TEST REPORT
IEC 60825-1
Safety of laser products
Part 1: Equipment classification and requirements

Report reference No. .....:	611061822501	
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Date of issue .....:	2018-10-05	
Testing Laboratory name.....:	TÜV SÜD Asia Ltd. Taiwan Branch	
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Testing location.....:	TÜV SÜD Asia Ltd. Taiwan Branch	
Applicant's name .....:	Ultimems, Inc.	
Address.....:	11F., No.213, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan (R.O.C.)	
Test specification:		
Standard .....:	IEC 60825-1:2014 (Third Edition) EN 60825-1:2014	
Test procedure .....:	N/A	
Non-standard test method .....:	N/A	
Test Report Form No......:	IEC60825_1E	
TRF originator .....:	ÖVE, modified by TÜV PS to IEC TRF	
Master TRF .....:	Dated 2014-07	

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Test item description .....:	Laser Scanning Projection Module
Trade mark .....:	**ANYBEAM**
Manufacturer.....:	Ultimems, Inc.
Model and/or type reference.....:	HD301
Ratings.....:	4.75 – 5.25 Vdc, Max. 3.5 W
Test item particulars:	
Classification of installation and use.....:	**movable** / stationary / fixed / permanent connection / for building-in
Supply Connection.....:	Class I / Class II / **Class III**
Possible test case verdicts:	
Test case does not apply to the test object ... :	N/A
Test object does meet the requirement ..... :	P (Pass)
Test object does not meet the requirement ... :	F (Fail)
Testing:	
Date of receipt of test item ..... :	2018-09-18
Date(s) of performance of tests ..... :	2018-09-21

General remarks:

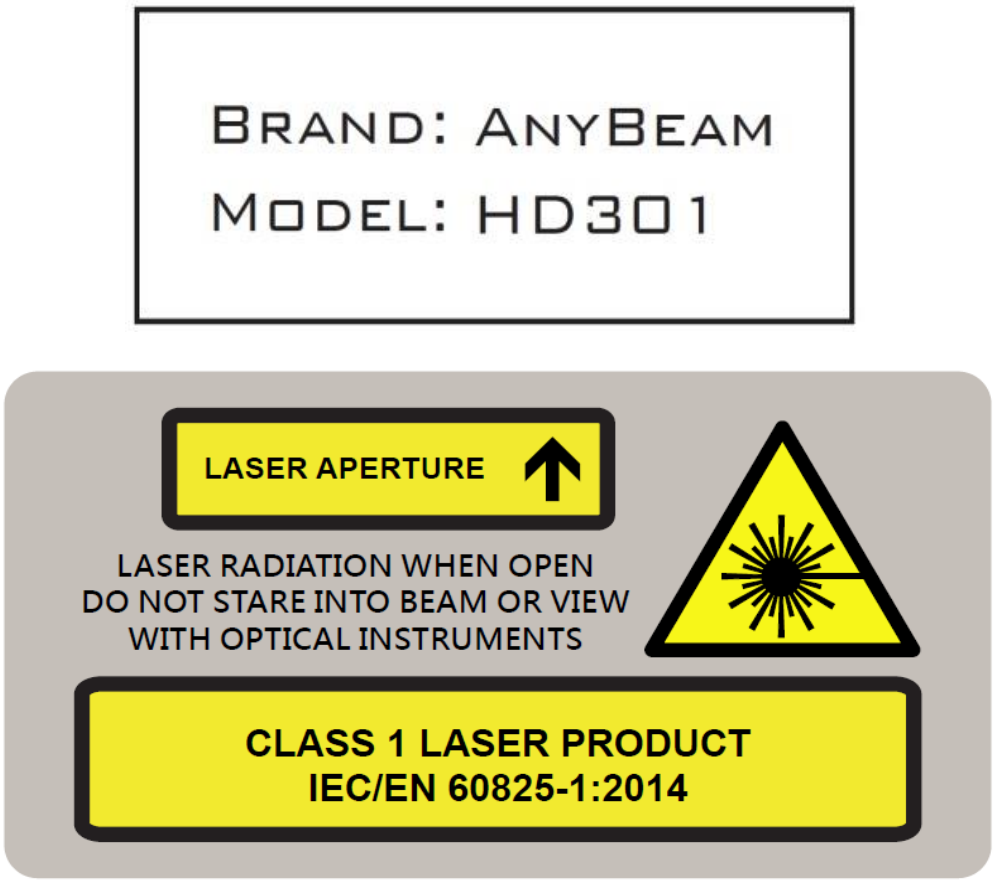
This report shall not be reproduced except in full without the written approval of the testing laboratory.
The test results presented in this report relate only to the object tested.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
Throughout this report a point is used as the decimal separator.
List of test equipment must be kept on file and available for review.

