Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Acoustic microstreaming due to an ultrasound contrast microbubble near a wall NIMA MOBADERSANY, KAUSIK SARKAR, George Washington University — In an ultrasound field, in addition to the sinusoidal motion of fluid particles, particles experience a steady streaming velocity due to nonlinear second order effects. Here, we have simulated the microstreaming flow near a plane rigid wall caused by the pulsations of contrast microbubbles. Although these microbubbles were initially developed as a contrast enhancing agents for ultrasound imaging, they generate additional therapeutic effects that can be harnessed for targeted drug delivery or blood brain barrier (BBB) opening. The microbubbles have a gas core coated with a stabilizing layer of lipids or proteins. We use analytical models as well as boundary element (BEM) simulation to simulate the flow around these bubbles implementing interfacial rheology models for the coating. The microstreaming flow is characterized by two wall bounded vortices. The size of the vortices decreases with the decrease of the separation from the wall. The vortex-induced shear stress is simulated and analyzed as a function of excitation parameters and geometry. These microstreaming shear stress plays a critical role in increasing the membrane permeability facilitating drug delivery or rupturing biological tissues.

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Date submitted: 31 Jul 2017 Electronic form version 1.4