

SO0001



LASER-INDUCED DAMAGE THRESHOLD (LIDT) MEASUREMENT REPORT

T-ON-1
TEST PROCEDURE
SAMPLE: SAMPLE

Request from

Address

Company

Address Line 1

Address Line 2

Country

Contact person

Name Surname

Inquiry ID

Inquiry ID: 0001

Purchase order

-

Testing institute

Address

UAB Lidaris

Saulėtekio al. 10

10223 Vilnius

Lithuania

Tester

Name Surname

Test date

01/01/2024

Sale order

SO0001

Test ID

-

Specimen

Name

Sample

Type

HR Metallic Coating

Dimensions

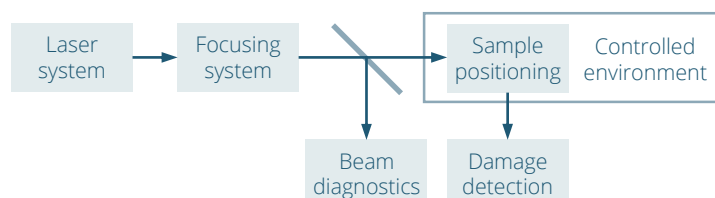
Ø25.5 x 4.0 mm

Packaging

Plastic box

TEST EQUIPMENT

Test setup

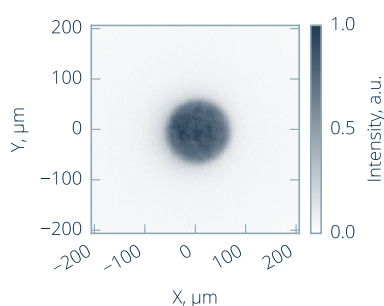


Laser and its parameters

Type	Continuous wave Yb:fiber laser
Manufacturer	IPG
Model	YLS6000-U
Central wavelength	1070.0 nm
Angle of incidence	45.0 deg
Polarization state	Random
Spatial beam profile in target plane	Near flat-top
Beam diameter in target plane (effective)	$(141.6 \pm 5.7) \mu\text{m}$
Longitudinal pulse profile	CW
Power stability	0.3 %

Energy/power meter

Manufacturer	Ophir
Model	10K-W-BB-45-V3
Calibration due date	2024-12



(a) Beam profile

Figure 1. Laser parameters used for measurements.

TEST SPECIFICATION

Definitions and test description

Laser-induced damage (LID) is defined as any permanent laser radiation induced change in the characteristics of the surface/bulk of the specimen which can be observed by an inspection technique and at a sensitivity related to the intended operation of the product concerned.¹

T-on-1 test involves exposure multiple test sites with increasing CW irradiances for specified exposition time. T in definition stands for exposition time.

Laser-induced damage threshold (LIDT) is defined as the average irradiance of lowest observed damaged level and first undamaged level below.

Test sites

Number of sites	130
Arrangement of sites	Hexagonal
Minimum distance between sites	750 µm
Site exposition duration	30 s

Analysis information

Online detection	Scattered light diode
Offline detection	Nomarski microscope
Software version	01dc75aa

Test environment

Environment	Air
Cleanroom class (ISO 14644-1)	ISO7
Pressure	1 bar
Temperature	23.1 - 23.5 C
Humidity	27.3 - 27.7 %

Sample preparation

Storage before test	Normal laboratory conditions
Dust blow-off	Canned air
Cleaning	None

¹ISO 21254-1:2011: Lasers and laser-related equipment - Test methods for laser-induced damage threshold - Part 1: Definitions and general principles, International Organization for Standardization, Geneva, Switzerland (2011)

LIDT TEST RESULTS

LIDT VALUE

	Irradiance	Linear power density
T(30 s)-on-1	$0.43^{+0.12}_{-0.10}$ MW/cm ²	$4.80^{+0.86}_{-0.79}$ kW/cm

CHARACTERISTIC DAMAGE CURVE

Table 1: T-on-1 thresholds for sample Sample.

	Analysis type	Irradiance	Linear power density
T(30 s)-on-1	Catastrophic	$1.07^{+0.29}_{-0.26}$ MW/cm ²	$11.9^{+2.1}_{-2.0}$ kW/cm
T(30 s)-on-1	Color mode	$0.43^{+0.12}_{-0.10}$ MW/cm ²	$4.80^{+0.86}_{-0.79}$ kW/cm

