LIDARIS
LIDT Service

LASER-INDUCED DAMAGE THRESHOLD (LIDT) MEASUREMENT REPORT

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

SAMPLE: CORNING 7980 100E AR355

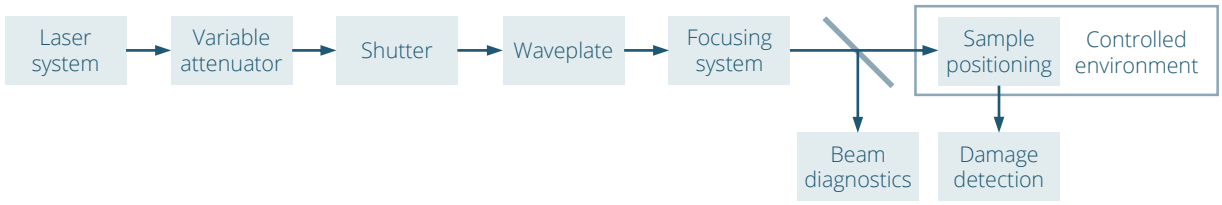
Request from	
Address	Altechna Mokslininku st. 6A 08412 Vilnius Lithuania
Contact person	Gabrielius Rimšelis
Purchase order	PU0009892-BEO

Testing institute	
Address	UAB Lidaris Saulėtekio al. 10 10223 Vilnius Lithuania
Tester	Lina Vigricaite
Test date	2018-05-18
Sale order	SO873
Test ID	KBJMWE

Specimen	
Name	Corning 7980 100E AR355
Type	e-Beam AR 355
Packaging	Plastic box

TEST EQUIPMENT

Test setup

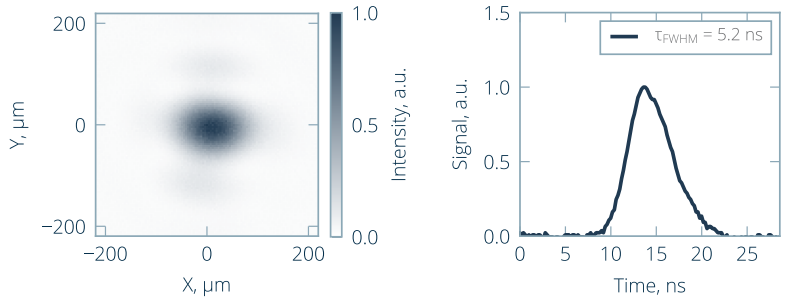


Laser and its parameters

Type	Q-switched, seeded Nd:YAG
Manufacturer	InnoLas Laser
Model	SpitLight Hybrid
Central wavelength	355.0 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 ($1/e^2$)	(189.0 ± 5.9) µm
Longitudinal pulse profile	Single longitudinal mode
Pulse duration (FWHM)	(5.2 ± 0.3) ns
Pulse to pulse energy stability	4.9 %

Energy/power meter

Manufacturer	Ophir
Model	PE50-DIF-C
Calibration due date	2019-09-01



(a) Beam profile (b) Pulse profile

Figure 1: Laser parameters used for measurements.

LIDARIS
LIDT Service

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.

Test sites

Number of sites	320
Arrangement of sites	Hexagonal
Minimum distance between sites	900 µm
Maximum pulses per site	1000

Damage detection

Online	Scattered light diode
Offline	Nomarski microscope

Test environment

Environment	Air
Cleanroom class (ISO 14644-1)	ISO8
Pressure	1 bar
Temperature	23 C
Humidity	49 %

Sample preparation

Storage before test	Normal laboratory conditions
Dust blow-off	Bulb blower
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)

TEST RESULTS

CHARACTERISTIC DAMAGE CURVE

Table 1: Estimated LIDTs for sample Corning 7980 100E AR355.

Test mode	Threshold
10-on-1	$19.6\ ^{+3.0}_{-3.0}$ J/cm^2
10^2-on-1	$19.6\ ^{+3.0}_{-3.0}$ J/cm^2
10^3-on-1	$19.2\ ^{+2.9}_{-2.9}$ J/cm^2

