

EN 55015:2013+A1:2015

EN 61547:2009

EN 61000-3-2:2014

EN 61000-3-3:2013

TEST REPORT

For

BAREBONES SYSTEMS, LLC.

1215 East Wilmington Avenue-Ste. 140 Salt Lake City, UT 84106

Model: LIV-257

Report Type: Original Report	Product Type: Vintage Flashlight
Report Number:	RDG200210031-05
Report Date:	2020-03-04
Reviewed By:	Jerry Zhang EMC Manager
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TABLE OF CONTENTS

General Information	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	4
OBJECTIVE	4
TEST METHODOLOGY	4
DECLARATIONS	5
System Test Configuration	6
DESCRIPTION OF TEST CONFIGURATION	6
EQUIPMENT MODIFICATIONS	6
EUT EXERCISE SOFTWARE	6
BLOCK DIAGRAM OF TEST SETUP	6
SUPPORT EQUIPMENT LIST AND DETAILS	6
SUPPORT CABLE LIST AND DETAILS	6
TEST EQUIPMENT LIST	7
ENVIRONMENTAL CONDITIONS.....	8
Summary of Test Results	9
1 – Conducted emissions	10
MEASUREMENT UNCERTAINTY	10
TEST SYSTEM SETUP.....	10
EMI TEST RECEIVER SETUP	11
TEST PROCEDURE	11
CORRECTED AMPLITUDE & MARGIN CALCULATION	11
TEST DATA	12
2 – Radiated electromagnetic disturbances 9 kHz to 30 MHz.....	14
EUT SYSTEM SETUP.....	14
EMI TEST RECEIVER SETUP	14
TEST DATA	15
3 – Radiated electromagnetic disturbances 30 MHz to 300 MHz	18
MEASUREMENT UNCERTAINTY	18
TEST SYSTEM SETUP.....	18
EMI TEST RECEIVER SETUP	19
TEST PROCEDURE	19
CORRECTED AMPLITUDE & MARGIN CALCULATION	19
TEST DATA	20
4 – Electrostatic discharges IEC 61000-4-2.....	22
MEASUREMENT UNCERTAINTY	22
TEST SYSTEM SETUP.....	22
TEST STANDARD.....	22
TEST PROCEDURE	23
TEST DATA	24
5 – Radio-frequency electromagnetic fields IEC 61000-4-3.....	26
MEASUREMENT UNCERTAINTY	26
TEST SYSTEM SETUP.....	26
TEST STANDARD.....	27
TEST PROCEDURE	27
TEST DATA	28
7 – Fast transients IEC 61000-4-4	29
MEASUREMENT UNCERTAINTY	29

TEST SYSTEM SETUP.....	29
TEST STANDARD.....	29
TEST PROCEDURE	29
TEST DATA	30
8 – Injected currents (radio-frequency common mode) IEC 61000-4-6	31
MEASUREMENT UNCERTAINTY	31
TEST SETUP.....	31
TEST STANDARD.....	31
TEST PROCEDURE	32
TEST DATA	33
9 – Surges IEC 61000-4-5.....	34
TEST SYSTEM SETUP.....	34
TEST STANDARD.....	34
TEST PROCEDURE	34
TEST DATA	35
10 – Voltage dips and short interruptions IEC 61000-4-11	36
TEST SETUP.....	36
TEST STANDARD.....	36
TEST PROCEDURE	36
TEST DATA	37
12 – Voltage fluctuations and flicker	38
TEST SYSTEM SETUP.....	38
TEST STANDARD.....	38
TEST DATA	40
Exhibit A – Eut Photographs	41
Exhibit B – Test Setup Photographs.....	49

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	Vintage Flashlight
EUT Model:	LIV-257
Multiple Models:	N/A
Rated Input Voltage:	DC 5V
The Highest Operating Frequency:	<108MHz
Serial Number:	RDG200210031
EUT Received Date:	2020/2/10
EUT Received Status:	Good

Objective

This report is prepared on behalf of *BAREBONES SYSTEMS,LLC.* in accordance with EN 55015:2013+A1:2015 Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment; EN 61547:2009 Equipment for general lighting purposes – EMC immunity requirements; EN 61000-3-2:2014 Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase); EN 61000-3-3:2013 Electromagnetic compatibility (EMC) Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

The objective is to determine the compliance of EUT with:

EN 55015:2013+A1:2015

EN 61547:2009

EN 61000-3-2:2014

EN 61000-3-3:2013.

Test Methodology

All measurements contained in this report were conducted with EN 55015:2013+A1:2015 Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment; EN 61547:2009 Equipment for general lighting purposes – EMC immunity requirements; EN 61000-3-2:2014 Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase); EN 61000-3-3:2013 Electromagnetic compatibility (EMC) Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “△”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

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This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk “★”.

FINAL

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The EUT was test in Charging&On mode.

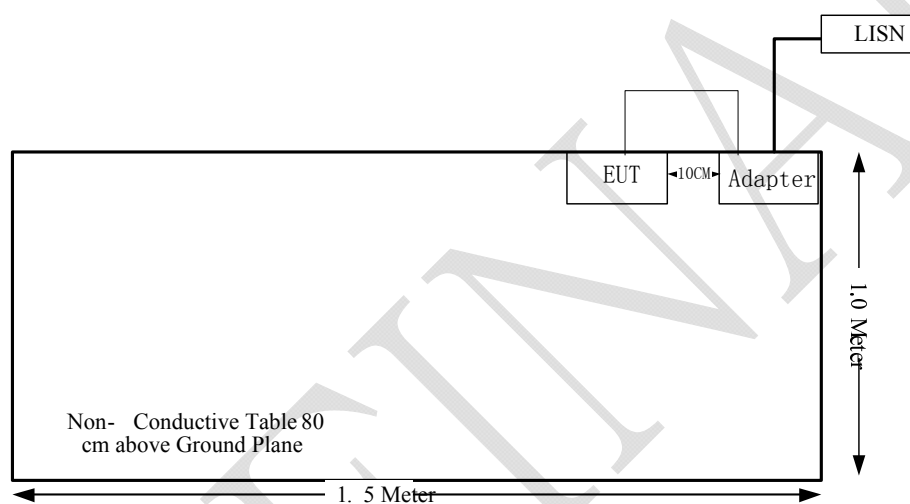
Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

No EUT software was used for testing.

Block Diagram of Test Setup



Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Dongang	Adapter	DA-00051000BU001	N/A

Support Cable List and Details

Cable Description	Shielding Cable	Ferrite Core	Length (m)	From Port	To
USB Cable	No	No	1.2	Adapter	EUT

Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission					
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
R&S	Two-line V-network	ENV 216	101614	2019-09-12	2020-09-12
R&S	EMI Test Receiver	ESCI	101121	2019-05-09	2020-05-09
Radiated electromagnetic					
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-01	2019-09-05	2020-09-05
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
EVERFINE	TRIPLE-LOOP antenna	LLA-2	903002	2018-07-12	2021-07-12
R&S	EMI Test Receiver	ESCI	101121	2019-05-09	2020-05-09
Radiated emissions below 1GHz					
R&S	EMI Test Receiver	ESCI	100224	2019-09-12	2020-09-12
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2019-09-05	2020-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2019-09-24	2020-09-24
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-02	2018-09-05	2020-09-05
Sonoma	Amplifier	310N	185914	2019-10-13	2020-10-13
Flicker & Harmonic					
ELGAR	AC Power Source	1751SX	5611	2019-09-10	2020-09-10
EM TEST	Harmonic & Flicker Analyzer	DPA 500	303278	2019-12-14	2020-12-14
CS					
Werlatone	Dual Directional Coupler	C5091-10	113192	2019-12-09	2020-12-09
HP	Power Meter	HP EPM-441A	GB37481494	2019-09-12	2020-09-12
Agilent	8482A Power sensor	8482A	US37296108	2019-09-12	2020-09-12
HP	Signal Generator	8648A	3246A00831	2019-09-12	2020-09-12
R&S	Power Amplifier	15A250	12934	N/A	N/A
NARDA	Attenuator	769-6	2754	N/A	N/A
COM-POWER	CDN	M325E	521064	2019-09-12	2020-09-12
EFT & Surge & Dips					
EM TEST	Ultra Compact Generator	UCS500-M6	V6016101357	2019-05-09	2020-05-09
EM TEST	Auto Transformer	MV2616	0403-16	N/A	N/A
ESD					
TESEQ	ESD Generator	NSG 438	1019	2019-09-18	2020-09-17

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
RS					
Sunol Sciences	Antenna	JB3	A060611-2	2017-08-25	2020-08-25
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2019-09-05	2020-09-05
AR	Power Amplifier	100W1000M1	13410	N/A	N/A
Microwave	Directional Coupler	441490	488Z	2019-07-16	2020-07-16
Agilent	EPM Series Power Meter	E4419B	MY45103907	2019-05-09	2020-05-09
Agilent	E-Series Avg Power Sensor	E9301A	MY41497625	2019-05-09	2020-05-09
Agilent	E-Series Avg Power Sensor	E9301A	MY41497628	2019-05-09	2020-05-09
HP	Signal Generator	8665B	3438a00584	2019-09-12	2020-09-12

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Temperature:	19.3~22.2°C
Relative Humidity:	49~70%
ATM Pressure:	101.8~102.2kPa
Tester:	Rain Yi, Sem Xiang, Vern Shen
Test Date:	2020.02.11~2020.02.24

Note:

*The relative humidity of ESD test environment is 49%.

SUMMARY OF TEST RESULTS

SN	Rule and Clause	Description of Test	Test Result
1	EN 55015 Clause 4.3.1	Conducted emissions	Compliance
2	EN 55015 Clause 4.4.1	Radiated electromagnetic disturbances 9 kHz to 30 MHz	Compliance
3	EN 55015 Clause 4.4.2	Radiated electromagnetic disturbances 30 MHz to 300 MHz	Compliance
4	EN 61547 Clause 5.2	Electrostatic discharges IEC 61000-4-2	Compliance
5	EN 61547 Clause 5.3	Radio-frequency electromagnetic fields IEC 61000-4-3	Compliance
6	EN 61547 Clause 5.4	Power frequency magnetic fields IEC 61000-4-8	Not applicable*
7	EN 61547 Clause 5.5	Fast transients IEC 61000-4-4	Compliance
8	EN 61547 Clause 5.6	Injected currents (radio-frequency common mode) IEC 61000-4-6	Compliance
9	EN 61547 Clause 5.7	Surges IEC 61000-4-5	Compliance
10	EN 61547 Clause 5.8	Voltage dips and short interruptions IEC 61000-4-11	Compliance
11	EN 61000-3-2	Harmonic current emissions	Not applicable**
12	EN 61000-3-3	Voltage fluctuations and flicker	Compliance

Note:

Not applicable*: The EUT is not sensitive to magnetic field.

Not applicable**: The EUT Power is less than 25W.

1 – CONDUCTED EMISSIONS

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

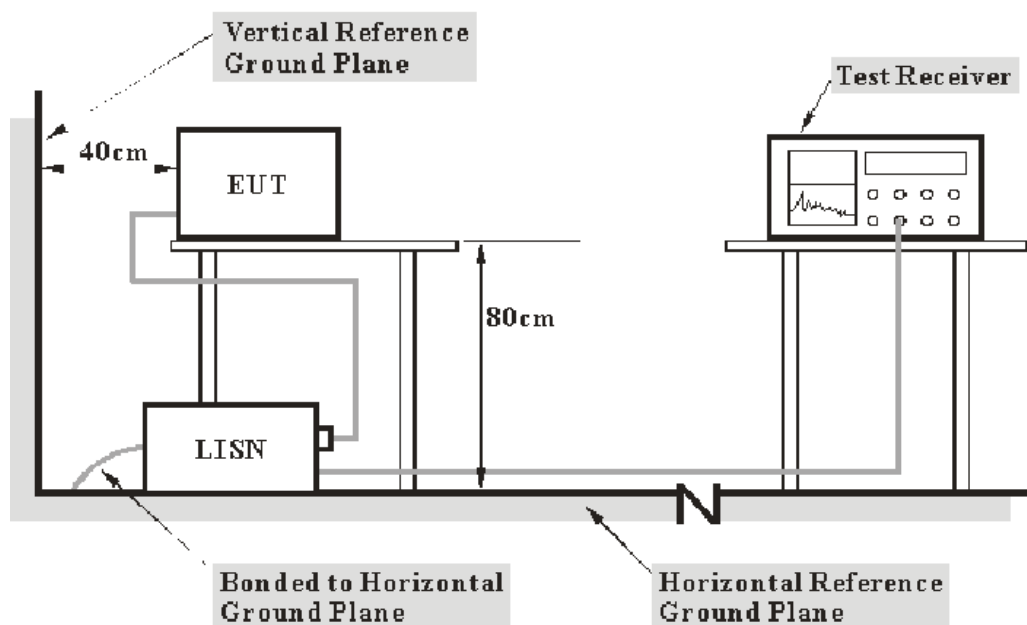
Based on CISPR 16-4-2: 2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.12 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with CISPR 16-1-1:2010+A1:2010, CISPR 16-2-1:2010 measurement procedure. The specification used was the EN 55015 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The power of adapter was connected to a 230 V/50Hz AC power source.

