Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Supersolid ^{4}He Likely Has Nearly Isotropic Superflow[1] WAYNE M. SASLOW, Texas A&M University, SHIVAKUMAR JOLAD, Penn State University — We extend previous calculations of the zero temperature superfluid fraction f_s (SFF) *vs* localization, from the fcc lattice to the experimentally realized (for solid ^{4}He) hcp and bcc lattices. The superfluid velocity is assumed to be a one-body function, and dependent only on the local density, taken to be a sum over sites of gaussians of width σ. Localization is defined as σ/d, with d the nearest-neighbor distance. As expected, for fcc and bcc lattices the superfluid density tensor is proportional to the unit tensor. To numerical accuracy of three-places (but no more), the hcp superfluid density tensor is proportional to the unit tensor. This implies that a larger spread in data on f_s, if measured on pure crystals, is unlikely to be due to crystal orientation. In addition, to three decimal places (but no more) the curves of f_s *vs* σ/d are the same for both the hcp and fcc cases. An expected value for the localization gives an f_s in reasonable agreement with experiment. The bcc lattice has a similar curve of f_s *vs* σ/d, but is generally smaller because the lattice is more dilute.

[1]Supported in part by DOE Grant No. DE-FG03-96ER45598.

Wayne M. Saslow
Texas A&M University

Date submitted: 03 Dec 2005 Electronic form version 1.4