

Stability of T-junction flow

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T-junctions are routinely used in microfluidic devices to produce droplets, but also to mix the content of two streams. Although these devices are miniaturized, the Reynolds number can become significant (~ 100) when high throughput is to be achieved.

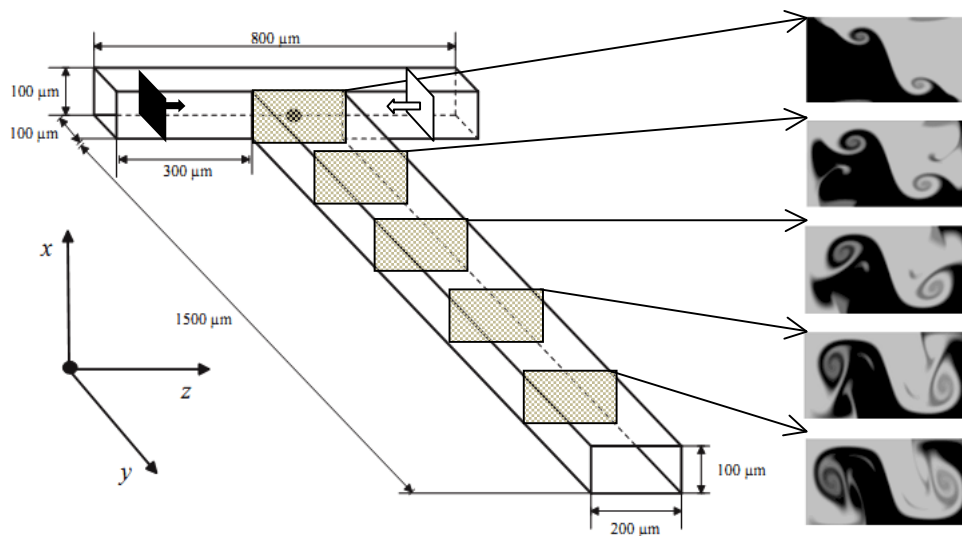


Fig. 1 Mixing in a T junction (Carsten Stemlich, PhD Thesis, Erlangen)

Depending on the Reynolds number, these T-junction flows have been observed to bifurcate from a symmetric state to a symmetry breaking (fig 1), before oscillations starts to set in. The influence of these hydrodynamic bifurcations is crucial on the quality of the mixing.

The main goal of the project is to analyse numerically the stability of T-junction flows, as a function of the Reynolds number. To this end, the CFD solver COMSOL will be used. This will enable the determination of the critical Reynolds number as a function of the geometry of the incoming channels.