Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Measurement of lateral tip-sample forces in the attractive regime with picometer resolution in three dimensions B.J. ALBERS, T.C. SCHWENDEMANN, M.Z. BAYKARA, N. PILET, U.D. SCHWARZ, Department of Mechanical Engineering, Yale University, New Haven — Three-dimensional (3D) dynamic force spectroscopy, i.e., the acquisition of frequency shift vs. distance curves in a dense raster over a surface in order to recover the true tip-sample interaction forces with high local resolution, has so far suffered from relatively low resolution, as long-term drift stability has been a problem. Nevertheless, its promise to deliver not only the normal forces with atomic resolution, but also the lateral forces as well as the energy dissipated during an individual oscillation cycle makes it interesting for high-resolution nanotribology. Using our recently completed home-built low temperature, ultrahigh vacuum NC-AFM, we were able to map the full 3D force field over highly oriented pyrolytic graphite, which was chosen due to its qualities as a solid lubricant. Lateral forces have been measured quantitatively in a grid with spacing better than 6 pm in all three directions and pN resolution. We will discuss the distance-dependence of the static lateral forces, their local distributions with regard to the underlying lattice, as well as influences of the tip shape.

Boris Albers

Date submitted: 23 Nov 2007 Electronic form version 1.4