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**Development and Application of an Improved PIV System for Turbomachinery Applications** DAVE GEBBIE, STEVE GORRELL, AFRL/PRTF, JORDI ESTEVADEORDAL, ISSI — The flow field due to blade-row interactions in turbomachinery includes phenomena producing unsteadiness and losses that affect the turbomachine performance. PIV techniques have been very useful in the past for identifying and understanding these phenomena that include shocks, wakes and vortices. Most successful PIV approaches have relied on optical probes inserted in modified stator blades or in the flow field to deliver the laser sheet inside the various internal regions of the blade-rows. These approaches have important drawbacks, such as probe intrusiveness, shadows in areas of interest and expensive glass windows. A new design that focuses on minimizing intrusiveness, effective laser delivery inside all regions of interest, and economical receiving windows is presented. The design of the PIV blades allows for small optics to be embedded inside with the location, size, and shapes determined through analysis of the flow path and CFD techniques. The optical performance of the design is tested in full scale models. An economical and fast technique based on rapid machining of transparent acrylic material for receiving windows is also presented. The design of the system is outlined and results from application to a transonic axial compressor presented.

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