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Turbine Blade Aero-elastic Mode Estimates from Blade Image Velocimetry¹ THOMAS APKER, MIKRUT PAUL, SCOTT MORRIS, THOMAS CORKE, University of Notre Dame — Blade Image Velocimetry (BIV) is a method of using a Particle Image Velocimetry (PIV) laser and optics to observe the motion of the unsupported end (tip) of a finite-length turbine blade in a rotating stage of a gas turbine that is undergoing linear aeroelastic deformation. The objective is to infer the combination of bending modes of the blade based on the tip motion. The projection from the tip motion to the full blade motion is made by calculating the eigenmodes of the simply supported geometry, and the inverse of their projection onto the tip space. From this, an individual BIV image can be used to estimate the instantaneous motion of the beam. A sequence of images can be used to estimate relative modal amplitudes. The steps to achieve this will be presented. Validation will come by comparing estimates made by the BIV method with direct measurements of the full motion of a self excited turbine blade obtained using a laser vibrometer.

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