Abstract Submitted
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Fiber Bragg Sensing of High Explosive Detonation Experiments at Los Alamos National Laboratory[1] GEORGE RODRIGUEZ, RICHARD SANDBERG, SCOTT JACKSON, SAMUEL VINCENT, QUINN MCCULLOCH, Los Alamos National Laboratory, ERIC UDD, Columbia Gorge Research — An all optical-fiber-based approach to measuring high explosive detonation front position and velocity is described. By measuring total light return using an incoherent light source reflected from a fiber Bragg grating sensor in contact with the explosive, dynamic mapping of the detonation front position and velocity versus time is obtained. We demonstrate three calibration procedures and provide several examples of detonation front measurements: PBX 9502 cylindrical rate stick, radial detonation front in PBX 9501, PBX 9501 detonation along curved meridian line, and detonation along a multi-HE cylindrical rate stick containing sections of PBX 9501, Comp B, TNT, PBX 9407, PBX 9520, and inert PMMA. In the PBX 9501 cylindrical rate stick measurement, excellent agreement with complementary diagnostics (electrical pins and streak camera imaging) is achieved, demonstrating accuracy in the detonation front velocity to below the 0.3% level when compared to the results from the pin data. Operating with components based on telecommunications technologies at 1550 nm, we believe this approach offers an attractive, safe, and affordable alternative for time continuous recording of HE detonation front sensing when compared existing methods.

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