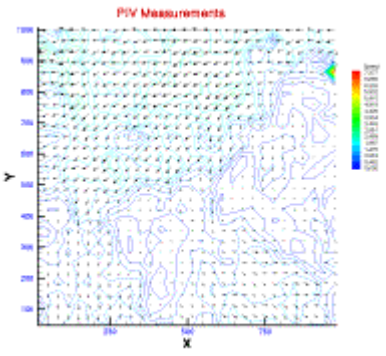
MEASUREMENTS IN A HIGH REYNOLDS NUMBER SWIRLING FLOW

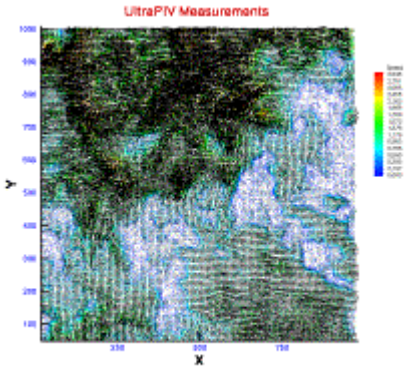
APPLICATION NOTE STEREOPIV-002

For most practical applications, the desire to get detailed flow information, including the nature of flow structures, requires the ability to work with smaller interrogation regions to get better spatial resolution. Increasing the spatial resolution without dramatically increasing the measurement uncertainty has been a key barrier to examining practical flow problems.

The development of UltraPIV™ system approach has eliminated this barrier. The solution lies in developing unique techniques that exploit the nature of the data and implementing algorithms that can successfully extract accurate velocity information with the needed resolution. The key aspects of the UltraPIV™ system approach include the unique Hart Correlation approach and the Double Correlation validation scheme. In addition to providing very high spatial resolution, this approach also increases measurement accuracy and processing speed.

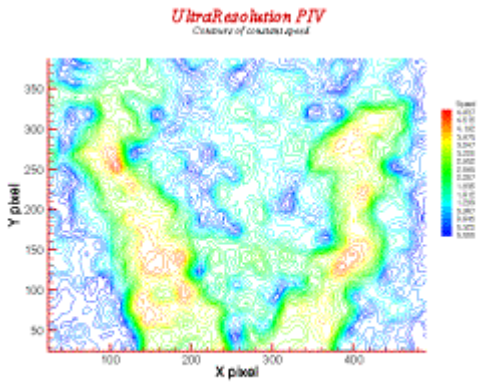


Conventional PIV Analysis

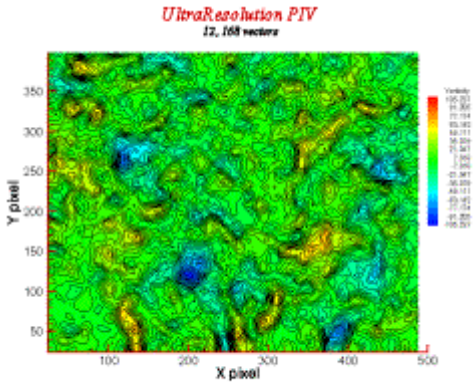


UltraPIV Analysis

The PIV measurements were made in a high Reynolds number swirling flow undergoing sudden expansion. Results obtained using the conventional analysis approach and the UltraPIV™ system approach show the ability of the UltraPIV™ system approach to get enhanced spatial resolution without sacrificing accuracy. In this particular flow situation, UltraPIV™ system approach provides 15 times more vectors than that using conventional PIV analysis approaches.



Magnitude of Velocity



Vorticity

Zoomed-in view (25% of the measured region)

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