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Spatially Varying Nanoconfinement as a Probe of Polymer Physics ALEXANDER KLOTZ, WALTER REISNER, McGill University — Complex nanofluidic systems have the capability to unveil a rich landscape of new polymer physics. One-dimensional channels and two-dimensional slits have been used for precise measurements of persistence length and to verify scaling laws. Recently, devices with spatially varying confinement have been used to gain further control over single molecule polymer conformation. We use a system consisting of a nanofluidic slit embedded with a lattice of pits acting as entropic traps. Single DNA polymers in this system self-organize into discrete conformational states. We have shown that this system can be used to define stable DNA configurations at equilibrium and to fine-tune diffusion to a local minimum corresponding to stable conformational states. Measurements of mean occupancy with varying device parameters can be fit to theory, giving information about the confinement free energy of DNA in a nanoslit (a subject of controversy) and the strength of excluded volume interactions. Measurements of the excluded volume interaction provide information about the strength of intersegmental repulsive electrostatic interactions, quantified by the notion of effective width. The scaling of width with respect to salt concentration is observed in single DNA molecules for the first time.

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