

## Seminar

Wednesday, March, 13, 14:00 h, PHY 5.0.20

### Dr. Christoph HEYL

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## *Moulding light*

*From Quasi-Guided Nonlinear Optics to Gas-Phase Sono-Photonics*

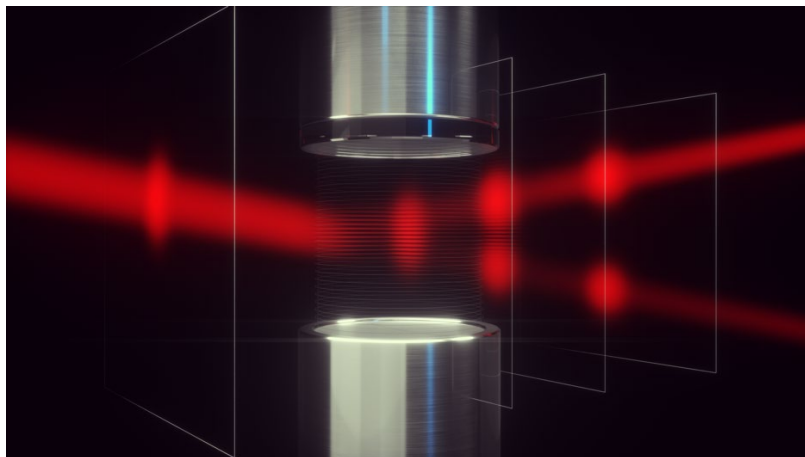


Figure: Laser pulse deflection at an invisible grating formed of air

Ultrafast optical laser pulses play a crucial role in various fields. They allow for precise measurements at the shortest time scales and highest field strengths, and are essential for industrial applications such as semiconductor manufacturing and healthcare. Although ultrafast lasers have been available for over half a century, our ability to create and control ultrafast pulses, as well as coherent light in general, is rapidly advancing until today. This talk will focus on two methods that enable entirely new light control schemes. The first method to be discussed will be recent advances in large-factor post-compression and shaping of ultrashort pulses approaching the few-cycle terawatt regime. The method relies on the use of multi-pass quasi-waveguides [1,2]. The second method introduced will be gas-phase sono-photonics, a method which enables contactless laser beam control directly in ambient air [3].

- [1] A.-L. Viotti, M. Seidel, E. Escoto, [...], C.M. Heyl, Multi-pass cells for post-compression of ultrashort laser pulses, *Optica* 9, 197–216 (2022).
- [2] P. Balla, H. Tünnermann, S.H. Salman, [...], C.M. Heyl, Ultrafast serrodyne optical frequency translator, *Nature Photonics* 17, 187–192 (2023).
- [3] Y. Schrödel, C. Hartmann, C. Zheng, [...], Heyl, C.M., Acousto-optic modulation of gigawatt-scale laser pulses in ambient air, *Nature Photonics* 18, 54–59 (2024).