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Helium injection in a turbulent boundary layer at hypersonic speeds PARTHAV DESAI, DIPANKAR SAHOO, ALEXANDER SMITS, Department of Mechanical and Aerospace Engineering, Princeton University — Low level of helium injection into a transitional or turbulent boundary layer can have substantial effect on the boundary layer structure, as shown by Auvity, Etz, Smits (Physics of Fluids, Vol 13 no 10, 2001) for the flow over a flat plate at Mach 8. Here, we report the results of additional experiments to study the effects of helium injection on the turbulence statistics and the wall heat flux. We use PIV to obtain the velocity fields, and infrared thermography to derive the wall heat transfer distribution. The helium is injected through a slot just downstream of the trip wire, and the ratio of the momentum flux of the helium to that of the freestream flow is varied from 0 to about 0.16, as in the case of Auvity et al. Supported under NASA Grant NNX08AB46A, Program Manager Catherine McGinley.

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