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Continuous cold atom source for stable inertial sensing CHARLES FANCHER, ADAM BLACK, MARK BASHKANSKY, JONATHAN KWOLEK, United States Naval Research Laboratory — Laser-cooled atomic ensembles are useful tools for inertial sensing based on atom interferometry. Pulsed cold-atom sensors suffer from dead time in the measurement cycle. Meanwhile, sensors that employ continuously cooled atom sources can suffer contrast reduction and phase shifts due to near-resonant scattered light produced in the laser cooling process. We present progress towards a beam source of alkali atoms that is continuously cooled is three dimensions and that substantially reduces the scattered light from laser cooling that reaches the sensor region. A 2D MOT produces a high-flux beam of transversely cooled atoms incident on the second stage, which is physically rotated by 10 degrees and has a continuously operating 3D moving optical molasses. This angular offset combined with in-vacuum apertures and mirrors eliminate all line-of-sight paths between the 2D MOT and the sensor region. The 3D molasses in the second stage is detuned by at least 5Γ from atomic resonance to reduce near-resonant light scatter. The reduction in 3D molasses capture velocity caused by this detuning is acceptable because only relatively small velocity changes (few m/s) are necessary to redirect and 3D-cool the atom beam from the 2D MOT. Recent experimental progress indicates success in continuous 3D cooling of the atomic beam from the 2D MOT and response of the atomic velocity distribution consistent with moving-frame optical molasses.

Charles Fancher
United States Naval Research Laboratory

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