Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Massively Parallel Single-Molecule Manipulation Using Centrifugal Force WESLEY WONG, KEN HALVORSEN, Harvard University — Precise manipulation of single molecules has led to remarkable insights in physics, chemistry, biology, and medicine. However, two issues that have impeded the widespread adoption of these techniques are equipment cost and the laborious nature of making measurements one molecule at a time. To meet these challenges, we have developed an approach that enables massively parallel single- molecule force measurements using centrifugal force [1]. This approach is realized in the centrifuge force microscope, an instrument in which objects in an orbiting sample are subjected to a calibration-free, macroscopically uniform force- field while their micro-to-nanoscopic motions are observed. We demonstrate high- throughput single-molecule force spectroscopy with this technique by performing thousands of rupture experiments in parallel, characterizing force-dependent unbinding kinetics of an antibody-antigen pair in minutes rather than days. Currently, we are taking steps to integrate high-resolution detection, fluorescence, temperature control and a greater dynamic range in force. With significant benefits in efficiency, cost, simplicity, and versatility, single-molecule centrifugation has the potential to expand single-molecule experimentation to a wider range of researchers and experimental systems.

[1] K. Halvorsen, W.P. Wong, Biophysical Journal - Letters 98 (11), (2010).

Wesley Wong
Harvard University

Date submitted: 23 Dec 2010 Electronic form version 1.4