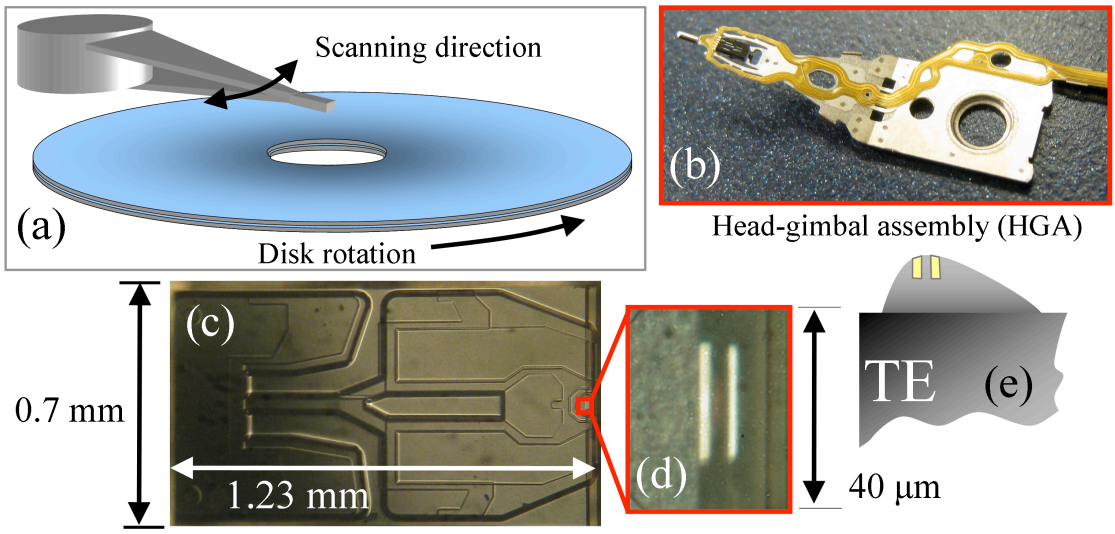
NANOHOUR

Wednesday, Jan 27, 2010 3:00 pm
Beckman Institute - Room 3269

Tbit/in^2 recording densities in magnetic storage

Raja R. Katta, Antonis I. Vakis, Andreas A. Polycarpou, MechSE

The head-disk interface (HDI) in magnetic storage hard disk drives (HDD) consists of a slider flying over an atomically smooth – with RMS roughness $\sigma \sim 5$ Å – disk surface at a nominal flying height (*FH*) of less than 10 nanometers and at speeds of few tens of meters per second. A read/write element on the slider read and writes data to/from the disk by sensing/orienting the grains on a magnetic layer present on the disk. To increase the recording density, the spacing between the read/write elements and the magnetic layer, termed magnetic spacing, must be further reduced to a couple of nm for 1 Tbit/in^2 recording densities. However, bringing the entire slider surface closer to the disk induces vibrations that could lead to catastrophic slider crashes.



Alternatively, thermal fly-height control (TFC) nanotechnology works by thermo-mechanically actuating a small volume around the read/write elements of the slider to bring them closer to the rotating disk surface while allowing the slider body to fly steadily at a nominal flying height of ~10 nm, thus avoiding the significant flying height modulations (*FHM*) typically caused by increased adhesive forces. Due to the need for reduced magnetic spacing, intermittent slider/disk contact might be unavoidable under certain conditions and could lead to scratch-induced data erasures. In the first part of this talk, research on slider/disk contact will be presented to gain fundamental understanding of disk damage and data erasures. In the second part, the dynamics at the HDI will be examined and recent work on the optimization of the geometry of TFC sliders for improved flyability, i.e. reduced *FH* and vibrations, will be presented.

Coffee and cookies will be served

http://nanohour.beckman.uiuc.edu