SEMINAR: Ultrafast nanoscopy by deactivated high-harmonic generation from solids

PETER KRAUS

March 26, 2026
15:00 to 16:00
Elements Room

ABSTRACT:
Attosecond, atomic-scale movies remain a long-standing dream, with transformative applications from tracking resonances in metamaterials to observing phase transitions in strongly correlated materials. We propose a radical new route to this vision: HADES - Harmonic Deactivation Microscopy. By confining solid-state HHG far below the diffraction limit using an orbital-angular-momentum prepulse, we achieve selective deactivation of harmonic emission through a generalized quantum-optical framework we recently introduced and demonstrated. This mechanism interferes hidden photon pathways to enhance or suppress HHG with near-unity efficiency. HADES opens the door to all-optical, label-free super-resolution nanoscopy and control over nonlinear light-matter interactions.

BIO:
Peter Kraus is the group leader of the i¿½High-harmonic generation and EUV sciencei¿½ eam at A
CNL (https://arcnl.nl/research-groups/high-harmonic-generation-and-euv-science/group-m emebers), and associate professor of physics at the Vrije Universiteit Amsterdam. Since July 2 24, Peter has also been part of the ARCNL management team as head of the metro ogy department. Peter's research interests lie in developing extreme ultraviolet (EUV) and hi hly nonlinear light sources from gas and solid-state high-harmonic generation, and apply hem for ultrafast spectroscopy and nanoscale metrology experiments with relevanc to nanolithography.
Prior to joining ARCNL/VU in 2018 as group leader/assistant professor, Peter Kraus worked at the University of California, Berkeley (USA) on the development of new experimental techniques for investigating attosecond phenomena in solid-state materials. Peter obtained his PhD at ETH Zurich (Switzerland) in 2015. Here, he developed and advanced the techniques of high harmonic-spectroscopy for investigations of electronic and nuclear structure and dynamics of molecular systems. His PhD thesis was awarded the ETH medal for outstanding theses and the Justin Jankunkas award by the American Physical society for the best thesis in chemical physics.
Since starting at ARCNL, Peter has obtained funding from the European Research Council

(ERC Starting grant 2022, ERC Proof of Concept 2024), NWO domain ENW in the form of a Veni (2018), a Vidi (2023) and open competition M-2 (2023), as well as funding from NWO domain TTW (Open Technology program, in 2020 and 2023).

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Hosted by: Prof. Dr. Pablo Loza and Prof. Dr. Niek van Hulst