

Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Excitation and control of autoresonant ion acoustic waves¹ LAZAR FRIEDLAND, Hebrew University of Jerusalem — Controlled excitation of nonlinear waves is one of the important goals of both basic and applied research. We study the excitation of large amplitude ion acoustic waves in plasmas from a trivial equilibrium by the adiabatic nonlinear phase-locking (autoresonance) with a chirped frequency drive. In this case, under certain conditions, the nonlinearity and variation of parameters work in tandem to preserve the phase-locking in the system via excursion of the ion acoustic wave in its parameter space, yielding controlled growth of the wave amplitude. We analyze formation of autoresonant ion acoustic waves via both the fluid and kinetic Vlasov-Poisson models. A weakly nonlinear, long wavelength limit of the fluid approximation for the ion acoustic waves is frequently associated with the KdV equation. We go beyond the driven KdV problem and study the formation of driven, strongly nonlinear, fluid-type ion acoustic waves. The Whitham's averaged variational principle is applied in analyzing these autoresonant excitations. At larger ion temperatures, our simulations show the possibility of formation of a phase-locked void (hole) in the ion distribution, yielding a particular type of autoresonant ion Bernstein, Green, and Kruskal (BGK) mode.

¹Supported by Israel Science Foundation

Lazar Friedland
Hebrew University of Jerusalem

Date submitted: 01 Jul 2014

Electronic form version 1.4