Abstract Submitted
for the GEC08 Meeting of
The American Physical Society

Applicability of Generalized Peek's Law to Scaling of Corona Onset Voltages in Electropositive Gases YAN-MING LI, Osram Sylvania — We have developed the steady state positive corona model with the ionization zone physics in the point-plane configuration. The geometry is axisymmetric, consisting of a pointed anode of small tip radius and a planar cathode. The model solves the Poisson equation, drift dominated electron and the positive ion transport equations with the nonlinear Townsend ionization source terms, to give the complete electric field, electron and positive ion density distributions. The corona plasma properties can be determined as function of discharge current, ranging from the pico-ampere up to a milli-ampere. The calculated voltage-current characteristics obeyed the Townsend equation, agreeing with the general experimental observations. The model is applied to different electropositive gases, argon, xenon, nitrogen and mercury. Corona onset potentials are determined based on the discharge voltages at very low currents. Extensive parametric study for argon positive corona with varying anode tip radius, gap distance and gas pressure has been completed. All the simulated corona onset voltages are very well described by the generalized Peek's Law [1]. At sufficiently high current in the range of 0.1 mA, discharge filament is formed near the anode tip. [1] Peek F. W., Dielectric Phenomena in High Voltage Engineering, McGraw Hill, New York (1929).

Yan-Ming Li
Osram Sylvania

Date submitted: 05 Jun 2008 Electronic form version 1.4