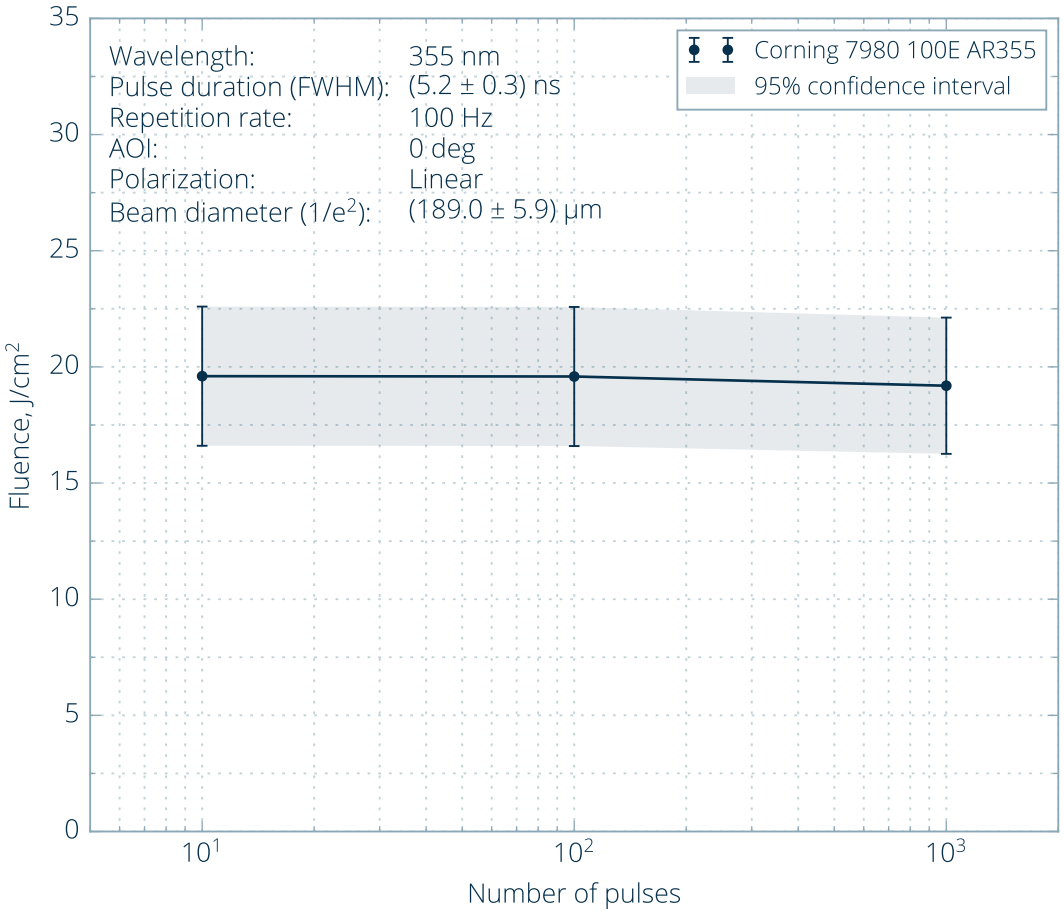
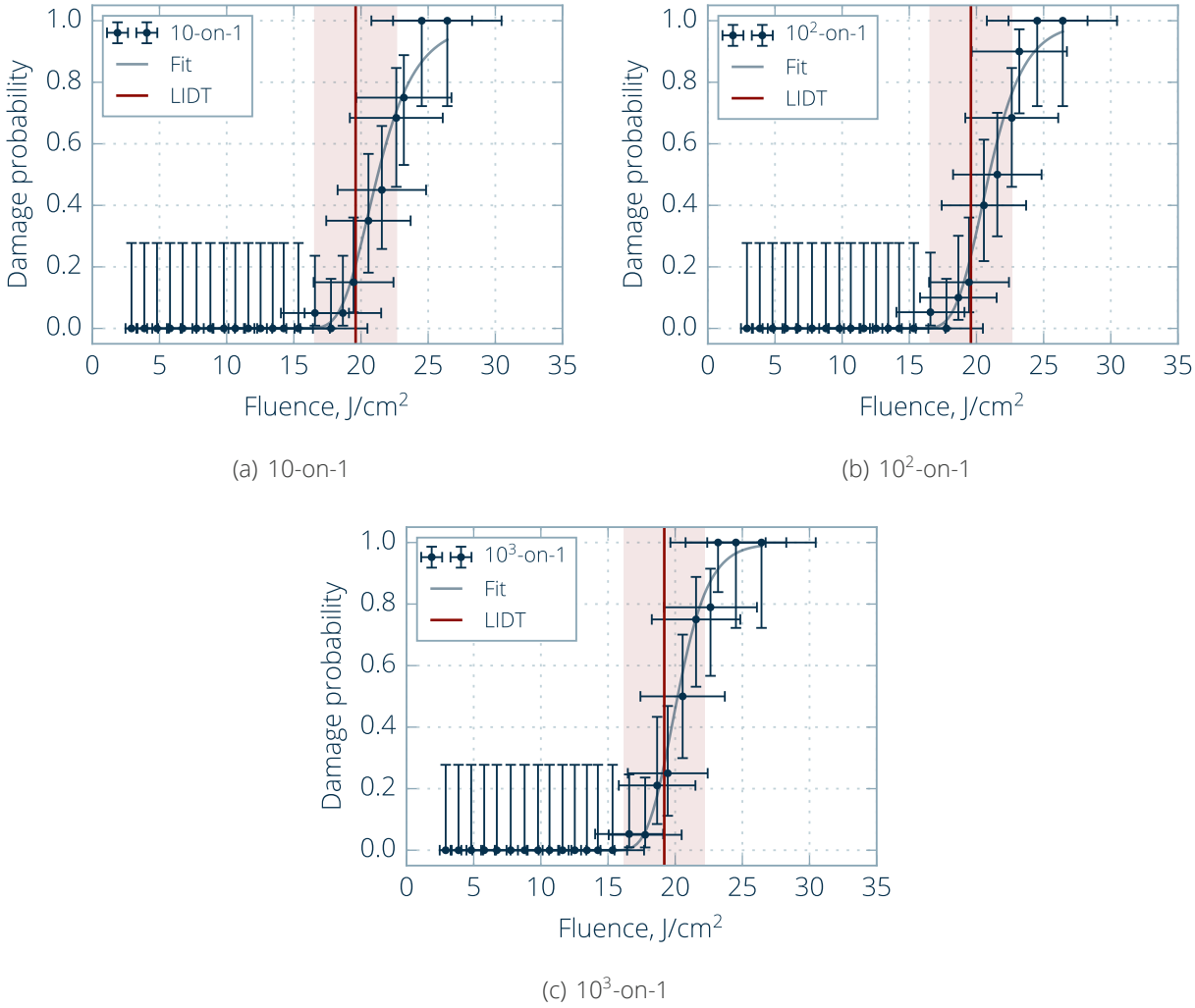


