SHENZHEN YARUI TESTING CO., LTD.
No. 620 HuaYuan Commercial Center, No. 347 XiXiang Road, XiXiang Town, Bao'An District, ShenZhen City
Tel : +86-755-27912080 Fax: +86-755-27916936

EMC TEST REPORT

Product name	:	Headlamp
Trademark	:	Fenix
Model no.	:	HP12
Adding Model(s)	:	HL40R,HL52R,HL55R,HL60R,HL65R,HP25R,HP30R,HP11
Test Standards	:	EN 55015: 2013+A1: 2015 EN 61547: 2009 EN 61000-3-2: 2014 EN 61000-3-3: 2013
Applicant	:	SHENZHEN LANGHENG ELECTRONIC CO.,LTD
Address of applicant	:	8/F 2nd Building, DongFangMing Industrial Center,33rd District, Bao'an, Shenzhen 518133, China.
Date of Receipt	:	February 17, 2017
Date of Test	:	February 17, 2017 - February 28, 2017
Data of issue.	:	February 28, 2017
Report No.	:	YRT201702323E

Test result	:	Pass *

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

CE

The CE mark as shown above can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/30/EU are considered.

CE EMC TEST Report

Equipment	Headlamp
Model Name	HP12
Adding Model(s):	HL40R,HL52R,HL55R,HL60R,HL65R,HP25R,HP30R,HP11
Model Difference	All the models are the similar, Difference is the power supply output current and power. The model HP12 is selected by test.
Manufacturer	SHENZHEN LANGHENG ELECTRONIC CO.,LTD
Manufacturer Address	8/F 2nd Building, DongFangMing Industrial Center,33rd District, Bao'an, Shenzhen 518133, China.
Product Description	The EUT is a Headlamp Operating frequency: N/A Connecting I/O port: N/A Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Power Source	DC Voltage
Power Rating	Input: DC 4.2V,3A,12.6W

Testing Engineer : (David Zhong)

Reviewed By: : (Allen Wang)

Approved Signatory : (Lily Yu)

SHENZHEN YARUI TESTING CO.,LTD. APPROVED

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1. TEST SUMMARY

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Result	Remark
CISPR 15: 2005+A2: 2008 EN 55015: 2013+A1: 2015	Conducted Emission	Class B	N/A	
	Radiated Emissions 9KHz to 30MHz	Class B	PASS	
	Radiated Emissions 30MHz to 300MHz	Class B	PASS	
IEC 61000-3-2: 2005+A1: 2008+A2: 2009 EN 61000-3-2: 2014	Harmonic Current Emission	Class A or D NOTE (2)	PASS	
IEC 61000-3-3: 2008 EN 61000-3-3: 2013	Voltage Fluctuations & Flicker	------	PASS	
EMC Immunity				
Standard IEC 61547: 2009 EN 61547: 2009	Test Item	Criterion	Result	Remark
IEC 61000-4-2: 2008 EN 61000-4-2: 2009	Electrostatic Discharge	B	PASS	
IEC 61000-4-3: 2006+A1+A2: 2010 EN 61000-4-3: 2006+A1: 2008+A2: 2010	RF electromagnetic field	A	PASS	
IEC 61000-4-4: 2010 EN 61000-4-4: 2012	Electric Fast Transients	B	PASS	
IEC 61000-4-5: 2005 EN 61000-4-5: 2014	Surges	B	PASS	
IEC 61000-4-6: 2008 EN 61000-4-6: 2014	Injected Current	A	PASS	
IEC 61000-4-8: 2009 EN 61000-4-8: 2010	Power Frequency Magnetic Field	A	PASS	
IEC 61000-4-11: 2004 EN 61000-4-11: 2004	Volt. Interruptions/ Volt. Dips	B / C / C **NOTE (3)**	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

(2) The power consumption of EUT is less than 75W and no Limits apply.

(3) Voltage dip: 0% reduction – Performance Criteria **B**

Voltage dip: 70% reduction – Performance Criteria **C**

Voltage Interruption: 0% Interruption – Performance Criteria **C**

(4) For client's request and manual description, the test will not be executed.

1.1 TEST FACILITY

SHENZHEN YARUI TESTING CO., LTD.

Address: No. 620 HuaYuan Commercial Center, No. 347 XiXiang Road, XiXiang Town, Bao'An District, ShenZhen City

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U，(dB)	NOTE
GTIC01	ANSI	150 KHz ~ 30MHz	3.2	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U，(dB)	NOTE
GTIA01	ANSI	30MHz ~ 1000MHz	4.7	
		1GHz ~6GHz	5.0	

2. GENERAL INFORMATION

2.1 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Running

For Conducted Test	
Final Test Mode	Description
Mode 1	Running

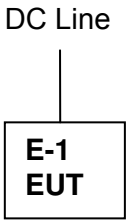
For Radiated Test	
Final Test Mode	Description
Mode 1	Running

For EMS Test	
Final Test Mode	Description
Mode 1	Running

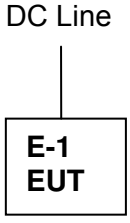
2.2 DESCRIPTION OF TEST SETUP

EUT was tested in normal configuration (Please See following Block diagrams)

EMI test wiring diagram



EMS test wiring diagram



2.3 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Headlamp	Fenix	HP12	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.4 MEASUREMENT INSTRUMENTS EQUIPMENTS LIST

2.4.1 CONDUCTED EMISSION

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	LISN	R&S	ENV216	101112	Aug. 05, 2017
2	LISN	R&S	ENV216	101113	Aug. 05, 2017
3	50Ω Terminator	N/A	N/A	N/A	Jul. 01, 2017
4	Test Cable	N/A	C01	N/A	Jul. 01, 2017
5	EMI Test Receiver	R&S	ESCI	100920	Aug. 04, 2017

2.4.2 RADIATED EMISSION（3M）

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	Schwarzbeck	CBL6141A	4180	Mar.17, 2017
2	Spectrum Analyzer	HP	8563E	02052	Mar.17, 2017
3	Horn Antenna	Schwarzbeck	BBHA 9120D	648	Mar.17, 2017
4	Test Cable	N/A	3M_C01	N/A	Jul. 01, 2017
5	Test Cable	N/A	3M-C02	N/A	Jul. 01, 2017
6	Pre-Amplifier	HP	8447D	1937A03050	Aug. 08, 2017
7	Pre-Amplifier	EMCI	EMC051835	980075	Aug. 05, 2017
8	EMI Test Receiver	R&S	ESCI	100658	Aug. 04, 2017
9	Antenna Mast	UC	UC3000	N/A	N/A
10	Turn Table	UC	UC3000	N/A	N/A

2.4.3 RADIATED EMISSION（10M）

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	R&S	HL562	100384	Mar.17, 2017
2	Test Cable	N/A	10M_C01	N/A	Jul. 01, 2017
3	Test Cable	N/A	10M-C02	N/A	Jul. 01, 2017
4	Pre-Amplifier	HP	8447D	1937A03050	Aug. 08, 2017
5	EMI Test Receiver	R&S	ESCI	100658	Aug. 04, 2017
6	Antenna Mast	FRANKONIA	FAM4	N/A	N/A
7	Turn Table	FRANKONIA	FC02	N/A	N/A

2.4.4 HARMONICS AND FLICK

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Harmonic & Flicker	CI	PACS-3	71906	May 19, 2017
2	Power Source	CI	5001ix-CTS-400	X71730	Feb. 21, 2017
3	Power Source	CI	5001ix-CTS-400-NO	55772	May 19, 2017
4	Power Source	CI	5001ix-CTS-400-NO	55773	May 19, 2017

2.4.5 ESD

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	ESD Simulator	EM TEST	DITO	N/A	Aug. 05, 2017

2.4.6 RS

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	INTEGRATED MEASUREMENT SYSTEM	R&S	IMS	100008	Mar.30, 2017
2	Antenna	R&S	HL046Z1	100063	Mar.17, 2017
3	Power Amplifier	BONN ELEKTRONIK	BLWA 0830-160/100/40D	076788	Apr.01.2017
4	Microwave Horn Antenna	ETS	HI-6005	00089587	Apr.01.2017

