

## HPIV using Polarization Multiplexing Holography in Bacteriorhodopsin (bR)

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Abstract Holographic particle image velocimetry (HPIV) is a three-dimensional flow measurement technique that can determine all fluid velocity components volumetrically (Hinsch 2002, Barnhart et al 2002). This paper demonstrates the use of bacteriorhodopsin (bR) as the holographic recording medium for a (HPIV) system. Using an off-axis hologram in bR, forwardly scattered double exposed images of particles in a turbulent flow are recorded. Bacteriorhodopsin, a polarization sensitive holographic recording material, has the ability to alter the polarization of the reconstruction beam, possibly resulting in the reconstruction of the original object polarization. Therefore, by using polarization multiplexing, two time separated holograms can be multiplexed in a single bR film, thereby allowing directional ambiguity in the HPIV flow data to be eliminated (Koek et al 2004, Chan et al 2004). For the first time, we successfully demonstrated this idea in a HPIV system by using a sequential holographic read-out method, to retrieve the two holograms independently.

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