Laser-Induced Damage Threshold (LIDT) Measurement Report

ISO21254-2: S-on-1 Test Procedure

Sample: R14006-9

LIDARIS
LIDT Service

Request from:	STFC RAL Rutherford Appleton Laboratory Harwell Oxford Didcot OX11 0QX United Kingdom
Contact person:	Maria Stefania De Vido
Testing institute:	Lidaris Ltd. Saulėtekio al. 10, LT-10223, Vilnius, Lithuania, EU
Tester/date:	E. Pupka / 2015-06-09

Specimen

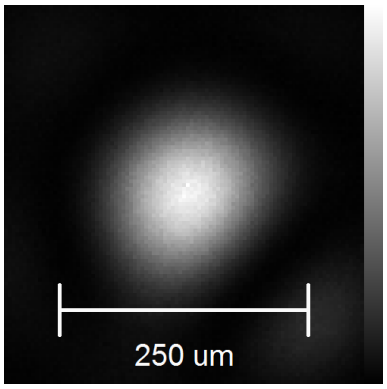
Name of sample:	R14006-9
Type of specimen:	Yb:YAG, uncoated
Storage, cleaning:	Plastic box, wrapped in paper for optics

Test specification

First harmonic of pulsed Nd:YAG InnoLas Laser: SpitLight Hybrid laser (λ = 1064 nm, linear polarization, pulse duration 10.2 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 used for testing

Wavelength:	1064 nm
Angle of incidence:	0 deg.
Polarization state:	linear
Pulse repetition frequency:	100 Hz
Spatial beam profile in target plane:	TEM_{00}
Longitudinal beam profile:	Single mode (SLM)
Beam diameter in target plane$_{(1/e^2)}$:	250.0 ± 5.4 µm (average from 64 pulses)
Pulse duration:	10.2 ns



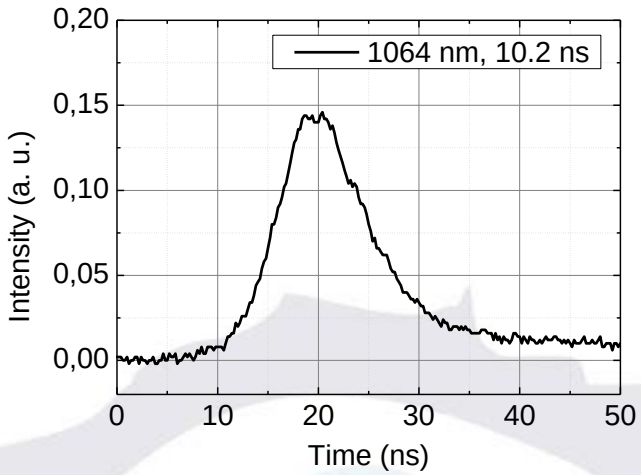


Fig. 1. Spatial beam profile in target plane (left) and oscilloscope curve (right).

Test procedure:	**S-on-1 test**
Number of sites per specimen:	212
Arrangement of test sites:	equally spaced
Minimum distance between sites:	875 μm
Damage detection:	Scattered light diode
Storage of the specimen:	Manufacturer's packaging, normal laboratory conditions
Test environment:	Industrial environment
Cleaning:	Dust blown off with clean air
Definition of LIDT:	Nonlinear fit to 0% of damage Probability

LIDARIS Ltd.
Address: Saulėtekio Al., 10 LT-10223 Vilnius, Lithuania, EU
Company code: 302813532
VAT registration: LT100007025612
Bank account (IBAN): LT30 7300 0101 3207 8596
Bank: Swedbank AB
Phone: +370 609 09233
Email: info@lidaris.com
Skype: lidt-service
www.lidaris.com

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Test result:

Table 1. Summarized LIDT's for sample R14006-9.

