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Using a light-gas gun for ultrafast, dynamic experiments at the Advanced Photon Source

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A 12-mm bore light-gas gun was developed for dynamic experiments at the Advanced Photon Source (Argonne National Laboratory). The gun system capable of reaching projectile velocities up to 1-km/s was designed to be portable for quick insertion/removal in the experimental hutch at Sector 32 ID-B while allowing the target chamber to rotate for sample alignment with the beam. The target chamber is equipped with auto-vent valves and flanges to prevent pressurization during the experiment. A key challenge in using the gun system to acquire dynamic data on the nanosecond time scale was synchronization (or bracketing) of the impact event with the incident X-ray pulses. A detailed description of the gun system along with experiment results obtained from qualification tests and synchrotron experiments that use phase contrast imaging (PCI) and X-ray Laue diffraction methods will be presented.