EMI Test Receiver Setup

The EMI Test Receiver was set to investigate the spectrum from 9 kHz to 30 MHz.

During the conducted emission test, the EMI Test Receiver was set with the following configurations:

Frequency Range	IF B/W
9 kHz – 150 kHz	200 Hz
150 kHz – 30 MHz	9 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result (QuasiPeak or Average) = Meter Reading + Corr.

Note:

Corr. = Cable loss + Factor of coupling device

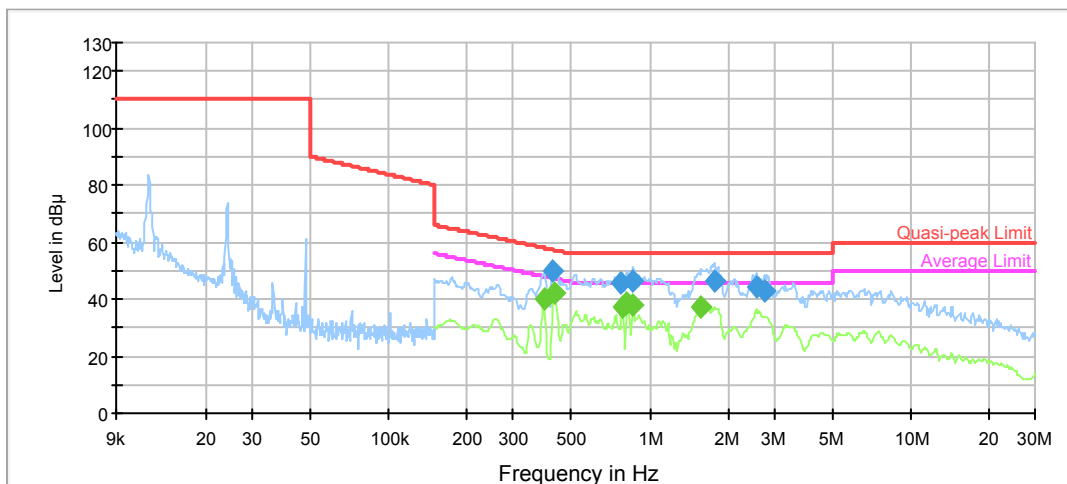
The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Result

Test Data

Please refer to following table and plots:

Model Number: LIV-257
Port: L
Test Mode: Charging&On
Power Source: AC 230V/50Hz
Note:



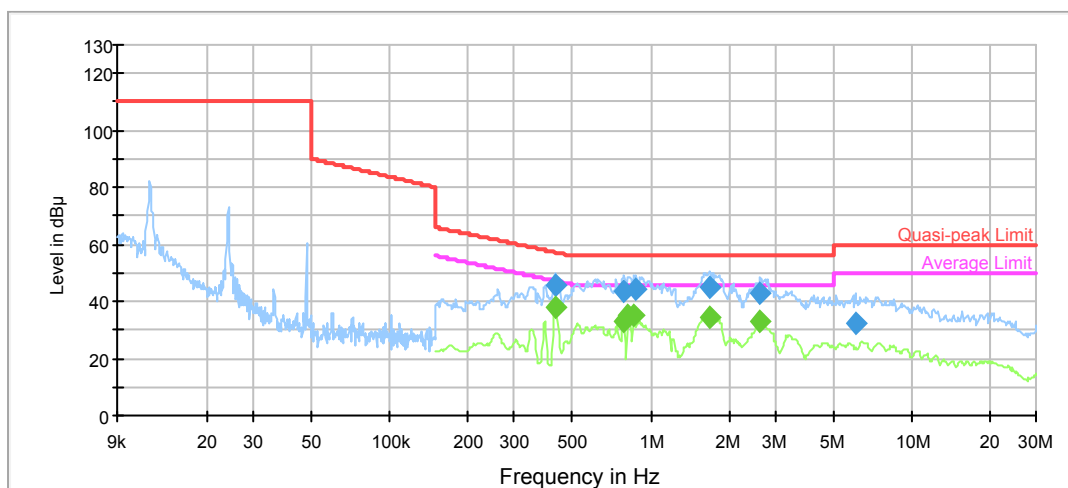
Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.426418	49.8	9.000	L1	9.7	7.5	57.3
0.774673	46.0	9.000	L1	9.7	10.0	56.0
0.864278	46.6	9.000	L1	9.7	9.4	56.0
1.769262	46.3	9.000	L1	9.8	9.7	56.0
2.556719	44.1	9.000	L1	9.8	11.9	56.0
2.741149	42.8	9.000	L1	9.8	13.2	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.393790	39.7	9.000	L1	9.7	8.3	48.0
0.430682	42.0	9.000	L1	9.7	5.2	47.2
0.782419	37.2	9.000	L1	9.7	8.8	46.0
0.822331	38.4	9.000	L1	9.7	7.6	46.0
0.864278	37.8	9.000	L1	9.7	8.2	46.0
1.570131	37.5	9.000	L1	9.8	8.5	46.0

Model Number: LIV-257
 Port: N
 Test Mode: Charging&On
 Power Source: AC 230V/50Hz
 Note:



Final Result 1

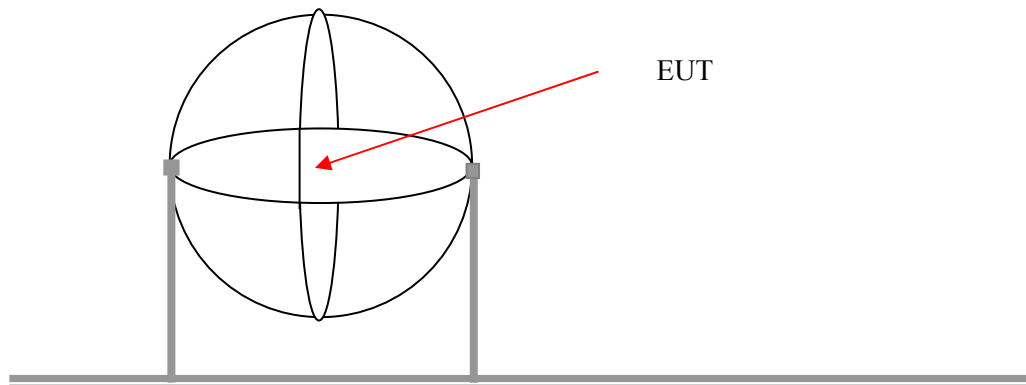
Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.430682	45.8	9.000	N	9.6	11.4	57.2
0.790244	43.5	9.000	N	9.6	12.5	56.0
0.881650	44.6	9.000	N	9.6	11.4	56.0
1.683392	44.8	9.000	N	9.6	11.2	56.0
2.634191	42.9	9.000	N	9.6	13.1	56.0
6.076347	32.7	9.000	N	9.7	27.3	60.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.430682	37.7	9.000	N	9.6	9.5	47.2
0.790244	33.2	9.000	N	9.6	12.8	46.0
0.822331	35.1	9.000	N	9.6	10.9	46.0
0.864278	35.2	9.000	N	9.6	10.8	46.0
1.683392	34.4	9.000	N	9.6	11.6	46.0
2.634191	33.0	9.000	N	9.6	13.0	46.0

2 - RADIATED ELECTROMAGNETIC DISTURBANCES 9 KHZ TO 30 MHZ

EUT System Setup



EMI Test Receiver Setup

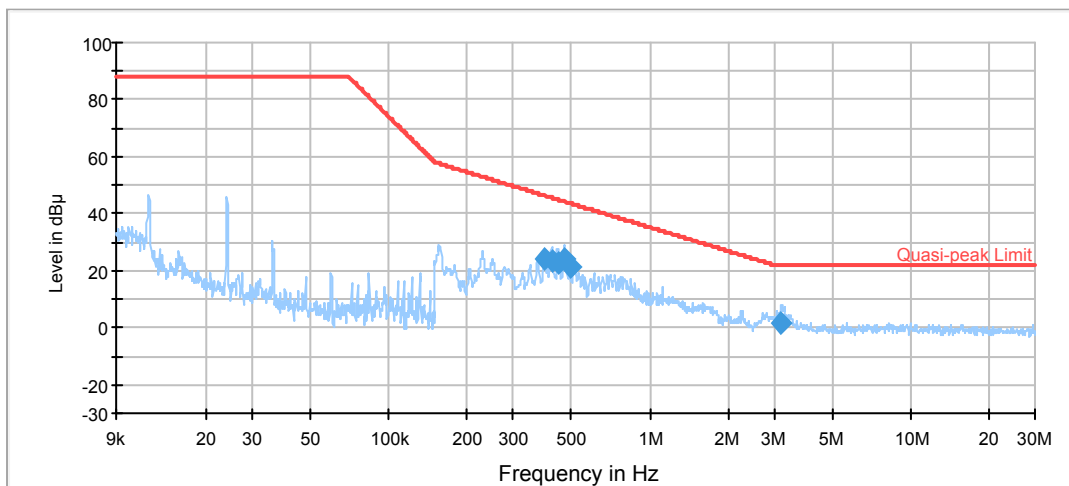
During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
9 kHz – 150 kHz	200 Hz
150 kHz – 30 MHz	9 kHz

Test Data

Please refer to following table and plots:

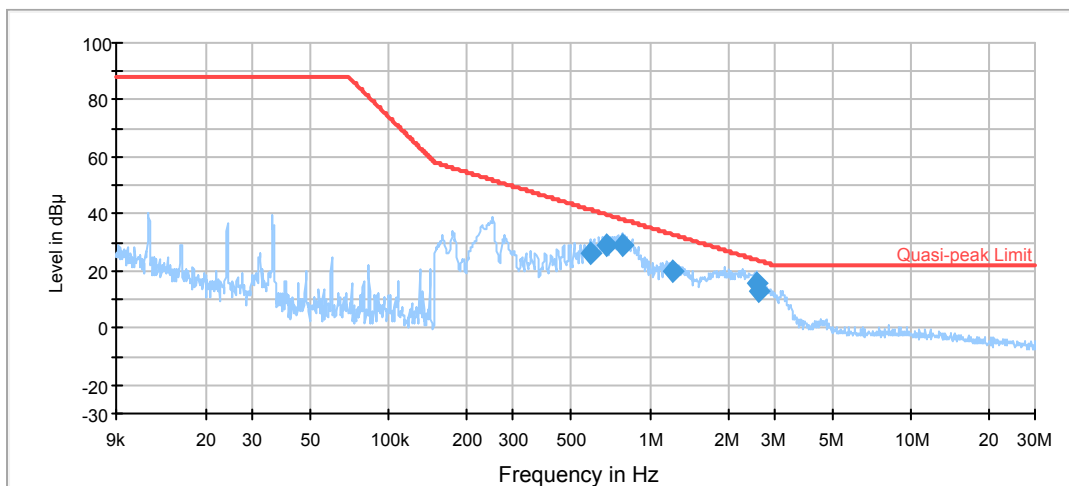
Model Number: LIV-257
Port: X
Test Mode: Charging&On
Power Source: DC 5V
Note:



