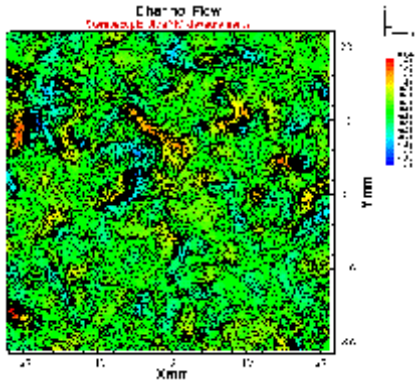
Measurements In a Turbulent Channel Flow

Application Note StereoPIV-005

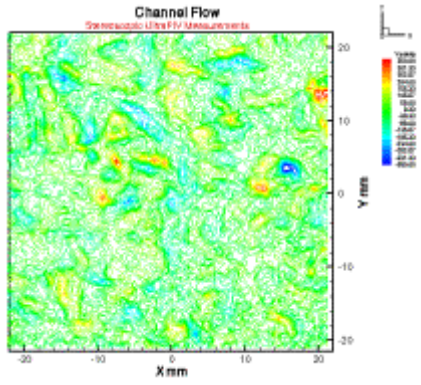
This application describes high spatial resolution 3-component measurements made in a fully developed, turbulent channel flow.

The objective of the current study was to identify, quantify, and understand the dominant structures in the centerplane of a channel flow. A high-resolution StereoPIV system was employed to examine the size, strength and orientation of typical structures in the flow.

The PowerView™ StereoPIV system consisted of a pair of frequency-doubled Nd:YAG lasers, an articulating light delivery arm, light sheet optics, a pair of PIVCAM 10-30 cameras with 1K × 1K pixel resolution, a pair of high-speed interface boards and INSIGHTUltra™ image acquisition and analysis software. The two-camera system using the optimum Scheimpflug configuration was set up in the horizontal plane to make three-component velocity measurements



W-component of velocity



Vorticity distribution

The measurements provided 12, 100 instantaneous three-component velocity vectors per set of frame-straddled, stereoscopic images. Data for 986 statistically independent, three-component velocity fields were captured and computed to compute detailed flow statistics.

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