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Progress toward studies of bubble-geometry Bose-Einstein condensates in microgravity with a ground-based prototype of NASA CAL[1]
NATHAN LUNDBLAD, THOMAS JARVIS, DANIEL PASELTINER, Bates College, COURTNEY LANNERT, Smith College — We have proposed using NASA's Cold Atom Laboratory (CAL, launching to the International Space Station in 2017) to generate bubble-geometry Bose-Einstein condensates through radiofrequency dressing of an atom-chip magnetic trap. This geometry has not been truly realized terrestrially due to the perturbing influence of gravity, making it an ideal candidate for microgravity investigation aboard CAL. We report progress in the construction of a functional prototype of the orbital BEC apparatus: a compact atom-chip machine loaded by a 2D+MOT source, conventional 3D MOT, quadrupole trap, and transfer coil. We also present preliminary modeling of the dressed trap uniformity, which will crucially inform the geometric closure of the BEC shell surface as atom number, bubble radius, and bubble aspect ratio are varied. Finally, we discuss plans for experimental sequences to be run aboard CAL guided by intuition from ground-based prototype operation.

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