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ A)	Bandwidth (kHz)	Triple Loop frame	Corr. (dB)	Margin (dB)	Limit (dB μ A)
0.396710	24.1	9.000	X	-15.5	22.2	46.3
0.421179	23.4	9.000	X	-15.5	22.2	45.6
0.447156	22.8	9.000	X	-15.5	22.1	44.9
0.467685	24.3	9.000	X	-15.5	20.0	44.3
0.494061	21.0	9.000	X	-15.5	22.7	43.7
3.206664	1.8	9.000	X	-15.4	20.2	22.0

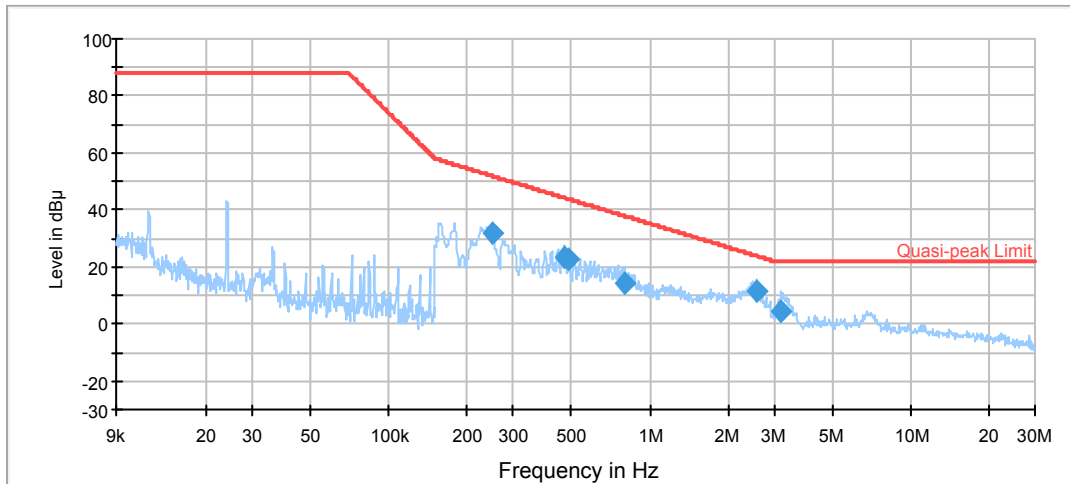
Model Number: LIV-257
Port: Y
Test Mode: Charging&On
Power Source: DC 5V
Note:



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ A)	Bandwidth (kHz)	Triple Loop frame	Corr. (dB)	Margin (dB)	Limit (dB μ A)
0.588291	26.4	9.000	Y	-15.6	15.2	41.6
0.686658	28.8	9.000	Y	-15.7	10.9	39.7
0.781732	29.2	9.000	Y	-15.8	9.0	38.2
1.218534	19.7	9.000	Y	-15.7	13.1	32.8
2.562009	15.7	9.000	Y	-15.7	8.2	23.9
2.639837	13.0	9.000	Y	-15.7	10.5	23.5

Model Number: LIV-257
Port: Z
Test Mode: Charging&On
Power Source: DC 5V
Note:



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ A)	Bandwidth (kHz)	Triple Loop frame	Corr. (dB)	Margin (dB)	Limit (dB μ A)
0.249477	31.9	9.000	Z	-15.3	20.0	51.9
0.467685	23.6	9.000	Z	-15.5	20.7	44.3
0.491603	22.9	9.000	Z	-15.6	20.8	43.7
0.801472	14.1	9.000	Z	-15.9	23.8	37.9
2.562009	11.4	9.000	Z	-15.8	12.5	23.9
3.206664	4.6	9.000	Z	-15.9	17.4	22.0

3 - RADIATED ELECTROMAGNETIC DISTURBANCES 30 MHZ TO 300 MHZ

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

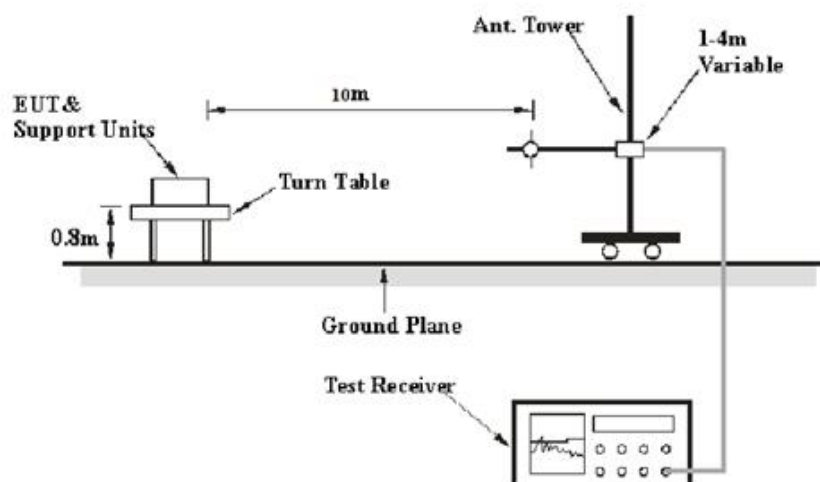
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB.

Table 1 – Values of U_{cispr}

Measurement		U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC)	(30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR)	(1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR)	(6 GHz to 18 GHz)	5.5 dB

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup



The radiated emission tests were performed in the 10 meters chamber test site, using the setup accordance with the CISPR 16-1-1:2010+A1:2010, CISPR16-2-3:2010. The specification used was EN 55015.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The power was connected to 230 V/50Hz AC power source.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 300 MHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz – 300 MHz	120 kHz	300 kHz	120kHz	QP

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

If the maximized peak measured value complies with under the QP limit more than 6dB, then it is unnecessary to perform QP measurement.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result = Meter Reading+ Corrected

Note:

Corrected = Antenna Factor + Cable Loss - Amplifier Gain

or

Corrected = Antenna Factor + Cable Loss + Insertion loss of attenuator - Amplifier Gain

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

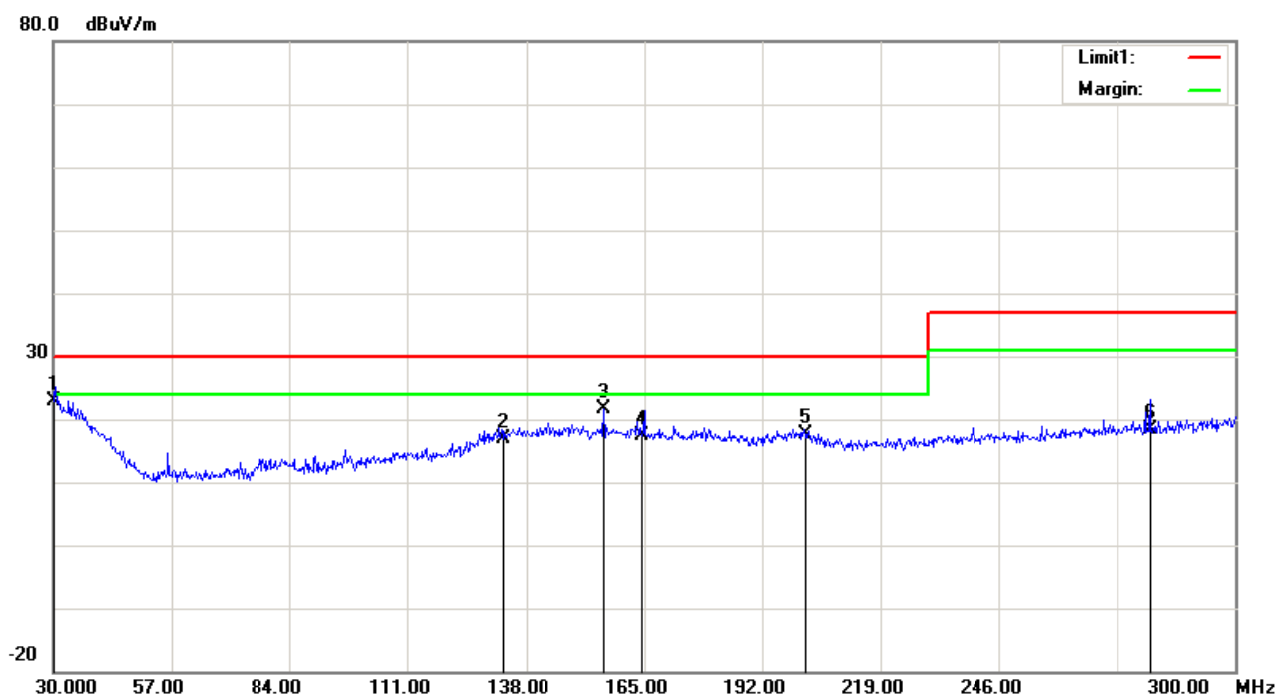
$$\text{Margin} = \text{Limit} - \text{Result}$$

Test Data

Please refer to following table and plots:

Condition: EN 55015 10m Radiation
EUT: Vintage Flashlight
Model: LIV-257
Test Mode: Charging&On
Note:

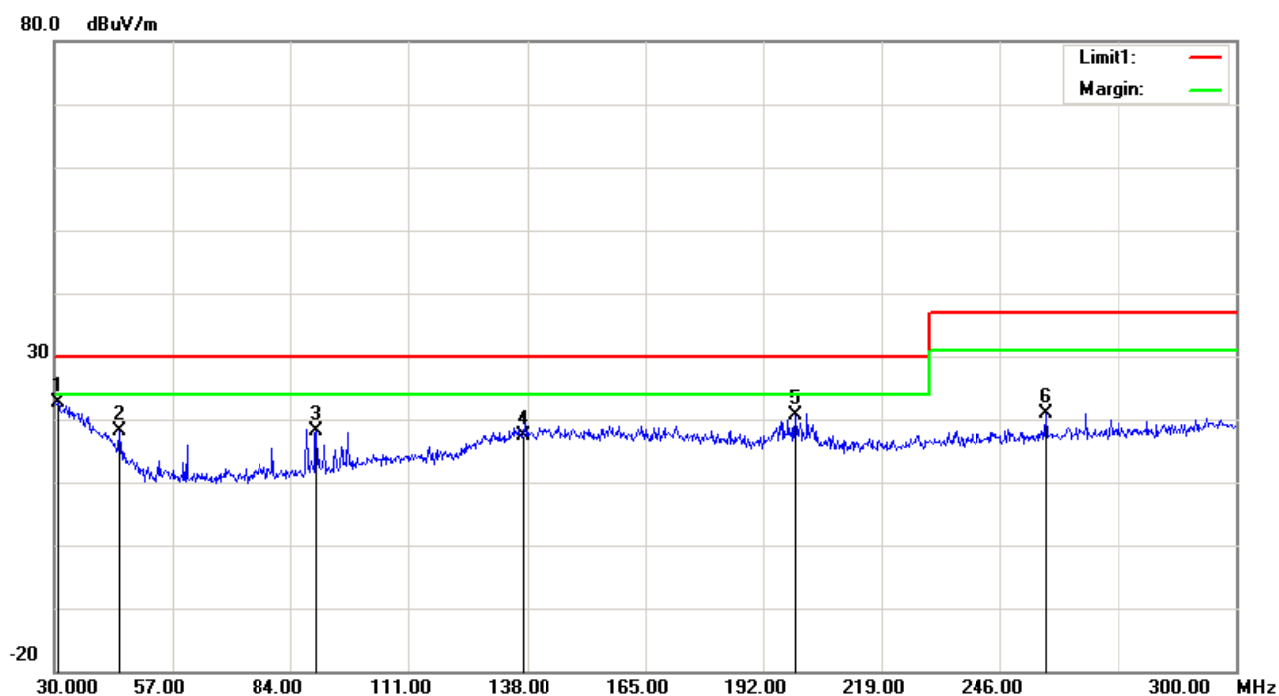
Polarization: Horizontal
Power: DC 5V
Distance: 10m



