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Influence of emitter temperature on the energy deposition in a low-pressure plasma. DMITRY LEVKO, LAXMINARAYAN RAJA, The University of Texas at Austin — The influence of emitter temperature on the energy deposition into low-pressure plasma is studied by the self-consistent one-dimensional Particle-in-Cell Monte Carlo Collisions model. Depending on the emitter temperature, different modes of discharge operation are obtained. The mode type depends on the plasma frequency and does not depend on the ratio between the densities of beam and plasma electrons. Namely, plasma is stable when the plasma frequency is small. For this plasma, the energy transfer from emitted electrons to plasma electrons is inefficient. The increase in the plasma frequency results first in the excitation of two-stream electron instability. However, since the thermal velocity of plasma electrons is smaller than the electrostatic wave velocity the resonant wave-particle interaction is inefficient for the energy deposition into the plasma. Further increase in the plasma frequency leads to the distortion of beam of emitted electrons. Then, the electrostatic wave generated due to two-stream instability decays into multiple slower waves. Phase velocities of these waves are comparable with the thermal velocity of plasma electrons which makes possible the resonant wave-particle interaction. This results in the efficient energy deposition from emitted electrons into the plasma.

Dmitry Levko
The University of Texas at Austin

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