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Visualization study of the normal-fluid motion in superfluid helium-4[1] JIAN GAO, Florada State University, Natl High Magnetic Field Lab, ALEX MAROKOV, University of Florida, Nat High Magnetic Field Lab, WEI GUO, STEVEN W. VAN SCIVER, Florada State University, Natl High Magnetic Field Lab, GARY G. IHAS, University of Florida, Nat High Magnetic Field Lab, DANIEL N. MCKINSEY, Yale University, WILLIAM F. VINEN, University of Birmingham, UK — Flow visualization in superfluid ^{4}He is challenging, yet crucial for attaining a detailed understandingof quantum turbulence. Two problems have impeded progress: finding and introducing suitable tracersthat are small yet visible; and unambiguous interpretation of the tracer motion. Metastable He_2 triplet molecules form angstrom-sized bubbles in helium and can be imaged using a laser-induced-fluorescence technique. At temperatures above 1 K, helium molecules solely follow the motion of the normal-fluid component without being affected by quantized vortices. In our recent experiments on thermal counterflow, by tracing a thin molecular line created via femtosecond-laser field-ionization technique, we are able to measure the instantaneous normal-fluid velocity field. We show that the obtained velocity probability density function (PDF) obeys a Gaussian distribution. We also discuss the calculated structure function of the novel normal-fluid turbulence in thermal counterflow.

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