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Periodic density variations in clouds of laser-cooled atoms TIMOTHY ROACH, PATRICK CONNOLLY, College of the Holy Cross — We present preliminary work looking at spatially periodic density variations in clouds of laser-cooled atoms. Such phenomena have been only minimally documented before and have been ascribed not to optical potentials but rather to variation in stickiness of the optical molasses, which itself results from variation in the character of the net optical field polarization. In our experiments, rubidium atoms are captured and held in a magneto-optic trap, using a fairly weak magnetic field gradient to facilitate a cloud of large size (∼3mm) and moderate density. Three orthogonal pairs of nearly counter-propagating laser beams provide the laser-cooling. A camera captures images of the atomic fluorescence. We observe periodic patterns both of a fringe-like (1D) and checkerboard (2D) appearance. For 1D patterns, the observed periods vary as $\lambda/sin\theta$, where λ=780nm is the laser wavelength and θ is the mis-alignment angle of a nearly counter-propagating pair.

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