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Multi-component measurements in high Reynolds number turbulent boundary layers RIO BAIDYA, JIMMY PHILIP, NICHOLAS HUTCHINS, JASON MONTY, IVAN MARUSIC, The University of Melbourne — Measurements, with highly resolved spectra are obtained in high Reynolds number (Re_τ) turbulent boundary layers using sub-miniature cross-wires. The probe consists of 2.5μm diameter platinum wires welded across the sharpened stainless steel prong tips, contained in a volume of $0.4 \times 0.4 \times 0.2\text{mm}^3$. Velocity profiles are measured at various stream-wise positions with nominally matched unit Reynolds number (U_∞/ν). In this manner the same probe geometry affords approximately matched viscous-scaled sensor length (l^+) and sensor spacing (Δs^+) across the entire range of Re_τ, such that Reynolds number trends can be observed free of spatial resolution effects. The probes have matched measurement volumes of approximately $14 \times 14 \times 7$ ($\pm 10\%$) viscous length scales across all Re_τ. The prong is inclined at 10° to the horizontal, permitting measurements close to the wall while also minimising blockage effects. The prongs are fabricated to account for this inclination, ensuring that the sensing elements remain parallel to the wall at the desired prong orientation. The resulting highly resolved multi-component velocity statistics up to $Re_\tau = 10,000$ and their associated trends against Re_τ will be presented.

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