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Measurements on Decay of Grid Turbulence in Superfluid ^{4}He in a Large Square Channel JIHEE YANG, GARY G. IHAS, Univ of Florida - Gainesville — Grid turbulence in superfluid ^{4}He is investigated over a temperature range from 1.5 to 2.1 K with different grid velocities. The attenuation of second sound is observed across a large channel (4.6 cm x 4.6 cm square) and analyzed to obtain vortex line density (L) over time. A novel phase and amplitude locked tracking system is used to minimize frequency shift effects on resonant peaks in the cavity caused by temperature fluctuations. A grid turbulence theory predicts that vortex line density decay as $L \sim t^{-11/10}$ or $t^{-17/14}$ in early times when the energy containing eddies increase from the length scale of the grid mesh. At later time, when the energy containing eddy size become comparable to the channel size, the vortex line density is expected to decay as $L \sim t^{-3/2}$ consistent with classical result[1]. We present results in decay of vortex line density from the large channel: evidence for $t^{-11/10}$ is observed partially for early time and t^{-2} instead of $t^{-3/2}$ is observed for later time. A consistent bump/plateau feature is observed in between the two decay regions that is not explained from the theory.

[1]S. R. Stalp, L. Skrbek, and R. J. Donnelly, Phys. Rev. Lett. 82, 4831 (1999)

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