2.4.7 EFT/BURST

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Electrical fast transient generator	3ctest	EFT-4003G	EC0471140	Mar.17, 2017

2.4.8 SURGE

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Surge generator	3ctest	SG-5006G	EC5581149	May 14, 2017
2	Surge CDN	3ctest	SGN-20G	EC5551128	May 14, 2017

2.4.9 INJECTION CURRENT

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Signal Generator	IFR	2023A	202301/368	Mar. 31, 2017
2	Power Amplifier	AR	75A250AM1	0320709	Sep. 23, 2017
3	CDN	FCC	FCC-801-M2	06043	Jun. 02, 2017
4	EM Clamp	FCC	F-203I-23MM	504	Jun. 09, 2017

2.4.10 POWER FREQUENCY MAGNETIC FIELD

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Power frequency magnetic field generator	3ctest	PFMF-1200G	EC0111101	May 14, 2017

2.4.11 VOLTAGE INTERRUPTION/DIPS

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Voltage dips and up generator	3ctest	VDG-1105G	EC0171116	Mar.17, 2017

2.4.12 Magnetic Emission Test Equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	Mar.17, 2017
2	Triple Loop Antenna	Schwarzbeck	HXYZ9170	9124	Mar.17, 2017

3. EMC EMISSION TEST

3.2 RADIATED ELECTROMAGNTIC DISTURBANCES MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT (9KHz to 30MHz)

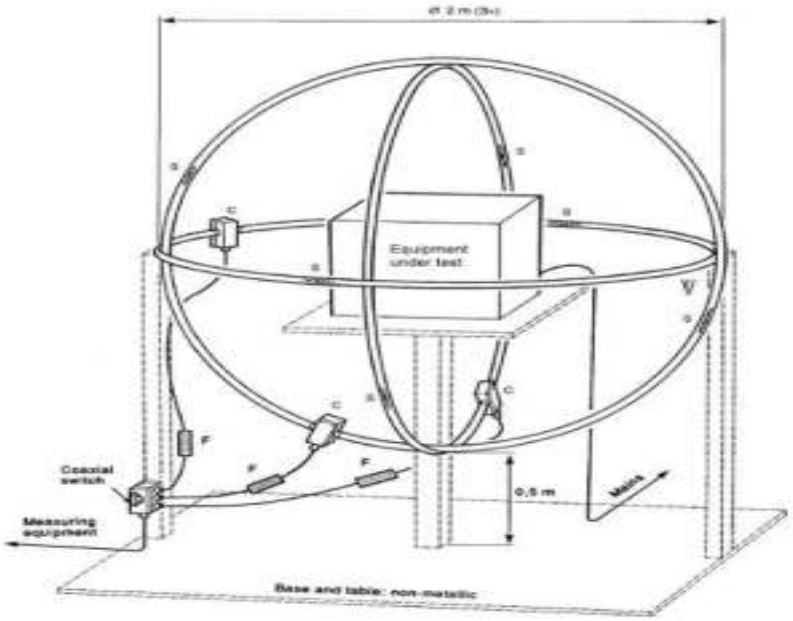
Frequency	☒ 2m	☐ 3m	☐ 4m
	dB(μA)	dB(μA)	dB(μA)
9 KHz~ 70 KHz	88	81	75
70 KHz ~ 150 KHz	88 to 58	81 to 51	75 to 45
150 KHz ~ 3 MHz	58 to 22	51 to 15	45 to 9
3 MHz ~ 30 MHz	22	15 to 16	9 to 12

Detector: Peak for pre-scan
Quasi-Peak if maximum peak within 6dB of limit

3.2.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.3 TEST SPECIFICATION



EUT was placed upon a wooden test table which was placed in the center of the test antenna, and operating in the mode as mentioned above. A receiver is used to detect the actual value of each frequency which need to be checked. All three field directions were measured in sequence.

3.2.4 MEASUREMENT DATA

An initial pre-scan was performed using the receiver in peak detection mode. The EUT was measured by 3 antenna position and peak emissions from the EUT were detected within 6dB of the class B limit line.
The following quasi-peak measurements were performed on the EUT.

3.3 RADIATED EMISSION MEASUREMENT

3.3.1 LIMITS OF RADIATED EMISSION MEASUREMENT (30 - 300MHz)

FREQUENCY (MHz)	10m	3m
	Quasi-peak dBuV/m	Quasi-peak dBuV/m
30 – 230	30	40
230 – 300	37	47

Notes:

(1) The limit for radiated test was performed according to as following: CISPR 15

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.3.2 TEST PROCEDURE

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 300MHz.

b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

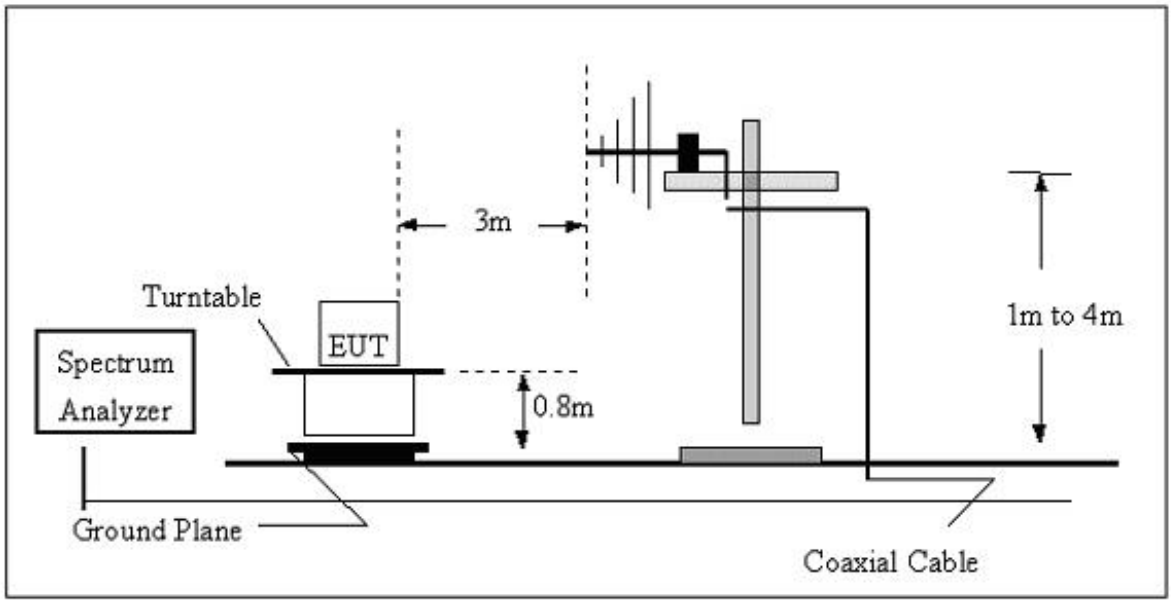
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.

