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Influence of a biased electrode on the electron energy distribution function[1] S.D. BAALRUD, Univ of Iowa, B. YEE, E.V. BARNAT, M.M. HOPKINS, Sandia National Laboratory — Positively biased electrodes can influence the electron energy distribution function (EEDF) by providing a sink for low energy electrons that would otherwise be trapped. In hot filament generated discharges, the EEDF typically consists of a cool trapped population at energies below the energy associated with ions sheaths at the chamber wall and a comparatively warm tail population associated with the filament primaries. Inserting a positively biased electrode has little influence if it is sufficiently small. However, as the electrode area approaches $\sqrt{2.3m_e/m_i}A_w$, where A_w is the chamber wall area, it collects most of the total electron current exiting the plasma. This can dramatically reduce the density of the otherwise trapped population, and cause the electron temperature to increase as the distribution approaches a temperature associated with the energetic filament primaries. A global model is developed, which shows the interconnected nature of the electron temperature, density and the plasma potential. The model is compared with Langmuir probe measurements in a dc filament generated plasma [1], and with new 2D PIC simulations. [1] Barnat, Laity and Baalrud, Phys. Plasmas 21, 103512 (2014).

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Scott Baalrud
Univ of Iowa

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