Contribution ID: **65** Type: **Invited Lecture**

Quantum Dynamics in Multiple Quantum Dots Systems

Quantum Dynamics in Multiple Quantum Dots Systems

Tatiana Mihaescu^{1}, Aurelian Isar^{1}, and Mihai A. Macovei^{2}

{}^{1} National Institute of Physics and Nuclear Engineering, Reactorului 30, RO-077125, Măgurele-Bucharest, Romania
{}^{2} Institute of Applied Physics, Moldova State University, Chișinău, Moldova
*E-mail: mihai.macovei@ifa.usm.md

Light-matter interactions have been always considered as a promising platform for novel applications. Therefore, here, we shall report our recent results obtained in a compound sample consisting from a semiconductor double quantum dot system, non-linearly coupled with a leaking single-mode microresonator. One demonstrates that this complex non-linear system exhibits a variety of interesting effects. Particularly, we have found the relationship among the electrical current through the double quantum dot and the microwave field inside the resonator that is nonlinearly coupled to it, with a corresponding emphasizing on their critical behaviors. Additionally, it is demonstrated that the quantum correlations of the photon flux generated into the resonator mode vary from super-Poissonian to Poissonian photon statistics, leading to single-qubit lasing phenomena at microwave frequencies [1].
The second part of the presentation focuses on a dense and dipole-dipole coupled ensemble of two-level emitters interacting via their environmental thermostat. The established thermal equilibrium of ensemble's quantum dynamics is described with respect to the dipole-dipole coupling strengths. Actually, we have demonstrated the quantum nature of the spontaneously scattered light field in this process for weaker thermal baths as well as non-negligible dipole-dipole couplings compared to the emitter's transition frequency [2].

[1] T. Mihaescu, A. Isar, and M. A. Macovei, (submitted) arxiv:2501.05967 (2025).
[2] M. A. Macovei, Phys. Rev. A. 110, 023712 (2024).

Primary authors: ISAR, Aurelian; MACOVEI, Mihai (Institute of Applied Physics); Dr MIHAESCU, Tatiana

Presenter: MACOVEI, Mihai (Institute of Applied Physics)