TEST REPORT

Reference No.	:	WTD19S08053604E
Applicant	:	Barebones Living
Address	:	1215 East Wilmington Avenue – Ste. 140, Salt Lake City, UT 84106, USA.
Manufacturer	:	DONGGUAN PROTRONIC ELECTRONICS LTD
Address	:	Protronic Building, Xiangxi Village, Shipai Town, Dongguan City, Guangdong Province, P. R. China.
Product	:	RailRoad Lantern
Model(s)	:	LIV-280, LIV-281, LIV-28xxxxx ("x"may be "0-9","a-z"or omitted)
Standards	:	EN 55015: 2013+A1: 2015 EN 61547: 2009
Date of Receipt sample	:	2019-08-07
Date of Test	:	2019-08-08 to 2019-08-12
Date of Issue	:	2019-08-13
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested; this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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1 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC (The Federal Communications Commission), CEC (California energy efficiency), ISED (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek (ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.

Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. Electro Magnetic Compatibility (EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

1.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Scope Covered By	Scope	Note
USA	ISO/IEC 17025	FCC ID \ SDOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand		NTC	-
Singapore		IDA	-

Note:
1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.
2. ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of …	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD19S08053604E	2019-08-07	2019-08-08 to 2019-08-12	2019-08-13	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product	:	RailRoad Lantern
Model(s)	:	LIV-280, LIV-281, LIV-28xxxxx ("x"may be "0-9","a-z"or omitted)
Model difference	:	Only the model name are different.
Remark	:	The model LIV-280 is the tested sample.

4.2 Details of E.U.T.

Ratings	:	Input: DC 5V Li-ion battery 2×18650 4400mAh 3.7V 16.28Wh

4.3 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test Lab: N/A

Lab address: N/A

Test items: N/A

4.4 Abnormalities from Standard Conditions

None.

5 Test Summary

EMISSION		
Test Item	**Test Standard**	**Result**
Conducted Disturbance at Mains Terminal, 9kHz to 30MHz	EN 55015	N/A
Radiation electromagnetic disturbance, 9kHz to 30MHz	EN 55015	Pass
Radiation Emission, 30MHz to 300MHz	EN 55015	Pass
IMMUNITY		
Test Item	**Test Method**	**Result**
Electrostatic Discharge(ESD)	IEC 61000-4-2	Pass
Radio-frequency electromagnetic fields (80MHz to 1GHz)	IEC 61000-4-3	Pass
Electrical Fast Transients (EFT)	IEC 61000-4-4	N/A
Surges	IEC 61000-4-5	N/A
Injected Currents, 0.15MHz to 80MHz	IEC 61000-4-6	N/A
Power-frequency magnetic field	IEC 61000-4-8	N/A
Voltage Dips and Interruptions	IEC 61000-4-11	N/A

Remark:

Pass	Test item meets the requirement
Fail	Test item does not meet the requirement
N/A	Test case does not apply to the test object

6 Equipment Used during Test

6.1 Equipment List

Radiated electromagnetic disturbance(9kHz to 30MHz)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMI Test Receiver	R&S	ESCI	101155	2018.09.11	2019.09.10
2	LARGE LOOP ANTENNA	Laplace	RF300	9057	2019.07.19	2020.07.18
3	Cable	Laplace	RF300	-	2019.07.19	2020.07.18
3m Semi-anechoic Chamber for Radiation(TDK)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2019.04.06	2020.04.05
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019.04.07	2020.04.06
3	Amplifier	ANRITSU	MH648A	M43381	2019.04.07	2020.04.06
4	Cable	HUBER+SUHNER	CBL2	525178	2019.04.07	2020.04.06
Electrostatic Discharge						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Electrostatic Discharge Simulator	SCHLODER	SESD 216	606144	2018.11.21	2019.11.20
Radio-frequency electromagnetic fields						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Signal Generater	R&S	SMB100A	105942	2018.09.11	2019.09.10
2	RF Power Amplifier	BONN Elektronik	BLWA0830-160/100/40D	128740	2018.09.11	2019.09.10
3	Gestockte Breitband (S tacked) Log.-per.Antenna	SCHWARZBECK	STLP9128D	043	2018.09.11	2019.09.10
4	Power Meter	R&S	NRP2	102031	2018.09.11	2019.09.10

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

6.3 Measurement Uncertainty

Parameter	Uncertainty (Note 1)
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Radiation electromagnetic disturbance (9kHz-30MHz)	±3.00dB
Radiated Emission(30MHz-300MHz)	±5.03dB

Note 1: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

6.5 Test Mode

Test Item	Test Mode	Test Voltage
EN 55015		
Radiation electromagnetic disturbance, 9kHz to 30MHz	Charging mode	DC 5V by PC
	Brightest mode*	3.7V Li-ion battery
	Darkest mode	3.7V Li-ion battery
Radiation Emission, 30MHz to 300MHz	Charging mode*	DC 5V by PC
	Brightest mode	3.7V Li-ion battery
	Darkest mode	3.7V Li-ion battery
EN 61547		
Electrostatic Discharge(ESD) ☒Air Discharge: ±8kV ☒Contact Discharge: ±4kV ☒HCP & VCP: ±4kV	Charging mode	DC 5V by PC
	Brightest mode*	3.7V Li-ion battery
	Darkest mode	3.7V Li-ion battery
Radio-frequency electromagnetic fields (RS) 80MHz-1000MHz,3V/m,80%	Charging mode	DC 5V by PC
	Brightest mode*	3.7V Li-ion battery
	Darkest mode	3.7V Li-ion battery
"*" shows the worst case mode which were recorded in this report.		

