High Speed Imaging for Detonation Science

S&T Campaign: Sciences for Lethality & Protection
Tier 2 Subtopic: Detonation Science

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Research Objective

• Utilize high speed imaging to measure optically pressure, temperature, and chemical species during explosive events.
• Use shockwave imaging to measure blast energy deposited on target.

Challenges

• Single shot mapping of all explosive parameters at real scale (several kg) to include peak shock pressure, surface temperature, chemical species at fireball surface
• Moving imaging frame rate from tens of kHz to MHz
• Active imaging (laser sheet probing at large scale)
• Ultra-high brightness femtosecond imaging
• Forcing metals to react in vicinity of detonation front

ARL Facilities and Capabilities Available to Support Collaborative Research

• Detonation Science Facility, Indoor/Outdoor Ranges, NEW to 20 kg.
• Low-parallax High Brightness Imaging Facility (unique to US).
• High Speed, High Definition framing cameras to 2.5 Mfps.
• Imaging emission spectroscopy.
• Charge formulation, manufacture, testing.
• Small scale testing of novel energetics.
• All classical explosive characterization tests (wedge, cylex, detonation velocity, etc.) performed.
• 4-channel Photonic Doppler Velocimetry (PDV) rig on site.
• Digital and film-based streak cameras.
• Full color, two-color imaging pyrometry

Examples of high speed imaging techniques applied to explosive events.

Example Publications (full list on request)


ARL open campus

AL Composites

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