Abstract Submitted
for the TSF16 Meeting of
The American Physical Society

**Thermodynamics of a Gravitational Gas with Periodic Boundary Conditions** BRUCE MILLER, PANKAJ KUMAR, Texas Christian University, DAN PIRJOL, National Institute of Physics and Nuclear Technology, Bucharest, Romania — We study the thermodynamic properties of a one-dimensional gas with one-dimensional gravitational interactions. Periodic boundary conditions are implemented as a modification of the potential consisting of a sum over mirror images (Ewald sum), regularized with an exponential cut-off. As a consequence, each particle carries with it its own background density. Using mean field theory, we show that the system has a phase transition at a critical temperature. Above the critical temperature the gas density is uniform, while below the critical point the system becomes inhomogeneous. Precise, event driven, numerical simulations of the model, which include the caloric curve, equation of state, radial distribution function and largest Lyapunov exponent, confirm the existence of the phase transition, and are in good agreement with the theoretical predictions.

Bruce Miller
Texas Christian University

Date submitted: 23 Sep 2016 Electronic form version 1.4