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Ion instability in Tonks-Langmuir model with collisions T.E. SHERIDAN, Ohio Northern University — The Tonks-Langmuir (TL) model describes a discharge with collisionless, kinetic ions and Boltzmann electrons. In the TL model, ions "born" throughout some volume are accelerated to the discharge walls by the self-consistent electric field in both the presheath and the sheath. That is, the TL model solves the Vlasov equation in a bounded geometry, and hence gives the full ion velocity distribution function. In this presentation, we consider the TL model in a one-dimensional planar geometry with a spatially-uniform source of warm ions. Ions are assumed to undergo "charge exchange" collisions with a constant collision frequency. We solve this model using a particle-in-cell (PIC) simulation. Preliminary investigations show that when the ion birth temperature is sufficiently low, and for collision frequencies which are a few percent of the ion plasma frequency, there is an ion instability in the presheath. At the same locations, the time-averaged ion distribution function displays three peaks, one of which may be associated with ions that inverse Landau damp on the waves.

Terrence Sheridan
Ohio Northern University

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