Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Steady streaming around a pulsating Bubble located at the velocity antinode of a Standing Wave MOHAMMAD ALHAMLI, College of Technological Studies, SADHAL SATWINDAR, University of Southern California — We have used the singular perturbation method to examine the steady streaming phenomenon with regard to a pulsating bubble levitated in a standing wave, positioned at the velocity antinode. The bubble undergoes both lateral and radial oscillations that have approximately the same small amplitude i.e., $\varepsilon \simeq \varepsilon' \ll 1$. We expanded the momentum equation using the small dimensionless amplitude of oscillation, ε and assumed a large frequency parameter i.e., $|M|^2 \gg 1$. We assumed $|M|$ to be in the intermediate range, and therefore included the terms in $O(|M|^{-1})$ but neglected the $O(|M|^{-2})$ terms. This gave us the chance to examine the effect that these intermediate values of $|M|$ have on the streaming. We have found that at intermediate values of $|M|$ the flow has a circulating vortex in the region below the equatorial plane. The general streaming flow direction is from the north pole to the south pole with symmetry across the polar axis. As we increase the value of $|M|$ the streaming starts to be more intense with a dipole pattern and no circulation. The phase shift between the pressure wave and the bubble radial oscillation also affects the intensity of the streaming flow.

Mohammad AlHamli
College of Technological Studies

Date submitted: 31 Jul 2015 Electronic form version 1.4