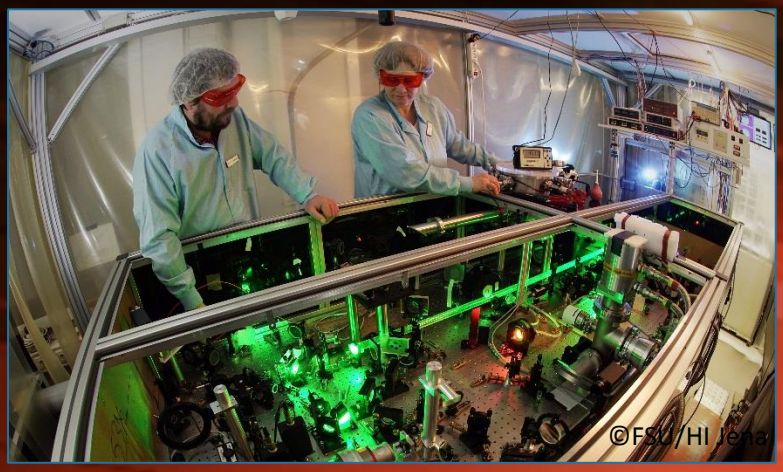
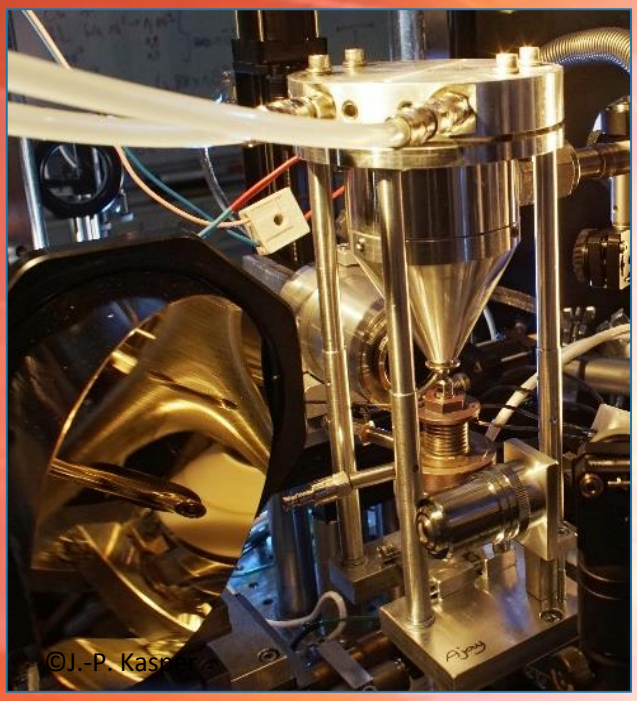
JETi40 Laser

Contact: Dr. Alexander Sävert email: alexander.saevert2@uni-jena.de



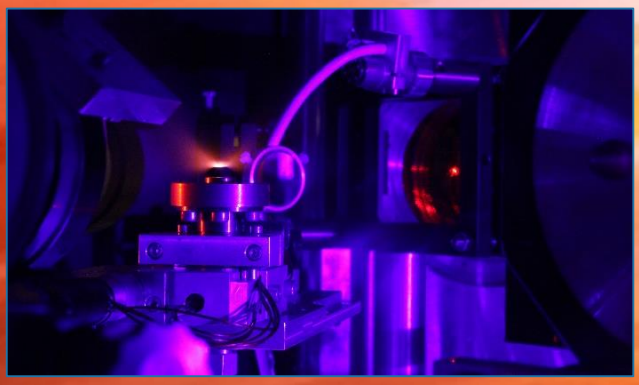
IOQ operates the Ti:Sapphire laser system JETi 40 with the following parameters:

- 25 fs, 700 mJ on target, 800 nm,
- 10 Hz repetition rate
- $I_L > 2 \times 10^{20}$ W/cm² (@ 800 nm)
- SHG-option for high contrast experiments $I_L = 1 \times 10^{20}$ W/cm² (@ 400 nm)
- plasma mirror supporting 10-Hz repetition rate in burst mode improving intensity contrast to > 10^{11}.
- Few-cycle (< 6 fs) probe beam line



Main research areas:

- laser-ion acceleration from thin foils and mass-limited targets,
- laser electron acceleration,
- surface high harmonic generation from solid targets
- optical probing of laser plasma interactions,
- X-ray generation and spectroscopy



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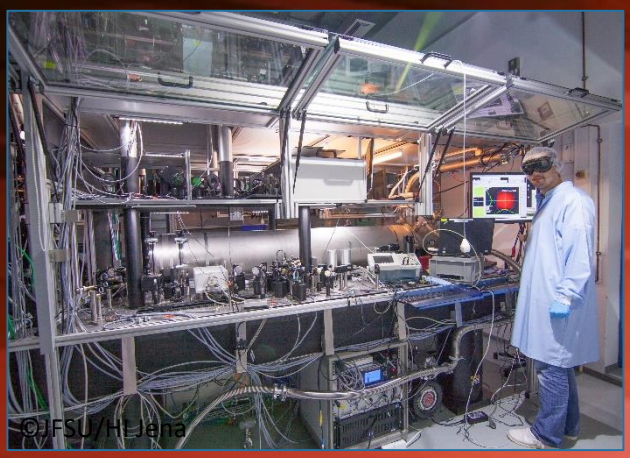
POLARIS Laser

Contact: Dr. Marco Hornung email: marco.hornung@uni-jena.de

The fully diode-pumped laser system POLARIS laser is operated by HI-Jena and IOA, which is a scientific tool well suited for sophisticated high-intensity experiments.