7 Emission Test Results

7.1 Radiation Electromagnetic Disturbance, 9kHz to 30MHz

Test Requirement	:	EN 55015
Test Method	:	EN 55015
Test Result	:	Pass
Frequency Range	:	9kHz to 30MHz
Class/Severity	:	Table 3a of EN 55015

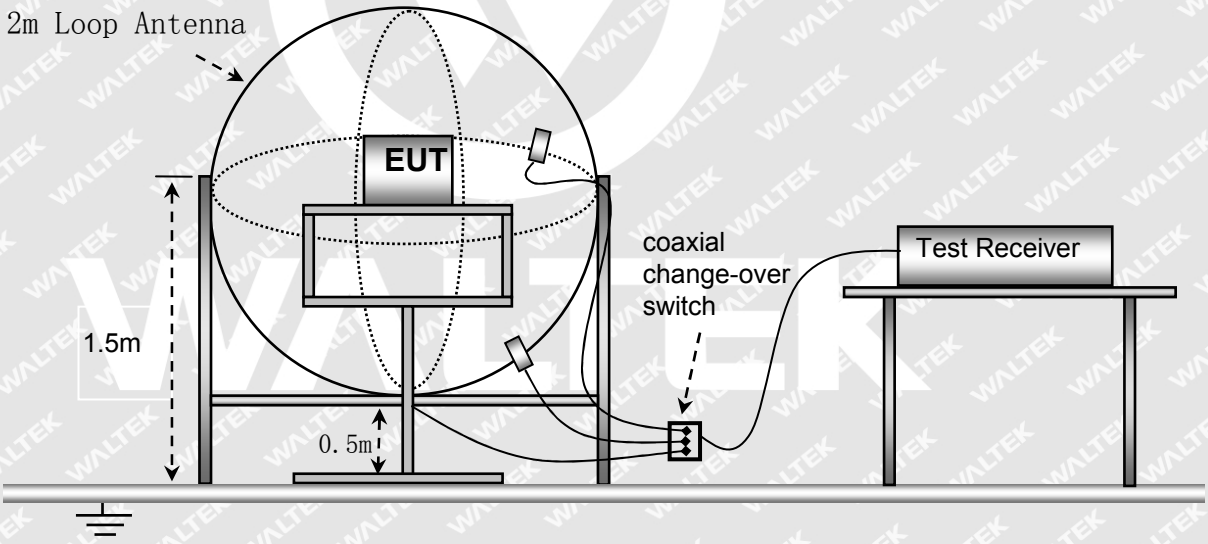
7.1.1 E.U.T. Operation

Operating Environment:

Temperature	:	21.8°C
Humidity	:	53.3%RH
Barometric Pressure	:	101.3kPa
EUT Operation	:	Refer to section 6.5.

7.1.2 Block Diagram of Test Setup

The Radiation Electromagnetic Disturbance (9kHz to 30MHz) test was performed in accordance with the EN 55015

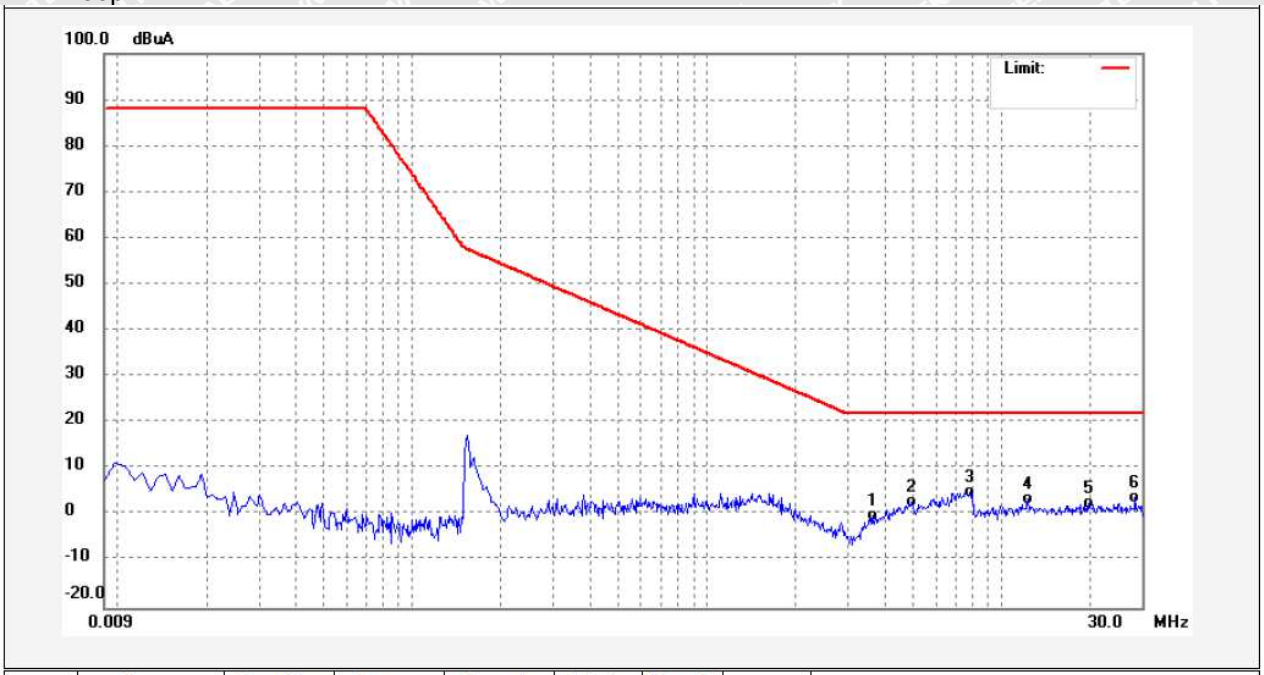


7.1.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for the loop antenna three directions. Quasi-peak measurements were performed if peak emissions were within 6dB of the Quasi-peak limit line.

