SINGLE-MOLECULE CHARACTERIZATION OF THE ELASTIC RESPONSE OF DNA & DNA-HISTONE COMPLEXES USING HORIZONTAL MAGNETIC TWEEZERS

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We report on novel magnetic tweezers that can apply stresses ranging from 0.01 to 100 pN to single DNA molecules in the horizontal plane, allowing us to explore the functional mechanisms of DNA compacting proteins. We calibrated our instrument to the overstretching transition. We also performed calibration by comparing the measured bead motion to a model of Brownian motion in a harmonic potential well. We obtained estimates of the probe drag coefficient (α) and stiffness of the system (κ) using Allan variance (AV), power spectral density (PSD) methods, and compared those data to the calibration based on the equipartition method. We report data from single-molecule studies on the interaction between single DNA molecules and core histones. Furthermore, we performed micromanipulation experiments with post-translationally modified nucleosomes. We will compare the data from experiments probing the binding of native and post-translationally modified histones to DNA and their force induced unbinding, which will help to quantify the relative affinities of histone DNA interactions in nucleosomes.