Laser Induced Damage Threshold

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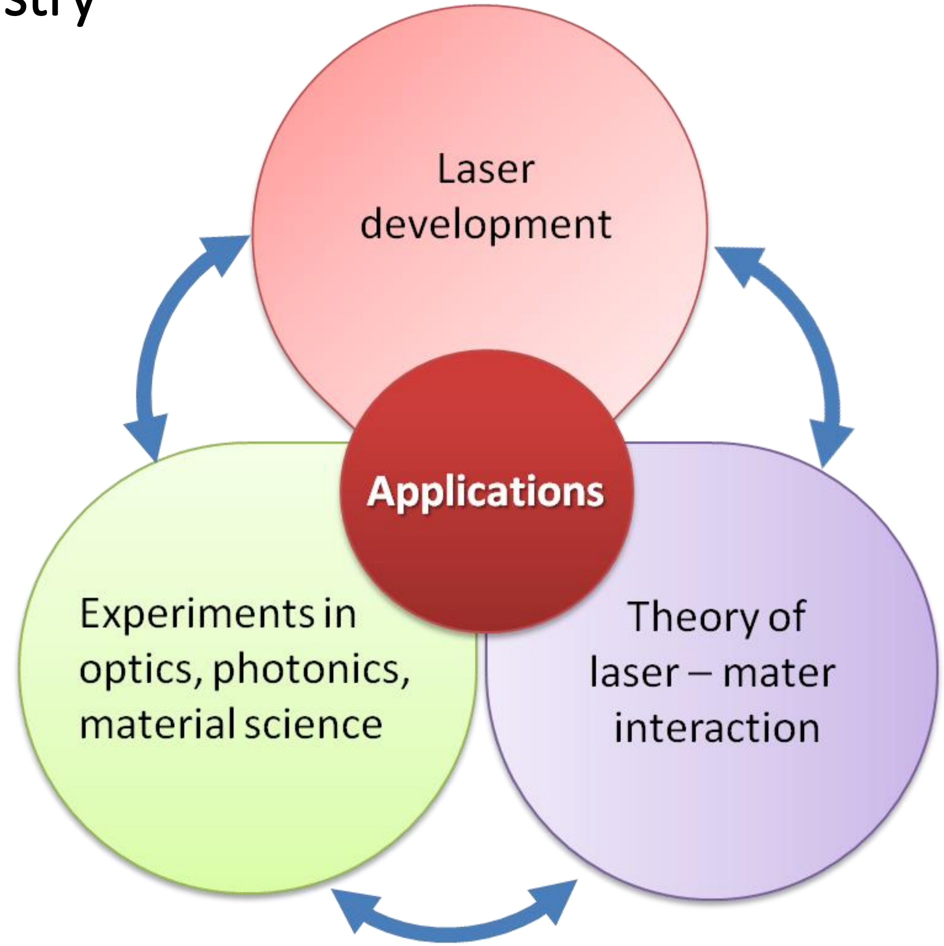
SUPERLASERS FOR THE REAL WORLD

HiLASE at a Glance

- Laser Technology R&D Infrastructure
- Next generation Lasers for Applications in hi-tech Industry

