

# Physical Mathematics Seminar

## Design and Optimization of a Solid State Qubit System

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**2:30 PM**  
**Building 2, Room 338**

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### Abstract

This talk will describe the simulation, design and optimization of a qubit for use in quantum communication or quantum computation. The qubit is realized as the spin of a single trapped electron in a semi-conductor quantum dot. The quantum dot and a quantum wire are formed by the combination of quantum wells and gates. The design goal for this system is a "double pinchoff", in which there is a single trapped electron in the dot and a single (or small number of) conduction states in the wire. Because of considerable experimental uncertainty in the system parameters, the optimal design should be "robust", in the sense that it is far away from unsuccessful designs. We use a Poisson-Schrodinger model for the electrostatic potential and electron wave function and a semi-analytic solution of this model. Through a Monte Carlo search, aided by an analysis of singular points on the design boundary, we find successful designs and optimize them to achieve maximal robustness.

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