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Optical Quantum Dots for Quantum Information

Abstract: Quantum information technology offers the possibility of revolutionary advances in fields including secure communications, computation and sensing. A major focus of research in this area involves physical implementation of qubits and of quantum gates for these technologies. Optical quantum dots can provide fast single and multiqubit operations in scalable systems that can be integrated into existing semiconductor technologies. This talk will describe recent work on the development of quantum dot spin qubits, on cavity mediated two-qubit and multiqubit gates and on tunnel coupled quantum dot molecules.

Bio: Thomas Reinecke is the Senior Scientist for Nanoelectronics at the Naval Research Laboratory (NRL), and he is also Head of the Electronic and Optical Properties Section of the Electronics Division. He did his Ph.D. at Oxford University on a Rhodes scholarship. He is a Fellow of the American Physical Society (1982), received the Humboldt Award for Senior Scientists from Germany in 1994, the E. O. Hulburt Award of NRL in 1999, the Sigma Xi Award for Basic Research, 1982, the Presidential Rank Award in 2005, the Navy Outstanding Scientist and Engineer Award, 2006, and the Horsley Award of the Virginia Academy of Sciences in 1995 and Distinguished Presidential Rank Award 2014. He is the author of more than 250 refereed journal articles with more than 8,000 citations in a wide range of nanoscience and solid state physics. His current research interests are in a range of nanoscience, including quantum information technology, thermoelectric materials, and electronic, thermal and optical properties of materials. He has been a visiting scientist at a number of leading research institutions, including the Max-Planck Institute for Solid State Physics in Stuttgart Germany and the Universities of Wuerzburg, Stuttgart and Dortmund in Germany.