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Non-Invasive Timing of Gas Gun Projectiles with Light Detection and Ranging[1] PETER GOODWIN, Center for Integrated Nanotechnologies (MPA-CINT), Los Alamos National Laboratory, MING WU, Sandia National Laboratory, DANA DATTELBAUM, Shock and Detonation Physics (WX-9), Los Alamos National Laboratory — We have developed a Light Detection and Ranging (LIDAR) diagnostic to track the position of a projectile inside of the gas gun barrel in real-time. This capability permits the generation of precisely timed trigger pulses useful for pre-triggering high-latency diagnostics such as a flash lamp-pumped laser. An initial feasibility test was performed using a 72 mm bore single-stage gas gun routinely used for dynamic research at Los Alamos National Laboratory. A 655-nm pulsed ($\sim$ 100 ps) diode laser operating at a pulse repetition rate of $\sim$100 kHz was used to interrogate the position of the moving projectile in real-time. The position of the projectile in the gun barrel was tracked over a distance of $\sim$3 meters prior to impact. The position record showed that the projectile moved at a constant velocity (483 m/s) prior to impacting the target. This velocity was in good agreement with independent measurements of the projectile velocity by photon Doppler velocimetry, and timing of the passage of the projectile through optical marker beams positioned at the muzzle of the gun. The LIDAR return can be processed in real-time to generate pre-trigger pulses at preset separations between the projectile and target.

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