Laser-Induced Damage Threshold (LIDT) Measurement Report

ISO21254-2: S-on-1 Test Procedure

Sample: R14006-10

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Tester/date: E. Pupka / 2015-06-09

Specimen

Name of sample: R14006-10

Type of specimen: Yb:YAG, IBS dielectric coating

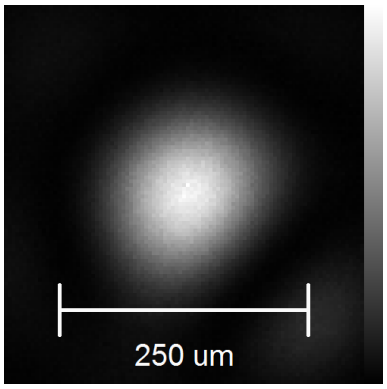
Storage, cleaning: Plastic box, wrapped in paper for optics

Test specification

First harmonic of pulsed Nd:YAG InnoLas Laser: SpitLight Hybrid laser (λ = 1064 nm, linear polarization, pulse duration 10.2 ns), $\lambda/2$ plate combined with additional polarizer attenuator, online scattered light damage detection, offline inspection of damage detection using Nomarski microscopy (100x).

Laser parameters used for testing

Wavelength:	1064 nm
Angle of incidence:	0 deg.
Polarization state:	linear
Pulse repetition frequency:	100 Hz
Spatial beam profile in target plane:	TEM_{00}
Longitudinal beam profile:	Single mode (SLM)
Beam diameter in target plane$_{(1/e^2)}$:	250.0 ± 5.4 µm (average from 64 pulses)
Pulse duration:	10.2 ns



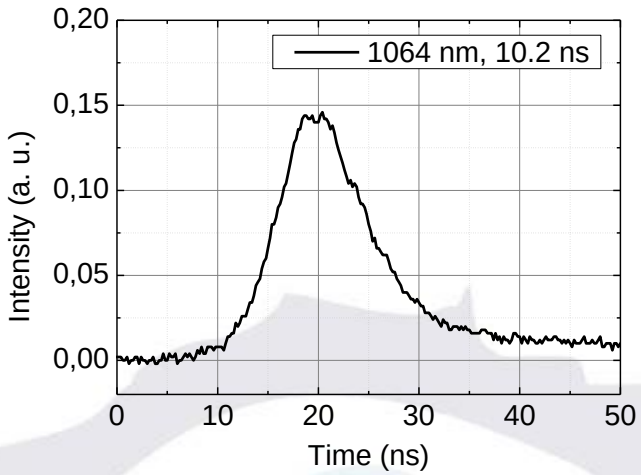


Fig. 1. Spatial beam profile in target plane (left) and oscilloscope curve (right).

Test procedure:	**S-on-1 test**
Number of sites per specimen:	207
Arrangement of test sites:	equally spaced
Minimum distance between sites:	875 μm
Damage detection:	Scattered light diode
Storage of the specimen:	Manufacturer's packaging, normal laboratory conditions
Test environment:	Industrial environment
Cleaning:	Dust blown off with clean air
Definition of LIDT:	Nonlinear fit to 0% of damage Probability

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Test result:

Table 1. Summarized LIDT's for sample R14006-10.

Test mode	Threshold – front surface, J/cm2	Threshold – rear surface, J/cm2
10-on-1	15.14 ≤ 19.32 ≤ 22.73	15.50 ≤ 19.16 ≤ 22.55
1000-on-1	8.40 ≤ 11.22 ≤ 13.58	11.21 ≤ 15.22 ≤ 18.63

