Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

The Physical Mechanisms Governing Drop Coalescence: Models vs Experiments JAMES SPRITTLES, University of Oxford, YULII SHIKHMURZAEV, University of Birmingham — The dominant physical mechanisms in the coalescence of liquid drops are identified by utilizing recent advances in experimental and computational techniques that resolve unprecedentedly small spatio-temporal scales. To do so, the predictions of both the "conventional" model and the (singularity-free) interface formation model, where the dynamics of an "internal interface" trapped between the two bulk phases takes a finite time to disappear, before the conventional model takes over, are compared to experimental measurements on microfluidic scales of the very initial moments of coalescence. Using the full numerical solution of the problem in the framework of each of the two models, we show that the recently reported electrical measurements are better described by the interface formation model. As a by product of our results, the range of validity of scaling laws proposed for the phenomenon is established, with inconsistencies in previous works rectified and particular attention paid to quantifying the external gas' effect on the dynamics. Finally, a new scaling law developed for the inertial regime is shown to capture experimental data from the literature remarkably well.

James Sprittles
University of Oxford

Date submitted: 28 Jun 2013 Electronic form version 1.4