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Proposal for measuring Big G using the NASA Cold Atom Lab aboard the International Space Station MARK EDWARDS, COLSON SAPP, Georgia Southern University, CHARLES CLARK, JQI and NIST — We propose an atom interferometry (AI) experiment to measure Big G constant in a microgravity environment. Our experiment is assumed to be conducted in NASAs Cold Atom Laboratory currently deployed to the Interna- tional Space Station. The idea is to carry out an AI sequence many times, first with a source mass present and then with no source mass. The basic AI sequence is to split a Bose-Einstein condensate (BEC) into two pieces using pulsed optical lattice potentials. These pieces fly apart in the presence of an harmonic potential and finally stop after one quarter trap period. The trap is then turned off for a wait time. The pieces acquire a relative velocity difference due to the differential grav- itational pull of the source mass. The trap is turned back on and the pieces then recombine and are split again. The result is two clouds left nearly motionless near the trap center creating an interference pattern due to their relative velocity. We have simulated this sequence using the Lagrangian Variational Method (LVM) where the trial wave function is a sum of Gaussian clouds. We show how big G can be extracted from the interference pattern that results and present an approximate error budget for the measurement.

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