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Particle simulation of a virtual cathode in bipolar flow

Authors
Verboncoeur, John
Vay, Jean-Luc
Stoltz, Peter

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Particle simulation of a virtual cathode in bipolar flow[1]
JOHN VERBONCOEUR, University of California-Berkeley, JEAN-LUC VAY, Lawrence Livermore National Laboratory, PETER STOLTZ, TechX Corp. — Virtual cathode formation is studied in a bipolar flow relevant to the High Current Experiment parameter regime. A 174 mA potassium ion beam with beam energy of 972 keV, confined in a conducting drift tube, is incident on a stainless steel plate. The ion impacts generate secondary electrons with an energy and angular dependent yield large compared to 1, resulting in a current sufficient for formation of a virtual cathode. Using enhanced ion-induced secondary models in the PIC codes XOOPIC and WARP, the formation of the virtual cathode and its effect on the bipolar flow is investigated, including time-dependent effects. Numerical issues including resolution of the virtual cathode scale length l_{vc} ?$_{De}$ and time scale ? 1/?$_{pe}$ are characterized. Results indicate an improvement in temporal and spatial fidelity leads to a lower and more stable virtual cathode potential as well as significant impact on neutrality in the bipolar flow.

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John Verboncoeur
johnv@nuc.berkeley.edu
University of California-Berkeley

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