Laser-Induced Damage Threshold (LIDT) Measurement Report

ISO 21254-2: S-on-1 Test Procedure

Sample: 2-HPCB-A-0125-E

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Specimen

Name of sample:	2-HPCB-A-0125-E
Type of specimen:	Polarizing cube
Storage, cleaning:	Wrapped in paper for optics

Test specification

Third harmonic of pulsed Nd:YAG InnoLas Laser: SpitLight Hybrid laser (λ = 355 nm, linear polarization, pulse duration 7.0 ns). $\lambda/2$ plate combined with additional polarizer attenuator, online scattered light damage detection, offline damage detection using Nomarski microscopy.

Laser parameters

Wavelength:	355 nm
Angle of incidence:	45 deg.
Polarization state:	linear S and P
Pulse repetition frequency:	100 Hz
Spatial beam profile in target plane:	TEM_{00}
Longitudinal beam profile:	Single mode (SLM)
Beam diameter in target plane $_{(1/e^2)}$:	(175.6 ± 3.2) µm (average from 500 pulses)
Pulse duration:	(7.0 ± 0.4) ns

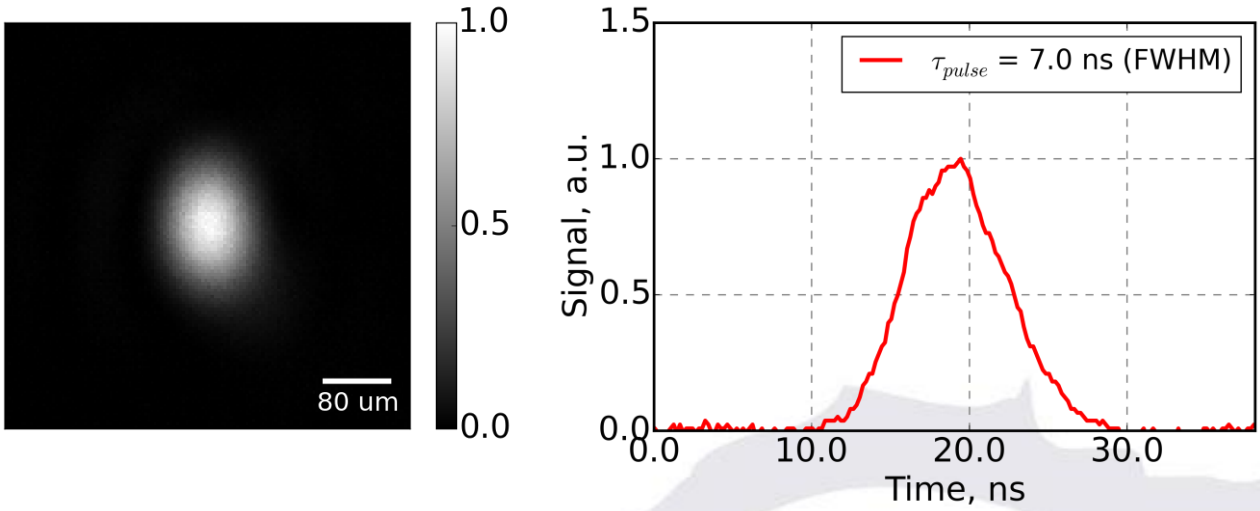

Fig. 1 Spatial beam profile in target plane (left) and temporal pulse profile (right)

Test procedure:	**S-on-1 test**
Number of sites per specimen:	121 (S pol.), 116 (P pol.)
Arrangement of test sites:	Equally spaced
Minimum distance between sites:	650 µm
Damage detection:	Online scattered light diode, offline Nomarski microscopy
Storage of the specimen:	Original packaging, normal laboratory conditions
Test environment:	Industrial environment
Cleaning:	Compressed air
Definition of LIDT:	Nonlinear fit to 0% of damage probability

Test result:

