



The newly established **Laboratory for Extreme Photonics (LEX-Photonics)** at the Faculty of Physics of the **Ludwig-Maximilians-Universität München (LMU)** aims at developing novel ultrahigh-power light sources with the final goal of applying these unique light pulses to medical diagnosis and therapy as well as to fundamental research in the field of attosecond science. LEX-Photonics constitutes a pillar that supports the future research facility **CALA (Centre for Advanced Laser Applications)**, which is a joint infrastructure of LMU, TUM, and MPQ in Garching.

One of the two laser infrastructures at CALA aims at generating wave-form controlled, few-cycle laser pulses with ultra-high peak and average power which will constitute the next generation of driver tools for attosecond science as well as high-power laser-matter interactions. This system is based on short-pulse-pumped optical parametric chirped pulse amplification (OPCPA), where the pump pulse duration is on the order of 1 ps. Short-pulse-pumped OPCPA is currently the only promising method to reach few-cycle pulse durations and TW-PW-scale peak powers simultaneously. Since at the same time our goal is to reach high average powers as well, we aim for a repetition rate of 5 kHz. Therefore, the pump laser, which is already under development, uses the diode-pumped Yb:YAG thin-disk technology, pioneered by researchers at LMU and MPQ.

This large-scale laser development project is carried out by a team of postgraduate and postdoctoral researchers and we are looking for both postgraduate and postdoctoral candidates to increase our team with the main focus on one of the two following aspects:

### **1. Diode-pumped thin-disk picosecond laser development**

Although the only possibility for the pump-laser architecture currently appears to be the thin-disk approach, there is still a large number of physical and technological issues to be resolved on the way to reach the desired output peak and average power with a beam quality that is suitable for OPCPA pumping. We will also try hitherto unexplored alternative schemes for realizing such a thin-disk system, with the aim for maximizing efficiency, minimizing both cost and footprint.

#### **Prerequisites:**

We encourage the application of both, postgraduate candidates aiming for a PhD position, and postdoctoral researchers. In both cases a strong interest in experimental work is necessary. Good knowledge of optics and of solid-state laser technology is highly desirable. Programming skills in LabView and some knowledge of Matlab/Mathematica would also be advantageous. The applicant must be able to work in a team, which requires appropriate communication and coordination skills.

### **2. Short-pulse-pumped OPCPA development**

Although the principle of short-pulse pumped OPCPA has been previously experimentally proven and is being implemented in the PFS project at MPQ, there remain a large number of

unresolved scientific questions. Firstly, the high average power at such peak powers has not been explored to date. Secondly, the short-pulse-pumped OPCPA scheme has very strict conditions on the temporal synchronization of the pump and the seed pulses. To this end, alternative schemes for generating the broadband seed pulse will be explored. Apart from the OPCPA development the applicant will have the opportunity to experience a large range of other aspects of the development of pulsed laser systems comprising ultrabroadband few-cycle oscillators, the hollow fiber compression technique, fiber amplifiers, high-repetition rate diode-pumped Yb:YAG thin-disk technology, etc.

**Prerequisites:**

We encourage the application of both, postgraduate candidates aiming for a PhD position, and postdoctoral researchers. In both cases a strong interest in experimental work is necessary. Good knowledge of optics, in particular non-linear optics, is highly desirable. Programming skills in LabView and some knowledge of Matlab/Mathematica would also be advantageous. The student/postdoc would become member of a team of researchers and technicians and needs to be open to such teamwork. In the case of a postdoctoral researcher the applicant is expected to participate in the coordination of the scientific work and in the supervision of PhD/Masters students.

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