No.	Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	30.0000	27.26	peak	-4.33	22.93	30.00	7.07
2	132.8700	26.67	peak	-9.78	16.89	30.00	13.11
3	155.8200	31.23	peak	-9.52	21.71	30.00	8.29
4	164.4600	26.75	peak	-9.45	17.30	30.00	12.70
5	201.9900	27.31	peak	-9.67	17.64	30.00	12.36
6	280.8300	26.84	peak	-8.58	18.26	37.00	18.74

Condition: EN 55015 10m Radiation
EUT: Vintage Flashlight
Model: LIV-257
Test Mode: Charging&On
Note:

Polarization: Vertical
Power: DC 5V
Distance: 10m



No.	Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1	30.8100	27.40	peak	-4.79	22.61	30.00	7.39
2	44.8500	30.96	peak	-12.83	18.13	30.00	11.87
3	89.9400	33.21	peak	-15.18	18.03	30.00	11.97
4	137.1900	26.89	peak	-9.39	17.50	30.00	12.50
5	199.2900	30.01	peak	-9.47	20.54	30.00	9.46
6	256.5300	30.38	peak	-9.58	20.80	37.00	16.20

4 - ELECTROSTATIC DISCHARGES IEC 61000-4-2

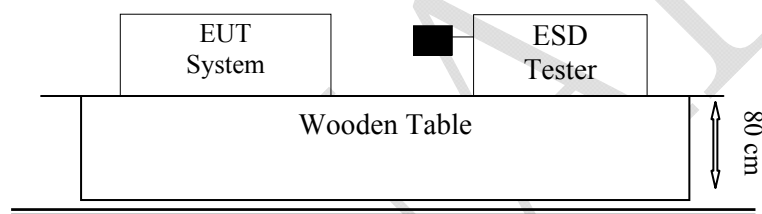
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-2) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	$\leq 15\%$	15%
Peak current I_p	$\leq 7\%$	6.30%
Current at 30 ns	$\leq 7\%$	6.30%
Current at 60 ns	$\leq 7\%$	6.30%

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup



Remark: ■ is the tip of the electrode

IEC 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

Test Standard

EN 61547:2009 (IEC 61000-4-2:2008)

Test level 3 for Air Discharges at ± 8 kV

Test level 2 for Contact Discharges at ± 4 kV

Test Level

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

Performance criterion: B**Test Procedure****Air Discharges:**

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

Contact Discharges:

All the procedure shall be same as Section 8.3.1 of IEC 61000-4-2, except that the tip of the Discharges electrode shall touch the EUT before the Discharges switch is operated.

Indirect Discharges 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 Discharges electrode positions vertically at a distance of 0.1 m from the EUT and with the Discharges electrode touching the coupling plane.

Indirect Discharges for vertical coupling plane

At least 20 single Discharges 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.

Test Data

Please refer to following tables:

Test Mode: Charging&On

Note:

Table 1: Electrostatic Discharge Immunity (Air Discharge)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-8 kV	+8 kV	-15 kV	+15 kV
Surface	A	A	A	A	A	A	/	/
Button	A	A	A	A	A	A	/	/

Table 2: Electrostatic Discharge Immunity (Direct Contact)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Metal shell	A	A	A	A	/	/	/	/
Type C Port	A	A	A	A	/	/	/	/

Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/

Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/

ESD Location Photo



Air Discharge: 

Direct Contact: 

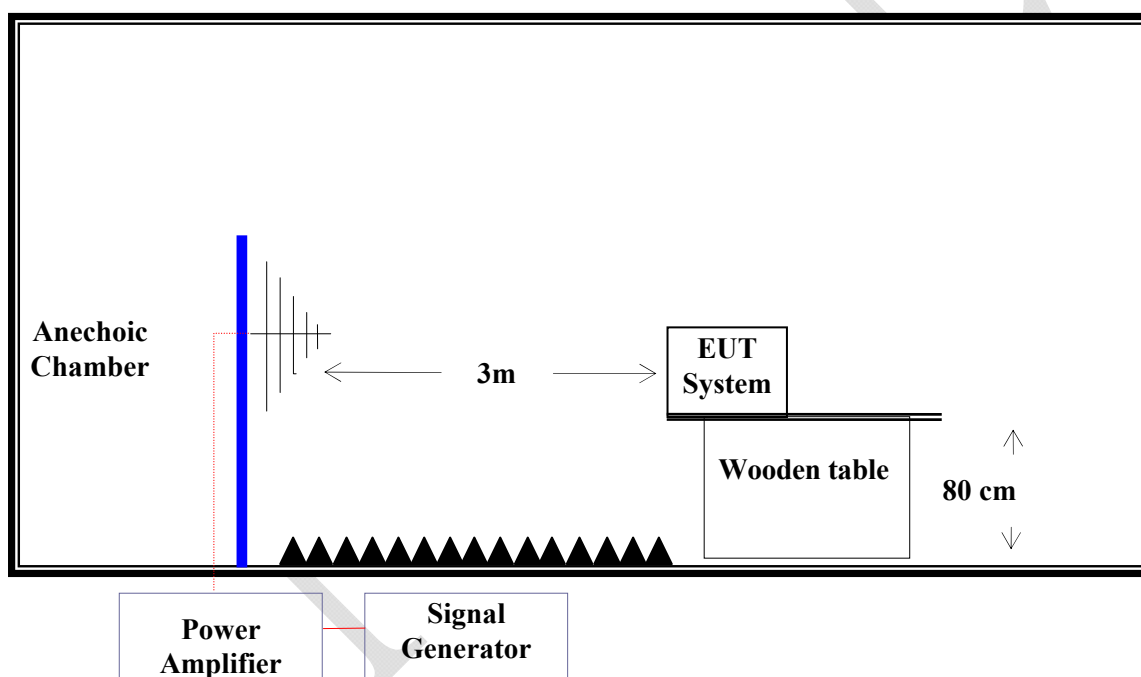
FINAL

5 - RADIO-FREQUENCY ELECTROMAGNETIC FIELDS IEC 61000-4-3**Measurement Uncertainty**

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-3) please refer to the following:

Parameter	U_{EN}	U_{lab}
Calibration process	1.88 dB	1.88 dB
Level setting	2.19 dB	2.19 dB

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup

Test Standard

EN 61547:2009 (IEC 61000-4-3:2006+A1:2008+A2:2010)
Test level 2 at 3 V/ m (unmodulated, r.m.s.)

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

Performance criterion: A

Test Procedure

The EUT and its simulators are placed on a turn table which is 0.1 meter above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance, a CCD camera is used to monitor the EUT. All the scanning conditions are as follows:

Test Data

Please refer to following tables:

Test Mode: Charging&On

Note:

Condition of Test	Remarks
Field Strength	3 V/m (Test Level 2)
RF Signal	1 kHz, 80% AM, sine wave
Sweep Frequency Step	1%, logarithmic
Dwell Time	1 Sec

Frequency Range (MHz)	Front Side		Rear Side		Left Side		Right Side	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	A	A	A	A	A	A	A	A

7 - FAST TRANSIENTS IEC 61000-4-4

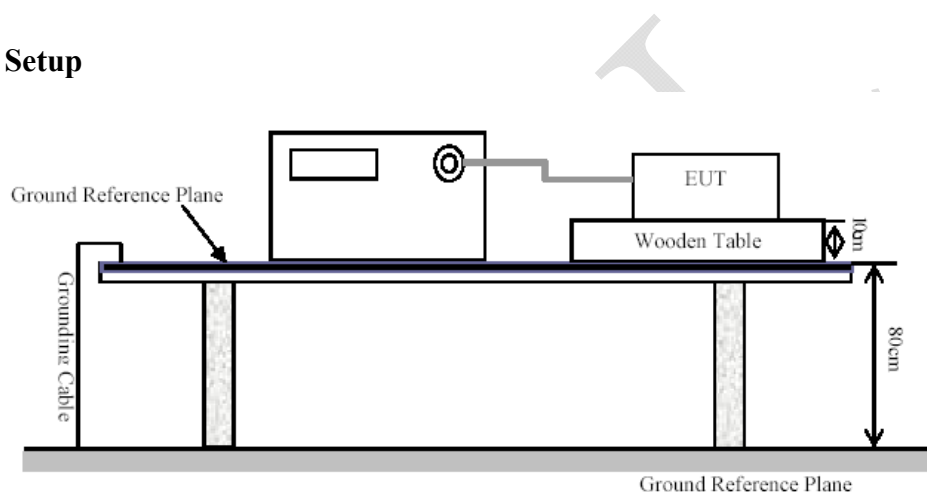
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-4) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	6.20%	6.20%
Peak voltage value V_p	8.60%	8.60%
Voltage pulse width t_w	5.90%	5.90%

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test System Setup



Test Standard

EN 61547:2009 (IEC 61000-4-4:2004)
Test Level 2 at 1.0 kV

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

Performance criterion: B

Test Procedure

The EUT was arranged for Power Line Coupling and for I/O Line Coupling through a capacitive clamp, where applicable. (Note: The I/O coupling test using a capacitive clamp is performed on the I/O interface cables that are longer in length than 3 meters.) A metal ground plane 2.4 meter by 2.0 meter was placed between the floor and the table and is connected to the earth by a 2.0 meter ground rod. The ground rod is connected to the test facility's electrical earth.

Test Data

Please refer to following tables:

Test Mode: Charging&On

Note:

Test Points		Test Level (kV)							
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
AC mains power input ports	L	A	A	A	A	/	/	/	/
	N	A	A	A	A	/	/	/	/
	Earth	/	/	/	/	/	/	/	/
	L+N	A	A	A	A	/	/	/	/
	L + Earth	/	/	/	/	/	/	/	/
	N + Earth	/	/	/	/	/	/	/	/
	L+N+Earth	/	/	/	/	/	/	/	/
Signal ports	/	/	/	/	/	/	/	/	/

8 - INJECTED CURRENTS (RADIO-FREQUENCY COMMON MODE)

IEC 61000-4-6

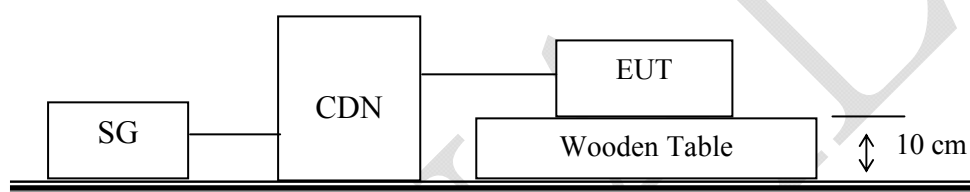
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-6) please refer to the following:

Parameter	U_{EN}	U_{lab}
CDN calibration process	1.27 dB	1.27 dB
CDN test process	1.36 dB	1.36 dB

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test setup



Test Standard

EN 61547: 2009 (IEC 61000-4-6:2009)

Test Level 2 at 3 V r.m.s. (unmodulated), 0.15 MHz ~ 80 MHz

Level	Voltage Level (r.m.s.) V
1	1
2	3
3	10
X	Special

Performance criterion: A

Test Procedure

- 1) Let the EUT work in test mode and test it.
- 2) The EUT are placed on an insulating support 0.1 m high above a ground reference plane.
CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT.
Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 3) The disturbance signal described below is injected to EUT through CDN.
- 4) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 5) The frequency range is swept from 150 kHz to 80 MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave.
- 6) Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s.
- 7) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

FINAL

Test Data

Please refer to following tables:

Test Mode: Charging&On

Note:

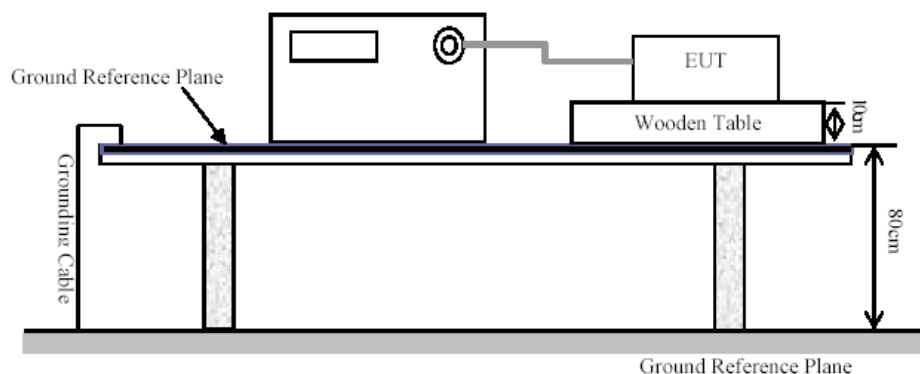
Table 1: _____ AC _____ mains power input port

