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**Observation and modeling of deflagration-to-detonation (DDT) transition in low-density HMX**[1] JOSEPH TRINGE, KEVIN VANDERSALL, JACK REAUGH, HAROLD LEVIE, Lawrence Livermore National Laboratory, BRYAN HENSON, LAURA SMILOWITZ, GARY PARKER, Los Alamos National Laboratory — We employ simultaneous flash x-ray radiography and streak imaging, together with a multi-phase finite element model, to understand deflagration-to-detonation transition (DDT) phenomena in low-density ($\sim$ 1.2 gm/cm$^3$) powder of the explosive cyclotetramethylene-tetranitramine (HMX). HMX powder was lightly hand-tamped in a 12.7 mm diameter column, relatively lightly-confined in an optically-transparent polycarbonate cylinder with wall thickness 25.4 mm. We observe apparent compaction of the powder in advance of the detonation transition, both by x-ray contrast and by the motion of small steel spheres pre-emplaced throughout the length of explosive. High-speed imaging along the explosive cylinder length provides a temporally continuous record of the transition that is correlated with the high-resolution x-ray image record. Preliminary simulation of these experiments with the HERMES model implemented in the ALE3D code enables improved understanding of the explosive particle burning, compaction and detonation phenomena which are implied by the observed reaction rate and transition location within the cylinder.

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Joseph Tringe
Lawrence Livermore National Laboratory

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