Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

A scalable micro-mixer for biomedical applications LUCA CORTELEZZI, SIMONE FERRARI, ANGELO DUBINI, Politecnico di Milano — Our study presents a geometrically scalable active micro-mixer suitable for biomedical/bioengineering applications and potentially assimilable in a Lab-on-Chip. We designed our micro-mixer with the goal of satisfying the following constraints: small dimensions, because the device must be able to process volumes of fluid in the range of $10^{-6} \div 10^{-9}$ liters; high mixing speed, because mixing should be obtained in the shortest possible time; constructive simplicity, to facilitate realizability, assimilability and reusability of the micro-mixer; and geometrical scalability, because the micro-mixer should be assimilable to microfluidic systems of different dimensions. We studied numerically the mixing performance of our micro-mixer both in two- and three-dimensions. We characterize the mixing performance in terms of Reynolds, Strouhal and Péclet numbers in order to establish a practical range of operating conditions for our micro-mixer. Finally, we show that our micro-mixer is geometrically scalable, ie., micro-mixers of different geometrical dimensions having the same nondimensional specifications produce nearly the same mixing performance.

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Date submitted: 01 Aug 2016 Electronic form version 1.4