

FIBER OPTIC DETONATION VELOCITY MEASUREMENT SYSTEM

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A new system, has been developed and validated for the measurement of detonation velocities within an explosive. The advantage of making this measurement is that explosive detonation symmetry and detonation characteristics of theoretical calculation is confirmed. The system is based on the use of fiber optic cables and measuring the light created by the ionization of gases produced by the detonation front.

This system is low in cost since multiple measurements are made on one fiber optic cable. One measurement is made on the on-axis of the fiber element, while the remainder are made on the cross-axis of the element. It has been shown that up to 22 separate time-of-arrival detonation detections have been made on a single fiber optic cable.

Advances in technology have led to the fielding of one channel (approximately 25 measurements) of this system for less than \$500 (US) per channel. The advances have allowed for production of photo-diode units which convert the photo signal to an analog signal at a lower cost than was previously acceptable.

Signal to noise ratios are conquered by the use of argon filled microspheres. The addition of these devices, at the point of measurement, increase the signal received by over a factor of 10. Therefore points of interest are easily distinguished from the noise.

In the last full scale test of this system, 129 measurements were attempted. Slightly over 100 of these measurements were successful with the majority of the failure attributed to one mishandle cable. When the data acquired from this system was compared to an expensive digital system also fielded a maximum discrepancy of only 6% was obtained.