Table 1 Summarized LIDT's for sample 2-HPCB-A-0125-E

Test mode	Polarizing surface threshold (S pol.), J/cm2	Polarizing surface threshold (P pol.), J/cm2
10-on-1	3.3 ≤ 3.7 ≤ 3.9	3.8 ≤ 4.2 ≤ 4.6
100-on-1	3.2 ≤ 3.5 ≤ 3.8	3.7 ≤ 4.1 ≤ 4.5
1000-on-1	3.2 ≤ 3.5 ≤ 3.8	3.7 ≤ 4.1 ≤ 4.5

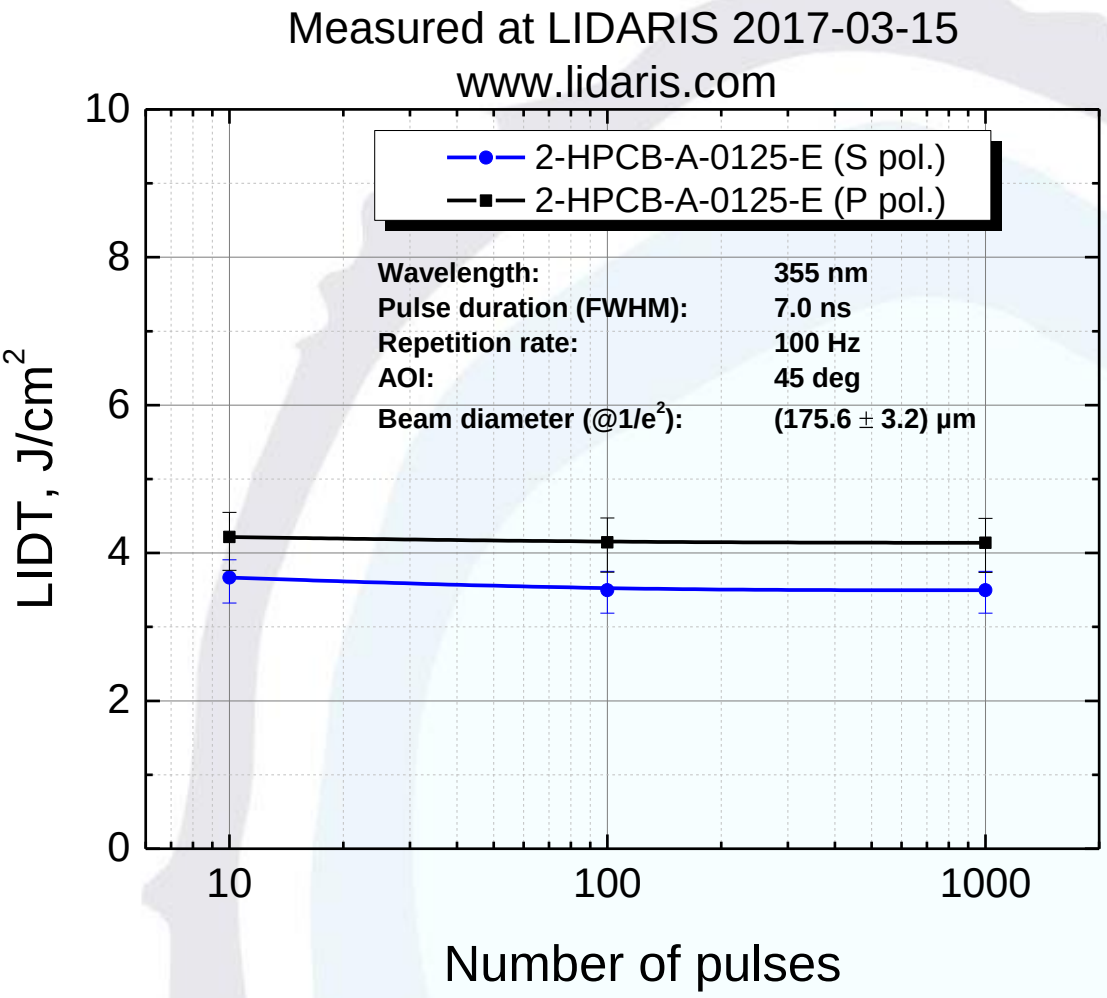

Fig. 2 Characteristic damage curve.