Test mode	Threshold – front surface, J/cm2	Threshold – rear surface, J/cm2
10-on-1	20.64 ≤ 23.59 ≤ 25.97	18.94 ≤ 21.56 ≤ 24.02
1000-on-1	15.76 ≤ 18.24 ≤ 20.19	13.85 ≤ 16.17 ≤ 17.85

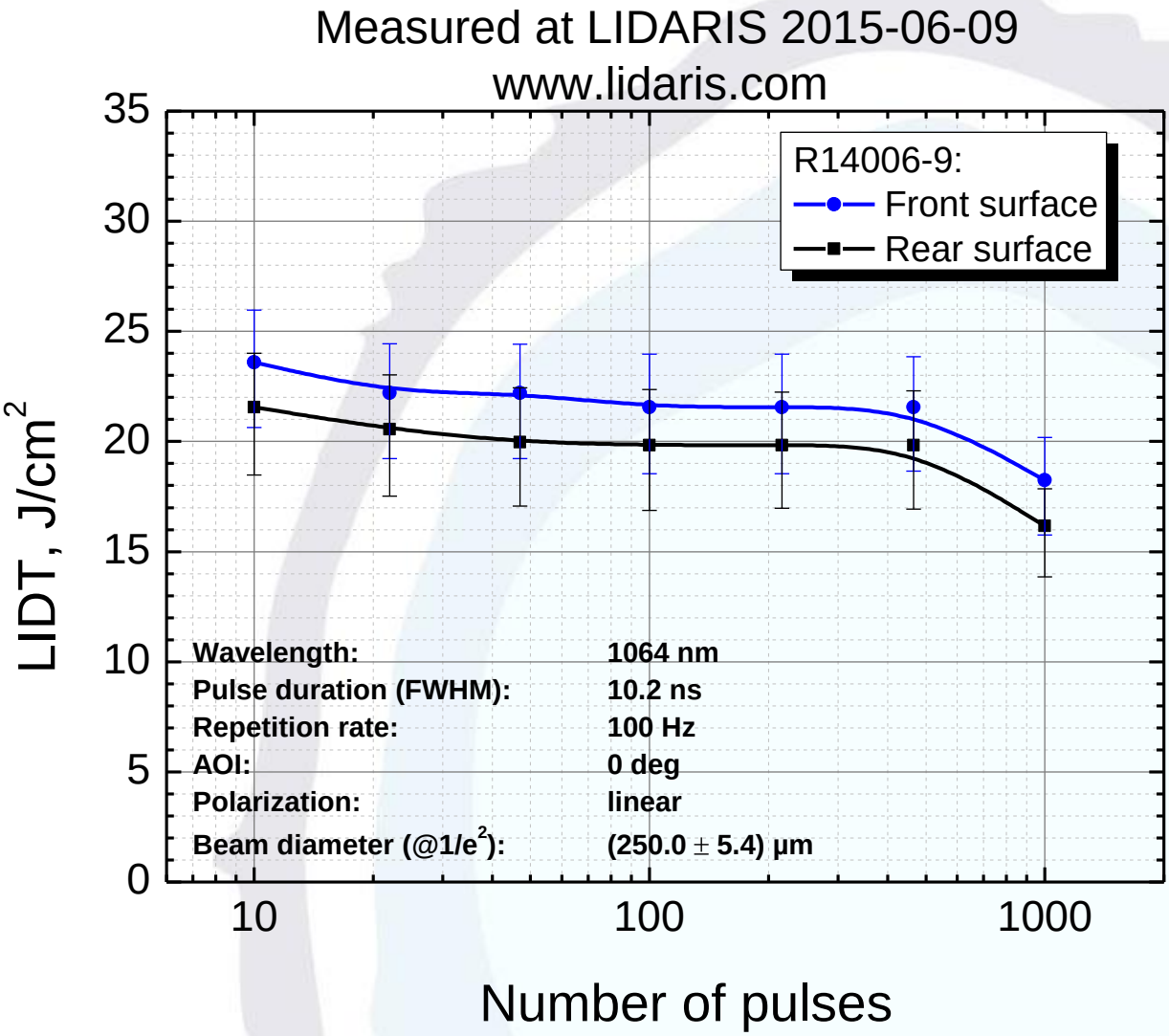

Fig. 2. Characteristic damage curve.

