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Well resolved pipe flow measurements at extreme Reynolds numbers[1] MARGIT VALLIKIVI, MARCUS HULTMARK, Princeton University, SEAN BAILEY, University of Kentucky, ALEXANDER SMITS, Princeton University — Statistics of the streamwise velocity component were measured at Reynolds numbers ranging from $Re_\tau = 1 \times 10^3$ to $Re_\tau = 1 \times 10^5$ in fully-developed pipe flow. Pipes with two different surface finishes were studied, allowing a comparison between high Reynolds numbers turbulence in the hydraulically smooth and rough regimes. For better spatial resolution a nano- scale thermal anemometry probe (NSTAP) was used to acquire the data. The data gives new insight on pipe flow turbulence at extremely high Reynolds numbers, showing no interaction between the inner and the outer layer. The results also show a Reynolds number dependent outer peak in the turbulent fluctuations, which is only evident at very high Reynolds numbers. These extremely high Reynolds numbers reveal that the scaling of the fluctuations is much more similar to that of the mean velocities than previously believed.

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