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Phonon spectrum measured in a 1D Yukawa chain J. GOREE, B. LIU, Dept. of Physics and Astronomy, Univ. of Iowa — An experiment is reported for a 1D chain of charged microspheres with a Yukawa pair potential. This work is motivated by chains of colloids confined in laser beams and Xe atoms confined in carbon nanotubes. Polymer microspheres are dispersed in a weakly- ionized rarefied gas. The resulting suspension, termed a dusty plasma, is a colloidal crystal. Depending on the confinement geometry, these suspensions can be 1D, 2D, or 3D. Dusty plasma suspensions resemble charge-stabilized colloidal suspensions: they both allow precise tracking of particles with digital video microscopy and manipulation of particles with lasers. The suspension in a dusty plasma is distinguished, however, by its extreme parameters: it is vastly softer, more weakly damped, and more dilute than colloids in water. In this talk, we describe oscillations of a non-bifurcated 1D chain. Using particle tracking to compute velocities of individual microspheres, we find the phonon spectrum. This is done both with and without time-modulated laser manipulation to excite phonons at a specific frequency. The measured spectrum is compared to a theoretical dispersion relation. Work supported by NASA and DOE.

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