Abstract Submitted
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Study of shock-shock interactions for a Double Wedge using the DSMC Approach[1] DEBOAH LEVIN, VARUN PATIL, Penn State University, SERGEY GIMELSHEIN, University of Southern California, JOANNA AUSTIN, University of Illinois, Urbana-Champaigne — The Direct Simulation Monte Carlo (DSMC) method, an approach for modeling finite-Knudsen number flows is being used to study the laminar, shock-shock interactions from hypersonic flows about a double-wedge configuration in the Hypervelocity Expansion Tube (HET) facility. The study focuses on the investigation of Mach 7 nitrogen flows about a 30-/55-deg double wedge model for stagnation enthalpy of 8.0 MJ/kg. Schlierens are generated to visualize the shock structure and shock-shock interactions present in these flows and are compared with the experimental images. The computed heat transfer values from the simulations match the experiment along the first surface, but on the second wedge the computed heat transfer distribution over predicts the measured peak values. The influence of different models for nonequilibrium nitrogen dissociation, rotational and vibrational relaxation rates, and gas-surface interactions on the shock interaction region are analyzed for high enthalpy flow features and heat transfer rates. Overall good agreement is observed in the experimental and computational results. Studies are being performed related to flow unsteadiness and three-dimensional affects to resolve remaining discrepancies between measurements and modeling.

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