

Abstract Submitted
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Effects of Roughness on Turbulence Spectra and Correlation Measurements¹ RALPH J. VOLINO, MICHAEL P. SCHULTZ, KAREN A. FLACK, U. S. Naval Academy — Zero pressure gradient, fully-developed, turbulent boundary layers have been documented on a smooth flat plate and a fully rough surface in a water tunnel facility. The roughness is produced using a wire mesh affixed to the surface. Profiles of the streamwise and wall-normal velocity components were acquired using laser Doppler velocimetry (LDV). Additional LDV data were acquired with high sampling rates at two locations in the profiles, corresponding to $y/\delta_{99} = 0.1$ and $y/\delta_{99} = 0.4$. From these data, turbulence spectra of the Reynolds normal stresses and shear stress are computed. Flow field measurements were also made using digital particle image velocimetry (PIV) in streamwise planes both normal to the surfaces and parallel to the surfaces. From the PIV data, two point correlations of the turbulence quantities are computed. The presentation will focus on the similarities and differences between the spectra and correlations on the rough and smooth walls, adding to comparisons of mean flow and turbulence statistics between rough and smooth surfaces presented previously.

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