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Evaluation of strained silicon on insulator for SET based single donor spin read-out PETER SHARMA, GREG TEN EYCK, DANIEL WARD, JASON DOMINGUEZ, KENTON CHILDS, JOEL WENDT, MICHAEL LILLY, MALCOLM CARROLL, Sandia National Laboratories — Recent successes in realizing single donor control and achieving very high fidelity gate operations has driven interest in silicon-based donor qubits. A number of proposals for donor to donor coupling rely on vertical field for Stark shift and ionization to a nearby interface. Back gating silicon on insulator is one approach to achieving sufficient field strengths. We present low temperature measurements of back gated FET structures and donor implanted SETs fabricated from strained silicon on insulator substrates with a low doped handle. This strained silicon system is useful for studying the effects of strain on both single donor physics and may provide insight into the behavior of strained silicon channels for quantum dots. We use FET thresholds to characterize the oxide/Si defect density. Back gating influences the transient time response, mobility, and FET threshold. These parameters are also modified by above band gap light illumination. Two transport channels are observed, which also strongly depend on back gate voltage and illumination. This work was performed, in part, at the Center for Integrated Nanotechnologies, an Office of Science User Facility operated for the U.S. Department of Energy Office of Science. Sandia National Laboratories is a multiprogram 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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