Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Experimental and theoretical analysis of vortex breakdown in the wake of the 25° Ahmed body CYRIL JERMANN, PHILIPPE MELIGA, M2P2 (CNRS - Centrale Marseille), GREGORY PUJALS, PSA Peugeot Citroen, FRANCOIS GALLAIRE, LFMI (EPFL - Lausanne), ERIC SERRE, M2P2 (CNRS - Centrale Marseille) — We study experimentally and theoretically the wake of the 25^o Ahmed body, considered a suitable test-case to reproduce the two counter-rotating longitudinal vortices widely encountered in automotive aerodynamics. The three-dimensional experimental mean flow is reconstructed at high Reynolds number ($Re = 2.8 \times 10^6$) from a series of cross-flow time-averaged planes acquired with a moving automated Stereo-PIV system. We observe a sharp decay of the axial velocity and vorticity in the near-wake, 0.5 times the projected length of the slanted surface downstream the square back, where the streamwise vortices is subjected to a strong adverse pressure gradient and the turbulent kinetic energy exhibits a peak in the vortex core. A stability analysis of the experimental velocity shows that the flow undergoes vortex breakdown roughly at the same position, through a transition from supercritical ($x < 0.5$) to subcritical ($x > 0.5$) conditions and the accumulation of upstream propagating axisymmetric waves.

Cyril Jermann
M2P2 (CNRS - Centrale Marseille), PSA Peugeot Citroen

Date submitted: 30 Jul 2014 Electronic form version 1.4