Solid State Institute
המכון למצב מוצק

TECHNION
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הטכניון
מכון טכנולוגי לישראל

SPECIAL SEMINAR

סמינר מיוחד

Spectral diffusion and the Stark effect in colloidal quantum dots

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Abstract

While colloidal quantum dots (CQDs) have become an important building block in electro-optical devices, in the realm of quantum science and technology, they are often considered inferior to other types of quantum emitters such as solid-state defects and epitaxial quantum dots. Despite their single-photon emission [1], demonstrations of quantum coherence and control are largely still lacking. The main obstacle towards these is spectral diffusion – stochastic fluctuations in the energy of photons emitted from an individual CQD even at cryogenic temperatures. In this talk, I will present our recent work providing, for the first time, direct and definitive proof that these fluctuations arise from stochastic electric fields in the micro environment [2]. The high sensitivity of CQDs to electric fields, through the quantum-confined Stark effect, is not only a bug but also a feature, enabling broadband coherent control of the temporal wavefunction of the emitted photon. To fulfill the unique potential that CQDs hold in the field of quantum optics, spectroscopy at fast-to-ultrafast (millisecond-to-femtosecond) timescales, relying on tools from the terahertz and femtosecond-laser toolboxes [3,4], will play a detrimental role.

[1] R. Tenne *et al.*, Nature Photonics **13**, 116 (2019).
[2] F. Conradt, ... , A. Leitenstorfer, and R. Tenne, Nano Lett. **23**, 9753 (2023).
[3] P. Henzler *et al.*, Phys. Rev. Lett. **126**, 067402 (2021).
[4] P. Fischer, G. Fitzky, D. Bossini, A. Leitenstorfer, and R. Tenne, Phys. Rev. B **106**, 205201 (2022).

ההרצאה תתקיים ביום שני, ה-15.1.2024 בשעה 12:30
באודיטוריום המכון למצב מוצק, קומת כניסה

The lecture will take place on Monday, 15.1.2024 at 12:30
at the Solid State Institute auditorium, entrance floor

Host: Assistant Professor Michael Krueger