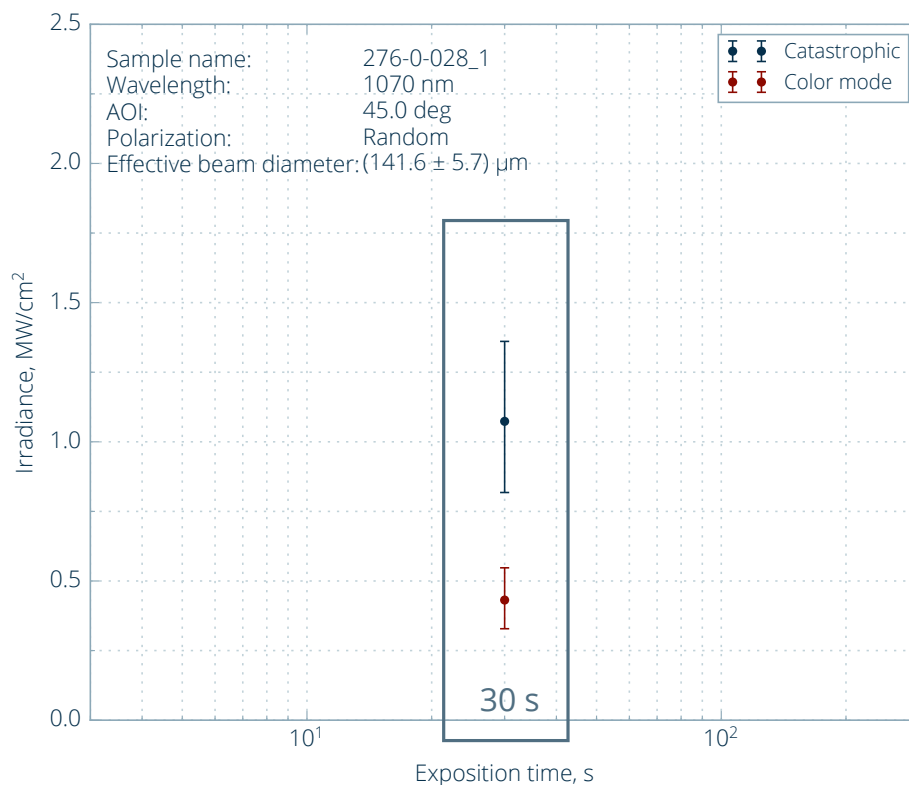
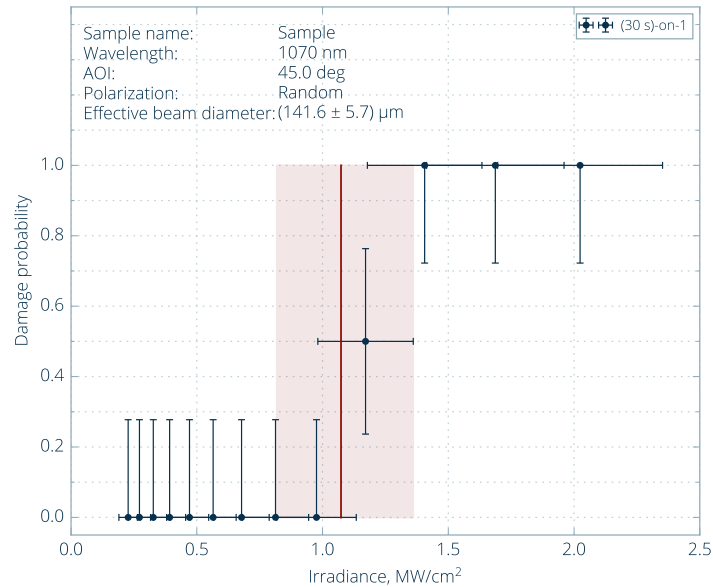


Figure 2. Characteristic damage curve.

DAMAGE PROBABILITY (CATASTROPHIC)



(a) T(30 s)-on-1

Figure 3. Damage probability plot.

TYPICAL DAMAGE MORPHOLOGY



Figure 4. Typical damage morphology: irradiance $1.41 \text{ MW}/\text{cm}^2$, exposition time 1 ms.

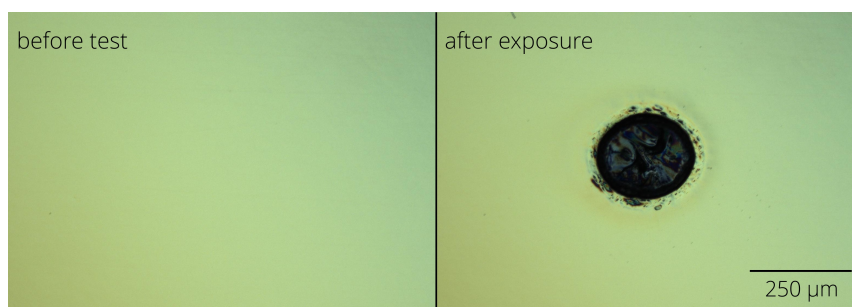
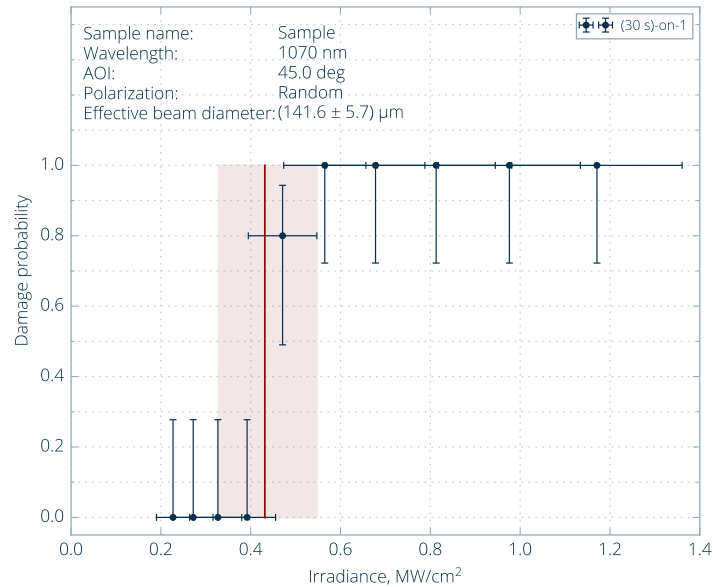


