

## Test Report

Report No.: GZEE220700256631

Date: 2022-08-04

The following sample(s) was/were submitted and identified on behalf of the client as:

Applicant: Shanghai Xiyin Technology Co., Ltd.  
Building C, No.888, Huanhu West 2<sup>nd</sup> Road, Special Area of China(shanghai)  
Pilot Free Trade Zone, Shanghai, China

Manufacturer: Same as applicant

Factory: Same as applicant

Testing location/address: SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch  
198 Kezhu Road, Science City, Economic & Technology Development Area,  
Guangzhou, Guangdong, China

Standard(s): EN 60825-1: 2014 + A11: 2021  
Safety of laser products - Part 1: Equipment classification and requirements

Test item description: Solid state lidar

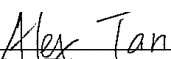
Trade Mark/Brand: —

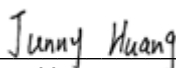
Model/Type reference: CS30

Ratings: 5 V; 0,5 A; 2,5 W

Test result: The test sample belongs to Class 1

Remark: Throughout this report a comma is used as the decimal separator.

  
Alex Tan  
Reviewer  
E&E Safety Laboratory

  
Junny Huang  
Project Engineer



SGS-CSTC Standards Technical Services Co., Ltd.  
Guangzhou Branch EEC Laboratory

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**Summary of testing:**

The laser product was tested under USB 5V and evaluated to be Class 1 according to EN 60825-1:2014 + A11: 2021.

**Use of uncertainty of measurement for decisions on conformity (decision rule) :**

No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

**Test item particulars..... :**

**Classification of installation and use..... :** Portable

**Supply Connection..... :** DC Connector

**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 .....:** 2022-07-21

**Date (s) of performance of tests.....:** 2022-07-22 to 2022-08-03

**General product information:**

The product can emit infrared light when powered.

Item	Manufacturer/ trademark	Type / model	Technical data
Laser	—	—	DC 2 V; 4,3 W; 938 – 942 nm



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Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>CLASSIFICATION PRINCIPLES</b>		
4.3	Classification rules		---
4.3 a	Radiation of a single wavelength		P
4.3 b	Radiation of multiple wavelengths		N/A
	1) Laser product emits at two or more wavelengths shown as additive in Table 1		N/A
	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)		N/A
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		P
	3) 30000 s		N/A
4.3 f	Repetitively pulsed or modulated lasers		P
	1) Any single pulse		P
	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.		N/A
	$\alpha$ measured at 200 mm distance from closest point of human access ( $\alpha > 5$ mrad).		N/A
	Un-weighted radiance L measured at 200 mm distance (comparison with $L_T = 1 \text{ MWm}^{-2}\text{s}^{-1}/\alpha$ ) under reasonably foreseeable single fault conditions.		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	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).		N/A
<b>5</b>	<b>DETERMINATION OF THE ACCESSIBLE EMISSION LEVEL and PRODUCT CLASSIFICATION</b>		
5.1	Tests		---
	Compliance under reasonably foreseeable single fault conditions.		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		---
5.4.2	Default (simplified) evaluation		P
	Conditions applied .....	Condition 1 and Condition 3	P
	Aperture diameter .....	50 mm (for Condition 1) 7 mm (for Condition 3)	P
	Reference point :.....	Surface of diffuser (For condition 3) The closest point to human access (For Condition 1)	P
	Measurement distance .....	2000 mm (for Condition 1) 100 mm (for Condition 3)	P
5.4.3	Evaluation condition for extended sources		—
	Conditions applied .....		N/A
	Most restrictive position .....		N/A
	Angular subtense of the apparent source $\alpha$ and $C_6$ : (for each condition)		N/A
5.4.3 a	Aperture diameters (for each condition).....		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
5.4.3 b	Angle of acceptance (for each condition).....:		N/A

**Measured laser radiation, calculations and comparison with AEL limits:**

**1. TEST CONDITIONS**

(1) General requirement

Temperature: 20 – 25 °C  
 Relative humidity: Max. 75 %

(2) Normal operation

The Laser is simulating normal operation to emit intentional optical power.

(3) Fault condition: Refer to the test result.

**2. MEASUREMENT METHOD**

(1) Measurement of Peak wavelength

The peak wavelength of Laser is measured under normal operation, used SPR-5000B spectrometer.

(2) Measuring distance

For condition 1: r = 2000 mm.  
 For condition 3: r = 100 mm.  
 For condition Skin/Cornea/Iris hazard: r = 0 mm

