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Three-dimensional features on oscillating microbubbles streaming flows MASSIMILIANO ROSSI, ALVARO G. MARIN, Bundeswehr University Munich, CHENG WANG, SASCHA HILGENFELDT, University of Illinois at Urbana-Champaign, CHRISTIAN J. KÄHLER, Bundeswehr University Munich —
Ultrasound-driven oscillating micro-bubbles have been used as active actuators in microfluidic devices to perform manifold tasks such as mixing, sorting and manipulation of microparticles. A common configuration consists in side-bubbles, created by trapping air pockets in blind channels perpendicular to the main channel direction. This configuration results in bubbles with a semi-cylindrical shape that creates a streaming flow generally considered quasi two-dimensional. However, recent experiments performed with three-dimensional velocimetry methods have shown how microparticles can present significant three-dimensional trajectories, especially in regions close to the bubble interface. Several reasons will be discussed such as boundary effects of the bottom/top wall, deformation of the bubble interface leading to more complex vibrational modes, or bubble-particle interactions. In the present investigation, precise measurements of particle trajectories close to the bubble interface will be performed by means of 3D Astigmatic Particle Tracking Velocimetry. The results will allow us to characterize quantitatively the three-dimensional features of the streaming flow and to estimate its implications in practical applications as particle trapping, sorting or mixing.

Massimiliano Rossi
Bundeswehr University Munich

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