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Division of Plasma Physics
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Category Number and Subject 1.3 Nonneutral Plasmas

☐ Theory ☒ Experiment

Saturation and Decay of an Asymmetry-Driven Induced Scattering Instability in a Pure Electron Plasma.*

D.L. EGGLESTON+ and J.H. MALMBERG, Univ. of Calif., San Diego -- Experimental data on the saturation and decay of a previously described[1] induced scattering instability will be presented. This instability is of particular interest because it is associated with an enhanced level of radial transport. The instability is driven by field asymmetries and initially produces a single growing mode (ω_1, k_1). As the instability develops, several harmonically related ($\omega_n = n\omega_1$, $k_n = nk_1$) eigenmodes of the plasma column grow up, resulting in a spatially localized moving potential perturbation with $\delta\phi/T \simeq 20\%$. After a period of rapid growth, the mode amplitudes saturate and vary slowly for roughly $10^5\ \omega_1^{-1}$. This quasi-equilibrium ends with an unusual change in the eigenmode phases wherein $\delta\phi$ changes from positive to negative. Plasma heating during this period increases the damping of all modes and rapidly quenches the instability.

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[1]D.L. Eggleston et al, Bull.Am.Phys.Soc. 31, 1493 (1986).

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