Typical damage morphology:

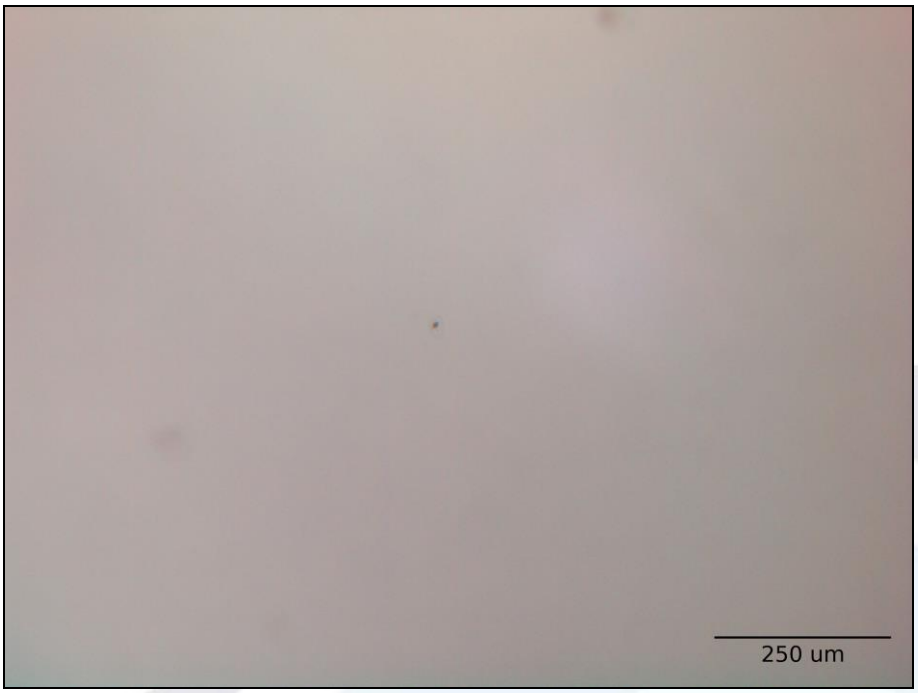

Fig. 3 Typical polarizing surface damage morphology (S pol.)
(Fluence 3.7 J/cm^2, damage after 466 pulses)

