

Software processing of images recorded by the holographic method in shock-wave ejecta experiments

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The shock-wave “dusting” process is the ejection of a stream of particles from a free surface of a material when a shock wave reaches this surface. This particle stream is generated primarily by imperfections in the metal surface finish, which give rise to Richtmyer–Meshkov instability: concave grooves invert and form jets that subsequently break up into numerous fine particles. The most thoroughly studied aspect of this phenomenon is its integral characteristic—the mass-velocity distribution of particles in the ejecta stream—measured using radiography, witness (indicator) plates, and piezoelectric sensors [1]. In the present work, the specifics of the holographic recording setup, a new approach to reconstructing the dust flow at a chosen depth using the angular spectrum method, and algorithms for automating particle detection and characterization are described. These include a neural-network-based algorithm for locating and identifying particles in reconstructed images [2], a procedure for determining the best-focused depth for each particle, and methods for estimating particle sizes.

- [1] Don Jayamanne J A, Burie J R, Durand O *et al.* 2024 *J. Appl. Phys.* **135** 073105
- [2] Ponomarenko D S, Antipov M V, Georgievskaya A B *et al.* 2025 Detection of particles in holographic images using a neural network *Proc. of the 17th Int. Conf. “Zababakhin Scientific Talks”* (Snezhinsk: RFNC-VNIITF)