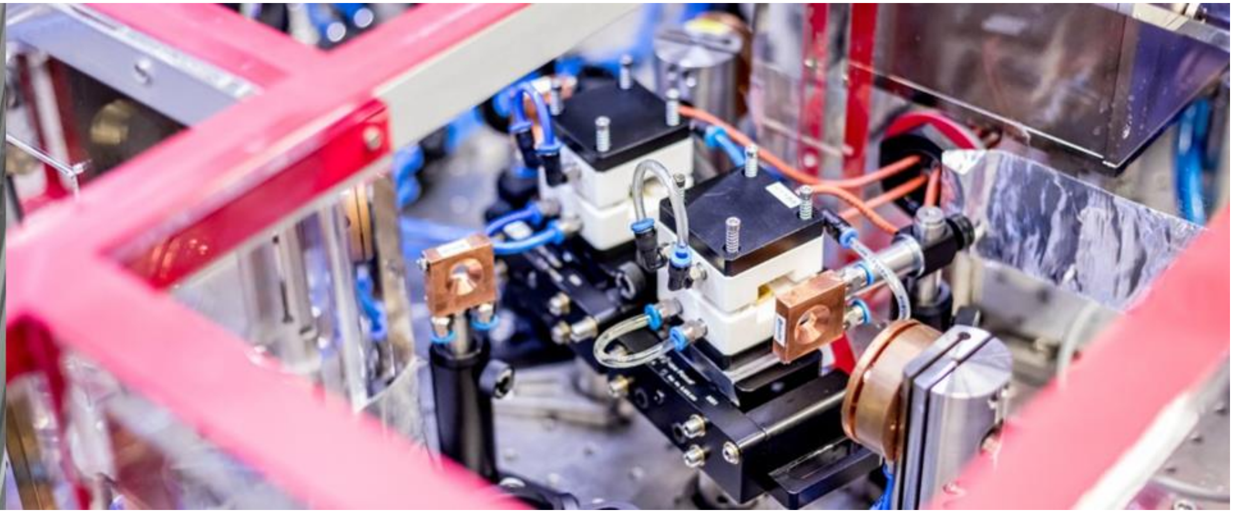


HiLASE Center

Center for development of new generation of diode pump solid state lasers

Lasers

- “BIVOJ” –diode pump 100J cryogenically cooled slab system (@1030 nm, 10 ns, 10 Hz)
- “PERLA” diode pump mJ thin – disk laser systems (@1030, 1.7 ps, 1-100 kHz)



HiLASE Applications

LSP – Laser Shock Peening

LIDT – Laser Induced Damage Threshold

MM – Laser micromachining and functional surfaces

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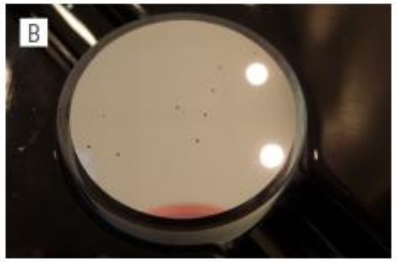
Laser Induced Damage Threshold (LIDT)

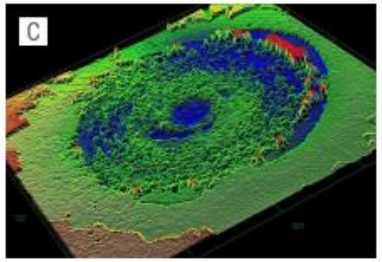
LIDT is at present the major limiting factor for increasing the performance of laser systems and their applications

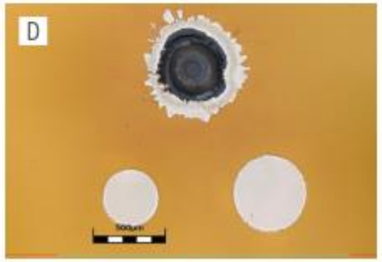
The LIDT value indicates the maximum amount of energy (power) that a surface can withstand before damage occurs.

