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Skin-Friction Measurements on Mathematically Generated Roughness in a Turbulent Channel Flow JULIO BARROS[1], MICHAEL SCHULTZ[2], KAREN FLACK[3], United States Naval Academy — Engineering systems are affected by surface roughness, however, predicting frictional drag has proven to be challenging. One open question is how roughness topography, whether it is idealized 2D and 3D or irregular with multi-scale features, impacts the frictional drag. A previous study from Flack and Schultz (2010) presented a new model to estimate frictional drag based on surfaces statistics. The present work takes a systematic approach by generating and manufacturing surfaces roughness where surface statistics, such as *rms*, skewness and power-spectral density can be controlled. Skin-friction measurements are conducted in a high Reynolds number turbulent channel flow facility, where the experiments cover all roughness regimes, from hydraulic-smooth to fully-rough. The surface roughness studied herein is produced using the random Fourier modes method with a varying power-law spectral slope, whereas the *rms* and surface amplitude are kept constant ($k_{rms} \sim 45\mu$m and $k_t \sim 200\mu$m) while still possessing a Gaussian probability-density-function. These surfaces are then 3D-printed and replicated using a mold/cast technique to generate the top and bottom walls of the channel flow facility.

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