Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Direct measurement of shear-induced cross-correlation of Brownian motion ANDREAS ZIEHL, CHRISTIAN WAGNER, Universität des Saarlandes — Shear-induced cross-correlations between particle fluctuations perpendicular and along streamlines are investigated experimentally and theoretically in a linear shear flow. We used optical tweezers to localize one or two particles, each in a harmonic potential, and to detect the positions of the particles as a function of time with a high spatial precision below 8nm. These positions are recorded via a high speed camera with 15kHz resolution. In contrast to measurements in a quiescent fluid, we find that in shear flow, generated in a special designed micro fluidic device, orthogonal movements of a bead in stream- and gradient- directions are correlated and the time reversal symmetry is broken. Again in a quiescent fluid, fluctuations of two particles, separated by a few microns, are known to be anti-correlated along their connecting vector due to hydrodynamic coupling. In linear shear flow, we found a coupling process that correlates the orthogonal directions of the two particles. The correlation exhibits a minimum in time and again the time reversal symmetry is broken.

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Date submitted: 27 Jul 2009 Electronic form version 1.4