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Space-Charge Limitations in Photon-Enhanced Thermionic Emission and Possible Solutions TSUYOHITO ITO, Osaka University, MARK CAPPELLI, Stanford University — Traditionally, thermionic energy conversion is most efficient at high temperatures ($>$ 1500 K). In a recent study [J.W. Schwede et al., Nature Materials 9, 762 (2010)], photon-enhanced thermionic emission (PETE) from semiconducting cathodes was shown to be a promising means of increasing the thermionically-driven cathode current density at relatively low cathode temperatures (500-1100K). However, at the high emitted current densities described in Ref. 1 (3 - 30 A/cm^2), one might expect that the electron transport will be space-charge limited. In this presentation, using a particle-in-cell (PIC) method, we simulate the PETE energy converter to clarify these space charge effects, and also to provide a possible solution to overcoming the limitation using an optically-produced non-equilibrium Cs plasma.

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