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Shock-like pulse experiment in a strongly coupled dusty plasma[1]
ANTON KANANOVICH, J. GOREE, Department of Physics and Astronomy, The University of Iowa, Iowa City, IA 52242 — Compressional pulses are excited in a dusty plasma using a wire moved at a supersonic speed. The dusty plasma consists of a 2D monolayer of polymer microspheres electrically levitated in a low-temperature argon RF plasma. The microspheres gained a large negative charge so that they interacted with each other as a strongly coupled component, partly shielded by the electrons and ions. The wire, which had a negative potential that repelled microspheres, was moved at a constant speed, causing a compressional pulse to propagate. This pulse had shock-like properties because the wire was moved faster than the longitudinal sound speed in the microspheres. The experiment was repeated for the dusty plasma both in liquid and solid states, all of the controlled parameters except for the dust kinetic temperature being equal. The laser rastering method was used to change the kinetic temperature. Several experimental runs were done with different wire speeds for the both cases. An increase in the wire propagation speed increased the propagation speed of the compressional pulse. High pulse propagation speeds were obtained with Mach numbers up to 5. For high pulse propagation speeds crystal buckling was observed. Video microscopy was the main diagnostic.

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Anton Kananovich
The University of Iowa

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