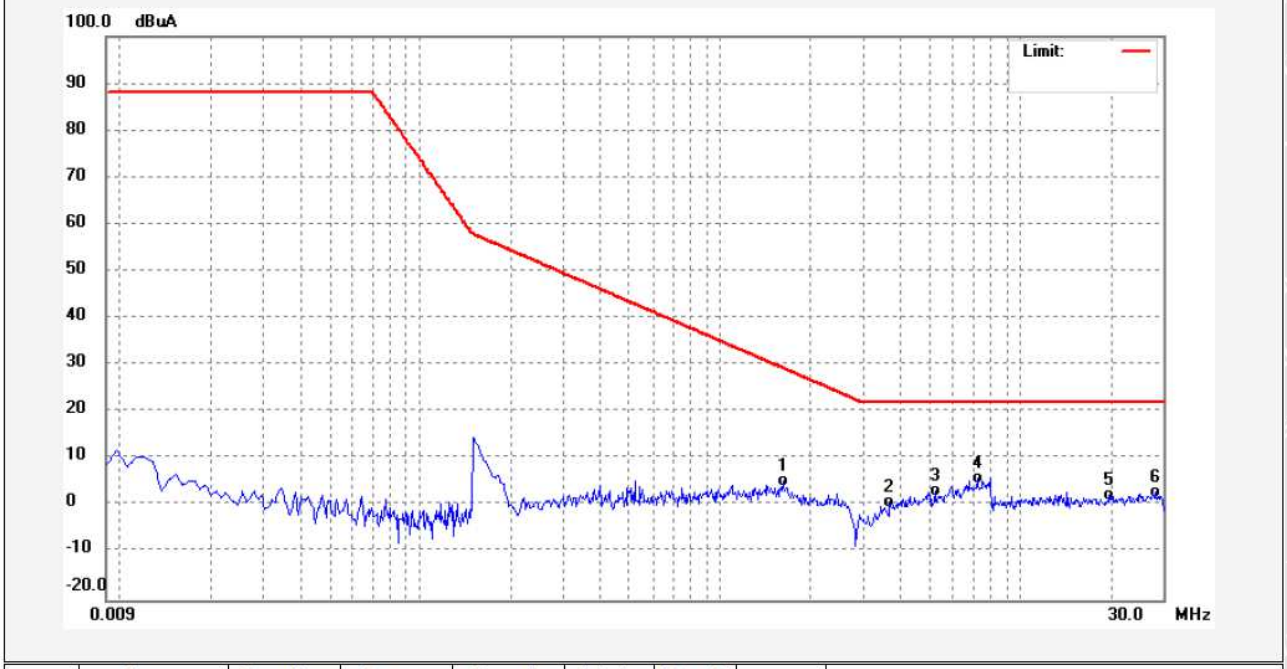
7.1.4 Radiation Electromagnetic Disturbance Test Data, 9kHz to 30MHz

Loop X:



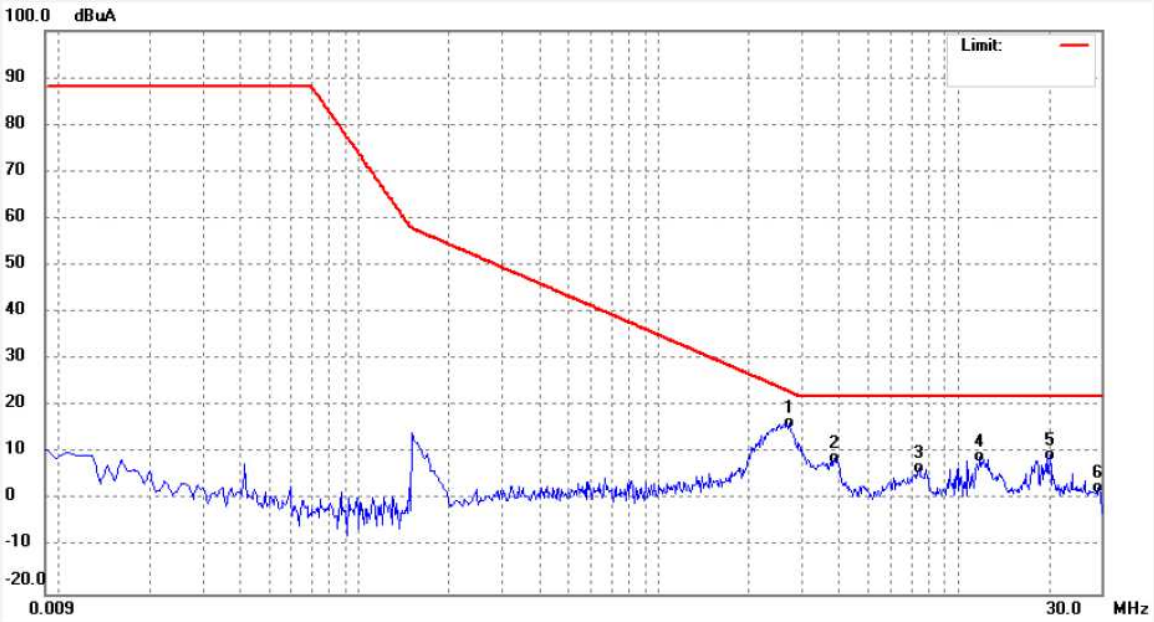
No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit dBuA	Margin (dB)	Detector	Remark
1	3.6426	-10.24	10.26	0.02	22.00	-21.98	QP	
2	4.9586	-7.39	10.25	2.86	22.00	-19.14	QP	
3	7.8066	-5.25	10.30	5.05	22.00	-16.95	QP	
4	12.2946	-6.90	10.37	3.47	22.00	-18.53	QP	
5	19.6786	-7.77	10.46	2.69	22.00	-19.31	QP	
6	28.3466	-6.91	10.63	3.72	22.00	-18.28	QP	