Current laser parameters:

- 100 fs, 17 J on target (54 J before compression) @ 1030 nm,
- 1/50 Hz repetition rate,
- ultra-high temporal contrast,
- On-target intensity > 1 x 10^{21} W/cm²

Main research areas:

- laser ion acceleration with conventional and mass limited targets,
- laser electron acceleration,
- optical probing of laser plasma interactions,
- Diode-pumped laser development,
- contrast enhancement of high power lasers systems.

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54 J pulses with 18 nm bandwidth from a diode-pumped chirped-pulse amplification laser system.
M. Hornung *et al.*, Optics Letters **41,** 5413 (2016).

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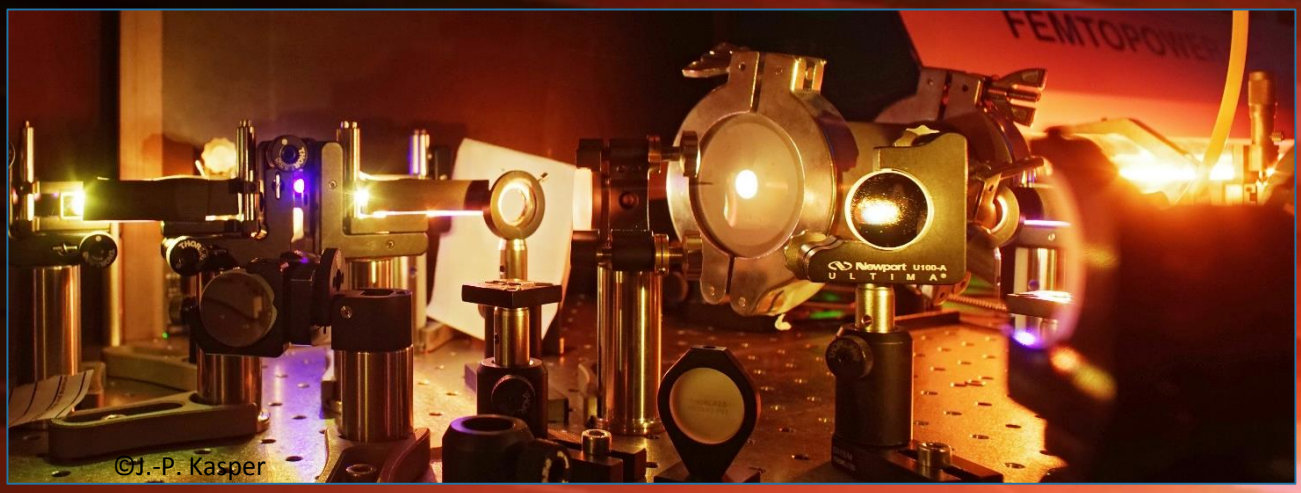
Few-Cycle Laser

Contact: Max Möller email: max.moeller@uni-jena.de



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In the Nonlinear Optics Group in Jena an ultrashort pulse Ti:Sa lasersystem is operated.

Six different kinds of pulsed laser radiation can be generated:

- 4fs, 250µJ, 700nm, 4kHz repetition rate
- 25fs, 1.25mJ, 800nm, 4kHz repetition rate
- 25fs, 10mJ, 800nm, 1kHz repetition rate
- 30-50fs10mJ, up to 2.5mJ, wavelength between 1µm to 2.5 µm, 1kHz repetition rate
- down to <12 fs, up to 1mJ, 1.8µm, 1kHz repetition rate
- tens of fs, up to 0.3 mJ, wavelength between 2.5 µm and 10 µm, 1kHz repetition


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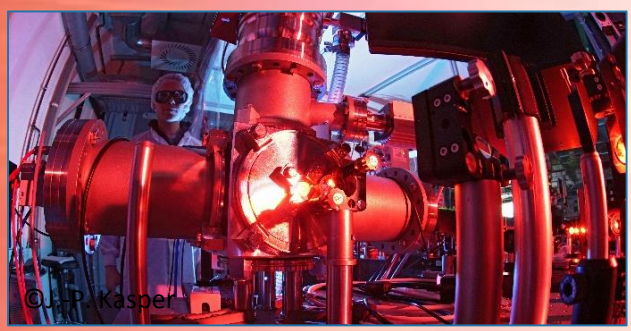
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Major aspects of the experiments in our laboratory are ionization and dissociation of molecules and atoms with few-cycle laser pulses sensitive on the carrier-envelope phase (CEP). Another major direction is XUV coherence tomography (XCT), a novel technique for cross-sectional nanoscale imaging with high harmonics.

Review of attosecond resolved measurement and control via carrier–envelope phase tagging with above-threshold ionization
T. Rathje et al., J. Phys. B: At. Mol. Opt. Phys. **45**(2012)

Nanometer resolution optical coherence tomography using broad bandwidth XUV and soft x-ray radiation
Silvio Fuchs *et al., Scientific Reports* **6**, 20658 (2016)

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The Helmholtz-Institute Jena and the Friedrich-Schiller University jointly operate the laser facilities that are open for external users through the Laserlab Access program. Several research groups within these institutions have ample experience in design, operation, and application of high-power lasers.
Examples are the all-diode pumped PW-class femtosecond laser POLARIS, several groundbreaking contributions in strong-field laser physics and relativistic laser plasma physics, and one of the finest labs for X-ray optics and spectroscopy.
The Helmholtz-Institute Jena has a vigorous program to enhance its experimental capabilities even further. In particular a new 200-TW laser system including new target areas were added recently.

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