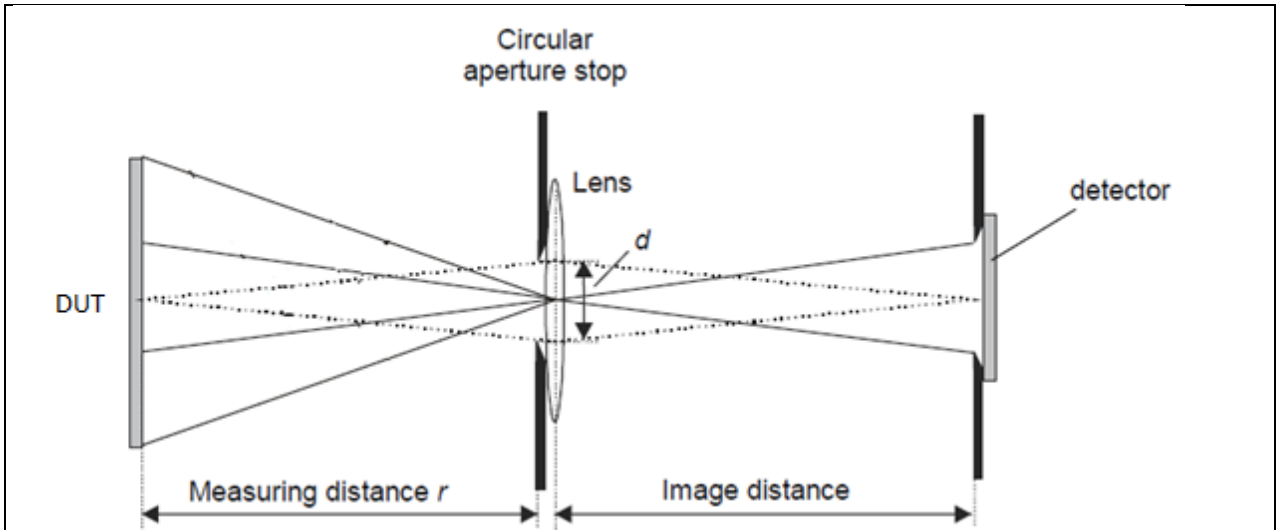
(3) Measurement of radiant power (used optical power meter)

The radiant power emitted from Laser of the product is measured under normal operation.

In case of condition 1, the Laser radiation is collected through a circular aperture stop having a diameter 50 mm and its location is 2000 mm away from the closet point of human access, consists of a lens with 150 mm focal length. See below picture.



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In case of condition 3, same as condition 1 except the Laser radiation is collected through a circular aperture stop having a diameter 7 mm and its location is 100 mm away from the apparent source, and focal length of the lens is 35 mm.

In case of condition Skin/Cornea/Iris Hazard, Laser radiation is collected through a circular aperture stop having a diameter 3,5 mm and its location is 0 mm away from the apparent source.

The measurement is performed at a position to detect a maximum radiation emitted from the apparent source.

**3. TEST RESULT**

All below measurements were performed at dark room with ambient temperature  $24,5 \pm 0,5 \text{ }^\circ\text{C}$ , Relative humidity  $60 \pm 5\%$ , the product was powered by DC connector.

(1) Measurement of wavelength

$\lambda_1 = 940 \text{ nm}$  (infrared)

(2) Measurement of laser radiant power

Normal operation:

For condition 1:

$P_{\lambda 1} = 10 \text{ nW}$

For condition 3

$P_{\lambda 1} = 0,1 \text{ mW}$



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For condition Skin/Cornea/Iris hazard:  $r = 0$  mm  
 $P_{\lambda 1} = 13$  mW

Single fault condition:

Condition 3:

Fault #1: C bridged: not worked, 0 W.

Fault #2: R bridged: 1 nW.

**4. CLASSIFICATION OF LASER RADIATION**

(1) Compare the accessible emission level of radiation emitted from Laser of the product with the accessible emission limit of certain class. This comparison is evaluated using the measurement value under each condition. Accessible emission levels are measurement value or calculated from the measurement value if necessary.

(2) Time base

The time base is 100 s.

(3) Correction factor for Laser

For simplified (default) method: Correction factor  $C_4 = 3,02$ ,  $C_6 = 1$   $C_7 = 1$ .

(4) Comparison with AEL

Condition	Evaluation method	Distance (mm)	AE	AEL Class 1	AEL Class 3B
Condition 1	Simplified (default) evaluation	2000	10 nW	$3,9 \times 10^{-4} C_4 C_7 W = 1,18$ mW	—
Condition 3	Simplified (default) evaluation	100	0,1 mW	$3,9 \times 10^{-4} C_4 C_7 W = 1,18$ mW	—
Skin /Cornea /Iris hazard	Simplified (default) evaluation	0	13 mW	—	500 mW

Conclusion:

Measured emission power is not exceeding the AEL for Class 1, therefore the product is classified as Class 1 laser product.

Measured emission power of Skin/Cornea/Iris hazard is not exceeding the AEL for Class 3B.



