Laser-Induced Damage Threshold (LIDT) Measurement Report

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

Sample: 2-HC45TFP-1064-0254-HP

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Specimen

Name of sample:	2-HC45TFP-1064-0254-HP
Type of specimen:	Polarizer
Storage, cleaning:	Plastic box

Test specification

Fundamental harmonic of pulsed Nd:YAG InnoLas Laser: SpitLight Hybrid laser (λ = 1064 nm, linear polarization, pulse duration 12.4 ns). $\lambda/2$ plate combined with additional polarizer attenuator, online scattered light damage detection, offline damage detection using Nomarski microscopy.

Laser parameters

Wavelength:	1064 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 $(1/e^2)$:	(201.5 ± 3.6) µm (average from 500 pulses)
Pulse duration:	(12.4 ± 0.4) ns

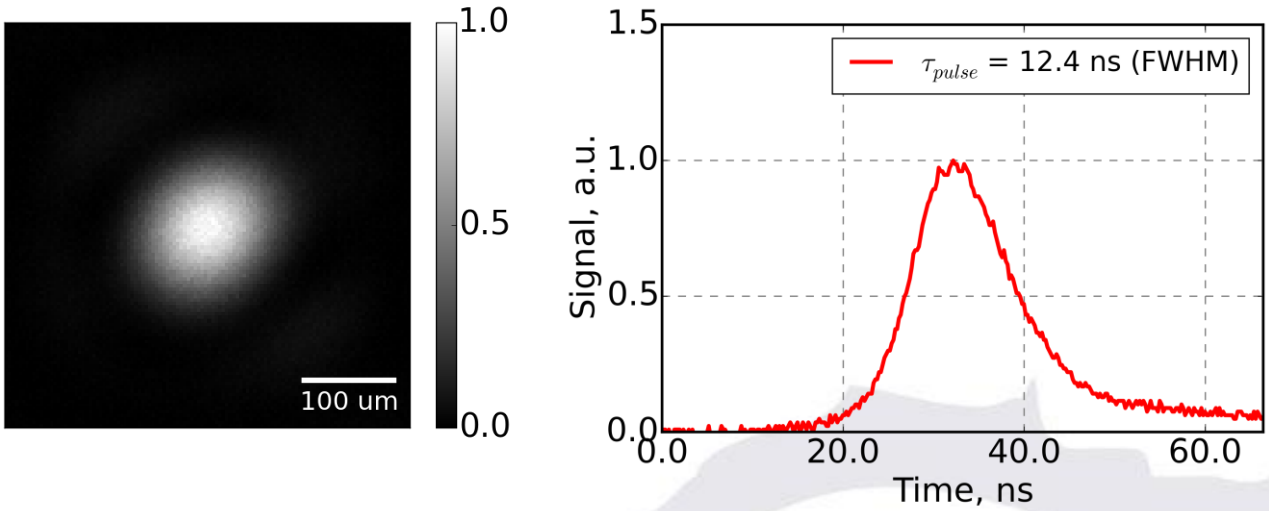

Fig. 1 Spatial beam profile in target plane (left) and temporal pulse profile (right)

Test procedure:	**S-on-1 test**
Number of sites per specimen:	207 (S pol.), 186 (P pol.)
Arrangement of test sites:	Equally spaced
Minimum distance between sites:	730 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-HC45TFP-1064-0254-HP.

Test mode	Polarizing surface threshold (S pol.), J/cm2	Polarizing surface threshold (P pol.), J/cm2
10-on-1	32.1 ≤ 57.2 ≤ 72.6	13.5 ≤ 15.5 ≤ 17.0
100-on-1	32.1 ≤ 57.2 ≤ 72.6	13.5 ≤ 15.5 ≤ 16.9
1000-on-1	32.1 ≤ 57.2 ≤ 72.6	13.5 ≤ 15.5 ≤ 16.7

