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Non-Linear Plasma Wave Decay to Longer Wavelengths[1]
AKANKSHA SAHA, JACOB SARET, FRANCOIS ANDEREGG, University of California, San Diego — We measure the decay of plasma waves to longer wavelengths for low phase velocity Electron Acoustic Waves (EAWs). These EAWs are kinetic waves which exist in the low frequency branch of electrostatic plasma waves in neutralized, pure electron and pure ion plasmas. At small amplitudes, EAWs have a phase velocity $v_{ph} \simeq 1.4\bar{v}$ and are strongly Landau damped. At larger amplitudes, EAWs nonlinearly trap particles near v_{ph}, hence flattening the distribution function, turning off the effects of Landau damping. We conduct experiments with pure electron plasmas in a Penning-Malmberg trap. To excite EAWs we use a long burst ($\sim$100 cycles) that gently modifies the velocity distribution function of the particles until the desired flat spot is achieved. We measure the decay of the standing plasma wave with $k_z = m_z\pi/L_p$, where L_p is the length of the plasma, for $m_z = 2 \rightarrow m_z = 1$. There exists an amplitude threshold for the $m_z = 2$ wave above which we observe phase locked exponential growth of the $m_z = 1$ wave at frequency $f_1 = f_2/2$.

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