

Laser-Induced Damage Threshold (LIDT) Measurement Report

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

Sample: 2-HPCB-C-0125

Request from: ALTECHNA Co.Ltd.
Mokslininku st. 6A
LT-08412 Vilnius
Lithuania

Contact person: Saulius Milkintas

Testing institute: Lidaris Ltd.
Saulėtekio al. 10
LT-10223 Vilnius
Lithuania, EU

Tester/date: E. Pupka / 2016-09-14

Specimen

Name of sample: 2-HPCB-C-0125

Type of specimen: Polarizing Cube for High Energy Applications

Storage, cleaning: Membrane box

Test specification

Fundamental harmonic of pulsed Nd:YAG InnoLas Laser: SpitLight Hybrid laser ($\lambda = 1064$ nm, linear polarization, pulse duration 12.0 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: 0 deg.
Polarization state: linear P
Pulse repetition frequency: 100 Hz
Spatial beam profile in target plane: TEM₀₀
Longitudinal beam profile: Single mode (SLM)
Beam diameter in target plane ($1/e^2$): (196.8 ± 2.6) μm (average from 500 pulses)
Pulse duration: (12.0 ± 0.4) ns

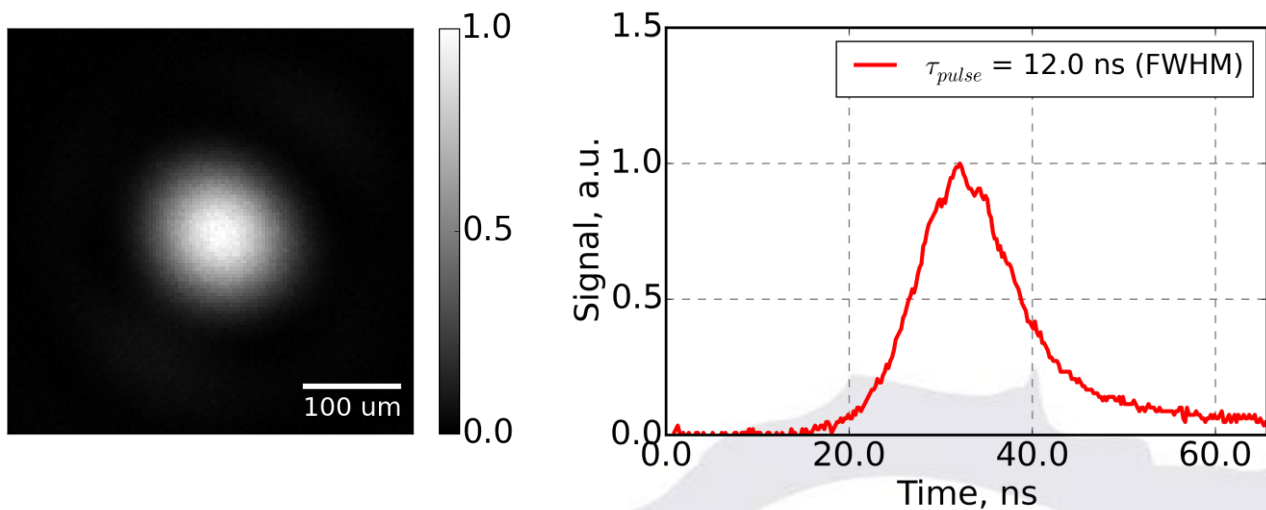


Fig. 1 Spatial beam profile in target plane (left) and temporal pulse profile (right)

Test procedure:

Number of sites per specimen:
Arrangement of test sites:
Minimum distance between sites:
Damage detection:

Storage of the specimen:
Test environment:
Cleaning:
Definition of LIDT:

S-on-1 test

81
Equally spaced
700 μm
Online scattered light diode,
offline Nomarski microscopy
Original packaging, normal laboratory conditions
Industrial environment
Compressed air
Nonlinear fit to 0% of damage probability

Test result:

Table 1 Summarized LIDT's for sample 2-HPCB-C-0125.

