The Center for
Light Matter Interaction
Tel Aviv University

LMI Seminar:

Time-resolved attosecond interferometry

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Wednesday December 4th, 2024
13:00-14:00

Light refreshments and drinks will be served at 12:30

Auditorium 011, Engineering Classroom Building, Faculty of Engineering, Tel-Aviv University

Abstract: Attosecond science has revolutionized the ability to capture extremely fast phenomena in nature, opening a window into a new temporal regime, in which electron dynamics are bserved on their natural time scale. Attosecond metrology relies on the ability to produce optical pulses, having attosecond duration. In attosecond metrology, the electronic dynamics are imprinted in the spectral intensity, phase and polarization state of such attosecond pulses. However, the optical measurement resolves only the spectral intensity while the phase and polarization information are lost, preventing a direct access to the full information encoded in the attosecond signal.

In my talk, I will describe how we extend one of the most fundamental optical schemes, interferometry, to the attosecond timescale. Our state-of-the-art all-optical attosecond interferometry scheme reveals some of the fastest phenomena in nature, such as the moment at which an electron is photoionized or the evolution of an electronic wavefunction under the tunneling barrier, as it propagates in a classically forbidden region. Our recent development of attosecond transient interferometry enables us to decouple and directly follow the temporal evolution of individual quantum paths induced in a light-driven system. Finally, I will describe unpublished results, establishing attosecond Fourier transform spectroscopy, capturing mili-eV scale physics on attosecond timescales and vectorial transient interferometry, probing dynamical symmetry breaking in field-driven atoms.

References:

1. D. Azoury, O. Kneller et al., Nature Photonics 13, 54 (2019).
2. D. Azoury*, O. Kneller* et al., Nature Photonics 13, 198 (2019).
3. O. Kneller, D. Azoury et al., Nature Photonics 16, 304 (2022).
4. O. Kneller*, C. Mor*, N. Klimkin* et al., Nature Photonics (2024).