Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Volumetric Velocity Fields Downstream of a 2-Bladed Turbine DANIEL TROOLIN, TSI Inc. Fluid Mechanics Research Instruments — Tip vortices of axial-flow turbines are important in understanding the mean and turbulent characteristics of the wake. Volumetric 3-component velocimetry (V3V) was used to examine the flow downstream of a model two-bladed turbine in air. The turbine had a diameter of 177.8 mm and was powered by a motor operating at approximately 150 rpm. The measurement volume (50 x 50 x 20 mm) was positioned approximately 5 mm downstream of the blade tip, in order to examine the tip vortex structure. The V3V system utilized three 4MP cameras with 85mm lenses positioned in a fixed triangular frame located at a distance of 450 mm from the back of the measurement volume. The illumination source was a 200 mJ dual-head pulsed Nd:YAG laser operating at 7.25 Hz and illuminating 1 micron olive oil droplets as tracer particles. The particle images were then analyzed to produce volumetric vector fields. The focus was placed on visualizing the complex interaction between the turbine tip vortices. Insights on the tip vortex dynamics and three dimensional characteristics of the wake flow will be discussed.

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Date submitted: 01 Aug 2013 Electronic form version 1.4