Institute of Applied Physics
Friedrich-Schiller-Universität Jena

Internship, Research Labworks, Master Thesis

in the subject area of

Integrated devices for high power fiber lasers

Over the last decades fibers have pushed laser technology, enabling more robust and efficient lasers. Power scaling beyond the 1kW mark enabled new industrial and medical applications. Fundamental to this development are groundbreaking developments like photonic crystal and large mode area fibers 1. A further integration of laser components is the key to further advances. Such components are for example filters, mode converters, reflectors and couplers. A key technology for inscribing such devices is ultrashort laser inscription 2.

The aim of this thesis is the realization and characterization of such devices within the laser fiber, e.g. mode selective fiber Bragg gratings and long period gratings. For this purpose the student can rely on the versatile ultrashort pulse laser inscription facilities of our group, which allow for three dimensional inscription in highly doped laser fibers. The device characterization will be based on advanced methods like tomography 3 and computer based holographic mode excitation 4.

1. Tünnermann, A., Schreiber, T. & Limpert, J. Fiber lasers and amplifiers: an ultrafast performance evolution. Appl. Opt. 49, F71–F78 (2010).

2. Thomas J. et al. Femtosecond pulse written fiber gratings: a new avenue to integrated fiber technology. Laser & Photon. Rev. 1–15 (2012).doi:10.1002/lpor.201100033

3. Dürr, F. et al. Tomographic measurement of femtosecond-laser induced stress changes in optical fibers. Appl. Phys. Lett. 84, 4983–4985 (2004).

4. Neil, M. A. A. et al. Method for the generation of arbitrary complex vector wave fronts. Opt. Lett. 27, 1929 (2002).

Covered subjects

- Integrated optics
- Waveguide optics
- Ultrashort optics
- Tomography

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