

IIT-I, DRDO develop imaging tech to capture fast-moving particles

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Indore: The Indian Institute of Technology, Indore (IIT-I), in collaboration with the Defence Research and Development Organisation (DRDO), has developed an innovative high-speed imaging technique to capture high-resolution images of fast-moving particles during an explosion.

The technological advancement is seen facilitating a comprehensive understanding of the intricate dynamics of a detonation and the analysis of the impact of high-velocity particles in the aftermath of an explosion.

The new technique, using the principles of Digital Inline Holography, can capture images with exposure times as low as 50 nanoseconds and allows recording up to 700,000 frames per second, giving researchers a real-time look at how particles behave during an explosion, said IIT-I.

IIT-I is working in collaboration with DRDO on multiple projects and recently delivered 10 pairs of real-time location tracking shoes equipped with embedded Radio Frequency Identification (RFID) and Global Positioning System (GPS) trackers for armed forces.

Principal investigator of



the team, who developed the method to capture fast-moving particles, Professor Devendra Deshmukh, faculty at IIT Indore, said, "This approach allows for a much sharper and more detailed visualisation of objects even in dust or combustion cloud, overcoming one of the biggest limitations of previous methods. The captured images help to accurately extract information about the objects' velocity,

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acceleration, and distribution in space. This level of detail is essential for researchers who need to understand not just where the objects are, but how they move and behave in the chaotic aftermath of an explosion".

He said the core of this innovation is a high-frequency (HF) light source chosen for its ability to penetrate the dense dust clouds.

In defence research, the

ability to clearly visualise and analyse the behaviour of fragments after an explosion can lead to improvements in both offensive and defensive technologies. This breakthrough is equally valuable to the aerospace industry, where high-speed imaging is essential for studying everything from fuel spray patterns to the impact of debris on spacecraft, said IIT-I.

IIT-I director Professor Su-

has Joshi said, "What makes this method truly stand out is its ability to significantly enhance time resolution. While conventional methods were limited to 1 microsecond exposure times, this new technique can capture images with exposure times as low as 50 nanoseconds. This dramatic increase in time resolution allows for far more detailed tracking of fast-moving objects, even in environments filled with dust, smoke, or other visual obstructions".

The new technique can be used in industries to analyse very high-speed processes like material cutting and spray formation.