Typical damage morphology:

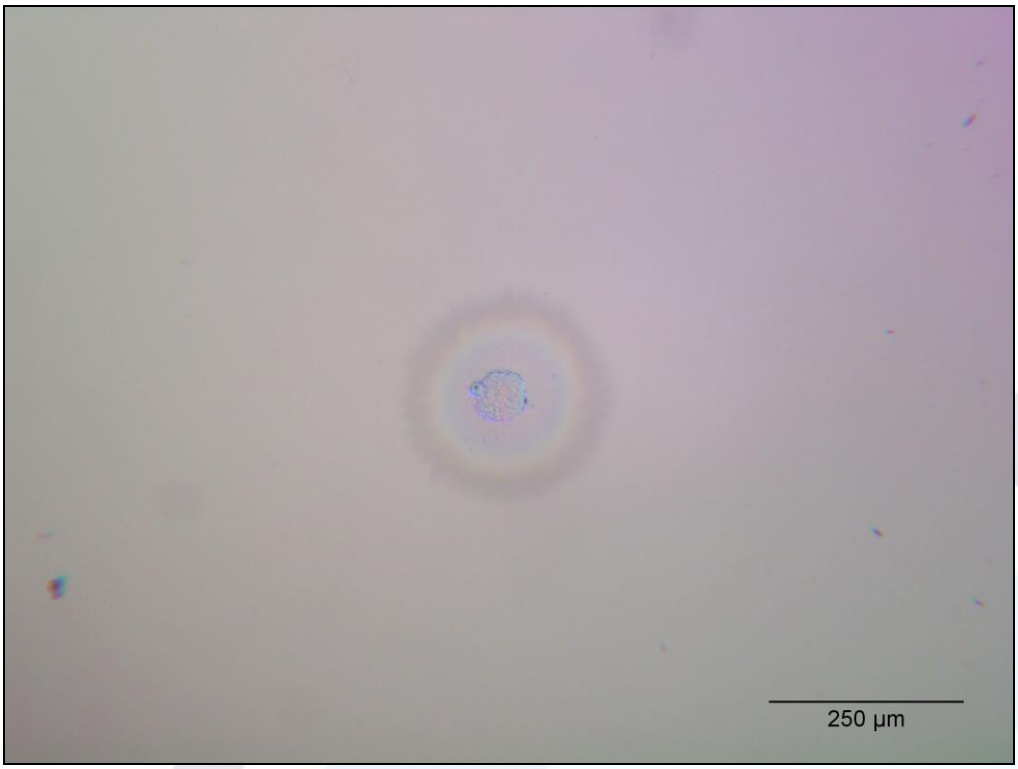

Fig. 3. Typical front surface damage morphology
(Energy density 40.51 J/cm^2, damage after 5 pulses)

