Abstract Submitted
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Experimental Investigations of Compressible Turbulent Boundary Layers with the Use of Nano-Scale Thermal Anemometry Probes (NSTAP)[1] KATHERINE KOKMANIAN, SUBRAHMANYAM DUVVURI, Princeton University, SVEN SCHARNOWSKI, MATTHEW BROSS, CHRISTIAN J. KAEHLER, Universitat der Bundeswehr Munchen, MARCUS HULTMARK, Princeton University — Nano-Scale Thermal Anemometry Probes (NSTAP) have been designed, tested and used in a wide variety of incompressible flows. These sensors are capable of measuring streamwise velocity fluctuations with an order of magnitude better resolution, both temporal and spatial, compared to conventional hot-wires, due to their miniature size and minute thermal mass (the heating element is only 60 microns long, 2 microns wide and 100 nm thick). Here we report recent efforts to redesign the NSTAP to withstand supersonic flow conditions. Work has been performed in Princeton's micro-nano fabrication laboratory in order to modify both the 2D layout and the 3D shapes of these sensors. The supersonic version of the NSTAP is evaluated in collaboration with Bundeswehr University. The ultimate objective of this work is to measure both fluctuating mass flow rate and total temperature in compressible turbulent boundary layers, by combining two supersonic sensors which operate at different overheat ratios.

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