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PIV Measurements of Laminar and Turbulent Channel Flow with Superhydrophobic Walls BRADY WOOLFORD, JOSEPH PRINCE, DANIEL MAYNES, BRENT WEBB, Brigham Young University — We report PIV measurements characterizing laminar and turbulent flow in a channel with a superhydrophobic bottom wall. The superhydrophobic wall is fabricated with micro-ribs and cavities that are oriented parallel and transverse to the flow direction and are subsequently coated with a hydrophobic coating. As a basis for comparison measurements were also made in a channel with smooth walls. The measurements span the Reynolds number range from 1000 to 7500. The channel hydraulic diameter is 8.3 mm with an aspect ratio of 10. The widths of the micro-ribs and cavities were 7.2 and 33 μm, respectively, with a depth of 15 μm. The PIV data captured aggregate velocities over multiple rib/cavity modules, such that a spanwise averaged velocity profile was obtained at the channel centerline. These measurements permitted characterization of the effective slip-velocity on the superhydrophobic wall in the laminar and turbulent flow regimes. The results for the laminar flow regime reveal no discernible slip velocity. In the turbulent flow regime, however, measurable slip was observed. Results presented include detailed time-averaged velocity, rms velocity, and the turbulent stress distributions.

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