Frequency range: _____ 150 _____ kHz to _____ 80 _____ MHz
■ Modulated: _____ Amplitude 80%, 1kHz sine wave □ Unmodulated □ Other:
Severity Level: _____ 3 _____ V Unmodulated , r.m.s

Level	Voltage Level (e.m.f.) U_0	Pass	Fail
1	1	/	/
2	3	A	/
3	10	/	/
X	Special	/	/

9 - SURGES IEC 61000-4-5

Test system Setup



Test Standard

EN 61547:2009 (IEC 61000-4-5:2006)
AC Mains: Line-Line: Test level 1 at 0.5 kV

Level	Open Circuit Output Test Voltage $\pm 10\%$
1	0.5 kV
2	1 kV
3	2 kV
4	4 kV
X	Special

Performance criterion: C

Test Procedure

- 1) Provide disturbance signal described below is injected to EUT.
- 2) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 3) Different phase angles are done individually.
- 4) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

Test Data

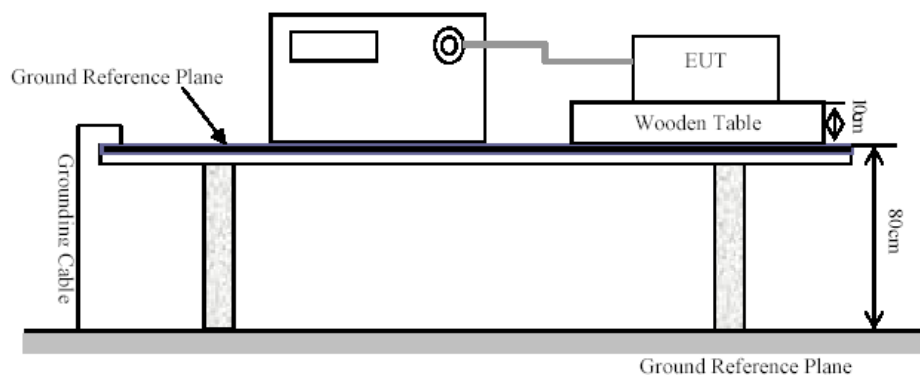
Please refer to following tables:

Test Mode: Charging&On

Note:

Table 1: _____ **AC** _____ mains power input port

Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	Line-Line	A	/
2	1kV	±	/	/	/
3	2kV	±	/	/	/
4	4kV	±	/	/	/

10 - VOLTAGE DIPS AND SHORT INTERRUPTIONS IEC 61000-4-11**Test setup****Test Standard**

EN 61547:2009 (IEC 61000-4-11:2004)

Test Levels and Performance Criterion

Level	U2 (% Reduction)	Duration (in period)	Performance criterion
1	30	10	C
2	100	0.5	B

Test Procedure

- 1) The interruption is introduced at selected phase angles with specified duration.
- 2) Record any degradation of performance.

Test Data

Please refer to following tables:

Test Mode: Charging&On

Note:

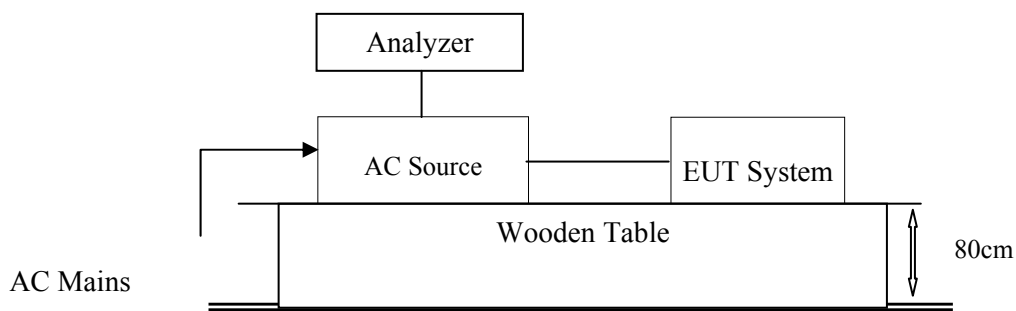
Table 1: Voltage Dips/Interruptions Test

U2 (% Reduction)	Td (Periods)	Phase Angle	N	Result
30	10	0/90/180/270	3	A
100	0.5	0/90/180/270	3	A

FINAL

12 - VOLTAGE FLUCTUATIONS AND FLICKER

Test System Setup



Test Standard

EN 61000-3-3:2013

Flicker Test Limits :

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test, measured or calculated according to clause 4 under test conditions described in clause 6 and annex A. Tests made to prove compliance with the limits are considered to be type tests.

The following limits apply:

- the value of P_{st} shall not be greater than 1,0;
- the value of P_{lt} shall not be greater than 0,65;
- the value of $d(t)$ during a voltage change shall not exceed 3,3 % for more than 500 ms;
- the relative steady-state voltage change, d_c , shall not exceed 3,3 %;
- the maximum relative voltage change d_{max} , shall not exceed
 - a) 4 % without additional conditions;
 - b) 6 % for equipment which is:

- switched manually, or
 - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.

Note: The cycling frequency will be further limited by the Pst and Plt limit. For example: a d_{max} of 6 % producing a rectangular voltage change characteristic twice per hour will give a Plt of about 0,65.

c) 7 % for equipment which is

- attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
- switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

In the case of equipment having several separately controlled circuits in accordance with 6.6, limits b) and c) shall apply only if there is delayed or manual restart after a power supply interruption; for all equipment with automatic switching which is energized immediately on restoration of supply after a power supply interruption, limits a) shall apply; for all equipment with manual switching, limits b) or c) shall apply depending on the rate of switching. 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.

Test Data

Please refer to following tables:

Short time (Pst): 10 min
Observation time: 120 min (12 Flicker measurement)
Test Mode: Charging&On
Power Source: AC 230V/50Hz
Test Result: PASS

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.012	3.30	PASS
dmax [%]	0.110	4.00	PASS
dt [s]	0.000	0.50	PASS

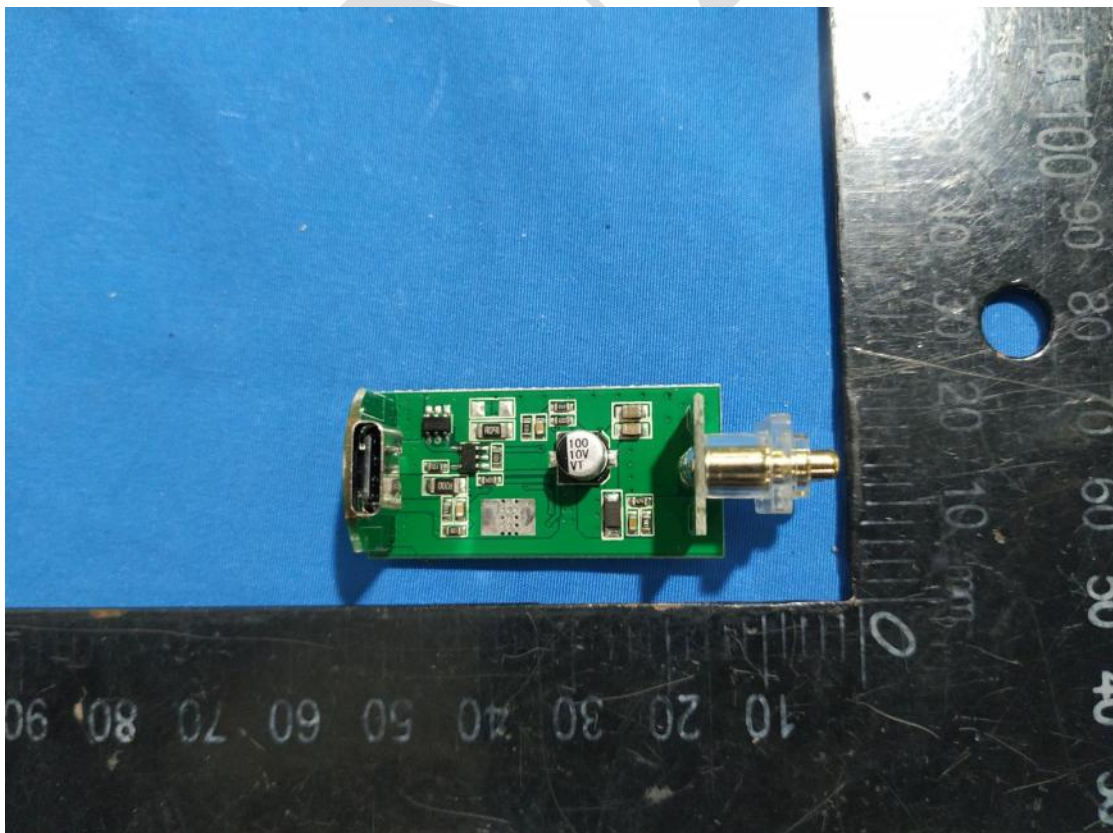
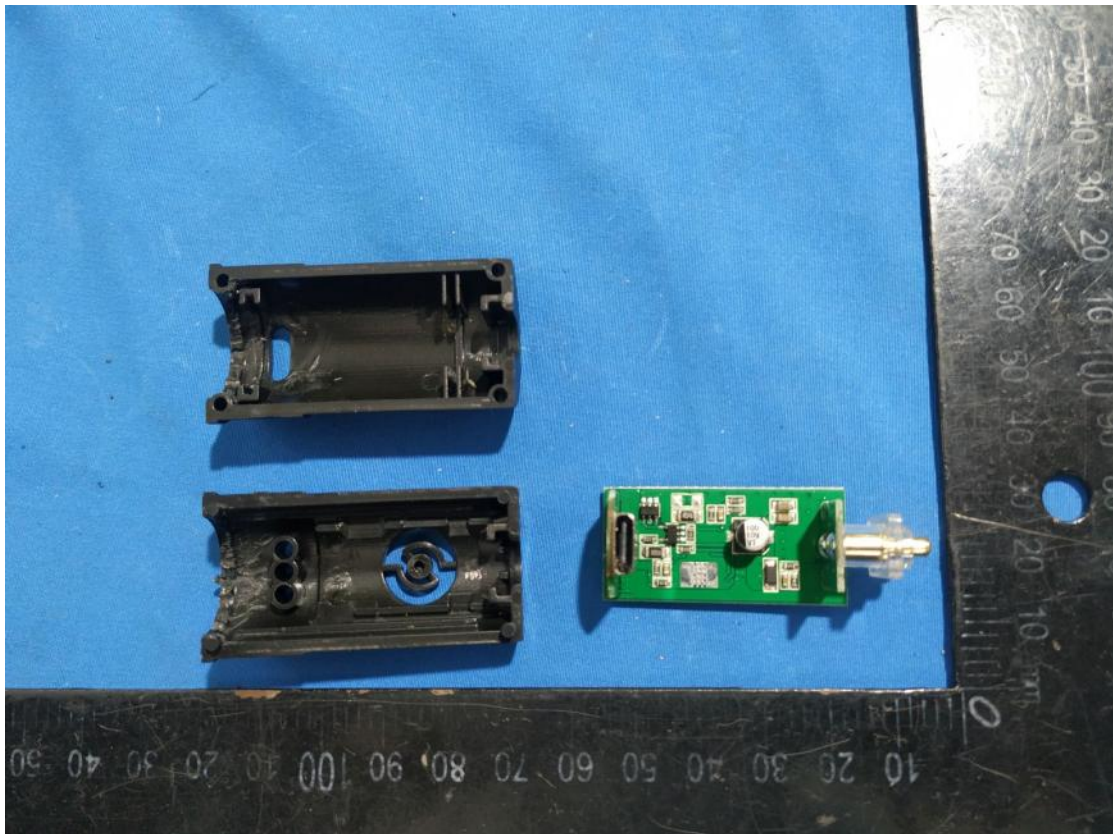
EXHIBIT A – EUT PHOTOGRAPHS

