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A tunable DNA spring in a nanochannel ROBERT RIEHN, RORY STAUNTON, SHUANG FANG LIM, Dept. of Physics, NC State University, ROBIJN BRUINSMA, Department of Physics, UC Los Angeles, WALTER REISNER, Technical University of Denmark, ROBERT AUSTIN, Dept. of Physics, Princeton University — dsDNA becomes linearized when it is confined to nanofluidic channels with a cross-section of $(100\ \mathrm{nm})^2$ or less, which has made them interesting for genomic DNA analyses. DNA is typically manipulated by means of electric fields. We have found that DNA undergoes a phase transition to a condensed state if an a.c. electric field is applied along the channel direction. The molecule collapses to about 1/4 of it's initial contour length. We will discuss how the effect depends on parameters such as frequency, field strength, channel dimensions, and will discuss the origin of the effect. Interestingly, DNA behaves like an artifical muscle that can be triggered by an a.c. electric field. Since the interaction is expected to hold for any solubilized polyelectrolyte, we speculate that the mechanism may lead to a new class of polymer-based mechanical actuators. These would not suffer from depolarization like piezo transducers.

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