

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Stereo-PIV measurements of a swirling flow in a straight duct with downstream contraction BENJAMIN LECLAIRE, LAURENT JACQUIN, JEAN-CHARLES ABART, ROBERT SOARES, DIDIER SOULEVANT, ONERA, Meudon, France — The generating conditions of a high-Reynolds swirling jet are addressed. The setup used involves a rotating honeycomb, followed by a transparent duct of constant cross-section and a final converging nozzle. Traditionally, the contraction is expected to reduce turbulence in the exit plane, thereby leading to a smooth upstream condition for the subsequent jet instabilities or breakdown. We find that this only pertains to the lowest rotation rates since developed turbulence progressively invades the nozzle exit plane as rotation increases. We therefore investigate the dynamics of the duct flow preceding the jet by means of stereo-PIV measurements in the duct portion of constant cross-section. The Reynolds number of the flow is fixed and the control parameters are the swirl number and the contraction ratio of the downstream nozzle. PIV reveals that at high swirl numbers, the flow exhibits a complex behaviour which may explain the turbulence found in the exit plane.

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Date submitted: 29 Jul 2005

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