Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

EMHD Calculations of Plasma Jet Acceleration[1] THOMAS HUGHES, CARSTEN THOMA, Voss Scientific, JIN-SOO KIM, SERGEI GALKIN, FAR-TECH, Inc. — The acceleration of plasma jets (density $n_i \sim 10^{16} - 10^{17}$ cm^{-3}) by magnetic pressure ($B \sim 1$ Tesla) is characterized by the presence of a thin, non-equilibrium current sheath at the plasma-vacuum interface. The sheath is where the electric fields, both inductive (in the plane of the sheath) and electrostatic (normal to the sheath), that accelerate the plasma are generated. We are using a hybrid numerical model with kinetic ions and a massless electron fluid to simulate this phenomenon. A hybrid treatment is desirable because, on the one hand, it avoids the small time-steps needed by kinetic electrons, and on the other hand, the ion mean free path and ion cyclotron radius can be comparable to the sheath thickness. The latter features are important for the parameters of interest, and are outside the scope of the MHD approximation. The main numerical difficulty is in treating the motion of the thin current sheath, with its discontinuous magnetic field gradient, through the stationary mesh. In 1-D, this has been overcome by solving for the magnetic vector potential. We will present results extending the algorithm to 2- and 3-D calculations.

[1]Work Supported by DOE SBIR DE-FG02-05ER84185.

Thomas Hughes
Voss Scientific

Date submitted: 25 Jul 2007 Electronic form version 1.4