Abstract Submitted
for the OSS07 Meeting of
The American Physical Society

Experiments on melting in two dimensions: Desperately seeking the hexatic phase T.E. SHERIDAN, Physics and Astronomy, Ohio Northern University — The melting transition in a two-dimensional complex plasma is studied in the DONUT experiment (Dusty Ohio Northern University experimenT). An initially strongly-coupled crystal made of $n \approx 3900$ monodisperse microspheres is "heated" by amplitude modulating the rf discharge power with a square wave at the vertical resonance frequency. The vertical motion is found to excite "random" acoustic waves in the plane of the crystal (i.e., the horizontal direction), effectively heating the crystal. As the "temperature" of the complex plasma increases, we observe a melting transition in qualitative agreement with the Kosterlitz, Thouless, Halperin, Nelson and Young (KTHNY) scenario. Translational order is initially lost as the dislocation density grows, and a hexatic phase is observed with short-range translational order and long-range orientational order. Further heating destroys the orientational order, resulting in a liquid.

Terrence Sheridan
Ohio Northern University

Date submitted: 12 Apr 2007 Electronic form version 1.4