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Down-Bore Two-Laser Heterodyne Velocimetry of an Implosion-Driven Hypervelocity Launcher MYLES HILDEBRAND, JUSTIN HUNEAULT, JASON LOISEAU, McGill University, ANDREW J. HIGGINS, McGill Univ — The implosion-driven launcher uses explosives to shock-compress helium, driving well-characterized projectiles to velocities exceeding 10 km/s. The masses of projectiles range between 0.1 – 10 g, and the design shows excellent scalability, reaching similar velocities across different projectile sizes. In the past, velocity measurements have been limited to muzzle velocity obtained via a high-speed videography upon the projectile exiting the launch tube. Recently, Photonic Doppler Velocimetry (PDV) has demonstrated the ability to continuously measure in-bore velocity, even in the presence of significant blow-by of high temperature helium propellant past the projectile. While a single-laser PDV is limited to approximately 8 km/s, a two-laser PDV system is developed that uses two lasers operating near 1550 nm to provide velocity measurement capabilities up to 16 km/s. The two laser PDV system is used to obtain a continuous velocity history of the projectile throughout the entire launch cycle. These continuous velocity data are used to validate models of the launcher cycle and compare different advanced concepts aimed at increasing the projectile velocity to well beyond 10 km/s.

Myles Hildebrand
McGill University

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