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Multi-component velocity and temperature measurements in wall bounded turbulent flow utilizing a novel sensor. CLAYTON BYERS, MARCUS HULTMARK, Princeton University — A unique study of the simultaneous velocity and temperature field in a turbulent flow is performed. By utilizing the Nano-Scale Thermal Anemometry Probe (NSTAP) developed at Princeton in multi-mode operation, two components of velocity and temperature can be measured. This is achieved using a single sensing element by combining the methods of constant current hot-wire anemometry (CCA) and a new velocity measurement technique called elastic filament velocimetry (EFV). By switching between the two modes at high frequency, two orthogonal components of velocity as well as temperature can be obtained. The switched mode sensing system is deployed in a heated turbulent boundary layer to obtain the magnitude and direction (2D) of the velocity as well as the temperature. The sensor switching is characterized and shown to have a sufficiently high bandwidth to obtain unattenauted turbulence measurements.

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