

Abstract Submitted
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Waves and Instabilities in Multispecies Nonneutral Plasmas¹

D.H.E. DUBIN, UCSD — This poster describes how several plasma waves and instabilities that have previously been studied only in neutral plasmas can also occur in multi-species nonneutral plasmas. Among these are ion sound waves, drift waves and ion temperature gradient (ITG) waves. The occurrence of these waves does not rely on the neutrality of the plasma, but rather on the coexistence of at least two species, at least one of which responds to the waves in a nearly adiabatic fashion; the others well-approximated by fluid theory. This typically (but not necessarily) requires a large mass ratio between species, but has nothing to do with the sign of the charge. The dispersion relations for these waves are similar to those in neutral plasmas, but there are some important differences. For example, weakly damped ion sound waves may propagate in a nonneutral plasma even when $T_e = T_i$, provided $n_i/n_e \geq 15$. Furthermore, drift and ITG waves are not necessarily unstable, the instabilities do not necessarily cause plasma loss, and they can be controlled (turned on and off) by manipulation of the density and temperature profiles using standard experimental techniques such as centrifugal separation and laser cooling/heating.

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