Abstract Submitted
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Theoretical studies of association and dissociation of Feshbach molecules in a microgravity environment[1] JOSE D'INCAO, JILA, Dept. of Physics, Univ of Colorado, Boulder, and NIST, JASON WILLIAMS, Jet Propulsion Laboratory, California Institute of Technology — NASAs Cold Atom Laboratory (CAL) is a multi-user facility scheduled for launch to the ISS in 2017. Our flight experiments with CAL will characterize and mitigate leading-order systematics in dual-atomic-species atom interferometers in microgravity relevant for future fundamental physics missions in space. As part of the initial state preparation for interferometry studies, here, we study the RF association and dissociation of weakly bound heteronuclear Feshbach molecules for expected parameters relevant for the microgravity environment of CAL. This includes temperatures on the pico-Kelvin range and atomic densities as low as $10^8/\mathrm{cm}^3$. We show that under such conditions, thermal and loss effects can be greatly suppressed, resulting in high efficiency in both association and dissociation of extremely weakly bound Feshbach molecules and allowing for high accuracy determination coherent properties of such processes. In addition we study the possibility to implement delta-kick cooling techniques for weakly bound heteronuclear molecules and explore numerically other methods for molecular association and dissociation including the effects of three-body interactions.

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