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Fully-kinetic Particle-in-Cell Simulations of Gas Switches CARSTEN THOMA, DALE WELCH, DAVID ROSE, WILLIAM ZIMMERMAN, CRAIG MILLER, ROBERT CLARK, Voss Scientific, LLC — We describe a fully-kinetic electromagnetic particle-in-cell Monte Carlo (PICMC) computational model for the modeling of breakdown phenomena in electrophilic gases such as SF_6 and air which has been implemented into the hybrid-PIC code LSP. We present the results of 2D and 3D gas closing switch simulations in which all species are treated kinetically. We demonstrate that this PICMC approach can be used to follow the entire evolution of the switch, from the initial avalanche and streamer formation up to the fully conducting phase. We utilize an 18-species chemistry model for air which is shown to agree with swarm parameters (breakdown threshold, drift velocity) obtained by experiment. Photon transport and photo-ionization are also included to permit the modeling of phenomena such as cathode-directed streamers. This computational model will be used to help design closing switches for pulsed-power systems.

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