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Dissecting Shock-Boundary Layer Interaction in Hypervelocity Flow¹

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Flying at velocities where the kinetic energy is comparable to the dissociation energy of the surrounding atmosphere leads to complex, nonlinear coupling between the flowfield and the gas thermochemistry. Shock-boundary layer interactions in such hypervelocity conditions are highly dynamically sensitive to this energy exchange and present significant predictive challenges. This presentation discusses our recent work in probing the flowfield directly, moving beyond surface measurements, in experiments carried out in two high-enthalpy facilities. Unique spectroscopic measurements of post-shock dissociated species and vibrational temperatures are coupled with high-speed flow structure visualizations to examine these time-dependent, nonequilibrium interactions.

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