Test mode	Polarizing surface threshold, J/cm ²	Front surface threshold, J/cm ²	Back surface threshold, J/cm ²
10-on-1	25.9 ≤ 28.1 ≤ 30.6	25.2 ≤ 27.0 ≤ 28.5	23.2 ≤ 27.3 ≤ 29.4
100-on-1	25.9 ≤ 28.1 ≤ 30.0	25.2 ≤ 27.0 ≤ 28.3	23.2 ≤ 25.9 ≤ 27.5
1000-on-1	25.9 ≤ 28.1 ≤ 29.9	25.2 ≤ 27.0 ≤ 28.2	23.2 ≤ 25.9 ≤ 27.1

Measured at LIDARIS 2016-09-14
www.lidaris.com

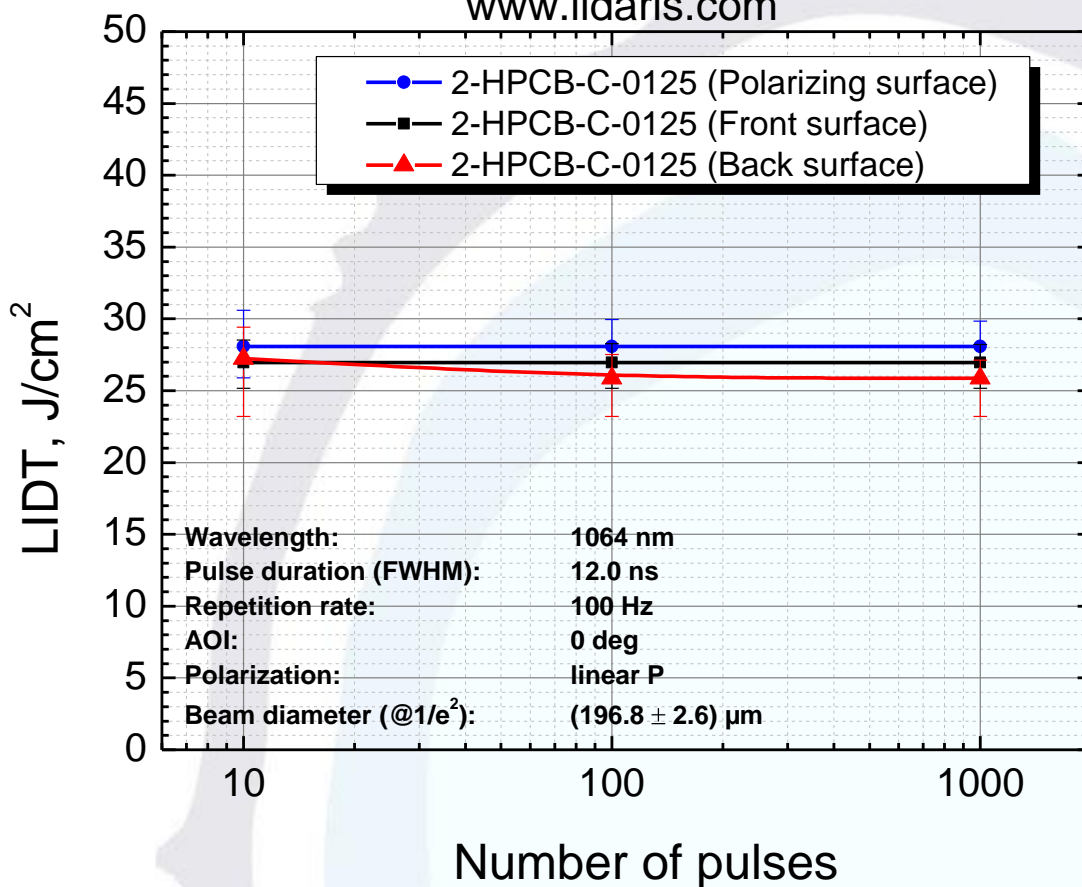
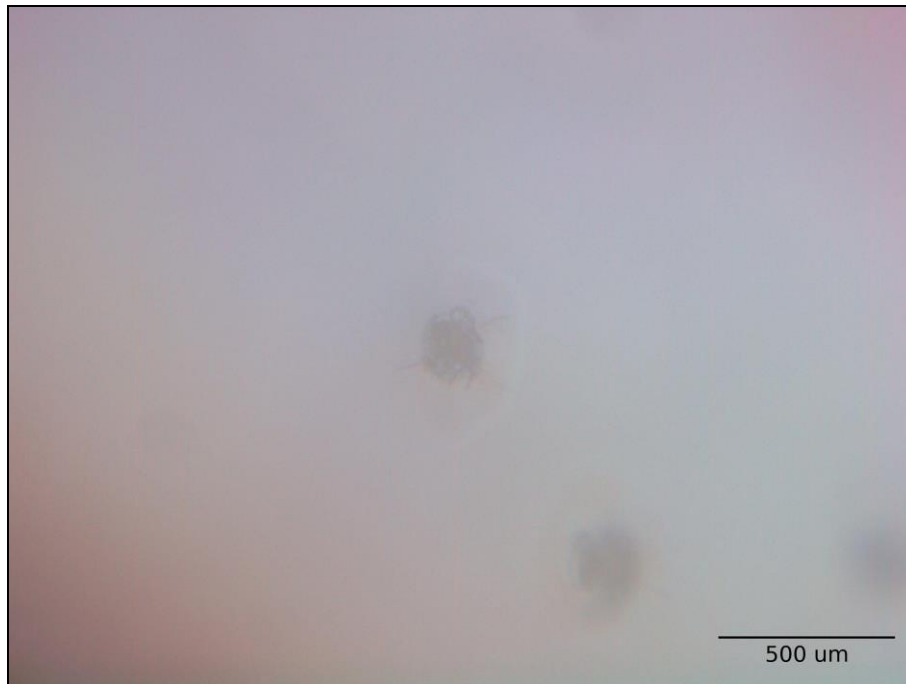


