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Flow measurement using electron beam fluorescence

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ABSTRACT

Low density, high-speed flows are of interest to many research areas including, spacecraft thrusters, hypersonic vehicle control, and atmospheric re-entry studies. Measurement of low-density gas flows by traditional methods such as Schlieren Photography or Particle Image Velocimetry is often not possible. In order to yield new information about gas behavior at low densities the technique of electron beam fluorescence is being re-evaluated. By recreating previous electron beam fluorescence setups used to measure density, the experiment operating parameters including beam strength and density ranges are assessed and a foundation can be built for further experimentation. Comparing intensity plots of imaged flows against expected luminosity of fluoresced gases provides correlation data to assess necessary experiment conditions. Future work includes, using spectroscopy to determine gas density, composition, velocity and temperature.

KEYWORDS

Electron beam fluoroscopy, electron fluorescence, low density gas flows, flow measurement, gas dynamics