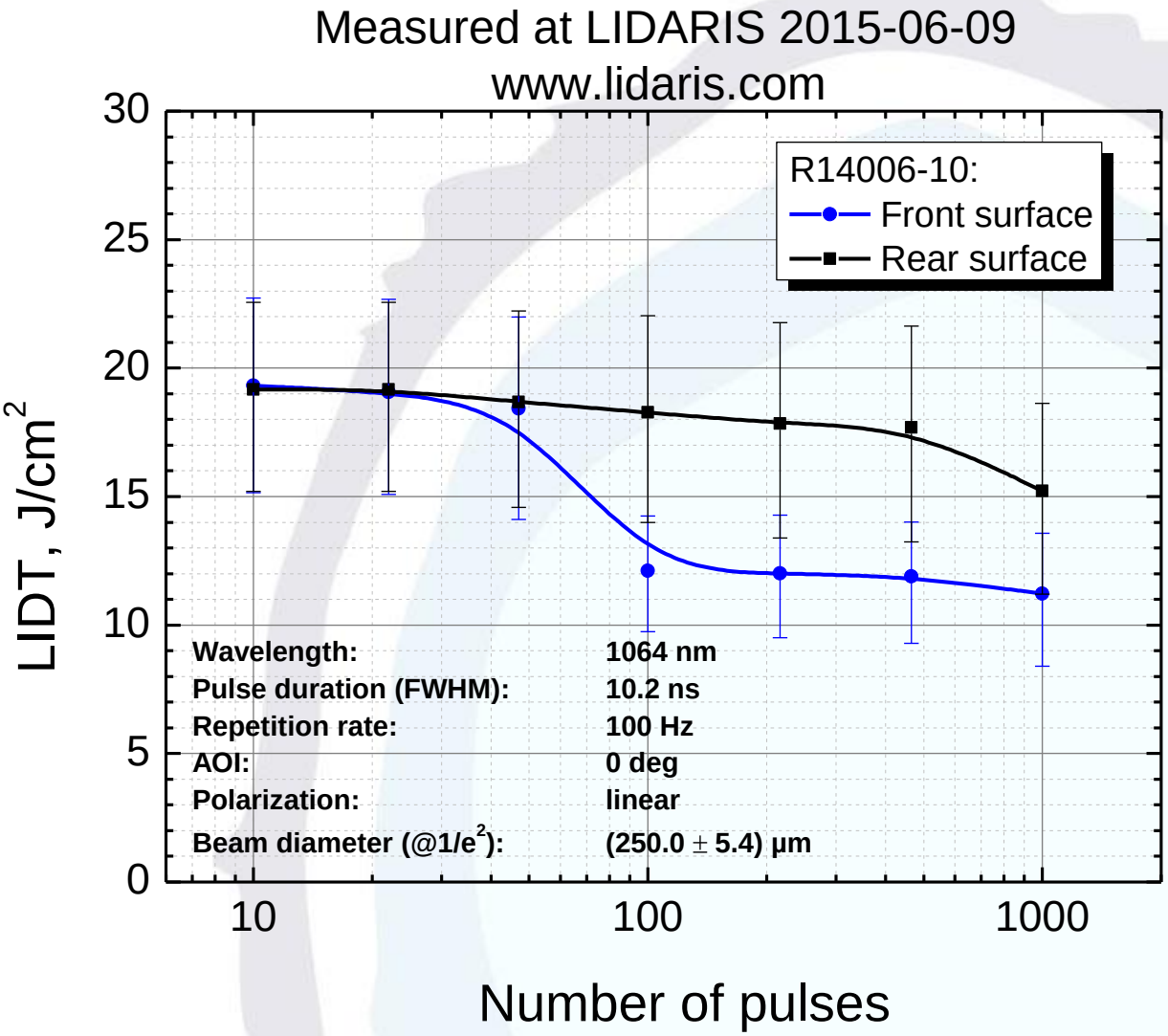

Fig. 2. Characteristic damage curve.

Typical damage morphology:

