

Laser-optical characterization of the flow field behind the NGV cascade of a three-sector combustor simulator using filtered Rayleigh scattering

M. Dues^{1*}, U. Doll², T. Bacci³, A. Picchi³, G. Stockhausen⁴, C. Willert⁴

¹ ILA R&D GmbH, Jülich, Germany

² Paul Scherrer Institute, 5232 Villigen PSI, Switzerland

³ Università degli Studi di Firenze (UNIFI), 50139 Firenze, Italy

⁴ Institute of Propulsion Technology, German Aerospace Centre (DLR), 51170 Köln, Germany

* Correspondent author: dues@ila.de

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HIGHLIGHTS

- Experimental investigation of pressure, temperature and velocity distributions downstream of a high pressure nozzle guide vane cascade of a non-reactive, three-sector combustor simulator
- Comparison of five-hole probe/ temperature sensor measurements and laser optical measurements by filtered Rayleigh scattering, extended by the method of frequency scanning (FSM-FRS)
- The interaction of the probe body with the flow field downstream of the NGV cascade results in different velocity distributions compared with the FSM-FRS measurements

ABSTRACT

The aero-thermal properties of the flow field downstream of an NGV cascade of a three-sector combustor simulator rig are characterized by means of five-hole probe/ temperature sensor measurements as well as laser-optical FSM-FRS diagnostics. Both methods are applied to acquire and analyze pressure, temperature and velocity information in a cross section downstream of the NGV. The study discusses current capabilities as well as limitations of both methods when being applied to turbomachinery configurations. In general, results obtained with both methods are on a similar absolute level. Based on a more detailed analysis, strong evidence for an intrusive interaction between the five-hole probe and the flow downstream of the NGV cascade is found, which is significantly influencing the probe's measurement accuracies.

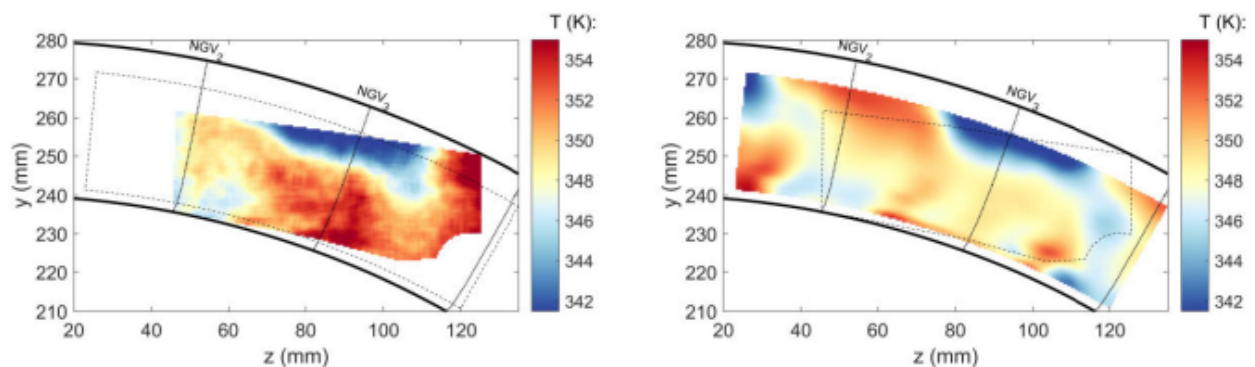


Fig. 1: Comparison of the temperature map measured with FRS (left) and interpolated probe data (right)