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3D localization of the tracer particles in digital inline holographic microscopy PIV/PTV: do the bright regions in the intensity reconstruction volume really correspond to the tracer particles? ASIF AHMED, BIHAI SUN, VICTOR CADARSO, JULIO SORIA, Department of Mechanical and Aerospace Engineering, Monash University (Clayton Campus), VIC 3800, Australia — Digital Inline Holographic Microscopy based PIV/PTV (DIHM-PIV/PTV) techniques are becoming increasingly popular because of their ability to provide 3C-3D flow measurement with high spatio-temporal resolution, minimal optical setup and easy calibration compared to other 3D flow measurement techniques. One of the major challenges of DIHM-PIV/PTV technique is to set the criteria for the localization of the tracer particles in the reconstruction volume. Conventionally this is performed by finding the bright regions with peak local intensity. However, these bright regions may not always correspond to the actual tracer particles, especially in case where micrometer-sized dielectric spheres are used as tracer particles. In conventional DIHM setup these microspheres generate highly localized light, called photonic nanojets, further away from their centroid in the shadow side of the particles. Therefore, the peak intensity of the nanojet region is much higher than that of the actual particle and if not taken into account could be misjudged as the tracer particle. In this study, we explore the effect of the size and optical properties of some common tracer particles and propose a novel algorithm based on the reconstruction phase for accurate 3D localization of the tracer particles.

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