Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Third Sound Propagation in Superfluid ^{4}He Films Adsorbed on Carbon Nanotube Bundles[1] SONNY VO, TIM HSIEH, JOHN SCHULMAN, GARY A. WILLIAMS, UCLA — We have observed the propagation of third sound waves in thin superfluid ^{4}He films adsorbed on carbon nanotube bundles. The nanotubes are sprayed onto a plexiglass substrate, forming a tangle of interconnected bundles that is about 15 μm thick and 2.5 cm square, with an average bundle diameter of about 4 nm. A heater and bolometer at opposite corners allow detection of resonant third sound modes, and the third sound speed is deduced from the resonant frequencies. The helium adsorption is greatly affected by the surface tension forces generated by the high curvature of the nanotubes, and the film thickness on the tubes remains very thin compared to the thickness in flat regions of the cell. As helium is metered into the cell at 1.3 K the Kosterlitz-Thouless transition on the nanotubes is observed as the onset of the third sound signal, and then with increasing film thickness the third sound velocity decreases. The velocity appears to be dropping towards zero at a finite value of the film thickness on the tubes, in qualitative agreement with a surface-tension instability predicted for cylindrical geometries by Cole and Saam [Phys. Rev. Lett., **32**, 985 (1974)].

[1]Work supported by the NSF, DMR 05-48521. We thank D. Hecht and G. Gruner for preparing the nanotubes.

Gary Williams
Dept. of Physics and Astronomy, UCLA

Date submitted: 26 Nov 2007 Electronic form version 1.4