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Clause	Requirement + Test	Result - Remark	Verdict
<b>6</b>	<b>ENGINEERING SPECIFICATIONS</b>		
6.2	Protective housing		—
6.2.1	General		—
	Protective housing prevents access to energy levels in excess of the AEL for Class 1.		N/A
	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		N/A
6.2.3	Removable laser system (laser system complies with requirements of Clauses 6 and 7).		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).		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.		N/A
6.3.2	Override mechanism		—
	Behaviour of override in operation when the panel is replaced.		N/A
	Visible or audible warning for override mode.		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
6.4	Remote interlock connector		N/A
6.5	Manual reset		N/A
6.6	Key control		N/A
6.7	Laser radiation emission warning		—
6.7.1	Laser product is a 3R ( $\lambda < 400$ nm; $\lambda > 700$ nm), 1C, 3B or 4 laser systems.		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		N/A
6.10	Viewing optics		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



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Clause	Requirement + Test	Result - Remark	Verdict
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.		N/A
	b) A warning device provides adequate warning of emission to any person within the housing.		N/A
	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		N/A
	- vibration and shock		N/A
6.15	Protection against other hazards		—
6.15.1	Non-optical hazards (product safety standard)		—
	- 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
<b>7</b>	<b>LABELLING</b>		
7.1	General		P
	Labels durable, permanently affixed		P
	Labels clearly visible		P
	Reading of labels is possible without exposure to laser radiation in excess of AEL for Class 1.		N/A
	Colour combination		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	Labelling impractical due to the size or design of the product.		N/A
	Warning label – Hazard symbol (Figure 3)		N/A
7.2 - 7.7	Text on explanatory label or pictogram (laser class, warning text)		P
7.8	Aperture label		N/A
7.9	Radiation output and standards information		P
	Max output of laser radiation .....		N/A
	Pulse duration .....		N/A
	Emitted wavelength(s) .....		N/A
	Name and publication date of the standard .....		P
7.10	Labels for access panels		N/A
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 .....		N/A
7.13	Warning for potential hazard to the skin or anterior parts of the eye - warning wording used.....		N/A
<b>8</b>	<b>OTHER INFORMATIONAL REQUIREMENTS</b>		
8.1	Information for the user		P
	a) adequate instructions for assembly, maintenance and safe use and description of the classification limitations, if appropriate.		P
	b) additional warning for Class 1M and 2M		N/A
	c) laser beam parameters for radiation above the AEL of Class 1		N/A
	• Wavelength .....		N/A
	• Beam divergence .....		N/A
	• Pulse pattern .....		N/A
	(pulse duration, repetition rate, ...)		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	<ul style="list-style-type: none"> <li>Maximum power or energy output .....</li> </ul>		N/A
	d) safety instruction for embedded laser products and other incorporated laser products.		N/A
	e) MPE and NOHD for Class 3B and 4 laser products; For collimated beam Class 1M and 2M lasers the extended NOHD (ENOH).D).		N/A
	f) information for the selection of eye protection.		N/A
	g) reproduction of all required labels and warnings.		P
	h) location of laser apertures		N/A
	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		N/A
	a) safety classification of each laser product stated in all descriptive material (e.g. brochures).		N/A
	b) adequate instructions for servicing available: <ul style="list-style-type: none"> <li>warnings and precautions regarding exposure of laser emission above Class 1</li> <li>maintenance schedule</li> <li>list of controls and procedures that could increase accessible emissions</li> <li>description of displaceable parts</li> <li>protective procedures for service personnel</li> <li>reproduction of labels and hazard warnings</li> </ul>		N/A
<b>9</b>	<b>ADDITIONAL REQUIREMENTS FOR SPECIFIC LASER PRODUCTS</b>		
9.1	Applicable other parts of the standard series IEC 60825		—
	IEC 60825-2 (Safety of optical communication systems)		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	IEC 60825-4 (Laser guards)		N/A
	IEC 60825-12 (Safety of free space optical communication systems used for transmission of information)		N/A
9.2	Medical laser products: Class 3B and Class 4 medical laser products comply with IEC 60601-2-22		N/A
9.3	Laser processing machines: Comply with IEC/ISO 11553 series.		N/A
9.4	Electric toys: Comply with IEC 62115		N/A
9.5	Consumer electronic products: Comply with IEC 60950 (IT-equipment) or IEC 60065 (AV equipment)		N/A
	Consumer laser products shall comply with applicable requirements for laser products of their class as well as with EN 50689. (For EN 60825-1/A11:2021)		N/A
	In addition, these products may be subject to specific safety standards such as EN 62368-1 (AV/ICT equipment). (For EN 60825-1/A11:2021)		N/A
	Products that are classified as Class 1C need to comply with the requirements of the respective specific vertical standard of the EN 60335 series or the EN 60601 series. (For EN 60825-1/A11:2021)		N/A



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Annex 1: Required labelling and information for user manual

The artwork below may be only a draft, and it shall be on marking plate:

Class 1 laser product

EN 60825: 2014 + A11: 2021

The outer border of above **Explanatory label** should be rounded.

Manufacturers of laser products shall be provided below following information on user manual:

- a) Adequate instructions for proper assembly, maintenance, and safe use, including clear warnings concerning precautions to avoid possible exposure to hazardous laser radiation and description of the classification limitations
- b) Reproduction of all required labels and warnings.



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**Test Report**

**Report No.: GZEE220700256631**

**Date: 2022-08-04**

Annex 2: Photo documentation

Details of: View for product

View:

general

front

rear

right

left

top

bottom

internal

Details of: View for Laser module

View:

general

front

rear

right

left

top

bottom

internal

--- END OF REPORT ---



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