Laser-Induced Damage Threshold (LIDT) Measurement Report

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

Sample: 1-OS-2-0254-5-[UBBHR]

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Tester/date:	E. Pupka / 2015-10-06

Specimen

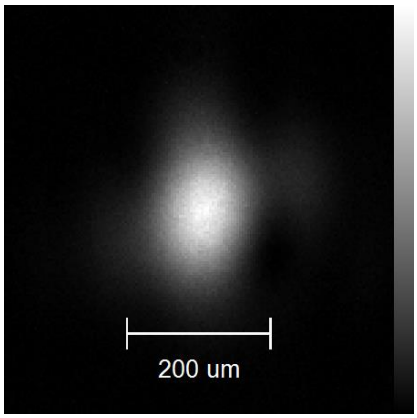
Name of sample:	1-OS-2-0254-5-[UBBHR]
Type of specimen:	UVFS, HR>99% @ 350-1100 nm, AOI = 0-50 deg
Storage, cleaning:	Plastic box, dust blow off by compressed air

Test specification

Third harmonic of pulsed Nd:YAG InnoLas Laser: SpitLight Hybrid laser (λ = 355 nm, linear polarization, pulse duration 6.4 ns), $\lambda/2$ plate combined with additional polarizer attenuator, online scattered light damage detection, offline inspection of damage detection using Nomarski microscopy.

Laser parameters

Wavelength:	355 nm
Angle of incidence:	45 deg.
Polarization state:	linear P
Pulse repetition frequency:	20 Hz
Spatial beam profile in target plane:	TEM_{00}
Longitudinal beam profile:	Single mode (SLM)
Beam diameter in target plane$_{(1/e^2)}$:	224.4 ± 10.7 µm (average from 64 pulses)
Pulse duration:	6.4 ± 0.5 ns



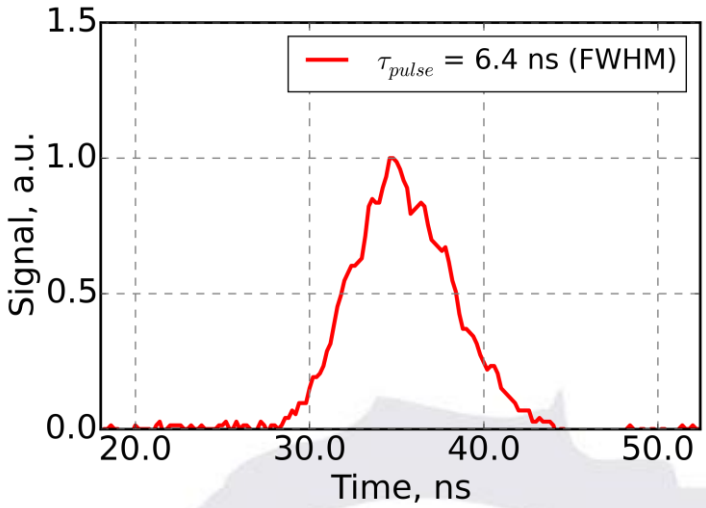


Fig. 1 Spatial beam profile in target plane (left) and oscilloscope trace (right)

Test procedure:	**S-on-1 test**
Number of sites per specimen:	429
Arrangement of test sites:	Equally spaced
Minimum distance between sites:	700 µm
Damage detection:	Scattered light diode
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

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Test result:

Table 1 Summarized LIDT's for sample 1-OS-2-0254-5-[UBBHR].

Test mode	Threshold, J/cm2
1-on-1	0.99 ≤ 1.13 ≤ 1.25
1000-on-1	0.55 ≤ 0.63 ≤ 0.71

