Superfluid counterflow turbulence in short channels

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Counterflow superfluid turbulence in cylindrical channels is usually described by assuming that the channel is sufficiently long for the velocity profiles to correspond to a fully developed situation, with vanishing radial flows, and only longitudinal flows. However, for channels with a length shorter than 0.05 $ReyD$, with D the diameter of the channel and Rey the Reynolds number $Rey = VD/\nu$, V being the average velocity of the normal component and ν its kinematic viscosity, the velocity profile has not yet arrived to the fully developed regime. This situation is often found in actual counterflow experiments. In this region, temperature gradient at a given heat flux is higher than that in a fully developed regime[1]. In this poster we present recent results of viscous entrance-flow theory[2] applied to the velocity profile of the normal component in turbulent counterflows and explore some of its difference with the results in the fully-developed region.

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