This report contains a total of 14 pages.

General product information:

The equipment is a Laser Scanning Projection Module as information technology equipment.
This laser product is designed as Class 1 during all process of operation.

Copy of the Marking Plate and Warning Labels:



Summary of testing:

The product was complied with the requirements of CLASS 1 LASER PRODUCT as specified in IEC 60825-1:2014.

The L_T measurement (Laser products designed to function as conventional lamps): See “Appendix 1: Test result”

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Clause	Requirement + Test	Result - Remark	Verdict

4	**CLASSIFICATION PRINCIPLES**		
4.3	Classification rules		---
4.3 a	Radiation of a single wavelength		N/A
4.3 b	Radiation of multiple wavelengths	Visible radiation	P
	1) Laser product emits at two or more wavelengths shown as additive in Table 1	400 nm to 700 nm	P
	2) Laser product emits at two or more wavelengths not shown as additive in Table 1		N/A
4.3 c	Radiation from extended sources (see 5.4.3)	The angular subtense of the source is greater than α_{min}	P
4.3 d	Non-uniform, non-circular or multiple apparent source		N/A
4.3 e	Time bases		---
	1) 0,25 s		N/A
	2) 100 s	Applicable time base	P
	3) 30000 s		N/A
4.3 f	Repetitively pulsed or modulated lasers		N/A
	1) Any single pulse		N/A
	2) Average power for pulse trains		N/A
	3) Pulse duration $t \leq T_i$ ..... : Number of pulses N and C_5 ..... :		N/A
	3) Pulse duration $t > T_i$ ..... : Number of pulses N and C_5 ..... :		N/A
4.4	Laser products designed to function as conventional lamps.	Laser projector	P
	α measured at 200 mm distance from closest point of human access (α > 5 mrad).	α= 55 mrad.	P
	Un-weighted radiance L measured at 200 mm distance (comparison with L_T = 1 $MWm^{-2}sr^{-1}/\alpha$) under reasonably foreseeable single fault conditions.	See “Appendix 1: Test result”	P
	Evaluation of emission according to IEC 62471 series (optional): Standard applied (IEC 62471 series)……,…..... : Risk Group……..…….. ….. : Labelling……..... : Classification of product based on accessible laser radiation (if no laser radiation accessible: Class 1).	This product complies with applicable requirements of IEC 62471-5 Lamp classification: Exempt Group Labelling: See the IEC 62471-5 Class 1 Laser product	P

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5	**DETERMINATION OF THE ACCESSIBLE EMISSION LEVEL and PRODUCT CLASSIFICATION**		
5.1	Tests	The laser emission level does not exceed the Class 1 AEL under all condition of operation, maintenance, service, single fault and leakage radiation	---
	Compliance under reasonably foreseeable single fault conditions.	No access to laser radiation in excess of Class 1	P
5.3	Determination of the class of the laser product ... : For Class 1C: vertical safety standard applied with requirements for Class 1C.		---
5.4	Measurement geometry		---
5.4.1	General	No human access to laser radiation in excess of Class 1	---
5.4.2	Default (simplified) evaluation	See “Appendix 1”	P
	Conditions applied ..... :		N/A
	Aperture diameter ..... :		N/A
	Reference point : ..... :		N/A
	Measurement distance ..... : (for each condition)		N/A
5.4.3	Evaluation condition for extended sources		N/A
	Conditions applied ..... :		N/A
	Most restrictive position ..... : (distance from reference point)		N/A
	Angular subtense of the apparent source α and C_6: (for each condition)		N/A
5.4.3 a	Aperture diameters (for each condition). ..... :		N/A
5.4.3 b	Angle of acceptance (for each condition)……..:		N/A

