

# PHOTONIK SEMINAR

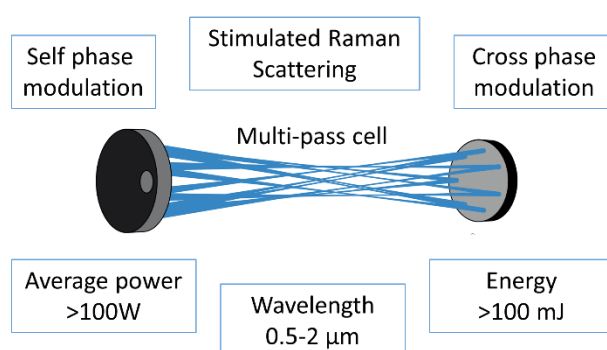
**Prof. Dr. Oleg Pronin**

Helmut Schmidt Universität

## Nonlinear optics in multipass cells and dual-comb spectroscopy

$\chi^{(3)}$  based nonlinear effects were extensively demonstrated in multipass cells over the last 6 years providing and establishing the field of  $\chi^{(3)}$  multipass nonlinear optics [1,2,3] (also see schematic summary-picture below). This talk is going to address the recent developments in this field including further peak and average power scalability towards sub-Joule energies and kW-level average power.

Moreover, the first proof-of-concept demonstration of  $\chi^{(2)}$  multipass nonlinear optics [4] where free space birefringent phase matching and quasi-phase matching can be realized with nearly all types of nonlinear materials is also going to be presented in this talk, for the first time.



Additionally, the highest peak power fully passive dual-comb laser system based on the thin-disk technology is going to be shown including the experiments on acetylene spectroscopy and its possible extension into the deep UV and XUV ranges.

- [1] J. Schulte, et al., "Nonlinear pulse compression in a multi-pass cell," *Optics letters* **41**, 4511–4514 (2016).  
 [2] K. Fritsch, et al., "All-solid-state multipass spectral broadening to sub-20 fs," *Optics letters* **43**, 4643–4646 (2018).  
 [3] M. Hanna, F. Guichard, N. Daher, Q. Bournet, X. Délen, and P. Georges *Laser & Photon. Rev.* **15**, 2100220 (2021). [4] N. Kovalenko, V. Hariton, K. Fritsch, O. Pronin  
 [5] K. Fritsch, T. Hofer, J. Brons, et al. Dual-comb thin-disk oscillator. *Nat Commun* **13**, 2584 (2022).

**Tuesday, 20<sup>th</sup> September 2022, 10:00 Uhr**

Seminarraum 387 (CBEG02) - Institut für Photonik  
Gußhausstraße 27-29, 1040 Wien