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Close-in Blast Waves from Spherical Charges* WILLIAM HOWARD, ALLEN KUHL, LLNL — We study the close-in blast waves created by the detonation of spherical high explosives (HE) charges, via numerical simulations with our Arbitrary-Lagrange-Eulerian (ALE3D) code. We used a finely-resolved, fixed Eulerian 2-D mesh (200 μm per cell) to capture the detonation of the charge, the blast wave propagation in air, and the reflection of the blast wave from an ideal surface. The thermodynamic properties of the detonation products and air were specified by the Cheetah code. A programmed-burn model was used to detonate the charge at a rate based on measured detonation velocities. The results were analyzed to evaluate the: (*i*) free air pressure-range curves: $\Delta p_s(R)$, (*ii*) free air impulse curves, (*iii*) reflected pressure-range curves, and (iv) reflected impulse-range curves. A variety of explosives were studied. Conclusions are: (*i*) close-in ($R < 10\ cm/g^{1/3}$), each explosive had its own (unique) blast wave (e.g., $\Delta p_s(R,\ HE) \sim a/R^n$, where n is different for each explosive); (*ii*) these close-in blast waves do not scale with the "Heat of Detonation" of the explosive (because close-in, there is not enough time to fully couple the chemical energy to the air via piston work); (*iii*) instead they are related to the detonation conditions inside the charge. Scaling laws will be proposed for such close-in blast waves. *This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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