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Investigation of Grid Turbulence in Superfluid ^{4}He with Improved Measurement Technique[1] JIHEE YANG, GARY G. IHAS, University of Florida - Gainesville — Quantum turbulence(QT), a tangle of quantized vorticity in a macroscopically correlated quantum fluid, can have many analogous aspects to classical turbulence. Understanding QT can give us insights into classical turbulence as well as fluids in general. We generate QT by pulling a grid through a 4.6 cm x 4.6 cm cross-section channel in superfluid ^{4}He. Second sound, a temperature/entropy wave, is used to monitor vorticity, ω. A resonant technique with high (3000) Q increases greatly the sensitivity of the measurement, but it requires a phase and amplitude locked tracking system which adheres to the resonant peak independent of frequency shifts. According to theories, the vorticity decays as $\omega \sim t^{-11/10}$ or $\omega \sim t^{-17/14}$ when the energy containing eddies are growing. When they saturate at the channel size, the vorticity begins decaying as $\omega \sim t^{3/2}$. These different decaying regions are examined in this large channel and compared to previous experiments that have been performed in 1 cm^2 square channels[2].

[1]US NSF DMR#1007937
[2]M. R. Smith, R. J. Donnelly, N. Goldenfeld, and W. F. Vinen, Phys. Rev. Lett. 71, 2583 (1993).; S. R. Stalp, Ph.D. dissertation, University of Oregon 1998.; L. Munday, Ph.D. dissertation, Lancaster University 2014.

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