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DNA Micromanipulation Using Novel High-Force, In-Plane Magnetic Tweezer CHRISTOPHER MCANDREW, PATRICK MEHL, ABHIJIT SARKAR, Department of Physics, The Catholic University of America, Washington, DC — We report the development of a magnetic force transducer that can apply piconewton forces on single DNA molecules in the focus plane allowing continuous high precision tethered-bead tracking. The DNA constructs, proteins, and buffer are introduced into a 200μL closed cell created using two glass slides separated by rigid spacers interspersed within a thin viscoelastic perimeter wall. This closed cell configuration isolates our sample and produces low-noise force-extension measurements. Specially-drawn micropipettes are used for capturing the polystyrene bead, pulling on the magnetic sphere, introducing proteins of interest, and maintaining flow. Various high-precision micromanipulators allow us to move pipettes and stage as required. The polystyrene bead is first grabbed, and held using suction; then the magnetic particle at the other end of the DNA is pulled by a force created by either two small (1mm x 2mm x 4mm) bar magnets or a micro magnet-tipped pipette. Changes in the end-to-end length of the DNA are observable in real time. We will present force extension data obtained using the magnetic tweezer.

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