Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

**Kinetic Particle Simulations of Dielectric Surface Breakdown** D.V. ROSE, D.R. WELCH, C. THOMA, R.E. CLARK, T.C. GENONI, W.R. ZIMMERMAN, Voss Scientific — Dielectric surface breakdown and flashover in high-voltage gas and vacuum environments are desirable for some applications (e.g., various gas discharge devices) and undesirable for others (e.g., insulator stacks). Accurate modeling of observed breakdown and flashover effects in these devices is difficult due to the complex surface and subsurface material properties of various dielectrics, stochastic processes, charging history, etc. Here, we explore the use of 3D kinetic particle simulations to model dielectric surface breakdown and streamer formation that in turn can lead to surface flashover in high pressure ($\sim$ 1 atm) gas environments. Relatively simple models for secondary charged particle emission from dielectric surfaces are used in conjunction with detailed gas breakdown models. From single initiation points, test simulations yield tree-like surface breakdown patterns, qualitatively consistent with numerous discharge experiments. The development of more advanced surface interaction models is discussed along with applications to specific dielectric breakdown experiments.

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Date submitted: 11 Jul 2013 Electronic form version 1.4