Production and Characterization of a Dual-Species Cold Atomic Beam

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An intense dual-species (Cs+Rb) cold atomic beam has been used to load simultaneous dual-species magneto-optical traps. The behavior of the colocated dual-species UHV MOTs has been characterized and compared to single-species behavior. In addition, possible cross-species interactions in such MOTs are being investigated.

To create the beam source we use a pyramidal trap geometry using large (~10cm) diameter trapping beams, and a separate retro-optic containing the (1mm) beam exit aperture. The single-species beams have been extensively characterized, and possess mean velocities of ~15 m/s, divergences of <20 mrad, and fluxes of 2.2 x 10^9 atom/s.

The behavior of colocated Cs and Rb UHV MOTs was studied through examination of loading rates, trap lifetimes, and relative steady-state sizes of individual species MOTs with and without the presence of a second species, in anticipation of interaction effects.

Numerical simulations have been done to study the dynamics of MOT formation in the pyramidal trap chamber and the emergence of the slow atomic beam. Current simulation work centers on the study of high-efficiency loading of UHV MOTs downstream from the beam source, and the interaction of such MOTs with a high-power quasi-static dipole trap.