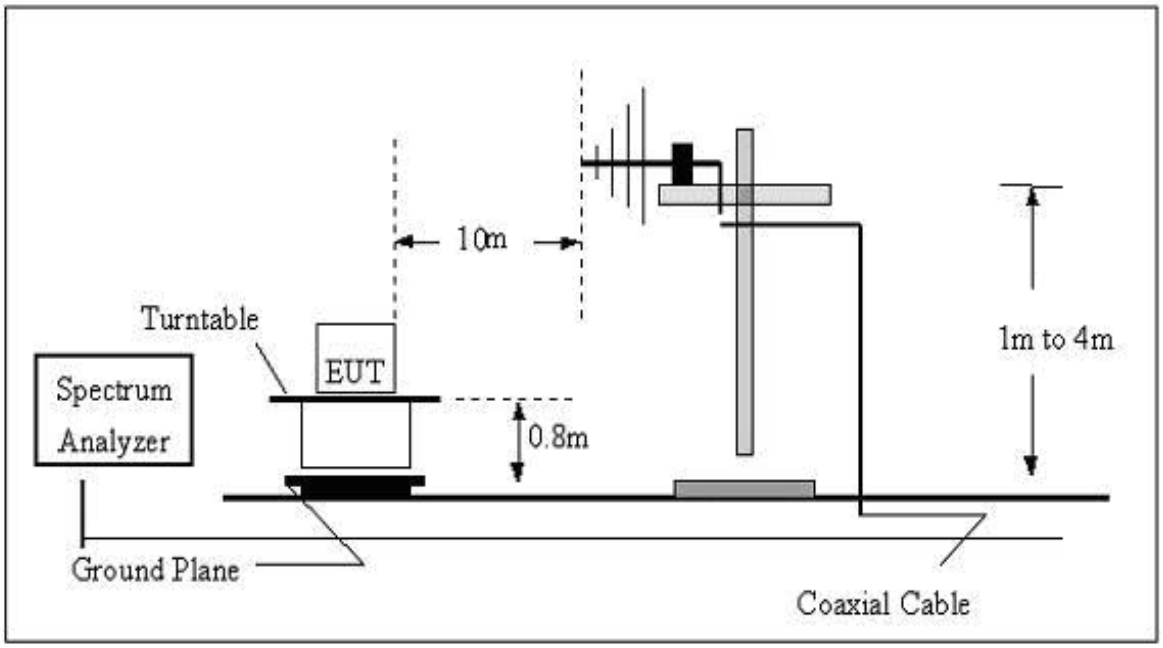
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3.3 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



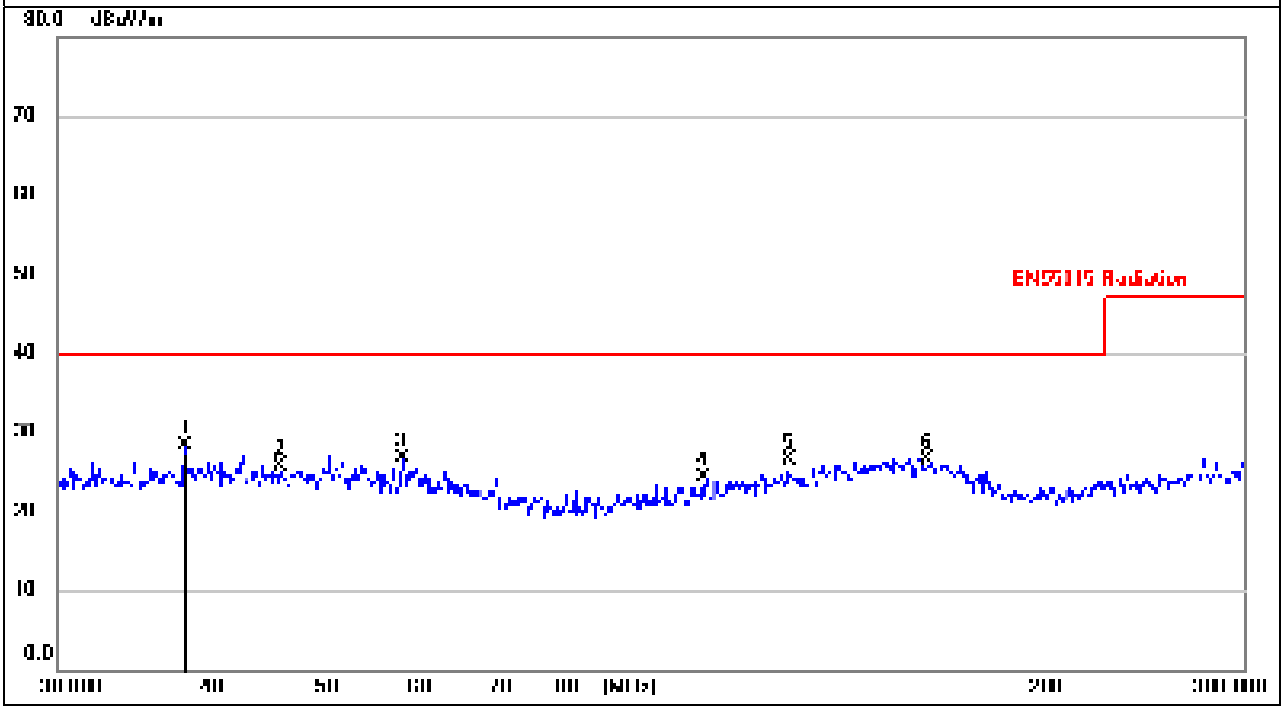
3.3.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.5 TEST RESULTS (30~300MHz)

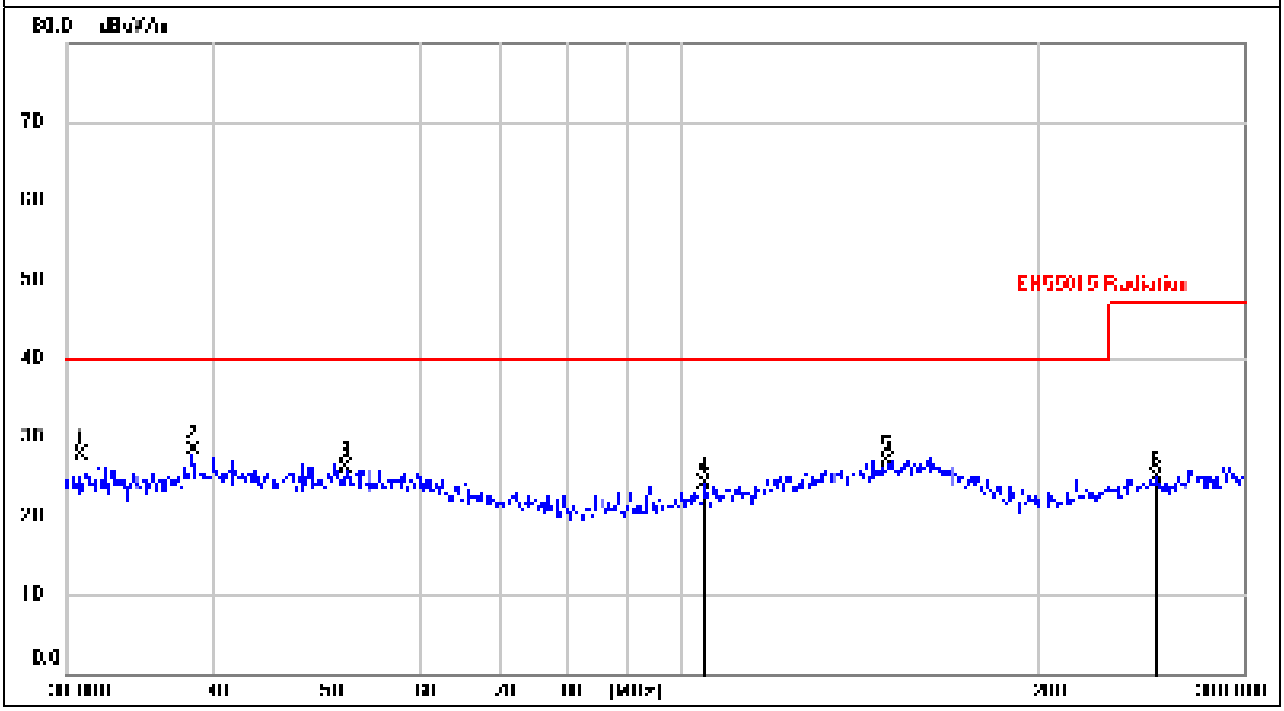
EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date：	2017-02-27
Test Mode ：	Running	Polarization：	Horizontal
Test Power ：	DC 4.2V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		cm	degree	
1	*	38.3814	14.41	13.96	28.37	40.00	-11.63	peak			
2		48.1446	11.97	13.69	25.66	40.00	-14.34	peak			
3		58.1953	13.67	13.10	26.77	40.00	-13.23	peak			
4		104.9035	13.21	11.08	24.27	40.00	-15.73	peak			
5		123.9143	13.75	12.85	26.60	40.00	-13.40	peak			
6		162.6003	12.16	14.37	26.53	40.00	-13.47	peak			



EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date：	2017-02-27
Test Mode ：	Running	Polarization：	Vertical
Test Power ：	DC 4.2V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		30.9116	14.39	13.34	27.73	40.00	-12.27	peak			
2	*	38.3811	14.25	13.96	28.21	40.00	-11.79	peak			
3		51.6581	12.54	13.62	26.16	40.00	-13.84	peak			
4		101.2607	13.11	11.00	24.11	40.00	-15.89	peak			
5		149.3211	12.46	14.51	26.97	40.00	-13.03	peak			
6		251.9300	12.67	12.11	24.98	47.00	-22.02	peak			



3.4 HARMONICS CURRENT

3.4.1 LIMITS OF HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Ampers)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Ampers)
	Odd Harmonics			Odd Harmonics	
Non Portable Tools or TV Receivers	3	2.30	TV Receivers	3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
	4	0.43		4	0.15
	8	0.30			
	8≤n≤40	0.23 · 8/n		DC	0.05

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Ampers)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A)	(mA/W)
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13<n<39	see Table II	3.85/n
			only odd harmonics required		

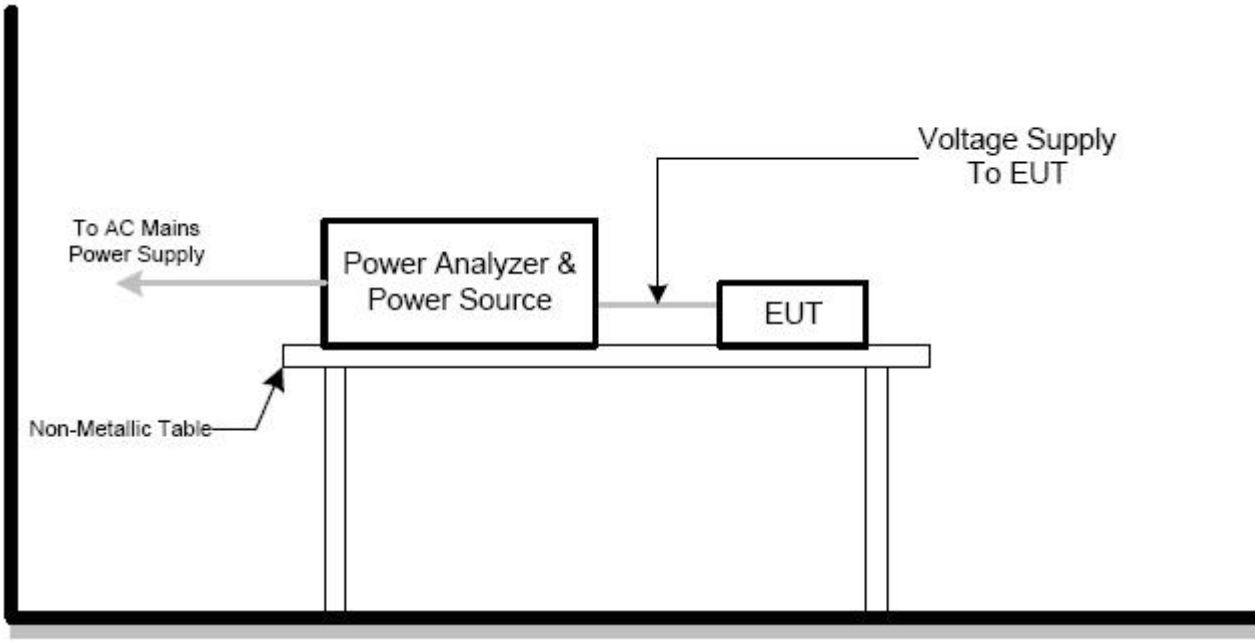
3.4.2 TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.
b. The classification of EUT is according to section 5 of EN 61000-3-2: 2009.The EUT is classified as follows:
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.
Class C: Lighting equipment.
Class D: Equipment having a specified power less than or equal to600 W of the following types: Personal computers and personal computer monitors and television receivers.
c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

3.4.3 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.4.4 TEST SETUP



3.4.5 TEST RESULTS

Pass

3.5 VOLTAGE FLUCTUATION AND FLICKERS

3.5.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0, Tp= 10 min.	≤ 1.0, Tp= 10 min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65, Tp=2 hr.	Long Term Flicker Indicator
dc	≤ 3%	≤ 3.3%	Relative Steady-State V-Chang
dmax	≤ 4%	≤ 4%	Maximum Relative V-change
d (t)	N/A	≤ 3.3% for > 500 ms	Relative V-change characteristic

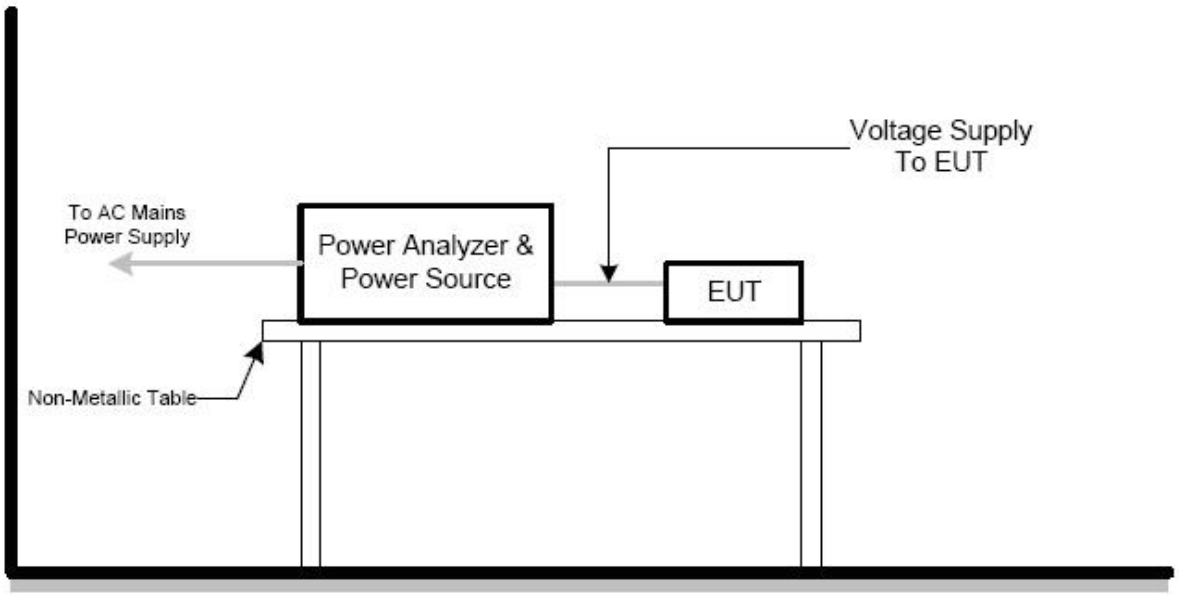
3.5.2 TEST PROCEDURE

a. Harmonic Current Test:
Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.
b. Fluctuation and Flickers Test:
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.
c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