Figure 5. Typical damage morphology: irradiance $1.69 \text{ MW}/\text{cm}^2$, exposition time 1 ms.

DAMAGE PROBABILITY (COLOR MODE)



(a) T(30 s)-on-1

Figure 6. Damage probability plot.

TYPICAL DAMAGE MORPHOLOGY

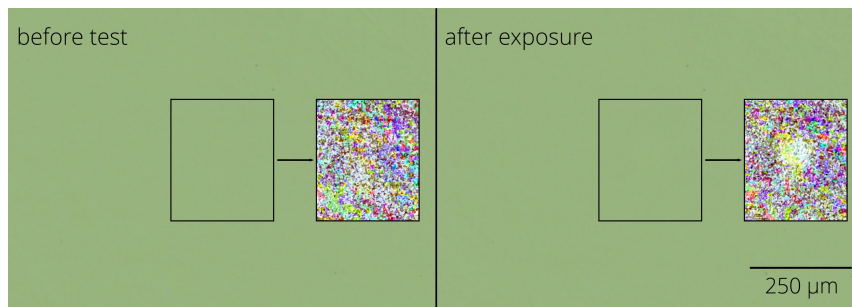


Figure 7. Typical damage morphology: irradiance 0.471 MW/cm², exposition time 30.0 s.



Figure 8. Typical damage morphology: irradiance 0.813 MW/cm², exposition time 30.0 s.

TECHNICAL NOTES

TECHNICAL NOTE 1: Oblique incidence

According to the ISO 21254-2:2011 standard, for spatial beam profiling perpendicular to the direction of beam propagation and angles of incidence differing from 0 degrees, the cosine of the angle of incidence is included in the calculation of the effective area, which leads to correct evaluation of laser irradiance at different angles of incidence (Figure 9).

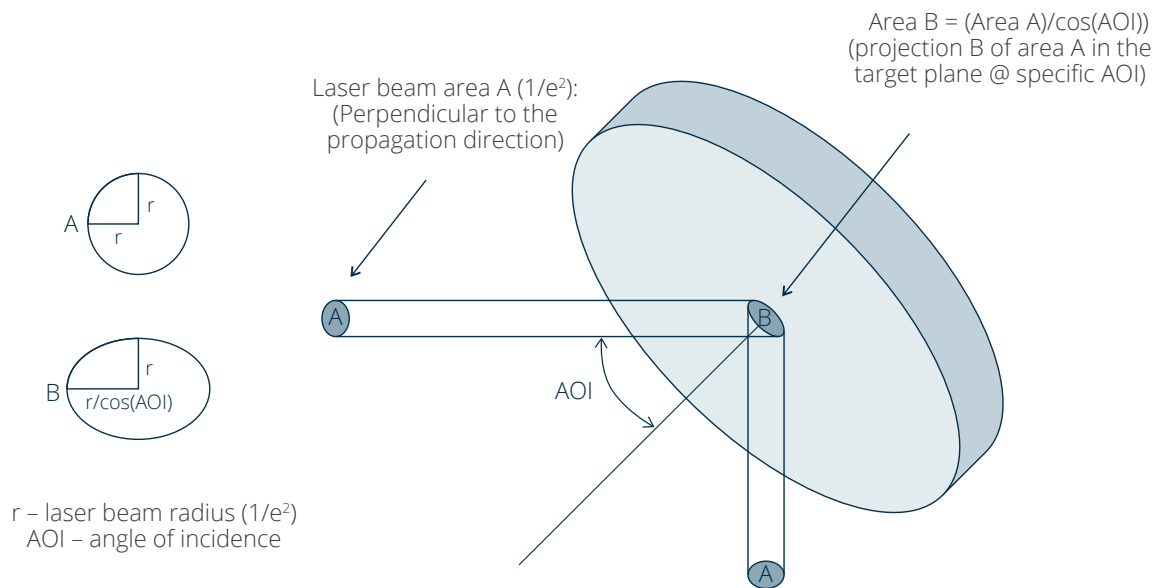


Figure 9. Oblique incidence.

HOW CAN I ORDER?

