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High resolution PIV of flow over biofilm covered walls JOEL HARTENBERGER, MARC PERLIN, STEVEN CECCIO, University of Michigan — Microbial, 'slime' biofilms detrimentally affect the performance of engineered systems used every day from heat exchangers to large ocean-going vessels. The presence of a slime layer on a pipe wall or external boundary often leads to a significant increase in drag and may alter the nature of the turbulence in the adjacent flow. Despite these consequences, relatively few efforts have been undertaken to understand the underlying physical processes which couple biofilm characteristics with increased drag and other alterations to the flow. Experiments performed in a 1:14 scale replica of the US Navy's Large Cavitation Channel (LCC) at the University of Michigan investigate the effect of biofilm composition, coverage and thickness on the development of an external turbulent boundary layer (TBL) through the use of conventional and micro PIV. A range of fields of view (FOVs) were used to capture both the inner and outer regions of the boundary layer. The fine resolution of micro PIV gives an in-depth look at the near-wall region of the flow and may provide evidence linking specific biofilm features with flow characteristics while the less resolved, larger FOVs capture flow behavior to the freestream. Measurement techniques used to characterize the biofilm will be presented along with a description of the mean flow and turbulent fluctuations in the TBL.

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