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Progress toward scalable quantum information processing using ^{6}Li and ^{133}Cs atoms ARJUN SHARMA, The University of Chicago, NATHAN GEMELKE, The Pennsylvania State University, SHIH-KUANG TUNG, CHENG CHIN, The University of Chicago — We present our progress on the construction of a novel, scalable quantum information processing system. The system consists of both fermionic ^{6}Li and bosonic ^{133}Cs atoms. The two species are simultaneously and independently trapped in two separate optical lattices. ^{6}Li atoms are cooled into a degenerate band-insulator state that will allow uniform loading of one atom per site. These ^{6}Li atoms serve as quantum bits (qubits). ^{133}Cs atoms have a lower filling of one atom per 100 sites and will serve as messengers to induce entanglement among the qubits. In order to implement collision-based entangling operations, our plan for initial studies include the interspecies collision properties of ^{133}Cs-^{6}Li at a magnetic field of up to 1000G, and the control of atoms on the single-atom level in two-color optical lattices.

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