Loop Y:



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit dBuA	Margin (dB)	Detector	Remark
1	1.6186	-4.82	10.16	5.34	29.41	-24.07	QP	
2	3.6706	-9.49	10.26	0.77	22.00	-21.23	QP	
3	5.2026	-7.06	10.25	3.19	22.00	-18.81	QP	
4	7.1986	-4.31	10.29	5.98	22.00	-16.02	QP	
5	19.8386	-8.21	10.47	2.26	22.00	-19.74	QP	
6	28.1186	-7.75	10.62	2.87	22.00	-19.13	QP	

Loop Z:



No.	Freq. (MHz)	Reading (dBuA)	Factor (dB)	Result (dBuA)	Limit dBuA	Margin (dB)	Detector	Remark
1	2.7225	6.31	10.23	16.54	23.17	-6.63	QP	
2	3.8546	-1.40	10.27	8.87	22.00	-13.13	QP	
3	7.3746	-3.48	10.29	6.81	22.00	-15.19	QP	
4	11.8066	-1.11	10.37	9.26	22.00	-12.74	QP	
5	20.1626	-0.98	10.47	9.49	22.00	-12.51	QP	
6	29.2826	-8.08	10.65	2.57	22.00	-19.43	QP	

7.2 Radiation Emission, 30MHz to 300MHz

Test Requirement	:	EN 55015
Test Method	:	EN 55015
Test Result.....	:	Pass
Frequency Range.....	:	30MHz to 300MHz
Class/Severity	:	Table B.1 of EN 55015
Antenna polarisation .. ……..	:	Horizontal& Vertical

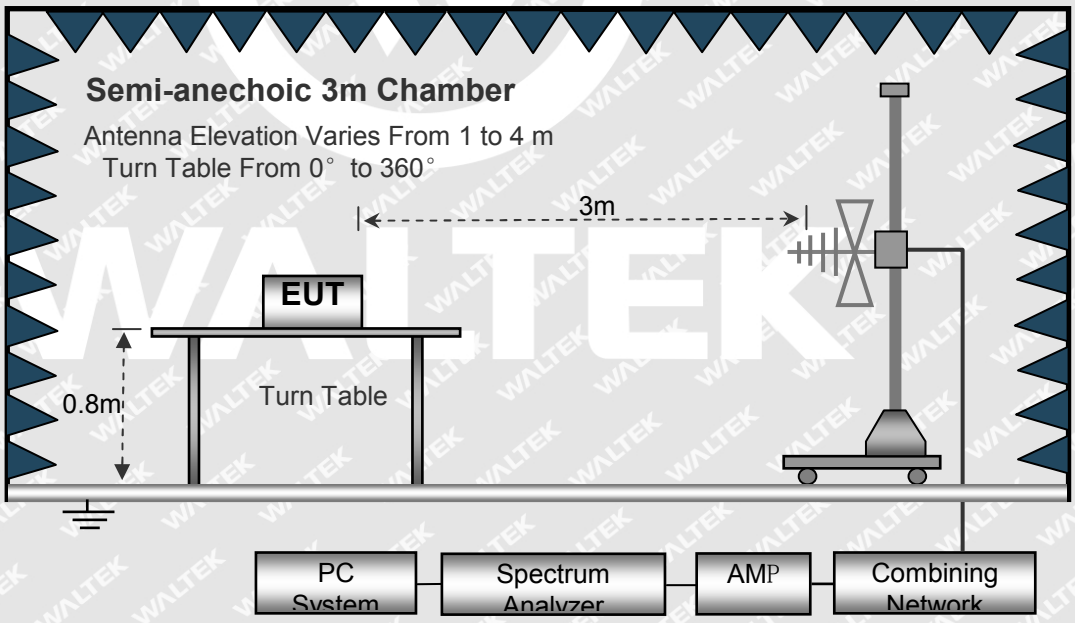
7.2.1 E.U.T. Operation

Operating Environment:

Temperature.....	:	21.7°C
Humidity	:	54.3%RH
Atmospheric Pressure.....	:	101.5kPa
EUT Operation	:	Refer to section 6.5.

