Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Phonon-roton modes, superfluidity and a Bose glass phase in nanoscale liquid ^{4}He JACQUES BOSSY, Institut Neel, CNRS-UJF, Grenoble, JONATHAN PEARCE, National Physical Laboratory, HELMUT SCHOBER, Institut Laue Langevin, Grenoble, HENRY GLYDE, university of Delaware — We present neutron scattering measurements of the elementary phonon-roton modes of liquid ^{4}He confined in nanoporous media. The aim is to compare phonon-roton (P-R) and superfluid density measurements in helium at nanoscales and in disorder. A specific goal is to determine the region of temperature and pressure in which well defined phonon-roton modes (and therefore BEC) exist and compare this with the superfluid phase region, i.e. with the superfluid-normal phase critical temperature T_c and pressure p_c in porous media. We find well defined P-R modes (BEC) extend to temperatures above T_c (up to $T_\lambda = 2.17$ K at SVP) and to pressures above p_c (up to a pressure p = 36.3-36.8 bars at $T \simeq 0$ but no modes above this pressure [1]). This suggests that there is a Bose glass phase consisting of local regions of BEC separated by normal liquid so that there is no phase coherence across the sample lying between the superfluid and normal liquid phase. The Bose glass phase surrounds the superfluid phase at all p and T. We compare this phase diagram with other dirty Bose systems. [1] Bossy et al. Phys. Rev. Lett. 101, 025301 (2008), Phys. Rev. B (in press)(2008)

Henry Glyde
University of Delaware

Date submitted: 21 Nov 2008 Electronic form version 1.4