

# Focused Laser Differential Interferometry for Hypersonic Flow Diagnostics

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## **ABSTRACT**

A focused laser differential interferometer has been designed for the investigation of freestream and boundary layer flows produced in the University of Southern Queensland's hypersonic wind tunnel. The design of the instrument is presented, including the implementation of mechanical devices to improve the signal measured using the focused laser differential interferometer. The instrument has been shown to have sufficiently high frequency resolution and signal-to-noise ratio such that the inertial subrange of the low density ( $\bar{\rho} \approx 34 \text{ g/m}^3$ ) freestream nozzle flow can be resolved. Measurements of the boundary layer flow on a conical-nosed ( $7^\circ$  half angle) cylinder show that the instrument can resolve the second mode instability present (typically in the order of 100–200 kHz) in the high speed transitional boundary layers.