Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

When are driven Langmuir waves resonant?[1] HARVEY ROSE, New Mexico Consortium — We are taught that small amplitude plasma waves are associated with zeroes of the linear dielectric function, $\varepsilon_0(k,\omega)$, in the complex ω plane and that, for Langmuir waves (LW) in particular, Landau damping diminishes their response to an external potential as $k\lambda_D$ increases. But finite amplitude LWs trap electrons, thus reducing Landau damping (O'Neil, Phys. Fluids **8** (1965)). Do trapping effects strengthen the response indefinitely with increase of LW amplitude or is there a $k\lambda_D$ dependent limit? One-dimensional (1D), small amplitude theory (Holloway and Dorning, Phys. Rev. **A44** (1991)) showed that thermal plasma supports traveling LWs if $k\lambda_D \lesssim 0.53$, consistent with LW resonance, $Re\left[\varepsilon_0(k,\omega)\right] = 0$ for real ω. Resonance is not possible for larger $k\lambda_D$. A model of 1D finite amplitude traveling LWs (Rose and Russell, Phys. Plasmas **8** (2001)) showed that increase of wave amplitude leads to a decrease of the resonant $k\lambda_D$ range, and diminished SRS gain rate (Rose and Yin, Phys Plasmas **15** (2008)). Results of 2D Vlasov simulations will be presented that manifest similar behavior: there is an amplitude limit to driven LWs, beyond which the LW response to an external potential is nonresonant. This limit decreases as $k\lambda_D$ approaches ≈ 0.5.

[1]Supported by NSF award ID 1004110 and the New Mexico Consortium.

Harvey Rose
New Mexico Consortium

Date submitted: 22 Jul 2011 Electronic form version 1.4