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6	**ENGINEERING SPECIFICATIONS**		
6.2	Protective housing		---
6.2.1	General		---
	Protective housing prevents access to energy levels in excess of the AEL for Class 1.	No access to laser radiation in excess of Class 1	P
	Protective housing prevents access to energy levels equivalent to Class 4 and withstands exposures under reasonably foreseeable single fault conditions.		N/A
	Maintenance of Class 1, 1C, 1M, 2, 2M, or 3R (access to emissions of Class 3B or 4 is prevented).		N/A
	Maintenance of Class 3B product (access to emission of Class 4 is prevented).		N/A
6.2.2	Service	No access to laser radiation in excess of Class 1	N/A
6.2.3	Removable laser system (laser system complies with requirements of Clauses 6 and 7).	No removable laser system	N/A
6.3	Access panels and safety interlocks		---
6.3.1	Panel is intended to be removed during operation (or maintenance) and would give access to higher energy levels (see Table 13).	No human access to laser radiation in excess of Class 1	N/A
	Accessible emission (after removal of the panel) corresponds to product Class (designated by “X” in Table 13)		N/A
	Emission through the opening if interlocked panel of Class 1, 1C, 1M, 2, or 2M is removed (Emission < AEL of Class 1M or 2M).		N/A
	Emission through the opening if interlocked panel of Class 3R, 3B, or 4 is removed (Emission < AEL of Class 3R).		N/A
	Requirements regarding reasonably foreseeable single fault condition.	Laser Class 1	N/A
6.3.2	Override mechanism		N/A
	Behaviour of override in operation when the panel is replaced.		N/A
	Visible or audible warning for override mode.		N/A
6.4	Remote interlock connector		N/A
6.5	Manual reset		N/A
6.6	Key control		N/A

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6.7	Laser radiation emission warning		---
6.7.1	Laser product is a 3R (λ<400 nm; λ>700 nm), 1C, 3B or 4 laser systems.	Class 1 laser product	N/A
6.7.2	Audible or visible warning.		N/A
	Warning is failsafe or redundant.		N/A
	Viewing of the visible warning does not require exposure to emissions > AEL for Class 1M and 2M.		N/A
6.7.3	Operational control and laser aperture are provided with a warning device when they are separated more than 2 m from warning device.		N/A
6.7.4	Visible indication of output aperture if laser emission may be distributed through more than one output.		N/A
6.7.5	Switch for handheld Class 3R device must be depressed for emission (in lieu of emission indicator).		N/A
6.8	Beam stop or attenuator		N/A
6.9	Controls	No human access to laser radiation in excess of Class 1	P
6.10	Viewing optics	Laser Class 1	N/A
	a) Human access to laser radiation in excess of Class 1M prevented when the shutter is opened or attenuation varied.		N/A
	b) Opening of the shutter or variation of the attenuation prevented when exposure to laser radiation in excess of Class 1M is possible.		N/A
6.11	Scanning safeguard		N/A
6.12	Safeguard for Class 1C products		N/A
	a) Human access to laser radiation in excess of AEL for Class 1 measured under Condition 3 is prevented.		N/A
	b) Human access to laser radiation in excess of AEL for Class 3B measured through 3,5 mm aperture at 5 mm distance from applicator is prevented.		N/A
6.13	Walk-in access		N/A
	a) Means provided so that any person inside the housing can prevent activation of Class 3B or 4 laser hazards.	Walk-in access not applicable	N/A
	b) A warning device provides adequate warning of emission to any person within the housing.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	c) Where “walk-in” access during operation is intended or reasonably foreseeable, emission of laser radiation that is equivalent to Class 3B or 4 while someone is present inside the enclosure of Class 1, Class 2 or Class 3R product is prevented by engineering means.		N/A
6.14	Environmental conditions		---
	- climatic conditions		P
	- vibration and shock		N/A
6.15	Protection against other hazards		---
6.15.1	Non-optical hazards (product safety standard)	This report covers laser radiation hazards only	N/A
	- electrical hazards;		N/A
	- excessive temperature;		N/A
	- spread of fire from the equipment;		N/A
	- sound and ultrasonics;		N/A
	- harmful substances;		N/A
	- explosion;		N/A
6.15.2	Collateral radiation		N/A
6.16	Power limiting circuit		N/A

