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Apparatus for study of spatially periodic density variations in optical molasses PATRICK CONNOLLY, TIMOTHY ROACH, College of the Holy Cross — We have developed a system to study large (mm) scale spatially periodic density variations in laser cooled atoms. The atoms are collected either in an optical molasses or a weak magneto-optic trap, in a conventional 6 beam configuration (three orthogonal pairs of nearly counter-propagating laser beams). Three video cameras provide views of atomic fluorescence along approximately orthogonal axes, so that the 3D spatial structure of the atomic cloud can be discerned. One camera view is nearly collinear with a laser beam; the other two are at 45 to laser beams. Fourier transforms of 2D images are used to quantify the periodicity. For simple 1D patterns, the observed periods scale lambda/sine(theta), where theta is angle of a nearly counter-propagating pair, relative to 180. Differential screw mirror mounts give 0.2mrad control of the relative angles for all three beam pairs so that 2D and 3D patterns can be produced and investigated.

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