Abstract Submitted
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Power-Law Dynamics in DNA[1] MARK BERG, DANIELE ANDREATTA, SOBHAN SEN, CATHERINE MURPHY, University of South Carolina, J. LOUIS PEREZ-LUSTRES, SERGEY KOVALENKO, NIKOLAS ERNSTING, Humboldt Universitat, ROBERT COLEMAN, Ohio State University — Measurements of solvation dynamics in the interior of DNA have been extended to cover a six decade time range from 40 fs to 40 ns. The solvation dynamics are reported by the Stokes shift of a coumarin group that is covalently bound within an oligonucleotide in place of a native base pair. Results from three techniques: time-correlated single photon counting, fluorescence up-conversion and transient absorption; are combined to cover the entire time range. Over this range, the dynamics follow a simple power law with a small exponent of 0.15. If the coumarin group is placed near the end of the oligonucleotide, a process with a 10 ps time constant occurs, in addition to the power-law dynamics. The power-law dynamics change if the counterion changes, and they change in a manner that correlates with the hydrodynamic radius of the counterion. Results on single-stranded DNA and on a DNA:protein complex are also reported. These experiments provide a variety of unexplained results that provide a challenge to the theory of DNA dynamics on fast time scales.

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