Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

A numerical investigation of Landau damping by bounce-resonant particles GRANT W. HART, BRYAN G. PETERSON, Brigham Young University — There is very little damping by particles which are velocity-resonant with an electrostatic wave in a non-neutral plasma because they remain in resonance only until they bounce off the end. The time spent in turning around dephases the particle from the wave. Particles which have a higher midplane velocity which compensates for the turn-around time remain coherent with the wave in an average sense and cause damping of the wave[1]. Previous attempts to measure Landau damping in non-neutral plasma Particle-in-Cell (PIC) codes have been unsuccessful because the mode amplitudes had to be too large for the damping to be linear. This was because of the density fluctuations caused by the limited number of particles. With increases in processing speed and memory available, we have been able to simulate modes small enough that the damping is linear for a substantial period of time. Velocity space diagnostics clearly show the damping is due to the bounce-resonant particles. Cutting off the distribution function in velocity space shows the expected effect of first increasing the damping, followed by a decrease. The mode frequency also shifts by more than expected as the cutoff passes through the bounce-resonant velocity.
[1]M. E. Koepke, Bull. Am. Phys. Soc., **49**, 40 (2004).

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Date submitted: 21 Jul 2006 Electronic form version 1.4