

Laser Induced Damage Threshold (LIDT): (S-on-1 test procedure: ISO 11254 - 2)

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Testing institute

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Specimen

Name of sample: UVFC 7980
Type of specimen: HR @ 1030-1070nm
AOI=45;
Storage, cleaning: Wrapping paper, no cleaning.

Test specification

Second harmonic of pulsed Nd:YAG NL303 G laser ($\lambda = 1064$ nm, linear polarization S, pulse duration 3,6 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

Wavelength: 1064 nm;
Angle of incidence: 45 deg;
Polarisation state: linear S;
Pulse repetition frequency: 10 Hz;
Spatial beam profile in target plane: TEM₀₀;
Longitudinal beam profile: Multimode;
Beam diameter in target plane ($1/e^2$): 150 μ m (average from 30 pulses);
Pulse duration: 3,6 ns;

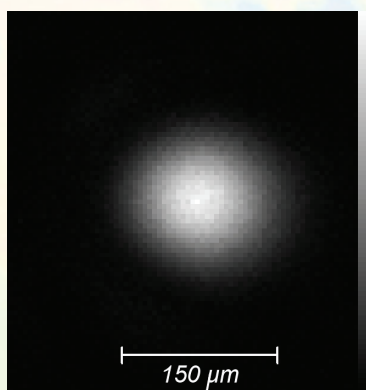


Fig. 1. Spatial beam profile in target plane.

Test result of UVFC 7980

Test procedure: S-on-1 test

Number of sites per specimen: 350;
 Arrangement of test sites: Equally spaced;
 Minimum distance between sites: 500 μm ;
 Damage detection: Scattered light diode;
 Storage of the specimen: Wrapping paper;
 Test environment: Industrial environment;
 Cleaning: No;
 Definition of LIDT: Model fit to 0% of damage probability;

LIDT_{1-on-1} = $30.4 \pm 4.5 \text{ J/cm}^2$
 LIDT_{1000-on-1} = $12.2 \pm 2.7 \text{ J/cm}^2$

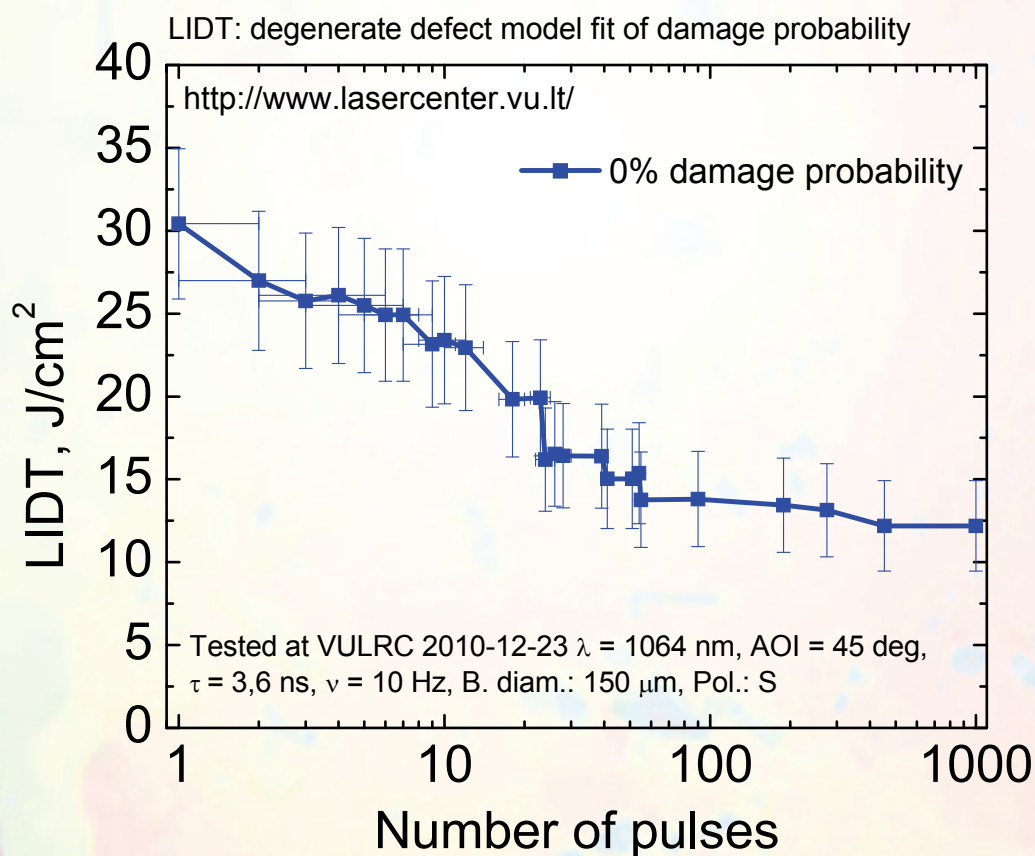


Fig. 2. Characteristic damage curve.

