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Quantification of particle concentration in sheet illumination imaging techniques PHILIP KNOWLES, NAVAIR Pax River, KEN KIGER, Univ. of Maryland — In numerous quantitative imaging methods such as PIV, light sheet illumination is used to limit the region of scattered light close to the focal plane of the camera, effectively improving the contrast of the in-focus image. It is often desirable to use these imaging methods not only to provide displacement information, but also additional metrics such as particle concentration as well. At its simplest level, the quantification of a dispersed particle concentration would seem straightforward: simply count the particles in the image and divide by the interrogation area and light sheet thickness. In practice, however, this typically only yields order-of-magnitude estimates of the concentration. Particle identification within the image will inherently depend on the image size and intensity, which in turn depends on the imaging optics, local illumination and particle position/geometry. In the current work, we demonstrate the influence of the light sheet profile (focusing/attenuation), scattering by tracer particles and wall reflections on determining the effective measurement volume. An empirical calibration method is presented to account for these effects, which allows for quantification of the concentration to within 15%. Application of this method to a multiphase suspension is demonstrated. This work is supported by the NSF under grant 0351443 and AFOSR grant FA95500810406.

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