Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Techniques for PIV-CFD Comparison in a Shock-boundary Layer Interaction DAVID HELMER, JOHN EATON, Stanford University — The outputs of a PIV experiment and a simulation of the same system are fundamentally different. PIV includes spatial averaging effects, particle travel effects, sampling effects, and multiple potential biases. In addition, there are many uncertainties, some of which are poorly understood or documented. These issues make direct comparisons between the two fields inappropriate in certain cases. To address this, a hierarchy of techniques for performing meaningful comparisons between simulations and experiments is described. The simplest transformation incorporates only spatial averaging. At the highest level of fidelity, a method for creating simulated PIV data from the simulation is outlined. This technique allows direct comparisons between PIV and CFD, and can also provide uncertainty estimates for quantities such as the turbulence intensity which are traditionally difficult to quantify experimentally. High-resolution PIV results of an investigation of a Mach 2.1 shock-boundary layer are shown. The PIV effects most relevant to a PIV-CFD comparison in this system are discussed, along with the necessary steps required to transform a CFD simulation of this system into a field that can be directly compared to the PIV.

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Date submitted: 02 Aug 2010 Electronic form version 1.4