7	**LABELLING**		
7.1	General		---
	Labels durable, permanently affixed	CLASS 1 LASER PRODUCT	P
	Labels clearly visible	CLASS 1 LASER PRODUCT	P
	Reading of labels is possible without exposure to laser radiation in excess of AEL for Class 1.	CLASS 1 LASER PRODUCT	P
	Colour combination		P
	Labelling impractical due to the size or design of the product.		P
	Warning label – Hazard symbol (Figure 3)		P
7.2 - 7.7	Text on explanatory label or pictogram (laser class, warning text)	CLASS 1 LASER PRODUCT	P
7.8	Aperture label	Laser Aperture	P
7.9	Radiation output and standards information		---
	Max output of laser radiation .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Pulse duration .....:		N/A
	Emitted wavelength(s) .....:		N/A
	Name and publication date of the standard.....:	IEC/EN 60825-1:2014	N/A
7.10	Labels for access panels		---
7.10.1 a) – f)	Labels for panels - warning wording used .....:		N/A
7.10.2	Labels for safety interlocked panels - Warning wording used .....:		N/A
7.11	Warning for invisible laser radiation .....:		N/A
7.12	Warning for visible laser radiation .....:	Visible laser radiation	N/A
7.13	Warning for potential hazard to the skin or anterior parts of the eye - warning wording used.....:		N/A
8	**OTHER INFORMATIONAL REQUIREMENTS**		
8.1	Information for the user		---
	a) adequate instructions for assembly, maintenance and safe use and description of the classification limitations, if appropriate.	user instructions or an operation manual that contains all relevant safety information	P
	b) additional warning for Class 1M and 2M		N/A
	c) laser beam parameters for radiation above the AEL of Class 1	CLASS 1	---
	• Wavelength .....:		N/A
	• Beam divergence .....:		N/A
	• Pulse pattern .....: (pulse duration, repetition rate, …)		N/A
	• Maximum power or energy output .....:		N/A
	d) safety instruction for embedded laser products and other incorporated laser products.	Class 1 laser product employing internal class 3B laser diode	P
	e) MPE and NOHD for Class 3B and 4 laser products; For collimated beam Class 1M and 2M lasers the extended NOHD (ENOHD).		N/A
	f) information for the selection of eye protection.		N/A
	g) reproduction of all required labels and warnings.	Spec. sheet	P
	h) location of laser apertures	Spec. sheet	P