7.2.2 Block Diagram of Setup

The Radiation Emission test was performed in accordance with EN 55015

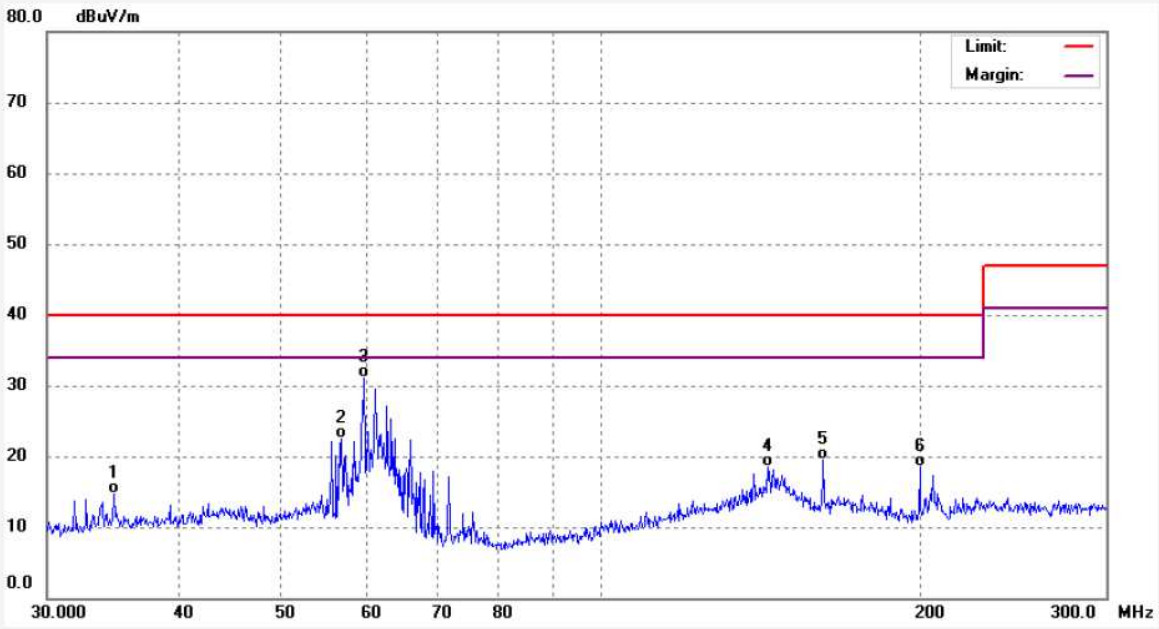


7.2.3 Measurement Data

The maximised peak emissions from the EUT was scanned and measured for both the Antenna Vertical Polarization and Antenna Horizontal Polarization. Quasi-peak measurements were performed if peak emissions were within 6dB of the Quasi-peak limit line.

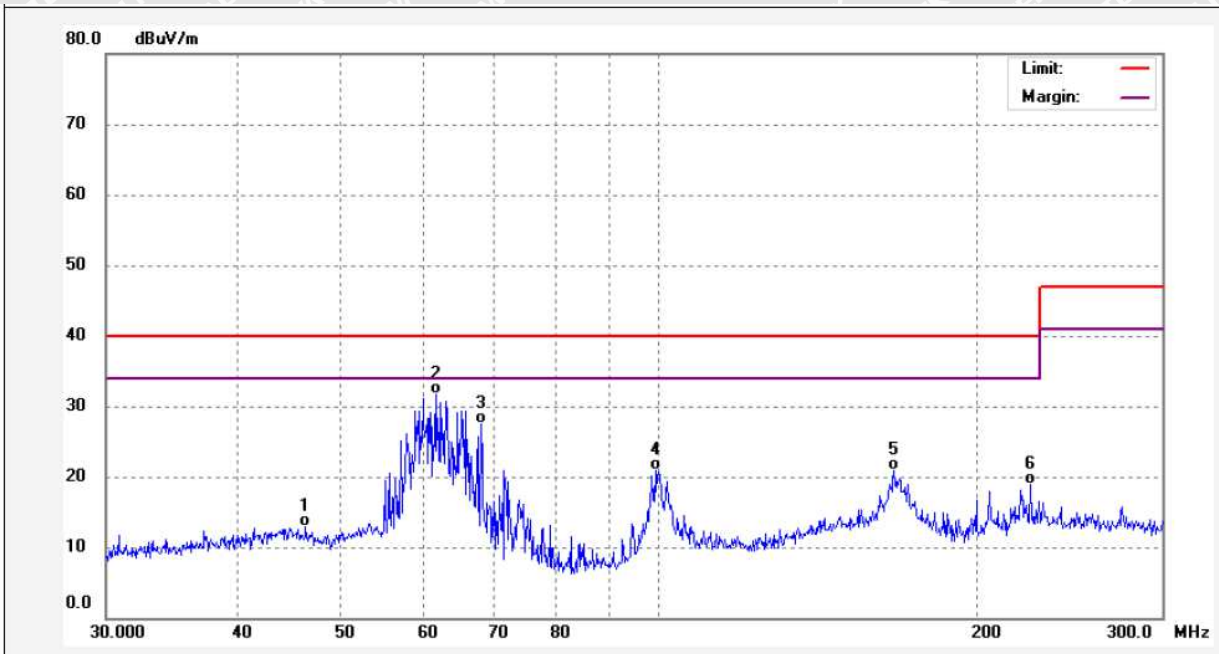
7.2.4 Radiation Emission Test Data, 30MHz to 300MHz

