Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Theory of microbubble streaming in confined geometries DAVID HANSEN, J.C. TSAI, SASCHA HILGENFELDT, Northwestern University — Bubbles attached to the walls of microfluidic devices are usually seen as a nuisance. When driven by ultrasound, however, the oscillating microbubbles generate steady streaming flows with large speeds and large shear forces. The principle of bubble streaming and the control of streaming speed and direction by substrate patterning have been demonstrated in a semi-infinite geometry, with a bulk liquid next to a wall. Here we treat a case more relevant for applications, where a second wall at a small distance from the first confines the fluid. We present analytical studies of directional flow through such a device, analyzing both its potential to mix the fluid in the gap and to transport it in a desired direction. Depending on the amplitude of the ultrasonic driving and the geometry of the device, the resulting flow can be controlled to provide either efficient fluid transport or effective fluid mixing.

Sascha Hilgenfeldt
Northwestern University

Date submitted: 01 Aug 2006 Electronic form version 1.4