REAL-TIME ANALYSIS OF RAMAN SPECTRA FOR TEMPERATURE FIELD CHARACTERIZATION IN AIRCRAFT EXHAUST NOISE STUDIES

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Raman scattering has long been used as a non-intrusive diagnostic of temperatures in combustion exhaust flows, using a variety of spectral analysis techniques. As part of their ongoing program of experiments to support development of computer codes that calculate exhaust flow fields and predict jet noise, NASA Glenn Research Center is developing a laser Raman diagnostic system that will measure mean temperatures and temperature fluctuations in hot and cold jet flows. We describe a software package, ART (Analysis for Raman Temperatures), that analyzes Raman spectra of air for temperature and density using vibrational or resolved or unresolved rotational bands, presenting results in a variety of real-time displays. Each analysis technique presents its own challenges in obtaining the most precise and accurate values, and we will comment on these issues by exhibiting example spectra of each type. The ART program is closely related to another Aerodyne software package (TDLWintel) which automates the acquisition and analysis of tunable laser absorption spectra.