Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Gas and particle motions in a rapidly decompressed flow BLAIR JOHNSON, HEATHER ZUNINO, RONALD ADRIAN, AMANDA CLARKE, Arizona State Univ — To understand the behavior of a rapidly decompressed particle bed in response to a shock, an experimental study is performed in a cylindrical (D = 4.1 cm) glass vertical shock tube of a densely packed (ρ = 61%) particle bed. The bed is comprised of spherical glass particles, ranging from D50 = 44-297 μm between experiments. High-speed pressure sensors are incorporated to capture shock speeds and strengths. High-speed video and particle image velocimetry (PIV) measurements are collected to examine vertical and radial velocities of both the particles and gas to elucidate features of the shock wave and resultant expansion wave in the lateral center of the tube, away from boundaries. In addition to optically analyzing the front velocity of the rising particle bed, interaction between the particle and gas phases are investigated as the flow accelerates and the particle front becomes more dilute. Particle and gas interactions are also considered in exploring mechanisms through which turbulence develops in the flow. This work is supported by the U.S. Department of Energy, National Nuclear Security Administration, Advanced Simulation and Computing Program, as a Cooperative Agreement under the Predictive Science and Academic Alliance Program, under Contract No. DE-NA0002378.

Blair Johnson
Arizona State Univ

Date submitted: 31 Jul 2017 Electronic form version 1.4