

Abstract Submitted
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Constant Current Plasma Anemometer¹ CURTIS MARSHAL, ERIC MATLIS, THOMAS CORKE, University of Notre Dame, SIVARAM GOGINENI, Spectral Energies, LLC — An improved design for a plasma anemometer that provides mega-Hertz bandwidth velocity measurements over a range of Mach numbers from subsonic to hypersonic, is presented. The anemometer uses a small volume of ionized air as the sensor. The ionized air is formed between two electrodes that are powered by a high-frequency AC voltage source. Resistance and capacitance elements in the AC power circuit that simulate a dielectric-barrier, have been added to prevent transient filament formation. This resulted in a 300-times reduction in the anemometer EMI of previous designs. In addition, a closed-loop feedback control has been added to maintain a constant current through the sensor. With constant current operation, the voltage drop across the ionized air between the electrodes varies linearly with air velocity (or mass-flux in a compressible flow). This is demonstrated through mean velocity calibrations of the anemometer for a range of velocities and feedback parameters. The dynamic response and other capabilities of the sensor will also be demonstrated.

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Thomas Corke
University of Notre Dame

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