

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Tomographic Particle Image Velocimetry Measurements of a High Reynolds Number Turbulent Boundary Layer¹ CALLUM ATKINSON, Laboratory for Turbulence Research in Aerospace and Combustion, Monash University, MICHEL STANISLAS, Laboratoire de Mécanique de Lille, Ecole Centrale de Lille, JULIO SORIA, Laboratory for Turbulence Research in Aerospace and Combustion, Monash University — Streamwise/wall-parallel volumes in the buffer region of a turbulent boundary layer at $Re_\theta = 7800$ and 11800 are measured using a 4 camera (2048×2048 px) tomographic particle image velocimetry (Tomo-PIV) system in the turbulent boundary layer wind tunnel at the Laboratoire de Mécanique de Lille (LML). Measurement volumes of $1200 \times 180 \times 1200$ pixels are achieved, the large boundary layer provided by this tunnel ($\delta \sim 0.3$ m) resulting in volumes of $470^+ \times 70^+ \times 470^+$ and $920^+ \times 140^+ \times 920^+$ wall units, respectively. The quality of the data acquired by this technique is assessed based on the mean velocity profile, velocity fluctuations, velocity power spectrum and the fluctuating divergence. Streaks and streamwise vortices are examined and an attempt is made to classify the flow using the invariants of the full velocity gradient tensor.

¹Support of the Australian Research Council and the Eiffel Fellowship is gratefully acknowledged.

Callum Atkinson
Laboratory for Turbulence Research in Aerospace
and Combustion, Monash University

Date submitted: 06 Aug 2009

Electronic form version 1.4