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Global Model of a Fast Ionization Wave in Helium[1] BENJAMIN YEE, EDWARD BARNAT, Sandia National Laboratories, JOHN FOSTER, University of Michigan — Technical challenges inhibit a complete examination of fast ionization waves via empirical means. The high-voltage pulses used to excite these waves can be on the order of nanoseconds or less. Such short timescales require instruments with exceptional sensitivity and bandwidth, but these may not be available or may not exist. In order to more completely understand the energetics of the fast ionization wave, a global model of a helium discharge was developed. We present the results of the model predictions and a comparison to experimental measurements when possible. The model follows 19 neutral helium states, helium ions, and electrons. Among the reactions included in the model are: electron impact ionization, electron (de)excitation, atomic excitation transfer, radiative decay, and radiation trapping. Comparisons demonstrate that the model can accurately predict 2^3S metastable densities, but discrepancies in the measured and predicted emissions indicate a greater than expected number of higher excited states. This suggests the presence of a persistent source of excitation which is believed to be the result of space charge buildup within the system.

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Benjamin Yee
Sandia National Laboratories

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