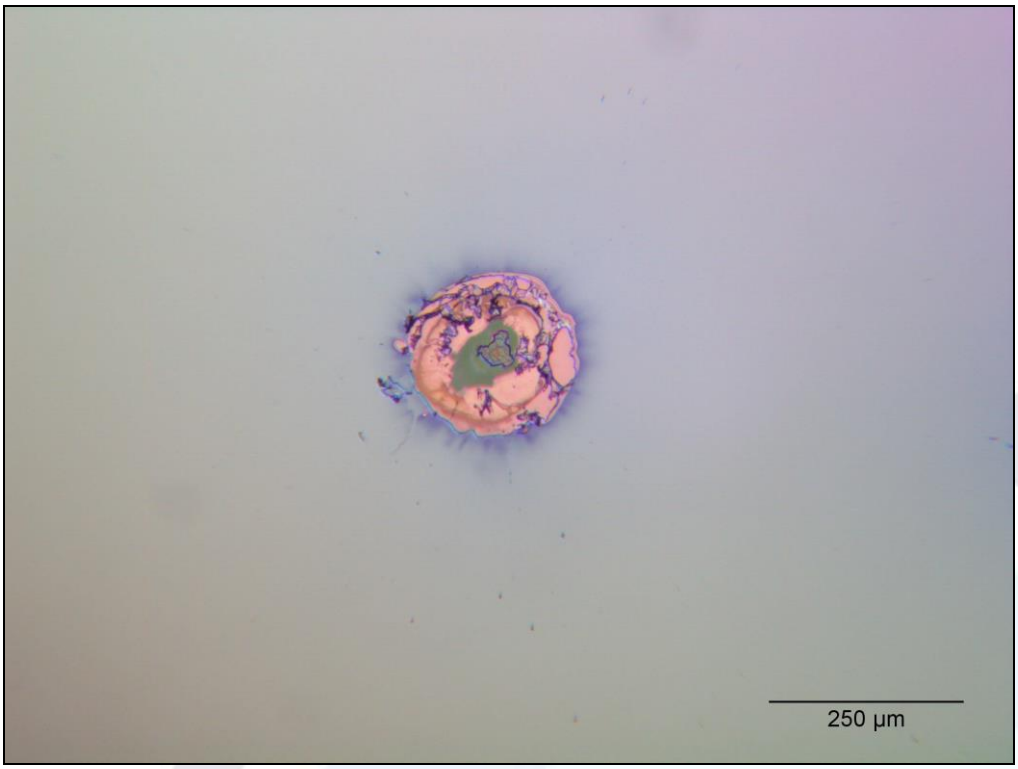

Fig. 3. Typical front surface damage morphology
(Energy density 30.21 J/cm^2, damage after 2 pulses)

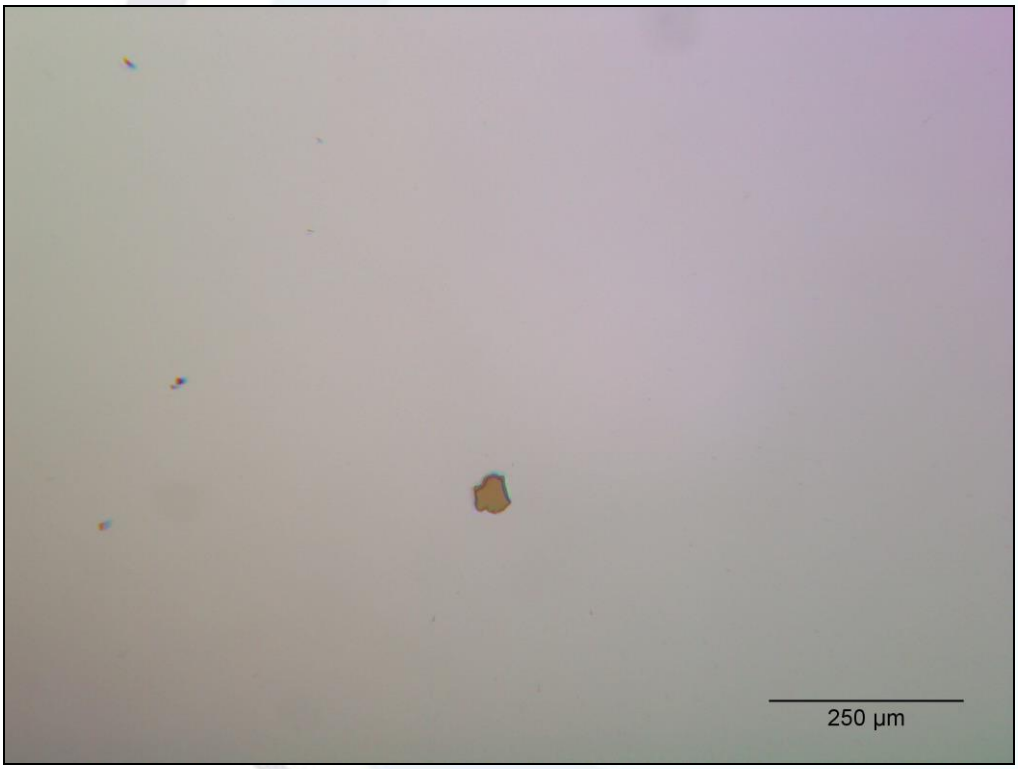

Fig. 4. Typical front surface damage morphology
(Energy density 12.64 J/cm^2, damage after 1000 pulses)

