

Eight Sequences Laser Shadowgraph for the Visualization of Hypervelocity Impact Debris Cloud

LIU Sen, XIE Ai-min, HUANG Jie, SONG Qiang, Zheng Lei, LUO Jin-yang

China Aerodynamics Research and Development Center, Mianyang, Sichuan 621000, China

e-mail: cardc@my-public.sc.cninfo.net

Eight sequences laser shadowgraph system has been set up on the hypervelocity impact range of Hypervelocity Aerodynamics Institute, CARDAC, to visualize the hypervelocity impact debris cloud. The system includes YAG laser source, shadowgrapher and imaging system. Satisfied debris cloud image, with impact velocities about 4.6km/s, was obtained with the technique of multi-light source divided in space, polarization decomposition, light angle magnification and compensated filter, etc.. Contents introduced in this paper are the principle, the debug of the system and the result of test.

Test results show that: (1) Eight images of the same object of hypervelocity impact debris cloud are imaged on eight sensitive medium at different time which least interval is 1 μ s and time of exposure is 10ns, which satisfies the need of photo of the debris cloud for the research of hypervelocity impact; (2) The system can be used in the field of other hypervelocity process.

Keywords: Hypervelocity impact; Debris cloud; Sequence photo; Shadowgraph; Laser