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Photon Doppler Velocimetry Measurements of Transverse Surface Velocities CHRISTOPHER R. JOHNSON, JEFF LAJEUNESSE, PETER SABLE, ASHLEY HATZENBIHLER, JOHN P. BORG, Marquette Univ — Photon Doppler Velocimetry (PDV) is a prominent optical diagnostic used for measuring displacement or velocity in dynamic experiments. A table-top experiment consisting of a 31mm diameter metal wheel mounted in a hand tool was setup to make steady state transverse surface velocity measurements using PDV for a range of velocities and surface preparations. The experiment consisted of PDV collimators positioned with respect to either the side or bottom face of the wheel at various angles to resolve transverse velocity components. Different preparations for the surface of the wheel were explored such as polishing, laser etching, chemical etching, mechanical milling, and retroreflective microspheres. Light return and transverse surface velocity were recorded for each surface preparation as a function of angle. Polished aluminum allowed adequate light return for only one degree from the normal of the wheel, while the retroreflective microspheres exhibited usable light for upwards of 30 degrees. Velocity measurements were performed over a range of 0 to 45 degrees from the surface normal of the rotating wheel for each surface preparation. Velocity measurements from the PDV experiments show good accuracy with theoretical wheel velocities between 0 and 10 m/s.

Christopher R. Johnson
Marquette Univ

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