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**Fidelity analysis of a Rydberg blockade CNOT gate with simulated quantum process tomography**[1] X.L. ZHANG, A.T. GILL, L. ISENHOWER, T.G. WALKER, M. SAFFMAN, University of Wisconsin — We present a detailed error analysis of a Rydberg blockade mediated controlled-NOT quantum gate between two neutral atoms. Numerical solutions of a master equation for the gate dynamics, including all known sources of technical error, are shown to be in good agreement with experiments. We also present numerical simulations of quantum process tomography to find the intrinsic fidelity, neglecting technical errors, of a Rydberg blockade controlled phase gate. The gate fidelity is characterized using trace overlap and trace distance measures. We show that the trace distance is linearly sensitive to errors arising from the finite Rydberg blockade shift and introduce a modified pulse sequence which corrects the linear errors. Error floors of $O(10^{-3})$ are found for $^{87}$Rb and Cs atoms.

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