

# LASER-INDUCED DAMAGE THRESHOLD (LIDT) MEASUREMENT REPORT

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

SAMPLE: M0075640 LOT0058857 SU012564

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### Request from

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Purchase order	PU0016005-AVA

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### Testing institute

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Tester	Egidijus Pupka
Test date	2020-01-15
Sale order	SO1618
Test ID	E61LRK

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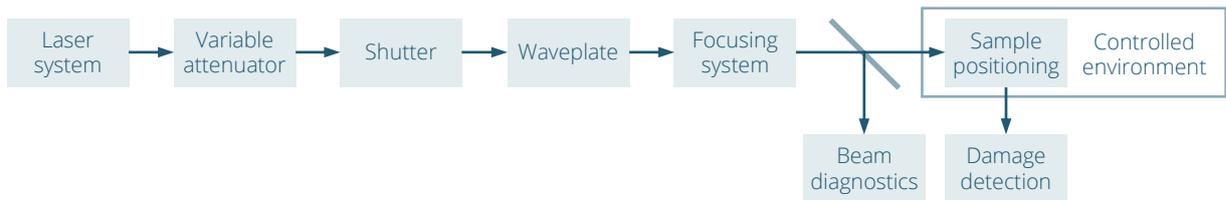
### Specimen

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Name	M0075640 LOT0058857 SU012564
Type	PR Coating (S1 PR (R=65±2%) @ 2075-2105 (centered @ 2090 nm))
Packaging	Membrane box

# 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	0.0 deg
Polarization state	Linear
Pulse repetition frequency	100 Hz
Spatial beam profile in target plane	Near Gaussian
Beam diameter in target plane (1/e <sup>2</sup> )	(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

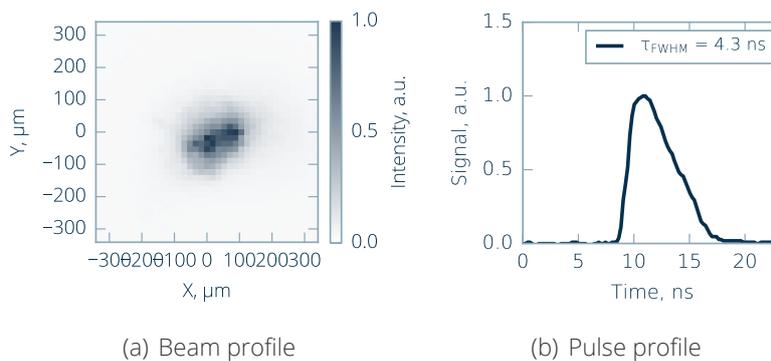


Figure 1. Laser parameters used for measurements.

# 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. 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. <sup>1</sup>

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

## Test sites

Number of sites	208
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

<sup>1</sup>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)

<sup>2</sup>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)

<sup>3</sup>J. Porteus and S. Seitel, Absolute onset of optical surface damage using distributed defect ensembles, Applied Optics, 23(21), 3796-3805 (1984)

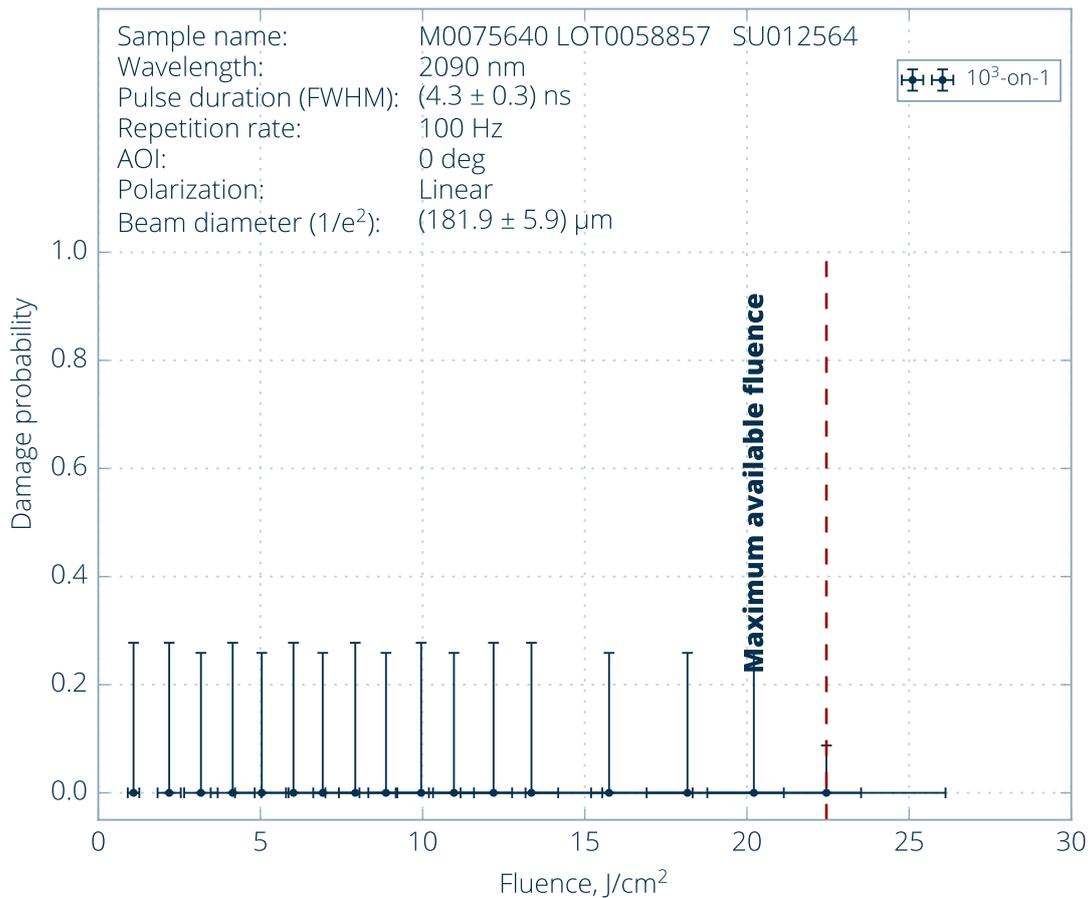
# LIDT TEST RESULTS

## LIDT VALUES

Table 1: Estimated LIDTs from fitting model for sample M0075640 LOT0058857 SU012564.

Test mode	Threshold (Offline detection - microscopy) <sup>4</sup>	Threshold (Offline detection - microscopy) scaled to 10 ns
10 <sup>3</sup> -on-1	> 22.5 $\begin{smallmatrix} +3.7 \\ -3.7 \end{smallmatrix}$ J/cm <sup>2</sup>	> 34.1 $\begin{smallmatrix} +5.6 \\ -5.6 \end{smallmatrix}$ J/cm <sup>2</sup>

## DAMAGE PROBABILITY



(a) 10<sup>3</sup>-on-1

Figure 2. Damage probability plot.

<sup>4</sup>Read Technical Note 1

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# TECHNICAL NOTES

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## TECHNICAL NOTE 1: No damages were found

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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.