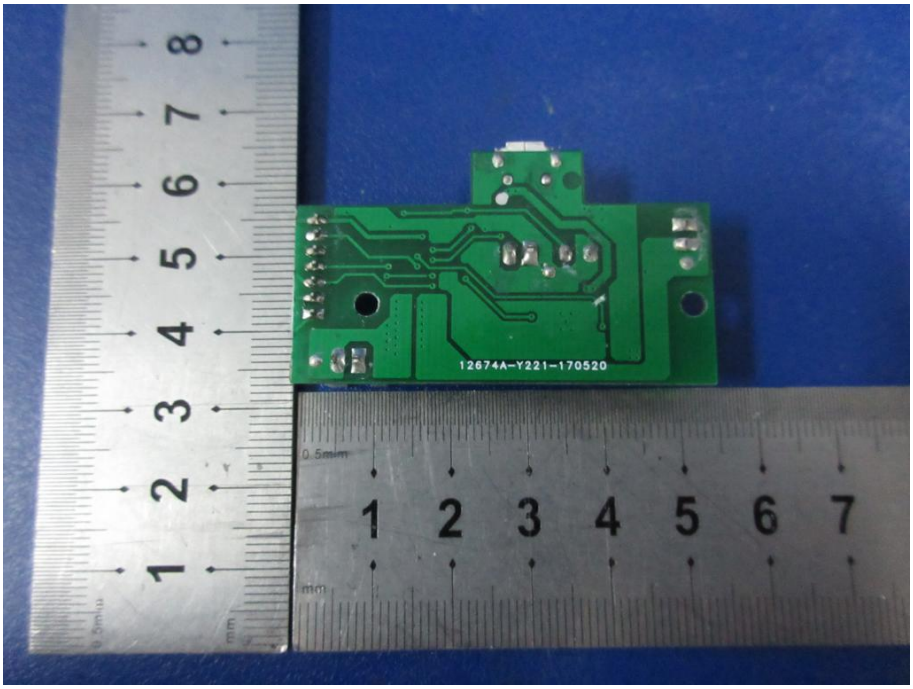








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LIV-262-Red

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