Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 02.1.3 (E)

Resonances arising from hydrodynamic memory - The Color of Brownian motion SYLVIA JENEY, MATTHIAS GRIMM, FLAVIO MOR, LASZLO FORRO, Ecole Polytech Fed de Lausanne, THOMAS FRANOSCH, Universitaet Erlangen-Nuernberg — Observation of the Brownian motion of a small probe interacting with its environment is one of the main strategies to characterize soft matter. Initially, the particle is driven by rapid collisions with the surrounding solvent molecules, referred to as thermal noise. Later, the friction between the particle and the viscous solvent damps its motion. Conventionally, thermal force is taken to be characterized by a Gaussian white noise spectrum. The friction is assumed to be given by the Stokes drag, suggesting that motion is overdamped at long times, when inertia becomes negligible. Here, we measured the noise spectrum of the thermal forces by tracking with high resolution a single micron-sized sphere suspended in a fluid, and confined by a stiff optical trap [1]. Coupling between sphere and fluid gives rise to hydrodynamic memory [2] and a resonance, equivalent to a colored peak in the power spectral density of the sphere's thermal fluctuations. Our results reveal that motion is not overdamped, even at long times. In view to exploit the particle-fluid-trap system as a nanomechanical resonator, we disentangle the two regimes in which the detected resonance is either sensitive to the fluid properties or to the particle's mass.

[1] Jeney et al. Nature 2011.
[2] Jeney et al. PRL 2008.

Sylvia Jeney
sylvia.jeney@epfl.ch
Ecole Polytech Fed de Lausanne

[X] Prefer Oral Session
[ ] Prefer Poster Session

Date submitted: 19 Dec 2011 Electronic form version 1.4