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Clause	Requirement + Test	Result - Remark	Verdict
	i) list of controls, adjustments of procedures for operation and maintenance - and warning statement.		N/A
	j) information (compatibility requirements) about laser energy source if not incorporated.		N/A
	k) additional warning for Class 1, 1M, 2, 2M, and 3R regarding skin or corneal burns.		N/A
	l) Information for Class 1C products (e.g. warning that repeated application may pose a risk).		N/A
8.2	Purchasing and service information		P
	a) safety classification of each laser product stated in all descriptive material (e.g. brochures).	Spec. sheet	P
	b) adequate instructions for servicing available: • warnings and precautions regarding exposure of laser emission above Class 1 • maintenance schedule • list of controls and procedures that could increase accessible emissions • description of displaceable parts • protective procedures for service personnel • reproduction of labels and hazard warnings		N/A
9	**ADDITIONAL REQUIREMENTS FOR SPECIFIC LASER PRODUCTS**		
9.1	Applicable other parts of the standard series IEC 60825		---
	IEC 60825-2 (Safety of optical communication systems)	Not applicable	N/A
	IEC 60825-4 (Laser guards)	Not applicable	N/A
	IEC 60825-12 (Safety of free space optical communication systems used for transmission of information)	Not applicable	N/A
9.2	Medical laser products: Class 3B and Class 4 medical laser products comply with IEC 60601-2-22	Not applicable	N/A
9.3	Laser processing machines: Comply with IEC/ISO 11553 series.	Not applicable	N/A
9.4	Electric toys: Comply with IEC 62115	Not applicable	N/A
9.5	Consumer electronic products: Comply with IEC 60950 (IT-equipment) or IEC 60065 (AV equipment)	IEC 60950 (IT-equipment)	N/A

Appendix 1: Test result

Item	Model	L_T result	L_T Limit	Verdict
(a) Normal operation				
1	HD301	2.72 x 10^5 $Wm^{-2}sr^{-1}$	18.18 $MWm^{-2}sr^{-1}$	P
(b) Fault condition				
2	HD301	2.95 x 10^5 $Wm^{-2}sr^{-1}$	18.18 $MWm^{-2}sr^{-1}$	P

Note:

(1) All models are tested under normal operation and single fault conditions as below:

a. Normal operation: The product is simulated normal using to emit intentional Laser light power and energy. All controls and adjustment are set to the default position by manufacturer and are combined to emit an output of Laser light power and energy.

b. Fault condition: The product is simulated a maximum Laser light power and energy, which could cause the increase of Laser output power and energy above normal operation condition.

(2) Test Condition:

Temperature: 23°C, Relative Humidity: 46 %, Test pattern: Full screen 100% White

(3) Leakage radiation (Laser): Max. 1.3 μW (No human access to laser radiation in excess of Class 1)

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Appended table	**EQUIPMENT MANUFACTURE INFORMATION (DATA SHEET) ABOUT THE CONTAINING LASER COMPONENT/S**		—
	Manufacturer ..... :	(1) OSRAM (2) OSRAM (3) USHIO	—
	Type designation ..... :	(1) PL 450B (2) PL 520B (3) HL63603TG	—
	Structure ..... :	-	—
	Wavelength ..... :	(1) Min. 440 nm, Max. 460 nm (2) Min. 515 nm, Max. 530 nm (3) Min. 632 nm, Max. 642 nm	—
	Output power (min. and max.) ..... :	(1) 80 mW (2) 80 mW (2) 120 mW	—
	Radiation is	-	—
	Continuous ..... :	-	—
	Pulsed ..... :	-	—
	Pulse time ..... :	-	—
	Pulse repetition frequency ..... :	-	—
	Others ..... :	-	—
	PIC UP UNIT		—
	Manufacturer ..... :	-	—
	Type designation ..... :	-	—
	Others ..... :	-	—
	TRANSMITTER/TRANSCIEVER UNIT		—
	Manufacturer ..... :	-	—
	Type designation ..... :	-	—
	Others ..... :	-	—

List of test equipment used			
Type of equipment	Model	Calibration Date	Calibration Due
Spectrometer	UVN SR-7 (Wavelength measurement)	2018/07/06	2019/07/05
Laser power & energy meter	MAESTRO (Laser power measurement)	2018/07/06	2019/07/05
Detector	PH100-SiUV-OD1 (Laser power measurement)	2018/07/06	2019/07/05
Optical Radiation Safety Test System	OST-300 (Radiation Photobiological measurement)	2017/10/28	2018/10/27

Photo: