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Measurements of gravitational acceleration from an echo atom interferometer[1] C. MOK, A. CAREW, B. BARRETT, R. BERTHIAUME, A. KUMARAKRISHNAN, Department of Physics and Astronomy, York University — We have developed two techniques involving a ground-state, time-domain echo atom interferometer (AI) to measure gravitational acceleration, g, from a sample of laser-cooled atoms. We compare and contrast measurements from a two-pulse and a three-pulse stimulated-echo AI described in PRA **84**, 063623 (2011). The two-pulse AI involves excitation by standing wave pulses separated in time by T_{21}, and detection at $2T_{21}$. In this case, the accumulation of the matter-wave fringes as a function of T_{21} is described by a frequency chirped signal analogous to the interference fringes recorded by a falling corner-cube Mach-Zehnder optical interferometer. In contrast, the three-pulse stimulated echo AI requires excitation by standing wave pulses separated by T_{21}, T_{32} and detection at $2T_{21} + T_{32}$. In this case, the signal from the AI as a function of T_{32} is modulated at a single frequency determined by T_{21}. Since the three-pulse AI is less sensitive to mirror vibrations and magnetic gradients, the measurement timescale is appreciably increased. We also consider the implementation of a RF-optical feedback loop to actively stabilize both AIs from the effects of mirror vibrations.

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