

Using Spatial Light Modulators to improve the technique of Focusing Laser Differential Interferometry

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ABSTRACT

A promising, non-intrusive laser diagnostic technique for analysing hypersonic gas flow structures is the Focusing Laser Differential Interferometer (FLDI). The instrument determines density gradients of test flows by using changes in phase between two spatially separated focused beams. This paper demonstrates an improvement to the traditional FLDI instrument design by replacing its Wollaston prism beam splitter with a more versatile digital counterpart - a spatial light modulator (SLM). Small scale versions of both the Wollaston prism based FLDI and the SLM based FLDI were independently constructed and used to measure the same test flow. The two optical arrangements are compared qualitatively and quantitatively in order to establish if the new technique can maintain a similar level of measurement quality to the traditional method whilst providing an added versatility to beam positioning and orientation. All measurements were of high quality and agree on the physical phenomena present in the flow, indicating that the SLM makes for a viable upgrade to the Wollaston prism in this context.