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Quantum Logic with Composite Pulse Sequences on Sr^+ RUTH SHEWMON, JAROSLAW LABAZIEWICZ, YUFEI GE, SHANNON WANG, ISAAC L. CHUANG, Center for Ultracold Atoms, MIT — The optical $5S_{1/2} \rightarrow 4D_{1/2}$ transition in Sr^+ is an attractive qubit because it can be addressed by diode lasers, which are relatively inexpensive and easy to operate. We characterize single-qubit rotations as well as a CNOT gate on a Sr^+ ion in a surface electrode Paul trap. To improve these operations, the frequency of the clock laser is stabilized to a high-finesse optical cavity. The resulting linewidth of the laser is approximately 300Hz. Composite pulse sequences, a technique adapted from NMR, have been shown to reduce the effects of systematic errors in a variety of quantum systems. We demonstrate several composite sequences that improve the fidelity of quantum logic operations on Sr^+.

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