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Numerical Modeling of Discrete Space Charge Affected Field Emission in Planar Emitters[1] I.M. RITTERSDORF[2], K.L. JENSEN, Naval Research Laboratory, D.A. SHIFFLER, Air Force Research Laboratory, A.S. RICHARDSON, R.J. ALLEN, Naval Research Laboratory, J.L. LEBOWITZ, Rutgers University, Y.Y. LAU, University of Michigan, J.W. SCHUMER, Naval Research Laboratory, J.W. LUGINSLAND, Air Force Office of Scientific Research — Field emission sources generate high brightness electron beams that may meet the needs of particle accelerators, high power microwave and x-ray sources, and vacuum electronic devices. Such sources are profoundly affected by space charge near emission sites, such as surface roughness protrusions. It is often impractical to resolve the spatial scale of such emission sites in a particle-in-cell code, and it is therefore desirable to treat such emission sites within a separate model (i.e., a Unit Cell model). This paper will focus on a Monte Carlo model that investigates discrete sheets of electrons emitted from a planar surface as a first step towards the goal of modeling geometrical surfaces. Planar model results showing oscillations in the current density that arise once the first sheet of charge transits across the diode gap and its convergence to analytical results will be presented.

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