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Detonation Wave Profiles in Plastic Bonded Explosives Measured using 1550 nm Heterodyne Velocimetry RICK GUSTAVSEN, Los Alamos National Laboratory — We have measured detonation wave profiles in several triaminotrinitrobenzene (TATB) and cyclotetramethylene tetranitramine (HMX or octogen) based plastic bonded explosives using 1550 nm Heterodyne Velocimetry. (Heterodyne Velocimetry is also called Photon Doppler Velocimetry or PDV.) Planar detonations were produced by impacting the explosive with projectiles launched in a gas gun. Particle velocity wave profiles were measured at the mirror/interface of the explosive and either a LiF or PMMA window. Mirrors consisted of either a thin vapor deposited aluminum layer, or a 6 micron thick aluminum foil. Focusing and collimating light collection probes were used. Time-Frequency-Analysis of the fringe data was carried out using both Wavelet and Short-Time-Fourier-Transform (STFT) methods. With clean fringe data, good profiles can be obtained with a 1 ns full width half maximum (FWHM) analysis window (STFT) or about 3 to 4 oscillations in the wavelet. Some profiles, however, have a noisy character which is correlated with intensity fluctuations in the raw fringe data. Wave profiles show a ZND reaction zone structure with a single reaction in the HMX based explosives and both fast and slow reactions in the TATB based explosives.

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