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

Pulse compression by nonlinear SHG with time predelay in borate crystals

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Some scientific and industrial applications, like high harmonic generation or material processing, require pulses shorter than 1 ps, usually achievable with an Yb:YAG thin-disk lasers. In the femtosecond regime, they have to rely on the Ti:sapphire laser, working at wavelength of 800 nm, and limited in the maximum available average power. Broadening the spectrum and compressing the pulses of the Yb:YAG thin-disk laser could make them more attractive for such applications and widen their potential use.

Second harmonic generation (SHG) in a nonlinear optical crystal with type II phase matching can be utilized as a pulse shaping and compression mechanism, when a time predelay between the input pulses is introduced. This method is usually employed with nonlinear crystals from the phosphate (PO_4) family. For efficient SHG of high-average-power Yb:YAG thin-disk lasers, borate crystals are preferred due to their superior thermal properties. These crystals, however, do not have optimal group velocities of the interacting pulses, which are necessary to achieve efficient compression.

In this seminar, numerical and experimental analysis of pulse compression of Yb:YAG lasers by SHG in borate crystals will be presented. First, numerical simulations focusing on LBO and BBO crystals will be introduced. Two cases are studied. First is a pulse compression caused by the back-conversion and controlled by the time predelay, with which one can achieve only limited results, due to the already mentioned non-optimal group velocities. But the effective group velocities can be changed by tilting of the pulse fronts, which is especially useful in the BBO crystal. Once a proper ratio of group velocities is found, pulses with durations around 100 fs can be generated. Both of these cases are also studied experimentally. Although the measured efficiency is usually lower than the simulated one, other pulse characteristics provide evidence of pulse shaping in accordance with the simulations for the first case, and evidence of ongoing pulse compression in the second studied case.

Overview of current status of harmonic generation by standard approach at Perla B laser will be given as well.

When: Friday, **30/09/2021 at 14:00**

Where: Seminar room (Perla), HiLASE Centre

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