Abstract Submitted
for the NWS09 Meeting of
The American Physical Society

Calibration of holographic optical tweezers for force measurements on biomaterials[1] ASTRID VAN DER HORST, NANCY FORDE, Department of Physics, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada — Holographic optical tweezers (HOTs) modify the phase of a laser beam to create and dynamically position multiple optical traps independently in 3D; refractive micrometer-sized particles can be held in these traps to function as probing handles. HOTs offer the flexibility needed to probe the mechanics of complex systems such as cells or protein networks. Thus far, however, HOTs have not found wide use in biophysics, in large part due to lack of evidence as to how exerted forces vary as the positions of HOT traps are changed. To perform quantitative force measurements, parameters such as trap stiffness, range of trap steering, and minimum step size are of key importance. We find for our HOT setup that stiffness does not change significantly over a range of $\sim 25\mu$m. In addition, we control and detect, using high-speed (>kHz) camera imaging, trap displacements to $\sim$1nm. Our results suggest that after full characterization HOTs can be successfully employed in quantitative experiments on biomaterials, e.g., probing elastomeric properties of structural protein networks.

[1]This work was funded by the Canada Foundation for Innovation and the Natural Sciences and Engineering Research Council of Canada.

Nancy Forde
Department of Physics, Simon Fraser University,
8888 University Drive, Burnaby, BC V5A 1S6, Canada

Date submitted: 10 Apr 2009 Electronic form version 1.4