

Abstract Submitted
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Geometric Relations for CYLEX Test Tube-Wall Motion¹ LARRY HILL, Los Alamos National Laboratory — The CYLinder EXpansion (CYLEX) test is a (precision, instrumented, high-purity annealed copper) pipe bomb. Its essential measured quantities are detonation speed and tube-wall motion. Its main purpose is to calibrate detonation product equations of state (EOS) by measuring how product fluid pushes metal. In its full complexity, CYLEX is an integral test, for which EOS calibration requires the entire system to be computationally modeled and compared to salient data. Stripped to its essence, CYLEX is a non-integral test for which one may perform the inverse problem, to infer the EOS directly from data. CYLEX analysis can be simplified by the fact that the test constituents achieve a steady traveling wave structure; this allows derivation of several useful geometric relationships regarding tube wall motion. The first such treatment was by G.I. Taylor. Although his analysis was limited to small wall deflection angles, he asserted that the results remain valid for arbitrary ones. I confirm this attribute and present additional useful relationships. In the past decade, CYLEX wall-motion instrumentation has migrated almost entirely from streak camera to PDV, yet discrepancies remain between the two methods. I further present geometric relationships that shed light on this issue.

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