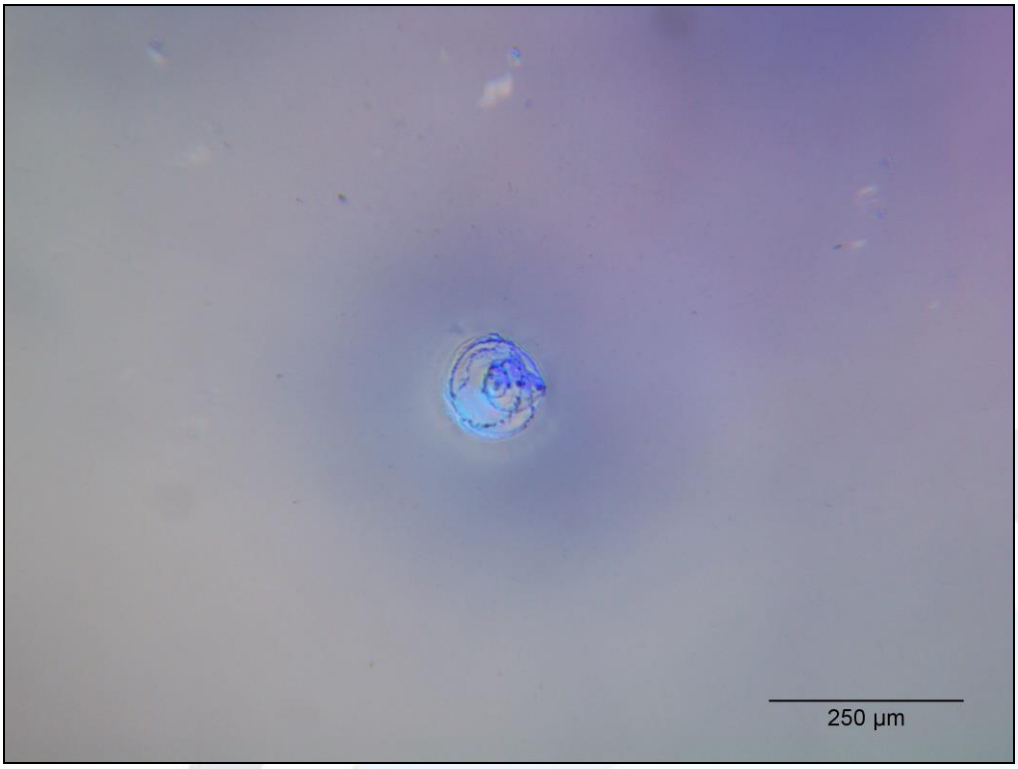

Fig. 5. Typical rear surface damage morphology
(Energy density 50.18 J/cm^2, damage after 8 pulses)

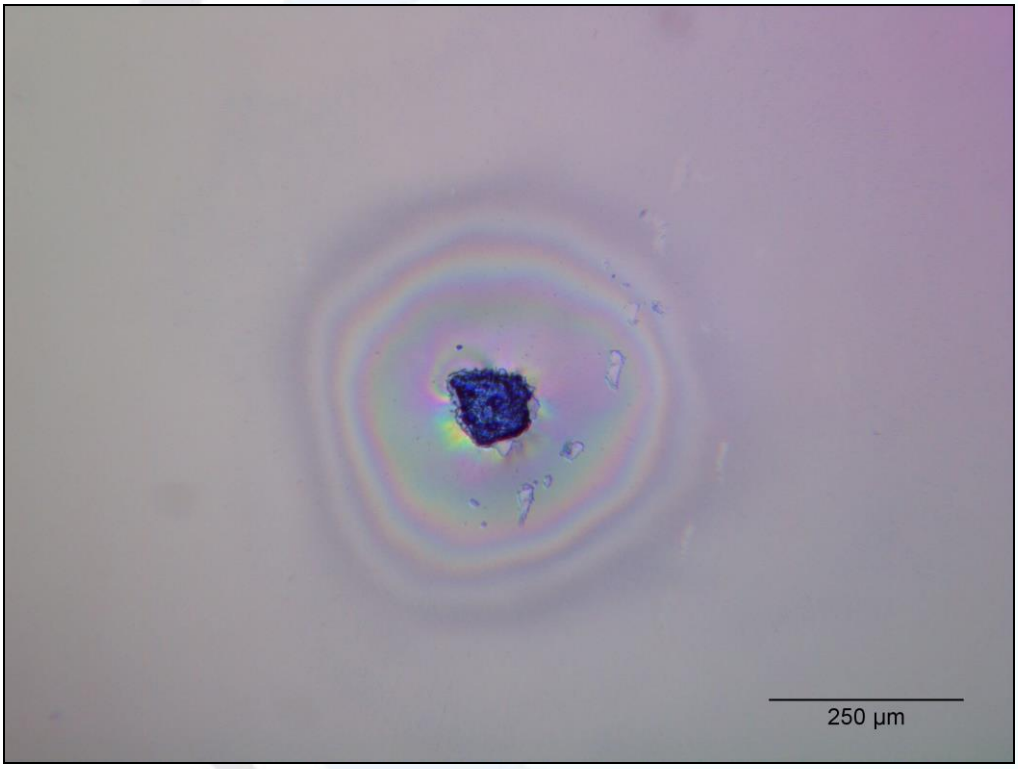

Fig. 6. Typical rear surface damage morphology
(Energy density 17.60 J/cm^2, damage after 1000 pulses)