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Employing Reduced Chemistry Models on E-Beam/Gas Systems¹ MATTHEW HOPKINS, CHRISTOPHER MOORE, BENJAMIN YEE, KATE BELL, Sandia National Laboratories, ANDREW FIERRO, University of New Mexico — In this work we examine the impact of using reduced and/or modified sets of cross sections on the interaction of an electron beam and a low-pressure background gas. Because most collisional plasma systems lack extensive sets of cross sections to model electron-neutral and other particle interactions, one often cannot provide good estimates of errors or uncertainties in complex non-equilibrium plasma systems (e.g., electrons impacting molecular species in air). To begin to understand the impact of using necessarily reduced chemistry models in a complex system in the future, we analyze the effect of using reduced chemistry models in a simpler system where more extensive cross section data exists. To do this, we simulate the interaction of a 3-6 keV electron beam with a 100 mTorr background of neutral ground state argon in a 1 cm 1D gap. The Aleph simulation code is used, which combines PIC and DSMC methodologies. An RLC-type boundary condition is used to capture some of the coupled circuit behavior and inductive effects (full consistency requires an electromagnetic treatment).

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> Matthew Hopkins Sandia National Laboratories

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