Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Understanding spontaneous sharp bending of DNA CHONGLI YUAN, ELIZABETH RHOADES, LYNDEN ARCHER, Cornell University — Gene expression often requires the interplay of two distant genetic regions and thus sharp bending of DNA is essential for gene functioning. Contrary to the conventional thinking that the bending of DNA strand below its persistent length was essentially facilitated by DNA binding proteins, Widom's group recently demonstrated, using cyclization assay, that such kind of sharp bending can be spontaneously formed (*Mol. Cell, 2004, 355*). Two models were referred in the original work to explain this "enhanced" flexibility of short DNA strand, namely, the melted single- and double-bubble models. To elucidate the detailed mechanism behind the DNA sharp bending, DNA molecules containing single- and double-melted bubbles was synthesized by introducing non Watson-Crick base pairs to the DNA backbone. Time resolved fluorescence energy transfer was used as the major tool to evaluate the bending stiffness of afore mentioned short DNA strand. The effect of bubble size, number and position on the DNA stiffness was independently evaluated. The energetic penalty of forming the locally melted structure was determined using other individual experiments. These results not only clarify the physical origin of the previously observed cyclizability of short DNA strand but also help to interpret the cyclization data of DNA molecules of wider size ranges.

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Date submitted: 07 Dec 2005 Electronic form version 1.4