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Plasma Anemometer Measurements and Optimization[1] CURTIS MARSHALL, ERIC MATLIS, THOMAS CORKE, University of Notre Dame, SIVARAM GOGINENI, Spectral Energies, LLC — Velocity measurements using a constant-current plasma anemometer were performed in a Mach 0.4 jet in order to further optimize the anemometer design. The plasma anemometer uses an AC glow discharge (plasma) formed in the air gap between two protruding low profile electrodes as the flow sensing element. The output from the anemometer is an amplitude modulated version of the AC voltage input that contains information about the mean fluctuating velocity components. Experiments were performed to investigate the effect of the electrode gap, AC current, and AC frequency on the mean and fluctuating velocity sensitivity and repeatability of the sensor. This involved mean velocity calibrations from 0 to 140 m/s and mean and fluctuating velocity profiles through the shear layer of the jet. Measurements with a constant temperature hot-wire anemometer were used for reference. The results showed an improvement in performance with increasing AC frequency that was attributed a more stable glow discharge. The agreement with the hot-wire were good, with the advantage of the plasma anemometer being its 100-times higher frequency response.

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