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Laboratory Studies of High Mach Number Shock Collisions with Foils and Density Discontinuities. MATTHIAS HOHENBERGER, R. CARLEY, J. LAZARUS, J. CHITTENDEN, R.A. SMITH, Imperial College, London — The dynamics of strong shocks, blast waves and radiative blast waves play a key role in astrophysical objects such as nebulae and supernova remnants. Our understanding of these complex systems is underpinned by numerical simulations, however despite decades of work modeling of such phenomena remains extremely challenging. The interaction of strong shocks with discontinuities and reflecting surfaces represents a particularly demanding scenario against which to test rad-hydrocodes. As a result we have been developing scaled laboratory experiments to provide high quality data for code benchmarking, and to aid our physical insight. We report on experimental and numerical investigations into the interaction of strong shocks and blast waves with solid obstructions and density discontinuities. Shocks were driven by focusing a high intensity 750fs laser into a near atmospheric density atomic cluster medium at 10E17 W/cm^2. Placing a solid foil in the gas stream used to create clusters produced a hydrodynamic bow shock, allowing us to investigate both shock-foil and shock-density discontinuity interactions. Shock evolution was followed as a function of time with an optical probe via Schlieren and interferometric imaging techniques. Numerical modeling of our experimental test system was carried out using the 3D magnetoresistive hydrocode GORGON.

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