Figure 2: Characteristic damage curve.

DAMAGE PROBABILITY



(a) 10-on-1

(b) 10^2-on-1

(c) 10^3-on-1

Figure 3: Damage probability plots.

TYPICAL DAMAGE MORPHOLOGY

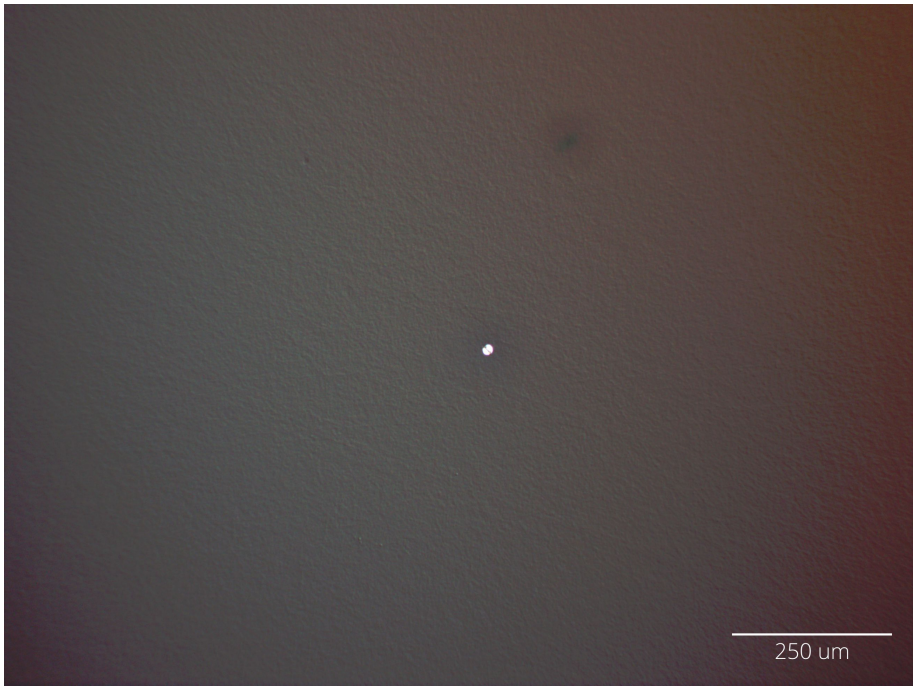


Figure 4: Typical damage morphology: fluence 21.8 J/cm^2, damage after 6 pulse(s).

