High performance CEP-stable few-cycle fiber-laser system for XUV generation

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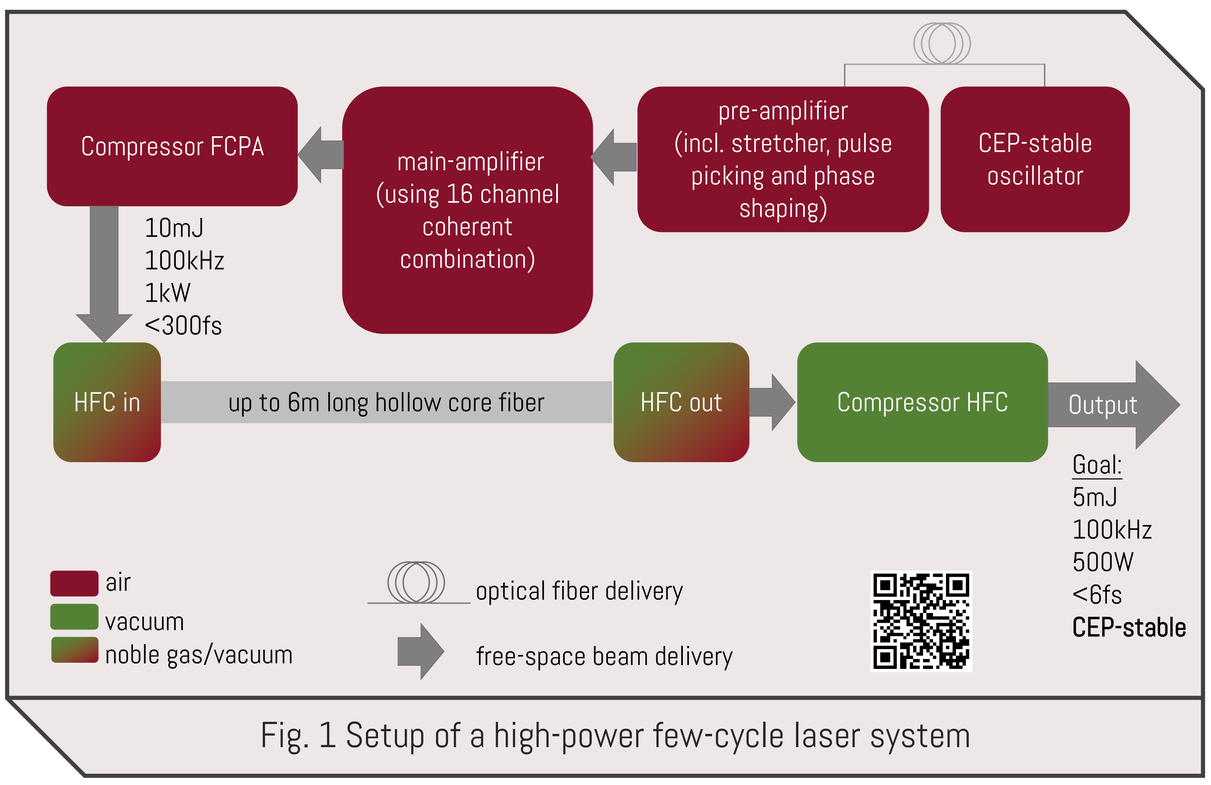


Fig. 1 Setup of a high-power few-cycle laser system

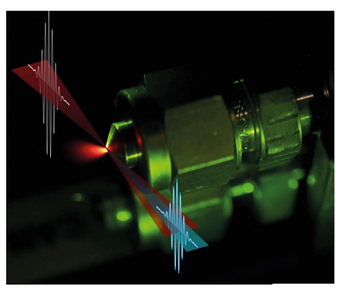
Long-term stable 10mJ/1kW/300fs CPA:

- 0.3% average power RMS deviation (9hours)
- 9µrad pointing RMS deviation (9hours)
- M^2<1.1

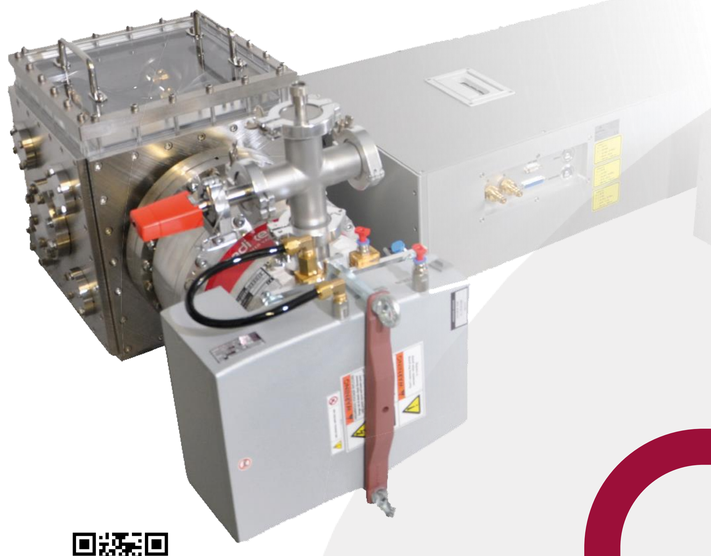
- Enables nonlinear compression to few-cycle with >60% efficiency

