

Abstract Submitted
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Simulating Real-Time Ion Production using a General Particle Tracer (GPT) Custom Element¹ JOSHUA YOSKOWITZ, Old Dominion University, SEBASTIAAN VAN DER GEER, Pulsar Physics, JOSEPH GRAMES, GEOFFREY KRAFFT, Jefferson Lab — A new custom element has been developed with the framework of General Particle Tracer (GPT) to simulate ion production and tracking in real time. This C++ custom element was developed to simulate electron impact ionization of residual gas molecules in a particle accelerator; however, it is readily extensible to other applications. The custom element uses Monte-Carlo routines to determine both the ion production rate and the secondary electron kinetic energy based on user-defined gas densities and theoretical values for the ionization cross section and the secondary electron differential cross section. It then uses relativistic kinematics to track the secondary electron, the scattered electron, and the newly formed ion after ionization. The ion production rate and the secondary electron energy distribution determined by the custom element have been benchmarked against theoretical calculations. The ionization custom element will be described in detail and its application in GPT simulations to determine the effects of ion production and ion trapping in dc high voltage photo-guns and beam lines at the Thomas Jefferson National Accelerator Facility will be presented.

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