Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Numerical investigation of non-equilibrium effects in hypersonic turbulent boundary layers PILBUM KIM, JOHN KIM, XIAOLIN ZHONG, JEFF ELDREDGE, University of California, Los Angeles — Direct numerical simulations of a spatially developing hypersonic boundary layer have been conducted in order to investigate thermal and chemical non-equilibrium effects in a hypersonic turbulent boundary layer. Two different flows, pure oxygen and pure nitrogen flows with specific total enthalpy, $h_{0,O_2} = 9.5017\,MJ/kg$ and $h_{0,N_2} = 19.1116\,MJ/kg$, respectively, have been considered. The boundary edge conditions were obtained from a separate calculation of a flow over a blunt wedge at free-stream Mach numbers $M_{\infty,O_2} = 15$ and $M_{\infty,N_2} = 20$. The inflow conditions were obtained from a simulation of a turbulent boundary layer of a perfect gas. Non-equilibrium effects on turbulence statistics and near-wall turbulence structures were examined by comparing with those obtained in a simulation of the same boundary layer with a perfect-gas assumption.

Pilbum Kim
University of California, Los Angeles

Date submitted: 31 Jul 2014 Electronic form version 1.4