Abstract Submitted
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Dislocation densities and lengths in solid ^{4}He from elastic measurements[1] ANDREW FEFFERMAN, ARIEL HAZIOT, Laboratoire de Physique Statistique de l'ENS, JOHN BEAMISH, University of Alberta, SEBASTIEN BALIBAR, Laboratoire de Physique Statistique de l'ENS — Elastic measurements on solid ^{4}He show large softening of the shear modulus due to motion of dislocations, behavior which has been described as quantum plasticity. Dislocation networks may also be responsible for the unusual behavior seen at low temperatures in torsional oscillator and flow experiments. However, existing estimates of dislocation densities in helium crystals vary by many orders of magnitude. By measuring the temperature and frequency dependence of the elastic dissipation, we have determined dislocation densities and network lengths in both single crystals and polycrystals of ^{4}He. The dislocation lengths are much longer than previous estimates, meaning that they are less connected than previously thought. Even in polycrystals, we find no evidence for the large densities of well-connected dislocations which would be needed to explain mass decoupling in torsional oscillators in terms of superfluidity in a dislocation network.

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