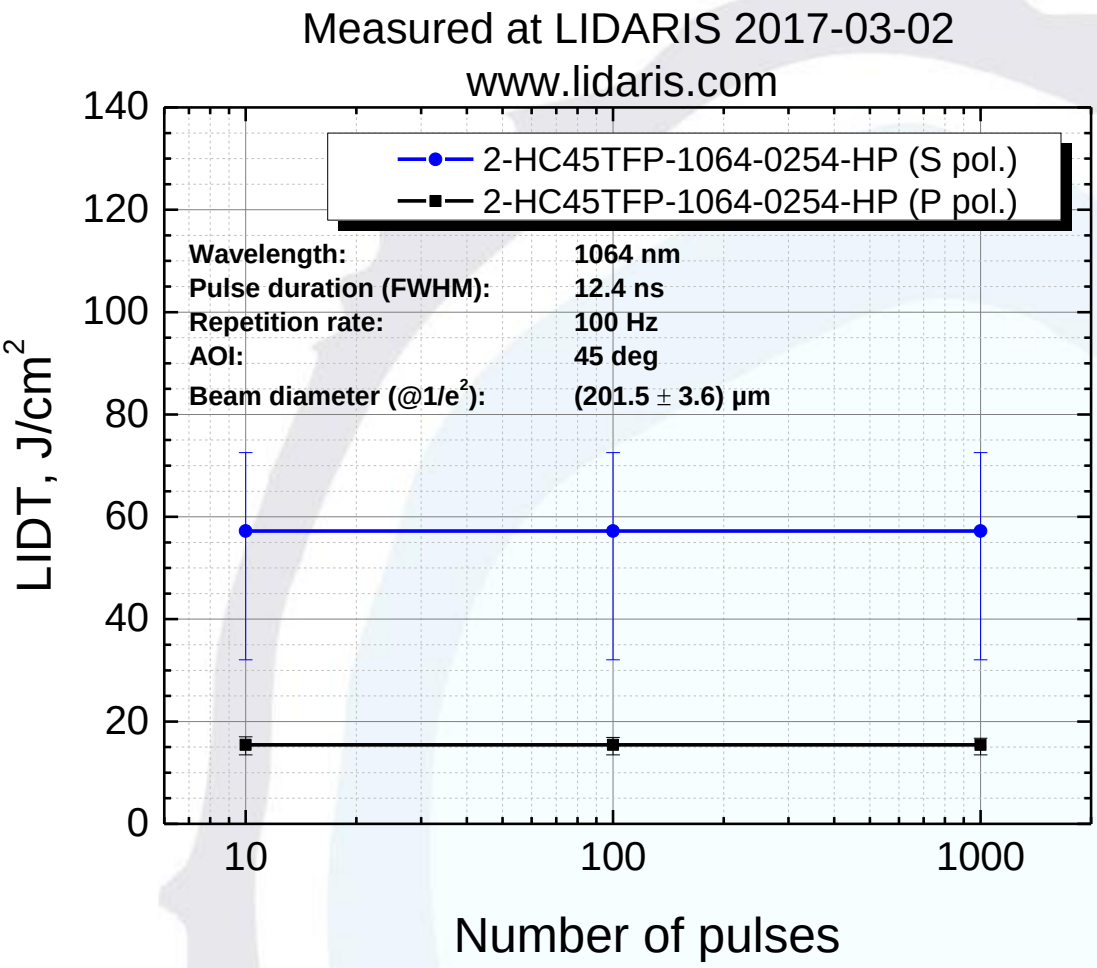

Fig. 2 Characteristic damage curve.

Typical damage morphology:

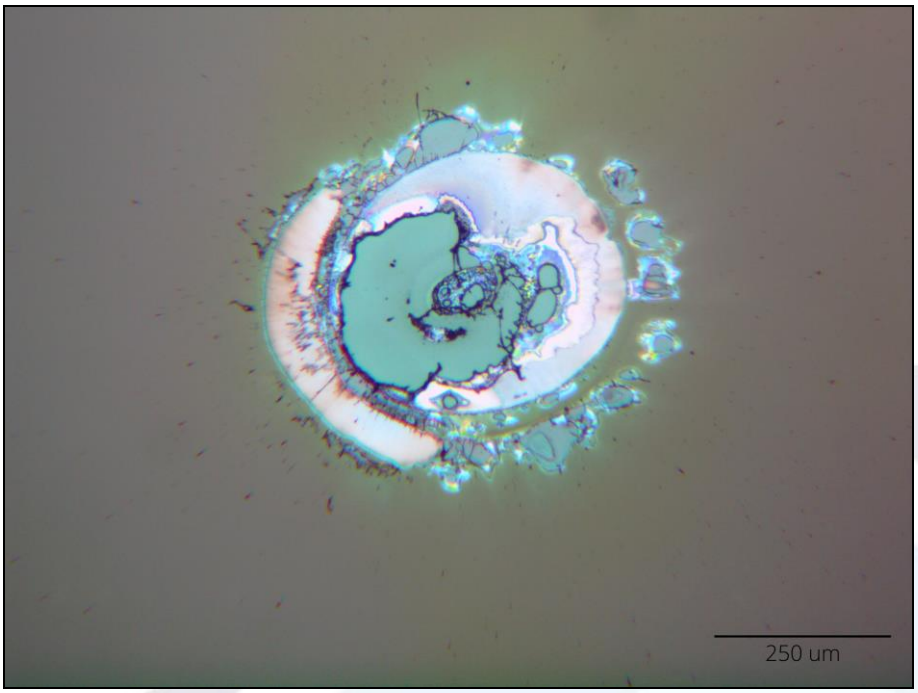

Fig. 3 Typical polarizing surface damage morphology (S pol.)
(Fluence 80.2 J/cm^2, damage after 1 pulse)

