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Electrostatic solitary waves in ion beam neutralization. CHAOHUI LAN, Institute of Fluid Physics, China Academy of Engineering Physics, China, IGOR KAGANOVICH, Princeton Plasma Physics Laboratory, USA — The excitation and propagation of electrostatic solitary waves (ESWs) are observed in two-dimensional particle-in-cell simulations of ion beam neutralization by electron injection by a filament. Electrons from the filament are attracted by positive ions and bounce inside the ion beam pulse. Bouncing back and forth electron streams start to mix, creating two-stream instability. The instability saturates with the formation of ESWs. These ESWs reach several centimeters in longitudinal size and are stable for a long time ($\gg \tau_b$, the duration of the ion beam pulse). The excitation of large-amplitude ESWs reduces the degree of neutralization of the ion beam pulse. In addition, the dissipation of ESWs causes heating of neutralizing electrons and their escape from the ion beam, leading to a further reduction of neutralization degree. The appearance of these waves can explain the results of previous experimental studies, which showed poor ion beam neutralization by electro-emitting filaments.

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