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HiLASE Centre is pleased to invite you to attend the seminar:

Development of a Cryogenic Disk Laser System for Application in High-Field Science and Industry

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Tabletop joule-class Yb:YAG laser systems can be applied in fundamental experiments in high-field science as well as the industry such as treatment of micro cracks on the surface of solids through laser shock pinning. The repetition rate of these laser systems is mainly limited by thermal issues in the gain medium. One elegant technique to increase the repetition rate towards 1 kHz meanwhile keeping a high beam quality, which is highly required in applications, is cryogenic cooling of a Yb:YAG disk while keeping a sufficiently high aspect ratio. Due to a higher absorption cross section at 77 K, the pump laser can be efficiently absorbed in a double-pass geometry and does not require a multipass pump chamber necessary in thin disk lasers. Moreover, a higher emission cross section in cryogenic temperatures reduces number of passes in an amplifier to obtain a high pulse energy. This can make a booster amplifier in the joule-class regime very compact. The main drawback of this approach is a higher level of amplified spontaneous emission (ASE) and lower onset of parasitic oscillation compared to lasers operated at 300 K.

In this talk, we will explain our approach of reducing ASE of a cryogenic disk through geometrical optimization of the gain medium and give further details of a proposed chirped pulse amplification laser system with a target pulse energy of 1 J at a high repetition rate of 1 kHz. The proposed laser system will be compact enough to sit on two optical tables and could be portable to an application site such as an industrial field or a small-scale laboratory in a research institute. We will also show initial status of bonding thin optics onto a metallic heat sink compatible for application in cryogenic temperatures. Relaxed conditions of polishing and bonding compared to thin disk lasers will ensure that the proposed laser system would be scalable in pulse energy upon increasing the size of a disk. Besides, in-house fabrication of a cryogenic disk can open a route of technology transfer for HiLASE to develop laser systems using other gain media such as Tm:YLF or Ho:YLF towards miscellaneous applications.

When: Friday, **29/06/2018 at 10:00**

Where: Seminar room, HiLASE Centre

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