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LASER-INDUCED DAMAGE THRESHOLD (LIDT) MEASUREMENT REPORT

S-ON-1 (ISO 21254-2) TEST PROCEDURE

SAMPLE: M0075638 LOT0058855 SU012564

Request from	
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Contact person	Aurelija Vasiljeva
Purchase order	PU0016006-AVA

Testing institute	
Address	UAB Lidaris Saulėtekio al. 10 10223 Vilnius Lithuania
Tester	Egidijus Pupka
Test date	2020-01-15
Sale order	SO1619
Test ID	EPX42Y

Specimen	
Name	M0075638 LOT0058855 SU012564
Type	HR Dielectric Coating (HR>99.8% @2075-2105 nm AOI=42-48)
Packaging	Membrane box

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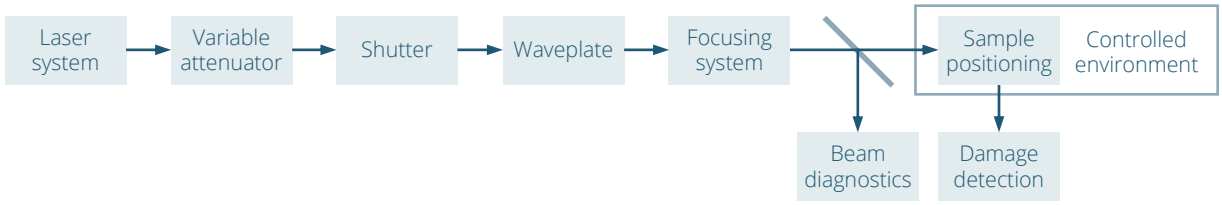
TEST EQUIPMENT

Test setup

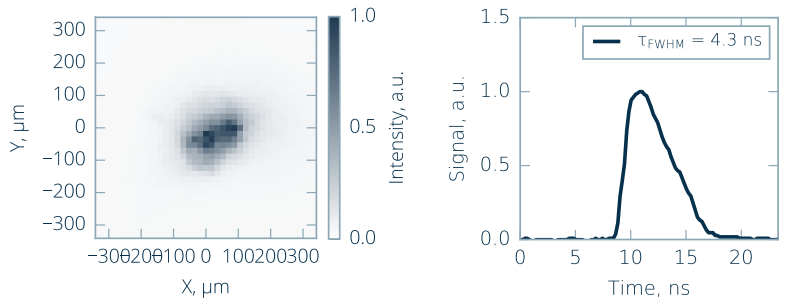


Laser and its parameters

Type	Q-switched, seeded Nd:YAG
Manufacturer	InnoLas Laser II
Model	SpitLight Hybrid with OPO
Central wavelength	2090.0 nm
Angle of incidence	45.0 deg
Polarization state	Linear P
Pulse repetition frequency	100 Hz
Spatial beam profile in target plane	Near Gaussian
Beam diameter in target plane ($1/e^2$)	(181.9 ± 5.9) µm
Longitudinal pulse profile	Single longitudinal mode
Pulse duration (FWHM)	(4.3 ± 0.3) ns
Pulse to pulse energy stability (SD)	4.5 %

Energy/power meter

Manufacturer	Ophir
Model	PE50-DIF-C
Calibration due date	2020-07-01



(a) Beam profile (b) Pulse profile

Figure 1. Laser parameters used for measurements.

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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. Laser-induced damage threshold (LIDT) is defined as the highest quantity of laser radiation incident upon the optical component for which the extrapolated probability of damage is zero. [1]

LID of the sample is investigated by performing a standardized S-on-1 test procedure.[2]
LIDT value is determined by fitting experimental damage probability data with a model derived for a Poisson damage process assuming degenerate defect ensemble. [3]

Test sites

Number of sites	210
Arrangement of sites	Hexagonal
Minimum distance between sites	600 µm
Maximum pulses per site	1000

Damage detection

Online	Scattered light diode
Offline	Nomarski microscope

Test environment

Environment	Air
Cleanroom class (ISO 14644-1)	ISO7
Pressure	1 bar
Temperature	23 C
Humidity	25 %

Sample preparation

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

[1] ISO 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)

[2] ISO 21254-2:2011: Lasers and laser-related equipment - Test methods for laser-induced damage threshold - Part 2: Threshold determination, International Organization for Standardization, Geneva, Switzerland (2011)

[3] J. Porteus and S. Seitel, Absolute onset of optical surface damage using distributed defect ensembles, Applied Optics, 23(21), 3796–3805 (1984)

