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Formation of heteronuclear Feshbach molecules in microgravity[1]
JOSE D'INCAO, JILA, Dept of Physics, Univ of Colorado and NIST, JASON WILLIAMS, Jet Propulsion Laboratory, California Institute of Technology, CA — NASAs Cold Atom Laboratory (CAL) is a multi-user facility scheduled for launch to the ISS in 2018. 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 association and dissociation of weakly bound heteronuclear Feshbach molecules, through magnetic field ramps, for expected parameters relevant for the microgravity environment of CAL. This includes temperatures on the pico-Kelvin range and atomic densities as low as $10^8/\mathrm{cm}^3$. In order to qualitatively explore this problem we developed a theoretical model in which a few atoms are subjected to an artificial trapping potential whose trap frequency is adjusted to reproduce the average interatomic distance in the ultracold gas. This model has been successfully used to analyze previous experiments in molecular formation and we will extent such approach to include various quantitative aspects related to the few-body physics in the problem. Within this model we can obtain the efficiency for molecular association and dissociation, as well as estimate the generated heating during the field ramps.

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