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Toward Simultaneous Quantum Degeneracy of ^{133}Cs and ^{6}Li Atoms ARJUN SHARMA, SKYLER DEGENKOLB, NATHAN GEMELKE, KATHY-ANNE BRICKMAN SODERBERG, CHENG CHIN, James Franck Institute and Department of Physics, The University of Chicago — A quantum degenerate mixture of ^{133}Cs and ^{6}Li atoms provides interesting prospects to investigate few- and many-body physics and to realize quantum information processing. Simultaneous evaporative cooling of bosonic ^{133}Cs and fermionic ^{6}Li is challenging. In an optical dipole trap formed with a 1064nm laser, ^{133}Cs (resonant transition at 852nm) experiences a deeper potential than ^{6}Li (at 671nm). Since laser cooling allows a much lower initial temperature for ^{133}Cs (10μK) than for ^{6}Li (150μK), a wide, shallow trap optimizes ^{133}Cs loading, but ^{6}Li requires a deep trap. Efficient cooling of ^{6}Li involves Feshbach resonance tuning near 800G, but ^{133}Cs collision properties are untested at high fields. Furthermore, sympathetic cooling of ^{6}Li by ^{133}Cs can suffer from the large mass ratio causing imperfect overlap of clouds and slow collisional rethermalization. We report our work toward collision studies of ^{133}Cs -^{6}Li and ^{133}Cs-^{133}Cs in fields up to 1000G and its implications for optimal evaporation, as well as the implementation of quantum gate operations.

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