Quantum information and metrology using electron spin qubits in semiconductors

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Isolated electron and nuclear spins provide promising platforms for constructing quantum two level systems, or qubits in semiconductors. This talk will overview two seemingly different but actually closely related research areas; 1. artificially fabricated semiconductor quantum dot based quantum electronics, and 2. diamond NV (nitrogen-vacancy) center based quantum information and metrology experiments, including discussion of fast silicon based spin qubits and electron and nuclear spin qubits using NV centers. Aimed at undergraduate level, I will give a general introduction to quantum measurements in quantum dots and NV centers using quantum point contact and optically detected magnetic resonance (ODMR) technique. The second part of the talk will focus on discussing implementations of advanced quantum measurement and validation protocols in silicon and NV center qubits, largely adopting techniques developed in superconducting qubits and nuclear magnetic resonance research fields.