- 580W input → 320W output

- Multi-mJ few-cycle pulses @100kHz



- HHG in Gas jet



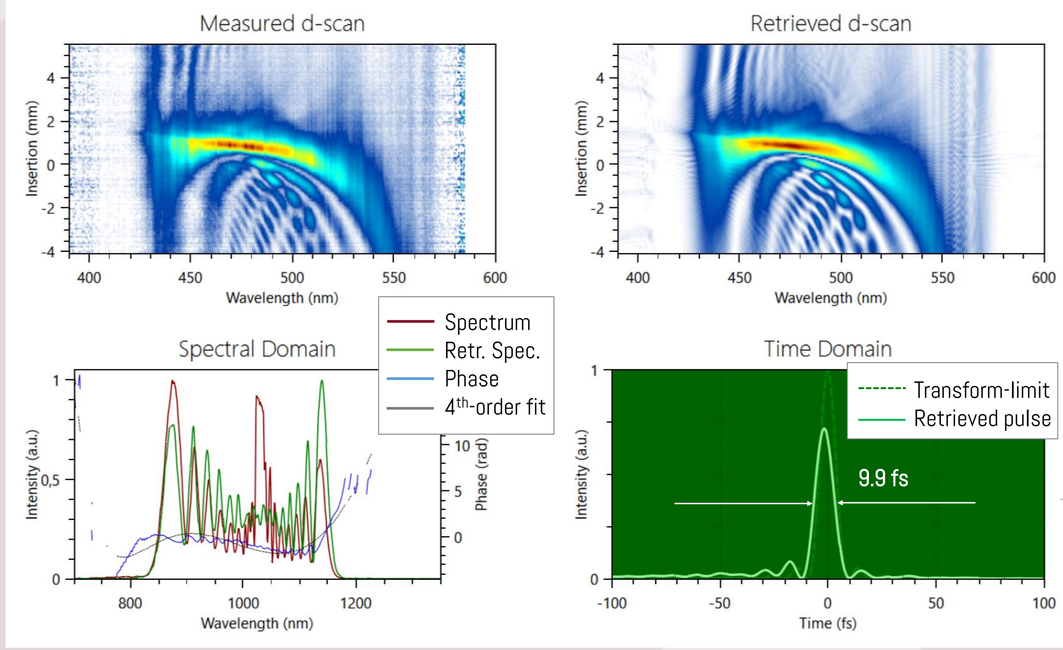
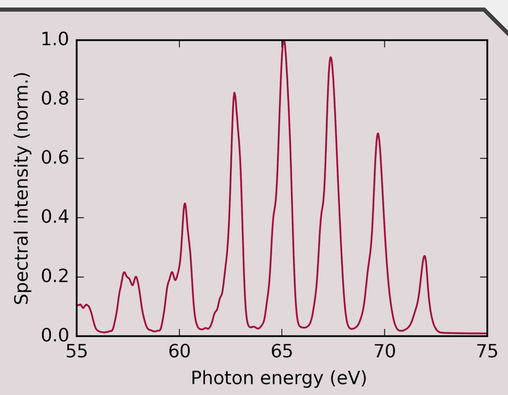


Fig. 2 D-scan Measurement of the pulse-shape at 320W/100kHz

T. Nagy et al., 'Generation of 3-cycle multi-mJ laser pulses at 318 W average power', accepted by Optica (2019)

Tunable Table-top XUV source



Possible parameter set

- Wavelength: 13.5nm (90eV)
- Photon flux: $\geq 5 \cdot 10^{10}$ photons/s
- Energy bandwidth: $\leq 1\%$
- Repetition rate: 100kHz – few MHz

Fig. 3 Possible parameters and examplary HHG spectrum (optimized for 68.8eV)

Summary

- Significant up-scaling of the average power of **stretched hollow-core-fibers**
- Generation of **multi-mJ**, **320W**, **sub-10fs** pulses in a 6m long, 400μm inner-diameter fiber
- Ideal driver for **XUV generation at** high photon energies **up to 150eV**

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