Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Stiffness of DNA nanotubes: insights for the design of dsDNA materials PAUL WEITEKAMP, Physics Department, UCSB, DANIEL SCHIFFELS, Physics Department, U Munich, ALEX ITEEN, DEBORAH FYGENSON, Physics Department, UCSB — DNA is increasingly used as a material in the design and construction of elaborate structures with nanoscale precision and functionalities. Whether self-assembled from tiles of short, synthetic oligomers or woven from purified genomic strands, most DNA nanostructures are based on parallel arrays of double-stranded DNA (dsDNA) held together by Holliday junction-like cross-links. There is considerable evidence that the double-helices thus intertwined are largely B-form in structure, but the mechanical integrity of the resulting nanostructures has gone largely unexplored. Here we present a systematic study of the stiffness of DNA nanotubes varying parameters such as helix number, cross-link density and strand complexity. We find stiffness is a useful reporter of structural quality for nanotubes and extract design principles for optimizing mechanical integrity of dsDNA materials.

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Date submitted: 20 Nov 2010

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