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Imaging High Speed Particles in Explosive Driven Blast Waves[1]

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Researchers Mr. Charles Jenkins and Dr. Yasuyuki Horie at the High Explosive Research & Development (HERD) facility at Eglin AFB with sponsorship from DTRA has successfully imaged high speed explosively driven metallic particles. The process uses an adapted, commercially available Particle Image Velocimetry (PIV) instrument. Regional and particle flow vectors are determined from particle displacement between two images taken in rapid succession. The instrument consists of a 120 mJ, pulsed Nd:YAG laser, camera system, synchronizer, and proprietary imaging software. The new PIV capability provides the ability for scientists and engineers to map explosively driven metallic particles in a blast wave. Characteristics of particle motion, interaction and dispersion can be determined by this method, providing measurements of key parameters such as particle size, shape, velocity, and concentration. This new capability to image and track small (from a few microns to as large as several hundred microns) high-speed particles without direct intervention by physical means, ensures that the particles are unchanged in their environment and provides greater measurement accuracy of particle dynamics in very short time scales. The capability can also be used to map large areas (square feet) or to zoom down at higher magnifications to study particle features such as particle agglomeration.

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