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Plasma Ion Stratification by Weak Planar Shocks¹ A. N. SIMAKOV, B. D. KEENAN, W. T. TAITANO, L. CHACÓN, Los Alamos National Laboratory — We derive fluid equations for describing steady-state planar shocks of a moderate strength ($0 < M-1 < 1$ with M the shock Mach number) propagating through an unmagnetized quasineutral collisional plasma comprising two separate ion species. In addition to the standard fluid quantities, such as the total mass density, mass-flow velocity, and electron and average ion temperatures, the equations describe shock stratification in terms of variations in the relative concentrations and temperatures of the two ion species along the shock propagation direction. We have solved these equations analytically for weak shocks ($0 < M-1 < 1$), with the results depending on M , ratios of the ion masses and charges, and the upstream mass fraction of one of the ion species. These analytical results are instrumental for gaining understanding in the behavior of weak shocks, and they have been used to verify kinetic simulations of shocks in multi-ion plasmas.

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Andrei Simakov
Los Alamos National Laboratory

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