INDUSTRIAL IMPLEMENTATION OF SLIPI RAYLEIGH THERMOMETRY

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Abstract
Planar Rayleigh Thermometry [1, 2] (RT) is a minimally intrusive technique capable of measuring two-dimensional temperature fields employing elastic scattering of a laser sheet off a flame. RT can be implemented together with other laser diagnostic techniques, such as Planar Laser Induced Fluorescence (P-LIF) [3], to provide a comprehensive picture of combustion processes and aid in the design of efficient combustors. Compared to other laser diagnostic techniques such as planar CARS [4], RT is characterized by a much lower experimental complexity and sensitivity to chemical species. Despite this, the technique has not seen a wide adoption in the industry since its first demonstration in 1981 by Dibble and Hollenbach [5]: mainly due to the intrinsically low signal levels offered by Rayleigh scattering compared to stray reflections from solid surfaces in combustors. Recent advancements through the works of Kristensson and others [6, 7] with the introduction of Structured Laser Illumination Planar Imaging (SLIPI), have shown drastic improvements of the signal to noise ratio achievable through RT: by using a structured laser sheet instead of a plain one, it is possible to efficiently remove the effects of background noise in post processing analysis.