Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Magneto hydrodynamics simulations of pulsed high density plasmas in electromagnetic guns HARISWARAN SITARAMAN, LAXMINARAYAN RAJA, University of Texas, Austin — Electromagnetic guns are a class of devices which uses the Lorentz force to accelerate bulk plasma/conducting solids to velocities $\sim$ km/s. This idea has been widely used in electromagnetic rail guns and in space propulsion systems. The electrically conducting region is typically a pulsed high density thermal plasma which interacts with the bounding solid surface resulting in ablation and materials chemical degradation. We perform a numerical modeling study of the plasma in an electromagnetic gun to understand the discharge physics and in particular study the plasma-surface interactions. The resistive Magneto hydrodynamics (MHD) equations which include the mass, momentum and energy equations for a conducting fluid along with the Maxwell's equations is used for this study. These equations constitute a stiff system with strong coupling between fluid dynamics and electromagnetics. The equations are solved on an unstructured mesh using a cell-centered finite volume formulation. Details of important species in the plasma and the particle and energy flux distribution at the solid boundaries are presented and the consequent plasma-surface interactions under varying operating conditions are discussed.

Hariswaran Sitaraman
University of Texas, Austin

Date submitted: 13 Jul 2011 Electronic form version 1.4