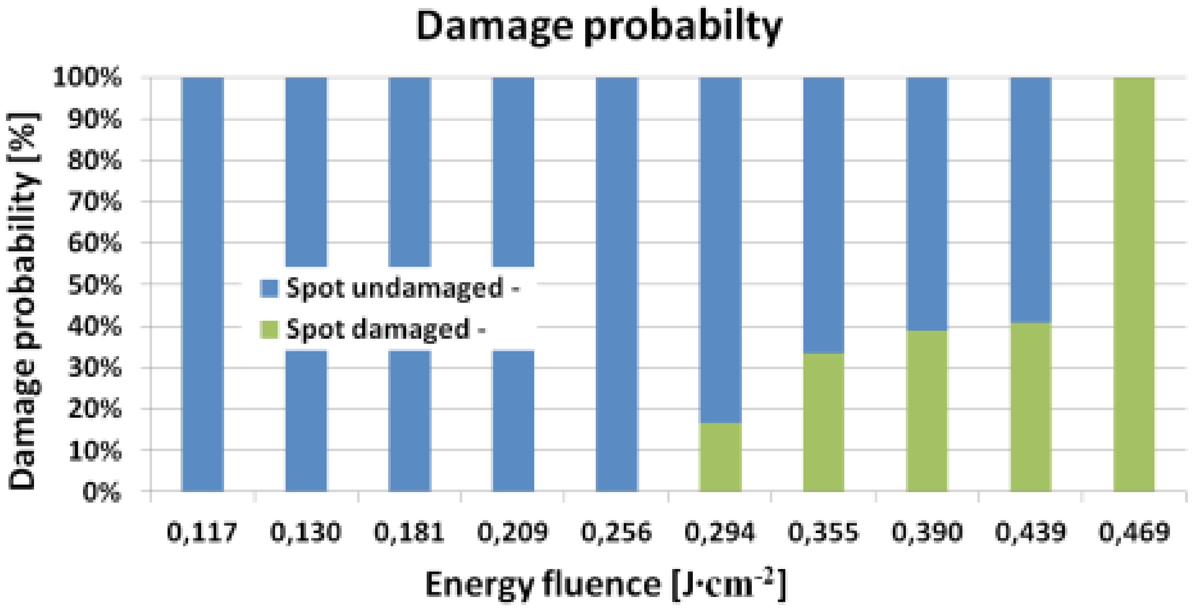


A) Laser mirror damage: plasma cloud formation during laser damage initiation
B) Damaged surface of tested mirror

C) Nomarski microscope image of damaged sites
D) 3D visualization of damaged site







LIDT experiment

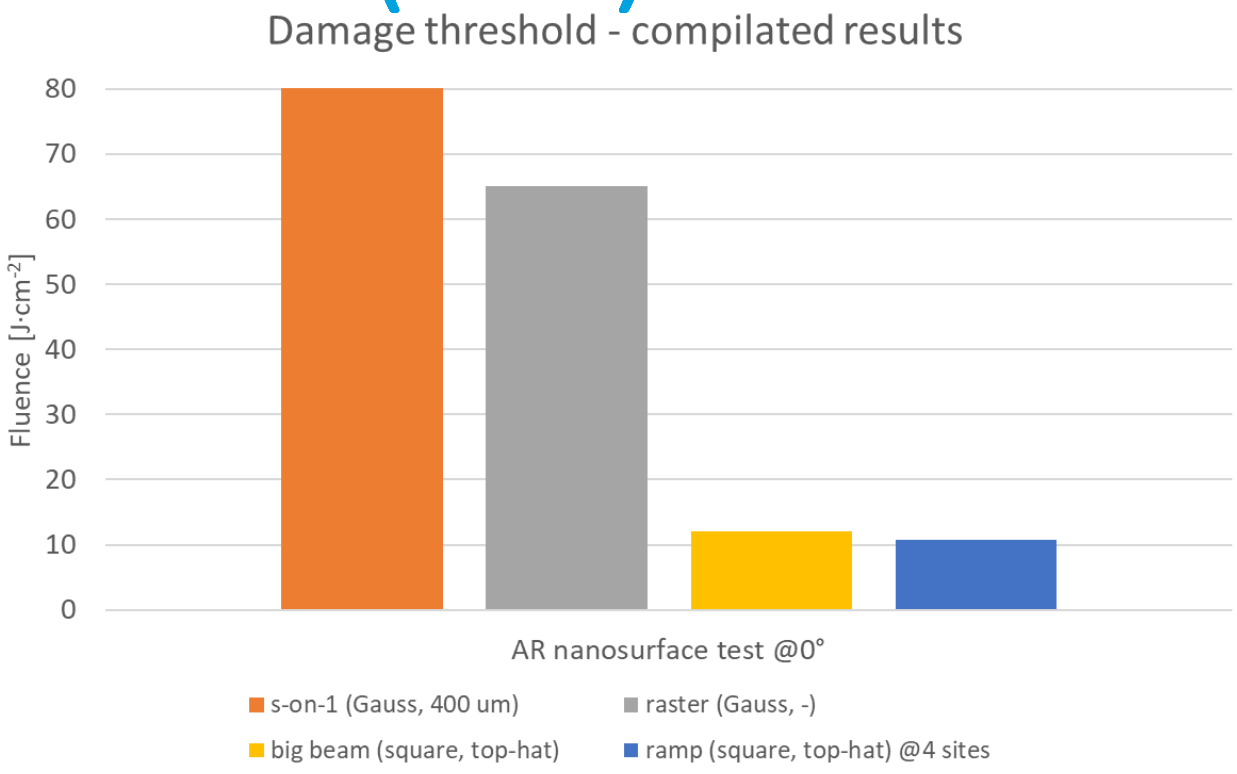
Laser Induced Damage Threshold (LIDT)

