Classical two-dimensional numerical algorithm for ?-Induced charge carrier advection-diffusion in Medipix-3 silicon pixel detectors
MASON BIAMONTE[1], University of Houston, JOHN IDARRAGA[2], University of Houston, CERN, MEDIPIX3 COLLABORATION — A classical hybrid alternating-direction implicit difference scheme is used to simulate two-dimensional charge carrier advection-diffusion induced by alpha particles incident upon silicon pixel detectors at room temperature in vacuum. A mapping between the results of the simulation and a projection of the cluster size for each incident alpha is constructed. The error between the simulation and the experimental data diminishes with the increase in the applied voltage for the pixels in the central region of the cluster. Simulated peripheral pixel TOT values do not match the data for any value of applied voltage, suggesting possible modifications to the current algorithm from first principles. Coulomb repulsion between charge carriers is built into the algorithm using the Barnes-Hut tree algorithm. The plasma effect arising from the initial presence of holes in the silicon is incorporated into the simulation. The error between the simulation and the data helps identify physics not accounted for in standard literature simulation techniques.

[1]Department of Physics, Mathematics
[2]Department of Physics

Mason Biamonte
University of Houston

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