Abstract Submitted
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Towards Strongly Interacting Quantum Mixtures of Light Fermions and Heavy Bosons[1] COLIN PARKER, SHIH-KUANG TUNG, JACOB JOHANSEN, CHENG CHIN, University of Chicago, YUJUN WANG, PAUL JULIENNE, Joint Quantum Institute and University of Maryland — Cold atomic gases have attracted interest as many body quantum simulators due to the tunable nature of the basic parameters, such as lattice depth, particle density, and interaction. However, for single species alkali atoms, simulations are limited by the nature of the interactions between atoms, which is necessarily short-range. Heteronuclear mixtures offer the potential for more exotic interactions, either by formation of cold molecules with a permanent electric dipole moment, or by allowing one species to mediate interactions between the other. With the addition of an optical lattice, an analog of electron-phonon interactions should be possible, with heavy bosons playing the role of material ions. In all of these scenarios, ^{6}Li and ^{133}Cs are a compelling choice, as they maximize the mass ratio within the stable alkali family. Furthermore, either species by itself offers significant tunability. Recently, we have discovered a family of interspecies Feshbach resonances between 800 and 900 G in the ^{6}Li-^{133}Cs system. These resonances are in a favorable position for the production of dual degenerate quantum gases. The implications for universal few-body states and strategies for sympathetic evaporation to dual degeneracy will be discussed.

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Colin Parker
University of Chicago

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