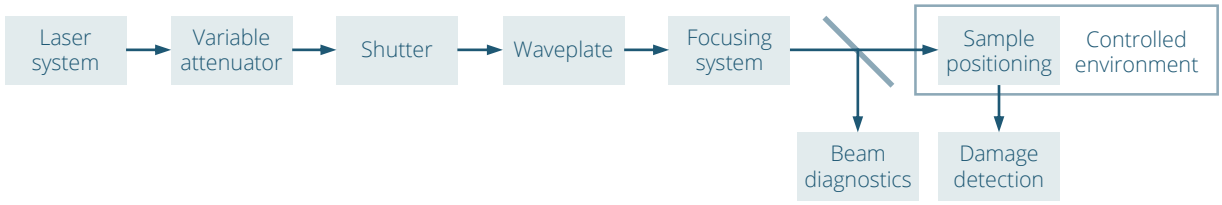
LIDARIS
LIDT Service

TEST EQUIPMENT

Test setup

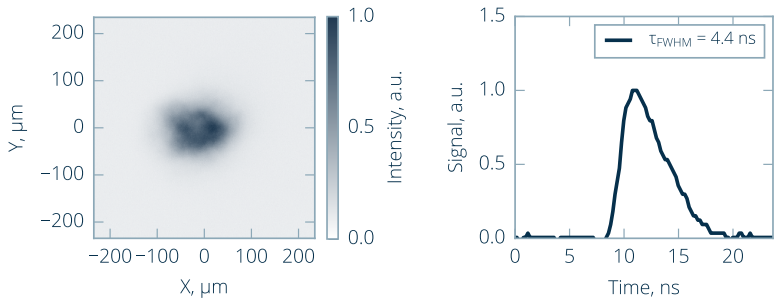


Laser and its parameters

Type	Q-switched, seeded Nd:YAG
Manufacturer	Ekspla
Model	NL940-100 OPO_L
Central wavelength	1535.0 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 ($1/e^2$)	(173.0 ± 3.8) µm
Longitudinal pulse profile	Single longitudinal mode
Pulse duration (FWHM)	(4.4 ± 0.3) ns
Pulse to pulse energy stability (SD)	1.3 %

Energy/power meter

Manufacturer	Ophir
Model	PE50-DIF-C
Calibration due date	2021-06-01



(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]

R-on-1 test uses multiple pulses when irradiating single site of the sample. Starting from very low values fluence is constantly increased step by step until damage is reached.

Test sites

Number of sites	9
Arrangement of sites	Hexagonal
Minimum distance between sites	550 µm
Start fluence	1.0
Fluence step	1.0
Pulses per fluence level	1000

Analysis information

Online detection	Scattered light diode
Offline detection	Nomarski microscope
Software version	dd33b07 - 9539b8e

Test environment

Environment	Air
Cleanroom class (ISO 14644-1)	ISO7
Pressure	1 bar
Temperature	22.5 - 22.6 C
Humidity	25.2 - 25.2 %

Sample preparation

Storage before test	Normal laboratory conditions
Dust blow-off	Compressed air
Cleaning	Isopropanol

[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)

LIDT TEST RESULTS

R-ON-1 LIDT

Table 1: Evaluated R-on-1 LIDT for sample M0078639 LOT0067556 ID72394.

Test mode	Threshold
R(1000)-on-1	$22.4\ ^{+2.5}_{-2.4}$ J/cm^2
R(1000)-on-1 (scaled to 20.0 ns)	$47.9\ ^{+5.4}_{-5.2}$ J/cm^2

