Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Analysis of Detonation Driving Zone in Condensed-Phase High Explosives at Varied Confinements STEPHEN VOELKEL, CARLOS CHIQUETE, MARK SHORT, Los Alamos National Laboratory — Lateral yielding of confiners used in detonations of condensed-phase high explosives (HEs) introduces streamline divergence into the flow and subsequently reduces the steady detonation's phase velocity to below its planar Chapman-Jouguet (CJ) limit. The resulting phase velocity is determined by the subsonic flow region behind the shock front, denoted the detonation driving zone (DDZ). The DDZ itself is dependent on the HE material properties, the thickness of the charge, and the confiner properties. Holding all else equal, at infinite thickness the phase velocity approaches the CJ limit. As the thickness decreases, so to does the phase velocity until the thickness reaches some critical value, below which the detonation is unable to sustain itself. In this work, we consider an idealized HE material and simulate steady detonations over a wide range of confinements. For each confinement, simulations at varied thicknesses between the CJ and critical limits are performed and analyzed. Correlations of the DDZ with the phase velocity are presented, with a specific focus on structures and relations that are independent of the confinement. Furthermore, we show that properties within the DDZ correlate with the critical thickness.

Stephen Voelkel
Los Alamos National Laboratory

Date submitted: 26 Jul 2019 Electronic form version 1.4