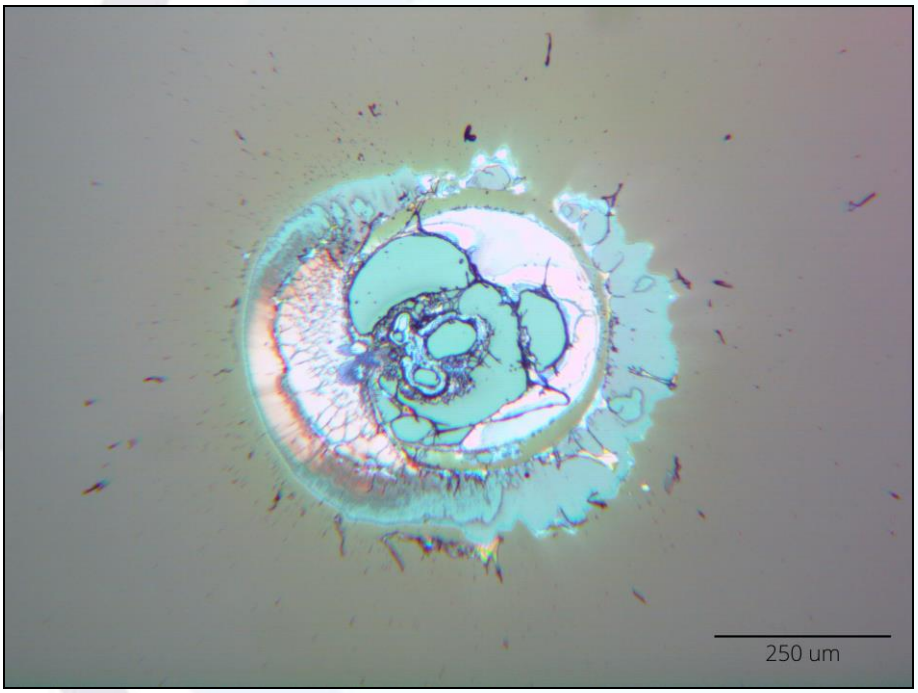

Fig. 4 Typical polarizing surface damage morphology (S pol.)
(Fluence 88.1 J/cm^2, damage after 435 pulses)

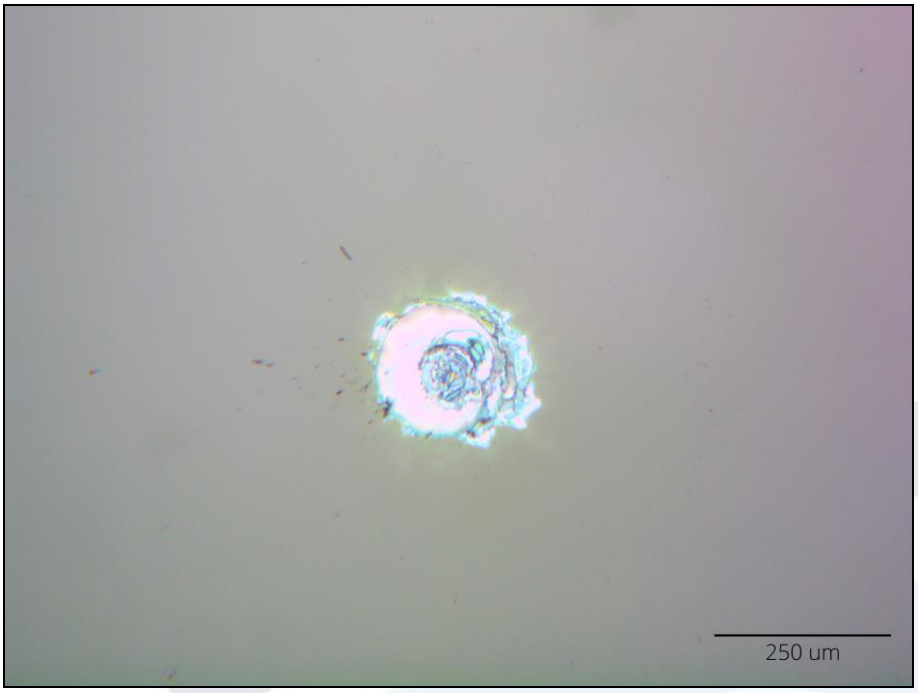

Fig. 5 Typical polarizing surface damage morphology (P pol.)
(Fluence 20.5 J/cm^2, damage after 7 pulses)