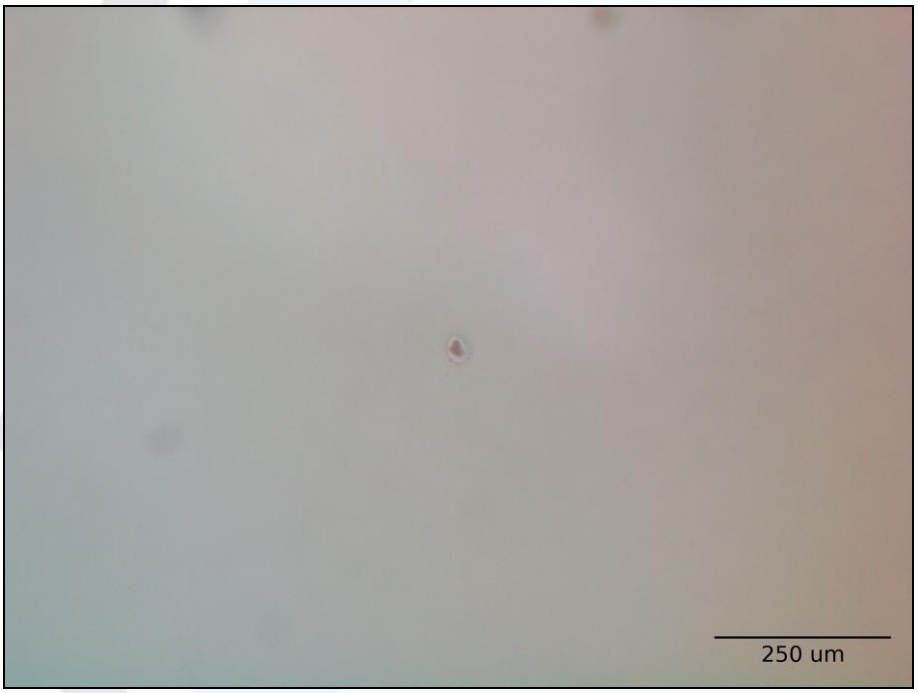

Fig. 4 Typical polarizing surface damage morphology (S pol.)
(Fluence 4.1 J/cm^2, damage after 31 pulses)

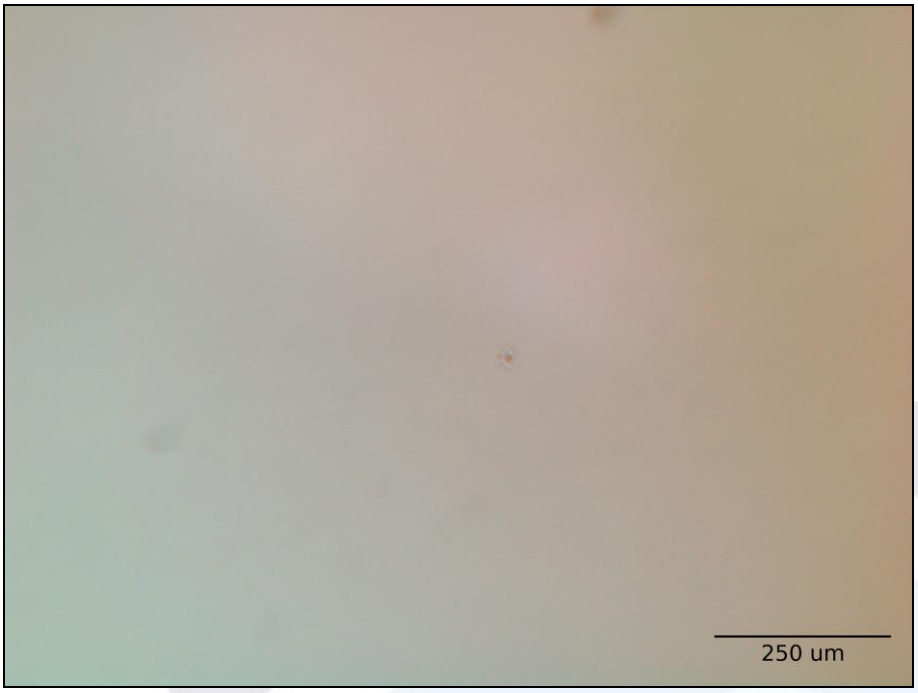

Fig. 5 Typical polarizing surface damage morphology (P pol.)
(Fluence 4.7 J/cm^2, damage after 688 pulses)