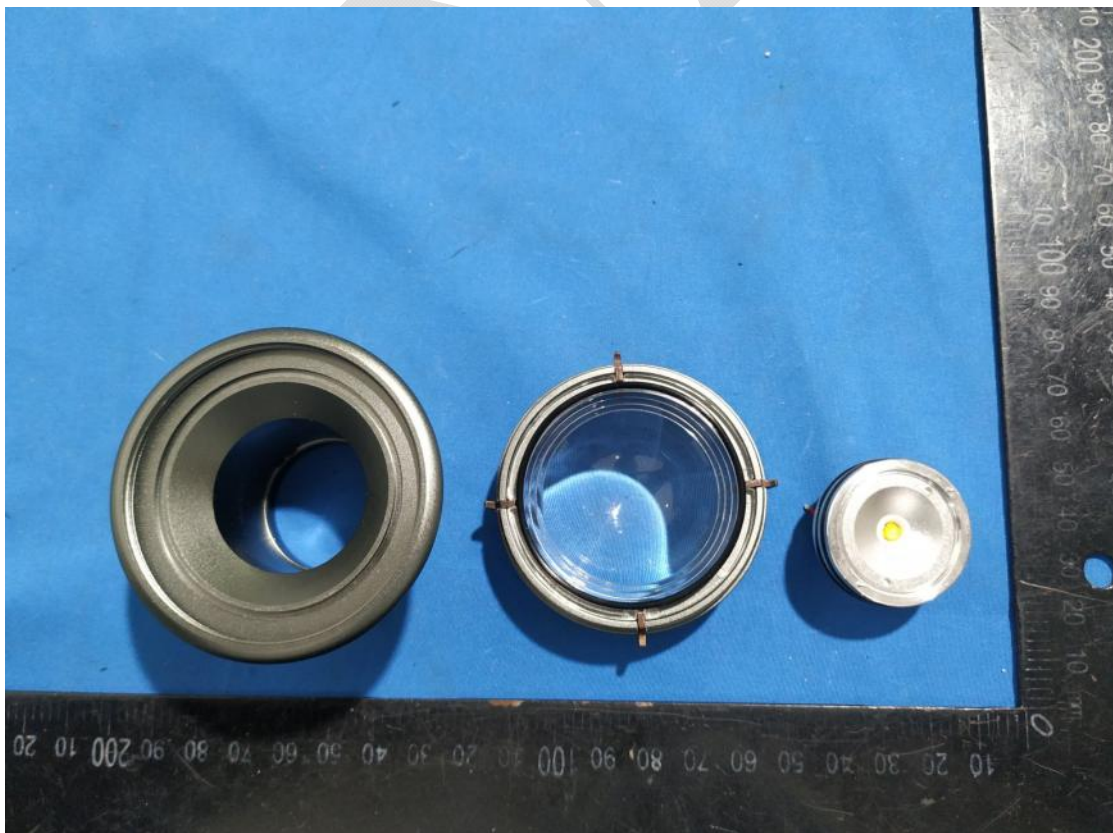
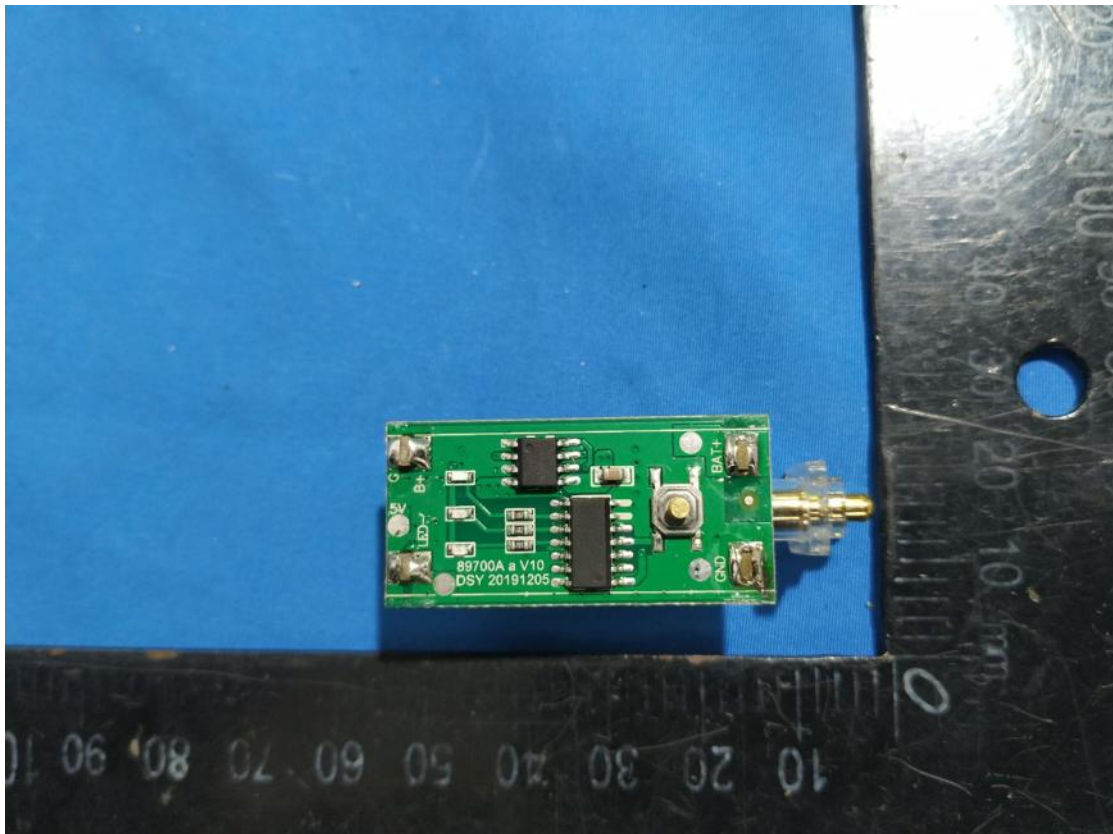


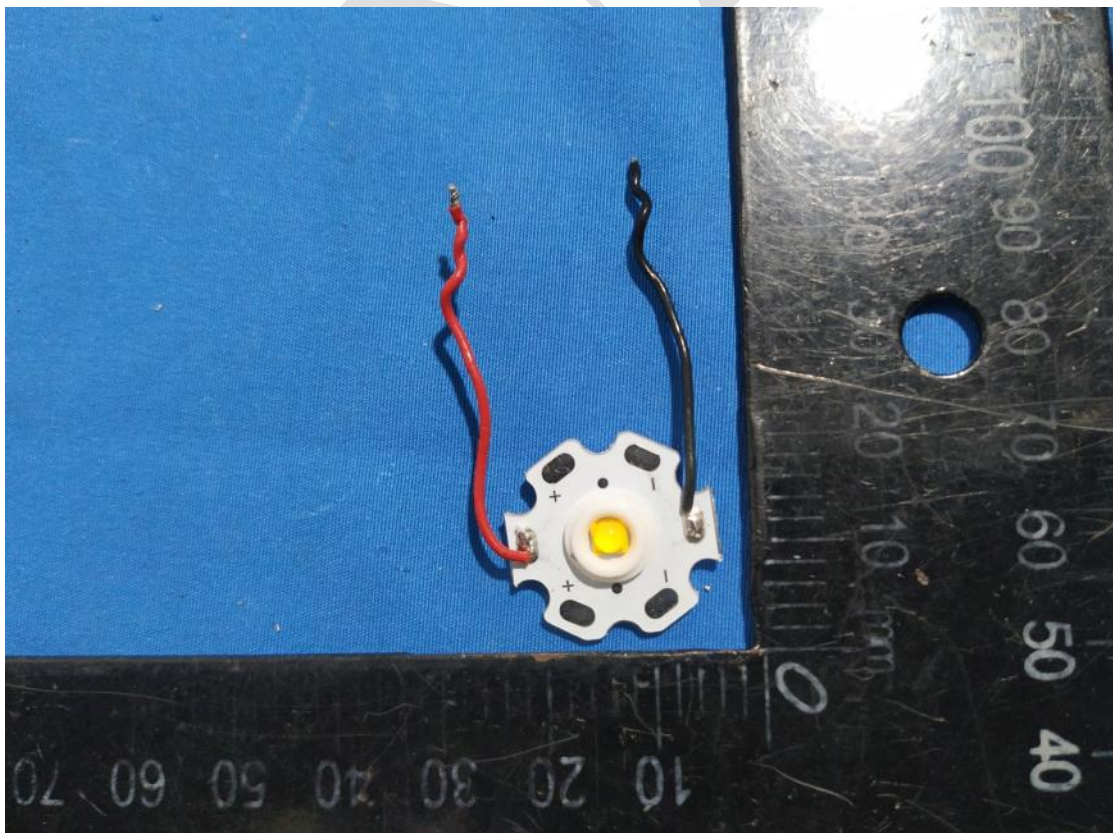
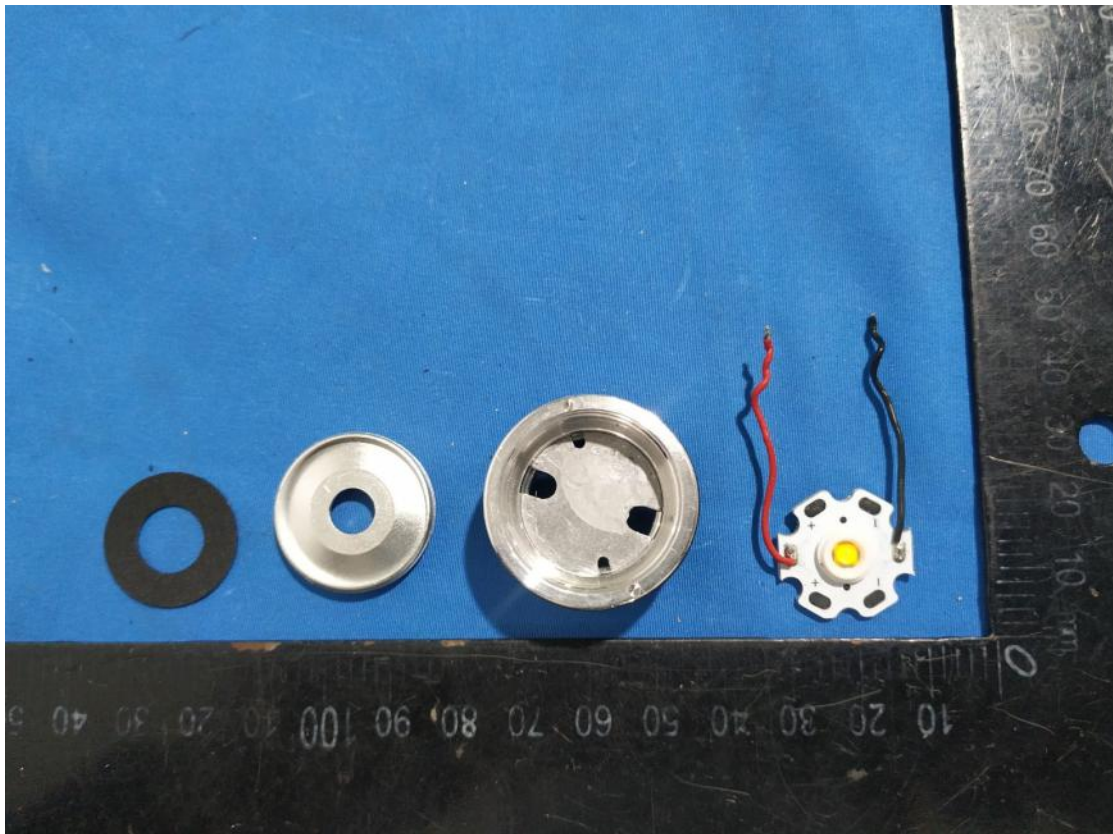