3.5.3 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.5.4 TEST SETUP



3.5.5 TEST RESULTS

PASS

4. EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/SERVRITY LEVEL/CRITERIA

Tests Standard No.	TEST SPECIFICATION Level	Test Mode Test Ports	Perform. Criteria	Remark
1. ESD IEC/EN 61000-4-2	8KV air discharge 4KV contact discharge	Direct Mode	B	
	4KV HCP discharge 4KV VCP discharge	Indirect Mode	B	
2. RS IEC/EN 61000-4-3	80 MHz to 1000 MHz 3V/m(rms), 1000Hz, 80%, AM modulated	Enclosure	A	
3. EFT/Burst IEC/EN 61000-4-4	1.0KV(peak) 5/50ns Tr/Th 5KHz Repetition Freq.	Power Supply Port	B	
	0.5 KV(peak) 5/50ns Tr/Th 5KHz Repetition Freq.	CTL/Signal Data Line Port	B	N/A
4. Surges IEC/EN 61000-4-5	0.5 KV(5P/5N) 1.2/50(8/20) Tr/Th us	L-N	B	
	1 KV(5P/5N) 1.2/50(8/20) Tr/Th us	L-PE N-PE	B	
5 Injected Current IEC/EN 61000-4-6	0.15 MHz to 80 MHz 3V(rms), 1000Hz 80% , AM Modulated 150Ω source impedance	CTL/Signal Port	A	N/A
	0.15 MHz to 80 MHz 3V(rms), 1000Hz 80% , AM Modulated 150Ω source impedance	AC Power Port	A	
	0.15 MHz to 80 MHz 3V(rms), 1000Hz 80% , AM Modulated 150Ω source impedance	DC Power Port	A	N/A
6. Power Frequency Magnetic Field IEC/EN 61000-4-8	50,60 Hz, 3A/m	Enclosure	A	
7. Volt. Interruptions Volt. Dips IEC/EN 61000-4-11	Voltage dip 70% Interruption 0%	AC Power Port	C B	

* Remark:

N/A : denotes test is not applicable in this Test Report

(1) : The EUT is a battery operating device and no any other cable connection to PC device.

(2) : Applicable only to cables which according to the manufacturer's specification supports communication on cables lengths greater than 3 m.

(3) : Applicable only to equipment containing devices susceptible to magnetic fields

4.2 GENERAL PERFORMANCE CRITERIA

According to **EN 55015** standard, the general performance criteria as following:

Criterion A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion B	After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

4.3 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

4.4 ESD TESTING

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV (Direct) Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode:	Air and Contact
Discharge Period:	1 second minimum

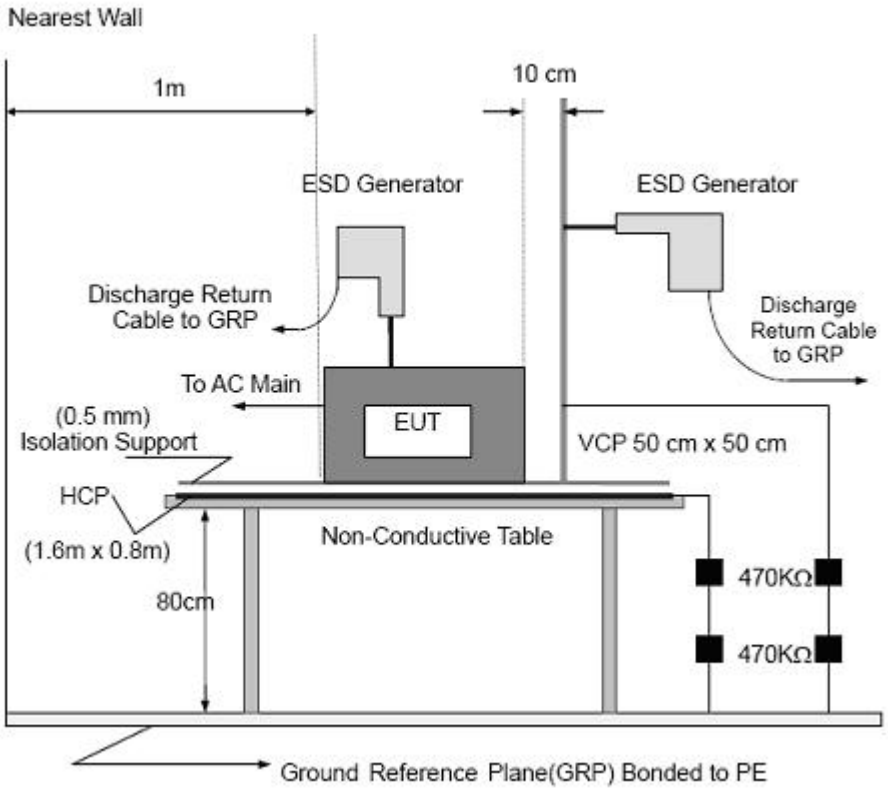
4.4.2 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT.
During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.
If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.

4.4.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.4.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date：	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

Table 1: Electrostatic Discharge Immunity (Air Discharge)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
enclosure	A	A	A	A	A	A	A	A		
slit	A	A	A	A	A	A	A	A		

Table 2: Electrostatic Discharge Immunity (Indirect Contact HCP)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
Front Side	A	A	A	A						
Top Side	A	A	A	A						
Back Side	A	A	A	A						
Left Side	A	A	A	A						
Right Side	A	A	A	A						

Table 3: Electrostatic Discharge Immunity (Indirect Contact VCP)

EN 61000-4-2 Test Points	Test Levels (kV)									
	-2	+2	-4	+4	-6	+6	-8	+8	-15	+15
Front Side	A	A	A	A						
Top Side	A	A	A	A						
Back Side	A	A	A	A						
Left Side	A	A	A	A						
Right Side	A	A	A	A						

Test Result: Pass

4.5 RS TESTING

4.5.1 TEST SPECIFICATION

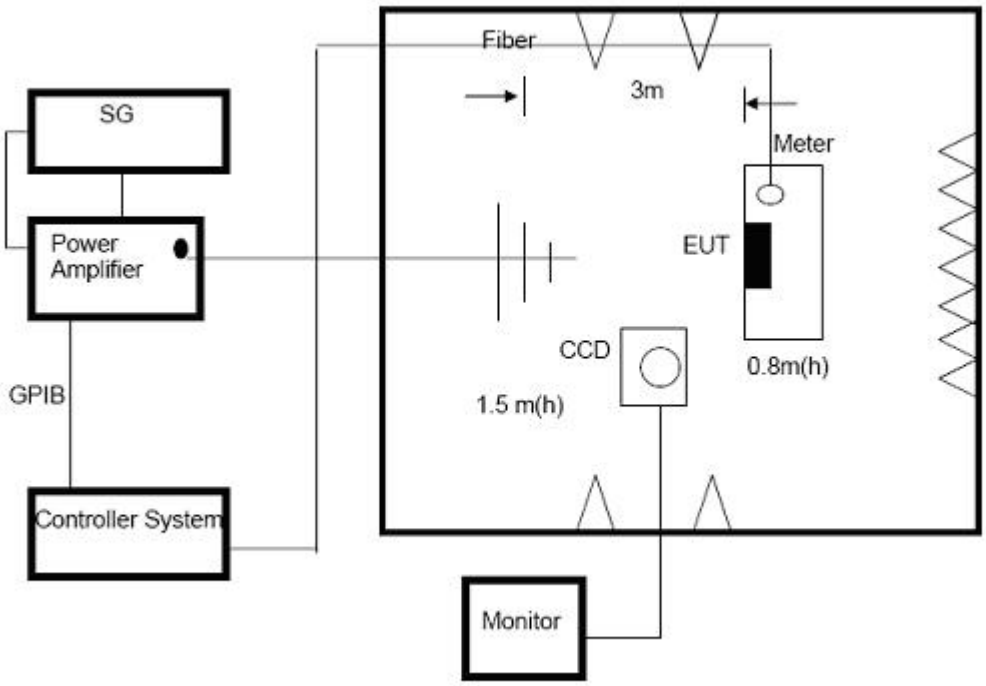
Basic Standard:	IEC/EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

4.5.2 TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.
The testing distance from antenna to the EUT was 3 meters.
The other condition as following manner:

a. The field strength level was 3V/m.
b. The frequency range is swept from 80 MHz to 1000 MHz, & 1400MHz - 2700MHz with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
c. Sweep Frequency 900 MHz, with the Duty Cycle:1/8 and Modulation: Pulse 217 Hz(if applicable)
d. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.5.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

4.5.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date :	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Perform. Criteria	Results	
80MHz - 1000MHz	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	**A**	**A**	**PASS**
			Rear			
			Left			
			Right			

Note:

1) P/N denotes the Positive/Negative polarity of the output voltage.
2) N/A - denotes test is not applicable in this test report.
3) Criteria A: There was no change operated with initial operating during the test.
4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
5) Criteria C: The system shut down during the test.

