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Measurement of superfluid thermal counterflow jet using PIV

MASAHIDE MURAKAMI, University of Tsukuba

The particle image velocimetry (PIV) technique was applied to the measurement of the thermal counterflow jet of superfluid He II in the superfluid turbulent state. Neutrally buoyant hydrogen-deuterium micro solid particles were used as tracer for PIV, which measures the velocity of the normal component. The velocity profile and the spatial decay of the jet velocity were compared with those of round turbulent jets of viscous fluids. The PIV velocity was compared with the theoretical prediction. It was found that the PIV velocity was always smaller than the theoretical prediction and this reduction ratio depended on the temperature, strongly in higher temperature range above 2.0 K and weakly below 2.0 K. It is considered that this results from the interaction of particles and/or the normal fluid component with high density quantized vortices. In collaboration with Takeshi Takakoshi, Motoki Maeda, and Naoki Yokota, University of Tsukuba.