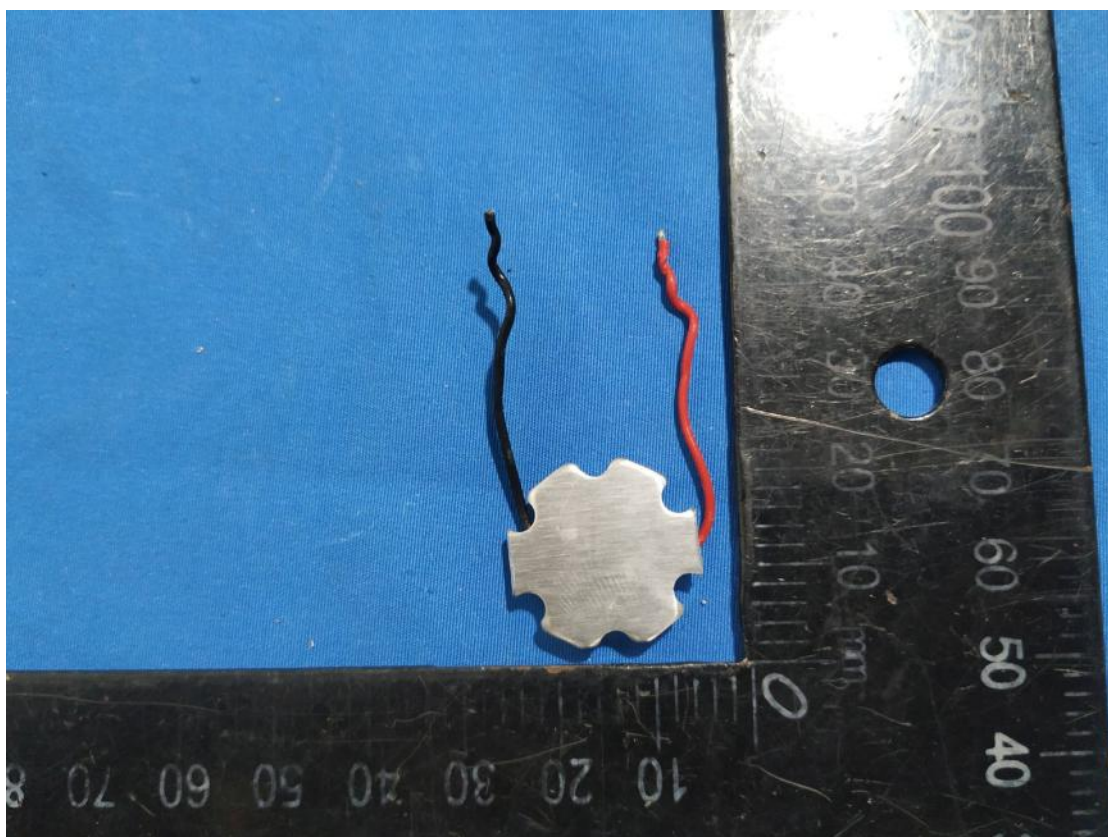


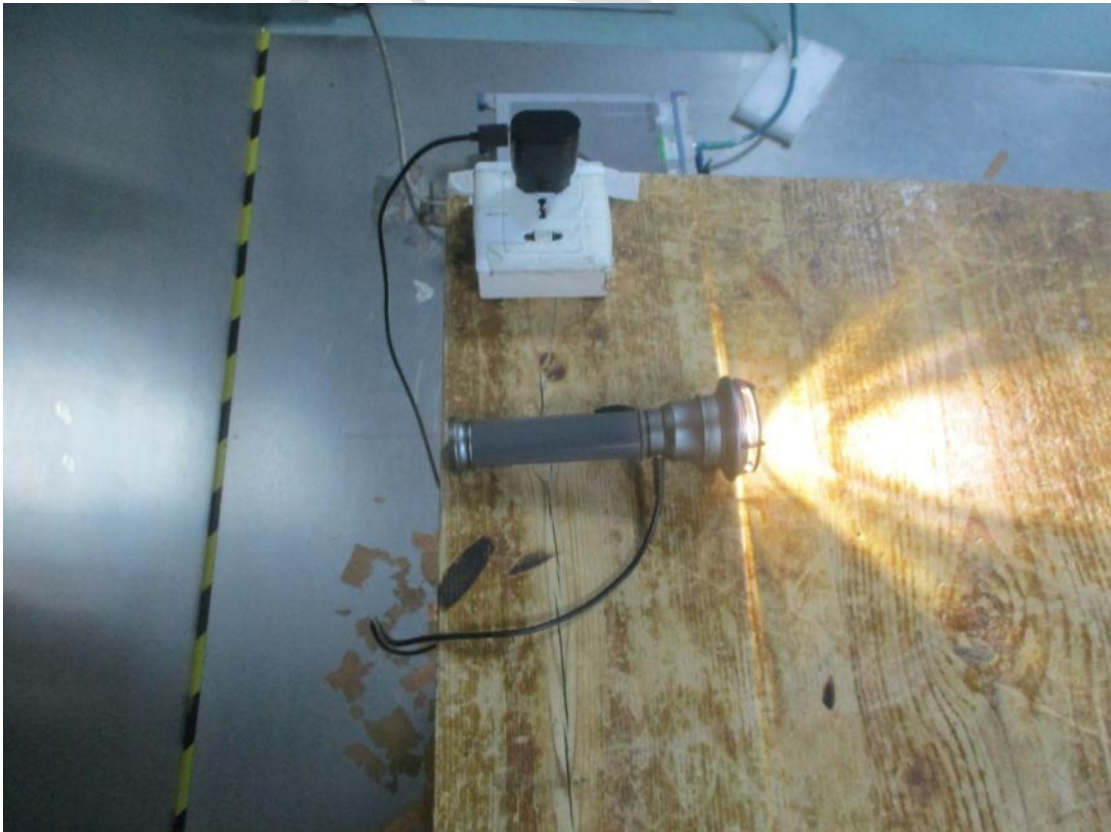
EXHIBIT B – TEST SETUP PHOTOGRAPHS

CE

CE front View



CE side View



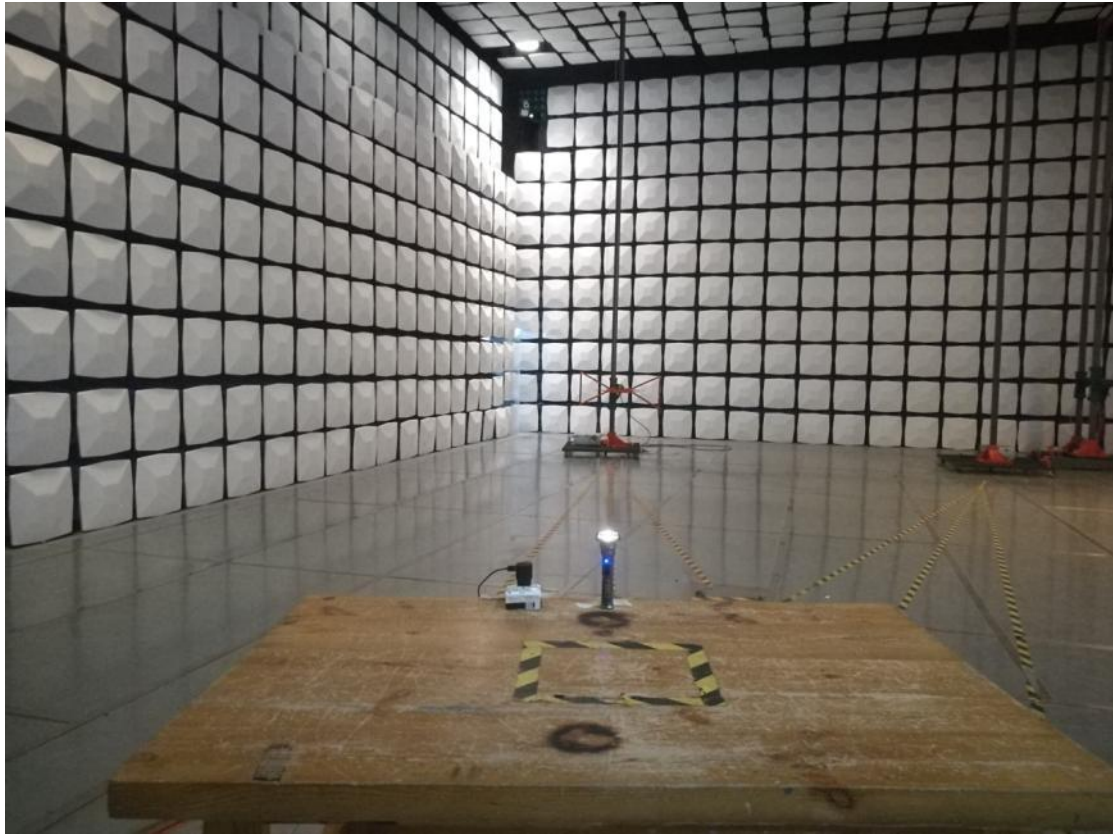
Inducted current

RE(Magnetic) View

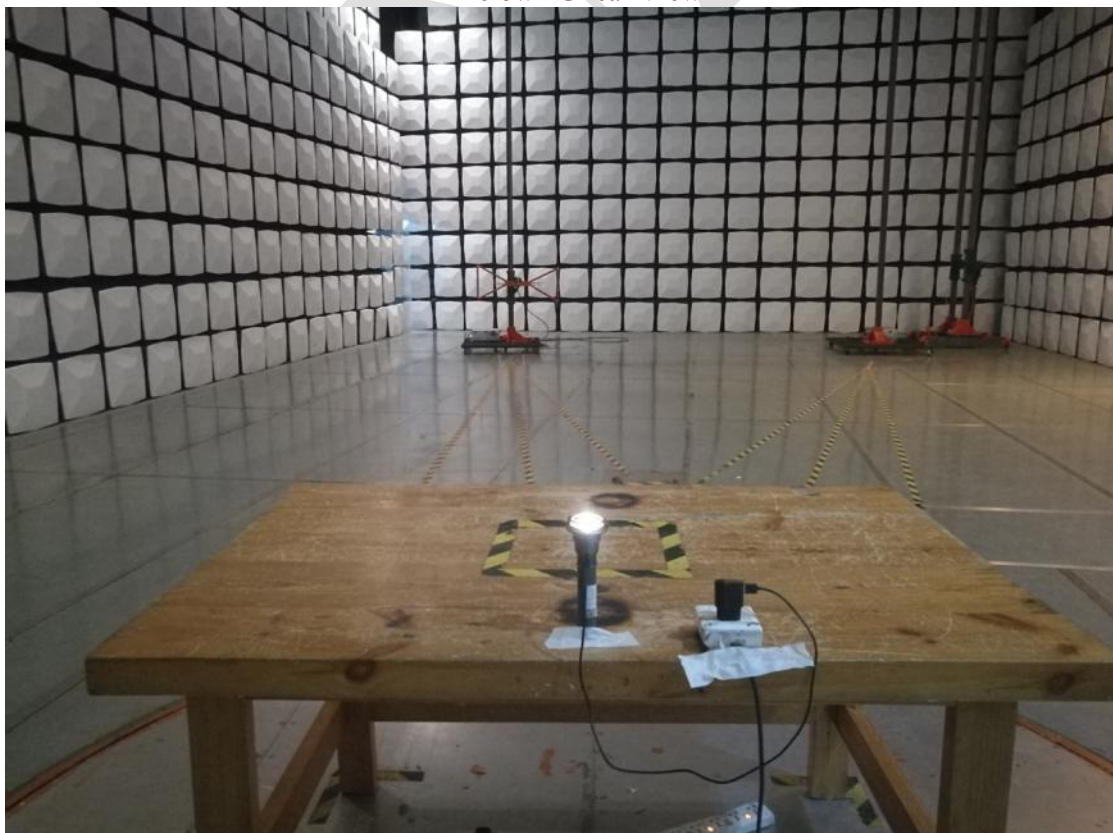


RE

RE Below 1G front View



RE Below 1G rear View



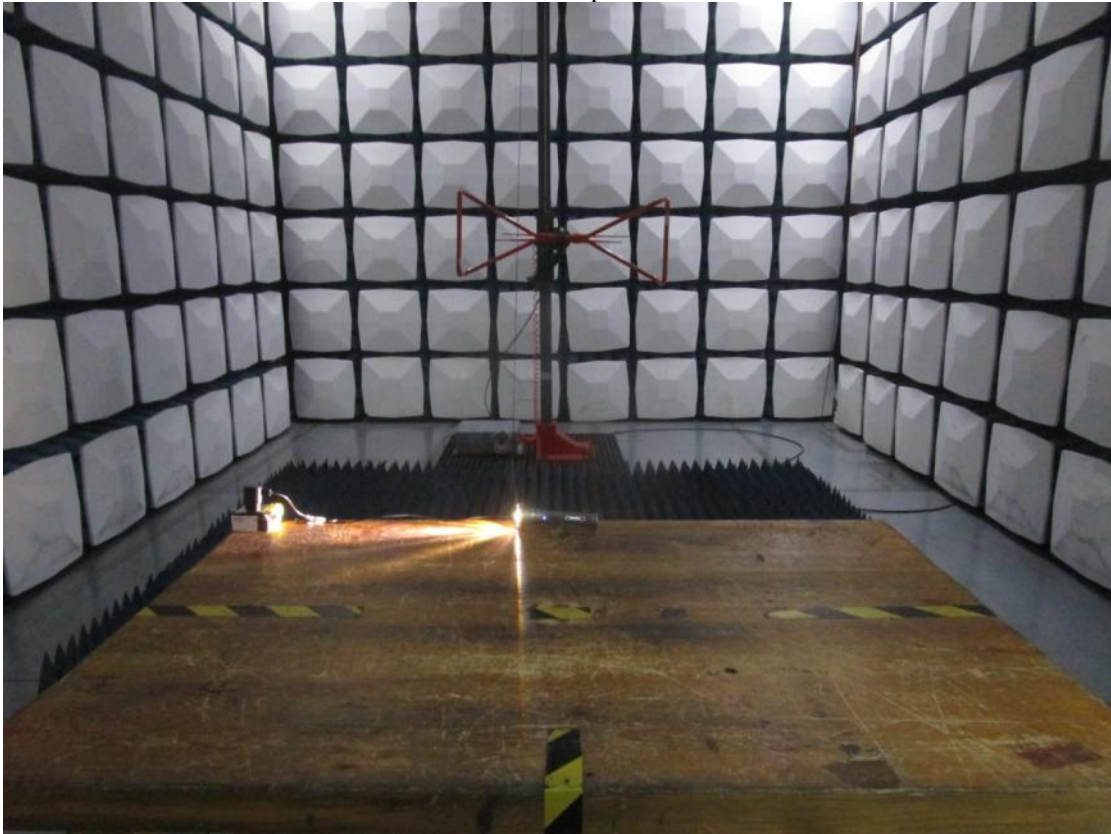
ESD

