Abstract Submitted
for the TSF14 Meeting of
The American Physical Society

Dynamics of a Piecewise Linear Bouncer CAMERON LANGER, BRUCE MILLER, Texas Christian University — The dynamical properties of a particle in a gravitational field colliding with a rigid wall moving with piecewise constant velocity are studied. We consider three distinct approaches to modeling the collision; elastic, inelastic with constant restitution coefficient and inelastic with a velocity-dependent restitution function. We confirm the existence of Fermi acceleration in the elastic model, and find periodic, quasi-periodic, and chaotic behavior in both inelastic models. We also examine the phenomenon of inelastic collapse. We address the related "sticking solutions" and their connection to both the overall dynamics and the phenomenon of self-reanimating chaos. Additionally we investigate the long-term behavior of the system as a function of both initial conditions and parameter values. The analytical and numerical investigations reveal that our model captures the essential features of the well-studied sinusoidally driven version and also exhibits behavior unique to the discontinuous dynamics.

Bruce Miller
Texas Christian University

Date submitted: 26 Sep 2014 Electronic form version 1.4