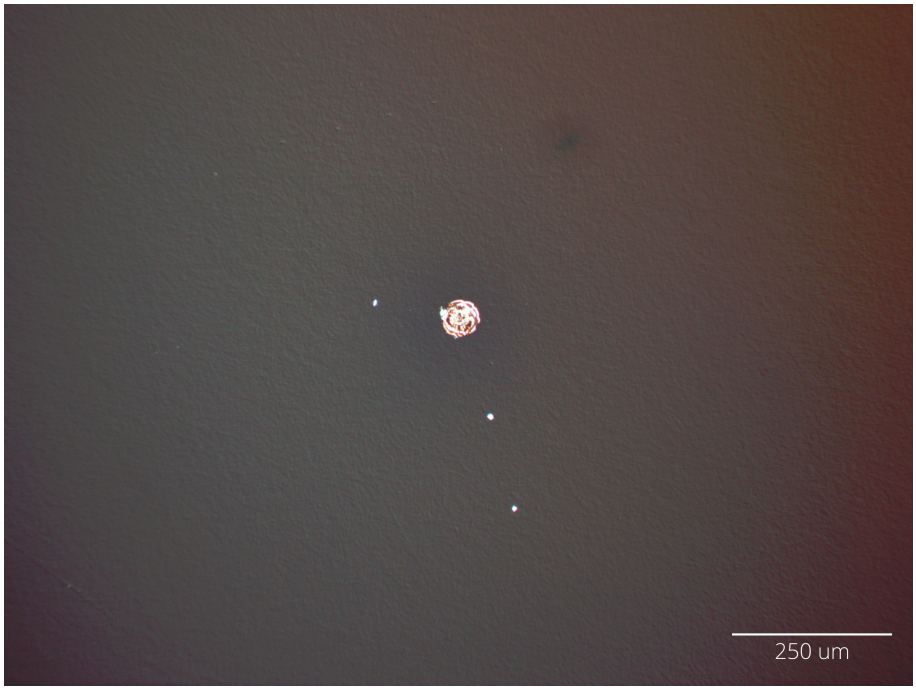


Figure 5: Typical damage morphology: fluence 23.2 J/cm^2, damage after 2 pulse(s).

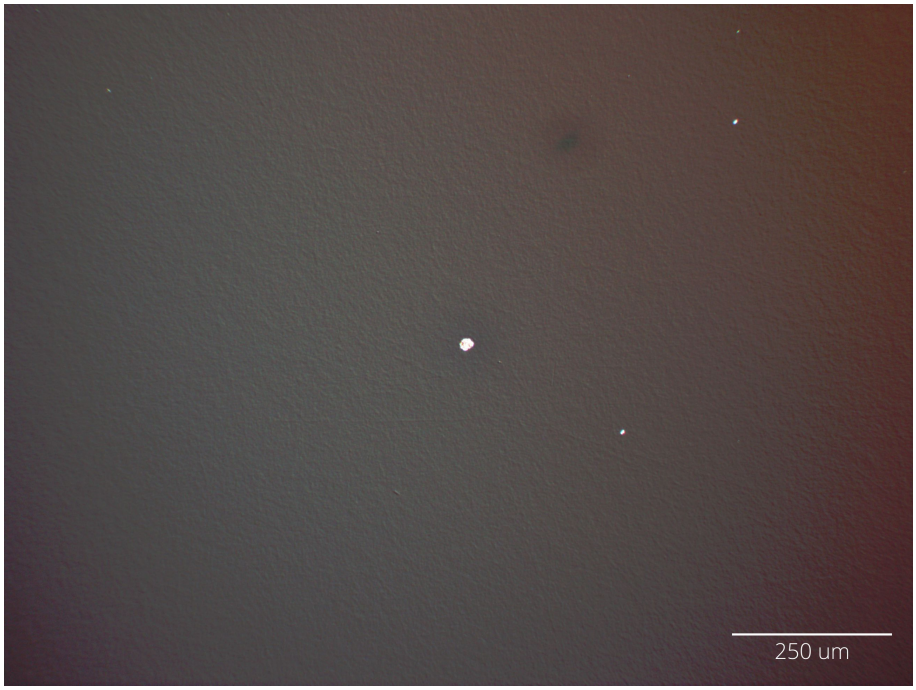


Figure 6: Typical damage morphology: fluence 23.2 J/cm^2, damage after 4 pulse(s).

