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Phase Transitions in 2-D Dusty Plasmas CHRISTOPHER JONES, MICHAEL MURILLO, Los Alamos National Laboratory — Dust grains suspended in plasma sheaths typically arrange into a two-dimensional layer. The interactions in the plane have been shown both theoretically and experimentally to be well-characterized by the screened Coulomb, or Yukawa, potential. The macroscopic size of the systems, as well as the fast time scales relative to the comparable colloid systems, allow for convenient comparison with both the simulation and theory of phase transitions in two-dimensional systems. We have performed molecular dynamics simulations of the 2-D Yukawa system, analysis of which leads to bounds on the melting transition in the coupling-screening parameter space. In our studies of melting, we employ the voronoi construction for the analysis of defects and the bond-orientational order parameter for the determination of long-range orientational order. We have also developed a combined radial/angular distribution function, useful for the anisotropic systems near melting. Our goal is to compare simulation results with the competing dislocation-mediated and grain-boundary-mediated theories of 2-D melting in a parameter regime typical of dusty plasmas.

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