

FRET Correlation Spectroscopy and Applications to Stochastic Molecular Dynamics

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Abstract

Recent single-molecule experiments have demonstrated the utility of Fluorescence Resonance Energy Transfer (FRET) in observing reaction kinetics and conformational dynamics in single RNA, DNA, and protein molecules. Using photon correlation spectroscopy techniques borrowed from quantum optics, we have extended the temporal resolution of these methods to the nanosecond regime. In this poster, we describe several potential applications of this technology to the observation of fast, stochastic molecular dynamics. We propose using these techniques for measuring the sequence-dependent elasticity of double-stranded DNA and also for observing stochastic kinetics in DNA branch migration. We are also interested in the fundamental physics of FRET including studies of cascaded FRET processes, and FRET at high excitation intensities. This work is in collaboration with the groups of R. Phillips, E. Winfree, and S. Quake.