Abstract Submitted
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Experimental and computational investigation of microwave interferometry (MI) for detonation front characterization[1] ROBERT REEVES, OWEN MAYS, JOE TRINGE, CLARK SOUERS, LISA LAUDERBACH, EMER BALUYOT, MARK CONVERSE, RON KANE, Lawrence Livermore National Laboratory — Microwave interferometry (MI) presents several advantages over more traditional existing shock and deflagration front diagnostics. Most importantly, it directly interrogates these fronts, instead of measuring the evolution of containment surfaces or explosive edges. Here we present the results of MI measurements on detonator-initiated cylinder tests, as well as on deflagration-to-detonation transition experiments, with emphasis on optimization of signal strength through coupling devices and through microwave-transparent windows. Full-wave electromagnetic field finite element simulations were employed to better understand microwave coupling into porous and near full theoretical maximum density (TMD) explosives. HMX and TATB-based explosives were investigated. Data was collected simultaneously at 26.5 GHz and 39 GHz, allowing for direct comparison of the front characteristics and providing insight into the dielectric properties of explosives at these high frequencies. MI measurements are compared against detonation velocity results from photonic Doppler velocimetry probes and high speed cameras, demonstrating the accuracy of the MI technique. Our results illustrate features of front propagation behavior that are difficult to observe with other techniques.

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