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Simulation of Self-Induced Mode Transitions of a Spatially-Localized Langmuir Eigenmode in a Cathode Sheath M.I. ZIMMERMAN, Department of Physics, West Virginia University, Morgantown, WV 26506, S.M. FINNEGAN, H. GUNELL, M.E. KOEPKE, N. BRENNING, EE Dept., KTH, Stockholm, Sweden — Laboratory experiments and computer simulations have previously been carried out to study situations in which an electron beam was accelerated from low electric potential, low density, and high magnetic field to high potential, high density, and low magnetic field in the sheath of a hot cathode discharge. Beam-driven Langmuir waves at the top of the density 'ramp' form an eigenmode in a cylinder bounded by the cathode and aligned with the axial magnetic field. The E-field envelope develops a localized shape at its maximum, referred to as a spike, where the eigenmode frequency matches the local plasma frequency. We perform computer simulations on the sensitivity of the location and frequency of the spike to the density gradient. The previously-used 1D PIC code is employed to investigate the relaxation of the eigenmode's spike. The hypotheses are that (a) the initially-excited eigenmode is determined by the slope of the density ramp and (b) the spike jumps discontinuously among different eigenmodes as it evolves in time. The spike envelope exhibits a bursty time-dependence which may explain the spectrum of whistler-mode waves observed in recent laboratory experiments.

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