Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

The diversity of streaming patterns around bubbles at a wall
DAVID HANSEN, Engineering Sciences & Applied Mathematics, Northwestern University, JIH-CHIANG TSAI, SASCHA HILGENFELDT, ESAM and Mechanical Engineering, Northwestern University — Oscillating bubbles attached to plane walls, typically driven by a resonant ultrasound field, have been shown to set up powerful steady streaming flows in microfluidic geometries. Understanding these flows quantitatively is essential for designing a variety of devices making use of transport, mixing, or force actuation capabilities of bubble-driven streaming flows. As has been observed by experimentalists, a rich variety of types of flow around bubbles attached to walls is possible. The nature of such a flow depends on many factors, including the bubble position, interactions between bubble oscillation modes, the boundary conditions on the bubble, and the interaction between bubble and wall boundary layers. We discuss these different flow patterns and correlate them with experimental observations. Properly understood, the variety of possible flows could allow for great flexibility in microfluidic applications.

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Date submitted: 06 Aug 2007 Electronic form version 1.4