

Abstract Submitted
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Hydrodynamic modes and the density-density correlation function of a supersolid CHI-DEUK YOO, ALAN DORSEY, Department of Physics, University of Florida — Recently Kim and Chan have observed the Non-classical Rotational Inertia of solid ^4He in Vycor glass [1] and in bulk [2] below around 200mK, and have interpreted their results as the onset of a supersolid phase [3]. As an alternative to detecting the supersolid phase, it is interesting to see whether a supersolid has a second sound mode analogous to a superfluid. We have derived hydrodynamics for a supersolid, and calculated the hydrodynamic mode frequencies for an isotropic supersolid, obtaining a longitudinal second sound mode. In addition, we have calculated the density-density correlation function in linear response theory, and find that one of the central Rayleigh peaks of a normal solid splits into two Brillouin peaks at $\omega = \pm c_2 q$ in supersolid phase, where c_2 is the second sound speed of a supersolid. This behavior could be revealed in a light scattering experiment from the solid.

- [1] E. Kim and M. H. W. Chan, *Nature* **427**, 225 (2004).
- [2] E. Kim and M. H. W. Chan, *Science* **305**, 1941 (2004).
- [3] A. J. Leggett, *Phys. Rev. Lett.* **25**, 1543 (1970).

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