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Interacting single atom interferometers[1]

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Atom interferometer experiments have achieved exquisite levels of sophistication in both applied pursuits and fundamental studies, inspiring new experiments that further challenge these frontiers. In our previous experiments, we have developed several techniques targeting fielded atom interferometer systems. These atom interferometers, by design, operate in a regime where interatomic interactions are kept to a minimum. In contrast, by laser dressing the typically employed ground states with highly polarizable Rydberg states we can create a coherent and controllable, state-dependent entangling interaction between atoms resulting in a Jaynes-Cummings type nonlinearity in the ground state spectrum. We have used this interaction to produce entangled Bell states between two atoms with $\geq 81 \pm 1$ % efficiency. In recent experiments, we are studying this new system using interacting single-atom interferometers.

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