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Quantum information processing using acceptors in silicon and phonon entanglement SUSAN CLARK, CHARLES REINKE, HAYDEN MCGUINNESS, IHAB EL-KADY, Sandia National Laboratories — Quantum computing with large numbers of qubits remains challenging due to the decoherence and complexity that arise as more qubits are added to a system. Here I propose a new platform for semiconductor quantum computing which may be robust to common sources of decoherence and may not be difficult to fabricate repeatedly. This system consists of a hole bound to an acceptor in silicon which has been implanted in the center of a mechanical cavity (similar to a photonic crystal cavity) and connected to other cavities by a system of waveguides. I will outline a basic entangling gate and calculations showing the promise of this platform as the ideal qubit. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U. S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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