Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Experimental and numerical analyses of flow and mixing regimes in a micro T-mixer ALESSANDRO MARIOTTI, CHIARA GALLETTI, MARIA VITTORIA SALVETTI, ELISABETTA BRUNAZZI, DICI - University of Pisa — Among the most common micro-devices, T-mixers, in which the inlets join the main channel with T-shaped branches, are widely used. Despite the very simple geometry, the laminar flow dynamics and mixing in a T-shaped micro-mixer are really complex. Different flow regimes have been identified and studied in the literature: by increasing the Reynolds number, steady regimes occur, namely the stratified, the steady symmetric (vortex), the steady asymmetric (engulfment) and then unsteady periodic regimes, namely the periodic asymmetric, the periodic symmetric, and finally the chaotic regime. These regimes have been characterized in details by using numerical simulations and flow stability analyses. Experimental studies are more limited, especially as far as unsteady regimes are concerned. A synergic analysis combining experimental flow visualizations and numerical simulations is presented here. A very good agreement is obtained between passive scalar concentration in numerical simulations and experimental flow visualizations. The scalar field behavior is connected with the vorticity dynamics available in numerical simulations. For the unsteady regimes, experimental characterization of the flow features suggested by previous numerical studies is shown for the first time.

Alessandro Mariotti
DICI - University of Pisa

Date submitted: 27 Jul 2017 Electronic form version 1.4