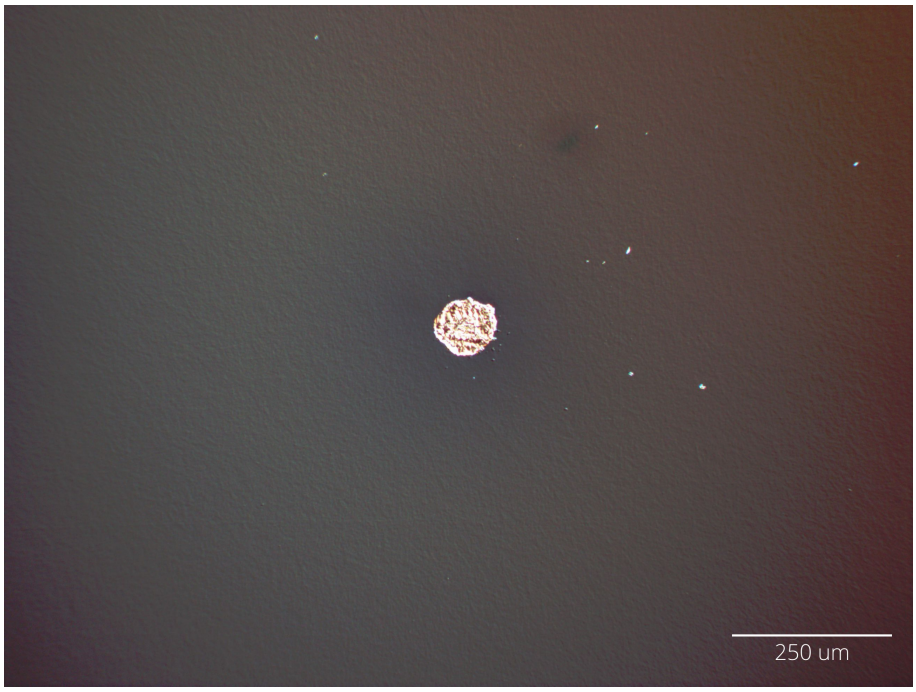


Figure 7: Typical damage morphology: fluence 25.8 J/cm^2, damage after 2 pulse(s).

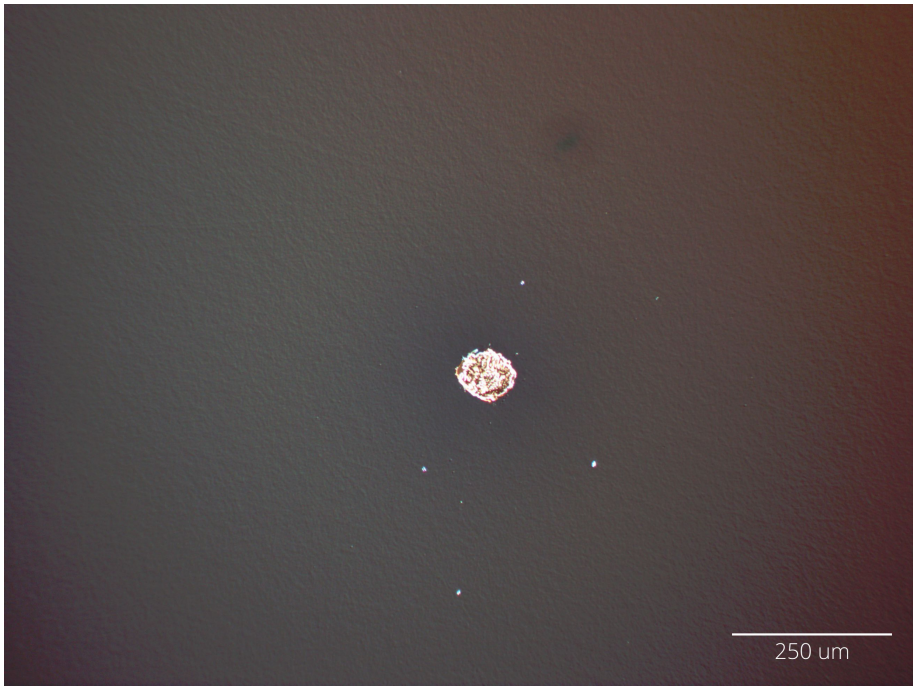


Figure 8: Typical damage morphology: fluence 27.6 J/cm^2, damage after 2 pulse(s).

TECHNICAL NOTE

Back surface damage

Back surface damage was observed. LIDT was estimated observing both front and back surface damages.