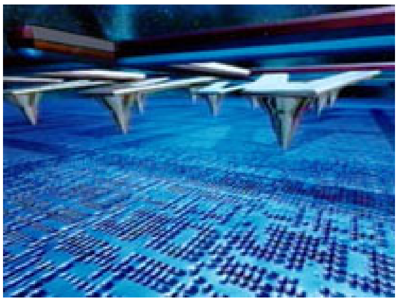
IBM says breakthrough memory technology may crawl out of lab in 2006 or 2007



IBM says its breakthrough memory technology, Millipede, will make it to market in 2006 or 2007, according to a Small Times report. The MEMS/nanotech combo storage effort, is creeping toward reality – this time with its first working quantum storage prototype. Millipede drives are being designed to fit in the same size packaging as SD flash cards with an expected memory capacity at debut of 40-Gbits to 80-Gbits.

Rather than using traditional magnetic or electronic means to store data, Millipede uses thousands of nano-sharp tips to punch indentations representing individual bits into a thin plastic film. The result is akin to a nanotech version of the venerable data processing 'punch card' developed more than 110 years ago, but with two crucial differences: the 'Millipede' technology is re-writeable (meaning it can be used over and over again). The Millipede technology could store 114-Tbits of data per square inch with a data transfer rate of 800-Gbits per second, according to the latest benchmarking of the technology.

"We can't release a product just because it works. It has to have a roadmap, before adding that Millipede would not make it to market in 2005 but could do in 2006 or 2007" report quotes Johannes Windeln, manager of the Millipede project. Once these questions are worked out, IBM must decide whether it will partner with another company to bring Millipede to market, or get back into the storage business again after having sold its group to Hitachi Data Systems in late 2002.

Technical background

The core of the Millipede project is a two-dimensional array of v-shaped silicon cantilevers that are 0.5 micrometers thick and 70 micrometers long. At the end of each cantilever is a downward-pointing tip less than 2 micrometers long. A sophisticated design ensures accurate leveling of the tip array with respect to the storage medium and dampens vibrations and external impulses. Time-multiplexed electronics, similar to that used in DRAM chips, address each tip individually for parallel operation. Electromagnetic actuation precisely moves the storage medium beneath the array in both the x- and y-directions, enabling each tip to read and write within its own storage field of 100 micrometers on a side. The short distances to be covered help ensure low power consumption.

For the operation of the device -- i.e. reading, writing, erasing and overwriting -- the tips are brought into contact with a thin polymer film coating a silicon substrate only a few nanometers thick. Bits are written by heating a resistor built into the cantilever to a temperature of typically 400 degrees Celsius. The hot tip softens the polymer and briefly sinks into it, generating an indentation. For reading, the resistor is operated at lower temperature, typically 300 degrees Celsius, which does not soften the polymer. When the tip drops into an indentation, the resistor is cooled by the resulting better heat transport, and a measurable change in resistance occurs.

To over-write data, the tip makes a series of offset pits that overlap so closely their edges fill in the old pits, effectively erasing the unwanted data. More than 100,000 write/over-write cycles have demonstrated the re-write capability of this concept.

While current data rates of individual tips are limited to the kilobits-per-second range, which amounts to a few megabits for an entire array, faster electronics will allow the levers to be operated at considerably higher rates. Initial nanomechanical experiments done at IBM's Almaden Research Center showed that individual tips could support data rates as high as 1 - 2 megabits per second.

Source: ww.ibm.com