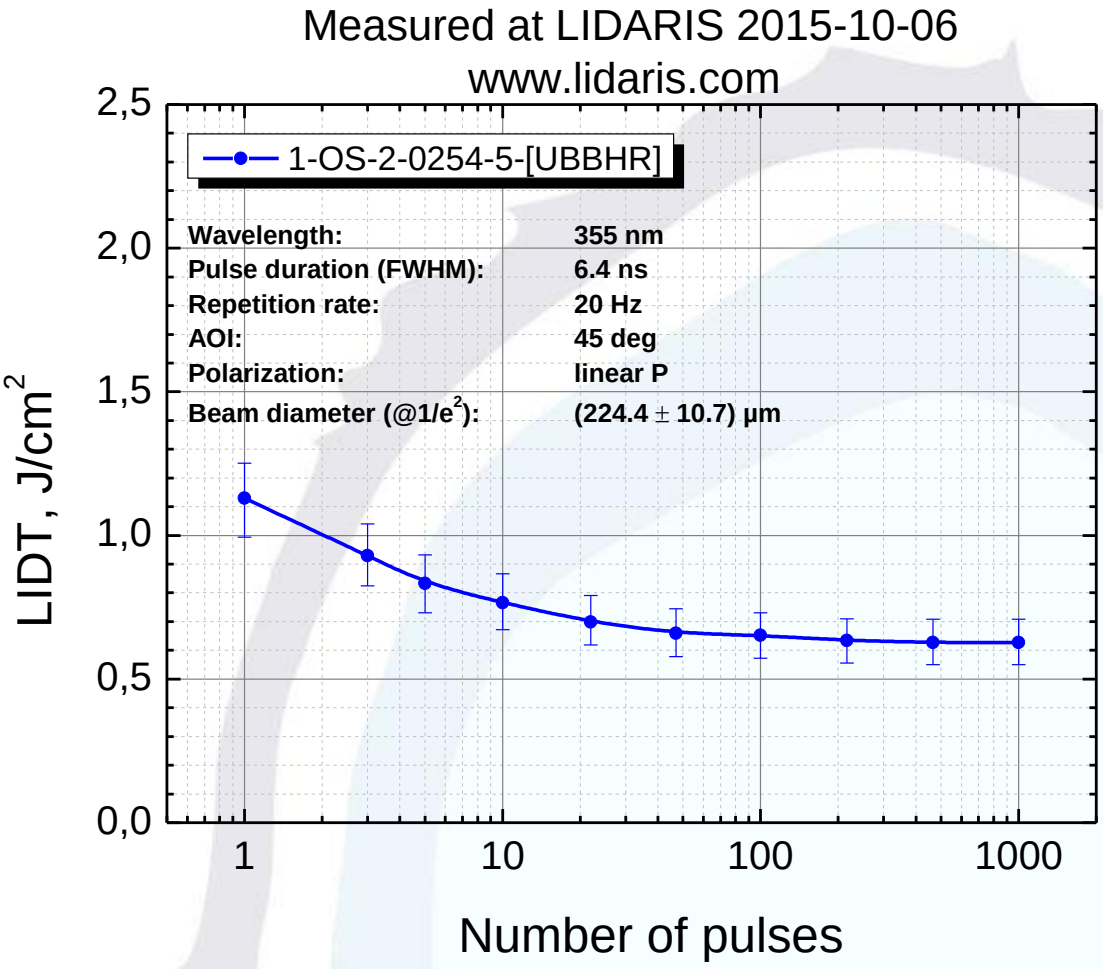

Fig. 2 Characteristic damage curve.

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Typical damage morphology:

