

Abstract Submitted  
for the MAR06 Meeting of  
The American Physical Society

**Electrophoresis of Large DNA Molecules in Microcontractions**

PATRICK DOYLE, GREG RANDALL, JU MIN KIM, MIT — The ability to controllably position and stretch large DNA molecules in a microfluidic format is important for gene mapping technologies such as Direct Linear Analysis (DLA). Current technologies developed for DLA use controlled hydrodynamic flows created in a microfluidic device. The downside to this approach is that the imposition of the no-slip condition at the channel walls generates vorticity which can lead to DNA chain tumbling and incomplete stretching. We have recently shown that electric field gradients can be readily generated in a microfluidic device and the resulting field is purely elongational. We present here single molecule studies of DNA molecules driven by an electric field through a microfabricated contraction. Analogous to the hydrodynamic deformation of DNA, we can define an electrophoretic Deborah number ( $De$ ) for our problem. We will discuss the effectiveness of the device to fully stretch DNA as a function of  $De$  and compare to stretching achieved in hydrodynamic flows. A detailed analysis of molecular stretching and the role of a non-homogeneous electric field will be discussed.

Patrick Doyle  
MIT

Date submitted: 04 Dec 2005

Electronic form version 1.4