Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Fully kinetic 3D electromagnetic particle-in-cell model of streamer formation and dynamics in high-pressure electronegative gases[1]
D.V. ROSE, D.R. WELCH, N. BRUNER, R.E. CLARK, T.C. GENONI, C. THOMA, W.R. ZIMMERMAN, Voss Scientific, P.K. RAMBO, B.W. ATHERTON, Sandia National Laboratories — Streamer and leader formation in high pressure devices is a dynamic process involving a hierarchy of physical phenomena. These include elastic and inelastic particle collisions in the gas, radiation generation, transport and absorption, and electrode interactions. We present a new 3D fully EM implicit particle-in-cell simulation model of gas breakdown leading to streamer formation in electronegative gases. The model uses a Monte Carlo treatment for all particle interactions and includes discrete photon generation, transport, and absorption for ultra-violet and soft x-ray radiation. Central to the realization of this fully kinetic particle treatment is an algorithm [D. R. Welch, et al., J. Comp. Phys. 227, 143 (2007)] that manages the total particle count by species while preserving the local momentum distribution functions and conserving charge.

[1]This work is funded by the US Department of Energy through Sandia National Laboratories.

David Rose
Voss Scientific

Date submitted: 29 Jul 2011 Electronic form version 1.4