Abstract Submitted
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Parametric Decay Instability of Near-Acoustic Waves in Fluid and Kinetic Regimes[1] M. AFFOLTER, F. ANDEREGG, C.F. DRISCOLL, University of California San Diego, F. VALENTINI, University of Calabria (Italy) — We present quantitative measurements of parametric wave-wave coupling rates and decay instabilities in the range 10 meV $<$T $<$1 eV. These experiments are conducted on a laser cooled pure ion plasmas confined in a cylindrical Penning-Malmberg trap. The axisymmetric, standing plasma waves have near-acoustic dispersion $\omega(\mathrm{k_z}) \propto \mathrm{k_z} - \alpha \mathrm{k_z^3}$, discretized by the axial wave number $\mathrm{k_z} = \mathrm{m_z}(\pi/\mathrm{L_p})$. The parametric coupling rates are measured between $\mathrm{m_z} = 2$ waves with large amplitude $\delta \mathrm{n_2}/\mathrm{n_0}$, and small amplitude $\mathrm{m_z} = 1$ waves, which have a small frequency detuning $\Delta\omega = 2\omega_1 - \omega_2$. On cold plasmas, the parametric coupling rates $\Gamma \propto (\delta \mathrm{n_2}/\mathrm{n_0})$ are consistent with cold fluid, 3-wave instability theory, and the decay instability occurs when $\Gamma > \Delta\omega/2$. In contrast, at higher temperatures, the $\mathrm{m_z} = 2$ wave is more unstable. The instability threshold is reduced from the cold fluid prediction as the plasma temperature is increased, which is in qualitative agreement with Vlasov simulations, but is not yet understood theoretically.

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