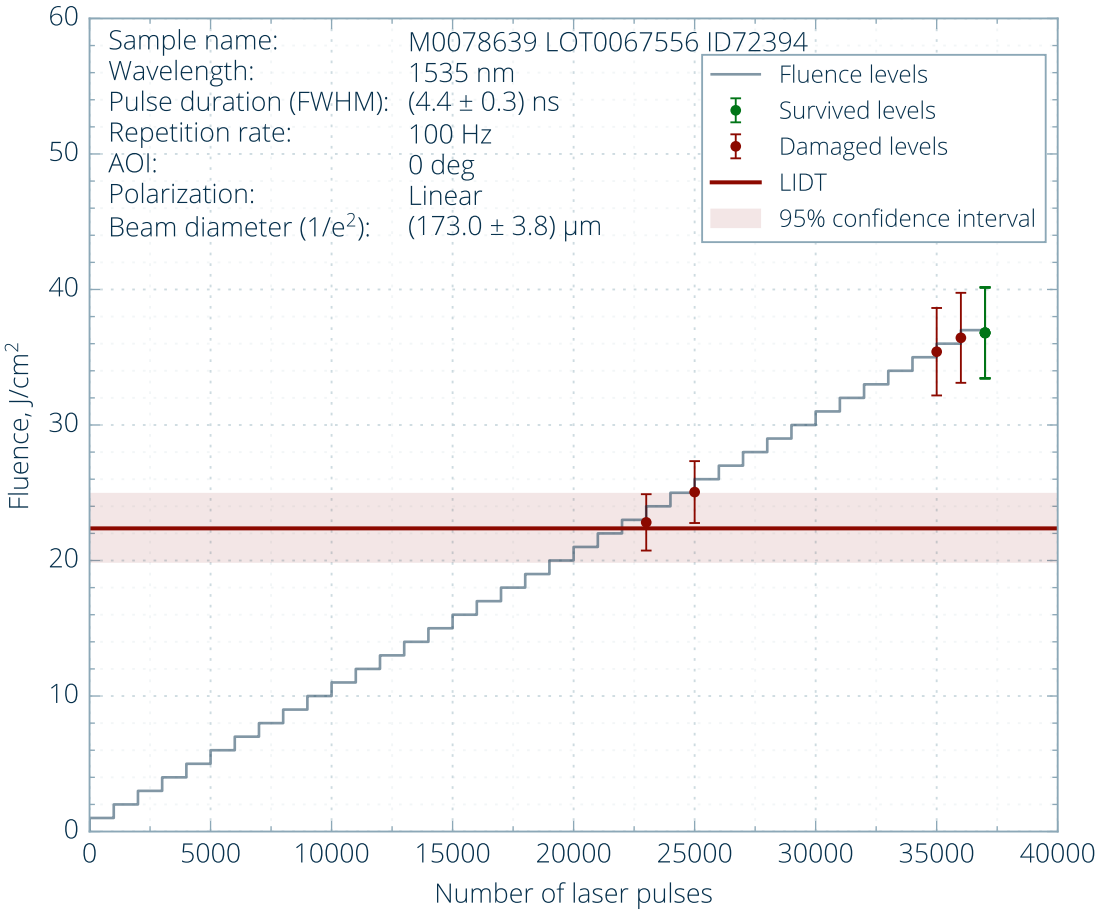

Figure 2. R-on-1 test results.

TEST POINTS

Table 2: R-on-1 damaged test points for sample M0078639 LOT0067556 ID72394.

Test mode	Damaging level	Mean fluence	Number of pulses
R(1000)-on-1	35	$35.4\ ^{+3.2}_{-3.2}$ J/cm^2	1000
R(1000)-on-1	23	$22.8\ ^{+2.1}_{-2.1}$ J/cm^2	1000
R(1000)-on-1	36	$36.4\ ^{+3.3}_{-3.3}$ J/cm^2	1000
R(1000)-on-1	25	$25.0\ ^{+2.3}_{-2.3}$ J/cm^2	1000
R(1000)-on-1	survived	$36.8\ ^{+3.4}_{-3.4}$ J/cm^2	-
R(1000)-on-1	survived	$36.8\ ^{+3.4}_{-3.4}$ J/cm^2	-
R(1000)-on-1	survived	$36.8\ ^{+3.4}_{-3.4}$ J/cm^2	-
R(1000)-on-1	survived	$36.8\ ^{+3.4}_{-3.4}$ J/cm^2	-
R(1000)-on-1	survived	$36.8\ ^{+3.4}_{-3.4}$ J/cm^2	-

TYPICAL DAMAGE MORPHOLOGY

Figure 3. Typical damage morphology: fluence 22.8 J/cm^2, damage after 1000 pulse(s) in fluence level.

