A study for the measurement of the drop concentration by using the time-shift technique

Lingxi Li[a,*], Simon Rosenkranz[b], Walter Schäfer[b], and Cameron Tropea[a]

[a]*Institute of Fluid Mechanics and Aerodynamics, Technische Universität Darmstadt, 64287, Darmstadt, Germany*
[b]*AOM-Systems GmbH, 64646 Heppenheim, Germany*

[*]*Presenting author (li@sla.tu-darmstadt.de)*

Colloidal drops are encountered frequently in numerous process industries, such as in pharmaceutical products or spray drying to produce powders. However, current optical measurement techniques are not capable of measuring the solid particle concentration in such drops **Error! Reference source not found.**. The present study is devoted to the measurement of drop size and particle concentration of colloidal drops using the time-shift technique [2]. This work builds on first results reported in [3], in which a Monte Carlo ray tracing method was used to predict the time-shift signal received from two-dimensional drops. In the current work, the ray tracing code has been expanded to consider a three-dimensional drop using algorithms described in **Error! Reference source not found.Error! Reference source not found.**. This approach, building on geometric optics, is more feasible in terms of computational effort than alternative methods (e.g., the discrete dipole approximation, or DDA), especially for larger drops and when the entire passage of the drop through the focused beam of the time-shift device must be captured. However, the DDA can be used to compute the signal amplitude for certain positions of the drop in the illuminating beam, and these results can be compared with the results from the Monte Carlo ray tracing method. The outcome of this investigation is a recommendation of signal processing steps necessary to estimate solid particle concentrations in drops from time-shift signals.

References

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Preferred mode of presentation: Oral