# Is it possible to detect long-range interactions among biomolecules through noise and diffusion?

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## Abstract

Fluctuation phenomena in biological systems are mainly related to diffusion phenomena inside living cells. Brownian diffusion of freely moving biomolecules is usually considered to drive the dynamics of the molecular machinery maintaining cellular functions and thus life. However, the high efficiency and rapidity of the encounters between cognate partners of biochemical reactions inside living cells calls for a more convincing explanation with respect to purely thermal-fluctuations-driven random walk. In fact, it has been surmised that a suitable interplay between Brownian diffusion and selective electrodynamic interactions acting at a long distance (up to thousands Angstroms) could make the job of significantly accelerating the encounter times of interacting biomolecules in living matter [1].

The present contribution consists of a report on ongoing experimental proof of concept of the possibility of activating the mentioned electrodynamic interactions between biomolecules, and that the excitation level can be sufficient to compete with Brownian diffusion. The ongoing experiments are performed in vitro by studying how diffusion is affected by the alleged activation of electrodynamic interactions. Diffusion is detected by means of Fluorescence Correlation Spectroscopy.

This kind of experiments are crucially complemented by TeraHertz spectroscopic studies of the activation of collective oscillations of the biomolecules used in the Fluorescence Correlation Spectroscopy experiments; these collective molecular oscillations are accompanied by large dipole moment vibrations entailing the activation of electrodynamic long-range interactions [2].

## References

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