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Turbulence Measurements with Hot Wires in High Reynolds Number Boundary Layers J.H.M. FRANSSON, N. HUTCHINS, R. OERLUE, M. CHONG, AND ICET TEAM — During the last decade there has been a renewed interest in the scaling of turbulent boundary layers, especially with regard to the mean and fluctuation velocity distributions. Recently the ICET team carried out velocity measurements in three different wind tunnels (at KTH, Univ. Melbourne and IIT) for overlapping Reynolds numbers in the range $11,000 < Re_\theta < 70,000$. The use of different facilities enables measurements at similar Reynolds numbers, but with different free stream velocities (due to different development length for the boundary layer in the different wind tunnels). A number of different hot-wire probes and anemometers were used. In addition, accurate and independent skin friction measurements using oil film interferometry have been made to determine the friction velocity (u_τ), which is essential for accurate scaling of the data. The peak value of the near wall rms of the streamwise velocity was found to increase with Reynolds number, when scaled with u_τ. On the other hand, the skewness and flatness of the streamwise velocity are found to exhibit similarity in the near wall region if measured with sufficiently small (in viscous units) hot-wire probes, indicating a similarity of the probability density distributions independent of Reynolds number. The measurements also provide time series that are used to evaluate the scaling of spectra and other time-domain quantities.

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