Department of Electrical and Computer Engineering
Texas Center for Superconductivity
Materials Engineering Program
Center for Integrated Bio and Nano Systems
10:00 a.m., April 23, 2021

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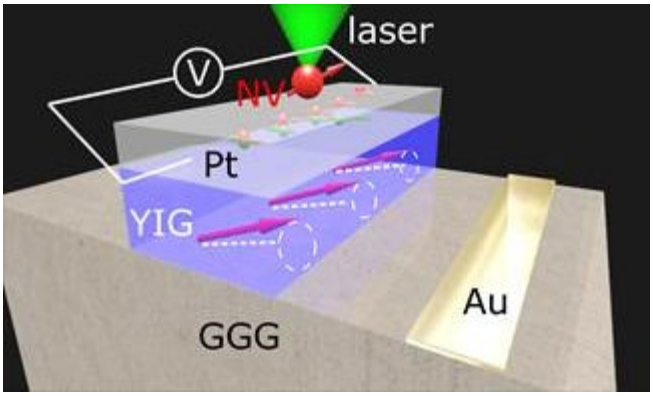
Harnessing Nitrogen Vacancy Centers in Diamond for Next-Generation Quantum Science and Technology

Chunhui Du

Department of Physics, University of California, San Diego

Abstract: Advanced quantum systems are integral to both scientific research and modern technology enabling a wide range of emerging applications. Nitrogen vacancy (NV) centers, optically-active atomic defects in diamond, are directly relevant in this context due to their single-spin sensitivity and functionality over a broad temperature range. Many of these advantages derive from their quantum-mechanical nature of NV centers that are endowed by excellent quantum coherence, controllable entanglement, and high fidelity of operations, enabling opportunities to outperform their classical counterpart. In this talk, I will present our recent efforts in developing NV-based quantum sensing platform and technologies. Specifically, we demonstrated electrical control of the coherent spin rotation rate of a single-spin qubit in an NV-spintronic hybrid quantum system. By utilizing electrically generated spin currents, we are able to achieve efficient tuning of magnetic damping and the amplitude of the dipolar fields generated by a micrometer-sized resonant magnet, enabling electrical control of the Rabi oscillation frequency of NV spin qubits. In addition, exploiting a state-of-the-art NV quantum sensing platform, we achieved optical detection of magnons with a broad range of wavevectors in magnetic insulator thin films. Our results highlight the potential of NV centers in designing functional hybrid solid-state systems for next-generation quantum-information technologies. The demonstrated coupling between NV centers and magnons further points to the possibility to establish macroscale entanglement between distant spin qubits and paves the way for developing transformative NV-based quantum computer.



Short Bio:

EDUCATION
2015 PhD in Physics, The Ohio State University, Columbus, OH.
2010 BS in Physics, East China Normal University, Shanghai, China.

HONORS AND AWARDS
National Science Foundation CAREER Award.
Air Force Office of Scientific Research Young Investigator Award.
Harold and Suzy Ticho Endowed Faculty Fellowship in Physics, University of California, San Diego.

RESEARCH EXPERIENCE
2019-present, Assistant Professor, Department of Physics, University of California, San Diego.
2015-2019, Postdoctoral Fellow, Department of Physics, Harvard University.

Please contact Prof. Xiaonan Shan <xshan@Central.UH.EDU> or Prof. Jiming Bao (jbao@uh.edu) if you want to meet with the speaker.