Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Positional Accuracy in Optical Trap-Assisted Nanolithography
CRAIG B. ARNOLD, EUAN MCLEOD, Princeton University — The ability to directly print patterns on size scales below 100 nm is important for many applications where the production or repair of high resolution and density features are important. Laser-based direct-write methods have the benefit of quickly and easily being able to modify and create structures on existing devices, but feature sizes are conventionally limited by diffraction. In this presentation, we show how to overcome this limit with a new method of probe-based near-field nanopatterning in which we employ a CW laser to optically trap and manipulate dispersed microspheres against a substrate using a 2-d Bessel beam optical trap. A secondary, pulsed nanosecond laser at 355 nm is directed through the bead and used to modify the surface below the microsphere, taking advantage of the near-field enhancement in order to produce materials modification with feature sizes under 100 nm. Here, we analyze the 3-d positioning accuracy of the microsphere through analytic modeling as a function of experimental parameters. The model is verified in all directions for our experimental conditions and is used to predict the conditions required for improved positional accuracy.

Craig B. Arnold
Princeton University

Date submitted: 24 Nov 2008

Electronic form version 1.4