Test setup photo View



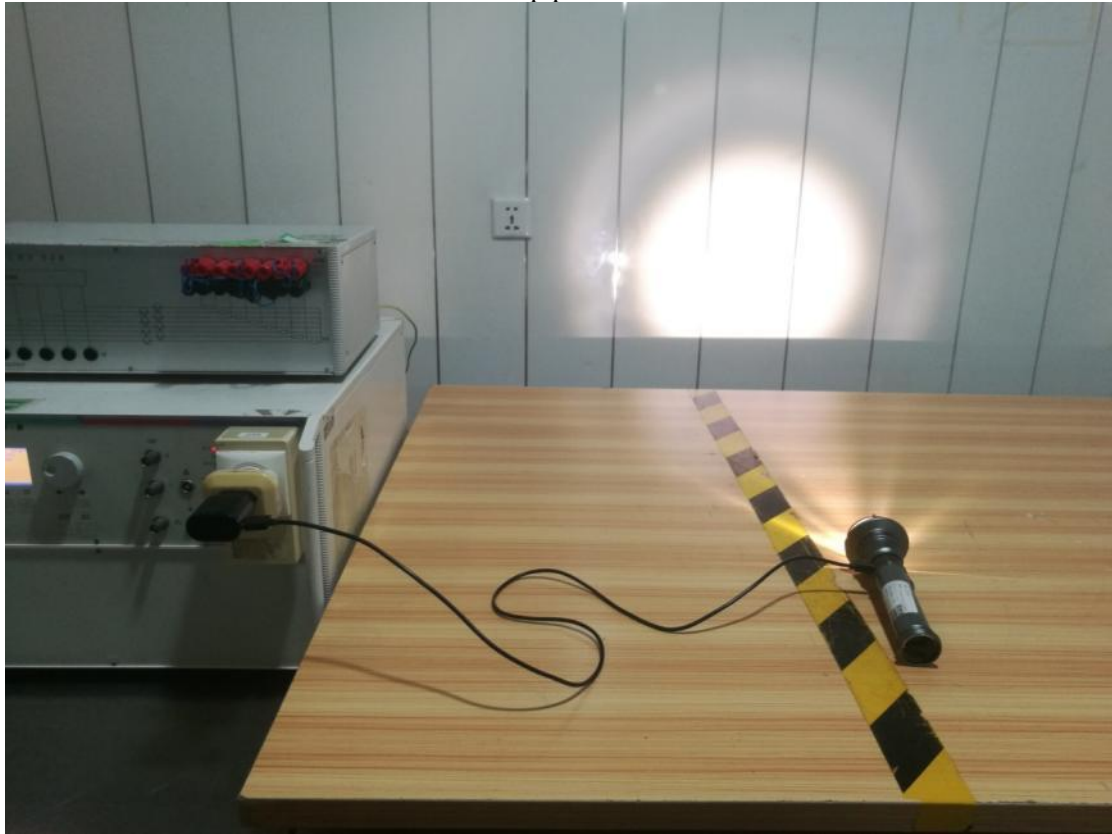
RS

AC Port Test Setup Photo View



EFT

Test setup photo View



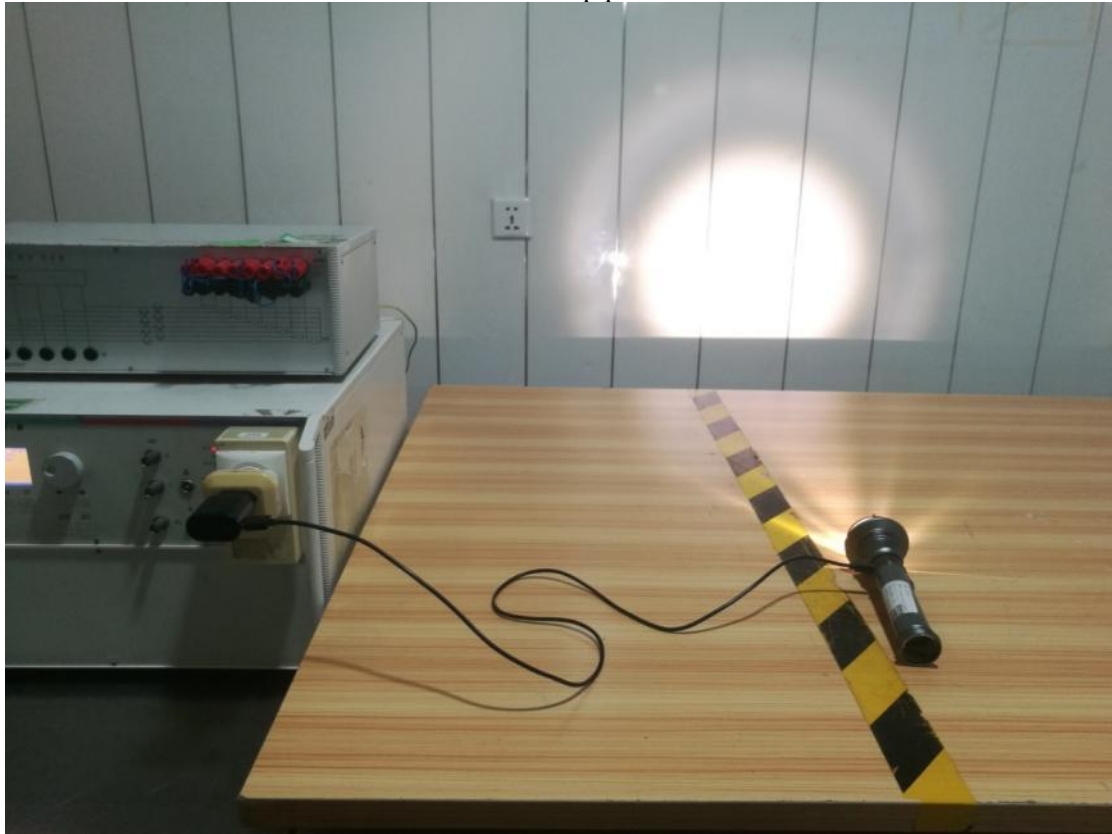
CS

AC Port Test Setup Photo View



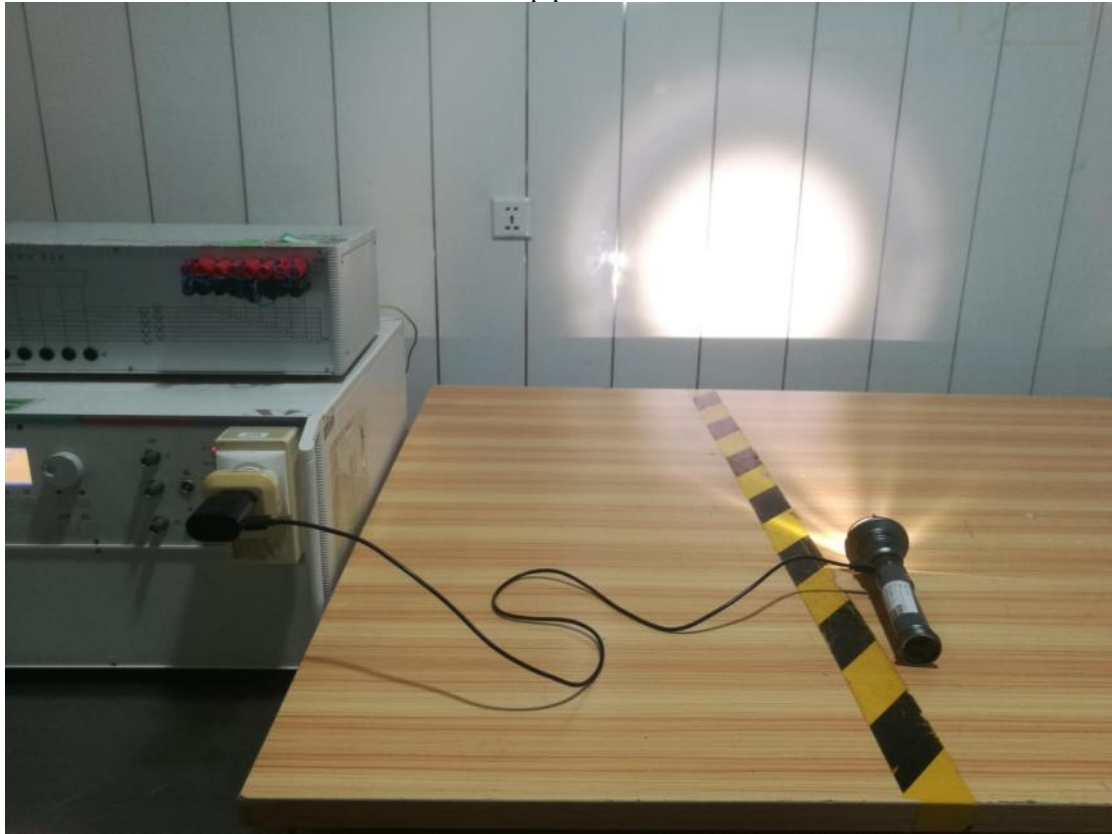
Surge

AC Port Test setup photo View



Dips

Test setup photo View



Flicker

Test setup photo View



*****END OF REPORT*****