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.6834	32.34	-17.61	14.73	40.00	-25.27	QP	
2	56.9012	39.67	-17.17	22.50	40.00	-17.50	QP	
3	59.7202	48.29	-17.14	31.15	40.00	-8.85	QP	
4	143.5890	34.72	-16.17	18.55	40.00	-21.45	QP	
5	162.2263	35.96	-16.54	19.42	40.00	-20.58	QP	
6	200.0420	37.82	-19.36	18.46	40.00	-21.54	QP	

Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	46.3576	29.67	-16.69	12.98	40.00	-27.02	QP	
2	61.5349	49.12	-17.47	31.65	40.00	-8.35	QP	
3	67.9393	47.03	-19.54	27.49	40.00	-12.51	QP	
4	99.3393	41.00	-20.19	20.81	40.00	-19.19	QP	
5	167.1557	37.31	-16.49	20.82	40.00	-19.18	QP	
6	224.9683	37.42	-18.54	18.88	40.00	-21.12	QP	

8 Immunity Test Results

8.1 Performance Criteria

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.
For further details, please refer to EN 61547

8.2 Electrostatic Discharge(ESD)

Test Requirement.....	:	EN 61547
Test Method	:	IEC 61000-4-2
Test Result	:	Pass
Discharge Impedance	:	330Ω / 150pF
Discharge Voltage	:	Air Discharge: ±8kV Contact Discharge: ±4kV HCP & VCP: ±4kV
Polarity.....	:	Positive & Negative
Number of Discharge	:	Minimum 10 times at each test point
Discharge Mode	:	Single Discharge
Discharge Period.....	:	1 second minimum

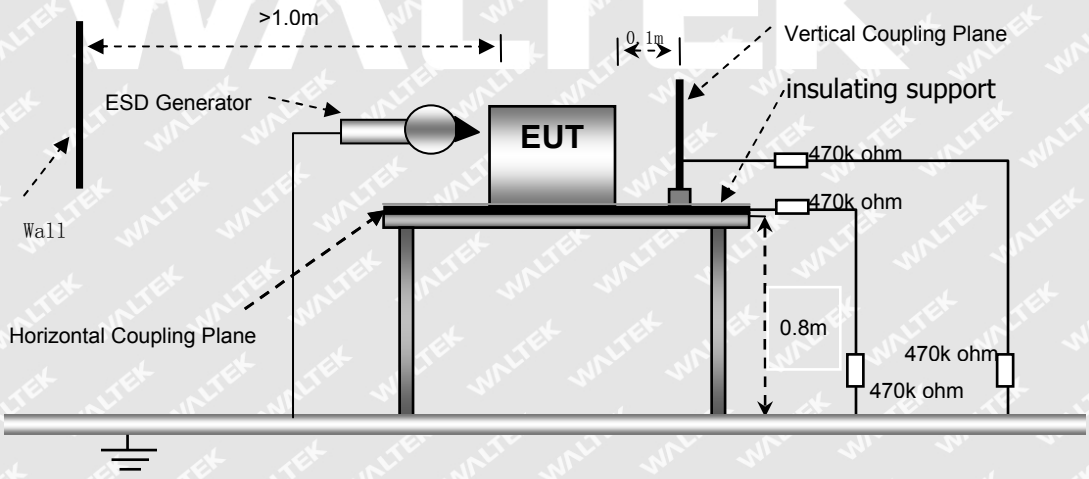
8.2.1 E.U.T. Operation

Operating Environment:

Temperature	:	22.8°C
Humidity	:	54.7%RH
Barometric Pressure	:	100.8kPa
EUT Operation	:	Refer to section 6.5.

8.2.2 Block Diagram of Setup

The ESD test was performed in accordance with the IEC 61000-4-2.



8.2.3 Direct Discharge Test Results

Observations: **Test points:** **1. All Exposed Surface & Seams;**
2. All metallic part

Direct Discharge			Test Results	
Applied Voltage (kV)	Performance Criterion	Test Point	Contact Discharge	Air Discharge
±8	B	1	N/A	Pass
±4	B	2	Pass	N/A

8.2.4 Indirect Discharge Test Results

Observations: **Test points:** **1. All sides.**

Indirect Discharge			Test Results	
Applied Voltage (kV)	Performance Criterion	Test Point	Horizontal Coupling	Vertical Coupling
±4	B	1	Pass	Pass

8.3 Radio-frequency electromagnetic fields, 80MHz to 1GHz

Test Requirement	:	EN 61547
Test Method	:	IEC 61000-4-3
Test Result.....	:	Pass
Frequency Range.....	:	80MHz to 1GHz
Test level.....	:	3V/m
Modulation.....	:	80%, 1kHz Amplitude Modulation.
Face of EUT.....	:	Front, Back, Left, Right
Antenna polarisation	:	Horizontal& Vertical