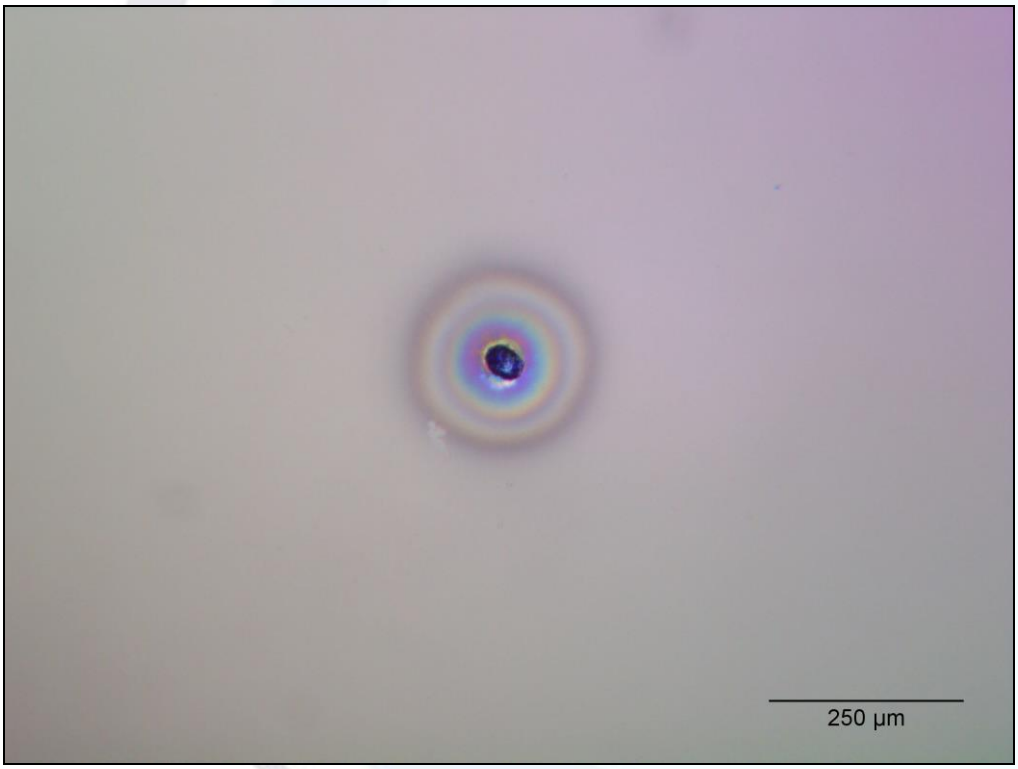

Fig. 4. Typical front surface damage morphology
(Energy density 15.21 J/cm^2, damage after 294 pulses)

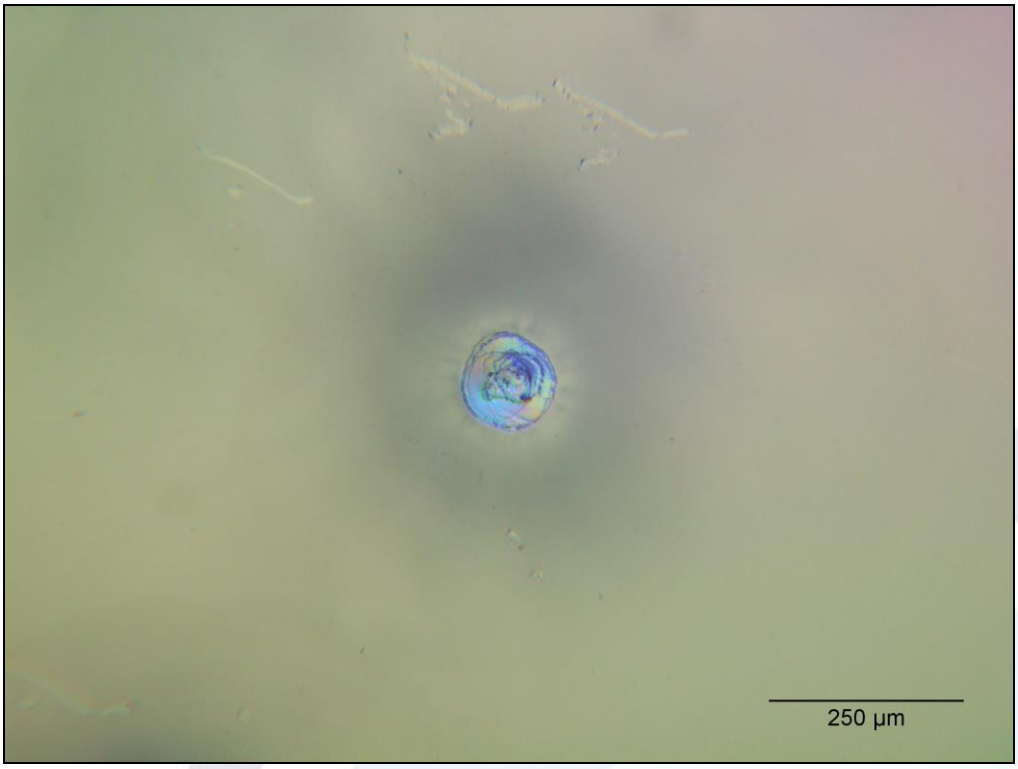

Fig. 5. Typical rear surface damage morphology
(Energy density 49.70 J/cm^2, damage after 5 pulses)

Fig. 6. Typical rear surface damage morphology
(Energy density 17.76 J/cm^2, damage after 1000 pulses)