Fig. 2 Characteristic damage curve.

Typical damage morphology:



**Fig. 3 Typical polarizing surface damage morphology
(Fluence 28.4 J/cm², damage after 6 pulses)**



**Fig. 4 Typical polarizing surface damage morphology
(Fluence 31.7 J/cm², damage after 5 pulses)**

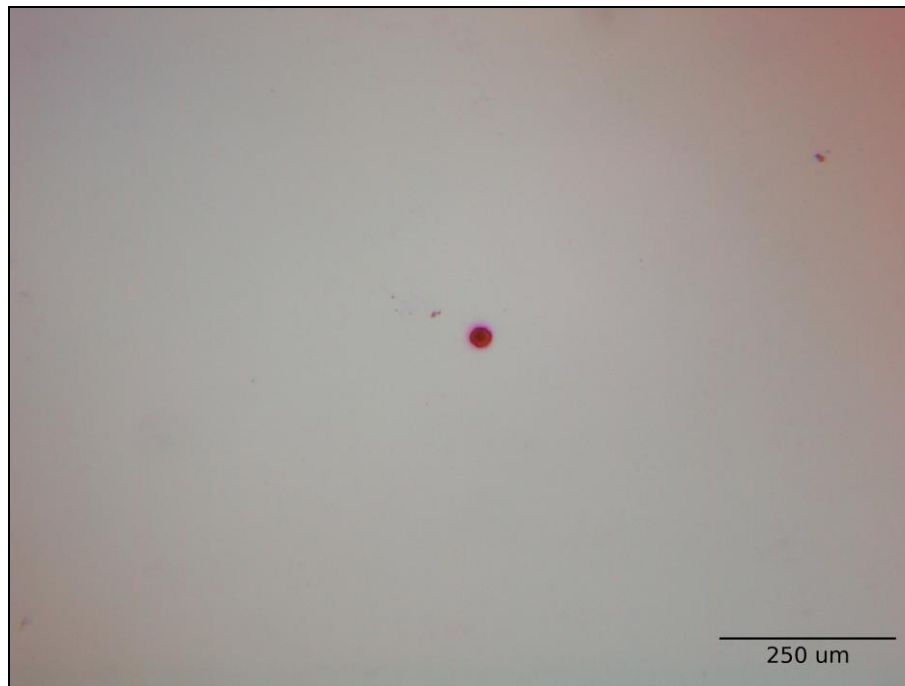


Fig. 5 Typical front surface damage morphology
(Fluence 27.3 J/cm^2 , damage after 1000 pulses)

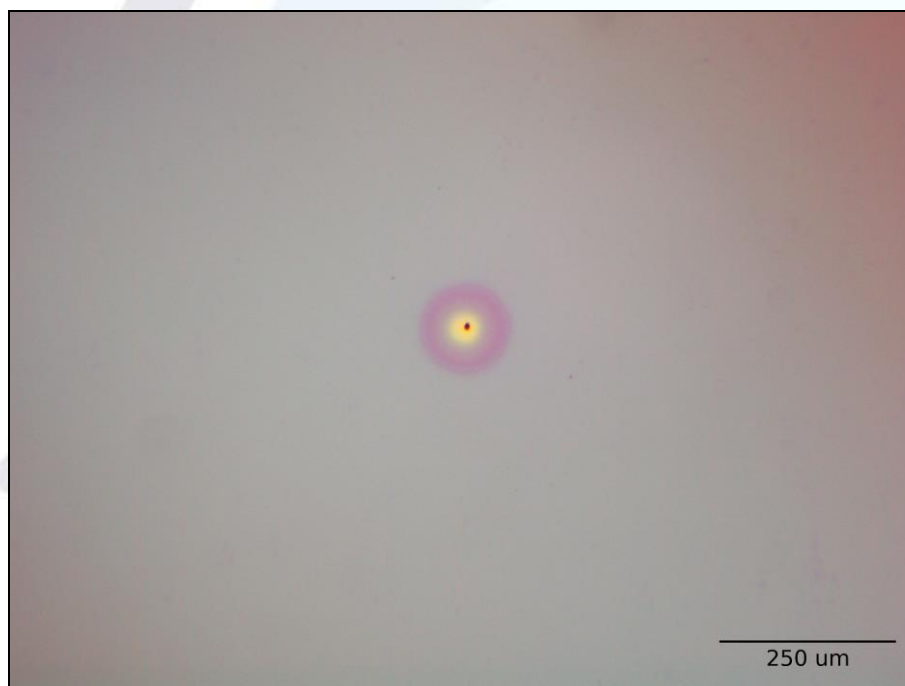


Fig. 6 Typical front surface damage morphology
(Fluence 42.7 J/cm^2 , damage after 11 pulses)

