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Effect of wire obstructions on the formation of modulated plasma waveguides[1] ANDREW GOERS, SUNG YOON, GEORGE HINE, JEFF MAGILL, HOWARD MILCHBERG, University of Maryland - College Park — Modulated plasma waveguides have been proposed as a means of quasi-phase matching laser plasma interactions for applications including direct acceleration of electrons by a high intensity laser pulse. We have demonstrated a technique for axially modulating plasma waveguides by periodically obstructing gas flow out of a cluster jet using an array of wires. This technique is inherently simpler and more easily varied compared to demonstrated optical techniques which axially modulate laser intensity at the target. However, in the previous study [B. Layer, et. al., Opt. Exp. 17, 4263(2009)] the modulation period could not be made less than 200um due to an observed density drop in the plasma between the wires for unknown reasons. By obstructing gas flow with only two wires with variable separation, we examine the aforementioned issue. Since the gas flow out of the cluster jet is supersonic, we observe shock wave formation from the wires with transverse interferometry and shadowgraphy. We find that as we increase the mean cluster size in the gas flow the effect of the shock wave to decrease plasma density between the wires is diminished, representing a transition to a ballistic flow regime. By optimizing jet parameters (e.g. temperature and height of plasma from the wires) we have been able to achieve plasma guiding structures with modulation periods less than 200um.

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Andrew Goers
University of Maryland - College Park

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