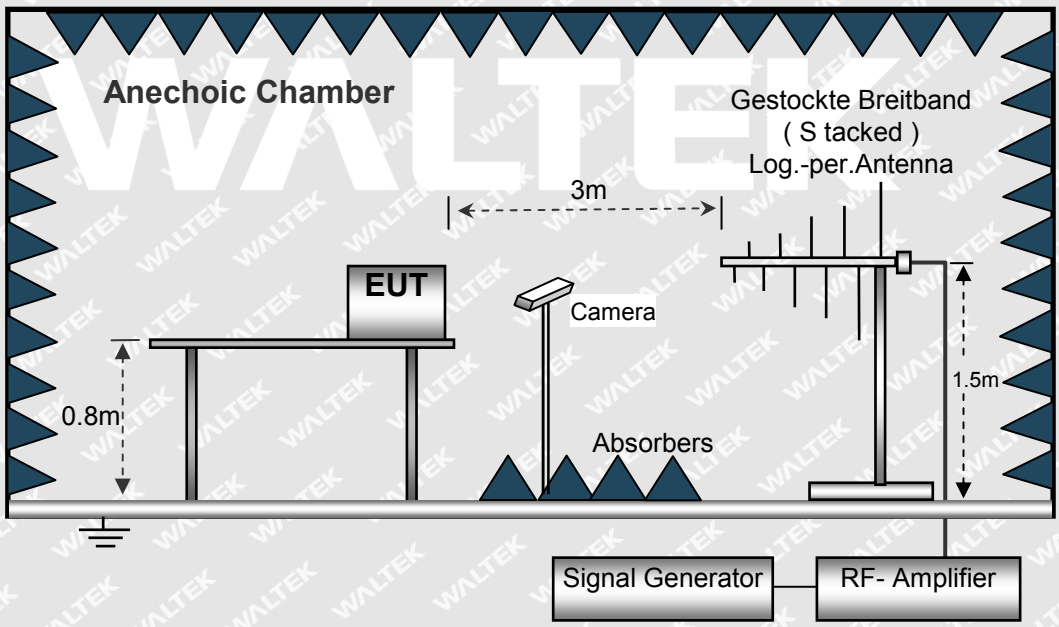
8.3.1 E.U.T. Operation

Operating Environment:

Temperature	:	21.7°C
Humidity.....	:	52.4% RH
Barometric Pressure.....	:	102.4kPa
EUT Operation.....	:	Refer to section 6.5.

8.3.2 Block Diagram of Setup

The Radio-frequency electromagnetic fields Immunity test was performed in accordance with the IEC 61000-4-3.



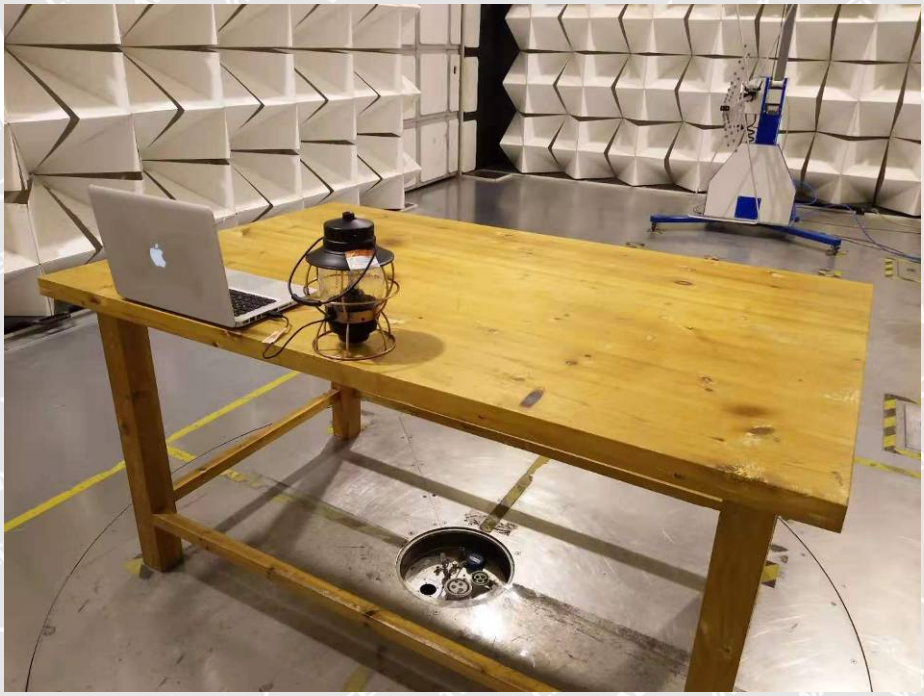
8.3.3 Test Results

Frequency	Face of EUT	Antenna polarisation	Test Level	Step Size	Dwell Time	Performance Criterion	Result
80 to 1000MHz	Front, Back, Left, Right	Horizontal	3V/m	1%	1s	A	Pass
80 to 1000MHz	Front, Back, Left, Right	Vertical	3V/m	1%	1s	A	Pass

