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Nonlocal Control of Electron Energy Distribution Functions in Plasmas with Active Boundaries V.I. DEMIDOV, WVU, I.D. KAGANOVICH, PPPL, A.S. MUSTAFAEV, SPbMTU, M.E. KOEPKE, WVU, Y. RAITSES, PPPL, S.F. ADAMS, AFRL, I. SCHWEIGERT, ITAM SB RAS — Nonlocal effects, associated with the presence of energetic electrons arising in volumetric processes and/or ejected into the plasma from the plasma boundaries have been studied. Presence of energetic electrons can significantly influence charged particle transport and plasma structure and, thereby, can serve to control plasma properties for plasma processing, plasma medicine, and other applications. Methods of controlling the electron energy distribution functions (EEDFs) are reviewed. These methods include designing the device geometry in such a way to separate the thermal electrons from the energetic electrons. This approach can be applied over a wide range of gas pressures. Another method involves applying additional voltage to conducting active boundaries. Both methods have been developed and tested for practical use in dc discharges, making use of both heated or cold cathodes. Nonlocal effects work best in short discharges without a positive column. Such discharges with a cold cathode can be especially advantageous for the practical development of micro-discharges at atmospheric pressure. This work was supported by the DOE (DE-SC0001939), NSF CBET-0903635, and AFOSR.

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