4.6 EFT/BURST TESTING

4.6.1 TEST SPECIFICATION

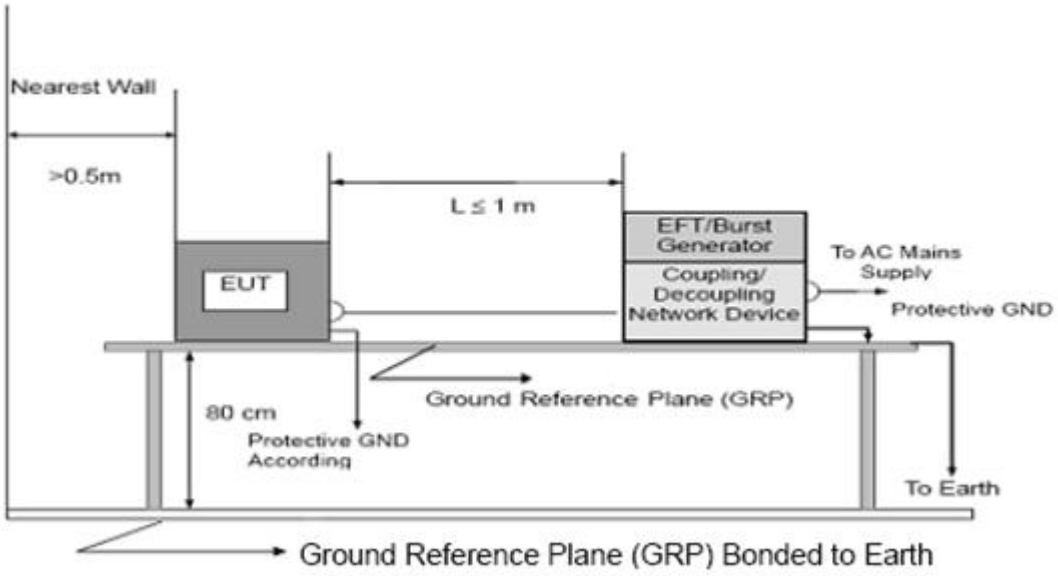
Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line: 1 kV Signal/Control Line: 0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

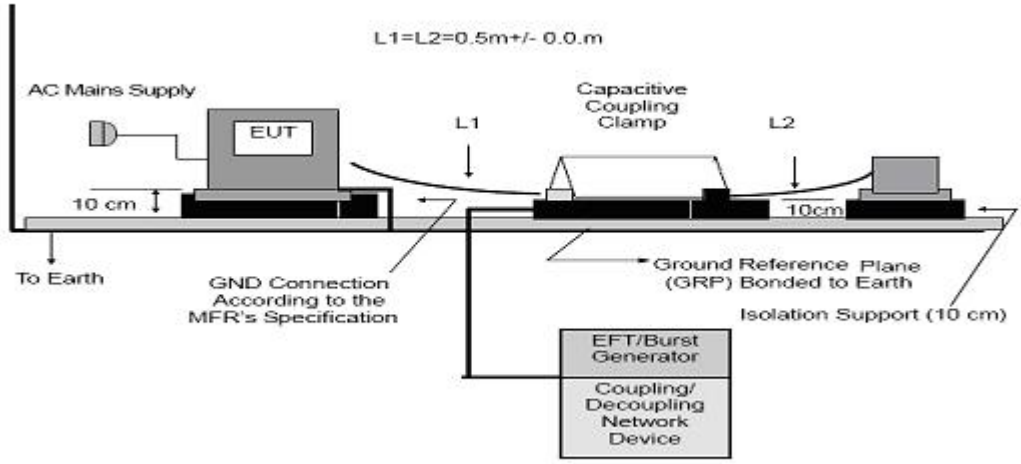
4.6.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

a. The length of power cord between the coupling device and the EUT should not exceed 1 meter.
b. Both positive and negative polarity discharges were applied.
c. The duration time of each test sequential was 1 minute

4.6.3 TEST SETUP





Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

4.6.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date :	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

Mode	(■) AC Power Line		( ) DC Power Line		( ) Signal/Control Line	
Test Level	1KV		0.5KV		0.5KV	
Port(s)	Polarity	Results	Polarity	Results	Polarity	Results
Line (L)	P	A	P		P	
	N	A	N		N	
Neutral (N)	P	A	P		P	
	N	A	N		N	
L-N	P	A	P		P	
	N	A	N		N	
Signal/Control Line	P		P		P	
	N		N		N	
Criteria	**B**		**B**		**B**	
Result	**A**		**N/A**		**N/A**	
	PASS		**N/A**		**N/A**	

Note:

1) P/N denotes the Positive/Negative polarity of the output voltage.

2) N/A - denotes test is not applicable in this test report

3) Criteria A: There was no change operated with initial operating during the test.

4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.

5) Criteria C: The system shut down during the test.

4.7 SURGE TESTING

4.7.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line：0.5 kV, 1 kV
Surge Input / Output:	L-N, L-PE, N-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

4.7.2 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

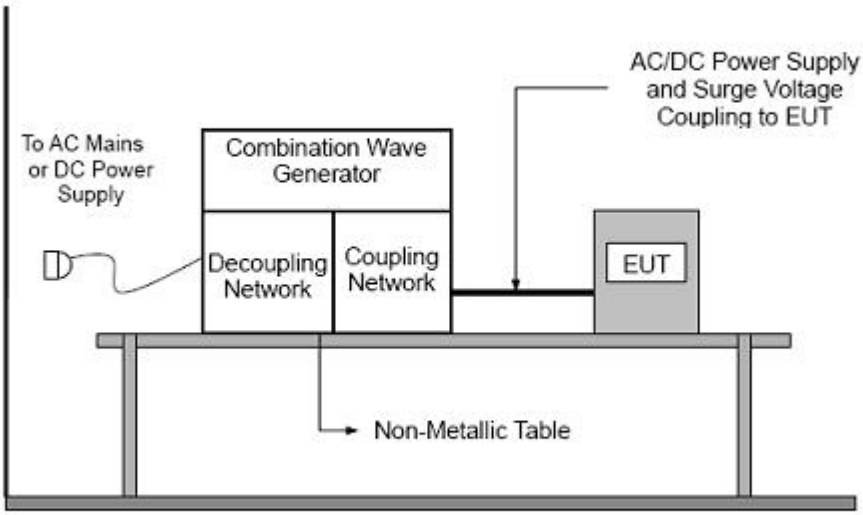
b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

4.7.3 TEST SETUP



4.7.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date :	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

Wave Form / EUT Ports Tested	1.2/50(8/20)Ti/Th us						Criteria	Result
	Polarity	Phase	Voltage					
			0.5kV	1kV	1.5kV	2kV		
L - N	+/-	0°	A				**B**	**PASS**
	+/-	90°	A					
	+/-	180°	A					
	+/-	270°	A					
L - PE	+/-	0°	A	A	N/A	N/A	**B**	**PASS**
	+/-	90°	A	A	N/A	N/A		
	+/-	180°	A	A	N/A	N/A		
	+/-	270°	A	A	N/A	N/A		
N - PE	+/-	0°	A	A	N/A	N/A	**B**	**PASS**
	+/-	90°	A	A	N/A	N/A		
	+/-	180°	A	A	N/A	N/A		
	+/-	270°	A	A	N/A	N/A		
Signal Line	+/-	N/A	N/A	N/A	N/A	N/A	**N/A**	**N/A**

Note:

1) Polarity and Numbers of Impulses：5 Pst / Ngt at each tested mode
2) N/A - denotes test is not applicable in this Test Report
3) Criteria A: There was no change operated with initial operating during the test.
4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
5) Criteria C: The system shut down during the test.

