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Mean Flow Measurements with Hot Wires in High Reynolds Number Boundary Layers R. DUNCAN, N. HUTCHINS, A. SEGALINI, J. MONTY, AND ICET TEAM — Mean flow measurements of high Reynolds number, Zero Pressure Gradient (ZPG) turbulent boundary layers are presented from the ICET data set using hot wire anemometry. The measurements were performed at momentum thickness Reynolds numbers in the range from 11,000 to 70,000, and compared to Pitot probe measurements at the same conditions. Various wire diameters, sensing lengths, probe designs and construction techniques are used, as well as different anemometer setups, in each of the facilities. Mean flow similarity between the three facilities is shown to be well within expected experimental uncertainty and ZPG layer manifestations, both when examining mean velocity profiles and integral parameters. The results reinforce the need for accurate near wall velocity and position measurements, as well as consistent analysis of physical and instrumentation biases. Various approaches are used to determine parameters such as the shape factor, the logarithmic overlap-region parameters, and the wake or outer flow parameters. Parameters extracted from the hot-wire profiles and those based on Pitot probe data are also compared and discussed in light of past experience with both instruments in different wall bounded flow experiments. Finally, consistency of the results is examined between the profile data and the skin friction behavior with Reynolds number, as measured by oil film interferometry.

Hassan Nagib
IIT

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