Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Dual microbead-labeled DNA manipulation with magnetic traps in a microfluidic device M. HOWDYSHELL, M. SIMON, M. POIRIER, R. SOORYAKUMAR, The Ohio State University — Biomolecular responses to mechanical force underlie many critical functions in the context of cellular physiology. In order to develop the technology to apply forces on individual biomolecules, we utilize an array of ferromagnetic disks on a silicon surface to trap and manipulate tethered DNA molecules. The force activation is achieved through remotely controlled programmable weak external magnetic fields that do not damage the biological entity. Moreover, to exploit both hydrodynamic and magnetic forces, the magnetic disks are imprinted within microfluidic channels, while a tethered microbead attached on each end of the DNA strand provides convenient force transmitting handles. Two separate approaches that are utilized involve use of two superparamagnetic beads or a superparamagnetic and nonmagnetic bead pair. The independently controlled hydrodynamic and magnetic forces allow for manipulation of the DNA in all directions within a horizontal plane. Hundreds of magnetic traps are readily patterned onto a single channel, providing the potential to multiplex an ensemble of individual molecules within the device.

Marci Howdyshell
The Ohio State University

Date submitted: 11 Nov 2011 Electronic form version 1.4