Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Wall Tracking Method for High Resolution Boundary Layer Measurements on a Wing-Fuselage Model[1] DAVID JEON, California Institute of Technology, CHRISTIAN WILLERT, Deutsches Zentrum fr Luft- und Raumfahrt, Kln, DAMIAN HIRSCH, MORTEZA GHARIB, California Institute of Technology
— Turbulent boundary layer experiments pose a problem with the large range of length scales that need to be resolved. Measurement techniques tend to focus at either end of this scale. Techniques like holographic PIV primarily measure the region nearest to the wall. Those like conventional PIV typically only resolve down to the log layer. A variation on PIV has been developed by one of us (Willert), where a long-range micro PIV setup is used to resolve down to sub-layer scales. This type of micro PIV setup was used on a wing-fuselage model to measure the boundary layer on the model at Re_θ up to 2700, from $y^+ \approx 1$ in the sub-layer nearly to the outer edge of the boundary layer. In addition, wall shear stress can be computed both using the profile in the sub-layer and the Clauser method through the log-layer and compared against each other. The greatest problem faced with this technique is compensating for apparent wall motion. For example, at the conditions where we can resolve down to $y^+ \approx 1$, the apparent wall motion is on the order of 10 wall units. After compensation, this drops below 0.1 wall units. Therefore, the wall tracking method used is critical to get data close to the wall.

[1]This work was supported by The Boeing Company through grant number CT-BA-GTA-1.

David Jeon
California Institute of Technology

Date submitted: 01 Aug 2019 Electronic form version 1.4