Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Surface current density distribution measurements of an electrically exploded foil via B-dot probe array data inversion[1] E.L. RUDEN, D.J. AMDAHL, R.H. COOKSEY, P.R. ROBINSON, Air Force Research Laboratory, Directed Energy Directorate, F.T. ANALLA, D.J. BROWN, M.R. KOSTORA, Leidos, Inc., J.F. CAMACHO, NumerEx, LLC — Measurements are presented of the current per unit length as a function of the transverse distance from the center of a water-tamped 80 μm Al foil that narrows to a central width of 15.2 cm as it explodes into warm dense matter by Ohmic heating. Current is delivered by the discharge of a 36 μF capacitor bank charged to 30 kV and discharged to a peak current of 342 kA in 2.0 μs. The distribution is calculated by the linear regularized inversion of signals from an array of B-dot probes distributed along the foil's central half-width. The probes are far enough away from the foil (1 cm) be noninvasive and mechanically undisturbed during the time of interest. These results are compared to 3-D MHD ALEGRA simulations of the geometry driven by an external coupled two-loop lumped circuit model which accurately represents the driver. The goal of the effort is to test, in conjunction with other diagnostics, ab initio models of the equation of state and electrical conductivity of matter under conditions encountered in single-shot pulsed power devices (1 - 10 eV and 0.1 - 1 $\times$ solid density).

[1]This work was supported by AFOSR LRIR 11RD02COR.

Edward Ruden
Air Force Research Laboratory, Directed Energy Directorate

Date submitted: 01 Jul 2014 Electronic form version 1.4