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Introducing a nano-scale crossed hot-wire for high Reynolds number measurements[1] YUYANG FAN, MATTHEW FU, JANIK KIEFER, MARCUS HULTMARK, Princeton University — Hot-wire anemometry is commonly used for high Reynolds number flow measurements, mainly because of its continuous signal and high bandwidth. However, measuring two components of velocity in high Reynolds number wall-bounded flows has proven to be quite challenging with conventional crossed hot-wires, especially close to the wall, due to insufficient resolution and obstruction from the probe. The Nano-Scale Thermal Anemometry Probe (NSTAP) is a miniature hot-wire that drastically increased the spatial and temporal resolutions for single-component measurements by using a nano-scale platinum wire. Applying a novel combining method and reconfiguration of the NSTAP design, we created a sensor (x-NSTAP) that is capable of two-component velocity measurements with a sensing volume of approximately $50 \times 50 \times 50\mu$m and a temporal resolution approximately one order of magnitude faster than a conventional hot-wire. The x-NSTAP is characterized and deployed in the Princeton Superpipe facility for accurate measurements of the Reynolds stresses at very high Reynolds numbers.

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