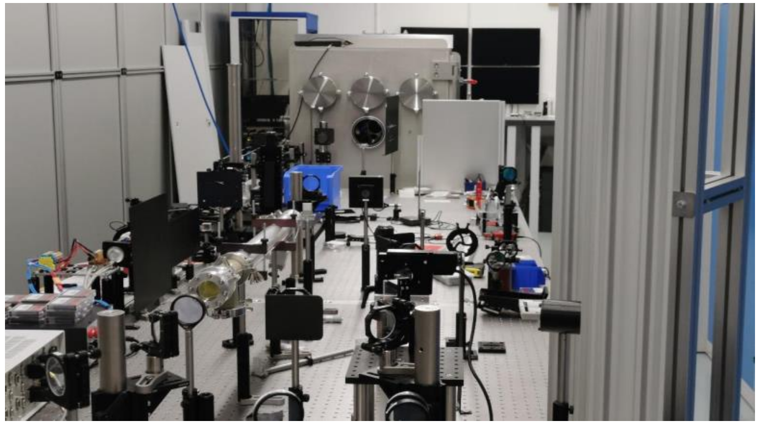
Fluence $\left[\frac{J}{cm^2}\right] = \frac{2E_{pulse}}{\pi\, r^2}$

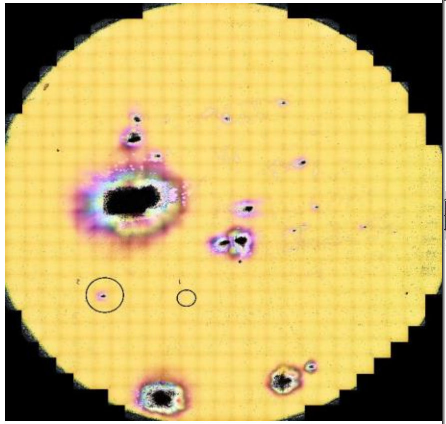
Regime 1: Low Energy per pulse, small spot

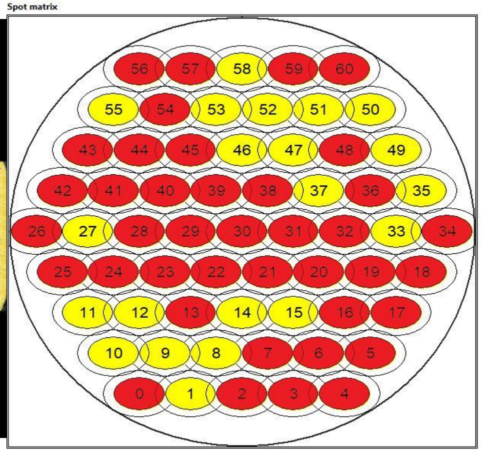
Regime 2: High Energy per pulse, big spot