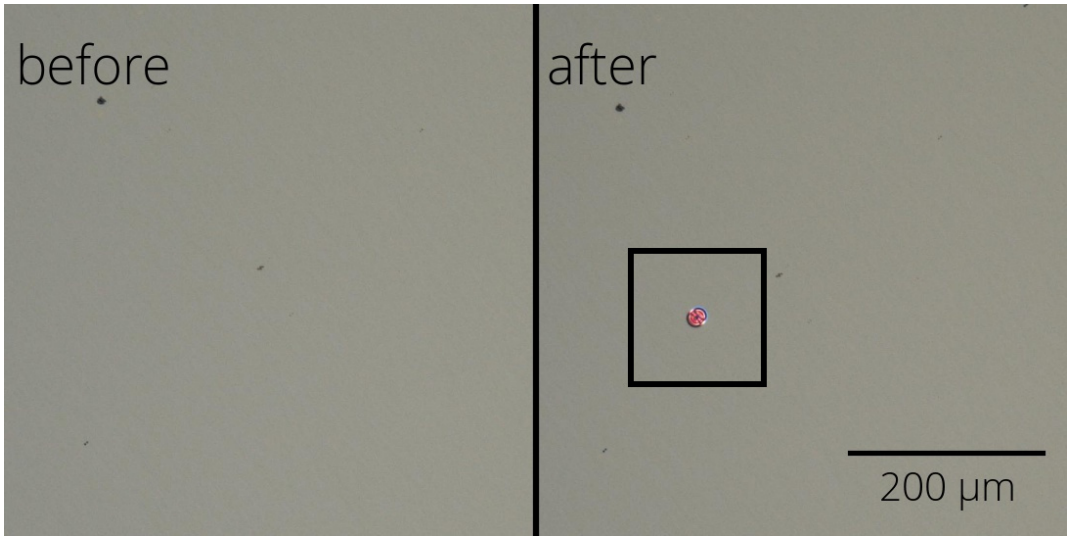

Figure 4. Typical damage morphology: fluence 25.1 J/cm^2, damage after 1000 pulse(s) in fluence level.

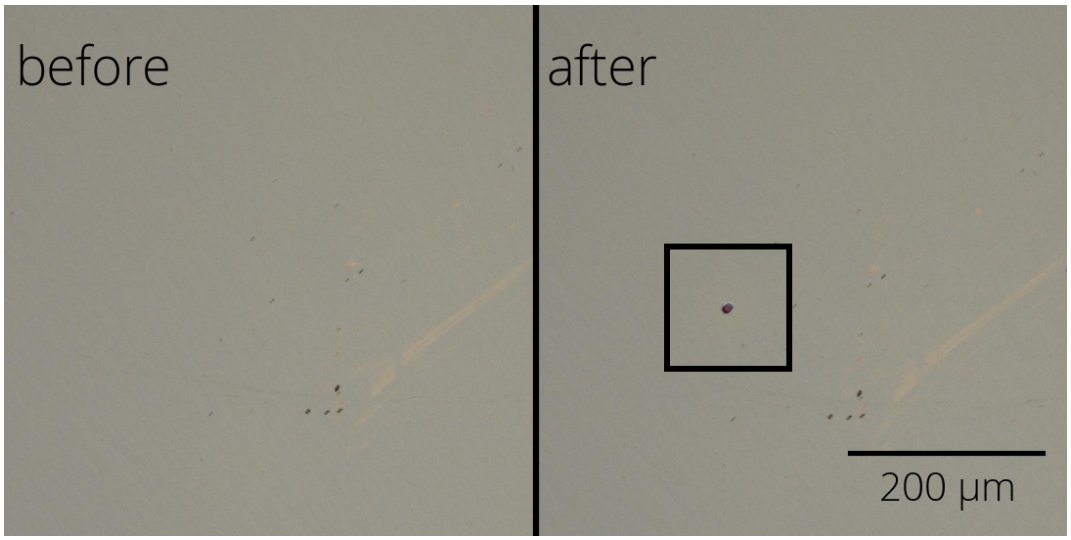

Figure 5. Typical damage morphology: fluence 35.4 J/cm^2, damage after 1000 pulse(s) in fluence level.