INVESTIGATION OF BOW SHOCK FORMATION IN PULSED-POWER-DRIVEN SUPER-SONIC PLASMA FLOWS

S. C. Bott, K. Gunasekera, G. W. Collins IV, D. Mariscal, J. Kim and F. N. Beg
University of California, San Diego, 9500 Gilman Drive LA Jolla, CA 92093

D. J. Ampleford
Sandia National Laboratories, PO Box 5800 Albuquerque, NM 87185

The development of shocks in plasma flows occurs in a wide range of environments, including fusion schemes and astrophysical objects. In wire array experiments, the plasma accelerated from the wire *via* the Lorentz force rapidly exceeds both the local sound and Alfven speeds, providing an interesting source for shock studies. Recently, the plasma flow in a 1 MA wire array z-pinch demonstrated both the formation of bow shocks around an obstacle in the plasma, and the feasibility of testing the effect of magnetic fields and radiation cooling on the shock formation in these systems[1].

In this work we present examination of bow shock formation in wire array plasma flows driven by the 250 kA GenASIS Linear Transformer Driver (LTD). The plasma densities produced are lower than on the 1 MA device used in Ref 1, and this allows continuous 2-dimensional quantitative measurements of the electron density, which was not previously possible. A closer examination of the shock structure is therefore possible for comparison for both analytical theory and simulation work. Shock formation is examined as a function of obstacle geometry and size, and preliminary results from both standard and inverse wire arrays will be presented.

1. D. J. Ampleford *et al*, "Bow-shocks in ablated plasma streams for nested wire array z-pinches: a laboratory astrophysics testbed for radiatively cooled shocks", Invited Paper UI3 5, presented at the 51st Annual Meeting of the Division of Plasma Physics November 2 - 6, 2009. Atlanta, Georgia, and *submitted to Phys Plasmas.*