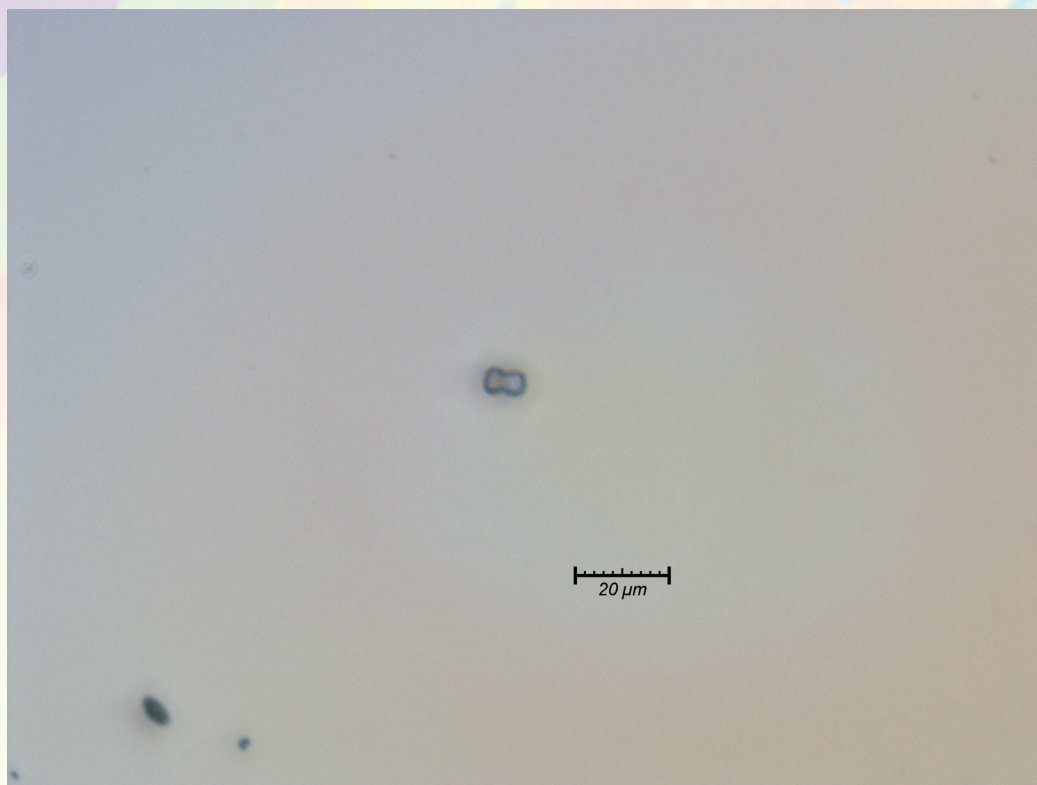


Fig. 3. Typical damage morphology
(Energy density $39,27 \text{ J/cm}^2$, damage after 2 pulses)

