Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Dislocation nucleation and motion observed in a 2D Yukawa triangular lattice V. NOSENKO, S. ZHDANOV, G. MORFILL, Max-Planck-Institute for extraterrestrial Physics — Dislocation nucleation and motion were studied experimentally in a 2D Yukawa triangular lattice. Edge dislocations were created in pairs in lattice locations where the internal shear stress exceeded a threshold and then moved apart in the glide plane at a speed higher than the sound speed of shear waves. The early stage of this process is identified as a stacking fault. At a later stage, supersonically moving dislocations generated shear-wave Mach cones. The experimental system, a plasma crystal, allowed observation of this process at an atomistic (kinetic) level. We used a monolayer suspension of microspheres in a plasma, i.e., a complex plasma, which is like a colloidal suspension, but with an extremely low volume fraction and a partially-ionized rarefied gas instead of solvent. At our experimental conditions, the suspension forms a highly ordered 2D triangular lattice. Dislocations were generated in this lattice due to the shear introduced by its differential rotation, with two "rigid" domain walls imbedded in it. We used digital video microscopy for direct imaging and particle tracking.

Volodymyr Nosenko
Max-Planck-Institute for extraterrestrial Physics

Date submitted: 27 Nov 2007 Electronic form version 1.4