Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Effect of Non-Adiabatic Electron Dynamics on the Non-Linear Evolution of Ion Acoustic Waves STEPHAN BRUNNER, CRPP - EPFL, RICHARD BERGER, LLNL, ERNEST VALEO, PPPL, LAURENT DIVOL, BERT STILL, LLNL — The effect of non-adiabatic electrons on the non-linear evolution of Ion Acoustic Waves (IAWs) is studied using a spatially one-dimensional Vlasov code. In a first stage, simulations were carried out to analyze the contribution of resonant particles from both electrons and ions to the non-linear frequency shift of IAWs. For electrons (resp. ions) these resonant particles are located in the bulk (resp. tail) of the distribution and contribute with a positive (resp. negative) shift to the frequency. Besides their dependence on the wave amplitude as well as on the essential plasma parameters, these shifts also vary according to the conditions under which the wave was generated (adiabatic/sudden). At sufficiently low temperature ratios $Z\,T_e/T_i \lesssim 10$ the ion and electron contributions can be competitive and thus cancel each other, while for higher ratios of $Z\,T_e/T_i$ the positive electron contribution dominates. Simulation results agree well with theoretical predictions [Morales and O'Neil, PRL **28**, 417 (1972); Dewar, Phys. Fluids **15**, 712 (1972)]. The positive frequency shift from non-adiabatic electrons may possibly enable matching conditions for a decay instability of the IAW to be verified. This mechanism is investigated in a second stage.

Stephan Brunner
CRPP

Date submitted: 14 Jul 2006 Electronic form version 1.4