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Entangling and detecting alkaline-earth Rydberg atoms with high fidelity[1] IVAYLO MADJAROV, JACOB COVEY, ADAM SHAW, JOONHEE CHOI, ANANT KALE, Caltech, ALEXANDRE COOPER, University of Waterloo, HANNES PICHLER, Caltech, VLADIMIR SCHKOLNIK, JASON WILLIAMS, Jet Propulsion Laboratory, MANUEL ENDRES, Caltech — We present recent results on high-fidelity entanglement and detection of strontium Rydberg atoms in tweezer arrays. Two-electron atoms such as strontium offer several advantages for Rydberg physics, such as the ability to rapidly auto-ionize the Rydberg electron. We implement such a scheme and demonstrate significantly increased Rydberg state detection fidelities compared to previous work relying on trapping losses. Building off recent work on atomic-array optical clocks, we use strontium's clock state as a metastable ground state from which single-photon Rydberg excitation with fast Rabi frequency is easily accessible. We observe high-fidelity and long-lived blockade oscillations and present a lower bound argument for entanglement fidelity measured without local spin-addressing. Finally, we discuss ongoing efforts into quantum simulation, quantum gates, and entanglement-enhanced clocks.

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Ivaylo Madjarov
Caltech

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