Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Density variations with mm-scale periodicity in optical molasses
TIMOTHY ROACH, PATRICK CONNOLLY, College of the Holy Cross — We have been studying large (mm) scale periodic density variations appearing in a conventional 6-beam magneto-optic trap and in optical molasses. Such phenomena have been 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. For example, a small misalignment angle between the two laser beams of a nearly counter-propagating pair produces phase changes across the interaction region giving rise to long scale variations in molasses. In this simplest instance, we find a 1D fringe-like periodic density variation corresponding to a wave vector equal to the difference between the wave vectors of the two nearly counter-propagating beams. For the case of nearly perfect counter-propagating alignment, the long scale spatial variation appears as an instability in the MOT cloud position, since small phase shifts in any one beam dramatically affect the net polarization. We observe that small misalignment of a second pair of nearly counter-propagating beams produces density variations that are rotated or are periodic in two dimensions. We will present recent results on angle and polarization dependence.

Timothy Roach
College of the Holy Cross

Date submitted: 26 Jan 2018 Electronic form version 1.4