Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Tiling analysis of melting in strongly-coupled dusty plasma* W.D. SURANGA RUHUNUSIRI, YAN FENG, BIN LIU, JOHN GOREE, The University of Iowa — A dusty plasma is an ionized gas containing micron-size particles of solid matter, which collect electrons and ions and become negatively charged. Due to large Coulomb interparticle potential energies, the microparticles represent a strongly-coupled plasma. In the absence of an external disturbance, the microparticles self-organize, arranging themselves in a crystalline lattice, due to their Coulomb interaction. If kinetic energy is added, the arrangement of microparticles becomes disordered, like atoms in a liquid. This melting process can be characterized by a proliferation of defects, which previous experimenters measured using Voronoi analysis. Here we use another method, tiling [1] to quantify defects. We demonstrate this method, which until now has been used only in simulations, in a dusty plasma experiment. A single layer of 4.83 μm polymer microparticles was electrically levitated in a glow discharge argon plasma. The lattice was melted by applying random kicks to the micoparticles from rastered laser beams. We imaged the particle positions and computed the corresponding tiling for both the crystalline lattice and liquid states. [1] Matthew A. Glaser, Phys. Rev A 41, 4585 (1990) *Work supported by NSF and NASA.

W.D. Suranga Ruhunusiri
The University of Iowa

Date submitted: 14 Jul 2010 Electronic form version 1.4