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NASA TECH BRIEF

The Effect of Object Motion in Fraunhofer Holography with Application to Velocity Measurements

An experimental investigation was undertaken in order to extend the Fraunhofer holography theory to include moving objects. The effort consisted of an analysis of the time dependence of the intensity of the total field at a recording plane due to the interference of a constant background field with the field diffracted by a moving object. The conclusions of this experimental investigation indicated that objects may move up to ten times their mean diameter during the observation time (within the constraints of the derived conditions), with the result that the motion of the objects produces fringe patterns in the hologram which are descriptive of that motion. It is physically possible to reconstruct the hologram from the recorded fringes so that the reproduced image is the path the object occupied during the observation time. This would be a nearly direct measure of velocity since the path length divided by the exposure time yields the velocity.

The experimental setup, which consisted of a laser light source providing the coherent radiation, a wire (the object) moving at a constant velocity and a 35mm camera to record the fringe patterns, can be used for a wide range of velocity measurements of micron-size particles. The general application of this technique would be in aerosol, cloud and fog, or in other small moving particle studies where size, velocity, and distribution are to be determined.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference: NASA-TN-D-5515 (N69-40812),
The Effect of Object Motion Fraunhofer
Holography with Application to Velocity
Measurements

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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Category 03