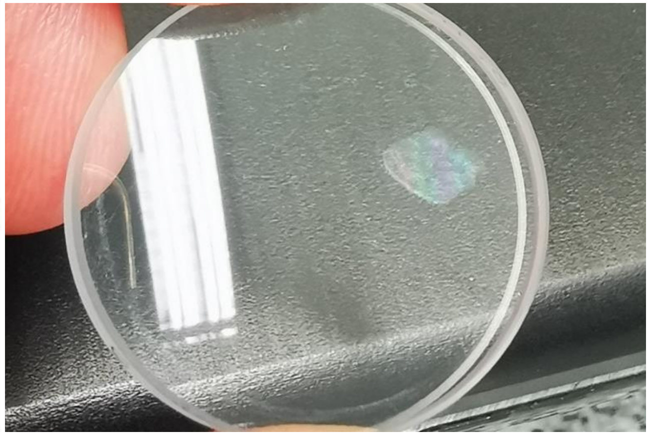
Important: to test under high energy & big spot



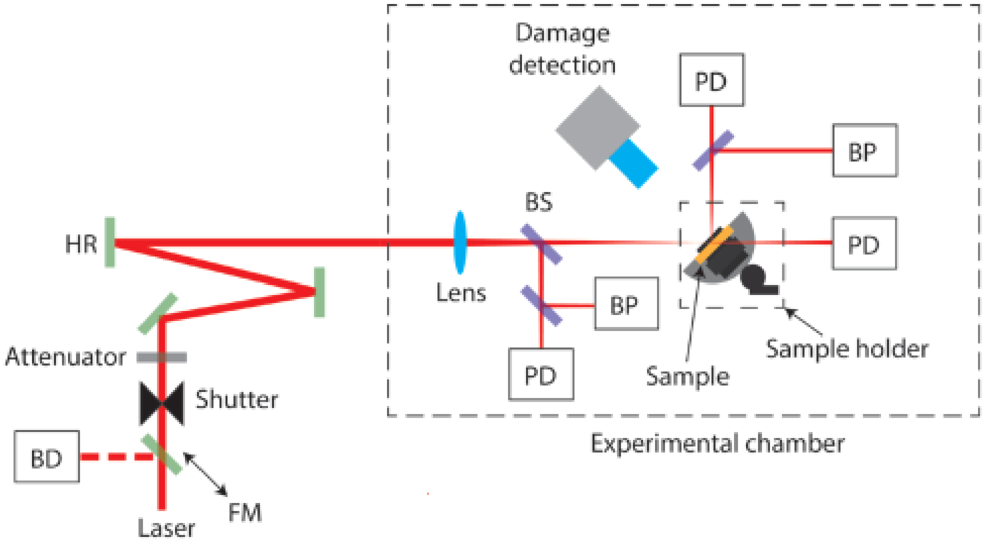








What we can do : LIDT service at HiLASE



The optical layout of the testing station.
BD – Beam Dump; FM – Flip Mirror, BS – Beam Sampler; PD – Photodetector;

Type of tests (ISO 21254):

1-on-1 and s-on-1, or custom raster scan and r-on-1 (ramp) procedures

Size and type of samples

- 0.5'' to 4'' diameter
- arbitrary shape (upon request)
- up to 1.5 kg weight
- transparent or reflective

Ambient testing conditions

- air (ISO class 7 clean, 20°C, 40% r.h.)
- vacuum (10^-3 mBar)
- cryo-temperatures (100-300 K) (From July 2021)

Radiation conditions

- 1030 nm/515 nm, 5 mJ/2.5 mJ, 1.8 ps, 1 kHz, round Gaussian beam, variable spot size
- 1030 nm, 20 mJ, 2 ps, 1 kHz, round Gaussian beam, variable spot size

- 1030 nm, 0.5 J, 10 ns, 10 Hz, round Gaussian beam, fixed spot size ~0.5 mm
- 1030 nm, 6 J, 10 ns, 10 Hz, square top-hat beam, fixed spot size 3x3 mm

What you can do for us

Jointly develop with us high-power optical components development by:

- Defects identification and studding there influence
- Material development and analysis
- Testing of optics testing under new operation regime

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