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4P27 - EMPIRE simulation of the RKA diode into the gas cell

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As part of a continued validation effort for Sandia's new plasma code, EMPIRE, we have modeled and are simulating the RKA beam experiment. Specifically, we have improved previous simulations of the RKA diode by using input parameters that more closely match the experiment and implementing Space Charge Limited (SCL) emission from the cathode velvet into EMPIRE. Moreover, we have begun simulations of the diode into the gas cell. The current EMPIRE (informal) validation effort is ultimately concerned with the electron-beam transport (e.g. electron-neutral chemistry) through an Ar-filled gas cell at various pressures from vacuum to ~ 1 Torr. Two collisional models are investigated in the present work: Monte Carlo Collisions (MCC) that assume a uniform, unperturbed background gas and the Direct Simulation Monte Carlo Method (DSMC) that models the background gas evolution self-consistently. In the current work, we will compare to CEA results and investigate the performance and accuracy of the two collision schemes across a range of pressures.

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