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Zero pressure gradient boundary layer at extreme Reynolds numbers[1] MARCUS HULTMARK, MARGIT VALLIKIVI, ALEXANDER SMITS, Princeton University — Experiments were conducted in a zero pressure gradient flat plate boundary layer using the Princeton/ONR High Reynolds number Test Facility (HRTF). The HRTF uses highly compressed air, up to 220 atmospheres, to produce Reynolds numbers up to $Re_\theta = 225,000$. This corresponds to a $\delta^+ = 65,000$ which is one of the highest Reynolds numbers ever measured in a laboratory. When using pressure to achieve high Reynolds numbers the size of the measurement probes become critical, thus the need for very small sensors is acute. The streamwise component of velocity was investigated using a nanoscale thermal anemometer (NSTAP) as well as a $200\mu m$ pitot tube. The NSTAP has a spatial resolution as well as a temporal resolution one order of magnitude better than conventional measurement techniques. The data was compared to recent data from a high Reynolds number turbulent pipe flow and it was shown that the two flows are more similar than previous data suggests.

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