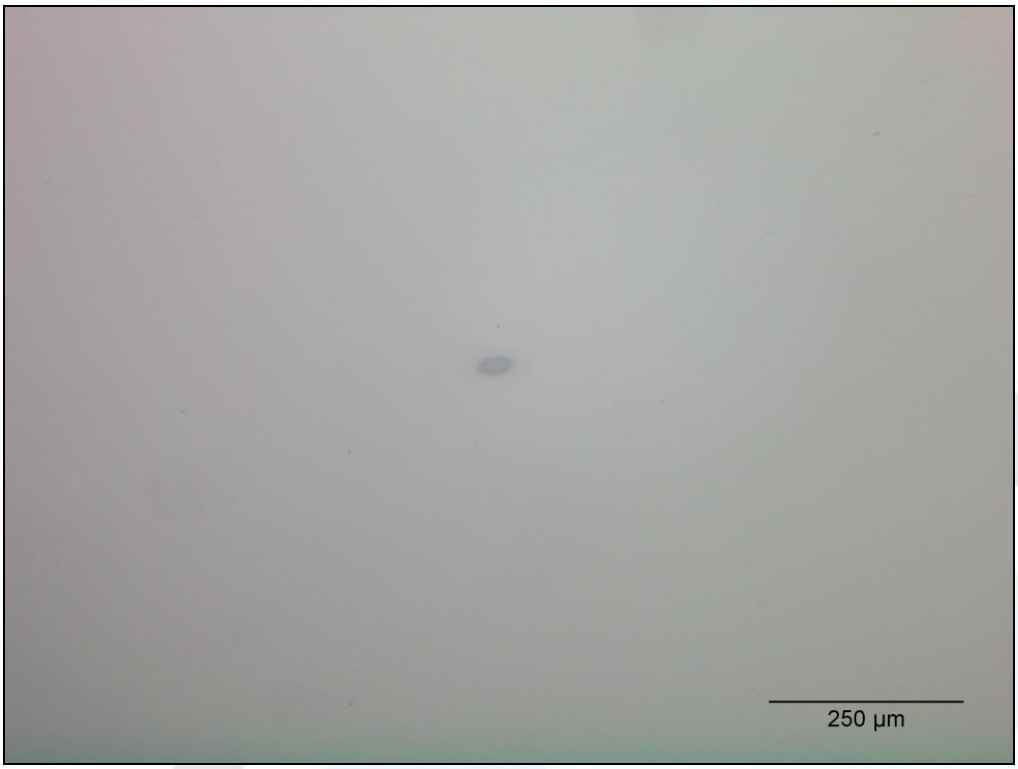

Fig. 3 Typical damage morphology
(Fluence 1.26 J/cm^2, damage after 1 pulse)

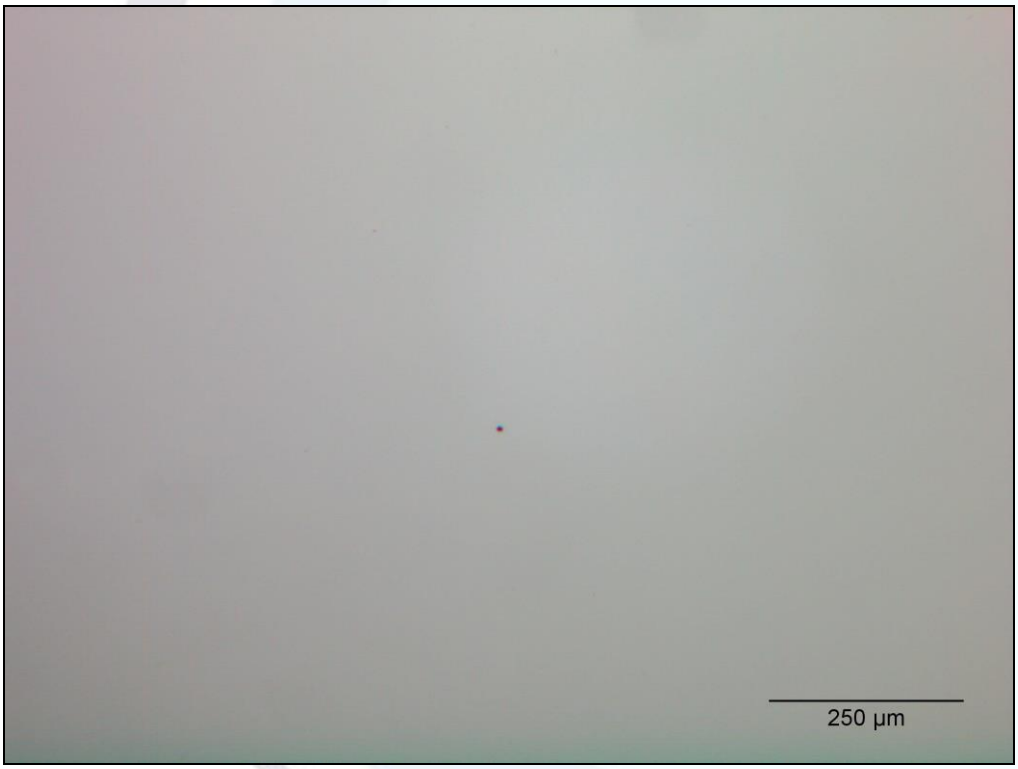

Fig. 4 Typical damage morphology
(Fluence 0.70 J/cm^2, damage after 255 pulses)

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Appendix 1 – LIDT approximation for 20 ns pulse duration:

Laser-Induced Damage Threshold (LIDT) results were approximated for 20.0 ns pulse duration from 6.4 ns pulse duration measurements using empirical square root of pulse duration law (see Table 2 and Fig. 5).

