Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Implications of steady streaming flows inside fish ears[1] CHARLOTTE KOTAS, PETER ROGERS, MINAMI YODA, Georgia Institute of Technology — Fish ears can typically hear sounds ranging from 10 to 1000 Hz with particle motions as small as 0.1 nm and discriminate sound sources with angular separations of 10–20 $^\circ$. They consist of dense geometrically complex bodies, the otoliths, surrounded by endolymph and tissue. Under acoustic stimulation, the fluid and tissue oscillate with respect to the otolith; these movements are registered by the deflection of hair cells embedded in the tissue next to the otolith. Although the hair cells are assumed to move with the fluid, it is unknown which characteristics of this relative motion are relevant to fish hearing. In particular, the steady streaming, or time-independent flow generated by the relative motion, should contain acoustically relevant information. These flows were modeled using a 350% scale model cod otolith immersed in a viscous fluid and oscillating sinusoidally in various orientations at frequencies of 8–24 Hz. Phase-locked particle pathline images of tracers suspended in the fluid were used to visualize the steady portion of the flow, which was quantified with particle-image velocimetry (PIV). The resulting steady flows at streaming Reynolds numbers of $O(10^{-1})$ or less depend on the oscillation frequency, amplitude and direction.

[1]Supported by ONR

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Date submitted: 04 Aug 2008 Electronic form version 1.4