Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Association and dissociation of Feshbach molecules in a microgravity environment JOSE P D'INCAO, JILA, NIST and Department of Physics University of Colorado, Boulder, CO, JASON R WILLIANS, 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 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. 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. Our theoretical model for ^{41}K-^{87}Rb mixture includes thermal, loss, and density effects in a simple and conceptually clear manner. We derive several conditions in terms of the temperature, density and scattering lengths, determining the regime in which one can achieve efficient association and dissociation. This research is supported by the National Aeronautics and Space Administration.

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Date submitted: 29 Jan 2016 Electronic form version 1.4