

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Search for new evidence of superfluidity in solid ^4He by phonon propagation¹ YUKI AOKI, HARRY KOJIMA, Rutgers University — The phonon propagation generated by heat pulse has been studied in solid ^4He under pressure between 25 and 56 bar to search for a sign of supersolid behavior at temperatures down to 40 mK. Response to input heat pulses are detected by a titanium film superconducting edge bolometer separated by a 4.5 mm thick solid ^4He from the heater. According to theoretical studies, a new fourth sound-like mode is expected to emerge in the supersolid state. The sensitivity of our bolometer has been improved from an earlier version by an order of magnitude by changing the film structure for the purpose of searching for a small temperature deviation signal accompanying the fourth sound-like propagation mode. The response of the bolometer to heat pulse was measured in different quality solid samples which had been grown with different cooling rates during solidification. The detected response signal has not revealed any identifiable signature of a new mode within a temperature excursion of about $\Delta T = 5 \mu\text{K}$ from the background signal shape. An estimated superflow velocity corresponding to the temperature excursion is greater than the critical velocity observed by Kim and Chan. Our detection sensitivity must be further increased before a definitive conclusion on the fourth sound-like mode can be made.

¹Research supported in part by NSF.

Haruo Kojima
Rutgers University

Date submitted: 18 Nov 2006

Electronic form version 1.4