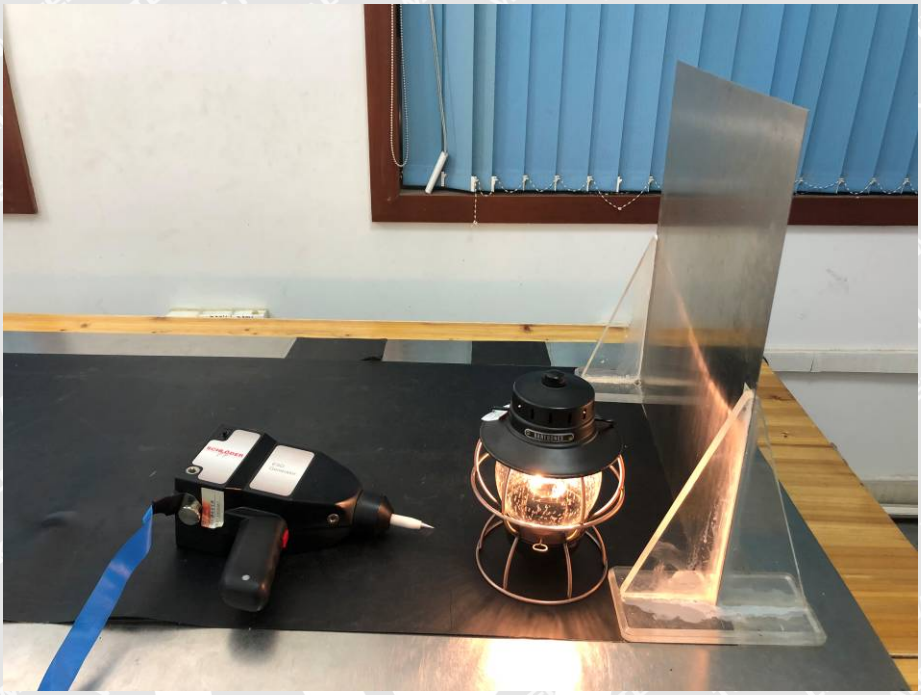
9 Photographs – Test Setup

9.1 Photograph –Radiation electromagnetic disturbance Test Setup

9.2 Photograph – Radiation Emission Test Setup



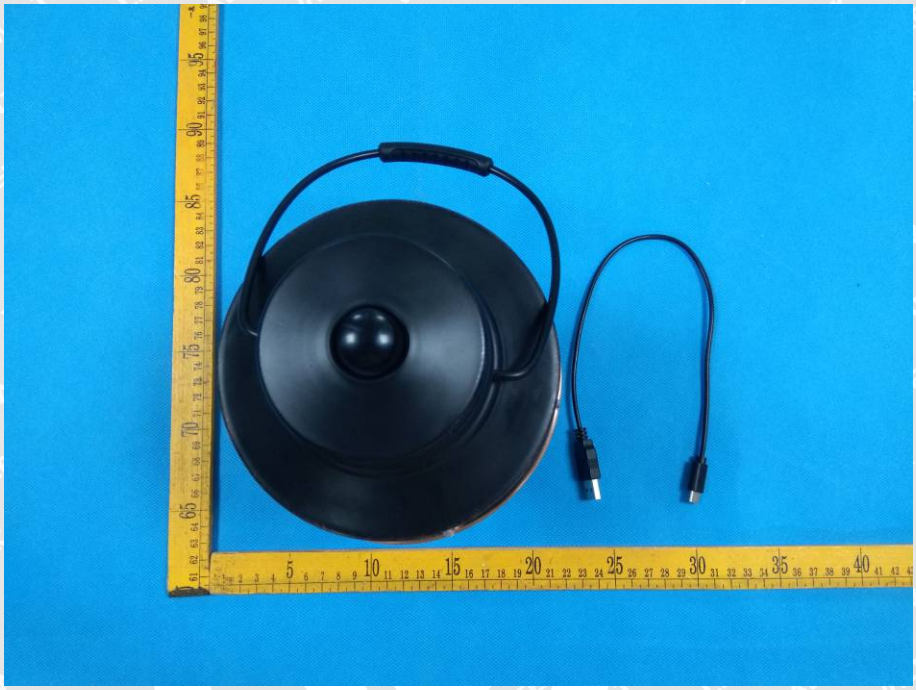
9.3 Photograph – ESD Immunity Test Setup

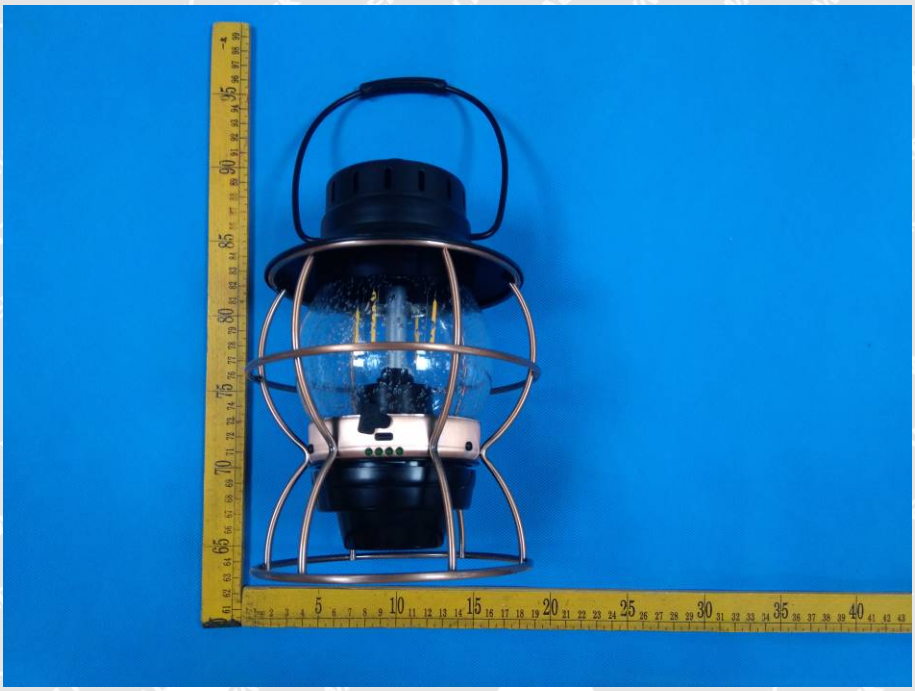


9.4 Photograph – Radio-frequency electromagnetic fields Immunity Test Setup

10 Photographs – Constructional Details

10.1 EUT –External Photos






BAREBONES

======End of Report======