Spins in Semiconductors for Quantum Information Science

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Abstract: Spin states are attractive in quantum information science for quantum bits and quantum sensing, due to a weak coupling to the environment that typically leads to long coherence times. Solid state spin systems can be particularly attractive for compact platforms and for scaling up to many quantum bits. I will discuss three semiconductor spin systems for quantum information science: point defects in solids, self-assembled quantum dots, and electrically defined quantum dots. These systems have different length scales, operating temperatures, and methods for control and readout. I will present some of my research on these systems and their roles in quantum information science.

Bio: Dr. Samuel Carter is a Researcher Lead at the Laboratory for Physical Sciences (LPS), performing experimental research on quantum sensing and quantum computing with solid state spin systems. He is an expert in quantum optics of solid-state qubits, coherent control of spins, and quantum sensing with defect spins in solids. He received his Ph.D. in Physics in 2004 at the University of California, Santa Barbara, working with Professor Mark Sherwin on terahertz-driven quantum wells, and he performed postdoctoral studies at NIST and the University of Colorado, Boulder with Professor Steve Cundiff on ultrafast optical spectroscopy of semiconductors. After working at the U.S. Naval Research Lab for 15 years in solid state quantum information science, Dr. Carter joined LPS where he is performing research on quantum sensing and quantum computing with spins systems in semiconductors.