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**Mach number and particle size effects on unsteady drag of microparticles behind a shock wave** ANKUR BORDOLOI, ADAM MARTINEZ, KATHY PRESTRIDGE, Los Alamos National Laboratory — The physics underlying to the unsteady drag of shock accelerated microparticles through the relaxation zone remain mysterious due to the lack of models that are relevant over length and time scales larger than the acoustic times. Experiments at the Horizontal Shock Tube (HST) have shown that the time dependent drag coefficient, $C_D(t)$ of a microparticle behind a shock wave can rise to orders of magnitude larger than values predicted by existing quasi-steady and unsteady drag models. In this presentation, we will extend our investigation by probing the sensitivity of drag to particle size and shock Mach number. The particle displacement relative to the shock is optically measured in the HST using high-speed microscopic Particle Tracking Velocimetry (PTV) synchronized with a shadowgraph system. The challenge of in-situ dynamic size measurement is overcome by using a Phase Doppler Particle Analyzer (PDPA). Time dependent drag coefficient is obtained by analyzing about 50 trajectories for incident Mach numbers, Ms = 1.2, 1.3, 1.4 and 1.5. With finer temporal resolution and more accurate particle size measurement than before, we will show that the early post-shock relaxation phase is Mach-sensitive in a systematic way before the particle relaxes to the post-shock gas velocity.

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