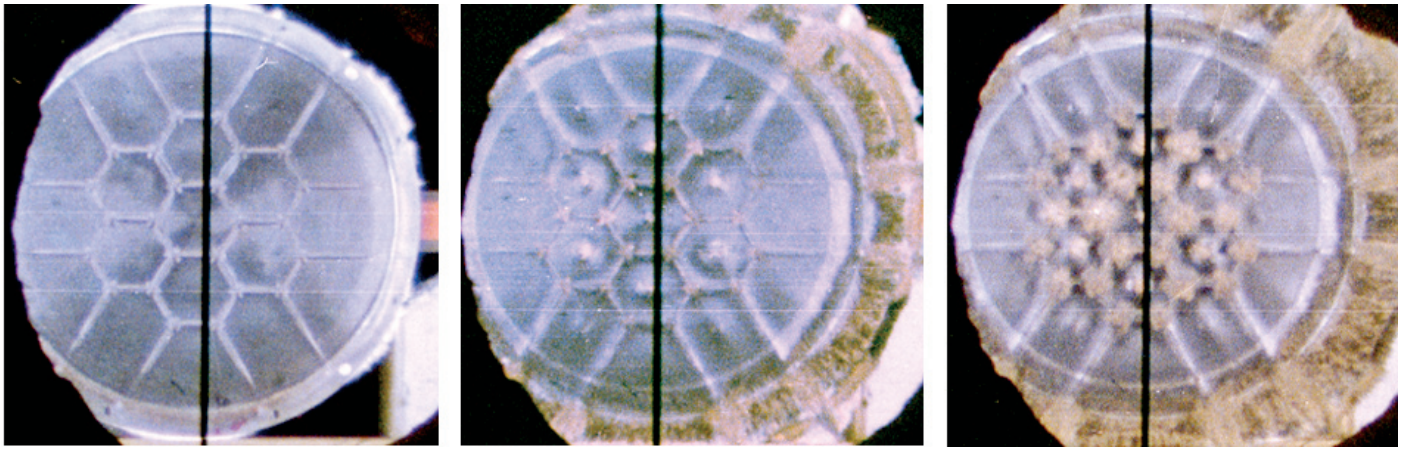
Air Force SBIR

Transition Impact

Intense Visible Pulsed Plasma Light Source for Test Instrumentation



High speed photography of the front of a fragmenting plate (or warhead) taken in sequence within a 7 microseconds time period.

- **Ultra high-speed imaging is an essential diagnostic for testing new warhead systems**
- **SBIR supported technology resulted in development of an intense plasma discharge light source that dramatically improves testing flexibility and safety while eliminating collateral damage and waste products from traditional light sources**

Air Force Requirements

Ultra high-speed imaging is an essential diagnostic during development of new warhead systems. Acquiring high resolution color images at 1,000,000 frames per second demands intense broadband illumination. The traditional light source, the argon candle, is an explosively driven shock wave in argon that radiates profusely but suffers many shortcomings – single shot lifetime, collateral damage from the explosion, hazardous waste byproducts, and significant standoff distances to avoid interfering with the tests. The Air Force sought a more flexible, benign replacement.

SBIR Technology

Prism Science Works developed an extremely intense plasma discharge light source, the MegaSun, as part of an Air Force SBIR project. It generates a large single pulse of intense white light sufficient to replace argon candles. Its inexpensive, modular, surface discharge lamps permit multiple set-up shots and foster flexible illumination geometries tailored to the experiment. The pulse-forming networks that drive the lamps can be adjusted for pulse durations ranging from 30 microseconds to one millisecond.

Prism Science Works won the prestigious SPIE 2000, Edgerton Award for the MegaSun technology. The citation observed that the MegaSun dramatically increased safety and quality of lighting in the high speed photography of detonation and explosive events and brings full circle “the strobe” as the tool for lighting in ultra high-speed photography. Among its advantages are the ability to perform dry runs to verify correct exposure, and the elimination of the damage and waste products produced by the exploding argon candles.

Air Force Transition Payoff

The dual flash system installed at Eglin Air Force Base is especially suited for capturing two important aspects of explosively formed projectile warheads. A short (30-70 microseconds) pulse illuminates the exploding warhead to capture formation aspects of the projectile. A second, separate flash (200-1000 microseconds) is positioned several meters downrange and delayed by a few milliseconds from the first system in order to document in-flight characteristics of the fully formed projectile.

The MegaSun system has expanded the photographic capabilities of the Eglin range by reducing shadowing, enlarging the range of items that can be easily filmed (e.g. long thin objects), illuminating several views in the same experiment, and providing light in highly constrained test configurations that were inaccessible with argon candles. With its easy setup and benign characteristics, the MegaSun reduces the valuable range time devoted to tests, resulting in significant cost savings.

SBIR Topic:
95-216

Title:
Intense Visible Pulsed Plasma Light Source for Test Instrumentation

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