4.8 INJECTION CURRENT TESTING

4.8.1 TEST SPECIFICATION

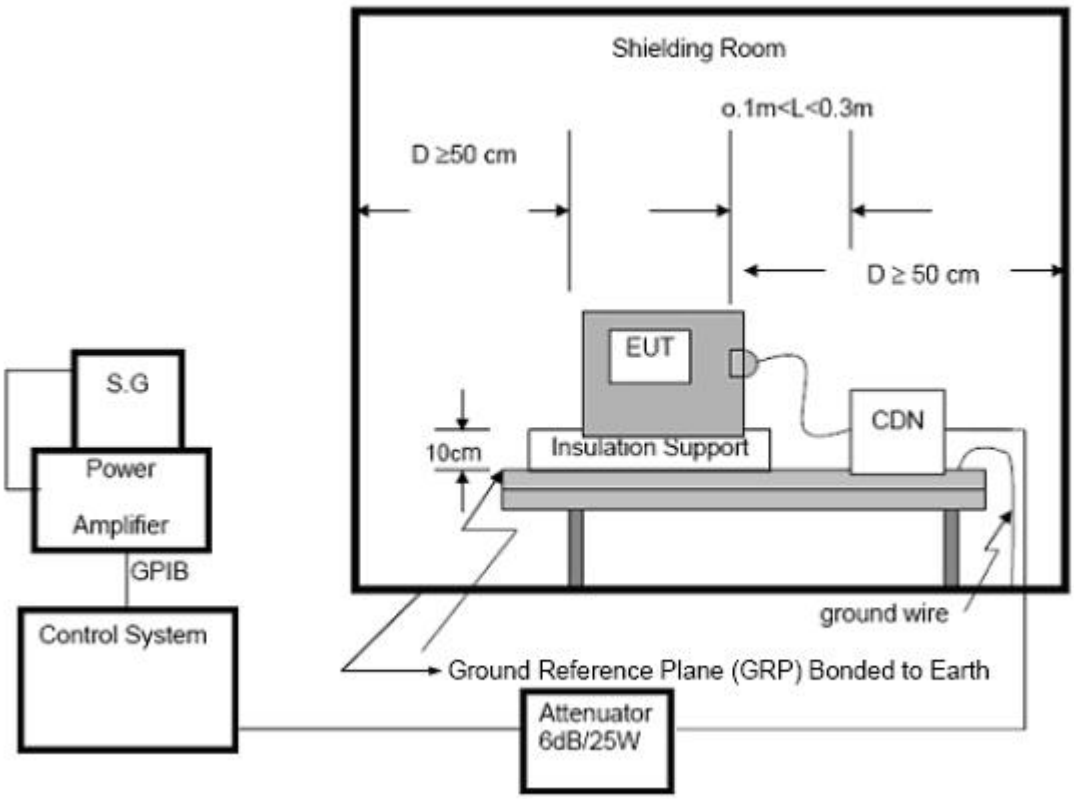
Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

4.8.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

a. The field strength level was 3V.
b. The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

4.8.3 TEST SETUP



NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.8.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date :	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

Test Ports (Mode)	Freq. Range MHz)	Field Strength	Perform. Criteria	Results	Judgment
Input/ Output AC. Power Port	0.15 ---80	3V(rms) AM Modulated 1000Hz, 80%	**A**	**A**	**PASS**
Input/ Output DC. Power Port	0.15 --- 80		**N/A**	**N/A**	**N/A**
Signal Line	0.15 --- 80		**N/A**	**N/A**	**N/A**

Note:

1) N/A - denotes test is not applicable in this Test Report.
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

4.9 POWER FREQUENCY MAGNETIC FIELD TESTING

4.9.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-8
Required Performance	A
Frequency Range:	50,60Hz
Field Strength:	3 A/m
Observation Time:	5 minute
Inductance Coil:	Rectangular type, 1mx1m

4.9.2 TEST PROCEDURE

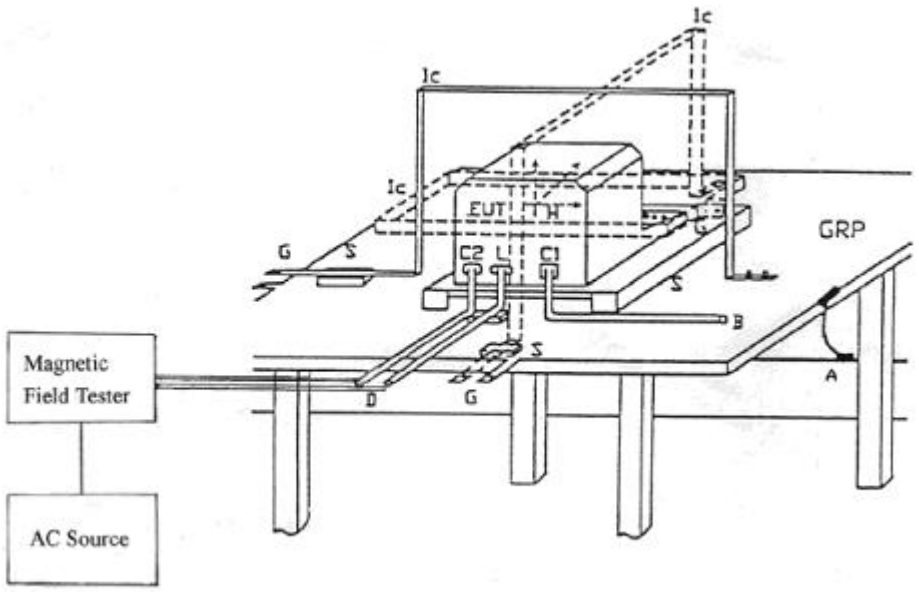
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

a. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.

b. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

4.9.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

4.9.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date :	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

Test Mode	Test Level	Antenna aspect	Duration (s)	Perform Criteria	Results	Judgment
Enclosure	3 A/m	X	300 s	**A**	**A**	**Pass**
Enclosure	3 A/m	Y	300 s	**A**	**A**	**Pass**
Enclosure	3 A/m	Z	300 s	**A**	**A**	**Pass**

Note:

1) N/A - denotes test is not applicable in this test report
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

4.10 VOLTAGE INTERRUPTION/DIPS TESTING

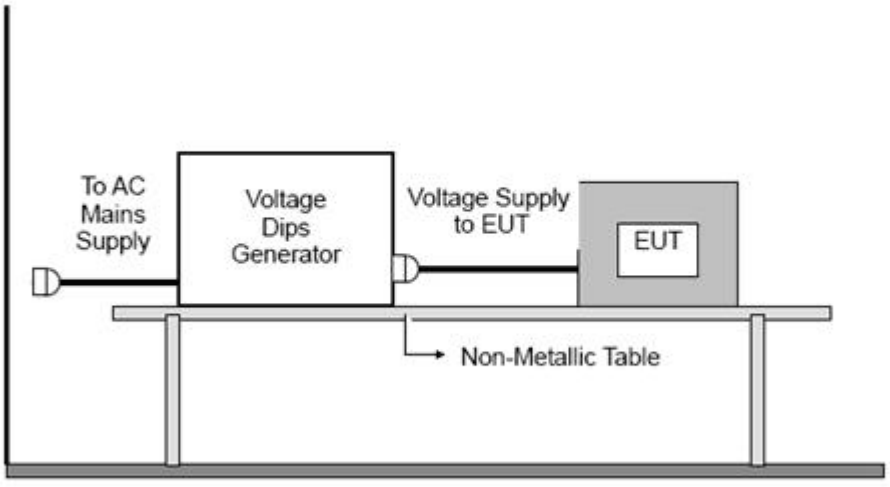
4.10.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance	C (For 70% Voltage Dips) B (For 0% Voltage Interruptions)
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

4.10.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.10.3 TEST SETUP



4.10.4 TEST RESULTS

EUT：	Headlamp	Model Name. ：	HP12
Temperature：	22 ℃	Relative Humidity：	54%
Pressure：	101 Kpa	Test Date :	2017-02-27
Test Mode ：	Running		
Test Power ：	DC 4.2V		

DC 4.2V				
Voltage Reduction	Duration (ms)	Perform Criteria	Results	Judgment
Voltage dip 70%	200	**C**	**B**	**PASS**
Voltage dip 0%	10	**B**	**B**	**PASS**

Note:

1). N/A - denotes test is not applicable in this test report.
2) Criteria A: There was no change operated with initial operating during the test.
3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
4) Criteria C: The system shut down during the test.

