Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Large-scale structures in high Reynolds number turbulent boundary layers CHRISTIAN J. KÄHLER, NICOLAS BUCHMANN, SVEN SCHARNOWSKI, Bundeswehr University Munich — Large-scale turbulent flow structures in a flat plate turbulent boundary layer with zero pressure gradient were investigated with PIV in a closed-loop transonic wind tunnel at Ma = 0.5 - 0.8, Re_τ = 5,100 - 9,500. The primary aim of the measurements was to simultaneously reach large Reynolds numbers and a low boundary layer thickness to model width ratio. The high Reynolds number is required to generate large scale structures with sufficient amplitude. The low ratio between the boundary layer thickness and the width of the model is necessary to avoid side effects resulting from the side walls and the blockage of the flow. Spatial two-point correlation and conditional correlations are calculated to determine the size and orientation of the large-scale flow structures. The difference between the correlation and conditional correlation analysis indicates that various large-scale structures with typical topologies exist and interact in turbulent boundary layer flows.

Christian J. Kähler
Bundeswehr University Munich

Date submitted: 01 Aug 2014 Electronic form version 1.4