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Streaming and particle motion in acoustically-actuated leaky systems NITESH NAMA, Pennsylvania State Univ, RUNE BARNKOB, Universitat des Bundeswehr, Munich, TONY JUN HUANG, Pennsylvania State Univ, CHRISTIAN KAHLER, Universitat des Bundeswehr, Munich, FRANCESCO COSTANZO, Pennsylvania State Univ — The integration of acoustics with microfluidics has shown great promise for applications within biology, chemistry, and medicine. A commonly employed system to achieve this integration consists of a fluid-filled, polymer-walled microchannel that is acoustically actuated via standing surface acoustic waves. However, despite significant experimental advancements, the precise physical understanding of such systems remains a work in progress. In this work, we investigate the nature of acoustic fields that are setup inside the microchannel as well as the fundamental driving mechanism governing the fluid and particle motion in these systems. We provide an experimental benchmark using state-of-art 3D measurements of fluid and particle motion and present a Lagrangian velocity based temporal multiscale numerical framework to explain the experimental observations. Following verification and validation, we employ our numerical model to reveal the presence of a pseudo-standing acoustic wave that drives the acoustic streaming and particle motion in these systems.

Nitesh Nama
Pennsylvania State Univ

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