Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Simulation of the Plasma Dynamics at the Ionization Front of High Pressure Discharges Using Monte Carlo Methods on an Adaptive Mesh[1] ANANTH N. BHOJ, University of Illinois, MARK J. KUSHNER, Iowa State University — During breakdown of high pressure discharges, such as coronas, a thin ionization front propagates across the gap. The ionization front has steep spatial gradients in the electric field and electron temperature which produce commensurate gradients in excitation rates. In spite of operating at high pressures where the electrons are highly collisional, these gradients may be severe enough that electron transport is non-local. To address these conditions, a new computational technique was developed that captures the non-local nature of the electron energy distribution (EED) at the ionization front. The basic computational platform is a 2-dimensional plasma hydrodynamics model based on unstructured meshes that addresses electrostatics and multi-fluid charged particle transport. The EED at the ionization front is captured using an electron Monte Carlo Simulation executed on an adaptive, rectilinear mesh. The location of the adaptive mesh is determined by sensors that select regions where non-local transport might occur. From the EEDs computed in the non-local regions, electron transport coefficients and sources are obtained and transferred to the fluid modules. Results will be discussed for positive and negative corona discharges in air and the non-local character of the ionization front will be described.

[1]Work was supported by the National Science Foundation.

Mark J. Kushner
Iowa State University

Date submitted: 15 Jun 2006 Electronic form version 1.4