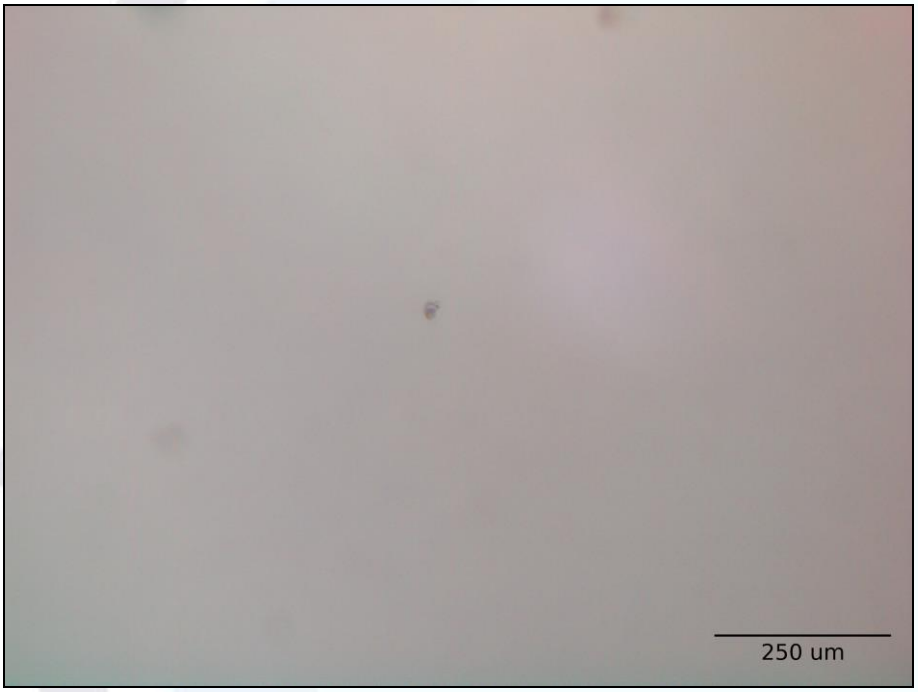

Fig. 6 Typical polarizing surface damage morphology (P pol.)
(Fluence 4.8 J/cm^2, damage after 5 pulses)

Technical Note

According to the ISO 21254-2 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 fluence.

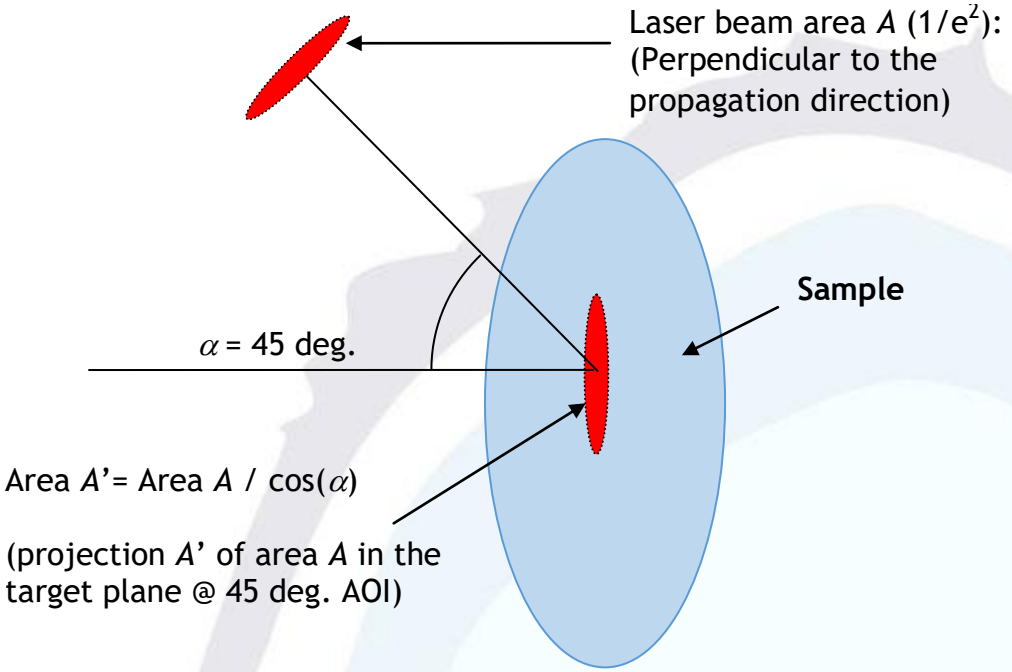

Fig. 7 Oblique incidence.