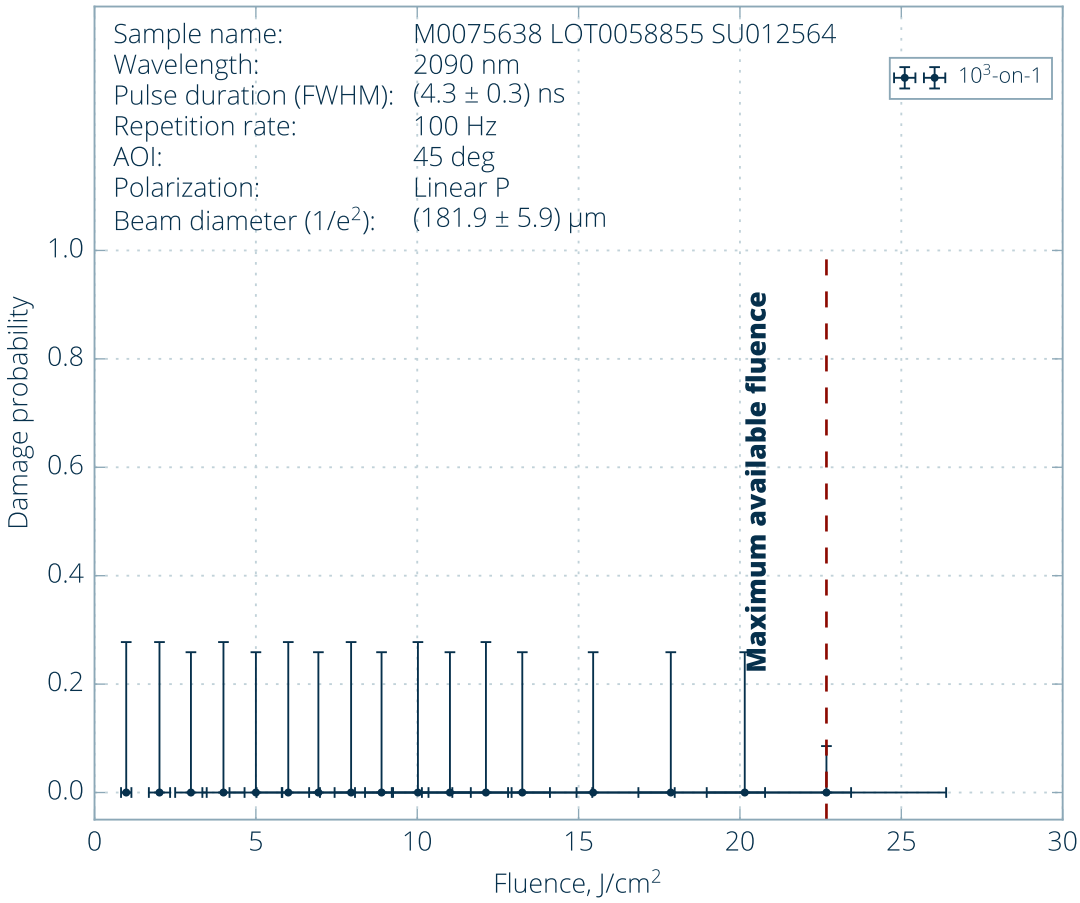
LIDT TEST RESULTS

LIDT VALUES

Table 1: Estimated LIDTs from fiting model for sample M0075638 LOT0058855 SU012564.

Test mode	Threshold (Offline detection - microscopy) [4]	Threshold (Offline detection - microscopy) scaled to 10 ns
10^3-on-1	> 22.7 $^{+3.7}_{-3.7}$ J/cm^2	> 34.5 $^{+5.6}_{-5.6}$ J/cm^2

DAMAGE PROBABILITY



(a) 10^3-on-1

Figure 2. Damage probability plot.

[4] Read Technical Note 1

TECHNICAL NOTES

TECHNICAL NOTE 1: No damages were found

No damages were found for this type of analysis, therefore, LIDT value could not be evaluated. LIDT value should be higher than maximum fluence value used in the test. This fluence value is written in the thresholds table.

TECHNICAL NOTE 2: 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 fluence at different angles of incidence (Figure 3).

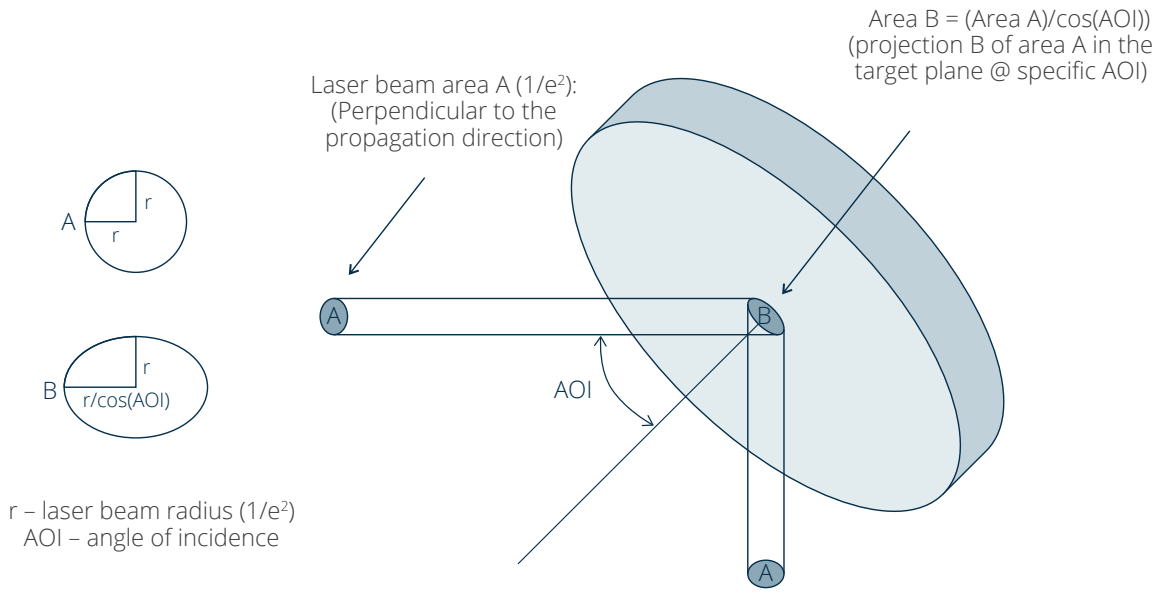


Figure 3. Oblique incidence.