

Optics of hybrid nano-materials: self-consistent studies

Professor Maxim Sukharev

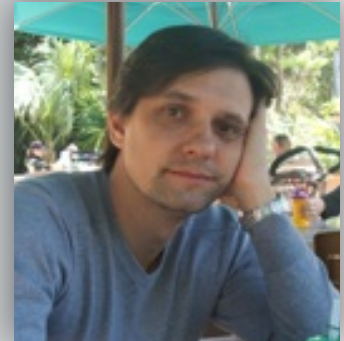
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ABSTRACT

Modern optics fueled by advances in nano-fabrication and laser physics is currently experiencing significant growth, as researchers are now experimentally capable of producing structures with a precision of 1 nm. We are presently witnessing a unique situation – the research centered at interaction of matter with electromagnetic radiation is fully diving into nanoscale, where one considers purely quantum systems optically driven by nano-materials. The possibilities are vast ranging from fundamental ideas on single atom/molecule optical manipulation, through control of light far below the diffraction limit, to optical engineering and photonic circuitry. Despite progress, the research in optics of quantum media coupled to nanomaterials is not complete. Many recent works consider just several quantum emitters driven by near-fields altered by plasmonic materials with a few very promising attempts to include collective effects, which as I will show play a pivotal role in quantum optics of nano-materials. The basis of our approach is to blend computational techniques in optics together with fundamentals of quantum atomic and molecular physics. A self-consistent model of Maxwell-Liouville-von Neumann equations is at the center of this presentation. This model is used to scrutinize both linear and nonlinear optical properties of ensembles of molecules strongly coupled to plasmonic nano-structures. The ideas of coherent control and STIRAP with collective effects taken into account are also discussed.

BIOGRAPHY

Dr. Sukharev received his Masters Degree in Theoretical Physics from the Moscow Engineering Physics Institute in 1997. In 2000 he completed and defended his Ph.D. thesis in Laser Physics at the Department of High-Power Lasers in the General Physics Institute of the Russian Academy of Sciences. In 2001 he received The French Ministry of Research Postdoctoral Fellowship and joined the research group of Professor Annick Suzor-Weiner at the Laboratory of Molecular Photophysics in the University of Paris South, Orsay, France. During this appointment he was involved in the research of optimal and coherent control of atoms and molecules in strong laser fields. In summer of 2003 he joined the research group of Professor Tamar Seideman at the Department of Chemistry, Northwestern University, Evanston, Illinois as a postdoctoral fellow performing simulations of optical properties of classical and quantum systems in strong external electromagnetic fields using high performance computing facilities. He joined Arizona State University as an assistant professor of physics in August 2008.



EVENT DETAILS

DATE:

Wednesday Sept. 26, 2012

TIME:

11:00 AM

LOCATION:

Babbio Center, Room 122
Stevens Institute of Technology

ATTENDANCE:

This event is open to Stevens' Faculty, Students, Staff, and Invited Guests