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Microgravity gradiometry measurement schemes with multiple-pathway atom interferometers[1] E. ASHWOOD, M. EDWARDS, Georgia Southern Univ, C.W. CLARK, Joint Quantum Institute — We propose a new atom-interferometric scheme for measuring the value and derivatives of the gravitational field in the microgravity environment found in the Cold-Atom Laboratory to be deployed to the International Space Station. The operation of the proposed atom interferometer consists of splitting a harmonically confined Bose-Einstein condensate into multiple pieces using a sequence of laser pulses. In a perfect harmonic oscillator potential all of the condensate pieces will come to rest at the same time. At this point, the harmonic trap is turned off. The nearly motionless condensate clouds then accumulate different phases due to their respective accelerations at different points in space. The trap is then turned back on bringing all of the clouds together at the same time at which point they are again split producing multiple interference patterns. We have simulated some of these interferometric schemes using a Lagrangian variational approximation to the 3D time–dependent Gross–Pitaevskii equation. We have used this method to facilitate rapid interferometer design and to understand how these interference patterns can be used to measure the gravitational field and its derivatives. We also compare the sensitivity of the different interferometric schemes.

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