# Technology Development for the Thinning of a Slider with an Integrated Microactuator (SLIM)

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**Abstract**

One requirement in increasing the recording density of Hard Disc Drives (HDD) is to provide second stage actuation. To do so, a second stage actuator has to be integrated in the read/write head to accomplish more accurate and higher frequency track following [1]. A Slider with an Integrated Microactuator (SLIM) is a cost competitive approach. It allows both a vertical (for head-to-disc spacing adjustment) and a lateral (for fine tracking) motion of the read/write element [2]. The SLIM consists of a mechanical and magnetic part, both fabricated on two separate wafers. The actuator micromagnetics is located in the bottom part of the device and consists of a pair of active parts. The actuator micromechanics on top includes (1) a base, (2) an actuated mounting platform to which the read/write element (residing on a chiplet) will be mounted, and (3) a pair of Si cantilevers serving as leaf springs connecting both, base and platform. A spacer joins the bottom and the top. Each of the three pieces (bottom, top, and spacer) is 100 µm thick; thus, the whole stacked structure slider body has a height of 300 µm. The assembly takes place on a double row bar level containing a row of ten sliders each facing each other. For handling reasons, the bottom (micromagnetics) part is left at a thickness of 525 µm until the double row bar is assembled.

The mechanical machining of the components of such complex stacked micro parts is challenging. A dicing process to release the floating mounting platform without damaging the Si cantilevers suspending them has already been evaluated [3]. The thinning process not only has to yield tight thickness tolerances, the surfaces of the thinned device must provide a quality high enough to serve as an air bearing surface (ABS).

For the actual thinning, a combination of the established “Thinning by Dicing” process [4], lapping, and nanogrinding techniques were applied. For each of the thinning steps, the parts were mounted on a thermo-release tape, which allowed a gentle dismount of the parts without damaging their delicate features. To allow an accurate alignment of the row bars on the bonding tool, two parallel U-shaped grooves were cut into the thermo-release tape. After completing the Thinning by Dicing step, the devices were transferred from the dicing tool to the lapping tool and mounted on a thermo-release tape again. The lapping step was used for achieving the nominal 100 µm thickness of SLIM double row bars. To achieve this thickness, 100 µm thick Si-dummies were mounted on both sides of each row bar on the lapping tool, serving as an end gauge. Whenever signs of machining occurred at the dummy parts, the desired end-point was reached. After completing lapping, the row bars were nanoground and polished to achieve the desired high ABS surface quality.

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[2] H.H. Gatzen et. al: A Slider with an Integrated Microactuator (SLIM) for Second Stage Actuation in Hard Disc Drives. Digest, Intermag 2008, Madrid 2008, DF-05

[3] S. Cvetkovic, H. Saalfeld, H.H. Gatzen: Dicing Process for the Device Separation of a Slider with an Integrated Microactuator (SLIM), ASPE08, Portland, USA, 2008 (accepted)

[4] M. Feil et al.: The Challenge of Ultra Thin Chip Assembly, Proc. 54th Electronic Components & Technology Conference, Las Vegas, USA, pp. 253-261, 2004