Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Self-Assembled DNA Structures for Molecular Force Measurement: A Magnetically Actuated Approach M. ARMSTRONG , S. LAUBACK, C. MILLER, C. PEACE, C. CASTRO, R. SOORYAKUMAR , Ohio State Univ - Columbus — Understanding molecular forces is important to comprehend many of the underlying properties of molecular machines and biological processes. The relevant forces in these cases often lie in the picoNewton range, and thus experiments on individual biomolecules must integrate techniques capable of measuring such forces. A mechanical system to measure molecular forces associated with interacting DNA strands is being developed by using self-assembled DNA nanostructures and super-paramagnetic beads. The DNA nanostructure consists of single-stranded DNA molecules which can be folded into a precise compact geometry using hundreds of short oligonucleotides, i.e., staples, via programmed molecular self-assembly. These nanostructures can be polymerized into micron-scale filaments. By functionalizing the filament ends with bispecific conjugate staples, the structure can be attached to a surface as well as labeled with magnetic beads in order to apply a force on the system. External magnetic fields provide the means to maneuver and manipulate the magnetically labeled DNA structures. Preliminary findings associated with the DNA constructs and their manipulation lay the groundwork to establish real-time control of DNA nanodevices with micromanipulation.

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Date submitted: 13 Nov 2014 Electronic form version 1.4