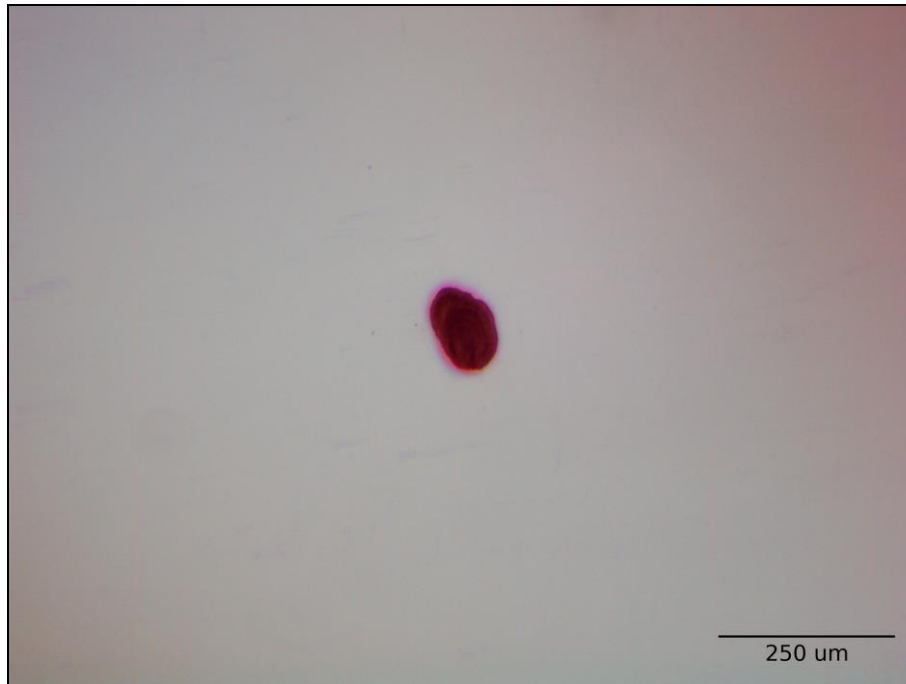


Fig. 7 Typical back surface damage morphology
(Fluence 27.2 J/cm^2 , damage after 1000 pulses)

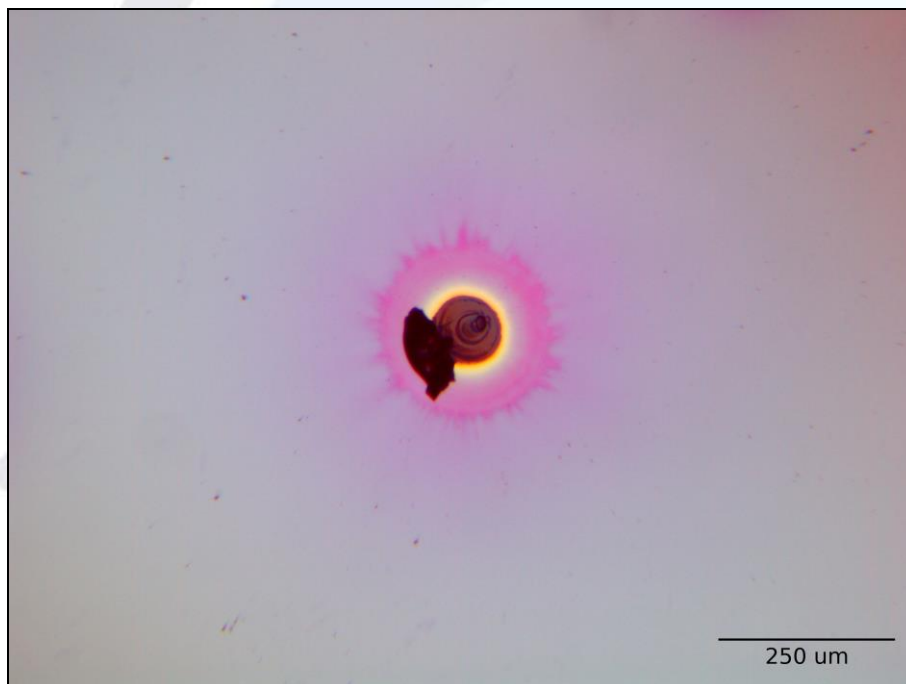


Fig. 8 Typical back surface damage morphology
(Fluence 37.8 J/cm^2 , damage after 27 pulses)

Technical note:

1. The provided threshold values are calculated for normal incidence in relation to the front surface in order to compare the LIDT values of different surfaces. The actual damaging fluence value on polarizing surface is $\cos(45^\circ) \approx 0.7$ times lower.
2. Per customer request, beam waist was always kept on the polarizing surface when translating the sample, therefore experimental fluence values for other surfaces are up to ~10% lower than provided in the measurement report (Rayleigh length was 28 mm).