

Studying the Interactions of Lithium and Cesium

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The lithium-cesium apparatus being built in our laboratory is nearly at the point where lithium and cesium can be simultaneously trapped using a magneto-optical trap (MOT), and subsequently an optical dipole trap. This presents the opportunity to study the interactions between the two atomic species. Two important interactions, for example, are elastic scattering, which could help sympathetically cool the two species into quantum degeneracy, and inelastic collisions, which could result in losses from the trap and should be minimized. Furthermore, the interaction properties will change with varying magnetic field due to Feshbach resonances. Thus, there is a rich parameter space in which to study these interactions, providing both necessary information for future steps in the experiment, and scientific knowledge regarding properties of these atomic species.

To do:

1. Construct the controller for the MOT magnetic field gradient and dipole trap magnetic field.
2. Optimize the lithium and cesium atomic number in the MOT, and qualitatively characterize the species' interactions.
3. Load both atomic species into the optical dipole trap.
4. Study lithium-cesium collision properties as a function of external magnetic field in the dipole trap, especially looking for inter-species Feshbach resonances.