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A turbulent boundary layer on a rough wall at hypersonic speeds DIPANKAR SAHOO, PARTHAV DESAI, ALEXANDER SMITS, Princeton University — Previous experiments on hypersonic turbulent boundary layers have documented the general features of the mean flow behavior on a smooth plate, but virtually no data exist describing the boundary layer behavior on a rough wall for Mach numbers greater than about 5. Here, we report PIV measurements of the mean flow and two components of velocity fluctuations on a flat plate with three different roughness geometries: a square bar roughness, and two diamond roughness elements of different height. The boundary layer develops at Mach 7.2 in a perfect gas, at a Reynolds number based on momentum thickness of about 3600. The results are compared with DNS under identical flow conditions. Supported under NASA Grant NNX08AB46A, Program Manager Catherine McGinley.

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