

Abstract Submitted
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Landau Theory for the Normal Solid-Supersolid Transition ALAN DORSEY, University of Florida, PAUL GOLDBART, University of Illinois at Urbana-Champaign, JOHN TONER, University of Oregon — Kim and Chan [1,2] have reported an anomalous decoupling transition of solid ^4He in a torsional oscillator measurement, and interpret their results as evidence for non-classical rotational inertia and a possible supersolid phase of ^4He . Motivated by these results, we [3] have developed a phenomenological Landau theory of the normal-solid to supersolid (NS-SS) transition in which superfluidity is coupled to the elasticity of the crystalline ^4He lattice. We find that the elasticity does not affect the universal properties of the superfluid transition, so that in an unstressed crystal the well-known λ -anomaly in the heat capacity of the superfluid transition should also appear at the NS-SS transition. We also find that the onset of supersolidity leads to anomalies in the elastic constants near the transition, that should be observable in sound speed measurements; conversely, inhomogeneous strains in the lattice can induce local variations of the superfluid transition temperature, leading to a broadened transition.

- [1] E. Kim and M. H. W. Chan, *Nature (London)* **427**, 225 (2004).
- [2] E. Kim and M. H. W. Chan, *Science* **305**, 1941 (2004).
- [3] A. T. Dorsey, P. M. Goldbart, and J. Toner, cond-mat/0508271.

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