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DNA dynamics in sub-persistence length confinement[1] YENG-LONG CHEN, ARSEN GRIGORYAN, Institute of Physics, Academia Sinica — Recent advances in genomic science and microscopy have spurred extensive investigation of the dynamics of double stranded DNA molecules in bulk solution and micron- and nano-scale fluidic channels. On the length scale of the DNA molecule's radius of gyration, classical polymer physics has been extremely successful in predicting the macromolecule's conformation and dynamics. With the availability of sub-100nm channels, it has become possible to study with detail the conformation and dynamics of DNA at the length scale of the DNA persistence length ($\sim$50nm), as well as DNA interactions with other molecules such as proteins. We employ Brownian dynamics simulations to explore DNA dynamics confined in channels of the DNA persistence length scale. The bending and thermal energy, the conformational entropy, and the DNA-surface interactions all contribute to the macromolecular dynamics. We compare our simulation results to the predictions of the Odijk theory for confined polymers, and we find that the confinement strongly affects the chain conformation and dynamics and lead to non-monotonic extensional relaxation.

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