Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Droplet collisions in a liquid GOSSE OLDENZIEL, RENÉ DELFOS, GERRIT ELSINGA, JERRY WESTERWEEL, Delft University of Technology — The collision of two equally sized fluid droplets in a continouous phase consisting of a second liquid is investigated. The outcome of the collision, i.e. coalescence or bouncing depends, for two given fluids, on the relative velocity of the droplets just before impact, and the mis-alignment of the collision Δx, nondimensionialized in a Weber number, $We = \rho_d U_{rel}^2 d_{ave}/\sigma$ and the alignment parameter $B = \Delta x/d_{ave}$. We studied nearly head-on collisons by launching the droplets from two opposing capillaries. High speed dual-axis shadowgraphy is used to reconstruct the 3D-droplet trajectories. We found that if the Weber number exceeds a critical value, the droplets will coalesce; for lower values they bounce off again. For silicon oil droplets with a dynamic viscosity 4.6 times that of the surrounding phase (water) the critical Weber number is found to be $We \approx 22.5$. For all bouncing droplets, the contact time was measured and found to be approximately equal to the theoretical droplet oscillation frequency period. Current work aims at investigating the influence of external continuous phase turbulence on the outcome of the collisions by placing the two-capillary system in between two counterrotating discs ("von Kármán flow").

Gosse Oldenziel
Delft University of Technology

Date submitted: 03 Aug 2012 Electronic form version 1.4