Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Motion of motile bacteria near a solid surface under shear flows[1]
MEHDI MOLAEI, JIAN SHENG, Texas Tech University — Shear is known to affect microorganism locomotion in several ways that includes rheotaxis, upstream motility, and periodic motion namely Jeffery orbits, which are crucial biological processes in biofilm formation. We investigate the effect of shear flow on the motility of *E.coli* by employing microfluidic devices, high speed microscopy, and digital holography microscopy. Digital holography enables us to track the bacteria and obtain 3D swimming trajectories; meanwhile, high speed microscopy at different distances from the surfaces of the microfluidics allows us to visualize fast occurring phenomena such as cell reorientation by shear or tumbling events and subsequently to quantify the angular dispersion of active particle suspension. The result shows that Jeffery orbital motion for motile *E. coli* is diametric different than that for passive bacteria. The results show that shear promotes bacterial re-orientation/tumbling near a solid surface whereas the tumbling is suppressed near a solid surface under quiescent flow condition. Ongoing analyses focus on determining whether this enhancement is the results of Jeffery orbital motion by the flow shear or the hydrodynamic interactions of bacteria with a solid surface.

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Date submitted: 01 Aug 2014 Electronic form version 1.4