

Abstract Submitted  
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**Effective solidity in vertical axis wind turbines** COLIN M. PARKER, MEGAN C. LEFTWICH, The George Washington University — The flow surrounding vertical axis wind turbines (VAWTs) is investigated using particle imaging velocimetry (PIV). This is done in a low-speed wind tunnel with a scale model that closely matches geometric and dynamic properties of a full size turbine. Previous results have shown a strong dependence on the tip-speed ratio and Reynolds number on the wake structure of the spinning turbine. However, it is not clear whether this is a speed or solidity effect. To determine this, we have measured the wakes of three turbines with different chord-to-diameter ratios, and a solid cylinder. The flow is visualized at the horizontal mid-plane as well as the vertical mid-plane behind the turbine. The results are both ensemble averaged and phase averaged by syncing the PIV system with the rotation of the turbine. By keeping the Reynolds number constant with both chord and diameter, we can determine how each affects the wake structure. As these parameters are varied there are distinct changes in the mean flow of the wake. Additionally, by looking at the vorticity in the phase averaged profiles we can see structural changes to the overall wake pattern.

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