



Solid State Institute
המכון למצב מוצק

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סמינר

Ultrafast Electron-Photon Quantum Interactions

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Abstract

The interaction of charged particles with strong electromagnetic fields is the basis for various phenomena in classical and quantum physics, with applications such as creating novel radiation sources, building small-sized optical accelerators, and improving spectroscopy techniques. A quantum theory of the electron interaction with strong photonic fields has been recently developed following the experimental demonstration of photon-induced near-field electron microscopy (PINEM) in the ultrafast transmission electron microscope. My PhD research contributes to the foundations of the PINEM effect, develops more advanced theories that extend the conventional PINEM, and predicts new kinds of interactions accessible in PINEM-like experiments. I find analytical solutions for the electron wavefunction after and during the interaction, which lead to new conservation laws in electron–laser interactions. My talk will describe how to use lasers to shape electron wavepackets, showing how to create electron energy combs. I will also talk about the concept of encoding quantum information on free electrons in the form of qubits (or a qudit), and how to manipulate this information and implement quantum gates using laser pulses. Finally, I will present my work on free-electron quantum walks with coherent uncertainty in electron-laser interactions, and conclude by describing PINEM-analogies that can guide us in discovering new kinds of interactions between free electrons and atoms.

ההרצאה תתקיים ביום רביעי, ה-3.2.2021 בשעה 12:30

[קישור](#)

The lecture will take place on Wednesday, 3.2.2021 at 12:30
via zoom: [Link](#)

Ph.D. Student of Assistant Professor Ido Kaminer