5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Radiated Measurement Photos

6. ATTACHMENT PHOTOGRAPHS OF EUT

Photo 1

Photo 2

Photo 3

Photo 4

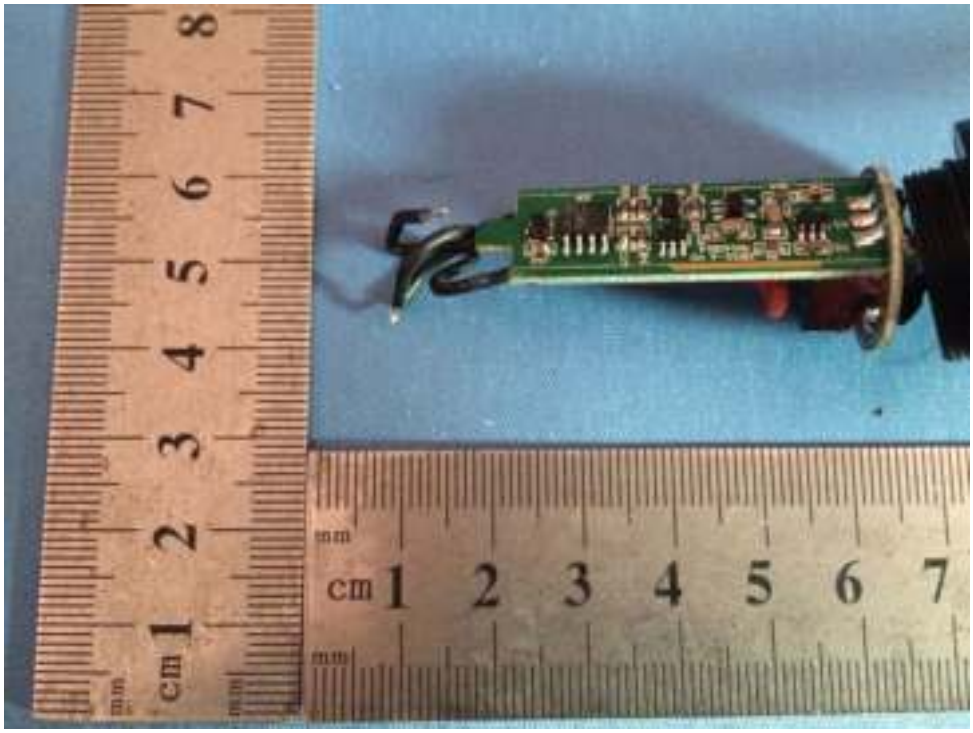


Photo 5

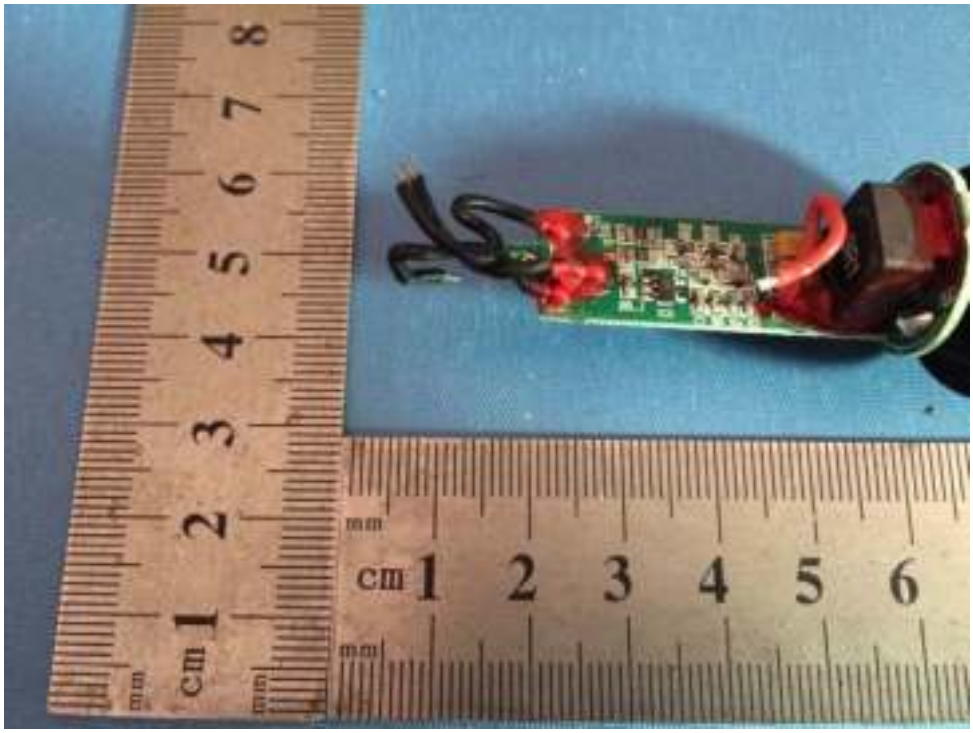
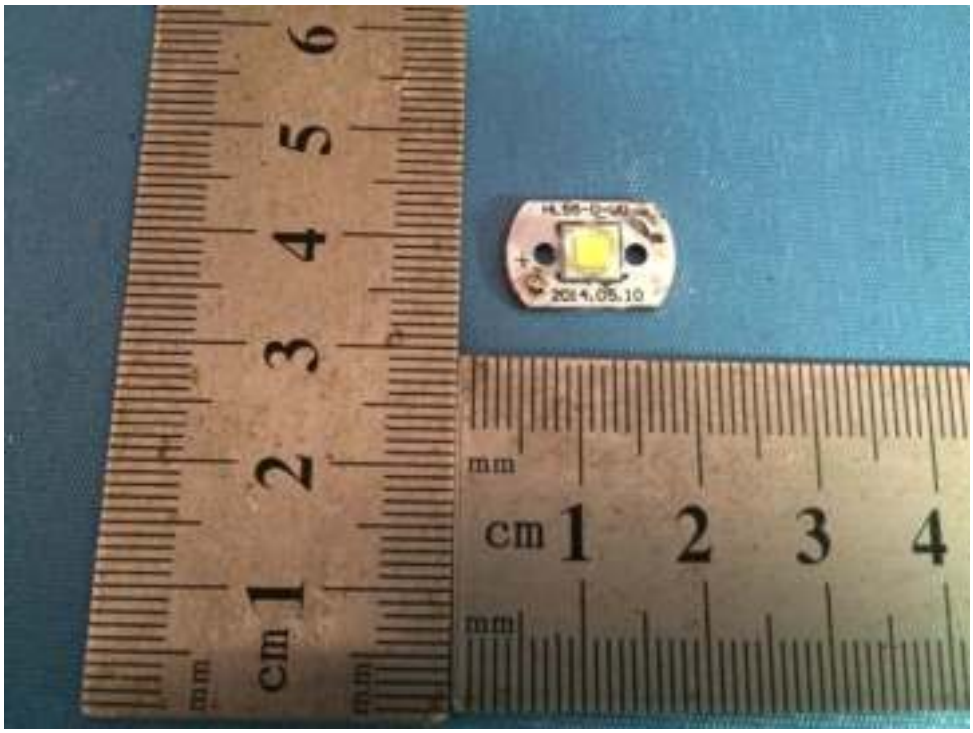


Photo 6



---The End---