Abstract Submitted
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Neutral Atom Lithography Using a Bright Metastable Helium Beam[1] CLAIRE SHEAN, JASON REEVES, HAROLD METCALF, SUNY Stony Brook — We have performed neutral atom lithography using a bright beam of metastable Helium (He*) that is collimated with the bichromatic force followed by two Doppler molasses velocity compression stages. We have previously demonstrated this lithography method using a metal grid to project its image on a self assembled monolayer (SAM) of nonanethiol. The open areas of the grid allow incident He* to damage the SAM molecules by depositing their 20 eV of internal energy on the surface. The undisturbed SAM regions then protect a gold coated Silicon wafer from a wet chemical etch. Samples created with this method have an edge resolution of 63 nm that was observed using an atomic force microscope. We have now achieved focusing of the He* beam into lines by the dipole force that the atoms experience while traversing a standing wave of $\lambda = 1083$ nm light tuned 500 MHz above the $2^3S_1 \longrightarrow 2^3P_2$ transition. The lines are separated by $\lambda/2$ and their length is comparable to the laser beam waist. Because bichromatic collimation makes such an intense He* beam, our exposure time can be as short as 10 minutes.

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