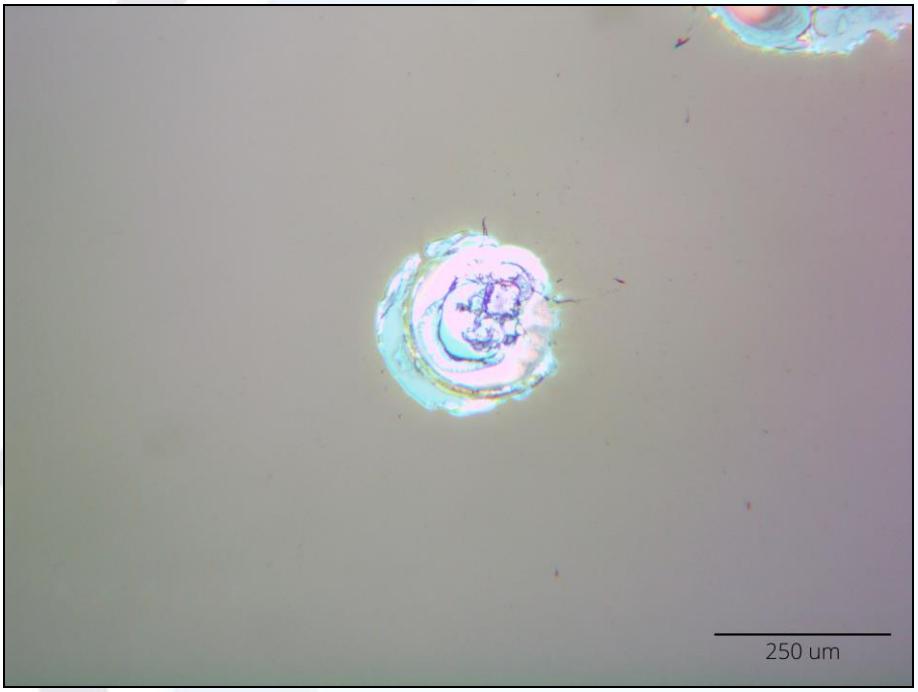

Fig. 6 Typical polarizing surface damage morphology (P pol.)
(Fluence 18.4 J/cm^2, damage after 198 pulses)

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.

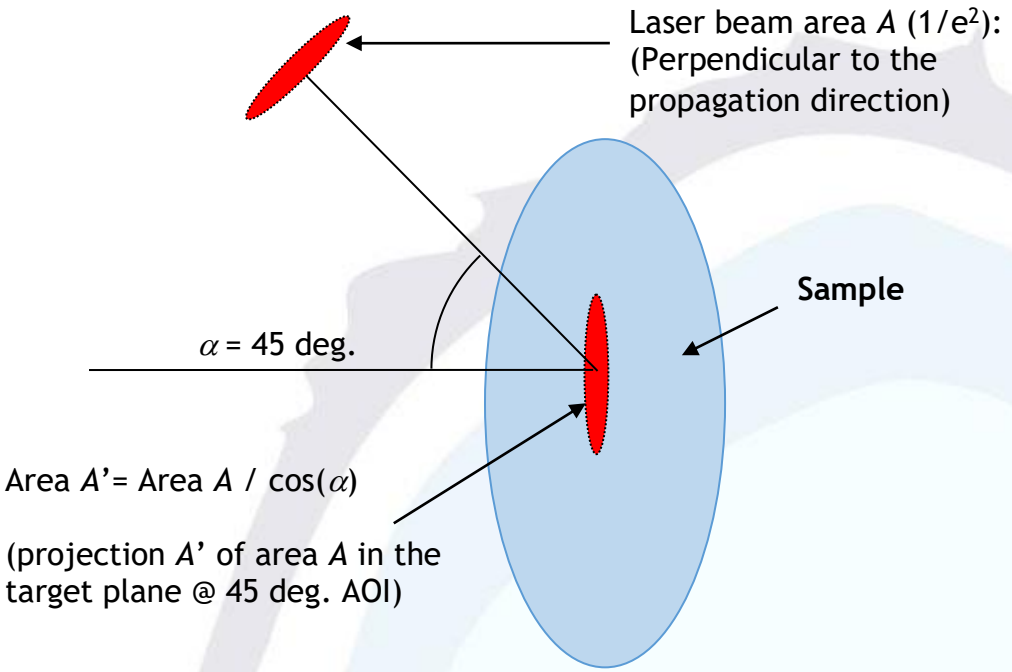

Fig. 7 Oblique incidence.