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Fiber-interferometric detection of gun-launched projectiles PETER GOODWIN, Los Alamos National Laboratory, BRUCE MARSHALL, National Security Technologies, LLC, RICHARD GUSTAVSEN, JOHN LANG, ADAM PACHECO, ERIC LOOMIS, DANA DATTELBAUM, Los Alamos National Laboratory — We are developing a new diagnostic useful for the non-invasive detection of projectile passage in the launch tube of a gas gun. The sensing element consists of a fiber-loop that is epoxy-bonded around the external circumference of launch tube. The hoop strain induced in the launch tube by the passage of the projectile causes a momentary expansion of the fiber loop. This transient change in path length is detected with high sensitivity using a fiber-optic based interferometer developed by the NSTec Special Technologies Laboratory. We have fielded this new diagnostic, along with fiber-Bragg grating (FBG) strain gauges we previously used for this purpose, on a variety of light gas guns used for shock compression studies at Los Alamos. Our preliminary results show that the fiber interferometer has improved sensitivity and dynamic range compared that of the FBG strain gauge approach. Moreover, the interferometric approach requires no hands-on alignment immediately prior to the experiment and is therefore easier to implement. Both approaches provide early, pre-event signals useful for triggering high-latency diagnostics.

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