Science and Technology

TRANSPORTATION SECURITY & EXPLOSIVES CHARACTERIZATION

IN-SITU EXPLOSION SHOCKWAVE SENSOR

AN IMPACT SENSOR DEVICE AND METHOD TO MEASURE MULTIPLE EXPLOSION REACTION ZONE DATA POINTS IN REAL-TIME DURING LIVE EXPLOSIVE TESTING EXPERIMENTS

Measuring how explosion shockwaves behave in different materials is key to studying their potential impact on surrounding areas. Traditional methods utilize flash x-rays, embedded pressure gauges, or timing pins. These methods become cost-prohibitive or technically inadequate in large-scale explosion experiments that exceed 100 pounds of explosive material.

The Fiber Light Relay System (FLRS) is an explosion impact sensor and software system that provides a simple, cost-effective method to collect and analyze shock measurements. When the explosive detonates, the fiber optic cable relays the shock output to a camera where the data is collected to calculate shock velocity and shock wave shape. This system can record data from hundreds of points with one or two cameras while the python software provides an accurate picture of the shock wave shape and travel behavior.

KEY BENEFITS

+ Reduces costs for large explosive testing
+ Supports high-volume data collection from a single detonation
+ Minimal set up time compared to traditional methods
+ Simple operation that does not require advanced skill

STAGE OF DEVELOPMENT

Proven System

PARTNERSHIP SOUGHT

License

INVENTORS

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DHS COMPONENT

Science and Technology Directorate

The Technology Transfer and Commercialization Branch (T2C) within the Office of Industry Partnerships (OIP) of the Department of Homeland Security (DHS) Science and Technology Directorate (S&T) serves as the centralized point to manage technology transfer activities throughout DHS and the DHS laboratory network. **T2C@hq.dhs.gov**

THE TECHNOLOGY

FLRS collects shock front time-of-arrival from multiple angles during a single experiment. Each individual time point can be used to calculate the shock velocity and shape. An anchor plate on both the interior and exterior side of the explosive charge wall attaches the optical fiber to the charge wall. The two anchor plates are fixed to the wall using quick-connect zip ties. This assembly is quick to install and requires minimal skill.

The sensor consists of a fiber optic cable securely attached to the explosive charge wall or to a panel adjacent to the explosive material. The optical fiber fixed to the charge wall relays the shock to a high-speed video camera through a patch panel. The fiber locations and light arrival are captured by the camera and a software program is used to calculate the detonation shock properties such as travel speed and shape.

FLRS sensor assemblies embedded into explosives

APPLICATIONS

The technology has several potential end-users:

+ **Explosives research and development personnel**
+ **Demolition experts**
+ **Underground mine or quarry operators**

PATENT INFORMATION

US Patent numbers 11,768,117

CONTACT INFORMATION

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TECHNOLOGY SOLUTION

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https://www.dhs.gov/science-and-technology/technology-transfer-program