Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Critical Reynolds numbers for particle capture in Y-, T-, and arrow-shaped junctions JESSE AULT, HOWARD STONE, Princeton University, DANIELE VIGOLO, ETH Zurich, STEFAN RADL, Graz University of Technology — Despite the prevalence of Y-, T- and arrow-shaped junctions in fluid flow networks, the flow behavior within these junctions is not yet fully understood. Vortical structures and vortex breakdown can lead to the unexpected trapping of particles within the junctions. In order to determine the flow regimes in which this phenomenon occurs, the critical Reynolds numbers for particle capture in a range of junction geometries are determined. These critical Reynolds numbers are sought experimentally for Y-, T- and arrow-shaped junctions with angles ranging from 10 110 degrees. Particle motion is visualized using a high-speed camera. OpenFOAM numerical simulations are performed for the same flows and the results are compared with the experimental measurements. The critical Reynolds numbers for capture as a function of the junction angle for various particle/liquid density ratios are plotted. The results demonstrate a maximum and minimum junction angle for which capture will occur, as well as an optimum junction angle for capture. Using these results, the capture phenomenon can be enhanced, or completely avoided, by selecting the appropriate flow geometry and Reynolds number.

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Date submitted: 30 Jul 2014 Electronic form version 1.4