Table 2. Approximated LIDT Results of sample 1-OS-2-0254-5-[UBBHR].

Test mode	Threshold, J/cm^2
1-on-1	1.76 ≤ 2.00 ≤ 2.21
1000-on-1	0.98 ≤ 1.11 ≤ 1.26

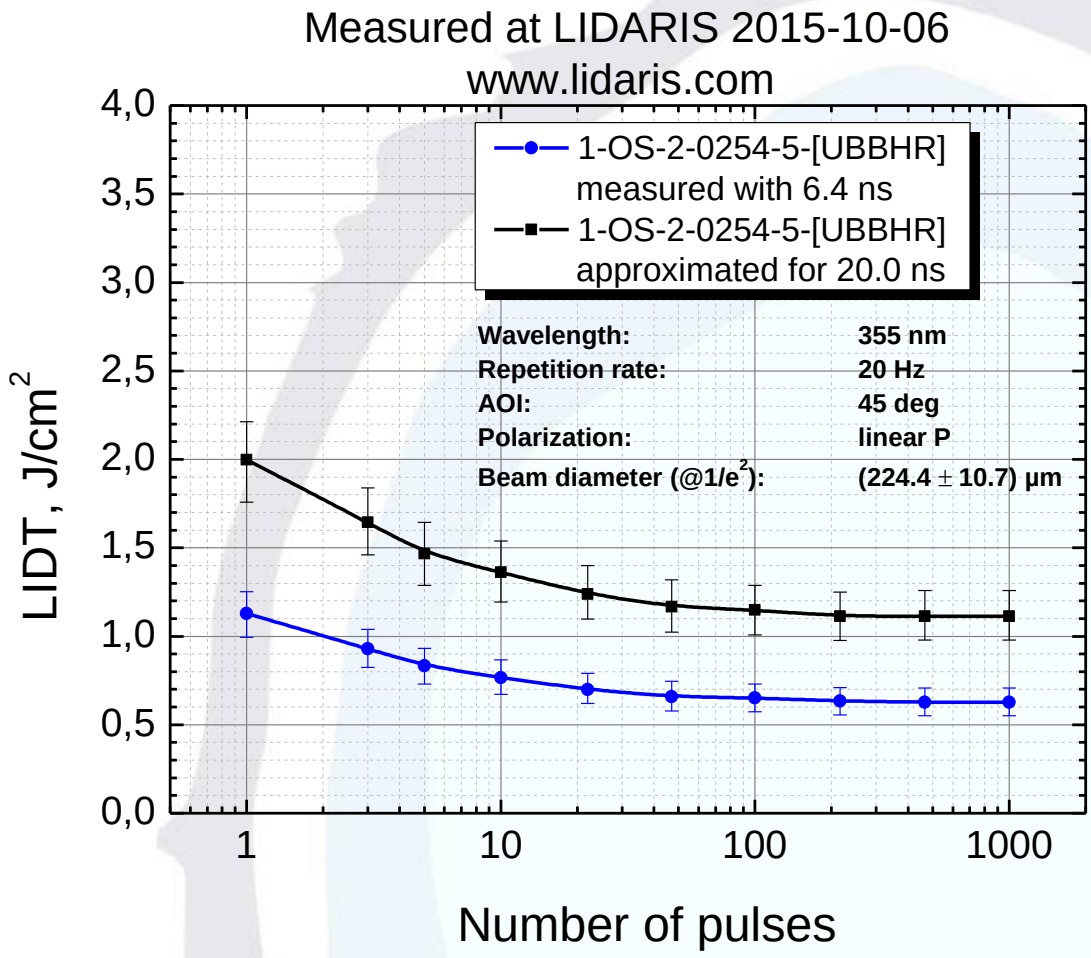

Fig. 5. Approximated characteristic damage curve.