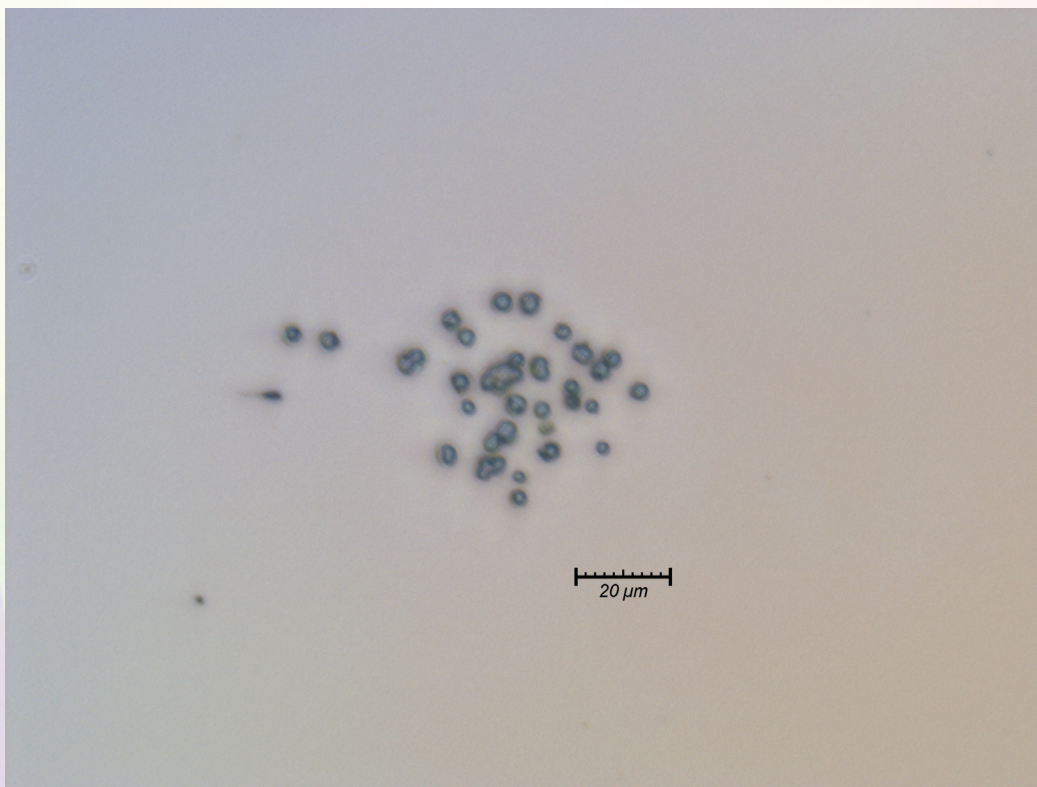


Fig. 4. Typical damage morphology
(Energy density $49,53 \text{ J/cm}^2$, damage after 1 pulse)

Technical Note 1

According to the ISO11254-2 norm 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 has to be included in the calculation of the effective area. Therefore the beam diameter increase due to the angle of incidence (AOI) is taken into account when calculating the laser fluency.

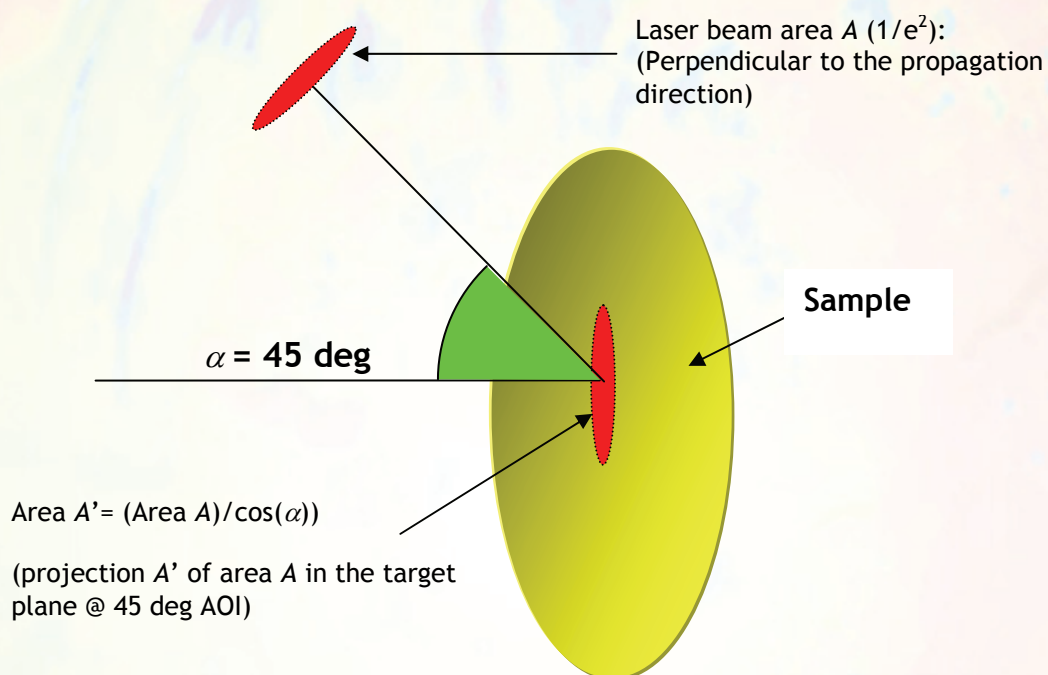


Fig. 5.