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Particle Image Velocimetry in Superfluid Helium

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The Particle Image Velocimetry (PIV) technique has been expanded recently to the very low temperature environment to study the unique behavior of superfluid helium. Superfluid helium (He II) is a peculiar fluid with apparent zero viscosity and extraordinary heat transfer capabilities. The model that is traditionally used to explain this behavior considers He II to be made of two interpenetrating fluid components, one being viscous and the other being non-viscous. Recently, the PIV technique has been introduced to He II experimentation in an attempt to visualize the unique transport properties. As part of this effort, appropriate particles and seeding techniques have been developed for this low temperature fluid in order to measure the velocities of these internal flows. Initially, it was expected that the particles would track the viscous fluid component of He II, but several recent experiments have demonstrated their interaction with the non viscous fluid component as well. In order to fully benefit from the PIV technique to increase our knowledge and understanding of this unique fluid, the motion of the particles needs to be understood in terms of the motion of the two fluid components. An experiment combining heat transfer and forced flow allows one to independently vary these two component velocities and correlate them with the velocity of the seeded particles. In collaboration with Ernesto Bosque, Ting Xu, and Steven Van Sciver, NHMFL / Florida State University.